



# Programmable Dual Fuel Thermostats

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## Installation, Start-Up, and Operating Instructions

**NOTE:** Read the entire instruction manual before starting the installation.

This symbol → indicates a change since the last issue.

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### SAFETY CONSIDERATIONS

Read and follow manufacturer instructions carefully. Follow all local electrical codes during installation. All wiring must conform to local and national electrical codes. Improper wiring or installation may damage thermostat.

Recognize safety information. This is the safety-alert symbol ⚠. When you see this symbol on the equipment and in the instruction manual, be alert to the potential for personal injury.

Understand the signal words DANGER, WARNING, and CAUTION. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies a hazard which **could** result in personal injury or death. CAUTION is used to identify unsafe practices which **would** result in minor personal injury or product and property damage.

### INTRODUCTION

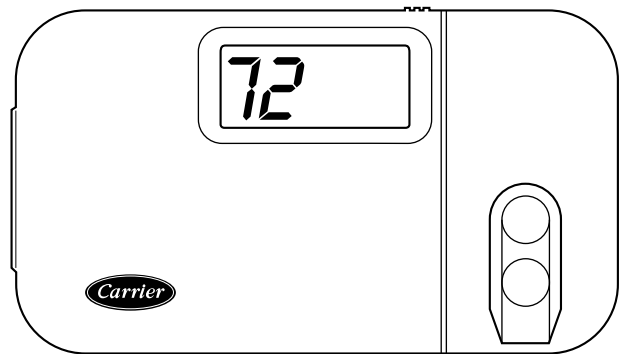
Carrier's 7-day programmable dual fuel thermostat is a wall-mounted, low-voltage thermostat which provides proper control of a heat pump (HP) and furnace combination without using a HP/furnace interface kit. Separate heating and cooling set points, plus auto changeover allow setback programming for maximum energy savings. Up to 4 time/temperature settings per 24 hour period for 7 independent days may be programmed. Batteries are not required; during a power interruption, the internal memory stores programs for an unlimited time and the clock continues to run for at least 72 hrs.

### → SYSTEM CONSIDERATIONS

The dual fuel thermostat is designed to be used only in HP/furnace installations. It replaces a conventional 2-stage HP thermostat and a HP/furnace interface kit. An outdoor temperature sensor, Part No. TSTATXXSEN01-B MUST be used with this thermostat. It is supplied with thermostat.



As an ENERGY STAR Partner, Carrier Corporation has determined that this product meets the ENERGY STAR guidelines for energy efficiency.



A98426

HEIGHT (IN.)	WIDTH (IN.)	DEPTH (IN.)
4-1/4	7-1/2	1-3/8

→ Fig. 1—Carrier Programmable Thermostat

### ⚠ CAUTION

If HP is not already equipped with a high-pressure switch, one must be added for dual fuel applications. It protects HP from overpressure which would occur if a failure resulted in both HP and furnace operating at same time. Kit No. KSAHI0201HPS includes required switch and instructions for its proper installation.

A HP/furnace installation has several special requirements. Foremost is that furnace and HP must not be allowed to operate at same time, except during HP defrost. A second is to have furnace complete a heating cycle once it is turned on. A third is the need to have HP not operate at all when outdoor temperatures are below a certain value. A fourth is to have the furnace not operate at all when outdoor temperatures are above a certain higher value. Finally, HP and furnace must work together properly to provide an efficient and comfortable defrost. These requirements are addressed by the dual fuel thermostat itself and an interface kit is NOT required.

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

## → APPLICATION

The dual fuel thermostat is designed for the following applications:

1-stage cool, 2-stage heat: 1-speed HP with 1-stage furnace  
1-stage cool, 3-stage heat: 1-speed HP with 2-stage furnace  
2-stage cool, 3-stage heat: 2-speed HP with 1-stage furnace  
2-stage cool, 4-stage heat: 2-speed HP with 2-stage furnace\*

\*This combination must use furnace algorithm to control furnace staging.

### Balance Point Temperature

The "balance point" temperature is a setting which affects the operation of the heating mode. This is a field-selected input temperature (range 5-55°F) where the dual fuel thermostat will monitor outdoor air temperature and decide whether to enable or disable the heat pump.

If the outdoor temperature is above the "balance point," the heat pump will energize first to try to satisfy the indoor temperature demand. If the heat pump does not make a sufficient improvement within a reasonable time period (i.e. 15 minutes), then the gas furnace will come on to satisfy the indoor temperature demand. If the outdoor temperature is below the "balance point," the heat pump will not be allowed to operate (i.e. locked out), and the gas furnace will be used to satisfy the indoor temperature.

There are three separate concepts which are related to selecting the final "balance point" temperature. Read each of the following carefully to determine the best "balance point" in a dual fuel installation:

#### **Capacity Balance Temperature:**

This is the point where the heat pump cannot provide sufficient capacity to keep up with the indoor temperature demand because of declining outdoor temperature. At or below this point, the furnace is needed to maintain proper indoor temperature.

#### **Economic Balance Temperature:**

Above this point, the heat pump is the most cost efficient to operate, and below this point, the furnace is the most cost efficient to operate. This can be somewhat complicated to determine and it involves knowing the cost of gas and electricity, as well as the efficiency of the furnace and heat pump. For the most economical operation, the heat pump should operate above this temperature (assuming it has sufficient capacity), and the furnace should operate below this temperature.

#### **Comfort Balance Temperature:**

When the heat pump is operating below this point, the indoor supply air feels uncomfortable (i.e. too cool). This is purely subjective and will depend on the homeowner's idea of comfort. Below this temperature, the gas furnace should operate in order to satisfy the desire for indoor comfort.

### Auxiliary Heat Lockout Setting

The "auxiliary heat lockout" setting is an optional lockout feature. This is in addition to the "balance point." The purpose of this feature is to lock out the gas furnace whenever the outdoor temperature is above the selected setting. The temperature range is 5-55°F. When the outdoor temperature is above the "auxiliary heat lockout" setting, the heat pump will become the primary source, and the gas furnace cannot come on (except in defrost or emergency heat mode).

The "auxiliary heat lockout" setting can never be set below the "balance point" setting, and likewise, the "balance point" can never be set above the "auxiliary heat lockout" setting. The range of each of these is from 5-55°F (or equivalent values in Celsius), or they can be turned off. When off, they do not limit the equipment operation. If the "auxiliary heat lockout" setting is moved down, it

will "push" the "balance point" so the two settings do not overlap. Likewise, moving up the "balance point" will push the "auxiliary heat lockout" setting.

When the two settings are the same, the system views this as a single outdoor "balance point" temperature, and the heat pump is used for above (warmer outdoor temperatures) and the furnace for below (colder outdoor temperatures.)

## DESCRIPTION OF OPERATION

### Cooling Operation—Single Speed

HP cooling:

O/W2 energizes reversing valve to select cooling operation.

G energizes furnace blower.

Y/Y2 energizes compressor and selects high blower speed at furnace.

When cooling demand is satisfied, G and Y/Y2 are de-energized. O/W2 will remain on to minimize cycling of reversing valve. It will turn off only when a call for heat occurs.

### Cooling Operation—Two Speed

Low-speed HP cooling:

O/W2 energizes reversing valve to select cooling operation.

G energizes furnace blower.

Y1/W2 energizes compressor at low speed and may determine furnace blower speed.

High-speed HP cooling:

Y/Y2 is added to low-speed cooling call to operate compressor at high speed and increase blower speed.

### Heating Operation—Single-Speed HP

HP heating:

O/W2 remains off to select heating operation.

G turns on furnace blower.

Y/Y2 energizes compressor and increases furnace blower speed.

### Heating Operation—Two-Speed HP

Low-Speed HP heating:

O/W2 remains off to select heating operation.

G turns on furnace blower.

Y1/W2 turns on compressor at low speed and may also adjust blower speed for low-speed HP operation.

High-Speed HP heating:

Y/Y2 is added to low-speed HP heating call to operate compressor at high speed and adjust blower for high-speed HP operation.

### Heating Operation—Single-Stage Furnace

W/W1 causes furnace to operate. Furnace controls its own blower at heating speed.

### Heating Operation—Two-Stage Furnace—Thermostat Control

Low heat:

W/W1 causes furnace to operate at low heat. Furnace controls its own blower at low heating speed.

High heat:

Y1/W2 is added to low-heat heating call to operate furnace in high-heat mode. Furnace controls its own blower at high heating speed.

### Heating Operation—Two-Stage Furnace—Algorithm Control

W/W1 causes furnace to operate. Based on amount of time it is required to be on, it determines when to operate at low heat and when to operate at high heat. It controls its own blower at proper speed.

→ Table 1—Heating Stages

WIRING DIAGRAM	SYSTEM TYPE	BALANCE POINT SETTING	STAGE 1	STAGE 2	STAGE 3
Fig. 2	1-speed HP 1-stage furnace	Above	HP	Furnace	—
		Below	Furnace	—	—
Fig. 4, 6, 8	1-speed HP 2-stage furnace	Above	HP	Furnace Lo	Furnace Hi
		Below	Furnace Lo	Furnace Hi	—
Fig. 3	2-speed HP 1-stage furnace	Above	HP Lo	HP Hi	Furnace
		Below	Furnace	—	—
Fig. 5, 7, 9	2-speed HP 2-stage furnace	Above	HP Lo	HP Hi	Furnace Lo or Hi
		Below	Furnace Lo or Hi	—	—

### Defrost Operation

A unique feature of this thermostat is that a defrost cycle, once started, will always be completed. This is true even if thermostat is satisfied during defrost. The result is that a heating cycle never begins with an uncompleted defrost and its associated "cold blow".

During operation of HP in heating mode, HP itself determines when a defrost is necessary. It initiates defrost by energizing its O and W wires. The signal on the O wire switches HP from heating to cooling mode and W signal starts furnace. Thermostat monitors this action by sensing the signal (which it did not create) on the O line. It responds by turning on its W outputs (both if 2-stage furnace) to hold furnace on high heat. At completion of defrost, indicated by removal of signal from HP on O wire, thermostat does 1 of 2 things. If it is satisfied, it turns off all Y, G, and W outputs which results in all equipment off. If not satisfied, it will turn off Y and G, leaving W on until it becomes satisfied. In this way it assures that furnace will be used to satisfy a heat demand existing after a defrost cycle is completed.

### Emergency Heat

If EHEAT mode is selected at thermostat, all heating will be done by furnace.

### Continuous Fan

If FAN ON is selected, thermostat energizes G terminal, which causes fan to operate when both heating and cooling are off.

### Staging Sequence—Heating

Depending on whether HP is single or 2 speed and whether furnace is single or 2 stage, the staging of thermostat outputs with increasing demand varies. Table 1 shows the heating staging sequence for all 4 possible combinations of single- and multi-stage equipment. Note that thermostat itself has a maximum of 3 heating stages. Note also that at outdoor temperatures below selected **balance point setting** no HP operation is allowed. As discussed earlier, once furnace is turned on, it remains on to satisfy all demand.

A "freeze protect" feature is built into the dual fuel thermostat. If **indoor** temperature sensor fails, and thermostat is in HEAT or AUTO mode, heat will be cycled when outdoor temperature is below 50°F. The amount of heat supplied will increase as outdoor temperature decreases, keeping structure from freezing.

## → INSTALLATION CONSIDERATIONS

### POWER

Note that this control does not require batteries and is not "power stealing". It does require 24 vac (R and C terminals) of the low-voltage transformer to be connected to it for proper operation. It will not operate without these 2 connections.

### OUTDOOR TEMPERATURE SENSING

The dual fuel thermostat uses outdoor temperature to determine whether the furnace or the heat pump is allowed to operate. The outdoor temperature sensor, Part No. TSTATXXSEN01-B, is supplied with the unit and must be installed. Plan installation so

that 2 wires can be run from the thermostat to an outdoor location, preferably on the north side of the house **or** refer to Installation Instructions included with the outdoor temperature sensor for simplified connection. Sensor can be mounted to outdoor unit and existing control wires may be used for its connection. Details are provided in the sensor Installation Instructions.

## INSTALLATION

### Step 1—Thermostat Location

Thermostat should be mounted:

- Approximately 5 ft (1.5m) from floor.
- Close to or in a frequently used room, preferably on an inside partitioning wall.
- On a section of wall without pipes or duct work.
- In a location where the outdoor temperature sensor wires can be routed to thermostat location. It is acceptable to use 2 separate wires in thermostat cable to connect outdoor sensor. These wires may be connected at furnace to another pair continuing to outdoor heat pump. The outdoor sensor may then be mounted and connected in vicinity of heat pump, but be sure it is not located in direct sunlight.

Thermostat should NOT be mounted:

- Close to a window, on an outside wall, or next to a door leading to the outside.
- Exposed to direct light and heat from a lamp, sun, fireplace, or other temperature-radiating object which may cause a false reading.
- Close to or in direct airflow from supply registers and return-air grilles.
- In areas with poor air circulation, such as behind a door or in an alcove.

### → Step 2—Set DIP Switches

There is a 4 section DIP switch within the thermostat which must be properly set by the installer. It is easiest to set these 4 switches before the thermostat is mounted on the wall, so STOP and complete the following steps:

1. Open hinged thermostat cover.
2. Remove cover completely by snapping it apart at hinge.
3. Open thermostat by pressing back half of the right end of plastic case inward while, at the same time, pulling front and back halves apart at the right end. The 2 halves will swing apart.
4. Snap hinge apart to completely separate the 2 halves.
5. Switches are located in upper right corner of circuit board. To change switch position, use corner of a small screwdriver to slide switch to opposite position.
6. After switches have been set, do not reassemble the 2 halves. The rear plastic will be first mounted to wall.

### Switch A - Not Used in Dual Fuel Thermostats

This switch must be in OFF position in all dual fuel applications. DO NOT turn ON.

### Switch B - Select Smart or Normal Setback Recovery

Selects between normal and smart recovery from setback. Normal recovery changes to the new set point at the programmed time. Smart recovery, which is active in heating mode only, starts earlier and adjusts the set point slowly so that room temperature will arrive at the programmed temperature at the programmed time.

TO SET:

OFF—for smart recovery. This is the factory default.

ON—for normal recovery.

### Switch C - Select Enable/Disable of Low-Ambient Cooling

Use to allow or prevent cooling operation below an outdoor temperature of 55°F. Prevention of cooling below 55°F adds to compressor reliability. If outdoor temperature sensor fails or is disconnected, cooling is allowed regardless of switch setting.

TO SET:

OFF—cooling is disabled at outdoor temperatures below 55°F.

ON—cooling is enabled at outdoor temperatures below 55°F.

### Switch D - Select Single-Speed or 2-Speed HP

Use this switch to tell dual fuel thermostat whether it is controlling a single- or 2-speed HP. It must be set properly.

TO SET:

OFF—for single-speed HP.

ON—for 2-speed HP.

## Step 3—Install Thermostat

### ⚠ WARNING

Before installing thermostat, turn off all power to unit. There may be more than 1 power disconnect. Electrical shock can cause personal injury or death.

1. Turn OFF all power to unit.
2. If an existing thermostat is being replaced:
  - a. Remove existing thermostat from wall.
  - b. Disconnect wires from existing thermostat, 1 at a time. Be careful not to allow wires to fall back into the wall.
  - c. As each wire is disconnected, record wire color and terminal marking.
  - d. Discard or recycle old thermostat.

**NOTE:** Mercury is a hazardous waste and **MUST** be disposed of properly.

3. Open thermostat rear door (mounting base) to expose mounting holes. The base can be removed to simplify mounting. Snap apart carefully at hinge to separate mounting base from remainder of thermostat.
4. Route thermostat wires through large hole in mounting base. Level mounting base against wall (for aesthetic value only—thermostat need not be leveled for proper operation) and mark wall through 2 mounting holes.
5. Drill two 3/16-in. mounting holes in wall where marked.
6. Secure mounting base to wall with 2 screws and anchors provided, (additional anchoring holes available for more secure mounting if needed) making sure all wires extend through hole in mounting base.
7. Adjust length and routing of each wire to reach proper terminal and connector block on mounting base with 1/4 in. of extra wire. Strip only 1/4 in. of insulation from each wire to prevent adjacent wires from shorting together when connected.
8. Match and connect equipment wires to proper terminals of the connector blocks. (See Fig. 2 through 9.) Both R and C must be connected for proper thermostat operation.

### ⚠ CAUTION

Improper wiring or installation may damage the thermostat. Check to make sure wiring is correct before proceeding with installation or turning on unit.

9. Push any excess wire into wall and against mounting base. Seal hole in wall to prevent air leaks. Leaks can affect operation.
  10. Snap hinge back together.
  11. Close thermostat assembly making sure pins on back of circuit board align with sockets in connector.
  - 12. If this is a replacement installation, be sure to remove the interface control which may have been used to interface a standard thermostat to a dual fuel installation. All the wires (with the exception of the outdoor sensor S1 and S2 wires) from the thermostat go directly to the furnace. The interface control must be removed and not used.
  13. Turn ON power to unit.
- On power up, display shows dF or d2 for a few seconds to indicate that it is a dual fuel thermostat. (See page 11.)

## → Step 4—Set Thermostat Configuration

Configuration options, like DIP switch settings, are intended to be selected at installation and normally are not modified by the homeowner. These options are not discussed in the Homeowner's Manual and therefore must be selected as part of the installation. A special procedure allows entry into the configuration mode. While in the configuration mode, 7 selections can be made. A description of each of these and how to use the configuration mode follows.

### CONFIGURATION OPTIONS—SUMMARY:

- Option 01—Anticipator adjustment
- Option 02—Clean filter timer adjustments
- Option 03—Fahrenheit or Celsius operation
- Option 04—07—Not applicable
- Option 08—Auxiliary heat lockout setting
- Option 09—10—Not applicable
- Option 11—Balance point setting
- Option 12—Not applicable
- Option 13—Room temperature offset adjustment
- Option 14—Not applicable
- Option 15—Enable AUTO mode

### TO ENTER THE CONFIGURATION MODE:

Press and hold FAN button for approximately 10 sec until COOL set point display indicates a flashing 01. The thermostat is now in the configuration mode. It will automatically exit this mode if no button is pressed for 3 minutes. Pressing END button will exit the configuration mode immediately.

### WHILE IN THE CONFIGURATION MODE:

The upper small (COOL set point) display indicates the selected option number and the large display indicates the selection made within that option. One of these will be flashing. The up and down buttons are used both to move between the available options and to make selection for each option. When the option number (small display) is flashing, the up and down buttons adjust it, moving between the available option numbers. After the desired option number has been selected, press SET TIME/TEMP button once. The large display will now flash, indicating that the up and down buttons now control the available choices within that option. Each

press of SET TIME/TEMP button switches between the available option (small display) and the available selections within each option (large display).

#### CONFIGURATION OPTIONS—SELECTION:

##### Option 1—Anticipator Adjustment

This adjustment controls the sensitivity and cycle rate of the thermostat. Higher numbers decrease the sensitivity and slow the cycle rate. Lower numbers increase the sensitivity and cycle rate. However, a limiting feature will not allow more than 4 cycles per hour, regardless of setting. Anticipator values can range from 1 to 9. Factory default is 3. This default setting will provide optimum performance in nearly all installations. Try it first. Do not change setting unless there is evidence of need to do so.

Unlike conventional anticipators, this setting is not to be determined by current draw. There is not need to measure, know, or compensate for current. There is also no droop with this thermostat. Regardless of setting and the number of stages, both heating and cooling will control to their respective set points.

##### TO ADJUST:

1. Enter configuration mode (if not already there). See above. The upper small (COOL set point) display will be flashing 01. If not, use up and down buttons to move it to 01.
2. Press SET TIME/TEMP button once to flash the current selection of 1 through 9 on the large display. Factory default is 3.
3. Use up and down buttons to move between the available choices.
4. Press SET TIME/TEMP button again to flash the upper small display for selection of another option, or press END to exit the configuration mode.

##### Option 2—Clean Filter Timer

Select hours of blower operation (heating, cooling, or fan) before CLEAN FILTER icon is displayed. With OFF selected, icon will never come on, disabling this feature. Time selection can be from 400 to 3600 hrs by selecting numbers 1 through 9. (Time is 400X number selected.) Factory default is 2 (800 hrs). Recommended selections are: disposable filter—400 to 800 hrs, media filter—1200 to 1600 hrs, or electronic air cleaner—1600 to 2400 hrs of blower operation.

##### TO SELECT OR ADJUST:

1. Enter configuration mode if not already there. See above. Use up and down buttons to make small (now flashing) display indicate 02.
2. Press SET TIME/TEMP button once to flash current selection of OF, or 1 through 9 on large display. Factory default is 2.
3. Use up and down buttons to move between the available choices.
4. Press SET TIME/TEMP button again to flash upper small display for selection of another option, or press END to exit configuration mode.

##### Option 3—Fahrenheit or Celsius Operation

Select between Fahrenheit and Celsius operation. Factory default is Fahrenheit.

##### TO SELECT:

1. Enter configuration mode if not already there. See above. Use up and down buttons to make small (now flashing) display indicate 03.
2. Press SET TIME/TEMP button once to flash current selection of F or C. Factory default is F.

3. Use up and down buttons to move between C and F on large display.
4. Press SET TIME/TEMP button again to flash upper small display for selection of another option, or press END to exit the configuration mode.

##### Option 8—Auxiliary Heat Lockout Setting

This option allows selection of an outdoor temperature of 5° through 55°F in 5° steps (or equivalent values in C), or OF (off). Furnace is prevented from operating for outdoor temperatures above the selected temperature. If OF (off) is selected, furnace operation is allowed at all outdoor temperatures. If selected, emergency heat (EHEAT) overrides this feature. Factory default is OF. This setting can only be equal to or above the setting choice made for Option 11. Moving this setting lower may "push" Option 11 setting downward.

##### TO SELECT:

1. Enter configuration mode if not already there. See above. Use up and down buttons to make small (now flashing) display indicate 08.
2. Press SET TIME/TEMP button once to flash large display.
3. Use up and down buttons to move between 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, or OF on large display. Factory default is OF. Remember, this may change setting for Option 11.
4. Press SET TIME/TEMP button again to flash upper small display for selection of another option, or press END to exit the configuration mode.

##### Option 11—Balance Point Setting

This option allows selection of an outdoor temperature of 5° through 55°F in 5° steps (or equivalent values in C), or OF (off). Heat pump is prevented from operating for outdoor temperatures below selected temperature. If OF (off) is selected, heat pump operation is allowed at all outdoor temperatures. Factory default is OF. This setting can only be equal to or below the setting choice made for Option 8. Moving this setting higher may "push" Option 8 setting upward.

##### TO SELECT:

1. Enter configuration mode if not already there. See above. Use up and down buttons to make small (now flashing) display indicate 11.
2. Press SET TIME/TEMP button once to flash large display.
3. Use up and down buttons to move between 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, or OF on large display. Factory default is OF. Remember, this may change setting for Option 8.
4. Press SET TIME/TEMP button again to flash upper small display for selection of another option, or press END to exit configuration mode.

##### Option 13—Room Temperature Offset Adjustment

This option allows calibration (or deliberate miscalibration) of the room temperature sensor. There are various reasons why homeowners may want to have the displayed temperature adjusted to a higher or lower value. The selected number is the number of degrees, plus or minus, which will be added to the actual temperature. The numbers can range between -5 and +5. Factory default is 0. This adjusted value will be used as the actual temperature for both the display and the control action. For example, if 2 is selected. 72° actual will read 74°. If set point is 72° then the room will control to an actual temperature of 70° which will be displayed and acted upon as if it were 72°. The effect is that a positive number selection will make the room temperature lower and vice versa. The thermostat is calibrated within an accuracy of plus or minus 1° when shipped from the factory, so this adjustment will provide the best accuracy when set to 0.

→ **Table 2—Active Outputs for Each Operating State**

1-SPEED HEAT PUMP		2-SPEED HEAT PUMP	
Fan	G	Fan	G
Cool	Y/Y2, O/W2, G	Lo Cool	Y1/W2, O/W2, G
HP Heat	Y/Y2, G	Hi Cool	Y1/W2, Y/Y2, O/W2, G
		Lo HP Heat	Y1/W2, G
		Hi HP Heat	Y1/W2, Y/Y2, G
Furnace Lo	W/W1		
Furnace Hi	W/W1, Y1/W2	Furnace	W/W1

**TO SELECT:**

1. Enter configuration mode if not already there. See above. Use up and down buttons to make small (now flashing) display indicate 13.
2. Press SET TIME/TEMP button once to flash large display.
3. Use up and down buttons to move between -5 and +5 in 1° steps on large display. Factory default is 0.
4. Press SET TIME/TEMP button again to flash upper small display for selection of another option, or press END to exit configuration mode.

**Option 15—Enable Auto Mode**

This option allows the installer to enable or disable AUTO mode (automatic changeover between heat and cool). When disabled, AUTO icon does not appear when successive presses of MODE button are used to move between OFF, HEAT, COOL, and EHEAT (in heat pump systems). Factory default is ON (AUTO enabled).

**TO SELECT:**

1. Enter configuration mode if not already there. See above. Use up and down buttons to make small (now flashing) display indicate 15.
2. Press SET TIME/TEMP button once to flash large display.
3. Use up or down button to move between ON and OF on large display. Factory default is ON (AUTO enabled).
4. Press SET TIME/TEMP button again to flash upper small display for selection of another option or press END to exit configuration mode.

→ **Step 5—Check Thermostat Operation**

Before doing the checkout, press HOLD button to turn on HOLD icon, locking the thermostat in hold mode. This will assure set points do not change during the checkout. Outputs for each stage of operation are listed in Table 2.

**TO TEST FAN:**

1. Press FAN button. Fan ON icon and the G output will go on within a few seconds, causing fan to operate.
2. Pressing FAN button again will turn off the G output and turn on Fan AUTO icon.

**TO TEST COOLING:**

Press MODE button until COOL icon under it turns on. Press down button until cool set point (upper right 2 digit display with COOL now flashing under it) is 2° or 3° below room temperature. This will create a cooling demand. A small triangle to the left of this COOL icon will flash or come on continually. Flashing means the equipment is going to turn on but is presently being held off by a system timer. (See "Operational Information" on page 11 for timer descriptions.) Defeat timer by pressing UP and FAN buttons together. This will make the triangle stay on and turn cooling equipment on. To turn off, raise cooling set point above room temperature. The cooling and the triangle will turn off within a few seconds.

If system has a 2-speed compressor, it will start on low and proceed to high 15 minutes later due to a staging timer which requires 15 minutes of low before high comes on. The UP and FAN buttons cannot be used to defeat this timer. This timer **can** be defeated by reducing the set point to more than 5° below room temperature, bringing on a high speed demand within 5 seconds. Remember—2-speed units have a 1 minute off time between low and high speed, so the thermostat's demand will not show immediately as a speed change in the outdoor unit. It will show immediately as an increase in the indoor fan speed.

**TO TEST HEAT PUMP HEATING:**

Press MODE button until HEAT icon under it turns on. Press up button until HEAT set point (LOWER right 2-digit display with HEAT now flashing under it) is 2° or 3° (not more) above room temperature. This will create a first stage heating demand. A small triangle to the left of this HEAT icon will flash or come on continually. Flashing means the equipment is going to turn on but is presently being held off by a system timer. (See "Operational Information" on page 11 for timer descriptions.) Defeat timer by pressing UP and FAN buttons together. This will make the triangle stay on and turn on the heat pump. To turn off, reduce the heating set point below the room temperature. The heating and the triangle will turn off within a few seconds.

If the system has a 2-speed compressor, it will start on low and proceed to high 15 minutes later due to a staging timer which requires 15 minutes of low before high comes on. The UP and FAN buttons cannot be used to defeat this timer. If set point is raised to more than 5° above room temperature, the staging timer is defeated and the thermostat will call for high speed heat pump heating within 5 sec. This is not recommended because once the demand exceeds 5°, the thermostat may jump to furnace heating at any time. Use the method below to test the furnace.

**TO TEST FURNACE HEATING:**

To test, press MODE button until EHEAT icon turns on. This will allow operation of the furnace only. Raising set point above room temperature will turn on the furnace. Reducing set point below room temperature will turn it off.

If the heat pump is single speed and the furnace is 2-stage, the thermostat can be used to control the second stage. (See Fig. 4, 6, and 8.) To test second stage, raise set point to more than 5° above room temperature (defeating 15-minute staging timer). Within 5 sec, the thermostat will bring on the furnace second stage.

→ **Step 6—Final Settings**

1. Assuming the system is to be left in operation after the installation is complete, use MODE button to select between HEAT, COOL, EHEAT, or AUTO to provide the desired operation of heating, cooling, or both.
2. The default set points and programmed schedule conform to the Energy Star requirements of the U.S. Department of Energy for both heating and cooling. These provide energy saving temperature settings.
3. Turn on HOLD if fixed set points are to be used. If the programmed schedule is to be used, make sure the HOLD icon is off.
4. For further information on temperature selection and programming, refer to Homeowner's Guide.
5. If AUTO mode is to be used, be sure both heat and cool set points are properly adjusted.
6. The FAN button may be used to select between AUTO (fan on only with equipment) and ON (fan on continuously) fan modes.

→ **Step 7—Checklist**

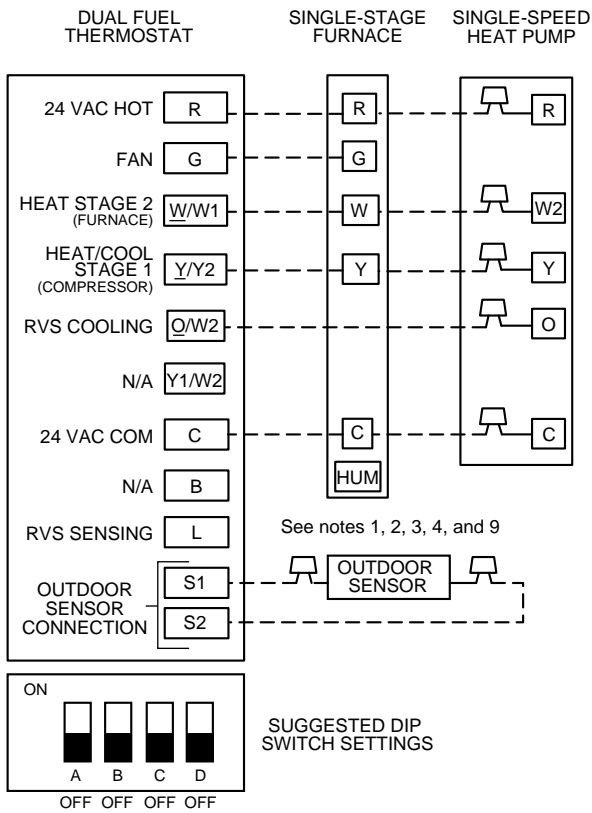
1. Put away tools and instruments, and clean up debris.
2. Review Homeowner's Guide with owner.
3. Leave literature packet with owner.
4. Fill out and return survey card.

→ **Table 3—Wiring Diagram Reference Chart**

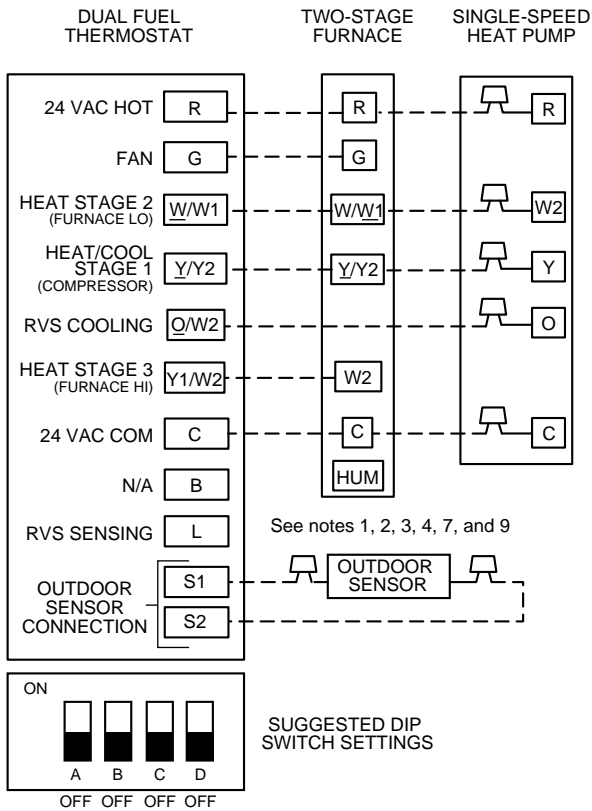
EQUIPMENT SELECTION	SINGLE-SPEED HEAT PUMP	TWO-SPEED HEAT PUMP
<b>1-Stage Furnace</b>	Fig. 2	Fig. 3
<b>2-Stage Furnace</b>	Fig. 4	Fig. 5
<b>Variable-Speed 2-Stage Non-Condensing Furnace</b>	Fig. 6	Fig. 7
<b>Variable-Speed 2-Stage Condensing Furnace</b>	Fig. 8	Fig. 9

**Table 4—Dual Fuel Thermostat Quick Reference**

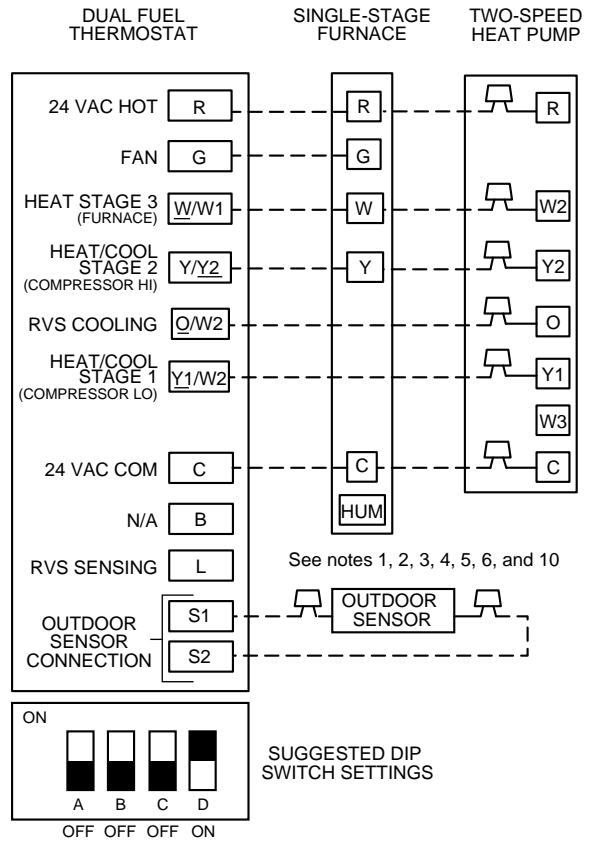
		THERMOSTAT OUTPUTS								
Outdoor Unit	Set DIP Switch D	24v Hot	Common	Fan	Heat Stage 1	Heat Stage 2	Heat Stage 3	Cool Stage 1	Cool Stage 2	Reversing Valve
<b>1-Speed HP</b>	OFF	R	C	G	Y/Y2 (compressor)	W/W1 (furnace lo)	Y1/W2 (furnace hi)	Y/Y2	N/A	O/W2
<b>2-Speed HP</b>	ON	R	C	G	Y1/W2 (compressor lo)	Y/Y2 (compressor hi)	W/W1 (furnace)	Y1/W2	Y/Y2	O/W2



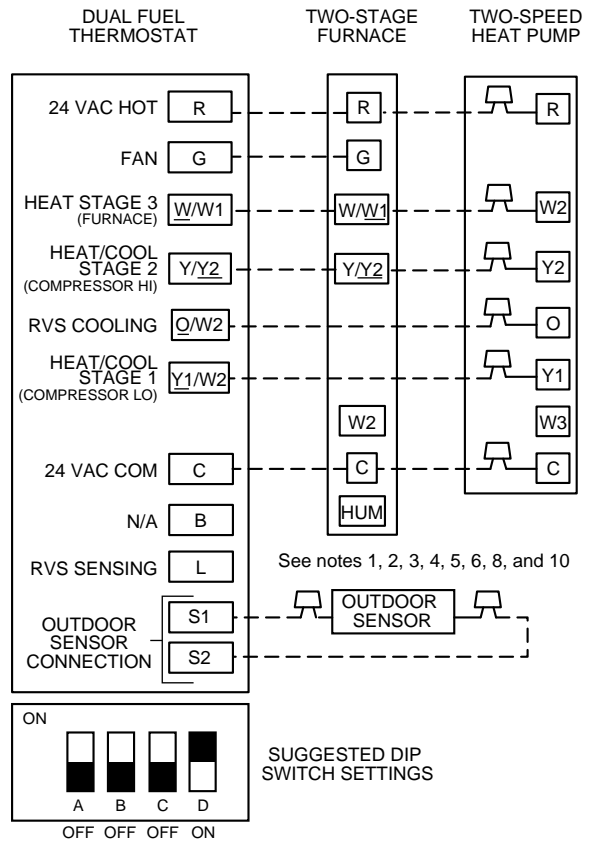
→ Fig. 2—Single-Stage Furnace with Single-Speed Heat Pump



→ Fig. 4—Two-Stage Furnace with Single-Speed Heat Pump



→ Fig. 3—Single-Stage Furnace with 2-Speed Heat Pump



→ Fig. 5—Two-Stage Furnace with 2-Speed Heat Pump

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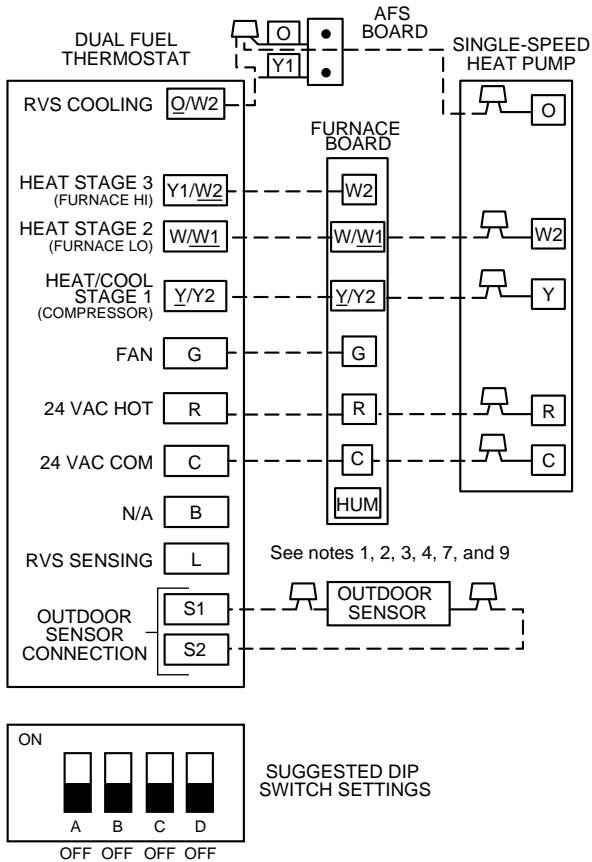
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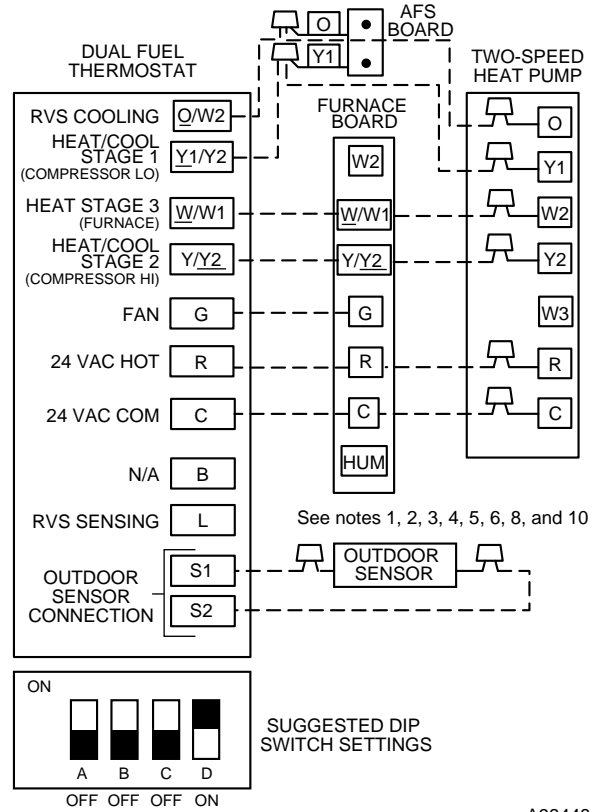


VARIABLE-SPEED 80% NON-CONDENSING FURNACE

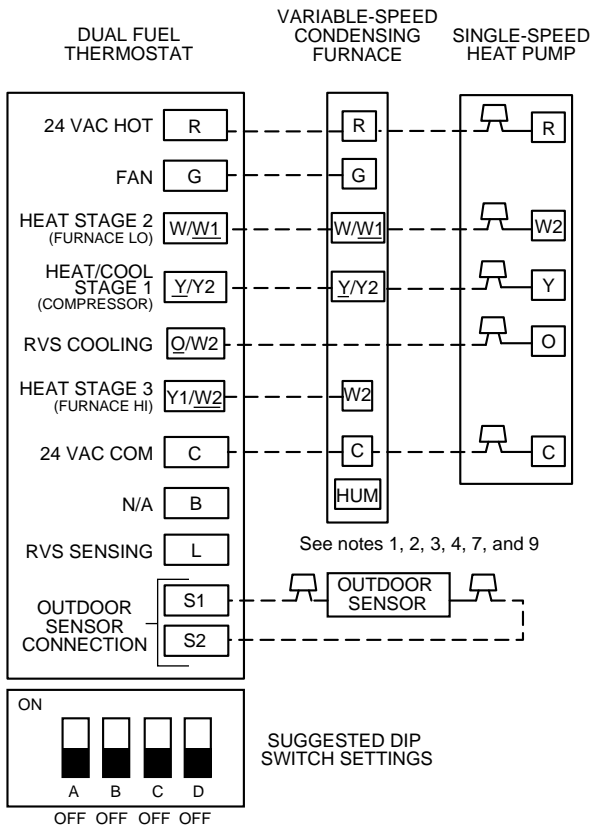


→ Fig. 6—Variable-Speed 2-Stage Non-Condensing Furnace with Single-Speed Heat Pump

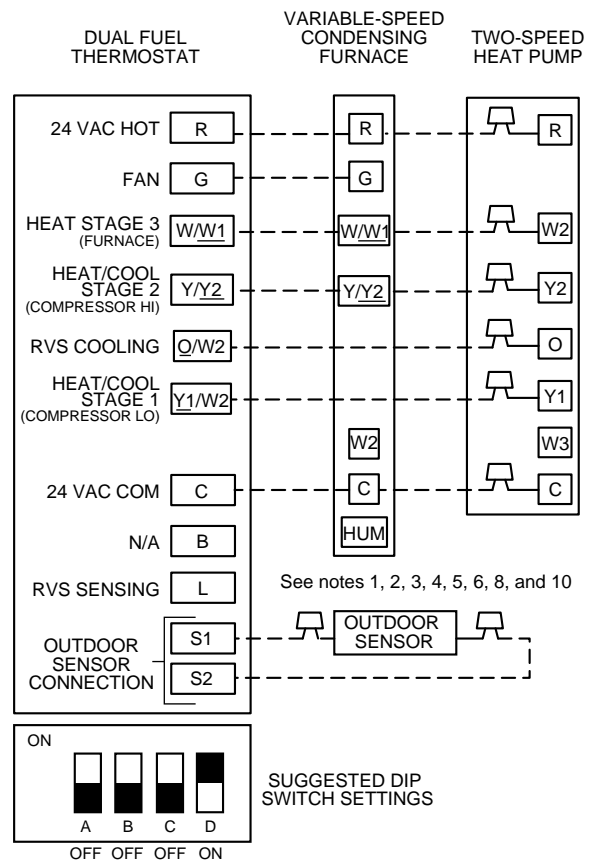
VARIABLE-SPEED 80% NON-CONDENSING FURNACE



→ Fig. 7—Variable-Speed 2-Stage Non-Condensing Furnace with 2-Speed Heat Pump



→ Fig. 8—Variable-Speed Furnace with Single-Speed Heat Pump



→ Fig. 9—Variable-Speed Furnace with 2-Speed Heat Pump

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→ WIRING DIAGRAM NOTES:

1. Heat pump **MUST** have a high pressure switch for dual fuel applications.
2. Outdoor Air Temperature Sensor must be attached in all dual fuel installations.
3. The RVS Sensing terminal "L" should not be connected. This is internally used to sense defrost operation.
4. Refer to indoor and outdoor equipment Installation Instructions for additional information and setup procedure.
5. Select the "ZONE" position on the 2-speed heat pump control board.
6. **Do not select** the "FURNACE INTERFACE" or "BALANCE POINT" option on the 2-speed heat pump control board. This is controlled internally by the Dual Fuel Thermostat.
7. As an option, lock the furnace into low-fire operation and let Y1/W2 control high-fire operation. Refer to indoor equipment Installation Instructions for proper setup.
8. Furnace must control its own second-stage heat operation via furnace control algorithm. Refer to indoor equipment Installation Instructions for proper setup.
9. Dip Switch D must be in the OFF position for single-speed compressor operation. This is the factory default.
10. Dip Switch D must be in the ON position for 2-speed compressor operation.

→ **OPERATIONAL INFORMATION**

Five-minute Compressor Timeguard

This timer prevents the compressor from starting unless it has been off for at least 5 minutes. It can be defeated for 1 cycle by simultaneously pressing the FAN button and the UP button.

Fifteen-minute Cycle Timer

This timer prevents the start of a heating or cooling cycle until at least 15 minutes after the last start of the same cycle. Its function is to assure that equipment is not cycled more than 4 times per hour. This timer is defeated for 1 cycle when the desired temperature is manually changed. It can also be defeated for 1 cycle by simultaneously pressing the FAN button and the UP button.

Fifteen-minute Staging Timer

In multistage heating or cooling, this timer prevents any higher stage from turning on until the preceding stage has been on for 15 minutes. This timer is defeated if the temperature error is greater than 5°F (usually due to a large change in desired temperature).

Three-minute Minimum On Time

In normal operation, when a stage turns on, it will not turn off for a minimum of 3 minutes.

Heat/Cool Set Points (Desired Temperatures)

A minimum difference of 2 degrees is enforced between heating and cooling set points. This is done by allowing one setting to "push" the other, to maintain this difference.

Auto Changeover

When the auto changeover mode is selected, a change from heat to cool (or vice versa) will not occur until an opposite mode demand has existed continually for 20 minutes. If the set point is changed, the 20 minute requirement is deleted.

Emergency Heat Mode

When emergency heat mode is selected, all Y signals are locked out and W becomes energized upon a call for heat.

Power On Check

When AC power is first applied, all icons of the display are turned on for a few seconds, and the temperature display reads "dF" if it is set for single speed compressor (DIP switch D set to OFF), or "d2" if it is set for 2-speed compressor (DIP switch D set to ON).

Error Codes

- - If thermostat cannot properly read room temperature, the room temperature display will indicate "--" and thermostat will enter FREEZE PROTECT mode. When outdoor temperature is below 50°F furnace will operate for sufficient time every half hour to keep home from freezing. The ON time is given by the formula: Minutes ON equals 15 minus (outdoor temperature in °F divided by 4).
- E2 - If the AC line voltage drops below a minimum (brownout) level, all outputs are turned off and the display indicates E2. If the AC line voltage disappears completely, the display will immediately go blank.
- E3 - If thermostat cannot properly read outdoor temperature, E3 will alternate with room temperature on the room temperature display and the outdoor temperature will read "--" (2 dashes).
- E6 - If defrost timer continues for longer than 15 minutes, E6 will be displayed. Check heat pump wiring or for a failed heat pump defrost control.

Auxiliary Heat Icon

This icon is displayed when the furnace is operating.

Smart Recovery

With Smart Recovery selected, the transition out of a heating setback begins 90 minutes before the selected recovery time and gradually adjusts room temperature so that the desired temperature will be achieved at the selected recovery time.

→ **Thermostat Troubleshooting**

SYMPTOM	WHAT TO CHECK
Blank LCD	Check for 24 VAC between R and C at terminal connections. Both R and C must be connected for proper operation.
"--" on temperature display	Temperature sensor reading out of range. Check sensor for damage. If recycling power does not clear display, thermostat should be replaced.
"E2" on temperature display	Brownout condition or too low of voltage to thermostat. Double check wiring and check for 24 VAC between R and C. E2 will clear 15 seconds after proper voltage is restored.
"E3" on temperature display	Outdoor temperature sensor reading out of range. An attempt to read outdoor temperature results in "--" on display. Check for shorted, open, or failed outdoor temperature sensor.
"E6" on temperature display	System stuck in defrost. Check wiring and heat pump defrost control board.
"Clean Filter" on temperature display	After the selected number of hours of blower operation "clean filter" will display on LCD. This is to remind the homeowner to "check" filter. Press "reset filter" button to clear display and reset timer to 0.
Cooling will not come on	Select COOL mode. Decrease cooling set point to 10 degrees below room temperature. Simultaneously press FAN and UP buttons to defeat timers. Check for 24 VAC at Y/Y2 terminal. If present, thermostat is OK and problem is with equipment or wiring. If not present, replace thermostat.
Heating will not come on	Select HEAT mode. Increase heating set point to 2 or 3 degrees (not more) above room temperature. Simultaneously press FAN and UP buttons to defeat timers for 1 cycle. Check for 24 VAC at Y/Y2 terminal (single-speed HP) or Y1/W2 terminal (2-speed HP) after 10 seconds. Increase heating set point to 7 or 8 degrees above room temperature. Check for 24VAC at W/W1 terminal.

# DUAL FUEL THERMOSTAT CONFIGURATION RECORD

Date \_\_\_\_\_

Owner/Operator \_\_\_\_\_ Thermostat Model No. \_\_\_\_\_

**A) Hardware Configuration**

- Switch A \_\_\_ Not Used. Do Not Turn On. (OFF = Dual Fuel Application)
- Switch B \_\_\_ Smart Recovery. (OFF = Enable, ON = Disable)
- Switch C \_\_\_ Low Ambient Cooling Lockout. (OFF = Disable, ON = Enable)
- Switch D \_\_\_ Heat Pump Staging. (OFF = 1-Speed, ON = 2-Speed)

**B) Mode Settings**

- \_\_\_ Hold (On or Off)
- \_\_\_ Mode (Off, Heat, Cool, Auto, Eheat)
- \_\_\_ Heating Set Point Value
- \_\_\_ Cooling Set Point Value
- \_\_\_ Fan (Auto or On)

**C) Configuration Options**

- 1 \_\_\_ Anticipator (1-9: factory default = 3)
- 2 \_\_\_ Clean Filter Timer (Off or 1-9: factory default = 2)
- 3 \_\_\_ Fahrenheit or Celsius (F or C: factory default = F)
- 4-7 \_\_\_ N/A
- 8 \_\_\_ Auxiliary Heat Lockout (Off or 5-55°F: factory default = Off)
- 9-10 \_\_\_ N/A
- 11 \_\_\_ Balance Point Temperature (Off or 5-55°F: factory default = 40)
- 12 \_\_\_ N/A
- 13 \_\_\_ Room Temperature Offset (-5 to +5: factory default = 0)
- 14 \_\_\_ N/A
- 15 \_\_\_ Enable Auto Mode (Off or On: factory default = On)

**D) Schedule**

	WAKE			DAY			EVE			SLEEP		
	TIME	HEAT	COOL	TIME	HEAT	COOL	TIME	HEAT	COOL	TIME	HEAT	COOL
Mon	___	___	___	___	___	___	___	___	___	___	___	___
Tue	___	___	___	___	___	___	___	___	___	___	___	___
Wed	___	___	___	___	___	___	___	___	___	___	___	___
Thu	___	___	___	___	___	___	___	___	___	___	___	___
Fri	___	___	___	___	___	___	___	___	___	___	___	___
Sat	___	___	___	___	___	___	___	___	___	___	___	___
Sun	___	___	___	___	___	___	___	___	___	___	___	___

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