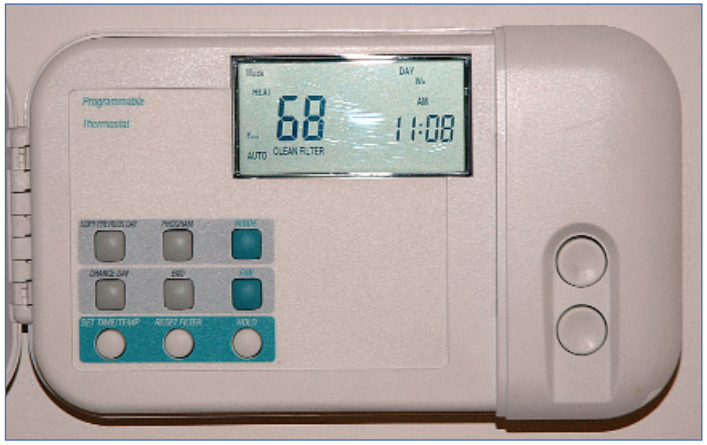
Programmable and Bimetal Strip Home Thermostats

Programmable Thermostat:

A modern, programmable thermostat is an excellent instrument to insure that energy is not wasted by heating and cooling a building when it is not needed. This thermostat can be set to automatically change temperature settings when no one is around, thus consuming less electricity. With many models, settings can be set to change several times a day over a weekly time period. This is helpful, for example to automatically raise and lower settings in the morning when you leave the house, but to have the system return the building to a comfortable temperature when you return. It can be programmed to change the temperature when you plan to sleep.

Because a programmable thermostat is controlled by electronic components, it is difficult for students to grasp its inner workings by simply viewing the circuitry. The older—but still commonly used— bimetal thermostat is pictured and explained to the right because it operates on the principle of thermal expansion, which is demonstrated in accompanying teacher materials.



Bimetal Thermostat:

Smart Ideas Sheets 1 and 2 contain a demonstration and explanation of the basic principles of a bimetal thermostat. Here is a basic explanation of the workings of an actual bimetal thermostat.

The bimetal strip is coiled, so that its longer length will fit in the small space provided by the thermostat housing. When the strip expands and contracts with the heating and cooling of the air around it. The position of the strip is tilted foward or backward by control lever that is calibrated with an actual temperature scale, for example 55 through 80° F.

In the version pictured here, two mercury switches are employed to turn heating and cooling equipment on and off. The switch is a sealed glass tube with a ball of mercury (an electrical conductor) sealed inside. One wire runs along the bottom of the tubes. There is an electrical contact halfway up the side of each tube on the right. As the bimetal coil expands, it tilts the tubes to the right. As the tube tilt past the horizontal plane, the mercury, rolls to the right, completing an electrical circuit between the bottom wire and contact point. In this system, the two glass tubes are sloped slightly off parallel. That way, one curcuit is completed before the other one. The two switches control the delay between the starting of heating and cooling units and the system's fan.