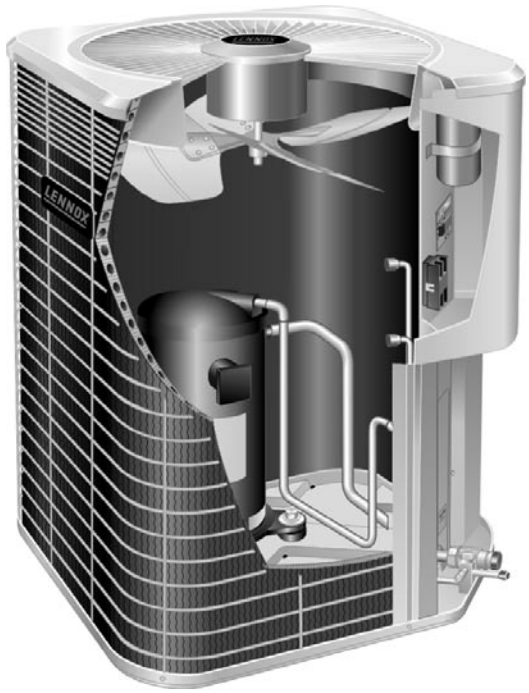
HSXA12 SERIES UNITS

The HSXA12 is a high efficiency residential split-system condensing unit, which features a scroll compressor and R410A refrigerant. HSXA12 units are available in sizes ranging from 1 1/2 through 5 tons. The series is designed for use with an expansion valve or RFC (approved for use with R410A) in the indoor unit.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.



⚠ WARNING

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

⚠ WARNING

Warranty will be voided if covered equipment is removed from original installation site. Warranty will not cover damage or defect resulting from:
Flood, wind, lightning, or installation and operation in a corrosive atmosphere (chlorine, fluorine, salt, recycled waste water, urine, fertilizers, or other damaging chemicals).

⚠ DANGER

Shock Hazard
Remove all power at disconnect before removing access panel.
Single phase HSXA12 units use single-pole contactors. Potential exists for electrical shock resulting in injury or death.
Line voltage exist at all components (even when unit is not in operation).

⚠ IMPORTANT

Operating pressures of this R410A unit are higher than pressures in R22 units. Always use service equipment rated for R410A.

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SPECIFICATIONS single phase

General Data	Model No.	HSXA12-018	HSXA12-024	HSXA12-030	HSXA12-036	HSXA12-042	HSXA12-048	HSXA12-060
	Nominal Tonnage (kW)	1.5 (5.3)	2 (7.0)	2.5 (8.8)	3 (10.6)	3.5 (12.3)	4 (14.1)	5 (17.6)
Connections (sweat)	Liquid line (o.d.) - in. (mm)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)
	Suction line (o.d.) - in. (mm)	3/4 (19.1)	3/4 (19.1)	3/4 (19.1)	3/4 (19.1)	7/8 (22.2)	7/8 (22.2)	1-1/8 (28.6)
Refrigerant	[1]R-410A charge furnished	3 lbs. 11 oz. (1.67 kg)	4 lbs. 2 oz. (1.86 kg)	5 lbs. 4 oz. (2.37 kg)	5 lbs. 14 oz. (2.65 kg)	6 lbs. 14 oz. (3.11 kg)	7 lbs. 15 oz. (3.59 kg)	9 lbs. 13 oz. (4.44 kg)
Condenser Coil	Net face area - sq. ft. (m^2) Outer	11.33 (1.05)	11.33 (1.05)	15.11 (1.40)	15.11 (1.40)	15.11 (1.40)	15.11 (1.40)	16.33 (1.52)
	Inner	- - -	- - -	5.4 (0.50)	5.4 (0.50)	14.4 (1.34)	14.4 (1.34)	15.71 (1.46)
	Tube diameter - in. (mm)	5/16 (7.9)	5/16 (7.9)	5/16 (7.9)	5/16 (7.9)	5/16 (7.9)	5/16 (7.9)	5/16 (7.9)
	No. of rows	1	1	2	2	2	2	2
	Fins per inch (m)	22 (866)	22 (866)	18 (748)	18 (748)	22 (866)	22 (866)	22 (866)
Condenser Fan	Diameter - in. (mm)	18 (457)	18 (457)	18 (457)	18 (457)	18 (457)	18 (457)	22 (559)
	No. of blades	3	3	4	4	4	4	4
	Motor hp (W)	1/6 (124)	1/6 (124)	1/6 (124)	1/6 (124)	1/3 (249)	1/4 (187)	1/3 (249)
	Cfm (L/s)	2200 (1040)	2200 (1040)	2430 (1145)	2430 (1145)	2800 (1320)	2785 (1315)	3790 (1790)
	Rpm	1100	1100	1090	1090	1100	1050	1075
	Watts	180	180	190	190	310	275	370
Shipping Data	lbs. (kg) 1 pkg.	136 (62)	138 (63)	157 (71)	160 (73)	185 (84)	185 (84)	214 (97)
OPTIONAL ACCESSORIES - MUST BE ORDERED EXTRA								
CCB1 EfficiencyPlus™ Humidity Control		**35H00**	**35H00**	**35H00**	**35H00**	**35H00**	**35H00**	**35H00**
EBR1 Blower Relay Kit (for CCB1)		**75H90**	**75H90**	**75H90**	**75H90**	**75H90**	**75H90**	**75H90**
Compressor Crankcase Heater		**90P12**	**90P12**	**90P12**	**90P12**	**90P12**	**90P12**	**90P12**
Low Ambient Kit		**34M72**	**34M72**	**34M72**	**34M72**	**34M72**	**34M72**	**34M72**
Mounting Base	Model No.	MB2-S **(69J06)**	MB2-S **(69J06)**	MB2-L **(69J07)**	MB2-L **(69J07)**	MB2-L **(69J07)**	MB2-L **(69J07)**	MB2-L **(69J07)**
	Net Weight	6 lbs. (3 kg)	6 lbs. (3 kg)	15 lbs. (7 kg)	15 lbs. (7 kg)	15 lbs. (7 kg)	15 lbs. (7 kg)	15 lbs. (7 kg)
	Dimensions - in. (mm)	22-1/4x22-1/4x3 (565 x 565x76)	22-1/4x22-1/4x3 (565 x 565x76)	32 x 34 x 3 (813x864x76)	32 x 34 x 3 (813x864x76)	32 x 34 x 3 (813x864x76)	32 x 34 x 3 (813x864x76)	32 x 34 x 3 (813x864x76)
Refrigerant Line Set	30 ft. (9 m) length	L15-26-30	L15-41-30	L15-41-30	L15-41-30	L15-65-30	L15-65-30	Field Fabricate
	40 ft. (12 m) length	L15-26-40	L15-41-40	L15-41-40	L15-41-40	L15-65-40	L15-65-40	Field Fabricate
	50 ft. (15 m) length	L15-26-50	L15-41-50	L15-41-50	L15-41-50	L15-65-50	L15-65-50	Field Fabricate
	Liquid Line o.d. - in. (mm)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)
	Suction Line o.d. - in. (mm)	5/8 (16)	3/4 (19)	3/4 (19)	3/4 (19)	7/8 (22.2)	7/8 (22.2)	1-1/8 (22.2)

[1]Refrigerant charge sufficient for 15 ft. (4.5 m) length of refrigerant lines.

ELECTRICAL DATA

General Data	Model No.	HSXA12-018 -230	HSXA12-024 -230	HSXA12-030 -230	HSXA12-036 -230	HSXA12-042 -230	HSXA12-048 -230	HSXA12-060 -230
	Line voltage data - 60hz	208/230v-1ph	208/230v-1ph	208/230v-1ph	208/230v-1ph	208/230v-1ph	208/230v-1ph	208/230v-1ph
	Rec. Max fuse size (amps)	20	30	30	35	40	50	60
	[1]Minimum circuit ampacity	13.8	17.8	19.4	20.2	25.7	30.5	36.2
Compressor	Rated load amps	10.3	13.5	15.1	15.4	19.2	23.1	27.6
	Locked rotor amps	51	61	72.5	83	104	134	158
	Power factor	.98	.98	.97	.95	.97	.98	.98
Condenser Fan Motor	Full load amps	1.1	1.1	1.1	1.1	1.9	1.7	1.9
	Locked rotor amps	1.9	1.9	1.9	1.9	4.1	3.1	4.1

[1]Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.
NOTE - Extremes of operating range are plus 10% and minus 5% of line voltage.

SPECIFICATIONS three phase

General Data	**Model No.**	**HSXA12-036**			**HSXA12-048**			**HSXA12-060**		
	Nominal Tonnage (kW)	3 (10.6)			4 (14.1)			5 (17.6)		
Connections (sweat)	Liquid line (o.d.) - in. (mm)	3/8 (9.5)			3/8 (9.5)			3/8 (9.5)		
	Suction line (o.d.) - in. (mm)	3/4 (19.1)			7/8 (22.2)			1-1/8 (28.6)		
Refrigerant	[1] R-410A charge furnished	5 lbs. 14 oz. (2.66 kg)			7 lbs. 15 oz. (3.60 kg)			9 lbs. 13 oz. (4.45 kg)		
Condenser Coil	Net face area - sq. ft. (m^2) Outer	15.11 (1.40)			15.11 (1.40)			16.33 (1.52)		
	Inner	5.4 (0.50)			14.4 (1.34)			15.71 (1.46)		
	Tube diameter - in. (mm)	5/16 (7.9)			5/16 (7.9)			5/16 (7.9)		
	No. of rows	2			2			2		
	Fins per inch (m)	18 (748)			22 (866)			22 (866)		
Condenser Fan	Diameter - in. (mm)	18 (457)			18 (457)			22 (559)		
	No. of blades	4			4			4		
	Motor hp (W)	1/6 (124)			1/4 (187) - 208/230V-3ph 1/3 (249) - 460V & 575V-3ph			1/3 (249)		
	Cfm (L/s)	2430 (1145)			2785 (1315) - 208/230V-3ph 2800 (1320) - 460V & 575V-3ph			3790 (1790)		
	Rpm	1090			1050 - 208/230V-3ph 1100 - 460V & 575V-3ph			1075		
	Watts	190			275 - 208/230V-3ph 310 - 460V & 575V-3ph			370		
Shipping Data	lbs. (kg) 1 pkg.	160 (73)			185 (84)			214 (97)		
ELECTRICAL DATA										
Electrical Data	**Model No.**	**HSXA12 -036-233**	**HSXA12 -036-463**	**HSXA12 -036-575**	**HSXA12 -048-233**	**HSXA12 -048-463**	**HSXA12 -048-575**	**HSXA12 -060-233**	**HSXA12 -060-463**	**HSXA12 -060-575**
	Line voltage data - 60hz - 3 phase	208/230V	460V	575V	208/230V	460V	575V	208/230V	460V	575V
	[2] Maximum Overcurrent Protection (amps)	25	10	10	35	15	10	40	20	15
	[3] Minimum circuit ampacity	15.4	6.9	5.9	21.7	9.8	7.9	24.5	12.2	9.4
Compressor	Rated load amps	11.5	5.1	4.3	16	7.1	5.6	18.1	9	6.8
	Power Factor	.95	.95	.95	.98	.98	.98	.98	.98	.98
	Locked rotor amps	77	35	31	91	46	37	137	62	50
Condenser Fan	Full load amps	1	.55	.55	1.7	.9	.9	1.9	.9	.9
	Locked rotor amps	2.3	1	1	3.1	2.1	2.1	4.1	2.1	2.1
OPTIONAL ACCESSORIES - MUST BE ORDERED EXTRA										
Compressor Crankcase Heater		**67K90**	**67K89**	**18M11**	**67K90**	**67K89**	**18M11**	**67K90**	**67K89**	**18M11**
Compressor Low Ambient Cut-Off		**45F08**			**45F08**			**45F08**		
Freezestat	3/8 in. tubing	**93G35**			**93G35**			**93G35**		
	1/2 in. tubing	**39H29**			**39H29**			**39H29**		
	5/8 in. tubing	**50A93**			**50A93**			**50A93**		
Hail Guard		**17L73**			**17L73**			**45M56**		
Low Ambient Kit		**34M72**			**34M72**			**34M72**		
Mounting Base	Model No.	MB2-L **(69J07)**			MB2-L **(69J07)**			MB2-L **(69J07)**		
	Net Weight	15 lbs. (7 kg)			15 lbs. (7 kg)			15 lbs. (7 kg)		
	Dimensions - in. (mm)	32 x 34 x 3 (813x864x76)			32 x 34 x 3 (813x864x76)			32 x 34 x 3 (813x864x76)		
Refrigerant Line Set	15 ft. (4.6 m) length	L15-41-15			L15-65-15			Field Fabricate		
	20 ft. (6.1 m) length	L15-41-20			- - -			Field Fabricate		
	30 ft. (9 m) length	L15-41-30			L15-65-30			Field Fabricate		
	40 ft. (12 m) length	L15-41-40			L15-65-40			Field Fabricate		
	50 ft. (15 m) length	L15-41-50			L15-65-50			Field Fabricate		
Unit Stand-Off Kit		**94J45**			**94J45**			**94J45**		

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

[1] Refrigerant charge sufficient for 20 ft. (6.0 m) length of refrigerant lines

[2] HACR type circuit breaker or fuse.

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

I - APPLICATION

HSXA12 condensing 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.

II - UNIT COMPONENTS

Unit components are illustrated in figure 1.

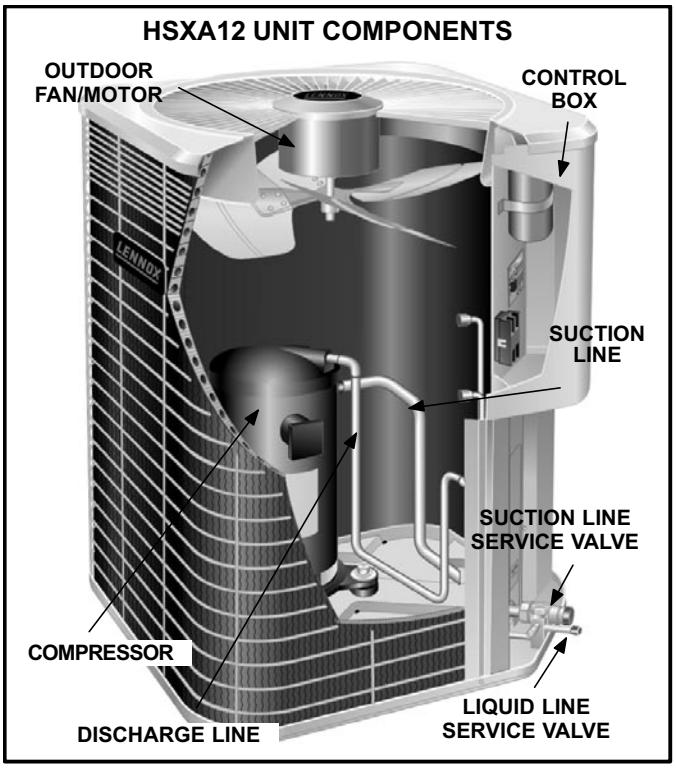


FIGURE 1

A - Control Box (Figures 2 and 3)

HSXA12 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 color-coded pigtail connections.

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.

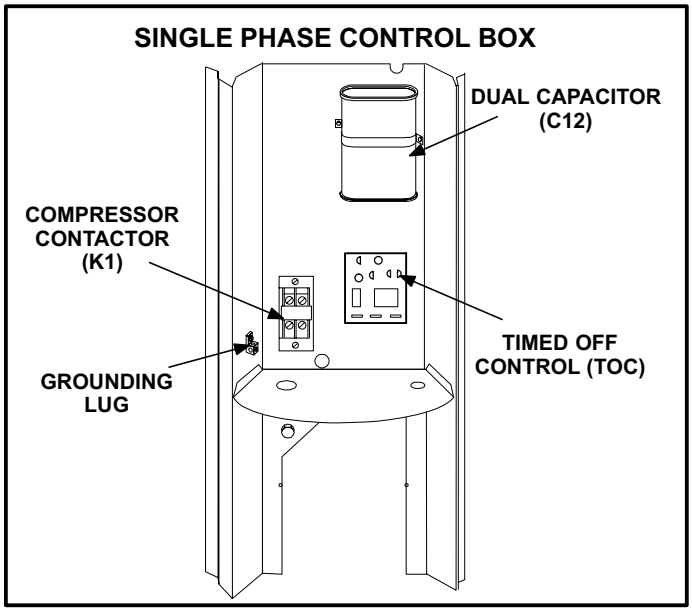


FIGURE 2

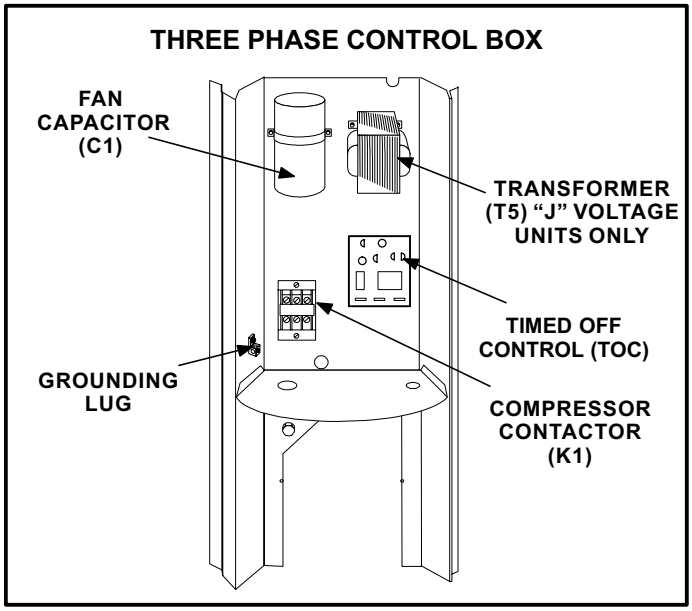


FIGURE 3

1 - Compressor Contactor K1

The compressor is energized by a contactor located in the control box. See figures 2 and 3. Single-pole contactors are used in single phase HSXA12 series units and three-pole contactors are used in HSXA12 three phase units. K1 is energized by the indoor thermostat terminal Y1 (24V) when thermostat demand is present.

2 - Dual Capacitor C12

The compressor and fan in HSXA12 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. See side of capacitor for ratings.

3 - Transformer T5 (three phase only)

Transformer T5 is used on all “J” voltage units. T5 is used as a step-down transformer for the outdoor fan motor. The transformer is located inside the unit control box (see figure 3). The transformer is rated at 3.4 VA with a 575 volt primary and a 460 volt secondary.

4 - Run Capacitor C1 (three phase only)

The fan in all three-phase units uses a single-phase permanent split capacitor motor. A single capacitor C1 is used for the fan motor. C1 is located inside the control box. See figure 3. Fan motor nameplate will have capacitor ratings.

5 - Timed Off Control TOC

The time delay is electrically connected between thermostat terminal Y and the compressor contactor. Between cycles, the compressor contactor is delayed for 5 minutes ± 2 minutes. At the end of the delay, the compressor is allowed to energize. When thermostat demand is satisfied, the time delay opens the circuit to the compressor contactor coil and the compressor is de-energized.

Without the time delay it would be possible to short cycle the compressor. A scroll compressor, when short cycled, can run backward if head pressure is still high. It does not harm a scroll compressor to run backward, but it could cause a nuisance tripout of safety limits (internal overload). For this reason, if a TOC delay should fail, it must be replaced. Do not bypass the control.

⚠ DANGER

DO NOT ATTEMPT TO REPAIR THIS CONTROL. UNSAFE OPERATION WILL RESULT. IF THE CONTROL IS FOUND TO BE INOPERATIVE, SIMPLY REPLACE THE ENTIRE CONTROL.

B - Compressor

The scroll compressor used in all HSXA12 model units, are designed for use with R410A refrigerant and operation at high pressures. Compressors are shipped from the factory with 3MA (32MMMA) P.O.E. oil charged for 20 ft of line set. See ELECTRICAL DATA table at the front of this manual or compressor nameplate for compressor specifications.

The scroll compressor design is simple, efficient and requires few moving parts. A cutaway diagram of the scroll compressor is shown in figure 4. 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.

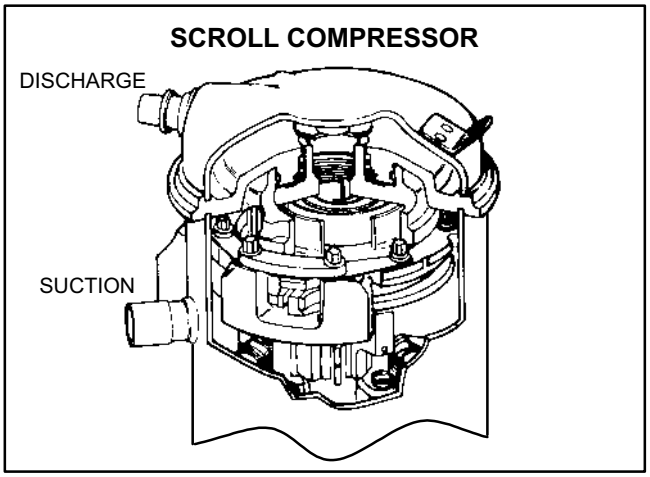


FIGURE 4

The scroll is a simple compression concept centered around the unique spiral shape of the scroll and its inherent properties. Figure 5 shows the basic scroll form. Two identical scrolls are mated together forming concentric spiral shapes (figure 6). One scroll remains stationary, while the other is allowed to ”orbit” (figure 7). Note that the orbiting scroll does not rotate or turn but merely orbits the stationary scroll.

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

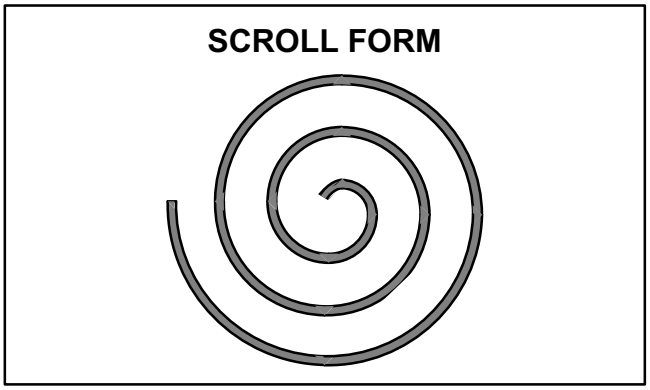


FIGURE 5

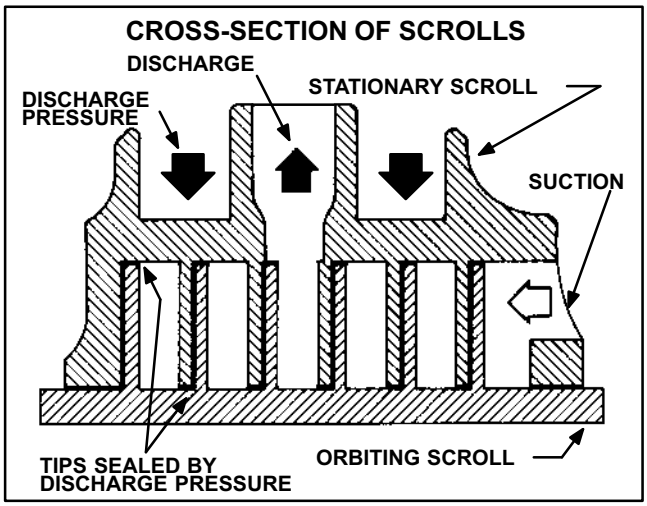


FIGURE 6

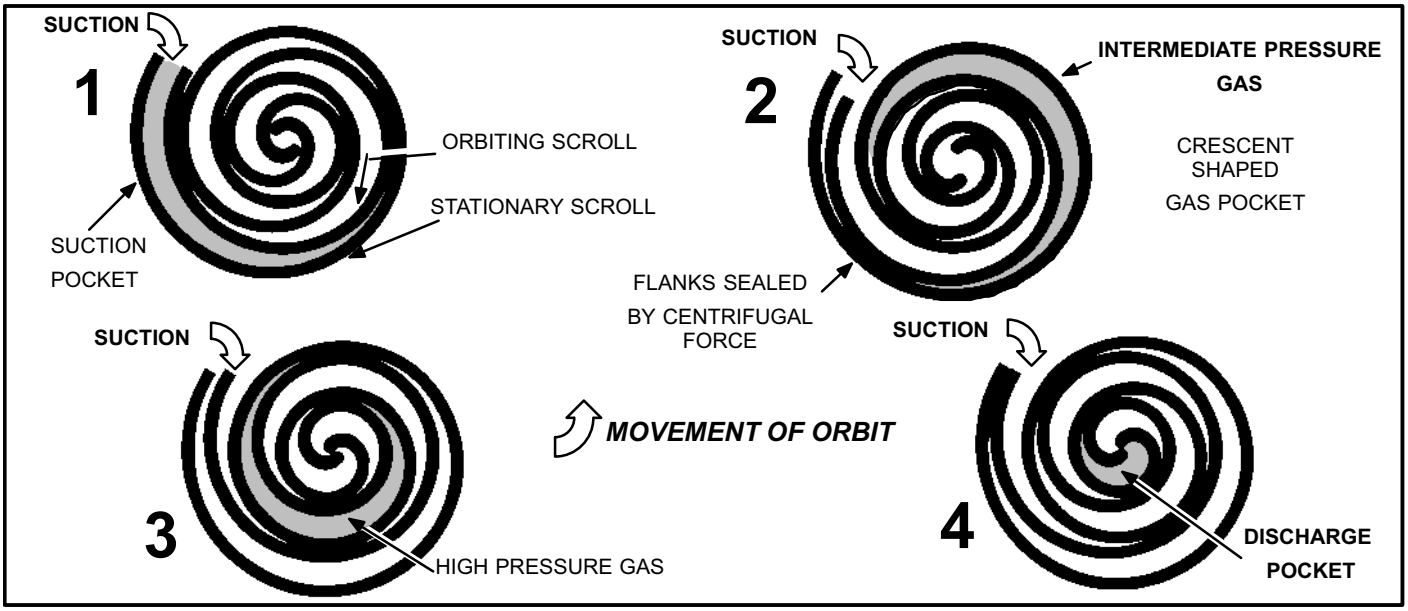


FIGURE 7

The counterclockwise orbiting scroll draws gas into the outer crescent shaped gas pocket created by the two scrolls (figure 7 - 1). The centrifugal action of the orbiting scroll seals off the flanks of the scrolls (figure 7 - 2). As the orbiting motion continues, the gas is forced toward the center of the scroll and the gas pocket becomes compressed (figure 7 - 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 6). The discharge pressure forcing down on the top scroll helps seal off the upper and lower edges (tips) of the scrolls (figure 6). 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.

Three-Phase Compressor Rotation

Three-phase scroll compressors must be phased sequentially to ensure correct compressor rotation and operation. At compressor start-up, a rise in discharge and drop in suction pressures indicates proper compressor phasing and operation. If discharge and suction pressures do not perform normally, follow the steps below to correctly phase the unit.

1 - Disconnect power to the unit.
2 - Reverse any two field power leads to the unit.
3 - Reapply power to the unit.

Discharge and suction pressures should operate within their normal start-up ranges.

NOTE - Compressor noise level may be significantly higher when phasing is incorrect and the unit will not provide cooling when compressor is operating backwards. Continued backward operation will cause the compressor to cycle on internal protector.

C - Drier

A filter drier designed for all HSXA12 model units must be installed in the liquid line. Driers installed for units using R22 must be replaced. The factory supplied drier is designed to remove moisture, which can lead to compressor failure. **Any time unit is exposed to open air due to service, drier must be replaced. All replacement driers must be approved for R410A refrigerant.**

D - Condenser 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.

ELECTRICAL DATA tables in this manual show specifications for condenser fans used in HSXA12s.

Access to the condenser fan motor on all units is gained by removing the seven screws securing the fan assembly. See figure 8. The condenser fan motor is removed from the fan guard by removing the four nuts found on the top panel. Drip loops should be used in wiring when servicing motor. See figure 9 if condenser fan motor replacement is necessary.

⚠ DANGER

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

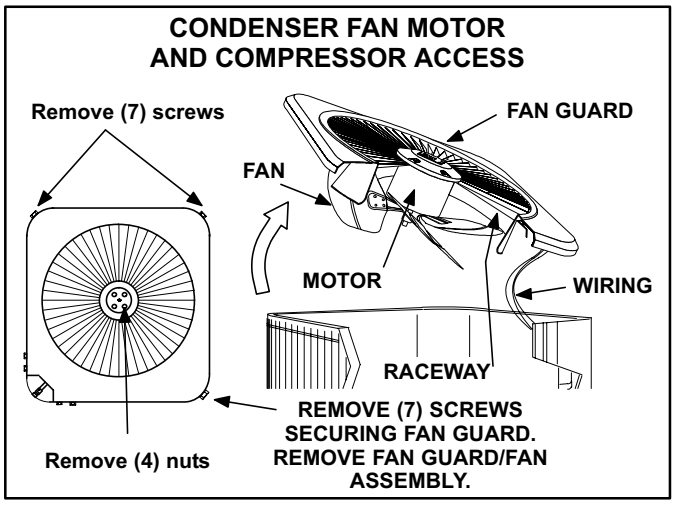


FIGURE 8

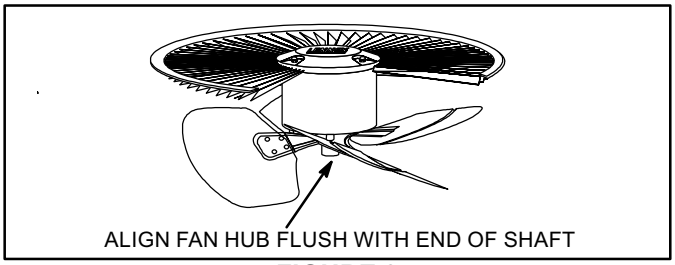


FIGURE 9

E - Low Pressure Switch

⚠ IMPORTANT

Pressure switch settings for R410A refrigerant will be significantly higher than units with R22.

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 40 ± 5 psi. The switch automatically resets when suction line pressure rises above 90 ± 5 psi.

F - High Pressure Switch

HSXA12 units are equipped with a high pressure switch that is located in the discharge line of the compressor. The switch (SPST, automatic reset, normally closed) removes power from the compressor when discharge pressure rises above factory setting at 640 ± 10 psi. and resets at 448 ± 10 psi.

III - REFRIGERANT SYSTEM

A - Plumbing

Field refrigerant piping consists of liquid and suction lines from the condensing unit (sweat connections) to the indoor evaporator coil (flare or sweat connections). Use Lennox L15 (sweat) series line sets as shown in table 1.

TABLE 1

Unit	Liquid Line	Suction Line	L15 Line Sets
HSXA12-018	3/8 in. (10 mm)	5/8 in. (16 mm)	L15-26 30 ft. - 50 ft. (9 m - 15 m)
HSXA12-024 HSXA12-030 HSXA12-036	3/8 in. (10 mm)	3/4 in. (19 mm)	L15-41 20 ft. - 50 ft. (6 m - 15 m)
HSXA12-042 HSXA12-048	3/8 in. (10 mm)	7/8 in. (22 mm)	L15-65 30 ft. - 50 ft. (9 m - 15 m)
HSXA12-060	3/8 in. (10 mm)	1-1/8 in. (29 mm)	Field Fabricated

The liquid line and vapor line service valves (figures 10 and 11) and gauge ports are accessible from the outside of the unit. Use the service ports for leak testing, evacuating, charging and checking charge.

Each valve is equipped with a service port which has a factory-installed Schrader valve. A service port cap protects the Schrader valve from contamination and serves as the primary leak seal.

To Access Schrader Port:

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

To Open Service Valve:

1 - Remove the stem cap with an adjustable wrench.

2 - Use a service wrench with a hex-head extension to back the stem out counterclockwise as far as it will go.

NOTE - Use a 3/16" hex head extension for 3/8" line sizes or a 5/16" extension for large line sizes.

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

To Close Service Valve:

1 - Remove the stem cap with an adjustable wrench.

2 - Use a service wrench with a hex-head extension to turn the stem clockwise to seat the valve. Tighten the stem firmly.

NOTE - Use a 3/16" hex head extension for 3/8" line sizes or a 5/16" extension for large line sizes.

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

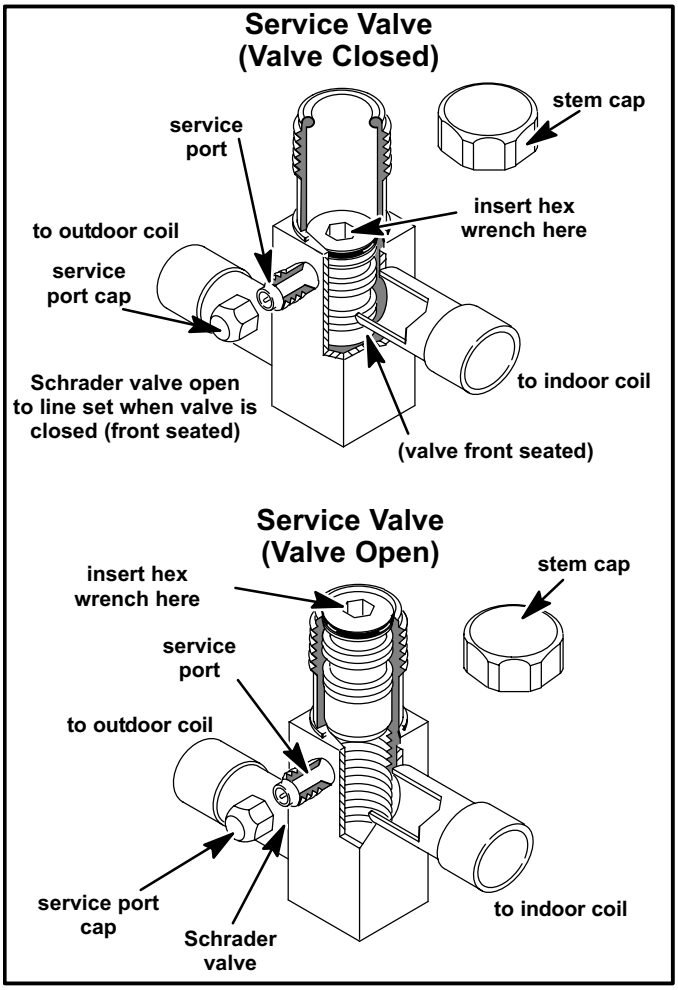


FIGURE 10

Vapor Line Ball Valve – 5 Ton Units Only

Vapor line service valves function the same way as the other valves, the difference is in the construction. These valves are not rebuildable. If a valve has failed, you must replace it. A ball valve is illustrated in figure 11.

The ball valve is equipped with a service port with a factory-installed Schrader valve. A service port cap protects the Schrader valve from contamination and assures a leak-free seal.

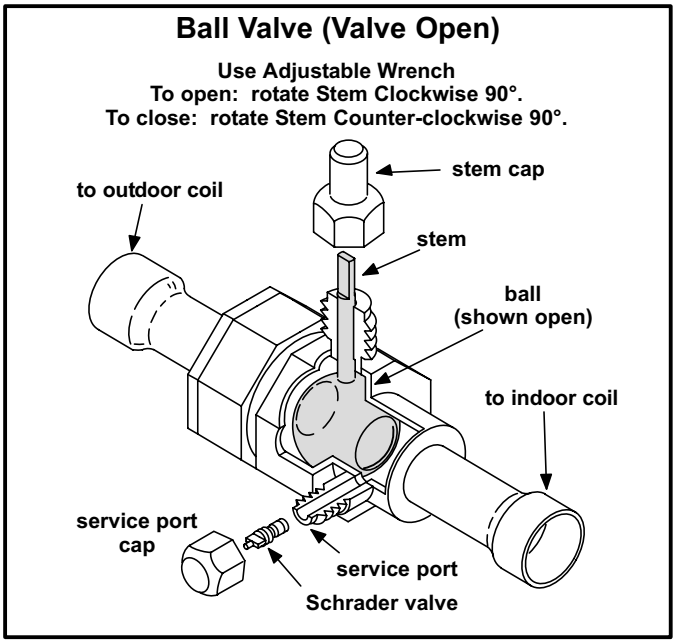


FIGURE 11

IV - CHARGING

A - Leak Testing

After the line set has been connected to the indoor and outdoor units, check the line set connections and indoor unit for leaks.

⚠ IMPORTANT

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

⚠WARNING

Danger of explosion: Can cause equipment damage, injury or death. Never use oxygen to pressurize a refrigeration or air conditioning system. Oxygen will explode on contact with oil and could cause personal injury.

⚠ 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).

Using an Electronic Leak Detector

1 - Connect a cylinder of R-410A to the center port of the manifold gauge set.

2 - With both manifold valves closed, open the valve on the R-410A cylinder (vapor only).

3 - Open the high pressure side of the manifold to allow the R-410A into the line set and indoor unit. Weigh in a trace amount of R-410A. [A trace amount is a maximum of 2 ounces (57 g) or 3 pounds (31 kPa) pressure.] Close the valve on the R-410A cylinder and the valve on the high pressure side of the manifold gauge set. Disconnect the R-410A cylinder.

4 - Connect a cylinder of nitrogen with a pressure regulating valve to the center port of the manifold gauge set.

5 - Connect the manifold gauge set high pressure hose to the vapor valve service port. *(Normally, the high pressure hose is connected to the liquid line port; however, connecting it to the vapor port better protects the manifold gauge set from high pressure damage.)*

6 - Adjust the nitrogen pressure to 150 psig (1034 kPa). Open the valve on the high side of the manifold gauge set which will pressurize line set and indoor unit.

7 - After a few minutes, open a refrigerant port to ensure the refrigerant you added is adequate to be detected. (Amounts of refrigerant will vary with line lengths.) Check all joints for leaks. Purge nitrogen and R-410A mixture. Correct any leaks and recheck.

B - Evacuating

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

NOTE - This evacuation process is adequate for a new installation with clean and dry lines. If excessive moisture is present, the evacuation process may be required more than once.

⚠ IMPORTANT

Use a thermocouple or thermistor electronic vacuum gauge that is calibrated in microns. Use an instrument that reads from 50 microns to at least 10,000 microns.

1 - Connect manifold gauge set to the service valve ports :
- low pressure gauge to *vapor* line service valve
- high pressure gauge to *liquid* line service valve

2 - Connect micron gauge.

3 - Connect the vacuum pump (with vacuum gauge) to the center port of the manifold gauge set.

4 - Open both manifold valves and start the vacuum pump.

5 - Evacuate the line set and indoor unit to an **absolute pressure** of 23,000 microns (29.01 inches of mercury). During the early stages of evacuation, it is desirable to close the manifold gauge valve at least once to determine if there is a rapid rise in **absolute pressure**. A rapid rise in pressure indicates a relatively large leak. If this occurs, repeat the leak testing procedure.

*NOTE - The term **absolute pressure** means the total actual pressure within a given volume or system, above the absolute zero of pressure. Absolute pressure in a vacuum is equal to atmospheric pressure minus vacuum pressure.*

6 - When the absolute pressure reaches 23,000 microns (29.01 inches of mercury), close the manifold gauge valves, turn off the vacuum pump and disconnect the manifold gauge center port hose from vacuum pump. Attach the manifold center port hose to a nitrogen cylinder with pressure regulator set to 150 psig (1034 kPa) and purge the hose. Open the manifold gauge valves to break the vacuum in the line set and indoor unit. Close the manifold gauge valves.

⚠ CAUTION

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

7 - Shut off the nitrogen cylinder and remove the manifold gauge hose from the cylinder. Open the manifold gauge valves to release the nitrogen from the line set and indoor unit.

8 - Reconnect the manifold gauge to the vacuum pump, turn the pump on, and continue to evacuate the line set and indoor unit until the absolute pressure does not rise above 500 microns (29.9 inches of mercury) within a 20-minute period after shutting off the vacuum pump and closing the manifold gauge valves.

9 - When the absolute pressure requirement above has been met, disconnect the manifold hose from the vacuum pump and connect it to an upright cylinder of R-410A refrigerant. Open the manifold gauge valves to break the vacuum from 1 to 2 psig positive pressure in the line set and indoor unit. Close manifold gauge valves and shut off the R-410A cylinder and remove the manifold gauge set.

C - Charging

⚠ WARNING

R410A refrigerant can be harmful if it is inhaled. R410A refrigerant must be used and recovered responsibly.

Failure to follow this warning may result in personal injury or death.

⚠IMPORTANT

Mineral oils are not compatible with R410A. If oil must be added, it must be a polyol ester oil.

This system is charged with R410A refrigerant which operates at much higher pressures than R22. The provided liquid line drier is approved for use with R410A. Do not replace it with components designed for use with R22. This unit is NOT approved for use with coils which include capillary tubes.

Processing Procedure

Units are factory charged with the amount of R410A refrigerant indicated on the unit rating plate. This charge is based on a matching indoor coil and outdoor coil with 15 ft. (4.5 m) line set. For varying lengths of line set, refer to table 2 for refrigerant charge adjustment.

TABLE 2

Liquid Line Set Diameter	Oz. per 5 ft. (grams per 1.5 m) adjust from 15 ft. (4.5 m) line set*
3/8 in. (10 mm)	3 ounces per 5 feet (85g per 1.5 m)

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

⚠IMPORTANT

Mineral oils are not compatible with R410A. If oil must be added, it must be a polyol ester oil.

The following procedure is intended as a general guide and is for use on expansion valve systems only. For best results, indoor temperature should be 70°F (21°C) to 80°F (26°C). Be sure to monitor system pressures while charging. A digital thermometer is required for checking ambient and liquid line temperatures.

1 - Record outdoor ambient temperature.

2 - Attach high pressure gauge set and operate unit for several minutes to allow system pressures to stabilize.

3 - Compare stabilized pressures with those provided in table 4, Normal Operating Pressures. 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. Pressures higher than those listed indicate that the system is overcharged. Pressures lower than those listed indicate that the system is undercharged. A temperature/pressure chart for R410A refrigerant is provided in table 5 for your convenience. Verify adjusted charge using the approach method.

⚠ IMPORTANT

Use table 4 as a general guide for performing maintenance checks. Table 4 is not a procedure for charging the system. Expect minor variations in these pressures due to differences in installations. Significant deviations could mean that the system is not properly charged or that a problem exists with some component in the system. Used carefully, table 4 could serve as a useful service guide.

Charging Using the Approach Method

TXV Systems – Outdoor Temp. ≥ 65°F (18°C)

When you charge an expansion valve system when the outdoor ambient temperature is 65°F (18°C) or above, it is best to charge the unit using the approach method.

Subtract the outdoor ambient temperature from the liquid line temperature to determine the approach temperature. **(Liquid Line °F (°C) - Outdoor Ambient °F (°C) = Approach Temperature.)** The resulting difference (approach temperature) should agree with the values given in table 3. If not, add refrigerant to lower the approach temperature or recover refrigerant from the system to increase the approach temperature.

NOTE - For best results, the same electronic thermometer should be used to check both outdoor ambient and liquid line temperatures.

If the system is low on charge, R410A refrigerant must be added. Be aware of the R410A refrigerant cylinder. It will be light maroon-colored. Refrigerant should be added through the suction valve in the liquid state. **Some R410A cylinders are equipped with a dip tube which allows you to draw liquid refrigerant from the bottom of the cylinder without turning the cylinder upside-down. The cylinder will be marked if it is equipped with a dip tube.**

⚠ IMPORTANT

REFRIGERANT SHOULD BE ADDED THROUGH THE VAPOR LINE VALVE IN THE LIQUID STATE.

D - Oil Charge

Refer to compressor nameplate.

Table 3
Approach Values

Model No.	Approach Temperature Liquid Line - Outdoor Ambient °F (°C)
-018	10 (5.6)
-024	12 (6.7)
-030	13 (7.2)
-036	12 (6.7)
-042	11 (6.1)
-048	12 (6.7)
-060	14 (7.8)

NOTE - For best results, use the same digital thermometer to check both outdoor ambient and liquid temperatures.

TABLE 4
Normal Operating Pressures In psig (liquid +/- 10 and suction +/- 5 PSIG)*

Mode	Out. Coil Entering Air Temp. °F (°C)	HSXA12 -018		HSXA12 -024		HSXA12 -030		HSXA12 -036		HSXA12 -042		HSXA12 -048		HSXA12 -060	
		LIQ	SUC	LIQ	SUC	LIQ	SUC	LIQ	SUC	LIQ	SUC	LIQ	SUC	LIQ	SUC
Fixed orifice	65 (18.3)	238	123	261	131	261	128	268	130	254	121	275	122	280	121
	75 (23.9)	275	131	300	135	300	133	308	134	296	128	318	128	332	126
	85 (29.4)	317	136	343	139	343	138	351	138	340	133	364	132	379	130
	95 (35.0)	362	141	391	143	387	141	398	142	389	138	413	136	427	135
	105 (40.6)	410	144	441	147	434	145	447	146	440	142	466	140	479	140
TXV	65 (18.3)	234	133	256	134	256	137	264	135	256	124	276	125	262	121
	75 (23.9)	270	135	298	137	296	139	305	138	296	127	318	131	304	127
	85 (29.4)	312	137	344	140	339	141	349	139	341	133	363	134	349	132
	95 (35.0)	361	138	394	142	384	144	396	140	389	136	414	136	397	136
	105 (40.6)	409	141	448	143	432	146	446	143	440	140	467	139	449	140

**These are typical pressures only. Indoor evaporator match up, indoor air quality, and evaporator load will cause the pressures to vary.*

TABLE 5
R410A Temperature Pressure Chart

Temperature °F	Pressure Psig	Temperature °F	Pressure Psig	Temperature °F	Pressure Psig	Temperature °F	Pressure Psig
32	100.8	63	178.5	94	290.8	125	445.9
33	102.9	64	181.6	95	295.1	126	451.8
34	105.0	65	184.3	96	299.4	127	457.6
35	107.1	66	187.7	97	303.8	128	463.5
36	109.2	67	190.9	98	308.2	129	469.5
37	111.4	68	194.1	99	312.7	130	475.6
38	113.6	69	197.3	100	317.2	131	481.6
39	115.8	70	200.6	101	321.8	132	487.8
40	118.0	71	203.9	102	326.4	133	494.0
41	120.3	72	207.2	103	331.0	134	500.2
42	122.6	73	210.6	104	335.7	135	506.5
43	125.0	74	214.0	105	340.5	136	512.9
44	127.3	75	217.4	106	345.3	137	519.3
45	129.7	76	220.9	107	350.1	138	525.8
46	132.2	77	224.4	108	355.0	139	532.4
47	134.6	78	228.0	109	360.0	140	539.0
48	137.1	79	231.6	110	365.0	141	545.6
49	139.6	80	235.3	111	370.0	142	552.3
50	142.2	81	239.0	112	375.1	143	559.1
51	144.8	82	242.7	113	380.2	144	565.9
52	147.4	83	246.5	114	385.4	145	572.8
53	150.1	84	250.3	115	390.7	146	579.8
54	152.8	85	254.1	116	396.0	147	586.8
55	155.5	86	258.0	117	401.3	148	593.8
56	158.2	87	262.0	118	406.7	149	601.0
57	161.0	88	266.0	119	412.2	150	608.1
58	163.9	89	270.0	120	417.7	151	615.4
59	166.7	90	274.1	121	423.2	152	622.7
60	169.6	91	278.2	122	428.8	153	630.1
61	172.6	92	282.3	123	434.5	154	637.5
62	195.5	93	286.5	124	440.2	155	645.0

Weighing in the Charge Fixed Orifice *or* *TXV Systems – Outdoor Temp < 65°F (18°C)*

If the system is void of refrigerant, or if the outdoor ambient temperature is cool, the refrigerant charge should be weighed into the unit. Do this after any leaks have been repaired.

1 - Recover the refrigerant from the unit.

2 - Conduct a leak check, then evacuate as previously outlined.

3 - Weigh in the unit nameplate charge.

If weighing facilities are not available or if you are charging the unit during warm weather, follow one of the other procedures outlined below.

Charging Using the Subcooling Method Fixed Orifice *Systems – Outdoor Temp. ≥ 65°F (18°C)*

If you charge a fixed orifice system when the outdoor ambient is 65°F (18°C) or above, use the subcooling method to charge the unit.

1 - With the manifold gauge hose still on the liquid service port and the unit operating stably, use a digital thermometer to record the liquid line temperature.

2 - At the same time, record the liquid line pressure reading.

3 - Use a temperature/pressure chart for R-410A to determine the saturation temperature for the liquid line pressure reading.

4 - Subtract the liquid line temperature from the saturation temperature (according to the chart) to determine subcooling. **(Saturation temperature - Liquid line temperature = Subcooling)**

5 - Compare the subcooling value with those in table 6. If subcooling is greater than shown, recover some refrigerant. If subcooling is less than shown, add some refrigerant.

Weighing in the Charge *TXV Systems, < 65°F (18°C) Outdoor Temp.*

1 - Recover the refrigerant from the unit.

2 - Conduct a leak check, then evacuate as previously outlined.

3 - Weigh in the factory charge as shown on the outdoor unit's rating plate (allowing for line set length).

E - Oil Charge

Refer to compressor nameplate.

Table 6
Subcooling Values for Fixed Orifice Systems

Outdoor Temp. °F (°C)	Liquid Subcooling [± 1°F (.6°C)]						
	-018	-024	-030	-036	-042	-048	-060
65 (18)	13 (7.2)	13 (7.2)	16 (8.9)	12 (6.7)	11 (6.4)	17 (9.4)	13 (7.2)
70 (21)	12 (6.7)	11 (6.1)	15 (8.3)	11 (6.1)	10 (5.6)	16 (8.9)	12 (6.7)
75 (24)	11 (6.1)	10 (5.6)	14 (7.8)	10 (5.6)	9 (5)	15 (8.3)	11 (6.1)
80 (27)	9 (5)	9 (5)	13 (7.2)	9 (5)	8 (4.5)	14 (7.8)	10 (5.6)
85 (29)	8 (4.5)	7 (3.9)	12 (6.7)	8 (4.5)	7 (3.9)	14 (7.8)	10 (5.6)
90 (32)	6 (3.3)	6 (3.3)	10 (5.6)	7 (3.9)	6 (3.3)	13 (7.2)	9 (5)
95 (35)	5 (2.8)	5 (2.8)	9 (5)	6 (3.3)	6 (3.3)	12 (6.7)	8 (4.5)
100 (38)	5 (2.8)	4 (2.2)	8 (4.5)	5 (2.8)	5 (2.8)	11 (6.1)	7 (3.9)
105 (41)	4 (2.2)	4 (2.2)	7 (3.9)	4 (2.2)	4 (2.2)	11 (6.1)	6 (3.3)
110 (43)	3 (1.7)	3 (1.7)	6 (3.3)	4 (2.2)	3 (1.7)	10 (5.6)	6 (3.3)
115 (45)	2 (1.1)	3 (1.7)	5 (2.8)	3 (1.7)	3 (1.7)	10 (5.6)	5 (2.8)

V - SERVICE AND RECOVERY

⚠WARNING

Polyol ester (POE) oils used with R410A refrigerant absorb moisture very quickly. It is very important that the refrigerant system be kept closed as much as possible. DO NOT remove line set caps or service valve stub caps until you are ready to make connections.

⚠ IMPORTANT

USE RECOVERY MACHINE RATED FOR R410A REFRIGERANT.

If the HSXA12 system must be opened for any kind of service, such as compressor or drier replacement, you must take extra precautions to prevent moisture from entering the system. The following steps will help to minimize the amount of moisture that enters the system during recovery of R410A.

1 - Use a regulator-equipped nitrogen cylinder to break the system vacuum. Do not exceed 5 psi. The dry nitrogen will fill the system, purging any moisture.

2 - Remove the faulty component and quickly seal the system (using tape or some other means) to prevent additional moisture from entering the system.

3 - Do not remove the tape until you are ready to install new component. Quickly install the replacement component.

4 - Evacuate the system to remove any moisture and other non-condensables.

Any time the HSXA12 sealed system is opened, the drier must be replaced and the system must be evacuated.

Any moisture not absorbed by the polyol ester oil can be removed by evacuation. Moisture that has been absorbed by the compressor oil can be removed by replacing the drier.

⚠ IMPORTANT

Evacuation of system only will not remove moisture from oil. Drier must be replaced to eliminate moisture from POE oil.

VI - MAINTENANCE

⚠WARNING

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

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

A - Outdoor Unit

1 - Clean and inspect the outdoor coil. The coil may be flushed with a water hose. Ensure the power is turned off before you clean the coil.

2 - Condenser fan motor is prelubricated and sealed. No further lubrication is needed.

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

4 - Check wiring for loose connections.

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

6 - Check amp-draw condenser fan motor.
Unit nameplate _____ Actual _____ .
NOTE - If owner complains of insufficient cooling, the unit should be gauged and refrigerant charge checked. Refer to section on refrigerant charging in this instruction.

B - Indoor Coil

1 - Clean coil, if necessary.

2 - Check connecting lines and coils for evidence of oil leaks.

3 - Check the condensate line and clean it if necessary.

C - Indoor Unit

1 - Clean or change filters.

2 - 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.

3 - *Belt Drive Blowers* - Check belt for wear and proper tension.

4 - Check all wiring for loose connections

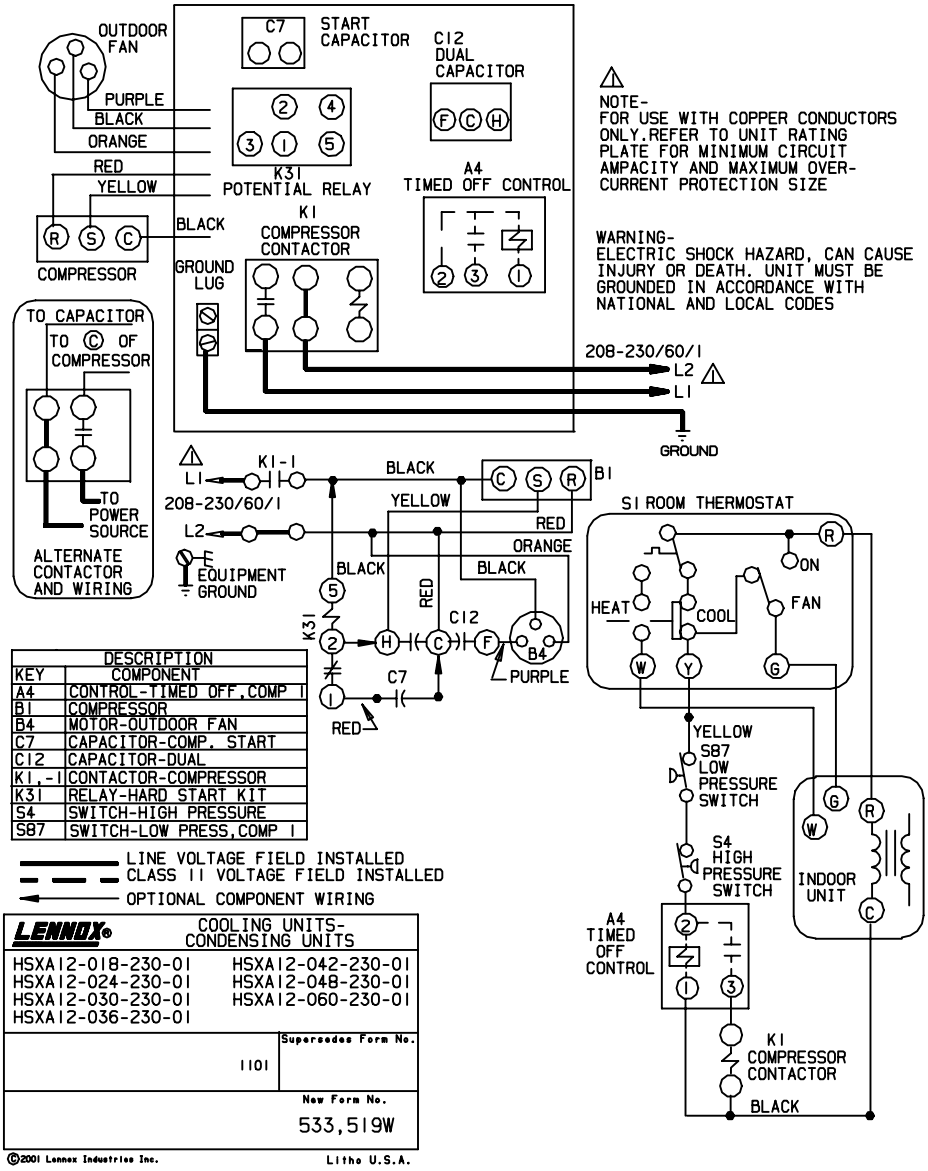
5 - Check for correct voltage at unit (blower operating).

6 - Check amp-draw on blower motor
Unit nameplate_____ Actual _____.

VII - WIRING DIAGRAMS AND SEQUENCE OF OPERATION

HSXA12 1 1/2 THROUGH 5 TON OPERATING SEQUENCE

Single Phase



KEY	DESCRIPTION COMPONENT
A4	CONTROL-TIMED OFF,COMP 1
B1	COMPRESSOR
B4	MOTOR-OUTDOOR FAN
C7	CAPACITOR-COMP. START
C12	CAPACITOR-DUAL
K1,-1	CONTACTOR-COMPRESSOR
K31	RELAY-HARD START KIT
S4	SWITCH-HIGH PRESSURE
S87	SWITCH-LOW PRESS,COMP 1

LENNOX® COOLING UNITS- CONDENSING UNITS	
HSXA12-018-230-01	HSXA12-042-230-01
HSXA12-024-230-01	HSXA12-048-230-01
HSXA12-030-230-01	HSXA12-060-230-01
HSXA12-036-230-01	
1101	Supersedes Form No.
	New Form No. 533,519W

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:

1 - Cooling demand initiates at Y1 in the thermostat.

2 - 24VAC from indoor unit (Y1) energizes the timed off control (TOC), which energizes compressor contactor K1 provided the 5 minute delay is satisfied.

3 - K1-1 N.O. closes, energizing compressor (B1) and outdoor fan motor (B4).

4 - Compressor (B1) and outdoor fan motor (B4) begin immediate operation..

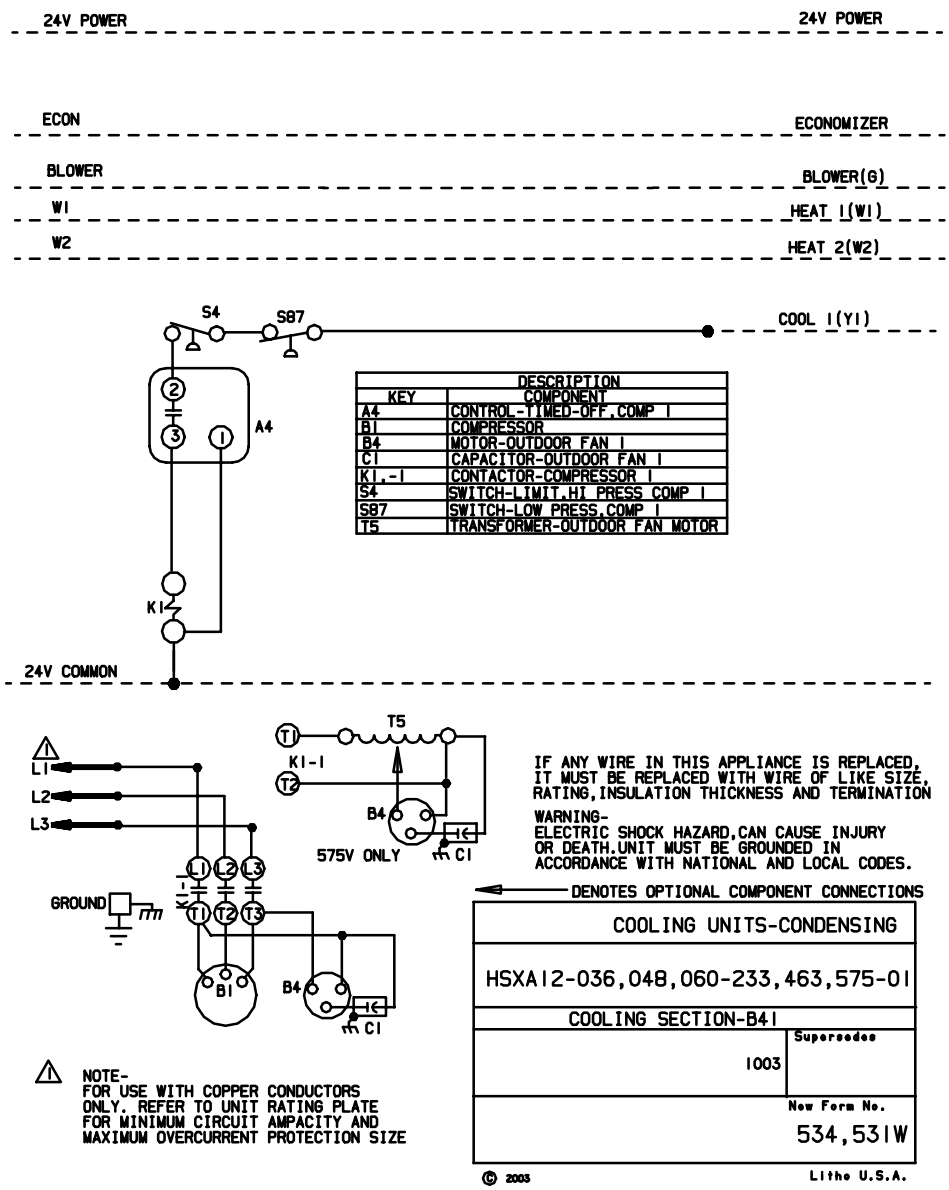
END OF COOLING DEMAND:

5 - Cooling demand is satisfied. Terminal Y1 is de-energized.

6 - Compressor contactor K1 is de-energized.

7 - K1-1 opens and compressor (B1) and outdoor fan motor (B4) are de-energized and stop immediately.

HSXA12 3 THROUGH 5 TON OPERATING SEQUENCE
Three Phase



KEY	DESCRIPTION COMPONENT
A4	CONTROL-TIMED-OFF,COMP 1
B1	COMPRESSOR
B4	MOTOR-OUTDOOR FAN 1
C1	CAPACITOR-OUTDOOR FAN 1
K1,-1	CONTACTOR-COMPRESSOR 1
S4	SWITCH-LIMIT,HI PRESS COMP 1
S87	SWITCH-LOW PRESS,COMP 1
T5	TRANSFORMER-OUTDOOR FAN MOTOR

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:

1 - Cooling demand initiates at Y1 in the thermostat.

2 - 24VAC from indoor unit (Y1) energizes the timed off control (TOC), which energizes compressor contactor K1 provided the 5 minute delay is satisfied.

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4 - Compressor (B1) and outdoor fan motor (B4) begin immediate operation..

END OF COOLING DEMAND:

5 - Cooling demand is satisfied. Terminal Y1 is de-energized.

6 - Compressor contactor K1 is de-energized.

7 - K1-1 opens and compressor (B1) and outdoor fan motor (B4) are de-energized and stop immediately.