CS/CD/CP Series

AIR-COOLED CONDENSING UNITS

Installation and Operation Manual

Part Number: E207120_D

Products that provide lasting solutions.

BEFORE YOU BEGIN

Read the safety information completely and carefully.

The precautions and use of the procedures described herein are intended to use the product correctly and safely. Comply with the precautions described below to protect you and others from possible injuries. Relative to their potential danger, the relevant matters are divided into four parts as defined by ANSI Z535.5

ANSI Z535.5 DEFINITIONS

- **DANGER** – Indicate[s] a hazardous situation which, if not avoided, will result in death or serious injury.

- **WARNING** – Indicate[s] a hazardous situation which, if not avoided, could result in death or serious injury.

- **CAUTION** – Indicate[s] a hazardous situation which, if not avoided, could result in minor or moderate injury.

- **NOTICE** – *Not related to personal injury* – Indicates[s] situations, which if not avoided, could result in damage to equipment.

****

Environmental Concerns

Hussmann recommends responsible handling of refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those that contain Hydrogen, Chlorine, Fluorine, and Carbon (HCFCs). Only certified technicians may handle these refrigerants. All technicians must be aware and follow the requirements set forth by the Federal Clean Air Act (Section 608) for any service procedure being performed on this equipment that involves refrigerant. Additionally, some states have other requirements that must be adhered to for responsible management of refrigerants.

WARNING

PERSONAL PROTECTION EQUIPMENT (PPE)

Only qualified personnel should install and service this equipment. Personal Protection Equipment (PPE) is required whenever servicing this equipment. Wear safety glasses, gloves, protective boots or shoes, long pants, and a long-sleeve shirt as required when working with this equipment. Observe all precautions on tags, stickers, labels and literature attached to this equipment.

WARNING

Contractors shall strictly adhere to specifications provided by the Engineer of Record (EOR), as well as US Environmental Protection Agency regulations, OSHA regulations, and all other federal, state and local codes. This work should only be done by qualified, licensed contractors. There are numerous hazards, not limited to, but including: burns due to high temperatures, high pressures, toxic substances, electrical arcs and shocks, very heavy equipment with specific lift points and structural constraints, food and product damage or contamination, public safety, noise, and possible environmental damage. Never leave operating compressors unattended during the manual soft-start process. Always power rocker switches off when unattended.

⚠ WARNING

Proper Field Wiring and Grounding Required! Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state electrical codes.

This warning does not mean that Hussmann products will cause cancer or reproductive harm, or is in violation of any product-safety standards or requirements. As clarified by the California State government, Proposition 65 can be considered more of a 'right to know' law than a pure product safety law. When used as designed, Hussmann believes that our products are not harmful. We provide the Proposition 65 warning to stay in compliance with California State law. It is your responsibility to provide accurate Proposition 65 warning labels to your customers when necessary. For more information on Proposition 65, please visit the California State government website.

⚠ WARNING

— LOCK OUT / TAG OUT —

To avoid serious injury or death from electrical shock, always disconnect the electrical power at the main disconnect when servicing or replacing any electrical component. This includes, but is not limited to, such items as controllers, electrical panels, condensers, lights, fans, and heaters.

⚠ CAUTION

This manual was written in accordance with originally perscribed equipment that is subject to change. Hussmann reserves the right to change all or part of the equipment for future stores such as, but not limited to, controllers, valves and electrical specifications. It is the installers responsibility to reference the refrigeration drawings supplied for each installation, as directed by the Engineer of Record.

⚠ WARNING

This equipment is prohibited from use in California with any refrigerants on the "List of Prohibited Substances" for that specific end-use, per California Code of Regulations, title 17, section 95374.

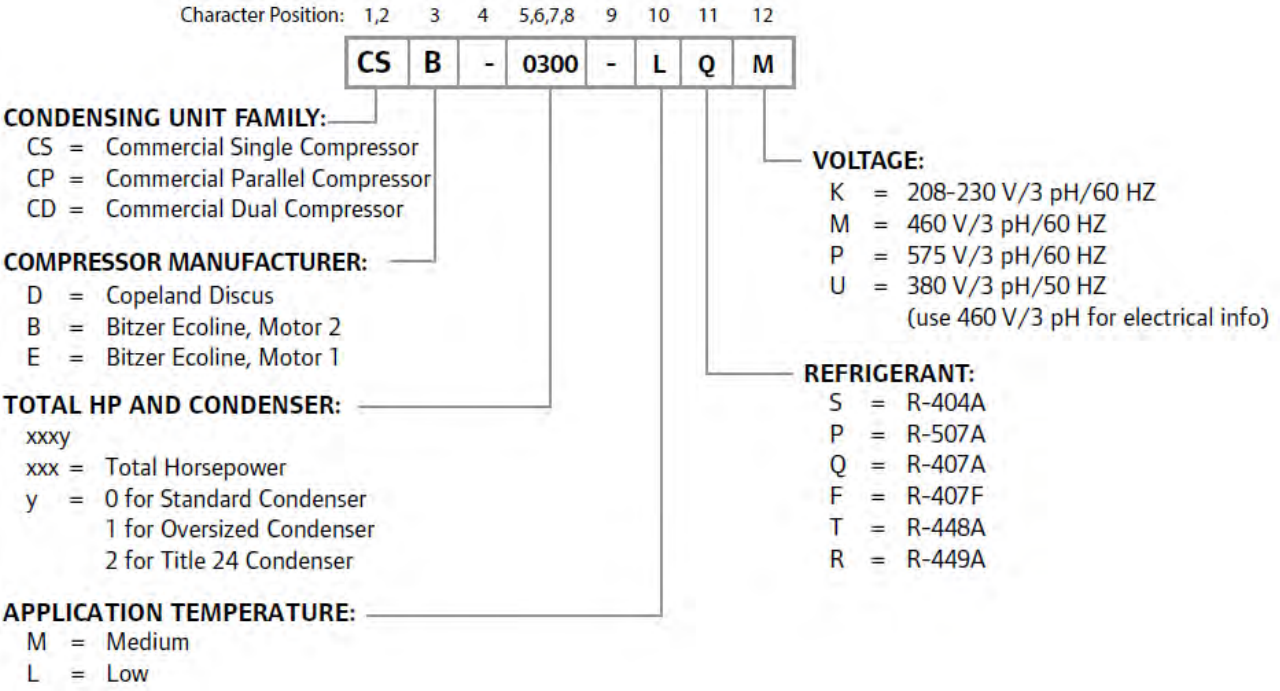
Use in other locations is limited to refrigerants permitted by country, state, or local laws and is the responsibility of the installer/end-user to ensure only permitted refrigerants are used.

This disclosure statement has been reviewed and approved by Hussmann and Hussmann attests, under penalty of perjury, that these statements are true and accurate.

TABLE OF CONTENTS

TABLES:

Commercial Large Condensing Unit Model Key



I. RECEIPT OF EQUIPMENT

A) DAMAGE CHECK

All equipment should be carefully checked for damage as soon as it is received. If any damage is evident, a notation must be made on the delivery receipt before it is signed, and claim should then be filed against the freight carrier.

B) CHECK VOLTAGE

Carefully check nameplate voltage and current characteristics to be sure unit is compatible with power supply.

C) HANDLING

Never hoist the unit from any point excepting the base lifting holes provided for this purpose. Lift with spreader and hooks as shown in Figure 1. When moving unit by forklift, lift from compressor end ONLY. Do not lift from condenser end.

D) LEVELING AND BOLT DOWN PROCEDURE

A solid level foundation should be provided for the unit large enough to accommodate the full length of the base rails. If the mounting location is not sturdy and perfectly level, place shims under low points before tightening down with hold-down bolts. Improper bolting-down procedure can seriously warp the framework, particularly with the large condenser fan units (3 fans or more).

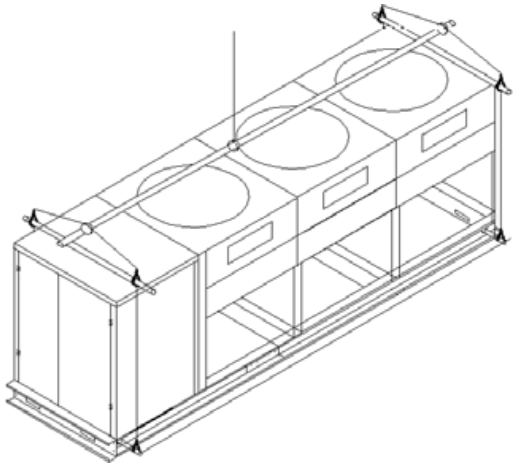


Figure 1.

E) UNIT LOCATION

Large air-cooled condensing units dissipate a tremendous amount of heat and require large volumes of air. Short-circuiting of the condenser air or restricting the free entry of air into the coil will result in reduced capacity and high-power consumption. Take care to reduce such negative operation effects by providing for unrestricted free airflow into and from the unit. At most, the unit should not be positioned to have no more than one of its sides positioned close to a vertical building side or wall. At that point, this should be a minimum of 3’ unit-to-wall free air clearance distance.

F) LOSS OF GAS HOLDING CHARGE

Each Condensing unit is evacuated to remove moisture, leak tested, and then shipped with a gas holding charge. Absence of this charge may indicate a leak has developed in transit. The system should not be charged with refrigerant until it is verified that there is no leak, or the source of the leak is located.

G) CHECK COMPRESSOR

The compressor is bolted to the base of the condensing unit using solid mounting techniques. Check the compressor mounting bolts. Tighten these bolts as much as possible to prevent excess vibration. Check electrical junction connections of the compressor; tighten only those that may have come loose during transit.

II. PIPING

1) REFRIGERATION PIPING

Use ACR grade copper tubing or conform otherwise to local and national codes. Piping methods must meet these codes and result in acceptable piping practice.

A) SUCTION LINE
Design and sizing of the suction line is critical to maintain:
1) Proper refrigerant velocity
2) Practical pressure drop (usually equivalent to 2 F maximum)
3) For proper oil return, all horizontal lines should be sloped downwards toward compressor at 1 inch per 10 feet.

Suction line risers must be trapped at the bottom of the rise and at every 20-foot increment for proper oil return. The proper balance is to design suction lines for approximately 1,200 ft. per min. velocity in risers and approximately 600 ft per min. velocity in horizontal lines. “P” traps should be installed at the bottom of all risers in suction lines for proper oil return.

Common suction line sizing that can be used with-but not instead of -ASHRAE- guidelines.

Suction lines should not be exposed to heat unless insulated. Insulation also prevents sweating and subsequent damage to goods.

B) LIQUID LINE
Avoid excessive liquid line pressure drop by using Table 1 and ASHRAE guidelines to size the liquid line. Install a liquid line solenoid valve at the evaporator.

On parallel compressor systems, if one compressor cycles off due to part load conditions, suction lines must be sized to allow for oil return under reduced load conditions.

2) LINE FABRICATION & SOLDERING

Copper pipe should be cut with a wheel type cutter and not with a hacksaw. Using a hacksaw produces copper filings that can cause problems if it gets into the system. Also, if the pipes to be used are not capped and perfectly clean, they should be cleaned with a clean lint free rag before fabrication into the system.

Soft solders should be avoided wherever possible, as in most cases they require the use of a flux. Most of the low temperature solder flux consists of heavy wax type materials which if allowed to enter the system cause excessive service problems in the form of wax at expansion valves which looks like moisture but cannot be removed by the average dryer core. Where silver brazing must be used between copper and brass or copper and steel joints, care should be taken to avoid excessive use of flux lest it be introduced into the system to create problems later. Easy-Flo or silver solders that contain sufficient silver content to still retain joint strength and yet require minimum use of flux are recommended here.

For copper-to-copper joints phos-copper solders with 4 to 15% silver content are recommended. No flux is required, and the resultant joints are of maximum strength without brittleness. Nitrogen should be used to exclude the oxygen within the pipes during soldering in order to prevent the creation of large quantities of copper oxide. Copper oxide is a good abrasive and if it gets into the compressor it can cause excessive wear and/or shorting out of electric motor windings.

3) LEAK TESTING

When all refrigeration connections have been completed, the entire system must be tested for leaks. With all valves in the system open, pressurize the system to no more than 175 PSIG with refrigerant and dry nitrogen. The use of an electronic type leak detector is highly recommended.

III. SYSTEM EVACUATION

CAUTION:

DO NOT use the compressor as a vacuum pump.
DO NOT start the compressor while it is in vacuum.

A two-stage vacuum pump is recommended if moisture is to be removed by evacuation. A single-stage pump will not remove moisture. An electronic vacuum gauge calibrated in microns is recommended for recording vacuum. Connect the vacuum meter to some point on the system, such as the purge connection on the condenser, so the actual vacuum is read rather than the vacuum at the vacuum pump. The pump should be connected to both the low- and high-pressure sides with copper tube or high vacuum hoses (1/2-inch I.D. minimum)

A vacuum of 500 microns and below is recommended to effectively remove moisture from the system. Close the valve at the pump and watch the gauge. If the system contains moisture or a leak is present the vacuum gauge will show a rise in pressure. When there is no visible rise in system pressure for 12 hours after the vacuum valve is shut off, evacuation is complete.

IV. ELECTRICAL

The power supply voltage, phase and frequency must match what is shown in the condensing unit data plate. All wiring must be carefully checked against the condensing unit wiring diagram.

V. CHARGING THE SYSTEM

Weigh the refrigerant cylinder before charging the system so an accurate record can be made of the amount of refrigerant put in the system. Refer to the condenser charge data shown on the next pages:

TABLE 1A & 1B
SINGLE COMPRESSOR
MEDIUM AND LOW TEMPERATURE REFRIGERANT CHARGES

SINGLE COMPRESSORS		CONDENSER CHARGE					
		R404A / R507A (pounds)		R448A/R449A (pounds)		R407A/R407F (pounds)	
Medium Temperature	Condenser	summer	winter	summer	winter	summer	winter
CS*-0100-M	LAVF-11310	6	25	6	26	7	27
CS*-0101-M	LAVF-12210	9	32	10	33	10	35
CS*-0102-M	LAVF-11410	8	33	8	34	9	36
CS*-0150-M	LAVF-12210	9	32	10	33	10	35
CS*-0151-M	LAVF-12310	13	48	14	50	14	52
CS*-0152-M	LAVF-12410	17	64	18	67	19	69
CS*-0200-M	LAVF-12210	9	32	10	33	10	35
CS*-0201-M	LAVF-12310	13	48	14	50	14	52
CS*-0202-M	LAVF-12410	17	64	18	67	19	69
CS*-0250-M	LAVF-12310	13	48	14	50	14	52
CS*-0251-M	LAVF-13310	18	72	19	75	20	78
CS*-0252-M	LAVF-12410	17	64	18	67	19	69
CS*-0300-M	LAVF-12312	13	48	14	50	14	52
CS*-0301-M	LAVF-13310	18	72	19	75	20	78
CS*-0302-M	LAVF-12410	17	64	18	67	19	69
CS*-0350-M	LAVF-13310	18	72	19	75	20	78
CS*-0351-M	LAVF-22310	26	96	28	100	29	104
CS*-0352-M	LAVF-13410	24	96	25	100	26	104
CS*-0400-M	LAVF-13310	18	72	19	75	20	78
CS*-0401-M	LAVF-22410	34	128	36	133	37	138

SINGLE COMPRESSORS		CONDENSER CHARGE					
		R404A / R507A (pounds)		R448A/R449A (pounds)		R407A/R407F (pounds)	
Low Temperature	Condenser	summer	winter	summer	winter	summer	winter
CS*-0150-L	LAVF-11410	8	33	8	34	9	36
CS*-0151-L	LAVF-12210	9	32	10	33	10	35
CS*-0220-L	LAVF-12210	9	32	10	33	10	35
CS*-0221-L	LAVF-12310	13	48	14	50	14	52
CS*-0222-L	LAVF-12410	17	64	18	67	19	69
CS*-0270-L	LAVF-12310	13	48	14	50	14	52
CS*-0271-L	LAVF-13210	13	48	14	50	14	52
CS*-0272-L	LAVF-12410	17	64	18	67	19	69
CS*-0300-L	LAVF-12310	13	48	14	50	14	52
CS*-0301-L	LAVF-13310	18	72	19	75	20	78
CS*-0302-L	LAVF-12410	17	64	18	67	19	69

TABLE 2A & 2B
DUAL COMPRESSOR
MEDIUM AND LOW TEMPERATURE REFRIGERANT CHARGES

DUALCOMPRESSORS		CONDENSER CHARGE					
		R404A / R507A (pounds)		R448A/R449A (pounds)		R407A/R407F (pounds)	
Medium Temperature	Condenser	summer	winter	summer	winter	summer	winter
CD-0100-M	LAVF-11210	4	17	4	18	4	18
CD-0101-M	LAVF-11410	8	33	8	34	9	36
CD-0150-M	LAVF-11410	8	33	8	34	9	36
CD-0151-M	LAVF-12210	9	32	10	33	10	35
CD-0160-M	LAVF-12210	9	32	10	33	10	35
CD-0161-M	LAVF-12310	13	48	14	50	14	52
CD-0162-M	LAVF-12410	17	64	18	67	19	69
CD-0180-M	LAVF-12210	9	32	10	33	10	35
CD-0181-M	LAVF-12410	17	64	18	67	19	69
CD-0200-M	LAVF-12310	13	48	14	50	14	52
CD-0201-M	LAVF-13310	18	72	19	75	20	78
CD-0202-M	LAVF-12410	17	64	18	67	19	69
CD-0240-M	LAVF-12410	17	64	18	67	19	69
CD-0241-M	LAVF-13310	18	72	19	75	20	78
CD-0300-M	LAVF-13310	18	72	19	75	20	78
CD-0301-M	LAVF-13410	24	96	25	100	26	104
CD-0400-M	LAVF-13310	18	72	19	75	20	78
CD-0401-M	LAVF-22310	26	96	28	100	29	104
CD-0402-M	LAVF-13410	24	96	25	100	26	104
CD-0500-M	LAVF-13410	24	96	25	100	26	104
CD-0501-M	LAVF-23310	36	144	38	150	40	156
CD-0600-M	LAVF-22410	34	128	36	133	37	138
CD-0601-M	LAVF-23310	36	144	38	150	40	156
CD-0700-M	LAVF-23310	36	144	38	150	40	156
CD-0701-M	LAVF-24310	48	192	51	200	53	207
CD-0702-M	LAVF-23410	48	192	51	200	53	207
CD-0800-M	LAVF-23410	48	192	51	200	53	207
CD-0801-M	LAVF-24410	64	254	68	264	70	274

DUALCOMPRESSORS		CONDENSER CHARGE					
		R404A / R507A (pounds)		R448A/R449A (pounds)		R407A/R407F (pounds)	
Low Temperature	Condenser	summer	winter	summer	winter	summer	winter
CD-0300-L	LAVF-12410	17	64	18	67	19	69
CD-0301-L	LAVF-13310	18	72	19	75	20	78
CD-0440-L	LAVF-13310	18	72	19	75	20	78
CD-0441-L	LAVF-13410	24	96	25	100	26	104
CD-0540-L	LAVF-13410	24	96	25	100	26	104
CD-0541-L	LAVF-22410	34	128	36	133	37	138
CD-0600-L	LAVF-22310	26	96	28	100	29	104
CD-0601-L	LAVF-23310	36	144	38	150	40	156
CD-0602-L	LAVF-22410	34	128	36	133	37	138

TABLE 3A & 3B
PARALLEL COMPRESSOR
MEDIUM AND LOW TEMPERATURE REFRIGERANT CHARGES

PARALLEL		CONDENSER CHARGE					
		R404A / R507A (pounds)		R448A/R449A (pounds)		R407A/R407F (pounds)	
Medium Temperature	Condenser	summer	winter	summer	winter	summer	winter
CP-0100-M	LAVF-11210	4	17	4	18	4	18
CP-0101-M	LAVF-11410	8	33	8	34	9	36
CP-0150-M	LAVF-11410	8	33	8	34	9	36
CP-0151-M	LAVF-12210	9	32	10	33	10	35
CP-0160-M	LAVF-12210	9	32	10	33	10	35
CP-0161-M	LAVF-12310	13	48	14	50	14	52
CP-0162-M	LAVF-12410	17	64	18	67	19	69
CP-0180-M	LAVF-12210	9	32	10	33	10	35
CP-0181-M	LAVF-12410	17	64	18	67	19	69
CP-0200-M	LAVF-12310	13	48	14	50	14	52
CP-0201-M	LAVF-13310	18	72	19	75	20	78
CP-0202-M	LAVF-12410	17	64	18	67	19	69
CP-0240-M	LAVF-12410	17	64	18	67	19	69
CP-0241-M	LAVF-13310	18	72	19	75	20	78
CP-0300-M	LAVF-13310	18	72	19	75	20	78
CP-0301-M	LAVF-13410	24	96	25	100	26	104
CP-0400-M	LAVF-13310	18	72	19	75	20	78
CP-0401-M	LAVF-22310	26	96	28	100	29	104
CP-0402-M	LAVF-13410	24	96	25	100	26	104
CP-0500-M	LAVF-13410	24	96	25	100	26	104
CP-0501-M	LAVF-23310	36	144	38	150	40	156
CP-0600-M	LAVF-22410	34	128	36	133	37	138
CP-0601-M	LAVF-23310	36	144	38	150	40	156
CP-0700-M	LAVF-23310	36	144	38	150	40	156
CP-0701-M	LAVF-24310	48	192	51	200	53	207
CP-0702-M	LAVF-23410	48	192	51	200	53	207
CP-0800-M	LAVF-23410	48	192	51	200	53	207
CP-0801-M	LAVF-24410	64	254	68	264	70	274

PARALLEL		CONDENSER CHARGE					
		R404A / R507A (pounds)		R404A / R507A (pounds)		R407A/R407F (pounds)	
LowTemp	Condenser	summer	winter	summer	winter	summer	winter
CP-0300-L	LAVF-12410	17	64	18	67	19	69
CP-0301-L	LAVF-13310	18	72	19	75	20	78
CP-0440-L	LAVF-13310	18	72	19	75	20	78
CP-0441-L	LAVF-13410	24	96	25	100	26	104
CP-0540-L	LAVF-13410	24	96	25	100	26	104
CP-0541-L	LAVF-22410	34	128	36	133	37	138
CP-0600-L	LAVF-22310	26	96	28	100	29	104
CP-0601-L	LAVF-23310	36	144	38	150	40	156
CP-0602-L	LAVF-22410	34	128	36	133	37	138

Connect the suction service gauge to the compressor suction service valve and the discharge service gauge to the receiver outlet port. The third hose from the charging manifold should be connected to the refrigerant cylinder.

CAUTION:

NEVER charge liquid refrigerant through the suction side of the system. When initially charging a system that is in a vacuum, liquid refrigerant can be directly added into the receiver until the system pressure equalizes with pressure in the refrigerant cylinder.

Start the system and finish charging until the sight glass is clear.

VI. OPERATION CHECKOUT

1) Check electrical connections, fan blade set screws and refrigerant connections. Be sure they are tight.
2) Check the low-pressure control setting. See Table 5 for proper setting.
3) With the system operating, check the supply voltage. It must be within +/- 10% of the voltage marked on the unit nameplate.
4) Check the room thermostat setting. Be sure it functions properly.
5) Check the compressor amp draw. It must not exceed the value on the unit data plate.
6) After the room temperature is reached, the expansion valve superheat must be checked. Too low suction superheat may cause liquid to return to the compressor. Too high suction superheat may cause excessive discharge temperatures. For maximum system capacity the minimum superheat must be 20 F and the maximum superheat must be 30 F to 40 F at the compressor for medium and low temperature, respectively.
7) After several hours of operation, check the compressor oil level. The oil level should be 1/2 the way up on the glass with the compressor off. Care must be taken to be sure the proper lubricant is used.
8) On freezer system after the coil is frosted, manually advance the defrost timer to initiate a defrost. Observe the defrost cycle to see if all controls are functioning properly and that the coil is clear of all frost before the system returns to refrigeration. Reset the defrost timer to the correct time of day.
9) After the room has reached temperature and the liquid line solenoid has closed, check the compressor to be sure it has pumped down and shut off. If the compressor continues to run, check the low-pressure control setting as outlined in Step #2.

VII. FEATURES AND CONTROLS

1) REFRIGERANT OIL

The oil level should be 1/2 the way up on the glass in the compressor with the compressor off. Oil level should be checked frequently during startup and during the first 48 hours of operating time. Since no dependable rule of thumb can be used, the only safe method is to carefully check the oil level and add as little oil as needed. If oil is required to be added, an oil pump is recommended to pump the oil directly into the compressor against suction pressure. Refrigerant oil should be purchased in sealed containers and should not be left open to atmosphere. Exposure to air and moisture for extended periods will result in contamination of the oil and cause harmful reactions in the compressor. Do not transfer oil from one container to another.

2) HIGH- AND LOW-PRESSURE CONTROLS

CS/CD/CP's are furnished with individual manual reset high-pressure and low-pressure controls. These are safety controls for the system. (See Table 5).

3) OIL FAILURE SWITCH

Each compressor on the Model CS/CP/CD unit has its own electronic oil pressure control. Should oil pump differential pressure, measured between the pump inlet and outlet, fall below 9 pig for a period of two minutes, the control will open and stop the compressor.

A trip of the oil pressure safety control is a warning that the compressor has been running without proper lubrication. Repeated trips of the control are a clear indication that something in the system requires immediate attention and corrective action.

If system is plagued with oil failure safety switch trip outs, it is almost always traceable to one of the following sources.

a) Shortage of oil in the compressor
b) Oil trapping in the system
c) Liquid slug back to the compressor for some reason.
d) Compressor short cycling
e) Refrigerant in the oil on startup
f) Malfunctioning oil pump
g) Clogged on the oil suction screen
h) Excessively low suction pressure
i) Possibly a defective control, but not probable
j) Low refrigerant charge in low ambient conditions

4) CRANKCASE HEATERS

Crankcase heaters are provided to reduce the possibility of refrigerant condensing in the crankcase oil.

> NOTE: The use of a crankcase heater installed on the compressor does not always assure that liquid refrigerant will not condense in the oil under severe weather conditions.

If the compressor is subjected to extremely low temperatures and the evaporator is in a relatively warm location, the temperature at the compressor may still drop below evaporator temperature in which case liquid refrigerant will condense in the oil.

5) ELECTRICAL POWER

Control voltage is 230/60/1 as standard.
All condensing units are factory tested for operation before leaving the plant and direction of rotation of all condenser fans are checked to see that they are the same. However, on installation, phase reversals may cause the fans to run backward. It's obvious that this can only be corrected in the field. On start-up, be sure to check that fan rotation is according to arrow decal on or near the fan blade. Airflow is up (vertical). Reversing of any two wires of the power supply to the condenser fan contactor will change the direction of the fan rotation.

6) CONDENSER FAN CYCLING

Condenser fan-cycling pressure controls are optional. The header-end fan(s) may not be cycled (must always run when the compressor is running).

See Table 6 for suggested pressure settings used on all multiple condenser fan systems.

7) LOW AMBIENT FLOODING CONTROLS ARE STANDARD

To obtain maximum energy efficiency, the ORI flooding valve should be field adjusted to allow the minimum condensing temperature permitted for the application in question, based on the compressor operating envelope. Due to variations in equipment designs and installations, the ORI flooding valve may need to be adjusted to a slightly higher pressure setting to achieve proper operation of the refrigeration system.

8) PUMPDOWN & RESET SWITCH

With toggle switch down in the reset and pump down position, the control circuit is reset, and the liquid line solenoid valve is de-energized. This allows the compressor to pump down on the low-pressure control.

With the toggle switch up in the run position, the liquid solenoid valve is energized and allows the system to cycle on the room thermostat.

VIII. NORMAL MAINTENANCE

1) Check compressor oil sight glass for proper level and check visible piping for oil spots, which may indicate a refrigerant leak.
2) Check liquid refrigerant sight glass for proper charge. If refrigerant must be added, use charging procedure outline in Section V.
3) Check inlet air side of condenser; surface should be free of foreign matter.

TABLE 4
RECOMMENDED LINE SIZES FOR R-404A and R-507

SYSTEM CAPACITY BTU/H	SUCTION LINE SIZE											
	SUCTION TEMPERATURE											
	+20° F Equivalent Suction Line Length				-20° F Equivalent Suction Line Length				Liquid Line Receiver to Expansion Valve			
	25'	50'	75'	100'	25'	50'	75'	100'	25'	50'	75'	100'
R-404A and R-507												
36,000	7/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1/2	1/2	1/2	1/2
42,000	1 1/8	1 1/8	1 1/8	1 3/8	1 1/8	1 3/8	1 3/8	1 5/8	1/2	1/2	1/2	1/2
48,000	1 1/8	1 1/8	1 3/8	1 3/8	1 1/8	1 3/8	1 3/8	1 5/8	1/2	1/2	1/2	5/8
54,000	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 3/8	1 5/8	1 5/8	1/2	1/2	1/2	5/8
60,000	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 3/8	1 5/8	1 5/8	1/2	1/2	5/8	5/8
66,000	1 1/8	1 3/8	1 3/8	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	1/2	1/2	5/8	5/8
72,000	1 1/8	1 3/8	1 3/8	1 5/8	1 3/8	1 5/8	1 5/8	1 5/8	1/2	5/8	5/8	5/8
78,000	1 1/8	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	5/8	5/8	5/8	5/8
84,000	1 1/8	1 3/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	2 1/8	5/8	5/8	5/8	5/8
90,000	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	1 5/8	2 1/8	2 1/8	5/8	5/8	5/8	7/8
120,000	1 3/8	1 5/8	1 5/8	2 1/8	1 5/8	2 1/8	2 1/8	2 1/8	5/8	5/8	7/8	7/8
150,000	1 5/8	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 5/8	5/8	7/8	7/8	7/8
180,000	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 5/8	2 5/8	7/8	7/8	7/8	7/8
210,000	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 5/8	2 5/8	2 5/8	7/8	7/8	7/8	7/8
240,000	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 5/8	2 5/8	2 5/8	7/8	7/8	1 1/8	1 1/8
300,000	2 1/8	2 1/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	3 1/8	7/8	1 1/8	1 1/8	1 1/8
360,000	2 1/8	2 1/8	2 5/8	2 5/8					1 1/8	1 1/8	1 1/8	1 3/8
480,000	2 1/8	2 5/8	2 5/8	3 1/8					1 1/8	1 1/8	1 3/8	1 3/8
600,000	2 5/8	2 5/8	3 1/8	3 1/8					1 1/8	1 3/8	1 3/8	1 5/8

Line sizes, which are shaded, indicate the maximum suction line size that may be used for a riser. In no case should the riser exceed the horizontal line size.

Properly placed suction traps must be used to insure proper oil return.

TABLE 5
LOW PRESSURE CONTROL SETTINGS

Minimum † Temperature	R-404A Max Cut In	Cut Out
50 F	85 Psig	40 Psig
40 F	70 Psig	35 Psig
30 F	50 Psig	30 Psig
20 F	40 Psig	20 Psig
10 F	30 Psig	10 Psig
0 F	25 Psig	5 Psig
-10 F	15 Psig	0 Psig
-20 F	10 Psig	0 Psig

† Temperature is the minimum ambient temperature at the condensing unit or the box design temperature, whichever is lower.

Example #1: 30 F minimum ambient, -20 F freezer. Use -20 F value from Table.
Example #2: -10 F minimum ambient, +35 F cooler. Use -10 F value from Table.

TABLE 6
FAN CYCLING CONTROL SETTINGS
(based on R-404A)

Total Number of Fans		Control Cut-In Settings PSIG		
Single Row	**Double Row**	**FCP-1**	**FCP-2**	**FCP-3**
2 (1 x 2)	4 (2 x 2)	220		
3 (1 x 3)	6 (2 x 3)	220	245	
4 (1 x 4)	8 (2 x 4)	220	245	265

Note: Settings based on 20 TD. Set cut out 35 psig below cut in. Fan(s) on header end to remain on at all times.

Use your QR reader to
reference current document
version on www.krack.com.

Krack, a Hussmann Corporation brand
1049 Lily Cache Lane, Unit A
Bolingbrook, Illinois 60440
Ph: 630.343.1022

www.krack.com

CSCDCPIO_031020