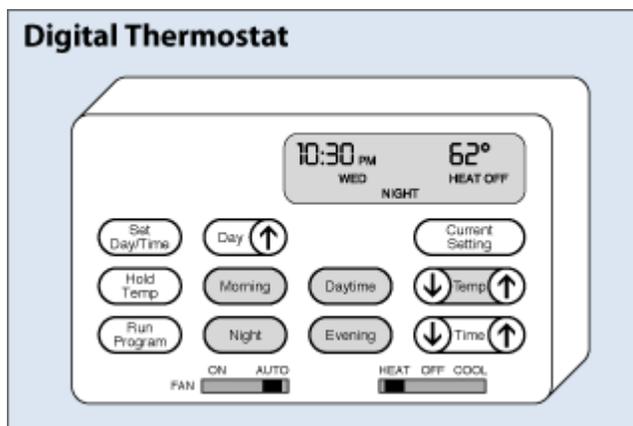


U.S. Department of Energy - Energy Efficiency and Renewable Energy

A Consumer's Guide to Energy Efficiency and Renewable Energy

Thermostats and Control Systems

You can save around 10% a year on your heating and cooling bills by simply turning your thermostat back 10°–15° for eight hours. You can do this automatically without sacrificing comfort by installing an automatic setback or programmable thermostat.



A programmable thermostat offers a lot of flexibility in its temperature settings.

Using a programmable thermostat, you can adjust the times you turn on the heating or air-conditioning according to a pre-set schedule. As a result, you don't operate the equipment as much when you are asleep or when the house is not occupied.

Programmable thermostats can store and repeat multiple daily settings (six or more temperature settings a day) that you can manually override without affecting the rest of the daily or weekly program. When shopping for a programmable thermostat, be sure to look for the ENERGY STAR® label.

General Thermostat Operation

You can easily save energy in the winter by setting the thermostat to 68°F while you're awake and setting it lower while you're asleep or away from home. By turning your thermostat back 10°–15° for 8 hours, you can save about 5%–15% a year on your heating bill—a savings of as much as 1% for each degree if the setback period is eight hours long. The percentage of savings from setback is greater for buildings in milder climates than for

those in more severe climates.

In the summer, you can follow the same strategy with central air conditioning, too, by keeping your house warmer than normal when you are away, and lowering the thermostat setting to 78°F (26°C) only when you are at home and need cooling. Although thermostats can be adjusted manually, programmable thermostats will avoid any discomfort by returning temperatures to normal as you wake or return home.

A common misconception associated with thermostats is that a furnace works harder than normal to warm the space back to a comfortable temperature after the thermostat has been set back, resulting in little or no savings. This misconception has been dispelled by years of research and numerous studies. The fuel required to reheat a building to a comfortable temperature is roughly equal to the fuel saved as the building drops to the lower temperature. You save fuel between the time that the temperature stabilizes at the lower level and the next time heat is needed. So, the longer your house remains at the lower temperature, the more energy you save.

Limitations For Homes With Heat Pumps, Electric Resistance Heating, Steam Heat, And Radiant Floor Heating

Programmable thermostats are generally not recommended for heat pumps. In its cooling mode, a heat pump operates like an air conditioner, so turning up the thermostat (either manually or with a programmable thermostat) will save energy and money. But when a heat pump is in its heating mode, setting back its thermostat can cause the unit to operate inefficiently, thereby canceling out any savings achieved by lowering the temperature setting. Maintaining a moderate setting is the most cost-effective practice. Recently, however, some companies have begun selling specially designed programmable thermostats for heat pumps, which make setting back the thermostat cost effective. These thermostats typically use special algorithms to minimize the use of backup electric resistance heat systems.

Electric resistance systems, such as electric baseboard heating, require thermostats capable of directly controlling 120-volt or 240-volt circuits. Only a few companies manufacture line-voltage programmable thermostats.

For steam heating and radiant floor heating systems, the problem is their slow response time: both types of systems may have a response time of several hours. This leads some people to suggest that setback is inappropriate for these systems. However, some manufacturers now offer thermostats that track the performance of your heating system to determine when to turn it on in order to achieve comfortable temperatures at your programmed time.

Alternately, a normal programmable thermostat can be set to begin its cool down well

before you leave or go to bed and return to its regular temperature two or three hours before you wake up or return home. This may require some guesswork at first, but with a little trial and error you can still save energy while maintaining a comfortable home.

Choosing and Programming a Programmable Thermostat

Most programmable thermostats are either digital, electromechanical, or some mixture of the two. Digital thermostats offer the most features in terms of multiple setback settings, overrides, and adjustments for daylight savings time, but may be difficult for some people to program. Electromechanical systems often involve pegs or sliding bars and are relatively simple to program.

When programming your thermostat, consider when you normally go to sleep and wake up. If you prefer to sleep at a cooler temperature during the winter, you might want to start the temperature setback a bit ahead of the time you actually go to bed; you probably won't notice the house cooling off as you prepare for bed. Also consider the schedules of everyone in the household; is there a time during the day when the house is unoccupied for four hours or more? If so, it makes sense to adjust the temperature during those periods.

Other Considerations

The location of your thermostat can affect its performance and efficiency. Read the manufacturer's installation instructions to prevent "ghost readings" or unnecessary furnace or air conditioner cycling. Place thermostats away from direct sunlight, drafts, doorways, skylights, and windows. Also make sure your thermostat is conveniently located for programming.

Learn More

Product Information

- [Programmable Thermostats](#)
ENERGY STAR®

Reading List

- "Electronic Thermostats." (June 1992). *Radio-Electronics*.
- "Energy Saving Thermostats." (October 1993). [Consumer Reports](#)."
- Wilson, T. (January-February 1991). "Good News on the 'Setback' Front." [Home Energy](#).
- "[Get Comfortable with Your Setback Thermostat](#)." (November 1999). The California Energy Commission.

- "Home Environment." (February 1992). *Home Mechanix*.
- "Home Q&A." (November 1995). *Home Mechanix*.
- "The Latest in Home Thermostats." (February 1990). *Consumers' Research Magazine*.
- "New Electronic Thermostats Save Money." (January 1989). *Consumers Digest*.
- "Programmable Thermostats: How to Buy and Install One in Your Home." (January 1989). [*Family Handyman*](#).
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