APPLICATION NOTE

Proving units: What are they and why should I care?

By James R. White, Shermco Industries, Inc.

Proving units are handheld, portable sources of a verified voltage that can be used to satisfy elements of the 2015 edition of NFPA 70E 110.4(A)(5), which states "(5) Operation Verification. When test instruments are used for testing the absence of voltage on conductors or circuit parts operating at 50 volts or more, the operation of the test instrument shall be verified on a known voltage source before and after an absence of voltage test is performed." The shaded words were added to the 2015 edition of NFPA 70E. "Known voltage source" is generally considered to be a voltage from a power system, generator or other reliable, verified source of voltage. Proving units were not discussed at the NFPA 70E committee meetings, as there was no public input concerning them at the time.

The inclusion of the words "known voltage source" was to disallow such operation verification methods as audible tones, flashing lights, static electricity, or "buzz boxes", all of which do not actually verify the voltage test instrument is functioning as it should. That being said, what a "known voltage source" is was not defined in the NFPA 70E, so as to not limit technology or try to direct workers to a specific methodology. The committee doesn't know what it doesn't know and it can't see into the future.

The Fluke PRV240 provides a safe, reliable voltage source for absence of voltage testing

Often, technicians are in areas where no sources of voltage can be found, such as when they are up-tower on wind generators or at remote pumping sites where the power has to be shut off or has gone off-line due to weather or other causes. As stated above, NFPA 70E requires that the "operation of the test instrument be verified on a known voltage source before and after an absence of voltage test is performed". When all voltage sources are de-energized, how can an absence of voltage test be safely performed? The Fluke proving unit is designed to provide a verified source to allow safe absence of voltage testing during such situations. The Fluke PRV240 is also designed to output either an ac voltage or dc voltage by use of a slide switch on its side.

The PRV240 can be used for ac or dc applications by using the slide switch

How can a proving unit be a "known voltage source" and why are other types of "voltage simulators" or "operation indicators" not adequate? This proving unit has a verified voltage output of 240 V. It is intended for low-voltage applications only. The PRV240, as delivered by Fluke Corporation has been tested and adjusted to provide this voltage output. Voltage simulators or audible or visual indicators have not been tested and verified and cannot be used as a "known voltage source." The difference comes down to whether the voltage output can be trusted to be within a specified range of voltages (240 V ± 10% for ≥1MΩ). The LED located between the terminals will illuminate if the PRV240 can supply a voltage within the specifications. If the proving unit cannot supply the

specified voltage output the LED does not illuminate and it becomes non-functional. When used as specified by Fluke Corporation, the proving unit is safe, reliable and satisfies the requirements of NFPA 70E, in my opinion. Although it will deliver a 240 V output, it is designed so the terminals are recessed and must be depressed by voltage test probes in order to initiate an output voltage. Even if contact were somehow made with the energized terminals or test probes, since it is battery powered it would not create a hazardous shock situation..

How to use the PRV240

Insert the batteries as shown by the symbols in the battery chamber

1. The PRV240 is "on" all the time, which means there are no on-off switches. Before taking the PRV240 into the field, check and ensure the batteries (four AA penlight batteries) are installed and connected correctly. Refer to the battery chamber for correct orientation of the batteries.

Firmly press the PRV240 terminals with the test probes

2. Using the test instrument to be used in the field for absence of voltage testing, verify operation of the PRV240 by placing the side switch to the "ac" position and depressing the terminals using the test instrument probes, as shown below. Orient the polarity of the test instrument probes as indicated on the face of the PRV240 (red for + and black for –).

3. Check the voltage output of the PRV240 to ensure it has the verified voltage of 240 V ± 10 %. If the voltage output is not within limits as specified by Fluke Corporation, replace all the batteries and re-verify the voltage output of the PRV240. If the voltage output is within specified limits, the PRV240 is ready for field use.

The PRV240 can be hung onto any metal surface using the supplied magnetic strap

4. To use in the field, the PRV240 can be hung onto metal-enclosed electrical equipment or other metal surfaces by using the convenient magnetic strap. Do not place the PRV240 where it could make contact with any potentially energized conductor or circuit part.

CAUTION: All electrical conductors and circuit parts must be treated as energized until tested and proven de-energized.

5. Following your company's policies and safe work practices, restrict access to the work area and ensure it will not be entered by unqualified persons or persons not actively involved in the absence of voltage test. If your company's procedures allow for a safety backup, ensure the safety backup is properly protected from the hazard using the specified PPE and equipment.
6. Set the slide switch to the proper voltage (ac or dc).

Depress the terminals of the PRV240 and verify the voltage output

7. Using the test instrument to be used for the absence of voltage test, depress the PRV240's terminals with the test instrument's probes until a voltage registers on the test instrument's display. Ensure the voltage is 240 V ± 10 % and the LED between the terminals illuminates. If the LED does not illuminate or the output voltage deviates more than the specified ± 10 %, discontinue use, replace the batteries and re-verify its output.
8. Perform the absence of voltage test following your company's test procedures.
9. Using the test instrument's probes, depress the PRV240's terminals and re-verify the operation of the test instrument. The PRV240 should output a voltage of 240 V ± 10 % and the LED should illuminate.
10. Secure the PRV240 and the test instrument so they cannot be damaged.
11. Secure the work area in accordance with your company's policies and safe work practices.
12. If the absence of voltage test proves the conductors and circuit parts are de-energized, the test procedure is completed.

NOTE: It may be necessary to wear arc-rated and shock PPE and equipment if there are conductors or circuit parts that are still exposed and energized, even after the absence of voltage testing is completed. This may be the case when the line-side of a circuit breaker or switch is energized, but the load-side is verified as de-energized. Follow your company's safe work practices and procedures to ensure any further work is performed safely.

Up-tower testing for the absence of voltage

When we conduct training at wind energy customer's sites we are often asked how absence of voltage testing can be safely performed, and how to ensure the employee is protected. Up until recently we did not have a good answer to that question. Now we do. The PRV240 is the best available method to verify test instrument operation before and after the absence of voltage test when up tower.

Modern wind generators reach hundreds of feet into the air

Wind turbine towers are imposing structures. As the size of the generator increase, blade length and the height of the tower also increase. A 2 MW wind generator will have a blade length of 143 ft. and a tower height of 259 ft. The latest land-based wind turbine to hit the market has an output of 7.5 MW. The effort to climb these towers to access the wind turbine is considerable (especially when the safety equipment, such as fall-arrest equipment is considered), as well as potentially dangerous. Trips up and down the tower have to be limited, so verifying the test instrument function before and after the absence of voltage test would not be practical using a land-based known voltage source.

Having a light, portable known voltage source is essential for worker safety and compliance with OSHA regulations and NFPA 70E. The PRV240 is ideal for just such a work situation. Light, portable and reliable, it can be securely attached to metal components using the strong magnetic strap supplied. Securing it in this manner makes the PRV240 convenient to use and also reduces any risk of the unit falling and possibly causing injury to workers on the ground. The light weight and ease of use make the PRV240 the obvious choice for such locations.

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