



# ESL 429/449 Series Self-Diagnostic Photoelectric Smoke Detectors

## Installation Instructions

California State Fire Marshal Approved  
MEA (New York City) Approved



### Description

The ESL 429/449 Series low-profile, self-diagnostic, two-wire and four-wire smoke detectors work on the light scattering principle. A pulsed infrared light-emitting diode serves as the light source, and a high-speed photo-diode as the sensing element. This design has superior protection against false alarms caused by dust, insects, RF, and ambient light.

These smoke detectors are especially suited for residential occupancies, including hotels, motels, and dormitories, as well as other commercial and industrial fire-system applications. This series is designed for two-wire and four-wire connection to 6-24 VDC fire alarm control panels, UL Listed for commercial or household fire protection.

### Features

**Self-diagnostics including automatic sensitivity testing.** Each detector in the series continually monitors its own sensitivity and operational status (see *Maintenance*).

A wide range of optional features are offered as shown in the *Product Selection Guide*. To provide for almost any application, these options include a built-in sounder, an auxiliary relay, an integral heat detector, and an isolated heat detector.

### Selecting a Location

Selecting a suitable location is critical to the operation of smoke alarms. This equipment should be installed in accordance with the National Fire Protection Association's (NFPA) Standard 72. See Figure 1.

#### A-11-8.3.a Where to Locate the Required Smoke Alarms 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 alarm(s) 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 alarm(s) 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 alarm is required, as shown in Figure 1 B.

In addition to smoke alarms outside of the sleeping areas, the installation of a smoke alarm 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 alarm should be installed in the living room or near the stairway to the upper level, or in both locations. The basement smoke alarm 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.

#### Where to Locate the Required Smoke Alarms in New Construction.

All of the smoke alarms specified for existing construction are required and, in addition, a smoke alarm is required in each bedroom.

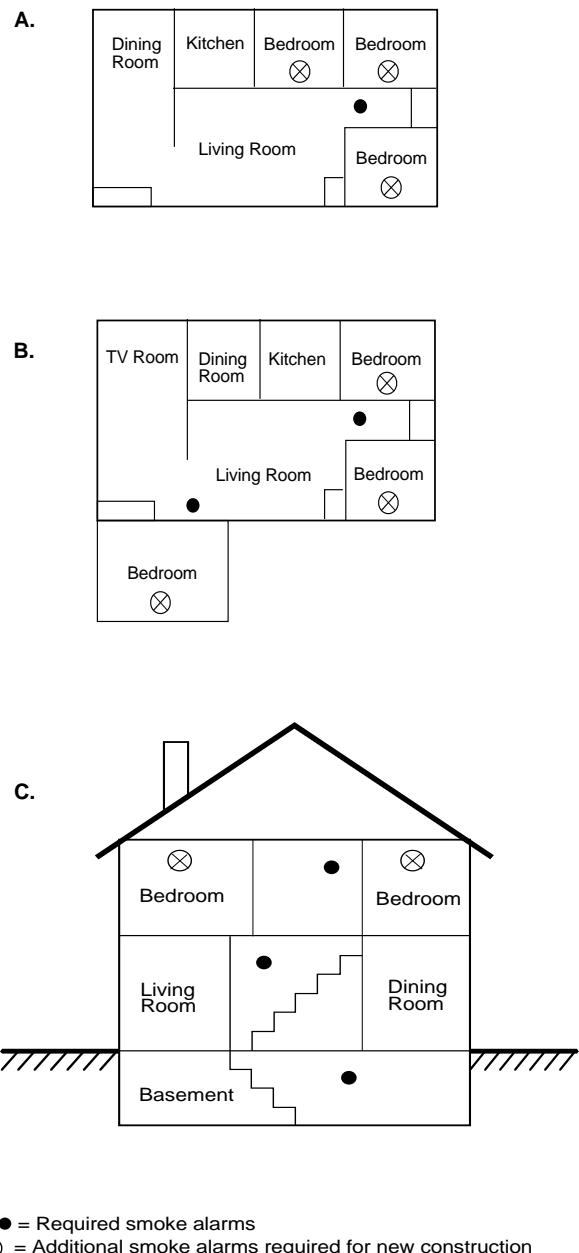
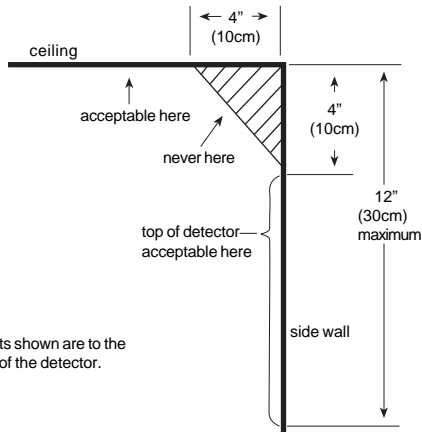


Figure 1 . Detector Location



**Figure 2. Detector Placement**

### Are More Smoke Alarms Desirable?

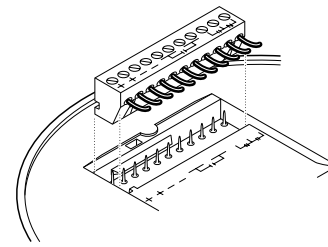
The required number of smoke alarms might not provide reliable early warning protection for those areas separated by a door from the areas protected by the required smoke alarms. For this reason, it is recommended that the householder consider the use of additional smoke alarms for those areas for increased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

### Important !

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

In addition to NFPA 72, use the following location guidelines to optimize performance and reduce the chance of false alarms:

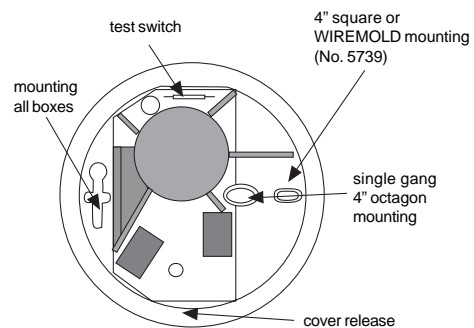
- Locate ceiling-mounted smoke detectors in the center of a room or hallway at least 4 inches (10cm) from any walls or partitions.
- Locate wall-mounted smoke detectors so the top of the alarm is 4 to 12 inches (10 to 30cm) below the ceiling. See Figure 2.
- When more than one detector is required, spacing of 30 feet (9m) may be used as a guide on smooth ceilings. Other spacing may be used depending on ceiling height, high air movement, and other conditions or response requirements.
- Locate in a suitable environment as follows:
  - Temperature between 32°F (0°C) and 100°F (38°C)
  - Humidity between 0 and 95% non-condensing
- Locate away from air conditioners, heating registers and any other ventilation source that may interfere with smoke entering the detector.
- Locate away from kitchens, wood stoves, garages, furnaces, and bathrooms.
- Mount smoke detectors on a firm permanent surface, typically a stud or metal runner.



**Figure 3. Plug-in Terminal Block**

### Note

For instructions on removal of terminal block and circuit board, call technical services at 800-648-7424.



**Figure 4. Detector Mounting**

## Installation

The detectors mount to standard single-gang electrical boxes, four-inch octagonal or four-inch square electrical boxes, or on WIREMOLD No. 5739 fixture boxes. The detectors may also be mounted directly to walls or ceilings where local codes/ jurisdictions permit.

1. Pull wire through the electrical box and connect to the plug-in terminal block supplied, one wire per terminal. See Figures 3 and 5.
2. Dress wiring neatly and snap the terminal block into the back of the detector.

### Note

The detector cover must be closed completely, to support the circuit board, while installing the terminal block.

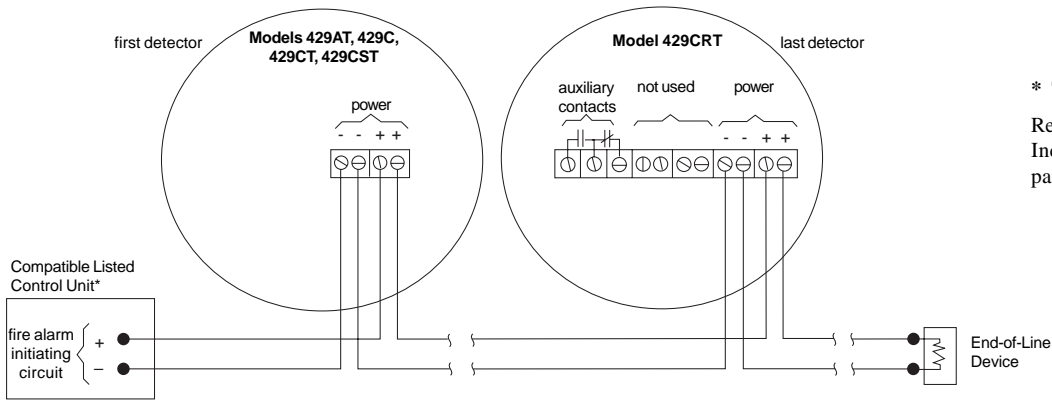
3. Open the cover and mount the detector, using the mounting holes provided. See Figure 4.

### Note

Positive air pressure from wire openings, conduit, mounting boxes, irregular mounting surfaces, or plenums causing air movement through and away from the detector may prevent proper operation. Seal all openings causing unwanted air flow using UL Listed expanding foam or Duxseal.

4. Remove the red plastic dust cover from the detector. The detectors are shipped with a dust cover for protection on construction sites with dusty environments.

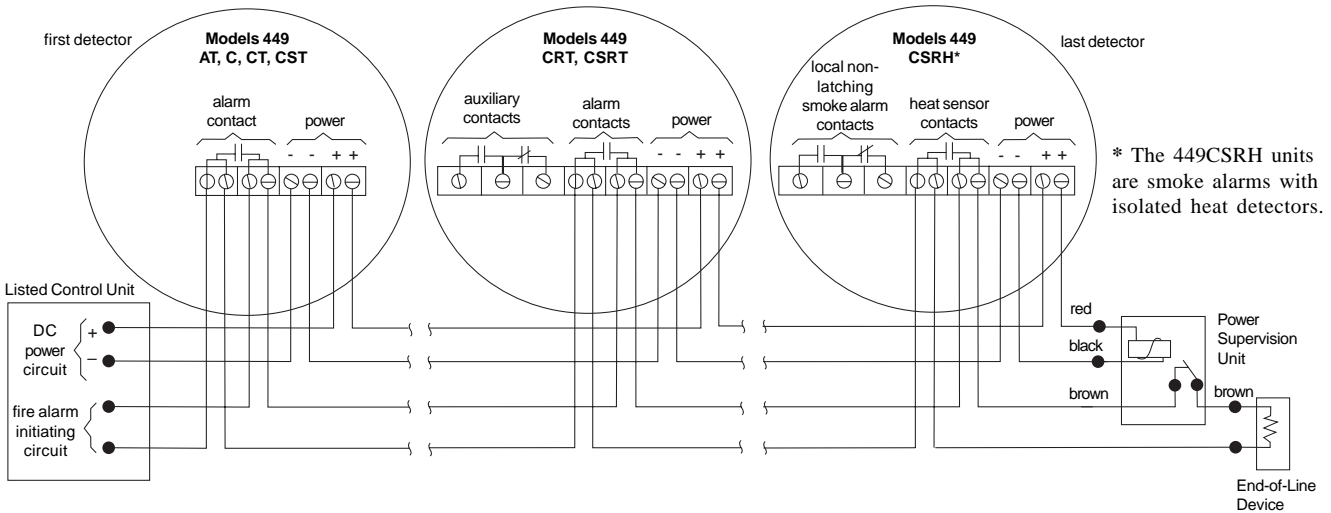
## 429 Series Wiring Diagram



### \* Two-Wire Compatibility

Refer to ESL's Compatibility Index for compatible control panel listings.

## 449 Series Wiring Diagram



\* The 449CSRH units are smoke alarms with isolated heat detectors.

Figure 5. Wiring Diagrams

## Supervision of System Wiring

Power wiring in four-wire systems is required by NFPA 72 to be supervised. This is accomplished by installing a power supervision relay at the end of the detector power circuit. The contacts of the supervision relay are wired in series with the system's alarm initiating circuit, and are closed when energized (see Figure 5). A break in the detector power circuit or a loss of power de-energizes the power supervision relay, opening the contacts and causing a trouble annunciation at the fire alarm control unit.

ESL models 204-6 V and 204-12/24 V are relays UL Listed for four-wire power supervision. Models 449CTE and 449CSTE are smoke detectors with a built-in end-of-line power supervision relay, and can be used to supervise a circuit in place of a power supervision relay. The 449CTE and 449CSTE will also automatically send a trouble signal to the control panel whenever the detector needs maintenance.

## Installation Test

After all connections are complete and the wiring is checked for errors, apply power to the system. There should be no alarm. If an alarm is reported, determine if a detector is latched in alarm or if there is a problem with the wiring.

## Smoke Test

The units should be tested in place annually using one of the following methods:

- A. Use Smoke! in a can<sup>®</sup> and follow the directions on the can.
- B. Hold a smoldering punk or cotton wick close to the unit and gently direct the smoke into the smoke entry openings for 20 seconds or until an alarm is indicated.

**Be sure to properly extinguish the smoke source after testing!** This is a go/no go test and is not a reliable indication of detector sensitivity. If it is successful, the LED will remain lit. To reset the detector, operate the system reset switch to remove power from the detectors. The control unit alarm and all auxiliary functions should be verified for a complete test of each detector.

## Heat Test

Models with heat sensors sample for heat every 3 seconds. Test heat sensors by using a hot air gun. Aim the gun at the heat sensor from 6-10 inches (15-25cm) away. The detector should go into alarm in less than 30 seconds.

## Sensitivity Test

1. Hold the magnet on the hinge side of the unit for more than one second (see Figure 7). The LED will flash 1 to 9 times.
2. Count the number of LED flashes, then use the following table to determine if any action is necessary.

### Flashes

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

After the sequence of flashes, if the sensitivity is within limits and all other tests pass, the unit goes into alarm until reset by the panel. If the sensitivity is not within limits, or an unserviceable hardware fault is detected, the alarm LED will continue to flash once per second until the unit is reset by the panel.

### Note

CSRH models auto reset.

## Maintenance

The smoke detectors are designed for easy field service and maintenance. If a detector drifts beyond its approved sensitivity range for more than 24 hours, or fails internal diagnostic tests, the unit automatically indicates trouble by flashing its LED every second. This meets field sensitivity testing requirements without the need for external meters.

### Note

Connect to a power supply that will not automatically reset. Since the self-diagnostics only indicate trouble after 27 hours, if the power supply automatically resets every 24 hours the self-diagnostic indication will never be signaled (the smoke detector will still signal alarm correctly).

In accordance with NFPA 72, smoke detector sensitivity should be checked within one year after installation and every alternate year thereafter, in commercial installations, or every three years in residential sites. See *Sensitivity Test*.

The detector's replaceable optical block chamber unsnaps for easy field cleaning and service. Whenever the status LED indicates cleaning is necessary, follow these steps:

1. Open the detector cover, unsnap and throw away the optical block chamber. See Figure 6.
2. Thoroughly blow off the optical base and snap a new optical block chamber (part #211) back in place.

### Note

Be sure the new optical block chamber is seated all the way down.

3. Close the detector cover and verify sensitivity. See *Sensitivity Test*.

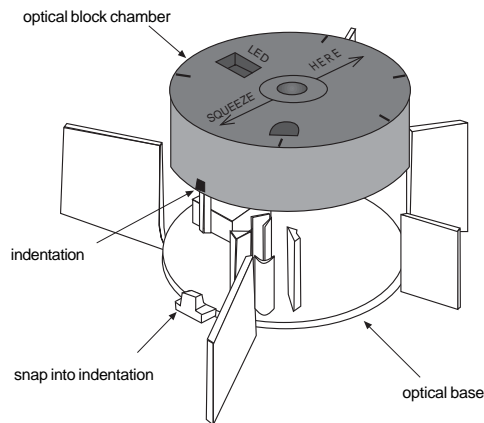


Figure 6. Detector Maintenance

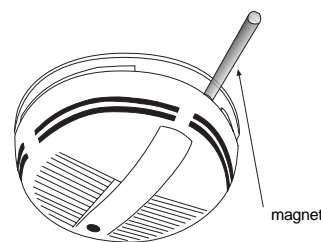


Figure 7. Sensitivity Testing

## Approvals

The smoke detectors are for use in commercial fire protective signaling systems and in household fire warning systems (NFPA 72).

### 429/449 Series

Listed by Underwriter's Laboratories; California State Fire Marshal approved (Listed # 7272-0447-128); MEA approved (New York City) (Listed # MEA 64-94-E) Factory Mutual approved.

# Planning for Emergencies

Develop a plan to prepare for emergency situations. Discuss and rehearse your plan with everyone by doing a fire drill every few months.



## WARNING

**Do not enter a building where sirens are sounding**

### Guidelines

- Understand how to use your fire system.
- Know the normal state of doors and windows: open, closed, or locked.
- Escape fast! (Do not stop to pack.)
- Use a different escape route if closed doors feel hot to the touch.
- Crawl and hold your breath as much as possible to help reduce smoke inhalation during your escape.
- Meet at a designated outdoor location.
- Emphasize that no one should return to the premises if there is a fire.
- Notify the fire department from a phone in another building.

### Your Floor Plan

When establishing your escape routes, consider the following guidelines:

- Have a drawing for each building level.
- Show all exits (two exits per room are recommended).
- Show the location of stairwells and fire escapes.
- Show the location of all components of the fire system.
- Show the locations of all fire extinguishers, hoses, ladders, etc.



## WARNING

**Smoke detectors CANNOT provide warnings for fires resulting from explosions, smoking in bed or other furniture, ignition of flammable liquids, vapors and gases, children playing with matches or lighters.**

# Warning! Limitations of Smoke Detectors

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

**Unreliable transmission or receiving of radio frequency (RF) signals may occur if the system is not installed, located, serviced and repaired properly.** RF signals sent by this detector may be blocked or reflected by metal objects. Adjacent devices or systems using radio frequency signals may interfere with the operation of this alarm. Test the system often to be sure that signals are being sent and received 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.**

# Limited Warranty

ESL is a brand of GE Security. The manufacturer warrants this smoke detector to be free from defects in material and workmanship under conditions of normal use for a term of 3 years from the date of manufacture.

During the warranty period, if a GE Security product or any of its components becomes defective, it will be repaired or replaced without charge.

Out-of-warranty units will be repaired at the discretion of the manufacturer or, if not, a card will be forwarded to the customer suggesting a replacement unit and the cost of that unit.

This warranty does not apply to units which have been subject to abuse, misuse, negligence or accident, or to which any modifications, alterations or repairs have been made or attempted.

This warranty is extended only to the original purchaser of the smoke detector and may be enforced only by such person. During the warranty period, if the detector or any warranted components thereof becomes defective, it will be replaced or repaired without charge at the manufacturer's discretion if returned in accordance with the following instructions:

Obtain a Return Authorization Number by calling 1-800-648-7422 or 503-692-4052, then carefully pack the detector in a well padded and insulated carton and return, postal charges prepaid to:

### Customer Service RMA#

**GE Security**

**12345 SW Leveton Drive**

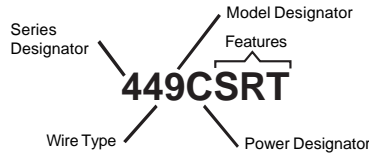
**Tualatin, OR 97062-9938**

A note should be included advising the nature of the malfunction. Care must be exercised in the proper packing of detectors returned under this warranty as GE Security will not be responsible for warranty repairs to equipment damaged because of improper packing.

**The above warranty is in lieu of all other express warranties, and implied warranties of merchantability and fitness for a particular purpose are limited in duration for a period of THREE years from the date of manufacture. Under no circumstances shall manufacturer be liable to the purchaser or any other person for incidental or consequential damages of any nature, including without limitation damages for personal injury or damages to property, and however occasioned, whether alleged as resulting from breach of warranty by manufacturer, the negligence of manufacturer or otherwise. Manufacturer's liability will in no event exceed the purchase price of the product. Some states do not allow limitations on how long an implied warranty lasts, or the exclusion or limitation of incidental or consequential damages, so the above limitations and exclusions may not apply to you. Unless a longer period is required by applicable law, any action against manufacturer in connection with this smoke detector must be commenced within one year after the cause of action has occurred.**

No agent, employee or representative of the Manufacturer nor any other person is authorized to modify this warranty in any respect. Repair or replacement as stated above is the exclusive remedy of the purchase hereunder. This warranty gives you specific legal rights and you also have other rights which vary from state to state.

# Product Selection Guide



## Wire Type

| Number | Description    |
|--------|----------------|
| 2      | Two-wire only  |
| 4      | Four-wire only |

## Model Designator

| Designator | Listing |
|------------|---------|
| 9          | UL      |

## Power Designator

| Designator | Power     |
|------------|-----------|
| A          | 6/12 VDC  |
| C          | 12/24 VDC |

## Features

| Designator | Feature  | Description  |
|------------|--|--|
| E          | End-of-Line Power Supervisory and Sensitivity Status Relay | Built-in end-of-line relay that also acts as a sensitivity status output. For four-wire only. Fail-safe relay trips upon loss of power or if smoke detector is outside the approved sensitivity range for more than one day. End-of-line resistor is easily connected to terminal with no extra wiring, or relay contacts can be connected to a separate trouble loop. |
| H          | Isolated Fixed Temp. and Rate-of-Rise Heat Detector        | Isolated fixed 135°F (57°C) and rate-of-rise heat detector, independently trips the LED and alarm relay output. Smoke detector activates internal sounder (local alarm) and auxiliary relay, but does not latch. Approved as both single station smoke alarm and system heat detector.   |
| R          | Auxiliary Relay  | Used to activate other devices such as elevator recall, door holders, etc. UL Listed for releasing services.   |
| S          | Built-in Sounder   | 85db built-in sounder alarms when smoke is detected or when power wiring polarity is reversed.   |
| T          | Integrated Fixed Temp. and Rate-of-Rise Heat Detector      | Integrated fixed 135°F (57°C) temp. and rate-of-rise heat detector offers double protection. Either heat detector or smoke detector can trip and latch LED and alarm relay outputs.  |

## Electrical Specifications

| Model      | 2-Wire | 4-Wire | Min. Volt. | Max. Volt. | Max. Ripple (PK to PK) (V) | Typ. Avg. Stby. Cur. (12-24V) (uA) | Typ. Alarm Cur. (12-24V) (mA) | Typ. Avg. Pol. Rev. Cur. (mA) | Alarm Relay Contacts (A) | Other Relay Contacts (A) |
|------------|--------|--------|------------|------------|----------------------------|------------------------------------|-------------------------------|-------------------------------|--------------------------|--------------------------|
| 429AT      | *      |        | 6.5        | 20         | 10%                        | 70                                 | *see S09A                     | -                             | -                        | -                        |
| 429C       | *      |        | 8.5        | 33         | 10%                        | 70                                 | *see S10A                     | -                             | -                        | -                        |
| 429CT      | *      |        | 8.5        | 33         | 10%                        | 70                                 | *see S10A                     | -                             | -                        | -                        |
| 429CRT     | *      |        | 8.5        | 33         | 10%                        | 70                                 | *see S11A                     | -                             | -                        | 2                        |
| 429CST     | *      |        | 8.5        | 33         | 10%                        | 70                                 | *see S11A                     | 10                            | -                        | -                        |
| 449C       |        | *      | 8.5        | 33         | 10%                        | 70                                 | 15                            | -                             | 0.5                      | -                        |
| 449CT      |        | *      | 8.5        | 33         | 10%                        | 70                                 | 15                            | -                             | 0.5                      | -                        |
| 449CRT     |        | *      | 8.5        | 33         | 10%                        | 70                                 | 31                            | -                             | 0.5                      | -                        |
| 449AT      |        | *      | 5.1        | 27         | 10%                        | 70                                 | 15                            | -                             | 0.5                      | -                        |
| 449CST     |        | *      | 8.5        | 33         | 10%                        | 70                                 | 40                            | 10                            | 0.5                      | -                        |
| 449CSRT    |        | *      | 8.5        | 33         | 10%                        | 70                                 | 51                            | 10                            | 0.5                      | 2                        |
| 449CSRH ** |        | *      | 8.5        | 33         | 10%                        | 70                                 | 51                            | 10                            | 0.5                      | 2                        |
| 449CSTE    |        | *      | 8.5        | 33         | 10%                        | 23mA                               | 51                            | 33                            | 0.5                      | 2                        |
| 449CTE     |        | *      | 8.5        | 33         | 10%                        | 23mA                               | 31                            | 23                            | 0.5                      | 2                        |

### Power Supervision Units

| Model                  | Min. Volt. | Max. Volt. | Typ. Avg. Stby. Cur. (uA)  | Relay Contacts (A) |
|------------------------|------------|------------|----------------------------|--------------------|
| 204-6V (UL Listed)     | 5.1        | 15         | 33mA @ 6VDC                | 0.5                |
| 204-12/24V (UL Listed) | 8.5        | 33         | 14mA @ 12VDC, 28mA @ 24VDC | 0.5                |

### Accessories

|         |   |
|---------|---|
| SM-200  | Smoke! in a can® canned smoke for functional testing of smoke detectors               |
| SM-EXT1 | Smoke! in a can® extension accessory  |
| 211     | Replacement optical blocks (set of 10)  |
| 241     | Terminal block for 4-wire smoke detectors 449CTE, 449CSTE, 449AT, 449C, 449CT, 449CST |

\* 429 models draw up to a maximum of 60mA current if not limited by panel.

\*\* 449CSRH model is a smoke alarm with isolated heat detector.

Certain items in the installation instructions are protected under one or more of the following patents: 5,546,074; 5,798,701; 5,821,666; 6,756,906

## Specifications

Operating temperature ..... 32°F to 100°F (0°C to 38°C)  
 Operating humidity range ..... 0 to 95% non-condensing  
 Sounder specifications ..... 85dB at 10 feet  
 Field wiring size ..... 14-24 AWG  
 Self-diagnostic indication ..... typically 27 hours after reset  
 (do not connect power supply that resets every 24 hours)

Heat detector ..... fixed temp 135°F, 50 foot (15m) spacing  
 rate-of-rise 15°F/min > 105°F (8°C/min > 41°C)  
 Auxiliary relay contacts ..... 2A @ 28VDC or 120VAC (resistive)  
 Alarm contacts ..... 500mA @ 36VDC (resistive)  
 Dimensions ..... 6.1" (15.5cm) diameter x 1.9" (4.7cm) deep  
 Weight ..... 8.8 oz. (0.25kg)  
 Color ..... white

**GE Security**  
 12345 SW Leveton Drive  
 Tualatin, OR 97062  
 503-692-4052

USA & Canada: 800-547-2556  
**Tech Support:** 800-648-7424  
 www.ge-security.com  
 14153D / September 2004