

Installation, Operation, and Service Manual

IM-04/05-R

P/N 3252229 Rev A
June 2026

Models Covered

IM-04-C6-R, IM-04-E5-R
IM-05-C12-R-EC10

Certifications



WARNING:

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.

READ THE ENTIRE MANUAL BEFORE INSTALLING OR USING THIS EQUIPMENT.

The equipment can be configured to use a variety of refrigerants during the ordering process. Different refrigerants have unique characteristics to be aware of, including the mild flammability of A2L refrigerants and potential toxicity of R-744 (CO₂) in high concentrations. If a leak is present or suspected, do not allow untrained personnel to attempt to find the cause and observe all warnings contained within this document. No open flames, cigarettes, or other possible sources of ignition should be used inside or in the vicinity of equipment containing flammable refrigerants.

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

FAILURE TO ABIDE BY THIS WARNING 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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User Safety and Product Information

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 or 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 IM-04/05-R unless otherwise stated or contextualized and “system” means a set of things working together as parts of an interconnecting network.

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.

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User Safety and Product Information

Serial Label Location

The Serial Label is located on the interior wall on the top left-hand side. Serial label contains all pertinent information such as model, serial number, amperage rating, refrigerant type, and other important installation and safety information.

UL/ETL Listing

These merchandisers 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.

NSF/UL EPH/ETL Sanitation Listing

These merchandisers are manufactured to meet ANSI / NSF-7 standard requirements for sanitation. Proper installation is required to maintain this listing. See page 33 for details.

Climate Class and Ambient Conditions

The test room climate class for this appliance is Climate Class 8. Climate Class 8 means the equipment has been tested for ambient of 75° F (23.9° C) dry bulb and 55% relative humidity.

Ambient conditions that equipment is designed for may exceed 75° F (23.9° C) and 55% relative humidity in some cases. Consult the labeling on the equipment for the maximum ambient temperature and humidity in which the equipment can be installed. Do not exceed the listed ambient conditions.

Federal / State Regulation

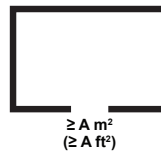
These merchandisers, at the time they are manufactured, meet all federal and state/provincial regulations. Proper installation is required to ensure these standards are maintained. Near the serial label, each case carries a label identifying the environment (temperature and relative humidity) in which the case was designed to be used.

Additional Important Symbols

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.



Minimum Room Floor Area



High Pressure



Grounding Connection Location

General Safety Instructions

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.

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 and sheet metal.



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.

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.

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.



Before Working with All Refrigerant Types

The following apply to ALL REFRIGERANT TYPES. Refrigerant specific warnings and safety information are present in the following sections. Do not attempt to install, service, or perform maintenance on any equipment without reading and understanding ALL applicable warnings related to the equipment.

READ THE ENTIRE MANUAL AND ALL WARNINGS BEFORE INSTALLING OR USING THIS EQUIPMENT.

- 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.
- This appliance shall only be connected to another appliance suitable for the same refrigerant.
- Be aware that refrigerants may not contain an odour.
- Excessive ambient conditions may cause condensation and sweating on doors. Facility operators are responsible for monitoring doors and floor conditions and ensuring the safety of all persons present. Installation and service must be performed by a qualified installer or service agency only as recommended by the manufacturer.
- 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.
- WARNING: Keep clear of obstruction, all ventilation openings in the appliance enclosure or in the structure for build-in.
- WARNING: Do not use mechanical devices or other means to accelerate the defrosting process, other than those recommended by the manufacturer.
- WARNING: Do not damage the refrigerating circuit.
- WARNING: Do not use electrical appliances inside the food/ice storage compartments unless they are the type recommended by the manufacturer.
- Do not use any means to clean, other than those recommended by the manufacturer.
- Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.
- The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).
- Do not pierce or burn refrigerant piping.
- Do not store items or flammable materials atop the unit. Do not walk on case.
- 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.

WARNING

- 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.
- Any insulation shall be suitable for use with the material being insulated.
- 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. Mechanical connections made in accordance shall be accessible for maintenance purposes.
- The installation of pipe-work shall be kept to a minimum.
- Provision shall be made for expansion and contraction of long runs of piping.
- Piping in refrigeration systems shall be so designed and installed to minimize the likelihood of hydraulic shock damaging the system.
- 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.
- Precautions shall be taken to avoid excessive vibration or pulsation of the refrigerant piping.
- 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.
- To reduce the risk of fire, electrical shock or injury when cleaning this merchandiser:
 - Unplug the merchandiser before cleaning.
 - Keep all liquids away from electrical and electronic components.
- Merchandiser must be grounded. All wiring must be in compliance with NEC and local codes.
- The appliance shall not be installed in public corridors or lobbies.
- All servicing of this appliance shall be performed only as recommended in this manual.
- 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 original specification, damage to seals, incorrect fitting of glands, etc.
- Ensure that the apparatus is mounted securely.
- 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.

WARNING

- 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.
- 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.
- Component parts shall be replaced with like components, and servicing shall be done by qualified service personnel only.
- 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.
- 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:
 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 hour 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 lesser 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.
- Solenoid valves shall be correctly positioned in the piping to avoid hydraulic shock.
- Solenoid valves shall not block in liquid refrigerant unless adequate relief is provided to the refrigerant system low pressure side.

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 R-744 (CO₂) Refrigerant

- **WARNING:** The refrigeration system is under high pressure. Do not tamper with it. Contact qualified service personnel before disposal.
- R-744 (CO₂) systems have similar safety concerns with all conventional refrigerants, in that it displaces oxygen, is heavier than air and will concentrate closer to the floor if there is a system leak. R-744 should be monitored for leaks similar to other refrigerants.
- If the refrigeration system is de-energized, venting of the R-744 through the pressure regulating relief valves on the refrigeration system can occur. In such cases, the system might need to be recharged with R-744, but in any case, the pressure regulating relief valve(s) shall not be defeated or capped. The relief setting shall not be altered.
- A sufficient number of pressure relief and pressure regulating relief valves might need to be provided based on the system capacity and located such that no stop valve is provided between the relief valves and the parts or section of the system being protected.
- A pressure relief device shall be installed in the high-pressure side of the refrigeration system between the motor-compressor and the gas cooler. There shall be no shut off devices or other components except piping between the motor-compressor and the pressure relief device that could introduce a pressure drop.
- The pressure relief device shall be mounted so that any refrigerant released from the system during its operation cannot cause harm to the user of the appliance. The aperture shall be located so that it is unlikely to be obstructed in normal use.
- The installed pressure relief device shall have no provisions for setting by the end user.
- The pressure setting of the installed pressure relief device shall be no higher than the design pressure of the high-pressure side.
- Confirm operation of leak detectors (e.g., by exhaling near the sensor), audible / visible alarms, and machine room ventilation before operation.
- Ventilate adjacent enclosed areas to prevent the formation of dangerous concentrations of carbon dioxide.
- Avoid contact of the skin or eyes with solid carbon dioxide (dry ice) or objects cooled by solid carbon dioxide.
- Additional information on the safe use and handling of carbon dioxide can be found in Standards from the Compressed Gas Association Standard (www.cganet.com).
- The following checks shall be applied to installations:
 - 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.

WARNING

- Replacement parts must be compatible with the specific equipment's maximum design pressure as shown on the equipment labeling. For example, if the equipment has been designed to meet 1,305 psig (90 bar) maximum design pressure then any replacement part must be 1,305 psig (90 bar) compatible.
- Never apply heat directly to piping containing CO₂. Rapid thermal expansion of CO₂ can cause the pipe to burst.
- Pressure transducers / leak detectors / warning lights / sounders/buzzers / and plant room ventilation must all be operational prior to charging with CO₂.
- Pressure relief devices / check valves must be located anywhere that liquid CO₂ can be trapped. Trapped CO₂ at -40° F (-40° C) will double in volume if allowed to rise to 86° F (30° C).
- Under no circumstances add Schrader valves to or remove Schrader valves from the system.
- Observe all warnings and labels on the unit being installed or serviced such as the one below indicating high pressure.



- All refrigeration servicing must be completed by a certified refrigeration installation professional, and all tubing and components must be qualified for R-744 (CO₂) applications, with a minimum design pressure that matches the system requirements listed on the equipment (e.g., 1,305 psig [90 bar]).
- Inspect all components prior to installation to ensure that they are free from defects or foreign materials and to confirm that they comply with all pressure and temperature ratings.

Asphyxiation

- R-744 is odorless, heavier than air, and is an asphyxiant gas. If sensor reading is maxed out or non-responsive assume an unsafe level of CO₂ and ventilate the room prior to entering.
- Practical limit of R-744 is 0.006 lb/ft³ (56,000 ppm).
- Personnel including rescue workers should not enter areas in which the carbon-dioxide content exceeds 3% (30,000 ppm) by measurement unless wearing an SCBA or supplied-air respirator.
- A leak of R-744 could result in a concentration exceeding the practical limit in an enclosed, occupied space such as a cold room. Precautions must be taken to prevent asphyxiation. These include the use of permanent leak detection, which activates an alarm in the event of a leak.
- The practical limit is defined in ASHRAE 34 but may vary depending on regional regulations. The table below summarizes the effect of R-744 at various concentrations in the air.

PPM of R-744 (CO ₂)	Effects
442	concentration in atmosphere
5,000	long-term exposure limit (8 hours)
15,000	short-term exposure limit (10 minutes)
30,000	discomfort, breathing difficulties, headache, dizziness, etc.
100,000	loss of consciousness, followed by death
300,000	quick and immediate death

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User Safety and Product Information

CO₂ Quality

- CO₂ that is purchased for use in refrigeration systems should be of a purity level high enough to prevent accumulation of non-condensable gases and moisture. A build-up of these gases can block small orifices (such as expansion valves) or lead to high discharge pressure, reducing operation or causing the system to become inoperable.
- CO₂ is commercially available at several different purity levels. The common names and percent purity are listed below. Hussmann recommends using “Refrigeration Grade” (99.99% purity) CO₂.
- Mixing of higher purity grades of CO₂ is acceptable. Lower grades of CO₂ contain higher levels of contaminants and water and will decrease system performance. Higher levels of moisture may react with the CO₂ and form carbonic acid that can degrade component integrity. Hussmann recommends keeping enough refrigeration grade CO₂ on-site to charge the system.
- Medical grade CO₂ should not be used, due to the outlet pressure regulators typically present on tanks.
- Bone-Dry grade is the minimum acceptable purity to ensure proper operation of the equipment and is pure enough to technically prevent accumulation of non-condensable gases in the system.
- R-744 (CO₂) purity:

R-744 (CO ₂) Grade	Purity
Industrial and Medical Grade	99.5%
Bone Dry (minimum acceptable)	99.8%
Anaerobic Grade	99.9%
Refrigeration Grade (recommended)	99.99%
Coleman/Instrument Grade	99.99%
Research Grade	99.999%
Ultra-Pure Grade	99.9999%

CO₂ Leak Detection

Leak detectors are required anywhere that CO₂ gas may leak or be vented. Leak detectors provide an alarm if CO₂ is detected at an amount that exceeds the maximum allowable CO₂ concentration. Leak detectors are not provided with the case. Consult local safety codes for exact requirements.

Piping

All piping, whether pre-installed at the factory or added in the field, must be chosen based on the Hussmann engineering transcritical CO₂ specifications, including material type, pipe diameter, and rated maximum working pressure. The design pressure of the system is 1,305 psig (90 bar).

Approved joining methods must be used for all piping and fittings to ensure the pipe's maximum pressure rating is maintained without reduction. The use roll-stop couplings for straight line pipe joints are recommended. Swaging of pipe joints is not recommended. Swaging weakens the copper at the swage point, reducing the maximum operating pressure rating.

- Piping—minimum design pressure greater than listed design pressure (e.g., 1,305 psig [90 bar])
- Fittings—Mueller Streamline XHP CuFe 1,885 psig (130 bar)
- Braze joints with alloy containing 15% silver (minimum)
 - Flux materials must contain no zinc and must also be water soluble
 - All field piping must be purged with nitrogen while brazing
- Schedule 40 carbon steel pipe or stainless-steel pipe
 - Must protect exterior from corrosion

User Safety and Product Information

Insulation

Insulation should be used in secondary system piping to reduce the heat transfer to ambient air and to maintain subcooling in the CO₂ liquid supply line to the case. The insulation should be sized to allow for the worst-case conditions of heating from store lighting and ambient temperatures. Pipe should be insulated according to local codes and customer specifications and manufacturer specifications.

When installing piping that has not been pre-insulated, there are several options for insulation. Closed-cell elastomeric insulation is extremely popular in refrigeration applications. This type of insulation can also be used in secondary system applications.

The manufacturer's internal case piping valves and components are insulated to prevent frost from building. Sufficient insulation is required on piping into the display case to eliminate frost on tubes and to minimize temperature rise of CO₂.

Check Valves and Pressure Relief Devices

Check valves are required wherever there is a possibility of trapping liquid CO₂ between valves that may be shut-off, including solenoid valves, service valves, and balancing valves. Check valves must be installed to vent high-pressure CO₂ back to the system. Hussmann recommends reverse return tubing instead of the use of shut-off valves for balancing purposes, but if shut-off valves are used, they must be relieved to the system through check valves.



Trapping of liquid CO₂ can result in extremely high pressure and must be avoided to prevent damage to equipment and personal injury.

Solenoid, check, and ball valves with integrated pressure relief must be qualified for CO₂ applications, with a minimum design pressure equal to that listed on the equipment (e.g., 1,305 psig [90 bar]).

The pressure relief device shall be mounted so that any refrigerant released from the system during its operation cannot cause harm to the user of the appliance. The aperture shall be located so that it is unlikely to be obstructed in normal use. The installed pressure relief device shall have no provisions for setting by the end user. The pressure setting of the installed pressure relief device shall be no higher than the design pressure of the high-pressure side.

Startup and Shut Down

If the refrigeration system is de-energized, venting of the R-744 (CO₂) through the pressure regulating relief valves on the refrigeration system can occur. In such cases, the system may need to be recharged with R-744 (CO₂), but in any case, the pressure regulating relief valve(s) are not to be defeated or capped. The relief setting shall not be altered.

Provisions must be made for startup and shutdown to prevent excessive pressures. Consult the pumping station instructions and local codes for requirements.

It is imperative that the case piping is clean and dry prior to charging the system with CO₂. All tubing MUST be rated with a minimum design pressure at or above the rating of the equipment. Consult equipment labeling to confirm pressure rating (e.g., 1,305 psig [90 bar]) before installation.

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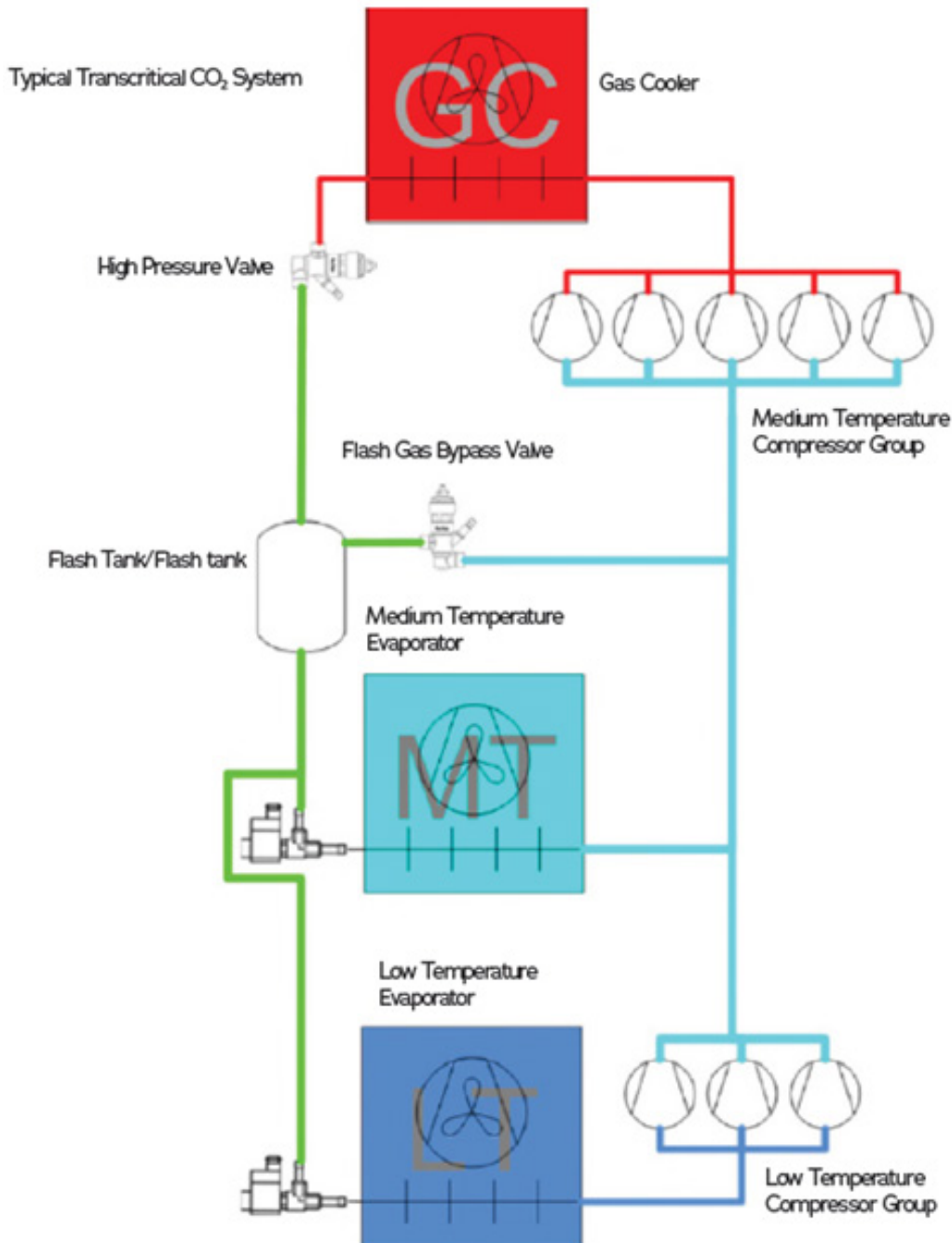
User Safety and Product Information

R-744 (CO₂) Pressure-Temperature Chart

A pressure-temperature chart can be found here for reference if needed: https://www.hussmann.com/ns/Supplemental_IO/GD_R-744_CO2_Pressure-Temperature_Chart_M001263_EN.pdf

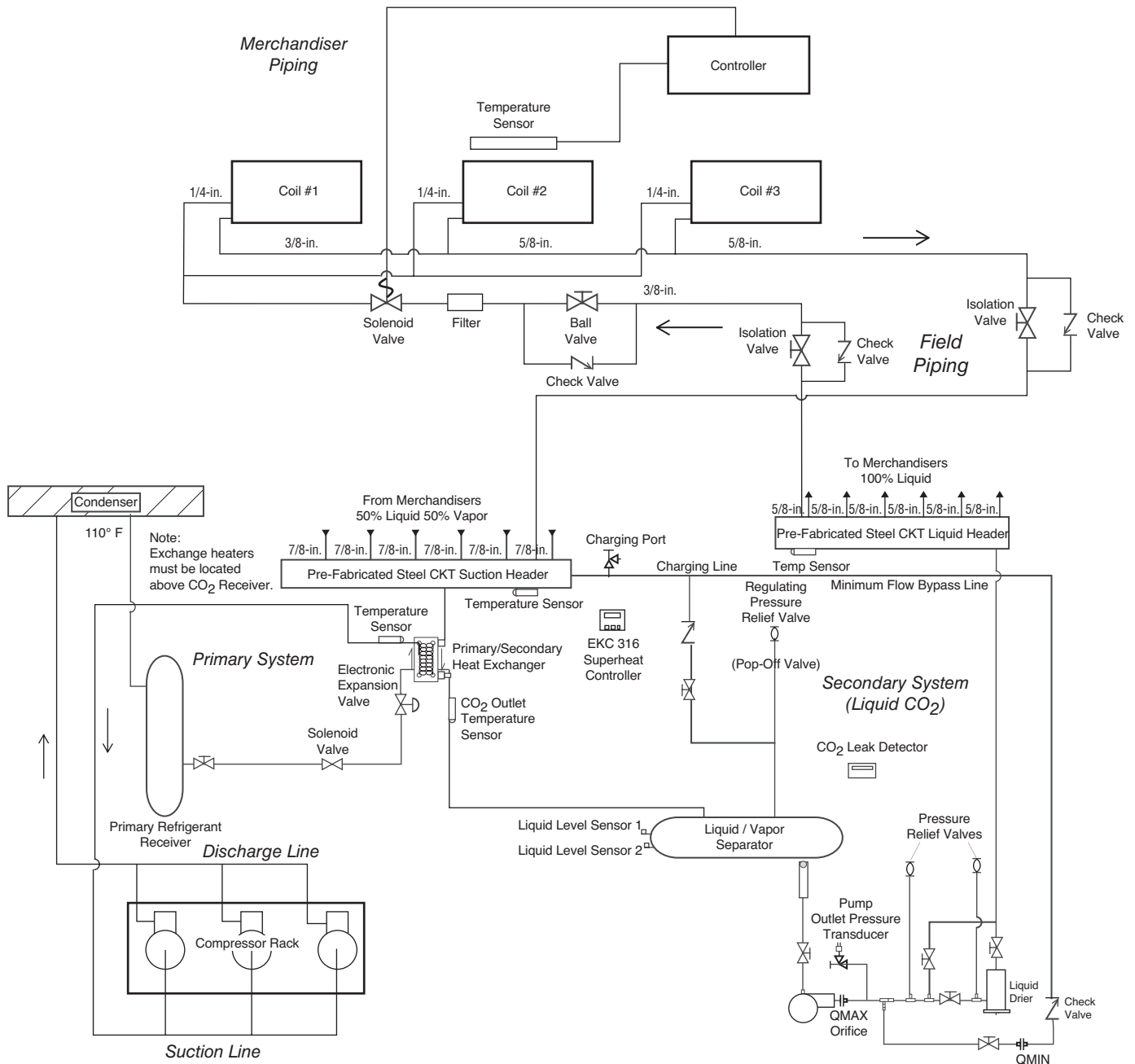
Example Transcritical CO₂ System Schematic

The system illustrations content in this manual are intended as general references. Diagrams included are for typical units and may differ from the actual unit purchased. Refer to the specific drawings that come with the unit for accurate troubleshooting and maintenance. Additional drawings can be requested if needed.



Example Pumped Liquid CO₂ System Schematic

Example schematic shown, actual design will vary by system.



Pumped Liquid CO₂ System Schematic



Before Working with A2L Refrigerants



- A2L refrigerant is flammable. Equipment that is 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 equipment containing flammable refrigerants.
- Failure to follow instructions can result in an explosion, death, injury and property damage.



This refrigeration equipment was manufactured for use with A2L low-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.
- A2L refrigerants are denser than air.
- No open flames, cigarettes, or other possible sources of ignition should be used inside the building where the units are located until the qualified service technician and/or local fire department determines that all refrigerant has been cleared from the area and from the refrigeration systems.
- 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.
- 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.

WARNING

- Replace components only with parts specified by the manufacturer. Other parts can result in the ignition of refrigerant in the atmosphere from a leak.
- Ducts connected to an appliance shall not contain a potential ignition source.
- Factory installed refrigerant sensors or detectors shall not be disconnected.
- 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 CO₂ 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.
- 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.

User Safety and Product Information

A2L Refrigerant Detection System Overview

Refrigerant Detection System

This equipment uses a Danfoss A2L gas sensor for gas concentration monitoring as standard, factory-installed equipment. Check your individual equipment's parts list to confirm which sensor your equipment uses before ordering replacements.

Application

A2L detection devices represent distinctive and intelligent refrigerant or flammable gas detectors. They are designed to identify and precisely measure A2L refrigerants commonly employed in refrigeration applications—detecting potential flammable gas leaks. A2L stationary gas sensors are engineered to continuously monitor and identify leaks of specific flammable refrigerants.

Installer And Operator Responsibility

Sensors require installation and maintenance by a qualified technician who follows all instructions and adheres to the prevailing standards in their respective industry and location. It is crucial to note that these guidelines serve as a reference, and the manufacturer disclaims any responsibility for misuse, improper installation, or operation of these components.

Failure to install and operate the equipment in conformity with provided instructions and all industry and local guidelines may result in severe injuries, including fatality, for which the manufacturer will not be held accountable.

Maintenance

Although the A2L sensor does not require calibration throughout its operational lifespan, routine maintenance is essential to ensure its proper functioning. Routine maintenance involves checking that the sensor membrane is clean and not blocked. Blockage can be removed by lightly brushing with a clean, damp cloth.

Verify its correct operation regularly as part of a maintenance routine. Avoid cleaning the device with corrosive chemicals, solvents, or abrasive detergents. Refrain from spraying cleaning or polishing aerosols onto the device.

View the “A2L Leak Detection Sensor Service and Mitigation” section for information on components, maintenance, and service.

Sensor Life

Leak sensors have an expected fifteen-year lifespan. If any malfunction happens, and it cannot be fixed following the proper troubleshooting procedure before this period, replace it immediately to prevent any fault. This component must be replaced with the same exact part by authorized service personnel only.

It is imperative that the refrigerant sensor, which has been initially installed at the factory, remains integral and should not be intentionally disconnected. Unauthorized disconnection of the factory-installed refrigerant sensor is strictly prohibited, and maintaining its operational status is essential for ensuring the ongoing safety and functionality of the system. Any tampering or disconnection may compromise the ability to detect and alert to the presence of refrigerant, posing potential risks to both equipment and personnel. It is imperative to adhere to these guidelines to uphold the integrity of the refrigeration system and comply with safety standards.

Sensor Location and Position

The location and position of the refrigerant sensor is critical and it should not be moved. It is crucial that the sensors are located only as defined by manufacturer. The position has been determined by laboratory testing to maximize effectiveness in detecting any leak promptly. Positioning sensors as directed by the manufacturer provides accurate performance of the sensor and enhances the overall safety and reliability of the system.

The sensor has an ongoing, self-testing routine to determine if a malfunction has occurred. If the sensor detects a malfunction, the sensor will trigger a mitigation event. Additionally, when the sensor reaches end of life, it will trigger a mitigation event. In both cases, the sensor will need to be replaced to restart the system.

IM-04/05-R

User Safety and Product Information

Splashguard Fans for A2L-Equipped Models

Splashguard fans are required in some cases (e.g., “tall” Insight closed-door cases and single-deck “short” cases). The fans are designed to mitigate potential flammability risks and ensure compliance with UL and ASHRAE safety standards.

A2L refrigerants are mildly flammable. A leak inside or outside the case can pose a hazard if refrigerant pools in stagnant areas. If a leak occurs, the shut-off valve system will limit the amount of refrigerant leaked, while the splashguard fan(s) mitigate flammability risk caused by the leaked refrigerant by dispersing leaked vapors away from confined spaces and toward the case’s ventilation path. This ensures concentrations remain below the lower flammability limit (LFL). The splashguard fan is mounted at the bottom of the case, where refrigerant is most likely to accumulate.

As with the leak detection system, the case will not operate if the splashguard fans are not properly installed and in working order as a safety precaution. Do not attempt to operate the case without splashguard fans fully installed.

CAUTION

- Do not use hot/warm water on cold glass surfaces. This can cause the glass to shatter and could result in personal injury. Allow glass fronts to warm before applying hot/warm water.
- Do not allow cleaning agent or cloth to contact food product.
- Product will be degraded and may spoil if allowed to sit in a non-refrigerated area.

NOTICE

- Merchandiser must operate for 24 hours before loading product.
- Regularly check merchandiser temperatures.
- Do not break the cold chain. Keep products in cooler before loading into merchandiser.
- Merchandisers are designed for loading ONLY pre-chilled products.

Model Description

The IM-04/05-R is an extension of the ISLA platform for multi-deck self-service cases.

Husmann Product Control

Serial number and shipping date of all equipment is recorded in Husmann’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.

IM-04/05-R

Installation Information

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.

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.

Unloading, Moving, and Transporting Case

Do not remove shipping braces until the merchandiser is positioned for installation.

Move the merchandiser as close as possible to its permanent location and remove all packaging. Check for damage before discarding packaging. Remove all separately packed accessories such as kits and shelves.

Improper handling may cause damage to the merchandiser when unloading. To avoid damage do not drag the merchandiser out of the trailer. Use a Lever Bar (also known as a Mule, Johnson Bar, J-Bar, Lever Dolly, or Pry Lever) where applicable.

Using J-Bars to get the merchandiser onto Dollies for transportation is the preferred and recommended technique for getting the case to its final location.

1. Remove lower body panels before lifting with a J-Bar to prevent damage.
2. The IM-04/05-R can be lifted with a J-Bar high enough to place furniture dollies under each base leg.
3. Engage the IM-04/05-R from the points illustrated in the Image Below.
4. Ensure the case is balanced before attempting to place on dollies. Reposition J-Bar if necessary.
5. Lift the case only as high as necessary to place a dolly.
6. Repeat the procedure at the other end and in the center as necessary.
7. IM-05-R (base legs) cases require 2 dollies.
8. Evenly support the entire base structure on rollers or dollies before attempting to move.

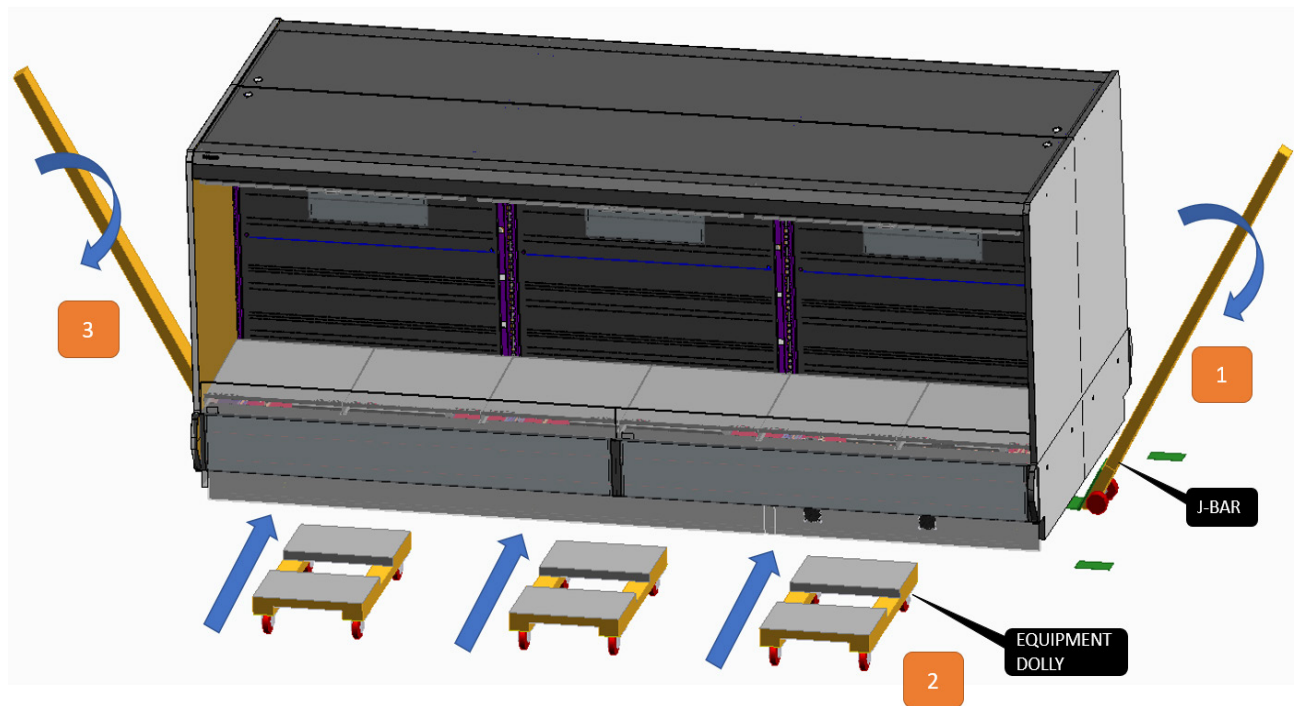
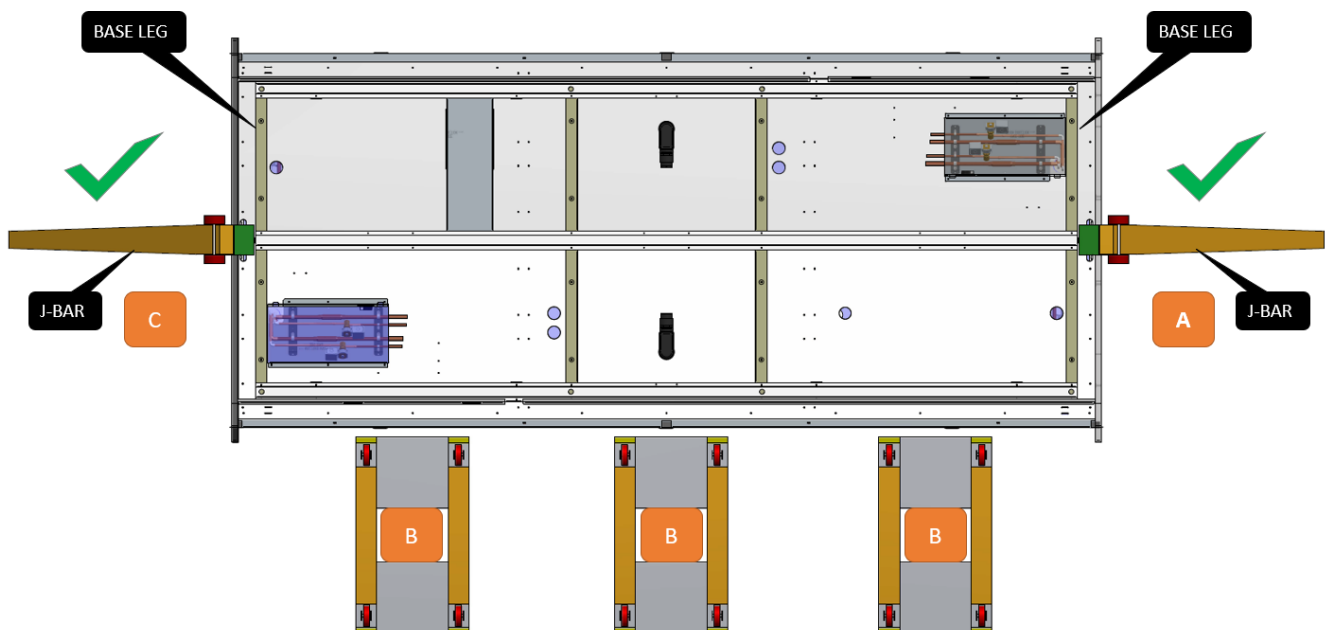
Each Base Leg must have its own dolly to properly support the case.

See next page.

- A. Safe J-Bar Lift Point centered on the left/right side of case
- B. Lift one side at a time with J-Bar
- C. Insert Dollies here one at a time

IM-04/05-R

Installation Information



IM-04/05-R

Installation Information

IM-04/05-R Transportation using Fork-Lifts

Using J-Bars and Dollies are the preferred technique, but a Fork-Lift can be used if the special requirements stated below are met

Remove lower body panels before lifting with a forklift to prevent damage

Before lifting the case, be sure forklift blades clear all casters. See Image Below.

The case can be raised at one end under the base leg to allow for placement of dollies.



Exterior Loading

Do NOT walk on top of the merchandiser or damage to the merchandisers and serious personal injury could occur. Merchandisers are not structurally designed to support excessive external loading such as the weight of a person. Do not place heavy objects on the merchandiser.

IM-04/05-R

Installation Information

Location

These display cases are designed for displaying products in air-conditioned stores where temperature is maintained at or below the ANSI / NSF-7 specified level and relative humidity is maintained at or below 55%. Refer to the label located on the merchandiser for the recommended maximum ambient operating temperature and relative humidity. Do not exceed the listed ambient conditions.

Placing refrigerated display cases in direct sunlight, near hot tables, or near other heat sources could impair their efficiency. Like other display cases, these are sensitive to air disturbances. Air currents passing around display cases can seriously impair their operation. Do not allow air conditioning, electric fans, open doors or windows, etc., to create air currents around the display case.

Clearances

-Minimum Clearances for Self-Contained case are to be followed as instructed for proper placement inside store locations.

Intake and exhaust clearances are to be a minimum of 8 ft when placed next to a solid wall.

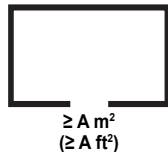
Height clearance measured from floor is a minimum of 10 ft vertically.

Minimum of 36 in. clearance if near an open aisle is required for proper cycle ventilation.

Case set location to be at least 15 ft away from any entrance/exit door.

Note: Under no circumstances should the top or rear of the case be in contact with elements (such as building structures, drywall, etc.) that may restrict airflow or impact operation. Consult listed clearances, or if uncertain, contact a Hussmann representative prior to installation.

Minimum Room Floor Area (A2L only)



The minimum floor area of the room shall be 260 Ft.² with ventilation

The “Minimum Room Floor Area” label provides the minimum room size into which the equipment can be placed. It is the responsibility of the installer to ensure any additional piping and/or equipment is also accounted for separately during installation. Equipment shall not be placed in a room with a floor area less than the value indicated next to the symbol.

Note: Refer to the “Minimum Room Floor Area Table (piping)” to reference the appropriate piping value(s) where needed.

There are two elements related to the room area: Minimum and Actual. Based on the releasable charge determined by internal volume of every component in the equipment, a Minimum Area is calculated. The equipment cannot be used in a space with an area smaller than the Minimum Area. Depending on the Actual Area of the room, different mitigation actions are determined. The Actual Area is based on the inside dimensions of the enclosed space.

Any fluid circuits connected to the appliance (such as to a water heat exchanger) shall safely release abnormal pressure. It shall not allow the release of FLAMMABLE REFRIGERANT into areas served by the other circuits if these do not comply with minimum room area limit.

^A Approximate charge based on normal operating conditions

IM-04/05-R

Installation Information

Minimum Room Floor Area Table (piping)

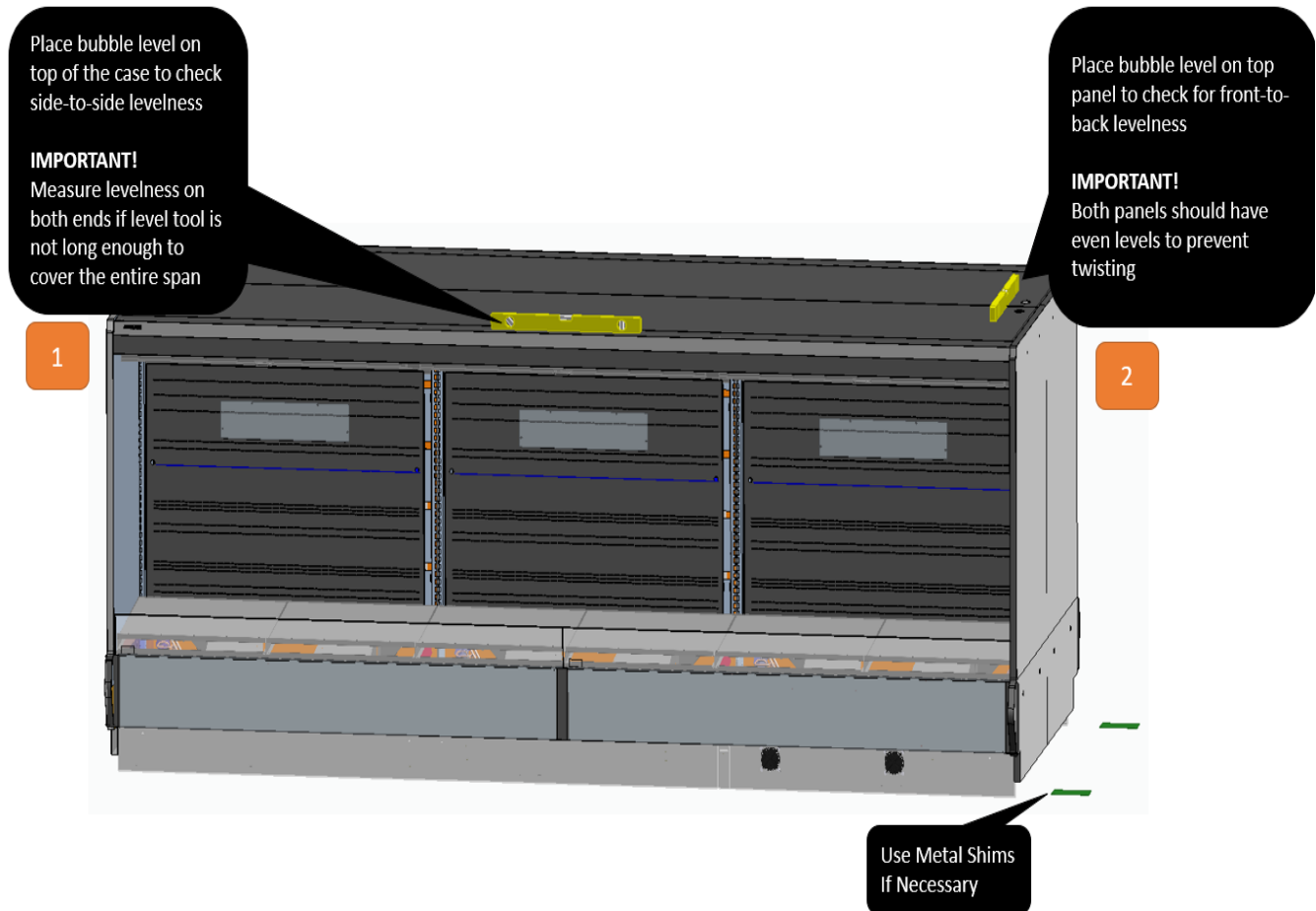
Liquid Line Piping Minimum Area in ft ² (m ²)										
Line Length ft (m)	Line Size (OD)									
	3/8"	1/2"	5/8"	7/8"	1 1/8"	1 3/8"	1 5/8"	1 7/8"	2 1/8"	2 5/8"
5 (1.5)	25 (2.3)	30 (2.8)	40 (3.7)	60 (5.6)	85 (7.9)	125 (11.6)	165 (15.3)	220 (20.4)	275 (25.5)	410 (38.1)
10 (3)	30 (2.8)	45 (4.2)	60 (5.6)	100 (9.3)	155 (14.4)	225 (20.9)	315 (29.2)	420 (39)	530 (49.2)	805 (74.8)
15 (4.6)	40 (3.7)	55 (5.1)	80 (7.4)	140 (13)	225 (20.9)	330 (30.7)	460 (42.7)	620 (57.6)	785 (72.9)	1,200 (111.5)
20 (6.1)	45 (4.2)	70 (6.5)	100 (9.3)	180 (16.7)	290 (26.9)	435 (40.4)	605 (56.2)	825 (76.6)	1,040 (96.6)	1,590 (147.7)
25 (7.6)	50 (4.6)	80 (7.4)	120 (11.1)	220 (20.4)	360 (33.4)	540 (50.2)	755 (70.1)	1,025 (95.2)	1,300 (120.8)	1,985 (184.4)
30 (9.1)	60 (5.6)	95 (8.8)	140 (13)	260 (24.2)	430 (39.9)	645 (59.9)	900 (83.6)	1,225 (113.8)	1,555 (144.5)	2,380 (221.1)
40 (12.2)	70 (6.5)	120 (11.1)	180 (16.7)	340 (31.6)	565 (52.5)	850 (79)	1,195 (111)	1,625 (151)	2,065 (191.8)	3,165 (294)
50 (15.2)	85 (7.9)	145 (13.5)	220 (20.4)	420 (39)	705 (65.5)	1,060 (98.5)	1,490 (138.4)	2,030 (188.6)	2,575 (239.2)	3,950 (367)
75 (22.9)	115 (10.7)	210 (19.5)	325 (30.2)	625 (58.1)	1,045 (97.1)	1,580 (146.8)	2,225 (206.7)	3,035 (282)	3,855 (358.1)	5,915 (549.5)
100 (30.5)	150 (13.9)	270 (25.1)	425 (39.5)	825 (76.6)	1,385 (128.7)	2,100 (195.1)	2,960 (275)	4,040 (375.3)	5,135 (477.1)	7,885 (732.5)
Vapor Line Piping Minimum Area in ft ² (m ²)										
Line Length ft (m)	Line Size (OD)									
	3/8"	1/2"	5/8"	7/8"	1 1/8"	1 3/8"	1 5/8"	1 7/8"	2 1/8"	2 5/8"
5 (1.5)	20 (1.9)	20 (1.9)	20 (1.9)	20 (1.9)	20 (1.9)	20 (1.9)	20 (1.9)	25 (2.3)	25 (2.3)	30 (2.8)
10 (3)	20 (1.9)	20 (1.9)	20 (1.9)	20 (1.9)	20 (1.9)	25 (2.3)	25 (2.3)	30 (2.8)	30 (2.8)	40 (3.7)
15 (4.6)	20 (1.9)	20 (1.9)	20 (1.9)	20 (1.9)	25 (2.3)	25 (2.3)	30 (2.8)	35 (3.3)	40 (3.7)	50 (4.6)
20 (6.1)	20 (1.9)	20 (1.9)	20 (1.9)	25 (2.3)	25 (2.3)	30 (2.8)	35 (3.3)	40 (3.7)	45 (4.2)	60 (5.6)
25 (7.6)	20 (1.9)	20 (1.9)	20 (1.9)	25 (2.3)	30 (2.8)	30 (2.8)	40 (3.7)	45 (4.2)	50 (4.6)	70 (6.5)
30 (9.1)	20 (1.9)	20 (1.9)	20 (1.9)	25 (2.3)	30 (2.8)	35 (3.3)	40 (3.7)	50 (4.6)	60 (5.6)	80 (7.4)
40 (12.2)	20 (1.9)	20 (1.9)	25 (2.3)	25 (2.3)	35 (3.3)	40 (3.7)	50 (4.6)	60 (5.6)	70 (6.5)	100 (9.3)
50 (15.2)	20 (1.9)	20 (1.9)	25 (2.3)	30 (2.8)	35 (3.3)	45 (4.2)	55 (5.1)	70 (6.5)	85 (7.9)	120 (11.1)
75 (22.9)	20 (1.9)	25 (2.3)	25 (2.3)	35 (3.3)	45 (4.2)	60 (5.6)	75 (7)	95 (8.8)	120 (11.1)	170 (16)
100 (30.5)	20 (1.9)	25 (2.3)	30 (2.8)	40 (3.7)	55 (5.1)	75 (7)	95 (8.8)	125 (11.6)	150 (13.9)	225 (20.9)

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Installation Information

Leveling Case

Be sure to position merchandisers properly, then level all four corners. Merchandiser(s) must be installed level to ensure proper operation of the refrigeration system, and to ensure proper drainage of defrost water. This merchandiser must be installed level (from back to front, and side to side) to allow maximum draining. Choose a level area to install case.



Level the Case sequentially, Using Metal Shims (If Necessary).

Check levelness left-to-right first (This usually requires the most correction on a single side)

Adjust front-to-back levelness after ensuring left-to-right levelness (Shims normally inserted in pairs during this check).

Important: Always level the first case in the lineup. All other cases should be driven from its levels.

Note: The use of metal shims is recommended in order to prevent shim deterioration over time

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Installation Information

Piping Overview

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

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 equipment be used as the basis for sizing the lines.

The horizontal suction line should slope away from the equipment toward the compressor. Vertical suction risers may require a trap at the bottom of the riser for proper oil return.

CO₂ Piping

Piping

Any piping material that meets all pressure and temperature ratings, material compatibility requirements and state and local building codes may be used for pumped liquid CO₂ applications. The design pressure of the system is labeled on the unit. Any connected components must meet the system design pressure (e.g., 1,305 psig [90 bar]).

Approved joining methods must be used for all piping and fittings to ensure the pipe's maximum pressure rating is maintained without reduction. The use roll-stop couplings for straight line pipe joints are recommended. Swaging of pipe joints is not recommended. Swaging weakens the copper at the swage point, reducing the maximum operating pressure rating.

CO₂ Piping Material

- Piping—minimum design pressure greater than system design pressure (e.g., 1,305 psig [90 bar])
- Fittings—Mueller Streamline XHP CuFe 1,885 psig (130 bar)
- Braze joints with alloy containing 15% silver (minimum)
 - Flux materials must contain no zinc and must also be water soluble
 - All field piping must be purged with nitrogen while brazing
- Schedule 40 carbon steel pipe or stainless-steel pipe
 - Must protect exterior from corrosion

Insulation

Insulation should be used in secondary system piping to reduce the heat transfer to ambient air and to maintain subcooling in the CO₂ liquid supply line to the case. The insulation should be sized to allow for the worst-case conditions of heating from store lighting and ambient temperatures. Pipe should be insulated according to local codes and customer specifications and manufacturer specifications.

When installing piping that has not been pre-insulated, there are several options for insulation. Closed-cell elastomeric insulation is extremely popular in refrigeration applications. This type of insulation can also be used in secondary system applications.

The manufacturer's internal case piping valves and components are insulated to prevent frost from building. Sufficient insulation is required on piping into the display case to eliminate frost on tubes and to minimize temperature rise of CO₂.

IM-04/05-R

Installation Information

Check Valves

Check valves are required wherever there is a possibility of trapping liquid CO₂ between valves that may be shut off, including solenoid valves, service valves, and balancing valves. Check valves must be installed to vent high pressure CO₂ back to the system. Hussmann recommends reverse return tubing instead of the use of shutoff valves for balancing purposes, but if shutoff valves are used, they must be relieved to the system through check valves.

WARNING—Trapping of liquid CO₂ can result in extremely high pressure and must be avoided to prevent damage to equipment and personal injury.

Solenoid, check, ball valves, and ball valves with integrated pressure relief must be qualified for CO₂ applications, with a minimum design pressure equal to or greater than the equipment design pressure (e.g., 1,305 psig [90 bar]).

Pumped Liquid R-744 (CO₂) Supply Piping

For systems utilizing pumped liquid CO₂, the liquid supply lines should be sized using the same guidelines as liquid lines. However, it is crucial to recognize that CO₂-pumped liquid is more resistant to pressure drop than standard liquid lines. The CO₂ pump introduces mechanical subcooling, enabling a higher pressure drop before the liquid begins to vaporize.

To ensure optimal performance, a system analysis is necessary to determine the maximum permissible pressure drop in both the supply and return lines. The combined pressure drop in the recirculation lines, the pressure drop across all system components, and any pressure changes due to elevation differences should not exceed the specified pressure differential rating of the pump.

Pumped Liquid R-744 (CO₂) Return Piping

For systems utilizing pumped liquid CO₂, the liquid return lines will carry a mixture of both liquid and vapor, with the exact ratio determined by the liquid overfeed rate. A system analysis must be conducted to identify the maximum permissible pressure drop in both the supply and return lines. The total pressure drop across the recirculation lines, all system components, and any changes in pressure due to elevation must not exceed the rated pressure differential of the pump.

It is essential to avoid over-sizing the liquid return riser lines. If the velocity becomes too low, liquid and vapor phases may separate, causing a significant increase in pressure drop as liquid accumulates in the vertical riser.

In pumped liquid CO₂ systems, the liquid temperature typically falls below 30° F (-1.1° C). Therefore, it is essential to adequately insulate these lines to prevent condensation and minimize heat absorption. Failure to properly insulate liquid lines can reduce the cooling capacity, leading to suboptimal system performance.

Application data for display cases can be found at Hussmann.com

Installation Information

Additional Piping Installation Requirements

- 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 an indoor and outdoor unit) that might be displaced during normal operation shall be protected against mechanical damage.
- 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.
- Look for the room area label on the equipment to identify the minimum room size. The information in this manual can also be used as an estimate. Always confirm the exact value on the equipment before installation.
- 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 equipment 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.

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Installation Information

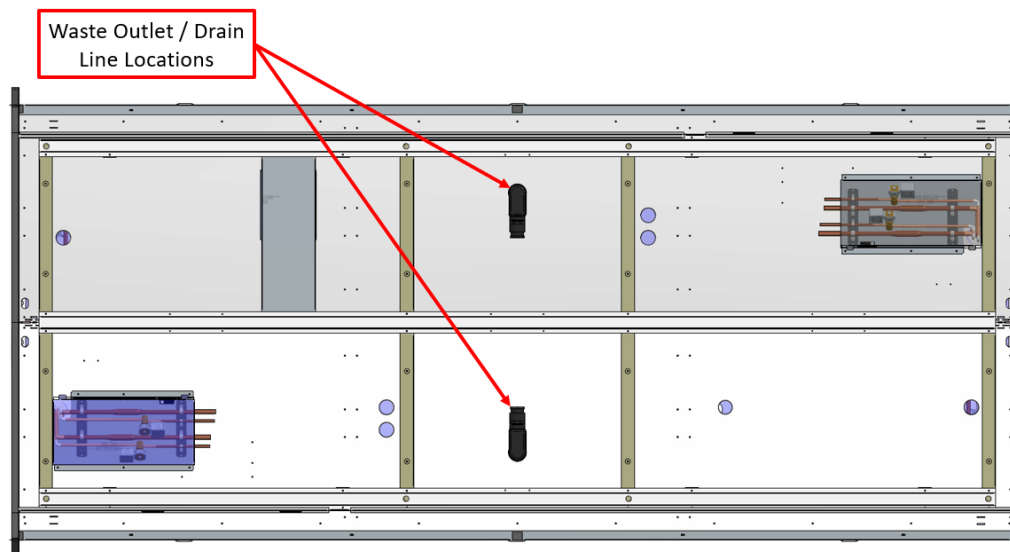
- Field-made refrigerant joints indoors shall be tightness tested according to applicable codes and requirements. The test method shall have a sensitivity of 0.18 oz (5 g) per year of refrigerant or better under a pressure of at least 0.25 times the maximum allowable pressure. No leak shall be detected.
- Equipment piping in the occupied space shall be installed in such a way to protect against accidental damage in operation and service.
- Any solenoid 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.

Line Connection Sizes

Consult the unit datasheet or contact a Hussmann representative for unit-specific line size inquiries.

Waste Outlet/Drain Line

See image below.



Electrical Information

Refer to the serial label located on the interior wall on the top left-hand side to determine MCA and MOPD and to verify input voltage before making any electrical connections.

Merchandisers require dedicated electrical circuit(s) with ground. 14 AWG is the minimum sized acceptable wire. The sensors use 18 AWG. Consult equipment datasheet or equipment serial label for additional electrical specifications. Always use a dedicated circuit with the amperage stated on the equipment. Where components of multiple units are required to be wired to a single circuit, ensure that the load is distributed properly and proper disconnect locations are used. Do not overload the circuit.

It is necessary to allow for disconnection of the appliance from the supply power after installation. Disconnect power before servicing merchandisers.

If in doubt, consult an electrician.

Refer to the wiring diagram in the Technical Data Sheet.

IM-04/05-R

Installation Information

Field Wiring

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. Actual ampere draw may be less than specified. When multiple display cases are on the same defrost circuit, the defrost termination thermostats are wired in series.

WARNING: Always check the serial label for component amperes.

Based on the full load amps of the system, select the largest connectible wire size (based on no more than three wires in the wireway and 86° F (30° C) environment per NEC).

Electrical Connections

All wiring must be in compliance with NEC and local codes. All electrical connections are to be made at a terminal block, in the electrical wireway, or in a handy box. Terminal block is not for case-to-case connection. 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.

Identification of Field Wiring

Leads for all electrical circuits are identified by colored plastic bands. These bands correspond to the color code sticker (shown below) located inside the display case wireway.

STANDARD CASE WIRE COLOR CODE CODIGO DE COLORES DE LOS ALAMBRES PARA LAS VITRINAS ESTANDAR CODE COULEUR POUR FILS DE BOITIER NORMALISE		
COLOR DESCRIPTION	DESCRIPCION	DESCRIPTION
 GROUND	TIERRA MASA	MASSE
 ANTI-SWEAT	ANTICONDENSACION	ANTI-SUINTEMENT
 LIGHTS	LUCES	ECLAIRAGE
 RECEPTACLES	ENCHUFES	PRISE DE COURANT
 T-STAT/SOLENOID 230VAC	TERMOSTATO/SOLENOIDE (230VAC)	SOUPAPE A SOLENOID (230 VAC)
 T-STAT/SOLENOID 115VAC	TERMOSTATO/SOLENOIDE (115VAC)	SOUPAPE A SOLENOID (115 VAC)
 T-STAT/SOLENOID 24VAC	TERMOSTATO/SOLENOIDE (24VAC)	SOUPAPE A SOLENOID (24 VAC)
 FAN MOTORS	VENTILADORES	VENTILATEUR
BLUE CONDENSING UNIT	UNIDAD DE CONDENSACION	UNITE DE CONDENSATION
USE COPPER CONDUCTORS ONLY UTILISEZ LES CONDUCTEURS DE CUIVRE SEULEMENT UTILICE LOS CONDUCTORES DE COBRE SOLAMENTE 430-01-0338 R101003		

Lighting

This case features pre-installed LED lighting. Refer to the equipment datasheet for wiring diagrams related to standard and optional lighting.

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Installation Information

Refrigerant Charging Procedure

Only the specified refrigerant type can be used.

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, and refrigerant tanks. Original service port washer and cap must be reinstalled to prevent refrigerant leaks. For A2L-equipped models, cap 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 unit.

Refrigerant	Charge
R-_____	_____ lbs

Installation and Operation

Pumped Liquid R-744 (CO₂) Start-Up Checklist

1. When the system(s) are ready for commissioning. Visually check all components. Check pressure and vacuum sheets complete. See Report #1A and #1B later in the document.
2. Load and check the controller's program and verify all Inputs and Outputs.
3. Main power available. Check for three-phase at sub-board. Connections tight on board. Compressors isolated. Check all cabinets (fans) clear of rubbish and that all electrical grounds have continuity and electrical tests have been completed by electrician.
4. Turn on power and check operation of cabinet and room fans, lights trim, heaters, door heaters, defrost heaters, drain heaters and all isolating switches. Start crank case heaters to warm oil.
5. Check individual breakers / fuse to prove circuits of all safety switches on refrigeration system, (HP/LP, oil failure). Compressor and condenser overloads for correct operation and set points, oil heaters and oil levels. All valves fully open. See Report #2 later in the document.
6. Start primary side compressors individually and check for correct three phase power and current draw. Charge up primary system. Open hot gas bypass lines to impose a load on the primary system during initial startup. Shut off hot gas bypass lines after system is charged.
7. Charge R-744 (CO₂) vessel initially with VAPOR until pressure is above 100 PSIG (6.9 bar), then continue charging with liquid. Charge with liquid until high liquid level sensor in the receiver senses liquid.
Note: Only one liquid CO₂ Pump may run at any given time. Shut off either the supply or return ball valve to the pump that is not in use. Dual pump operation—alternating pumps is not recommended by the pump manufacturer.
8. Start the liquid CO₂ pump. Then commence branch cooling in a staged basis of one branch at a time taking care to ensure that the CO₂ vessel pressure does not rise above 400 PSIG (27.6 bar)—do not rush this initial start-up stage, and do not run the CO₂ system until the high side system is fully operational.
Note: Do not open all solenoid valves at once. Run high side plant and check (adjust if necessary) superheats and operation of interstage heat exchanger.
9. Check cabinet and room temp setting, including cut in and cut out operation. Confirm the operation of the CO₂ leak detectors and alarm system.
Note: CO₂ leak detectors are to be located in every cooler room, freezer room, food preparation area, plant room and the retail area (as required by code).
10. Check defrost (and current draw on elements) operation and safety termination for each individual branch.
11. Check oil temps / pressures and high pressure / low pressure, pressures, and settings.
12. Check and record running amperages of compressors and condensers. Check moisture indicator.
13. Check and record operational amperages of all electrical loads (i.e., fans, lights, anti-sweat heaters, defrost heaters, etc.)
14. Turn off plant and recheck all electrical terminals for tightness or signs of overheating.
15. Check alarm system operation and settings.
16. After 100 hours of running on the primary system change: drier cores, suction filter cores, lubricant, and replace oil filters / strainers on the secondary system change: liquid line and dryer cores
17. Note: Maintenance requires these drier cores be replaced whenever the system is opened or at a minimum of every six months.
18. Leak test system and re-check electrical terminals. Re-check cabinet and room temp settings; including cut in and cut out operation.
19. Full training and the onsite Instruction Manual are to be provided by the refrigeration contractor to the employer's key (nominated) onsite store staff prior to the store opening date. This must include detailed safety training with particular attention to CO₂.

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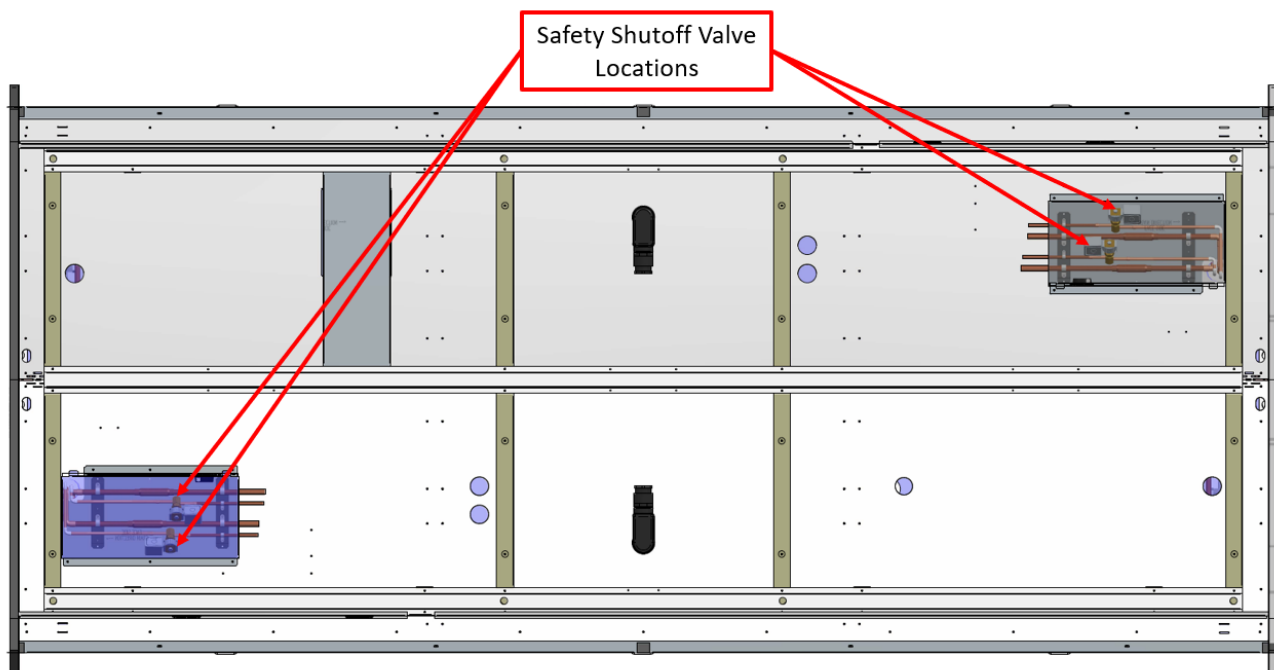
Installation Information

Thermostatic Expansion Valve (TXV) Adjustment

Expansion valves must be adjusted to fully feed the evaporator. Before attempting any adjustments, make sure the evaporator is either clear or very lightly covered with frost and that the fixture is within 10°F of its expected operating temperature.

Safety Shut-Off Valves (A2L only)

- Safety shut off valves are factory-installed on each case. Do not bypass safety shut off valves.
- Safety shut-off valves shall not block in liquid refrigerant unless adequate relief is provided to the refrigerant system low pressure side.
- Safety shut-off valves are located in such a way such that leaks upstream of the safety shut-off valve shall not enter the internal volume of the partial unit and in a space with a room volume large enough so that the maximum refrigerant charge complies to the limit for releasable charge.
- Safety shut-off valves are positioned to enable access for maintenance by an authorized person.



Pumped Liquid R-744 (CO₂) Case Inlet Solenoid Valve

The 120 VAC case inlet solenoid valve is normally closed and must receive a signal from the rack or case controller to provide temperature control. The solenoid valve must shut off (de-energize) during defrost and when case discharge air temperature is satisfied. Settings are provided on the CO₂ application data sheets for each specific case model.

Differential of the controller must be set to 2° F (1.1° C) or less to avoid large fluctuations in discharge air temperature. A swing of as much as 5° F (2.8° C) total (+/-2.5° F [1.4° C]) will not affect product temperatures.

Liquid line solenoid lead wires are terminated in the raceway and marked with an identification tag or connected to a factory installed case controller.

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Installation Information

Panel Installation

Re-install panels removed during forklift transport and installation. Failure to do so may result in faulty operation of the case.

NSF Compliant Sealing of The Case to The Floor

When the appliance is designed to be sealed to the floor or countertop the following procedure must be followed to establish proper sanitary operation. First, ensure the floor area is clean and free from debris. Begin by positioning the appliance in its designated installation spot, ensuring sufficient clearance on the back and sides according to the specified "Clearances" for proper ventilation. Next, level the appliance from front to back and side to side, as described in "Method for Leveling." Once level, outline the base of the appliance on the floor. Then, lift and support the front of the appliance. Apply a bead of NSF-approved sealant to the floor, positioned about 1/2 inch (13 mm) inside the front part of the outline. The bead should be substantial enough to cover the entire appliance surface when lowered onto it. Afterward, raise and support the rear of the appliance and apply the sealant to the floor along the remaining three sides. Finally, carefully lower the appliance and inspect it to ensure a complete seal around the entire perimeter and clean off any extra sealant as necessary. Once the appliance is sealed in accordance with these procedures, the result is intended to prevent liquid spillage on adjacent surfaces of the floor or countertop from passing under inaccessible portions of the equipment.

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Installation Information

Shelf Installation

After the cabinet is leveled, the shelves may be installed.

Load Limits

The standard shelves are rated as shown in the chart below. Exceeding this load can cause damage to the shelves, case, damage to store products, and potentially create a hazardous condition for customers and store personnel. Product must be within designated load limit to ensure proper refrigeration and air curtain performance. Product shelves should be loaded so that the product does not extend over the front edge of the shelf. Product loaded over the edge will interfere with air circulation in the cabinet. It is also desirable to leave a small space between the rear interior wall and the product on the shelves, to allow air to enter the cabinet interior through the perforations in the rear wall.

Case	Do not exceed Max Load (evenly distributed) per pan.
IM-04/05 (4',6',8',12')	140 lbs. (63.5 kg)
IM-04/05 5'	175 lbs. (79.4 kg)
IM-04/05 3'	200 lbs. (90.7 kg)

Shelves	Do not exceed Max Load (evenly distributed) per shelf.
IM-04/05 (3'x 8")	70 lbs. (31.8 kg)
IM-04/05 (3'x 10")	90 lbs. (40.8 kg)
IM-04/05 (3'x 12")	110 lbs. (49.9 kg)
IM-04/05 (3'x 14")	125 lbs. (56.7 kg)
IM-04/05 (3'x 16")	145 lbs. (65.8 kg)
IM-04/05 (4'x 8")	95 lbs. (43.1 kg)
IM-04/05 (4'x 10")	120 lbs. (54.4 kg)
IM-04/05 (4'x 12")	145 lbs. (65.8 kg)
IM-04/05 (4'x 14")	195 lbs. (88.5 kg)
IM-04/05 (4'x 16")	220 lbs. (99.8 kg)
IM-04/05 (5'x 8")	120 lbs. (54.4 kg)
IM-04/05 (5'x 10")	155 lbs. (70.3 kg)
IM-04/05 (5'x 12")	185 lbs. (83.9 kg)
IM-04/05 (5'x 14")	210 lbs. (95.3 kg)
IM-04/05 (5'x 16")	240 lbs. (108.9 kg)

Product Stocking

In addition to the prior recommendations for spacing, product should always be maintained at proper temperature. This means the temperature of the product must be controlled from the time the product is received through storage, preparation, and display to maximize the life of the product.

Product should not be placed inside the merchandisers until merchandisers are at proper operating temperature. Allow merchandiser 24 hours to operate before loading product. Proper rotation of product during stocking is necessary to prevent product loss. Always bring the oldest product to the front and set the newest to the back.

Do not use non-approved shelving, baskets, display racks, or any accessory that could disrupt air curtain performance.

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Operation and Controller

Pumped Liquid R-744 (CO₂) Operation

Sequence of Operation

This section describes the general operation of the R-744 liquid recirculation secondary systems. These systems are designed to be used in conjunction with a centralized parallel compressor rack system. The R-744 liquid recirculation system regulates case temperatures by circulating carbon dioxide through a case evaporator as it absorbs heat. The returning carbon dioxide is cooled to a liquid by the primary refrigerant supplied from the rack. The carbon dioxide is then pumped back through the case evaporator.

When the secondary system control circuit is powered up (120 volts) the chiller controller is powered. This controller regulates superheat on the primary side and must be programmed before starting the refrigeration system.

Turn on the main on/off switch to energize the pump. One pump will be "ON," and one pump will be "OFF" as a backup pump. The pump that is "ON" will now run continuously. The R-744 receiver pressure and temperature is controlled by stepping the primary rack compressor capacity.

The rack stages compressors on and off based on the input from R-744 receiver pressure transducer. The EEV controller will regulate the superheat on the primary refrigerant side.

Defrost is initiated when the rack controller sends a signal to de-energize a case solenoid valve. The solenoid valve closes, and after a specified time delay, electric heat is switched on. Once the defrost period has elapsed, the electric heat is switched off. After a second time delay, the solenoid valve is energized. The R-744 (CO₂) refrigerant then resumes flow through the case.

Commissioning Checklist: https://www.hussmann.com/ns/Supplemental_IO/GD_Pumped_Liquid_R-744_CO2_Commissioning_Checklist_M001264.pdf

CO₂ Temperature Control

The CO₂ temperature is controlled by using the CO₂ receiver pressure as the reference point for the primary side compressor capacity.

Read CO₂ Receiver Pressure Control

Pressure Rise

IF

CO₂ receiver pressure rises 2 PSIG (0.1 bar) above the saturation pressure for the selected CO₂ setpoint temperature,

THEN

Rack controller increases the primary-side compressor capacity until the set point temperature CO₂ saturation pressure is reached.

Pressure Drop

IF

CO₂ receiver pressure falls 2 PSIG (0.1 bar) below the saturation pressure for the selected CO₂ setpoint temperature,

THEN

Rack controller decreases the primary-side compressor capacity until the set point temperature

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Operation and Controller

Shutdown Modes

Low Pump Differential Pressure (PSIG [bar])

The rack controller (e.g., Copeland E3) monitors the discharge and suction pressure across the CO₂ pump that is “ON” and calculates the differential pressure using a flex combiner.

There will be dual pumps operating in parallel. One pump will be “ON” running continuously, and one pump will be “OFF” as a backup. There is a switch on the control panel to switch between Pump 1 or Pump 2. The two pumps will have different sets of discharge and suction pressure transducers.

Operation when pressure is in range:

IF

the differential pressure (psi [bar]) across the pump is greater than 5 psi (0.3 bar) or less than 60 psi (4.1 bar),

THEN

Rack controller sends output to turn the pump ON.

Operation when pressure is out of range:

IF

the differential pressure (psi [bar]) across the pump drops below 5 psi (0.3 bar) for a period of 10 seconds,

OR

IF

the differential pressure (psi [bar]) across the pump rises above 60 psi (4.1 bar) for a period of 10 seconds,

THEN

Rack controller sends output to turn the pump OFF. Rack controller sends alarm to identify “LOW PUMP DIFFERENTIAL PRESSURE SHUT DOWN.” After a 2-minute time delay, Rack controller sends output to turn the pump ON.

Multiple Restart and Lockout Procedure

IF

2nd shutdown is within 15 minutes,

THEN

re-start after time delay of 2 minutes.

IF

3rd shutdown is within 15 minutes,

THEN

re-start after time delay of 2 minutes.

IF

4th shutdown within 15 minutes,

THEN

lockout and require an inspection by service technician.

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Operation and Controller

Alarm Modes

Lower Liquid Level Sensor

IF

the receiver liquid level drops below lower liquid level sensor for a period of 2 seconds,

THEN

Rack controller sends output to turn the pump OFF. The rack controller sends an alarm to identify "LOW RECEIVER LIQUID LEVEL SHUT DOWN." After a 2-minute time delay, Rack controller sends output to turn the pump ON.

Upper Liquid Level Sensor

IF

the CO₂ receiver pressure exceeds 25 PSIG (1.7 bar) above the controller suction setpoint for 30 seconds,

THEN

the exact controller suction setpoint may vary slightly from system to system; stating specific setpoints for CO₂ temperatures -20° F (-28.9° C) and 20° F (-6.7° C) using psia while the controller is set using PSIG.

CO₂ Leak Detector Alarm

IF

the presence of CO₂ exceeds ____ ppm (adjustable setting 4,000–9,000 ppm),

THEN

CO₂ leak detector sends alarm to identify "CO₂ LEAKAGE ALARM."

CO₂ Receiver Pressure Transducer Alarm

Low Temp. Systems (-20° F [-28.9° C])

IF

the CO₂ receiver pressure exceeds 25 PSIG (1.7 bar) above 200 PSIG (13.8 bar) for 30 seconds,

THEN

rack controller sends alarm signal to identify "HIGH CO₂ RECEIVER PRESSURE."

IF

the CO₂ receiver pressure drops 25 PSIG (1.7 bar) below 200 PSIG (13.8 bar) for 30 seconds,

THEN

rack controller sends alarm to identify "LOW CO₂ RECEIVER PRESSURE."

Medium Temp. Systems (20° F [-6.7° C])

IF

the CO₂ receiver pressure exceeds 25 PSIG (1.7 bar) above 422 PSIG (29.1 bar) for 30 seconds,

THEN

rack controller sends alarm to identify "HIGH CO₂ RECEIVER PRESSURE."

IF

the CO₂ receiver pressure drops 25 PSIG (1.7 bar) below 422 PSIG (29.1 bar) for 30 seconds.

THEN

rack controller sends alarm to identify "LOW CO₂ RECEIVER PRESSURE."



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

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

Checks and Repairs for A2L Equipment

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 CO₂ 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:
 - i. The actual refrigerant charge is in accordance with the room size within which the refrigerant containing parts are installed.
 - ii. The ventilation machinery and outlets are operating adequately and are not obstructed.
 - iii. If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant.
 - iv. Marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected.
 - v. 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 material which are inherently resistant to being corroded or are suitably protected against being so corroded.

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Maintenance and Service

- 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.
- 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.
- Any vacuum used for cleaning coils should be approved for flammable refrigerants.

Checks and Repairs for R-744 (CO₂) Equipment

- Replacement parts must be compatible with the specific equipment's maximum design pressure as shown on the equipment labeling. For example, if the equipment has been designed to meet 1,305 psig (90 bar) maximum design pressure then any replacement part must be 1,305 psig (90 bar) compatible.

Checks and Repairs for All Equipment

- 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 merchandiser:
 - Unplug the merchandiser before cleaning.
 - Keep all liquids away from electrical and electronic components.

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Maintenance and Service

Care and Cleaning

Long life and satisfactory performance of any equipment is dependent upon the care it receives. To ensure long life, proper sanitation and minimum maintenance costs, this equipment should be thoroughly cleaned, all debris removed and the interiors washed down. Cleaning often will control or eliminate odor buildup. Frequency of cleaning is dependent on usage and local health requirements.

Exterior Surfaces

The exterior surfaces must be cleaned with a mild detergent without chloride and warm water to protect and maintain their attractive finish. **NEVER USE ABRASIVE CLEANSERS OR SCOURING PADS.**

Cleaning Bumpers

Clean bumpers with household spray cleaners.

Cleaning Under Merchandiser

Remove lower body panels. Use a vacuum with a long wand attachment to remove accumulated dust and debris from under the merchandiser. Use a vacuum only if it has been certified for use around flammable refrigerants.

Cleaning Stainless Steel Surfaces

Use non-abrasive cleaning materials, and always polish with the grain of the steel. Use warm water or add a mild detergent to the water and apply with a cloth. Always wipe dry after wetting.

Use non-chlorine containing cleaners such as window cleaners and mild detergents. Do not use cleaners containing salts as this may cause pitting and rusting of the stainless-steel finish. Do not use bleach.

Clean frequently to avoid build-up of hard, stubborn stains. A stainless-steel cleaning solution may be used periodically to minimize scratching and remove stains.

Rinse and wipe dry immediately after cleaning. Never use hydrochloric acid (muriatic acid) on stainless steel.

Interior Surfaces

The interior surfaces may be cleaned with most domestic detergents, ammonia-based cleaners and sanitizing solutions that do not contain chloride with no harm to the surface.

Cleaning Coils

NEVER USE SHARP OBJECTS AROUND COILS.

Use a soft brush or vacuum brush to clean debris

from coils. Do not puncture Coils! Do not bend fins. Contact an authorized service technician if a coil is punctured, cracked, or otherwise damaged.

ICE in or on the coil indicates the refrigeration and defrost cycle is not operating properly. Contact an authorized Service Technician to determine the cause of icing and to make proper adjustments as necessary. To maintain product integrity, move all product to a cooler until the merchandiser has returned to normal operating temperatures.

Cleaning Honeycomb

NEVER USE SHARP OBJECTS AROUND HONEYCOMB.

The Honeycomb must be cleaned with a mild detergent without chloride and warm water to protect and maintain their attractive finish. **NEVER USE ABRASIVE CLEANSERS OR SCOURING PADS.**

Mild Detergent: A non- abrasive, neutral-pH cleaning agent free of chlorides and harsh chemicals.

A dirty Honeycomb will block normal air flow. The Honeycomb should be inspected at least once per month. Clean as necessary after inspection. More frequent inspection/cleaning may be required depending on the environment.

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Maintenance and Service

Do Not Use:

- Abrasive cleaners and scouring pads, as these will damage the finish.
- Solvent, oil or acidic based cleaners on any interior surfaces.

Cleaning Condenser Coils

Coils should be cleaned at least once per month. Additional cleaning may be required depending on environment. A dirty condenser blocks normal airflow through the coils.

Airflow blockage increases energy consumption & reduces the merchandiser's ability to maintain operating temperatures.

To clean the coils, use a vacuum cleaner with a wand attachment & a soft (non-metallic) brush to remove dirt & debris. Do not bend fins. Always wear gloves & protective eye wear when cleaning near sharp coil fins & dust particles.

Use a vacuum only if it has been certified for use around flammable refrigerants.

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Maintenance and Service

Troubleshooting

This guide is designed to help identify, diagnose and resolve common issues.

Issue	Possible Cause(s)	Potential Solution
case temperature is too warm	ambient conditions may be affecting the case operation.	ensure case is not positioned near sources of air disturbances such as open doors, windows, electric fans, or air conditioning vents; case must be located at least 15 feet away from any doors or windows; check ambient design conditions on the serial plate
	discharge air temp is out of specified range	check evaporator fan operation
		check electrical connections and input voltage
		fans are installed backwards; check airflow direction
		make sure fan blades have correct pitch and are per specification
		check to see that fan plenum is installed correctly with no air gaps
		check suction pressure and ensure that it meets factory specifications
	case is in defrost; check defrost settings see technical datasheet	
	product is outside of the load limit area, blocking airflow	redistribute product so it does not exceed load limit there is a sticker on the inside of the case indicating the maximum load limit
coil is freezing over. condensing coil or evaporator coil is clogged or dirty	return air is blocked, make sure debris is not blocking the intake section	
	coil close-offs are not installed. Inspect coil to make sure these parts are on the case	
	clean coil	
case temperature is too cold	t-stat temp is set too low	check settings; see technical specifications on the datasheet
	ambient conditions may be affecting the case operation	ensure case is not positioned near sources of air disturbances such as open doors, windows, electric fans, or air conditioning vents; case must be located at least 15 feet away from any doors or windows; check ambient design conditions on the serial plate
frost or ice on evaporator coil	evaporator fans are not functioning	check electrical connections
	defrost clock is not functioning	case should be serviced by a qualified service technician
	coil is freezing over	return air is blocked, make sure debris is not blocking the intake section
		coil close-offs are not installed. Inspect coil to make sure these parts are on the case
coil freezing	lack of airflow over the coil	check for proper clearance and installation location
		coil is clogged or dirty - clean coils
		check fans for cleanliness and proper function
	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
water has pooled under case; case not draining properly	case drain is clogged.	clear drain.
	PVC drains under case may have a leak.	repair as needed.
	case tub has unsealed opening.	seal as needed.
	if case is in a lineup, case-to-case joint is missing	install case-to-case joint and seal as needed.
	evaporator pan is overflowing	check electrical connections to evaporation pan; check pan float assembly
	case is not level	ensure case is level using metal shims as necessary
	drain screen or p-trap clogged	clear debris
lights do not come on	LED driver / light socket wiring	check electrical connections
	LED driver needs to be replaced	case should be serviced by a qualified technician
	LED fixture socket / connection	case should be serviced by a qualified technician
	LED fixture needs to be replaced	lighting should only be replaced with like parts contact your Hussmann representative
	light switch needs to be replaced	case should be serviced by a qualified service technician

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Refrigerant Removal, Evacuation, and Recovery

WARNING: Always use a pressure regulator when operating nitrogen tanks.

WARNING: Never trap liquid refrigerant between closed valves as this could cause a hydraulic explosion.

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.

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 EEV ice blockage, wax build up, acid oil, and sludge formation.

Do not simply purge the system. 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.

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

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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.

Leak Detection (all refrigerants)

Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. Do not unplug any device if a leak is detected or suspected. 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 Recovery section provided.

A2L Leak Detection Sensor Service and Mitigation

WARNING

- Do not drop or apply direct impact to the sensor.
- Do not apply any sharp-pointed items to the membrane filter. A broken filter will damage the water protection feature and accuracy in detection.
- Do not cover the membrane filter.
- Do not apply any air or liquid flow with high pressure.
- Do not install the sensor on curved surfaces unless the sensor remains securely fixed without bending.
- The sensor should NOT be mounted with the membrane and sensor exposed to protect the sensor from contamination and moisture.
- Do not expose the detector to temperatures above 248° F (120° C); the plastic housing may become deformed.
- Do not spray any cleaning agents on the sensor.
- Do not clean the device with corrosive chemical products, solvents, or abrasive detergents.
- Clean the enclosure only with a damp cloth. Electrostatic spark risk.
- If a leak is suspected, all naked flames shall be removed/extinguished.
- The use of silicon sealant can inhibit the effectiveness of some types of leak detection equipment. Intrinsically safe components do not have to be isolated prior to working on them.
- **IMPORTANT—Electrostatic Spark Risk—**Disconnect all electrical connections and pass a damp cloth on the detector enclosure before performing any maintenance.

It is recommended to always have spare sensors on-hand to prevent system from being down for an extended period in the event of a sensor expiration or failure.

A2L-equipped equipment comes with pre-installed Danfoss sensors. If your equipment uses A2L and has a different sensor or no sensor present as indicated, contact Hussmann immediately before proceeding with service or maintenance.

It is important not to relocate, remove, or disable any factory leak detection devices. These components must be replaced with the same exact part by authorized service personnel only.

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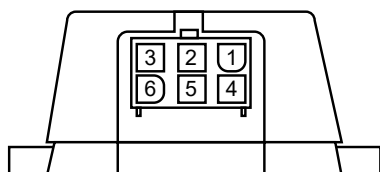
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Sensor Parts List

Danfoss System	
Part Description	Part Number
R-454A sensor	3216202
R-454C sensor	3216203
12-inch (305 mm) sensor harness	3216204
40-inch (1 m) sensor harness	3216206
60-inch (1.5 m) sensor harness	3216207
100-inch (2.5 m) sensor harness	3216208
240-inch (6.1 m) sensor harness	3216209

Sensor Specifications and Wiring

Specification	Value
Electrical Voltage	24 VAC +/- 10% and 24 VDC (8–32 VDC)
Compatible Refrigerant	R-454A or R-454C (as specified)



Pin Number	Function	Harness Wire Color (at sensor connection)
Pin 1	Supply Voltage	red
Pin 2	Earth/Ground	black
Pin 3	Mod A (Data +) (not used)	white
Pin 4	Mod B (Data -) (not used)	blue
Pin 5	Input Relay	yellow
Pin 6	Normally Open Contacts Output	orange

Relay Operation

- Relay is energized on power up when not in alarm state
- Relay is de-energized in alarm or no power state

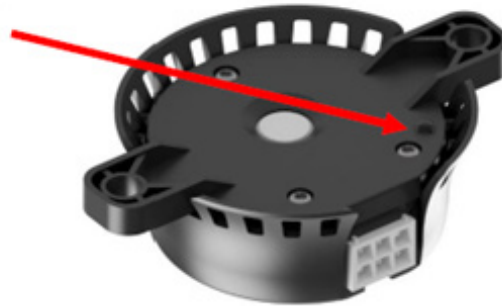
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Sensor Mitigation and Alarms

When the sensor is powered on, an LED positioned on the back of the sensor near the sensor membrane indicates its status. When the sensor is mounted, the LED backlights the sensor and can be seen as a reflection on the mounting surface.

	Solid green	-Sensor power-up and self-test
	Blinking green	-Normal operation (heartbeat)
	Solid red	-Alarm state – gas detected
	Blinking red	-Sensor fault



When the sensor detects a gas reading at or above the alarm threshold, the relay de-energizes, causing the relay contacts to open during the alarm. Additionally, the alarm flag is set in the alarm status register.

To reset the alarm, the sensor reading must drop at least 2.5% below the alarm threshold. Once this happens follow instructions in the 'Sensor Reset Instructions' section below. After completing this, the relay re-energizes and the sensor returns to normal operation. The alarm flag is also cleared by these actions. After the alarm is reset, the relay remains open for five seconds before resuming normal operation.

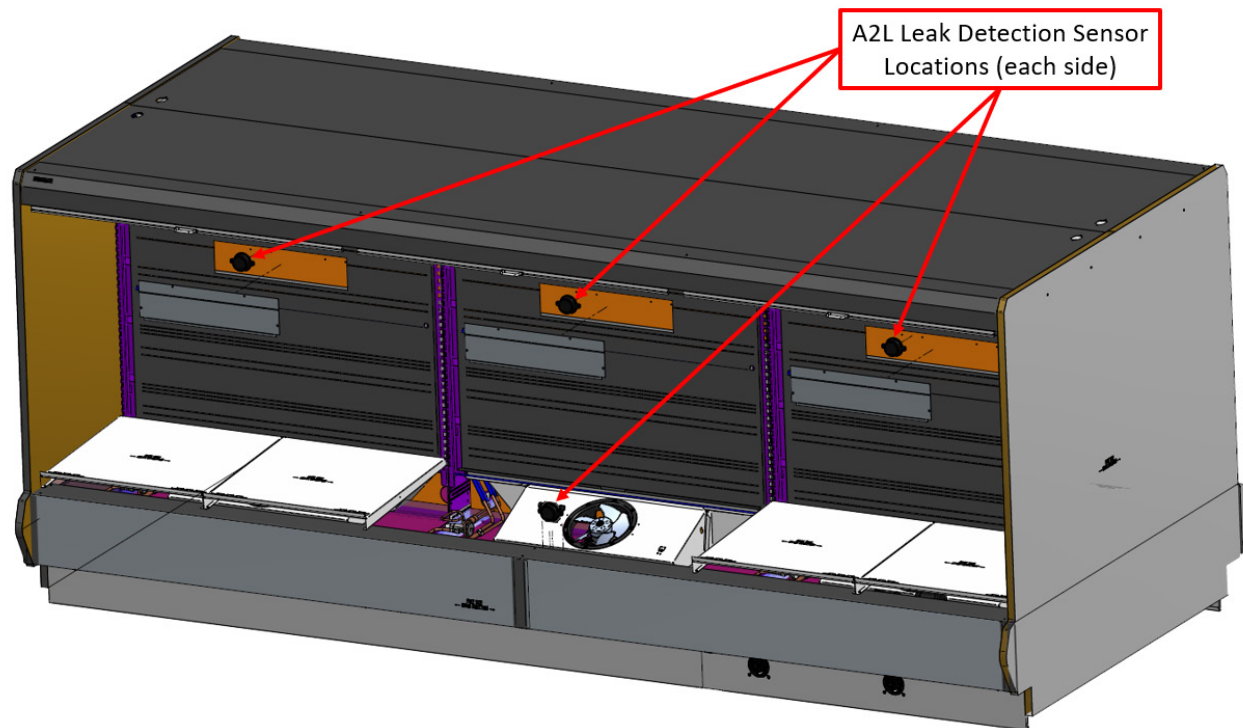
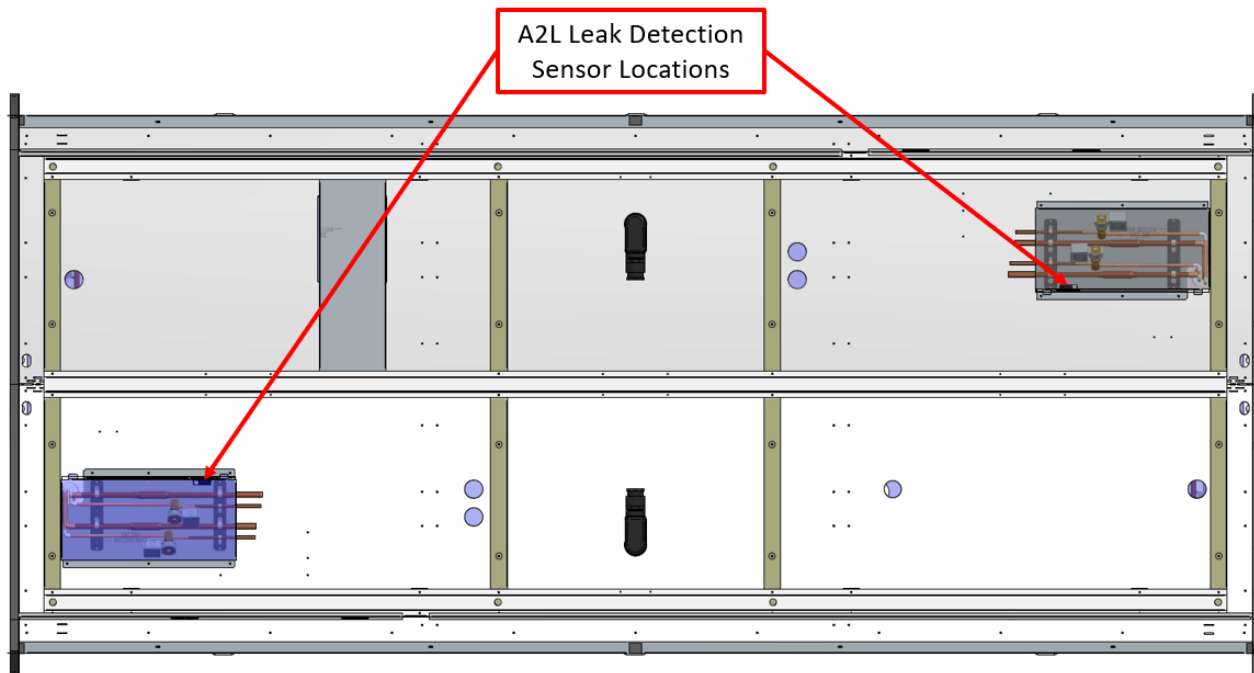
Note: If not manually reset, the sensor will not automatically reset for approximately 24 days.

Self-diagnostics are performed when the sensor is first powered on. If a fault is detected the sensor LED will begin to blink red approximately 5 seconds after being powered on. These tests ensure the integrity of the memory, embedded program, and power supply.

The sensor continuously performs diagnostics to monitor its integrity, checking for issues such as shorts, open circuits, out-of-range values, and communication errors, as well as the integrity of the on-board memory, programming, oscillator, and voltage levels.

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Maintenance and Service Sensor Position



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Sensor System Check

These steps should be used to verify proper operation at system startup and periodically (at least annually) during normal maintenance.

Warning: The lighter used for testing should never be struck or lit to cause a spark or flame at any point, it is only being used for the gas it emits.

1. Power on sensor 1 and let it complete initialization routine.
2. Green light should be active (normal status/blinking).
3. Expose sensor 1 to mixture by holding the button on a lighter without touching the striker (it should trigger in less than 60 seconds). The end of the lighter the gas comes out will need to be placed near the base of the sensor where it mounts to the unit.
4. Verify that sensor 1 triggers an alarm (open/de-energized inside relay) and switches to red light.
5. Verify that the liquid shut-off solenoid(s) are de-energized and closed.
6. Verify that ventilation fans are activated (if applicable).
7. Wait five minutes, then manually reset the sensor using the procedure in the following section and verify it is in normal state.
8. If the case has multiple sensors, repeat steps 3-7 for each remaining sensor.

If needed, the system (external to the sensor) can also be tested independently by opening the circuits that go to pin #5 and #6 wherever possible in the wiring harness without cutting. This would simulate the sensor detecting a leak and allow the shut-off valve(s) and ventilation (if applicable) function to be tested. If this method is used, ensure any disconnected wiring is reconnected and perform the reset procedure (in the following section) before finishing service/inspection.

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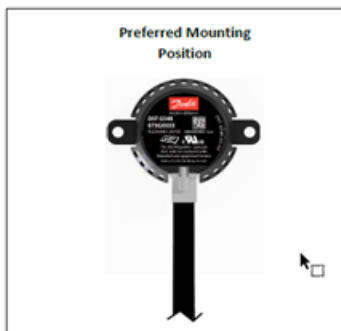
Sensor Reset Instructions (after leak event or test)

1. Verify Safe Conditions
 - Confirm that there is no active refrigerant leak and that the environment is safe to proceed.
 - Ensure all personnel involved are properly trained and authorized to perform reset operations.
2. Access Control Panel
 - Open the electrical control panel where the power for leak detection system is installed.
3. Locate the Toggle Switch
 - Inside the control panel, identify the designated switch assigned for the leak sensor power control.
4. Perform Power Cycle Reset
 - Flip the toggle switch to the OFF position to remove power from the leak detection sensor.
 - Wait approximately 5–10 seconds to allow the sensor and associated safety circuits to fully de-energize.
 - Flip the toggle switch back to the ON position to reapply power.
5. Confirm System Reset:
 - Verify that the sensor alarm has been cleared.
 - Confirm that all safety valves have returned to their normal operating state.
 - Observe the system for any abnormal indicators or alarm recurrence.

Sensor Replacement

Replacement sensors should be of the same type and mounted in the original locations and orientation only.

- Max torque for screws is 6.2 lb-in (0.7 N-m)
- Mounting holes are sized for #10– #12 self-tapping sheet metal screws
- Recommended installation position is with connector down. When this is not possible, rotation up to 90 degrees left or right is acceptable.



Mount Sensor with cable facing downward if possible. This is to minimize Water ingress from the cable and connector.



Alternative mounting if downward is not possible. Cable can exit 90 degrees from right or left side. Any angle from downward 0 degrees up to 90 degrees can be used.



Replacement Steps

1. Before replacing sensor, first ensure no refrigerant leak is detected and then that the power is off. Also, ensure the exact same sensor part number is being used as a replacement by comparing the two sensors.
2. Remove two mounting screws from sensor.
3. Disconnect wires from relay and controller.
4. Attach new sensor in the same orientation and position with the previously removed screws.
5. Connect wiring to relay and controller per the wiring diagram.
6. Reconnect power. The refrigerant sensor should now run through the initialization process.

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Component Replacement

For A2L leak detection system parts, please refer to the respective section of the manual.

Replacement Parts

For A2L leak detection system part numbers, please refer to the respective section of the manual.

Scan the QR code on the last page for part information.

Decommissioning

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 not 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 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

Revision History

Revision A: Initial Release.



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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