KRACK By HUSSMANN

EVOLVE A2L



Installation, Operation, and Service Manual

C-Series A2L

Large, High-Capacity Commercial and Industrial Condensing Unit

P/N 3247531 **Rev** B
November 2026

Refrigerant Type
A2L (R-454A or R-454C)

Certifications

c UL us LISTED

WARNINGS:

READ THE ENTIRE MANUAL BEFORE INSTALLING OR USING THIS EQUIPMENT.

If the information in these instructions are not followed exactly, a fire or explosion may result, causing property damage, personal injury, or death. Installation and service must be performed by a qualified installer or service agency.

This equipment uses a low flammability A2L as the refrigerant. If a refrigerant leak is present or even suspected, do not allow untrained personnel to attempt to find the cause. No open flames, cigarettes, or other possible sources of ignition should be used inside or in the vicinity of the equipment.

Equipment is for outdoor use only and limited to use in an altitude of 6,562 ft (2 km) or less.

FAILURE TO ABIDE BY THESE WARNINGS COULD RESULT IN AN EXPLOSION, DEATH, INJURY, AND PROPERTY DAMAGE.

We reserve the right to change or revise specifications and product design in connection with any feature of our products. Such changes do not entitle the buyer to corresponding changes, improvements, additions or replacements for equipment previously sold or shipped.

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Legal Disclaimer

Review all safety warnings on the case and in this manual before attempting start-up. Hussmann shall not be liable for any repair of replacement made without the written consent of Hussmann, or when the product is installed or operated in a manner contrary to the printed instructions covering installation and service which accompanied such product. Please note that failure to follow the instructions in this document may void your factory warranty.

As used herein, “appliance”, “unit”, and “equipment” each refer to C-Series A2L condensing units unless otherwise stated or contextualized and “system” means a set of things working together as parts of an interconnecting network.

Environmental Concerns

Hussmann recommends responsible handling of refrigerants. 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.

ANSI Z535.5 Definitions

The definitions below are used to clarify the magnitude and urgency of harm and damage, considering problems arising from misuse. Relative to their potential danger, the definitions are divided into five parts according to ANSI Z535 Series.



DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.



WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



NOTICE is used to address practices not related to personal injury.



SAFETY INSTRUCTIONS (or equivalent) signs indicate specific safety-related instructions or procedures.

Proposition 65



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.

Serial Label Location

The serial label is located on compressor side of the unit (on the doors at the end). Serial label contains all pertinent information such as model, serial number, amperage rating, and refrigerant information.

UL Listing

These condensing units are manufactured to meet ANSI / UL 60335-2-89 and CSA C22.2 standard requirements for safety. Proper installation is required to maintain this listing. This appliance is to be installed in accordance with the Safety Standard for Refrigeration Systems, ANSI/ASHRAE 15.

Federal / State Regulation

At the time they are manufactured, this equipment meets all federal and state/provincial regulations. Proper installation is required to ensure these standards are maintained.

Additional Important Labeling

The symbols below indicate specific types of information on the equipment.



DANGER—Indicates a risk of fire or explosion. Flammable refrigerant used. To be repaired only by trained service personnel. Do not puncture refrigerant tubing.



Grounding Connection Location

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SAFETY INSTRUCTIONS

General Safety Instructions

This manual was written in accordance with originally prescribed equipment that is subject to change. Hussmann reserves the right to change or revise specifications and product design in connection with any feature of our products.

Only qualified personnel should install and service this equipment. Personal Protection Equipment (PPE) is required. Wear safety glasses, gloves, protective boots or shoes, long pants, and a long-sleeve shirt when working with this equipment and while handling glass.



The safety of our customers and employees is paramount. The precautions and procedures described in this manual are intended as general methods for safe use of this equipment. Please be sure to comply with the precautions described in this manual to protect you and others from possible harm. Always follow OSHA standards for safety.

Observe the refrigerant type the equipment is designed to work with and any and all precautions on tags, stickers, labels and literature provided and referenced for this equipment. Use only Hussmann approved parts approved through the Hussmann Performance Parts Website. Verify that all repair parts are identical models to the ones they are replacing. Do not substitute parts such as motors, switches, relays, heaters, compressors, power supplies, or solenoids. Read all safety information regarding the safe handling of refrigerant and refrigerant oil, including the Material Safety Data Sheet. MSDS sheets can be obtained from your refrigerant supplier. Service is to be performed by factory-authorized service personnel, so as to minimize the risk of possible injury due to incorrect parts or improper service.

Contractors must strictly adhere to specifications provided by the Engineer of Record (EOR), as well as US EPA regulations, OSHA regulations, and all other federal, state, and local codes. There are numerous hazards, not limited to, but including: burns due to high temperatures or refrigerant flammability, high pressures, toxic substances, electrical arcs and shocks, very heavy equipment with specific lift points and structural constraints, public safety, noise, and possible environmental damage.

WARNING—READ ENTIRE MANUAL BEFORE ATTEMPTING TO SERVICE THIS PRODUCT. ALL SAFETY PRECAUTIONS MUST BE FOLLOWED. ALL WARNINGS MUST BE UNDERSTOOD BEFORE INSTALLATION OR USE.

⚠ DANGER



A2L FLAMMABLE REFRIGERANT USED

- A2L refrigerant is flammable. Units that are configured to use A2L refrigerants require special attention. No open flames, cigarettes, or other possible sources of ignition should be used inside or in the vicinity of units containing flammable refrigerants.
- Failure to follow instructions can result in an explosion, death, injury and property damage.

⚠ WARNING

THIS REFRIGERATION EQUIPMENT WAS MANUFACTURED FOR USE WITH A2L LOWER FLAMMABILITY REFRIGERANTS. INSTALLATION AND SERVICE MUST ONLY BE PERFORMED BY A QUALIFIED SERVICE PROVIDER. FAILURE TO ABIDE BY THIS WARNING COULD RESULT IN AN EXPLOSION, DEATH, INJURY AND PROPERTY DAMAGE

- WARNING—Risk of fire or explosion—Flammable refrigerant used. To be repaired only by trained service personnel. Do not puncture refrigerant tubing.
- WARNING—Risk of fire—Dispose of properly in accordance with federal or local regulations. Flammable refrigerant used.
- WARNING—Risk of fire—Flammable refrigerant used. Consult repair manual/owner's guide before attempting to service this product. All safety precautions must be followed.
- WARNING—Risk of fire due to flammable refrigerant used—Follow handling instructions carefully in compliance with national regulations.
- WARNING—Risk of fire or explosion—Store in a well ventilated room without continuously operating flames or other potential ignition.
- WARNING—Risk of fire or explosion—Auxiliary devices which may be ignition sources shall not be installed in the ductwork, other than auxiliary devices listed for use with the specific appliance. See instructions.
- WARNING—In order to reduce flammability hazards the installation of this appliance must only be carried out by a suitably qualified person.
- WARNING—Risk of fire or explosion—Dispose of properly in accordance with federal or local regulations. Flammable refrigerant used.
- WARNING—Do not damage the refrigerating circuit.
- WARNING—Do not use mechanical devices or other means to accelerate the defrosting process, other than those recommended by the manufacturer.
- WARNING: Keep clear of obstruction, all ventilation openings in the appliance enclosure or in the structure for building-in.
- A2L refrigerants are denser than air.
- If a refrigerant leak is present or suspected, do not allow untrained personnel to attempt to find the cause.
- A refrigerant leak must be repaired by a qualified service technician.

⚠WARNING

- No open flames, cigarettes, or other possible sources of ignition should be used near the equipment or its installation location until a qualified service technician and/or local fire department determines that all refrigerant has been cleared from the area and from the refrigeration systems.
- Do not bypass safety shut-off valves located in the refrigeration system.
- The appliance shall not be installed indoors.
- All servicing of this appliance shall be performed only as recommended in this manual.
- This appliance shall only be connected to another appliance suitable for the same refrigerant.
- Installation and service must be performed by a qualified installer or service agency only as recommended by the manufacturer. Do not use any means to clean or service other than those recommended by the manufacturer.
- Contractors must 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 must only be done by qualified, licensed contractors.
- Installation and use of this appliance includes 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.
- Do not store items or flammable materials atop the unit. Do not walk or climb on unit.
- Do not store explosive substances, such as aerosol cans with flammable propellant, in this appliance.
- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Children should be supervised to ensure that they do not play with the appliance.
- Piping in refrigeration systems shall be so designed and installed to minimize the likelihood of hydraulic shock damaging the system. Solenoid valves shall be correctly positioned in the piping to avoid hydraulic shock.
- Factory installed refrigerant sensors or detectors shall not be disconnected.
- If a leak is present or even suspected, do not allow untrained personnel to attempt to find the cause.
- A hand-held leak detector (“sniffer”) will be used before any repair and/or maintenance.
- Do not use any means to clean, other than those recommended by the manufacturer.
- Do not pierce or burn.
- Be aware that refrigerants may not contain an odour.
- Protection devices, piping, and fittings shall be protected as far as possible against adverse environmental effects, for example, the danger of water collecting and freezing in relief pipes or the accumulation of dirt and debris.
- Piping material, pipe routing, and installation shall include protection from physical damage in operation and service, and be in compliance with national and local codes and standards, such as ANSI/ASHRAE 15, IAPMO Uniform Mechanical Code, ICC International Mechanical Code, or CSA B52. All field joints shall be accessible for inspection prior to being covered or enclosed.

⚠WARNING

- Always use a pressure regulator when operating nitrogen tanks.
- The installation of pipe-work shall be kept to a minimum.
- Provision shall be made for expansion and contraction of long runs of piping.
- Flexible pipe elements shall be protected against mechanical damage, excessive stress by torsion, or other forces, and that they should be checked for mechanical damage annually.
- After completion of field piping for split systems, the field pipework shall be pressure tested with an inert gas and then vacuum tested prior to refrigerant charging, according to the following requirements as detailed by UL safety standard. Pressures may come from unit data label or from customer specification.

1. The minimum test pressure for the low side of the system shall be the low side design pressure and the minimum test pressure for the high side of the system shall be the high side design pressure, unless the high side of the system cannot be isolated from the low side of the system in which case the entire system shall be pressure tested to the low side design pressure.
2. The test pressure after removal of pressure source shall be maintained for at least 1 h with no decrease of pressure indicated by the test gauge, with test gauge resolution not exceeding 5 % of the test pressure.
3. During the evacuation test, after achieving a vacuum level specified in the manual or less, the refrigeration system shall be isolated from the vacuum pump and the pressure shall not rise above 1,500 microns within 10 min. The vacuum pressure level shall be specified in the manual, and shall be the lessor of 500 microns or the value required for compliance with national and local codes and standards, which may vary between residential, commercial, and industrial buildings.

- Mechanical connections made in accordance shall be accessible for maintenance purposes.
- 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 doors, lights, fans, heaters, and thermostats.
- Means for disconnection must be incorporated in the fixed wiring in accordance with the wiring rules.
- Unit must be grounded. All wiring must be in compliance with NEC and local codes.
- 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.
- Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges, or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans..
- Particular attention shall be paid to ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected. This shall include damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.
- Ensure that seals or sealing materials have not degraded to the point that they no longer serve the purpose of preventing the ingress of flammable atmospheres. Replacement parts shall be in accordance with the manufacturer’s specifications.
- During repairs to sealed components, all electrical supplies shall be disconnected from the equipment being worked upon prior to any removal of sealed covers, etc. If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.

⚠WARNING

- Component parts are designed for use with flammable refrigerants and are non-incendive and non-sparking. To minimize the risk of possible ignition due to incorrect parts, component parts shall only be replaced with identical repair parts. Servicing must be done by qualified service personnel only, so as to minimize the risk of possible damage due to incorrect parts or improper service.
- Intrinsically safe components are the only types that can be worked on while live in the presence of a flammable atmosphere. The test apparatus shall be at the correct rating.
- Replace components only with parts specified by the manufacturer. Other parts can result in the ignition of refrigerant in the atmosphere from a leak.
- If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.
- Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that this will not exceed the permissible voltage and current permitted for the equipment in use.
- Ducts connected to an appliance shall not contain a potential ignition source.
- Be careful when moving or lifting unit. Serious bodily injury or death could occur from falling equipment.
- Precautions shall be taken to avoid excessive vibration or pulsation of the refrigerant piping.
- Any insulation shall be suitable for use with the material being insulated.
- Ensure that the apparatus is mounted securely. Do not use adhesives to fix the unit in place, since they are not considered to be a reliable fixing means.
- Any pressure-relief devices and fusible plugs shall discharge to the atmosphere at a location not less than 15 ft (4.57 m) above the adjoining ground level and not less than 20 ft (6.1 m) from any window, ventilation opening, or exit in any building.
- Refrigerant circuit access ports located outdoors shall be secured to prevent unauthorized access.

FAILURE TO ABIDE BY THESE WARNINGS COULD RESULT IN AN EXPLOSION, DEATH, INJURY, AND PROPERTY DAMAGE. READ ALL WARNINGS PRIOR TO INSTALLING, PERFORMING MAINTENANCE, OR SERVICING THE EQUIPMENT IN ANY WAY.

Before Working with A2L Refrigerant

Safety Checks

- Prior to beginning work on systems containing FLAMMABLE REFRIGERANTS, safety checks are necessary to ensure that the risk of ignition is minimized.
- Work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed.
- All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.
- The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e., non-sparking, adequately sealed, or intrinsically safe.
- If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available on hand. A dry chemical or CO_2 fire extinguisher should be adjacent to the charging area.
- No person carrying out work in relation to a REFRIGERATING SYSTEM which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment shall be surveyed to make sure that there are no flammable hazards or ignition risks. “No Smoking” signs shall be displayed.
- Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.
- Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times, the manufacturer’s maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer’s technical department for assistance.
- The following checks shall be applied to installations using FLAMMABLE REFRIGERANTS:
  a. The actual REFRIGERANT CHARGE is in accordance with the room size within which the refrigerant containing parts are installed.
  b. The ventilation machinery and outlets are operating adequately and are not obstructed.
  c. If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant.
  d. Marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected.
  e. Refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

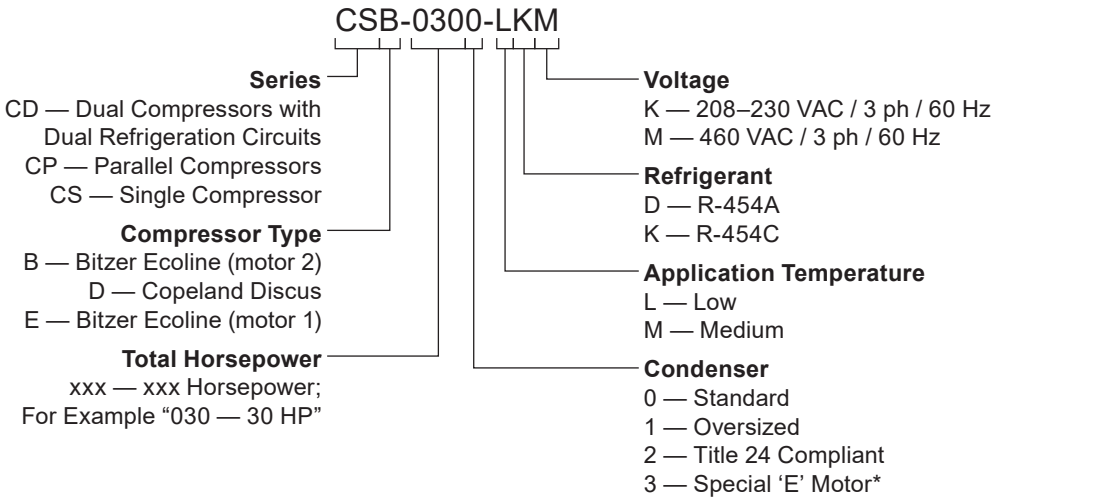
Equipment Labeling

The type of refrigerant to be used is prominently displayed on the serial label. All equipment includes complete wiring diagrams. All wiring is color coded.

Model Identification

Model Nomenclature

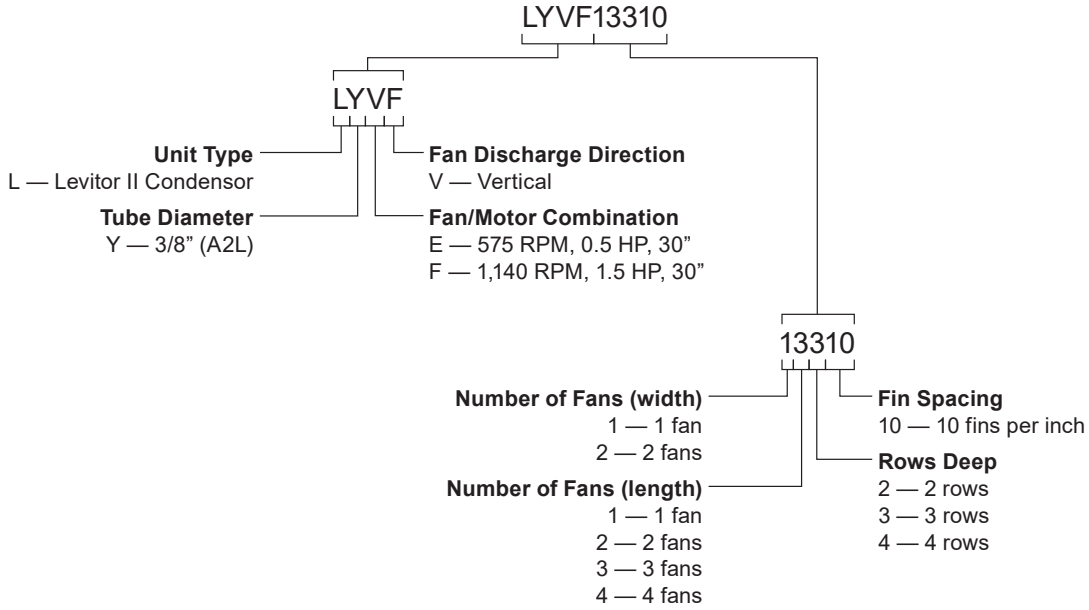
The nomenclature of a typical configuration is shown below, but not all variables are fully defined here. Please contact Krack for more details If interested in non-standard configurations.



*Low temperature CS-A2L and CP-A2L only

Condenser Identification

Models with Standard (0), Oversized (1), and Title 24 Compliant (2) identifiers in the C-Series A2L model number will use an LYVF style condenser, while models with Special ‘E’ Motor (3) identifier will use an LYVE style condenser. The condenser number shown in the specification tables in this document represents the specific condenser model. For example, CDB-0300-MDM would use condenser LYVF13310 based on the Standard (0) identifier and the condenser number 13310. The first two numbers of the condenser number are also used in the unit size ID to show the number of fan rows and number of fans in each row.



Model Size ID

The physical size ID callouts for units combine the series of unit that appears at the beginning of the unit part number (e.g., CD) with the number fan rows and fans per row (i.e., 22, meaning 2 rows of fans with 2 fans in the row). Number of fan rows and number of fans in a row are also the fist two numbers of the displayed condenser number shown in each model's specification section for size reference.

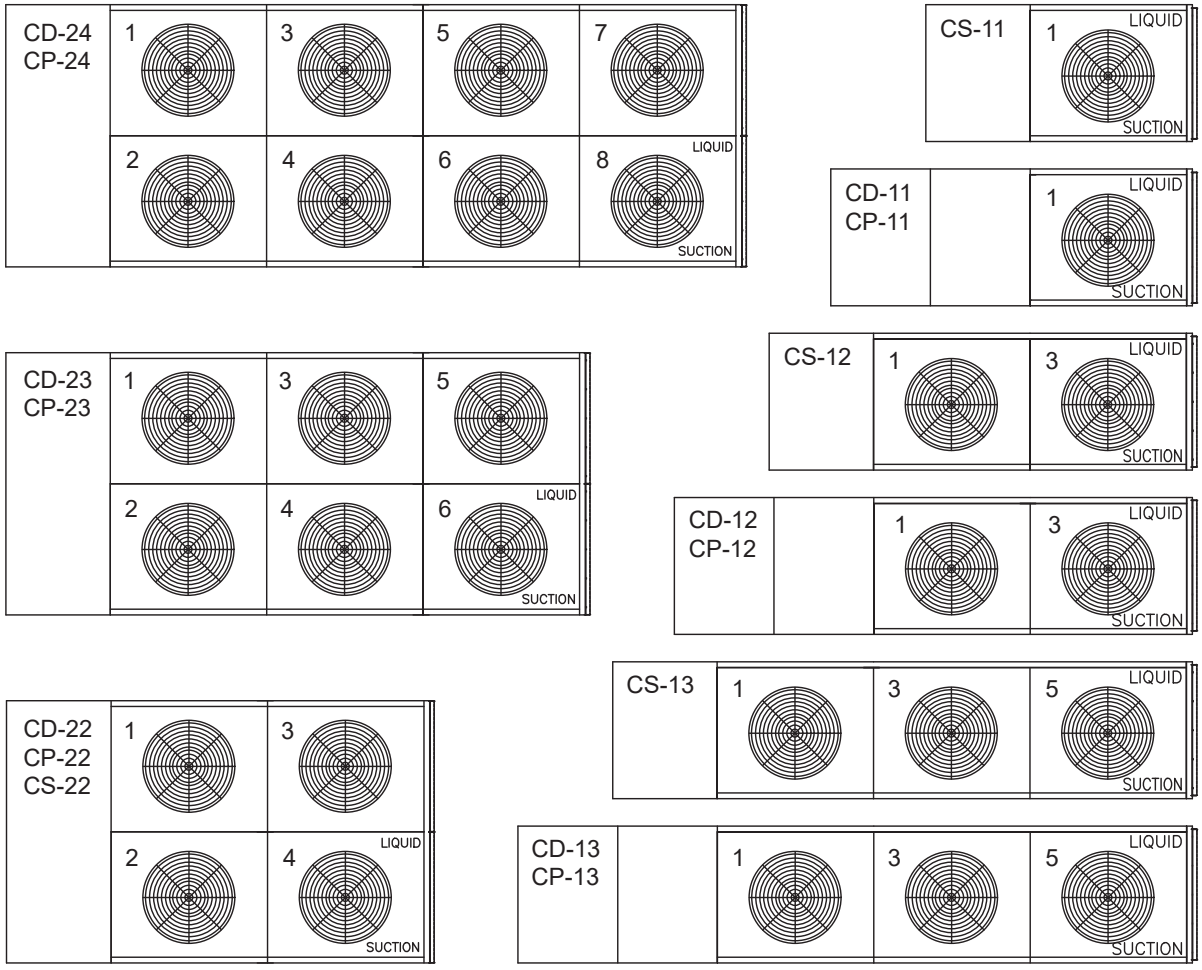
CD-22

Series
CD — Dual Compressors with Dual Refrigeration Circuits
CP — Parallel Compressors
CS — Single Compressor

Number of Fans in Each Row
1 — 1 Fan per Row
2 — 2 Fans per Row
3 — 3 Fans per Row
4 — 4 Fans per Row

Number of Fan Rows
1 — 1 Row of Fans
2 — 2 Rows of Fans

Unit Layout



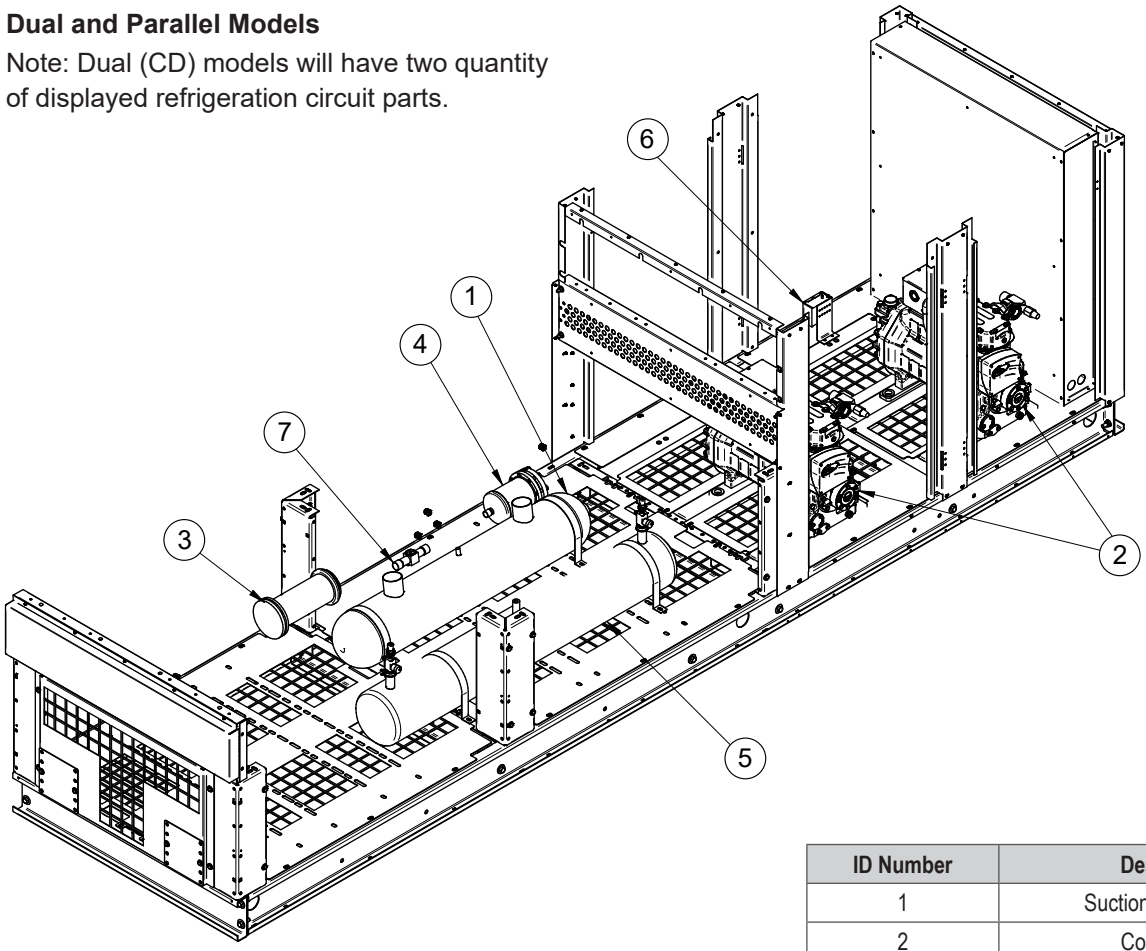
Krack/Hussmann Product Control

Serial number and shipping date of all equipment is recorded in Hussmann's files for warranty and replacement part purposes. All correspondence pertaining to warranty or parts ordering must include the serial number of each piece of equipment involved. This is to ensure the customer is provided with the correct parts.

Component Views

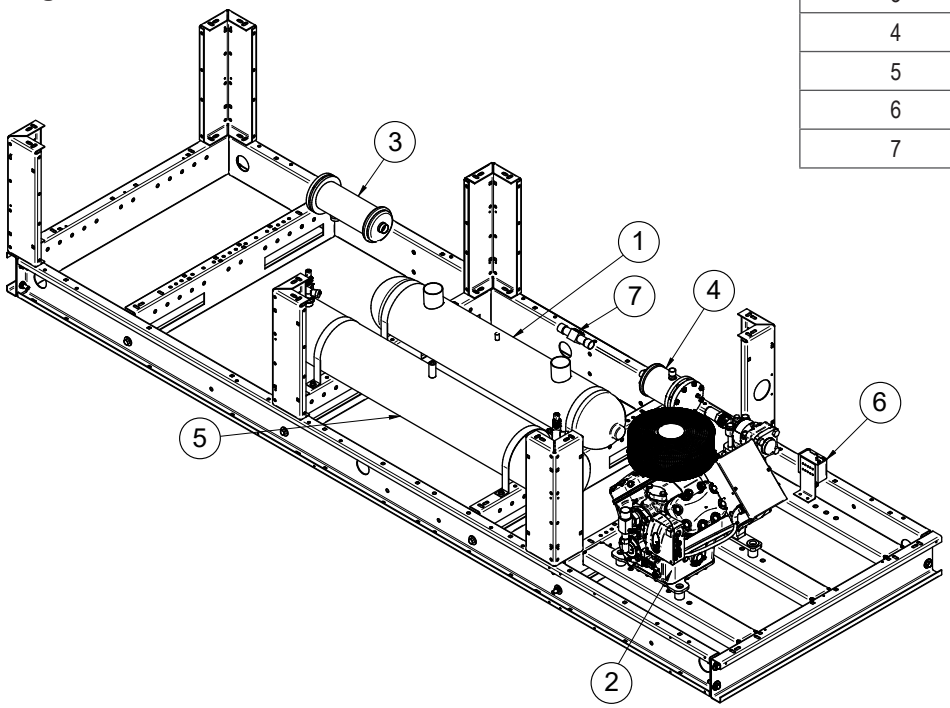
Dual and Parallel Models

Note: Dual (CD) models will have two quantity of displayed refrigeration circuit parts.



ID Number	Description
1	Suction Accumulator
2	Compressor
3	Suction Filter
4	Liquid Filter Drier
5	Receiver
6	Low Pressure Control
7	Sight Glass

Single Models



Equipment Inspection / Shipping Damage

Upon delivery of the equipment, verify that the correct equipment has been received by comparing the information on the equipment serial label with the ordering and submittal documents. All equipment should be thoroughly examined for shipping damage before and during unloading. Equipment has been carefully inspected at our factory prior to shipment. Any claim for loss or damage must be made to the carrier. The carrier will provide any necessary inspection reports and/or claim forms.

The refrigeration coil section of each C-Series is leak tested, evacuated to remove moisture, and then shipped with a pressurized nitrogen 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 and repaired if necessary.

The compressor is bolted to the base of the condensing unit. Check the compressor mounting bolts and ensure these bolts are tightened to 490 ft-lb (664 Nm) of torque to prevent excess vibration. Also check electrical connections of the compressor and re-tighten only those that have come loose during transit.

Apparent Loss or Damage

If there is an obvious loss or damage, it must be noted on the freight bill or express receipt and signed by the carrier's agent; otherwise, carrier may refuse claim.

Concealed Loss or Damage

When loss or damage is not apparent until after equipment is uncrated, retain all packing materials and submit a written response to the carrier for inspection within 15 days.

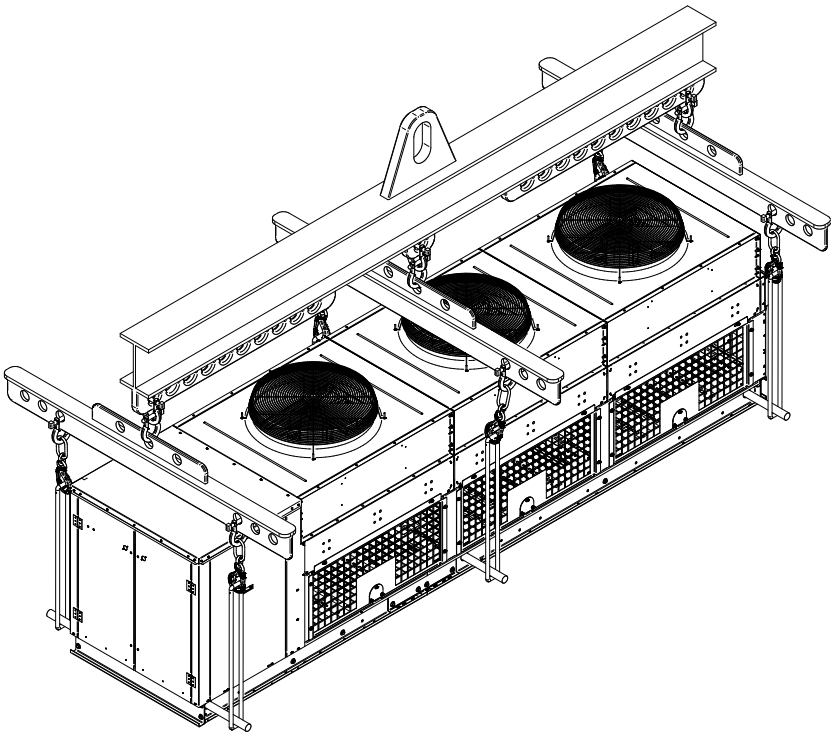
Installation Information

Equipment Handling

Under no circumstances should the manifolds, piping return, or control panel be used for lifting or moving the unit. Secure lifting hooks to the underside of the base. Never hoist the unit from any point except the base lifting holes provided for this purpose. Lift with spreader and hooks as shown. If necessary to move the unit by forklift for final placement, lift from compressor end only—do not lift from condenser end.

The installer is responsible to see that equipment used to move the unit is operated within its limits. Maximum weight for each configuration is shown. Exact weight by unit model can be found in the unit datasheet if needed.

Unit Configuration	Maximum Approximate Weight lb (kg)
CD-11	up to 1,960 (889)
CD-12	up to 2,920 (1,324)
CD-13	up to 3,826 (1,736)
CD-22	up to 4,175 (1,894)
CD-23	up to 5,346 (2,425)
CD-24	up to 6,411 (2,908)
CP-11	up to 2,005 (909)
CP-12	up to 2,965 (1,345)
CP-13	up to 3,809 (1,728)
CP-22	up to 4,182 (1,897)
CP-23	up to 5,462 (2,477)
CP-24	up to 6,332 (2,872)
CS-11	up to 1,739 (789)
CS-12	up to 2,399 (1,088)
CS-13	up to 3,165 (1,436)
CS-22	up to 3,672 (1,665)



Exterior Loading

Do NOT walk on top of the equipment or damage to the equipment and serious personal injury could occur. Equipment is not structurally designed to support external loading.

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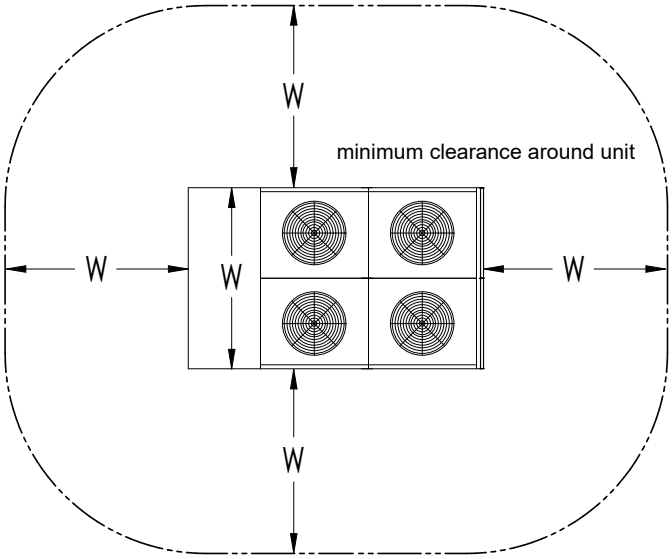
Installation Information

Location

Units require adequate space to allow unrestricted ambient airflow into and out of the fan section. There should be nothing directly covering the top of the unit (or the fan side for a horizontal discharge unit) and the unit should have a distance equal to the unit width clear on any side (as depicted below, applicable to walls, fences, and any other barrier type as well as another unit). Fences must be at least 50% open. The distances shown should be increased whenever possible. No more than one side of the unit should be adjacent to a building wall or similar large structure to prevent airflow restriction.

The equipment's position relative to the prevailing winds should be considered where necessary. Higher than expected head pressures will result in poor system performance if the suggested distances are not used.

Note: "W" below equals the total width of the unit. CX-22 configuration model shown for reference.



Unit should be located away from heated air exhausts, steam vents, or corrosive airflow whether it comes from the job site or from another nearby source. A corrosive atmosphere will require an appropriate coil coating or copper fins to protect the coil and extend the life of the unit.

Equipment must be located in a dedicated operating area to provide enough working space for service personnel and meet applicable electrical codes. Check national and local codes for requirements before installation. If this product is enclosed within a penthouse, lean-to, or other open structure, natural or mechanical ventilation must be provided.

A solid, level foundation must be provided for the unit. It must be large enough to accommodate the full length of the base rails. The floor must solidly support the unit as a live load. Ground level installation seldom presents problems, but a mezzanine installation must be carefully engineered. A concrete base must be built on the mezzanine floor to keep mechanical vibrations and noise to an acceptable level.

Refrigerant circuit access ports located outdoors shall be secured to prevent unauthorized access. Units of any kind shall not be installed within 20 ft (6.1 m) of any building opening.

Required spacing is site specific. It is the installer's responsibility to check local codes and standards.

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Installation Information

Unit Mounting

Caution: Improper torquing procedure can warp the framework, particularly with the larger condenser fan units (3 fans or more).

If the mounting location is not sturdy and perfectly level, place shims under low points before tightening down with hold-down bolts. Hard mounting is standard on all units.

All piping was carefully design to absorb the vibration that is generated by the compressor and fan motors. When setting the unit, plan in relation to the rest of the equipment to be installed and existing structures. Some minimum and maximum distances are listed in the 'Location' section and must be observed.

Note: Piping equivalent is not the same as linear distance.

It is the responsibility of the installing contractor to ensure that final installation meets all applicable code requirements.

Receiver Capacity

Receiver capacity data is listed at 90% full and 90° F (32.2 °C).

Receiver Size	Refrigerant	
	R-454A	R-454C
8 5/8" x 28" (219 mm x 711 mm)	42 lb (19.1 kg)	43 lb (19.5 kg)
8 5/8" x 48" (219 mm x 1.22 m)	74 lb (33.6 kg)	75 lb (34 kg)
8 5/8" x 60" (219 mm x 1.52 m)	92 lb (41.7 kg)	94 lb (42.6 kg)
10 3/4" x 48" (273 mm x 1.22 m)	112 lb (50.8 kg)	114 lb (51.7 kg)
10 3/4" x 72" (273 mm x 1.83 m)	171 lb (77.6 kg)	175 lb (79.4 kg)
10 3/4" x 96" (273 mm x 2.44 m)	229 lb (103.9 kg)	234 lb (106.1 kg)
10 3/4" x 108" (273 mm x 2.74 m)	258 lb (117 kg)	264 lb (119.7 kg)
10 3/4" x 144" (273 mm x 3.66 m)	340 lb (154.2 kg)	348 lb (157.9 kg)

Electrical Information

Equipment requires a dedicated electrical circuit(s) with ground. Consult equipment datasheet for additional electrical specifications. Always use a dedicated circuit with the amperage stated on the equipment. Do not overload the circuit. Refer to the serial label located on the control panel to determine wire size (MCA) and over-current protection (MOPD). If in doubt, consult an electrician.

It is necessary to allow for disconnection of the appliance from the supply power after installation. Disconnect power before servicing any equipment. If the C-Series is equipped with an electrical power disconnect switch, ensure the switch is locked in the "OFF" position before any electrical work is performed to the unit.

Special Fan Considerations

Fan motors operating at higher elevations will draw lower than rated amps, as well as draw a less effective air volume across the coil surface. This is due to the reduced density of the higher altitude air resulting in higher compressor discharge pressure along with reduced unit capacity. Consult factory if you suspect this situation.

Condensing units are factory-tested for operation (including correct fan rotation direction) before shipping. However, phase reversals may cause the fans to run backward.

Field Wiring

WARNING: All power supplied to the equipment must be shut off before opening any compartments, cleaning, or performing maintenance.

WARNING: Always check the serial label or datasheet for component voltage and amperes.

Components are wired as completely as possible at the factory with all work completed in accordance with the National Electrical Code (NEC). All deviations required by governing electric codes will be the responsibility of the installer. All wiring must be in compliance with governing electrical codes.

Field wiring must be sized for component amperes stamped on the serial label. Main lugs in the compressor control panel are sized for copper wire only. Actual ampere draw may be less than specified. Based on the full load amps of the system, select the largest connectible wire size based on NFPA 70® (NEC) and local codes.

Electrical Connections

All wiring must be in compliance with NEC and local codes. The power supply voltage, phase, and frequency must match what is shown on the unit data label. Motor voltage, horsepower, and full load amps (F.L.A.) can also be found on the main serial label. All electrical connections are to be made at a terminal block, in the electrical wireway, or in a handy box. The equipment must be properly grounded and should only be worked on by a qualified technician/electrician.

Any field-supplied connectors must be UL compliant for the intended application, including compliance in relation to potential hazards presented by flammable refrigerants, and follow all other applicable codes including NEC.

Unit Cooler Fan Wiring

Unit cooler fan should be wired from the condensing unit panel (or an outside panel for off-time defrost if needed).

Evaporator Mounted Liquid Line Solenoid

Power for a liquid line solenoid can be picked up from the fan circuit.

Cooler Door Switch Wiring

The switch must be mounted to the cooler door frame and must be wired to control the field-installed liquid line solenoid and evaporator fans. Door switches are wired in series.

Other Controls

The basic defrost circuits are shown on the wiring diagrams in this manual. When other controls are used, refer to the manual included with that control.

Wiring Diagrams

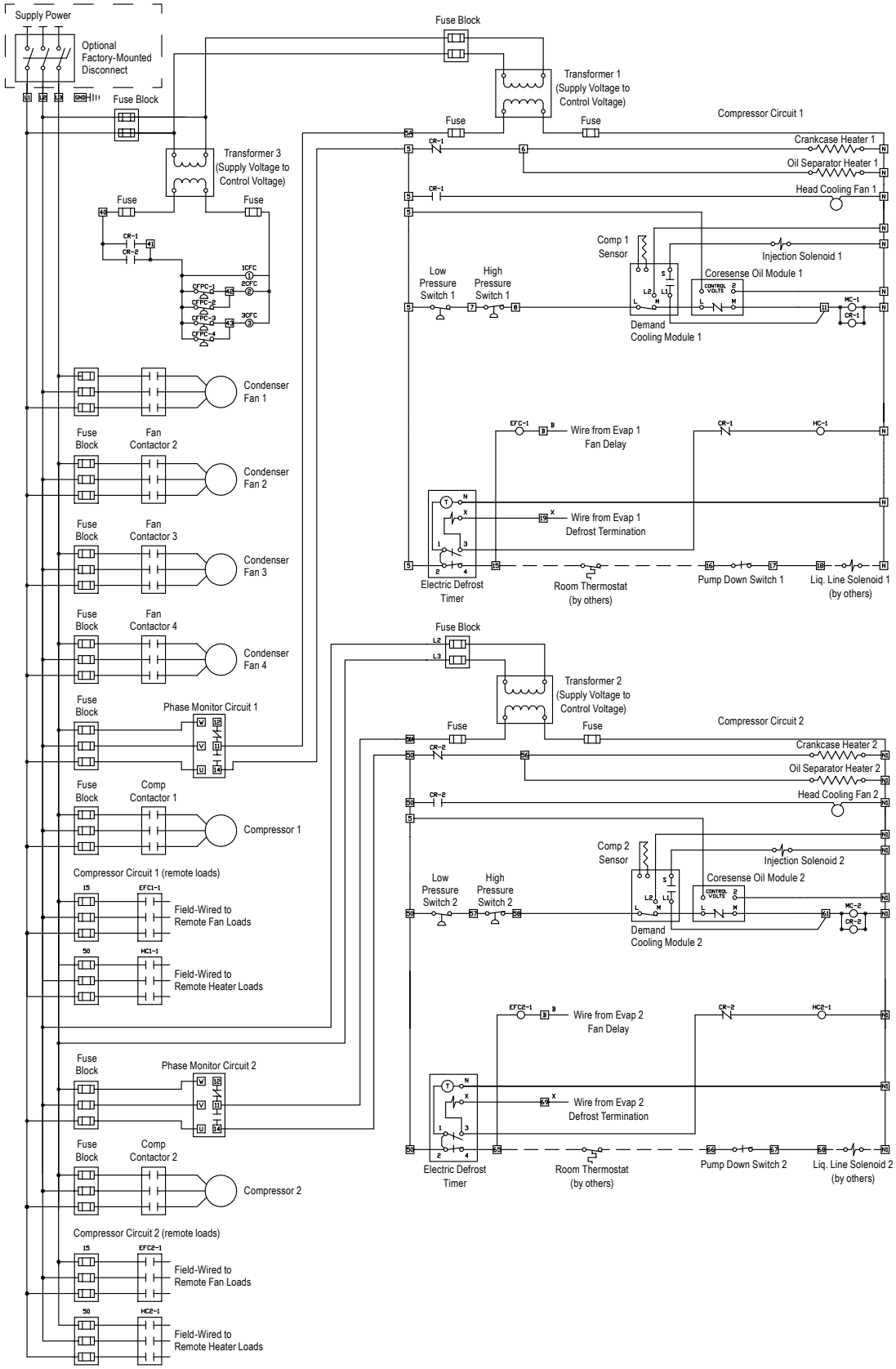
Example diagrams are provided, but do not represent every possible option. Examples show optional equipment such as Copeland compressor(s), unloader, demand cooling, oil separator, 115 VAC control circuit, etc., in some cases. Always consult the wiring diagrams provided with the equipment being worked on for the most accurate information.

Equipment-specific wiring diagrams are included with the equipment from the factory and must remain with the unit after installation for future use—do not discard.

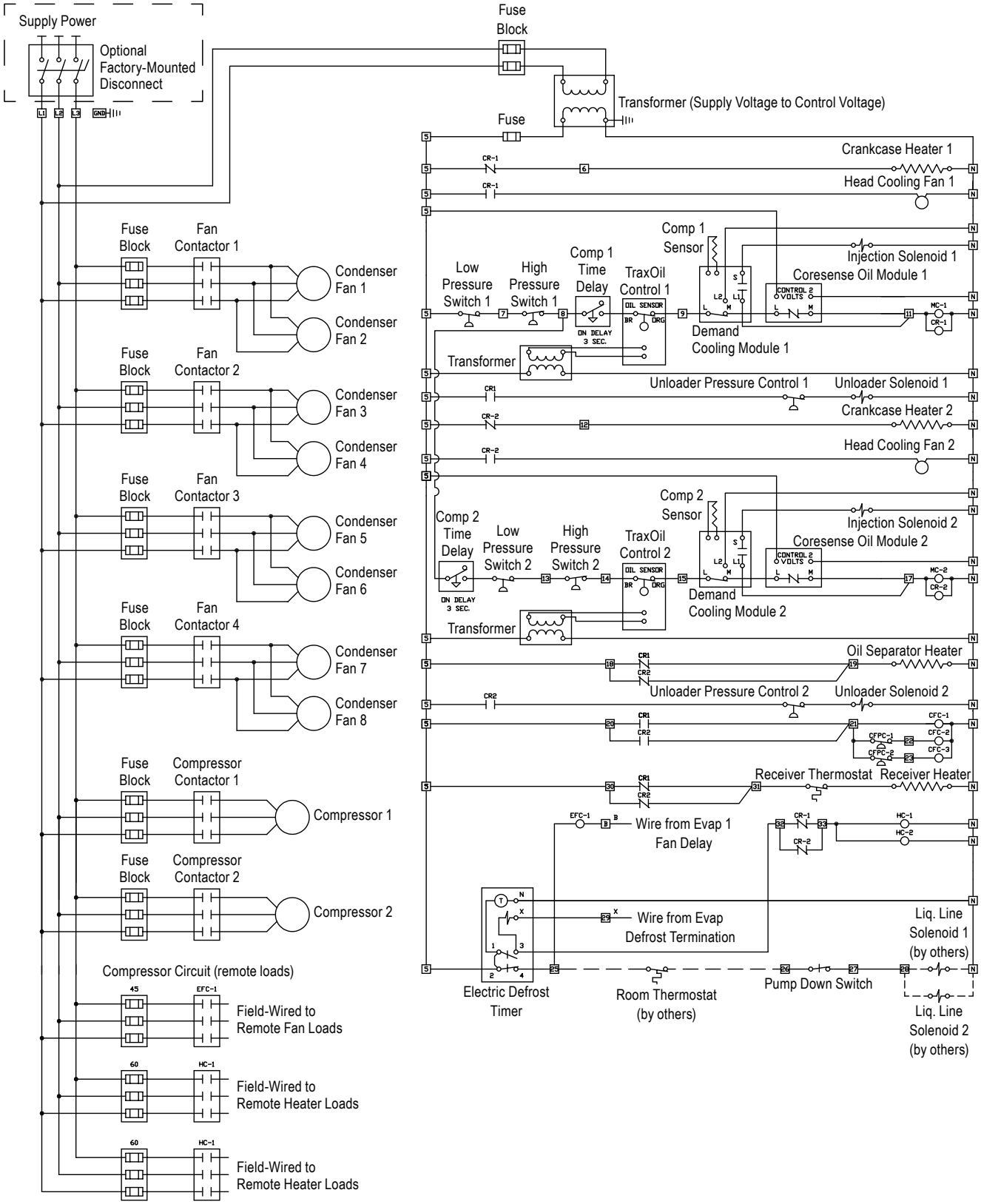
C-Series A2L

Installation Information

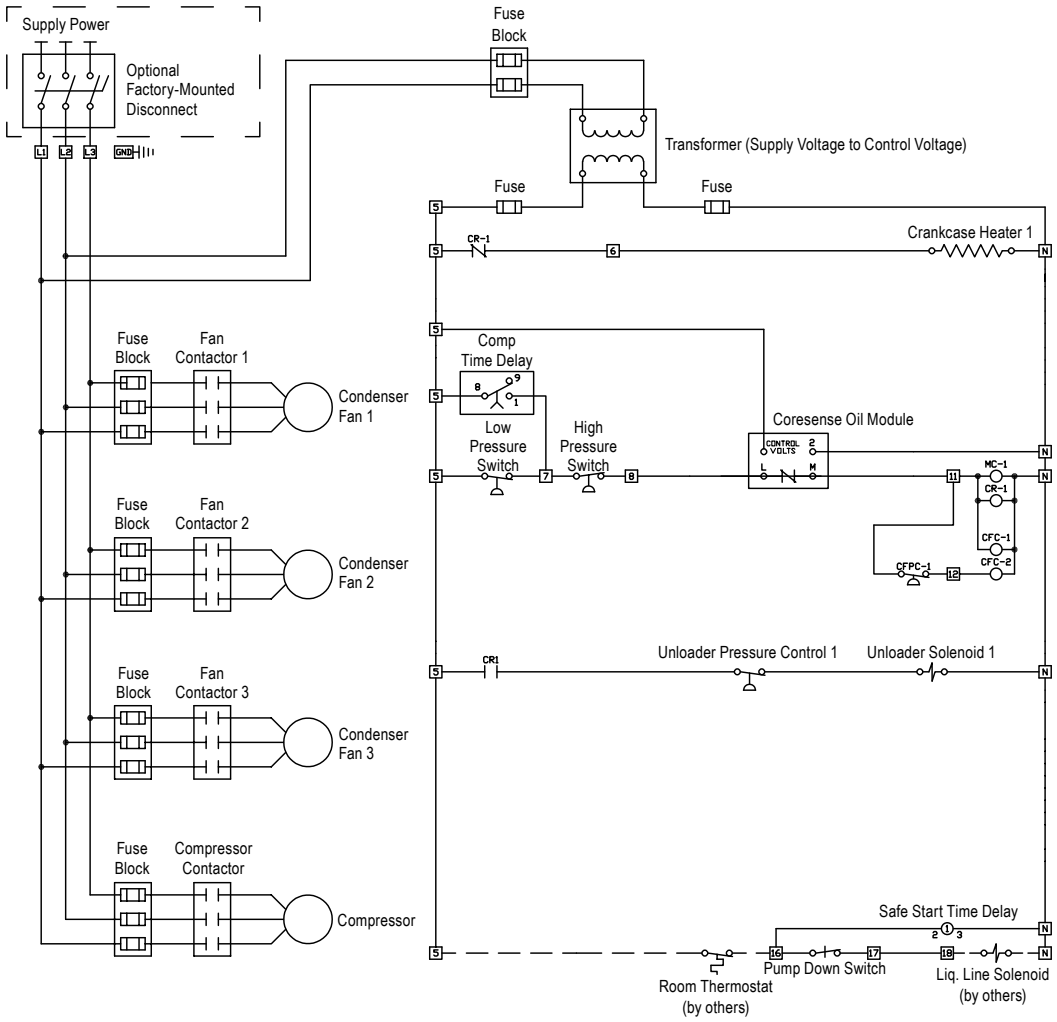
CD Wiring



CP Wiring


Supply Power
Optional Factory-Mounted Disconnect
L1
L2
L3
GND
Fuse Block
Transformer (Supply Voltage to Control Voltage)
Fuse
Crankcase Heater 1
Head Cooling Fan 1
CR-1
Comp 1 Sensor
Injection Solenoid 1
Coresense Oil Module 1
Low Pressure Switch 1
High Pressure Switch 1
Comp 1 Time Delay
TraxOil Control 1
ON DELAY 3 SEC.
Demand Cooling Module 1
Transformer
Unloader Pressure Control 1
Unloader Solenoid 1
Crankcase Heater 2
Head Cooling Fan 2
CR-2
Comp 2 Sensor
Injection Solenoid 2
Coresense Oil Module 2
Comp 2 Time Delay
Low Pressure Switch 2
High Pressure Switch 2
TraxOil Control 2
Demand Cooling Module 2
Oil Separator Heater
Unloader Pressure Control 2
Unloader Solenoid 2
Receiver Thermostat
Receiver Heater
Wire from Evap 1 Fan Delay
Wire from Evap Defrost Termination
Liq. Line Solenoid 1 (by others)
Electric Defrost Timer
Room Thermostat (by others)
Pump Down Switch
Liq. Line Solenoid 2 (by others)
Fuse Block
Fan Contactor 1
Condenser Fan 1
Condenser Fan 2
Fan Contactor 2
Condenser Fan 3
Condenser Fan 4
Fan Contactor 3
Condenser Fan 5
Condenser Fan 6
Fan Contactor 4
Condenser Fan 7
Condenser Fan 8
Compressor Contactor 1
Compressor 1
Compressor Contactor 2
Compressor 2
Compressor Circuit (remote loads)
Field-Wired to Remote Fan Loads
Field-Wired to Remote Heater Loads
Field-Wired to Remote Heater Loads

CS Wiring


Supply Power
Optional
Factory-Mounted
Disconnect
L1
L2
L3
GND
Fuse
Block
Transformer (Supply Voltage to Control Voltage)
Fuse
Fuse
CR-1
Crankcase Heater 1
Fuse
Block
Fan
Contactor 1
Condenser
Fan 1
Comp
Time Delay
Low
Pressure
Switch
High
Pressure
Switch
Coresense Oil Module
CONTROL VOLTS
MC-1
CR-1
CFC-1
CFC-2
CFPC-1
Fuse
Block
Fan
Contactor 2
Condenser
Fan 2
CR1
Unloader Pressure Control 1
Unloader Solenoid 1
Fuse
Block
Fan
Contactor 3
Condenser
Fan 3
Fuse
Block
Compressor
Contactor
Compressor
Safe Start Time Delay
Room Thermostat
(by others)
Pump Down Switch
Liq. Line Solenoid
(by others)

Piping Overview

Important: Since Hussmann has no direct control over the installation, providing freeze-burst protection is the responsibility of the installing contractor.

Important: The inlet and outlet manifold headers are not designed to support field piping.

System design must conform to all local and national codes, laws, and regulations applying to the site of installation. In addition, the safety code for mechanical refrigeration (ASME B31.5) should be followed as a guide for installation and operation practice.

Refrigerant line sizes and piping techniques should be obtained from the ASHRAE guide or equivalent reference. Under no circumstances should the refrigerant connection size of the unit be used as the basis for sizing the lines. Lines must be properly braced throughout the system.

Piping Installation Requirements

- Use only clean, dehydrated, sealed refrigeration grade copper tubing.
- Nitrogen should be used to purge the air from the connecting tubing during brazing in order to prevent copper oxide formations. Warning: Always use a pressure regulator on nitrogen tanks.
- AC&R type copper tubing should be used throughout.
- Tubing should be cut with a wheel-type cutter, not a hacksaw. Deburr before assembly.
- If the onsite tubing lengths to be used were not previously capped (i.e., are not perfectly clean) they should be dragged internally with a clean, lint-free rag before fabricating into the system. Always clean all pipe and fitting areas that will be brazed with the proper grade emery cloth.
- Soft solders are not to be used.
- Plan to use only oxy-acetylene brazing.
- All joints should be made with silver alloy brazing material, and use 45% silver solder for dissimilar metals.
- A higher content silver brazing rod must be used to avoid excessive use of flux, less it be pushed into the system piping, which will create problems later. Use a silver solder which contains sufficient silver content necessary for joint strength and flexibility yet requires minimum use of flux. For copper-to-copper joints, use a phos-copper solder with 15% silver content. Some easy-flow types require no flux, and the resultant joints are of maximum strength without brittleness.
- Installation shall include protection from physical damage in operation and service and be in compliance with national and local codes and standards, such as ANSI/ASHRAE 15, IAPMO Uniform Mechanical Code, ICC International Mechanical Code, or CSA B52. All field joints shall be accessible for inspection prior to being covered or enclosed.
- The installation of pipework shall be kept to a minimum.
- A brazed, welded, or mechanical connection shall be made before opening the valves to permit refrigerant to flow between the refrigerating system parts.
- Mechanical connectors used indoors shall comply with ISO 14903 or UL 207 or CSA C22.2 No. 140.3. When mechanical connectors are reused indoors, sealing parts shall be renewed. When flared joints are reused indoors, the flare part shall be refabricated.
- Refrigerant tubing shall be protected or enclosed to avoid damage. Flexible refrigerant connectors (such as connecting lines between the indoor and outdoor unit) that might be displaced during normal operation shall be protected against mechanical damage.

Installation Information

- Mechanical connections shall be accessible for maintenance purposes.
- Provision shall be made for expansion and contraction of long runs of piping.
- Protection devices, piping, and fittings shall be protected as far as possible against adverse environmental effects, for example, the danger of water collecting and freezing in relief pipes or the accumulation of dirt and debris.
- Piping in refrigeration systems shall be so designed and installed to minimize the likelihood of hydraulic shock damaging the system.
- Steel pipes and components shall be protected against corrosion with a rustproof coating before applying any insulation.
- Flexible pipe elements shall be protected against mechanical damage, excessive stress by torsion, or other forces, and they should be checked for mechanical damage annually.
- Precautions shall be taken to avoid excessive vibration or pulsation of the refrigerant piping.
- After completion of field piping for split systems, the field pipework shall be pressure tested with an inert gas and then vacuum tested prior to refrigerant charging, according to the following requirements as detailed by UL safety standard. Pressures may come from unit data label or from customer specification.

1. The minimum test pressure for the low side of the system shall be the low side design pressure and the minimum test pressure for the high side of the system shall be the high side design pressure, unless the high side of the system cannot be isolated from the low side of the system in which case the entire system shall be pressure tested to the low side design pressure.
2. The test pressure after removal of the pressure source shall be maintained for at least 1 hour with no decrease of pressure indicated by the test gauge, with rest gauge resolution not exceeding 5% of the test pressure.
3. During the evacuation test, after achieving a vacuum level specified in the manual or less, the refrigeration system shall be isolated from the vacuum pump and the pressure shall not rise above 1500 microns within 10 min.

- Field-made refrigerant joints indoors shall be tightness tested according to applicable codes and requirements.
- Equipment piping in the occupied space shall be installed in such a way to protect against accidental damage in operation and service.
- Solenoid valves and/or safety shut-off valves shall be correctly positioned in the piping to avoid hydraulic shock or pressure.
- Insulation shall be suitable for use with the material being insulated.
- The indoor equipment and pipes shall be securely mounted and guarded such that accidental rupture of equipment cannot occur from such events as moving furniture or reconstruction activities.

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Piping Installation

The purging process should only be done with the compressor system off and with pressures equalized. Do not attempt to do this unless you are qualified and have the proper reclaim/recovery equipment mandated by the EPA.

Undersizing connecting lines will cause several problems in the refrigeration system. High pressure drop in the suction line takes away from the system's capacity as well as resulting in excessive power usage.

Oversizing a suction line will inhibit compressor lube oil circulation. The proper balance is to design suction lines for approximately 1,200–2,500 ft/min (366–762 m/min) velocity in vertical risers and 700–2,500 ft/min (213–762 m/min) in sloped horizontal runs depending on application. "P" traps should be installed at the base of all vertical riser lines to facilitate proper oil return to the compressor. This is especially true immediately downstream of the compressor in order to prevent refrigerant liquid and/or oil migrating back into the compressor heads when the compressor is not running.

High pressure drop in the liquid line can result in the complete reduction of the liquid sub cooling, thus causing flash gas at the expansion valve. Coil starving and reduced capacity will be the result. Liquid lines can also be misapplied if sized too large. Incorrect sizing affects the oil-to-refrigerant mixture ratio as well as necessitating charging the system with an excessive amount of refrigerant. Proper sizing of both the suction and liquid lines is a necessity for a properly working system. Always install a liquid line solenoid valve at the evaporator.

Avoid excessive liquid line pressure drop by using the provided 'refrigerant charge tables' and ASHRAE guidelines to size the liquid line. 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.

Generally, horizontal piping runs should grade slightly downwards in the direction of flow. Avoid long horizontal lines on roofs. The liquid line is to be sized so the velocity does not exceed 100 ft/min (30.5 m/min). Where the ambient temperature can be below the evaporator room temperature, a check valve must be installed in the liquid line to prevent liquid migration to the unit.

Provisions must be made to accommodate expansion and contraction of the lines, especially if the lines have long runs with few elbows or bends. The lines must also be adequately supported at frequent intervals in accordance with good piping practice. It is necessary that field bracing provide adequate support at the unit connections.

Pressure testing of the piping should be done as soon as the field piping has been completed. The high-side test pressure should not exceed the pressure listed on the condenser nameplate. Nitrogen may be used to increase the trace refrigerant pressure for leak testing. It is recommended that an electronic type leak tester be used. Shipping vibrations can stress joints, thus producing operating leaks that would otherwise go undetected from just a low-pressure holding charge. Therefore, check for leaks at all joints—field and factory—before charging the system.

Suction lines should not be exposed to heat unless properly insulated.

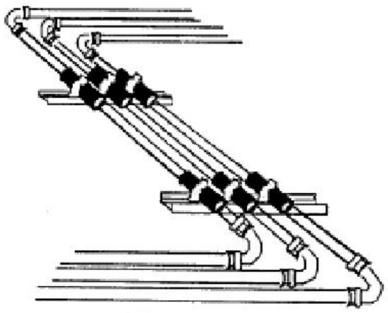
Refrigeration Line Runs

Liquid lines and suction lines must be free to expand and contract independently of each other. Do not clamp or solder them together. Supports must allow tubing to expand and contract freely. Do not exceed 100 feet (30.5 m) without a change of direction and/or offset.

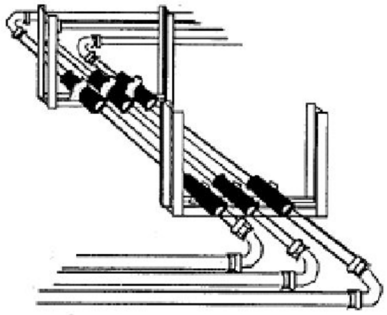
Pitch horizontal suction lines toward the compressor with a slope of 1/2 in. (13 mm) for every 10 ft (3 m). All suction risers should have a p-trap installed at the base of the riser and have an inverted trap installed at the top of the riser. All traps should be the same diameter as the horizontal run. Install a suction midpoint p-trap for every 20 ft (6.1 m) of vertical rise. Install a one-piece trap for both the base and inverted trap.

Use long radius elbows to reduce line resistance and breakage. Avoid the use of 45-degree elbows. Install service valves at several locations for ease of maintenance and reduction of service costs. These valves must be UL approved for the minimum design working pressure of the system.

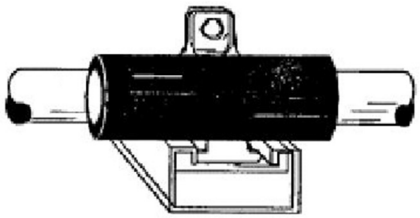
floor run



ceiling run



support detail



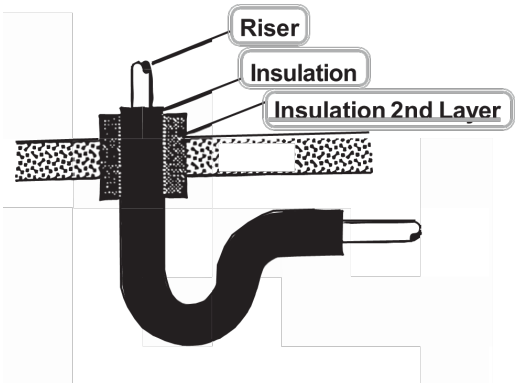
Angle Valve and Elbow Run Lengths

Angle valves and elbows must be figured as additional straight pipe. The chart below gives equivalent lengths for these components.

Tubing Size	Angle Valve	Long Radius 90° Elbow
1/2”	6 ft (1.83 m)	0.9 ft (0.27 m)
5/8”	7 ft (2.1 m)	1 ft (0.31 m)
7/8”	9 ft (2.7 m)	1.4 ft (0.43 m)
1 1/8”	12 ft (3.7 m)	1.7 ft (0.52 m)
1 3/8”	15 ft (4.6 m)	2.3 ft (0.7 m)
1 5/8”	18 ft (5.5 m)	2.6 ft (0.79 m)
2 1/8”	24 ft (7.3 m)	3.3 ft (1 m)
2 5/8”	29 ft (8.8 m)	4.1 ft (1.25 m)
3 1/8”	35 ft (10.7 m)	5 ft (1.52 m)
3 5/8”	41 ft (12.5 m)	5.9 ft (1.8 m)
4 1/8”	47 ft (14.3 m)	6.7 ft (2 m)

Piping Through Walls and Floors

Refrigeration lines that are run through walls or floors must have a p-trap installed, and the lines must be properly insulated. Avoid running lines through the refrigeration cases. When this is done, the lines must be adequately insulated using a closed-cell elastomeric foam insulation.



Refrigerant Line Sizing

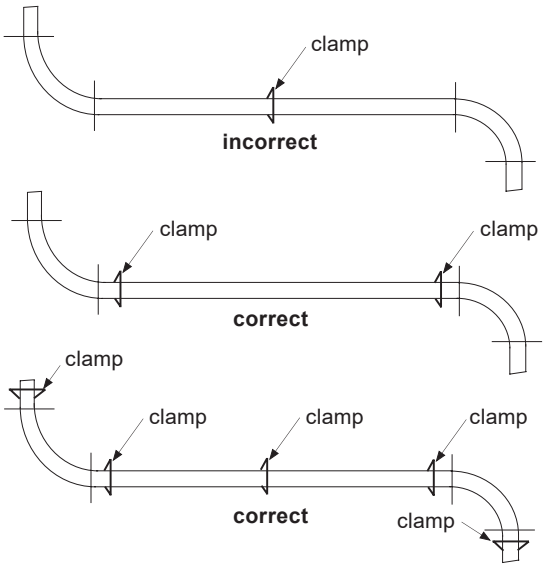
Refer to ASHARE standards for line sizing. The installer is responsible for sizing the piping for each application.

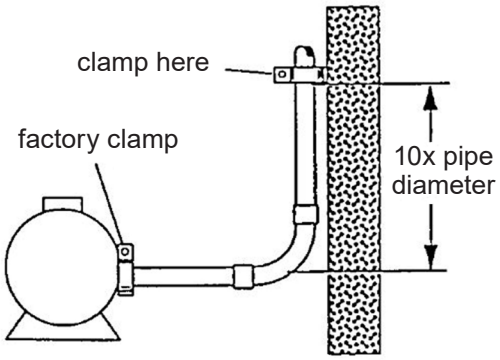
Refrigeration Line Stubs Out

Stub sizes do not necessarily match line sizes. Reduction fittings must be field supplied and installed. The installer is responsible to account for any factors which may affect the system.

Piping From Machinery to Solid Object

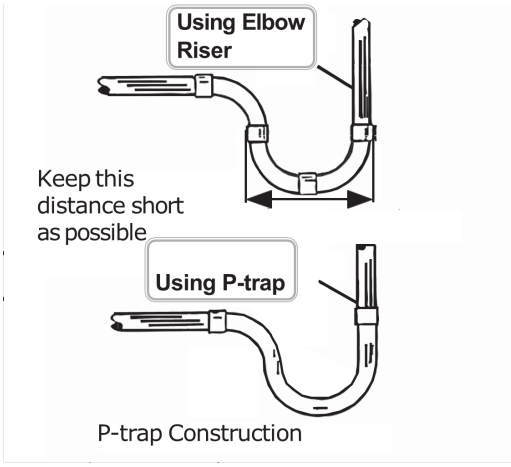
When mounting lines from machinery to a solid object, allow line to be able to move appropriately to prevent metal fatigue from vibration. Do not over support piping that is in contact with the compressor. The machinery must not be tightly stressed from piping that does not allow for some vibration. If piping is too tight metal fatigue will occur.





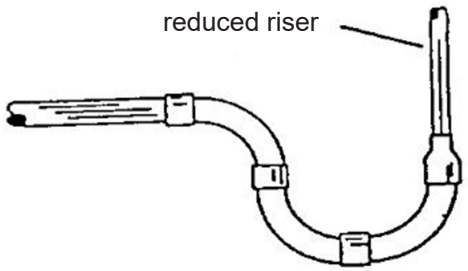
P-Trap Construction

P-traps must be installed at the bottom of all suction risers to return oil to the compressors to avoid trapping oil.



Reduced Riser

When a reduced riser is necessary, place the reduction coupling downstream of the p-trap.

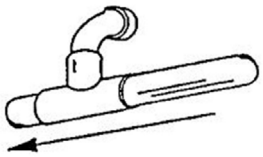


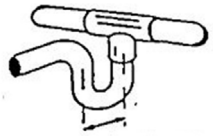
Installation Information

Suction Line

Pitch line in direction of flow. Size may be reduced by one size at one third of run load and again after the second third. Do not reduce below evaporator connection size. Suction returns from evaporators enter at the top of the branch line.

Suction Line Return





Liquid Line Take Off Loop

Liquid Line (off-time and electric defrost)

Line may be reduced by one size after one half of the case load run. Do not reduce below evaporator connection size. Take-offs to evaporators exit the bottom of the liquid line. Provide an expansion loop for each evaporator take-off (minimum 3 in. [76 mm] diameter).

Field Connections of Heat Reclaim

This will not apply to factory heat reclaim. Each circuit of the heat reclaim coil is tagged to correspond with a specific condensing unit and must be connected only to that unit.

Special Piping for Open Rooms

An open preparation room allows heat infiltration from the rest of the store at a rate which may jeopardize total refrigeration performance. To protect the rest of the refrigeration system, open preparation evaporators must be piped with a crankcase pressure regulating valve (CPR). The CPR is field-installed in the suction line(s) from the evaporator(s). The installer is responsible for proper adjustment of the valve.

Insulation

Additional insulation for the balance of the liquid and suction lines is recommended wherever condensation drippage is objectionable or the lines are exposed to ambient conditions.

Protecting Valves and Clamps

When brazing near factory installed clamps or valves be sure to protect them with a wet rag to avoid overheating. Insulate all reduced risers. Avoid using water or wet rags to cool a brazed joint. Allow brazed joints to air cool.

All clamps must be properly anchored. Rubber grommets must be installed to prevent chafing of the lines.

Elbows

Only use long radius elbows. Long elbows have been shown to have less pressure drop and greater strength. It is especially important to use long radius elbows for hot gas discharge lines.

Factory Supplied Stubs

Stub sizes provided do not automatically correspond to the line sizes necessary. It is the installer’s responsibility to supply reduction couplings.

Purge Valve Location

The purge valve must be installed at the highest point of an inverted p-trap, with at least a 6 in. (152 mm) rise

Warning: Vent the receiver safety relief device properly. Use with approved recovery vessel only.

Purge Relief Valve

A standard fusible plug is installed on all receivers. The connection size for piping from the fusible plug is 3/8” NPT. An optional relief valve is also available, which replaces the fusible plug and has the same connection size for piping (3/8” NPT).

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System Piping and Operation

Refrigeration Cycle

Typically, refrigeration falls into low or medium temperature ranges. An average low temperature condensing unit maintains a suction temperature of -20° F (-28.9° C) with a low-temp satellite operating at -33° F (-36.1° C). A common medium temperature condensing unit operates at 25° F (-3.9° C) with a low-temperature satellite operating at 7° F (-13.9° C).

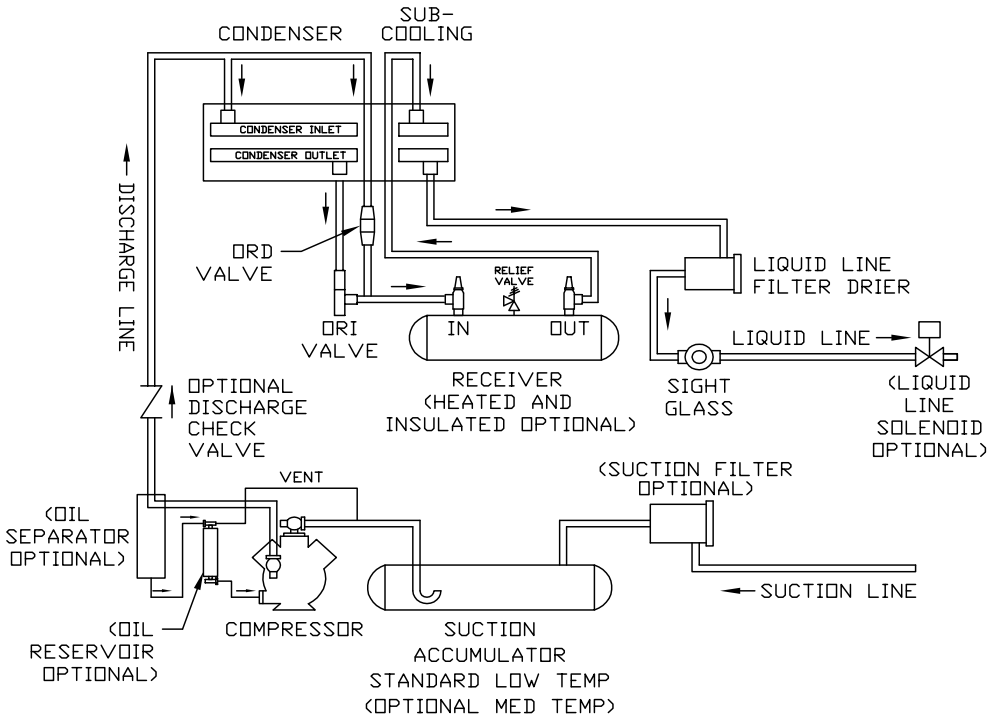
These constants are maintained throughout the following explanations.

- In the diagrams, refrigerant flow direction is generally clockwise and indicated by directional arrows.
- Electric solenoid valves carry the same initial abbreviations as in the electric schematics.
- Refrigeration lines not actually in the cycle being discussed are shown closed or removed.
- Pressure in oil lines will also retain a fixed pattern.

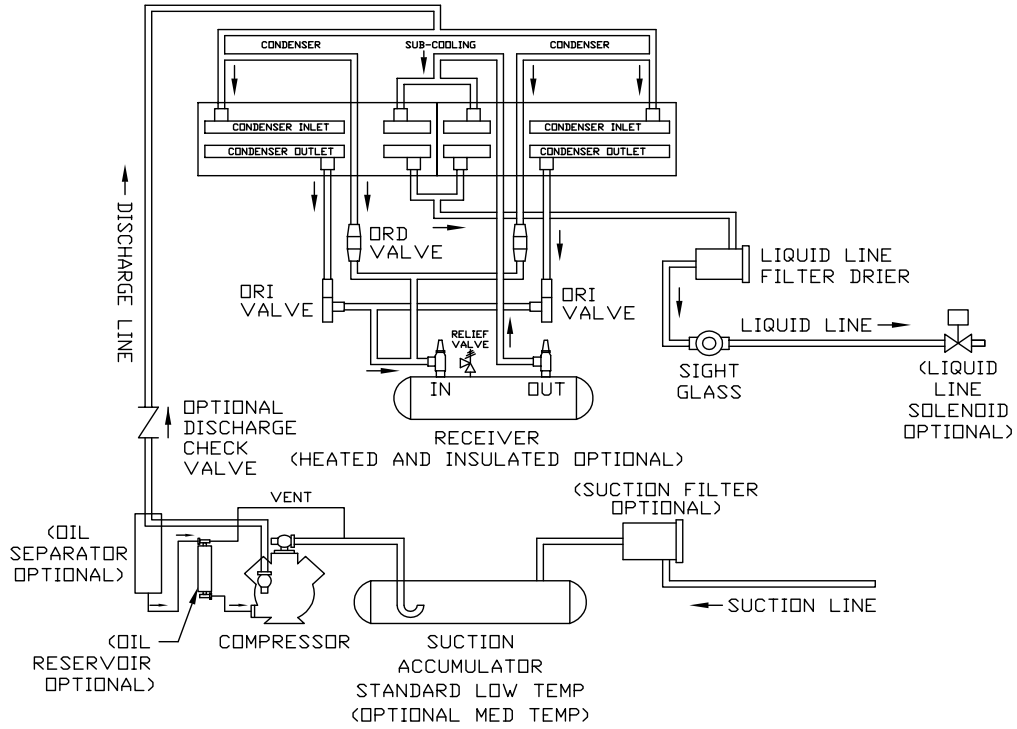
System Piping Diagram

CD Unit and CS Single Row Unit

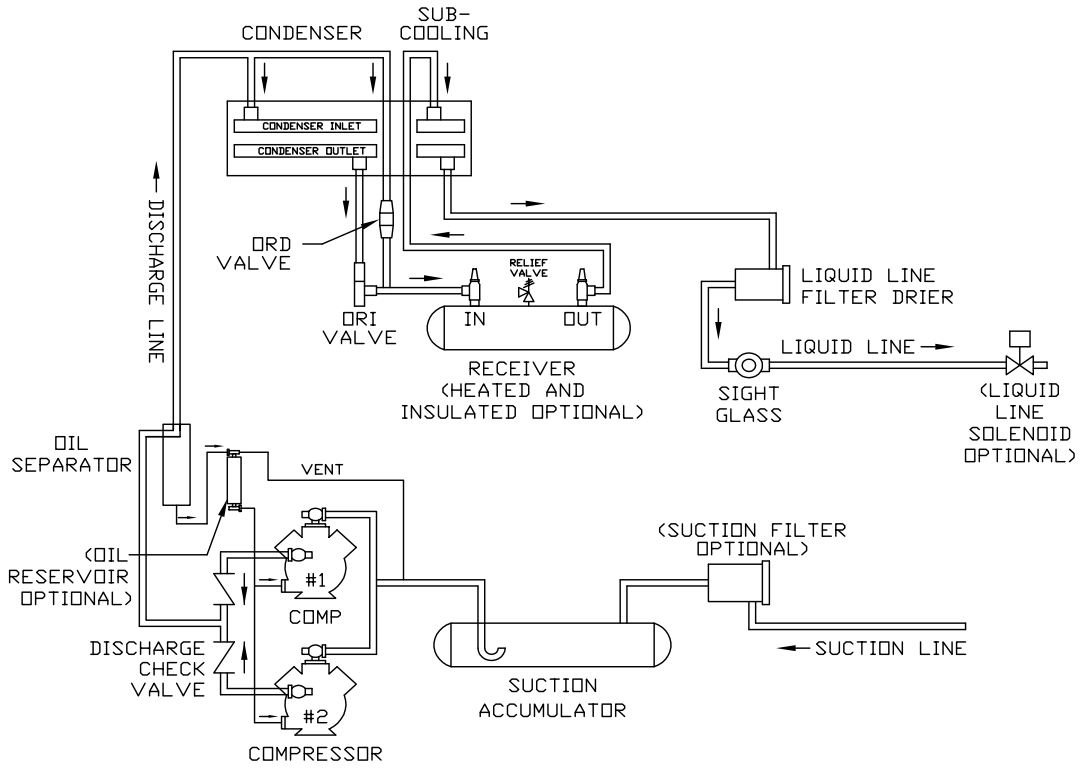
CD units will have two of these circuits.



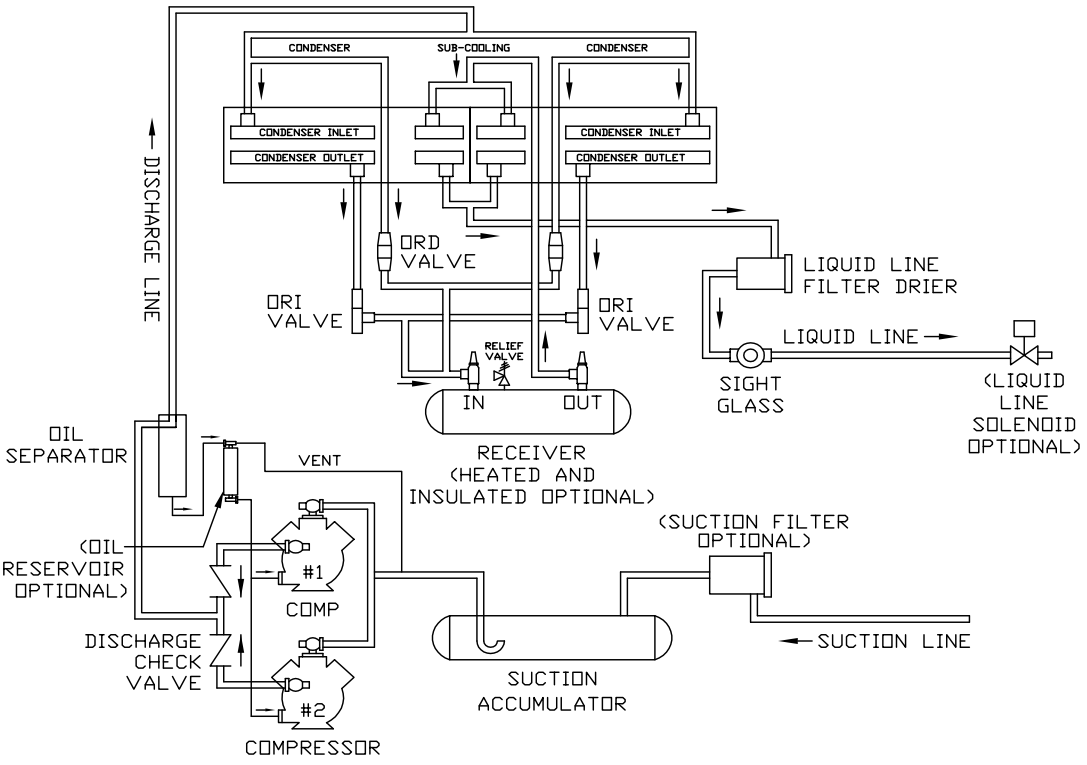
CS Double Row Unit



CP Single Row Unit



CP Double Row Unit



Oil Separator

Beginning with the compressor, refrigerant vapor is compressed and flows to the oil separator. The oil is stored in the bottom of the oil separator and returned to the compressors through the oil return line.

When an oil separator is installed the following components are required:

- Check valve on the discharge line after the oil separator, to prevent refrigerant migration during low ambient temperatures from the condenser to the oil separator and from that to the compressor.
- Oil line solenoid, on the oil return line, to prevent the oil returning from the compressor (when the compressor is not running) or heat reclaim. The excessive oil in the crankcase when the compressor starts, could cause damage to the compressor such as broken valve plate, piston, etc.

Oil Failure Switch

Each compressor has its own electronic oil pressure control. Should oil pump differential pressure, measured between the pump inlet and outlet, fall below 9 PSIG (62 kPa) for a period of two minutes, the control will open and stop the compressor.

Crankcase Heaters

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

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.

Pumpdown and 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.

Low Pressure Control Settings

Low-pressure controls are manual reset controls that act as safety controls for the system.

Temperature[A]	Pressure PSIG (kPa)			
	R-454A		R-454C	
	Max Cut-In	Max Cut-Out	Max Cut-In	Max Cut-Out
-25° F (-31.7° C)	9 (62)	2 (14)	5 (34)	1 (7)
-20° F (-28.9° C)	12 (83)	3 (21)	7 (48)	2 (14)
-15° F (-26.1° C)	15 (103)	4 (28)	10 (69)	3 (21)
-10° F (-23.3° C)	19 (131)	5 (34)	13 (90)	4 (28)
-5° F (-20.6° C)	23 (159)	6 (41)	16 (110)	5 (34)
0° F (-17.8° C)	27 (186)	7 (48)	20 (138)	6 (41)
5° F (-15° C)	32 (221)	12 (83)	24 (165)	7 (48)
10° F (-12.2° C)	37 (255)	17 (117)	28 (193)	8 (55)
15° F (-9.4° C)	43 (296)	23 (159)	33 (228)	13 (90)
20° F (-6.7° C)	48 (331)	28 (193)	38 (262)	18 (124)
25° F (-3.9° C)	55 (379)	35 (241)	43 (296)	23 (159)
30° F (-1.1° C)	62 (427)	42 (290)	49 (338)	29 (200)

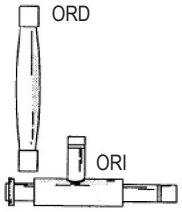
[A]Temperature indicates the minimum ambient temperature at the condensing unit or the box design temperature, whichever is lower.

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Flooding Valves

For low ambient conditions, fan cycling or flooding valves are required. 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 and evaporator expansion device selection criteria.

The flooding valve maintains head pressure in low ambient conditions by restricting liquid refrigerant flow from the condenser. This causes liquid refrigerant to be backed up in the condenser thus reducing available heat transfer surface and causing the discharge pressure to rise.



Units are equipped with adjustable ORI flooding valves for winter control and ORD differential valves for receiver pressure regulation. Multi-fan units are also equipped with a temperature control to cycle off half the fans in low-ambient conditions. 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.

Fan Cycle Operation

Care must be used by the engineer or installing contractor to monitor and make adjustments to prevent the fans from cycling too often or cycling more than one bank of fans at the same time. Short cycling or erratic fan cycling over extended periods of time will cause additional thermal stress to the condenser tubes and increase the potential for leaks in the coil.

It is recommended that units be purchased with the winter isolation solenoid valves. With solenoids, the refrigerant flow to that specific module can be cut off as the fans power down, ensuring proper refrigerant flow.

Fan Control Settings

The following tables contain the settings to which the control panel components are set for the ordered application, settings for pressure sensing controls, and the settings for temperature setting controls. Consult the wiring schematic for the specific unit/order to confirm circuit details.

Note: Do not set fans to cycle-on more than 240 times per day, or lower than a minimum of 40 PSI (2.8 bar) discharge pressure differential swing. The maximum short cycling frequency is three minutes on, three minutes off.

Settings	R-454A				R-454C			
Motor Contactor	MC1 / MC2	MC3 / MC4	MC5 / MC6	MC7 / MC8	MC1 / MC2	MC3 / MC4	MC5 / MC6	MC7 / MC8
Differential	Fan(s) run whenever compressor(s) are powered.				Fan(s) run whenever compressor(s) are powered.			
Fan On								
Fan Off								
Differential		40				40		
Fan On		275				240		
Fan Off		235				200		
Differential		40	40			40	40	
Fan On		237	275			210	240	
Fan Off		197	235			170	200	
Differential		40	40	40		40	40	40
Fan On		225	250	275		200	220	240
Fan Off		185	210	235		160	180	200

Pre-Startup

- Observe all previous listing warnings, cautions, and requirements to ensure all listed requirements are met and/or observed before proceeding.
- Visually inspect all lines and joints for proper piping practices to minimize the potential for leaks.
- Close angle valves for pressure transducers.
- Open valves to condenser and receiver.
- Liquid line solenoid valve solenoid should be energized.
- Verify refrigerant requirements for system, compressors, and TEVs in merchandisers and coolers.
- Verify electrical supply and component requirements.

Oil Levels

Check the oil sticker on the condensing unit before adding oil. All oil used must match the specification put forth by the compressor manufacturer. Use only new, sealed containers and do not transfer oil from one container to another.

Before operation and during initial run time, check that oil levels for the compressor to ensure sight glass is 1/2 full. If oil is required to be added, an oil pump is recommended to pump the oil directly into the compressor against suction pressure.

Test Charge and Evacuation

Using vapor refrigerant trace gas to pressurize the system to 15 PSIG (1.03 bar). Carefully add dry nitrogen to bring the system pressure up to a minimum of 150 PSIG (10.3 bar). Use an electronic leak detector to inspect all connections. If a leak is found, isolate, repair, and retest. Be sure system is at or just above 150 PSIG (10.3 bar) and all valves closed to isolate the leak are opened afterward. After the last leak is repaired and retested, the system must be re-pressurized to 150 PSIG (10.3 bar) and stand unaltered for 12 hours with no pressure drop.

Nitrogen and moisture will remain in the system unless proper evacuation procedures are followed. Nitrogen left in the system may cause head pressure problems. Moisture causes TEV ice blockage, wax build up, acid oil, and sludge formation.

Do not simply purge the system to the atmosphere. This procedure is expensive, harmful to the environment, and may leave moisture and nitrogen behind.

Do not run the compressors to evacuate. This procedure introduces moisture into the compressor’s crankcase oil and does not produce adequate vacuum to remove moisture from the rest of the system at normal temperatures.

A two-stage vacuum pump is recommended if moisture is to be removed by evacuation (a single-stage pump will not remove moisture). The pump should be connected to both the low- and high-pressure sides with copper tube or high vacuum hoses. Connect an electronic vacuum gauge calibrated in microns to a point on the system, such as the purge connection on the condenser, so the actual vacuum is read rather than the value at the vacuum pump.

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.

Pre-Charge Checklist

While the system is being evacuated preparation for charging can begin. During any of the pull downs check:

Check controller program if applicable.

Display Cases, Walk-In Coolers, and Freezers

- Electrical requirements and power supply
- Electrical connections tight and clean
- Proper fan operation
- Thermostat setting

Condensing Unit

- Electrical requirements and power supply
- Electrical connections are tight and clean
- Proper fan operation
- Pressure settings
- Defrost settings
- Adjust head pressure valve

Note: Remember to reinstate control to unit components that were jumpered to test.

During the last evacuation look up and make a list of the required control settings for the system. High and low pressure, winter control settings, and other controls on the system should be noted.

Compressor Motor Rotation Check (Scroll)

Note: Do not run compressors for more than 10 seconds during test.

To check compressor rotation, use the following procedure:

- Install gauges on suction and discharge side of compressor. A momentary compressor run should cause a drop in suction header and a rise in discharge header pressure.
- With main disconnect OFF, switch OFF all breakers or fuses in the control panel.
- Turn ON main disconnect.
- Look for the light on the single phase protector. If it is not lit, turn OFF the main disconnect. Have the field connections to the main breaker of the unit corrected so the phase protector indicates phase alignment (the light is lit).
- Turn ON the main disconnect.
- Momentarily turn ON the compressor and verify correct pumping direction. If the compressor is rotating backwards, change two legs on the load side of the compressor contactor.

Refrigerant Charging Procedure

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.

Only the specified refrigerant type can be used. See the equipment datasheet for information on operating and releasable charge. Shut down the unit at first indication of unusual operation.

The triple evacuation method should be used to achieve a leak-free, dry system. For the first evacuation, the system should be pulled down to 1,000 microns. The second evacuation should be pulled to 500 microns. The final evacuation should be pulled down to at least 300 microns. A dry, leak-free system is when the system holds a vacuum of 300 microns for 24 hours with the vacuum pump de-energized and valved off. Between each evacuation, break the vacuum with dry nitrogen.

When connecting hoses between the refrigeration system, manifold gauges, and refrigerant cylinder, ensure that the connections are secure and there are no potential sources of ignition nearby. Ensure that contamination of different refrigerants does not occur when using charging equipment.

Use dedicated hoses to service the type of refrigeration system being serviced (e.g., R-454C equipment for an R-454C system). Hoses or lines should be as short as possible to minimize the amount of refrigerant contained in them.

Ensure that the refrigeration system is properly grounded prior to charging the system with refrigerant, to avoid the potential for static build-up.

In addition to conventional charging procedures, the following requirements shall be followed:

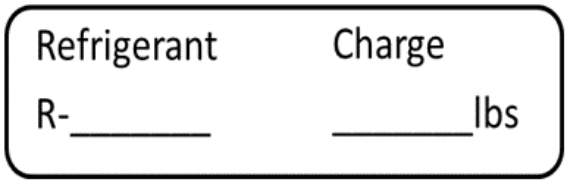
a. Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
b. Cylinders shall be kept in an appropriate position according to the instructions.
c. Ensure that the REFRIGERATING SYSTEM is earthed prior to charging the system with refrigerant.
d. Label the system when charging is complete (if not already).
e. Extreme care shall be taken not to overfill the REFRIGERATING SYSTEM.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

Extreme care must be taken not to overfill the refrigeration system. After charging, carefully disconnect the hoses, attempting to minimize the quantity of refrigerant released. Further leak check the service ports, hoses, refrigerant tanks. Original service port washers and caps anywhere in the system must be reinstalled to prevent refrigerant leaks. Caps must be tightened to 12–14 in-lb (1.4–1.6 nm) torque.

Refrigerant Charge Label

After charging is complete, note the refrigerant type and charge amount using permanent marking on the refrigerant charge label affixed to the equipment.



Approximate Refrigerant Charge Tables

Line runs and other connected equipment can result in different system charge values.

Dual Compressor/Dual Circuit

Note: Values are calculated per refrigeration circuit on dual compressor, dual circuit models.

Model	R-454A		R-454C	
Medium Temperature	**Summer**	**Winter**	**Summer**	**Winter**
CD*-0100-M( )[ ]	19 (8.6)	24.6 (11.2)	19.1 (8.7)	24.9 (11.3)
CD*-0101-M( )[ ]	20.8 (9.5)	30.7 (13.9)	21 (9.5)	31.1 (14.1)
CD*-0150-M( )[ ]	20.9 (9.5)	30.8 (14)	21 (9.5)	31.2 (14.1)
CD*-0151-M( )[ ]	23.1 (10.5)	33.5 (15.2)	23.3 (10.6)	34 (15.4)
CD*-0160-M( )[ ]	25.9 (11.8)	36.3 (16.5)	26.2 (11.9)	36.8 (16.7)
CD*-0161-M( )[ ]	27.8 (12.6)	42.3 (19.2)	28 (12.7)	42.9 (19.5)
CD*-0162-M( )[ ]	29.6 (13.4)	48.3 (21.9)	29.9 (13.6)	49 (22.2)
CD*-0180-M( )[ ]	26.1 (11.8)	36.4 (16.5)	26.3 (11.9)	36.9 (16.8)
CD*-0181-M( )[ ]	40 (18.1)	58.6 (26.6)	40.3 (18.3)	59.4 (27)
CD*-0200-M( )[ ]	38.1 (17.3)	52.6 (23.9)	38.5 (17.4)	53.3 (24.2)
CD*-0201-M( )[ ]	45.1 (20.4)	67.3 (30.5)	45.5 (20.6)	68.3 (31)
CD*-0202-M( )[ ]	40 (18.1)	58.6 (26.6)	40.3 (18.3)	59.4 (27)
CD*-0240-M( )[ ]	40 (18.1)	58.6 (26.6)	40.3 (18.3)	59.4 (27)
CD*-0241-M( )[ ]	45.1 (20.4)	67.3 (30.5)	45.5 (20.6)	68.3 (31)
CD*-0300-M( )[ ]	45.4 (20.6)	67.6 (30.7)	45.8 (20.8)	68.6 (31.1)
CD*-0301-M( )[ ]	54.3 (24.6)	82.7 (37.5)	54.8 (24.8)	83.9 (38)
CD*-0400-M( )[ ]	45.4 (20.6)	67.6 (30.7)	45.8 (20.8)	68.6 (31.1)
CD*-0401-M( )[ ]	51 (23.2)	80.1 (36.3)	51.5 (23.3)	81.2 (36.8)
CD*-0402-M( )[ ]	54.3 (24.6)	82.7 (37.5)	54.8 (24.8)	83.9 (38)
CD*-0500-M( )[ ]	54.3 (24.6)	82.7 (37.5)	54.8 (24.8)	83.9 (38)
CD*-0501-M( )[ ]	69 (31.3)	113.4 (51.5)	69.6 (31.6)	115.1 (52.2)
CD*-0600-M( )[ ]	62.2 (28.2)	99.5 (45.1)	62.7 (28.4)	100.9 (45.8)
CD*-0601-M( )[ ]	88 (39.9)	132.5 (60.1)	88.7 (40.2)	134.3 (60.9)
CD*-0700-M( )[ ]	93.4 (42.4)	137.9 (62.5)	94.2 (42.7)	139.8 (63.4)
CD*-0701-M( )[ ]	104.3 (47.3)	160.9 (73)	105.2 (47.7)	163.2 (74)
CD*-0702-M( )[ ]	99 (44.9)	155.7 (70.6)	99.8 (45.3)	158 (71.7)
CD*-0800-M( )[ ]	99.2 (45)	156 (70.8)	100.1 (45.4)	158.2 (71.8)
CD*-0801-M( )[ ]	131 (59.4)	204 (92.5)	132.1 (59.9)	206.9 (93.8)

Model	R-454A		R-454C	
Low Temperature	**Summer**	**Winter**	**Summer**	**Winter**
CD*-0300-L( )[ ]	37.2 (16.9)	55.8 (25.3)	37.5 (17)	56.6 (25.7)
CD*-0301-L( )[ ]	40.9 (18.5)	63.1 (28.6)	41.2 (18.7)	64 (29)
CD*-0440-L( )[ ]	41 (18.6)	63.2 (28.7)	41.3 (18.7)	64.1 (29.1)
CD*-0441-L( )[ ]	49.9 (22.6)	78.3 (35.5)	50.3 (22.8)	79.4 (36)
CD*-0540-L( )[ ]	54.2 (24.6)	82.5 (37.4)	54.6 (24.8)	83.7 (38)
CD*-0541-L( )[ ]	54.6 (24.8)	91.9 (41.7)	55.1 (25)	93.3 (42.3)
CD*-0600-L( )[ ]	50.9 (23.1)	79.9 (36.3)	51.3 (23.3)	81.1 (36.8)
CD*-0601-L( )[ ]	68.8 (31.2)	113.3 (51.4)	69.4 (31.5)	115 (52.1)
CD*-0602-L( )[ ]	54.6 (24.8)	91.9 (41.7)	55.1 (25)	93.3 (42.3)

* Compressor type ( ) Refrigerant type [ ] Voltage

Parallel Compressor

Model	R-454A		R-454C	
Medium Temperature	**Summer**	**Winter**	**Summer**	**Winter**
CP*-0100-M( )[ ]	31.8 (14.4)	43.2 (19.6)	32.1 (14.6)	43.7 (19.8)
CP*-0101-M( )[ ]	35.6 (16.2)	55.4 (25.1)	35.9 (16.3)	56.2 (25.5)
CP*-0150-M( )[ ]	35.7 (16.2)	55.5 (25.2)	36 (16.3)	56.2 (25.5)
CP*-0151-M( )[ ]	44.4 (20.1)	65.2 (29.6)	44.7 (20.3)	66 (29.9)
CP*-0160-M( )[ ]	47.3 (21.5)	68.1 (30.9)	47.7 (21.6)	69 (31.3)
CP*-0161-M( )[ ]	51 (23.2)	80.1 (36.3)	51.5 (23.3)	81.2 (36.8)
CP*-0162-M( )[ ]	62.2 (28.2)	99.5 (45.1)	62.7 (28.4)	100.9 (45.8)
CP*-0180-M( )[ ]	47.3 (21.5)	68.1 (30.9)	47.7 (21.6)	69 (31.3)
CP*-0181-M( )[ ]	62.2 (28.2)	99.5 (45.1)	62.7 (28.4)	100.9 (45.8)
CP*-0200-M( )[ ]	62.1 (28.2)	91.1 (41.3)	62.6 (28.4)	92.4 (41.9)
CP*-0201-M( )[ ]	74.4 (33.8)	118.9 (53.9)	75.1 (34.1)	120.6 (54.7)
CP*-0202-M( )[ ]	65.8 (29.9)	103.1 (46.8)	66.4 (30.1)	104.6 (47.4)
CP*-0240-M( )[ ]	65.8 (29.9)	103.1 (46.8)	66.4 (30.1)	104.6 (47.4)
CP*-0241-M( )[ ]	93.4 (42.4)	137.9 (62.5)	94.2 (42.7)	139.8 (63.4)
CP*-0300-M( )[ ]	93.7 (42.5)	138.1 (62.7)	94.5 (42.9)	140 (63.5)
CP*-0301-M( )[ ]	99.2 (45)	156 (70.8)	100.1 (45.4)	158.2 (71.8)
CP*-0400-M( )[ ]	93.7 (42.5)	138.1 (62.7)	94.5 (42.9)	140 (63.5)
CP*-0401-M( )[ ]	113.4 (51.4)	171.5 (77.8)	114.3 (51.9)	173.8 (78.8)
CP*-0402-M( )[ ]	99.2 (45)	156 (70.8)	100.1 (45.4)	158.2 (71.8)
CP*-0500-M( )[ ]	99.7 (45.2)	156.4 (71)	100.5 (45.6)	158.6 (72)
CP*-0501-M( )[ ]	133.2 (60.4)	222.1 (100.7)	134.3 (60.9)	225.3 (102.2)
CP*-0600-M( )[ ]	121.2 (55)	195.7 (88.8)	122.1 (55.4)	198.5 (90)
CP*-0601-M( )[ ]	142.7 (64.7)	231.6 (105.1)	143.8 (65.2)	234.9 (106.6)
CP*-0700-M( )[ ]	134.1 (60.8)	223 (101.1)	135.1 (61.3)	226.1 (102.6)
CP*-0701-M( )[ ]	197.3 (89.5)	310.5 (140.8)	198.9 (90.2)	314.9 (142.8)
CP*-0702-M( )[ ]	189.5 (86)	303.1 (137.5)	191 (86.7)	307.3 (139.4)
CP*-0800-M( )[ ]	189.5 (86)	303.1 (137.5)	191 (86.7)	307.3 (139.4)
CP*-0801-M( )[ ]	212 (96.2)	358 (162.4)	213.8 (97)	363.3 (164.8)

Model	R-454A		R-454C	
Low Temperature	**Summer**	**Winter**	**Summer**	**Winter**
CP*-0300-L( )[ ]	62.1 (28.2)	99.3 (45.1)	62.6 (28.4)	100.8 (45.7)
CP*-0301-L( )[ ]	68.8 (31.2)	113.3 (51.4)	69.4 (31.5)	115 (52.1)
CP*-0303-L( )[ ]	62.1 (28.2)	99.3 (45.1)	62.6 (28.4)	100.8 (45.7)
CP*-0440-L( )[ ]	69.1 (31.4)	113.6 (51.5)	69.7 (31.6)	115.2 (52.3)
CP*-0441-L( )[ ]	93.7 (42.5)	150.5 (68.2)	94.5 (42.8)	152.6 (69.2)
CP*-0443-L( )[ ]	93.7 (42.5)	150.5 (68.2)	94.5 (42.8)	152.6 (69.2)
CP*-0540-L( )[ ]	98.9 (44.9)	155.7 (70.6)	99.8 (45.3)	158 (71.6)
CP*-0541-L( )[ ]	121 (54.9)	195.5 (88.7)	121.9 (55.3)	198.3 (89.9)
CP*-0543-L( )[ ]	120.6 (54.7)	195.2 (88.5)	121.6 (55.2)	198 (89.8)
CP*-0600-L( )[ ]	94.5 (42.9)	152.5 (69.2)	95.3 (43.2)	154.7 (70.2)
CP*-0601-L( )[ ]	132.9 (60.3)	221.8 (100.6)	134 (60.8)	225.1 (102.1)
CP*-0602-L( )[ ]	121 (54.9)	195.5 (88.7)	121.9 (55.3)	198.3 (89.9)
CP*-0603-L( )[ ]	144 (65.3)	257.5 (116.8)	145.2 (65.9)	261.5 (118.6)

* Compressor type ( ) Refrigerant type [ ] Voltage

C-Series A2L

Installation Information

Single Compressor

Model	R-454A		R-454C	
Medium Temperature	**Summer**	**Winter**	**Summer**	**Winter**
CS*-0100-M( )[ ]	33.7 (15.3)	49.3 (22.4)	34 (15.4)	49.9 (22.7)
CS*-0101-M( )[ ]	38.2 (17.3)	58.9 (26.7)	38.5 (17.5)	59.7 (27.1)
CS*-0102-M( )[ ]	35.6 (16.2)	55.4 (25.1)	35.9 (16.3)	56.2 (25.5)
CS*-0150-M( )[ ]	41.2 (18.7)	62 (28.1)	41.5 (18.8)	62.8 (28.5)
CS*-0151-M( )[ ]	51 (23.2)	80.1 (36.3)	51.5 (23.3)	81.2 (36.8)
CS*-0152-M( )[ ]	54.8 (24.8)	92 (41.7)	55.2 (25)	93.4 (42.4)
CS*-0200-M( )[ ]	41.2 (18.7)	62 (28.1)	41.5 (18.8)	62.8 (28.5)
CS*-0201-M( )[ ]	51 (23.2)	80.1 (36.3)	51.5 (23.3)	81.2 (36.8)
CS*-0202-M( )[ ]	62.2 (28.2)	99.5 (45.1)	62.7 (28.4)	100.9 (45.8)
CS*-0250-M( )[ ]	51 (23.2)	80.1 (36.3)	51.5 (23.3)	81.2 (36.8)
CS*-0251-M( )[ ]	69 (31.3)	113.4 (51.5)	69.6 (31.6)	115.1 (52.2)
CS*-0252-M( )[ ]	62.2 (28.2)	99.5 (45.1)	62.7 (28.4)	100.9 (45.8)
CS*-0300-M( )[ ]	58.5 (26.5)	87.5 (39.7)	58.9 (26.7)	88.7 (40.2)
CS*-0301-M( )[ ]	88 (39.9)	132.5 (60.1)	88.7 (40.2)	134.3 (60.9)
CS*-0302-M( )[ ]	62.2 (28.2)	99.5 (45.1)	62.7 (28.4)	100.9 (45.8)
CS*-0350-M( )[ ]	93.4 (42.4)	137.9 (62.5)	94.2 (42.7)	139.8 (63.4)
CS*-0351-M( )[ ]	94.2 (42.7)	152.2 (69.1)	95 (43.1)	154.4 (70.1)
CS*-0352-M( )[ ]	99 (44.9)	155.7 (70.6)	99.8 (45.3)	158 (71.7)
CS*-0400-M( )[ ]	93.7 (42.5)	138.1 (62.7)	94.5 (42.9)	140 (63.5)
CS*-0401-M( )[ ]	120.9 (54.8)	195.4 (88.6)	121.8 (55.3)	198.2 (89.9)

Model	R-454A		R-454C	
Low Temperature	**Summer**	**Winter**	**Summer**	**Winter**
CS*-0150-L( )[ ]	35.6 (16.1)	55.4 (25.1)	35.9 (16.3)	56.1 (25.5)
CS*-0151-L( )[ ]	38.1 (17.3)	58.9 (26.7)	38.4 (17.4)	59.7 (27.1)
CS*-0153-L( )[ ]	35.6 (16.1)	55.4 (25.1)	35.9 (16.3)	56.1 (25.5)
CS*-0220-L( )[ ]	38.2 (17.3)	59 (26.8)	38.5 (17.5)	59.8 (27.1)
CS*-0221-L( )[ ]	48.1 (21.8)	77.1 (35)	48.5 (22)	78.2 (35.5)
CS*-0222-L( )[ ]	51.8 (23.5)	89.1 (40.4)	52.2 (23.7)	90.4 (41)
CS*-0223-L( )[ ]	51.8 (23.5)	89.1 (40.4)	52.2 (23.7)	90.4 (41)
CS*-0270-L( )[ ]	50.9 (23.1)	79.9 (36.3)	51.3 (23.3)	81.1 (36.8)
CS*-0271-L( )[ ]	55.8 (25.3)	88 (39.9)	56.3 (25.6)	89.3 (40.5)
CS*-0272-L( )[ ]	54.6 (24.8)	91.9 (41.7)	55.1 (25)	93.3 (42.3)
CS*-0273-L( )[ ]	54.6 (24.8)	91.9 (41.7)	55.1 (25)	93.3 (42.3)
CS*-0300-L( )[ ]	50.9 (23.1)	79.9 (36.3)	51.3 (23.3)	81.1 (36.8)
CS*-0301-L( )[ ]	68.8 (31.2)	113.3 (51.4)	69.4 (31.5)	115 (52.1)
CS*-0302-L( )[ ]	62.1 (28.2)	99.3 (45.1)	62.6 (28.4)	100.8 (45.7)
CS*-0303-L( )[ ]	62.1 (28.2)	99.3 (45.1)	62.6 (28.4)	100.8 (45.7)

* Compressor type ( ) Refrigerant type [ ] Voltage

Final Checks

Once the system is up and running, it is the responsibility of the installer to see that all the fine adjustments and checks are made so the condensing unit delivers maximum temperature performance and efficiency for the customer. These include:

- Confirm ORI flooding valve setpoint (when applied)
- Confirm fan-cycling temperature-control setpoint
- Defrost scheduling and timing condenser controls
- Winter controls
- TEV superheat adjustment
- High and low pressure controls
- Thermostat settings
- Adjustments to electronic controls
- Check supply voltage to ensure it is within +/- 10% of the voltage marked on the unit serial label
- Check the compressor amp draw to ensure it is not exceeding the value on the unit serial label
- Make sure electrical enclosure is properly grounded and reinstall panel door after service
- Repeatedly check compressor oil level and ensure oil level is 1/2 way up on the sight glass several times during first 48 hours of operation

Thoroughly inspect all field piping while the equipment is running and add supports where line vibration occurs. Be sure additional supports do not conflict with pipe expansion and contraction.

After the room temperature is reached, the expansion valve superheat must be checked. Suction superheat that is too low may cause liquid to return to the compressor, while suction superheat that is too high may cause excessive discharge temperatures. Target 9° F (5° C) superheat at the evaporator outlet. Superheat at the compressor inlet should be 20°–30° F (11.1°–16.7° C) for medium temperature applications and 20°–40° F (11.1°–22.2° C) for low temperature applications.

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.

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, re-check the low-pressure control setting.

When condition space is completely stocked, check the operation of the system again.

After 48 hours of operation, replace the liquid drier and suction filter cores (if applicable).

After 90 days, recheck the entire system including all field wiring.

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⚠WARNING

READ ALL WARNINGS AND PROCEDURES IN THIS MANUAL AND ON THE UNIT BEFORE SERVICING OR PERFORMING MAINTENANCE ON THIS EQUIPMENT.

FAILURE TO ABIDE BY THESE WARNINGS COULD RESULT IN AN EXPLOSION, DEATH, INJURY, AND PROPERTY DAMAGE.

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimized.

- Work shall be undertaken under a controlled procedure, as documented below, to minimize the risk of a flammable gas or vapor being present while work is being performed.
- Prior to performing any service work, make sure all tools and equipment have been certified for use with flammable refrigerants.
- All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.
- The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e., non-sparking, adequately sealed, or intrinsically safe.
- If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available on hand. A dry chemical or CO_2 fire extinguisher should be adjacent to the charging area.
- No person carrying out work in relation to a refrigerating system which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment shall be surveyed to make sure that there are no flammable hazards or ignition risks. “No Smoking” signs shall be displayed.
- Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.
- During repairs to sealed components, all electrical supplies shall be disconnected from the equipment being worked upon prior to any removal of sealed covers, etc. If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation. Particular attention shall be paid to the following to ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected. This shall include damage to cables, excessive number of connections, terminals not made to the original specification, damage to seals, incorrect fitting of glands, etc.

  i. Ensure that the apparatus is mounted securely.
  ii. Ensure that seals or sealing materials have not degraded to the point that they no longer serve the purpose of preventing the ingress of flammable atmospheres. Replacement parts shall be in accordance with the manufacturer’s specifications.

- Component parts are designed for use with flammable refrigerants and are non-incendive and non-sparking. To minimize the risk of possible ignition due to incorrect parts, component parts shall only be replaced with identical repair parts. Servicing shall be done by qualified service personnel only, so as to minimize the risk of possible damage due to incorrect parts or improper service.
- Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times, the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer's technical department for assistance.
- Intrinsically safe components are the only types that can be worked on while live in the presence of a flammable atmosphere. The test apparatus shall be at the correct rating. Replace components only with parts specified by the manufacturer. Other parts can result in the ignition of refrigerant in the atmosphere from a leak.
- Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment, so all parties are advised. Initial safety checks shall include:
  i. Ensure that capacitors are discharged—this shall be done in a safe manner to avoid the possibility of sparking.
  ii. Ensure that no live electrical components and wiring are exposed while charging, recovering, or purging the system.
  iii. Ensure that there is continuity of earth bonding.
- Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that this will not exceed the permissible voltage and current permitted for the equipment in use.
- 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 doors, lights, fans, heaters, and thermostats.
- Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges, or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.
- Refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.
- To reduce the risk of fire, electrical shock or injury when cleaning this equipment:
  -Remove supply power from the equipment before cleaning.
  -Keep all liquids away from electrical and electronic components.
- If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.

Maintenance and Cleaning

Proper maintenance and cleaning are critical for optimal system performance. It is recommended that the equipment and all piping and system components be visually inspected regularly. No acidic or caustic cleaners and no abrasive materials should be used to clean the equipment.

⚠WARNING

- Remove supply power from the condensing unit and connected refrigeration system before working on the equipment.
- Use caution and proper safety precautions when working on or around sheet metal pieces or fan blades to avoid potential injury.
- Improper service and maintenance may cause personal and/or property damage.
- Have quenching cloth and fire extinguisher available in proximity to any work being performed.

Inspection

If the condensing unit is equipped with an electrical power disconnect switch, make sure the switch is locked in the “OFF” position before any electrical work is performed on the unit. Without a disconnect switch on the unit, make sure all power to the unit is off from the source.

Electrical connections should be inspected periodically and tightened if required. Loose electric connections can cause severe electrical damage as well as nuisance trip out and burnouts.

During the unit startup phase, check the fans for the correct rotation. While the fans are rotating the airflow should pass through the coil surface first, flow through the fan and away from the unit. If the fans are pushing the air into the coil surface the fans are rotating in the wrong direction and the motor wiring needs to be corrected.

Regular inspection ensures reliable operation and reduces downtime.

Preventative Maintenance

Every Two Weeks

- Review system pressures, temperatures, and oil levels.
- Check alarm history and electrical supply voltages.
- Inspect for vibration, noise, or abnormal operating conditions.

Monthly

- Inspect contactor, fan motors, and electrical terminals.
- Check inlet air side of condenser and ensure surface is free of foreign matter.
- Clean condenser fan blades and guards.
- Check insulation, conduits, and control panel integrity.
- Verify oil separator and filter-drier performance.
- Check compressor oil level and refrigerant level using sight glasses and check visible piping for oil spots.

Every Three Months

- Record suction, discharge, and liquid line pressures and temperatures.
- Test safety and control devices.
- Clean suction and liquid line strainers.
- Check compressor mounts and piping support integrity.

Annually

- Replace oil, liquid, and suction filter cores.
- Take an oil sample and analyze for acid or contamination.
- Clean condenser coils and verify refrigerant charge.
- Inspect pressure relief discharge lines.
- Verify alarm sequences and safety interlocks.

Every Two Years

- Inspect protective coatings and repaint as needed.

Maintenance Documentation

Keep a maintenance log recording the following information:

- Date, technician name, and unit serial number.
- Operating pressures, temperatures, and amperage readings.
- Components replaced or adjusted.
- Refrigerant or oil added and quantities.
- Alarms observed and corrective actions taken

Cleaning

For maximum efficiency, condensing units should be cleaned every 4 to 6 months maximum (more frequently if possible) so that airflow is not restricted. More frequent cleaning will be necessary under severe conditions.

Primary Coil Cleaning (remove gross debris, dry coil)

1. Remove power from the unit.
2. Carefully remove the coil guard(s) and access panels as needed to access coil.
3. Carefully remove any large debris from the coil manually, making sure all proper safety equipment is used.
4. Utilize a 10” corn broom (reference ASTM F2367-04a) to remove dust and dirt from the outside of the coil. Repeat with an extended tool on the inside face of the coil. Gently sweep in vertical direction from the top to the bottom of the coil, without applying pressure to the surface. This will remove the majority of the dust and entrained debris.
5. Use an explosion-proof vacuum to clean the compressor side of the unit. Low pressure compressed air can also be used.
6. Reinstall and re-secure all the removed guards/panels.
7. With the area safe and clear, apply power and turn the condenser fans back on.

In the majority of circumstances this will be sufficient to properly clean the coil, but if additional cleaning is needed, proceed to the following section.

Alternate Coil Cleaning (low pressure coil rinse)

1. Remove power from the unit.
2. Carefully remove the coil guard(s) and access panels as needed to access coil.
3. Carefully remove any large debris from the coil manually if it has not been done already, making sure all proper safety equipment is used.
4. The coil should only be rinsed with potable water. No chemical cleaners should be used as this may damage the coil.
5. Using a hose with an adjustable, angled spray nozzle and water pressure of 50–100 PSI (3.5–6.9 bar), access the coil through the top. Rinse, taking care not to directly spray the condenser motor, electrical connections, or wiring.
6. Reinstall and re-secure all the removed guards/panels.
7. Check to ensure everything is reinstalled properly and the system is sufficiently dried, then restore power.

Troubleshooting

This section assumes that the technician has a basic understanding of electrical systems and safe diagnostic practices for refrigeration equipment. Make certain to observe all safety warnings and precautions listed in this manual during the troubleshooting process. Ensure all applicable wiring diagrams/schematics are available for use during troubleshooting before beginning.

During the troubleshooting process, it is important to follow all procedures carefully to identify whether a fault originates within the electrical system or from external components such as motors, sensors, or control circuits. Proper diagnostic technique will help to ensure a safe and accurate resolution.

Note: Analog meters (volt-ohm meters or VOMs) can draw excessive current that may permanently damage sensitive electrical or electronic components. Always use a digital multimeter (DMM) when measuring voltage, current, or resistance. If the selected range is exceeded, the DMM display will show “OL” (overload).

General Refrigerant Side Troubleshooting

Issue	Troubleshooting Steps
High Suction Pressure	1. Check if superheat is high. If it is, the load on evaporator is too high. 2. Check if condensing pressure is high. If it is, check if condenser coil is clean. If it is not, clean the coil and re-check. If it is, the refrigerant charge is too high. 3. Check if expansion valve bulb is installed and insulated correctly
Low Suction Pressure	1. Check if the high side pressure drop is high. If yes, there is a liquid line restriction 2. Check liquid drier and for any closed valve(s). 3. Check if subcooling is low. If yes, refrigerant charge is too low.
Oil Failure Switch Tripped	1. Check for a shortage of oil in the compressor 2. Check oil trapping in the system 3. Check liquid for slug back to the compressor 4. Check for compressor short cycling 5. Check for refrigerant in the oil on startup 6. Check for malfunctioning oil pump 7. Check for clogged oil suction screen 8. Check for excessively low suction pressure 9. Check for defective control 10. Low refrigerant charge in low ambient conditions

Electrical Side Troubleshooting

Issue	Troubleshooting Steps
Compressor Does Not Start/Run	1. Verify supply power. Check that the unit's main disconnect and compressor circuit breaker are in the ON position and that full supply voltage is present at the line side of the contactor. 2. Check contactor operation. Observe whether the compressor contactor is being energized when the system calls for cooling. If the contactor energizes, proceed to Step 3. If the contactor does not energize, go to Step 6. 3. Confirm compressor operation. If the contactor is energized, verify that the compressor is receiving power. Cycle the compressor circuit breaker OFF and ON—the compressor should stop and restart with the breaker. Alternatively, use a digital clamp-on ammeter to check for current draw on all three phase wires between the contactor and compressor. If no amperage is detected, continue to Step 4. 4. Inspect compressor terminal connections. Turn the compressor circuit breaker OFF before opening the compressor terminal box. Check that all power leads inside the terminal box are secure and properly torqued. Loose terminals can cause open circuits or high-resistance faults. If connections are tight and power is present, but the compressor still does not start, the compressor may have an internal failure and require replacement. 5. Check for mechanical or electrical damage. Examine the compressor body and wiring for any signs of overheating, short circuits, or insulation damage. 6. Verify control circuit continuity. If the contactor does not energize, troubleshoot the control circuit wiring. Using the unit-specific wiring diagram and a digital multimeter, locate where the circuit is open. Typical components in this circuit include phase monitor, safety switches (high pressure, low pressure, oil level, and discharge line thermostat), and control transformer and interlocks. 7. Check safety devices. Ensure all pressure and temperature safeties are within their operating range and not tripped. Verify that suction pressure is above 2 PSIG (0.14 bar) to avoid low-pressure lockout. Confirm that the system is not in a defrost or compressor lockout condition that temporarily prevents operation. 8. After confirming that all wiring, safeties, and power connections are in good condition, reset the system and monitor operation. If the compressor still fails to start, component replacement may be necessary.
Defrost Circuit Malfunctioning	1. Check defrost timer. Confirm it is advancing and initiating defrost at scheduled intervals. 2. When timer initiates defrost, verify that the defrost contactor coil energizes. Check for 208–230 VAC at the defrost heaters or solenoid valve. 3. If no voltage, check continuity through the termination thermostat and safety devices. Ensure power is being supplied from the timer output contacts. 4. If heaters or valve are energized but coil temperature does not rise, measure current draw of heaters. Inspect wiring, heater resistance, and any blown fuses. 5. After defrosting, confirm the termination thermostat opens when coil temperature rises, ending the defrost cycle.

Issue	Troubleshooting Steps
Temperature Sensor Malfunction	1. Verify sensor placement. Confirm that the temperature probe is correctly located in the air stream at the evaporator outlet. Ensure the sensor is not touching coils, metal surfaces, or insulation, as direct contact can cause inaccurate readings. 2. Inspect wiring and connections. Examine all sensor wiring for loose, corroded, or damaged terminals. Using a digital multimeter, check for continuity between the sensor leads and terminal connections to confirm the circuit is intact. 3. Measure sensor resistance (out of circuit). Disconnect the sensor and measure resistance with a digital multimeter set to ohms (Ω) at ambient temperature. Record both the measured resistance and the surrounding air temperature. 4. Compare to the manufacturer's resistance-temperature data. For example, a 10 kΩ NTC thermistor should measure approximately 10,000 Ω at 77 °F (25 °C). If readings deviate significantly, the sensor may be out of calibration. 5. Check sensor response. Simulate temperature changes by gently warming the sensor (e.g., with your hand) or cooling it (e.g., placing in ice water). The resistance should decrease as temperature rises and increase as temperature falls. If resistance remains unchanged, the sensor is likely defective. 6. Check sensor voltage (in circuit). Reconnect the sensor and power the system. Using a voltmeter, measure the voltage across the sensor terminals while in operation. Confirm that the voltage fluctuates within the expected range as temperature changes. 7. Evaluate input circuit configuration. If resistance and voltage readings are correct but the displayed temperature remains inaccurate, verify that the input circuit or monitoring device is properly configured for the sensor type and resistance curve. 8. Replace the sensor if it shows an open circuit, short circuit, or resistance values that are far from expected at known temperatures.

Condenser Troubleshooting

Issue	Probable Cause(s)		Potential Solutions
high condensing temperature	lack of airflow over the coil	incorrect installation	check for proper clearance and installation location
		coil clogged/dirty	clean coil
		fan issue	check fans for cleanliness and proper function
		controller issue	check for proper controller settings and operation
	low refrigerant charge/pressure		check system charge/pressure
			check system piping to ensure there are no problematic restrictions or design features
			check for abnormal pressure drops at metering devices and valves
excessive/abnormal fan or motor noise	dirty fan guard or blade		clean guard/fan
	damaged fan blade or motor		inspect fan blade and motor for physical or functional damage; replace as needed
	interference with housing or guard		check for proper component clearance
fans not operating	improper or damaged wiring		check wiring and repair/replace as needed
	defective motor		replace motor
	defective controller or relay		test and as needed replace defective component(s)

Refrigerant Removal, Evacuation, and Recovery

When breaking into the refrigerant circuit to make repairs—or for any other purpose—conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration. The following procedure shall be adhered to:

a. Safely remove refrigerant following local and national regulations
b. Purge the circuit with inert gas
c. Evacuate
d. Purge with inert gas
e. Open the circuit by cutting or brazing

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. The system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems.

Refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place.

Ensure that the outlet for the vacuum pump is not close to any potential ignition sources and that ventilation is available.

Recovery Procedure

When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely. When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available.

All cylinders to be used are designated for the recovered refrigerant and labeled for that refrigerant (i.e., special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of all appropriate refrigerants including, when applicable, FLAMMABLE REFRIGERANTS. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manufacturer if in doubt.

The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that FLAMMABLE REFRIGERANT does not remain within the lubricant. The evacuation process shall be carried out prior to returning the compressor to the supplier. Only electric heating to the compressor body shall be employed to accelerate this process.

When oil is drained from a system, it shall be carried out safely.

Service

Make certain to observe all safety warnings and precautions listed in this manual during the service process.

Compressor Replacement

Each installation environment is unique. Plan carefully to ensure the compressor can be moved safely without causing harm to personnel, equipment, or structures. Before removing the existing compressor, ensure the replacement unit is prepared for installation and that the following items are verified:

- Replacement compressor model and specifications
- Electrical requirements and connections
- Refrigerant application and capacity
- Piping layout, suction/discharge gaskets, and mounting configuration

Place the replacement compressor in an accessible area, uncrated and ready for installation. Disconnect power from the condensing unit and control circuits. Open circuit breakers or remove fuses, tag all disconnected wires, and remove conduit from the compressor.

Front-seat the suction and discharge valves, and close oil supply and equalizing lines. Bleed pressure from both ports into an approved recovery vessel. Remove any reusable external components and plug all open ports per manufacturer specifications. Remove suction/discharge bolts and mounting hardware. When lifting, use approved lifting equipment such as a hoist or hydraulic lift—never use piping or structural panels for support.

Clean gasket surfaces on both the valves and the new compressor to bright metal. Avoid scoring or grooving these surfaces. Install the new compressor in reverse order, ensuring all connections are properly torqued and leak-tested before system evacuation and start-up.

Drier and Filter Core Replacement

Shut down and isolate the system section containing the core to be replaced. Recover refrigerant and relieve pressure into an approved recovery cylinder. Open the housing, replace the core, close the assembly, charge the system, and perform a pressure test and leak inspection before returning the system to service.

Fan Blade Replacement

1. Ensure system is fully powered down and all supply power is disconnected.
2. Remove the the fan guard hardware and place the guard aside.
3. Loosen the set screw and gently and evenly pull the fan blade off of the motor shaft.
   Note: It is important to protect your hands from both the fan and the edges of condenser. Do not attempt to remove in a way that will cause your hands to be caught between the condenser housing and fan blade.
4. Once the old blade is removed, place the new blade on the shaft in the same orientation and position, then tighten the set screw.
5. Check for proper rotation and clearance.
6. If no interference is present, reinstall the fan guard and the retaining nuts.
   Note: Do not under any circumstance connect power to the condenser or attempt to use the system without the fan guard(s) installed.
7. Restore power to the condenser and system and check for proper operation.

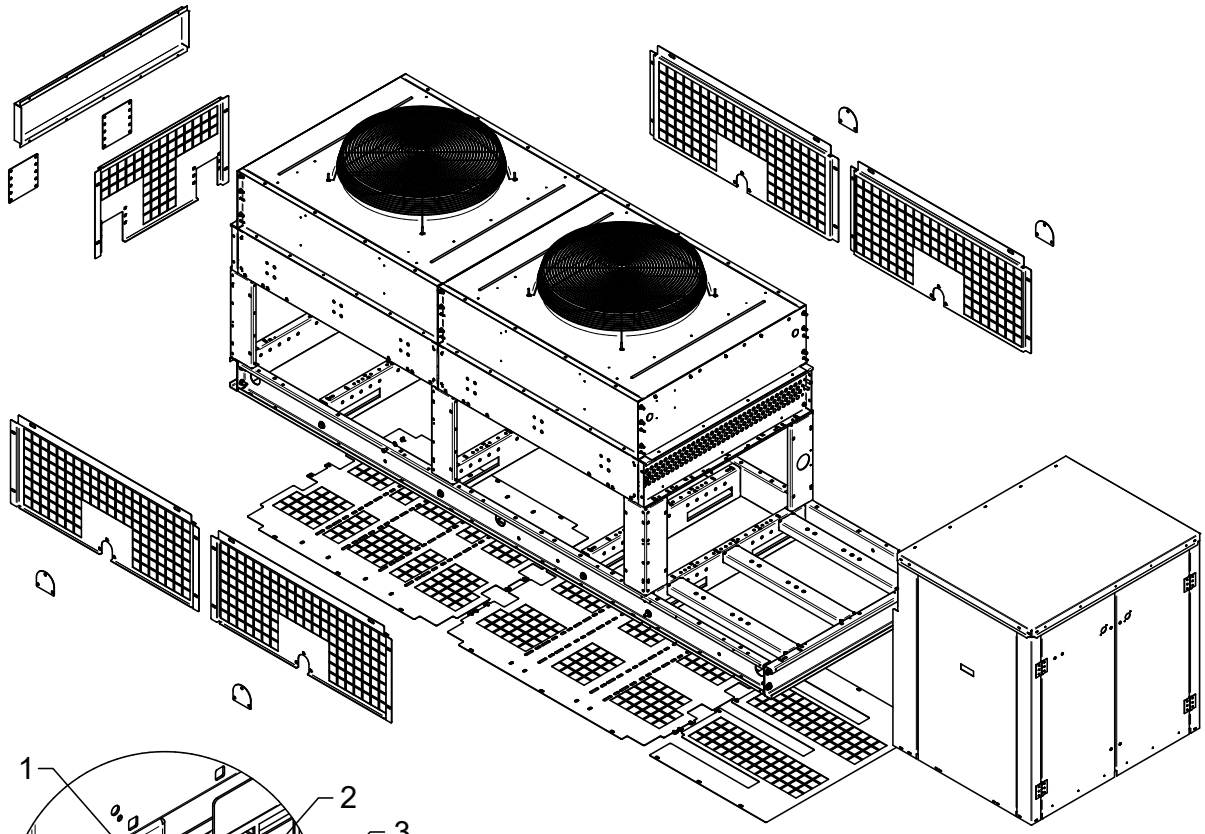
Fan Motor Replacement

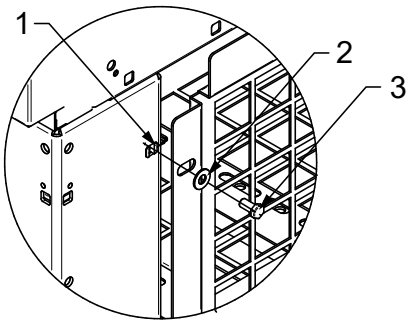
1. Ensure system is fully powered down and all supply power is disconnected.
2. Remove the the fan guard hardware and place the guard aside.
3. Loosen the set screw and gently and evenly pull the fan blade off of the motor shaft.
   Note: It is important to protect your hands from both the fan and the edges of condenser. Do not attempt to remove in a way that will cause your hands to be caught between the condenser housing and fan blade.
4. Unplug the motor electrical connections.
5. Loosen/remove the hardware attaching the motor mount to the motor and pull the old motor out of the condenser.
6. Mount the new motor to the motor mount in the same orientation as the original.
7. Connect motor electrical wiring.
8. Attach fan blade in the same orientation and position as it was in prior to removal, then tighten the set screw.
9. Check for proper rotation and clearance.
10. If no interference is present, reinstall the fan guard and the retaining nuts.
    Note: Do not under any circumstance connect power to the condenser or attempt to use the system without the fan guard(s) installed.
11. Restore power to the condenser and system and check for proper operation.

Guard Screen Installation / Removal

All guard screens are installed using nut retainers mounted to structural elements of the unit.

Ensure all screens are reinstalled before resuming operation if is necessary to remove them for maintenance or cleaning.





ID	Fastening Hardware	Part Number
1	Nut Retainer	051560
2	Washer	051280
3	Screw	0503200000

Leak Detection

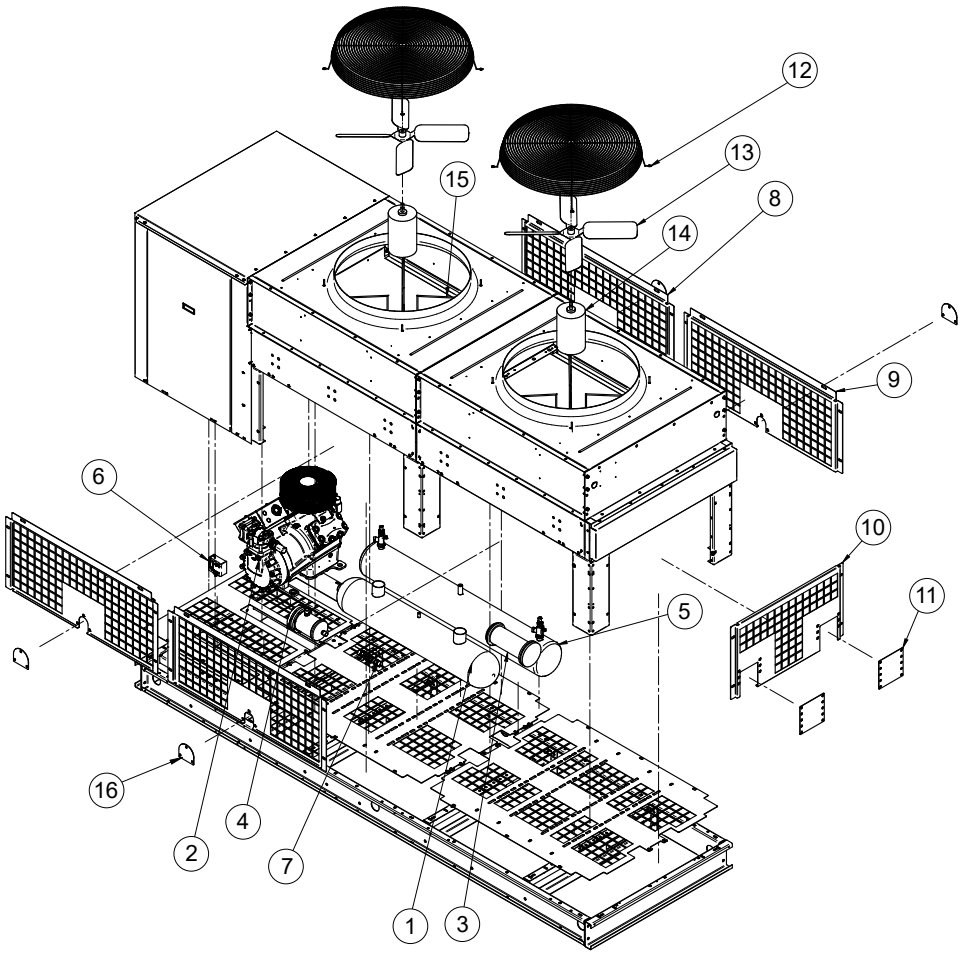
Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used. The following leak detection methods are deemed acceptable for all refrigerant systems:

- Electronic leak detectors may be used to detect refrigerant leaks but, in the case of FLAMMABLE REFRIGERANTS, the sensitivity might not be adequate, or might need recalibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25% maximum) is confirmed.
- Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine can react with the refrigerant and corrode the copper pipe-work.

Note: Examples of leak detection fluids are bubble method and fluorescent method agents.

If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut-off valves) in a part of the system remote from the leak. Removal of refrigerant shall be according to the ‘Refrigerant Removal, Evacuation, and Recovery’ section provided.

Replacement Parts List



Item Number	Description		Hussmann/Krack Part Number
1	Suction Accumulator	3836H Suction Accumulator 6X22;1-3/8”	BM04046
		3810H Suction Accumulator 6X30;1-5/8”	BM04047
		3839H Suction Accumulator 6X48;2-1/8”	E150326
		A8-25H Suction Accumulator 8-5/8X48;2-5/8”	E152342
		3873H Suction Accumulator 10-3/4x48;3-1/8”	BM04069
2	Compressor	Discus 208 VAC 3-Phase 2YC	3242221
		Discus 460 VAC 3-Phase 2YC	3242239
		Discus 208/230 VAC 3-Phase	3254516
		Discus 460 VAC 3-Phase 2YL	3242243
		Discus 208 VAC 3-Phase 2YA	3242219
		Discus 460 VAC 3-Phase 2YA	3242237
		Discus 208/230 VAC 3-Phase	3254517
		Discus 460 VAC 3-Phase 3YA	3254519
		Discus 208/230 VAC 3-Phase	3254520
		Discus 460 VAC 3-Phase 3YB	3254521
		Discus 208 VAC 3-Phase 3YF	3242232
		Discus 460 VAC 3-Phase 3YF	3254523

Item Number	Description		Hussmann/Krack Part Number
2	Compressor	Discus 208–230 VAC 3-Phase	3249884
		Discus 460 VAC 3-Phase 3YS	3254524
		Discus 208/230/460 VAC 3-Phase	3254526
		Discus 208/230/460 VAC 3-Phase	3254527
		Discus 208/230/460 VAC 3-Phase	3254528
		Discus 208/230/460 VAC 3-Phase	3254529
		Discus 208/230/460 VAC 3-Phase	3254530
		Discus 208/230/460 VAC 3-Phase	3254540
		Discus 208/230/460 VAC 3-Phase	3254541
		Discus 208/230/460 VAC 3-Phase	3254542
		Discus 208/230/460 VAC 3-Phase	3254543
		Discus 208/230/460 VAC 3-Phase	3254544
		Discus 230/460 VAC 3-Phase	3254545
		Discus 208/230/460 VAC 3-Phase	3254533
		Discus 230/460 VAC 3-Phase	3249885
		Discus 208/230/460 VAC 3-Phase	3254536
		Discus 208/230/460 VAC 3-Phase	3254537
		Discus 208/230/460 VAC 3-Phase	3254546
		Discus 208/230/460 VAC 3-Phase	3254547
		Discus 208/230/460 VAC 3-Phase	3254551
		Discus 208/230/460 VAC 3-Phase	3254548
		Discus 208/230/460 VAC 3-Phase	3254549
		Discus 208/230/460 VAC 3-Phase	3254550
		4FES52DU-1D 208 VAC	0005536
		4FES54SU-1D 460 VAC	0005537
		4EES62DU-1D 208 VAC	0005539
		4EES64SU-1D 460 VAC	0005540
		4DES72DU-1D 208 VAC	0005542
		4DES74SU-1D 460 VAC	0005543
		4CES92DU-1D 208 VAC	0005545
		4CES94SU-1D 460 VAC	0005546
		Ecoline 4TES-12-2N	E210864001
		4PES152NU-1D 208/460 VAC	0005552
		Ecoline 4NES-20-2NU	E210868001
		Ecoline 4JE-22-2NU	E210870001
		Ecoline 4HE-25-2NU	E210872001
		Ecoline 4GE-30-2NU	E210874001
		Ecoline 6HE-35-2NU	E210876001
		Ecoline 6GE-40-2NU-2D	E210878001
		4FES32DU-1D 208 VAC	1H94654001
		4FES34SU-1D 460 VAC	1H94655001
		4EES42DU-1D 208 VAC	1H94657001
		4EES44SU-1D 460 VAC	1H94658001

Item Number	Description		Hussmann/Krack Part Number
2	Compressor	4DES52DU-1D 208 VAC	1H94660001
		4DES54SU-1D 460 VAC	1H94661001
		4CES62DU-1D 208 VAC	1H94663001
		4CES64SU-1D 460 VAC	1H94664001
		4TES92NU-1D 208/460 VAC	1H94672001
		4PES122NU-1D 208/460 VAC	1H94676001
		4NES142NU-1D 208/460 VAC	1H94680001
		4JE152NU-1D 208/460 VAC	1H94682001
		4HE182NU-1D 208/460 VAC	1H94684001
		4GE232NU-1D 208/460 VAC	1H94686001
		6HE-28-2NU-2D 230 VAC	E211088001
		6GE342NU-2D 208/460 VAC	1H94692001
3	Suction Filter	SF-289T 1-1/8" ODF	E150061
		SF-4811T 1-3/8"	E150384
		SF-4813T 1-5/8"	E150062
		SF-6417T 2-1/8"	E150063
		SF-6421T 2-5/8"	E150385
		RSF-489-T 1-1/8"	E150391
		RSF-4811T 1-3/8"	E150355
		RSF-4813-T 1-5/8"	E150259
		RSF-4817-T 2-1/8"	E150389
		RSF-4821-T 2-5/8"	E150526
		RSF-9621-T 2-5/8"	BM02151
		RSF-9625-T 3-1/8"	E151726
Not Shown	Suction Filter Element		E150260
4	Liquid Filter Drier	C-053-S 3/8" ODF	E151538
		C-487-G 7/8" ODF	BM02115
		C969G 1-1/8" ODF	BM02116
		C14411G 1-3/8" ODF#	BM02117
		C19213G 1-5/8" ODF	E152343
Not Shown	Drier Core		E206972
5	Receiver	8.625" X 60"	3248573
		10.75" X 48"	3248571
		10.75 X 72"	3248574
		10.75" X 96"	3248570
		10.75" X 108"	3248566
		10.75" X 144"	3248568
		8-5/8" X 28"	BM04084
		8-5/8" X 48"	BM04086
Not Shown	Receiver Strap	8 5/8" Diameter	E152198
		10 3/4" Diameter	E152199

Item Number	Description		Hussmann/Krack Part Number
6	Low Pressure Control	P170AB12C	E207001
		P100-DA-9D	E156202
		P70AA-151D	E151802
7	Sight Glass	SA-17S 7/8" ODF	200223
		SA19S 1-1/8" ODF	E150146
		SA211 1-3/8" ODF	E150147
		SA-213 1-5/8" ODF	E150367
8	Side Screen Guard (small)		3247121
9	Side Screen Guard (medium)		3247122
10	Rear Screen Guard	1-Wide	3247123
		2-Wide	3249966
11	Rear Plate Cover		3232227
12	Fan Guard		E280792
13	Fan Blade	E Motor (Condenser ID 3)	E209267001
		F Motor (Condenser ID 0, 1, or 2)	E209267
14	Fan Motor	E Motor (Condenser ID 3)	E206880
		F Motor (Condenser ID 0, 1, or 2)	3236097
Not Shown	Motor Ring (E Motor)		E209540001
	Motor Ring (F Motor)		80034
15	Motor Bracket (E Motor)		E209538001
	Motor Bracket (F Motor)		E208055
16	Small Cover Plate		3232226
Not Shown	Relief Valve	235 PSI	3177382
		450 PSI	E151600
	Solenoid Valve	ME19S270 240V 7/8"	E313020
		ME25S290 240V 1-1/8"	E313022
		ME19S270 115V 7/8"	E313019
		ME25S290 115V 1-1/8"	E313021
		ME35S1110 230V 1-3/8"	E157066001
		ME35S1110 115V 1-3/8"	E157067001
	Check Valve	A17939 7/8"	10930MU
		806C-11S 1-1/8"	11804
		807C-13S 1-3/8"	11805
		808C-15S 1-5/8" ODS	E150087
		809C-21S 2-1/8" ODS	E205552
		MS-42 2-5/8"	BM02061
	ORD Valve	4-20 5/8" ODF	200206
	ORI Valve	6-65/225 7/8" ODF	200209
		6-65/225H 1-1/8" ODF	BM01012
		10-65/225 7/8" ODF	BM01024
		10-65/225 1-1/8" ODF*	200205
		10-65-225 1-3/8" ODF\	E410494001

Item Number	Description		Hussmann/Krack Part Number
Not Shown	Rotolock Components	7/8" IDS; 1-1/4-12 Valve	BM02072
		1-1/8" IDS; 1-1/4-12 Valve	BM02074
		1-1/8" IDS; 1-3/4-12 Valve	E152211
		1-3/8" IDS; 1-3/4-12 Valve	BM02064
		1-5/8" ODS 1-3/4"-12 BA11X14 Adapter	E151768
		W-1343 1-3/8" x 1-1/8" Bushing	E151772
	S-9104H Reservoir Pressure Valve		E150600
	S-9109 Oil Reservoir		E150601
	Ball Valve	591A-11ST 1-1/8"	E150625
		FP 1.375" A17866	417712000
		593A-15ST 1-5/8" ODS	E205371
		594WA-21ST 2-1/8" ODS	E205653
		594WA-25ST 2-5/8" ODS	E150347
		596WA-31ST 3-1/8" ODS	E152317
		593WA-15ST	E205368
		0.375" PKLS LIN A14850	E206098
		587WA-14ST 7/8" ODS	E150066
	Oil Separator	903 7/8"	E150299
		904 1-1/8"	E150247
		905 1-3/8"	E150212
		1 5/8"	E152484
		3 1/8"	E151522
		S-5185 5/8"	E151887
		S-5187	E151457
		S-5190 1-3/8	E151519
		S-5192	E151455
		S-5203 2-5/8"	E151521
		926 1-5/8"	E152454
		927	E152206
		A-FC8241717 2-1/8"	E152485
		S-5604 Turbashed	E152471
		S-5608 Turbashed	E152472
	Transformer	50 VA MTE Control	10804
		500 VA 480/240P 240/120A	E151494
		500 VA GP Control	E150100
		B250PU1519JJ 250VA 480/240-120A	E201651
		GP0250-EG00-B106 250 VA 600-380P/230-115S	E201674
	Oil Control	TRAXOIL OMB-1-JB/ST 24 V ASC 2	E152429
		P545NCB-25C Bitzer Oil Fail Control	E151870
	Oil Level Sensor	OLC-K1 230 VAC 347318-06	1H15556001
		OLC-K1 115 VAC 347318-07	1H15556002
	Coil Defrost Heater	LH2 1,000 W, 208 VAC	E104183
		LH3 1,500 W, 208 VAC	E104184
		LH4 2,000 W, 208 VAC	E104185

Item Number	Description			Hussmann/Krack Part Number
Not Shown	Disconnect Switch	Fused	CH324NRB 200 A, 240 V	BN03195
			;HF362R, 60A, 600V	E311238
			HF363R, 100 A, 600 V	E151524
			H324NRB, 200 A, 250 V	E151525
			H365NRB, 400 A, 600 V	E152549
			H364NRB, 200 A, 600 V	0705527
		Non-Fused	OT30E3P, 30 A	BN03161
			OT63B6-170	BN03159
			OT100B6-170	BN03160
			OT160B6-210 125 A	BN03168
			OT200B8-240	BN03171
			3P 400 A 600 VAC	3217638
	Contactor	DP 32 A, 110–120 VAC		3233806
		DP 32 A, 208–240 VAC		3233808
		DP 40 A, 110–120 VAC		3233810
		DP 40 A, 208–240 VAC		3233811
		DP 50 A, 110–120 VAC		3233812
		DP 50 A, 208–240 VAC		3233813
		DP 60 A, 110–120 VAC		3233814
		DP 60 A, 208–240 VAC		3233815
		DP 75 A, 110–120 VAC		3233816
		DP 75 A, 208–240 VAC		3233817
		C25GNF390A 90 A, 115 VAC		E209972001
		C25GNF390B 90 A, 230 VAC		E209972002
		C25HNE3120A 120 A, 115 VAC		E209973001
		C25HNE3120B 120 A, 230 VAC		E209973002
		C25KNE3200A 150 A, 115 VAC		E209974001
		C25KNE3200B 150 A, 230 VAC		E209974002
	Relay	3RH2122-1AP60 220V/240V 2NO/2NC RELAY		E202178
		3RH2122-1AK60 110V/120V 2NO/2NC RELAY		E201767
	Wire Harness	1-Fan (Single)		E152238
		2/4-Fan (Single/Left)		E152239
		3/6-Fan (Single/Left)		E152241
		8-Fan (Left)		E152243
		4-Fan (Right)		E152240
		6-Fan (Right)		E152242
		8-Fan (Right)		E152244
	Receiver Thermostat 50 F/60 F SPDT			BN04025
	Unloader Solenoid	Discus	998-0326-02 120 VAC 3D	E151666
			998-0326-03 240 VAC 3D	E151012
			998-0213-02 120 VAC 4D-8D	E150419
			998-0213-03 240 VAC 4D-8D	E152282
		Bitzer	884-0202-01 120 VAC	E410293001
			884-0203-03 230 VAC	E152459

Item Number	Description			Hussmann/Krack Part Number
Not Shown	Crankcase Heater		918-0028-00 100 W/120 VAC	E410375001
			918-0028-01 100 W/240 VAC	E210430001
			892-1120-01 115 VAC 120 W	E152555
			892-1120-02 230 VAC 120 W	E152556
			892-1120-13 115 VAC 120 W	E152557
			892-1120-14 230 VAC 120 W	E152540
			892-1140-01 115 VAC 140 W	E152329
			892-1140-02 230 VAC 140 W	E306003
			40 W/230 VAC 9HT5400	3032220
	Phase Loss Monitor		208–480 VAC	E201708
			DPC01DM69 575 VAC	BN04257
	Anti Short Cycle Relay 2x2 Solid State Timer THCU1023E			E151429
	Safe Start Time Delay		TGL1300A4S TDR 115 VAC 300 Seconds	E151407
			TGL2300A4S TDR 230 VAC 300 Seconds	E151408
	Pump Down Switch		1185/20 SPEMCO TOGGLE SWITCH@	201434
			12-B TOGGLE SWITCH BOOT	E150199
	Defrost Timer		6145-20B 230 VAC	10574B
			6145-0B 115 VAC	10575B
	Circuit Breaker	Compressor	NGG3B015L 15 A	E152576
			NGG3B020L 20 A	E152577
			NGG3B025L 25 A	E152578
			NGG3B030L 30 A	E152579
			NGG3B040L 40 A	E152580
			NGG3B050L 50 A	E152581
			NGG3B060L 60 A	E152582
			NGG3B070L 70 A	E152583
			NGG3B080L 80 A	E152584
			NGG3B090L 90 A	E152585
			NGG3B100L 100 A	E152586
			NGG3B125L 125 A	E152587
		Misc.	SH203-C2 3 Poles / 2 A ABB	E410437001
			S201-C3 CB 3 A, 1 P Curve C ABB	E210677001
			S201-C4 CB 4 A, 1 P Curve C ABB	E210677002
			SH202T-C6 ABB	E410435001
			S201-C10 CB 10 A, 1 P Curve C ABB	E210677003
			SH202T-C10 2 Poles / 10 A ABB	E410436001
			S203-C10 CB 10 A, 3 P CURVE C ABB	E210706001
			50 A 460 VAC ABB 1SDA050875R	E210603001
	Compressor Oil		BVA 32HE POE (Bitzer)	E152443
			Ultra 32CC POE Oil 998-E022-00	E315785
	Oil Filter			3088488

Decommissioning Process

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its details. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample should be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task is commenced.

a. Become familiar with the equipment and its operation.
b. Isolate the system electrically.
c. Before attempting the procedure, ensure:
   i. Mechanical handling equipment is available, if required, for handling refrigerant cylinders.
   ii. All personal protective equipment is available and being used correctly.
   iii. The recovery process is supervised at all times by a qualified, competent person.
   iv. Recovery equipment and cylinders conform to the appropriate standards.
d. Pump down refrigerant system, if possible.
e. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
f. Make sure that cylinder is situated on the scales before recovery takes place.
g. Start the recovery machine and operate in accordance with instructions.
h. Do no overfill cylinders (no more than 80% volume liquid charge).
i. Do not exceed the maximum working pressure of the cylinder, even temporarily.
j. When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
k. Recovered refrigerant shall not be charged into another refrigerating system unless it has been cleaned and checked.

Equipment shall be labeled stating that it has been decommissioned and emptied of refrigerant. The label shall be dated and signed. For appliances or cylinders containing flammable refrigerants, ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.

Warranty

To obtain warranty information or other support, contact your Hussmann representative or visit: https://www.hussmann.com/services/warranty.

Please include the model and serial number of the product.

For questions about your equipment, please contact our Technical Support Team at 1-866-785-8499

For general support or service calls, contact our Customer Support Call Center at 1-800-922-1919

For ordering aftermarket warranty parts, call 1-855-HussPrt (1-855-487-7778) or email the following address: Hussmann_part_warranty@hussmann.com

SQUARED Hotline (tech support line)

Level one provides product initial tech support and can connect the caller to level two, if required.
888-SQUARED (888-778-2733)

Sporlan

www.sporlanonline.com

Emerson (Fault Finder app)

www.emersonclimate.com/en-us/Resources/Mobile_Apps/Pages/mobileapps.aspx

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Revision History

Revision A: (November 2026) Initial release.
Revision B: (November 2026) Added addition unit identification information.

Scan the QR code on your mobile device to access additional product information or order parts using equipment serial number.

Parts may also be ordered at:
parts.hussmann.com
Call toll free: 1.855.487.7778

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