
Should Test Portals be used for Absence of Voltage Testing?



What are Test Portals?

Test portals are permanently mounted devices that can be used with a portable tester, such as a digital multimeter, to measure the presence of voltage. These devices are a valuable tool for troubleshooting and *measuring voltage presence*.



Examples of Test Portals

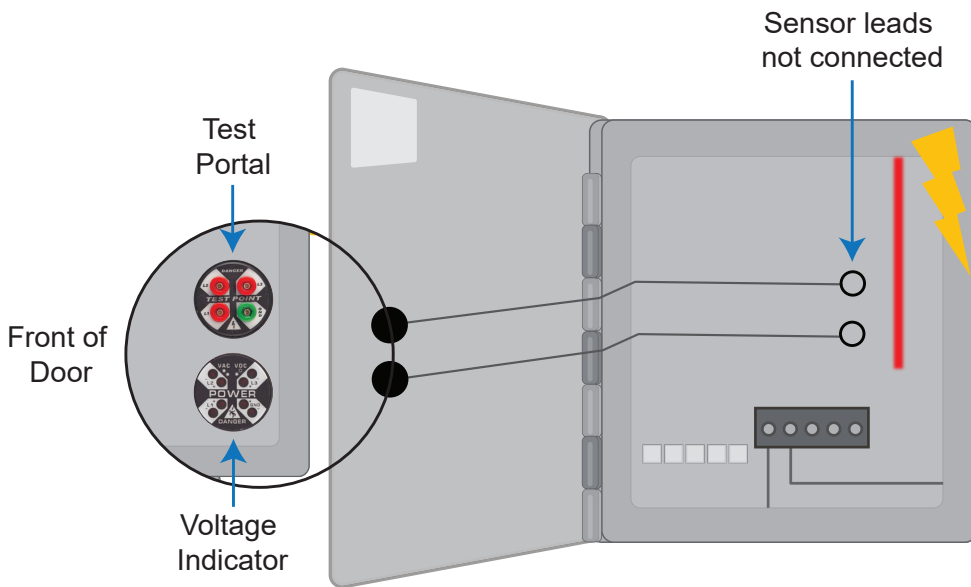
Use Cases and Features of Test Portals

Test portals will test at the point in the circuit at which the test leads are installed. Test portals may have features such as IP20 “finger safe” ingress protection as well as a high impedance circuit to limit current at the test points to less than 5mA. The impedance reduces the likelihood of shock or arc flash when measuring voltage presence via the portals, but the added impedance requires a conversion to determine the actual voltage value.

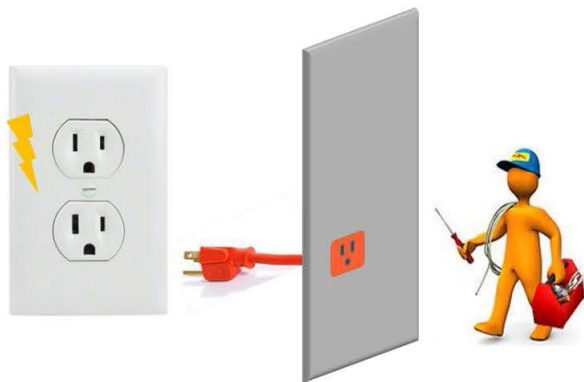
Should Test Portals be used to Verify the Absence of Voltage?

The process for verifying the absence of voltage, often referred to as the “live-dead-live test,” is described in NPFA 70E Article 120.5 and OSHA 1910.333 (b)(2)(iv)(B). Using test portals with a portable test instrument can lead to unreliable results when testing for absence of voltage and is not recommended. Here are some of the reasons why voltage test portals are not adequate for absence of voltage testing:

- 1. Installation Test** – verifying absence of voltage through a permanently mounted device requires assurance that you are in contact with the test point when the measurement is taken. If the device is not properly terminated, and the device leads are disconnected, no voltage will be detected, regardless of whether or not the conductor is energized. This is why permanently mounted voltage testers are required to have an installation test to confirm that the product is in contact with the conductor at the time the voltage measurement is taken. Test portals do not have a feature to verify sensor leads are connected to the source conductor when a measurement with a portable test instrument is taken. This condition could result in reading zero voltage when voltage is present. Using the test portal for testing the absence of voltage, is analogous to testing the end of an extension cord to verify power at an outlet where you cannot see the other end of the extension cord plug – if the cord is not plugged into the source, testing the other end will not help you determine if the outlet is energized.



Poor workmanship or installation failures can lead to a zero voltage indication when the conductor is energized.

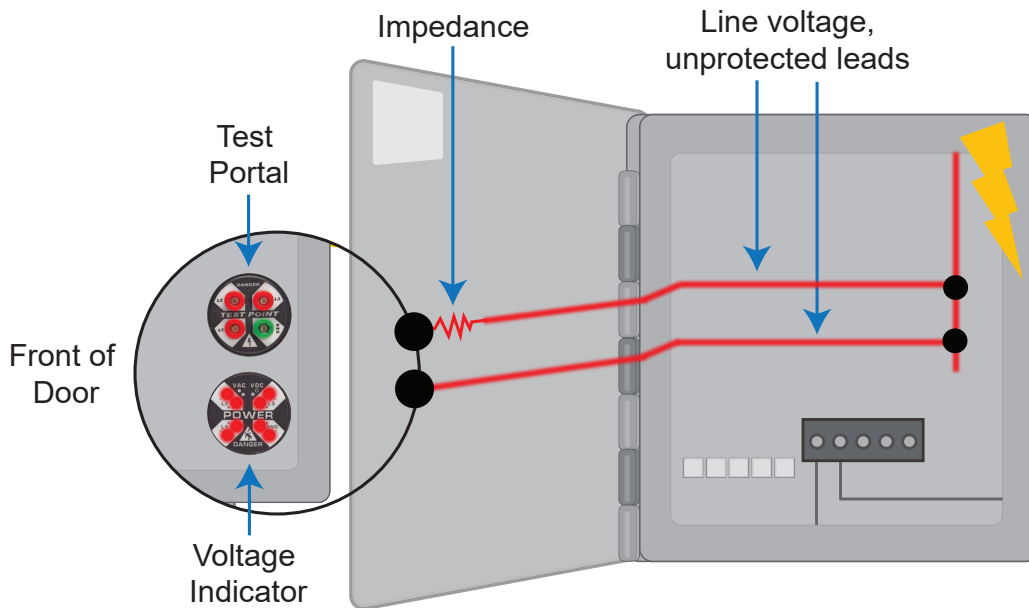


If the cord is not plugged in, measuring zero volts does **not** guarantee the outlet is not energized!



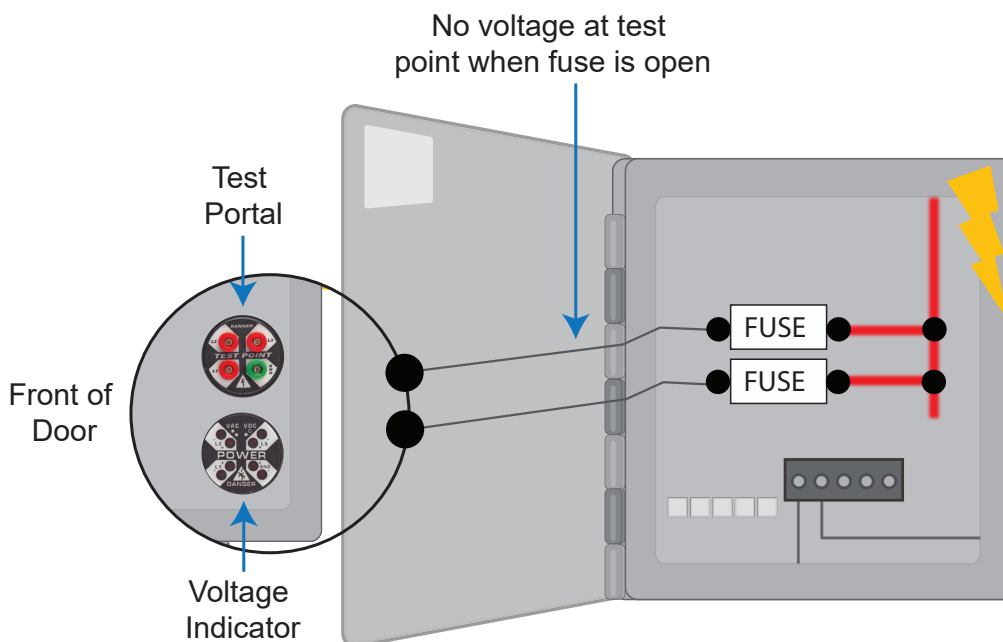
Verifying absence of voltage through a permanently-mounted device requires an **installation test** to ensure the source is being tested.

2. Bringing hazardous voltage to the door – Installing voltage portals will result in hazardous three-phase voltage across the hinge and/or on the external enclosure door. **Bringing source voltage (ex. 480V) directly to an accessible surface is not a best practice, particularly when that surface moves, like a door – see image below.** The sensor wire will be subject to damage from a pinch point (ex. Routed across a hinged door) or wear & tear caused by vibration etc. and could eventually present shock hazards. Test portals are designed with the impedance at the portal; therefore, the wire is not protected.



Both Test Portal and Voltage Indicator leads bring hazardous voltage to the door

3. Installation Code Requirements – the local authority having jurisdiction (AHJ) or inspector will often require overcurrent protection for test portals with leads longer than 12 inches in order for the installation to meet NEC or UL 508A requirements. For fused installations, the portals will only be testing the load side of the fuse, NOT the actual source conductor. **The circuit part i.e. source conductor could be energized if the fuse is open and a portable tester would not detect voltage through the test portal, resulting in a “false negative”.** Additionally, using short circuit protection creates **additional termination failure points.**



If the fuse is open, zero voltage will be indicated when the conductor is energized.

NFPA 70E

NFPA 70E has requirements for verifying the absence of voltage with **portable** test instruments (120.5(7)) and **permanently mounted** test instruments (120.5(7) Exception 1). Use of test portals for absence of voltage are not addressed in any edition NFPA 70E.

Test portals are permanently mounted but rely on a portable tester. As a hybrid, test portals would have to meet the requirements of both parts to ensure a reliable result. This involves having an installation test for the permanently mounted leads or directly testing the tester to the source conductor.

Test portals were proposed as additions into the standard for absence of voltage verification in the 2021 edition, but were rejected by the NFPA 70E Technical Committee.

- Public Input PI No. 101 – proposed adding specific language to allow for using a “permanently installed protective impedance device” (test portal) and a portable test instrument (voltmeter) as an alternate means of verifying the absence of voltage.

Committee result → Rejected

- Public Comment PC No. 106 – re-write step (7) to describe and enable use of test portals for verifying the absence of voltage.

Committee result → Rejected

NOTE: NFPA 70E 2021 edition will **incorporate a reference to UL 1436 as the standard with listing and labeling requirements for a permanently mounted Absence of Voltage Tester (AVT)** described in 120.5(7) Exception 1. UL 1436 has several requirements for permanently mounted testers including an installation test for the sensor leads. Test portals do not meet UL 1436.

https://www.nfpa.org/assets/files/AboutTheCodes/70E/70E_EEW_AAA_A2020_SD_ballotfinal.pdf

Conclusions

Test portals are a great tool to reduce risk when troubleshooting and measuring voltage **presence**. However, proving **absence** of voltage through a permanently mounted device has additional requirements.

The test portal can be thought of as an extension of the circuit part or source conductor – not the actual circuit part. Portals are okay to do a preliminary verification check at the portal. However, before removing PPE or performing any work, best practice is to perform **an additional test with the portable test instrument directly at the source conductor or actual circuit part to conclusively prove a de-energized condition exists.**



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