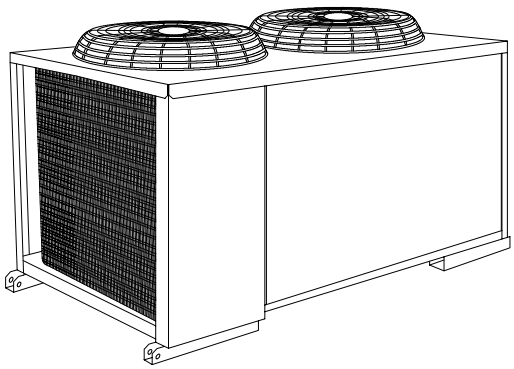
Installation, Start–Up, and Service Instructions



SPLIT SYSTEM

3 PHASE, 12–1/2 to 20 TON

AC CONDENSERS

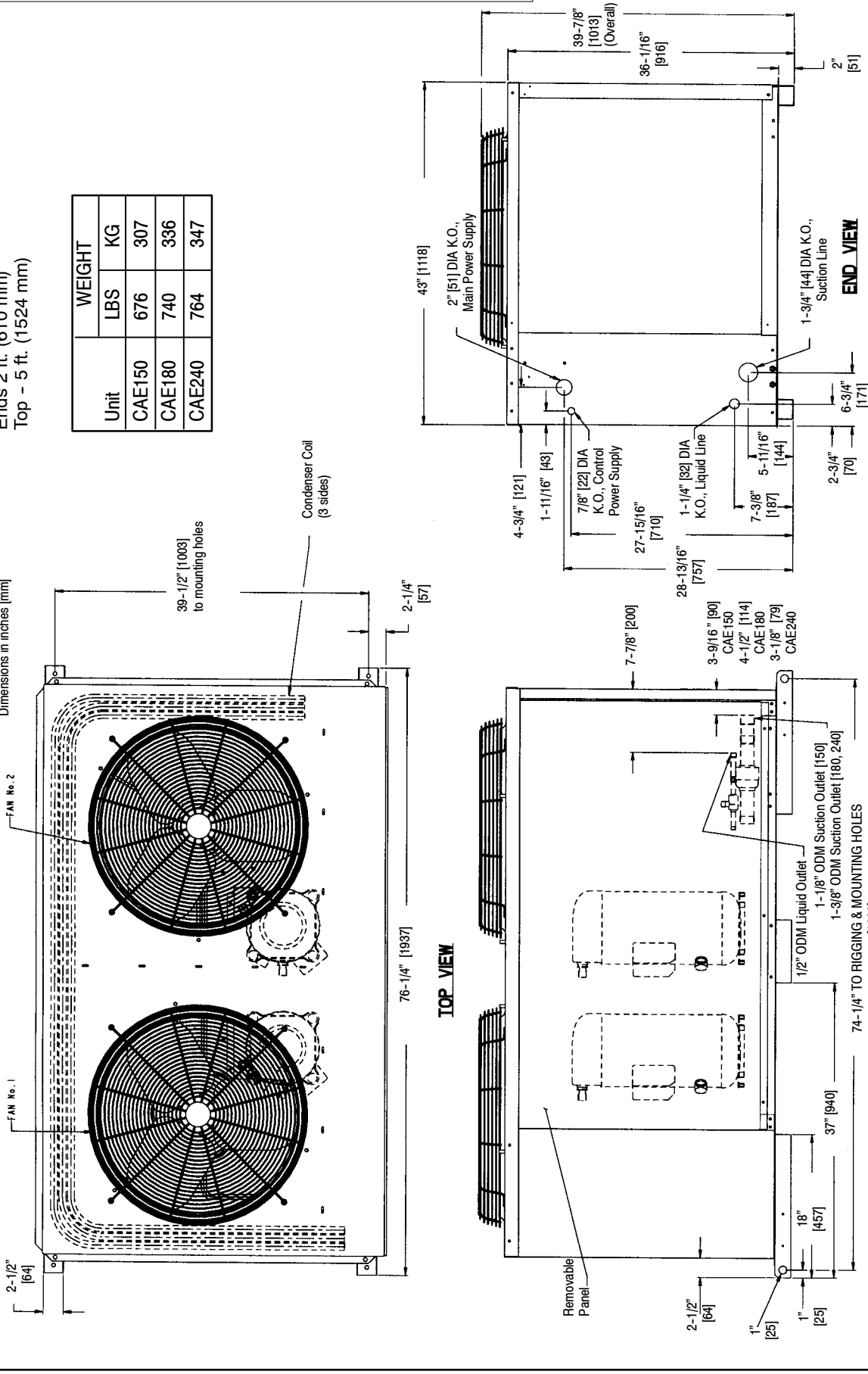
Save This Manual for Future Reference

501 01 2200 02
12/16/04

Figure 1 Dimensions & Weight

Notes:
Service clearances are as follows:
Side (compressor) 3-1/2 ft. (1067 mm)
Side (opposite compressor) 3 ft. (914 mm)
Ends 2 ft. (610 mm)
Top - 5 ft. (1524 mm)

Unit	WEIGHT	
	LBS	KG
CAE150	676	307
CAE180	740	336
CAE240	764	347



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.

Top skid assembly should be left in place until after the unit is rigged into its final location.

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.

Locating The Outdoor Unit:

Check local codes covering zoning, noise, platforms.

If practical, avoid locating next to fresh air intakes, vent or 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.

Allow sufficient space for airflow clearance, wiring, refrigerant piping, and servicing unit.

Rig and Mount the Unit:

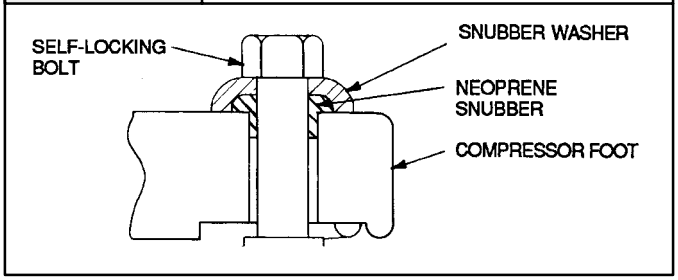
CAUTION

Be sure unit panels are securely in place prior to rigging.

RIGGING - These units are designed for overhead rigging. Refer to rigging label for preferred rigging method. Spreader bars are not required if top crating is left on unit. All panels must be in place when rigging. As further protection for coil faces, plywood sheets may be placed against sides of unit, behind cables. Run cables to a central suspension point so that angle from the horizontal is not less than 45 degrees. Raise and set unit down carefully.

COMPRESSOR MOUNTING - As shipped, the compressor is held tightly in place by self-locking bolts. Before starting unit, loosen self-locking bolts until the snubber washer can be moved sideways with finger pressure. Do not remove shipping bolts. See Fig. 2.

Figure 2 **Compressor Mounting**



Clearances:

Locate unit so that outdoor coil (condenser) airflow is unrestricted on all sides and above. See Figure 1 for unit clearances and weight.

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 and weights 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.

Installing Refrigerant Lines

Complete Refrigerant Piping Connections

IMPORTANT: A refrigerant receiver is not provided with the unit. Do not install a receiver.

SIZE REFRIGERANT LINES – Consider the length of piping required between outdoor unit and indoor unit (evaporator), the amount of liquid lift, and compressor oil return. See Tables 1 & 2 for line sizing. Refer to indoor unit installation instructions for additional information.

NOTE: Use the piping data in Table 2 as a general guide only.

Table 1 - Liquid Line Data

Unit	Liquid Line		
	Maximum Allowable Liquid Lift ft. (m)	Maximum Allowable Pressure Drop psig (kPa)	Maximum Allowable Temp. Loss
CAE150	60 (18)	7 (48.3)	2 (1)
CAE180			
CAE240			

* Inlet and Outlet
NOTE: Data show is for units operating at 45° F (7.2° C) saturated suction temperature and 95° F (35° C) entering air termperature.

Table 2 - Refrigerant Piping Sizes

Unit	Linear Length of Interconnecting Piping - Ft. (m)							
	0 - 25 (0 - 7.5)		25 - 50 (7.5 - 15)		50 - 75 (15 - 23)		75 - 100 (23 - 30)	
	Line Size (in. OD)							
	L	S	L	S	L	S	L	S
CAE150	1/2	1-1/8	1/2	1-1/8	1/2	1-1/8	1/2	1-3/8
CAE180	1/2	1-3/8	1/2	1-3/8	1/2	1-3/8	5/8	1-3/8
CAE240	1/2	1-3/8	1/2	1-3/8	5/8	1-3/8	5/8	1-3/8

L = Liquid, S = Suction

NOTES:

1. Pipe sizes are based on a 2° F (1.1° C) saturated temperature loss for liquid lines and a 1.5° F (0.8° C) saturated temperature loss for suction lines.
2. Pipe sizes are based on an equivalent length equal to the maximum length of interconnecting piping plus 50% for fittings. A more accurate estimate may result in smaller sizes.
3. For applications with refrigerant line lengths greater than 100 ft., contact your distributor's technical service agent.

INSTALL FILTER DRIER(S) AND MOISTURE INDICATOR(S) – Every unit should have a filter drier and liquid-moisture indicator (sight glass). In some applications, depending on space and convenience requirements, it may be desirable to install 2 filter driers and sight glasses. One filter drier and sight glass may be installed at **'A'** locations in Fig. 3. or, 2 filter driers and sight glasses may be installed at **'B'** locations.

Select the filter drier for maximum unit capacity and minimum pressure drop. Complete the refrigerant piping from indoor unit to outdoor unit before opening the liquid and suction lines at the outdoor unit.

INSTALL LIQUID LINE SOLENOID VALVE – SOLENOID DROP – It is recommended that a solenoid valve be placed in the main liquid line (see Fig. 3) between condensing unit and fan coil. (A liquid line solenoid valve is required when the liquid line length exceeds 75 ft [23 m]. This valve prevents refrigerant migration (which causes oil dilution) to the compressor during the off cycle at low outdoor ambient temperatures. The solenoid should be wired in parallel with the compressor contactor coil. This means of electrical control is referred to as solenoid drop control.

INSTALL LIQUID LINE SOLENOID VALVE (Optional) – CAPACITY CONTROL – If 2-step cooling is desired, place a solenoid valve in the location shown in Fig.3.

MAKE PIPING CONNECTIONS – Do not remove run around loop from suction and liquid line stubs in the compressor compartment until piping connections are ready to be made. Pass nitrogen or other inert gas through piping while brazing to prevent formation of copper oxide.

CAUTION

Recover holding charge prior to removal of runaround piping loop.

4. Open service valves:

   a. Discharge service valve on compressor.

   b. Suction service valve on compressor.

   c. Liquid line valve.

5. Remove 1/4 -in. flare cap from liquid valve Schrader port.

6. Attach refrigerant recovery device and recover holding charge.

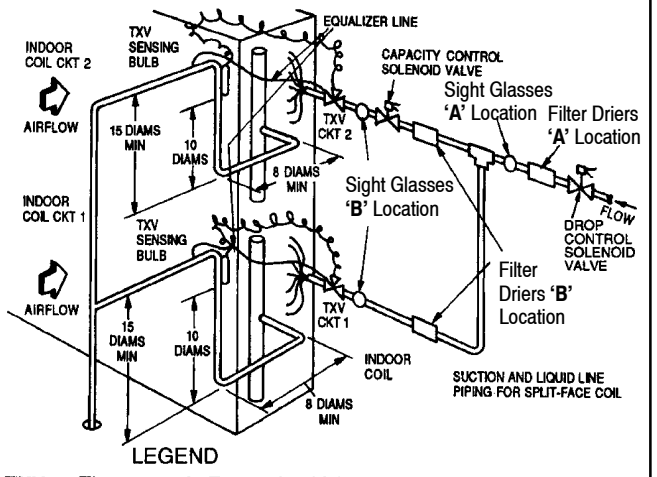
7. Remove runaround loop.

8. Install a field-supplied liquid moisture indicator in the piping immediately leaving outdoor unit.

9. If necessary, install field-supplied thermostatic expansion valve(s) (TXVs) in air handler.

If 2 TXVs are installed and two-step cooling is desired, install field-supplied liquid line solenoid valve ahead of the upper TXV (see Fig. 3).

Figure 3 **Location of Sight Glass(es) & Filter Driers**



Install Accessories

Field install accessories such as low-ambient control before proceeding with wiring. Refer to the instructions shipped with the accessory.

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.

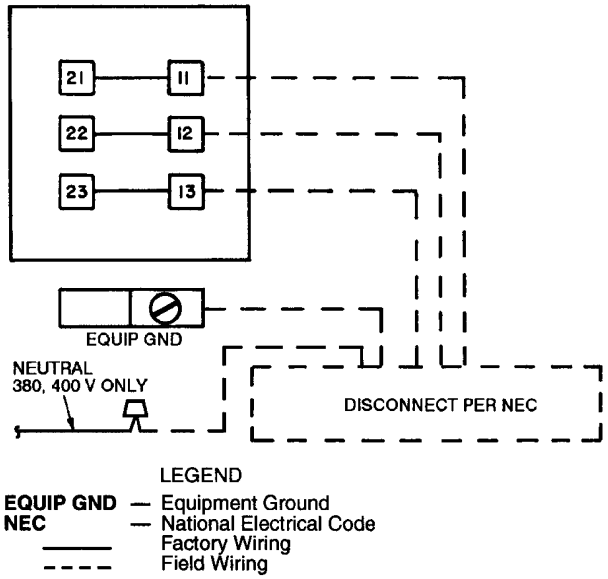
POWER WIRING - Unit is factory wired for voltage shown on nameplate. Provide adequate fused disconnect switch within sight from unit and readily accessible from unit, but out of the reach of children. Lock switch open (off) to prevent power from being turned on while unit is being serviced. Disconnect switch, fuses, and field wiring must comply with national and local code requirements.

Route power wires through opening in unit end panel to connection in unit control box as shown on unit label diagram and in Fig. 4. Unit must be grounded.

Affix crankcase heater warning sticker to unit disconnect switch.

CONTROL CIRCUIT WIRING - Control voltage is 24 v. See unit label diagram for field-supplied wiring details. Route control wires through opening in unit end panel to connection in unit control box.

Figure 4 **Wiring Connections**



Main Power Supply Wiring

Pre-Start-Up

IMPORTANT: Before beginning Pre-Start-Up or Start-Up, review Start-Up Checklist at the back of this book. The Checklist assures proper start-up of a unit and provides a record of unit condition, application requirements, system information, and operation at initial start-up.

CAUTION

Do not attempt to start the condensing unit, even momentarily, until the following steps have been completed. Compressor damage may result.

System Check

1. Check all air handler(s) and other equipment auxiliary components. Consult the manufacturer's instructions regarding any other equipment connected to the condensing unit. If unit has field-installed accessories, be sure all are properly installed and correctly wired. If used, airflow switch must be properly installed.

2. Backseat (open) compressor suction and discharge valves. Now close valves one turn to allow refrigerant pressure to reach test gages.

3. Open liquid line service valve.

4. Check tightness of all electrical connections.

5. Be sure unit is properly leak checked, dehydrated, and charged. See Preliminary Charge, this page.

6. Electrical power source must agree with nameplate rating.

7. *Crankcase heater must be firmly locked into compressor crankcase. Be sure crankcase is warm (heater must be on for 24 hours before starting compressor).*

8. Be sure compressor floats freely on the mounting springs and that snubber washers can be moved with finger pressure. See Compressor Mounting Section.

Leak Test - Leak test the entire refrigerant system using soap bubbles and/or an electronic leak detector.

Turn On Crankcase Heater - Turn on crankcase heater for 24 hours before starting the unit to be sure all the refrigerant is out of the oil. To energize the crankcase heater, proceed as follows:

1. Set the space thermostat set point above the space temperature so there is no demand for cooling.

2. Close the field disconnect.

3. Turn the fan circuit breaker on. Leave the compressor circuit breakers off. The crankcase heater is now energized.

CAUTION

Prior to starting compressor, a preliminary refrigerant charge must be added to avoid possible compressor damage.

Start-Up

Compressor crankcase heater must be on for 24 hours before start-up. After the heater has been on for 24 hours, the unit can be started.

PRELIMINARY CHECKS

1. Ensure that compressor service valves are backseated.

2. Verify that each compressor floats freely on its mounting springs.

3. Check that electric power supply agrees with unit nameplate data.

4. Verify that compressor crankcase heater is securely in place.

5. Check that compressor crankcase heater has been on at least 24 hours.

6. Recheck for leaks using same procedure as previously outlined in Pre-Start-Up section.

7. If any leaks are detected, evacuate as previously outlined in Pre-Start-Up section.

8. All internal wiring connections must be tight, and all barriers and covers must be in place.

NOTE: CAE units do not have a compressor oil level sight glass. These units are factory changed with the required amount of oil.

COMPRESSOR ROTATION - On 3-phase units with scroll compressors, it is important to be certain compressor is rotating in the proper direction. To determine whether or not compressor is rotating in the proper direction:

1. Connect service gages to suction and discharge pressure fittings.

2. Energize the compressor.

3. The suction pressure should drop and the discharge pressure should rise, as is normal on any start-up.

If the suction pressure does not drop and the discharge pressure does not rise to normal levels:

1. Note that the condenser fan is probably also rotating in the wrong direction.

2. Turn off power to the unit, tag disconnect.

3. Reverse any two of the unit power leads.

4. Reapply power to the compressor, verify correct pressures.

The suction and discharge pressure levels should now move to their normal start-up levels.

COMPRESSOR OVERLOAD – This overload interrupts power to the compressor when either the current or internal motor winding temperature becomes excessive, and automatically resets when the internal temperature drops to a safe level. This overload may require up to 60 minutes (or longer) to reset. If the internal overload is suspected of being open, disconnect the electrical power to the unit and check the circuit through the overload with an ohmmeter or continuity tester.

START UNIT – The field disconnect is closed, the fan circuit breaker is closed, and the space thermostat is set above ambient so that there is no demand for cooling. Only the crankcase heater will be energized.

Next, close the compressor circuit breaker and then reset space thermostat below ambient so that a call for cooling is ensured.

NOTE: Do not use circuit breaker to start and stop the compressor except in an emergency.

After starting, there is a delay of at least 3 seconds before compressor starts.

CAUTION

Never charge liquid into the low–pressure side of system. Do not overcharge. During charging or removal of refrigerant, be sure indoor–fan system is operating.

ADJUST REFRIGERANT CHARGE – Unit must be charged in Cooling mode only. Refer to Cooling Charging Charts, Fig. 5 and to Table 3 for maximum charge level. Do not exceed maximum refrigerant charge. For applications with line lengths greater than 100 ft, contact your distributor technical service agent. Vary refrigerant until the conditions of the chart are met. Note that charging charts are different from type normally used. Charts are based on charging the units to the correct subcooling for the various operating conditions. Accurate pressure gage and temperature sensing device are required. Connect the pressure gage to service port on the liquid line service valve. Mount the temperature sensing device on the liquid line, close to the liquid line service valve and insulate it so that outdoor ambient temperature does not affect the reading. Indoor airflow must be within the normal operating range of the unit. Operate unit a minimum of 15 minutes. Ensure pressure and temperature readings have stabilized. Plot liquid pressure and temperature on chart and add or reduce charge to meet curve. Adjust charge to conform with charging chart, using the liquid pressure and temperature to read chart.

If the sight glass is cloudy, check refrigerant charge again. *Ensure all fans are operating.* Also ensure maximum allowable liquid lift has not been exceeded. If charged per chart and if the sight glass is still cloudy, check for a plugged filter drier or a partially closed solenoid valve. Replace or repair, as needed.

FINAL CHECKS – Ensure all safety controls are operating, control panel covers are on, and the service panels are in place.

Table 3 – Maximum Refrigerant Charge

	R–22	
	(lb)	(kg)
CAE150	48	18.0
CAE180	48	18.0
CAE240	48	18.0

Operating Sequence

Cooling

When the thermostat calls for stage one cooling at start–up, and all safety devices are satisfied, the compressor contactor 1 (C1) energizes causing compressor no. 1 and outdoor–fan motor no. 1 to start (the indoor–fan contactor should be wired to start at the same time as the compressor). The liquid line solenoid (LLS) valve will open when compressor no. 1 starts, allowing refrigerant to flow in the system.

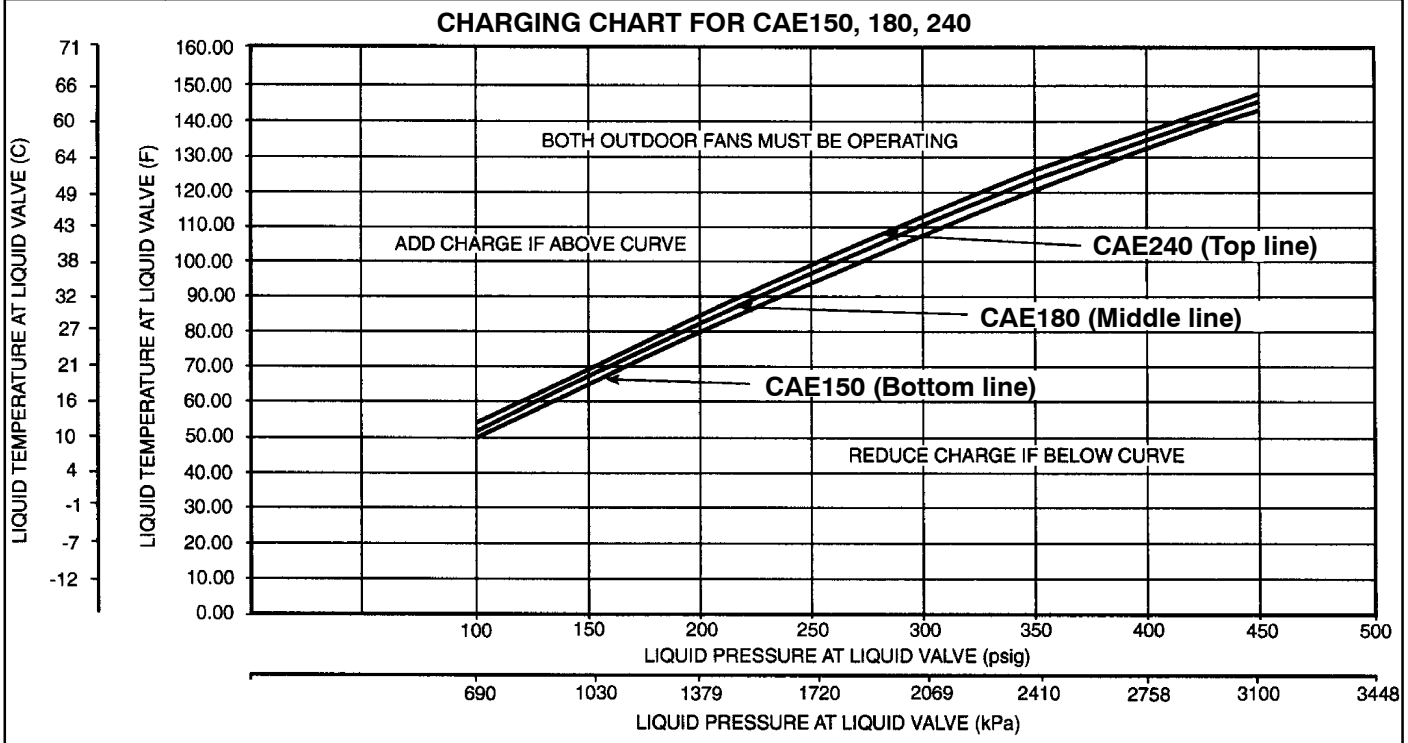
When the thermostat calls for stage two cooling, compressor contactor no. 2 (C2) energizes causing compressor no. 2 and outdoor–fan motor no. 2 to start. As the cooling demand decreases, stage two on the thermostat opens, causing compressor no. 2 and outdoor–fan motor no. 2 to shut down. As the cooling continues to decrease, stage one of the thermostat opens causing compressor no. 1 and outdoor–fan motor no. 1 to shut down. The LLS valve for each compressor will close when the associated compressor stops, minimizing the potential for refrigerant migration during the off cycle.

Heating

The heating thermostat energizes a field–supplied relay, which operates heating controls and energizes the indoor unit relay. When the fan switch is set at AUTO, the indoor unit fan cycles with the heating control. The indoor unit fan runs continuously when the fan switch is set at ON.

Causes of complete unit shutdown are: interruption of supplied power, open compressor internal protector (IP), open control circuit breaker, or an open high– or low–pressure safety switch.

Figure 5 **Charging Charts**



Service

Head Pressure Control – Fan cycling is a standard feature. The no. 2 fan cycles in response to changes in liquid pressure. The switch cycles the fan off at 160 +/– 10 psig (1103 +/– 69 kPa) as pressure decreases, and cycles it back on at 255 +/– 10 psig (1758 +/– 69 kPa).

Crankcase Heater – The heater prevents refrigerant migration and compressor oil dilution during shutdown whenever compressor is not operating. It is wired to cycle with the compressor; the heater is off when compressor is running, and on when compressor is off.

Both compressor service valves must be closed whenever the crankcase heater is deenergized for more than 6 hours. The crankcase heater is operable as long as the control circuit is energized.

Compressor Protection

COMPRESSOR OVERTEMPERATURE PROTECTION (IP) – A thermostat installed on compressor motor winding reacts to excessively high winding temperatures and shuts off the compressor.

CRANKCASE HEATER – Heater minimizes absorption of liquid refrigerant by oil in crankcase during brief or extended shutdown periods. The control circuit is maintained if compressor fan motor circuit breakers are turned off. The main disconnect must be on to energize crankcase heater.

IMPORTANT: Never open any switch or disconnect that energizes the crankcase heater unless unit is being serviced or is to be shut down for a prolonged period. After a prolonged shutdown on a service job, energize the crankcase heater for 24 hours before starting the compressor.

High-Pressure Switches – Switches have fixed, nonadjustable settings. Switches are mounted on the compressors.

Low-Pressure Switches – Switches have fixed, non-adjustable settings. Switches are mounted on the compressors.

Loss of Charge Switches – The Switches have fixed, non-adjustable settings. Switches are mounted on liquid line.

TO CHECK – Slowly close liquid shutoff valve and allow compressor to pump down. Do not allow compressor pumpdown below 2 psig (13.8 kPa). Compressor should shut down when suction pressure drops to cutout pressure in specification sheet tables, and should restart when pressure builds up to cut-in pressure shown.

Outdoor Fans – Each fan is supported by a formed-wire mount bolted to the fan deck and covered with a wire guard. Fan motors have permanently lubricated bearings.

Lubrication

FAN MOTORS have sealed bearings. No provisions are made for lubrication.

COMPRESSOR has its own oil supply. Loss of oil due to a leak in the system should be the only reason for adding oil after the system has been in operation.

Coil Cleaning and Maintenance – Routine cleaning of coil surfaces is essential to minimize contamination build-up and remove harmful residue. Inspect coils monthly and clean as required.

CLEANING COILS – Coils can be cleaned with a vacuum cleaner, washed out with low velocity water, blown out with low-pressure compressed air, or brushed (do not use wire brush). Fan motors are drip-proof but not waterproof. Do NOT use acid cleaners.

Clean outdoor coil annually or as required by location or outdoor air conditions. Inspect coil monthly, and clean as required. Fins are not continuous through coil sections; dirt and debris may pass through first section, become trapped between 2nd and 3rd rows of fins and restrict outdoor airflow. Use a flashlight to determine if dirt or debris has collected between coil sections. Clean coil as follows:

1. Turn off unit power.
2. Remove screws holding rear corner posts and top cover in place. Pivot top cover up 12 to 18 in. (305 to 457 mm) and support with a rigid support. See Fig. 6.
3. Remove clips securing tube sheets together at the return bend end of the coil. Carefully spread the ends of the coil rows apart by moving the outer sections. See Fig. 7.
4. Using a water hose, or other suitable equipment, flush down between the sections of coil to remove dirt and debris.
5. Clean the remaining surfaces in the normal manner.
6. Reposition outer coil sections.
7. Reinstall clips which secure tube sheets.
8. Replace top cover and rear corner posts.

Figure 6 Pivot and Support Top Cover

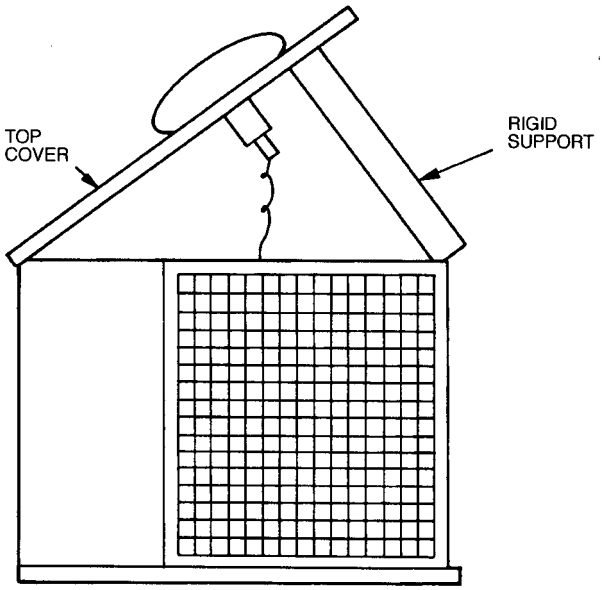
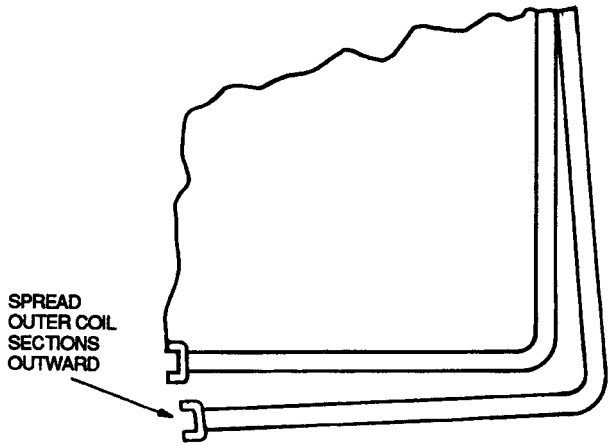


Figure 7 Coil Cleaning (Typical)



TROUBLESHOOTING	
PROBLEM	**SOLUTION**
COMPRESSOR DOES NOT RUN	
Contactor Open	
1. Power off.	1. Restore power.
2. Fuses blown in field power circuit.	2. After finding cause and correcting, replace with correct size fuse.
3. No control power.	3. Check control circuit breaker; reset if tripped or replace if defective.
4. Thermostat circuit open.	4. Check thermostat setting.
5. Compressor circuit breaker tripped.	5. Check for excessive compressor current draw. Reset breaker, replace if defective.
6. Safety device lockout circuit active.	6. Reset lockout circuit at thermostat or circuit breaker.
7. Low-pressure switch open.	7. Check for refrigerant undercharge, obstruction of indoor airflow, or whether compressor suction shutoff valve is fully open. Make sure liquid line solenoid valve(s) is open.
8. High-pressure switch open.	8. Check for refrigerant overcharge, obstruction of outdoor airflow, air in system, or whether compressor discharge valve is fully open. Be sure outdoor fans are operating correctly.
9. Compressor overtemperature switch open.	9. Check for open condition. Allow for reset. Replace if defective.
10. Loose electrical connections.	10. Tighten all connections.
11. Compressor stuck.	11. See compressor service literature.
Contactor Closed	
1. Compressor leads loose.	1. Check connections.
2. Motor windings open.	2. See compressor service literature.
3. Single phasing.	3. Check for blown fuse. Check for loose connection at compressor terminal.
COMPRESSOR STOPS ON HIGH PRESSURE SWITCH	
Outdoor Fan On	
1. High-pressure switch faulty.	1. Replace switch.
2. Reversed fan rotation.	2. Confirm rotation, correct if necessary.
3. Airflow restricted.	3. Remove obstruction.
4. Air recirculating.	4. Clear airflow area.
5. Noncondensables in system.	5. Recover refrigerant and recharge as required.
6. Refrigerant overcharge.	6. Recover refrigerant as required.
7. Line voltage incorrect.	7. Consult power company.
8. Refrigerant system restrictions.	8. Check or replace filter drier, expansion valve, etc. Check that compressor discharge service valve is fully open.
Outdoor Fan Off	
1. Fan slips on shaft.	1. Tighten fan hub setscrews.
2. Motor not running.	2. Check power and capacitor.
3. Motor bearings stuck.	3. Replace bearings.
4. Motor overload open.	4. Check overload rating. Check for fan blade obstruction.
5. Motor burned out.	5. Replace motor.
COMPRESSOR CYCLES ON LOW PRESSURE SWITCH	
Indoor -Air Fan Running	
1. Compressor suction service valve partially closed.	1. Open valve fully.
2. Liquid line solenoid valve(s) fails to open.	2. Check liquid line solenoid valve(s) for proper operation. Replace if necessary.
3. Filter drier plugged.	3. Replace filter drier.
4. Expansion valve power head defective.	4. Replace power head.
5. Low refrigerant charge.	5. Add charge. Check low-pressure switch setting.
Airflow Restricted	
1. Coil iced up.	1. Check refrigerant charge.
2. Coil dirty.	2. Clean coil fins.
3. Air filters dirty.	3. Clean or replace filters.
4. Dampers closed.	4. Check damper operation and position.
Indoor-Air Fan Stopped	
1. Electrical connections loose.	1. Tighten all connections.
2. Fan relay defective.	2. Replace relay.
3. Motor overload open.	3. Power supply.
4. Motor defective.	4. Replace motor.
5. Fan belt broken or slipping.	5. Replace or tighten belt.

TROUBLESHOOTING (Cont.)	
PROBLEM	**SOLUTION**
COMPRESSOR RUNNING BUT COOLING INSUFFICIENT	
Suction Pressure Low	
1. Refrigerant charge low.	1. Add refrigerant.
2. Head pressure low.	2. Check refrigerant charge. Check outdoor-air fan thermostat settings.
3. Air filters dirty.	3. Clean or replace filters.
4. Expansion valve power head defective.	4. Replace power head.
5. Indoor coil partially iced.	5. Check low-pressure setting.
6. Indoor airflow restricted.	6. Remove obstruction.
Suction Pressure High	
1. Unloaders not functioning.	1. Check unloader adjustments. Check unloader setting.
2. Compressor valve defective.	2. See compressor service literature.
3. Heat load excessive.	3. Check for open doors or windows in vicinity of fan coil.
UNIT OPERATES TOO LONG OR CONTINUOUSLY	
1. Low refrigerant charge.	1. Add refrigerant.
2. Control contacts fused.	2. Replace control.
3. Air in system.	3. Purge and evacuate system.
4. Partially plugged expansion valve or filter drier.	4. Clean or replace.
SYSTEM IS NOISY	
1. Piping vibration.	1. Support piping as required.
2. Compressor noisy.	2. Check valve plates for valve noise. Replace compressor if bearings are worn.
COMPRESSOR LOSES OIL	
1. Leak in system.	1. Repair leak.
2. Crankcase heaters not energized during shutdown.	2. Check wiring and relays. Check heater and replace if defective.
3. Improper interconnecting piping design.	3. Check piping for oil return. Replace if necessary.
FROSTED SUCTION LINE	
Expansion valve admitting excess refrigerant.	Adjust expansion valve.
HOT LIQUID LINE	
1. Shortage of refrigerant due to leak.	1. Repair leak and recharge.
2. Expansion valve opens too wide.	2. Adjust expansion valve.
FROSTED LIQUID LINE	
1. Restricted filter drier.	1. Remove restriction or replace.
2. Liquid line solenoid valve partially closed.	2. Replace valve.
COMPRESSOR WILL NOT UNLOAD	
1. Defective unloader.	1. Replace unloader.
2. Defective capacity control solenoid valve (if used).	2. Replace valve.
3. Miswired capacity control liquid line solenoid (if used).	3. Rewire correctly.
4. Weak, broken, or wrong valve body spring.	4. Replace spring.
COMPRESSOR WILL NOT LOAD	
1. Miswired capacity control liquid line solenoid (if used).	1. Rewire correctly.
2. Defective capacity control solenoid valve (if used).	2. Replace valve.
3. Plugged strainer (high side).	3. Clean or replace strainer.
4. Stuck or damaged unloader piston or piston ring(s).	4. Clean or replace the necessary parts.

I. START-UP CHECKLIST

Outdoor: Model No.	Serial No.
INDOOR: Air Handler Manufacturer -	
Model No.	Serial No.
Additional Accessories:	

II. PRE-START-UP

OUTDOOR UNIT

IS THERE ANY SHIPPING DAMAGE? (Y/N)_____

IF SO, WHERE:

WILL THIS DAMAGE PREVENT UNIT START-UP? (Y/N)_____

CHECK POWER SUPPLY. DOES IT AGREE WITH UNIT? (Y/N)_____

HAS THE GROUND WIRE BEEN CONNECTED? (Y/N)_____

HAS THE CIRCUIT PROTECTION BEEN SIZED AND INSTALLED PROPERLY? (Y/N)_____

ARE THE POWER WIRES TO THE UNIT SIZED AND INSTALLED PROPERLY? (Y/N)_____

HAVE COMPRESSOR HOLDDOWN BOLTS BEEN LOOSENED (Snubber washers are snug, but not tight)? (Y/N)_____

CONTROLS

ARE THERMOSTAT AND INDOOR FAN CONTROL WIRING CONNECTIONS MADE AND CHECKED? (Y/N)_____

ARE ALL WIRING TERMINALS (including main power supply) TIGHT? (Y/N)_____

HAS CRANKCASE HEATER BEEN ENERGIZED FOR 24 HOURS? (Y/N)_____

INDOOR UNIT

HAS WATER BEEN PLACED IN DRAIN PAN TO CONFIRM PROPER DRAINAGE? (Y/N)_____

ARE PROPER AIR FILTERS IN PLACE? (Y/N)_____

HAVE FAN AND MOTOR PULLEYS BEEN CHECKED FOR PROPER ALIGNMENT? (Y/N)_____

DO THE FAN BELTS HAVE PROPER TENSION? (Y/N)_____

HAS CORRECT FAN ROTATION BEEN CONFIRMED? (Y/N)_____

PIPING

ARE LIQUID LINE SOLENOID VALVES LOCATED AT THE INDOOR COILS AS REQUIRED? (Y/N)_____

HAVE LEAK CHECKS BEEN MADE AT COMPRESSOR, OUTDOOR AND INDOOR COILS, TXVs (Thermostatic Expansion Valves), SOLENOID VALVES, FILTER DRIERS, AND FUSIBLE PLUGS WITH A LEAK DETECTOR? (Y/N)_____

LOCATE, REPAIR, AND REPORT ANY LEAKS.

HAVE ALL COMPRESSOR SERVICE VALVES BEEN FULLY OPENED (BACKSEATED)? (Y/N)_____

HAVE LIQUID LINE SERVICE VALVES BEEN OPENED? (Y/N)_____

IS THE OIL LEVEL IN EACH COMPRESSOR CRANKCASE VISIBLE IN THE COMPRESSOR SIGHT GLASSES? (Y/N)_____

CHECK VOLTAGE IMBALANCE

LINE-TO-LINE VOLTS: AB_____V AC_____V BC_____V

(AB + AC + BC)/3 = AVERAGE VOLTAGE =_____ V

MAXIMUM DEVIATION FROM AVERAGE VOLTAGE = _____V

VOLTAGE IMBALANCE = 100 X (MAX DEVIATION)/(AVERAGE VOLTAGE) =_____

IF OVER 2% VOLTAGE IMBALANCE, DO NOT ATTEMPT TO START SYSTEM! CALL LOCAL POWER COMPANY FOR ASSISTANCE.

III. START-UP	
	CHECK INDOOR UNIT FAN SPEED AND RECORD.
	CHECK OUTDOOR UNIT FAN SPEED AND RECORD.
	AFTER AT LEAST 10 MINUTES RUNNING TIME, RECORD THE FOLLOWING MEASUREMENTS: OIL PRESSURE_____ SUCTION PRESSURE_____ SUCTION LINE TEMP_____ DISCHARGE PRESSURE_____ DISCHARGE LINE TEMP_____ ENTERING OUTDOOR UNIT AIR TEMP_____ LEAVING OUTDOOR UNIT AIR TEMP_____ INDOOR UNIT ENTER-AIR DB (dry bulb) TEMP_____ INDOOR UNIT ENTER-AIR WB (wet bulb) TEMP_____ INDOOR UNIT LEAVING-AIR DB TEMP_____ INDOOR UNIT LEAVING-AIR WB TEMP_____
	COMPRESSOR AMPS - L1_____ L2_____ L3_____
	CHECK THE COMPRESSOR OIL LEVEL SIGHT GLASSES; ARE THE SIGHT GLASSES SHOWING OIL LEVEL IN VIEW? (Y/N)_____
	NOTES