

Installation Instructions



SPLIT SYSTEM 3 PHASE 6.3 to 10 TON AC CONDENSERS

Save This Manual for Future Reference

Installation/ Startup Information

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

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 C1-1999 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.

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

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.

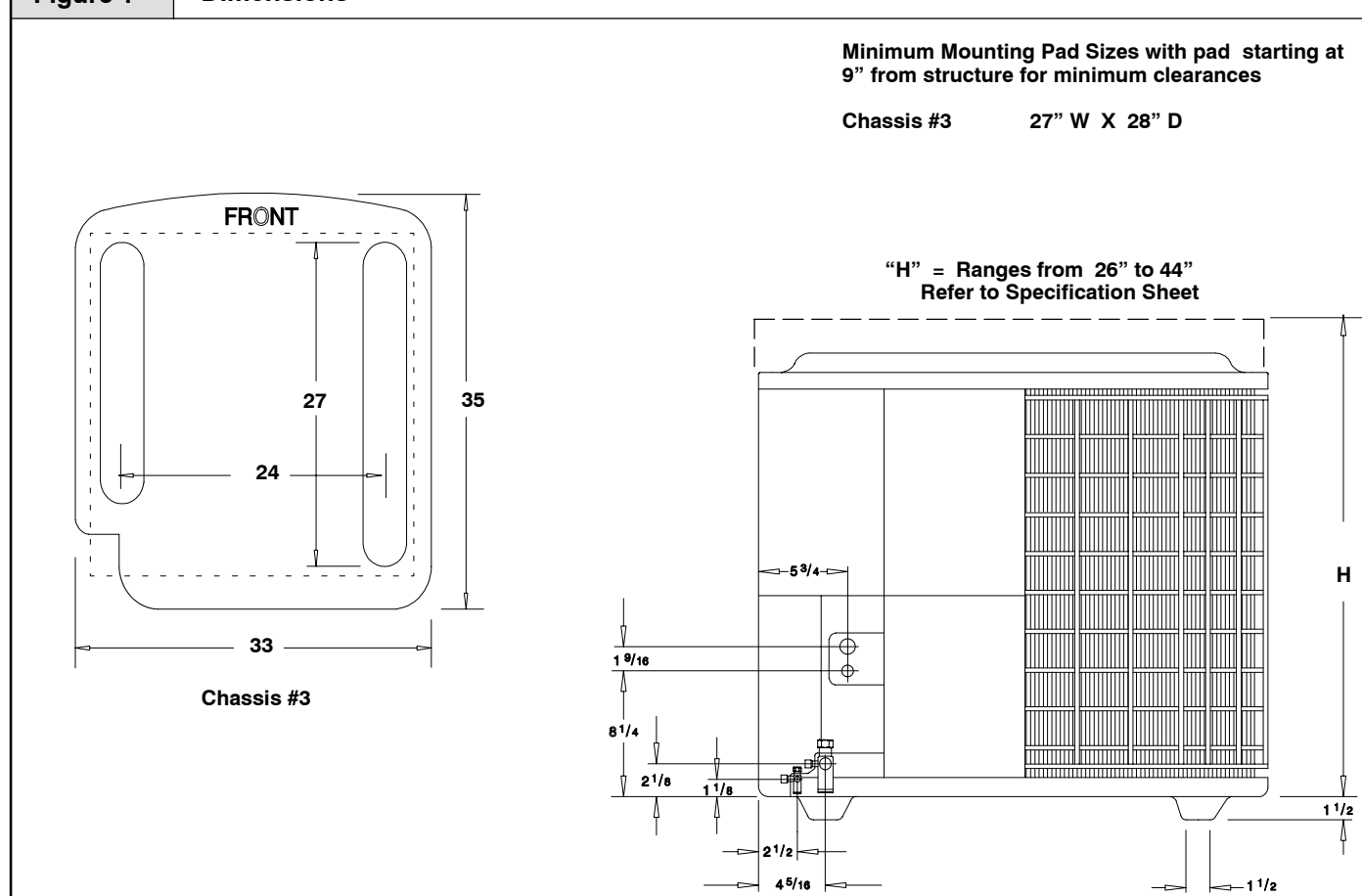
Safety Precautions

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.

Figure 1

Dimensions



Locating The Outdoor Unit:

Check local codes covering zoning, noise, platforms.

If practical, avoid locating next to fresh air intakes, vent or bedroom windows. Noise may carry into the openings and disturb people inside.

Placement of the unit should be in a well drained area or unit must be supported high enough so runoff will not enter the unit.

Do not locate where heat, lint or exhaust fumes will be discharged on unit (as from dryer vents).

Roof top installations are acceptable providing the roof will support the unit and provisions are made for water drainage and the noise or vibration through the structure.

Do not install the unit in a recessed or confined area where recirculation of discharge air may occur.

Heat Pumps Only: The top surface of platform must be above average winter snow levels to prevent coil blockage.

Clearances:

Nominal operating clearances, where practical, are 48 inches (120 cm) above unit for discharge air and 18 inches (40cm) around coil for intake air on three sides. Clearance on one side (normally between unit and structure) may be reduced to 6 inches (15cm). Nominal clearances are based from a solid parallel object, wall, roof overhang, etc.

Do Not install under roof overhangs without guttering. A minimum vertical clearance of 48" is required to overhang.

The clearance may be reduced from a single object with a small surface area, such as the end of a wall, outside corner of a wall, fence section or a post, etc. As a general rule the width of the object should equal the minimum clearance from the unit. For example, a 4 inch (10cm) fence post could be 4 inches (10cm) from the unit.

Inside corner locations on single story structures require evaluation. Large overhanging soffits may cause air recirculation in a corner area even though recommended clearances are maintained. As a guide locate the unit far enough out so that half of the discharge grille is out from under the soffit.

Two or more units may be spaced with 18 inches (45cm) between units.

A service clearance of 24 inches (60cm) is desirable from control box end or side. Control box and corner panel below it can be loosened and moved out to the side to facilitate servicing. Internal components can be accessed through control box corner or top only.

Unit Support:

The unit must be level, and supported above grade by beams, platform or a pad. Platform or pad can be of open or solid construction but should be of permanent materials such as concrete, bricks, blocks, steel or pressure treated timbers approved for ground contact. Refer to Unit Clearances to help determine size of supports etc. Soil conditions should be considered so the platform or pad does not shift or settle excessively and leave the unit only partially supported.

CAUTION

Inadequate support could cause excessive vibration and noise or binding and stress on refrigerant lines resulting in equipment failure.

To minimize vibration or noise transmission, it is recommended that supports not be in contact with the building structure. However, slabs on grade constructions with an extended pad are normally acceptable.

A. Ground Level Installation:

If beams or an open platform are used for support it is recommended that the soil be treated or area be graveled to retard the growth of grasses and weeds.

B. Roof Top Installation:

This type of installation is not recommended on wood frame structures where low noise levels are required.

Supporting structure or platform for the unit must be level. If installation is on a flat roof the unit should be 4 inches (10cm.) above roof level. Four by four posts placed over a load bearing wall make a suitable mounting platform.

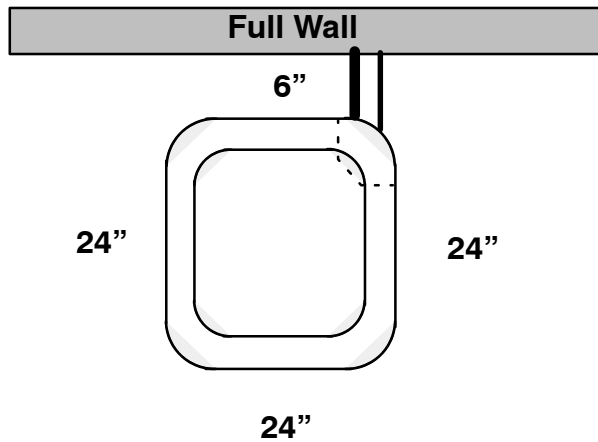
If possible, place the unit over one or more load bearing walls. If there are several units, mount them on platforms that are self-supporting and span load bearing walls. These suggestions are to minimize noise and vibration transmission through the structure. If the structure is a home or apartment, avoid (if practical) locating the unit over bedrooms or study.

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.

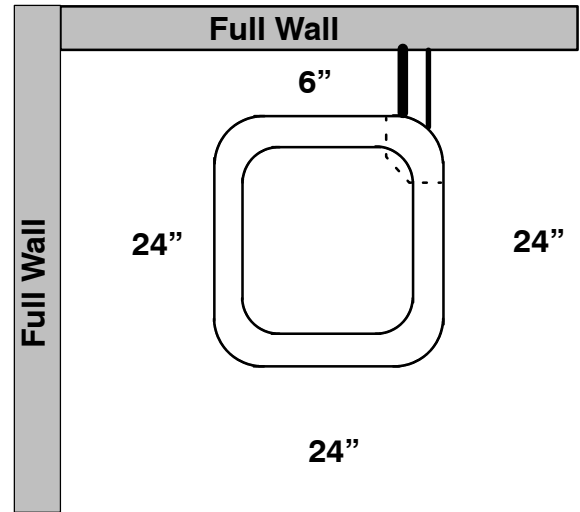
Figure 2

Clearances

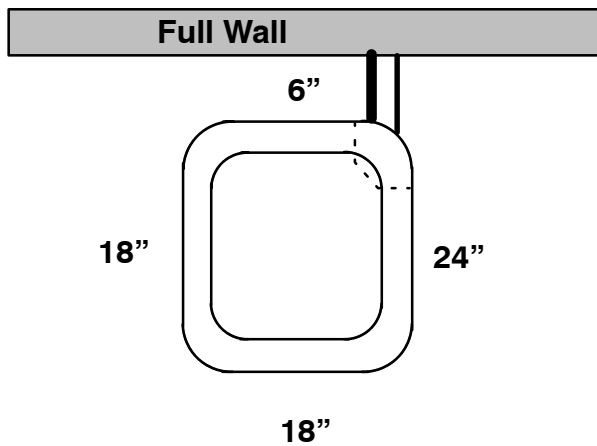
Recommended Clearances



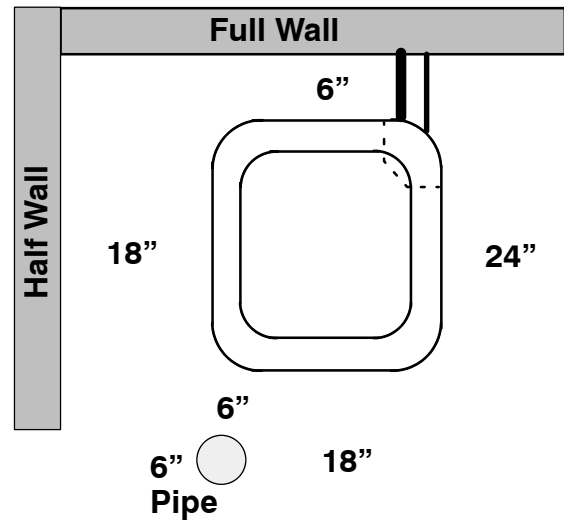
Minimum Clearances



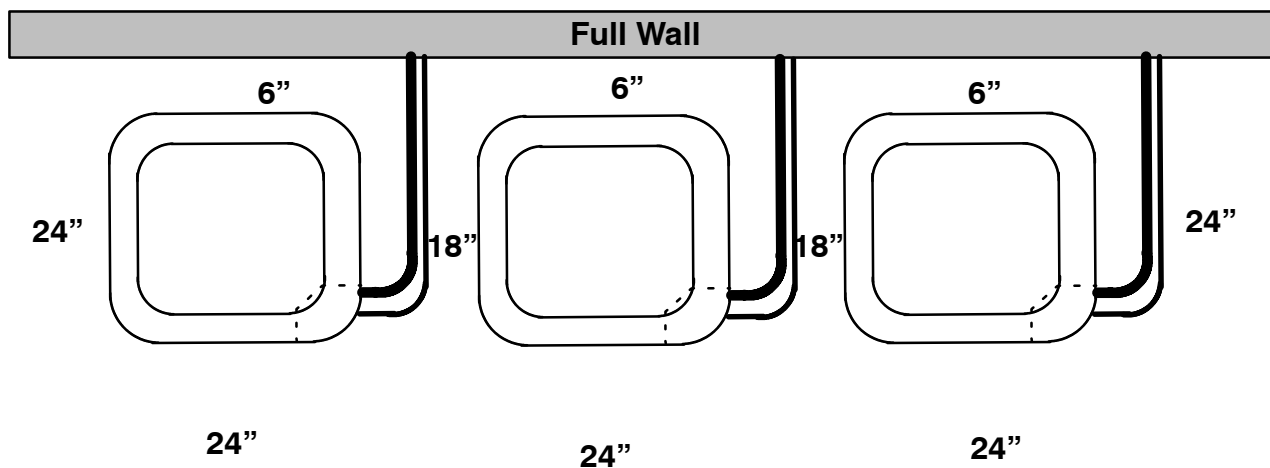
Minimum Clearances



Minimum Clearances



Minimum Clearances



Installing Refrigerant Lines

Component Matches

Check to see that you have the proper system components. **APPROVED MATCHED SYSTEM COMPONENTS MUST BE USED.** Refer to the Sales Specification Sheet or Split System Summary for match data, orifice sizes, and recommended charge.

The suggested charge values are for split systems using 25ft (7.5m) of refrigerant line between the indoor and outdoor units. If shorter or longer lines are used, the recommended charge will have to be adjusted.

Refrigeration Line Sets

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.

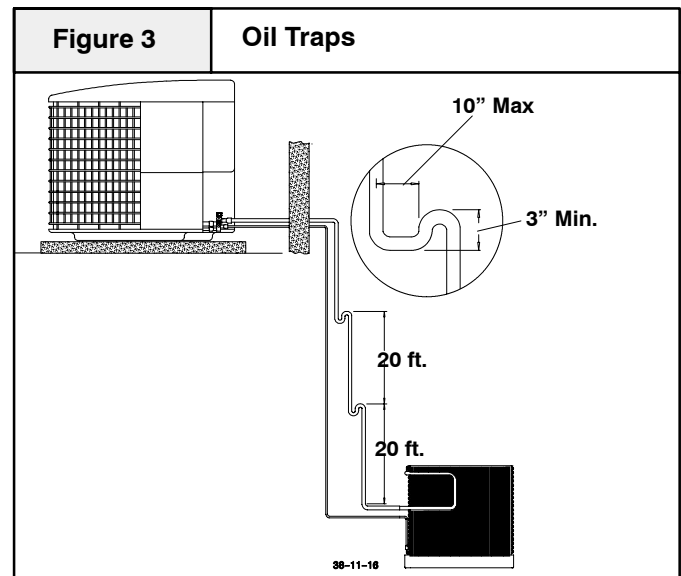
Suspension And Installation Of Refrigeration Lines

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 the suction line. Both lines should be insulated in extremely long runs in an attic or underground in a raceway, 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.

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 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.

CAUTION

Do not heat valve body above 250 degrees F.

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 a 10 oz. hold-in charge only.

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 holding charge and vacuum 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 closed position. This will allow the mechanic to evacuate the refrigeration lines and the indoor coil, without disturbing the holding charge and vacuum 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

Remove the service valve cap, if there is a male valve stem see instructions for Ball Valves. For the standard service valve there are two variations, but both have internal stems. The first style uses an internal snap ring to retain the valve stem and the second has a rolled top and also has finer threads on the valve cap. **NOTE: You may encounter more than one type of valve on a unit.**

For service valves fully insert a hex wrench into the stem. A back-up wrench is required on the valve body to open the valve stem. Backout counterclockwise until the valve stem stops or just touches the retaining ring. **NOTE: THIS IS NOT A BACKSEATING VALVE.** For valves with retainer rings care must be taken to prevent dislodging them when opening valve.

The service valve cap is a primary seal for the valve and must be properly tightened to prevent leaks. Make sure cap is clean and apply refrigerant oil to threads and sealing surface of cap.

For valves with retaining rings: 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" and 3/4", 15-21 ft. lbs on 7/8" valves. If torque wrench is not available, tighten cap finger tight and then tighten one (1) additional wrench flat or 1/6 of a turn.

For valves with rolled tops: Replace service valve cap tighten cap finger tight and then tighten one (1) additional wrench flat or 1/6 of a turn to properly seat the sealing surfaces. Subsequent installations will seat with 1/2 to 1 wrench flat of turning.

Gauge Ports: All Valves

Check for leaks at the schrader port and tighten valve core if necessary. Install plastic caps finger tight.

Ball Valves

On models with ball type valves use a 6" crescent wrench to rotate the valve stem 90° counter clockwise. Retighten valve cap to 6-8 ft. lbs. If torque wrench is not available, tighten cap finger tight and then tighten one (1/2) additional wrench flat.

REFRIGERATION PIPING & CHARGING

Total length of refrigerant lines must not exceed 100 feet with a maximum vertical separation of 50 feet unless precautions are taken to protect the compressor from refrigerant migration during the off cycle.

The recommended method of checking charge is by sub-cooling on systems using a thermal expansion valve. Measure at liquid line service valve on the outdoor unit. The oil charge is sufficient for 50 feet.

For oil requirements greater than 50 feet refer to **Figure 4.**

Figure 4 - Addition of Refrigeration Oil

Distance (Feet)	Suction Line Size
	1-1/8
0-49	-
50-59	2 oz.
60-69	4 oz.
70-79	6 oz.
80-89	8 oz.
90-99	10 oz.

Figure 6 - Addition of Refrigeration Charge

Liquid Line Diameter	oz. Per Linear Ft.
1/2	1.20
5/8	1.80

See next page for Charging Chart.

Figure 5 - Charging Chart

UNIT	Reference Charge Level ¹ R-22 Ounces	Liquid Line Size ²	Suction Line Size ³	Min. Subcooling Recommended Deg. F	Acceptable Subcooling Range
CAC075	245	5/8" (1/2")	1-1/8"	10°	10° - 18°
CAC090	240	5/8" (1/2")	1-1/8"	10°	10° - 15°
CAC120	384	5/8"	1-1/8"	10°	10° - 15°
CAE075	285	1/2" (5/8")	1-1/8"	10°	10° - 18°
CAE090	328	5/8" (1/2")	1-1/8"	10° Both Compressors 6° One Compressor	12° - 20° Both Compressors 6° - 14° One Compressor

NOTES: Outdoor units to matched with thermostatic expansion valve indoor units only.

1. Approximate charge level with recommended line sizes 25 feet in length.

2. Size in parenthesis is acceptable alternate line size.

3. Do not increase the suction line diameter for vertical suction risers any larger than what is shown.

Electrical Wiring

WARNING

Electrical Shock Hazard.

Shut off electric power at fuse box or service panel before making any electrical connections.

Failure to shut off electric power can result in, property damage, personal injury and/or death.

Refer to the unit rating plate for proper supply voltage.

For international models only: The unit should be wired through a properly sized disconnect switch that opens all poles.

APPROVED FOR USE WITH COPPER CONDUCTORS ONLY. DO NOT USE ALUMINUM WIRE.

REFER TO UNIT RATING PLATE FOR CIRCUIT PROTECTION.

Grounding

Permanently ground unit in accordance with the National Electrical Code and local codes or ordinances. Use a copper conductor of the correct size from the grounding terminal in control box to a grounded connection in the service panel or a properly driven and electrically grounded ground rod.

Wiring Connections

Make all outdoor electrical supply (Line Voltage) connections with raintight conduit and fittings. Most codes require a disconnect switch outdoors within sight of the unit.

Route Line Voltage wiring through entrance and through hole in the bottom of the Control Box to connect to Contactor and Ground Lug.

If local codes require the use of a separate enclosed compartment for field low volt connections then the provided electrical box should be installed with the instructions on page 8 and Figure 6. If an enclosed compartment is not required, connections can be made outside of the unit under the control box. The pigtail wires have 600V insulation meeting approval for use in high voltage areas.

NOTE: The blue low voltage wire is 24vac common and is grounded to the control box.

Use of Rigid Metal Conduit

It is recommended that wires be tied together or twisted together inside the conduit. This will minimize any buzzing type sounds that could be produced with high current loads, such as during starting. Under some conditions it may be necessary to use a hard start kit to eliminate problem noises.

Control Box Access

Remove the four screws. Cover is notched so it will slide out from under top edge of unit.

Installing Low Voltage Utility Box

See Figures 6 and 7 and Wiring Diagram on unit.

1. Remove all parts from utility box.
2. Remove knockouts on top and bottom of utility box.
3. Place one lock nut on either side of the pipe nipple .
4. Insert one end of pipe nipple assembly into one of the holes in the utility box made in step 2 up to the lock nut.
5. Attach pipe nipple assy. to utility box using one lock nut.
6. Insert the free end of pipe nipple into the low volt hole in the control box bottom from the underside of the unit up to the lock nut. Be sure to orient the box so the utility box cover can be installed after the high volt conduit is installed.
7. Attach the utility box assembly to the control box bottom using the last lock nut.
8. Attach bushing to the exposed end of the pipe nipple in the control box to avoid cutting the wires from the unit.
9. Route unit low volt wires through the pipe nipple into the utility box.
10. Route field low volt wires into utility box from the bottom and make connections inside the box.
11. Install the utility box cover plate.

Figure 6

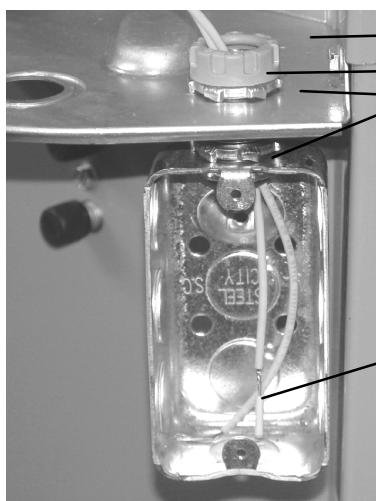
Low Voltage Connections



Locknut

Low Voltage Utility Box

Remove Knockouts



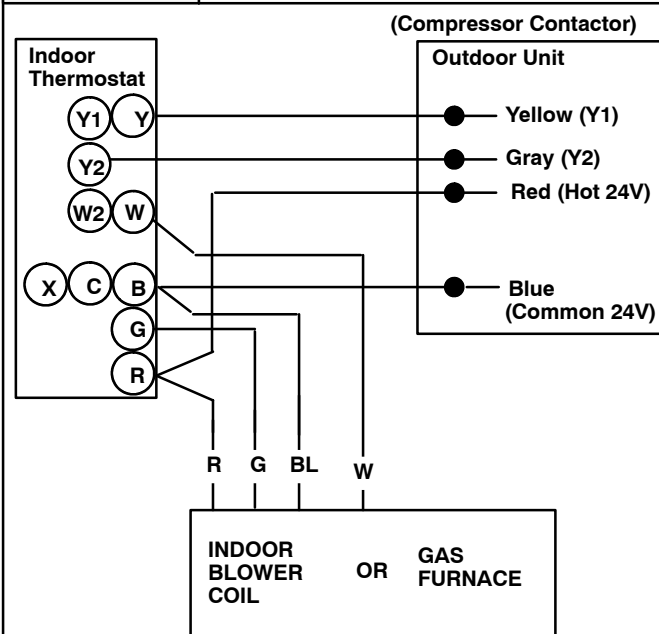
Control Box

Bushing

Locknut

Low Voltage Wires
(Yellow)Make Low Voltage
Connections in
Box

Figure 7

A/C Condenser Typical Low
Voltage Connections

Start-Up Procedure

Start-up Procedure

1. Close electrical disconnects to energize system.
2. Energize crankcase heater on units so equipped.
3. Set Thermostat selector switch to OFF.
4. Set room thermostat at desired temperature. Be sure setpoint is below indoor ambient temperature for cooling and above indoor ambient for heating.
5. 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 if it was necessary to adjust.
6. 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 and heat pumps 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 (Subcooling Method), Cooling Only

1. Attach an accurate temperature sensing device to the liquid line approximately 4" - 6" away from the liquid line service valve. The temperature sensing device should be clamped securely to the liquid line, on a horizontal plane (between 9 & 3 O'clock) and insulated. Record the liquid line temperature.
2. Measure and record the liquid line refrigeration pressure. (Measure at the liquid 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 subcooling.

Figure 8 - Temperature / Pressure Chart R-22

Deg. F	PSIG	Deg. F	PSIG
70	121.4	112	232.7
72	125.7	114	239.3
74	130	116	246.1
76	134.5	118	252.9
78	139	120	259.9
80	143.6	122	267
82	148.4	124	274.2
84	153.2	126	281.6
86	158.2	128	289.1
88	163.2	130	296.8
90	168.4	132	304.6
92	173.7	134	312.5
94	179.1	136	320.6
96	184.6	138	328.8
98	190.2	140	337.3
100	195.9	142	345.8
102	201.8	144	354.5
104	207.7	146	363.3
106	213.8	148	372.3
108	220	150	381.5
110	226.4		

3. The unit is properly charged if the subcooling level is within the acceptable range as recommended in Figure 8.

If the actual subcooling levels are higher than shown, the system is most likely over-charged, and charge should be removed. Remove charge, and recalculate subcooling values. Continue adjusting charge until the actual subcooling matches the recommended values.

If the actual subcooling levels are lower than shown, the system is most likely under-charged, and charge should be added. Add charge in 4 to 6 ounce increments, and recalculate subcooling values. Continue adjusting charge until the actual subcooling level 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 subcooling calculations made.

Operating Sequence

CAE075, Cooling

At start-up, the thermostat calls for cooling. With all safety devices satisfied, the compressor contactor and fan contactor energize, causing the compressor and outdoor-fan motor to operate. Contacts energize, allowing the field-supplied and -installed indoor-fan contactor to function. A field-supplied and -installed liquid line valve also opens, allowing the system to function in Cooling mode. As cooling demand is satisfied, the thermostat contacts break, deenergizing the contactor and causing the system to shut off. The liquid line solenoid valve closes, minimizing the potential for refrigerant migration. The compressor does not restart until the thermostat again calls for cooling. The system is protected with a safety circuit so that the system will not start if a fault exists (i.e., high or low pressure fault). To reset the safety circuit, set the thermostat to eliminate the cooling demand, then return to original set point. This should be done only once, and if system shuts down due to the same fault, determine the problem before attempting to restart the system.

CAE090 & CAC120, Cooling

When thermostat calls for cooling, terminals G and Y1 are energized. The indoor (evaporator) fan contactor (IFC) and compressor contactor no. 1 (C1) are energized and evaporator-fan motor, compressor no. 1 and condenser fans start. If the thermostat calls for a second stage of cooling by energizing Y2, compressor contactor no. 2 (C2) is energized and compressor no. 2 starts.

When the thermostat Y1 and Y2 are satisfied, C1 and C2 are deenergized and the compressors and outdoor (condenser) fan motor (OFM) along with the indoor contactor (IFC) shut off.

Maintenance

WARNING

Electrical Shock Hazard.

Shut off electric power at fuse box or service panel before making any electrical connections.

Failure to shut off electric power can result in, property damage, personal injury and/or death.

Condensate Drain

During the cooling season check at least monthly for free flow of drainage and clean if necessary.

Cleanliness

These tips will help you keep your air conditioner looking better and working more efficiently:

1. Free air flow is essential. Keep the outdoor coil clean and free of restrictions. Keep fences, shrubs, snow drifts and any other obstructions at least two feet from all coil air inlets.
2. Keep the coil free of grass clippings, weeds and other debris. **BE SURE TO TURN OFF ELECTRICITY BEFORE CLEANING!**

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.

3. Never use a weather cover over the outdoor unit unless it is a ventilated type or made of breathable fabric that will allow moisture to evaporate rapidly. A cover that holds moisture in the unit will cause more rust build-up and damage than normal exposure to weather.