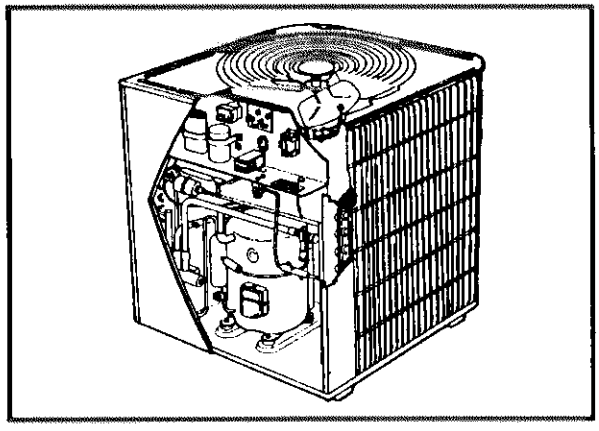
HP19 SERIES UNITS

The HP19 is a high efficiency residential split-system heat pump. Several models are available in sizes ranging from 1-1/2 through 5 tons. The series uses expansion valves in the outdoor unit and new RFCIII™ refrigerant flow control device in the indoor unit. The flow control device is detailed in the B19/CB19/ECB19 Unit Information Manual.

This manual is divided into sections which discuss the major components, refrigerant system and charging procedures, maintenance and operation sequences. All specifications in this manual are subject to change.



SPECIFICATIONS

Model No.		HP19-211	HP19-261	HP19-311	HP19-411 HP19-413	HP19-461 HP19-463	HP19-511 HP19-513	HP19-651 HP19-653
Outdoor Coil	Face area (sq.ft.) inside / outside	11.83/ 8.57	11.83/ 8.57	15.94/ 15.34	15.94/ 15.34	18.22/ 17.53	21.64/ 20.81	23.92/ 23.01
	Tube diameter (in.)	3/8	3/8	3/8	3/8	3/8	3/8	3/8
	No. of Rows	1.75	1.75	2	2	2	2	2
	Fins per Inch	18	18	18	18	18	18	20
Outdoor Fan	Diameter (in.)	20	20	24	24	24	24	24
	No. of Blades	4	4	3	3	3	4	4
	Motor hp	1/6	1/6	1/6	1/6	1/6	1/4	1/4
	Cfm	2300	2300	3350	3350	3400	3900	4100
	RPM	840	840	820	820	820	860	815
	Watts	185	185	210	210	200	290	350
Refrigerant-22 (charge furnished)		6lbs. 5oz.	6lbs. 14oz.	9lbs. 5oz.	11lbs. 3oz.	12lbs. 10oz	12lbs. 13oz	16lbs. 4oz.
Liquid line connection		3/8	3/8	3/8	3/8	3/8	3/8	3/8
Vapor line connection		5/8	5/8	3/4	3/4	7/8	7/8	1-1/8

ELECTRICAL DATA

Model No.		HP19-211	HP19-261	HP19-311	HP19-411	HP19-413	HP19-461	HP19-463
Line voltage data - 60hz.		208/230/1ph	208/230/1ph	208/230/1ph	208/230/1ph	208/230/1ph	208/230/1ph	208/230/3ph
Compressor	Rated load amps	9.7	12.1	14.2	15.6	10.8	18.3	11.7
	Power factor	.98	.98	.98	.98	.88	.98	.88
	Locked rotor amps	54	57	66	75.8	65	97.6	73.4
Outdoor Coil Fan Motor	Full load amps	1.1	1.1	1.1	1.1	1.1	1.1	1.1
	Locked rotor amps	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Max fuse or c.b. size (amps)		20	25	30	35	25	40	25
*Minimum circuit ampacity		13.3	16.3	18.9	20.6	14.6	24.0	15.8

Model No.		HP19-511	HP19-513		HP19-651	HP19-653	
Line voltage data - 60hz.		208/230/1ph	208/230/3ph	460/3ph	208/230/1ph	208/230/3ph	460/3ph
Compressor	Rated load amps	20.4	13.3	6.2	27.6	17.7	9.4
	Power factor	.98	.88	.88	.98	.88	.88
	Locked rotor amps	107.4	74	37	135	105	55
Outdoor Coil Fan Motor	Full load amps	2.2	2.2	1.1	1.7	1.7	1.1
	Locked rotor amps	4.5	4.5	2.0	3.0	3.0	2.0
Max fuse or circuit breaker size (amps)		45	30	15	60	40	20
*Minimum circuit ampacity		27.7	18.9	8.9	36.2	23.9	12.9

*Refer to National Electrical Code Manual to determine wire, fuse and disconnect size requirements.

NOTE - Extremes of operating range are plus 10% and minus 5% of line voltage

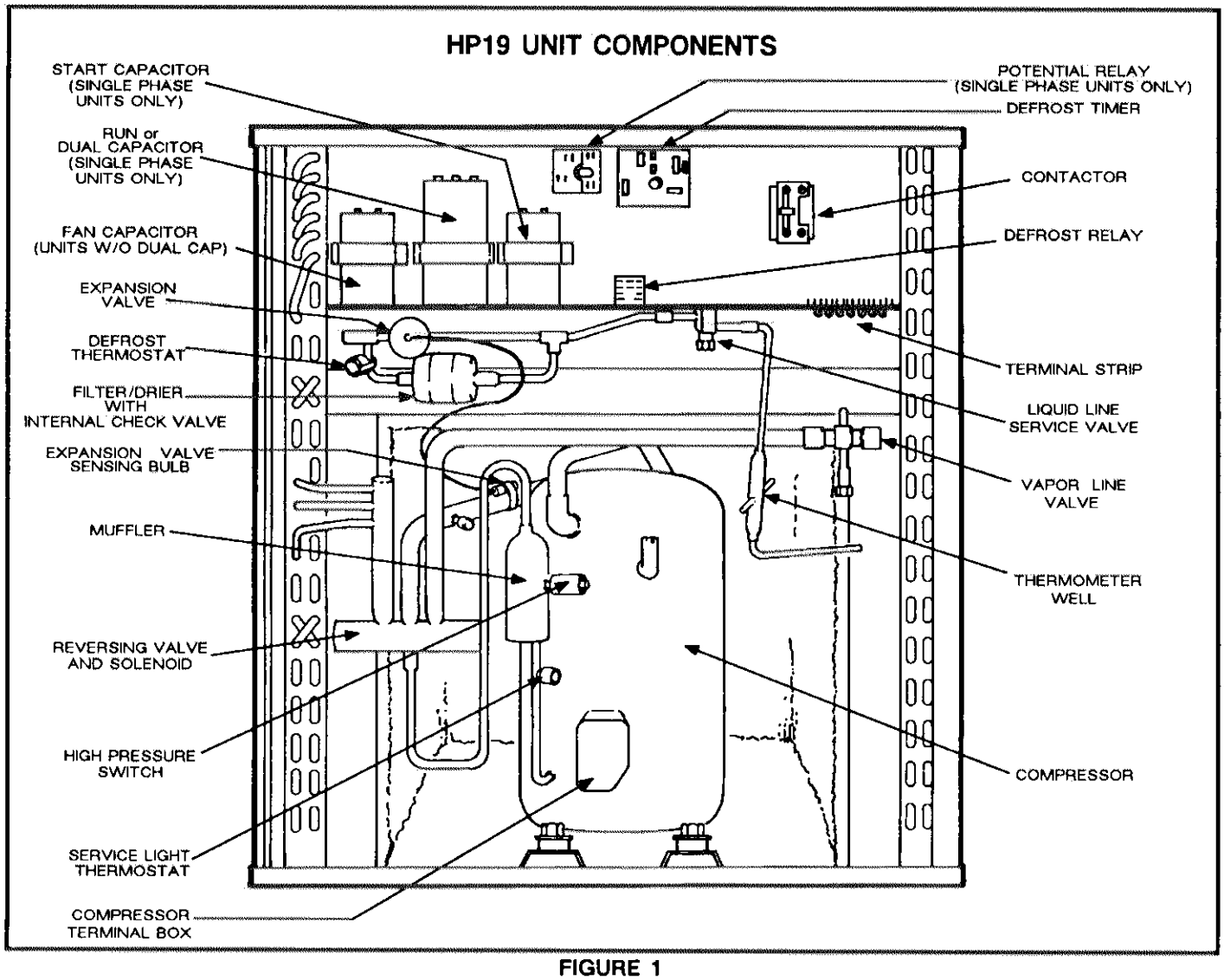


FIGURE 1

I-APPLICATION

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.

II-UNIT COMPONENTS

A-Transformer

The contactor, reversing valve, high pressure switch and defrost timer are all powered by 24VAC supplied by the indoor unit. All other controls in the outdoor unit are powered by line voltage. Refer to unit wiring diagram. The HP19 is not equipped with an internal line voltage to 24V transformer.

B-Contactor

The compressor is energized by a contactor located in the control box. Single phase units use SPST contactors and three phase units use 3 pole double break contactors. The contactor is energized by indoor thermostat terminal M when thermostat demand is present.

C-Terminal Strip

All HP19's are equipped with a low voltage terminal strip located in the unit control box for making-up thermostat wiring connections (refer to figure 1).

D-Compressor

Table 1 shows the specifications of compressors used in HP19 series units. All compressors are equipped

with internal pressure relief valves and use insertion type self-regulating crankcase heaters which are powered at all times.

TABLE 1

COMPRESSOR SPECIFICATIONS						
Unit	Phase	Btuh	LRA	RLA	Oil fl.oz.	Heater Watts
HP19-211	1	16,700	54	9.7	40	30
HP19-261	1	22,800	57	12.1	40	30
HP19-311	1	26,400	66	14.2	50	30
HP19-411	1	32,700	75.8	15.6	55*	40
HP19-413	3	32,100	65	10.8	55*	40
HP19-461	1	38,300	97.6	18.3	54	30
HP19-463	3	37,750	73.4	11.7	54**	27
HP19-511	1	42,300	107.4	20.4	54	30
HP19-513Y	3	41,800	74	13.3	54	30
HP19-513G	3	41,800	37	6.2	54	30
HP19-651	1	58,300	135	27.6	70	40
HP19-653Y	3	58,600	105	17.7	70	40
HP19-653G	3	58,600	55	9.4	70***	40

*Heat Pump Grade Mineral Oil Viscosity 190-210
**Heat Pump Grade Mineral Oil Viscosity 150
***Texaco Capella WF-32 or Sunlso 3GS or White Oil M/M Sontex 200-LT

E-Outdoor Fan Motor

The specifications table on page 1 of this manual shows the specifications of outdoor fans used in HP19's. In all units, the outdoor fan is controlled by the compressor contactor and is de-energized when the defrost relay is energized.

F-High Pressure Switch

All units are equipped with a high pressure switch (manual reset type) mounted on the compressor discharge line. The manually reset high pressure switch has a 'cutout' point of 410 psig. The switch is electrically connected in series with the contactor coil. When the high pressure switch 'trips' the contactor cannot energize.

G-Service Light Thermostat

All units are equipped with a service light thermostat mounted on the compressor discharge line. The switch is electrically connected to the service light in the indoor thermostat. The switch is closed on compressor start-up and the thermostat service light is momentarily lighted. When compressor discharge line temperature reaches 130±5°F, S7 opens. If discharge line temperature drops below 110±5°F during unit operation, (indicating a problem in the system), the switch closes. If thermostat demand is present when S7 closes, the service light is powered to indicate service is needed.

H-Start Capacitor

All single phase HP19's are equipped with a start capacitor connected in parallel with the run capacitor. The capacitor is switched off by the potential relay when the compressor nears full speed. Table 2 shows start capacitor ratings for single phase HP19's.

Three phase HP19's do not use start capacitors.

TABLE 2

HP19 START CAPACITOR RATING		
Units	MFD	VAC
HP19-211,-261,-311	88-108	250
HP19-411	145-175	330
HP19-461,-511	135-155	320
HP19-651	176-216	330

I-Dual Capacitor

The compressor and fan in HP19-211,-261,-311,-411 and -461 series units use permanent split capacitor motors. A single 'dual' capacitor is used for both the fan motor and the compressor (see unit wiring diagram). The fan side of the capacitor and the compressor side of the capacitor have different mfd ratings. This capacitor is located inside the unit control box (see figure 1). Table 3 shows the ratings of the dual capacitor.

TABLE 3

HP19 DUAL CAPACITOR RATING			
Units	Terminal	MFD	VAC
HP19-211	FAN	5	370
	HERM	25	
HP19-261	FAN	5	
	HERM	30	
HP19-311	FAN	5	
	HERM	35	
HP19-411	FAN	5	
	HERM	40	
HP19-461	FAN	5	
	HERM	45	

J-Run Capacitor

HP19-511,-651 series units use separate fan and compressor run capacitors. The run capacitor is located in the unit control box and is is electrically connected as shown in the unit wiring diagram. These capacitors are rated 45 MFD at 440 VAC.

K-Fan Capacitor

All HP19 series units (single and three phase) use single phase PSC outdoor fan motors which require an external run capacitor. This capacitor is located inside the unit control box. Table 3 shows the capacitance rating of dual capacitors used in some single phase units. All other HP19's use a separate fan capacitor (see Table 4 for ratings).

TABLE 4

HP19 FAN CAPACITOR RATING		
Units	MFD	VAC
HP19-511	5	370
HP19-651	10	
HP19-413,-463Y	5	370
HP19-513Y	5	
HP19-513G	7	
HP19-653Y	10	
HP19-653G	7	

L-Defrost Thermostat

A defrost thermostat is mounted on the liquid line between the expansion valve and the distributor. The thermostat opens at 70±5°F and closes at 35±5°F. For defrost to begin, the defrost thermostat must be closed when the defrost timer calls for defrost.

M-Reversing Valve and Solenoid

A refrigerant reversing valve with electromechanical solenoid is used to reverse refrigerant flow during unit operation. The reversing valve is energized during cooling demand and during defrost. Refer to figures 7 and 8 for more information.

N-Defrost Timer

The CMC defrost control (figure 2) is a solid state control manufactured by Hamilton Standard. The control provides automatic swtiching from normal heating operation to defrost mode and back. The control provides 14 minute defrost periods at 30, 60 or 90 minute field changeable intervals. The control monitors thermostat demand and 'holds' the timer in place between thermostat demand. A set of diagnostic pins are also provided for troubleshooting the unit.

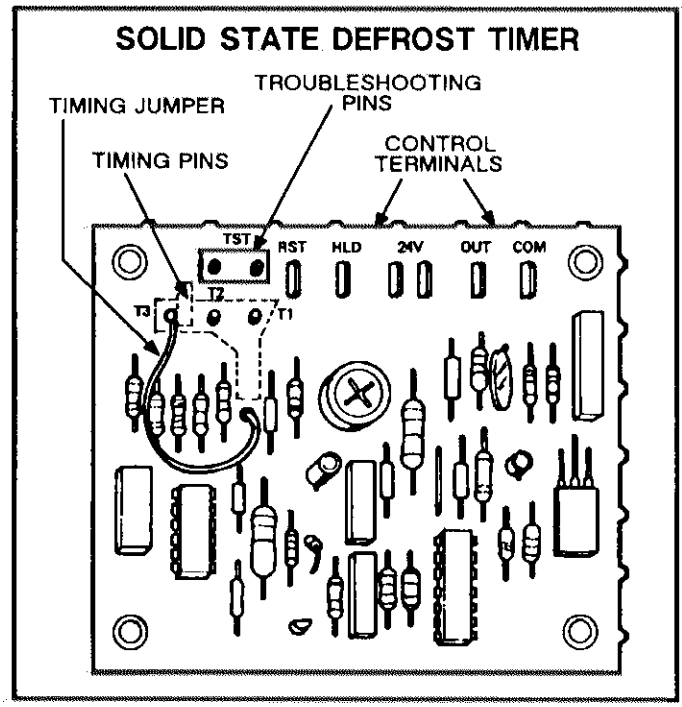


FIGURE 2

The control contains a solid state timer which switches an external defrost relay through 1/4" male spades mounted on the control's circuit board. When the defrost thermostat closes (call for defrost), the defrost timer initiates a 30, 60 or 90 minute (depending on how the control is preset) timing seqeunce. If the defrost thermostat remains closed when the timing sequence ends, the defrost relay is energized and defrost begins.

Defrost Control Components

1- Timing Pins 30(T1), 60(T2), 90(T3)

Each of these pins provides a different timed interval between defrosts. A jumper connects the pins to circuit board pin W1. Table 5 shows the timings of each pin. The defrost interval can be field changed to 30, 60 or 90 minutes. The defrost period (14 minutes) cannot be changed. To change the interval between defrosts, simply remove the jumper from the pin it is connected to and reconnect the jumper to one of the other available pins (see figure 3).

2- Timing Jumper

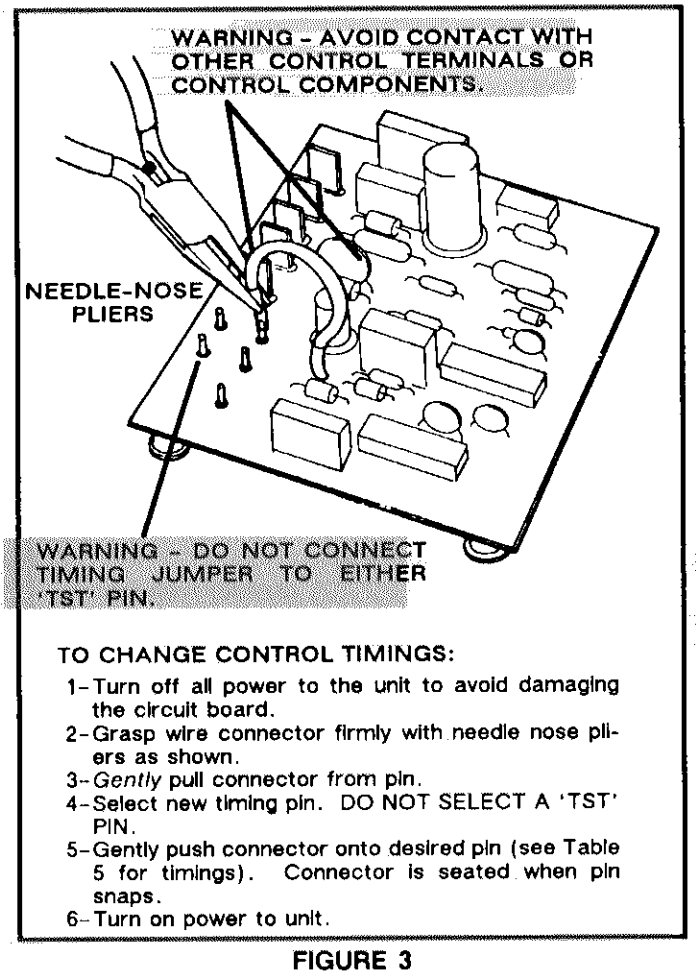
The timing jumper is a factory installed jumper on the circuit board used to connect pin W1 to one of the three timing pins. The jumper may be con-

nected to any one of the timing pins but must never be connected to either of the 'TST' pins. See Caution.

TABLE 5

DEFROST CONTROL CMC TIMINGS	INTERVAL BETWEEN DEFROSTS WITH JUMPER CONNECTED TO:			DEFROST TIME
	30 (T1)	60 (T2)	90 (T3)	
NORMAL OPERATION	30 ± 3 MIN.	60 ± 6 MIN.	90 ± 9 MIN.	14 ± 1.4 MIN.
'TST' PINS JUMPERED TOGETHER	7 ± 0.7 SEC.	14 ± 1.4 SEC.	21 ± 2.1 SEC.	3.3 ± 0.3 SEC.

CAUTION - DO NOT CONNECT TIMING JUMPER TO EITHER 'TST' PIN. 'TST' PINS ARE USED ONLY DURING A TEST AND MUST NOT CONNECT WITH ANY OF THE TIMING PINS. CONTROL DAMAGE WILL RESULT.



TO CHANGE CONTROL TIMINGS:

1-Turn off all power to the unit to avoid damaging the circuit board.
2-Grasp wire connector firmly with needle nose pliers as shown.
3-*Gently* pull connector from pin.
4-Select new timing pin. DO NOT SELECT A 'TST' PIN.
5-Gently push connector onto desired pin (see Table 5 for timings). Connector is seated when pin snaps.
6-Turn on power to unit.

FIGURE 3

3- '24V' Terminal

Terminal '24V' receives 24VAC from the control transformer through the defrost thermostat. This terminal powers the control's internal timer and relays. Terminal '24V' is powered only when there is a call for defrost (defrost thermostat closed). The timer begins timing at 0 only after terminal '24V' receives power.

4- 'COM' Terminal

Terminal 'COM' provides 24VAC Common.

5- 'HLD' Terminal

Terminal 'HLD' holds the internal timer in place between thermostat demands and allows the unit to continue timing upon resumption of thermostat demand. Terminal 'HLD' is connected directly to thermostat demand.

NOTE - Hold function operates between thermostat demands only when defrost thermostat is closed.

6- 'OUT' Terminal

Terminal 'OUT' controls defrost when connected to one side of the defrost relay coil. An internal relay connected to terminal 'OUT' closes to allow external defrost relay to energize and initiate defrost. At the end of the defrost period, the internal relay connected to terminal 'OUT' opens to de-energize the external defrost relay.

7- 'RST' Terminal

Terminal 'RST' is not used in this application.

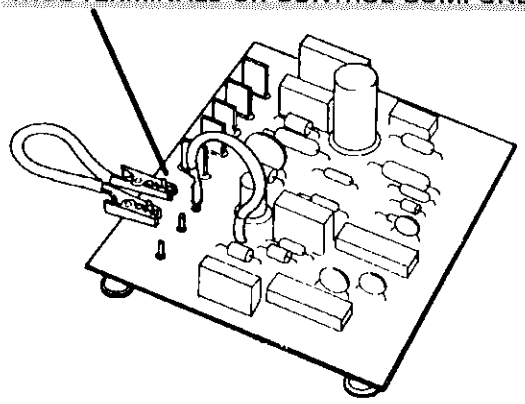
8- 'TST' Pins

Each board is equipped with a set of test pins for use in troubleshooting the unit. When jumpered together, these pins reduce the control timing to about 1/256 original time (see table 5 and figure 4).

IMPORTANT - CONTROL WILL BEGIN TEST MODE ONLY IF NORMAL LOAD IS APPLIED TO CONTROL TERMINALS. DO NO ATTEMPT TO OPERATE OR TEST CONTROL OUT OF UNIT.

A defrost period can last up to 14 minutes and can be terminated two ways. If the defrost thermostat does not open within 14 minutes after defrost begins, the timer will de-energize the defrost relay and the unit will resume normal operation. If the defrost thermostat opens during the 14 minute defrost period, the defrost relay is de-energized and the unit resumes normal operation. Refer to figure 5.

WARNING - AVOID CONTACT WITH OTHER CONTROL TERMINALS OR CONTROL COMPONENTS.



TO PLACE CONTROL IN TEST MODE:

1-Turn off all power to avoid damaging the circuit board.
2-Make sure all control terminals are connected as shown on unit wiring diagram before attempting to place control in test mode. See NOTE below.

NOTE - Control will not go into test mode when disconnected from unit. Unit load must be applied to control terminals before the control will go into test mode.

3-Connect jumper to 'TST' pins as shown.
4-Turn indoor thermostat to heat mode and adjust to highest temperature setting.
5-Turn on power to unit.
6-See Table 5 for control timings in 'TST' mode.
7-Turn on power to unit and re-adjust thermostat. Be sure to remove jumper when test is complete.

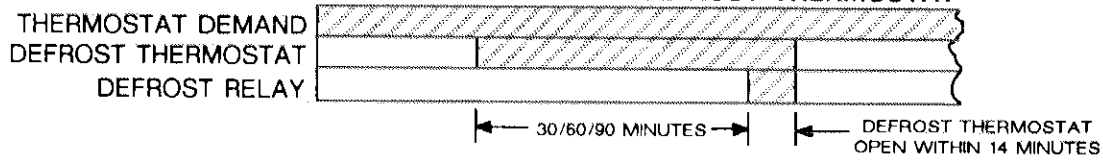
FIGURE 4

HP19 SERIES UNITS
TYPICAL DEFROST TIMINGS

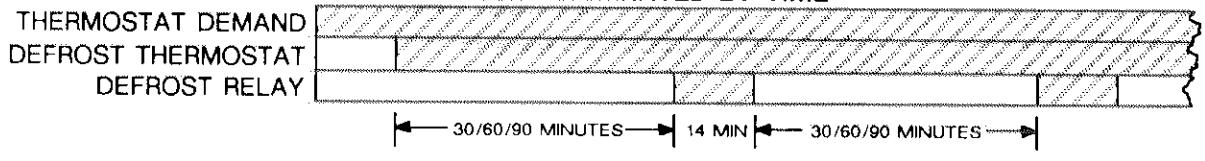
CLOSED, ON
OPEN, OFF

Note - Control begins timing at 0 when defrost thermostat closes. Defrost is terminated when defrost relay is de-energized. Anytime defrost thermostat opens, defrost relay is immediately de-energized, defrost timer resets and 'HOLD' function stops.

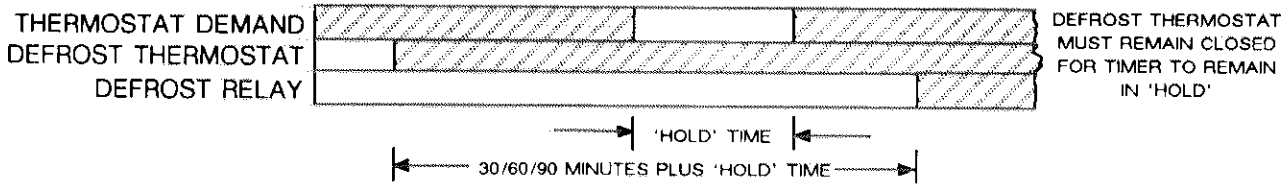
NORMAL HEATING OPERATION:
DEFROST TERMINATED BY DEFROST THERMOSTAT



NORMAL HEATING OPERATION:
DEFROST TERMINATED BY TIME



NORMAL HEATING OPERATION
INTERRUPTED BY THERMOSTAT DEMAND: 'HOLD' FUNCTION



DEFROST PERIOD INTERRUPTED BY THERMOSTAT DEMAND:
'HOLD' FUNCTION

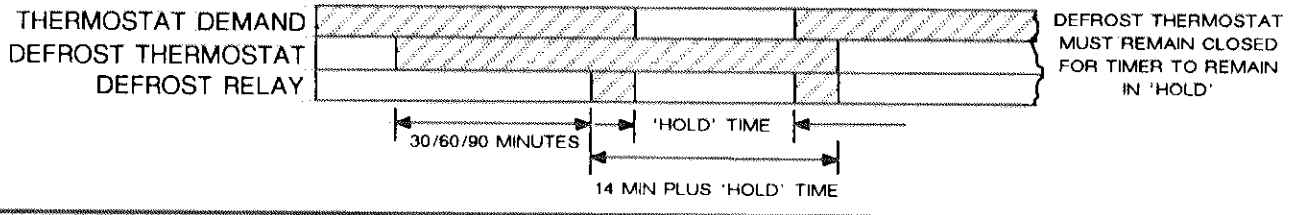


FIGURE 5

III-REFRIGERANT SYSTEM

A-Plumbing

Field refrigerant piping consists of liquid and vapor lines from the outdoor unit (sweat connections). Use Lennox L10 series line sets as shown in table 6 or field fabricated refrigerant lines. Refer to the piping section of the Lennox Service Unit Information Manual (SUI-803-L9) for proper size, type and application of field-fabricated lines.

TABLE 6

MODEL NO.	LIQUID LINE	VAPOR LINE	L10 LINE SETS
HP19-211 HP19-261	5/16 in.	5/8 in.	L10-21 10 ft. - 50 ft.
HP19-311 HP19-410	3/8 in.	3/4 in.	L10-41 20 ft. - 50 ft.
HP19-461 HP19-510	3/8 in.	7/8 in.	L10-65 30 ft. - 50 ft.
HP19-650	3/8 in.	1-1/8 in.	FIELD FABRICATED

A check valve and expansion valve are used in parallel in the liquid line. The check valve is closed when the unit is in heating mode to force refrigerant through the expansion valve. The check valve is open when the unit is in cooling mode.

Separate discharge and suction service ports are provided at the compressor for connection of gauge manifold during charging procedure. Figures 7 and 8 show HP19 gauge manifold connections.

B-Service Valves

The liquid line and vapor line service valves and gauge ports are accessible on the inside of the unit. The "one shot" vapor line service valve (figure 6) cannot be closed once it has been opened. These gauge ports are used for leak testing, evacuating, charging and checking charge. A separate gauge port is provided for checking the suction pressure when the unit is in the heating cycle.

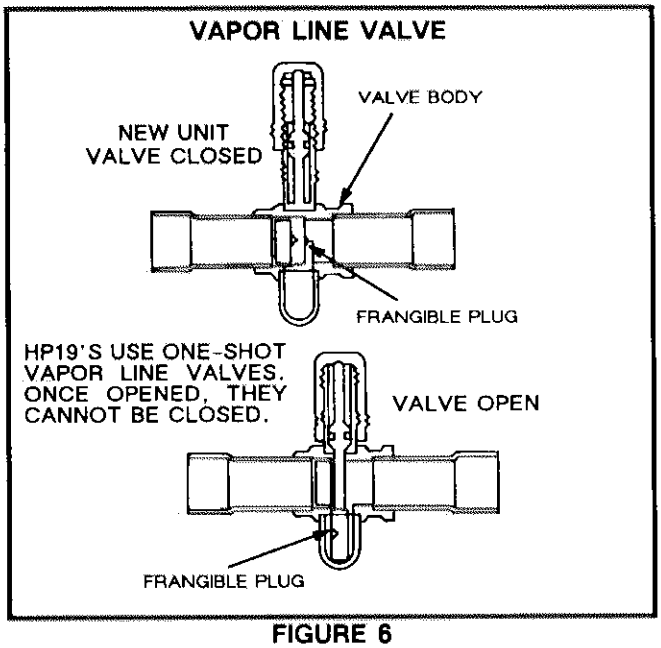


FIGURE 6

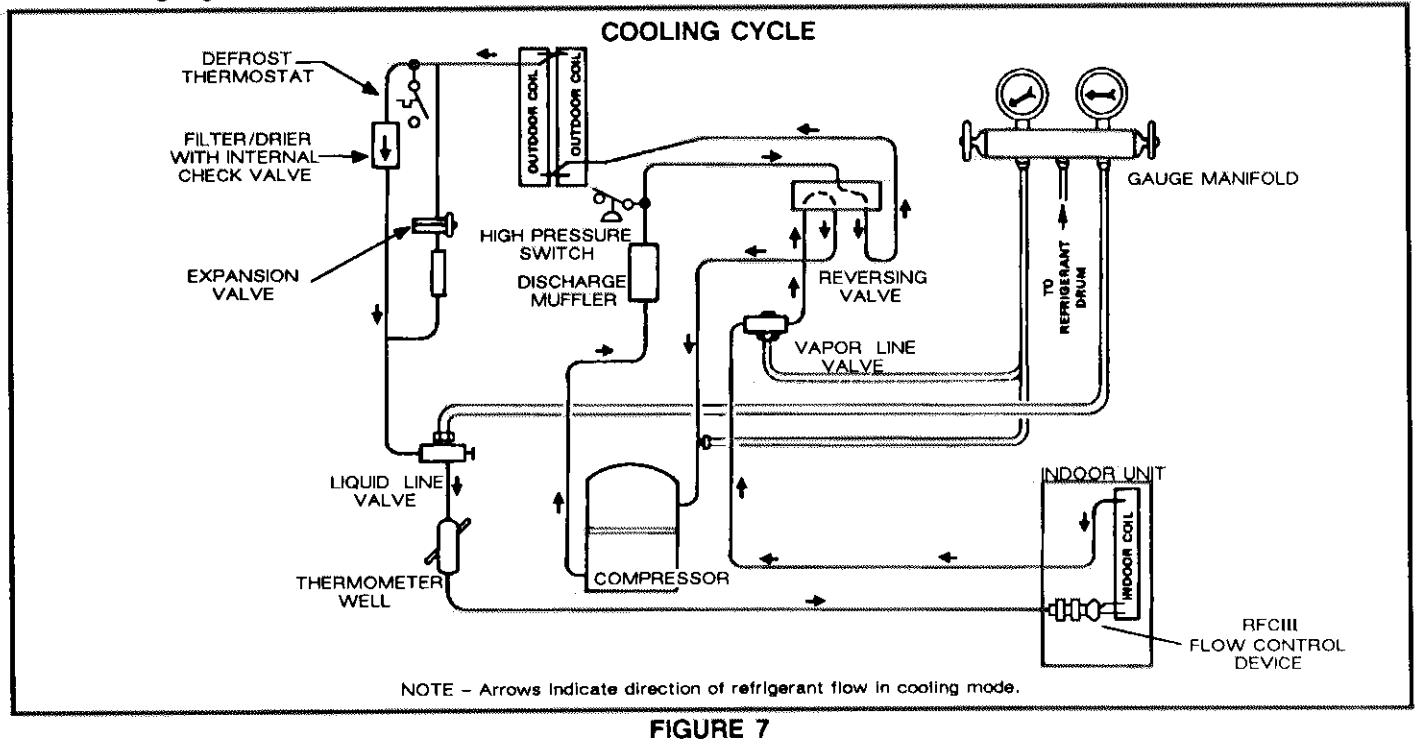


FIGURE 7

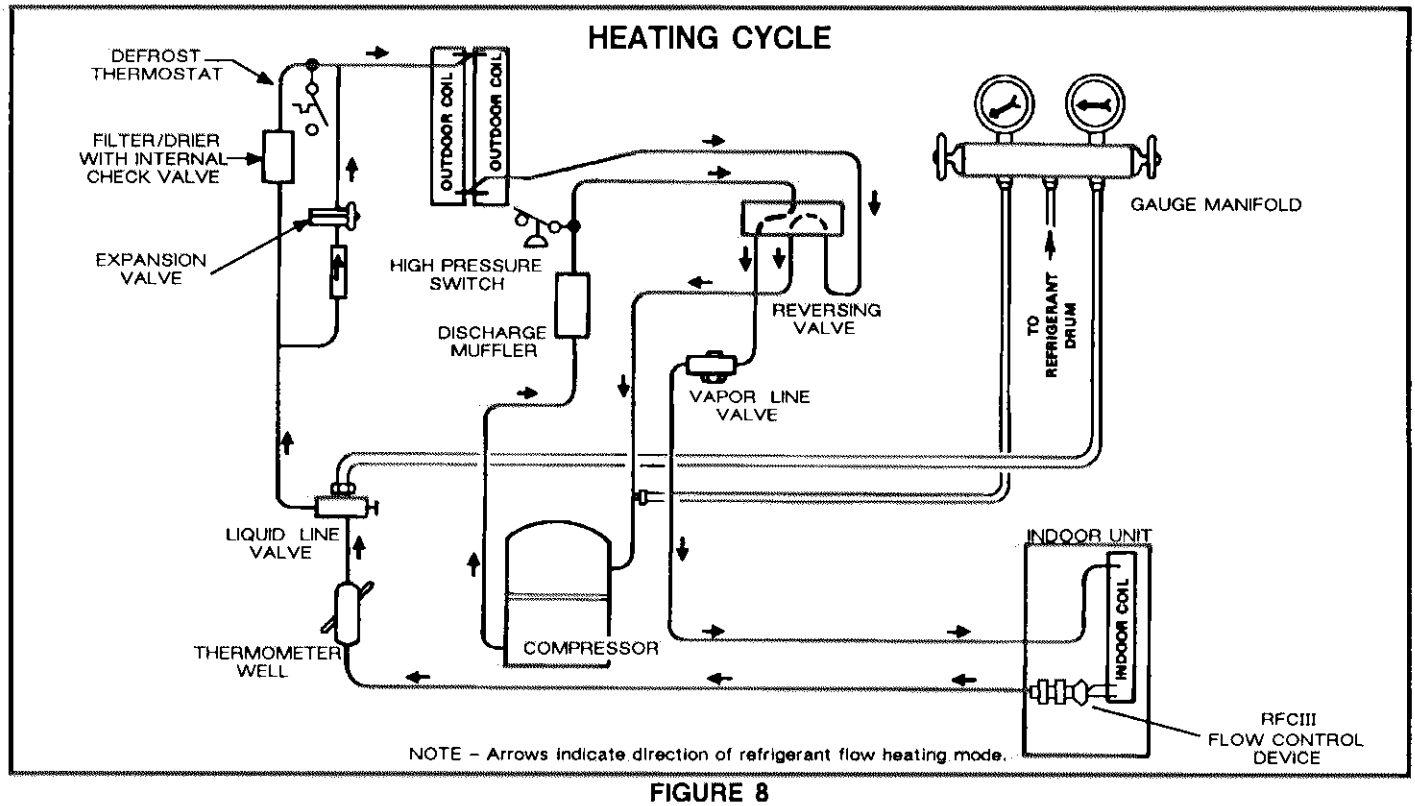


FIGURE 8

IV-CHARGING

The unit is factory-charged with the amount of R-22 refrigerant indicated on the unit rating plate. This charge is based on a matching indoor coil and outdoor coil with a 25 foot (7820mm) line set. For varying lengths of line set, refer to table 7 for refrigerant charge adjustment. A blank space is provided on the unit rating plate to list actual field charge.

TABLE 7

LINE SET DIAMETER		Ozs per ft. (ml per mm) adjust from 25 ft. (7620mm) line set*
Vapor	Liquid	
5/8 in. (16mm)	5/16 in. (8mm)	1/2 ounce (15ml)
5/8 in. (16mm)	3/8 in. (10mm)	1 ounce (30ml)
3/4 in. (19mm)	3/8 in. (10mm)	1 ounce (30ml)
7/8 in. (22mm)	3/8 in. (10mm)	1 ounce (30ml)
1-1/8 in. (29mm)	3/8 in. (10mm)	1 ounce (30ml)

** if line length is greater than 25 feet (7620 mm), add this amount. If line length is less than 25 feet (7620 mm), subtract this amount.*

A-Leak Testing

1- Attach gauge manifold and connect a drum of dry nitrogen to center port of gauge manifold.

CAUTION-When using dry nitrogen, a pressure reducing regulator must be used to prevent excessive pressure in gauge manifold, connecting hoses, and within the system. Regulator setting must not exceed 150 psig (1034 kPa).

2- Open high pressure valve on gauge manifold and pressurize line set and indoor coil to 150 psig (1034 kPa).

3- Check lines and connections for leaks.

NOTE-If electronic leak detector is used, add a trace of refrigerant to the nitrogen for detection by the leak detector.

4- Release nitrogen pressure from the system, correct any leaks and recheck.

B-Evacuating the System

1- Attach gauge manifold as shown in figure 7. Connect vacuum pump (with vacuum gauge) to center port of gauge manifold. With both manifold service valves open, start pump and evacuate indoor coil and refrigerant lines.

NOTE–A temperature vacuum gauge, mercury vacuum (U-tube), or thermocouple gauge should be used. The usual Bourdon tube gauges are not accurate enough in the vacuum range.

2- Evacuate the system to 29 inches (737mm) vacuum. During the early stages of evacuation, it is desirable to stop the vacuum pump at least once to determine if there is a rapid loss of vacuum. A rapid loss of vacuum would indicate a leak in the system and a repeat of the leak testing section would be necessary.

3- After system has been evacuated to 29 inches (737mm), close gauge manifold valves to center port, stop vacuum pump and disconnect from gauge manifold. Attach an upright nitrogen drum to center port of gauge manifold and open drum valve slightly to purge line at manifold. Break vacuum in system with nitrogen pressure by opening manifold high pressure valve. Close manifold high pressure valve to center port.

4–Close nitrogen drum valve and disconnect from gauge manifold center port. Release nitrogen pressure from system.

5- Reconnect vacuum pump to gauge manifold center port. Evacuate system through manifold service valves until vacuum in system does not rise above 29.7 inches (754mm) mercury (5mm absolute pressure) within a 20–minute period after stopping vacuum pump.

6- After evacuation is complete, close manifold center port, and connect refrigerant drum. Pressurize system slightly with refrigerant to break vacuum.

C–Charging

The system should be charged in the cooling cycle if weather conditions permit. The following procedures are intended as a general guide and slight variations in temperature and pressure should be expected. Large variations may indicate a need for further servicing. This procedure is for cooling mode only.

If the system is completely void of refrigerant, the recommended and most accurate method of charging is to weigh the refrigerant into the unit according to the total amount ahown on the unit nameplate and in table 8. Refer to the Lennox Unit Information Service manual for proper procedure.

TABLE 8

Model	Refrigerant Charge R-22
HP19-211	6 lbs. 4 oz.
HP19-261	6 lbs. 14 oz.
HP19-311	9 lbs. 5 oz.
HP19-411	11 lbs. 3 oz.
HP19-413	11 lbs. 3 oz.
HP19-461	12 lbs. 10 oz.
HP19-463	12 lbs. 10 oz.
HP19-511	12 lbs. 13 oz.
HP19-513	12 lbs. 13 oz.
HP19-651	16 lbs. 4 oz.
HP19-653	16 lbs. 4 oz.

If weighing facilities are not available or if unit is just low on charge, the following procedures apply.

BEFORE CHARGING
(steps 1 through 4)

NOTE – The following procedures require accurate readings of ambient temperature, liquid temperature and liquid pressure for proper charging. Use a thermometer with accuracy of ±2°F and a pressure gauge with accuracy of ±5PSIG.

1- Connect gauge manifold as shown in figure 7. Connect an upright R-22 drum to center port of gauge manifold.

2- Record outdoor ambient temperature.

3- If indoor temperature is below 74°F, set room thermostat to 74°F (23°C) in "Emergency Heat" or "Heat" position and allow unit to run until heating demand is satisfied. This will create the necessary load for proper charging of system in cooling cycle. Change thermostat setting to 68°F (20°C) in "Cool" position. Allow unit to run until system pressures stabilize.

4- Check to make sure that thermometer well is filled with mineral oil before checking liquid line temperature.

EXPANSION VALVE SYSTEMS ONLY
(steps 5 and 6)

IMPORTANT – Units using RFCIII use a separate procedure from units using an expansion valve.

5– If ambient temperature is less than 60°F (10°C), air flow will need to be restricted to achieve pressures above 200 psig (See figure 9). These higher pressures are necessary for checking the approach temperature. Block equal sections of air intake panels, moving obstructions sideways as shown until liquid pressure rises above 200 psig.

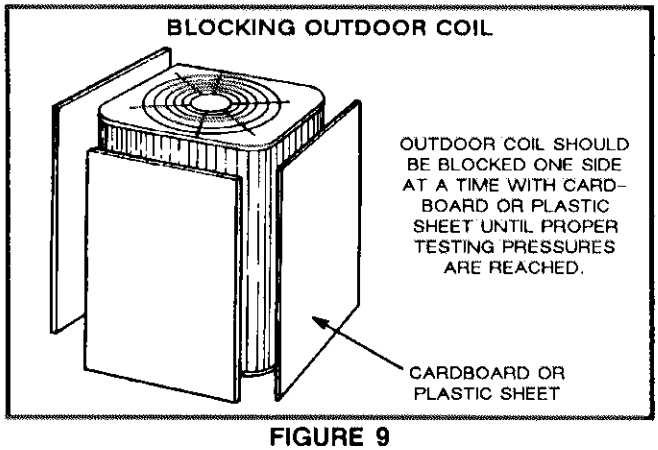


FIGURE 9

6– Place thermometer in well and read liquid line temperature. Difference between ambient and liquid line temperatures should match values given in table 9 (approach temperature = liquid line temperature minus ambient temperature). Refrigerant must be added to lower approach temperature. Remove refrigerant from system to increase approach temperature.

TABLE 9

APPROACH METHOD - MATCHUPS NOT USING RFCIII	
Model	**Liquid Temp Minus Ambient Temp. (°F)**
HP19-211	7
HP19-261	6
HP19-311	5
HP19-411/413	7
HP19-461/463	8
HP19-511/513	7
HP19-651/653	11

RFCIII SYSTEMS ONLY
(steps 7 and 8)

7– It is not recommended that the system be charged below 60°F. If charging below 60°F is required, the most reliable method is to weigh in the charge listed on the unit nameplate. This amount will be correct for a system with a line set of 15 feet. If line set is longer or shorter than 15 feet, add or remove refrigerant as shown in table 7.

8– If ambient temperature is above 60°F, place thermometer in well and read liquid line temperature. Read liquid line pressure from gauge and convert to condensing temperature using standard R-22 temperature/pressure conversion chart (or conversion scale on gauge). The difference between the liquid line temperature and the conversion temperature is subcooling (subcooling temperature = conversion temperature minus liquid temperature). The subcooling temperature should approximate the values given in table 10. Add refrigerant to increase subcooling and remove refrigerant to reduce subcooling.

TABLE 10

SUBCOOLING METHOD - RFCIII MATCHUPS ONLY							
Outdoor Unit	**Indoor Unit**	**Subcooling at Various Ambient Temperatures °F**					
		65	**75**	**85**	**95**	**105**	**115**
HP19-211	CB/CBH19-21	10	9	7	6	4	2
HP19-261	CB/CBH19-26	9	8	7	6	4	2
HP19-311	CB/CBH19-31	11	10	8	7	5	3
HP19-411	CB/CBH19-41	13	12	12	11	9	6
HP19-461	CB19-51	13	12	12	11	9	6
HP19-461	CH19-51	13	12	12	11	9	6
HP19-511	CB19-51	13	12	12	10	7	4
HP19-511	CH19-51	13	12	12	10	7	4
HP19-651	CB19-65	8	7	6	5	3	2
HP19-651	CH19-65	8	7	6	5	3	2

ALL UNITS

9– When unit is properly charged, liquid line pressures should approximate those given in table 11.

D–Oil Charge

Table 1 shows the factory oil charge in HP19 series units.

TABLE 11

NORMAL OPERATING PRESSURES															
MODE	OUTDOOR COIL ENTERING AIR TEMPERATURE	HP19-211		HP19-261		HP19-311		HP19-411 HP19-413		HP19-461 HP19-463		HP19-511 HP19-513		HP19-651 HP19-653	
		LIQ. ± 10 PSIG	SUC. ± 5 PSIG	LIQ. ± 10 PSIG	SUC. ± 5 PSIG	LIQ. ± 10 PSIG	SUC. ± 5 PSIG	LIQ. ± 10 PSIG	SUC. ± 5 PSIG	LIQ. ± 10 PSIG	SUC. ± 5 PSIG	LIQ. ± 10 PSIG	SUC. ± 5 PSIG	LIQ. ± 10 PSIG	SUC. ± 5 PSIG
COOLING RFCIII ONLY	75 °F	165	71	177	68	165	69	169	63	181	71	169	69	175	70
	85 °F	195	77	207	74	194	75	200	70	211	76	200	75	205	74
	95 °F	225	82	238	79	223	80	232	77	242	82	232	80	235	79
	105 °F	257	85	270	81	253	82	266	79	275	84	265	82	267	81
COOLING EXPANSION VALVE ONLY	75 °F	167	77	180	75	169	76	171	73	182	78	172	76	177	75
	85 °F	196	80	209	77	196	78	201	75	212	80	202	78	206	77
	95 °F	225	82	238	79	223	80	232	77	242	82	232	80	235	79
	105 °F	257	85	270	81	253	82	266	79	275	84	265	82	267	81
HEATING ALL UNITS	20 °F	168	35	175	33	177	33	181	32	177	32	185	33	183	29
	30 °F	178	44	188	42	190	42	195	40	194	41	201	42	195	37
	40 °F	190	54	201	51	203	51	210	49	210	50	217	51	207	45
	50 °F	202	64	214	61	216	61	225	58	228	60	232	60	219	53

NOTE - Liquid line pressure in heating mode may vary more than ±10 PSIG depending on unit matchup.

V-Maintenance

At the beginning of each heating or cooling season, the system should be cleaned as follows:

A-Heat Pump Unit

1- Clean and inspect outdoor coil. (Coil may be flushed with a water hose.

2- Outdoor fan motor is prelubricated and sealed. Always relubricate motor according to instructions on the motor manufacturer's nameplate.

3- Visually inspect all connecting lines, joints and coils for evidence of oil leaks.

4- Check for correct voltage at unit (unit operating).

5- Check all wiring for loose connections.

6- Check amp-draw on heat pump fan motor.
Unit nameplate_____Actual_____.

NOTE - If insufficient heating or cooling occurs, the unit should be gauged and refrigerant charge checked.

B-Indoor Coil

1- Clean coil if necessary.

2- Check connecting lines, joints and coil for evidence of oil leaks.

3- Check condensate line and clean if necessary.

C-Indoor Unit

1- Clean or change filters.

2- Lubricate blower motor: Always relubricate motor according to instructions on the motor manufacturer's nameplate. If no instructions are provided, use the following as a guide:

a- *Motors without Oiling Ports* -- Prelubricated and sealed. No further lubrication required.

b- *Direct Drive Motors with Oiling Ports* -- Prelubricated for an extended period of operation. For extended bearing life, relubricate with a few drops of SAE 10 non-detergent oil once every two years. It may be necessary to remove blower assembly for access to oiling ports.

3- Adjust blower speed for cooling. The static pressure drop over the coil should be checked to determine the correct blower CFM. Refer to Lennox Engineering Handbook for Static Pressure and CFM tables.

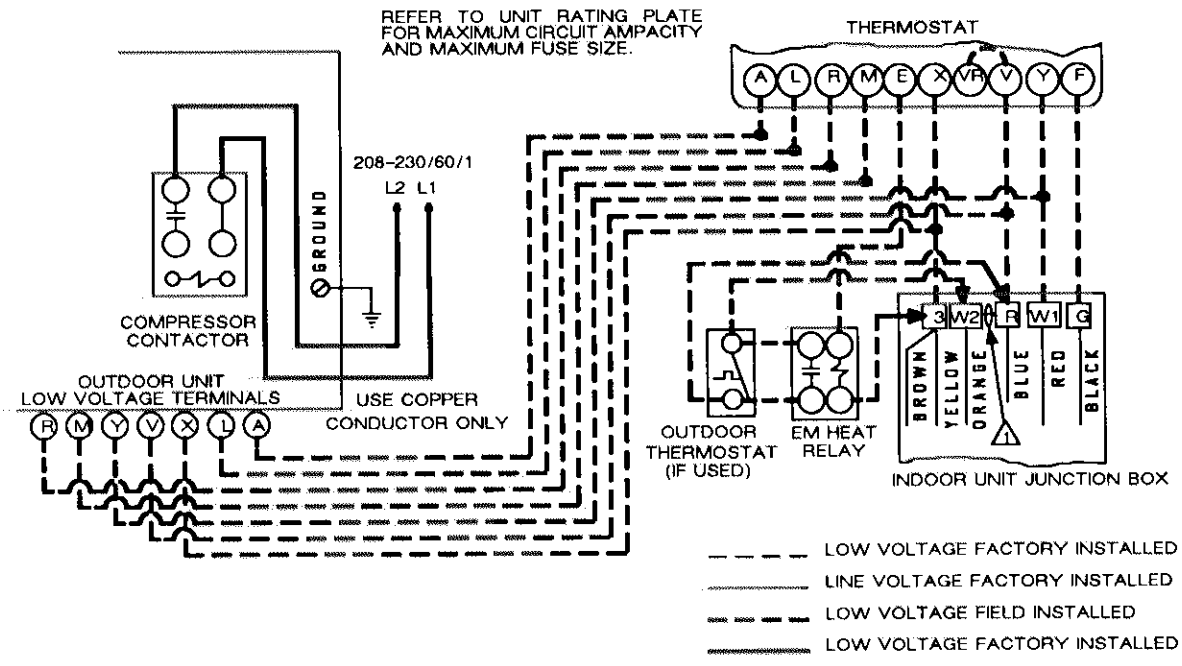
4- Check all wiring for loose connections.

5- Check for correct voltage at unit.

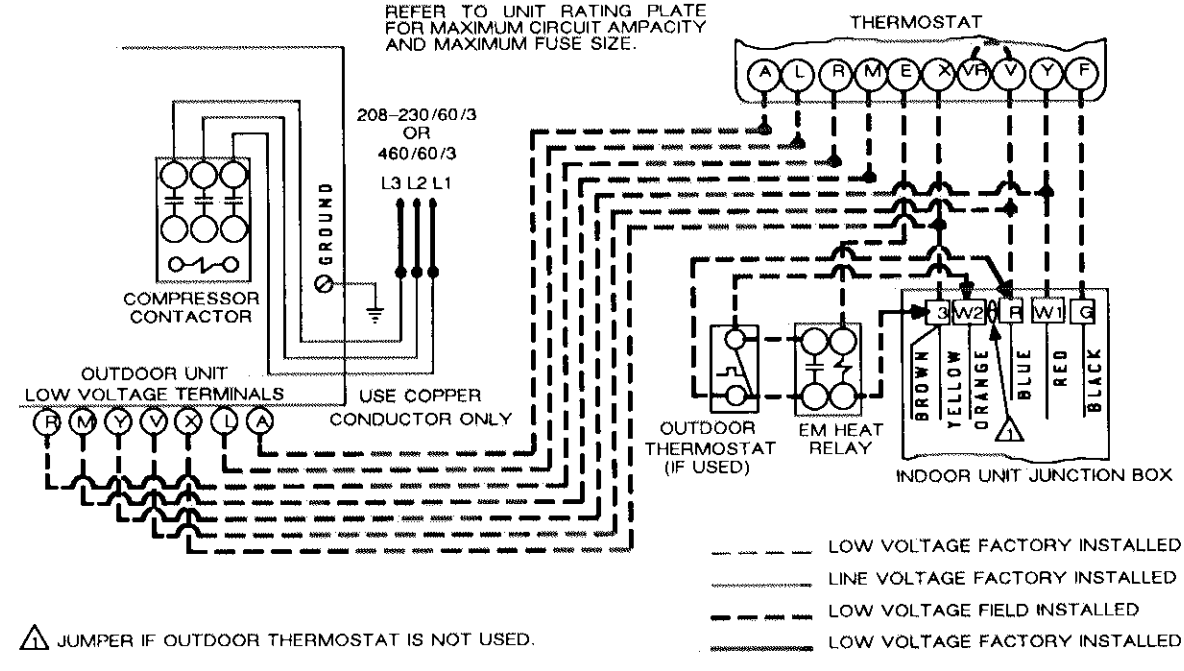
6- Check amp-draw on blower motor.
Unit nameplate_____Actual_____.

VI-WIRING DIAGRAMS AND OPERATION SEQUENCE

A-Field Wiring



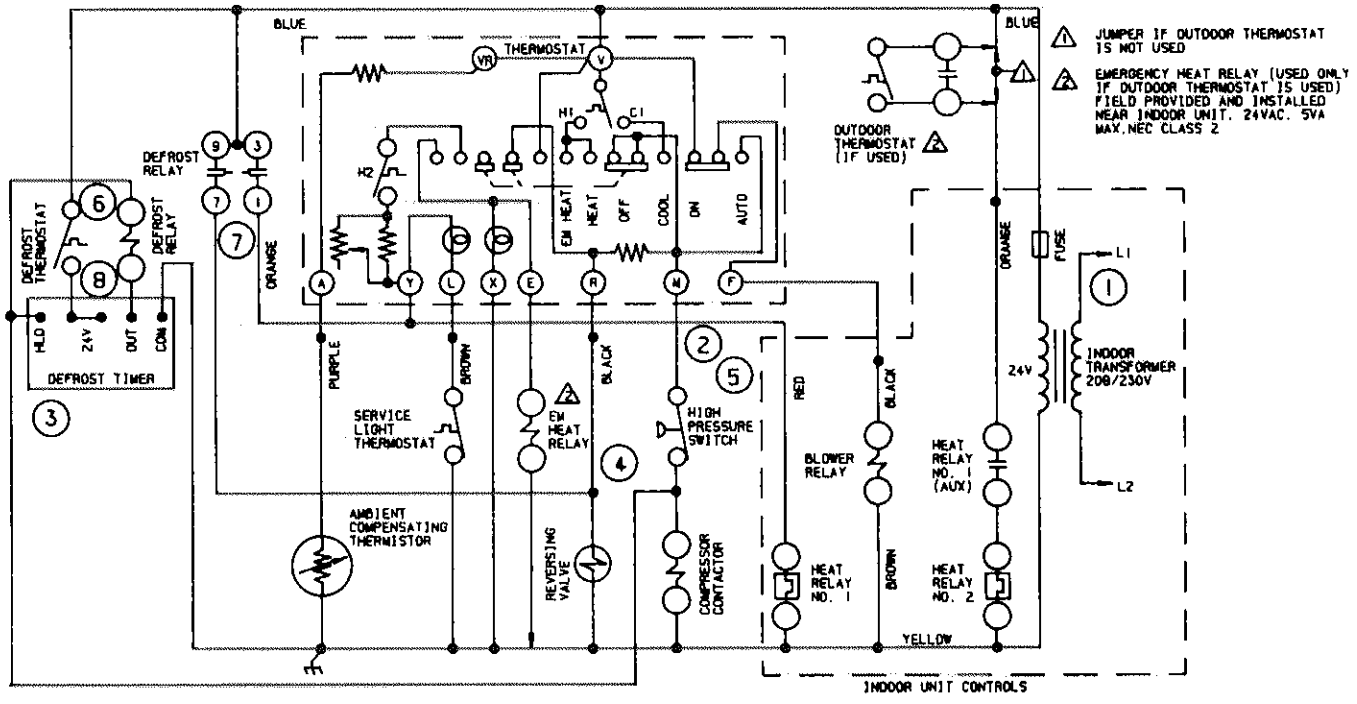
SINGLE PHASE FIELD WIRING



⚠1 JUMPER IF OUTDOOR THERMOSTAT IS NOT USED.

THREE PHASE FIELD WIRING

UNIT DIAGRAM
LOW VOLTAGE OPERATION SEQUENCE



B-Operation Sequence - Low Voltage

1- Transformer in indoor unit supplies 24VAC power to the thermostat and outdoor unit's controls.

2- Cooling demand energizes thermostat terminals M and R. Voltage from terminal M passes through high pressure switch and energizes compressor contactor.

3- Thermostat demand (from thermostat terminal M) is also supplied to the defrost control. Defrost control cannot operate in cooling mode because defrost thermostat cannot close.

4- Thermostat demand (from thermostat terminal R) energizes reversing valve.

5- Heating demand energizes thermostat terminal M. Voltage from terminal M passes through high pressure switch and energizes compressor contactor.

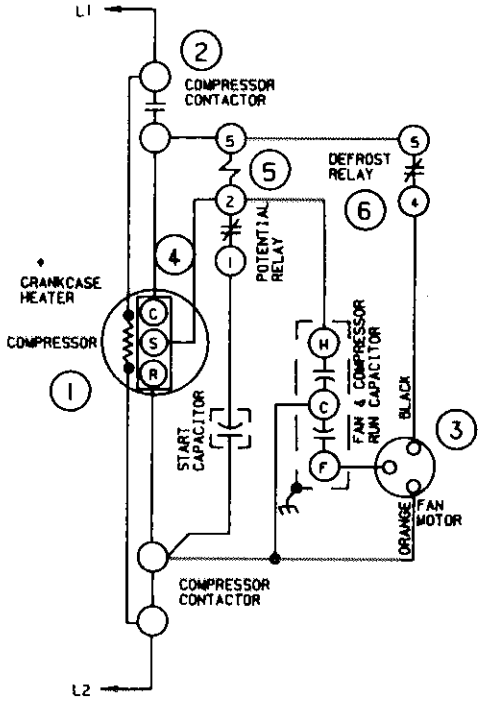
6- During heating operation, when outdoor coil drops below 35 ± 4° F, the defrost thermostat closes. When defrost thermostat closes, defrost timer begins timing. If defrost thermostat remains closed at the end of 30, 60 or 90 minutes, defrost relay energizes and defrost begins.

7- When defrost relay energizes, reversing valve and indoor electric heat relay are energized.

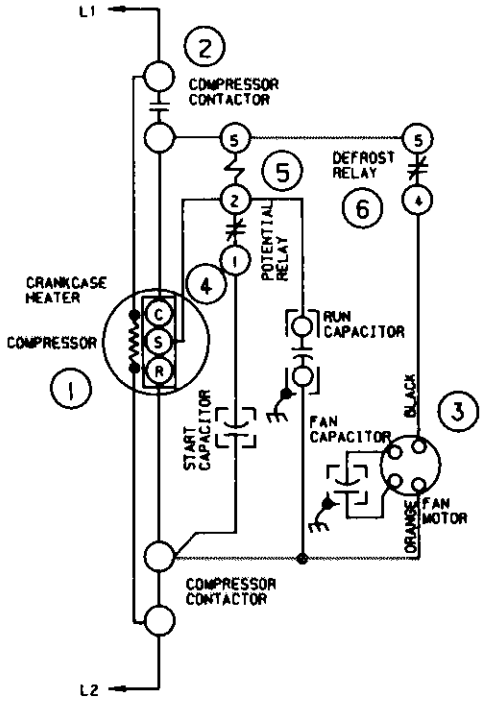
8- Defrost continues until 10 ± 1 minutes have elapsed or until the defrost thermostat opens. When defrost thermostat opens to terminate defrost, the defrost timer loses power and resets. Defrost timing is stopped until the next call for defrost (when defrost thermostat closes).

9- After each thermostat demand, timed off control locks-out the circuit to conpressor contactor coil and defrost control for 5 ± 2 minutes. At the end of the timed off delay, timed off control allows the compressor contactor and defrost control to be energized upon demand as in step 2.

LINE VOLTAGE OPERATION SEQUENCE - SINGLE PHASE UNITS

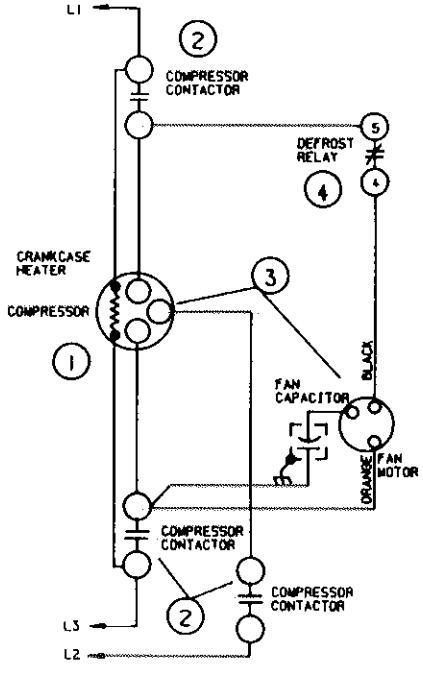


DUAL CAPACITOR



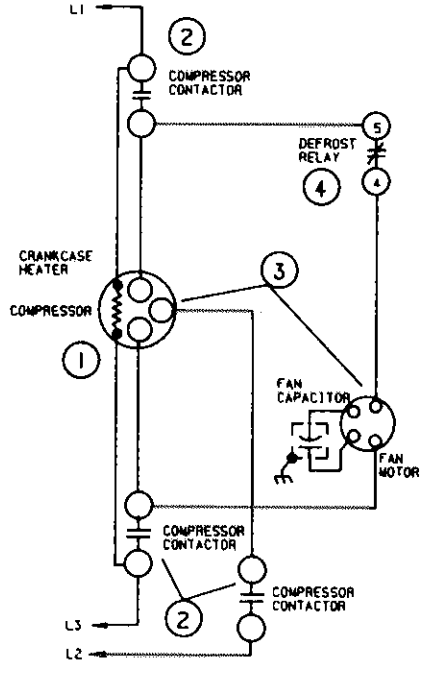
SEPARATE CAPACITORS

LINE VOLTAGE OPERATION SEQUENCE - THREE PHASE UNITS



THE THREE PHASE MOTOR(S) ARE PROTECTED UNDER PRIMARY SINGLE PHASING CONDITIONS

THREE WIRE FAN MOTOR



THE THREE PHASE MOTOR(S) ARE PROTECTED UNDER PRIMARY SINGLE PHASING CONDITIONS

FOUR WIRE FAN MOTOR

C–Operation Sequence – Line Voltage Single Phase Units

1– Crankcase heater is powered at all times by L1 and L2.

2– Compressor contactor is energized by indoor thermostat demand. Contactor contacts close when contactor is energized.

3– When the contactor closes, the outdoor fan immediately begins operating and the compressor begins startup.

4– Compressor terminal C is energized by L1 through the contactor contacts. Terminal R is powered by L2 through the contactor (powered at all times). Terminal S is powered by the start capacitor and the H side of the dual capacitor.

5– As the compressor nears full speed, the potential relay is energized (terminals 5–2) and potential relay contacts 1–2 open.

6– During defrost, defrost relay contacts 4–5 open to de-energize the outdoor fan.

D–Operation Sequence – Line Voltage Three Phase Units

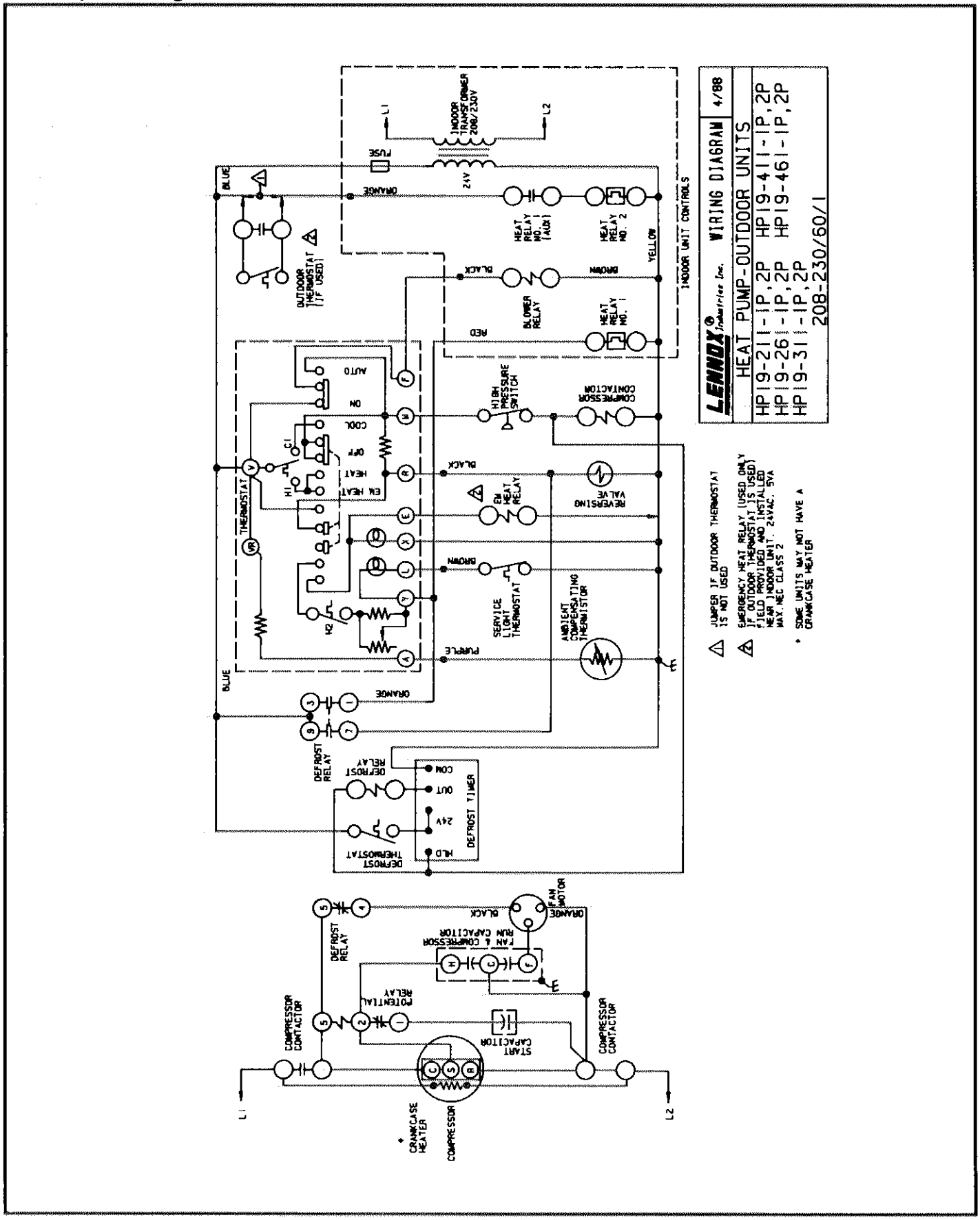
1– Crankcase heater is powered at all times by L1 and L3.

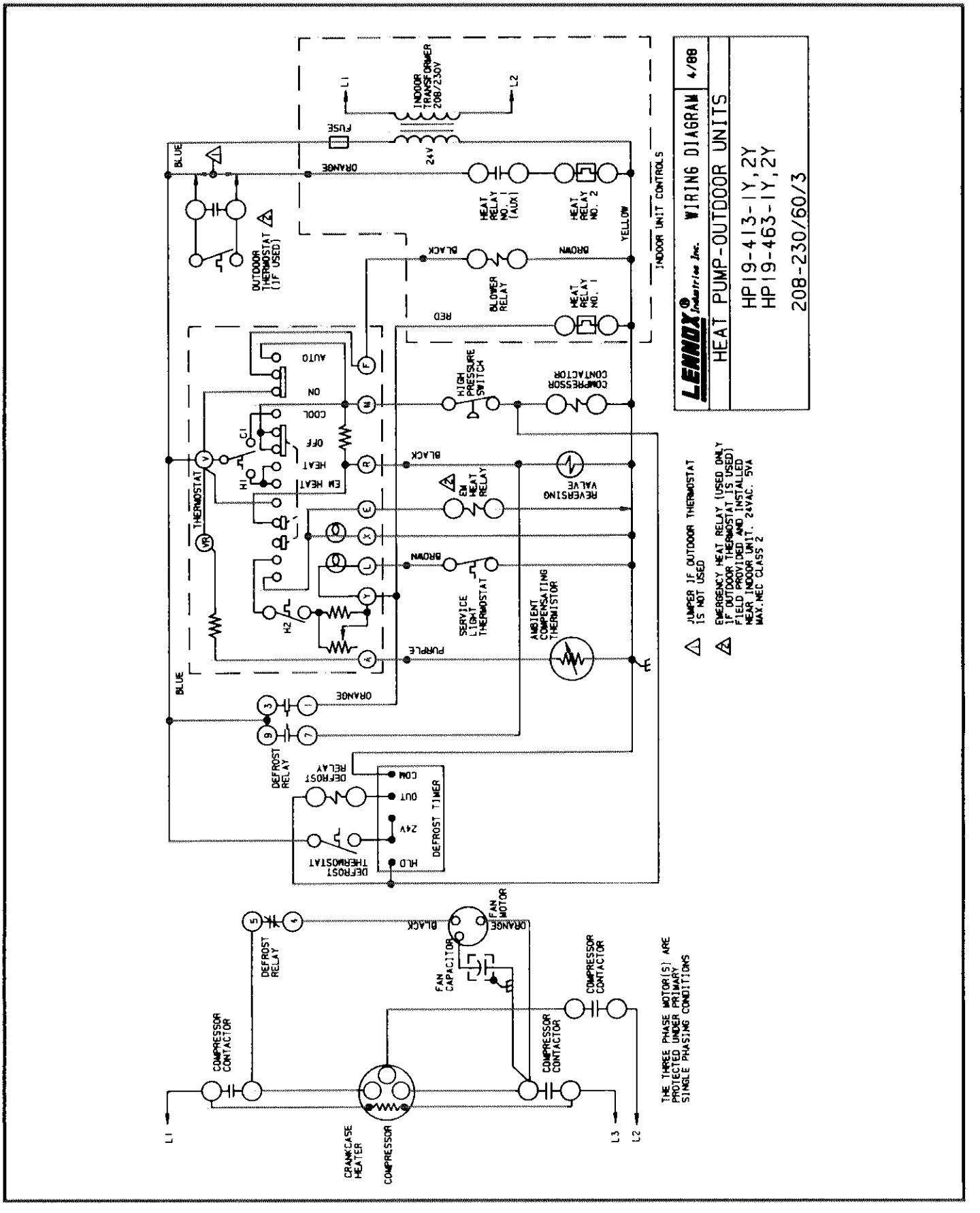
2– Compressor contactor is energized by indoor thermostat demand. Contactor contacts close when contactor is energized.

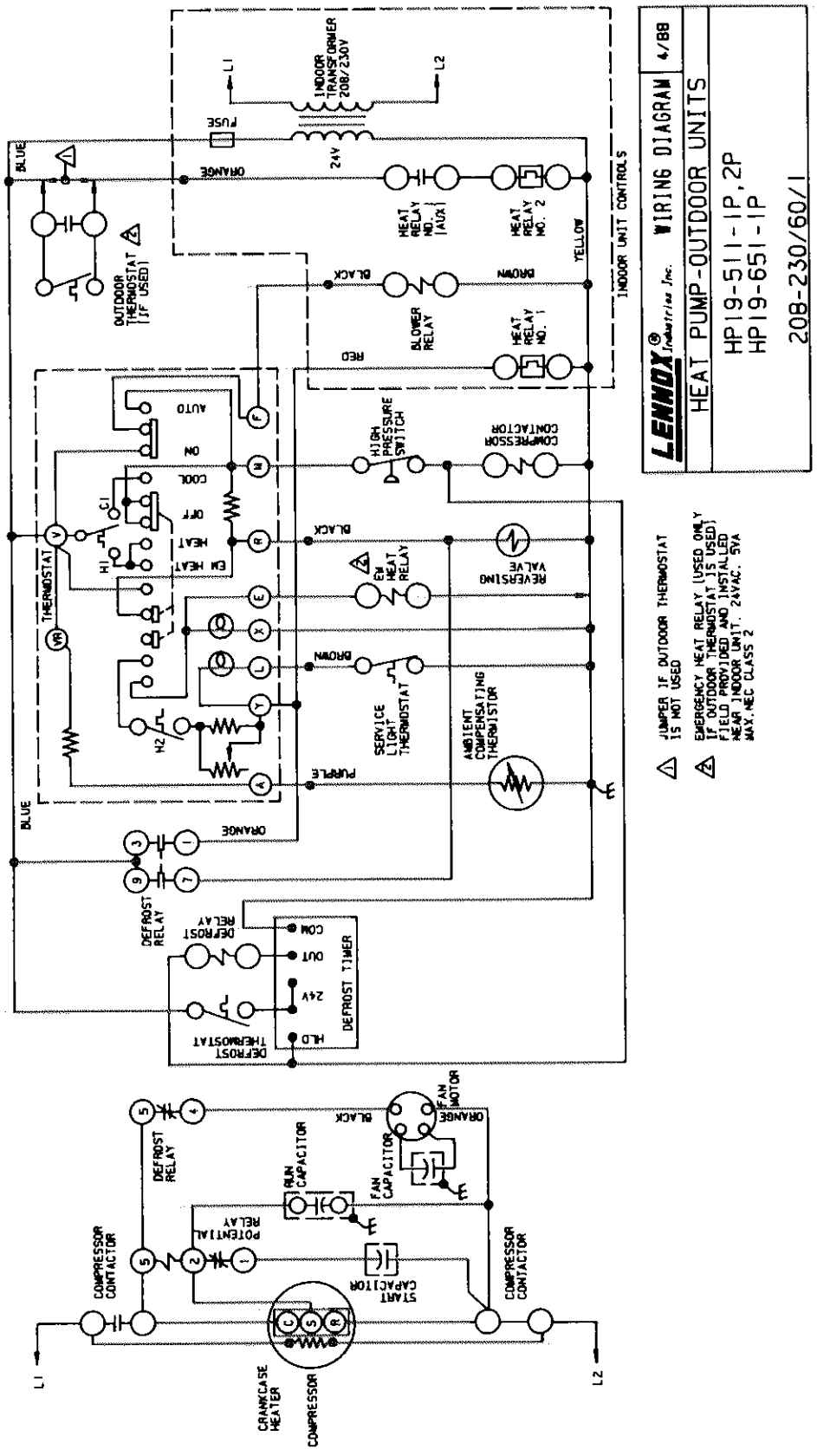
3– When contactor closes, outdoor fan (L1 and L3) and compressor (L1, L2 and L3) immediately begin operating.

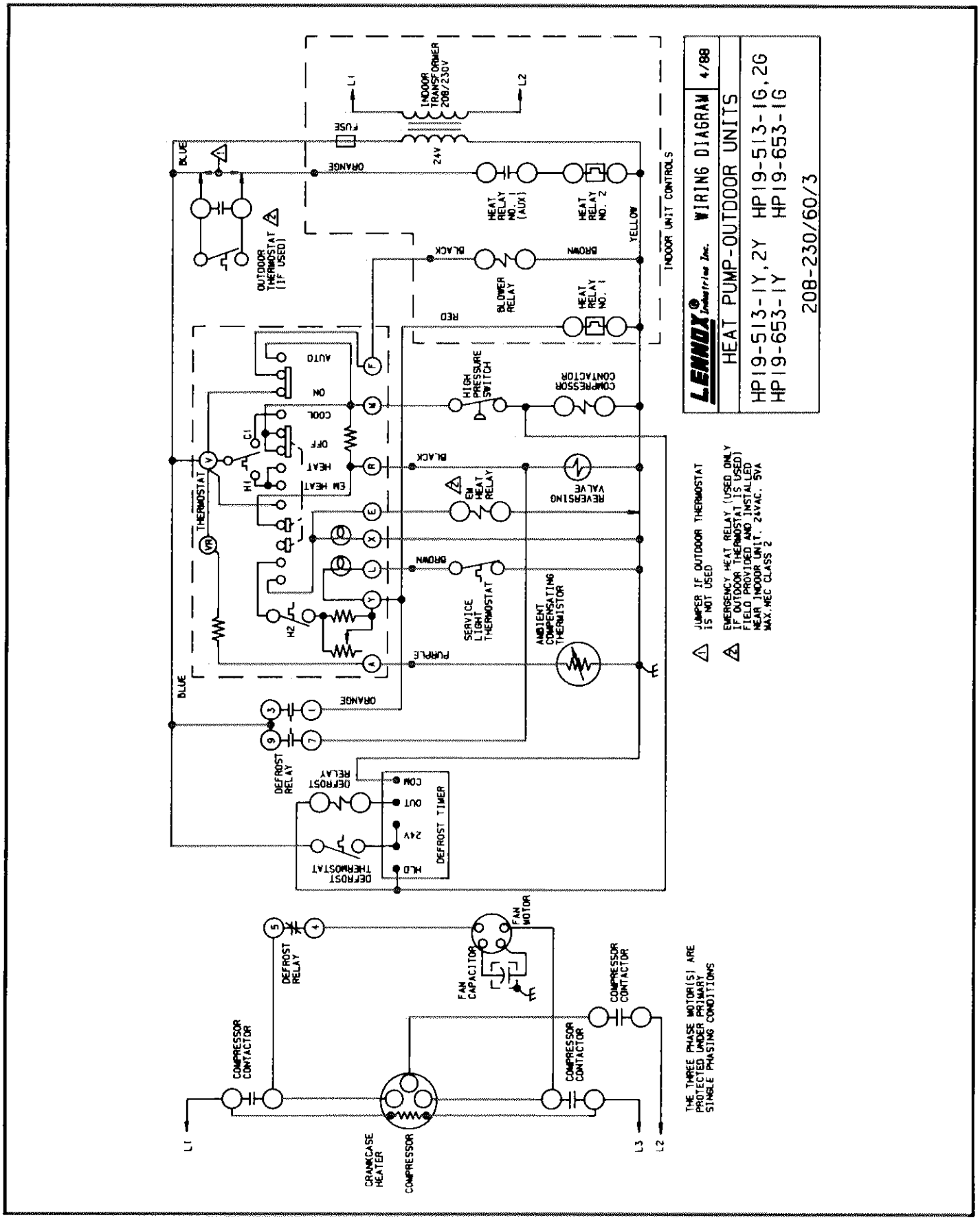
4– During defrost, defrost relay contacts 4–5 open to de-energize outdoor fan.

E-Complete Diagrams




LENNOX Industries Inc.
WIRING DIAGRAM
4/00
HEAT PUMP-OUTDOOR UNITS
HP19-413-1Y,2Y
HP19-463-1Y,2Y
208-230/60/3
INDOOR UNIT CONTROLS
INDOOR TRANSFORMER 208/230V
FUSE
24V
HEAT RELAY NO. 1 (AUX)
HEAT RELAY NO. 2
HEAT RELAY NO. 1
BLOWER RELAY
OUTDOOR THERMOSTAT (IF USED)
HIGH PRESSURE SWITCH
COMPRESSOR CONTACTOR
REVERSING VALVE
EM HEAT RELAY
SERVICE LIGHT THERMOSTAT
AMBIENT COMPENSATING THERMISTOR
THERMOSTAT
AUTO
ON
COOL
OFF
HEAT
EM HEAT
DEFROST RELAY
DEFROST TIMER
DEFROST THERMOSTAT
FAN MOTOR
FAN CAPACITOR
CRANKCASE HEATER
COMPRESSOR
BLUE
ORANGE
BLACK
BROWN
YELLOW
RED
PURPLE
JUMPER IF OUTDOOR THERMOSTAT IS NOT USED
EMERGENCY HEAT RELAY (USED ONLY IF OUTDOOR THERMOSTAT IS USED) FIELD PROVIDED AND INSTALLED NEAR INDOOR UNIT. 24VAC. 5VA MAX. NEC CLASS 2
THE THREE PHASE MOTOR(S) ARE PROTECTED UNDER PRIMARY SINGLE PHASING CONDITIONS


LENNOX Industries Inc.
WIRING DIAGRAM
4/88
HEAT PUMP-OUTDOOR UNITS
HP19-511-1P, 2P
HP19-651-1P
208-230/60/1
INDOOR UNIT CONTROLS
INDOOR TRANSFORMER 208/230V
L1
L2
FUSE
24V
BLUE
ORANGE
BLACK
BROWN
YELLOW
RED
PURPLE
OUTDOOR THERMOSTAT (IF USED)
HEAT RELAY NO. 1 (AUX)
HEAT RELAY NO. 2
BLOWER RELAY
HEAT RELAY NO. 1
HIGH PRESSURE SWITCH
COMPRESSOR CONTACTOR
REVERSING VALVE
EM HEAT RELAY
SERVICE LIGHT THERMOSTAT
AMBIENT COMPENSATING THERMISTOR
THERMOSTAT
AUTO
ON
COOL
OFF
HEAT
EM HEAT
HI
C1
H2
DEFROST RELAY
DEFROST TIMER
COM
OUT
24V
HLD
DEFROST THERMOSTAT
FAN MOTOR
RUN CAPACITOR
FAN CAPACITOR
POTENTIAL RELAY
START CAPACITOR
COMPRESSOR CONTACTOR
CRANKCASE HEATER
COMPRESSOR
JUMPER IF OUTDOOR THERMOSTAT IS NOT USED
EMERGENCY HEAT RELAY (USED ONLY IF OUTDOOR THERMOSTAT IS USED) FIELD PROVIDED AND INSTALLED NEAR INDOOR UNIT. 24VAC. 5VA MAX. NEC CLASS 2


LENNOX Industries Inc.
WIRING DIAGRAM
4/88
HEAT PUMP-OUTDOOR UNITS
HP19-513-1Y, 2Y HP19-513-1G, 2G
HP19-653-1Y HP19-653-1G
208-230/60/3
INDOOR UNIT CONTROLS
INDOOR TRANSFORMER 208/230V
FUSE
24V
HEAT RELAY NO. 1 (AUX)
HEAT RELAY NO. 2
BLOWER RELAY
HEAT RELAY NO. 1
HIGH PRESSURE SWITCH
COMPRESSOR CONTACTOR
REVERSING VALVE
EM HEAT RELAY
SERVICE LIGHT THERMOSTAT
AMBIENT COMPENSATING THERMISTOR
OUTDOOR THERMOSTAT (IF USED)
THERMOSTAT
AUTO
ON
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DEFROST THERMOSTAT
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COM
OUT
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HLD
FAN MOTOR
FAN CAPACITOR
COMPRESSOR CONTACTOR
CRANKCASE HEATER
COMPRESSOR
L1
L2
L3
BLUE
ORANGE
BROWN
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PURPLE
JUMPER IF OUTDOOR THERMOSTAT IS NOT USED
EMERGENCY HEAT RELAY (USED ONLY IF OUTDOOR THERMOSTAT IS USED) FIELD PROVIDED AND INSTALLED NEAR INDOOR UNIT. 24VAC, 5VA MAX. MEC CLASS 2
THE THREE PHASE MOTOR(S) ARE PROTECTED UNDER PRIMARY SINGLE PHASING CONDITIONS