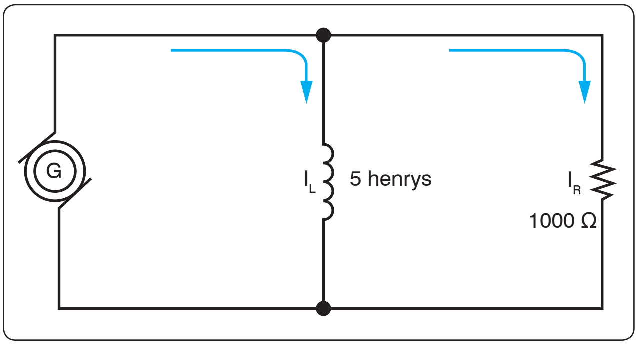

Figure 12-138. *AC parallel circuit containing inductance and resistance.*

Solution:

$$I_T = \sqrt{I_L{}^2 + I_R{}^2}$$
$$= \sqrt{(0.0584)^2 + (0.11)^2}$$
$$= \sqrt{0.0155}$$
$$= 0.1245 \text{ ampere}$$

Since inductive reactance causes voltage to lead the current, the total current, which contains a component of inductive current, lags the applied voltage. If the current and voltages are plotted, the angle between the two, called the phase angle, illustrates the amount the current lags the voltage.

In *Figure 12-139*, a 112-volt generator is connected to a load consisting of a 2 µf capacitance and a 10,000-ohm resistance in parallel. What is the value of the impedance and total current flow?

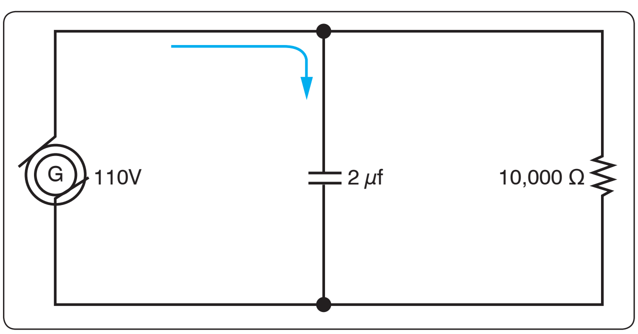

Figure 12-139. *A parallel AC circuit containing capacitance and resistance.*

Solution:

First, find the capacitive reactance of the circuit:

$$X_C = \frac{1}{2\pi fC}$$

Changing 2 µf to farads and entering the values into the formula given:

$$= \frac{1}{2 \times 3.14 \times 60 \times 0.000002}$$
$$= \frac{1}{0.00075360} \text{ or } \frac{10{,}000}{7.536}$$
$$= 1{,}327\ X_C \text{ capacitive reactance}$$

To find the impedance, the impedance formula used in a series AC circuit must be modified to fit the parallel circuit:

$$Z = \frac{RX_C}{\sqrt{R^2 + X_C{}^2}}$$
$$= \frac{10{,}000 \times 1{,}327}{\sqrt{(10{,}000)^2 + (1{,}327)^2}}$$
$$= 0.1315\ \text{W (approximately)}$$

To find the current through the capacitance:

$$I_C = \frac{E}{X_C}$$
$$I_C = \frac{110}{1{,}327}$$
$$= 0.0829 \text{ ampere}$$

To find the current flowing through the resistance:

$$I_R = \frac{E}{R}$$
$$= \frac{110}{10{,}000}$$
$$= 0.011 \text{ ampere}$$

To find the total current in the circuit:

$$I_T{}^2 = \sqrt{I_R{}^2 + I_C{}^2}$$
$$I_T = \sqrt{I_L{}^2 + I_R{}^2}$$
$$= 0.0836 \text{ ampere (approximately)}$$

Resonance

It has been shown that both inductive reactance:

$$(X_L = 2\pi fL)$$

and capacitive reactance:

$$X_C = \frac{1}{2\pi fC}$$

are functions of an AC frequency. Decreasing the frequency decreases the ohmic value of the inductive reactance, but a decrease in frequency increases the capacitive reactance. At