

## FIRE-GUARD

### FIRE-GUARD® Arc Fault Circuit Interrupter (AFCI)



CH115AF



CH115CAF



BR115AF



BR115CAF

### Product Description

Eaton's FIRE-GUARD Arc Fault Circuit Interrupter (AFCI) is a residential circuit breaker that incorporates advanced Electronic Technology which recognizes the unique current and/or voltage signatures associated with arcing faults, and acts to interrupt the circuit to reduce the likelihood of an electrical fire.

With the Cutler-Hammer FIRE-GUARD AFCI, protection from arcing faults is combined with the protection afforded by standard residential circuit breakers. The FIRE-GUARD AFCI protects against arcing directly as well as responding to overcurrents by conventional thermal and magnetic trips.

FIRE-GUARD AFCI can also be equipped with 5 mA ground fault personnel protection, providing a residential circuit breaker that protects against arcing faults, thermal overloads and short circuits, and in addition, 5 mA ground fault protection in one integrated design.

Eaton Corporation has the widest selection of AFCI product solutions on the market today.

### Application Description

#### Fire Prevention

The AFCI product is a rare fire safety product in that it is pro-active and not re-active by nature. Most fire safety products such as smoke detectors, fire extinguishers, escape ladders, oxygen bottles and the like expect that a fire has already started and will be used to safely exit or mitigate the problem. The AFCI product is pro-active in that it detects a problem that can cause fires and works to mitigate the problem before the fire begins.

Household electrical problems caused more than 67,000 fires and more than \$800 million in property losses in 2003. Electrical fires cause an estimated 485 deaths annually and injure almost 2,300 more. Electrical fires can be caused by numerous problems, including appliance defects or misuse, incorrect installation of wiring, or misapplied electrical cords.

In 1992, the Consumer Product Safety Commission (CPSC) contracted with Underwriters Laboratories (UL) to research and evaluate products and

technology that could reduce the likelihood of residential fires. UL identified that "arcing faults" could eventually lead to the ignition of a fire as one possible cause of residential fires.

### Historical Perspective

Prior to the FIRE-GUARD AFCI, present-day residential circuit breakers were designed to protect wiring from excessive heating by opening automatically when an overload condition was present. These breakers typically contain a bimetal and magnetic trip element. During low current overloads, heating of the bimetal element causes the breaker to unlatch the contact-separation mechanism, turning power off in the affected circuit. For high overcurrent conditions, such as short circuits, the high magnetic field associated with high current flow causes the "instantaneous tripping" of the breaker mechanism. The breaker response time is a function of the circuit current and time, with faster response at higher currents. In particular, the circuit breaker Time versus Current characteristics, is selected to prevent conductor damage. Present overcurrent devices, such as circuit breakers and fuses, represent a major safety feature in today's residences. They prevent excessive temperatures in the conductors or conductor insulation and they reduce the incidence of household fires, to a great extent, through their prevention of overheating effects.

The response time of present-day circuit breakers is determined solely by the duration and magnitude of the circuit overcurrent. This response is adequate to protect the wiring if the circuit wiring integrity has been maintained. However, once this integrity has been compromised via broken wires or deteriorated insulation, electric arcs can occur. These arcs are characterized by a plasma flame which can release temperatures in excess of 6000°C. An arcing fault can go undetected by a thermal, as well as magnetic trip element. The challenge answered by the FIRE-GUARD AFCI is to enhance circuit protection by identifying the presence of arcing faults, and responding to their presence by opening the circuit in times which are faster than standard circuit breakers. By integrating custom electronics into a present-day circuit breaker, the FIRE-GUARD meets the challenge and offers enhanced protection from household fires.

### Product Selection

Table 4-33. Type CH 3/4-Inch (19.1 mm) Wide FIRE-GUARD AFCI Circuit Breakers

Poles	Ampere Rating	Configuration	Catalog Number	Price U.S. \$
Single-Pole 10 kAIC	15	Branch Feeder AFCI	CH115AF	
		Branch Feeder AFCI with GFCI	CH115AFGF	
		Branch Feeder AFCI in Clamshell Package	CH115AFCS	
	20	Combination Type AFCI	CH115CAF	
		Combination Type AFCI in Clamshell Package	CH115CAFCS	
		Combination Type AFCI Plug-on Neutral	CH115CAFPN ③	
Double-Pole 10 kAIC ①②	15	Branch Feeder AFCI	CH120AF	
		Branch Feeder AFCI with GFCI	CH120AFGF	
		Branch Feeder AFCI in Clamshell Package	CH120AFCS	
	20	Combination Type AFCI	CH120CAF	
		Combination Type AFCI in Clamshell Package	CH120CAFCS	
		Combination Type AFCI Plug-on Neutral	CH120CAFPN ③	
Double-Pole 10 kAIC ①②	15	Branch Feeder AFCI Common Trip	CH215AF	
		Branch Feeder AFCI Independent Trip	CH215AFIT	
	20	Branch Feeder AFCI Common Trip	CH220AF	
		Branch Feeder AFCI Independent Trip	CH220AFIT	

① Common trip refers to 2-pole 240 volt load application sourced by 120/240 Vac (See Figure 4-14).

② Independent trip refers to 2-pole shared neutral circuits (see Figure 4-13 and Figure 4-15).

③ Requires plug-on neutral loadcenter.

Table 4-34. Type BR 1-Inch (25.4 mm) Wide AFCI Circuit Breakers

Poles	Ampere Rating	Configuration	Catalog Number	Price U.S. \$
Single-Pole 10 kAIC	15	Branch Feeder AFCI	BR115AF	
		Branch Feeder AFCI with GFCI	BR115AFGF	
		Branch Feeder AFCI in Clamshell Package	BR115AFCS	
	20	Combination Type AFCI	BR115CAF	
		Combination Type AFCI in Clamshell Package	BR115CAFCS	
		Combination Type AFCI Plug-on Neutral	BR115CAFPN ③	
Double-Pole 10 kAIC ④⑤	15	Branch Feeder AFCI	BR120AF	
		Branch Feeder AFCI with GFCI	BR120AFGF	
		Branch Feeder AFCI in Clamshell Package	BR120AFCS	
	20	Combination Type AFCI	BR120CAF	
		Combination Type AFCI in Clamshell Package	BR120CAFCS	
		Combination Type AFCI Plug-on Neutral	BR120CAFPN ③	
Double-Pole 10 kAIC ④⑤	15	Branch Feeder AFCI Common Trip	BRL215AF	
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Table 4-35. UL Classified Branch Feeder AFCIs

Poles	Ampere Rating	Configuration	Catalog Number	Price U.S. \$
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Type CL 1-Inch Wide per Pole Classified Arc Fault Circuit Interrupters —  
Fit Square D HOMELINE®, GE, Siemens, Murray®, Thomas & Betts® and Crouse-Hinds® Loadcenters

Single-Pole	15	AFCI	CL115AF	
	20	AFCI	CL120AF	

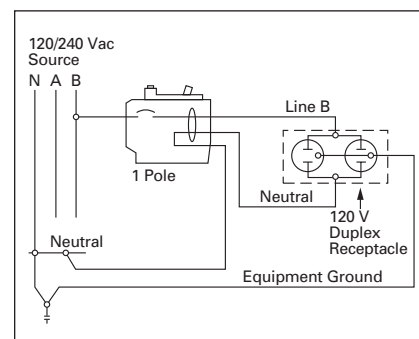


Figure 4-12. Single-Pole Single 120 Volt Load Application Sourced by 120/240 Vac

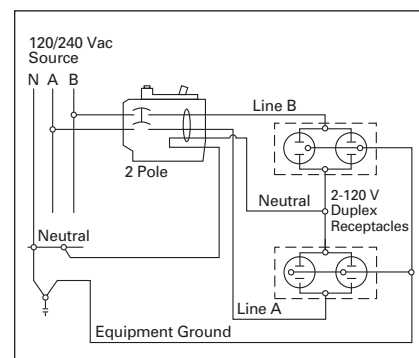


Figure 4-13. 2-Pole Shared Neutral with Multi-Duplex Receptacle Application

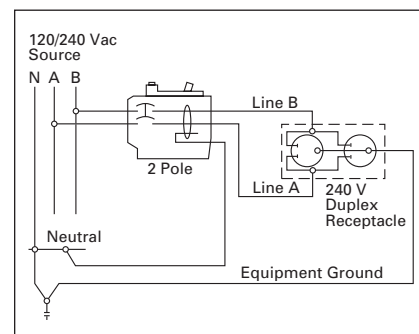


Figure 4-14. 2-Pole 240 Volt Load Application Sourced by 120/240 Vac

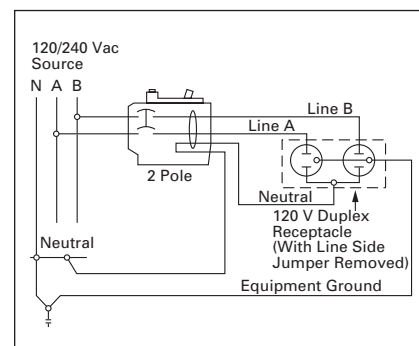


Figure 4-15. 2-Pole Shared Neutral with Duplex Receptacle Application

Discount Symbol ..... 22CD

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Double-Pole 10 kAIC ①②	15	Branch Feeder AFCI	CH120AF	
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		Branch Feeder AFCI in Clamshell Package	CH120AFCS	
	20	Combination Type AFCI	CH120CAF	
		Combination Type AFCI in Clamshell Package	CH120CAFCS	
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① Common trip refers to 2-pole 240 volt load application sourced by 120/240 Vac (See Figure 4-14).

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		Combination Type AFCI in Clamshell Package	BR115CAFCS	
		Combination Type AFCI Plug-on Neutral	BR115CAFPN ③	
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		Branch Feeder AFCI in Clamshell Package	BR120AFCS	
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		Combination Type AFCI in Clamshell Package	BR120CAFCS	
		Combination Type AFCI Plug-on Neutral	BR120CAFPN ③	
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Type CL 1-Inch Wide per Pole Classified Arc Fault Circuit Interrupters —  
Fit Square D HOMELINE®, GE, Siemens, Murray®, Thomas & Betts® and Crouse-Hinds® Loadcenters

Single-Pole	15	AFCI	CL115AF	
	20	AFCI	CL120AF	

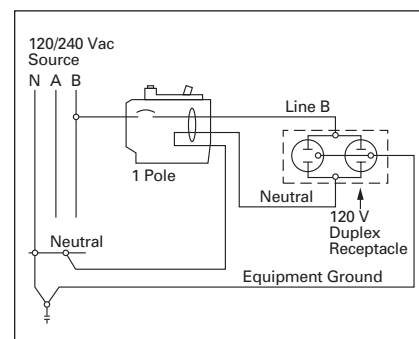


Figure 4-12. Single-Pole Single 120 Volt Load Application Sourced by 120/240 Vac

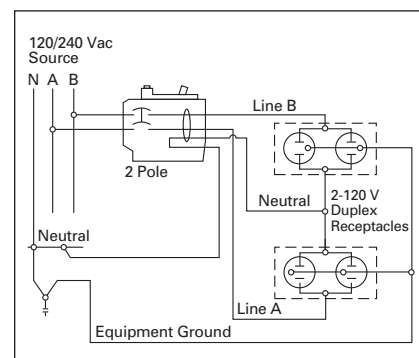


Figure 4-13. 2-Pole Shared Neutral with Multi-Duplex Receptacle Application

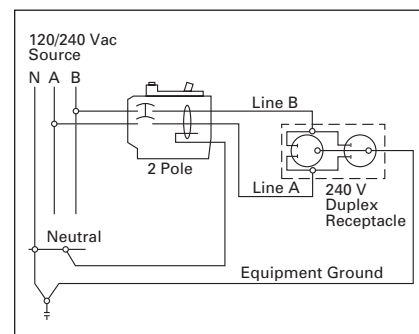


Figure 4-14. 2-Pole 240 Volt Load Application Sourced by 120/240 Vac

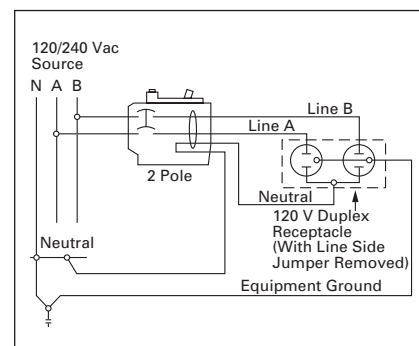


Figure 4-15. 2-Pole Shared Neutral with Duplex Receptacle Application

Discount Symbol ..... 22CD