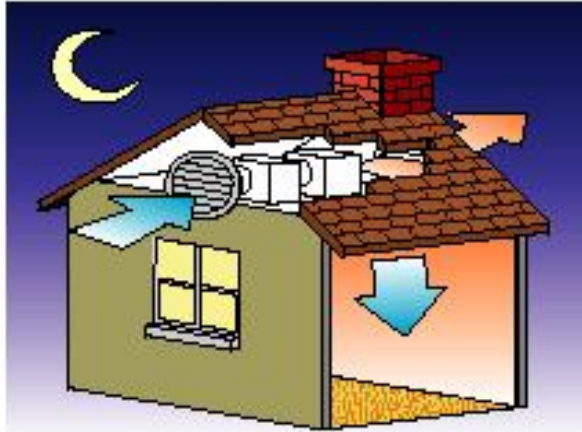




NightBreeze

Heating, Ventilation, and Cooling System

Owner's Manual



US Patent No. 7,398,821

Contents

System Description

- How is the NightBreeze System Different?..... 1
- How Does Ventilation Cooling Work? 1
- What if I Still Need Air Conditioning? 2
- How Does the Heating System Work?..... 2

Using the Thermostat

- Understanding the Thermostat Buttons and Display..... 2
- Operating Modes..... 3
- Programming Schedules 3
- Short Term Settings..... 5
- Pre-Cool Settings 6
- Operating the Fan Manually 7
- Winter Ventilation..... 8
- Setting the Clock..... 8
- Advanced and Technician Settings 8

Operating Recommendations

- Summer Operation 9
- Winter Operation..... 9
- Spring and Fall..... 9

Maintaining Your System

- Changing the Filter..... 9
- Other Maintenance 10

System Description

What is NightBreeze?

The NightBreeze system was developed by researchers to eliminate the need for air conditioning in mild climates and reduce the size of air conditioners in hotter climates, and to provide improved indoor air quality and comfort. By following these instructions carefully you can insure that you will experience the comfort and energy savings the system was designed to provide.

How is the NightBreeze System Different?

The NightBreeze system heats and cools your house just like any other furnace-air conditioning system, by delivering warm or cool air through ducts to each room. Features that distinguish the NightBreeze from other systems include:

- An automatic damper that allows the house to be ventilated and cooled using filtered outside air, without the necessity to open windows
- A control system that anticipates hot weather and automatically ventilates your house with cool night air to provide optimal comfort while minimizing air conditioner energy use
- A quiet, efficient, variable speed blower that provides just the amount of airflow needed to meet heating and cooling needs
- A furnace that obtains its heat from your water heater instead of from direct gas combustion, thereby improving household safety
- A thermostat that is easy to use

How Does Ventilation Cooling Work?

On summer evenings in many areas of the country people open windows to ventilate their homes with outdoor air, both to obtain natural cooling and to remove stale air. The cool air absorbs heat from warm interior surfaces and furnishings. In the morning windows are closed and the cool surfaces absorb heat during the day, keeping the house cool and comfortable. Houses with more massive walls and floors store this “coolth” more effectively. The lower the temperature the house reaches at night, the more comfortable the house stays during the day.

Managing windows in this manner reduces the need for air conditioning and saves energy, but personal schedules and security concerns may interfere with using windows for ventilation. Also, there may not be sufficient outdoor breezes to adequately flush the house with cool air.

NightBreeze provides ventilation cooling automatically, eliminating the necessity of operating windows (though it is still good practice.) NightBreeze uses the heating/air conditioning system fan to bring in filtered outside air and flush out warm, stale indoor air.

The system also allows you to select the lowest temperature you want the house to reach overnight. As the weather becomes milder, the system automatically decreases the amount of ventilation to prevent the house from being over-cooled.

What If I Still Need Air Conditioning?

In addition to allowing you to set your lowest acceptable indoor temperature, you can set the highest temperature that you want the house to reach. The air conditioner (if you have one) will operate if the house rises above this high temperature setting. The special thermostat allows you to see whether the air conditioner is likely to operate, given your high and low temperature settings and current weather conditions.

How Does the Heating System Work?

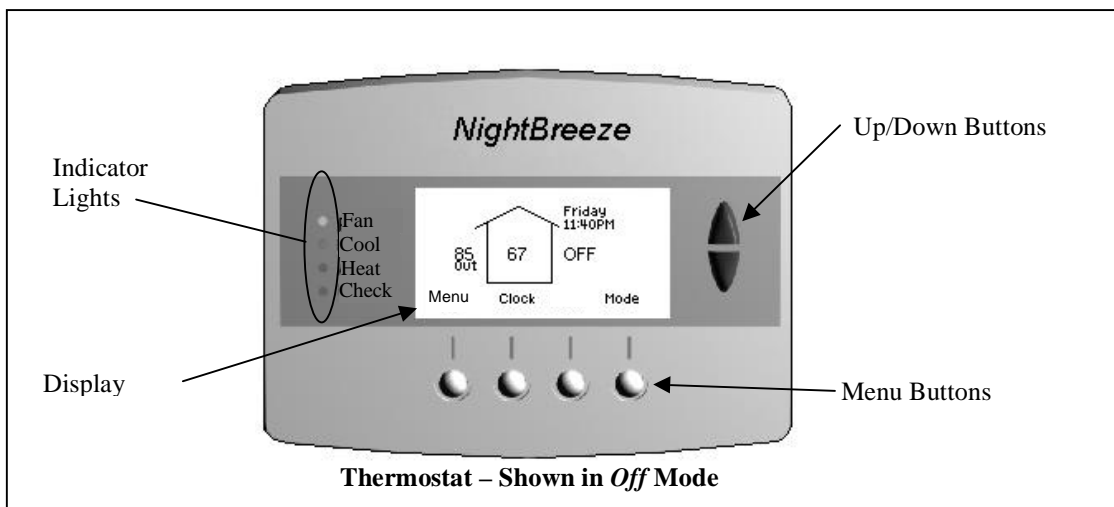
Unlike gas furnaces that obtain heat directly from combusted gas, NightBreeze circulates water from your hot water source to a coil that is similar to the radiator in your car. A blower circulates air through the warm coil and into your house. The speed that the blower operates varies with the amount of heating that is needed, and thus it is very quiet. Most of the time you may not even be aware it is running.

Using The Thermostat

Understanding the Thermostat Buttons and Display

There are four buttons along the bottom of the thermostat and two on the right of the display that are used to make temperature and other settings. The functions of these buttons are described by labels on the display. Referring to the picture below, the button on the bottom right sets the operating “mode” (heating, cooling, etc.). These labels may change, depending on what settings are being made. The two up/down buttons on the right side of the display

are primarily used to adjust temperature settings, though they are also used for setting the clock and heating schedule times. The thermostat has four colored lights to the left of the display that indicate what the system is doing. The Fan, Cool, and Heat lights tell whether the fan, air conditioner, or furnace are operating, respectively. The Check light indicates that the system needs attention (filter change, service, error, etc.); see Menu/Diagnostics screen for more details.



The number located inside the house icon on the display screen is the indoor temperature. The temperature to the left of the house is the outdoor temperature. A window in the house icon opens when it is cooler outdoors than indoors, indicating that windows can be opened to ventilate the house in summer. Day of the week and the current time are also shown in the upper right of the display.

Arrows appear on the screen to indicate if the system fan is running. Different arrows are used to indicate whether the fan is recirculating indoor air, or ventilating with outdoor air (see *Operating the Fan Manually* for examples).

A circular arrow inside the house icon indicates that the fan is recirculating indoor air, while a squiggly arrow indicates you are ventilating the house with outdoor air.

Operating Modes

The NightBreeze thermostat has three operating “modes”: *Off*, *Cool*, and *Heat*. A *Vacation* mode is also available through the Advanced Settings menu. In *Cool* mode the system will provide ventilation cooling and air conditioning. In *Heat* mode the system will provide heating, and if desired, fresh air ventilation. In *Vacation* mode the system will provide both heating and cooling, if needed.

Programming Temperature Schedules

You have a choice between *Simple* and *Detailed* options for programming heating and cooling temperature settings. The NightBreeze system is provided with both heating and cooling schedules set to *Simple*.

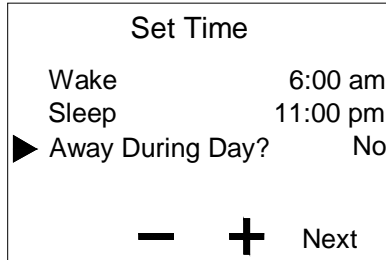
Which programming option should I choose? If you work Monday through Friday and need only two temperature settings, one while you are away or asleep, and one while you are at home, you should choose the *Simple* options for both heating and cooling. If you have a more complicated work schedule and/or want more than two programmed temperatures, use the *Detailed* schedule for heating and the *Simple* schedule for cooling. The *Detailed* cooling schedule is only recommended if you have a strong need to schedule indoor temperatures during the summer. The *Simple* cooling option will provide the greatest energy savings.

How do I select or change the programming option? At the main screen, press **Menu**. Press the up/down buttons to scroll to *Advanced Settings* and press **Select**. Press the up/down buttons to select either *Heating Schedule* or *Cooling Schedule*. Press the +/- buttons to change the schedules to either *D* (Detailed) or *S* (Simple). Press **Done** twice to return to the main screen. See **Maintaining your System** for more information on the *Advanced Settings* menu.

How do I set my preferred heating (winter) temperatures using the Simple programming option? First press the **Mode** button until HEAT is displayed. Then press **Set**. The next screen will appear:

Set Temperature	
Home/Awake	67
Away/Sleep	61
-	+ Next

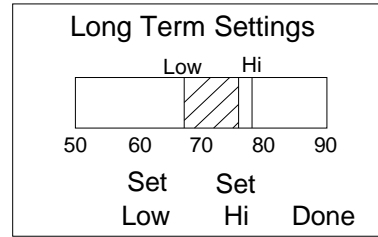
Use the up/down keys to select the temperature you want to change, and the +/- buttons to adjust the temperature. Press **Next** to set your schedule times and the following screen will appear.



Again, use the up/down keys to select the time period and the +/- buttons to adjust the times. If you work during the day and want the temperature to be set back, select 'Yes' for *Away During Day?* using the +/- buttons. Press **Next** to return to the main screen.

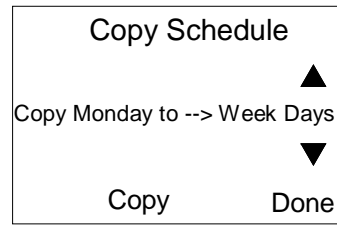
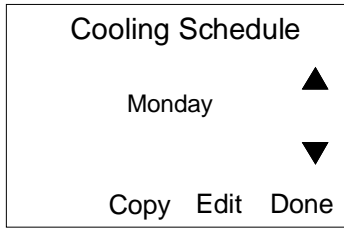
Note: The Simple heating schedule sets the temperature back while you are away or asleep, and sets it up while you are home and/or awake. It also assumes you will be home during weekends.

How do I set my preferred cooling (summer) temperatures using the Simple programming option? Press the **Mode** button until COOL is displayed. Then press **Set**. An image similar to the following will appear. The *Low* setting is the lowest temperature that you want the ventilation system to cool the house to. The *Hi* setting is the same as the air conditioner setting (if you have one), or the highest temperature you want the house to reach. The shaded bar in the middle represents the range of indoor temperatures you will be likely to experience, given the settings you have selected.

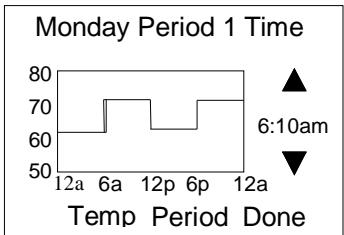
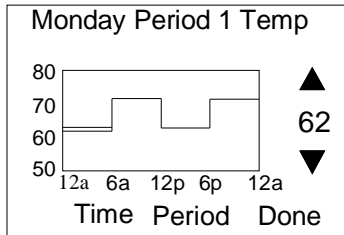


Press **Set Low** to modify the low temperature setting, and use the up/down keys to select your preferred low temperature. The lower you set this temperature, the less your air conditioner will be needed. A setting of 65°F is recommended. Press **Done**, then press **Set Hi** to select the temperature that you want your air conditioner to turn on, using the up/down keys to adjust the temperature. Press **Done** twice to return to the main screen. Your system will now combine ventilation and air conditioning to provide the comfort you have selected.

How do I set my preferred heating or cooling temperatures using the Detailed programming option? If setting preferred cooling temperatures using the detailed programming option, Press the **Mode** button until COOL is displayed. Then press **Set**. Similar to the simple programming option, the *Low* setting is the lowest temperature that you want the ventilation system to cool the house to. The *Hi* setting is the same as the air conditioner setting, but with more options available than the simple programming option offers. Press **Set Low** to modify the low temperature setting, and use the up/down keys to select your preferred low temperature. Press **Done**.



Press **Set Hi**. The *Cooling Schedule* menu will appear. Press the up/down keys to select which day of the week's schedule you would like to modify, then Press **Edit**.



The day is divided into periods, and each period has a preferred temperature setting. Press **Period** to toggle between the different periods of the day. A period will flash once it is selected. Press the up/down keys to modify the preferred temperature for the given period. Press **Time** to edit the time in which the period will begin. Once the time is set, press **Done**.

Also included in the detailed scheduling is an option to copy schedules. Press the up/down keys to select which day of the week's schedule you would like to copy and press **Copy**. Press the up/down keys to select different days of the week, weekdays, weekends, or all days to copy the selected schedule to. Press **Copy** to copy the schedule, then press **Done**. Press **Done** twice more to return to the main screen.

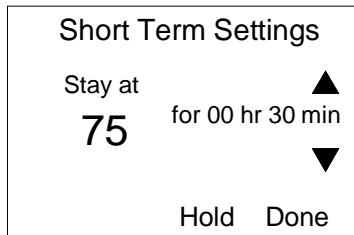
If setting preferred heating temperatures using the detailed programming option, Press the **Mode** button until HEAT is displayed. Then press **Set**. Press the up/down keys to select which day of the week's schedule you would like to modify, then Press **Edit**. A similar graph to that of the *Cooling* schedule (left) appears. Follow the same directions given for the *Cooling* schedule to edit the *Heating* schedule. Then press **Done**.

To copy schedules in heating, Press **Copy** and follow the directions for copying schedules in cooling. Then press **Done**. Press **Done** twice more to return to the main screen.

Short Term Settings

This feature is for temporarily raising or lowering the indoor temperature if your *Long Term Settings* are not providing the level of comfort you want at the current time. To access the *Short Term Settings*

menu, Press the up/down buttons to change the temperature. Then press **Set**.

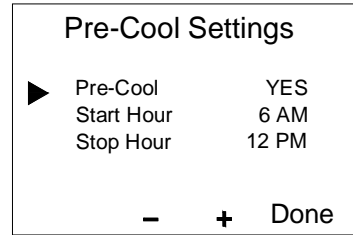


Press the up/down buttons to set the time interval to maintain the short term temperature setting (in intervals of 15 minutes). The temperature setting will be held for the amount of time specified in the *Short Term Settings* screen, after which the temperature setting will revert to the programmed schedule. You may also hold the short term setting for as long as you want by pressing the **Hold** button. This will return you to the main screen where *Hold* is displayed under the current mode. By pressing the **Cancel** button you can cancel the timed or held settings and revert back to the programmed temperature schedule.

Pre-Cool Settings

The NightBreeze Pre-Cool option allows you to automatically pre-cool your home [using the Air Conditioner] during off-peak hours when rates are lower, thereby minimizing on-peak energy use and lowering your overall utility bill. This feature effectively substitutes early morning air conditioner operation for afternoon operation, and is most useful in areas where ventilation cooling alone cannot prevent air conditioner use.

To enable the Pre-Cooling function, press the **Menu**. Press the up/down buttons to select *Pre Cooling*, then press **Select**. The following Pre-Cool Settings Screen should appear:

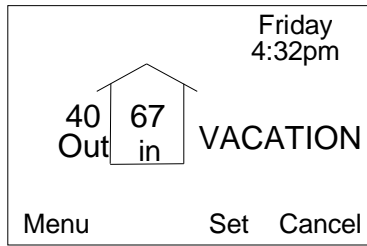


Press the up/down buttons to move the cursor to the *Pre-Cool* line. Use the +/- buttons to change to "Yes" or "No". Again, press the up/down along with the +/- buttons to change to the *Start Hour* and *Stop Hour* for Pre-Cooling. The Stop hour should correspond to the starting time of your utility's on-peak period. You may adjust the Start hour to achieve the desired amount of pre-cooling. Once you are done, press **Done** twice to return to the main screen.

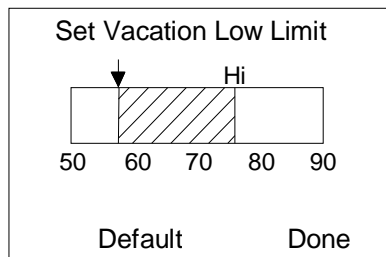
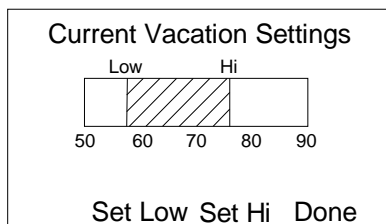
The NightBreeze system automatically determines the temperature to which the house should be cooled to reduce on-peak electric use, and varies this temperature depending on weather conditions, up to the cooling temperature that you have set.

Vacation Mode

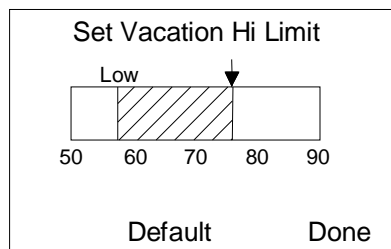
Vacation Mode is used to set upper and lower temperature limits while you are away for extended periods of time. In this mode the thermostat will use the ventilation system, air conditioner, and heater as needed to maintain indoor temperatures within the selected limits. Wider settings (for example 55° low and 85° high) may completely eliminate furnace and air conditioner use, and will result in lower energy costs.



To use vacation mode, Press the **Menu** button. Press the up/down buttons to scroll to *Vacation*, then press **Select**. This will return you to the main screen where VACATION is displayed.



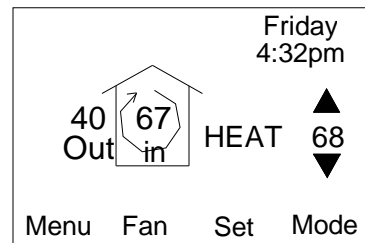
Press **Set** to access the *Current Vacation Settings*. Press **Set Low**, then press the up/down buttons to set the lower temperature limit. If you wish to use the default settings, press **Default**. Once the temperature has been set, press **Done**.



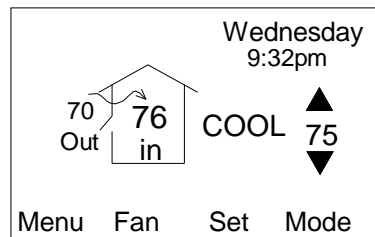
Now press **Set Hi**, then press the up/down buttons to set the upper temperature limit. If you wish to use the default settings, press **Default**. Once the temperature has been set, press **Done**. Press **Done** again to return to the main screen.

Operating the Fan Manually

Normally the fan operates automatically, and only while the system is ventilating, heating, or cooling. However, you may manually turn on the fan from any operating mode except VACATION.



Press the **Fan** button. If you press the button once, a circular arrow inside the house icon will blink, indicating that the fan is recirculating indoor air.



If you press the fan button a second time, a squiggly arrow will appear, indicating you are ventilating the house with outdoor air.

Pressing the fan button a third time will revert to automatic fan operation, or after one hour the fan will return to automatic operation by itself.

Note that these arrow symbols appear any time the fan is operating, but the

arrows only blink if the fan has been turned on manually.

The fan will automatically go off after a preset length of time. Adjust this time in 1 hour increments by selecting Manual Fan Time from the Advance Settings menu.

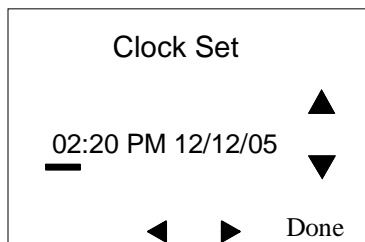
Manual fan operation may be useful if you want to remove indoor odors, or just mix indoor air. The fan consumes energy, so routine manual operation of the fan is not recommended.

Winter Ventilation

To keep indoor air fresh, the fan and damper will operate while the thermostat is set to heating mode to ventilate your house with a small volume of outside air each hour. This volume of air is set by your installer using the *Technician Settings* feature of the thermostat. Advanced settings are described in a later section of this manual.

Setting the Clock

The NightBreeze thermostat has a permanent battery that retains clock time through power outages up to several hours. If you want to change the time, for example to adjust for daylight savings time, press the **Mode** button mode button until OFF mode is displayed. Then press the **Clock** button.



Use the left and right arrow buttons to position the cursor (underline) under the

hours, minutes, day, month, or year. Use the up/down buttons to modify the time or date. Press **Done** when you have finished, and then press **Mode** to return to your preferred operating mode.

Advanced Settings

Several advanced settings can be adjusted from the Advanced Settings menu:

- Display Settings – (screen contrast, brightness, screen timeout, etc.)
- Heating and Cooling schedule type (set to either simple or detailed). See Programming Schedules section for more information.
- Synchronize Zones (used in 2-zone systems only)
 - o YES = both thermostats use the same schedules
 - o NO = both thermostats use unique schedules
- Manual Fan Time – Length of time (in hours) how long the fan will run when operated manually. Note: A setting of 0 means the fan will run indefinitely

Technician Settings

Certain control settings were made by your installer to configure the NightBreeze system to the particular conditions under which it was installed.

You may find it useful to access some of these settings to:

- Re-calibrate indoor and outdoor temperature sensors
- Modify the maximum fan speed for ventilation cooling or manual vent.
- Change the fresh air ventilation rate

- Deactivate the air conditioner

To access the *Technician Settings*: on the MENU screen, select *Advanced Settings*. On the *Advanced Settings* screen, hold down the up and down buttons at the same time until the *Technician Settings* appears. **Refer to the Installation Manual before making any changes to these settings.**

Diagnostic Screen

If the Check (or Service) Light illuminates on the front panel, you can access the Diagnostic Screen to determine the cause. From any screen, press the MENU button, then select DIAGNOSTIC SCREEN. Use the UP and DOWN arrows to see if any item is reporting an error. .

Operating Recommendations

Summer Operation

By allowing your house to cool off as much as possible at night you will reduce the amount of air conditioning you will need. The following tips will help you to save energy and stay comfortable:

- Set the low limit temperature to 65° or lower
- Set the high limit temperature to 80°
- Open windows when convenient to assist fan ventilation (but only when the window is open on the thermostat house icon)
- Minimize the use of short-term temperature settings
- Use window coverings to block out the sun during the day

Winter Operation

The following tips will also help you stay warm and comfortable during the winter months:

- Use lower temperature settings for periods when the house is not occupied
- Keep your windows closed and let the system provide fresh air ventilation
- Minimize use of short-term temperature settings
- Use window coverings to keep heat in at night, and open them to allow in heat from the sun during the day

Spring and Fall

Turn off the system and let the house coast, using windows for ventilation when needed.

Maintaining Your System

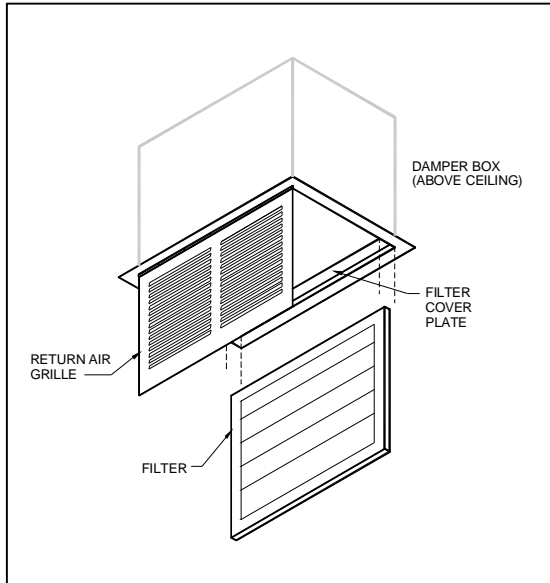
Changing the Filter

The NightBreeze filter cleans outdoor air that is used to ventilate the house, as well as indoor air that is recirculated. As a result it may require more frequent changing than you are accustomed to. A dirty filter will not appreciably reduce the rate of air delivery to your house, but it will cause the fan to work harder and will increase your energy bill.

For best results, change your filter every 3 months. If you live in an area with a large amount airborne dust or pollens you should inspect the filter monthly and replace it as needed.

The recommended filter for NightBreeze is the 3M Filtrete 1000 or 1250. Filter dimensions are 20" x 30" x 1".

To access the filter, locate your ceiling return air grille. Rotate the two fasteners located on the rim of the grille opposite the hinge (turn counterclockwise), and allow the grille to swing down. Then rotate the two retaining clips holding the



filter cover plate in place and open the cover. Carefully withdraw the filter, install the recommended replacement, and close the filter cover and grille.

After changing the filter, please reset the filter run-time clock. From any mode screen, press MENU, then select FILTER RESET. On the Filter Reset screen, press RESET.

Other Maintenance

Besides changing the filter, no other routine maintenance is required.

However, you should:

- Keep the outside air intake clear of leaves and other debris
- Take precautions to avoid damage to the outdoor temperature sensor (located near the outside air intake)
- Keep your water heater in good operating condition, since it is the source of heat for the NightBreeze