

Installation, Commissioning and Service Manual



TECUMSEH

Outdoor Condensing Units

Contents

A	.... Introduction	2
B	.... Installation	3
	General Safety & Receiving	3
	Placement and Orientation	4
	Lifting Instructions	5
	Electrical Connections	6
	Refrigerant Piping	7
	Leak Testing	8
	System Evacuation	10
	System Charging	11
	Approved Hermetic Compressor Oils	13
C	.... System Start-Up	14
D	.... Operational Checkout .	15
E	.... Maintenance	16
F	.... Trouble Shooting	17
G	.... Start-up Information...	20

A

INTRODUCTION

The purpose of this Manual is to assist the contractor and other interested people in the proper handling, installation and servicing of Tecumseh Outdoor Condensing Units. It is of great importance to follow these guidelines to avoid improper installations that may cause unit failure, poor performance or reduced reliability.

Installation related issues that are not covered in this manual should be approached and resolved by applying generally accepted criteria and knowledge from the commercial refrigeration industry.

As the condensing unit is only a part of the refrigeration system it becomes very important to properly select and employ them in the system.

The refrigeration system should be properly designed, components properly selected and balanced in order to ensure a reliable performance of the system in general and the condensing unit in particular.

Poor system design, inappropriate component selection and balance will compromise condensing unit performance and reliability.

Care should be taken in the purchase of mating components to ensure that these parts are the best suited to the published performance of the condensing unit. Furthermore, the cleanliness to the total system installation has a bearing on the reliability and performance of the condensing unit and its system.

B

INSTALLATION

General Safety and Receiving

Installation Codes

The units must be installed in accordance with all applicable national and local codes.

Trained personnel only

The installation and start up, the service and troubleshooting of these condensing units should be done only by those with the necessary knowledge, training and equipment.



WARNING:

Main power supply should always be disconnected and locked off to avoid accidental start up or electric shock. Failure to do so could result in injury or death.

Some parts like condenser fins or some corners on the sheet metal parts are sharp and may potentially cause injury. Use extra caution when working around these parts.

Receiving Inspection

The unit should be inspected before unpacking for signs of damage or loss and packing list should be checked against material received to ensure shipment is complete.

A report should be compiled and a claim must be filed with the freight carrier if shipping damage is discovered.

If damages to the packing are obvious but no visible damage on the unit or the parts are noted then a report should be compiled and a claim for “probable hidden damages” should be filed with the transportation carrier.

WARRANTY:

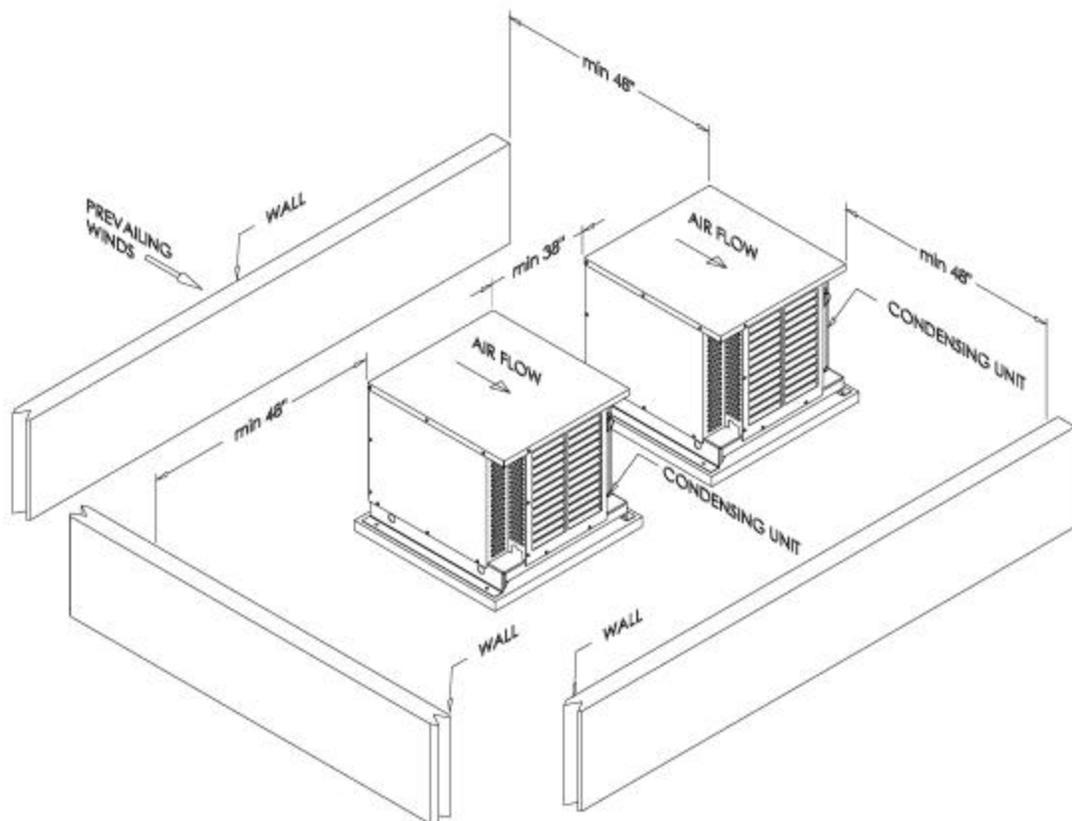
The manufacturer is not responsible for damages or loss caused by the transportation carrier.

Placement and Orientation

The decision to properly locate the position of these outdoor air-cooled condensing units should carefully consider important factors like:

- ⇒ Weight of the unit. If units are installed on the roof then their weight and weight distribution should be checked against the building specifications and the building codes.
- ⇒ Distance of the unit to the refrigerated cabinet.
- ⇒ Distance to the power supply. (See electrical connections, page 8)
- ⇒ Space around the condensing unit and in between adjacent units. This should consider prevention of the re-circulation of the air and insure enough airflow through the unit. These distances should also provide enough room around the units so that enclosure panels may be removed and such that adequate accessibility is provided to the compressor, electrical boxes and other controls. Use the following diagram as a point of reference.
- ⇒ Orientation of the units should consider the prevailing wind direction. It is recommended not to position the units in such a way that the airflow direction through the unit faces the prevailing wind direction for the area.

The units should be mounted and secured on adequate rigid and levelled bases, to avoid improper lubrication conditions for the compressor. Never use the shipment pallet as a permanent mounting base. If vibration is a concern then proper vibration isolators should be installed under the mounting base.

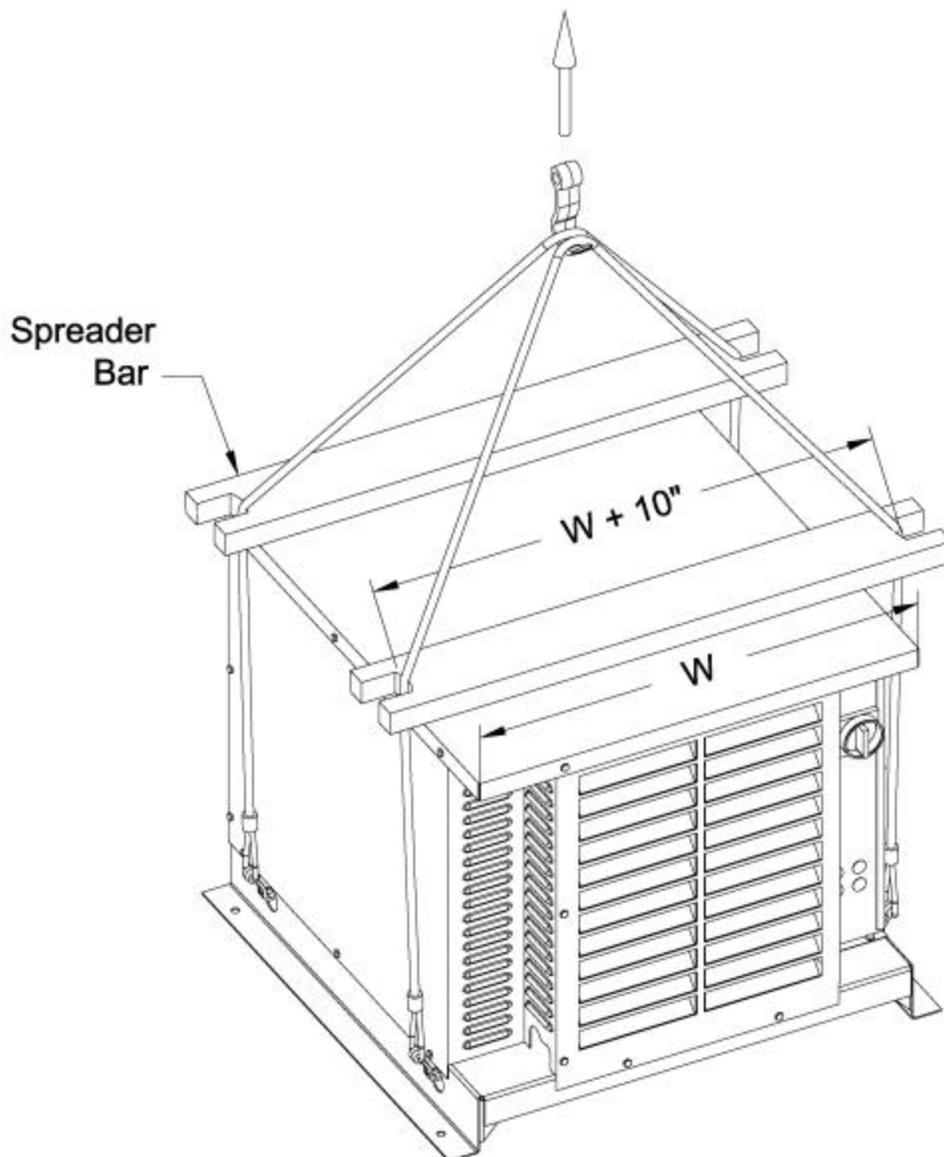


Lifting instructions

When a crane is used to lift the unit then proper measures should be taken to protect the enclosure panels. It is strongly recommended the application of spreader bars to prevent damages to the sides. Some care should be taken to locate the center of gravity before lifting. The compressor as the heaviest part of the unit may not be located in the center of the unit base. If provided, holes on the base plate should be used to lift the unit.

· HANDLING

Never lift or displace the outdoor units with enclosure panels removed. All the panels should be in place and properly tightened. Don't remove the shipment pallet until the unit arrives at the final destination. If unit has to be re-located then apply a proper pallet to carry the unit.



Electrical Connections

All electrical wirings must be done in compliance with all applicable local and national codes.

Check and verify before any electrical installation if the voltage and phases of the supply satisfy those required by the nameplate of the unit. In order that these units have the starting, operating and dependability characteristics required of them, the compressor and its protective devices are designed for operation within a very specific minimum and maximum voltage range. This voltage range is defined in the following table:

Voltage shown on Unit Nameplate	Voltage Code	Voltage Range
208-230-60-1	XD, XN	235 –197
200-230-60-3	XT	253 – 180

Refer to “Minimum Circuit Ampacity” and “Maximum Fuse Size” data on the unit nameplate and applicable electrical codes to size the electrical wires, fuses and over current protection devices.

Refer to wiring diagram (attached inside of the electrical cabinet) to complete unit control circuit.

A pump down cycle should be employed to control all these units. Solenoid valve for the liquid line is an option that may be supplied loose and should be field installed by others. Room thermostat is supplied and installed by others.

The following are some typical wiring diagrams. Generally the wiring diagrams will show all electrical components, even those that are offered as options or should be supplied and installed by others. Should any component be added to the unit as a field supplied option then the wiring should follow the given diagram.

.. **WARRANTY**

Any non-compliance with voltage ranges and phase balances or any altering of electrical components without Tecumseh written approval will void the warranty.

Refrigerant Piping

Standard piping practices and local codes should be employed to size and install refrigerant gas and liquid lines.

· PIPING

Employ only Refrigeration grade copper tubing. Always keep the tubes free of moisture and dirt and remove any burrs present on the tubes.

- A) The selection of the suction gas line sizes should be guided by the following criteria:
- ⇒ Assurance of adequate velocity, thus ensuring oil return capability (the tube size must be limited to maintain velocities no less than 750 fpm for horizontal and down flow and no less than 1500 fpm for up flow)
 - ⇒ Assurance of acceptable pressure drop (The tube size should be limited to maintain velocities no greater than 1500 fpm for horizontal and down flow and no greater than 2500 fpm for up flow.)
 - ⇒ Assurance of satisfactory sound level (the tube size should be limited to maintain velocities no greater than 3000 fpm.)

Horizontal suction lines should be sloped downward in the direction of the compressor at least 1/2" per 10' of line. A suction trap should be installed at the base of suction risers. Suction line lengths in excess 100 feet may require additional oil be added to the compressor.

B) Liquid line sizes are based on pressure drops that will not permit gas formation for horizontal lengths up to 100'. For lines longer than 100' horizontal and for lines that travel up vertically additional sub-cooling must be provided to overcome the vertical liquid head pressures and extra length. Liquid refrigerant in vertical column will exert a downward pressure of 0.5 – 0.6 pounds per linear foot of tube, and depending upon the direction of the refrigerant flow, will either add or subtract from the liquid line pressure drop.

C) Elbows, valves and reduced joint sizes increase pressure drop and deserve additional consideration.

D) Long radius elbows should be employed to minimize pressure losses.

E) To prevent oxidation and scale forming inside the tubes it is recommended to flow dry nitrogen through the tubing during the soldering operations. A light flow of about 1/4 CFM is sufficient.

F) Follow the manufacturer's instructions when brazing service valves or other parts that may be damaged by excessive heat.

G) After all leak check procedures (below) are complete, refrigerant lines that may be exposed to high and low ambient temperatures should be insulated. As a rule of thumb, suction lines should be insulated with an industry accepted material of no less than 3/4" wall thickness. Liquid lines should also be insulated with at least 1/2" wall thickness. The insulating material should be of a kind intended for outdoor use.

Pressure testing for leaks

A pressure leak test is **mandatory** and is to be performed for the complete refrigeration system, **including the condensing unit**, prior to system charging.

To thoroughly leak check the system, the system should be pressurized to a maximum of 150 PSIG with dry nitrogen to the high and low side of the system. With the pressure equalized at 150 PSIG, a leak check should be performed on **EVERY** joint in the system, including the condensing unit, to ensure that no major leaks are present. The initial charge may then be released.

The leak check procedure should then be repeated using a much more accurate means to determine that the system is 100% free of leaks. Use of electronic leak detection equipment is highly recommended due to its potential accuracy when used correctly in accordance with the manufacturers instructions. If trace amounts of refrigerant are used, use only the refrigerant indicated on the serial label of the condensing unit.

If trace amounts of refrigerant are used during the leak check procedure, this must be properly recovered and disposed of in an appropriate manner to protect the environment.

As an added precaution, the leak check charge should be left in the system for no less than 12 hours without loss of pressure.

Every joint in the system including, but not limited to, factory welds, flare nuts and pressure controls must be leak checked.

A leak free system is required for the installation to function correctly.

System Flushing, Purging, and Pressure Testing for Leaks

Failure to properly flush, purge, or pressure test a system for leaks can result in serious injury or death from explosion, fire, or contact with acid-saturated refrigerant or oil mists.

Follow these precautions when flushing, purging or pressure testing a system for leaks:

- ⇒ Use purging products according to the manufacturer's instructions
- ⇒ To purge a system, use only dry nitrogen.
- ⇒ When pressure testing for leaks, use only regulated dry nitrogen or dry nitrogen plus trace amounts of serial label refrigerant.
- ⇒ When purging or pressure testing any refrigeration or air conditioning system for leaks, never use air, oxygen or acetylene.
 - Oxygen can explode on contact with oil.
 - Acetylene can decompose and explode when exposed to pressures greater than approximately 15 PSIG.
 - Combining an oxidizing gas, such as oxygen or air, with an HCFC or HFC refrigerant under pressure can result in a fire or explosion.

- ⇒ Use a pressure regulating valve and pressure gauges.
 - Commercial Cylinders of nitrogen contain pressures in excess of 2000 PSIG at 70°F. At pressures much lower than 2000 PSIG, compressors can explode and cause serious injury or death. To avoid over pressurizing the system, always use a pressure-regulating valve on the nitrogen cylinder discharge. The pressure regulator must be able to reduce the pressure down to 1 to 2 Psig and maintain this pressure.
 - The regulating valve must be equipped with two pressure gauges:
 - ◇ One gauge to measure cylinder pressure
 - ◇ One gauge to measure discharge or down stream pressure
- ⇒ Use a pressure relief valve.
 - In addition to pressure regulating valve and gauges, always install a pressure relief valve. This can also be frangible disc type pressure relief device. This device should have a discharge port at least ½” NPT size. The valve or frangible disc device must be set to 175 Psig.
- ⇒ **Do not pressurize the system beyond 150 PSIG field leak test pressure.**
- ⇒ Disconnect nitrogen cylinder and release the pressure in the system before evacuating and connecting a refrigerant container.

Nitrogen pressurizing method to be used as a major leaking detector process, more detailed leak check with refrigerant leak detectors is necessary. Use only serial label refrigerant for leak detection.

.. **Pressure Controls**

Always protect low (or dual) pressure control from excessive high pressure. It is recommended to disconnect the low-pressure (or the low side of the dual pressure) control prior to pressurization.

.. **WARRANTY**

Follow the leak check procedure very carefully. Warranty will be voided if compressor fails as a result of refrigerant leakage related problems. Leakage of refrigerant to the atmosphere has been identified as a major source of global warming and ozone depletion.

System evacuation

Following the pressure testing for leaks, the system must be evacuated.

Use a vacuum pump (not a compressor) to draw a vacuum of 1000 microns or less from both sides of the system. Do not attempt to draw a vacuum on the system with the pump connected only on the low side. The high side of the system should be interconnected with the low side by using a minimum 3/8" OD copper tube. Use a good electronic gauge to measure the vacuum because a refrigeration gauge cannot provide an accurate reading at this resolution.

Break the vacuum with dry nitrogen.

Repeat this procedure at least three times. Final vacuum should reach at least minimum 100 microns.

These procedures should be performed at ambient temperature above 65°F. If ambient temperature is below 65°F then the final vacuum must be 50 microns.

Note the Following:

Never use a compressor to evacuate a system. Instead, use a high pressure vacuum pump specifically designed for that purpose. Never start the compressor while it is under a deep vacuum. Always break the vacuum with a refrigerant charge before energizing the compressor.

Failure to follow these instructions can damage the hermetic terminal. As always, to avoid serious injury or death from terminal venting with ignition, never energize the compressor unless the terminal cover is securely fastened.

.. WARRANTY

Follow the evacuation procedure very carefully. Warranty will be voided if compressor fails as a result of moisture related problems.

Refrigerant Charging

Failure to properly charge the system can result in serious injury or death from explosion or fire.

Follow these precautions when charging a system

⇒ Do not operate the compressor without charge in the system.

- Operating the compressor without a charge in the system can damage the hermetic terminals.
- To reduce the risk of serious injury or death from fire due to terminal venting, never energize the compressor unless the protective terminal cover is securely fastened.
- After the system has been evacuated, break the vacuum with the specified refrigerant and proceed to charge the system.

⇒ Use proper refrigerant.

- Use only the refrigerant specified on the serial label when charging the system. Using a different refrigerant can lead to excess system pressure and an explosion.

⇒ Do not overcharge a refrigeration system.

Overcharging the system immerses the compressor, motor, piston, connecting rods and cylinders in liquid refrigerant. This creates a hydraulic block preventing the compressor from starting. The hydraulic block is also known as locked rotor.

Continued supply of electricity to the system causes heat to build in the compressor. This heat will eventually vaporize the refrigerant and rapidly decrease system pressure. If, for any reason, the thermal protector fails to open the electrical circuit, system pressure can rise to high enough levels to cause a compressor housing explosion.

It is highly recommended to charge the system into the high side through the process port provided in the liquid valve. Employ a liquid line drier when charging to ensure clean and dry refrigerant entering into the system.

If charging through the low side, then the refrigerant should enter in gas form only. Break the vacuum by allowing refrigerant vapor to enter into the system through the service suction valve, or Rota Lock adaptor. When the low side pressure reaches 60 PSIG for R22, start the compressor and continue charging at rate **no more** than 5 pounds per minute.

Vapor charging is not allowed for blended type refrigerants. (R404A should always be charged in liquid form, unless the whole amount of refrigerant from the container is used.)

.. WARRANTY

Use of a refrigerant other than those listed on the serial label will void the compressor warranty.

Refrigerant Charge Adjustment for Low Ambient Conditions

Model Number	Refrig.	Above 70 F	50 F	30 F	10 F	0 F	Below 20 F
AKA9459EXDHG	R-22	2.4	2.5	2.6	2.7	2.7	2.8
AKA9470EXDHG	R-22	3.2	3.3	3.5	3.5	3.6	3.7
AJA9484EXDHG	R-22	3.2	3.3	3.5	3.5	3.6	3.7
AWG4518EXNHG	R-22	3.2	3.3	3.5	3.5	3.6	3.7
AWG4523EXNHG	R-22	4.4	4.6	4.7	4.8	4.9	5
AWG4523EXTHG	R-22	4.4	4.6	4.7	4.8	4.9	5
AWG4525EXNHG	R-22	5.9	6.2	6.3	6.5	6.7	6.8
AWG4525EXTHG	R-22	5.9	6.2	6.3	6.5	6.7	6.8
AWG4530EXNHG	R-22	5.9	6.2	6.3	6.5	6.7	6.8
AWG4530EXTHG	R-22	5.9	6.2	6.3	6.5	6.7	6.8
AVA4544EXNHG	R-22	13.2	13.8	14.2	14.6	14.9	15.2
AVA4544EXTHG	R-22	13.2	13.8	14.2	14.6	14.9	15.2
AVA4547EXNHG	R-22	13.2	13.8	14.2	14.6	14.9	15.2
AVA4547EXTHG	R-22	13.2	13.8	14.2	14.6	14.9	15.2
AGA4551EXNHG	R-22	13.2	13.8	14.2	14.6	14.9	15.2
AGA4551EXTHG	R-22	13.2	13.8	14.2	14.6	14.9	15.2
AGA4560EXNHG	R-22	16.3	17	17.5	18	18.3	18.7
AGA4560EXTHG	R-22	16.3	17	17.5	18	18.3	18.7
AJA2423ZXDHG	R-404A	2.2	2.3	2.3	2.4	2.5	2.6
AJA2436ZXDHG	R-404A	2.2	2.3	2.3	2.4	2.5	2.6
AWA2444ZXDHG	R-404A	2.2	2.3	2.3	2.4	2.5	2.6
AWA2481ZXDHG	R-404A	3.9	4.1	4.2	4.4	4.4	4.6
AWA2481ZXTHG	R-404A	3.9	4.1	4.2	4.4	4.4	4.6
AVA2511ZXNHG	R-404A	3.9	4.1	4.2	4.4	4.4	4.6
AVA2511ZXTHG	R-404A	3.9	4.1	4.2	4.4	4.4	4.6
AVA2514ZXNHG	R-404A	5.3	5.6	5.8	5.9	6.1	6.1
AVA2514ZXTHG	R-404A	5.3	5.6	5.8	5.9	6.1	6.1
AKA9464ZXDHG	R-404A	2.8	3	3.1	3.2	3.2	3.3
AWA9512ZXNHG	R-404A	5.3	5.6	5.8	5.9	6.1	6.1
AWA9511ZXNHG	R-404A	3.9	4.1	4.2	4.4	4.4	4.6
AWA9511ZXTHG	R-404A	3.9	4.1	4.2	4.4	4.4	4.6
AWA9513ZXNHG	R-404A	3.9	4.1	4.2	4.4	4.4	4.6
AWA9513ZXTHG	R-404A	3.9	4.1	4.2	4.4	4.4	4.6
AVA9522ZXNHG	R-404A	11.9	12.4	12.8	13.2	13.5	13.8
AVA9522ZXTHG	R-404A	11.9	12.4	12.8	13.2	13.5	13.8
AVA9532ZXNHG	R-404A	11.9	12.4	12.8	13.2	13.5	13.8
AVA9532ZXTHG	R-404A	11.9	12.4	12.8	13.2	13.5	13.8
AGA9539ZXNHG	R-404A	14.6	15.3	15.8	16.3	16.6	17
AGA9539ZXTHG	R-404A	14.6	15.3	15.8	16.3	16.6	17

C

System Start-Up Procedure

- ⇒ Check the electrical connections if they are properly attached and secured.
- ⇒ Check the electrical supply versus nameplate specifications.
- ⇒ Check if the Voltage deviation is within the specified range.
- ⇒ Check all mechanical and electrical connections if they are properly tightened and secured. Compressor mounting parts, fan motor mounting screws, fan blade tightening screw, shroud electrical boxes etc.
- ⇒ Check that the safety and pressure controls are connected and set correctly.
- ⇒ Check that the suction and liquid valves are open.
- ⇒ Check by isolating the compressor motor if the control circuit including thermostat and solenoid valve(if used) is wired and operates correctly.
- ⇒ Confirm that the system has been properly leak tested, evacuated and charged. If not, then follow the leak testing, evacuating and charging procedures described respectively at “Pressure testing for leaks”, “System evacuation” and “Refrigerant charging”. **If the system has been previously charged then make sure that the crank case heater is turned on at least 24 hours prior to start up**, otherwise warm up the compressor bottom shell to assure that the refrigerant will not cause damage to the compressor due to the slugging condition. Do not attempt to warm up the compressor by applying a flame to the crankcase.
- ⇒ Turn on the electrical power to the condensing unit and unit cooler(s) or freezer(s). The compressor will start when the low-pressure control closes.
- ⇒ Always re-assemble the enclosure panels when start-up job is completed. Never leave loose or not properly tightened panels.

D

Operational checkout procedure

- ⇒ Check if the Voltage deviation is within the specified range.
- ⇒ Check that the ampere draw doesn't exceed the amperage specified on the nameplate.
- ⇒ Check the phase unbalance if there is a three-phase connection. **Unbalance should not exceed 2%**
- ⇒ Check that the discharge and suction pressures are within the allowable design limits.
- ⇒ Check the liquid flow in the liquid sight glass.
- ⇒ Measure compressor and evaporator superheats. Make proper adjustments if necessary.
- ⇒ Check the high-pressure control setting by simulating a condenser block, shutting off the fans and observing with extreme caution the pressure rise.
- ⇒ Check the low-pressure setting by simulating a pump-down cycle. Observe the cut-off pressure, and adjust according to the table below.
- ⇒ Check (if equipped) the defrost and timer controls for proper initiation and termination settings.
- ⇒ If any malfunction is observed at any time during either start-up or operational checkout procedures, stop the unit, disconnect power and correct the malfunction accordingly.
- ⇒ **Re-check after 48 hours** of operation for loose electrical connections, abnormal vibrations that may have developed, refrigerant charge and correct any probable malfunction observed.
- ⇒ Always re-assemble the enclosure panels when operational check out procedure is completed. Never leave loose or not properly tightened panels.

Low Pressure Control Settings					
Minimum Temperature	R22		R404A		+ Temperature is the minimum ambient temperature at the condensing unit or the box design temperature whichever is lower. Example #1 30 F minimum ambient, -20 F freezer. Use -20 F value from the table. Example #2 -10 F minimum ambient, 35 F cooler. Use the -10 F value from the table.
	Max Cut In	Max Cut Out	Max Cut In	Max Cut Out	
50 F	70 PSIG	30 PSIG	85 PSIG	40 PSIG	
40 F	55 PSIG	25 PSIG	70 PSIG	35 PSIG	
30 F	40 PSIG	20 PSIG	50 PSIG	30 PSIG	
20 F	30 PSIG	10 PSIG	40 PSIG	20 PSIG	
10 F	20 PSIG	5 PSIG	30 PSIG	10 PSIG	
0 F	15 PSIG	0 PSIG	25 PSIG	5 PSIG	
-10 F	10 PSIG	0 PSIG	15 PSIG	0 PSIG	
-20 F	8 PSIG	0 PSIG	10 PSIG	0 PSIG	

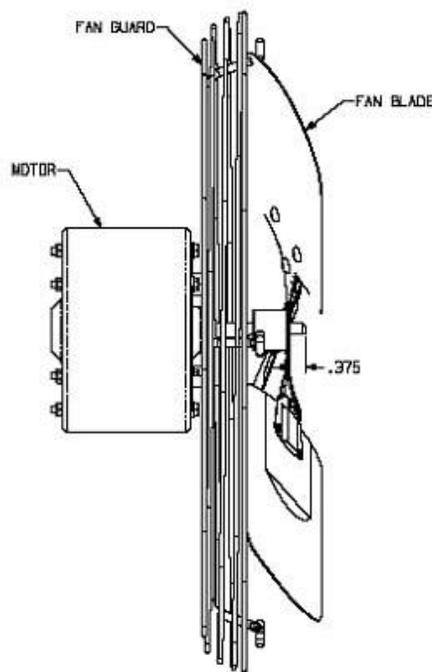
⇒

E

MAINTENANCE

The refrigeration systems should be scheduled for check-up, inspection and maintenance service, at least twice a year, in order to assure a trouble free operation for many years. When servicing these systems the main power supply must be disconnected and locked off. Extreme care must be used when servicing a unit that requires the power to be “ON”.

- ⇒ Inspect for abnormal indications, vibration, noise.
- ⇒ Inspect and feel the bottom crankcase housing and determine that it is warm. Make sure that the upper housing is not sweating.
- ⇒ Inspect **all** electrical parts for loose connections. Tighten them if necessary
- ⇒ Inspect insulation status of all wires.
- ⇒ Inspect contactors and make sure that they are functioning correctly.
- ⇒ Inspect the fan motors, make sure that the fan blades are tight and all mounting joints are tight. Refer to the figure below for proper positioning of the fan on the motor shaft.
- ⇒ Check the crankcase and receiver heaters for proper operation. Use an ampere meter to check for current draw.
- ⇒ Inspect refrigerant level in the system.
- ⇒ Check and make sure that the condenser surface is clean and free of dirt and debris.
- ⇒ Inspect the operation of the control system. Make sure that all of the safety controls are operational and functioning properly.
- ⇒ Check all refrigeration piping. Make sure that all mechanical joints and flare nuts are tight.
- ⇒ Always re-assemble the enclosure panels when maintenance job is completed. Never leave loose or not properly tightened panels.



F

TROUBLE SHOOTING

This trouble-shooting chart is not designed to replace the training required for a professional refrigeration service person, nor is it comprehensive.

As a trained professional, for your safety and others always be aware of the following issues:

- ⇒ Terminal venting and Electrocutation
- ⇒ Properties of refrigerant and other chemicals involved
- ⇒ Proper compressor removal methods
- ⇒ Proper system flushing, purging and leak testing methods
- ⇒ Proper system charging methods
- ⇒ Proper system evacuation method
- ⇒ Start capacitor overheating issues

Complaint	Possible Causes
Compressor starts and runs, but short cycles on thermal protector	<ol style="list-style-type: none"> 1 Too much current passing through thermal protector <ol style="list-style-type: none"> a Extra sources of current draw b Compressor motor has winding shorted 2 Low voltage to compressor (single phase) or unbalanced voltage (three phase) 3 Compressor electrical problems, such as thermal protector or run capacitor not working properly 4 Discharge pressure too high 5 Suction pressure too high 6 Return gas too warm
Unit runs OK, but run cycle is shorter than normal (due to components other than thermal protector)	<ol style="list-style-type: none"> 1 System component not functioning properly (thermostat, control contactor) 2 High pressure cut - out due to: <ol style="list-style-type: none"> a Insufficient air supply b Overcharge of refrigerant c Air in the system 3 Low pressure cut - out due to : <ol style="list-style-type: none"> a Liquid line solenoid leaking b Under charge of refrigerant c Restriction in expansion device
Unit operates long or continuously	<ol style="list-style-type: none"> 1 Under charge of refrigerant 2 System component such as thermostat or contactor not functioning properly , or control contacts stuck or frozen closed. 3 Refrigerated space/cabinet has excessive load or poor insulation, or system inadequate to handle load 4 Evaporator coil iced 5 Restriction in refrigeration system 6 Dirty condenser 7 Dirty filter
Space or cabinet temperature too high	<ol style="list-style-type: none"> 1 System problems such as: <ol style="list-style-type: none"> a Control setting too high b Expansion valve too small c Cooling coil too small d Inadequate air circulation 2 Refrigerated space has excessive load or poor insulation or system may be inadequate to handle load

Complaint	Possible causes
Compressor will not start-no hum	<ul style="list-style-type: none"> 1 System component not functioning properly <ul style="list-style-type: none"> a Control/contactor stuck in open position b Thermostat not functioning properly c Control is off 2 Line disconnect switch is open 3 Circuit breaker tripped or fuse open or removed 4 Thermal protector not working properly 5 Wiring improper or loose 6 Compressor motor has a ground fault (short circuit)
Compressor will not start - hums but trips on thermal protector	<ul style="list-style-type: none"> 1 Improperly wired 2 Low voltage to compressor 3 System component not functioning properly (thermostat, control contactor) 4 Compressor electrical problems <ul style="list-style-type: none"> a Compressor motor has a winding open or shorted b Start capacitor not working properly c Relay does not close 5 Liquid refrigerant in compressor 6 Internal mechanical trouble in compressor
Compressor starts but does not switch off of start winding	<ul style="list-style-type: none"> 1 Improperly wired 2 Low voltage to compressor 3 Compressor electrical problems <ul style="list-style-type: none"> a Compressor motor has a winding open or shorted b Relay fails to open c Run capacitor not working properly 4 Discharge pressure too high 5 Internal mechanical trouble in compressor
Liquid line frosted or sweating	<ul style="list-style-type: none"> 1 System problems such as, restriction in filter drier or strainer or liquid shut - off partially closed
Suction line frosted or sweating	<ul style="list-style-type: none"> 1 System problems such as: <ul style="list-style-type: none"> a Expansion valve passing excess refrigerant b Expansion valve stuck open c Evaporator fan not running d Overcharge of refrigerant

G

Start-up Information

Important: This start-up information should be completely filled in for each installation and remain with the unit as a permanent record for future reference. Future service work may be logged on the proceeding page.

Name & address of installation _____

Name, address, phone & fax # of Installing contractor _____

Type of System (Cooler, Freezer, etc...) _____
Design Box Temperature _____ °F
Condensing Unit System start-up date _____
Unit model # _____
Unit serial # _____
Compressor model # _____
Compressor serial # _____
Evaporator(s) Manufacturer _____
Evaporator(s) QTY _____
Expansion valve - Manufacturer _____
Expansion Valve Model # _____
Leak Check Procedure: _____ Unit leak check
by: _____
Company: _____ Date: _____
Refrigerant Type _____ Total Charge _____
System evacuation # of times _____
Final micron _____
Ambient at start-up _____ °F
Operating box temperature _____ °F
Thermostat setting _____ °F
Defrost settings _____ / day Minutes fail safe _____
Condensing unit electrical rating: Volts _____ Phase _____ Hz _____
Voltage at compressor terminals: L1/L2 _____ L2/L3 _____ L1/L3 _____
Amperage at compressor: L1 _____ L2 _____ L3 _____
Compressor discharge pressure _____ psig
Compressor suction pressure _____ psig
Discharge line temperature at compressor _____ °F
Suction line temperature at compressor _____ °F
Superheat at compressor _____ °F
Suction line temperature at evaporator TX valve bulb _____ °F
Superheat at evaporator _____ °F

