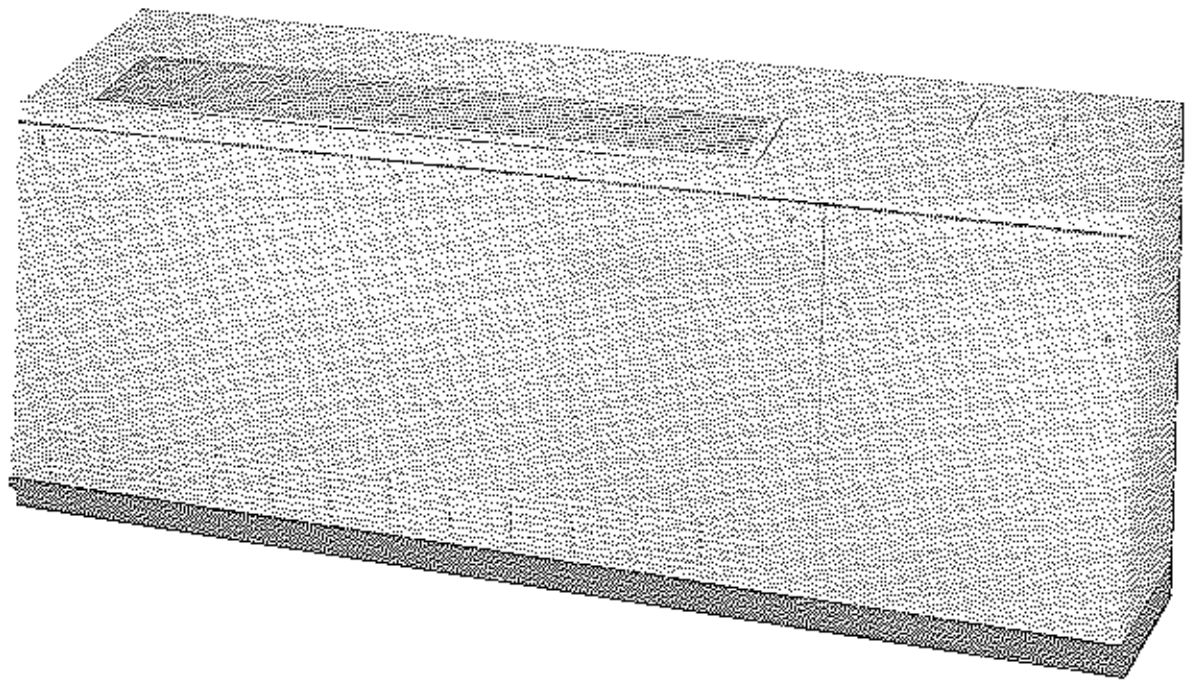
ClimateMaster

CCL SERIES

Classroom Console Air Conditioners
Water Source Heat Pumps

Installation, Operation & Maintenance Instructions



GENERAL INFORMATION

Inspection

Upon receipt of shipment, carefully check the shipment against the bill of lading. Verify that all CCL units have been received. Inspect each unit for damage. Assure that the carrier makes proper notation on the delivery receipt of all shortages and damage identified and that he completes a Carrier Inspection Report. Concealed damage not discovered during unloading must be reported to the carrier within fifteen (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 within fifteen (15) days of receipt of shipment of all damage .

Introduction

ClimateMaster Classroom Air Conditioner Water Source Heat Pump units are decentralized room terminals designed for field connection to a closed-circuit piping loop. They are offered in capacities ranging from 24,000 to 42,000 BTUH cooling and 30,000 to 48,000 BTUH heating.

Units are typically installed in perimeter zones, usually under windows. Supply air is discharged directly into the conditioned space through discharge grills located in the top of the unit.

Unit electrical data is provided in the *Installation* section of this manual. General information about the units including physical characteristics, filter sizes and refrigerant charges is provided in Table 1 (facing page). Refer to project submittal drawings for additional technical data and wiring diagrams.

Storage

⚠ CAUTION

DO NOT store or install CCL units in corrosive environments or in locations subject to temperature or humidity extremes (e.g., attics, garages, rooftops, etc.). Corrosive conditions and high temperature or humidity can significantly reduce performance, reliability, and service life.

Upon the arrival of the equipment at the job sit, immediately store units in their shipping cartons in a clean, dry area. **Always move units in an upright position.** Tilting units on their sides may cause equipment damage.

Store units in an upright position at all times. Stack units a maximum of 3 units high. Use pallets to separate each layer of units. **Do not remove equipment from shipping cartons until equipment is required for installation.**

Unit Protection

Cover CCL units on the job site with either shipping cartons, vinyl film, or an equivalent protective covering. Cap the open ends of pipes stored on the job site. 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 clean-up.

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

⚠ WARNING

To avoid equipment damage, do not use these units as a source of heat during construction process. The mechanical components and filters used in these units quickly become clogged with construction dirt and debris which may cause system damage and necessitate costly unit clean-up.

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TABLE 1

General Classroom Air Conditioner Heat Pump Data

PHYSICAL CHARACTERISTICS	CCL-024	CCL-030	CCL-036	CCL-042
Blower:				
Motor Horsepower (2 each)	1/12	1/6	1/6	3/4
Wheel Size (D" x W") in. (4 each)	5 3/4 x 8	5 3/4 x 8	5 3/4 x 8	5 3/4 x 8
Filter Size (2 each Unit)	12 x 24 x 1	12 x 24 x 1	12 x 24 x 1	12 x 24 x 1
Unit Weight (Lbs.)				
Shipping	430	440	450	460
Operating	400	410	420	430
Ref.-To-Air Heat Exchanger:				
Face Area (Sq. Ft.)	3.056	3.333	3.667	4.000
No. of Rows Deep	2	2	3	3
Copper Tube Size (O.D. In.)	3/8	3/8	3/8	3/8
No. of Fins/Inch	11	11	11	11
Refrig. Charge (R-22)/CKT.	39	41	44	54
No. of Circuits	1	1	1	1
Unit W" x H" x D"	84 x 32 x 15.25	84 x 32 x 15.25	84 x 32 x 15.25	84 x 32 x 15.25
Water In/Water Out (I.D. Hose)	1"	1"	1"	1"
Condensate Size (I.D. Vinyl)	3/4"	3/4"	3/4"	3/4"

* Refer to unit nameplate for specific data

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. Complete the inspections and instructions listed below to prepare a CCL unit for installation.

1. Compare the electrical data on the unit nameplate with ordering and shipping information to verify that the correct unit has been shipped.

2. Keep both the chassis and cabinet covered with the shipping carton until all plastering, painting, and finish work is complete and it is time to install the chassis and cabinet.

3. Verify that the 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.

INSTALLATION

The installation of Classroom Air Conditioner Water Source Heat Pumps 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 Code. It is the responsibility of the Installing Contractor to determine and comply with ALL applicable Code and Regulations.

Note: An *Installation Checklist* is provided at the end of this manual. Complete this checklist after all installation procedures are completed. A periodic maintenance checklist provided in the *Maintenance* section outlines recommended maintenance schedules. A *start-up Inspection Log* is also included at the end of this manual to encourage thorough unit checkout at initial start-up. These checklists are not a substitute for the detailed information found in the *Installation* section of this manual.

1. CCL units are typically installed along an outside wall of the room. Provide adequate space in front of the unit for service and maintenance. Locate the Classroom Air Conditioner so that it provides adequate air circulation throughout the room.

2. Remove access panels and inspect the interior of the unit. Adjust refrigerant tubing so that it is not touching other tubing, components, or the cabinet

3. Compressors in all CCL Water Source Heat Pumps are internally spring mounted for quiet operation. Loosen the three (3) compressor bolts on units until the compressor rides freely on the isolators.

4. Install water lines and drain lines as described in the *Supply and Return Piping* and *Condensate Piping* sections of this manual. Route hoses carefully to avoid kinks and short bend radii.

5. Place the CCL unit on a rubber or neoprene isomode pad to reduce vibration transmission to the building structure. Rest the entire base of the unit (not just the corners) on the pad.

6. Make all necessary electrical connections as described in the *Electrical Wiring* section of this manual. Consult the wiring diagram on the back of the compressor access panel to ensure proper hook-up.

Supply and Return Piping

System piping MUST comply with all applicable codes. In addition, the following precautions must be taken for each unit:

1. Install Shut-off/balancing valves and unions at each unit to permit unit removal for servicing.

2. Install strainers at the inlet of each circulating pump.

Install Supply and Return Piping as follows:

1. Remove the flexible pressure rated hoses provided inside the unit. Connect the unit to stubouts in the floor or wall with these hoses. Take care to avoid kinks in the hoses during removal and instllation.

2. Verify that the water loop system is clean and free of contaminants and air.

3. Fill the system.

4. When the system has been properly cleaned, checked, and filled, and all connections have been made, turn on the loop pump.

5. Inspect all connections and repair any leaks.

Condensate Piping

Connect the unit condensate drain to the building condensate drain with a flexible, nonpressure-rated 3/4 inch I.D. plastic hose. Avoid kinks in this hose to ensure an unobstructed flow of condensate from the unit to the drain.

The horizontal run of the condensate hose is usually too short to pose any drainage problems however, the horizontal run of condensate line ought to be pitched at least one inch for every 10 feet of run in the direction of flow. Avoid low points and unpitched piping since dirt collects in these areas and may cause stoppage and overflow.

Field installation of a trap or vent is not required unless specified by local codes. CCL units are designed in a blow-through configuration. The condensate drain pan is located on the outlet side of the blower so that the pressure in the drain pan is higher than the atmosphere.

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.

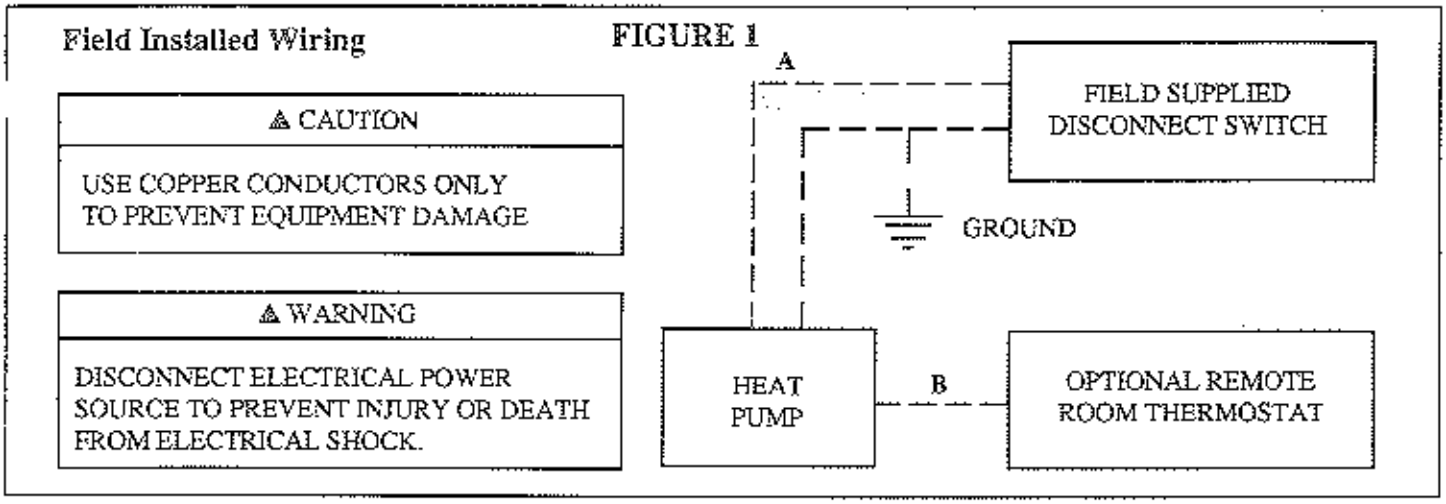
CAUTION: Use only copper conductors for field installed electrical wiring. Unit terminals are not designed to accept other types of conductors.

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

Consult the unit wiring diagram located on the inside of the compressor access panel to ensure proper electrical hookup. The installing (or electrical) contractor must make the field connections shown in Figure 1 (facing page).

Modify the transformer connection for units rated 208-230 volts with a 24-volt transformer when the actual power supply is 230 volts. Refer to the unit wiring diagram for details of this procedure.

Field Installed Wiring **FIGURE 1**



A = Two power wires on single-phase units; three power wires on three-phase units. B = 1 H/1 C manual changeover or auto changeover - 4 wires. **NOTE:** All customer-supplied wiring must be copper only, and must conform to NEC and local electrical codes. Wiring shown with dashed lines must be field-supplied and field-installed.

Make all final electrical connections with a length of flexible conduit to minimize vibration and sound transmission to the building. **Leave an additional two feet of slack in the flexible conduit and wiring inside the unit. This slack is necessary to allow the control box to slide out for access.**

Louver and Outdoor Air Damper and Cabinet

Outdoor air louvers are typically provided by others and are installed in the outside wall according to the manufacturer's instructions.

The cabinet must fit tight against the wall and align with the outdoor air damper and the louver. A gasket is provided around the back of the heat pump cabinet to seal the cabinet to the wall. Keep the gasket away from the damper to insure a snug fit.

Locate wall studs and drill holes in the back of the cabinet. Secure the unit to the wall. For ease of installation, drill holes in the back of the cabinet which are larger than required. Use a large washer with each screw to secure the unit to the wall. This allows movement of the unit for proper adjustment to the center of the the stud. Use extreme care in drilling holes in the cabinet so that none of the components are damaged.

Installation of Optional Wall-Mounted Thermostat

CCL WSHP units are built with standard internal thermostats in either manual changeover (MCO) or automatic changeover (ACO) configuration. No external, field-installed low-voltage wiring is required.

When desired, the unit can be furnished with a 24-volt control circuit which is field-wired to a ClimateMaster-supplied accessory remote thermostat. Two remote 24-volt thermostat options are available: a single-stage ACO thermostat, and a single-stage MCO thermostat.

⚠ CAUTION

Zone integrity must be maintained to efficiency control units or groups of units. Unless zones of control are considered and accounted for, adjacent units may operate in heating and cooling modes simultaneously.

Low-voltage wiring between the unit and the wall thermostat must compy with all applicable electrical codes (i.e., NEC and local codes), and be completed before the unit is installed. Use of four-wire, color-coded, low-voltage cable is recommended.

Table 2 below lists recommended wire sizes and lengths to install the thermostat. The total resistance of low-voltage wiring must not exceed 1 ohm. Any resistance in excess of 1 ohm may cause the control to malfunction because of high voltage drop.

Table 2 - Recommended Thermostat Wire Sizes

WIRE SIZE	MAX. WIRE LENGTH*
18-Gauge75 Feet	75 Feet
16-Gauge125 Feet	125 Feet
14-Gauge200 Feet	200 Feet

*Length = Physical distance from thermostat to unit.

CLOSED LOOP EARTH COUPLED APPLICATIONS

Introduction

CAUTION

The following instructions represent industry accepted installation practices for Closed Loop Earth Coupled Heat Pump Systems. They are provided to assist the contractor in installing trouble free ground loops. These instructions are recommendations only. State and Local Codes MUST be followed and installations MUST conform to all applicable Codes. It is the responsibility of the Installing Contractor to determine and comply with ALL applicable Codes and Regulations.

Closed Loop Earth Coupled Heat Pump systems are commonly installed in one of three configurations: horizontal, vertical and pond loop. Each configuration provides the same benefit of using the moderate temperature of the earth as a heat source/heat sink. Piping configurations can be either series or parallel.

Series piping configurations typically use 1-1/2" or 2" pipe. Parallel piping configurations typically use 3/4" or 1" pipe for loops and 1-1/2" or 2" pipe for headers and service lines. Parallel configurations require headers to be either "closed-coupled" short headers or reverse return design.

Select the installation configuration which provides the most cost effective method of installation after considering all application constraints.

Refer to IGSHPA publication *Closed Loop/Ground Source Heat Pump systems Installation Guide* (Sections 4-6) for complete ground loop design, materials requirements and joining information. Also refer to the computer programs provided by Engineered Economics Associates Inc. for computer design aids.

Pre-Installation

Prior to installation, locate and mark all existing underground utilities, piping, etc. Install new construction before sidewalks, patios, driveways and other construction has begun. During construction, accurately mark on the plot plan all piping and earth coupling to avoid potential future damage to the installation.

Horizontal Applications

To install Horizontal earth couplings, dig trenches using either a chain-type trenching machine or a backhoe. Dig trenches approximately 5 feet apart. Trenches must be at least 5 feet from existing utility lines, foundations and property lines and at least 10 feet from privies and wells. Trenches may be curved to avoid obstructions and may be turned around corners.

When multiple pipes are laid in a trench, space pipes properly and backfill carefully to avoid disturbing the spacing of the pipes in the trench.

Vertical Applications

To install Vertical earth couplings, drill boreholes using any size drilling equipment. Regulations which govern water well installations also apply to vertical ground loop installations. Vertical Applications typically require multiple boreholes. Space boreholes a minimum of 10 feet apart.

Unless other requirements are mandated by code, use the following guideline when locating boreholes:

- 5 feet from foundations and lot lines
- 10 feet from utility lines and drain fields
- 20 feet from non-public wells
- 50 feet from public wells
- 100 feet from cesspools, feedlots, lagoons, privies, seepage pits and septic tanks.

The minimum diameter for 1" U-bend well bores is 4 inches. Larger diameter boreholes may be cut if convenient unless local code requires an expensive method of backfilling. Assemble the U-bend assembly, fill it with water and pressure test the assembly prior to insertion into the borehole.

To add weight and prevent the pipe from curving and digging into the borehole wall during insertion, tape a length of conduit, pipe or reinforcing bar to the U-bend end of the assembly. This technique is particularly useful when inserting the assembly into a borehole filled with water or drilling mud solutions, since a water filled pipe may be buoyant under these circumstances. Tape the pipes together every 10 feet to prevent the assembly from separating under downward pressure and bowing out against the borehole wall.

Carefully backfill the boreholes to within 10 feet of the surface. Use a mixture of heavy sand and fine pea gravel unless local codes mandate other material.

When all U-bends are installed, dig the header trench 6 feet deep and as close to the boreholes as possible. Use a spade to break through from ground level to the bottom of the trench. At the bottom of the trench, dig a relief to allow the pipe to bend for proper access to the header.

Building Entry

Seal and protect the entry point of the earth coupling into the building as shown in Figures 2-5 below.

Slab on Grade Construction

New Construction: When possible, position the pipe in the proper location prior to pouring the slab. To prevent wear as the pipe expands and contracts, protect the pipe with a layer of insulation as shown in Figure 2. When the slab is poured prior to installation, create a chase through the slab for the service lines with 4" PVC street elbows and sleeves. Refer to Section 4 of the IGSHPA manual for details.

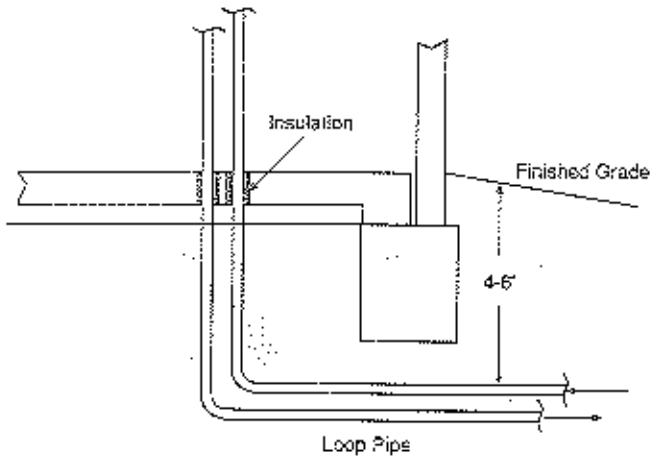


Figure 2

Retrofit Construction: Trench as close as possible to the footing. Bring the loop pipe up along the outside wall of the footing until it is higher than the slab. Enter the building as close to the slab as the construction allows. Shield and insulate the pipe to protect it from damage and the elements as shown in Figure 3.

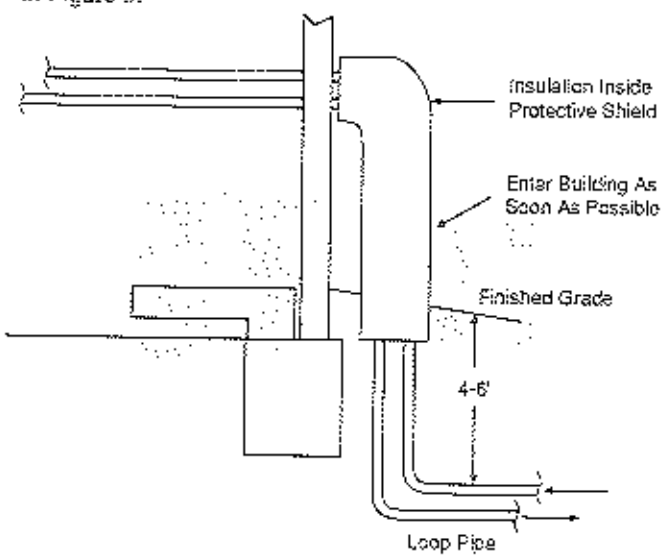


Figure 3

Pier and Beam (crawl space)

New and Retrofit Construction: Bury the pipe between piers to the point that it is directly below the point of entry into the building. Bring the pipe up into the building. Shield and insulate piping as shown in Figure 4 to protect it from damage.

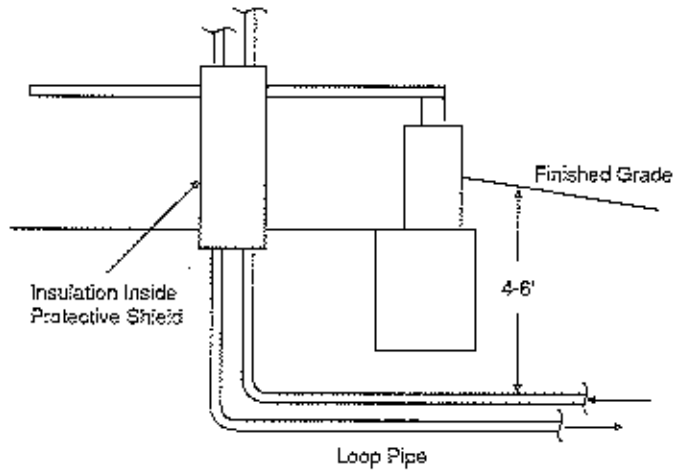


Figure 4

Below Grade Entry

New and Retrofit Construction: Bring the pipe through the wall as shown in Figure 5. For applications in which loop temperature may fall below freezing, insulate pipes at least 4 feet into the trench to prevent ice forming near the wall.

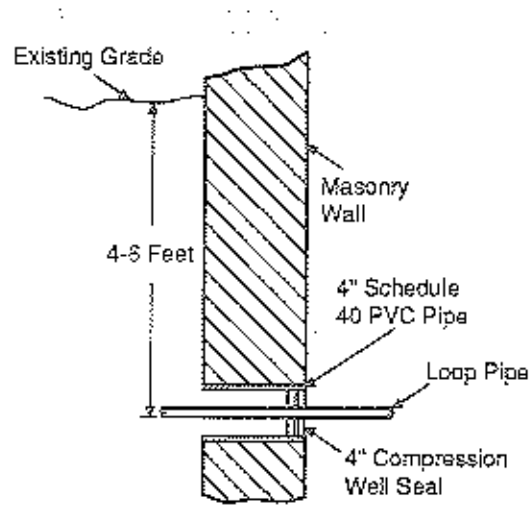


Figure 5

Loop Testing

Upon completion of the ground loop piping, pressure test the loop to assure a leak free system.

Parallel systems: Test Parallel systems as each leg is completed. Test again prior to the connection of the headers. Test the system for a final time when the entire loop is assembled and all legs are attached.

Series Systems: Test series systems once when the entire loop is assembled.

Horizontal Systems: Test Horizontal systems when the loop is installed.

Vertical U-Bends and Pool Loop systems: Test Vertical U-bends and pond loop assemblies prior to installation with a test pressure of at least 100 psi. Either water or air may be used as the testing medium.

Flushing and Purging

Upon completion of system installation and testing, flush the system to remove all foreign objects and purge to remove all air. See Table 3 below for approximate fluid volumes.

Table 3
Approximate Fluid Volume per 100" of Pipe

Size	Pipe	Volume (Gallons)
1"	Copper	4.1
1.25"	Copper	6.4
1.5"	Polybutylene	9.2
1" CTS	Polybutylene	3.7
1.25" CTS	Polybutylene	5.6
1.5" CTS	Polybutylene	7.8
2" SDR-CTS	Polybutylene	13.4
.75" IPS	Polybutylene	2.8
1" IPS	Polybutylene	4.5
1.25" IPS	Polybutylene	7.8
1.50" IPS	Polybutylene	11.5
2" IPS	Polybutylene	18.0
.75" Schedule 40	Polyethylene	2.77
.75" SDR-11	Polyethylene	3.01
1" Schedule 40	Polyethylene	4.49
1" SDR-11	Polyethylene	4.73
1.25" Schedule 40	Polyethylene	7.7
1.5" Schedule 40	Polyethylene	10.575
2" Schedule 40	Polyethylene	17.4

Refer to Section 7 of the IGSHPA manual for more information on flushing and purging Closed Loop Earth Coupled Systems.

Start the pump. When the pump is first started, only air may be discharged out of the return hose. After a few minutes a mixture of water, air and debris is discharged. When the discharge is clear water, add antifreeze and water as necessary. Refer to Table 4 below or the IGSHPA manual for the correct type and amount of antifreeze to add. Do not allow air to enter the system during the flushing process.

When the flushing pump assembly is equipped with valves to reverse direction of flow through the earth loop, reverse direction frequently during the flushing period to remove all trapped air. Flushing is complete when all air and debris is removed from the earth loop and when air bubbles no longer are discharged from the return hose.

With the pump running, rotate the module valves as shown in Figure 6. Flush the heat pump following the instructions in the *Start-up Preparation* section of this manual.

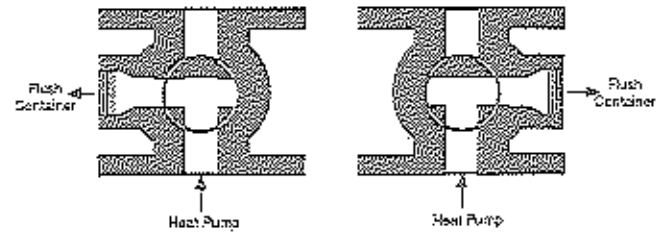


Figure 6

Pressurizing the System

When the earth loop and the heat pump are both flushed of air and debris, rotate the module valves as shown in Figure 7 while the pump is running.

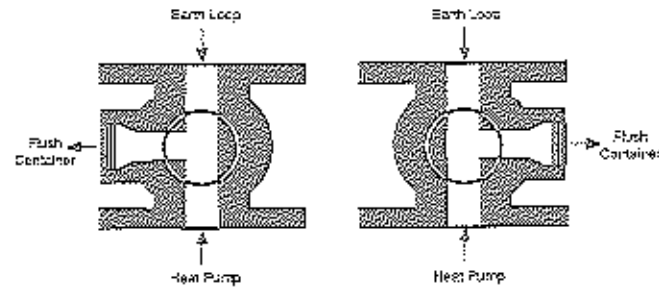


Figure 7

Rotate the discharge module valve as shown in Figure 8 below. Discharge flow should stop and system pressure should increase steadily as the pump forces more water into the system. If pressure does not decrease or if water levels fall, air remains in the system and further purging is necessary.

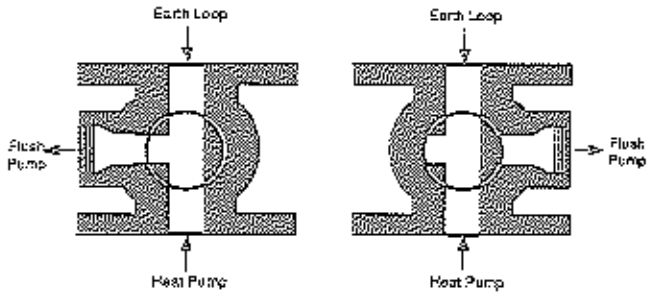


Figure 8

When system pressure reaches 40 psi, rotate the other module valve as shown in Figure 9 below.

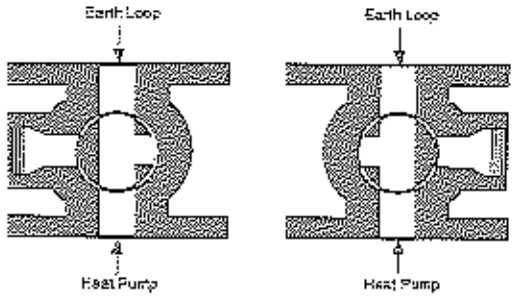


Figure 9

Turn off the flush pump. The system should maintain pressure. Excess pressure may be released by momentarily rotating either module valve to discharge a small volume of water. Typically some pressure loss occurs due to the expansion of the earth loop pipe under pressure. However, unless the system leaks, pressure will stabilize.

Positive pressure must be maintained at all times to protect the circulator(s). Normal operating pressures are 15 - 40 psi.

Start-up Considerations

Follow instructions in *Unit Start-up* section of this manual. The following additional considerations must be made:

Circulator(s) Operation: Check circulator(s) for proper operation. If circulator(s) are not operating, immediately turn off the power and diagnose the problem.

Pressure Drop: Measure the pressure drop at the pressure-temperature plugs across the heat pump heat exchanger using a single water pressure gauge. Compare the measurement with flow versus pressure drop data for the heat pump to determine actual flow rate. If flow rate is too low, recheck the selection of the loop pump module model for sufficient capacity. If the module selection is correct, trapped air or a restriction in the loop is the most likely cause of the condition, and must be corrected.

Anti-Freeze: The amount of antifreeze required depends upon the loop design. Refer to Section 7 and appendix A of the IGSHPA manual for a full discussion of antifreeze types and their applications. Refer to Table 5 for recommended anti-freeze percentages by volume.

⚠ WARNING

Do not use calcium chloride in a ClimateMaster CCL unit. The use of calcium chloride will void the equipment warranty.

Antifreeze Protection (Table 4)

Type	Minimum Temp for Freeze Protection			
	10° F	15° F	20° F	25° F
Methanol	25%	21%	16%	10%
Propylene Glycol	26%	23%	19%	9%

All percentages are by volume (gal/gal), not weight.

START-UP PREPARATION

Closed Loop Systems Only (Not Earth Coupled)

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 unit is disconnected and that the heat rejector is de-energized

2. Install the system with the supply hose connected directly to the return riser valve. Use a single length of flexible hose as illustrated in Figure 10 below.

NOTE: When one hose is too short to make the connection without exceeding the minimum bend radius of the hose, substitute two length of flexible hose joined together with a field-supplied, standard MPT coupling. Use the flare by Flare adapter provided with the hose kit as shown in Figure 11.

3. Fill the system with water, leaving the air vents open. Bleed all air from the system but do not allow the system to over flow. Check the system for leaks and make any required repairs. Adjust the water and air level in the expansion tank.

4. With strainers in place, start the pumps. Systematically check each vent to ensure that all of the air is bled from the system.

5. Verify that make-up water is available and adjusted to properly replace any space remaining when all air is evacuated. Check the system for leaks and make any additional repairs required.

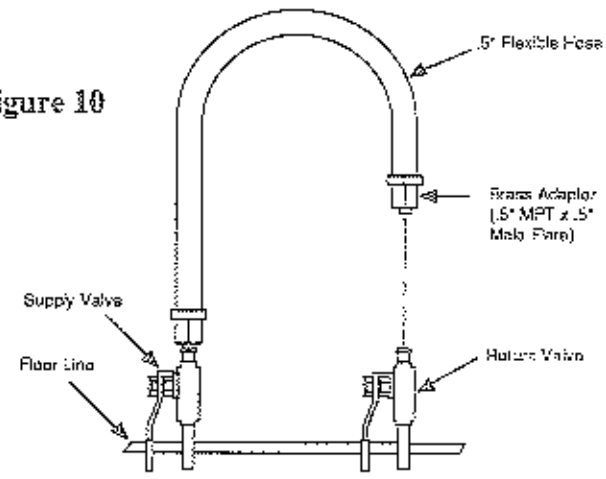


Figure 10

6. Set the boiler to raise the loop temperature to approximately 85° F. Open the drain at the lowest point in the system. Verify that make-up water replacement rate equals rate of bleed. Continue to bleed the system until the water appears clean or for at least three hours whichever is longer.

7. Completely drain the system.

8. Refill the system and add trisodium phosphate in a proportion of approximately one pound per 150 gallons of water. Reset the boiler 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.

9. Circulate the solution for a minimum of eight to 24 hours. At the end of this period, shut off the circulating pump and drain the solution. Repeat system cleaning if desired.

10. When the cleaning process is complete, remove the short-circuit hoses. Re-connect the hoses to the proper supply and return the connections to the unit. Refill the system and bleed off all air.

11. Test the system pH with litmus paper. The system water should be slight 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.

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

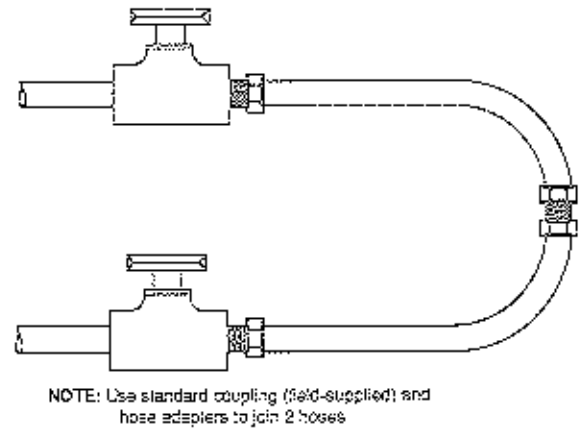


Figure 11

SYSTEM CHECKOUT

When the installation is complete and the system is cleaned and flushed, follow the System Checkout procedure below. Record systems parameters on the *Water Source Heat Pump Start-Up and Inspection Sheet* on page 14. The installing contractor should also complete the abbreviated "Installation Checklist"

( ) 1. **Voltage Check:** 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, be sure to verify the proper heating and cooling set-points as well).

( ) 3. **System Water pH:** Verify that system water exhibits an approximately neutral balance (i.e., a pH of 7.5 or 8.5); this will contribute to the longevity of the hoses and heat exchangers.

( ) 4. **System Flushing:** Proper system cleaning and flushing is the most important aspect of the start-up procedure for water source heat pump installations. Make sure that the system has been flushed properly, with all supply and return hoses connected end-to-end as illustrated in either Figure 7 or Figure 8. (This particular method not only facilitates system flushing, but also prevents fouling of the unit heat exchangers by system water.)

Water used in the system must be clear city water with no visible dirt, piping slag, or chemical cleaning agents apparent.

( ) 5. **Closed-Type Cooling Tower (or Open Tower w/ Heat Exchanger):** Required to ensure continued cleanliness of the system water, while providing the means for removing excess heat from the building. Be sure to check equipment for proper temperature set points and operation.

( ) 6. **Balanced Water Flow Rate to Heat Pump:** Make sure that as each heat pump unit is installed the inlet and outlet water temperatures are recorded. Refer to the "WSHP System Start-Up/Inspection Sheet."

This check will eliminate nuisance unit trip-outs resulting from water velocities that are either too low or too high; it can also prevent the occurrence of erosive water flow rates.

( ) 7. **Standby Pump Installed:** Each system must have a standby pump for proper sequencing and operation.

( ) 8. **System Controls Operational:** Verify that the system controls are functioning and providing the proper sequencing; this check is necessary to ensure that no catastrophic system failures occur (e.g., frozen cooling towers or heat exchangers, nuisance system shutdowns, etc.)

( ) 9. **Freeze Protection from Water System:** Be sure that freeze protection is provided for the outdoor portion of the loop water system. Inadequate freeze protection can lead to extremely expensive tower ans system piping repairs.

NOTE: A problem commonly associated with this type of system occurs when it is filled during construction for the purpose of cleaning, flushing and testing. After testing is complete and the system is drained, the building is often left without heat during winter conditions. Since the condensor coils never fully drain by themselves, they will freeze unless glycol is added to the system. Be sure to avoid this practice whenever winter conditions prevail.

( ) 10. **System Water Loop Free of Air:** Verify that all air is removed from the system. (Air in the system will impair unit operation and cause corrosion in the system piping.)

( ) 11. **Unit Filters Clean:** Check to ensure that unit filter is clean; this will contribute to the proper operation of the unit by ensuring adequate airflow across the coil.

ClimateMaster recommends that the contractor clean or install a new filter in each unit shortly after initial unit start-up. In addition, use a vacuum to remove any debris or dirt lodged in or on the units.

( ) 12. **Check Units Fans for Free Rotation:** Manually rotate fans to make sure that they rotate freely, and that they are secured properly to the fan shaft. Do not oil fan motors on start-up; they were lubricated at the factory.

( ) 13. **System Control Center Installed:** A system control and alarm panel is a necessity to ensure control of the temperature set points for operation of the system's heat rejector and boiler.

Ideally, the panel should also contain condition signals, both audio and visual, to indicate abnormal loop water temperatures or lack of water flow. Indicator lights for the primary and standby loop circulator pumps, where used, should also be provided.

( ) 14. **Miscellaneous:** Note any questionable aspects of the installation.

UNIT START-UP

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

NOTE: This equipment is designed for indoor installation ONLY.

1. Adjust all valves to the full open position, and turn on the line power to all heat pump units.

⚠ WARNING

HIGH VOLTAGE IS PRESENT IN SOME AREAS OF THE ELECTRICAL PANELS WITH THE DISCONNECT SWITCH(ES) CLOSED. BE SURE TO EXERCISE CAUTION WHEN WORKING WITH ENERGIZED EQUIPMENT.

2. **Operate each unit first in the cooling mode.** Room temperature should be in the normal range (i.e., approximately 70° to 75°F DB, and 61° to 65°F WB). Loop water temperature entering the heat pumps should be at least 70°F, but not in excess of 110°F. Refer to Table 5 for more specific information on the operating parameters of CCL units.

NOTE: Three factors determine the operating limits of a CCL unit - (1) return air temperature, (2) water temperature, and (3) ambient temperature. Whenever any one of these factors is at a minimum or maximum level, the other two factors must be at normal levels to ensure proper unit operation.

a. Adjust the unit thermostat to the coolest position and turn the fan speed switch to "HI". If the unit has an optional MCO thermostat, set the selector switch to cool. Both the fan and compressor should run.

b. Check for cool air delivery at the unit grille a few minutes after the units have begun to operate. List the identification number of any machines that do not function at this time.

c. Check the elevation and cleanliness of the condensate lines; any dripping could be a sign of a blocked line.

3. Operate each heat pump in the heating cycle immediately after checking cooling cycle operation. A time delay will prevent the compressor from re-starting for approximately 3 minutes.

NOTE: CCL heat pumps are designed to start heating and operate in an ambient of 40° F, with entering air at 40° F, with entering water at 40° F, with a minimum return air temperature of 50°F and with both entering air and water at the flow rates used in the ARI Standard 320-86 rating test, for initial start-up in winter..

a. Adjust the unit thermostat to the warmest setting and turn the fan speed switch to "HI". If the unit has an optional MCO thermostat, set the selector switch to heat. The blower should start immediately and after the time delay is complete the compressor will start.

b. Once the unit has begun to run, check for warm air delivery at the unit grille. Again the installing contractor must list the serial number of any machine that does not function.

4. Log the unit operating conditions at initial start-up for each unit to establish a permanent operating record.

5. If the unit fails to operate, conduct the following checks:

a. Check the voltage and current; it should be in accordance with the electrical specifications described on the unit nameplate. A voltage variation of +/- 10% of nameplate utilization voltage is acceptable except in three-phase systems where voltage variations must not exceed 2%.

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 the unit's safety cutouts to stop unit operation.

d. Verify that the supply and return piping is properly connected to the inlet and outlet connections on the unit.

Table 5

Air Limits	Cooling	Heating
Min Ambient Air	40° F	40° F
Rated Ambient Air	80° F	70° F
Max. Ambient Air	100 ° F	85 ° F
Min Entering Air	50° F	40° F
Rated Entering Air db/wb	80/67 ° F	70 ° F
Max Entering Air db/wb	100/83° F	80° F
Water Limits		
Min Entering Water	40° F	40° F
Normal Entering Water	85° F	70° F
Max. Entering Water	110° F	90° F

Note: Minimum Air and Water conditions can only be used at ARI flow rates. Only one maximum or minimum value may be used with CCL Units. All other parameters must be at normal conditions.

When the unit is 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.

e. If the fan fails to operate, check to see that the fan wheel turns freely and that it is secured to the shaft. Also, determine whether the fan operates during both the heating and cooling modes.

f. If the checks described above fail to reveal the problem and the unit still will not operate, be sure to contact a trained service technician to ensure proper diagnosis and repair of the equipment.

MAINTENANCE

Perform the maintenance procedures outlined below at the intervals indicated.

⚠ WARNING

TO PREVENT INJURY OR DEATH DUE TO ELECTRICAL SHOCK OR CONTACT WITH MOVING PARTS, OPEN UNIT DISCONNECT SWITCH BEFORE SERVICING UNIT.

1. Inspect filters every three months.

Establish a regular maintenance schedule. Clean filters frequency. Maintenance as needed.

⚠ CAUTION

To avoid fouled machinery and extensive unit clean-up, do not operate units without filters in place or use as a temporary heat source during construction.

To remove the filter from the CCL unit, slide the filter out of its frame located in the return air opening at the bottom front of the unit. When re-installing the filter, use the slide-in rails of the filter frame to guide the filter into the proper position.

2. 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 algaecide every three months will typically eliminate algae problems in most locations.

3. Lubricate fan motors annually.

All ClimateMaster heat pumps are fully lubricated when shipped from the factory. Do not oil initially.

4. Visually inspect the unit at least once a month.

During inspection, give special attention to hose assemblies. Note any signs of deterioration or cracking, and repair leaks immediately.

5. Conduct an amperage check annually on the compressor and fan motor.

Amperage draw on 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 to detect deterioration prior to component failure.

6. Clean the heat exchangers at least once each year (or more frequently if the unit is located in a "dirty" environment).

Safety Control Reset

All ClimateMaster heat pumps are furnished with high-pressure, low-pressure and low-temperature cutouts to prevent the machine from operating at abnormal conditions of temperature or water flow.

The high-pressure control used on CCL units is designed to open its contacts at 380 psi and automatically re-close them at 300 psig. The contacts of the low-temperature switch open at 35°F and reclose at 50°F. A lockout relay, electrically linked with these cutouts interrupts unit heating or cooling operation.

The machine must be reset manually. Reset is accomplished by pressing the STBY button, and then pushing either HI HEAT, LO HEAT, HI COOL or LO COOL to restart the unit in the desired mode of operation. (The CCL unit can also be reset by opening and closing the supply power disconnect switch.)

NOTE: If the unit must be reset more than twice, check the unit for a dirty filter, abnormal entering water temperature, inadequate or excessive water flow, and internal malfunctions. If the unit continues to cutout, contact a trained service technician.

Classroom Air Conditioner WSHP System Start-Up/Inspection Sheet

Installing Contractor: Use this form to thoroughly check out the system and units before and during start-up

Job Name _____ Job Location _____

Sales Order No. _____ Installing Contractor _____

Sales Engineer _____ Bldg. Maintenance Mgr. _____

Sales Office _____ Engineer _____

Telephone _____

In order to minimize troubleshooting and costly unit and system failures, complete the following checks and data entries before the system is put into full Operation.

Loop Water Circuit

☐ Cleaning/Flushing Completed per Specification

Date: _____

Company: _____

☐ Balanced per Specification

Date: _____

Company: _____

☐ Chemical Treatment per Specification

Date: _____

Company: _____

Loop Temperature Control Method

☐ System Panel Installed

Panel Type: _____

Checked for proper operation of:

☐ High Temperature Alarm
☐ Low Temperature Alarm
☐ No Flow Alarm
☐ Pump Sequencing Device
☐ Pump Lead/Lag Feature
☐ Cooling Tower
☐ Boiler

Boiler

Boiler Type: _____

Boiler Model No: _____

☐ Operating Control Setpoint _____ F
(Should be 60° to 70°F)

☐ Hi-Limit Cutout Setpoint _____ F
(Should be 80°F)

☐ Steps of Heating Checked in Sequence

☐ Checked Line Current to Each Heater Element
(Electric Only)

Heat Rejector

☐ Closed-Loop Cooling Tower

☐ Tower Make/Model No.: _____

☐ Full Loop Water Flow through Tower

Checked for proper operation of:

☐ Closure Dampers
☐ Spray Pump
☐ Fan Motors
☐ Sump Float Valve
☐ Sump Heater
☐ Heat Tape (on Exposed Piping)
☐ Exposed Piping Properly Insulated

☐ Open Tower w/Heat Exchanger

☐ Tower Make/Model No.: _____

☐ Heat Exch. Model No.: _____

☐ Tower Operates Properly

☐ Loop Water Inlet Temp. _____ F

☐ Loop Water Outlet Temp. _____ F

☐ Tower Water Inlet Temp. _____ F

☐ Tower Water Outlet Temp. _____ F

☐ Tower Loop Pumps

Quantity: _____

☐ Automatic Sequencing

☐ Alarms

System Make-Up Water

☐ Automatic

☐ Manual

☐ Chemically Treated

Make-Up Air System

☐ Installed per Specification

System Main Circulating Pumps

Pump Make/Model No: _____

Quantity: _____

☐ Automatic Pump Sequencing

☐ No Flow Alarm

☐ Discharge Pressure _____ psig

☐ Suction Pressure _____ psig

☐ Flow Rate _____ psig

Vibration Isolation

☐ from floor

☐ from Piping System

System Piping

Piping Materials _____

☐ Thermometer/Aquastats Installed in Loop

☐ Correct Level in Expansion Tank

Air Vents

☐ Installed at Proper Points in System

Individual Heat Pump Check

Complete this inspection for each unit:

Unit Location _____

Unit Model No. _____

Unit Serial No. _____

☐ Clean Filter

☐ Clean Drain Pan

☐ Condensate Trap Installed

Unit Started In

☐ Heating Mode

☐ Cooling Mode

☐ Entering Air Temp _____ F

☐ Leaving Air Temp _____ F

☐ Entering Water Temp _____ F

☐ Leaving Water Temp _____ F

☐ Volts (Under Load) _____ V

☐ Fan Amps _____

☐ Compressor Amps _____

Comments _____

Installation Checklist

The following form should be filled out by the installing contractor and returned to the local ClimateMaster Sales Office.

Job Name _____ Job Location _____

Sales Order No. _____ Installing Contractor _____

Sales Engineer _____ Engineer _____

Sales Office _____ Bldg. Maintenance Mgr. _____

Telephone No. _____

Essential Items Checklist

- ☐ Voltage
- ☐ System Water pH
- ☐ Loop Temp. Cooling Setpoint _____ F
- ☐ Loop Temp. Heating Setpoint _____ F
- ☐ Loop Water Flushed Clean
- ☐ Closed-Type Cooling Tower
- ☐ Water Flow Rate to Heat Pump(s) Balanced
- ☐ Standby Pump Installed
- ☐ System Controls Functioning Properly
- ☐ Outdoor Portion of Water System Protected from Freeze-Up
- ☐ Loop System Free of Air
- ☐ Filters Clean
- ☐ Condensate Traps Installed
- ☐ Other Conditions Found

_____

_____

_____

_____

_____

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