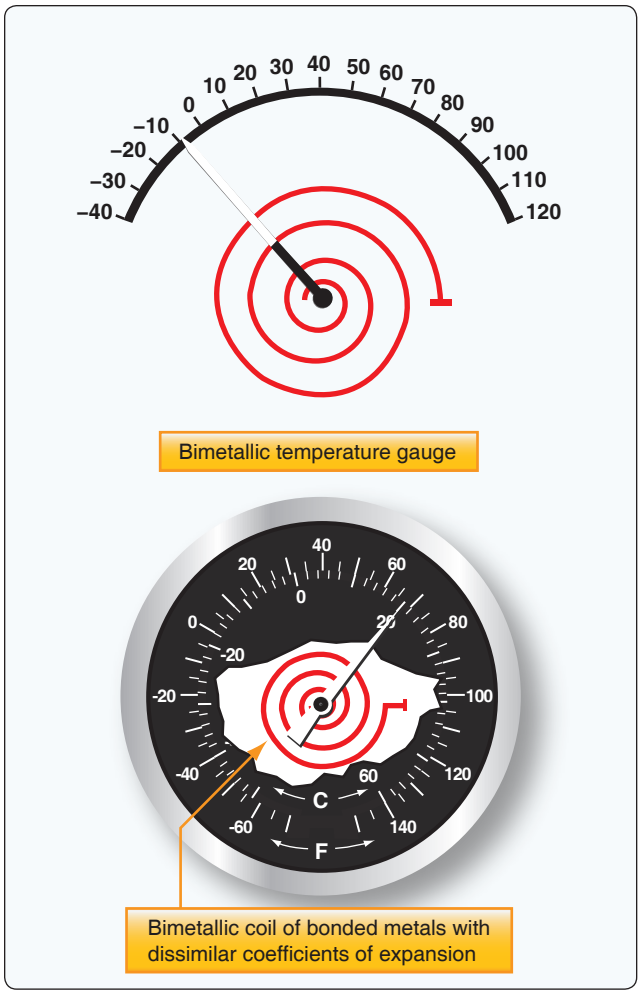


**Figure 10-66.** *A bimetallic temperature gauge works because of the dissimilar coefficients of expansion of two metals bonded together. When bent into a coil, cooling or heating causes the dissimilar metal coil to tighten, or unwind, moving the pointer across the temperature scale on the instrument dial face.*

**Figure 10-67.** *A bimetallic outside air temperature gauge and its installation on a light aircraft.*

directly with temperature. By filling a sensing bulb with such a volatile liquid and connecting it to a bourdon tube, the tube causes an indication of the rising and falling vapor pressure due to temperature change. Calibration of the dial face in degrees Fahrenheit or Celsius, rather than psi, provides a temperature reading. In this type of gauge, the sensing bulb is placed in the area needing to have temperature measured. A long capillary tube connects the bulb to the bourdon tube in the instrument housing. The narrow diameter of the capillary tube ensures that the volatile liquid is lightweight and stays primarily in the sensor bulb. Oil temperature is sometimes measured this way.

### Electrical Temperature Measuring Indication

The use of electricity in measuring temperature is very common in aviation. The following measuring and indication systems can be found on many types of aircraft. Certain temperature ranges are more suitably measured by one or another type of system.

#### *Electrical Resistance Thermometer*

The principle parts of the electrical resistance thermometer are the indicating instrument, the temperature-sensitive element (or bulb), and the connecting wires and plug connectors. Electrical resistance thermometers are used widely in many types of aircraft to measure carburetor air, oil, free air temperatures, and more. They are used to measure low and medium temperatures in the –70 °C to 150 °C range.

For most metals, electrical resistance changes as the temperature of the metal changes. This is the principle upon which a resistance thermometer operates. Typically, the electrical resistance of a metal increases as the temperature rises. Various alloys have a high temperature-resistance coefficient, meaning their resistance varies significantly with temperature. This can make them suitable for use in temperature sensing devices. The metal resistor is subjected to the fluid or area in which temperature needs to be