

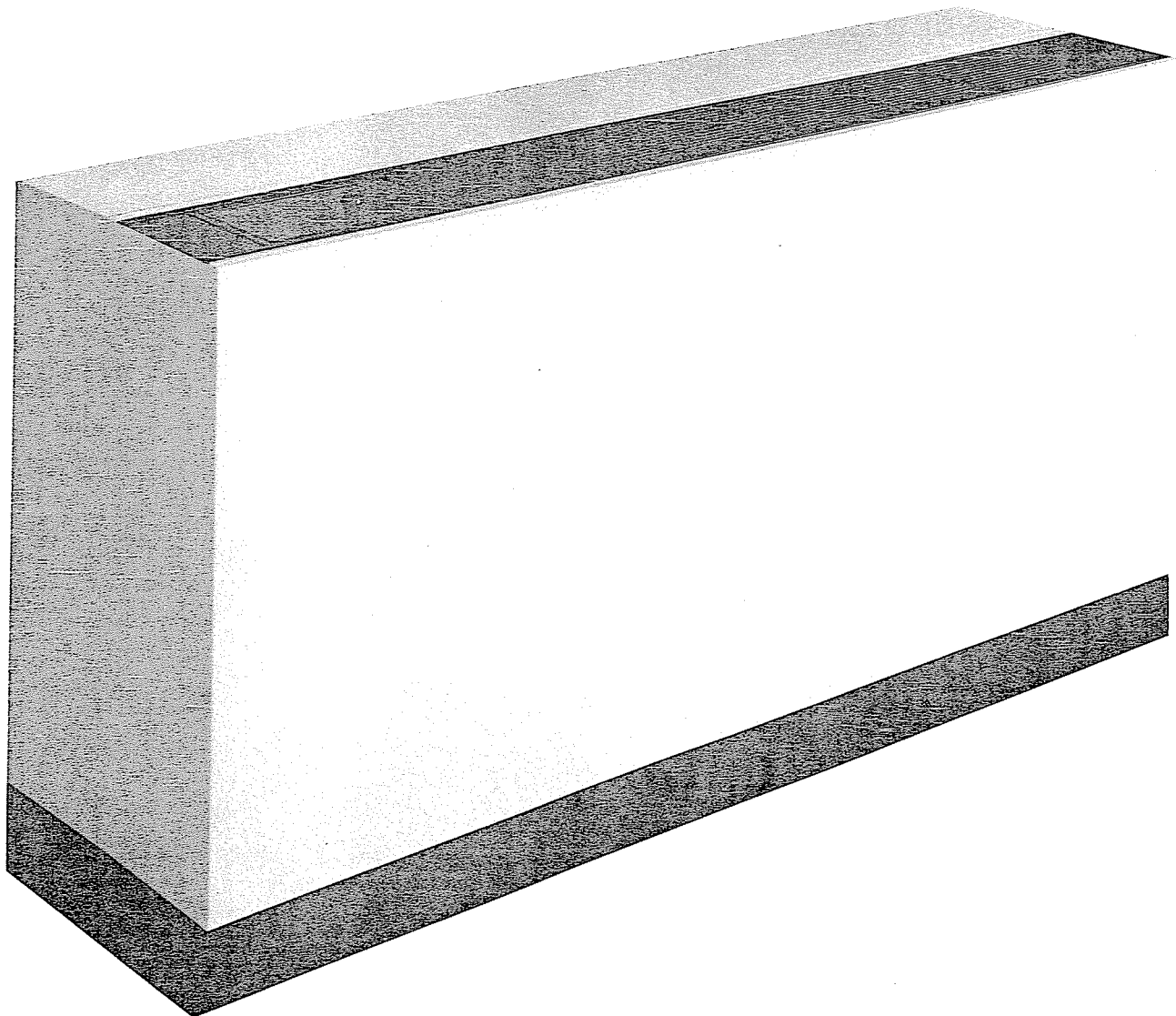
**ClimateMaster**

# Climate Master 801 Series

## Installation Operation Maintenance

Water Source Heat Pumps: Console Units

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# General Information

Climate Master Console Water Source Heat Pump units are decentralized room terminals designed for field connection to a closed-circuit piping loop within the building. Ranging from 7,200 to 19,000 BTUH cooling and 9,200 to 21,200 BTUH heating these 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.

**CAUTION:** Do NOT apply Console WSHP units in locations subject to temperature extremes (e.g., attics, garages, rooftops, etc.). The temperature, humidity and corrosive conditions which are often present under these circumstances can greatly inhibit performance, reliability, and service life.

Unit electrical data is provided in the "Installation" section of this manual. General information about these units including filter size, refrigerant charge, etc.—is provided in Table 1.

## Initial Inspection

Be sure to inspect the carton or crating housing on each Console WSHP unit as it is received at the job site and before signing the freight bill. Verify that all items have been received and that there is no visible damage; note any shortages or damage on all copies of the freight bill. In the event of damage or shortage, remember that the purchaser is responsible for filing the necessary claims with the carrier. Concealed damage not discovered until after unloading must be reported to the carrier within 15 days of its receipt.

Unit wiring diagrams and installation/operation/maintenance instructions are provided with each unit. Before unit start-up, be sure to read these manuals to become familiar with the unit and its operation.

Notice that an installation checklist is provided at the end of this manual; it should be completed after all the installation procedures described have been accomplished. A periodic maintenance checklist is provided in the "Maintenance" section to outline recommended maintenance schedules. Do not substitute these checklists for the detailed information found in the appropriate sections of this manual.

In addition, a start-up inspection log has also been included at the end of this manual to encourage thorough unit checkout at initial start-up.

**Table 1**  
**General Console Heat Pump Unit Data**

<b>GENERAL 801 UNIT DATA</b>					
	<b>MODEL NUMBER</b>				
<b>PHYSICAL CHARACTERISTIC</b>	<b>80108</b>	<b>80110</b>	<b>80112</b>	<b>80115</b>	<b>80119</b>
Blower:					
Motor Horsepower	1/20	1/20	1/20	1/12	1/12
Wheel Size (D" x W") In. (2 ea.)	6 3/8" x 5 3/4"	6 3/8" x 5 3/4"	6 3/8" x 5 3/4"	8 1/6" x 5 3/4"	8 1/6" x 5 3/4"
Filter Size	10 3/4" x 30 3/4" x 3/8"			10 3/4" x 32 3/4" x 3/8"	
Unit Weight (Lbs.):					
Shipping	178	180	195	200	220
Operating	170	172	187	190	210
Ref.-to-Air Heat Exchanger:					
Face Area (Sq. Ft.)	1.36	1.56	1.94	2.08	2.08
No. of Rows Deep	2	2	3	3	4
Copper Tube Size (OD In.)	3/8	3/8	3/8	5/16	5/16
No. of Fins/Inch	13	12	13	14	14
Refrig. Charge (R-22)/CKT.					
No. of Circuits	1	1	1	1	1
Unit W" x H" x D"	48" x 24" x 13"			52" x 24" x 13"	
Water In/Out Size (O.D./Sweat)	5/8"	5/8"	5/8"	5/8"	5/8"
Condensate Size (I.D. Vinyl)	5/8"	5/8"	5/8"	5/8"	5/8"

## Storage

If the equipment is not needed for immediate installation upon its arrival at the job site, it should be left in its shipping carton and stored in a clean, dry area of the building, or in a warehouse. Units must be stored in an upright position at all times. If carton stacking is necessary, do not stack units more than two or three high; use pallets to separate each layer of units. Do not remove any equipment from its shipping package until it is needed for installation.

## Unit Protection

Once the Console WSHP units are properly positioned on the job site, they must be covered with either a shipping carton, vinyl film, or an equivalent protective covering; open ends of pipes stored on the job site must be capped. This precaution is especially important in areas where painting, plastering, or spraying of fireproof material and the like is not yet complete. Foreign material that is allowed to accumulate within the units can prevent proper start-up and necessitate costly clean-up operations.

Before installing any of the system components, be sure to examine each pipe, fitting, and valve; remove any dirt found on these components.

Do NOT use these units as a source of heat during construction of the building since the units' mechanical components and filters will quickly fill with construction dirt and debris. (Operating a unit with a clogged filter impairs or prevents unit operation, and--as stated earlier--necessitates costly unit clean-up.) Climate Master strongly recommends that an alternate means of providing temporary heat be used.

## Preinstallation

To prepare a Console WSHP unit for installation, be sure to complete the inspections and instructions listed below:

1. Compare the electrical data on the unit nameplate with ordering and shipping information to verify that the correct unit has been shipped.
2. Use the shipping carton to keep both the chassis and cabinet covered until installation is complete, and all plastering, painting, etc. is finished.
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 should be clean and tight at the terminals. The compressors of all Console WSHP units are internally spring-mounted so there are no hold-down bolts to remove.

# INSTALLATION

Use the instructions below to properly install the unit.

1. After unpacking the Console WSHP unit from its shipping carton, remove the front cabinet by lifting the cabinet up and away from the unit.

NOTE: To protect the cabinet from damage during the installation process return it to its original shipping carton.

2. Remove the chassis from the rear cabinet by removing the two nuts from the rear cabinet and four screws from the base.
3. Position the rear cabinet against the finished wall with the base directly on the finished floor.
4. Align the four slotted holes in the back of the rear cabinet with a solid support structure of the wall.
5. If necessary, shim under the base to level the unit. Then attach the rear cabinet firmly to the wall with four screws.
6. Install the chassis into the rear cabinet by sliding it into the channels in the base. Check and align electrical, water and condensate connections accordingly.
7. Before making final water connections, short-circuit the supply and return connections as described and illustrated in the "Start Up" section of this manual for flushing the system. Depending upon the water piping option connection ordered, it may be necessary to use adapters for connection of hoses.
8. After flushing the system (see "Preparation For Start-Up: System Cleaning and Flushing"), connect piping or hoses to the proper supply, return and condensate connections of each unit.

9. Refer to "Electrical Wiring" and make the necessary connections. Be sure to consult the wiring diagram provided with the unit to ensure the proper electrical hook-up.
10. Use the piping and hose installation information provided in "Supply and Return Piping," "Condensate Piping," and "Installation of Supply, Return and Condensate Hoses" to complete the water connections to the unit.
11. Reinstall the front cabinet on the chassis by lowering carefully the front cabinet over the chassis onto the rear cabinet.
12. Install any other system component as required.

Consult manufacturer's instructions provided with each piece of equipment.

### Supply and Return Piping

Besides complying with any applicable codes, system piping should also include the following features:

1. a drain valve at the base of each supply and return riser to enable system flushing at start-up and during routine servicing;
2. shut-off/balancing valves and unions at each unit to permit unit removal for servicing; and,
3. strainers at the inlet of each system circulating pump. (Shut-off/balancing valves, flow indicators, and drain tees in the supply runout and return at each floor facilitate loop balancing and servicing.)

Insulation is not required on the loop water piping except on those sections that run through unheated areas or outside the building. This is because the loop temperature is normally between 60 and 90 F; therefore, the piping will neither sweat nor suffer heat loss.

### Condensate Piping

In most system applications, Console WSHP units are positioned directly above each other on successive floors, and the condensate risers are located next to the units. A flexible, nonpressure-rated 5/8-inch ID plastic hose is used to connect the unit condensate drain connection to the condensate riser. To ensure an unobstructed flow of condensate from the unit to the riser, this hose must be carefully connected to avoid kinks.

Though the horizontal run of the condensate hose is usually too short to pose any drainage problems, it is important to remember that horizontal runs of condensate line are typically pitched at least one inch for every 10 feet of run in the direction of flow. Low points and unpitched piping cannot be allowed, since dirt will collect in these areas and cause stoppage and overflow.

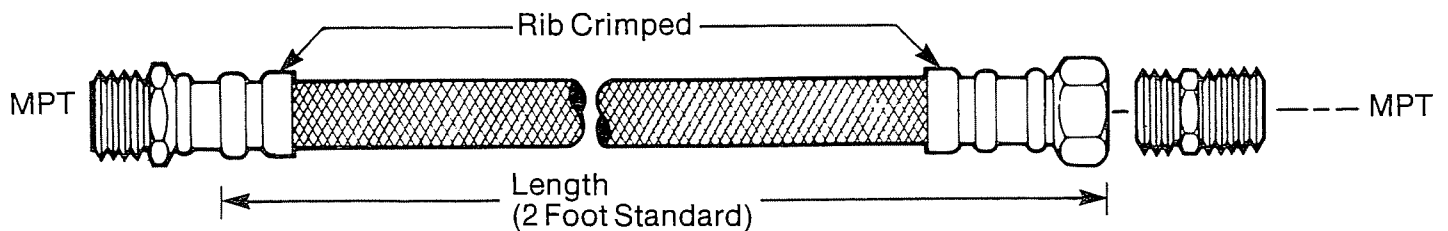
Console WSHP console units are designed in a blow-through configuration. Since the condensate drain pan is located on the outlet side of the pan, the pressure there is greater than that of the atmosphere. As a result, field installation of a trap or vent is not required unless specified by local codes.

### Installation of Supply and Return Hoses

Optional pressure-rated hose assemblies designed specifically for use with Console WSHP units may be ordered from Climate Master, though hoses of a similar type can also be obtained from alternate suppliers in the field. In either case, these hoses will provide long life and trouble-free service if they are properly selected, installed and maintained.

Supply and return hoses are fitted with swivel-joint fittings at one end to prevent the hose from twisting; male adapters are provided to secure the hose assemblies to the unit and risers. Refer to Figure 1 for an illustration of the hose, and to Table 2 for a listing of the hose kits available.

**Figure 1**  
**Supply Return Hose Kit**



**Table 2  
Supply and Return Hose Specifications**

Size	Part Number		
	Galvanized Steel	Stainless Steel	Rubber
1/2" ID 2' LONG	AK5012	AK5022	AK5002
1/2" ID 1' LONG	AK5011	—	—

I.D.	O.D.	Sizes and Operating Pressures							
		Galvanized Braid			Stainless Steel Braid		Rubber		
		Minimum Bend Radius	Operating Pressure (PSI)	Bursting Pressure (PSI)	Operating Pressure (PSI)	Bursting Pressure (PSI)	Minimum Bend Radius	Operating Pressure (PSI)	Bursting Pressure (PSI)
1/2"	23/32"	2-7/8"	300	1200	375	1500	6"	250	1000

Note: 1/2" MPT connection at one end of supply/return hose; other end is 1/2" FPT connection.

**CAUTION:** Extremely corrosive system water may require use of special corrosion-resistant fittings and hoses. When this condition is encountered, water treatment is required.

Hose assemblies must be installed properly and checked regularly. Improper installation of hose assemblies may cause failure or reduce service life. Because water leaks can cause severe damage to carpeting, furniture, etc., it is extremely important that the installation guidelines provided below be strictly followed to ensure that water leaks do not occur.

To properly select and install the hose assemblies:

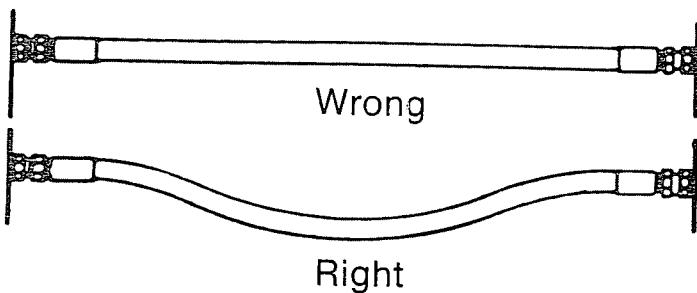
1. Select the proper hose length to allow the slack required between connection points. Since the hose may change in length from 2 to - 4 percent under the surge of high pressure, it is necessary to provide sufficient slack for expansion and contraction. See Figure 2.
2. Hoses must also be selected to the proper length to ensure that the minimum bend radius is not exceeded. Exceeding the minimum bend radius can cause the hose to collapse, thus reducing the water flow rate, and/or damaging the hose wall construction. A minimum bend radius specification of four inches means that the shortest distance between sections of bent hose cannot be less than eight inches.

Use the following minimum bend radii when selecting metal hoses:

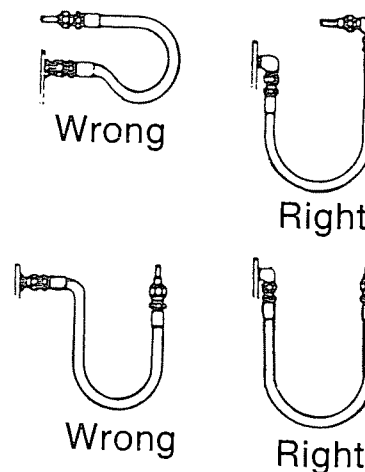
1/2-Inch Hose = 2-7/8-Inch Minimum Bend Radius

Where the radius falls below the required minimum, an angle adapter should be used, as shown in Figure 3, to avoid sharp bends in the hose.

**Figure 2.  
Stack Allowance for Hose Installation**



**Figure 3.  
Use of Angle Adapter to Achieve Proper Bend Radius**



**Note:** Bend radius specifications are for hose assemblies stored at temperatures above 40 F (4 C). If hoses have been stored at temperatures below 40 F, the hose will be stiffer than normal. Under these conditions, increase the minimum specified bend radius by 50 percent, and use extreme care to avoid bending the hose.

3. Pipe joint compound is not necessary where Teflon thread tape has been preapplied to hose assemblies, or when flared-end connections are used. In those instances where pipe joint compound is preferred in lieu of tape, use only a small amount on the male pipe threads of the fitting adapters. Be sure to prevent any sealant from reaching the flared surfaces of the joint.
4. Where brass fittings are used, the maximum torque--without damage to the fitting--is 30 footpounds. If a torque wrench is not available, use "finger-tight" plus one quarter turn. Tighten steel fittings as necessary.
5. Do not twist hose to avoid damage to the hose wall or rubber compound.
6. Hose connections are completed with the incorporation of combination shut-off/balancing valves at each unit supply and return riser to simplify removal of the unit, as well as proper water flow adjustment.

## Electrical Wiring

**WARNING:** TO AVOID POSSIBLE INJURY OR DEATH DUE TO ELECTRICAL SHOCK, OPEN SUPPLY POWER DISCONNECT SWITCH AND SECURE IT IN THAT POSITION.

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

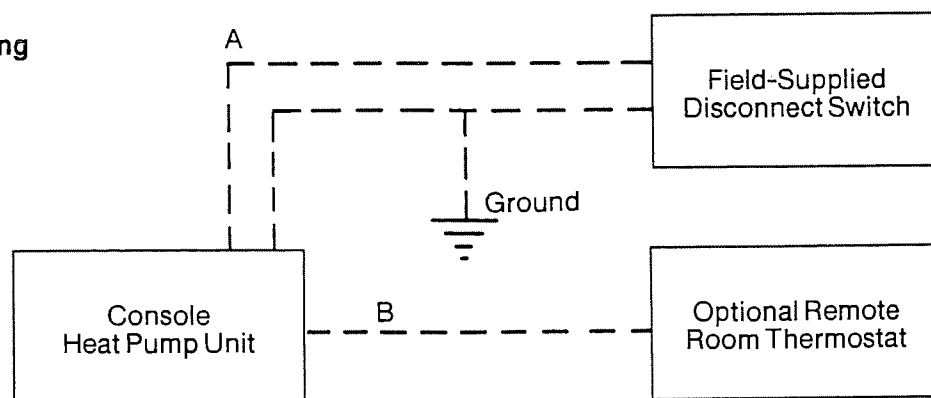
All field-installed wiring--including the electrical ground--must comply with the National Electrical Code, as well as applicable local codes. In addition, all field wiring must conform to the Class II temperature limitations described in the NEC. Refer to Figure 4 for a schematic of the field connections which must be made by the installing (or electrical) contractor.

To ensure proper electrical hookup, be sure to consult the unit wiring diagram pasted on the side of the chassis control box. For units with wall mounted thermostats; the 24-volt transformer connection must be modified if the unit nameplate voltage is 208-230 volts and the actual supply power is 208 volts. Unit electrical data is provided in the General Data Chart.

**Note:** To minimize vibration and sound transmission to the structure, all final unit electrical connections should be incased in a length of flexible, rather than rigid conduit.

Once field-installed wiring to the unit is complete, verify that all electrical connections to the line- and low-voltage terminal boards are correct and secure.

**Figure 4.**  
**Field-Installed Wiring**



A= Two power wires.

B= 1H/1C manual changeover or auto changeover -- 4 wires.

**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 installed.

**CAUTION:** USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE.

**WARNING:** DISCONNECT ELECTRICAL POWER SOURCE TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK.

# GENERAL DATA CHART

Model Number	Voltages 1 Phase	Heater Watts	Min. CRC Ampacity	Max. Fuse	Comp. LRA	Comp. RLA	Blower FLA	Total FLA	Hi Speed CFM	Lo Speed CFM	Hi Speed RPM	Lo Speed RPM	Blower HP	Wt. Lbs.
801-08	208/230		4.83	15	22.4	3.50	0.45	3.95	350	320	1040	1000	1/20	178
		1000/1220	7.10	15	22.4	3.50	0.45	5.75	350	320	1040	1000	1/20	180
		1510/1850	10.50	15	22.4	3.50	0.45	8.45	350	320	1040	1000	1/20	180
		2000/2450	13.80	15	22.4	3.50	0.45	11.15	350	320	1040	1000	1/20	180
		2960/3600	20.00	20	22.4	3.50	0.45	16.10	350	320	1040	1000	1/20	180
		3800/4650	25.80	30	22.4	3.50	0.45	20.65	350	320	1040	1000	1/20	180
	265		4.20	15	19.0	3.00	0.45	3.45	350	320	1040	1000	1/20	178
		1000	5.20	15	19.0	3.00	0.45	4.25	350	320	1040	1000	1/20	180
		1500	7.60	15	19.0	3.00	0.45	6.15	350	320	1040	1000	1/20	180
		2000	9.90	15	19.0	3.00	0.45	8.00	350	320	1040	1000	1/20	180
		3000	14.60	15	19.0	3.00	0.45	11.75	350	320	1040	1000	1/20	180
		3700	17.90	20	19.0	3.00	0.45	14.40	350	320	1040	1000	1/20	180
801-10	208/230		5.95	15	21.3	4.40	0.45	4.85	350	320	1040	1000	1/20	180
		1000/1220	7.10	15	21.3	4.40	0.45	5.75	350	320	1040	1000	1/20	182
		1510/1850	10.50	15	21.3	4.40	0.45	8.45	350	320	1040	1000	1/20	182
		2000/2450	13.80	15	21.3	4.40	0.45	11.15	350	320	1040	1000	1/20	182
		2960/3600	20.00	20	21.3	4.40	0.45	16.10	350	320	1040	1000	1/20	182
		3800/4650	25.80	30	21.3	4.40	0.45	20.65	350	320	1040	1000	1/20	182
	265		5.40	15	22.3	3.90	0.45	4.35	350	320	1040	1000	1/20	180
		1000	5.40	15	22.3	3.90	0.45	4.35	350	320	1040	1000	1/20	182
		1500	7.60	15	22.3	3.90	0.45	6.15	350	320	1040	1000	1/20	182
		2000	9.90	15	22.3	3.90	0.45	8.00	350	320	1040	1000	1/20	182
		3000	14.60	15	22.3	3.90	0.45	11.75	350	320	1040	1000	1/20	182
		3700	17.90	20	22.3	3.90	0.45	14.40	350	320	1040	1000	1/20	182
801-12	208/230		7.58	15	28.0	5.70	0.45	6.15	380	355	1040	1000	1/20	195
		1000/1220	7.58	15	28.0	5.70	0.45	6.15	380	355	1040	1000	1/20	197
		1510/1850	10.50	15	28.0	5.70	0.45	8.45	380	355	1040	1000	1/20	197
		2000/2450	13.80	15	28.0	5.70	0.45	11.15	380	355	1040	1000	1/20	197
		2960/3600	20.00	20	28.0	5.70	0.45	16.10	380	355	1040	1000	1/20	197
		3800/4650	25.80	30	28.0	5.70	0.45	20.65	380	355	1040	1000	1/20	197
	265		6.70	15	27.4	5.00	0.45	5.45	380	355	1040	1000	1/20	197
		1000	6.70	15	27.4	5.00	0.45	5.45	380	355	1040	1000	1/20	195
		1500	7.60	15	27.4	5.00	0.45	6.15	380	355	1040	1000	1/20	197
		2000	9.90	15	27.4	5.00	0.45	8.00	380	355	1040	1000	1/20	197
		3000	14.60	15	27.4	5.00	0.45	11.75	380	355	1040	1000	1/20	197
		3700	17.90	20	27.4	5.00	0.45	14.40	380	355	1040	1000	1/20	197
801-15	208/230		8.30	15	36.0	6.20	0.55	6.75	510	430	1040	1000	1/12	200
		1000/1220	8.30	15	36.0	6.20	0.55	6.75	510	430	1040	1000	1/12	202
		1510/1850	10.50	15	36.0	6.20	0.55	8.45	510	430	1040	1000	1/12	202
		2000/2450	13.80	15	36.0	6.20	0.55	11.15	510	430	1040	1000	1/12	202
		2960/3600	20.00	20	36.0	6.20	0.55	16.10	510	430	1040	1000	1/12	202
		3800/4650	25.80	30	36.0	6.20	0.55	20.65	510	430	1040	1000	1/12	202
	265		7.30	15	33.0	5.40	0.50	5.90	510	430	1040	1000	1/12	202
		1000	7.30	15	33.0	5.40	0.50	5.90	510	430	1040	1000	1/12	200
		1500	7.60	15	33.0	5.40	0.50	6.15	510	430	1040	1000	1/12	202
		2000	9.90	15	33.0	5.40	0.50	8.00	510	430	1040	1000	1/12	202
		3000	14.60	15	33.0	5.40	0.50	11.75	510	430	1040	1000	1/12	202
		3700	17.90	20	33.0	5.40	0.50	14.40	510	430	1040	1000	1/12	202
801-19	208/230		10.30	15	40.6	7.80	0.55	8.35	545	500	1040	1000	1/12	220
		1000/1220	10.30	15	40.6	7.80	0.55	8.35	545	500	1040	1000	1/12	222
		1510/1850	10.50	15	40.6	7.80	0.55	8.35	545	500	1040	1000	1/12	222
		2000/2450	13.80	15	40.6	7.80	0.55	8.45	545	500	1040	1000	1/12	222
		2960/3600	20.00	20	40.6	7.80	0.55	11.15	545	500	1040	1000	1/12	222
		3800/4650	25.80	30	40.6	7.80	0.55	16.10	545	500	1040	1000	1/12	222
	265		8.90	15	34.0	6.70	0.50	7.20	545	500	1040	1000	1/12	222
		1000	8.90	15	34.0	6.70	0.50	7.20	545	500	1040	1000	1/12	220
		1500	8.90	15	34.0	6.70	0.50	7.20	545	500	1040	1000	1/12	222
		2000	9.90	15	34.0	6.70	0.50	8.00	545	500	1040	1000	1/12	222
		3000	14.60	15	34.0	6.70	0.50	11.75	545	500	1040	1000	1/12	222
		3700	17.90	20	34.0	6.70	0.50	14.40	545	500	1040	1000	1/12	222

### Installation of Optional Wall-Mounted Thermostat

Console WSHP units are built with standard internal thermostats in either the manual changeover (MCO) or automatic changeover (ACO) configuration; no external, field-installed low-voltage wiring is required. See Figure 6 for manual changeover (MCO) wiring diagram or Figure 5 for automatic changeover (ACO) wiring diagram.

Where desired, however, the console unit can be furnished with a 24-volt control circuit which is then field-wired to a Climate Master-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 efficiently 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.

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

Recommended wire sizes and lengths for installing the thermostat are provided in Table 4. The total resistance of these low-voltage wires must not exceed 1 ohm; any resistance in excess of 1 ohm may cause the control to malfunction because of the high voltage drop.

The thermostat heat anticipator setting for Console WSHP units with MCO thermostats is fixed; for units with ACO thermostats, set the first-stage heat anticipator at 1.1 amps and the second-stage heat anticipator at 0.4 amps.

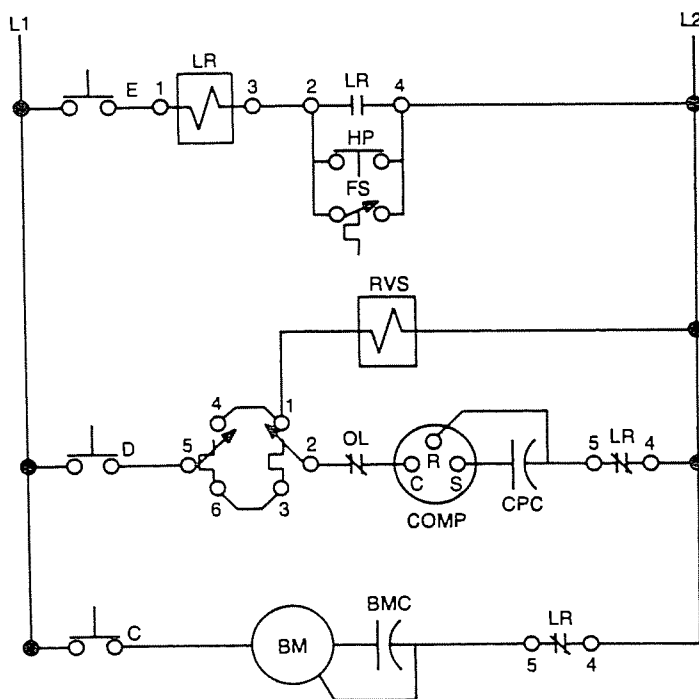
**Table 4**  
**Recommended Thermostat Wire Sizes**

Wire Size	Max. Wire Length*
18-Gauge	75 Feet
16-Gauge	125 Feet
14-Gauge	200 Feet

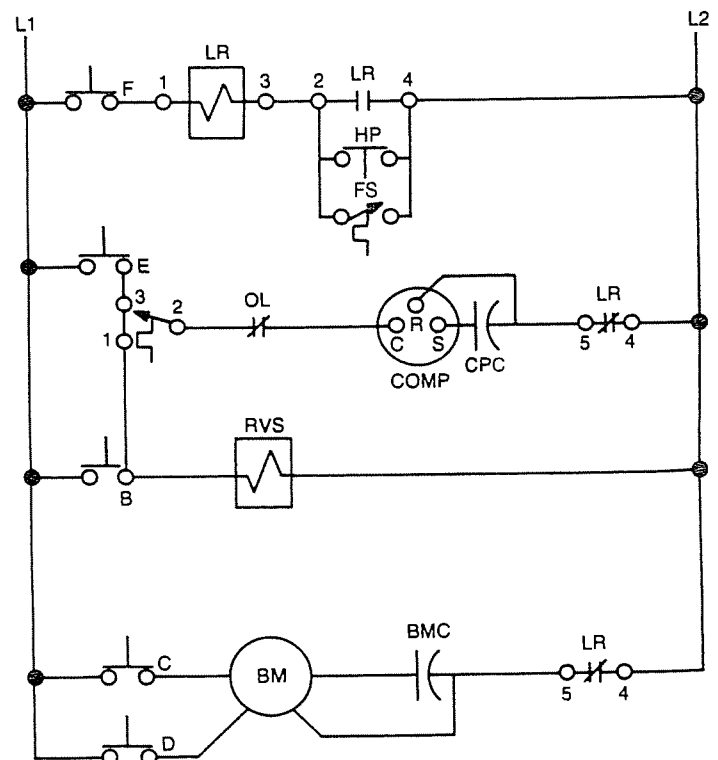
\*Length = Physical distance from thermostat to unit.

**LEGEND**  
 BM = Blower Motor  
 BMC = Blower Motor Capacitor  
 COMP = Compressor  
 CPC = Compressor Capacitor  
 FS = Freezestat  
 HP = High Pressure Switch  
 LR = Lockout Relay  
 OL = Overload  
 RVS = Reversing Valve Solenoid

**Figure 5**



**Figure 6**



### **Optional Night Setback Control**

The control loop for a hard-wired night setback (NSB) system consists of a central (or zone) night setback control panel and an individual NSB relay at each heat pump. Designed to satisfy the energy conservation requirements of such applications as motels and small office buildings, the components of the NSB control system can be varied to accommodate a specific installation.

Available night setback component options are briefly described below:

[ ] **Low Limit Night Thermostat Option.** Used in conjunction with a night setback control panel, this thermostat establishes the minimum level to which the temperature in the conditioned space can fall. If the temperature drops below this point, the low limit night thermostat energizes the units to ensure that the minimum acceptable temperature is maintained. This is especially important during the winter months when equipment and pipes are susceptible to damage resulting from cold temperatures.

Note: Instead of using one central low limit thermostat at the NSB control panel, an individual low limit thermostat can be installed at each heat pump unit.

[ ] **Remote Night Setback Relays.** These relays turn the heat pump units on and off in response to an electrical signal from the central NSB control panel.

[ ] **Override Timer Option.** An optional override timer may be installed next to the thermostat serving each heat pump unit. Each timer is a manually-operated, normally-open switch. When closed (or energized), the timer will override the NSB circuit to provide normal comfort cooling or heating in the zone for up to two hours.

# Start-Up

## Preparation for Start-Up

### System Cleaning and Flushing

Cleaning and flushing the Water Source Heat Pump System-when correctly done-is the single most important step to ensuring proper start-up and the continued efficient operation of the system.

Carefully follow the instructions provided below to properly clean and flush the system:

**WARNING: BEFORE SERVICING THE UNIT, OPEN UNIT DISCONNECT TO PREVENT INJURY OR DEATH DUE TO ELECTRICAL SHOCK OR CONTACT WITH MOVING PARTS.**

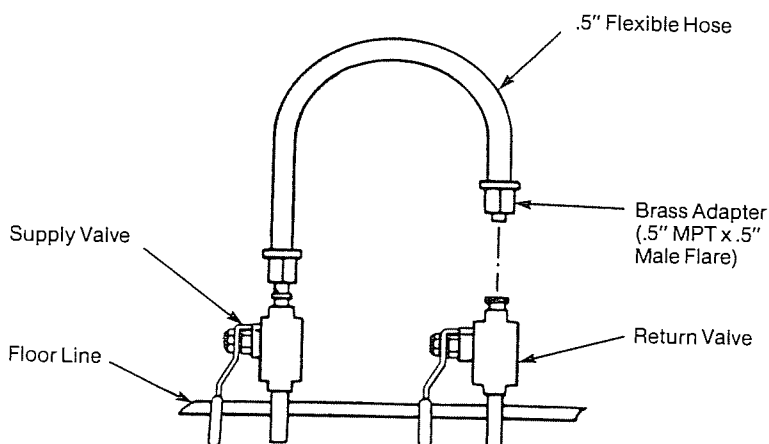
1. Install the system with the supply hose connected directly to the return riser valve; this can be accomplished with a single length of flexible hose, as illustrated in Figure 7.  
**Note:** Substitute two lengths of flexible hose joined together with a field-supplied, standard NPT coupling and the flare-fitting-to-pipe adapters provided with the hose kit (Figure 8) whenever one length of hose is too short (i.e., the resulting connection would exceed the minimum bend radius of the hose).
2. Verify that electrical power to the units is disconnected, and that the heat rejector is de-energized.
3. Fill the system with water, leaving the air vents open. Watch to see that all of the air is bled from the system; at the same time, prevent any over low of water. Check the system for leaks and repair appropriately.
4. Check and adjust the water/air level in the expansion tank.
5. Start the pumps—with the strainers in place—and systematically check each vent to ensure that all of the air is bled from the system. Verify that make-up water is available and adjusted properly to replace the space taken up by the air.

Again, check for system leaks and repair any that are apparent before proceeding.

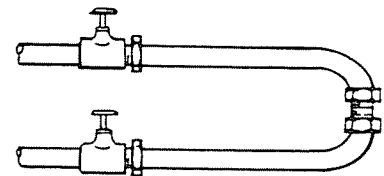
6. Set the boiler to raise the loop temperature to approximately 85° F. Open a drain at the lowest point in the system; make sure that the make-up water replacement rate equals the rate of bleed.

Continue to bleed the system until the water appears clean—or for at least three hours-whichever is longest; then, completely drain the system.

**Figure 7.**  
Temporary Connection for  
Flushing System Piping



**Figure 8.**  
Alternate Connection Method: Flare-by-Flare  
Adapter to Join Hoses



**Note:**  
Use standard coupling (field-supplied) and hose adapters to join 2 hoses.

7. 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.  
 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 if necessary. (Many contractors repeat this operation-i.e., filling and dumping—as many as eight times to ensure system water cleanliness.)
8. Remove the short-circuited hoses, and reconnect the hoses to the proper supply and return connections on each of the WSHP units. Then, refill the system and remove all of the air.  
 Test the system pH with litmus paper, and leave the system water slightly alkaline (i.e., pH 7.5 to 8.5). If the system continues to be acidic, appropriate chemicals must be added.  
**CAUTION:** At no time should "Stop-Leak" or any similar chemical agent be used in this system. Addition of such chemicals to the loop water will foul the system and inhibit unit operation.
9. After the system is successfully cleaned and flushed, set up the controls to properly maintain loop temperatures; then, check the main system panels, safety cutouts, and alarms.

### System Checkout

After completing the installation (including system cleaning and flushing) of the Water Source Heat Pump System, a series of system checks and recordings of system parameters must be made. An outline of these system checks is provided below, and covers only the most essential aspects of the system. A much more complete checklist is provided in the "Water Source Heat Pump System Start-Up and Inspection Sheet" found near the end of this manual. The installing contractor should use this form to ensure that the system check out and start-up inspections are conducted properly.

In addition, the installing contractor should also complete the abbreviated "Installation Checklist" at the back of this booklet and return it to the local Climate Master Sales Office.

- [ ] 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; see Table 5. (When conducting this check, be sure to verify the proper heating and cooling set-points as well.)

**Table 5  
Console WSHP Operating Limits**

Constraint	Minimum	Normal	Maximum
Power Supply Voltage: <sup>1</sup> 208-230/60/1 265/60/1	197 240	208-230 265	252 290
Entering Air Temperature: <sup>2</sup> Wet Bulb (Cooling) Dry Bulb (Heating)	57 F 50 F	61-67 F 65-75 F	75 F 80 F
Entering Water Temperature: Cooling Heating	60 F 60 F	80-90 F 65-75 F	95 F 95 F
Surrounding Ambient	40 F DB	70-75 F DB 61-65 F WB	80 F DB 70 F WB
Water Pressure (Excluding Hose Kits)	—	—	400 Psig

**Notes:**

1. Voltage utilization range complies with ARI Standard 110.
2. When using 100 percent outside air as a source of ventilation, a 40 F DB minimum and a 78 F WB are acceptable, but the cabinet may sweat during hot weather.
3. Determination of operating limits is dependent primarily upon 3 factors: (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 should be at normal levels to ensure proper unit operation.
4. Extreme variations in temperature and humidity, and corrosive water or air will adversely affect unit performance, reliability and service life.

- [ ] 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 for 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 and 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 condenser 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.  
Climate Master 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 Unit 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:

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 cycle.** 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 Console WSHP units.

**Note:** Three factors determine the operating limits of a Console WSHP 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. Turn the built-in thermostat dial on the unit control panel to the coolest position, and press the HI COOL button. Both the fan and compressor should run.

**For heat pumps equipped with an optional, accessory MCO thermostat,** adjust the thermostat temperature indicator to the lowest setting, and the selector switch to COOL. At this time, both the fan and compressor should run.

**For heat pumps equipped with an optional, accessory ACO thermostat,** set the thermostat temperature indicators to the far left position, and the selector switch to AUTO. At this time, both the fan and the compressor should run.

- b. Check for cool air delivery at the registers or 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 after checking cooling cycle operation.**

**Note:** Console WSHP heat pumps are designed to start heating at a minimum return air temperature of 50 F with a normal water flow rate and ambient temperature.

- a. Turn the built-in thermostat dial on the unit control panel to the warmest position, and press the HI HEAT button. Both the fan and compressor should run.

If the unit is equipped with an optional, accessory MCO thermostat, adjust the thermostat temperature indicator to the highest setting and set the selector switch to HEAT; both the fan and the compressor should run.

If the unit is equipped with an optional, accessory ACO thermostat, set the thermostat temperature indicator levers to the far right position with the selector switch still set on AUTO; both the fan and compressor should run.

- b. Once the unit has begun to run, check for warm air delivery at the registers or unit grille. Again, the installing contractor should note the room identification of any machines that do 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.
- 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.

When the unit is in the cooling mode, the leaving water temperature is approximately 12 to 15 F warmer than that of the entering water (at the application flow rate of 2 to 2.5 gpm/ton). The temperature differential across the coil during cooling operation is 20 F.

During the heating cycle, the leaving water temperature is approximately 6 to 8 F cooler than that of the entering water (at the recommended application flow rate). The temperature differential across the coil is 30 F during the heating mode.

- 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

### Maintenance Procedures

Perform the maintenance procedures outlined below at the intervals indicated.

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

- [ ] Inspect filters every three months.

A regular maintenance schedule is recommended, and the frequency of filter cleaning depends upon the type of occupancy (e.g., hotel, office, school).

**CAUTION:** To avoid fouled machinery and extension 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 a Console WSHP unit simply slide the filter out of its frame located in the return air opening at the bottom front of the unit. When installing the filter, be sure to use the slide-in rails of the filter frame to guide the filter into the proper position.

### CLEANING FILTERS

Remove excess dust and lint by rapping dirty side down or by vacuuming. Clean filters by flushing with a stream of water from both the exhaust and intake side. If filters are extremely dirty or linted, fill container with warm water and mild detergent, and "swish" filters in water. Rinse clean and allow to dry before recoating with RP Super Filter Coat.

- [ ] **Check condensate drain pans for algae growth at three-month intervals.**

When algae growth is apparent, consult a water treatment specialist for proper chemical treatment. Typically, the application of an algicide every three months will eliminate algae problems in most locations.

- [ ] **Lubricate fan motors annually.**

All Climate Master heat pumps are fully lubricated when shipped from the factory; **do not oil initially.**

- [ ] **Visually inspect the unit at least once each year.**

When inspecting each Console WSHP unit, give special attention to the hose assemblies; note any signs of deterioration or cracking, and repair any leaks immediately.

- [ ] **Conduct an amperage check annually on the compressor and fan motor.**

- [ ] Amperage draw on this equipment should not exceed normal full load or rated load amps by more than 10 percent of the values noted on the unit nameplate. Record the values obtained in this check in a log book so that a deteriorating condition in a fan motor or compressor can be detected prior to component failure.

- [ ] **Clean the heat exchangers at least once each year (or more frequently if the unit is located in a "dirty" environment) to help maintain proper unit operating efficiency.**

### Safety Control Reset

All Climate Master heat pumps are furnished with high-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 Console WSHP units is designed to open its contacts at 380 psi and automatically reclose them at 300 psig, while the contacts of the low-temperature switch open at 35 F and reclose at 50 F. A lockout relay is electrically linked with these cutouts, and interrupts unit heating or cooling operation until the machine is reset manually.

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

**Note:** If the unit must be reset more than twice, be sure to check it for a dirty filter, abnormal entering water temperature, inadequate or excessive water flow, and internal malfunctions; then contact a trained service technician.

# Console 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 \_\_\_\_\_  
Sales Order No. \_\_\_\_\_  
Sales Engineer \_\_\_\_\_  
Sales Office \_\_\_\_\_  
Telephone \_\_\_\_\_

Job Location \_\_\_\_\_  
Installing Contractor \_\_\_\_\_  
Bldg. Maintenance Mgr. \_\_\_\_\_  
Engineer \_\_\_\_\_

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 Climate Master Sales Office.

Job Name \_\_\_\_\_  
Sales Order No. \_\_\_\_\_  
Sales Engineer \_\_\_\_\_  
Sales Office \_\_\_\_\_  
Telephone No. \_\_\_\_\_

Job Location \_\_\_\_\_  
Installing Contractor \_\_\_\_\_  
Engineer \_\_\_\_\_  
Bldg. Maintenance Mgr. \_\_\_\_\_

## Essential Items Checkout

- 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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Continuing engineering research results in steady improvements. Therefore, these specifications are subject to change without notice.

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