

**HP26 SERIES UNITS**

The HP26 is a high efficient residential split-system heat pump which features a scroll compressor. It operates much like a standard heat pump, but the scroll compressor is unique in the way that it compresses refrigerant. **Early** model HP26 units (-261, -311, -411, -461) are available in sizes ranging from 2 through 3-1/2 tons. **Late** model HP26 units (-018, -024, -030, -036, -042, -048, -060) are available in sizes ranging from 1-1/2 through 5 tons. All models use expansion valves in both, the outdoor and the indoor unit. This manual is divided into sections which discuss the major components, refrigerant system and charging procedures, maintenance and operation sequences, for both **early** and **late** model HP26 model units.

Information contained in this manual is intended for use by qualified service technicians only. All specifications are subject to change.



LATE MODEL  
HP26 SHOWN

**⚠ IMPORTANT**

The Clean Air Act of 1990 bans the intentional venting of (CFC's and HFC's) as of July 1, 1992. Approved methods of recovery, recycling or reclaiming must be followed. Fines and/or incarceration may be levied for noncompliance.

**⚠ WARNING**

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a qualified installer or service agency.

**⚠ WARNING**

Refrigerant can be harmful if it is inhaled. Refrigerant must be used and recovered responsibly. Failure to follow this warning may result in personal injury or death.

**⚠ WARNING**



Electric shock hazard. Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch(es). Unit may have multiple power supplies.

**TABLE OF CONTENTS**

GENERAL .....	1
Specifications and Electrical Data .....	2
I Application .....	4
II Scroll Compressor .....	4
III Unit Components .....	5
IV Plumbing .....	15
V Charging .....	20
VI Maintenance .....	23
VII Wiring and Operating Sequence .....	24

### SPECIFICATIONS (EARLY MODELS)

Model No.			HP26-261	HP26-311	HP26-411	HP26-461
Condenser Coil	Net face area (sq. ft.)	Outer coil	11.83	15.94	15.94	18.22
		Inner coil	8.57	15.34	15.34	17.53
	Tube dia. (in.) & no. of rows		3/8 — 1.75	3/8 — 2	3/8 — 2	3/8 — 2
	Fins per inch		18	18	18	20
Condenser Fan	Diameter (in.) & no. of blades		20 — 4	24 — 3	24 — 3	24 — 3
	Motor hp		1/6	1/6	1/6	1/6
	Cfm		2300	3350	3350	3400
	Rpm		840	820	820	820
	Watts		185	210	210	200
*Refrigerant — HCFC22 charge furnished			8 lbs. 1 oz.	10 lbs. 10 oz.	10 lbs. 14 oz.	12 lbs. 0 oz.
Liquid line (o.d. in.) connection (sweat)			3/8	3/8	3/8	3/8
Vapor line (o.d. in.) connection (sweat)			5/8	3/4	3/4	7/8

\*Refrigerant charge sufficient for 25 ft. (7.6m) length of refrigerant lines.

### ELECTRICAL DATA (EARLY MODELS)

Model No.		HP26-261	HP26-311-1	HP26-411	HP26-461
Line voltage data		208/230v 60hz-1ph			
Compressor	Rated load amps	11.6	13.5	18.0	20.0
	Power factor	.96	.96	.96	.97
	Locked rotor amps	62.5	76.0	90.5	107.0
Condenser Coil Fan Motor	Full load amps	1.1	1.1	1.1	1.1
	Locked rotor amps	2.0	2.0	2.0	2.0
Rec. max. fuse or circuit breaker size (amps)		25	30	35	40
*Minimum circuit ampacity		15.6	18.0	23.6	26.1

\*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.

**SPECIFICATIONS (LATE MODELS)**

Model No.		HP26-018	HP26-024	HP26-030	HP26-036	HP26-042	HP26-048	HP26-060	
Outdoor Coil	Net face area sq. ft. (m <sup>2</sup> )	Outer Coil	11.91 (1.11)	11.91 (1.11)	16.04 (1.49)	16.04 (1.49)	18.33 (1.70)	24.06 (2.24)	24.06 (2.24)
		Middle Coil	----	----	----	----	----	----	23.33 (2.17)
		Inner Coil	8.27 (0.77)	8.27 (0.77)	15.56 (1.45)	15.56 (1.45)	17.78 (1.65)	23.33 (2.17)	12.28 (1.14)
	Tube diameter — in. (mm)		5/16 (8)	5/16 (8)	5/16 (8)	5/16 (8)	5/16 (8)	5/16 (8)	5/16 (8)
	No. of rows		2	2	2	2	2	2	3
	Fins per inch (m)		22 (866)	22 (866)	22 (866)	22 (866)	22 (866)	22 (866)	22 (866)
Outdoor Coil Fan	Diameter in. (mm) — No. of blades		20 (508) - 4	20 (508) - 4	24 (610) - 3	24 (610) - 3	24 (610) - 3	24 (610) - 4	24 (610) - 3
	Motor hp (W)		1/10 (75)	1/10 (75)	1/6 (124)	1/6 (124)	1/6 (124)	1/4 (187)	1/3 (249)
	Cfm (L/s)		1860 (880)	1860 (880)	3000 (1415)	3000 (1415)	3100 (1465)	4200 (1980)	4600 (1350)
	Rpm		825	825	825	825	825	825	1075
	Watts		165	165	230	230	230	345	420
*Refrigerant furnished (HCFC-22)		6 lbs. 14 oz. (3.11 kg)	6 lbs. 3 oz. (2.80 kg)	8 lbs. 9 oz. (3.87 kg)	9 lbs. 5 oz. (4.22 kg)	10 lbs. 13 oz. (4.89 kg)	12 lbs. 5 oz. (5.58 kg)	13 lbs. 3 oz. (5.97 kg)	
Liquid line conn. o.d. — in. (mm) sweat		3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	
Vapor line conn. o.d. — in. (mm) sweat		5/8 (15.9)	3/4 (19)	3/4 (19)	3/4 (19)	7/8 (22.2)	7/8 (22.2)	1-1/8 (28.6)	
Shipping wt. — lbs. (kg) 1 package		190 (86)	191 (87)	236 (107)	244 (111)	262 (119)	352 (160)	372 (169)	

\*Refrigerant charge sufficient for 15 ft. (4.5m) length of refrigerant lines.

**ELECTRICAL DATA (LATE MODELS)**

Model No.		HP26-018	HP26-024	HP26-030	HP26-036		HP26-042	
Line voltage data		208/230v 60hz-1ph	208/230v 60hz-1ph	208/230v 60hz-1ph	208/230v 60hz-1ph	208/230v 60hz-3ph	208/230v 60hz-1ph	208/230v 60hz-3ph
Compressor	Rated load amps	8.4	10.3	13.5	16.1	10.3	18	12.5
	Power factor	.96	.96	.96	.96	.82	.97	.82
	Locked rotor amps	47	56	72.5	88	77	104	88
Outdoor Coil Fan Motor	Full load amps	0.8	0.8	1.1	1.1	1.1	1.1	1.1
	Locked rotor amps	1.6	1.6	2.0	2.0	2.0	2.0	2.0
Rec. max. fuse or circuit breaker size (amps)		15	20	30	35	20	40	25
*Minimum circuit ampacity		11.3	13.7	18	21.2	14	23.6	16.8

\*Refer to National or Canadian 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.

**ELECTRICAL DATA (LATE MODELS)**

Model No.		HP26-048			HP26-060		
Line voltage data		208/230v 60hz-1ph	208/230v 60hz-3ph	460v 60hz-3ph	208/230v 60hz-1ph	208/230v 60hz-3ph	460v 60hz-3ph
Compressor	Rated load amps	23.8	13.5	7.4	28.9	17.4	9.0
	Power factor	.94	.87	.87	.94	.85	.85
	Locked rotor amps	129	99	49.5	169	123	62
Outdoor Coil Fan Motor	Full load amps	1.7	1.7	1.1	2.3	2.3	1.1
	Locked rotor amps	3.8	3.8	2.2	4.8	4.8	2.2
Rec. max. fuse or circuit breaker size (amps)		45	30	15	60	40	20
*Minimum circuit ampacity		31.5	18.6	10.4	38.5	24.1	12.4

\*Refer to National or Canadian 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.

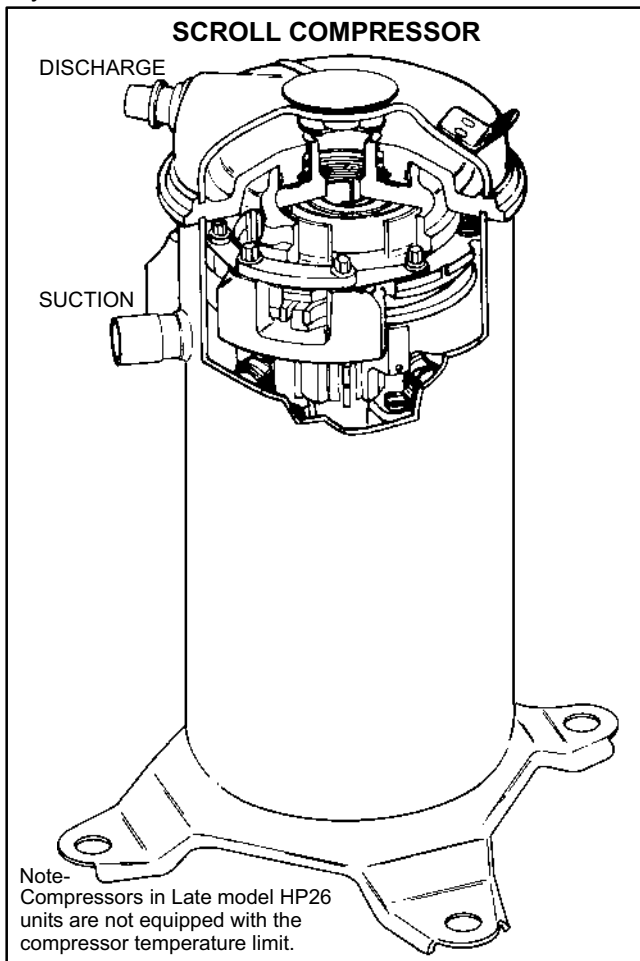
## I-APPLICATION

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.

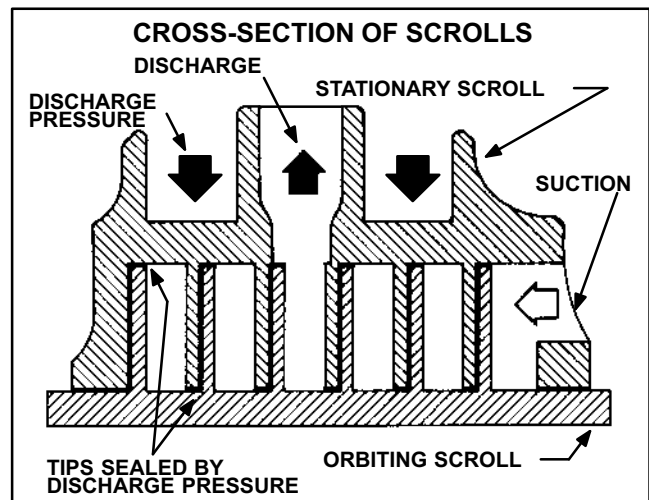
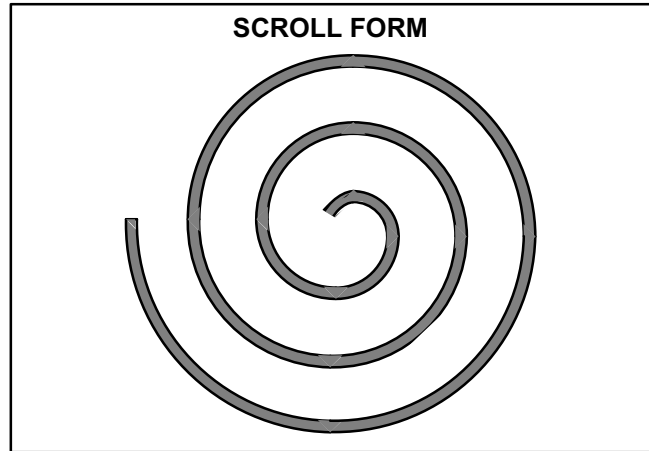
## II-SCROLL COMPRESSOR

The scroll compressor design is simple, efficient and requires few moving parts. A cutaway diagram of the scroll compressor is shown in figure 1. The scrolls are located in the top of the compressor can and the motor is located in the bottom of the compressor can. The oil level is immediately below the motor.

The scroll is a simple compression concept centered around the unique spiral shape of the scroll and its inherent properties. Figure 2 shows the basic scroll form. Two identical scrolls are mated together forming concentric spiral shapes (figure 3). One scroll remains stationary, while the other is allowed to "orbit" (figure 4). Note that the orbiting scroll does not rotate or turn but merely "orbits" the stationary scroll.



*NOTE - The head of a scroll compressor may be hot since it is in constant contact with discharge gas.*



The counterclockwise orbiting scroll draws gas into the outer crescent shaped gas pocket created by the two scrolls (figure 4 - 1). The centrifugal action of the orbiting scroll seals off the flanks of the scrolls (figure 4 - 2). As the orbiting motion continues, the gas is forced toward the center of the scroll and the gas pocket becomes compressed (figure 4 - 3). When the compressed gas reaches the center, it is discharged vertically into a chamber and discharge port in the top of the compressor (figure 1). The discharge pressure forcing down on the top scroll helps seal off the upper and lower edges (tips) of the scrolls (figure 3). During a single orbit, several pockets of gas are compressed simultaneously providing smooth continuous compression. The scroll compressor is tolerant to the effects of liquid return. If liquid enters the scrolls, the orbiting scroll is allowed to separate from the stationary scroll. The liquid is worked toward the center of the scroll and is discharged. If the compressor is replaced, conventional Lennox cleanup practices must be used.

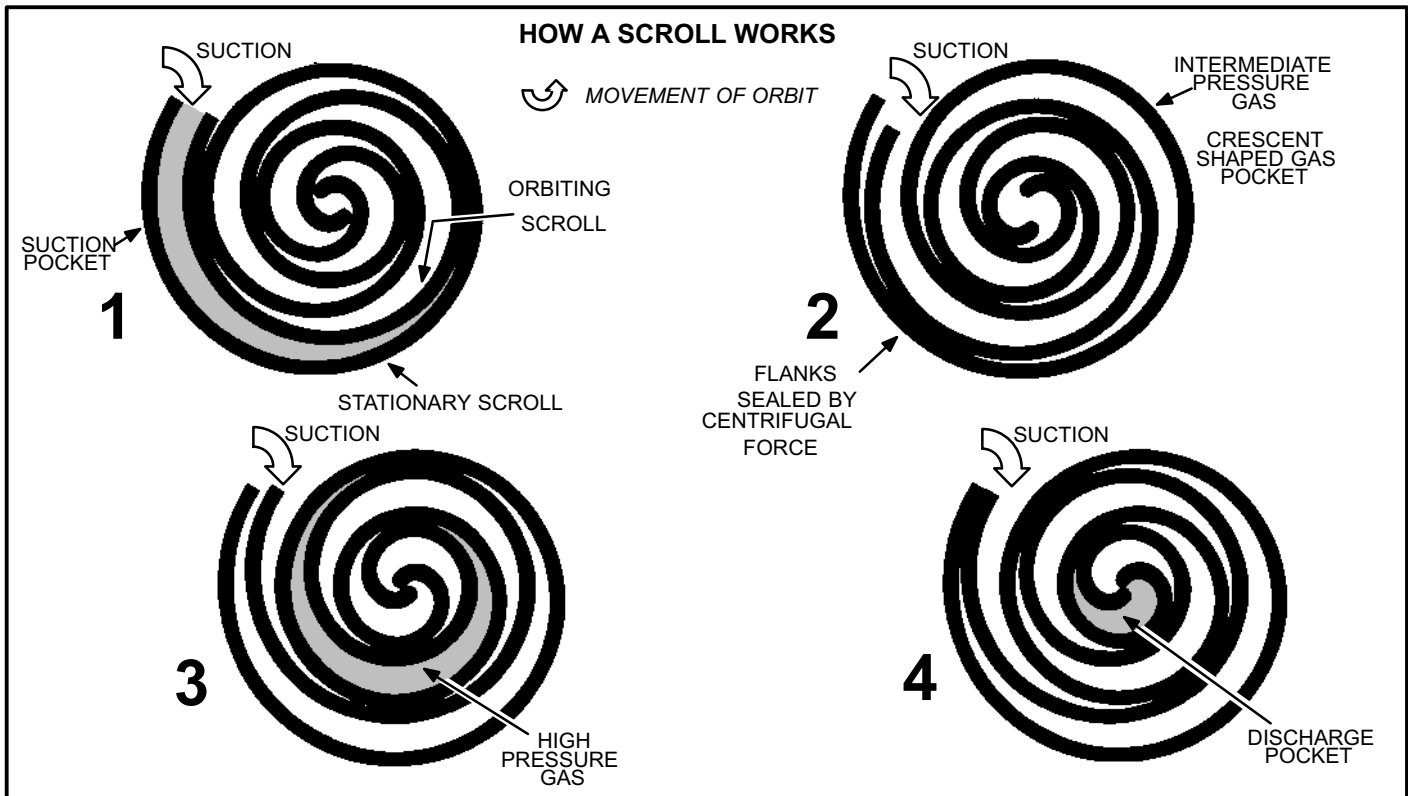


FIGURE 4

### III-UNIT COMPONENTS

#### ELECTROSTATIC DISCHARGE (ESD) Precautions and Procedures

#### ⚠ CAUTION

Electrostatic discharge can affect electronic components. Take precautions during unit installation and service to protect the unit's electronic controls. Precautions will help to avoid control exposure to electrostatic discharge by putting the unit, the control and the technician at the same electrostatic potential. Neutralize electrostatic charge by touching hand and all tools on an unpainted unit surface before performing any service procedure.

#### A-Transformer

The contactor, reversing valve, time delay, temperature sensor 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 HP26 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. A single pole contactor is used in early model HP26 units. Single pole and double pole contactors are used in late model HP26 units. See wiring diagram for specific unit. Three-pole contactors are used in three-phase late model HP26 units. The contactor is energized by indoor thermostat terminal Y when thermostat demand is present.

#### ⚠ DANGER



**Electric Shock Hazard.**  
May cause injury or death.

Disconnect all remote electrical power supplies before opening unit panel. Unit may have multiple power supplies.

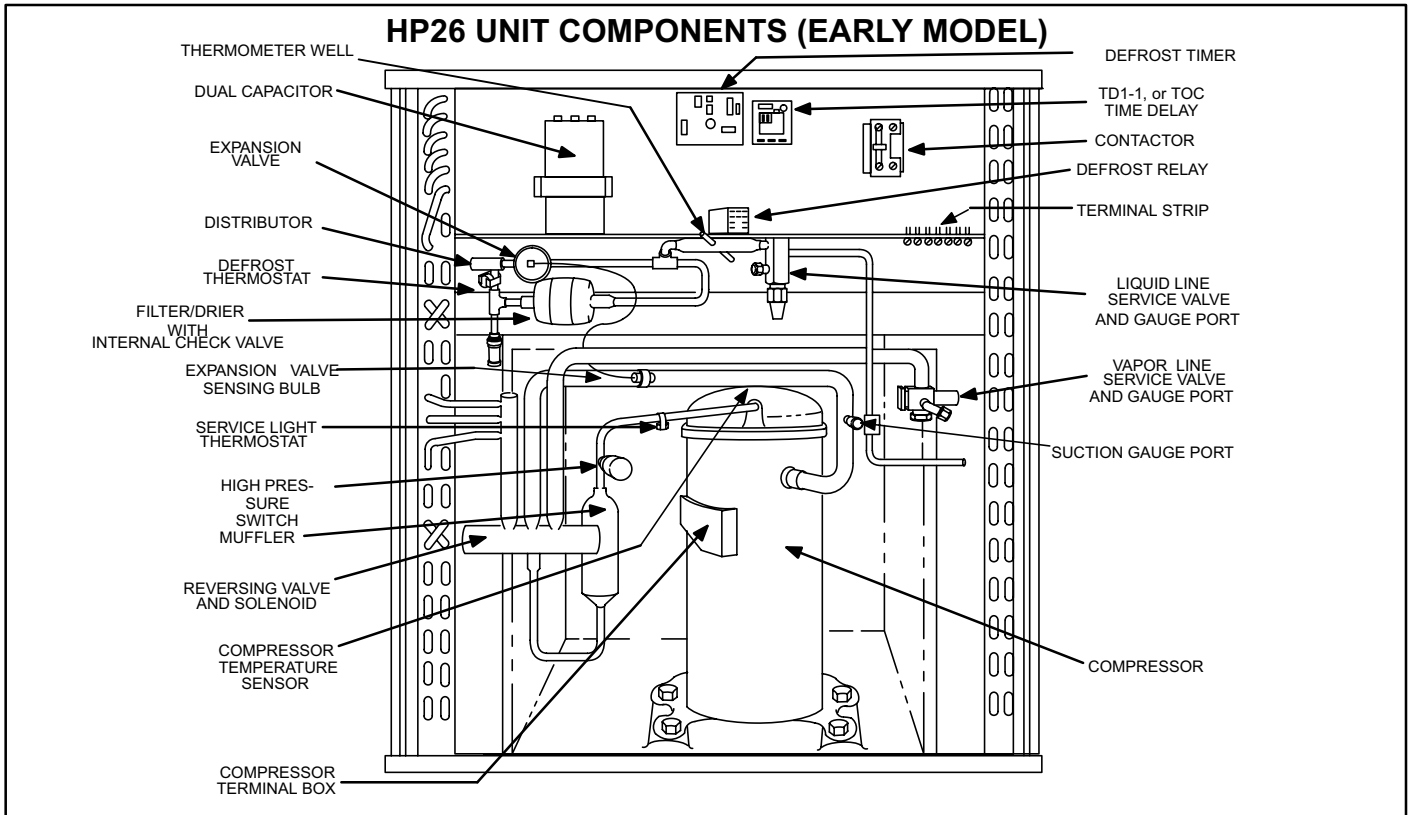
Some units are equipped with single-pole contactors. When unit is equipped with a single-pole contactor, line voltage is present at all components (even when unit is not in operation).

#### C-Terminal Strip

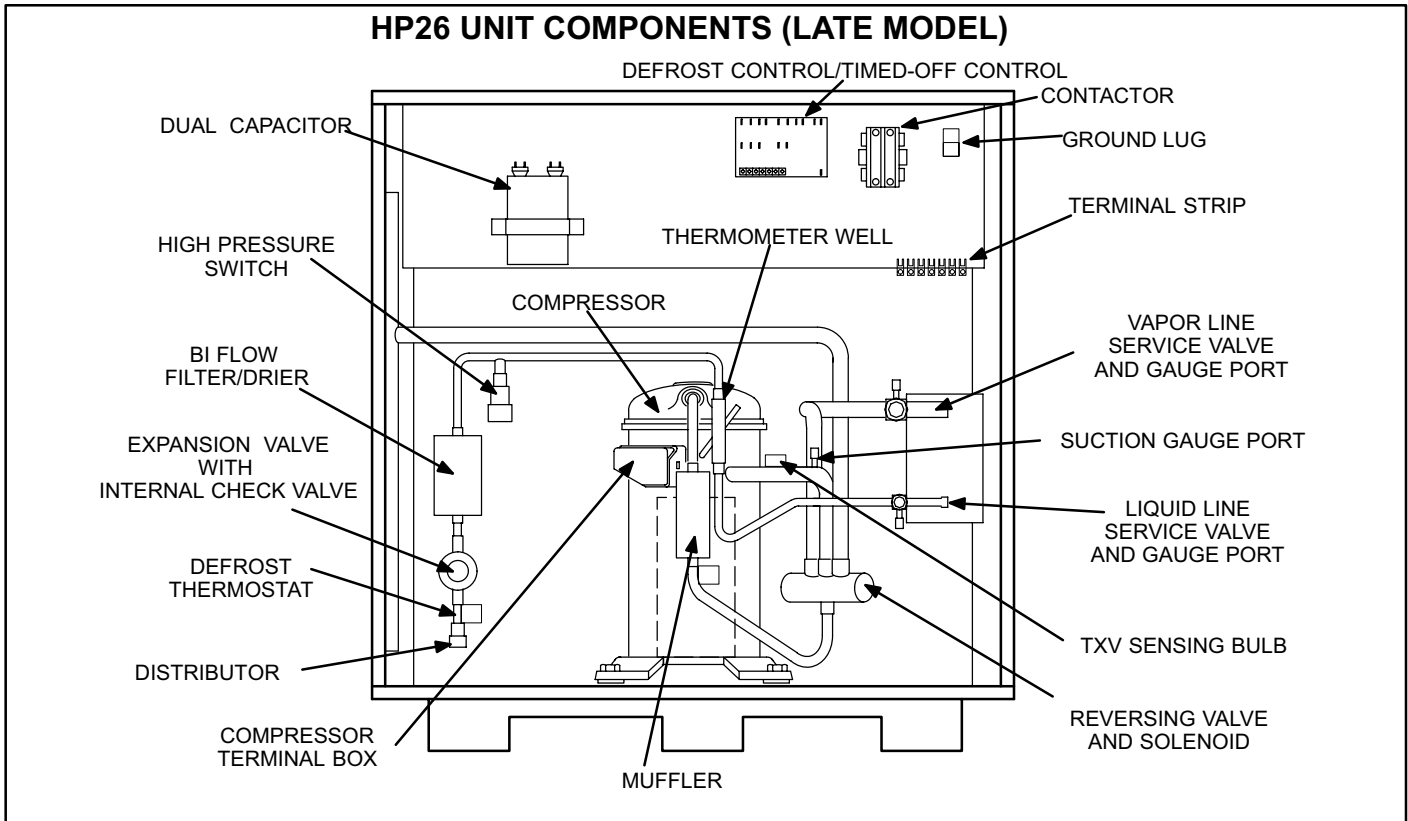
All HP26s are equipped with a low voltage terminal strip located in the unit control box for making thermostat wiring connections.

#### D-Compressor

Table 1 (early model HP26) and table 2 (late model HP26) show the specifications for compressors used in HP26 series units.



**FIGURE 5**



**FIGURE 6**

**TABLE 1  
EARLY MODEL HP26**

Unit	Vac	Phase	LRA	RLA	Oil fl.oz.
HP26-261	208/230	1	62.5	11.6	28*
HP26-311	208/230	1	76.0	13.5	28*
HP26-411	208/230	1	90.5	18.0	34*
HP26-461	208/230	1	107	20.0	38*

\*Shipped with conventional white oil (Sontex 200LT). 3GS oil may be used if additional oil is required.

**TABLE 2  
LATE MODEL HP26**

Unit	Vac	Phase	LRA	RLA	Oil fl.oz.
HP26-018	208/230	1	47.0	8.4	38*
HP26-024	208/230	1	56.0	10.3	30*
HP26-030	208/230	1	72.5	13.5	30*
HP26-036	208/230	1	88	16.0	42*
HP26-042	208/230	1	104	18.0	42*
HP26-048	208/230	1	129	23.7	53*
HP26-060	208/230	1	169	28.8	50*
HP26-036	208/230	3	77	10.3	42*
HP26-042	208/230	3	88	12.5	42*
HP26-048	208/230	3	99	13.5	53*
HP26-048	460	3	49.5	7.4	53*
HP26-060	208/230	3	123	17.4	53*
HP26-060	460	3	62	9.0	53*

\*Shipped with conventional white oil (Sontex 200LT). 3GS oil may be used if additional oil is required.

## E-High Pressure Switch

An automatic-reset single-pole single-throw high pressure switch located in the liquid line of the compressor shuts off the compressor when liquid line pressure rises above the factory setting. The switch is normally closed and is permanently adjusted to trip (open) at  $410 \pm 10$  psi. See figure 6 (late models) or figure 5 (early models) for switch location

## F-Low Charge Switch (Optional Early Models Only)

Early HP26 units may have a Low charge switch. The switch is a N.C. pressure switch located on the discharge line of the compressor. The switch opens on low pressure drop in the discharge line to shut off the compressor. The switch opens at  $25 \pm 5$  psi and closes at  $55 \pm 5$  psi.

## G-TD1-1, TOC Time Delay (early model only)

Early model HP26 units are equipped with a Lennox-built TD1-1 time delay or TOC timed off control, located in the control box. The time delay is electrically connected between thermostat terminal Y1 and the compressor contactor. On initial thermostat demand, the compressor contactor is delayed for 8.5 seconds using the TD1-1. At the end of the delay the compressor is allowed to energize. Units with the TOC will have a 5 minute  $\pm 2$  minutes off time, at the end of thermostat demand. At the end of the 5-minute delay, the compressor is allowed to energize if there is a call for cool. With both controls, when thermostat demand is satisfied, the time delay opens the circuit to the compressor contactor coil and the compressor is de-energized. **The TOC cannot be repaired. If the TOC is inoperative replace entire control.**

## H-Compressor Temperature Limit (Early Models Only)

Each scroll compressor in the early model HP26 units is equipped with a temperature limit located on the outside top of the compressor. The limit is a SPST thermostat which opens when the discharge temperature exceeds  $280^\circ\text{F} \pm 8^\circ\text{F}$  on a temperature rise. When the switch opens, the circuit to the compressor contactor and the time delay is de-energized and the unit shuts off. The switch automatically resets when the compressor temperature drops below  $130^\circ\text{F} \pm 14^\circ\text{F}$ .

The sensor can be accessed by prying off the snap plug on top of the compressor (see figure 8). Make sure to securely reseal the sensor after replacement. The limit pigtails are located inside the unit control box. Figure 7 shows the arrangement of compressor line voltage terminals and high temperature limit pigtails.

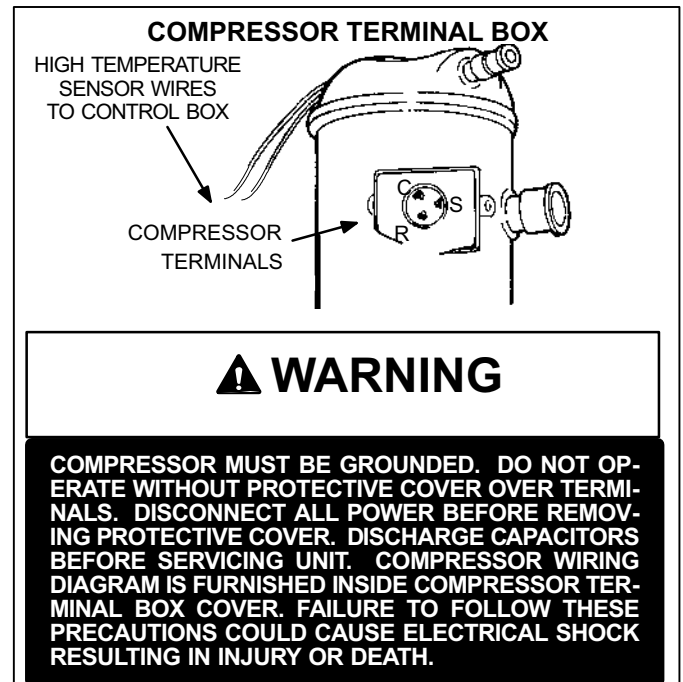
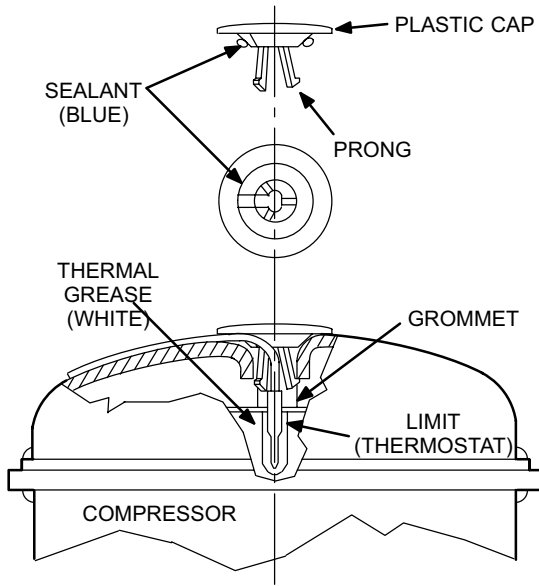


FIGURE 7

## I-Service Light Thermostat

HP26 units built prior to March 2003 are equipped with a service light thermostat located on the compressor discharge line. The switch is electrically connected to the service light in the indoor thermostat. The service light, when lit, indicates the compressor is not running. The service light is powered from W1 (2nd stage heat) terminal of the indoor thermostat. The service light thermostat will close and light when the discharge line falls below  $110 \pm 5^\circ\text{F}$ , indicating a problem in the system. The service light thermostat opens and the service light goes off when discharge line reaches  $130 \pm 5^\circ\text{F}$  indicating the compressor is running. On late model units the service light connections are made on terminals on the defrost control board (figure 15).

### COMPRESSOR HIGH TEMPERATURE LIMIT CHANGEOUT (Early Models Only)



#### Instructions

- 1- With power off, disconnect wiring to limit.
- 2- Dislodge limit/cap assembly from compressor. Plastic cap and silicone seal will break away. Discard all pieces.
- 3- Remove thermostat and grommet from compressor. Thoroughly clean all blue adhesive and white silicone thermal grease from compressor and the inside of the thermostat tube. Thermostat tube should be clean and free of debris.
- 4- Using Lennox kit 93G8601, dip end of thermostat into plastic bottle labeled "Silicone Thermal Grease G.E. #G641" and coat end of thermostat. Carefully insert thermostat/grommet assembly into thermostat tube of compressor. Avoid contact with top of compressor.
- 5- Clean excess thermal grease from under cap lip and top lip of compressor opening.
- 6- Install protector assembly as shown, feeding wire leads through channel provided in cap.
- 7- Apply a bead of sealant around lip of cap at area shown in illustration and into the thermostat tube area.
- 8- Install assembly as shown. Align wires to channel in compressor shell. Sufficient force is required to snap plastic cap into tube to engage all three prongs.
- 9- Re-connect wiring.
- 10- After completing thermostat replacement, discard remaining parts.

FIGURE 8

### J-Condenser Fan Motor

The specifications tables on pages 1 and 2 of this manual show the specifications of outdoor fans used in early and late model HP26s. In **early** model units, the outdoor fan is controlled by the compressor contactor and is de-energized when the **defrost relay** is energized. In **late** model units, the outdoor fan is controlled by the compressor contactor but the **defrost control** will de-energize the outdoor fan. See figure 9 if condenser fan motor replacement is necessary.

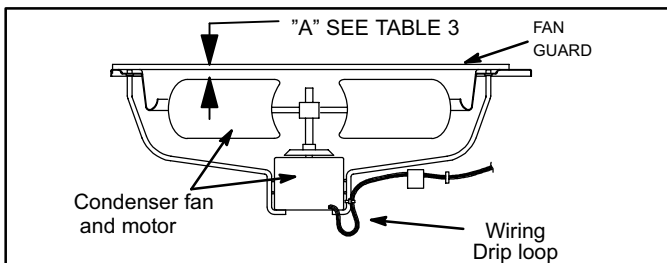


FIGURE 9

TABLE 3

HP26 UNIT	"A" DIM. $\pm 1/8$ "	Fan Blade Vendor
-018, -024,	7/8"	Lau
		Revcor
-030, -036, -042,	1-1/16"	Lau
		Revcor
-048, -060	1-3/16"	Lau
		Revcor

### K-Ambient Compensating Thermistor

HP26 units built prior to March 2003 have an ambient compensating thermistor mounted on the outdoor fan wiring harness. The thermistor is an NTC thermistor (negative temperature coefficient - increase in temperature equals decrease in resistance) (see figure 10). The device is connected in series with the heat anticipation resistor inside the indoor thermostat. The thermistor varies the indoor thermostat heat anticipator current according to outdoor ambient temperature to prevent abnormal thermostat droop. As outdoor temperature increases, the resistance across the thermistor drops. As the resistance across the thermistor drops, the current through the heat anticipation resistor increases. Therefore, heat anticipation increases as outdoor temperature decreases. Resistance at 77°F = 260 ohms  $\pm$  5%; at 100°F = 150 ohms; at 32°F = 861 ohms. On late model HP26 units, the ambient thermistor connections are made at terminals on the defrost control.

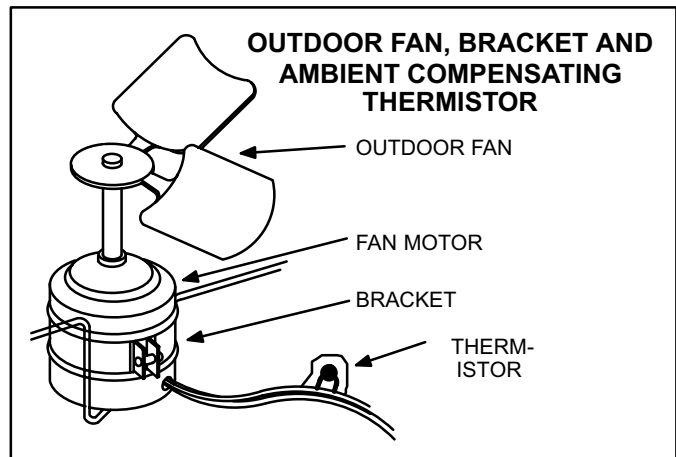


FIGURE 10



## L--Dual Capacitor

The compressor and fan in both early and late model single-phase HP26 model 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. The capacitor is located inside the unit control box (see figure 6 for early models or figure 5 for late models). Table 4 shows the ratings of the dual capacitor for early HP26 models and table 5 shows ratings of dual capacitors for late model HP26 models.

**TABLE 4  
Early Model Units**

HP26 DUAL CAPACITOR RATING				
Units	Terminal	MFD	VAC	
HP26-261	FAN	5	370	
	HERM	30		
HP26-311	FAN	5		
	HERM	35		
HP26-411	FAN	5		440
	HERM	35		
HP26-461	FAN	5		
	HERM	35		

**TABLE 5  
Late Model Units**

HP26 DUAL CAPACITOR RATING			
Units	Terminal	MFD	VAC
HP26-018	FAN	4	370
	HERM	30	
HP26-024	FAN	4	
	HERM	40	
HP26-030	FAN	5	
	HERM	45	
HP26-036	FAN	5	
	HERM	50	
HP26-042	FAN	5	
	HERM	55	
HP26-048	FAN	10	
	HERM	60	
HP26-060	FAN	10	
	HERM	80	

## M-Defrost System-Early Models

### Defrost Thermostat

A defrost thermostat is mounted on the liquid line between the filter/drier 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.

### Defrost Relay

The defrost relay controls defrost. The relay is a 3PDT relay powered by 24 VAC from the thermostat and is enabled during both cooling and heating modes (except emergency heat). The relay is only powered when the defrost control is

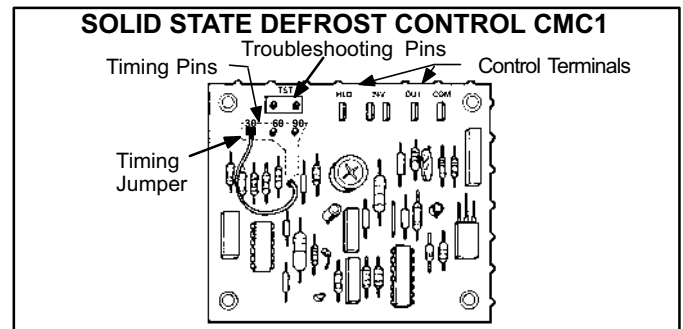
calling for defrost. When energized, the reversing valve and indoor auxiliary heat are energized. Simultaneously, the outdoor fan is de-energized. The defrost relay latches in for the duration of the defrost period. Refer to unit wiring diagram and operation sequence in the back of this manual.

### Reversing Valve and Solenoid

A refrigerant reversing valve with an 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 17 and 18 for more information.

### Defrost Control

The CMC1 defrost control (figure 11) is a solid-state control manufactured by Hamilton Standard. The control provides automatic switching 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 11**

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 sequence. If the defrost thermostat remains closed when the timing sequence ends, the defrost relay is energized and defrost begins.

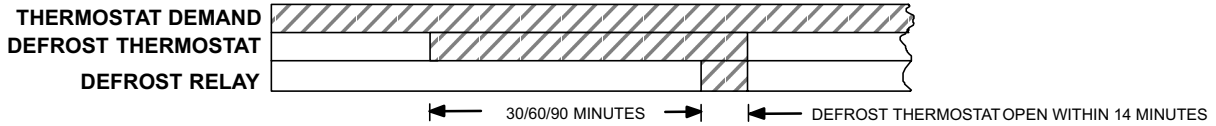
A defrost period can last up to 14 minutes and can be terminated by either of two ways. If the defrost thermostat does not open within 14 minutes after defrost begins, the timer will de-energize the defrost relay and the unit will resume normal operation. If the defrost thermostat opens during the 14-minute defrost period, the defrost relay is de-energized and the unit resumes normal operation. Refer to figure 12.

## HP26 SERIES EARLY MODEL UNITS TYPICAL DEFROST TIMINGS

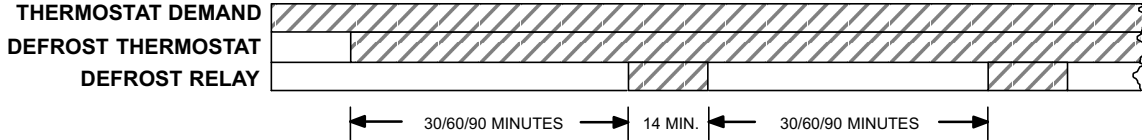
CLOSED, ON   
 OPEN, OFF 

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.

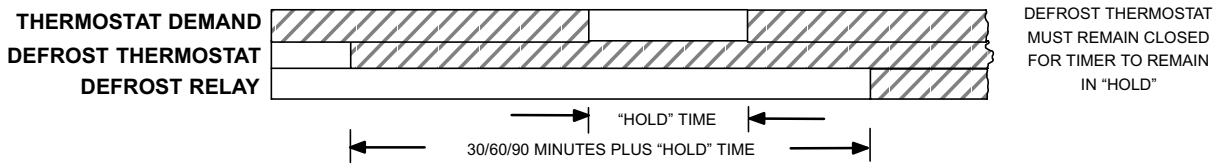
### NORMAL HEATING OPERATION: DEFROST TERMINATED BY DEFROST THERMOSTAT



### NORMAL HEATING OPERATION: DEFROST TERMINATED BY TIME

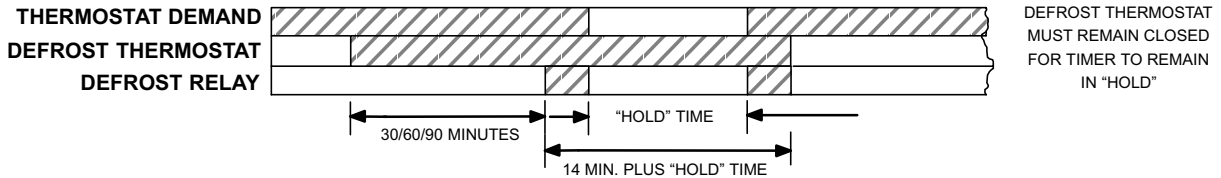


### NORMAL HEATING OPERATION INTERRUPTED BY THERMOSTAT DEMAND: "HOLD" FUNCTION



DEFROST THERMOSTAT MUST REMAIN CLOSED FOR TIMER TO REMAIN IN "HOLD"

### DEFROST PERIOD INTERRUPTED BY THERMOSTAT DEMAND: "HOLD" FUNCTION



DEFROST THERMOSTAT MUST REMAIN CLOSED FOR TIMER TO REMAIN IN "HOLD"

FIGURE 12

## Defrost Control Components

### 1- Timing Pins 30, 60, 90

Each of these pins provides a different timed interval between defrosts. A jumper connects the pins to circuit board pin W1. Table 6 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 13).

TABLE 6

CMC1 DEFROST CONTROL TIMINGS	INTERVAL BETWEEN DEFROSTS WITH JUMPER CONNECTED TO:			DEFROST TIME
	30	60	90	
NORMAL OPERATION	30 ± 3 MIN.	60 ± 6 MIN.	90 ± 9 MIN.	14 ± 1.4 MIN.
"TST" PINS JUMPER TOGETHER	7 ± 0.7 SEC.	14 ± 1.4 SEC.	21 ± 2.1 SEC.	3.3 ± 0.3 SEC.

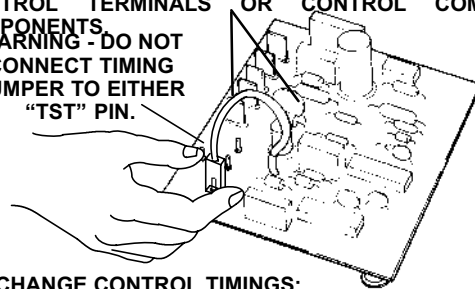
### 2- Timing Jumper

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 connected to any one of the timing pins but must never be connected to either of the "TST" pins. See Caution on this page.

### 3- "COM" Terminal

Terminal "COM" provides 24VAC Common.

**DEFROST CONTROL TIMING CHANGES**  
**WARNING - AVOID CONTACT WITH OTHER CONTROL TERMINALS OR CONTROL COMPONENTS.**  
**WARNING - DO NOT CONNECT TIMING JUMPER TO EITHER "TST" PIN.**



#### TO CHANGE CONTROL TIMINGS:

- 1- Turn off all power to the unit to avoid circuit board damage.
- 2- Grasp wire connector firmly with fingers.
- 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 6 for timings).
- 6- Turn on power to unit.

FIGURE 13

## 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.

#### 4- "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 6 and figure 14).

### **⚠ IMPORTANT**

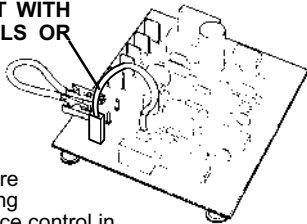
**Control will begin test mode only if normal load is applied to control terminals. Do not attempt to operate or test control out of unit.**

#### **DEFROST CONTROL TEST MODE**

**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. However, if outdoor ambient is 40°F (4.4°C) or warmer, the defrost thermostat may not close and may not allow test mode to initiate. If this happens, it may be necessary to jumper 24V to the 24V terminal in order to initiate defrost.*

- 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 6 for control timings in "TST" mode.
- 7- Be sure to turn off power and remove jumper when test is complete. Turn on power and re-adjust thermostat.

**FIGURE 14**

#### 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. This is the only time that the timer is operating.*

#### 6- "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.

#### 7- "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.

## **N-Defrost System-Late Models**

### **Units built prior to April 2002**

The defrost system includes two components: a defrost thermostat, and a defrost control.

#### **Defrost Thermostat**

The defrost thermostat is mounted on the liquid line between the check/expansion valve and the distributor. When defrost thermostat senses 35°F (2°C) or cooler, its contacts close and send a signal to the defrost control board to start the defrost timing. It also terminates defrost when the liquid line warms up to 70°F (21°C).

#### **Defrost Control**

The defrost control board combines functions of a time/temperature defrost control, defrost relay, time delay, diagnostic LEDs and field connection terminal strip. See figure 15.

The control provides automatic switching from normal heating operation to defrost mode and back. During compressor cycle (room thermostat demand cycle), if the "O" input is not on and the defrost thermostat is closed the control accumulates compressor run times at 30, 60 or 90 minute field adjustable intervals. If the defrost thermostat remains closed when the accumulated compressor run time ends, the defrost relay is energized and defrost begins.

#### **Defrost Control Components**

##### **1- Defrost Control Timing Pins**

Each timing pin selection provides a different accumulated compressor run period during one thermostat run cycle. This time period must occur before a defrost cycle is initiated. The defrost interval can be adjusted to 30, 60 or 90 minutes. See figure 15. The defrost period is a maximum of 14 minutes and cannot be adjusted. If no timing is selected, the control defaults to 90 minutes.

A TEST option is provided for troubleshooting. When the jumper is placed across the TEST pins, the timing of all functions is reduced by a factor of 128. For example, a 30 minute interval during TEST is 14 seconds and the 14-minute defrost is reduced to 6.5 seconds.

The TEST mode may be started at anytime. If the jumper is in the TEST position at power-up or for longer than five minutes, the control will ignore the TEST selection and will default to a 90 minute interval.

##### **2- Time Delay**

The timed-off delay is five minutes long. The delay feature is provided to help protect the compressor in case of an interruption in power to the unit or when a pressure switch resets.

### 3- Pressure Switch Safety Circuits

The defrost control incorporates a pressure switch safety circuit that allows the application of an additional pressure switch; high pressure switch (S4) is factory-wired to this circuit. See figure 15. PS1 and PS2 terminals are wired in series with a jumper internal to the control board. This feature is available on all late model units.

During one demand cycle, the defrost control will lock out the unit on the third instance that the unit goes off on any auto-reset pressure switch wired to this circuit. The diagnostic LEDs will display a pattern for a locked out pressure switch on the third open pressure switch occurrence. See table 7. The unit will remain locked out until 24 volt power is broken to terminal "R" on the defrost control and then re-made.

The PS2 safety circuit terminals are connected to the compressor thermostat. An optional loss of charge switch may be field-installed by connecting it in series with the other switches. See unit wiring diagram.

### 4- Diagnostic LEDs

The defrost board uses two LEDs for diagnostics. The LEDs flash a specific sequence according to the condition.

TABLE 7

DEFROST CONTROL BOARD DIAGNOSTIC LED		
MODE	LED 1	LED 2
Normal Operation/ Power to board	Flash together with LED 2	Flash together with LED 1
Time Delay To Protect Compressor	Alternating Flashes with LED 2	Alternating Flashes with LED 1
Pressure Switch Open	Off	On
Pressure Switch Lockout	On	Off
Board Malfunction	On	On

### 5- Ambient Thermistor & Service Light Connection

The defrost control board provides terminal connections for the ambient thermistor and service light. These features provide a service light thermostat which activates the room thermostat service light during periods of inefficient operation. The thermistor compensates for changes in ambient temperature which might cause thermostat droop.

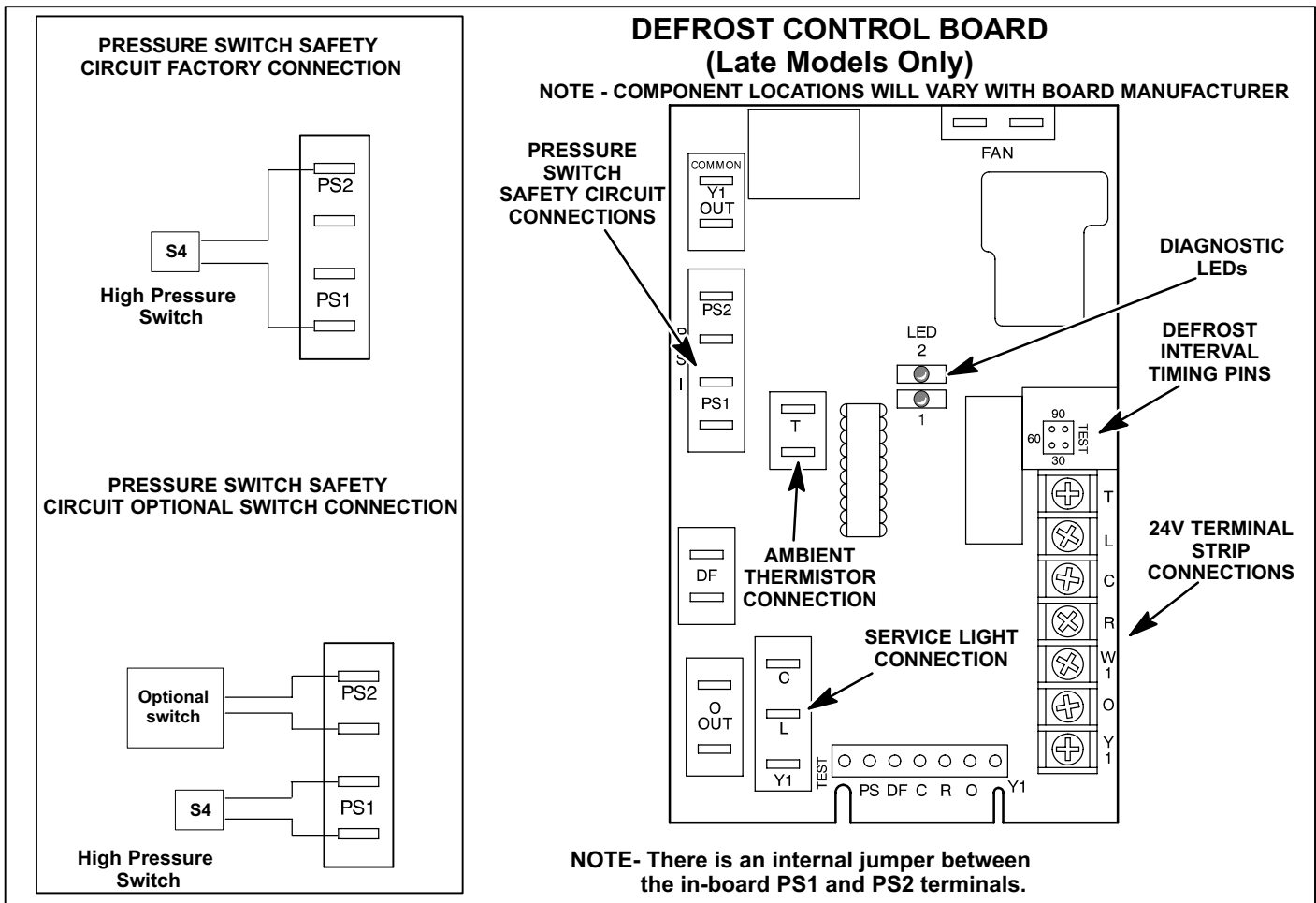


FIGURE 15

## O-Defrost System-Late Models Units built April 2002 and Later

The defrost system includes two components:

- a defrost thermostat
- a defrost control

### Defrost Thermostat

The defrost thermostat is located on the liquid line between the check/expansion valve and the distributor. When the defrost thermostat senses 42°F (5.5°C) or cooler, its contacts close and send a signal to the defrost control board to start the defrost timing. It also terminates defrost when the liquid line warms up to 70°F (21°C).

### Defrost Control

The defrost control board includes the combined functions of a time/temperature defrost control, defrost relay, time delay, diagnostic LEDs, and a terminal strip for field wiring connections. See figure 15.

The control provides automatic switching from normal heating operation to defrost mode and back. During compressor cycle (call for defrost), the control accumulates compressor run times at 30, 60, or 90 minute field adjustable intervals. If the defrost thermostat is closed when the selected compressor run time interval ends, the defrost relay is energized and defrost begins.

### Defrost Control Timing Pins

Each timing pin selection provides a different accumulated compressor run time period during one thermostat run cycle. This time period must occur before a defrost cycle is initiated. The defrost interval can be adjusted to 30 (T1), 60 (T2), or 90 (T3) minutes. See figure 15. The defrost timing jumper is factory-installed to provide a 60-minute defrost interval. If the timing selector jumper is not in place, the control defaults to a 90-minute defrost interval. The maximum defrost period is 14 minutes and cannot be adjusted.

A TEST option is provided for troubleshooting. **The TEST mode may be started any time the unit is in the heating mode and the defrost thermostat is closed or jumpered.** If the jumper is in the TEST position at power-up, the control will ignore the test pins. When the jumper is placed across the TEST pins for two seconds, the control will enter the defrost mode. If the jumper is removed before an additional 5-second period has elapsed (7 seconds total), the unit will remain in defrost mode until the defrost thermostat opens or 14 minutes have passed. If the jumper is not removed until after the additional 5-second period has elapsed, the defrost will terminate and the test option will not function again until the jumper is removed and re-applied.

### Time Delay

The timed-off delay is five minutes long. The delay helps protect the compressor from short-cycling in case the power to the unit is interrupted or a pressure switch opens. The delay is bypassed by placing the timer select jumper across the TEST pins for 0.5 seconds.

### Pressure Switch Circuits

The defrost control includes two pressure switch circuits. The high pressure switch (S4) is factory-connected to the board's HI PS terminals. The board also includes LO PS terminals to accommodate the addition of a field-provided low pressure or loss of charge pressure switch. See figure 15. This feature is available on all units.

During a single demand cycle, the defrost control will lock out the unit after the third time that the circuit is interrupted by any pressure switch that is wired to the control board. In addition, the diagnostic LEDs will indicate a locked out pressure switch after the third occurrence of an open pressure switch. See table 2. The unit will remain locked out until power is broken then remade to the control or until the jumper is applied to the TEST pins for 0.5 seconds.

*NOTE - The defrost control board ignores input from the low pressure switch terminals during the TEST mode, during the defrost cycle, during the 90-second start-up period, and for the first 90 seconds each time the reversing valve switches heat/cool modes. **If the TEST pins are jumpered and the 5-minute delay is being bypassed, the LO PS terminal signal is not ignored during the 90-second start-up period.***

### Ambient Thermistor & Service Light Connection

The defrost control board provides terminal connections for the ambient thermistor and a service light. The thermistor compensates for changes in ambient temperature which might cause thermostat droop. The service light thermostat provides a signal which activates the room thermostat service light during periods of inefficient operation.

### Diagnostic LEDs

The defrost board uses two LEDs for diagnostics. The LEDs flash a specific sequence according to the diagnosis.

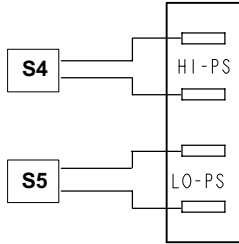
TABLE 2

DEFROST CONTROL BOARD DIAGNOSTIC LED		
MODE	LED 1	LED 2
Normal operation / power to board	Synchronized Flash with LED 2	Synchronized Flash with LED 1
Board failure or no power	Off	Off
Board failure	On	On
High pressure switch open	Flash	On
Low pressure switch open	On	Flash
Pressure switch lockout	On	Off
Anti-short-cycle / 5-minute delay	Alternating Flash with LED 2	Alternating Flash with LED 1

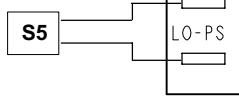
# DEFROST CONTROL BOARD

## PRESSURE SWITCH WIRING CONNECTIONS

High Pressure Switch  
(Factory-wired)

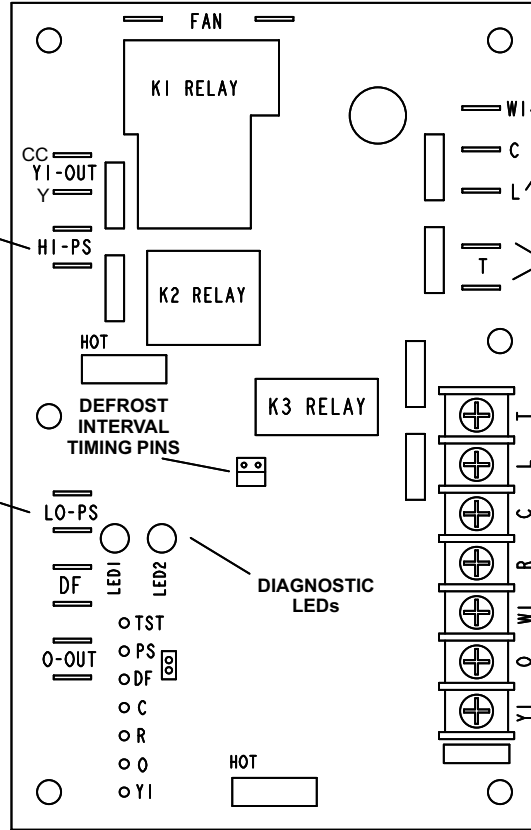


Optional Pressure Switch  
(Field-provided and installed -- jumper removed)



HIGH PRESSURE SWITCH TERMINALS

OPTIONAL PRESSURE SWITCH TERMINALS  
(Remove factory-installed jumper to install pressure switch.)



SERVICE LIGHT TERMINALS

AMBIENT THERMISTER TERMINALS

24V TERMINAL STRIP

DIAGNOSTIC LEDs

FIGURE 16

## IV-Plumbing

Field refrigerant piping consists of liquid and vapor lines from the outdoor unit (sweat connections). Use Lennox L10 or L15 series line sets as shown in table 8 and 9 for field-fabricated refrigerant lines. Table 8 shows line sets for early model HP26 units. Table 9 shows line sets for late model HP26 units. 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.

On early model HP26 units, 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.

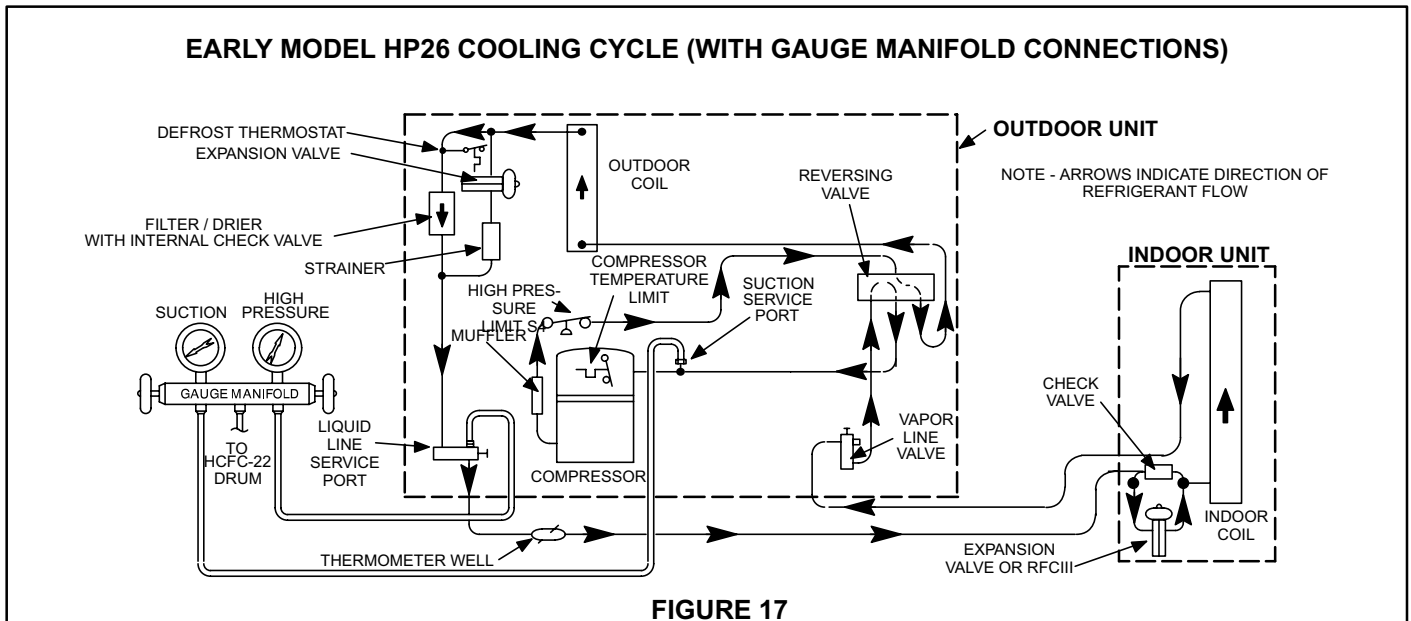
Separate discharge and suction service ports are provided at the service valves for connection of gauge manifold during charging procedure. Figures 17 and 18 show early model HP26 refrigerant flow and gauge manifold connections. Late model HP26 units have a combination expansion/check valve with a biflow filter drier. See figure 19 and 20 for refrigerant flow and gauge manifold connections.

**TABLE 8**  
**Early Model Units**

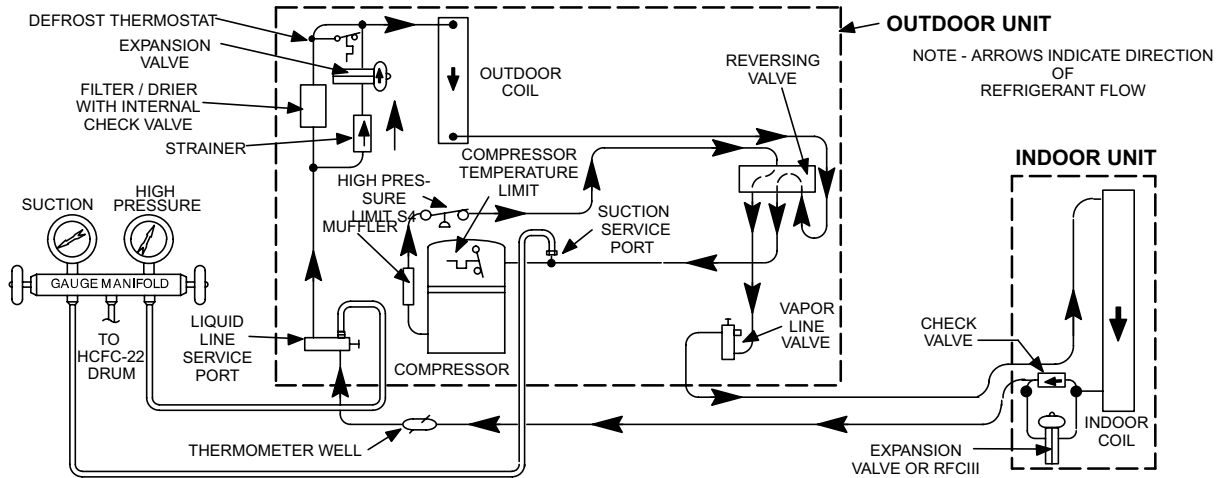
HP26 UNIT	LIQUID LINE	VAPOR LINE	L10 LINE SETS	L15 LINE SETS
-261	3/8 in. (9.5mm)	5/8 in. (15.9mm)	L10-26 20 ft. - 50 ft. (6.1m-15.2m)	L15-26 20 ft. - 50 ft. (6.1m-15.2m)
-311 -411	3/8 in. (9.5mm)	3/4 in. (19.1mm)	L10-41 20 ft. - 50 ft. (6.1m-15.2m)	L15-41 20 ft. - 50 ft. (6.1m-15.2m)
-461	3/8 in. (9.5mm)	7/8 in. (22.2mm)	L10-65 30 ft. - 50 ft. (9.1m-15.2m)	L15-65 30 ft. - 50 ft. (9.1m-15.2m)

**TABLE 9**  
**Late Model Units**

HP26 UNIT	LIQUID LINE	VAPOR LINE	L10 LINE SETS	L15 LINE SETS
-018	3/8 in. (9.5mm)	5/8 in. (15.9mm)	L10-26 20 ft. - 50 ft. (6.1m-15.2m)	L15-26 15 ft. - 50 ft. (4.5m-15.2m)
-024,-030, -036	3/8 in. (9.5mm)	3/4 in. (19.1mm)	L10-41 20 ft. - 50 ft. (6.1m-15.2m)	L15-41 15 ft. - 50 ft. (4.5m-15.2m)
-042,-048	3/8 in. (9.5mm)	7/8 in. (22.2mm)	L10-65 30 ft. - 50 ft. (9.1m-15.2m)	L15-65 15 ft. - 50 ft. (4.5m-15.2m)
-060	3/8 in. (9.5mm)	1-1/8 in. (29m)	FIELD FABRICATE	FIELD FABRICATE

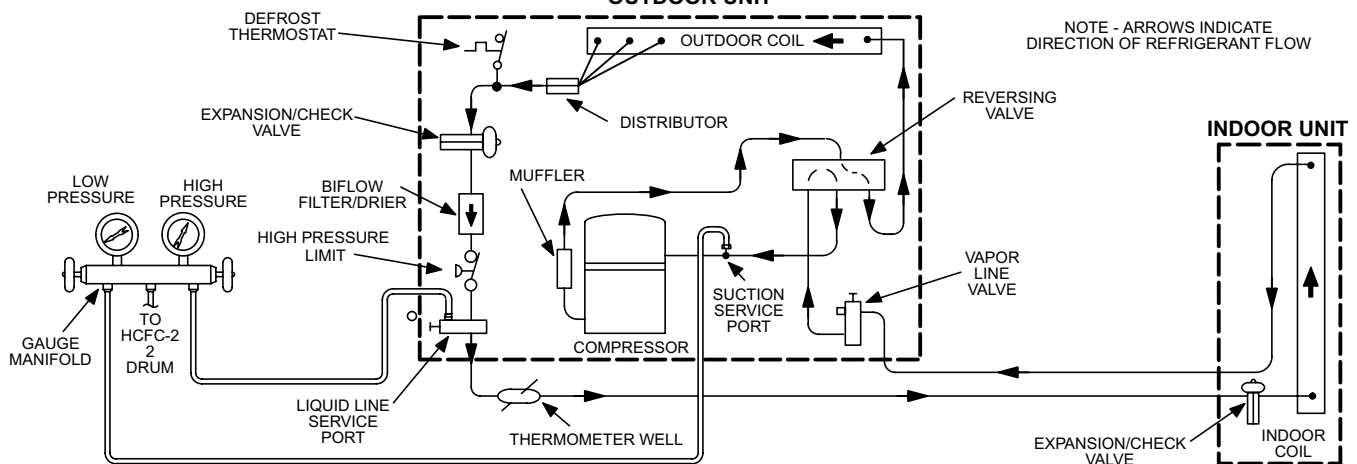


**EARLY MODEL HP26 HEATING CYCLE (WITH GAUGE MANIFOLD CONNECTIONS)**



**FIGURE 18**

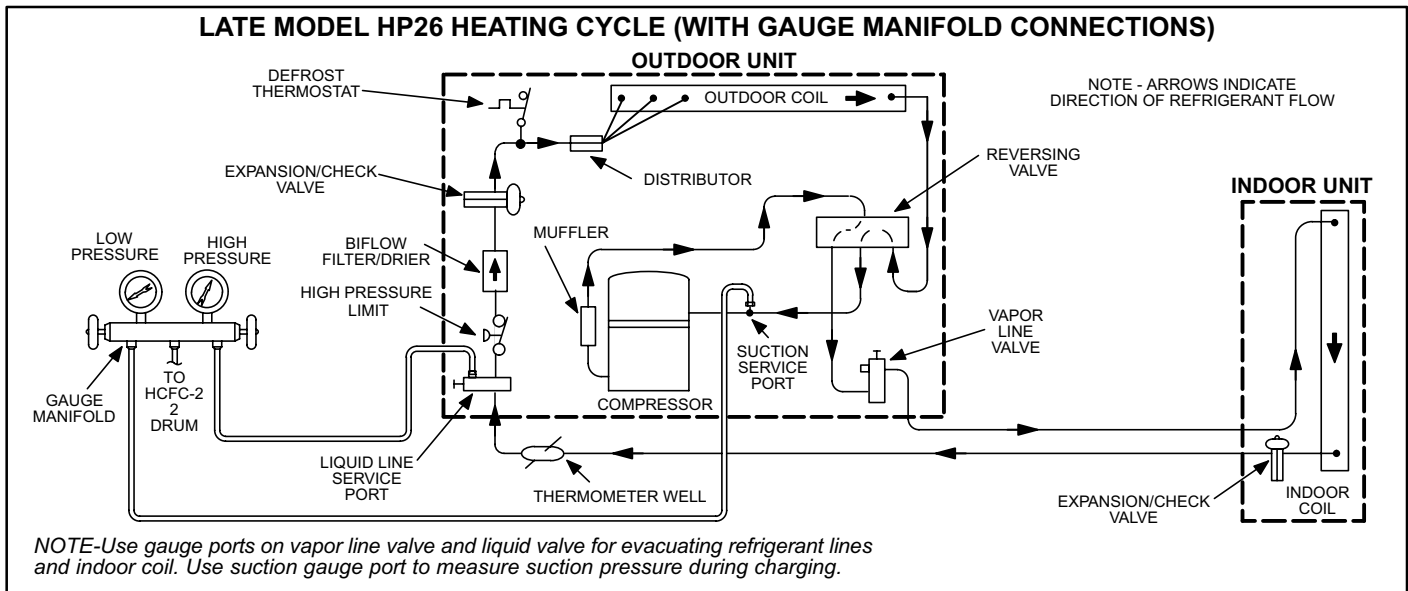
**LATE MODEL HP26 COOLING CYCLE (WITH GAUGE MANIFOLD CONNECTIONS)**



*NOTE-Use gauge ports on vapor line valve and liquid valve for evacuating refrigerant lines and indoor coil. Use suction gauge port to measure suction pressure during charging.*

**FIGURE 19**





**FIGURE 20**

**A-Service Valves (Early Models)**

**⚠ IMPORTANT**

**FIGURES 21 AND 22 ARE FOR EARLY MODEL HP26 UNITS ONLY.**

**1 - Liquid Line Service Valve**

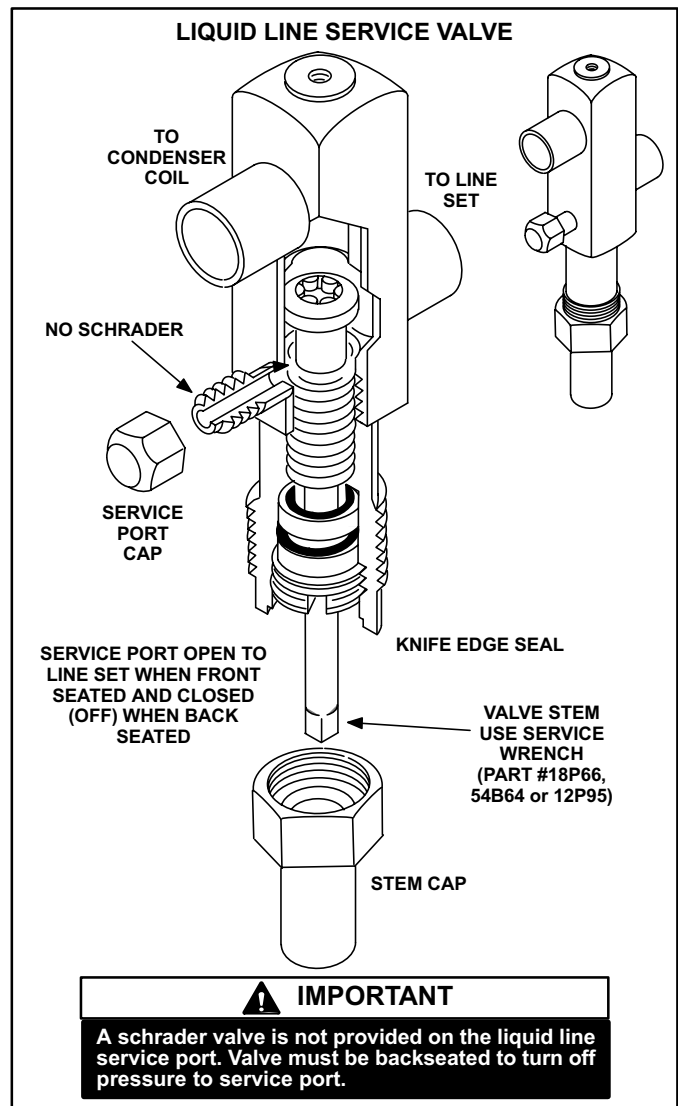
A full-service liquid line valve made by one of several manufacturers may be used. All liquid line service valves function the same way, differences are in construction. Valves are not rebuildable. If a valve has failed it must be replaced. The liquid line service valve is illustrated in figure 21.

The valve is equipped with a service port. There is no schrader valve installed in the liquid line service port. A service port cap is supplied to seal off the port.

The liquid line service valve is a front and back seating valve. When the valve is backseated the service port is not pressurized. The service port cap can be removed and gauge connections can be made.

**⚠ CAUTION**

**The service port cap is used to seal the liquid line service valve. Access to service port requires backseating the service valve to isolate the service port from the system. Failure to do so will cause refrigerant leakage.**



**FIGURE 21**

### To Access Service Port:

- 1- Remove the stem cap. Use a service wrench (part #18P66, 54B64 or 12P95) to make sure the service valve is backseated.
- 2- Remove service port cap and connect high pressure gauge to service port.
- 3- Using service wrench, open valve stem (one turn clockwise) from backseated position.
- 4- When finished using port, backseat stem with service wrench. Tighten firmly.
- 5- Replace service port and stem cap. Tighten finger tight, then tighten an additional 1/6 turn.

### To Close Off Service Port:

- 1- Using service wrench, backseat valve.
  - a - Turn stem counterclockwise.
  - b - Tighten firmly.

### To Open Liquid Line Service Valve:

- 1- Remove the stem cap with an adjustable wrench.
- 2- Using service wrench, backseat valve.
  - a - Turn stem counterclockwise until backseated.
  - b - Tighten firmly.
- 3- Replace stem cap, finger tighten then tighten an additional 1/6 turn.

### To Close Liquid Line Service Valve:

- 1- Remove the stem cap with an adjustable wrench.
- 2- Turn the stem in clockwise with a service wrench to front seat the valve. Tighten firmly.
- 3- Replace stem cap, finger tighten then tighten an additional 1/6 turn.

## 2 - Vapor Line Service Valve

A full service non-backseating vapor line service valve is used on early model HP26 series units. Different manufacturers of valves may be used. All vapor line service valves function the same way, differences are in construction.

Valves are not rebuildable. If a valve has failed it must be replaced. The vapor line service valve is illustrated in figure 22.

The valve is equipped with a service port. A schrader valve is factory installed. A service port cap is supplied to protect the schrader valve from contamination and assure a leak free seal.

### To Access Schrader Port:

- 1- Remove service port cap with an adjustable wrench.
- 2- Connect gauge to the service port.
- 3- When testing is completed, replace service port cap. Tighten finger tight, then tighten an additional 1/6 turn.

### To Open Vapor Line Service Valve:

- 1- Remove stem cap with an adjustable wrench.
- 2- Using service wrench and 5/16" hex head extension (part #49A71) back the stem out counterclockwise until the valve stem just touches the retaining ring.

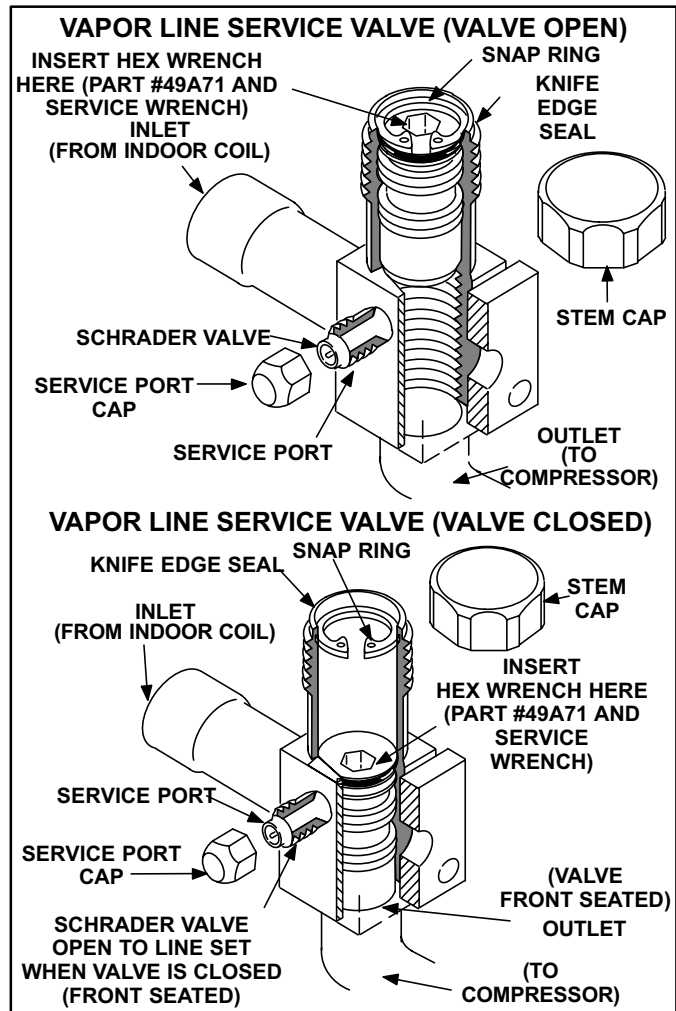


FIGURE 22

## **⚠ DANGER**

**Do not attempt to backseat this valve. Attempts to backseat this valve will cause snap ring to explode from valve body under pressure of refrigerant. Personal injury and unit damage will result.**

- 3- Replace stem cap and tighten firmly (tighten finger tight, then tighten an additional 1/6 turn).

### To Close Vapor Line Service Valve:

- 1- Remove stem cap with an adjustable wrench.
- 2- Using service wrench and 5/16" hex head extension (part #49A71) turn stem in clockwise to seat the valve. Tighten firmly.
- 3- Replace stem cap. Tighten finger tight, then tighten an additional 1/6 turn.

## B-Service Valves (Late Models)

The liquid line and vapor line service valves and gauge ports are accessible by removing the compressor access cover. Full service liquid and vapor line valves are used. See figures 23 and 24. The service ports are used for leak testing, evacuating, charging and checking charge. A schrader valve is factory installed. A service port is supplied to protect the schrader valve from contamination and serve as a primary leak seal. Valves are not rebuildable. If a valve fails, it must be replaced.

*NOTE- Always keep valve stem clean.*

### ⚠ IMPORTANT

Figures 23 and 24 are for late model HP26 units.

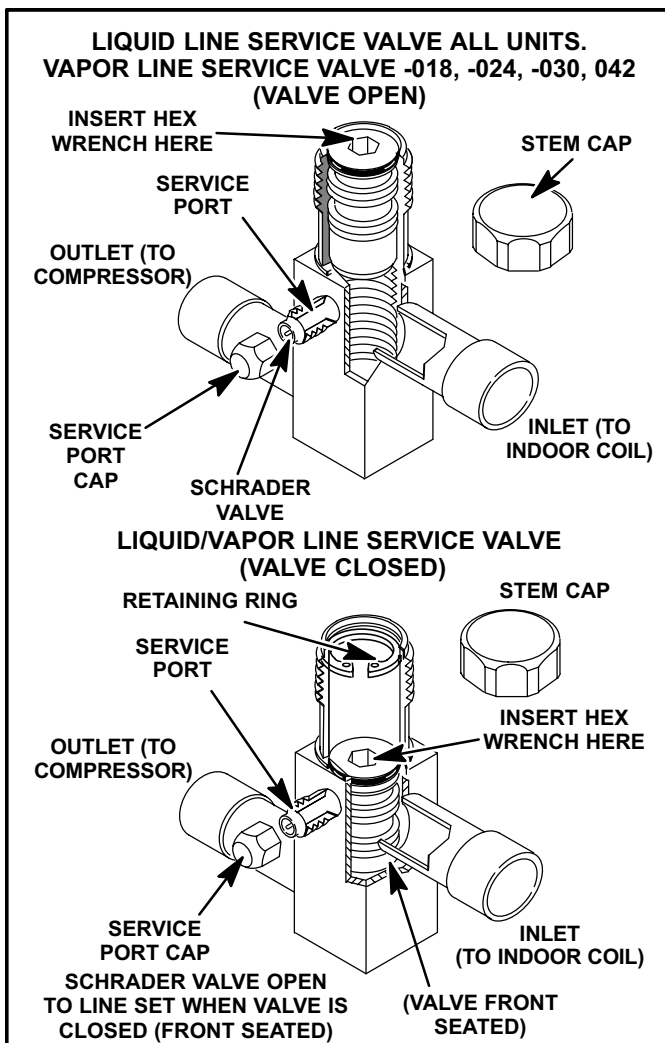


FIGURE 23

### ⚠ IMPORTANT

**Service valves are closed to the heat pump unit and open to line set connections. Do not open until refrigerant lines have been leak tested and evacuated. All precautions should be exercised to keep the system free from dirt, moisture and air.**

#### To Access Schrader Port:

- 1- Remove service port cap with an adjustable wrench.
- 2- Connect gauge to the service port.
- 3- When testing is completed, replace service port cap. Tighten finger tight, then an additional 1/6 turn.

#### To Open Liquid or Vapor Line Service Valve:

- 1- Remove stem cap with an adjustable wrench.
- 2- Using service wrench and 5/16" hex head extension back the stem out counterclockwise until the valve stem just touches the retaining ring.
- 3- Replace stem cap tighten firmly. Tighten finger tight, then tighten an additional 1/6 turn.

### ⚠ DANGER

**Do not attempt to backseat this valve. Attempts to backseat this valve will cause snap ring to explode from valve body under pressure of refrigerant. Personal injury and unit damage will result.**

#### To Close Liquid or Vapor Line Service Valve:

- 1- Remove stem cap with an adjustable wrench.
- 2- Using service wrench and 5/16" hex head extension, turn stem clockwise to seat the valve. Tighten firmly.
- 3- Replace stem cap. Tighten finger tight, then tighten an additional 1/6 turn.

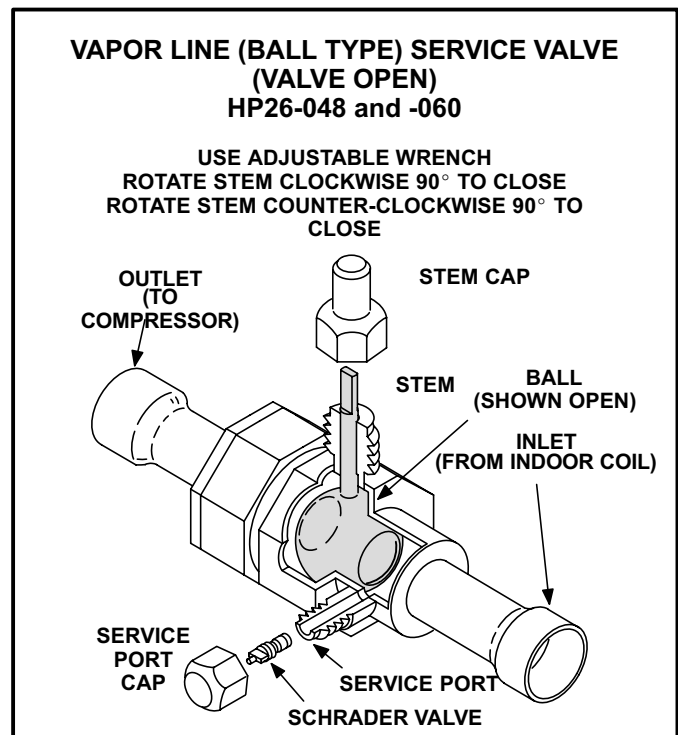


FIGURE 24

## V-CHARGING

Unit charge is based on a matching indoor coil and outdoor coil with a 15 foot (4.5m) line set. For varying lengths of line set, refer to table 10.

**TABLE 10**

Liquid Line Set Diameter	Ounce per 5 foot (ml per mm) adjust from 15 ft. (4.56m)*
1/4 in. (6 mm)	1 ounce per 5 feet (30 ml per 1524 mm)
5/16 in. (8mm)	2 ounce per 5 feet (60 ml per 1524 mm)
3/8 in. (9.5 mm)	3 ounce per 5 feet (90 ml per 1524 mm)

\*If line set is greater than 15 ft. (4.5m) add this amount. If line set is less than 15 ft. (4.5m) subtract this amount

### A-Leak Testing

- 1 - Attach gauge manifold and connect a drum of dry nitrogen to center port of gauge manifold.
- 2 - Open high pressure gauge valve and pressurize line set and indoor coil to 150 psig (1034 kPa).

## ! WARNING



**Danger of Explosion. Can cause injury, death and equipment damage. When using dry nitrogen, use a pressure-reducing regulator, set at 150 pig (1034 kPa) or less to prevent excessive pressure.**

- 3 - Check lines and connections for leaks.

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

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

### B-Evacuating the System

Evacuating the system of non-condensables is critical for proper operation of the unit. Non-condensables are defined as any gas that will not condense under temperatures and pressures present during operation of an air conditioning system. Non-condensables such as water vapor, combine with refrigerant to produce substances that corrode copper piping and compressor parts.

## ! IMPORTANT

**The compressor should never be used to evacuate a refrigeration or air conditioning system.**

- 1 - Attach gauge manifold. 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.

## ! IMPORTANT

**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 evacuating system 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 - Connect vacuum pump to gauge manifold center port. Evacuate system through manifold service valves until vacuum in system does not rise above .5mm of mercury absolute pressure or 500 microns 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.

## ! CAUTION

**Danger of Equipment Damage. Avoid deep vacuum operation. Do not use compressors to evacuate a system. Extremely low vacuums can cause internal arcing and compressor failure. Damage caused by deep vacuum operation will void warranty.**

### C-Charging

Charging must be done in the cooling mode. If 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 shown on the unit nameplate.

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

Separate discharge and vapor line service ports are provided outside the unit for connection of gauge manifold during charging procedure as well as a suction line service port.

### 1 - Expansion Valve Systems

The following procedures are intended as a general guide for use with expansion valve systems only. For best results, indoor temperature should be between 70 °F and 80 °F (21 °C and 26.5 °C). If outdoor temperature is 60 °F (16 °C) or above the approach method of charging is used. If outdoor temperature is less than 60 °F (16 °C) the subcooling method of charging is used. Slight variations in charging temperature and pressure should be expected. Large variations may indicate a need for further servicing.

**! IMPORTANT**

The following procedures require accurate readings of ambient (outdoor) temperature, liquid temperature and liquid pressure for proper charging. Use a thermometer with accuracy of  $\pm 2$  °F and a pressure gauge with accuracy of  $\pm 5$  PSIG.

#### APPROACH METHOD (TXV SYSTEMS)

(Ambient Temperature Above 60 °F [16 °C])

- 1- Connect gauge manifold. Connect an upright HCFC-22 drum to center port of gauge manifold.
- 2- Record outdoor air (ambient) temperature.
- 3- Operate indoor and outdoor units in cooling mode. Allow outdoor unit to run until system pressures stabilize.
- 4- Make sure thermometer well is filled with mineral oil before checking liquid line temperature.
- 5- Place thermometer in well and read liquid line temperature. Liquid line temperature should be a few degrees warmer than the outdoor air temperature. Table 11 shows how many degrees warmer the liquid line should be in early model HP26 units and table 12 shows how many degrees warmer the liquid line should be in late model HP26 units.

Add refrigerant to make the liquid line cooler.

Remove refrigerant to make the liquid line warmer.

**TABLE 11**  
**Early Model HP26 Units**

APPROACH METHOD - EXPANSION VALVE SYSTEMS AMBIENT TEMPERATURE ABOVE 60 °F (16 °C)	
HP26 UNIT	Liquid Temp. Minus Ambient Temp. °F (C°)
-261,-311	$6 \pm 1$ (3.33 $\pm$ .5)
-411	$7 \pm 1$ (3.9 $\pm$ 1)
-461, -048, -060	$10 \pm 1$ (5.6 $\pm$ .5)

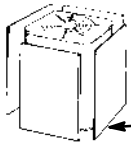
**TABLE 12**  
**Late Model HP26 Units**

APPROACH METHOD - EXPANSION VALVE SYSTEMS AMBIENT TEMPERATURE ABOVE 60 °F (16 °C)	
HP26 UNIT	Liquid Temp. Minus Ambient Temp. °F (C°)
-018	$5 \pm 1$ (2.8 $\pm$ .5)
-024	$13 \pm 1$ (7.2 $\pm$ .5)
-030,-042	$7 \pm 1$ (3.9 $\pm$ 1)
-036	$10.5 \pm 1$ (5.8 $\pm$ .5)

#### SUBCOOLING METHOD (TXV SYSTEMS)

(Ambient Temperature Below 60 °F [16 °C])

*NOTE- It may be necessary to restrict air flow in order to reach liquid pressures in the 200-250 psig range which are required for checking charge. Block equal sections of air intake panels as shown in figure 25, moving obstructions sideways until liquid pressures in the 200-250 psig range are reached.*



**BLOCKING OUTDOOR COIL**  
Block outdoor coil one side at a time with cardboard or plastic sheets until proper testing pressures are reached.

**CARDBOARD OR PLASTIC SHEET**

**FIGURE 25**

- 1- Connect gauge manifold. Connect an upright HCFC-22 drum to center port of gauge manifold.
- 2- Operate indoor and outdoor units in cooling mode. Allow units to run until system pressures stabilize.
- 3- Make sure thermometer well is filled with mineral oil before checking liquid line temperature.
- 4- Read liquid line pressure and convert to condensing temperature using temperature/ pressure conversion chart. Condensing temperature (from gauges) should be a few degrees warmer than the liquid line.
- 5- Place thermometer in well and read liquid line temperature. Table 13 shows how much warmer the condensing temperature should be in early model HP26 units. Table 14 shows how much warmer the condensing temperature should be in late model HP26 units. Add refrigerant to make the liquid line cooler. Recover refrigerant to make the liquid line warmer.
- 6- When unit is properly charged liquid line pressures should approximate those given in table 15 or 16.

**TABLE 13**  
**Early Model HP26 Units**

SUBCOOLING METHOD - EXPANSION VALVE SYSTEMS AMBIENT TEMPERATURE BELOW 60 °F (16 °C)	
HP26 UNIT	Subcooling °F (°C)
-311	$8 \pm 2$ (4.4 $\pm$ 1)
-261	$7 \pm 2$ (3.9 $\pm$ 1)
-048,-060	$4 \pm 2$ (2.2 $\pm$ 1)
-411	$12 \pm 2$ (6.6 $\pm$ 1)
-461	$6 \pm 2$ (3.3 $\pm$ 1)

**TABLE 14**  
Late Model HP26 Units

SUBCOOLING METHOD - EXPANSION VALVE SYSTEMS AMBIENT TEMPERATURE BELOW 60 °F (16 °C)	
HP26 UNIT	Subcooling °F (°C)
-018	11 ± 2 (6.1 ± 1)
-024	8 ± 2 (4.4 ± 1)
-030	5 ± 2 (2.8 ± 1)
-036	3 ± 2 (1.7 ± 1)
-042	7 ± 2 (3.9 ± 1)
-060	4 ± 2 (2.2 ± 1)

**⚠ IMPORTANT**

Use table 15 and 16 as a general guide for performing maintenance checks. Table 15 and 16 is not a procedure for charging the system. Minor variations in pressures may be expected due to differences in installations. Significant deviations may mean the system is not properly charged or that a problem exists with some component in the system. Used prudently, table 15 and 16 could serve as a useful service guide.

**D-Oil Charge**

Refer to tables 1 and 2 on page 4.

**TABLE 15 (Early Model)**  
HP26 NORMAL OPERATING PRESSURES

COOLING OPERATION								
OUTDOOR TEMP. (°F)	HP26-261		HP26-311		HP26-411		HP26-461	
	Liq. ± 10 psig	Suct. ± 5 psig	Liq. ± 10 psig	Suct. ± 5 psig	Liq. ± 10 psig	Suct. ± 5 psig	Liq. ± 10 psig	Suct. ± 5 psig
75	180	75	169	76	171	73	171	77
85	209	77	196	78	201	75	199	79
95	238	79	223	80	232	77	229	80
105	270	81	253	82	266	79	265	81
HEATING OPERATION								
OUTDOOR TEMP. (°F)	HP26-261		HP26-311		HP26-411		HP26-461	
	Liq. ± 10 psig	Suct. ± 5 psig	Liq. ± 10 psig	Suct. ± 5 psig	Liq. ± 10 psig	Suct. ± 5 psig	Liq. ± 10 psig	Suct. ± 5 psig
20	175	33	177	33	181	32	187	33
30	188	42	190	42	195	40	194	45
40	201	51	203	51	210	49	210	53
50	214	61	216	61	225	58	233	59

**TABLE 16 (Late Model)**  
HP26 NORMAL OPERATING PRESSURES

COOLING OPERATION														
OUT-DOOR TEMP. (°F)	HP26-018		HP26-024		HP26-030		HP26-036		HP26-042		HP26-048		HP26-060	
	Liq. ± 10 psig	Suct. ± 5 psig	Liq. ± 10 psig	Suct. ± 5 psig	Liq. ± 10 psig	Suct. ± 5 psig	Liq. ± 10 psig	Suct. ± 5 psig	Liq. ± 10 psig	Suct. ± 5 psig	Liq. ± 10 psig	Suct. ± 5 psig	Liq. ± 10 psig	Suct. ± 5 psig
65	145	78	147	78	135	77	139	75	140	71	139	76	143	73
75	166	79	171	79	159	78	164	76	165	72	164	77	170	75
85	186	80	202	80	177	78	182	77	194	73	193	79	199	76
95	228	82	232	82	216	79	221	78	224	75	223	80	224	78
105	262	83	268	83	249	82	256	80	260	76	259	81	267	79
HEATING OPERATION														
OUT-DOOR TEMP. (°F)	HP26-018		HP26-024		HP26-030		HP26-036		HP26-042		HP26-048		HP26-060	
	Liq. ± 10 psig	Suct. ± 5 psig	Liq. ± 10 psig	Suct. ± 5 psig	Liq. ± 10 psig	Suct. ± 5 psig	Liq. ± 10 psig	Suct. ± 5 psig	Liq. ± 10 psig	Suct. ± 5 psig	Liq. ± 10 psig	Suct. ± 5 psig	Liq. ± 10 psig	Suct. ± 5 psig
20	172	32	165	30	175	35	172	33	185	29	179	34	190	29
30	182	41	171	39	183	49	178	44	186	39	190	43	202	39
40	193	50	182	48	194	58	190	52	199	47	203	50	217	47
50	203	59	197	58	208	62	208	58	222	55	216	56	233	52

## VI-MAINTENANCE

### **WARNING**



**Electric shock hazard. Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch(es). Unit may have multiple power supplies.**

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

#### **A-Outdoor Unit**

- 1- Clean and inspect outdoor coil. (Coil may be flushed with a water hose).
- 2- Visually inspect all connecting lines, joints and coils for evidence of oil leaks.

### **IMPORTANT**

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

#### **B-Indoor Coil**

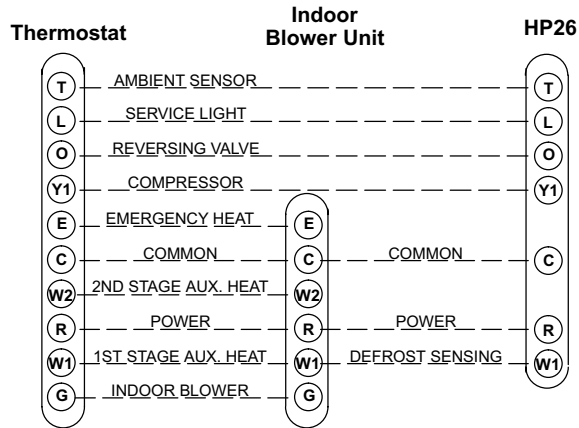
- 1- Clean coil if necessary.
- 2- Check lines and coil for evidence of oil leaks.
- 3- Check condensate line and clean if necessary.

#### **C-Indoor Unit**

- 1- Clean or change filters.
- 2- Adjust blower cooling speed. Static pressure drop over coil should be checked to determine correct blower CFM. Refer to Lennox Engineering Handbook.
- 3- Belt Drive Blowers - Check condition and tension.
- 4- Check all wiring for loose connections.
- 5- Check for correct voltage at unit.
- 6- Check amp-draw on blower motor.  
Unit nameplate \_\_\_\_\_ Actual \_\_\_\_\_.

# VII-WIRING DIAGRAM/OPERATING SEQUENCE

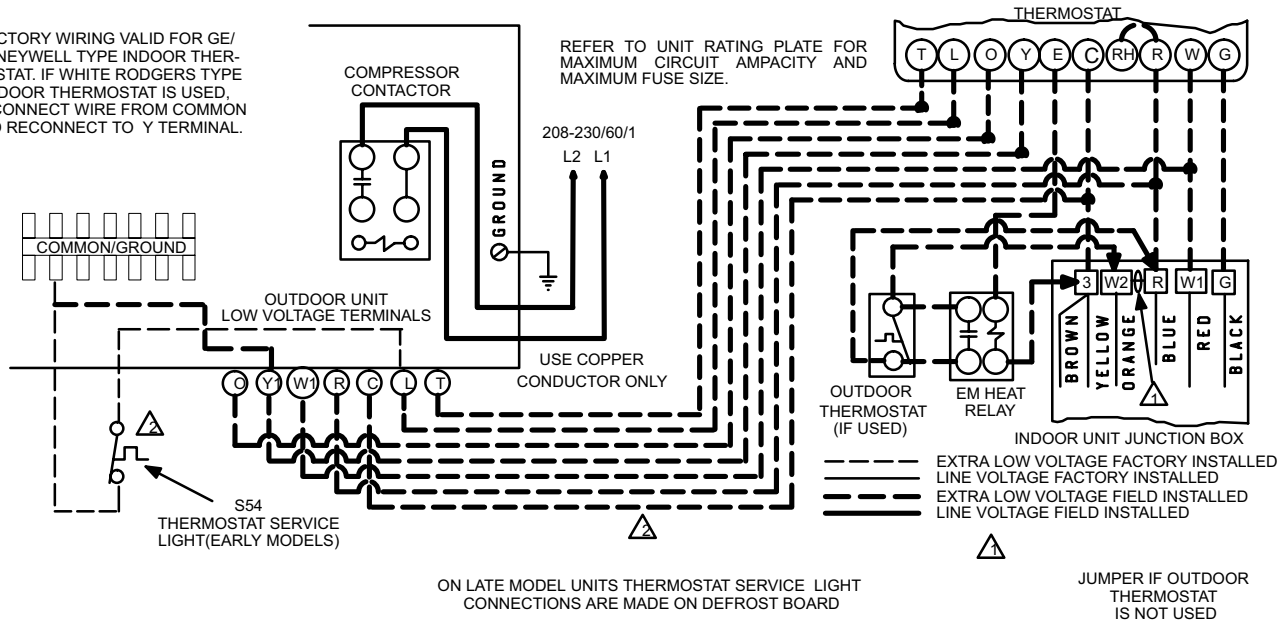
## HP26 and TYPICAL BLOWER UNIT THERMOSTAT TERMINAL DESIGNATIONS



## FIELD WIRING (All Units)

FACTORY WIRING VALID FOR GE/HONEYWELL TYPE INDOOR THERMOSTAT. IF WHITE RODGERS TYPE INDOOR THERMOSTAT IS USED, DISCONNECT WIRE FROM COMMON AND RECONNECT TO Y TERMINAL.

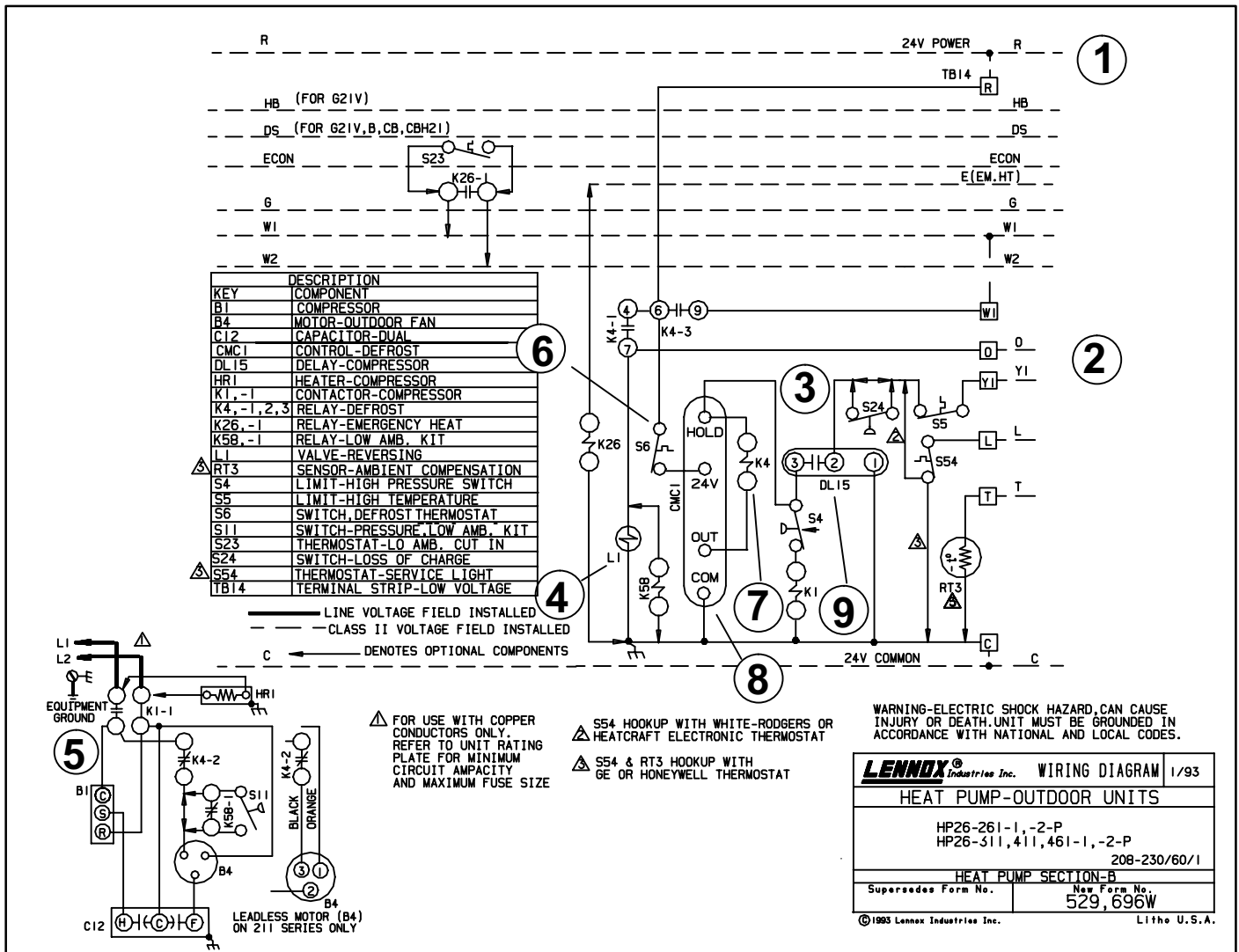
REFER TO UNIT RATING PLATE FOR MAXIMUM CIRCUIT AMPACITY AND MAXIMUM FUSE SIZE.



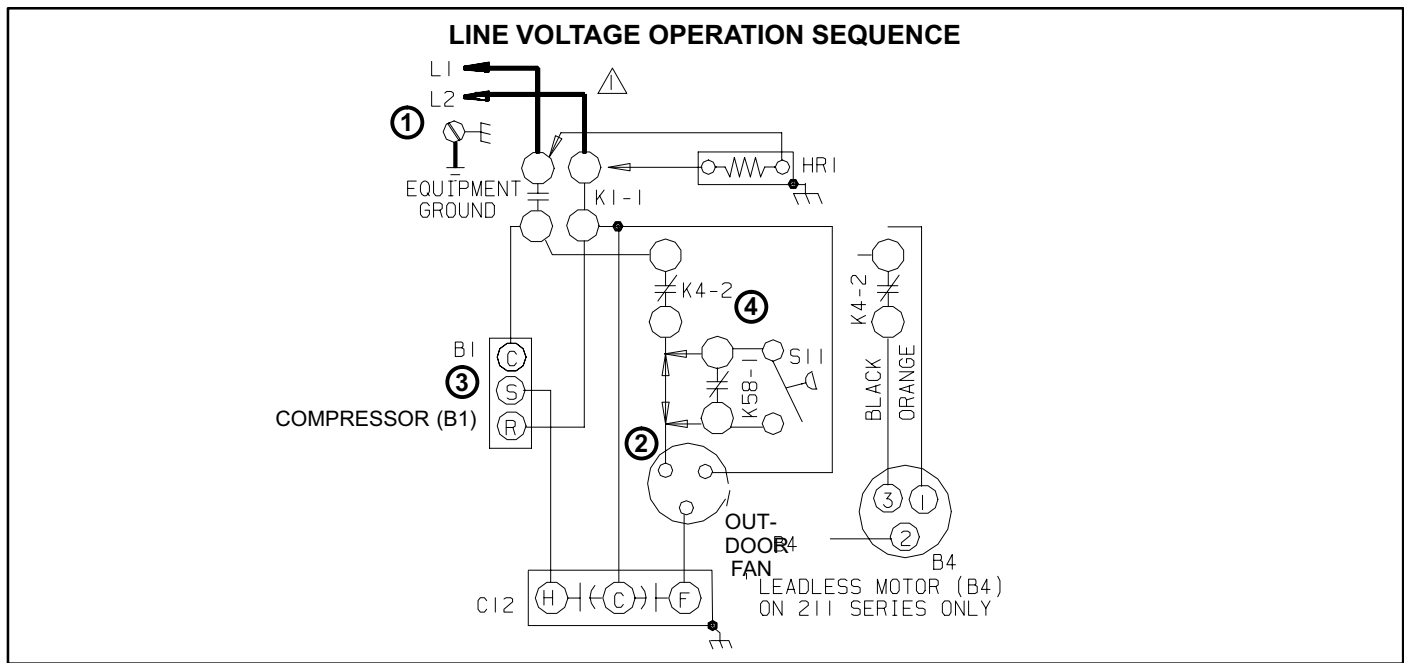


## A-Operation Sequence - Low Voltage Early Model HP26-1 (208/230V)

- 1- Transformer in indoor unit supplies 24VAC power to the thermostat and outdoor unit controls. Internal thermostat wiring energizes terminal O by cooling mode selection, energizing the reversing valve L1.
- 2- Cooling demand energizes thermostat terminal Y1. Provided 5 minute compressor delay (DL15) is satisfied, (Some early HP26 units will have the TD1-1, 8.5 second delay not shown in diagram) voltage from terminal Y1 passes through high pressure switch (S4) and energizes compressor contactor (K1).
- 3- Thermostat demand (from thermostat terminal Y1) is also supplied to the defrost control (CMC1). Defrost control cannot operate in cooling mode because defrost thermostat cannot close.
- 4- Thermostat demand (from thermostat terminal O) energizes reversing valve (L1).
- 5- Heating demand energizes thermostat terminal Y1. Voltage from terminal Y1 passes through high pressure switch (S4) and energizes compressor contactor (K1), provided the 5 minute compressor delay is satisfied.
- 6- During heating operation, when outdoor coil drops below  $35 \pm 4^\circ$  F, the defrost thermostat (S6) closes. When defrost thermostat closes, defrost timer (CMC1) 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 (K4-1) and indoor electric heat (K4-3) relay are energized. K4-2 de-energizes outdoor fan (B4).
- 8- Defrost continues until  $14 \pm 1$  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 is satisfied time delay locks out the circuit to compressor contactor coil and defrost control for  $5 \pm 2$  minutes. At the end of the timed period, the time delay allows the compressor contactor and defrost control to be energized upon demand as in step 2.



## B-Operation Sequence - Line Voltage Early Model HP26 -1 (208/230V)



- 1- Compressor contactor K1 is energized by indoor thermostat demand. Contacts close when contactor is energized.
- 2- When the contacts close, the outdoor fan immediately begins operating and the compressor begins startup.
- 3- Compressor terminal C is energized by L1 through the compressor contactor. 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.
- 4- During defrost, defrost relay K4-2 open to de-energize the outdoor fan.

## C-Operating Sequence - Line Voltage Late Model HP26 (208/230V, 460V)

### COOLING

- A- Transformer from indoor unit supplies 24VAC power to the thermostat and outdoor unit controls.
- 1A- Internal wiring energizes terminal O by cooling mode selection, energizing the reversing valve. Cooling demand initiates at Y1 in the thermostat.
- 2- 24VAC energizes N.C. high pressure limit S4 energizing compressor contactor K1. (*HP26-7 units are equipped with a double-pole contactor*).
- 3- K1-1 N.O. closes energizing compressor B1 and outdoor fan motor B4.
- 4- Compressor B1 and outdoor fan motor B4 begin immediate operation.

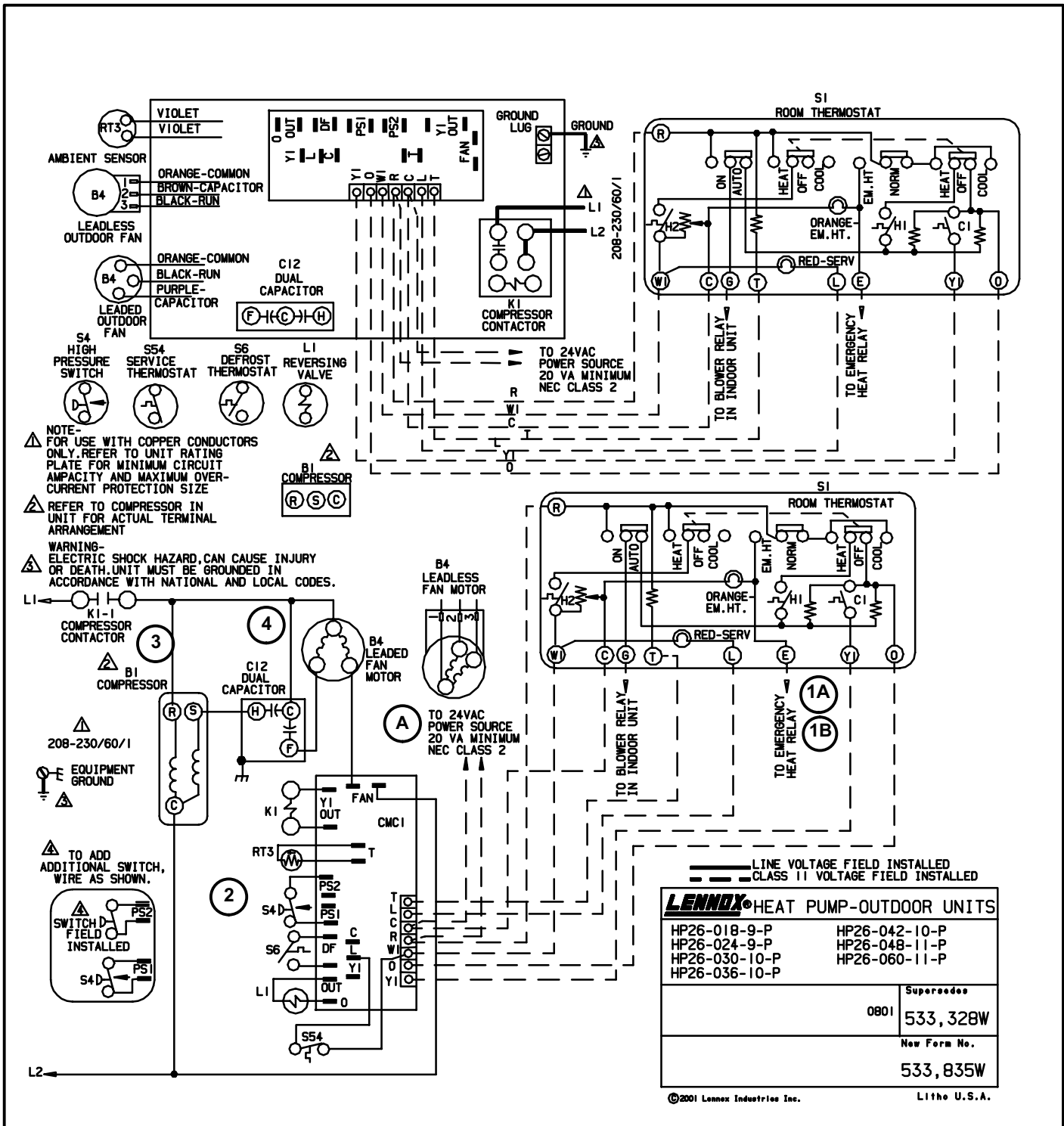
### HEATING

- 1B- Internal wiring de-energizes terminal O by heating mode selection, de-energizing the reversing valve. Heating demand initiates at Y1.
- 2- 24VAC energizes N.C. high pressure limit S4, energizing compressor contactor K1.
- 3- K1-1 N.O. closes energizing compressor and outdoor fan motor
- 4- Compressor B1 and outdoor fan motor B4 begin immediate operation.

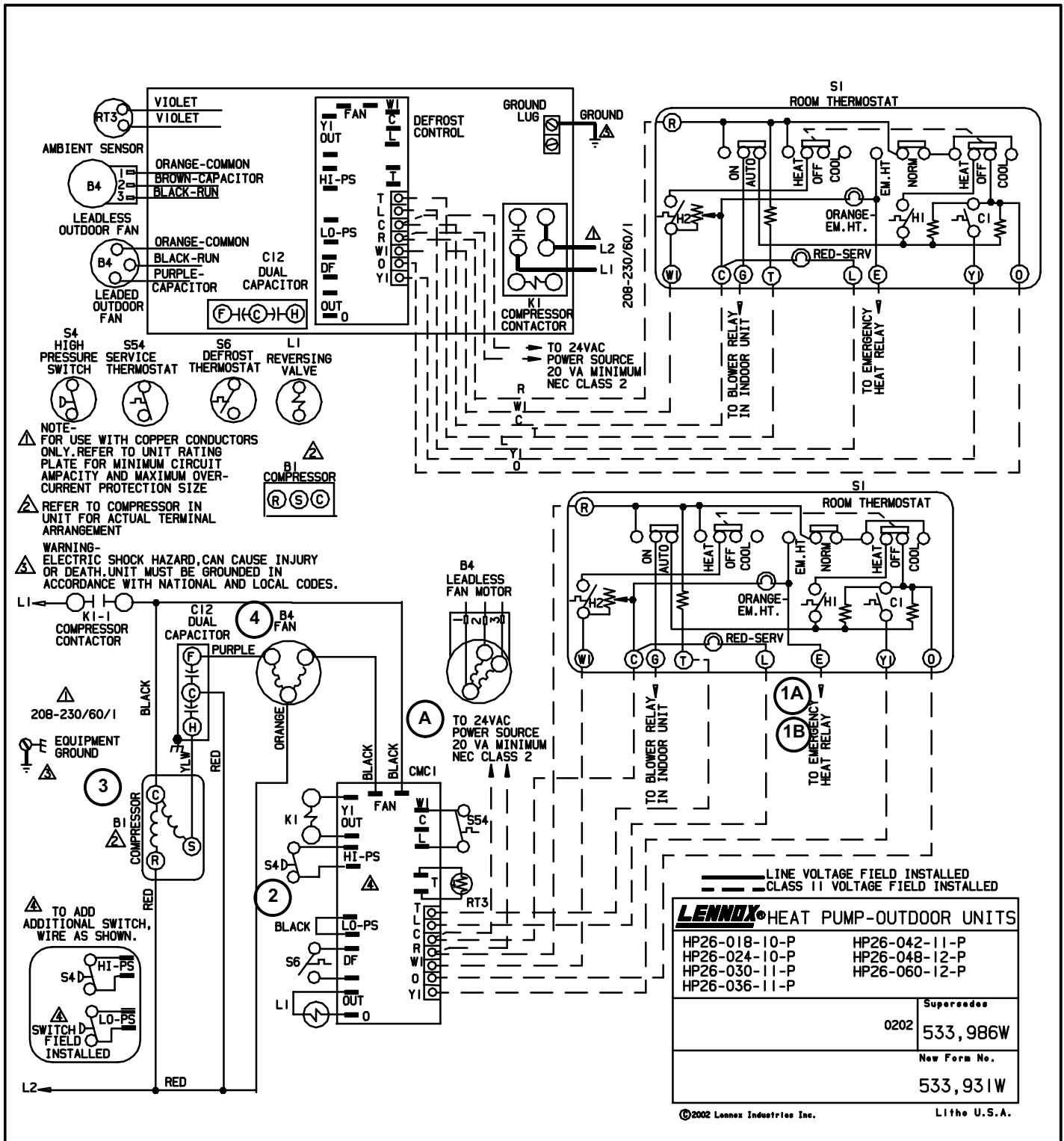
### DEFROST MODE

- 1. During heating operation when outdoor coil temperature drops below 35°F (2°C) or 42°F (5.5°C) see *defrost system description for specific unit dash number* defrost switch (thermostat) S6 closes.
- 2. Defrost control CMC1 begins timing. If defrost thermostat (S6) remains closed at the end of the 30, 60 or 90 minute period, defrost relay energizes and defrost begins.
- 3. During defrost CMC1 energizes the reversing valve and W1 on the terminal strip (operating indoor unit on the first stage heat mode), while de-energizing outdoor fan motor B4.
- 4. Defrost continues 14 ± 1 minutes or until thermostat switch (S6) opens. When defrost thermostat opens, defrost control timer loses power and resets.
- 5. When CMC1 resets, the reversing valve and W1 on the terminal strip are de-energized, while the outdoor fan motor B4 is energized.
- 6. After each thermostat demand, time delay locks out the circuit to compressor contactor coil and defrost control for 5 minutes ± 2 minutes. At the end of the timed period, the time delay allows the compressor contactor and defrost control to be energized upon demand as in step 1.

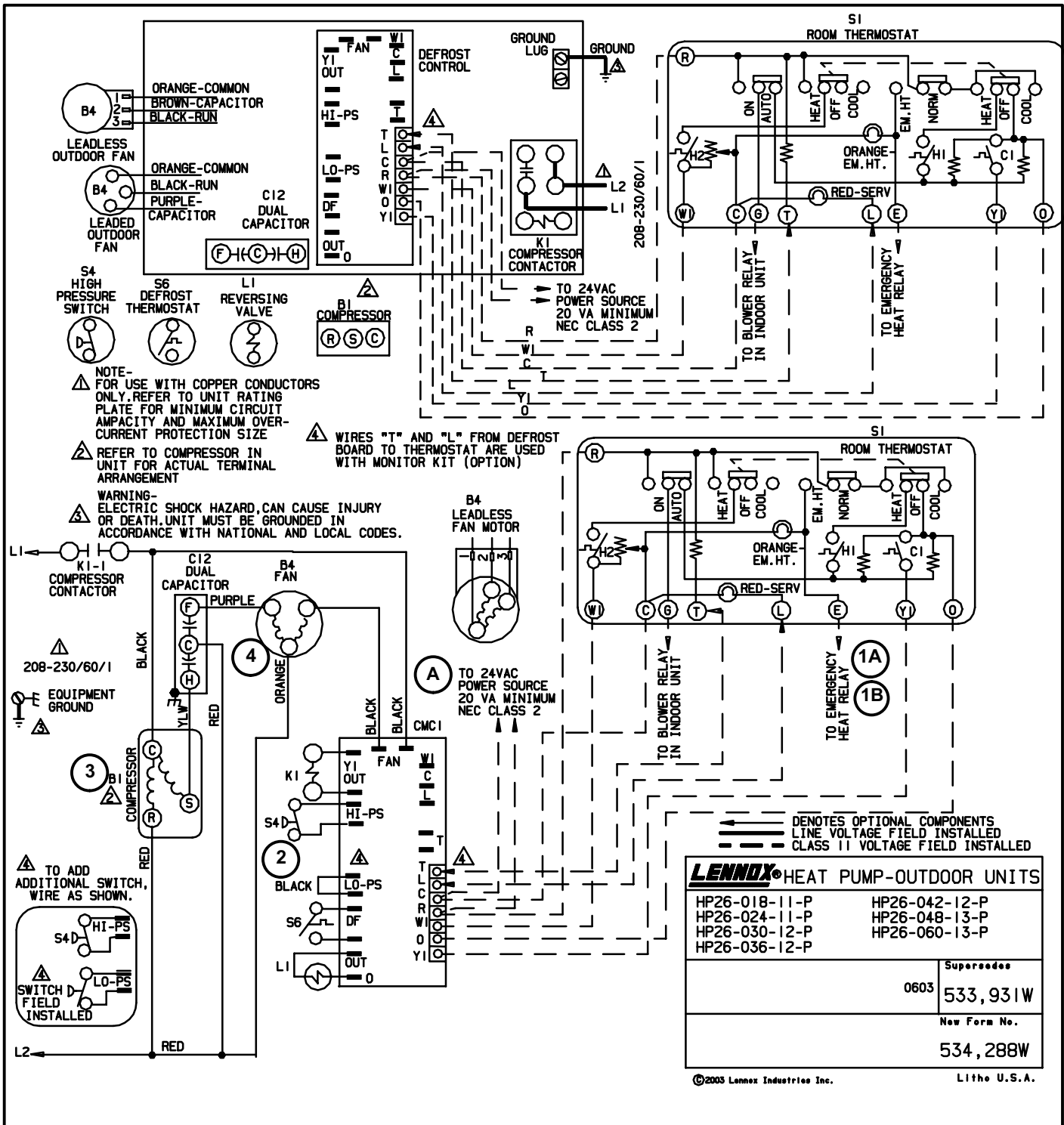
# D-Diagram - Single-Phase (208/230V) - Late Model HP26



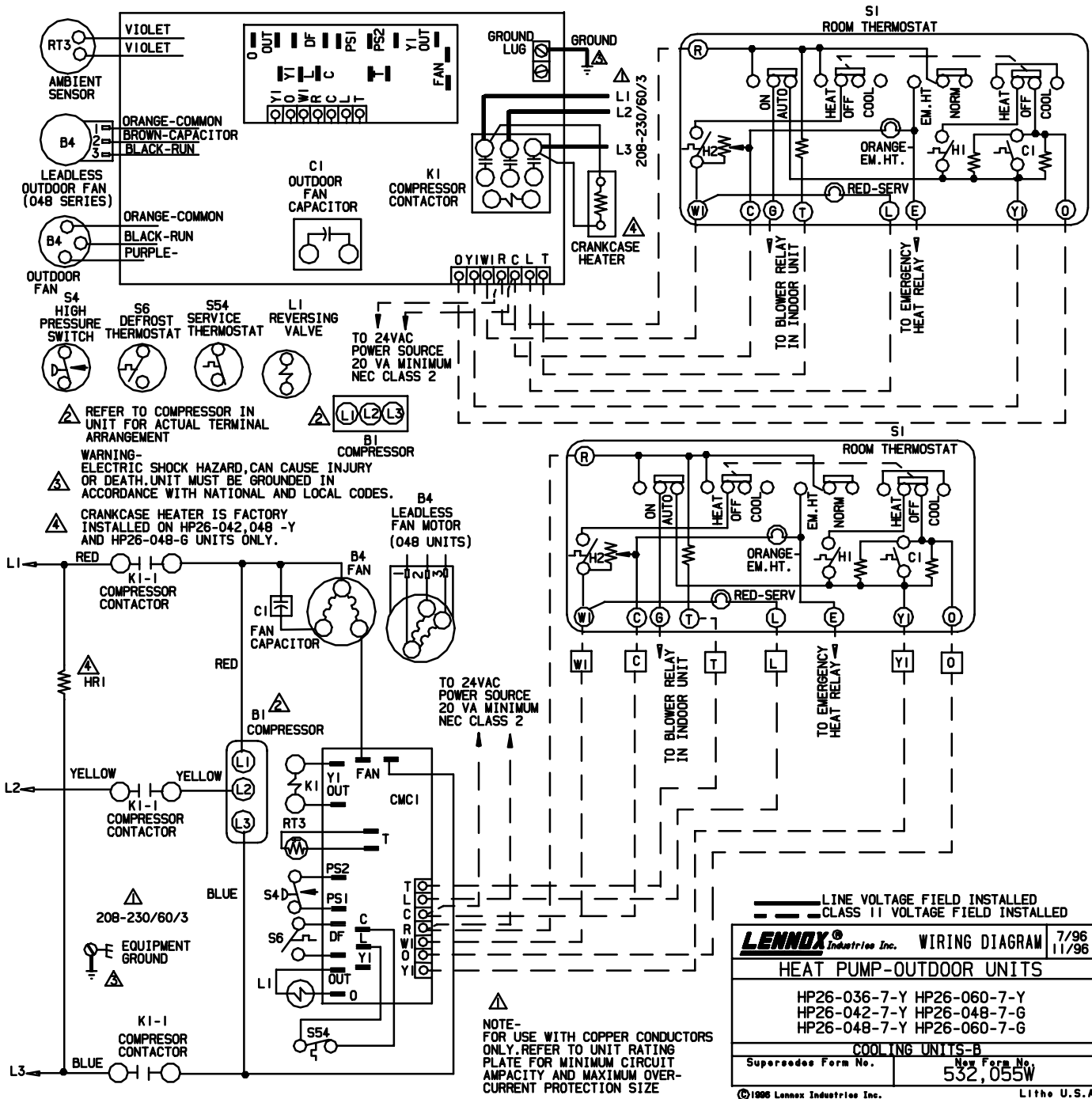
# E-Diagram - Single-Phase (208/230V) - Late Model HP26



# F-Diagram - Single-Phase (208/230V) - Late Model HP26

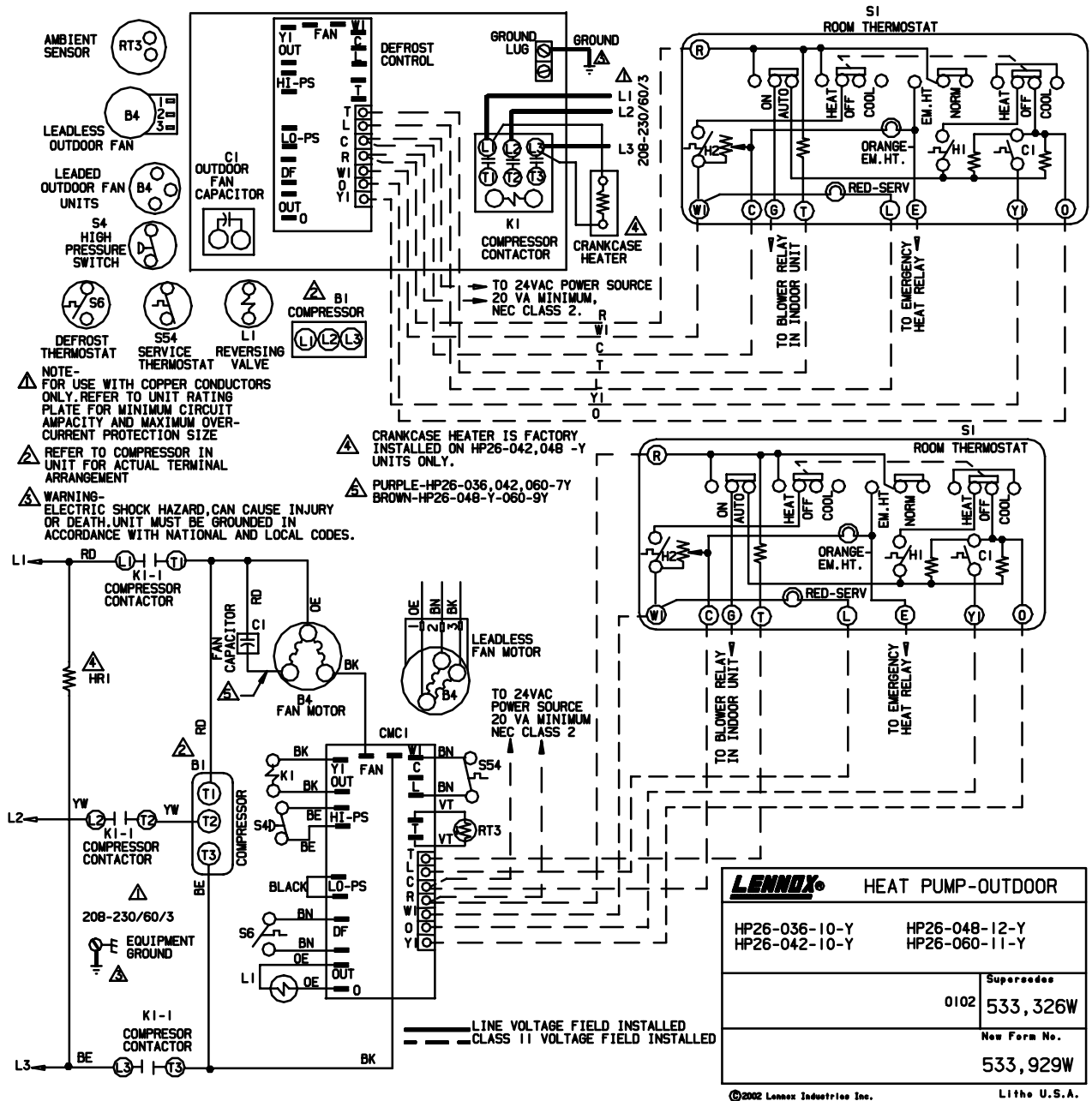


# G-Diagram - Three-Phase (208/230V and 460V) - Late Model HP26



NOTE-Three-phase compressors must be phased correctly. Compressor noise will be significantly higher if phasing is incorrect. Compressor will operate backwards so unit will not provide cooling or heating. Continued backward operation will cause compressor to cycle on internal protector.

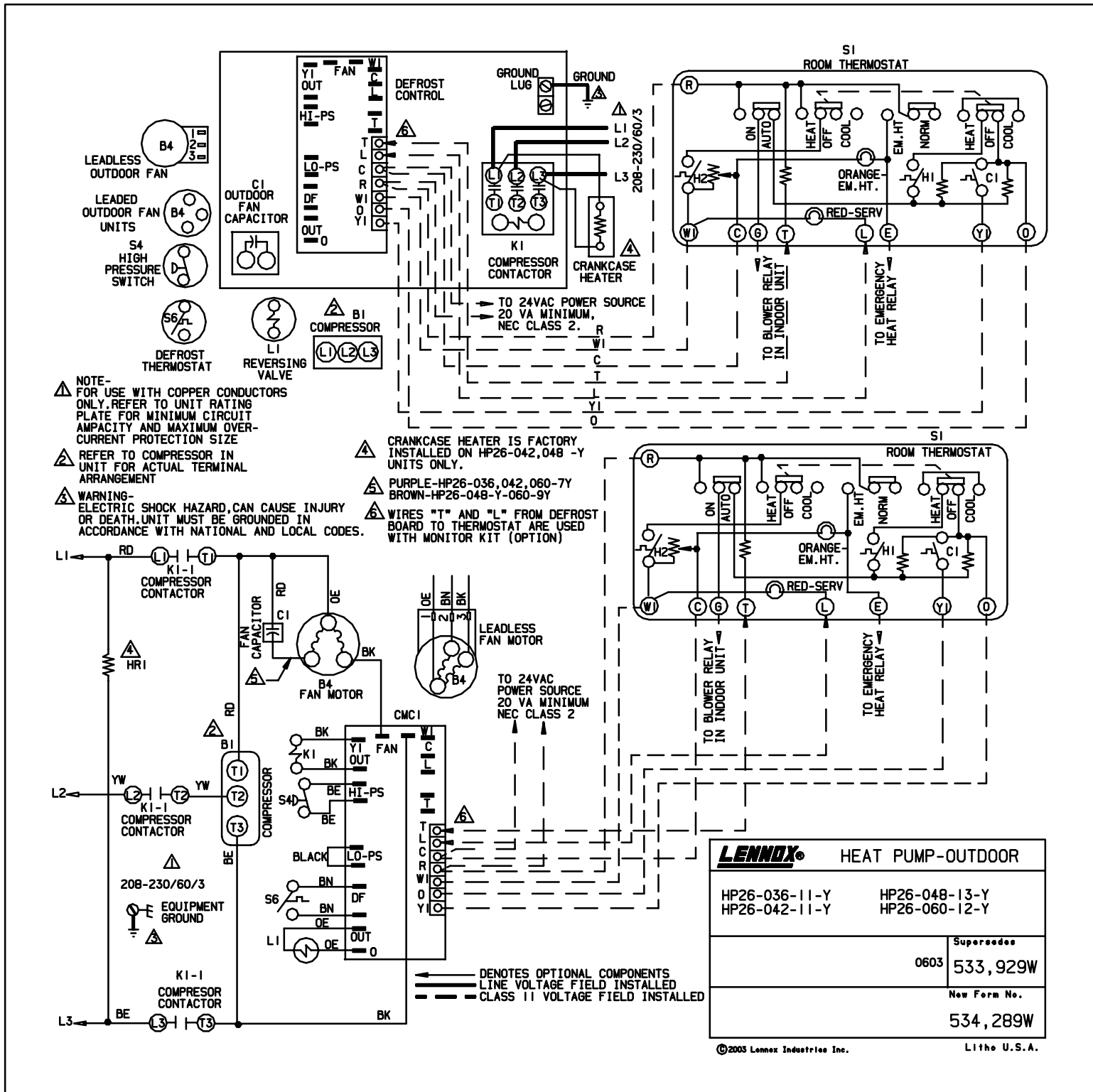
# H-Diagram - Three-Phase (208/230V) - Late Model HP26



*NOTE-Three-phase compressors must be phased correctly. Compressor noise will be significantly higher if phasing is incorrect. Compressor will operate backwards so unit will not provide cooling or heating. Continued backward operation will cause compressor to cycle on internal protector.*

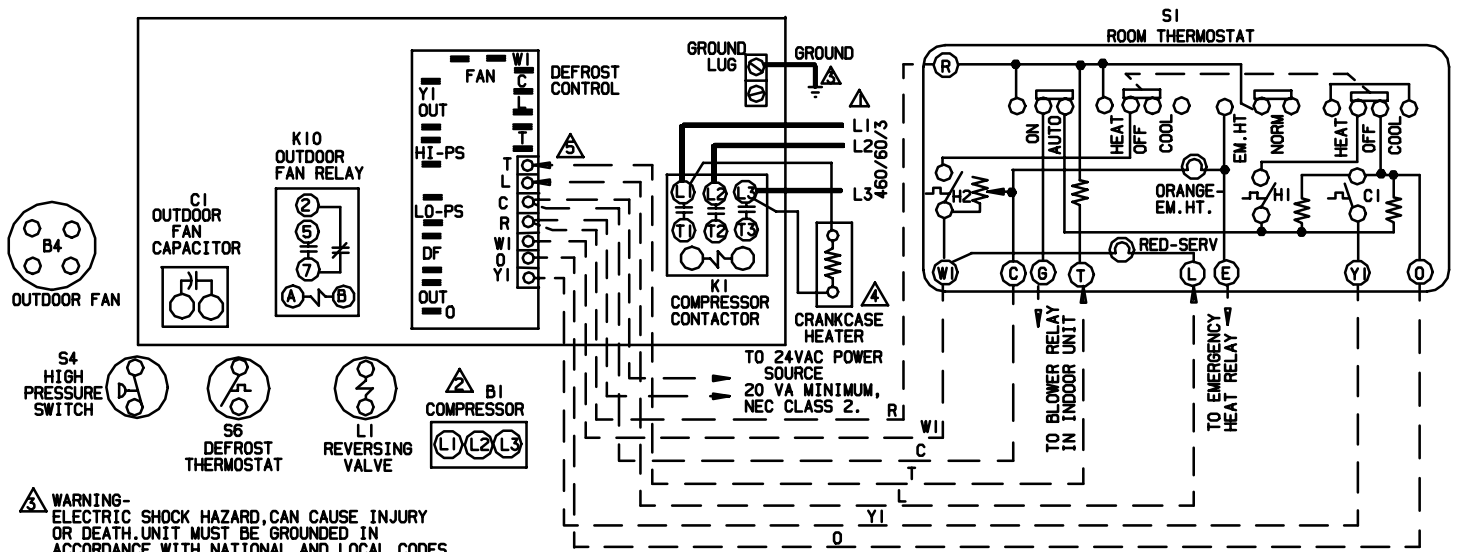


# I-Diagram - Three-Phase (208/230V) - Late Model HP26



NOTE-Three-phase compressors must be phased correctly. Compressor noise will be significantly higher if phasing is incorrect. Compressor will operate backwards so unit will not provide cooling or heating. Continued backward operation will cause compressor to cycle on internal protector.

# J-Diagram - Three-Phase (460V) - Late Model HP26



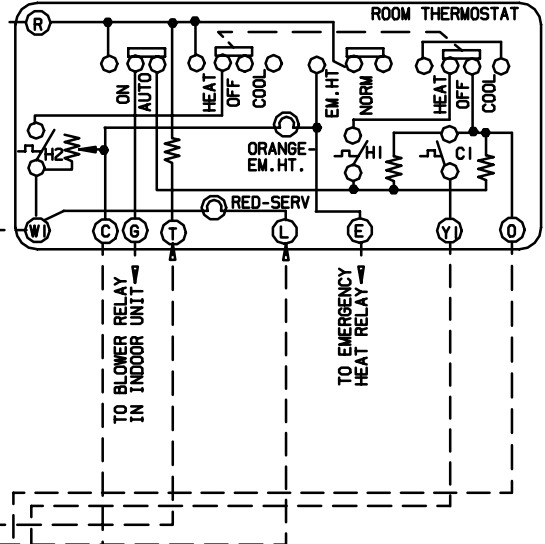
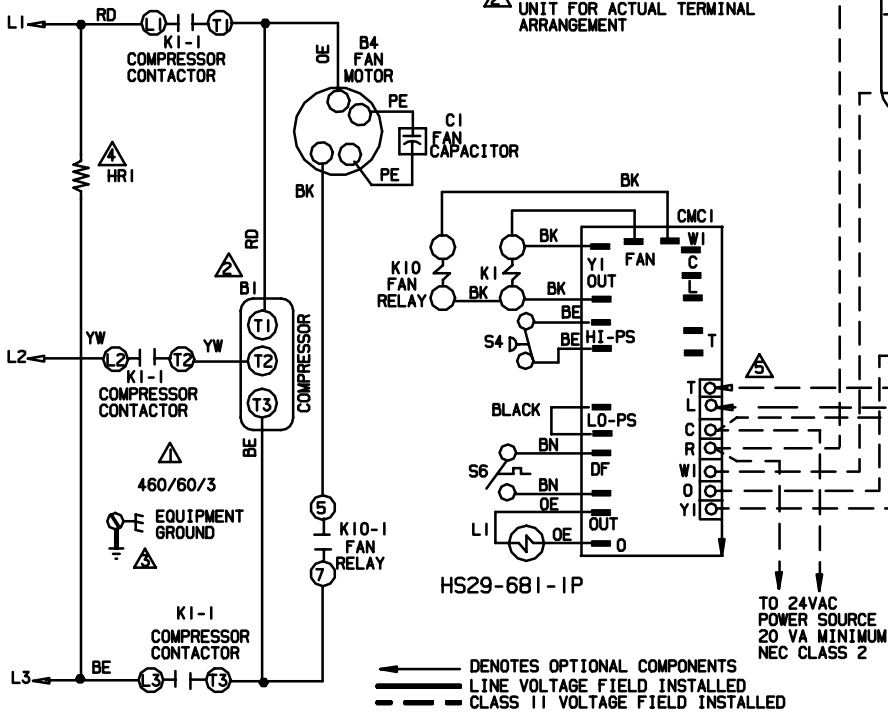
**WARNING-**  
ELECTRIC SHOCK HAZARD, CAN CAUSE INJURY OR DEATH. UNIT MUST BE GROUNDED IN ACCORDANCE WITH NATIONAL AND LOCAL CODES.

**CRANKCASE HEATER IS FACTORY INSTALLED ON HP26-036, 042, 048 UNITS ONLY.**

**WIRES "T" AND "L" FROM DEFROST BOARD TO THERMOSTAT ARE USED WITH MONITOR KIT (OPT)**

**NOTE-**  
FOR USE WITH COPPER CONDUCTORS ONLY. REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAXIMUM OVER-CURRENT PROTECTION SIZE

**REFER TO COMPRESSOR IN UNIT FOR ACTUAL TERMINAL ARRANGEMENT**



LENNOX® HEAT PUMP-OUTDOOR UNITS	
HP26-036-4-G	Supersedes 0603 533, 930W New Form No. 534, 290W
HP26-048-12-G	
HP26-042-4-G	
HP26-060-12-G	

©2005 Lennox Industries Inc.

Li the U.S.A.

*NOTE-Three-phase compressors must be phased correctly. Compressor noise will be significantly higher if phasing is incorrect. Compressor will operate backwards so unit will not provide cooling or heating. Continued backward operation will cause compressor to cycle on internal protector.*