



RESIDENTIAL SOLUTIONS

Residential Electronic Circuit Interrupters

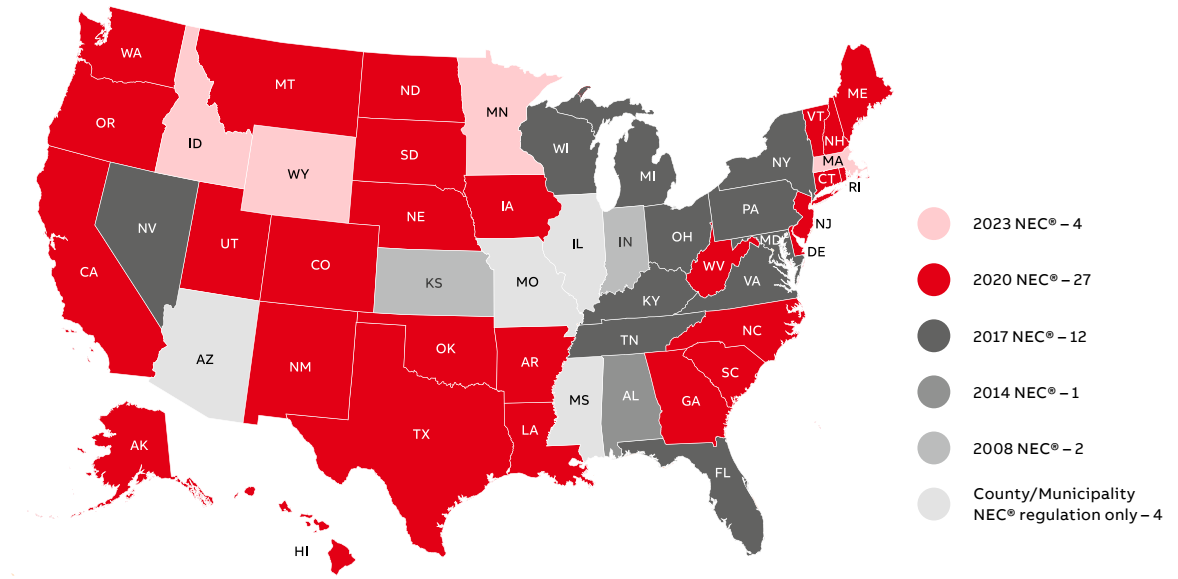


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The 2023 NEC® and what it means for residential construction

01 NEC in effect as of Feb. 1, 2023, according to NFPA To view the NFPA's latest NEC adoption maps, visit <https://www.nfpa.org/NEC/NEC-adoption-and-use/NEC-adoption-maps>.



The NEC provides updated requirements for ground fault circuit interruption (GFCI), arc fault circuit interruption (AFCI), surge protection, emergency disconnect and other areas affecting residential construction. ABB has the expertise, products and solutions to help you comply with the NEC and the latest code changes for 2023.

Why the NEC matters

NFPA 70®, the National Electrical Code® (NEC), is “the benchmark for safe electrical design, installation and inspection to protect people and property from electrical hazards,” according to the National Fire Protection Association (NFPA), developers of the code.

The code is not federal law, but some form or version of the NEC has been adopted by all 50 states. Thus, compliance with the NEC within the U.S. is not optional, but mandatory, and critical to the safety and wellbeing of workers, homeowners and tenants.

NEC adoption by state

Every three years, the NFPA updates the NEC. As you can see from the map on the following page, different states adopt the NEC at different rates. As of July 1, 2023, four states have completed their 2023 NEC update process. The 2020 NEC is in effect in twenty-seven states, the 2017 NEC is in effect in twelve, the 2014 NEC is in effect in one states and the 2008 NEC is in effect in two states.

It’s important to note that local authorities having jurisdiction (AHJs) and governing bodies may impose additional requirements to and/or deviations from the NEC, so you should always confirm code requirements with the local jurisdiction.

Dual Function Circuit Interrupter (DFCI)

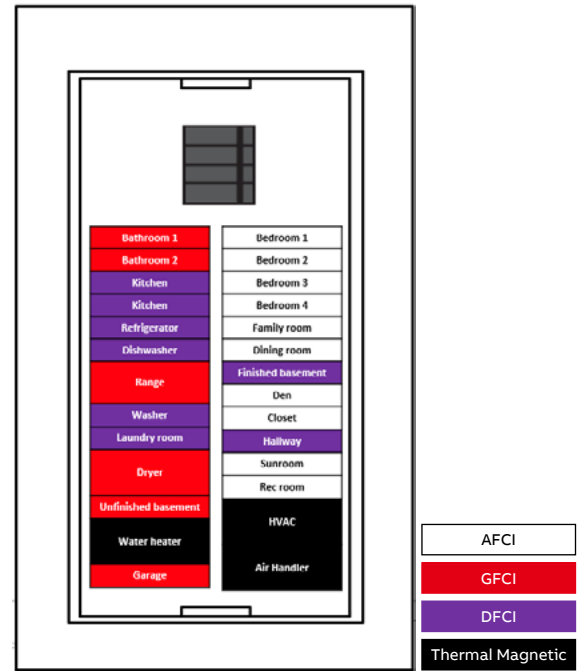
Provides ground fault and arc fault circuit protection in one unit

Dual function circuit interrupters utilize both GFCI and AFCI detection technology.

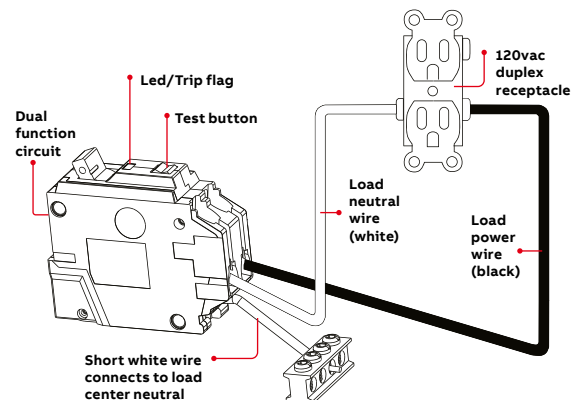
- GFCI protection guards against ground faults, and is an effective means of preventing electrical shocks. GFCI circuit breakers accomplish this by detecting when current is “leaking” somewhere outside its intended path. If your body provides the path to ground for this “leakage” you could be burned, shocked or even electrocuted.
- AFCI protection guards against damage or fires that can result from arcing and sparking. Arc Faults can arise from deteriorated wires, poor connections and breaches in wire insulation. With more than 67,000 home fires claiming more than 485 lives and injuring 2,300 victims annually, the added safety provided by AFCI protection is an important step forward in reducing this risk.

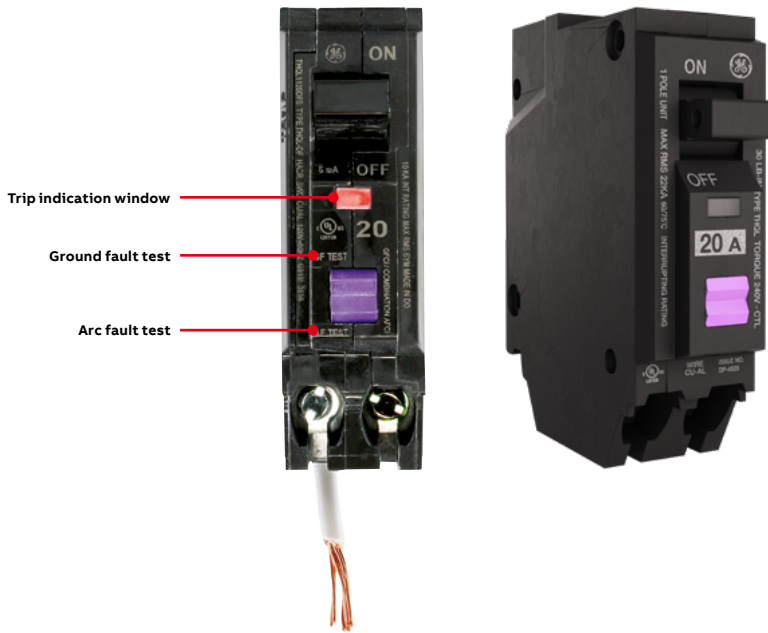
Dual function (DFCI) breakers — Provide both ground fault and arc fault protection. Required by NEC 2020 and newer code in or with:

- Kitchen counter
- Dishwasher
- Clothes washer
- Laundry room or area



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Wiring diagram





Features

Our DFCI has useful features for assisting you or your electrician in troubleshooting a trip. Should the DFCI trip, the LED inside the trip flag window will indicate the last known trip condition when the breaker is reenergized as shown in the chart below.

Push to Test

ABB's two position push to test allows verification of the AFCI and GFCI protection independently. It's also a good way to practice observing the LED indications covered below.

Specifications

- Combination Arc Fault Circuit Interrupter and Class A 5mA Ground Fault Circuit Interrupter
- 120VAC, 60 Hz
- Wire range #14-8 AWG
- UL listed Arc Fault Circuit Interrupters no. 1699
- UL listed Ground Fault Circuit Interrupters no. 493
- UL listed Molded Case Circuit Breakers no. 489

LED Color Pattern	Last known trip condition
Orange	Overload
Orange-Red	Arc fault
Orange-Yellow	Ground fault

Dual Function Circuit Interrupter Catalog Numbers

Ampere rating	1-pole, 120/240 volts ac		1-pole, 120/240 volts ac	
	Ordering code		Ordering code	
	Long pig tail	Short pig tail	Short pig tail	Plug-on neutral
10,000 AIC				
15	THQL1115DF	THQL1115DFS		THQL1115PDF
20	THQL1120DF	THQL1120DFS		THQL1120PDF
22,000 AIC				
15	THHQL1115DF	-		THHQL1115PDF
20	THHQL1120DF	-		THHQL1120PDF



Combination Arc Fault Circuit Interrupter (AFCI)

Provides arc fault protection

—

Electrical fires in homes break out more than 67,000 times each year in the U.S. alone. Many result from arc faults. Arc faults are unintended electrical arcs that may ignite combustible materials in the home. Four types of arc faults may occur: line-to-line, line-to-ground, line-to-neutral, or a series arc fault, which is arcing over a gap within a single wire.

Arc fault (AFCI) breakers — Help prevent the arc faults that can result in electrical fires. Required by 2020 NEC for use in:

- Family room
- Dining room
- Living room
- Bedroom
- Sunroom
- Library
- Den
- Office hallways
- Closets
- Recreation room
- Kitchen (except where otherwise noted)

Arc Faults may arise from a number of situations

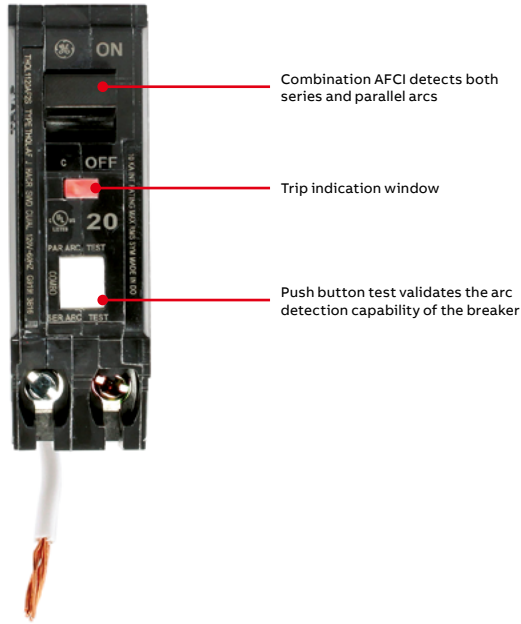
- Damaged wires
- Wires pinched to grounded metal box
- Worn electrical insulation
- Corroded connections
- Loose electrical connections
- Shorted wires
- Wires or cords in contact with vibrating metal
- Overheated or stressed electrical cords and wires
- Misapplied/damaged appliances

ABB Combination AFCIs help protect against all types of arc faults

An arc fault circuit interrupter (AFCI) detects arc faults and de-energizes the circuit before a fire can start. ABB Combination AFCIs offer multiple kinds of protection.

- Parallel protection – Combination AFCIs can detect and interrupt parallel arc faults (line-to-line, line-to-ground, line-to-neutral, or a series arc fault).
- Series Protection – A series arc fault is the unintended flow of electricity over a gap within a single wire. These arc faults were not detectable until advanced technology allowed the development of the Combination AFCI breaker.
- Overload protection.
- Short circuit protection.

These combination AFCIs electronically identify unique current and voltage characteristics of all arc faults and de-energize the entire circuit when one occurs.



Combination AFCI detects both series and parallel arcs

Trip indication window

Push button test validates the arc detection capability of the breaker

- ABB is one of the few companies to offer **AFCI in a 1 inch standard breaker** package freeing up valuable wire space.
- **Meets most recent National Electric Code** requirements for all dwelling units.
- **2 position Push button test** validates the arc detection capability of the breaker (Series and Parallel).
- **Protects the entire circuit** with an easy plug-in breaker design.
- **Combination AFCIs** are able to detect series and parallel arcs at a very low current level.

Specifications

- 1 pole
- 15A or 20A
- 10kAIC or 22kAIC
- 120/240 VAC
- Wire Range #14-8 AWG CU / #12-8 AWG AL
- UL listed Arc Fault Circuit Interrupters No. 1699
- UL Listed Molded Case Circuit Breakers No. 489



Arc Fault Circuit Interrupter Catalog Numbers

Ampere rating	1-pole, 120/240 volts ac ¹		1-pole, 120/240 volts ac	1-pole, 120/240 volts ac
	Ordering code		Ordering code	Ordering code
	Long pig tail	Short pig tail	Short pig tail	Plug-on neutral
10,000 AIC				
15	THQL1115AF2	THQL1115AF2S	THQL1115AF2S	THQL1115PAF2
20	THQL1120AF2	THQL1120AF2S	THQL1120AF2S	THQL1120PAF2
22,000 AIC				
15	THHQL1115AF2	-	-	THHQL1115PAF2
20	THHQL1120AF2	-	-	THHQL1120PAF2

¹ Combination AFCI compliant with 2008 NECTM and later

The ABB AFCI Advantage

Multi-wire circuits, shared neutrals, and mixed neutrals = No Problem!

New construction applications

Other manufacturers often use some form of Ground Fault measurement to aid in the detection of Arc Fault signatures. The only way for them to have a shared neutral solution is to create a two pole breaker with one neutral input shared by both poles of the breaker.

- Purchasing a 2 pole AFCI breaker that is specific to the shared application is generally quite a bit more expensive than two 1 pole breakers.
- Installers must inventory a completely different breaker catalog number and plan the number of shared neutrals runs.
- Installers must keep track of the neutrals as they would with a standard 1 pole installation.

ABB's simple solution uses (2) 1 pole breakers tied together with a handle tie.

- The handle tie is the only added expense – quite small.
- You don't have to carry a separate catalog number – just use two of the standard 1 pole breakers.
- ABB's AFCI does not monitor the neutral at all.
- Only the pigtail on the breaker has to be connected to energize the breaker – as with our competition.

Retrofit applications

ABB sets itself apart in its ability to ignore mixed and shared neutrals commonly found in existing installations.

The risk of having shared or non-isolated neutrals in retrofit situation is very high and will cause breakers that use a ground fault scheme in their AFCI detection to nuisance trip.

Disadvantaged breakers that use a ground fault scheme in their AFCI detection:

- The circuit's neutral must come back to the specific breaker from which the hot leg originated.
- The neutral cannot be combined with other neutrals downstream.
- If the above conditions are not met the AFCI will trip as a result of its ground fault detection.
- All circuits with the above conditions must be cleaned up to achieve AFCI protection.

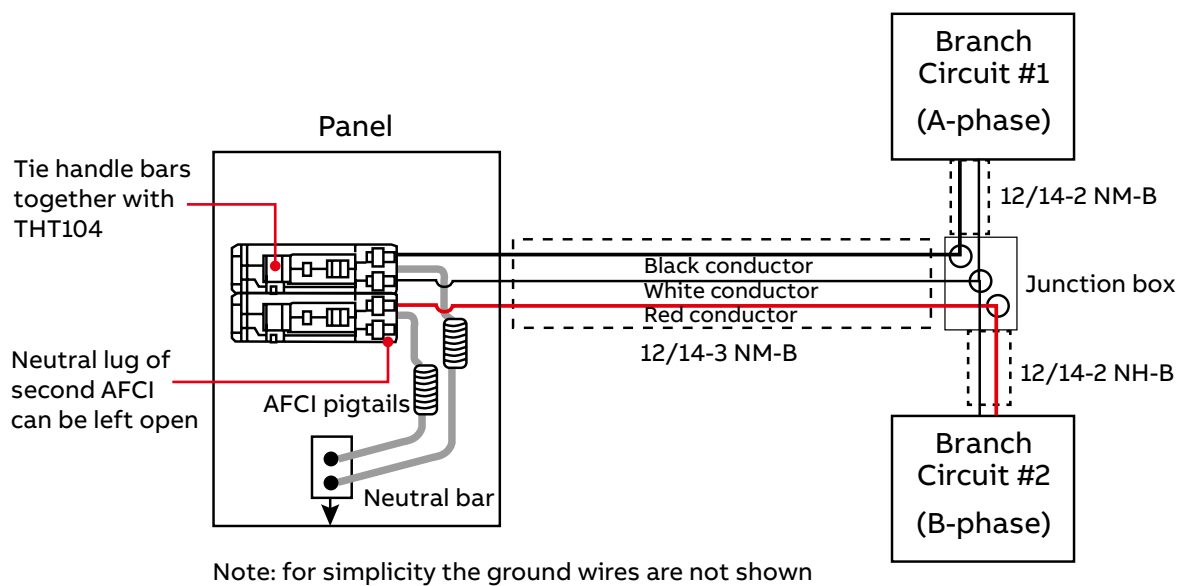
The ABB solution is a one pole AFCI breaker – Period!

- Install the ABB AFCI as you would any traditional circuit breaker.
- The ABB AFCI does not need to monitor the neutral to provide full protection.
- The ABB AFCI will not trip if the neutral for the protected circuit is combined downstream with neutrals of other circuits.

The ABB solution is the superior alternative when compared to receptacle options as well.

- The entire circuit is AFCI protected regardless of the length of the home run.
- Contractors and homeowners need not worry about:
 - Accessibility issues either code driven or due to the location of the receptacles.
 - Trip reset procedures are always conducted at the load center – reducing callbacks when customers cannot figure out where to reset a trip device.

Wiring diagram



Ground Fault Circuit Interrupter with Self-Test (GFCI)

Provides ground fault protection



The GFCI circuit interrupter provides protection against overloads, short circuits and ground faults. It detects very low levels of electrical current leakage (ground faults), and acts quickly to shut off power, preventing serious shock.

Ground fault (GFCI) breakers — Help protect people from electric shock. Required by the National Electrical Code (NEC)

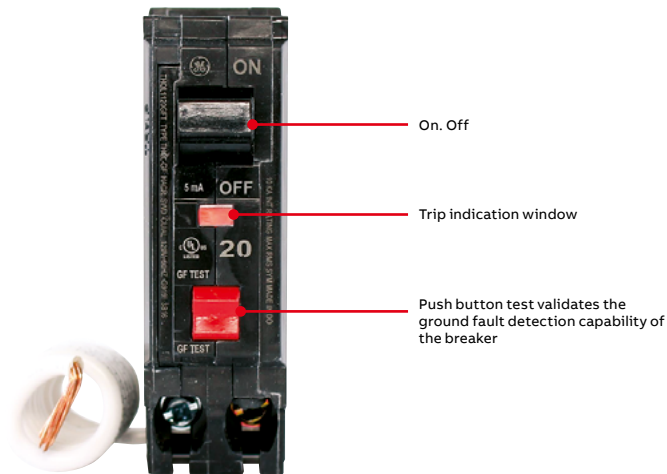
for use in or with:

- Bathroom
- Garage
- Porch
- Pool area
- Laundry
- Unfinished basement
- Clothes dryer
- Stove/oven/range
- Outdoors

What is a Ground Fault?

Normally, the electrical current traveling to an electrical appliance is equal to the current traveling from that appliance. However, an imbalance in that flow indicates a current leak — also referred to as a “ground fault,” because the leaking current is escaping to the ground.

If the leaking current is traveling through a person, that person could be injured, burned, severely shocked or electrocuted. For example, when a hair dryer is dropped into a sink full of water, some of the electrical current leaks out of the appliance and into the water. This current leak could be enough to kill someone who comes in contact with the water, but not be large enough to trip a non-ground fault circuit interrupter. (Standard circuit breakers only guard against over-loads and short circuits. They are not designed to protect people from electrical shocks).



Why ABB Ground Fault Circuit Interrupters with Self-Test?

Self-test functionality is a UL requirement on all GFCI devices that began in June of 2015. This variant of the GFCI ensures its ground fault circuitry is functioning properly by automatically running diagnostic testing on a periodic basis. Should a problem be detected, the circuit breaker will trip and will need to be replaced.

When installed in a home's load center, the ABB GFCI Self-Test does everything a circuit breaker does and it helps protect people against dangerous electrical shock caused by ground faults. Whenever it detects a ground fault, it almost instantaneously shuts off power, helping to prevent an electrical shock.

Specifications

- Class A 5mA Ground Fault
- Circuit Interrupter
- 1 or 2 pole
- 15A, 20A, 25A, 30A, 35A, 40A, 45A, or 50A
- 10KAIC
- 120 Vac or 120/240 Vac
- Wire Range #14-8 AWG CU / #12-8 AWG AL
- UL Listed Molded Case Circuit Breakers No. 489

Ground Fault Circuit Interrupter Catalog Numbers

Ampere rating	1-pole, 120 volts ac		1-pole, 120 volts ac		1-pole, 120 volts ac		2-pole, 120/240 volts ac		1-pole, 120/240 volts ac	
	Ordering code		Ordering code		Ordering code		Ordering code		Ordering code	
	Long pig tail		Short pig tail		Plug-on neutral		Long pig tail		Plug-on neutral	
10,000 AIC										
15	THQL1115GFT	THQL1115GFTS	THQL1115PGFT	THQL2115GFT	THQL2115PGFT					
20	THQL1120GFT	THQL1120GFTS	THQL1120PGFT	THQL2120GFT	THQL2120PGFT					
25	THQL1125GFT	-	THQL1125PGFT	THQL2125GFT	THQL2125PGFT					
30	THQL1130GFT	-	THQL1130PGFT	THQL2130GFT	THQL2130PGFT					
35	-	-	-	THQL2135GFT2	-					
40	-	-	-	THQL2140GFT2	-					
45	-	-	-	THQL2145GFT2	-					
50	-	-	-	THQL2150GFT2	-					
22,000 AIC										
15	THHQL1115GFT	-	THHQL1115PGFT	THHQL2115GFT	THHQL2115PGFT					
20	THHQL1120GFT	-	THHQL1120PGFT	THHQL2120GFT	THHQL2120PGFT					
25	THHQL1125GFT	-	THHQL1125PGFT	THHQL2125GFT	THHQL2125PGFT					
30	THHQL1130GFT	-	THHQL1130PGFT	THHQL2130GFT	THHQL2130PGFT					

Accessories

Description	Breaker Type	Product Number
THQP Padlocking Handle Lock	THQP	TQPPL
THQL Padlocking Handle Lock	THQL	THP100
THQL AF, GF, DF Padlocking Handle Lock	THQL AF, GF, DF	THP100E

*Snap on handle lock
Padlock not included



ABB Inc.

305 Gregson Drive
Cary, NC 27511

electrification.us.abb.com

Additional information

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