

# Ground Fault Circuit Interrupt Report

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## 1 Introduction

Ground Fault Circuit Interrupts (GFCI's or GFI's) are a type of protection circuit commonly seen in bathrooms, kitchens and outdoor power sockets. Their existence is to reduce the risk of an immediately lethal electrical shock, such as a toaster being dropped in a bathtub full of water. Most circuit breakers are intended to handle very large currents and trip after a relatively long time [1]. A potentially lethal electric shock can occur at very small currents as small as 30mA [2]. Since circuit breakers are slow to trip and are designed to only trip under massive amounts of current, an extra safety measure for household plugs is essential.

## 2 General Design and Theory of Operation

GFCI's have many different names throughout the world, but they are part of a broader family of devices known simply as *Residual Current Devices*, or RCDs. These devices detect currents in the range of 5-30mA, and can disconnect much more quickly than a circuit breaker.

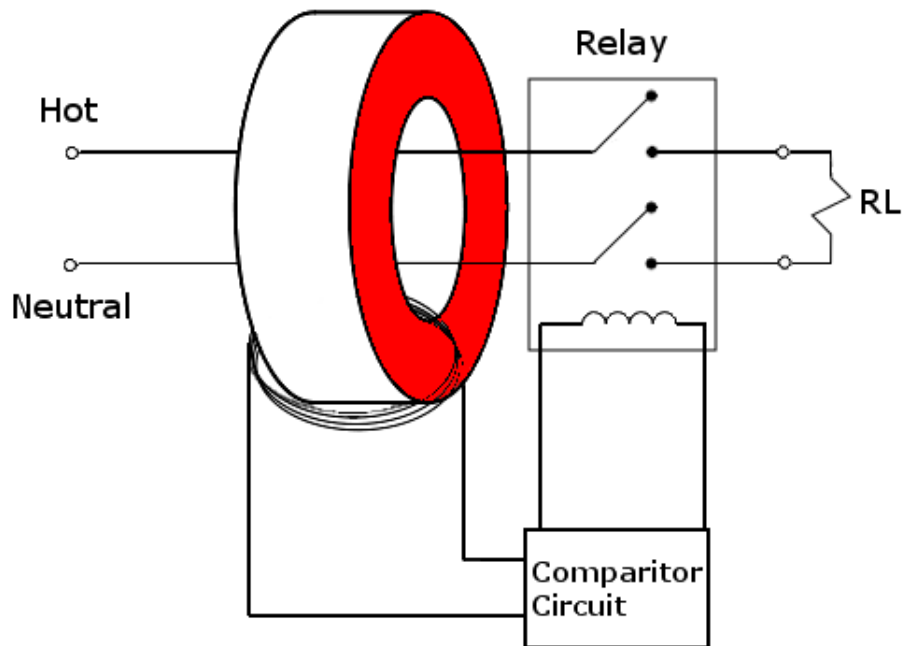


Figure 1: Circuit diagram of a GFCI

The most important part of an RCD is the current transformer that measures the difference in current through the live and neutral conductor. If the difference is not zero, then this means there is current *leaking* out of the circuit. Control logic will then disconnect the circuit. As seen in Figure 1 below, the relay will disconnect the circuit if it detects anything unusual from the current transformer.[3]

## References

- [1] *Circuit Breaker Characteristic Trip Curves and Coordination*. Bulletin No. 0600DB0105, Cedar Rapids, IA, USA, August 2001.
- [2] Lipman, Everett A, *Electrical Safety Information*. Santa Barbara, CA, USA, August 2007
- [3] *CPSC Fact Sheet, Pub. 099*. U.S. Consumer Product Safety Commission, Bethesda, MD, USA, Accessed April 2014