installation operation and maintenance instructions

HP20 Series Units

RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE

HEAT PUMP UNITS
502,394M
10/89
Supersedes 502,311M

Litho U.S.A

LENNOX Industries Inc.

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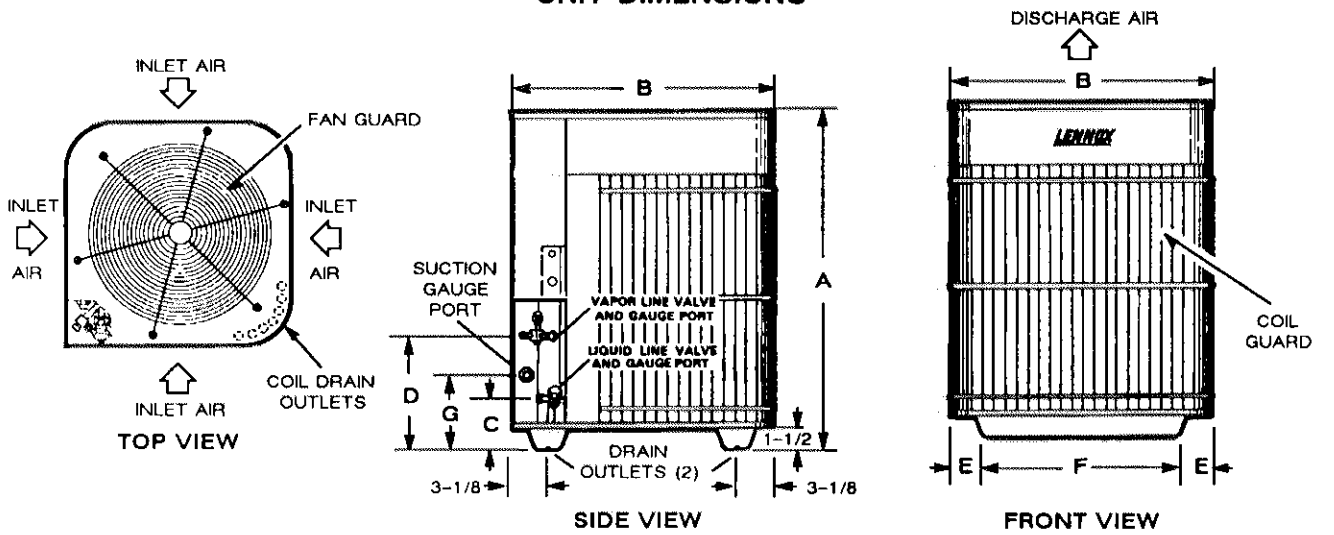
UNIT DIMENSIONS



MODEL NO.	A	B	C	D	E	F	G
HP20-211 HP20-261 HP20-311 HP20-411	28-3/4 in. (730mm)	22-1/4 in. (565mm)	3-5/8 in. (92mm)	7-1/2 in. (191mm)	3-5/8 in. (92mm)	15 in. (381mm)	5-3/4 in. (146mm)
HP20-461	33-9/16 in. (852mm)	28-13/16 in. (732mm)	4-9/16 in. (116mm)	9-5/16 in. (237mm)	5-3/8 in. (137mm)	18-1/16 in. (459mm)	7-3/16 in. (183mm)

START-UP AND PERFORMANCE CHECK LIST

Job Name _____ Job No. _____ Date _____
Job Location _____ City _____ State _____
Installer _____ City _____ State _____
Unit Model No. _____ Serial No. _____ Serviceman _____
Nameplate Voltage _____ Amps:
Minimum Circuit Ampacity _____ Supply _____ Outdoor Fan _____
Maximum Fuse Size _____ Compressor _____
Electrical Connections Tight? ☐ Indoor Filter Clean? ☐ Indoor Blower RPM _____
Supply Voltage (Unit Off) _____ S.P. Drop Over Evaporator (Dry) _____

HEAT PUMP SECTION

Refrigerant Lines:
Leak Checked? ☐
Service Valves Tightened? ☐ Properly Insulated? ☐
Outdoor Fan Checked? ☐
Voltage With Compressor Operating _____
Outdoor Coil Entering Air Temperature _____
Discharge Pressure _____ Suction Pressure _____
Refrigerant Charge Checked? ☐

THERMOSTAT

Calibrated? ☐ Properly Set? ☐ Level? ☐

I-SHIPPING AND PACKING LIST

Package 1 of 1 contains:

1-Assembled heat pump unit

Check unit for shipping damage. Consult last carrier immediately if damage is found.

These instructions are intended as a general guide and do not supersede local codes in any way. Authorities having jurisdiction should be consulted before installation.

II-INSTALLATION

HP20 heat pump units are approved and warranted only for installation with specially matched indoor coils, L10 line sets, and refrigerant control devices as designated by Lennox. Refer to the Lennox Engineering Handbook for approved systems.

Setting the Unit

Heat pump units operate under a wide range of weather conditions; therefore, several factors must be considered when positioning the outdoor unit. Refer to figure 1 for installation clearances.

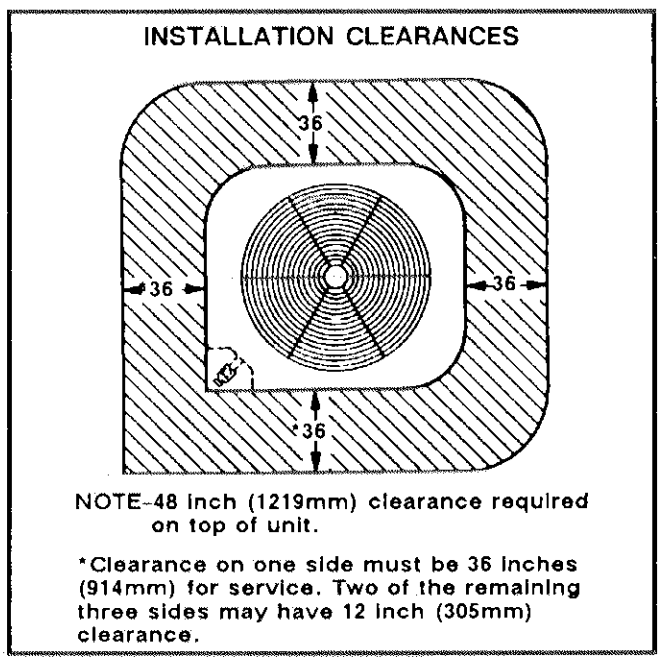


FIGURE 1

1- Place a sound-absorbing material, such as Isomode, under the unit if it will be installed in a location or position that will transmit sound or vibration to the living area or adjacent buildings.

2- Mount unit high enough above ground or roof to allow adequate drainage of defrost water and prevent ice build-up.

3- In heavy snow areas, do not locate unit where drifting will occur. The unit base should be elevated above the depth of average snows.

NOTE-Elevation of the unit may be accomplished by constructing a frame using suitable materials. If a support frame is constructed, it must not block drain holes in unit base.

4- When installed in areas where low ambient temperatures exist, locate unit so winter prevailing winds do not blow directly into outdoor coil.

5- Locate unit away from overhanging roof lines which would allow water or ice to drop on, or in front of, coil or into unit.

A-Slab Mounting (See figure 2)

When installing unit at grade level, top of slab should be high enough above the grade so that water from higher ground will not collect around unit. Slab should have a slope tolerance away from the building of 2 degrees or 2 inches per 5 feet (51 mm per 1524 mm). This will prevent ice build-up under the unit during a defrost cycle. Refer to roof mounting section for barrier construction if unit must face prevailing winter winds.

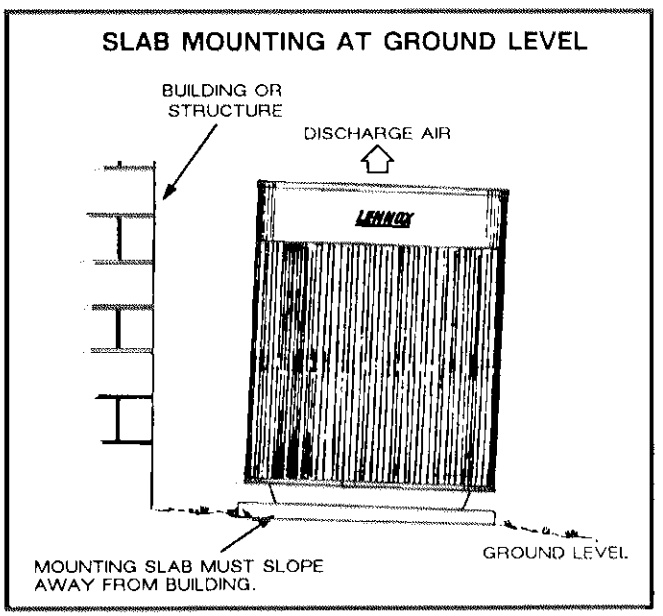


FIGURE 2

B-Roof Mounting (See figure 3)

If unit coil cannot be mounted away from prevailing winter winds, a wind barrier should be constructed. Size barrier at least the same height and width as outdoor unit. Mount barrier 24 inches (610 mm) from the sides of the unit in the direction of prevailing winds.

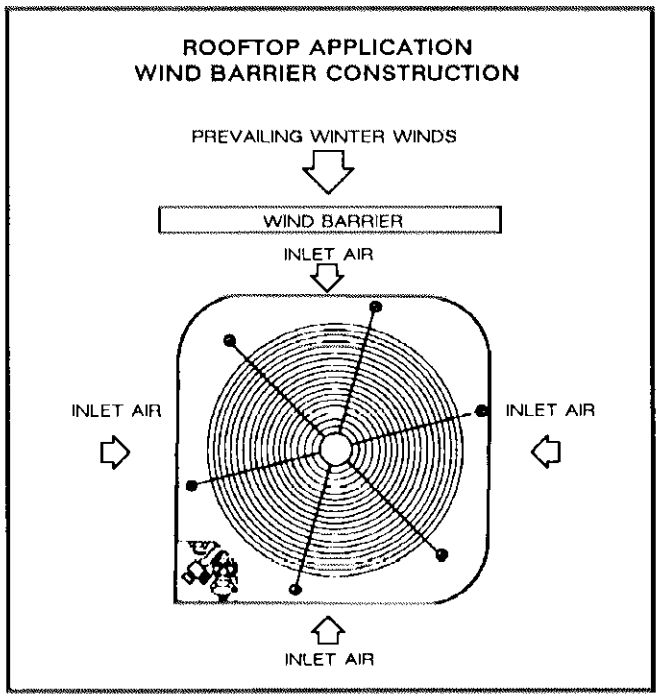


FIGURE 3

III-ELECTRICAL CONNECTIONS (Figure 4)

Wiring must conform with the National Electric Code (NEC) and local codes. An application diagram is included in this instruction and in indoor unit instructions.

Refer to unit rating plate for minimum circuit ampacity and maximum fuse size.

1- Provide line voltage power supply to unit from a properly sized disconnect switch.

2- Install room thermostat (ordered separately) in the conditioned area. Locate thermostat where it will not be affected by sunlight, drafts or vibration. Do not install thermostat on an outside wall. A position approximately 5 feet (1524 mm) from the floor and near the center of the conditioned area is most desirable.

3- Provide low voltage wiring from outdoor to indoor unit and from thermostat to indoor unit as indicated on the field diagram in this instruction.

4- Ground unit either through supply wiring or with an earth ground.

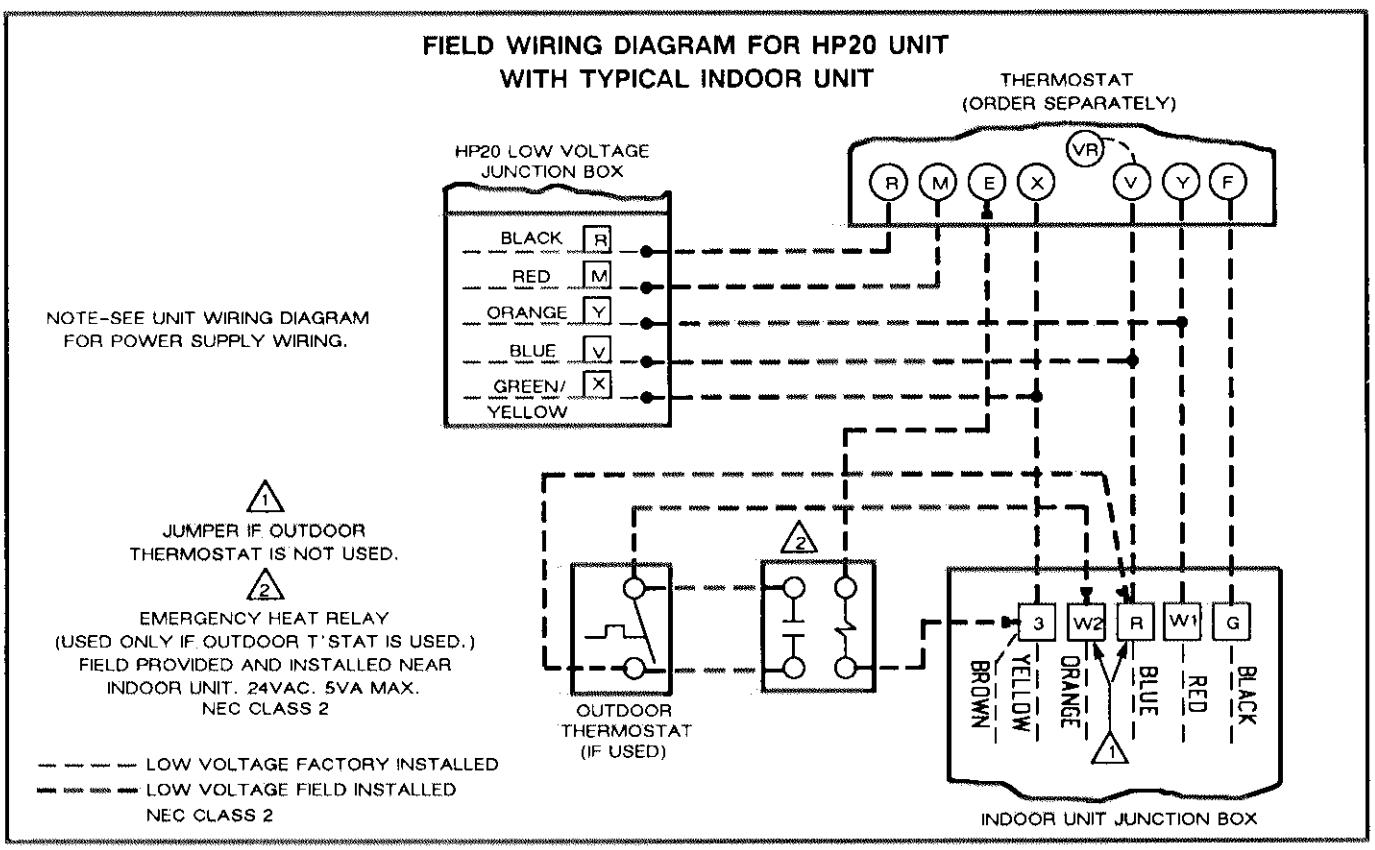


FIGURE 4

IV-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 1 or use field-fabricated refrigerant lines. Refer to the piping section of the Lennox Unit Information Service manual for proper size, type and application of field-fabricated lines.

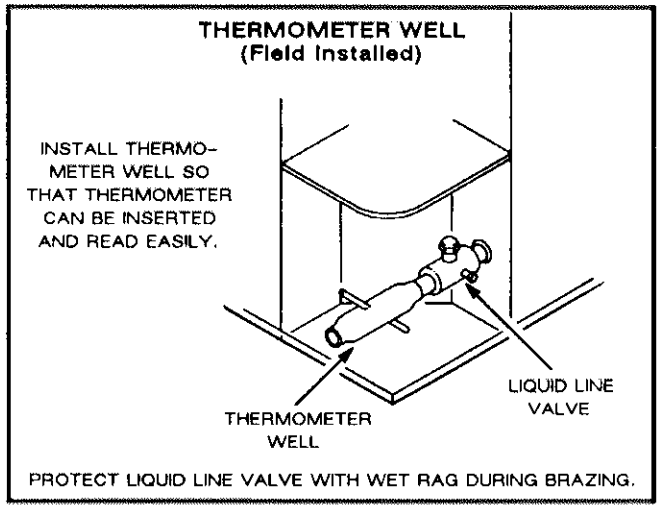


FIGURE 5

The thermometer well (packaged separately and attached to the liquid line) should be installed in the liquid line close to the HP20 unit as shown in figure 5. Take care to install thermometer well so that thermometer can be inserted and read easily. Wrap a wet cloth around the liquid line valve body and copper tube stub to protect from heat damage during brazing. Quench the joint with water or wet cloth to prevent possible heat damage to the valve core.

NOTE-Line length should be no greater than 50 feet (15.2 m). Select line set diameters from table 1 to ensure oil return to compressor. Failure to follow these recommendations could result in poor compressor lubrication and will void compressor warranty.

TABLE 1

UNIT	LIQUID LINE	VAPOR LINE	L10 LINE SETS
HP20-211 HP20-261	5/16 in. (8mm)	5/8 In. (16mm)	L10-21 20 ft. - 50 ft. (6.1m -15.2m)
HP20-311 HP20-411	3/8 In. (10mm)	3/4 In. (19mm)	L10-41 20 ft. - 50 ft. (6.1m -15.2m)
HP20-461	3/8 In. (10mm)	7/8 In. (22mm)	L10-65 30 ft. - 50 ft. (9.1m - 15.2m)

NOTE-To obtain maximum efficiency, remove the 3/4" reduction from the L10-65 series line sets and the flare fitting from the indoor coil. Then, make a seat connection using a 7/8" X 1-1/8" reducer bushing.

A-Sweat Connections

1- End of refrigerant lines must be cut flush, round and free from nicks or dents and must also be deburred (I.D. and O.D.).

2- Wrap a wet cloth around the valve body and copper tube stub and braze the line set tubing to the thermometer well and copper tube stub.

3- Quench the brazed joints with water or a wet cloth to prevent possible heat damage to the valve core and opening port.

B-Indoor Coil Connections

Piping consists of flare connections to the indoor coil. Refer to installation instructions packaged with the indoor coil and the expansion valve kit for proper installation of the expansion valve.

V-REFRIGERATION

Processing Procedure

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 (7620 mm) line set. For varying lengths of line set, refer to table 2 for refrigerant charge adjustment. A blank space is provided on the unit rating plate to list actual field charge.

TABLE 2

Line Set Dia.		Ozs. per ft. (ml per mm) adjust from 25 ft. (7620 mm) line set*
Vapor	Liquid	
5/8 in. (16mm)	5/16 In. (8mm)	1/2 ounce (15ml)
5/8 in. (16mm)	3/8 In. (10mm)	1 ounce (30ml)
3/4 in. (19mm)	3/8 In. (10mm)	1 ounce (30ml)
7/8 in. (22mm)	3/8 In. (10mm)	1 ounce (30ml)
1-1/8 In. (29mm)	1/2 In. (13mm)	1-3/4 ounce (52ml)

**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-Service Valves and Gauge Manifold Attachment

The liquid line and vapor line service valves and gauge ports are accessible from outside of the unit (the vapor line service valve 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.

IMPORTANT-Service valves are closed to 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 in keeping the system free from dirt, moisture and air.

B-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 collector is used, add a trace of refrigerant to the nitrogen for leak detection.

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

C-System Evacuation

1- Attach gauge manifold as shown in figure 6. Connect vacuum pump (with vacuum gauge) to center port of gauge manifold. With both manifold service valves open, start pump and evacuate indoor coil and refrigerant lines.

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

2- Evacuate the system to 29 inches (737 mm) 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 leak testing procedures would be necessary.

3- After the system has been evacuated to 29 inches (737 mm), 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 (754 mm) mercury (5 mm absolute pressure) with a 20-minute period after stopping vacuum pump.

6- After evacuation is completed, close manifold service valves, disconnect vacuum pump from gauge manifold center port, and connect refrigerant drum. Pressurize system slightly with refrigerant to break vacuum.

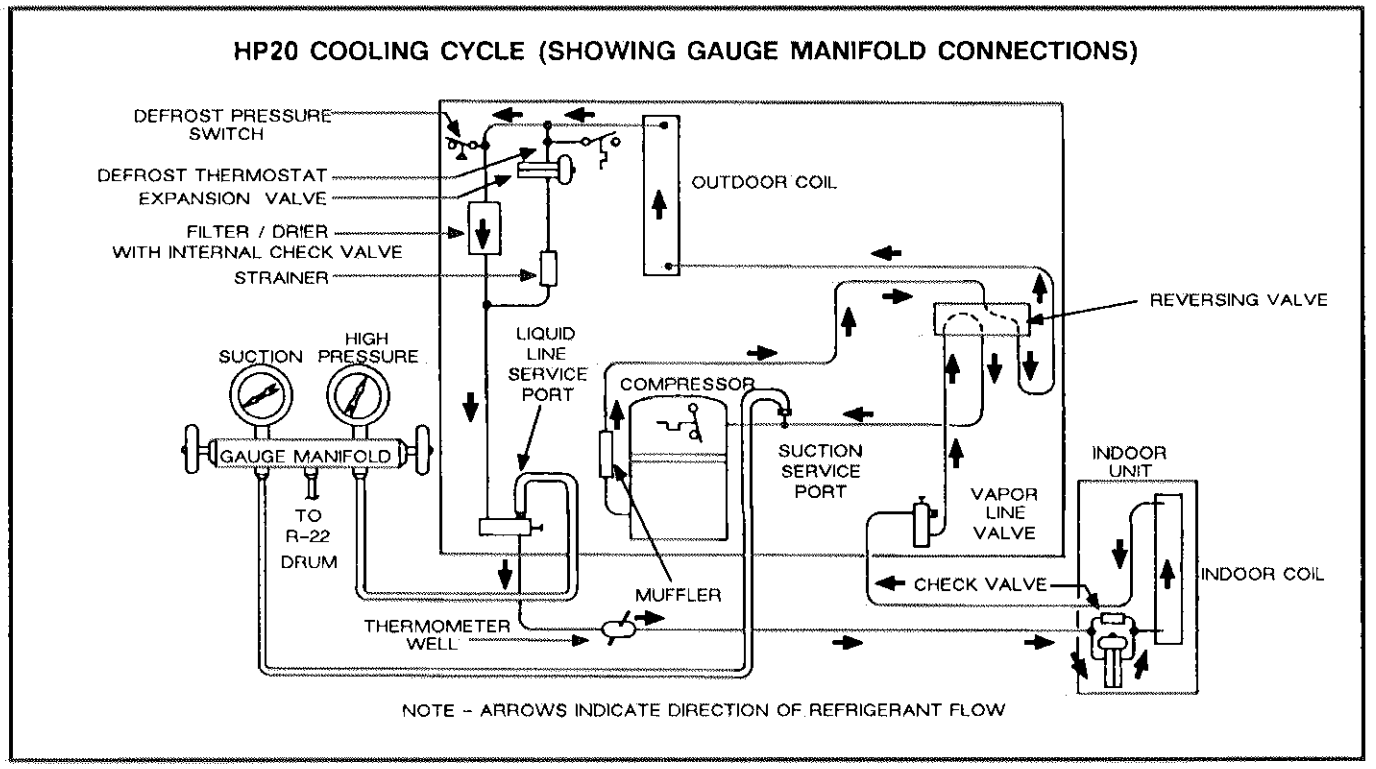


FIGURE 6

VI-UNIT START-UP AND ADJUSTMENTS

A-Start-Up

1- Rotate fan to check for frozen bearings or binding.

2- Inspect all factory and field-installed wiring for loose connections.

3- Open liquid line and vapor line service valves to release refrigerant charge (contained in heat pump unit) into the system.

4- To open vapor line valve, tighten the opening cap (longest) until it hits bottom (nut will be within 1/8 inch [3 mm] or less of the body). Tighten an additional 1/4 turn to make the metal to metal seal (See figure 7).

NOTE-When tightening, the torque will increase then drop off as the frangible plug shears.

5- Check voltage supply at the disconnect switch. The voltage must be within the range listed on the unit nameplate. If not, do not start the equipment until the power company has been consulted and the voltage condition has been corrected.

6- Set the thermostat for a cooling demand, turn on power to indoor blower coil and close heat pump unit disconnect to start unit.

7- Recheck unit voltage with unit running. Power must be within range shown on unit nameplate. Check amperage draw of unit. Refer to unit nameplate for correct running amps.

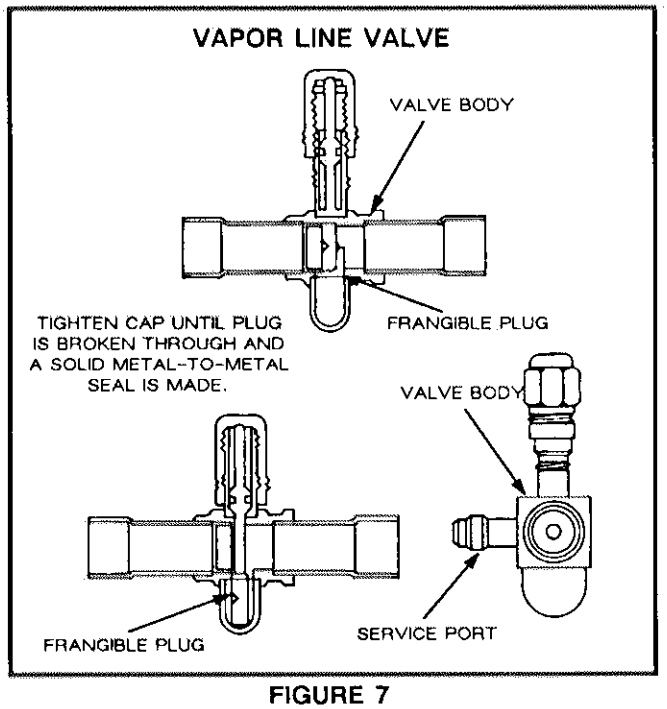


FIGURE 7

B-Charging

The following charging procedure is intended as a general guide. It is intended for use on expansion valve systems only. For best results, indoor temperature should be between 70°F and 80°F. Be sure to monitor system pressures while charging. Charging should be done in cooling mode.

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. Refer to the Lennox Unit Information Service Manual for procedure.

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

2- Connect gauge manifold as shown in figure 6. Connect an upright R-22 drum to center port of gauge manifold.

3- 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 system charging in the cooling cycle. Change thermostat setting to 68°F (20°C) in "Cool" position. Allow unit to run until system pressures stabilize.

Approach Method
(Ambient Temperature of 60°F [16°C] or Above)

4- If outdoor temperature is 60°F (16°C) or above, the approach method of checking charge is used. The approach temperature is equal to the liquid line temperature minus the ambient temperature. Place the thermometer in the thermometer well and read the liquid line temperature. The difference between the ambient temperature should match the value given in table 3.

TABLE 3

MODEL	LIQ. TEMP MINUS AMB. TEMP. (°F)
HP20-211	9.0 to 11.0
HP20-261	11.0 to 13.0
HP20-311	12.0 to 14.0
HP20-411	10.0 to 12.0
HP20-461	7.0 to 9.0

NOTE-For best results, use same thermometer to measure both ambient and liquid line temperatures.

An approach temperature greater than the value given in table 3 indicates an undercharge. Add refrigerant slowly and continue to watch liquid line temperature until approach temperature approximates the value given in table 3.

An approach temperature less than the value shown in table 3 indicates an overcharge. Use an approved refrigerant reclaiming method to remove refrigerant from the system.

Subcooling Method
(Ambient Temperatures Below 60°F [16°C])

5- If outdoor temperature is less than 60°F (16°C), the subcooling method of charging is used. The subcooling temperature is equal to the condensing temperature minus the liquid line temperature.

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 8, moving obstructions sideways until liquid pressures in the 200-250 psig range are reached.

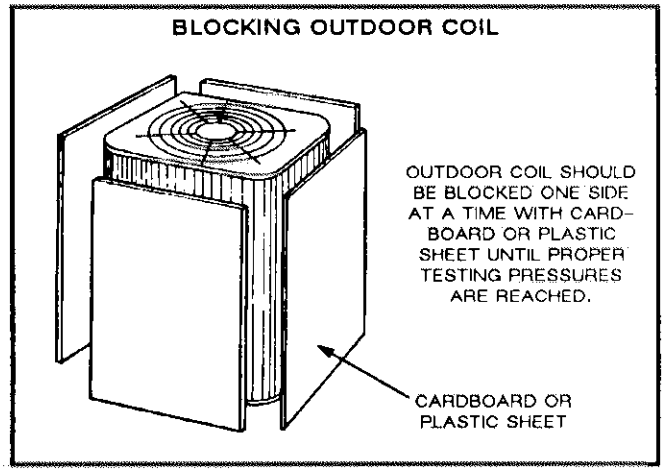


FIGURE 8

Insert thermometer in well and check liquid line temperature. Read liquid line pressure from gauge and convert to condensing temperature using standard R-22 temperature/pressure conversion chart. The subcooling temperature should approximate the value given in table 5.

A subcooling temperature less than the value given in table 5 indicates an undercharge. Add refrigerant slowly and continue to watch liquid line temperature until subcooling temperature approximates the value given in table 5.

A subcooling temperature greater than the value given in table 5 indicates an overcharge. Use an approved refrigerant reclaiming method to remove refrigerant from system.

TABLE 5

MODEL	SUBCOOLING (°F)
HP20-211	8.0° ± 3.0°
HP20-261	8.0° ± 3.0°
HP20-311	9.0° ± 3.0°
HP20-411	13.0° ± 3.0°
HP20-461	10.0° ± 3.0°

C-Compressor Oil Charge

Refer to Lennox Cooling Service Handbook for correct procedure to check and add compressor oil.

VII-OPERATION

A-Filter Drier

The filter drier is equipped with an internal check valve for correct refrigerant flow (See figure 6). If replacement is necessary, order another of like design and capacity. A strainer in the liquid line gives additional protection.

B-Thermostat Operation

Some heat pump thermostats incorporate isolating contacts and an emergency heat function (which includes an amber indicating light). The thermostat is not included with the unit and must be purchased separately.

C-Emergency Heat Function

An emergency heat function is designed into some thermostats. This feature is applicable when isolation of outdoor unit is required or when auxiliary electric heat is staged by outdoor thermostats. When the room thermostat is placed in the emergency heat position, the outdoor unit control circuit is isolated from power and field-provided relays bypass the outdoor thermostats. An amber indicating light simultaneously comes on to remind the homeowner that he is operating in the emergency heat mode.

D-Defrost System

The HP20 defrost system includes three components: a defrost thermostat, a defrost pressure switch and a defrost control with a timer.

Defrost Thermostat

The defrost thermostat is mounted on the liquid line between the expansion valve and the distributor. When the defrost timer calls for a defrost, the unit will go into defrost only if the defrost thermostat reads liquid line temperatures of 35°F (2°C) or colder.

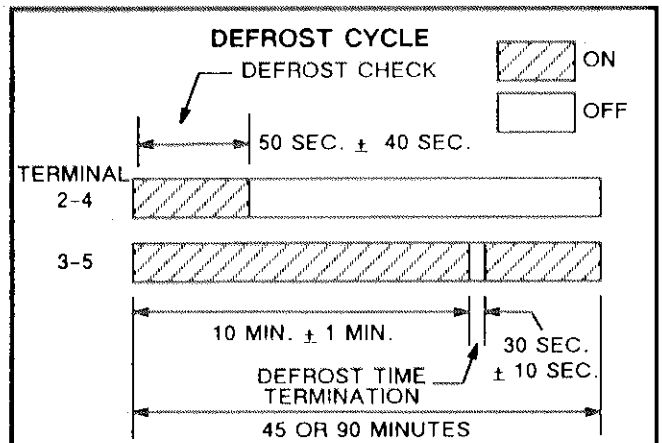
Defrost Pressure Switch

The defrost pressure switch is mounted on the discharge line between the distributor and the filter drier. This automatically reset switch cuts in at 260 psig and holds the unit in the defrost cycle until discharge pressures reach the 275 psig cut-out point.

Defrost Control and Timer

The defrost control timer is located in the unit control box and is the deciding factor in both initiating and terminating the defrost cycle. The knob on the front of the control adjusts the defrost interval from 90 to 45 minutes if warranted by climatic conditions.

Once a 10-minute defrost cycle has begun, it can be terminated in a shorter period of time if the liquid line pressure has risen to its 325 psig cut-out point. However, the defrost timer will not allow the defrost to last longer than 10 minutes. See figure 9 for defrost cycle sequence.



Timer terminals 2-4 close for 50 sec. ± 40 sec. every 90 minutes (or 45 minutes as preset) to check for defrost. Timer terminals 3-5 open for 30 sec. ± 10 sec. every 90 minutes (or 45 minutes as preset) to terminate defrost. Refer to the operation sequence in the back of this manual for more information.

FIGURE 9

E-Compressor Timed-Off Control

This unit is equipped with a time delay which protects the compressor by preventing short-cycling.

VIII-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 condenser coil (may be flushed with a water hose).

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

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

4- Check all wiring for loose connections.

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

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

7- Inspect drain holes in coil compartment base and clean if necessary.

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

B-Indoor Coil

1- Clean coil if necessary.

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

3- Check condensate line and clean if necessary.

C-Indoor Unit

1- Clean or change filters.

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

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

   b- *Direct Drive Motors with Oiling Ports* -- Prelubricated for an extended period of operation. For extended bearing life, relubricate with a few drops of SAE No. 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 pressure drop over the coil should be checked to determine the correct blower CFM. Refer to the Lennox Cooling Service Handbook for pressure drop tables and procedures.

4- Check all wiring for loose connections.

5- Check for correct voltage at unit.

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