

FA156549 - Ver. 7.0 - Why can I measure voltage between the ground and neutral wires when my UPS is on battery?



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Issue:

Why can I measure voltage between the ground and neutral wires when my UPS is on battery?

Product Line:

Smart-UPS

Environment:

All models, All Serial Numbers

Cause:

Normal Operation, required by UL.

Resolution:

The voltage readings a customer measures on the input plug when the UPS is on inverter is due to the continuous neutral in the UPS. At the time the Smart-UPS 3G was designed, UL prohibited the breaking of the neutral during battery operation. There is not enough energy present at the plug under this type of situation to even give the smallest of electric shocks. In addition, the capacitive divider present in the UPS due to some common mode filtering devices in the UPS may also cause the customer to measure some voltage. However, our product was designed to meet all the safety requirements to bear the UL mark. Recently UL has reversed their position on continuous neutrals and has made changes to their standards, which require both hot and neutral to be broken during battery operation. Ground however is never broken.

The newer Smart-UPS products (Part numbers beginning with SUA, SUM, or SURT) were designed in accordance with the revised standard and will not exhibit the behavior. The Smart-UPS 3G line has also been updated so that it will comply with the new standard effective 02/01. On November 17, 2000 UL's standard changed to have backfeed protection for stationary UPS's, with an output that is not a separately derived system must de-energize all supply conductors i.e. break both line and neutral. The backfeed protection requirement is listed below from UL 1778 Section 29. All paragraph references are to a section in UL 1778.

A UPS shall be provided with backfeed to prevent a potential involving a risk of electric shock (see Electric Shock Section 8) from being present on its input terminals during interruption of the input ac power.

With reference to the requirement in 29.1, performance of the protection is to be judged by conducting the Backfeed Protection Test, Section 48.

The protection mentioned above shall employ an automatic switching device having air-gap contacts such as an electromechanical relay for preventing a potential involving a risk of electric shock from appearing on the input terminals. A unit provided with a remote shunt-trip circuit breaker, which will open the input ac circuit when the input ac power is interrupted, complies with this requirement. If the remote shunt-trip circuit breaker is not provided with the unit, then a marking as described in 72.1.33 shall be provided.

Exception: An electronic control employing a solid-state power switching component and subjected to the tests described in 29.6 may be provided in lieu of an air-gap contact device.

The backfeed protection for a stationary UPS, with an output that is not a separately derived system, shall:

- a) Open or de-energize all supply conductors; or
- b) Make the blades of the supply cord inaccessible when the supply cord is removed from the receptacle,

Exception: This requirement does not apply to a stationary UPS provided with a single output receptacle.

One result of breaking the input Neutral and Hot connections when operating on battery is that you may be able to measure voltage between Neutral and Ground at the output receptacles when the UPS is on battery. This is phantom voltage which cannot damage equipment or give the smallest of electric shocks.