GROUND-CHECK MONITOR INDUCED AND COUPLED AC PERFORMANCE

Typically the induced ac voltage in a ground-check circuit is viewed as shown in Figure 1.

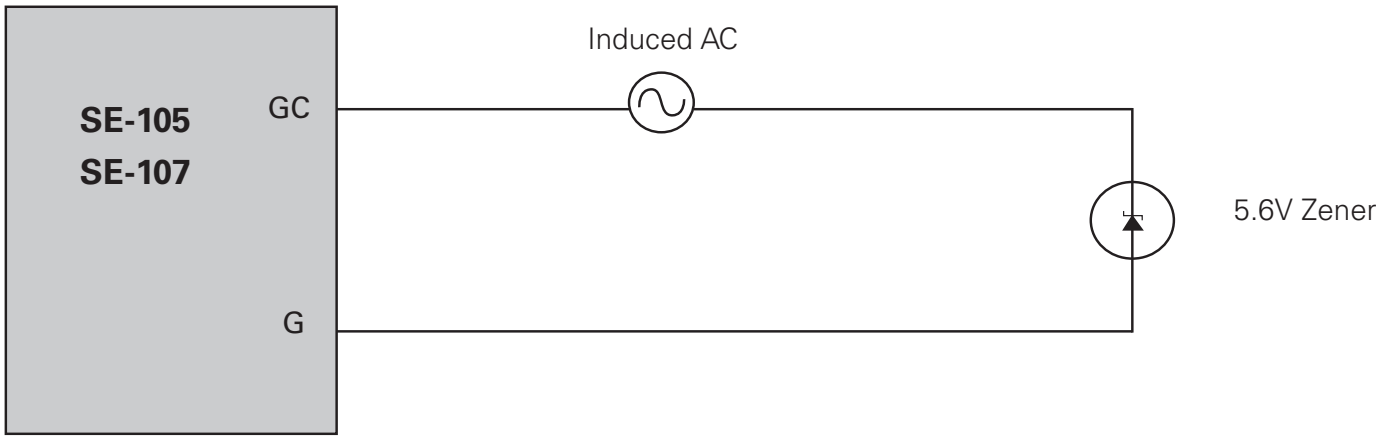

Figure 1

This circuit applies for applications where the induced ac results from current flowing in the power conductors. The cable capacitance is typically ignored in fixed-frequency applications because capacitive currents are low and do not influence ground-check operation. The SE-105 and SE-107 are specified for 25 Vac continuous operation at 50/60 Hz but has been tested over an induced AC frequency range up to 22 kHz.

The equivalent circuit in Figure 2 is the circuit that applies when a variable frequency drive (VFD) is used.

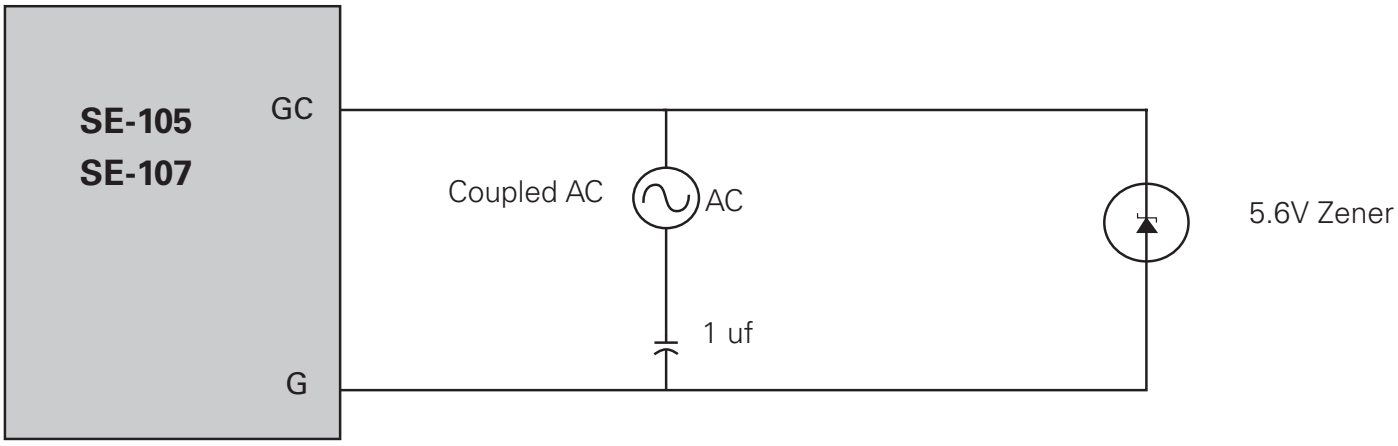

Figure 2

The 1 uf capacitor is a "best guess" typical value that represents the coupling between the VDF noise on the power cables and the GC circuit. The ac voltage appears as soon as the drive output is enabled and represents the noise generated by the carrier frequency and voltage. This value is not a function of load current and is always present.

For the circuit of Figure 2, a noise current of 100 mA will cause the SE-105/107 to trip. At the point of trip, the GC to G voltage at the SE-105/107 end is 3 Vdc.

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Possible Noise Solutions

- Since the coupled ac of Figure 2 is a function of carrier frequency, some improvement may be gained by reducing the carrier frequency to a minimum value.
- Output filtering (dv/dt filter) reduces the high frequency components coupled into the output cables.
- Input reactor filtering reduces noise coupled back to the source which will improve performance on other neighbouring GC circuits. Although a drive may be connected to a short motor cable, the VFD noise is reflected back on the power cables and will flow in the capacitance of other connected cables. If these cables are long, the condition in Figure 2 may be present and can cause nuisance trips.
- The addition of a capacitor between GC and C at the SE-105/107 can improve noise performance by a factor of 10. Capacitance values should not exceed 10 uf. Bigger is not better since any parallel capacitance will also reduce the induced ac specification. *Note: a non-polarized capacitor is required.*

System Tests

The dc voltage from GC to G can be used to determine the type of noise and severity of the noise. Measure the voltage and start the drive at minimum frequency. Any voltage drop is the result of coupled ac. Any voltage below 4 Vdc (trip occurs at 3 Vdc) should be considered a problem. If there is a immediate trip, then the issue is severe and one or all of the possible noise solutions previously listed should be investigated.