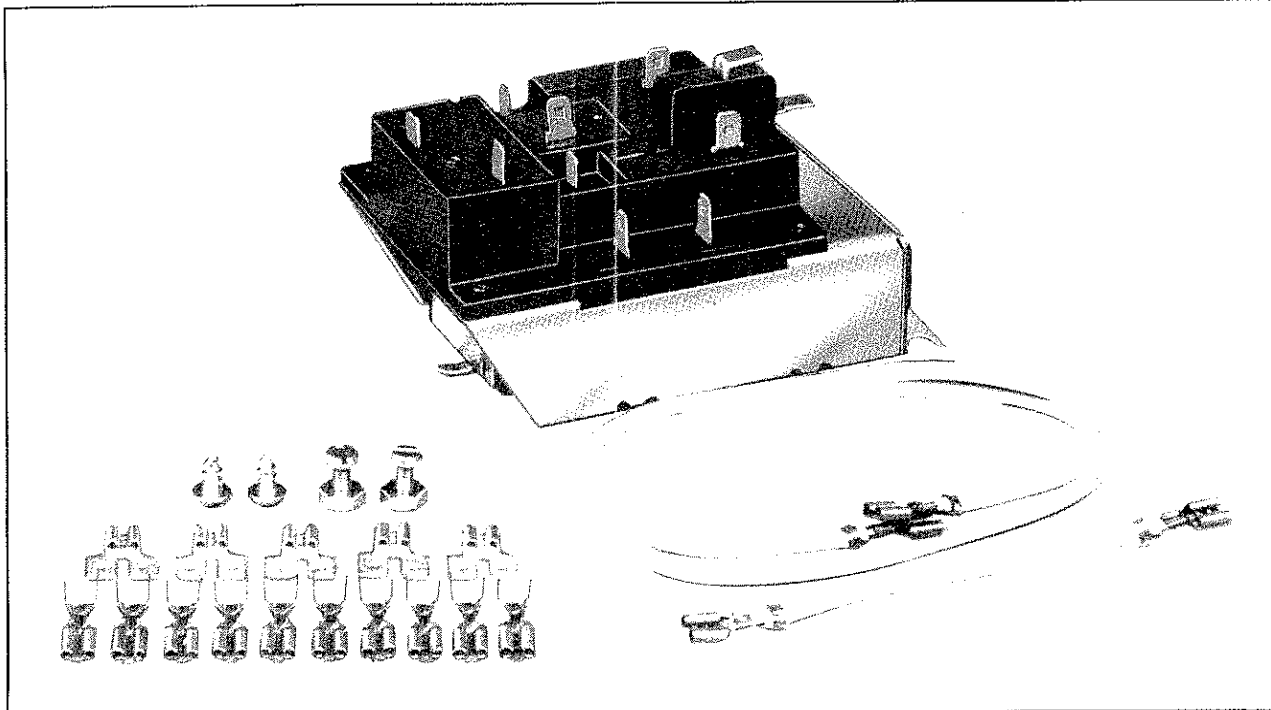


ELECTRIC FURNACE SEQUENCER



THE R8330D IS A RECONTROL REPLACEMENT FOR MOST SINGLE OR MULTIPLE ELEMENT ELECTRIC FURNACE SEQUENCERS. EACH R8330D CAN SEQUENCE A FAN AND UP TO 3 HEATING ELEMENTS. AS MANY AS 3 SEQUENCERS MAY BE CONNECTED THROUGH THE AUXILIARY SWITCH TO CONTROL UP TO 9 HEATING ELEMENTS.

THE SEQUENCER CAN BE USED ON MOST FURNACES USING LINE VOLTAGE LIMITS FOR 240 VOLT AND 240/120 VOLT ISOLATED FAN AND 240 VOLT COMBINATION RATED WIRING SYSTEMS. IT MAY ALSO BE USED IN PILOT DUTY LIMIT SYSTEMS WHEN WIRED AS SHOWN IN FIG. 15 OR 16.

- Quick-connect terminals for easy wiring.
- Sequencer is ambient compensated for use in temperatures from minus 20 to plus 162 F [minus 29 to plus 72 C].

- Meets or exceeds all industry standards (Underwriters Laboratories Inc., C.S.A. NEMA, EEI-NEMA).

- Mounts in any position.

- Thermostat current draw is constant (0.4 amp).

- Field-proven quiet, reliable operation.

- Single unit control of up to 3 heating elements and fan; reduces control space requirements and simplifies wiring in furnace.

- 2 or 3 sequencers may be connected in series using the auxiliary switch(es). Two sequencers will control from 4 to 6 elements, 3 sequencers will control from 7 to 9 heating elements.

- Wiring accessories included to make installation quick and efficient.

FEATURES

Up to four relays of most other models can be replaced with a single Honeywell R8330D. It's really four relays in one plus an option for tie-in with a second and a third R8330D sequencer. The Honeywell TRADELINE Electric Furnace Sequencer is designed to sequence three elements plus fan control. In addition, it includes an auxiliary switch for use on jobs with more than three elements. This switch allows hookup to a second and a third R8330D sequencer to control additional elements. Up to 9 elements can be controlled in this fashion.

Simplify your replacement service stock—there's no need to carry an endless supply of models to assure like-for-like replacement. The R8330D will allow you to replace most older and existing controls by Camstat, Robertshaw, Texas Instruments, Therm-O-Disc, White-Rodgers, RBM, and Honeywell. See APPLICATION section for model number listings.

Everything you need is included. This Tradeline R8330D package includes wiring accessories (21138J Envelope Assembly) to assure quick, easy replacement. These extra parts include mounting screws, nuts and bolts for side of furnace mounting, double male terminal adapters, jumper for the fan speed changeover relay, new quick-connect terminals, and a short jumper wire. Extra parts that may not be necessary on an installation can still be useful as additions to your regular tool kit.

The Honeywell R8330D Electric Heat Sequencer meets or surpasses all current industry standards: Underwriters Laboratories Inc., C.S.A., EEI-NEMA. Updating older installations with controls that meet current industry standards for safety and performance is important because—

- Meeting Underwriters Laboratories Inc. standards assures excellent mechanical reliability, electrical safety, and switch life expectancy. (Underwriters Laboratories Inc. standards do not include comfort performance criteria.)
- Meeting the EEI-NEMA standard means the R8330 sequences elements and fan ON and OFF with 10 seconds minimum between stages at 106 percent of rated voltage at 125 F [52 C].

It also assures you that it will perform its switching function under the most severe operating conditions such as minus 20 F [minus 29 C] and only 85 percent of rated voltage and up to 162 F [72 C] and 112 percent of rated voltage. Consistent sequential timing of fan and elements protects the elements from overheating and burning out.

● Compliance with stringent C.S.A. standards includes these additional tests not required under any of the other standards:

1. 100,000 cycle life test at rated load and at rated voltage.

2. Thermal relays and sequencers shall not operate to actuate the load or auxiliary contacts or permit the contacts to remain actuated *without the control circuit being energized* at any temperature from minus 40 F [minus 40 C] to plus 175 F [plus 79 C] or 50 F [28 C] above any such higher recommended ambient temperature as may be claimed by the manufacturer. The time taken for the contacts to open shall not exceed 5 minutes after the R8330 has been "ON" for 15 minutes at the extreme temperatures.

3. The load and auxiliary contacts of a relay or sequencer shall operate within 5 minutes after energizing the circuit at 85 percent of rated voltage with the device maintained at 32 F [0 C] or at such lower ambient temperature as may be claimed by the manufacturer (minus 20 F [minus 29 C] for the Tradeline R8330D).

Convenience features make replacement easier with consistent results. All R8330D's have a constant current draw of .4 amps for use with conventional single or multistage thermostats. The same thermostat heater setting for all applications eliminates confusion and nuisance problems.

The ambient temperature compensation and constant thermostat current draw found in the R8330D means consistently correct sequencing of both fan and elements regardless of the mounting position and location. The result is room temperature swings of less than 2 F [1 C] for steady, satisfying home comfort for the customer.

APPLICATION

The R8330D provides a recontrol replacement for most single or multiple element electric furnace sequencers. Each R8330D sequencer switches a fan and up to 3 heating elements. Two or 3 sequencers may be connected in series using the auxiliary switch(es). Two sequencers will control from 4 to 6 heating elements, 3 sequencers will control from 7 to 9 heating elements.

The R8330D Electric Furnace Sequencer can be used for straight 240 volt isolated fan, combined 240 and 120 volt isolated fan, and 240 volt combination rated furnace system circuits. It may also be used in pilot duty limit systems when wired as shown in Figs. 15 and 16. Timing is 10 seconds minimum between stages. All stages of a single control sequence will come on within 2 minutes and go off within 4 minutes at nominal voltage and ambient temperature. The sequencer may be mounted in any position in the furnace. For installation dimensions, see Fig. 1.

ELECTRICAL RATINGS: LOAD CONTACT RATING

VOLTS AC	CONTACT RATINGS (3-4, 5-6, AND 7-8)		COMBINED RESISTIVE AND INDUCTIVE CONTACT RATINGS (3-4 ONLY)			
	RESISTIVE		RESISTIVE		INDUCTIVE	
	AMPS	KW	AMPS	KW	AFL	ALR
208	25.0	5.2	20.8	4.3	4.2	10.0
240	25.0	6.0	23.0	5.5	7.0	42.0
277	21.7	6.0	18.0	5.0	3.6	8.6

FAN CONTACTS (F1, F2)

VOLTS AC	INDUCTIVE AMPS	
	FULL LOAD	LOCKED ROTOR
120 ^a	7.2	43.2
120, 208, 240 ^b	6.9	41.4
277	4.9	29.4

^a1/3 hp.

^b3/4 hp.

Pilot Duty Rating—62.5 VA at 24V ac.

AUXILIARY SWITCH: 3.6 amps full load; 21.6 amps locked rotor at 240V ac; 5 amps resistive at 24, 120, 208, and 240V ac; 35 VA pilot duty at 24V ac.

CONTROL VOLTAGE: 24V ac; 0.40 amp.

AMBIENT TEMPERATURE: Minus 20 F to plus 162 F [minus 29 to plus 72 C].

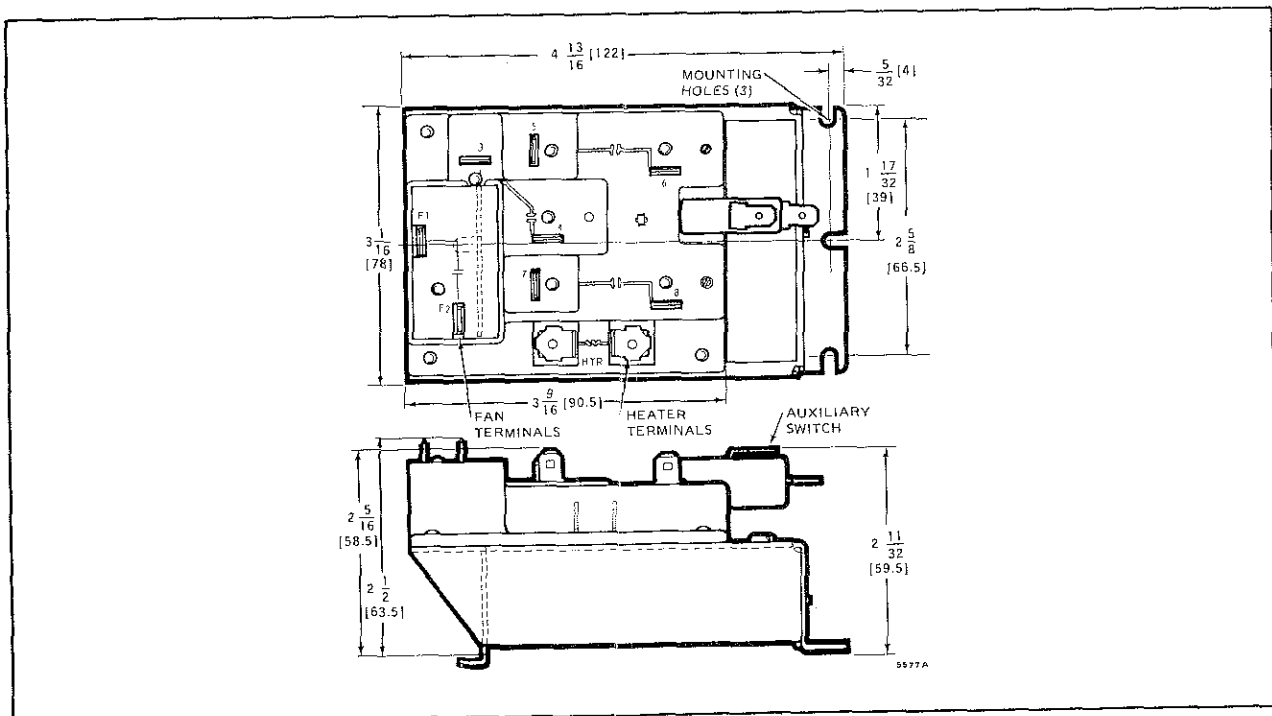


FIG. 1—R8330 DIMENSIONS IN INCHES [MILLIMETERS SHOWN IN BRACKETS].

RECONTROL REPLACEMENT FOR APPLIANCES WITH LINE VOLTAGE LIMITS

REPLACEMENT FOR:					
<u>CAMSTAT</u>	<u>HONEYWELL</u>		<u>WHITE-RODGERS</u>		<u>THERM-O-DISC</u>
S106	R4154A	R8330B	24A11	24A51	1151
S206	R4154B	R8330C	24A12	24A52	1151A
S306	R4154C	R8330D	24A14	24A53	1152
S406	R4154D	R8330E	24A20	24A54	1152A
14-100	R8154A	R8330F	24A21	24A55	
14-200	R8154B	R8330G	24A22	24A56	
14-300	R8154C	R8330H			
14-400	R8154D	R8330J			
	R8206A	R8330K			<u>TEXAS INSTRUMENTS</u>
	R8206B	W879A			60000A
	R8206C	W879B			60000E
	R8330A	W879C	<u>ROBERTSHAW</u>		60200A
<u>RBM</u>		W879D	TDS-1	TDS-2-21	60700A
189			TDS-2	TDS-2-25	60704A

RECONTROL REPLACEMENT FOR APPLIANCES WITH PILOT DUTY LIMIT (See Figs. 15 and 16)

FOR REPLACEMENT OF:	USE
<u>HONEYWELL</u>	
R4154A	2-R8330D, plus 1-R8214G, plus 1-AT72D
R4154B	1-R8330D, plus 1-R8212G, plus 1-AT72D
R4154C	1-R8330D, plus 1-R8212G, plus 1-AT72D
R4154D	1-R8330D, plus 1-R8212G, plus 1-AT72D
R8154A	2-R8330D, plus 1-R8214G
R8154B	1-R8330D, plus 1-R8212G
R8154C	1-R8330D, plus 1-R8212G
R8154D	1-R8330D, plus 1-R8212G
R8206A	1-R8330D
R8206B	1-R8330D
R8206C	1-R8330D
W879A ^a	2-R8330D, plus 1-R8214G
W879B ^a	2-R8330D, plus 1-R8214G
W879C ^a	2-R8330D, plus 1-R8214G
W879D ^a	2-R8330D, plus 1-R8214G

NOTE: Use 1 main pole of contactor to switch 2 elements, if necessary.

^aComponents of a typical system include W879 Sequencing Panel, W879D add-on panel, R8330A Load Relays, R8301 Time Delay Relays, and AT20A,C, AT40A,C, or AT88A Transformers. W879D add-on panel may be used with W879A to provide sequencing control of up to 9 elements. Two W879B panels may be connected in series to provide added capacity. Entire system must be replaced.

INSTALLATION

CAUTION

1. Installer must be a trained, experienced serviceman.
2. Disconnect power supply before connecting wiring to prevent electrical shock and equipment damage.
3. Conduct a thorough checkout after the installation is complete.

LOCATION

The design of the furnace and location of the original sequencers will guide control location. Make sure the area selected is within the control's ambient temperature range of minus 20 to plus 162 F [minus 29 to plus 72 C]. The R8330D may be mounted in any position inside the furnace enclosure. It cannot be mounted on the outside.

WIRING

All wiring must comply with applicable codes and ordinances. Refer to manufacturer's wiring diagram if available. Figs. 5 to 13 show typical hookups using the R8330D in different systems with up to 9 elements. An optional method of wiring a single speed fan is shown in Fig. 14. Figs. 15 and 16 show pilot duty limit hookups for typical systems. Fold one of the figure pages open to the needed furnace system schematic. The wiring instructions are repeated opposite both pages of figures for convenience.

1. Remove all existing sequencers that are in the heating element circuits. **DO NOT REMOVE**—

- Fan speed changeover relay.
- Fuse blocks and terminal strips.
- 24 volt transformer.
- Limits and cutouts on the heaters.

2. Remove all wiring except the lead or wires from the—

- Low voltage terminal block.
- Changeover relay.
- Heating elements and limits.
- Line voltage fuse or terminal blocks.

3. Seal all old screw holes with screws or duct tape.

4. Use the R8330D as a template and drill two 3/16 inch [5 mm] holes for each control in a convenient location. Mount the R8330D's, using the screws on unexposed furnace surfaces. Use the nuts and bolts when mounting on a surface which exposes the mounting hardware to the outside.

5. Replacement of the female wiring terminals that connect to the R8330 is recommended. Use the terminals supplied. Follow the schematic for the system you are servicing and:

- a. Reconnect low voltage thermostat, sequencer heater, and changeover relay wires.
- b. Reconnect the fan circuit. Be sure the fan leadwires are the same as the original to insure proper fusing.
- c. Reconnect the heater element circuits one at a time. Make sure that the line voltage wires (L1) to the element(s) are connected with the same size fuse as the return line (L2) for each element. There should be no more than 2 elements (2 elements and fan in combination

rated circuits) per fuse pair. A limit must remain wired with each heating element.

d. In pilot duty limit systems, add contactor(s) as shown in Figs. 15 and 16.

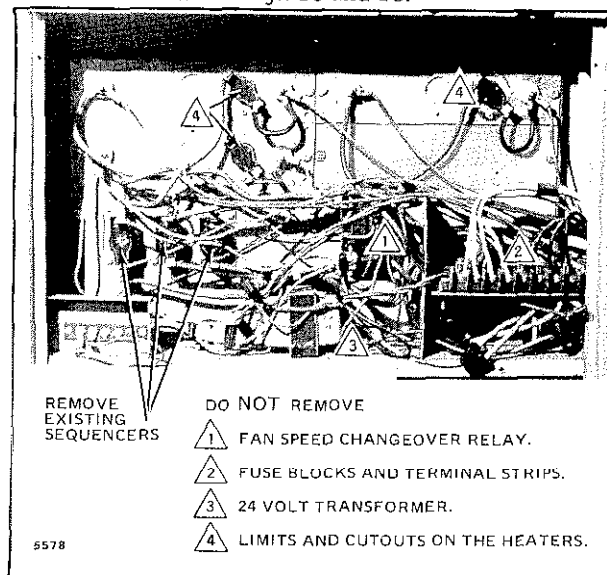


FIG. 2—REMOVE OLD SEQUENCERS.

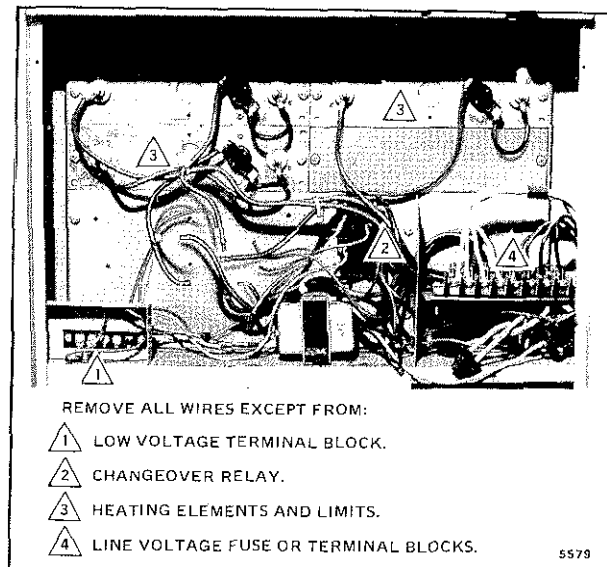


FIG. 3—REMOVE WIRING.

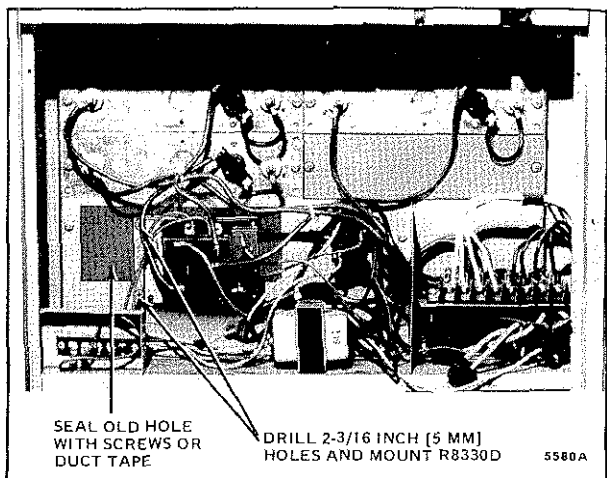
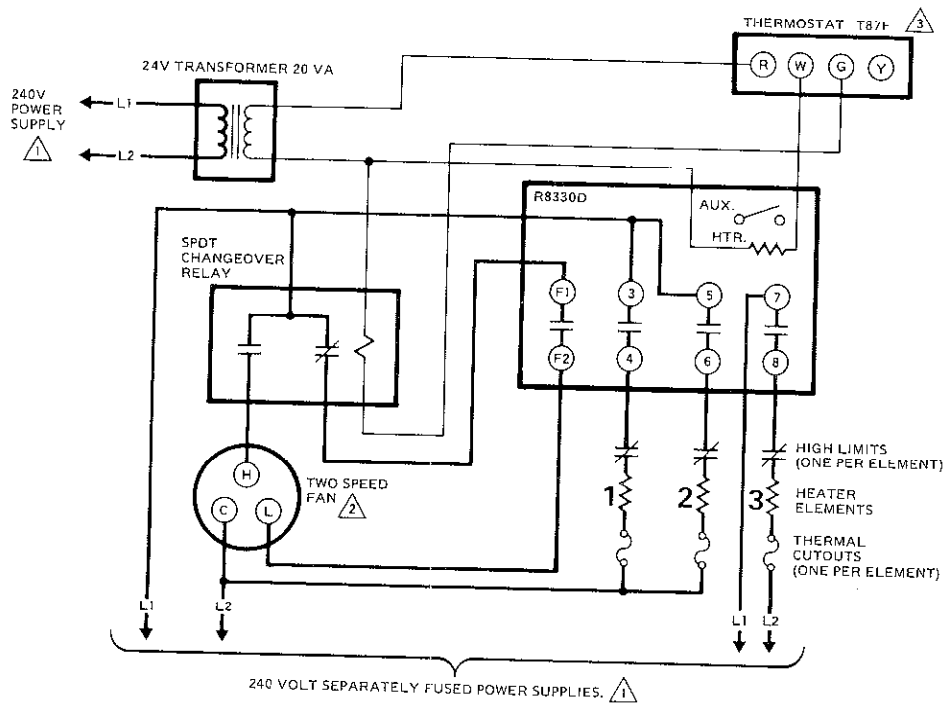


FIG. 4—INSTALL R8330D.



OPERATIONAL SEQUENCE	
SEQUENCE ON THERMOSTAT CALLS FOR HEAT	SEQUENCE OFF THERMOSTAT SATISFIED
THERMOSTAT CONTACTS CLOSE	THERMOSTAT CONTACTS OPEN
ELMT. 1	ELMT. 3
FAN	ELMT. 2
ELMT. 2	ELMT. 1
ELMT. 3	FAN

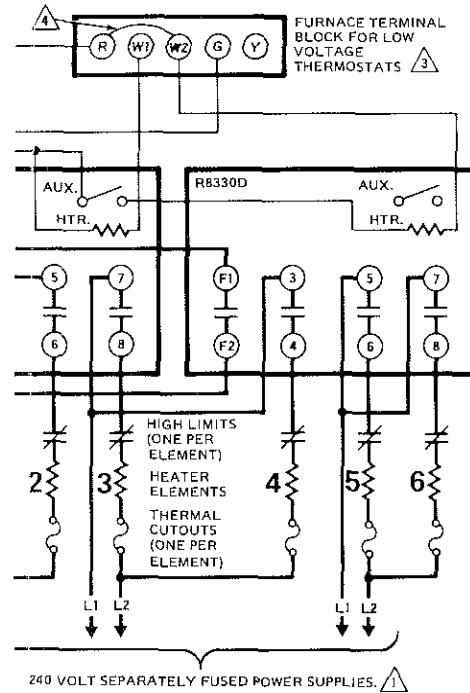
FOR A 2 ELEMENT SYSTEM, LEAVE TERMINALS 7 AND 8 ON R8330D BLANK.
 FOR A 1 ELEMENT SYSTEM, LEAVE TERMINALS 7, 8 AND 5, 6 ON R8330D BLANK.

- 1 PROVIDE SEPARATE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
- 2 FAN MAY BE WIRED FOR DELAYED OFF. REFER TO FIG 14
- 3 HEAT ANTICIPATOR SETTING 0.4 AMP.

5581

FIG. 5--WIRING SCHEMATIC FOR UP TO 3 ELEMENT 240 VOLT SYSTEM--ISOLATED FAN.

OPERATIONAL SEQUENCE	
SEQUENCE ON THERMOSTAT CALLS FOR HEAT	SEQUENCE OFF THERMOSTAT SATISFIED
THERMOSTAT CONTACTS CLOSE	THERMOSTAT CONTACTS OPEN
ELMT. 1 FAN	ELMT. 3
ELMT. 2	ELMT. 2
ELMT. 3 AUXILIARY CLOSES	ELMT. 1 AUXILIARY OPENS
ELMT. 4	ELMT. 6
ELMT. 5	ELMT. 5
ELMT. 6 AUXILIARY CLOSES	ELMT. 4 AUXILIARY OPENS
ELMT. 7	ELMT. 9
ELMT. 8	ELMT. 8
ELMT. 9	ELMT. 7 FAN



OPERATIONAL SEQUENCE	
SEQUENCE ON THERMOSTAT CALLS FOR HEAT	SEQUENCE OFF THERMOSTAT SATISFIED
THERMOSTAT CONTACTS CLOSE	THERMOSTAT CONTACTS OPEN
ELMT. 1 FAN	ELMT. 3
ELMT. 2	ELMT. 2
ELMT. 3 AUXILIARY CLOSES	ELMT. 1 AUXILIARY OPENS
ELMT. 4	ELMT. 6
ELMT. 5	ELMT. 5
ELMT. 6	ELMT. 4 FAN

FOR A 5 ELEMENT SYSTEM, LEAVE TERMINALS 7 AND 8 ON THE SECOND R8330D BLANK.

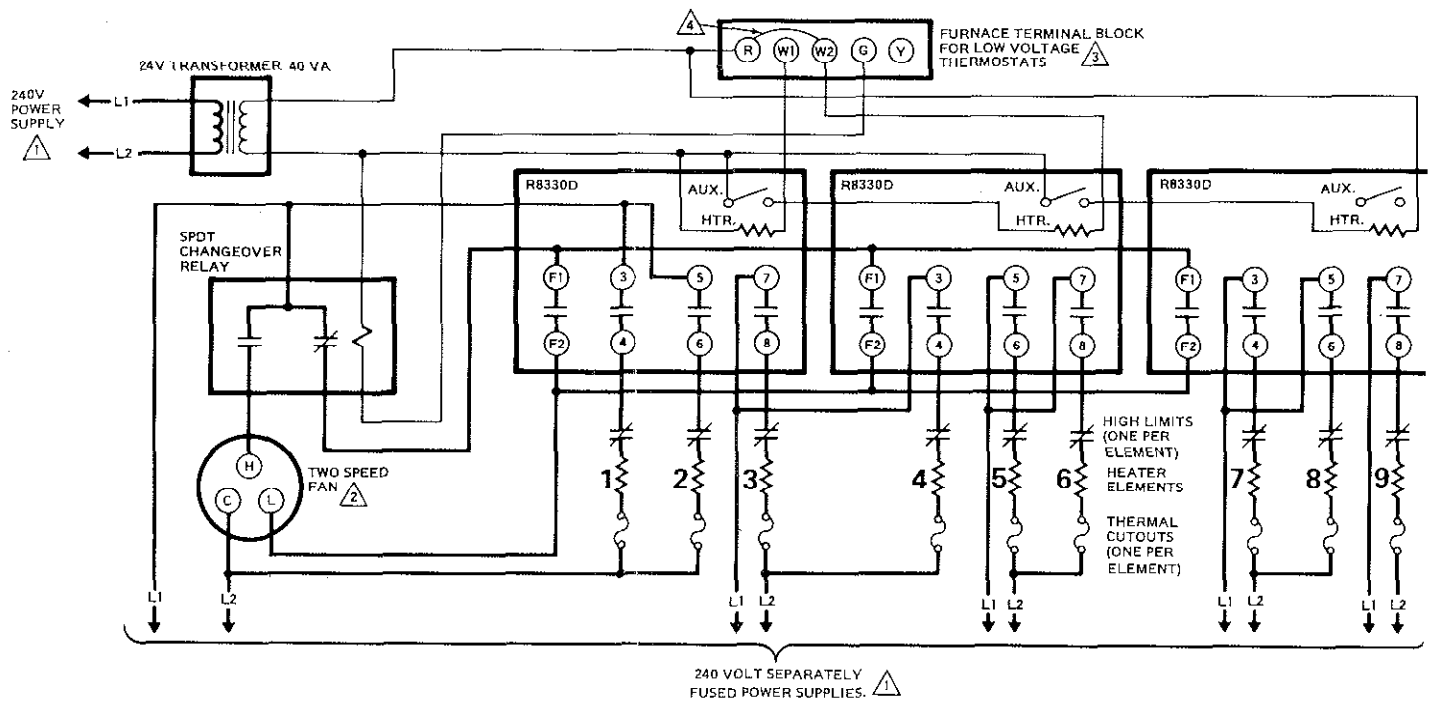
FOR A 4 ELEMENT SYSTEM, LEAVE TERMINALS 7,8 AND 5,6 ON THE SECOND R8330D BLANK.

5522
PART 1 OF 2

5522
PART 2 OF 2

FIG. 6—WIRING SCHEMATIC FOR UP TO 6 ELEMENT 240 VOLT SYSTEM—ISOLATED FAN.

OPEN FOR SCHEMATIC OF UP TO 9 ELEMENTS



- 1 PROVIDE SEPARATE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
- 2 FAN MAY BE WIRED FOR DELAYED OFF. REFER TO FIG. 14
- 3 HEAT ANTICIPATOR SETTING 0.4 AMP.
- 4 MAKE CONNECTIONS AS SHOWN FOR SINGLE STAGE THERMOSTAT. REMOVE JUMPER FOR 2-STAGE THERMOSTAT APPLICATION.

FOR A 8 ELEMENT SYSTEM, LEAVE TERMINALS 7 AND 8 ON THE THIRD R8330D BLANK.

FOR A 7 ELEMENT SYSTEM, LEAVE TERMINALS 7,8 AND 5,6 ON THE THIRD R8330D BLANK.

FIG. 7—WIRING SCHEMATIC FOR UP TO 9 ELEMENT 240 VOLT SYSTEM—ISOLATED FAN.

INSTALLATION

(Repeat of page 6 for convenience.)

CAUTION

1. Installer must be a trained, experienced serviceman.
2. Disconnect power supply before connecting wiring to prevent electrical shock and equipment damage.
3. Conduct a thorough checkout after the installation is complete.

LOCATION

The design of the furnace and location of the original sequencers will guide control location. Make sure the area selected is within the control's ambient temperature range of minus 20 to plus 162 F [minus 29 to plus 72 C]. The R8330D may be mounted in any position inside the furnace enclosure. It cannot be mounted on the outside.

WIRING

All wiring must comply with applicable codes and ordinances. Refer to manufacturer's wiring diagram if available. Figs. 5 to 13 show typical hookups using the R8330D in different systems with up to 9 elements. An optional method of wiring a single speed fan is shown in Fig. 14. Figs. 15 and 16 show pilot duty limit hookups for typical systems. Fold one of the figure pages open to the needed furnace system schematic. The wiring instructions are repeated opposite both pages of figures for convenience.

1. Remove all existing sequencers that are in the heating element circuits. **DO NOT REMOVE**—
 - Fan speed changeover relay.
 - Fuse blocks and terminal strips.
 - 24 volt transformer.
 - Limits and cutouts on the heaters.
2. Remove all wiring except the lead or wires from the—
 - Low voltage terminal block.
 - Changeover relay.
 - Heating elements and limits.
 - Line voltage fuse or terminal blocks.
3. Seal all old screw holes with screws or duct tape.
4. Use the R8330D as a template and drill two 3/16 inch [5 mm] holes for each control in a convenient location. Mount the R8330D's, using the screws on unexposed furnace surfaces. Use the nuts and bolts when mounting on a surface which exposes the mounting hardware to the outside.
5. Replacement of the female wiring terminals that connect to the R8330 is recommended. Use the terminals supplied. Follow the schematic for the system you are servicing and:
 - a. Reconnect low voltage thermostat, sequencer heater, and changeover relay wires.
 - b. Reconnect the fan circuit. Be sure the fan leadwires are the same as the original to insure proper fusing.
 - c. Reconnect the heater element circuits one at a time. Make sure that the line voltage wires (L1) to the element(s) are connected with the same size fuse as the return line (L2) for each element. There should be no more than 2 elements (2 elements and fan in combination

rated circuits) per fuse pair. A limit must remain wired with each heating element.

- d. In pilot duty limit systems, add contactor(s) as shown in Figs. 15 and 16.

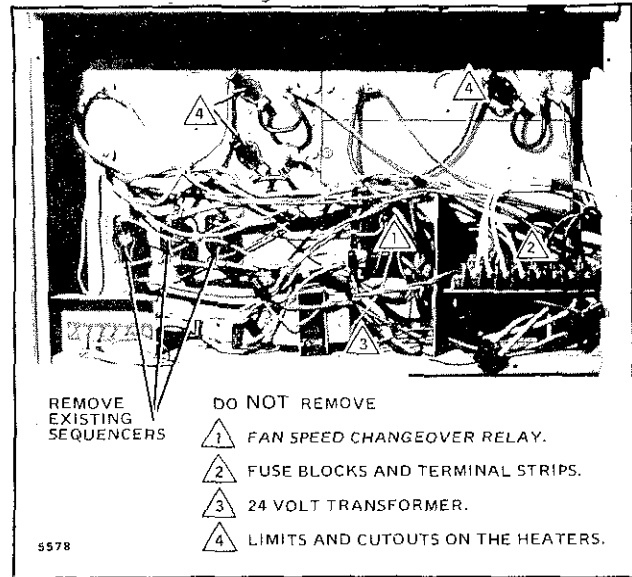


FIG. 2—REMOVE OLD SEQUENCERS.

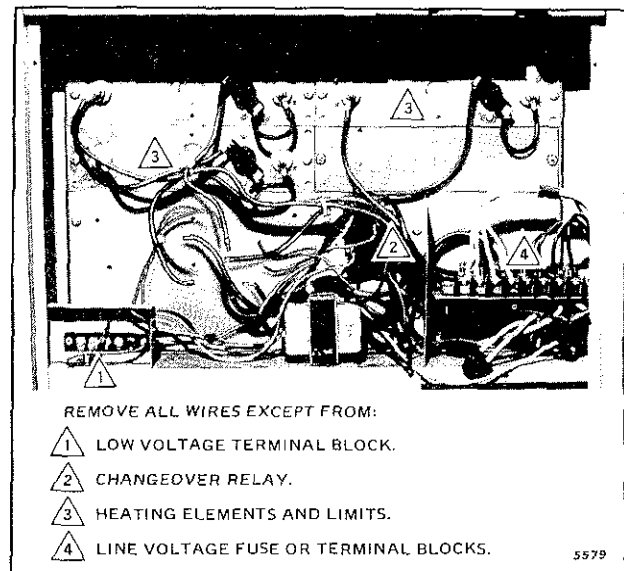


FIG. 3—REMOVE WIRING.

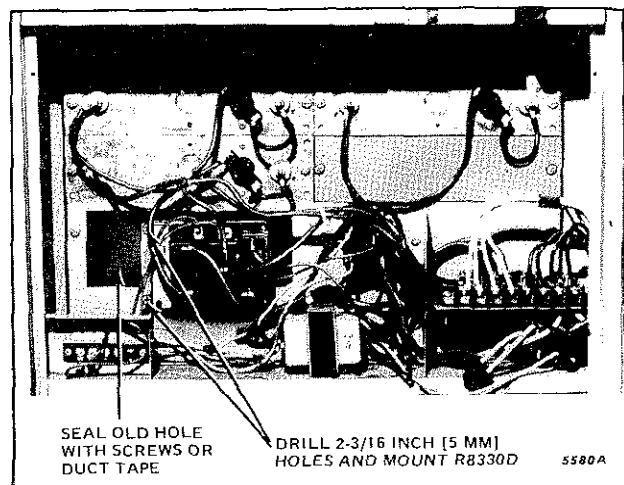


FIG. 4—INSTALL R8330D.

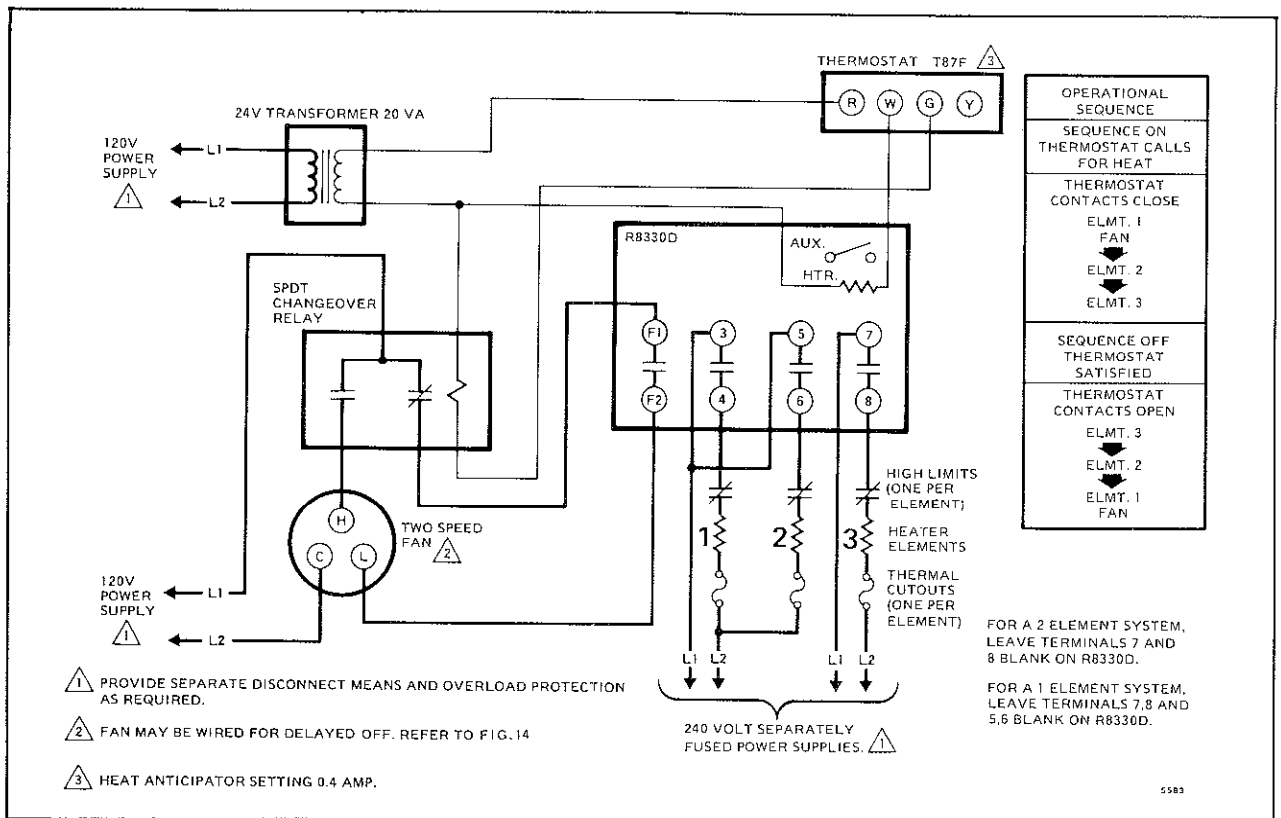


FIG. 8--WIRING SCHEMATIC FOR UP TO 3 ELEMENT 240/120 VOLT SYSTEM--ISOLATED FAN.

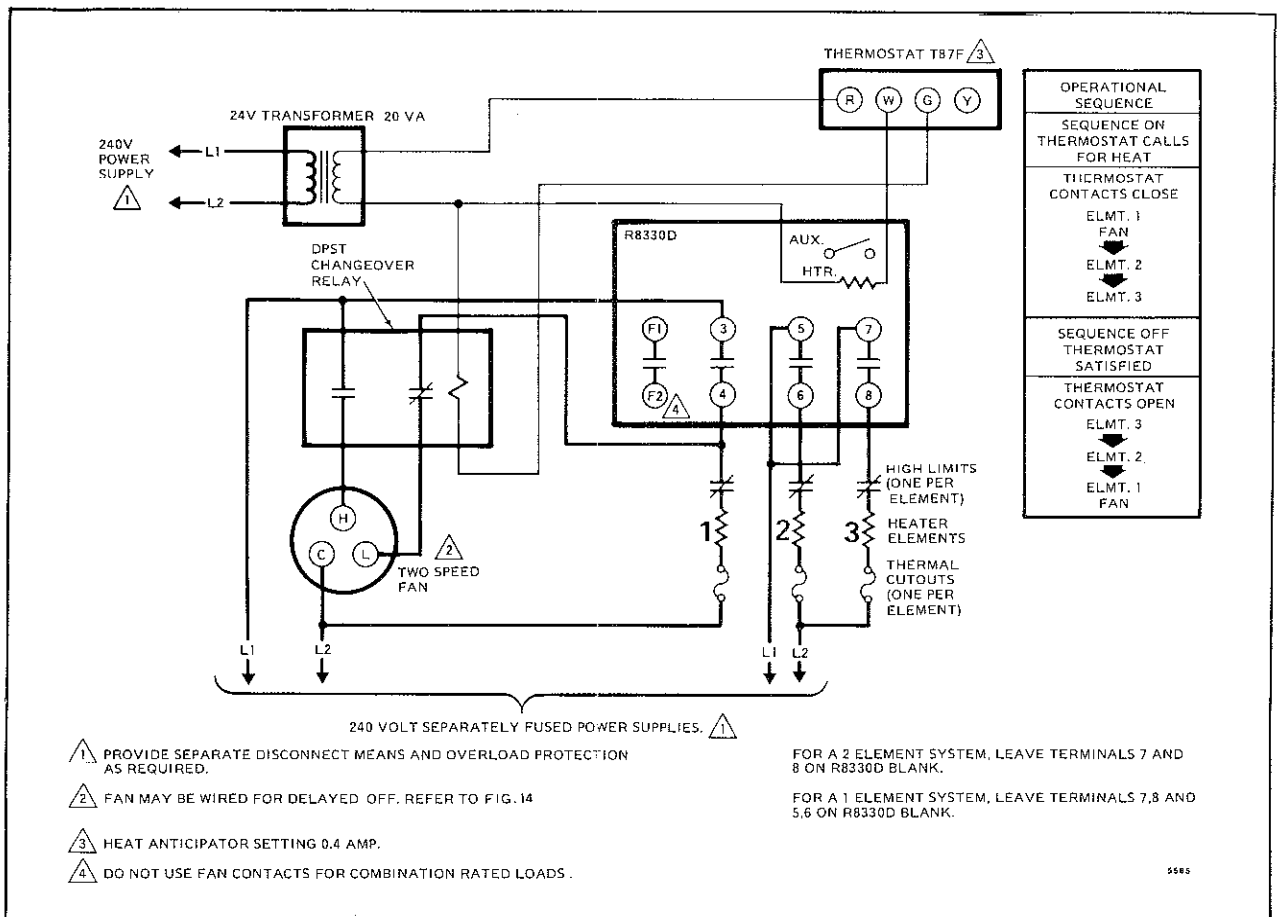


FIG. 11--WIRING SCHEMATIC FOR UP TO 3 ELEMENT 240 VOLT SYSTEM--COMBINATION RATED.

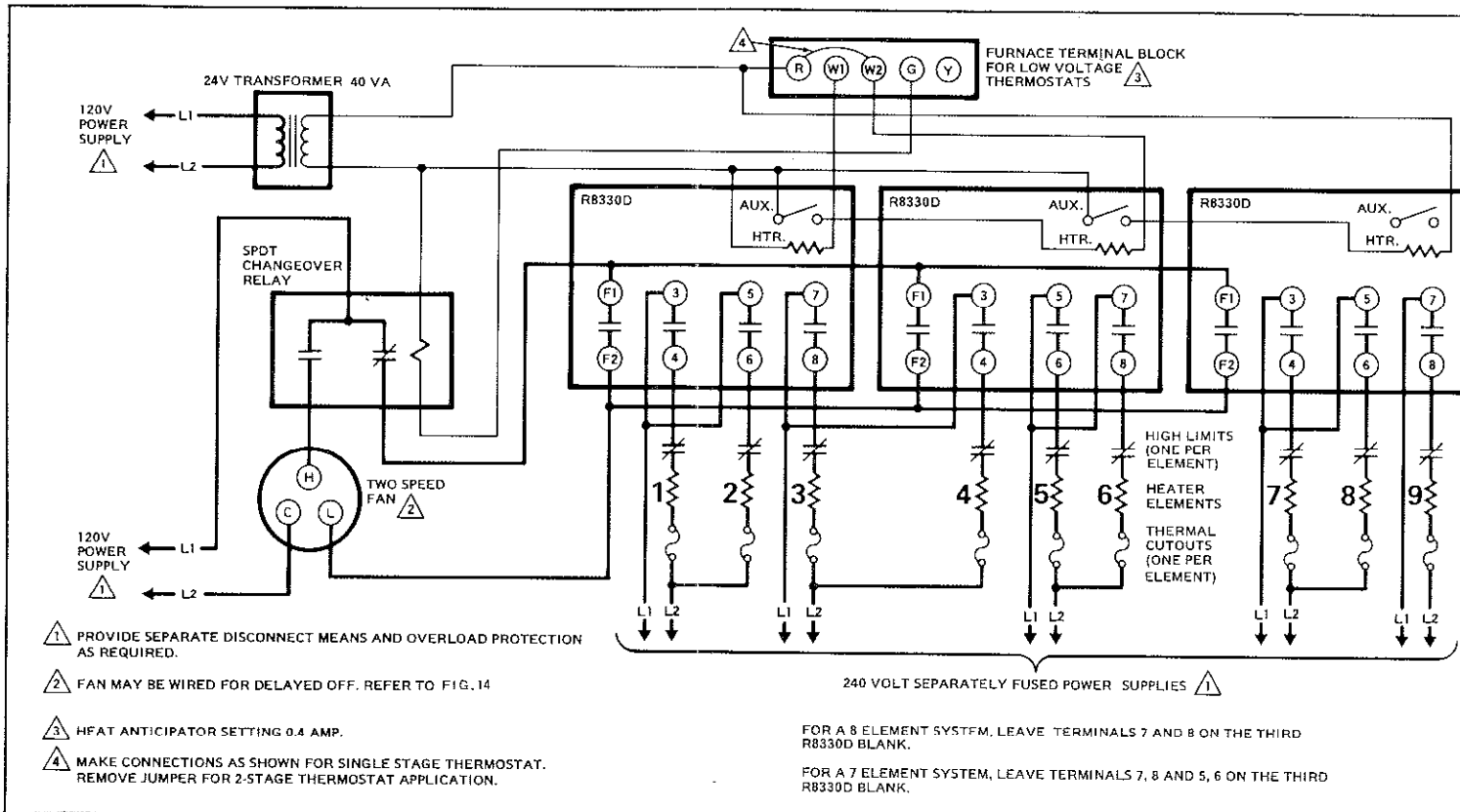


FIG. 10—WIRING SCHEMATIC FOR A 9 ELEMENT 240/120 VOLT SYSTEM—ISOLATED FAN.

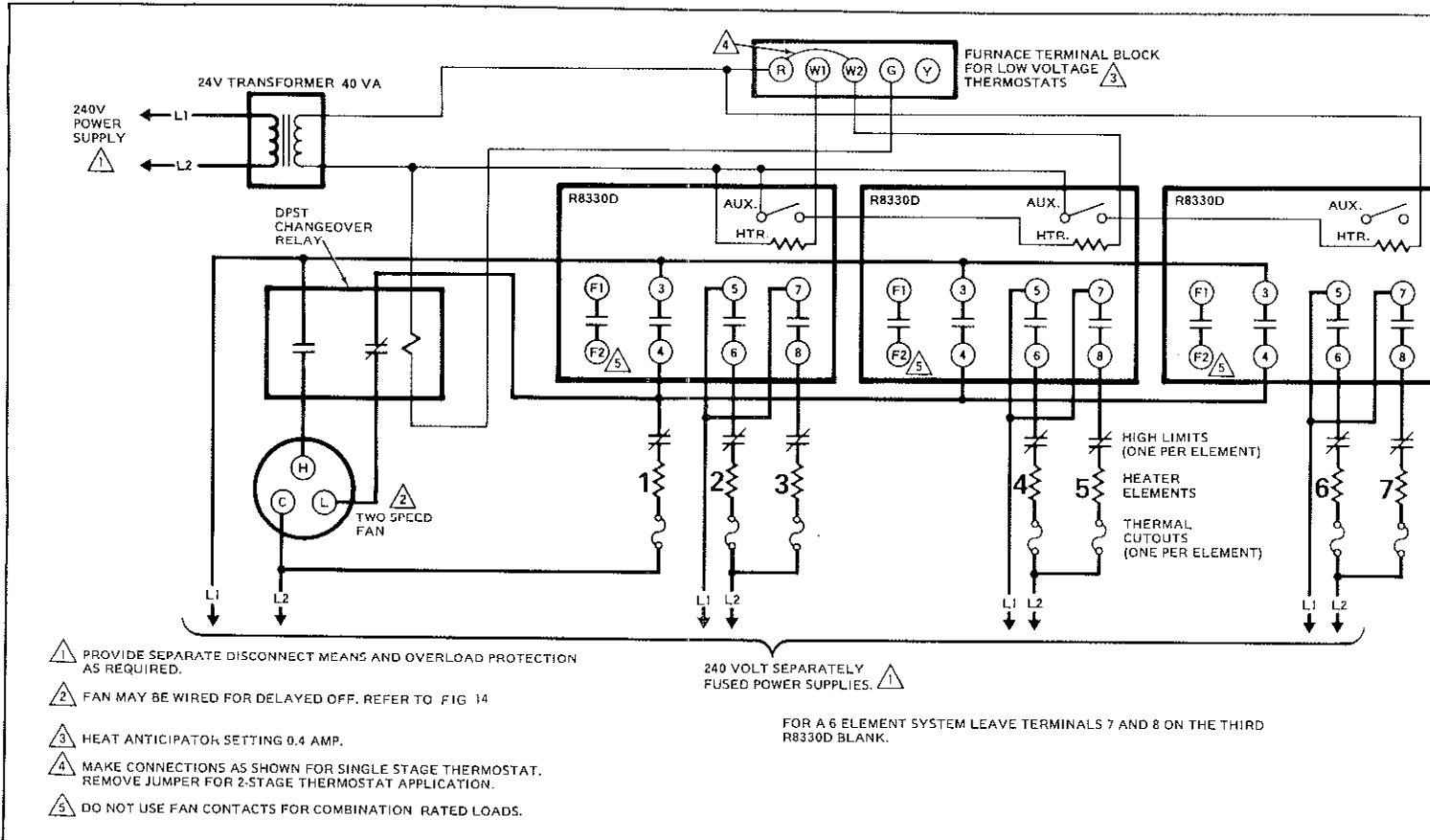
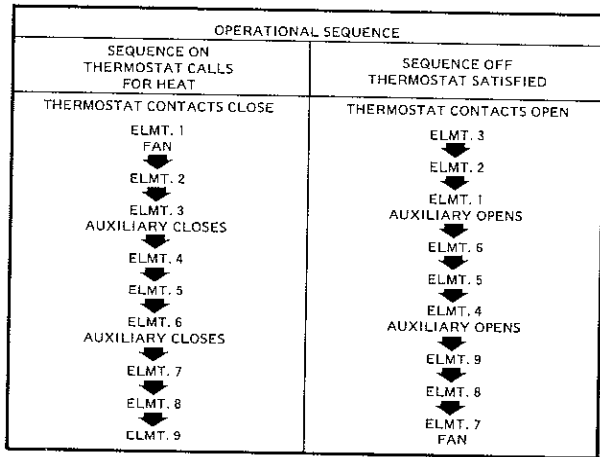
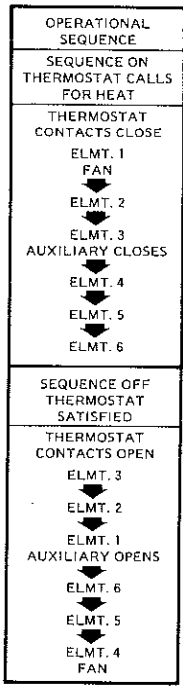
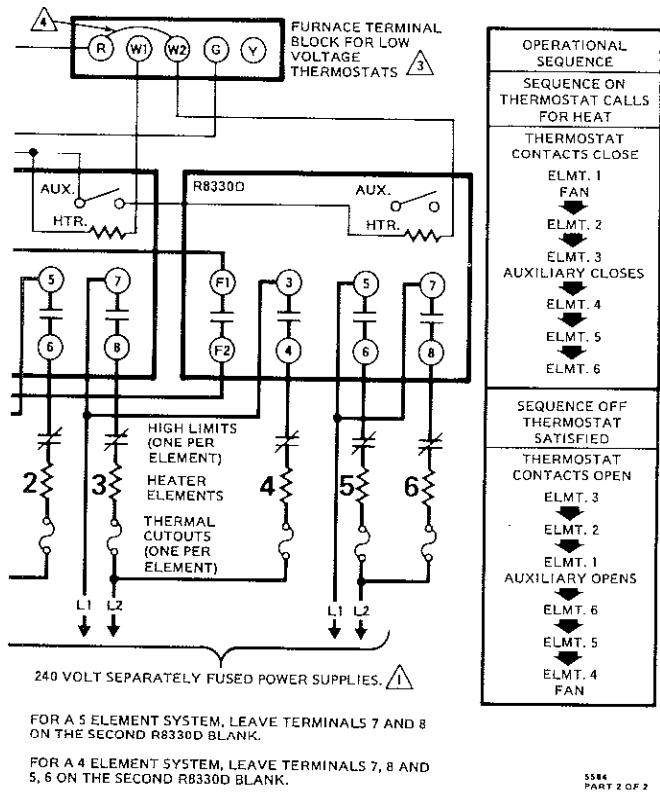


FIG. 13—WIRING SCHEMATIC FOR UP TO 7 ELEMENT 240 VOLT SYSTEM—COMBINATION RATED.

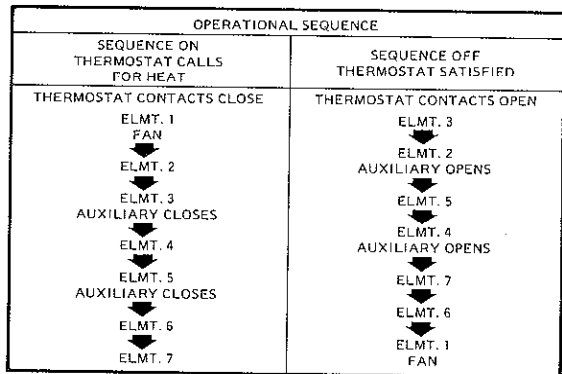


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PART 1 OF 2

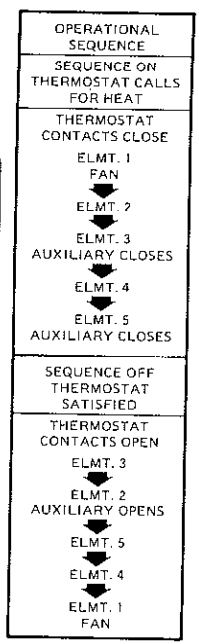
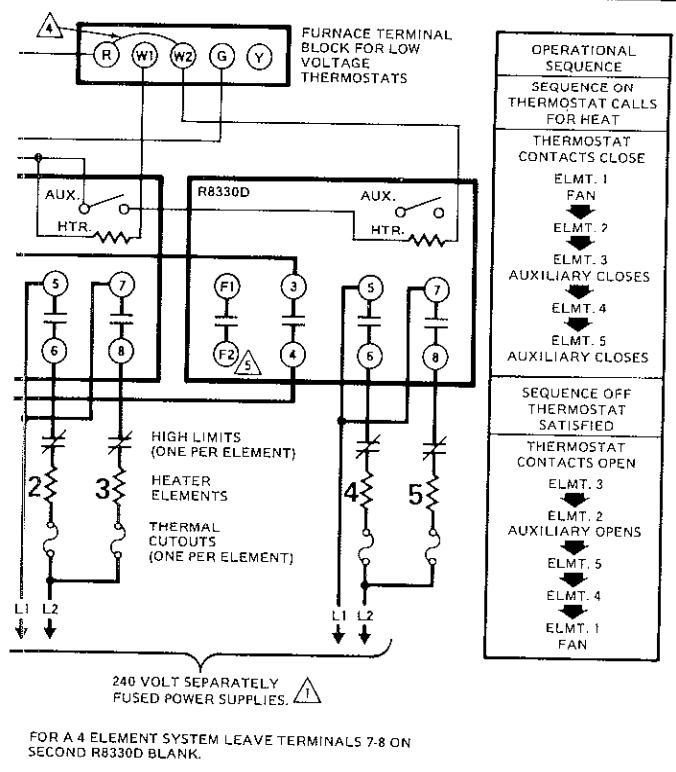


5584
PART 2 OF 2

FIG. 9—WIRING SCHEMATIC FOR UP TO 6 ELEMENT 240/120 VOLT SYSTEM—ISOLATED FAN.



5586
PART 1 OF 2



5586
PART 2 OF 2

FIG. 12—WIRING SCHEMATIC FOR UP TO 5 ELEMENT 240 VOLT SYSTEM—COMBINATION RATED.

OPEN FOR SCHEMATICS FOR MORE ELEMENTS

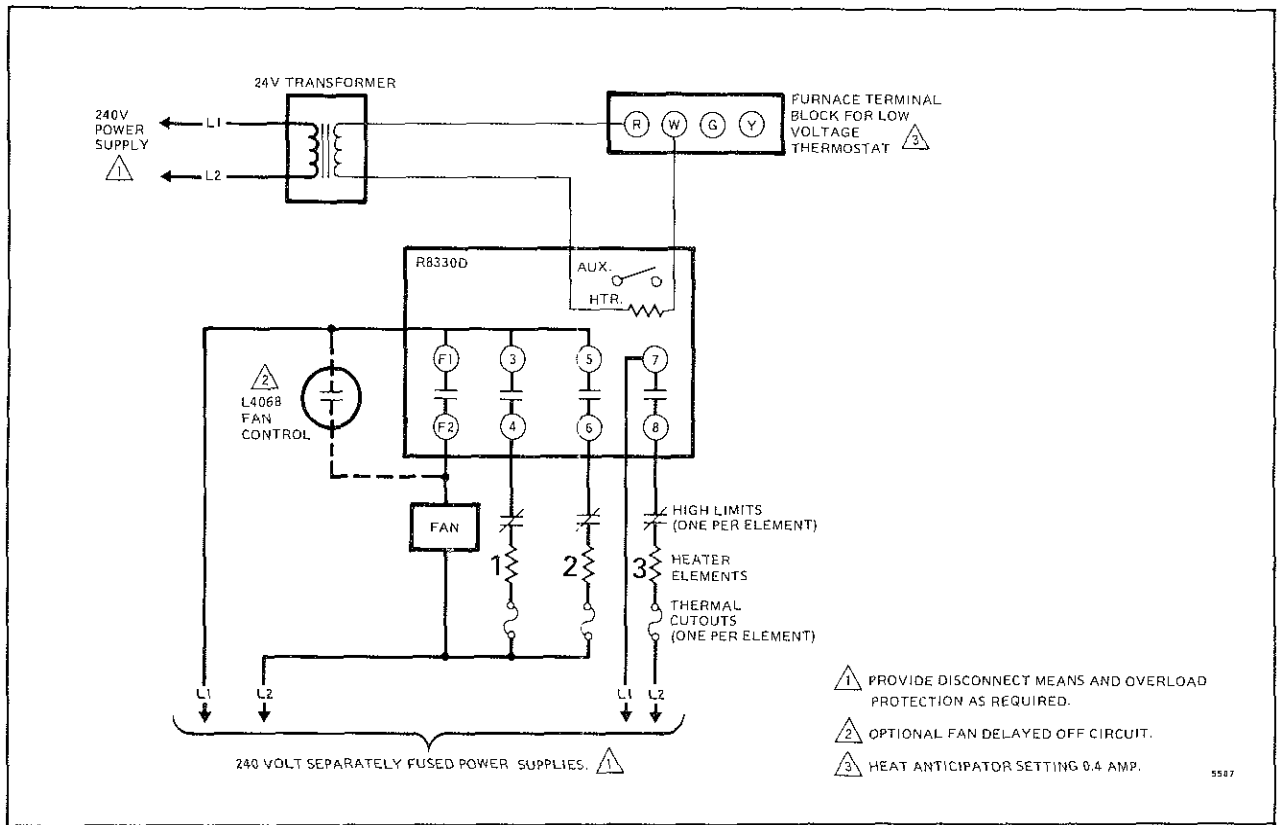


FIG. 14—SINGLE SPEED FAN WIRING.

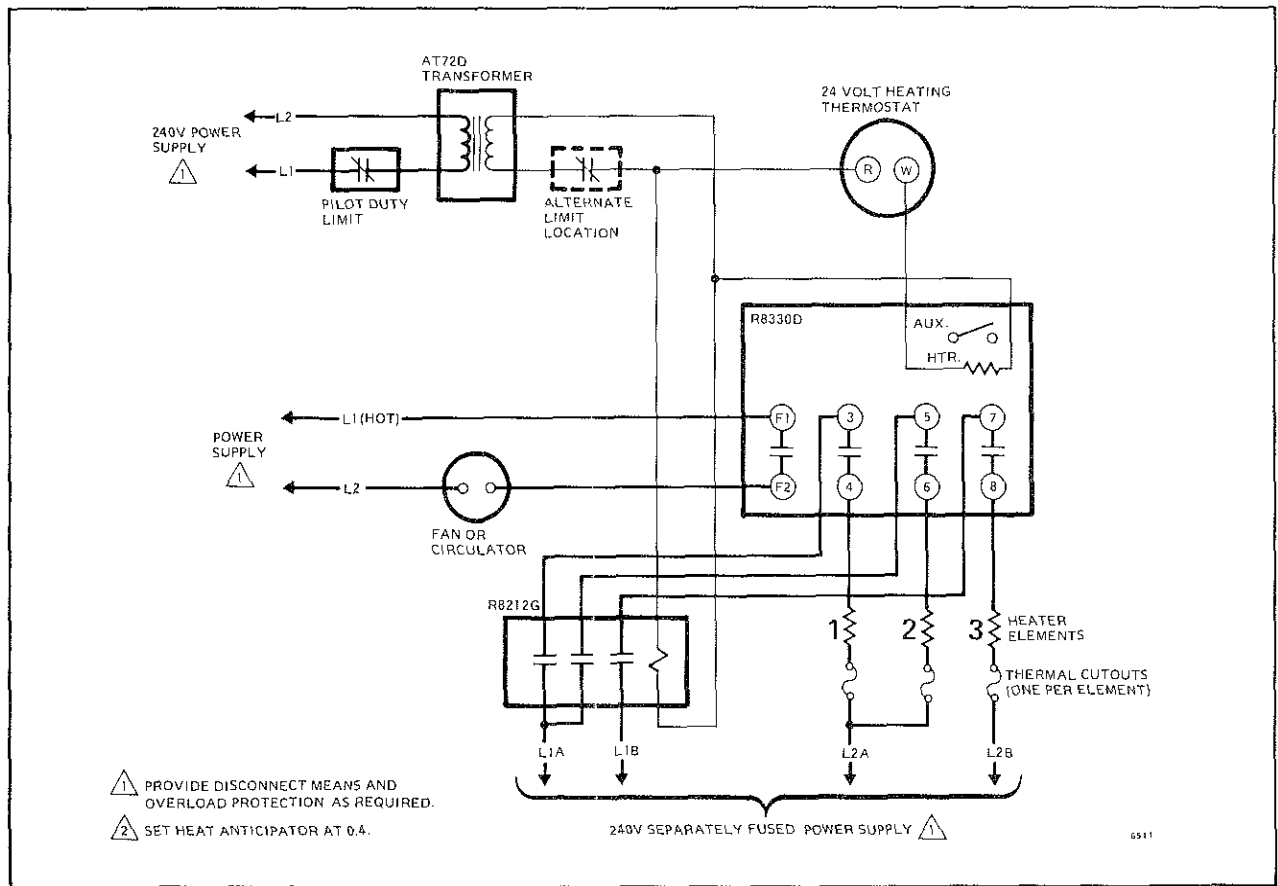


FIG. 15—TYPICAL HOOKUP FOR R8330D WITH PILOT DUTY LIMIT—3 ELEMENTS.

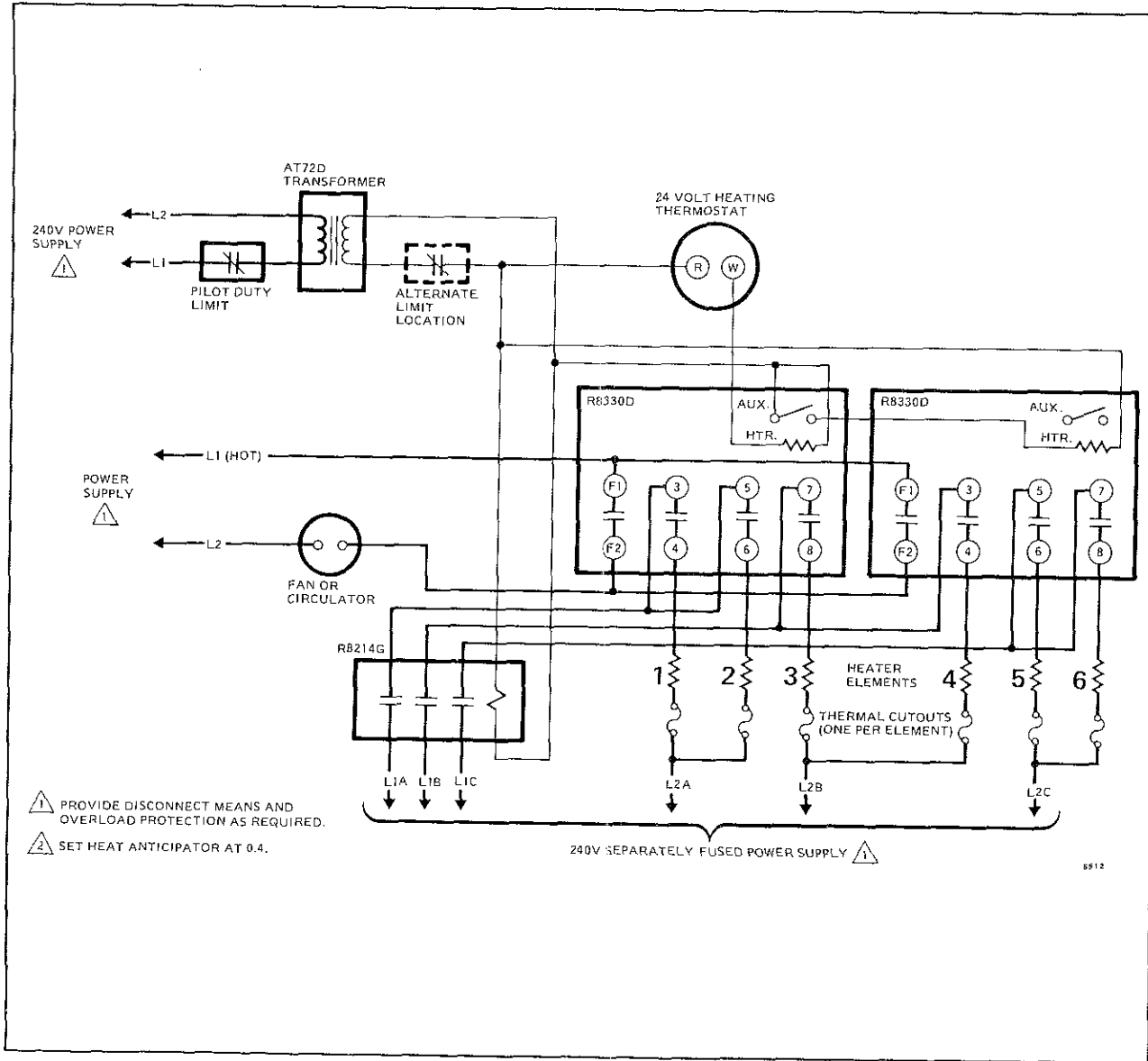


FIG. 16—TYPICAL HOOKUP FOR R8330D WITH PILOT DUTY LIMIT—6 ELEMENTS.

CHECKOUT AND SERVICE

CHECKOUT

Set the system thermostat to call for heat and make sure that all elements sequence on and off properly and that fan starts with first element on and stays on until all elements are off. Refer to Operation Sequence on appropriate wiring schematic. In pilot duty limit systems, contactor(s) should drop out when control circuit is de-energized by the pilot duty limit (Figs. 15 and 16).

NOTE: This is a time delay device; allow at least 4 minutes per sequencer for elements to sequence on and off.

SERVICE

The R8330 is not field repairable. If any component fails, it should be replaced. No adjustment or periodic service is required on these controls.

TROUBLESHOOTING

PRELIMINARY CHECKOUT FOR SYSTEM WITH LINE VOLTAGE LIMITS

1. Check system wiring for any loose or broken connections.

2. With power off, disconnect the fan at R8330. Turn power on and set the thermostat to call for heat. As the R8330 sequences the heater elements on, check the limit controls on the heaters for proper operation. Replace any limit that does not de-energize its element.

Turn the thermostat to the lowest setting and turn power off. Reconnect the fan and turn the power on. Sequence the furnace on and off to be sure the fan and all heating elements operate properly.

PRELIMINARY CHECKOUT FOR SYSTEM WITH PILOT DUTY LIMIT

1. Check system wiring for any loose or broken connections.

2. With power off, disconnect the fan at R8330. Turn power on and set the thermostat to call for heat. When furnace temperature rises to limit set point, the pilot duty limit should open the control circuit to de-energize the contactor(s). All elements must turn off. Replace limit or contactor(s) which are not working properly.

Turn the thermostat to the lowest setting and turn power off. Reconnect the fan and turn the power on. Sequence the furnace on and off to be sure the fan and all heating elements operate properly.

NOTE: Check out systems with circulator by lowering pilot duty limit setting with the power on. The contactor(s) should drop out as in the above procedure when furnace temperature rises to limit set point. If limit has a nonadjustable setting, disconnect one of the transformer secondary leads at the contactor coil terminals. The contactor(s) should drop out. (NOTE: This does not check the function of the limit itself.) Be sure to reconnect lead(s) at contactor coil terminals.

TRANSFORMER CHECKOUT

1. Use an ac voltmeter to measure the voltage across the secondary terminals. If voltage is 24V ac \pm 10 percent, proceed to check the R8330. If incorrect, proceed to step 2.

2. Check that voltage across transformer primary is within \pm 10 percent of rated voltage. If correct, replace the transformer. If the primary voltage is incorrect, correct source problems.

R8330 SYSTEM CHECKOUT

Refer to applicable wiring diagrams. Note that if R8330 sequencers are used in combination, the troubleshooting procedure must be adapted for the individual system.

1. Move the thermostat set point above the room temperature so that thermostat calls for heat—

a. If system does not start (after time delay), proceed to step 2.

b. If fan and/or some heating elements start (but not all), proceed to step 3.

c. If fan and heating elements all sequence on properly, proceed to step 4.

2. Jumper Rh to W1 at the thermostat—

a. If fan and heating elements now begin operating (after time delay), check thermostat and wiring and replace thermostat if necessary. Proceed to step 4.

b. If neither fan nor heating elements operate (and system wiring was checked), replace the R8330.

NOTE: See Preliminary Checkout for System with Pilot Duty Limit in systems with pilot duty limit before replacing R8330.

CAUTION

The R8330 contacts carry line voltage.

3. Jumper across the R8330 terminals controlling the inoperative fan or heating element. If the fan or element now starts, the contacts are not conducting; replace the R8330.

NOTE: If element is not energized, check to see that second stage of thermostat is operating (or that R to W2 is jumpered for single stage thermostat). In hookup with more than one R8330, check to see that control circuit wiring is as specified by the appropriate schematic.

4. When all elements and fan are on, break the power supply to the R8330 by lowering the thermostat set point (or removing jumper Rh-W1) so that switch breaks. Check to make sure that all heating stages sequence off. The fan should operate until all stages are off.