

INSTALLATION INSTRUCTIONS

Fossil Fuel Kit AFOSL500-1

&

Outdoor Thermostat/Low Ambient Control Kit ASTAT503-1

⚠ WARNING

Installation and servicing of air conditioning equipment can be hazardous due to internal refrigerant pressure and live electrical components. Only trained and qualified service personnel should install or service this equipment. Installation and service performed by unqualified persons can result in property damage, personal injury, or death.

⚠ WARNING

Risk of electrical shock. Before installing or servicing unit, be sure ALL power to the unit is OFF. More than one disconnect switch may be present. Failure to disconnect power supplies can result in property damage, personal injury, or death.

⚠ WARNING

As with any mechanical equipment, personal injury can result from contact with sharp metal edges. Be careful when handling equipment.

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General

Fossil fuel kit AFOSL500-1 is recommended for use with heat pumps in combination with a fossil fuel (gas or oil) furnace. The fossil fuel kit, when used in conjunction with outdoor thermostat ASTAT503-1, can be used to switch from heat pump to fossil fuel furnace operation and to control the point at which the heat pump operation will be switched to fossil fuel furnace operation. The fossil fuel kit can be used with single or two stage fossil fuel furnaces (including variable speed) as well as single or two stage heat pumps.

Outdoor thermostat/low ambient control ASTAT503-1 can be used with fossil fuel kit AFOSL500-1 as described above or in electric heat and/or heat pump applications. The outdoor thermostat can be set to deactivate the heat pump at a user-selected set point and satisfy the heat call only with electric heat (or fossil fuel furnace heat, depending on the application) at outdoor ambient temperatures below the selected set point.

Operation Description – AFOSL500-1 Fossil Fuel Kit

On heat demand, the 1st stage of the thermostat closes and energizes the heat pump operation. The heat pump will continue to operate until the 1st stage heat demand is satisfied. If the heat pump is operating below the balance point and cannot satisfy the heat load, the thermostat will switch to 2nd stage. The heat pump will be de-energized and the furnace will energize. Once 2nd stage has been satisfied, the unit will continue to run in the furnace mode until the 1st stage heat demand has also been satisfied. Upon the next call for heat, the heat pump operation will resume as outlined above.

Operation Description – AFOSL500-1 Fossil Fuel Kit with ASTAT503-1 Outdoor Thermostat

An outdoor thermostat can be used to optimize the performance of a dual fuel system based on fuel cost vs. heat load. Above the adjustable set point, the system operates as outlined above in **Operation Description – AFOSL500-1 Fossil Fuel Kit**. Below the set point, the outdoor thermostat locks out heat pump operation and switches furnace

operation to 1st stage of the thermostat. When outdoor temperature rises to above the set point, normal heat pump operation is resumed. This system can be tailored for most efficient operation relative to local fuel cost.

Operation Description – ASTAT503-1 Outdoor Thermostat/Low Ambient Control

The outdoor thermostat delays electric heat operation until it is necessary. In heat pump applications, the outdoor thermostat keeps the load on the heat pump as long as possible. In straight electric heat applications, the outdoor thermostat keeps the heating load on low power as long as possible.

Heat loss calculations of the house or structure, equipment size, and balance points must be considered when determining the proper outdoor temperature at which the calculated structural heat loss exactly matches the heating capacity of the unit which is the balance point. The outdoor thermostat should be set at the balance point when an additional stage of heat is required to maintain indoor design temperature.

NOTE: Electric heat must be energized during a heat pump defrost cycle to temper the indoor air. In heat pump applications, wire only part of the elements through the outdoor thermostat or, in cases where all of the elements are controlled through the outdoor thermostat, adjust the outdoor thermostat set point above the ambient temperature where defrosting will occur.

AFOSL500-1 Fossil Fuel Kit Features

- Turns off heat pump when furnace is operating (except during defrost periods)
- Two stage heat option – 2nd stage heat call shuts off heat pump, turns on furnace

NOTE: Once 2nd stage of the thermostat is satisfied, the furnace will remain on and complete the 1st stage call for heat. This allows the furnace to reach its optimum efficiency. Next cycle call for heat will begin with heat pump 1st stage unless ambient is below ODT set point.

- 3 minute timed off delay

Delay is activated during initial power up, loss and restoration of power, and after all heat pump heat and cool cycles.

Compressor prevented from restarting within 3 minutes of an off cycle and on power up.

NOTE: Unit must be in the thermostat off cycle at least 3 minutes. If the call is initiated before the 3 minute delay has expired the defrost board will delay the compressor from coming on for 3 minutes. If the call is

initiated after the 3 minute off delay has expired the compressor will come on within 5 seconds from the call.

- 5 second debounce on Y, W1, E, and O thermostat inputs

Thermostat inputs must remain at least 5 seconds before the defrost board responds.

- Outdoor thermostat (optional)

Automatically switches between heat pump and furnace operation at a specific adjustable outdoor ambient set point temperature.

Fail safe mode: In the event the outdoor thermostat N.O. contacts fail/stick closed, the defrost board will prevent the furnace from being activated by a cooling call.

Installation

⚠ WARNING

Risk of electrical shock. Disconnect all power supplies before servicing. More than one disconnect switch may be present. Failure to do so can result in property damage, personal injury, or death.

Mounting Fossil Fuel Kit AFOSL500-1

1. Choose a location that will permit mounting the fossil fuel kit near or within the fossil fuel furnace.
2. Using the fossil fuel board as a template, mark the location of the mounting holes.
3. Use screws to mount the fossil fuel kit.

Mounting Outdoor Thermostat ASTAT503-1

Make wiring connections to terminals before mounting thermostat (see **Making Electrical Connections** on page 3).

Electric Heat Only Applications (No Outdoor Unit)

Thermostat kit must be installed outdoors in outdoor mounting box ASTATBOX502-1.

Electric Heat with Condensing Unit Applications

Thermostat kit may be mounted in unit compressor compartment if space allows. It is not necessary to route capillary tube to outdoor fan section. Compressor will not be operating, so equal temperatures will exist. If space in compressor compartment is limited, thermostat may be installed outside of unit on an adjacent wall using outdoor mounting box ASTATBOX502-1.

Heat Pump Applications

House the outdoor thermostat in outdoor mounting box ASTATBOX502-1 and install outside on an adjacent wall by the outdoor unit.

Installing ASTAT503-1 Using Mounting Box ASTATBOX502-1

When thermostat is installed outside in mounting box, mounting box and sensing bulb must be located where they will not be affected by direct sunlight or wind.

1. Remove cover from thermostat box and insert thermostat capillary tube through grommet in bottom of box, or leave capillary tube coiled inside the mounting box.
2. Remove adjustment knob and securing screws from thermostat. Insert thermostat through back of mounting box with shaft extending through the opening. Line up mounting holes and re-install screws. Place adjustment knob back on thermostat.
3. Coil excessive capillary tubing or secure with clamps if necessary.

Making Electrical Connections

All wiring should be done in accordance with the National Electrical Code, ANSI/NFPA No. 70 (latest edition); Canadian Electrical Code Part 1, CSA C22.1 (latest edition); or local codes where they prevail.

Fossil Fuel Kit AFOSL500-1 Connections

When using outdoor thermostat ASTAT503-1 with AFOSL500-1 fossil fuel kit, the tab on the fossil fuel kit control board next to the terminal strip for the heat pump field wiring connections must be broken for the outdoor thermostat to function with the fossil fuel kit (see Figure 1 on page 5).

See Figures 2 and 3 on pages 6 and 7 for fossil fuel kit field wiring connections for furnace (single stage and two stage), heat pump, and thermostat.

Outdoor Thermostat ASTAT503-1 Connections

Make wiring connections to terminals before mounting thermostat. Enclose connections where they will not be affected by direct sunlight or wind. Refer to Figure 4 on page 8 for typical thermostat wiring connections. Class 2 type wire may be used for low voltage wiring.

NOTE: Emergency heat relay, if used, is field provided.

AFOSL500-1 Fossil Fuel Kit Operation

Cooling Call (1st stage)

On a 1st stage cooling call, the outdoor compressor and fan are energized along with the indoor circulating air fan.

Thermostat Call

Inputs (24VAC)

R + Y/G/O on T-STAT terminal strip of fossil fuel board

Outputs (24VAC)

Y terminal of heat pump terminal strip of fossil fuel board energizes outdoor compressor Y (3 minute off delay after power up and after compressor cycle)

O terminal of heat pump terminal strip of fossil fuel board energizes outdoor reversing valve. O remains energized as long as the thermostat is in the cool mode.

G terminal of furnace terminal strip of fossil fuel board energizes G of furnace energizing indoor fan.

Y terminal of furnace terminal strip of fossil fuel board energizes Y of furnace energizing indoor fan cooling CFM.

Cooling Call (2nd Stage)

On a 2nd stage cooling call, the outdoor compressor, fan, and indoor fan are switched to Y2 – 2nd stage compressor call and Y2 – 2nd stage indoor fan CFM.

Thermostat Call

Inputs (24VAC)

R + Y2 on T-STAT terminal strip of fossil fuel board

Outputs (24VAC)

Y2 terminal of heat pump terminal strip of fossil fuel board energizes outdoor compressor Y2 (if used).

Y2 terminal of heat pump terminal strip of fossil fuel board energizes Y2 CFM of furnace (if used).

Thermostat Removes Call (24VAC)

R-Y2 = Y2 to furnace (if used) de-energized, Y2 to heat pump (if used) de-energized. Compressor goes back to 1st stage, circulating air blower goes to Y1 CFM.

R-Y/G = Compressor Y, fan G off. 3 minute delay starts.

R + O = O remains energized as long as the thermostat is in the cool mode.

Fan On Call

On a fan on call, the indoor fan is energized.

Thermostat Call

Inputs (24VAC)

R + G on T-STAT terminal strip of fossil fuel board

Outputs (24VAC)

G terminal of furnace terminal strip of fossil fuel board energizes G of furnace energizing indoor fan.

Heat Call (1st Stage) without outdoor stat ODT or with outdoor stat ODT when ambient is above ODT set point.

On a 1st stage heat call, the thermostat will energize Y and G to the fossil fuel board, the fossil fuel board will energize the heat pump in the heat mode.

Thermostat Call

Inputs (24VAC)

R + Y/G on T-STAT terminal strip of fossil fuel board.

Outputs (24VAC)

Y terminal of heat pump terminal strip of fossil fuel board energizes outdoor compressor Y (3 minute off delay after power up and after compressor off cycle)

G terminal of furnace terminal strip of fossil fuel board energizes G of furnace energizing indoor fan on speed.

Y terminal of furnace terminal strip of fossil fuel board energizes Y of furnace energizing indoor fan on cooling CFM.

Heat Call (2nd stage) without outdoor stat ODT or with outdoor stat ODT when ambient is above ODT set point.

On a 2nd stage heat call, the thermostat will energize W1 to the fossil fuel board, the fossil fuel board will de-energize the heat pump and energize the furnace. Once the 2nd stage heat call is satisfied, the fossil fuel board will keep the furnace on to finish the cycle until 1st stage heat call is satisfied. The next heat call cycle will begin with heat pump again unless an ODT is used and the ambient drops below the outdoor ambient.

Thermostat Call

Inputs (24VAC)

R + W1 on T-STAT terminal strip of fossil fuel board. R + Y/G on T-STAT terminal of fossil fuel board remains.

Outputs (24VAC)

W1 terminal of furnace terminal strip of fossil fuel board energizes W1 of furnace energizing furnace.

Y/G of furnace terminal strip of fossil fuel board is removed (de-energized).

Y/G of heat pump terminal strip of fossil fuel board is removed (de-energized).

Heat Call (3rd stage) without outdoor stat ODT or with outdoor stat ODT when ambient is above ODT set point.

NOTE: A three stage heat thermostat may be used with a two stage furnace to obtain 2nd stage furnace heat call by demand (see Figure 3 on page 7).

A 3rd stage call for heat will energize the 2nd stage of the furnace (demand call). The furnace 2nd stage timer function must be disabled (placed in the NONE position) for this feature (if applicable).

On a thermostat call 3rd stage heat to W2 of the fossil fuel board thermostat terminal strip, W2 of the fossil fuel board furnace terminal strip will energize the 2nd stage heat of the furnace.

If using ODT and ambient is below the ODT set point, the 3rd stage will bring on 2nd stage of furnace if 1st stage does not meet demand.

Heat Call (2nd stage satisfied) without outdoor stat ODT or with outdoor stat ODT when ambient is above ODT set point.

Outputs (24VAC)

W1 terminal of thermostat terminal strip of fossil fuel board is removed, Y/G remains.

Heat Call (1st stage satisfied) without outdoor stat ODT or with outdoor stat ODT when ambient is above ODT set point.

Outputs (24VAC)

Y/G of thermostat terminal strip of fossil fuel board is removed, furnace cycles off.

Heat Call (1st stage) with outdoor stat ODT, ambient below set point.

On a 1st stage heating call, the thermostat will energize Y and G to the fossil fuel board. Fossil fuel board and ODT will energize the furnace for heating demand.

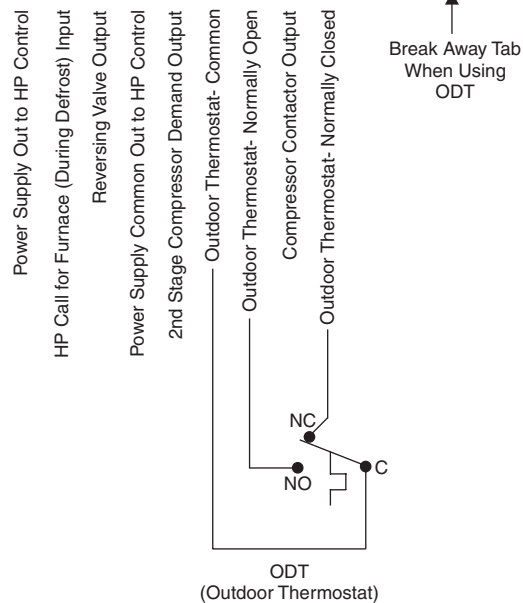
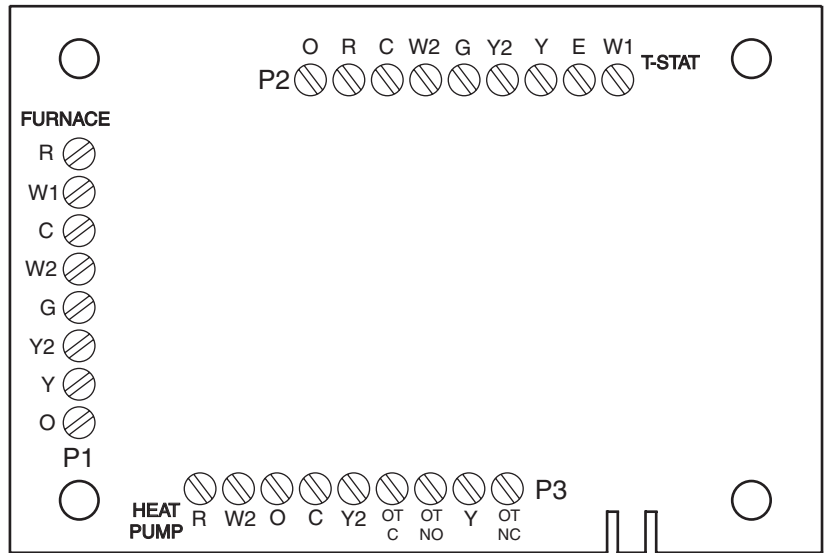
Fossil Fuel Kit Field Wiring Connections

Minimum Thermostat Requirements:

- Heat pump thermostat
- Two stage heat/single stage cooling
- Emergency heat function

- Call for Reversing Valve
- Power Supply Out to Thermostat
- Power Supply Common Out to Thermostat
- Call for 2nd Stage Furnace Heat
- Call for Blower Fan
- Call for 2nd Stage Compressor
- Call for Compressor
- Call for Emergency Heat
- Call for Furnace Heat

- Power Supply Input
- Furnace Demand Output
- Power Supply Input (Common)
- Second Stage Furnace Demand Output
- Blower Fan Demand Output
- Second Stage Compressor Output
- Compressor Output
- Reversing Valve Output



NOTE
NO/NC position on ODT based on ambient relationship to set point selected:
As shown here, ambient is above set point.

Figure 1

Thermostat Call

Inputs (24VAC)

R + Y/G on T-STAT terminal strip of fossil fuel board.

Outputs (24VAC)

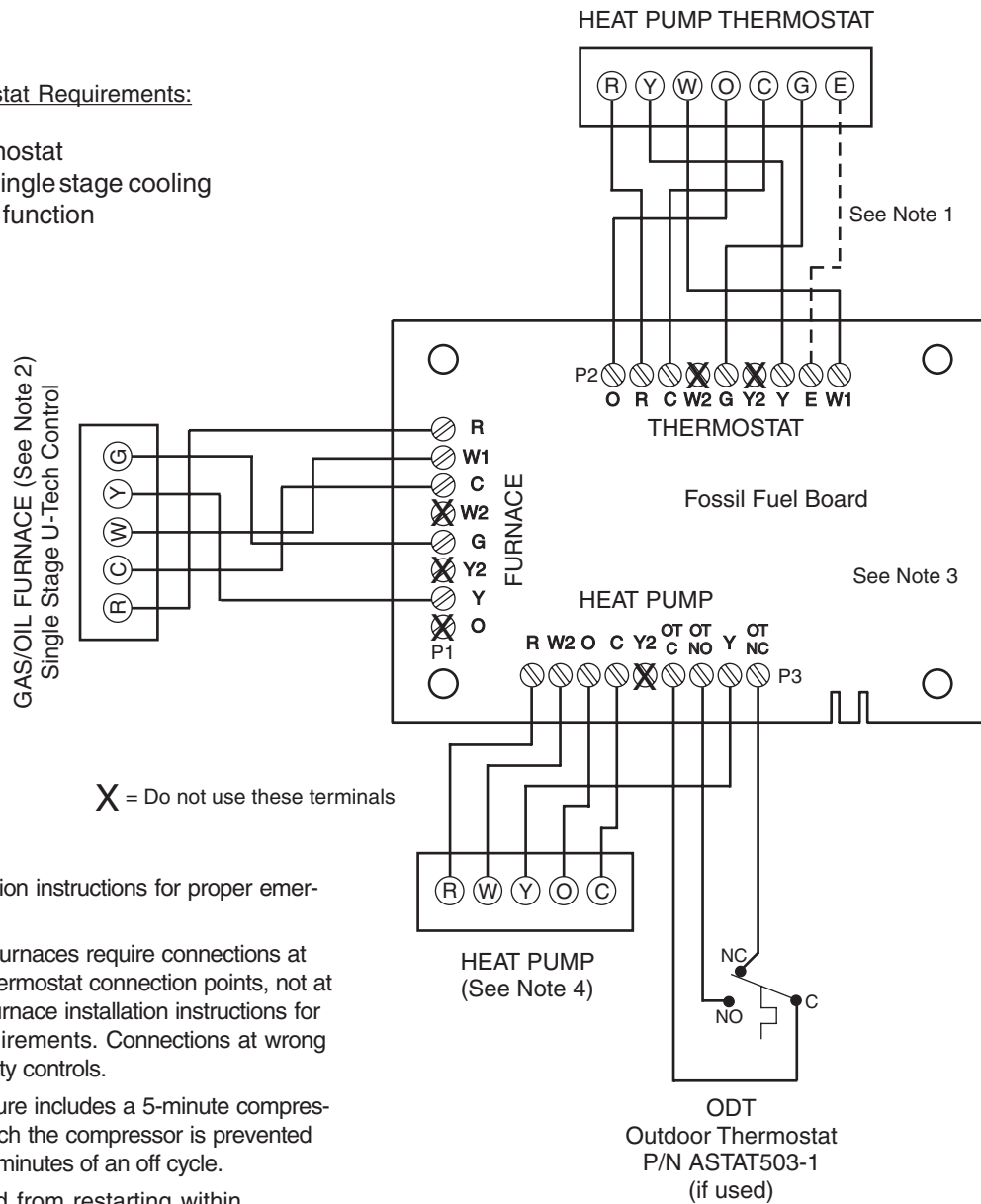
W1 terminal of furnace terminal strip of fossil fuel board energizes W1 of furnace energizing furnace.

Y/G on furnace terminal strip of fossil fuel board is removed by way of ODT ambient switchover temperature.

Fossil Fuel Kit with Single Stage Furnace Wiring Connections

Minimum Thermostat Requirements:

- Heat pump thermostat
- Two stage heat/single stage cooling
- Emergency heat function



NOTES

1. See thermostat installation instructions for proper emergency heat connection.
2. **WARNING:** Certain oil furnaces require connections at pigtail wires, or other thermostat connection points, not at the circuit board. See furnace installation instructions for proper connection requirements. Connections at wrong points may bypass safety controls.
3. Heat pump defrost feature includes a 5-minute compressor off delay during which the compressor is prevented from restarting within 5 minutes of an off cycle.
4. Compressor prevented from restarting within 3 minutes of an off cycle or on power up (feature of fossil fuel board).

Figure 2

Defrost

During a heat pump heating mode run cycle, if the unit has accumulated enough run time and the defrost sensor is closed, the unit will go into defrost mode. The outdoor condenser fan will shut off and the reversing valve will switch over to cooling mode. The furnace will turn on to temper the indoor air.

Inputs (24VAC)

R + W from outdoor heat pump defrost board to heat pump terminal strip W2 of fossil fuel board.

Outputs (24VAC)

W1 terminal of furnace terminal strip of fossil fuel board energizes furnace W or W1 for heat call during tempering during defrost mode.

Fossil Fuel Kit with Two Stage Furnace Wiring Connections

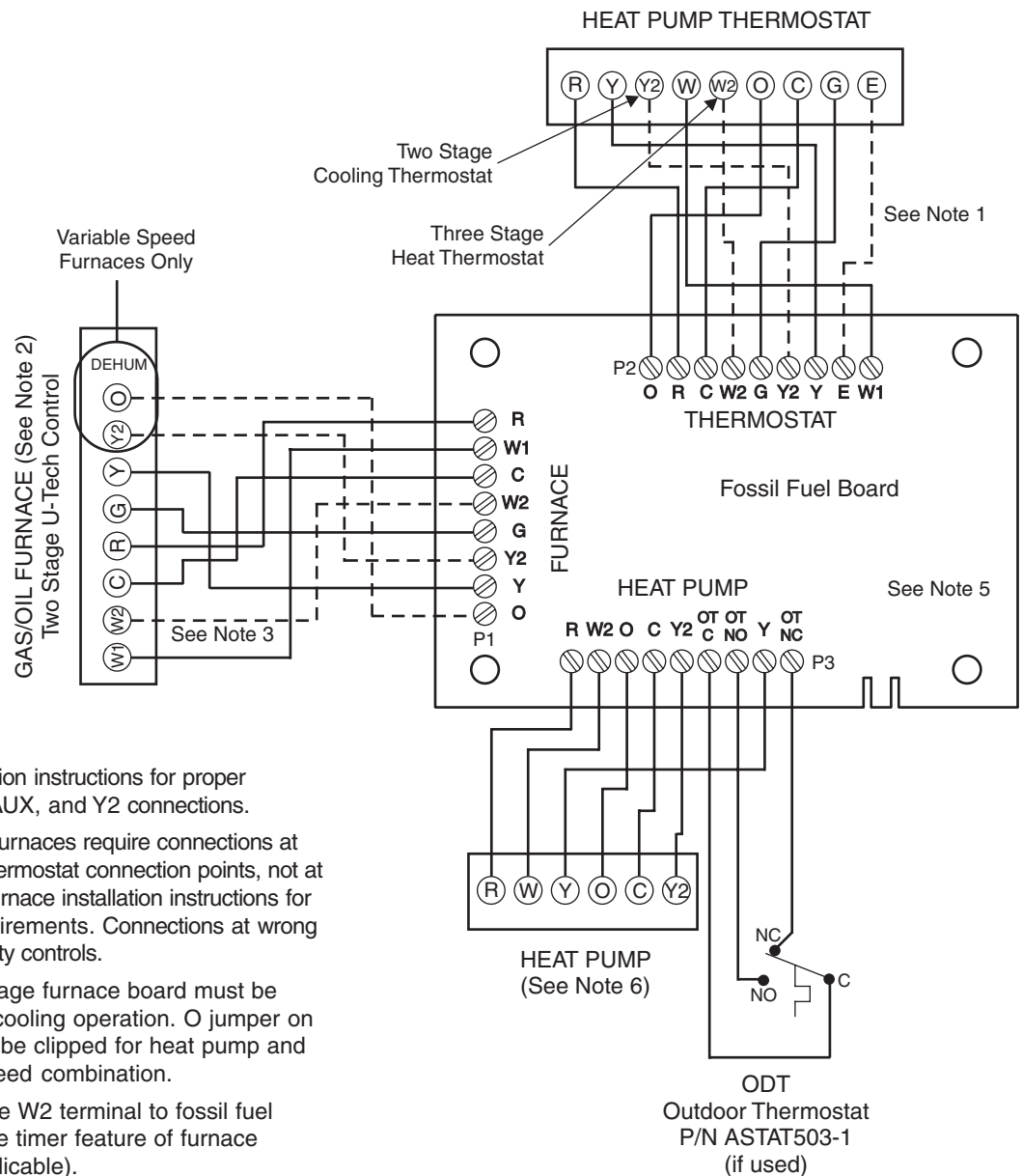
Minimum Thermostat Requirements:

Option 1

- Heat pump thermostat
- Two stage heat/single stage cooling
- Emergency heat function
- 2nd stage furnace controlled by the timer selection option on the furnace control board (if applicable)

Option 2

- Heat pump thermostat
- Three stage heat/single stage or two stage cooling
- Emergency heat function
- 2nd stage furnace controlled by 3rd stage heat call from thermostat. With this application, the 2nd stage timer selection option on the furnace control board must be set to the NONE position (if applicable).



NOTES

1. See thermostat installation instructions for proper emergency heat, W2, AUX, and Y2 connections.
2. **WARNING:** Certain oil furnaces require connections at pigtail wires, or other thermostat connection points, not at the circuit board. See furnace installation instructions for proper connection requirements. Connections at wrong points may bypass safety controls.
3. Y-Y2 jumper on two stage furnace board must be clipped for two stage cooling operation. O jumper on two stage board must be clipped for heat pump and two stage variable speed combination.
4. Do not connect furnace W2 terminal to fossil fuel board if using 2nd stage timer feature of furnace ignition control (if applicable).
5. Compressor prevented from restarting within 3 minutes of an off cycle or on power up (feature of fossil fuel board).
6. Heat pump defrost feature includes a 5-minute compressor off delay during which the compressor is prevented from restarting within 5 minutes of an off cycle.

Figure 3

Outdoor Thermostat Typical Wiring Connections

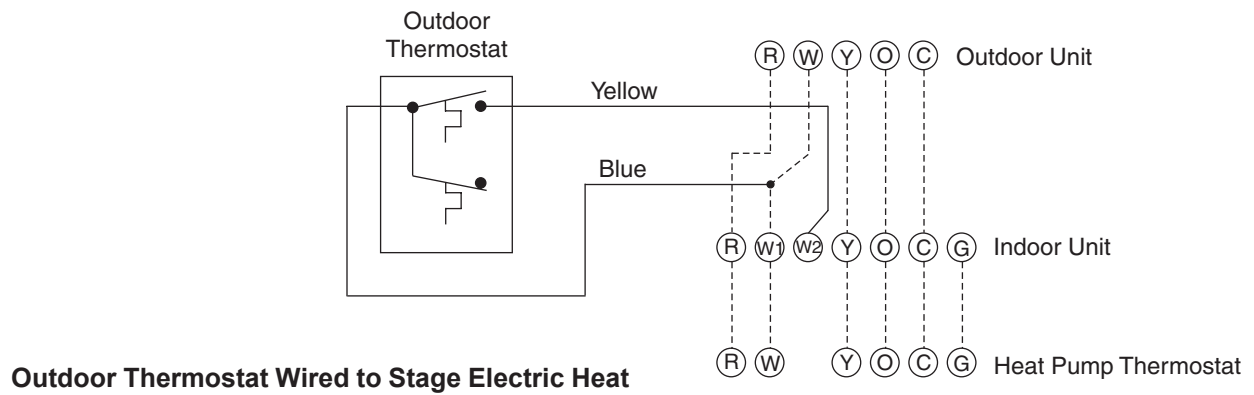
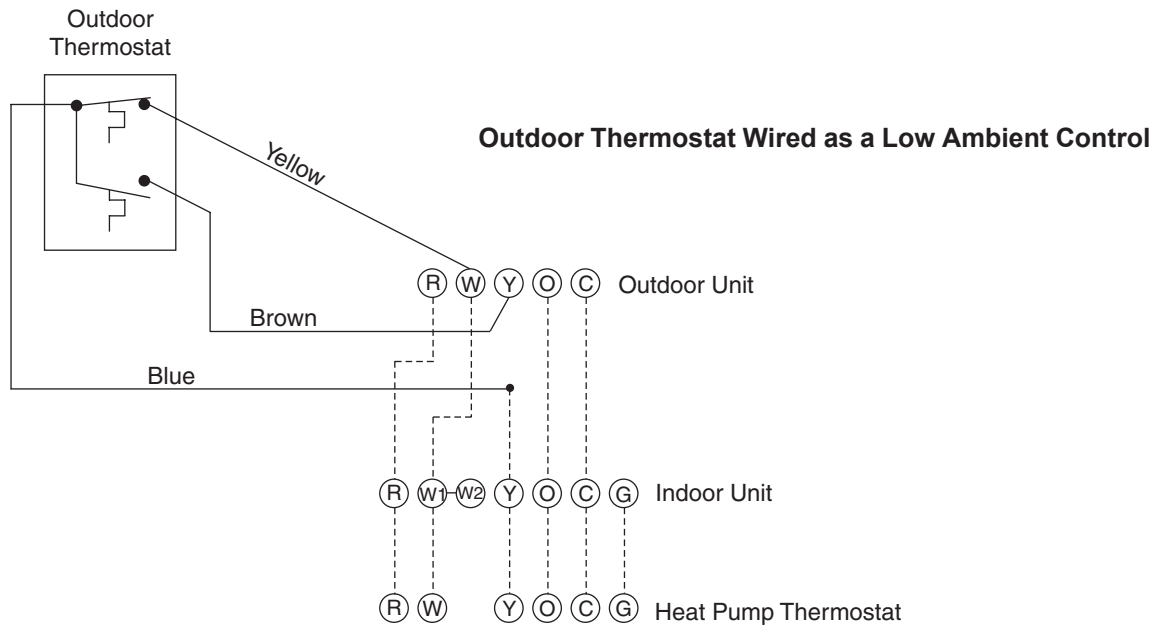


Figure 4

Emergency Heat

Emergency heat function overrides the heat pump function and the outdoor stat ODT function. The emergency heat function will energize the furnace as 1st stage heat.

Inputs (24VAC)

R + E on T-STAT terminal strip of fossil fuel board.

Outputs (24VAC)

W1 terminal of furnace terminal strip of fossil fuel board energizes furnace W or W1 for emergency heat call.