

ES5 SERIES UNITS

I - INTRODUCTION

The ES5 electric furnace is designed for up-flow, down-flow and horizontal installations. Figure 1 illustrates a typical cutaway. Several heater sizes are available. The heating output table lists the KW for each furnace at various voltages. The unit model number identifies the approximate

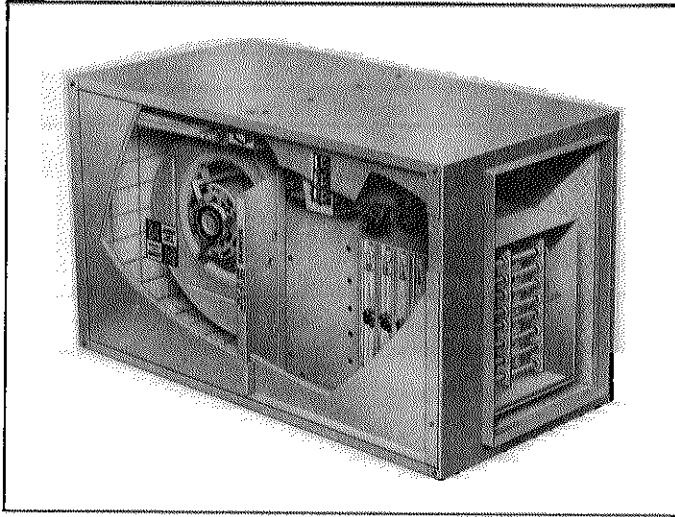


FIGURE 1

amount of Btuh output. Figure 2 explains the model number designation.

Two different styles of heat relays are used in ES5 units. The dash number at the end of model number designates the type used. Dash 1 is Honeywell while dash 2 is Robertshaw. Refer to sections within this manual for further information on the controls.

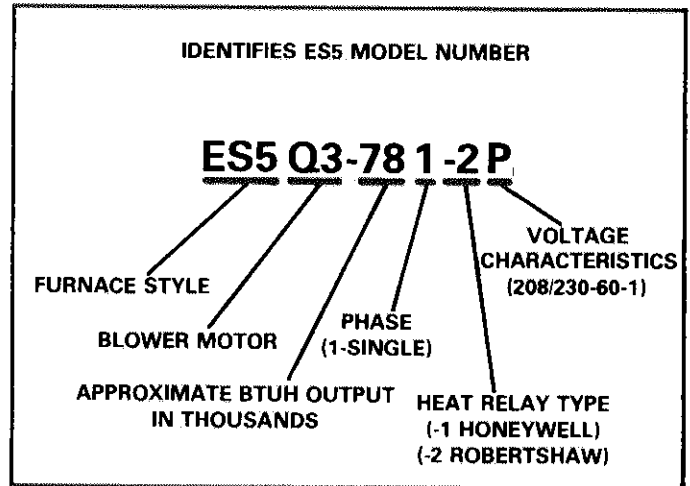
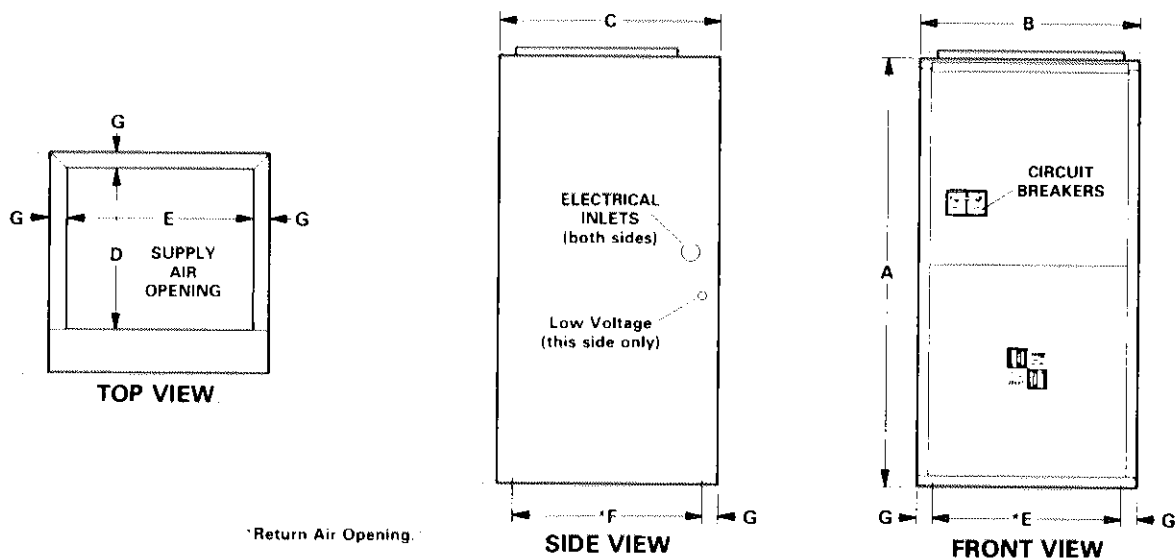


FIGURE 2

II - UNIT INFORMATION

A - Dimensions



Model No	A	B	C	D	E	F	G
ES5Q2-321-471	40 in (1016 mm)	20 1/2 in (521 mm)	20 1/2 in (521 mm)	14 3/8 in (365 mm)	17 1/2 in (445 mm)	17 1/2 in (445 mm)	1 1/2 in (38 mm)
ES5Q3-471-551-631-781 ES5Q4-631	42 in (1067 mm)	24 1/2 in (622 mm)	20 1/2 in (521 mm)	14 3/8 in (365 mm)	21 1/2 in (546 mm)	17 1/2 in (445 mm)	1 1/2 in (38 mm)
ES5Q5-781	54 in (1372 mm)	25 in (635 mm)	24 1/2 in (622 mm)	18 3/8 in (467 mm)	22 in (559 mm)	21 1/2 in (546 mm)	1 1/2 in (38 mm)

B - Specifications

Model Number	ES5Q2-321	ES5Q2-471	ES5Q3-471	ES5Q3-631	ES5Q3-781	ES5Q4-631	ES5Q5-781
†Output Btuh	27,000	40,000	40,000	53,000	68,000	55,000	70,000
†A.F.U.E.	97.3%	97.6%	98.0%	97.9%	98.2%	98.6%	98.5%
Blower wheel nominal diam. x width (in.)	9 x 7		10 x 7			10 x 8	12 x 12
Blower motor horsepower	1/4		1/3			1/2	3/4
Free filter area (sq. ft.)	5.2		6.0			6.0	8.6
Filter cut size (in.)	20 x 40 x 1		20 x 46 x 1			20 x 46 x 1	24 x 54 x 1
Tons of cooling that can be added	1-1/2 or 2		2-1/2 or 3			3-1/2 or 4	3-1/2, 4 or 5
Shipping weight (lbs.)	98		115			124	177
No. of packages	1		1			1	1
Electrical characteristics	208/240 volt — 60 hertz — 1 phase (All Models)						

†Annual Fuel Utilization Efficiency based on D.O.E. test procedures and F.T.C. labeling regulations.

C - Heating Output

UNIT MODEL NO.	OUTPUT	
	VOLTAGE	KW
ES5Q2-321	208	6.9
	220	7.7
	230	8.4
	240	9.2
ES5Q2-471 ES5Q3-471	208	10.4
	220	12.0
	230	12.7
	240	13.8

UNIT MODEL NO.	OUTPUT	
	VOLTAGE	KW
ES5Q3-631 ES5Q4-631	208	13.8
	220	15.5
	230	16.9
	240	18.4
ES5Q3-781 ES5Q5-781	208	17.3
	220	19.3
	230	21.1
	240	23.0

D - Blower Performance

ES5Q2 Series Blower Performance

External Static Pressure (in. wg.)	Air Volume (cfm) @ Various Speeds		
	High	Medium	Low
0	1300	980	690
.05	1290	990	695
.10	1265	990	700
.15	1245	985	700
.20	1225	985	705
.25	1200	975	700
.30	1175	965	700
.40	1110	940	690
.50	1035	905	675
.60	945	855	640

NOTE — All cfm is measured external to the unit with the air filter in place.

ES5Q3 Series Blower Performance

External Static Pressure (in. wg.)	Air Volume (cfm) @ Various Speeds			
	High	Med-High	Medium	Low
0	1510	1305	1040	895
.05	1495	1300	1040	900
.10	1480	1290	1040	900
.15	1460	1280	1035	900
.20	1445	1275	1035	900
.25	1425	1265	1030	895
.30	1405	1250	1025	895
.40	1360	1225	1010	885
.50	1305	1185	985	865
.60	1240	1125	940	835

NOTE — All cfm is measured external to the unit with the air filter in place.

ES5Q4-631 Blower Performance

External Static Pressure (in. wg.)	Air Volume (cfm) @ Various Speeds		
	High	Medium	Low
0	1990	1525	1220
.05	1970	1520	1215
.10	1945	1510	1210
.15	1915	1500	1205
.20	1885	1490	1200
.25	1855	1480	1195
.30	1820	1465	1190
.40	1740	1430	1180
.50	1640	1385	1150
.60	1525	1325	1100

NOTE — All Cfm is measured external to the unit with the air filter in place.

ES5Q5-781 Blower Performance

External Static Pressure (in. wg.)	Air Volume (cfm) @ Various Speeds				
	High	Med-High	Medium	Med-Low	Low
0	2700	2435	2160	1735	1565
.05	2690	2420	2155	1730	1560
.10	2680	2405	2150	1730	1550
.15	2660	2390	2140	1720	1540
.20	2650	2370	2130	1715	1525
.25	2630	2355	2120	1705	1515
.30	2610	2340	2105	1700	1500
.40	2570	2295	2075	1670	1460
.50	2525	2250	2040	1640	1420
.60	2470	2205	2000	1600	1360

NOTE — All cfm is measured external to the unit with the air filter in place.

III - COMPONENTS

Figure 3 shows an ES5 exploded view. Figures 4, 5, 6, 7, 8 and 9 show the control box arrangements for the various units.

1 - Element

Each element is rated for 4.6 KW at 240 volts. The heat relay steps "on" each element. Each element is protected by both a thermal fuse and a limit control.

The thermal fuse has a cutoff temperature of 333°F and a resistive interrupt current of 40A. The limit control de-energizes the element at excessive temperatures. See Table 1 for control set points.

TABLE 1

UNIT	CUT-OUT TEMPERATURE	CUT-IN TEMPERATURE
ES5Q2 Series	120°F	95°
ES5Q4 Series		
ES5Q5 Series	130°F	95°
ES5Q3 Series		

2 - Transformer

230 volt primary/24 volt secondary — 30VA.

3 - Circuit Breakers

Circuit breakers serve as unit protection.

IV - BLOWER SPEED

Table 2 shows the speed selection chart for the various motors. Actual unit CFM can be determined using the Blower Performance Charts.

TABLE 2

SPEED	BLOWER MOTOR LEAD			
	ES5Q2	ES5Q3	ES5Q4	ES5Q5
LOW	RED	RED	RED	RED
MEDIUM LOW	---	YELLOW	---	YELLOW
MEDIUM	YELLOW	---	YELLOW	BLUE
MEDIUM HIGH	---	BROWN	---	BROWN
HIGH	BLACK	BLACK	BLACK	BLACK

Important - To prevent motor burnout, never connect more than motor lead to any one connection. Tape unused motor leads separately.

V - SCHEMATIC WIRING DIAGRAM OPERATING SEQUENCE

Figure 10 illustrates a typical ES5Q3-781-2P application.

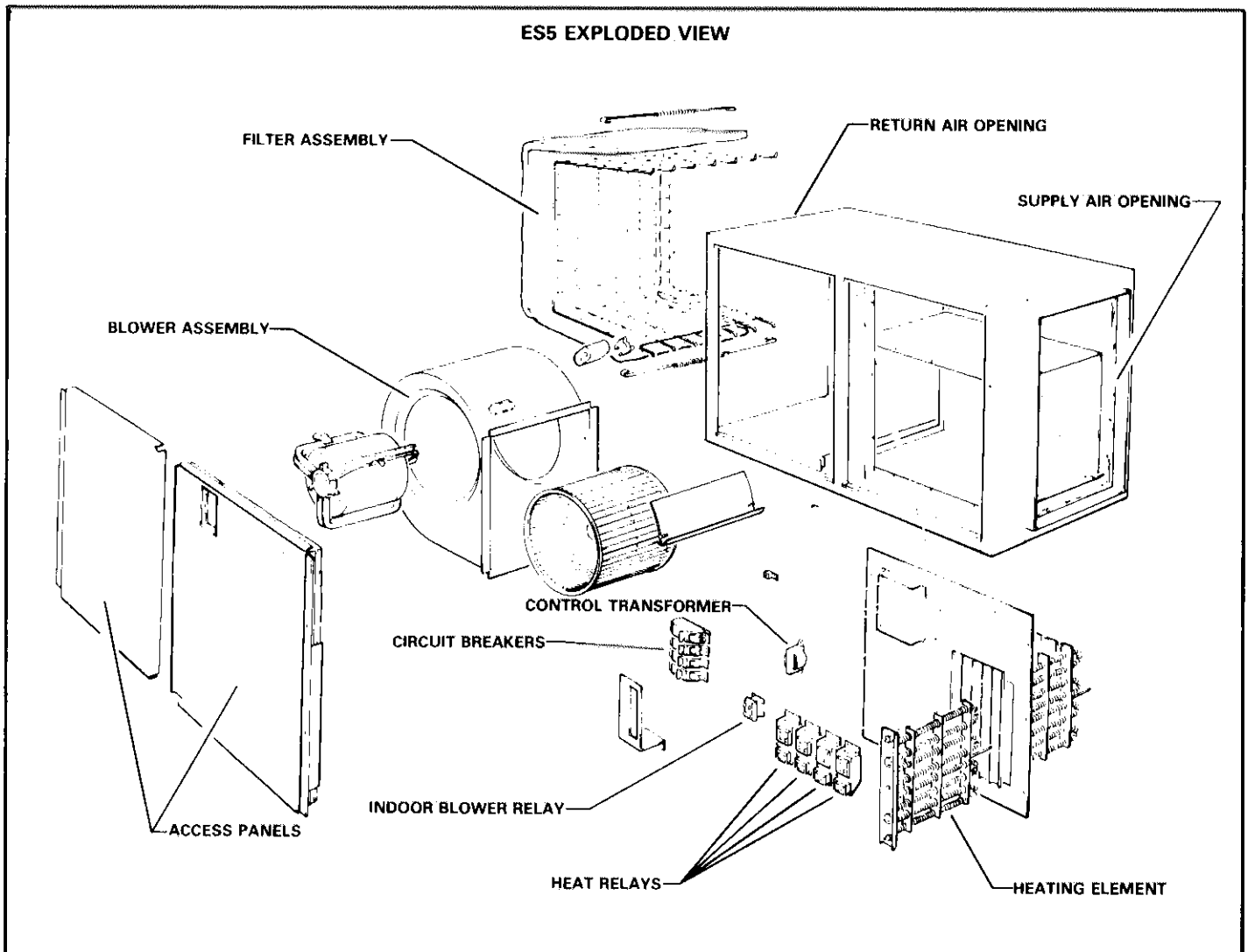


FIGURE 3

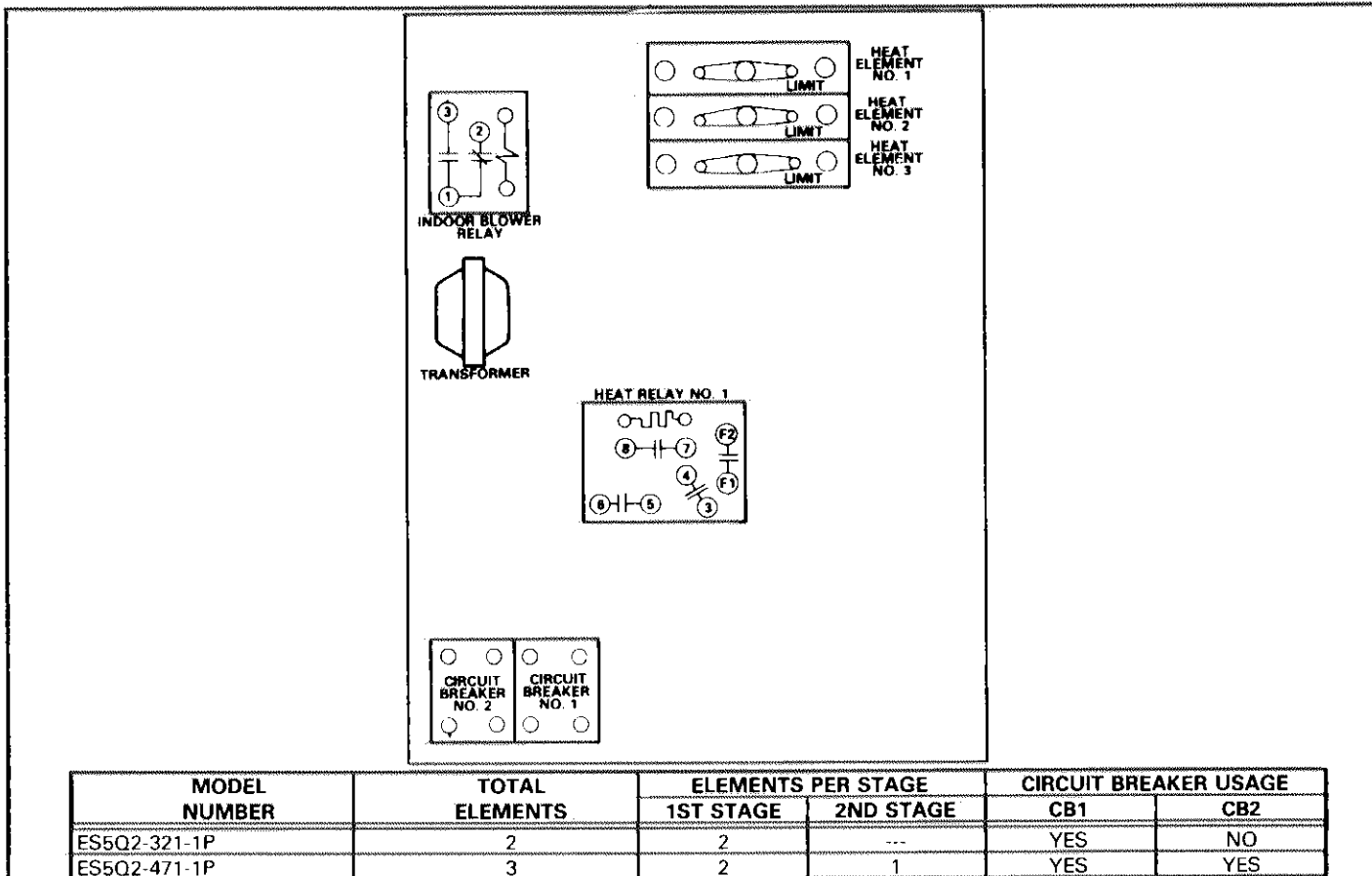


FIGURE 4

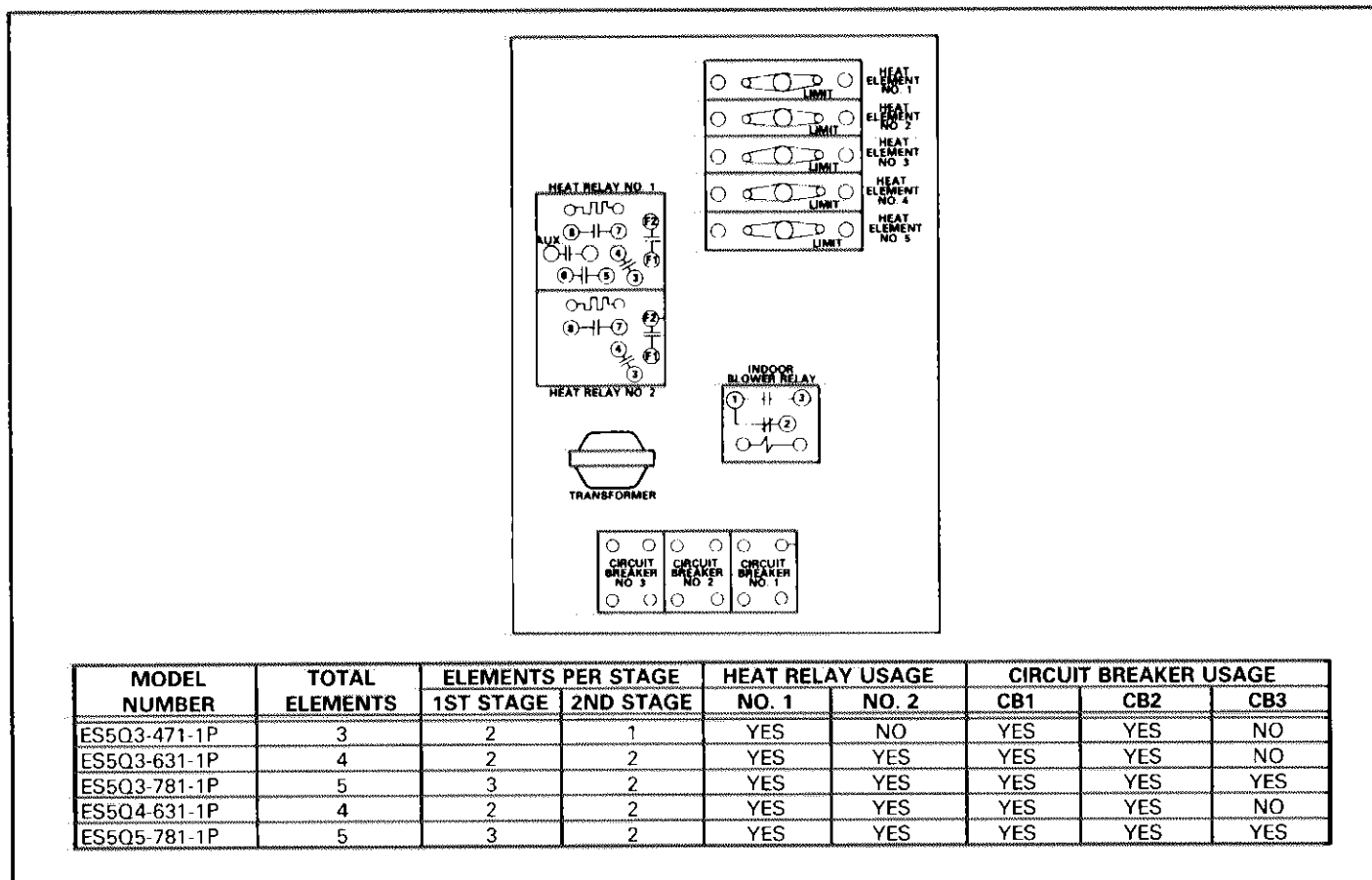
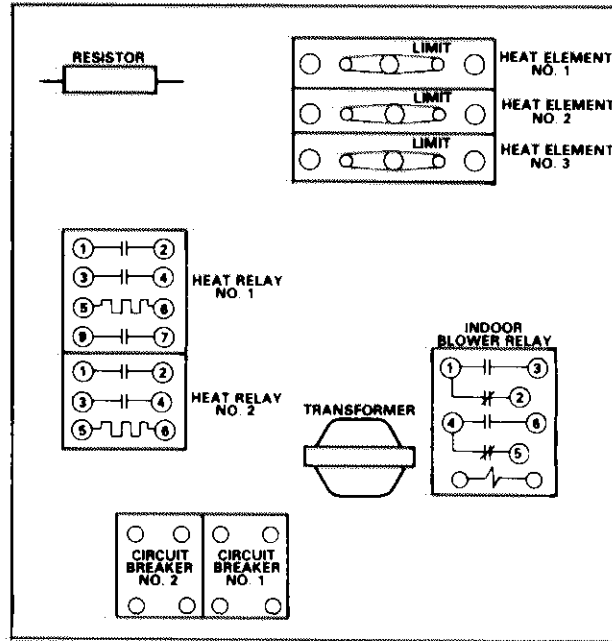
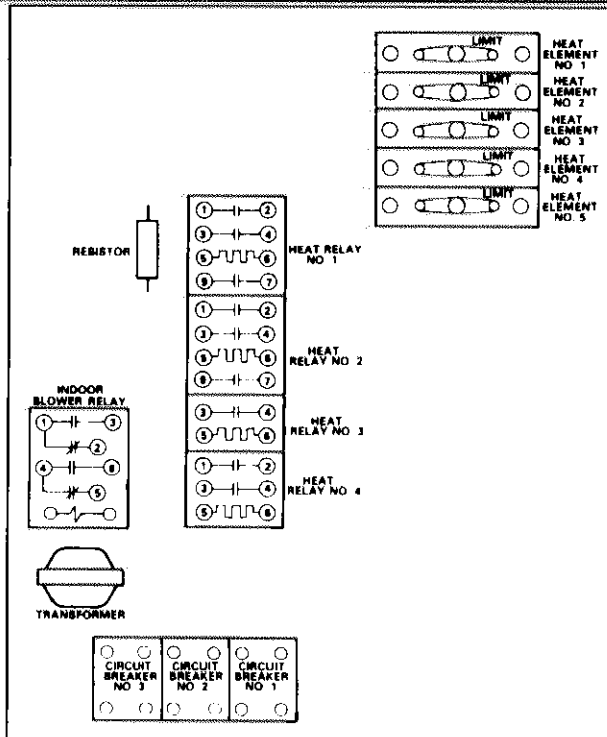


FIGURE 5



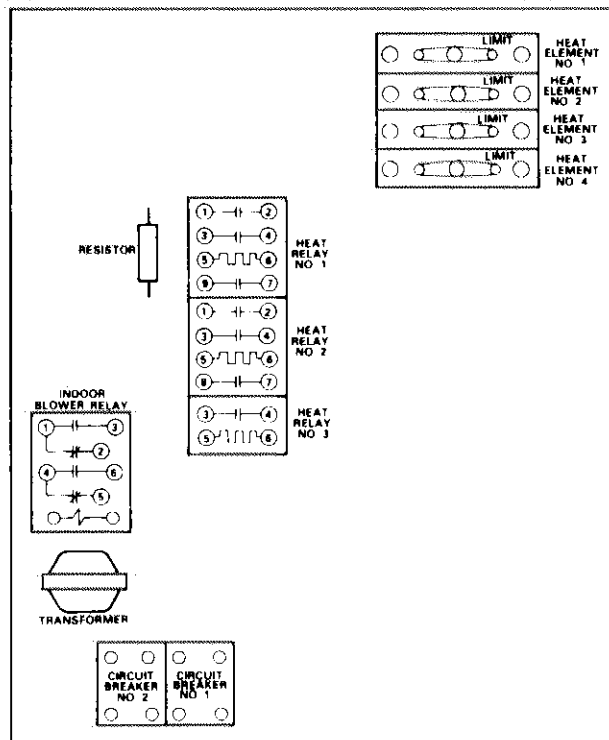
MODEL NUMBER	TOTAL ELEMENTS	ELEMENTS PER STAGE		RELAY USAGE		CIRCUIT BREAKER USAGE	
		1ST STAGE	2ND STAGE	K2	K3	CB1	CB2
ES5Q2-321-2P	2	2	---	YES	NO	YES	NO
ES5Q2-471-2P	3	2	1	YES	YES	YES	YES

FIGURE 6



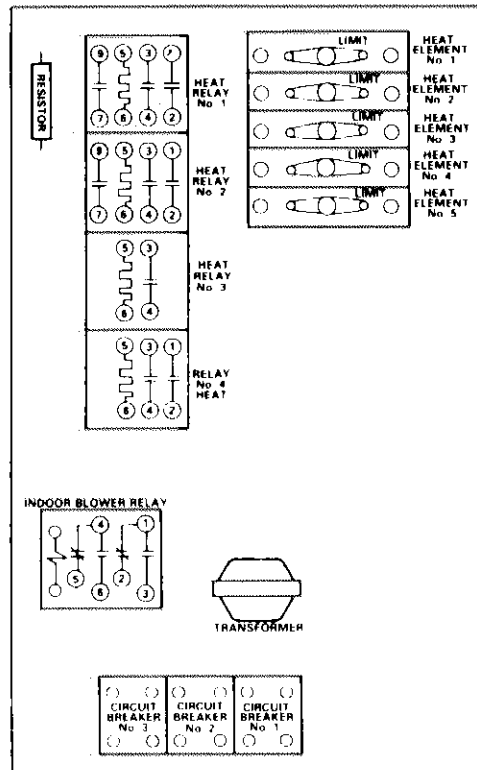
MODEL NUMBER	TOTAL ELEMENTS	ELEMENTS PER STAGE			RELAY USAGE				CIRCUIT BREAKER USAGE		
		1ST STAGE	2ND STAGE	3RD STAGE	K2	K3	K4	K5	CB-1	CB-2	CB-3
ES5Q3-471-2P	3	2	1	---	YES	YES	NO	NO	YES	YES	NO
ES5Q3-631-2P	4	2	2	---	YES	YES	YES	NO	YES	YES	NO
ES5Q3-781-2P	5	2	2	1	YES	YES	YES	YES	YES	YES	YES

FIGURE 7



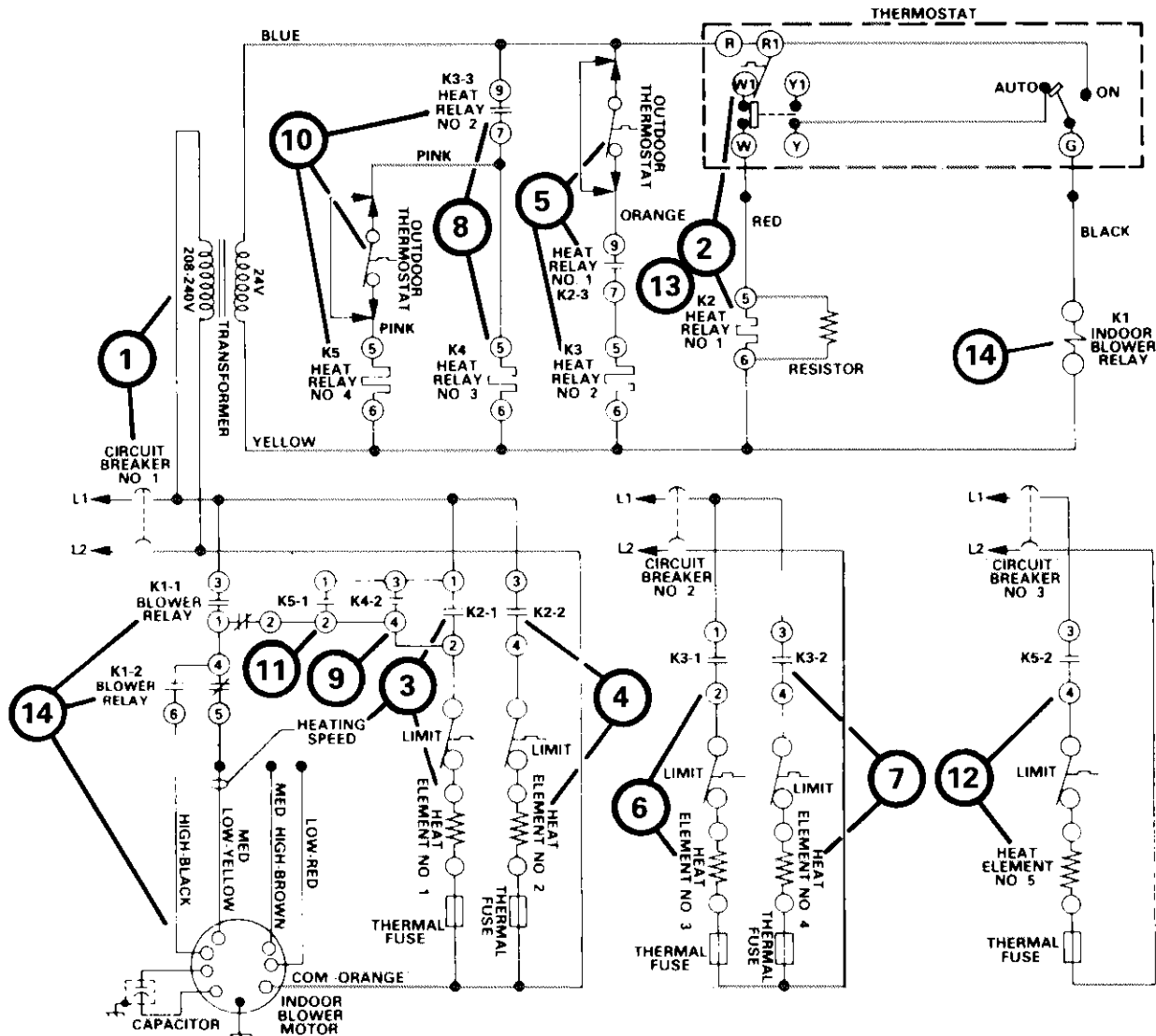
MODEL NUMBER	TOTAL ELEMENTS	ELEMENTS PER STAGE	
		1ST STAGE	2ND STAGE
ES5Q4-631-2P	4	2	2

FIGURE 8



MODEL NUMBER	TOTAL ELEMENTS	ELEMENTS PER STAGE		
		1ST STAGE	2ND STAGE	3RD STAGE
ES5Q5-781-2P	5	2	2	1

FIGURE 9



HEATING DEMAND

- 1 - The control transformer is fed off the number 1 circuit breaker. The transformer provides 24 volts to the control circuit.
- 2 - The thermostat makes to "W" leg on a heating demand. This energizes (K2) Heat Relay No. 1.
- 3 - N.O. K2-1 contacts close to energize the blower motor on minimum speed through N.C. K1 contacts. K2-1 simultaneously energizes the first heating element to bring on the first 5 KW.
- 4 - After a short time delay, N.O. K2-2 contacts close to bring on the second element.
- 5 - N.O. K2-3 contacts also make at the same time as those in step 4. If the optional outdoor thermostat is made, the (K3) Heat Relay No. 2 is energized.
- 6 - N.O. K3-1 contacts close to bring on the third element.
- 7 - After a short time delay, N.O. K3-2 contacts make to bring on the fourth element.
- 8 - N.O. K3-3 contacts also make at the same time as those in step 7. This energizes (K4) Heat Relay No. 3.

- 9 - N.O. K4-2 closes to lock in the blower circuit, thus assuring blower operation when elements are energized.
- 10 - K3-3 also energizes (K5) Heat Relay No. 4 providing that the optional outdoor thermostat is made.
- 11 - N.O. K5-1 contacts close to again lock in the blower circuit to the element demand.
- 12 - N.O. K5-2 contacts close to energize the fifth element.
- 13 - When the heating demand is satisfied, the thermostat bulb breaks the control circuit. This de-energizes K2. The heat relays sequence the elements off. The blower motor is the last to cycle off.

COOLING DEMAND

- 14 - On a cooling demand, (K1) Indoor Blower Relay is energized. N.O. K1 contacts close to energize blower motor on higher speed.

FIGURE 10