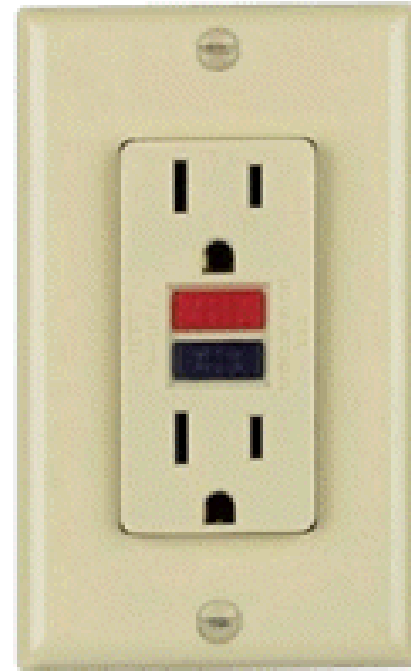


Ground Fault Circuit Interrupters (GFCIs)

Ground fault circuit interrupters (GFCIs) are a big part of your lives whether you are aware of them or not. They are one of your best friends and the same time they can be one of the most aggravating devices in your home.

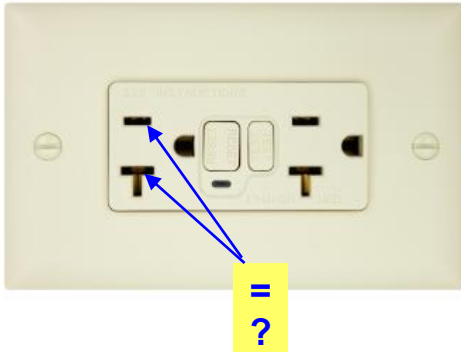
GFCIs (sometimes shortened to GFI) have been required by the US National Electrical Code for many years now. All receptacles (power outlets) in areas where water is nearby must be protected by a GFCI. Specifically, receptacles for kitchen counters, bathrooms, garages and outdoors are protected, along with a couple of other locations where there is a potential for water and electricity to mix. Water increases the likelihood of electric current causing harm to a person who accidentally contacts power plugged into an outlet, so protecting receptacles in these areas significantly improves safety.



Ground Fault Circuit Interrupters (GFCIs)

GFCI Operation

GFCIs work by electronically comparing the current in the line (hot) conductor with the current in the neutral wire, which should normally be equal. Any difference in the amperage in the two wires indicates some stray current leaking to earth ground.



A current imbalance of 5 milliamperes (0.005 Amps or 5mA) or greater should cause the GFCI to trip and disconnect the circuit. If we assume that this stray current is flowing through a human body, by quickly disconnecting the power a serious electric shock can be avoided.

Nuisance trips are much more common than genuine electric shocks against which GFCIs are intended to protect. Certain appliances and electronic devices have high frequency currents flowing in them which may naturally couple to earth, perhaps enough to trip a GFCI. Another common example is where rain or irrigation water collects in or around an exterior light socket or power plug and allows current to flow to earth through a wet mineralized path to ground. If this leakage current exceeds 5mA, the required GFCI for the outdoor receptacle should trip. The GFCI doesn't know or care if the leakage current is flowing through a human body, it simply trips as it is designed to do. Now your Christmas lights or whatever is operating outdoors will switch off, along with any other equipment connected to the same circuit.

Ground Fault Circuit Interrupters (GFCIs)

Types of GFCI Devices



GFCI devices can be part of a circuit breaker panel but these are usually wired to individual specific loads.

This type is most often used to protect dedicated outlets for spas, pools and such.

More often a special GFCI outlet is installed as a receptacle in one of the areas where it is required. These devices are designed to protect all circuits connected downstream of them as well. So to save money most home builders install only one GFCI receptacle per branch circuit and wire all the other normal (cheap) outlets in that area to the special receptacle to achieve protection.



Ground Fault Circuit Interrupters (GFCIs)

Types of GFCI Devices

A typical home may have two identifiable GFCI receptacles in the kitchen, and another for all the bathrooms. Beyond that there may be one for the garage and one for outdoor receptacles, or these might be fed from the kitchen or bath. Although you may count only three or four GFCI devices in your home, the remaining required receptacles are protected by them, and those normal-looking protected outlets should be marked as such.



Ground Fault Circuit Interrupters (GFCIs)

Locating GFCI Reset

When an outdoor receptacle trips because of leakage current, you have to figure out where to reset it. This can be very challenging because it is rarely obvious where the GFCI device is located unless you are plugged directly into one. The GFCI, whether in the breaker panel or in a power outlet, will always have a test and reset button. If you haven't mapped out your receptacles and know where the GFCI button is for each, you will have to try all the reset buttons until you find it. So I suggest that you go around the house and identify the GFCI reset button for every outlet requiring one. That way you are prepared to quickly restore power when the time comes.

The best way to do this is to use a simple, inexpensive GFCI tester from a home improvement or hardware store. This is a good item to have since you should periodically check the operation of GFCIs anyway. Test each GFCI outlet per the next section to locate the reset button for each downstream receptacle.



Typical Outlet Checkers with GFCI Test Feature

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GFCI Testing

Go around the house to all GFCI protected receptacles (outdoors, kitchen, baths, garage) and verify that the GFCI really shuts off power when you press the test button. This will also force you to locate the GFCI device to reset the circuit, so you will know where it is in the future. Check the downstream outlets as well (a normal-looking receptacle that is protected by one of the GFCI devices.)

Test both outlets of a duplex GFCI because it is possible--although unlikely--that only one may trip off (I have experienced this.)

DO NOT rely on the test button built into the GFCI !!

It is supposed to work properly and very likely will. However, I have seen several GFCI receptacles apparently trip with the test button yet still leave power on, to both downstream circuitry and to those outlets on the faceplate, and not because it was wired improperly. ***This is a very dangerous situation*** because it creates a false sense of security, and I have seen several of these. This is probably more true of the older GFCIs since newer ones have more self-diagnostic features.



Ground Fault Circuit Interrupters (GFCIs)

GFCI Testing

There is some belief that GFCI receptacles age and wear out, so they should be tested periodically. This is sound advice, since the protectors have internal electronic circuitry which is susceptible to power spikes and general device reliability. Manufacturers generally recommend monthly testing (often marked on the faceplate) but few people actually do it this frequently. Check all GFCI circuits at least one a year or whenever one has tripped on its own.

A unit which does not trip when tested, or which leaves power on when it apparently trips should be replaced immediately. Do not use the circuit until it is properly protected.

Newer GFCIs have improved features such as indicator lights and enhanced safety circuitry which can detect a failed device. These also fail to operate if the receptacle is mis-wired Line to Load.



Web links more GFCI information:

<http://www.thecircuitdetective.com/gfis.htm>

<http://www.naturalhandyman.com/iip/inelectrical/infgfi.html>