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NetWatchman White Paper Series

Thermostat Control And Temperature Logging

Overview

NetWatchman offers several exciting features intended to help manage energy costs while making your home more comfortable and convenient. For the purpose of this paper, these features are divided into two broad categories: Thermostats and Temperature Logging. As the name implies, the ‘Thermostat’ topic discusses how NetWatchman helps you *control* temperature. Because NetWatchman keeps you connected to your home even while you are away, all of our thermostat-control features can also be managed remotely – although the specific features vary depending upon the thermostat-control features you purchase/install. Even if you decide not to *control* temperature, you may decide to install temperature sensors for the purpose of logging temperature or reporting temperature remotely while you are away from the premises. This latter topic is discussed much later in the paper and includes several features you may elect to purchase/install.

Thermostats Control Temperature

NetWatchman offers two very different approaches for controlling temperature. The prices of these two approaches and the capabilities vary widely. As such, much of this section of the paper will compare/contrast your choices. Those two choices include:

- Smart Thermostat (Programmable Temperatures and Temperature Reporting)
- Basic SetBack Thermostat

Paragraphs that follow describe each of these choices in further detail.

Smart Thermostat with Programmable Temperatures/Reporting

This product provides five different occupancy modes: At Home, Asleep, Away, At Work and Vacation. For each of the five modes you will specify a heat temperature. If your home includes air conditioning, you may also specify a cool temperature. That would be up to 10 temperatures in five pairs. (You do not need to use all five modes). Recall that NetWatchman as Home Automation modes: At Home, Night, Away, and Vacation. When you set NetWatchman in At Home Mode, your thermostat will select the heat/cool pair associated with At Home. And so it goes with Away and Vacation Modes. *If you choose to do so*, you may setup a workday schedule. When you arm NetWatchman

in Away Mode, then during the workday period, the 'At Work' heat/cool pair will be selected. This permits you to pre-warm/cool your home in anticipation of returning from work. If you come home early, changing NetWatchman to At Home mode immediately returns your thermostat to the more-comfortable At Home temperature pair. Most customers will choose to equate Asleep Thermostat mode with NetWatchman's At Night Mode – setting NetWatchman to Night Mode causes your thermostat to select the heat/cool pair associated with Asleep. However, more sophisticated customers may also setup an *optional* sleep schedule. When NetWatchman is in Night Mode and during the sleep schedule period, the Asleep temperature pair is selected. This schedule allows you to pre-warm/cool your home in anticipation of waking up. Although Work and Sleep schedule features are included in the price, they are optional. Both schedule-features, if used, can be varied based on day-of-week.

If you also purchase the alarm-wakeup clock feature on NetWatchman (sold separately), your thermostat can optionally change to the At Home temperature one hour before the wakeup time you set before going to bed.

Temperature information is stored in NetWatchman and is programmed using either the NetHome PC program or the internet (pdf forms). This thermostat also reports temperature information back to NetWatchman – so you'll be able to query temperature remotely, log temperature in NetWatchman's logs for later use/email; and send messages with temperature notifications (see later topic).

This feature uses an advanced thermostat manufactured by Residential Control Systems. You can view the thermostat and read more about its features at <http://www.resconsys.com/products/stats/serial.htm>

(Model TR16 with the RS485 interface). An optional exterior temperature sensor is available and this sensor can also be used to report exterior temperature to NetWatchman (for remote internet access, logging, etc). For those who are technically interested, NetWatchman sends thermostat commands over the Zigbee Radio Network to an RS485 interface which, in turn, connects to the TR16 thermostat.

The TR16 thermostat replaces your existing thermostat. You must have four or five wires going to your existing thermostat. If you have only a two wire thermostat, you would need to run additional wires (typically requiring professional skills). You will need to mount two additional boxes near your heater/cooler unit and you will need to cut wires and strip wires. Although these are low voltage wires, basic electrical and mechanical skills are required. One of the two additional boxes must be plugged into an AC outlet – you'll need a spare outlet that is safely near (5 feet) the mounting location. The TR16 thermostat is a full, professional quality product that supports multiple stage heat pumps and more complex systems. However, caution is advised if you are installing anything other than a basic gas/cool system – professional installation may be advisable.

The TR16 thermostat is not stocked by Genesis but is available from many sources – we have seen prices below \$200 and approaching \$300. The required RS485 Zigbee interface must be obtained from Genesis and has a price of about \$85.

None of the NetWatchman product choices support electric heat. We strongly advise against controlling stoves,

fireplaces or other equipment where automatic, unattended ignition may pose a fire hazard.

Smart Thermostats – Notes Regarding Purchase and Support/Questions

Smart thermostats are not stocked by Genesis/NetWatchman. You must purchase the thermostat from the sites listed above or other authorized dealers. While we certainly do answer questions regarding NetWatchman programming, we do not provide basic support of the thermostat. This means that you must install the thermostat and be able to fully control temperature manually before you attempt any NetWatchman connection. After the thermostat is installed and fully functional, we will be pleased to answer additional questions regarding programming.

While we do not stock the TR16 thermostat, we do supply the Zigbee RS485 interface you will require. Call for availability prior to ordering the TR16.

All of these thermostat choices require that you be able to strip low voltage wires and that you have basic mechanical skills. For example, the smart thermostat requires that you replace your existing thermostat stripping wires as necessary, carefully labeling wires and following instructions, and mechanically mounting the new thermostat display on the wall.

Do Not Use for Freeze Protection / Fire Detection

Throughout NetWatchman documentation you are reminded that NetWatchman should never be used where a failure might cause death, injury or significant property damage. As such, **never rely upon NetWatchman to provide freeze protection or to alert you of freezing temperatures. Temperature sensors connected to NetWatchman should not be used for fire detection.** Never operate heating equipment or any other equipment automatically where there is a fire danger caused by automatic or accidentally continuous operation. Despite our attempts to make the system reliable, there is a possibility of malfunctions that might enable expensive energy bills. Genesis Engineering Inc assumes no responsibility for such losses. These warnings and limitations apply to all of your thermostat choices.

Basic Setback Thermostat

An entirely different approach is to simply enable/disable your existing thermostat. NetWatchman refers to this feature as a Basic Setback. For an economical price of about \$95, a NetWatchman module is connected between your existing thermostat and your existing heater (/cooler). When NetWatchman is in Away or Vacation mode, your existing thermostat is disconnected from the heater/cooler – it's that simple. Anticipating your arrival, you can even use the internet (or phone) to set NetWatchman to At Home mode – re-enabling your existing thermostat. If you left that thermostat ON in a comfortable setting, the home will pre-warm (or cool) to greet you. It's perfect for vacation homes, a second home or those who travel.

Additional variations of this basic setback design are discussed in later paragraphs. This setback approach can only be used for basic gas heaters or 4 wire gas heater/air conditioners. Do not use this system for heat pumps, multi-stage systems or for

electric heat. If you have any thermostat type other than a basic 2 wire (heat) or basic 4 wire (heat/cool) thermostat, do not use this setback module.

NetWatchman supports an add-on temperature sensor that can be connected to most Display Modules (consult the price list for availability – approx cost \$75). If you have an interior sensor, you can optionally setup the Basic SetBack Thermostat Module to work in conjunction with that temperature sensor. When you are in Away or Vacation Mode your thermostat is disabled. But, when it becomes colder than a pre-set value you have setup in NetWatchman's configuration, the existing thermostat is re-enabled. (Assuming you left your existing thermostat ON at a higher temperature, the house will be heated). Although this feature creates a low-temperature limit, you should not rely upon this feature for freeze protection. If your system includes both heating and cooling, this temperature sensor feature can only operate with heating and you must leave your thermostat in the HEAT position while Away or on Vacation.

Regardless of whether you have an interior temperature sensor or not, the Basic SetBack Thermostat always re-enables your existing thermostat when you are in At Home or Night Mode.

As with all of the thermostats described, you must be able to strip wire and have basic mechanical skills. The SetBack Module must be located near your heater and requires an available AC outlet.

Temperature Sensing / Logging

Up until this point, this white paper focused on *controlling* temperature. The remainder of this paper discusses *knowing* temperature without necessarily *controlling* it.

As discussed above, NetWatchman permits you to add temperature sensors. Up to two sensors can be added. One is designated 'interior' the other is designated 'exterior'. There are three physical products that can supply this temperature information:

- The TR16 Smart Thermostat provides interior temperature reading back to NetWatchman
- An optional Exterior Sensor can be purchased from RCS for connection to the TR16. When connected, this sensor provides exterior temperature information to NetWatchman. The RCS TR16 exterior sensor is rugged and clearly intended for outside use. However, it requires a wire run from the exterior location to the TR16 thermostat display. Because your thermostat display is usually already mounted on an interior wall, this may require a new wire run in an existing wall – ruling out this choice for all but the most advanced homeowners.
- A Zigbee radio network sensor is also available (referred to as a Wall Router). This small unit plugs into a wall outlet (slightly larger than a night light) and also serves to 'repeat' the radio network (so it also improves radio network reception). Each one of these modules can be designated to provide either the 'Interior' or 'Exterior' reading. It can be plugged into any AC outlet. It is not intended for wet locations.

Although there can be only one 'Interior' sensor and only one (optional) 'Exterior' Sensor, you can mix and match sources. So, for example, your TR16 Smart Thermostat might supply the 'Interior' temperature while a separately purchased 'Wall Router' in the basement supplies 'Exterior' information.

Temperature Information at your Command

Interior temperature and optional Exterior temperature information is available remotely whenever you request full status over the internet (for example from a browser). Assuming you have the temperature sensor information (or TR16 provided information), there is no extra charge for this feature.

Add-A-Feature: Temperature Logging (A871)

Create a Record of Temperature in your Logs

As noted elsewhere, a powerful feature of NetWatchman is the ability to log information about your home. Your most recent log can be accessed over the internet from any browser without charge. In addition, you can purchase several add-on features that help you manage/obtain. This includes, for example, the ability to send more frequent logs to your email address. Now you can include temperature data in those logs. For one low, add-on price, you can elect to log either 'interior' or 'exterior temperatures, or both! You can make log entries hourly or every four hours.

Add-A-Feature: Log High and Low Temperatures (A872)

Create your own records of daily highs and lows

For a very low price this feature helps you track high and low temperatures. A single daily entry is made in your log noting four records: daily high, daily low for both interior temperature and exterior temperature.

Add-A-Feature: Temperature Notification (B873)

Receive Email when a temperature limit is exceeded

Establish a temperature limit you select. If that limit is reached, you'll be immediately notified with an email to your pager/cell. Other notification methods are possible. With each temperature notification feature you'll supply a temperature limit. That limit can be a high or a low (email me if the temperature goes above the limit or, alternately, email me if the temperature goes below the limit). The limit you establish would typically apply to the interior temperature but you could, instead, choose to be notified of exterior temperature. Obviously, you must also have appropriate temperature sensor features in place. Email is sent to the single email address you have designated and that email address applies to all pager/cell messages sent by your NetWatchman for any purpose.

You'll receive notification when the temperature is first reached. If the temperature remains in the limit range (for example, remains below the low temperature limit), notification is sent only once. If the temperature passes through the limit multiple times per day, only one notification is sent in any one calendar day. Remember, these notifications result in a phone call to our servers and that call may result in toll charges to your phone bill.

Although this feature can be a substantial convenience, you are reminded that NetWatchman should not be relied upon to protect property against freeze conditions.

Add-A-Feature: Comfort Fob (B874)

Override temperature settings to something more comfortable

All of the thermostat control products described previously will provide energy savings by using a different temperature setting while you are away, asleep, etc. While this temperature setting results in savings it is typically less comfortable. Most of these thermostat products have an override capability --- if you want to return to a more comfortable setting. For example, with the smart thermostats, you'll be able to walk up to the thermostat and change temperature -- much as you would do with any, regular thermostat. And, of course, you can already force a more comfortable setting by changing NetWatchman's mode to At Home mode.

In most cases, then, you will not need any other override method. A few of our customers have found special needs and have requested an additional override method. In some instances, customers are using At Home, Away, Night Modes for other purposes and changing NetWatchman to At Home mode to restore a comfortable temperature would interfere with other features. In some instances, customers have wanted a

temporary 'comfort' setting that will automatically expire back to an economical savings setting (for example, a they first fall asleep or, perhaps, for a child to use such that the more expensive setting is not left on indefinitely). For those customers, we've created a 'comfort fob' feature. You'll receive an additional fob – just like the one you use for arming the alarm. Except this fob does something special. When touched to a reader, your thermostat is temporarily forced to your most comfortable setting for up to 2 hours. This occurs without changing the arm/disarm mode or other home automation modes (such as At Home). If you do change NetWatchman modes (for example, you go Away), the 2 hour comfort setting immediately expires.