HEAT CONTROLLER

INSTALLATION, OPERATION & MAINTENANCE MANUAL

HZ series

Two-Stage
Horizontal Vertical and Downflow
System Sizes 024-070

Heat Controller • 1900 Wellworth Ave. • Jackson, MI 49203 • (517)787-2100 • www.heatcontroller.com

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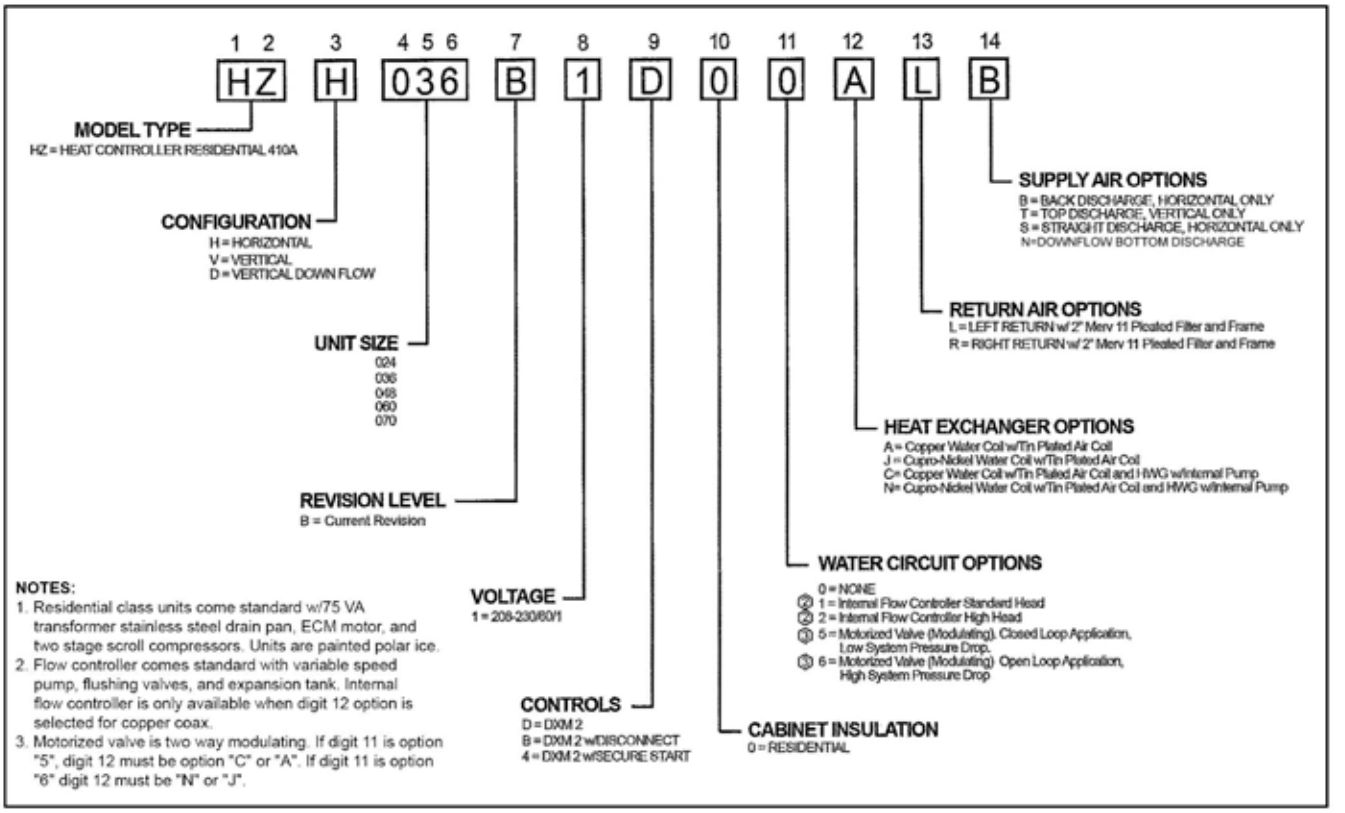
Model Nomenclature: General Overview



Safety

Warnings, cautions and notices appear throughout this manual. Read these items carefully before attempting any installation, service, or troubleshooting of the equipment.

DANGER: Indicates an immediate hazardous situation, which if not avoided will result in death or serious injury. DANGER labels on unit access panels must be observed.

WARNING: Indicates a potentially hazardous situation, which if not avoided could result in death or serious injury.

⚠ WARNING! ⚠

WARNING! Polyolester Oil, commonly known as POE oil, is a synthetic oil used in many refrigeration systems including those with HFC-410A refrigerant. POE oil, if it ever comes in contact with PVC or CPVC piping, may cause failure of the PVC/CPVC. PVC/CPVC piping should never be used as supply or return water piping with water source heat pump products containing HFC-410A as system failures and property damage may result.

⚠ WARNING! ⚠

WARNING! 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.

CAUTION: Indicates a potentially hazardous situation or an unsafe practice, which if not avoided could result in minor or moderate injury or product or property damage.

NOTICE: Notification of installation, operation or maintenance information, which is important, but which is not hazard-related.

⚠ WARNING! ⚠

WARNING! 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, refrigerant circuit oil will remain in the compressor. To avoid leakage of compressor oil, refrigerant lines of the compressor must be sealed after it is removed.

⚠ CAUTION! ⚠

CAUTION! 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 will quickly become clogged with construction dirt and debris, which may cause system damage.

General Information

Inspection
Upon receipt of the equipment, carefully check the shipment against the bill of lading. Make sure all units and accessories have been received. Inspect the packaging of each unit, and inspect each unit for damage. Insure that the carrier makes proper notation of any shortages or damage on all copies of the freight bill and 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 your equipment supplier of all damage within fifteen (15) days of shipment.

Storage
Equipment should be stored in its original packaging in a clean, dry area. Store units in an upright position at all times. Stack units a maximum of 3 units high.

Unit Protection
Cover units on the job site with either the original packaging or an equivalent protective covering. Cap the open ends of pipes stored on the job site. In areas where painting, plastering, and/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 clean-up.

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

Pre-Installation
Installation, Operation, and Maintenance instructions are provided with each unit. Horizontal equipment is designed for installation above false ceiling or in a ceiling plenum. Other unit configurations are typically installed in a mechanical room. The installation site chosen should include adequate service clearance around the 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 that the correct unit has been shipped.
2. Keep the cabinet covered with the original packaging 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.
5. Remove any blower support packaging (water-to-air units only).
6. Locate and verify any hot water generator (HWG), hanger, or other accessory kit located in the compressor section or blower section.

⚠ CAUTION! ⚠

CAUTION! DO NOT store or install units in corrosive environments or in locations subject to temperature or humidity extremes (e.g., rooftops, etc. See Tables 12a and 12b for acceptable temperature ranges). Corrosive conditions and high temperature or humidity can significantly reduce performance, reliability, and service life. Always move and store units in an upright position. Tilting units on their sides may cause equipment damage.

⚠ CAUTION! ⚠

CAUTION! CUT HAZARD - Failure to follow this caution may result in personal injury. Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts and servicing heat pumps.

Duct System Installation
The duct system should be sized to handle the design airflow quietly. Refer to Figure 1 for vertical duct system details. A flexible connector is recommended for both discharge and return air duct connections on metal duct systems to eliminate the transfer of vibration to the duct system. To maximize sound attenuation of the unit blower, the supply adn return plenums should include internal fiberglass duct liner or be constructed from ductboard for the first few feet. Application of the unit to uninsulated ductwork in an unconditioned space is not recommended, as the unit's performance will be adversely affected.

At least one 90° elbow should be included in the supply duct to reduce air noise. If air noise or excessive air flow is a problem, the blower speed can be changed. For airflow charts, consult catalog specifications for the series and model of the specific unit.

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

The installation of geothermal heat pump units and all associated components, parts and accessories which make up the GHP system 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.

Vertical Installation

Vertical Unit Location
Packaged units are not designed for outdoor installation. Locate the unit in an INDOOR area that allows enough space for service personnel to perform typical maintenance or repairs without removing the unit from the installed location. Vertical units are typically installed in a mechanical closet or basement. Never install units in areas subject to freezing or where humidity levels could cause cabinet condensation (such as unconditioned spaces subject to 100% outside air). Also, 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 or other method. Any access panel screws that would be difficult to remove after the unit is installed should be removed prior to setting the unit. Refer to Figures 1 and 2 for typical installation illustrations. Refer to unit catalog specifications for dimensional data.

1. Install the unit on a piece of rubber, neoprene or other mounting pad material for sound isolation. The pad should be at least 3/8" [10mm] to 1/2" [13mm] in thickness. Extend the pad beyond all four edges of the unit.
2. Do not block filter access with piping, conduit or other materials. Refer to unit catalog specifications for dimensional data.
3. Provide access to water valves and fittings and screwdriver access to the unit side panels, discharge collar and all electrical connections.

Figure 1: Vertical Unit Mounting Using Ducted Return

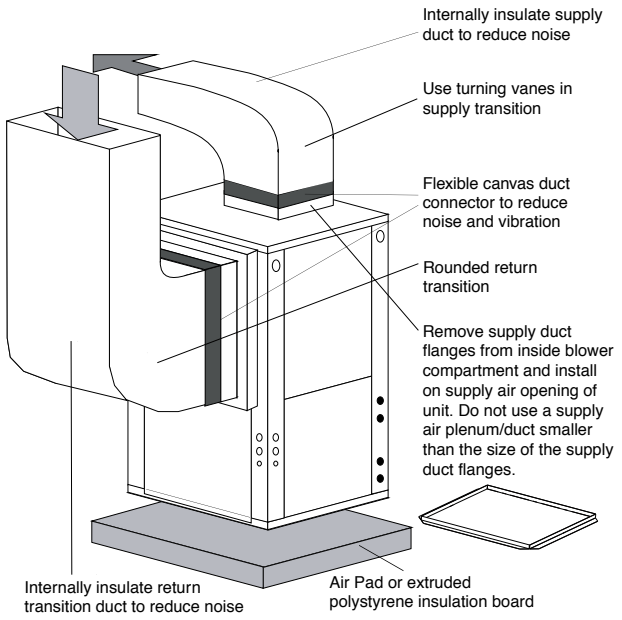
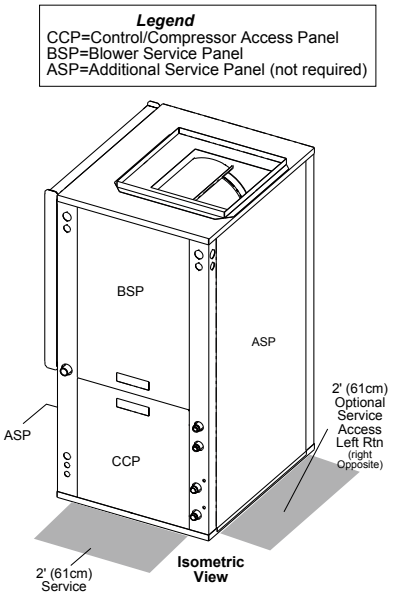


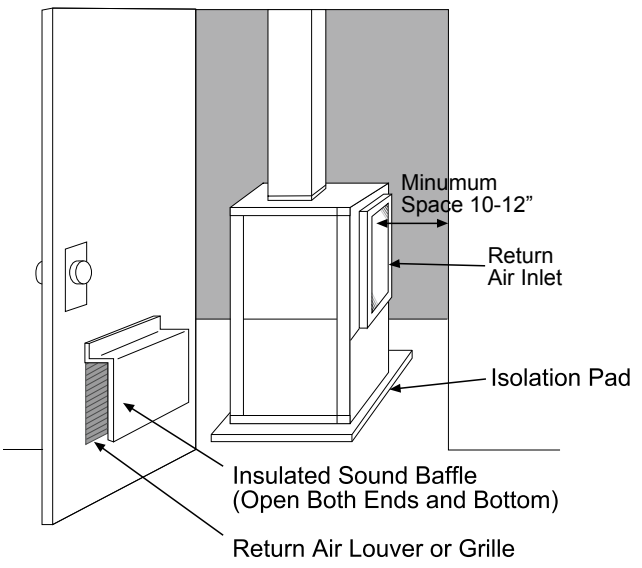
Figure 2: Service Access



Sound Attenuation for Vertical Units
Sound attenuation is achieved by enclosing the unit within a small mechanical room or a closet. Additional measures for sound control include the following:

1. Mount the unit so that the return air inlet is 90° to the return air grille (refer to Figure 3). Install a sound baffle as illustrated to reduce line-of sight sound transmitted through return air grilles.
2. Mount the unit on a unit isolation pad to minimize vibration transmission to the building structure. For more information on unit isolation pads, contact your distributor.

Figure 3: Vertical Sound Attenuation - Free Return



Condensate and Water Connection

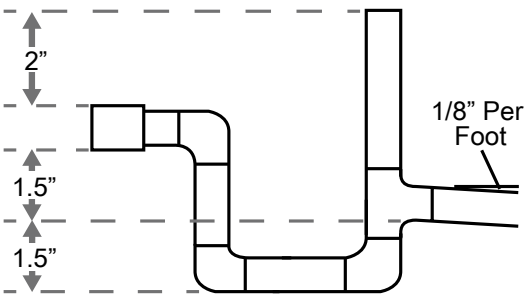
Condensate Piping
Pitch the unit toward the drain as shown in Figure 5 to improve the condensate drainage. On small units (less than 2.5 tons/8.8 kW), insure that unit pitch does not cause condensate leaks inside the cabinet.

Install condensate trap at each unit with the top of the trap positioned below the unit condensate drain connection as shown in Figure 9. Design the depth of the trap (water-seal) based upon the amount of External Static Pressure (ESP) capability of the blower (where 2 inches [51mm] of ESP capability requires 2 inches [51mm] of trap depth). As a general rule, 1-1/2 inch [38mm] trap depth is the minimum.

Each unit must be installed with its own individual trap and connection to the condensate line (main) or riser. Provide a means to flush or blow out the condensate line. DO NOT install units with a common trap and/or vent.

Always vent the condensate line when dirt or air can collect in the line or a long horizontal drain line is required. Also vent when large units are working against higher external static pressure than other units connected to the same condensate main since this may cause poor drainage for all units on the line. WHEN A VENT IS INSTALLED IN THE DRAIN LINE, IT MUST BE LOCATED AFTER THE TRAP IN THE DIRECTION OF THE CONDENSATE FLOW.

Figure 9: Condensate Connection



* Some units include a painted drain connection. Using a threaded pipe or similar device to clear any excess paint accumulated inside this fitting may ease final drain line installation.

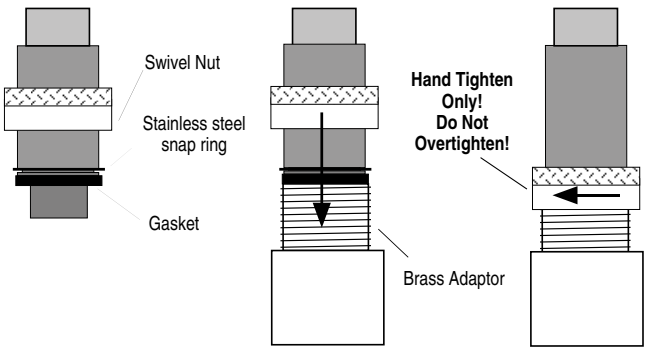
⚠ CAUTION! ⚠

CAUTION! Ensure condensate line is pitched toward drain 1/8 inch per ft [11mm per m] of run.

Water Connections-Residential Models
Residential models utilize swivel piping fittings for water connections that are rated for 450 psi (3101 kPa) operating pressure. The connections have a rubber gasket seal similar to a garden hose gasket, which when mated to the flush end of most 1” threaded male pipe fittings provides a leak-free seal without the need for thread sealing tape or joint compound. Check for burrs and ensure that the rubber seal is in the swivel connector prior to attempting any connection (rubber seals are shipped attached to the swivel connector). DO NOT OVER TIGHTEN or leaks may occur.

The female locking ring is threaded onto the pipe threads which holds the male pipe end against the rubber gasket, and seals the joint. HAND TIGHTEN ONLY! DO NOT OVERTIGHTEN!

Figure 10: Water Connections



Integrated Variable - Speed Water Flow Control Heat Pump Applications Overview

Integrated Variable Speed Water Flow Control is a revolutionary new, intelligent, and efficient way to circulate water (or water plus antifreeze) using INTERNAL, variable water flow control. The factory-installed high-efficiency variable-speed pump uses 60%-80% less wattage than a traditional fixed speed pump. Integrated Variable Speed Water Flow Control technology improves performance of the unit by reducing the amount of energy required to optimize the flow of water throughout a GHP System and also reduces the space, cost, and labor required to install external water flow control mechanisms (flow controllers, solenoid and flow control valves).

Integrated Variable Speed Water Flow Control Configurations:

1) **Internal Flow Controller - For Closed Loop Applications**
   This is the most common configuration for closed loops. With this factory-installed standard option, the unit is built with an Internal Variable Speed Pump and other components to flush and operate the unit correctly (including an expansion tank, flush ports and flushing valves). The pump speed is controlled by the DXM2 control based on the difference in entering and leaving water temperatures (ΔT). The Internal Flow Controller pump includes an internal check valve for multiple unit installations. A copper water coil is standard with this option.

   Note: Internal Flow Controllers are also very suitable for multiple unit installations depending on pump performance requirements.

2) **Internal Modulating Motorized Valve – For Large Closed Loop Applications (external central pumping)**
   Primarily for use on multi-unit closed loop applications with central pumping. With this factory-installed option, the unit includes a low pressure drop modulating motorized valve that is controlled by the DXM2 microprocessor control based on the difference in the entering and leaving water temperatures (ΔT). A Copper Water Coil is standard with this option. The modulating valve in this option has a higher Cv than the open loop option.

3) **Internal Modulating Motorized Valve - For Open Loop Applications**
   For use on open loop applications. With this factory-installed, standard option, the unit is built with an internal modulating motorized valve controlled by the Communicating DXM2 control board based on entering and leaving water temperatures (ΔT). A low Cv modulating motorized valve is used for this application to provide more precise control against the higher system pressure differential of open loop applications. A Cupro-Nickel water coil comes standard with this option.

Details on these options are included in the following sections on ground loop and ground water applications.

Figure 11a: Typical Closed-Loop Application (with Internal Flow Controller Shown)

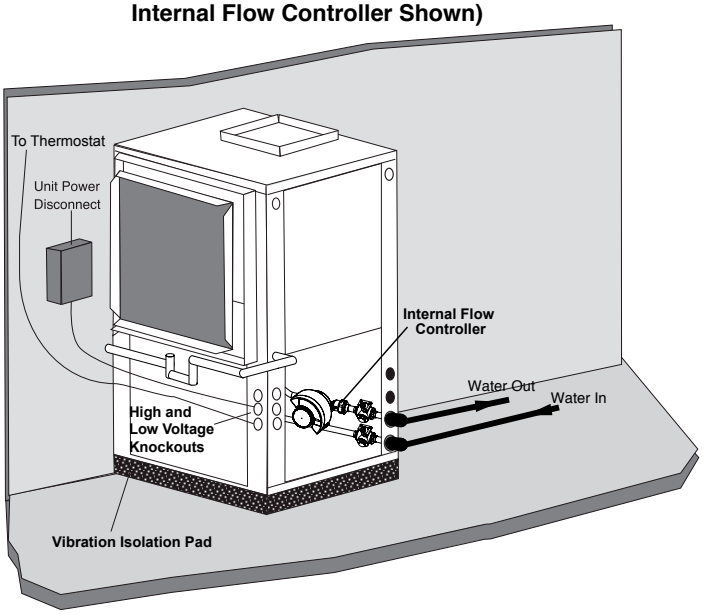
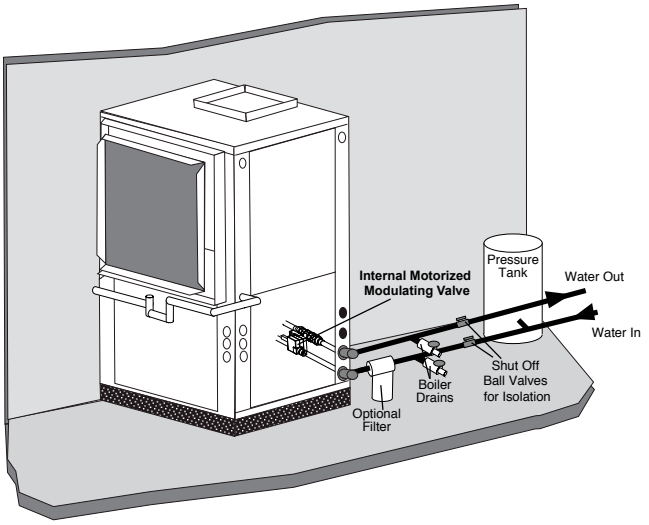


Figure 11b: Typical Open Loop Application (with Internal Modulating Motorized Valve Shown)

For use on applications using external source for flow



⚠ CAUTION! ⚠

CAUTION! The following instructions represent industry accepted installation practices for closed loop earth coupled heat pump systems. Instructions are provided to assist the contractor in installing trouble free ground loops. These instructions are recommendations only. State/provincial and local codes MUST be followed and installation MUST conform to ALL applicable codes. It is the responsibility of the installing contractor to determine and comply with ALL applicable codes and regulations.

Closed Loop Heat Pump Applications with Internal Flow Controller

Units with internal flow control come with built-in variable speed pumps, an expansion tank, flushing ports and a three way valve (used to flush the unit). The variable speed pump is controlled by the Communicating DXM2 board based on the difference between the entering and leaving water temperature (ΔT). For operation outside of the normal entering water temperature range (50° or 60°F - 110°F for cooling, 30°F-70°F for heating) the DXM2 controller may automatically adjust the control ΔT to account for the abnormal entering water temperatures, maintaining an appropriate flow rate for proper unit operation. The expansion tank helps to maintain constant loop pressure despite the natural expansion and contraction of the loop as the seasons and loop temperatures vary.

Packaged Digital units with Internal Flow Controller option are also provided with an expansion tank to help maintain positive pressure on the complete system through all seasons.

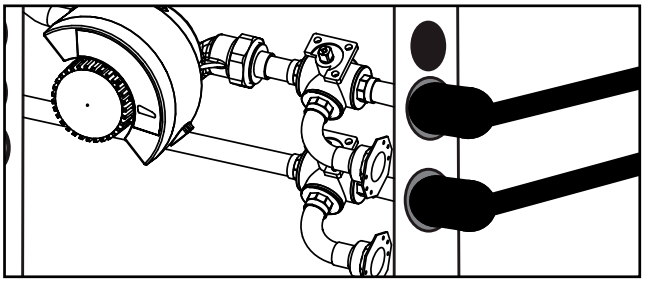
Pre-Installation

Prior to installation, locate and mark all existing underground utilities, piping, etc. Install loops for new construction before sidewalks, patios, driveways, and other construction has begun. During construction, accurately mark all ground loop piping on the plot plan as an aid in avoiding potential future damage to the installation.

Piping Installation

The typical closed loop ground source system is shown in Figures 6a and 11a. All earth loop piping materials should be limited to polyethylene fusion only for in-ground sections of the loop. Galvanized or steel fittings should not be used at any time due to their tendency to corrode. All plastic to metal threaded fittings should be avoided due to their potential to leak in earth coupled applications. A flanged fitting should be substituted. Earth loop temperatures can range between 25 and 110°F [-4 to 43°C]. Flow rates between 2.25 and 3 gpm per ton [2.41 to 3.23 l/m per kW] of cooling capacity is recommended in these applications.

Internal Flow Controller



Test individual horizontal loop circuits before backfilling. Test vertical U-bends and pond loop assemblies prior to installation. Pressures of at least 100 psi [689 kPa] should be used when testing. Do not exceed the pipe pressure rating. Test entire system when all loops are assembled.

⚠ NOTICE! ⚠

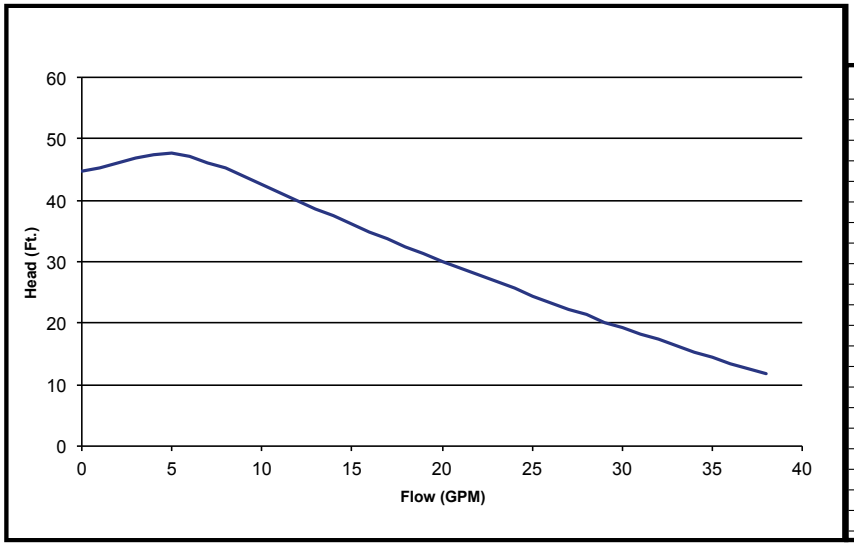
NOTICE! If installing MULTIPLE Internal Variable Speed Flow Controller units (in parallel) on one loop, please refer to section 'Multiple Unit Piping and Flushing' (later in this document).

The following section will help to guide you through flushing a unit with internal flow control.

Pressure/Water Ports

The pressure ports built in to the unit are provided as a means of measuring drop through the unit. The water flow through the unit can be checked by measuring the incoming water pressure at the supply water pressure port and subtracting the leaving water pressure at the return water pressure port. Comparing the pressure differential to the pressure drop table/flow rate in Tables 17a through 17e in this manual will determine the flow rate through the unit.

Figure 13: Internal Variable Speed Flow Controller Maximum Performance



GPM	Head (ft)	GPM	Head (ft)
0.0	44.7	21.0	28.9
1.0	45.4	22.0	27.8
2.0	46.1	23.0	26.7
3.0	46.8	24.0	25.6
4.0	47.5	25.0	24.5
5.0	47.7	26	23.4
6.0	47.1	27	22.3
7.0	46.1	28	21.3
8.0	45.3	29	20.2
9.0	43.9	30	19.2
10.0	42.6	31	18.2
11.0	41.2	32	17.3
12.0	39.9	33	16.3
13.0	38.7	34	15.4
14.0	37.4	35	14.4
15.0	36.1	36	13.5
16.0	34.9	37	12.6
17.0	33.7	38	11.7
18.0	32.5		
19.0	31.3		
20.0	30.1		

Flushing the Earth Loop

Once piping is completed between the unit and the ground loop, final purging and charging of the loop is needed.

A flush cart (at least a 1.5 hp [1.1kW] 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 [0.6 m/s] in all piping)**, using a filter in the loop return line, of the flush cart to eliminate debris from the loop system. See Table 1 for flow rate required to attain 2fps [0.6 m/s]. The steps below must be followed for proper flushing.

Table 1: Minimum Flow Required to Achieve 2 ft/sec variety

PE Pipe Size	Flow (GPM)
3/4"	4
1"	6
1 1/4"	10
1 1/2"	13
2"	21

Units with internal variable speed pumps also include a check valve internal to the pump. It is not possible to flush backwards through this pump. Care must be taken to connect the flush cart hoses so that the flush cart discharge is connected to the “water in” flushing valve of the heat pump.

Loop Fill
Fill loop (valve position A, see Figure 15a) with water from a garden hose through flush cart before using flush cart pump to ensure an even fill and increase flushing speed. When water consistently returns back to the flush reservoir, switch to valve position B (figure 15b).

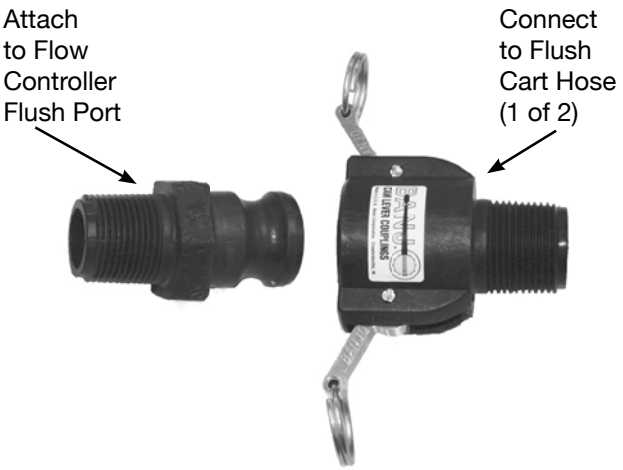
Isolate expansion tank for flushing procedure using the ball valve. During dead heading of flush cart pump, isolation will prevent compression of bladder in the expansion tank and flush cart fluid level dropping below available capacity.

Figure 14a: Typical Cleanable Flush Cart Strainer (100 mesh [0.149mm])

⚠ WARNING! ⚠

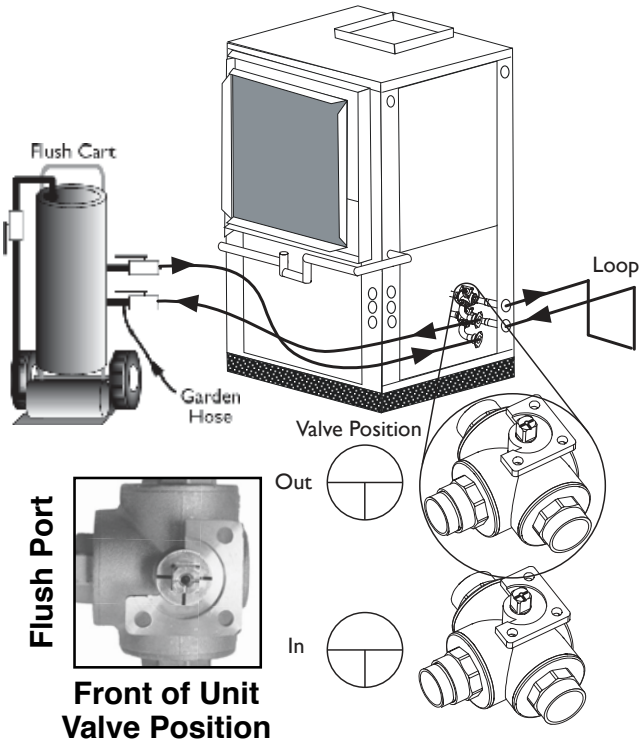
WARNING! Disconnect electrical power source to prevent injury or death from electrical shock.

Figure 14b: Cam Fittings for Flush Cart Hoses



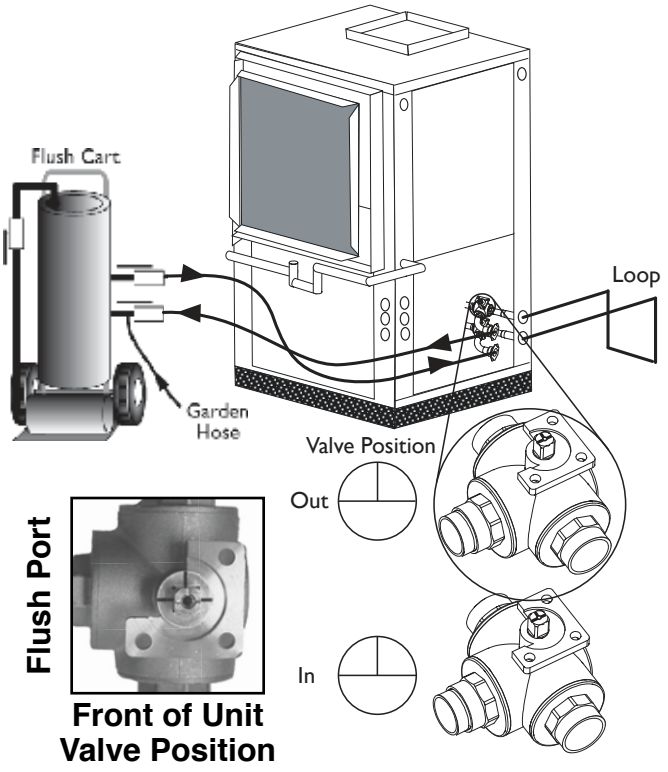
NOTICE: A hydrostatic pressure test is required on ALL piping, especially underground piping before final backfill per IGSHPA and the pipe manufacturers recommendations.

Figure 15a: Valve Position A - Loop Fill/Flush



Flushing the Earth Loop

Figure 15b: Valve Position B - Unit Fill / Flush



Unit Fill
Unit fill valves should be switched to Position B while flush cart is pumping to fill the unit heat exchanger (see Figure 15b). The valves position should be maintained until water is consistently returned into the flush reservoir.

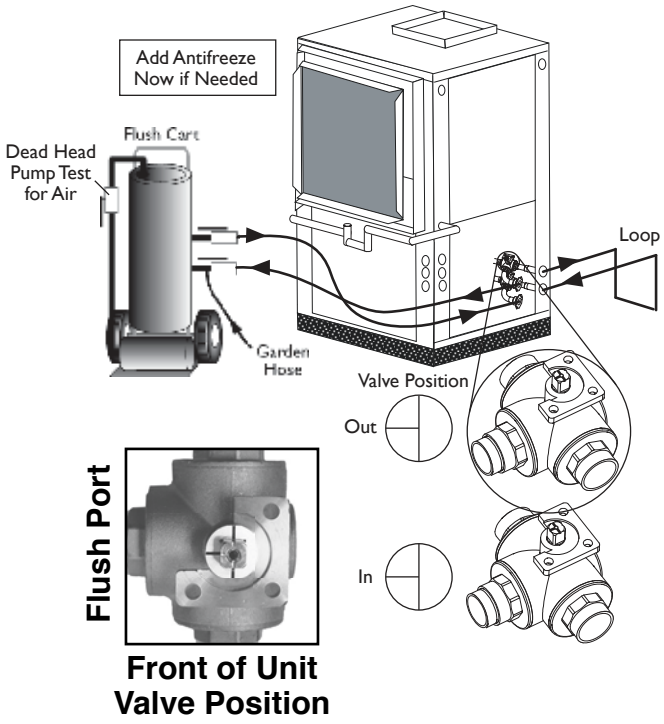
Loop Flush
Switch to valve Position A. The supply water may be shut off and the flush cart turned on to begin flushing. Once the flush reservoir is full, do not allow the water level in the flush cart tank to drop below the pump inlet line or air can be pumped back out to the earth loop. Try to maintain a fluid level in the tank above the return tee so that air can not be continuously mixed back into the fluid. Surges of 50 psi [345 kPa] can be used to help purge air pockets by simply shutting off the flush cart return valve going into the flush cart reservoir. This process 'dead heads' the pump to 50 psi [345 kPa]. To dead head the pump until maximum pumping pressure is reached, open the valve back up 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. If all air is purged from the system, the level will drop only 3/8" in a 10" [25.4 cm] diameter PVC flush tank (about a half gallon [1.9 liters]) since liquids are incompressible. If the level drops more than this level, flushing should continue since air is still being compressed in the loop fluid. Do this a number of times.

NOTICE: Actual flushing time require will vary for each installation due to piping length, configuration, and flush cart pump capacity. 3/8" or less fluid level drop is the ONLY indication that flushing is complete.

Switch valves to Position B to flush the unit. Flush through the unit until all air pockets have been removed.

Move valves to position C. By switching both valves to this position, water will flow through the loop and the unit heat exchanger. Finally, the dead head test should be checked again for an indication of air in the loop. Fluid level drop is your only indication of air in the loop.

Figure 15c: Valve Position C - Full Flush



Pressurize and Operate
As shown in Figure 15d, close the flush cart return valve to pressurize the loop to at least 50 psi [345 kPa], not to exceed 75 psi [517 kPa]. Open the isolation valve to the expansion tank and bleed air from the expansion tank piping using the schraeder valve located in front of the expansion tank. This will allow loop pressure to compress the expansion tank bladder, thus charging the expansion tank with liquid. After pressurizing, close the flush cart supply valve to isolate the flush cart. Move the Flow Controller valves to Position D.

Loop static pressure will fluctuate with the seasons and 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. Unhook

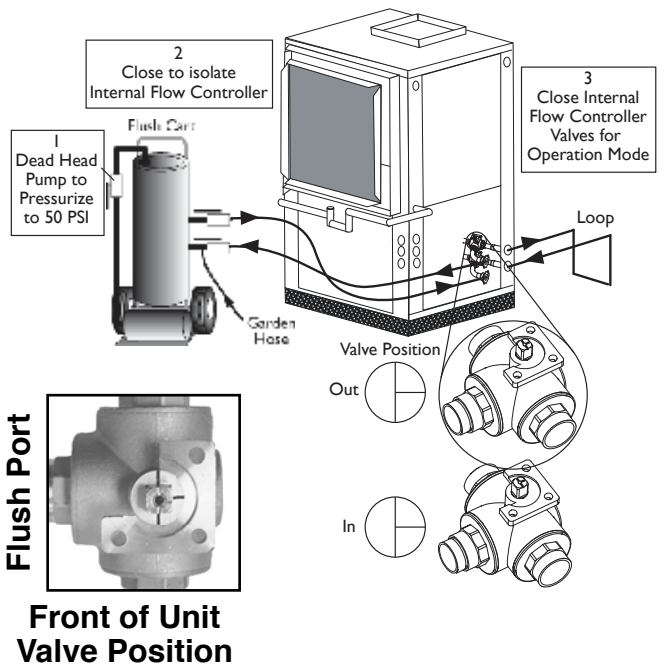
Flushing the Earth Loop

the flush cart from the Internal Flow Controller. Install Flow Controller caps to ensure that any condensation/leakage remains contained within the Flow Controller package.

If the loop pressure is between 50 and 75 psi [345 to 517 kPa] upon completion of flushing, pressures should be sufficient for all seasons.

NOTICE: It is recommended to run the unit in the cooling, then heating mode for 15-20 minutes each to 'temper' the fluid temperature and prepare it for pressurization. This procedure helps prevent the periodic "flat" loop condition of no pressure.

Figure 15d: Valve Position D - Pressurize and Operation



Multiple Unit Piping and Flushing

Often projects require more than one heat pump. Where possible, it makes sense for multiple units to share a common ground loop. Common ground loops for multiple units bring new challenges including the need to avoid backward flow through inactive units, increased pumping requirements, and more complex flushing needs. Three types of multiple unit systems are described below along with guidelines for installation of each type.

Integrated Variable Speed Water Flow Control technology is a great assist for systems with multiple units. Integrated Variable Speed Water Flow Control is available in three different configurations:

1. Internal variable-speed pump
2. Internal modulating valve for closed loops
3. Internal modulating valve for open loops

The internal modulating valve for open loops version should never be used on closed loops.

The internal variable speed pump version of Integrated Variable Speed Water Flow Control includes an internal Magna variable speed circulator controlled by the DXM2 microprocessor, internal 3-way flushing valves, an internal bladder type expansion tank, and front-mounted pressure ports that allow access to the pressure drop across the coaxial heat exchanger only. The Magna pump includes an internal check valve. The pump curve for the Magna circulator is shown in Figure 13. The internal expansion tank will operate as a pressure battery for the geothermal system. It will absorb fluid from the loop when loop pressure rises and inject fluid into the loop when loop pressure falls. In this way the expansion tank will help to maintain a more constant loop pressure and avoid flat loops due to seasonal pressure changes in the loop.

When using the internal variable speed pump as the loop pump in multiple unit installations it is important to ensure that the variable speed pump can provide adequate flow through the heat pump against the loop head when all units are operating.

It may be possible to flush a multiple unit system through the unit's flushing valves. Flushing pressure drop of the valve may be calculated to determine if it is acceptable. Engineering data for the 3-way flushing valves can be found in Table 2.

Table 2: Internal 3-Way Flushing Valve Data

Model	Flushing Connection	Straight Flow Cv	90° Flow Cv
HZ024-036	3/4" FPT	25	10.3
HZ048-070	1" FPT	58	14.5

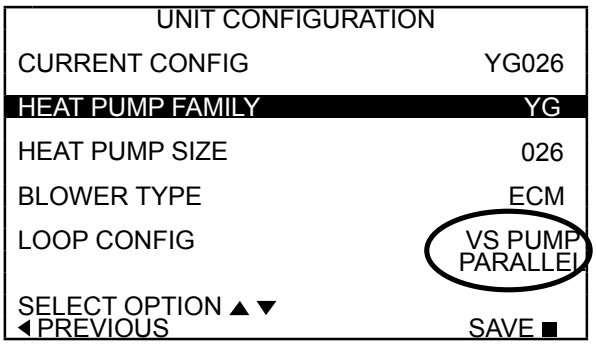
For example, if a system includes two 2-ton units and four ¾ loop circuits we can calculate the flushing pressure drop as follows. From Table 1 we know that it will take 4 gpm to flush each ¾" circuit. If there is no provision to isolate the circuits for flushing, we will have to flush with a minimum of 4 circuits x 4 gpm/circuit = 16 gpm total. A check of other piping sizes used must be done to ensure that 16 gpm total flow will flush all piping.

Pressure drop through the flushing valve can be calculated using the following formula.

$\Delta P = (GPM/Cv)^2$ where,
ΔP = pressure drop in psi through the valve while flushing
GPM = flushing flow in gallons per minute
Cv = valve Cv in flushing mode

We know from Table 2 that the Cv for the flushing valve in a YG026 is 10.3 in the flushing mode (90° flow). Therefore, $\Delta P = (GPM/Cv)^2 = (16/10.3)^2 = 2.4$ psi per valve (there are two flushing valves). So long as the flushing pump is able to provide 16 gpm at the flushing pressure drop of the loop plus the 2.4 x 2 valves = 4.8 psi of the flushing valves, the internal flushing valves may be used. If the flushing pump is not able to overcome the pressure drop of the internal flushing valves, then larger external flushing valves must be used.

Unit Configuration
Multiple units with internal variable-speed flow controller and check valve, piped in parallel sharing a common loop MUST be configured for 'VS PUMP PARALLEL' in Installer Settings Menu.



Installer Settings → System Config → Unit Config → Loop Config

Multiple Units with Internal Flow Controllers
The simplest multiple unit system is one with two (or more) units utilizing internal Flow Controllers with no external pumps or flushing valves. In this case the units are piped in parallel and use the internal flushing valves to flush the system. The variable speed pump includes an internal check valve to prevent back (short circuiting) flow through the units.

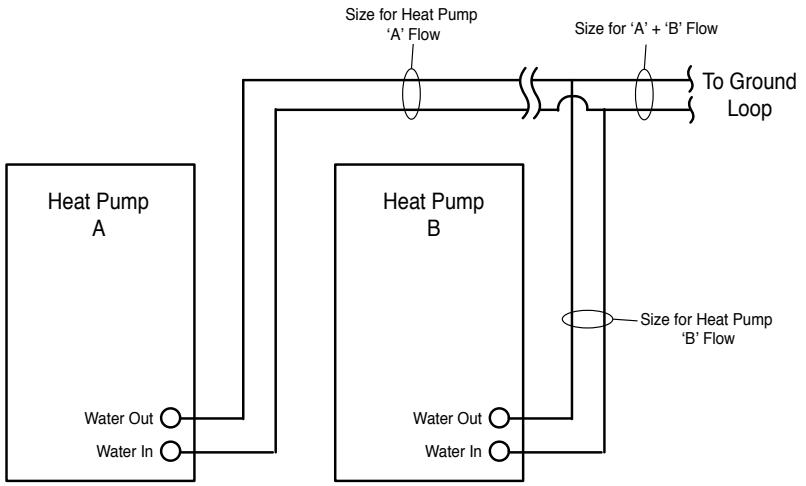
In this case, flush the loop through the internal flushing valves in the unit farthest from the loop first. Once the loop is flushed, then change the internal flushing valves to flush the heat pump. Next, move the flushing cart to the next closest unit to the loop.

Multiple Unit Piping and Flushing

Again, flush the loop through the internal flushing valves. This is important as there may be air/debris in the lines from this unit to the common piping. Once flushing begins the air will be move into the loop and will need to be flushed out. After the loop is flushed through the second unit, change the flushing valves to flush the second unit. This process should be repeated for additional units working from the farthest from the loop to the closest to the loop.

This type of application can generally be employed for systems to 12 tons depending on loop design. However, it is important perform appropriate calculations to confirm that the variable speed pump can provide adequate flow through all heat pumps against the loop head when all units are operating.

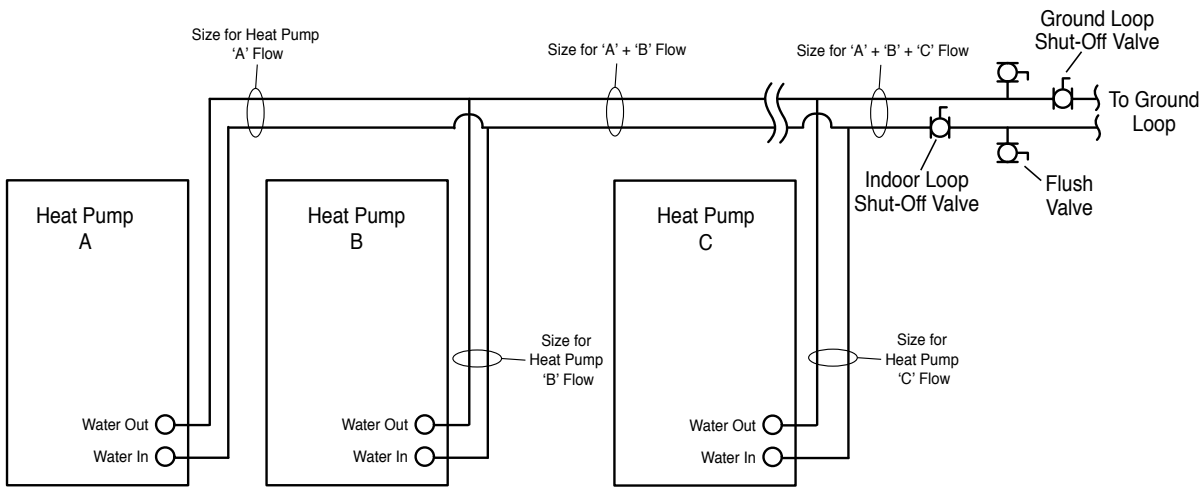
Figure 16a: Multiple Units with Internal Flow Controllers



Multiple Units with Internal Flow Controllers and External Flushing Valves

When the number of units or flushing requirements reaches a point where it is no longer feasible to flush through the internal valves (generally systems of more than 12 tons depending on loop design), external flushing valves should be installed. In this case, three-way flushing valves should be used or additional isolation valves must be installed to be able to isolate the loop during flushing.

Figure 16b: Multiple Units with Internal Flow Controllers and External Flushing Valves



First, flush the ground loop. The installer should close the indoor loop shut-off valve (or the internal flushing valves in all units) and open the ground loop shut-off valve to prevent flow through the indoor loop while flushing the ground loop.

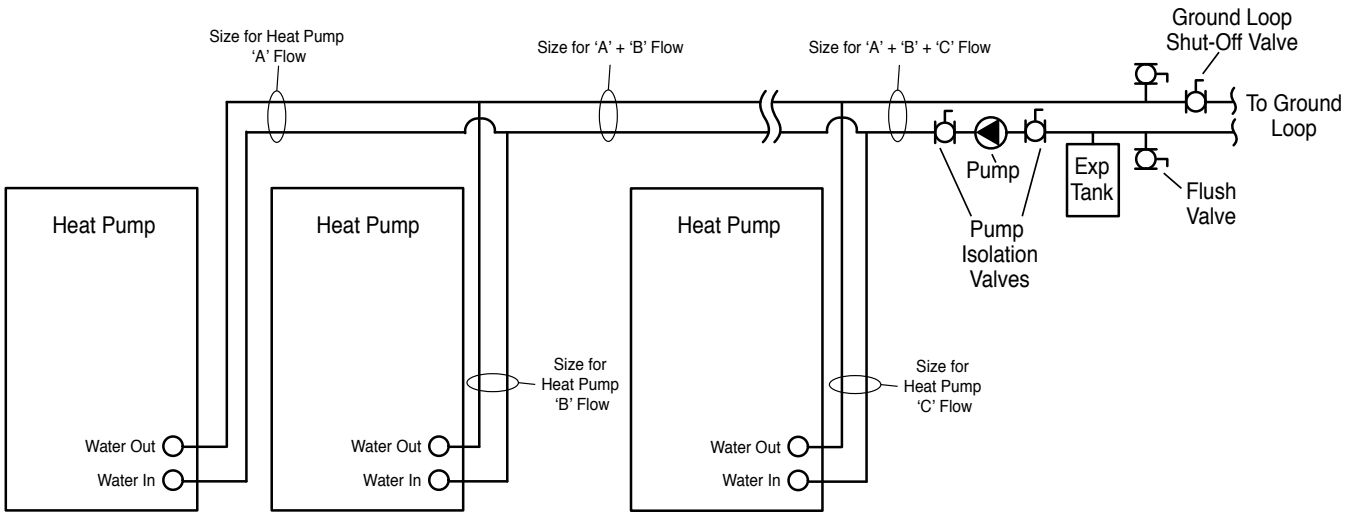
Once the ground loop is flushed, close the ground loop shut-off valve and open the indoor loop valve(s) to flush the units and indoor piping. Remember that there is an internal check valve in the variable speed pump and that backward flow the unit is not possible.

Multiple Unit Piping and Flushing

Multiple Units with Internal Modulating Valves and Central Pump

This is an application where multiple units are used in conjunction with a central, variable speed pump. In this case, units with closed loop modulating valves are used (do not use open loop modulating valves on a closed loop system). External flushing valves are required. This application is for larger systems, including commercial.

Figure 16c: Multiple Units with Internal Modulating Valves and Central Pump



Before flushing, the installer should manually open all modulating valves as detailed in Closed Loop – External Central Pumping section of this manual. Next, flush the ground loop. The installer should close a pump isolation valve and open the ground loop shut-off valve to prevent flow through the indoor loop while flushing the ground loop.

Once the ground loop is flushed, close the ground loop shut-off valve and open the pump isolation valve to flush the units and indoor piping. Once the system is flushed remember to return the modulating valves to their normal operating position.

Ground Loop Applications

Antifreeze Selection - General
In areas where minimum entering loop temperatures drop below 40°F [4.4°C] or where piping will be routed through areas subject to freezing, antifreeze is needed. Alcohols and glycols are commonly used as antifreeze solutions. Your local representative should be consulted for the antifreeze best suited to your area. Freeze protection should be maintained to 15°F [8.5°C] below the lowest expected entering loop temperature.

Initially calculate the total volume of fluid in the piping system using Table 3. Then use the percentage by volume shown in Table 4 for the amount of antifreeze. Antifreeze concentration should be checked from a well mixed sample using a hydrometer to measure specific gravity.

Table 3: Fluid Volume

Fluid Volume (gal [liters] per 100' [30 meters] Pipe)		
Pipe	Size	Volume (gal) [liters]
Copper	1"	4.1 [15.3]
	1.25"	6.4 [23.8]
	2.5"	9.2 [34.3]
Polyethylene	3/4" IPS SDR11	2.8 [10.4]
	1" iPS SDR11	4.5 [16.7]
	1.25" IPS SDR11	8.0 [29.8]
	1.5" IPS SDR11	10.9 [40.7]
	2" IPS SDR11	18.0 [67.0]
Unit Heat Exchanger	Typical	1.0 [3.8]
Flush Cart Tank	10" Dia x 3ft tall [254mm x 91.4cm tall]	10 [37.9]

⚠ WARNING! ⚠

WARNING! Always dilute alcohols with water (at least 50% solution) before using. Alcohol fumes are flammable and can cause serious injury or death if not handled properly.

When handling methanol (or any alcohol), always wear eye protection and rubber gloves as alcohols are easily absorbed through the skin.

Table 4: Antifreeze Percentages by Volume

Type	Minimum Temperature for Low Temperature Protection			
	10°F [-12.2°C]	15°F [-9.4°C]	20°F [-6.7°C]	25°F [-3.9°C]
Methanol	21%	17%	13%	8%
Propylene Glycol	29%	24%	18%	12%
Ethanol*	23%	20%	16%	11%

* Must not be denatured with any petroleum based product

Contact your distributor if you have any questions as to antifreeze selection.

⚠ WARNING! ⚠

WARNING! Always use properly marked vehicles (D.O.T. placards), and clean/suitable/properly identified containers for handling flammable antifreeze mixtures. Post and advise those on the jobsite of chemical use and potential dangers of handling and storage.

NOTICE: DO NOT use automotive windshield washer fluid as antifreeze. Washer fluid contains chemicals that will cause foaming.

⚠ CAUTION! ⚠

CAUTION! Always obtain MSDS safety sheets for all chemicals used in ground loop applications including chemicals used as antifreeze.

Antifreeze Charging
It is highly recommended to utilize premixed antifreeze fluid where possible to alleviate many installation problems and extra labor.

The following procedure is based upon pure antifreeze and can be implemented during the Full Flush procedure with three way valves in the Figure 15c - Valve Position C. If a premixed mixture of 15°F [-9.4°C] freeze protection is used, the system can be filled and flushed with the premix directly to prevent handling pure antifreeze during the installation.

1) Flush loop until all air has been purged from system and pressurize to check for leaks before adding any antifreeze.
2) Run discharge line to a drain and hook up antifreeze drum to suction side of pump (if not adding below water level through approved container). Drain flush cart reservoir down to pump suction inlet so reservoir can accept the volume of antifreeze to be added.
3) Calculate the amount of antifreeze required by first calculating the total fluid volume of the loop from Table 3. Then calculate the amount of antifreeze needed using Table 4 for the appropriate freeze protection level. Many southern applications require freeze protection because of exposed piping to ambient conditions.
4) Isolate unit and prepare to flush only through loop (see Figure 15a). Start flush cart, and gradually introduce the required amount of liquid to the flush cart tank (always introduce alcohols under water or use suction of pump to draw in directly to prevent fuming) until attaining the proper antifreeze protection. The rise in flush reservoir level indicates amount of antifreeze added (some carts are marked with measurements in gallons or liters). A ten inch [25.4 cm] diameter cylinder, 3 foot [91.4 cm] tall holds approximately 8 gallons [30.3 liters] of fluid plus the hoses (approx. 2 gallons, [7.6 liters], which equals about

Open Loop Applications

10 gallons [37.9 liters] total. If more than one tankful is required, the tank should be drained immediately by opening the waste valve of the flush cart noting the color of the discharge fluid. Adding food coloring to the antifreeze can help indicate where the antifreeze is in the circuit and prevents the dumping of antifreeze out the waste port. Repeat if necessary.

5) Be careful when handling methanol (or any alcohol). Always wear eye protection and rubber gloves. The fumes are flammable, and care should be taken with all flammable liquids. Open flush valves to flush through both the unit and the loop and flush until fluid is homogenous and mixed. It is recommended to run the unit in the heating and cooling mode for 15-20 minutes each to 'temper' the fluid temperature and prepare it for pressurization. Devoting this time to clean up can be useful. This procedure helps prevent the periodic "flat" loop condition.
6) Close the flush cart return valve; and immediately thereafter, close the flush cart supply valve, leaving a positive pressure in the loop of approximately 50 psi [345 kPa]. This is a good time to pressure check the system as well. Check the freeze protection of the fluid with the proper hydrometer to ensure that the correct amount of antifreeze has been added to the system. The hydrometer can be dropped into the flush reservoir and the reading compared to Chart 1a for Methanol, 1b for Propylene Glycol, and 1c for Ethanol to indicate the level of freeze protection. Do not antifreeze more than a +10°F [-12.2°C] freeze point. Specific gravity hydrometers are available in the residential price list. Repeat after reopening and flushing for a minute to ensure good second sample of fluid. Inadequate antifreeze protection can cause nuisance low temperature lockouts during cold weather.

⚠ WARNING! ⚠

WARNING! Always dilute alcohols with water (at least 50% solution) before using. Alcohol fumes are flammable and can cause serious injury or death if not handled properly.

When handling methanol (or any alcohol), always wear eye protection and rubber gloves as alcohols are easily absorbed through the skin.

7) Close the flush cart return valve; immediately thereafter, close the flush cart supply valve, shut off the flush cart leaving a positive pressure in the loop of approximately 50-75 psi [345-517 kPa]. Refer to Figure 15d for more details.

Low Water Temperature Cutout Setting - DXM2 Control
When antifreeze is selected, the LT1 jumper (JW3) should be clipped to select the low temperature (antifreeze 10°F [-12.2°C]) set point and avoid nuisance faults (see "Low Water Temperature Cutout Selection" in this manual).

Chart 1a: Methanol Specific Gravity

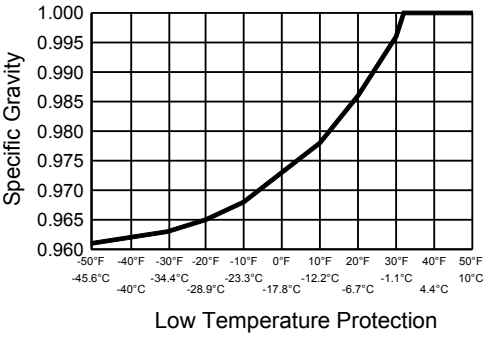


Chart 1b: Propylene Glycol Specific Gravity

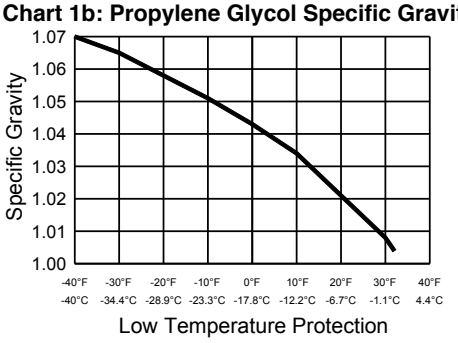


Chart 1c: Ethanol Specific Gravity

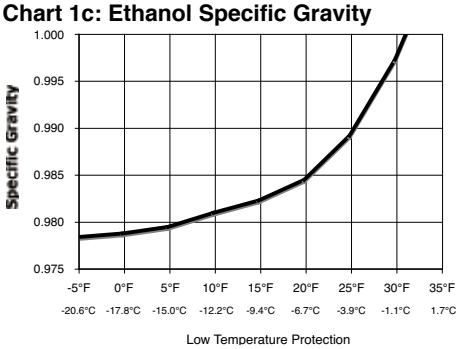
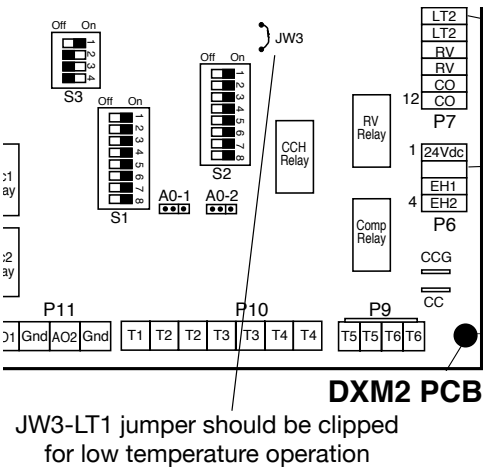
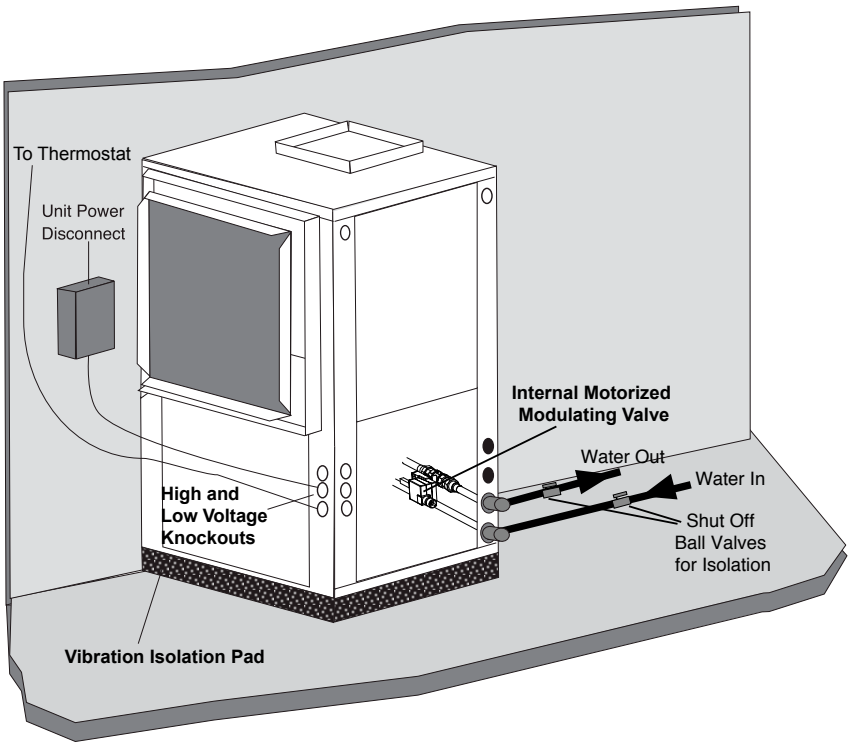


Figure 17: Low Temperature Cutout Selection



Closed Loop - External Central Pumping Applications

Figure 18: Typical Closed Loop with Central Pumping Application (with Internal Modulating Motorized Valve Shown)



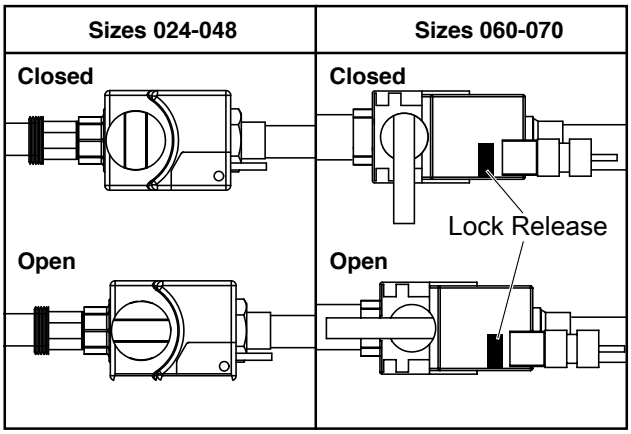
HZ packaged units are available with a modulating water valve option for closed-loop applications with external central pumping (designated by a 5 in the 11th position of the unit model number). With this option, the Modulating Valve is regulated by the Communicating DXM2 board based on entering and leaving water temperature (ΔT). The DXM2 board outputs a 0-10v signal to determine valve position (flow rate). The modulating valve defaults to closed position if it loses signal but still has 24V power running to it. If the motorized modulating valve loses both signal from the DXM2 board AND 24V power, it will remain in the same position it was in when it lost 24V power.

Note: The Cv (flow coefficient) of the valve used in these units is DIFFERENT that the Cv of the valve used in the open loop unit. It is not advisable for use in open loop applications as sound/noise issues may result. Units with the water circuit for closed loop, central pumping option are only available with a copper water coil.

To manually open the internal modulating motorized water valve in HZ026 – 049 push down on the handle to unlock it. Then rotate the handle to the open position as shown in Figure 19. This fully opens the valve for flushing. Once flushing is complete, return the valve handle to its normally closed position.

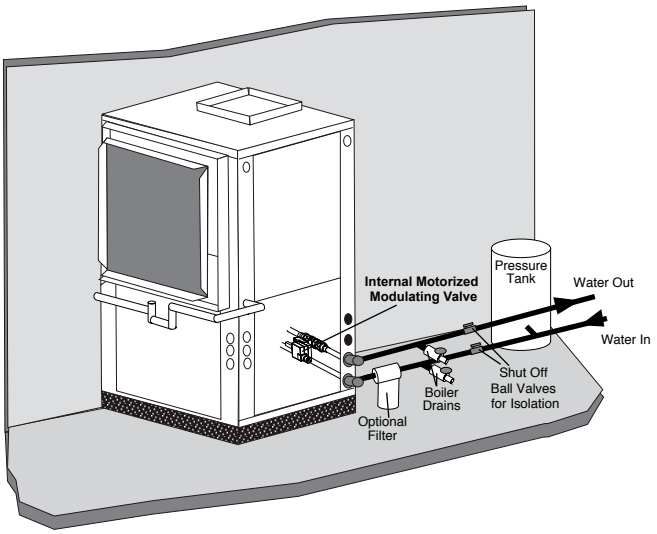
To manually open the internal modulating motorized water valve in HZ064 – 072, push down on the lock release button while turning the handle to the open position as shown in Figure 19. This fully opens the valve for flushing. Once flushing is complete, press the lock release again and return the valve handle to its normally closed position.

Figure 19: Internal Modulating Motorized Valve Positions



Open Loop or Ground-Water Applications

Figure 20: Typical Open Loop/Well Application



⚠ CAUTION! ⚠

CAUTION! Refrigerant pressure activated water regulating valves should never be used with this equipment.

HZ packaged units are available with a water circuit option for open loop applications (designated by a 6 in the 11th position of the unit model number).

The Motorized Modulating Valve is regulated by the Communicating DXM2 board based on entering and leaving water temperature (ΔT). The DXM2 board gives a 0-10v signal to determine flow rate. The motorized modulating valve defaults to closed position if it loses signal but still has 24V power running to it. If the motorized modulating valve loses both signal from the DXM2 board AND 24V power, it will remain in the same position it was in when it lost 24V power. DO NOT USE open loop units in closed loop applications due to significant pressure drop through the open loop motorized modulating valve. This option is only available with Cupro-Nickel Water Coil.

To manually open the internal modulating motorized water valve in HZ024 – 048 push down on the handle to unlock it. Then rotate the handle to the open position as shown in Figure 19. This fully opens the valve for flushing. Once flushing is complete, return the valve handle to its normally closed position.

To manually open the internal modulating motorized water valve in HZ060 – 070, push down on the lock release button while turning the handle to the open position as shown in Figure 19. This fully opens the valve for flushing. Once flushing is complete, press the lock release again and return the valve handle to its normally closed position.

Open Loop - Ground Water Systems
Typical open loop piping is shown in Figure 20. Shut off valves should be included for ease of servicing. Boiler drains or other valves should be “tee’d” into the lines to allow acid flushing of the heat exchanger. Shut off valves should be positioned to allow flow through the coax via the boiler drains without allowing flow into the piping system. Schrader ports built into unit may be used to measure heat exchanger pressure drop. Water temperature can be viewed on the communicating thermostat. Supply and return water piping should be limited to copper, HPDE, or other acceptable high temperature material. Note that PVC or CPVC material is not recommended as they are not compatible with the polyolester oil used in HFC-410A products.

Water quantity should be plentiful and of good quality. Consult Table 5 for water quality requirements. Integrated Variable Speed Water Flow Control units for open loop applications always come with Cupro-Nickel coils. In ground water situations where scaling could be heavy or where biological growth such as iron bacteria will be present, an open loop system is not recommended. Heat exchanger coils may over time lose heat exchange capabilities due to build up of mineral deposits. Heat exchangers must only be serviced by a qualified technician, as acid and special pumping equipment is required. Desuperheater coils can likewise become scaled and possibly plugged. In areas with extremely hard water, the owner should be informed that the heat exchanger may require occasional acid flushing. In some cases, the desuperheater option should not be recommended due to hard water conditions and additional maintenance required.

Water Quality Standards
Table 5 must be consulted for water quality requirements. Scaling potential should be assessed using the pH/Calcium hardness method. If the pH <7.5 and the Calcium hardness is less than 100 ppm, scaling potential is low. If this method yields numbers out of range of those listed, a monitoring plan should be implemented in these probable scaling situations. Other water quality issues such as iron fouling, corrosion prevention and erosion and clogging should be referenced in Table 5.

Pressure Tank and Pump
Use a closed, bladder-type pressure tank to minimize mineral formation due to air exposure. The pressure tank should be sized to provide at least one minute continuous run time of the pump using its drawdown capacity rating to prevent pump short cycling. Discharge water from the unit is not contaminated in any manner and can be disposed of in various ways, depending on local building codes (e.g. 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

Open Loop or Ground-Water Applications

department to assure compliance in your area.

The pump should be sized to handle the home's domestic water load (typically 5-9 gpm [23-41 l/m]) plus the flow rate required for the heat pump. Pump sizing and expansion tank must be chosen as complimentary items. For example, an expansion tank that is too small can cause premature pump failure due to short cycling. Variable speed pumping applications should be considered for the inherent energy savings and smaller pressure tank requirements.

Water Coil Low Temperature Limit Setting
For all open loop systems the 30°F [-1.1°C] LT1 setting (factory setting-water) should be used to avoid freeze damage to the unit. See "Low Water Temperature Cutout Selection" (Figure 17) in this manual for details on the low limit setting.

Water Quality Requirements

Table 5: Water Quality Requirements

Water Quality Parameter	HX Material	Closed Recirculating	Open Loop and Recirculating Well		
Scaling Potential - Primary Measurement					
Above the given limits, scaling is likely to occur. Scaling indexes should be calculated using the limits below					
pH/Calcium Hardness Method	All	-	**pH < 7.5 and Ca Hardness <100ppm**		
Index Limits for Probable Scaling Situations - (Operation outside these limits is not recommended)					
Scaling indexes should be calculated at 66°C for direct use and HWG applications, and at 32°C for indirect HX use. A monitoring plan should be implemented.					
Ryznar Stability Index	All	-	**6.0 - 7.5** If >7.5 minimize steel pipe use.		
Langelier Saturation Index	All	-	**-0.5 to +0.5** If <-0.5 minimize steel pipe use. Based upon 66°C HWG and Direct well, 29°C Indirect Well HX		
Iron Fouling					
Iron Fe $^{2+}$ (Ferrous) (Bacterial Iron potential)	All	-	**<0.2 ppm (Ferrous)** If Fe^{2+} (ferrous)>0.2 ppm with pH 6 - 8, O2<5 ppm check for iron bacteria.		
Iron Fouling	All	-	**<0.5 ppm of Oxygen** Above this level deposition will occur.		
Corrosion Prevention					
pH	All	**6 - 8.5** Monitor/treat as needed	**6 - 8.5** Minimize steel pipe below 7 and no open tanks with pH <8		
Hydrogen Sulfide (H_2S)	All	-	**<0.5 ppm** At H_2S>0.2 ppm, avoid use of copper and copper nickel piping or HX's. Rotten egg smell appears at 0.5 ppm level. Copper alloy (bronze or brass) cast components are OK to <0.5 ppm.		
Ammonia ion as hydroxide, chloride, nitrate and sulfate compounds	All	-	**<0.5 ppm**		
Maximum Chloride Levels			Maximum Allowable at maximum water temperature.		
			10°C	24°C	38 °C
	Copper	-	<20ppm	NR	NR
	Cupronickel	-	<150 ppm	NR	NR
	304 SS	-	<400 ppm	<250 ppm	<150 ppm
	316 SS	-	<1000 ppm	<550 ppm	< 375 ppm
	Titanium	-	>1000 ppm	>550 ppm	>375 ppm
Erosion and Clogging					
Particulate Size and Erosion	All	<10 ppm of particles and a maximum velocity of 1.8 m/s Filtered for maximum 841 micron [0.84 mm, 20 mesh] size.	<10 ppm (<1 ppm "sandfree" for reinjection) of particles and a maximum velocity of 1.8 m/s. Filtered for maximum 841 micron 0.84 mm, 20 mesh] size. Any particulate that is not removed can potentially clog components.		

The Water Quality Table provides water quality requirements for ClimateMaster coaxial heat exchangers. The water should be evaluated by an independent testing facility comparing to this Table and when properties are outside of these requirements, an external secondary heat exchanger must be used to isolate the heat pump heat exchanger from the unsuitable water. Failure to do so will void the warranty for the coaxial heat exchanger and any other components damaged by a leak.

Notes:
- Closed Recirculating system is identified by a closed pressurized piping system.
- Recirculating open wells should observe the open recirculating design considerations.
- NR - Application not recommended.
- "-" No design Maximum.

Hot Water Generator

The HWG (Hot Water Generator) or desuperheater option provides considerable operating cost savings by utilizing heat energy from the compressor discharge line 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.

Heat pumps equipped with the HWG option include a built-in water to refrigerant heat exchanger that eliminates the need to tie into the heat pump refrigerant circuit in the field. The control circuit and pump are also built in for residential equipment. Figure 21 shows a typical example of HWG water piping connections on a unit with built-in circulating pump. This piping layout prevents sludge/debris from the bottom of the tank being pulled into the HWG pump.

The temperature set point of the HWG is field selectable to 125°F or 150°F . The 150°F set point allows more heat storage from the HWG. For example, consider the amount of heat that can be stored by the HWG when using the 125°F set point, versus the amount of heat that can be generated by the HWG when using the 150°F set point.

In a typical 50 gallon two-element electric water heater the lower element should be turned down to 100°F, or the lowest setting, to get the most from the HWG. The tank will eventually stratify so that the lower 80% of the tank, or 40 gallons, becomes 100°F (controlled by the lower element). The upper 20% of the tank, or 10 gallons, will be maintained at 125°F (controlled by the upper element).

Using a 125°F set point, the HWG can heat the lower 40 gallons of water from 100°F to 125°F, providing up to 8,330 btu's of heat. Using the 150°F set point, the HWG can heat the same 40 gallons of water from 100°F to 150°F and the remaining 10 gallons of water from 125°F to 150°F, providing a total of up to 18,743 btu's of heat, or more than twice as much heat as when using the 125°F set point.

Electric water heaters are recommended. If a gas, propane, or oil water heater is used, a second preheat tank must be installed (Figure 22). If the electric water heater has only a single center element, the dual tank system is recommended to insure a usable entering water temperature for the HWG.

Typically a single tank of at least 50 gallons (189 liters) is used to limit installation costs and space. However, a dual tank, as shown in Figure 22, is the preferred system, as it provides the maximum storage and temperate source water to the HWG.

⚠ WARNING! ⚠

WARNING! A 150°F SETPOINT MAY LEAD TO SCALDING OR BURNS. THE 150°F SET POINT MUST ONLY BE USED ON SYSTEMS THAT EMPLOY AN APPROVED ANTI-SCALD VALVE.

It is always advisable to use water softening equipment on domestic water systems to reduce the scaling potential and lengthen equipment life. In extreme water conditions, it may be necessary to avoid the use of the HWG option since the potential cost of frequent maintenance may offset or exceed any savings. Consult Table 5 for scaling potential tests.

Figure 21: Typical HWG Installation

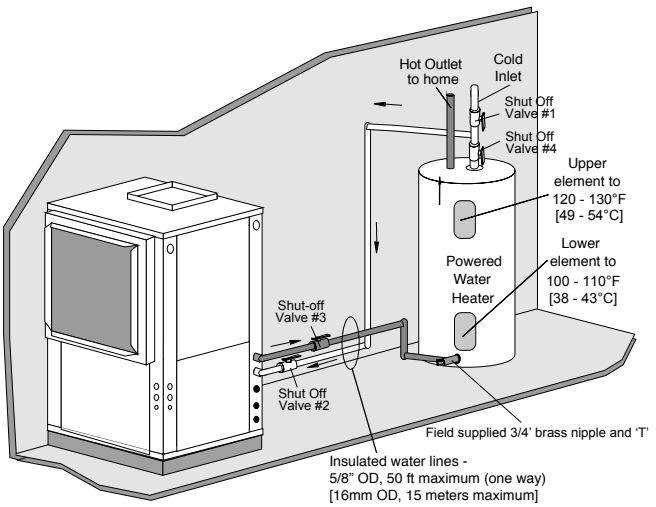
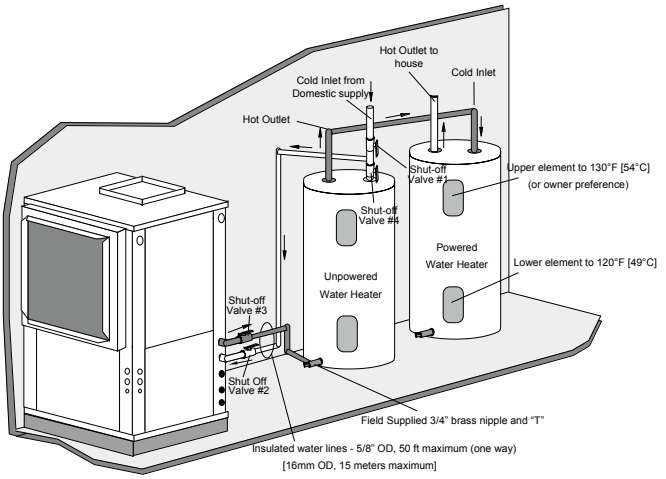


Figure 22: HWG Double Tank Installation



Hot Water Generator

Installation

The HWG is controlled by two sensors and the DXM2 microprocessor control. One sensor is located on the compressor discharge line to sense the discharge refrigerant temperature. The other sensor is located on the HWG heat exchanger's "Water In" line to sense the potable water temperature.

⚠ WARNING! ⚠

WARNING! UNDER NO CIRCUMSTANCES SHOULD THE SENSORS BE DISCONNECTED OR REMOVED. FULL LOAD CONDITIONS CAN DRIVE HOT WATER TANK TEMPERATURES FAR ABOVE SAFE TEMPERATURE LEVELS IF SENSORS DISCONNECTED OR REMOVED.

The DXM2 microprocessor control monitors the refrigerant and water temperatures to determine when to operate the HWG. The HWG will operate any time the refrigerant temperature is sufficiently above the water temperature. Once the HWG has satisfied the water heating demand during a heat pump run cycle, the controller will cycle the pump at regular Intervals to determine if an additional HWG cycle can be utilized.

When the control is powered and the HWG pump output is active for water temperature sampling or HWG operation, the DXM2 status LED will slowly flash (On 1 second, Off 1 second).

If the control has detected a HWG fault, the DXM2 status LED will flash a numeric fault code as follows:

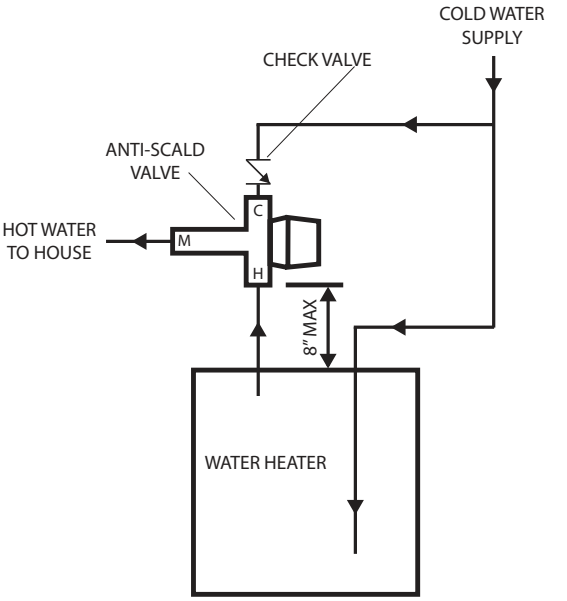
High Water Temperature (>160ºF)	5 flashes
Hot Water Sensor Fault	6 flashes
Compressor Discharge Sensor Fault	6 flashes

Fault code flashes have a duration of 0.3 seconds with a 10 second pause between fault codes. For example, a "Compressor Discharge sensor fault" will be six flashes 0.3 seconds long, then a 10 second pause, then six flashes again, etc.

⚠ WARNING! ⚠

WARNING! USING A 150°F SETPOINT ON THE HWG WILL RESULT IN WATER TEMPERATURES SUFFICIENT TO CAUSE SEVERE PHYSICAL INJURY IN THE FORM OF SCALDING OR BURNS, EVEN WHEN THE HOT WATER TANK TEMPERATURE SETTING IS VISIBLY SET BELOW 150°F. THE 150°F HWG SETPOINT MUST ONLY BE USED ON SYSTEMS THAT EMPLOY AN APPROVED ANTI-SCALD VALVE (PART NUMBER AVAS4) AT THE HOT WATER STORAGE TANK WITH SUCH VALVE PROPERLY SET TO CONTROL WATER TEMPERATURES DISTRIBUTED TO ALL HOT WATER OUTLETS AT A TEMPERATURE LEVEL THAT PREVENTS SCALDING OR BURNS!

Figure 23: Anti-Scald Valve Piping Connections



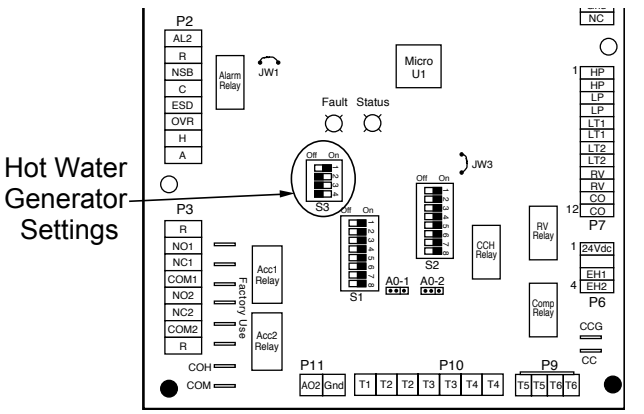
Hot Water Generator settings are determined by DIP switches 3-2, 3-3, and 3-4.

DIP 3-2 controls the HWG Test Mode. It provides for forced operation of the HWG output, activating the HWG pump for up to five minutes. ON = HWG test mode, OFF = normal HWG operation. The control will revert to standard operation after five minutes regardless of switch position.

DIP 3-3 determines HWG set point temperature. It provides for selection of the HWG operating set point. ON = 150°F (66°C), OFF = 125°F (52°C).

DIP 3-4 is for the HWG status. It provides HWG operation control. ON = HWG mode enabled, OFF = HWG mode disabled. Units are shipped from the factory with this switch in the OFF position.

Figure 24: Hot Water Generator Settings



Hot Water Generator

⚠ WARNING! ⚠

WARNING! The HWG pump Is fully wired from the factory. Use extreme caution when working around the microprocessor control as it contains line voltage connections that presents a shock hazard that can cause severe injury or death!

The heat pump, water piping, pump, and hot water tank should be located where the ambient temperature does not fall below 50°F [10°C]. Keep water piping lengths at a minimum. DO NOT use a one way length greater than 50 ft. (one way) [15 m]. See Table 6 for recommended piping sizes and maximum lengths.

All installations must be in accordance with local codes. The installer is responsible for knowing the local requirements, and for performing the installation accordingly. DO NOT activate the HWG (turn DIP 3-4 to the ON position) until "Initial Start-Up" section, below is completed. Powering the pump before all installation steps are completed will damage the pump.

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. When using an existing tank, it should be flushed with cold water after it is drained 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 1/2" [12.7mm] I.D. copper, route and install the water piping and valves as shown in Figures 21 or 22. Install an approved anti-scald valve if the 150°F HWG setpoint is or will be selected. An appropriate method must be employed to purge air from the HWG piping. This may be accomplished by flushing water through the HWG (as in Figures 21 and 22) or by installing an air vent at the high point of the HWG piping system.
2. Insulate all HWG water piping with no less than 3/8" [10mm] wall closed cell insulation.
3. Open both shut off valves and make sure the tank drain valve is closed.

Water Tank Refill

1. Close valve #4. Ensure that the HWG valves (valves #2 and #3) are open. Open the cold water supply (valve #1) to fill the tank through the HWG piping. This will force water flow through the HWG and purge air from the HWG piping.
2. Open a hot water faucet to vent air from the system until water flows from faucet; turn off faucet. Open valve #4.
3. Depress the hot water tank pressure relief valve handle to ensure that there is no air remaining in the tank.
4. Inspect all work for leaks.
5. Before restoring power or fuel supply to the water heater, adjust the temperature setting on the tank thermostat(s) to insure 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 [38°C] or the lowest setting; the upper element should be adjusted to 120-130°F [49-54°C]. Depending upon the specific needs of the customer, you may want to adjust the upper element differently. On tanks with a single thermostat, a preheat tank should be used (Fig 21b).
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 fully open.
2. Turn on the heat pump and allow it to run for 10-15 minutes.
3. Set S3-4 to the "ON" position (enabled) to engage the HWG. See Figure 24.
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 5-10°F [3-6°C].
6. Allow the unit to operate for 20 to 30 minutes to insure that it is functioning properly.

Table 6: HWG Water Piping Sizes and Length

Unit Nominal Tonnage	Nominal HWG Flow (gpm)	1/2" Copper (max length*)	3/4" Copper (max length*)
2.0	0.8	50	-
2.5	1.0	50	-
3.0	1.2	50	-
3.5	1.4	50	-
4.0	1.6	45	50
5.0	2.0	25	50
6.0	2.4	10	50

*Maximum length is equivalent length (in feet) one way of type L copper.

⚠ CAUTION! ⚠

CAUTION! Use only copper piping for HWG piping due to the potential of high water temperatures for water that has been in the HWG heat exchanger during periods of no-flow conditions (HWG pump not energized). Piping other than copper may rupture due to high water temperature and potable water pressure.

Electrical - Line Voltage

⚠ WARNING! ⚠

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

⚠ CAUTION! ⚠

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

Table 7a: HZ Series Electrical Data

Model	Compressor			HWG Pump FLA	Fan Motor FLA	Total Unit FLA	Min Circuit Amps	Max/ Fuse HACR
	RLA	LRA	Qty					
024	11.7	58.3	1	0.5	3.9	16.1	19.0	30
036	15.3	83.0	1	0.5	3.9	19.7	23.5	35
048	21.2	104.0	1	0.5	6.9	28.6	33.9	50
060	27.1	152.9	1	0.5	6.9	34.5	41.2	60
070	29.7	179.2	1	0.5	6.9	37.1	44.5	70

Rated Voltage of 208-230/60/1 Min/Max Voltage of 197/254
HACR circuit breaker in USA only All fuses Class RK-5

Table 7b: HZ Series Electrical Data with Magna Inernal Flow Controller

Model	Compressor			HWG Pump FLA	Loop Pump FLA	Fan Motor FLA	Total Unit FLA	Min Circuit Amps	Max/ Fuse HACR
	RLA	LRA	Qty						
024	11.7	58.3	1	0.5	1.7	3.9	17.8	20.7	30
036	15.3	83.0	1	0.5	1.7	3.9	21.4	25.2	40
048	21.2	104.0	1	0.5	1.7	6.9	30.3	35.6	50
060	27.1	152.9	1	0.5	1.7	6.9	36.2	42.9	70
070	29.7	179.2	1	0.5	1.7	6.9	38.8	46.2	70

Rated Voltage of 208-230/60/1 Min/Max Voltage of 197/254
HACR circuit breaker in USA only All fuses Class RK-5

⚠ WARNING! ⚠

WARNING! Disconnect electrical power source to prevent injury or death from electrical shock.

⚠ CAUTION! ⚠

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

Electrical - Line Voltage
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 electrical data for fuse sizes. Consult wiring diagram for field connections that must be made by the installing (or electrical) contractor.

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

General Line Voltage Wiring
Be sure the available power is the same voltage and phase 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 is applicable.

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 25. Consult Tables 7a through 7b for correct fuse size. Note: always refer to the unit dataplate for unit electrical data.

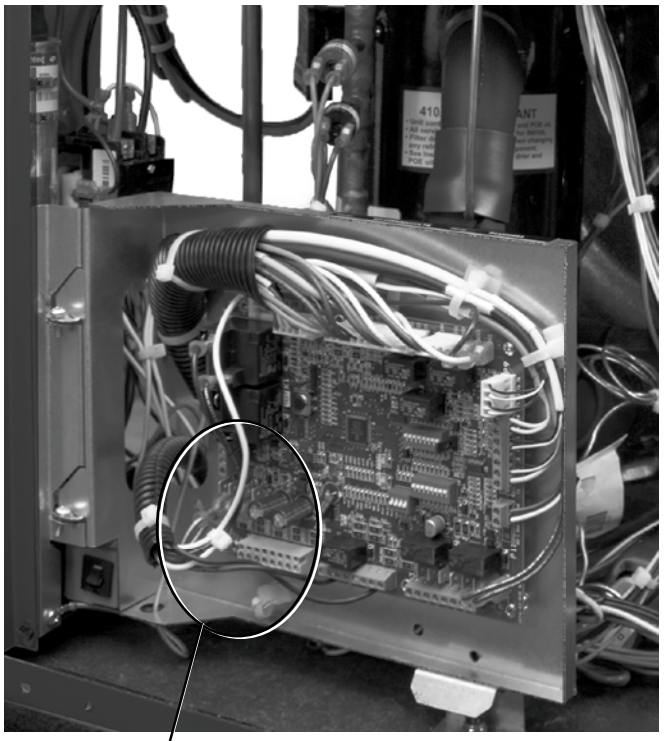
208 Volt Operation
All residential 208-230 Volt units are factory wired for 230 Volt operation. The transformer may be switched to the 208V tap as illustrated on the wiring diagram by switching the red (208V) and the orange (230V) wires at the contactor terminal.

Figure 25: GT-PC Single Phase Line Voltage Field Wiring

Unit Power Supply
(see electrical tables 7a - 7b for minimum circuit amps and maximum breaker size)

Electrical - Low Voltage Wiring

Figure 26: GT-PC Low Voltage Field Wiring



Low Voltage Field Wiring

Accessory Connections
A terminal paralleling the compressor contactor coil has been provided on the DXM2 control. Terminal “A” is designed to control accessory devices. Note: This terminal should be used only with 24 Volt signals and not line voltage. Terminal “A” is energized with the compressor contactor (see Figure 27).

The DXM2 controller includes two accessory relays ACC1 and ACC2. Each relay includes a normally open (NO) and a normally closed (NC) contact. Accessory relays may be configured to operate as shown in Tables 8 and 9.

Table 8: Accessory Relay 1 Configuration

DIP 2.1	DIP 2.2	DIP 2.3	ACC1 Relay Option
ON	ON	ON	Cycle with fan
OFF	ON	ON	N/A for Residential Applications
ON	OFF	ON	Water valve – Slow opening
ON	ON	OFF	Outside air damper
OFF	ON	OFF	Whole House Dehumidification option – Dehumidistat
OFF	OFF	OFF	Whole House Dehumidification option – Humidistat
OFF	OFF	ON	N/A for Residential Applications
ON	OFF	OFF	N/A for Residential Applications

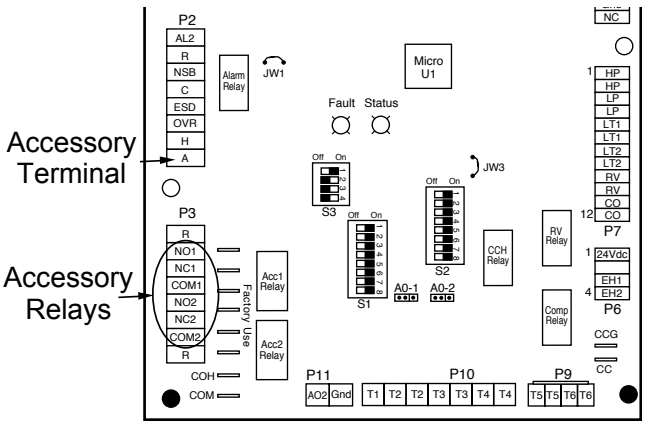
All other DIP combinations are invalid

Table 9: Accessory Relay 2 Configuration

DIP 2.4	DIP 2.5	DIP 2.6	ACC2 Relay Option
ON	ON	ON	Cycle with compressor
OFF	ON	ON	N/A for Residential Applications
ON	OFF	ON	Water valve – Slow opening
OFF	OFF	ON	Humidifier
ON	ON	OFF	Outside air damper

All other DIP combinations are invalid

Figure 27: Accessory Connections



Electrical - Thermostat Wiring

Thermostat Installation

The thermostat should be located on an interior wall in a larger room, away from supply duct drafts. DO NOT locate the thermostat in areas subject to sunlight, drafts or on external walls. The wire access hole behind the thermostat may in certain cases need to be sealed to prevent erroneous temperature measurement due to air infiltration through the wall cavity. Position the thermostat back plate against the wall so that it appears level and so the thermostat wires protrude through the middle of the back plate. Mark the position of the back plate mounting holes and drill holes with a 3/16" (5mm) bit. Install supplied anchors and secure plate to the wall. Thermostat wire must be 18 AWG or larger wire. Wire the appropriate thermostat as shown in Figures 28a and 28b to the low voltage terminal strip on the DXM2 control board. Practically any heat pump thermostat will work with these units, provided it has the correct number of heating and cooling stages. However, using the communicating thermostat is highly recommended for on-site, easier configuration, monitoring and diagnosis.

⚠ CAUTION! ⚠

CAUTION! Refrigerant pressure activated water regulating valves should never be used with Geothermal equipment.

⚠ CAUTION! ⚠

CAUTION! If communicating thermostat is not installed, a communicating service tool must be used to configure and diagnose this system.

Figure 27: Communication Flow

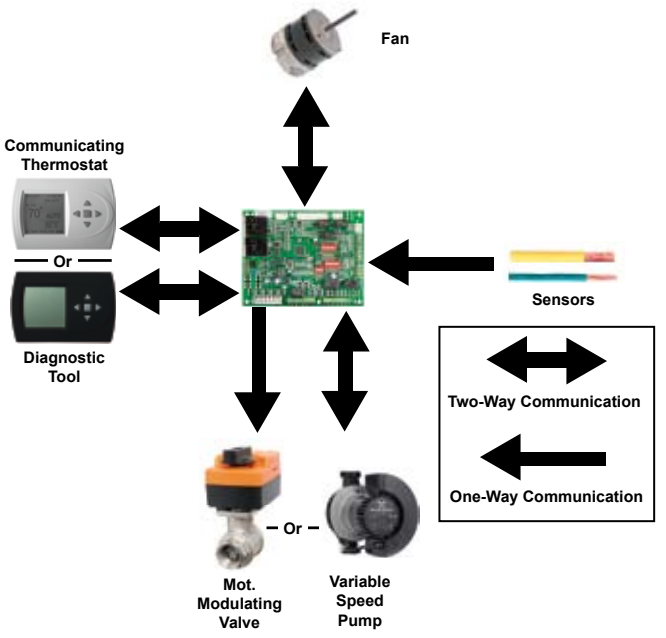


Figure 28a: Two-Way Unit Communicating System Communicating Thermostat Connection to DXM2 Control

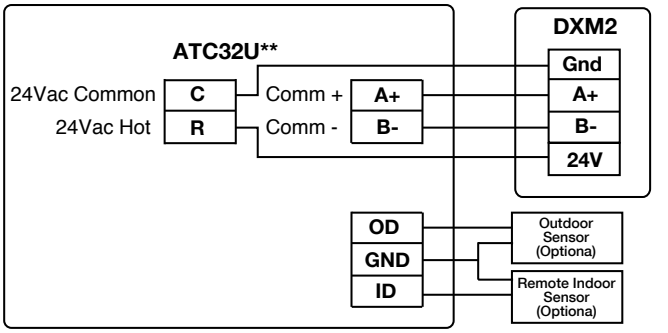
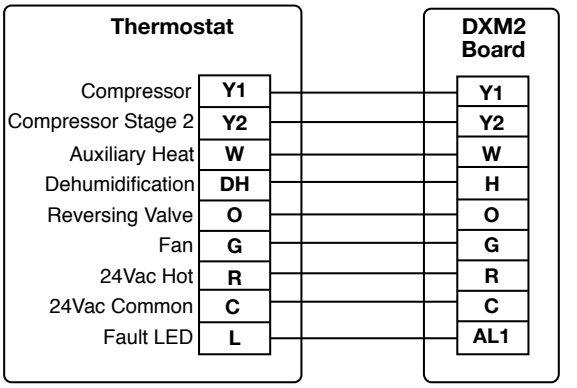
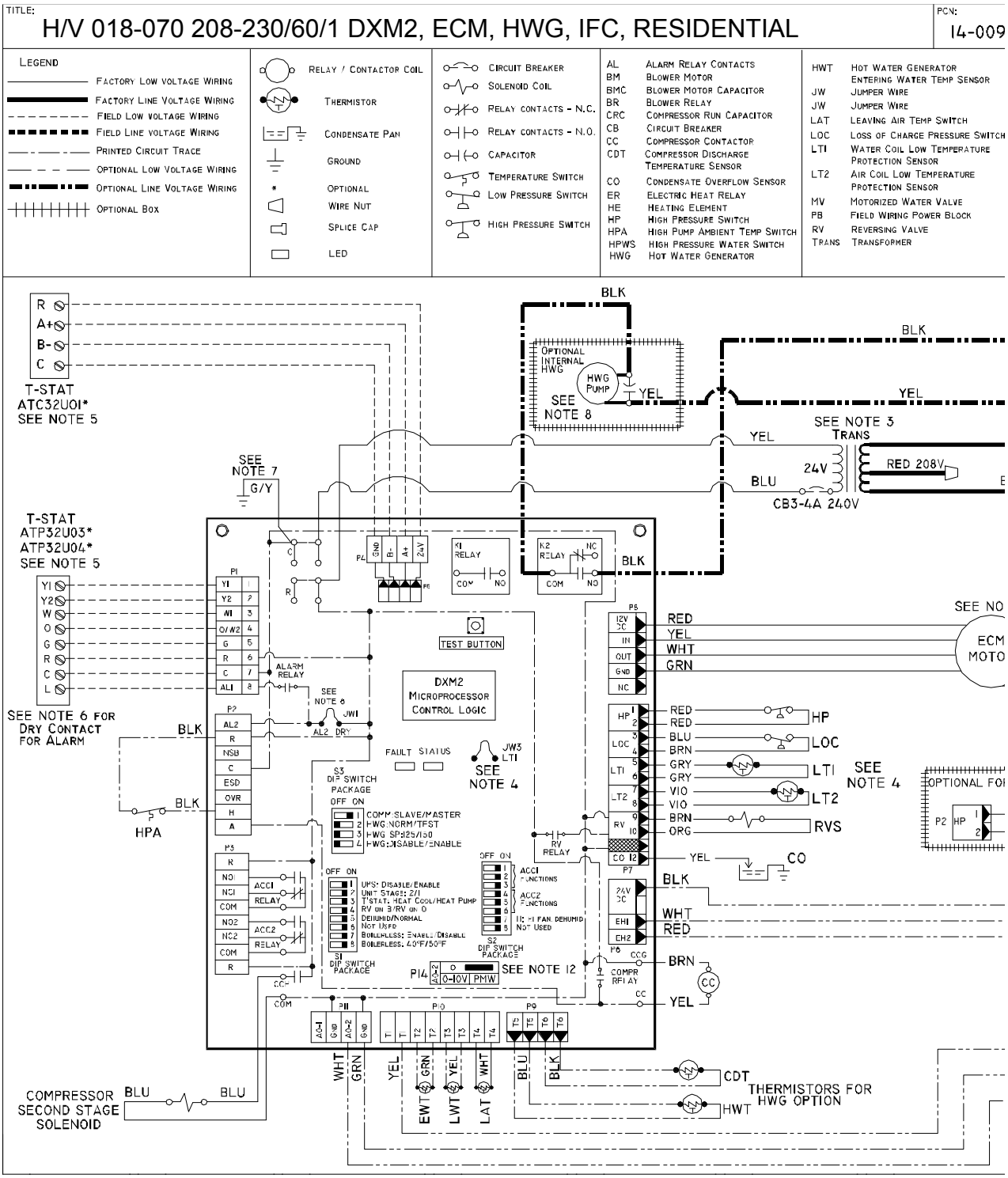


Figure 28b: Conventional 3 Heat / 2 Cool Thermostat Connection to DXM2 Control



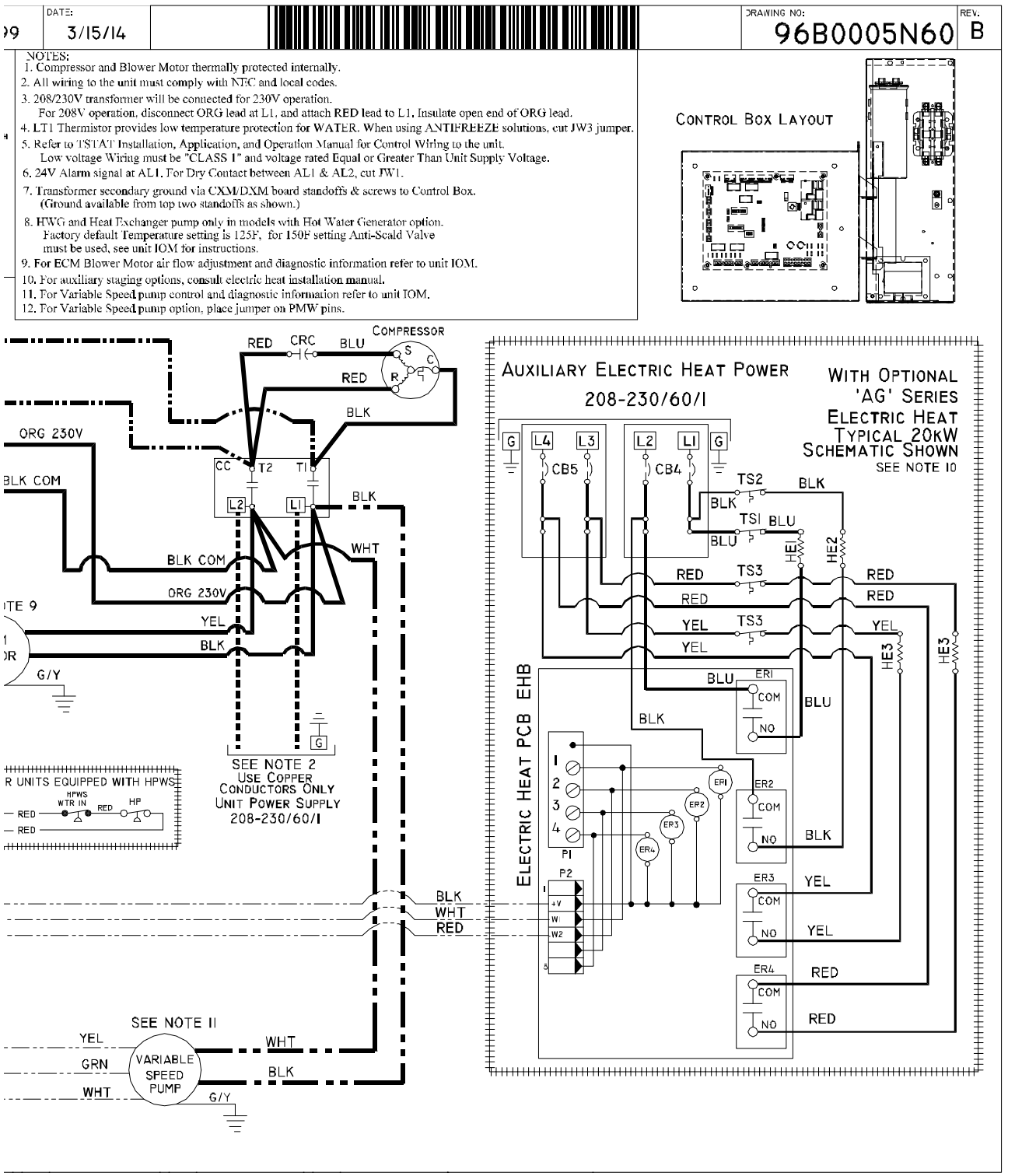
Notes:
1) ECM automatic dehumidification mode operates with dehumidification airflows in the cooling mode when the dehumidification output from thermostat is active. Normal heating and cooling airflows are not affected.
2) DXM2 board DIP switch S2-7 must be in the auto dehumidification mode for automatic dehumidification
3) DH connection not possible with units with internal pump. Use ATC32U**.
4) Only use ATC Communicating Thermostat when using Humidifier (H Input) with units with internal flow controller.

DXM2 Wiring Diagram with Internal Flow Controller - 96B0005N60 - Part 1 of 2

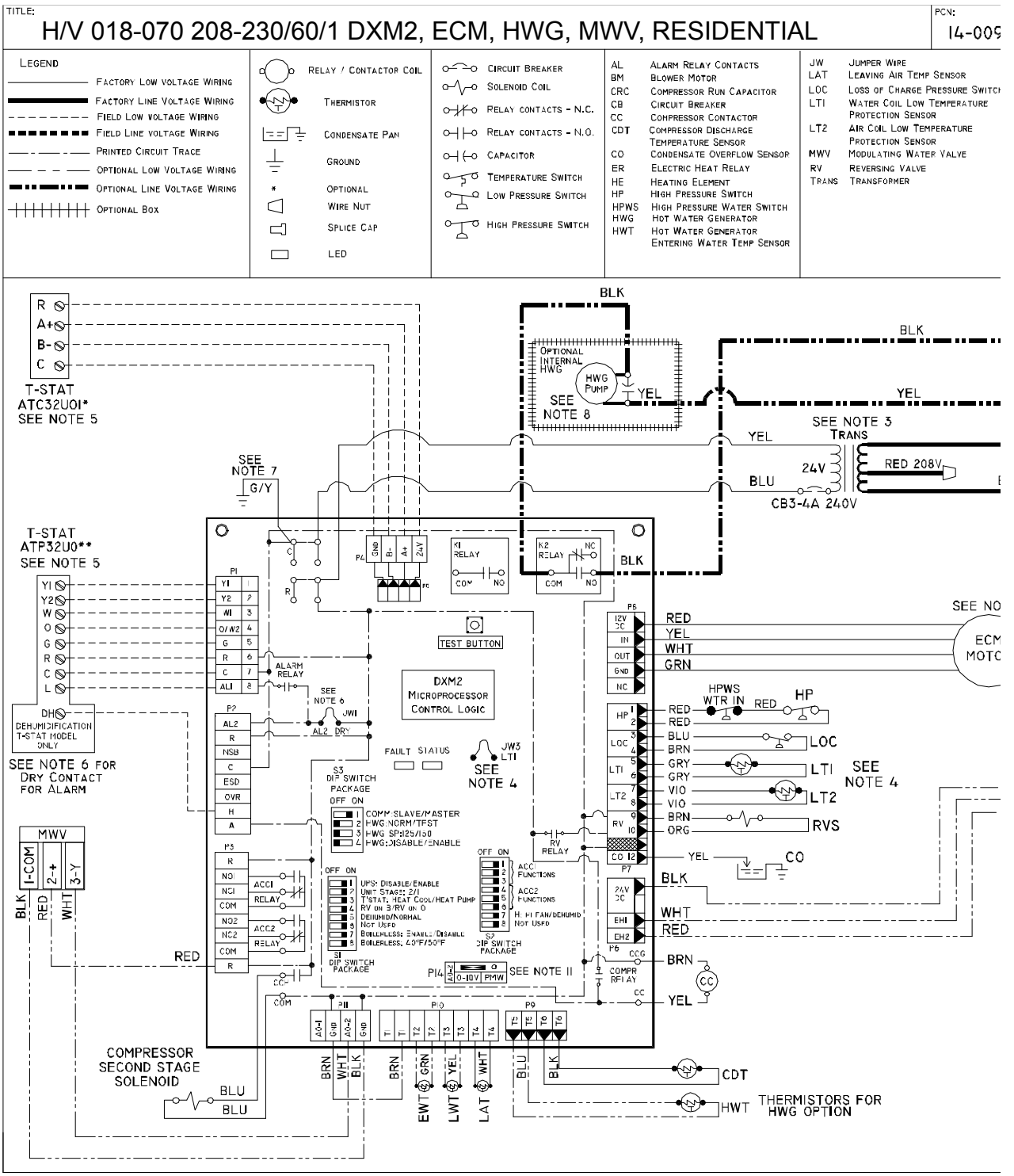


This diagram includes typical wiring details but is not applicable to all units. For specific unit wiring, refer to the diagram or the units' control panel.

DXM2 Wiring Diagram with Internal Flow Controller - 96B0005N60 - Part 2 of 2

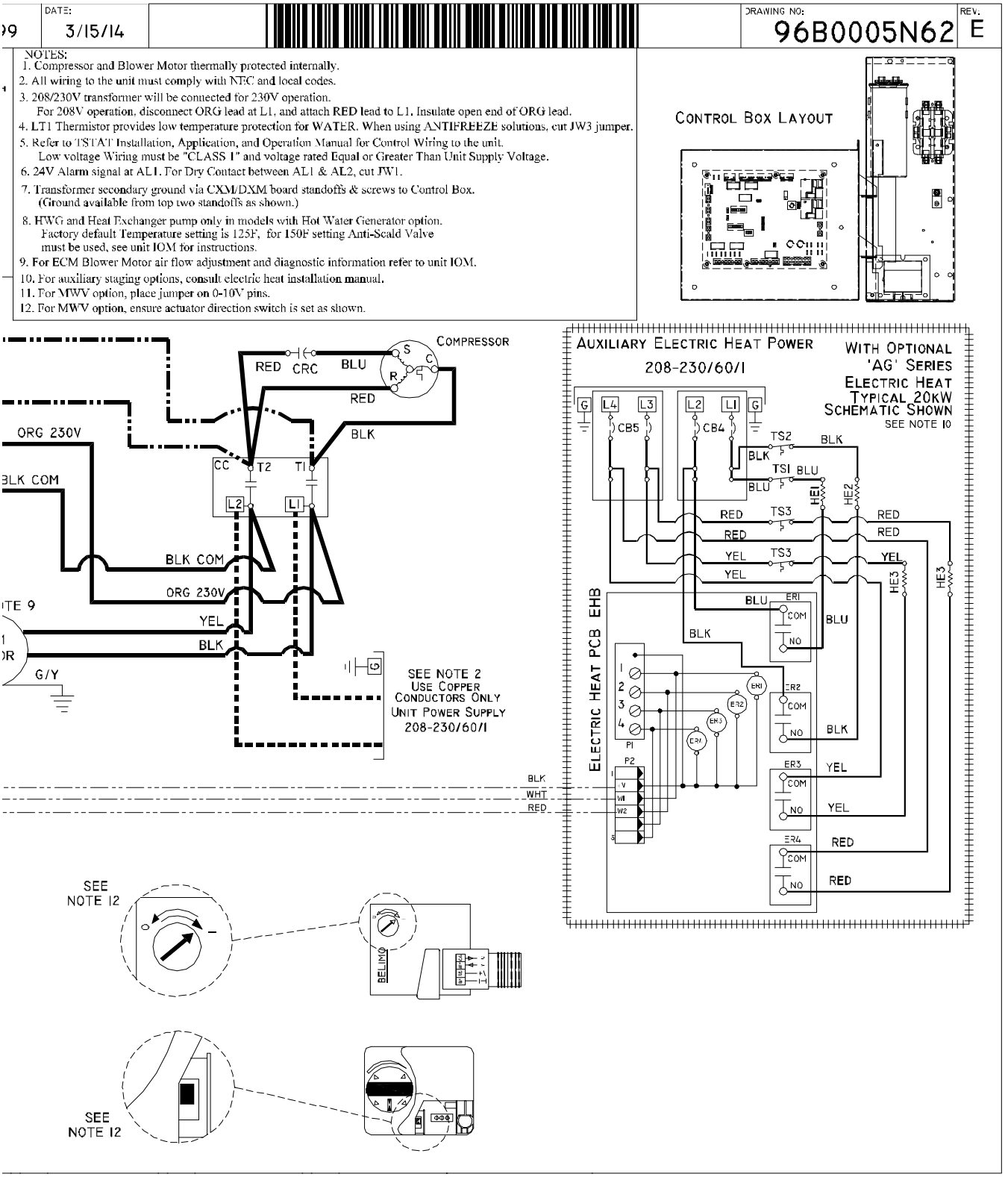


DXM2 Wiring Diagram with Motorized Modulating Water Valve - 96B0005N62 - Part 1 of 2



This diagram includes typical wiring details but is not applicable to all units. For specific unit wiring, refer to the diagram or the units' control panel.

DXM2 Wiring Diagram with Motorized Modulating Water Valve - 96B0005N62 - Part 2 of 2



ECM Blower Control

The ECM fan is controlled directly by the DXM2 control board that converts thermostat inputs and CFM settings to signals used by the ECM motor controller. To take full advantage of the ECM motor features, the communicating thermostat should be used.

The DXM2 control maintains a selectable operating airflow [CFM] for each heat pump operating mode. For each operating mode there are maximum and minimum airflow limits. See the ECM Blower Performance tables (Table 10) for the maximum, minimum, and default operating airflows.

Airflow levels are selected using the configuration menus of a communicating thermostat or diagnostic tool. The configuration menus allow the installer to independently select and adjust the operating airflow for each of the operating modes. Air flow can be selected in 25 CFM increments within the minimum and maximum limits shown in Table 10. The blower operating modes include:

- First Stage Cooling (Y1 & O)
- Second Stage Cooling (Y1, Y2, & O)
- First Stage Cooling in Dehumidification Mode (Y1, O, & Dehumid)
- Second Stage Cooling in Dehumidification Mode (Y1, Y2, O, & Dehumid)
- First Stage Heating (Y1)
- Second Stage Heating (Y1 & Y2)
- Third Stage (Auxiliary) Heating (Y1, Y2, & W)
- Emergency Heating (W with no Y1 or Y2)
- Fan (G with no Y1, Y2, or W)

It is necessary to use the communicating thermostat to engage the Auto Dehumidification feature on units with Internal Flow Controllers. Units with Internal Flow Controllers utilize the 'H' terminal on the DXM2 as an input for an ambient temperature switch. Units without the Internal Flow Controller option use the 'H' terminal on the DXM2 controller to initiate the Auto Dehumidification mode. Refer to the DXM2 AOM for more information (part #97B0003N15).

The ECM motor includes "soft start" and "ramp down" features. The soft start feature is a gentle increase of motor rpm at blower start up. This creates a much quieter blower start cycle.

The ramp down feature allows the blower to slowly decrease rpm to a full stop at the end of each blower cycle. This creates a much quieter end to each blower cycle and adds overall unit efficiency.

The ramp down feature is eliminated during an ESD (Emergency Shut Down) situation. When the DXM2 ESD input is activated, the blower and all other control outputs are immediately de-activated.

The duration of the "ramp down" periods are adjustable from 0 seconds to 255 seconds. This adjustment is available in the Aiflow Selection screen using the communicating thermostat or configuration/diagnostics tool, see Figure 29.

Special Note for AHRI Testing: To achieve rated airflow for AHRI testing purposes, it is necessary to change the CFM settings to rated airflow.

Figure 29: Airflow Configuration Screen on Communicating Thermostat

AIRFLOW SELECTION	CFM
HEAT STAGE 1	600
HEAT STAGE 2	750
AUXILIARY HEAT	850
EMERGENCY HEAT	850
COOL STAGE 1	525
COOL STAGE 2	700
COOL DEHUMID 1	425
COOL DEHUMID 2	550
CONTINUOUS FAN	350
HEAT OFF DELAY	60
COOL OFF DELAY	30
◀ PREVIOUS	NEXT ▶

ECM Blower Performance Data

Table 10: HZ Series ECM Blower Performance Data Table

Airflow in CFM with wet coil and clean air filter

Model	Max ESP (in. wg)	Fan Motor (hp)	Range	Cooling Mode		Dehumid Mode		Heating Mode		Fan Only Mode	Aux/ Emerg Mode
				Stg 2	Stg 1	Stg 2	Stg 1	Stg 2	Stg 1		
024	1.0	1/2	Default	700	525	550	425	750	600	350	850
			Maximum	1000	800	800	600	1000	850	1000	1000
			Minimum	600	450	550	400	600	450	300	700
036	0.9	1/2	Default	1050	800	850	650	1100	850	550	1350
			Maximum	1500	1100	1200	900	1500	1100	1500	1500
			Minimum	900	600	825	550	900	600	450	1350
048	1.0	1	Default	1400	1050	1100	850	1500	1150	700	1500
			Maximum	2000	1500	1600	1200	2000	1500	2000	2000
			Minimum	1200	900	1100	825	1200	900	600	1350
060	0.7	1	Default	1750	1300	1400	1050	1875	1450	875	1875
			Maximum	2300	1900	2000	1500	2300	1900	2300	2300
			Minimum	1500	1100	1375	1000	1500	1100	750	1500
070	0.7	1	Default	1900	1450	1650	1250	2000	1650	950	2000
			Maximum	2300	2200	2000	1800	2300	2200	2300	2300
			Minimum	1800	1350	1650	1250	1800	1350	900	1800

Airflow is controlled within 5% up to the Max ESP shown with wet coil

DXM2 Controls

DXM2 Controller DXM2 is the next generation in controls and is capable of 2-way communication with smart components, like the communicating thermostat, ECM fan motor, Magna Variable-Speed Pump and configuration/ diagnostic tool.

For most residential applications, configuration, monitoring and diagnostics can all be done from the thermostat/ service tool so there's no need to read LEDs and change DIP switches.

For details on user settings, refer to Communicating Thermostat User Manual.

For details on Installer settings (not to be used by consumers), refer to Communicating Thermostat Installer manual.

For details on installer/service settings on the configuration/ diagnostic tool, refer to it's operation manual.

For further details on the DXM2 control, refer to the DXM2 Application, Operation and Maintenance Manual. The DXM2 AOM is shipped with each unit.

Thermostat compatibility
It is strongly recommended that communicating thermostat or configuration/ diagnostic tool be used with DXM2 control, to ensure easy configuration, monitoring and diagnostics, in PLAIN English. For example, Airflow CAN NOT be configured without either the communicating thermostat or configuration/ diagnostic tool

Field Hardware Configuration Options - Note: In the following field hardware configuration options, changes should be made ONLY when power is removed from the DXM2 control.

Water coil low temperature limit setting: Jumper 3 (JW3-LT1 Low Temp) provides field selection of temperature limit setting for LT1 of 30°F or 10°F [-1°F or -12°C] (refrigerant temperature).

Not Clipped = 30°F [-1°C]. Clipped = 10°F [-12°C].

A0-2: Configure Modulating Valve or Variable-Speed Pump (Internal water flow Models Only)

A0-2 jumper (Figure 32) Factory Set to "IOV" if using Internal Modulating Motorized Valve or "PMW" if using Internal Variable-Speed Pump. This applies only to units with Internal Water Flow Control.

DIP Switches – There's no need to change the DIP switches settings on Residential units. All DIP switches in S1 and S2 should be "on". In S3, S3-1 should be "on" and the rest should be "off". For more details on DIP switches, refer to the DXM2 AOM (part # 97B0003N15).

⚠ CAUTION! ⚠

CAUTION! Do not restart units without inspection and remedy of faulting condition. Equipment damage may occur.

DXM2 Control Start-up Operation
The control will not operate until all inputs and safety controls are checked for normal conditions. The compressor will have a 5 minute anti-short cycle delay at power-up. 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.

After the random start delay and anti-short cycle delay, the compressor relay will be energized. On all subsequent compressor calls, the random start delay is omitted.

Test Mode Button
Test mode allows the service technician to check the operation of the control in a timely manner. By momentarily pressing the TEST push button, the DXM2 control enters a 20 minute test mode period in which all time delays are sped up 15 times.

Figure 30: Test Mode Button

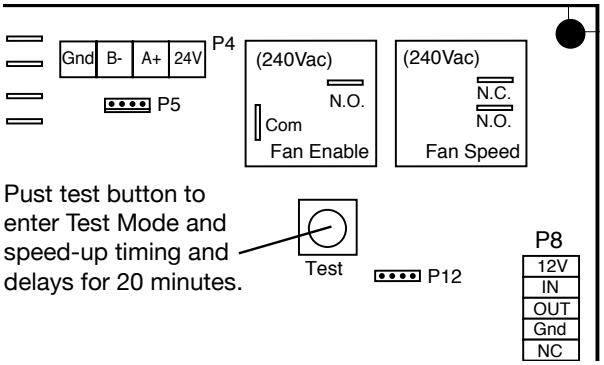


Table 11: Unit Operation

Conventional T-stat signal (Non-Communicating)	Unit
	ECM fan
G	Fan only
G, Y1	Stage 1 heating[1]
G, Y1, Y2	Stage 2 heating[1]
G, Y1, Y2, W	Stage 3 heating[1]
G, W	Emergency heat
G, Y1, O	Stage 1 cooling[2]
G, Y1, Y2, O	Stage 2 cooling[2]

1 Stage 1 = 1st stage compressor, 1st stage fan operation
Stage 2 = 2nd stage compressor, 2nd stage fan operation
Stage 3 = 2nd stage compressor, auxiliary electric heat, 3rd stage fan operation

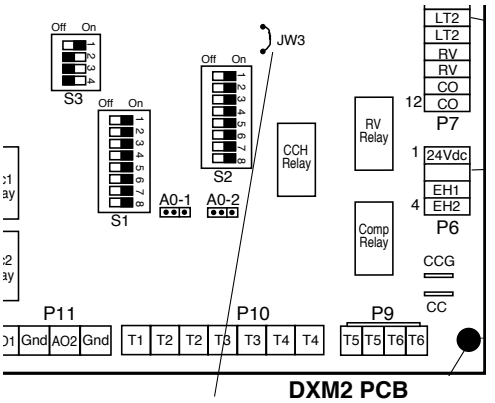
2 Stage 1 = 1st stage compressor, 1st stage fan operation, reversing valve
Stage 2 = 2nd stage compressor, 2nd stage fan operation, reversing valve

DXM2 Layout and Connections

Low Water Temperature Cutout Selection
The DXM2 control allows the field selection of low water (or water-antifreeze solution) temperature limit by clipping jumper JW3, which changes the fault cutout temperature associated with thermistor LT1. Note that the LT1 thermistor is located on the refrigerant line between the coaxial heat exchanger and expansion device (TXV). Therefore, LT1 is sensing refrigerant temperature, not water temperature, which is a better indication of how water flow rate/ temperature is affecting the refrigeration circuit.

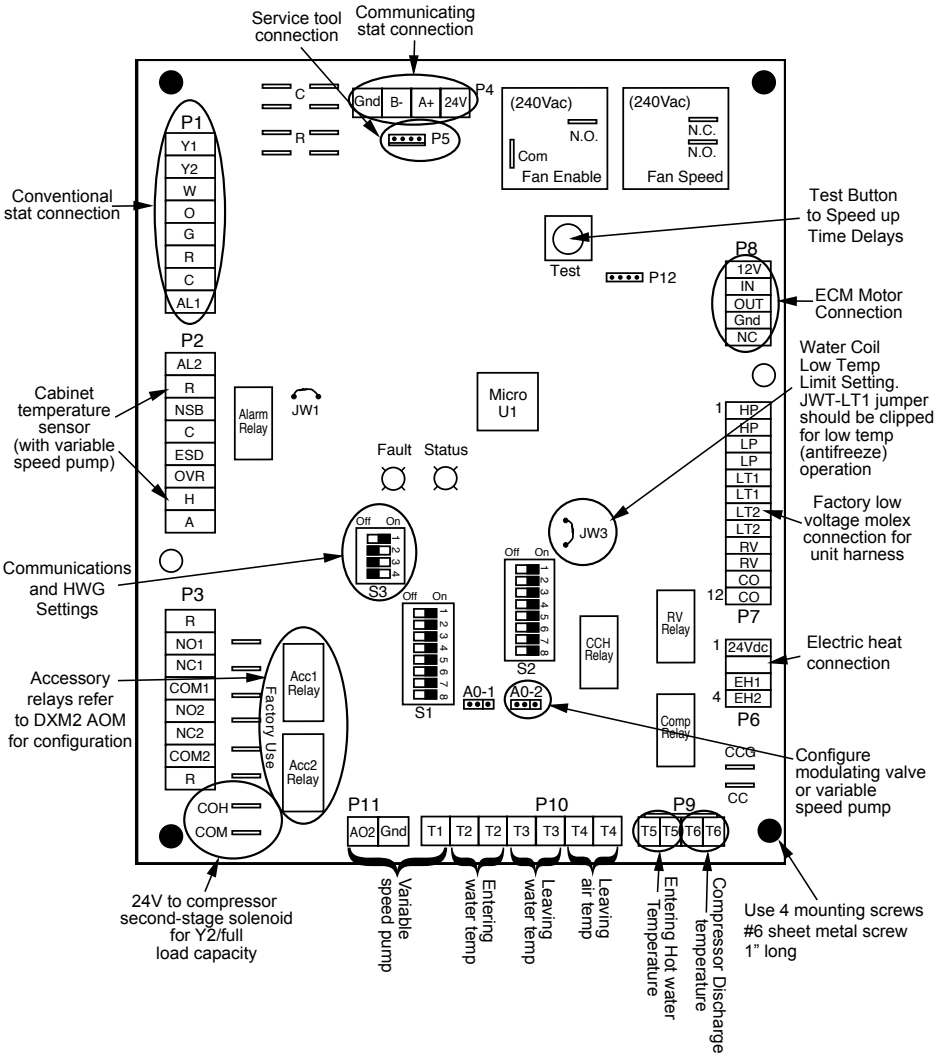
The factory setting for LT1 is for systems using water (30°F [-1.1°C] refrigerant temperature cutout or fallout). In low water temperature (extended range) applications with antifreeze (most ground loops), jumper JW3 should be clipped as shown in Figure 31 to change the setting to 10°F [-12.2°C] refrigerant cutout or fallout temperature, a more suitable temperature when using an antifreeze solution. All residential units include water/refrigerant circuit insulation to prevent internal condensation, which is required when operating with entering water temperatures below 59°F [15°C].

Figure 31: LT1 Limit Setting



JW3-LT1 jumper should be clipped for low temperature (antifreeze) operation

Figure 32: DXM2 Layout and Connections



Unit Commissioning and Operating Conditions

Operating Limits
Environment – Units are designed for indoor installation only. Never install units in areas subject to freezing or where humidity levels could cause cabinet condensation (such as unconditioned spaces subject to 100% outside air).
Power Supply – Voltage utilization shall comply with unit data plate.

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 insure proper unit operation. Extreme variations in temperature and humidity and/or corrosive water or air will adversely affect unit performance, reliability, and service life. Consult Table 12a for operating limits.

Table 12a: Operating Limits

Operating Limits	Unit	
	Cooling	Heating
Air Limits		
Min. ambient air, DB	45ºF [7ºC]	39ºF [4ºC]
Rated ambient air, DB	80.6ºF [27ºC]	68ºF [20ºC]
Max. ambient air, DB	130ºF [54ºC]	85ºF [29ºC]
Min. entering air, DB/WB	65/45ºF [18/7ºC]	50ºF [10ºC]
Rated entering air, DB/WB	80.6/66.2ºF [27/19ºC]	68ºF [20ºC]
Max. entering air, DB/WB	100/75ºF [38/24ºC]	80ºF [27ºC]
Water Limits		
Min. entering water	20ºF [-6.7ºC]	20ºF [-6.7ºC]
Normal entering water	50-110ºF [10-43ºC]	30-70ºF [-1 to 21ºC]
Max. entering water	120ºF [49ºC]	120ºF [49ºC]
Normal Water Flow	1.5 to 3.0 gpm / ton [1.6 to 3.2 l/m per kW]	

Commissioning Conditions
Consult Table 12b for commissioning conditions. Starting conditions vary depending upon model and are based upon the following notes:

Notes:
1. Conditions in Table 12b are not normal or continuous operating conditions. Minimum/maximum limits are start-up conditions to bring the building space up to occupancy temperatures. Units are not designed to operate under these conditions on a regular basis.
2. Voltage utilization complies with AHRI Standard 110.

Table 12b: Commissioning Limits

Commissioning Limits	Unit	
	Cooling	Heating
Air Limits		
Min. ambient air, DB	45ºF [7ºC]	39ºF [4ºC]
Rated ambient air, DB	80.6ºF [27ºC]	68ºF [20ºC]
Max. ambient air, DB	130ºF [54ºC]	85ºF [29ºC]
Min. entering air, DB/WB	60ºF [16ºC]	40ºF [4.5ºC]
Rated entering air, DB/WB	80.6/66.2ºF [27/19ºC]	68ºF [20ºC]
Max. entering air, DB/WB	110/83ºF [43/28ºC]	80ºF [27ºC]
Water Limits		
Min. entering water	20ºF [-6.7ºC]	20ºF [-6.7ºC]
Normal entering water	50-110ºF [10-43ºC]	30-70ºF [-1 to 21ºC]
Max. entering water	120ºF [49ºC]	120ºF [49ºC]
Normal Water Flow	1.5 to 3.0 gpm / ton [1.6 to 3.2 l/m per kW]	

Unit Start-Up and Operating Conditions

Unit and System Checkout
BEFORE POWERING SYSTEM, please check the following:

UNIT CHECKOUT
- ❑ Shutoff valves: Insure that all isolation valves are open.
- ❑ Line voltage and wiring: Verify that voltage is within an acceptable range for the unit and wiring and fuses/ breakers are properly sized. Verify that low voltage wiring is complete.
- ❑ Unit control transformer: Insure that transformer has the properly selected voltage tap. Residential 208-230V units are factory wired for 230V operation unless specified otherwise.
- ❑ Loop/water piping is complete and purged of air. Water/ piping is clean.
- ❑ Antifreeze has been added if necessary.
- ❑ Entering water and air: Insure that entering water and air temperatures are within operating limits of Tables 12a and 12b.
- ❑ Low water temperature cutout: Verify that low water temperature cut-out on the DXM2 control is properly set.
- ❑ Unit fan: Manually rotate fan to verify free rotation and insure that blower wheel is secured to the motor shaft. Be sure to remove any shipping supports if needed. DO NOT oil motors upon start-up. Fan motors are pre-oiled at the factory. Check unit fan CFM selection and compare to design requirements.
- ❑ Condensate line: Verify that condensate trap is installed and pitched.
- ❑ HWG is switched off at SW 3-4 unless piping is completed and air has been purged from the system.
- ❑ Unit air coil and filters: Insure that filter is clean and accessible. Clean air coil of all manufacturing oils.
- ❑ Unit controls: Verify that DXM2 field selection options are properly set. Low voltage wiring is complete.
- ❑ Blower CFM and Water ΔT is set on communicating thermostats or diagnostic tool.
- ❑ Service/access panels are in place.

SYSTEM CHECKOUT
- ❑ System water temperature: Check water temperature for proper range and also verify heating and cooling set points for proper operation.
- ❑ System pH: Check and adjust water pH if necessary to maintain a level between 6 and 8.5. Proper pH promotes system longevity (see Table 5).
- ❑ System flushing: Verify that all air is purged from the system. Air in the system can cause poor operation or system corrosion. Water used in the system must be potable quality initially and clean of dirt, piping slag, and strong chemical cleaning agents. Some antifreeze solutions may require distilled water.
- ❑ Internal Flow Controller: Verify that it is purged of air and in operating condition.
- ❑ System controls: Verify that system controls function and operate in the proper sequence.
- ❑ Low water temperature cutout: Verify that low water temperature cut-out controls are set properly (LT1 - JW3).
- ❑ Miscellaneous: Note any questionable aspects of the installation.

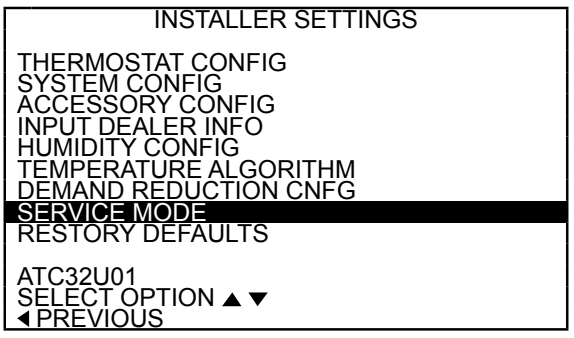
⚠ CAUTION! ⚠

CAUTION! Verify that ALL water valves are open and allow water flow prior to engaging the compressor. Freezing of the coax or water lines can permanently damage the heat pump.

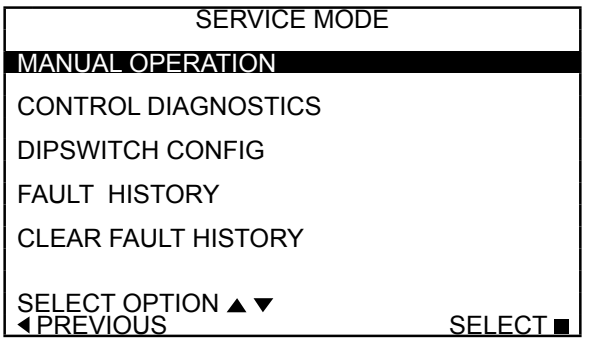
⚠ CAUTION! ⚠

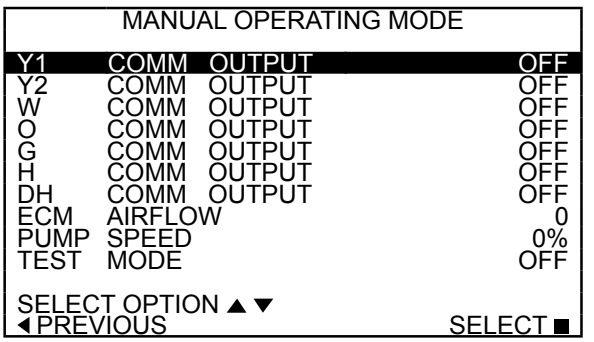
CAUTION! To avoid equipment damage, DO NOT leave system filled in a building without heat during the winter unless antifreeze is added to the water loop. Heat exchangers never fully drain by themselves and will freeze unless winterized with antifreeze.

Unit Start-up Procedure
1. Turn the thermostat fan position to “ON.” Blower should start.
2. Turn Blower off.
3. Ensure all valves are adjusted to their full open position. Ensure line power to the heat pump is on.
4. Room temperature should be within the minimum-maximum ranges of listed in the unit IOM. During start-up checks, loop water temperature entering the heat pump should be between 30°F [-1°C] and 95°F [35°C].
5. It is recommended that water-to-air units be first started in the cooling mode, when possible. This will allow liquid refrigerant to flow through the filter-drier before entering the TXV, allowing the filter-drier to catch any debris that might be in the system before it reaches the TXV.
6. Two factors determine the operating limits of geothermal heat pumps, (a) return air temperature, and (b) entering water temperature. When either of the factors is at a minimum or maximum level, the other factor must be at normal levels to insure proper unit operation.
   a. Place the unit in Manual Operation. When in manual mode activate Y1,Y2, and O to initiate the cooling mode. Also manually increase CFM until desired cooling CFM is achieved. Next adjust pump speed % until desired loop temperature difference (leaving water temperature minus entering water temperature) is achieved. (For modulating valve adjust valve %).



Unit Start-Up Procedure





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 bypassed on the DXM2 control board by placing the unit in the "Test" mode as shown in the unit IOM. Check for normal air temperature drop of 15°F to 25°F (cooling mode).

c. Verify that the compressor is on and that the water temperature rise (cooling mode) is within normal range.

Water Flow, gpm (l/m)	Rise, Cooling °F
For Closed Loop: Ground Source or Closed Loop Systems at 3 gpm per ton (3.9 l/m per kw)	9 - 12
For Open Loop: Ground Water Systems at 1.5 gpm per ton (2.0 l/m per kw)	20 - 26

d. Check the elevation and cleanliness of the condensate lines. Dripping may be a sign of a blocked line. Check that the condensate trap is filled to provide a water seal.
e. Turn thermostat to "OFF" position. A hissing noise indicates proper functioning of the reversing valve.

7. Allow five (5) minutes between tests for pressure to equalize before beginning heating test.

a. Go into Manual Mode activate Y1, and Y2 for Heating. Also manually increase CFM until desired heating CFM is achieved. Next adjust pump speed % until desired loop temperature difference (entering water temperature minus leaving water temperature) is achieved. (For modulating valve adjust valve %).
b. Check for warm 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 bypassed on the DXM2 control board by placing the unit in the "Test" mode as shown in the unit IOM. Check for normal air temperature rise of 20°F to 30°F (heating mode).

Water Flow, gpm (l/m)	Drop, Heating °F
For Closed Loop: Ground Source or Closed Loop Systems at 3 gpm per ton (3.9 l/m per kw)	4 - 8
For Open Loop: Ground Water Systems at 1.5 gpm per ton (2.0 l/m per kw)	10 - 17

c. Verify that the compressor is on and that the water temperature fall (heating mode) is within normal range.
e. Check for vibration, noise, and water leaks.

8. If unit fails to operate properly, perform troubleshooting analysis (see troubleshooting section in the unit IOM). If the check described fails to reveal the problem and the unit still does not operate, contact a trained service technician to insure proper diagnosis and repair of the equipment.
9. When testing is complete, exit the Installer Menu and set thermostat to maintain desired comfort level for normal operation.
10. BE CERTAIN TO FILL OUT AND RETURN ALL WARRANTY REGISTRATION PAPERWORK.

Unit performance may be verified by calculating the unit heat of rejection and heat of extraction. Heat of Rejection (HR) can be calculated and compared to the performance data pages in this IOM. The formula for HR is as follows: HR = TD x GPM x 500 (or 485 for anti-freeze solutions), where TD is the temperature difference between the entering and leaving water, and GPM is the flow rate in U.S. GPM determined by comparing the unit heat exchanger pressure drop to Table 13.

Heat of Extraction (HE) can also be calculated and compared to the performance data pages in this IOM. The formula for HE is as follows: HE = TD x GPM x 500 (or 485 for anti-freeze solutions), where TD is the temperature difference between the entering and leaving water, and GPM is the flow rate in U.S. GPM determined by comparing the unit heat exchanger pressure drop to Table 13.

Unit Start-Up Procedure

If performance during any mode appears abnormal, refer to the DXM2 section or troubleshooting section of this manual.

NOTE: To obtain maximum performance, the air coil should be cleaned before start-up. A 10% solution of dishwasher detergent and water is recommended.

⚠ WARNING! ⚠

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.

Unit Operating Conditions

Table 13: Coax Water Pressure Drop

Model	GPM	Pressure Drop (psi)			
		30°F	50°F	70°F	90°F
024	4.0	1.5	1.3	1.1	1.0
	6.0	3.1	2.6	2.3	2.1
	7.0	4.1	3.4	3.0	2.7
	8.0	5.1	4.3	3.8	3.4
036	4.0	1.2	1.0	0.8	0.6
	6.0	2.6	2.5	2.3	2.1
	8.0	4.5	4.2	4.0	3.7
	9.0	5.7	5.2	4.8	4.4
048	5.5	1.1	0.9	0.8	0.7
	8.3	2.2	2.1	2.0	1.8
	11.0	3.9	3.6	3.2	3.1
	12.0	4.5	4.2	3.8	3.5
060	7.0	0.5	0.3	0.2	0.1
	10.5	1.9	1.8	1.7	1.6
	14.0	3.9	3.5	3.2	2.9
	15.0	4.8	4.3	3.9	3.5
070	7.5	1.7	1.5	1.3	1.3
	11.3	3.9	3.4	3.0	2.8
	15.0	6.9	6.0	5.4	5.0
	17.0	8.9	7.7	6.9	6.5

Table 14: Water Temperature Change Through Heat Exchanger

Water Flow, gpm (l/m)	Rise, Cooling °F	Drop, Heating °F
For Closed Loop: Ground Source or Closed Loop Systems at 3 gpm per ton (3.9 l/m per kw)	9 - 12	4 - 8
For Open Loop: Ground Water Systems at 1.5 gpm per ton (2.0 l/m per kw)	20 - 26	10 - 17

Unit Operating Conditions

Table 15: Series Typical Unit Operating Pressures and Temperatures

024		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
Entering Water Temp °F	Water Flow GPM/ton	Suction Pressure PSIG	Discharge Pressure PSIG	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB	Suction Pressure PSIG	Discharge Pressure PSIG	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30*	1.5 2.25 3							72-83 75-85 78-88	273-293 275-295 277-297	6-11 6-11 6-11	3-8 3-8 3-8	5.9-7.9 4.2-6.2 2.7-4.7	16-22 17-23 18-24
50	1.5 2.25 3	128-138 128-138 128-138	186-206 172-192 158-178	18-23 18-23 18-23	8-13 6-11 6-11	16.3-18.3 12.1-14.1 7.8-9.8	19-25 20-26 20-26	102-112 106-116 110-120	302-322 303-323 305-325	8-12 8-12 8-12	6-11 6-11 6-11	8.9-10.9 6.7-8.7 4.5-6.5	22-28 23-29 23-29
70	1.5 2.25 3	136-146 136-146 136-146	281-301 267-287 253-273	7-12 7-12 7-12	7-12 5-10 4-9	15.7-17.7 11.6-13.6 7.6-9.6	19-25 19-25 19-25	128-138 134-144 141-151	330-350 332-352 334-354	10-15 10-15 10-15	8-13 8-13 8-13	11.3-13.3 8.5-10.5 5.8-7.8	27-34 28-35 28-35
90	1.5 2.25 3	139-149 139-149 139-149	368-388 354-374 340-360	6-11 6-11 6-11	7-12 5-10 5-10	14.9-16.9 11-13 7.2-9.2	18-24 18-24 18-24	162-172 166-176 171-181	367-387 372-392 377-397	14-19 15-20 17-22	10-15 10-15 10-15	14.4-16.4 10.8-12.8 7.1-9.1	33-41 34-42 34-42
110	1.5 2.25 3	143-153 143-153 143-153	465-485 450-470 433-453	6-11 6-11 6-11	7-12 5-10 5-10	13.9-15.9 10.2-12.2 6.5-8.5	17-23 17-23 17-23						

*Based on 15% Methanol antifreeze solution

036		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
Entering Water Temp °F	Water Flow GPM/ton	Suction Pressure PSIG	Discharge Pressure PSIG	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB	Suction Pressure PSIG	Discharge Pressure PSIG	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30*	1.5 2.25 3							69-79 73-83 76-86	293-313 297-317 300-320	7-12 7-12 7-12	14-19 14-19 14-19	8.9-10.9 6.7-8.7 4.5-6.5	17-23 18-24 19-25
50	1.5 2.25 3	129-139 128-138 128-138	225-245 211-231 197-217	15-20 15-20 15-20	10-15 9-14 9-14	21.9-23.9 16.1-18.1 10.3-12.3	18-24 19-25 19-25	96-106 100-110 105-115	322-342 326-346 331-351	10-15 10-15 10-15	17-22 17-22 17-22	12.2-14.2 9.3-11.3 6.4-8.4	23-29 24-30 24-30
70	1.5 2.25 3	136-146 135-145 135-145	302-322 283-303 265-285	9-14 9-14 9-14	13-18 12-17 12-17	21.5-23.5 15.8-17.8 10-12	18-24 19-25 19-25	123-133 129-139 135-145	352-372 358-378 364-384	11-16 11-16 11-16	19-24 19-24 19-24	15-17 11.6-13.6 8.2-10.2	28-35 29-36 30-37
90	1.5 2.25 3	140-150 140-150 140-150	390-410 369-389 349-369	7-12 8-13 8-13	13-18 8-13 8-13	20.5-22.5 14.9-16.9 9.3-11.3	17-23 17-23 17-23	157-167 169-179 181-191	390-410 399-419 408-428	13-18 13-18 14-19	18-23 16.5-21.5 15-20	21-23 15.5-17.5 10.5-12.5	36-44 37-45 39-47
110	1.5 2.25 3	145-155 145-155 145-155	488-508 467-487 447-467	7-12 8-13 8-13	13-18 8-13 8-13	19-21 14-16 9-11	17-23 17-23 17-23						

*Based on 15% Methanol antifreeze solution

048		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
Entering Water Temp °F	Water Flow GPM/ton	Suction Pressure PSIG	Discharge Pressure PSIG	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB	Suction Pressure PSIG	Discharge Pressure PSIG	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30*	1.5 2.25 3							66-76 69-79 72-82	286-306 289-309 292-312	7-12 7-12 7-12	8-13 9-14 9-14	8-10 6-8 4-6	18-24 19-25 19-25
50	1.5 2.25 3	125-135 123-133 122-132	242-262 224-244 205-225	13-18 13-18 14-19	10-15 9-14 7-12	20.9-22.9 15.6-17.6 10.2-12.2	19-25 19-25 19-25	93-103 98-108 103-113	314-334 320-340 326-346	8-13 8-13 8-13	10-15 10-15 10-15	11.5-13.5 8.7-10.7 5.9-7.9	23-29 24-30 25-31
70	1.5 2.25 3	133-143 132-142 131-141	310-330 290-310 270-290	8-13 8-13 9-14	8-13 7-12 5-10	20.5-22.5 15.2-17.2 9.9-11.9	19-25 19-25 19-25	123-133 130-140 137-147	344-364 354-374 361-381	9-14 9-14 9-14	9-14 9-14 9-14	15-17 11.5-13.5 7.9-9.9	28-35 29-36 30-37
90	1.5 2.25 3	138-148 137-147 136-146	396-416 374-394 352-372	7-12 7-12 7-12	7-12 6-11 4-9	19.2-21.2 14.3-16.3 9.3-11.3	18-24 18-24 18-24	165-175 175-185 185-195	390-410 401-421 413-433	13-18 15-20 17-22	8-13 8-13 8-13	19.6-21.6 15-17 10.3-12.3	37-45 38-46 39-47
110	1.5 2.25 3	144-154 143-153 142-152	497-517 472-492 447-467	7-12 7-12 7-12	5-10 4-9 3-8	18-20 13.3-15.3 8.5-10.5	17-23 17-23 17-23						

*Based on 15% Methanol antifreeze solution

Unit Operating Conditions

Table 15: Series Typical Unit Operating Pressures and Temperatures: Continued

060		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
Entering Water Temp °F	Water Flow GPM/ton	Suction Pressure PSIG	Discharge Pressure PSIG	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB	Suction Pressure PSIG	Discharge Pressure PSIG	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30*	1.5 2.25 3							66-76 69-79 72-82	282-302 285-305 289-309	10-16 10-16 10-16	9-14 9-14 10-15	8-10 6-8 4-6	19-25 19-25 20-26
50	1.5 2.25 3	128-138 126-136 125-135	238-258 222-242 205-225	16-21 21-26 26-31	14-19 13-18 12-17	20.5-22.5 14.9-16.9 9.2-11.2	21-27 21-27 21-27	90-100 95-105 99-109	310-330 313-333 316-336	11-17 11-17 11-17	12-17 12-17 12-17	11.3-13.3 8.5-10.5 5.7-7.7	24-30 25-31 26-32
70	1.5 2.25 3	135-145 134-144 133-143	315-335 296-316 276-296	10-15 12-17 15-20	14-19 13-18 11-16	21-23 15.5-17.5 10-12	22-28 22-28 22-28	115-125 120-130 126-136	337-357 341-361 345-365	12-18 12-18 12-18	14-19 14-19 15-20	14-16 10.6-12.6 7.3-9.3	28-35 29-36 30-37
90	1.5 2.25 3	139-149 138-148 138-148	408-428 386-406 364-384	10-15 10-15 10-15	15-20 13-18 11-16	20.1-22.1 14.8-16.8 9.5-11.5	21-27 21-27 21-27	157-167 161-171 166-176	390-410 394-414 398-418	15-20 15-20 15-20	14-19 14-19 15-20	18.2-20.2 13.9-15.9 9.6-11.6	37-45 38-46 39-47
110	1.5 2.25 3	144-154 143-153 142-152	515-535 493-513 469-489	8-13 8-13 8-13	14-19 13-18 12-17	19-21 14-16 9-11	20-26 20-26 20-26						

*Based on 15% Methanol antifreeze solution

070		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
Entering Water Temp °F	Water Flow GPM/ ton	Suction Pressure PSIG	Discharge Pressure PSIG	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB	Suction Pressure PSIG	Discharge Pressure PSIG	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30*	1.5 2.25 3							61-71 65-75 68-78	292-312 296-316 300-320	11-16 11-16 10-15	13-18 14-19 15-20	7.2-9.2 5.4-7.4 3.5-5.5	19-25 20-26 21-27
50	1.5 2.25 3	131-141 130-140 129-139	210-230 205-225 200-220	10-15 11-16 13-18	12-17 12-17 12-17	18.5-20.5 14-16 9.5-11.5	22-28 23-29 24-30	89-99 98-108 106-116	327-347 337-357 348-368	10-15 10-15 10-15	19-24 14-19 9-14	10.9-12.9 8.3-10.3 5.7-7.7	26-32 28-34 30-36
70	1.5 2.25 3	135-145 131-141 128-138	300-320 295-315 290-310	10-15 11-16 13-18	15-20 14-19 14-19	17.6-19.6 13.8-15.8 10-12	23-29 23-29 23-29	119-129 132-142 144-154	365-385 380-400 395-415	10-15 10-15 10-15	21-26 16-21 11-16	14.7-16.7 11.3-13.3 7.9-9.9	33-39 36-42 38-44
90	1.5 2.25 3	139-149 137-147 135-145	390-410 370-390 350-370	10-15 10-15 10-15	16-21 14-19 13-18	16.7-18.7 12.6-14.6 8.5-10.5	22-28 22-28 22-28	162-172 172-182 182-192	418-438 430-450 444-464	10-15 10-15 11-16	19-24 19-24 19-24	19.4-21.4 14.7-16.7 10.1-12.1	43-49 45-51 47-53
110	1.5 2.25 3	145-155 145-155 144-154	490-510 470-490 452-472	10-15 10-15 9-14	16-21 14-19 13-18	15.9-17.9 11.7-13.7 7.4-9	20-27 20-27 20-27						

*Based on 15% Methanol antifreeze solution

Table 16: Antifreeze Correction

Antifreeze Type	Antifreeze %	Cooling			Heating		WPD Corr. Fct. EWT 30°F
		EWT 90°F			EWT 30°F		
		Total Cap	Sens Cap	Power	Htg Cap	Power	
Water	0	1.000	1.000	1.000	1.000	1.000	1.000
Propylene Glycol	5	0.995	0.995	1.003	0.989	0.997	1.070
	15	0.986	0.986	1.009	0.968	0.990	1.210
	25	0.978	0.978	1.014	0.947	0.983	1.360
Methanol	5	0.997	0.997	1.002	0.989	0.997	1.070
	15	0.990	0.990	1.007	0.968	0.990	1.160
	25	0.982	0.982	1.012	0.949	0.984	1.220
Ethanol	5	0.998	0.998	1.002	0.981	0.994	1.140
	15	0.994	0.994	1.005	0.944	0.983	1.300
	25	0.986	0.986	1.009	0.917	0.974	1.360
Ethylene Glycol	5	0.998	0.998	1.002	0.993	0.998	1.040
	15	0.994	0.994	1.004	0.980	0.994	1.120
	25	0.988	0.988	1.008	0.966	0.990	1.200

Table 17a: Performance Data-HZ Model 024-Full Load

Performance capacities shown in thousands of Btuh

Antifreeze use recommended in this range. Also Clip JW3 on DXM2 board.

EWT °F	Cooling - EAT 80/67 °F										Heating - EAT 70°F									
	GPM	WPD		CFM	TC	SC	kW	EER	HR	LWT	HWC	GPM	WPD		CFM	HC	kW	COP	HE	LAT	LWT	HWC
		PSI	FT										PSI	FT								
20	1.3	0.3	0.6	750	29.3	18.1	1.16	33.2	25.3	70.0	1.4	6.0	1.9	4.4	840	16.5	1.73	2.8	10.7	88.2	16.4	1.5
	1.4	0.3	0.6	850	29.8	19.5	1.20	33.9	24.9	70.0	1.4	6.0	1.9	4.4	950	16.8	1.68	2.9	11.0	86.3	16.3	1.5
30	1.7	0.3	0.7	750	29.3	18.1	1.16	33.2	25.3	70.0	1.4	3.0	0.7	1.6	840	18.2	1.69	3.2	12.6	90.1	21.6	1.7
	1.7	0.3	0.7	850	29.8	19.5	1.20	33.9	24.9	70.0	1.4	3.0	0.7	1.6	950	18.5	1.64	3.3	12.9	88.0	21.4	1.8
	1.7	0.3	0.7	750	29.3	18.1	1.16	33.2	25.3	70.0	1.4	4.5	1.1	2.6	840	19.1	1.68	3.3	13.4	91.0	24.0	1.8
	1.7	0.3	0.7	850	29.8	19.5	1.20	33.9	24.9	70.0	1.4	4.5	1.1	2.6	950	19.4	1.63	3.5	13.8	88.9	23.9	1.9
	1.7	0.3	0.7	750	29.3	18.1	1.16	33.2	25.3	70.0	1.4	6.0	1.8	4.0	840	19.5	1.67	3.4	13.9	91.5	25.4	1.9
	1.7	0.3	0.7	850	29.8	19.5	1.20	33.9	24.9	70.0	1.4	6.0	1.8	4.0	950	19.8	1.62	3.6	14.3	89.3	25.2	1.9
40	2.2	0.4	1.0	750	29.3	18.1	1.16	33.2	25.3	70.0	1.4	3.0	0.6	1.5	840	21.0	1.66	3.7	15.4	93.1	29.7	2.1
	2.3	0.4	1.0	850	29.8	19.5	1.20	33.9	24.9	70.0	1.4	3.0	0.6	1.5	950	21.3	1.61	3.9	15.8	90.8	29.5	2.1
	2.2	0.4	1.0	750	29.3	18.1	1.16	33.2	25.3	70.0	1.4	4.5	1.1	2.5	840	22.0	1.65	3.9	16.5	94.3	32.7	2.2
	2.3	0.4	1.0	850	29.8	19.5	1.20	33.9	24.9	70.0	1.4	4.5	1.1	2.5	950	22.4	1.60	4.1	16.9	91.8	32.5	2.3
	2.2	0.4	1.0	750	29.3	18.1	1.16	33.2	25.3	70.0	1.4	6.0	1.6	3.8	840	22.6	1.64	4.0	17.1	94.9	34.3	2.3
	2.3	0.4	1.0	850	29.8	19.5	1.20	33.9	24.9	70.0	1.4	6.0	1.6	3.8	950	23.0	1.59	4.2	17.5	92.4	34.2	2.3
50	3.0	0.6	1.4	750	29.1	18.0	1.19	33.1	24.5	72.0	1.4	3.0	0.6	1.4	840	23.8	1.64	4.2	18.2	96.2	37.8	2.4
	3.0	0.6	1.4	850	29.6	19.4	1.23	33.8	24.0	72.5	1.5	3.0	0.6	1.4	950	24.1	1.59	4.5	18.7	93.5	37.5	2.5
	3.3	0.7	1.6	750	29.3	18.1	1.16	33.2	25.3	70.0	1.4	4.5	1.0	2.3	840	25.1	1.64	4.5	19.5	97.6	41.3	2.6
	3.4	0.7	1.6	850	29.8	19.5	1.20	33.9	24.9	70.0	1.4	4.5	1.0	2.3	950	25.4	1.59	4.7	20.0	94.8	41.1	2.6
	3.3	0.7	1.6	750	29.3	18.1	1.16	33.2	25.3	70.0	1.4	6.0	1.6	3.6	840	25.8	1.64	4.6	20.2	98.4	43.3	2.7
	3.4	0.7	1.6	850	29.8	19.5	1.20	33.9	24.9	70.0	1.4	6.0	1.6	3.6	950	26.2	1.59	4.8	20.7	95.5	43.1	2.7
60	3.0	0.6	1.3	750	27.9	17.6	1.30	32.3	21.4	81.5	1.9	3.0	0.6	1.3	840	26.7	1.64	4.8	21.1	99.4	45.9	2.8
	3.0	0.6	1.3	850	28.4	18.9	1.35	33.0	21.0	82.0	1.9	3.0	0.6	1.3	950	27.1	1.59	5.0	21.6	96.4	45.6	2.8
	4.5	1.0	2.3	750	28.8	17.9	1.22	32.9	23.7	74.6	1.5	4.5	1.0	2.3	840	28.2	1.65	5.0	22.5	101.0	50.0	2.9
	4.5	1.0	2.3	850	29.3	19.3	1.26	33.6	23.3	74.9	1.6	4.5	1.0	2.3	950	28.6	1.60	5.2	23.1	97.9	49.7	3.0
	6.0	1.5	3.5	750	29.2	18.1	1.18	33.1	24.8	71.0	1.4	6.0	1.5	3.5	840	29.0	1.66	5.1	23.3	102.0	52.2	3.0
	6.0	1.5	3.5	850	29.7	19.4	1.22	33.8	24.3	71.3	1.4	6.0	1.5	3.5	950	29.4	1.61	5.4	24.0	98.7	52.0	3.1
70	3.0	0.6	1.3	750	26.4	17.0	1.43	31.3	18.5	90.9	2.4	3.0	0.6	1.3	840	29.6	1.66	5.2	23.9	102.6	54.1	3.1
	3.0	0.6	1.3	850	26.9	18.3	1.48	32.0	18.2	91.3	2.4	3.0	0.6	1.3	950	30.1	1.61	5.5	24.6	99.3	53.6	3.2
	4.5	1.0	2.2	750	27.5	17.5	1.33	32.0	20.7	84.2	2.0	4.5	1.0	2.2	840	31.4	1.69	5.4	25.6	104.6	58.6	3.3
	4.5	1.0	2.2	850	28.0	18.8	1.38	32.7	20.3	84.5	2.1	4.5	1.0	2.2	950	31.8	1.64	5.7	26.2	101.0	58.3	3.3
	6.0	1.5	3.4	750	28.0	17.7	1.28	32.4	21.8	80.8	1.8	6.0	1.5	3.4	840	32.3	1.71	5.5	26.5	105.7	61.2	3.4
	6.0	1.5	3.4	850	28.5	19.0	1.33	33.1	21.4	81.0	1.9	6.0	1.5	3.4	950	32.8	1.66	5.8	27.2	102.0	60.9	3.4
80	3.0	0.6	1.3	750	24.8	16.3	1.58	30.2	15.7	100.1	3.0	3.0	0.6	1.3	840	32.6	1.71	5.6	26.7	106.0	62.2	3.4
	3.0	0.6	1.3	850	25.2	17.5	1.64	30.8	15.4	100.5	3.0	3.0	0.6	1.3	950	33.1	1.66	5.8	27.5	102.3	61.7	3.5
	4.5	0.9	2.2	750	26.0	16.8	1.48	31.0	17.6	93.8	2.6	3.7	0.7	1.7	840	33.9	1.74	5.7	27.9	107.4	65.0	3.5
	4.5	0.9	2.2	850	26.4	18.1	1.53	31.6	17.3	94.1	2.6	3.8	0.8	1.8	950	34.4	1.69	6.0	28.7	103.6	65.0	3.6
	6.0	1.4	3.3	750	26.2	16.9	1.45	31.1	18.1	90.4	2.4	3.7	0.7	1.7	840	33.9	1.74	5.7	27.9	107.4	65.0	3.5
	6.0	1.4	3.3	850	26.7	18.2	1.50	31.8	17.8	92.7	2.4	3.8	0.8	1.8	950	34.4	1.69	6.0	28.7	103.6	65.0	3.6
90	3.0	0.6	1.3	750	23.1	15.5	1.75	29.0	13.2	109.4	3.7	2.2	0.4	0.9	840	33.9	1.74	5.7	27.9	107.4	65.0	3.5
	3.0	0.6	1.3	850	23.5	16.7	1.81	29.7	13.0	109.8	3.7	2.3	0.4	1.0	950	34.4	1.69	6.0	28.7	103.6	65.0	3.6
	4.5	0.9	2.2	750	24.3	16.1	1.63	29.8	14.9	103.2	3.2	2.2	0.4	0.9	840	33.9	1.74	5.7	27.9	107.4	65.0	3.5
	4.5	0.9	2.2	850	24.7	17.3	1.69	30.4	14.6	103.5	3.3	2.3	0.4	1.0	950	34.4	1.69	6.0	28.7	103.6	65.0	3.6
	6.0	1.4	3.2	750	24.9	16.3	1.57	30.2	15.8	100.1	3.0	2.2	0.4	0.9	840	33.9	1.74	5.7	27.9	107.4	65.0	3.5
	6.0	1.4	3.2	850	25.3	17.5	1.63	30.9	15.5	100.3	3.0	2.3	0.4	1.0	950	34.4	1.69	6.0	28.7	103.6	65.0	3.6
100	3.0	0.6	1.3	750	21.3	14.8	1.95	28.0	10.9	118.7	4.4	1.6	0.2	0.6	840	33.9	1.74	5.7	27.9	107.4	65.0	3.5
	3.0	0.6	1.3	850	21.7	15.9	2.02	28.6	10.7	119.1	4.5	1.6	0.3	0.6	950	34.4	1.69	6.0	28.7	103.6	65.0	3.6
	4.5	0.9	2.1	750	22.5	15.3	1.81	28.7	12.4	112.7	3.9	1.6	0.2	0.6	840	33.9	1.74	5.7	27.9	107.4	65.0	3.5
	4.5	0.9	2.1	850	22.9	16.4	1.88	29.3	12.2	113.0	4.0	1.6	0.3	0.6	950	34.4	1.69	6.0	28.7	103.6	65.0	3.6
	6.0	1.4	3.2	750	23.1	15.5	1.76	29.0	13.1	109.7	3.7	1.6	0.2	0.6	840	33.9	1.74	5.7	27.9	107.4	65.0	3.5
	6.0	1.4	3.2	850	23.5	16.7	1.82	29.7	12.9	109.9	3.7	1.6	0.3	0.6	950	34.4	1.69	6.0	28.7	103.6	65.0	3.6
110	3.0	0.6	1.3	750	19.7	14.2	2.18	27.1	9.0	128.1	5.3	1.2	0.1	0.3	840	33.9	1.74	5.7	27.9	107.4	65.0	3.5
	3.0	0.6	1.3	850	20.0	15.2	2.26	27.7	8.9	128.5	5.4	1.3	0.1	0.3	950	34.4	1.69	6.0	28.7	103.6	65.0	3.6
	4.5	0.9	2.1	750	20.7	14.6	2.04	27.7	10.2	122.3	4.7	1.2	0.1	0.3	840	33.9	1.74	5.7	27.9	107.4	65.0	3.5
	4.5	0.9	2.1	850	21.1	15.7	2.11	28.2	10.0	122.6	4.8	1.3	0.1	0.3	950	34.4	1.69	6.0	28.7	103.6	65.0	3.6
	6.0	1.4	3.1	750	21.3	14.8	1.96	28.0	10.8	119.3	4.4	1.2	0.1	0.3	840	33.9	1.74	5.7	27.9	107.4	65.0	3.5
	6.0	1.4	3.1	850	21.6	15.9	2.03	28.6	10.6	119.5	4.5	1.3	0.1	0.3	950	34.4	1.69	6.0	28.7	103.6	65.0	3.6
120	3.0	0.5	1.2	750	18.2	13.7	2.46	26.6	7.4	137.7	6.2	1.0	0.1	0.2	840	33.9	1.74	5.7	27.9	107.4	65.0	3.5
	3.0	0.5	1.2	850	18.5	14.7	2.55	27.2	7.3	138.1	6.4	1.0	0.1	0.2	950	34.4	1.69	6.0	28.7	103.6	65.0	3.6
	4.5	0.9	2.0	750	19.1	14.0	2.29	26.9	8.3	132.0	5.6	1.0	0.1	0.2	840	33.9	1.74	5.7	27.9	107.4	65.0	3.5
	4.5	0.9	2.0	850	19.4	15.0	2.37	27.5	8.2	132.2	5.8	1.0	0.1	0.2	950	34.4	1.69	6.0	28.7	103.6	65.0	3.6
	6.0	1.3	3.1	750	19.5	14.1	2.20	27.1	8.9	129.0	5.3	1.0	0.1	0.2	840	33.9	1.74	5.7	27.9	107.4	65.0	3.5
	6.0	1.3	3.1	850	19.9	15.2	2.28	27.7	8.7	129.2	5.5	1.0	0.1	0.2	950	34.4	1.69	6.0	28.7	103.6	65.0	3.6

Interpolation is permissible; extrapolation is not.
Flow is controlled to maintain minimum LWT 70° F in cooling and maximum LWT 65° F in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
For operation in the shaded areas, please see the Performance Data Selection Notes.

All performance is based upon the lower voltage of dual voltage rated units.
Operation at or below 40° F EWT is based on 15% methanol antifreeze solution.
See Performance correction tables for operating conditions other than those listed above.

For Part Load data, refer to Specification Catalog

Table 17b: Performance Data-HZ Model 036-Full Load

Performance capacities shown in thousands of Btuh

Antifreeze use recommended in this range. Also Clip JW3 on DXM2 board.

EWT °F	Cooling - EAT 80/67 °F										Heating - EAT 70°F									
	GPM	WPD		CFM	TC	SC	kW	EER	HR	LWT	HWC	GPM	WPD		CFM	HC	kW	COP	HE	LAT	LWT	HWC
		PSI	FT										PSI	FT								
20	2.0	0.6	1.5	1100	44.2	26.6	1.70	26.0	49.9	70.0	1.8	9.0	4.3	9.9	1100	25.2	2.23	3.3	17.8	91.2	16.1	2.0
	2.0	0.7	1.5	1250	45.0	28.6	1.76	25.6	51.0	70.0	1.8	9.0	4.3	9.9	1250	25.6	2.16	3.5	18.2	89.0	15.9	2.1
30	2.5	0.7	1.7	1100	44.2	26.6	1.70	26.0	49.9	70.0	1.8	4.5	1.5	3.5	1100	27.7	2.25	3.6	20.1	93.3	21.0	2.3
	2.5	0.7	1.7	1250	45.0	28.6	1.76	25.6	51.0	70.0	1.8	4.5	1.5	3.5	1250	28.1	2.18	3.8	20.7	90.8	20.8	2.4
	2.5	0.7	1.7	1100	44.2	26.6	1.70	26.0	49.9	70.0	1.8	6.8	2.6	6.1	1100	29.0	2.26	3.8	21.4	94.4	23.7	2.5
	2.5	0.7	1.7	1250	45.0	28.6	1.76	25.6	51.0	70.0	1.8	6.8	2.6	6.1	1250	29.5	2.19	3.9	22.0	91.8	23.5	2.5
	2.5	0.7	1.7	1100	44.2	26.6	1.70	26.0	49.9	70.0	1.8	9.0	3.9	9.1	1100	29.7	2.26	3.9	22.1	95.0	25.1	2.6
	2.5	0.7	1.7	1250	45.0	28.6	1.76	25.6	51.0	70.0	1.8	9.0	3.9	9.1	1250	30.2	2.19	4.0	22.7	92.4	25.0	2.6
40	3.3	0.9	2.2	1100	44.2	26.6	1.70	26.0	49.9	70.0	1.8	4.5	1.4	3.2	1100	31.8	2.28	4.1	24.0	96.7	29.3	2.8
	3.4	1.0	2.2	1250	45.0	28.6	1.76	25.6	51.0	70.0	1.8	4.5	1.4	3.2	1250	32.2	2.21	4.3	24.7	93.9	29.0	2.9
	3.3	0.9	2.2	1100	44.2	26.6	1.70	26.0	49.9	70.0	1.8	6.8	2.4	5.6	1100	33.3	2.30	4.2	25.5	98.1	32.5	3.0
	3.4	1.0	2.2	1250	45.0	28.6	1.76	25.6	51.0	70.0	1.8	6.8	2.4	5.6	1250	33.8	2.23	4.4	26.2	95.1	32.3	3.1
	3.3	0.9	2.2	1100	44.2	26.6	1.70	26.0	49.9	70.0	1.8	9.0	3.6	8.4	1100	34.2	2.31	4.3	26.3	98.8	34.1	3.1
	3.4	1.0	2.2	1250	45.0	28.6	1.76	25.6	51.0	70.0	1.8	9.0	3.6	8.4	1250	34.7	2.24	4.5	27.1	95.7	34.0	3.2
50	4.5	1.3	3.0	1100	43.9	26.6	1.74	25.3	49.7	72.1	2.0	4.5	1.3	3.0	1100	35.8	2.33	4.5	27.9	100.1	37.6	3.3
	4.5	1.3	3.0	1250	44.6	28.6	1.80	24.8	50.8	72.6	2.0	4.5	1.3	3.0	1250	36.3	2.26	4.7	28.6	96.9	37.3	3.4
	5.0	1.5	3.4	1100	44.2	26.6	1.70	26.0	49.9	70.0	1.8	6.8	2.3	5.2	1100	37.6	2.36	4.7	29.6	101.6	41.3	3.5
	5.1	1.5	3.5	1250	45.0	28.6	1.76	25.6	51.0	70.0	1.8	6.8	2.3	5.2	1250	38.2	2.29	4.9	30.3	98.3	41.1	3.6
	5.0	1.5	3.4	1100	44.2	26.6	1.70	26.0	49.9	70.0	1.8	9.0	3.4	7.9	1100	38.6	2.38	4.7	30.5	102.5	43.2	3.6
	5.1	1.5	3.5	1250	45.0	28.6	1.76	25.6	51.0	70.0	1.8	9.0	3.4	7.9	1250	39.2	2.31	5.0	31.3	99.0	43.0	3.7
60	4.5	1.3	2.9	1100	42.3	26.1	1.90	22.3	48.7	81.7	2.6	4.5	1.3	2.9	1100	39.8	2.40	4.9	31.6	103.5	45.9	3.7
	4.5	1.3	2.9	1250	43.0	28.1	1.97	21.9	49.8	82.1	2.7	4.5	1.3	2.9	1250	40.4	2.33	5.1	32.5	99.9	45.6	3.8
	6.8	2.1	4.9	1100	43.5	26.5	1.78	24.5	49.5	74.6	2.1	6.8	2.2	5.0	1100	41.9	2.45	5.0	33.5	105.2	50.1	4.0
	6.8	2.1	4.9	1250	44.3	28.5	1.84	24.1	50.6	75.0	2.2	6.8	2.2	5.0	1250	42.5	2.37	5.3	34.4	101.5	49.9	4.1
	9.0	3.3	7.5	1100	44.0	26.6	1.72	25.6	49.8	71.1	1.9	9.0	3.3	7.5	1100	43.0	2.47	5.1	34.6	106.2	52.3	4.1
	9.0	3.3	7.5	1250	44.8	28.6	1.78	25.2	50.9	71.3	1.9	9.0	3.3	7.5	1250	43.7	2.39	5.4	35.5	102.3	52.1	4.2
70	4.5	1.2	2.9	1100	40.4	25.4	2.07	19.5	47.4	91.1	3.4	4.5	1.2	2.9	1100	43.9	2.49	5.2	35.4	106.9	54.3	4.2
	4.5	1.2	2.9	1250	41.1	27.4	2.15	19.1	48.4	91.5	3.5	4.5	1.2	2.9	1250	44.5	2.41	5.4	36.3	103.0	53.9	4.3
	6.8	2.1	4.8	1100	41.8	26.0	1.95	21.5	48.4	84.2	2.8	6.8	2.1	4.8	1100	46.2	2.55	5.3	37.5	108.9	59.0	4.5
	6.8	2.1	4.8	1250	42.6	27.9	2.02	21.1	49.4	84.6	2.9	6.8	2.1	4.8	1250	46.9	2.47	5.6	38.5	104.8	58.7	4.6
	9.0	3.1	7.2	1100	42.5	26.2	1.88	22.6	48.8	80.9	2.5	9.0	3.1	7.2	1100	47.6	2.58	5.4	38.7	110.0	61.4	4.6
	9.0	3.1	7.2	1250	43.2	28.2	1.95	22.2	49.9	81.1	2.6	9.0	3.1	7.2	1250	48.3	2.50	5.7	39.8	105.8	61.2	4.7
80	4.5	1.2	2.9	1100	38.2	24.6	2.29	16.7	45.9	100.4	4.3	4.5	1.2	2.9	1100	48.0	2.59	5.4	39.2	110.4	62.6	4.6
	4.5	1.2	2.9	1250	38.8	26.4	2.37	16.4	46.9	100.9	4.4	4.5	1.2	2.9	1250	48.8	2.51	5.7	40.2	106.1	62.1	4.7
	6.8	2.0	4.7	1100	39.8	25.2	2.13	18.6	47.0	93.8	3.6	5.4	1.5	3.5	1100	49.5	2.63	5.5	40.5	111.7	65.0	4.8
	6.8	2.0	4.7	1250	40.5	27.1	2.21	18.3	48.0	94.2	3.7	5.5	1.6	3.6	1250	50.3	2.55	5.8	41.6	107.3	65.0	4.9
	9.0	3.1	7.1	1100	40.5	25.5	2.07	19.6	47.5	90.6	3.3	5.4	1.5	3.5	1100	49.5	2.63	5.5	40.5	111.7	65.0	4.8
	9.0	3.1	7.1	1250	41.2	27.4	2.14	19.3	48.5	90.8	3.4	5.5	1.6	3.6	1250	50.3	2.55	5.8	41.6	107.3	65.0	4.9
90	4.5	1.2	2.9	1100	35.8	23.6	2.54	14.1	44.4	109.7	5.3	3.2	0.9	2.0	1100	49.5	2.63	5.5	40.5	111.7	65.0	4.8
	4.5	1.2	2.9	1250	36.4	25.4	2.63	13.8	45.4	110.2	5.5	3.3	0.9	2.1	1250	50.3	2.55	5.8	41.6	107.3	65.0	4.9
	6.8	2.0	4.6	1100	37.4	24.3	2.36	15.8	45.5	103.4	4.6	3.2	0.9	2.0	1100	49.5	2.63	5.5	40.5	111.7	65.0	4.8
	6.8	2.0	4.6	1250	38.1	26.1	2.45	15.5	46.4	103.8	4.7	3.3	0.9	2.1	1250	50.3	2.55	5.8	41.6	107.3	65.0	4.9
	9.0	3.0	6.9	1100	38.3	24.6	2.28	16.8	46.0	100.2	4.3	3.2	0.9	2.0	1100	49.5	2.63	5.5	40.5	111.7	65.0	4.8
	9.0	3.0	6.9	1250	38.9	26.5	2.36	16.5	47.0	100.4	4.3	3.3	0.9	2.1	1250	50.3	2.55	5.8	41.6	107.3	65.0	4.9
100	4.5	1.2	2.8	1100	33.3	22.5	2.83	11.8	43.0	119.1	6.5	2.3	0.7	1.5	1100	49.5	2.63	5.5	40.5	111.7	65.0	4.8
	4.5	1.2	2.8	1250	33.9	24.2	2.93	11.6	43.9	119.5	6.7	2.4	0.7	1.5	1250	50.3	2.55	5.8	41.6	107.3	65.0	4.9
	6.8	2.0	4.5	1100	35.0	23.2	2.62	13.3	43.9	112.9	5.7	2.3	0.7	1.5	1100	49.5	2.63	5.5	40.5	111.7	65.0	4.8
	6.8	2.0	4.5	1250	35.6	25.0	2.72	13.1	44.9	113.3	5.9	2.4	0.7	1.5	1250	50.3	2.55	5.8	41.6	107.3	65.0	4.9
	9.0	3.0	6.8	1100	35.8	23.6	2.54	14.1	44.4	109.9	5.3	2.3	0.7	1.5	1100	49.5	2.63	5.5	40.5	111.7	65.0	4.8
	9.0	3.0	6.8	1250	36.4	25.4	2.63	13.9	45.4	110.1	5.5	2.4	0.7	1.5	1250	50.3	2.55	5.8	41.6	107.3	65.0	4.9
110	4.5	1.2	2.8	1100	30.9	21.4	3.17	9.7	41.7	128.5	7.9	1.8	0.5	1.2	1100	49.5	2.63	5.5	40.5	111.7	65.0	4.8
	4.5	1.2	2.8	1250	31.4	23.0	3.29	9.5	42.6	128.9	8.0	1.8	0.5	1.2	1250	50.3	2.55	5.8	41.6	107.3	65.0	4.9
	6.8	1.9	4.5	1100	32.4	22.1	2.94	11.0	42.5	122.5	7.0	1.8	0.5	1.2	1100	49.5	2.63	5.5	40.5	111.7	65.0	4.8
	6.8	1.9	4.5	1250	33.0	23.8	3.05	10.8	43.4	122.9	7.1	1.8	0.5	1.2	1250	50.3	2.55	5.8	41.6	107.3	65.0	4.9
	9.0	2.9	6.7	1100	33.3	22.5	2.84	11.7	42.9	119.5	6.6	1.8	0.5	1.2	1100	49.5	2.63	5.5	40.5	111.7	65.0	4.8
	9.0	2.9	6.7	1250	33.8	24.2	2.94	11.5	43.9	119.7	6.7	1.8	0.5	1.2	1250	50.3	2.55	5.8	41.6	107.3	65.0	4.9
120	4.5	1.1	2.6	1100	28.5	20.3	3.59	7.9	40.8	138.1	9.4	1.5	0.4	0.8	1100	49.5	2.63	5.5	40.5	111.7	65.0	4.8
	4.5	1.1	2.6	1250	29.0	21.9	3.72	7.8	41.7	138.5	9.6	1.5	0.4	0.8	1250	50.3	2.55	5.8	41.6	107.3	65.0	4.9
	6.8	1.9	4.3	1100	29.9	21.0	3.32	9.0	41.3	132.2	8.4	1.5	0.4	0.8	1100	49.5	2.63	5.5	40.5	111.7	65.0	4.8
	6.8	1.9	4.3	1250	30.5	22.6	3.44	8.9	42.2	132.5	8.6	1.5	0.4	0.8	1250	50.3	2.55	5.8	41.6	107.3	65.0	4.9
	9.0	2.9	6.6	1100	30.7	21.3	3.19	9.6	41.7	129.3	8.0	1.5	0.4	0.8	1100	49.5	2.63	5.5	40.5	111.7	65.0	4.8
	9.0	2.9	6.6	1250	31.3	23.0	3.31	9.4	42.6	129.5	8.1	1.5	0.4	0.8	1250	50.3	2.55	5.8	41.6	107.3	65.0	4.9

Interpolation is permissible; extrapolation is not.
Flow is controlled to maintain minimum LWT 70° F in cooling and maximum LWT 65° F in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
For operation in the shaded areas, please see the Performance Data Selection Notes.

All performance is based upon the lower voltage of dual voltage rated units.
Operation at or below 40° F EWT is based on 15% methanol antifreeze solution.
See Performance correction tables for operating conditions other than those listed above.

For Part Load data, refer to Specification Catalog

Table 17c: Performance Data-HZ Model 048-Full Load

Performance capacities shown in thousands of Btuh

Antifreeze use recommended in this range. Also Clip JW3 on DXM2 board.

EWT °F	Cooling - EAT 80/67 °F											Heating - EAT 70°F									
	GPM	WPD		CFM	TC	SC	kW	EER	HR	LWT	HWC	GPM	WPD		CFM	HC	kW	COP	HE	LAT	LWT	HWC
		PSI	FT										PSI	FT								
20	2.5	0.1	0.2	1360	54.0	33.1	2.26	23.9	61.6	70.0	2.3	12.0	4.1	9.4	1450	31.4	3.17	2.9	20.9	90.1	16.5	3.3
	2.5	0.1	0.2	1550	54.9	35.6	2.34	23.5	62.9	70.0	2.3	12.0	4.1	9.4	1650	31.9	3.07	3.0	21.4	87.9	16.4	3.3
30	3.1	0.1	0.2	1360	54.0	33.1	2.26	23.9	61.6	70.0	2.3	6.0	0.9	2.1	1450	34.7	3.16	3.2	24.2	92.2	21.9	3.4
	3.1	0.1	0.2	1550	54.9	35.6	2.34	23.5	62.9	70.0	2.3	6.0	0.9	2.1	1650	35.3	3.06	3.4	24.8	89.8	21.7	3.5
	3.1	0.1	0.2	1360	54.0	33.1	2.26	23.9	61.6	70.0	2.3	9.0	2.1	4.9	1450	36.2	3.16	3.4	25.7	93.1	24.3	3.5
	3.1	0.1	0.2	1550	54.9	35.6	2.34	23.5	62.9	70.0	2.3	9.0	2.1	4.9	1650	36.8	3.06	3.5	26.3	90.6	24.1	3.5
	3.1	0.1	0.2	1360	54.0	33.1	2.26	23.9	61.6	70.0	2.3	12.0	3.8	8.8	1450	37.1	3.16	3.4	26.5	93.7	25.6	3.5
	3.1	0.1	0.2	1550	54.9	35.6	2.34	23.5	62.9	70.0	2.3	12.0	3.8	8.8	1650	37.6	3.06	3.6	27.2	91.1	25.5	3.6
40	4.1	0.2	0.5	1360	54.0	33.1	2.26	23.9	61.6	70.0	2.3	6.0	0.8	1.8	1450	39.9	3.18	3.7	29.2	95.5	30.3	3.6
	4.2	0.2	0.5	1550	54.9	35.6	2.34	23.5	62.9	70.0	2.3	6.0	0.8	1.8	1650	40.5	3.08	3.9	30.0	92.7	30.0	3.7
	4.1	0.2	0.5	1360	54.0	33.1	2.26	23.9	61.6	70.0	2.3	9.0	2.0	4.6	1450	41.7	3.21	3.8	30.9	96.6	33.1	3.7
	4.2	0.2	0.5	1550	54.9	35.6	2.34	23.5	62.9	70.0	2.3	9.0	2.0	4.6	1650	42.3	3.11	4.0	31.7	93.8	32.9	3.8
	4.1	0.2	0.5	1360	54.0	33.1	2.26	23.9	61.6	70.0	2.3	12.0	3.6	8.4	1450	42.7	3.22	3.9	31.8	97.3	34.7	3.8
	4.2	0.2	0.5	1550	54.9	35.6	2.34	23.5	62.9	70.0	2.3	12.0	3.6	8.4	1650	43.3	3.12	4.1	32.7	94.3	34.6	3.9
50	6.0	0.7	1.7	1360	54.0	33.2	2.29	23.6	61.7	70.6	2.3	6.0	0.7	1.7	1450	45.0	3.26	4.0	34.0	98.8	38.7	3.9
	6.0	0.7	1.7	1550	54.9	35.7	2.37	23.2	63.0	71.0	2.3	6.0	0.7	1.7	1650	45.7	3.16	4.2	34.9	95.7	38.4	4.0
	6.2	0.8	1.8	1360	54.0	33.1	2.26	23.9	61.6	70.0	2.3	9.0	1.9	4.3	1450	47.2	3.30	4.2	36.0	100.1	42.0	4.1
	6.3	0.8	1.9	1550	54.9	35.6	2.34	23.5	62.9	70.0	2.3	9.0	1.9	4.3	1650	47.9	3.20	4.4	37.0	96.9	41.8	4.1
	6.2	0.8	1.8	1360	54.0	33.1	2.26	23.9	61.6	70.0	2.3	12.0	3.5	8.0	1450	48.3	3.33	4.2	37.1	100.9	43.8	4.1
	6.3	0.8	1.9	1550	54.9	35.6	2.34	23.5	62.9	70.0	2.3	12.0	3.5	8.0	1650	49.1	3.23	4.5	38.1	97.5	43.7	4.2
60	6.0	0.7	1.6	1360	53.1	33.6	2.52	21.1	61.6	80.5	2.9	6.0	0.7	1.6	1450	50.2	3.37	4.4	38.8	102.1	47.1	4.3
	6.0	0.7	1.6	1550	54.0	36.1	2.61	20.7	62.9	81.0	2.9	6.0	0.7	1.6	1650	51.0	3.27	4.6	39.8	98.6	46.7	4.4
	9.0	1.8	4.2	1360	53.9	33.4	2.35	22.9	61.8	73.7	2.4	9.0	1.8	4.2	1450	52.7	3.44	4.5	41.0	103.6	50.9	4.4
	9.0	1.8	4.2	1550	54.8	36.0	2.44	22.5	63.1	74.0	2.5	9.0	1.8	4.2	1650	53.5	3.33	4.7	42.1	100.0	50.6	4.5
	12.0	3.4	7.8	1360	54.0	33.1	2.27	23.8	61.6	70.3	2.3	12.0	3.4	7.8	1450	54.0	3.48	4.5	42.2	104.5	53.0	4.5
	12.0	3.4	7.8	1550	54.9	35.6	2.35	23.4	63.0	70.5	2.3	12.0	3.4	7.8	1650	54.8	3.37	4.8	43.3	100.8	52.8	4.6
70	6.0	0.7	1.5	1360	51.0	33.0	2.78	18.3	60.4	90.1	3.6	6.0	0.7	1.5	1450	55.5	3.52	4.6	43.5	105.4	55.5	4.6
	6.0	0.7	1.5	1550	51.9	35.5	2.88	18.0	61.7	90.6	3.7	6.0	0.7	1.5	1650	56.3	3.41	4.8	44.7	101.6	55.1	4.7
	9.0	1.8	4.0	1360	52.6	33.5	2.60	20.2	61.3	83.6	3.1	9.0	1.8	4.0	1450	58.2	3.60	4.7	46.0	107.2	59.8	4.9
	9.0	1.8	4.0	1550	53.5	36.0	2.69	19.9	62.7	83.9	3.1	9.0	1.8	4.0	1650	59.1	3.49	5.0	47.2	103.2	59.5	5.0
	12.0	3.3	7.6	1360	53.2	33.6	2.51	21.2	61.6	80.3	2.8	12.0	3.3	7.6	1450	59.7	3.64	4.8	47.3	108.1	62.1	5.0
	12.0	3.3	7.6	1550	54.1	36.1	2.60	20.8	63.0	80.5	2.9	12.0	3.3	7.6	1650	60.6	3.53	5.0	48.6	104.0	61.9	5.1
80	6.0	0.7	1.5	1360	48.1	31.8	3.07	15.7	58.6	99.5	4.5	6.0	0.7	1.5	1450	60.7	3.67	4.8	48.2	108.8	63.9	5.1
	6.0	0.7	1.5	1550	49.0	34.2	3.18	15.4	59.8	99.9	4.6	6.0	0.7	1.5	1650	61.6	3.56	5.1	49.5	104.6	63.5	5.2
	9.0	1.7	4.0	1360	50.1	32.7	2.87	17.5	59.9	93.3	3.8	6.5	0.8	1.9	1450	61.6	3.70	4.9	49.0	109.4	65.0	5.2
	9.0	1.7	4.0	1550	51.0	35.1	2.97	17.2	61.1	93.6	3.9	6.7	0.9	2.1	1650	62.6	3.59	5.1	50.3	105.1	65.0	5.3
	12.0	3.2	7.5	1360	51.1	33.0	2.77	18.4	60.4	90.1	3.6	6.5	0.8	1.9	1450	61.6	3.70	4.9	49.0	109.4	65.0	5.2
	12.0	3.2	7.5	1550	51.9	35.5	2.87	18.1	61.7	90.3	3.6	6.7	0.9	2.1	1650	62.6	3.59	5.1	50.3	105.1	65.0	5.3
90	6.0	0.7	1.5	1360	44.9	30.2	3.40	13.2	56.5	108.8	4.8	3.9	0.1	0.2	1450	61.6	3.70	4.9	49.0	109.4	65.0	5.2
	6.0	0.7	1.5	1550	45.7	32.5	3.52	13.0	57.7	109.2	4.9	4.0	0.1	0.2	1650	62.6	3.59	5.1	50.3	105.1	65.0	5.3
	9.0	1.7	3.9	1360	47.1	31.3	3.17	14.8	57.9	102.9	4.5	3.9	0.1	0.2	1450	61.6	3.70	4.9	49.0	109.4	65.0	5.2
	9.0	1.7	3.9	1550	47.9	33.6	3.29	14.6	59.1	103.1	4.6	4.0	0.1	0.2	1650	62.6	3.59	5.1	50.3	105.1	65.0	5.3
	12.0	3.2	7.4	1360	48.1	31.8	3.07	15.7	58.5	99.8	5.6	3.9	0.1	0.2	1450	61.6	3.70	4.9	49.0	109.4	65.0	5.2
	12.0	3.2	7.4	1550	49.0	34.2	3.18	15.4	59.8	100.0	5.7	4.0	0.1	0.2	1650	62.6	3.59	5.1	50.3	105.1	65.0	5.3
100	6.0	0.6	1.5	1360	41.7	28.6	3.77	11.1	54.6	118.2	5.9	2.8	0.1	0.2	1450	61.6	3.70	4.9	49.0	109.4	65.0	5.2
	6.0	0.6	1.5	1550	42.5	30.8	3.91	10.9	55.8	118.6	6.0	2.9	0.1	0.2	1650	62.6	3.59	5.1	50.3	105.1	65.0	5.3
	9.0	1.7	3.8	1360	43.7	29.6	3.52	12.4	55.8	112.4	5.6	2.8	0.1	0.2	1450	61.6	3.70	4.9	49.0	109.4	65.0	5.2
	9.0	1.7	3.8	1550	44.5	31.8	3.65	12.2	57.0	112.7	5.7	2.9	0.1	0.2	1650	62.6	3.59	5.1	50.3	105.1	65.0	5.3
	12.0	3.2	7.3	1360	44.8	30.1	3.41	13.2	56.4	109.4	6.8	2.8	0.1	0.2	1450	61.6	3.70	4.9	49.0	109.4	65.0	5.2
	12.0	3.2	7.3	1550	45.6	32.4	3.53	12.9	57.6	109.6	7.0	2.9	0.1	0.2	1650	62.6	3.59	5.1	50.3	105.1	65.0	5.3
110	6.0	0.6	1.4	1360	38.9	27.3	4.23	9.2	53.4	127.8	7.3	2.2	0.1	0.2	1450	61.6	3.70	4.9	49.0	109.4	65.0	5.2
	6.0	0.6	1.4	1550	39.5	29.3	4.38	9.0	54.5	128.2	7.4	2.2	0.1	0.2	1650	62.6	3.59	5.1	50.3	105.1	65.0	5.3
	9.0	1.6	3.7	1360	40.6	28.0	3.95	10.3	54.0	122.0	6.8	2.2	0.1	0.2	1450	61.6	3.70	4.9	49.0	109.4	65.0	5.2
	9.0	1.6	3.7	1550	41.3	30.2	4.09	10.1	55.2	122.3	7.0	2.2	0.1	0.2	1650	62.6	3.59	5.1	50.3	105.1	65.0	5.3
	12.0	3.1	7.2	1360	41.5	28.5	3.80	10.9	54.5	119.1	8.3	2.2	0.1	0.2	1450	61.6	3.70	4.9	49.0	109.4	65.0	5.2
	12.0	3.1	7.2	1550	42.2	30.6	3.94	10.7	55.7	119.3	8.4	2.2	0.1	0.2	1650	62.6	3.59	5.1	50.3	105.1	65.0	5.3
120	6.0	0.6	1.3	1360	36.8	26.6	4.79	7.7	53.2	137.7	8.8	1.8	0.1	0.2	1450	61.6	3.70	4.9	49.0	109.4	65.0	5.2
	6.0	0.6	1.3	1550	37.4	28.6	4.96	7.5	54.3	138.1	9.0	1.8	0.1	0.2	1650	62.6	3.59	5.1	50.3	105.1	65.0	5.3
	9.0	1.6	3.6	1360	37.9	26.9	4.44	8.5	53.1	131.8	8.3	1.8	0.1	0.2	1450	61.6	3.70	4.9	49.0	109.4	65.0	5.2
	9.0	1.6	3.6	1550	38.6	28.9	4.60	8.4	54.3	132.1	8.5	1.8	0.1	0.2	1650	62.6	3.59	5.1	50.3	105.1	65.0	5.3
	12.0	3.0	7.0	1360	38.6	27.2	4.27	9.0	53.3	128.9	8.3	1.8	0.1	0.2	1450	61.6	3.70	4.9	49.0	109.4	65.0	5.2
	12.0	3.0	7.0	1550	39.3	29.2	4.43	8.9	54.4	129.1	8.5	1.8	0.1	0.2	1650	62.6	3.59	5.1	50.3	105.1	65.0	5.3

Interpolation is permissible; extrapolation is not.
Flow is controlled to maintain minimum LWT 70° F in cooling and maximum LWT 65° F in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
For operation in the shaded areas, please see the Performance Data Selection Notes.

All performance is based upon the lower voltage of dual voltage rated units.
Operation at or below 40° F EWT is based on 15% methanol antifreeze solution.
See Performance correction tables for operating conditions other than those listed above.

For Part Load data, refer to Specification Catalog

Table 17d: Performance Data-HZ Model 060-Full Load

Performance capacities shown in thousands of Btuh

Antifreeze use recommended in this range. Also Clip JW3 on DXM2 board.

EWT °F	Cooling - EAT 80/67 °F											Heating - EAT 70°F									
	GPM	WPD		CFM	TC	SC	kW	EER	HR	LWT	HWC	GPM	WPD		CFM	HC	kW	COP	HE	LAT	LWT	HWC
		PSI	FT										PSI	FT								
20	3.3	0.2	0.4	1630	73.0	48.1	3.02	24.2	83.2	70.0	2.7	15.0	7.3	16.8	1800	42.8	3.89	3.2	29.8	92.0	16.0	3.8
	3.4	0.2	0.2	1850	74.3	51.7	3.13	23.7	85.0	70.0	2.8	15.0	7.3	16.8	2050	43.4	3.77	3.4	30.6	89.6	15.9	3.8
30	4.2	0.1	0.2	1630	73.0	48.1	3.02	24.2	83.2	70.0	2.7	7.5	1.7	3.9	1800	46.9	3.95	3.5	33.6	94.1	21.0	3.9
	4.2	0.1	0.2	1850	74.3	51.7	3.13	23.7	85.0	70.0	2.8	7.5	1.7	3.9	2050	47.6	3.82	3.6	34.5	91.5	20.8	4.0
	4.2	0.1	0.1	1630	73.0	48.1	3.02	24.2	83.2	70.0	2.7	11.3	3.7	8.6	1800	49.1	3.98	3.6	35.8	95.3	23.6	4.0
	4.2	0.1	0.1	1850	74.3	51.7	3.13	23.7	85.0	70.0	2.8	11.3	3.7	8.6	2050	49.9	3.86	3.8	36.7	92.5	23.5	4.1
	4.2	0.1	0.2	1630	73.0	48.1	3.02	24.2	83.2	70.0	2.7	15.0	6.1	14.1	1800	50.4	4.00	3.7	36.9	95.9	25.1	4.0
	4.2	0.1	0.2	1850	74.3	51.7	3.13	23.7	85.0	70.0	2.8	15.0	6.1	14.1	2050	51.2	3.88	3.9	37.9	93.1	24.9	4.1
40	5.5	0.3	0.6	1630	73.0	48.1	3.02	24.2	83.2	70.0	2.7	7.5	1.2	2.7	1800	53.9	4.06	3.9	40.2	97.7	29.3	4.2
	5.7	0.3	0.2	1850	74.3	51.7	3.13	23.7	85.0	70.0	2.8	7.5	1.2	2.7	2050	54.7	3.94	4.1	41.3	94.7	29.0	4.2
	5.5	0.3	0.6	1630	73.0	48.1	3.02	24.2	83.2	70.0	2.7	11.3	3.0	7.0	1800	56.7	4.12	4.0	42.8	99.2	32.4	4.3
	5.7	0.3	0.8	1850	74.3	51.7	3.13	23.7	85.0	70.0	2.8	11.3	3.0	7.0	2050	57.6	3.99	4.2	44.0	96.0	32.2	4.4
	5.5	0.3	0.6	1630	73.0	48.1	3.02	24.2	83.2	70.0	2.7	15.0	5.3	12.2	1800	58.3	4.15	4.1	44.3	100.0	34.1	4.3
	5.7	0.3	0.8	1850	74.3	51.7	3.13	23.7	85.0	70.0	2.8	15.0	5.3	12.2	2050	59.2	4.02	4.3	45.5	96.7	33.9	4.4
50	7.5	0.9	2.0	1630	72.4	47.8	3.08	23.5	82.8	72.1	2.8	7.5	0.9	2.0	1800	61.1	4.21	4.3	46.9	101.5	37.5	4.5
	7.5	0.9	2.0	1850	73.6	51.4	3.20	23.0	84.5	72.5	2.9	7.5	0.9	2.0	2050	62.1	4.08	4.5	48.2	98.0	37.2	4.6
	8.3	1.2	2.8	1630	73.0	48.1	3.02	24.2	83.2	70.0	2.7	11.3	2.6	6.0	1800	64.5	4.28	4.4	50.0	103.2	41.1	4.6
	8.5	1.3	3.0	1850	74.3	51.7	3.13	23.7	85.0	70.0	2.8	11.3	2.6	6.0	2050	65.5	4.15	4.6	51.3	99.6	40.9	4.7
	8.3	1.2	2.8	1630	73.0	48.1	3.02	24.2	83.2	70.0	2.7	15.0	4.7	10.8	1800	66.3	4.32	4.5	51.7	104.1	43.1	4.7
	8.5	1.3	3.0	1850	74.3	51.7	3.13	23.7	85.0	70.0	2.8	15.0	4.7	10.8	2050	67.3	4.19	4.7	53.0	100.4	42.9	4.8
60	7.5	0.7	1.7	1630	69.5	46.7	3.35	20.7	80.9	81.6	3.5	7.5	0.7	1.7	1800	68.5	4.37	4.6	53.6	105.2	45.7	4.9
	7.5	0.7	1.7	1850	70.7	50.3	3.47	20.4	82.6	82.0	3.6	7.5	0.7	1.7	2050	69.5	4.24	4.8	55.1	101.4	45.3	5.0
	11.3	2.4	5.4	1630	71.7	47.6	3.15	22.8	82.3	74.6	3.0	11.3	2.4	5.4	1800	72.3	4.46	4.7	57.1	107.2	49.8	5.1
	11.3	2.4	5.4	1850	73.0	51.1	3.26	22.4	84.1	75.0	3.1	11.3	2.4	5.4	2050	73.4	4.33	5.0	58.6	103.2	49.6	5.2
	15.0	4.3	10.0	1630	72.7	48.0	3.05	23.8	83.0	71.1	2.8	15.0	4.3	10.0	1800	74.4	4.52	4.8	59.0	108.3	52.1	5.2
	15.0	4.3	10.0	1850	74.0	51.6	3.16	23.4	84.8	71.3	2.8	15.0	4.3	10.0	2050	75.5	4.38	5.1	60.6	104.1	51.9	5.3
70	7.5	0.7	1.7	1630	66.1	45.5	3.67	18.0	78.6	91.0	4.4	7.5	0.7	1.7	1800	75.8	4.55	4.9	60.3	109.0	53.9	5.3
	7.5	0.7	1.7	1850	67.3	48.9	3.81	17.7	80.3	91.4	4.5	7.5	0.7	1.7	2050	77.0	4.41	5.1	61.9	104.8	53.5	5.4
	11.3	2.3	5.2	1630	68.6	46.4	3.43	20.0	80.3	84.2	3.8	11.3	2.3	5.2	1800	80.1	4.67	5.0	64.2	111.2	58.6	5.6
	11.3	2.3	5.2	1850	69.8	49.9	3.56	19.6	82.0	84.6	3.8	11.3	2.3	5.2	2050	81.3	4.52	5.3	65.9	106.7	58.3	5.7
	15.0	4.1	9.5	1630	69.9	46.9	3.32	21.0	81.1	80.8	3.5	15.0	4.1	9.5	1800	82.4	4.73	5.1	66.3	112.4	61.2	5.7
	15.0	4.1	9.5	1850	71.1	50.4	3.44	20.6	82.8	81.0	3.5	15.0	4.1	9.5	2050	83.7	4.59	5.3	68.0	107.8	60.9	5.8
80	7.5	0.8	1.8	1630	62.5	44.1	4.05	15.4	76.2	100.3	5.5	7.5	0.8	1.8	1800	83.1	4.75	5.1	66.9	112.8	62.2	5.8
	7.5	0.8	1.8	1850	63.5	47.5	4.19	15.1	77.8	100.8	5.6	7.5	0.8	1.8	2050	84.4	4.61	5.4	68.7	108.1	61.7	5.9
	11.3	2.2	5.2	1630	65.1	45.1	3.78	17.2	77.9	93.8	4.7	9.3	1.4	3.3	1800	86.0	4.84	5.2	69.5	114.3	65.0	6.0
	11.3	2.2	5.2	1850	66.2	48.5	3.91	16.9	79.6	94.1	4.8	9.5	1.5	3.6	2050	87.3	4.69	5.5	71.3	109.4	65.0	6.1
	15.0	4.1	9.4	1630	66.4	45.6	3.65	18.2	78.7	90.5	4.3	9.3	1.4	3.3	1800	86.0	4.84	5.2	69.5	114.3	65.0	6.0
	15.0	4.1	9.4	1850	67.5	49.0	3.78	17.9	80.4	90.7	4.4	9.5	1.5	3.6	2050	87.3	4.69	5.5	71.3	109.4	65.0	6.1
90	7.5	0.8	2.0	1630	58.7	42.6	4.49	13.1	74.0	109.7	6.7	5.6	0.2	0.4	1800	86.0	4.84	5.2	69.5	114.3	65.0	6.0
	7.5	0.8	2.0	1850	59.8	45.8	4.65	12.9	75.6	110.2	6.8	5.7	0.2	0.5	2050	87.3	4.69	5.5	71.3	109.4	65.0	6.1
	11.3	2.3	5.2	1630	61.3	43.7	4.18	14.7	75.5	103.4	5.8	5.6	0.2	0.4	1800	86.0	4.84	5.2	69.5	114.3	65.0	6.0
	11.3	2.3	5.2	1850	62.3	47.0	4.33	14.4	77.1	103.7	5.9	5.7	0.2	0.5	2050	87.3	4.69	5.5	71.3	109.4	65.0	6.1
	15.0	4.0	9.3	1630	62.6	44.2	4.03	15.5	76.3	100.2	5.4	5.6	0.2	0.4	1800	86.0	4.84	5.2	69.5	114.3	65.0	6.0
	15.0	4.0	9.3	1850	63.7	47.5	4.18	15.2	77.9	100.4	5.5	5.7	0.2	0.5	2050	87.3	4.69	5.5	71.3	109.4	65.0	6.1
100	7.5	0.9	2.0	1630	55.2	41.1	5.00	11.0	72.3	119.3	8.1	4.0	0.1	0.2	1800	86.0	4.84	5.2	69.5	114.3	65.0	6.0
	7.5	0.9	2.0	1850	56.2	44.2	5.18	10.8	73.9	119.7	8.3	4.1	0.1	0.2	2050	87.3	4.69	5.5	71.3	109.4	65.0	6.1
	11.3	2.3	5.2	1630	57.5	42.1	4.65	12.4	73.4	113.0	7.1	4.0	0.1	0.2	1800	86.0	4.84	5.2	69.5	114.3	65.0	6.0
	11.3	2.3	5.2	1850	58.5	45.3	4.82	12.1	75.0	113.3	7.3	4.1	0.1	0.2	2050	87.3	4.69	5.5	71.3	109.4	65.0	6.1
	15.0	4.0	9.3	1630	58.8	42.6	4.48	13.1	74.0	109.9	6.7	4.0	0.1	0.2	1800	86.0	4.84	5.2	69.5	114.3	65.0	6.0
	15.0	4.0	9.3	1850	59.8	45.9	4.65	12.9	75.6	110.1	6.8	4.1	0.1	0.2	2050	87.3	4.69	5.5	71.3	109.4	65.0	6.1
110	7.5	0.8	1.8	1630	52.2	39.6	5.60	9.3	71.4	129.0	9.8	3.1	0.1	0.1	1800	86.0	4.84	5.2	69.5	114.3	65.0	6.0
	7.5	0.8	1.8	1850	53.1	42.6	5.80	9.2	72.9	129.4	10.0	3.2	0.1	0.1	2050	87.3	4.69	5.5	71.3	109.4	65.0	6.1
	11.3	2.2	5.1	1630	54.1	40.6	5.20	10.4	71.9	122.7	8.7	3.1	0.1	0.1	1800	86.0	4.84	5.2	69.5	114.3	65.0	6.0
	11.3	2.2	5.1	1850	55.0	43.6	5.39	10.2	73.4	123.1	8.8	3.2	0.1	0.1	2050	87.3	4.69	5.5	71.3	109.4	65.0	6.1
	15.0	4.0	9.2	1630	55.2	41.1	5.01	11.0	72.3	119.6	8.2	3.1	0.1	0.1	1800	86.0	4.84	5.2	69.5	114.3	65.0	6.0
	15.0	4.0	9.2	1850	56.1	44.2	5.19	10.8	73.8	119.8	8.3	3.2	0.1	0.1	2050	87.3	4.69	5.5	71.3	109.4	65.0	6.1
120	7.5	0.6	1.3	1630	50.0	38.5	6.30	7.9	71.6	139.1	11.7	2.5	0.1	0.1	1800	86.0	4.84	5.2	69.5	114.3	65.0	6.0
	7.5	0.6	1.3	1850	50.8	41.4	6.53	7.8	73.1	139.5	11.9	2.6	0.1	0.1	2050	87.3	4.69	5.5	71.3	109.4	65.0	6.1
	11.3	2.0	4.7	1630	51.3	39.2	5.83	8.8	71.3	132.6	10.4	2.5	0.1	0.1	1800	86.0	4.84	5.2	69.5	114.3	65.0	6.0
	11.3	2.0	4.7	1850	52.2	42.1	6.04	8.6	72.8	132.9	10.6	2.6	0.1	0.1	2050	87.3	4.69	5.5	71.3	109.4	65.0	6.1
	15.0	3.8	8.8	1630	52.1	39.6	5.62	9.3	71.3	129.5	9.8	2.5	0.1	0.1	1800	86.0	4.84	5.2	69.5	114.3	65.0	6.0
	15.0	3.8	8.8	1850	53.0	42.6	5.82	9.1	72.9	129.7	10.0	2.6	0.1	0.1	2050	87.3	4.69	5.5	71.3	109.4	65.0	6.1

Interpolation is permissible; extrapolation is not.
Flow is controlled to maintain minimum LWT 70° F in cooling and maximum LWT 65° F in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
For operation in the shaded areas, please see the Performance Data Selection Notes.

All performance is based upon the lower voltage of dual voltage rated units.
Operation at or below 40° F EWT is based on 15% methanol antifreeze solution.
See Performance correction tables for operating conditions other than those listed above.

For Part Load data, refer to Specification Catalog

Table 17e: Performance Data-HZ Model 070-Full Load

Performance capacities shown in thousands of Btuh

Antifreeze use recommended in this range. Also Clip JW3 on DXM2 board.

EWT °F	Cooling - EAT 80/67 °F											Heating - EAT 70°F									
	GPM	WPD		CFM	TC	SC	kW	EER	HR	LWT	HWC	GPM	WPD		CFM	HC	kW	COP	HE	LAT	LWT	HWC
		PSI	FT										PSI	FT								
20	3.7	0.3	0.6	1630	79.6	49.1	3.49	22.8	91.3	70.0	4.4	17.0	8.9	20.6	1800	46.6	4.66	2.9	31.1	94.0	16.3	4.9
	3.7	0.3	0.6	1850	81.0	52.8	3.61	22.4	93.3	70.0	4.5	17.0	8.9	20.6	2050	47.3	4.52	3.1	31.9	91.4	16.2	5.0
30	4.6	0.2	0.5	1630	79.6	49.1	3.49	22.8	91.3	70.0	4.4	8.5	2.2	5.1	1800	51.6	4.77	3.2	35.6	96.5	21.6	5.1
	4.7	0.3	0.6	1850	81.0	52.8	3.61	22.4	93.3	70.0	4.5	8.5	2.2	5.1	2050	52.4	4.63	3.3	36.6	93.7	21.4	5.2
	4.6	0.2	0.5	1630	79.6	49.1	3.49	22.8	91.3	70.0	4.4	12.8	4.6	10.6	1800	54.0	4.83	3.3	37.8	97.8	24.1	5.3
	4.7	0.3	0.6	1850	81.0	52.8	3.61	22.4	93.3	70.0	4.5	12.8	4.6	10.6	2050	54.8	4.68	3.4	38.8	94.8	23.9	5.4
	4.6	0.3	0.5	1630	79.6	49.1	3.49	22.8	91.3	70.0	4.4	17.0	7.6	17.6	1800	55.3	4.86	3.3	39.0	98.4	25.4	5.3
	4.7	0.3	0.6	1850	81.0	52.8	3.61	22.4	93.3	70.0	4.5	17.0	7.6	17.6	2050	56.1	4.71	3.5	40.1	95.3	25.3	5.5
40	6.1	0.5	1.2	1630	79.6	49.1	3.49	22.8	91.3	70.0	4.4	8.5	1.6	3.8	1800	59.4	4.96	3.5	42.7	100.5	29.9	5.6
	6.2	0.6	1.3	1850	81.0	52.8	3.61	22.4	93.3	70.0	4.5	8.5	1.6	3.8	2050	60.3	4.80	3.7	43.9	97.2	29.7	5.7
	6.1	0.5	1.2	1630	79.6	49.1	3.49	22.8	91.3	70.0	4.4	12.8	3.9	8.9	1800	62.1	5.02	3.6	45.3	102.0	32.9	5.8
	6.2	0.6	1.3	1850	81.0	52.8	3.61	22.4	93.3	70.0	4.5	12.8	3.9	8.9	2050	63.1	4.87	3.8	46.5	98.5	32.7	5.9
	6.1	0.5	1.2	1630	79.6	49.1	3.49	22.8	91.3	70.0	4.4	17.0	6.7	15.5	1800	63.6	5.06	3.7	46.6	102.7	34.5	5.9
	6.2	0.6	1.3	1850	81.0	52.8	3.61	22.4	93.3	70.0	4.5	17.0	6.7	15.5	2050	64.6	4.90	3.9	47.9	99.2	34.4	6.1
50	8.5	1.3	3.0	1630	79.1	49.0	3.54	22.3	91.0	71.4	4.5	8.5	1.3	3.0	1800	66.9	5.14	3.8	49.6	104.4	38.3	6.2
	8.5	1.3	3.0	1850	80.5	52.6	3.67	21.9	93.0	71.9	4.6	8.5	1.3	3.0	2050	67.9	4.99	4.0	50.9	100.7	38.0	6.3
	9.1	1.6	3.7	1630	79.6	49.1	3.49	22.8	91.3	70.0	4.4	12.8	3.4	7.8	1800	70.1	5.23	3.9	52.5	106.1	41.8	6.5
	9.3	1.7	3.9	1850	81.0	52.8	3.61	22.4	93.3	70.0	4.5	12.8	3.4	7.8	2050	71.2	5.07	4.1	53.9	102.1	41.5	6.6
	9.1	1.6	3.7	1630	79.6	49.1	3.49	22.8	91.3	70.0	4.4	17.0	6.0	13.9	1800	71.8	5.27	4.0	54.0	106.9	43.6	6.6
	9.3	1.7	3.9	1850	81.0	52.8	3.61	22.4	93.3	70.0	4.5	17.0	6.0	13.9	2050	72.9	5.11	4.2	55.5	102.9	43.5	6.8
60	8.5	1.2	2.7	1630	76.1	47.8	3.87	19.6	89.2	81.0	5.4	8.5	1.2	2.7	1800	74.4	5.34	4.1	56.4	108.3	46.7	6.9
	8.5	1.2	2.7	1850	77.4	51.4	4.01	19.3	91.1	81.4	5.6	8.5	1.2	2.7	2050	75.5	5.18	4.3	57.9	104.1	46.4	7.1
	12.8	3.1	7.1	1630	78.3	48.7	3.63	21.6	90.6	74.2	4.7	12.8	3.1	7.1	1800	78.0	5.44	4.2	59.6	110.1	50.7	7.3
	12.8	3.1	7.1	1850	79.7	52.3	3.76	21.2	92.5	74.5	4.8	12.8	3.1	7.1	2050	79.2	5.28	4.4	61.2	105.8	50.4	7.4
	17.0	5.6	13.0	1630	79.3	49.1	3.52	22.6	91.2	70.7	4.4	17.0	5.6	13.0	1800	80.0	5.50	4.3	61.4	111.1	52.8	7.5
	17.0	5.6	13.0	1850	80.7	52.7	3.64	22.2	93.1	71.0	4.5	17.0	5.6	13.0	2050	81.2	5.33	4.5	63.0	106.7	52.6	7.7
70	8.5	1.1	2.6	1630	72.4	46.3	4.26	17.0	86.9	90.4	6.7	8.5	1.1	2.6	1800	81.9	5.56	4.3	63.1	112.1	55.2	7.7
	8.5	1.1	2.6	1850	73.7	49.8	4.42	16.7	88.7	90.9	6.8	8.5	1.1	2.6	2050	83.2	5.38	4.5	64.8	107.6	54.8	7.9
	12.8	3.0	6.8	1630	75.0	47.4	3.98	18.9	88.5	83.8	5.8	12.8	3.0	6.8	1800	86.0	5.68	4.4	66.7	114.2	59.5	8.2
	12.8	3.0	6.8	1850	76.3	50.9	4.12	18.5	90.4	84.2	5.9	12.8	3.0	6.8	2050	87.3	5.50	4.6	68.5	109.4	59.3	8.4
	17.0	5.4	12.4	1630	76.3	47.9	3.85	19.8	89.3	80.5	5.4	17.0	5.4	12.4	1800	88.2	5.75	4.5	68.7	115.4	61.9	8.5
	17.0	5.4	12.4	1850	77.6	51.5	3.99	19.5	91.2	80.7	5.5	17.0	5.4	12.4	2050	89.5	5.57	4.7	70.5	110.4	61.7	8.7
80	8.5	1.2	2.7	1630	68.4	44.7	4.72	14.5	84.4	99.9	8.2	8.5	1.2	2.7	1800	89.5	5.79	4.5	69.9	116.0	63.6	8.7
	8.5	1.2	2.7	1850	69.5	48.1	4.89	14.2	86.2	100.3	8.4	8.5	1.2	2.7	2050	90.9	5.61	4.7	71.7	111.0	63.1	8.8
	12.8	2.9	6.7	1630	71.2	45.8	4.40	16.2	86.1	93.5	7.1	9.5	1.5	3.6	1800	91.2	5.84	4.6	71.4	116.9	65.0	9.0
	12.8	2.9	6.7	1850	72.4	49.3	4.56	15.9	88.0	93.8	7.3	9.8	1.6	3.8	2050	92.6	5.66	4.8	73.3	111.8	65.0	9.2
	17.0	5.2	12.1	1630	72.6	46.4	4.24	17.1	87.0	90.2	6.6	9.5	1.5	3.6	1800	91.2	5.84	4.6	71.4	116.9	65.0	9.0
	17.0	5.2	12.1	1850	73.8	49.9	4.40	16.8	88.8	90.5	6.7	9.8	1.6	3.8	2050	92.6	5.66	4.8	73.3	111.8	65.0	9.2
90	8.5	1.2	2.8	1630	64.1	43.0	5.26	12.2	82.0	109.3	10.0	5.7	0.2	0.5	1800	91.2	5.84	4.6	71.4	116.9	65.0	9.0
	8.5	1.2	2.8	1850	65.2	46.2	5.45	12.0	83.8	109.7	10.3	5.9	0.3	0.6	2050	92.6	5.66	4.8	73.3	111.8	65.0	9.2
	12.8	2.9	6.7	1630	67.0	44.1	4.89	13.7	83.6	103.1	8.8	5.7	0.2	0.5	1800	91.2	5.84	4.6	71.4	116.9	65.0	9.0
	12.8	2.9	6.7	1850	68.1	47.4	5.07	13.4	85.4	103.4	9.0	5.9	0.3	0.6	2050	92.6	5.66	4.8	73.3	111.8	65.0	9.2
	17.0	5.2	12.0	1630	68.4	44.7	4.71	14.5	84.5	99.9	8.2	5.7	0.2	0.5	1800	91.2	5.84	4.6	71.4	116.9	65.0	9.0
	17.0	5.2	12.0	1850	69.6	48.1	4.88	14.2	86.3	100.1	8.4	5.9	0.3	0.6	2050	92.6	5.66	4.8	73.3	111.8	65.0	9.2
100	8.5	1.2	2.8	1630	59.8	41.2	5.88	10.2	79.9	118.8	12.2	4.1	0.1	0.2	1800	91.2	5.84	4.6	71.4	116.9	65.0	9.0
	8.5	1.2	2.8	1850	60.9	44.3	6.09	10.0	81.6	119.2	12.5	4.2	0.1	0.2	2050	92.6	5.66	4.8	73.3	111.8	65.0	9.2
	12.8	2.9	6.7	1630	62.6	42.3	5.46	11.5	81.3	112.7	10.8	4.1	0.1	0.2	1800	91.2	5.84	4.6	71.4	116.9	65.0	9.0
	12.8	2.9	6.7	1850	63.7	45.5	5.66	11.2	83.0	113.0	11.0	4.2	0.1	0.2	2050	92.6	5.66	4.8	73.3	111.8	65.0	9.2
	17.0	5.2	12.0	1630	64.0	42.9	5.27	12.2	82.0	109.6	10.1	4.1	0.1	0.2	1800	91.2	5.84	4.6	71.4	116.9	65.0	9.0
	17.0	5.2	12.0	1850	65.1	46.2	5.46	11.9	83.8	109.9	10.3	4.2	0.1	0.2	2050	92.6	5.66	4.8	73.3	111.8	65.0	9.2
110	8.5	1.1	2.6	1630	55.7	39.5	6.61	8.4	78.3	128.4	14.7	3.2	0.1	0.1	1800	91.2	5.84	4.6	71.4	116.9	65.0	9.0
	8.5	1.1	2.6	1850	56.7	42.5	6.85	8.3	80.0	128.8	15.0	3.3	0.1	0.1	2050	92.6	5.66	4.8	73.3	111.8	65.0	9.2
	12.8	2.9	6.6	1630	58.3	40.6	6.13	9.5	79.3	122.4	13.1	3.2	0.1	0.1	1800	91.2	5.84	4.6	71.4	116.9	65.0	9.0
	12.8	2.9	6.6	1850	59.3	43.6	6.36	9.3	81.0	122.7	13.4	3.3	0.1	0.1	2050	92.6	5.66	4.8	73.3	111.8	65.0	9.2
	17.0	5.1	11.8	1630	59.6	41.1	5.91	10.1	79.9	119.4	12.3	3.2	0.1	0.1	1800	91.2	5.84	4.6	71.4	116.9	65.0	9.0
	17.0	5.1	11.8	1850	60.7	44.2	6.12	9.9	81.6	119.6	12.6	3.3	0.1	0.1	2050	92.6	5.66	4.8	73.3	111.8	65.0	9.2
120	8.5	0.9	2.1	1630	52.0	38.1	7.45	7.0	77.6	138.3	17.6	2.6	0.1	0.1	1800	91.2	5.84	4.6	71.4	116.9	65.0	9.0
	8.5	0.9	2.1	1850	52.9	41.0	7.72	6.8	79.2	138.6	18.0	2.7	0.1	0.1	2050	92.6	5.66	4.8	73.3	111.8	65.0	9.2
	12.8	2.7	6.2	1630	54.2	39.0	6.91	7.8	77.9	132.2	15.8	2.6	0.1	0.1	1800	91.2	5.84	4.6	71.4	116.9	65.0	9.0
	12.8	2.7	6.2	1850	55.2	41.9	7.16	7.7	79.6	132.5	16.1	2.7	0.1	0.1	2050	92.6	5.66	4.8	73.3	111.8	65.0	9.2
	17.0	5.0	11.5	1630	55.5	39.4	6.65	8.3	78.3	129.2	14.9	2.6	0.1	0.1	1800	91.2	5.84	4.6	71.4	116.9	65.0	9.0
	17.0	5.0	11.5	1850	56.4	42.4	6.90	8.2	80.0	129.4	15.2	2.7	0.1	0.1	2050	92.6	5.66	4.8	73.3	111.8	65.0	9.2

Interpolation is permissible; extrapolation is not.
Flow is controlled to maintain minimum LWT 70° F in cooling and maximum LWT 65° F in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
For operation in the shaded areas, please see the Performance Data Selection Notes.

All performance is based upon the lower voltage of dual voltage rated units.
Operation at or below 40° F EWT is based on 15% methanol antifreeze solution.
See Performance correction tables for operating conditions other than those listed above.

For Part Load data, refer to Specification Catalog

Preventive Maintenance

Water Coil Maintenance
(Direct ground water applications only) - If the system is installed in an area with a known high mineral content (125 P.P.M. or greater) in the water, it is best to establish a periodic maintenance schedule with the owner 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 the heat exchanger material and copper water lines. Generally, the more water flowing through the unit, the less chance for scaling. Therefore, 1.5 gpm per ton [2.0 l/m per kW] is recommended as a minimum flow. Minimum flow rate for entering water temperatures below 50°F [10°C] is 2.0 gpm per ton [2.6 l/m per kW].

Water Coil Maintenance
(All other water loop applications)
Generally water coil maintenance is not needed for closed loop systems. However, if the piping is known to have high dirt or debris content, it is best to establish a periodic maintenance schedule with the owner so the water coil can be checked regularly. 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 (3.9 l/m per kW) may produce water (or debris) velocities that can erode the heat exchanger wall and ultimately produce leaks.

Hot Water Generator Coils
See water coil maintenance for ground water units. If the potable water is hard or not chemically softened, the high temperatures of the desuperheater will tend to scale even quicker than the water coil and may need more frequent inspections. In areas with extremely hard water, a HWG is not recommended.

Filters
Filters must be clean to obtain maximum performance. Filters 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. It is especially important to provide consistent washing of these filters (in the opposite direction of the normal air flow) once per month using a high pressure wash similar to those found at self-serve car washes.

Condensate Drain
In areas where airborne bacteria may produce a “slimy” substance in the drain pan, it may be necessary to treat the drain pan chemically with an algaecide approximately every three months to minimize the problem. The condensate pan may also need to be cleaned periodically to insure 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 plugging and eventual overflow.

Compressor
Conduct annual amperage checks to insure that amp draw is no more than 10% greater than indicated on the serial plate data.

Fan Motors
All residential units have permanently lubricated fan motors. Further lubrication is not recommended. Conduct annual amperage check to insure amp draw is no more than 10% greater than indicated on serial data plate.

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.

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, vertical cabinets are set up from the floor a few inches [7 - 8 cm] to prevent water from entering the cabinet. 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 charts for pressures and temperatures. Verify that air and water flow rates are at proper levels before servicing the refrigerant circuit.

Troubleshooting

General

If operational difficulties are encountered, perform the preliminary checks below before referring to the troubleshooting charts.

- 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, 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 "DXM2 Troubleshooting Process Flowchart" or "Functional Troubleshooting Chart."

DXM2 Board

DXM2 board troubleshooting in general is best summarized as verifying inputs and outputs. After inputs and outputs have been verified, board operation is confirmed and the problem must be elsewhere. Below are some general guidelines for troubleshooting the DXM2 control.

Field Inputs

Conventional thermostat inputs are 24VAC from the thermostat and can be verified using a voltmeter between C and Y1, Y2, W, O, G. 24VAC will be present at the terminal (for example, between "Y1" and "C") if the thermostat is sending an input to the DXM2 board.

Proper communications with a thermostat can be verified using the Fault LED on the DXM2. If the control is NOT in the Test mode and is NOT currently locked out or in a retry delay, the Fault LED on the DXM2 will flash very slowly (1 second on, 5 seconds off), if the DXM2 is properly communicating with the thermostat.

Sensor Inputs

All sensor inputs are 'paired wires' connecting each component to the board. Therefore, continuity on pressure switches, for example 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 thermistor resistance chart shown in Table 18. An ice bath can be used to check the calibration of the thermistor.

Table 18: Nominal resistance at various temperatures

Temp (ºC)	Temp (ºF)	Resistance (kOhm)	Temp (ºC)	Temp (ºF)	Resistance (kOhm)
-17.8	0.0	85.34	55	131.0	2.99
-17.5	0.5	84.00	56	132.8	2.88
-16.9	1.5	81.38	57	134.6	2.77
-12	10.4	61.70	58	136.4	2.67
-11	12.2	58.40	59	138.2	2.58
-10	14.0	55.30	60	140.0	2.49
-9	15.8	52.38	61	141.8	2.40
-8	17.6	49.64	62	143.6	2.32
-7	19.4	47.05	63	145.4	2.23
-6	21.2	44.61	64	147.2	2.16
-5	23.0	42.32	65	149.0	2.08
-4	24.8	40.15	66	150.8	2.01
-3	26.6	38.11	67	152.6	1.94
-2	28.4	36.18	68	154.4	1.88
-1	30.2	34.37	69	156.2	1.81
0	32.0	32.65	70	158.0	1.75
1	33.8	31.03	71	159.8	1.69
2	35.6	29.50	72	161.6	1.64
3	37.4	28.05	73	163.4	1.58
4	39.2	26.69	74	165.2	1.53
5	41.0	25.39	75	167.0	1.48
6	42.8	24.17	76	168.8	1.43
7	44.6	23.02	77	170.6	1.39
8	46.4	21.92	78	172.4	1.34
9	48.2	20.88	79	174.2	1.30
10	50.0	19.90	80	176.0	1.26
11	51.8	18.97	81	177.8	1.22
12	53.6	18.09	82	179.6	1.18
13	55.4	17.26	83	181.4	1.14
14	57.2	16.46	84	183.2	1.10
15	59.0	15.71	85	185.0	1.07
16	60.8	15.00	86	186.8	1.04
17	62.6	14.32	87	188.6	1.01
18	64.4	13.68	88	190.4	0.97
19	66.2	13.07	89	192.2	0.94
20	68.0	12.49	90	194.0	0.92
21	69.8	11.94	91	195.8	0.89
22	71.6	11.42	92	197.6	0.86
23	73.4	10.92	93	199.4	0.84
24	75.2	10.45	94	201.2	0.81
25	77.0	10.00	95	203.0	0.79
26	78.8	9.57	96	204.8	0.76
27	80.6	9.16	97	206.6	0.74
28	82.4	8.78	98	208.4	0.72
29	84.2	8.41	99	210.2	0.70
30	86.0	8.06	100	212.0	0.68
31	87.8	7.72	101	213.8	0.66
32	89.6	7.40	102	215.6	0.64
33	91.4	7.10	103	217.4	0.62
34	93.2	6.81	104	219.2	0.60
35	95.0	6.53	105	221.0	0.59
36	96.8	6.27	106	222.8	0.57
37	98.6	6.01	107	224.6	0.55
38	100.4	5.77	108	226.4	0.54
39	102.2	5.54	109	228.2	0.52
40	104.0	5.33	110	230.0	0.51
41	105.8	5.12	111	231.8	0.50
42	107.6	4.92	112	233.6	0.48
43	109.4	4.72	113	235.4	0.47
44	111.2	4.54	114	237.2	0.46
45	113.0	4.37	115	239.0	0.44
46	114.8	4.20	116	240.8	0.43
47	116.6	4.04	117	242.6	0.42
48	118.4	3.89	118	244.4	0.41
49	120.2	3.74	119	246.2	0.40
50	122.0	3.60	120	248.0	0.39
51	123.8	3.47	121	249.8	0.38
52	125.6	3.34	122	251.6	0.37
53	127.4	3.22	123	253.4	0.36
54	129.2	3.10			

Troubleshooting

Outputs
The compressor and reversing valve relays are 24VAC and can be verified using a voltmeter. For units with ECM blower motors, the DXM2 controls the motor using serial communications, and troubleshooting should be done with a communicating thermostat or diagnostic tool. The alarm relay can either be 24VAC as shipped or dry contacts for use with DDC controls by clipping the JW1 jumper. Electric heat outputs are 24VDC "ground sinking" and require a voltmeter set for DC to verify operation. The terminal marked "24VDC" is the 24VDC supply to the electric heat board; terminal "EH1" is stage 1 electric heat; terminal "EH2" is stage 2 electric heat. When electric heat is energized (thermostat is sending a "W" input to the DXM2 controller), there will be 24VDC between terminal "24VDC" and "EH1" (stage 1 electric heat) and/or "EH2" (stage 2 electric heat). A reading of 0VDC between "24VDC" and "EH1" or "EH2" will indicate that the DXM2 board is NOT sending an output signal to the electric heat board.

Test Mode
Test mode can be entered for 20 minutes by pressing the Test pushbutton. The DXM2 board will automatically exit test mode after 20 minutes.

Advanced Diagnostics
To properly troubleshoot advanced control features, and to aid in troubleshooting basic control features, a communicating thermostat or diagnostic tool must be used.

Service Mode
The Service Mode provides the installer with several functions for troubleshooting, including Manual Operation, Control Diagnostics, Control Configuration, and Fault History.

Manual Operation – The Manual Operation mode allows the installer to bypass normal thermostat timings and operating modes, to directly activate the thermostat inputs to the DXM2, activate the DXM2 Test mode, and directly control the ECM blower, internal flow center, and proportional valve.

Control Diagnostics – The Control Diagnostics menus allow the installer to see the current status of all DXM2 control switch inputs, values of all temperature sensor inputs, control voltage, ECM blower, internal flow center, and proportional valve operating status and parameters.

Dipswitch Configuration – The Dipswitch Configuration menus allow the installer to easily see the current DXM2 control configuration.

Fault History – In addition to the fault code, the DXM2 stores the status of all control inputs and outputs when a fault condition is detected. The fault history covering the last five lockout conditions is stored and may be retrieved from the DXM2. After a specific fault in the fault history is selected, the operating mode and time when the fault occurred are displayed, with options to select specific control status values when the lockout occurred.

Fault Temp Conditions – This option displays the DXM2 temperature and voltage values when the lockout occurred.

Fault Flow Conditions – This option displays the DXM2 ECM blower, pump, and valve operating parameters when the lockout occurred.

Fault I/O Conditions – This option displays the status of the DXM2 physical and communicated inputs and the relay outputs when the lockout occurred.

Fault Configuration Conditions – This option displays the status of the DXM2 option selections when the lockout occurred.

Fault Possible Causes – This option displays a list of potential causes of the stored fault.

Clear Fault History – The Clear Fault History option allows the fault history stored in the non-volatile memory of the DXM2 to be cleared.

DXM2 Troubleshooting Process Flowchart/Functional Troubleshooting Chart
The "DXM2 Functional Troubleshooting Process Flowchart" is a quick overview of how to start diagnosing a suspected problem, using the fault recognition features of the DXM2 board. The "Functional Troubleshooting Chart" on the following page is a more comprehensive method for identifying a number of malfunctions that may occur, and is not limited to just the DXM2 controls. Within the chart are five columns:

- The "Fault" column describes the symptoms.
- Columns 2 and 3 identify in which mode the fault is likely to occur, heating or cooling.
- The "Possible Cause column" identifies the most likely sources of the problem.
- The "Solution" column describes what should be done to correct the problem.

⚠ WARNING! ⚠

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.

DXM2 Process Flow Chart

⚠ WARNING! ⚠

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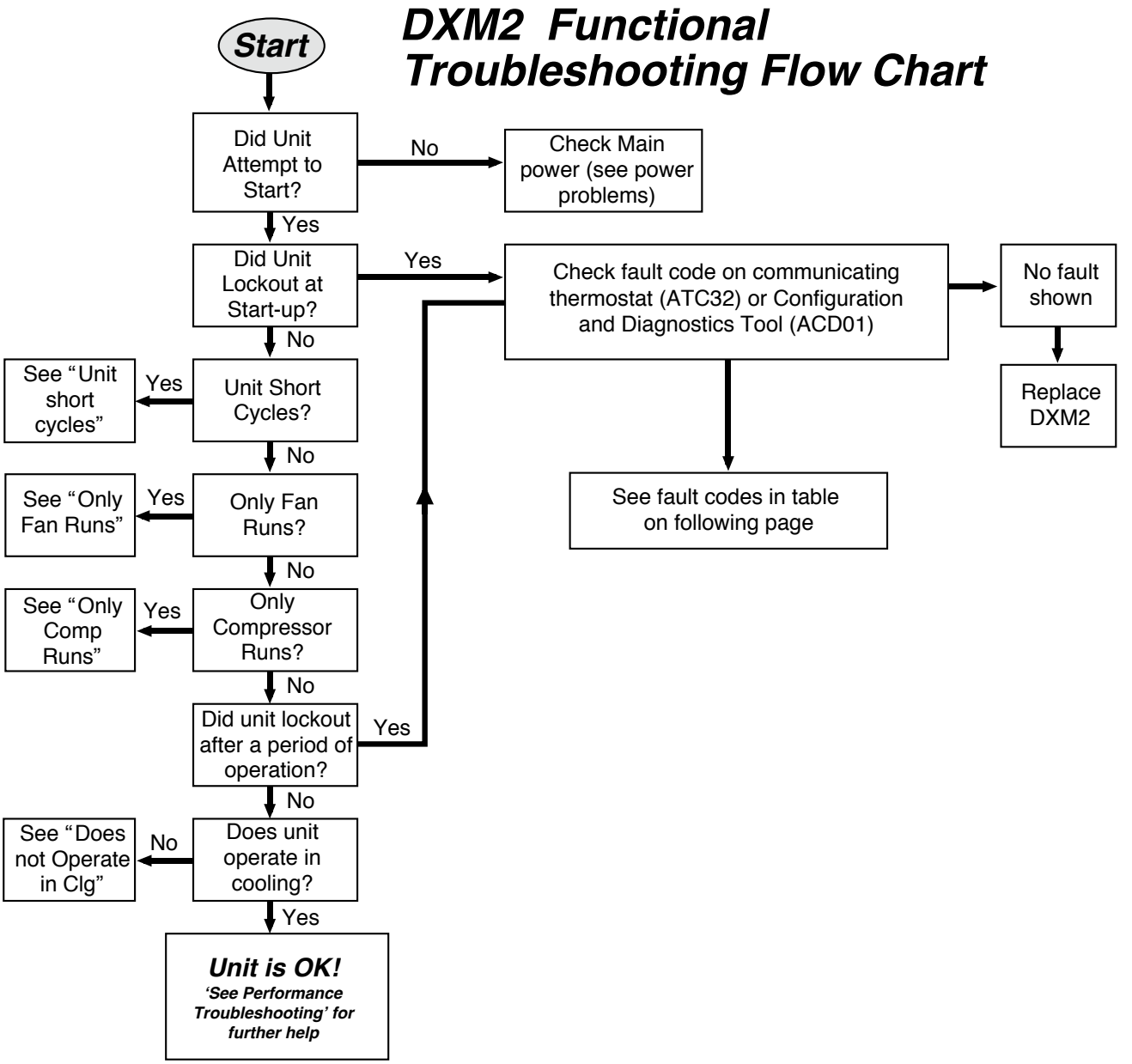


Functional Troubleshooting

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 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
	X		Frozen water heat exchanger	Thaw heat exchanger
	X	X	Bad HPWS Switch	Replace HPWS Switch
LP/LOC Fault-Code 3 Low Pressure/Loss of Charge	X	X	Insufficient charge	Check for refrigerant leaks
	X		Compressor pump down at start-up	Check charge and start-up water flow
LT1 Fault - Code 4 Water Low Temperature	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 low temperature setting (30°F vs 10°F)	Clip LT1 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
LT2 Fault - Code 5 Low Air Temperature		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 low temperature 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 High Condensate Level	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
	X	X	Plugged air filter	Replace air filter
	X	X	Restricted return air flow	Find and eliminate rectriction - increase return duct and/or grille size
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

Functional Troubleshooting

Fault	Htg	Clg	Possible Cause	Solution
Unit Performance Sentinel-Code 8	X		Heating Mode LT2>125°F	Check for poor air flow or overcharged unit
		X	Cooling Mode LT1>125°F OR LT2< 40°F	Check for poor water flow, or air flow
Swapped Thermistor Code 9	X	X	LT1 and LT2 swapped	Reverse position of thermistors
ECM Fault - Code 10	X	X	Blower does not operate	Check blower line voltage
				Check blower low voltage wiring
			Blower operating with incorrect airflow	Wrong unit size selection
				Wrong unit family selection
				Wrong motor size
				Incorrect blower selection
Low Air Coil Pressure Fault (Whole House Dehumidification) Code 11		X	Reduced or no air flow in cooling or Whole House Dehumidification	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
			Air temperature out of range	Too much cold vent air - bring entering air temp within design parameters
			Bad pressure switch	Check switch continuity and operation - replace
Low Air Coil Temperature Fault - (Whole House Dehumidification) Code 12		X	Reduced airflow in cooling, Whole House Dehumidification, or constant fan	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
			Air temperature out of range	Too much cold vent air - bring entering air temp within design parameters
			Bad thermistor	Check temp and impedance correlation per chart
IFC Fault Code 13 Internal Flow Controller Fault	X	X	No pump output signal	Check DC voltage between A02 and GND - should be between 0.5 and 10 VDC with pump active
			Low pump voltage	Check line voltage to the pump
			No pump feedback signal	Check DC voltage between T1 and GND. Voltage should be between 3 and 4 VDC with pump OFF, and between 0 and 2 VDC with the pump ON
			Bad pump RPM sensor	Replace pump if the line voltage and control signals are present at the pump, and the pump does not operate
ESD - ERV Fault (DXM Only) Green Status LED Code 3	X	X	ERV unit has fault (Rooftop units only)	Troubleshoot ERV unit fault
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 filte r
	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 DXM2 - put in Test Mode and jumper Y1 and R to give call for compressor

Performance Troubleshooting

Symptom	Htg	Clg	Possible Cause	Solution
Insufficient Capacity/ Not Cooling or Heating Properly	X	X	Dirty filter	Replace or clean
	X		Rduced or no air flow in heating	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	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	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 in heating	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	Reduced or no water flow in cooling	Check pump operation or valve operation/setting
				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 over charged	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 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		Water temperature out of range	Bring water temp within design parameters
		X	Reduced 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	X	Insufficient charge	Check for refrigerant leaks

Performance Troubleshooting

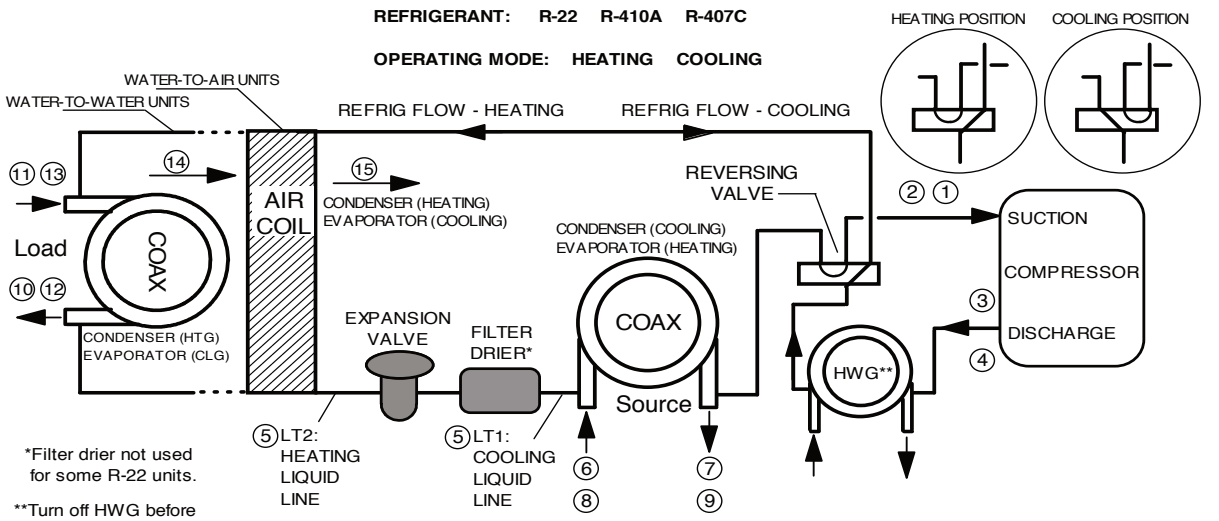
Symptom	Htg	Clg	Possible Cause	Solution
Low Dischage Air Temperature in Heating	X		Too high of air flow	Check fan motor speed selection and airflow chart
	X		Poor performance	See “Insufficient Capacity”
High Humidity		X	Too high of air flow	Check fan motor speed selection and airflow chart
		X	Unit oversized	Recheck loads and sizing check sensible clg load and heat pump capacity
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 blower relay 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 or DXM2. Put in Test Mode and then jumper Y1 and W1 to R to give call for fan, compressor and electric heat.
Unit Doesn't Operate in Cooling		X	Reversing Valve	Set for cooling demand and check 24VAC on RV coil.
				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	For DXM2 check for “O” RV setup not “B”.
		X	Thermostat wiring	Check O wiring at heat pump. DXM2 requires call for compressor to get RV coil “Click.”
Modulating Valve Troubleshooting	X	X	Improper output setting	Verify the AO-2 jumper is in the 0-10V position
			No valve output signal	Check DC voltage between AO2 and GND. Should be O when valve is off and between 3.3v and 10v when valve is on.
			No valve operation	Check voltage to the valve
				Replace valve if voltage and control signals are present at the valve and it does not operate

Troubleshooting Form

Customer: _____ Loop Type: _____ Startup Date: _____

Model #: _____ Serial #: _____ Antifreeze Type & %: _____

Complaint: _____



	Description	Heating	Cooling	Notes
	Voltage			
	Compress Amps			
1	Suction Temp			
2	Suction Press			
2a	Saturation Temp			
2b	Superheat			
3	Discharge Temp			
4	Discharge Press			
4a	Saturation Temp			
4b	Subcooling			
5	Liquid Line Temp			
6	Source Water In Tmp			
7	Source Water Out Tmp			Temp Diff. =
8	Source Water In Pres			
9	Source Water Out Pres			
9a	Press Drop			
9b	GPM			
10	Load Water In Temp			<--Water-to-Water units only
11	Load Water Out Temp			Temp Diff. =
12	Load Water In Pres			<--Water-to-Water units only
13	Load Water Out Pres			<--Water-to-Water units only
13a	Press Drop			<--Water-to-Water units only
13b	GPM			<--Water-to-Water units only
14	Return Air Temp			<--Water-to-Air units only
15	Supply Air Temp			Temp Diff. =

Heat of Extraction (Absorption) or Heat of Rejection:

HE or HR (Btuh) = _____ Enter HE or HR: _____

Fluid Factor:
500 (Water); 485 (Antifreeze)

_____ **Flow Rate (GPM) x** _____ **Temp. Diff (deg F) x** _____ **Fluid Factor**

Note: Never connect refrigerant gauges during startup procedures. Conduct water-side analysis using P/T ports to determine water flow and temperature difference. If water-side analysis shows poor performance, refrigerant troubleshooting may be required. Connect refrigerant gauges as a last resort.

Notes

Revision History

Date	Page #	Description
24 Sept., 14	All	First Published

Due to ongoing product improvements, specifications and dimensions are subject to change and correction without notice or incurring obligations. Determining the application and suitability for use of any product is the responsibility of the installer. Additionally, the installer is responsible for verifying dimensional data on the actual product prior to beginning any installation preparations.

Incentive and rebate programs have precise requirements as to product performance and certification. All products meet applicable regulations in effect on date of manufacture; however, certifications are not necessarily granted for the life of a product. Therefore, it is the responsibility of the applicant to determine whether a specific model qualifies for these incentive/rebate programs.

HEAT CONTROLLER

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A MAS Company