CLIMATEMASTER®

Ultra Classic

HIGH EFFICIENCY GEOTHERMAL COMFORT

Ultra Classic (VT) Series Residential Vertical Two-Stage Geothermal Heat Pumps

Installation, Operation & Maintenance Instructions

69197343

Revision: 07/07/05D

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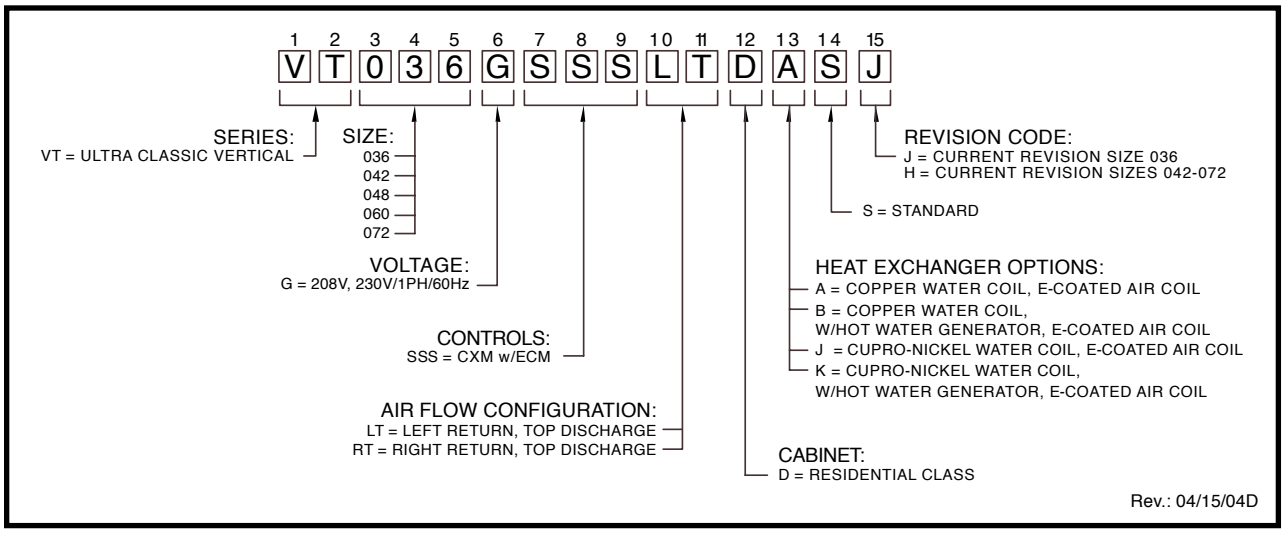
GENERAL INFORMATION

Model Nomenclature



Inspection

Upon receipt of the equipment, carefully check the shipment against the bill of lading. Make sure all units have been received. Inspect the carton or crating of each unit, and inspect each unit for damage. Assure the carrier makes proper notation of any shortages or damage on all copies of the freight bill and he completes a common carrier inspection report. Concealed damage not discovered during unloading must be reported to the carrier within 15 days of receipt of shipment. ***If not filed within 15 days, the freight company can deny the claim without recourse.*** **Note: It is the responsibility of the purchaser to file all necessary claims with the carrier.** Notify the ClimateMaster Customer Service of all damage within fifteen (15) days of shipment.

Introduction

ClimateMaster UltraClassic Geothermal Heat Pump units are typically installed in a floor level closet, basement, or in a small mechanical room. The installation site chosen for these units must allow adequate clearance for maintenance and servicing of the unit without its removal from the installation location.

Storage

CAUTION: DO NOT store or install 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. Always move units in an upright position. Tilting units on their sides may cause equipment damage.

Equipment should be stored in its shipping carton in a clean, dry area. Store units in an upright position at all times. Stack vertical units a maximum of 2 units high. **DO NOT remove equipment from shipping cartons until equipment is required for installation.**

Unit Protection

Cover 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 spraying has not been completed, all due precautions must be taken to avoid physical damage to the units and contamination by foreign material. Physical damage and contamination may prevent proper start-up and may result in costly equipment cleanup.

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

GENERAL INFORMATION

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 the system before operation.

Prepare units for installation as follows:

1. Compare the electrical data on the unit nameplate with ordering and shipping information to verify the correct unit has been shipped.
2. Keep the cabinet covered with the shipping carton until installation is complete and all plastering, painting, etc., is finished.
3. Verify 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.

⚠ WARNING

Remove Fan Motor shipping bracket in rear of Air Handler compartment.

⚠ WARNING

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

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

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

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

The installation of geothermal heat pump units and all associated components, parts and accessories which make up the installation shall be in accordance with the regulations of ALL authorities having jurisdiction and MUST conform to all applicable codes. It is the responsibility of the Installing Contractor to determine and comply with ALL applicable codes and regulations.

Table 1: Physical Data

MODEL	036	042	048	060	072
Fan Wheel (Dia. X Width), in.	9 X 7	11 X 10		11 X 10	
Fan Motor & HP	ECM - 1/2	ECM - 1/2	ECM - 1	ECM - 1	
No. Refrigerant Circuits	2	2	2	2	2
Compressors	2 - Rotary	2 - Scroll		2 - Scroll	
No. Coaxial Heat Exchangers	2	2	2	2	2
R - 22 Charge (Sys A / Sys B), oz	40 / 40	57 / 59	62 / 62	54 / 54	58 / 58
Water Connection Size (fpt swivel)	1"	1"	1"	1"	1"
Air Coil Length x Height, in.	20 X 24	24 X 24	24 X 32	24 X 36	24 X 36
Filter - 1" ElectroStatic (Std.)	24 x 24	27 x 31	27 x 31	27 x 35	27 x 35
Weight - Operating (lbs.)	225	275	305	385	450
Weight - Packaged (lbs.)	235	285	315	395	460

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All units have txv expansion devices, 20 ga sheet metal, and 7/8" & 1-1/8" electrical knockouts.

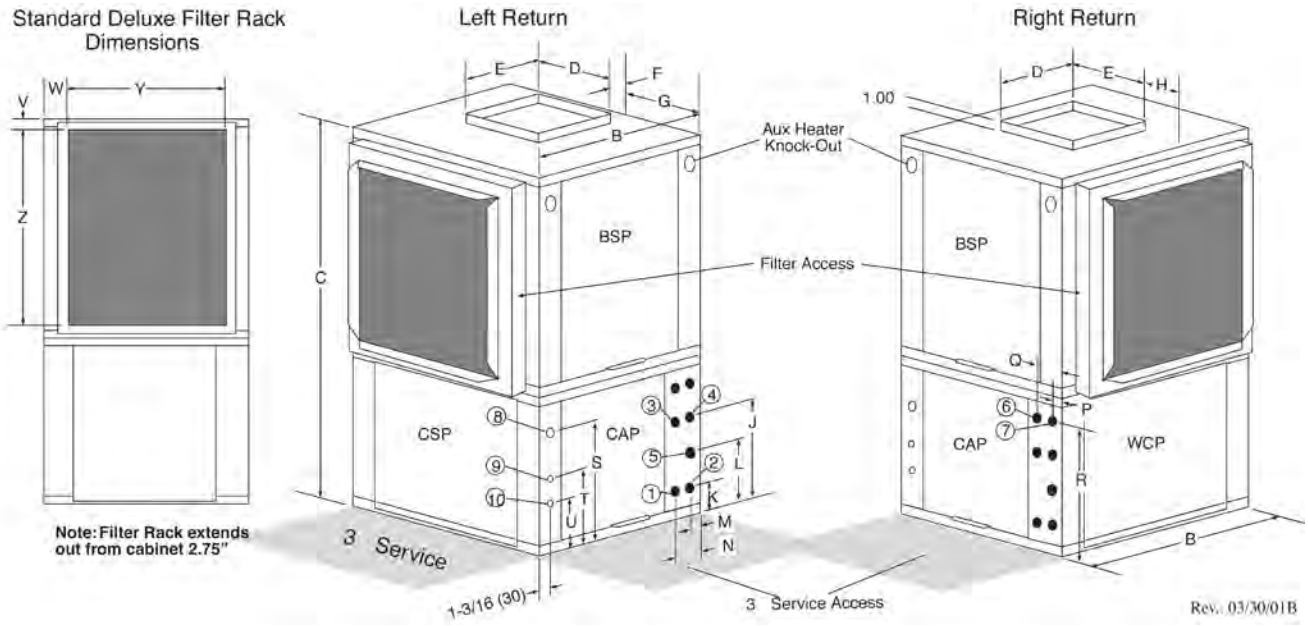
All units have dual 1" Swivel water connections (4 total)

HWG utilizes 1/2" fpt water connections and is available only on circuit A.

All units have 3/4" fpt condensate drain connections.

INSTALLATION

Physical Dimensions



Legend

1	Water Inlet for Circuit A - 1" FPT Swivel Connection
2	Water Inlet for Circuit B - 1" FPT Swivel Connection
3	Water Outlet for Circuit A - 1" FPT Swivel Connection
4	Water Outlet for Circuit B - 1" FPT Swivel Connection
5	Condensate - 3/4" FPT Connection
6	Hot Water Generator Inlet for Circuit A - 1/2" FPT
7	Hot Water Generator Outlet for Circuit A - 1/2" FPT
8	Low voltage thermostat knockout for 1/2" conduit
9	External Pump Power Imockout for 1/2" conduit
10	Unit power knockout for 3/4" conduit

Abbreviations

CAP	Control Access Panel
BSP	Blower Service panel
CSP	Compressor Service panel
WCP	Water Circuit Access Panel

Model		Overall Cabinet			Discharge Connection (duct flange installed (±0.10 in)					Water Connections								Electrical Knockouts			Return Connection (using std deluxe filter rack (±0.10 in)			
										Water and Condensate					Hot Water Generator									
		A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	Y	Z
		Width	Depth	Height	Supply Depth	Supply Width				Water Out	Water In	Cond-ensate					HWG	Power Supply	Ext Pump	Low Voltage			Return Width	Return Height
036	inches	25	25	51 1/2	13 15/16	13 15/16	1	5 1/2	5	14	2 7/8	8 7/8	2 1/2	5 1/2	1 3/4	6	22 5/8	12 1/8	9 5/8	8	2	1 7/8	21 3/4	21 3/4
	mm	635	635	1308	354	354	25	140	127	356	73	225	64	140	44	152	575	308	244	203	51	48	552	552
042	inches	28 1/8	28 1/8	59 1/2	17 15/16	17 15/16	2 5/8	5	5 1/8	17 5/8	2 7/8	8 7/8	2 1/8	5 3/4	1 1/2	6 1/4	22 5/8	12 1/8	9 5/8	8	2	1 7/8	24 5/8	29 3/8
	mm	714	714	1511	456	456	67	127	130	448	73	225	54	146	38	159	575	308	244	203	51	48	626	746
048	inches	28 1/8	28 1/8	59 1/2	17 15/16	17 15/16	2 5/8	5	5 1/8	17 5/8	2 7/8	8 7/8	2 1/8	5 3/4	1 1/2	6 1/4	22 5/8	12 1/8	9 5/8	8	2	1 7/8	24 5/8	29 3/8
	mm	714	714	1511	456	456	67	127	130	448	73	225	54	146	38	159	575	308	244	203	51	48	626	746
060	inches	28 1/8	28 1/8	63 3/8	17 15/16	17 15/16	2 5/8	5	5 1/8	17 5/8	2 7/8	8 7/8	2 1/8	5 3/4	1 1/2	6 1/4	22 5/8	12 1/8	9 5/8	8	2	1 7/8	24 5/8	33 3/8
	mm	714	714	1610	456	456	67	127	130	448	73	225	54	146	38	159	575	308	244	203	51	48	626	848
072	inches	28 1/8	28 1/8	63 3/8	17 15/16	17 15/16	2 5/8	5	5 1/8	17 5/8	2 7/8	8 7/8	2 1/8	5 3/4	1 1/2	6 1/4	22 5/8	12 1/8	9 5/8	8	2	1 7/8	24 5/8	33 3/8
	mm	714	714	1610	456	456	67	127	130	448	73	225	54	146	38	159	575	308	244	203	51	48	626	848

Vertical unit shipped with deluxe duct collar/filter rack extending from unit 2.75" and is suitable for duct connection.
Discharge flange is field installed

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INSTALLATION

General Unit Location

Locate the unit in an indoor area that allows easy removal of the filter and access panels, and has enough space for service personnel to perform maintenance or repair. Provide sufficient room to make water, electrical and duct connection(s). If the unit is located in a confined space, such as a closet, provisions must be made for return air to freely enter the space by means of a louvered door, etc. Any access panel screws that would be difficult to remove after the unit is installed should be removed prior to setting the unit. These units are not approved for outdoor installation and, therefore, must be installed inside the structure being conditioned. Do not locate in areas where ambient conditions are not maintained with 40-100°F and up to 75% relative humidity.

Vertical Units Location and Access

Vertical Units are typically installed in a floor level closet, basement, or in a small mechanical room. Install units with adequate clearance to allow maintenance and servicing. Conform to the following guidelines when selecting unit location:

1. Provide adequate clearance for filter replacement and drain pan cleaning. Do not block filter access with piping, conduit or other materials. Refer to the unit catalog for Vertical Unit Dimensions.
2. Provide access for fan and fan motor maintenance and for servicing the compressor and coils without removing the unit. **Note: UltraClassic compressor and refrigerant circuit service requires that left side access be provided.**
3. Provide an unobstructed path to the unit within the closet or mechanical room. Space should be sufficient to allow removal of the unit, if necessary.
4. Provide access to water valves and fittings and screwdriver access to the unit side panels, discharge collar and all electrical connections.

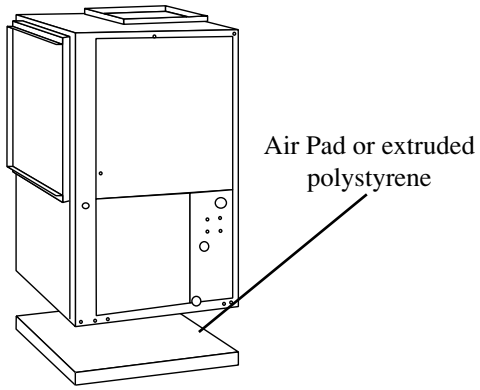
Setting Vertical Units

Vertical units are available in left or right air return configurations. Vertical units should be mounted level on a vibration absorbing pad or extruded polystyrene slightly larger than the base to provide isolation between the unit and the floor. It is not necessary to anchor the unit to the floor (see Figure 1a).

Duct System

A field installed air outlet bracket is provided on vertical units to facilitate duct connection. A flexible connector is recommended for both discharge and return air duct connections on metal duct systems. Uninsulated duct should be insulated with a minimum of one-inch duct insulation. Application of the unit to uninsulated ductwork in an unconditioned space is not recommended as the unit's performance will be adversely affected.

Figure 1a: Vertical unit mounting



If the unit is connected to existing ductwork, a previous check should have been made to assure the ducts have the capacity to handle the air required for the unit. If ducting is too small, as in the replacement of heating only systems, larger ductwork should be installed. All existing ductwork should be checked for leaks and repaired as necessary.

The duct system should be sized to handle the design airflow quietly. To maximize sound attenuation of the unit blower, the supply and return plenums should include internal duct liner of glass fiber or be of ductboard construction for the first few feet. If air noise or excessive air flow is a problem, the airflow can be changed. See the Blower Performance and Fan Speed sections for further instruction (See Page 14).

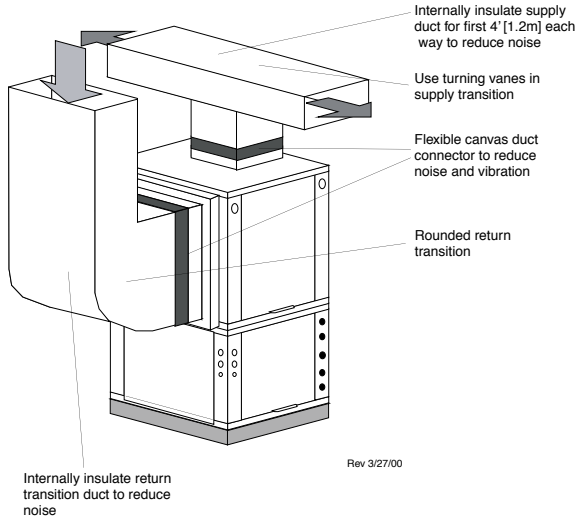
Air Coil

To obtain maximum performance, the air coil should be cleaned before start-up. A 10% solution of dishwasher detergent and water is recommended for both sides of coil, a thorough water rinse should follow.

Water Connections

The UltraClassic Heat Exchanger water connections are swivel piping fittings that accept a 1" Male Pipe Thread (MPT) connector. The swivel connector has a rubber gasket seal similar to a garden hose gasket, which when mated to the flush end of any 1" threaded pipe provides a leak-free seal without the need for thread sealing tape or compound. Check to insure that the rubber seal is in the swivel connector prior to attempting any connection. (The rubber seals are shipped attached the swivel connector.) DO NOT OVERTIGHTEN or leaks may occur.

Never use flexible hoses smaller than 1" inside diameter on the unit and limit hose length to 10 ft. per connection. Check carefully for water leaks. Figure 3 shows a manifold being used in an earth loop application. Flow (pressure drop) and temperature measurements in the configuration will represent the total flow going through both coaxes regardless of which refrigerant circuits are active. Figure 4 illustrates a well system using individual connections. Flow and temperature measurements will represent each refrigerant circuit.



To make the connection to a ground loop system, mate the brass loop connection against the rubber gasket in the swivel connector, and thread the female locking ring onto the pipe threads, while maintaining the brass connector in the desired direction (see Figure 2). Tighten the connectors by hand to provide a leak proof joint. When connecting to an open loop (ground water) system, thread any 1" MPT fitting (PVC or copper) into the swivel connector and tighten in the same manner as noted above. The open and closed loop piping system must include pressure/temperature taps for serviceability.

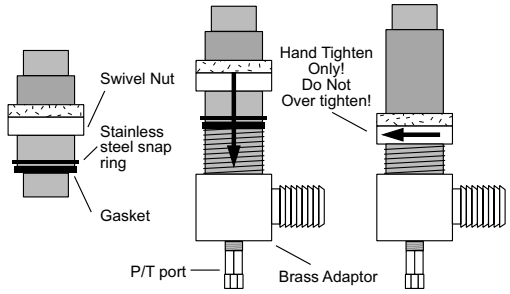


Figure 2: The Female Locking Ring is threaded onto the pipe threads which holds the male pipe end against the gasket, and seals the joint. HAND TIGHTEN ONLY! DO NOT OVERTIGHTEN!

Condensate Drain

Each unit utilizes a condensate hose inside the cabinet as a trapping loop, therefore an external trap is not necessary. Figure 5 shows typical condensate connections.

Each unit must be installed with means to flush or blowout the condensate drain line. Do not install units with a common trap and/or vent.

Install a vent in the condensate line of any application which may allow dirt or air to collect in the line. Always vent when the application requires a long, horizontal run. When some sagging in the condensate line may be anticipated (as in a long line of plastic pipe) or when "double trapping" may occur. Also vent when large units are working against higher external static pressure that other units connected to the same condensate main since this may cause poor drainage for all units on the line.

Figure 3: Loop Piping using a manifold

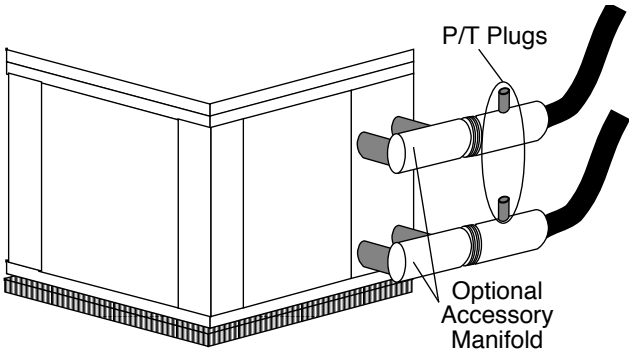


Figure 4: Well Piping using a individual connections

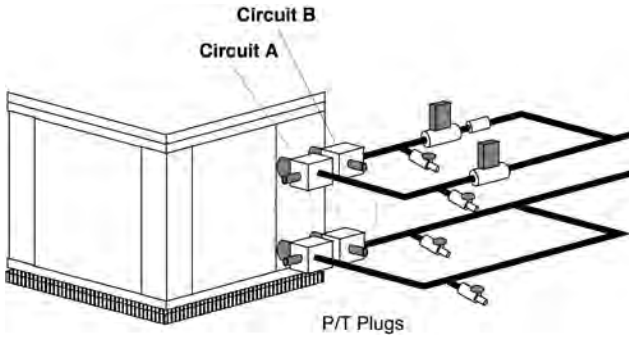
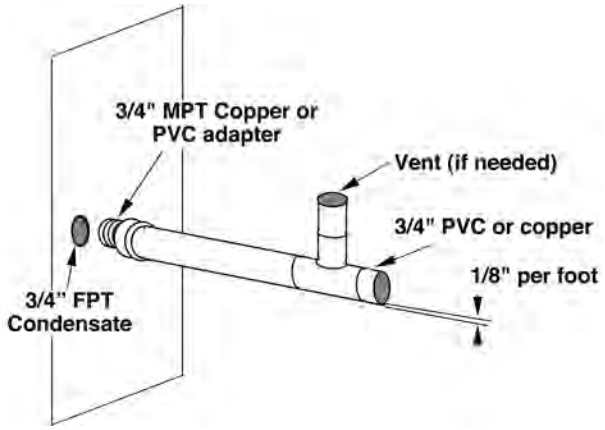


Figure 5: Typical drain connection



GROUND LOOP APPLICATION

Piping Installation

The typical closed loop ground source system is shown in Figure 10. All earth loop piping materials should be limited to only polyethylene fusion in inground sections of the loop and galvanized or steel fitting should not be used at any time due to their tendency to corrode. All plastic to metal threaded fittings should be avoided as well due to their potential to leak in earth coupled applications and a flanged fitting substituted. P/T plugs should be used so that flow can be measured using the pressure drop of the unit heat exchanger in lieu of other flow measurement means. Earth loop temperatures can range between 25-110°F and 2.25 to 3 gpm of flow per ton of cooling capacity is recommended in these applications. Upon completion of the ground loop piping, pressure test the loop to assure a leak free system.

Horizontal Systems: Test individual loops as installed. Test entire system when all loops are assembled.

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.

Table 2: Approximate Fluid Volume (gal.) per 100' of Pipe

Pipe	Size	Volume
Copper	1"	4.1
	1.25"	6.4
	1.5"	9.2
Rubber Hose	1"	3.9
Polyethylene	3/4" IPS SDR11	2.8
	1" IPS SDR11	4.5
	1 1/4" IPS SDR11	8.0
	1 1/2" IPS SDR11	10.9
	2" IPS SDR11	18.0
	1 1/4" IPS SCH40	8.3
	1 1/2" IPS SCH40	10.9
	2" IPS SCH40	17.0
Unit Heat Exchanger	Typical	1.0
Flush Cart Tank	10" diam x 3 ft	10.0

Flushing the Earth Loop

Once piping is completed between the unit, flow center and the ground loop (Figure 10), final purging and charging of the loop is needed. A flush cart (at least a 1.5 hp pump) is needed to achieve adequate flow velocity in the loop to purge air and dirt particles from the loop itself. Antifreeze solution is used in most areas to prevent freezing. All air and debris must be removed from the earth loop piping system before operation. Flush the loop with a high volume of water at a high velocity (2 fps in all piping), both directions. The steps below must be followed for proper flushing. Fill loop with water from a garden hose through flush cart before using flush cart pump to ensure an even fill. Once full, do not allow the water level in the flush cart tank to drop below the pump inlet line or air can be pumped back out to the earth loop. Try to maintain a fluid level in the tank above the return tee so that air can not be continuously mixed back into the fluid. 50 psi surges can be used to help purge air pockets by simply shutting off the return valve going into the flush cart reservoir. This "dead heads" the pump to 50 psi. To purge, dead head the pump until maximum pumping pressure is reached. Open the return valve and a pressure surge will be sent through the loop to help purge air pockets from the piping system. Notice the drop in fluid level in the flush cart tank. **Note: If air is purged from the system, the level will drop only 1-2 inches in a 10" diameter PVC flush tank (about a half gallon) since liquids are incompressible**. If the level drops more than this, flushing should continue since air is still being compressed in the loop fluid. Do this "dead head" procedure a number of times.

When the fluid level is dropping less than 1-2" in a 10" diameter tank the flow can be reversed. Finally the dead head test should be checked again for an indication of air in the loop. **Note: This fluid level drop is your only indication of air in the loop.**

Table 3: Antifreeze Percentages by Volume

Type	Minimum Temperature for Freeze Protection			
	10°F	15°F	20°F	25°F
Methanol	25%	21%	16%	10%
100% USP food grade Propylene Glycol	38%	30%	22%	15%

GROUND LOOP APPLICATION

Antifreeze may be added before, during or after the flushing procedure. However, depending upon which time is chosen, antifreeze could be wasted when emptying the flush cart tank. See antifreeze section for more details. Loop static pressure will fluctuate with the seasons. Pressures will be higher in the winter months than during the cooling season. This fluctuation is normal and should be considered when charging the system initially. Run the unit in either heating or cooling for a number of minutes to condition the loop to a homogenous temperature. This is a good time for tool cleanup, piping insulation etc. Then final flush and pressurize the loop to a static pressure of 40-50 psi (winter) 15-20 psi (summer).

After pressurization, be sure to remove the plug in the end of the Grundfos loop pump motor(s) to allow trapped air to be discharged and to insure the motor housing has been flooded. This is not required for Taco circulators. Insure the loop flow center provides adequate flow through the unit by checking pressure drop across the heat exchanger and comparing it to the figures shown in Table 12.

Antifreeze

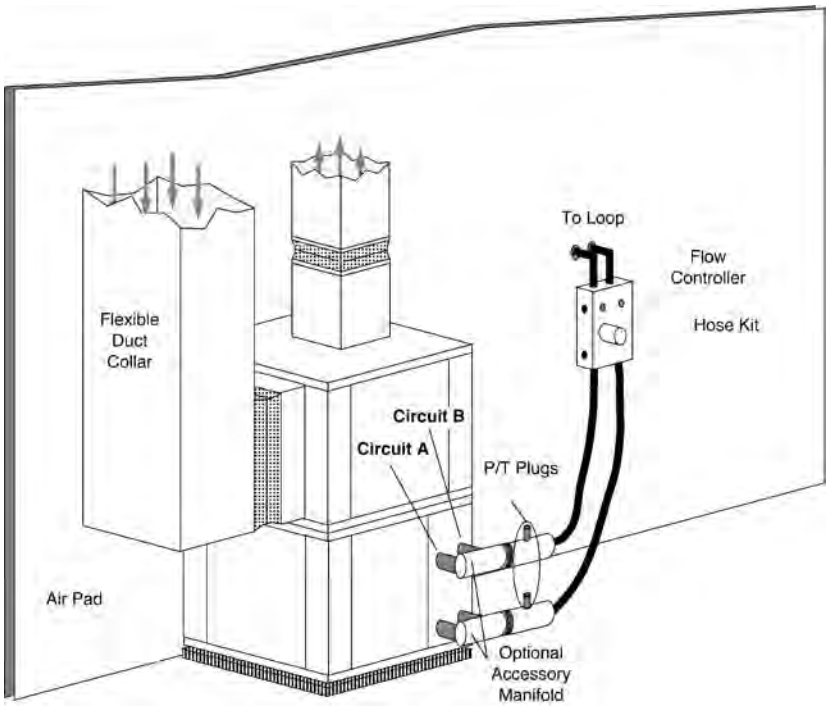
In areas where minimum entering loop temperatures drop below 40°F or where piping will be routed through areas subject to freezing, anti-freeze is needed. Alcohols and glycols are commonly used as antifreezes, however your local territory manager should be consulted for the antifreeze best suited to your area. Freeze protection should be maintained to 15°F below the lowest expected entering loop temperature. For example, if 30°F is the minimum expected entering loop temperature, the leaving loop temperature would be 25-22°F and freeze protection should be at 15°F (30°F-15°F=15°F). All alcohols should be premixed and pumped from a reservoir outside of the building when possible or introduced under water level to prevent fuming. Initially calculate the total volume of fluid in the piping system using Table 2. Then use the percentage by volume shown in Table 3 for the amount of antifreeze. Antifreeze concentration should be checked from a well mixed sample using a hydrometer to measure specific gravity. See Flow Controller IOM for more information.

Freeze Protection Setting

CXM or DXM Control:

When an antifreeze is selected, the FP1 jumper (JW3) should be clipped to select the low temperature (Antifreeze 10°F) setpoint to avoid nuisance faults. See Freeze Protection Selection. Valves should be included in case of servicing. Boiler drains or other valves should be "tee'd" in the line to allow acid flushing of just the heat exchanger. Pressure temperature plugs should be used so that flow and temperature can be measured. The water freezestat should be wired. Piping materials should be limited to PVC SCH80 or copper. **Note: Due to the pressure and temperature extremes, PVC SCH40 is not recommended.**

Figure 10: Typical Closed Loop System.



OPEN LOOP - WELL WATER SYSTEMS

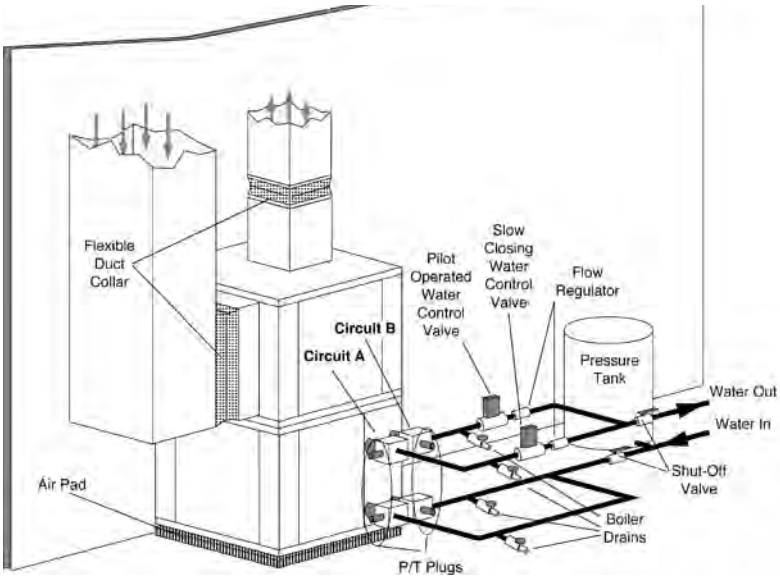
Water Quality

Water quality should be plentiful and of good quality. Table 4 shows recommended water quality guidelines. The unit can be ordered with either a copper or cupro-nickel water heat exchanger. Copper is recommended for closed loop systems and open loop ground water systems that are not high in mineral content or corrosiveness. In conditions anticipating heavy scale formation or in brackish water, a cupro-nickel heat exchanger is recommended. In ground water situations where scaling could be heavy or where biological growth such as iron bacteria will be present, a closed loop system is recommended. Heat exchanger coils may over time lose heat exchange capabilities due to a build up of mineral deposits inside. These can be cleaned only by a qualified service mechanic as acid and special pumping equipment are required. **Note: Desuperheater coils can likewise become scaled and possibly plugged. In areas with extremely hard water, the home owner should be informed that the heat exchanger may require occasional acid flushing.**

Expansion Tank

Use a closed, bladder-type expansion tank to minimize mineral formation due to air exposure. The expansion tank should be sized to handle at least one minute run time of the pump to prevent premature pump failure using its drawdown capacity rating. The pump should be sized to the home's domestic water load (5-9 gpm) plus the heat pump water load. Discharge water from the unit is not contaminated in any manner and can be disposed of in various ways, depending on local building codes, i.e. recharge well, storm sewer, drain field, adjacent stream or pond, etc. Most local codes forbid the use of sanitary sewer for disposal. Consult your local building and zoning department to assure compliance in your area.

Figure 11: Typical Well Water/Open Loop System



Water Control Valve

Note the placement of the water control valve. Always maintain water pressure in the heat exchanger by placing water control valves at the outlet of the unit to prevent mineral precipitation. Pilot operated slow closing valve's solenoid valves are recommended to reduce water hammer. If water hammer persists, a mini-expansion tank can be mounted on the piping to help absorb the excess hammer shock. Insure that the total "VA" draw of the valve can be supplied by the unit transformer. For instance the slow closing valve can draw up to 35VA. This can overload smaller 40 or 50 VA transformers depending on the other controls employed. A typical pilot operated solenoid valve draws approximately 15VA. Note the wiring diagram in Figure 20.

Flow Regulation

Flow regulation can be accomplished by two methods. Most water control valves have a flow adjustment built in. By measuring the pressure drop through the unit heat exchanger flow rate can be determined and compared to Table 9. Since the pressure is constantly varying two pressure gauges might be needed. Simply adjust the water control valve until the desired flow of 1.5 to 2 gpm per ton is achieved. Secondly a flow control device may be installed. The devices are typically an orifice that is designed to allow a specified flow rate. These are mounted on the outlet of the water control valve. On occasion these valves can produce a velocity noise that can be reduced by applying some back pressure. This is accomplished by slightly closing the leaving isolation valve of the well water setup.

Freeze Protection Setting

CXM or DXM Control:

When well water is used, the FP1 jumper (JW3) should NOT be clipped, but should be left in the factory position of water setting (30°F). See Freeze Protection Selection.

Table 4: Water Quality Standards

Acidity pH	7 to 9 range for copper. Cupro-nickel may be used in the 5-9 range.		
Total Hardness	Calcium and magnesium carbonate should not exceed 20 grains per gallon (350 ppm)		
Iron Oxides	Less than 1 ppm		
Iron Bacteria	No level allowable		
Corrosiveness		*Max Allowable Level*	*Coax Mtl*
	Ammonia, Ammonium hydroxide	0.5 ppm	Cu
	Ammonium chloride, Ammonium nitrate	0.5 ppm	Cu
	Ammonium Sulfate	0.5 ppm	Cu
	Chlorine/Chlorides	0.5 ppm	CuNi
	Hydrogen Sulfide (rotten egg smell)	None Allowable	-
Brackish	Use Cupro-nickel heat exchanger when concentrations of calcium or sodium chloride are greater than 125 ppm are present. (Seawater is approximately 25,000 ppm)		

Note: To convert ppm to grains per gallon, divide by 17. Hardness in mg/l is equivalent to ppm

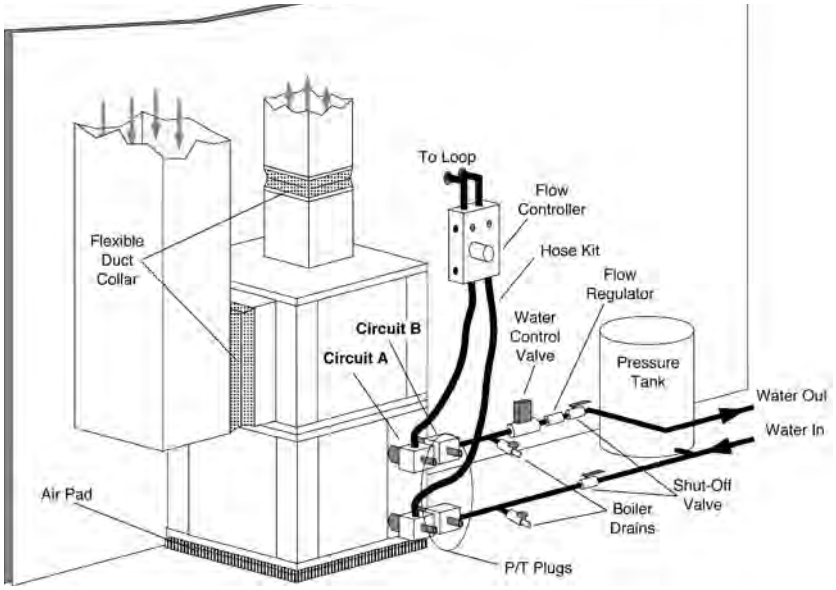
HYBRID GROUND LOOP/WELL WATER SYSTEMS

The UltraClassic dual refrigerant circuits with individual water connections for each, allows each refrigerant circuit to utilize a different ground source and benefit from a dramatically shortened earth loop as illustrated in Figure 12. For instance a 4 ton unit can utilize a 2.5 ton earth loop on circuit 1 and well or city water on circuit 2. The earth loop is used as first stage with the well or city water source used as the second circuit. Using the well as second stage greatly reduces the amount of earth loop required and limits the well or city water usage.

Note: City water rates should be examined for feasibility before installation. City water should not be used as a source in areas where water temperatures fall below 45°F. ClimateMaster should be consulted when sizing earth loops for this application because of the increased runtime on the earthloop. Traditional loop sizing will be inadequate and can result in poor performance and possibly complete failure of the system.

Pete's plugs should be installed on both systems to facilitate servicing. Standard water flows can be utilized on each circuit 2.25 - 3 gpm /ton for earth loops and 1.5-2 per ton well/city water. Each circuit should have the appropriate freezestat setting. Be sure circuit A is Earth Loop and circuit B is Well setting or City. The Ground Loop and Well System sections should be consulted for further details.

Figure 12: Typical Hybrid Loop/Well system



HOT WATER GENERATOR

The HWG (Hot Water Generator) or desuperheater option provides considerable operating cost savings by utilizing excess heat energy from the heat pump to help satisfy domestic hot water requirements. The HWG is active throughout the year, providing virtually free hot water when the heat pump operates in the cooling mode or hot water at the COP of the heat pump during operation in the heating mode. Actual HWG water heating capacities are provided in the appropriate heat pump performance data.

All Climate Master heat pumps equipped with the HWG option include a built-in water to refrigerant heat exchanger to eliminate the need to open and tie into the heat pump's refrigerant circuit in the field. The control circuit is also built in. The concentric fitting is optional. Figure 14 is a typical example of HWG water piping connections on an UltraClassic unit with a built-in pump. Using a concentric or coaxial hot water tank connection fitting eliminates the need to tie into the hot water tank cold water piping. (see Figure 16)

Typically a single tank of at least 52 gallons is used to limit installation costs and space. However, a dual tank, as shown in Figure 15, is the most efficient system providing the maximum storage and temperate source water to the desuperheater. Using a concentric hot water tank connection fitting eliminates the need to tie into the hot water tank water piping. In high liming areas (hardness>100ppm or 6 grains per gallon) the alternative piping scheme in Figure 16 may be used to eliminate the possible scaling of the smaller cross-sectioned area of the concentric fitting. It is always advisable to use water softening equipment on domestic well water systems to reduce the liming potential and lengthen equipment life. In extreme water conditions, it may be wise to not use the HWG option since the probable cost of frequent maintenance may offset or exceed any savings.

Installation

The HWG aquastat is set at 125 °F and is located on the HWG heat exchanger "Water In" line. If the HWG is connected incorrectly or if circulation is reversed, the aquastat will sense leaving water temperature and prevent HWG operation. UNDER NO CIRCUMSTANCES DISCONNECT OR REMOVE THE HWG AQUASTAT! Full load conditions could drive hot water tank temperatures far above desirable temperature levels if the aquastat has been disconnected or removed.

The heat pump, water piping, pump, and hot water tank should be located where the ambient temperature does not fall below 50 °F. Keep water piping lengths at a minimum – DO NOT use a one way length greater than 50 feet. All installations must be made in accordance with local codes. The installer is responsible for knowing the local requirements, and for performing the installation accordingly.

Figure 14: Typical UltraClassic HWG Installation

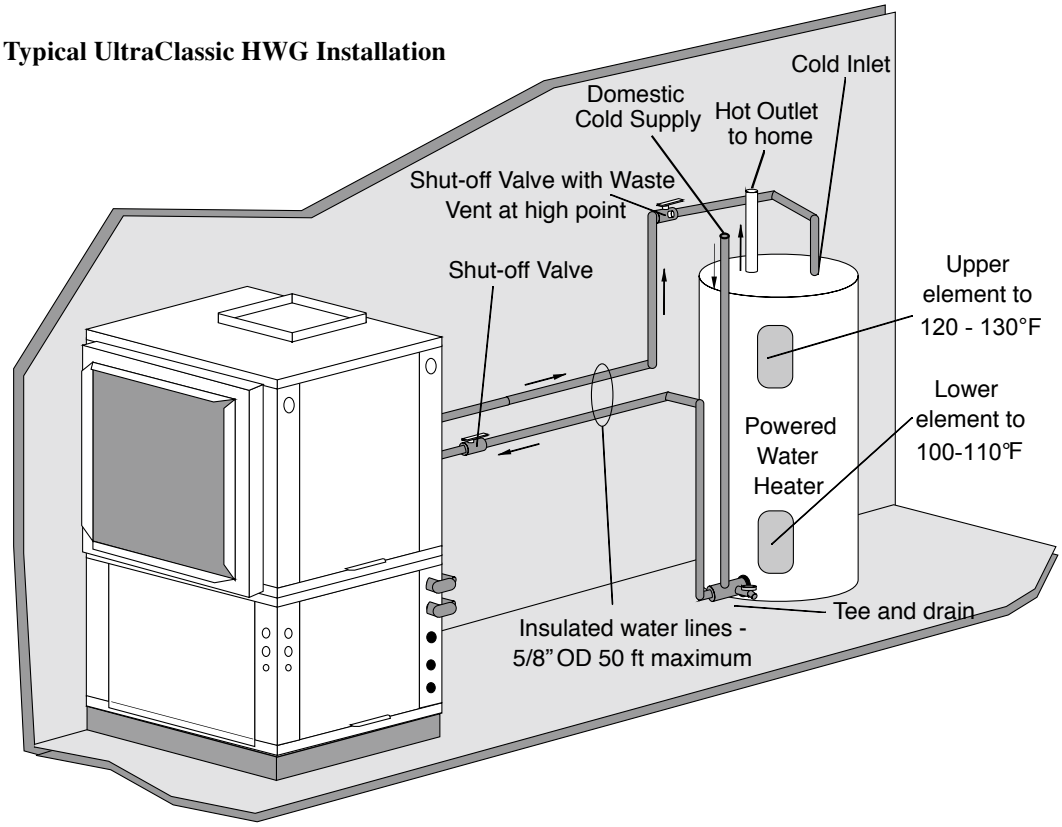
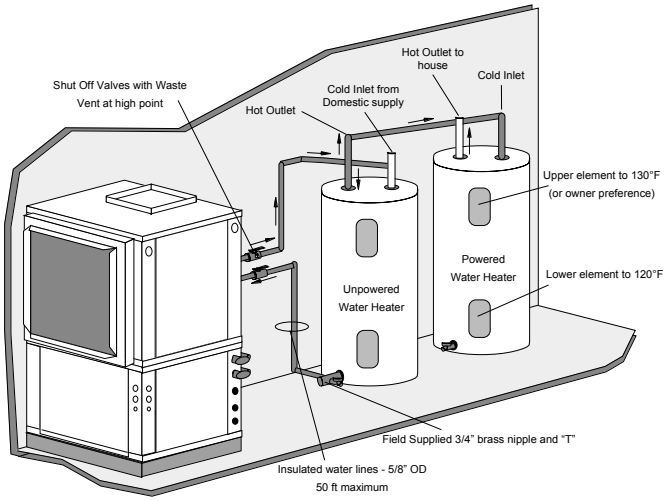


Figure 15: UltraClassic HWG Double Tank Installation



Water Tank Preparation

1. Turn off power or fuel supply to the hot water tank.
2. Connect a hose to the drain valve on the water tank.
3. Shut off the cold water supply to the water tank.
4. Open the drain valve and open the pressure relief valve or a hot water faucet to drain tank.
5. In an existing tank, once drained the tank should be flushed with cold water until the water leaving the drain hose is clear and free of sediment.
6. Close all valves and remove the drain hose.
7. Install HWG water piping.

HWG Water Piping

1. Using at least 5/8" O.D. copper, route and install the water piping, valves and air vent as shown in Figures 14, 15, or 16. When used, the air vent MUST be at the high point of the HWG water piping.
2. Insulate all HWG water piping with no less than 3/8" wall closed cell installation.
3. Open both shut off valves and make sure the tank drain valve is closed.

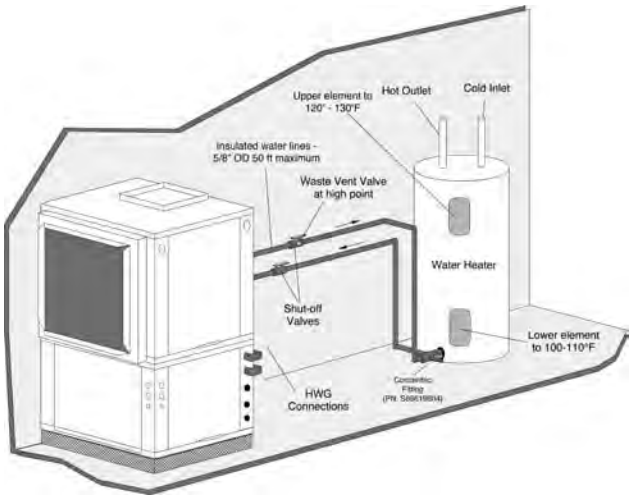
Water Tank Refill

1. Open the cold water supply to the tank.
2. Open a hot water faucet to vent air from the system until water flows from the faucet, then close.
3. Depress the hot water tank pressure relief valve handle to ensure there is no air remaining in the tank.
4. Inspect all work for leaks.
5. Before restoring the power or fuel supply to the water heater, adjust the temperature setting on the tank theremostat(s) to ensure maximum utilization of the heat available from the refrigeration system and conserve the most energy. On tanks with both upper and lower elements and thermostats, the lower element should be turned down to 100°F or lowest setting, while the upper element should be adjusted to 120°F. Depending upon the specific needs of the customer, you may want to adjust the upper element differently. On tanks with a single thermostat, lower the thermostat setting to 120°F or the "LOW" position.
6. Replace access cover(s) and restore power or fuel supply.

Initial Start-Up

1. Make sure all valves in the HWG water circuit are full open.
2. Turn on the heat pump and allow it to run for 10-15 minutes.
3. Turn the heat pump and heat pump power supply "OFF" and CONNECT POWER TO THE HWG PUMP as shown in Figure 17. On units with the internally mounted pump, connect the pump power lead as instructed on the lead tag.
4. The HWG pump should not run if the compressor is not running.
5. The temperature difference between the water entering and leaving the HWG coil should be approximately 10°F.
6. Allow the unit to operate for 20 to 30 minutes to ensure it is functioning properly.

Figure 16: Alternate UltraClassic HWG Piping



ELECTRICAL-LINE VOLTAGE

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.

WARNING

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 electrical ground, must comply with the National Electrical Code as well as all applicable local codes.

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

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

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

Table 5: Electrical Data

Model	Compressor				Fan Motor HP	Fan Motor FLA	HWG Pump Amps	Loop Pump Amps	Total FLA Amps	Minimum Circuit Ampacity	Max Fuse USA	Max Fuse Can	Min Wire AWG	Maximum Wire Length (ft.)
	Sys A		Sys B											
	RLA	LRA	RLA	LRA										
036	7.1	38	7.1	38	1/2	4.3	0.4	4.0	22.9	24.7	30	30	10	70
042	10.0	42	10.7	47	1/2	4.3	0.4	4.0	29.4	32.1	40	40	8	90
048	10.7	47	11.4	54	1.0	7.0	0.4	4.0	33.5	36.3	45	45	6	120
060	13.6	67	13.6	67	1.0	7.0	0.4	4.0	38.6	42.0	50	50	6	110
072	15.0	73	15.0	73	1.0	7.0	0.4	4.0	41.4	45.2	50	50	6	100

All units rated Voltage of 208-230/60/1. Rev.: 03/30/01B
All units Min/Max Voltage of 187/253.
HACR breaker in USA only. All fuses Class RK-5.
Wire length based on one way measurement with 2% Voltage drop and wire size based upon 60°C copper conductors.

General Line Voltage Wiring

Be sure the available power is the same voltage and phase as that shown on the unit serial plate. Line and low voltage wiring must be done in accordance with local codes or the National Electric Code, whichever applicable.

Unit Power Connection

Line voltage connection is made by connecting the incoming line voltage wires to the "L" side of the contactor as shown in Figure 16. Consult Table 5 for correct wire and fuse size.

External Loop Power Connection

If the unit is to be used with an external loop pump, t pump(s) will be connected to the loop pump terminal the unit electrical box as shown in Figure 17. The pu will automatically be cycled as required by the unit.

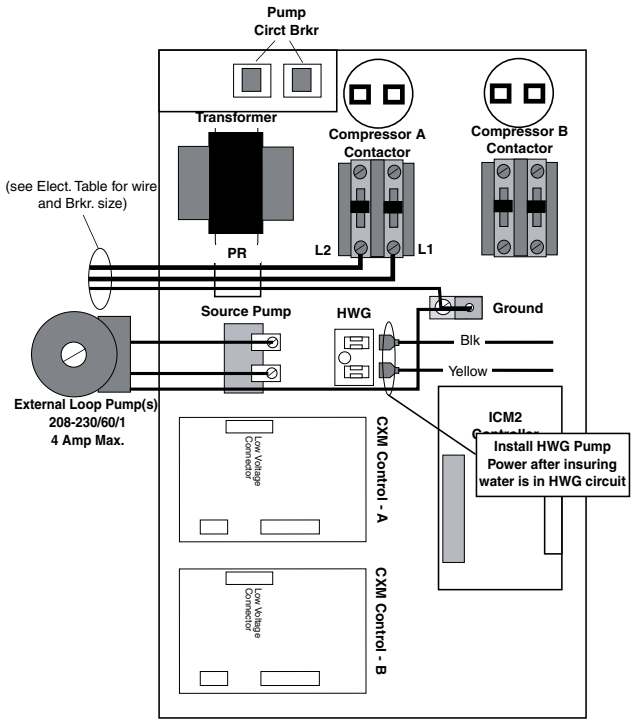
208 Volt Operation

All 208-230 Volt units are factory wired for 230 Vol The transformers may be switched to 208V operatior illustrated on the wiring diagram.

HWG Pumping Wiring

Install HWG Pump power wires on HWG Pump pow block after insuring water is in HWG circuit.

Figure 17: Line Voltage Field Wiring



ECM FAN MOTOR

Fan speeds are selected with jumpers for version I or via a nine position DIP switch for version II. To take full advantage of the ECM motor features, a multi-stage thermostat should be used (2-stage heat/2-stage cool or 3-stage heat/2-stage cool).

Note: Power must be off to the unit for at least three seconds before the ECM motor will recognize a speed change. The motor will recognize a change in the CFM Adjust or dehumidification mode settings while the unit is powered.

There are four different airflow settings from lowest airflow rate (speed tap 1) to the highest airflow rate (speed tap 4). The charts below indicate settings for both versions of the ECM interface board, followed by detailed information for each setting.

Cooling settings: The cooling setting determines the cooling (normal) CFM for all units with ECM motor. Cooling (normal) setting is used when the unit is not in dehumidification mode. This setting also determines the heating CFM for Genesis (GS) units. Tap 1 is the lowest CFM setting, while tap 4 is the highest CFM setting. To avoid air coil freeze-up, tap 1 may not be used if the dehumidification mode is selected. Consult submittal data or specifications catalog for the specific unit series and model to correlate speed tap setting to airflow in CFM.

Heating settings: The heating setting determines the heating CFM for Tranquility 27™ (TT) and Tranquility 20™ (TS) units. This setting is not used for Genesis (GS) units. Tap 1 is the lowest CFM setting, while tap 4 is the highest CFM setting. Consult submittal data or specifications catalog for the specific unit series and model to correlate speed tap setting to airflow in CFM.

Auxiliary/Emergency Heat settings: The auxiliary/emergency heat setting determines the CFM when the unit is in auxiliary heat or emergency heat mode. This setting is used for residential units with internal electric heat. When auxiliary electric heat is energized (i.e. compressor and electric heat), the greater of the auxiliary/emergency or heating setting will be used. A “G” (fan) signal must be present from the thermostat for electric heat to operate. Consult the submittal data or specifications catalog for the specific unit series and model to correlate speed tap setting to airflow in CFM.

CFM Adjust settings: The CFM adjust setting allows four selections. The NORM setting is the factory default position. The + or – settings adjust the airflow by +/- 15%. The +/- settings are used to “fine tune” airflow adjustments. The TEST setting runs the ECM motor at 70% torque, which causes the motor to operate like a standard PSC motor, and disables the CFM counter.

Dehumidification Mode settings: The dehumidification mode setting provides field selection of humidity control. When operating in the normal mode, the cooling airflow settings are determined by the cooling tap setting above. When dehumidification is enabled there is a reduction in airflow in cooling to increase the moisture removal of the heat pump. Consult submittal data or specifications catalog for the specific unit series and model to correlate speed tap to airflow in CFM. The dehumidification mode can be enabled in two ways.

1. Constant Dehumidification Mode: When the dehumidification mode is selected (via DIP switch or jumper setting), the ECM motor will operate with a multiplier applied to the cooling CFM settings (approx. 20-25% lower airflow). Any time the unit is running in the cooling mode, it will operate at the lower airflow to improve latent capacity. The “DEHUM” LED will be illuminated at all times. Heating airflow is not affected. NOTE: Do not select dehumidification mode if cooling setting is tap 1.
2. Automatic (Humidistat-controlled) Dehumidification Mode: When the dehumidification mode is selected (via DIP switch or jumper setting) AND a humidistat is connected to terminal DH (version II) or HUM (version I), the cooling airflow will only be reduced when the humidistat senses that additional dehumidification is required. The DH (or HUM) terminal is reverse logic. Therefore, a humidistat (not dehumidistat) is required. The “DEHUM” LED will be illuminated only when the humidistat is calling for dehumidification mode. Heating airflow is not affected. NOTE: Do not select dehumidification mode if cooling setting is tap 1.

ECM FAN MOTOR

Table 6: ECM Board Tap Settings

Cooling settings: TT, TS, GS units*

Tap Setting	Version I 69243707 *HP CFM* Jumper	Version II 17B0019N01 DIP Switch SW1	SW2
1	1	ON	ON
2	2	ON	OFF
3	3	OFF	ON
4	4	OFF	OFF

*GS units use the same settings for both cooling (normal) CFM and heating CFM.

Heating settings: TT, TS units*

Tap Setting	Version I 69243707 *DELAY* Jumper	Version II 17B0019N01 DIP Switch SW3	SW4
1	1	ON	ON
2	2	ON	OFF
3	3	OFF	ON
4	4	OFF	OFF

*This table not used for GS units.

Aux/Emerg Heat settings: TT, TS, GS units*

Tap Setting	Version I 69243707 *AUX CFM* Jumper	Version II 17B0019N01 DIP Switch SW5	SW6
1	1	ON	ON
2	2	ON	OFF
3	3	OFF	ON
4	4	OFF	OFF

*Residential units

CFM Adjust settings: TT, TS, GS units

Tap Setting	Version I 69243707 *CFM Adj* Jumper	Version II 17B0019N01 DIP Switch SW7	SW8
TEST	1	ON	ON
-	2	ON	OFF
+	3	OFF	ON
NORM	4	OFF	OFF

Dehum Mode settings: TT, TS, GS units

Tap Setting	Version I 69243707 *Dehumid* Jumper	Version II 17B0019N01 DIP Switch SW9
NORM	pins 1,2	ON
Dehumid	pins 2,3	OFF

Figure 18a: ECM Version II Interface Layout

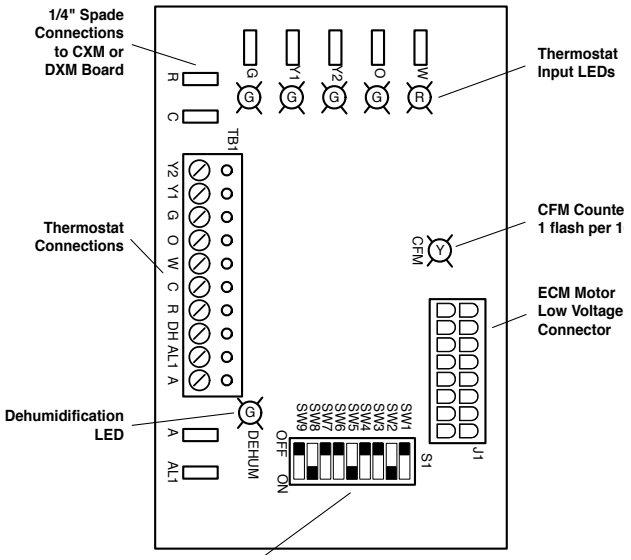
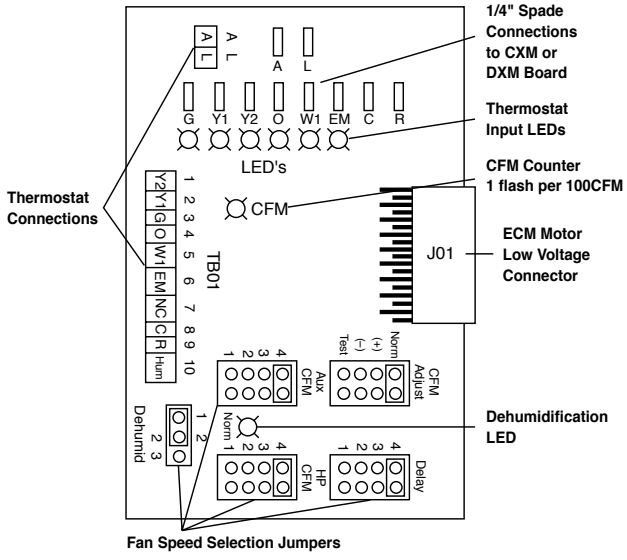


Figure 18b: ECM Version I Interface Layout



ECM BLOWER DATA

Table 7: Blower performance table and fan speed selection

Model	Max ESP (in wg)	Fan Motor (hp)	Tap Setting	Normal Mode Htg & Normal Clg			Dehumid Mode			Aux CFM Setting	Aux Emerg Mode
				Stg 2	Stg 1	Fan	Stg 2	Stg 1	Fan		
036	0.5	1/2	4	1290	710	650	1010	550	650	4	1290
			3	1200	660	600	940	520	600	**3**	**1200**
			2	**1110**	**610**	**560**	**870**	**480**	**560**	2	1110
			1	1020	560	510				1	1020
042	0.5	1/2	4	1450	800	730	1130	620	730	4	1450
			3	1400	770	700	1090	600	700	**3**	**1400**
			2	**1300**	**720**	**650**	**1010**	**560**	**650**	2	1300
			1	1190	660	600				1	1190
048	0.75	1	4	1720	950	860	1340	740	860	4	1720
			3	1600	880	800	1250	690	800	**3**	**1600**
			2	**1480**	**810**	**740**	**1150**	**630**	**740**	2	1480
			1	1360	750	680				1	1360
060	0.75	1	4	2150	1180	1080	1680	920	1080	4	2150
			3	2000	1100	1000	1560	860	1000	**3**	**2000**
			2	**1850**	**1020**	**930**	**1440**	**800**	**930**	2	1850
			1	1700	940	850				1	1700
072	0.75	1	4	2250	1280	1130	1760	1000	1130	4	2250
			3	2130	1210	1070	1660	940	1070	**3**	**2130**
			2	**2000**	**1140**	**1000**	**1560**	**890**	**1000**	2	2000
			1	1900	1080	950				1	1900

Bold figures indicate factory settings, setting on all models.

Rev.: 07/06/05D

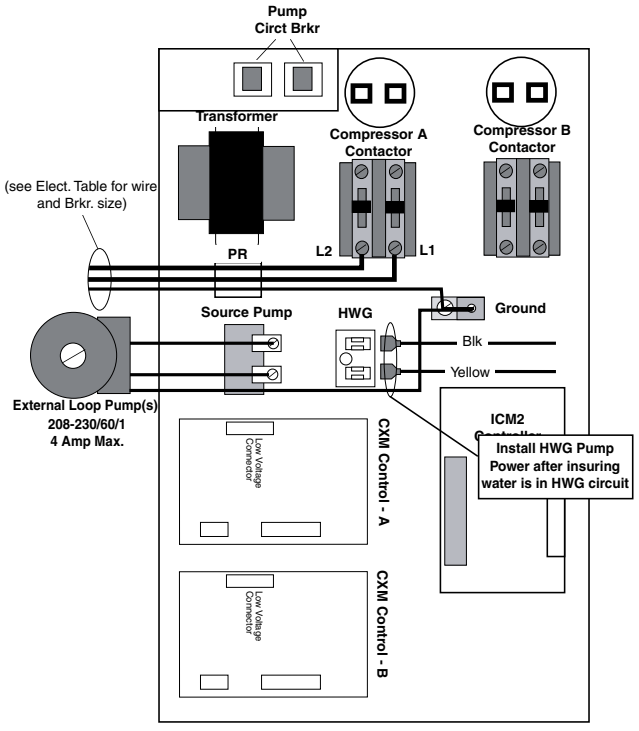
These values represent Left return models. For right return units move the CFM adj from (norm) to the (+) setting.
During Auxiliary operation the CFM will run at the higher of the HP or AUX settings.
Airflow is controlled within ± 5% up to Max ESP shown with wet coil and with 1" throwaway filter.
Standard 1" electrostatic filter will add 0.15 in wg when clean.
When Dehumidification mode is selected, HP CFM setting must be 4, 3, or 2 only.
All units ARI/ISO/ASHRAE 13256-1 rated at maximum external static.

ELECTRICAL - LOW VOLTAGE

Thermostat Connections

The thermostat should be wired directly to the ECM control board as shown in Figure 19. Consult the Thermostat section for specific wiring.

Figure 19: Low Voltage Field Wiring



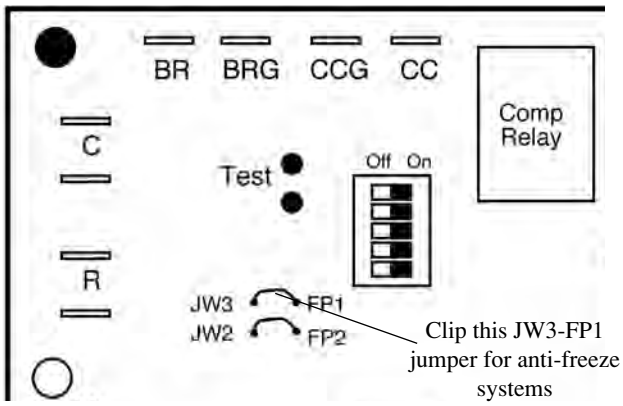
Water Freeze Protection - FP1

The CXM/DXM control allows the field selection of source fluid freeze protection points. The factory setting of FP1 is set for water (30°F). In earth loop applications jumper JW3 (FP1- antifreeze 10°F) should be clipped as shown in Figure 20 to change the setting to 10°F, a more suitable temperature when using antifreezes in colder earth loops.

Air Coil Freeze Protection - FP2

The Air coil freeze protection is factory set at 30°F and should not need adjusting.

Figure 20: Changing FP1-Freeze Protection Setpoint



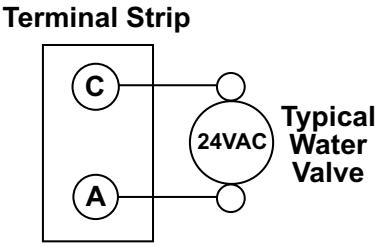
CXM PCB

ELECTRICAL - LOW VOLTAGE

Accessory Connections

A terminal paralleling the compressor contactor coil have been provided on the CXM/DXM control of the UltraClassic line. "A" has been provided to control accessory devices, such as water valves, electronic air cleaners, humidifiers, etc. **Note: This terminal should be used only with 24 Volt signals and not line voltage signals.** This signal operates with the compressor contactor. See Figure 21 or the wiring schematic for details.

Figure 21: Accessory Wiring



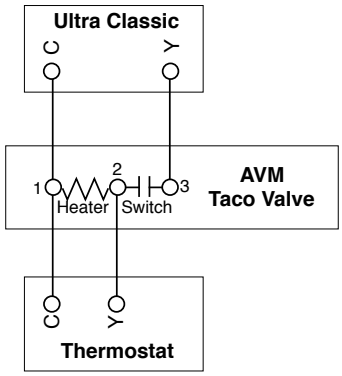
Water Solenoid Valves

When using solenoid valves on ground water installations. Figure 21 illustrates a typical well water control valve wiring which will limit wasted water during a lockout condition. A slow closing valve may be required to prevent water hammer. When using an AVM -Taco Slow Closing valves on UltraClassic Series equipment Figure 20 wiring should be utilized. The valve takes approximately 60 seconds to open (very little water will flow before 45 seconds) and it activates the compressor only after the valve is completely opened (by closing its end switch). Only relay or triac based electronic thermostats should be used with the AVM valve. When wired as shown, the valve will operate properly with the following notations:

1 - The valve will remain open during a unit lockout.

2 - The valve will draw approximately 25-35 VA through the "Y" signal of the thermostat. **Note: This can overheat the anticipators of electromechanical thermostats.** Therefore only relay or triac based thermostats should be used.

Figure 22: Well Water AVM Valve Wiring



Thermostat Selection and Wiring

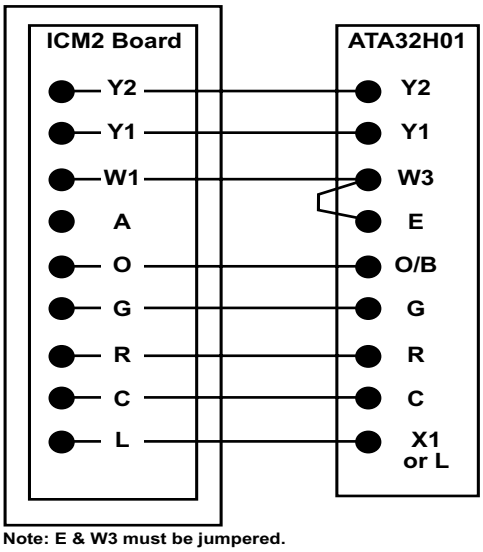
ATA32H01 - Auto Changeover electronic 3 Heat / 2 Cool thermostat

This electronic thermostat, Fig 23, is suited to all Ultra-Classic applications.

The UltraClassic also employs an ECM board that features:

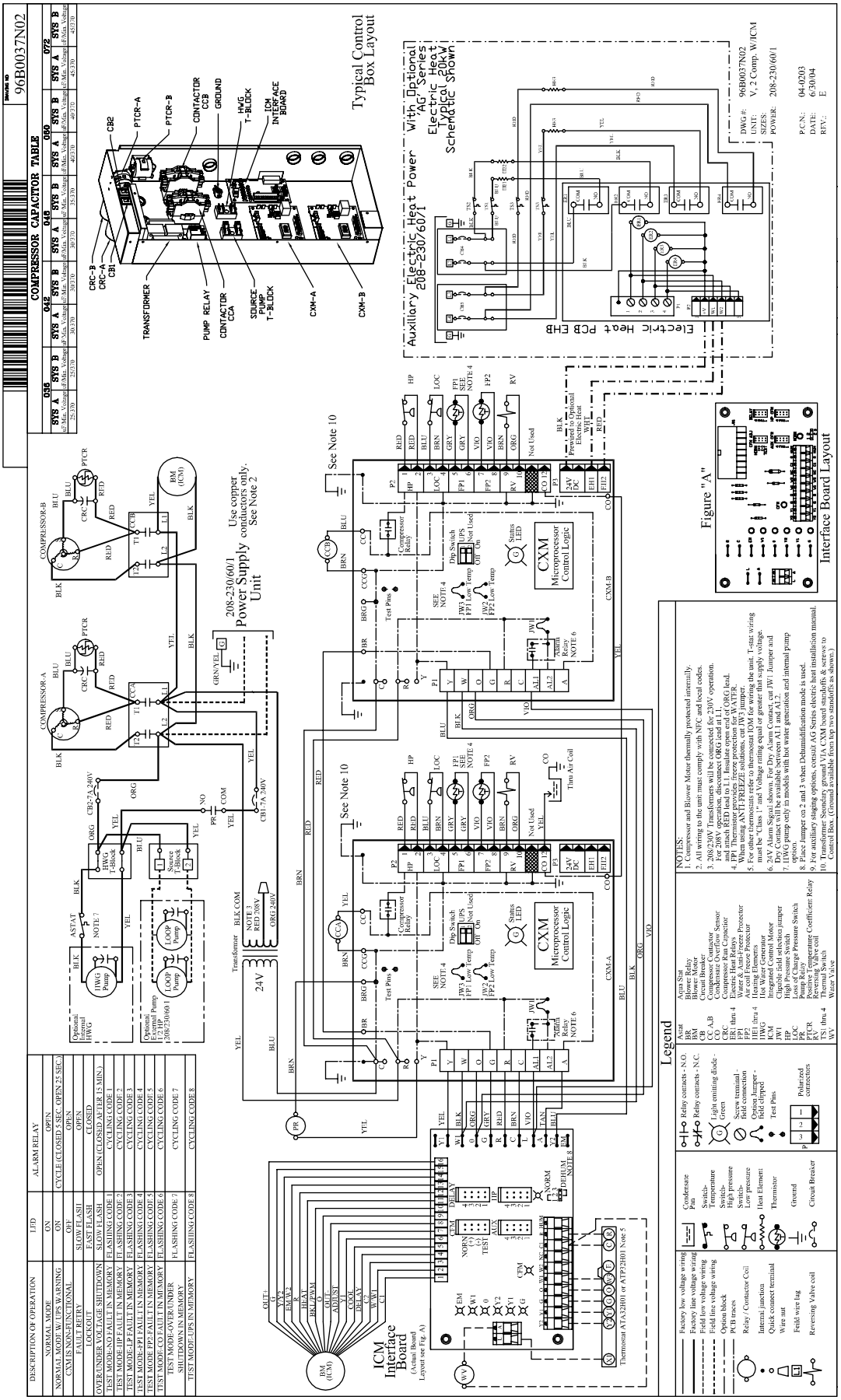
- Thermostat terminal connections
- Thermostat signal diagnostic LED's
- Airflow selection
- Airflow LED (100 cfm per flash)
- Dehumidification Mode Jumper

Figure 23: ATA32H01 wiring



Note: E & W3 must be jumpered.

ELECTRICAL SCHEMATIC



CXM CONTROL DESCRIPTION

Features

- Anti-short cycle protection
- High and Low pressure cutouts
- Water Coil freeze protection
- Air Coil freeze protection
- Random Start
- Unit Performance Sentinel
- Over/Under Voltage protection
- Diagnostic LED
- Reset Lockout at unit or disconnect
- Intelligent Reset
- Condensate Overflow sensor
- Test Mode
- Electric Heat Outputs
- Accessory Water Valve Connection
- Optional LonWorks Control

Field Selectable Inputs

Test Mode - Test Mode allows the service personnel to check the operation of the control in a timely manner. By **momentarily** shorting the test terminals, the CXM control enters a 20 minute Test Mode period in which all time delays are sped up 15 times. Upon entering Test Mode, the Status LED will flash a code representing the last fault. For Diagnostic ease at the thermostat, the alarm relay will also cycle during test mode. The Alarm relay will cycle on and off similar to the status LED to indicate a code representing the last fault, at the thermostat. Test mode can be exited by shorting the test terminals for 3 seconds.

Retry Mode - If the control is attempting a retry of a fault, the status LED will slow flash (slow flash = one flash every 2 seconds) to indicate the control is in process of retrying.

Note: In the following field configuration options, jumper wires should be clipped ONLY when power is removed from the CXM control.

Water Coil Freeze Protection Limit Setting - Jumper 2 (JW3-F12 Low Temp) provides field selection of temperature limit setting for FP1 to be 30°F or 10°F.

Not Clipped = 30°F. Clipped = 10°F.

Air Coil Freeze Protection Limit Setting - Jumper 3 (JW2-FP2 Low Temp) provides field selection of temperature limit setting for FP2 to be 30°F or 10°F.

Not Clipped = 30°F. Clipped = 10°F.

Alarm Relay Setting - Jumper 1 (JW1-AL2 Dry) provides field selection of Alarm Relay terminal AL2 to be jumpered to 24Vac or to be dry (no connection).

Not Clipped = AL2 connected to R. Clipped = AL2 dry contacts (no connection).

DIP Switches

Unit Performance Sentinel Disable - Dip Switch 1 provides field selection to disable The UPS Feature

On = Enabled. Off = Disabled.

Stage 2 - Dip Switch 2 provides selection of whether compressor has an on delay. If set to stage 2, the compressor will have a 3 second delay before energizing. Also, if set for stage 2, the alarm relay will NOT cycle during test mode.

On = Stage 1. Off = Stage 2.

Table 8: LED & Alarm Relay Operations

Description of Operation	LED	Alarm Relay
Normal Mode	On	Open
Normal Mode with UPS Warning	On	Cycle (closed 5 sec., Open 25 sec.)
CXM is non-functional	Off	Open
Fault Retry	Slow Flash	Open
Lockout	Fast Flash	Closed
Over/Under Voltage Shutdown	Slow Flash	Open (Closed after 15 minutes)
Test Mode - No fault in memory	Flashing Code 1	Cycling Code 1
Test Mode - HP Fault in memory	Flashing Code 2	Cycling Code 2
Test Mode - LP Fault in memory	Flashing Code 3	Cycling Code 3
Test Mode - FP1 Fault in memory	Flashing Code 4	Cycling Code 4
Test Mode - FP2 Fault in memory	Flashing Code 5	Cycling Code 5
Test Mode - CO Fault in memory	Flashing Code 6	Cycling Code 6
Test Mode - Over/Under shutdown in memory	Flashing Code 7	Cycling Code 7
Test Mode - UPS in memory	Flashing Code 8	Cycling Code 8
Test Mode - Swapped Thermistor	Flashing Code 9	Cycling Code 9

Special Notes and Examples:
-Slow Flash = 1 flash every 2 seconds
-Fast Flash = 2 flashes every 1 second
-Flash code 2 = 2 quick flashes, 10 sec. pause, 2 quick flashes, 10 sec. pause, etc.

CXM CONTROL DESCRIPTION

Safety Features

The following safety features are provided to protect the compressor, heat exchangers, wiring and other components from damage caused by operation outside of design conditions.

Anti-Short Cycle Protection- The control features a 5 minute anti-short cycle protection for the compressor. **Note: The 5 minute anti-short cycle also occurs at power up.**

Random Start - The control features a random start upon power up of from 5-80 seconds.

Fault Retry - In Fault Retry mode, the Status LED begins slow flashing to signal that the control is trying to recover from a fault input. The CXM control will stage off the outputs and then “try again” to satisfy the thermostat "Y" input call. Once the thermostat input calls are satisfied, the control will continue on as if no fault occured. If 3 consecutive faults occur without satisfying the thermostat "Y" input call, then the control will go to Lockout mode. The last fault causing the lockout will be stored in memory and can be viewed by going into test mode.

Lockout - In Lockout mode, the Status LED will begin fast flashing. The compressor relay is turned off immediately. Lockout mode can be soft reset via the thermostat “Y” input or can be hard reset via the disconnect. The last fault causing the lockout will be stored in memory and can be viewed by going into test mode.

Lockout with Emergency Heat - While in Lockout mode, if W becomes active, then Emergency Heat mode will occur.

High Pressure Switch - When the High Pressure Switch opens due to high refrigerant pressures, the Compressor relay is de-energized immediately since the High Pressure Switch is in series with the compressor contactor coil. The High Pressure Fault recognition is immediate as well. High Pressure Lockout Code = 2
Example: 2 quick flashes, 10 sec pause, 2 quick flashes, 10 sec. pause, etc.

Low Pressure Switch - The Low Pressure Switch must be open and remain open for 30 continuous seconds during "on" cycle to be recognized as a Low Pressure fault. If the low pressure switch is open for 30 seconds prior to compressor power up it will be considered a low pressure (loss of charge) fault. The Low Pressure Switch input is bypassed for the initial 60 seconds of a compressor run cycle. Low Pressure Lockout Code = 3.
thermistor temperature must be below the selected freeze

Water Coil Freeze Protection (FP1) - The FP1 protection limit setting for 30 continuous seconds during a compressor run cycle to be recognized as a FP1 fault. The FP1 input is bypassed for the initial 60 seconds of a compressor run cycle. FP1 Lockout Code = 4.

Air Coil Freeze Protection (FP2) - The FP2 thermistor temperature must be below the selected freeze protection limit setting for 30 continuous seconds during a compressor run cycle to be recognized as a FP2 fault. The FP2 input is bypassed for the initial 60 seconds of a compressor run cycle. FP2 Lockout Code = 5.

Condensate Overflow - The Condensate Overflow sensor must sense overflow levels for 30 continuous seconds to be recognized as a CO fault. Condensate Overflow will be monitored at all times. CO Lockout Code = 6.

Over/Under Voltage Shutdown - An Over/Under Voltage condition exists when the control voltage is outside the range of 19Vac to 30Vac. Over/Under Voltage Shutdown is self resetting in that if the voltage comes back within range of 19Vac to 30Vac for at least 0.5 seconds, then normal operation is restored. This is not considered a fault or lockout. If the CXM is in over/under voltage shutdown for 15 minutes, the alarm relay will close. Over/Under Voltage Shutdown Code = 7.

Unit Performance Sentinel-UPS (patent pending) - The UPS feature warns when the heat pump is operating inefficiently. A UPS condition exists when:

a) in heating mode with compressor energized, if FP2 is greater than 125°F for 30 continuous seconds,
or
b) in cooling mode with compressor energized, if FP1 is greater than 125°F for 30 continuous seconds, or FP2 is less than 40°F for 30 continuous seconds.

If a UPS condition occurs, the control will immediately go to UPS warning. The status LED will remain on as if the control is on Normal mode. (see"LED and Alarm Relay Operation Table"). Outputs of the control, excluding LED and Alarm Relay, will NOT be affected by UPS. The UPS condition cannot occur during a compressor off cycle. During UPS warning, the alarm relay will cycle on and off. The cycle rate will be On for 5 seconds, Off for 25 seconds, On for 5 seconds, Off for 25 seconds, etc. Unit Performance Sentinel Warning Code = 8.

CXM CONTROL DESCRIPTION

Diagnostic Features

The Status LED on the CXM control advises the serviceman of the current status of the CXM control. The status LED can display either the current CXM mode or the last fault memory if in test mode. See Table 8 for a complete listing of codes.

Unit Operation Description

PowerUp - The unit will not operate until all the inputs and safety controls are checked for normal conditions. **Note: The compressor will have a 5 minute anti-short cycle delay at power-up.**

Standby - In Standby mode, Y and W inputs are not active. Inputs O and G may be active. Compressor will be off.

Cooling - To enter Cooling mode, Y and O become active. The first time after power-up that there is a call for compressor, the compressor will follow a 5 to 80 second random start delay. There will also be a 5 min compressor anti-short cycle protection time as well. After the random start delay, the compressor relay is energized. On all subsequent compressor calls, the random start delay is omitted.

Heating Stage 1 - To enter Heating Stage 1 mode, Y becomes active. The first time after power-up that there is a call for compressor, the compressor will follow a 5 to 80 second random start delay. There will also be a 5 min compressor anti-short cycle protection time as well. After the random start delay, the compressor relay is energized. On all subsequent compressor calls, the random start delay is omitted.

Heating Stage 2 - To enter Heating Stage 2 mode, W becomes active (Y already active). The Compressor relay remains on. EH1 is turned on immediately. With continuing Heating Stage 2 demand, EH2 will turn on after 10 minutes. The EH2 will not turn on in heating (or will turn off if already on) if loop temperature is above approximately 50°F (FP1 >45°F).

Emergency Heat - In Emergency Heat mode, W becomes active while Y is not active. EH1 is turned on immediately. With continuing Emergency Heat demand, EH2 will turn on after 5 minutes. The FP1 and FP2 temperatures do not effect emergency heat operation.

ECM Control Board

The UltraClassic also employs an ECM board that features:

- Thermostat terminal connections
- Thermostat signal diagnostic LED's
- Airflow selection
- Airflow LED (100 cfm per flash)
- Dehumidification Mode Jumper

Table 9: Fault Description Table

Fault	Fault LED Code	Fault Condition
High Pressure Switch	2	HP Open Instantly
Low Pressure Switch or LOC	3	LP open for 30 continuous seconds before or during a call (bypassed for first 60 seconds)
Freeze Protection Coax - FP1	4	FP1 below Temp limit for 30 continous seconds (bypassed for first 60 seconds of operation)
Freeze Protection Air Coil - FP2	5	FP2 below Temp limit for 30 continous seconds (bypassed for first 60 seconds of operation)
Condensate overflow	6	Sense overflow (grounded) for 30 continous seconds
Over/Under Voltage Shutdown	7 (Autoreset)	"R" power supply is <19VAC or >30VAC

TROUBLESHOOTING INFORMATION

General

CXM board troubleshooting in general is best summarized as simply varifying inputs and outputs. After this process has been varified, confidence in board operation is confirmed and the trouble must be else where. Below are some general guidelines required for developing training materials and procedures when applying the CXM control.

Field Inputs

All inputs are 24VAC from the thermostat.and can be varified using a Volt meter between C and Y, G, O, W. See the I/O Reference table below.

Sensor Inputs

All sensor inputs are "paired wires" connecting each component with the board. Therefore continuity on pressure switches, and the condensate switch can be checked at the board connector.

The thermistor resistance should be measured with the connector removed so that only the impedance of the thermistor is measured. If desired this reading can be compared to the chart shown in the thermistor section of this manual based upon the actual termperature of the thermistor clip. An ice bath can be used to check calibration of a thermistor if needed.

Outputs

The compressor relay is 24VAC and can be varified using a voltmeter. The fan signal is passed through the board to the external fan relay. The alarm relay can either be 24VAC as shipped or dry contacts (measure continuity during fault) for use with DDC by clipping the J1 jumper. Electric heat outputs are 24VDC ground sinking and require a voltmeter set for DC to varify operation. See the I/O Reference table below.

Test Mode

Test mode can be entered for 20 minutes by shorting the test pins.

Table 10: CXM Input/Output Reference Table

Connection	Input or Output	Description
R	-	24 VAC
C	-	24 VAC (grounded common)
Y	I	Connect to thermostat - Y output call for compressor
W	I	Connect to thermostat - W output call for Htg2 or Emerg Ht
O	I	Connect to thermostat - 0 output call for reversing valve with cooling
G	I	Connect to thermostat - G output call for fan
AL1	O	Connect to thermostat fault light - 24VAC or dry alarm
AL2	O	Alarm Relay 24VAC or dry
A	O	Output for water solenoid valve - paralleled with compressor contactor coil
BR	O	Connection for blower relay-direct connect from G
BRG	O	Blower relay common connection
CC	O	Connection for compressor contactor
CCG	O	Compressor contactor common connection
HP	I	High Pressure Switch input terminals
LP	I	Low Pressure Switch input terminals
FP1	I	Water Coil Freeze Protection Thermistor Input
FP2	I	Air Coil Freeze Protection Thermistor Input
RV	O	Reversing Valve Output Terminals - direct connect from "O"
CO	I	Condensate overflow input terminals
24VDC	O	24 VDC supply to electric heat module
W1	O	Output terminal for stage 1 electric heat
W2	O	Output terminal for stage 2 electric heat

TROUBLE ANALYSIS

Preliminary Trouble Inspection

WARNING

HAZARDOUS VOLTAGE! DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING. Failure to disconnect power before servicing can cause severe personal injury or death.

If operational difficulties are encountered, be sure to perform the preliminary checks before referring to the Troubleshooting Chart.

- Verify that the unit is receiving electrical supply power.
- Make sure the fuses in the fused disconnect switches are intact.

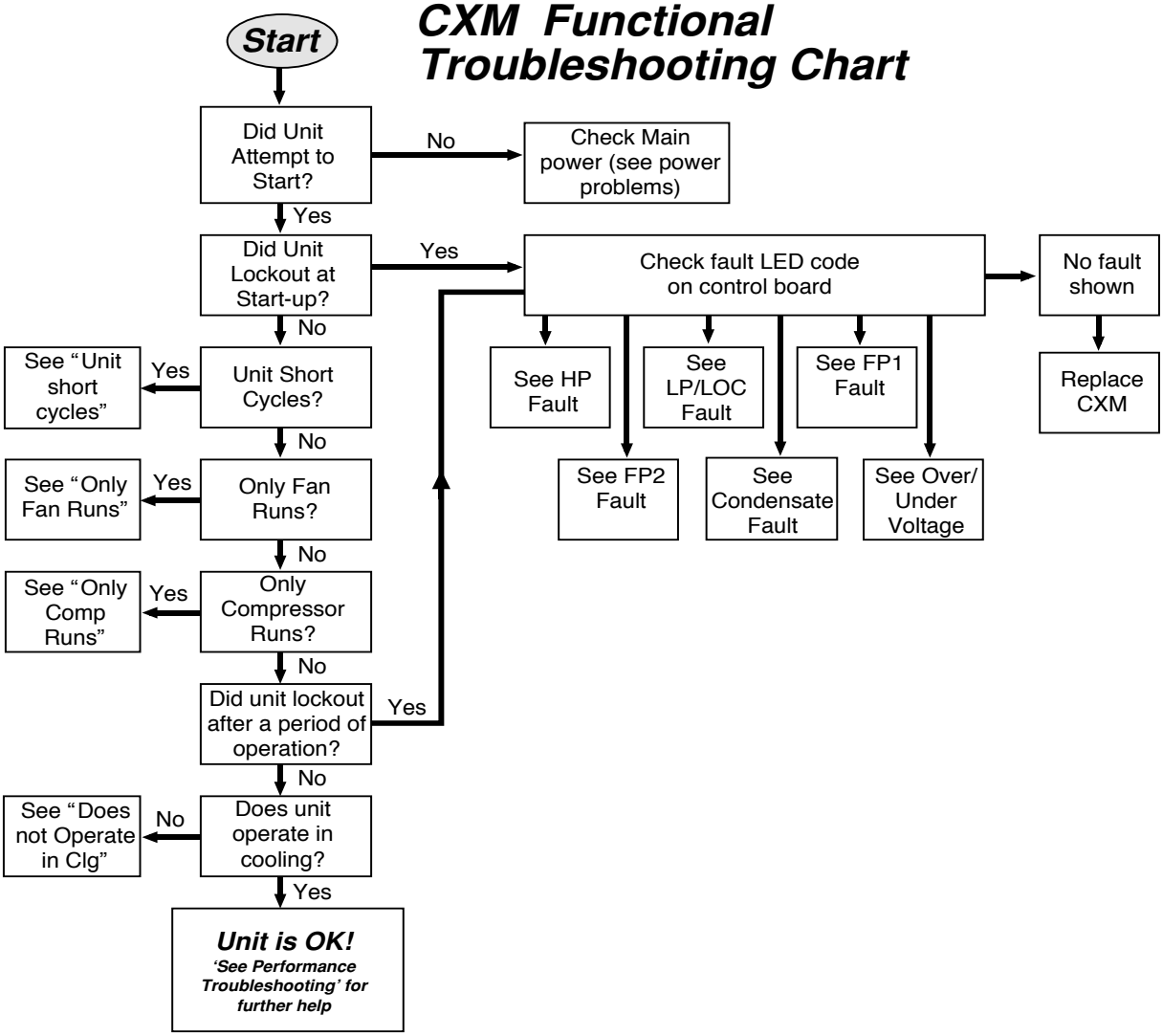
After completing the preliminary checks described above, be sure to inspect for other obvious problems such as leaking connections, broken or disconnected wires, etc.

If everything appears to be in order, but the unit still fails to operate properly, refer to the following Troubleshooting Chart.

Troubleshooting Chart

The Troubleshooting Chart that follows is provided to serve as an aid for identifying malfunctions that may occur. Within the chart are three columns:

1. The Problem column describes what the unit is doing.
2. The Cause column identifies the most likely sources of the problem.
3. The Correction column describes what should be done to correct the problem.



FUNCTIONAL TROUBLESHOOTING

Fault	Htg	Clg	Possible Cause	Solution
Main power Problems	X	X	Green Status LED Off	Check Line Voltage circuit breaker and disconnect
				Check for line voltage between L1 and L2 on the contactor
				Check for 24VAC between R and C on CXM/DXM
				Check primary/secondary voltage on transformer
HP Fault-Code 2 High pressure		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting
				Check water flow adjust to proper flow rate
		X	Water Temperature out of range in cooling	Bring water temp within design parameters
	X		Reduced or no Air flow in heating	Check for dirty air filter and clean or replace
				Check fan motor operation and airflow restrictions
				Dirty Air Coil- construction dust etc.
				Too high of external static. Check static vs blower table
	X		Air Temperature out of range in heating	Bring return air temp within design parameters
	X	X	Overcharged with refrigerant	Check superheat/subcooling vs typical operating condition table
	X	X	Bad HP Switch	Check switch continuity and operation. Replace
LP/LOC Fault-Code 3	X	X	Insufficient charge	Check for refrigerant leaks
Low Pressure/Loss of Charge	X		Compressor pump down at start-up	Check charge and start-up water flow
FP1 Fault - Code 4 Water Coil low temperature limit	X		Reduced or no water flow in heating	Check pump operation or water valve operation/setting
				Plugged strainer or filter. Clean or replace.
				Check water flow adjust to proper flow rate
	X		Inadequate anti-freeze level	Check antifreeze density with hydrometer
	X		Improper temperature limit setting (30°F vs 10°F)	Clip JW3 jumper for antifreeze (10°F) use
	X		Water Temperature out of range	Bring water temp within design parameters
	X	X	Bad thermistor	Check temp and impedance correlation per chart
FP2 fault - Code 5 Air Coil low temperature limit		X	Reduced or no Air flow in cooling	Check for dirty air filter and clean or replace
				Check fan motor operation and airflow restrictions
				Too high of external static. Check static vs blower table
		X	Air Temperature out of range	Too much cold vent air? Bring entering air temp within design parameters
		X	Improper temperature limit setting (30°F vs 10°F)	Normal airside applications will require 30°F only
	X	X	Bad thermistor	Check temp and impedance correlation per chart
Condensate Fault-Code 6	X	X	Blocked Drain	Check for blockage and clean drain
	X	X	Improper trap	Check trap dimensions and location ahead of vent
		X	Poor Drainage	Check for piping slope away from unit
				Check slope of unit toward outlet
				Poor venting. Check vent location
		X	Moisture on sensor	Check for moisture shorting to air coil
Over/Under Voltage-Code 7 (Auto resetting)	X	X	Under Voltage	Check power supply and 24VAC voltage before and during operation.
				Check power supply wire size
				Check compressor starting. Need hard start kit?
				Check 24VAC and unit transformer tap for correct power supply voltage
	X	X	Over Voltage	Check power supply voltage and 24VAC before and during operation.
				Check 24VAC and unit transformer tap for correct power supply voltage
Unit Performance Sentinel-Code 8	X		Heating mode FP2>125°F	Check for poor air flow or overcharged unit.
		X	Cooling Mode FP1>125°F OR FP2< 40°F	Check for poor water flow, or air flow
No Fault Code Shown	X	X	No compressor operation	See "Only fan operates"
	X	X	Compressor Overload	Check and Replace if necessary
	X	X	Control board	Reset power and check operation
Unit Short Cycles	X	X	Dirty Air Filter	Check and Clean air filter
	X	X	Unit in "Test Mode"	Reset power or wait 20 minutes for auto exit.
	X	X	Unit selection	Unit may be oversized for space. Check sizing for actual load of space.
	X	X	Compressor Overload	Check and Replace if necessary
Only Fan Runs	X	X	Thermostat position	Insure thermostat set for heating or cooling operation
	X	X	Unit locked out	Check for lockout codes. Reset power.
	X	X	Compressor Overload	Check compressor overload. Replace if necessary.
	X	X	Thermostat wiring	Check thermostat wiring at heat pump. Jumper Y and R for compressor operation in test mode.

FUNCTIONAL TROUBLESHOOTING

Only Compressor Runs	X	X	Thermostat wiring	Check G wiring at heat pump. Jumper G and R for fan operation.
	X	X	Fan motor relay	Jumper G and R for fan operation. Check for Line voltage across BR contacts.
				Check fan power enable relay operation (if present)
	X	X	Fan motor	Check for line voltage at motor. Check capacitor
	X	X	Thermostat wiring	Check thermostat wiring at heat pump. Jumper Y and R for compressor operation in test mode.
Unit Doesn't Operate in Cooling		X	Reversing Valve	Set for cooling demand and check 24VAC on RV coil and at CXM/DXM board.
				If RV is stuck, run high pressure up by reducing water flow and while operating engage and disengage RV coil voltage to push valve.
		X	Thermostat setup	Check for 'O' RV setup not 'B'
		X	Thermostat wiring	Check O wiring at heat pump. Jumper O and R for RV coil 'Click'.
		X	Thermostat wiring	Put thermostat in cooling mode. Check for 24VAC on O (check between C and O); check for 24VAC on W (check between W and C). There should be voltage on O, but not on W. If voltage is present on W, thermostat may be bad or wired incorrectly.

PERFORMANCE TROUBLESHOOTING

Performance Troubleshooting	Htg	Clg	Possible Cause	Solution
Insufficient capacity/	X	X	Dirty Filter	Replace or clean
Not cooling or heating	X		Reduced or no Air flow	Check for dirty air filter and clean or replace
properly			in heating	Check fan motor operation and airflow restrictions
				Too high of external static. Check static vs blower table
		X	Reduced or no Air flow	Check for dirty air filter and clean or replace
			in cooling	Check fan motor operation and airflow restrictions
				Too high of external static. Check static vs blower table
	X	X	Leaky duct work	Check supply and return air temperatures at the unit and at distant duct registers if significantly different, duct leaks are present
	X	X	Low refrigerant charge	Check superheat and subcooling per chart
	X	X	Restricted metering device	Check superheat and subcooling per chart. Replace.
		X	Defective Reversing Valve	Perform RV touch test
	X	X	Thermostat improperly located	Check location and for air drafts behind stat
	X	X	Unit undersized	Recheck loads & sizing check sensible clg load and heat pump capacity
	X	X	Scaling in water heat exchanger	Perform Scaling check and clean if necessary
	X	X	Inlet Water too Hot or Cold	Check load, loop sizing, loop backfill, ground moisture.
High Head Pressure	X		Reduced or no Air flow	Check for dirty air filter and clean or replace
			in heating	Check fan motor operation and airflow restrictions
				Too high of external static. Check static vs blower table
		X	Reduced or no water flow	Check pump operation or valve operation/setting
			in cooling	Check water flow adjust to proper flow rate
		X	Inlet Water too Hot	Check load, loop sizing, loop backfill, ground moisture.
	X		Air Temperature out of range in heating	Bring return air temp within design parameters
		X	Scaling in water heat exchanger	Perform Scaling check and clean if necessary
	X	X	Unit Overcharged	Check superheat and subcooling. Reweigh in charge
	X	X	Non-condensables insystem	Vacuum system and reweigh in charge
	X	X	Restricted metering device	Check superheat and subcooling per chart. Replace.
Low Suction Pressure	X		Reduced water flow	Check pump operation or water valve operation/setting
			in heating	Plugged strainer or filter. Clean or replace.
				Check water flow adjust to proper flow rate
	X		Water Temperature out of range	Bring water temp within design parameters
		X	Reduced Air flow	Check for dirty air filter and clean or replace
			in cooling	Check fan motor operation and airflow restrictions
				Too high of external static. Check static vs blower table
		X	Air Temperature out of range	Too much cold vent air? Bring entering air temp within design parameters
	X	X	Insufficient charge	Check for refrigerant leaks
Low discharge air temperature in heating	X		Too high of air flow	Check fan motor speed selection and airflow chart
	X		Poor Performance	See 'Insufficient Capacity'
High humidity		X	Too high of air flow	Check fan motor speed selection and airflow chart
		X	Unit oversized	Recheck loads & sizing check sensible clg load and heat pump capacity

UNIT START UP

Operating Limits

Environment – This unit is designed for indoor installation ONLY.

Power Supply – A voltage variation of +/– 10% of nameplate utilization voltage is acceptable.

Starting Conditions

GT-X Units – Units start and operate in an ambient of 45°F with entering air at 45°F, entering water at 32°F and both air and water at the stated flow rates of ISO/ASHRAE/ARI 13256-1 for initial winter start-up.

Notes:

1. **These are not normal or continuous operating conditions. It is assumed that winter start-up is to bring the building space up to occupancy temperatures.**
2. **Voltage utilization range complies with ARI Standard 110.**

Determination of operating limits is dependent primarily upon three factors: 1) return air temperature 2) water temperature and 3) ambient temperature. When any one of these factors is at minimum or maximum levels, the other two factors should be at normal levels to ensure proper unit operation.

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

Table 11: Operating Limit

Air Limits	Ultra Classic	
	Cooling	Heating
Min. Ambient Air	45°F	45°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	110/83°F	80°F
Water Limits		
Min. Entering Water	30°F	20°F
Normal Entering Water	50-90°F	30-60°F
Max. Entering Water	110°F	90°F

BEFORE POWERING UNIT, check the following:

- ❑ High voltage is correct and matches nameplate
- ❑ Fuses, breakers and wire size correct
- ❑ Low voltage wiring complete
- ❑ Piping completed and water system cleaned and flushed
- ❑ Air is purged from closed loop system
- ❑ Isolation valves are open, water control valves or loop pumps wired
- ❑ Condensate line open and correctly pitched
- ❑ Transformer switched to lower voltage tap if needed
- ❑ Air coil cleaned
- ❑ HWG pump disconnected unless piping is completed and air has been purged
- ❑ Blower rotates freely – shipping support has been removed
- ❑ Blower speed correct (taps on correct pins)
- ❑ Air filter is clean and in position
- ❑ Service/access panels are in place
- ❑ Return air temperature is between 40-80°F in heating and 50-110°F in cooling
- ❑ CXM field selectable options such as thermistor settings are correct.

UNIT START UP

Start up Procedure

⚠ WARNING

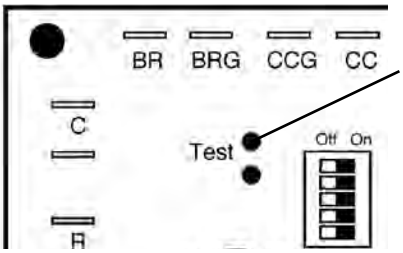
When the disconnect switch is closed, high voltage is present in some areas of the electrical panel. Exercise caution when working with energized equipment.

1. Turn thermostat fan position to "ON." Blower should start.
2. Balance air flow at registers.
3. Adjust all valves to their full open position. Turn on the line power to all heat pump units.
4. Operate unit in cooling cycle. Room temperature should be approximately 45-100°F DB. For Start-up check, loop water temperature entering the heat pumps should be between 40°F and 90°F.
5. Two factors determine the operating limits of a ClimateMaster UltraClassic System– (a) return air temperature, and (b) water temperature. When any one of these factors is at a minimum or maximum level, the other factor must be at normal levels to ensure proper unit operation.
   a. Adjust the unit thermostat to the coolest position. Slowly reduce thermostat setting until the compressor activates.
   b. Check for cool air delivery at the unit grille within a few minutes after the unit has begun to operate.

   Note: Units have a five minute time delay in the control circuit that can be eliminated on the CXM PCB as shown below in Figure 24. See controls description for detailed features of the control.
   c. Verify that the compressor is on and that the water flow rate is correct by measuring pressure drop through the heat exchanger using the Pete's plugs and comparing to Table 13.
   d. Check the elevation and cleanliness of the condensate lines. Dripping may be a sign of a blocked line. Check that the condensate trap includes a water seal.
   e. Refer to Table 12. Check the difference in temperature of supply and return water temperature, usually referred to as Delta-T Water. If Delta-T Water is outside the range shown in table 12, check cooling refrigerant pressure in table 14. Verify correct water flow by comparing unit pressure drop across the heat exchanger versus the data in Table 12. Heat of rejection can be calculated and compared to specification catalog.
   f. Check air temperature drop across the coil when compressor is operating. Air temperature should drop between 15°F and 25°F.
   g. Turn thermostat to "OFF" position. A hissing noise indicates proper functioning of the reversing valve.
6. Operate the heat pump in the heating cycle immediately after checking cooling cycle operation. Allow five (5) minutes between tests for pressure to equalize or cycle the reversing valve to equalize.
   a. Turn thermostat to lowest setting and set thermostat switch to "HEAT" position.
   b. Slowly turn thermostat to a higher temperature until the compressor activates.
   c. Check for warm air delivery at the unit grille within a few minutes after the unit has begun to operate.
   d. Check the temperature of both supply and discharge water. Refer to Table 12. If temperature is within range, proceed with test. If temperature is outside operating range, check heating refrigerant pressures in Table 14.
   e. Check air temperature rise across the coil when compressor is operating. Air temperature should rise between 20°F and 30°F. Heat of extraction can be calculated and compared to specification catalog.
   f. Check for vibration, noise, and water leaks.
7. If unit fails to operate, perform Troubleshooting analysis. If the check described fails to reveal the problem and the unit still does not operate, contact a trained service technician to ensure proper diagnosis and repair of the equipment.
8. When testing is complete, set system to maintain desired comfort level.
9. BE CERTAIN TO FILL OUT AND FORWARD ALL WARRANTY REGISTRATION PAPERS TO CLIMATEMASTER.

Note: If performance during any mode appears abnormal, refer to the troubleshooting section. To obtain maximum performance the air coil should be cleaned before start-up. A 10% solution of dishwasher detergent and water is recommended.

Figure 24: Test Mode Pins



Short test pins together to enter Test Mode and speed-up timing and delays for 20 minutes

CXM Board

Table 12: Water Temperature Change Through Heat Exchanger

Water Flow Rate (GPM)	Water Circuits Headered Together				Water Circuits Not Headered Together	
	One Circuit Active		Both Circuits Active			
	Delta-T Rise (Clg)	Delta-T Drop (Htg)	Delta-T Rise (Clg)	Delta-T Drop (Htg)	Delta-T Rise (Clg)	Delta-T Drop (Htg)
For Closed Loop: Ground Source or Cooler/Boiler systems at 3 gpm/ton	4.5 - 6 °F	2 - 4 °F	9 - 12 °F	4 - 8 °F	9 - 12 °F	4 - 8 °F
For Open Loop: Ground Water systems at 1.5 gpm/ton	10 - 13 °F	5 - 8 °F	20 - 26 °F	10 - 17 °F	20 - 26 °F	10 - 17 °F

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Table 13: Water Pressure Drop Table

Model	Single Circuit					Both Circuits					Both Circuits w/ access manifold				
	GPM	Pressure Drop (psi)				GPM	Pressure Drop (psi)				GPM	Pressure Drop (psi)			
		30°F	50°F	70°F	90°F		30°F	50°F	70°F	90°F		30°F	50°F	70°F	90°F
036	2	1.2	1.1	1.0	0.9	4	1.2	1.1	1.0	0.9	4	1.8	1.7	1.6	1.5
	3	2.1	1.9	1.8	1.7	6	2.1	1.9	1.8	1.7	6	3.2	3.0	2.8	2.6
	4	3.4	3.1	2.9	2.7	8	3.4	3.1	2.9	2.7	8	4.9	4.6	4.3	4.0
	6	6.6	6.2	5.7	5.4	12	6.6	6.2	5.7	5.4	12	9.4	8.7	8.1	7.6
042	3	0.6	0.6	0.5	0.5	6	0.6	0.6	0.5	0.5	6	1.6	1.5	1.4	1.3
	4	0.9	0.9	0.8	0.8	8	0.9	0.9	0.8	0.8	8	2.2	2.1	1.9	1.8
	5	1.3	1.2	1.1	1.1	10	1.3	1.2	1.1	1.1	10	2.9	2.7	2.5	2.4
	7	2.3	2.1	2.0	1.9	14	2.3	2.1	2.0	1.9	14	4.5	4.2	3.9	3.7
048	3	0.6	0.6	0.5	0.5	6	0.6	0.6	0.5	0.5	6	1.5	1.4	1.3	1.2
	4	0.9	0.9	0.8	0.8	8	0.9	0.9	0.8	0.8	8	2.2	2.0	1.9	1.8
	6	1.8	1.7	1.5	1.4	12	1.8	1.7	1.5	1.4	12	3.9	3.6	3.4	3.2
	8	2.9	2.7	2.5	2.3	16	2.9	2.7	2.5	2.3	16	6.0	5.6	5.2	4.9
060	4	0.9	0.9	0.8	0.8	8	0.9	0.9	0.8	0.8	8	2.0	1.9	1.8	1.6
	5	1.3	1.2	1.1	1.1	10	1.3	1.2	1.1	1.1	10	2.8	2.6	2.5	2.3
	7	2.3	2.1	2.0	1.9	14	2.3	2.1	2.0	1.9	14	4.8	4.5	4.2	3.9
	10	4.2	3.9	3.6	3.4	20	4.2	3.9	3.6	3.4	20	8.8	8.2	7.6	7.1
072	4	0.9	0.9	0.8	0.8	8	0.9	0.9	0.8	0.8	8	1.9	1.8	1.7	1.6
	6	1.8	1.7	1.5	1.4	12	1.8	1.7	1.5	1.4	12	3.7	3.5	3.2	3.0
	8	2.9	2.7	2.5	2.3	16	2.9	2.7	2.5	2.3	16	6.0	5.6	5.2	4.9
	12	5.7	5.3	4.9	4.6	24	5.7	5.3	4.9	4.6	24	12.3	11.5	10.6	10.0

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Table 14: Unit operating pressures and temperatures

Entering Water Temp °F	Water Flow GPM/ton	Cooling** - without HWG active						Heating - without HWG active					
		Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Rise °F	Air Temp* Drop °F DB	Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Drop °F DB	Air Temp* Rise °F
30	1.5	75-85	90-105	25-40	12-20	21-24	21-26	34-39	167-186	12-16	1-4	7.6-8.4	14-20
	2.3	74-84	80-95	25-40	11-18	13-16	21-26	37-43	172-191	12-16	1-4	4.8-5.6	16-22
	3.0	73-83	70-85	25-40	10-16	6-11	21-26	40-46	177-196	12-16	1-4	3.4-4.2	16-22
50	1.5	75-85	125-155	12-20	10-18	20-23	20-25	50-60	180-210	10-17	1-5	10.8-11.9	23-29
	2.3	74-84	120-142	12-20	9-16	12-15	20-25	53-62	185-215	10-17	1-5	6.7-8.1	24-30
	3.0	73-83	115-138	12-20	8-14	8-12	20-25	55-65	190-220	10-17	1-5	5.1-5.9	25-31
70	1.5	75-85	179-198	9-16	8-15	19-22	19-24	71-82	205-230	14-19	1-5	14.0-15.2	28-34
	2.3	74-84	168-186	9-16	8-14	12-17	19-24	73-85	210-238	14-19	1-5	9.0-10.2	30-37
	3.0	73-83	158-175	9-16	8-12	7-12	19-24	76-88	215-242	14-19	1-5	6.7-7.9	31-38
90	1.5	75-85	229-251	9-17	8-15	18-21	17-23	85-95	220-260	18-28	2-5	14.4-16.6	32-39
	2.3	74-84	218-241	9-17	8-14	10-14	17-23	90-100	225-265	18-28	2-5	10.8-12.4	33-41
	3.0	73-83	208-230	9-17	8-12	6-11	17-23	95-105	230-270	18-28	2-5	7.2-8.3	35-42
110	1.5	77-87	280-320	8-15	10-25	17-20	15-20						
	2.3	76-86	270-310	8-15	10-24	9-13	15-20						
	3.0	75-85	260-300	8-15	10-22	5-10	15-20						

HWG should be disabled for accurate chart comparison.
*Based on Nominal 400 cfm per ton airflow and 70°F EAT htg and 80/67°F EAT cooling.
**Cooling air and water numbers can vary greatly with changes in humidity.
Subcooling is based upon the head pressure at compressor service port.

NOTES

CLIMATE MASTER, INC.
LIMITED EXPRESS WARRANTY/LIMITATION OF REMEDIES AND LIABILITY FOR RESIDENTIAL CLASS PRODUCTS

It is expressly understood that unless a statement is specifically identified as a warranty, statements made by Climate Master, Inc. a Delaware corporation, ("CM") or its representatives, relating to CM's products, whether oral, written or contained in any sales literature, catalog or agreement, are not express warranties and do not form a part of the basis of the bargain, but are merely CM's opinion or commendation of CM's products. **EXCEPT AS SPECIFICALLY SET FORTH HEREIN, THERE IS NO EXPRESS WARRANTY AS TO ANY OF CM'S PRODUCTS. CM MAKES NO WARRANTY AGAINST LATENT DEFECTS. CM MAKES NO WARRANTY OF MERCHANTABILITY OF THE GOODS OR OF THE FITNESS OF THE GOODS FOR ANY PARTICULAR PURPOSE.**

GRANT OF LIMITED EXPRESS WARRANTY

CM warrants its Residential Class products, purchased and retained in the United States of America and Canada, to be free from defects in material and workmanship under normal use and maintenance as follows: (1) Air conditioning, heating and/or heat pump units built or sold by CM ("CM Units") for five (5) years from the Warranty Inception Date (as defined below); (2) Thermostats, auxiliary electric heaters and geothermal pumping modules built or sold by CM, when installed with CM Units, for five (5) years from the Warranty Inception Date (as defined below); (3) Sealed refrigerant circuit components of CM Units (which components only include the compressor, refrigerant to air/water heat exchangers, reversing valve body and refrigerant metering device) for ten (10) years from the Warranty Inception Date (as defined below); and (4) Other accessories and parts built or sold by CM, which are not supplied under warranty, for one (1) year from the date of shipment from CM. The "Warranty Inception Date" shall be the date of original unit installation, or six (6) months from date of unit shipment from CM, whichever comes first.

To make a claim under this warranty, parts must be returned to CM in Oklahoma City, Oklahoma, freight prepaid, no later than ninety (90) days after the date of the failure of the part; if CM determines the part to be defective and within CM's Limited Express Warranty, CM shall, when such part has been either replaced or repaired, return such to a factory recognized distributor, dealer or service organization, F.O.B. CM, Oklahoma City, Oklahoma, freight prepaid. The warranty on any part repaired or replaced under warranty expires at the end of the original warranty period.

This warranty does not cover and does not apply to: (1) Air filters, fuses, refrigerant, fluids, oil; (2) Products relocated after initial installation; (3) Any portion or component of any system that is not supplied by CM, regardless of the cause of the failure of such portion or component; (4) Products on which the unit identification tags or labels have been removed or defaced; (5) Products on which payment to CM, or to the owner's seller, is in default; (6) Products subjected to improper or inadequate installation, maintenance, repair, wiring or voltage conditions; (7) Products subjected to accident, misuse, negligence, abuse, fire, flood, lightning, unauthorized alteration, misapplication, contaminated or corrosive air or liquid supply, operation at abnormal air or liquid temperatures or flow rates, or opening of the refrigerant circuit by unqualified personnel; (8) Mold, fungus or bacteria damages; (9) Corrosion or abrasion of the product; (10) Products supplied by others; (11) Products which have been operated in a manner contrary to CM's printed instructions; (12) Products which have insufficient performance as a result of improper system design or improper application, installation, or use of CM's products; or (13) Electricity or fuel costs, or any increases or unrealized savings in same, for any reason whatsoever.

CM is not responsible for: (1) The costs of any fluids, refrigerant or system components supplied by others, or associated labor to repair or replace the same, which is incurred as a result of a defective part covered by CM's Limited Express Warranty; (2) The costs of labor, refrigerant, materials or service incurred in diagnosis and removal of the defective part, or in obtaining and replacing the new or repaired part; (3) Transportation costs of the defective part from the installation site to CM, or of the return of that part if not covered by CM's Limited Express Warranty; or (4) The costs of normal maintenance.

This Limited Express Warranty applies to CM Residential Class products manufactured on or after June 9, 2003 (CM Units with serial numbers beginning with E124 and higher), and is not retroactive to any products produced prior to June 9, 2003 (CM Units with serial numbers beginning with E123 and lower).

Limitation: This Limited Express Warranty is given in lieu of all other warranties. If, notwithstanding the disclaimers contained herein, it is determined that other warranties exist, any such express warranty, including without limitation any express warranties or any implied warranties of fitness for particular purpose and merchantability, shall be limited to the duration of the Limited Express Warranty.

LIMITATION OF REMEDIES

In the event of a breach of the Limited Express Warranty, CM will only be obligated at CM's option to repair the failed part or unit, or to furnish a new or rebuilt part or unit in exchange for the part or unit which has failed. If after written notice to CM's factory in Oklahoma City, Oklahoma of each defect, malfunction or other failure, and a reasonable number of attempts by CM to correct the defect, malfunction or other failure, and the remedy fails of its essential purpose, CM shall refund the purchase price paid to CM in exchange for the return of the sold good(s). Said refund shall be the maximum liability of CM. **THIS REMEDY IS THE SOLE AND EXCLUSIVE REMEDY OF THE BUYER OR PURCHASER AGAINST CM FOR BREACH OF CONTRACT, FOR THE BREACH OF ANY WARRANTY OR FOR CM'S NEGLIGENCE OR IN STRICT LIABILITY.**

LIMITATION OF LIABILITY

CM shall have no liability for any damages if CM's performance is delayed for any reason or is prevented to any extent by any event such as, but not limited to: any war, civil unrest, government restrictions or restraints, strikes, or work stoppages, fire, flood, accident, shortages of transportation, fuel, material, or labor, acts of God or any other reason beyond the sole control of CM. **CM EXPRESSLY DISCLAIMS AND EXCLUDES ANY LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGE IN CONTRACT, FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY, OR IN TORT, WHETHER FOR CM's NEGLIGENCE OR AS STRICT LIABILITY.**

OBTAINING WARRANTY PERFORMANCE

Normally, the dealer or service organization who installed the products will provide warranty performance for the owner. Should the installer be unavailable, contact any CM recognized distributor, dealer or service organization. If assistance is required in obtaining warranty performance, write or call:

Climate Master, Inc. • Customer Service • 7300 SW 44th Street • Oklahoma City, Oklahoma 73179 • (405) 745-6000 • e-service@climatemaster.com

NOTE: Some states or Canadian provinces do not allow limitations on how long an implied warranty lasts, or the limitation or exclusions of consequential or incidental damages, so the foregoing exclusions and limitations may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state and from Canadian province to Canadian province.

Please refer to the CM Installation, Operation and Maintenance Manual for operating and maintenance instructions.

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PREVENTIVE MAINTENANCE

Water Coil Maintenance –
(Direct Ground Water Applications Only)
If the installation is performed in an area with a known high mineral content (125 P.P.M. or greater) in the water, it is best to establish with the owner a periodic maintenance schedule so the coil can be checked regularly. Consult the well water applications section of this manual for a more detailed water coil material selection. Should periodic coil cleaning be necessary, use standard coil cleaning procedures which are compatible with either the heat exchanger material or copper water lines. Generally, the more water flowing through the unit the less chance for scaling therefore 1.5 gpm per ton is recommended as a minimum flow.

Water Coil Maintenance –
(Other Water Loop Applications)
Generally water coil maintenance is not needed however, if the installation is located in a system with a known high dirt or debris content, it is best to establish with the owner a periodic maintenance schedule so the coil can be checked regularly. These dirty installations are a result of the deterioration of iron or galvanized piping or components in the system or open cooling towers requiring heavy chemical treatment and mineral buildup through water use. Should periodic coil cleaning be necessary, use standard coil cleaning procedures which are compatible with both the heat exchanger material and copper water lines. Generally, the more water flowing through the unit, the less chance for scaling, however flow rates over 3 gpm per ton can produce water (or debris) velocities that can erode the heat exchanger wall and ultimately produce leaks.

Filters – Filters must be clean to obtain maximum performance. They should be inspected every month under normal operating conditions and be replaced when necessary. Units should never be operated without a filter.

Washable high efficiency electrostatic filters, when dirty, can exhibit a very high pressure drop for the fan motor and reduce air flow resulting in poor performance. With ECM fan motors, excessive fan watts will be used as well. It is especially important to provide consistent washing of these filters (in opposite direction of the normal air flow) once per month using a high pressure wash similar to that found at self-serve car washes.

Condensate Drain – In areas where airborne bacteria produce a slime in the drain pan, it may be necessary to treat chemically with an algaecide every three months or so to minimize the problem. The condensate pan may also need to be cleaned periodically to assure indoor air quality. The condensate drain can pick up lint and dirt, especially with dirty filters. Inspect the drain twice a year to avoid the possibility of overflow.

Fan Motors - All units have lubricated fan motors. FAN MOTORS SHOULD NEVER BE LUBRICATED UNLESS OBVIOUS, DRY OPERATION IS SUSPECTED. Periodic maintenance oiling is not recommended because it will result in dirt accumulating on excess oil and cause eventual motor failure.

Air Coil – The air coil must be cleaned to obtain maximum performance. Check once a year under normal operating conditions and, if dirty, brush or vacuum clean. Care must be taken not to damage the aluminum fins while cleaning. **CAUTION: Fin edges are sharp.**

Hot Water Generator Coils – See water coil maintenance for ground water units. If the domestic water is hard or not chemically softened the high temperatures of the desuperheater will tend to "lime up" even quicker than the water coil and may need more frequent inspections.

Cabinet - Do not allow water to stay in contact with the cabinet for long periods of time to prevent corrosion of the cabinet sheet metal. Generally the cabinet is set up from the floor a few inches for prevention. The cabinet can be cleaned using a mild detergent.

Refrigerant System - To maintain sealed circuit integrity, do not install service gauges unless unit operation appears abnormal. Reference the operating chart for pressure and temperatures. Verify that air and water flow rates are at proper levels before servicing the refrigerant circuit.

Part # 69197343

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