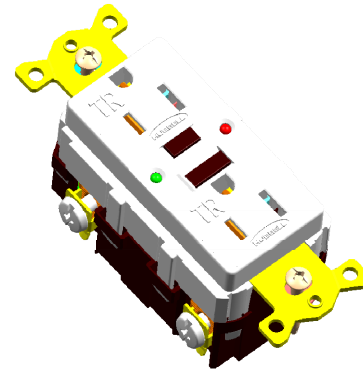


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## Hubbell Technical Paper Industrial “Self-Test Tamper Resistant” Ground Fault Receptacle

### Background

All of today’s GFCI receptacle manufacturers rely entirely on the end user to test the functionality of the unit. End users are required to execute a “test & reset” function to verify that the product is performing correctly. The timing of this test as recommended by manufacturers and agencies such as UL & CSA, is a minimum of one time per month. Operation of the “test button” provides critical information relating to the functionality of the device and its ability to provide people protection. Despite the once a month requirement, it is known that most users do not test their ground fault receptacles at any point in time. On average when a GFCI receptacle is tested, it is at a frequency of only one time per year.



Given these facts, UL, CSA and the CPSC are calling for more intelligent product features and less dependence on the end user. It is apparent that testing a GFCI once per month is not a viable requirement for the end user. A CPSC field study concluded “consumers could neither be trusted to conduct the tests (*test button*) as often as recommended nor take the necessary steps to fix the situation if they found a ground fault receptacle to be faulty...the consumer should be given as little responsibility as possible in ensuring the safety of the product...why not remove the consumer from the equation completely and have GFCI’s test themselves?” This is a major step towards what the Hubbell AUTOGUARD™ GFR design will accomplish.

### Self-Test Patented Technology

With little or no testing being done, what does this tell us regarding the ability of a GFR to provide people protection? After all, this **is** a people protection device. Unfortunately no one will ever know if it works until the very second it is needed. The new Hubbell self-test ground fault receptacle directly addresses this concern. An internally generated simulated ground fault will enable the GFCI to check for proper operation of the unit every 60 seconds. This provision is a major feature that surpasses any existing design on the market. The validation test for GFCI functionality can now be performed automatically. This diagnostic feature literally tests & monitors itself by way of the electronic design. With this feature, the ability to provide people protection can now be verified on a continuous basis. This is a significant contrast when comparing the one time per month recommendation that is suggested today.

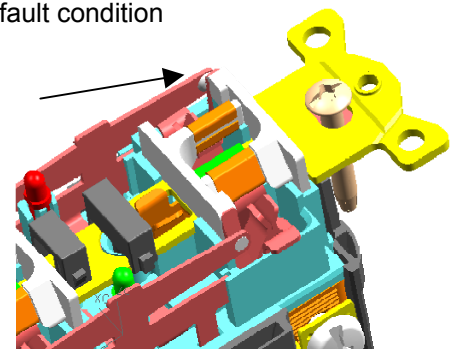
With this added self-test feature, a Hubbell ground fault receptacle now has three provisions for providing protection.

1. Continuous electronic sensing & testing, utilizing diagnostic software located on the printed circuit board.
2. Traditional testing mode by manually operating the “test and reset” buttons
3. Traditional auto-sensing mode for immediate interruption for a ground fault condition

### Tamper Resistant Patented Technology

The Hubbell design employs an electro-mechanical switching mechanism to obtain the tamper resistant safety feature. This is a major innovation when compared to tamper resistant products today that simply utilize a plastic sliding shutter design. In the Hubbell design, when an object enters the blade opening (contact), NO POWER is available at this blade opening (contact), NO POWER is available at this location.

Power will only become available when a two-wire blade such as a standard plug enters the face contacts.



**If Individual  
object enters  
= NO POWER**



## **Additional Safety Advantages**

Reverse Wire Safety Feature - The Hubbell GFR will not have power at both the face and downstream if the line and load are reverse wired. Additionally, the unit will not be able to reset under a reversed wiring condition. Typically if the line and load are reversed, there will be power at the face and the end user would assume there is ground fault protection at the point of use.

End of Use Indicator – a rapid flashing red LED will indicate if the unit can no longer provide ground fault protection. This indication will occur regardless of the specific test mode that is being conducted, automatic or manual.

Surge Withstand - Underwriters Laboratories requires all ground fault receptacles to meet a 6kV, 3kA surge test without compromising the people protection function of the unit. If a unit cannot meet this performance requirement, it must shut down and become totally inoperable.

Hubbell meets the surge withstand requirement by design without relying on a non-operational lock out mode to meet the test. Hubbell opted to build a more robust device by incorporating a heavy duty Metal Oxide Varistors (MOV) into the product. This MOV was specifically designed into the Hubbell GFCI receptacle with the intention of passing the UL 6 kV, 3kA surge immunity test and to continue to provide power and protection to the face and downstream loads. This design direction results in a more survivable device in the field and provides power to the user rather than shutting down the device because the electronic circuitry cannot withstand the application. With surge issues representing over 70% of failures in the GFCI industry, the Hubbell approach is not only effective but necessary as well.

Among the many concerns created by a non-operational mode include required workarounds if immediate power is needed. Extension cords remotely located from the initial point of use poses a compromise to safety. As has been well documented in the electrical industry, extension cords at times can be a “sloppy fix” due to vulnerability for physical abuse. Also, low quality and often under-rated cords are used for extended periods of times. Another concern is the lack of confidence that consumers would begin to feel regarding GFCI if they were locked out of power. This may lead to a further hesitation to actually perform the suggested monthly test for evaluating GFCI functionality. If the end result is lock out, it may be viewed as a deterrent to test.

Manual Test – This latest Hubbell design incorporates a full system test function. The Hubbell GFCI when tested actually induces a simulated ground fault leakage current to the printed circuit board. This in turn causes the mechanical system to react based on the action of the solenoid. The entire mechanical and electronic GFCI system is reviewed for functionality. Some competitive units do not conduct any test when the “test button” is activated. An artificial mechanical trip only, takes place when the button is operated. Portions of the electronics are tested during the **reset** mode by actuating the solenoid to unlock the device. During this process, the mechanical trip system is never tested. A hand held GFCI receptacle tester, such as the Hubbell GFT2G, must be used to fully test these competitive devices to ensure that the device is operational.

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