TSA*H4 SERIES UNITS

The TSA*H4 is a high efficiency commerical split-system condensing unit, which features a scroll compressor and designed for HFC-410A refrigerant. TSA*H4 units are available in sizes ranging from 3 through 5 tons. The series is designed for use with an expansion valve (TXV) 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

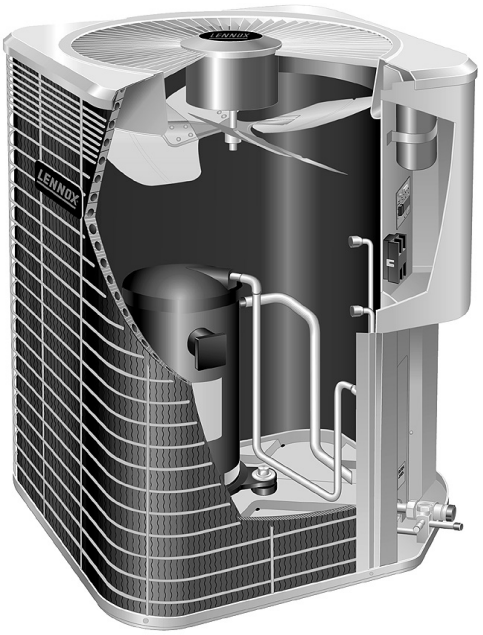
Operating pressures of this HFC-410A unit are higher than pressures in HCFC-22 units. Always use service equipment rated for HFC-410A.

⚠ 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).



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SPECIFICATIONS

General Data	Model No.	TSA036H4	TSA042H4	TSA048H4	TSA060H4
	Nominal Tonnage	3	3.5	4	5
Connections (sweat)	Liquid line o.d. - in.	3/8	3/8	3/8	3/8
	Suction line o.d. - in.	7/8	7/8	7/8	1-1/8
[1] **Refrigerant (R-410A) furnished**		6 lbs. 11oz.	8 lbs. 10 oz.	10 lbs. 0 oz.	12 lbs. 0 oz.
Outdoor Coil	Net face area - sq. ft. Outer coil	21.00	16.33	21.00	22.00
	Inner coil	- - -	15.71	20.25	21.33
	Tube diameter - in.	5/16	5/16	5/16	5/16
	Number of rows	1	2	2	2
	Fins per inch	26	22	22	22
Outdoor Fan	Diameter - in.	22	22	22	26
	Number of blades	3	4	4	4
	Motor hp	1/6	1/4	1/4	1/3
	Cfm	3160	3500	3600	4400
	Rpm	850	825	825	825
	Watts	215	310	310	310
Shipping Data - lbs. 1 package		164	198	221	238

ELECTRICAL DATA

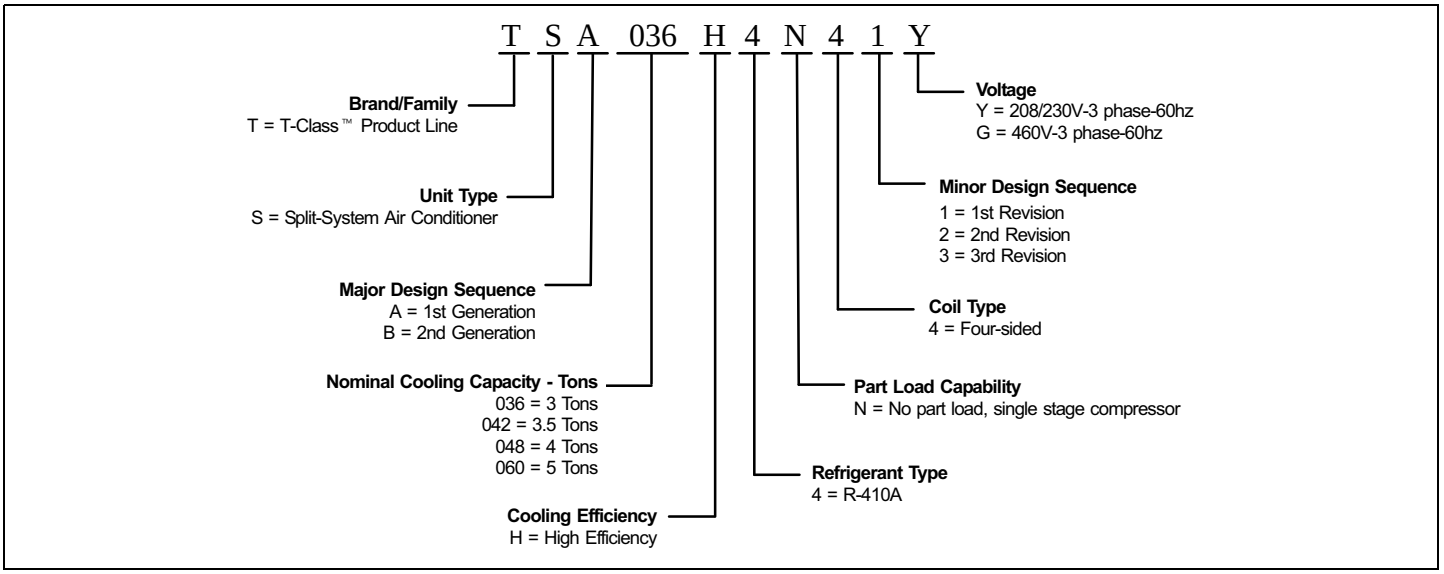
	Line voltage data - 60 hz - 3ph	208/230V	460V	208/230V	460V	208/230V	460V	208/230V	460V
	[2] Maximum overcurrent protection (amps)	20	15	30	15	30	15	35	15
	[3] Minimum circuit ampacity	13	7.65	18.2	8.5	18.8	8.8	21.8	10.7
Compressor	Rated load amps	9	5.64	13.2	6.0	13.7	6.2	16	7.8
	Power factor	.85	.84	.83	.81	.90	.92	.90	91
	Locked rotor amps	71	38	88	44	83.1	41	110	52
Condenser Fan Motor	Full load amps	1.1	0.6	1.7	1.0	1.7	1.0	1.8	1.0
	Locked rotor amps	2.1	1.1	3.1	2.3	3.1	2.3	2.9	2.5

OPTIONAL ACCESSORIES - must be ordered separately

For update-to-date information, see any of the following publications:

- Lennox 14ACX Engineering Handbook
- Lennox Product Catalog
- Lennox Price Book

MODEL NUMBER IDENTIFICATION



I - APPLICATION

TSAH4 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.

TSAH4 PARTS ARRANGEMENT

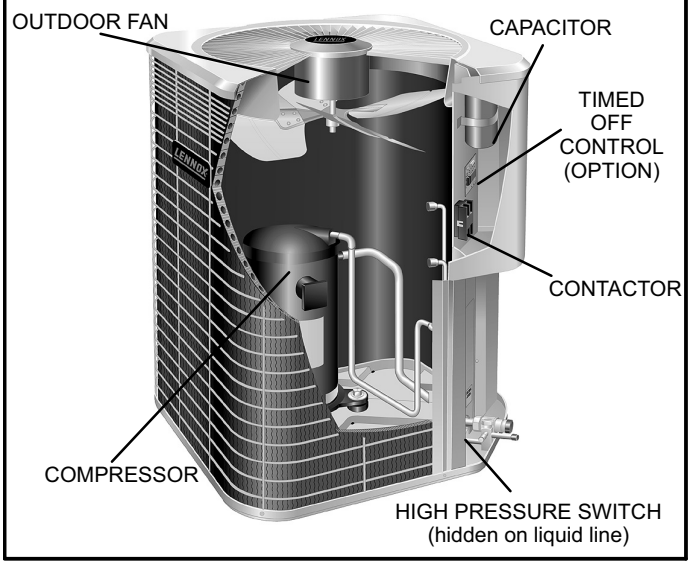


FIGURE 1

TSAH4 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.

A - Compressor Contactor K1

The compressor is energized by a single-pole contactor located in the control box. K1 is energized by the indoor thermostat terminal Y1 (24V) when thermostat demand is present.

B - Timed Off Control TOC (option)

The time delay, located ion the control box, is electrically connected between thermostat terminal Y and the compressor contactor. Between cycles, the compressor contactor is delayed for 5 minutes ± 2 minutes but may last as long as 8 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.

C - Loss of Charge Switch (option)

An auto-reset, single-pole/single-throw low loss of charge 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 to 55 ± 5 psi.

D - High Pressure Switch

TSAH4 units are equipped with a high pressure switch that is located in the liquid line. The switch (SPST, manual reset, normally closed) removes power from the compressor contactor control circuit when liquid line pressure rises above factory setting at 590 ± 10 psi.

E - Low Pressure Switch

TSAH4 units are equipped with a low pressure switch that is located in the suction line. The switch (SPST, auto reset, normally closed) removes power from the compressor contactor control circuit when suction line pressure drops below 25 ± 5 psi. The switch resets (closes) when suction line pressure rises above 55 psi ± 5 psi.

F - Crankcase Heater (HR1)

HR1 prevents liquid from accumulating in the compressor. HR1 is controlled by S40 located on the liquid line. When liquid line temperature drops below 50° F S40 closes energizing HR1. S40 will open, de-energizing HR1 once liquid line temperature reaches 70° F.

G - Drier

A filter drier is factory provided and should be installed in the liquid line. The drier is designed to remove moisture, which can lead to compressor failure. **Any time the unit is exposed to air due to service, drier must be replaced. All replacement driers must be approved for R-410A refrigerant.**

H - Compressor

The scroll compressor design is simple, efficient and requires few moving parts. A cutaway diagram of the scroll compressor is shown in figure 2. 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.

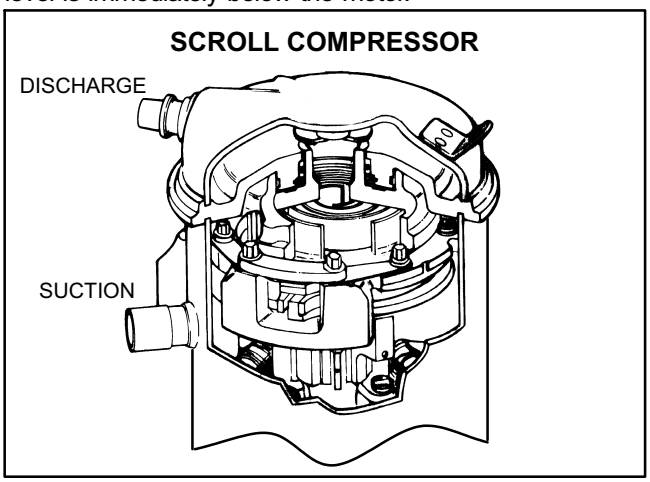


FIGURE 2

The scroll is a simple compression concept centered around the unique spiral shape of the scroll and its inherent properties. Figure 3 shows the basic scroll form. Two identical scrolls are mated together forming concentric spiral shapes (figure 4). One scroll remains stationary, while the other is allowed to "orbit" (figure 5). Note that the orbiting scroll does not rotate or turn but merely orbits the stationary scroll.

The counterclockwise orbiting scroll draws gas into the outer crescent shaped gas pocket created by the two scrolls (figure 5 - 1). The centrifugal action of the orbiting scroll seals off the flanks of the scrolls (figure 5 - 2). As the orbiting motion continues, the gas is forced toward the center of the scroll and the gas pocket becomes compressed (figure 5 - 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 4). The discharge pressure forcing down on the top scroll helps seal off the upper and lower edges (tips) of the scrolls (figure 4). 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.

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

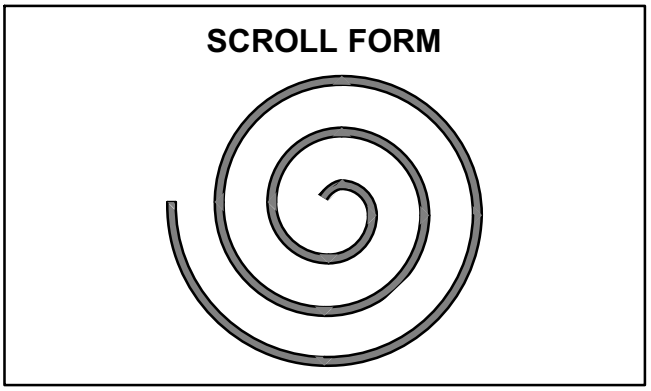


FIGURE 3

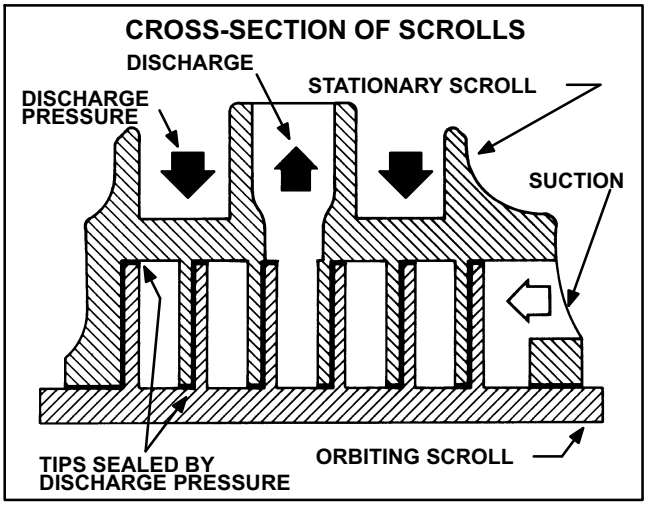


FIGURE 4

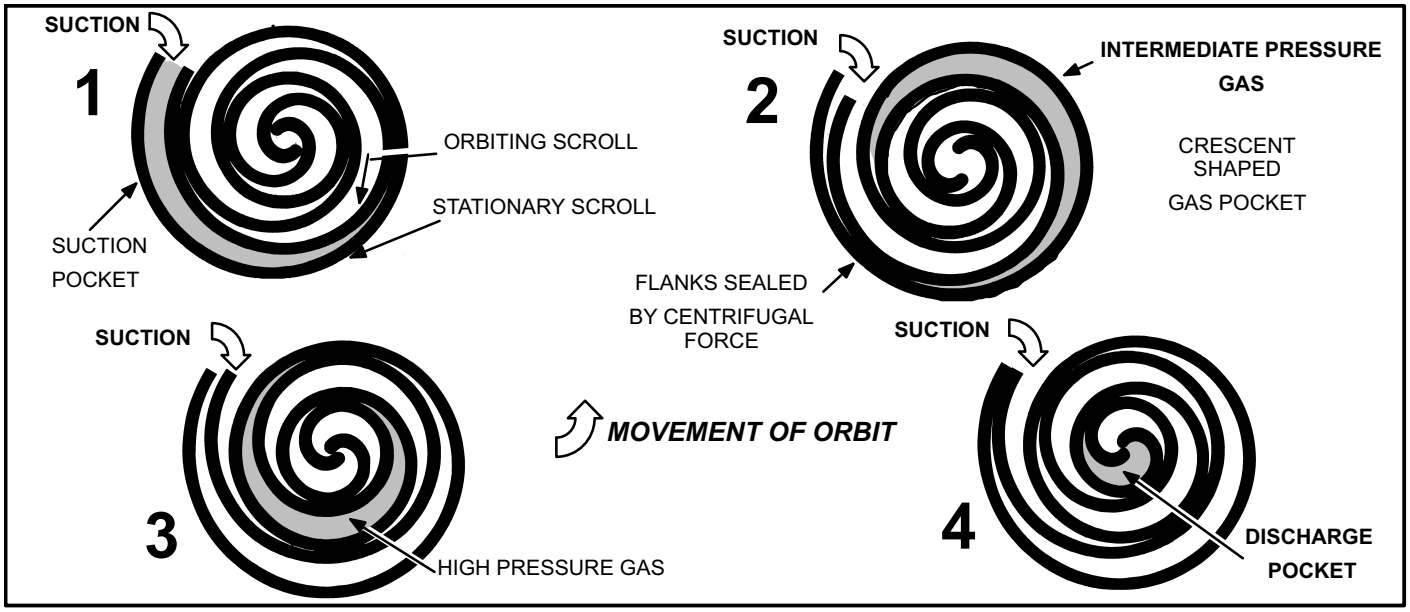


FIGURE 5

I - Condenser Fan Motor

All units use three-phase PSC fan motors which require a 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 TSAH4 ’s.

Access to the condenser fan motor on all units is gained by removing the seven screws securing the fan assembly. See figure 6. The condenser fan motor is removed from the fan guard by removing the four nuts found on the top panel. Drip loops (to prevent moisture from entering the motor) should be used in wiring when servicing motor. See figure 7 if condenser fan motor replacement is necessary.

J - Fan Capacitor C1

Capacitor C1, located in the control box, assists in the start up of condenser fan motor B4. Capacitor ratings will be on side of capacitor or condenser fan name plate.

⚠ DANGER

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

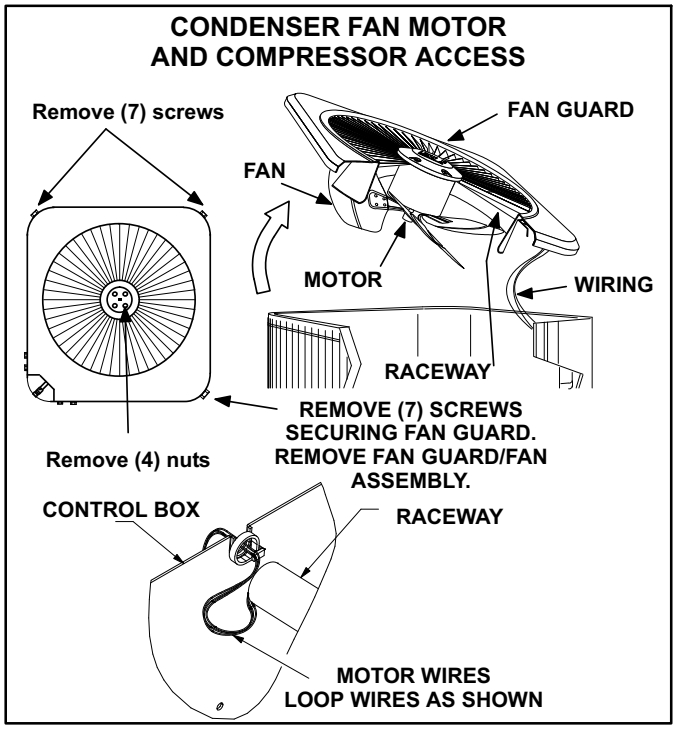


FIGURE 6

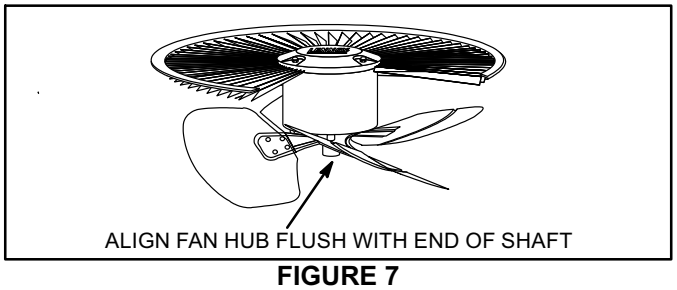


FIGURE 7

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 (sweat connections). Use Lennox L15 (sweat) series line sets as shown in table 1.

TABLE 1

Unit	Liquid Line	Suction Line	L15 Line Sets
-036 -042 -048	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)	Field Fabricated

The liquid line and vapor line service valves (figures 8 and 9) 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. *Service valves are not rebuildable. If a valve has failed, you must replace it.*

⚠ IMPORTANT

Only use Allen wrenches of sufficient hardness (50Rc - Rockwell Hardness Scale min). Fully insert the wrench into the valve stem recess. Service valve stems are factory-torque (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.

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 - Using the adjustable wrench to keep the valve stationary, 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 - Using the adjustable wrench to keep the valve stationary, 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.

NOTE - Stem cap must be replaced to help prevent valve leakage.

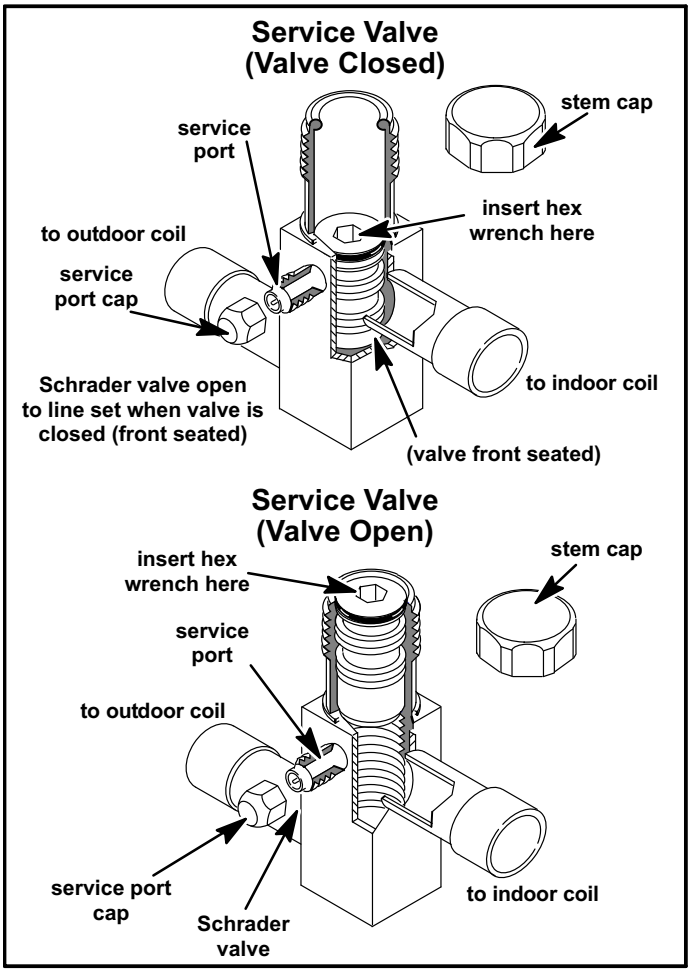


FIGURE 8

Vapor Line Ball Valve

Vapor line ball valves function the same way as the other valves, the difference is in the construction. A ball valve is illustrated in figure 9.

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.

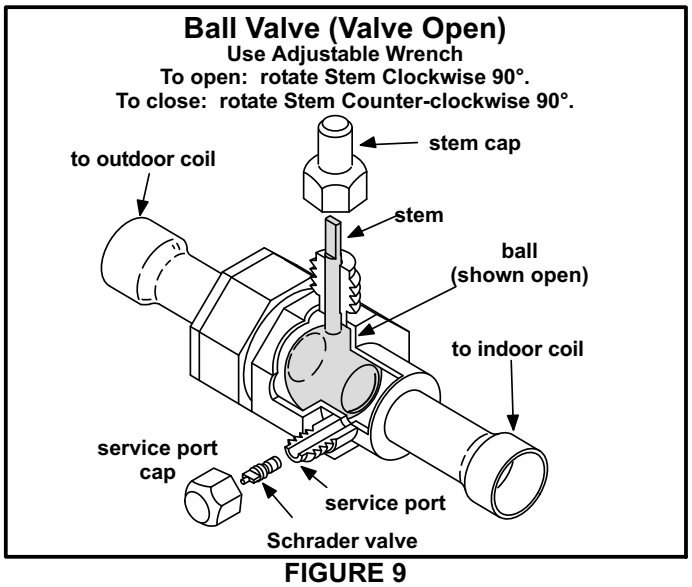


FIGURE 9

IV - CHARGING

⚠ WARNING

R-410A refrigerant can be harmful if it is inhaled. R-410A refrigerant must be used and recovered responsibly.

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

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

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 could result in personal injury or death.

⚠ 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 adjust the pressure from 0 to 450 psig (3103 kPa).

Using an Electronic Leak Detector

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

2 - With both manifold valves closed, open the valve on the HFC-410A cylinder.

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

B - Evacuating

Evacuating the system of non-condensables is critical for proper operation of the unit. Non-condensables are defined as any gas that will not condense under temperatures and pressures present during operation of an air conditioning system. Non-condensables 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 20,000 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 air from the hose with nitrogen. 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 HFC-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 RHFC-410A cylinder and remove the manifold gauge set.

C - Charging

This system uses HFC-410A refrigerant which operates at much higher pressures than HCFC-22. The provided liquid line filter drier is approved for use with HFC-410A. Do not replace it with components designed for use with HCFC-22. This unit is NOT approved for use with coils which use capillary tubes as a refrigerant metering device.

Factory Charge

Units are 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 15 ft. (4.6 m) line set. For varying lengths of line set, refer to table 2 for refrigerant charge adjustment.

TABLE 2

Refrigerant Charge per Line Set Lengths	
Liquid Line Set Diameter	**Oz. per 5 ft. (g per 1.5 m) adjust from 15 ft. (4.6 m) line set***
3/8 in. (9.5 mm)	3 ounce per 5 ft. (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.*

⚠ IMPORTANT

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

NOTE - The compressor is charged with sufficient polyol ester oil. If oil must be added to the compressor in the field, use Mobil EAL ™ Arctic 22CC or ICI EMKARATE ™ RL32CF.

⚠ IMPORTANT

If unit is equipped with a crankcase heater, it should be energized 24 hours before unit start-up to prevent compressor damage as a result of slugging.

1. Rotate fan to check for binding.
2. Inspect all factory- and field-installed wiring for loose connections.
3. After evacuation is complete, open both the liquid and suction line service valves to release the refrigerant charge contained in the outdoor unit into the system.
4. Replace the stem caps and tighten.
5. Check voltage supply at the disconnect switch. The voltage must be within the range listed on the unit's nameplate. If not, do not start the equipment until you have consulted with the power company and the voltage condition has been corrected.
6. Set the thermostat for a cooling demand. Turn on power to the indoor indoor unit and close the outdoor unit disconnect switch to start the unit.
7. Recheck voltage while the unit is running. Power must be within range shown on the nameplate.
8. Check system for sufficient refrigerate by using the procedures listed under *Testing and Charging System*.

SETTING UP TO CHECK CHARGE

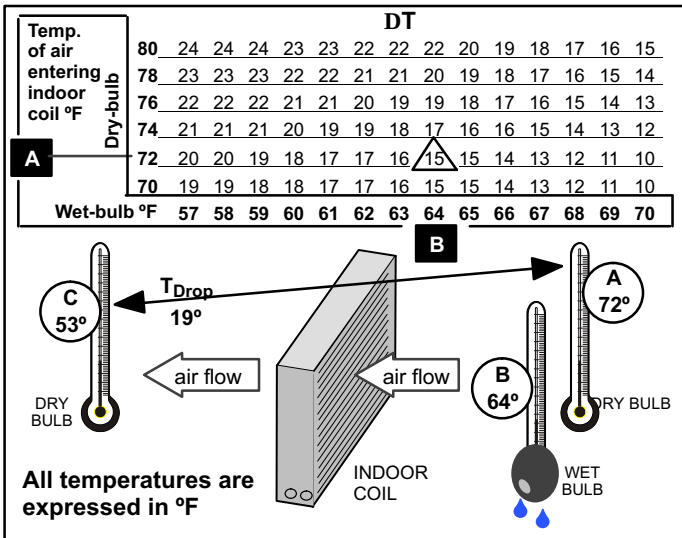
1. Close manifold gauge set valves. Connect the center manifold hose to an upright cylinder of HFC-410A.
2. Connect the manifold gauge set to the unit's service ports as illustrated in figure 11.
   - low pressure gauge to suction line service port.
   - high pressure gauge to liquid line service port.

INDOOR COIL AIRFLOW CHECK

Check indoor coil airflow using the Delta-T (DT) process as illustration in figure 10.

DETERMINING CHARGE METHOD

To determine the correct charging method, use the illustration in figure 10.



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).

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**.

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

Cº	T_{Drop}	–	DT	=	ºF	*ACTION*
53º	19	–	15	=	4	*Increase the airflow*
58º	14	–	15	=	-1	*(within ±3º range) no change*
62º	10	–	15	=	-5	*Decrease the airflow*

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 ±3º.

Figure 10. Checking Indoor Coil Airflow Guide

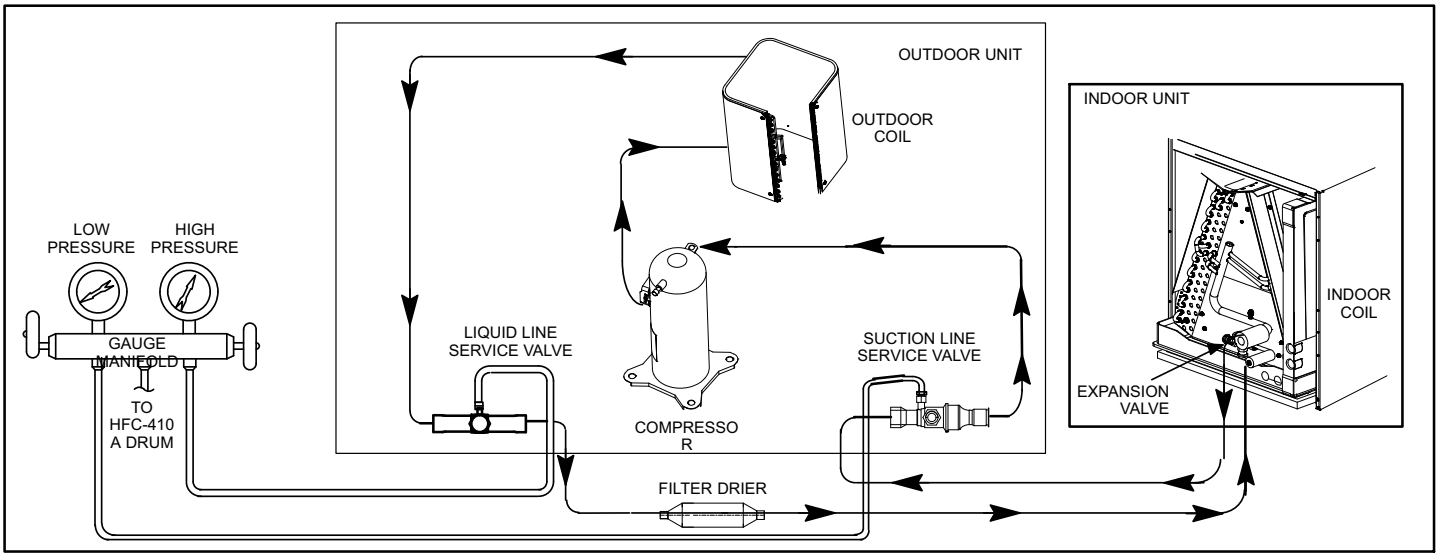


Figure 11. Charging System

START: Determine how refrigerant is metered

WHEN TO CHARGE?

- Warm weather best
- Can charge in colder weather

CHARGE METHOD? Determine by:

- Metering device type
- Outdoor ambient temperature

REQUIREMENTS:

- Sufficient heat load in structure
- Indoor temperature between 70-80ºF (21-26ºC)
- Manifold gauge set connected to unit
- Thermometers:
  - to measure outdoor ambient temperature
  - to measure liquid line temperature
  - to measure suction line temperature

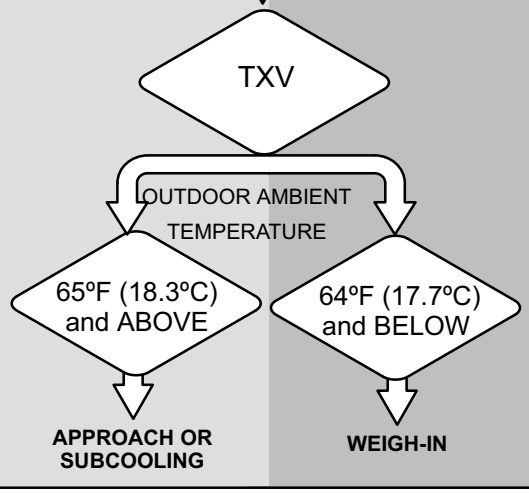


Figure 12. Determining Charge Method

START: Measure outdoor ambient temperature

ABOVE or BELOW

64ºF and BELOW

65ºF and ABOVE

USE EITHER APPROACH OR SUBCOOLING METHOD

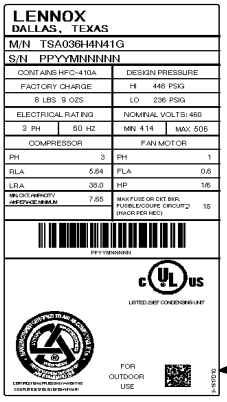
1. .Check Liquid and suction line pressures
2. .Compare unit pressures with Table 10, *Normal Operating Pressures*.
3. .Conduct leak check; evacuate as previously outlined.
4. .Weigh in the unit nameplate charge plus any charge required for line set differences over feet.

WEIGH IN TXV

Refrigerant Charge per Line Set Length

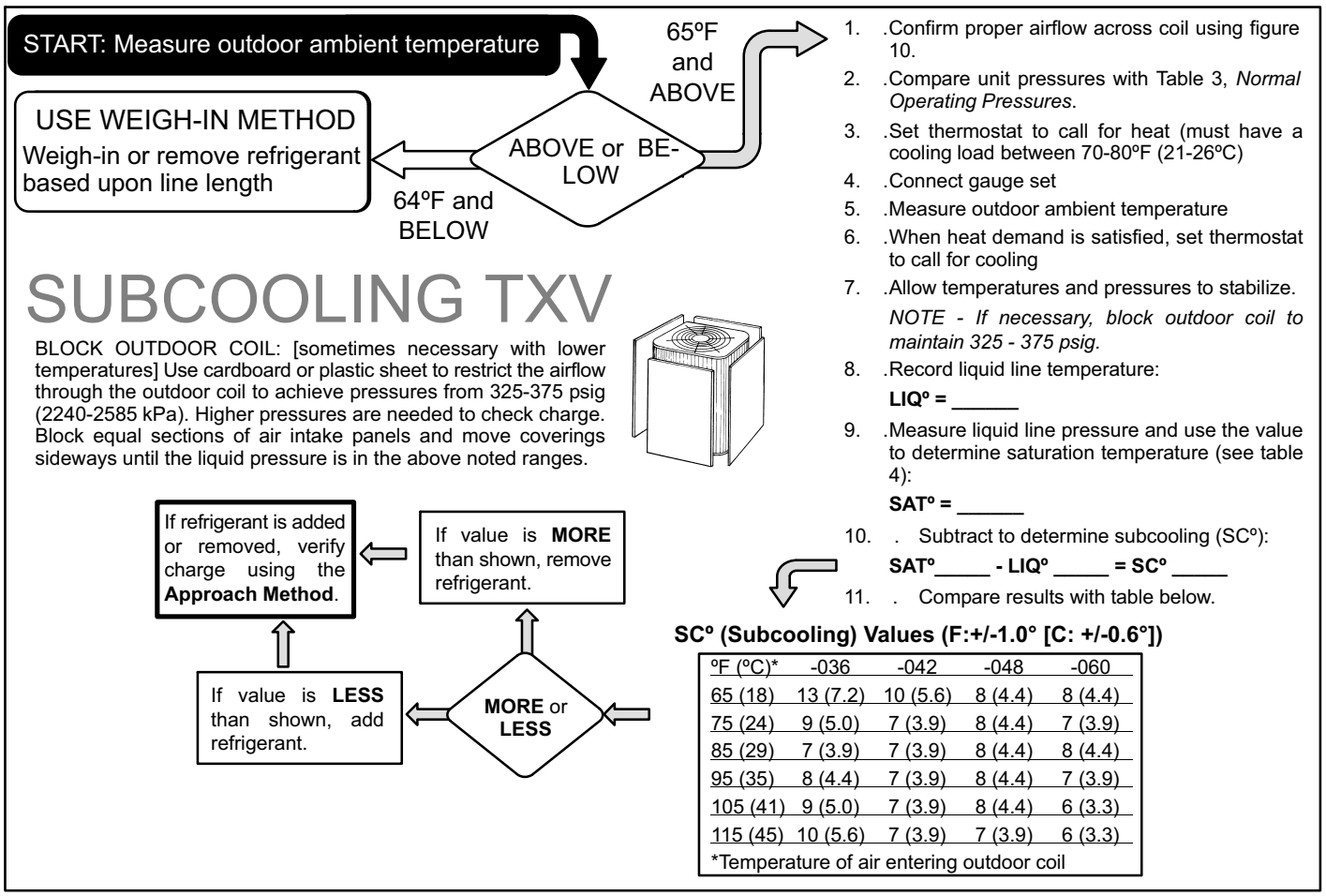
Liquid Line Set Diameter	Ounces per 5 feet (g per 1.5 m) adjust from 15 feet (4.6 m) line set*
3/8” (9.5 mm)	3 ounce per 5’ (85 g per 1.5 m)

*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.*



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

Figure 13. Weigh In Method

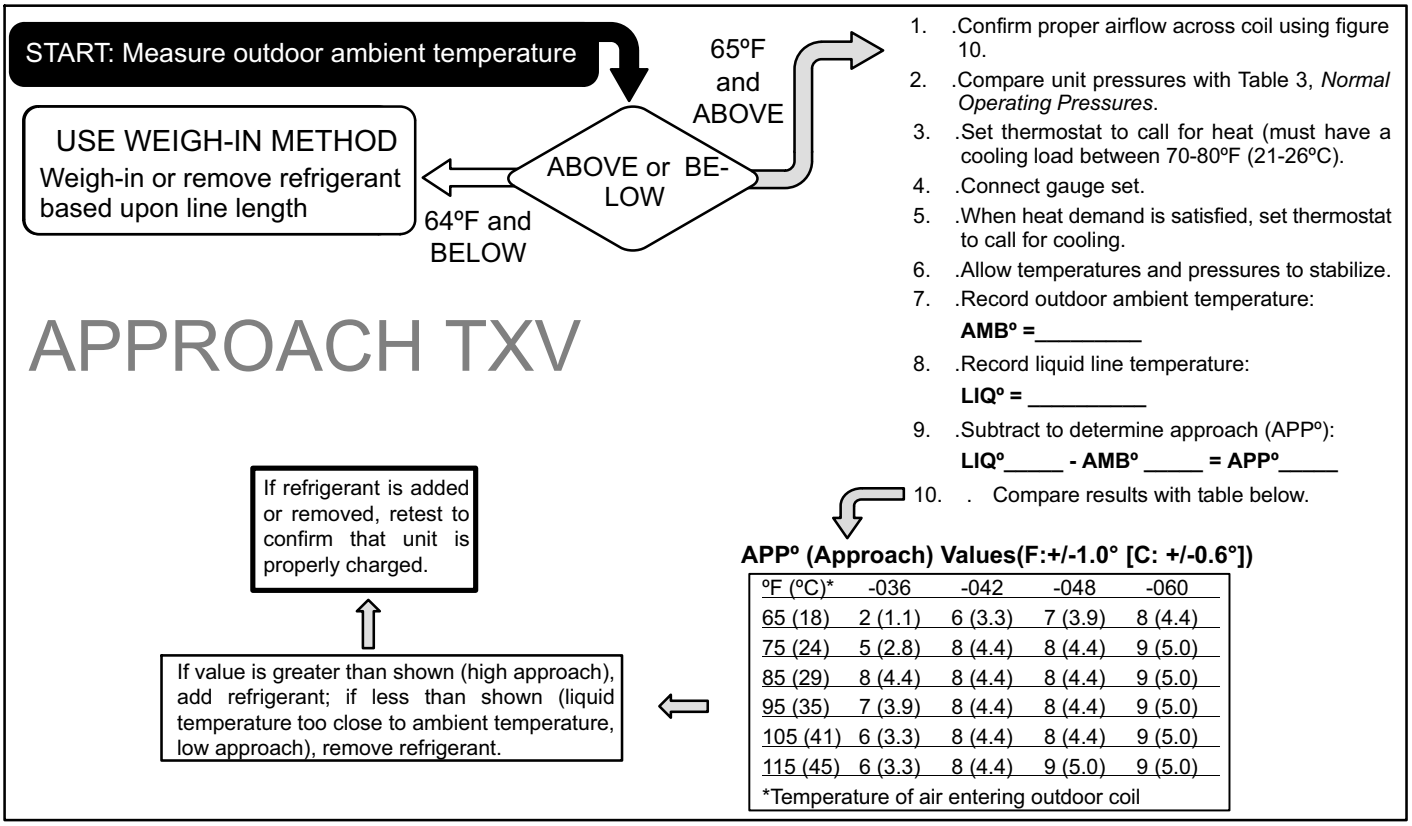


SCº (Subcooling) Values (F:+/-1.0° [C: +/-0.6°])

ºF (ºC)*	-036	-042	-048	-060
65 (18)	13 (7.2)	10 (5.6)	8 (4.4)	8 (4.4)
75 (24)	9 (5.0)	7 (3.9)	8 (4.4)	7 (3.9)
85 (29)	7 (3.9)	7 (3.9)	8 (4.4)	8 (4.4)
95 (35)	8 (4.4)	7 (3.9)	8 (4.4)	7 (3.9)
105 (41)	9 (5.0)	7 (3.9)	8 (4.4)	6 (3.3)
115 (45)	10 (5.6)	7 (3.9)	7 (3.9)	6 (3.3)

*Temperature of air entering outdoor coil

Figure 14. HFC-410A Subcooling TXV Charge



APPº (Approach) Values(F:+/-1.0° [C: +/-0.6°])

ºF (ºC)*	-036	-042	-048	-060
65 (18)	2 (1.1)	6 (3.3)	7 (3.9)	8 (4.4)
75 (24)	5 (2.8)	8 (4.4)	8 (4.4)	9 (5.0)
85 (29)	8 (4.4)	8 (4.4)	8 (4.4)	9 (5.0)
95 (35)	7 (3.9)	8 (4.4)	8 (4.4)	9 (5.0)
105 (41)	6 (3.3)	8 (4.4)	8 (4.4)	9 (5.0)
115 (45)	6 (3.3)	8 (4.4)	9 (5.0)	9 (5.0)

*Temperature of air entering outdoor coil

Figure 15. HFC-410A Approach TXV Charge

Table 3. HFC-410A Normal Operating Pressures (Liquid +10 and Suction +5 psig)

⚠ IMPORTANT	**Use this table to perform maintenance checks; it 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.**

14ACX	-036	-042	-048	-060
°F (°C)*	Liquid / Suction	Liquid / Suction	Liquid / Suction	Liquid / Suction
Expansion Valve (TXV)				
65 (18)	238 / 132	236 / 138	238 / 136	239 / 133
70 (21)	254 / 135	253 / 140	256 / 138	258 / 135
75 (24)	273 / 138	273 / 141	277 / 139	278 / 136
80 (27)	293 / 140	296 / 142	299 / 140	300 / 137
85 (29)	316 / 142	318 / 143	320 / 139	323 / 138
90 (32)	340 / 143	341 / 144	343 / 140	346 / 139
95 (35)	366 / 144	366 / 146	369 / 141	370 / 140
100 (38)	392 / 145	392 / 147	395 / 142	396 / 142
105 (41)	420 / 147	417 / 148	422 / 144	415 / 143
110 (43)	449 / 148	445 / 149	450 / 146	449 / 145
115 (45)	480 / 149	475 / 151	481 / 148	476 / 147

Table 4. HFC-410A Temperature (°F) - Pressure (Psig)

°F	Psig	°F	Psig	°F	Psig	°F	Psig	°F	Psig	°F	Psig	°F	Psig	°F	Psig
32	100.8	48	137.1	63	178.5	79	231.6	94	290.8	110	365.0	125	445.9	141	545.6
33	102.9	49	139.6	64	181.6	80	235.3	95	295.1	111	370.0	126	451.8	142	552.3
34	105.0	50	142.2	65	184.3	81	239.0	96	299.4	112	375.1	127	457.6	143	559.1
35	107.1	51	144.8	66	187.7	82	242.7	97	303.8	113	380.2	128	463.5	144	565.9
36	109.2	52	147.4	67	190.9	83	246.5	98	308.2	114	385.4	129	469.5	145	572.8
37	111.4	53	150.1	68	194.1	84	250.3	99	312.7	115	390.7	130	475.6	146	579.8
38	113.6	54	152.8	69	197.3	85	254.1	100	317.2	116	396.0	131	481.6	147	586.8
39	115.8	55	155.5	70	200.6	86	258.0	101	321.8	117	401.3	132	487.8	148	593.8
40	118.0	56	158.2	71	203.9	87	262.0	102	326.4	118	406.7	133	494.0	149	601.0
41	120.3	57	161.0	72	207.2	88	266.0	103	331.0	119	412.2	134	500.2	150	608.1
42	122.6	58	163.9	73	210.6	89	270.0	104	335.7	120	417.7	135	506.5	151	615.4
43	125.0	59	166.7	74	214.0	90	274.1	105	340.5	121	423.2	136	512.9	152	622.7
44	127.3	60	169.6	75	217.4	91	278.2	106	345.3	122	428.8	137	519.3	153	630.1
45	129.7	61	172.6	76	220.9	92	282.3	107	350.1	123	434.5	138	525.8	154	637.5
46	132.2	62	175.4	77	224.4	93	286.5	108	355.0	124	440.2	139	532.4	155	645.0
47	134.6			78	228.0			109	360.0			140	539.0		

V - 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. Make sure power is off before cleaning. Clean and inspect outdoor coil. The coil may be flushed with a water hose.

   The outdoor coil is protected by an inner mesh screen and a wire cage (see figure 16). If debris has collected between the mesh screen and the coil and cannot be dislodged by spraying unpressurized water from inside coil surface to the outside, the mesh may be removed by first removing the top of the unit which will allow for removal of the wire cage.

   Then, using pliers to grip the head of the push pins, pull straight out to extract the push pins along one side of the coil. If necessary, remove the push pins along the back of the unit; it is usually unnecessary to fully remove the inner mesh screen.

   Drape the mesh screen back and wash the coil. When all the debris has been removed from the coil, reinstall the mesh screen by positioning it in its original position and reinserting the push pin. No tool is required to push the pin back into the same slot in the fins.

   If the push pin is loose and tends not to stay in place, brush the fins with a fin brush (22 fins/in). Line up the push pin a couple fins to the right or left of the original hole and re-insert the pin.
2. Outdoor 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 outdoor fan motor.

   Unit nameplate _____ Actual _____ .

NOTE - If owner reports insufficient cooling, the unit should be gauged and refrigerant charge checked. See refrigerant charging section.

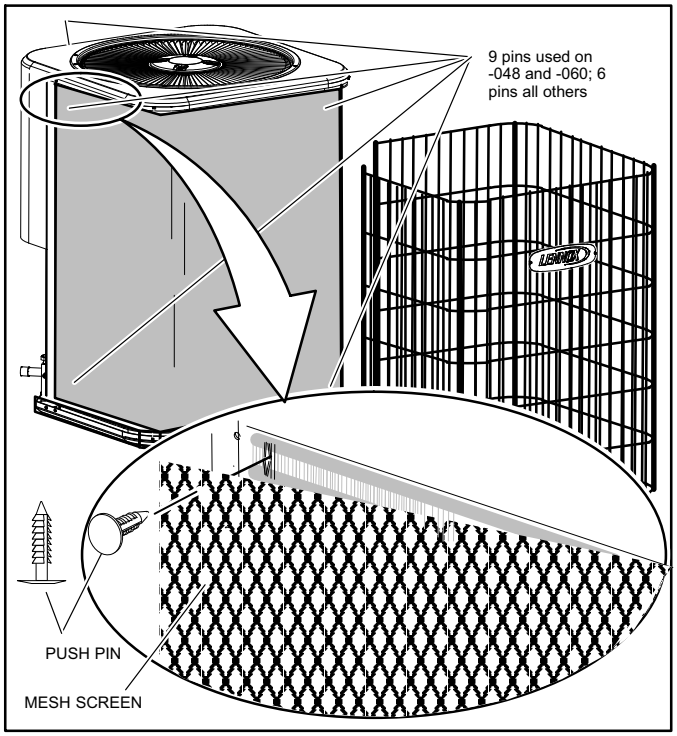


Figure 16

Indoor Coil

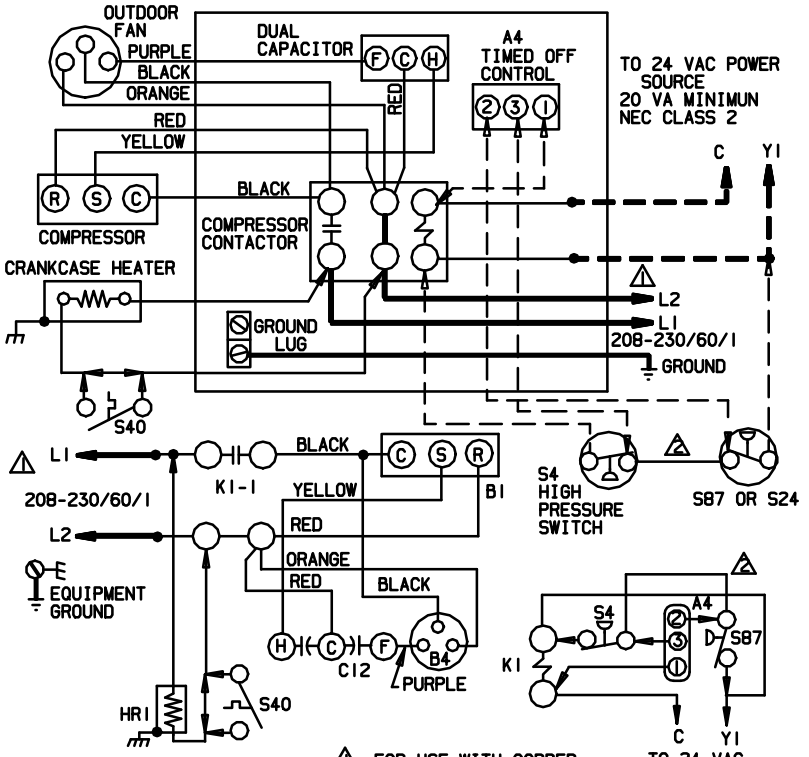
1. Clean coil, if necessary.
2. Check connecting lines and coils for signs of oil leaks.
3. Check the condensate pan line and clean if necessary.

Indoor Unit

1. Clean or change filters.
2. Adjust blower speed for cooling. The pressure drop over the coil should be measured to determine the correct blower CFM. Refer to the unit information service manual for pressure drop tables and procedure.
3. Check all wiring for loose connections
4. Check for correct voltage at unit (blower operating).
5. Check amp-draw on blower motor.

   Unit nameplate_____ Actual _____.

VI - TSAH4 UNIT WIRING DIAGRAM AND SEQUENCE OF OPERATION



DESCRIPTION	
KEY	COMPONENT
A4	CONTROL-TIMED OFF
B1	COMPRESSOR
B4	MOTOR-OUTDOOR FAN
C12	CAPACITOR-DUAL
HR1	HEATER-COMPRESSOR
K1-1	CONTACTOR-COMPRESSOR
S4	SWITCH-HIGH PRESSURE
S24	SWITCH-LOSS OF CHARGE
S40	THERMOSTAT-CRANKCASE
S87	SWITCH-LOW PRESS.COMP 1

09/05	Supersedes Form No.
	New Form No. 534,773W

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 TOC timed off control (if used) which energizes contactor K1 (provided S4 high pressure switch is closed).

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.