



OVERLAPPING NEUTRAL

What is an Overlapping Neutral?

When applied to a transfer switch, overlapping neutral refers to the fourth pole of the switch, normally used for switching the neutral conductor, operating in a make before break manner.

Nature of the Controversy

A great deal of discussion has taken place within the electrical industry regarding the necessity of four pole switching in power distribution systems. This discussion has focused on two main points, namely;

1. Whether or not switching of the neutral conducting path is necessary, and,
2. If so, should such a switching operation be 'make before break' in nature.

Discussion

(1) The problem of four pole switching arises only in the case of four wire systems that have ground detection, **and** which have more than one source of current. Not all such systems need four pole switching devices. For instance, consider the everyday case of a double ended substation feeding a switchboard with two main and one tie circuit breakers.

Reputable manufacturers offer equipment suitable for this application incorporating three pole circuit breakers or switches, using a single point grounding scheme for the two power sources. Extensions of this scheme often can be used to accommodate three or even more sources of current.

However, situations do arise which are not amenable to the single point grounding solution. Sources of current may be located in such a manner as to make single point grounding extremely awkward, not to say impossible. Also, in larger installations, a ring bus system with multiple power sources is occasionally used. In both of these cases, four pole switching devices are a good engineering choice. Thus, in the case of a transfer switch, a legitimate need for a fourth pole does arise occasionally.

(2) If a system designer has decided to use a four pole transfer switch, he may want to decide whether the fourth pole should be overlapping in operation.

There appears to be no requirement for such an operation from consideration of either the theoretical parameters or the historical information available. One manufacturer does point out that under conditions of unbalanced load, slight voltage escalation across the load is possible. But this voltage escalation occurs only if it is assumed that the neutral is disconnected before the phase conductors. The time difference in operation of the poles of a four pole switching device is so small that the voltage transient, were it to occur, would have negligible effect. In addition, the same manufacturer speculates that normal switching transients could cause damage to equipment while it is not solidly grounded via the neutral. It is difficult to understand how a switching (or any other) transient, generated up stream of transfer switch, can damage a load down stream from the same switch, at a time when the switch is in the act of transfer, i.e. when the load is disconnected from both sources of power.

Perspective:

1. There is a legitimate though rare need for a four pole transfer switch.
2. There is no need for the fourth pole to have a make before break characteristic.
3. As part of its complete line of transfer switches, Cutler-Hammer offers four pole transfer switches.