



installation and start-up instructions

PROGRAMMABLE THERMOSTAT

TSTAT

Cancels: New

II TSTAT-0-14
9-96

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

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

Payne's 7-day programmable thermostats are wall-mounted, low-voltage thermostats which maintain room temperature by controlling the operation of a heating and air conditioning system. Separate heating and cooling setpoints, plus auto changeover allow setback programming for maximum energy savings. All of the thermostats allow up to 4 time/temperature settings to be programmed per 24 hr period and store programs for 7 independent days. 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.

INSTALLATION CONSIDERATIONS

POWER

Note that all TSTAT models require no batteries and are not "power stealing". They do require 24VAC (R and C terminals) to be connected for proper operation. Thermostat will not operate without these 2 connections.

MODELS

There are 3 different models. The 9th and 10th letters of the part number indicate the model. These 2 letters appear on the package and on the circuit board. Be sure to have the proper thermostat for the intended application. Models are:

- AC - 1-stage cool, 1-stage heat - for AC systems only.
- HP - 1-stage cool, 2-stage heat - for either HP or AC with 2-stage heat.
- 2S - 2-stage cool, 2-stage heat - for 2-speed AC systems, or
2-stage cool, 3-stage heat - for 2-speed HP systems, or
1-stage cool, 4-stage heat - for 1-speed HP with special
3-stage electric heat.

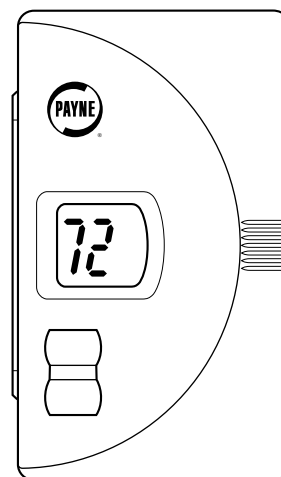
Use each only for its intended purpose. (See Table 1.)

INSTALLATION

I. THERMOSTAT LOCATION

Thermostat should be mounted:

- Approximately 5 ft (1.5m) from floor.



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

Fig. 1—Payne Programmable Thermostat

- Close to or in a frequently used room, preferably on an inside partitioning wall.
- On a section of wall without pipes or duct work.

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.

II. SET DIP SWITCHES

There are 4 small switches on the back of the circuit board which must be set by the installer. The ON position is indicated by small letters on the switch itself. Ignore numbers 1-4 on the switch. The switch designation (A through D) is on the circuit board next to the switch. To change a switch position use the corner of a small screwdriver to slide it between on and off. Make these selections BEFORE installing the thermostat—it is much easier.

SWITCH A - ZONING SELECT (ACTIVE ON ALL MODELS)

This switch selects or defeats the 4 cycles per hour limit and a 5-minute compressor timeguard. These timers **MUST** be enabled for normal operation and disabled for zoning applications. (In zoning applications the zone control center performs these timing functions.)

TO SET:

- OFF— for normal operation. This is the factory default.
- ON—for zoned installations ONLY.

TABLE 1—MODEL SELECTION AND WIRING DIAGRAM CHART

OUTDOOR UNIT	AIR CONDITIONER		HEAT PUMP	
	1 Speed	2 Speed	1 Speed	2 Speed
1-Stage Furnace	Model AC See Fig. 2	Model 2S See Fig. 8	Requires Interface Control or Dual Fuel Thermostat	Model 2S See Fig. 11
2-Stage Furnace	Model AC See Fig. 3	Model HP See Fig. 4	Requires Interface Control or Dual Fuel Thermostat	Model 2S See Fig. 12
Typical Fan Coil	Model AC See Fig. 5	Model HP See Fig. 6	Model HP See Fig. 7	Model 2S See Fig. 13
FK4C Fan Coil	Model AC See Fig. 15	Model HP See Fig. 16	Model 2S See Fig. 14	Model 2S See Fig. 18

**SWITCH B - SETBACK RECOVERY
(ACTIVE ON ALL MODELS)**

Selects between normal and smart recovery from setback. Normal recovery changes to the new setpoint at the programmed time. Smart recovery, which is active in heating mode only, starts earlier and adjusts the setpoint 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 - HP/AC SELECT
(ACTIVE ON HP AND 2S MODELS ONLY)**

Use to select between AC and HP installations. HP and 2S models have an extra relay to control the HP reversing valve. When a HP thermostat is placed in the AC mode, this extra relay is converted to a second stage heat output. This allows thermostat control of 2-stage furnaces or 2-stage strip heat with AC systems. (AC mode also uses W rather than Y for first-stage heat.)

TO SET:

OFF—for HP applications. Extra relay controls reversing valve. This is factory default.

ON—for AC applications. Extra output can be used for 2-stage heat.

**SWITCH D - STAGING SELECT
(ACTIVE ON 2S MODELS ONLY)**

This switch converts a 2-speed heat pump thermostat with 1 stage of auxiliary heat into a 1-speed heat pump thermostat with 3 stages of auxiliary heat for comfortable leaving air temperature. It requires selected heaters with 2:1 ratio element sizes plus an FK4 fan coil. Refer to FK4 fan coil literature for details.

TO SET:

OFF—for normal 2-speed operation. This is factory default.

ON—for special 3-stage heat with FK4 fan coil.

III. 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 Table 1, and Fig. 2 through 24.) 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. Turn ON power to unit.

On power up, display shows selected setup mode AC, HP, A2, H2, or HS for a few seconds depending on model and DIP switch settings.

IV. 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 made as part of the installation. A special procedure allows entry into the configuration mode. The thermostat will automatically exit this mode if no button is pressed for 10 seconds. While in configuration mode, 5 option choices can be made:

1. Fahrenheit or Celsius—Selection.
2. G (Fan) ON with any W (Heat)—Selection.
3. High ambient heat lockout (HP and 2S models only)—Selection and Value Adjustment.
4. Clean filter timer—Selection and Value Adjustment.
5. 'Anticipator'—Value Adjustment.

An explanation for each of these and how to enter the configuration mode follows.

TO ENTER THE CONFIGURATION MODE:

Press and hold FAN button for approximately 10 sec until room temperature disappears and display reads "--". You are now in the configuration mode.

NOTE: If no button is pressed for 10 sec, thermostat will exit mode and resume normal operation. To re-enter configuration mode, FAN button must be pressed and held again.

WHILE IN CONFIGURATION MODE, THESE SELECTIONS ARE AVAILABLE:

FAHRENHEIT OR CELSIUS—SELECTION

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

TO SELECT:

1. Enter configuration mode.
2. Press CHANGE DAY button to display F or C.
3. Use either up or down button to change between F and C.

G (FAN) ON WITH ANY W (HEAT)—SELECTION

Select whether the G (fan) output is to be OFF or ON when a W (furnace or strip heat) output is ON. Factory default is OFF.

TO SELECT:

1. Enter configuration mode.
2. Press HOLD button to display OF (off) or ON (on).
3. Use either up or down button to change between OF (off) and ON (on).

HIGH AMBIENT ELECTRIC HEAT LOCKOUT—SELECTION AND ADJUSTMENT

Present in HP and 2S models only when configured as a heat pump. Outdoor temperature sensor must be attached. Selection allows lockout of any W (Electric Heat) when outdoor temperature is above a selected value. Temperatures of 15 to 55°F (or equivalent values in °C) can be selected. Feature can be enabled or disabled. EMERGENCY HEAT mode disables. Factory default is OFF (disabled).

TO SELECT:

1. Enter configuration mode.
2. Press COPY PREVIOUS DAY button.
3. Use up and down buttons to move between OF (off), 15, 20, 25, 30, 35, 40, 45, 50, or 55.

CLEAN FILTER TIMER—SELECTION AND ADJUSTMENT

Select hours of blower operation before CLEAN FILTER icon is displayed. Timer accumulates total blower hours. Selection can range from 400 to 3600 hours or can be turned off. Factory default is 2 (800 hours). Recommended selections are: disposable filter—400 to 800 hours, media filter—1200 to 1600 hours, or electronic air cleaner—1600 to 2400 hours of blower operation.

TO SELECT:

1. Enter configuration mode.
2. Press RESET FILTER button to display OF (off) or digits 1 through 9.
3. Use up and down buttons to move between selections. Total hours equals 400 times the displayed number. OF (off) turns feature off.
4. During the selection process, the CLEAN FILTER icon will remain on, even if OF (off) is chosen.

'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 sensitivity and increase cycle rate. However, a limiting feature will not allow more than 4 equipment cycles per hour, regardless of setting. Values can range from 1 to 9. Default is 3. This default selection 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 no need to measure, know, or compensate for current. There is also no 'droop' with this thermostat, regardless of 'anticipator' setting.

This adjustment controls only sensitivity and cycle rate—up to the maximum of 4 cycles per hour.

TO ADJUST:

1. Enter configuration mode.
2. Press MODE button to display value between 1 and 9. Factory default is 3.
3. Use up and down buttons to move between values.

V. HOLD, FAN, MODE BUTTON OPERATION

1. Pressing HOLD button disables the time/temperature schedule and "holds" the current desired temperature. When active, the HOLD annunciator is turned on. A second press of the HOLD button releases the hold feature and turns off the annunciator.
2. Pressing the FAN button alternately selects AUTO or ON fan operation. Fan annunciator displays the current selection.
3. Pressing the MODE button will select OFF, HEAT, COOL, and AUTO. Heat pumps also have an EHEAT mode. Mode annunciator displays the current selection.
4. Operation of other buttons is explained in the Homeowner's Guide.

VI. CHECK THERMOSTAT OPERATION

A. Select Hold

1. Press HOLD button to select "hold" feature. This will prevent the setpoint from changing until the desired time/temperature schedule is entered.

B. Fan Operation

1. Press FAN button, starting fan operation. Fan annunciator switches from AUTO to ON.
2. Press FAN button, stopping fan operation. Fan annunciator switches from ON to AUTO.

C. Heating Operation

1. Press MODE button until HEAT is displayed under the mode annunciator.
2. Press up button until display reads 10 degrees above room temperature. Heating system should begin to operate within 5 minutes.

D. Cooling Operation

1. Press MODE button until COOL is displayed under the mode annunciator.
2. Press down button until display reads 10 degrees below room temperature. Cooling system should begin to operate within 5 minutes.

VII. SELECT DESIRED OPERATION

1. Press FAN button to select AUTO or ON position. Fan annunciator displays current selection.
2. Press MODE button to select OFF, HEAT, COOL, AUTO. Heat pumps will also have an EHEAT mode. Mode annunciator displays current selection.
3. Press up or down buttons to select desired temperature.
4. If daily cycles are to be programmed now, refer to Homeowner's Guide for programming instructions.
5. If thermostat has not been programmed, press HOLD button to retain desired temperature setting.

NOTE: If HOLD button is not left ON, temperature setting will be lost until time/temperature program is entered.

VIII. CHECKLIST

- 1. Put away tools and instruments, and clean up debris.
- 2. Review Homeowner’s Guide with owner.
- 3. Leave literature packet with owner.

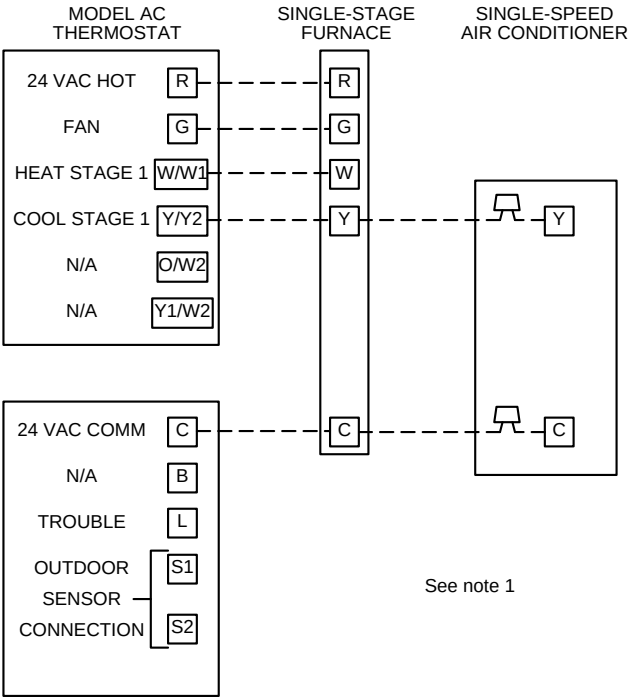
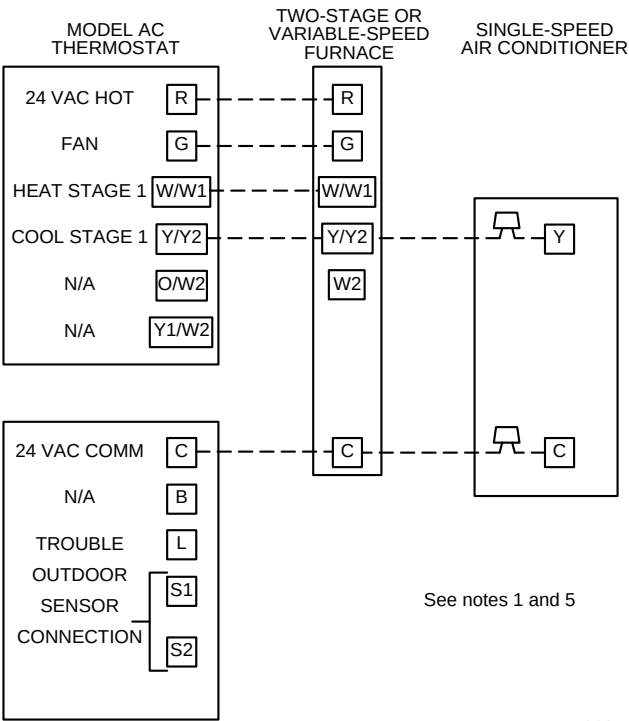


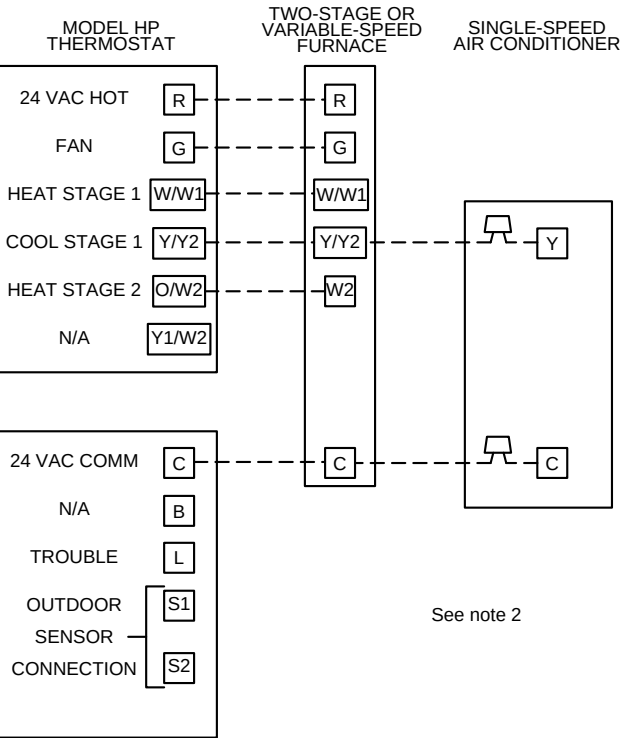
Fig. 2—Single-Speed Air Conditioner with Single-Stage Furnace—Model AC Thermostat

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Fig. 3—Single-Speed Air Conditioner with 2-Stage or Variable-Speed Furnace—Model AC Thermostat



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Fig. 4—Single-Speed Air Conditioner with 2-Stage or Variable-Speed Furnace—Model HP Thermostat

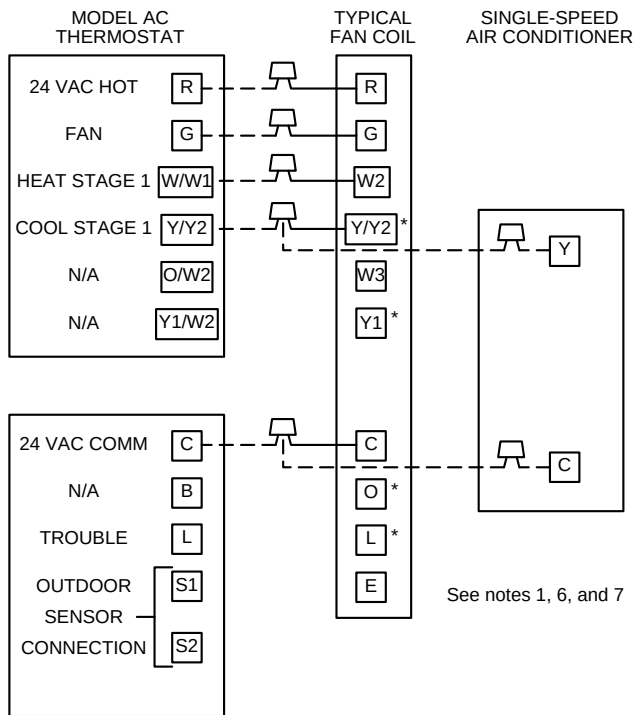


Fig. 5—Single-Speed Air Conditioner with Typical Fan Coil—Model AC Thermostat (Single-Stage Heat Control)

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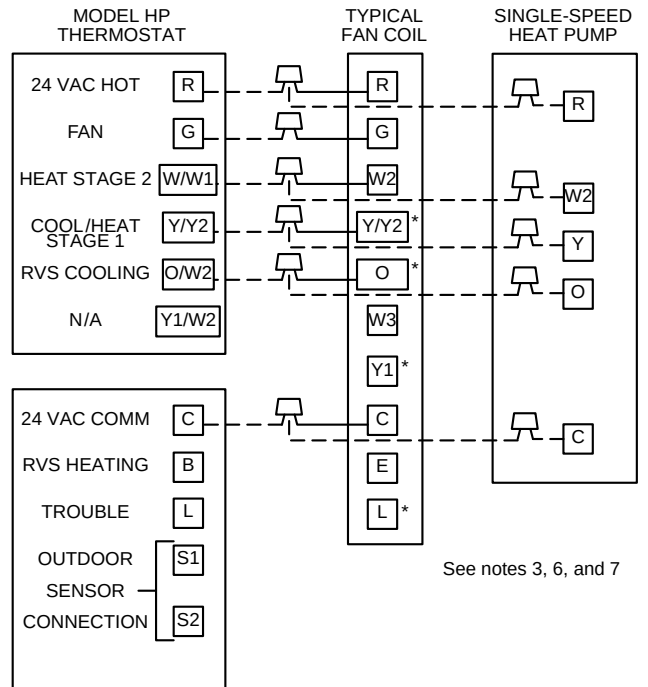


Fig. 7—Single-Speed Heat Pump with Typical Fan Coil—Model HP Thermostat

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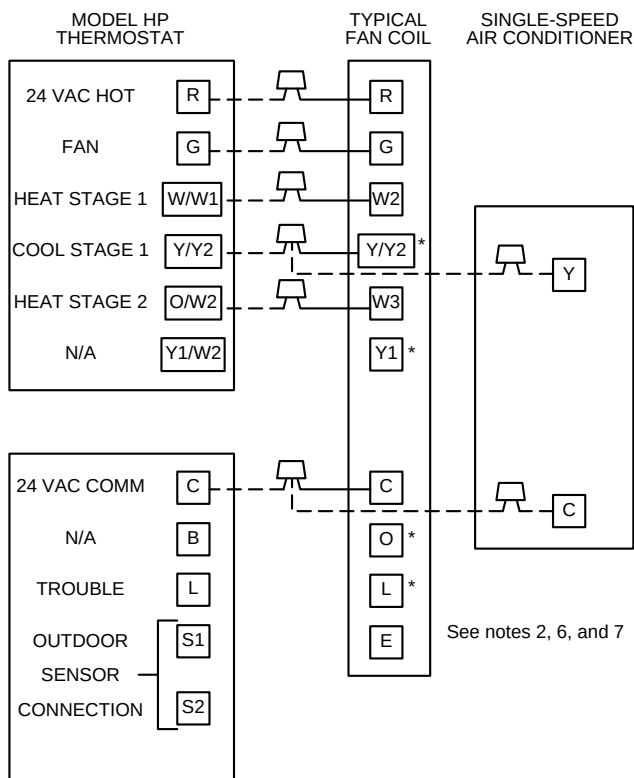


Fig. 6—Single-Speed Air Conditioner with Typical Fan Coil—Model HP Thermostat (Dual-Stage Heat Control)

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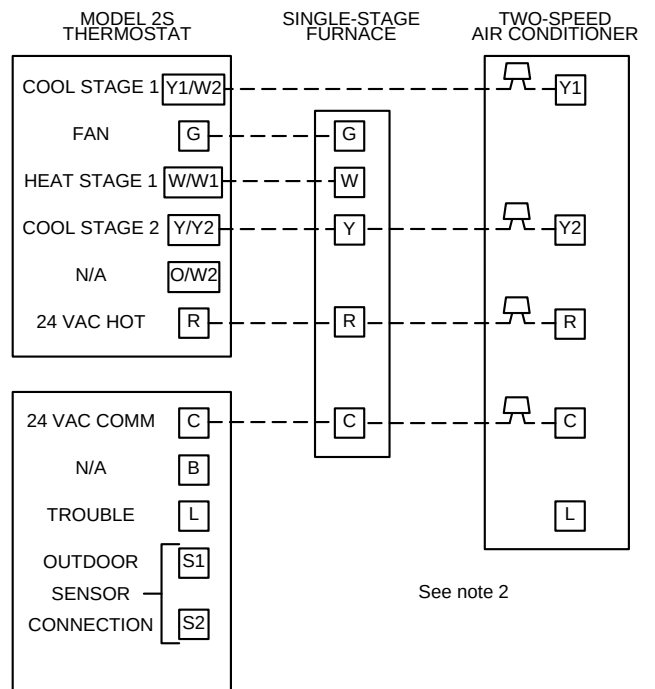


Fig. 8—Two-Speed Air Conditioner with Single-Stage Furnace—Model 2S Thermostat

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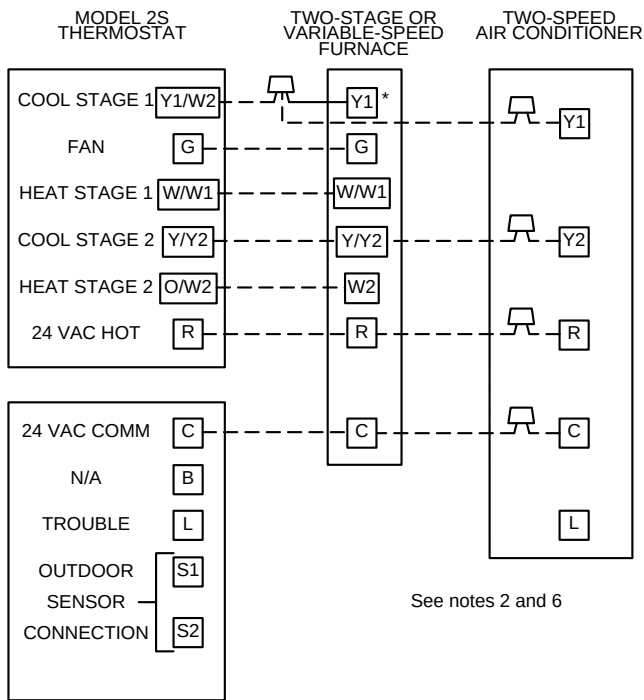


Fig. 9—Two-Speed Air Conditioner with 2-Stage or Variable-Speed Furnace—Model 2S Thermostat

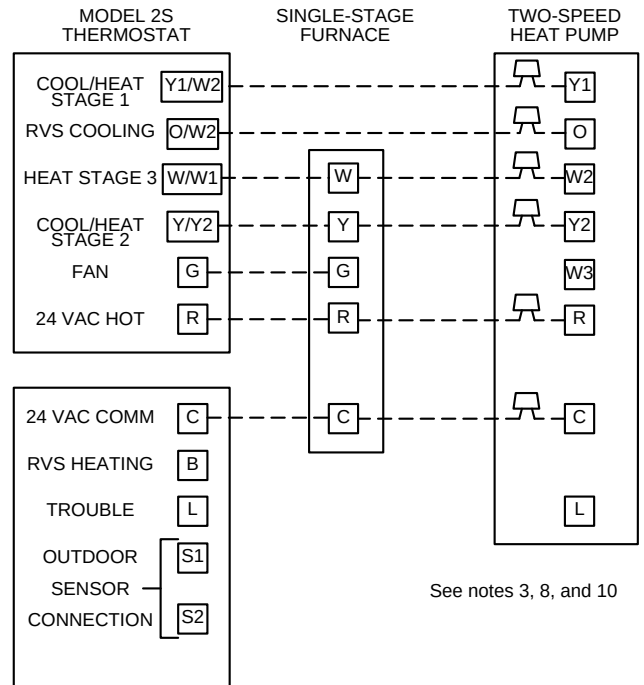


Fig. 11—Two-Speed Heat Pump with Single-Stage Furnace—Model 2S Thermostat

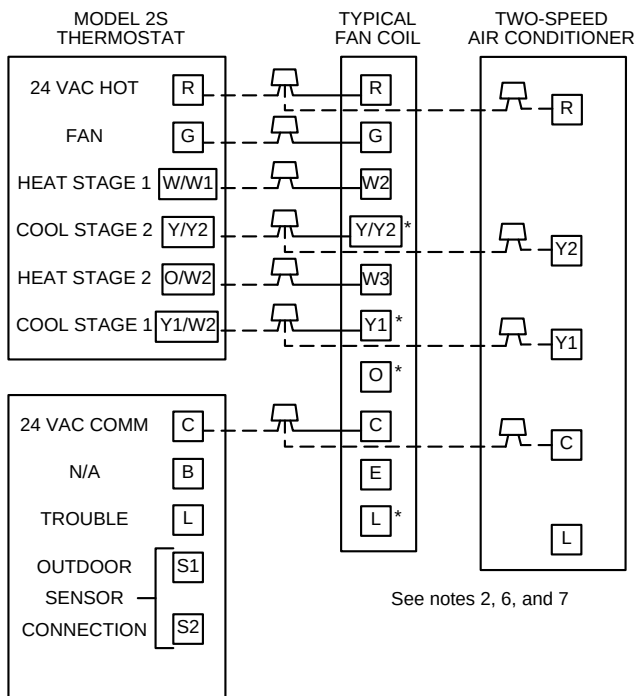


Fig. 10—Two-Speed Air Conditioner with Typical Fan Coil—Model 2S Thermostat

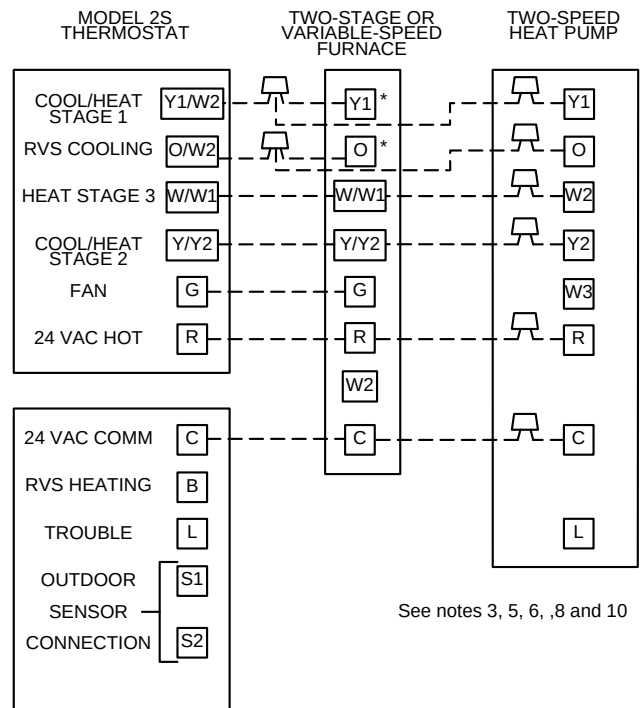


Fig. 12—Two-Speed Heat Pump with 2-Stage or Variable-Speed Furnace—Model 2S Thermostat

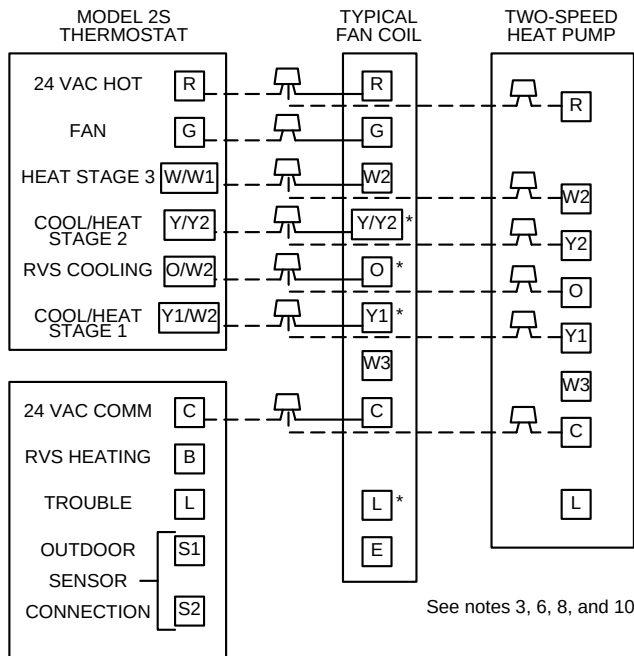


**Fig. 13—Two-Speed Heat Pump
with Typical Fan Coil—Model 2S Thermostat**

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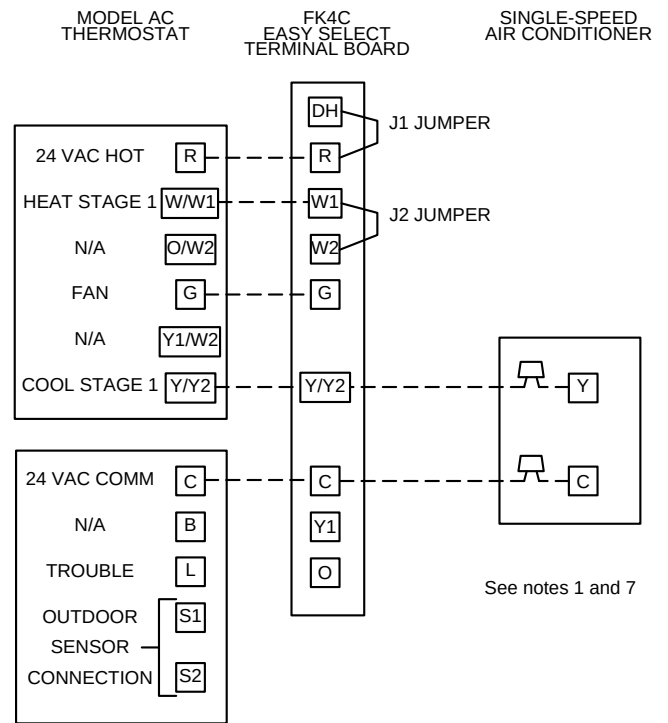


**Fig. 15—Single-Speed Air Conditioner
with FK4C Fan Coil—Model AC Thermostat**

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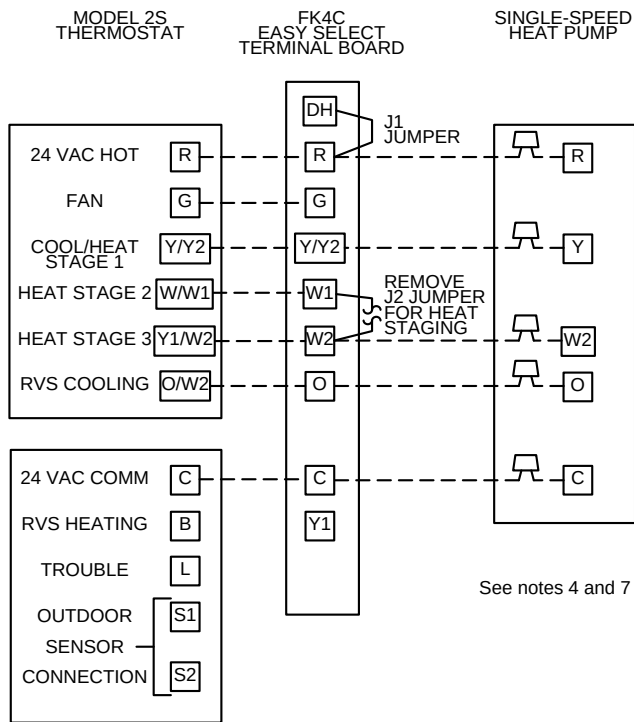


**Fig. 14—Single-Speed Heat Pump
with FK4C Fan Coil and Special 3-Stage Electric Heat
—Model 2S Thermostat**

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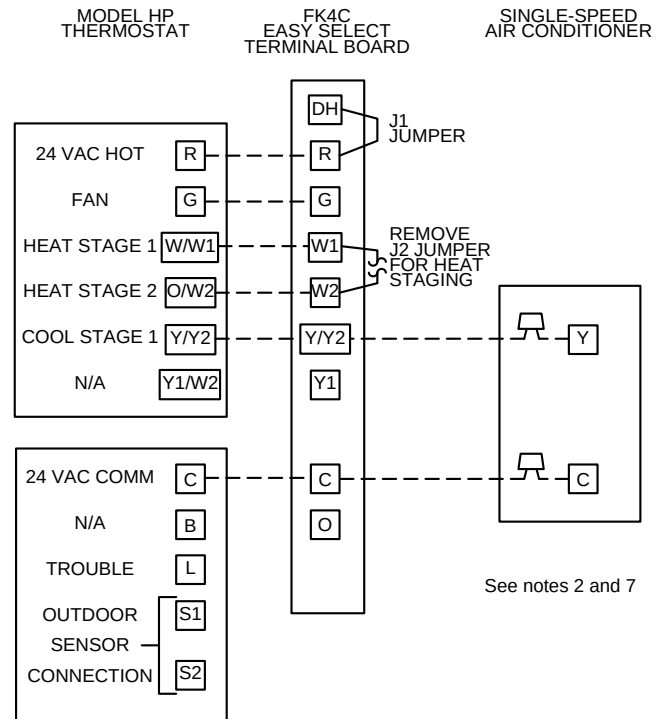


**Fig. 16—Single-Speed Air Conditioner
with FK4C Fan Coil—Model HP Thermostat**

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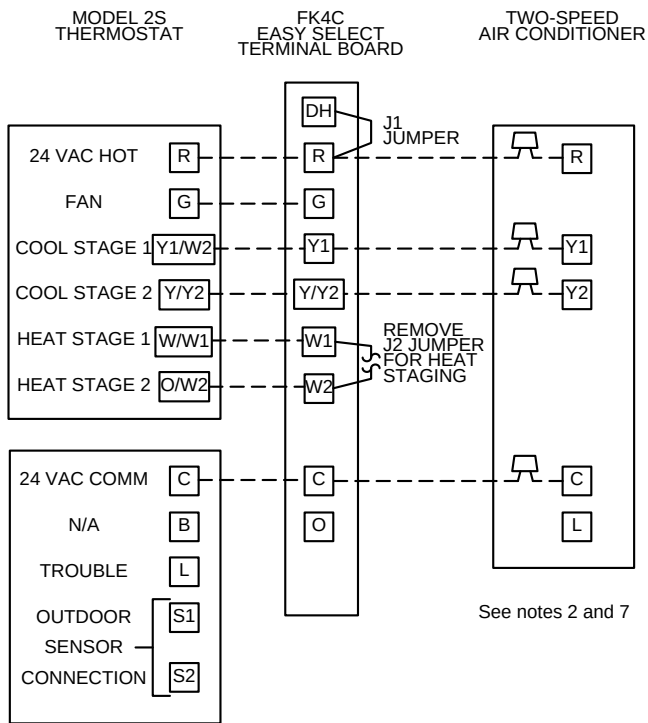


Fig. 17—Two-Speed Air Conditioner with FK4C Fan Coil—Model 2S Thermostat

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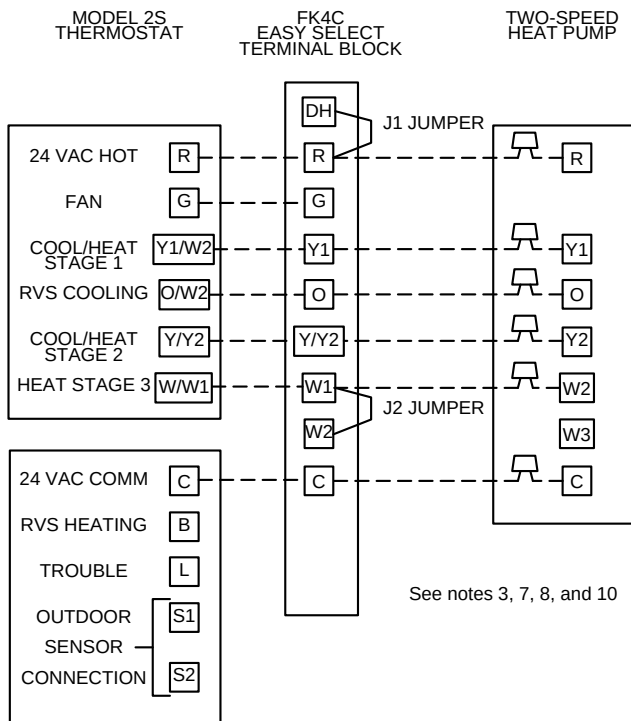
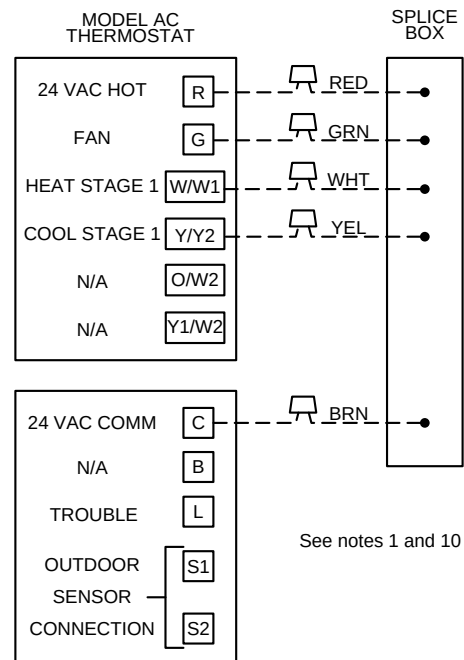


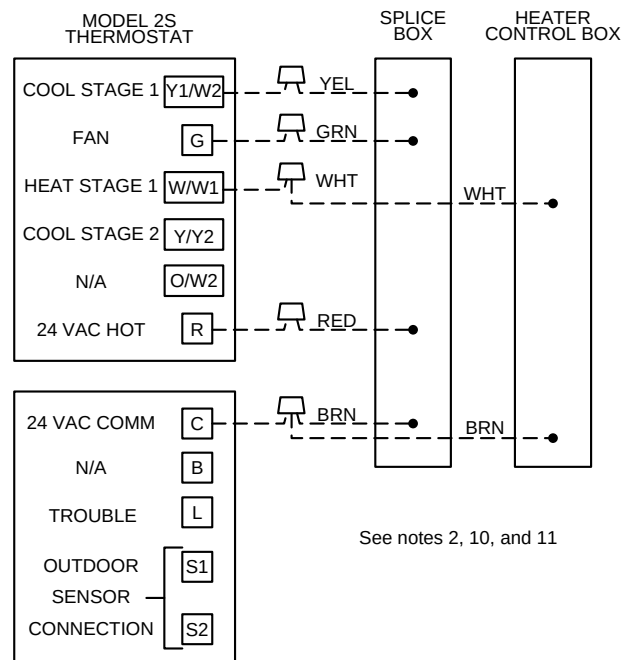
Fig. 18—Two-Speed Heat Pump with FK4C Fan Coil—Model 2S Thermostat

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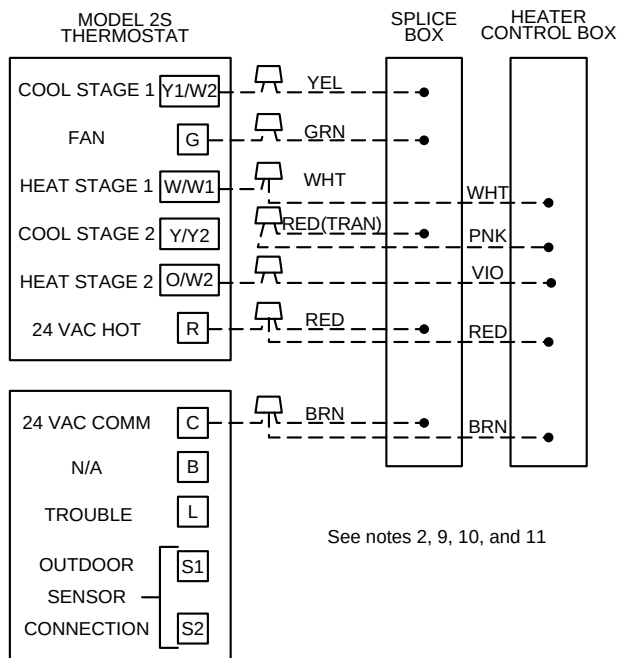
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Fig. 19—Single-Speed Packaged Air Conditioner with Single-Stage Gas Furnace (588A, 589A)



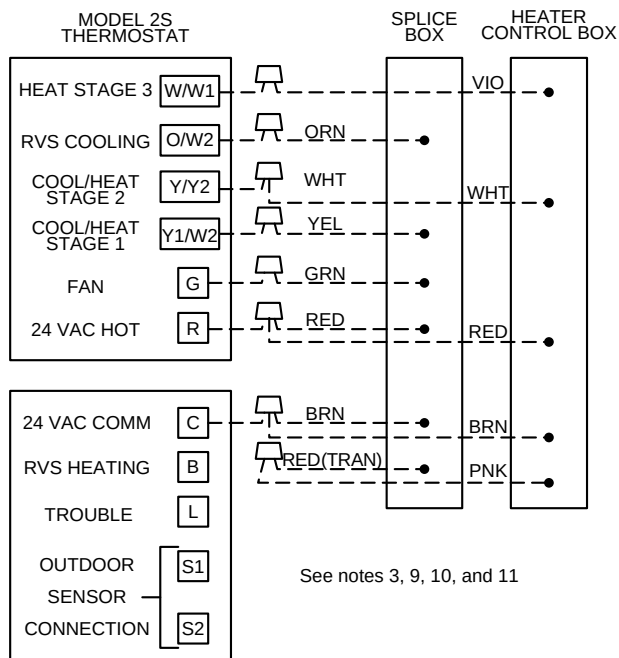
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Fig. 20—Single-Speed Packaged Air Conditioner with Single-Stage Electric Heat (555A, 557A, 764A)



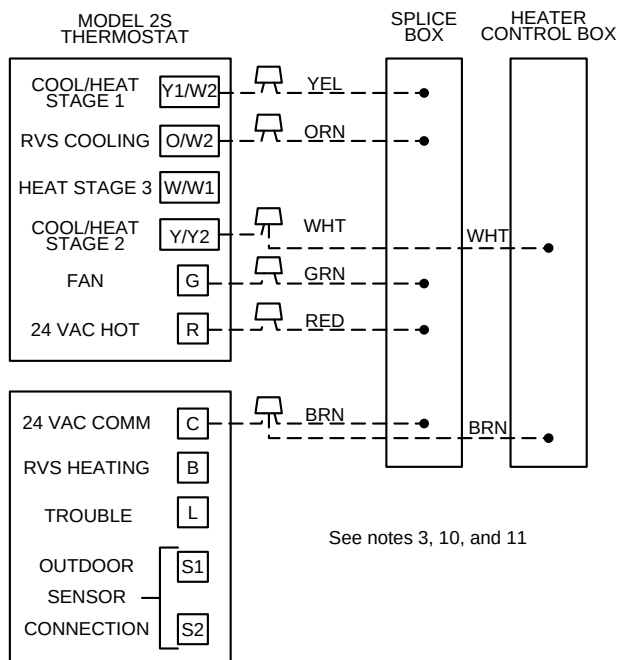
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Fig. 21—Single-Speed Packaged Air Conditioner with 2-Stage Electric Heat (555A, 557A, 764A)



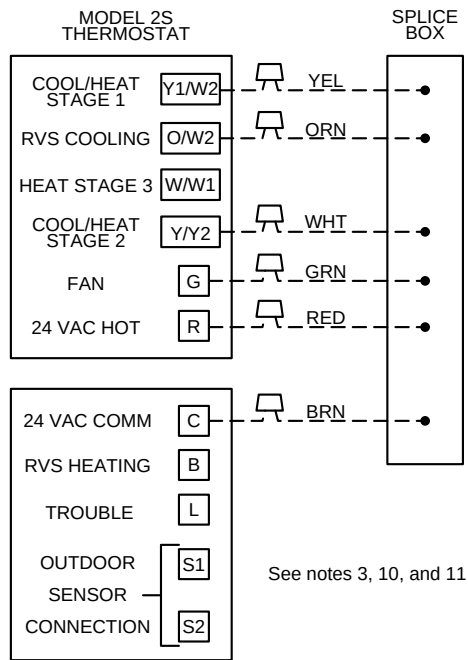
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Fig. 23—Single-Speed Packaged Heat Pump with 2-Stage Electric Heat (655A, 657A, 864A)



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Fig. 22—Single-Speed Packaged Heat Pump with Single-Stage Electric Heat (655A, 657A, 864A)



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Fig. 24—Single-Speed Packaged Heat Pump with Single-Stage Gas Furnace (658A)

WIRING DIAGRAM NOTES

1. Model AC has no connection to its O/W2 or Y1/W2 outputs. Switch C does nothing. It can only control 1-stage cool and 1-stage heat.
2. Model HP or 2S, when used in air conditioner installations (Switch C ON), uses O/W2 to control second-stage heat. Refer to indoor unit Installation Instructions for proper setup.
3. Model HP or 2S, when used in heat pump installations (Switch C OFF), uses O/W2 to control the reversing valve.
4. Special application: Model 2S thermostat with switch C OFF and switch D ON uses single-speed heat pump, FK4 fan coil with selected 2:1 size ratio heaters. Provides 3 stages of auxiliary heat for even heating comfort via W/W1 and Y1/W2. Refer to FK4 Installation Instructions.
5. Furnace second-stage is controlled by its internal algorithm. Refer to furnace instructions for proper setup.
6. Terminals marked with * may not be present on equipment.
7. Refer to fan coil Installation Instructions for proper wiring.
8. Select the "ZONE" position on the 2-speed heat pump control board.
9. Omit red and pink wires from diagram when wiring a 764A or an 864A with 2-stage heaters.
10. Refer to outdoor equipment Installation Instructions for proper set up.
11. Program thermostat to bring on G (fan) with any W (heat) selection. See Step 4, Procedure 2, under set thermostat configuration.

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 mode button and the INCREASE TEMPERATURE 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 mode button and the INCREASE TEMPERATURE 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).

TWO-MINUTE MINIMUM ON TIME

In normal operation, when a stage turns on, it will not turn off for a minimum of 2 minutes.

HEAT/COOL SETPOINTS (DESIRED TEMPERATURES)

A minimum difference of 3 degrees is enforced between heating and cooling desired temperatures. 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 for 20 minutes. If the setpoint is changed, the 20 minute requirement is deleted.

EMERGENCY HEAT MODE

When thermostat is configured as a heat pump and 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 segments of the display are turned on for a few seconds. Following this, the temperature display indicates the model/configuration via the following 2 digit code:

AC—1-speed air conditioner, HP—1-speed heat pump, A2—2-speed air conditioner, H2—2-speed heat pump, HS—1-speed heat pump with 3-stage auxiliary heat.

ERROR CODES

E1 - If the thermostat cannot properly read room temperature, the display will indicate E1 and all outputs (except the fan if on) will turn off. This is to prevent operation of the equipment if the thermostat has failed.

E2 - If the AC line voltage drops below a minimum (brownout) level, all outputs are turned off and the display indicates E2. This condition will remain for 15 seconds after proper line voltage is restored. If the AC line voltage disappears completely, the display will immediately go blank.

ENERGY SAVINGS ICON

This icon is displayed under these conditions: 1-speed HP heating without auxiliary heat, 2-speed HP on LO or HI speed heating without auxiliary heat, 2-speed HP or AC on LO speed cooling.

SMART RECOVERY

With Smart Recovery selected, the transition out of a heating setback begins a fixed time period before the selected recovery time and gradually adjusts room temperature so that the desired temperature will be achieved at the selected recovery time. The fixed time period is 1 hr for furnaces and 1.5 hrs for heat pumps.

THERMOSTAT TROUBLESHOOTING

SYMPTOM	WHAT TO CHECK
No LCD on temperature display	Check for 24 VAC between R and C at terminal connections. Both R and C must be connected for proper operation.
"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.
"E1" on temperature display	Temperature sensor reading out of range. Check sensor for damage. If recycling power does not clear display, thermostat should be replaced.
"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.
"Trouble" on temperature display	This will indicate a problem with system equipment. 24 VAC is present on the "L" terminal connection.
"--" on temperature display	If the outdoor sensor is open, not connected, or shorted "--" will be displayed.
Cooling will not come on	Select COOL mode. Decrease cooling setpoint to 10 degrees below room temperature. Simultaneously press FAN and INCREASE TEMPERATURE 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 setpoint to 10 degrees above room temperature. Simultaneously press FAN and INCREASE TEMPERATURE buttons to defeat timers. Check for 24 VAC at Y/Y2 (with HP) or W/W1 (with AC) terminal. If present, thermostat is OK and problem is with equipment or wiring. If not present, replace thermostat.

SERVICE TRAINING

Packaged Service Training programs are an excellent way to increase your knowledge of the equipment discussed in this manual, including:

- Unit Familiarization
- Maintenance
- Installation Overview
- Operating Sequence

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