

AAON Coil Products

CA SERIES CONDENSING UNITS



INSTALLATION AND OPERATION MANUAL

**MANUFACTURED
IN THE U.S.A**

! WARNING

Scroll compressors will be damaged by operation with the wrong rotation. THE LOW PRESSURE SWITCH HAS BEEN DISCONNECTED AFTER TESTING AT THE FACTORY.

The wiring must be reconnected and proper rotation determined at the time of start-up by a qualified service technician using suction and discharge pressures gauges. Any alteration should only be made at the unit power connection.

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CAUTION

Installation and service must be performed by a qualified installer or service agency.



IMPORTANT

The Clean Air Act of 1990 bans the intentional venting of refrigerant (CFC's and HCFC's) as of July 1, 1992. Approved methods of recovery, recycling or reclaiming must be followed. Fines and/or incarceration may be levied for non-compliance.

Owner should pay particular attention to the words: NOTE, CAUTION AND WARNING. NOTES are intended to clarify or make the installation easier. CAUTIONS are given to prevent equipment damage. WARNINGS are given to alert owner that personal injury and/or equipment damage may result if installation procedure is not handled properly.

It is the intent of AAON Coil Products, Inc. to provide accurate and current specification information. However, in the interest of product improvement, AAON Coil Products, Inc. reserves the right to change pricing, specifications and/or design of its products without notice, obligation or liability.

INSTALLATION

AAON Coil Products 'CA' Series units are designed for fast easy installation

GENERAL

All CA condensing units have lifting areas at the underside of the equipment to allow moving and placement without physical damage. Arrange spreader bars, blocking or other lifting devices to prevent any damage to the coils or cabinet of the condensing unit. These condensing units may be placed on a roof or at ground level since they are designed for exposure to weather.

When roof mounted, a steel frame must be provided that will support the unit above the roof itself.

When installed at ground level, a substantial base must be provided that will not settle.

LOCATION

Airflow to and from the condensing unit must not be restricted. Obstruction to air flow will result in decreased performance and efficiency. The installation position must provide at least 3 feet of side clearance for proper air flow into the coils. When units are mounted adjacent to each other the clearance required between them would be 6 feet.

Condensing units should not be installed in an enclosure or pit that is deeper than the height of the unit. When a recessed installation is used the side clearance requirement is doubled to 6 feet for the inlet air.

The CA 02 through CA 05 model sizes have a horizontal airflow pattern. The discharge air side of one unit should not be aligned with the intake of another. The discharge air should be faced away from the adjacent building or structure.

The CA 08 through CA 25 models have a vertical air discharge. There must be no obstruction above the equipment that may deflect this air back to the inlet of the condensing unit. Do not place the unit under an overhang.

Condensing unit operation can also be affected by wind. It is good practice to position the unit so its length is parallel with the prevailing wind.

SERVICE CLEARANCE

One end of the CA condensing unit contains the access door that must be accessible for periodic service. This area contains the compressor, controls, safety devices, refrigerant service and shut-off valves.

It is recommended that a minimum of 4 feet be left free at this end of the unit for proper and easier servicing.

SETTING THE UNIT

If cables or chains are used to hoist the unit, care should be taken to prevent damage to the cabinet.

Hoist unit to a point directly above the pad, and lower unit into the proper place. Unit may also be positioned with a forklift. Remove the harness used in hoisting. Make sure the unit is properly seated and level.

ELECTRICAL

Check the unit data plate to make sure it agrees with the power supply. Connect power to the unit according to the wiring diagram provided with the unit.

The power and control wiring may be brought in through the holes provided at one corner of the unit. Protect the branch circuit in accordance with code requirements. If the control wires are to run inside the same conduit, use 600 volt wire or as required by applicable codes. The unit must be electrically grounded in accordance with the National Electric Code, ANSI / NFPA No. 70-1984 when installed if an external source is utilized, in Canada use current C.S.A. Standard C22.1 Canadian Electric Code Part 1.

Power wiring is to the unit terminal block or compressor contactor. All wiring beyond this point has been done by the manufacturer.

Connect the control wiring and apply power to the unit. **CHECK COMPRESSOR FOR PROPER ROTATION BY STARTING UNIT ONLY AFTER CONNECTING PRESSURE GAUGES TO SUCTION AND DISCHARGE.**

THE COMPRESSOR WILL BE DESTROYED IF RUN IN THE WRONG DIRECTION.

NOTE: All units are factory wired for 230, 380, 415, 460 or 575 volt.

THERMOSTAT

Low voltage room thermostat should be located on an inside wall 4 to 5 feet above the floor where it will not be subjected to drafts, sun exposure or heat from electrical fixtures or appliances. Follow manufacturer's instructions enclosed with thermostat for general installation procedure.



IMPORTANT

Three phase Scroll Compressors are directional and start-up must be performed by a qualified service technician using suction and discharge gauges.



WARNING

Electric shock hazard. Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit to OFF at disconnect switch(es). Unit may have multiple power supplies.

REFRIGERANT PIPING

GENERAL

All refrigeration systems are factory assembled, including a holding charge of R-22, and tested. On 13 - 25 ton units the refrigerant system includes dual condenser coils providing two stage cooling. These systems are provided with liquid line filter driers and fully hermetic compressors. Compressors are equipped with a positive pressure forced lubrication system and crankcase heater. The air cooled condenser coil(s) is constructed of copper tubes with aluminum fins (copper fins optional), the air is pulled through with steel propeller fans.

All CA Condensing units have factory furnished liquid and suction line shutoff valves. The pipe sizes must be selected to meet the actual installation conditions and not simply based on the connection sizes at the evaporator and/or condensing unit.

The refrigeration section of these appliances has been listed by E.T.L. as meeting the applicable provisions of UL 1995, CAN/CSA C22.2, No. 236-Second Edition.

NOTE: Crankcase Heater Operation

The 8 through 25 ton sizes are equipped with a crankcase heater, which should be energized at least 24 hours prior to setting the thermostat for cooling operation with the compressor.

This section is not intended to provide all the information required by the designer or installer of the refrigerant piping between the condensing units and the low side components. The appropriate sections of the ASHRAE Guide and the ASME standards should be used for final information.

The piping between the condenser and low side must assure:

- minimum pressure drop
- continuous oil return
- prevention of liquid refrigerant slugging or carryover.

Acceptable system design and installation will include consideration as follows:

Interconnecting Piping Summary

- piping from the condensing unit to the indoor air handler is the responsibility of the installing contractor.
- only clean "ACR" tubing should be used.
- condensing units are provided with in-line shutoff valves on both the liquid and suction lines. These should remain closed until the system is ready for start-up.
- piping should conform to generally accepted practices and codes.
- care must be taken not to cross the circuits on multiple circuit systems.

! IMPORTANT

The Clean Air Act of 1990 bans the intentional venting of refrigerant (CFC's and HCFC's) as of July 1, 1992. Approved methods of recovery, recycling or reclaiming must be followed. Fines and/or incarceration may be levied for non-compliance.

- once piped, the interconnecting piping and air handler MUST BE evacuated to 50 microns or less; leak checked and charged with R22 refrigerant.
- open the shut off valves.
- run unit, check rotation of compressors using refrigerant gauges.
- check super heat and subcooling; subcooling should be 10-13°F, evaporator superheat should be 10-15 °F. Also check the compressor discharge line superheat. It should be at least 60°F.
- make sure airhandler thermal expansion valve bulb is mounted with good thermal contact on the correct suction line on a horizontal section, close to the evaporator in the 4 or 8 o'clock position and insulated.
- the suction line should be insulated for its entire length.

SUCTION LINE

The suction line pipe size should be selected to have a maximum pressure drop of 3 PSI for the equivalent length of piping that is used. This corresponds to approximately 2°F with R22.

Any vertical suction risers should be checked to confirm that oil will be returned to the compressor. (Use the following tables for pipe sizing information). All suction lines must be pitched in the direction of flow and supported to maintain their position.

Fully insulated piping must be used between the evaporator and the condensing unit. A suction accumulator is not included as part of the CA condensing unit and must be field furnished and installed if required by job conditions.

R22 SUCTION LINE CAPACITY

Pressure Loss = 3 PSI (2°F) at 40°F saturated suction

LINE SIZE - inches	MAX. TONS / COMPRESSOR
5/8"	1.1
7/8"	2.9
1 1/8"	5.8
1 3/8"	10.1
1 5/8"	16.0

NOTE: Pressure loss, PSI/100 feet of equivalent line length due to line friction. (Corresponding change in R22 saturation temperature.)

LIQUID LINE

The liquid line pipe size should be selected to have a maximum pressure drop of 6 PSI which corresponds to approximately 2°F with R22.

The CA condensing units have a built in filter drier. The units do not include a liquid line solenoid valve and this must be field furnished and installed if required by job conditions.

(OPTIONAL) HOT GAS LINE

The hot gas bypass option is a system that maintains evaporator pressure at or above a minimum value. This will prevent the coil from freezing and also keep the velocity of the refrigerant gas sufficiently high for proper oil return to the compressor when the cooling is at light load conditions.

Pressure drop in the hot gas line is normally designed not to exceed the equivalent of a 2°F change in saturation temperature. The recommended sizing table below is based on a 1°F change in saturation temperature.

Hot gas bypass lines must be insulated to minimize heat loss and condensation of gas inside the piping and to prevent injury from high temperature surfaces.

R22 LIQUID LINE CAPACITY

Pressure Loss = 3 PSI (1°F) at 100°F liquid

LINE SIZE - inches	MAX. TONS / COMPRESSOR
1/2"	3.6
5/8"	6.7
7/8"	18.2

NOTE: Pressure loss, PSI/100 feet of equivalent line length due to line friction. (Corresponding change in R22 saturation temperature.)

R22 HOT GAS BYPASS LINE CAPACITY

Pressure Loss = 3 PSI (1°F) at 40°F saturated suction

LINE SIZE - inches	TONS / COMPRESSOR
1/2"	0.85
5/8"	1.6
7/8"	4.2
1 1/8"	8.5
1 3/8"	14.8

NOTE: Pressure loss, PSI/100 feet of equivalent line length due to line friction. (Corresponding change in R22 saturation temperature.)

MINIMUM TONS CAPACITY

To Carry Oil Up a Suction Riser at 40°F saturated suction

LINE SIZE - inches	Min. TONS / COMPRESSOR
3/4"	0.8
7/8"	1.1
1 1/8"	1.8
1 3/8"	2.9
1 5/8"	4.0
2 1/8"	7.2

FITTING LOSSES

In Equivalent Feet of Straight Copper Tubing

Line Size - in.	90° Std.	90° LongRad	90° Street	45° Std.	45° Street	180° Std.
1/2"	1.4	0.9	2.3	0.7	1.1	2.3
5/8"	1.6	1.0	2.5	0.8	1.3	2.5
7/8"	2.0	1.4	3.2	0.9	1.6	3.2
1 1/8"	2.6	1.7	4.1	1.3	2.1	4.1
1 3/8"	3.3	2.3	5.6	1.7	3.0	5.6
1 5/8"	4.0	2.6	6.3	2.1	3.4	6.3
2 1/8"	5.0	3.3	8.2	2.6	4.5	8.2

NOTE: The equivalent feet for a piping system must include the equivalent length of straight tubing for all the fittings, as well as, any valves that are added to the system.

WEIGHT OF REFRIGERANT 22

In Type L Copper Tubing (Pounds / 100 Feet)

Line Size - in.	LIQUID AT 100°F	SUCTION AT 40°F
3/8"	4.3	.065
1/2"	7.9	.120
5/8"	12.7	.195
7/8"	26.4	.405
1 1/8"	45.0	.690
1 3/8"	68.6	1.05
1 5/8"	- - -	1.49
2 1/8"	- - -	2.58

WIRING DIAGRAMS

A complete set of unit wiring diagrams is provided and located inside the control compartment door.

HEATING SYSTEMS

(optional as part of indoor air handler)

When heat is called for, the cooling section is inoperable except for the indoor blower motor. Actual heating is accomplished by an indoor air handling unit with heating capabilities.

CHECK OUT PROCEDURES

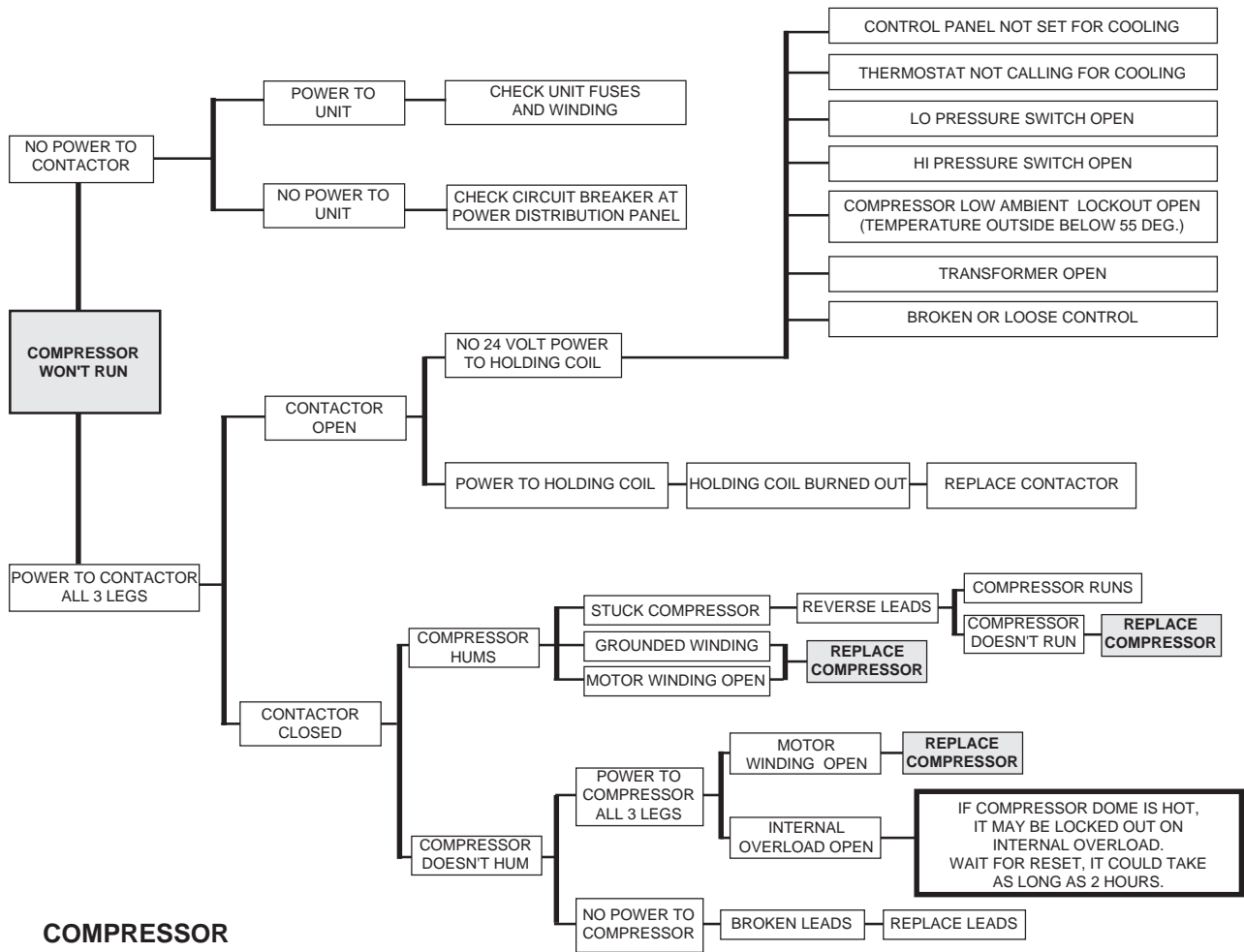
CAUTION: Before leaving installation, a complete operating cycle should be observed to see that all components are functioning properly.

COOLING

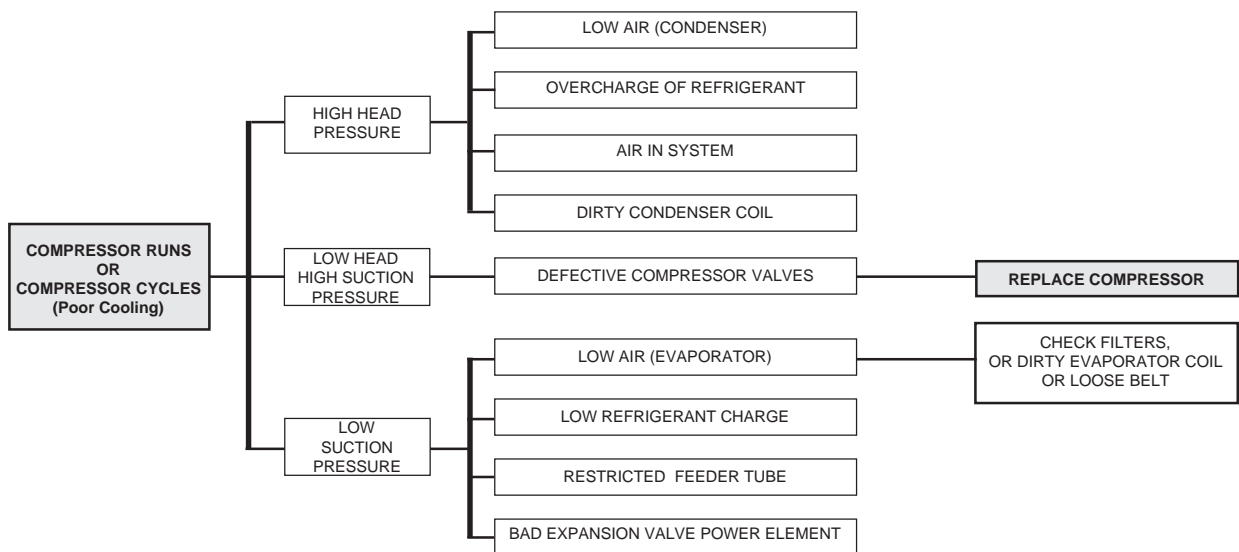
1. Main Power Switch(es) is / are on and power is to the unit.
2. Put the thermostat in cooling mode and place the "fan" switch to on.
Check to see if air handler blower is running in the correct direction and at the nameplate amperage.
3. TURN COOLING ON - Check to see that the compressor is operating.
Check the amperage draw and compare to the nameplate (check amperage at the load side of the compressor contactor).

TROUBLE	POSSIBLE CAUSE
COOLING PACKAGE	
SYSTEM OFF	<ol style="list-style-type: none"> 1. Check power at line side of contactor(s). 2. Thermostat not set for cooling. 3. High pressure control tripped. 4. Low pressure switch open (loss of charge). 5. Low pressure switch open (clogged filters).
CONDENSER FAN WILL NOT RUN	<ol style="list-style-type: none"> 1. Overload thermal protector open in motor. 2. Motor run capacitor open or shorted. 3. Fan or shaft stuck.
EVAPORATOR BLOWER WILL NOT RUN	<ol style="list-style-type: none"> 1. Overload thermal protector open in motor. 2. Relay not closing. 3. Capacitor shorted or open (PSC motors only). 4. Stuck shaft or blower wheel.
COMPRESSOR SHORT CYCLES	<ol style="list-style-type: none"> 1. Check for low refrigeration charge. 2. Compressor overload opening. 3. Ambient temperature too low. 4. Thermostat in supply air stream. 5. Filters dirty or air flow restricted. 6. Evaporator blower not running.
FAN MOTOR RUNS HOT AND CUTS OUT	<ol style="list-style-type: none"> 1. Line voltage too high.
COMPRESSOR WILL NOT START	<ol style="list-style-type: none"> 1. Line voltage too low. 2. Limit switches are open. 3. Overload or pressure control tripped.
BLOWER DOES NOT DELIVER AIR	<ol style="list-style-type: none"> 1. Blower running backwards (3 phase only). 2. Dirty filters. 3. Duct obstruction.

COMPRESSOR CHECKOUT PROCEDURE



COMPRESSOR CHECKOUT PROCEDURE



SERVICING, TROUBLE SHOOTING AND MAINTENANCE

In the event the unit cannot be made to function correctly, it is strongly recommended that only servicemen who are well qualified and experienced in heating and air conditioning be permitted to service the systems.

GENERAL LUBRICATING INSTRUCTIONS

All original condensing unit motors and fan bearings REQUIRE NO LUBRICATION.

COIL INFORMATION

The condenser coil(s) MUST BE KEPT CLEAN. This will reduce electrical use, maintain capacity and reduce stress on the unit.

Before attempting to clean the coils; set thermostat to the "OFF" position; turn the electrical power to the unit to the "OFF" position at the disconnect switch. The condenser coil can be thoroughly cleaned by washing from the inside out with water and a coil cleaner and can be brushed on the outside by a broom. If coil is extremely dirty with clogged fins, a serviceman who specializes in coil cleaning should be called.

DO NOT BEND OR DAMAGE FINS.

If the unit has been off for over an hour, restore power to the unit and wait two hours before turning the thermostat on.

The inside (evaporator) coil can be inspected at the air handler by removing the filters and observing the cleanliness of the coil from the filter side.

If dirty, have an experienced serviceman clean by washing from the blower side toward the filter side.

AIR HANDLER - FILTER INFORMATION

Install new filters with size indicated on the filters or as indicated by installation instructions before running the air handler. Be sure filters are installed in the correct direction with respect to the air flow.

FILTERS SHOULD BE CHECKED EVERY 30 DAYS AND REPLACED OR CLEANED AS NECESSARY.

Do not permit the unit to be operated unless the filters are in place. Operation of the unit without filters will result in a clogged evaporator coil - a very expensive service job to correct.

AIR HANDLER - BLOWER INFORMATION

CLEAN BLOWER WHEELS are necessary to reduce electrical use, maintain capacity and reduce stress on the unit. To inspect and clean the blower; set thermostat to the "OFF" position; turn the electrical power to the unit to the "OFF" position at the disconnect switch. Clean the assembly, check the bearings for looseness, inspect the belt condition and tightness, check screws for tightness, rotate blower wheel while listening close to each bearing and with a finger on the bearing to check for noise or roughness in the bearing, which indicates a failing bearing. Replace blower deck, turn on the power to the unit, if the unit has been off over an hour do not turn the thermostat on for two or more hours after turning on disconnect.

OBSTRUCTION TO AIR FLOW

Supply and return air grilles must be kept clear so air can be freely drawn into and discharged from the system.

AAON Coil Products

CA COOLING UNITS



INSTALLATION AND OPERATION MANUAL

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