

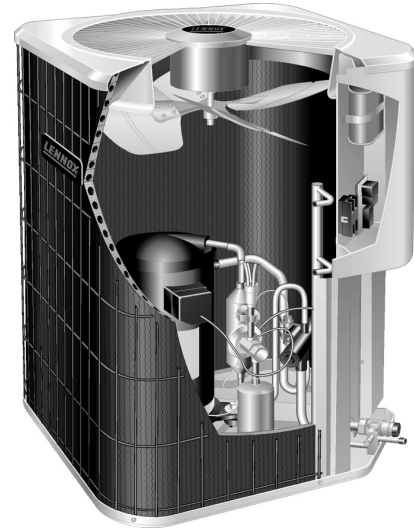
13HPX SERIES UNITS

The 13HPX is a residential split-system heat pump. The series is designed for use with expansion valves (TXV) and R-410A refrigerant. All 13HPX units utilize scroll compressors.

13HPX series units are available in 1 1/2, 2, 2 -1/2, 3, 3 -1/2, 4 and 5 ton capacities. All major components (indoor blower and coil) must be matched according to Lennox recommendations for the compressor to be covered under warranty. Refer to the Engineering Handbook for approved system matchups.

This manual is divided into sections which discuss the major components, refrigerant system, charging procedure, maintenance and operation sequence.

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



**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.

⚠ 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.

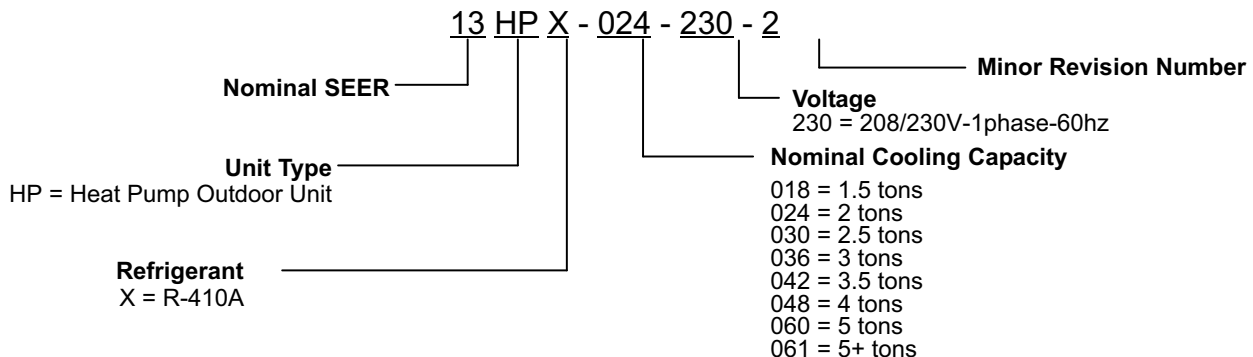
⚠ CAUTION

In order to avoid injury, take proper precaution when lifting heavy objects.

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MODEL NUMBER IDENTIFICATION



SPECIFICATIONS

General Data		Model No.	13HPX-018	13HPX-024	13HPX-030	13HPX-036
Nominal Tonnage			1.5	2	2.5	3
¹ Sound Rating Number			76	76	76	76
Connections (sweat)	Liquid line o.d. - in.		3/8	3/8	3/8	3/8
	Vapor line o.d. - in.		3/4	3/4	3/4	7/8
² Refrigerant		R-410A charge furnished	7 lbs. 4 oz.	7 lbs. 8 oz.	8 lbs. 6 oz.	8 lbs. 12 oz.
Outdoor Coil	Net face area	Outer coil	15.21	15.21	13.30	15.21
		sq. ft. Inner coil	---	---	12.60	14.50
		Tube diameter - in.	5/16	5/16	5/16	5/16
		No. of rows	1	1	2	2
		Fins per inch	22	22	22	22
Outdoor Fan	Diameter - in.		18	18	18	18
	No. of Blades		3	3	4	4
	Motor hp		1/5	1/5	1/5	1/5
	Cfm		2400	2400	2440	2450
	Rpm		1130	1130	1095	1100
	Watts		166	166	194	190
Shipping Data - lbs. 1 package			140	150	170	180

ELECTRICAL DATA

Line voltage data - 60 hz - 1ph		208/230V	208/230V	208/230V	208/230V
³ Maximum overcurrent protection (amps)		20	30	30	35
⁴ Minimum circuit ampacity		12.3	17.9	18.7	21.9
Compressor	Rated Load Amps	9.0	13.5	14.1	16.7
	Locked Rotor Amps	48	58.3	73	79
	Power Factor	0.96	0.97	0.98	0.98
Outdoor Fan Motor	Full Load Amps	1.1	1.1	1.1	1.1
	Locked Rotor Amps	1.9	1.9	1.9	1.9

OPTIONAL ACCESSORIES - must be ordered extra

Compressor Crankcase Heater		93M05	•	•	•	•
Compressor Hard Start Kit		10J42	•			
		88M91		•	•	•
Compressor Low Ambient Cut-Off		45F08	•	•	•	•
Compressor Sound Cover		69J03	•	•	•	•
Freezestat	3/8 in. tubing	93G35	•	•	•	•
	5/8 in. tubing	50A93	•	•	•	•
Hail Guards		92M89	•	•		•
		92M88			•	
⁵ Low Ambient Kit		54M89	•	•	•	•
Low Pressure Switch Bypass Thermostat		13W07	•	•	•	•
Mild Weather Kit		33M07	•	•	•	•
Monitor Kit - Service Light		76F53	•	•	•	•
Mounting Base		69J06	•	•	•	•
Outdoor Thermostat Kit	Thermostat	56A87	•	•	•	•
	Mounting Box	31461	•	•	•	•
Refrigerant Line Sets	L15-41-20	L15-41-40	•	•	•	
	L15-41-30	L15-41-50				
	L15-65-30	L15-65-40 L15-65-50				•
Time Delay Relay Kit		58M81	•	•	•	•
Unit Stand-Off Kit		94J45	•	•	•	•

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

¹ Sound Rating Number rated in accordance with test conditions included in ARI Standard 270.

² Refrigerant charge sufficient for 15 ft. length of refrigerant lines.

³ HACR type circuit breaker or fuse.

⁴ Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.

⁵ Crankcase Heater and Freezestat are recommended with Low Ambient Kit.

SPECIFICATIONS

General Data		Model No.	13HPX-042	13HPX-048	13HPX-060	13HPX-061	
Nominal Tonnage			3.5	4	5	5	
¹ Sound Rating Number			80	80	80	80	
Connections (sweat)		Liquid line o.d. - in.	3/8	3/8	3/8	3/8	
		Vapor line o.d. - in.	7/8	7/8	1-1/8	1-1/8	
² Refrigerant		R-410A charge furnished	10 lbs. 10 oz.	13 lbs. 2 oz.	15 lbs. 3 oz.	15 lbs. 9 oz.	
Outdoor Coil		Net face area	18.66	21.11	24.50	29.09	
		Outer coil sq. ft.	17.95	20.31	23.56	28.16	
		Inner coil					
		Tube diameter - in.	5/16	5/16	5/16	5/16	
		No. of rows	2	2	2	2	
Outdoor Fan		Fins per inch	22	22	22	22	
		Diameter - in.	22	22	22	26	
		No. of Blades	4	4	4	4	
		Motor hp	1/3	1/3	1/4	1/3	
		Cfm	3890	3890	3830	45500	
		Rpm	1080	1085	825	830	
		Watts	400	375	330	307	
Shipping Data - lbs. 1 package			220	250	255	298	

ELECTRICAL DATA

Line voltage data - 60 hz - 1ph		208/230V	208/230V	208/230V	208/230V	
³ Maximum overcurrent protection (amps)		40	50	60	60	
⁴ Minimum circuit ampacity		24.1	28.9	34.6	34.6	
Compressor		Rated Load Amps	17.9	21.8	26.3	26.3
		Locked Rotor Amps	112	117	134	134
		Power Factor	0.94	0.95	0.98	0.98
Outdoor Fan Motor		Full Load Amps	1.7	1.7	1.7	1.8
		Locked Rotor Amps	4.1	4.1	3.1	2.9

OPTIONAL ACCESSORIES - must be ordered extra

Compressor Crankcase Heater	Factory	•	•	•	•
Compressor Hard Start Kit	88M91	•	•	•	•
Compressor Low Ambient Cut-Off	45F08	•	•	•	•
Compressor Sound Cover	69J03	•	•	•	•
Freezestat	3/8 in. tubing	93G35	•	•	•
	5/8 in. tubing	50A93	•	•	•
Hail Guards		12W21	•		
		92M90		•	
		92M94			•
		94M94			•
⁵ Low Ambient Kit	54M89	•	•	•	•
Low Pressure Switch Bypass Thermostat	13W07	•	•	•	•
Mild Weather Kit	33M07	•	•	•	•
Monitor Kit - Service Light	76F53	•	•	•	•
Mounting Base	69J07	•	•	•	•
Outdoor Thermostat Kit	Thermostat	56A87	•	•	•
	Mounting Box	31461	•	•	•
Refrigerant Line Sets	L15-65-30		•	•	
	L15-65-40 L15-65-50				
	Field Fabricate			•	•
Time Delay Relay Kit	58M81	•	•	•	•
Unit Stand-Off Kit	94J45	•	•	•	•

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

¹ Sound Rating Number rated in accordance with test conditions included in ARI Standard 270.

² Refrigerant charge sufficient for 15 ft. length of refrigerant lines.

³ HACR type circuit breaker or fuse.

⁴ Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.

⁵ Crankcase Heater and Freezestat are recommended with Low Ambient Kit.

I - UNIT COMPONENTS

Unit components are illustrated in figure 1.

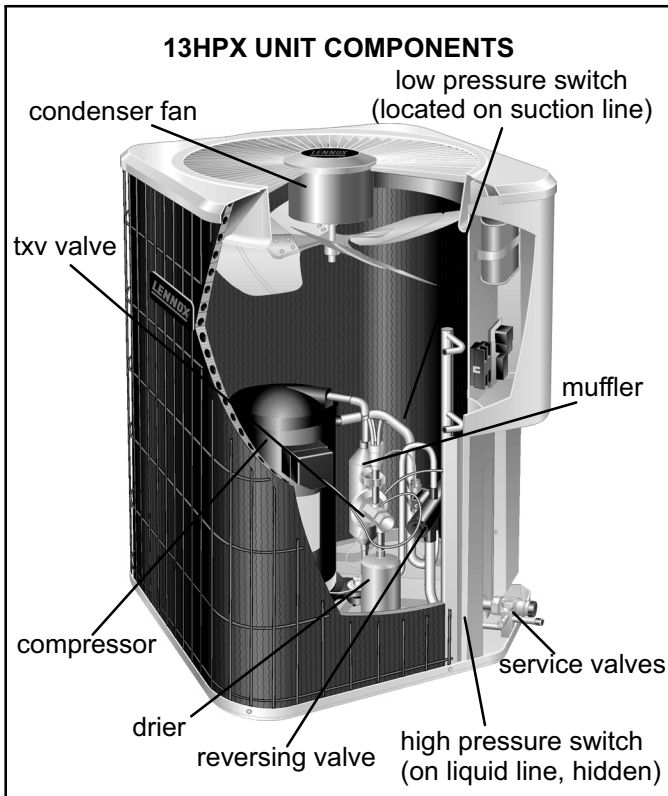


FIGURE 1

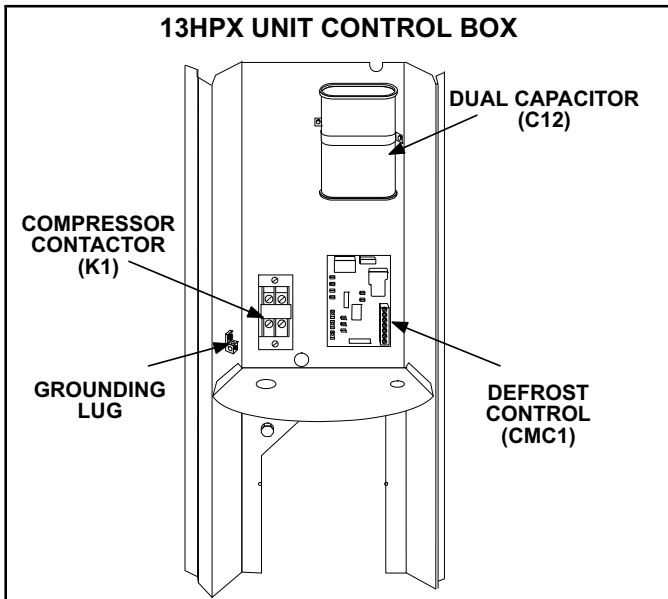


FIGURE 2

A - Control Box (Figure 2)

13HPX units are not equipped with a 24V transformer. All 24 VAC controls are powered by the indoor unit. Refer to wiring diagram.

Electrical openings are provided under the control box cover. Field thermostat wiring is made to a 24V terminal strip located on the defrost control board located in the control box. See figure 3.

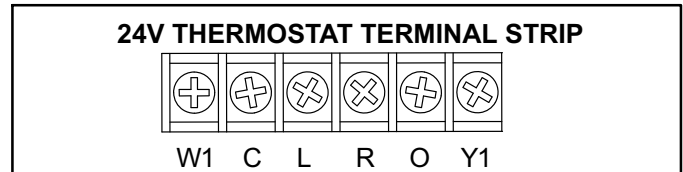


FIGURE 3

1 - Compressor Contactor K1

The compressor is energized by a contactor located in the control box. See figure 2. Single-pole contactors are used in 13HPX series units. See wiring diagrams for specific unit. K1 is energized through the CMC1 board by the indoor thermostat terminal Y1 (24V) 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).

2 - Dual Capacitor C12

The compressor and fan in 13HPX series units use permanent split capacitor motors. The capacitor is located inside the unit control box (see figure 2). A single "dual" capacitor (C12) is used for both the fan motor and the compressor (see unit wiring diagram). The fan side and the compressor side of the capacitor have different MFD ratings.

3 - Defrost System

The 13HPX defrost system includes two components: a defrost thermostat and a defrost control.

Defrost Thermostat

The defrost thermostat is located on the liquid line between the check/expansion valve and the distributor. When defrost thermostat senses 42°F (5.5°C) or cooler, the thermostat 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, diagnostic LEDs and terminal strip for field wiring connections. See figure 4.

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.

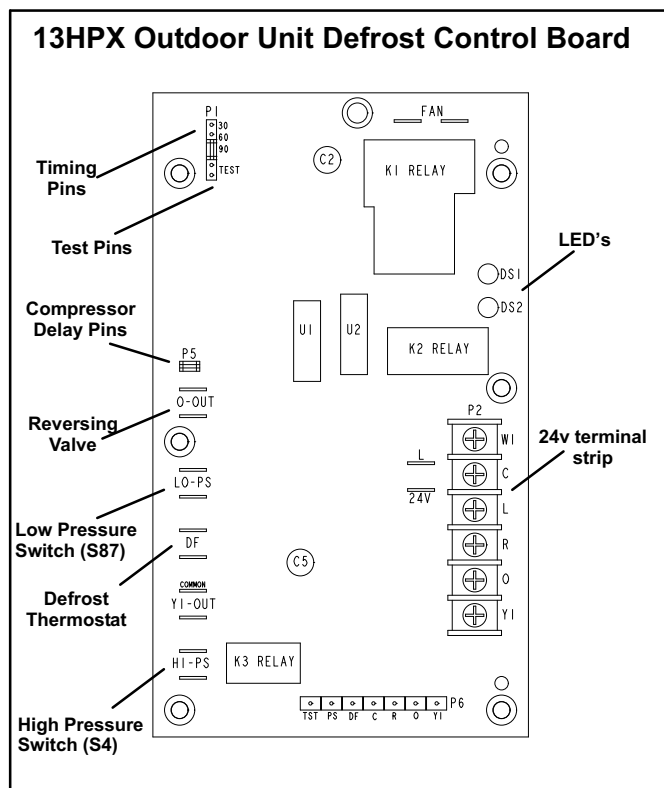


FIGURE 4

Defrost Control Timing Pins

Each timing pin selection provides a different accumulated compressor run time period for one defrost 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 4). The defrost timing jumper is factory-installed to provide a 60-minute defrost

interval on the 5 ton unit but a 90-minute defrost interval on all other 13HPX size units. 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.

Compressor Delay

The defrost board has a field-selectable function to reduce occasional sounds that may occur while the unit is cycling in and out of the defrost mode. The compressor will be cycled off for 30 seconds going in and out of the defrost mode when the compressor delay jumper is removed.

NOTE - The 30-second "off" cycle is not functional when jumpering the TEST pins.

Time Delay

The timed-off delay is five minutes long. The delay helps to 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 Circuit

The defrost control incorporates two pressure switch circuits. The high pressure switch (S4) connects to the board's HI PS terminals. The board also includes terminals LO-PS for a low pressure switch (S87). See figure 4 for switch terminal location.

During a single demand cycle, the defrost control will lock out the unit after the fifth time that the circuit is interrupted by any pressure switch wired to the control board. In addition, the diagnostic LEDs will indicate a locked-out pressure switch after the fifth occurrence of an open pressure switch (see Table 1). The unit will remain locked out until power to the board is interrupted, then re-established 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 as follows:

- 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.**

Diagnostic LEDs

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

TABLE 1

Defrost Control Board Diagnostic LED		
Mode	Green LED (DS2)	Red LED (DS1)
No power to control	OFF	OFF
Normal operation / power to control	Simultaneous Slow FLASH	
Anti-short cycle lock-out (5 minute)	Alternating Slow FLASH	
Low pressure switch fault	OFF	Slow FLASH
Low pressure switch lockout	OFF	ON
High pressure switch fault	Slow FLASH	OFF
High pressure switch lockout	ON	OFF

B - Compressor

All 13HPX units utilize a 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 5. The scrolls are located in the top of the compressor can and the motor is located just below. 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 6 shows the basic scroll form. Two identical scrolls are mated together forming concentric spiral shapes (figure 7). One scroll remains stationary, while the other is allowed to "orbit" (figure 8). Note that the orbiting scroll does not rotate or turn but merely orbits the stationary scroll.

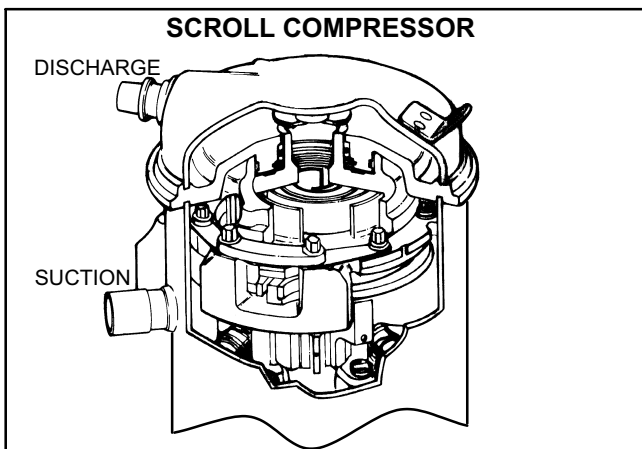


FIGURE 5

NOTE - During operation, the head of a scroll compressor may be hot since it is in constant contact with discharge gas.

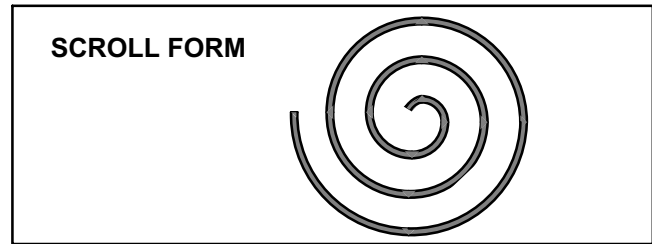


FIGURE 6

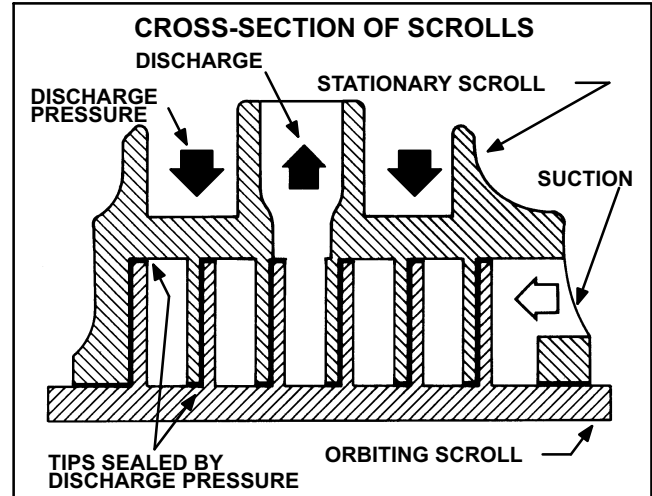


FIGURE 7

The counterclockwise orbiting scroll draws gas into the outer crescent shaped gas pocket created by the two scrolls (figure 8 - 1). The centrifugal action of the orbiting scroll seals off the flanks of the scrolls (figure 8 - 2). As the orbiting motion continues, the gas is forced toward the center of the scroll and the gas pocket becomes compressed (figure 8 - 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 7). The discharge pressure forcing down on the top scroll helps seal off the upper and lower edges (tips) of the scrolls (figure 7). 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.

Due to its efficiency, the scroll compressor is capable of drawing a much deeper vacuum than reciprocating compressors. Deep vacuum operation can cause internal fusite arcing resulting in damaged internal parts and will result in compressor failure. Never use a scroll compressor for evacuating or "pumping-down" the system. This type of damage can be detected and will result in denial of warranty claims.

The scroll compressor is quieter than a reciprocating compressor, however, the two compressors have much different sound characteristics. The sounds made by a scroll compressor do not affect system reliability, performance, or indicate damage.

See compressor nameplate and ELECTRICAL DATA table on page 2 for compressor specifications.

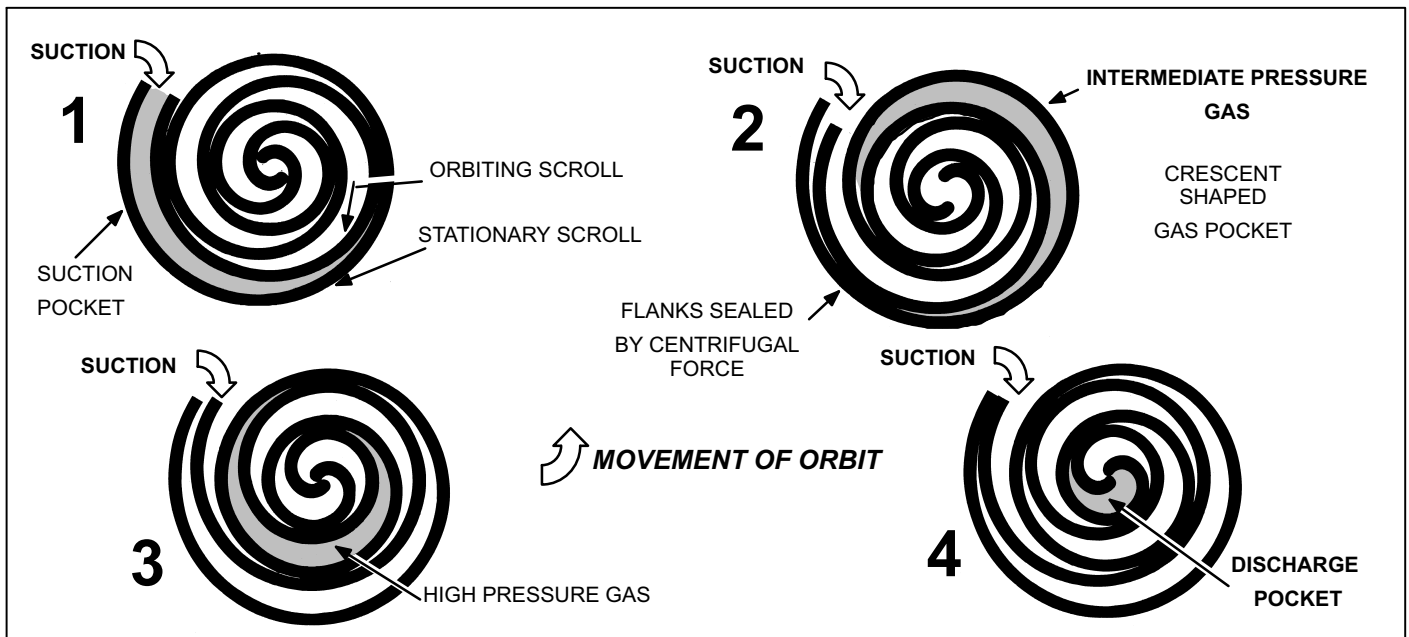


FIGURE 8

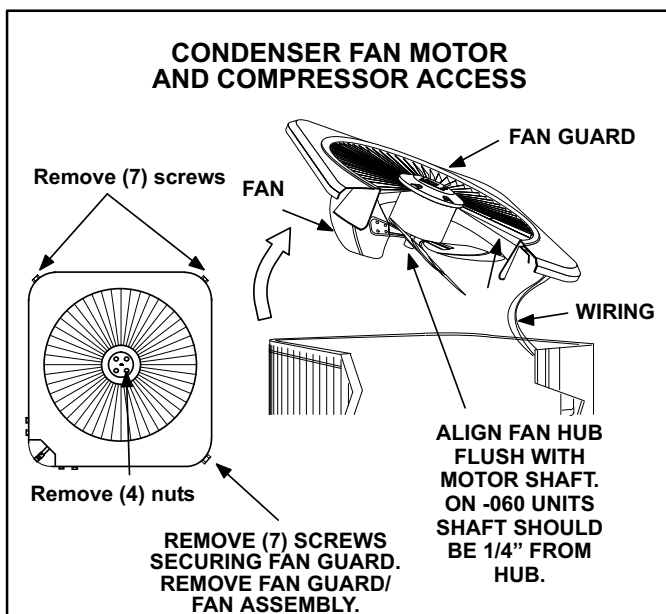


FIGURE 9

⚠ DANGER

Make sure all power is disconnected before beginning electrical service procedures.

C - Outdoor Fan Motor

All units use single-phase PSC fan motors which require a run capacitor. In all units, the condenser fan is controlled by the compressor contactor (and defrost control during defrost cycles).

ELECTRICAL DATA tables in this manual show specifications for condenser fans used in 13HPXs.

Access to the condenser fan motor on all units is gained by removing the seven screws securing the fan assembly. See figure 9. The outdoor fan motor is removed from the fan guard by removing the four nuts found on the top panel. If replacing outdoor fan motor on the 13HPX-060, align motor shaft 1/4" from the hub. For all other 13HPX model units, motor shaft should be flush with hub. See figure 9. Drip loops should be used in wiring when servicing motor.

D - Reversing Valve L1 and Solenoid

A refrigerant reversing valve with electromechanical solenoid is used to reverse refrigerant flow during unit operation. The reversing valve requires no maintenance. The only replaceable part is the solenoid. If the reversing valve itself has failed, it must be replaced.

If replacement is necessary, access reversing valve by removing the outdoor fan motor. Refer to figure 9.

E - High Pressure Switch S4

⚠ IMPORTANT

Pressure switch settings for R-410A refrigerant will be significantly higher than units with R-410A.

An auto-reset, single-pole/single-throw high pressure switch is located in the liquid line. This switch 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 590 ± 15 psi.

F - Low Pressure Switch S87

An auto-reset, single-pole/single-throw low pressure switch is located in the suction line. This switch shuts off the compressor when suction pressure drops below the factory setting. The switch is closed during normal operating pressure conditions and is permanently adjusted to trip

(open) at 25 ± 5 psi. The switch automatically resets when suction line pressure rises above 40 ± 5 psi. Under certain conditions the low pressure switch is ignored. See *Pressure Switch Circuit* in the Defrost Control description.

G - Drier

A filter drier designed for all 13HPX model units is factory installed in the liquid line. The filter drier is designed to remove moisture and foreign matter, which can lead to compressor failure.

Moisture and / or Acid Check

Because POE oils absorb moisture, the dryness of the system must be verified any time the refrigerant system is exposed to open air. A compressor oil sample must be taken to determine if excessive moisture has been introduced to the oil. Table 2 lists kits available from Lennox to check POE oils.

If oil sample taken from a system that has been exposed to open air does not test in the dry color range, the filter drier **MUST** be replaced.

⚠ IMPORTANT

Replacement filter drier MUST be approved for R-410A refrigerant and POE application.

Foreign Matter Check

It is recommended that a liquid line filter drier be replaced when the pressure drop across the filter drier is greater

II - REFRIGERANT SYSTEM

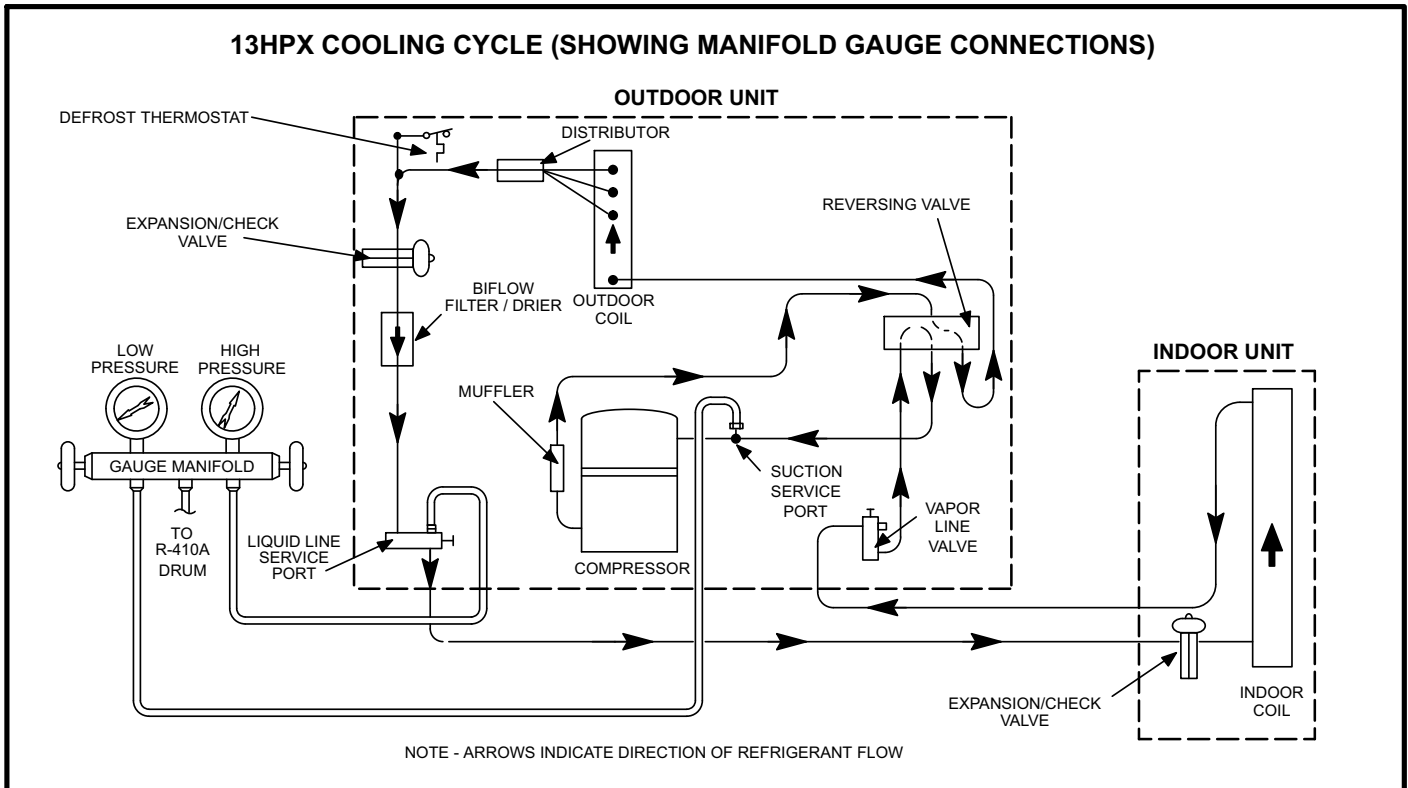


FIGURE 10

than 4 psig. To safeguard against moisture entering the system follow the steps in section III - sub section C - "Evacuating the System" when replacing the drier.

H - Crankcase Heater HR1 & Thermostat S40 (options)

Crankcase heater HR1 is an option for all size units, while thermostat S40 is an option for 5 ton units only. HR1 is a 40 watt heater that prevents liquid from accumulating in the compressor. In the 13HPX-060 (5 ton unit) HR1 is controlled by thermostat S40 located in the liquid line. When liquid line temperature drops below 50° F, S40 closes energizing HR1. S40 will open once liquid line temperature reaches 70° , de-energizing HR1.

TABLE 2

KIT	CONTENTS	TUBE SHELF LIFE
10N46 - Refrigerant Analysis	Checkmate-RT700	
10N45 - Acid Test Tubes	Checkmate-RT750A (three pack)	2 - 3 years @ room temperature. 3+ years refrigerated
10N44 - Moisture Test Tubes	Checkmate - RT751 Tubes (three pack)	6 - 12 months @ room temperature. 2 years refrigerated
74N40 - Easy Oil Test Tubes	Checkmate - RT752C Tubes (three pack)	2 - 3 years @ room temperature. 3+ years refrigerated
74N39 - Acid Test Kit	Sporian One Shot - TA-1	

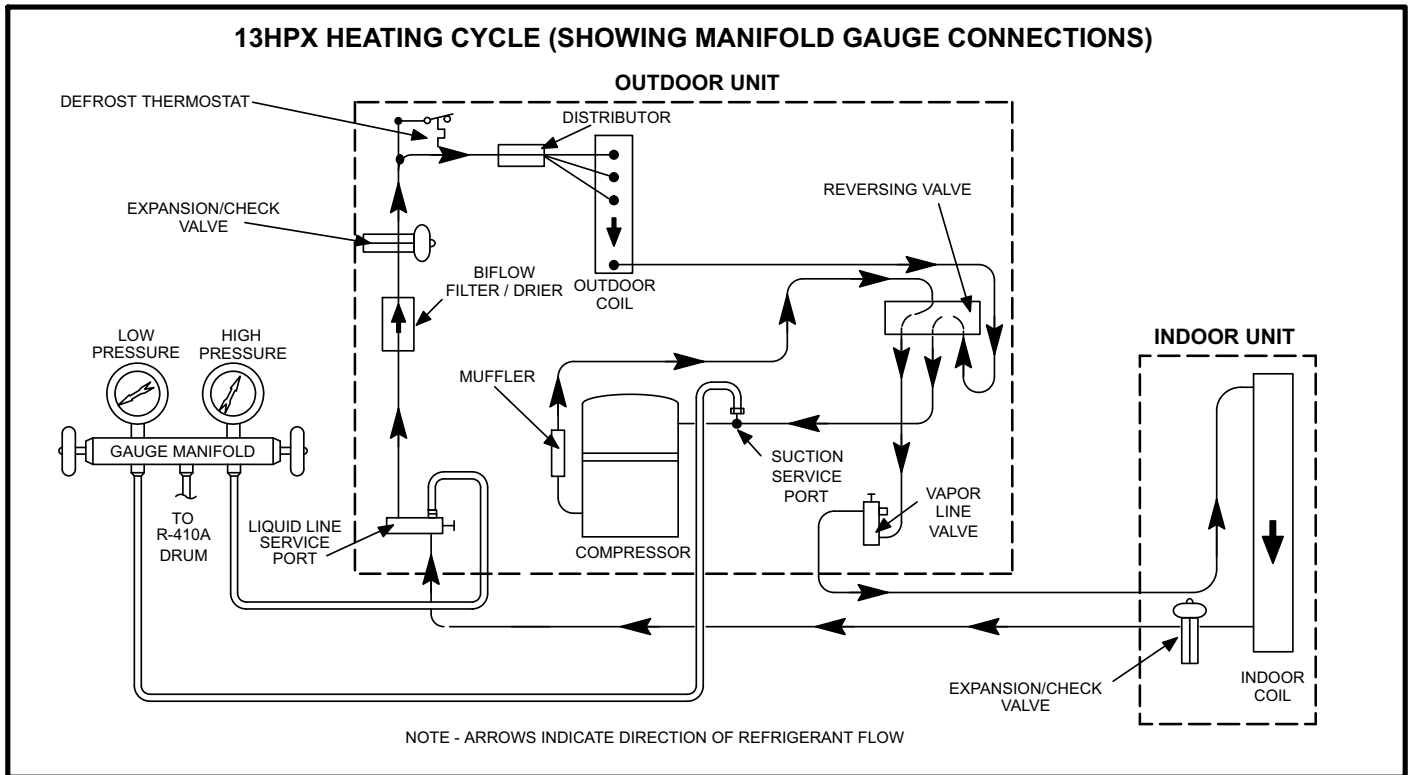


FIGURE 11

A - Plumbing

Field refrigerant piping consists of liquid and vapor lines from the outdoor unit (sweat connections). Use Lennox L15 (sweat) series line sets as shown in table 3.

TABLE 3

Refrigerant Line Sets					
Model	Field Connections		Recommended Line Set		
-018 -024 -030	3/8 in. (10 mm)	3/4 in. (19 mm)	3/8 in. (10 mm)	3/4 in. (19 mm)	L15-41 15 ft. - 50 ft. (4.6 m - 15 m)
-036 -042 -048	3/8 in. (10 mm)	7/8 in. (22 mm)	3/8 in. (10 mm)	7/8 in. (22 mm)	L15-65 15 ft. - 50 ft. (4.6 m - 15 m)
-060 -061	3/8 in. (10 mm)	1-1/8 in. (29 mm)	3/8 in. (10 mm)	1-1/8 in. (29 mm)	Field Fabricated

B - Service Valves

⚠ IMPORTANT

Only use Allen wrenches of sufficient hardness (50Rc - Rockwell Harness Scale min). Fully insert the wrench into the valve stem recess. Service valve stems are factory torqued (from 9 ft lbs for small valves, to 25 ft lbs for large valves) to prevent refrigerant loss during shipping and handling. Using an Allen wrench rated at less than 50Rc risks rounding or breaking off the wrench, or stripping the valve stem recess.

The liquid and vapor line service valves (figures 12 and 13) and gauge ports are accessible from outside the unit.

Each valve is equipped with a service port. The service ports are used for leak testing, evacuating, charging and checking charge. A Schrader valve is factory installed. A service port cap is supplied to protect the Schrader valve from contamination and serve as the primary leak seal.

NOTE-Always keep valve stem caps clean.

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 hex head extension (5/16 for vapor line and 3/16 for liquid line), back the stem out counterclockwise until the valve stem just touches the retaining ring.
- 3 - Replace stem cap and 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 hex head extension (5/16 for vapor line and 3/16 for liquid line), turn stem clockwise to seat the valve. Tighten firmly.

- 3 - Replace stem cap. Tighten finger tight, then tighten an additional 1/6 turn.

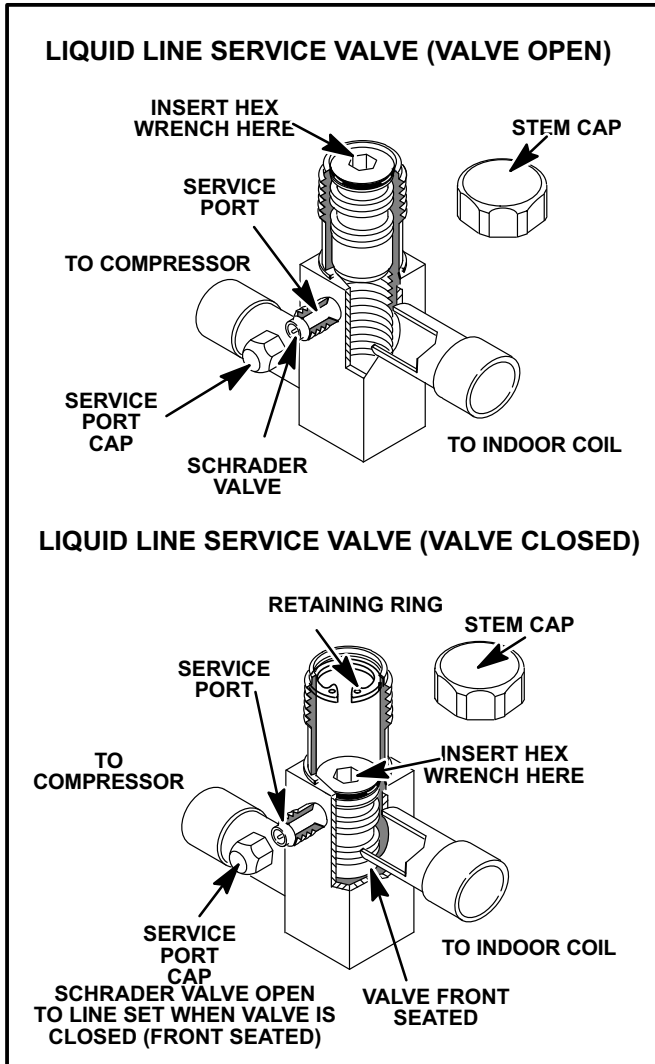


FIGURE 12

Vapor Line (Ball Type) Service Valve

A ball-type full service valve is used on 13HPX. Valves are not re-buildable. If a valve has failed it must be replaced. A ball valve is illustrated in figure 13.

The ball 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.

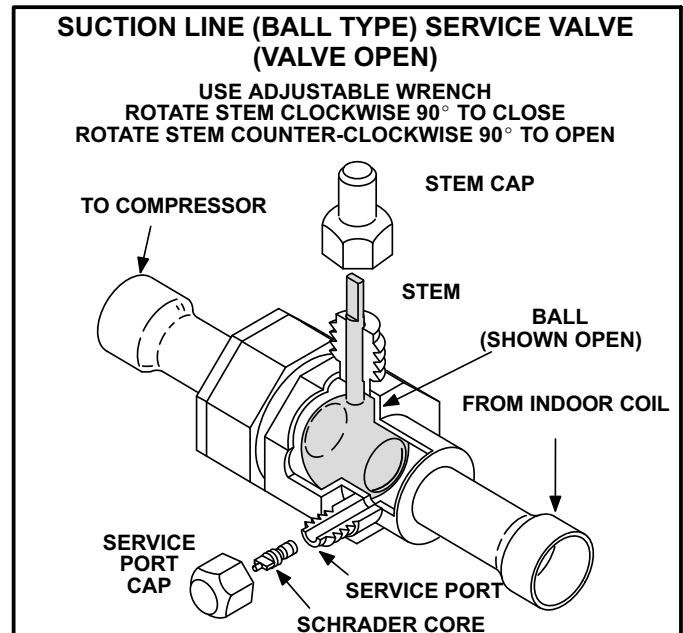


FIGURE 13

III - CHARGING

A - Pumping Down System

⚠ CAUTION

Deep vacuum operation (operating compressor at 0 psig or lower) can cause internal fuseite arcing resulting in a damaged or failed compressor. This type of damage will result in denial of warranty claim.

The system may be pumped down when leak checking the line set and indoor coil or making repairs to the line set or indoor coil.

- 1- Attach gauge manifold.
- 2- Front seat (close) liquid line valve.
- 3- Start outdoor unit.
- 4- Monitor suction gauge. Stop unit when 0 psig is reached.
- 5- Front seat (close) suction line valve.


B - Leak Testing (To Be Done Before Evacuating)

- 1- Attach gauge manifold and connect a drum of dry nitrogen to center port of gauge manifold.
- 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-The preferred method is to use an electronic leak or Halide detector. Add a small amount of R-410A (3 to 5 psig [20kPa to 34kPa]) then pressurize with nitrogen to 150 psig.

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

⚠ WARNING	
	Fire, Explosion and Personal Safety Hazard. Failure to follow this warning could result in damage, personal injury or death. Never use oxygen to pressurize or purge refrigeration lines. Oxygen, when exposed to a spark or open flame, can cause damage by fire and / or an explosion, that can result in personal injury or death.

⚠ WARNING	
	Danger of explosion! When using a high pressure gas such as dry nitrogen to pressurize a refrigerant or air conditioning system, use a regulator that can control the pressure down to 1 or 2 psig (6.9 to 13.8 kPa).

C - Evacuating the 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.	

⚠ IMPORTANT	
The 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- 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.

D - Charging

This system is charged with HFC-410A refrigerant which operates at much higher pressures than HCFC-22. The recommended check expansion valve is approved for use with HFC-410A. Do not replace it with a valve that is designed to be used with HCFC-22. This unit is NOT approved for use with coils that include metering orifices or capillary tubes.

The unit is factory-charged with the amount of HFC-410A refrigerant indicated on the unit rating plate. This charge is based on a matching indoor coil and outdoor coil with a 15 foot (4.6 m) line set. A blank space is provided on the unit rating plate to list the actual field charge.

⚠ IMPORTANT	
Mineral oils are not compatible with HFC-410A. If oil must be added, it must be a polyol ester oil.	

CHECKING INDOOR AIRFLOW

NOTE - Be sure that filters and indoor and outdoor coils are clean before testing.

COOLING MODE INDOOR AIRFLOW CHECK

Check airflow using the Delta-T (DT) process (figure 4).

HEATING MODE INDOOR AIRFLOW CHECK

Blower airflow (CFM) may be calculated by energizing electric heat and measuring:

- temperature rise between the return air and supply air temperatures at the indoor coil blower unit,
- measuring voltage supplied to the unit,
- measuring amperage being drawn by the heat unit(s).

Then, apply the measurements taken in following formula to determine CFM:

$$CFM = \frac{\text{Amps} \times \text{Volts} \times 3.41}{1.08 \times \text{Temperature rise (F)}}$$

SETUP FOR CHARGING

Connect the manifold gauge set to the unit's service ports.

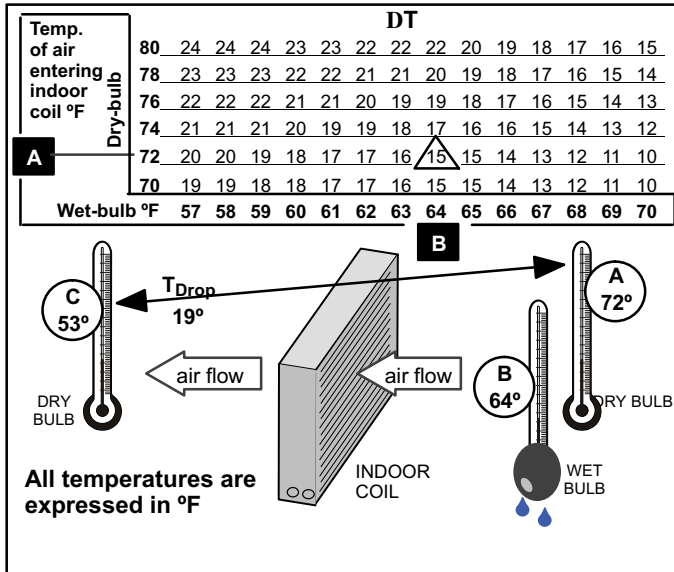
- low pressure gauge to **vapor service port**
- high pressure gauge to **liquid service port**

Close manifold gauge set valves. Connect the center manifold hose to an upright cylinder of HFC-410A.

CALCULATING CHARGE

If the system is void of refrigerant, first, locate and repair any leaks and then weigh in the refrigerant charge into the unit. To calculate the total refrigerant charge:

Amount specified on nameplate	Adjust amt. for variation in line set length (table in figure 6)	Additional charge specified per indoor unit matchup tables.	Total charge
_____	+ _____	+ _____	= _____



Step 1. Determine the desired DT—Measure entering air temperature using dry bulb (A) and wet bulb (B). DT is the intersecting value of A and B in the table (see triangle).

Step 2. Find temperature drop across coil—Measure the coil's dry bulb entering and leaving air temperatures (A and C). Temperature Drop Formula: (T_{Drop}) = A minus C.

Step 3. Determine if fan needs adjustment—If the difference between the measured T_{Drop} and the desired DT (T_{Drop}-DT) is within ±3°, no adjustment is needed. See examples: Assume DT = 15 and A temp. = 72°, these C temperatures would necessitate stated actions:

C°	T _{Drop}	DT	=	°F	ACTION
53°	19	15	=	4	Increase the airflow
58°	14	15	=	-1	(within ±3° range) no change
62°	10	15	=	-5	Decrease the airflow

Step 4. Adjust the fan speed—See indoor unit instructions to increase/decrease fan speed.

Changing air flow affects all temperatures; recheck temperatures to confirm that the temperature drop and DT are within ±3°.

Figure 4. Checking Indoor Airflow over Evaporator Coil using Delta-T (DT) Chart

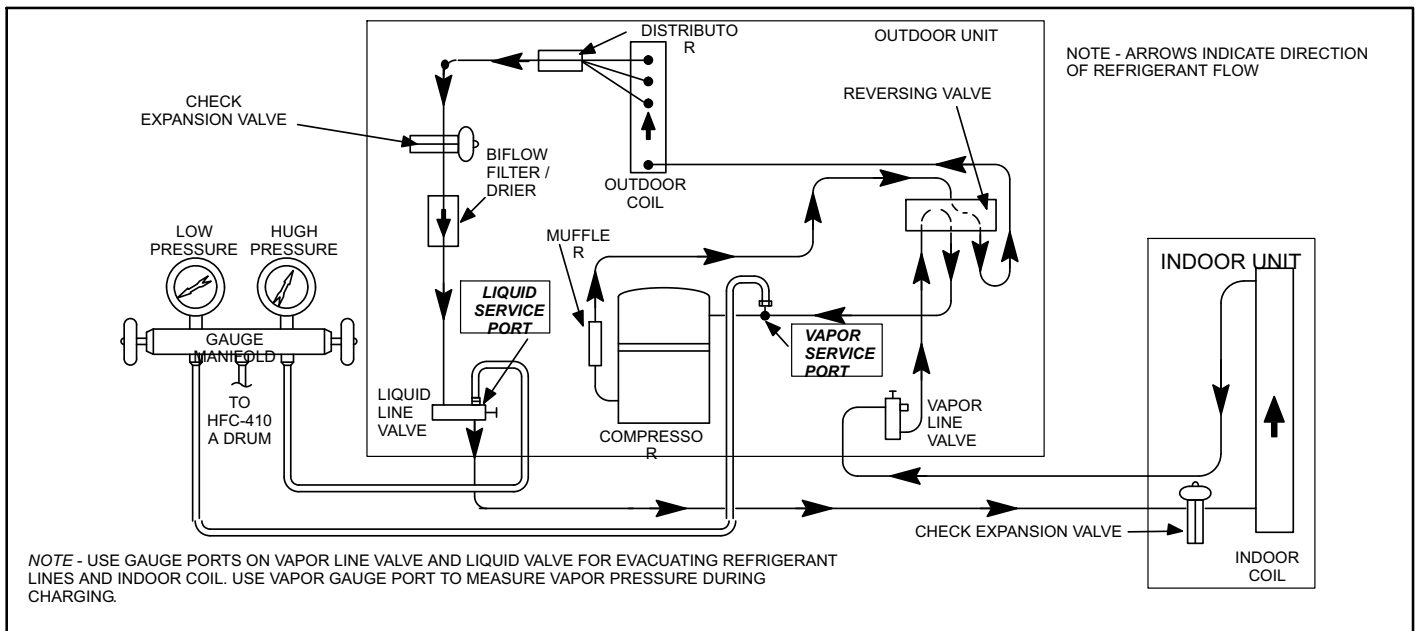


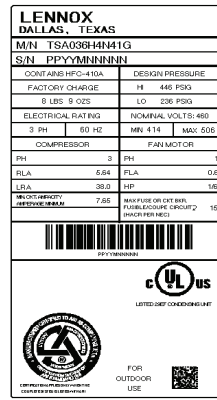
Figure 5. 13HPX Cooling Cycle (Showing Gauge Manifold Connections)

WEIGH IN

Refrigerant Charge per Line Set Length

Liquid Line Set Diameter	Ounces per 5 feet (g per 1.5 m) adjust from 15 feet (4.6 m) line set*
3/8" (9.5 mm)	3 ounce per 5' (85 g per 1.5 m)

NOTE - *If line length is greater than 15 ft. (4.6 m), add this amount. If line length is less than 15 ft. (4.6 m), subtract this amount.

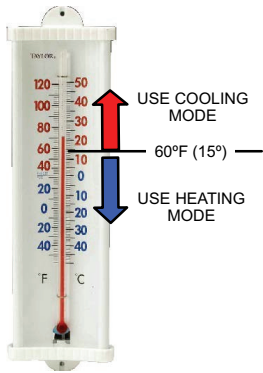


- 1.. Check Liquid and suction line pressures
- 2.. Compare unit pressures with *Normal Operating Pressures* tables.
- 3.. Conduct leak check; evacuate as previously outlined.
- 4.. Weigh in the unit nameplate charge plus any charge required for line set differences over feet.

This nameplate is for illustration purposes only. Go to actual nameplate on outdoor unit for charge information.

Figure 6. Using Weigh In Method

SUBCOOLING



SAT° = _____
 LIQ° = _____
 SC° = _____

1. Check the airflow as illustrated in figure 4 to be sure the indoor airflow is as required. (Make any air flow adjustments before continuing with the following procedure.)
2. Measure outdoor ambient temperature; determine whether to use **cooling mode** or **heating mode** to check charge.
3. Connect gauge set.
4. Check Liquid and Vapor line pressures. Compare pressures with Normal Operating Pressures tables, (*The reference table is a general guide. Expect minor pressure variations. Significant differences may mean improper charge or other system problem.*)
5. Set thermostat for heat/cool demand, depending on mode being used:

Using cooling mode—When the outdoor ambient temperature is 60°F (15°C) and above. Target subcooling values in table below are based on 70 to 80°F (21-27°C) indoor return air temperature; if necessary, operate heating to reach that temperature range; then set thermostat to cooling mode setpoint to 68°F (20°C). When pressures have stabilized, continue with step 6.

Using heating mode—When the outdoor ambient temperature is below 60°F (15°C). Target subcooling values in table below are based on 65-75°F (18-24°C) indoor return air temperature; if necessary, operate cooling to reach that temperature range; then set thermostat to heating mode setpoint to 77°F (25°C). When pressures have stabilized, continue with step 6.
6. Read the liquid line temperature; record in the LIQ° space.
7. Read the liquid line pressure; then find its corresponding temperature in the temperature/ pressure chart listed in table 24 and record it in the SAT° space.
8. Subtract LIQ° temp. from SAT° temp. to determine subcooling; record it in SC° space.
9. Compare SC° results with table below, being sure to note any additional charge for line set and/or match-up.
10. If subcooling value is greater than shown in unit indoor matchup tables for the applicable unit, remove refrigerant; if less than shown, add refrigerant.
11. If refrigerant is added or removed, repeat steps 6. through 10. to verify charge.

Figure 7. Using Subcooling Method

INDOOR UNIT MATCHUPS — 13HPX-XXX-230-04

Table 8. 13HPX-018

INDOOR MATCHUPS	Target Subcooling		*Add charge	
	Heat (±5°F)	Cool (±1°F)	lb	oz
CBX26UH-018	14	9	0	3
CBX32MV-018/024-230	12	12	0	0
CBX32MV-024/030-230	12	19	1	1

Table 9. 13HPX-024

INDOOR MATCHUPS	Target Subcooling		*Add charge	
	Heat (±5°F)	Cool (±1°F)	lb	oz
CBX26UH-024	22	16	1	0
CB30U-31	14	15	1	5
CBX32M-030	14	15	1	5
CBX32MV-018/024	14	15	0	9
CBX32MV-024/030	14	15	1	5
CH33-25B	14	15	0	0
CH33-36A	14	15	0	8
CH33-36B	14	15	0	0
CH33-36C	14	15	0	14
CR33-30/36	20	16	1	0
CX34-25	14	15	0	9
CX34-31	14	15	1	5
CX34-36	14	15	0	4

Table 10. 13HPX-030

INDOOR MATCHUPS	Target Subcooling		*Add charge	
	Heat (±5°F)	Cool (±1°F)	lb	oz
CBX26UH-030	22	6	1	7
CBX26UH-036	25	4	0	11
CBX27UH-030-230	15	4	0	11
CBX27UH-036-230	15	4	0	11
CBX32M-030 -036, -042	15	4	0	11
CBX32MV-024/030, -036	15	4	0	11
CH33-25B	15	4	0	0
CH33-31B	15	4	0	11
CH33-36A	15	4	0	8
CH33-36B	15	4	0	0
CH33-36C	15	4	0	11
CH33-42	15	4	0	11
CR33-30/36	38	9	0	13
CX34-25, -31	15	4	0	11
CX34-36	28	3	0	0
CX34-38 SN# 6007 and after	4	4	0	11
CX34-38 before SN# 6007	20	4	0	11
CX34-42	28	3	0	0

Table 11. 13HPX-036

INDOOR MATCHUPS	Target Subcooling		*Add charge	
	Heat (±5°F)	Cool (±1°F)	lb	oz
CBX26UH-036	17	10	2	7
CBX27UH-036-230	10	5	2	7
CBX27UH-042-230	10	10	2	13
CBX32M-036, -042	10	5	2	7
CBX32MV-036-230	10	5	2	7

CH33-31A, -31B	10	5	2	8
CH33-36B	10	5	0	0
CH33-36C	10	5	0	5
CH33-42	10	5	2	8
CH33-44/48B	10	5	2	10
CH33-48C	10	5	2	10

INDOOR MATCHUPS	Target Subcooling		*Add charge	
	Heat (±5°F)	Cool (±1°F)	lb	oz
CR33-30/36	25	5	0	6
CR33-48	25	5	2	8
CR33-50/60	10	5	2	10
CX34-36B	10	5	0	1
CX34-38 SN# 6007 and after	5	5	2	7
CX34-38 before SN# 6007	10	5	2	7
CX34-42B	10	5	0	1
CX34-44/48B	10	5	2	7

Table 12. 13HPX-042

INDOOR MATCHUPS	Target Subcooling		*Add charge	
	Heat (±5°F)	Cool (±1°F)	lb	oz
CBX26UH-042	26	5	1	1
CBX26UH-048	10	12	4	5
CBX27UH-042-230	10	6	4	5
CBX27UH-048-230	10	6	4	5
CBX32M-036, -042	15	5	0	0
CBX32MV-036	15	5	0	0
CBX32MV-048-230	10	6	4	5
CH33-43C, -48C	10	6	1	1
CH33-49C, -50/60C	10	6	4	5
CH33-60D	10	6	2	6
CR33-48	32	5	0	5
CR33-50/60	32	9	2	6
CR33-60	32	9	2	6
CX34-43C	10	6	1	1
CX34-49	10	6	3	7
CX34-50/60C	10	6	1	1

Table 13. 13HPX-048

INDOOR MATCHUPS	Target Subcooling		*Add charge	
	Heat (±5°F)	Cool (±1°F)	lb	oz
CBX26UH-048	9	11	1	7
CBX26UH-060	24	18	2	7
CBX27UH-048-230	11	11	1	3
CBX27UH-060-230	24	18	2	7
CBX32M-048	11	11	1	3
CBX32M-060	11	11	1	3
CBX32MV-048	11	11	1	3
CBX32MV-060-230	11	11	1	3
CH33-43C	18	7	0	0
CH33-49C, -50/60C	11	11	1	3
CH33-60D	11	11	0	9
CH33-62D	11	11	1	10
CR33-50/60	25	7	0	9
CR33-60	25	7	0	9
CX34-49	11	11	1	1
CX34-60D	11	11	0	9

Table 14. 13HPX-060

INDOOR MATCHUPS	Target Subcooling		*Add charge	
	Heat (±5°F)	Cool (±1°F)	lb	oz
CBX26UH-060	10	11	1	7
CBX27UH-060-230	10	9	0	13
CBX32MV-060	10	9	0	0
CBX32MV-068	10	9	0	9
CH33-60D	10	9	0	0
CH33-62D	10	9	0	11
CX34-62D	10	9	0	6

*Amount of charge required in additional to charge shown on unit name-plate. (Remember to consider line set length difference.)

INDOOR UNIT MATCHUPS — 13HPX-XXX-230-01 through 13HPX-XXX-230-03

Table 15. 13HPX-018

INDOOR MATCHUPS	Target Subcooling		*Add charge	
	Heat (±5°F)	Cool (±1°F)	lb	oz
CBX26UH-018	11	9	0	3
CBX32MV-018/024-230	12	12	0	0
CBX32MV-024/030-230	12	19	1	1

Table 16. 13HPX-024

INDOOR MATCHUPS	Target Subcooling		*Add charge	
	Heat (±5°F)	Cool (±1°F)	lb	oz
CBX26UH-024	20	16	1	0
CB30U-31	14	15	1	5
CBX32M-030	14	15	1	5
CBX32MV-018/024	14	15	0	9
CBX32MV-024/030	14	15	1	5
CH33-25B	14	15	0	0
CH33-36A	14	15	0	8
CH33-36B	14	15	0	0
CH33-36C	14	15	0	14
CR33-30/36	20	16	1	0
CX34-25	14	15	0	9
CX34-31	14	15	1	5
CX34-36	14	15	0	4

Table 17. 13HPX-030

INDOOR MATCHUPS	Target Subcooling		*Add charge	
	Heat (±5°F)	Cool (±1°F)	lb	oz
CBX26UH-030	19	6	1	7
CBX26UH-036	25	4	0	11
CBX27UH-030-230	15	4	0	11
CBX27UH-036-230	15	4	0	11
CBX32M-030 -036, -042	15	4	0	11
CBX32MV-024/030, -036	15	4	0	11
CH33-25B	15	4	0	0
CH33-31B	15	4	0	11
CH33-36A	15	4	0	8
CH33-36B	15	4	0	0
CH33-36C	15	4	0	11
CH33-42	15	4	0	11
CR33-30/36	20	4	0	11
CX34-25, -31	15	4	0	11
CX34-36	28	3	0	0
CX34-38 SN# 6007 and after	4	4	0	11
CX34-38 before SN# 6007	20	4	0	11
CX34-42	28	3	0	0

Table 18. 13HPX-036

INDOOR MATCHUPS	Target Subcooling		*Add charge	
	Heat (±5°F)	Cool (±1°F)	lb	oz
CBX26UH-036	14	10	2	7
CBX27UH-036-230	10	5	2	7
CBX27UH-042-230	10	10	2	13
CBX32M-036, -042	10	5	2	7
CBX32MV-036-230	10	5	2	7
CH33-31A, -31B	10	5	2	8
CH33-36B	10	5	0	0
CH33-36C	10	5	0	5
CH33-42	10	5	2	8
CH33-44/48B	10	5	2	10
CH33-48C	10	5	2	10

*Amount of charge required in additional to charge shown on unit name-plate. (Remember to consider line set length difference.)

INDOOR MATCHUPS	Target Subcooling		*Add charge	
	Heat (±5°F)	Cool (±1°F)	lb	oz
13HPX-036 (Continued)				
CR33-30/36	25	5	0	6
CR33-48	25	5	2	8
CR33-50/60	10	5	2	10
CX34-36B	10	5	0	1
CX34-38 SN# 6007 and after	5	5	2	7
CX34-38 before SN# 6007	10	5	2	7
CX34-42B	10	5	0	1
CX34-44/48B	10	5	2	7

Table 19. 13HPX-042

INDOOR MATCHUPS	Target Subcooling		*Add charge	
	Heat (±5°F)	Cool (±1°F)	lb	oz
CBX26UH-042	26	5	1	1
CBX26UH-048	10	12	4	5
CBX27UH-042-230	10	6	4	5
CBX27UH-048-230	10	6	4	5
CBX32M-036, -042	15	5	0	0
CBX32MV-036	15	5	0	0
CBX32MV-048-230	10	6	4	5
CH33-43C, -48C	10	6	1	1
CH33-49C, -50/60C	10	6	4	5
CH33-60D	10	6	2	6
CR33-48	32	5	0	5
CR33-50/60	32	9	2	6
CR33-60	32	9	2	6
CX34-43C	10	6	1	1
CX34-49	10	6	3	7
CX34-50/60C	10	6	1	1

Table 20. 13HPX-048

INDOOR MATCHUPS	Target Subcooling		*Add charge	
	Heat (±5°F)	Cool (±1°F)	lb	oz
CBX26UH-048	11	11	1	7
CBX26UH-060	24	18	2	7
CBX27UH-048-230	11	11	1	3
CBX27UH-060-230	24	18	2	7
CBX32M-048	11	11	1	3
CBX32M-060	11	11	1	3
CBX32MV-048	11	11	1	3
CBX32MV-060-230	11	11	1	3
CH33-43C	18	7	0	0
CH33-49C, -50/60C	11	11	1	3
CH33-60D	11	11	0	9
CH33-62D	11	11	1	10
CR33-50/60	25	7	0	9
CR33-60	25	7	0	9
CX34-49	11	11	1	1
CX34-60D	11	11	0	9

Table 21. 13HPX-060

INDOOR MATCHUPS	Target Subcooling		*Add charge	
	Heat (±5°F)	Cool (±1°F)	lb	oz
CBX26UH-060	8	11	1	7
CBX27UH-060-230	10	9	0	13
CBX32MV-060	10	9	0	0
CBX32MV-068	10	9	0	9
CH33-60D	10	9	0	0
CH33-62D	10	9	0	11
CX34-62D	10	9	0	6

⚠ IMPORTANT

Use the following tables a general guide when performing maintenance checks. This is not a procedure for charging the unit (Refer to Charging / Checking Charge section). Minor variations in these pressures may be expected due to differences in installations. Significant differences could mean that the system is not properly charged or that a problem exists with some component in the system.

Table 22. Normal Operating Pressures - Liquid ±10 & Vapor ±5 PSIG*

13HPX-XXX-230-04							
	13HPX-018	13HPX-024	13HPX-030	13HPX-036	13HPX-042	13HPX-048	13HPX-060
°F (°C)**	Liq / Vap	Liq / Vap	Liq / Vap	Liq / Vap	Liq / Vap	Liq / Vap	Liq / Vap
Cooling							
65 (18)	234 / 142	258 / 140	238 / 137	260 / 136	231 / 135	246 / 134	256 / 116
75 (24)	273 / 144	299 / 142	278 / 138	303 / 140	267 / 138	286 / 136	298 / 123
85 (29)	316 / 145	347 / 145	322 / 140	348 / 143	314 / 140	330 / 138	345 / 131
95 (35)	365 / 148	399 / 148	369 / 143	398 / 145	367 / 143	379 / 140	395 / 135
105 (41)	421 / 151	460 / 150	425 / 144	452 / 148	414 / 146	432 / 143	450 / 138
115 (45)	492 / 152	534 / 152	487 / 147	512 / 151	473 / 148	492 / 146	512 / 141
Heating							
60 (15)	325 / 135	353 / 130	337 / 123	350 / 131	366 / 129	348 / 119	379 / 127
50(10)	309 / 114	330 / 109	322 / 110	331 / 111	348 / 110	334 / 105	361 / 109
40 (4)	293 / 96	307 / 90	304 / 90	314 / 91	333 / 91	312 / 84	341 / 89
30 (-1)	278 / 79	291 / 75	284 / 77	303 / 74	317 / 70	300 / 73	323 / 71
20 (-7)	264 / 65	276 / 59	271 / 62	290 / 62	298 / 58	286 / 60	310 / 60

**These are most-popular-match-up pressures. Indoor match up, indoor air quality, and indoor load cause pressures to vary.*

***Temperature of the air entering the outside coil.*

Table 23. Normal Operating Pressures - Liquid +10 & Vapor +5 PSIG*

13HPX-XXX-230-01 through 13HPX-XXX-230-03								
°F (°C)**	13HPX-018	13HPX-024	13HPX-030	13HPX-036	13HPX-042	13HPX-048	13HPX-060	13HPX-061
	Liquid/ Vapor	Liquid / Vapor	Liquid / Vapor	Liquid/ Vapor	Liquid / Vapor	Liquid / Vapor	Liquid / Vapor	Liquid/ Vapor
Cooling								
65 (18)	234 / 142	258 / 140	238 / 137	260 / 136	231 / 135	246 / 134	256 / 116	237 / 135
75 (24)	273 / 144	299 / 142	278 / 138	303 / 140	267 / 138	286 / 136	298 / 123	275 / 137
85 (29)	316 / 145	347 / 145	322 / 140	348 / 143	314 / 140	330 / 138	345 / 131	317 / 139
95 (35)	365 / 148	399 / 148	369 / 143	398 / 145	367 / 143	379 / 140	395 / 135	366 / 141
105 (41)	421 / 151	460 / 150	425 / 144	452 / 148	414 / 146	432 / 143	450 / 138	417 / 144
115 (45)	492 / 152	534 / 152	487 / 147	512 / 151	473 / 148	492 / 146	512 / 141	472 / 147
Heating								
60 (15)	325 / 130	353 / 130	328 / 127	350 / 131	360 / 135	361 / 130	370 / 127	386 / 122
50(10)	309 / 114	330 / 109	313 / 110	331 / 107	340 / 110	334 / 100	350 / 102	342 / 81
40 (4)	293 / 96	307 / 90	297 / 93	314 / 88	324 / 91	302 / 92	331 / 81	332 / 76
30 (-1)	278 / 79	291 / 75	284 / 77	290 / 74	307 / 73	300 / 73	309 / 62	322 / 73
20 (-7)	264 / 65	276 / 59	271 / 62	283 / 58	298 / 61	286 / 60	300 / 56	304 / 59

*These are most-popular-match-up pressures. Indoor match up, indoor air quality, and indoor load cause pressures to vary.
 **Temperature of the air entering the outside coil.

Table 24. HFC-410A Temp. (°F) - Pressure (Psig)

°F	Psig	°F	Psig	°F	Psig	°F	Psig
-40	10.1	21	80.5	56	158.2	91	278.2
-35	13.5	22	82.3	57	161	92	282.3
-30	17.2	23	84.1	58	163.9	93	286.5
-25	21.4	24	85.9	59	166.7	94	290.8
-20	25.9	25	87.8	60	169.6	95	295.1
-18	27.8	26	89.7	61	172.6	96	299.4
-16	29.7	27	91.6	62	175.4	97	303.8
-14	31.8	28	93.5	63	178.5	98	308.2
-12	33.9	29	95.5	64	181.6	99	312.7
-10	36.1	30	97.5	65	184.3	100	317.2
-8	38.4	31	99.5	66	187.7	101	321.8
-6	40.7	32	100.8	67	190.9	102	326.4
-4	43.1	33	102.9	68	194.1	103	331
-2	45.6	34	105	69	197.3	104	335.7
0	48.2	35	107.1	70	200.6	105	340.5
1	49.5	36	109.2	71	203.9	106	345.3
2	50.9	37	111.4	72	207.2	107	350.1
3	52.2	38	113.6	73	210.6	108	355
4	53.6	39	115.8	74	214	109	360
5	55	40	118	75	217.4	110	365
6	56.4	41	120.3	76	220.9	111	370
7	57.9	42	122.6	77	224.4	112	375.1
8	59.3	43	125	78	228	113	380.2
9	60.8	44	127.3	79	231.6	114	385.4
10	62.3	45	129.7	80	235.3	115	390.7
11	63.9	46	132.2	81	239	116	396
12	65.4	47	134.6	82	242.7	117	401.3
13	67	48	137.1	83	246.5	118	406.7
14	68.6	49	139.6	84	250.3	119	412.2
15	70.2	50	142.2	85	254.1	120	417.7
16	71.9	51	144.8	86	258	121	423.2
17	73.5	52	147.4	87	262	122	428.8
18	75.2	53	150.1	88	266	123	434.5
19	77	54	152.8	89	270	124	440.2
20	78.7	55	155.5	90	274.1	125	445.9

E - Oil Charge

See compressor nameplate.

IV - 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.

Maintenance and service must be performed by a qualified installer or service agency. At the beginning of each cooling season, the system should be checked as follows:

Outdoor Unit

1. Clean and inspect outdoor coil (may be flushed with a water hose). Ensure power is off before cleaning.
2. Outdoor unit fan motor is pre-lubricated and sealed. No further lubrication is needed.
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 outdoor 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.

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.

Indoor Unit

1. Clean or change filters.
2. Lennox blower motors are prelubricated and permanently sealed. No more lubrication is needed.
3. Adjust blower speed for cooling. Measure the pressure drop over the coil to determine the correct blower CFM. Refer to the unit information service manual 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 _____.

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

V - BRAZING

Before brazing remove access panels and any piping panels to avoid burning off paint. Be aware of any components ie, service valves, reversing valve, pressure switches that may be damaged due to brazing heat.

When making line set connections, use 1 to 2 psig dry nitrogen to purge the refrigerant piping. This will help to prevent oxidation into the system.

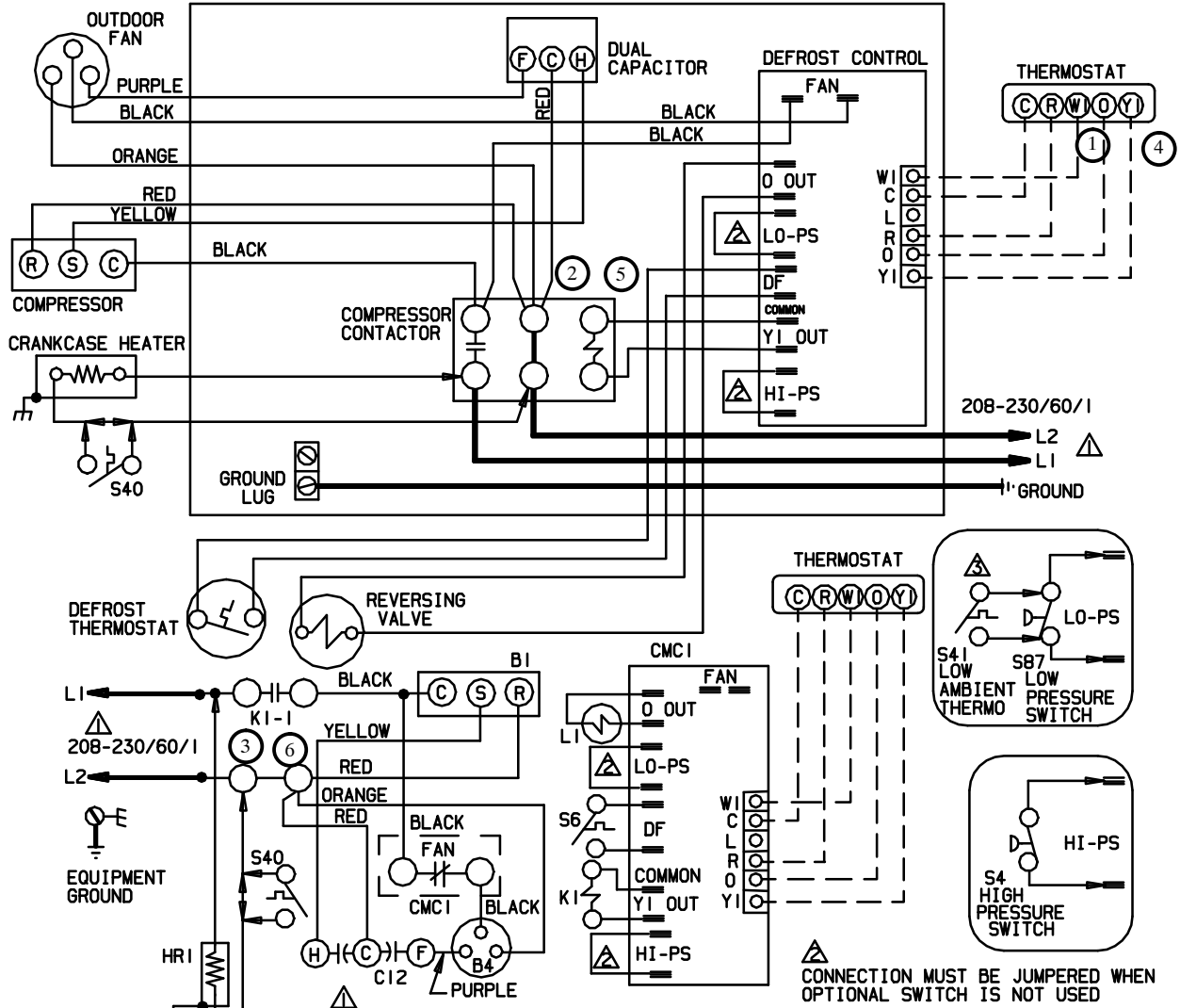
WARNING

Danger of explosion: Can cause equipment damage, injury or death. When using a high pressure gas such as dry nitrogen to pressurize a refrigeration or air conditioning system, use a regulator that can control the pressure down to 1 or 2 psig (6.9 to 13.8 kPa).

- 1 - Cut ends of copper square (free from nicks or dents). Debur the ends. The pipe must remain round, do not pinch end of line.
- 2 - Wrap wet rag around any components that may be damaged.
- 3 - Use silver alloy brazing rods (5 or 6 percent minimum silver alloy for copper to copper brazing or 45 percent silver alloy for copper to brass or copper to steel brazing) which are rated for use with R-22 and R-410A refrigerant.
- 4 - After brazing quench the joints with a wet rag to prevent possible heat damage to any components.

VI - WIRING DIAGRAM AND SEQUENCE OF OPERATION

13HPX UNIT DIAGRAM



KEY	DESCRIPTION
	COMPONENT
B1	COMPRESSOR
B4	MOTOR-OUTDOOR FAN
C12	CAPACITOR- DUAL
CMC1	CONTROL-DEFROST
HRI	HEATER-COMPRESSOR
K1.-1	CONTACTOR-COMPRESSOR
L1	VALVE-REVERSING
S4	SWITCH-HIGH PRESSURE
S6	SWITCH-DEFROST
S40	THERMOSTAT-CRANKCASE
S41	THERMOSTAT-LOW AMBIENT
S87	SWITCH-LOW PRESSURE

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

⚠ S41 TO BE MOUNTED IN CONTROL BOX AND WIRED IN PARALLEL WITH LOW PRESSURE SWITCH

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

← DENOTES OPTIONAL COMPONENTS
 — LINE VOLTAGE FIELD INSTALLED
 - - - CLASS II VOLTAGE FIELD INSTALLED

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	534,774W

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13HPX OPERATING SEQUENCE

This is the sequence of operation for 13HPX series units. The sequence is outlined by numbered steps which correspond to circled numbers on the adjacent diagram. The steps are identical for both cooling and first stage heating demand with the exception reversing valve L1 is energized during cooling demand and de-energized during heating demand.

NOTE- The thermostat used may be electromechanical or electronic.

NOTE- Transformer in indoor unit supplies power (24 VAC) to the thermostat and outdoor unit controls.

COOLING:

Internal thermostat wiring energizes terminal O by cooling mode selection, energizing the reversing valve L1.

- 1 - Demand initiates at Y1 in the thermostat.
- 2 - 24VAC energizes compressor contactor K1.
- 3 - K1-1 N.O. closes, energizing compressor (B1) and outdoor fan motor (B4).

END OF COOLING DEMAND:

- 4 - Demand is satisfied. Terminal Y1 is de-energized.
- 5 - Compressor contactor K1 is de-energized.
- 6 - K1-1 opens and compressor (B1) and outdoor fan motor (B4) are de-energized and stop immediately.

FIRST STAGE HEAT:

Internal thermostat wiring de-energizes terminal O by heating mode selection, de-energizing the reversing valve L1.

See steps 1, 2 and 3.

End of FIRST STAGE HEAT:

See steps 4, 5 and 6.

DEFROST MODE:

- 7 - During heating operation when outdoor coil temperature drops below $42^{\circ}(5.5^{\circ}\text{C})$ defrost switch (thermostat) S6 closes.
- 8 - 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.
- 9 - 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.
- 10 - Defrost continues 14 ± 1 minutes or until thermostat switch (S6) opens. When defrost thermostat opens, defrost control timer loses power and resets.