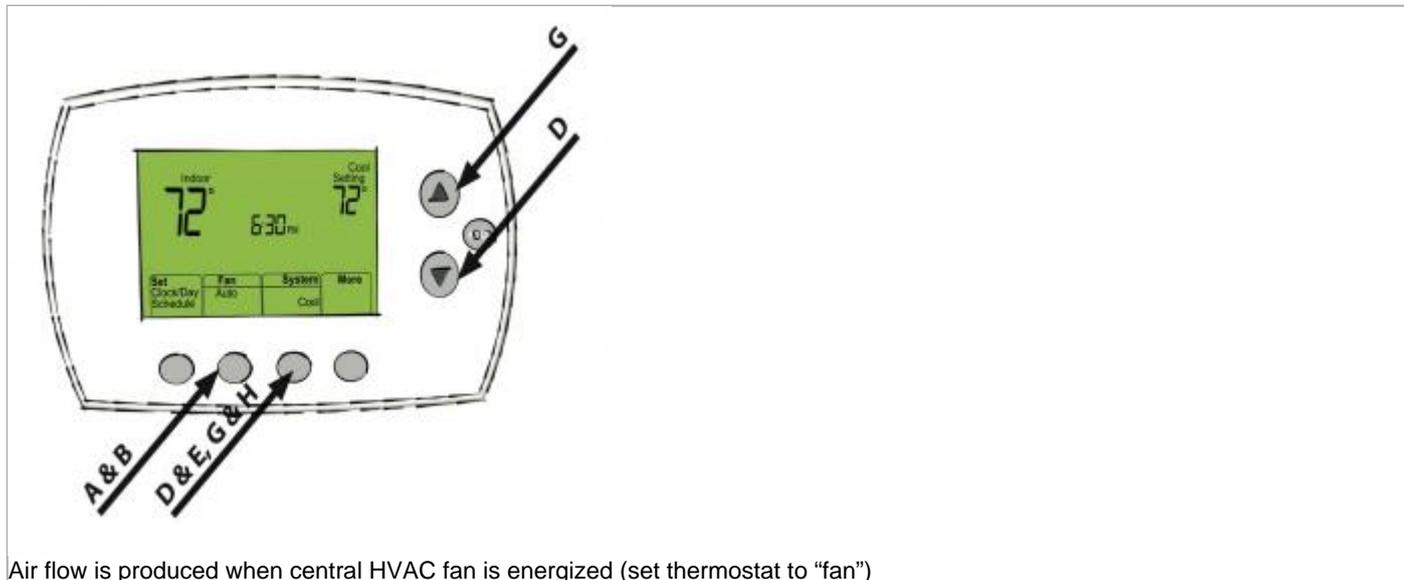


Thermostat Controls

Last Updated: 08/13/2014

Scope



Air flow is produced when central HVAC fan is energized (set thermostat to “fan”)

Install a programmable thermostat to control the heating and cooling equipment.

Test the thermostat to ensure that it works in heating, cooling, and fan modes.

DOE Zero Energy Ready Home Notes

The [DOE Zero Energy Ready Home National Program Requirements](#) target home specifications (Exhibit 2) state that programmable thermostats are required (except for zones with radiant heat). In homes with heat pumps, the programmable thermostat should have “adaptive recovery” technology to prevent excessive use of electric back-up heating.

ENERGY STAR Certified Homes Notes

[Note: Guidance for ENERGY STAR Certified Homes Version 3.0, Revision 08 is coming soon.]

[HVAC System Quality Checklist](#), Controls. Air flow is produced when central HVAC fan is energized (set thermostat to “fan”). Cool air flow is produced when the cooling cycle is energized (set thermostat to “cool”). In cases where the condenser unit is installed after the time of inspection by the Home Energy Rating System (HERS) rater, the rater is exempt from verifying cool air flow when the condenser is for an AC unit and also from heated air flow when the condenser is for a heat pump unit. To prevent potential equipment damage, the rater shall not conduct the cool air test if the outdoor temperature is $\leq 55^{\circ}\text{F}$ or, if known, below the manufacturer-recommended minimum operating temperature for the cooling cycle. When this occurs, the rater shall mark ‘N/A’ on the Checklist for this item. Heated air flow is produced when the heating cycle is energized (set thermostat to “heat”).

Description

In homes with central HVAC equipment, a programmable thermostat should be installed. If the home has a heat pump for heating and cooling, the programmable thermostat should have adaptive-recovery technology. These specially designed thermostats for heat pumps are equipped with an adaptive-recovery technology that directs the heat pump to minimize the use of costly auxiliary heating, which is typically electric resistance heat, when returning the space from a set-back temperature to the desired temperature. For example, the owner may input a temperature setback to 62°F during the day in the winter while they are at work with the temperature returning to 68°F at 5 pm. In the afternoon, the thermostat's microprocessor senses the temperature difference to be overcome and triggers the heat pump earlier allowing it to bring up the space temperature gradually over a longer period of time. This allows the heat pump alone to provide the temperature increase and minimizes the use of the more costly electric resistance auxiliary heat. Electronic thermostats with adaptive recovery technology "learn" from experience how soon to turn on the heating or cooling system. They do this by recording the time it takes to hit the target temperature and adjusting the start time accordingly. Within a week or so of installation, a programmable thermostat with adaptive recovery technology will have adjusted to the home's specific heating and cooling system, construction type, and local climate.

ENERGY STAR Certified Homes Thermostat Testing

The ENERGY STAR Certified Homes program requires that the thermostat be tested by a Home Energy Rating System (HERS) rater to ensure that the fan, cooling, and heating settings operate correctly.

In cases where the condenser unit is installed after the inspection by the rater, the rater is exempt from verifying the cool air flow. If the condenser is part of a heat pump, the rater is also exempt from testing hot air flow. To prevent potential equipment damage, the rater should not conduct the cool air flow test if the outdoor temperature is less than or equal to 55°F or below the manufacturer-recommended minimum operating temperature for the cooling cycle, if that is known. When this occurs, the rater should mark 'N/A' on the ENERGY STAR checklist for this item.

How to Test Air Flow

1. Manually turn the fan to "on" at the thermostat
2. Check for air flow at supply registers
3. Reset the thermostat to the original settings before continuing.

How to Test Cooling Setting

1. Manually set the system to "cool" at the thermostat and set the fan to "auto." If the system does not have air conditioning, this item does not need to be verified
2. Change the set point temperature to 3°F below the ambient temperature
3. Check for cool air flow at the supply registers
4. Reset the thermostat to the original settings before continuing.

How to Test Heating Setting

1. Manually set the system to "heat" at the thermostat and set the fan to "auto"
2. Change the set point temperature to 3°F above the ambient temperature
3. Check for warm air flow at the supply registers
4. Reset the thermostat to the original settings.

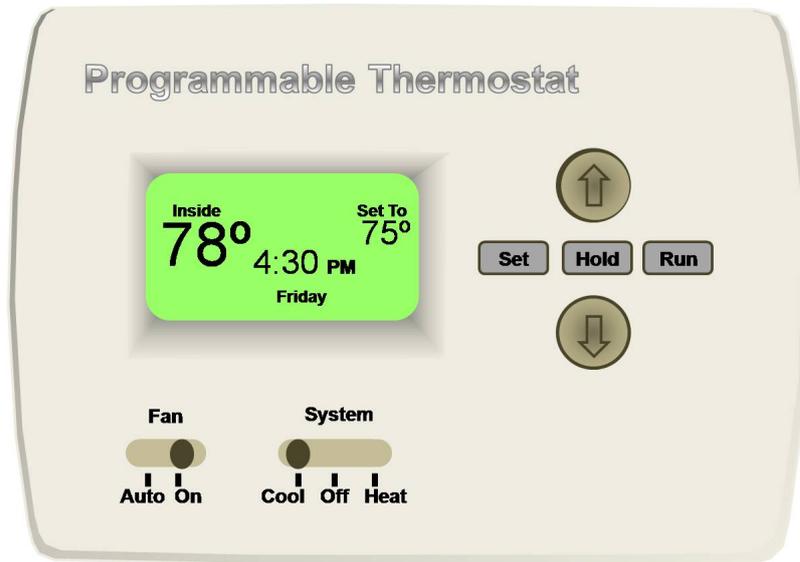


Figure 1 - The HERS rater should test the thermostat fan, cool, and heat settings to make sure the system blows ventilation, [Reference](#)

cooled, and warmed air. [Image not found
https://basc.pnnl.gov/sites/all/themes/pnnl_btp/images/REF_icon.png](https://basc.pnnl.gov/sites/all/themes/pnnl_btp/images/REF_icon.png)

Ensuring Success

In homes with central HVAC equipment, a programmable thermostat should be installed. This thermostat should be tested by the HERS rater to ensure that the fan, cooling, and heating settings operate.

In homes with a heat pump, the thermostat should be equipped with adaptive recovery technology.

Climate

No climate specific information applies.

Training

Right and Wrong Images

None Available

CAD

None Available

Compliance

The Compliance tab contains both program and code information. Exact code language is copyrighted and may require purchase from the publisher. While we continually update our database, links may have changed since posting. Please contact our webmaster if you find broken links.

[ENERGY STAR Certified Homes](#)

[Note: Guidance for ENERGY STAR Certified Homes Version 3.0, Revision 08 is coming soon.]

ENERGY STAR Certified Homes (Version 3.0, Revision 07), HVAC System Quality Checklist, Controls. Air flow is produced when central HVAC fan is energized (set thermostat to “fan”). Cool air flow is produced when the cooling cycle is energized (set thermostat to “cool”). In cases where the condenser unit is installed after the time of inspection by the Rater, the Rater is exempt from verifying cool air flow when the condenser is for an AC unit and also from heated air flow when the condenser is for a heat pump unit. To prevent potential equipment damage, the Rater shall not conduct this test if the outdoor temperature is $\leq 55^{\circ}\text{F}$ or, if know, below the manufacturer-recommended minimum operating temperature for the cooling cycle. When this occurs, the Rater shall mark ‘N/A’ on the Checklist for this item. Heated air flow is produced when the heating cycle is energized (set thermostat to “heat”).

[DOE Zero Energy Ready Home](#)

Exhibit 1: Mandatory Requirements. Certified under ENERGY STAR Qualified Homes Version 3.

The DOE Zero Energy Ready Home National Program Requirements’ target home specifications (Exhibit 2) state that programmable thermostats are required (except for zones with radiant heat). In homes with heat pumps, the programmable thermostat should have “adaptive recovery” technology to prevent excessive use of electric back-up heating.

[2009 IECC](#)

Section 403.1.1 Programmable thermostat. Where the primary heating system is a forced air-furnace, at least one programmable thermostat is installed to control the primary heating system and has set-points initialized at 70 degree F for the heating cycle and 78 degree F for the cooling cycle.*

[2009 IRC](#)

Section N1103.1.1 Programmable thermostat. Where the primary heating system is a forced air-furnace, at least one programmable thermostat is installed to control the primary heating system and has set-points initialized at 70 degree F for the heating cycle and 78 degree F for the cooling cycle.*

[2012 IECC](#)

Section R403.1.1 Programmable thermostat. Where the primary heating system is a forced air-furnace, at least one programmable thermostat is installed to control the primary heating system and has set-points initialized at 70 degree F for the heating cycle and 78 degree F for the cooling cycle.*

[2012 IRC](#)

Section N1103.1.1 Programmable thermostat. Where the primary heating system is a forced air-furnace, at least one programmable thermostat is installed to control the primary heating system and has set-points initialized at 70 degree F for the heating cycle and 78 degree F for the cooling cycle.*

*Due to copyright restrictions, exact code text is not provided. For specific code text, refer to the applicable code.

More Info.

Access to some references may require purchase from the publisher. While we continually update our database, links may have changed since posting. Please contact our webmaster if you find broken links.

Case Studies

None Available

References and Resources*

1. [DOE Zero Energy Ready Home National Program Requirements](#)

Author(s): DOE

Organization(s): DOE

Publication Date: August, 2015

Standard requirements for DOE's Zero Energy Ready Home national program certification.

2. [ENERGY STAR Certified Homes, Version 3 \(Rev. 07\) Inspection Checklists for National Program Requirements](#)

Author(s): EPA

Organization(s): EPA

Publication Date: June, 2013

Standard document containing the rater checklists and national program requirements for ENERGY STAR Certified Homes, Version 3 (Rev. 7).

*Publication dates are shown for formal documents. Dates are not shown for non-dated media. Access dates for referenced, non-dated media, such as web sites, are shown in the measure guide text.

Contributors to this Guide

None Available