How GFCIs Protect You

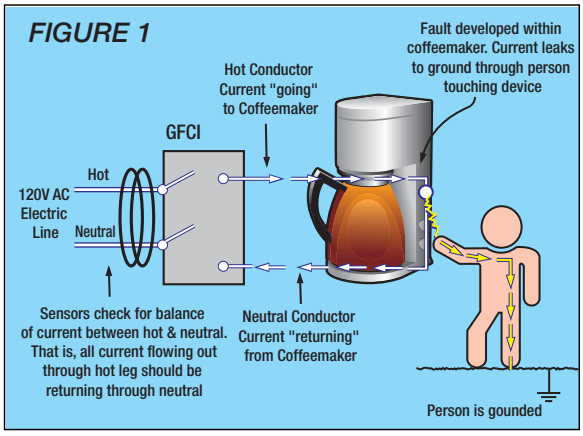
"...GFCIs Save Lives"*

The Need for Ground Fault Protection

Electrical wiring systems are the foundation of the modern technological world, but they are not foolproof. Whenever electrical current is flowing through circuit conductors, there will always be the risk of fire or serious electrical shock if certain conditions occur. Most people assume that a circuit breaker is the safety net in an electrical system, but this is only partially true.

The circuit conductors in any wiring system are rated for a maximum electrical current. In the event of a severe short, excessive current flows in the conductors, and this can quickly lead to serious overheating and fire. This is where circuit breakers go to work. They "trip" open when excessive current occurs, thereby protecting the building structure. However, the current level needed to trip a circuit breaker is many times greater than the amount that can deliver a powerful, and possibly lethal, electrical shock to a person.

Another type of short, called a **Ground Fault**, can easily occur when the "hot" conductor in an electrical device touches a device's metal enclosure due to exposure through a break in its insulation. Using a coffeemaker as an example, consider what could happen if a wire becomes frayed or the device becomes damaged over time. The "hot" conductor in the coffeemaker (see *Figure 1*) may come in contact with the metal body. A person touching the coffeemaker could then become a path to ground for current leaking from the metal body. This ground fault condition can be life threatening even though the current flow may be far less than the amount required to trip a circuit breaker.



How a GFCI Works

When current is leaking to ground, not all current flowing through the "hot" conductor is returning through the "neutral" conductor. *Figure 1* shows how a **Ground Fault Circuit Interrupter (GFCI)** monitors this difference in current flow between the hot and neutral conductors. As long as the difference in current is zero, the GFCI allows current to flow. However, if the GFCI senses even a slight difference in the current flow between the two conductors (a ground fault), it reacts by opening its internal double-pole contacts to interrupt the flow of electrical current through the device. The GFCI must be sensitive to the minimum amount of current that can harm a human being, and it must trip instantaneously.

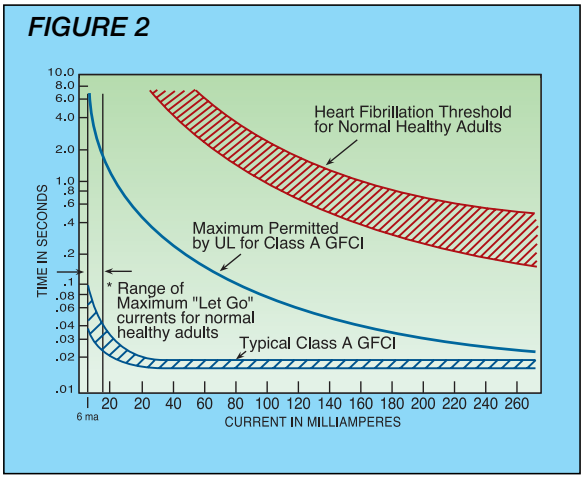


Figure 2 summarizes GFCI tripping characteristics in general. According to UL Standard 943, a Class A GFCI must trip when there is a ground fault current of 5mA (±1mA). *Figure 2* also shows trip time requirements.

GFCI receptacles are used in place of standard duplex receptacles and can also be wired in a feed-through manner to provide ground fault protection for receptacles wired downstream.

* Electrical Safety Foundation International (ESFI)