

INSTALLATION / START-UP INFORMATION

These instructions must be read and understood completely before attempting installation.

After uncrating unit, inspect thoroughly for hidden damage. If damage is found, notify the transportation company immediately and file a concealed damage claim.

The units are designed for use in residential and commercial type buildings with a wide variety of Furnace/Air Handlers and Evaporator Coil combinations. They can be used with conventional forced warm air heating systems and/or straight cooling systems independent of the heating.

Charging specifications and wiring diagrams are supplied separately with each unit and should be referenced for optimum performance.

WARNING

Installation or repairs made by unqualified persons can result in hazards to you and others. Installation **MUST** conform with local building codes or, in the absence of local codes, with the the National Electrical Code NFPA 70/ANSI C1-1993 or current edition and Canadian Electrical Code Part 1 CSA C.22.1.

The information contained in this manual is intended for use by a qualified service technician familiar with safety procedures and equipped with the proper tools and test instruments.

Failure to carefully read and follow all instructions in this manual can result in equipment malfunction, property damage, personal injury and/or death.

CAUTION: Improper installation, adjustment, alteration, service or maintenance can void the warranty.

The weight of the condensing unit requires caution and proper handling procedures when lifting or moving to avoid personal injury. Use care to avoid contact with sharp or pointed edges.

Safety Precautions

1. Always wear safety eye wear and work gloves when installing equipment.
2. Never assume electrical power is disconnected. Check with meter and disconnect.
3. Keep hands out of fan areas when power is connected to equipment.
4. R-22 causes frost-bite burns.
5. R-22 is toxic when burned.

NOTE TO INSTALLING DEALER: The Owners Instructions and Warranty are to be given to the owner or prominently displayed near the indoor Furnace/Air Handler Unit.

Foundation Construction

Zoning ordinances may govern the minimum distance the condensing unit can be installed from the property line. Check before proceeding.

The remote condensing unit is to be installed on a solid foundation. This foundation should extend a minimum of 2" beyond the sides of the condensing unit and must be level.

This foundation can be a precast slab. It can also be a monolithic poured slab. To eliminate the possibility of

noise transmission, the foundation slab should NOT be in contact with or be an integral part of the building foundation.

NOTE: At no time should the condensing unit be set on bricks or concrete blocks.

Condensing Unit Location

These units are designed with "top discharge" condenser air movement. The condenser air is taken in through the condenser coil and is discharged out the top.

For quiet operation and maximum efficiency, eliminate any obstructions which might interfere with air discharge.

After making allowances for zoning ordinances, care should be exercised not to locate the condensing unit immediately adjacent to sleeping areas or in corners where operating noise levels can be amplified. Select a location as reasonably close to the indoor unit as possible to avoid any long refrigeration line runs. Place the unit so there is a minimum of 24" between the building and the service panel of the unit to allow for service.

Ensure there is a minimum of 12" between the coil inlet and the building wall, other structure or shrubs.

CAUTION: DO NOT install unit below an overhang that does not have guttering. A minimum vertical clearance of 60" is required to overhang.

Roof Top Installations

If it is necessary to install units on a roof structure, be sure to elevate and level the units. Ensure the roof structure and anchoring method are adequate for unit location. Consult local codes regarding rooftop mounting.

NOTE: When condensing unit is to be installed on a bonded guaranteed roof, a release must be obtained from the building owner to free the installer from all liabilities.

Evaporator Orifice Selection

The condensing unit must be matched to an approved evaporator. (See the warranty certificate or piston selection chart.) Some evaporator coils require an orifice (piston or restrictor) in order to operate properly with the appropriate outdoor condensing unit.

NOTE: The proper piston or restrictor must be installed in the evaporator coil liquid connection prior to the installation of the refrigerant lines.

Refer to the Piston Selection Chart furnished with the unit. If the coil does not have a piston already installed or if the restrictor/piston installed is not the one indicated on the Chart, a replacement piston is required. The correct number piston is either included with unit or may be purchased from a wholesale distributor. See the evapo-

rator coil (indoor unit) instructions for details of changing the piston.

Refrigeration Line Sets

NOTE: It is permissible to add to the line length, refer to line sizing instructions for total lengths allowed. If it is necessary to add tubing in the field, use dehydrated or dry sealed deoxidized copper refrigeration tube. DO NOT use copper water pipe.

It is important that no tubing is cut or seals broken until you are ready to actually make connections to the evaporator and to the condenser section.

Do not remove rubber plugs or copper caps from the tube ends until ready to make connections at evaporator and condenser.

PLEASE! UNDER NO CIRCUMSTANCES LEAVE THE LINES OPEN TO THE ATMOSPHERE FOR ANY PERIOD OF TIME.

Be extra careful with sharp bends. This tubing can "kink" very easily, and if this occurs, the entire tube length will have to be replaced. Extra care at this time will eliminate future service problems.

Suspension And Installation Of Refrigeration Lines

DO NOT fasten liquid or suction lines in direct contact with the floor or ceiling joist. Use an insulated or suspension type of hanger. Keep both lines separate, and insulate only the suction line. Both lines may require insulation in extremely long runs in an attic, 50' or more.

Do not let refrigerant lines come in direct contact with foundation. When running refrigerant lines through the foundation or wall, the openings should be made large enough to allow for a sound absorbing material to be placed or installed between the tubing and the foundation. This will prevent noise transmission between the tubing and the wall section (foundation) or the building.

Installation Instructions For Condensing Units That Are Higher Than Evaporator

It is recommended that vertical suction risers not be upsized. Proper oil return to the compressor should be maintained with suction gas velocity. If velocities drop below 1500 fpm (feet per minute), oil return will be decreased. An oil trap should be installed every 20' of vertical suction line riser (condenser above evaporator.) Refer to line sizing charts.

Line Valves

The outdoor condensing unit is supplied with straight sweat brass service valves with copper stubs.

All line valves are positioned to seal the refrigerant in the condensing unit with gauge ports open to connecting lines when the Schraeder valve is depressed. Gauge ports have Schraeder installed and require use of charging hoses with depressors. Do not heat valve body above 250 degrees F.

Brazing Connections

WARNING

Fire Hazard

Refrigerant and oil mixture under pressure could ignite as it escapes and contacts brazing torch resulting in Fire. Make sure the refrigerant charge is properly removed from both the high and low sides of the system before brazing any component or lines.

FAILURE TO DO SO COULD RESULT IN BODILY INJURY OR DEATH.

Before making braze connections, be sure all joints are clean. Before heat is applied for brazing, nitrogen should be flowing through the tubing to prevent oxidation and scale formation on the inside of the tubing.

Liquid & Suction Lines

Fully annealed refrigeration lines should be used when installing the system.

The coil may also be checked for leaks using pressure and/or halide torch or electronic leak detector.

The following is the recommended method for making braze connections at the refrigerant line connections:

1. Clean refrigerant tube end with emery cloth or steel brush.
2. Use a suitable brazing alloy for copper to copper joints.
3. Insert tubing into swage fitting connection.
4. Apply heat absorbing paste or heat sink product to prevent damage to the service valve.
5. Braze joint.
6. Quench the joint and tubing with water using a wet rag. Leave rag on fitting body and re-wet with water to help cool area.

Evacuating, And Charging Instructions

NOTE

Intentional release of CFC or HCFC Refrigerant to the Atmosphere violates Federal Law. It may also violate State and Local Codes. Check all Federal, State and Local Codes before proceeding.

These instructions are intended for use with condensing units that are precharged at the factory with adequate refrigerant to handle 15 to 25 feet of refrigerant tubing depending on series.

NOTE: Do not use any portion of the charge for purging or leak testing. It is mandatory that a thorough evacuation of the refrigerant in the piping and evaporator be performed.

The liquid line and suction line service valves have been closed after final testing at the factory. **Do not disturb these valves until the lines have been leak checked and evacuated or the charge in the unit may be lost.**

Recommended Method Of Evacuating A System

1. Connect the vacuum pump to the suction and liquid line gauge ports.
2. If the evacuation is being performed on a new system installation, the valves should be kept in the "front

seated" (closed) position. This will allow the mechanic to evacuate the refrigeration lines and the indoor coil, without disturbing the factory charge in the outdoor unit.

3. Follow the vacuum pump manufacturer's instructions. Allow the pump to operate until the system has been evacuated down to 300 microns. Allow the pump to continue running for an additional 15 minutes. Turn off the pump and leave the connections secured to the two service valves. After 5 minutes, if the system fails to hold 500 microns or less, check all connections for tight fit and repeat the evacuation procedure.

4. Isolate the vacuum pump from the system by closing the shutoff valves on the gauge bar. Disconnect the vacuum pump.

Valve Actuation: Service Valves

A) After evacuation of the connecting lines, remove the service valve cap and fully insert the hex wrench into the stem. A back-up wrench is required on the valve body to open the valve stem (not required on ball valves.) Back-out counterclockwise until the valve stem just touches the retaining ring. NOTE: THIS IS NOT A BACKSEATING VALVE. Care must be taken to prevent dislodging retainer ring when opening valve. Some models have ball type suction valves that can be opened with a 6" crescent wrench by rotating the valve stem 90° counterclockwise.

B) Replace service valve cap and torque to; 8-11 ft. lbs. on 1/4" and 3/8" valves, 12-16 ft. lbs. on 5/8", 3/4", and 15-21 ft. lbs. 7/8" valves, 6-8 ft. lbs. on ball valves.

NOTE: The cap is the primary seal and must be tightened to prevent leaks.

C) Torque gauge port cap 6-8 ft. lbs.

REFRIGERATION PIPING & CHARGING

The recommended method of addition or removal of refrigerant is by weight.

Units are shipped with a holding charge only. See Rating Plate for recommended charge which includes 25' of line set. Condensing units should be charged for the connecting line and a matching evaporator coil. See Figure 4 for adding refrigerant to longer line sets. Some matching coils may need more refrigerant than the factory charge. Always check charge by superheat method and performance curves. The oil charge is sufficient for 40 feet.

For oil requirements refer to **Figure 2**. For piping lengths up to 50 feet refer to **Figure 3** for pipe size, and **Figure 4** for refrigerant adjustment.

On applications where liquid floodback to the compressor is likely to occur, use of a suction line accumulator is recommended.

Figure 2 - Addition of Refrigeration Oil	
Distance (Feet)	Suction Line Size
	1-1/8
0-40	-
40	2 oz.
50	4 oz.

Figure 3 - LINE SIZING (Up to 50' length line sets)		
Unit Size	Liquid	Suction
7-1/2 & 10 Ton	5/8"	1-1/8"

Figure 4 - Addition of Refrigeration Charge

LiquidLine Diameter	oz. Per Linear Ft.
5/8	1.80
Unit is shipped with a holding charge.	

Electrical Connections

WARNING

Electrical shock hazard.

Turn OFF electric power at fuse box or service panel before making any electrical connections and ensure a proper ground connection is made before connecting line voltage.

Failure to do so can result in property damage, personal injury and/or death.

Be sure to check all Local Codes to determine that the unit is installed in accordance with Local requirements. Consult the National Electric Code for wire size requirements.

Line voltage connections are made at the line side of the contactor in the electrical box of the condensing unit. The unit should be wired through a properly sized fused disconnect switch. Follow the appropriate wiring diagram attached to the inside of the access door of the condensing unit.

Proper fusing recommendations are also indicated on the Unit Rating Plate. However, in general, the best fuse for any unit is the smallest fuse that will hold the equipment on the line under normal use and service without nuisance tripping breakers or blowing of fuses. Time-delay fuses such as fuse-tron, or fusestat are recommended to prevent blowing due to starting current (the current in-rush when the equipment starts is referred to as the Locked Rotor Amps or LRA). A fuse of this kind sized properly, will give maximum equipment protection. Use 60°C wire or higher.

NOTE: Three Phase Units - If the units are wired incorrectly, they will try to run backwards. The compressor will make a loud bang when started and then shut down if the phase is wrong on the wiring.

CONTROL WIRING - Refer to the unit wiring diagram for low voltage wiring details.

Pre-Start Procedure

1. Close electrical disconnects to energize system.
2. Energize crankcase heater on units so equipped.

Start-up Procedure

1. Set Thermostat selector switch to OFF.
2. Set room thermostat at desired temperature. Be sure setpoint is below indoor ambient temperature.
3. Set the system switch of the thermostat on COOL and fan switch for continuous operation or AUTO, as desired. Operate unit for 15-20 minutes, then check the system refrigerant charge.

4. After the refrigerant charge has been adjusted, the system is now ready for continuous operation.

Final Refrigeration Charge Adjustment

Before any adjustment is made to the refrigerant charge, it is imperative that the air flow characteristics of the indoor blower be established.

When checking indoor air flow, it is important to remember that the blower will deliver a higher quantity of air across a dry coil versus a wet coil. Blower charts are calculated with a dry coil.

Recommended air flow for installations of cooling units is 350–450 CFM per ton (12,000 BTUH) through a wet coil. Refer to indoor unit installation instructions for proper methods of determining air flow and blower performance.

To Check System Refrigerant Charge (Superheat Method)

1. Attach an accurate temperature sensing device to the suction line approximately 4" – 6" away from the suction line service valve. The temperature sensing device should be clamped securely to the suction line, on a horizontal plane (between 9 & 3 O'clock) and insulated. Record the suction line temperature.

2. Measure and record the suction line refrigeration pressure. (Measure at the suction line service valve gauge port.) Using Temperature / Pressure Chart convert this pressure to the saturation refrigerant temperature. The difference between actual and saturated temperatures is the amount of superheat.

Figure 6 - Temperature / Pressure Chart					
Temperature °F.	PSIG R-22	Temperature °F.	PSIG R-22	Temperature °F.	PSIG R-22
-6	19.3	19	41.9	41	70.0
-4	20.8	20	43.0	42	71.4
-2	22.4	21	44.1	43	73.0
0	24.0	22	45.3	44	74.5
1	24.8	23	46.4	45	76.0
2	25.6	24	47.6	46	77.6
3	26.4	25	48.8	47	79.2
4	27.3	26	49.9	48	80.8
5	28.2	27	51.2	49	82.4
6	29.1	28	52.4	50	84.0
7	30.0	29	53.6	55	92.6
8	30.9	30	54.9	60	101.6
9	31.8	31	56.2	65	111.2
10	32.8	32	57.5	70	121.4
11	33.7	33	58.8	75	132.2
12	34.7	34	60.1	80	143.6
13	35.7	35	61.5	85	155.7
14	36.7	36	62.8	90	168.4
15	37.7	37	64.2	95	181.8
16	38.7	38	65.6	100	195.9
17	39.8	39	67.1	105	210.8
18	40.8	40	68.5	110	226.4
				115	242.7

3. Measure and record the outside ambient air temperature.

4. Optimum performance will be achieved when the operating charge produces 15°–20° F suction superheat at compressor with 82° F outdoor ambient and 80° F dry bulb (67° F wet bulb) indoor temperature (ARI "B" test conditions) at rated airflow. If these conditions cannot be obtained, compare the calculated superheat value with the recommended values given in **Figure 7**.

Figure 7 - Recommended Superheat Values

Outside Air Temp ° F	Superheat °F Variator or Piston
65	38 – 45
75	27 – 33
85	20 – 25
95	10 – 15
105	2 – 6

If the actual superheat readings are higher than shown, the system is most likely under-charged, and charge should be added. Add charge in 4 ounce increments, and recalculate superheat values. Continue adjusting charge until the actual superheat approximately matches the recommended values.

If the actual superheat readings are lower than shown, the system is most likely over-charged, and charge should be removed. Remove charge in 4 to 6 ounce increments, and recalculate superheat values. Continue adjusting charge until the actual superheat approximately matches the recommended values.

NOTE: Each time that charge is added or removed from the system, allow the system to run approximately 15 minutes before pressure and temperature readings are taken and superheat calculations made.

NOTE: Indoor Wet Bulb Temperature (and Relative Humidity) will alter superheat values. All readings should be at 50% humidity inside and 350 to 450 CFM per ton across the indoor coil.

Figure 8 - Ambient Operating Ranges

	Minimum *	Maximum *
Without Fan Cycle Control	60° F (15.6° C)	115° F (46° C)
With Fan Cycle Control	0° F (-17.8° C)	115° F (46° C)
* Dry Bulb Temperature		

Unit Maintenance

The unit should be inspected and cleaned on an annual basis by a qualified technician. This should include checking for adequate clearances, electrical connections, duct connections / blockages, air filters, air flow, lubrication, and operational performance of system. **Coils may require cleaning. The coil should always be cold when cleaning. Use an alkaline based cleaner only. Cleaning a hot coil or using an acid based cleaner will remove the paint from the fins and may clog the coil.**