

## What is unique about the Siemens Combination AFCI?

The Arc Fault Circuit Interrupter (AFCI) technology is important to electrical contractors as they work to build safe, efficient electrical distribution systems. Diagnosing the cause of AFCI trips can be confusing, but the unique trip indicators built into every Siemens AFCI offer help that is not available on any other AFCI.



Siemens Combination Type AFCI trip indicators provide a valuable analysis tool to help electricians pinpoint the type of trip. These indicators are in the form of LEDs that appear near the handle of the breaker. The LED indications will appear for 5 seconds each time the AFCI is turned "ON" up to 30 days after the last trip.

- One LED will be illuminated if the last trip was a result of an arcing fault. On the 2-pole AFCI, the leg on which the arcing fault was detected can be determined based on which single LED was illuminated.
- Two LEDs (three LEDs on the 2-pole AFCI) will be illuminated if the last trip was a result of an arcing fault to ground.
- No indication will be displayed if the AFCI trips as a result of an overcurrent condition.



The last known trip indication can also be cleared from memory to assist with verifying resolution of the problem by following this simple process:

1. Turn the AFCI to the "OFF" position.
2. Press and hold PTT button(s).
3. Turn the AFCI to the "ON" position.
4. Release PTT button(s) within 3 seconds.

### LED Indication Guide (after recent trip has occurred)

Turn AFCI to "ON" position. Observe LED indications and compare to chart below:

LED indications will appear for 5 seconds each time the AFCI is turned "ON." Display will appear each time the AFCI is reset up to 30 days after last trip.

#### 1-pole CAFCI LED indication guide

| LED indicator |         | Last known trip condition |
|---------------|---------|---------------------------|
| LED (A)       | LED (B) |                           |
| OFF           | OFF     | Overcurrent               |
| ON            | OFF     | Arc Fault                 |
| ON            | ON      | Arc Fault to ground       |

#### 2-pole CAFCI LED indication guide

| LED indicator |          |          | Last known trip condition |
|---------------|----------|----------|---------------------------|
| Yellow 1      | Yellow 2 | Yellow 3 |                           |
| OFF           | OFF      | OFF      | Overcurrent               |
| ON            | OFF      | OFF      | Arc fault (Leg A)         |
| OFF           | OFF      | ON       | Arc fault (Leg B)         |
| ON            | ON       | ON       | Arc fault to ground       |

### Siemens Combination Type AFCI Troubleshooting Procedure

Siemens has developed a step-by-step troubleshooting procedure that simplifies the process of diagnosing the cause of AFCI trips. See instruction sheet at [www.usa.siemens.com/afci](http://www.usa.siemens.com/afci) for more details. An abbreviated procedure is listed below:

- 1) Check AFCI wiring
  - Load power, load neutral, and panel neutral (pigtail)
  - Multi-wire branch circuits used on single pole AFCI (dedicated load neutral wires required for single pole AFCIs)
  - Check all connection points for neutral-to-ground connections
- 2) If load(s) present:
  - Disconnect all loads
  - Re-connect and re-energize each load, one at a time
- 3) If no load present:
  - Disconnect AFCI load side wires and re-energize AFCI (panel neutral (pigtail) must remain connected)

Siemens Branch/Feeder AFCIs utilize a single trip window that distinguishes between an arcing event and an overcurrent condition as the reason for the last known trip condition. This window is permanently reset each time the AFCI is reset.

The information provided in this brochure contains merely general descriptions or characteristics of performance which in case of actual use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of contract.

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Siemens Industry, Inc.  
 Building Technologies Division  
 5400 Triangle Parkway  
 Norcross, GA 30092  
 1-800-964-4114  
[info.us@siemens.com](mailto:info.us@siemens.com)

[www.usa.siemens.com/afci](http://www.usa.siemens.com/afci)

# Reduce the risk of electrical fires



## Combination Type AFCI

Answers for industry. **SIEMENS**

## What is an arc fault?

An arc-fault is an unintentional discharge of electricity in a circuit.

Arcing exists in two basic varieties:

- **Natural, or normal occurring arcing:**
  - Occurs when a light is switched on or a vacuum cleaner or any motor driven appliance is turned on.
- **Unsafe arc-faults:**
  - Occurs either as series or parallel faults in wire, electrical devices, or connected loads.



Arcing faults, which can and generally do go undetected by traditional circuit protection means, can reach extraordinarily high temperatures — upwards of 9,000 degrees Fahrenheit.



The heating of surrounding materials creates a carbon remnant that acts as a high impedance conductor. As the carbon path extends, the by-products of the arc increase the available fuel source, magnifying the likelihood of a fire.

## What causes an arc-fault?

Arc-faults may occur anywhere in the home's electrical system in several ways:

### Line-to-Neutral



Damaged power supply cord (Example: door continually "pinches" cord)



Pushing furniture against cords plugged into outlets

### Line-to-Ground



Accidentally piercing electrical cable behind drywalls with drill bit, nail, or screw



Hammering electrical cable staples too tightly into studs during rough wiring

### Series



Screw terminal where a wire is connected to a receptacle may become loose as it is pushed back into the work box

## History of the AFCI

During the early to mid 1980s, a United States Fire Administration (USFA) report helped prompt the U.S. Consumer Product Safety Commission to investigate deeper into the causes of electrical fires. The report which was completed in 1987, concluded electrical fires occurred most often in branch circuit wiring, followed by receptacle outlets, and extension cords. Satisfied with the results, in 1994 the CPSC issued a request to 800 manufacturers to submit any new technology for evaluation to reduce the risk of electrical fires.

The 2005 NEC® requires the Combination Type AFCI to be implemented January 1, 2008. The proposed wording for the 2008 NEC will expand protection from just the bedrooms to all living areas.

### AFCIs provide an increased level of safety to the electrical wiring system.

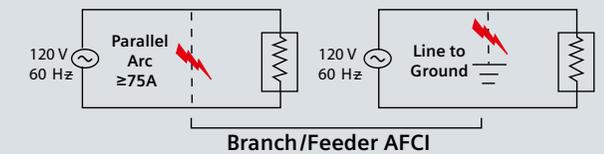
Statistics: Based on home wiring issues, the U.S. Fire Administration estimates:

- 67,800 fires each year<sup>①</sup>
- 485 deaths annually<sup>①</sup>

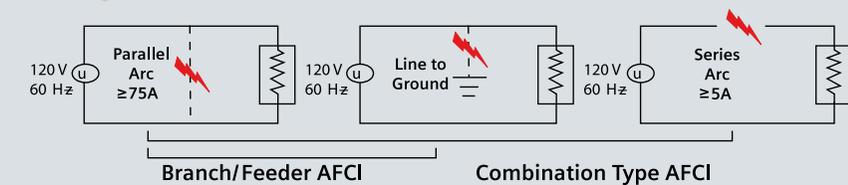
## Combination AFCI

- "Combination" does NOT mean an AFCI + GFCI
- Provides protection against the high-energy parallel (line-to-neutral and line-to-ground) arcing and low-energy series arcing.<sup>②</sup> Combination = parallel + series arcing
- Protects downstream branch circuit wiring, cord sets, and power supply cords.

<sup>②</sup> Branch/Feeder AFCI only protects against high energy arcing



The Branch/Feeder AFCI can only detect line-to-neutral and line-to-ground arcing faults, as illustrated above.



A Combination Type AFCI detects all three types of arcing: line-to-neutral, line-to-ground, and series arcing. The Combination Type AFCI differs from the Branch/Feeder AFCI in its ability to detect series arcing faults.

- ~2,300 injuries annually<sup>①</sup>
- \$868 million in property losses<sup>①</sup>

### National Electric Code® Progression 1999 NEC®

- Listed AFCI future requirement in Code
  - Allows Branch/Feeder AFCI
- January 1, 2002: bedroom receptacles

### 2002 NEC®

- Listed AFCI in ALL bedroom circuits
  - Allows Branch/Feeder AFCI

### 2005 NEC®

- Combination Type AFCI in bedroom circuits
- Branch/Feeder AFCI permitted until January 1, 2008

### 2008 NEC®

- Combination Type AFCI
- Expand to 1 pole, 15 – 20A circuits installed in family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, or similar rooms or areas

<sup>①</sup> On the Safety Circuit: A Fact Sheet on Home Electrical Fire Prevention. United States Fire Administration (2006)