LENNOX®
Service Literature

UNIT INFORMATION

Corp 0413-L3
Revised 07-2006

SSA

3, 4 AND 5 ton
(10.5, 14 and 17.6 kW)

SSA COMMERCIAL CONDENSING UNITS

The SSA is a high efficiency commercial split-system condensing unit, which features a two-stage scroll compressor and R410A refrigerant. SSA units are available in 3, 4 and 5 (036, 048 and 060) ton sizes. The series is designed for use with an expansion valve only (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.

IMPORTANT

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

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

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.

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.

TABLE OF CONTENTS

Specifications

General Data	Nominal Tonnage / Model No.	3 / SSA036H4	4 / SSA048H4	5 / SSA060H4
[1] Cooling Performance	Net cooling capacity - Btuh (kW)	37,000 (10.8)	49,000 (14.4)	59,000 (17.3)
	Total unit watts	2935	4085	5310
	SEER	17.25	16.35	15.30
	EER	12.60	12.30	11.35
	[2] Sound Rating Number (dB)	72	75	76
Refrigerant	[3] R-410A charge furnished	8 lbs. 5 oz (3.77 kg)	8 lbs. 13 oz (4.00 kg)	11 lbs. 7 oz (5.19 kg)
Compressor Type (No.)		Copeland Scroll Ultra Tech™ Two-Stage (1)	Copeland Scroll Ultra Tech™ Two-Stage (1)	Copeland Scroll Ultra Tech™ Two-Stage (1)
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)	7/8 (22.2)	7/8 (22.2)	1-1/8 (28.5)
Condenser Coil	Net face area - sq. ft. (m2) Outer coil	16 (1.94)	18.3 (1.70)	21.8 (2.03)
	Inner coil	13.3 (1.24)	13.3 (1.24)	21.1 (1.96)
	Tube diameter - in. (mm)	5/16 (0.52)	5/16 (0.52)	5/16 (0.52)
	No. of rows	1.83	1.73	2
	Fins per inch (m)	22	22	22
Condenser Fan	Diameter - in. (mm)	24 (610)	24 (610)	24 (610)
	No. of blades	3	3	3
	Motor hp (W)	1/6 (124)	1/4 (187)	1/4 (187)
	Cfm (L/s)	3160 (1485)	3900 (1840)	4200 (1980)
	Rpm	825	820	820
	Watts	200	270	300

[1] Certified in accordance with USE certification program which is based on ARI Standard 210/240 with 25 ft. (7.6 m) of connecting refrigerant lines.
[2] Sound Rating Number rated in accordance with test conditions included in ARI Standard 270.
[3] Refrigerant charge sufficient for 15 ft. (4.6 m) length of refrigerant lines.

Electrical Data

Electrical Data	Model No.	SSA036H4		SSA048H4		SSA060H4	
	Line voltage data - 3ph-60hz	208/230V	460V	208/230V	460V	208/230V	460V
	[1] Maximum overcurrent protection (amps)	25	15	30	15	40	20
	[2] Minimum circuit ampacity	15.1	6.8	18.6	9.2	23.7	12.4
Compressor	Rated load amps	11.2	4.5	13.5	6.4	17.6	9.0
	Locked rotor amps	58	29	88	41	123	62
	Power factor	.98	.98	.99	.99	.99	.99
Condenser Fan Motor	Full load amps	1.1	1.1	1.7	1.1	1.7	1.1
	Locked rotor amps	2	2	3.1	2	3.1	2

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

Field Installed Accessories

	Model No.	SSA036H4	SSA048H4	SSA060H4
Compressor Low Ambient Cut-Off		**45F08**	**45F08**	**45F08**
Compressor Time-Off Control		**47J27**	**47J27**	**47J27**
Freezestat	3/8 in. tubing	**93G35**	**93G35**	**93G35**
	1/2 in. tubing	**39H29**	**39H29**	**39H29**
	5/8 in. tubing	**50A93**	**50A93**	**50A93**
Hail Guards		**79M15**	**79M15**	**79M16**
Indoor Blower Speed Relay Kit		**40K58**	**40K58**	**40K58**
[1] **Low Ambient Kits**	to 30°F (-1°C)	**34M72**	**34M72**	**34M72**
	[2] to 0°F (-18°C) Controller	**43N88**	**43N88**	**43N88**
	Condenser Fan Motor - 208/230V	**69H73**	**69H73**	**69H73**
	460V	**69H74**	**69H74**	**69H74**
	Run Capacitor	**53H32**	**53H32**	**53H32**
Mounting Base	Catalog No. (Model No.)	**69J07** (MB2-L)	**69J07** (MB2-L)	**69J07** (MB2-L)
	Net Weight	15 lbs. (7 kg)	15 lbs. (7 kg)	15 lbs. (7 kg)
	Dimensions - in. (mm)	32 x 34 x 3 (813 x 864 x 76)	32 x 34 x 3 (813 x 864 x 76)	32 x 34 x 3 (813 x 864 x 76)
Refrigerant Line Set	15 ft. (4.6 m) length	L15-65-15	L15-65-15	Field Fabricate
	30 ft. (9 m) length	L15-65-30	L15-65-30	Field Fabricate
	40 ft. (12 m) length	L15-65-40	L15-65-40	Field Fabricate
	50 ft. (15 m) length	L15-65-50	L15-65-50	Field Fabricate
Time Delay Relay Kit		**58M81**	**58M81**	**58M81**

[1] 3/8 in. Freezestat must be ordered separately.

[2] Condenser fan motor and capacitor must be replaced (order separately).

I-APPLICATION

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. A misapplied system will cause erratic operation and can result in early compressor failure.

II-Unit Components

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.

A-Two-Stage Scroll Compressor (B1)

TWO-STAGE MODULATED SCROLL

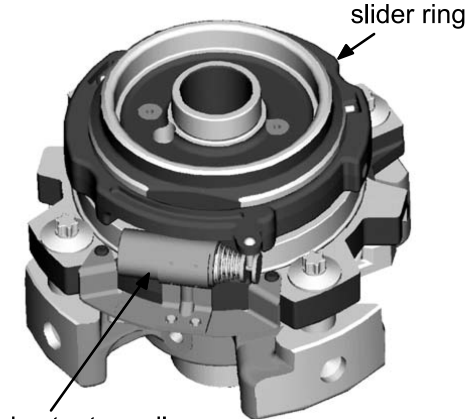


FIGURE 1

The scroll compressor design is simple, efficient and requires few moving parts. A cutaway diagram of the scroll compressor is shown in figure 1.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 2 shows the basic scroll form. Two identical scrolls are mated together forming concentric spiral shapes (figure 3). One scroll remains stationary, while the other is allowed to “orbit” (figure 4). Note that the orbiting scroll does not rotate or turn but merely “orbits” the stationary scroll.

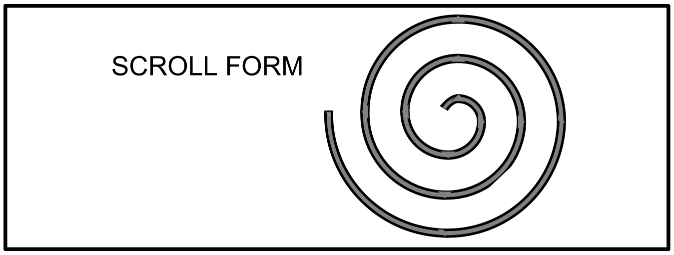


FIGURE 2

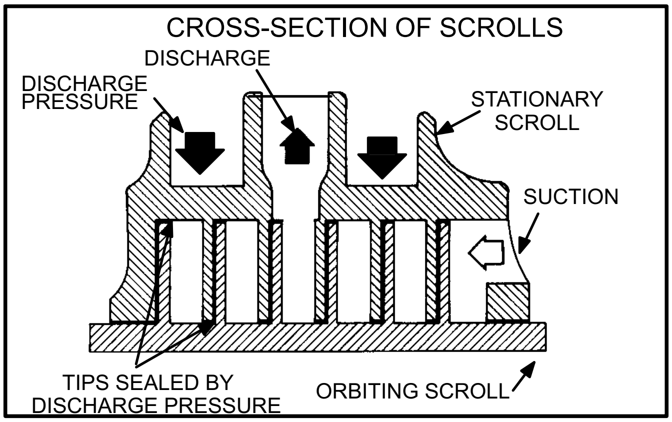


FIGURE 3

The counterclockwise orbiting scroll draws gas into the outer crescent shaped gas pocket created by the two scrolls (figure 4 - 1). The centrifugal action of the orbiting scroll seals off the flanks of the scrolls (figure 4 - 2). As the orbiting motion continues, the gas is forced toward the center of the scroll and the gas pocket becomes compressed (figure 4 -3). When the compressed gas reaches the center, it is discharged vertically into a chamber and discharge port in the top of the compressor (figure1). The discharge pressure forcing down on the top scroll helps seal off the upper and lower edges (tips) of the scrolls (figure 3). During a single orbit, several pockets of gas are compressed simultaneously providing smooth continuous compression.

The scroll compressor is tolerant to the effects of liquid return. If liquid enters the scrolls, the orbiting scroll is allowed to separate from the stationary scroll. The liquid is worked toward the center of the scroll and is discharged. If the compressor is replaced, conventional Lennox cleanup practices must be used.

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. This type of damage can be detected and will result in denial of warranty claims.The scroll compressor can be used to pump down refrigerant as long as the pressure is not reduced below 7 psig.

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

The scroll compressors in all SSA 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. If oil must be added for service, Copeland has approved Mobil EAL™ Arctic 22CC and ICI EMKARATE™ RL32CF for use with these compressors. Lennox recommends adding 1 oz. of oil per additional 10 ft. for applications with line sets over 50 ft. See electrical section in this manual for compressor specifications.

TWO-STAGE OPERATION

The two-stage scroll compressor operates like any standard scroll compressor with the exception the two-stage compressor modulates between first stage (low capacity approximately 67%) and second stage (high capacity). Modulation occurs when gas is bypassed through bypass ports (figure 5 bypass ports open) in the first suction pocket. This bypassing of gas allows the compressor to operate on first stage (low capacity) if thermostat demand allows. Indoor thermostat setting will determine first or second stage operation. The compressor will operate on first-stage until demand is satisfied or the indoor temperature reaches the thermostat set point calling for second-stage.

Second-stage (high capacity) is achieved by blocking the bypass ports (figure 5 bypass ports closed) with a slider ring. The slider ring begins in the open position and is controlled by a **24VDC** internal solenoid. On a Y2 call the internal solenoid closes the slider ring, blocking the bypass ports and bringing the compressor to high capacity. Two-stage modulation can occur during a single thermostat demand as the motor runs continuously while the compressor modulates from first-stage to second- stage.

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

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 vapor pressures indicate proper compressor phasing and operation. If discharge and vapors pressures do not perform normally, follow the steps below to correctly phase in 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 vapor pressures should operate at their normal start-up ranges.

NOTE - Compressor noise level will 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.

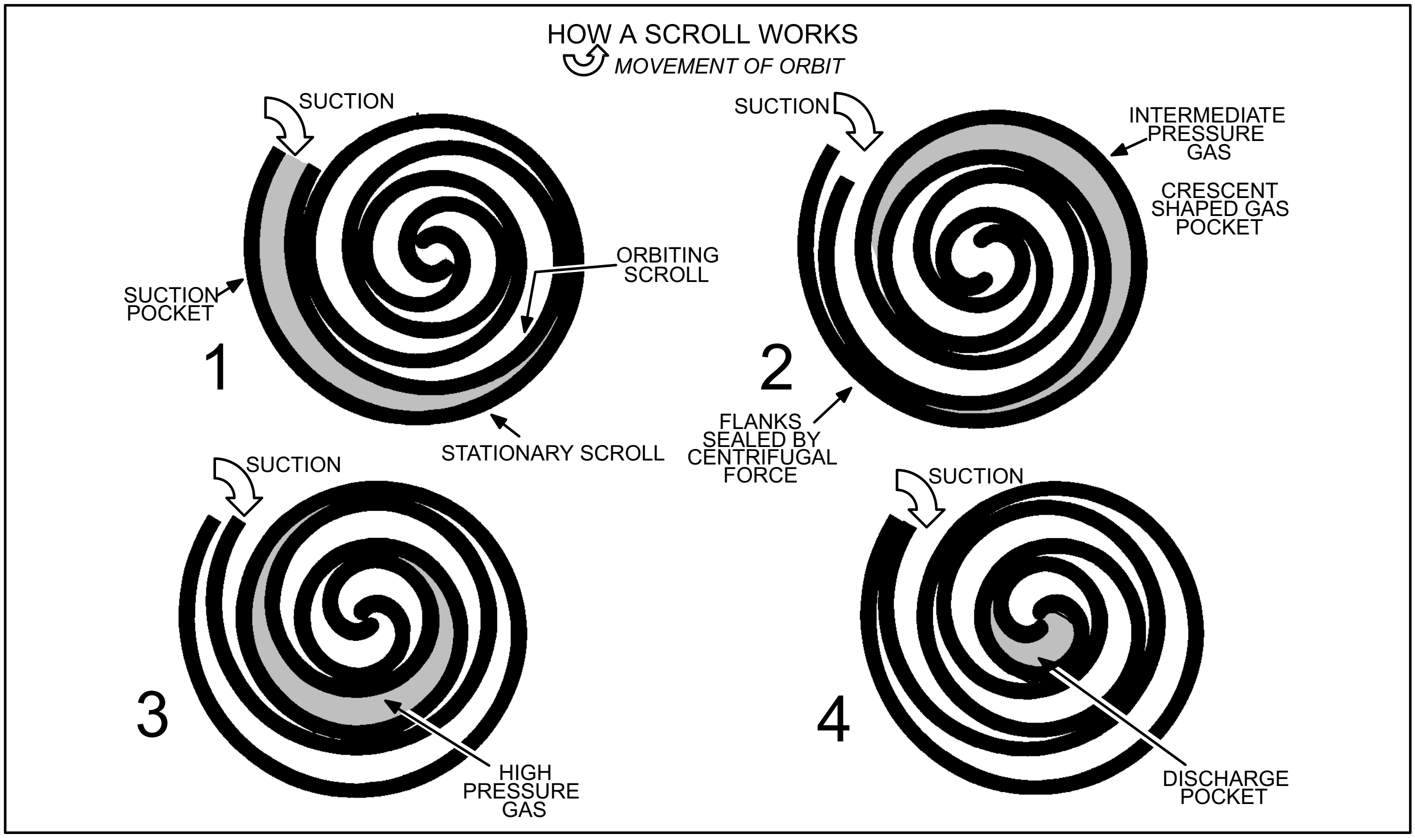


FIGURE 4

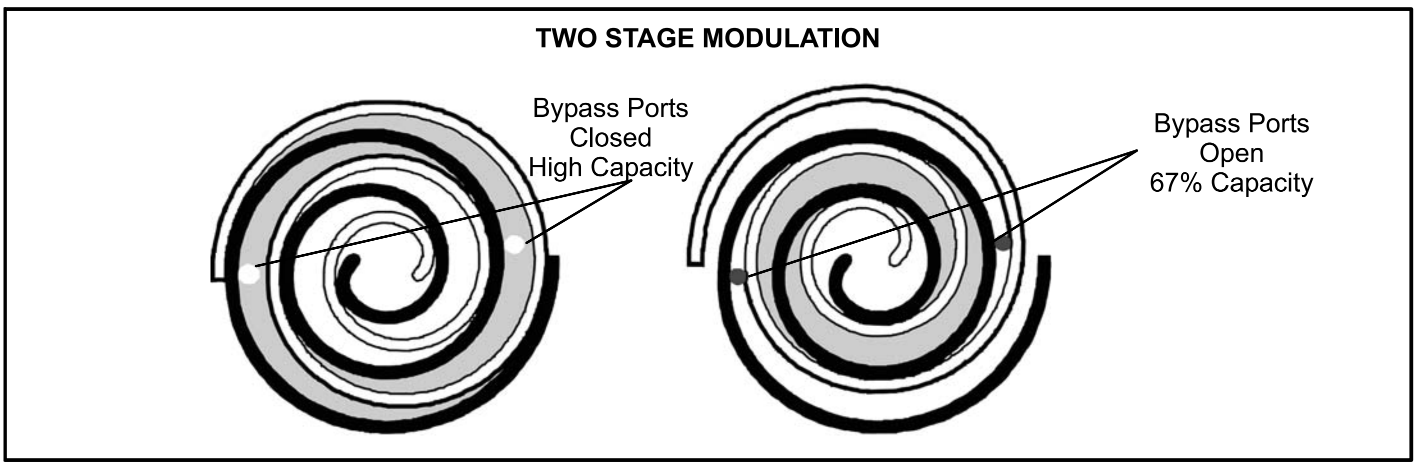


FIGURE 5

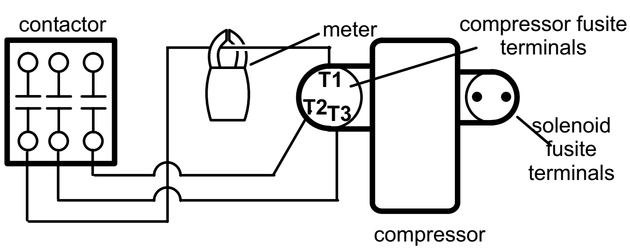
INTERNAL SOLENOID (L34)

The internal unloader solenoid controls the two-stage operation of the compressor by shifting a slide ring mechanism to open two by-pass ports in the first compression pocket of the scrolls in the compressor. The internal solenoid is activated by a **24 volt direct current solenoid coil.** The coil power requires 20VAC. The internal wires from the solenoid in the compressor are routed to a 2 pin fusite connection on the side of the compressor shell. The external electrical connection is made to the compressor with a molded plug assembly. This plug contains a full wave rectifier that converts 24 volt AC into 24 volt DC power to power the unloader solenoid. Refer to unit diagram for internal circuitry view of plug).

If it is suspect the unloader is not operating properly, check the following

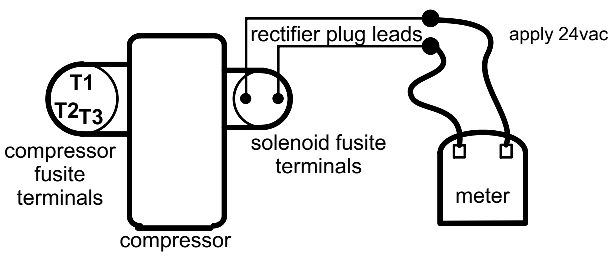
STEP 1

Connect an amp meter onto the common main power leg of the compressor (black wire). With compressor operating, cycle 24VAC on and off to full wave recifier plug at 10 second intervals (cycle from Y1 to Y2 demands). The amperage should go up or down at least 25%. If amperage varies as voltage is applied to the recifier plug, the unloader solenoid is operating correctly and no further checks are required. If amperage does not change, proceed to step 2.



STEP 2

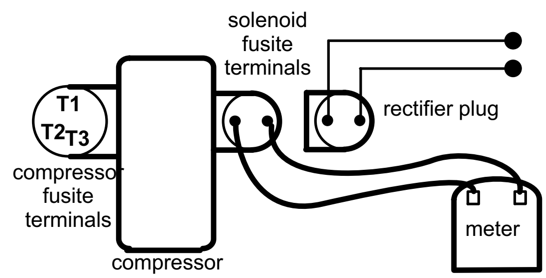
Shut compressor off. Apply 24VAC directly to the full wave rectifier plug wire leads and listen for a “click” as the solenoid returns to its original position. If “click can’t be heard, go to step 3 & 4.



STEP 3

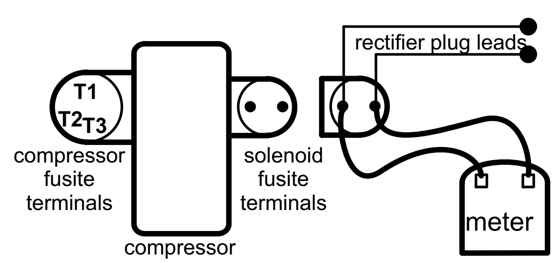
Shut all power off to unit (main and low voltage). Unplug the molded plug from unloader solenoid fusite. Using a volt meter set on 200 ohm scale (a) measure the resistance at the 2 fusite pins that go to the internal unloader solenoid in the compressor. The resistance should be 32 to 60 ohms depending on the compressor temperature.

(b) Measure the resistance from each fusite pin to ground. There should **not be** continuity to ground. If coil is grounded replace compressor.



STEP 4

With all power off to the unit, unplug the full wave rectifier plug from the fusite connection on the compressor. Turn the low voltage power back onto the unit. Supply 24VAC to the wires of the full wave rectifier plug. Set volt meter to DC volts and measure the DC voltage at the female connector end of the full wave rectifier plug. The DC voltage reading should be 1.5 to 3 volts lower than the input voltage to the plug wire leads. (EX: Input voltage is 24VAC output voltage is 22VDC).



B-High Pressure Switch (S4)

⚠ IMPORTANT

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

A manual-reset, single-pole/single-throw high pressure switch is located in the liquid line. The 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 640 $\pm$ 10 psi. See figure 8 for switch location.

C-Low Pressure Switch (S87)

All SSA units are equipped with an auto-reset, single-pole/single-throw low pressure switch is located in the vapor line.This switch shuts off the compressor when vapor line pressure drops below the factory setting. The switch is closed during normal operating pressure conditions and is permanently adjusted to trip (open) at 50 $\pm$ 5 psi. The switch automatically resets when vapor line pressure rises above 90 $\pm$ 5 psi. See figure 8 for switch location.

D-Crankcase Heater (HR1) and Thermostat

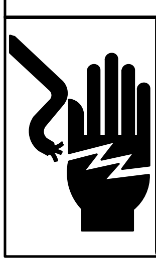
The compressor in the Y voltage SSA units are equipped with a 70 watt, belly band type crankcase heater. HR1 prevents liquid from accumulating in the compressor. HR1 is controlled by a thermostat located on the liquid line. When liquid line temperature drops below 50° F the thermostat closes energizing HR1. The thermostat will open, de-energizing HR1 once liquid line temperature reaches 70° F.

The compressor in the G voltage SSA units have a thermostat located in the dis-charge line. When discharge line temperature drops below 74° F the thermostat closes energizing HR1. The thermostat will open, de-energizing HR1 once discharge line temperature reaches 94° F .

E-Contactor (K1)

The compressor is energized by a contactor located in the control box. SSA units are three-phase with triple pole contactors. See figure 8 for location.

⚠ DANGER



Shock Hazard

Remove all power at disconnect before removing access panel.
Potential exists for electrical shock resulting in injury or death.
Line voltage exists at all components (even when unit is not in operation).

F-Condenser Fan Motor (B4) & Capacitor (C1)

SSA units use single-phase PSC fan motors which require a run capacitor. The capacitor assists in the start up of the condenser fan. Rating s for (C1) will be on condenser fan motor nameplate. The specifications tables in this manual show the specifications of outdoor fans used in SSA units. In all units, the outdoor fan is controlled by the compressor contactor. See figure 6 if condenser fan motor replacement is necessary.

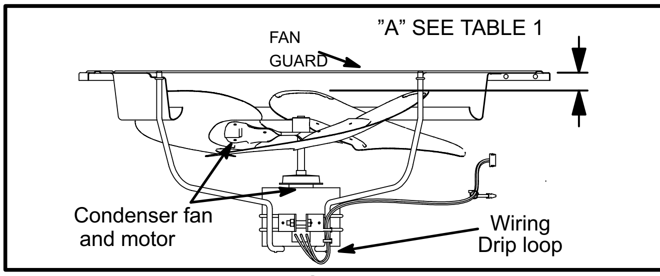


FIGURE 6

⚠ IMPORTANT

Route fan motor leads away from fan blades when replacing fan motor. Use wire drip loop as shown in figure 6.

TABLE 1

SSA UNIT	"A" DIM. $\pm$ 1/8"
-036	1-1/2"
-048	2-1/16"
-060	2-1/16"

Rain shield location is critical on the condenser fan assembly. Installing the shields to close to the bearing hub will create noise and may affect operation. Installing too far away will allow moisture to enter bearing resulting in motor failure. See figure 7.

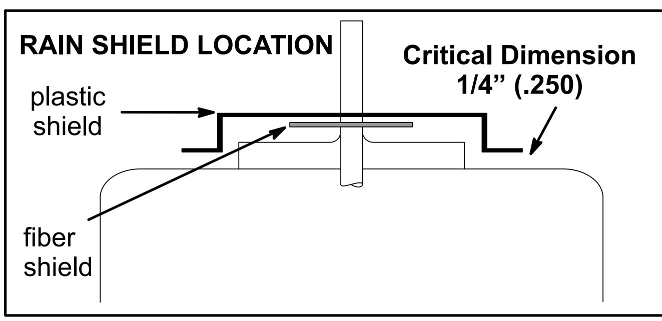


FIGURE 7

SSA PARTS ARRANGEMENT

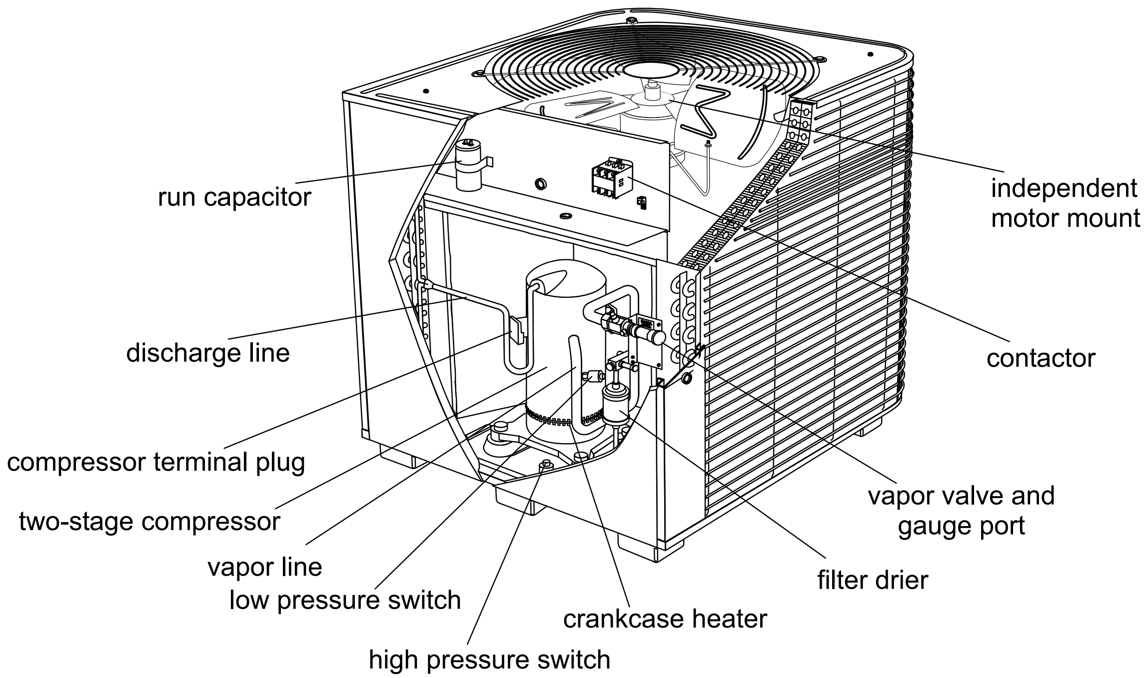


FIGURE 8

G-Drier

A filter drier designed for all SSA 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 R410A 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 than 4 psig.

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	Sporlan One Shot - TA-1	

MEASURING FILTER DRIER PRESSURE DROP

1- Shut off power to unit.

2- Remove high pressure switch from fitting next to filter drier.
(A schrader core is located under the high pressure switch).

3- Install high pressure gauge hose onto high pressure switch fitting.

4- Turn power on to unit and turn room thermostat to call for cooling.

5- Record pressure reading on gauge.

6- Remove hose from high pressure fitting and install on liquid line valve.

7- Read liquid line valve pressure.

8- High pressure fitting pressure - liquid line valve pressure = filter drier pressure drop.

9- If pressure drop is greater than 4 psig replace filter drier. See figure 10.

10- Re-install high pressure switch.

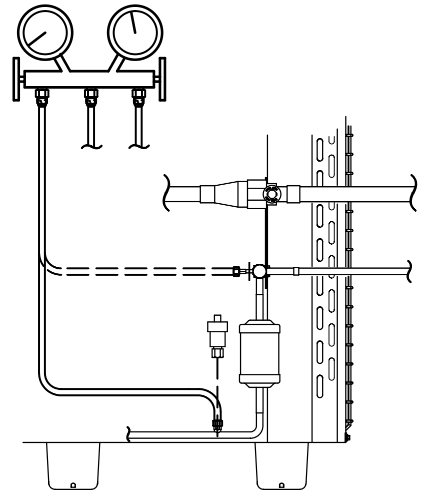


FIGURE 9

REPLACING FILTER DRIER

1- Recover all refrigerant from unit.

2- Remove original filter drier.

3- Install new filter drier in existing location or alternate location as shown. *Proper brazing procedures should be followed.*

4- Evacuate system. See section IV- part B-.

5- Recharge system. See section IV- part C-.

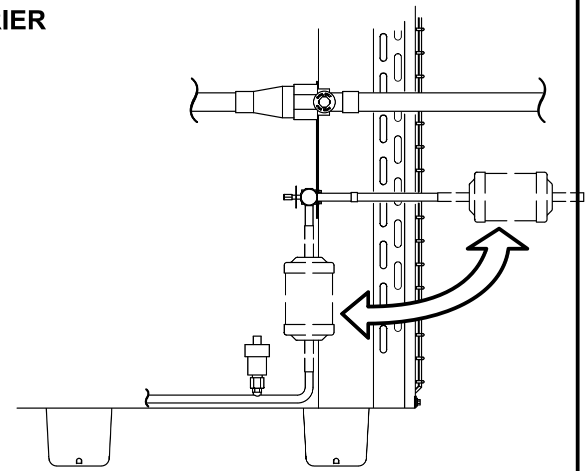


FIGURE 10

III-REFRIGERANT SYSTEM

A-Plumbing

Field refrigerant piping consists of liquid and vapor lines from the outdoor unit (sweat connections) to the indoor coil (flare or sweat connections). Use Lennox L15 (sweat, non-flare) series line sets as shown in table 3 or use field-fabricated refrigerant lines. Valve sizes are also listed in table 3.

TABLE 3

SSA	Valve Size Connections		Recommended Line Set		
	Liquid Line	Vapor Line	Liquid Line	Vapor Line	L15 Line Sets
-036	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)
-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	3/8 in. (10 mm)	1-1/8 in. (29 mm)	3/8 in. (10 mm)	1-1/8 in. (29 mm)	Field Fabricated

NOTE - Units are designed for line sets of up to fifty feet (15 m). Select line set diameters from table 3 to ensure that oil returns to the compressor.

B-Service Valves

The liquid line and vapor line service valves (figures 11 and 12) and gauge ports are used for leak testing, evacuating, charging and checking charge. See table 4 for torque requirements.

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.

TABLE 4

Part	Recommended Torque	
Service valve cap	8 ft.- lb.	11 NM
Sheet metal screws	16 in.- lb.	2 NM
Machine screws #10	28 in.- lb.	3 NM
Compressor bolts	90 in.- lb.	10 NM
Gauge port seal cap	8 ft.- lb.	11 NM

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.

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.

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

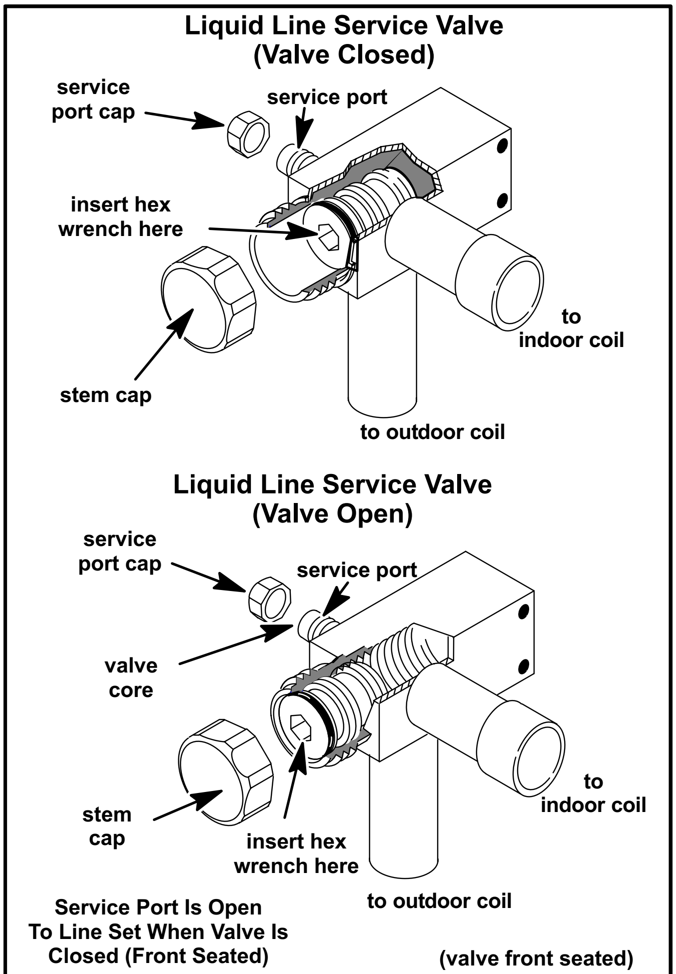


FIGURE 11

Vapor Line Ball Valve – All Units

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 12.

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.

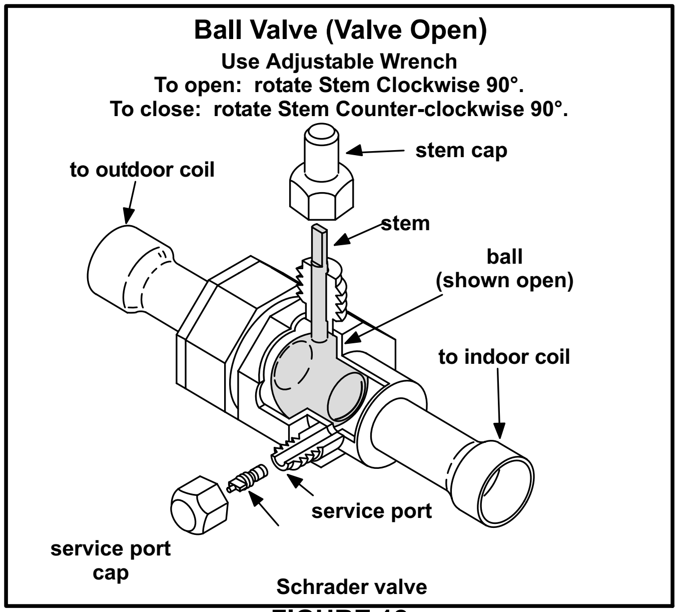


FIGURE 12

IV-CHARGING

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. (4.6m) line set. For varying lengths of line set, refer to table 5 for refrigerant charge adjustment.

TABLE 5

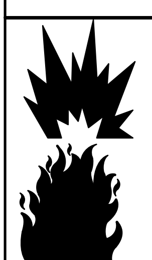
Liquid Line Set Diameter	Oz. per 5 ft. (grams per 1.5m) adjust from 15 ft. (4.6 m) line set*
3/8 in. (10 mm)	3 ounces per 5 feet (85 g per 1.5 m)

**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.*

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.

⚠ 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).

Using an Electronic Leak Detector

1 - Connect the high pressure hose of the manifold gauge set 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 helps to protect the manifold gauge set from damage caused by high pressure.)*

2 - With both manifold valves closed, connect the cylinder of R410A refrigerant. Open the valve on the R410A cylinder (vapor only).

3 - Open the high pressure side of the manifold to allow R410A into the line set and indoor unit. Weigh in a trace amount of R410A. *[A trace amount is a maximum of 2 ounces (57 g) refrigerant or 3 pounds (31 kPa) pressure.]* Close the valve on the R410A cylinder and the valve on the high pressure side of the manifold gauge set. Disconnect R410A cylinder.

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

5 - Adjust nitrogen pressure to 150 psig (1034 kPa). Open the valve on the high side of the manifold gauge set in order to pressurize the line set and the indoor coil.

6 - After a few minutes, open a refrigerant port to check that an adequate amount of refrigerant has been added for detection (refrigerant requirements will vary with line lengths). Check all joints for leaks. Purge nitrogen and R410A mixture. Correct any leaks and recheck.

B-Evacuating the System

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 R410A 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 R410A cylinder and remove the manifold gauge set.

C-Charging

⚠IMPORTANT

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

The compressor is charged with sufficient polyolester oil for line set lengths up to 50 ft. If line set lengths longer than 50 ft. will be required, add 1 ounce of oil for every additional 10 ft. of line set. Do not add any more than 7 oz. of oil. Copeland has approved Mobil EAL™ Arctic 22CC and ICI EMKARATE™ RL32CF for use with these compressors when oil must be added in the field.

Weighing in the Charge 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.

Subcooling Method Outdoor Temp. < 65°F (18°C)

When the outdoor ambient temperature is below 65°F (18°C), use the subcooling method to charge the unit. It may be necessary to restrict the air flow through the outdoor coil to achieve pressures in the 325-375 psig (2240-2585 kPa) range. These higher pressures are necessary for checking the charge. Block equal sections of air intake panels and move obstructions sideways until the liquid pressure is in the 325-375 psig (2240-2585 kPa) range. See figure 13.

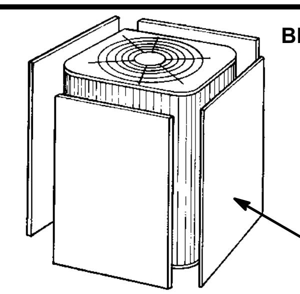


FIGURE 13

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 R410A to determine the saturation temperature for the liquid line pressure reading. See table 9.

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. Be aware of the R410A refrigerant cylinder. It will be light maroon-colored. Refrigerant should be added through the vapor line valve in the liquid state. **Some R410A cylinders are equipped with a dip tube that 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.**

TABLE 6
Subcooling Values for Charging

Model Number	Second Stage (High Capacity) Subcooling Values Saturation Temp. - Liquid Line Temp. °F (°C)
SSA-036	10.0 ± 1 (5.6 ± .5)
SSA-048	10.0 ± 1 (5.6 ± .5)
SSA-060	7 ± 1 (3.9 ± .5)

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). Monitor system pressures while charging.

1 - Record outdoor ambient temperature using a digital thermometer.

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 8, “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.

Approach Method

4 - Use the same digital thermometer you used to check the outdoor ambient temperature to check the liquid line temperature.

5 - The difference between the ambient and liquid temperatures should match values given in table 7. If the values don't agree with the those in table 7, add refrigerant to lower the approach temperature, or recover refrigerant from the system to increase the approach temperature. Be aware of the R410A refrigerant cylinder. It will be light maroon-colored. Refrigerant should be added through the vapor 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.**

TABLE 7
APPROACH TEMPERATURES

Model Number	High Capacity Approach Temperature Liquid Line Temp. - Outdoor Ambient °F (°C)
SSA-036	6.2 ± 1 (3.5 ± .5)
SSA-048	6.0 ± 1 (3.3 ± .5)
SSA-060	10.0 ± 1 (5.6 ± .5)

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

⚠ IMPORTANT

Use table 8 to perform maintenance checks. Table 8 is not a procedure for charging the system. Minor variations in these pressures may be 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.

⚠ IMPORTANT

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

D-Oil Charge

Refer to compressor nameplate.

TABLE 8
NORMAL OPERATING PRESSURES
(Liquid ±10 and Suction ±5 psig)

First Stage (Low Capacity)						
Outdoor Coil Entering Air Temp. °F (°C)	036H4		048H4		060H4	
	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor
65 (18.3)	224	135	216	138	233	143
75 (23.9)	258	139	249	140	270	145
85 (29.4)	300	143	288	143	312	147
95 (35.0)	342	147	332	145	358	147
105 (40.6)	395	148	380	147	407	149
115 (46.1)	451	149	430	150	456	150
Second Stage (High Capacity)						
Outdoor Coil Entering Air Temp. °F (°C)	**036H4**		**048H4**		**060H4**	
	Liquid	**Vapor**	**Liquid**	**Vapor**	**Liquid**	**Vapor**
65 (18.3)	233	131	226	132	251	127
75 (23.9)	266	134	261	135	291	135
85 (29.4)	306	137	301	137	334	141
95 (35.0)	361	141	347	140	375	142
105 (40.6)	401	142	395	142	434	146
115 (46.1)	455	144	448	145	487	149

TABLE 9
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

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 SSA system must be opened for any kind of service, such as compressor or filter 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.

The SSA system MUST be checked for moisture anytime the system is opened.

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

IMPORTANT

Evacuation of system only will not remove moisture from oil. Filter 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.

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:

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 on condenser fan motor.

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.

Indoor Coil

1 - Clean coil, if necessary.

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

3 - Check condensate line and clean, if necessary.

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.

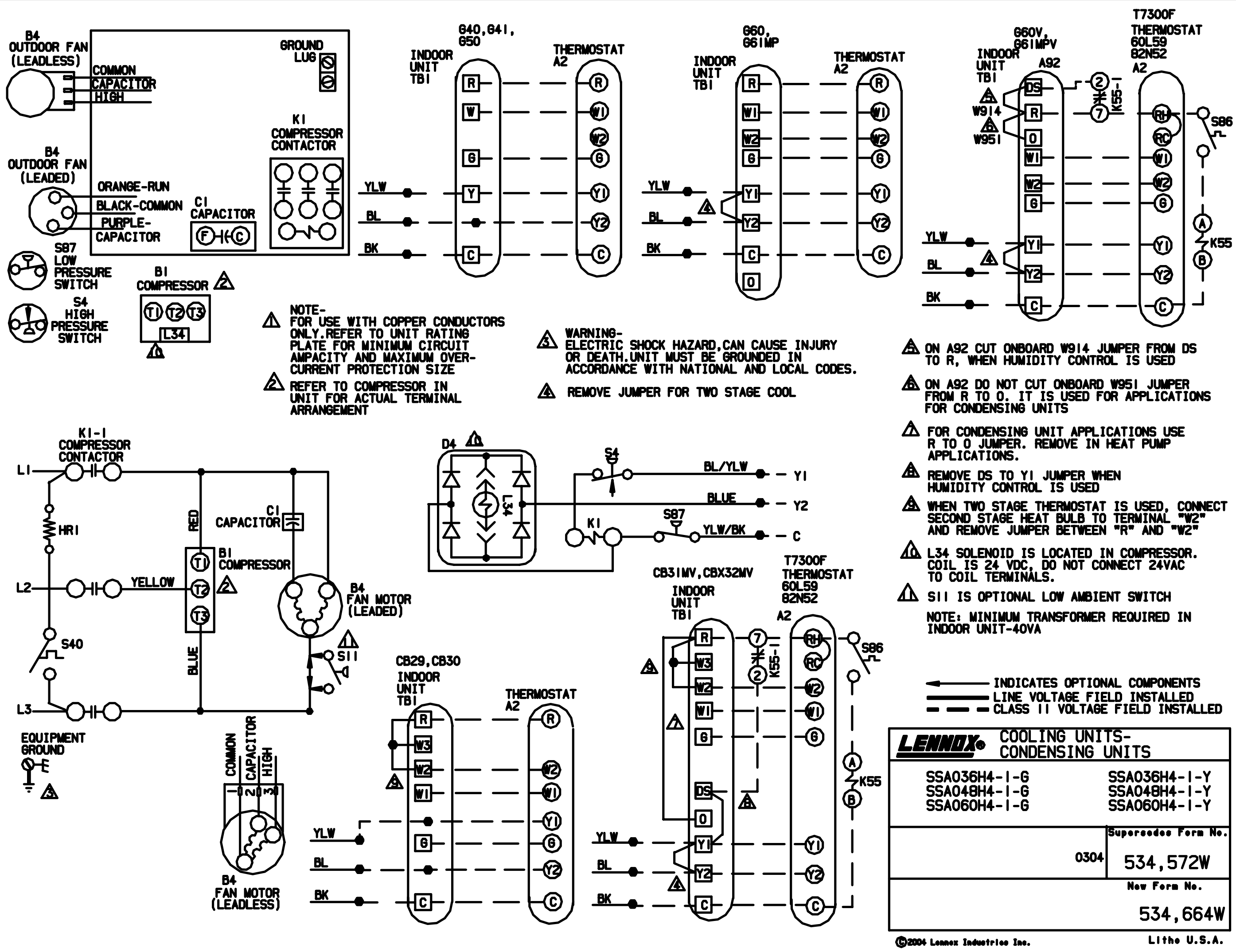
3 - *Belt Drive Blowers* - Check belt for wear and proper tension.

4 - Check all wiring for loose connections

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

6 - Check amp-draw on blower motor.

VII-DIAGRAMS / OPERATING SEQUENCE
A- Unit Diagram SSA-036/060-1G, 1Y



Sequence of Operation SSA-036/060 G, Y

NOTE - First and second stage cool operate independant of each other and can modulate back and forth according to thermostat demand.

First Stage Cool (low capacity)

1. Cooling demand initiates at Y1 in the thermostat.
2. Voltage from terminal Y passes through S4 high pressure switch, energizes K1 compressor contactor, passes through S87 low pressure switch and returns to common side of the 24VAC power.
3. K1 closes energizing B1 compressor and B4 outdoor fan.
4. Solenoid L34 is NOT energized so the slider ring remains open, limiting compressor to low capactiy.

Second Stage Cool (high capacity)

Compressor is operating in first stage cool

5- Second stage thermostat demand sends voltage to rectifier plug D4. D4 converts the AC voltage to DC voltage and energizes L34 unloader solenoid. L34 then closes the slider ring, allowing the compressor to operate at high capacity.