

Protecting Your Future

# **Refrigeration System**

# **Original Instructions Installation, Operation and Maintenance Manual**

This manual is updated as new information and models are released. Visit our website for the latest manual.







Part Number: 550001058-12 08/19

#### **Safety Notices**

# A DANGER

Indicates a hazardous situation that, if not avoided, will result in death or serious injury. This applies to the most extreme situations.

#### A Warning

Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

#### Notice

Indicates information considered important, but not hazard-related (e.g. messages relating to property damage).

#### A Caution

Indicates a situation that, if not avoided, could damage the refrigeration system or result in minor injury.

NOTE: Indicates useful, extra information about the procedure you are performing.

### **A** Warning

Read this manual thoroughly before operating, installing or performing maintenance on the equipment. Failure to follow instructions in this manual can cause property damage, injury or death.

#### A Caution

Installation and maintenance/servicing are to be performed only by trained and qualified personnel familiar with commercial refrigeration systems.

#### **Caution**

Ensure that all field wiring conforms to the equipment requirements and all applicable local and national codes.

#### **Caution**

Disconnect all power sources before servicing the refrigeration equipment.

# **A**Caution

Sheet metal and coil surfaces have sharp edges. Use appropriate protective gloves to prevent injury.

### **Caution**

Use appropriate eye protection during installation and servicing.

# **Table of Contents**

General Information       4         Receiving Inspection       4         Warranty Information       4         Installation       5         Evaporator Units       5         Section 3       6         Wiring       8         Section 4       8         Piping       9         Pipings       9         Oil Traps       9         Oil Traps       10         Drain Lines       10         Pre Charged Lines       11         Leak Testing       12         PK Models       13         PC Models       14         Refrigerant Charging units       15         Section 5       Operational Start-Up         Opersor Superheat       16         Compressor Superheat       16         Compressor Superheat       17         Articlox Thermostst With LDA       18	Section 1		
Receiving Inspection       4         Warranty Information       4         Section 2       1         Installation       5         Evaporator Units       5         Section 3       6         Wiring       8         Section 4       9         Piping       9         Cleanliness       9         Oli Traps       9         Oli Traps       10         Drain Lines       10         PR Models       12         PR Models       13         PCL Models       14         Refrigerant Charging       14         Section 5       0         Operational Start-Up       16         Compressor Superheat       15         Conton Defrost Setup.       21         Electric Defrost Setup.       21         Custom Defrost Setup.       21         Custom Defrost Setup.       22         Section 6       Maintenance	General Information		
Warranty Information       4         Section 2       Installation         Installation       5         Evaporator Units       5         Section 3       6         Wiring       8         Section 4       9         Piping       9         Piping       9         Pipe Supports       9         Oil Traps       10         Drain Lines       10         Drain Lines       10         Drain Lines       11         Leak Testing       12         P Models       13         PCL Models       13         PCL Models       13         PCL Models       13         PCL Models       14         Refrigerant Charging       14         Refrigerant Charging       15         Compressor Superheat       15         Compressor Superheat       16         Compressor Superheat       17         Proublerot Setupints       20         Custom Defrost Setupints       20         Custom Defrost Setupints       20         Custom Defrost Setupints       20         Custom Defrost Setupints       22		Receiving Inspection	
Installation Condensing Units Evaporator Units Condensing			
Installation Condensing Units Evaporator Units Condensing	Section 2		
Condensing Units			
Evaporator Units       6         Section 3       Wiring         Section 4       Piping         Piping       9         Cleanliness       9         Pipe Supports       9         Oil Traps       10         Drain Lines       10         Pre-Charged Lines       11         Leak Testing       12         PK Models       13         PCL Models       13         PC Models       14         Refrigerant Charging       14         Section 5       0         Operational Start-Up       16         Compressor Mounts       15         Start-Up       16         Compressor Superheat       17         ArcticFox Thermostat With LDA       18         Section 6       Maintenance         Maintenance       23         Po.E. Lubricants       23         P.O.E. Lubricants       23         P.O.E. Lubricants       23         P.O.E. Lubricants       2	mstandton	Condensing Units	5
Section 3 Wiring Wiring Wiring Wiring Section 4 Piping Piping Pipe Supports 9 Oil Traps 9 Oil Traps 9 Oil Traps 10 Orain Lines 10 Pre-Charged Lines 10 Pre-Charged Lines 11 Leak Testing 12 PR Models 13 PCL Models 13 PCL Models 13 PCL Models 13 PC Model		-	
Wiring Wiring	Section 3		
Section 5 Operational Start-Up Pre-Start Checks			
Section 4 Piping	wiring		
Piping Piping Piping Piping Pipe Supports Pi		Wiring	
Piping			
Cleanliness	Piping		
Pipe Supports       9         Oil Traps       10         Drain Lines       10         Pre-Charged Lines       11         Leak Testing       12         PR Models       12         PC Models       13         PCL Models       13         PC Models       14         Section 5       0         Operational Start-Up       16         Compressor Mounts       15         Start-Up       16         Compressor Superheat       16         Evaporator Superheat       16         Evaporator Superheat       16         Evaporator Superheat       16         Evaporator Setup       20         Custom TOD Defrost Setup       21         Electric Defrost Timer       22         Section 6       Maintenance       23         Maintenance       23         Pro.E. Lubricants       23         P.O.E. Lubricants       23         <		Piping	9
Oil Traps       10         Drain Lines       10         Pre-Charged Lines       11         Leak Testing       12         PR Models       13         PC Models       13         PCL Models       13         PC Models       14         Section 5       0         Operational Start-Up       15         Compressor Mounts       15         Start-Up       16         Compressor Superheat       17         ArcticFox Thermostat With LDA       18         Setpoints       19         Custom DO Defrost Setpoints       20         Custom DO Defrost Setpoints       21         Electric Defrost Timer       22         Section 6       Maintenance         Preventive Maintenance Tasks       23         P.O.E. Lubricants       23         Section 7       23         Troubleshooting       24		Cleanliness	
Drain Lines 10 Pre-Charged Lines 11 Leak Testing 12 PR Models 12 PC Models 13 PCL Models 13 PCL Models 13 PC Models 13 PR Models 13 PR Models 13 PC Models 14 Refrigerant Charging 14 Section 5 Operational Start-Up Pre-Start Checks 15 Compressor Mounts 15 Start-Up 16 Pre-Start Checks 15 Compressor Superheat 16 Evaporator Superheat 16 Evaporator Superheat 16 Setpoints 19 Custom TOD Defrost Setpoints 20 Custom Defrost Setup 21 Electric Defrost Stepoints 20 Custom Defrost Setup 21 Section 7 Troubleshooting Pre-Start Charging 23 Evaporator Superheat 22 Section 7 Troubleshooting 24 Evaporator 24 Condensing Unit 25 Seton 0 Evaporator 24 Condensing Unit 25 Seton 24 Evaporator 24 Condensing Unit 25 Seton 24 Evaporator 24 Condensing Unit 25 Seton 24 Seton 25 Seton		Pipe Supports	
Pre-Charged Lines		Oil Traps	
Leak Testing		Drain Lines	
PR Models		Pre-Charged Lines	
PC Models       13         PCL Models       13         System Evacuation       13         PR Models       13         PC Models       14         Refrigerant Charging       14         Section 5       0         Operational Start-Up       15         Compressor Mounts       15         Start-Up       16         Compressor Superheat       16         Evaporator Superheat       17         ArcticFox Thermostat With LDA       18         Setpoints       19         Custom DD Defrost Setpoints       20         Custom Defrost Setup       21         Electric Defrost Timer       22         Section 6       Maintenance         Preventive Maintenance Tasks       23         P.O.E. Lubricants       23         P.O.E. Lubricants       23         Section 7       24         Condensing Unit       25		Leak Testing	
PCL Models		PR Models	
System Evacuation		PC Models	
PR Models		PCL Models	
PC Models		System Evacuation	
PCL Models		PR Models	
Refrigerant Charging       14         Section 5       Operational Start-Up         Pre-Start Checks       15         Compressor Mounts       15         Start-Up       16         Compressor Superheat       16         Evaporator Superheat       17         ArcticFox Thermostat With LDA       18         Setpoints       19         Custom TOD Defrost Setpoints       20         Custom Defrost Setup       21         Electric Defrost Timer       22         Section 6       Maintenance         Preventive Maintenance Tasks       23         P.O.E. Lubricants       23         P.O.E. Condensing Unit       24         Condensing Unit       25		PC Models	
Section 5 Operational Start-Up Pre-Start Checks		PCL Models	
Operational Start-Up Pre-Start Checks		Refrigerant Charging	
Pre-Start Checks	Section 5		
Pre-Start Checks	Operational Start-Up		
Compressor Mounts	operational event op	Pre-Start Checks	
Section 6 Maintenance Section 7 Troubleshooting Sector 17 Cuartor Superheat			
Compressor Superheat		•	
Evaporator Superheat17ArcticFox Thermostat With LDA18Setpoints19Custom TOD Defrost Setpoints20Custom Defrost Setup21Electric Defrost Timer22Section 6Preventive Maintenance TasksMaintenance23P.O.E. Lubricants23Section 723TroubleshootingEvaporatorEvaporator24Condensing Unit25		•	
ArcticFox Thermostat With LDA			
Custom TOD Defrost Setpoints		• •	
Custom TOD Defrost Setpoints		Setpoints	
Custom Defrost Setup 21 Electric Defrost Timer 22 Section 6 Maintenance Preventive Maintenance Tasks 23 P.O.E. Lubricants 23 Section 7 Troubleshooting Evaporator 24 Condensing Unit 25		-	
Electric Defrost Timer		•	
Section 6 Maintenance Section 7 Troubleshooting Evaporator		•	
Maintenance Preventive Maintenance Tasks	Section 6		
Preventive Maintenance Tasks			
P.O.E. Lubricants		Preventive Maintenance Tasks	23
Section 7 Troubleshooting Evaporator24 Condensing Unit25			
Troubleshooting Evaporator	Section 7		
Evaporator			
Condensing Unit		Evaporator	24
-		•	
	System Start-I In Charklie	-	

#### **Receiving Inspection**

- 1. Check the shipment carefully and compare to the bill of lading.
- 2. Account for all items listed and inspect each container for damage.
- 3. Carefully inspect for any concealed damage.
- 4. Report any shortages or damages to the carrier, noteon the bill of lading, and file a freight claim.
- 5. Damaged material cannot be returned to the manufacturer without prior approval.
- 6. A Return Material Authorization (RMA) must be obtained. Contact a sales representative at 800-826-7036.

#### **Warranty Information**

For information regarding warranty guidelines, claim form, product registration, warranty verification, or locating a service provider please visit our website at <u>www.kolpak.com</u> or call 800-225-9916.

#### **Condensing Units**

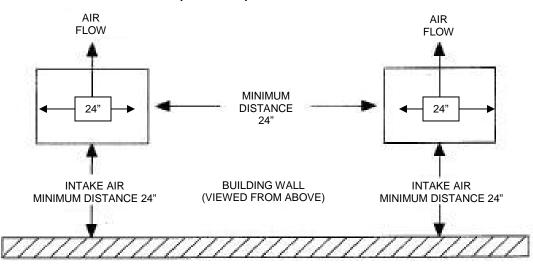
- Check the selected installation location to ensure that racks, braces, flooring, foundations, etc. are adequate to support the condensing unit weight.
- The installation location is clean, dry, and level.
- Locate away from corrosive and noise sensitive atmospheres.
- Use the condensing unit skid and base when moving the unit. Do not remove unit from skid until the unit is moved to the mounting location.
- Mount the condensing unit base to pads or structural rails using properly sized bolts through the unit base. Center of condensing unit needs to be properly supported.



# Correct

# Incorrect

- Locate where there is a sufficient and unrestricted supply of clean ambient air.
- Locate where this is adequate space for the removal of the heated discharged air from the condensing unit area.
- Do not position multiple units so that discharge air from one unit is blowing into the condenser inlet air of the other unit.
- All sides of the unit should be positioned a minimum distance equal to the total width of the condensing unit away from any other unit, wall, or obstruction.
- Check the selected installation location to ensure that racks, braces, flooring, foundations, etc. are adequate to support the condensing unit weight.
- The installation location is clean, dry, and level.
- Locate away from corrosive and noise sensitive atmospheres.
- Use the condensing unit skid and base when moving the unit. Do not remove unit from skid until the unit is moved to the mounting location.
- Mount the condensing unit base to pads or structural rails using properly sized bolts through the unit base. Center of
  condensing unit needs to be properly supported.



Example of Multiple Units with Horizontal Airflow

Failure to observe clearance and air flow requirements will result in poor system performance and premature equipment failure!

#### **Evaporator Units**

- Do not place the evaporator above or close to door openings. This will help prevent potential icing problems.
- Allow a minimum clearance equal to or greater than the coil height on all sides of the coil for proper air flow and service access.
- Use the evaporator coil for a template to locate and drill the mounting holes (1/2" diameter).
- Place a 1" and a 1-5/8" washer on each nylon bolt and insert through the drilled mounting holes in the ceiling from the exterior of the walk-in ceiling panel.

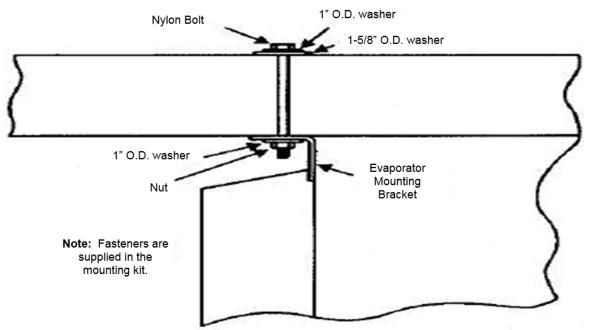
# *NOTE:* Nylon bolts are supplied to prevent thermal transfer between the exterior of the walk-in and the interior of the walk-in. Do not use metal bolts.

- Lift the evaporator coil until the nylon bolts extend through the mounting brackets.
- Install washers and secure with nuts. Tighten until the coil is firm against the ceiling. The evaporator coil must be level.
- Additional information is available in the installation manual supplied with the evaporator.

# 

Failure to observe clearance and air flow requirements will result in poor system performance and premature equipment failure!

# **Evaporator Coil Mounting Diagram**



#### Wiring

- All electrical connections and routing must comply with local and national codes.
- Do not modify the factory installed wiring without written factory approval.
- The field wiring must enter through the knockouts provided.
- Refer to the nameplate on the condensing or evaporator coil to determine the proper electrical power supply.
- Wire type should be of copper conductor only and properly sized to handle the electrical load.
- The unit and coil must be properly grounded.
- Condensing unit wiring diagrams are and attached inside the electrical box cover.
- Evaporator coil wiring diagrams are and inside the evaporator cover.
- To view Basic Cooler/Freezer Evaporator Wiring Service Video, scan the QR code below.



• For the latest wiring diagrams, scan the QR code below.



## A WARNING

All wiring must comply with local and national codes. Wiring must be performed only by a refrigeration technician or certified electrician. Failure to follow these guidelines may result in injury!

# 

Check all wiring connections, including factory terminals, before operation. Connections can become loose during shipment and installation.

### Piping

- All refrigeration piping and components are to be installed in accordance with applicable local and national codes and in conformance with industry refrigeration guidelines to ensure proper operation of the refrigeration system.
- Only refrigeration grade copper tubing should be used.
- Long radius elbows should be used. Short radius elbows have points of excessive stress concentration and are subject to breaking at these points, do not use short radius elbows.
- Suction lines must be insulated with a minimum <sup>3</sup>/<sub>4</sub>" thick insulation tubing to reduce heat pick-up.

#### Cleanliness

- Condensing units and evaporator coils are cleaned and dehydrated at the factory.
- The condensing unit must remain closed and pressurized until the piping is complete and final connections are ready to be made.

#### 

The maximum air exposure for dehydrated condensing units is 15 minutes. Systems exposed longer than 15 minutes must have the compressor oil and drier filter replaced. Leaving a system exposed to the atmosphere for more than 15 minutes can result in premature system failure.

- Do not remove base mount valve covers until work is ready to be performed.
- Ensure that all refrigeration tubing is clean and dry prior to installation.
- Use only tubing cutters when trimming tubing to the proper length. Do not use saws to cut tubing.

#### 

#### The use of saws to cut tubing can contaminate the system with copper chips causing premature system failure.

- Brazing joints require a dry inert gas, typically nitrogen, be passed through the lines at a low pressure to prevent scaling and oxidation.
- Use only silver solder brazing alloys. Minimize the amount of flux to prevent internal contamination. Flux only the male portion of the joint.
- Thoroughly clean fluxed joints after brazing.

#### 

Dry inert gas must be passed through the system while brazing to prevent scaling and oxidation. Scaling and oxides can clog refrigeration components resulting in system failure.

#### **Pipe Supports**

- All tubing should be supported in a least two locations (near the end of each tubing run).
- Long runs will require additional support.
- As a guide, support 3/8" to 7/8" pipe every five feet, 1-1/8" to 1-3/8" every seven feet, and 1-5/8" to 2-1/8" every ten feet.
- Do not leave a corner unsupported when changing directions.
- Place supports within 2 feet of each direction change.
- Piping that is attached to a vibrating object (such as a compressor or compressor base) must be supported in a manner that will not restrict the movement of the vibrating object.
- Rigid mounting will fatigue the tubing causing refrigerant leaks.

## **Oil Traps**

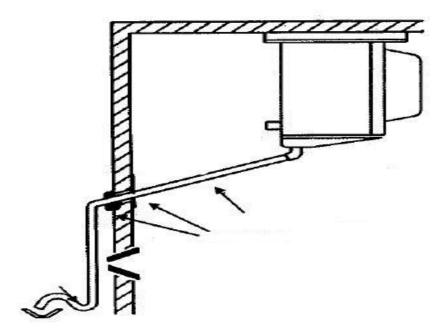
- To ensure proper oil return to the compressor, a P-type oil trap should be installed at the base of each suction riser of four feet or more.
- The suction trap must be the same size as the suction line.
- Additional traps are necessary for long vertical risers. Add a trap for each length of pipe (approximately 20 feet) to insure proper oil return.
- Suction lines must slope ¼" per 10 feet toward the compressor.
- Install a suction line trap at the evaporator outlet if the suction line rises to a point higher than the connection on the evaporator.

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Failure to properly install oil traps can prevent sufficient oil return to the compressor resulting in premature compressor failure.

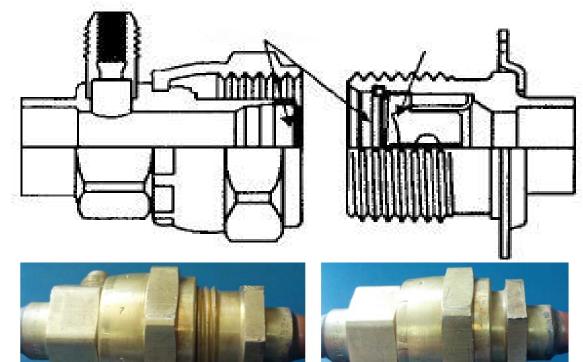
#### **Drain Lines**

- Evaporator coil drain lines should be pitched a minimum of 1/2" per foot to allow proper drainage and exit the walk-in as quickly as possible.
- Insulate and seal the drain line where it passes through the wall.
- Copper drain line is required.
- Freezer compartment drain lines must have heat tape wrapped around the copper drain line and must have ¾" thick insulation tubing.
- Do not locate drain line P-traps within the freezer space.
- Do not reduce the drain line size.
- Locate a drain line P-trap outside of the cooler space.
- Any outdoor P-traps exposed to low ambient temperatures should be wrapped with a drain line heater (provide 20 watts of heat per foot of drain line at 0°F, 30 watts per foot at -20°F.
- Freezer/cooler combo boxes can have one common drain line. However, there must be a P-trap located between the freezer evaporator and the cooler evaporator located inside the cooler compartment.
- The cooler compartment P-trap should be located between the cooler evaporator and the external drain location.



#### **Pre-Charged lines and Quick Connects**

- Route the suction and liquid line sets between the condensing unit and evaporator coil following the piping guidelines identified in this manual.
- Remove the dust caps from the quick connect fittings and verify that the o-rings are intact.
- Wipe the coupling seals and threaded surfaces with a clean cloth to prevent contamination.
- Lubricate the threads and o-rings with Polyol Ester oil.
- Thread the coupling halves together by hand to ensure proper thread mating.
- Tighten with a wrench until the coupling bodies "bottom" or until there is definite resistance.
- Tighten an additional ¼ turn to ensure proper brass-to-brass seating.
- Once the system is opened and pressurized, check each fitting for refrigerant leaks. If a leak is detected, tighten until the leak stops.



# INCORRECT

# CORRECT

# A WARNING

Do not loosen and disconnect the quick connect fittings before reclaiming the refrigerant and depressurizing the system. Disconnecting a pressurized system can result in injury!

## 

Quick connects are for one time use only. Once disconnected, the coupling cannot be re-used. Refrigerant leaks will occur if the couplings are re-used resulting in poor system performance.

• Excess line set length should never be allowed to coil in the vertical position. Excess line length should be laid flat on its side.





# INCORRECT

# CORRECT

#### Leak Testing

- After all connections are complete the refrigeration system must be tested for leaks.
- Failure to perform a leak test can result in unsatisfactory system performance, additional servicing and service costs, and possible system failure.
- Leak test should be performed using an electronic leak detector.
- All joints and components, both factory and field installed, should be thoroughly inspected for leaks.
- The system installation must be leak free!

#### Leak Testing "PR" model systems

- Open both the liquid and suction service valves.
- Ensure the solenoid valve is energized and open.
- Add 50 psi refrigerant, then pressurize with dry nitrogen to the low side test pressure identified on the unit rating label.
- Allow thirty minutes for refrigerant to reach all parts of the system.
- Check all joints and components with an electronic leak detector.

## Leak Testing "PC" model systems

- Leave the service valves closed, the condensing unit is charged with refrigerant.
- Ensure the solenoid valve is energized and open.
- Add 50 psi refrigerant, then pressurize with dry nitrogen to the low side test pressure identified on the unit rating label.
- Allow thirty minutes for refrigerant to reach all parts of the system.
- Check all joints and components with an electronic leak detector.

#### Leak Testing "PCL" model systems

- Open both the liquid and suction service valves.
- Ensure the solenoid valve is energized and open.
- Allow thirty minutes for refrigerant to reach all parts of the system.
- Check all joints and components with an electronic leak detector.
- If a leak is detected, relieve the pressure and/or reclaim the refrigerant and repair the leak.
- If additional brazing is required, pass a dry inert gas (nitrogen) through the system to prevent contamination.
- Reference page 12 of this manual for leaks located at quick connects couplings.
- Retest the system as outlined above until no leaks are detected.

## 

If a braze joint is detected leaking, dry inert gas must be passed through the system while repairing the joint to prevent scaling and oxidation. Scaling and oxides can clog refrigeration components resulting in system failure.

# 

Always use the system specified refrigerant when pressuring to perform a leak test.

#### **System Evacuation**

- Evacuation of the refrigeration system is necessary to remove all air and moisture from the system.
- A reliable rotary vacuum pump with an accurate deep vacuum gauge is recommended.
- Do not use the system compressor as a vacuum pump and do not operate the compressor while the system is under vacuum.

#### Evacuation of "PR" model systems

- Open both the liquid and suction service valves.
- Ensure the solenoid valve is energized and open.
- Connect vacuum pump to the liquid and suction service valves located on the condensing unit.
- Evacuate the system to 250 microns and maintain for a minimum of 4 hours.
- Perform a vacuum decay test for a minimum of ten minutes to ensure the system is leak free and dry.

#### Evacuation of "PC" model systems

- Leave the service valves closed, the condensing unit has been evacuated and is charged with refrigerant.
- Ensure the solenoid valve is energized and open.
- Connect vacuum pump to the liquid and suction service valves. located on the condensing unit.
- Evacuate the system to 250 microns and maintain for a minimum of 4 hours.
- Perform a vacuum decay test for a minimum of ten minutes to ensure the system is leak free and dry.

#### Evacuation of "PCL" model systems

• "PCL" systems do not require evacuation.

### 

Do not use the system compressor to evacuate the system. Do not start the compressor while the system is under vacuum. This may damage to the compressor and cause premature system failure.

#### **Refrigerant Charging**

- The refrigerant charge should be added to the system through the liquid line service valve located on the condensing unit.
- Do not charge liquid refrigerant into the suction service valve!
- The initial charge should be determined by weight and sight glass indication.
- Start the system. If the condensing temperature is 105° F or greater, charge the system until the sight glass clears.
- If the condensing unit temperature is below 105° F, reduce the condenser face surface area to raise the discharge pressures above 105° F and to charge to a clear sight glass.
- Return to a full condenser face area when charging is complete.

**NOTE:** PC & PCL refrigerant charge amounts are based on average ambient operating temperatures across the United States. Any refrigerant amount added or removed based on ambient operating temperatures is considered part of normal maintenance and is not covered under warranty.

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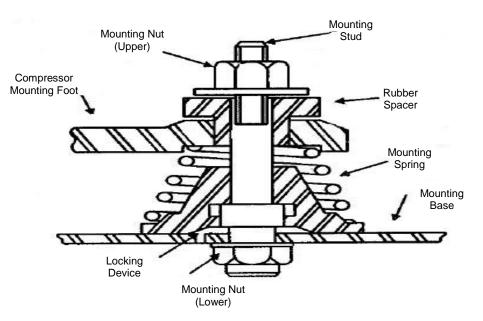
Do not charge liquid refrigerant into the suction service valve located on the condensing unit. Do not overcharge the system. These conditions can permit liquid refrigerant to enter the compressor and cause damage to internal components resulting in premature system failure.

#### **Pre-Start Checks**

- The first 2 4 hours of operation after initial start-up is a critical time.
- Do not just start the system and leave.
- Pressure values, compressor and evaporator superheat, and inspecting for excessive vibrations and loose connections
  are some of checks that must be performed prior to leaving the system.
- Verify that all service valves are fully open.
- Ensure that all refrigerant and electrical connections are tight.
- Verify that the wiring and piping is properly routed and secured.
- The compressor mounting bolts are properly adjusted (see compressor mounts on page 18).
- All fan motors and mounting brackets are tight.
- The condensing unit base and evaporator coil are properly secured.

#### **Compressor Mounts**

- Hermetic Compressors hermetic compressor springs are mounted internally; check the compressor mounting bolts to ensure the nuts have not become loose during shipment.
- Semi-Hermetic Compressors most semi-hermetic compressors have external spring mounts and are factory assembled. The following actions are required once the condensing unit is installed and before system start-up:
  - Loosen the upper mounting nuts.
  - Remove the spring steel clips from the mounting springs.
  - Retighten the upper mounting nuts until the compressor can float on the springs approximately 1/16" between the mounting nut and rubber grommet.



#### Properly Adjusted Compressor

#### 

Failure to ensure the compressor mounts are properly tightened can result in fatigue to the system piping causing leaks and poor system performance.

### Start-Up

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Do not start the system while in a vacuum. Do not leave the system unattended until normal operating conditions are achieved.

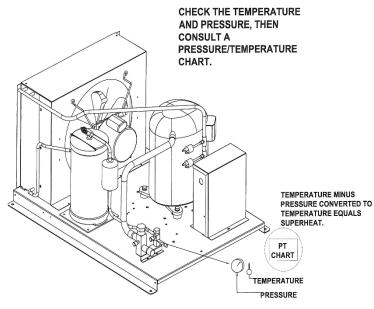
- Operate the system for a minimum of two hours and perform checks of the following:
  - Check the compressor discharge and suction pressures to ensure they are in the normal operating range.
  - Check the liquid line sight glass for proper refrigerant charge (based off of 105°F condenser coil).
- Monitor the compressor oil level (semi-hermetic compressors), add oil as necessary to keep the level at ¾ sight glass when idle and ½ sight glass when running.
- Check the voltage and amperage at the compressor terminals. Voltage must be within +10% or -5% of the rating indicted on the condensing unit name plate. On three phase compressors, verify there is a balanced load.
- Check all fans on the evaporator coil and condensing unit to be sure they are operational and turning in the correct direction.
- Check the piping and electrical connections for vibration. Add supports and strapping if needed.
- Check the crankcase heater operation (if equipped).
- Set the defrost control time and verify the defrost initiation settings. See pages 28-30 for additional details.
- Set temperature control to desired temperature range.
- Check the compressor and evaporator superheat (reference pages 21-23).
- After all system checks have been checked, properly adjusted, and verified, replace all Schrader caps, service valve caps, electrical box covers, housings, etc. File a copy of this manual for future reference.

#### 

Failure to check and properly adjust compressor superheat can result in premature system failure.

#### **Compressor Superheat**

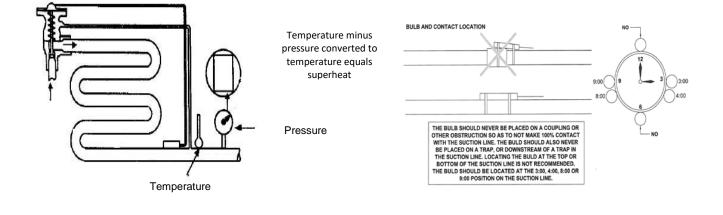
- Compressor superheat is a critical value that must be checked. Check the compressor superheat as follows:
  - Determine the suction pressure at the suction service valve of the compressor.
  - Determine the saturation temperature at the observed suction pressure using refrigeration pressure temperature tables.
  - $\circ$  Measure the suction line temperature 6 -10 inches away from the compressor.
  - Subtract the saturation temperature (step 2) from the measured temperature (step 3). The difference is the superheat of suction gas.
- A low suction superheat can cause liquid to return to the compressor. This will cause dilution of the oil and eventual failure of the bearings, rings and valves.
- A high suction superheat will cause excessive discharge temperatures, which cause a breakdown of the oil. This causes piston ring wear, and piston and cylinder wall damage.
- System capacity decreases as the suction superheat increases.
- For maximum system capacity, keep the suction superheat as low as practical. Copeland requires a minimum compressor superheat of 20°F; however, to improve compressor life, 25°F to 40°F is preferred.
- Adjust the expansion valve at the evaporator when adjustments to the suction superheat are necessary.
- Refer to "Evaporator Superheat" on the next 2 pages for more information.



DETERMINING COMPRESSOR SUPERHEAT

#### **Evaporator Superheat**

- Check the evaporator superheat once the walk-in has reached the desired temperature. Generally, systems with a
  design temperature drop of 10°F should have an evaporator superheat value of 6°-10°F on freezers and 8°-12°F on
  coolers for maximum efficiency.
- To determine the evaporator superheat:
  - Measure the suction pressure at the evaporator outlet.
  - Convert the pressure to saturation temperature referencing a temperature-pressure chart.
  - Measure the temperature of the suction line at the expansion valve bulb. Ensure the bulb is mounted at the correct location on the suction tube.
  - Subtract the saturation temperature reading (step 2) from the measured temperature (step 3). The difference is the evaporator superheat.



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#### Minimum compressor superheat of 20°F may override these recommendations on systems with short line runs.

# 

The condensing unit must have the discharge pressure above the equivalent 105°F condensing pressure (reference refrigerant charging on page 16).

## 

Correct location and full contact of the expansion valve bulb is extremely important for proper system performance.

#### ArcticFox Thermostat With LDA

• To view the ArcticFox LDA Service Video, scan the QR code below.

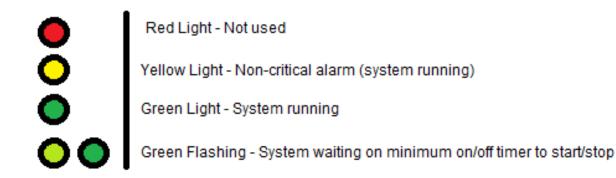


P/N 550005663 P/N 550005664 Air Defrost Evaporators Electric Defrost Evaporators

**P/N 550005663** - is used on all Air Defrost model evaporators and features a built in Air Defrost time clock. The default defrost settings are every 6 hours for 30 minutes. See pages 20-21 for default and custom defrost setting instructions.

P/N 550005664 - is used on all Electric defrost model evaporators. See page 22 for Electric Defrost Timer setting instructions.

#### **NOTE:** The 550005664 display will be blank during the electric defrost cycle.



Access Setpoint mode by pressing and holding the ENTER button until

ts (Temperature setpoint) displays on the screen

- Use the 🔺 up and 🕎 down arrows to scroll through the available setpoints
- Press to view the current setting
- Use the up and down arrows to change the setpoint
- Press and hold the button to confirm each setpoint change
- Press the BACK button to escape

#### Setpoints

- tS = Temperature setpoint
- diF = Differential
- CSH = Maximum compressor starts/stops
- dPd = Defrost per day
- tod = time of day ( only used when custom defrost is selected)
- dFt = Defrost time
- HAO = High Alarm Offset

LAO = Low Alarm Offset

tAd =Temperature Alarm Delay

Adr = Mod Bus Address

Unt = Ynits for temperature display (FAH or CEL)

# **Basic Setpoints**

Setpoint	Description	Minimum	550005663 Default	550005664 Default	Maximum
tS	Temperature Setpoint	-50°F (-45°C)	35°F	10°F	100°F (38°C)
diF	Differential	1°F	3.5°F	3.5°F	30°F
CSH	Maximum Compressor Starts/Hour	5 (Off)*	0 (off)	0 (off)	10
dPd	Defrost Per Day	0	4	0	12, CUS**
dFt	Defrost Time	0 min	30 min	0 min	720 min
HAO	High Alarm Offset	1°F	10°F	10°F	10°F
LAO	Low Alarm Offset	1°F	5°F	5°F	10°F
tAd	Temp Alarm Delay	1 min	60 min	60 min	180 min
Adr	Mod Bus Address	1	1	1	247
Unt	Units for Temp Display	FAH	FAH	FAH	CEL

\*Selecting fewer than 5 compressor starts per hour results in the starts per hour feature being

turned off. The compressor will then function on temperature only.

\*\* Selecting CUS (custom) unlocks 12 tod (time of day) defrost setpoints.

# Custom tod (Time of Day) Defrost Setpoints

Setpoint	Description	Minimum	Default	Maximum
tod	Time of Day	0.0	12.0	23.5
d1	Start time of day #1	0.0	dis (disabled)	23,dis (disabled)
d2	Start time of day #2	0.0	dis	23,dis
d3	Start time of day #3	0.0	dis	23,dis
d4	Start time of day #4	0.0	dis	23,dis
d5	Start time of day #5	0.0	dis	23,dis
d6	Start time of day #6	0.0	dis	23,dis
d7	Start time of day #7	0.0	dis	23,dis
d8	Start time of day #8	0.0	dis	23,dis
d9	Start time of day #9	0.0	dis	23,dis
d10	Start time of day #10	0.0	dis	23,dis
d11	Start time of day #11	0.0	dis	23,dis
d12	Start time of day #12	0.0	dis	23,dis

**Note:** The time of day defrost setting use military time. The first 2 digits are the hour and the 1 digit after the decimal is the minutes.

### **Custom Defrost Setup**

#### **Custom Defrost Setup**

The following steps will guide you through the setup of the custom defrost feature.

#### Abbreviations:

CUS = custom d1 = custom defrost 1 diS = disabled dpd = defrosts per day ts = temperature setpoint tod = time of day



STEP 1 Press and hold the ENTER button, tS is displayed on the LEDs



STEP 2 Press the dup arrow until dPd is displayed,



then press ENTER, 6 (default) will be displayed.



# STEP 3

Press the 🛕 up arrow until CUS is displayed.



Press and hold the ENTER button for 3 seconds until the dPd is displayed.



#### STEP 4 Press the dup arrow until tod (time of day) is displayed,



then press ENTER

Use the 🔺 up arrow and 💙 down arrow to set the time.

Note: The time is displayed in military time (24-hr clock) The 1st 2 digits are the hour. The minutes are after the decimal. Since there are only 3 digits, the time will be set to the nearest 10 minutes. See examples below.

## Examples:

8:10 am would be 8.1 on the controller's display



4:32 pm would be 16.3 on the controller's display.



After the time is set, press and hold the ENTER button for 3 seconds, until tod is displayed



#### STEP 5

Press the **人** up arrow to display Defrost 1 (**d1**).



To set the first defrost, press ENTER button.

#### dis (disabled) will be displayed.



Use the 💙 down arrow to set the defrost time.

Note: Defrost times may only be set on the hour.

#### Example:



Once the correct time is displayed, press and hold the ENTER button until d1 is displayed.



#### STEP 6

Repeat steps as necessary for d2 to d12.

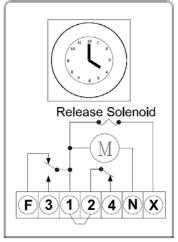




Press the BACK button to save settings, and return to the main screen (room temp will be displayed).

### **Electric Defrost Timer**

#### ELECTRIC DEFROST TIMER



#### **Electric Defrost Time Clock Instructions:**

- Instructions for setting the timer is located on the inside cover of the time clock.
- The defrost timer clock must be set to the correct time at initial start-up and after any power interruptions.
- Set the clock by rotating the clock face until the correct time is at the arrow on the face of the timer.
- The switch is programmed by pushing the captive trippers to the inner ring for the entire period the load is to be turned "ON".
- When a tripper is pushed to the outside, the switch is in the "DEFROST" position.
- Each defrost tripper represents 15 minutes of defrost time.
- The timer is factory set for four defrost cycles daily: 4:00AM, 10:00AM, 4:00PM, and 10:00PM.
- Each defrost cycle is programmed for 45 minutes duration.
- The defrost times may be changed to initiate at periods of low activity (trippers pushed out will close contacts to terminals 1 & 3).
- Do not install the electric defrost time clock inside of the walk-in.

#### **Note:** If the defrost termination thermostat fails to close, the fail safe setting on the timer will terminate the defrost cycle. The timer starts the defrost cycle automatically at the predetermined times. A setting of two to four defrost cycles per day is typical. For heavier frost loads, additional cycles may be required.

#### When the defrost cycle begins:

- Switch 2 to 4 opens in the time clock, breaking the circuit to the room thermostat, liquid line solenoid, and evaporator fan motors. This allows the compressor to pump down and shut off. Simultaneously, switch 1 to 3 closes in the timer, energizing the defrost heaters.
- The heaters increase the coil temperatures above 32°F, melting the frost off the coil.
- When the coil warms to approximately 55°F, the defrost termination thermostat closes and energizes the switching solenoid in the timer. At this time, switch 1 to 3 in the timer opens, terminating the defrost heaters. Simultaneously, switch 2 to 4 closes in the time clock, energizing the temperature control circuit.
- Suction pressure rises, the low pressure control closes, and the compressor starts.
- The fan relay closes when the coil temperature reaches approximately 30°F. This energizes the fan motors.
- The system operates in the refrigeration cycle until another defrost cycle is initiated by the timer.

# Section 6 Maintenance

#### **Preventive Maintenance Tasks**

Area	Task	Frequency
Evaporator	Check for proper defrosting	Monthly
	Clean the coil and drain pan	Every 6 months
	Check for proper drainage	
Condenser	Inspect /clean the coil if the air supply is near polluting sources (such as cooking appliances)	Monthly
	Clean the coil surface	Every 3 months
General	Check/tighten all electrical connections	Every 6 months
	Check all wiring and insulators	
	Check contactor for proper operation and contact point deterioration	
	Check all fan motors	
	Tighten fan set screws, and motor mount nuts and bolts	
	For semi-hermetics, check the oil level in the system	
	Check the operation of the control system	
	Make certain all safety controls are operating properly	
	Check operation of the drain line heater and examine for cuts and abrasions	
	Check/tighten all mechanical/flare connections	

# 

Failure to keep the condenser coil clean will result in reduced airflow through the condenser, resulting in poor system performance and premature compressor failure.

## Polyol Ester (POE) Lubricants

- Polyol Ester (POE) lubricants quickly absorb moisture from the ambient surroundings.
- POE lubricants absorb moisture more rapidly and in greater quantity than conventional mineral oils.
- Because moisture levels greater than 100 PPM will result in system corrosion and component failure, it is essential that system exposure to ambient conditions be kept to a minimum.
- If a system is left open to the atmosphere for more than 15 minutes, the liquid line drier and compressor oil must be replaced.
- Drain at least 95% of the oil from the compressor suction port.
- Measure the amount of removed oil, and replace it with exactly the same amount of new POE oil.
- Mobil EAL<sup>™</sup> ARCTIC 22 CC is the preferred Polyol Ester lubricant because of its particular additives.
- ICI Emkarate RL 32S is an acceptable alternative when the Mobil is not available.
- These POE lubricants must be used with HFC refrigerants.
- Lubricants are packaged in specially designed, sealed containers.
- Once opened, use the lubricant immediately.
- Properly dispose of any unused lubricant.

# Section 7 Troubleshooting

# **Evaporator Troubleshooting**

Problem	Possible Cause	Corrective Action
Fan(s) will not operate.	Main switch open	Close switch
	Blown fuse(s)	Replace fuse(s). Check for short
		circuits or overload conditions.
	Defective motor	Replace motor.
	Defective timer or defrost thermostat	Replace defective component.
	Unit in defrost cycle	Wait for completion of cycle.
Walk-in temperature too high.	Thermostat set too high	Adjust thermostat.
	Superheat too high	Adjust thermal expansion valve.
	System low on refrigerant	Locate and repair leak, recover,
		evacuate and recharge.
	Coil iced up	Manually defrost coil. Check defrost
		controls.
Ice accumulating on ceiling around	Defrost duration is too long	Adjust defrost termination thermostat
evaporator and/or on fan guards,		(if adjustable).
venturi, or blades.	Fan delay not delaying fans after	Replace defective defrost thermostat.
	defrost period	
	Defective defrost thermostat or timer	Replace defective component.
	Too many defrost cycles per day	Reduce number of defrost cycles per
		day.
Frost on coil after defrost cycle.	Coil temperature not getting above	Check heater operation
	freezing point during defrost	
	Not enough defrost cycles per day	Adjust timer for more defrost cycles
		per day
	Defrost cycle too short	Adjust timer for longer cycle, check
		defrost thermostat mounting
	Defective timer or defrost thermostat	Replace defective component.
Ice accumulating in drain pan.	Defective heater	Replace heater.
	Unit not pitched properly	Check and adjust.
	Drain line plugged	Clean drain line.
	Defective drain line heater	Replace heater.
	Defective timer or thermostat	Replace defective component.

# **Condensing Unit Troubleshooting**

Problem	Possible Cause	Corrective Action
Compressor will not run.	Main switch open	Close switch
	Fuse blown	Check electrical circuits and motor
		winding for shorts or grounds.
		Investigate for possible overloading.
		Replace fuse after fault is corrected.
	Thermal overloads tripped	Overloads are automatically reset.
		Check unit closely when unit comes
		back on line.
	Defective contactor or coil	Repair or replace
	System shut down by safety devices	Determine type and cause of shutdown and correct
	No cooling required	None. Wait until cooling is required.
	Liquid line solenoid will not open.	Repair or replace coil.
	Low pressure switch will not close.	Replace switch
	Motor electrical trouble	Check motor for open windings or short
		circuit.

Problem	Possible Cause	Corrective Action
	Loose wiring	Check all wire junctions. Tighten all terminal screws.
Compressor noisy or vibrating	Flooding of refrigerant into crankcase	Check superheat setting of expansion valve
	Improper pipe support	Relocate or add hangers
	Worn compressor	Replace compressor
High discharge pressure	Non-condensable in system	Recover, evacuate and charge
	System overcharged with refrigerant	Remove excess charge
	Discharge shut-off valve partially closed	Open valve
	Fan not running	Check electrical circuit or replace defective fan motor
	Insufficient condenser air supply	Check for cause and correct
	Dirty condenser coil	Clean coil
Low discharge pressure	Faulty head pressure control	Check head pressure control operation.
	Suction shut-off valve partially closed	Open valve
	Insufficient refrigerant in system	Locate and repair leak, recover, evacuate and recharge
	Low suction pressure	Check for proper refrigerant charge
High suction pressure	Excessive load	Reduce load or add additional equipment
	Expansion valve overfeeding	Secure and insulate TXV bulb or if required adjust superheat.
Low suction pressure	Lack of refrigerant	Locate and repair leak, recover, evacuate and charge.
	Evaporator dirty or iced	Clean
	Clogged liquid line or suction line filter- drier	Replace filter-drier
	Expansion valve malfunctioning	Check and reset for proper superheat
	Condensing temperature too low	Check head pressure control
	Improper TXV	Check for proper sizing

Problem	Possible Cause	Corrective Action
Compressor loses oil	Lack of refrigerant	Locate and repair leak, recover, evacuate and recharge
	Excessive compression ring blow-by	Replace compressor
	Refrigerant flood back	Maintain proper superheat at compressor
	Improper piping or traps	Correct piping
Compressor thermal protector switch open	Operating beyond design	Add facilities so that operating conditions are within allowable limits
	Discharge valve partially shut	Open valve
	Dirty condenser coil	Clean coil
	Overcharged system	Correct charge

Notes:

# System Start-up Checklist

Date System Installed: Installer and Address:		/	/	
Phone Number:	(	)	-	
Start-Up Service Agend	cy:			
Phone Number:	(	)	-	

Freezer Condensing Unit				
Inspection Feature	Data	Accept	Reject	Action Required
Model Number:				
Serial Number:				
Electrical Volts:				
Electrical Phase:				
Amperage @ L1:				
Amperage @ L2:				
Amperage @ L3:				
Ambient Temp:	°F			
Comp. Discharge Pressure:	PSIG			
Comp. Suction Pressure:	PSIG			
Suction Line Temp @ Comp.:	°F			
Discharge Line Temp @ Comp.:	°F			
Comp. Superheat:	°F			
Defrost Setting (4 day/45 min):				
All electrical connections are tight:				
Unit base properly supported:				
Fans Running & No Vibration:				
All guards, covers attached:				
Refrigerant Sight Glass Clear:				
Comp. Oil Level @ 1/2 Sight Glass:				
Comp. Mounting Clips Removed:				
Suction line insulated fully and properly supported:				

Freezer Evaporator					
Inspection Feature	Data	Accept	Reject	Action Required	
Evaporator installed with nylon bolts with proper					
airflow clearance:					
Model Number:					
Serial Number:					
Electrical Volts:					
Electrical Phase:					
Suction Line Temp @ Evap:	°F				
Evap Superheat:	°F				
Thermostat Set:	°F				
Operating Temp:	°F				
TXV Bulb Properly Mounted:					
All guards, covers attached:					
All electrical connections are tight:					
Defrost Heater Amp Draw:	A				

Freezer Piping						
Inspection Feature	Data	Accept	Reject	Action Required		
Suction Lines Insulated:						
Oil Trap at Base of Suction Riser:						
Copper Drain Lines Sloped Min 1/2" ft:						
Piping Supported Every 5':						
Copper drain line heater attached, working, and insulated:						
Copper Drain Line Trapped Outside Freezer Space:						

Cooler Condensing Unit				
Inspection Feature	Data	Accept	Reject	Action Required
Model Number:				
Serial Number:				
Electrical Volts:				
Electrical Phase:				
Amperage @ L1:				
Amperage @ L2:				
Amperage @ L3:				
Ambient Temp:	°F			
Comp. Discharge Pressure:	PSIG			
Comp. Suction Pressure:	PSIG			
Suction Line Temp @ Comp.:	°F			
Discharge Line Temp @ Comp.:	°F			
Comp. Superheat:	°F			
Defrost Setting (4 day/45 min):				
All electrical connections are tight:				
Unit base properly supported:				
Fans Running & No Vibration:				
All guards, covers attached:				
Refrigerant Sight Glass Clear:				
Comp. Oil Level @ 1/2 Sight Glass:				
Comp. Mounting Clips Removed:				
Suction line insulated fully and properly supported:				

Cooler Evaporator				
Inspection Feature	Data	Accept	Reject	Action Required
Evaporator installed with nylon bolts with proper				
airflow clearance:				
Model Number:				
Serial Number:				
Electrical Volts:				
Electrical Phase:				
Suction Line Temp @ Evap:	°F			
Evap Superheat:	°F			
Thermostat Set:	°F			
Operating Temp:	°F			
TXV Bulb Properly Mounted:				
All guards, covers attached:				
All electrical connections are tight:				

Cooler Piping				
Inspection Feature	Data	Accept	Reject	Action Required
Suction Lines Insulated:				
Oil Trap at Base of Suction Riser:				
Copper Drain Lines Sloped Min 1/2" ft:				
Copper Drain Lines Insulated:				
Copper Piping Supported Every 5':				
Copper Drain Line Trapped Outside Cooler Space:				

Walk-In Freezer				
Inspection Feature	Data	Accept	Reject	Action Required
Serial Number:				
Interior Lights Installed and Working:				
All Penetrations Sealed:				
Doors/Jambs Squared and Operating Properly:				
All Panel Locks Fully Engaged:				
All Plug Buttons Installed:				
Door Heater Working:				
Door Sweeps Adjusted:				
Heat Air Vent Working:				
Door Closers Adjusted and Working:				
Wainscot and Trim Installed:				
Alarm Set and Working:				
Thermometer Bulb Mounted and Calibrated:				
Walk-In Clean (no excessive caulk, etc.)				
Walk-in at proper temperature:				

Walk-In Cooler				
Inspection Feature	Data	Accept	Reject	Action Required
Serial Number:				
Interior Lights Installed and Working:				
All Penetration Sealed:				
Doors/Jambs Squared and Operating				
Properly:				
All Panel Locks Fully Engaged:				
All Plug Buttons Installed:				
Door Heater Working:				
Door Sweeps Adjusted:				
Heat Air Vent Working:				
Door Closers Adjusted and Working:				
Wainscot and Trim Installed:				
Alarm Set and Working:				
Thermometer Bulb Mounted and Calibrated:				
Walk-In Clean (no excessive caulk, etc.)				
Walk-in at proper temperature:				

Notes:

Superintendent/Customer Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Service Tech/Installer Signature: \_\_\_\_\_

Date: \_\_\_\_\_

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