Appendix 3
Thermostats

This appendix describes how to work with thermostats in HCA and covers these topics:

- Supported thermostats
- Creating a thermostat device
- Thermostat properties
- Working with thermostats
- Additional information for RCS thermostats
- Practical Design Group THUM device

Supported Thermostats

HCA fully supports these thermostats:

- NEST
- SmartHome Insteon Thermostat adapter
- SmartHome 2441TH and 2441ZTH Insteon thermostats
- Residential Control Systems (RCS) TX15 Thermostat
- Residential Control Systems (RCS) TX15B Bi-Directional Thermostat
- Residential Control Systems (RCS) TXB16 Bi-Directional Thermostat
- Residential Control Systems (RCS) TU16 UPB Thermostat

In addition to these thermostats, some other devices, while not really thermostats, are supported in similar ways in HCA. These are:

- SmartHome X10 TempLinc
- Practical Design Group THUM

Note: There are support for other thermostats implemented using the User Implemented Class method. See the technical notes on this topic for information.

Creating a thermostat device

Adding a thermostat to your home design is like adding any device, start the New Device Wizard and at step three when the device type is selected, select one of the above listed types.

The UPB thermostat is imported into your design in the same way as other UPB devices.

Insteon thermostats, like all Insteon devices, are assigned an address at the factory and it is discovered during add.

The NEST thermostat is handled much directly and the next section explains the add process.

NEST Thermostat

The NEST thermostat has a much more complex protocol for communication than any of the other supported thermostat types. Communication is not made with the thermostat directly but with the NEST servers which then control the thermostat. Before HCA can work with it you must first authorize HCA to access all the thermostats in your NEST account.

Select the "Nest" button in the Protocols category.
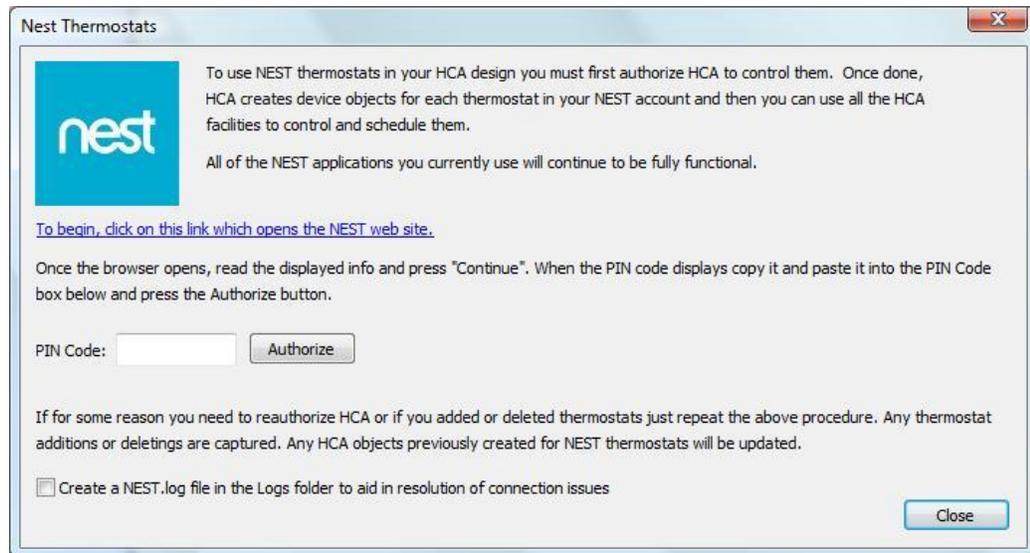
As the dialog says, you first click on the link to login to your nest account and then to authorize HCA. The web site displays a PIN Code that is entered in HCA. Once completed then HCA creates devices for each thermostat in your account. This need only be done once. If you add or remove thermostats just repeat this process and new thermostats are added and removed ones deleted.

CAUTION: When you click on the link your default browser is opened. Some users have reported problems with Internet Explorer in that the page comes up with a big gray rectangle and no controls or other display. Chrome seems to work fine.

NOTE: Providing HCA access to the thermostat in no way limits you use of all the other options for controlling your NEST thermostats – mobile clients, browser support, etc. In fact, you should view the HCA support of the NEST thermostats as an adjunct to all the facilities that NEST provides in their mobile applications.
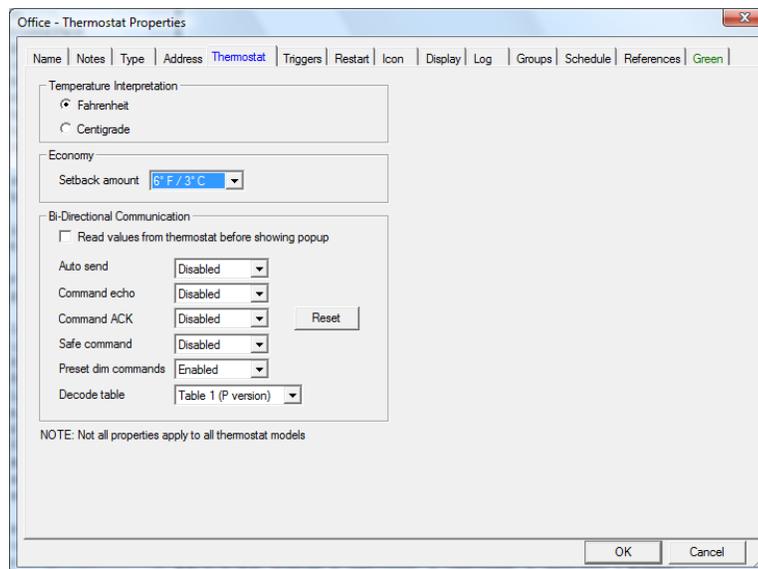
Thermostat Properties

When the properties dialog of a thermostat device is opened, there is an additional tab labeled *Options*. What appears on this tab depends up[on the kind of thermostat in use.

For the NEST and Insteon thermostats the tab shows only a few options:
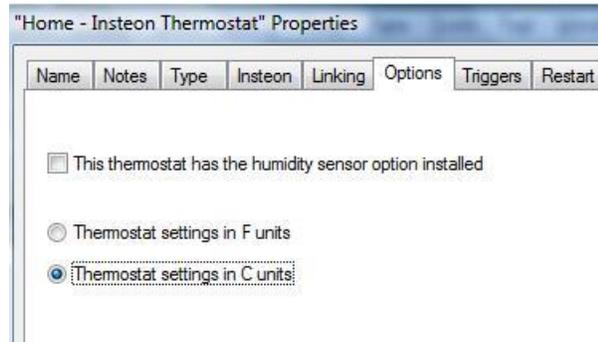
For the older RCS X10 thermostats the tab appears as:

Most of these settings should be obvious or are described in the RCS documentation and should only be changed after checking that documentation. A few notes may be helpful:

- The Command echo, Command ACK, and Safe Command options are communication modes of the thermostat that can increase the transmission reliability of commands sent to and received from the thermostat.

- The Preset dim commands, and decode table options are for the method of sending commands to the thermostats.

- The Auto Send option enabled the thermostat to send information out when the current temperature changes or changes to the setpoint, mode, etc, are made at the thermostat.

- The *Read values* checkbox tells HCA to poll the thermostat each time the thermostat popup is shown with the current temperature and setpoint. Since communication is by X10 powerline commands this will introduce a small time lag in opening the dialog.

- The Reset button does not reset the thermostat but rather resets HCA's communication with the thermostat. If any of the special communication modes are in use, and some how the communication mode is different for HCA and the thermostat, communication will not be possible. To get HCA and the thermostat back in sync, press the Reset button and follow the directions given.

- Not all of these options apply to all thermostats. Thermostats that are not bi-directional don't use many of these options.

Working with thermostats

Once a thermostat is added to your home you can do many things with it. Right click on the icon and the popup menu contains a thermostat selection. Selecting it displays this control panel for thermostat.
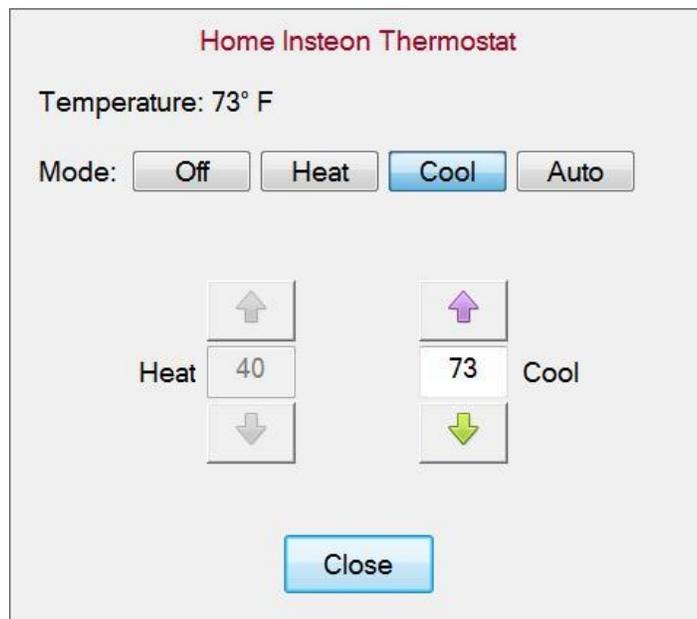
The up and down buttons move the set points by one degree. After a 1 second pause the set point change is sent to the thermostat. This lets you change the setpoint with multiple button presses and then when the desired setpoint is entered the command is sent to the thermostat.

NOTE: Each supported thermostat has different remote access capabilities and restrictions. Some types make the heat and cool setpoints available for modification at any time. Other thermostat types only allow for remotely changing the setpoints based upon the mode. For example, the Insteon thermostat only let the heat setpoint to be set when in heat mode, the cool setpoint only when in cool mode, and only the heat setpoint when in Auto mode. The UI implements this restriction by enabling and disabling the setpoint controls as needed.

You can also schedule and program thermostats. When scheduling a thermostat rather than specifying on and off conditions, the setpoint can be changed:


When using the Visual Scheduler to create schedule entries for a thermostat drag and drop the time markers with the T. A popup dialog allows you to select a setpoint and other options.

In programs the Thermostat and Thermostat Test elements are used to work with thermostats. The Thermostat element allows selection of the setpoint and other options. Its properties are:
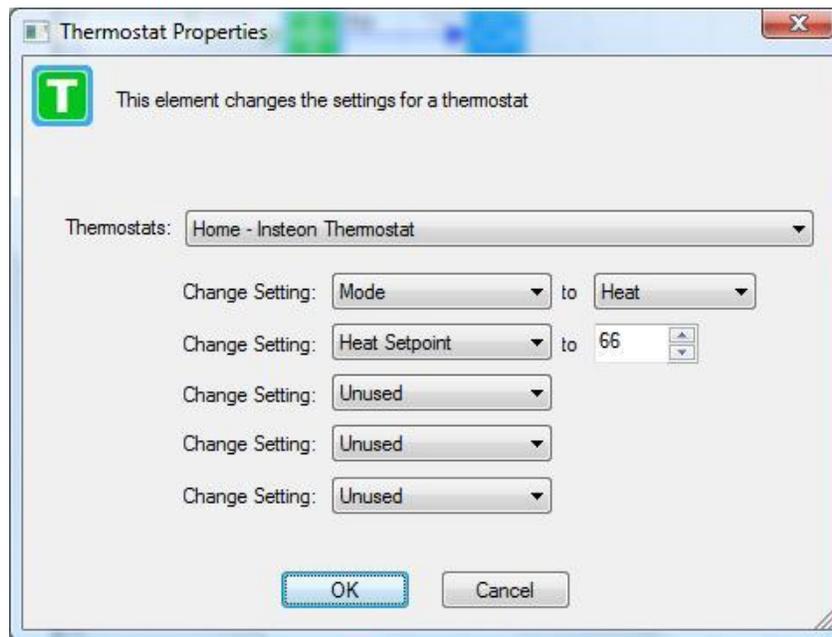
The Thermostat Test element allows for reading data from a thermostat and executing different elements based upon a test on the data retrieved. As such it is only useful with bi-directional thermostats. Its properties are:
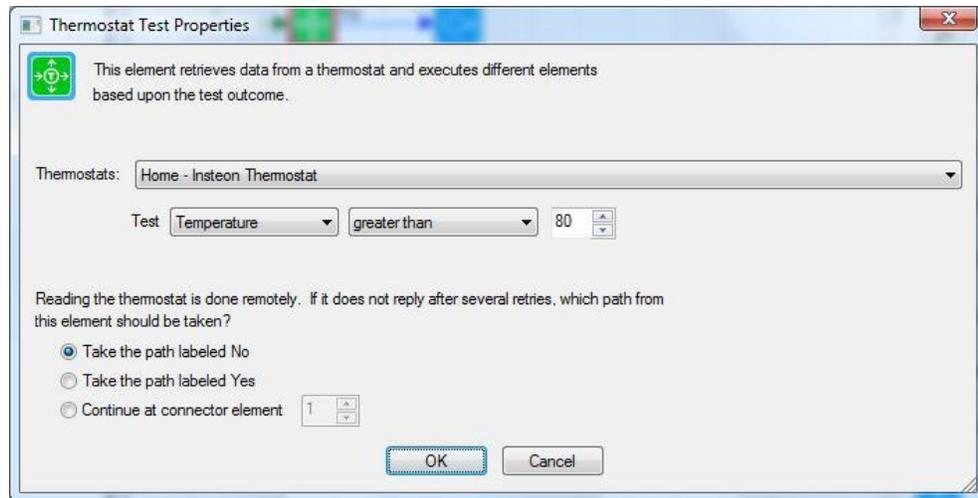
Specify the data to retrieve and then the test to be performed on the data. Like all testing elements that operate upon data retrieved from some device, if for whatever reason, the data does not come back from the request, you can specify which branch to take from the testing element.

Finally, you can start programs when various conditions reported by the thermostat happen. In the X10 RCS case this can be when the setpoint, current temperature, mode, etc is changed. If the Auto Send option is enabled (see the thermostat properties dialog above) these conditions send preset dim commands. Preset dim commands can be used as alternative triggers for HCA programs. Exactly what preset dim commands are sent for each condition is described in the RCS documentation.

Compute and ComputeTest element support.

Two functions are available for thermostats: _GetThermostat and _SetThermostat

Value = _GetThermostat ("thermostat name", code)

The "Thermostat name" is the two part name for the thermostat.

The code is the setting to be retrieved. These are:

Code	Setting	Returned value
0	Temperature	Integer value
1	Heat Setpoint	Integer value
2	Mode	Off = 0. Heat = 1, Cool = 2, Auto = 3
3	Fan	0 = On, 1 = Off
4	Economy	0 = On, 1 = Off
5	Aux Heat	0 = On, 1 = Off
6	Humidity	Integer value
7	Cool Setpoint	Integer value
8	Has Leaf (NEST only)	0 = On, 1 = Off

13	Nest Mode (NEST only)	0 = Away, 1 = Home

It is up to program that use this function to request only settings supported by the thermostat and for the setpoints only when in the correct mode.

The return value is the setting retrieved or an error. You should use the _IsBool on the result to determine if you have received the requested data or an error.

Bool = _SetThermostat ("thermostat name", code, value, code , value, …)

You can supply up to 11 arguments. The 1st is the two part name for the thermostat device. The next two arguments are the code and value of the setting to change. The next arguments are up to 4 other code-value pairs.

The valid codes are:

Code	Setting	Data
0	Temperature	Integer value
1	Heat Setpoint	Integer value
2	Mode	Off = 0. Heat = 1, Cool = 2, Auto = 3
3	Fan	0 = On, 1 = Off
4	Economy	0 = On, 1 = Off
7	Cool Setpoint	Integer value
13	NEST mode (NEST only)	0 = Away, 1 = Home

Note: When changing the NEST mode it changes all thermostats in the structure associated with the thermostat being controlled

Additional information for X10 RCS thermostats

The RCS thermostat does **not** store the communication protocol settings for Command Echo, Command ACK, and Safe command in a memory chip that retains its state when power is removed from the control unit.

If HCA and the thermostat are using one of the special communication modes and power is lost, when power is restored, HCA and the thermostat will be out of sync.

You may have the thermostat control unit on a circuit that doesn't lose power, or you may not. So HCA has a hard time knowing what to do upon power restore.

Because of this, power failure recovery is left up to the user in this case. If you use one of these special communication protocols, the suggestion is that you create a program that is run during power failure restoration.

This program would transmit to the thermostat to reestablish the communication mode. Specifying that a program be run at power failure restoration is done by creating a trigger for this condition.

In this program you can use the "X10 Send" visual programmer element to send out the appropriate command sequence to set the thermostat control unit into the communication mode you want.

For example, if your thermostat is on house code J and you want to enable ACK mode, create a program, mark it to run during power failure restoration (see the Advanced tab), then open the visual programmer tab. Add a "Send X10" element and set its properties as appropriate.

Again, see the RCS documentation for all the appropriate command sequences.

In this way you can tailor power failure recovery for RCS thermostats to your specific needs.

Practical Design Group THUM

The THUM is a USB connected temperature and humidity monitor. While not a thermostat in the true sense of the word it does share many common properties with how HCA implements them.

To add a THUM device to your computer connect it via a USB cable then add it to your design using the New Device Wizard. Once you do that then you can:

1.   Right click on the icon and a popup appears showing the current temperature and humidity.

2.   Use the THUM in the Thermostat Test visual programmer element to test for the current temperature and humidity levels.

The only property you can set with the THUM is the reporting units – Celsius or Fahrenheit. To do this select the device and open it's properties dialog and choose the Units tab.