Figure 9.1 A volunteer during secondary electric shock test. (From Charles F. Dalziel, Electric shock hazard, IEEE spectrum, 1972, Courtesy of IEEE.)

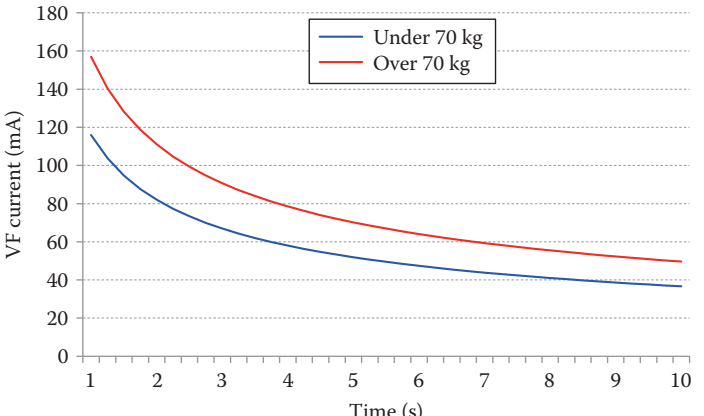


Figure 9.2 Ventricular fibrillation current as a function of shock duration.

009x002.eps

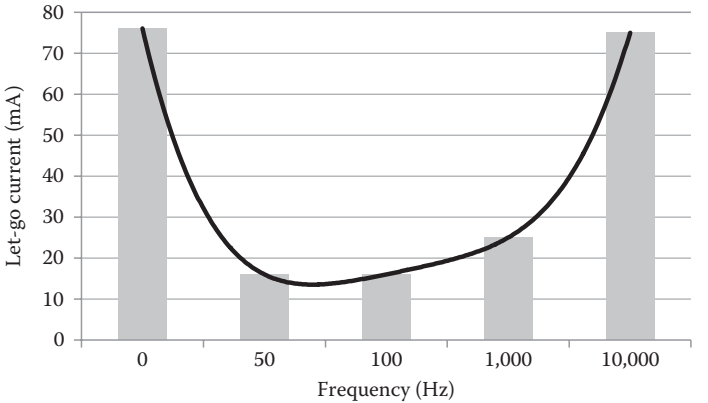


Figure 9.3 Let-go current as a function of frequency for men.

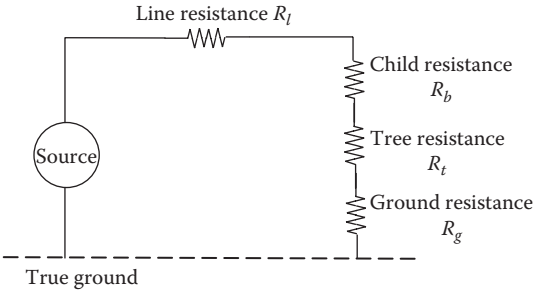


Figure 9.4 Model representation of the accident.

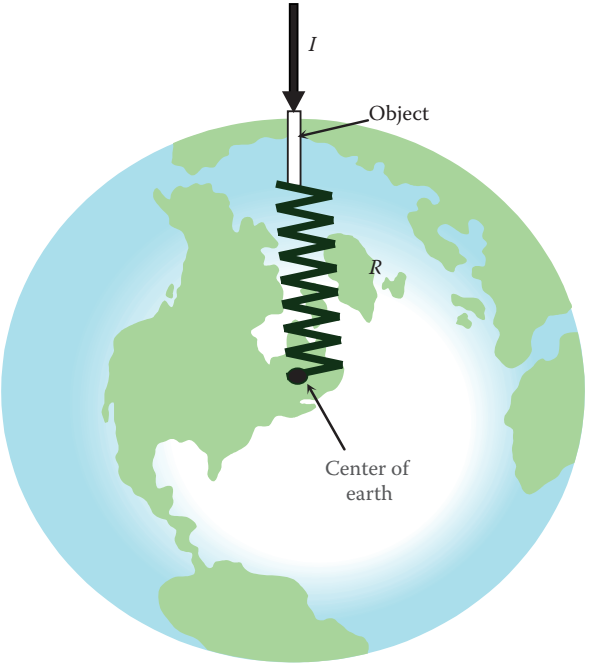


Figure 9.5 Ground resistance.

009x005.eps

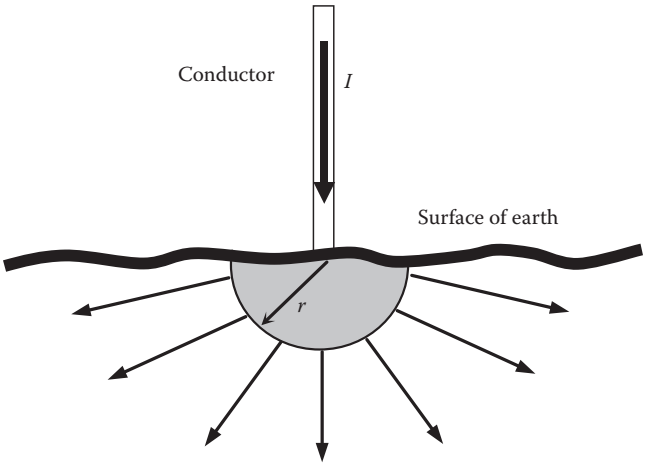


Figure 9.6 Current dispersion of a hemisphere.

009x006.eps

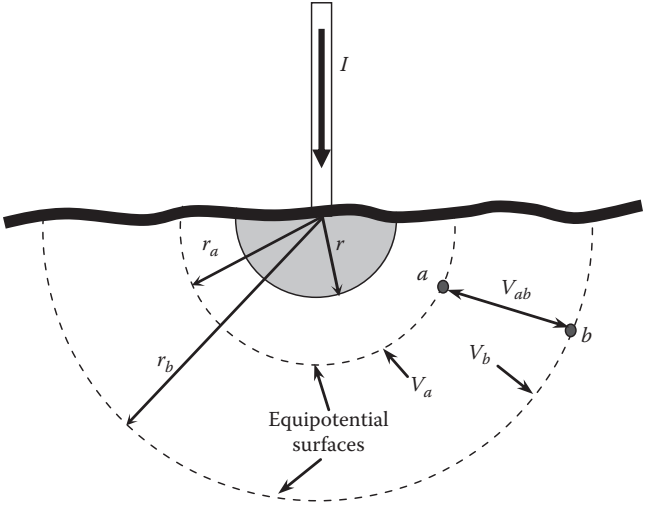


Figure 9.7 Equipotential surface.

009x007.eps

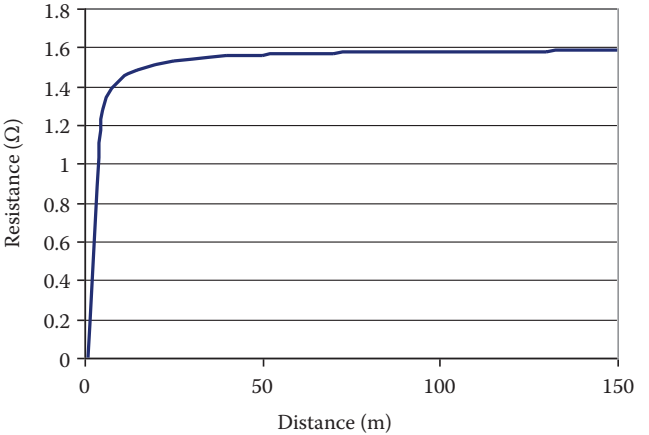


Figure 9.8 Ground resistance between the hemisphere and points at various distances.

009x008.eps

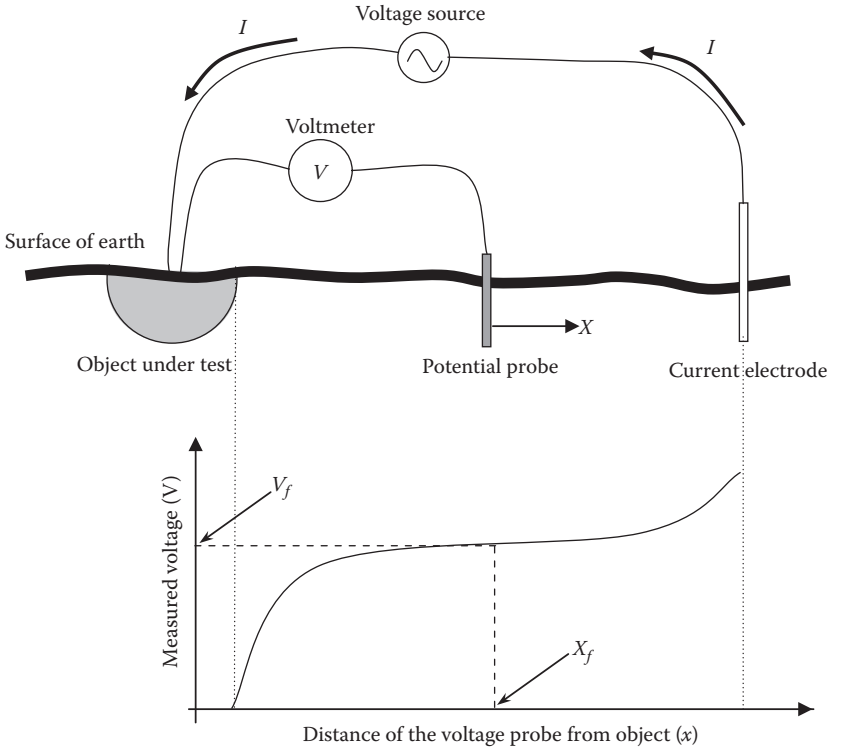


Figure 9.9 Fall-of-potential method to measure ground resistance.

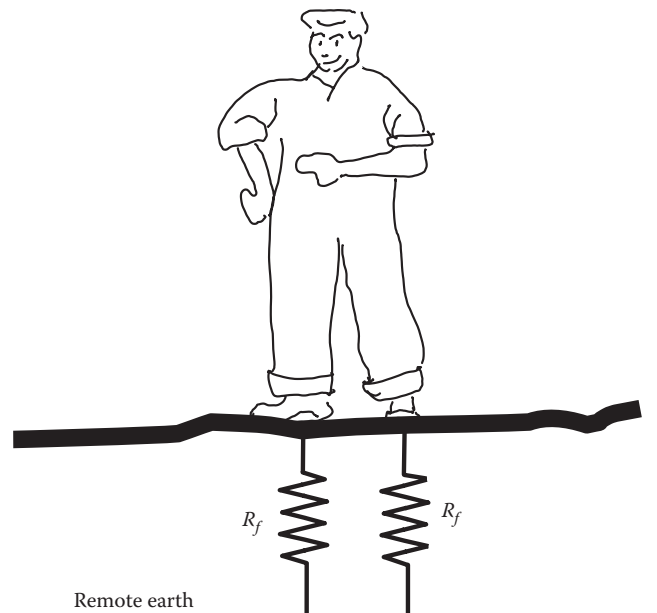
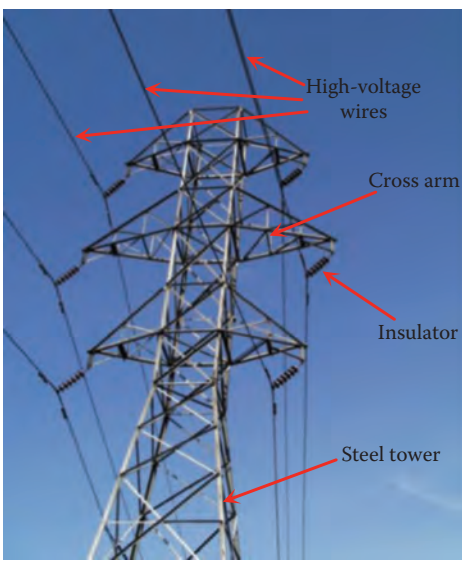


Figure 9.10 Feet resistance.

009x010.eps



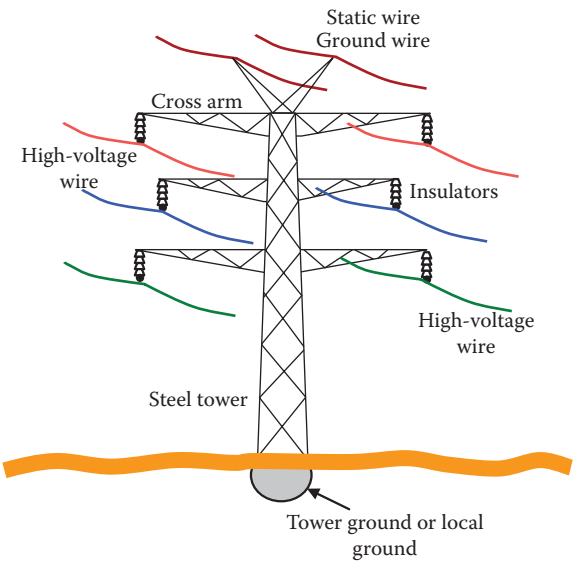


Figure 9.11 Main components of a steel power line.

009x011.eps

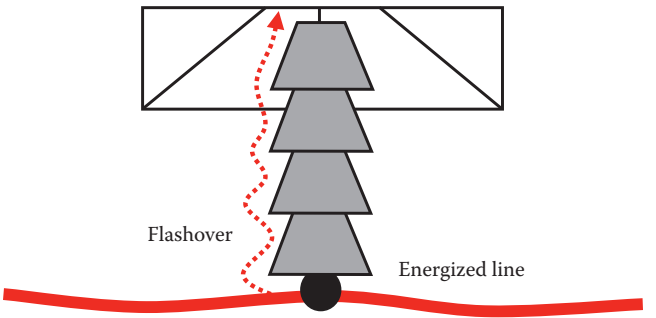


Figure 9.12 Insulation leakage or flashover due to conductive depositions on the insulator.

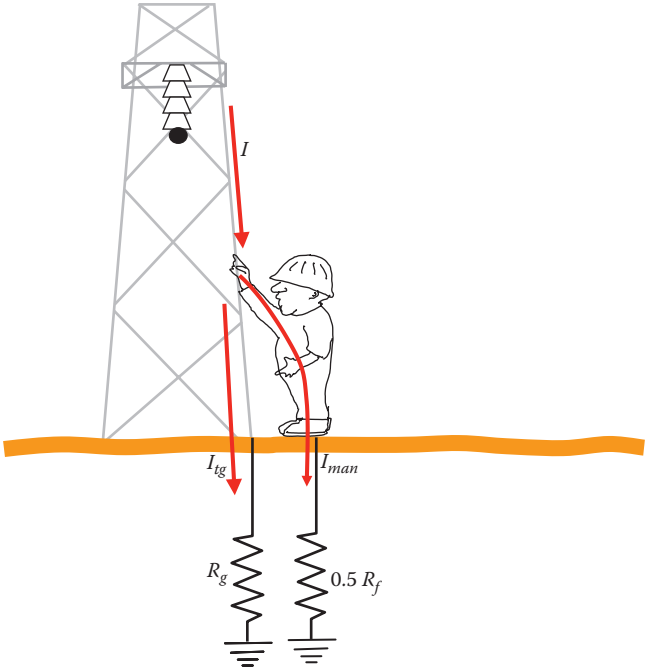


Figure 9.13 Touch potential.

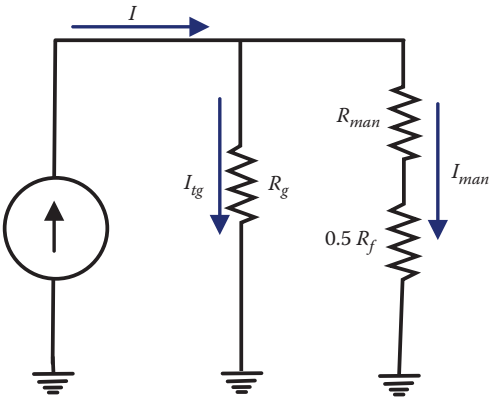


Figure 9.14 Circuit diagram of Figure 9.13.

009x014.eps

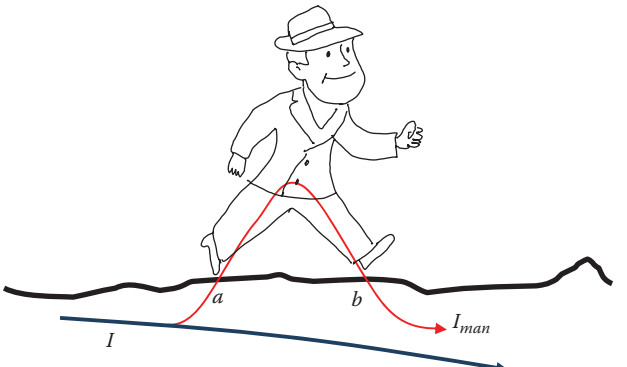


Figure 9.15 Current through a person due to step potential.

009x015.eps

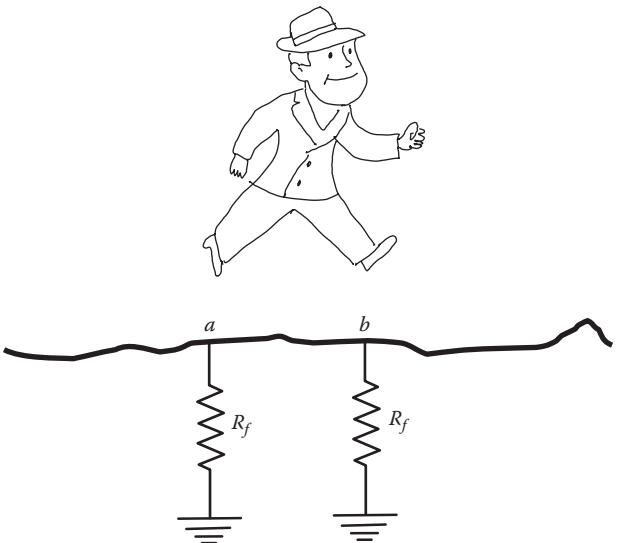


Figure 9.16 Thevenin's impedance.

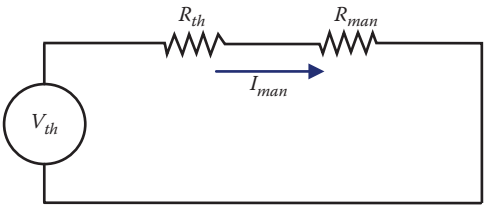


Figure 9.17 Equivalent circuit for the step potential.

009x017.eps

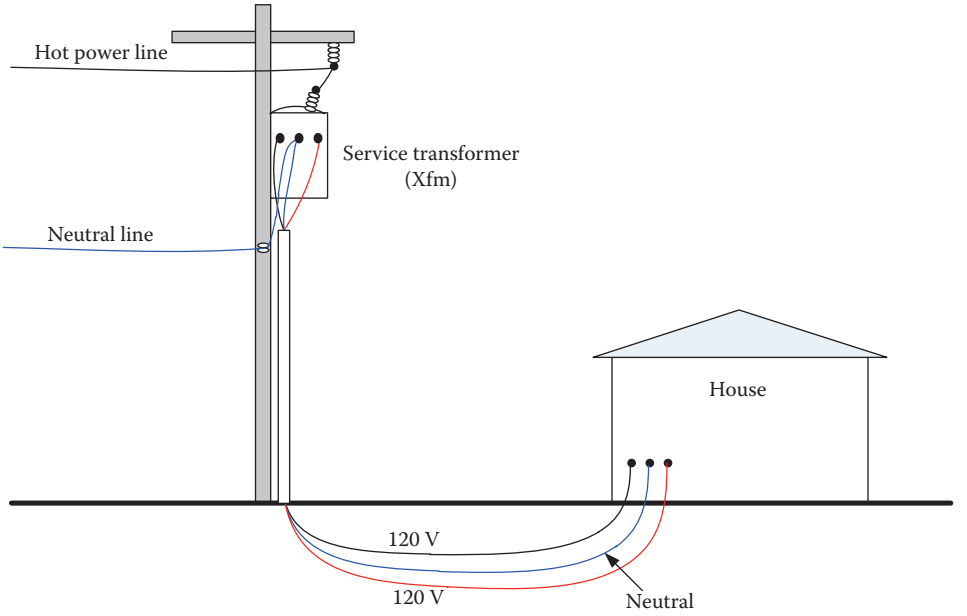


Figure 9.18 Dwelling service.

009x018.eps

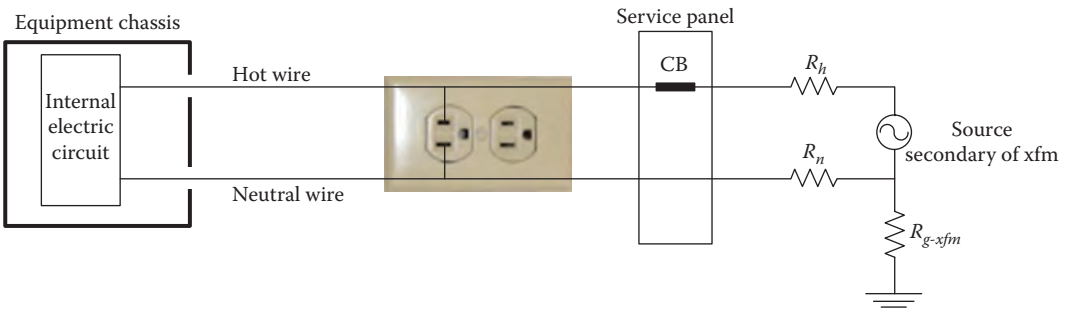


Figure 9.19 A basic connection of electrical equipment.

009x019.eps

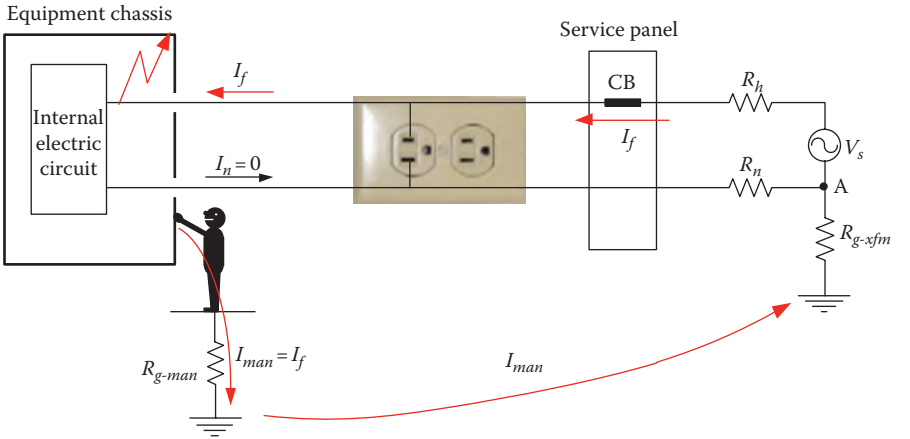


Figure 9.20 A person touching a floating chassis of faulty equipment.

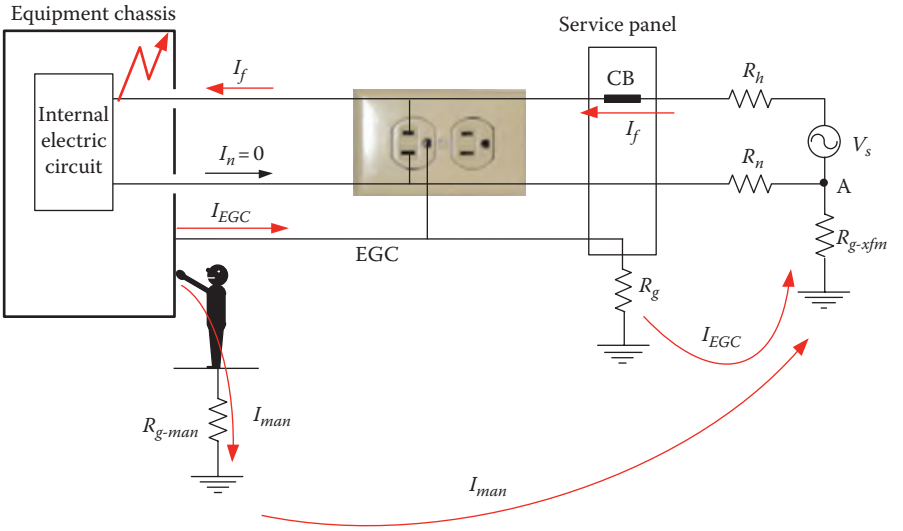


Figure 9.21 A person touching a chassis with EGC during fault.

009x021.eps

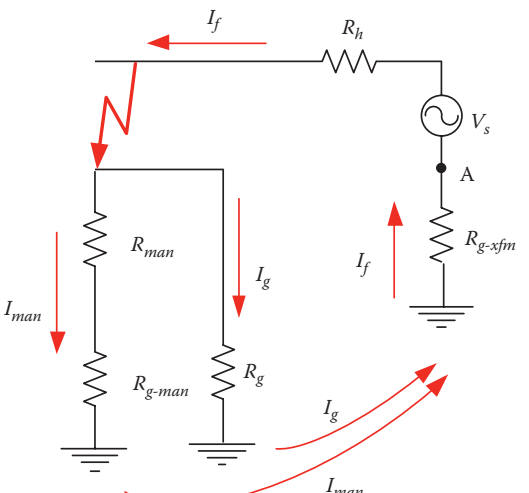


Figure 9.22 Equivalent circuit for the system in Figure 9.21.

009x022.eps

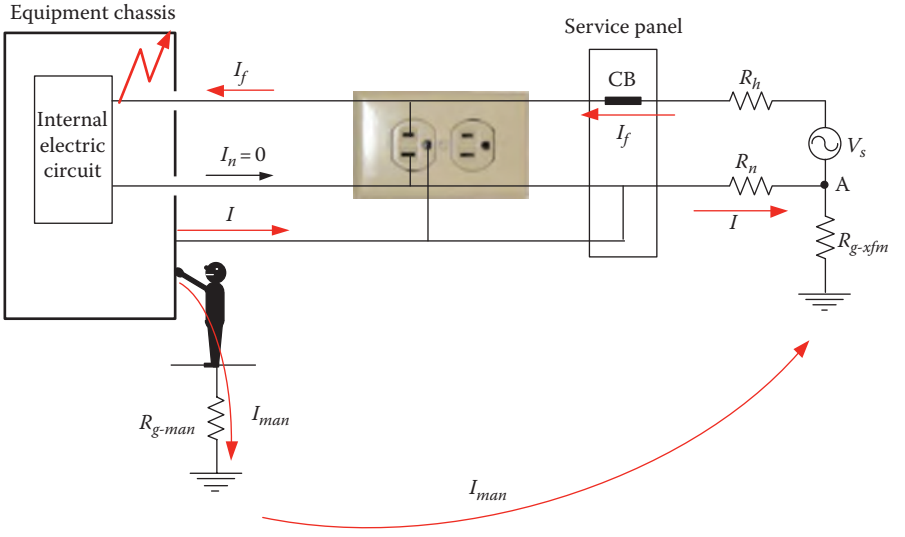


Figure 9.23 A person touching a chassis bonded to system neutral.

009x023.eps

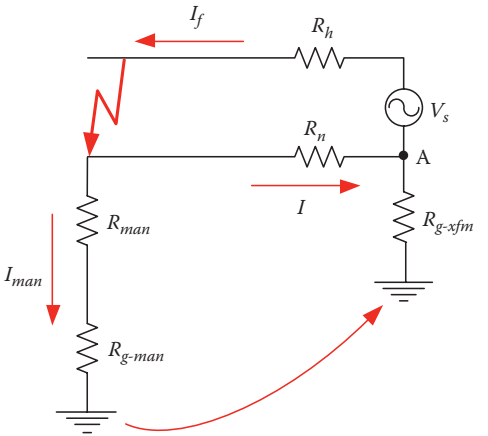


Figure 9.24 Equivalent circuit for Figure 9.23.

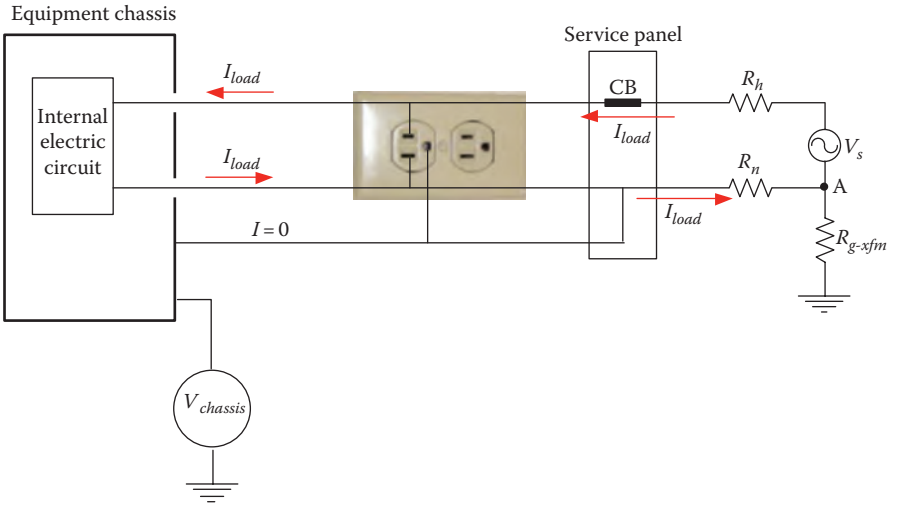


Figure 9.25 Chassis voltage of heavily loaded equipment.

009x025.eps

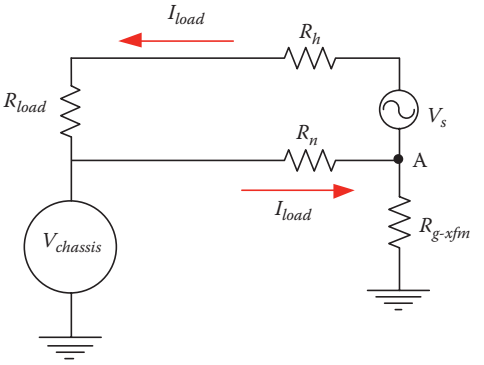


Figure 9.26 Equivalent circuit for Figure 9.25.

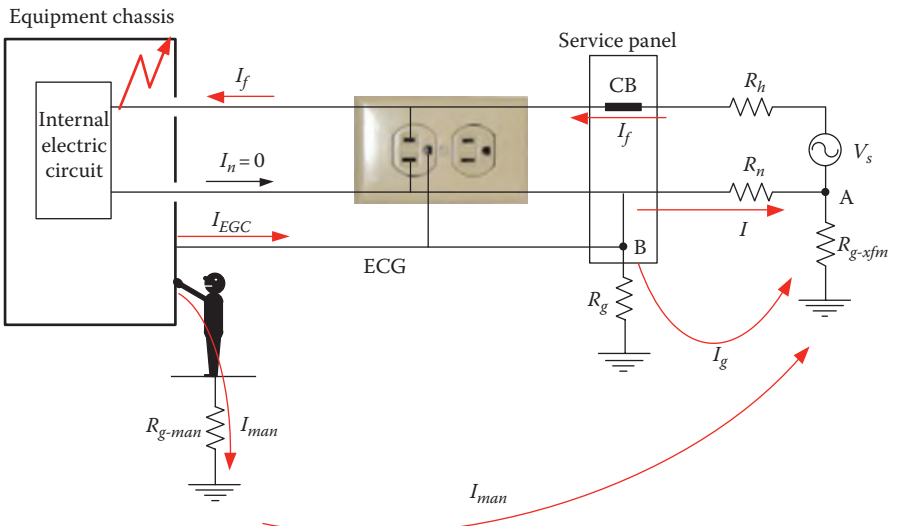


Figure 9.27 Modern wiring system.

009x027.eps

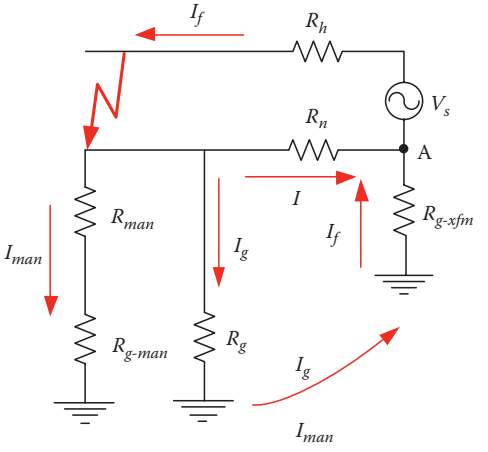


Figure 9.28 Equivalent circuit for the system in Figure 9.27.

009x028.eps

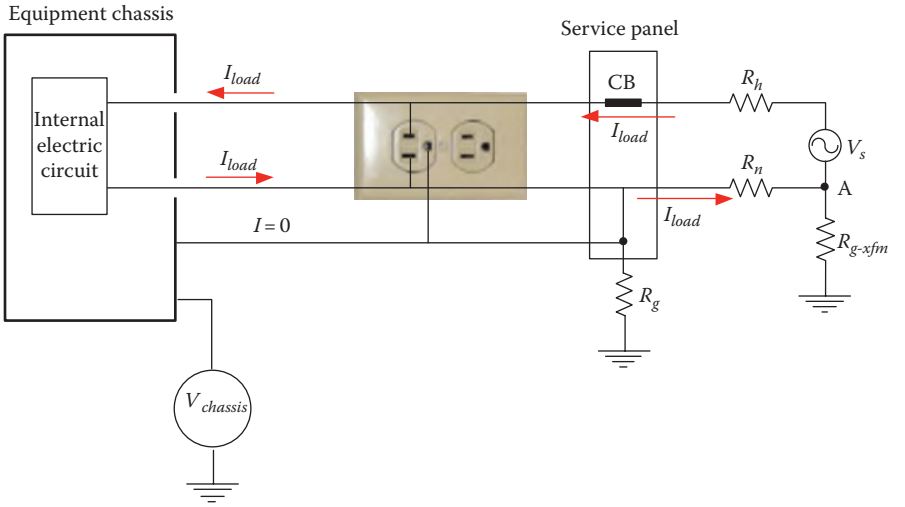


Figure 9.29 Chassis voltage of heavily loaded equipment with local ground.

009x029.eps

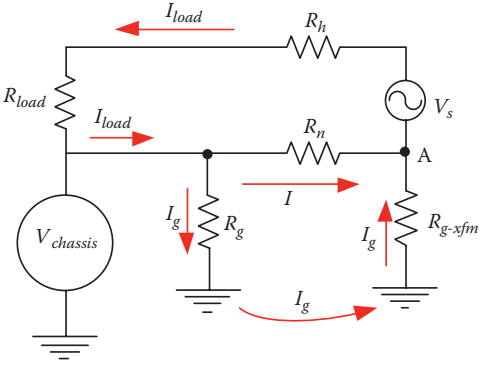


Figure 9.30 Equivalent circuit for Figure 9.29.

009x030.eps

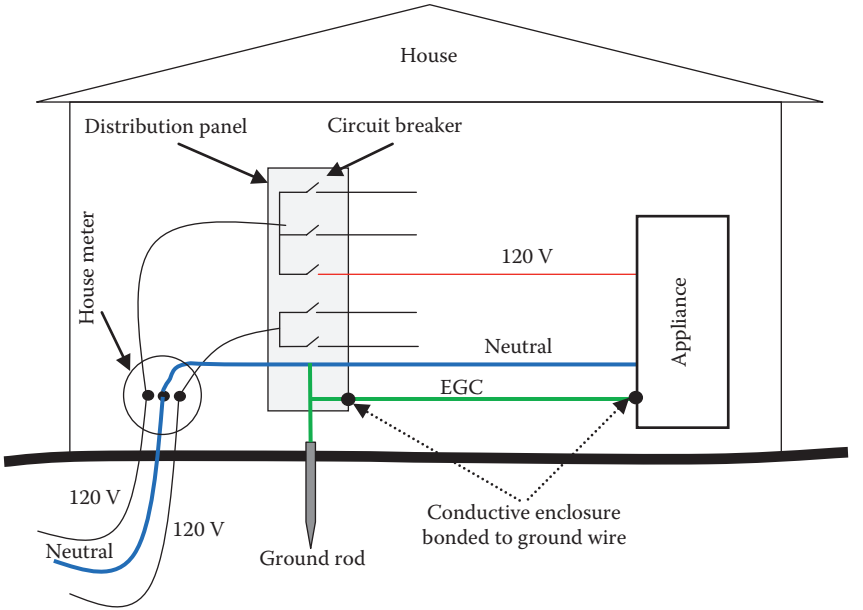
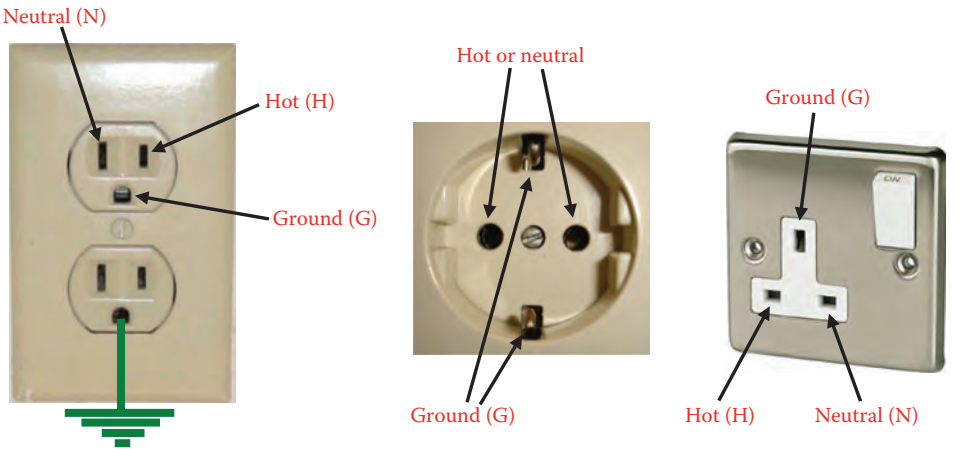


Figure 9.31 Electric circuit distribution inside a dwelling.



Type 1: Most of America

Type 2: Most of Europe

Type 3: England, parts of the Middle - East and Asia

Figure 9.32 Three types of household outlets.

009x032.eps

(a) (b) (c)

Figure 9.33 Common household plugs in North America. (a) Type 1: unpolarized, (b) Type 1: polarized, and (c) Type 1: three prongs.

009x033.eps

(a)

(b)

(c)

Figure 9.34 Common international household plugs. (a) Type 2: unpolarized, (b) Type 2: three prongs, and (c) Type 3: three prongs.

009x034.eps

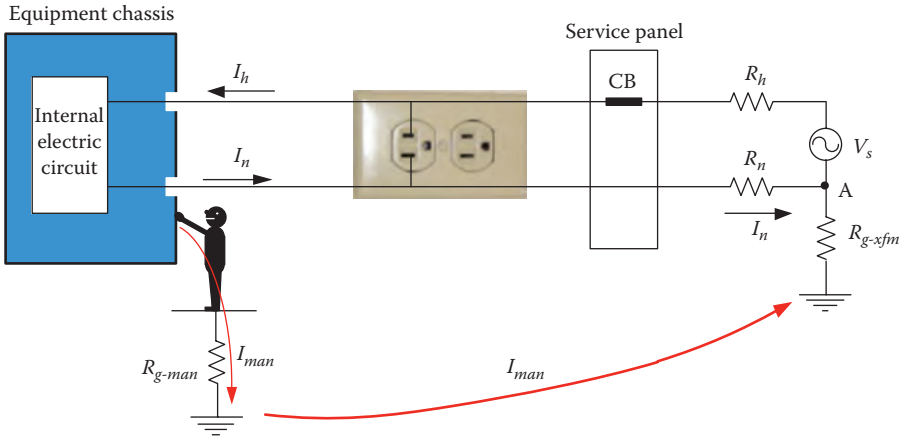


Figure 9.35 Water inside a device can create hazardous condition.

009x035.eps

Figure 9.36 GFCI outlet.

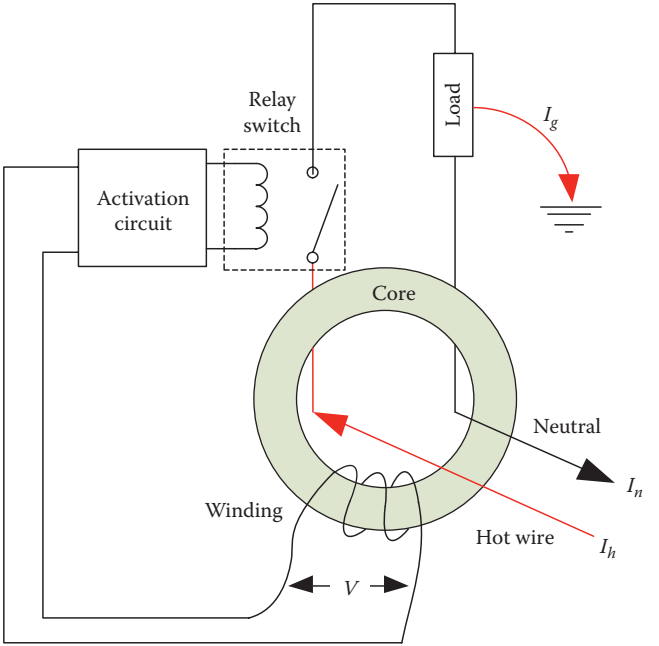


Figure 9.37 GFCI circuit.

009x037.eps

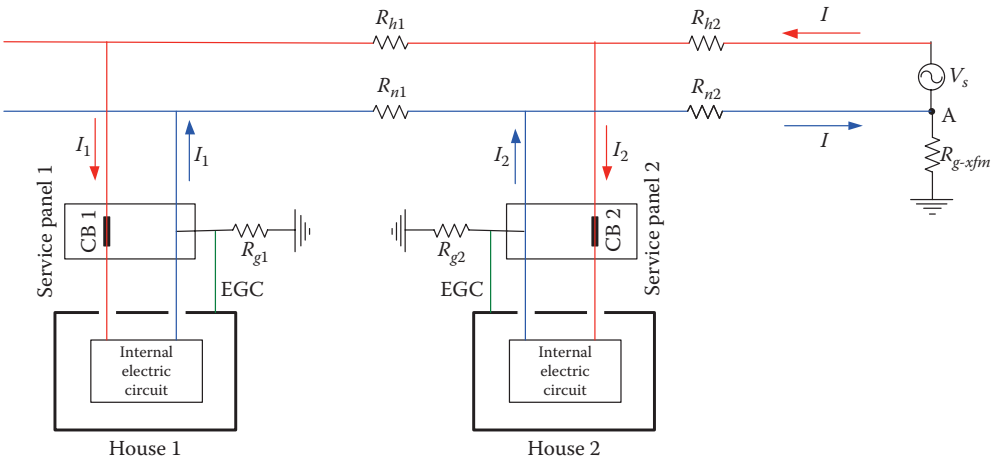


Figure 9.38 More than one house served by the same transformer.

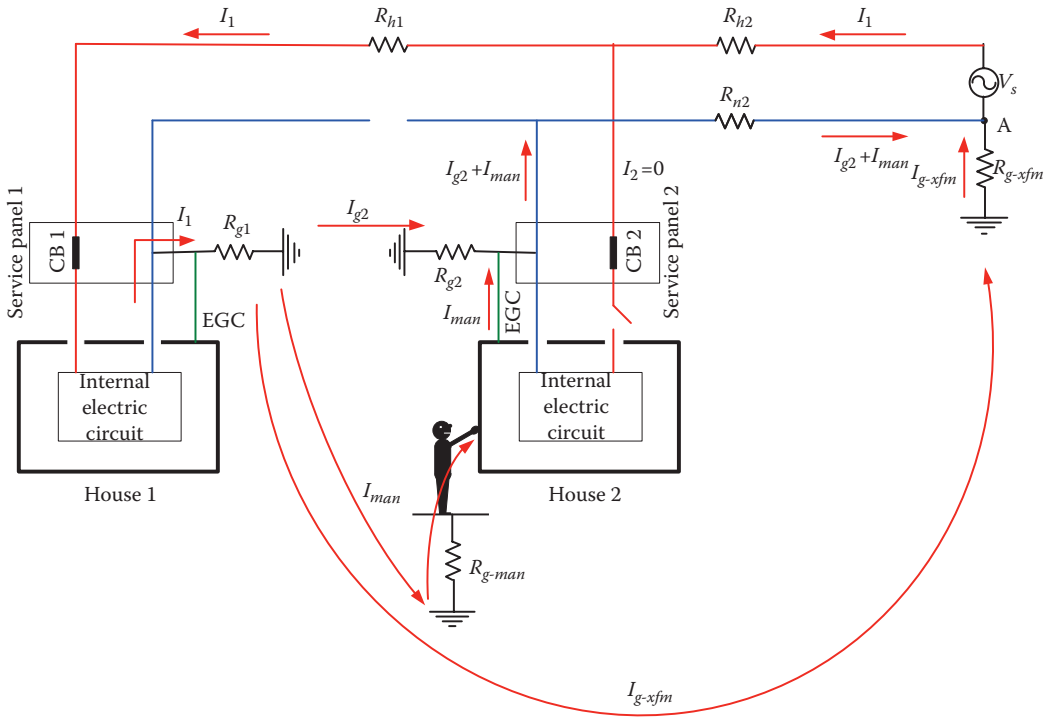


Figure 9.39 Hazard due to broken neutral wire.

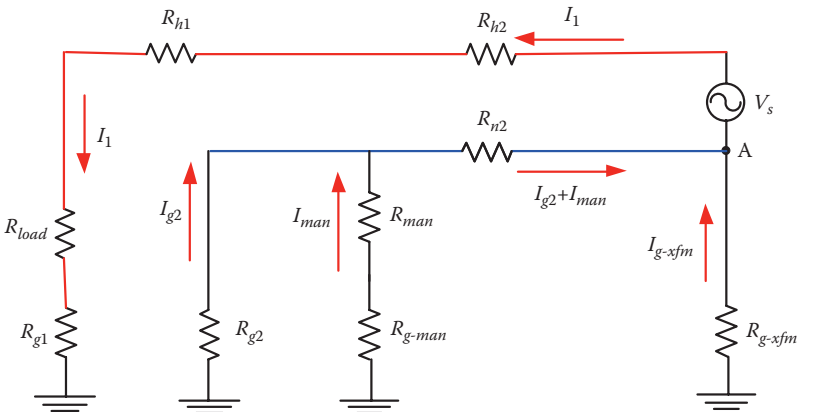


Figure 9.40 Equivalent circuit of system in Figure 9.39.

009x040.eps

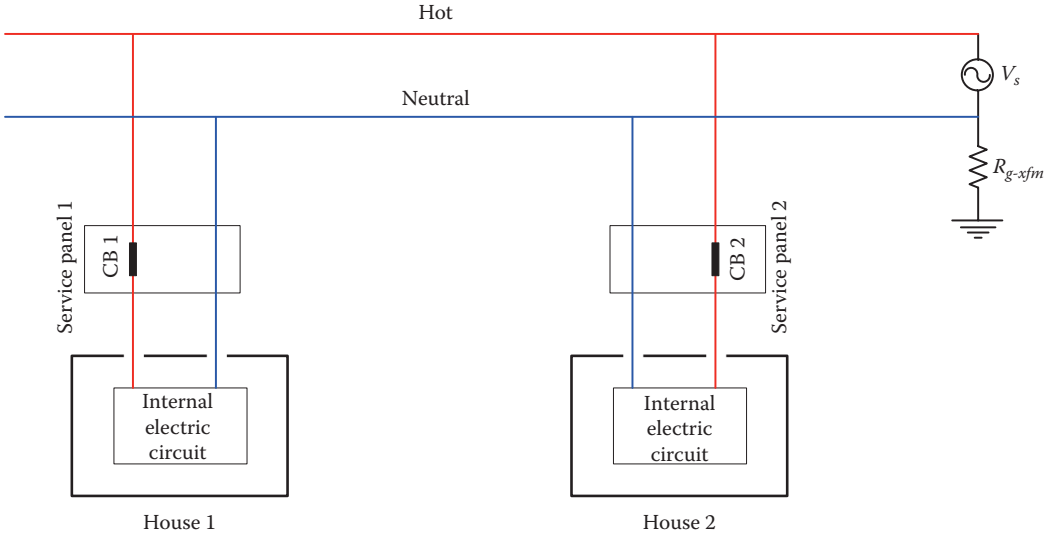


Figure 9.41 System without ground wire.

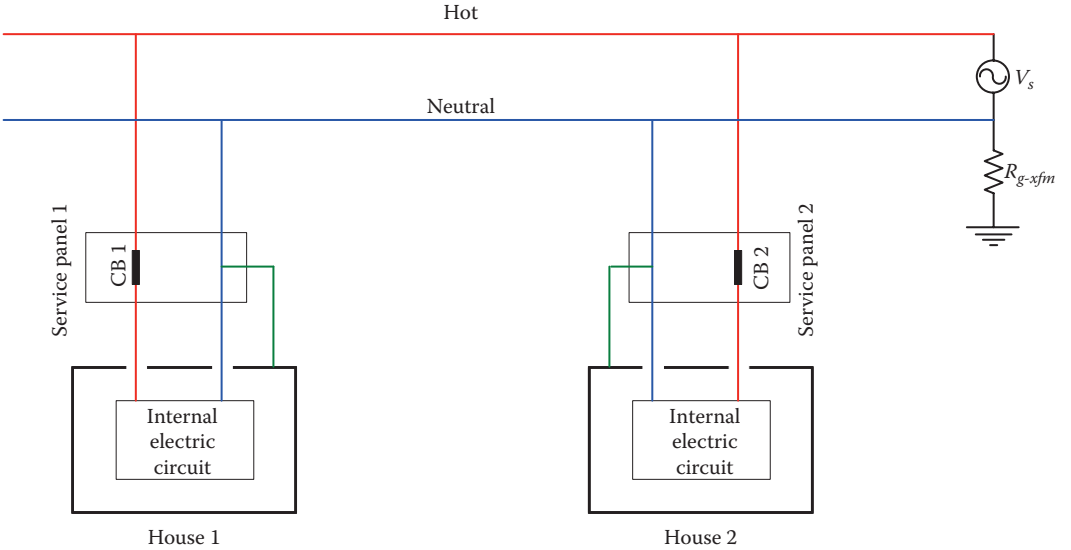


Figure 9.42 System without bonded neutral to chassis.

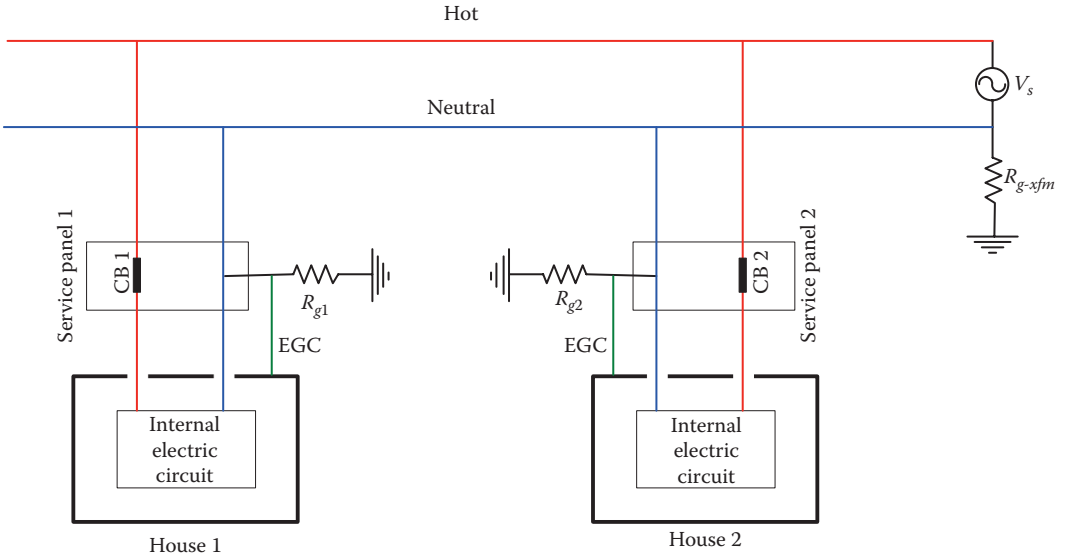


Figure 9.43 System with bonded and grounded neutral.

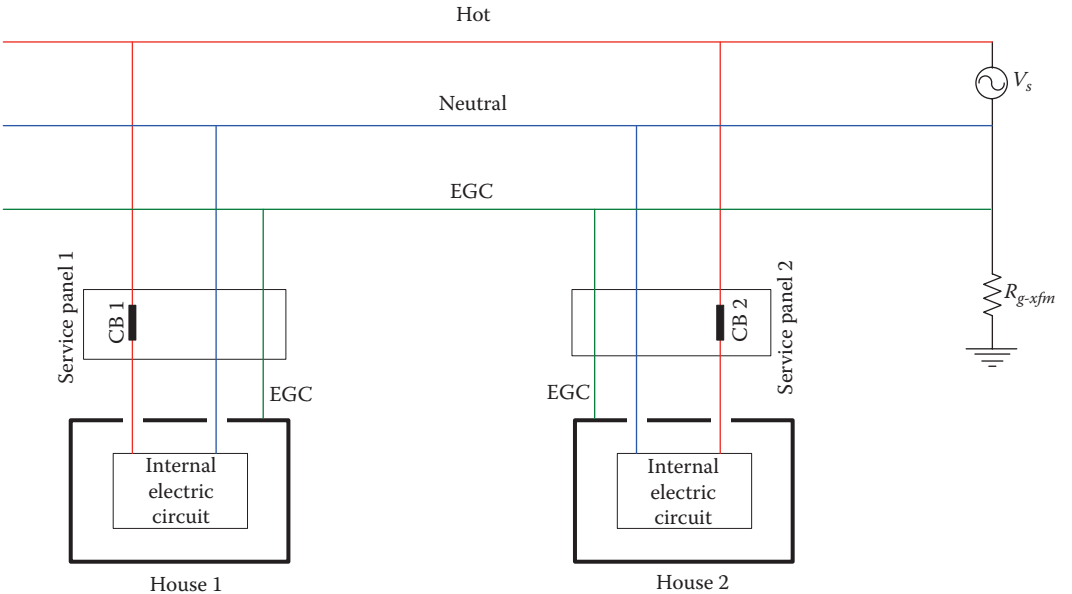


Figure 9.44 System with separated ground wire.

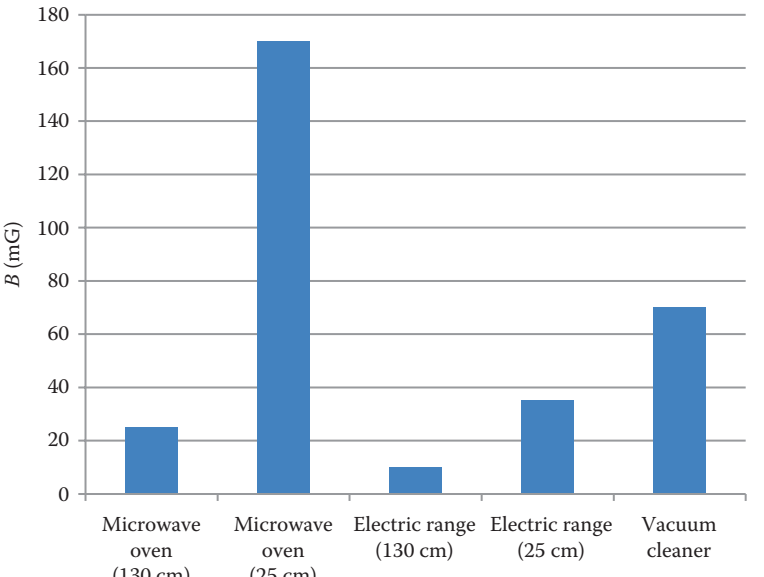


Figure 9.45 MF density of home appliances.