



Back to Basics: What Apprentices Really Need to Know About Testing Tamper Resistant Outlets

Keith Moffatt

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Apprentices, it's no secret that there is a lot to learn. As an Electrical Training Alliance (ETA) partner, it's our job and privilege to foster your growth. Not only are you tasked to learn the skills and technology needed to succeed in the electrical industry, you also need to know the National Electrical Code (NEC) and stay current with all its updates. Knowing the codes is just one piece of the job, we are here to help guide you to the right tools to successfully meet NEC standards and do it safely.

One of the latest updates to NEC was to increase the number of places where tamper-resistant receptacles must be installed. Article 406 of the NEC was expanded to require 15A and 20A, 125V and 250V tamper-resistant receptacles in dwelling units, hotel rooms, and child care facilities. In addition to homes and schools, structures such as dormitories, hospitals, and recreation facilities now require tamper-resistant protection.

These new requirements are primarily in place to protect children. We all remember back when we were growing up and items were pushed into wall outlets that should not have been. Tamper-resistant outlets have a mechanical safety shutter that keeps the terminal slots in the outlets covered. This makes it virtually impossible for anyone to accidentally or purposefully insert a foreign object, such as a paper clip or a small toy, into an outlet. Tamper resistant outlets allow access to power when the safety shutter is opened, which occurs when both prongs of an electrical plug enter at precisely at the same time.

With these increased regulations in place to provide a high level of safety, electricians are performing far more tamper-resistant receptacle installations than ever before. Which makes it critical to master how to safely test non-contact voltage (NCV) detectors when installing these receptacles.



USING NCV DETECTORS

Electricians have used NCV detectors for many years to verify when and where electrical power is on or off. These wonderful tools work by sensing the invisible electrostatic field that is around any conductor with AC voltage applied to it. As long as voltage is present, NCV detectors work even when electrical current is not flowing in the conductor being checked.

The tamper-resistant safety shutter makes the traditional single tipped NCV detector much less effective because it cannot enter the outlet slots. To detect power without using a dual-tipped NCV detector, users are left with one of two choices:

1. Try to stick something else into the other slot to activate the shutter. This is very dangerous and should never be attempted!
2. Try to detect the static field outside of the safety shutter on an outlet by using a less selective detector that is overly sensitive.

A detector that is overly sensitive will not accurately sort out hot conductors in an electrical box. Most, if not all, of the conductors will show up as being electrically hot. These detectors may not be selective enough to do the job. It is a compromise between being too sensitive and not being sensitive enough. While many electricians prefer to use a non-contact voltage detector that is automatically set, we recommend apprentices use a detector that has been set to be less-sensitive and then check the outlet slot with an insert tip detector. This process reinforces critical safety steps.

The best NCV detectors have their sensitivity optimized so they have good selectivity. They detect only electrostatic fields that are very close to the antenna used in their tip. This reduces the chances of a detector giving a "false alert." A detector that gives false readings is of little value to anyone.

You should not have to compromise by using an overly sensitive detector. Many electricians recommend using an NCV that inserts into the outlet. There are two types of NCV detectors: single and dual tipped. For example, Greenlee was the first to introduce a universal dual tipped NCV detector that provides reliable voltage detection on any 110V tamper resistant outlet and tracing conductors. This tool has a safety rating up to 1,000V. The nondual tip NCV detector safely moves the tamper-resistant safety shutter out of the way as it enters the outlet, the same as an electrical plug does entering the outlet.



This allows the tool to use the same optimized selectivity as a traditional single tipped NCV detector. A dual tipped NCV detector will work uncompromisingly in a crowded electrical box and on conventional outlets, and can be used to troubleshoot conductors and equipment.

Selecting the right NCV detector is a big step to safety testing tamper-resistant outlets. Once you have that taken care of, you're ready to get to work.

CHECKING VOLTAGE/POLARITY

Here's how to check voltage/polarity of 110V outlets (see Diagram 1):

- Notice that one tip of the detector mechanically operates the safety shutter used on tamper-resistant outlets. It is marked with "N."
- Notice that the second tip contains the detector antenna which senses the presence of AC voltage. It is marked with "H."
- Turn on the detector:
 - Insert both tips into the slots of an outlet. Should voltage be present on the side with the antenna tip "H," it will cause the detector to alert.
 - To check the opposite terminal slot of the outlet, remove and rotate the detector 180 degrees and re-insert. If voltage is present on that side, the detector will alert.

IMPORTANT: Test the detector on a known live circuit, before and after use.

Adhering to safe practices is critical in our industry. This is because wiring mistakes are made more often than one would expect. Furthermore, there are often optional ways to wire different devices. This makes it so one cannot assume anything about how a circuit is wired. Each circuit needs to be checked correctly before starting work. A good example: It is common practice to wire all outlets in an electrical box the same way. It is not unheard of, however, to wire one in a pair using a switch in the circuit; leaving the rest directly wired to the source. This is so the switch outlet can have the added convenience of being able to turn a light plugged into it off and on. Note, the power remains on in the other outlets.

The caution is this - if you check one outlet and it is not powered, the other outlets in the box may have power, so each outlet specifically must be checked.

Remember that both sides of the outlet need to be checked when determining if an outlet has voltage. Failure to do so may result in death or injury if the outlet polarity



is incorrect. Best practice dictates when using any non-contact voltage detector to check it on a known live circuit before and after using it to assure your safety.

Safely testing tamper-resistant receptacles is a necessary skill for any apprentice. With the NEC's new requirements, today's apprentices will install more of these receptacles than any of their predecessors. It's more important than ever for apprentices to safely and efficiently test tamper-resistant receptacles using dual tipped non-contact voltage detectors. Know that your ETA Training Partners are here to answer any questions you have. We are invested in helping you grow your career in the electrical industry.

Keith Moffatt is a Senior Product Manager in Test and Measurement for Greenlee, a Textron company. An engineering expert, Moffatt has 25 years of experience in the electrical industry. Learn more about Greenlee by visiting www.greenlee.com.