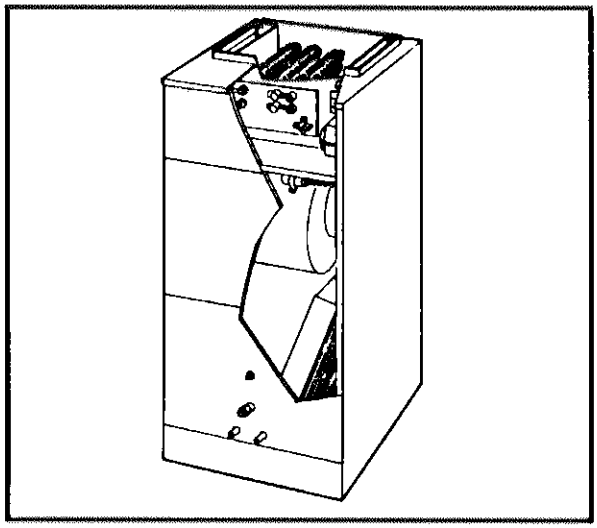
CB19 SERIES UNITS
INCLUDING CB19, CBH19 and B19 / CH19 SERIES BLOWER COILS and ECB19 ELECTRIC HEAT

The CB19 is a high efficiency residential split system blower/coil featuring new RFCIII™ refrigerant flow control device. Several models are available in sizes ranging from 1-1/2 through 5 tons. The units come with factory installed RFCIII refrigerant flow control device in the indoor unit. RFCIII eliminates the need for expansion valve or check valve. RFCIII is designed for matchups to the HP19 heat pump only. When CB19 series units are matched with units other than HP19, field installed expansion valve and check valve must be used. Field installed expansion valve and check valve may also be used in place of RFCIII when CB19 is matched to HP19.

All specifications in this manual are subject to change.



SPECIFICATIONS

Model No.		CB19-21	CBH19-21	CB19-26	CBH19-26	CB19-31	CBH19-31
Indoor Coil	Net face area (sq.ft.)	4.22	4.22	4.22	4.22	5.27	5.27
	Tube diameter (in.) & no. of rows	3/8 - 3	3/8 - 3	3/8 - 3	3/8 - 3	3/8 - 3	3/8 - 3
	Fins per inch	12	12	12	12	13	13
	Vapor line connection (in.) - flare	5/8	5/8	5/8	5/8	3/4	3/4
	Liquid line connection (in.) - flare	3/8	3/8	3/8	3/8	3/8	3/8
Condensate drain (mpt) in.		(2) 3/4	(2) 3/4	(2) 3/4	(2) 3/4	(2) 3/4	(2) 3/4
Nominal cooling capacity (tons)		1-1/2		2		2-1/2	
Refrigerant		R-22		R-22		R-22	
Blower wheel nominal diameter x width (in.)		9 x 7		9 x 8		10 x 7	
Blower motor hp		1/10		1/5		1/3	
Electrical characteristics		208/230 volts -- 60 hertz -- All models					

Model No.		CB19-41	CBH19-41	CB19-51	CBH19-51	CB19-65	CBH19-65
Indoor Coil	Net face area (sq.ft.)	5.27	5.27	7.0	7.22	7.0	7.22
	Tube diameter (in.) & no. of rows	3/8 - 3	3/8 - 3	3/8 - 3	3/8 - 3	3/8 - 3	3/8 - 3
	Fins per inch	13	13	14	14	14	14
	Vapor line connection (in.) - flare	3/4	3/4	3/4	3/4	1-1/8 sweat	1-1/8 sweat
	Liquid line connection (in.) - flare	3/8	3/8	3/8	3/8	3/8	3/8
Condensate drain (mpt) in.		(2) 3/4	(2) 3/4	(2) 3/4	(2) 3/4	(2) 3/4	(2) 3/4
Nominal cooling capacity (tons)		3		4		5	
Refrigerant		R-22		R-22		R-22	
Blower wheel nominal diameter x width (in.)		10 x 9		11.8 x 8		12 x 9	
Blower motor hp		1/3		1/3		1/2	
Electrical characteristics		208/230 v-60 hz-1 ph		208/230 v-60 hz-1 ph or 460 v-60 hz-1 ph			

CB19-21 AND CBH19-21 BLOWER PERFORMANCE

External Static Pressure (in. wg.)	Air Volume (cfm) @ Various Speeds		
	High	Medium	Low
0	855	630	530
.05	830	625	525
.10	800	620	520
.15	765	610	515
.20	730	595	505
.25	685	570	490
.30	640	535	465
.40	525	425	365

CB19-26 AND CBH19-26 BLOWER PERFORMANCE

External Static Pressure (in. wg.)	Air Volume (cfm) @ Various Speeds		
	High	Medium	Low
0	1150	1020	870
.05	1105	985	860
.10	1065	955	850
.15	1020	920	825
.20	960	875	795
.25	905	830	755
.30	845	780	710
.40	680	625	550

CB19-31 AND CBH19-31 BLOWER PERFORMANCE

External Static Pressure (in. wg.)	Air Volume (cfm) @ Various Speeds		
	High	Medium	Low
0	1400	1270	1050
.05	1370	1250	1050
.10	1335	1220	1050
.15	1290	1190	1040
.20	1240	1150	1025
.25	1190	1110	1000
.30	1130	1060	970
.40	1000	945	885
.50	855	815	765

CB19-41 AND CBH19-41 BLOWER PERFORMANCE

External Static Pressure (in. wg.)	Air Volume (cfm) @ Various Speeds		
	High	Medium	Low
0	1630	1380	1130
.05	1590	1370	1150
.10	1550	1350	1160
.15	1500	1330	1160
.20	1450	1310	1160
.25	1400	1270	1150
.30	1340	1230	1130
.40	1200	1130	1050
.50	1010	960	890

CB19-51 AND CBH19-51 BLOWER PERFORMANCE WITH 208/230 VOLT MOTOR

External Static Pressure (in. wg.)	Air Volume (cfm) @ Various Speeds		
	High	Medium	Low
0	1950	1640	1380
.05	1910	1620	1370
.10	1870	1600	1350
.15	1830	1580	1330
.20	1780	1550	1310
.25	1730	1520	1290
.30	1680	1490	1260
.40	1570	1400	1200
.50	1410	1280	1100

CB19-51 AND CBH19-51 BLOWER PERFORMANCE WITH 460 VOLT (1 Phase) MOTOR

External Static Pressure (in. wg.)	Air Volume (cfm) @ Various Speeds	
	High	Low
0	2020	1630
.05	1950	1610
.10	1920	1600
.15	1870	1570
.20	1820	1540
.25	1770	1500
.30	1710	1460
.40	1590	1350
.50	1430	1250

CB19-65 AND CBH19-65 BLOWER PERFORMANCE WITH 208/230 VOLT MOTOR

External Static Pressure (in. wg.)	Air Volume (cfm) @ Various Speeds		
	High	Medium	Low
0	2415	2205	1830
.05	2360	2165	1815
.10	2305	2125	1800
.15	2245	2085	1780
.20	2185	2040	1760
.25	2130	2000	1735
.30	2070	1950	1705
.40	1940	1845	1630
.50	1810	1725	1540
.60	1665	1585	1405

CB19-65 AND CBH19-65 BLOWER PERFORMANCE WITH 460 VOLT (1 Phase) MOTOR

External Static Pressure (in. wg.)	Air Volume (cfm) @ Various Speeds	
	High	Low
0	2380	2250
.05	2340	2180
.10	2290	2140
.15	2250	2110
.20	2190	2065
.25	2130	2015
.30	2075	1970
.40	1945	1860
.50	1820	1760

NOTE-All CFM measured external to unit.
NOTE-Electric heaters have no appreciable air resistance. For optional upflow air filter resistance see Engineering Handbook.

I-APPLICATION

CB19 series includes several different models. CB19's are field convertible upflow or downflow units. CBH19's are horizontal flow units only. CBH19-51 & 65 units are available with blower and coil in separate cabinets. The B19-51 & 65 portion includes a blower and controls only in an individual cabinet. The CH19-51 & 65 includes a RFCIII coil only in an individual cabinet.

All major components (indoor blower / coils) must be matched according to Lennox recommendations for the compressor to be covered under warranty. Refer to the Engineering Handbook for approved system matchups. A misapplied system will cause erratic operation and can result in early compressor failure.

A-Unit Matchups

RFCIII is not approved for all matchups. Approved matchups which may use RFCIII are discussed in the RFCIII section of this manual. Matchups not approved for RFCIII must use an expansion valve. Also, expansion valve may be substituted in all matchups approved for RFCIII. RFCIII to expansion valve changeover is covered in more detail in the RFCIII section of this manual.

II-UNIT COMPONENTS

B19 and CB19 control box is shown in figures 1, 2 and 3. Optional electric heat fits through an opening located in the center of the control box. Filler plates cover this opening when no electric heat is used. Electric heat control arrangement is detailed in the electric heat section of this manual.

A-Transformer

All CB19 series units use a single line voltage to 24VAC transformer mounted in the control box. The transformer supplies power to the control circuits in the indoor and outdoor unit. Transformers are rated at 70VA. 208/240 (P) voltage transformers use two primary voltage taps as shown in figure 4.

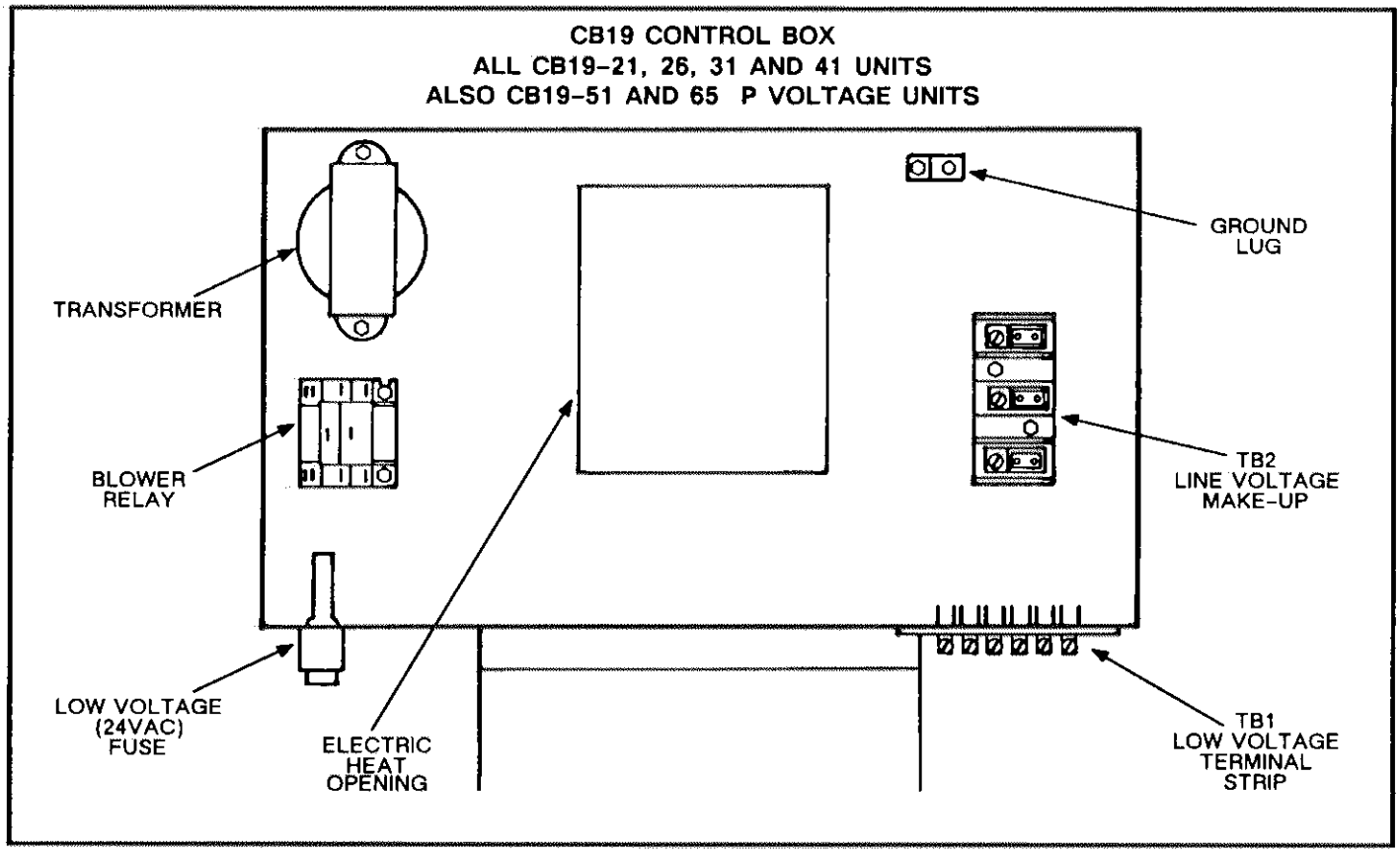


FIGURE 1

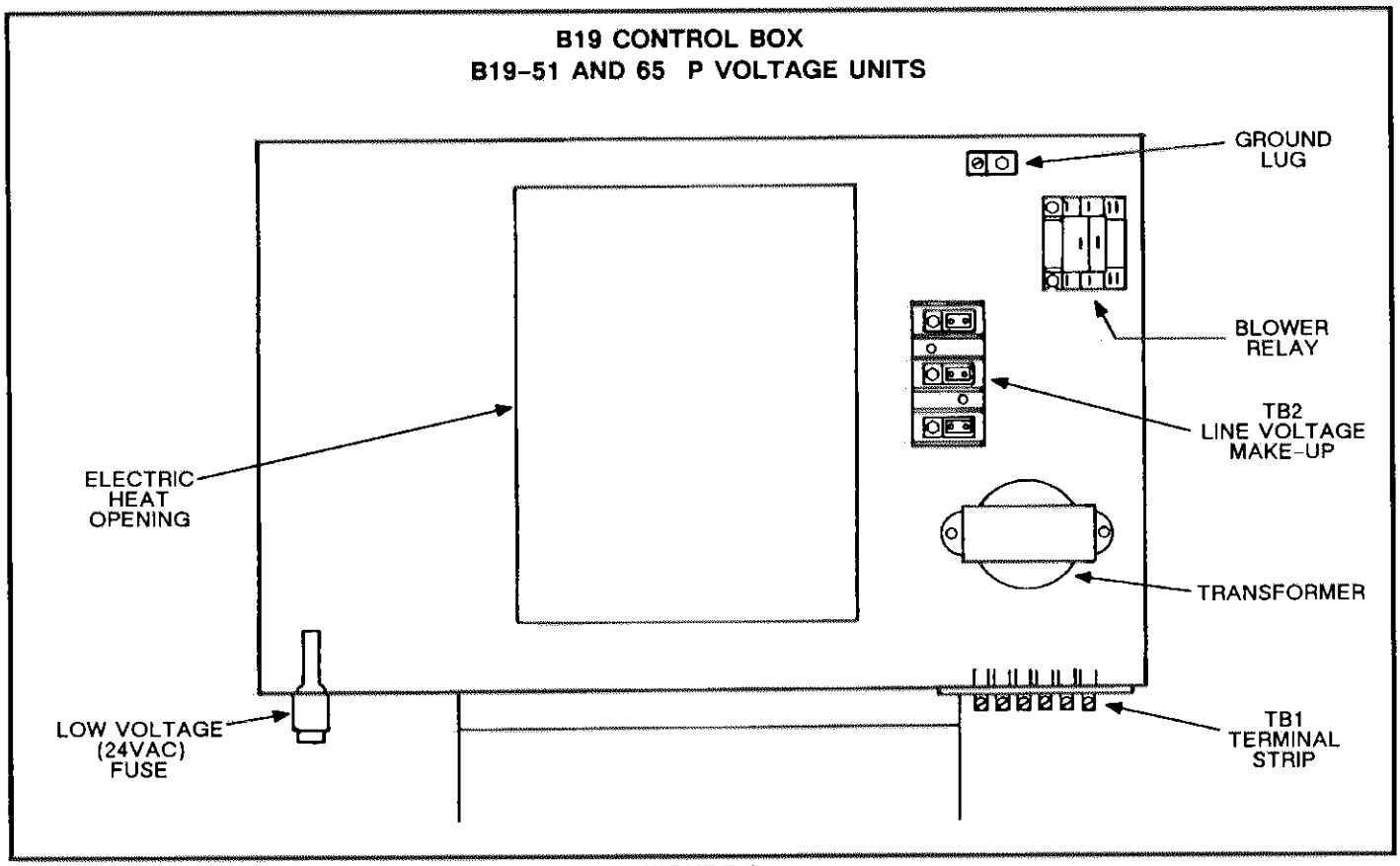


FIGURE 2

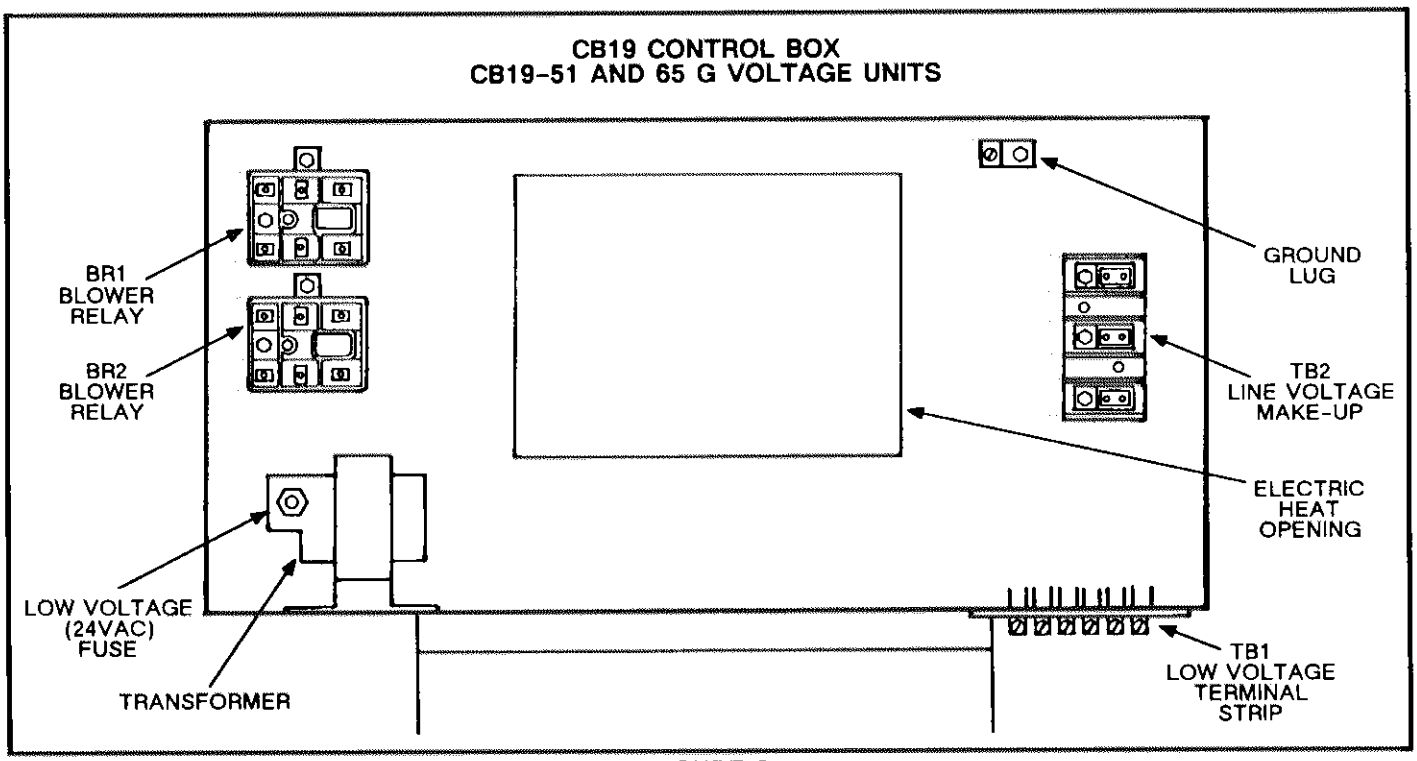


FIGURE 3

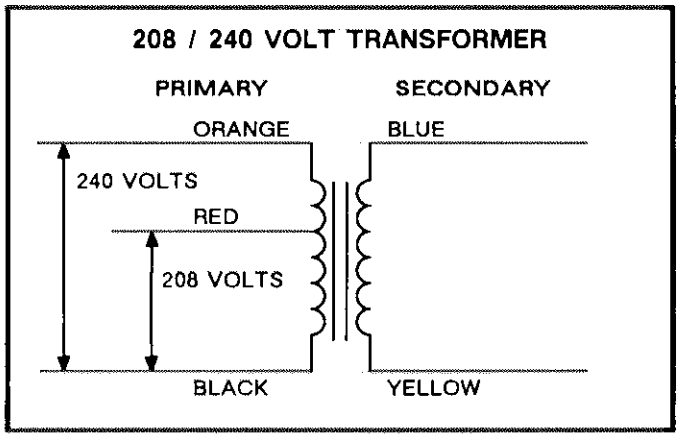


FIGURE 4

480 (G) voltage transformers are equipped with an integral fuse connected in series with the blue secondary voltage wire. The fuse may be accessed outside the transformer and is rated 3.5A.

B-Transformer Fuse

208/240 (P) voltage transformers are not equipped with internal secondary voltage overcurrent protection. Units equipped with P voltage transformers use a separate fuse located in the unit control box. The fuse is connected in series with the blue secondary voltage wire and is rated 3.2A at 300V.

C-Blower Relay

P voltage units use a single DPDT relay to energize the blower motor. The relay coil is energized by blower demand from indoor thermostat. When the coil is energized, a set of N.O. contacts closes to energize the blower motor on high speed. When de-energized, a set of N.C. contacts allows the optional electric heat relay to energize the blower on electric heating speed (refer to unit wiring diagram).

G voltage units use two SPST relays to energize the blower motor (refer to unit wiring diagram). The first blower relay (K1 or BR1) is used to directly energize the second blower relay (K2 or BR2). The first relay is energized by blower demand from the indoor thermostat. When the first relay coil is energized, a set of N.O. contacts closes to energize the second relay. When the second relay is energized, N.O. contacts 6-3 close to energize the blower on high speed and contacts 1-2 open to disconnect the low speed motor wiring. When indoor blower demand stops, both relays are de-energized. Second relay contacts 6-3 open to de-energize the blower motor and contacts 1-2 close to allow the optional electric heat relay to energize the blower on electric heating speed.

D-Terminal Strip

All CB19, CBH19 and B19 units are equipped with a low voltage terminal strip located in the control box. The strip is used for making up all indoor thermostat and outdoor unit low voltage wiring connections (see figures 1, 2 and 3).

E-Blower / Motor

All CB19 series units use single phase PSC blower motors. A single run capacitor is mounted on the blower housing. All motors use multiple speed taps. Typically, the high speed tap is energized during compressor operation and a lower speed tap is energized during electric heat operation.

Blower motors in P voltage units have three speed taps and motors in G voltage units have two speed taps. Blower motor specifications are listed in table 1. Blower specifications are listed in the tables on pages 1 and 2.

A third tap (blue) on G voltage motors is used for internal wiring during low speed operation and must not be connected to line voltage. During low speed (red tap) operation, the high speed (black) tap is disconnected from line voltage and is connected to the blue internal wiring tap (see figure 5).

TABLE 1

BLOWER MOTOR - 825 RPM - CCW ROTATION				
Unit	**Volts**	**Phase**	**HP**	**FLA**
CB19/CBH19-21	208/230	1	1/10	.7
CB19/CBH19-26	208/230	1	1/5	1.4
CB19/CBH19-31	208/230	1	1/3	1.9
CB19/CBH19-41	208/230	1	1/3	1.9
CB19/B19-51	208/230	1	1/3	2.4
CB19/B19-51	460	1	1/3	1.3
CB19/B19-65	208/230	1	1/2	4.4
CB19/B19-65	460	1	1/2	1.9

All units are factory wired for the proper blower speed in both heat pump and cooling applications with or without electric heat. No field wiring is required. Table 2 shows the factory set blower speeds. All speeds shown are minimums. Do not change motor taps to operate at speeds lower than those shown in table 2.

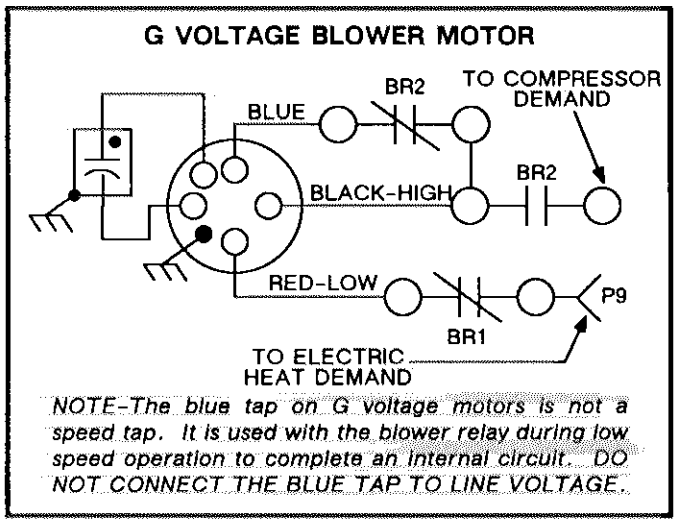


FIGURE 5

TABLE 2

Unit	FACTORY SET BLOWER SPEED	
	Compressor Operation with or without Electric Heat	Electric Heat Operation Only
P voltage	High	Medium
G voltage	High	Low

F-Capacitor

All CB19 series units use single phase PSC motors. The run capacitor is mounted on the blower housing. Capacitor ratings are shown in table 3.

TABLE 3

Unit	Capacitor Rating
CB19-21 & 26 CBH19-21 & 26	5 MFD at 370 V
CB19-31 & 41 CBH19-31 & 41	15 MFD at 370 V
B19-51 & 65 CB19-51 & 65 CBH19-51 & 65	20 MFD at 370 V

G-Coil

All CB19 series units have dual coils arranged in an 'V' configuration. Each coil has three rows of copper tubes fitted with ripple-edged aluminum fins. An expansion distributor feeds multiple parallel circuits through the coils.

H-RFCIII Flow Control Device

RFCIII is a primary expansion mechanism eliminating the need for an expansion valve or check valve. It controls the flow of refrigerant through the coil in both cooling and heating modes.

1- RFCIII Matchups

Even though RFCIII is factory installed in all CB19 series units, it is not applicable to all CB19 matchups. Applicable matchups are shown in table 4. All other matchups, as shown in table 4, must use an expansion valve.

TABLE 4

Matchup		Expansion	Orifice I.d.
Blower Coil	Heat Pump	Device	inches
CB19-21 CBH19-21	HP19-211	RFCIII	.055
CB19-26 CBH19-26	HP19-261	RFCIII	.061
CB19-31 CBH19-31	HP19-311	RFCIII	.067
CB19-41 CBH19-41	HP19-411	RFCIII	.071
CB19-51 B19/CH19-51	HP19-461	RFCIII	.079*
CB19-51 B19/CH19-51	HP19-511	RFCIII	.085
CB19-65 B19/CH19-65	HP19-651	RFCIII	.098
ALL OTHER MATCHUPS		EXPANSION VALVE	ORIFICE REMOVED

*SHIPPED IN B19/CB19-51 BAG ASSEMBLY AND FIELD INSTALLED

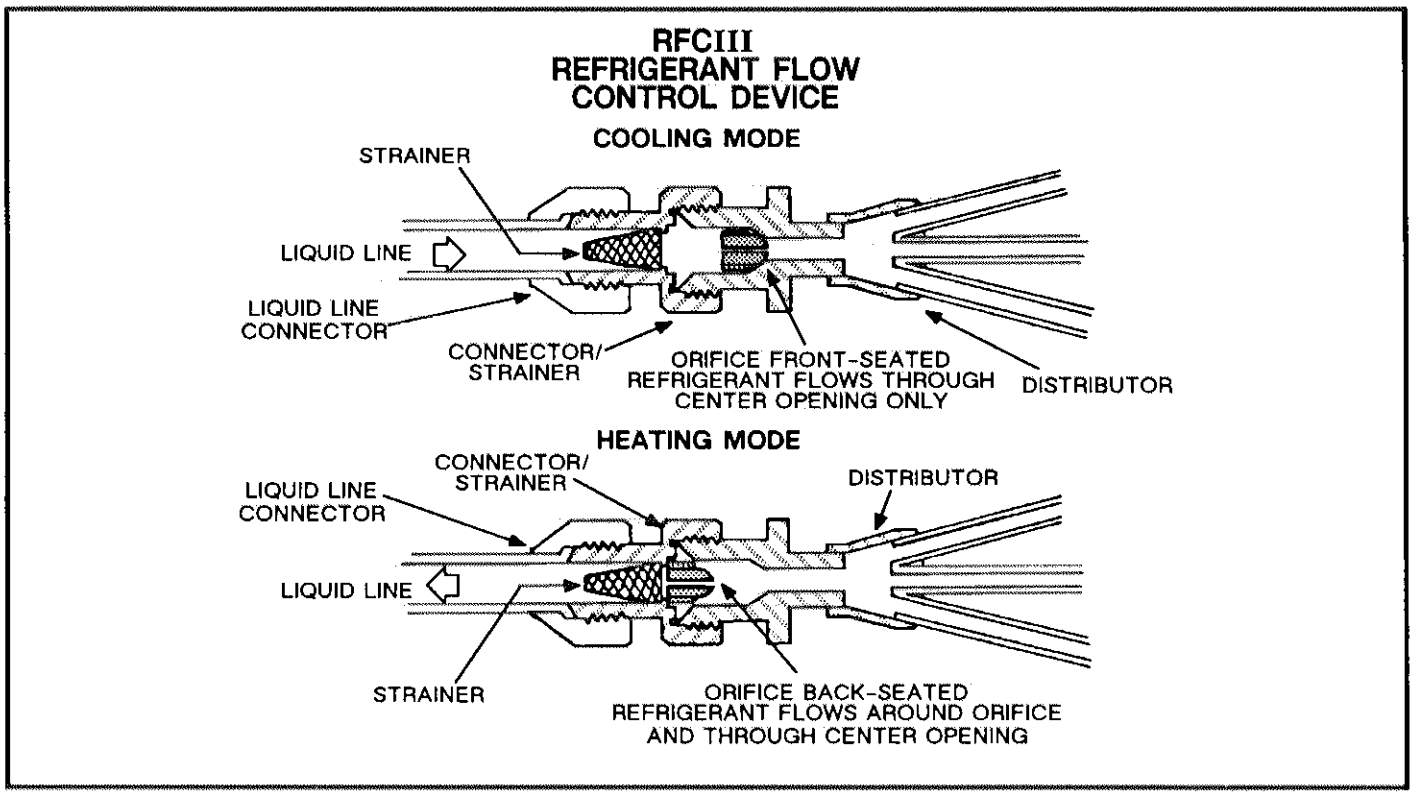


FIGURE 6

2-Operation

RFCIII components are shown in figure 6. Refrigerant flows through the RFCIII in both cooling and heating modes. During cooling mode, refrigerant flow front-seats the orifice forcing liquid refrigerant to pass through the center of the orifice. The orifice restricts refrigerant flow facilitating expansion. As the liquid exits the orifice into the distributor, it expands and evaporates. During heating mode, refrigerant flow back-seats the orifice. When the orifice is back-seated, refrigerant flow is allowed to pass around and through the orifice unrestricted.

A screen type strainer in the liquid line connector prohibits debris from entering the orifice chamber during cooling mode. If the refrigerant system is opened for service, the liquid line connector should be removed and the strainer cleaned.

The orifice inside diameter is critical to proper RFCIII operation. The orifice is sized specifically to the CB19/HP19 matchup. Table 4 shows the orifice i.d. required for each matchup. Orifice i.d. is stamped on the outside of the orifice as shown in figure 7.

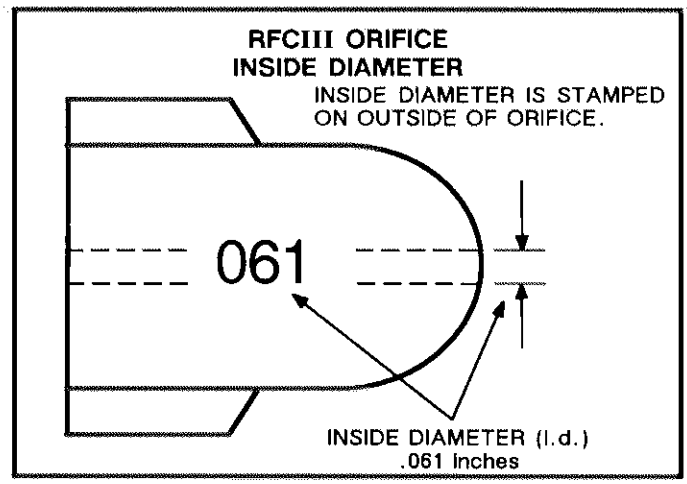


FIGURE 7

3- Connecting an Expansion Valve

The components used in RFCIII systems are shown in figure 8. If an expansion valve is used, the same components shown in figure 8 are used *but the orifice must be removed* (see figure 9). RFCIII liquid line connector/strainer and distributor are left in place and the liquid line connects to the expansion valve check valve. When RFCIII is used as an expansion device (figure 8), the orifice is left in place and the liquid line connects to the liquid line connector/strainer.

RFCIII REFRIGERANT FLOW CONTROL DEVICE

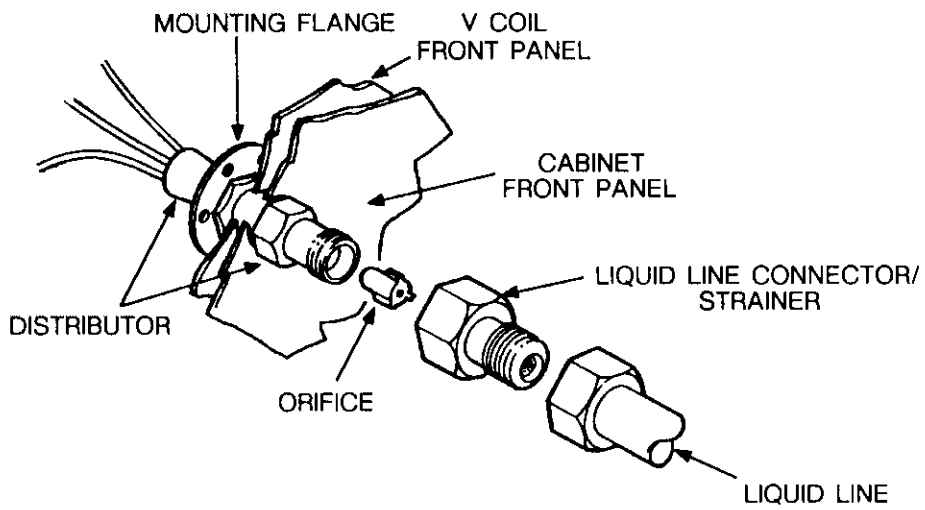


FIGURE 8

FIELD CONVERSION
RFCIII TO EXPANSION VALVE

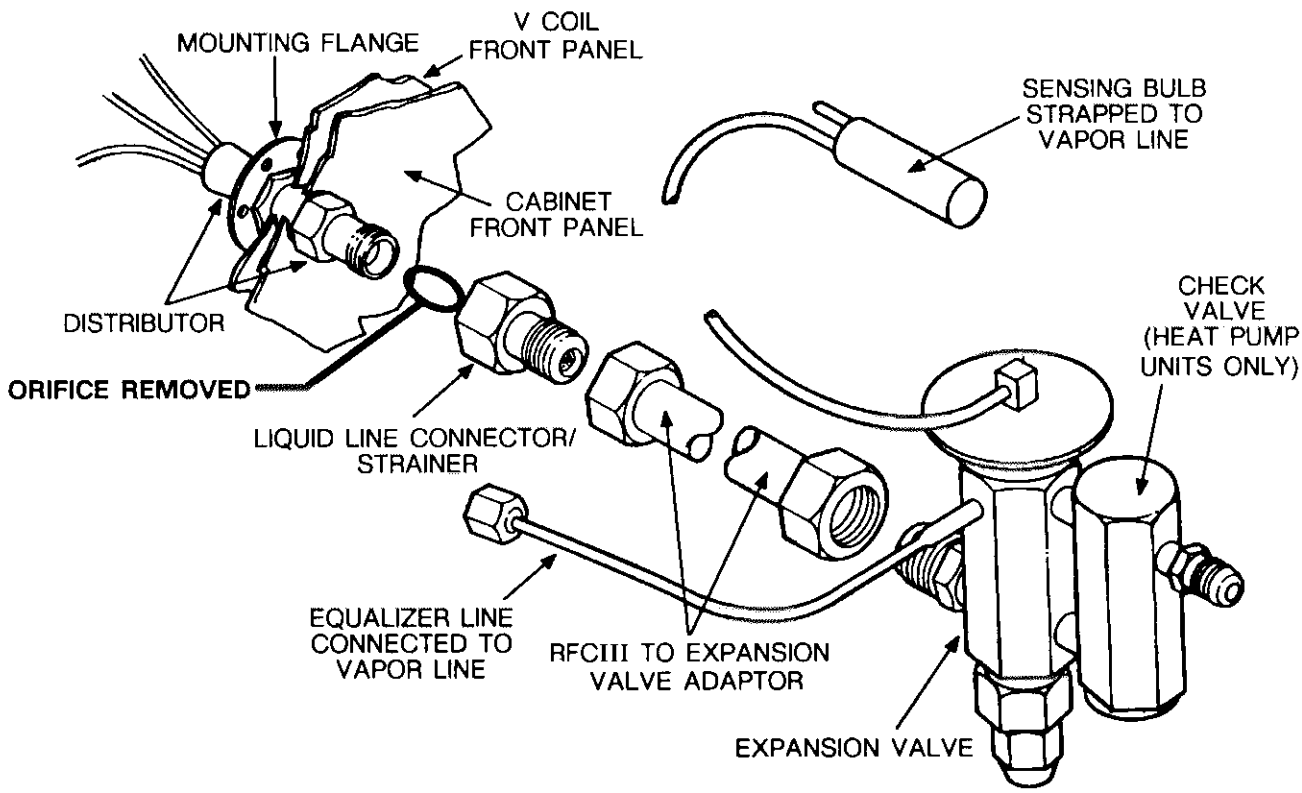


FIGURE 9

III-OPTIONAL ECB19 ELECTRIC HEAT

A-Matchups and Ratings

The following tables (tables 5, 6, 7 and 8) show all possible CB19 to ECB19 matchups. Also shown in the tables are ECB19 electrical ratings.

CB19 & CBH19 - 21 & 26
OPTIONAL ELECTRIC HEAT DATA (TABLE 5)

Blower-Coil Unit Model No.	Electric Heat Unit Model No.	No. of Steps & phase	Volts Input	kw Input	Btuh Input	*Minimum Circuit Ampacity	
						Circuit 1	Circuit 2
CB19-21 CBH19-21	ECB19-2.5	1 step 1 phase	208	1.9	6,400	12.3	----
			220	2.1	7,200	12.8	----
			230	2.3	7,800	13.4	----
			240	2.5	8,500	13.9	----
	ECB19-5	1 step 1 phase	208	3.8	12,800	23.5	----
			220	4.2	14,300	24.8	----
			230	4.6	15,700	25.9	----
			240	5.0	17,100	26.9	----
	ECB19-6	2 steps 1 phase	208	4.5	15,400	28.0	----
			220	5.0	17,200	29.3	----
			230	5.5	18,800	30.9	----
			240	6.0	20,500	32.2	----
	ECB19-7	2 steps 1 phase	208	5.3	17,900	32.5	----
			220	5.9	20,100	34.4	----
			230	6.4	21,900	35.8	----
			240	7.0	23,900	37.4	----
	ECB19-8	2 steps 1 phase	208	6.0	20,500	37.0	----
			220	6.7	22,900	39.0	----
			230	7.3	25,100	40.8	----
			240	8.0	27,300	42.6	----
	ECB19-10	2 steps 1 phase	208	7.5	25,600	45.9	----
			220	8.4	28,700	48.6	----
			230	9.2	31,400	50.8	----
			240	10.0	34,100	53.0	----
CB19-26 CBH19-26	ECB19-2.5	1 step 1 phase	208	1.9	6,400	13.2	----
			220	2.1	7,200	13.7	----
			230	2.3	7,800	14.3	----
			240	2.5	8,500	14.8	----
	ECB19-5	1 step 1 phase	208	3.8	12,800	24.4	----
			220	4.2	14,300	25.7	----
			230	4.6	15,700	26.8	----
			240	5.0	17,100	27.8	----
	ECB19-6	2 steps 1 phase	208	4.5	15,400	28.9	----
			220	5.0	17,200	30.2	----
			230	5.5	18,800	31.8	----
			240	6.0	20,500	33.7	----
	ECB19-7	2 steps 1 phase	208	5.3	17,900	33.4	----
			220	5.9	20,100	35.3	----
			230	6.4	21,900	36.7	----
			240	7.0	23,900	38.3	----
	ECB19-8	2 steps 1 phase	208	6.0	20,500	37.9	----
			220	6.7	22,900	39.9	----
			230	7.3	25,100	41.7	----
			240	8.0	27,300	43.4	----
	ECB19-10	2 steps 1 phase	208	7.5	25,600	46.8	----
			220	8.4	28,700	49.5	----
			230	9.2	31,400	51.7	----
			240	10.0	34,100	53.9	----
	ECB19-12.5	3 steps 1 phase	208	9.4	32,000	39.4	18.9
			220	10.5	35,800	41.2	19.9
			230	11.5	39,200	43.4	20.8
			240	12.5	42,600	45.2	21.8
	ECB19-15	3 steps 1 phase	208	11.3	38,400	46.9	22.7
			220	12.6	43,000	49.1	23.9
			230	13.5	47,000	51.7	25.0
			240	15.0	51,200	53.9	26.0

*Refer to National Electrical Code manual to determine wire, fuse and disconnect size requirements. Use wires suitable for at least 167°F.

CB19 & CBH19 - 31 & 41
OPTIONAL ELECTRIC HEAT DATA (TABLE 6)

Blower-Coil Unit Model No.	Electric Heat Unit Model No.	No. of Steps & phase	Volts Input	kw Input	Btuh Input	*Minimum Circuit Ampacity	
						Circuit 1	Circuit 2
CB19-31 CBH19-31 CB19-41 CBH19-41	ECB19-5	1 step 1 phase	208	3.8	12,800	25.0	----
			220	4.2	14,300	26.3	----
			230	4.6	15,700	27.4	----
			240	5.0	17,100	28.4	----
CB19-41 CBH19-41	ECB19-5	3 steps 3 phase	208	3.8	12,800	15.4	----
			220	4.2	14,300	16.2	----
			230	4.6	15,700	16.8	----
			240	5.0	17,100	17.4	----
CB19-31 CBH19-31	ECB19-6	2 steps 1 phase	208	4.5	15,400	29.5	----
			220	5.0	17,200	30.8	----
			230	5.5	18,800	32.4	----
			240	6.0	20,500	33.7	----
CB19-41 CBH19-41	ECB19-7	2 steps 1 phase	208	5.3	17,900	34.0	----
			220	5.9	20,100	35.9	----
			230	6.4	21,900	37.3	----
			240	7.0	23,900	38.9	----
CB19-41 CBH19-41	ECB19-7.5	3 steps 3 phase	208	5.6	19,200	21.9	----
			220	6.3	21,500	23.0	----
			230	6.9	23,500	24.0	----
			240	7.5	25,600	24.9	----
CB19-31 CBH19-31	ECB19-8	2 steps 1 phase	208	6.0	20,500	38.5	----
			220	6.7	22,900	40.5	----
			230	7.3	25,100	43.3	----
			240	8.0	27,300	44.0	----
CB19-41 CBH19-41	ECB19-10	2 steps 1 phase	208	7.5	25,600	47.4	----
			220	8.4	28,700	50.1	----
			230	9.2	31,400	52.3	----
			240	10.0	34,100	54.5	----
CB19-41 CBH19-41	ECB19-10	3 steps 3 phase	208	7.5	25,600	28.4	----
			220	8.4	28,700	29.9	----
			230	9.2	31,400	31.3	----
			240	10.0	34,100	32.5	----
CB19-31 CBH19-31	ECB19-12.5	3 steps 1 phase	208	9.4	32,000	40.0	18.9
			220	10.5	35,800	42.2	19.9
			230	11.5	39,200	44.0	20.8
			240	12.5	42,600	45.8	21.8
CB19-41 CBH19-41	ECB19-15	3 steps 1 phase	208	11.3	38,400	47.5	22.7
			220	12.6	43,000	50.1	23.9
			230	13.5	47,000	52.3	25.0
			240	15.0	51,200	54.5	26.0
CB19-41 CBH19-41	ECB19-15	3 steps 3 phase	208	11.3	38,400	41.5	----
			220	12.6	43,000	43.7	----
			230	13.5	47,000	45.7	----
			240	15.0	51,200	47.5	----
	ECB19-20	3 steps 1 phase	208	15.0	51,200	47.4	45.0
			220	16.8	57,300	50.1	47.8
			230	18.4	62,700	52.3	49.9
			240	20.0	68,200	54.5	52.2

*Refer to National Electrical Code manual to determine wire, fuse and disconnect size requirements. Use wires suitable for at least 167°F.

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OPTIONAL ELECTRIC HEAT DATA (TABLE 7)

Blower-Coil Unit Model No.	Electric Heat Unit Model No.	No. of Steps & phase	Volts Input	kw Input	Btuh Input	*Minimum Circuit Ampacity		
						Circuit 1	Circuit 2	Circuit 3
CB19-51 CBH19-51	ECB19-5	1 step 1 phase	208	3.8	12,800	25.7	----	----
			220	4.2	14,300	26.9	----	----
			230	4.6	15,700	28.0	----	----
			240	5.0	17,100	29.0	----	----
	ECB19-6	2 step 1 phase	208	4.5	15,400	30.2	----	----
			220	5.0	17,100	31.4	----	----
			230	5.5	18,800	33.0	----	----
			240	6.0	20,500	34.3	----	----
	ECB19-7	2 step 1 phase	208	5.3	17,900	34.7	----	----
			220	5.9	20,100	36.6	----	----
			230	6.4	21,900	37.9	----	----
			240	7.0	23,900	39.5	----	----
	ECB19-7	3 step 3 phase	440	5.9	20,100	11.3	----	----
			460	6.4	21,900	11.7	----	----
			480	7.0	25,900	12.2	----	----
	ECB19-7.5	3 step 3 phase	208	5.6	19,200	22.5	----	----
			220	6.3	21,500	23.7	----	----
			230	6.9	23,500	24.7	----	----
			240	7.5	25,600	25.5	----	----
	ECB19-8	2 step 1 phase	208	6.0	20,500	39.2	----	----
			220	6.7	22,900	41.1	----	----
			230	7.3	25,100	42.9	----	----
			240	8.0	27,300	44.7	----	----
	ECB19-10	2 step 1 phase	208	7.5	25,600	48.0	----	----
			220	8.4	28,700	50.8	----	----
			230	9.2	31,400	52.9	----	----
			240	10.0	34,100	55.2	----	----
	ECB19-10	3 step 3 phase	208	7.5	25,600	29.0	----	----
			220	8.4	28,700	30.6	----	----
			230	9.2	31,400	31.9	----	----
			240	10.0	34,100	33.2	----	----
	ECB19-10	3 step 3 phase	440	8.4	28,700	15.4	----	----
			460	9.2	31,400	16.1	----	----
			480	10.0	34,100	16.7	----	----
	ECB19-12.5	3 step 1 phase	208	9.4	32,000	40.7	18.9	----
			220	10.5	35,800	42.8	19.9	----
			230	11.5	39,200	44.7	20.8	----
			240	12.5	42,600	46.4	21.8	----
	ECB19-15	3 step 1 phase	208	11.3	38,400	48.2	22.7	----
			220	12.6	43,000	50.8	23.9	----
			230	13.5	47,000	52.9	25.0	----
			240	15.0	51,200	55.2	26.0	----
	ECB19-15	3 step 3 phase	208	11.3	38,400	42.2	----	----
			220	12.6	43,000	44.3	----	----
			230	13.5	47,000	46.3	----	----
			240	15.0	51,200	48.2	----	----
	ECB19-15	3 step 3 phase	440	12.6	43,000	22.3	----	----
			460	13.8	47,000	23.3	----	----
			480	15.0	51,200	24.2	----	----
	ECB19-20	4 steps 1 phase	208	15.0	51,200	48.0	45.0	----
			220	16.8	57,300	50.8	47.8	----
			230	18.4	62,700	52.9	49.9	----
			240	20.0	68,200	55.2	52.2	----
	ECB19-20	6 steps 3 phase	208	15.0	51,200	29.0	26.0	----
			220	16.8	57,300	30.6	27.6	----
			230	18.4	62,700	31.9	28.4	----
			240	20.0	68,200	33.2	30.2	----
	ECB19-20	6 steps 3 phase	440	16.8	57,300	29.2	----	----
			460	18.4	62,700	30.5	----	----
			480	20.0	68,200	31.7	----	----
	ECB19-25	5 steps 1 phase	208	18.8	64,100	48.0	45.0	22.7
			220	21.0	71,700	50.8	47.8	23.9
			230	23.0	78,300	52.9	49.9	25.0
			240	25.0	85,300	55.2	52.2	26.0

*Refer to National Electrical Code manual to determine wire, fuse and disconnect size requirements. Use wires suitable for at least 167°F.

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OPTIONAL ELECTRIC HEAT DATA (TABLE 8)

Blower-Coil Unit Model No.	Electric Heat Unit Model No.	No. of Steps & phase	Volts Input	kw Input	Btuh Input	*Minimum Circuit Ampacity		
						Circuit 1	Circuit 2	Circuit 3
CB19-65 CBH19-65	ECB19-8	2 steps 1 phase	208	6.0	20,500	41.7	----	----
			220	6.7	22,900	43.6	----	----
			230	7.3	25,100	45.4	----	----
			240	8.0	27,300	47.2	----	----
	ECB19-10	2 steps 1 phase	208	7.5	25,600	50.5	----	----
			220	8.4	28,700	53.3	----	----
			230	9.2	31,400	55.4	----	----
			240	10.0	34,100	57.7	----	----
	ECB19-10	3 steps 3 phase	208	7.5	25,600	31.5	----	----
			220	8.4	28,700	33.1	----	----
			230	9.2	31,400	34.4	----	----
			240	10.0	34,100	35.7	----	----
	ECB19-10	3 steps 3 phase	440	8.4	28,700	16.2	----	----
			460	9.2	31,400	16.8	----	----
			480	10.0	34,100	17.4	----	----
	ECB19-12.5	3 steps 1 phase	208	9.4	32,000	43.2	18.9	----
			220	10.5	35,800	45.3	19.9	----
			230	11.5	39,200	47.2	20.8	----
			240	12.5	42,600	48.9	21.8	----
	ECB19-15	3 steps 1 phase	208	11.3	38,400	50.7	22.7	----
			220	12.6	43,000	53.3	23.9	----
			230	13.5	47,000	55.4	25.0	----
			240	15.0	51,200	57.7	26.0	----
	ECB19-15	3 steps 3 phase	208	11.3	38,400	44.7	----	----
			220	12.6	43,000	46.8	----	----
			230	13.5	47,000	48.8	----	----
			240	15.0	51,200	50.7	----	----
	ECB19-15	3 steps 3 phase	440	12.6	43,000	23.0	----	----
			460	13.5	47,000	24.0	----	----
			480	15.0	51,200	24.9	----	----
	ECB19-20	4 steps 1 phase	208	15.0	51,200	50.5	45.0	----
			220	16.8	57,300	53.3	47.8	----
			230	18.4	62,700	55.4	49.9	----
			240	20.0	68,200	57.7	52.2	----
	ECB19-20	6 steps 3 phase	208	15.0	51,200	31.5	26.0	----
			220	16.8	57,300	33.1	27.6	----
			230	18.4	62,700	34.4	28.9	----
			240	20.0	68,200	35.7	30.2	----
	ECB19-20	6 steps 3 phase	440	16.8	57,300	29.9	----	----
			460	18.4	62,700	31.2	----	----
			480	20.0	68,200	32.4	----	----
	ECB19-25	5 steps 1 phase	208	18.8	64,100	50.5	45.0	22.7
			220	21.0	71,700	53.3	47.8	23.9
			230	23.0	78,300	55.4	49.9	25.0
			240	25.0	85,300	57.7	52.2	26.0
	ECB19-25	6 steps 3 phase	208	18.8	64,100	38.2	32.7	----
			220	21.0	71,700	39.9	34.4	----
			230	23.0	78,300	41.5	36.0	----
			240	25.0	85,300	43.2	37.7	----
	ECB19-25	6 steps 3 phase	440	21.0	71,700	36.8	----	----
			460	23.0	78,300	38.4	----	----
			480	25.0	85,300	39.9	----	----
	ECB19-30	6 steps 1 phase	208	22.5	76,900	50.5	45.0	45.0
			220	25.2	86,000	53.3	47.8	47.8
			230	27.5	94,000	55.4	49.9	49.9
			240	30.0	102,400	57.7	52.2	52.2

*Refer to National Electrical Code manual to determine wire, fuse and disconnect size requirements. Use wires suitable for at least 167°F.

B-Electric Heat Components

ECB19 parts arrangement is shown in figures 10, 11, 12, 13 and 14. All ECB19 units consist of electric heating elements exposed directly to the airstream. Elements are sequenced on and off by heat relays in response to thermostat demand.

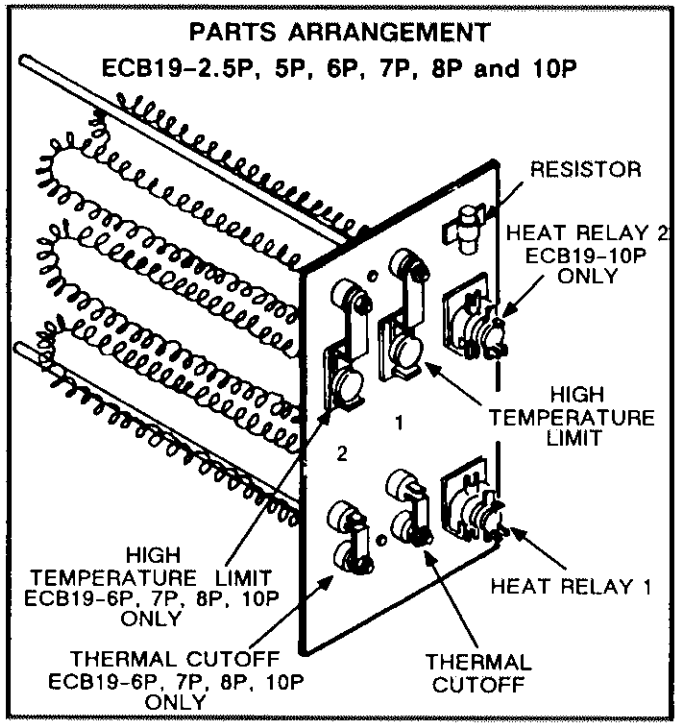


FIGURE 10

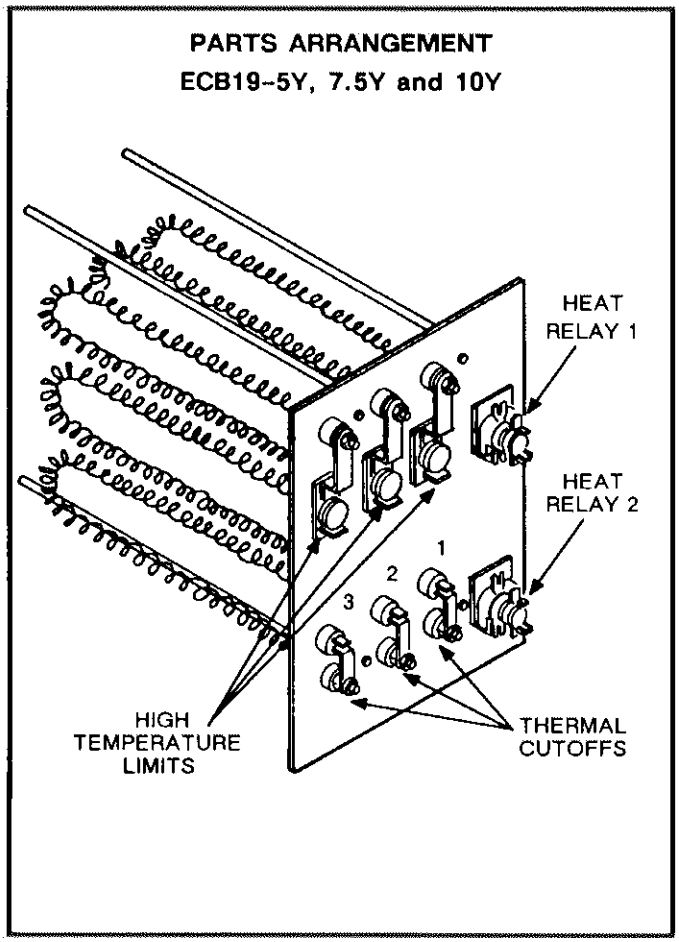


FIGURE 11

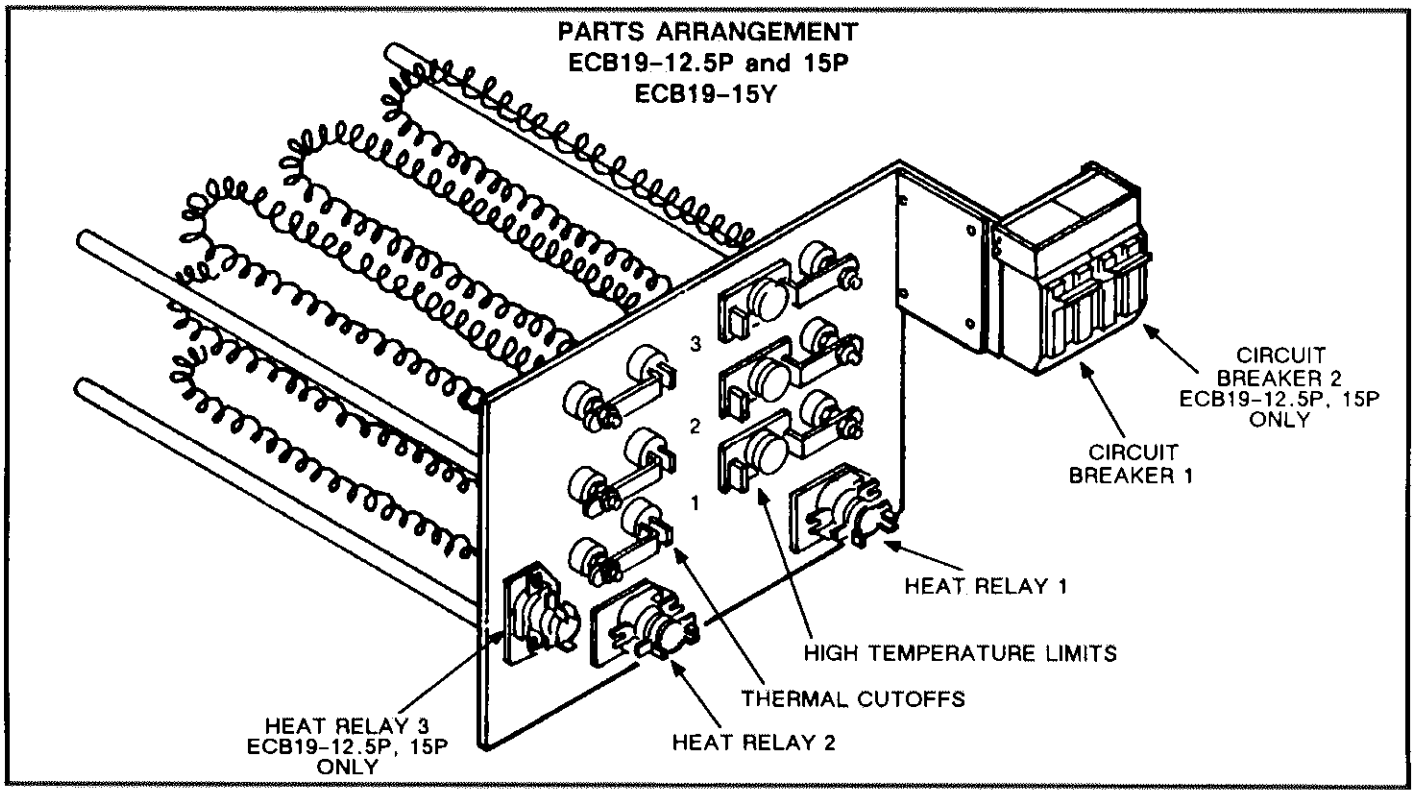


FIGURE 12

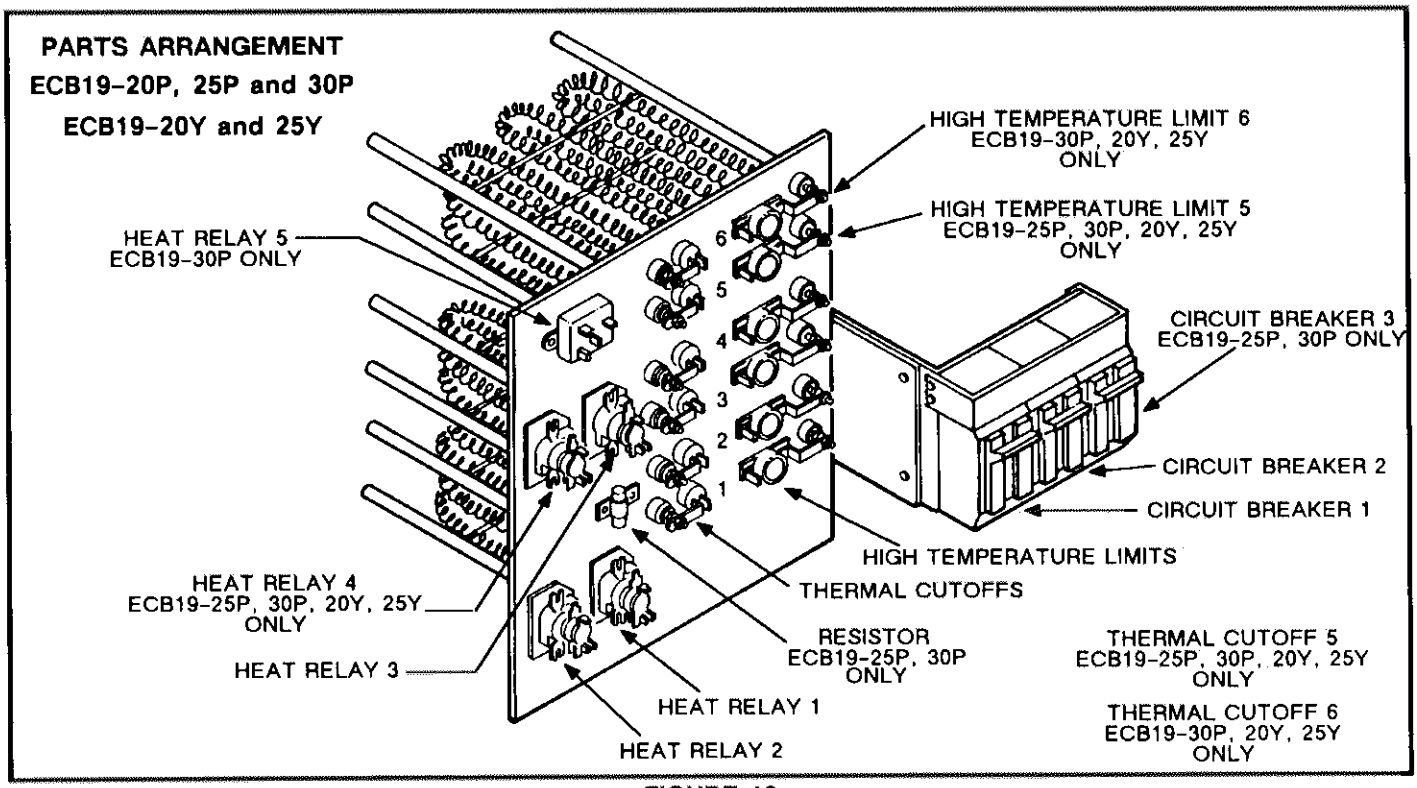


FIGURE 13

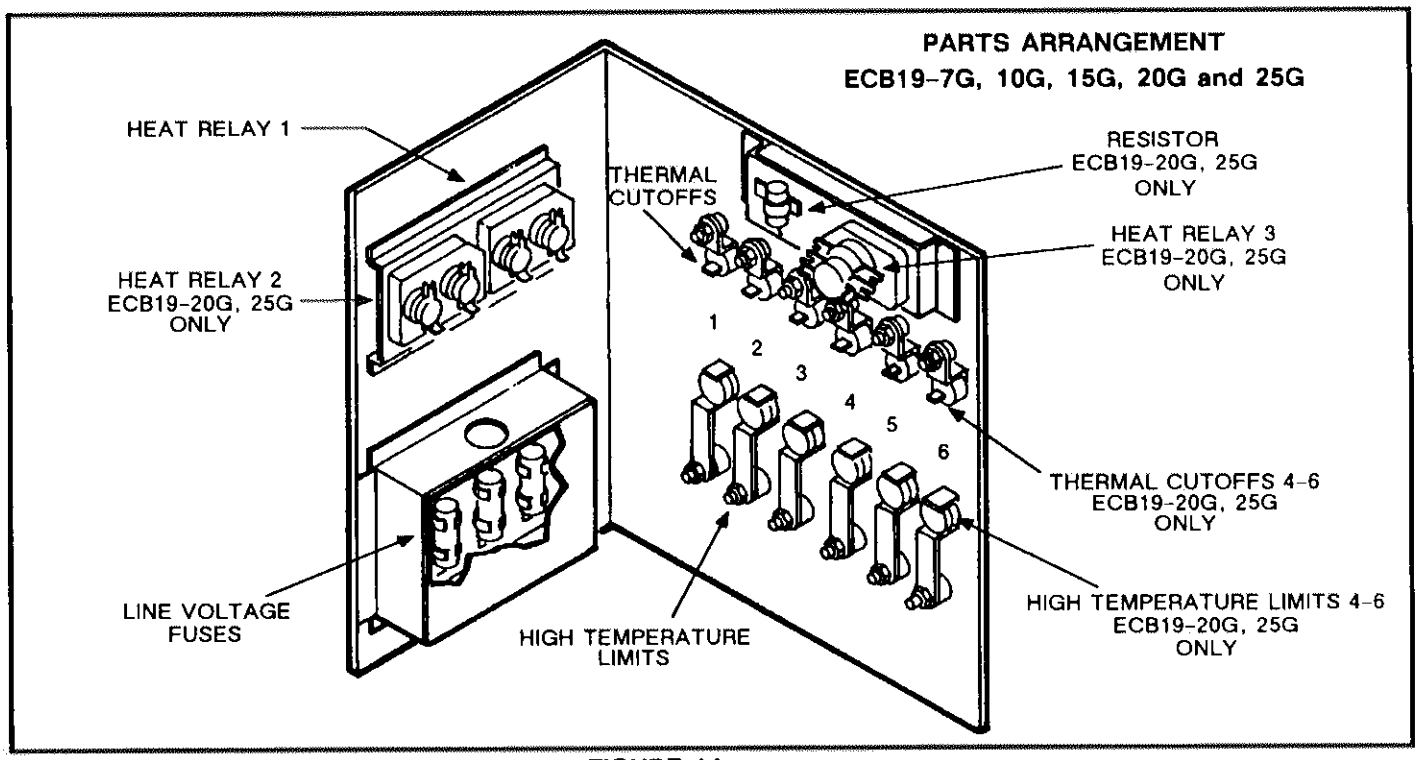


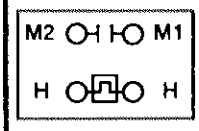
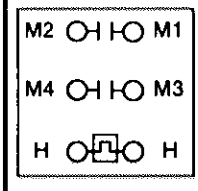
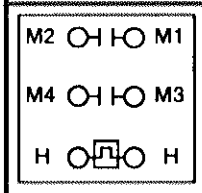
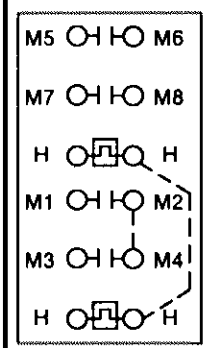
FIGURE 14

1- Thermal (Heat) Relay

Thermal sequencing (heat) relays are used to energize heating elements in all ECB19 series units. A heat relay is a N.O. relay with a resistive element for a coil and a bimetal disk actuating the contacts. When the relay is energized, the internal resistance heats the bimetal disk causing the contacts to close. When the relay is de-energized, the disk cools and the contacts open.

A sequencing relay has multiple contacts. Each set of contacts is connected to a separate bimetal disk. When the relay is energized, internal resistance heats the disks at different rates causing the contacts to close at different times. The contacts are calibrated to operate on a first on last off basis. In some heat relays, all or part of the contacts may be physically connected (not electrically connected) together so that they open and close at the same time. Other relays have two resistive coils; each with its own set of contacts. These relays operate as two independent relays. Table 9 shows the heat relays used in ECB19 series units.

TABLE 9

Heat Relay	Operation	Coil	ECB19 Usage*				
			HR1	HR2	HR3	HR4	HR5
	**ONE TIMING** M1-M2 closes 1-60 sec. after H-H is energized and opens 1-45 sec. after H-H is de-energized.	24V	ECB19-2.5P	———	———	———	———
			ECB19-5P	———	———	———	———
			———	ECB19-10P	———	———	———
			———	———	ECB19-12.5P	———	———
			———	———	ECB19-15P	———	———
			———	———	———	———	ECB19-30P
	**TWO TIMINGS** Both sets of contacts close 1-110 sec. after H-H is energized and open 1-110 sec. after H-H is de-energized. Terminals M1-M2 operate on a first on last off basis.	24V	ECB19-6P	———	———	———	———
			ECB19-7P	———	———	———	———
			ECB19-8P	———	———	———	———
			ECB19-10P	———	———	———	———
			ECB19-12.5P	ECB19-12.5P	———	———	———
			ECB19-15P	ECB19-15P	———	———	———
			ECB19-20P	ECB19-20P	ECB19-20P	———	———
			ECB19-25P	ECB19-25P	———	ECB19-25P	———
			ECB19-30P	ECB19-30P	———	ECB19-30P	———
			ECB19-5Y	ECB19-5Y	———	———	———
			ECB19-7.5Y	ECB19-7.5Y	———	———	———
			ECB19-10Y	ECB19-10Y	———	———	———
			ECB19-15Y	ECB19-15Y	———	———	———
			ECB19-20Y	ECB19-20Y	ECB19-20Y	ECB19-20Y	———
			ECB19-25Y	ECB19-25Y	ECB19-25Y	ECB19-25Y	———
			———	———	ECB19-20G	———	———
			———	———	ECB19-25G	———	———
	**TWO TIMINGS** Both sets of contacts close 1-110 sec. after H-H is energized and open 1-110 sec. after H-H is de-energized. Terminals M1-M2 operate on a first on last off basis.	240V	———	———	ECB19-25P	———	———
			———	———	ECB19-30P	———	———
	**THREE TIMINGS** Both resistive coils are activated together. Contacts M1-M2 and M3-M4 actuate together. All contacts close 1-110 sec. after the resistive coils are energized and open 1-110 sec. after the coils are de-energized. Terminals M1-M2 operate on a first on last off basis followed by M5-M6 then M7-M8.	24V	ECB19-7G	———	———	———	———
			ECB19-10G	———	———	———	———
			ECB19-15G	———	———	———	———
			ECB19-20G	ECB19-20G	———	———	———
			ECB19-25G	ECB19-25G	———	———	———

*Refer to unit wiring diagram. Diagram refers to the thermal (heat) relay as 'HR'.

2- Resistor

ECB19 series units have one or two thermal (heat) relays connected directly to the indoor thermostat (terminal Y for heat pump thermostats and terminal W1 for heat/cool thermostats). If two heat relays are connected to the thermostat, the relays are connected in parallel (for example, refer to ECB19-5Y unit wiring diagram in back of this manual). A resistor is used in all applications which use a single heat relay connected to thermostat demand (for example, refer to ECB19-10P diagram in back of this manual). The resistor is connected in parallel with the heat relay.

A resistor is used in parallel with single heat relays to reduce the effects of inrush current on the thermostat. Heat relays used in ECB19 series units draw approximately .7 amps each immediately after being energized. As the relay coil heats and resistance builds, the current subsides. Within a few seconds after being energized, the current is reduced to minimum level (approximately .18 amps each). The resistors used in ECB19 series units are shown in figure 10. The resistor is located on the ECB19 control panel.

TABLE 10

Unit	Resistor Rating
ECB19-2.5P	150 ohm ± 10% 10 watt
ECB19-5P	
ECB19-6P	
ECB19-7P	
ECB19-8P	
ECB19-10P	
ECB19-25P	
ECB19-30P	
ECB19-20G	
ECB19-25G	

*All ECB19 units equipped with heat relay resistor are listed in this table.

3- Heating Elements

Optional ECB19 electric heat is composed of helix wound nichrome bare heating elements which are exposed directly to the airstream. Heating elements are energized directly by the heat relays. Once energized, heat transfer is instantaneous. Small kw units use a single heating element connected to line voltage by way of a heat relay and safety limits. All other units use multiple small kw elements connected in parallel. The kw of each element is added together to reach the total kw input of the unit. Each element is energized independently by a thermal sequencing (heat) relay and is protected by safety limits. Heating elements used in ECB19 series units are listed in table 11.

TABLE 11

Unit	Total Watts	Elements	
		Watts Each	Number of Elements
ECB19-2.5P	2500@240V	2500	1
ECB19-5P	5000@240V	5000	1
ECB19-5Y	5000@240V	1667	3
ECB19-6P	6000@240V	3000	2
ECB19-7P	7000@240V	3500	2
ECB19-7G	7000@480V	2500	3
ECB19-7.5Y	7500@240V	2333	3
ECB19-8P	8000@240V	4000	2
ECB19-10P	10,000@240V	5000	2
ECB19-10Y	10,000@240V	3333	3
ECB19-10G	10,000@480V	3333	3
ECB19-12.5P	12,500@240V	4167	3
ECB19-15P/15Y	15,000@240V	5000	3
ECB19-15G	15,000@480V	5000	3
ECB19-20P	20,000@240V	5000	4
ECB19-20Y	20,000@240V	3333	6
ECB19-20G	20,000@480V	3333	6
ECB19-25P	25,000@240V	5000	5
ECB19-25Y	25,000@240V	4167	6
ECB19-25G	25,000@480V	4170	6
ECB19-30P	30,000@240V	5000	6

4- High Temperature Limit

Each ECB19 uses a an auto-reset type high temperature limit connected in series with each heating element. The high temperature limit is used as a primary limit. If the switch exceeds its factory preset limit (table 12), it opens and cuts-out only the element it is connected to.

TABLE 12

Unit	ECB19 High Temperature Limit Control	
	No. of Limits	Description
ECB19-2.5P	1	SPST NORMALLY CLOSED OPEN AT 150°F ± 5°F ON RISE CLOSE AT 115°F ± 7°F ON FALL AUTO-RESET
ECB19-5P	1	
ECB19-5Y	3	
ECB19-6P	2	
ECB19-7P	2	
ECB19-7.5Y	3	
ECB19-8P	2	
ECB19-10P	2	
ECB19-10Y	3	
ECB19-12.5P	3	
ECB19-15P	3	
ECB19-15Y	3	
ECB19-15G	3	
ECB19-20Y	6	
ECB19-25P	5	
ECB19-25Y	6	
ECB19-30P	6	SPST NORMALLY CLOSED OPEN AT 140°F ± 5°F ON RISE CLOSE AT 105°F ± 7°F ON FALL AUTO-RESET
ECB19-7G	3	
ECB19-10G	3	
ECB19-20G	6	
ECB19-25G	6	
ECB19-20P	4	SPST NORMALLY CLOSED OPEN AT 150°F ± 5°F ON RISE CLOSE AT 110°F ± 7°F ON FALL AUTO-RESET

5- High Temperature (Thermal) Cutoff

All ECB19 series units use a high temperature (thermal) cutoff fuse connected in series with each element. The fuse provides secondary high temperature protection to each element. The fuses are ceramic non-resettable fusible links which must be replaced after being tripped. Each cutoff is factory preset to open at 333°F ± 3°F.

6- Fuses

Some ECB19 series units are equipped with line voltage overcurrent protection. G voltage units use class T fuses for line voltage overcurrent protection. Class T fuses used in ECB19 series units are shown in table 13.

TABLE 13

Unit	Line Voltage Fuse - ECB19 G Voltage Units		
	No. of Fuses	Type	Rating
ECB19-7G	3	Class T	15 Amp 600 VAC
ECB19-10G	3	Class T	20 Amp 600 VAC
ECB19-15G	3	Class T	25 Amp 600 VAC
ECB19-20G	3	Class T	35 Amp 600 VAC
ECB19-25G	3	Class T	40 Amp 600 VAC

7- Circuit Breakers

Larger P and Y voltage units (12.5 kw and above) are equipped with circuit breakers for line voltage overcurrent protection. Circuit breakers used in ECB19 series units are shown in table 14.

TABLE 14

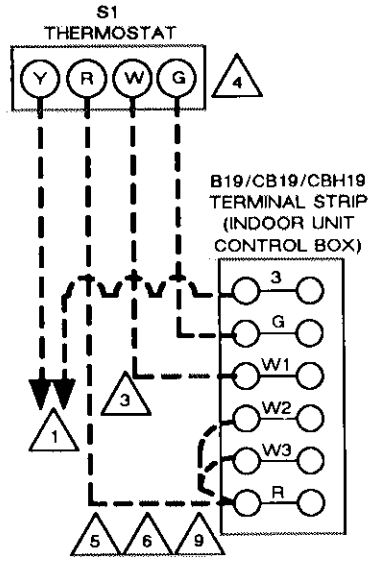
Unit	ECB19 ELECTRIC HEAT CIRCUIT BREAKER RATINGS*		
	Circuit Breaker 1	Circuit Breaker 2	Circuit Breaker 3
ECB19-12.5P	2 pole - 50 Amp - 120/240 VAC	2 pole - 50 Amp - 120/240 VAC	———
ECB19-15P	2 pole - 60 Amp - 120/240 VAC	2 pole - 30 Amp - 120/240 VAC	———
ECB19-20P	3 pole - 40 Amp - 240 VAC	3 pole - 40 Amp - 240 VAC	———
ECB19-25P	2 pole - 60 Amp - 120/240 VAC	2 pole - 60 Amp - 120/240 VAC	2 pole - 30 Amp - 120/240 VAC
ECB19-30P	2 pole - 60 Amp - 120/240 VAC	2 pole - 60 Amp - 120/240 VAC	2 pole - 60 Amp - 120/240 VAC
ECB19-15Y	3 pole - 60 Amp - 240 VAC	———	———
ECB19-20Y	3 pole - 40 Amp - 240 VAC	3 pole - 40 Amp - 240 VAC	———
ECB19-25Y	3 pole - 50 Amp - 240 VAC	3 pole - 40 Amp - 240 VAC	———

*Only ECB19 (P and Y voltage) units 12.5 kw and larger are equipped with circuit breakers.

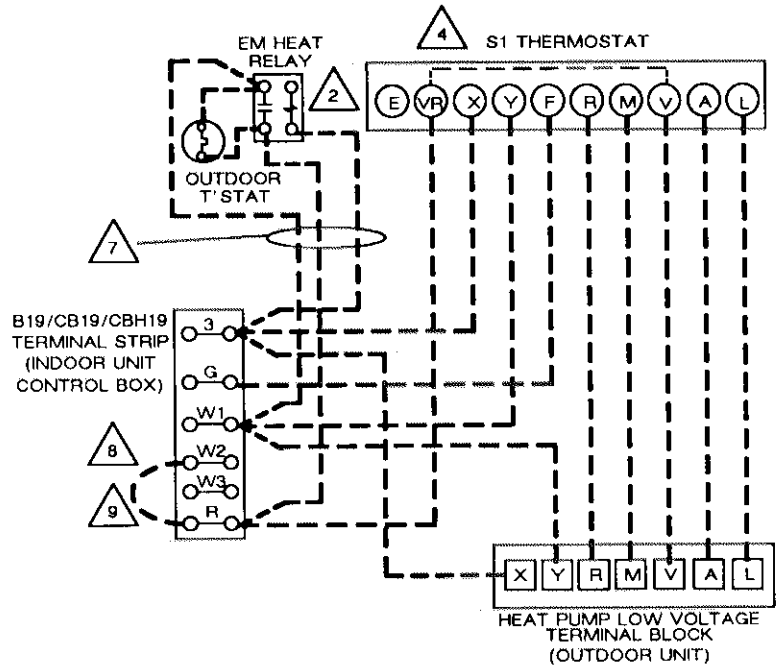
IV-WIRING DIAGRAMS AND OPERATION SEQUENCE

A-Field Wiring to Thermostat and Outdoor Unit

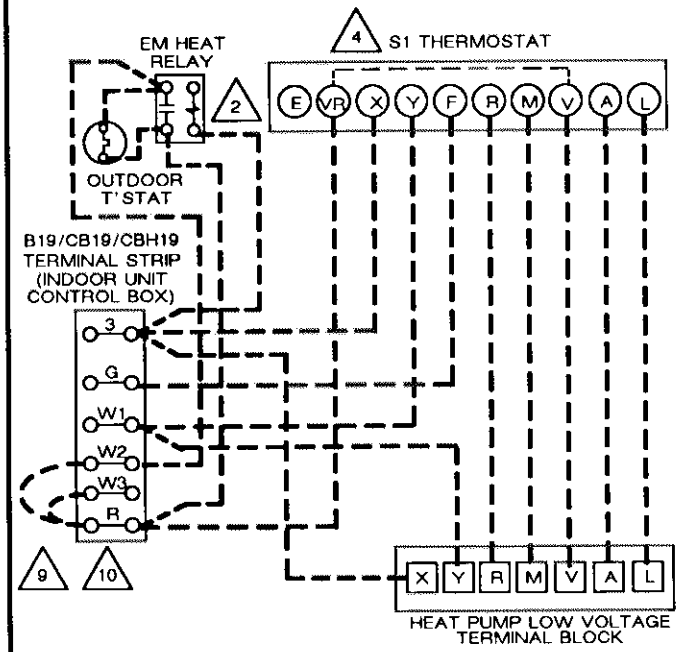
COOLING UNIT APPLICATIONS
ALL B19 / CB19 / ECB19 UNITS



HEAT PUMP APPLICATION
ALL B19 / CB19 UNITS
ECB19-2.5P, 5P, 6P, 7P and 8P
ECB19-5Y, 7.5Y, 10Y and 15Y
ECB19-7G, 10G, 15G, 20G and 25G



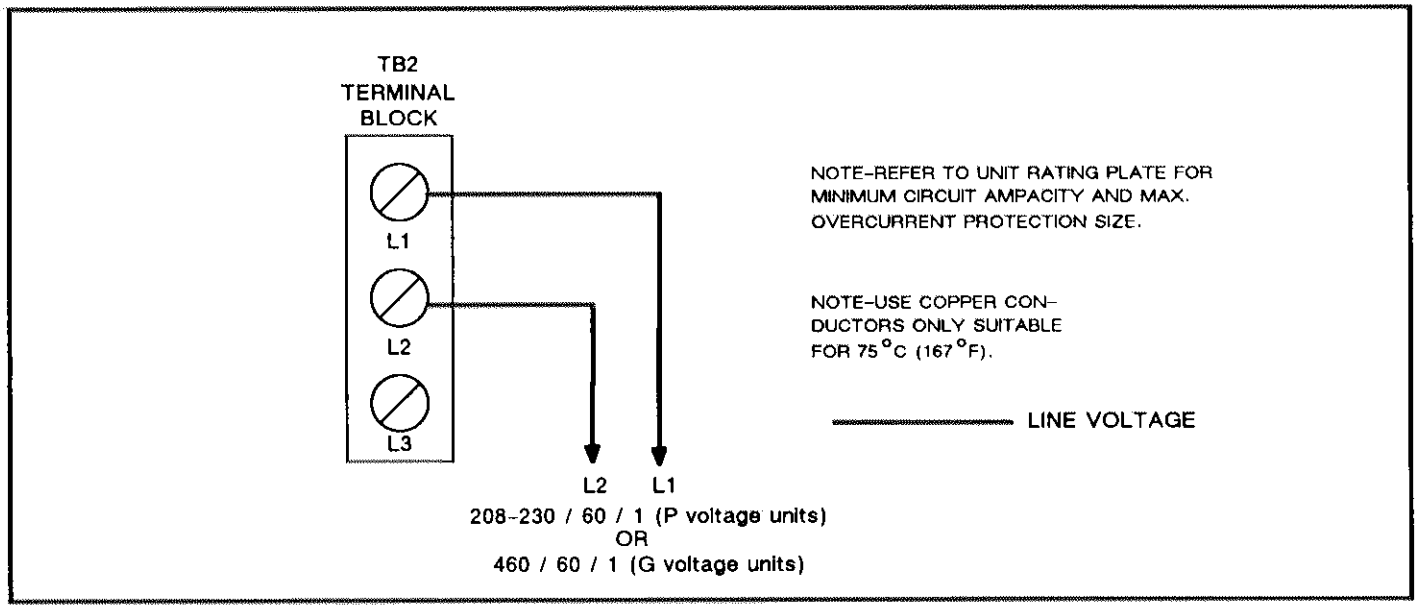
HEAT PUMP APPLICATION
ECB19-10P, 12.5P, 15P, 20P, 25P and 30P
ECB19-20Y and 25Y



LOW VOLTAGE FIELD INSTALLED

1. To external load (compressor) 24VAC @ .50 amp max.
2. Emergency heat relay (used only if outdoor thermostat is used) field provided and installed near outdoor unit. 24VAC 5VA max NEC class 2.
3. W to W1 required only when electric heat is used.
4. Thermostat heat anticipation setting .4 amp (electric heat).
5. R to W2 used only in ECB19-10P, 12.5P, 15P, 20P, 20Y and 25Y applications.
6. R to W2 and W3 used only in ECB19-25P and 30P applications.
7. Emergency heat relay and outdoor thermostat used only as an option when electric heat is used.
8. R to W2 connection used only in ECB19-20G and 25G applications.
9. When two stage thermostat is used (with or without electric emergency heat relay and outdoor thermostat) R to W2 jumper is not used.
10. ECB19-25P, 30P ONLY. R to W3 connection used only when emergency heat relay is not used. Emergency heat relay connects to W3 rather than W2 as shown.

B-Field Wiring Line Voltage to B19 / CB19 Units without Electric Heat



C-Field Wiring Electric Heat to CB19

FIELD WIRING AND LINE VOLTAGE CONNECTIONS FOR ECB19-2.5P AND 5P UNITS

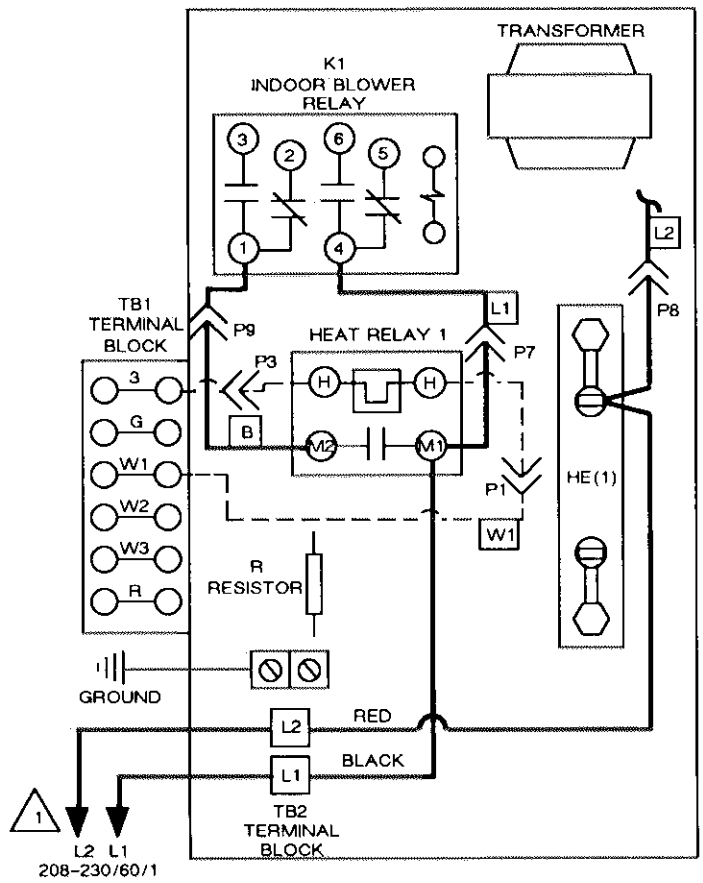
NOTE-REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAX. OVERCURRENT PROTECTION SIZE.

LINE VOLTAGE

LOW VOLTAGE NEC CLASS 2

NOTE-USE COPPER CONDUCTORS ONLY SUITABLE FOR 75°C (167°F).

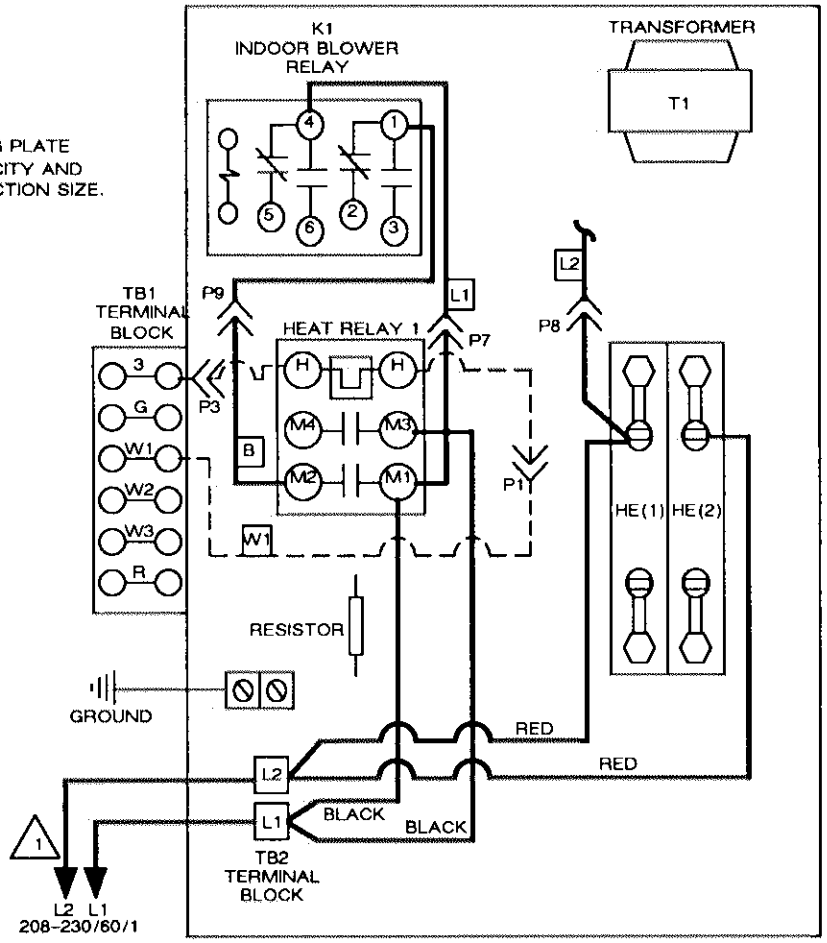
MINIMUM WIRE SIZE	
UNIT	WIRE SIZE
ECB19-2.5-1P	12
ECB19-5.0-1P	10



1 NO CONDUCTOR TO EXCEED 125V TO GROUND.

FIELD WIRING AND LINE VOLTAGE CONNECTIONS FOR ECB19-6P, 7P AND 8P UNITS

NOTE-REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAX. OVERCURRENT PROTECTION SIZE.



NOTE-USE COPPER CONDUCTORS ONLY, SUITABLE FOR 75°C (167°F).

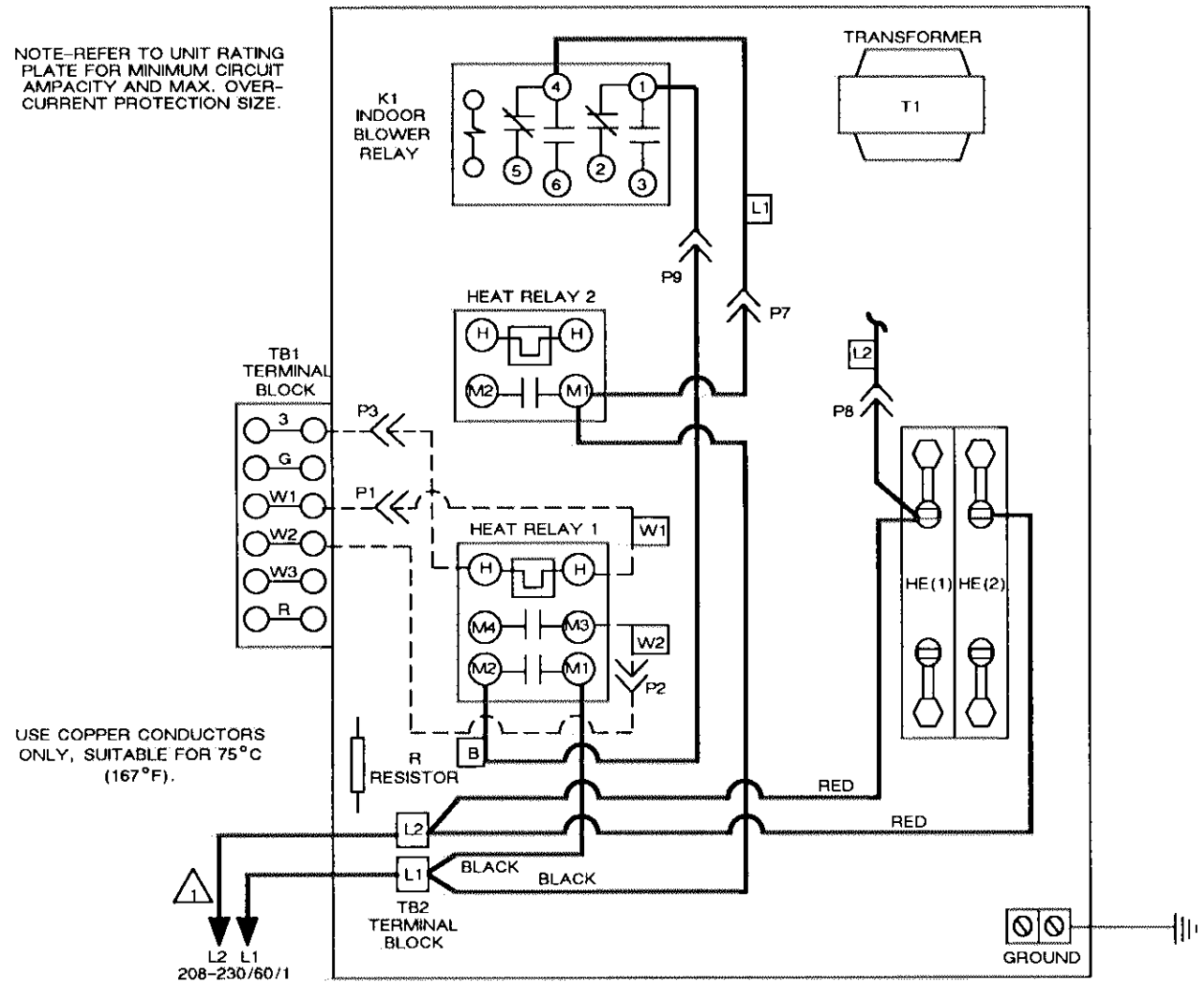
1 NO CONDUCTOR TO EXCEED 125V TO GROUND.

MINIMUM WIRE SIZE	
UNIT	WIRE SIZE
ECB19-6.0-1P	8
ECB19-7.0-1P	8
ECB19-8.0-1P	6

——— LINE VOLTAGE

– – – – – LOW VOLTAGE NEC CLASS 2

FIELD WIRING AND LINE VOLTAGE CONNECTIONS FOR ECB19-10P UNITS



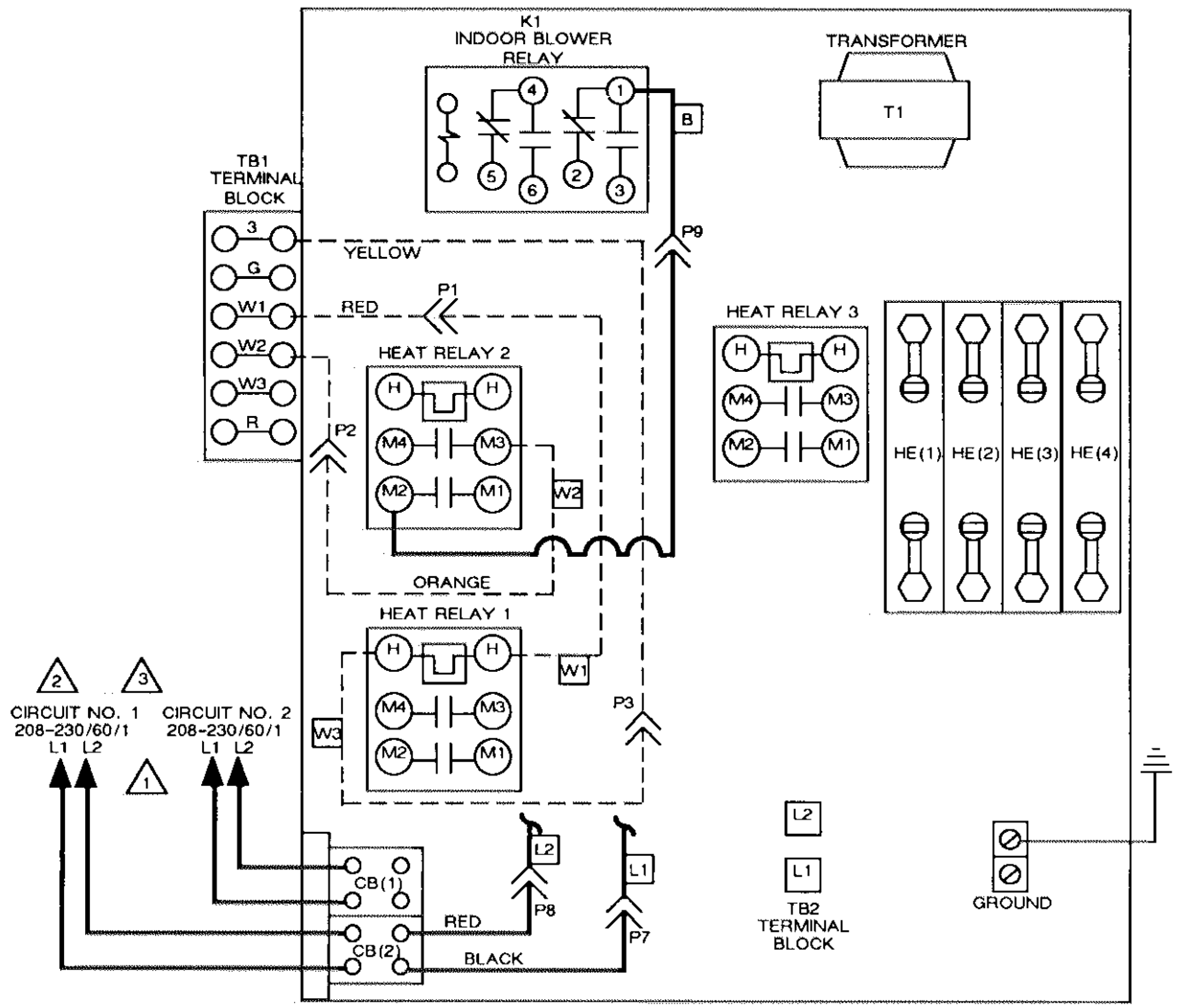
⚠1 NO CONDUCTOR TO EXCEED 125V TO GROUND.

MINIMUM WIRE SIZE	
UNIT	WIRE SIZE
ECB19-10.0-1P	6

LINE VOLTAGE

LOW VOLTAGE NEC CLASS 2

FIELD WIRING AND LINE VOLTAGE CONNECTIONS FOR ECB19-12.5P, 15P AND 20P UNITS



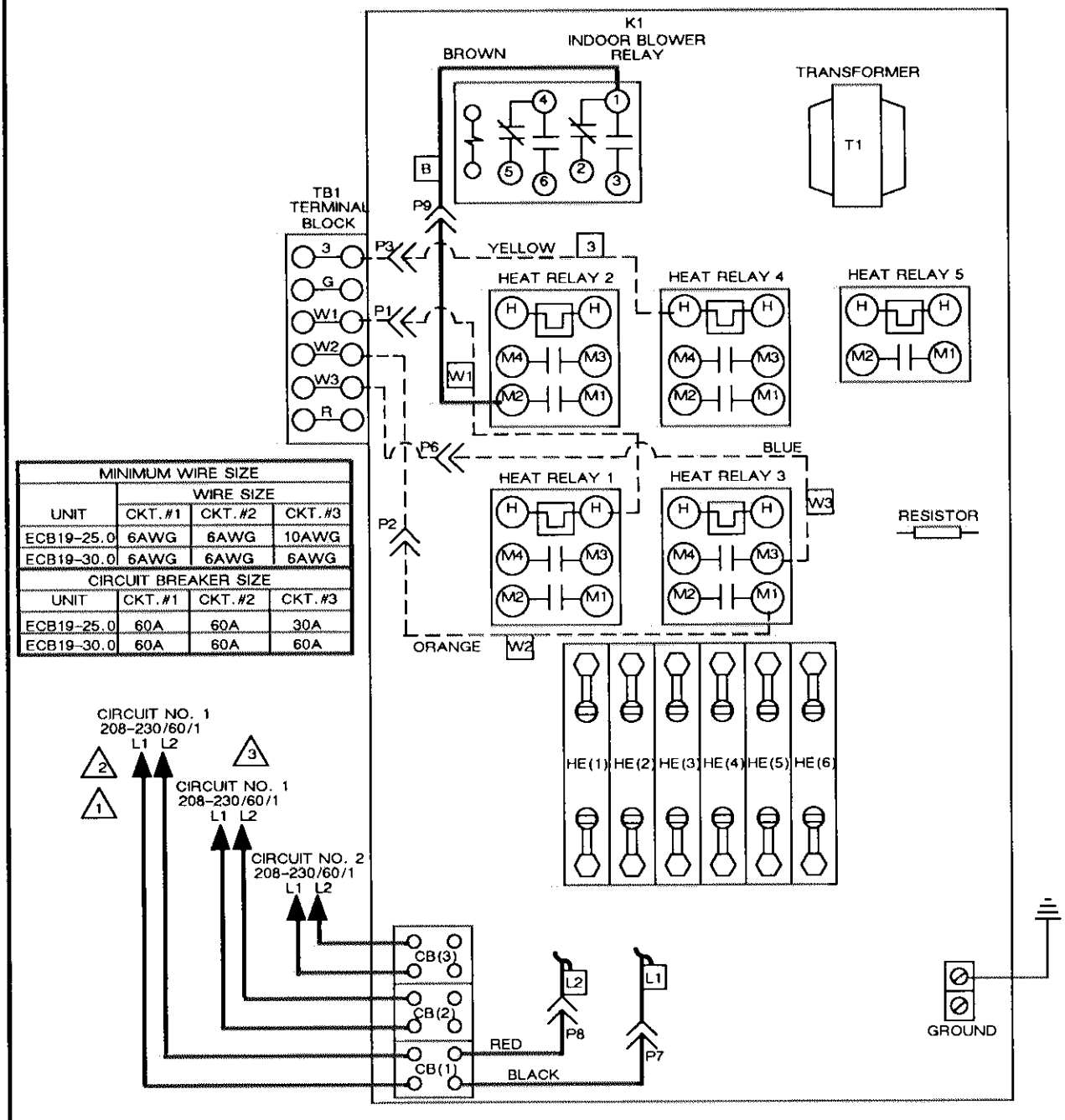
1. NO CONDUCTOR TO EXCEED 125V TO GROUND.
2. REFER TO SINGLE DISCONNECT POWER SOURCE RATING PLATE ON INDOOR UNIT FOR MIN. CIRCUIT AMPACITY, MIN. WIRE SIZES AND MAX. OVERCURRENT PROTECTION.
3. USE COPPER CONDUCTORS ONLY, SUITABLE FOR 75°C (167°F).

MINIMUM WIRE SIZE	
UNIT	WIRE SIZE
ECB19-12.5-1P (Ckt.#1)	8
ECB19-12.5-1P (Ckt.#2)	10
ECB19-15.0-1P (Ckt.#1)	6
ECB19-15.0-1P (Ckt.#2)	10
ECB19-20.0-1P (Ckt.#1)	6
ECB19-20.0-1P (Ckt.#2)	6

——— LINE VOLTAGE

– – – – – LOW VOLTAGE NEC CLASS 2

FIELD WIRING AND LINE VOLTAGE CONNECTIONS FOR ECB19-25P AND 30P UNITS



MINIMUM WIRE SIZE			
	WIRE SIZE		
UNIT	CKT.#1	CKT.#2	CKT.#3
ECB19-25.0	6AWG	6AWG	10AWG
ECB19-30.0	6AWG	6AWG	6AWG
CIRCUIT BREAKER SIZE			
UNIT	CKT.#1	CKT.#2	CKT.#3
ECB19-25.0	60A	60A	30A
ECB19-30.0	60A	60A	60A

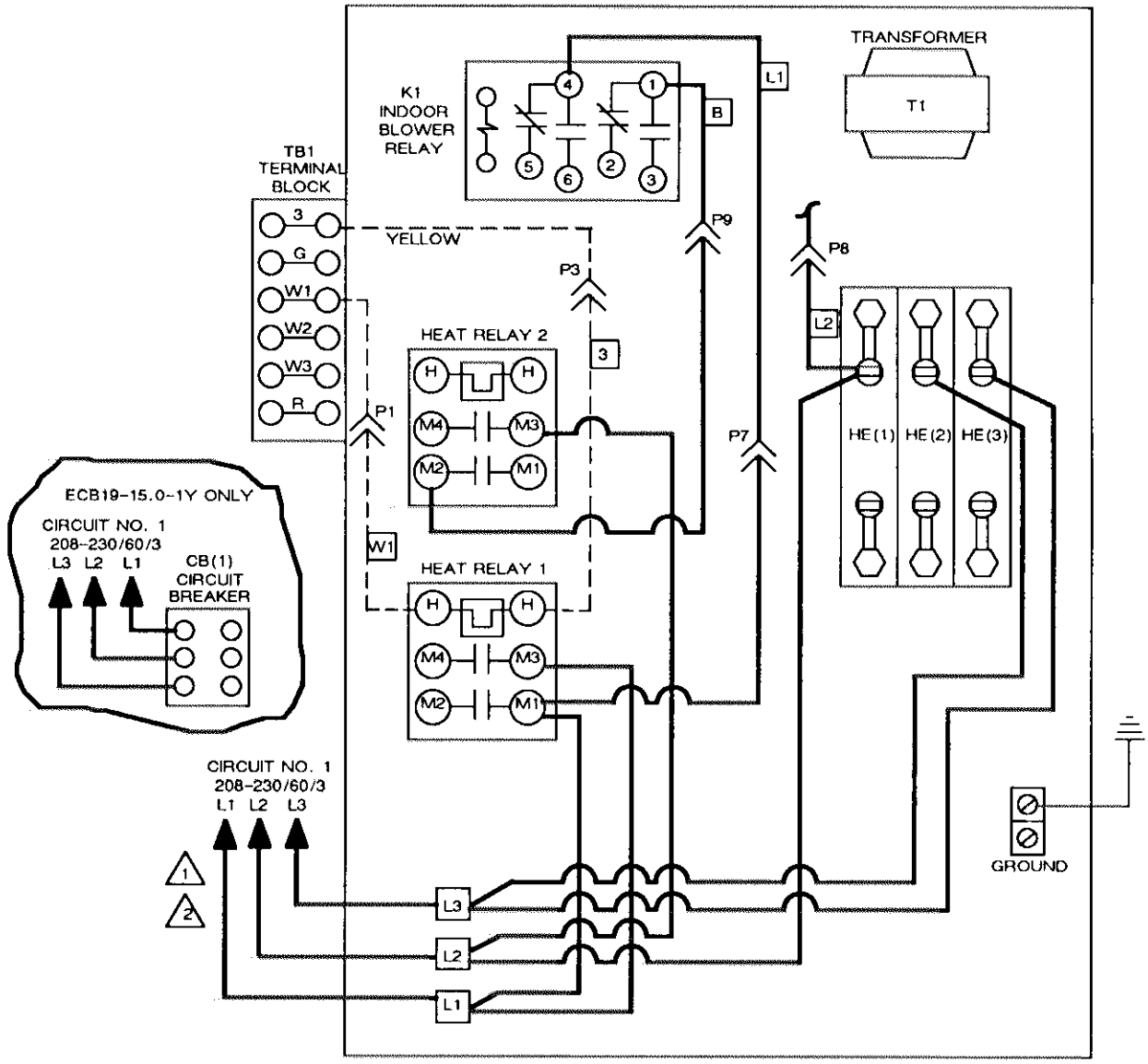
LINE VOLTAGE

LOW VOLTAGE NEC CLASS 2

1. NO CONDUCTOR TO EXCEED 125V TO GROUND.
2. REFER TO SINGLE DISCONNECT POWER SOURCE RATING PLATE ON INDOOR UNIT FOR MIN. CIRCUIT AMPACITY, MIN. WIRE SIZES AND MAX. OVERCURRENT PROTECTION.
3. USE COPPER CONDUCTORS ONLY, SUITABLE FOR 75°C (167°F).

FIGURE 9

FIELD WIRING AND LINE VOLTAGE CONNECTIONS FOR ECB19-5Y, 7.5Y, 10Y AND 15Y UNITS



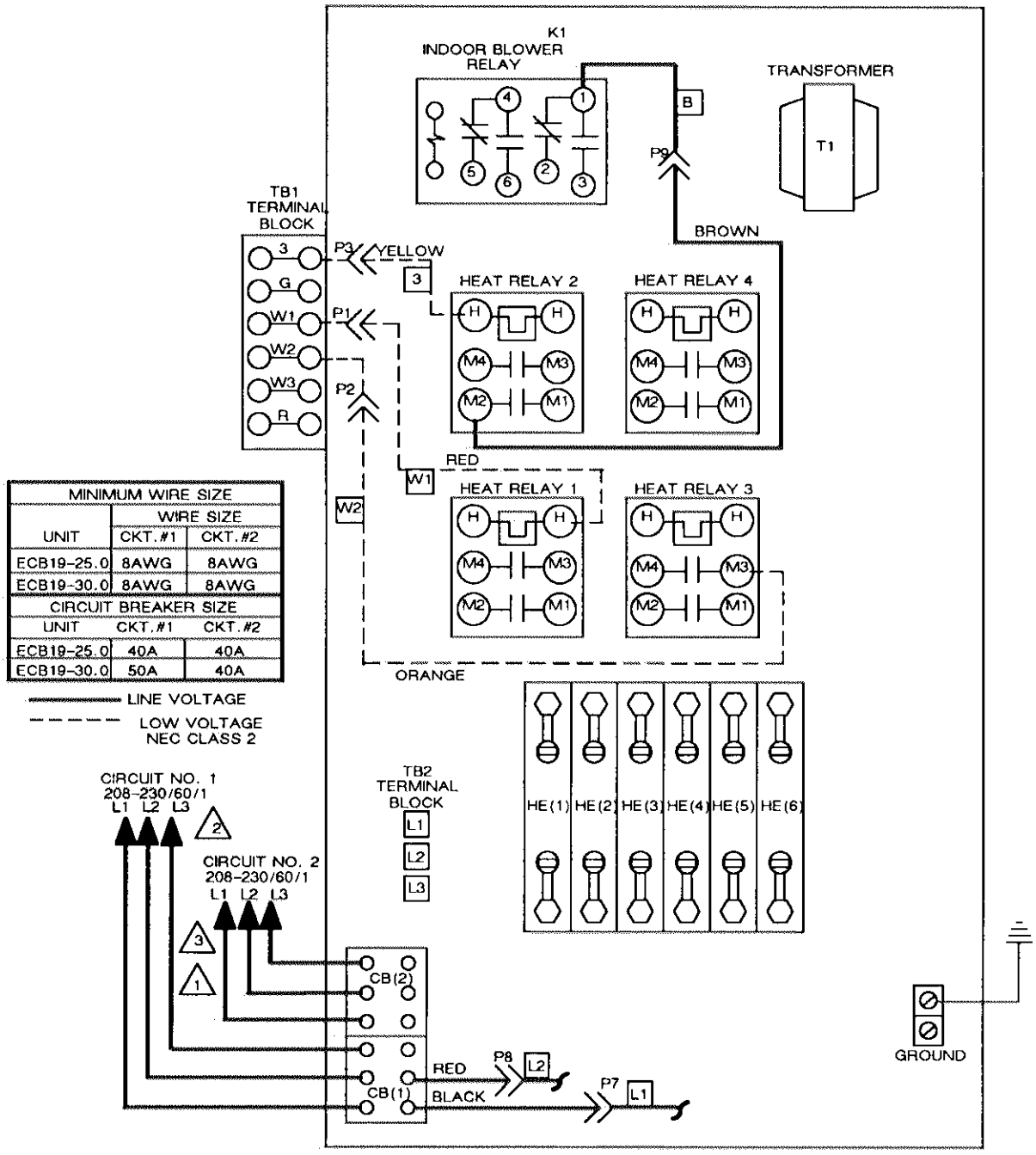
1. NO CONDUCTOR TO EXCEED 125V TO GROUND.
2. USE COPPER CONDUCTORS ONLY, SUITABLE FOR TEMPERATURES INDICATED IN TABLE.

MINIMUM WIRE SIZE	
UNIT	WIRE SIZE
ECB19-5.0-1Y	12AWG (75°C)
ECB19-7.5-1Y	10AWG (75°C)
ECB19-10.0-1Y	8AWG (75°C)
ECB19-15.0-1Y	6AWG (75°C)

——— LINE VOLTAGE
– – – – – LOW VOLTAGE NEC CLASS 2

FIGURE 10

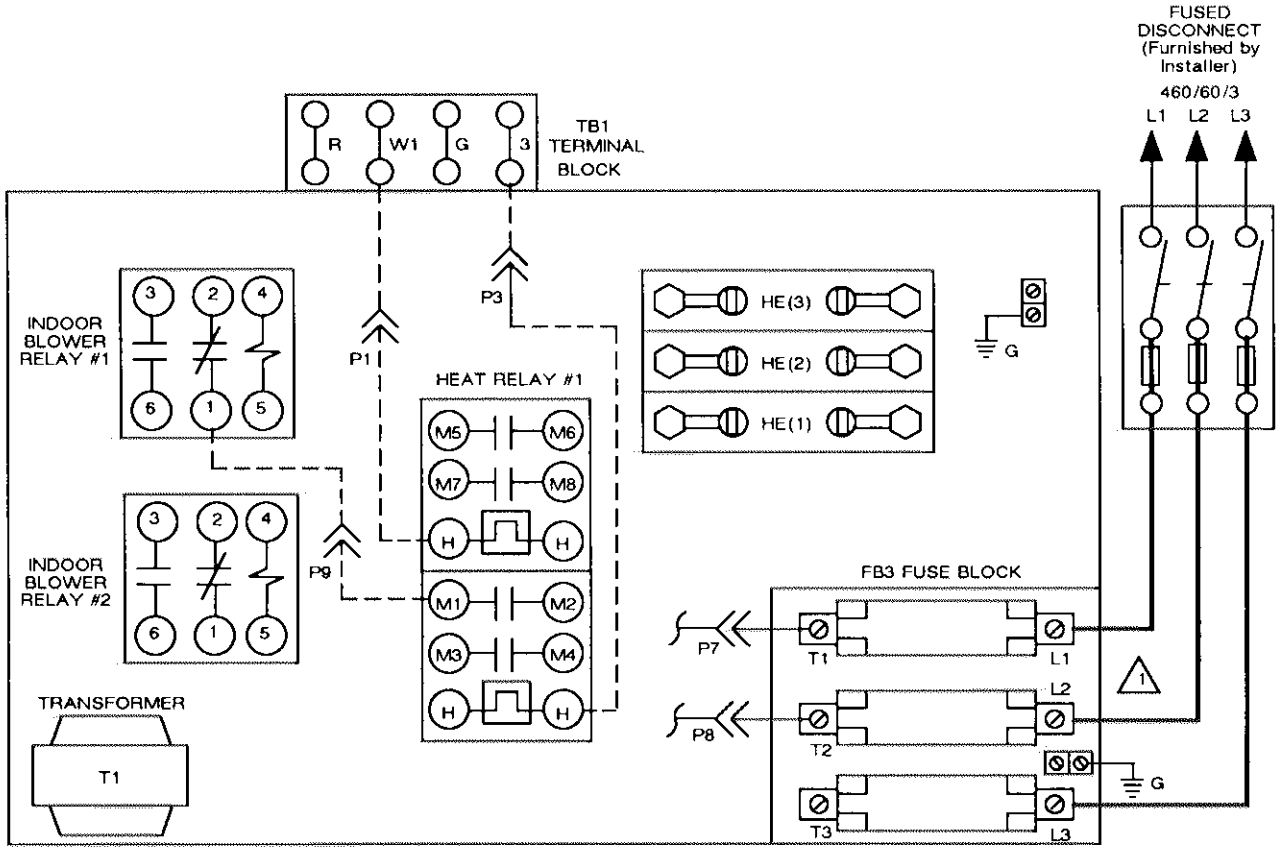
FIELD WIRING AND LINE VOLTAGE CONNECTIONS
FOR ECB19-20Y AND 25Y UNITS



MINIMUM WIRE SIZE		
	WIRE SIZE	
UNIT	CKT.#1	CKT.#2
ECB19-25.0	8AWG	8AWG
ECB19-30.0	8AWG	8AWG
CIRCUIT BREAKER SIZE		
UNIT	CKT.#1	CKT.#2
ECB19-25.0	40A	40A
ECB19-30.0	50A	40A

1. NO CONDUCTOR TO EXCEED 125V TO GROUND.
2. REFER TO SINGLE DISCONNECT POWER SOURCE RATING PLATE ON INDOOR UNIT FOR MIN. CIRCUIT AMPACITY, MIN. WIRE SIZES AND MAX. OVERCURRENT PROTECTION.
3. USE COPPER CONDUCTORS ONLY, SUITABLE FOR TEMPERATURES INDICATED IN TABLE.

FIELD WIRING AND LINE VOLTAGE CONNECTIONS FOR ECB19-7G, 10G AND 15G UNITS



1

MINIMUM WIRE SIZE	
UNIT	WIRE SIZE
ECB19-7.0-1G	14AWG (75°C)
ECB19-10.0-1G	12AWG (75°C)
ECB19-15.0-1G	10AWG (75°C)

USE COPPER CONDUCTORS ONLY, SUITABLE FOR TEMPERATURES INDICATED IN TABLE.

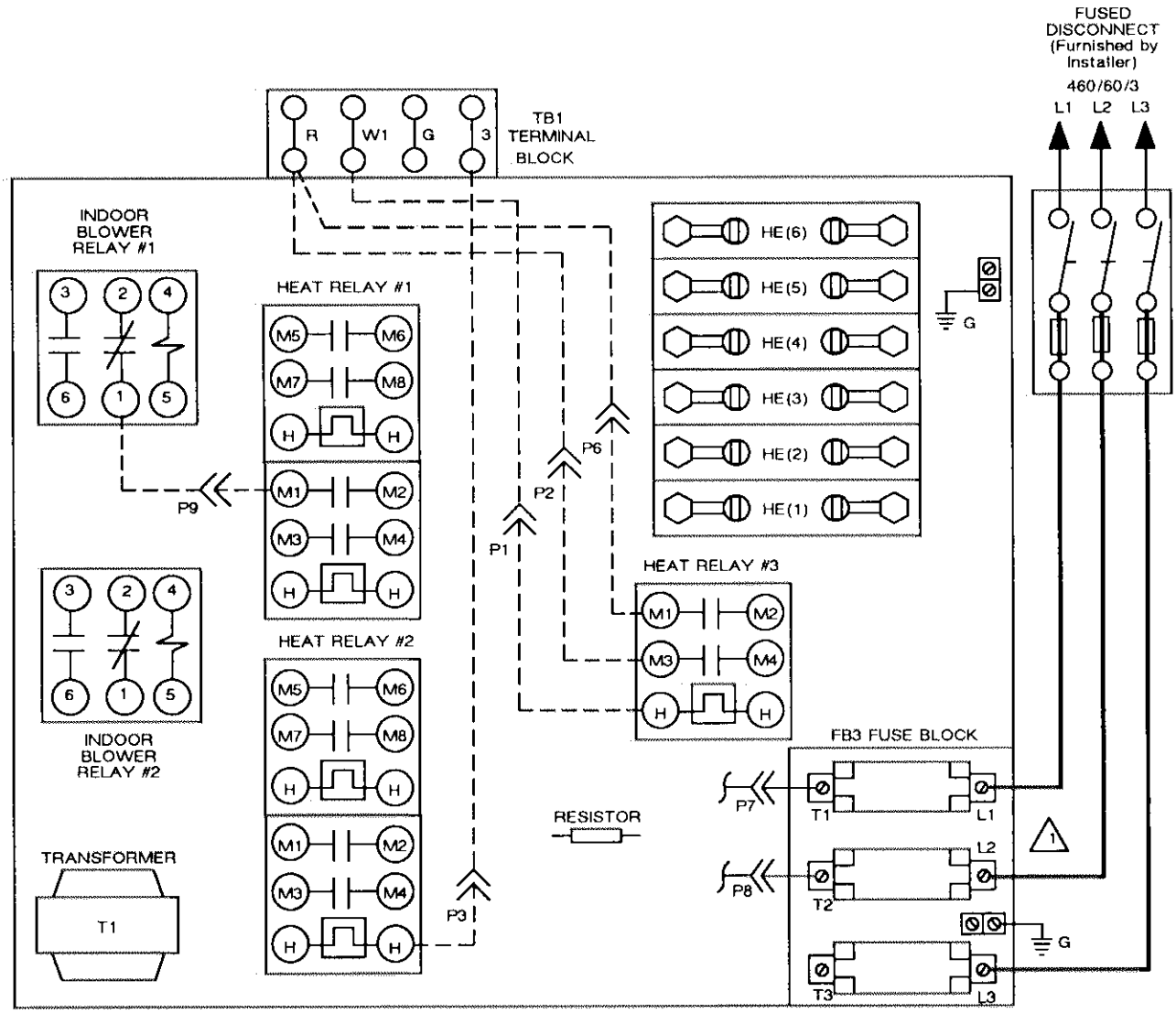
NOTE-REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAX. OVER-CURRENT PROTECTION SIZE.

——— LINE VOLTAGE

– – – – – LOW VOLTAGE NEC CLASS 2

NOTE-ALL REMAINING WIRES FACTORY INSTALLED.

FIELD WIRING AND LINE VOLTAGE CONNECTIONS FOR ECB19-20G AND 25G UNITS



1 MINIMUM WIRE SIZE	
UNIT	WIRE SIZE
ECB19-20.0-1G	8AWG (75°C)
ECB19-25.0-1G	8AWG (75°C)

USE COPPER CONDUCTORS ONLY, SUITABLE FOR TEMPERATURES INDICATED IN TABLE.

NOTE-REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAX. OVER-CURRENT PROTECTION SIZE.

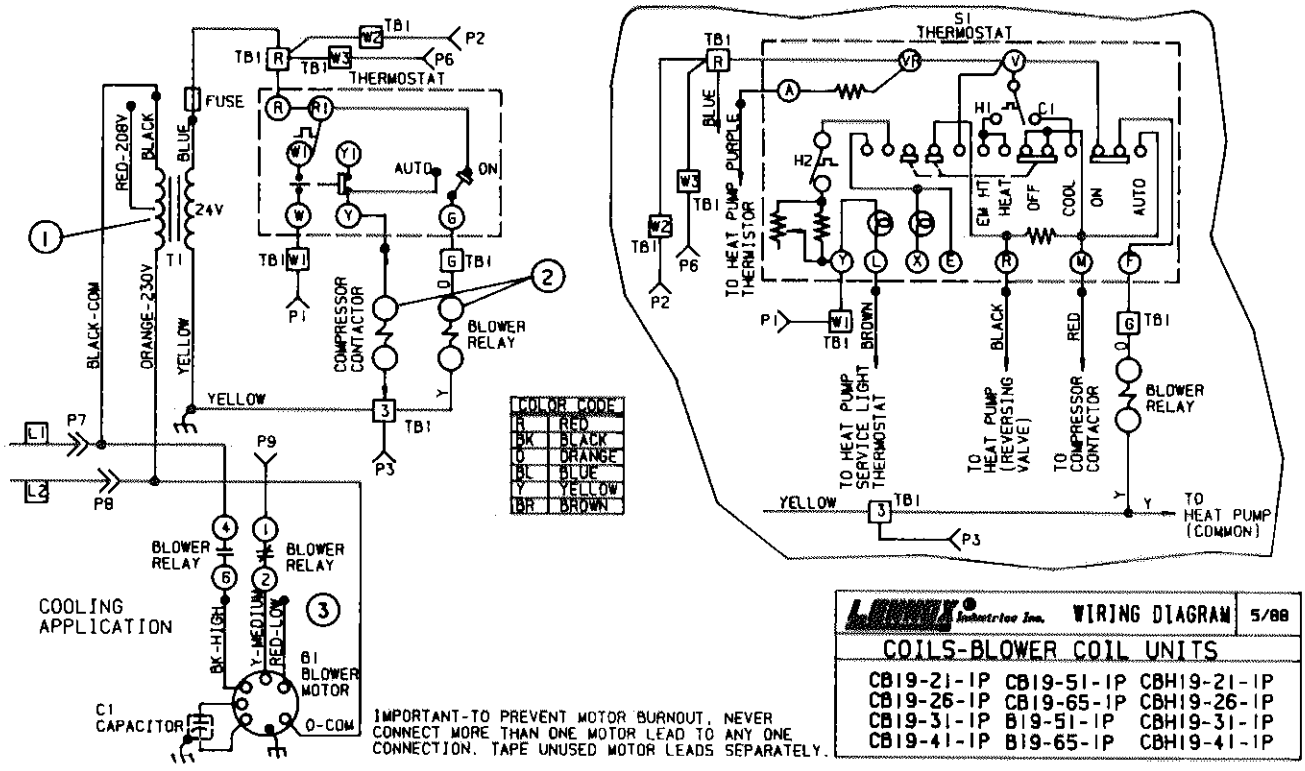
——— LINE VOLTAGE

– – – – – LOW VOLTAGE NEC CLASS 2

NOTE-ALL REMAINING WIRES FACTORY INSTALLED.

FIGURE 12

D-Unit Diagrams and Operation Sequence



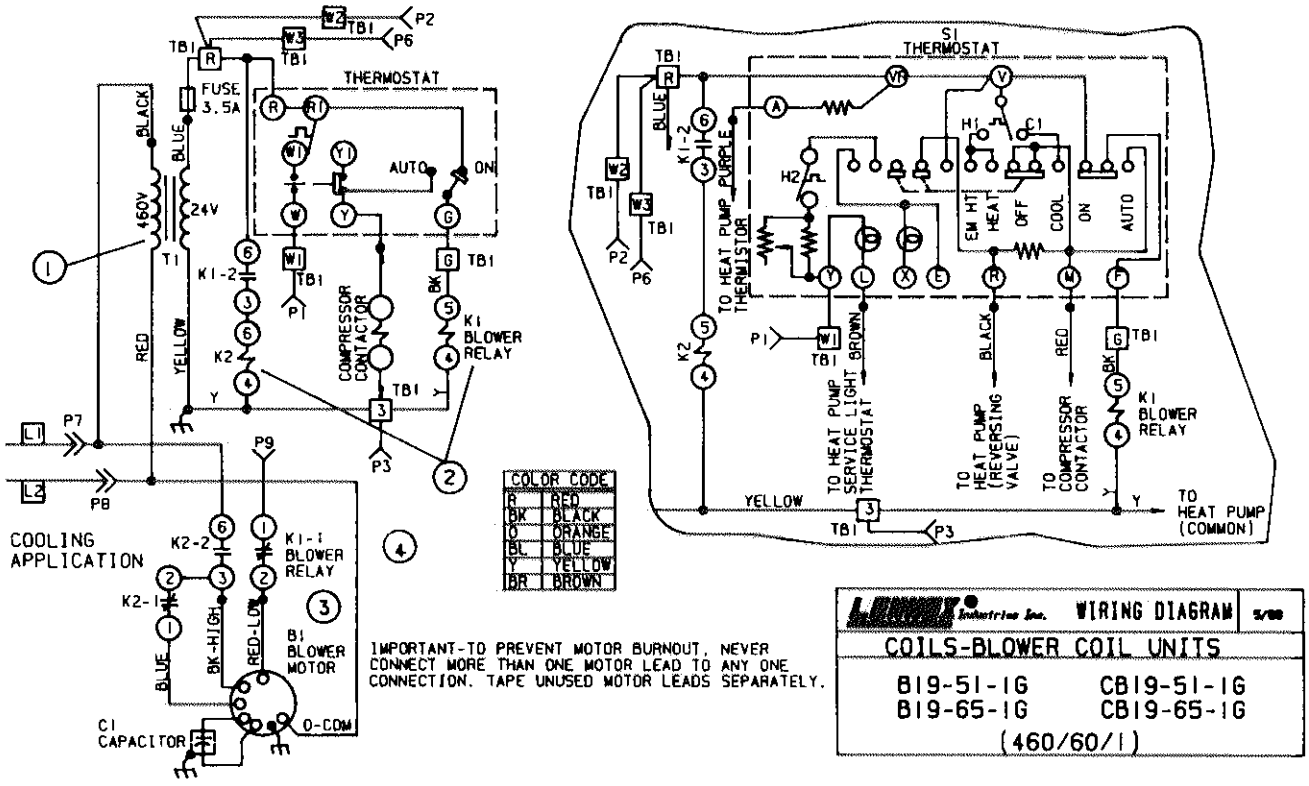
B19-51P and 65P
CB19-21P, 26P, 31P, 41P, 51P and 65P
CBH19-21P, 26P, 31P and 41P

Operation Sequence:

1- Transformer supplies 24VAC power to indoor thermostat, indoor unit and outdoor unit controls.

2- On compressor demand, blower relay and compressor contactor are energized. Blower relay contacts 4-6 close to energize blower on high speed.

3- When compressor demand stops, blower relay is de-energized and contacts 4-6 open. Blower motor stops.



B19-51G and 65G
CB19-51G and 65G

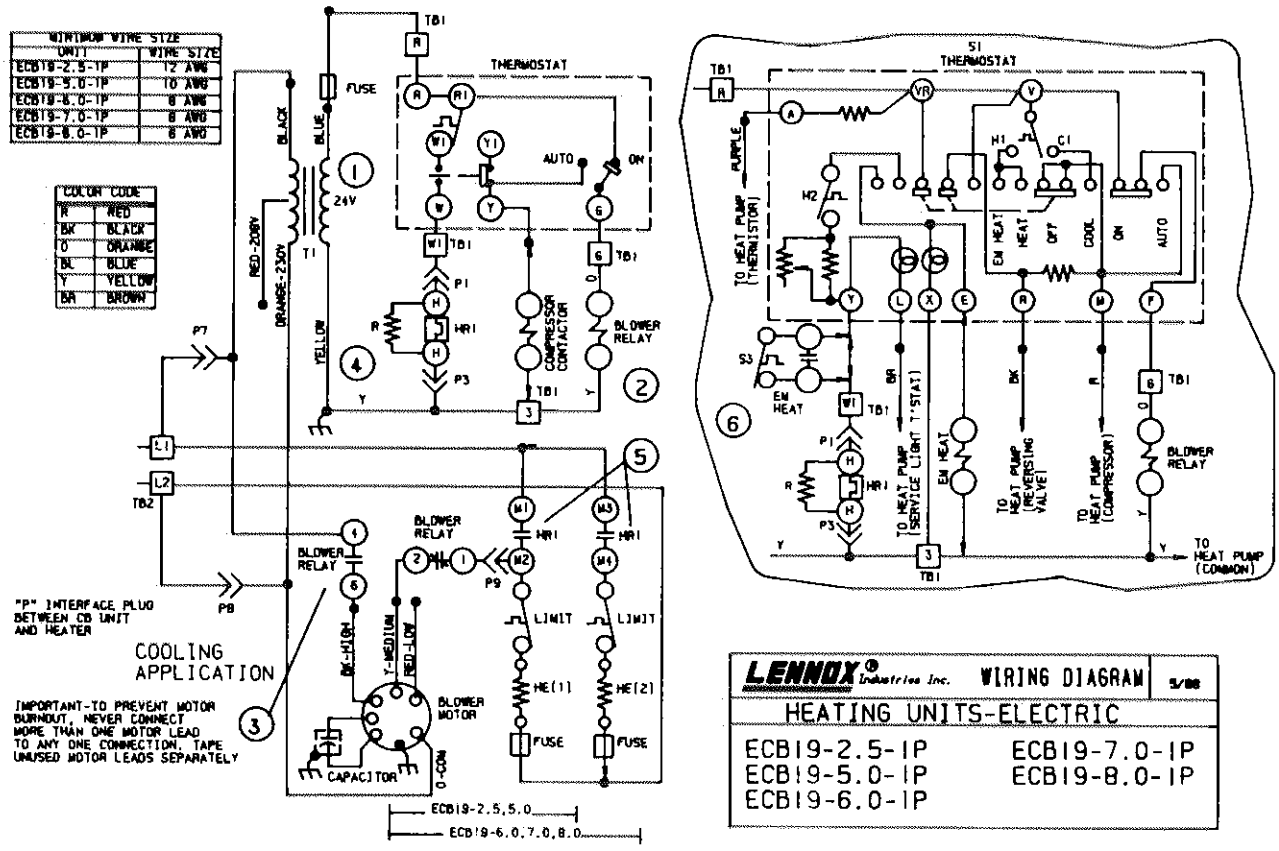
Operation Sequence:

1- Transformer supplies 24VAC power to indoor thermostat, indoor unit and outdoor unit controls.

2- On compressor demand, blower relay K1 and compressor contactor are energized. Relay contacts K1-2 close and K1-1 open.

3- When K1-2 (terminals 3-6) close, relay K2 is energized. Relay contacts K2-2 (terminals 3-6) and K2-1 (terminals 1-2) open. Blower is energized on high speed.

4- When compressor demand stops, blower relay K1 is de-energized. Contacts K1-2 (terminals 3-6) open to de-energize relay K2. Contacts K2-2 (terminals 3-6) open to de-energize the blower.



ECB19-2.5P, 5P, 6P, 7P and 8P

Operation Sequence:

1- Transformer Supplies 24VAC power to indoor thermostat, indoor unit and outdoor unit controls.

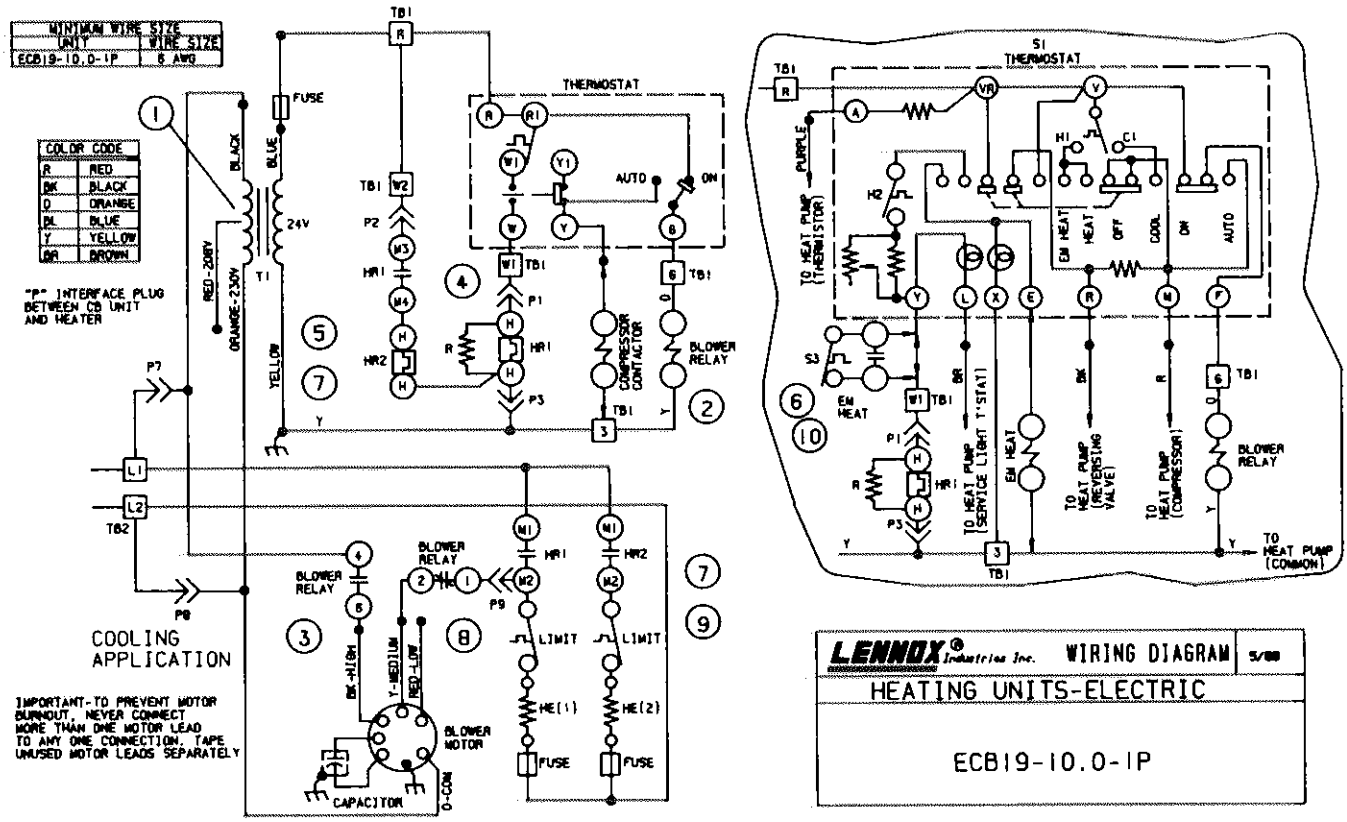
2- On compressor demand, blower relay and compressor contactor are energized. Relay contacts 4-6 close to energize blower on high speed. Contacts 1-2 open to disconnect heating speed.

3- When compressor demand stops blower relay is de-energized and contacts 4-6 open to de-energize the blower. Contacts 1-2 close to reconnect heating speed.

4- On heating demand heat relay HR and resistor R are energized (optional outdoor thermostat, if installed, must be closed before heat relay can energize). Within 1-110 seconds HR1 contacts M1-M2 (then M3-M4, if so equipped) close to energize heating element(s). The blower is energized on heating speed through M1-M2 and through blower relay contacts 1-2.

5- When heating demand stops HR1 and R are de-energized. 1-110 sec. later HR1 contacts M3-M4 then M1-M2 open to de-energize heating elements. Blower is de-energized when M1-M2 opens.

6- When there is a call for emergency heat, emergency heat relay closes to shunt across outdoor thermostat and energize HR1. Compressor contactor is locked out by indoor thermostat.



ECB19-10P

Operation Sequence:

1- Transformer supplies 24VAC power to indoor thermostat, indoor unit and outdoor unit controls.

2- On compressor demand, blower relay and compressor contactor are energized. Blower relay contacts 4-6 close to energize blower on high speed. Conacts 1-2 open to disconnect heating speed.

3- When compressor demand stops, blower relay is de-energized and contacts 4-6 open to de-energize blower. Contacts 1-2 close to re-connect heating speed.

4- On heating demand, heat relay HR1 and resistor R are energized.

5- 1-110 sec. later contacts M1-M2 close to energize 1st heating element and energize blower on heating speed then M3-M4 close to energize heat relay HR2.

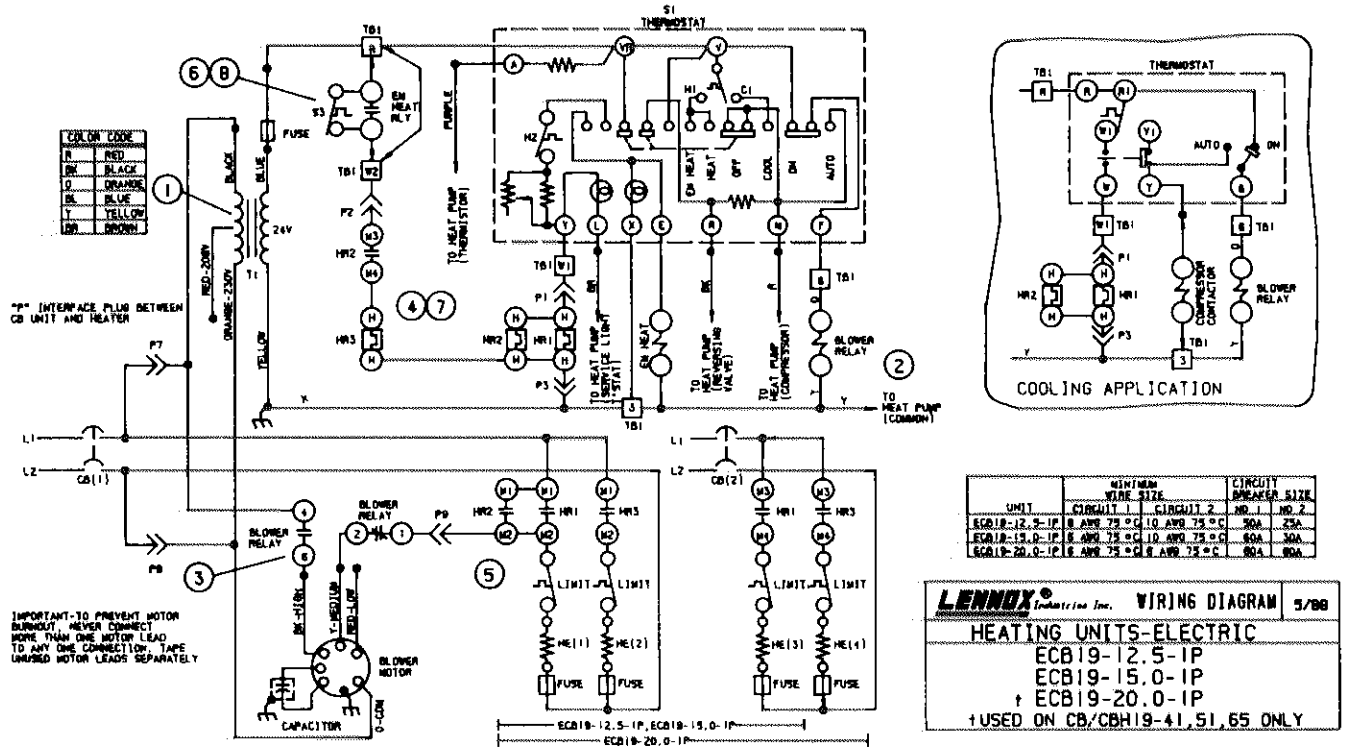
6- Optional outdoor thermostat, if installed, must be closed before HR2 can energize. When HR2 is energized, HR2 M1-M2 contacts close 1-110 sec. later to energize 2nd heating element.

7- When heating demand stops HR1 and R are de-energized.

8- Within 1-110 sec., HR1 terminals M3-M4 open to de-energize HR2 then HR1 terminals M1-M2 open to de-energize 1st stage heating element and blower.

9- 1-110 sec, after HR2 is de-energized, HR2 terminals M1-M2 open to de-energize 2nd heating element.

10- When there is a call for emergency heat, emergency heat relay closes to shunt across outdoor thermostat and energize HR1. Compressor contactor is locked out by indoor thermostat.



ECB19-12.5P, 15P and 20P

Operation Sequence:

1- Transformer supplies 24VAC power to indoor thermostat, indoor unit and outdoor unit controls.

2- On compressor demand, blower relay and compressor contactor are energized. Blower relay contacts 4-6 close to energize blower on high speed. Contacts 1-2 open to disconnect heating speed.

3- When compressor demand stops, blower relay is de-energized and contacts 4-6 open to de-energize blower. Contacts 1-2 close to re-connect heating speed.

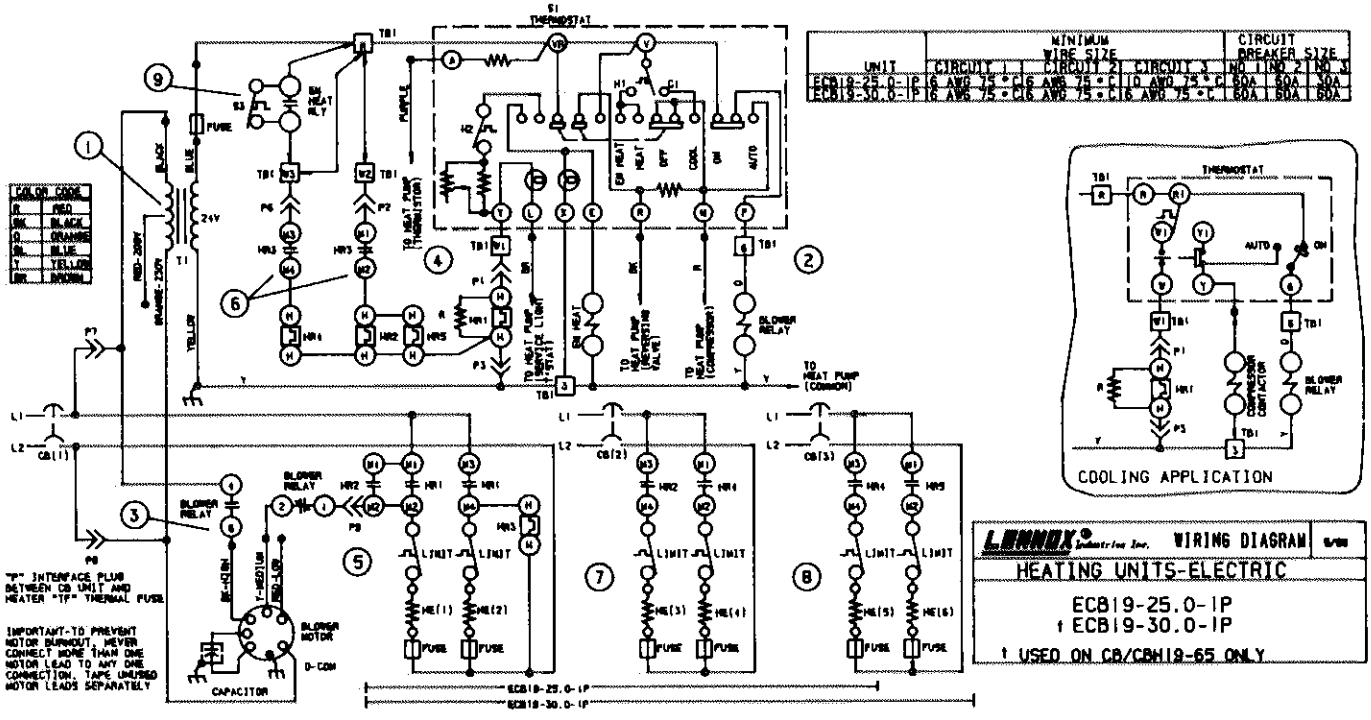
4- On heating demand, heat relays HR1 and HR2 are energized.

5- Within 1-110 sec., HR1 terminals M1-M2 and HR2 terminals M1-M2 energize 1st heating element and energize blower on heating speed. Then (within same 1-110 sec.) HR1 terminals M3-M4 close to energize 3rd heating element and HR2 terminals M3-M4 close to energize HR3.

6- Optional outdoor thermostat, if installed, must be closed before heat relay HR3 can energize. Within 1-110 sec., HR3 terminals M1-M2 close to energize 2nd heating element then M3-M4 close to energize 4th heating element (if so equipped).

7- When heating demand stops, HR1 and HR2 are de-energized first followed by HR3. Heat relay terminals operate on a first on last off basis within 1-110 sec. after being de-energized.

8- When there is a call for emergency heat, emergency heat relay closes to shunt across outdoor thermostat. Heat relay HR3 is energized in sequence after HR1 and HR2. Compressor contactor is locked out by indoor thermostat.



ECB19-25P and 30P

Operation Sequence:

1- Transformer supplies 24VAC power to indoor thermostat, indoor unit and outdoor unit controls.

2- On compressor demand, blower relay and compressor contactor are energized. Blower relay contacts 4-6 close to energize blower on high speed. Contacts 1-2 open to disconnect heating speed.

3- When compressor demand stops, blower relay is de-energized and contacts 4-6 open to de-energize blower. Contacts 1-2 close to re-connect heating speed.

4- On heating demand, heat relay HR1 and resistor R are energized.

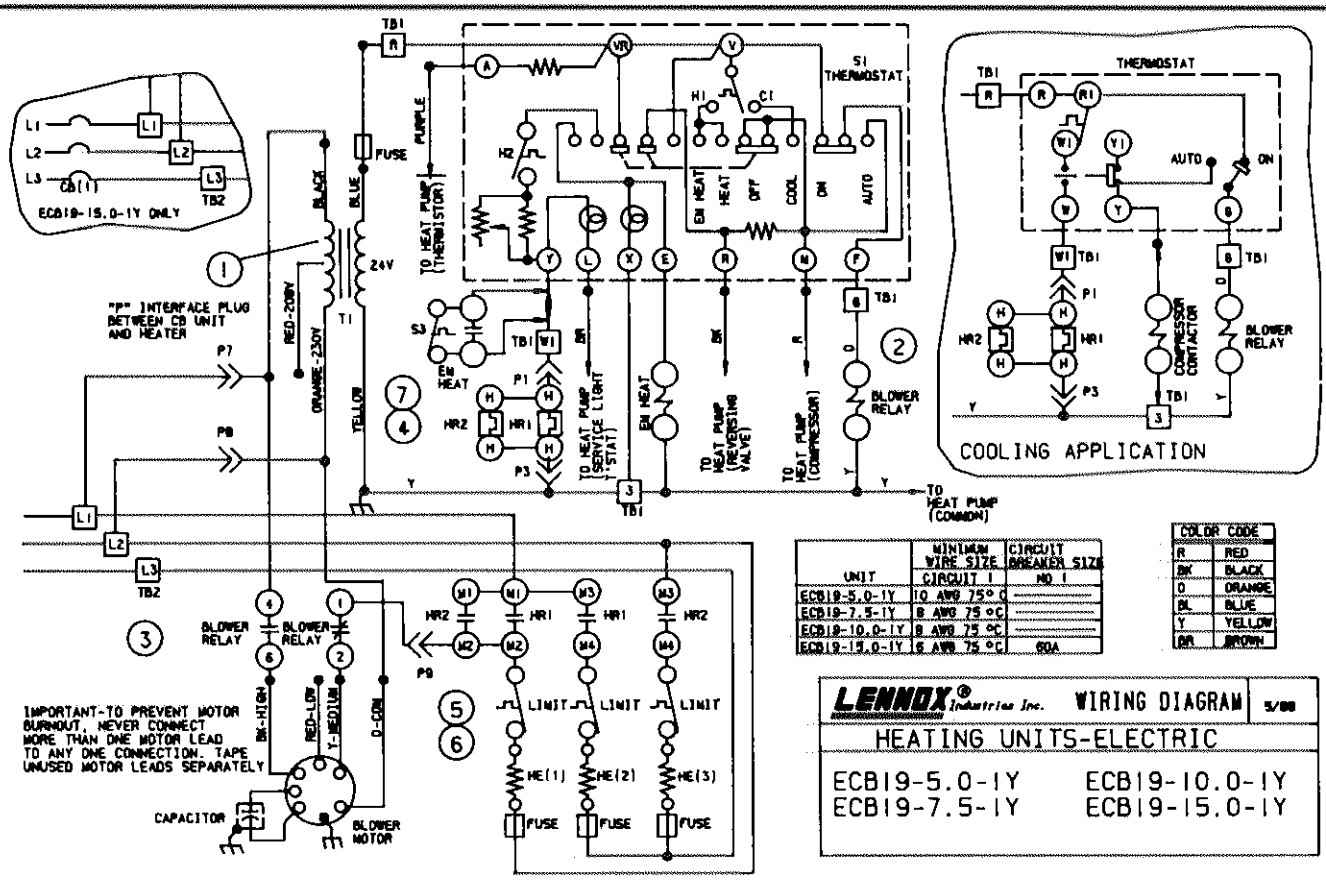
5- 1-110 sec. later contacts M1-M2 close to energize 1st heating element and energize blower on heating speed then M3-M4 close to energize 2nd heating element and heat relay HR3.

6- 1-110 sec. after HR3 is energized, terminals M1-M2 close to energize heat relays HR2 and HR5 (if so equipped) then M3-M4 terminals close to energize heat relay HR4 (optional outdoor thermostat, if installed, must be closed before heat relay HR4 can energize).

7- Within 1-110 sec. after HR2, HR4 and HR5 are energized, HR2 terminals M1-M2 close to lock-in blower operation, HR4 terminals M1-M2 close to energize 4th heating element and HR5 terminals M1-M2 (if so equipped) close to energize 6th heating element. Then HR2 terminals M3-M4 close to energize 3rd heating element and HR4 terminals M3-M4 close to energize 5th heating element.

8- When heating demand stops, Heat relay HR1 is de-energized first followed by HR3. Then HR2 and HR5 are de-energized followed by HR4. Heat relay terminals operate on a first on last off basis within 1-110 sec. after being de-energized.

9- When there is a call for emergency heat, emergency heat relay closes to shunt across outdoor thermostat. Heat relay HR4 is energized in sequence after HR1, HR3, HR2 and HR5. Compressor contactor is locked out by indoor thermostat.



UNIT	MINIMUM WIRE SIZE CIRCUIT 1	CIRCUIT BREAKER SIZE NO. 1
ECB19-5.0-1Y	10 AWG 75° C	----------
ECB19-7.5-1Y	8 AWG 75 °C	----------
ECB19-10.0-1Y	8 AWG 75 °C	----------
ECB19-15.0-1Y	6 AWG 75 °C	60A

ECB19-5Y, 7.5Y, 10Y and 15Y

Operation Sequence:

1- Transformer supplies 24VAC power to indoor thermostat, indoor unit and outdoor unit controls.

2- On compressor demand, blower relay and compressor contactor are energized. Blower relay contacts 4-6 close to energize blower on high speed. Contacts 1-2 open to disconnect heating speed.

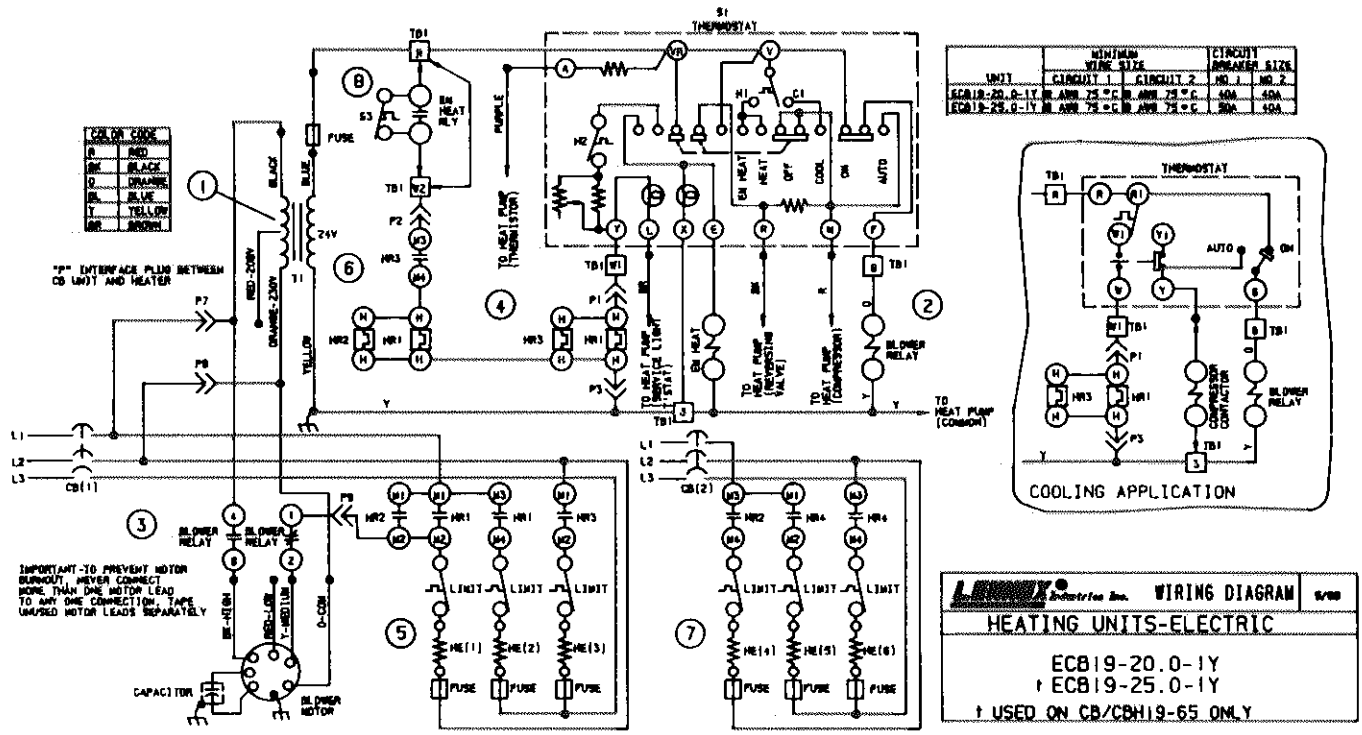
3- When compressor demand stops, blower relay is de-energized and contacts 4-6 open to de-energize blower. Contacts 1-2 close to re-connect heating speed.

4- On heating demand, heat relays HR1 and HR2 are energized (optional outdoor thermostat, if installed, must be closed before heat relays HR1 and HR2 can energize).

5- Within 1-110 sec., HR1 terminals M1-M2 and HR2 terminals M1-M2 energize 1st heating element and energize blower on heating speed. Then (within same 1-110 sec.) HR1 terminals M3-M4 close to energize 2nd heating element and HR2 terminals M3-M4 close to energize 3rd heating element.

6- When heating demand stops, heat relays HR1 and HR2 are de-energized together. Heat relay terminals operate on a first on last off basis within 1-110 sec. after being de-energized.

7- When there is a call for emergency heat, emergency heat relay closes to shunt across outdoor thermostat. Compressor contactor is locked out by indoor thermostat.



ECB19-20Y and 25Y

Operation Sequence:

1- Transformer supplies 24VAC power to indoor thermostat, indoor unit and outdoor unit controls.

2- On compressor demand, blower relay and compressor contactor are energized. Blower relay contacts 4-6 close to energize blower on high speed. Contacts 1-2 open to disconnect heating speed.

3- When compressor demand stops, blower relay is de-energized and contacts 4-6 open to de-energize blower. Contacts 1-2 close to re-connect heating speed.

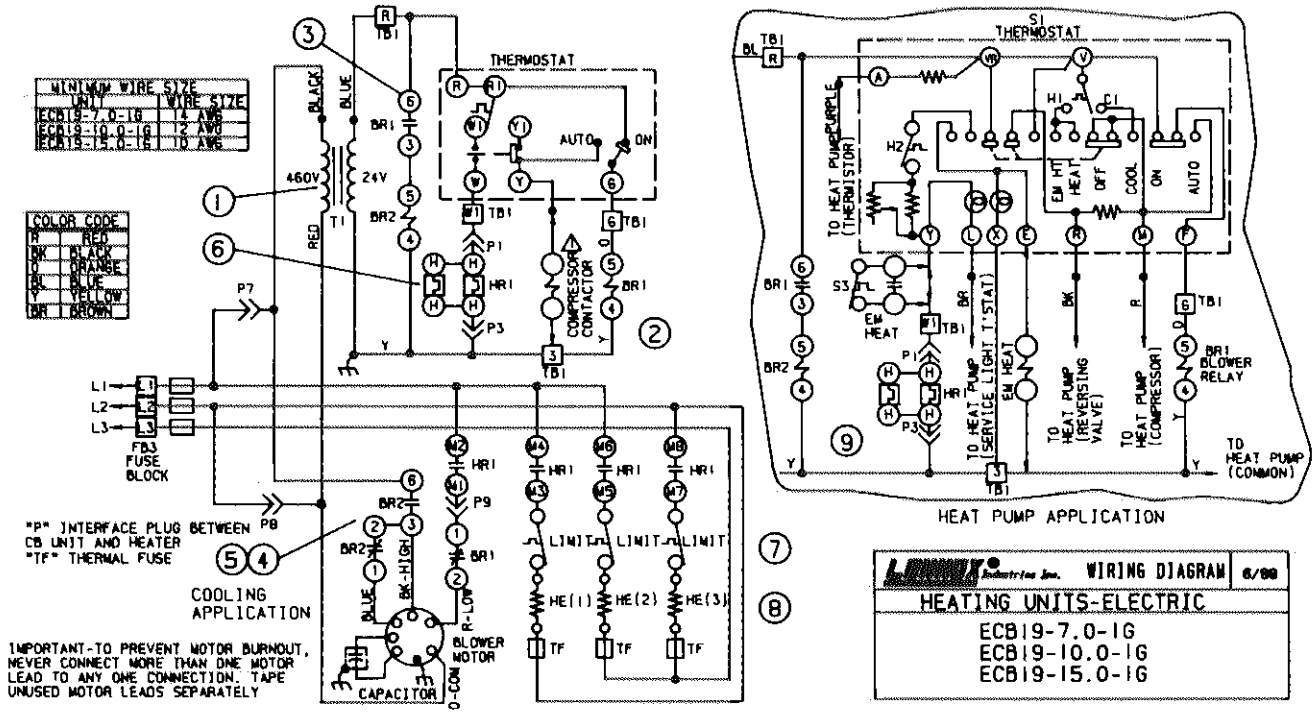
4- On heating demand, heat relays HR1 and HR3 are energized.

5- Within 1-110 sec., HR1 terminals M1-M2 energize 1st heating element and energize blower on heating speed while HR3 terminals M1-M2 energize 3rd heating element. Then (within same 1-110 sec.) HR1 terminals M3-M4 close to energize 2nd heating element and HR3 terminals M3-M4 close to energize heat relays HR2 and HR4.

6- Within 1-110 sec. after HR2 and HR4 are energized, HR2 terminals M1-M2 close to lock-in blower operation and HR4 terminals M1-M2 energize 5th heating element. Then (within same 1-110 sec.) HR2 terminals M3-M4 close to energize 4th heating element and HR4 terminals M3-M4 close to energize 6th heating element.

7- When heating demand stops, heat relays HR1 and HR3 are de-energized together. Then heat relays HR2 and HR4 are de-energized together. Heat relay terminals operate on a first on last off basis within 1-110 sec. after being de-energized.

8- When there is a call for emergency heat, emergency heat relay closes to shunt across outdoor thermostat and energize heat relays HR2 and HR4 in sequence after HR1 and HR3. Compressor contactor is locked out by indoor thermostat.



ECB19-7G, 10G and 15G

Operation Sequence:

1- Transformer supplies 24VAC power to indoor thermostat, indoor unit and outdoor unit controls.

2- On compressor demand, blower relay 1 (BR1) and compressor contactor are energized. BR1 terminals 3-6 close to energize blower relay 2 (BR2) and terminals 1-2 open to disconnect heating speed.

3- BR2 terminals 3-6 close to energize blower on high speed and terminals 1-2 open to disconnect blower motor heating speed internal wiring.

4- When compressor demand stops, BR1 is de-energized. Terminals 1-2 close to re-connect heating speed and terminals 3-6 open to de-energize BR2.

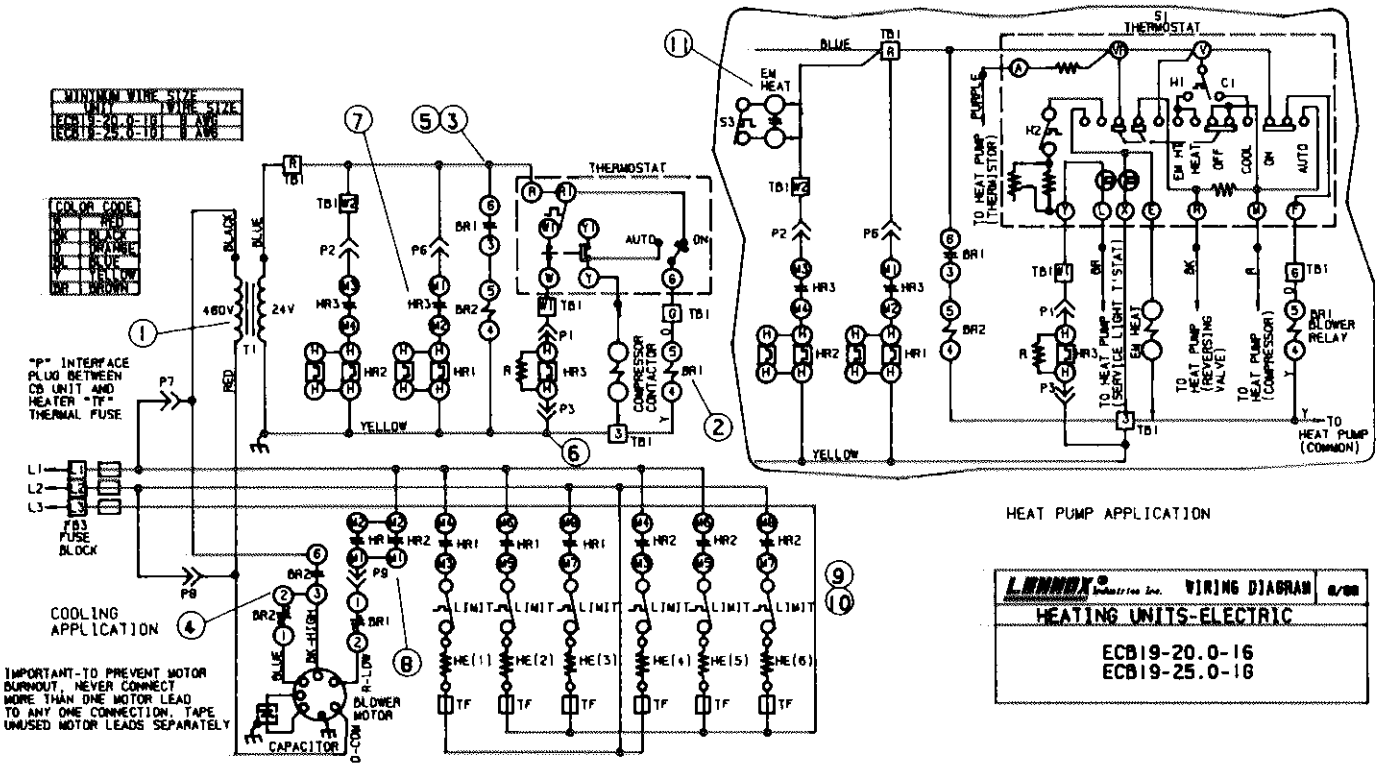
5- BR2 terminals 3-6 open to de-energize the blower and terminals 1-2 close to connect heating speed internal wiring.

6- On a heating demand heat relay HR1 is energized (optional outdoor thermostat, if installed, must be closed before heat relay HR1 can energize).

7- Within 1-110 sec., HR1 terminals M1-M2 and M3-M4 close together to energize the blower on heating speed and energize 1st heating element. Then (also within the same 1-110 sec.), terminals M5-M6 close to energize 2nd heating element before terminals M7-M8 close to energize 3rd heating element.

8- When heating demand stops, heat relay HR1 is de-energized. Heat relay terminals operate on a first on last off basis within 1-110 sec. after being de-energized.

9- When there is a call for emergency heat, emergency heat relay closes to shunt across outdoor thermostat. Compressor contactor is locked out by indoor thermostat.



ECB19-20G and 25G

Operation Sequence:

1- Transformer supplies 24VAC power to indoor thermostat, indoor unit and outdoor unit controls.

2- On compressor demand, blower relay 1 (BR1) and compressor contactor are energized. BR1 terminals 3-6 close to energize blower relay 2 (BR2) and terminals 1-2 open to disconnect heating speed.

3- BR2 terminals 3-6 close to energize blower on high speed and terminals 1-2 open to disconnect blower motor heating speed internal wiring.

4- When compressor demand stops, BR1 is de-energized. Terminals 1-2 close to re-connect heating speed and terminals 3-6 open to de-energize BR2.

5- BR2 terminals 3-6 open to de-energize the blower and terminals 1-2 close to connect heating speed internal wiring.

6- On a heating demand heat relay HR3 and resistor R are energized.

7- Within 1-110 sec., HR3 terminals M1-M2 close to energize heat relay HR1 then HR3 terminals M3-M4 close to energize heat relay HR2.

8- Within 1-110 sec. after HR1 is energized, HR1 terminals M1-M2 close to energize blower on heating speed and M3-M4 close to energize 1st heating element. Then (also within the same 1-110 sec.) terminals M5-M6 close to energize 2nd heating element before terminals M7-M8 close to energize 3rd heating element.

9- Within 1-110 sec. after HR2 is energized, HR2 terminals M1-M2 close to lock-in blower on heating speed and M3-M4 close to energize 4th heating element. Then (also within the same 1-110 sec.) terminals M5-M6 close to energize 5th heating element before terminals M7-M8 close to energize 6th heating element.

10- When heating demand stops, heat relay HR3 is de-energized. Then heat relay HR1 is de-energized followed by heat relay HR2. Heat relay terminals operate on a first on last off basis within 1-110 sec. after being de-energized.

11- When there is a call for emergency heat, emergency heat relay closes to shunt across outdoor thermostat and energize heat relay HR2 in sequence after HR3. Compressor contactor is locked out by indoor thermostat.