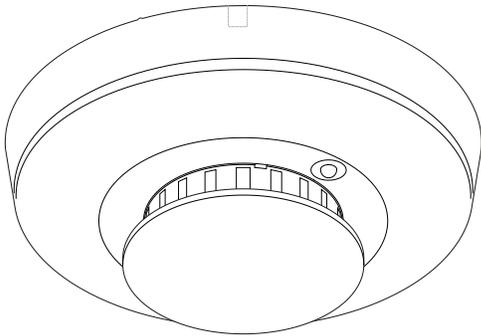




# ESL 500 Series Photoelectric Smoke Detector Installation Sheet



## Description

**Note:** This document is intended for licensed electricians or alarm installers. We cannot provide technical support to unqualified persons.

The ESL 500 Series Photoelectric Smoke Detectors include two-wire and four-wire, 12 VDC and 24 VDC detectors for fire system applications. Depending on the model, the smoke detector provides the features described below.

**Detector-base lock:** Discourages unauthorized removal of the smoke detector by requiring a screwdriver to remove the detector from the base. See Figure 3.

**CleanMe:** Enables a CleanMe compatible control panel to receive a warning signal, indicating that the optical chamber needs to be replaced. This feature is available on the 521-528 series of two-wire detectors only.

**Note:** Turning on the CleanMe signal without a compatible control panel creates a trouble event.

The detectors ship with the CleanMe feature turned off. To turn on the CleanMe signal move DIP switch 2 on the back of the detector to the ON position. See Figure 2.

**Self-diagnostics:** Includes automatic sensitivity testing. Once a day and immediately upon first power up, each 500N Series detector performs a full diagnostic test that includes a dynamic test of the sensing chamber and internal electronics. This meets NFPA 72 field sensitivity testing requirements without the need for external meters.

**Drift compensation:** The detectors automatically adjust sensitivity, up to a maximum of 1.0%/ft., as the detectors become dirty.

**Voltage range selection for UL two-wire compatibility:** The two-wire 500N Series detectors can operate in the 6 to 12 V range, or in the 12 to 24 V range. Use DIP switch 1 to select the desired voltage. See Figure 2, Table 1, and “Specifications” for details.

## Compatibility

Please refer to the *ESL Compatibility Index* for a complete listing of control panels and proper identifiers. For a copy of the compatibility index, see “Contact information” on page 8. Remember, four-wire smoke detectors do not require a compatibility listing.

## Selecting a location

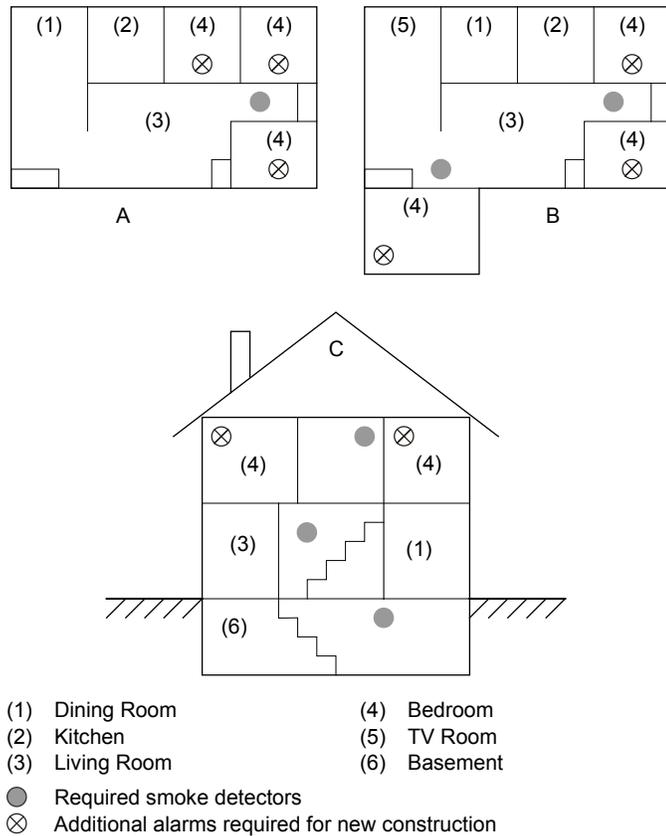
Selecting a suitable location is critical to the operation of smoke detectors. This equipment should be installed in accordance with NFPA 72. Figure 1 shows required and additional locations.

**Where to locate the required smoke detectors in existing construction.** The major threat from fire in a family living unit occurs at night when everyone is asleep. The principal threat to persons in sleeping areas comes from fires in the remainder of the unit. Therefore, a smoke detector is best located between the bedroom areas and the rest of the unit. In units with only one bedroom area on one floor, the smoke detector should be located as shown in Figure 1-A.

In family living units with more than one bedroom area or with more than one floor, more than one smoke detector is required, as shown in Figure 1-B.

In addition to smoke detectors outside of the sleeping areas, the installation of a smoke detector on each additional story of the family living unit, including the basement, is required. These installations are shown in Figure 1-C. The living area smoke detector should be installed in the living room or near the stairway to the upper level, or in both locations. The basement smoke detector should be installed in close proximity to the stairway leading to the floor above. Where installed on an open-joisted ceiling, the alarm should be placed on the bottom of the joists. The alarm should be positioned relative to the stairway to intercept smoke coming from a fire in the basement before the smoke enters the stairway.

**Figure 1: Detector location**



- *Do not* locate detectors in or near bathrooms or kitchens.
- Locate smoke alarms in a suitable environment with temperature and humidity as defined in “Specifications” on page 8.
- Locate smoke detectors away from air conditioners, heating registers, and any other ventilation source that may interfere with smoke entering the alarm.
- Mount smoke detectors on a firm, permanent surface.

## Installing the detector

All wiring must conform to the National Electric Code (NEC) and local codes having jurisdiction. Use 12 to 24 AWG wire to install the detector.

**Note:** Electrical supervision requires that the wire run be broken at each terminal. Do not loop the field wires around the terminals.

1. Set the DIP switch (if applicable) for the desired voltage range and CleanMe operation. Refer to Figure 2 and Table 1 for settings.
2. If you are using the detector-base lock, remove the detector knockout and break off the tab on the mounting base. See Figure 3.
3. Remove the red plastic cover from the detector. The detector is shipped with a cover for protection against construction site dust.
4. Run system wiring to the detector location and mount electrical boxes if necessary.
5. Line up and attach the gasket (if the detector includes one) and mounting base to the electrical box, wall, or ceiling using the screws provided. Use wall anchors if necessary. See Figure 4.
6. Strip the system wires and connect them to the appropriate terminals on the detector. See “Wiring” on page 4.
7. Attach the detector to the mounting base as follows:
  - a. Line up the raised tab on the side of the detector with the arrow on the mounting base. See Figure 5.
  - b. Insert the smoke detector into the base and turn clockwise approximately 15 degrees. It should snap firmly into place.
8. Apply power and test the detector. See “Smoke testing” on page 5.

**Where to locate the required smoke detectors in new construction.** All of the smoke detectors specified for existing construction are required and, in addition, a smoke detector is required in each bedroom.

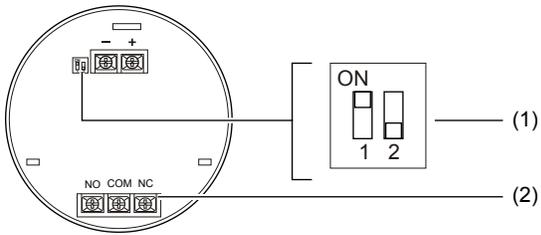
**Are more smoke detectors desirable?** The required number of smoke detectors might not provide reliable early warning protection for those areas separated by a door from the areas protected by the required smoke detectors. For this reason, it is recommended that the householder consider the use of additional smoke detectors for those areas for increased protection. The additional areas include the basement, bedrooms, dining room, furnace room, utility room, and hallways not protected by the required smoke detectors. The installation of smoke detectors in kitchens, attics (finished or unfinished), or garages is not normally recommended, as these locations occasionally experience conditions that can result in improper operation.

**Note:** Regulations pertaining to smoke detector installation vary from state to state. For more information, contact your local fire department or local authority having jurisdiction.

**Additional considerations.** In addition to NFPA 72, use the following location guidelines to optimize performance and reduce the chance of false alarms from the detector:

- Locate ceiling-mounted smoke detectors in the center of a room or hallway at least 4 in. (10 cm) from any walls or partitions.
- Locate wall-mounted smoke detectors so the top of the alarm is 4 to 12 in. (10 to 31 cm) below the ceiling.

**Figure 2: DIP switch and relay location**



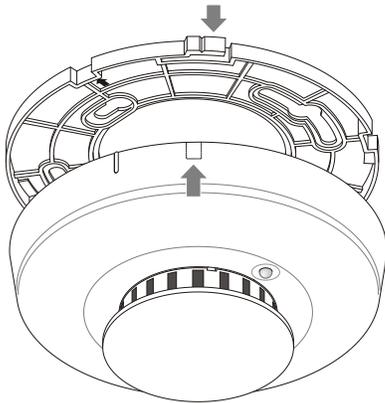
- (1) DIP switch. See Table 1 for settings.
- (2) Relay terminals. CRXT models only.

**Table 1: DIP switch settings**

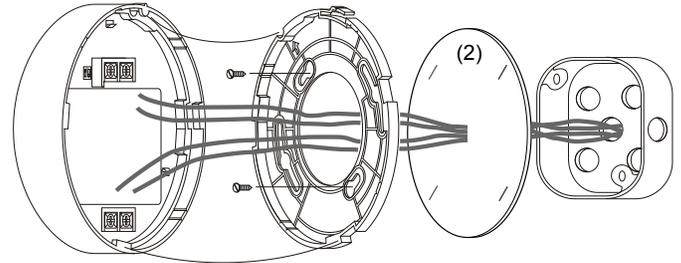
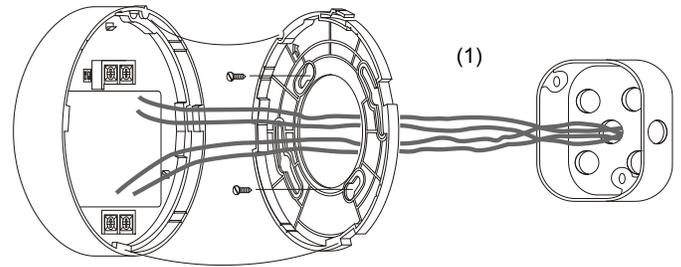
Switch	Setting	Description
S1 Voltage range	ON	6 to 12 V range
	OFF	12 to 24 V range
S2 CleanMe [1]	ON	Signal on
	OFF	Signal off

[1] Applies to the 521-528 series only

**Figure 3: Detector-base lock**

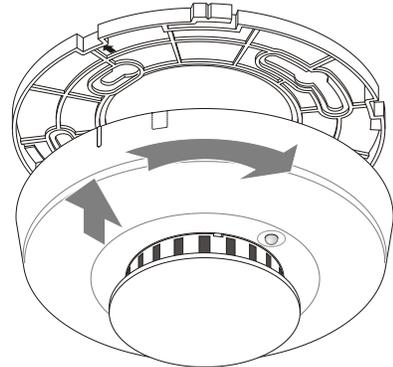


**Figure 4: Detector installation**



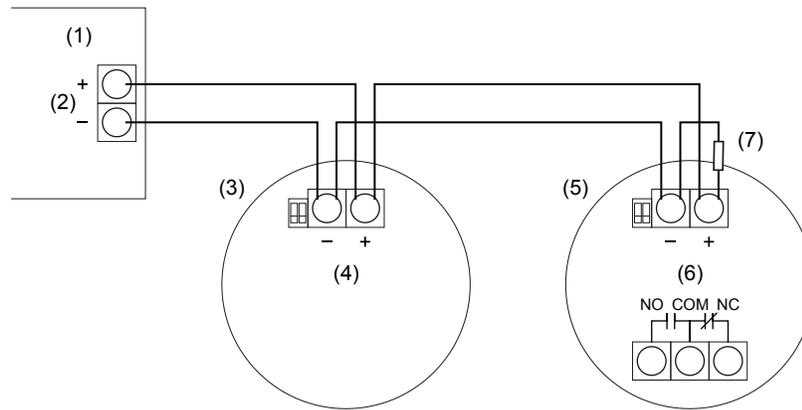
- (1) Models without gaskets: 511C, 518C, 521B, 521BXT, 528B
- (2) Models with gaskets: 528CRXT, 541C, 541CXT, 548C

**Figure 5: Mounting**



## Wiring

Figure 6: 511-518 and 521-528 series two-wire wiring



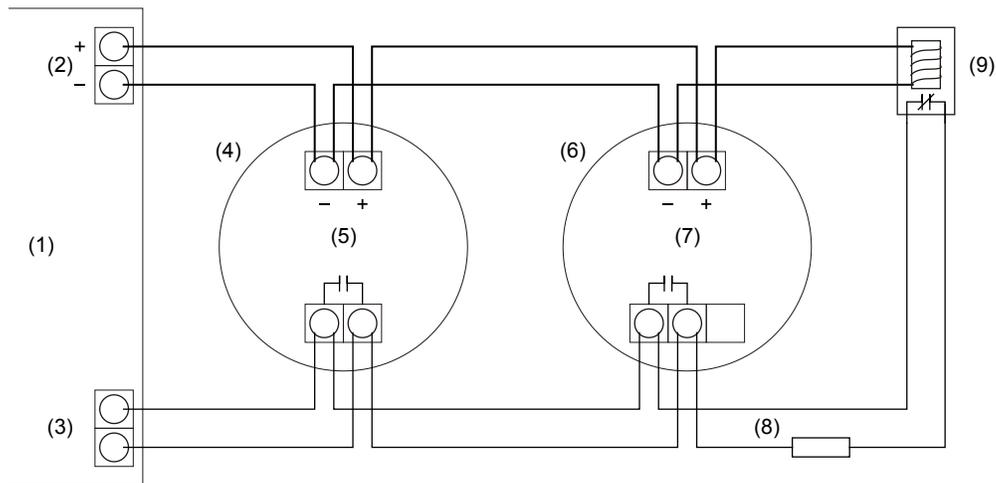
- (1) Listed control panel
- (2) Two-wire initiating circuit
- (3) First detector
- (4) Model: 511C-518C, 521B-528B, or 521BXT

- (5) Last detector
- (6) Model: 528CRXT
- (7) EOL device

**Caution:** Risk of system failure. The system may not operate if the detector is not connected to the control unit initiating device circuit as specified in the detector or control unit literature.

**Note:** 521-528 series two-wire detectors are polarity sensitive.  
**Note:** 511-518 series models are not CleanMe compatible.

Figure 7: 541-548 series four-wire wiring



- (1) Listed control panel
- (2) Power
- (3) Initiating circuit
- (4) First detector
- (5) Model: 541C-548C

- (6) Last detector
- (7) Model: 541CXT
- (8) EOL resistor
- (9) ESL 204-12/24V Power Supervision Relay

**Caution:** Risk of system failure. The system may not operate if the detector is not connected to the control unit initiating device circuit as specified in the detector or control unit literature.

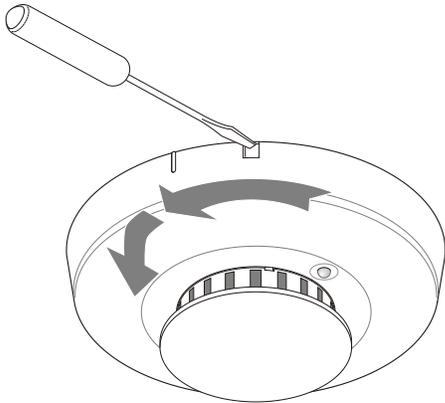
**Note:** 541-548 series models are not CleanMe compatible.

## Removing the detector

**To remove the detector from the mounting base:** Grasp the detector and turn it counterclockwise approximately 15 degrees. The detector should snap off of the mounting base.

**To remove the detector from the mounting base when the detector-base lock is used:** Insert a small screwdriver into the locking tab slot on the side of the base and press in while simultaneously turning the detector counterclockwise 15 degrees. See Figure 8.

Figure 8: Unlocking the detector



## Understanding the LED

The LED on the detector indicates the status of the detector as follows.

- Flashing every 9 seconds = Normal operation
- On = Detects smoke, sending an alarm
- Off or flashing once every 1.5 seconds = Trouble or maintenance is required. Test the detector. See “Sensitivity testing” below.

## Smoke testing

Smoke detectors should be tested in place annually using one of the following methods:

- Use Smoke! In A Can (P/N SM-200), a canned aerosol simulated smoke, and follow the directions on the can.
- Hold a smoldering punk or cotton wick close to the unit and gently direct the smoke into the detector for 20 seconds or until an alarm is indicated.

Be sure to extinguish the smoke source after testing!

The detector LED should stay on and an alarm should be indicated at the control panel. Use the system reset switch to reset the detector.

## Sensitivity testing

The detector provides a sensitivity test that allows you to check the detector sensitivity using a test magnet and the LED indicator on the detector as follows:

1. Hold the test magnet up to the raised TEST letters on the top of the detector for 2 seconds. See Figure 9. Once the test starts, the alarm LED flashes one to nine times.
2. Count the number of times the LED flashes and use the following table to determine the status of the detector sensitivity and what action to take, if any.

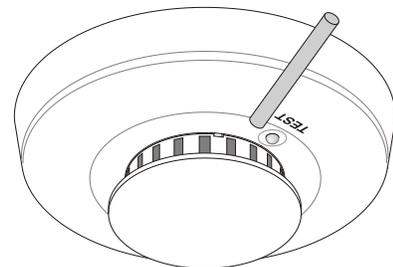
Table 2: Sensitivity status

Flashes	Indication	Action
0 to 1	Unserviceable hardware fault	Reset and rerun the sensitivity test. If the error persists, replace the unit.
2 to 3	Unit is becoming insensitive	Clean and reset the unit. Rerun the sensitivity test. If the error persists, replace the unit.
4 to 7	Unit is within normal sensitivity range	N/A
8 to 9	Unit is becoming too sensitive	Verify that the optical chamber is snapped down securely. Clean the unit.

After the test:

- If the sensitivity is within limits and all other tests pass, the detector goes into alarm and must be reset from the control panel.
- If the sensitivity is not within limits or an unserviceable hardware fault has been detected, the detector LED flashes every 1.5 seconds until the detector is serviced.

Figure 9: Testing the detector



## Cleaning the detector

Clean the detector cover with a dry or damp (water) cloth as needed to keep it free from dust and dirt.

When necessary, clean the detector interior and replace the optical chamber as follows:

1. Disconnect the alarm notification appliances, service release devices, and extinguishing systems.
2. Slide a flat-blade screwdriver into the slot on the detector cap and gently push the handle down to pry the cap up and off. See Figure 10.
3. Press in on the sides of the optical chamber and pull it up and away from the detector and discard. See Figure 11.
4. Use a vacuum to remove dust and dirt from the optical chamber base.
5. Line up the new optical chamber with the optical chamber base and snap it down into place.
6. Replace the detector cap as follows:
  - a. Line up the tabs on the cap with the slots on the detector.
  - b. Insert the cap into the smoke detector and turn clockwise approximately 15 degrees. It should snap firmly into place.
7. Test the detector sensitivity (See "Sensitivity testing" on page 5).
8. Reconnect all alarm notification appliances, service release devices and extinguishing systems.

**Note:** The control panel alarm and all auxiliary functions should be verified for a complete test of the system.

Figure 10: Removing the detector cap

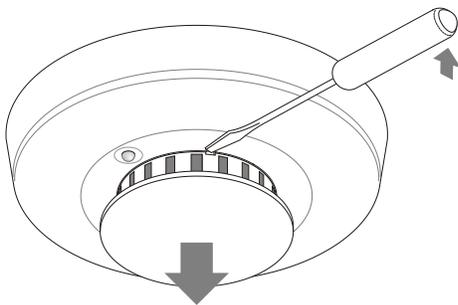
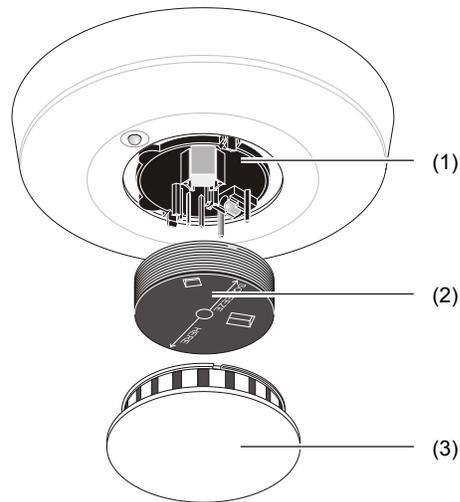


Figure 11: Removing the optical chamber



- (1) Optical chamber base
- (2) Optical chamber
- (3) Detector cap

## Maintenance

These smoke detectors are designed for easy field service and maintenance. When installed and used properly, they require minimal maintenance.

The smoke detector should be tested monthly. See "Sensitivity testing" and "Smoke testing" on page 5.

## Fire prevention and escape

The purpose of an early warning smoke detector is to detect the presence of fire in its early stages and sound an alarm giving the occupants time to exit the premises safely.

### Avoid fire hazards

No detection device can protect life in all situations. Therefore, safeguards should be taken to avoid potentially dangerous situations as follows:

- Do not smoke in bed.
- Do not leave children home alone.
- Never clean with flammable liquids such as gasoline.
- Properly store materials. Use general good housekeeping techniques to keep your home neat and tidy. A cluttered basement, attic, or other storage area invites fire.
- Use combustible materials and electrical appliances carefully and only for their intended uses.
- Do not overload electrical outlets.
- Do not store explosive and/or fast burning materials in your home.
- Even after proper precautions have been taken, fires can start. Be prepared.

## In case of fire

In the event of a fire, do the following:

- Leave immediately. Don't stop to pack or search for valuables.
- In heavy smoke, hold your breath and stay low, crawl if necessary. The clearest air is usually near the floor.
- If you have to go through a closed door, carefully feel the door and doorknob to see if undue heat is present. If they seem cool, brace your foot against the bottom of the door with your hip against the door and one hand against the top edge. Open it slightly. If you feel a rush of hot air, slam the door quickly and latch it. Unvented fire tends to build up considerable pressure. Be sure all members of the household realize and understand this danger.
- Use your neighbor's phone or a street fire alarm box to call the fire department. The job of extinguishing the fire should be left to the professionals.

## Be prepared

Practice the following steps to prepare you and your family in the event of a fire:

- Perform fire drills regularly. Use them to assure recognition of an alarm signal.
- Draw a floor plan and show two exits from each room. It is important that children be instructed carefully, because they tend to hide in times of crisis.
- Establish one meeting place outside the home. Insist that everyone meet there during an alarm. This will eliminate the tragedy of someone reentering the house for a missing member who is actually safe.
- If you have children or physically challenged people residing in your household, use window decals to help emergency personnel identify the sleeping quarters of these individuals.

## Limitations of smoke detectors

**WARNING:** Risk of personal injury or death. Smoke detectors *cannot* provide warnings for fires resulting from explosions, smoking in bed or other furniture, ignition of flammable liquids, vapors, and gases, or children playing with matches or lighters. Failure to properly install, test, and maintain a smoke detector system may cause it to fail resulting in loss of life or property.

Smoke detectors are very reliable, but may not work under all conditions. No fire alarm provides total protection of life or property. Smoke detectors are not a substitute for life insurance.

**Smoke detectors require a source of power to work.** This smoke detector will not operate and the alarm will not sound if the detector is not installed properly.

**Smoke detectors may not be heard.** A sound sleeper or someone who has taken drugs or alcohol may not awaken if the detector is installed outside a bedroom. Closed or partially closed doors and distance can block sound. This detector is not designed for the hearing impaired.

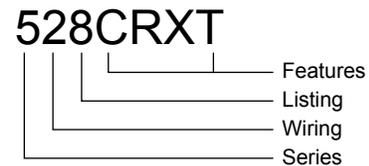
**Smoke detectors may not always activate and provide warning early enough.** Smoke detectors only activate when enough smoke reaches the detector. If a fire starts in a chimney, wall, roof, on the other side of closed doors, or on a different level of the property, enough smoke may not reach the detector for it to alarm.

Smoke detectors are a significant help in reducing loss, injury, and even death. However, no matter how good a detection device is, nothing works perfectly under every circumstance and we must warn you that you cannot expect a smoke detector to ensure that you will never suffer any damage or injury.

Current studies have shown smoke detectors may not awaken all sleeping individuals. It is the responsibility of individuals in the household that are capable of assisting others to provide assistance to those who may not be awakened by the alarm sound, or to those who may be incapable of safely evacuating the area unassisted.

## Model numbers

Figure 12: Model number codes



B	6 to 33 V operation
C	8.5 to 33 V operation
R	Auxiliary relay
XT	Multiple criteria algorithm, rate-of-rise and fixed temp. sensors

## Product ordering

Model	Description
511C-518C	2-wire, photoelectric, 6.5-33VDC
521B-528B	2-wire, photoelectric, 6.5-33VDC
521BXT	2-wire, photoelectric, 8.5-33VDC, multi-criteria algorithms, fixed/rate of rise heat
528CRXT	2-wire, photoelectric, 8.5-33VDC, aux. relay, multi-criteria algorithms, fixed/rate of rise heat
541C-548C	4-wire, photoelectric, 8.5-33VDC
541CXT	4-wire, photoelectric, 8.5-33VDC, multi-criteria algorithms, fixed/rate of rise heat
Accessory	Description
SM-200	Smoke! In A Can (canned smoke) for functional testing of smoke detectors
SM-EXT1	Extension tube for Smoke! In A Can
211	Replacement optical chambers (set of 10)

## Specifications

Voltage	DIP switch 1 ON for standard 12 V operation (6.5 to 20 VDC), polarity sensitive DIP switch 1 OFF for standard 24 V operation (8.5 to 33 VDC), polarity sensitive
Maximum ripple	10% (Vp-p)
Typical average standby current	70 $\mu$ A (at 12 or 24 V)
Typical alarm current	Up to 60 mA maximum if not limited by control panel (at 12 or 24 V)
Aux. relay contacts	2 A at 30 VDC; Form C
Alarm contacts	500 mA at 36 VDC (resistive)
Photoelectric sensitivity	3.1% +0.5% -1.0%
Operating temperature	32 to 100°F (0 to 37°C)
Operating humidity	0 to 95% noncondensing
RFI immunity	20 V/m minimum; 0 to 1,000 MHz
Color	White head and base
Field wiring size	12 to 24 AWG
Electrical boxes	Fits standard single-gang and 3-1/2 in. and 4 in. round ceiling electrical boxes
Detector packaging	10 detectors per carton
Heat detector	Rate-of-rise 15°F/min and >105°F (8.3°C/min and >40.6°C)
UL two-wire compatibility identifiers	521-528 DIP switch 1 ON = S09A 521-528 DIP switch 1 OFF = S10A, S11A (RX models) 511-518 = S10A
Drift compensation adjustment	1.0%/ft. max.
Detector head dimensions	5.0 in. (12.7 cm) diameter; 2 in. (5.0 cm) deep
Mounting dimensions	4.75 in. (12.1 cm) diameter; 0.3 in. (0.8 cm) deep
Reset time	1 second minimum

## Regulatory information

Listings	511, 521, 541 = UL 268 518, 528, 548 = ULC
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## Contact information

For contact information, see [www.interlogix.com](http://www.interlogix.com).