GROUND DETECTION IN THE REAL WORLD

BACKGROUND

Power plants and substations are initially clean and free of grounding material. As time passes, dirt and other contaminants pervade their environments. Batteries, often stored unprotected, can spill electrolyte onto the support racks and enclosures. This conductive electrolyte, combined with carbon dust and other conductive material, can cause an imbalance and a ground fault.

Placing two (2) battery chargers together onto one battery is a common way to achieve a higher level of redundancy on the dc bus. This configuration also connects two (2) ground detection circuits in parallel, simultaneously cutting the detection sensitivity in half and doubling the current flow from the battery to building ground. A quick way to restore sensitivity is to disable the ground detection circuit on one of the battery chargers. Some dc bus configurations can create a false ground fault when more than one type of ground detection circuit is connected to the system. An imbalance can also be created in applications where two (2) batteries/chargers are tied together at the negative (-), with two (2) separate positive (+) feeds to the separate loads. Each battery charger contains its own ground detection alarm circuit which is in parallel with the negative (-), but not with the positive (+).

TROUBLESHOOTING GROUND DETECTION CIRCUITS

Once a ground fault has been detected, measure and record the two (2) voltages between building ground to positive (+) and building ground to negative (-). Next, measure the total dc bus voltage.

- If there is a slight difference between the first two (2) measurements, then there is a ***partial short to building ground***. Depending on the ground detection circuit supplied with the battery charger, you will need to make calculations to determine the resistance of the ground fault that has been detected.
- If there is full voltage with one measurement and zero volts with the other, then there is a ***direct short to the bus*** on the side that measures zero.
- If the first two (2) measurements are equal (half the dc bus voltage), then the ground fault alarm is false. The ground detection circuit may need an adjustment, or it may need to be checked for defective parts in the circuit. The problem is with the ***charger***.

FIXING A GROUND FAULT

Once we have determined the severity of the fault, we can examine the loads that might contain those paths to ground. Often it is easy to shed the loads, one at a time, to find the partial short through the dc distribution panel. If the ground fault to the dc bus is a direct short, remove the pieces of equipment connected to the dc bus one at a time. Determine the location of the fault in the following order:

- First, remove the battery charger. This often removes the ground detection alarm circuit itself. Once the dc bus leads are removed, a DVM can be used to measure the voltages between the dc bus and building ground to see if the bond to ground has been reduced.
- If the short to building ground is still present, reconnect the battery charger, using its ground detection circuit. Shed the loads one at a time and identify if and when the fault disappears.
- The last place to look is the batteries. If the battery charger can support the dc loads, lift the leads off the batteries. Use a DVM to measure the voltage of dc bus to building ground.

RELATED MATERIAL

JD0062-00 SCR/SCRF Application Note - Measuring Battery-To-Ground Voltages