AC13 SERIES UNITS

The AC13 is a high efficiency residential split-system condensing unit, which features a scroll compressor. AC13 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 HCFC-22) 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 AC13 units use single-pole contactors. Potential exists for electrical shock resulting in injury or death.
Line voltage exists at all components (even when unit is not in operation).

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SPECIFICATIONS *(018 024 030 036 042 -1 & -2, 048-1, -2, -3 &060-1, -2, -3)*

General Data	Model No.	AC13-018	AC13-024	AC13-030	AC13-036	AC13-042	AC13-048-4 *-1 / -3 units*	AC13-060
	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)	7/8 (22.2)	7/8 (22.2)	7/8 (22.2)	1-1/8 (28.6)
[1] Refrigerant (R-22) furnished		4 lbs. 0 oz. (1.81 kg)	4 lbs. 8 oz. (2.04 kg)	5 lbs. 5 oz. (2.41 kg)	6 lbs. 15 oz. (3.15 kg)	6 lbs. 15 oz. (3.15 kg)	9 lbs 8 oz (4.31) *9 lbs. 12 oz. (4.42 kg)*	13 lbs. 6 oz. (6.07 kg)
Outdoor Coil	Net face area - sq. ft. (m^2) Outer coil	13.22 (1.23)	15.11 (1.40)	13.22 (1.23)	13.22 (1.23)	15.11 (1.40)	18.67 (1.73) *21.00 (1.95)*	24.50 (2.28)
	Inner coil	- - -	- - -	12.60 (1.17)	12.60 (1.17)	14.40 (1.34)	18.0 (1.67) *20.27 (1.88)*	23.56 (2.19)
	Tube diameter - in. (mm)	5/16 (8)	5/16 (8)	5/16 (8)	5/16 (8)	5/16 (8)	5/16 (8)	5/16 (8)
	Number of rows	1	1	2	2	2	2	2
	Fins per inch (m)	22 (866)	22 (866)	22 (866)	22 (866)	22 (866)	22 (866)	22 (866)
Outdoor Fan	Diameter - in. (mm)	18 (457)	18 (457)	18 (457)	18 (457)	18 (457)	22 (559)	22 (559)
	Number of blades	3	3	4	4	4	4	4
	Motor hp (W)	1/5 (149)	1/5 (149)	1/5 (149)	1/5 (149)	1/3 (249)	1/4 (186)	1/4 (186)
	Cfm (L/s)	2500 (1180)	2500 (1180)	2450 (1155)	2450 (1155)	2930 (1385)	3830 (1805)	3830 (1805)
	Rpm	1100	1100	1100	1100	1100	825	825
	Watts	200	200	200	200	310	330	330
Shipping Data - lbs. (kg) 1 package		154 (55)	164 (59)	179 (68)	180 (68)	210 (80)	260 (106)	287 (107)
ELECTRICAL DATA								
	Line voltage data - 60 hz - 1ph	208/230V	208/230V	208/230V	208/230V	208/230V	208/230V	208/230V
	[2] Maximum overcurrent protection (amps)	15	20	30	30	45	40	60
	[3] Minimum circuit ampacity	10.7	14.1	18.7	19.1	25.9	25.7	33.3
Compressor	Rated load amps	7.7	10.4	14.1	14.4	19.2	19.2	26.1
	Power factor	.98	.96	.96	.96	.98	.94	.96
	Locked rotor amps	40.3	54.0	67.0	77.0	104.0	97.0	141.0
Condenser Fan Motor	Full load amps	1.0	1.0	1.0	1.0	1.9	1.7	1.7
	Locked rotor amps	1.9	1.9	1.9	1.9	4.1	3.1	3.1
OPTIONAL ACCESSORIES - must be ordered extra								
Compressor Crankcase Heater	**93M04**	•	•	•	•			
	93M05					•	•	•
Compressor Hard Start Kit	**10J42**	•						
	88M91		•	•	•	•	•	•
Compressor Low Ambient Cut-Off	**45F08**	•	•	•	•	•	•	•
Compressor Sound Cover	**69J03**	•	•	•	•	•	•	•
Compressor Time-Off Control	**47J27**	•	•	•	•	•	•	•
Freezestat 3/8 in. tubing	**93G35**	•	•	•	•	•	•	•
5/8 in. tubing	**50A93**	•	•	•	•	•	•	•
High Pressure Switch Kit	**94J46**	•	•	•	•	•	•	•
Loss of Charge Switch Kit	**84M23**	•	•	•	•	•	•	•
[5]Low Ambient Kit	**24H77**	•	•	•	•	•	•	•
Refrigerant Line Sets	L15-41-20, L15-41-30, L15-41-40, L15-41-50	•	•	•				
	L15-65-30, L15-65-40, L15-65-50				•	•	•	
	Field Fabricate							•
Time Delay Relay Kit	**58M81**	•	•	•	•	•	•	•

NOTE — Extremes of operating range are plus 10% and minus 5% of line voltage.
[1] Refrigerant charge sufficient for 15 ft. (4.6 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.
[5] Crankcase Heater and Freezestat are recommended with Low Ambient Kit.

SPECIFICATIONS

General Data	Model No.	AC13-018	AC13-024	AC13-030	AC13-036	AC13-042	AC13-048	AC13-060
	Nominal Tonnage	1.5	2	2.5	3	3.5	4	5
Connections (sweat)	Liquid line o.d. - in.	3/8	3/8	3/8	3/8	3/8	3/8	3/8
	Suction line o.d. - in.	3/4	3/4	3/4	7/8	7/8	7/8	1-1/8
[1] Refrigerant (R-22) furnished		4 lbs. 0 oz.	4 lbs. 8 oz.	4 lbs. 13 oz.	5 lbs. 12 oz.	6 lbs. 6 oz.	7 lbs. 8 oz.	10 lbs. 0 oz.
Outdoor Coil	Net face area - sq. ft. Outer coil	13.22	15.11	15.11	15.11	16.33	21.00	18.67
	Net face area - sq. ft. Inner coil	- - -	- - -	- - -	- - -	- - -	- - -	18.01
	Tube diameter - in.	5/16	5/16	5/16	5/16	5/16	5/16	5/16
	Number of rows	1	1	1	1	1	1	2
	Fins per inch	22	22	26	26	26	26	22
Outdoor Fan	Diameter - in.	18	18	18	18	18	22	22
	Number of blades	3	3	3	3	4	4	4
	Motor hp	1/5	1/5	1/5	1/5	1/4	1/4	1/4
	Cfm	2500	2500	2500	2500	3870	3870	3870
	Rpm	1100	1100	1100	1100	840	840	840
	Watts	200	200	200	200	320	320	320
Shipping Data - lbs. 1 package		154	164	168	170	206	229	248

ELECTRICAL DATA

Line voltage data - 60 hz - 1ph		208/230V	208/230V	208/230V	208/230V	208/230V	208/230V	208/230V
[2] Maximum overcurrent protection (amps)		15	20	30	30	40	40	60
[3] Minimum circuit ampacity		10.7	14.1	18.7	19.1	25.7	25.7	33.3
Compressor	Rated load amps	7.7	10.4	14.1	14.4	19.2	19.2	26.1
	Power factor	.98	.96	.96	.96	.98	.94	.96
	Locked rotor amps	40.3	54.0	67.0	77.0	104.0	97.0	141.0
Condenser Fan Motor	Full load amps	1.0	1.0	1.0	1.0	1.7	1.7	1.7
	Locked rotor amps	1.9	1.9	1.9	1.9	3.1	3.1	3.1

OPTIONAL ACcESSORIES - must be ordered extra

Compressor Crankcase Heater	**93M04**	•	•	•	•			
	93M05					•	•	•
Compressor Hard Start Kit	**10J42**	•						
	88M91		•	•	•	•	•	•
Compressor Low Ambient Cut-Off	**45F08**	•	•	•	•	•	•	•
Compressor Sound Cover	**69J03**	•	•	•	•	•	•	•
Compressor Time-Off Control	**47J27**	•	•	•	•	•	•	•
Freezestat 3/8 in. tubing	**93G35**	•	•	•	•	•	•	•
5/8 in. tubing	**50A93**	•	•	•	•	•	•	•
High Pressure Switch Kit	**94J46**	•	•	•	•	•	•	•
Indoor Blower Off Delay Relay	**58M81**	•	•	•	•	•	•	•
Loss of Charge Switch Kit	**84M23**	•	•	•	•	•	•	•
Low Ambient Kit	**24H77**	•	•	•	•	•	•	•
Refrigerant Line Sets	L15-41-20, L15-41-30, L15-41-40, L15-41-50	•	•	•				
	L15-65-30, L15-65-40, L15-65-50				•	•	•	
	Field Fabricate							•

NOTE — Extremes of operating range are plus 10% and minus 5% of line voltage.
[1] Refrigerant charge sufficient for 15 ft. (4.6 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

AC13 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 match-ups.

II - UNIT COMPONENTS

Unit components are illustrated in figure 1.

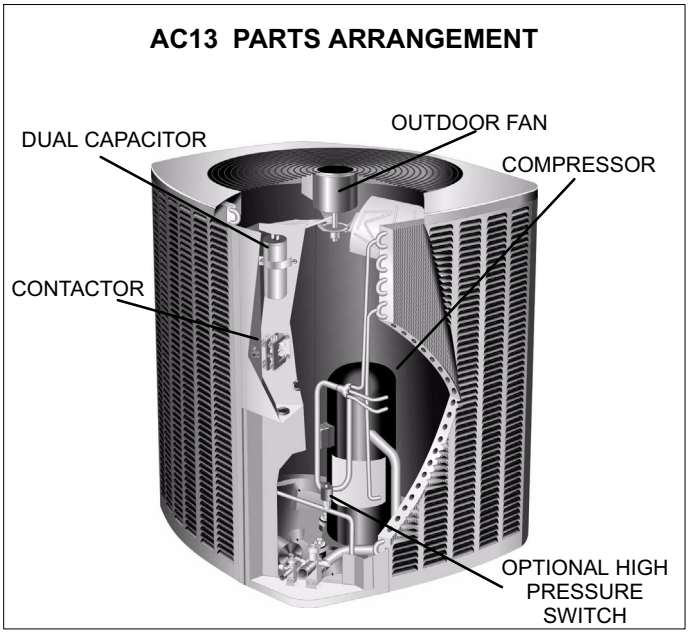


FIGURE 1

⚠ CAUTION

To prevent personal injury, or damage to panels, unit or structure, be sure to observe the following:

While installing or servicing this unit, carefully stow all removed panels out of the way, so that the panels will not cause injury to personnel, nor cause damage to objects or structures nearby, nor will the panels be subjected to damage (e.g., being bent or scratched).

While handling or stowing the panels, consider any weather conditions, especially windy conditions, that may cause panels to be blown around and battered.

Remove the louvered panels as follows:

1 - Remove 2 screws, allowing the panel to swing open slightly (see figure 2).

2 - **Hold the panel firmly throughout this procedure.** Rotate bottom corner of panel away from hinge corner post until lower 3 tabs clear the slots (see figure 2, Detail B).

3 - Move panel down until lip of upper tab clears the top slot in corner post (see figure 2, Detail A).

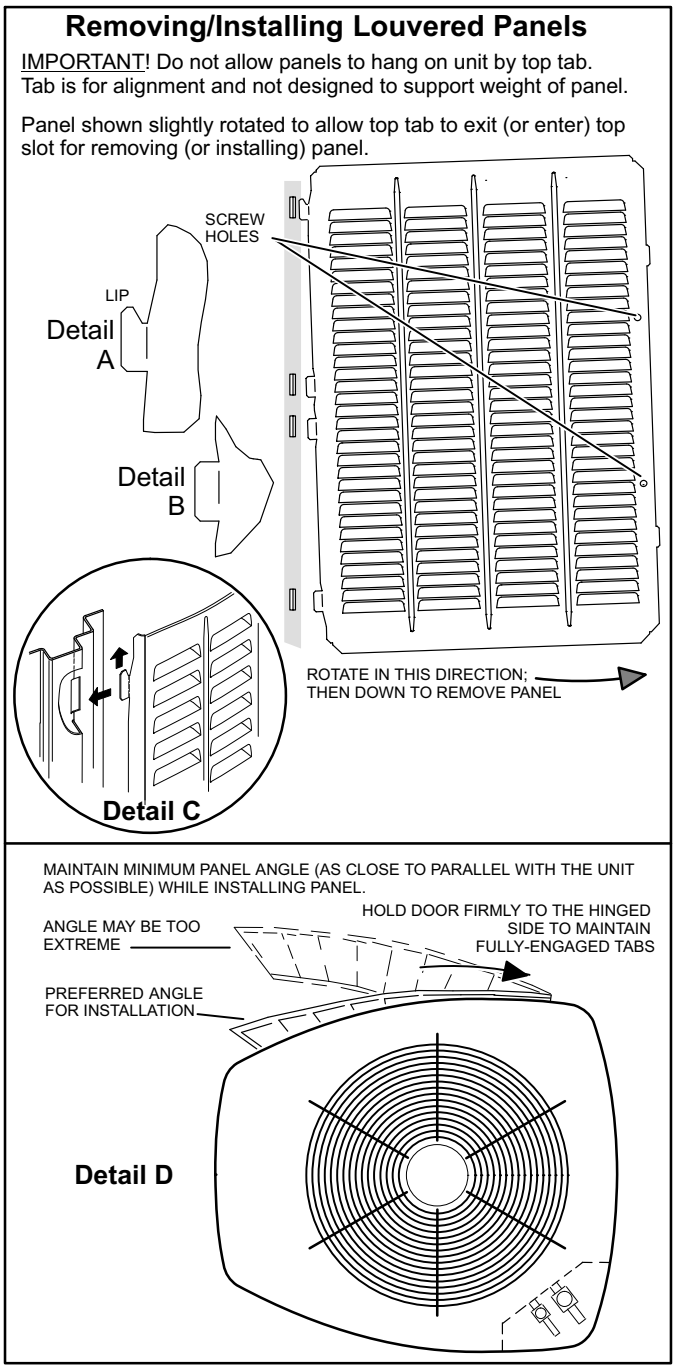


FIGURE 2

Position and Install Panel—Position the panel almost parallel with the unit (figure 2, Detail D) with the “screw side” as close to the unit as possible. Then, in a continuous motion:

- Slightly rotate and guide the lip of top tab inward (figure 2, Details A and C); then upward into the top slot of the hinge corner post.
- Rotate panel to vertical to fully engage all tabs.
- Holding the panel's hinged side firmly in place, close the right-hand side of the panel, aligning the screw holes.

When panel is correctly positioned and aligned, insert the screws and tighten.

A - Control Box (Figure 3)

AC13 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.

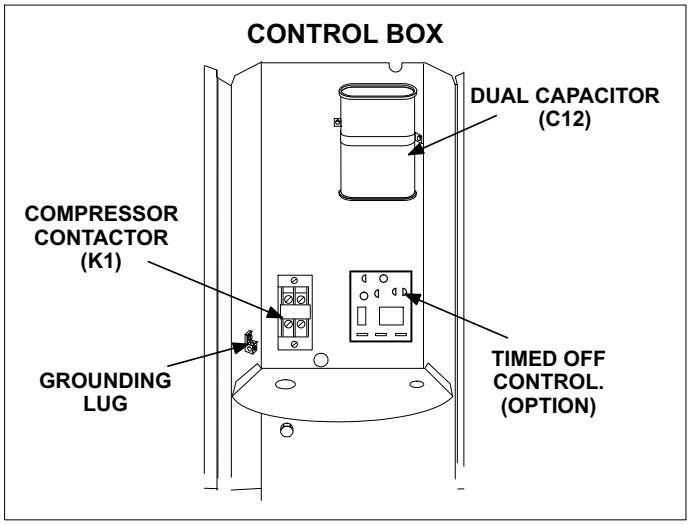


FIGURE 3

1 - Compressor Contactor K1

The compressor is energized by a single-pole contactor located in the control box. See figure 3. K1 is energized by the indoor thermostat terminal Y1 (24V) when thermostat demand is present.

2 - Dual Capacitor C12

The compressor and fan in AC13 series units use permanent split capacitor motors. The capacitor is located inside the unit control box (see figure 3). 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 - Timed Off Control TOC (option)

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 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.

B - Compressor

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.

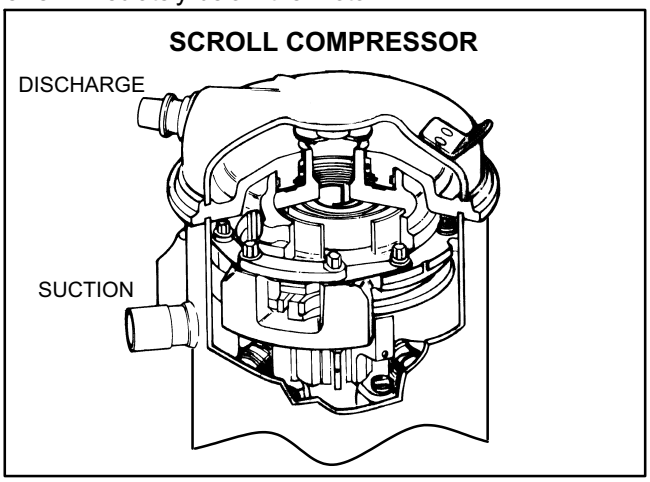


FIGURE 4

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.

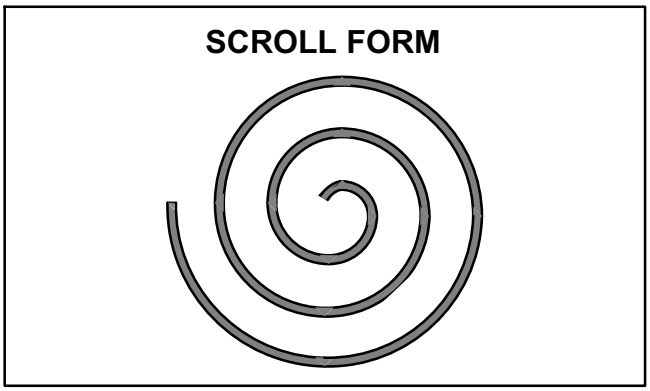


FIGURE 5

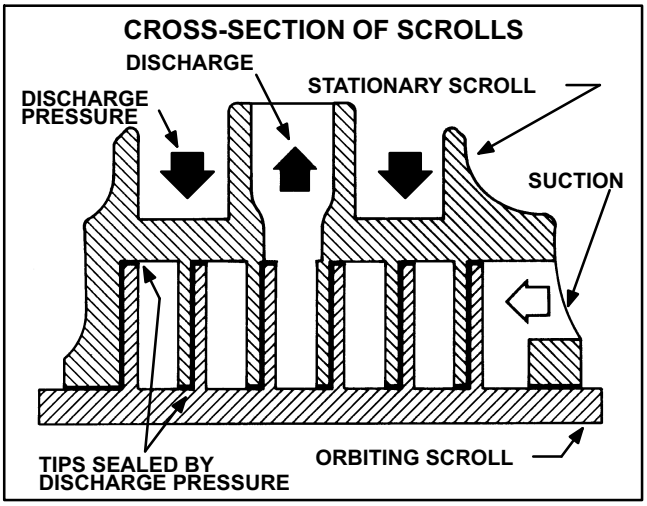


FIGURE 6

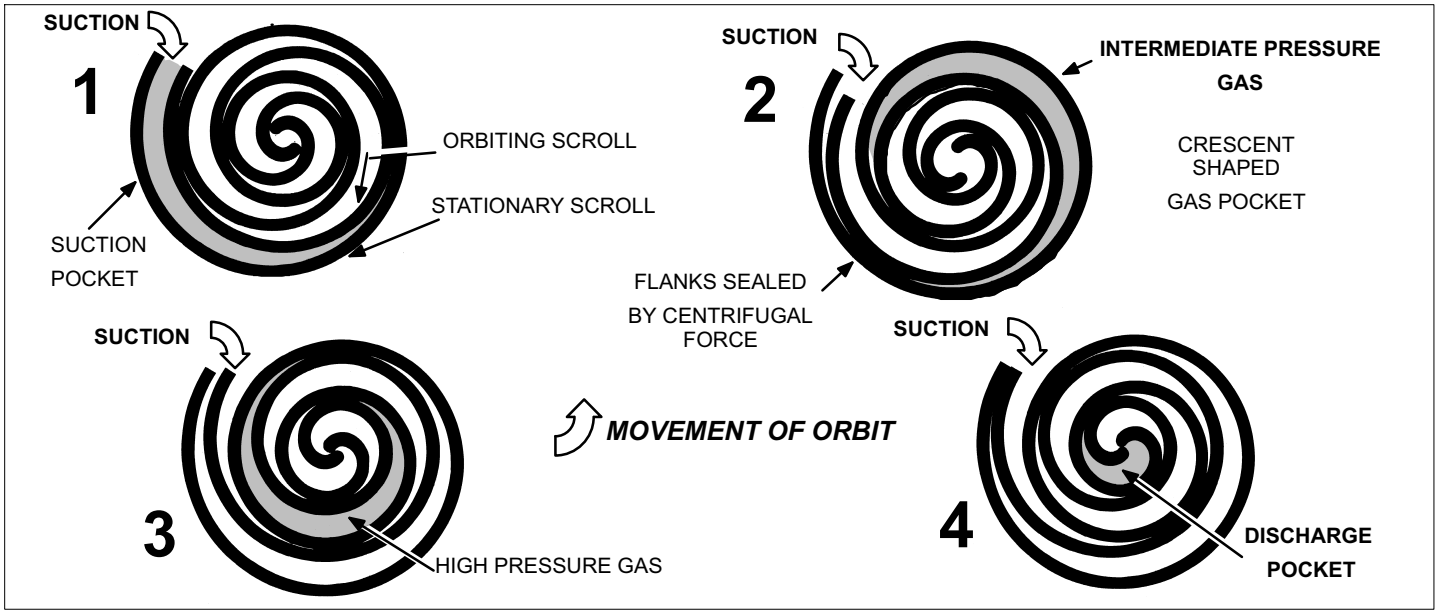


FIGURE 7

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.

C - 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 AC13 's.

Access to the condenser fan motor on all units is gained by removing the four screws securing the fan assembly. See figure 8. The grill fan assembly can be removed from the cabinet as one piece. See figure 9. The condenser fan motor is removed from the fan guard by removing the four nuts found on top of the grill. See figure 9 if condenser fan motor replacement is necessary.

⚠ DANGER

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

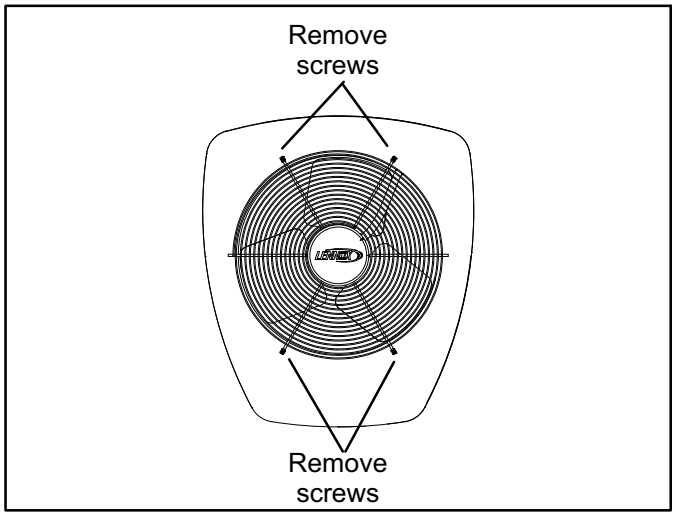


FIGURE 8

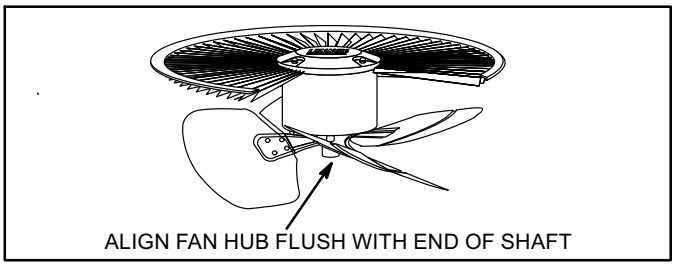


FIGURE 9

D - 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 above 55 ± 5 psi.

rises to 55 ± 5 psig.

E - High Pressure Switch (option)

AC13 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 discharge pressure rises above factory setting at 410 ± 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 (sweat connections). Use Lennox L15 (sweat) series line sets as shown in table 1.

TABLE 1

Unit	Liquid Line	Suction Line	L15 Line Sets
-018 -024 -030	3/8 in. (10 mm)	3/4 in. (19 mm)	L15-41 15 ft. - 50 ft. (4.6 m - 15 m)
-036 -042 -048	3/8 in. (10 mm)	7/8 in. (22 mm)	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 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. *Service valves are not rebuildable. If a valve has failed, you must replace it.*

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.

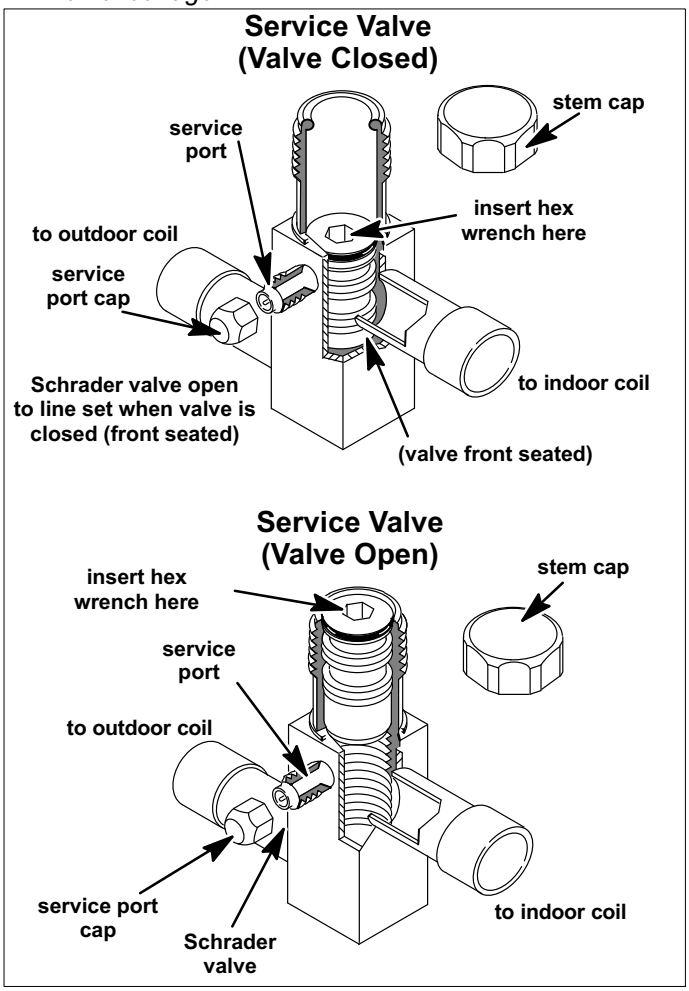


FIGURE 10

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. 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.

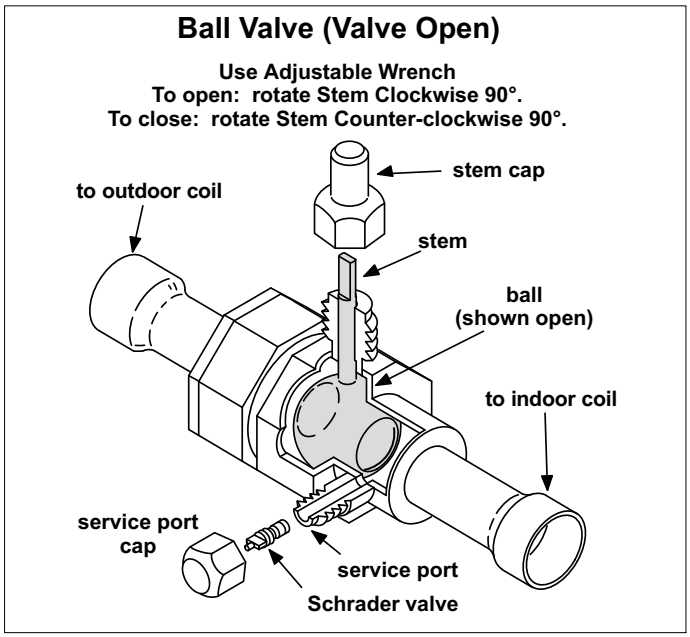


FIGURE 11

IV - 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 cooling season, the system should be serviced. In addition, the system should be cleaned as follows:

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 pre-lubricated 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.

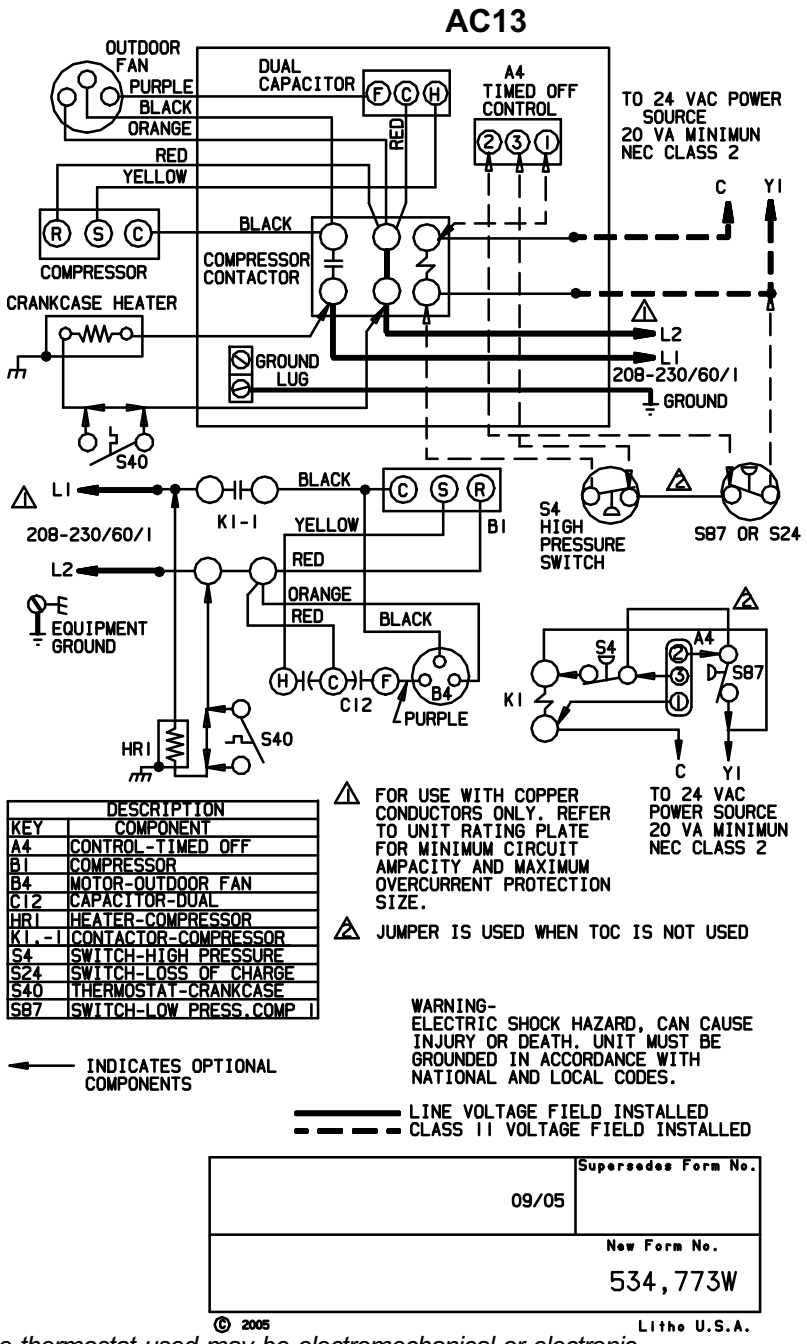
Indoor Coil

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.

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 _____.

V - SEQUENCE OF OPERATIONS



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.

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 and the TOC(if used) begins its off cycle timing.

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.

VI - CHARGING

⚠ WARNING

R-22 refrigerant can be harmful if it is inhaled. R-22 refrigerant must be used and recovered responsibly.

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

B - 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 (CFCs and HFCs) 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 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 a cylinder of R-22 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 R-22 cylinder.

3 - Open the high pressure side of the manifold to allow the R-22 into the line set and indoor unit. Weigh in a trace amount of R-22. [A trace amount is a maximum of 2 ounces (57 g) or 3 pounds (31 kPa) pressure.] Close the valve on the R-22 cylinder and the valve on the high pressure side of the manifold gauge set. Disconnect the R-22 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-22 mixture. Correct any leaks and recheck.

C - 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 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 rap id 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 R-22 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-22 cylinder and remove the manifold gauge set.

E - Charging

Applicable charging data by unit size and dash number is listed below. Actual unit charging stickers are located at the end of this manual. See nameplate on unit for model number.

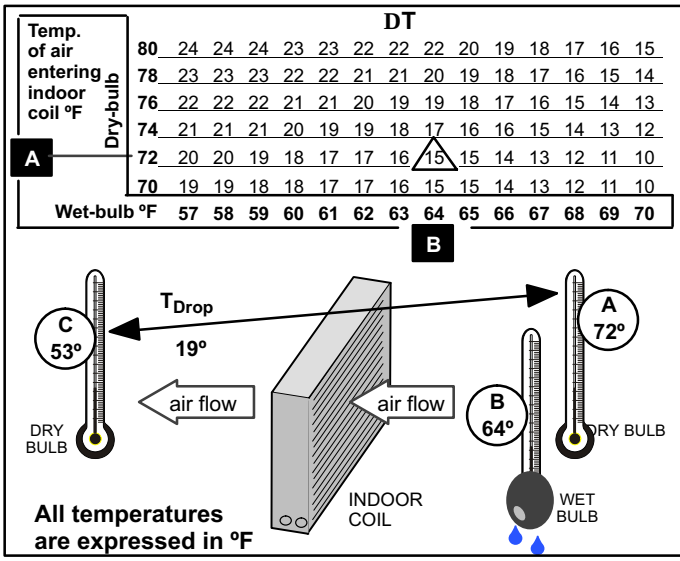
TABLE 2

Model / Unit Size	401296	580072-01
AC13-XXX-230-02	X	
AC13-XXX-230-03		X
AC13-XX-230-04		X
AC13-048-230-05 and -06		X
AC13-60-230-05		X
XXX indicate the following size units: 018, 024, 030, 042, 048 and 060.		

Units are factory-charged with the amount of R-22 refrigerant indicated on the unit nameplate. This charge is based on a matching indoor coil and outdoor coil with 15 ft. (4.6 m) of line set. For varying lengths of line set, refer to table 3 on page 13 for refrigerant charge adjustment.

Check Indoor Airflow before Charging

NOTE - Be sure that filters and indoor and outdoor coils are clean before testing. Check indoor airflow using the step procedures as illustrated in figure 12.



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

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

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

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

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

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

FIGURE 12

Determining Charge Method

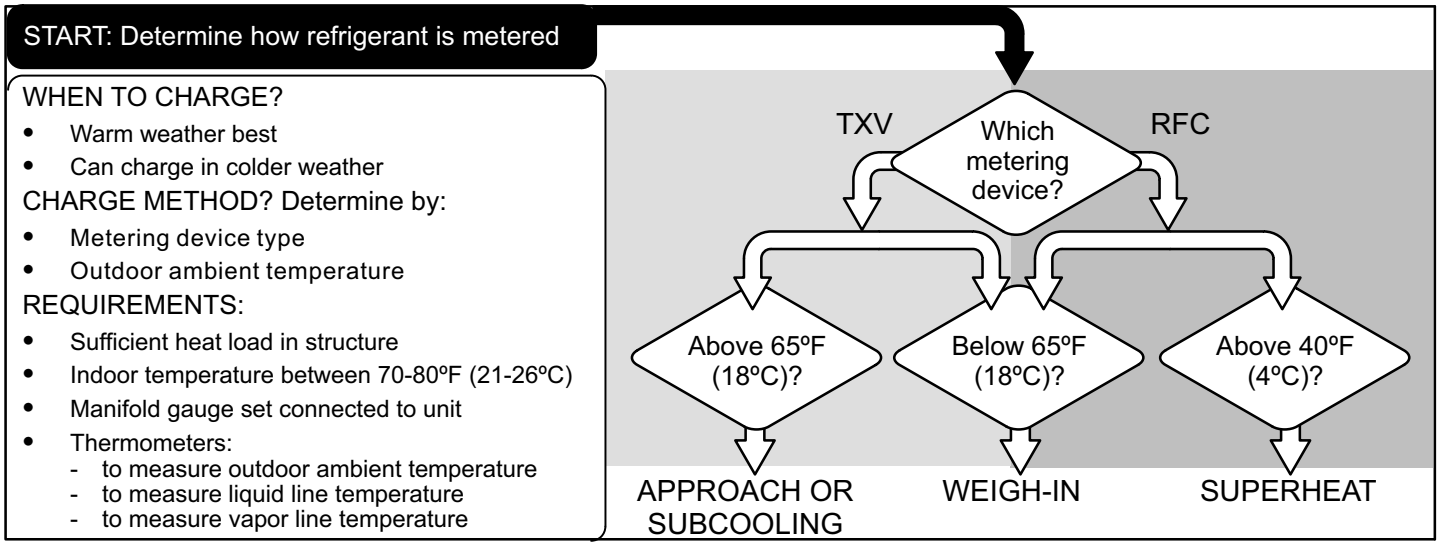


FIGURE 13

Weigh in Charge

1. Confirm proper airflow across coil per instructions as illustrated in figure 12 on page 12.
2. Check Liquid and Vapor line pressures and compare with normal operating pressures listed on the applicable charging sticker form located at the end of this manual.
3. Recover the refrigerant from the unit.
4. Conduct leak check; evacuate as previously outlined.
5. Weigh in the unit nameplate charge plus any charge required for line sets differences from 15 feet and any extra indoor unit match-up amount. If weighing facilities are not available, use either Superheat or TXV subcooling method.

Table 3
Refrigerant Charge per Line Set Lengths

Liquid Line Set Diameter	Ounces per 5 feet (g per 1.5 m) adjust from 15 feet (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.*	

START: Measure outdoor ambient temperature

ABOVE

Outdoor ambient 40ºF (4ºC)?

BELOW

USE WEIGH-IN METHOD

Weigh-in or remove refrigerant based upon line length

SUPERHEAT RFC

1.. Confirm proper airflow across coil using figure 12 on page 12.

2.. Check liquid and vapor line pressures and compare unit pressures with Normal Operating Pressures listed on the applicable charging sticker.

(Note: Normal operating pressures listed are a general guide. Expect minor pressures variations. Significant differences may mean improper charge or other system problem.)

3.. Use SUPERHEAT to correctly charge unit or to verify the charge is correct.

SUPERHEAT METHOD

4.. Set thermostat to call for heat (must have a cooling load between 70-80ºF (21-26ºC)

5.. Connect gauge set

6.. When heat demand is satisfied, set thermostat to call for cooling

7.. Allow temperatures and pressures to stabilize

8.. Measure the vapor line pressure and use the use value to determine saturation temperature SATº =_____

9.. Record vapor line temperature VAPº =_____

10.. Subtract to determine superheat (SHº):

11.. VAPº - _____ SATº _____ = SHº_____

12.. Record the wet bulb temperature (air entering indoor coil) WB =_____

13.. Record outdoor ambient temperature

14.. Compare results with table to the left

SHº (Superheat) Values (+/-5ºF)

See table 2 to determine which of the two charging stickers attached at the end of this manual should be used here.

If refrigerant added or removed, retest to confirm that unit is properly charged

If value is greater than shown, add refrigerant; if less than shown, remove refrigerant.

NOTE - Do not attempt to charge system where a dash appears, system could be overcharged. Superheat is taken at vapor line service port. Vapor line superheat must never be less than 5ºF at the vapor line service port.

START: Measure outdoor ambient temperature

ABOVE

Outdoor Ambient 65ºF (18ºC)?

BELOW

USE WEIGH-IN METHOD

Weigh-in or remove refrigerant based upon line length

APPROACH TXV

1.. Confirm proper airflow across coil using figure 12 on page 12.

2.. Check liquid and vapor line pressures and compare unit pressures with Normal Operating Pressures listed on the applicable charging sticker.

(Note: Normal operating pressures listed are a general guide. Expect minor pressures variations. Significant differences may mean improper charge or other system problem.)

3.. Use APPROACH to correctly charge unit or to verify the charge is correct.

APPROACH METHOD

4.. Set thermostat to call for heat (must have a cooling load between 70-80ºF (21-26ºC)

5.. Connect gauge set

6.. When heat demand is satisfied, set thermostat to call for cooling

7.. Allow temperatures and pressures to stabilize

8.. Record outdoor ambient temperature AMBº =_____

9.. Record line temp. LIQº = _____

10.. Subtract to determine approach (APPº):

11.. LIQº_____ - AMBº _____ = APPº_____

12.. Compare results with table to the left

APPº (Approach) Values(F:+/-1.0°; [C: +/-0.5°])

See table 2 to determine which of the two charging stickers attached at the end of this manual should be used here.

If value is greater than shown (high approach), add refrigerant; if less than shown (liquid temp too close to ambient temp, low approach), remove refrigerant.

If refrigerant added or removed, retest to confirm that unit is properly charged

START: Measure outdoor ambient temperature

Above or below 65ºF (18ºC)?

ABOVE

BELOW

USE WEIGH-IN METHOD

Weigh-in or remove refrigerant based upon line length

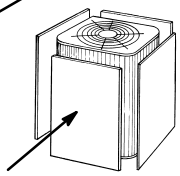
1.. Confirm proper airflow across coil using figure 12 on page 12.

2.. Check liquid and vapor line pressures and compare unit pressures with Normal Operating Pressures listed on the applicable charging sticker.

(Note: Normal operating pressures listed are a general guide. Expect minor pressures variations. Significant differences may mean improper charge or other system problem.)

3.. Use SUBCOOLING to correctly charge unit or to verify the charge is correct.

SUBCOOLING TXV



SUBCOOLING METHOD

4.. Set thermostat to call for heat (must have a cooling load between 70-80ºF (21-26ºC)

5.. Connect gauge set

6.. Measure outdoor ambient temperature

7.. When heat demand is satisfied, set thermostat to call for cooling

8.. Allow temperatures and pressures to stabilize [NOTE - IF NECESSARY, block outdoor coil to maintain 325 - 375 psig]

9.. Record line temp. LIQº = _____

10.. Measure liquid line pressure and use the value to determine saturation temperature SATº = _____

11.. Subtract to determine subcooling (SCº):

12.. SATº_____ - LIQº _____ = SCº _____

13.. Compare results with table to the left.

BLOCK OUTDOOR COIL - Sometimes necessary with lower temperatures] Use cardboard or plastic sheet to restrict the airflow through the outdoor coil to achieve pressures from 200-250 psig . Higher pressures are needed to check charge. Block equal sections of air intake panels and move coverings sideways until the liquid pressure is in the above noted ranges.

SCº (Subcooling) Values (F:+/-1.0°; [C: +/-0.5°])

See table 2 to determine which of the two charging stickers attached at the end of this manual should be used here.

If value is greater than shown, remove refrigerant; if less than shown, add refrigerant

If refrigerant added or removed, verify charge using the approach method

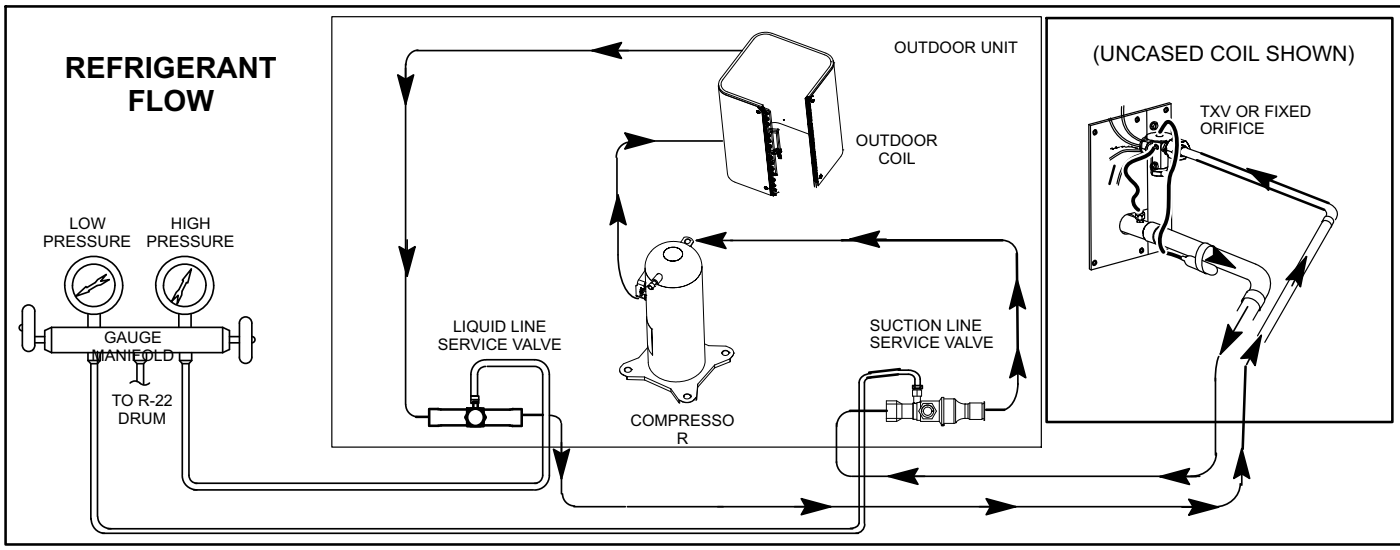


FIGURE 14

TABLE 4 HCFC-22 Temperature (°F) - Pressure (Psig)

°F	Psig	°F	Psig	°F	Psig	°F	Psig	°F	Psig	°F	Psig	°F	Psig
32	57.5	50	84.1	68	117.3	86	158.2	104	207.7	122	267.1	140	337.4
33	58.8	51	85.7	69	119.4	87	160.7	105	210.8	123	270.7	141	341.6
34	60.2	52	87.4	70	121.4	88	163.2	106	213.8	124	274.3	142	345.9
35	61.5	53	89.1	71	123.5	89	165.8	107	216.9	125	278.0	143	350.3
36	62.9	54	90.8	72	125.7	90	168.4	108	220.0	126	281.7	144	354.6
37	64.3	55	92.6	73	127.8	91	171.0	109	223.2	127	285.4	145	359.0
38	65.7	56	94.4	74	130.0	92	173.7	110	226.4	128	289.2	146	363.5
39	67.1	57	96.1	75	132.2	93	176.4	111	229.6	129	293.0	147	368.0
40	68.6	58	98.0	76	134.5	94	179.1	112	232.8	130	296.9	148	372.5
41	70.0	59	99.8	77	136.7	95	181.8	113	236.1	131	300.8	149	377.1
42	71.5	60	101.6	78	139.0	96	184.6	114	239.4	132	304.7	150	381.7
43	73.0	61	103.5	79	141.3	97	187.4	115	242.8	133	308.7		
44	74.5	62	105.4	80	143.6	98	190.2	116	246.1	134	312.6		
45	76.1	63	107.3	81	146.0	99	193.0	117	249.5	135	316.7		
46	77.6	64	109.3	82	148.4	100	195.9	118	253.0	136	320.7		
47	79.2	65	111.2	83	150.8	101	198.8	119	256.5	137	324.8		
48	80.8	66	113.2	84	153.2	102	201.8	120	260.0	138	329.0		
49	82.4	67	115.3	85	155.7	103	204.7	121	263.5	139	333.2		

CHARGING PROCEDURE

FOR COMPLETE CHARGING DETAILS, REFER TO THE OUTDOOR UNIT INSTALLATION INSTRUCTION.

AIRFLOW CHECK - Both airflow and refrigerant charge must be monitored for a proper system set-up. It may be necessary to alternately check and adjust the airflow and the refrigerant charge.

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

To determine temperature drop across indoor coil (Delta-T), measure the entering air dry bulb (DB) and wet bulb (WB) temperatures at the indoor coil. Find Delta-T in table 1. Measure coil's leaving air DB and subtract that value from entering air DB. The measured difference should be within ±3ºF (±1.8ºC) of table value; if too low, decrease the indoor fan speed (refer to indoor unit for information). If the Delta-T is too high, increase the indoor fan speed. Repeat charging procedure and Delta-T (air flow adjustment) procedure until both are correct.

Example: *assume entering air DB - 72, WB - 64, leaving DB - 53. Therefore, Delta-T should be 15 (per table); delta across coil is 72 - 53 or 19 (which is 4ºF higher than table value); action necessary: increase fan speed.*

Table 1. Evaporator Coil Delta-T

Dry bulb temperature of air entering indoor coil (ºF)															
80	24	24	24	23	23	22	22	22	20	19	18	17	16	15	
78	23	23	23	22	22	21	21	20	19	18	17	16	15	14	
76	22	22	22	21	21	20	19	19	18	17	16	15	14	13	
74	21	21	21	20	19	19	18	17	16	16	15	14	13	12	
72	20	20	19	18	17	17	16	15	15	14	13	12	11	10	
70	19	19	18	18	17	17	16	15	15	14	13	12	11	10	
ºF	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**	

[Wet bulb temperature of air entering indoor coil]

Table 2. Superheat (SH) Value RFC System - ±5ºF

Dry bulb temperature of ambient air entering outdoor unit (ºF)															
40	15	18	20	23	26	29	32	34	38	41	43	46	48	51	
45	13	16	18	21	24	27	30	33	36	39	41	44	46	49	
50	11	14	16	19	22	25	28	31	34	37	39	42	44	47	
55	9	12	14	17	20	23	27	30	33	36	38	40	42	44	
66	7	10	12	15	18	21	24	27	30	33	35	38	40	43	
65	-	6	10	13	16	19	21	24	27	30	33	36	38	41	
70	-	-	7	10	13	16	19	21	24	27	30	33	36	39	
75	-	-	-	6	9	12	15	18	21	24	28	31	34	37	
80	-	-	-	-	5	8	12	15	18	21	25	28	31	35	
85	-	-	-	-	-	-	8	11	15	19	22	26	30	33	
90	-	-	-	-	-	-	5	9	13	16	20	24	27	31	
95	-	-	-	-	-	-	-	6	10	14	18	22	25	29	
100	-	-	-	-	-	-	-	-	8	12	16	21	24	28	
105	-	-	-	-	-	-	-	-	5	9	13	17	22	26	
110	-	-	-	-	-	-	-	-	-	6	11	15	20	25	
115	-	-	-	-	-	-	-	-	-	-	8	14	18	24	
ºF	**50**	**52**	**54**	**56**	**58**	**60**	**62**	**64**	**66**	**68**	**70**	**72**	**74**	**76**	

[Wet bulb temperature of air entering indoor coil]

Model	-18	-24	-30	-36	-42	-48	-60
Table 3- Normal Operating Pressures[1]							
°F(°C)[2]	**TXV System** - Liquid Line (±10 psig) / Vapor Line (±5 psig)						
65 (18)	141 / 80	147 / 79	147 / 75	155 / 79	147 / 78	144 / 77	152 / 73
70 (21)	154 / 81	159 / 79	159 / 75	169 / 80	158 / 78	152 / 77	164 / 75
75 (24)	166 / 81	173 / 76	172 / 76	183 / 81	172 / 79	163 / 78	177 / 77
80 (27)	180 / 82	187 / 81	186 / 77	199 / 81	189 / 79	179 / 78	192 / 78
85 (29)	195 / 82	218 / 82	201 / 77	215 / 82	205 / 80	195 / 79	208 / 79
90 (32)	209 / 83	202 / 81	216 / 78	233 / 82	222 / 81	212 / 80	225 / 80
95 (35)	222 / 83	234 / 82	233 / 79	252 / 83	241 / 81	229 / 80	243 / 80
100 (38)	244 / 84	251/ 83	250 / 80	271 / 83	259 / 82	245 / 81	261 / 81
105 (41)	258 / 85	267 /80	268 / 80	291 / 84	279 / 82	265 / 81	280 / 82
110 (43)	286 / 85	287 / 84	287 / 81	311 / 85	299 / 83	287 / 82	299 / 83
115 (45)	294 / 86	307 / 82	306 / 82	331 / 86	320 / 84	309 / 83	320 / 83
°F(°C)[2]	**Fixed Orifice** - Liquid Line (±10 psig) / Vapor Line (±5 psig)						
65 (18)	144 / 73	147 / 68	148 / 65	162 / 75	158 / 72	151 / 71	152 / 68
70 (21)	157 / 76	160 / 71	161 / 67	174 / 76	170 / 75	161 / 73	165 / 71
75 (24)	167 / 78	173 / 74	175 / 70	187 / 78	182 / 76	172 / 75	178 / 73
80 (27)	182 / 80	189 / 77	190 / 73	201 / 79	195 / 78	185 / 76	193 / 76
85 (29)	196 / 82	203 / 79	205 / 75	215 / 81	209 / 80	198 / 77	208 / 78
90 (32)	211 / 84	219 / 81	221 / 77	231 / 82	224 / 81	213 / 79	224 / 80
95 (35)	225 / 84	238 / 83	237 / 79	247 / 83	240 / 82	227 / 80	239 / 81
100 (38)	242 / 86	255 / 85	254 / 80	265 / 84	256 / 84	243 / 81	258 / 82
105 (41)	256 / 86	272 / 86	271 / 81	283 / 85	273 / 85	259 / 82	276 / 83
110 (43)	278 / 88	294 / 87	289 / 82	302 / 86	290 / 86	276 / 84	294 / 85
115 (45)	293 / 88	317 /88	308 / 83	321 / 87	310 / 87	293 / 85	313 / 86
Table 4- Approach (APP) Values[3] - TXV System - ºF (ºC) ±1ºF (0.5ºC)							
All	6 (3.3)	10 (5.6)	8 (4.4)	12 (6.7)	5 (2.8)	6 (3.3)	7 (3.8)
Table 5- Subcooling (SC) Values[4] - TXV System - ºF (ºC) ±1ºF (0.5ºC)							
All	8 (4.4)	8 (4.4)	9 (5)	10 (5.6)	14 (8)	10 (5.6)	13 (7.2)

1 Typical pressures; indoor evaporator match up, indoor air quantity, and evaporator load will cause the pressures to vary.

2 Temperature of air entering outside coil.

3 Approach = Liquid Line Temp. minus Outdoor Ambient Temperature

4 Subcooling = Saturation Temp. minus Liquid Line Temp Temperature

HCFC-22 CHARGING INFORMATION

FOR COMPLETE CHARGING DETAILS, REFER TO THE OUTDOOR UNIT INSTALLATION INSTRUCTION.

AIRFLOW CHECK - Both airflow and refrigerant charge must be monitored for a proper system set-up. It may be necessary to alternately check and adjust the airflow and the refrigerant charge.

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

To determine temperature drop across indoor coil (Delta-T), measure the entering air dry bulb (DB) and wet bulb (WB) temperatures at the indoor coil. Find Delta-T in table 1. Measure coil's leaving air DB and subtract that value from entering air DB. The measured difference should be within ±3ºF (±1.8ºC) of table value; if too low, decrease the indoor fan speed (refer to indoor unit for information). If the Delta-T is too high, increase the indoor fan speed. Repeat charging procedure and Delta-T (air flow adjustment) procedure until both are correct.

Example: *assume entering air DB - 72, WB - 64, leaving DB - 53. Therefore, Delta-T should be 15 (per table); delta across coil is 72 - 53 or 19 (which is 4ºF higher than table value); action necessary: increase fan speed.*

Table 1. Evaporator Coil Delta-T

Dry bulb temperature of air entering indoor coil (ºF)															
	80	24	24	24	23	23	22	22	22	20	19	18	17	16	15
	78	23	23	23	22	22	21	21	20	19	18	17	16	15	14
	76	22	22	22	21	21	20	19	19	18	17	16	15	14	13
	74	21	21	21	20	19	19	18	17	16	16	15	14	13	12
	72	20	20	19	18	17	17	16	15	15	14	13	12	11	10
	70	19	19	18	18	17	17	16	15	15	14	13	12	11	10
	ºF	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**
		[Wet bulb temperature of air entering indoor coil]													

Table 2. Superheat (SH) Value RFC System - ±5ºF

Dry bulb temperature of ambient air entering outdoor unit (ºF)															
	40	15	18	20	23	26	29	32	34	38	41	43	46	48	51
	45	13	16	18	21	24	27	30	33	36	39	41	44	46	49
	50	11	14	16	19	22	25	28	31	34	37	39	42	44	47
	55	9	12	14	17	20	23	27	30	33	36	38	40	42	44
	66	7	10	12	15	18	21	24	27	30	33	35	38	40	43
	65	-	6	10	13	16	19	21	24	27	30	33	36	38	41
	70	-	-	7	10	13	16	19	21	24	27	30	33	36	39
	75	-	-	-	6	9	12	15	18	21	24	28	31	34	37
	80	-	-	-	-	5	8	12	15	18	21	25	28	31	35
	85	-	-	-	-	-	-	8	11	15	19	22	26	30	33
	90	-	-	-	-	-	-	5	9	13	16	20	24	27	31
	95	-	-	-	-	-	-	-	6	10	14	18	22	25	29
	100	-	-	-	-	-	-	-	-	8	12	16	21	24	28
	105	-	-	-	-	-	-	-	-	5	9	13	17	22	26
	110	-	-	-	-	-	-	-	-	-	6	11	15	20	25
	115	-	-	-	-	-	-	-	-	-	-	8	14	18	24
	ºF	**50**	**52**	**54**	**56**	**58**	**60**	**62**	**64**	**66**	**68**	**70**	**72**	**74**	**76**
		[Wet bulb temperature of air entering indoor coil]													

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Model	-18	-24	-30	-36	-42	-48	-60
Table 3- Normal Operating Pressures[1]							
°F(°C)[2]	**TXV System** - Liquid Line (±10 psig)/Vapor Line (±5 psig)						
65 (18)	138 / 79	148 / 79	147 / 75	155 / 79	147 / 78	144 / 77	152 / 73
70 (21)	148 / 80	160 / 79	159 / 75	169 / 80	158 / 78	152 / 77	164 / 75
75 (24)	160 / 80	174 / 80	172 / 76	183 / 81	172 / 79	163 / 78	177 / 77
80 (27)	174 / 81	188 / 81	186 / 77	199 / 81	189 / 79	179 / 78	192 / 78
85 (29)	188 / 81	203 / 81	201 / 77	215 / 82	205 / 80	195 / 79	208 / 79
90 (32)	204 / 81	220 / 82	216 / 78	233 / 82	222 / 81	212 / 80	225 / 80
95 (35)	219 / 82	236 / 83	233 / 79	252 / 83	241 / 81	229 / 80	243 / 80
100 (38)	236 / 82	253 / 83	250 / 80	271 / 83	259 / 82	245 / 81	261 / 81
105 (41)	253 / 83	272 / 84	268 / 80	291 / 84	279 / 82	265 / 81	280 / 82
110 (43)	272 / 84	291 / 85	287 / 81	311 / 85	299 / 83	287 / 82	299 / 83
115 (45)	291 / 84	311 / 85	306 / 82	331 / 86	320 / 84	309 / 83	320 / 83
°F(°C)[2]	**Fixed Orifice** - Liquid Line (±10 psig)/Vapor Line (±5 psig)						
65 (18)	139 / 67	147 / 71	148 / 65	162 / 75	158 / 72	151 / 71	152 / 68
70 (21)	149 / 70	159 / 73	161 / 67	174 / 76	170 / 75	161 / 73	165 / 71
75 (24)	161 / 74	172 / 75	175 / 70	187 / 78	182 / 76	172 / 75	178 / 73
80 (27)	175 / 77	186 / 77	190 / 73	201 / 79	195 / 78	185 / 76	193 / 76
85 (29)	189 / 79	200 / 79	205 / 75	215 / 81	209 / 80	198 / 77	208 / 78
90 (32)	203 / 81	216 / 81	221 / 77	231 / 82	224 / 81	213 / 79	224 / 80
95 (35)	218 / 82	232 / 82	237 / 79	247 / 83	240 / 82	227 / 80	239 / 81
100 (38)	234 / 83	247 / 83	254 / 80	265 / 84	256 / 84	243 / 81	258 / 82
105 (41)	251 / 85	264 / 85	271 / 81	283 / 85	273 / 85	259 / 82	276 / 83
110 (43)	269 / 86	285 / 86	289 / 82	302 / 86	290 / 86	276 / 84	294 / 85
115 (45)	287 / 87	302 / 87	308 / 83	321 / 87	310 / 87	293 / 85	313 / 86
Table 4- Approach (APP) Values[3] - TXV System - ºF (ºC) ±1ºF (0.5ºC)							
All	6 (3.3)	6 (3.3)	8 (4.4)	12 (6.7)	5 (2.8)	6 (3.3)	7 (3.8)
Table 5- Subcooling (SC) Values[4] - TXV System - ºF (ºC) ±1ºF (0.5ºC)							
All	7 (3.8)	12 (6.7)	9 (5.0)	10 (5.6)	14 (8.0)	10 (5.6)	13 (7.2)

1 Typical pressures; indoor evaporator match up, indoor air quantity, and evaporator load will cause the pressures to vary.
2 Temperature of air entering outside coil.
3 Approach = Liquid Line Temp. minus Outdoor Ambient Temperature
4 Subcooling = Saturation Temp. minus Liquid Line Temp Temperature