



SINGLE-PHASING CONDITIONS AND AUTOMATIC TRANSFER SWITCHES

ENGINEERING BRIEF

EB020 Rev 0 04/03/04

Single-phasing conditions occur when a single phase (A, B or C) from the normal power source (utility) fails. This abnormal condition is generally picked up by the automatic transfer switch as a failure which requires the transfer of building loads to the emergency power source (generator).

In some cases, however, this “single phasing” condition may go unnoticed. In applications where electrical motors constitute a large portion of the building loads (generally greater than 50% of the load), a “phantom” voltage is generated by the electric motors and fed back to the automatic transfer switch sensing terminals. If the phantom voltages are within the broad parameters of “normal” conditions, the automatic transfer switch may not recognize the fault. In such a condition, damages to three phase loads such as transformers and electric motors are very likely.

As a method of protection against this fault scenario, Thomson Technology automatic transfer switches offer phase balance protection logic that monitors each phase’s voltage in relation to specified parameters. If any one phase varies from the set limits, the condition is recognized as a single-phasing event and the load is safely transferred to the alternate power source.

The phase balance protection described above offers a certain degree of equipment protection. However, in the event that the emergency generator does not start, the automatic transfer switch remains connected to the utility source and no protection is achieved.

A key feature of Thomson Technology’s automatic transfer switches is the ability to detect the single phase condition and use the controller’s fault output as a signal to energize an optional electrical shunt trip in the automatic transfer switch utility switch, thereby disconnecting the failed utility from the source. Since there is no way to know which phase may fail, the shunt trip power is derived from a 24Vdc power source, whether it be the engine starting batteries, or isolated control power. This sequence of events would result in the load having no power until the emergency generator can be started, or until the utility is restored to its normal condition.

To specify an automatic transfer switch equipped with the capabilities described above, design engineering firms may adopt the following text in their specifications:

“Automatic transfer switch shall have inherent phase balance protection logic to detect a ‘single-phasing’ condition, and its controller shall be equipped with a fault output terminal interconnected to a 24Vdc integral shunt trip, within the transfer switch, to disconnect the utility source from the load.”