the conductors more than 40 diameters apart (about 25 mm or 1 inch).

**Magnetic Coupling**

Magnetic coupling is also a problem. When a current flows in a closed circuit, it produces a magnetic flux which is proportional to the current. If two wires are parallel, the flux produced in one wire will induce a voltage in the second wire. This induced voltage constitutes noise. When you are running wires between sensitive electronic components, avoid laying signal wires parallel to noisy, high-current AC power lines. If a signal line must cross a power line, have it do so at a right angle.

**Common-Impedance Coupling**

Common-impedance coupling occurs when currents from two different circuits flow through a common impedance. Two examples of this type of coupling are shown in figures 4 and 5. In figure 4, the ground currents of both circuits flow through a common ground impedance. The ground potential of circuit 1 is modulated by circuit 2, and vice versa. Any fluctuations in the ground current of circuit 2 will be coupled through the ground impedance, \( X_{g} \), to circuit 1.

Another example is the power-distribution schematic diagram shown in figure 5. Any change in the current required by circuit 2 will affect the voltage at the terminals of circuit 1. This effect is due to the common impedance of the power-supply lines and internal source impedance, \( R_{s} \), of the power supply. Shorter leads will help reduce the line impedance, but the source impedance always remains. The typical computer system plagued with common-impedance noise is one where the builder has attempted to use the processor power supply to run everything, including peripherals. The apparent economy is outweighed by periodic system crashes and unpredictable errors.

**Radiated-Field Coupling**

Radiated electric and magnetic fields provide the last form of coupling. This form of coupling can be most easily thought of as free-air radio transmission. The interfering circuit broadcasts noise just like a radio station, and every conductive surface in the receiver acts as an antenna. At close distances, the noise can in fact be much stronger than a real radio station. Many readers...