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Arc Fault Circuit Interrupter Troubleshooting Guide

Arc Fault Circuit Interrupters (AFCIs) are devices that alleviate the effects of arcing faults to protect buildings against the dangers of electrical fires. Determining the cause of an AFCI trip can be confusing and time-consuming, but the innovated trip indicators and the Siemens exclusive Intelli-Arc™ Diagnostic Tool offer help to the troubleshooting process.

The Siemens exclusive LED trip indicators and the Intelli-Arc™ Diagnostic Tool are valuable to help electricians pinpoint the location on the circuit that is causing the breaker to trip.

This guide will outline a step-by-step procedure to resolve the cause of the AFCI trip.



Troubleshooting checklist card can be ordered at usa.siemens.com/afci



usa.siemens.com/afci

Homeowners and Electrical Contractors: Start by removing the cause

Troubleshooting should only be performed by qualified electricians. However, there are measures that the homeowners and electrical contractors can take to possibly eliminate the problem before it arises. These few tricks can save the homeowner time, money, and the stress of an AFCI trip.

Homeowners

There are six preventative factors homeowners can take in order to decrease the chance that a breaker will trip.

- First, all connections between the light socket and the light bulb base should be tight. An arc can occur in a loose connection, which will cause the AFCI breaker to trip.
- Beware that the circuit is not overloaded with an excessive amount of electronics. The breaker is only able to support a specified amount of wattage, and if exceeded, the breaker will trip.
- Protect electronics on surge protectors. They will protect the electronics from times of high electrical surges, like thunderstorms.
- All electronics purchased should be Underwriters Laboratories (UL) listed, or equivalent, and comply with part 15 of the FCC rules, or they may cause unnecessary tripping.
- Make sure furniture is not on or pushing against electrical wires.
- If any blackened plugs, very damaged wires, or noisy circuit breakers are discovered, an electrical problem has occurred and the homeowner should call an electrician.

Electrical Contractors

Electrical contractors can also take some preventative steps during the installation process.

- Ensure properly maintained tools are used, i.e. sharp blades.
- Route wires in strategic areas so homeowners and other trades are less likely to pierce through a wire.
- If possible, perform work after the other trades, i.e. HVAC and plumbing, have completed.
- Wire receptacles around the screw instead of backstabbing; it creates great wear and tear on the wiring over time.

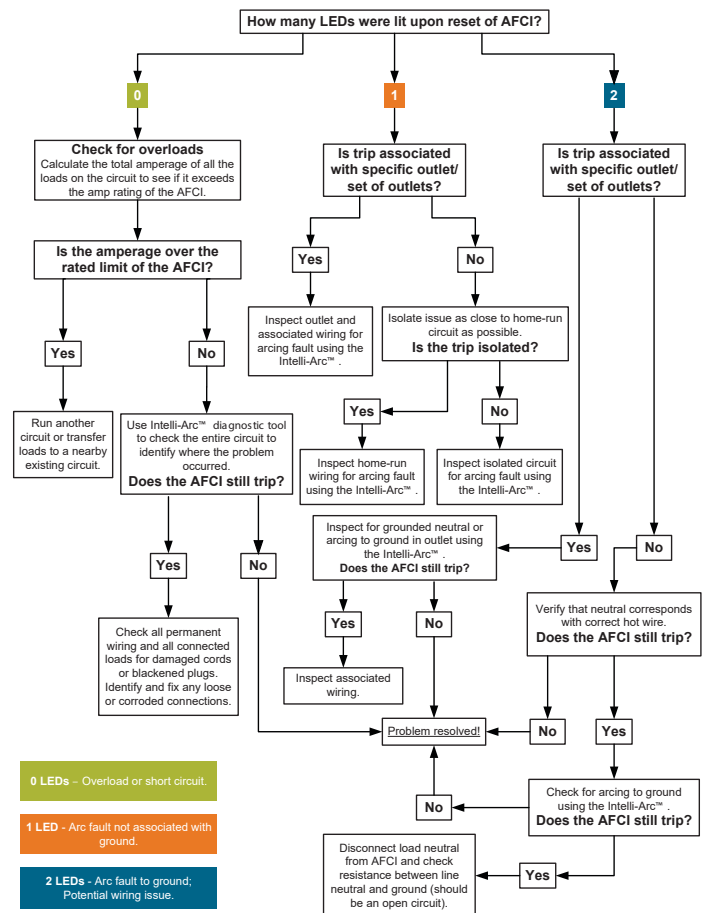
Fact: The largest cause of non-confined fires in one- and two- family residential building fires between 2008 and 2010 occurred because of an electrical malfunction^①. AFCIs help to prevent such tragedies.

① "One- and Two-Family Residential Building Fires (2008-2010)," U.S. Fire Administration, May 2012

AFCI trips: Finding the cause

The first step to troubleshooting is to eliminate the most common causes. For newer installations, the prevalent errors occur because of short circuits, overloads, and a single pole AFCI being used on a multi-wire branch, which is often known as a shared neutral. On remodeled houses, the wiring or loads attached to the circuits are common causes for AFCI tripping. Siemens trip indicators on the AFCI are a valuable troubleshooting tool for the electrical contractor to guide him or her in the right direction. Depending on the number of poles the AFCI has different LED light combinations that indicate trip condition. These trip indicators will appear for 5 seconds after the AFCI is turned to an ON position for up to 30 days of the last trip. The last known trip can also be cleared. The only way to test to see if the AFCI breaker is properly working is to use the Push-to-Test button located on the device. Other "AFCI testers" on the market are not UL endorsed and will cause confusing and misleading results.

The figures below are displays troubleshooting methods when a 1-pole AFCI trips.

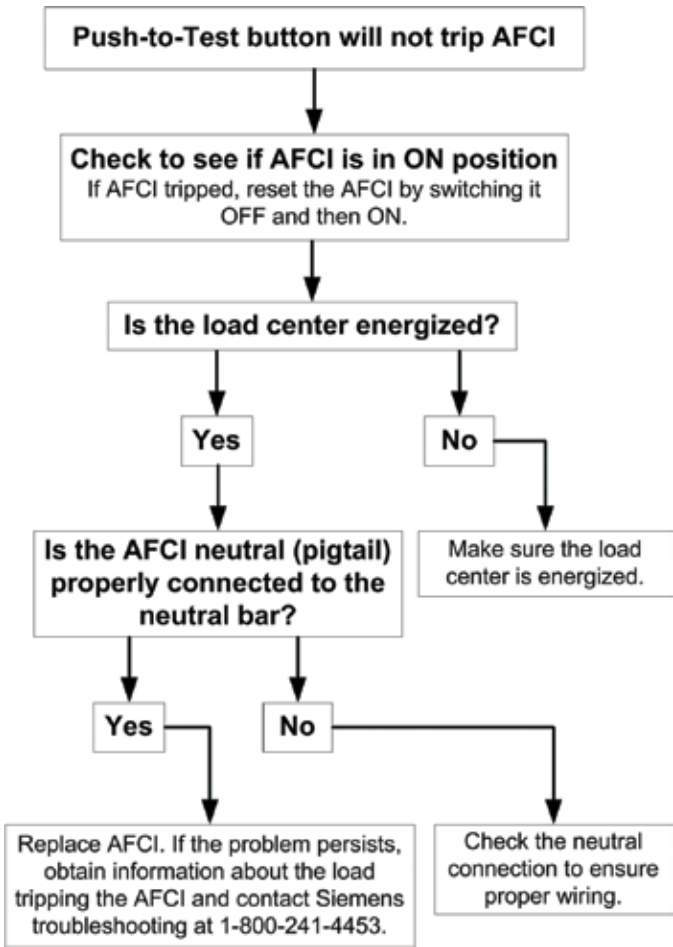


Fact: Siemens was the first to introduce the LED indicator technology in AFCIs and the two-pole AFCI. Siemens strives to engineer the best products that are leaders in the market.

The last known trip condition can be cleared by the following process for both 1- and 2-pole breakers:

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

The figure below is an aid for a step-by-step procedure if the Push-to-Test button is not functioning correctly.



Intelli-Arc™ Diagnostic Tool

Using the Intelli-Arc™ Diagnostic Tool with good troubleshooting techniques, an electrical contractor can accurately pinpoint the location on the branch circuit where either the arc or arc-to-ground fault occurred. The diagnostic tool presents information on the type and magnitude of the fault, along with the level of current flowing through the circuit.

The Intelli-Arc™ Diagnostic Tool is not a conventional tester that is currently out on the market; it is a tool to see what is happening in the circuit. The diagnostic tool locates the underlying problem to allow the electrical contractor to fix the faulting issue.

The purpose of the Intelli-Arc™ Diagnostic Tool is to speed the troubleshooting process for the electrical contractor, saving the contractor time and money. This is accomplished by improving the accuracy in the troubleshooting process, reducing the time spent on the problem site.



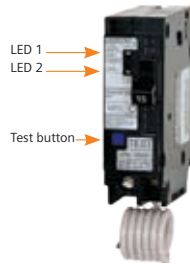
Fact: The Intelli-Arc™ Diagnostic Tool works with any breaker, regardless of brand!

Operational Instructions

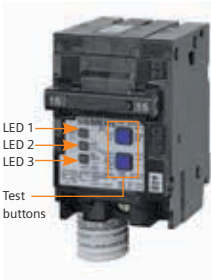
The Intelli-Arc™ Diagnostic Tool should only be handled by a qualified electrical contractor.

1. De-energize all individual loads on the branch circuit that is being evaluated (switches, receptacles, junction boxes, work boxes, etc.).
2. Find the breaker supplying the power to the branch circuit under evaluation, and turn it "ON". Use caution.
3. Turn "ON" the handheld device.
4. Energize and then de-energize loads one by one on the branch circuit being evaluated. Observe the LED indications on the handheld device while completing this process. Consider trying to energize and de-energize combination of loads also.
5. The "GF" and "AF" LEDs will lock in the top (red) position when any event causes the device to read the maximum levels, even if the event ceases to exist. Press the "CLEAR" button to continue evaluation of the branch circuit.

1-Pole CAFCI Circuit Breaker			
LED indicators		Last known trip condition	Troubleshooting
1	2		
Off	Off	Overcurrent	Ensure current on the circuits does not exceed the current rating for the breaker.
On	Off	Arc fault	Check wiring for the parallel and series arc faults. Check devices for series arc faults. Use Intelli-Arc to assist and accelerate diagnosis.
On	On	Arc fault to ground	Check wiring, switches, and receptacles for possible ground leakage. Use Intelli-Arc or circuit tester to troubleshoot. Using safe electrical practices, systematically identify the source of the ground fault.



2-Pole CAFCI Circuit Breaker				
LED indicators			Last known trip condition	Troubleshooting
1	2	3		
Off	Off	Off	Overcurrent	Ensure current on the circuits does not exceed the current rating for the breaker.
On	Off	Off	Arc fault (leg A)	Check wiring for the parallel and series arc faults. Check devices for series arc faults. Use Intelli-Arc to assist and accelerate diagnosis.
Off	Off	On	Arc fault (leg B)	Check wiring for the parallel and series arc faults. Check devices for series arc faults. Use Intelli-Arc to assist and accelerate diagnosis.
On	On	On	Arc fault to ground	Check wiring, switches, and receptacles for possible ground leakage. Use Intelli-Arc or circuit tester to troubleshoot. Using safe electrical practices, systematically identify the source of the ground fault.



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Siemens Advantage

Arc fault circuit interrupter technology has and will keep on saving lives and protecting property damage by stopping electrical fires before they occur. Prevention is better than intervention.

Fact: The Intelli-Arc™ Diagnostic Tool is a Siemens exclusive product.

With over 160 years of engineering and innovation, Siemens develops products to increase levels of safety. Siemens AFCI products have advanced semiconductor technology that are designed to detect and react to the unique characteristics of arcing. They have been thoroughly tested to dramatically decrease the amount of nuisance tripping.

The trip indicators used in conjunction with the Intelli-Arc™ Diagnostic Tool will expedite the troubleshooting process, which will save the electrical contractor time and the homeowner money. Easy to follow flowcharts will also aid in the debugging process.

Further Information

If you would like to learn more about arc fault circuit interrupter technology or different products available, please visit usa.siemens.com/afci.

If a certain load is causing the AFCI to trip, please obtain information about the load, i.e. the model number of the product, and contact Siemens troubleshooting at 1-800-241-4453.

Various jurisdictions in each state require AFCIs to be installed in different locations within a residential house according to the National Electrical Code® (NEC). Please contact a local authority to find more information.

The technical data presented in this document is based on an actual case or on as-designed parameters, and therefore should not be relied upon for any specific application and does not constitute a performance guarantee for any projects. Actual results are dependent on variable conditions. Accordingly, Siemens does not make representations, warranties, or assurances as to the accuracy, currency or completeness of the content contained herein. If requested, we will provide specific technical data or specifications with respect to any customer's particular applications. Our company is constantly involved in engineering and development. For that reason, we reserve the right to modify, at any time, the technology and product specifications contained herein.