operation maintenance and installation instructions

HS10 Series Units

COOLING UNITS
501,340M
9/77

RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE

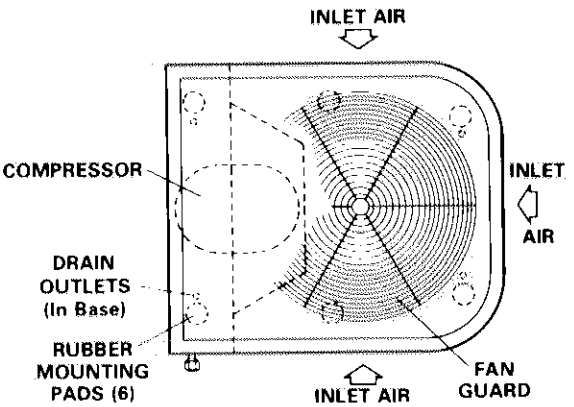
LENNOX Industries Inc.

Columbus, Ohio/Decatur, Georgia/Fort Worth, Texas/Sacramento, California/Marshalltown, Iowa/Lennox Industries (Canada) LTD - Calgary, Toronto

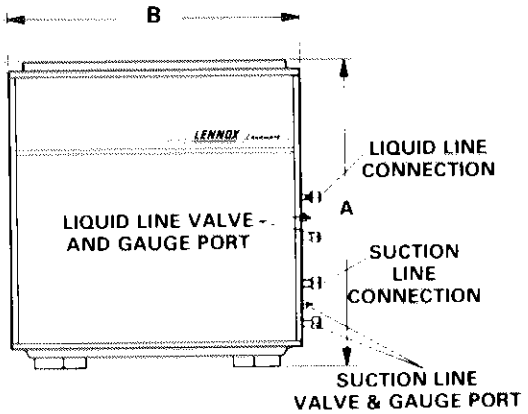
TABLE OF CONTENTS

UNIT DIMENSIONS

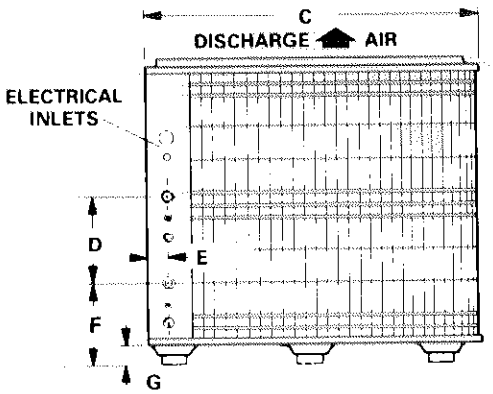
MODEL NO.	HS10-311V-4	HS10-411V-5	HS10-460V-5
A	27-1/16 in. 687 mm	34-1/16 in. 865 mm	34-1/16 in. 865 mm
B	25-7/8 in. 657 mm	25-7/8 in. 657 mm	25-7/8 in. 657 mm
C	29-7/8 in. 759 mm	29-7/8 in. 759 mm	29-7/8 in. 759 mm
D	6-7/8 in. 175 mm	7-5/8 in. 194 mm	6-7/8 in. 175 mm
E	2-1/16 in. 52 mm	2-1/16 in. 52 mm	2-1/16 in. 52 mm
F	7 in. 178 mm	7 in. 178 mm	7-3/4 in. 197 mm
G	1-3/4 in. 44 mm	1-3/4 in. 44 mm	1-3/4 in. 44 mm



TOP VIEW



FRONT VIEW



SIDE VIEW

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 _____
Minimum Circuit Ampacity _____
Maximum Fuse Size _____
Electrical Connections Tight? ☐
Supply Voltage (Unit Off) _____

Amps:
Supply _____ Condenser Fan _____
Compressor _____
Indoor Filter Clean? ☐ Indoor Blower RPM _____
S.P. Drop Over Evaporator (Dry) _____
Condenser Entering Air Temperature _____
Discharge Pressure _____ Suction Pressure _____
Refrigerant Charge Checked? ☐

COOLING SECTION

Refrigerant Lines:
Leak Checked? ☐ Properly Insulated? ☐
Service Valves Backseated? ☐
Condenser Fan Checked? ☐
Voltage With Compressor Operating _____

THERMOSTAT

Calibrated? ☐ Properly Set? ☐ Level? ☐

PROCESSING - STARTUP - OPERATION - MAINTENANCE

CAUTION TO INSTALLER

Due to fluorocarbon damage to the ozone layer in the stratosphere, Lennox recommends strict refrigeration procedures that prevent venting R-22 refrigerant into the atmosphere during installation and service of Lennox refrigeration systems.

I - UNIT PROCESSING

HS10 series condensing units are factory charged with the amount of R-22 refrigerant indicated on the unit rating plate. Refer to Figure 1. A blank space is provided to list actual field charge. The factory charge is based on a matched condensing unit and indoor coil with a 25 ft. (7,62 m) line set.

IMPORTANT - Service valves are closed to condensing unit and open to line set connections. Do not open until refrigerant lines and indoor coil have been leak tested and evacuated. All precautions should be exercised in keeping the system free from dirt, moisture and air.

MODEL NUMBER	**HS10-311V-4P**
SERIAL NUMBER	**5175E00001**
REFRIGERANT	Refrigerant - 22
FACTORY CHARGED	**5** lbs **0** oz
FIELD CHARGE	lbs oz
TEST PRESSURE	High 450
	Low 150

FIGURE 1

A - Service Valves and Gauge Manifold Attachment

Liquid and suction service valve seating adjustments and service gauge ports are on outside of cabinet. Refer to Figure 2. These gauge ports are used for leak testing, evacuating, charging and checking charge.

A gauge port for system pumpdown is provided in the liquid line between the condenser coil and filter-drier if future service work is required.

Note - The liquid service valve on this unit is not a back-seating valve. The gauge port cannot be shutoff by back seating the valve.

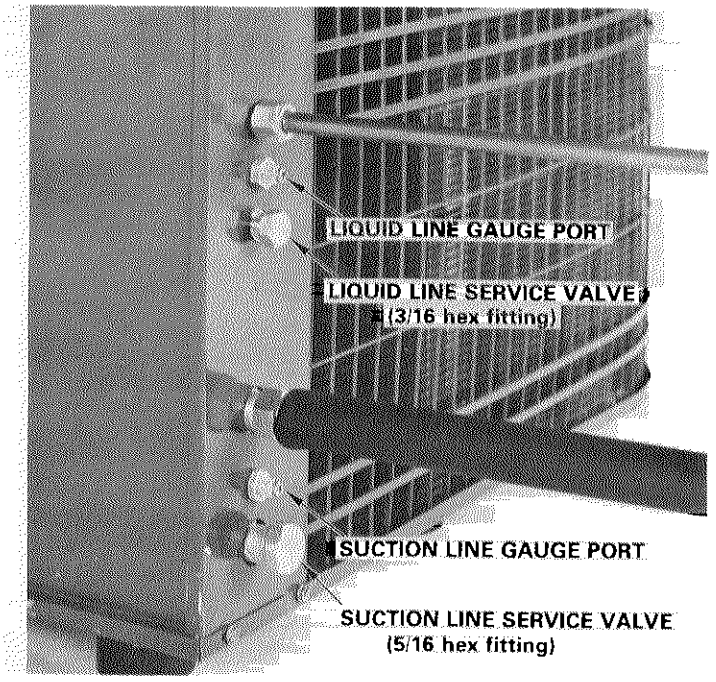


FIGURE 2

WARNING - Condenser coil may not have sufficient volume to allow a complete pump down. Always connect a high pressure gauge to the liquid line gauge port during system pump down. High pressure must not exceed 410 psig (2827 kPa).

B - Leak Testing Installed Piping

1 - Attach gauge manifold and connect a drum of dry nitgrogen 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.

C - Evacuating and Dehydrating The System

Evacuate the system as follows:

1 - Attach gauge manifold and connect vacuum pump (with vacuum gauge) to center port of gauge manifold. With both gauge manifold service valves open, start the pump and evacuate evaporator and refrigerant lines.

NOTE - A temperature vacuum gauge, mercury vacuum "U" tube or thermocouple gauge should be used. The usual Bourdon tube gauges are inaccurate in the vacuum range.

2 - Evacuate the system to 29 inches (737 mm) vacuum. During the initial stages of evacuation, stop the vacuum pump at least once to determine if there is a loss of vacuum. A rapid loss of vacuum indicates a leak in the system and section "B - Leak Testing Installed Piping" must be repeated.

3 - After system has been evacuated to 29 inches (737 mm) close manifold valves to center port. Stop the vacuum pump and disconnect from gauge manifold. Attach a drum of dry nitrogen to center port of gauge manifold, open drum valve slightly to purge line, then break vacuum in system to 3 psig (20.7 kPa) pressure by opening manifold high pressure valve to center port.

4 - Close nitrogen drum valve, disconnect drum from manifold center port, and release nitrogen pressure from system.

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

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

D - Startup Procedure

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

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

3 - Open liquid line and suction line service valves (back seat) to release refrigerant charge (contained in condensing unit) into the system.

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

5 - Set the thermostat for a cooling demand, turn on power to evaporator blower and close condensing unit disconnect to start unit.

6 - 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.

E - Charging

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 amount shown on the unit nameplate. Refer to the "Lennox Cooling Service Handbook" for procedure. If weighing facilities are not available or if unit is just low on charge, use the following procedure:

1 - Attach gauge manifold and connect an upright R-22 drum to center port of gauge manifold.
2 - Open drum valve and charge a quantity of refrigerant gas into the system through the suction port. Close refrigerant drum valve and allow unit to run for a few minutes to stabilize operating pressures.
3 - Check refrigerant charge according to section "F - Checking Charge." Continue to charge and check until proper charge is obtained.

F - Checking Charge

Refrigerant charge is checked by the use of a "Normal Operating Pressure Curve that is mounted in each unit and is also in this instruction. The three factors needed to use the pressure curve are: condenser entering air temperature, suction pressure and liquid pressure.

1 - Attach gauge manifold, start unit and allow unit to run for a few minutes to stabilize operating pressures.
2 - Using a thermometer, record the condenser entering air temperature, and record the suction and liquid operating pressures.
3 - From the correct "Normal Operating Pressure Curve", find the suction pressure, and follow across the curve to the correct entering air temperature. From this point, read down to the liquid pressure. If liquid pressure is within 3 psig (20.7 kPa) of the reading on manifold high pressure gauge the unit is properly charged. If not, refer section "E - Charging.
4 - After charging, remove gauge manifold and replace service caps.

II - SYSTEM OPERATION

Condensing unit and indoor blower cycles on demands from room thermostat. When blower switch on thermostat is switched to "ON" position, indoor blower operates continuously.

A - Compressor Timed Interlock

A compressor timed interlock control, mounted in the unit control box, is provided on the HS10 unit to prevent fast cycling of the compressor. At the end of a compressor cycle the control goes through a five minute timed interlock period during which the compressor is de-energized.

B - Pressure Switches

High and low refrigerant pressure switches are provided on the unit. Refer to Figure 3. High pressure switch is manual reset and low pressure switch is automatic reset.

Pressure Switch	Pressure-Out		Pressure-In	
	Psig	kPa	Psig	kPa
High	410	2827	Manual	Manual
Low	25	172	55	379

C - Two Speed Condenser Fan Motor

The two speed fan motor is controlled by a refrigerant temperature sensing thermostat attached to the condenser coil (refer to Figure 3). The thermostat (non-adjustable) switches fan motor at following approximate temperatures:

HS10 Model	HIGH		LOW	
	Ambient	Refrigerant	Ambient	Refrigerant
311 thru 460	90F (32.1C)	110F (43.3C)	75F (23.8C)	95F (35.0C)

Motor may be on either high or low speed between these temperatures, depending if outdoor temperature is on a rise or fall condition.

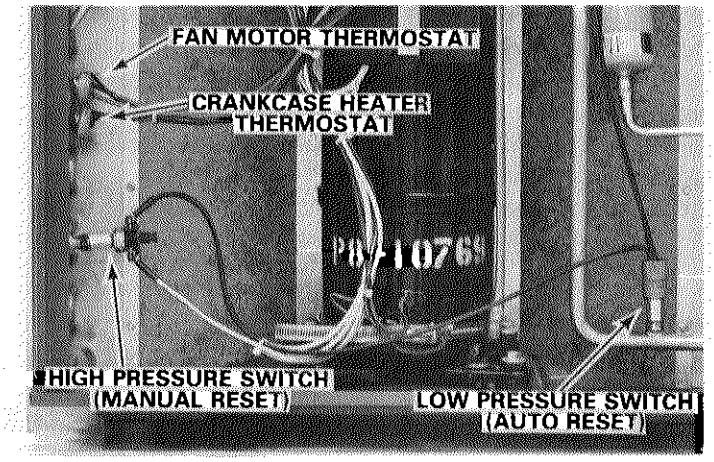


FIGURE 3

D - Compressor Crankcase Heater

To maintain the compressor refrigerant oil at a safe operating temperature, the compressor is equipped with a crankcase heater (oil rectifier). The crankcase heater is controlled by a refrigerant temperature sensing thermostat mounted on the condenser coil. Refer to Figure 3. This thermostat is calibrated to energize heater at ambient temperatures below approximately 65°F (18.3°C) and de-energize the heater at temperatures above approximately 85°F (29.4°C). Heater may be energized or de-energized between 65°F (18.3°C) and 85°F (29.4°C) depending if outdoor temperature is on a rise or fall condition.

III - MAINTENANCE

At the beginning of each cooling season the system should be checked as follows:

A - Condensing Unit

1 - Clean and inspect condenser coil. (May be flushed with a water hose.)
2 - Condenser fan motor is prelubricated and sealed. No further lubrication required under normal operation.
3 - Visually inspect connecting lines 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 condenser fan motor.

Unit nameplate _____ Actual _____

NOTE - If owner complains of insufficient cooling, the unit should be gauged and refrigerant charge checked. Refer to sections - Checking Charge and Charging in this manual.

B - Evaporator Coil

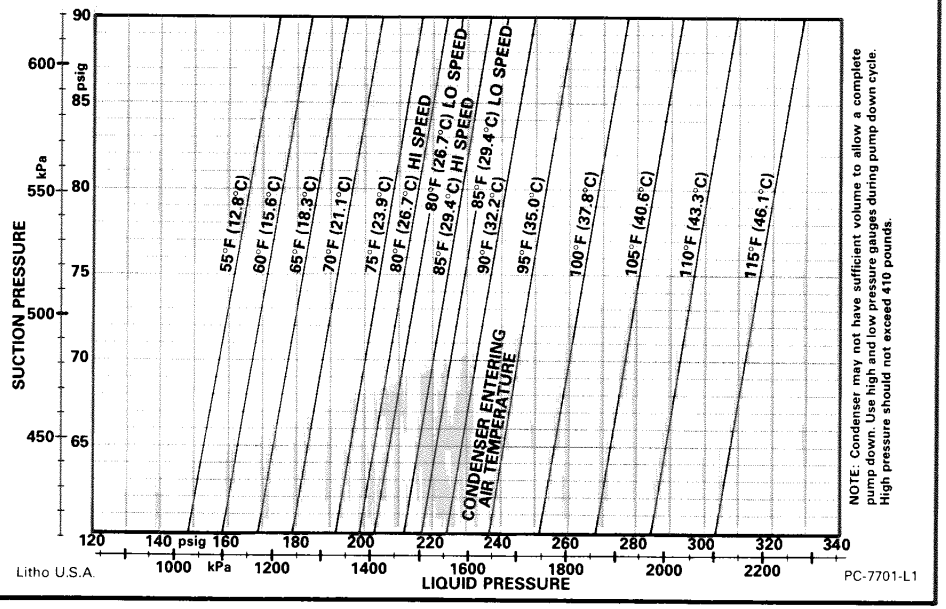
1 - Clean coil, if necessary.
2 - Check connecting lines and coils for evidence of oil leaks.
3 - Check condensate line and clean, if necessary.

C - Indoor Unit

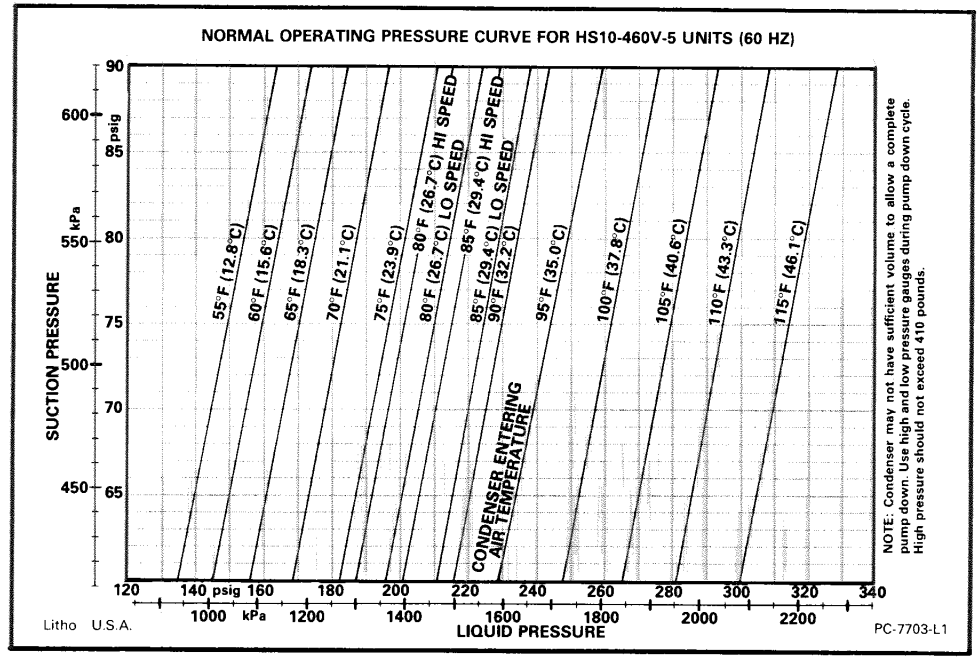
1 - Clean or change filters.
2 - Lubricate blower motor and blower bearings according to instructions on indoor unit.
3 - Adjust blower speed for cooling. The pressure drop over the coil should be measured to determine the correct blower CFM. Refer to the Cooling Service Handbook for pressure drop tables and procedure.
4 - *Belt Drive Blowers* - Check belt for wear and proper tension.
5 - Check all wiring for loose connections.
6 - Check for correct voltage at unit (blower operating).
7 - Check amp-draw on blower motor.

Motor nameplate _____ Actual _____

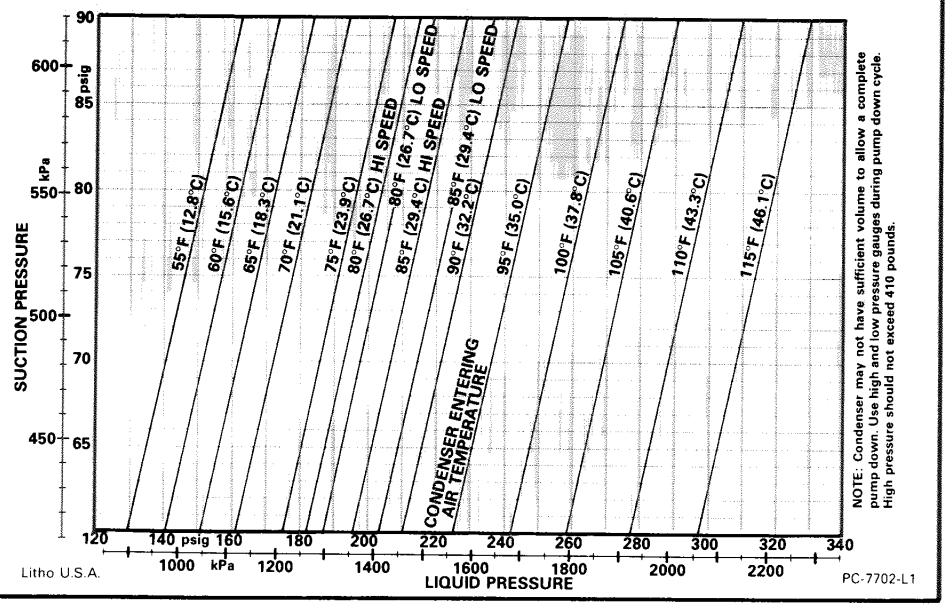
NORMAL OPERATING PRESSURE CURVE FOR HS10-311V-4 UNITS (60 HZ)



NORMAL OPERATING PRESSURE CURVE FOR HS10-460V-5 UNITS (60 HZ)



NORMAL OPERATING PRESSURE CURVE FOR HS10-410V-5 UNITS (60 HZ)



APPLICATION - INSTALLATION

I - SHIPPING AND PACKING LIST

Package 1 of 1 contains:

1 - Assembled unit

1 - Room thermostat

II - GENERAL

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

III - SHIPPING DAMAGE

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

IV - APPLICATION

HS10 series condensing units are designed for expansion valve systems. **They are not designed for RFC systems.** When the following expansion valve kits with internal bleed ports are used on indoor coils, a compressor start kit **is not** required for HS10 unit:

LB-25778CA - 2 ton indoor coil kit
LB-25778CB - 3 ton indoor coil kit
LB-25778CC - 4 ton indoor coil kit
LB-25778CD - 5 ton indoor coil kit

NOTE - All other expansion valve indoor coils or kits will require the use of a compressor start kit on the HS10 unit.

V - CLEARANCES

Provide service and air flow clearances as illustrated in Figure 1.

36 inches (914 mm) at service access panel
12 inches (305 mm) at back and sides
48 inches (1219 mm) top clearance

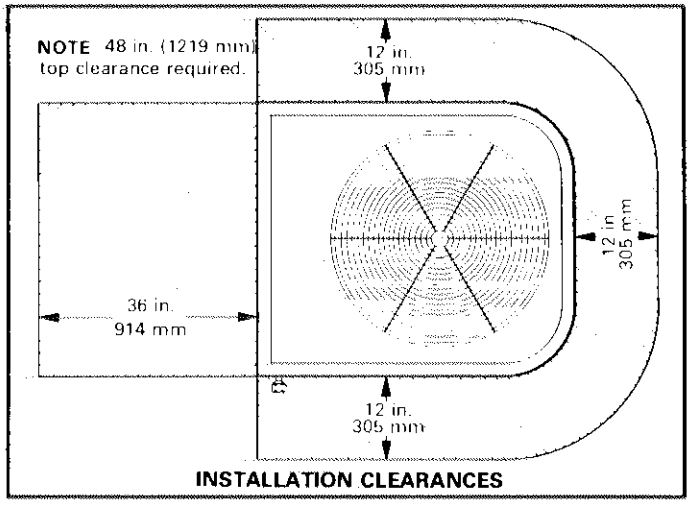


FIGURE 1

VI - SETTING THE UNIT

Refer to unit dimensions on Page 1 for sizing mounting slab, platforms or supports.

A - Slab Mounting

When installing unit at grade level, install on a level slab high enough above the grade to allow adequate drainage of water. Top of the slab should be located so run-off water from higher ground will not collect around unit.

B - Roof Mounting

Install the unit a minimum of 4 inches (102 mm) above the surface of the roof. Care must be taken to insure that the weight of the unit is properly distributed over roof joists and rafters. Either redwood or steel supports are recommended.

VII - ELECTRICAL

Wiring must conform to the National Electric Code (NEC) and local codes. Application diagrams are provided in this instruction and in furnace or blower/coil unit instructions.

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

A - Low Voltage

2 wire low voltage connections are made up just below the control box. Refer to Figure 2.

B - Line Voltage

To facilitate conduit, knockouts are provided in cabinet panel that line up with a wiring hole in control box. Route conduit through knockout in cabinet and terminate at hole in control box as illustrated in Figure 2.

CAUTION - The contactor terminals in the HS10 series units are not suitable for the connection of aluminum field wiring. For aluminum wiring, it is recommended that: (1) aluminum field wiring be spliced to the factory provided copper stub wiring with suitable connectors or that (2) copper wiring be used from the unit contactor and joined to the aluminum field wiring at a field installed unit disconnect switch that is suitable for both copper and aluminum conductors. Refer the following special instructions for joining aluminum and copper conductors.

SPECIAL INSTRUCTIONS FOR ALUMINUM CONDUCTOR CONNECTIONS TO COPPER CONDUCTOR OR TERMINALS

The dissimilar physical, electrical and chemical properties of copper and aluminum requires that special joining techniques be used when making electrical connections between the two metals.

1 - Use only connectors which are U.L. approved for aluminum and for the particular application. Such connectors for joining aluminum to copper conductors will be tin plated, have separate bars for placement between conductors to prevent direct contact between aluminum and copper, and have large bearing surfaces to minimize unit pressures for minimum cold flowing of the aluminum and subsequent loosening of joints.

2 - After insulation is stripped from aluminum conductor, coat the end of the conductor with corrosion inhibitor, such as Burndy "Penetrox," and wire brush through the inhibitor to the aluminum surface.

3 - After cleaning, recoat aluminum conductor with Penetrox A and make up the connections.
IMPORTANT - Follow the manufacturer's recommendations of torque requirements for tightening bolts.

4 - Coat the entire connection with Penetrox A.

5 - If applicable, provide suitable wrap around the connection for moisture and/or electrical protection.

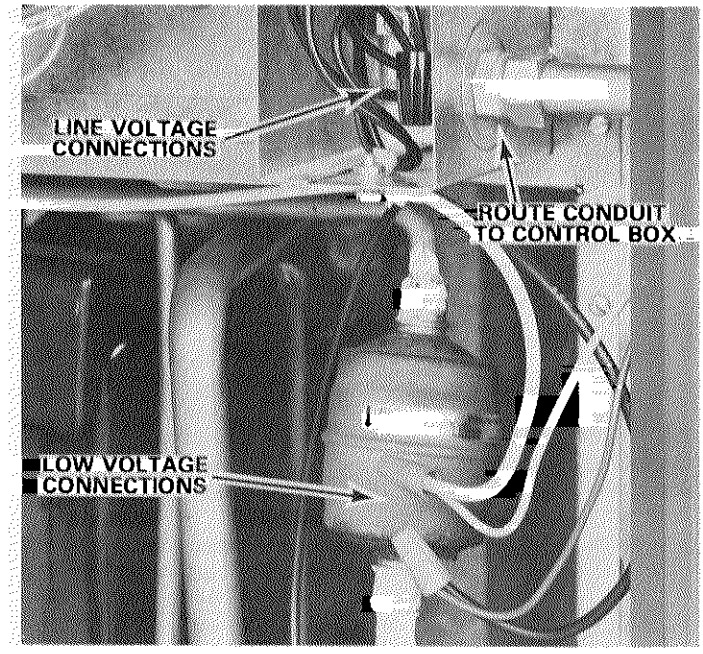


FIGURE 2

VIII - REFRIGERANT PIPING

Field refrigerant piping consists of liquid and suction lines from the condensing unit to the indoor evaporator coil. Use either Lennox L10 series line sets as indicated in Table 1 or field fabricated refrigerant lines. Refer to "Piping Section" of the Lennox Cooling Service Handbook for proper size, type and application of field fabricated lines.

A - Piping Connections at Condensing Unit

All HS10 units are equipped with compression fitting connections. To assure proper compression line connections, make connections as follows:

Step 1 - (Figure 3) Check that end of refrigerant line is:
- a - cut square
- b - round
- c - not nicked or dented
- d - de-burred (I.D. and O.D.)

Step 2 - Remove nut from fitting. Discard shipping plug and O-ring. (Figure 4)

Step 3 - Slip the nut and ferrule onto the tubing. Then apply a few drops of refrigerant oil on the ferrule and the fitting threads (Figure 5). The oil will reduce assembly torque and assist sealing.

Step 4 - (Figure 6) insert the tube end into fitting body until it bottoms. Push the ferrule into place and draw the nut up snug with a wrench (until increase in torque is felt) while holding the tube in bottomed position.

IMPORTANT - The tube end must stay bottomed in the fitting during final assembly to ensure proper seating, sealing and rigidity.

Step 5 - Finally, mark the nut and tube (Figure 7) and tighten 1-1/2 turns from the mark.

B - Piping Connections at Indoor Coil

Consists of flare connections to indoor coil. Refer to installation instructions with indoor coil and expansion valve kits (if used) for proper refrigerant line connections.

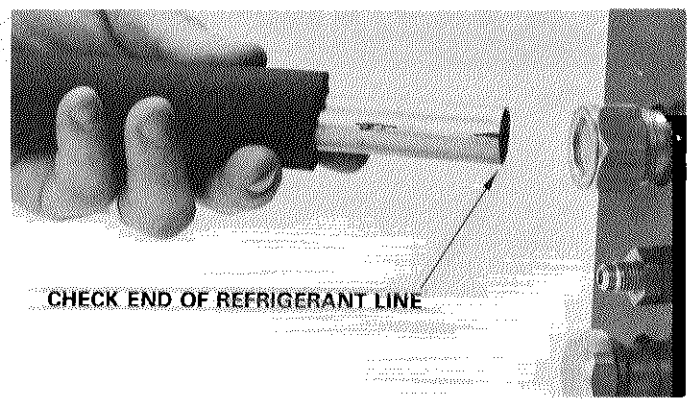


FIGURE 3

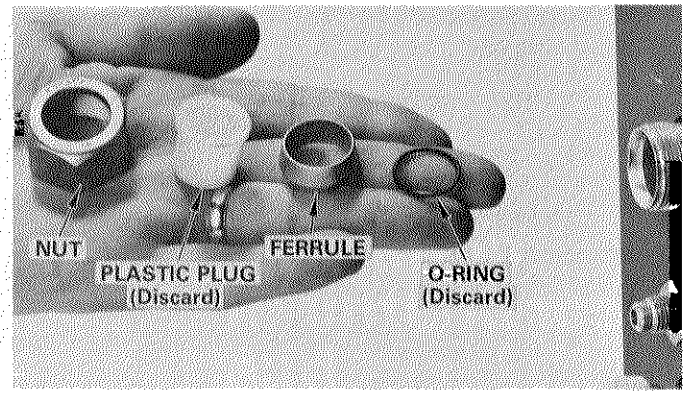


FIGURE 4

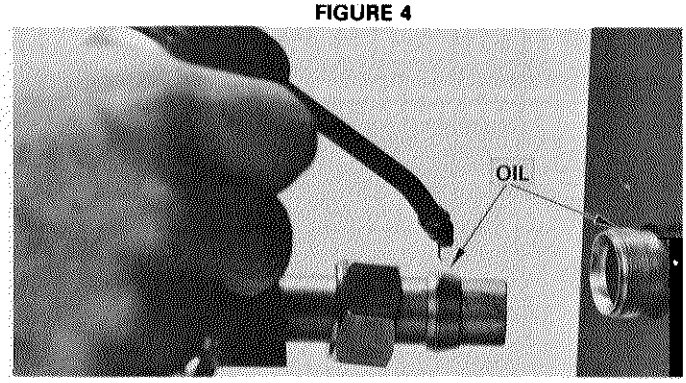


FIGURE 5

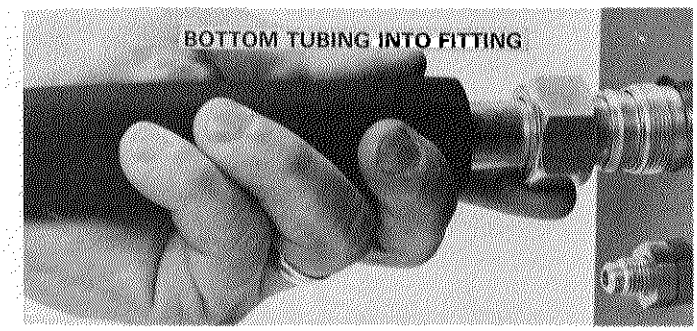


FIGURE 6

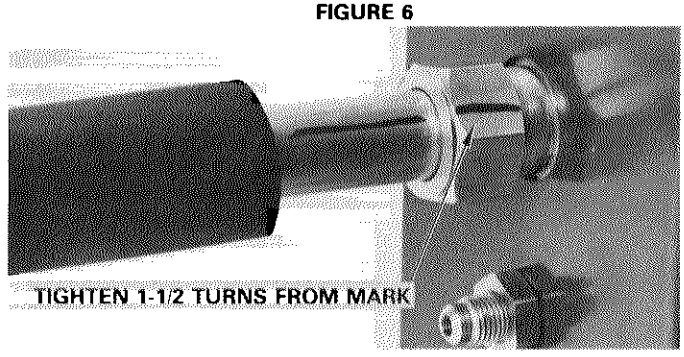
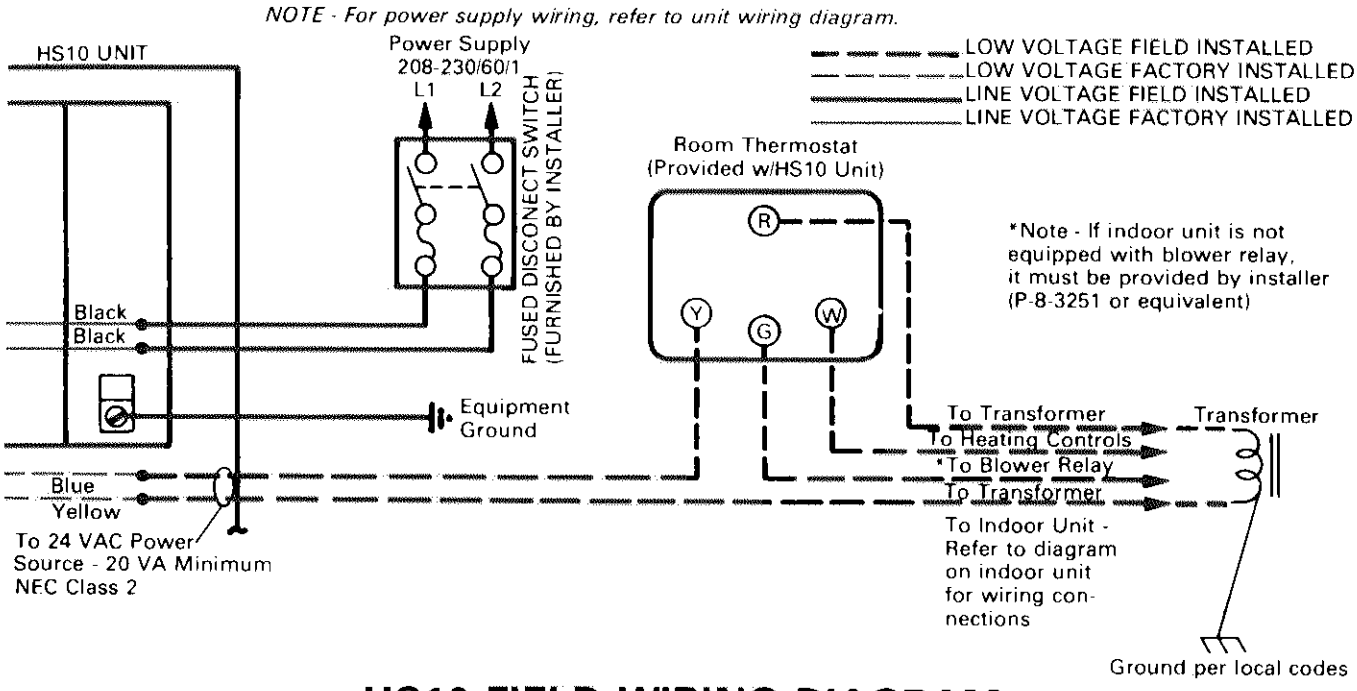


FIGURE 7

TABLE 1

Condensing Unit Model	L10 LINE SETS											
	Line Set Numbers	Length		Suction Line Connections				Liquid Line Connections			
				Cond. Unit (Stub)		Indoor Coil (Flare)		Cond. Unit (Stub)		Indoor Coil (Flare)	
		ft	m	In	mm	In	mm	In	mm	In	mm
HS10-311V HS10-410V	L10-41-20	20	6,1	3/4	19,1	3/4	19,1	3/8	9,5	3/8	9,5
	L10-41-30	30	9,1	3/4	19,1	3/4	19,1	3/8	9,5	3/8	9,5
	L10-41-40	40	12,2	3/4	19,1	3/4	19,1	3/8	9,5	3/8	9,5
	L10-41-50	50	15,2	3/4	19,1	3/4	19,1	3/8	9,5	3/8	9,5
HS10-460V	L10-65-30	30	9,1	7/8	22,2	3/4	19,1	3/8	9,5	3/8	9,5
	L10-65-40	40	12,2	7/8	22,2	3/4	19,1	3/8	9,5	3/8	9,5
	L10-65-50	50	15,2	7/8	22,2	3/4	19,1	3/8	9,5	3/8	9,5



HS10 FIELD WIRING DIAGRAM
525,016W