



**CD Series**

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**ClimaDry Rooftop Series  
Water Source Heat Pumps**

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**Installation, Operation &  
Maintenance Instructions**

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# GENERAL INFORMATION

## Inspection

Upon receipt of shipment at the job site, carefully check the shipment against the bill of lading. Make sure all units have been received. Inspect the carton or crating of each ClimaDry Rooftop Unit and inspect each unit for damage. Assure that the carrier makes proper notation of any shortages or damage on all copies of the freight bill and that he completes a Carrier Inspection Report. Concealed damage not discovered during unloading must be reported to the carrier within 15 days of receipt of shipment. **NOTE: It is the responsibility of the purchaser to file all necessary claims with the carrier.** Notify the ClimateMaster Traffic Department of all damage within fifteen (15) days of shipment.

## Introduction

This Installation and Operation Manual is for Climate Master ClimaDry Series Rooftop Water Source Heat Pump systems (CD Series).

ClimateMaster ClimaDry Rooftop Units are typically designed for zoned control of heating, cooling, dehumidification and Makeup Air in large commercial or industrial applications.

The installation site chosen for these units must allow adequate clearance on all sides for maintenance and servicing.

Electrical data is provided in the Installation section of this manual. Refer to project submittal drawings for specific unit technical data and wiring diagrams.

## Storage

Upon the arrival of equipment at the job site, immediately store units in a clean, dry area. **Store units in an upright position at all times.** Do not stack ClimaDry Rooftop units.

## Unit Protection

Cover ClimaDry Rooftop Units on the job site. Cap the open ends of pipes. In areas where painting, plastering, or the spraying of fireproof material has not been completed, all due precautions must be taken to avoid physical damage to the units and contamination by foreign material. **Physical damage and contamination may prevent proper start-up and may result in costly equipment cleanup.**

Examine all pipes, fittings, and valves before installing any of the system components. Remove any dirt found on these components.

## Pre-Installation

Installation, operation and maintenance instructions are provided with each unit. Before unit start-up, read all manuals and become familiar with the unit and its operation. Thoroughly check out the system before operation.

Prepare ClimaDry Rooftop Units for installation as follows:

1. Compare the electrical data on the unit nameplate with ordering and shipping information to verify that the correct unit has been shipped.
2. Select an installation site on the roof which allows adequate clearance for maintenance and servicing of the unit. A minimum of two (2) feet of clearance is required on all four (4) sides of the unit.
3. Verify that refrigerant tubing is free of kinks or dents, and that it does not touch other unit components.
4. Inspect all electrical connections. Connections must be clean and tight at the terminals.
5. Examine all pipes, fittings, valves and components before installing the system. Remove any dirt found on or in these components and assure that all components are securely fitted.
6. Install curb according to manufacturer's instructions.
7. Properly size supply and return duct work. Return air duct work may be installed at this time. See also page four (4).
8. Mount supply air duct to curb before installing unit.

**CAUTION: Supply air duct is inaccessible from inside unit once unit is installed.**

## ▲ WARNING

**To avoid equipment damage, DO NOT use these units as a source of heating or cooling during the construction process. The mechanical components and filters used in these units will quickly become clogged with construction dirt and debris which may cause system damage.**

***Some units may be charged with refrigerants other than R-22 and are so labeled. Use appropriate refrigerant handling techniques. Mixing refrigerants in units is dangerous and can cause equipment damage.***

**To avoid the release of refrigerant into the atmosphere, the refrigerant circuit of this unit must only be serviced by technicians which meet local, state and federal proficiency requirements.**

# INSTALLATION

*The installation of ClimaDry Rooftop Water Source Heat Pump Units and all associated components, parts and accessories that make up the installation shall be in accordance with the regulations of ALL Authorities having jurisdiction and MUST conform to all applicable Codes. It is the responsibility of the Installing Contractor to determine and comply with ALL applicable Codes and Regulations.*

**CAUTION: All refrigerant discharged from this unit must be recovered without exception. Technicians must follow industry accepted guidelines and all local, state and federal statutes for the recovery and disposal of refrigerants.**

**When a compressor is removed from this unit, system refrigerant circuit oil will remain in the compressor. To avoid leakage of compressor oil, the refrigerant lines of the compressor must be sealed after it is removed.**

**Mineral oil or equipment exposed to mineral oil (manifold gauges, vacuum pumps or hoses) cannot be used to service units charged with R-407C refrigerant and P.O.E. oil. R-407C and P.O.E. oil are extremely hygroscopic (they absorb water from air). Only P.O.E. oil that has been verified as moisture free can be added to the system. Consult factory for more information.**

1. Provide adequate clearance for filter replacement and drain pan cleaning. Do not block filter access with piping, conduit or other materials. Refer to Table 1 for ClimaDry Rooftop Unit Dimensions.
2. Provide access for fan and fan motor maintenance and for servicing the compressor and coils without removal of the unit.
3. Provide an unobstructed path to the unit to enable removal of the unit if necessary.
4. Provide access to water valves and fittings, and adequate access to the unit side panels, discharge collar and all electrical connections.

Follow these guidelines when installing the curb.

1. Assure that the curb to frame gasket is installed per manufacturer's instructions.
2. Set unit on curb.
3. Align unit so that return air and supply air in the unit match return and supply air opening in the curb frame.
4. Run supply and return loop piping and electrical supply lines through the pipe chase provided in the curb.

**Table 1: Typical Unit Dimensions**

Unit Size	Dimensions in inches (LxWxH)
CD-660	171.6 x 104.0 x 105.5

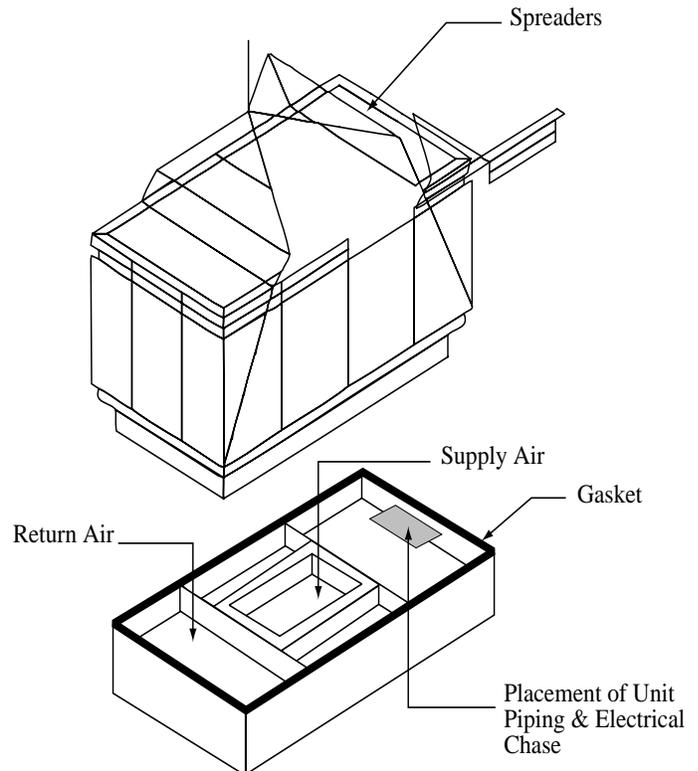
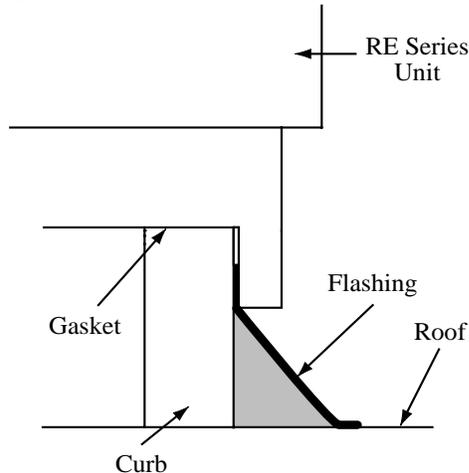
**NOTE: Refer to job submittal for actual unit dimensions. Dimensions shown above include curb.**

## Location, Access and Curb Installation

ClimaDry Rooftop Units are designed to interlock with the roof curbs. Refer to Figure 1 for an illustration of a typical curb installation.

Install curbs with adequate clearance to allow unit maintenance and servicing. Conform to the following guidelines when selecting curb location.

**Figure 1 - WR Curb Installation**



## Installation of Supply and Return Piping

Follow these piping guidelines.

### ▲ WARNING

**Piping must comply with all applicable Codes.**

1. Install a drain valve at the base of each supply and return riser to facilitate system flushing.
2. Install shut-off/balancing valves and unions at each unit to permit unit removal for servicing.
3. Place strainers at the inlet of each system circulating pump.

Insulation is not required on loop water piping except where the piping runs through unheated areas or outside the building. Because loop temperature is normally between 60° F and 90° F, piping will not sweat nor lose heat under normal ambient conditions.

Pipe joint compound is not necessary when Teflon threaded tape is pre-applied to hose assemblies or when flared-end connections are used. If pipe joint compound is preferred, use compound only in small amounts on the male pipe threads of the fitting adapters. Prevent sealant from reaching the flared surfaces of the joint.

Maximum allowable torque for brass fittings is 30 foot-pounds. If a torque wrench is not available, tighten finger-tight plus one quarter turn. Tighten steel fittings as necessary.

**CAUTION: Corrosive system water requires corrosion-resistant fittings and hoses and may require water treatment.**

## Condensate Piping

Install a condensate trap at each unit with the top of the trap positioned below the unit condensate drain connection.

Design the length of the trap (water-seal) based upon the amount of positive or negative pressure on the drain pan. As a rule, 1" of trap is required for each inch of negative pressure on the unit.

Note: that condensate is allowed to drain onto the roof.

Figure 2 illustrates a typical trap and vent used with WR Heat Pumps. Each unit must be installed with its own, individual trap.

## Electrical Wiring

### ▲ WARNING

**To avoid possible injury or death due to electrical shock, open the power supply disconnect switch and secure it in an open position during installation.**

**Use only copper conductors for field installed electrical wiring. Unit terminals are not designed to accept other types of conductors.**

All field installed wiring, including electrical ground, must comply with the National Electrical Code as well as all applicable local codes. In addition, all field wiring must conform to Class II temperature limitations described in the NEC.

Refer to the unit wiring diagrams included with submittal drawings for fuse sizes and a schematic of the field connections which must be made by the installing (or electrical) contractor.

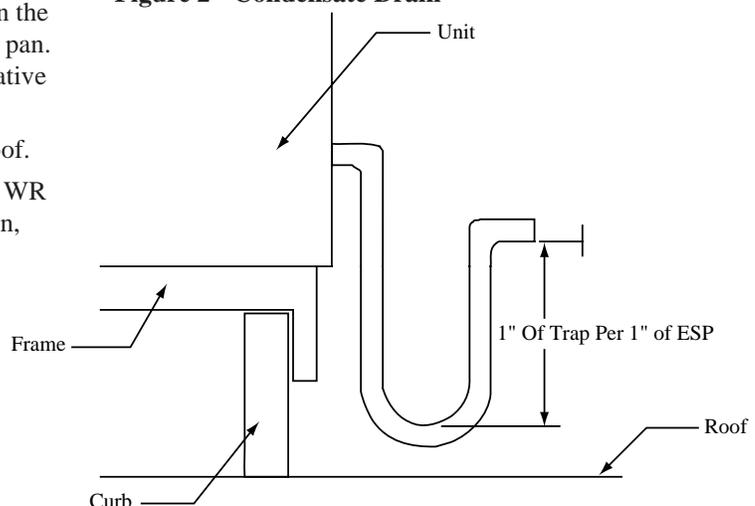
Consult the unit wiring diagram located on the inside of the compressor access panel to ensure proper electrical hookup.

All final electrical connections must be made with a length of flexible conduit to minimize vibration and sound transmission to the building.

This unit is equipped with a CMC-2000 Series controller. Refer to unit wiring diagram and CMC-2000 Series Rev. E IOM (part # 69626510) for additional information. The unit is factory supplied with a humidity sensor and a CO<sub>2</sub> (IAQ) Sensor. Do not use a heat pump thermostat. Use a temperature sensor with Y, G and W outputs. Mount all sensors out of drafts, away from room supply air and in a position where ambient indoor conditions are typical for the zone.

To install unit thermostats, follow vender installation instructions shipped with each thermostat.

**Figure 2 - Condensate Drain**



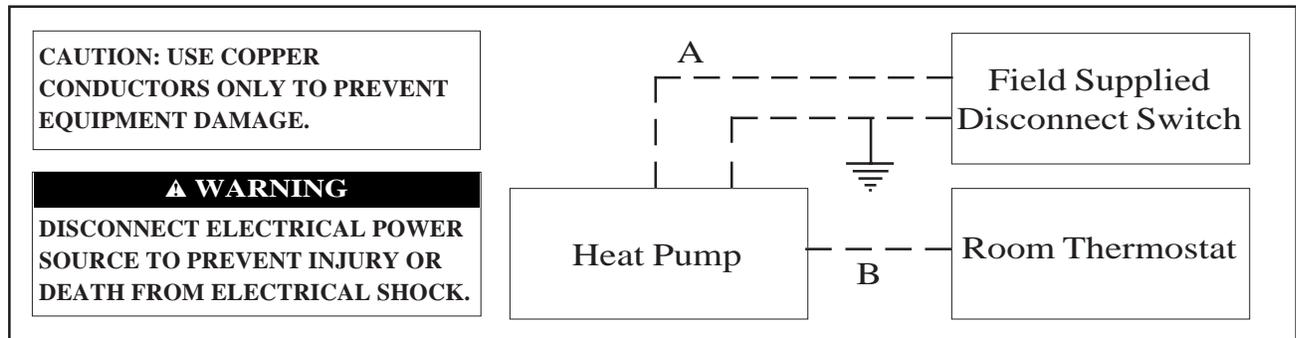
**CAUTION: Maintain zone integrity to assure accurate and efficient operational control of units or groups of units. Without adequate zone control, adjacent units may operate in heating and cooling mode simultaneously.**

All wiring must comply with all applicable electrical codes including NEC and local codes. Complete all wiring before units are installed. Use four-wire, color-coded, low-voltage cable for all wiring. ACO wall thermostats may also require the installation of two (2) jumper wires: one jumper wire may be required between thermostat terminals RC and RH and the other between terminals W2 and Y1. Refer to the wiring diagram to verify the need for jumpers.

Refer to Table 2 for wire sizes and lengths. Do not allow the total resistance of all low-voltage wires used to exceed 1 ohm. Resistance in excess of 1 ohm may cause high voltage drop which may result in control malfunction. Refer to the Thermostat Installation and Operation Manual to determine recommended heat anticipator settings.

For additional wiring information pertinent to units supplied with a Climate Master CMC-2000 Series Control Board, refer to the CMC-2000 Series Installation, Operation Manual (Part #: 69626515) supplied with the unit.

**Table 2: Typical Field Installed Wiring**



A= Two power wires on single-phase units; three power wires on three-phase units. B= 1 heat /1 cool /manual or Auto Change-over remote 24V thermostat. Note: All customer-supplied wiring to be copper only and must conform to NEC and local electrical codes. Wiring shown with dashed lines must be field-supplied and field-installed.

## Operating Limits

**Environment** - This unit is designed for outdoor installation.

**Power Supply** - A voltage variation of +/- 10% of nameplate utilization voltage is acceptable. Three-phase system imbalance should not be allowed to exceed 2%.

When any one of these factors is at minimum or maximum levels, the other two factors should be at normal levels to ensure proper unit operation.

2. Extreme variations in temperature and humidity, and corrosive water or air will adversely affect unit performance, reliability and service life.

## Starting Conditions

Units start and operate with entering water at 40° F and with both air and water at the stated flow rates of ARI Standard 320-96 rating test for initial winter start-up.

## Notes

1. Determination of operating limits is dependent primarily upon 3 factors:
  - 1) Return air temperature
  - 2) Water temperature
  - 3) Ambient temperature.

**Table 3**

Air Limits	Cooling	Heating
Rated Ambient Air	80° F	70° F
Min. Entering Air	50° F	40° F
Rated Entering Air db/wb	80/67° F	70° F
Max Entering Air wb/db	110/83°F	80° F
<b>Water Limits</b>		
Min. Entering Water	40° F	40° F
Normal entering Water	85° F	70° F
Max Entering Water	110° F	90° F

# START-UP PREPARATION

## System Cleaning and Flushing

Cleaning and flushing the unit is the single most important step to ensure proper start-up and continued efficient operation of the system.

Follow the instructions below to properly clean and flush the system:

### ▲ WARNING

**To prevent injury or death due to electrical shock or contact with moving parts, open unit disconnect before servicing unit.**

1. Verify that electrical power to the units is disconnected.
2. Install the system with the supply hose connected directly to the return riser valve. Use a single length of flexible hose.
3. Open all air vents. Fill the system with water. Do not allow system to overflow. Bleed all air from the system. Check the system for leaks and repair appropriately.
4. Verify that all strainers are in place. Start the pumps and systematically check each vent to ensure that all air is bled from the system.
5. Verify that makeup water is available. Adjust makeup water appropriately to replace the air which was bled from the system. Check and adjust the water/air level in the expansion tank.
6. Set the boiler (when used) to raise the loop temperature to approximately 85° F. Open a drain at the lowest point in the system. Adjust the makeup water replacement rate to equal the rate of bleed.
7. Refill the system and add trisodium phosphate in a proportion of approximately one pound per 150 gallons of water. Reset the boiler (when used) to raise the loop temperature to about 100° F.

**CAUTION: To avoid possible damage to piping systems constructed of plastic piping, DO NOT allow loop temperature to exceed 110° F.**

Circulate the solution for a minimum of eight (8) to twenty-four (24) hours. At the end of this period, shut off the circulating pump and drain the solution. Repeat system cleaning if necessary.

8. When the cleaning process is complete, remove the short-circuited hoses. Reconnect the hoses to the proper supply and return the connections to each of the Rooftop Units. Refill the system and bleed off all air.
9. Add antifreeze to the system in climates where ambient temperature falls below freezing, using the proportion of antifreeze shown in Table 4, below. The volume of antifreeze required will vary throughout the United States and Canada based on outdoor design temperature.
10. Test the system pH with litmus paper. The system water should be slightly alkaline ( pH 7.5 to 8.5). Add chemicals as appropriate to maintain acidity levels.

**CAUTION: DO NOT use “Stop-Leak” or any similar chemical agent in this system. Addition of these chemicals to the loop water will foul the system and will inhibit unit operation.**

11. When the system is successfully cleaned, flushed, refilled and bled, check the main system panels, safety cutouts, and alarms. Set the controls to properly maintain loop temperatures.

**Table 4: Percent Anti-Freeze Required by Volume\***

Anti-Freeze	Minimum Ambient Temperature			
	0°	10°	20°	30°
Methanol	25%	21%	16%	10%
Propylene Glycol	26%	23%	19%	9%
Potassium Acetate	22%	17%	13%	9%
Ethylene Glycol	24%	20%	16%	12%

*\*Local codes may preclude the use of certain anti-freezes in specific applications. Ensure that the anti-freeze selected is compatible with all system components.*

**Note: When anti-freeze is used in the loop assure it is compatible with teflon tape or the pipe joint compound used.**

# SYSTEM CHECKOUT

When the installation is complete and the system is cleaned and flushed, follow the System Checkout procedure outlined below .

- 1. Voltage: Ensure that voltage is within the utilization range specifications of the unit compressor and fan motor.
  - 2. System Water Temperature: Ensure that it is within an acceptable range to facilitate start-up. (When conducting this check, also verify proper heating and cooling set points.)
  - 3. System Water pH: Verify system water acidity. (pH = 7.5 or 8.5) Proper pH promotes the longevity of hoses and heat exchangers.
  - 4. System Flushing: Properly clean and flush system periodically. Ensure that all supply and return hoses are connected end-to-end to facilitate system flushing and prevent fouling of the heat exchanger by system water.  

Water used in the system must be of potable quality and clean of dirt, piping slag, and chemical cleaning agents.
  - 5. Closed-Type Cooling Tower or Open Tower with Heat Exchanger: Check equipment for proper temperature set points and operation.
  - 6. Balanced Water Flow Rate to Heat Pump.
  - 7. Standby Pump: Verify that the standby pump is properly installed and in operating condition.
  - 8. Access Panels: Assure that all access panels in the filter and fan section are securely closed.
  - 9. Air Dampers: Air Dampers leave factory at optimal settings. To assure proper equipment operation, verify that all air dampers are at factory settings. It is also important to verify that the air control system operates within job specifications.
  - 10. System Controls: To ensure that no catastrophic system failures occur, verify that system controls are functioning and that the sequencing is correct.
  - 11. Freeze Protection for Water System: Verify that freeze protection is provided for the building loop water system when outdoor design conditions require. Inadequate freeze protection can cause system operating problems.
- NOTE: DO NOT allow the construction site to fall below freezing once the system is installed and tested. Condenser coils never fully drain by themselves and will freeze unless winterized with antifreeze.**
- 12. System Water Loop: Verify that all air is bled from the system. Air in the system impedes unit operation and causes corrosion in the system piping.
  - 13. Unit Filters: To avoid system damage, ensure that the unit filter is clean.
  - 14. Unit Fans: Manually rotate fans to assure free rotation. Ensure that fans are properly secured to the fan shaft. Do not oil fan motors on start-up since they are lubricated at the factory.
  - 15. System Control Center: To ensure control of the temperature set-points for operation of the system's heat rejector and boiler (when used), examine the system control and alarm panel for proper installation and operation.
  - 16. Miscellaneous: Note any questionable aspects of the installation.

# UNIT START-UP

Use the procedure outlined below to initiate proper unit start-up:

## **▲ WARNING**

**When the disconnect switch is closed, high voltage is present in some areas of the electrical panel. Exercise caution when working with energized equipment.**

1. Adjust all water valves to their full open position. Turn on the line power to all heat pump units.
2. Operate each unit in the cooling cycle. Room temperature should be approximately 70° to 75° F DB, and 61° to 65° F WB. Loop water temperature entering the heat pumps should be between 60° F and 110° F.

When the unit is operating in the cooling mode under ARI conditions, the leaving water temperature is approximately 10° F warmer than the entering water temperature at 3 GPM / ton.

- a. Turn the unit thermostat to the cooling position. If the unit has an optional MCO thermostat, set the selector switch to cool. Both the fan and compressor should run.

For heat pumps with ACO, adjust the cooling set point to a temperature at least 3° F below room temperature.

- b. Check for cool air delivery at a system grille within a few minutes after the unit has begun to operate. List the identification number of any machines that do not function.
3. Operate each heat pump in the heating cycle immediately after checking cooling cycle operation. A time delay will prevent the compressor from restarting for approximately 5 minutes.

**NOTE: Rooftop heat pump units are designed to start heating at a minimum return air temperature of 40° F with normal water flow rate and ambient temperature.**

- a. If the unit has an optional MCO thermostat, set the temperature indicator to the highest setting and set the selector switch to HEAT. The fan and the compressor should start.

If the unit has an optional ACO thermostat, set the temperature indicator to the far right setting and set the selector switch to AUTO. The fan and the compressor should start.

- b. Once the unit has begun to run, check for warm air delivery at the unit grille. List the serial number of any machines that do not function.
4. Test the Air Control System, verifying the operation of all sensors (Humidity, Temperature and CO<sub>2</sub>.)
5. Establish a permanent operating record by logging the unit operating conditions at initial start-up for each unit.
6. If a unit fails to operate, conduct the following checks:
  - a. Check the voltage and current. They should comply with the electrical specifications described on the unit nameplate.
  - b. Look for wiring errors. Check for loose terminal screws where wire connections have been made on both the line and low-voltage terminal boards.
  - c. Check for dirty filters. A clogged filter will cause safety cutouts to stop unit operation.
  - d. Check the supply and return piping. They must be properly connected to the inlet and outlet connections on the unit.
  - e. Check the fan. If the fan fails to operate, verify that the fan wheel turns freely and that it is secured to the shaft. Also verify that the fan operates in both heating and cooling modes.
  - f. If the checks described above fail to reveal the problem and the unit still will not operate, contact a trained service technician to ensure proper diagnosis and repair of the equipment.

# MAINTENANCE

## Maintenance Procedures

Perform the maintenance procedures outlined below periodically as indicated.

### **▲ WARNING**

**To prevent injury or death due to electrical shock or contact with moving parts, open unit disconnect switch before servicing unit.**

**FILTERS:** Inspect filters monthly or more frequently when outdoor conditions require. Establish a regular maintenance schedule. Clean filter and maintenance frequently depending upon need.

**CAUTION: The ClimaDry Rooftop unit introduces large quantities of outdoor air. Compliance with recommended filter maintenance is imperative to assure proper equipment operation and high indoor air quality.**

ClimaDry Rooftop Units have three (3) sets of filters: One (1) set of outdoor air filters and two (2) sets of room return air filters. To remove all filters from the unit, open the door to the return air compartment. Slide filters out on their frames. When reinstalling filters, use the slide-in rails of the filter frame to guide them into proper position. Verify that the airflow arrow found on the top of each filter points toward the unit. Always replace filters with the same size and quantity of filters as removed from the unit.

### **▲ WARNING**

**To avoid physical injury DO NOT enter filter compartment when changing filters.**

**CAUTION: To avoid fouled machinery and extensive unit cleanup, do not operate units without filters in place. DO NOT use equipment as a temporary heating or cooling source during construction.**

**CONDENSATE PANS:** Check condensate drain pans for algae growth every three months. If algae growth is apparent, consult a water treatment specialist for proper chemical treatment. The application of an algacide every three (3) months will typically eliminate algae problems in most locations.

**FAN MOTORS:** Lubricate fan motors annually. All ClimateMaster Rooftop Units are fully lubricated at the factory. DO NOT oil during installation.

Conduct amperage checks annually. Amperage draw should not exceed normal full load or rated load amps by more than 10 percent of the values noted on the unit nameplate. Maintain a log of amperage values to detect deterioration prior to component failure.

**UNIT INSPECTION:** Visually inspect the unit annually. Pay special attention to hose assemblies. Repair any leaks and replace deteriorated hoses immediately.

**COMPRESSOR:** Conduct an amperage check on the compressor annually. Amperage draw should not exceed normal full load or rated load amps by more than 10 percent of the values noted on the unit nameplate. Maintain a log of amperage values to detect deterioration prior to component failure.

### **▲ WARNING**

**When replacing the compressor contactor or lockout relay in a unit with electromechanical controls, use only ClimateMaster replacement parts. Substitution with other components may result in an inoperative safety circuit and may cause a hazardous condition.**

**HEAT EXCHANGERS:** Clean heat exchangers annually. Inspect heat exchangers regularly and clean more frequently if the unit is located in a “dirty” environment.



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