ZERO ZONE
CRYSTAL MERCHANDISER® FREEZERS
With CoolView® Doors & ChillBrite® LED Lighting
INSTALLATION & OPERATION MANUAL
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CASE MODELS REFERENCED IN THIS MANUAL

THIS INSTALLATION & OPERATION MANUAL PERTAINS TO THE FOLLOWING ZERO ZONE DISPLAY CASE MODELS:

- **RVLC30** 30” x 74” CoolView® Doors
- **RVLC30BB** Back-to-Back Cases w/ 30” x 74” CoolView® Doors
Limited Warranty

Zero Zone, Inc. (Seller) hereby warrants that any products manufactured by it and sold are warranted to be free from defects in material and workmanship, under normal use and service for its intended purpose, for a period of one (1) year from the date of original installation (not to exceed 15 months from the date of factory shipment). Zero Zone ChillBrite® LED Lighting carries a 5-year parts warranty. Zero Zone CoolView® Doors carry a 10-year glass pack parts warranty. The obligation under this warranty shall be limited to repairing or exchanging any part, or parts, FOB Factory, which is proven to the satisfaction of the Zero Zone Service Department to be defective. Zero Zone reserves the right to inspect the job site, installation, and reason for failure. This limited warranty does not cover labor, freight, or loss of food or product, including refrigerant loss. This warranty does not apply to motors, switches, controls, lamps, driers, fuses, or other parts manufactured by others and purchased by the Seller unless the manufacturer of these items warrants the same to the Seller, and then only to the extent of those manufacturer’s warranty to the Seller. Any products sold on an “AS IS” basis shall not be covered by this warranty.

Extended Warranties

In addition to the standard limited warranty, for further consideration, the Seller will extend to the original purchaser prior to shipment, a limited extended warranty on the compressor only, following expiration of the standard warranty. The Seller agrees to repair or exchange, at its option, or provide reimbursement for such exchange as directed, less any credit allowed for return of the original compressor, of a compressor of like or similar design and capacity, if it is shown to the satisfaction of Zero Zone that the compressor is inoperative due to defects in factory workmanship or material under normal use and services as outlined by Zero Zone in its Installation & Operation Manuals and other instructions.

Length of Extended Warranty

Any compressor warranty may be extended for an additional four (4) years, but such extension must be purchased prior to shipment to be effective. This warranty is only for the compressor and not for any other associated parts of the refrigeration system.

Product Not Manufactured by the Seller

The written warranty, if any, provided by the manufacturer of any part of the refrigeration unit sold by Seller to Buyer, but not manufactured by Seller, is hereby assigned to the Buyer. However, Seller makes no representation or warranty regarding the existence, validity, or enforceability of any such written warranty.

Limitation and Exclusion of Warranties

THE WARRANTIES SET FORTH HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES AND REMEDIES WHATSOEVER, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE.
**INTRODUCTION**

**Important User Information**

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All rights reserved. No part of the contents of this manual may be reproduced, copied, or transmitted in any form or by any means including graphic, electronic, or mechanical methods or photocopying, recording, or information storage and retrieval systems without the written permission of the publisher, unless it is for the purchaser’s personal use.

The information in this manual is subject to change without notice and does not represent a commitment on the part of Zero Zone. Zero Zone does not assume any responsibility for any errors that may appear in this manual. In no event will Zero Zone be liable for technical or editorial omissions made herein, nor for direct, indirect, special, incidental, or consequential damages resulting from the use or defect of this manual.

The information in this document is not intended to cover all possible conditions and situations that might occur. The end user must exercise caution and common sense when installing, using, or maintaining Zero Zone products. Zero Zone products should only be installed by qualified, professional refrigeration technicians. If any questions or problems arise, call Zero Zone at 800-247-4496.

Any change to a Zero Zone product made during the installation, startup, or at any other time must be submitted in writing to Zero Zone for approval and be approved by Zero Zone in writing prior to commission. The product warranty is voided when any unapproved change is made to a Zero Zone product.

**Manufacturer**

Zero Zone, Inc.

110 N Oakridge Dr • North Prairie, WI 53153 • 800-247-4496 • www.zero-zone.com

**Intended Use**

Zero Zone products are intended to be installed and used as described in this manual and other related Zero Zone literature, specifications, drawings, and data. Always install Zero Zone products on a level surface.

The information contained in this manual pertains to the Zero Zone **Crystal Merchandiser® (RVLCL)** freezer case with Zero Zone CoolView® doors and Zero Zone ChillBrite® LED lighting.

Potential case features include:

- Brushless D.C. electronic fan motors or PSC fan motors
- Zero Zone ChillBrite® LED lighting
- Zero Zone CoolView® doors with heated glass and rails

These display cases were designed and tested using the following industry standards:

- NSF 7 – Commercial Refrigerators and Freezers (ANSI Approved) (equipment certified by NSF)
- UL 471 – Commercial Refrigerators and Freezers (ANSI Approved) (equipment certified by ETL)
- ASHRAE Standard 72-2014 – Method of Testing Commercial Refrigerators and Freezers (ANSI Approved)
- AHRI 1200 – Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets (ANSI Approved)
- DOE Compliant (All U.S. Sales)

ASHRAE Standard 72-2014 specifies the test conditions for the equipment. It includes the ambient conditions of 75°F dry bulb and 55% RH. It also specifies the door opening requirements for the performance test. Doors are opened six times in one hour for six seconds. The door opening test period is for eight hours during one 24-hour performance test. As an example, a 5-door case will have 240 door openings during one 24-hour test. Consult the factory if your store exceeds these test conditions.
Installation & Operation

Delivery Inspection

These display cases were carefully factory-tested, inspected, cleaned, and properly packed to ensure delivery in the best possible condition. The equipment should be unpacked and checked for damage immediately upon delivery. Do not place “leave, store or hold” case outdoors in direct sunlight, or in high ambient temperature. DAMAGE MUST BE NOTED AT TIME OF DELIVERY AND ALL CLAIMS FOR DAMAGES MUST BE FILED WITH THE TRANSPORTATION COMPANY - NOT WITH ZERO ZONE. The carrier will supply necessary report and claim forms.

Packaging

Numbered labels identify the order of cases in a lineup. The first number indicates the store order number. The second number indicates the lineup. The third number indicates the joint in a lineup (from left to right, when viewed from the front of the case). Back-to-Back cases follow the same labeling. See Figure 1 on page 16.

The first case in the lineup (Case 1) has a packet attached to the door handle that contains the manual, special instructions for installing ordered options, and touch-up paint if the cases are custom painted. Every other case in the lineup has a packet attached to the door that contains the specific information for that case. The shop order is taped to each case's right-hand door.

Bumpers are shipped on top of the case. Shelves for the case are tie-wrapped and blocked into the individual cases. Other accessories like drain traps, drain pans, condensate evaporation pans, and hat channels are shipped in the case that requires the parts.

Materials for joining cases include caulk, joining bolts, splices, and end filler posts, and are also located in each case.

The door is prevented from opening during shipment with the use of a door-holding shipping bracket. The bracket is screwed to the top of each case's right-hand door.

Location

These cases must not be installed in the direct rays of the sun or near a source of radiant heat.

Be certain that the floor under the installation is of sufficient strength to prevent sagging. Out-of-level conditions will result in reduced performance.

Wall cases (cases set with a back to a wall), cases set back-to-back, and cases set back-to-end should be positioned to allow a minimum of 2" to 4" of space behind the back of the unit(s). This will allow necessary air to circulate behind the display case(s) and prevent condensation. Higher humidity stores with minimal air circulation require a 4" gap.

Installation Leveling

A lineup solely made of freezers should be level front to back and right to left.

When joining a freezer and cooler in a short lineup, both cases should be tilted back with an additional 3/16" of shims under the front bases after the case is leveled. See Figure 2A on page 17. On long lineups, the tilt back on the coolers should gradually increase while working away from the cooler/freezer joint until the last case has an additional 3/8" of shims under the front base and the tilt back on the freezers should gradually decrease to no additional shims while working away from the cooler/freezer joint. See Figure 2B on page 17.

Cases should be set level right to left to allow complete drainage of defrost water. Since a level floor area is seldom available, the following steps are recommended to insure a level installation. See Figure 3 on page 18.

1. Measure off and mark on floor the exact dimensions of the case lineup. (Check blueprints).
2. Snap a chalk line at the locations for the front and back positions of the base rails.
3. Mark locations of all joints (front and back).
4. Using a laser level or transit, find the highest point along both base rail position lines. Using the high point as a reference, mark the difference directly on the floor to each joint (front and back).

5. If you plan on using optional “hat channels” to raise the case height, place them under each pair of bases. On some cases, all bases are not directly in line from front to back. See Figure 4 on page 19 and Figure 5 on page 20 for base locations. The 3 and 4-door hat channels will be angled slightly to support the front and rear bases because the bases themselves are not in line.

6. Place the required number of shims under each base or optional hat channel at each joint (front and back) to equal the highest point. The case is designed with minimal gaps between adjacent doors to provide a clean appearance. To maintain even, consistent gaps and proper door operation, the case must be leveled front-to-back and side-to-side. Check case squareness to within 1/8". See Figure 6 on page 21. Shims should not extend beyond the front case bases or they will interfere with the installation of kick plates. Tape all shims in place. The shims should be oriented to sit under the front and rear bends of each base.

7. The RVLC30 2-door through 5-door cases have segmented bases mounted at the ends and under the center section of the case. The RVLC30 1-door and RVLC30BB have full bases that run front-to-back and are located at the ends and under the center sections of the case. Place additional support shims under all other bases or hat channels, leaving no gaps taller than one shim.

8. Tape all shims in place (See Figure 7 on page 22). See Figure 8 on page 23 for the correct orientation of shims under the base or channel.

9. If you are joining coolers to freezers, RVMC cases should be set with a slight backward tilt to offset the forward lean of a fully loaded case. When joining a freezer and cooler in a short lineup, both cases should be tilted back with an additional 3/16" of shims under the front bases after the case is leveled. See Figure 2A on page 17. On long lineups, the tilt back on the coolers should gradually increase while working away from the cooler/freezer joint until the last case has an additional 3/8" of shims under the front base and the tilt back on the freezers should gradually decrease to no additional shims while working away from the cooler/freezer joint. See Figure 2B on page 17.

10. If you’ve purchased seismic restraints, specific instructions for attaching those restraints are included in your document package. These instructions should be read and understood before the lineup is assembled.

Case Movement

⚠️ CAUTION! DO NOT PULL ON THE MULLIONS WHEN MOVING THE CASE. THE END FRAME CAN BE USED TO PUSH/PULL THE CASE. DOLLIES MAY BE PLACED AGAINST THE CASE BOTTOM, BUT AVOID CRUSHING THE BUMPER SUPPORT OR DRAIN PIPE.


The RVLC30 and RVLC30BB cases have steel protective support plates under the ends (not under insulated dividers). These are designed to protect the end from Johnson Bar damage. Per NSF, these must be removed after cases are set.

The Back-to-Back cases are shipped with wood planks that allow the use of pipe rollers. These wood planks should be removed after the case is moved to its final location (See Figure 9 on page 24).

<table>
<thead>
<tr>
<th>MODEL</th>
<th>FORKLIFT FROM ENDS</th>
<th>JOHNSON BAR</th>
<th>FURNITURE DOLLY</th>
<th>PIPE ROLLERS</th>
<th>SAFE (CASE) JACKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>RVLC30</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>RVLC30BB</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Care should be taken when moving the cases. The doors should be secured so they cannot open while the case is moved.
INSTALLATION & OPERATION

Only experienced certified forklift drivers should use forklifts to move the cases. The case should only be lifted off the floor as high as necessary for transport. The forklift should be driven slowly, avoiding any abrupt motions or bumps.

The following forklift dimensions must be maintained to avoid damaging the case when it is lifted. Fork blades wider than 4” will not fit in the bases.

2-Door Cases
- Forks must extend from 26” to no more than 30” under the case.

3-Door Cases
- Use 48” long forks!
- Forks must extend from 39” to no more than 43” under the case.

4 & 5-Door Cases
- Use 48” long forks!

IMPORTANT: Fork blades wider than 4” will not fit in the bases.

Spacer blocks are factory-installed in the end bases of 4 and 5-door cases that use bases taller than 3 1/2”. These blocks limit the cases forward tilt at the opposite end from the forklift while it is being lifted and must be used when lifting 4 or 5-door cases with bases taller than 3 1/2”. See Figure 10 on page 25.

For low shipping height applications, Zero Zone has optional expandable bases. As shipped, the base is 1 3/4” tall. It is attached with spacers that allow the base to slide away from the bottom of the case, creating a gap that allows the use of forklift blades thicker than 1 3/4”.

When the case needs to move through an 80” door opening, the case is shipped with a 1” base on a wood pallet. Remove the case from the pallet to slide the case through the 80” doorway. Drain elbow will need installation on a 1” base. Use extra thick PVC cement.

Lineup Assembly

Zero Zone display cases have been engineered for continuous display. This means that any number of cases can be joined together to create a display of any desired length. The bottom of the end panel is protected with a removable steel plate that must be removed after the cases are set.

The cases will be ready for assembly after removal of the packaging material.

Case caulking instructions are shipped with every case, explaining the proper procedure for joining cases. See Figure 11 on page 26 and See Figure 12 on page 27 for instructions.

FIELD-INSTALLED CAULK SEALANT APPLICATION NOTES:

Butyl sealant is used to join cases and Silicone or NSF approved sealant is used for NSF compliance. Sealants should not contact one another as this may affect adhesion or color of each.

Remove all shipping blocks applied to inside of base ends before joining cases.
Remove End protection plate located below END on outside of case.

FAILURE TO FOLLOW THE INTENT OF CASE JOINING INSTRUCTIONS WITH SEALANTS WILL CAUSE FROST INSIDE THE CASE.

For NSF case installation compliance, the interior case seams need to be sealed using NSF approved caulk (not supplied). See Figure 14 on page 29.
After setting the first case, the next case is slid into position and bolted to the first case using four 3/8" bolts that are provided. Begin tightening the bolts at the top rear, working down the back of the case and up the front, making sure that the front seams are flush. Cases are not designed to be pulled together using the joining bolts.

Alignment holes are located in the lower steel end frames. These are located 7" in from the joining holes.

Once the cases have been caulked and slid together, start the joining bolts, but do not tighten them. Slide the center extrusion (T-strip) between the end mullions See Figure 13 on page 28. Begin tightening the bolts at the top rear, working down the back of the case and up the front, making sure that the front seams are flush. Cases are not designed to be pulled together using the joining bolts.

**Drain Line**

The drain is located at the center of the case in the floor pan. The drain can be reached by removing the coil covers and then tipping the fan plenum towards the doors. The 1” PVC drain outlet is located at the center front of the case behind the kick plate.

The drain exits the case in the center. The bases are designed for lateral runs of drain pipe to pass through and the drain pipe must be installed in this area. See Figure 15 on page 30. There is no room in front of the base for drain pipe because the kick plate installs directly to the front of the bases.

Install the tee to the outlet pipe and a drain trap to the tee. Plug the open end of the tee using the clean-out plug supplied with the drain trap kit. The tee, drain trap and plug are supplied with the case. The drain trap must be level. The drain trap should be primed with water after installation. The drain line must be pitched away from the case enough to insure proper drainage. Consult your local codes for minimum requirements.

**Condensate Evaporation System**

Zero Zone remote cases can be equipped with an automatic condensate evaporation system. The system uses a pump and drain pan located behind the kick plate and a condensate evaporator pan mounted on the top of the case.

Condensate water and any liquid spilled in the case drains out into the drain pan. The pump is equipped with a float that turns the pump on when there is a sufficient liquid level. Liquid is pumped through a plastic hose through a check valve and into the condensate evaporation pan. The evaporation pan is equipped with a heater and a float switch to turn on when the heater is submerged in liquid. When the heater is energized, the pan will be extremely hot and should not be touched. The pump and condensate pan should be cleaned regularly. Any spilled product should be cleaned to prevent odors.

**Trim**

The cases are supplied with a 3” protective bumper. Each case has its own bumper assembly including end caps. The case was shipped with the bumper support and snap track installed on the front of the case. The bumper may need trimming before snapping it onto the snap track.

Full height (top) trim is provided to hide the door hardware located on the top exterior of the case. The top trim is factory-installed. Joint splices are shipped loose to be installed on-site at the upper case joints.

**Kick Plates**

Each case is shipped with a front kick plate. Cases with end panels receive 1 side kick plate per end. Cases that join together get a kick plate splice.

Front and side kick plates are attached to the case bases using Tinnerman clips. The flange on the front kick plate faces forward and is at the top. The screw (supplied) goes through the kick plate and into the Tinnerman clip. See Figure 16 on page 31.

There is a natural gap between the top of the kick plate and the underside of the case that allows 50 CFM of air return per door. If more return air is required, contact the factory to order optional louvered kick plates.
Cleaning

Although your Zero Zone cases are thoroughly cleaned before shipping, the cases should be thoroughly cleaned again before start-up and routinely thereafter to maintain a clean appearance. Use mild detergent and warm water (never an abrasive cleaner) to wipe out the inside of the case before start-up. The case drain should be regularly cleared of debris and price tags.

Internal components are easily accessed by the removal of mounting screws and sheet metal component parts. The components can be cleaned using a mild detergent and warm water or a mild sanitizer. Once the wire racks and deck pans and are removed, the coil and drain pan can be flushed. All food products should be removed from the case when flushing with a hose. Do not use high-pressure water or steam to clean the interior.

UNDER CASE FLOOR CLEANING (NSF)

The floor underneath your Zero Zone display case can be cleaned by following a few simple steps:

1. Remove the fasteners that hold the bottom kick plate to the display case. The fasteners are accessed from the front of the unit.
2. With the kick plates removed, remove paper and other debris (typically price tags or receipts) from the floor.
3. Vacuum under the case to remove any dust build-up that may be present.
4. Using a mild detergent and warm water, mop underneath the unit with a clean mop.
5. When finished mopping, squeegee any remaining water underneath the unit to the floor drains to speed the drying process. Replace the kick plates when the floor has dried.

GLASS SURFACES

Cleaning interior glass reduces fogging and increases visibility. Wipe down glass or plexiglass mirrors or ends with a glass cleaner. Do not use any products containing silicone or anti-fog.

Shelf Location

- The shelves are adjustable in 1" increments and may be located in any position for best display advantage.
- Be sure brackets are completely seated.
- Wire shelf brackets are stamped with “R” for Right and “L” for left to aid installation.
- Bottom basket is shipped in a tipped-forward position, but may be rotated 180° to obtain a flat position.

Shelves

Zero Zone manufactures many different styles of shelves, baskets, and product stops. Some of the baskets may be reversed and used as a typical shelf. Shelves are strapped to the shelf brackets for shipping. The fully assembled shelves are installed in cases prior to shipping.

Solid shelves have three parts. A solid center section and two snap-in brackets. Solid shelves can be disassembled for cleaning. A screwdriver can be used to spread the snap open to remove the brackets from the center section.

Loading the Case

The case may be loaded with merchandise after it has been operated for at least 24 hours with correct case temperature and proper control operation. While loading the shelves, leave a minimum of 1" air space between the top of the merchandise and the shelf above it so the customer can remove the merchandise. The air space allows an air curtain on top of the product. Product should not extend beyond the front of the shelves or block the return air grill. The shelf loads are as follows:
<table>
<thead>
<tr>
<th>ITEM</th>
<th>SHELF DESCRIPTION</th>
<th>MAXIMUM LOAD PER SHELF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>22&quot; and 24&quot; deep</td>
<td>250 lbs.</td>
</tr>
<tr>
<td>2</td>
<td>Bakery or Meat Brackets</td>
<td></td>
</tr>
<tr>
<td></td>
<td>At 0°</td>
<td>250 lbs.</td>
</tr>
<tr>
<td></td>
<td>At 5°</td>
<td>250 lbs.</td>
</tr>
<tr>
<td></td>
<td>At 10°</td>
<td>150 lbs.</td>
</tr>
<tr>
<td>3</td>
<td>Ice Shelves</td>
<td>500 lbs.</td>
</tr>
</tbody>
</table>

*Heavy duty shelves are available and are labeled as such.*

**Light Switch**

The light switch is located on the ceiling on the right-hand side of the display case.

**Case Thermometer**

The cases are shipped with 2 thermometers. One thermometer is factory-mounted in the discharge air stream. The second thermometer is shipped loose and should be installed in the warmest product location. Specific instructions are packaged with the shipped loose thermometer.
See Figure 17 on page 32 and Figure 18 on page 33 for the typical component layout of the 30” door case.

The kick plate must be removed to gain access to the drain clean out. Disassemble the kick plate by removing the 2 or 3 metal screws located in the kick rail.

**Evaporator**

The evaporator coil, located at the rear bottom of the case, is factory-assembled with distributor, expansion valve, and other refrigeration components. To inspect the coil, remove the center or left of center coil cover. A small inspection window is located at the rear of the case. To inspect the entire coil, remove the remaining coil covers and raise the evaporator cover.

**Expansion Valve**

Unless otherwise specified, a superheat adjustable externally equalized thermostatic expansion valve with a removable strainer and pressure limiting charge is mounted to the evaporator coil. The valve is not preset. Adjust the superheat setting for maximum coil effectiveness. Typical superheat settings are between 6°F and 10°F. Close coupled systems should use the higher superheat setting to minimize the chance of liquid flood back. To adjust the expansion valve, remove the right end coil cover. Remove the cap from the bottom of the valve. When looking at the valve stem end, turn the valve stem counterclockwise to decrease superheat. Turn the valve stem clockwise to increase superheat. Measure the suction line temperature at the expansion valve sensing bulb and compare it to the suction temperature corresponding to the saturated pressure. Make sure that line pressure drop is taken into account.

Turn the valve stem only 1/4 turn at a time and allow sufficient time (20 to 30 minutes) for the valve to settle before making any further adjustments. Replace the valve stem cap after the valve superheat has been adjusted. **BE CERTAIN THE VALVE STEM CAP IS WIPED DRY FIRST.**

⚠️ **CAUTION!** DISCONNECT POWER TO THE CASE BEFORE SERVICING ELECTRICAL COMPONENTS TO AVOID PERSONAL INJURY AND DAMAGE TO THE UNIT.

**Evaporator Fans**

Air is circulated throughout the case with 115 volt fan motors. These motors must be operating at all times except during defrost. Fan motors should be replaced with motors having the same characteristics including type, physical size, lubricant temperature range, wattage and RPM. Fan blades should be replaced with OEM parts or have the same fan pitch as the OEM fan blade.

**Fan Removal**

1. Unplug fan from fan power supply plug located on the front face of the fan housing.
2. Remove the fan blade nut and fan blade.
3. Remove the two mounting bolts and remove the fan assembly from the fan housing.
4. Remove the three fan motor mounting screws from the back of the fan motor.

Reverse steps 1-4 to install.
Air Curtain Velocity

Air curtain velocity is affected by stocking levels, coil frost loads, temperature, fan condition, and measurement method. Zero Zone recommends using an Alnor® Velometer Jr.*, set to the 0-to-800 fpm range. Air velocity should be measured at the back edge of the discharge air honeycomb; at the center of the middle door in the case (other doors have slightly lower velocity). A typical RVLC30 velocity reading is 400 to 500 feet per minute in a fully-packed case, after the case has defrosted and pulled down to operating temperature. Air curtain velocity in a partially-packed display case is significantly lower because more air exits the back wall duct holes.

LED Power Supplies

LED power supplies are located in the main electrical box of the RVLC30. The standard location of the electrical box is on the top of the case, but there is an option to mount the electrical box below the case in a slide-out drawer. See Figure 19 on page 34. This option must be specified on the original case order.
Piping Penetrations

Unless otherwise specified, the liquid and suction connections are made inside the case under the evaporator fan/coil cover. Refrigerant piping may enter the case through the left rear back panel or the left rear top panel of the case. The copper pipe should not touch or rub on the edges of the sheet metal. After connections have been made, the refrigeration access hole in the case must be sealed completely with an aerosol-dispersed Urethane insulation or equivalent, like Great Stuff™, for example. Penetrations made in sheet metal baffles should also be sealed.

Refrigerant Piping

Correct refrigeration line sizing and industry standard installation practices are essential for proper system operation. Zero Zone recommends that, on a case utilizing top refrigeration exit, the riser be sized to maintain refrigerant velocity and oil return. Refrigeration risers are an available factory-installed option. Zero Zone recommends one riser per refrigeration circuit on circuits utilizing hot gas defrost. Field piping must be 3" away from the defrost heater element on cases utilizing electric defrost.

The end frames on the cases have cut-outs built into them to allow for case-to-case field piping, if desired.

Zero Zone recommends a liquid line drier and moisture-indicating sight glass installed on each case prior to the expansion valve, these are also a factory-installed option. See Figure 20 on page 35 and Figure 21 on page 36.

Leak Check/Evacuation/Charging

After all of the refrigeration piping and system components have been assembled, the entire system must be pressurized and checked for leaks. When the system is leak free, evacuate with a deep vacuum pump. Triple evacuation should be done to a minimum of 500 microns and nitrogen sweep is recommended. After the system has been thoroughly evacuated of all moisture and non-condensable gas, charge the system with the proper refrigerant, using “hi-side/low-side” charging techniques. Refer online to GreenChill Leak Check Guidelines.

Temperature Settings

<table>
<thead>
<tr>
<th>R404A FROZEN FOOD</th>
<th>R404A ICE CREAM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rack Systems</strong></td>
<td><strong>Rack Systems</strong></td>
</tr>
<tr>
<td>Evaporator Temp -7°F</td>
<td>Evaporator Temp -16°F</td>
</tr>
<tr>
<td><strong>Condensing Unit</strong></td>
<td><strong>Condensing Unit</strong></td>
</tr>
<tr>
<td>Condensing Unit Cut-In 35 psig</td>
<td>Condensing Unit Cut-In 27 psig</td>
</tr>
<tr>
<td>Condensing Unit Cut-Out 24 psig</td>
<td>Condensing Unit Cut-Out 16 psig</td>
</tr>
<tr>
<td><strong>Return &amp; Discharge Air Temperature</strong></td>
<td><strong>Return &amp; Discharge Air Temperature</strong></td>
</tr>
<tr>
<td>Return Air Temp Cut-In 6°F</td>
<td>Return Air Temp Cut-In -3°F</td>
</tr>
<tr>
<td>Return Air Temp Cut-Out 0°F</td>
<td>Return Air Temp Cut-Out -9°F</td>
</tr>
<tr>
<td>Discharge Air Temp Cut-In 3°F</td>
<td>Discharge Air Temp Cut-In -6°F</td>
</tr>
<tr>
<td>Discharge Air Temp Cut-Out -3°F</td>
<td>Discharge Air Temp Cut-Out -12°F</td>
</tr>
</tbody>
</table>

Temperature Control

When purchased, factory-installed discharge air sensors are located in the center of the case behind the access panel in the ceiling panel. There is a sticker installed on the panel that states “sensor located behind.”

If the case is ordered with defrost termination sensors, Zero Zone provides the following sensor locations unless otherwise directed by the customers’ spec.

1. On cases utilizing hot gas defrost, the sensor is strapped to the dump line.
2. On cases utilizing electric defrost, the sensor is placed in the center of the evaporator coil.
General

⚠️ **CAUTION!** DISCONNECT POWER TO THE CASE BEFORE SERVICING ELECTRICAL COMPONENTS TO AVOID PERSONAL INJURY AND DAMAGE TO THE UNIT.

See Figure 22 on page 37 for the typical wiring diagram for a low temperature case equipped with electric defrost. See Figure 23 on page 38 for the typical wiring diagram for a low temperature case equipped with hot gas defrost. Each case is provided with a wiring diagram located in the electric box that shows the exact wiring of the case.

There are many control options available for multiple case defrost systems. Wiring diagrams and instructions can be obtained by contacting Zero Zone’s Service Department.

External wiring should be sized according to the amperage rating stamped on the serial plate. The serial plate is located on the ceiling inside the left-hand door. Typical electrical values are shown on specification sheets for each of these cases in the bag attached to the case or are available at www.zero-zone.com. All internal wiring has been done at the factory. Cases with standard wiring have their control wires terminated in an electrical box located on top of the case. A terminal block has been used to simplify field connections.

All wiring must comply with the National Electrical Code and all local codes. After installation of the equipment, correct operation of the electrical circuits and controls and defrost operation and termination should be verified. All operating voltages and amperages should be measured and recorded.

Optional Electrical Wiring

**SINGLE POINT CONNECTION**

The “single point” connection system is designed to reduce the time required to install and wire one display case with one condensing unit. Figure 22 on page 37 and Figure 23 on page 38 are typical diagrams for this system.

All of the display case controls, including the disconnect switch and the electronic case controls are installed on the case and pre-wired. The liquid line solenoid valve is installed in the liquid line and wired. The power to operate the display case is connected at the case disconnect switch. The power to operate the condensing unit is connected in the condensing unit control panel. There are no interconnecting wires between the condensing unit and display case.

The controls operate the system as a pump down defrost. When the display case begins defrost, the liquid line solenoid valve, fans and anti-sweat heaters are de-energized. The defrost heaters are energized. The compressor continues to run and pumps down the coil. The compressor cycles off on its low-pressure control. If there is any residual liquid left in the coil, the suction line pressure will rise and the compressor may turn on and pump down the coil.

The liquid line solenoid is energized at the end of the defrost cycle and the defrost heaters are de-energized. The suction line pressure rises and the compressor starts. When the low temperature evaporator reaches operating temperature, the fans and anti-condensate door heaters are energized.

**MASTER/SATELLITE CONNECTION**

The master/satellite connection system allows one condensing unit to be connected to multiple cases. See Figure 24 on page 39 shows a typical diagram for this system.

All of the display case controls, including the disconnect switch, time clock, temperature control, and defrost temperature control, are installed on the case and pre-wired. The liquid line solenoid is pre-wired but is not installed in the liquid line.

The power to operate each display case is connected at each case’s disconnect switch. The power to operate condensing unit is connected at the condensing unit. There are no interconnecting wires between the condensing unit and display case. There are interconnecting wires
that need to be connected between the cases. The liquid line solenoid valve needs to be installed in the common liquid line before the liquid is distributed to the cases.

The controls operate the system as a pump down defrost. When the display case begins defrost, the liquid line solenoid valve, fans and anti-sweat heaters are de-energized. The defrost heaters are energized. The compressor continues to run and pumps down the coil.

The master case contains the time clock. Interconnecting case wiring allows the master case to control the satellite cases. When defrost is initiated in the master case, it sends an electrical signal to each case to energize the defrost relay and initiate a defrost in all of the satellite cases. A second set of interconnecting wires is connected in series between each of the cases. Each case defrost heater is de-energized when the coil reaches the defrost termination temperature. An additional signal is relayed to the next case indicating that the termination temperature has been reached. When all of the cases have reached termination temperature, the defrost termination circuit is complete and the defrost is terminated.

The liquid line solenoid is energized at the end of the defrost cycle and the defrost heaters are de-energized. The suction line pressure rises and the compressor starts. When the evaporator reaches operating temperature, the delay thermostat (Klixons) will close, energizing the fans and anti-sweat door heaters.
DEFROSTING

General

Periodic defrosting to keep the coil free of frost is accomplished automatically by a time clock used in conjunction with an electric or hot gas defrost. For best results, temperature termination of defrost is strongly recommended on Zero Zone cases.

Defrost Settings and Controls

ELECTRIC DEFROST

**Frequency:** One defrost per day is recommended. **Time of day:** Avoid defrosting during periods of heavy shopping or stocking. **Drip Time:** Electric defrost does not require any drip time because Zero Zone provides a built-in fan delay thermostat.

<table>
<thead>
<tr>
<th>Electric Defrost Fail-safe Times:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FROZEN FOOD</strong></td>
</tr>
<tr>
<td>1/Day at 55 Minutes</td>
</tr>
<tr>
<td><strong>ICE CREAM</strong></td>
</tr>
<tr>
<td>1/Day at 55 Minutes</td>
</tr>
</tbody>
</table>

At ASHRAE test conditions and 208 volt defrost heater operation, the typical observed defrost durations are 30 minutes for frozen food and 40 minutes for ice cream.

**Preferred Termination:** For optimal performance, Zero Zone recommends a temperature-terminated defrost, using a defrost termination thermostat or probe sensing the coil temperature. The case has the probe located at the center of the coil in the center of the bottom row of tubes. If the case is so equipped, the defrost termination temperature is 50°F. Zero Zone provides a defrost termination thermostat unless a control system defrost probe is requested.

Temperature termination based on coil temperature allows the length of defrost to vary depending on how much frost is on the coil and the defrost heater voltage. Coil frost is a function of shopping patterns, stocking habits, general door maintenance and ambient temperature and humidity. More frost requires a longer defrost. A lower defrost heater voltage extends the defrost duration.

**Alternate Termination:** If it is not possible to terminate the defrost cycle based on a defrost termination thermostat or probe sensing the temperature at the coil, and the only available temperature probe is sensing the discharge air temperature, then the termination temperature should be set to 65°F, zero minutes drip time.

Zero Zone electric defrost freezers are delivered with the defrost thermostat open-on-rise contacts wired in series with the defrost heaters. Unless the installer rewires the defrost thermostat, the defrost heater is de-energized when defrosting is complete.

Electric defrost freezer is equipped with a high-limit, snap-disc thermostat that de-energizes the defrost heater if the coil temperature exceeds 85°F to provide a secondary safety termination.

HOT GAS DEFROST

**Frequency:** One hot gas defrost per day is recommended. **Time of day:** Nighttime defrosting is preferred to avoid periods of heavy shopping or stocking. **Drip time:** Hot gas defrost requires a 5 minute drip time.

<table>
<thead>
<tr>
<th>Hot Gas Defrost Fail-safe Times:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FROZEN FOOD</strong></td>
</tr>
<tr>
<td>Hot Gas</td>
</tr>
<tr>
<td>1/Day at 30 Minutes 5 Minute Drip</td>
</tr>
<tr>
<td>Reduced Temp Hot Gas</td>
</tr>
<tr>
<td>1/Day at 40 Minutes 5 Minute Drip</td>
</tr>
<tr>
<td><strong>ICE CREAM</strong></td>
</tr>
<tr>
<td>Hot Gas</td>
</tr>
<tr>
<td>1/Day at 30 Minutes 5 Minute Drip</td>
</tr>
<tr>
<td>Reduced Temp Hot Gas</td>
</tr>
<tr>
<td>1/Day at 40 Minutes 5 Minute Drip</td>
</tr>
</tbody>
</table>
DEFROSTING

Preferred Termination: For optimal performance, Zero Zone recommends a temperature-terminated defrost, using a defrost termination thermostat or probe attached to the dump line. At ASHRAE test conditions, termination ranges from 12-22 minutes. If the cases are so equipped, the defrost termination is 65°F at the dump line. Zero Zone provides a defrost termination thermostat unless a control system defrost probe is requested.

Defrost Operation

ELECTRIC DEFROST

The compressor stops when the defrost is initiated in a non-pump-down system. On pump-down systems, the liquid line solenoid will be de-energized when the defrost is initiated. The clock will energize the defrost contactor, which will energize the defrost heater. This de-energizes the 115-volt fans and anti-sweat heaters.

HOT GAS DEFROST

Several types of hot gas defrost methods (using time-actuated, time-terminated or temperature-terminated defrost timers) can be used to defrost the evaporator.

The refrigeration system designer and installer are responsible for correct line sizing for effective hot gas defrost and liquid return from the freezers. Sizing and component selection depend on the type of defrost, size, and location of high side refrigeration system.

Zero Zone freezers equipped for hot gas defrost consist of a side port distributor and a TXV check valve for coil defrost, and a suction line check valve to bypass hot gas to the serpentine coil. The serpentine coil is attached to the bottom of the pan to ensure pan and drain defrost.

The timer starts the hot gas defrost cycle by energizing a solenoid, reversing valve, or directional valve. The hot gas is injected from the source into the suction line of the evaporator to be defrosted. The hot gas flows into the serpentine coil attached to the floor of the case and then into the evaporator. Condensed liquid leaves the evaporator through the side port distributor, through a check valve into the liquid line. See Figure 18 on page 33.

General Notes

The refrigeration technician should recheck coil condition after one week of retail operations to be certain that the frequency and duration of defrost is adequate for the particular store and locality. For example, if defrost voltage is below 200 volts, additional fail-safe time may be required.

When using time terminated defrost, the defrost termination thermostat should be wired in series with the defrost heater.

Defrost termination thermostats may be wired in series for multiple evaporator installations.

Defrost termination thermostats may be used as a digital input for electronic controllers.

Limit Thermostat

Each freezer has factory-set limit thermostats (Klixons) attached to the coil on the right end of the freezer to regulate the operation of the evaporator fans and defrost heater.

⚠️ CAUTION! IMPORTANT! OPERATION OF THE LIMIT THERMOSTATS CAUSES THE EVAPORATOR FANS TO REMAIN OFF UNTIL THE COMPRESSOR IS OPERATING AND THE COIL TEMPERATURE IS BROUGHT BELOW THE THERMOSTAT CUT-IN SETTING (10°F ). SUPERHEAT MUST BE SET CORRECTLY BY THE INSTALLING CONTRACTOR FOR PROPER THERMOSTAT OPERATION.
When the freezer first operates, the fans may cycle off and on a few times until coil temperature stabilizes below 10°F. The superheat must be set for proper operation. Electric defrost models have a high limit thermostat installed on the coil, wired in series with the defrost heaters. This thermostat opens if the temperature reaches 85°F. See Figure 23 on page 38.

Defrost Heater Element

One half of the U-shape heater is located on the front of the coil and the other half is located on the rear of the coil See Figure 17 on page 32. The electric wire leads are connected in a raceway under the coil cover on the right-hand side of the case.

Heater Element Removal

The U-shape defrost heater has one leg located on the front of the coil and one leg located on the rear of the coil. The front heater is located approximately 1" off the floor and the rear heater is approximately 2" off the floor. The heater is secured to the coil by a number of stainless steel heater retaining clips. The heater is fastened to the floor on the right-hand side of the coil. Remove fasteners holding the heater to the floor.

The U-shape defrost heater can be removed by first pulling the front leg of the retaining clip away from the coil and sliding the heater out from under the clip. The rear leg of the heater can then be removed by raising the retaining clips 2" at a time, working from right to left on the coil. Repeat this process until the retaining clips are free of the coil. The heater will slide up with the retaining clip.

Heaters are installed in the reverse order of how they were removed.

Anti-Sweat Heaters

The case has one anti-sweat heater located in each mullion, including the end mullions, and one anti-sweat heater in the case sill. The mullion heater is located behind the front metal strike plate. Remove the front fasteners on the mullion and remove the front strike plate to access the heater. The case sill heater is located under the front metal strike plate below the door opening. Contact Zero Zone’s Service Department for instructions for servicing this heater.

For locations with low humidity and tightly controlled ambient conditions the lower sill heater may be disconnected for additional energy savings.
ILLUSTRATIONS
Case Label Information

**FIGURE 1**

<table>
<thead>
<tr>
<th>LEFT TO RIGHT</th>
<th>FRONT OF LINEUP CASE JOINT LABELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.1</td>
<td>1.1.1</td>
</tr>
<tr>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LEFT TO RIGHT</th>
<th>FRONT OF LINEUP BACK TO BACK CASE JOINT LABELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.1</td>
<td>1.1.1</td>
</tr>
<tr>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>

KEY: 1.1.1
STORE# LINE-UP# JOINT#
ILLUSTRATIONS
Freezer to Cooler Leveling

FIGURE 2

2A. Short Case Lineup

2B. Long Case Lineup

NOTES:
1. FOR SHORT CASE LINEUPS, USE 3/16" OF SHIMS AFTER LEVELING.
2. FOR LONGER CASE LINEUPS, AFTER LEVELING, START WITH NO ADDITIONAL SHIMS ON FAR END OF VLC CASE AND SHIM UP EVENLY TO 3/8" OF SHIMS ON FAR END OF VMC CASE.
3. SHIM FRONT BASES ONLY.
ILLUSTRATIONS
Leveling Cases Prior to Joining

FIGURE 3

3A. Measure and mark exact case outline

3B. Mark floor level differences

3C. Shim placement at each base.
ILLUSTRATIONS

RVLC30 Base Locations

FIGURE 4

Refer back to page 3
MEASURE SQUARENESS FROM TOP RIGHT CORNER OF CASE TO BOTTOM LEFT CORNER OF CASE AT POINTS SPECIFIED. MEASURE AGAIN FROM TOP LEFT CORNER OF CASE AND BOTTOM RIGHT CORNER OF CASE. MEASUREMENTS SHOULD BE EQUAL. MAXIMUM DEVIATION TO BE NO MORE THAN 1/8".
ILLUSTRATIONS

Shim Orientation

FIGURE 8

CASE FRONT

VLC SHIM PLACEMENT

CASE FRONT

BB SHIM PLACEMENT

C. SHIM JOINTS TO EQUAL HIGHEST POINTS

SP-6057 REV. A

Refer back to page 3
FIGURE 9

SP-6061 REV. A
Refer back to page 4
FOLLOWING THIS PROCEDURE IS CRITICAL TO
JOINED CASES BEING SEALED CORRECTLY!

1. Apply one 1/4" to 3/8" wide bead of BUTYL SEALANT, as shown with dashed lines, to the End Mullion. Apply two beads at Ceiling, Rear Wall, and Base. Apply to only one (1) case at joint, not both cases, as excessive amounts of sealant may squeeze out of joint.

2. After cases are joined and tightened, caulk the top and back exterior seams, if possible, to further ensure there are no voids in the joint.

3. This process must be repeated at all case joints.
1. Apply one 1/4" to 3/8" wide bead of BUTYL SEALANT, as shown with dashed lines, to the Door Frame/End Mullion. Apply two beads at Ceiling, Rear Wall, and Base. Apply to only one (1) case at joint, not both cases, as excessive amounts of sealant may squeeze out of joint.

2. After cases are joined and tightened, caulk the top and back exterior seams, if possible, to further ensure there are no voids in the joint.

3. This process must be repeated at all case joints.

FOLLOWING THIS PROCEDURE IS CRITICAL TO JOINED CASES BEING SEALED CORRECTLY!
Attach Item 5 to first case using item 3 on top and bottom of End Brkt. Then join cases using items 1, 2, & 4.

View from inside of case.

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty</th>
<th>Description</th>
<th>ZZ P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>#10-24 x 1/2&quot; Slt Truss Hd Screw</td>
<td>64-0145-P1</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>#10-24 Barrel Bolt Slotted</td>
<td>64-0146-P1</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>#8 x 1/2 Hex Head Screw</td>
<td>64-0207-P1</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
<td>1/4&quot; Flat Washer</td>
<td>64-0512-P1</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>Trim Vert Center Extrusion</td>
<td>37-0410</td>
</tr>
</tbody>
</table>

Caulk Case Joints Per I & O Manual

Shipped loose in case

Refer back to page 5
REQUIRED SEALING FOR NSF APPROVED INSTALLATION ONLY

SURFACES OF AREAS TO BE CAULKED SHOULD BE CLEAN, DRY, AND FREE OF FROST. SURFACE TEMPERATURE OF THESE AREAS SHOULD BE ABOVE 40°F.

1. Cases to be joined properly before continuing to step 2. Refer to CASE – JOINT CAULKING INSTRUCTION for more information. This document is included in your information packet. Avoid excess caulk during this step to prevent it from coming out of the joints. This will affect step 2 as butyl and silicone sealants do not mix.
2. Apply silicone-based caulk-sealant bead to areas shown at left to meet sealant requirements for NSF-approved installations.
3. Apply small beads of sealant smoothly at seams between end frame of case and end panel or insulated divider, but do not thin or feather excessively, because it may affect adhesion.

NOTE: Caulk sealant lines are shown dashed in views at left. Field caulk sealant must be applied in a continuous fashion to seal the affected area with the desired bead width and penetration.
Fig 15

Use shims to achieve 3/8" height for proper tilt back. Front bases only.

SP-6076 REV. A
KICKPLATE INSTALLATION:
1. INSTALL TINERMAN NUT AT EACH BASE
2. INSTALL KICKPLATE END
3. INSTALL KICKPLATE WITH TOP FLANGE FACING OUTWARD
4. INSERT FASTENERS TO SECURE KICKPLATE AND KICKPLATE ENDS

DETAIL A (ASSEMBLED)

DETAIL A (EXPLODED)
FIGURE 17

30" ELECTRIC DEFROST

ITEM NO. | PART NAME
---|---
1 | COIL COVER
2 | FAN
3 | LIQUID LINE
4 | SUCTION LINE
5 | FAN HOUSING
6 | HEAT EXCHANGER
7 | EXPANSION VALVE
8 | HEATING ELEMENT
9 | HEATER CLIP
10 | DEFROST TERMINATION PROBE LOCATION

Refer back to page 8
30" HOT GAS DEFROST

FIGURE 18

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>COIL COVER</td>
</tr>
<tr>
<td>2</td>
<td>FAN</td>
</tr>
<tr>
<td>3</td>
<td>FAN HOUSING</td>
</tr>
<tr>
<td>4</td>
<td>COIL</td>
</tr>
<tr>
<td>5</td>
<td>CHECK VALVE</td>
</tr>
<tr>
<td>6</td>
<td>SERPENTINE</td>
</tr>
<tr>
<td>7</td>
<td>SLHX HEAT EXCHANGER</td>
</tr>
<tr>
<td>8</td>
<td>TXV VALVE</td>
</tr>
<tr>
<td>9</td>
<td>HAND VALVE (OPTIONAL)</td>
</tr>
<tr>
<td>10</td>
<td>DRIER (OPTIONAL)</td>
</tr>
<tr>
<td>11</td>
<td>CHECK VALVE</td>
</tr>
<tr>
<td>12</td>
<td>HOT GAS SOL VLV (OPTIONAL)</td>
</tr>
<tr>
<td>13</td>
<td>HOT GAS CLIP</td>
</tr>
<tr>
<td>14</td>
<td>DEFROST TERMINATION PROBE LOCATION</td>
</tr>
</tbody>
</table>
NOTES:
1. ELECTRICAL BOX MOUNTED ON TOP FOR SHIPPING ONLY.
2. BOX TO BE REMOVED AND INSERTED UNDER DISPLAY CASE IN ELECTRICAL BOX BRACKETS AT EITHER LEFT OR RIGHT LOCATION. (NO NEED TO UN-WIRE. ELECTRICAL CONDUIT IS LONG ENOUGH TO ACCOMODATE BOTH LOCATIONS).
3. ELECTRICAL BOX IS NOT TO BE PLACED ON FLOOR DUE TO POSSIBLE WATER HAZARD.
### Refrigeration Line Sizing - Frozen Foods

#### FIGURE 20

<table>
<thead>
<tr>
<th>R-404 Line Sizing Tables for Zero Zone VZ/VLC Frozen Food Freezer (-7°F Evaporator Temperature)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Liquid Line Sizing - Electric Defrost</strong></td>
</tr>
<tr>
<td>Up to 50 equivalent feet</td>
</tr>
<tr>
<td>90°F Liquid, 2°F Pressure Drop</td>
</tr>
<tr>
<td><strong>For rated Btuh:</strong></td>
</tr>
<tr>
<td>From</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>7,310</td>
</tr>
<tr>
<td>15,010</td>
</tr>
<tr>
<td>27,310</td>
</tr>
<tr>
<td>64,610</td>
</tr>
<tr>
<td><strong>For rated Btuh:</strong></td>
</tr>
<tr>
<td>5/16”</td>
</tr>
<tr>
<td>3/8”</td>
</tr>
<tr>
<td>1/2”</td>
</tr>
</tbody>
</table>

#### Notes:
- For hot gas defrost, use a liquid line one size larger than shown.
- Use maximum liquid temperatures other than 90°F, multiply rated Btuh by liquid correction factor before using the Liquid Line Sizing Table.
- **For 1°F pressure drop, multiply rated BTU by 1.44 before using the Suction Horizontal Line Sizing Table.**
- **For maximum liquid temperatures other than 90°F, multiply rated Btuh by liquid correction factor before using the Liquid Line Sizing Table.**

---

### Liquid Correction Factors for Suction Horizontal Line Sizing Table

<table>
<thead>
<tr>
<th>Liquid Temperature</th>
<th>Maximum Allowable Riser Size For Adequate Oil Return*</th>
</tr>
</thead>
<tbody>
<tr>
<td>40°F</td>
<td>0.94</td>
</tr>
<tr>
<td>50°F</td>
<td>0.97</td>
</tr>
<tr>
<td>60°F</td>
<td>1.00</td>
</tr>
<tr>
<td>70°F</td>
<td>1.05</td>
</tr>
<tr>
<td>80°F</td>
<td>1.12</td>
</tr>
<tr>
<td>90°F</td>
<td>1.21</td>
</tr>
<tr>
<td>100°F</td>
<td>1.37</td>
</tr>
</tbody>
</table>

---

### Liquid Correction Factors for Suction Vertical Riser Sizing Table

Maximum Allowable Riser Size For Adequate Oil Return*

70°F Minimum Liquid Temperature, using 0.35 PSI Per 100 Feet (per 2006 ASHRAE Handbook - Refrigeration).

<table>
<thead>
<tr>
<th>Riser Btuh</th>
<th>From</th>
<th>To</th>
<th>Vertical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,360</td>
<td>1/2</td>
<td>1,730</td>
<td>3/8”</td>
</tr>
<tr>
<td>2,560</td>
<td>5/8</td>
<td>4,110</td>
<td>5/8”</td>
</tr>
<tr>
<td>6,800</td>
<td>10,300</td>
<td>1/2</td>
<td>14,910</td>
</tr>
<tr>
<td>13,910</td>
<td>24,300</td>
<td>1/2</td>
<td>35,500</td>
</tr>
<tr>
<td>24,310</td>
<td>38,400</td>
<td>1/2</td>
<td>56,900</td>
</tr>
<tr>
<td>38,410</td>
<td>62,500</td>
<td>1/2</td>
<td>83,200</td>
</tr>
<tr>
<td>80,010</td>
<td>122,000</td>
<td>1/2</td>
<td>142,000</td>
</tr>
</tbody>
</table>

* For 1°F pressure drop, multiply rated Btuh by 1.44 before using the Suction Vertical Riser Sizing Table.

---

### Liquid Correction Factors for Liquid Line Sizing Table

For maximum liquid temperatures other than 90°F, multiply rated Btuh by liquid correction factor before using the Liquid Line Sizing Table.

<table>
<thead>
<tr>
<th>Liquid Temperature</th>
<th>Maximum Allowable Liquid Line Size</th>
<th>Maximum Allowable Vertical Line Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>40°F</td>
<td>0.66</td>
<td>1.00</td>
</tr>
<tr>
<td>50°F</td>
<td>0.76</td>
<td>1.04</td>
</tr>
<tr>
<td>60°F</td>
<td>0.81</td>
<td>1.08</td>
</tr>
<tr>
<td>70°F</td>
<td>0.86</td>
<td>1.12</td>
</tr>
<tr>
<td>80°F</td>
<td>0.92</td>
<td>1.16</td>
</tr>
<tr>
<td>90°F</td>
<td>1.00</td>
<td>1.27</td>
</tr>
<tr>
<td>100°F</td>
<td>1.09</td>
<td>1.37</td>
</tr>
</tbody>
</table>

---

### Suction Vertical Riser Sizing

Liquid Temperature, using 0.35 PSI Per 100 Feet (per 2006 ASHRAE Handbook - Refrigeration).

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Vertical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,360</td>
<td>1/2</td>
<td>2,550</td>
</tr>
<tr>
<td>2,560</td>
<td>5/8</td>
<td>4,110</td>
</tr>
<tr>
<td>6,800</td>
<td>10,300</td>
<td>1/2</td>
</tr>
<tr>
<td>13,910</td>
<td>24,300</td>
<td>1/2</td>
</tr>
<tr>
<td>24,310</td>
<td>38,400</td>
<td>1/2</td>
</tr>
<tr>
<td>38,410</td>
<td>62,500</td>
<td>1/2</td>
</tr>
<tr>
<td>80,010</td>
<td>122,000</td>
<td>1/2</td>
</tr>
</tbody>
</table>

* For 1°F pressure drop, multiply rated Btuh by 1.44 before using the Suction Vertical Riser Sizing Table.

---

Subject to change without notice.

Special situations which cause the actual Btuh to differ from the rated Btuh of the cases.

It may be necessary to make adjustments to compensate for special situations which cause the actual Btuh to differ from the rated Btuh of the cases.

All liquid line and suction line sizes are inches, refrigeration O.D. Subject to change without notice.

---

**Notes:**
- Larger suction horizontal line size may be used, if preferred.
- 3/4 suction horizontal line may be used to reduce cost.
- Larger liquid line size may be used (such as 3/8), if preferred.
- 3/4 liquid line may be used to reduce cost.
- Subject to change without notice.

---

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**ILLUSTRATIONS**

**Refrigeration Line Sizing - Ice Cream**

**FIGURE 21**

**R-404 Line Sizing Tables for Zero Zone VZ/VLC Ice Cream Freezer (-16°F Evaporator Temperature)**

<table>
<thead>
<tr>
<th>Liquid Line Sizing - Electric Defrost*</th>
<th>90°F Liquid, 2°F Pressure Drop‡</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Up to 50 equivalent feet</strong></td>
<td><strong>Up to 100 equivalent feet</strong></td>
</tr>
<tr>
<td>From</td>
<td>To</td>
</tr>
<tr>
<td>0</td>
<td>7,090</td>
</tr>
<tr>
<td>7,100</td>
<td>14,600</td>
</tr>
<tr>
<td>14,610</td>
<td>26,500</td>
</tr>
<tr>
<td>26,510</td>
<td>62,800</td>
</tr>
<tr>
<td>62,810</td>
<td>117,000</td>
</tr>
</tbody>
</table>

*For hot gas defrost, use a liquid line one size larger than shown.

† For 1°F pressure drop, multiply rated Btuh by 1.45 before using the Liquid Line Sizing Table.

‡ For 1°F pressure drop, multiply rated Btuh by 1.44 before using the Suction Horizontal Line Sizing Table.

+++ Larger suction horizontal line size may be used, if preferred.

§ For 1°F pressure drop, multiply rated Btuh by 1.45 before using the Liquid Line Sizing Table.

**Liquid Correction Factors for Liquid Line Sizing Table - Use Maximum Liquid Temperature**

<table>
<thead>
<tr>
<th>Maximum Liquid Temperature</th>
<th>40°F</th>
<th>50°F</th>
<th>60°F</th>
<th>70°F</th>
<th>80°F</th>
<th>90°F</th>
<th>100°F</th>
<th>110°F</th>
<th>120°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid Correction Factor</td>
<td>0.95</td>
<td>0.94</td>
<td>0.94</td>
<td>0.95</td>
<td>0.97</td>
<td>1.00</td>
<td>1.05</td>
<td>1.12</td>
<td>1.23</td>
</tr>
</tbody>
</table>

**Suction Horizontal Line Sizing**

<table>
<thead>
<tr>
<th>Suction Horizontal Line Sizing</th>
<th>90°F Liquid, 2°F Pressure Drop‡</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Up to 50 equivalent feet</strong></td>
<td><strong>Up to 100 equivalent feet</strong></td>
</tr>
<tr>
<td>From</td>
<td>To</td>
</tr>
<tr>
<td>0</td>
<td>1,420</td>
</tr>
<tr>
<td>1,430</td>
<td>3,360</td>
</tr>
<tr>
<td>3,370</td>
<td>6,300</td>
</tr>
<tr>
<td>6,310</td>
<td>10,500</td>
</tr>
<tr>
<td>10,510</td>
<td>16,600</td>
</tr>
<tr>
<td>16,610</td>
<td>33,600</td>
</tr>
<tr>
<td>33,610</td>
<td>58,400</td>
</tr>
<tr>
<td>58,410</td>
<td>92,300</td>
</tr>
<tr>
<td>92,310</td>
<td>162,000</td>
</tr>
</tbody>
</table>

*For 1°F pressure drop, multiply rated Btuh by 1.44 before using the Suction Horizontal Line Sizing Table.

++ Larger suction horizontal line size may be used, if preferred.

† For 1°F pressure drop, multiply rated Btuh by 1.45 before using the Liquid Line Sizing Table.

**Liquid Correction Factors for Suction Horizontal Line Sizing - Use Maximum Liquid Temperature**

<table>
<thead>
<tr>
<th>Maximum Liquid Temperature</th>
<th>40°F</th>
<th>50°F</th>
<th>60°F</th>
<th>70°F</th>
<th>80°F</th>
<th>90°F</th>
<th>100°F</th>
<th>110°F</th>
<th>120°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid Correction Factor</td>
<td>0.72</td>
<td>0.76</td>
<td>0.80</td>
<td>0.86</td>
<td>0.92</td>
<td>1.00</td>
<td>1.10</td>
<td>1.22</td>
<td>1.38</td>
</tr>
</tbody>
</table>

**Suction Vertical Riser Sizing**

<table>
<thead>
<tr>
<th>Suction Vertical Riser Sizing</th>
<th>90°F Liquid, 2°F Pressure Drop‡</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Allowable Riser Size For Adequate Oil Return*</td>
<td>70°F Minimum Liquid Temperature, using 0.35 PS Per 100 Feet (per 2006 ASHRAE Handbook - Refrigeration).</td>
</tr>
<tr>
<td>From</td>
<td>To</td>
</tr>
<tr>
<td>1,210</td>
<td>2,280</td>
</tr>
<tr>
<td>2,290</td>
<td>3,810</td>
</tr>
<tr>
<td>3,820</td>
<td>6,050</td>
</tr>
<tr>
<td>6,060</td>
<td>12,400</td>
</tr>
<tr>
<td>12,410</td>
<td>21,600</td>
</tr>
<tr>
<td>21,610</td>
<td>34,300</td>
</tr>
<tr>
<td>34,310</td>
<td>71,300</td>
</tr>
<tr>
<td>71,310</td>
<td>127,000</td>
</tr>
</tbody>
</table>

*It may be necessary to make adjustments to compensate for special situations which cause the actual Btuh to differ from the rated Btuh of the cases.

All liquid line and suction line sizes are inches, refrigeration O.D.

Subject to change without notice.

**Liquid Correction Factors for Suction Vertical Riser Sizing Table - Use Minimum Liquid Temperature**

<table>
<thead>
<tr>
<th>Minimum Liquid Temperature</th>
<th>40°F</th>
<th>50°F</th>
<th>60°F</th>
<th>70°F</th>
<th>80°F</th>
<th>90°F</th>
<th>100°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid Correction Factor</td>
<td>0.83</td>
<td>0.88</td>
<td>0.94</td>
<td>1.00</td>
<td>1.08</td>
<td>1.17</td>
<td>1.28</td>
</tr>
</tbody>
</table>

PES, 2/1/16

SP-0612-02, Rev C

Refer back to page 10
ILLUSTRATIONS

Electric Defrost Wiring Diagram

FIGURE 22

Refer back to page 11
 FIGURE 23

Hot Gas Defrost Wiring Diagram
ILLUSTRATIONS
Master/Satellite Wiring Diagram

FIGURE 24

MASTER (CONTROLLER) CASE - MOUNTED IN CASE B WHEN TWO CASES ARE CONNECTED TOGETHER

SATELLITE (CONTROLLED) CASE WHEN TWO CASES ARE CONNECTED TOGETHER

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TECHNICAL QUESTION? FOR SERVICE CALL 1-800-247-4466
D/A NO. 65-1329 REV. C

Refer back to page 11
For other technical support, please refer to Zero Zone Installation & Operation Manuals available on the Service page at:

WWW.ZERO-ZONE.COM

or contact the Zero Zone Service Department at:

800-247-4496

All specifications subject to change without notice.