LENNOX Industries Inc.

Corp. 8906-L5
Replaces Corp. 8903−L4

Litho U.S.A.

LENNOX DIMENSION ™ HP22 SERIES UNITS

The HP22 is a high efficiency residential split−system heat pump which features a scroll compressor. It operates much like a standard heat pump, but the HP22's scroll compressor is unique in the way that it compresses refrigerant. Several models are available in sizes ranging from 2 through 3−1/2 tons. The series uses expansion valves in the outdoor unit and in the indoor unit.

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.		HP22−261	HP22−311	HP22−411	HP22−461
Outdoor Coil	Face area (sq.ft.) inside / outside	8.57/ 11.83	15.34/ 15.94	15.34/ 15.94	17.53/ 18.22
	Tube diameter (in.)	3/8	3/8	3/8	3/8
	No. of Rows	1.75	2	2	2
	Fins per inch	18	18	18	18
Outdoor Fan	Diameter (in.)	20	24	24	24
	No. of Blades	4	3	3	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−22 (charge furnished)		8 lbs. 1 oz.	10 lbs. 13 oz.	11 lbs. 2 oz.	12 lbs. 8 oz.
Liquid line connection		3/8	3/8	3/8	3/8
Vapor line connection		5/8	3/4	3/4	7/8

ELECTRICAL DATA

Model No.		HP22−261	HP22−311	HP22−411	HP22−461
Line voltage data − 60hz./1 phase		208/230V	208/230V	208/230V	208/230V
Compressor	Rated load amps	11.6	13.5	18	20
	Power factor	.96	.96	.96	.97
	Locked rotor amps	62.5	76	90.5	107
Outdoor 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
Max fuse or c.b. 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

I−APPLICATION

All major components (indoor blower/coils) must be matched according to Lennox recommendations for the compressor to be covered under warranty. HP22 is primarily designed for matchup to CB19 series blower coils and ECB19 series electric heat. 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 2. 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 1 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.

SCROLL FORM

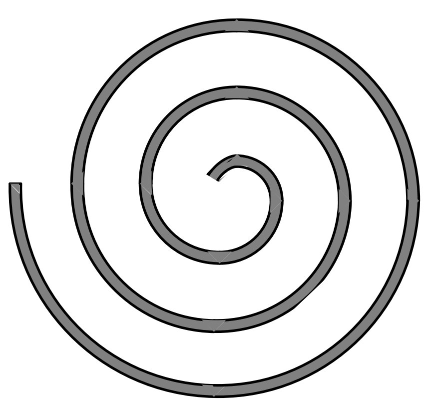


FIGURE 1

SCROLL COMPRESSOR

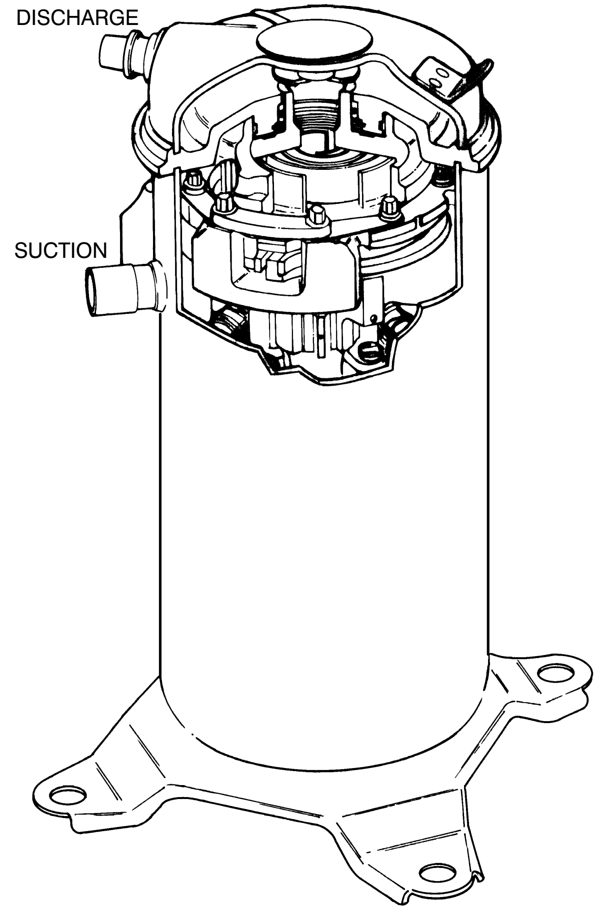


FIGURE 2

CROSS−SECTION OF SCROLLS

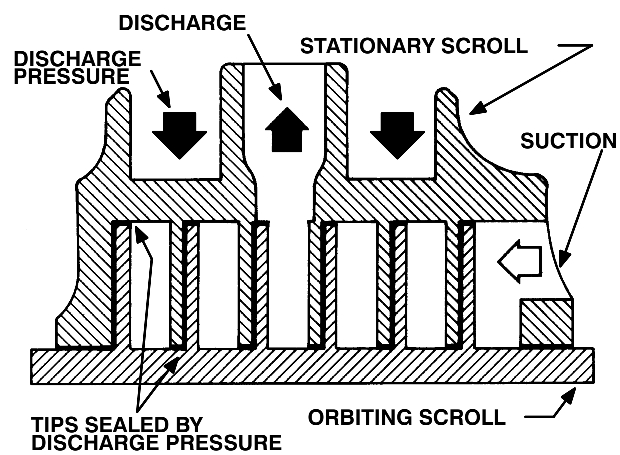


FIGURE 3

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 2). 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.

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

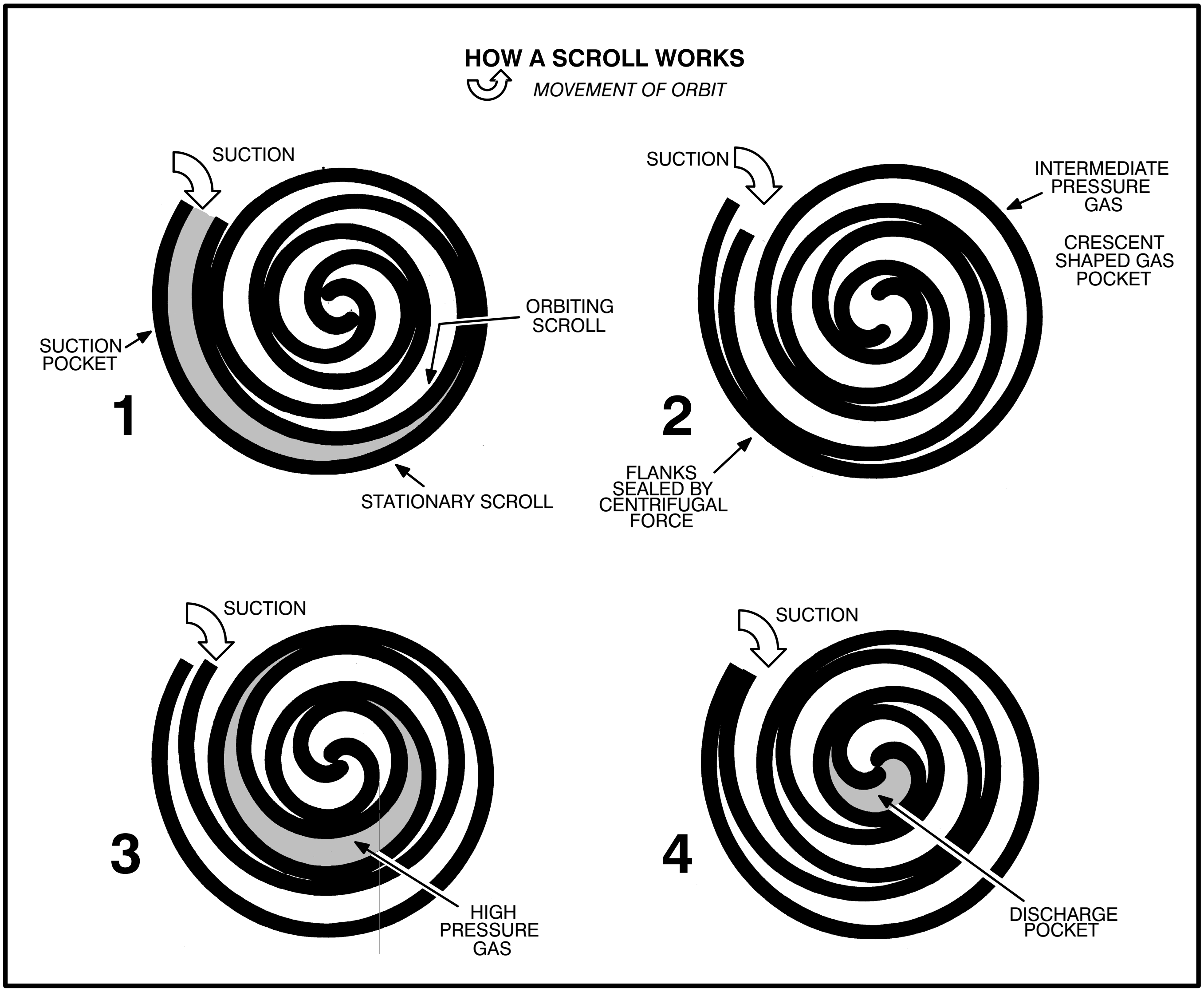


FIGURE 4

HP22 UNIT COMPONENTS

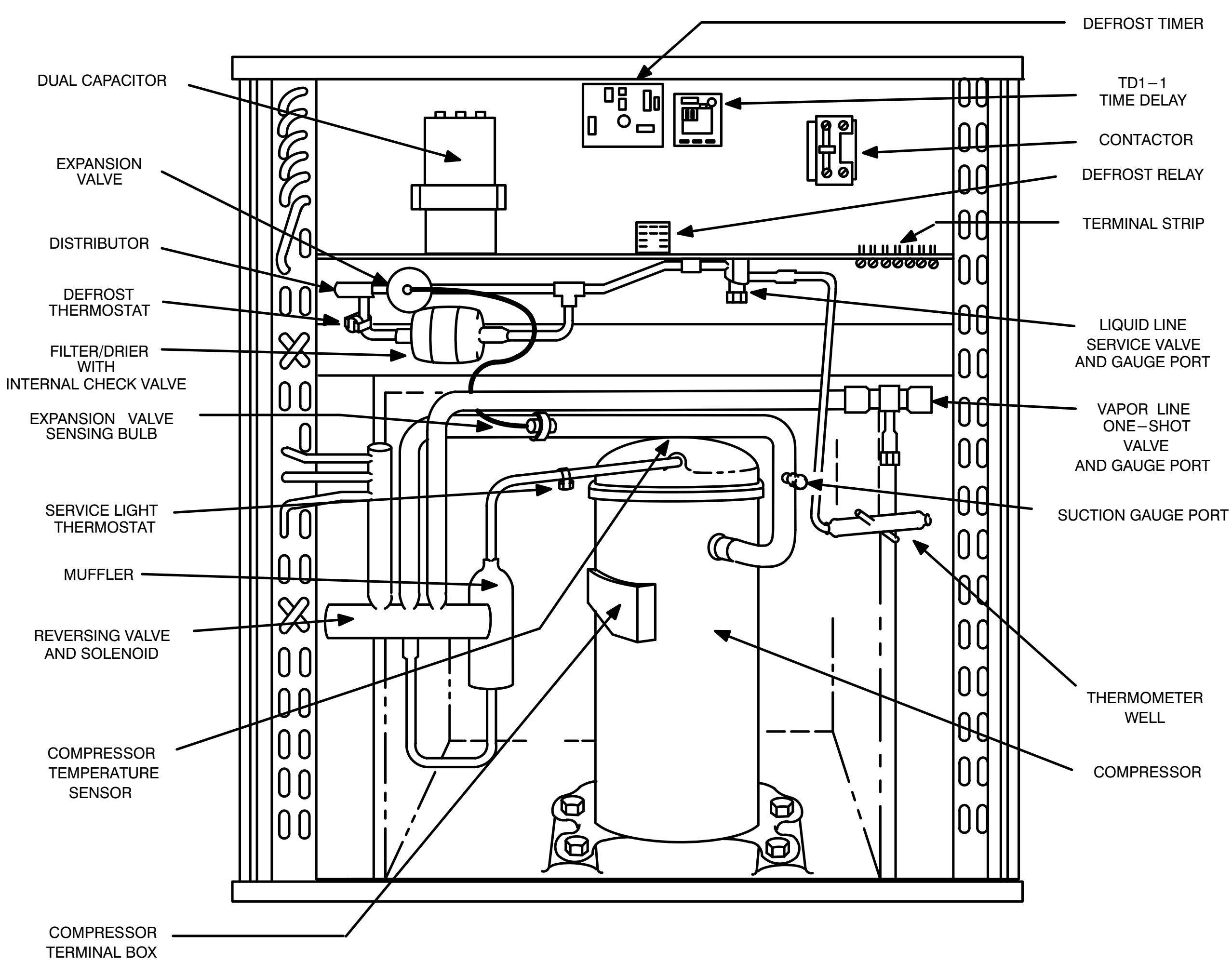


FIGURE 5

III−UNIT COMPONENTS

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 HP22 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. All units use SPST contactors. The contactor is energized by indoor thermostat terminal M when thermostat demand is present.

C−TD1−1 Time Delay

Each HP22 is equipped with a Lennox built TD1−1 time delay located in the control box (figure 5). The time delay is electrically connected between thermostat terminal M and the compressor contactor. On initial thermostat demand, the compressor contactor is delayed for 8.5 seconds. At the end of the delay, the compressor is allowed to energize. When thermostat demand is satisfied, the time delay opens the circuit to the compressor contactor coil and the compressor is de−energized.

D−Terminal Strip

All HP22's are equipped with a low voltage terminal strip located in the unit control box for making thermostat wiring connections (refer to figure 5).

E–Compressor

Table 1 shows the specifications of compressors used in HP22 series units.

TABLE 1

Unit	Phase	Btuh	LRA	RLA	Oil fl.oz.
HP22–261	1	22,800	62.5	11.6	28*
HP22–311	1	28,500	76	13.5	28*
HP22–411	1	34,000	90.5	18	34*
HP22–461	1	39,700	107	20	38*

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

WARNING – DO NOT OPERATE WITHOUT PROTECTIVE COVER OVER TERMINALS. DISCONNECT ALL POWER BEFORE REMOVING PROTECTIVE COVER. DISCHARGE CAPACITORS BEFORE SERVICING UNIT.

F–Temperature Sensor

Each scroll compressor is equipped with a temperature sensor located on the outside top of the compressor. The sensor is a SPST thermostat which opens when the discharge temperature exceeds 280°F $\pm$ 8°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°F $\pm$ 14°F.

DISCHARGE TEMPERATURE SENSOR

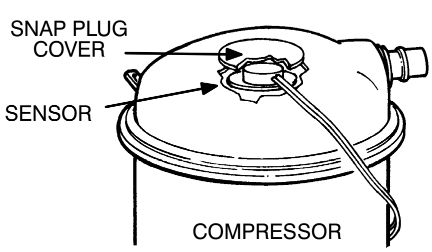


FIGURE 6

The sensor can be accessed by prying off the snap plug on top of the compressor (see figure 6). Make sure to securely reseal the sensor after replacement. The sensor pigtails are located inside the unit control box. Figure 7 shows the arrangement of compressor line voltage terminals and discharge sensor pigtails.

COMPRESSOR TERMINAL BOX

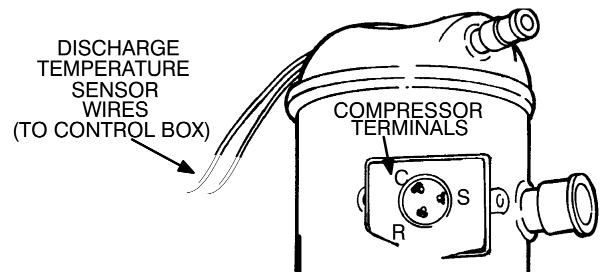


FIGURE 7

G–Outdoor Fan Motor

The specifications table on page 1 of this manual shows the specifications of outdoor fans used in HP22's. In all units, the outdoor fan is controlled by the compressor contactor and is de–energized when the defrost relay is energized.

H–Temperature Compensation Thermistor

All HP22's have a small device mounted on the outdoor fan wiring harness called a temperature compensation thermistor (see figure 8). The device is connected in series with a heat anticipation resistor inside the indoor thermostat. This feature helps to prevent abnormal droop caused by the anticipation resistors. The device is an NTC thermistor (negative temperature coefficient – increase in temperature equals decrease in resistance). 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.

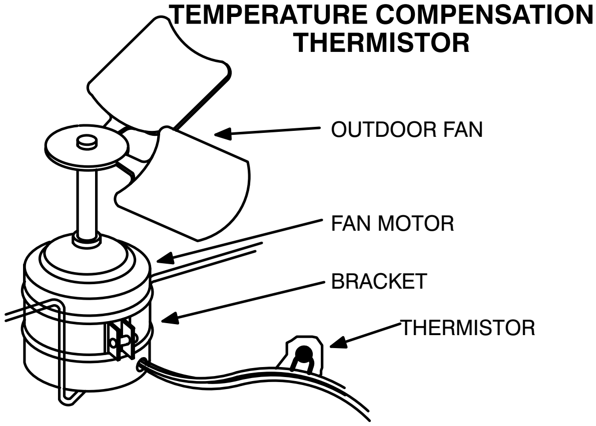


FIGURE 8

TABLE 2

HP22 DUAL CAPACITOR RATING			
Units	**Terminal**	**MFD**	**VAC**
HP22−261	FAN	5	370
	HERM	30	
HP22−311	FAN	5	
	HERM	35	
HP22−411	FAN	5	440
	HERM	35	
HP22−461	FAN	5	
	HERM	35	

I−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 startup and the thermostat service light is momentarily lighted. When compressor discharge line temperature reaches 130$\pm$5°F, the thermostat opens and the service light goes off.

If discharge line temperature drops below 110$\pm$5°F during unit operation, (indicating a problem in the system), the thermostat closes and the service light is powered to indicate service is needed.

J−Dual Capacitor

The compressor and fan in HP22−261,−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. The capacitor is located inside the unit control box (see figure 5). Table 2 shows the ratings of the dual capacitor.

K−Defrost Thermostat

A defrost thermostat is mounted on the liquid line between the filter/drier and the distributor. The thermostat opens at 70$\pm$5°F and closes at 35$\pm$5°F. For defrost to begin, the defrost thermostat must be closed when the defrost timer calls for defrost.

L−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 14 and 15 for more information.

M−Defrost Timer

The CMC defrost control (figure 9) 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.

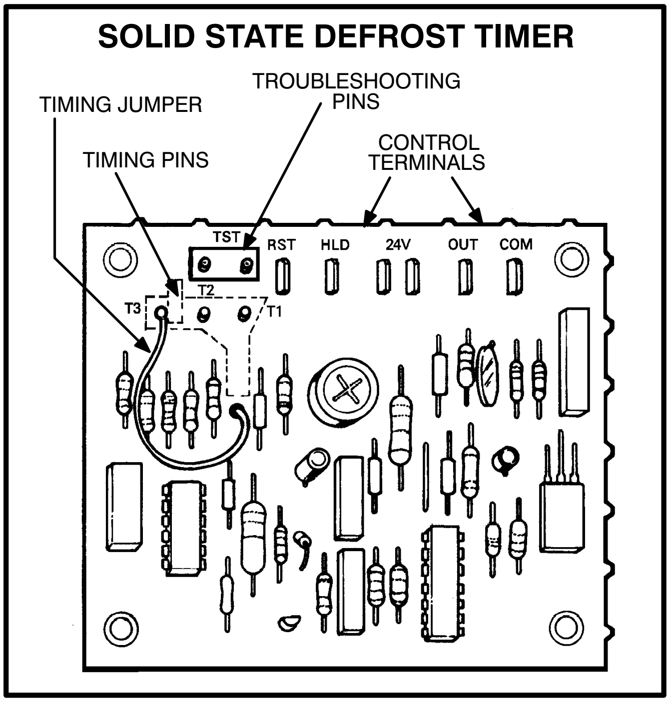
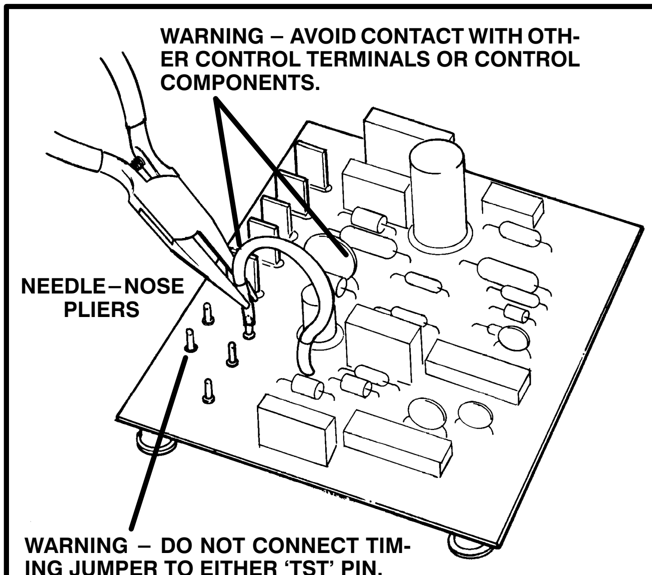


FIGURE 9

TABLE 3

DEFROST CONTROL CMC TIMINGS	INTERVAL BETWEEN DEFROSTS WITH JUMPER CONNECTED TO: 30 (T1)	60 (T2)	90 (T3)	DEFROST TIME
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 3 for timings). Connector is seated when pin snaps.
6– Turn on power to unit.

FIGURE 10

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 3 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 10).

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.

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.

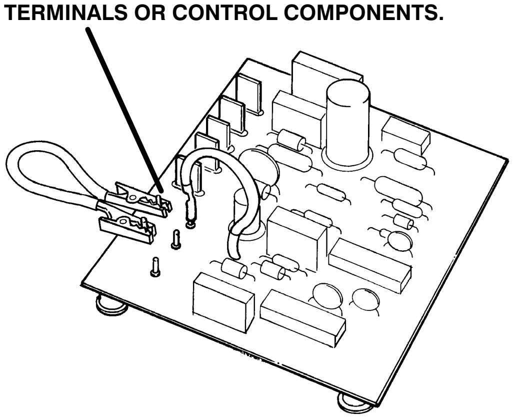
8– ‘TST’ Pins

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 3 and figure 11).

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 12.

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 3 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 11

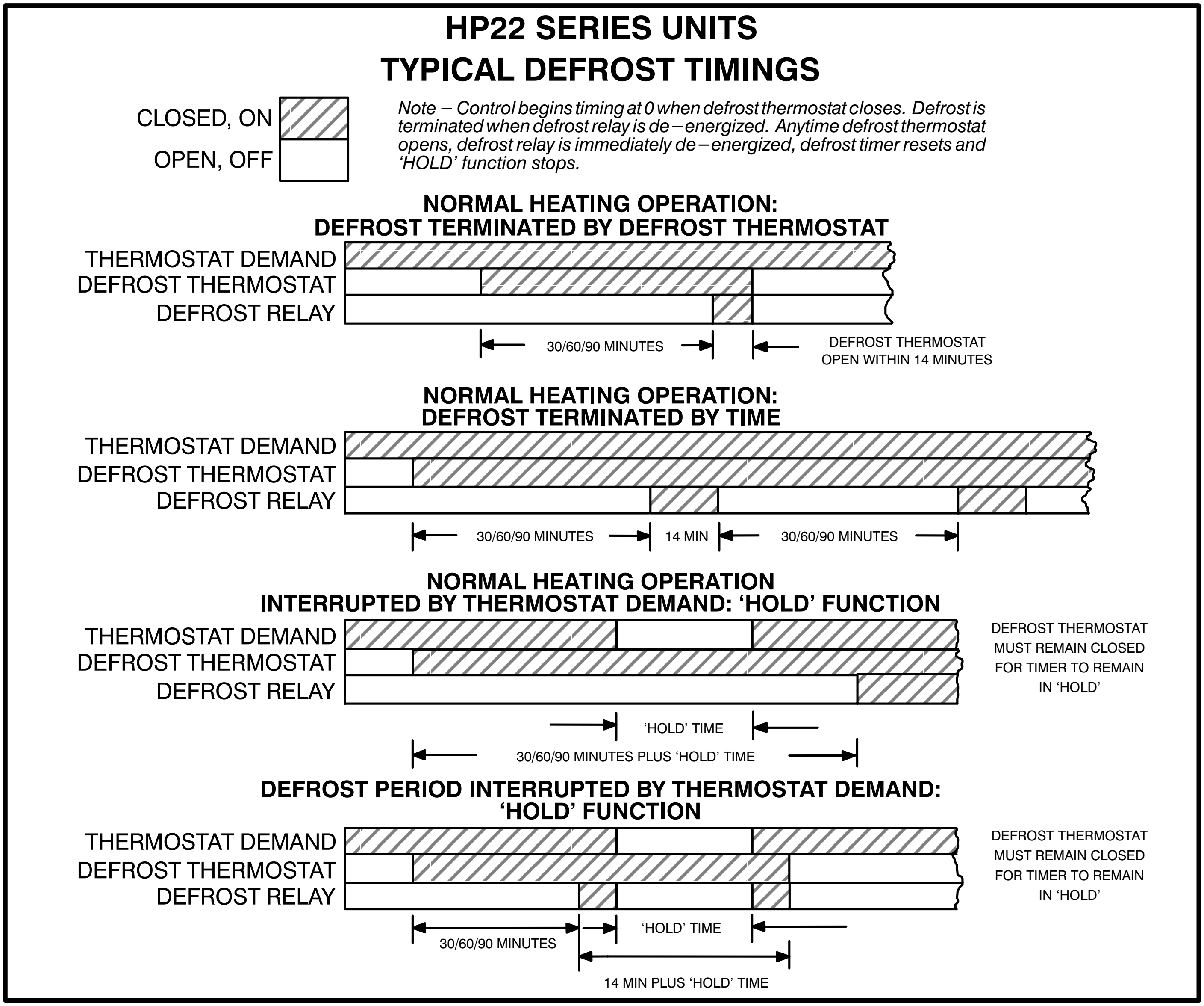


FIGURE 12

IV–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 4 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 4

MODEL NO.	LIQUID LINE	VAPOR LINE	L10 LINE SETS
HP22–261	3/8 in.	5/8 in.	L10–26 20 ft. – 50 ft.
HP22–311 HP22–411	3/8 in.	3/4 in.	L10–41 20 ft. – 50 ft.
HP22–461	3/8 in.	7/8 in.	L10–65 30 ft. – 50 ft.

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 14 and 15 show HP22 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 13) 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.

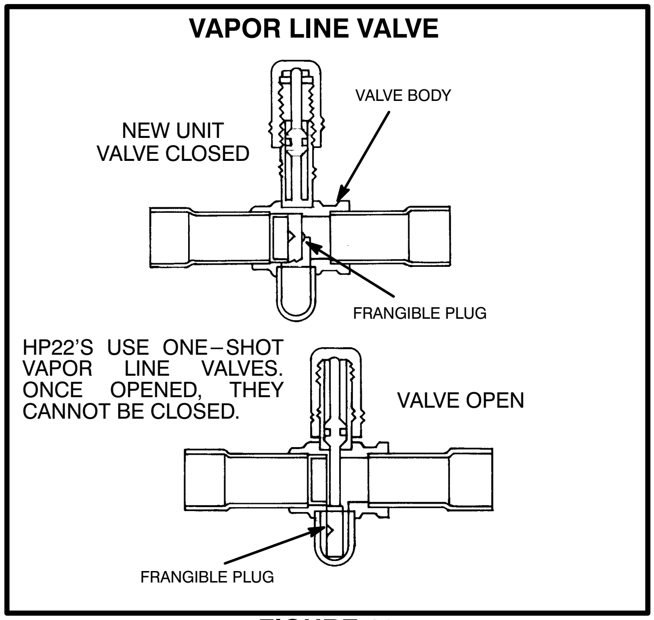


FIGURE 13

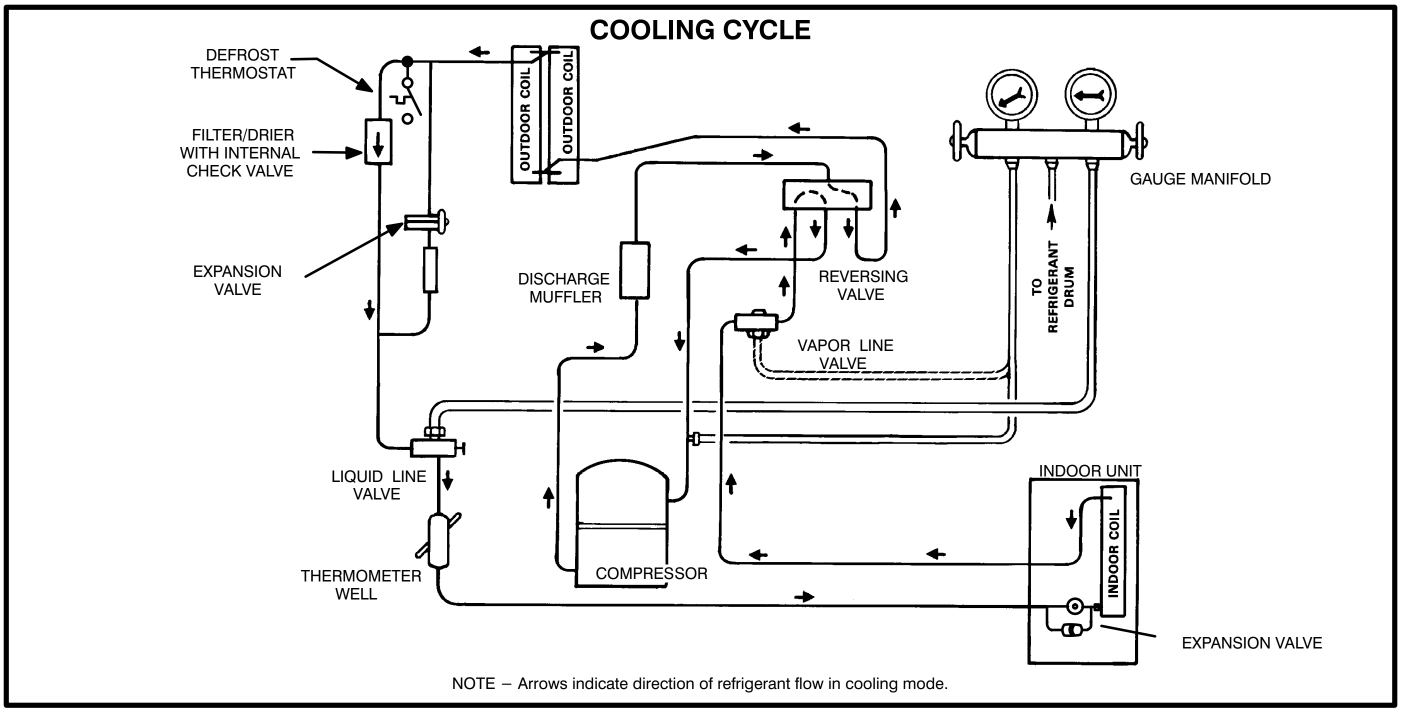


FIGURE 14

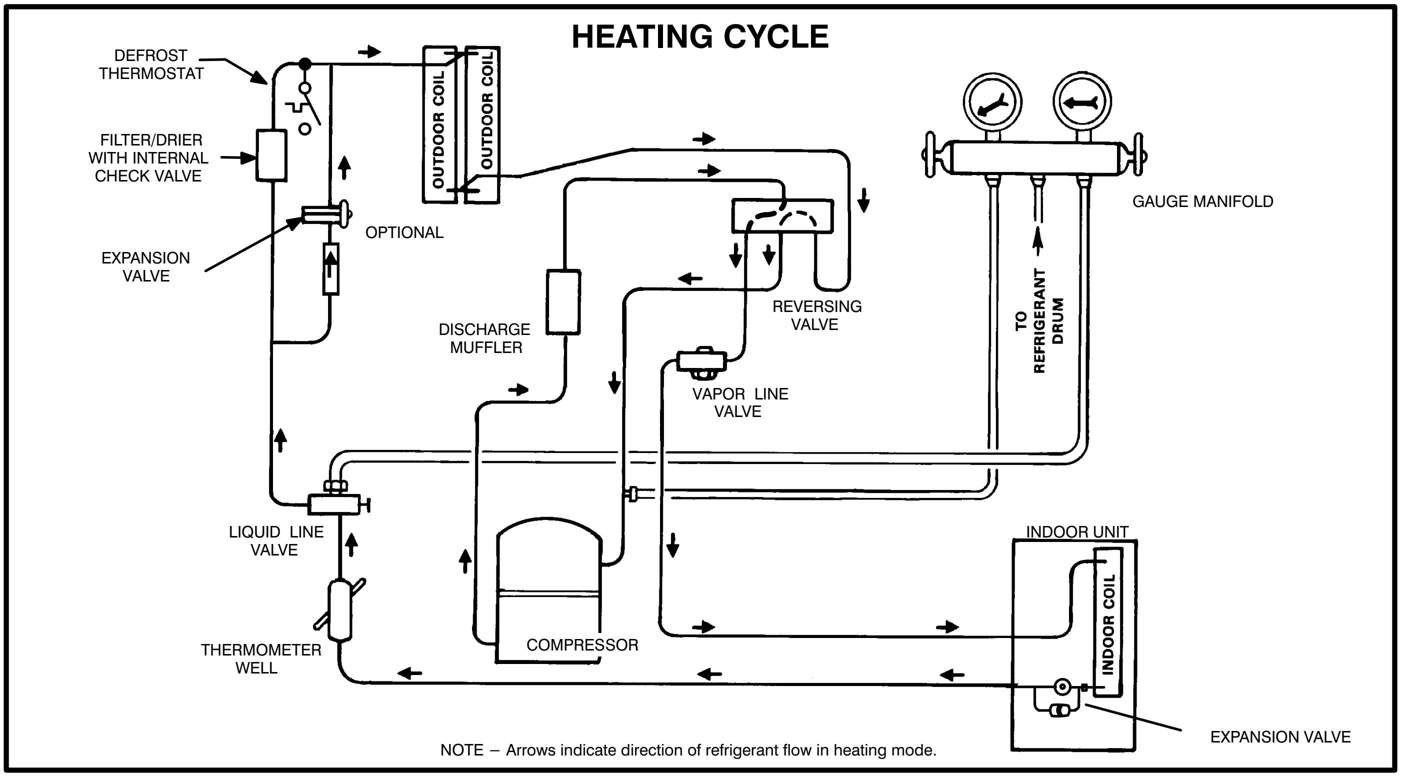


FIGURE 15

V–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 5 for refrigerant charge adjustment. A blank space is provided on the unit rating plate to list actual field charge.

TABLE 5

LINE SET DIAMETER		Ozs per ft. (ml per mm) adjust from 25 ft. (7620mm) line set*
Vapor	Liquid	
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)

** 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 14. 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.

IMPORTANT – Compliant scroll compressors (as with any refrigerant compressor) should never be used to evacuate a refrigeration or air conditioning system.

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.

WARNING – DEEP VACUUM OPERATION CAN CAUSE INTERNAL FUSITE ARCING RESULTING IN A DAMAGED OR FAILED COMPRESSOR. THIS TYPE OF DAMAGE WILL RESULT IN DENIAL OF WARRANTY CLAIMS.

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 shown on the unit nameplate and in table 6. Refer to the Lennox Service Unit Information manual SUI for proper procedure.

TABLE 6

Model	Refrigerant Charge R–22
HP22–261	8 lbs. 4 oz.
HP22–311	10 lbs. 10 oz.
HP22–411	10 lbs. 14 oz.
HP22–461	12 lbs. 8 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 (outdoor) 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 14. 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.

5– If outdoor temperature is 60°F (10°C) or above, place thermometer in well and read liquid line temperature. Difference between ambient and liquid line temperatures should match values given in table 7 (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 7

APPROACH METHOD – EXPANSION VALVE SYSTEMS	
Model	Liquid Temp Minus Ambient Temp. (°F)
HP22–261	6
HP22–311	6
HP22–411	7
HP22–461	8

6– If outdoor temperature is 60°F (10°C) or below, air flow will need to be restricted to achieve pressures in the 200–250 psig range (See figure 16). 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 is in the 200–250 psig range.

7– Read liquid line temperature. Read liquid line pressure from gauge and convert to condensing temperature using standard R–22 temperature / pressure conversion chart. The difference between the liquid line temperature and the conversion temperature is the subcooling temperature (subcooling = conversion temperature minus liquid temperature). Subcooling should approximate values given in table 8. Add refrigerant to increase subcooling and remove refrigerant to reduce subcooling.

TABLE 8

SUBCOOLING METHOD – TXV SYSTEMS	
Model	**Subcooling (°F)**
HP22–261	7±2
HP22–311	8±2
HP22–411/461	12±2

8– When unit is properly charged (whether by approach or subcooling method) liquid line pressures should approximate those given in table 9

BLOCKING OUTDOOR COIL

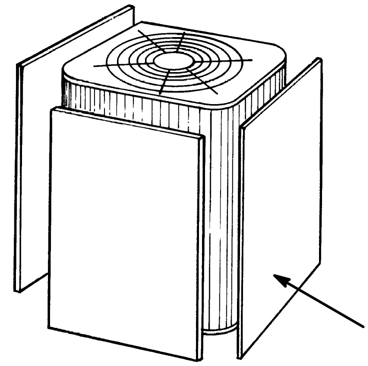


FIGURE 16

D–Oil Charge

Table 1 shows the factory oil charge in HP22 series units.

TABLE 9

NORMAL OPERATING PRESSURES									
MODE	**OUTDOOR COIL ENTERING AIR TEMPERATURE**	**HP22–261**		**HP22–311**		**HP22–411**		**HP22–461**	
		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	75 °F	180	75	169	76	171	73	182	78
	85 °F	209	77	196	78	201	75	212	80
	95 °F	238	79	223	80	232	77	242	82
	105 °F	270	81	253	82	266	79	275	84
HEATING	20 °F	175	33	177	33	181	32	177	32
	30 °F	188	42	190	42	195	40	194	41
	40 °F	201	51	203	51	210	49	210	50
	50 °F	214	61	216	61	225	58	228	60

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

VI–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 ports are sealed with plugs. No further lubrication is required. Oiling ports can be accessed for lubrication after extended operation by removing plugs. Be sure to securely reseal after servicing.

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– Lubrication of blower motor: 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.

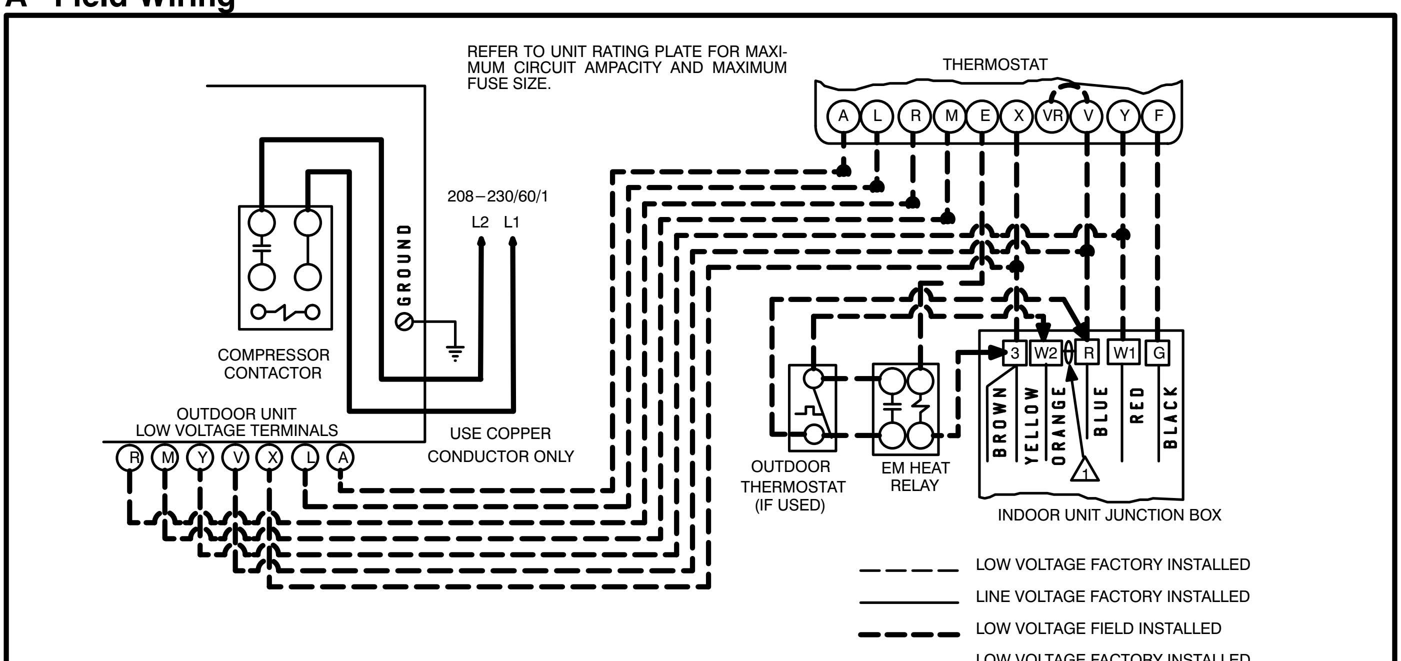
4– Check all wiring for loose connections.

5– Check for correct voltage at unit.

6– Check amp–draw on blower motor.
Unit nameplate________Actual________.

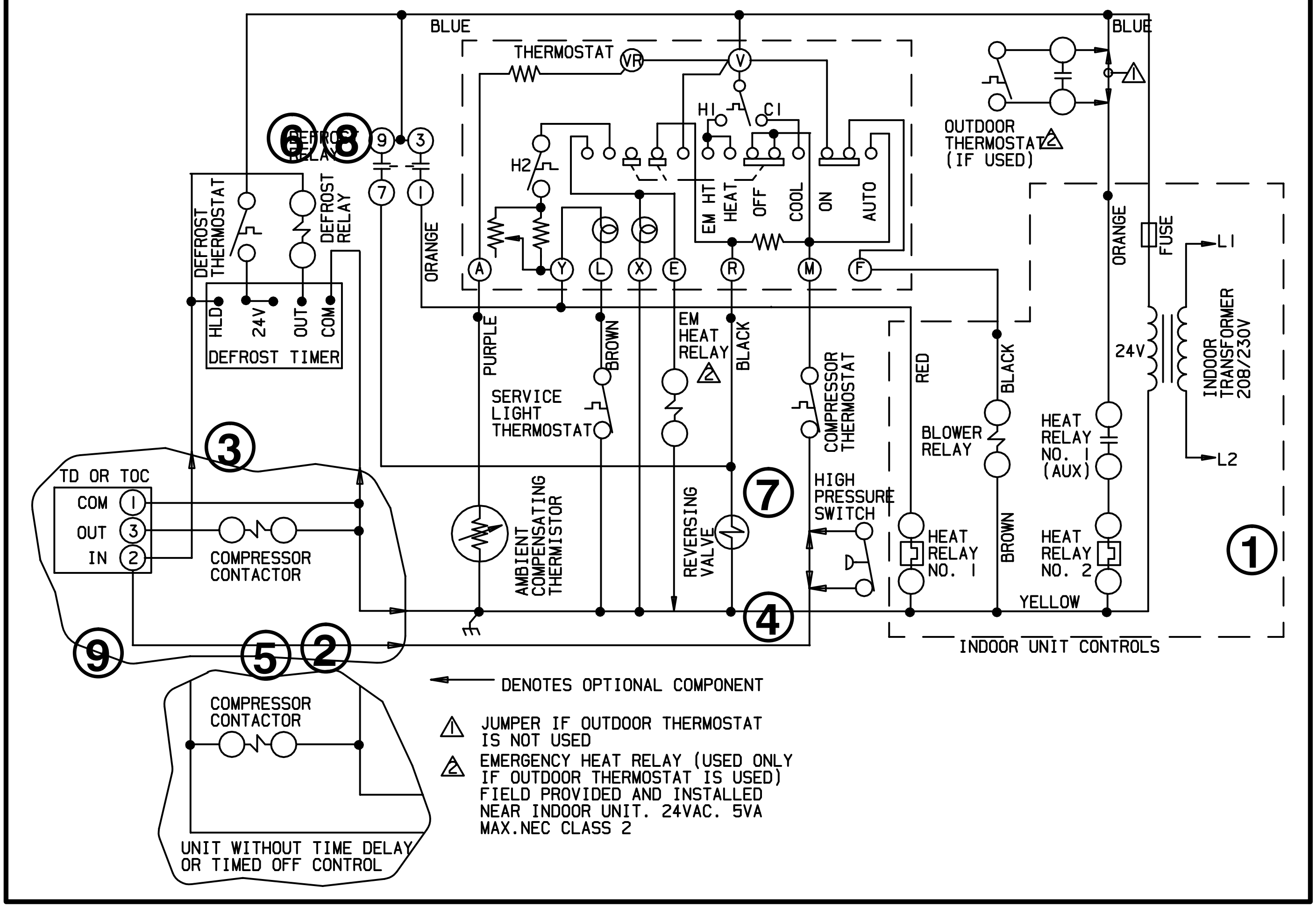
VII–WIRING DIAGRAMS AND OPERATION SEQUENCE

A–Field Wiring



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 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.

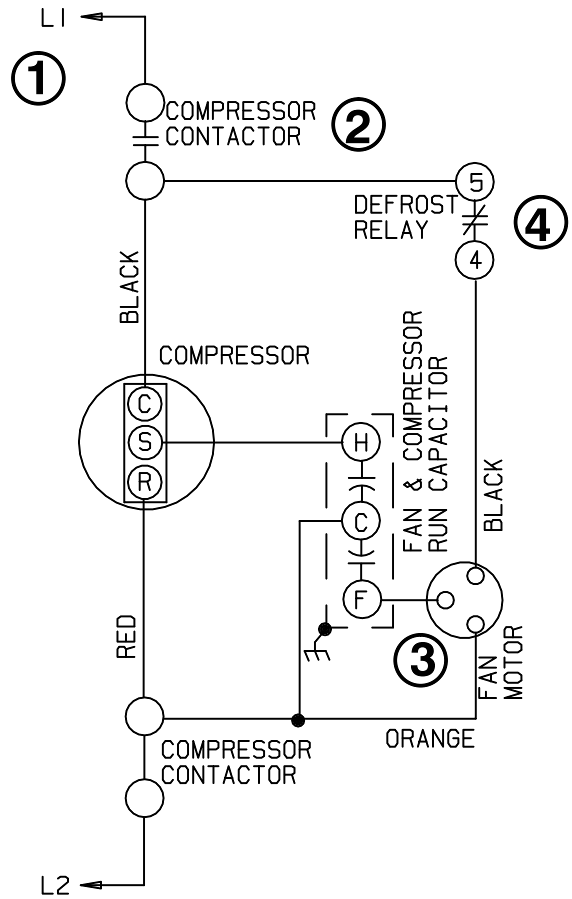
6– During heating operation, when outdoor coil drops below 35 ± 4° F, the defrost thermostat closes. When defrost thermostat closes, defrost timer begins timing. If defrost thermostat remains closed at the end of 30, 60 or 90 minutes, defrost relay energizes and defrost begins.

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

8– Defrost continues until 14 ± 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, time delay locks–out the circuit to conpressor contactor coil and defrost control for 5 ± 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.

LINE VOLTAGE OPERATION SEQUENCE



C–Operation Sequence – Line Voltage Single Phase Units

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

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

3– 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.

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

D−Complete Diagrams