



97B0072N11

Residential Horizontal & Vertical  
Packaged Geothermal Heat Pumps

Installation, Operation &  
Maintenance Instructions

Rev.: November 18, 2022

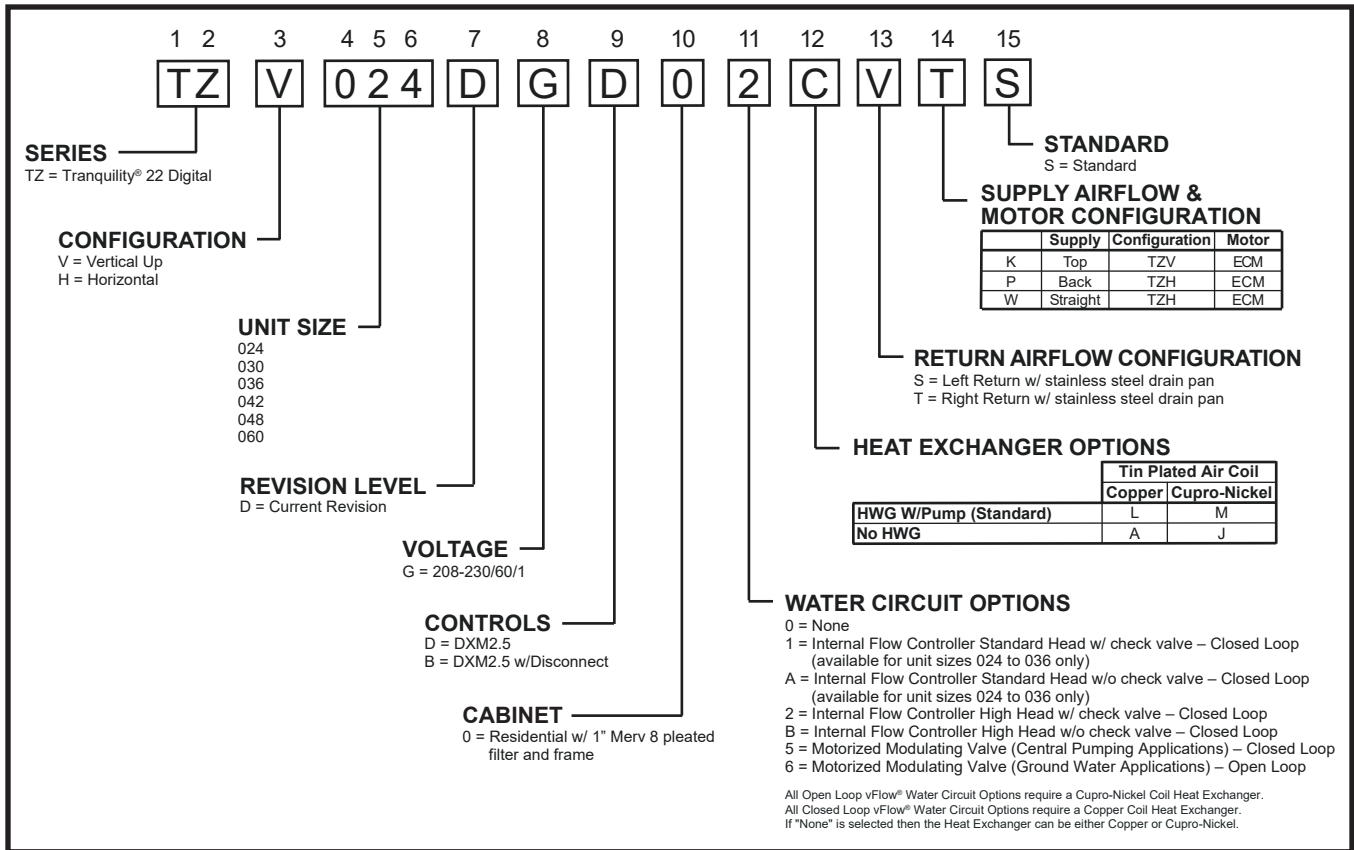


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# Model Nomenclature: General Overview



NOTE: Above model nomenclature is a general reference. Consult individual specification sections for detailed information.

# Safety

## 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.

The following warning complies with State of California law, Proposition 65.

**! WARNING! !**

**WARNING!** This product can expose you to chemicals including Carbon Black, which is known to the State of California to cause cancer and Methanol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**! WARNING! !**

**WARNING!** The EarthPure® Application and Service Manual should be read and understood before attempting to service refrigerant circuits with HFC-410A.

**! 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 can quickly become clogged with construction dirt and debris, which may cause system damage and void product warranty.

## 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.

### INSTALLATION BEST PRACTICES

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.

### DUCT SYSTEM INSTALLATION

The duct system should be sized to handle the design airflow quietly. Refer to Figure 6a and 6b for horizontal duct system details or Figure 2 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 and return plenums should include internal fiberglass duct liner or be constructed from duct board 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.

## 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 inches [10 mm] to 1/2 inches [13 mm] 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

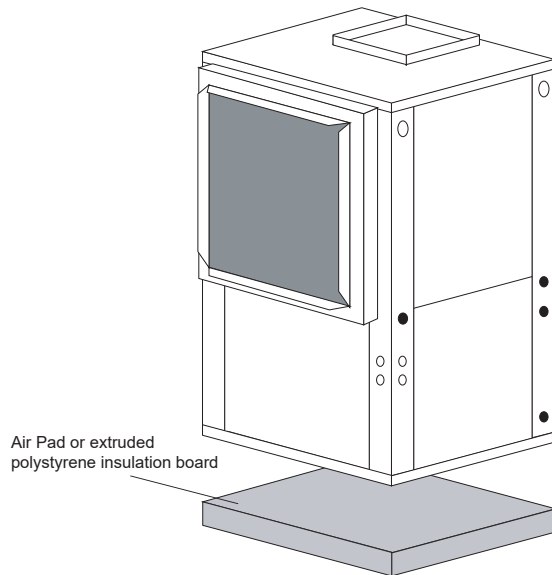
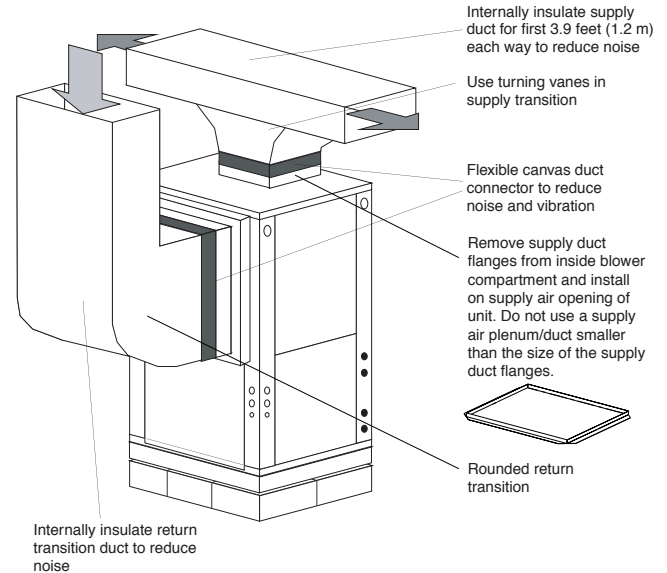


Figure 2: Typical Vertical Unit Installation Using Ducted Return Air

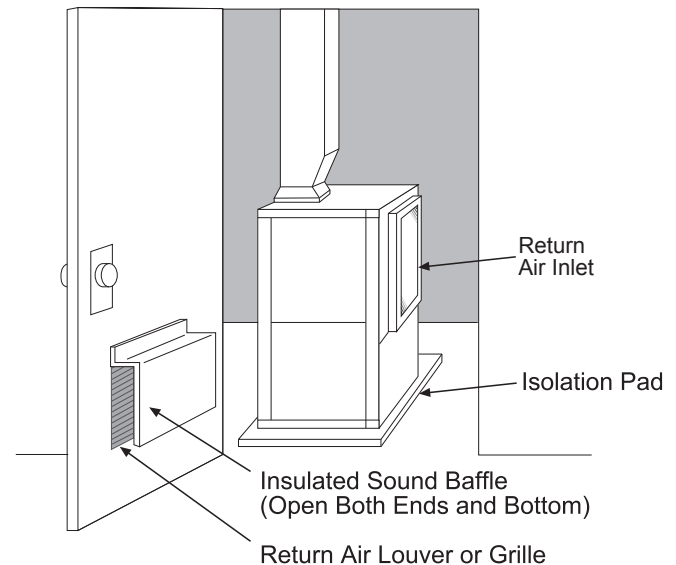


### SOUND ATTENUATION FOR VERTICAL UNITS

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. If free return, 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 Tranquility® Unit Isolation Pad to minimize vibration transmission to the building structure. For more information on Tranquility Unit Isolation Pads, contact your distributor.

Figure 3: Vertical Sound Attenuation



## Horizontal Installation

### HORIZONTAL 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 unit from the ceiling. Horizontal units are typically installed above a false ceiling or in a ceiling plenum. 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). Consideration should be given to access for easy removal of the filter and access panels. 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 any 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 7a and 7b for an illustration of a typical installation. Refer to unit catalog specifications for dimensional data.

Conform to the following guidelines when selecting a unit location:

1. Provide a hinged access door in concealed-spline or plaster ceilings. Provide removable ceiling tiles in T-bar or lay-in ceilings. Refer to horizontal unit dimensions for specific series and model in unit catalog specifications. Size the access opening to accommodate the service technician during the removal or replacement of the compressor, control, or blower assembly.
2. Provide access to hanger brackets, water valves and fittings. Provide screwdriver clearance to access panels, discharge collars and all electrical connections.
3. DO NOT obstruct the space beneath the unit with piping, electrical cables and other items that prohibit future removal of components or the unit itself.
4. Use a manual portable jack/lift to lift and support the weight of the unit during installation and servicing.

### MOUNTING HORIZONTAL UNITS

Horizontal units have 4 hanger brackets partially attached at the factory, one at each corner. Enclosed within the unit there is a hanger kit hardware bag containing vibration isolation grommets, washers, screws and a hanger installation instruction page. One additional screw from the hardware bag must be added to each hanger bracket before unit installation. Tighten each screw to 75 in-lbs (8.5 Nm). See Figure 1. Refer to the hanger installation instruction page contained in the hardware bag for details of final hanger bracket attachment and unit suspension. See Figure 1a.

Use four (4) field supplied threaded rods and factory provided vibration isolators to suspend the unit. Safely lift the unit into position supporting the bottom of the unit. Ensure the top of the unit is not in contact with any external objects. Connect the top end of the 4 all-thread rods, slide rods through the brackets and grommet then assemble washers and double nuts at each rod. Ensure that the unit is approximately level and that the threaded rod extends past the nuts.

Pitch the unit toward the drain as shown in Figure 6 to improve the condensate drainage. On small units (less than 2.5 Tons/8.8 kW) ensure that unit pitch does not cause condensate leaks inside the cabinet.

**NOTE: The top panel of a horizontal unit is a structural component. The top panel of a horizontal unit must never be removed from an installed unit unless the unit is properly supported from the bottom. Otherwise, damage to the unit cabinet may occur.**

Figure 4: Hanger Bracket

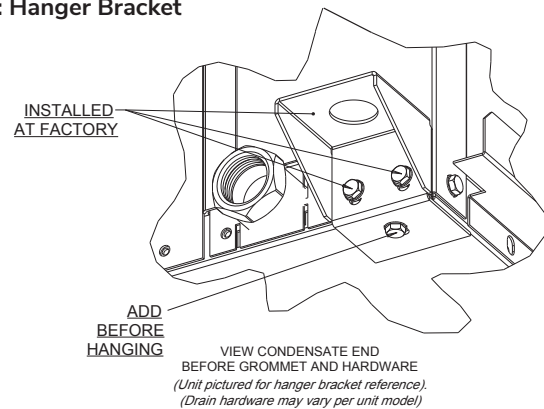
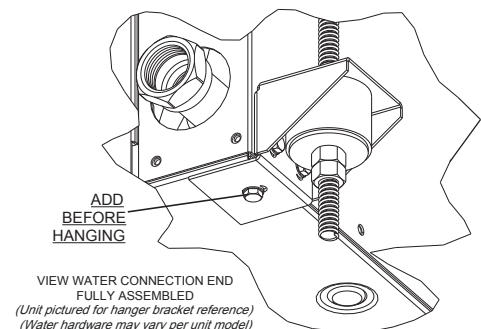
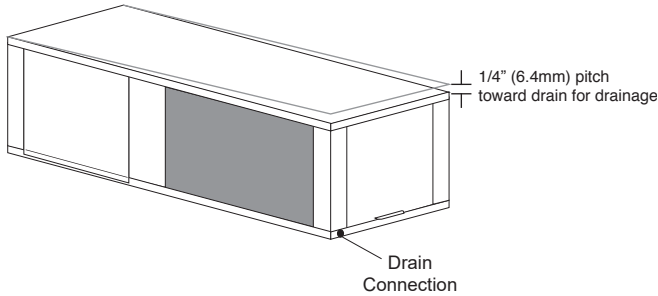


Figure 4a:

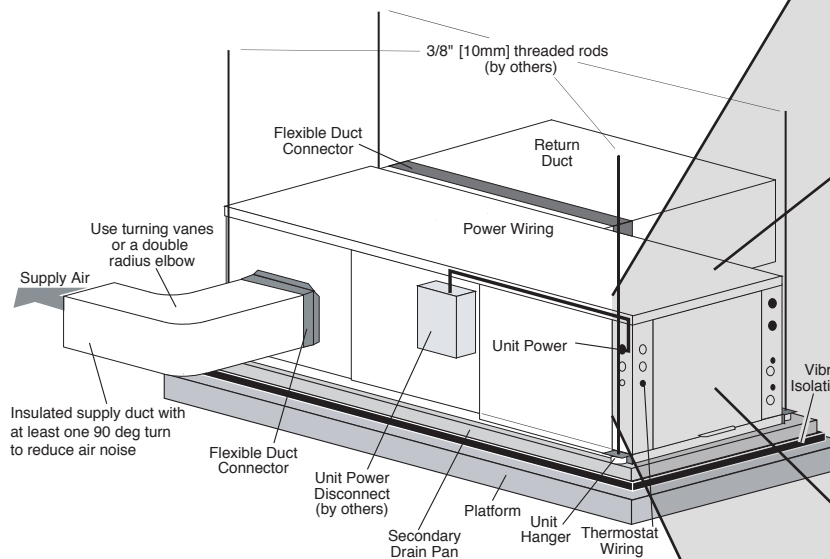


## Horizontal Installation, Cont'd.

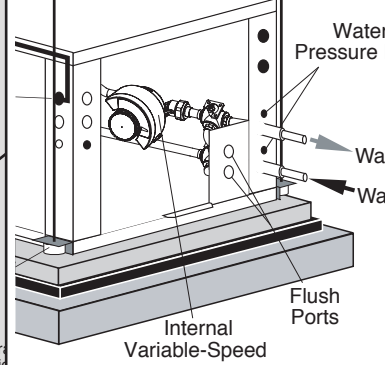
**Figure 5: Horizontal Unit Pitch**



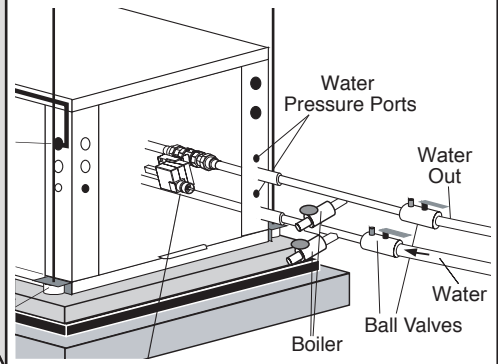
**Figure 6: Horizontal Unit Mounting**



**Figure 6a: Typical Closed Loop Horizontal Unit Installation (with Internal Flow Controller)**



**Figure 6b: Typical Ground Water Horizontal Unit Installation (with Internal Motorized Modulating Valve)**



### AIR COIL

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



## Horizontal Installation, Cont'd.

### Field Conversion of Air Discharge

#### OVERVIEW

Horizontal units can be field converted between side (straight) and back (end) discharge using the instructions below.

**NOTE: It is not possible to field convert return air between left or right return models due to the necessity of refrigeration copper piping changes.**

#### PREPARATION

It is best to field convert the unit on the ground before hanging. If the unit is already hung it should be taken down for the field conversion.

#### SIDE TO BACK DISCHARGE CONVERSION

1. Place unit in well lit area. Remove the screws as shown in Figure 8 to free top panel and discharge panel.
2. Lift out the access panel and set aside. Lift and rotate the discharge panel to the other position as shown, being careful with the blower wiring.
3. Check blower wire routing and connections for tension or contact with sheet metal edges. Reroute if necessary.
4. Check refrigerant tubing for contact with other components.
5. Reinstall top panel and screws noting that the location for some screws will have changed.
6. Manually spin the fan wheel to ensure that the wheel is not rubbing or obstructed.
7. Replace access panels.

#### BACK TO SIDE DISCHARGE CONVERSION

If the discharge is changed from back to side, use above instruction noting that illustrations will be reversed.

#### LEFT VS. RIGHT RETURN

It is not possible to field convert return air between left or right return models due to the necessity of refrigeration copper piping changes. However, the conversion process of side to back or back to side discharge for either right or left return configuration is the same. In some cases, it may be possible to rotate the entire unit 180 degrees if the return air connection needs to be on the opposite side. Note that rotating the unit will move the piping to the other end of the unit.

Figure 7: Left Return Side to Back

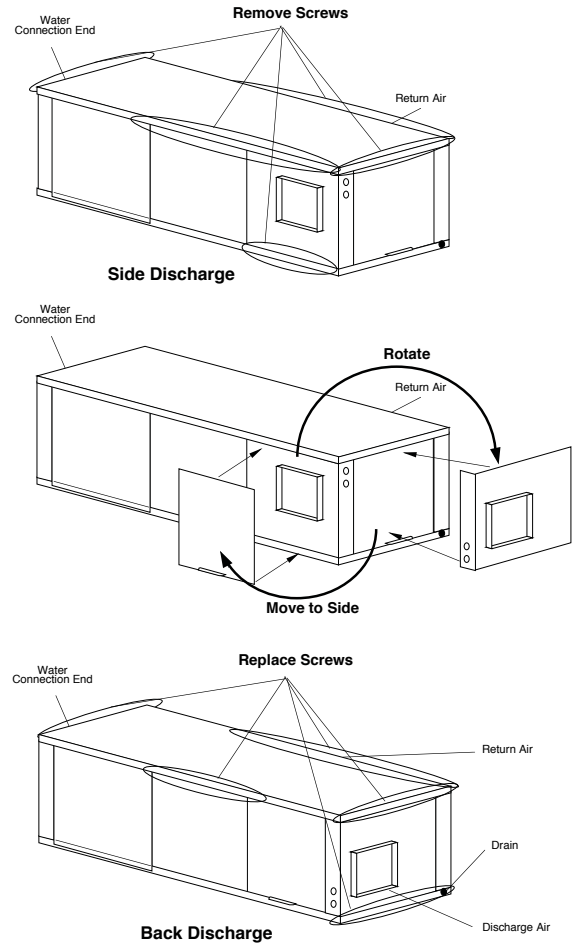
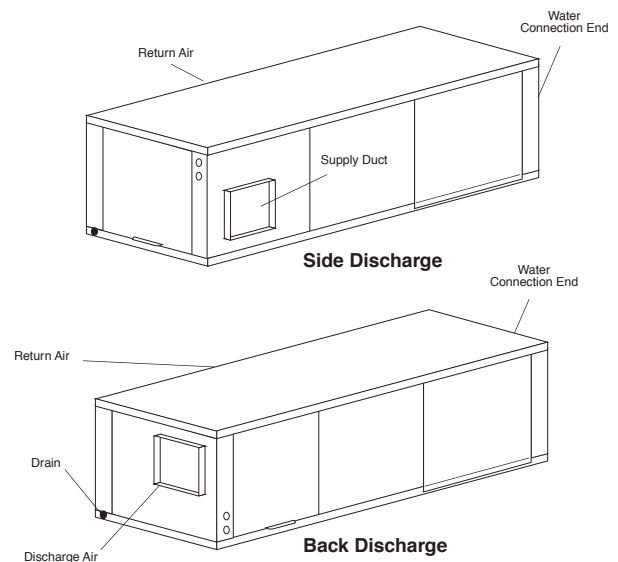


Figure 8: Right Return Side to Back



## Condensate and Water Connection

### CONDENSATE PIPING

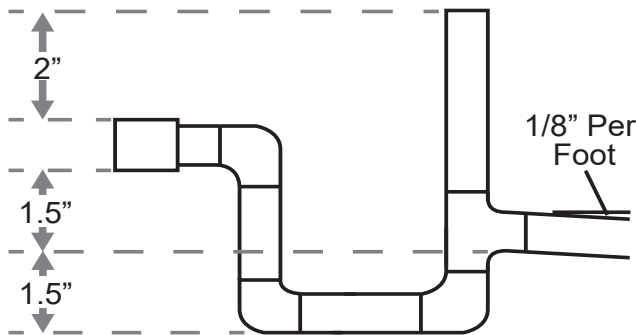
Pitch the unit toward the drain as shown in Figure 6 to improve the condensate drainage. On small units (less than 2.5 tons/8.8 kW), insure that unit pitch does not cause condensate leaks inside the cabinet.

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 [51 mm] of ESP capability requires 2 inches [51 mm] of trap depth). As a general rule, 1-1/2 inch [38 mm] 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



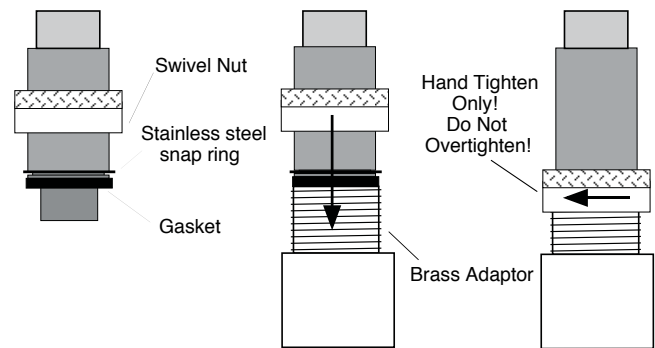
**CAUTION!** Ensure condensate line is pitched toward drain 1/8 inch per ft [11 mm per m] of run.

### WATER CONNECTIONS

Swivel piping fittings are used 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



**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.

# vFlow® Heat Pump Applications Overview

vFlow® 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. vFlow 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).

## vFlow® Configurations

(Model Digit 11 must be 1, 2, 5, or 6):

### 1. INTERNAL FLOW CONTROLLER – FOR CLOSED LOOP APPLICATIONS

This is the most common configuration for closed loops. With this factory-installed 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 DXM2.5 control based on the difference in entering and leaving water temperatures ( $\Delta T$ ). 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)

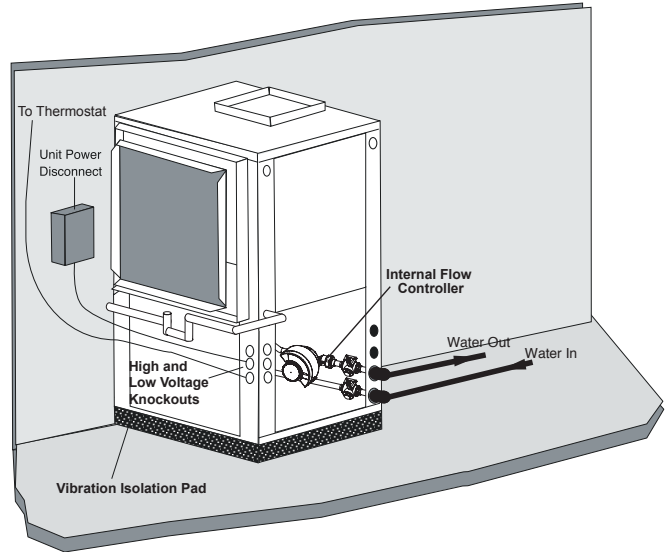
Primarily for use on multi-unit closed loop applications with central pumping. With this factory-installed option, the unit includes a low pressure drop modulating motorized valve that is controlled by the DXM2.5 microprocessor control based on the difference in the entering and leaving water temperatures ( $\Delta T$ ). 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

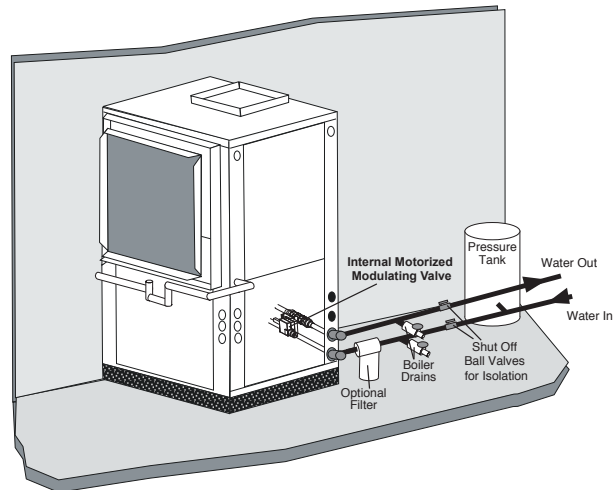
For use on open loop applications. With this factory-installed, option, the unit is built with an internal modulating motorized valve controlled by the Communicating DXM2.5 control board based on entering and leaving water temperatures ( $\Delta T$ ). A low Cv modulating motorized valve is used for this 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 w/Internal Flow Controller

Units with internal flow control come with a built-in variable speed pump, an expansion tank, flushing ports and three-way valves (used to flush the unit). The variable speed pump is controlled by the Communicating DXM2.5 board based on the difference between the entering and leaving water temperature ( $\Delta T$ ). 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 DXM2.5 controller may automatically adjust the control  $\Delta T$  to account for the abnormal entering water temperatures, maintaining an appropriate flow rate for proper unit operation. When entering water temperatures are abnormally low for cooling, or abnormally high for heating, the DXM2.5 controller will maintain a constant leaving water temperature which will allow the unit to operate properly under those conditions. The internal expansion tank helps to maintain constant loop pressure despite the natural expansion and contraction of the loop as the seasons and loop temperatures vary. The expansion tank also helps to avoid flat loop callbacks.

### 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.

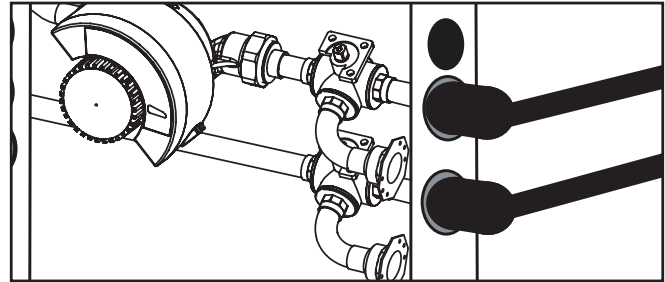
### PIPING INSTALLATION

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 and it is also recommended for inside piping. 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 ground loop applications. 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.

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.

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

Figure 12: Internal Flow Controller



### WATER PRESSURE SCHRADER PORTS

The pressure ports built in to the unit are provided as a means of measuring pressure drop through the water-to-refrigerant heat exchanger. The water pressure ports are schrader ports smaller than refrigerant schrader ports. They are the same size as tire schrader ports. A digital pressure gauge is recommended for taking pressure readings through these ports. The water flow through the unit can be determined by measuring the water pressure at the “water pressure out” port and subtracting it from the water pressure at the “water pressure in” port. Comparing the pressure differential to the pressure drop table (Table 10) in this manual will determine the flow rate through the unit.

### ⚠ NOTICE! ⚠

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

### Digital Tire Pressure Gauge



## Closed Loop Heat Pump Applications w/Internal Flow Controller, Cont'd.

Figure 13: Standard Head Variable Pump Performance

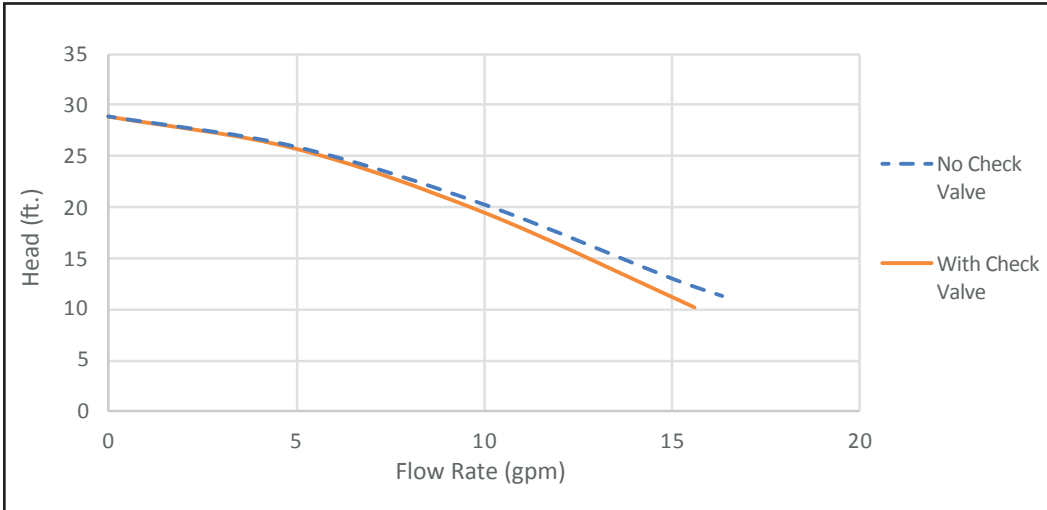
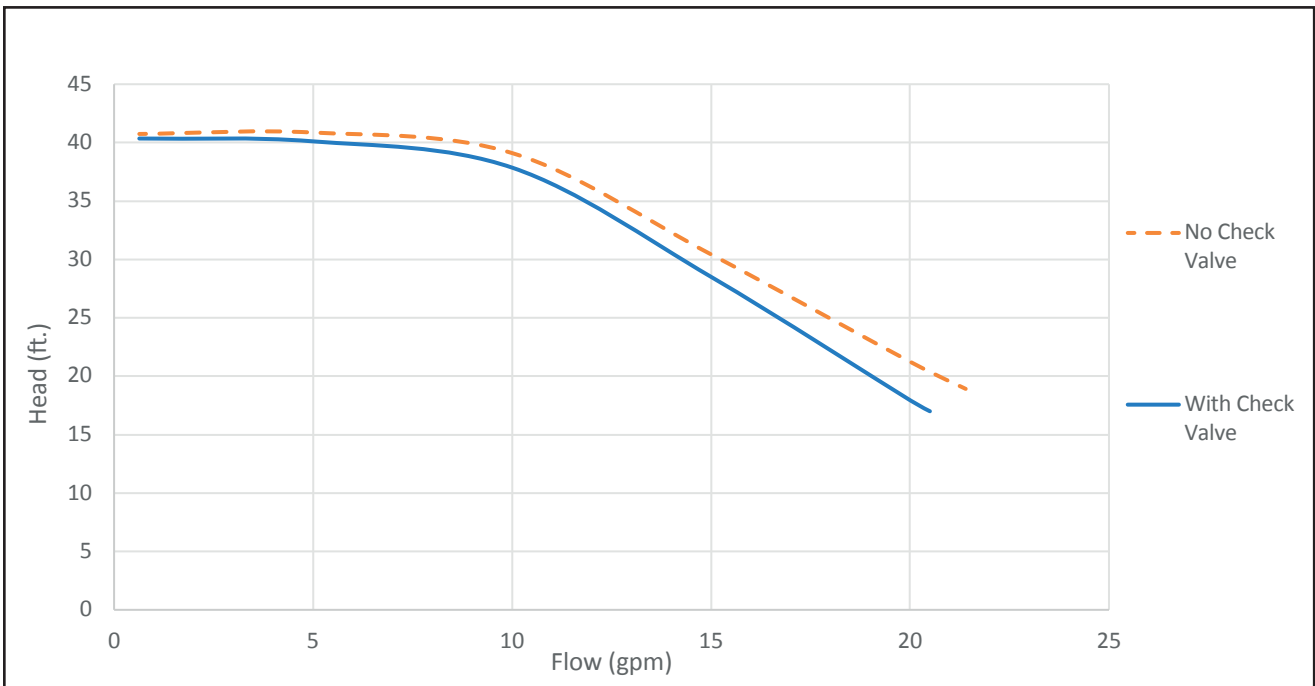


Figure 13a: High Head Variable Pump Performance



## 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 [1.1 kW] 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 2 fps [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 [4.3 L/M per KW]
1"	6 [6.5 L/M per KW]
1 1/4"	10 [10.8 L/M per KW]
1 1/2"	13 [14.0 L/M per KW]
2"	21 [22.6 L/M per KW]

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

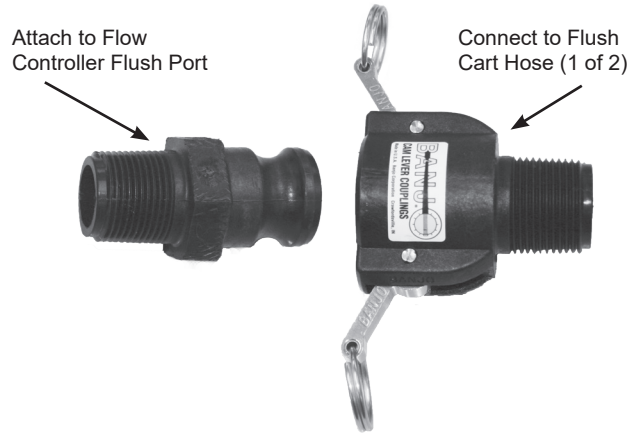
Fill loop (valve position A, see Figure 15a) with water from a garden hose through flush cart before using flush cart pump to ensure an even fill and increase flushing speed. When water consistently returns back to the flush reservoir, switch to valve position B (figure 15b).

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 [0.149 mm])**

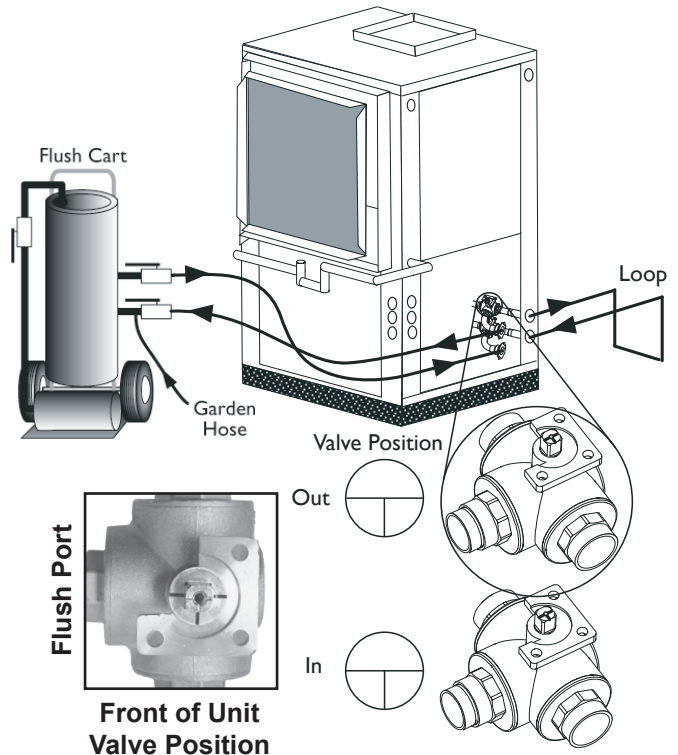


**Figure 14b: Cam Fittings for Flush Cart Hoses**



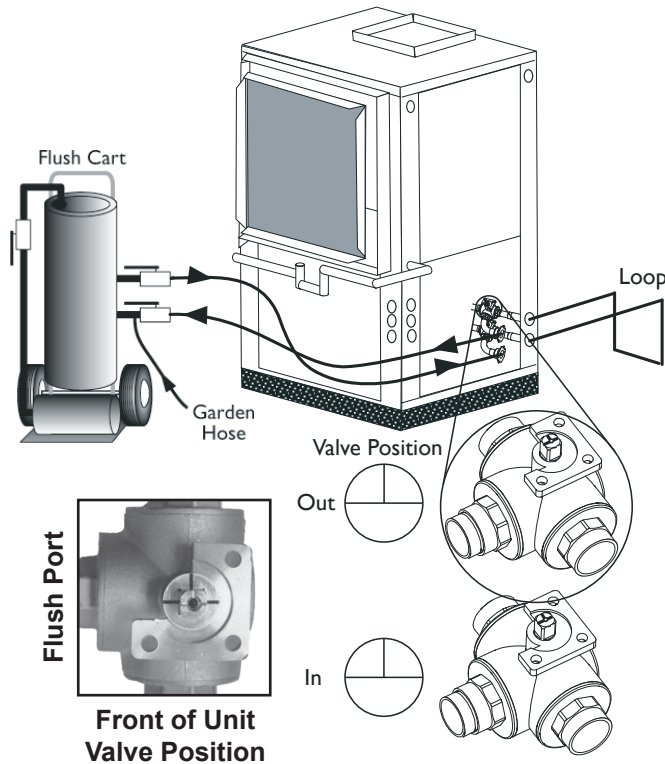
**NOTICE: A hydrostatic pressure test is required on ALL piping, especially underground piping before final backfill per IGSHA and the pipe manufacturers recommendations.**

**Figure 15a: Valve Position A – Loop Fill/Flush**



## Flushing the Earth Loop, Cont'd.

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

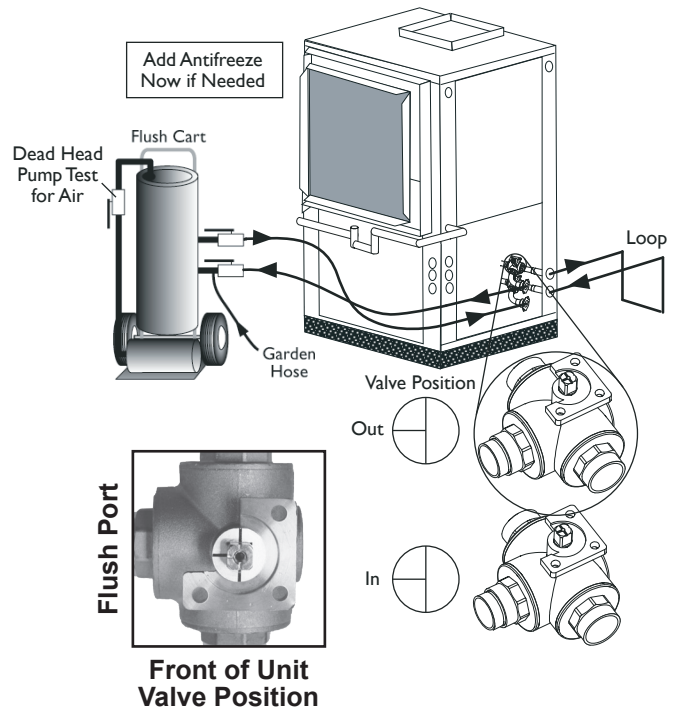
Switch to valve Position A. The supply water may be shut off and the flush cart turned on to begin flushing. Once the flush reservoir is full, do not allow the water level in the flush cart tank to drop below the pump inlet line or air can be pumped back out to the earth loop. Try to maintain a fluid 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 inches in a 10 inches [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 inches 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

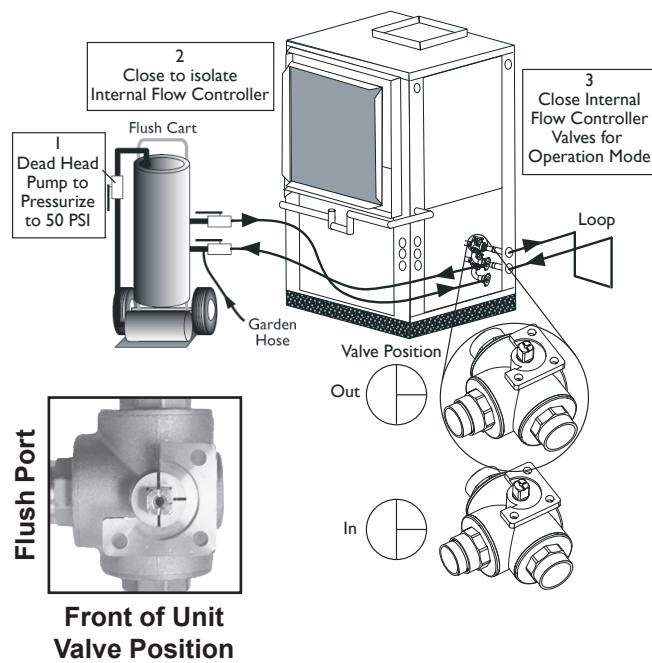
As shown in Figure 15d, close the flush cart return valve to pressurize the loop to at least 50 psi [345 kPa], not to exceed 75 psi [517 kPa]. Open the isolation valve to the expansion tank and bleed air from the expansion tank piping using the schrader valve located in front of the expansion tank. This 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.

## Flushing the Earth Loop, Cont'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 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.

**Figure 15d: Valve Position D – Pressurize and Operation**



**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.



## 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.

vFlow® internal variable flow technology is a great assist for systems with multiple units. vFlow 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 vFlow includes an internal variable speed circulator controlled by the DXM2.5 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 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.

Units with the standard head pump should not be combined with units with high head pumps on the same loop. Standard head pumps are best suited for small applications with a single unit.

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
TZ024 - 042	3/4" FPT	25	10.3
TZ048 - 060	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.

$$\Delta P = (GPM/Cv)^2 \text{ where,}$$

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 TZ024 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 vFlow® 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.

UNIT CONFIGURATION	
CURRENT CONFIG	TZ024
HEAT PUMP FAMILY	TZ
HEAT PUMP SIZE	024
BLOWER TYPE	ECM
LOOP CONFIG	VS PUMP PARALLEL
SELECT OPTION ▲ ▼	
◀ PREVIOUS	SAVE ■

Installer Settings ➡ System Config ➡ Unit Config ➡ Loop Config

## Multiple Unit Piping and Flushing, Cont'd.

### MULTIPLE UNITS WITH INTERNAL FLOW CONTROLLERS

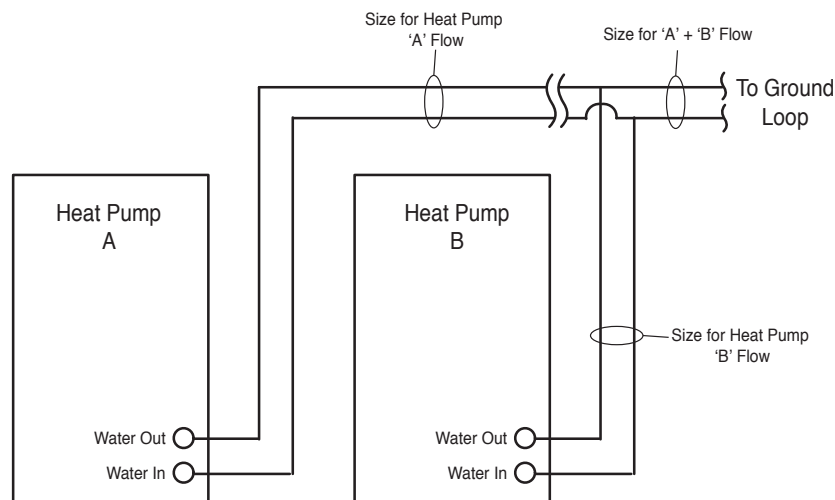
The simplest multiple unit system is one with two (or more) units utilizing internal Flow Controllers with no external pumps or flushing valves. In this case the units are piped in parallel and use the internal flushing valves to flush the system. The variable speed pump includes an internal check valve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

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

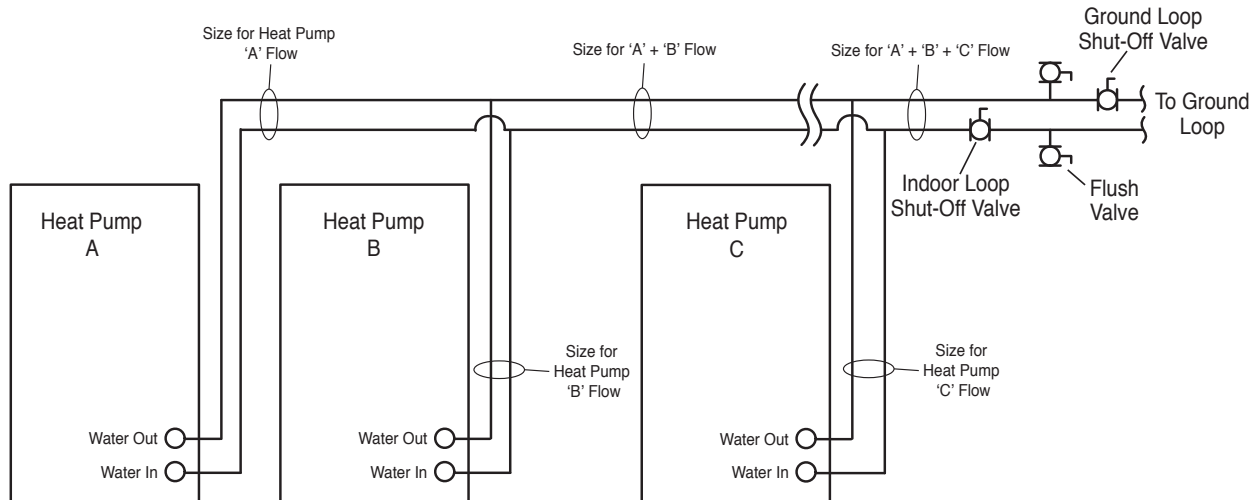
When the number of units or flushing requirements reaches a point where it is no longer feasible to flush through the internal valves (generally systems of more than 12 tons depending on loop design), external flushing valves should be installed. In this case, three-way flushing valves should be used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

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, Cont'd.

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



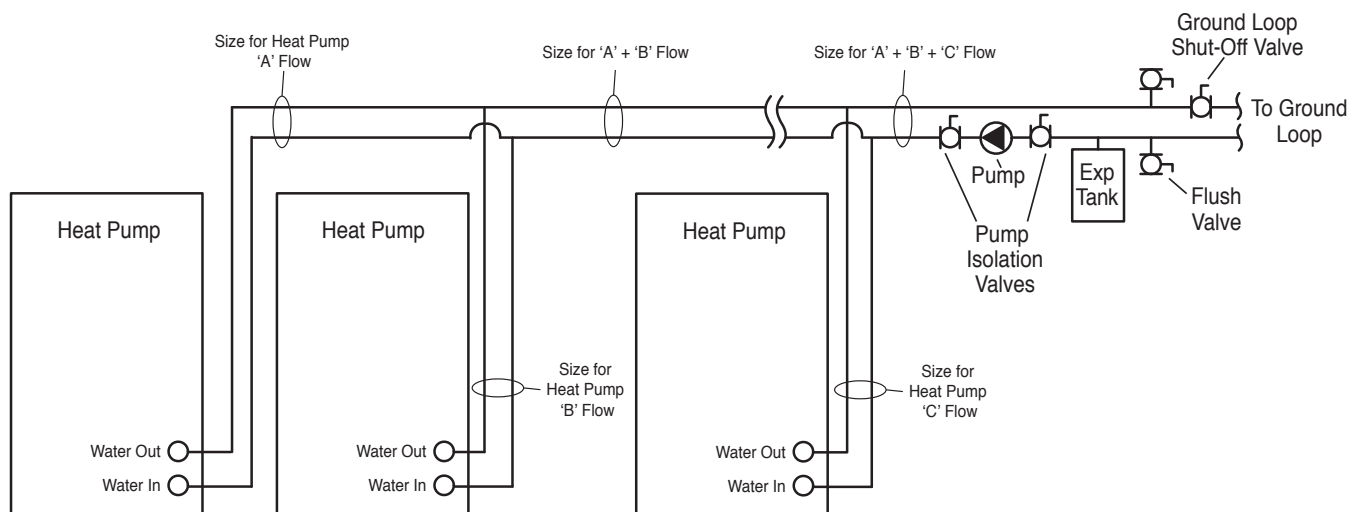
### MULTIPLE UNITS WITH INTERNAL MODULATING VALVES AND CENTRAL PUMP

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.

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.

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



## Ground-Loop Heat Pump 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]
Fluid Cooler	036/060	7.4 [28]
Flush Cart Tank	10" Dia x 3 ft tall [25.4 cm x 91.4 cm 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 ClimateMaster 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 job site 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 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

## Ground Loop Heat Pump Applications, Cont'd.

- 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.
- 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.
  - 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.

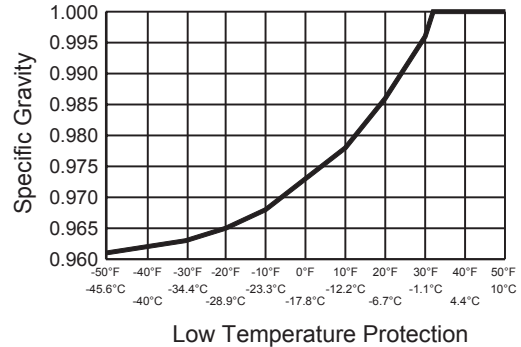
When handling methanol (or any alcohol), always wear eye protection and rubber gloves as alcohols are easily absorbed through the skin.

- 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 – DXM2.5 CONTROL

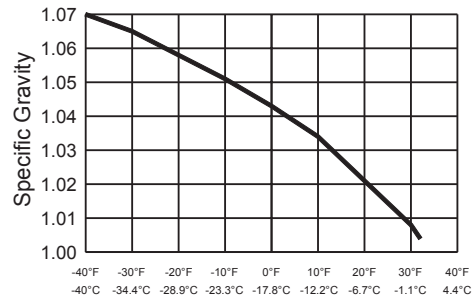
When antifreeze is selected, the LT1 jumper (JW3) should be clipped to select the low temperature (antifreeze 10°F [-12.2°C]) set point and avoid nuisance faults (see "Low Water Temperature Cutout Selection" in this manual).

**Chart 1a: Methanol Specific Gravity**



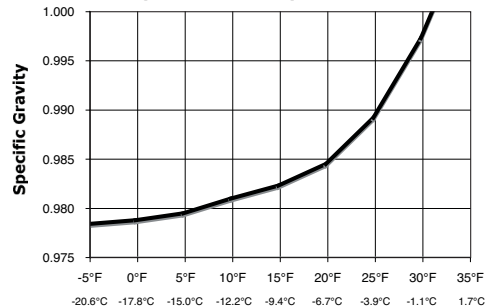
Low Temperature Protection

**Chart 1b: Propylene Glycol Specific Gravity**



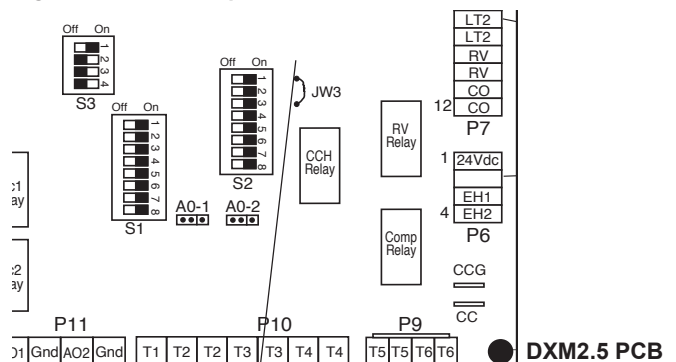
Low Temperature Protection

**Chart 1c: Ethanol Specific Gravity**



Low Temperature Protection

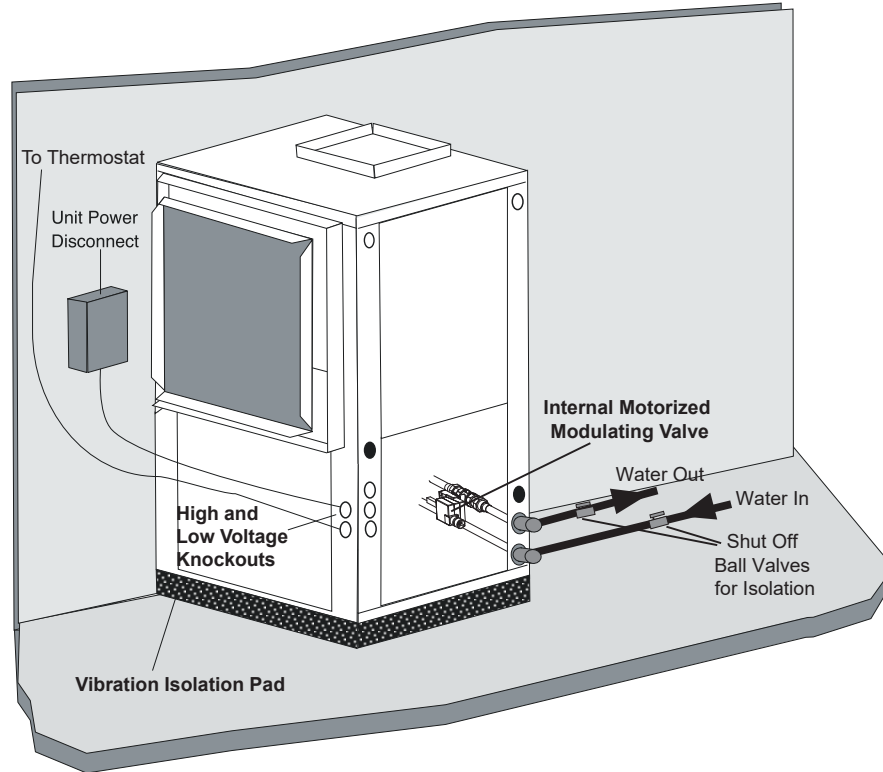
**Figure 17: Low Temperature Cutout Selection**



**JW3-LT1 jumper should be clipped for low temperature operation.**

## Closed Loop – External Central Pumping Applications

Figure 17: Typical Closed Loop with Central Pumping Application (with Internal Modulating Motorized Valve Shown)



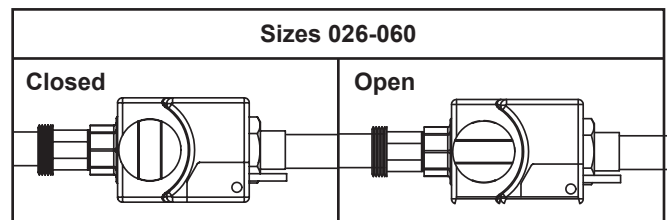
Tranquility® Digital packaged units are available with a modulating water valve option for closed-loop applications with external central pumping (designated by a 5 in the 11th position of the unit model number). With this option, the Modulating Valve is regulated by the Communicating DXM2.5 board based on entering and leaving water temperature ( $\Delta T$ ). The DXM2.5 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 DXM2.5 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 TZ024 – 060 push down on the handle to unlock it. Then rotate the handle to the open position as shown in Figure 18. This fully opens the valve for flushing. Once flushing is complete, return the valve handle to its normally closed position.

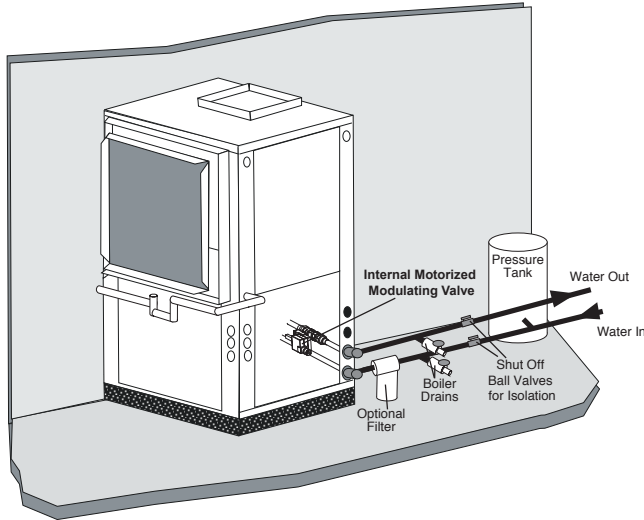
To manually open the internal modulating motorized water valve in TZ024 – 060, push down on the lock release button while turning the handle to the open position as shown in Figure 18. This fully opens the valve for flushing. Once flushing is complete, press the lock release again and return the valve handle to its normally closed position.

Figure 18: Internal Modulating Motorized Valve Positions



## Open Loop or Ground-Water Heat Pump Applications

Figure 19: Typical Open Loop/Well Application



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

Tranquility® 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 DXM2.5 board based on entering and leaving water temperature ( $\Delta T$ ). The DXM2.5 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 DXM2.5 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 TZ024 – 060 push down on the handle to unlock it. Then rotate the handle to the open position as shown in Figure 18. This fully opens the valve for flushing. Once flushing is complete, return the valve handle to its normally closed position.

### OPEN LOOP – GROUND WATER SYSTEMS

Typical open loop piping is shown in Figure 19. 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 4 for water quality requirements. vFlow® 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 REQUIREMENTS

Table 4 should 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 4.

## Open Loop or Ground-Water Heat Pump Applications, Cont'd.

### **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 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**

Clean water is essential to the performance and life span of water source heat pumps. Contaminants, chemicals, and minerals all have the potential to cause damage to the water heat exchanger if not treated properly. All closed water loop systems should undergo water quality testing and be maintained to the water quality requirements listed in this table.

CLIMATEMASTER WATER QUALITY REQUIREMENTS							
For Closed-Loop and Open-Loop Systems							
	Description	Symbol	Units	Heat Exchanger Type			
				Closed Loop Recirculating	Open Loop, Tower, Ground Source Well		
					All Heat Exchanger Types	COAXIAL HX Copper Tube in Tube	COAXIAL HX Cupronickel
Scaling Potential	pH - Chilled Water <85°F			7.0 to 9.0	7.0 to 9.0	7.0 to 9.0	7.0 to 9.0
	pH - Heated Water >85°F			8.0 to 10.0	8.0 to 10.0	8.0 to 10.0	8.0 to 10.0
	Alkalinity	(HCO <sub>3</sub> <sup>-</sup> )	ppm - CaCO <sub>3</sub> equiv.	50 to 500	50 to 500	50 to 500	50 to 500
	Calcium	(Ca)	ppm	<100	<100	<100	<100
	Magnesium	(Mg)	ppm	<100	<100	<100	<100
	Total Hardness	(CaCO <sub>3</sub> )	ppm - CaCO <sub>3</sub> equiv.	30 to 150	150 to 450	150 to 450	150 to 450
	Langelier Saturation Index	LSI		-0.5 to +0.5	-0.5 to +0.5	-0.5 to +0.5	-0.5 to +0.5
Ryznar Stability Index	RSI		6.5 to 8.0	6.5 to 8.0	6.5 to 8.0	6.5 to 8.0	
Corrosion Prevention	Total Dissolved Solids	(TDS)	ppm - CaCO <sub>3</sub> equiv.	<1000	<1000	<1000	<1500
	Sulfate	(SO <sub>4</sub> <sup>2-</sup> )	ppm	<200	<200	<200	<200
	Nitrate	(NO <sub>3</sub> <sup>-</sup> )	ppm	<100	<100	<100	<100
	Chlorine (free)	(Cl)	ppm	<0.5	<0.5	<0.5	<0.5
	Chloride (water < 80°F)	(Cl <sup>-</sup> )	ppm	<20	<20	<150	<150
	Chloride (water > 120°F)	(Cl <sup>-</sup> )	ppm	<20	<20	<125	<125
	Hydrogen Sulfide <sup>a</sup>	(H <sub>2</sub> S)	ppb	<0.5	<0.5	<0.5	<0.5
	Carbon Dioxide	(CO <sub>2</sub> )	ppm	0	<50	10 to 50	10 to 50
	Iron Oxide	(Fe)	ppm	<1.0	<1.0	<1.0	<0.2
	Manganese	(Mn)	ppm	< 0.4	<0.4	<0.4	<0.4
	Ammonia	(NH <sub>3</sub> )	ppm	<0.05	<0.1	<0.1	<0.1
	Chloramine	(NH <sub>2</sub> CL)	ppm	0	0	0	0
Fouling & Biological	Iron Bacteria		cells/mL	0	0	0	0
	Slime Forming Bacteria		cells/mL	0	0	0	0
	Sulfate reducing bacteria		cells/mL	0	0	0	0
	Suspended Solids <sup>b</sup>	(TSS)	ppm	<10	<10	<10	<10
Electrolysis All HX types	Earth Ground Resistance <sup>x</sup>		Ohms	0	Consult NEC & local electrical codes for grounding requirements		
	Electrolysis Voltage <sup>5</sup>		mV	<300	Measure voltage internal water loop to HP ground		
	Leakage Current <sup>5</sup>		mA	<15	Measure current in water loop pipe		
	Building Primary Electrical Ground to unit, must meet local diameter and penetration length requirements Do not connect heat pump to steel pipe unless dissimilar materials are separated by using Di-electric unions. Galvanic corrosion of heat pump water pipe will occur.						

## Water Quality Requirements, Cont'd.

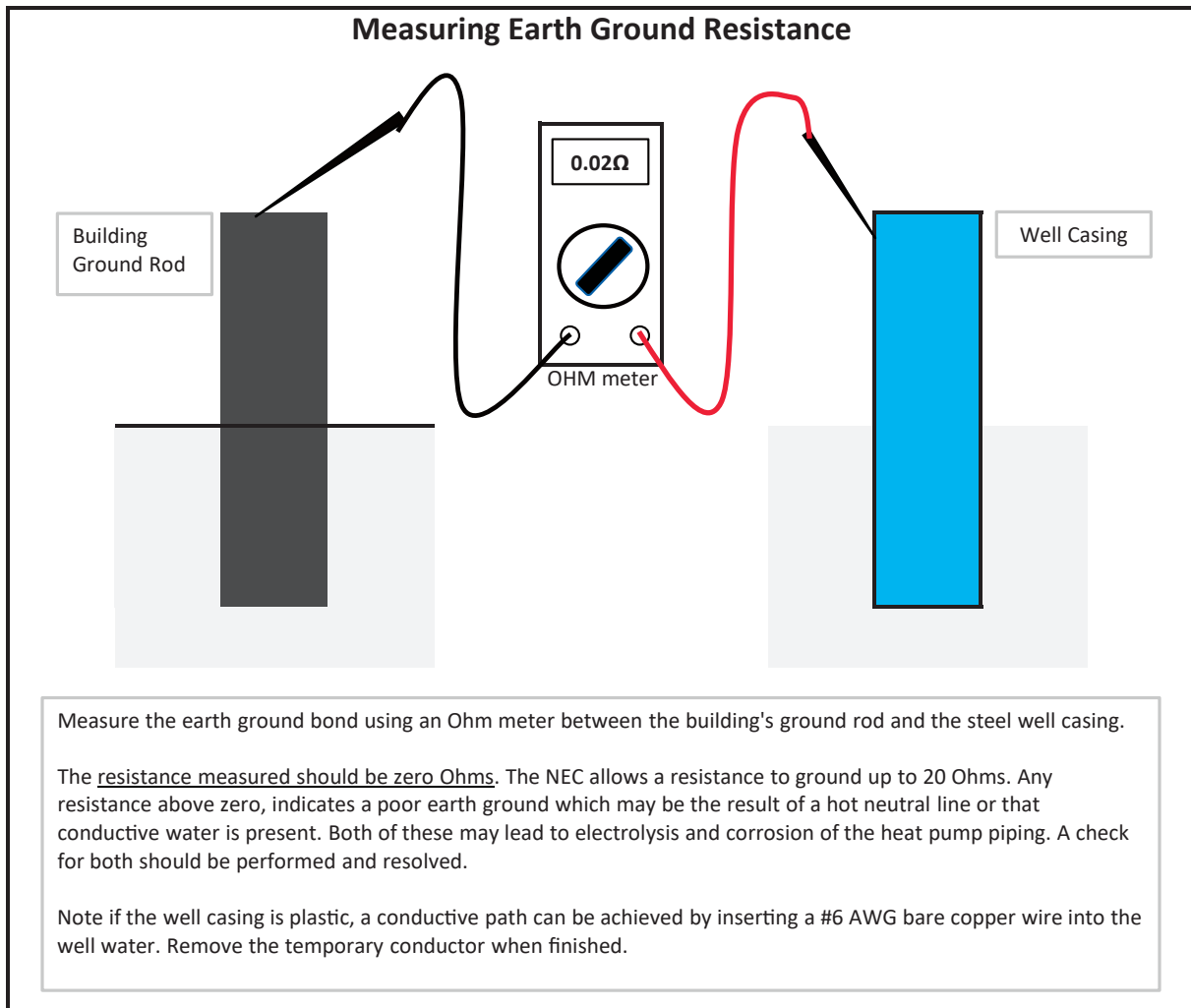
1. The ClimateMaster Water Quality Table provides water quality requirements for coaxial & brazed plate heat exchangers.
2. The water must be evaluated by an independent testing facility comparing site samples against this Table. When water properties are outside of these parameters, the water must either be treated by a professional water treatment specialist to bring the water quality within the boundaries of this specification, or an external secondary heat exchanger must be used to isolate the heat pump water system from the unsuitable water. Failure to do so will void the warranty of the heat pump system and will limit liability for damage caused by leaks or system failure.
3. Regular sampling, testing and treatment of the water is necessary to assure that the water quality remains within acceptable levels thereby allowing the heat pump to operate at optimum levels.
4. If closed-loop systems are turned off for extended periods, water samples must be tested prior to operating the system.
5. For optimal performance, it is recommended that the closed-loop piping systems are initially filled with de-ionized water.
6. Well water with chemistry outside of these boundaries, and salt water or brackish water requires an external secondary heat exchanger. Surface/Pond water should not be used.
7. If water temperature is expected to fall below 40°F, antifreeze is required. Refer to the heat pump IOM for the correct solution ratios to prevent freezing.
  - α Hydrogen Sulfide has an odor of rotten eggs. If one detects this smell, a test for H<sub>2</sub>S must be performed. If H<sub>2</sub>S is detected above the limit indicated, remediation is necessary (Consult with your Water Testing/Treatment Professional) or a secondary heat exchanger is required using appropriate materials as recommended by the heat exchanger supplier.
  - β Suspended solids and particulates must be filtered to prevent fouling and failure of heat exchangers. Strainers or particulate filters must be installed to provide a maximum particle size of 600 micron (0.60 mm, 0.023 in.) using a 20 to 30 mesh screen size. When a loop is installed in areas with fine material such as sand or clay, further filtration is required to a maximum of 100 micron. Refer to the Strainer / Filter Sizing Chart to capture the particle sizes encountered on the site.
  - χ An electrical grounding system using a dedicated ground rod meeting NEC and Local Electrical codes must be installed. Building Ground must not be connected the WSHP piping system or other plumbing pipes.
  - δ Refer to IOM for instructions on measuring resistance and leakage currents within water loops.

**Do not use PVC pipe for water loop (compressor POE oil and glycols damage PVC) use of HDPE pipe is recommended.**

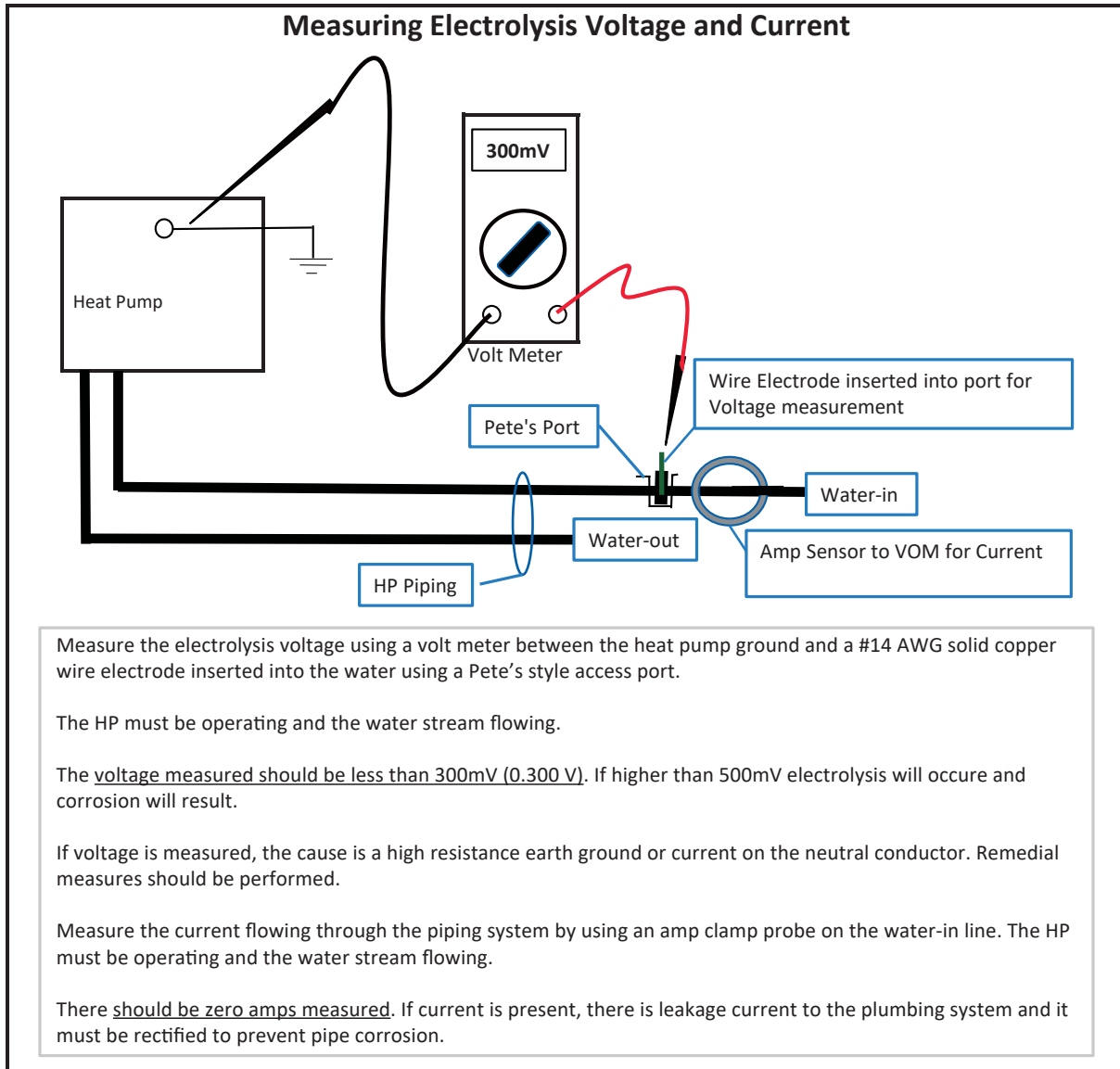
Strainer / Filter Sizing			
Mesh Size	Particle Size		
	Microns	MM	Inch
20	840	0.840	0.0340
30	533	0.533	0.0210
60	250	0.250	0.0100
100	149	0.149	0.0060
150	100	0.100	0.0040
200	74	0.074	0.0029

ppm = parts per million  
ppb = parts per billion

## Water Quality Requirements, Cont'd.



## Water Quality Requirements, Cont'd.



## 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. The figure to the left 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 setpoint 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 (HWG Double Tank Installation Figure). 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 the HWG Double Tank Installation Figure, is the preferred system, as it provides the maximum storage and temperate source water to the HWG.

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 4 for scaling potential tests.

**⚠ WARNING! ⚠**

**WARNING!** A 150°F setpoint may lead to scalding or burns. The 150°F setpoint must only be used on systems that employ an approved anti-scald valve.

Figure 20: Typical Single Tank HWG Installation

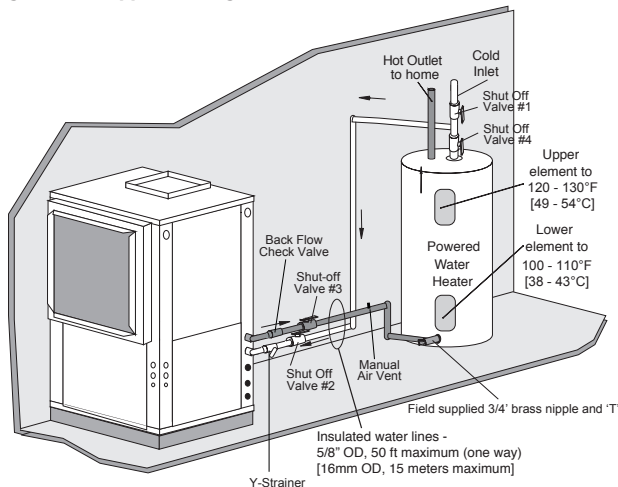
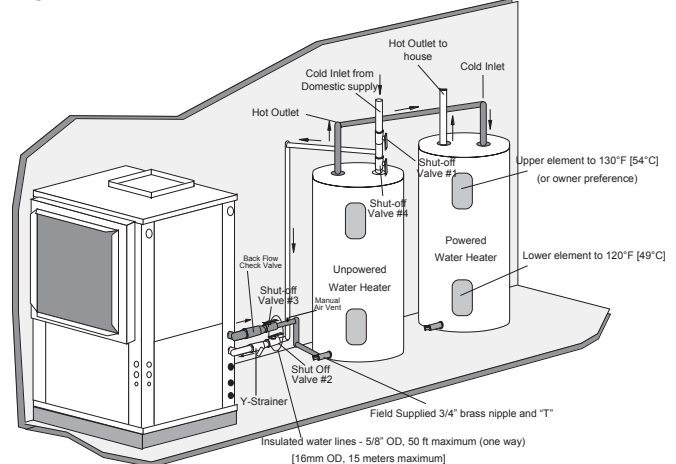


Figure 21: HWG Double Tank Installation



## Hot Water Generator, Cont'd.

### INSTALLATION

The HWG is controlled by two sensors and the DXM2.5 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 are disconnected or removed.

The DXM2.5 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 DXM2.5 status LED will slowly flash (On 1 second, Off 1 second).

If the control has detected a HWG fault, the DXM2.5 status LED will flash a numeric fault code as follows:

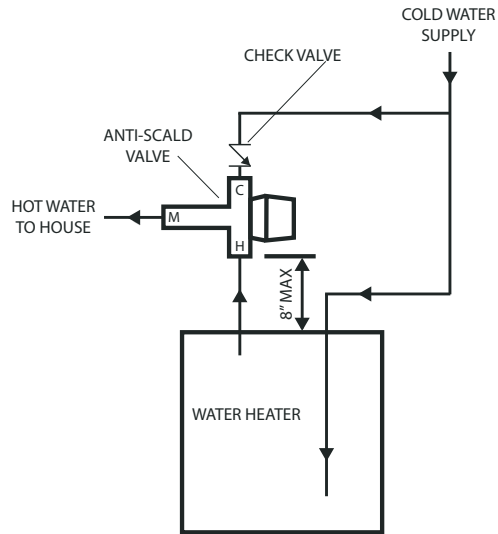
High Water Temperature (> 160°F)	5 flashes
Hot Water Sensor Fault	6 flashes
Compressor Discharge Sensor Fault	6 flashes

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 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 22: 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.

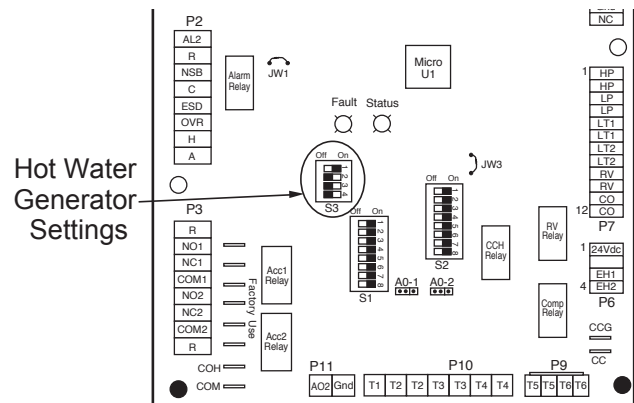
ON = 150°F (66°C), OFF = 125°F (52°C).

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 23: Hot Water Generator Settings



## Hot Water Generator, Cont'd.

### **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 5 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 inches [12.7 mm] I.D. copper, route and install the water piping and valves as shown in Figures 20 or 21. 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 the figures on page 23) 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 inches [10 mm] 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 (HWG Double Tank Installation Figure on page 23).
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 \*.
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. CPVC, PEX, or other plastic pipe should not be used HWG piping

## 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.

**⚠ 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.

**Table 8a: Tranquility® 22 (TZ) Series Electrical Data with Internal Flow Controller**

High Head Variable Pump

Model	Compressor			HWG Pump FLA	Int 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	1.44	3.9	17.5	20.4	30
030	13.1	73.0	1	0.5	1.44	3.9	18.9	22.2	35
036	15.3	83.0	1	0.5	1.44	3.9	21.1	24.9	40
042	17.9	96.0	1	0.5	1.44	5.2	25.0	29.5	45
048	21.2	104.0	1	0.5	1.44	5.2	28.3	33.6	50
060	27.1	152.9	1	0.5	1.44	6.9	35.9	42.7	70

Rated Voltage of 208-230/60/1  
 HACR circuit breaker in USA only

Min/Max Voltage of 197/254  
 All fuses Class RK-5

High Head Variable Pump

Model	Compressor			HWG Pump FLA	Int 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	0.7	3.9	16.5	19.7	30
030	13.1	73.0	1	0.5	0.7	3.9	18.2	21.4	30
036	15.3	83.0	1	0.5	0.7	3.9	20.4	24.2	45

**Table 8b: Tranquility® 22 (TZ) Series Electrical Data without Internal Flow Controller**

Model	Compressor			HWG Pump FLA	Ext 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	4.0	3.9	20.1	23.0	30
030	13.1	73.0	1	0.5	4.0	3.9	21.5	24.7	35
036	15.3	83.0	1	0.5	4.0	3.9	23.7	27.5	40
042	17.9	96.0	1	0.5	4.0	5.2	27.6	32.0	45
048	21.2	104.0	1	0.5	4.0	5.2	30.9	36.2	50
060	27.1	152.9	1	0.5	4.0	6.9	38.5	45.2	70

Rated Voltage of 208/230/60/1

Min/Max Voltage of 197/254

### 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.

**Figure 24: Tranquility® Single Phase Line Voltage Field Wiring**

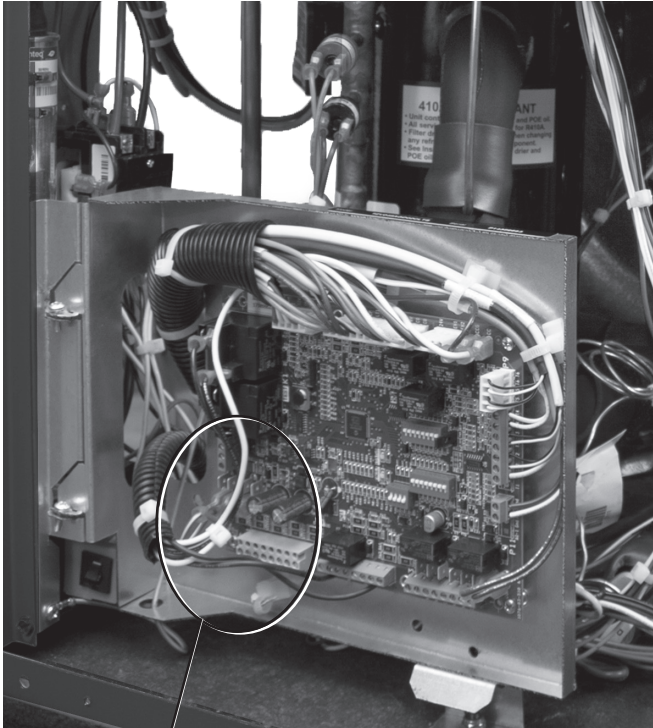


**Unit Power Supply**  
 (see electrical tables 5a - 5b for minimum circuit amps and maximum breaker size)



## Electrical – Low Voltage Wiring

Figure 25: Tranquility® Low Voltage Field Wiring



Low Voltage Field Wiring

### 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 21. Consult Tables 5a and 5b for correct fuse size.

### 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.

### ACCESSORY CONNECTIONS

A terminal paralleling the compressor contactor coil has been provided on the DXM2.5 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 26).**

The DXM2.5 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 6 and 7.

Table 9: 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	ClimaDry® II option – Dehumidistat
OFF	OFF	OFF	ClimaDry® II – Humidistat
OFF	OFF	ON	N/A for Residential Applications
ON	OFF	OFF	N/A for Residential Applications

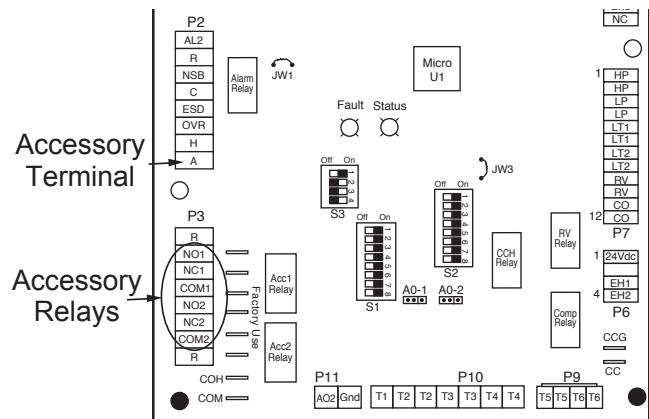
All other DIP combinations are invalid

Table 10: 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 26: Accessory Connections



# Electrical – Thermostat Wiring and Auxiliary Heat

## 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" (5 mm) 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 26a and 26b to the low voltage terminal strip on the DXM2.5 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 iGate® 2 Communicating (AWC) Thermostat is highly recommended for on-site, easier configuration, monitoring and diagnosis.

Figure 26a: iGate® 2 Communicating (AWC) Thermostat Connection to DXM2.5 Control

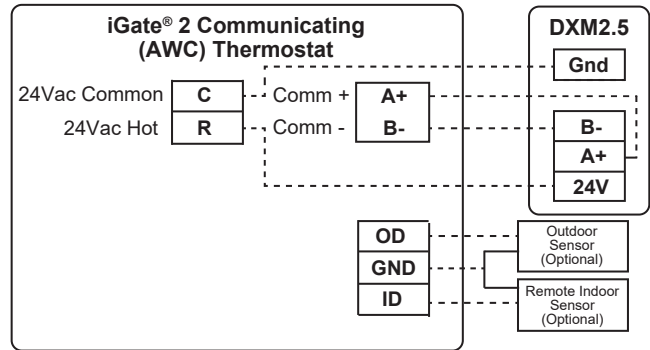
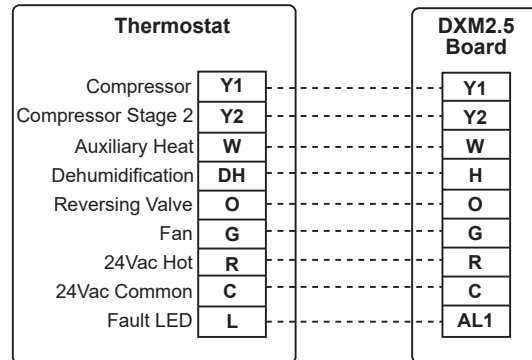


Figure 26b: Conventional 3 Heat / 2 Cool Thermostat Connection to DXM2.5 Control



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) DXM2.5 board DIP switch S2-7 must be in the auto dehumidification mode for automatic dehumidification.
- 3) DH connection not possible with units with internal variable speed pump. Use iGate® 2 Communicating (AWC) Thermostat.
- 4) Only use iGate® 2 Communicating (AWC) Thermostat when using Humidifier (H Input) in units with internal variable speed pump.

**⚠ CAUTION! ⚠**

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

**⚠ CAUTION! ⚠**

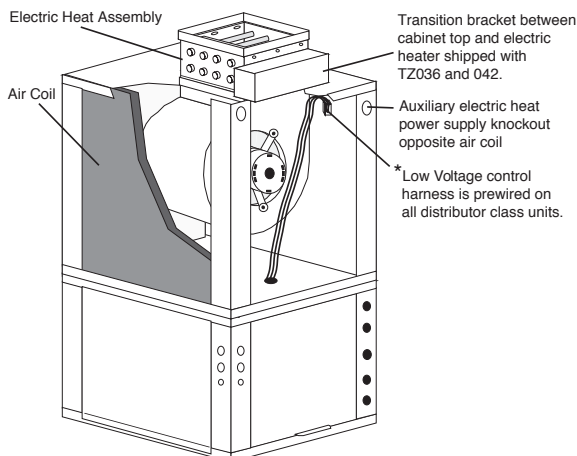
**CAUTION!** If communicating thermostat is not installed, a communicating service tool must be used to configure and diagnose this system.

## AUXILIARY HEAT INSTALLATION

In both vertical and horizontal configurations, auxiliary electric heater is installed externally to the unit.

For installation instructions, refer to the Electric Heat IOM, 97B0005N02.

## Typical Vertical External Mount Installation







## Constant Volume (CV) ECM

**The Intelligent Constant Volume (CV) ECM blower motor** provides unmatched functionality that saves installing and service technicians time while also providing increased comfort levels to occupants.

CV ECM's are programed to maintain a constant CFM across a wide range of external static pressures (ESP). This functionality differs from traditional PSC or even Constant Torque (CT) ECM's. With traditional PSC and CT ECM fan motors, as ESP is increased CFM is reduced. To increase or decrease the speed of the fan motor requires a fan motor switch or a technician to wire into a different motor tap. CT ECM's provide increased efficiency over PSC motors but with no additional functionality. With a CV ECM, as changes in ESP occur the fan motor will adjust its speed to deliver the desired CFM (within its operating range). This ensures the system is delivering the airflow and capacity it was designed for.

A major benefit of the CV ECM over other fan motor types its ability to adjust airflow remotely through the iGate® 2 web portal/mobile app or directly at the unit with a communicating diagnostic service tool or thermostat. Airflow levels can be adjusted in increments of 25 CFM from the units minimum and maximum CFM range (see CV ECM configuration table for details). This functionality allows technicians to dial in airflow during start-up and commissioning via an easy to use service tool. During operation occupants may have a desire for airflow adjustments. Reducing CFM can reduce airflow sound levels and increase cooling dehumidification (latent capacity). Technicians can easily make these adjustments without making wiring changes reducing service time with minimal disruption to the occupants.

The fan motor operating modes include:

- First Stage Cooling (Y1 & O)
- Second Stage Cooling (Y1, Y2, & O)
- First Stage Heating (Y1)
- Second Stage Heating (Y1 & Y2)
- Fan (G with no Y1, Y2, or W)

The CV ECM motor includes “soft start” and “ramp down” features. The soft start feature gently increases the motors rpm at blower start up resulting quieter blower start cycles. Likewise, the ramp down feature allows the blower to slowly decrease rpm to a full stop resulting in a quieter end to each blower cycle. The ramp down feature (also known as the heating or cooling “Off Delay”) also has the functionality to be field selected by the technician in the allowable range of 0 to 255 seconds.



**Airflow Configuration  
Screen on Mobile App**

## Blower Performance Data

**Table 11: Tranquility® 22 (TZ) Series CV 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	0.75	1/2	Default	750	575	650	500	750	575	350	750
			Maximum	850	650	800	600	850	850	850	850
			Minimum	600	450	600	450	600	450	300	650
030	0.5	1/2	Default	950	650	800	575	950	650	450	950
			Maximum	1100	750	1000	700	1100	1100	1100	1100
			Minimum	750	525	750	525	750	525	375	750
036	0.6	1/2	Default	1125	750	975	650	1125	750	525	1125
			Maximum	1250	950	1200	800	1250	1250	1250	1250
			Minimum	900	600	900	600	900	600	450	900
042	0.6	3/4	Default	1300	925	1125	825	1300	925	600	1300
			Maximum	1475	1100	1400	1000	1475	1475	1475	1475
			Minimum	1050	750	1050	750	1050	750	525	1050
048	0.75	3/4	Default	1500	1125	1300	975	1500	1125	700	1500
			Maximum	1700	1300	1600	1200	1700	1700	1700	1700
			Minimum	1200	900	1200	900	1200	900	600	1350
060	0.75	1	Default	1875	1500	1625	1300	1875	1500	875	1875
			Maximum	2100	1700	2000	1600	2100	2100	2100	2100
			Minimum	1500	1200	1500	1200	1500	1200	750	1500

Airflow is controlled within 5% up to the Max ESP shown with wet coil  
 Factory shipped on default CFM

## Controls – DXM2.5



### **DXM2.5 CONTROLS**

For detailed control information, see the DXM2.5 Application, Operation, and Maintenance (AOM) manual (part # 97B0142N01).

# Operating & Commissioning Limits

## 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 AHRI standard 110.

Determination of operating limits is dependent primarily upon three factors: 1) return air temperature. 2) water temperature, and 3) ambient temperature. When any one of these factors is at minimum or maximum levels, the other two factors should be at normal levels to 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 9a for operating limits.

**Table 12a: Building Operating Limits**

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

## COMMISSIONING LIMITS

Consult Table 9b for commissioning limits. Starting limits vary depending upon model and are based upon the following notes:

### NOTES:

1. Limits in Table 9b 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: Building Commissioning Limits**

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



## Unit & System Checkout

### **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 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 9a and 9b.
- Low water temperature cutout:** Verify that low water temperature cut-out on the DXM2.5 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 DXM2.5 field selection options are properly set. Low voltage wiring is complete.
- Blower CFM and Water  $\Omega$ T 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 4).
- 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.

# Unit Start-Up Procedure

## 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 %).

MANUAL OPERATING MODE			
Y1	COMM	OUTPUT	OFF
Y2	COMM	OUTPUT	OFF
W	COMM	OUTPUT	OFF
O	COMM	OUTPUT	OFF
G	COMM	OUTPUT	OFF
H	COMM	OUTPUT	OFF
DH	COMM	OUTPUT	OFF
ECM	AIRFLOW		0
PUMP	SPEED		0%
TEST	MODE		OFF
SELECT OPTION ▲ ▼			
◀ PREVIOUS			SELECT ■

- 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 DXM2.5 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.
- 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.

INSTALLER SETTINGS	
<b>THERMOSTAT CONFIG</b>	
SYSTEM CONFIG	
ACCESSORY CONFIG	
INPUT DEALER INFO	
HUMIDITY CONFIG	
TEMPERATURE CONTROL	
DEMAND REDUCTION CNFG	
SERVICE MODE	
SETPOINT LIMITS	
RESTORE DEFAULTS	
DXM2.5	3.3
AWC99U01	C 1.0
SELECT OPTION ▲ ▼	
◀ PREVIOUS	

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

- 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 DXM2.5 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).**

SERVICE MODE	
<b>MANUAL OPERATION</b>	
CONTROL DIAGNOSTICS	
DIPSWITCH CONFIG	
FAULT HISTORY	
CLEAR FAULT HISTORY	
SELECT OPTION ▲ ▼	
◀ PREVIOUS	
SELECT ■	

## Unit Start-Up Procedure, Cont'd.

Water Flow, gpm (l/m)	Drop, Heating °F
<b>For Closed Loop:</b> Ground Source or Closed Loop Systems at 3 gpm per ton (3.9 l/m per kw)	4 - 8
<b>For Open Loop:</b> 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.
- d. 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:

$$HR = TD \times GPM \times 500 \text{ (or 485 for anti-freeze solutions),}$$

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 10.



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:

$$HE = TD \times GPM \times 500 \text{ (or 485 for anti-freeze solutions),}$$

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 10.

If performance during any mode appears abnormal, refer to the DXM2.5 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: TZ Coax Water Pressure Drop**

Model	GPM	Pressure Drop (psi)			
		30°F*	50°F	70°F	90°F
<b>024 Rev B</b>	2.5	0.8	0.3	0.2	0.2
	3.0	1.2	0.6	0.5	0.5
	3.8	1.8	1.1	0.9	0.8
	4.5	2.7	1.6	1.2	1.2
	6.0	3.9	2.8	2.2	2.0
<b>030</b>	3.0	1.7	0.9	0.8	0.8
	3.8	2.3	1.2	1.1	1.1
	4.5	2.7	1.6	1.4	1.4
	6.0	3.8	2.4	2.2	2.1
	7.5	5.1	3.5	3.1	2.9
<b>036 Rev B</b>	4.0	0.6	0.1	0.1	0.1
	6.0	1.8	1.0	0.7	0.7
	6.8	2.3	1.5	1.1	1.1
	8.0	3.2	2.2	1.8	1.7
	9.0	4.0	2.9	2.4	2.3
<b>042</b>	3.8	1.7	1.0	0.9	0.9
	5.3	2.7	1.8	1.6	1.5
	7.5	4.5	3.1	2.8	2.6
	7.9	4.8	3.4	3.1	2.9
	10.5	7.4	5.4	4.9	4.7
<b>048</b>	4.5	1.4	1.1	0.9	0.8
	6.0	2.0	1.7	1.4	1.3
	6.8	2.5	2.1	1.8	1.7
	9.0	4.0	3.4	3.0	2.7
	12.0	6.5	5.5	4.9	4.5
<b>060 Rev B</b>	6.0	1.2	0.9	0.8	0.8
	<b>7.5</b>	2.1	1.7	1.5	1.4
	9.0	3.1	2.5	2.3	2.2
	12.0	5.4	4.6	4.2	3.9
	15.0	8.1	7.0	6.4	6.1

\* Based on 15% methanol antifreeze solution

**Table 14: Water Temperature Change Through Heat Exchanger**

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

**Table 15: Antifreeze Correction**

Antifreeze Type	Antifreeze %	Cooling			WPD Corr. Fct. EWT 40°F
		EWT 40°F			
		Total Cap	Sens Cap	Power	
<b>Propylene Glycol</b>	15	0.968	0.968	0.990	1.210
	25	0.947	0.947	0.983	1.360
<b>Methanol</b>	15	0.968	0.968	0.990	1.160
	25	0.949	0.949	0.984	1.220
<b>Ethanol</b>	15	0.944	0.944	0.983	1.300
	25	0.917	0.917	0.974	1.360
<b>Ethylene Glycol</b>	15	0.980	0.980	0.994	1.120
	25	0.966	0.966	0.990	1.200

## Unit Operating Conditions, Cont'd.

**Table 16: TZ 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 Drop °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							67-77	305-325	6-11	6-11	8.0-10.0	19-25
	2.25							72-82	310-330	6-11	7-12	5.9-7.9	19-25
	3							77-87	314-334	6-11	7-12	3.8-5.8	19-25
50	1.5	127-137	244-264	9-14	13-18	20.6-22.6	19-25	98-108	346-366	9-14	8-13	11.1-13.1	26-32
	2.25	125-135	240-160	10-15	11-16	15.6-17.6	19-25	104-114	350-370	9-14	7-12	8.1-10.1	26-32
	3	124-134	237-257	11-16	8-13	11.4-13.4	19-25	111-121	355-375	9-14	6-11	5.2-7.2	27-33
70	1.5	132-142	322-342	8-13	14-19	20-22	18-24	129-139	384-404	11-16	10-15	14.4-16.4	32-38
	2.25	131-141	325-345	9-14	12-17	14.8-16.8	18-24	137-147	390-410	11-16	7-12	10.5-12.5	33-39
	3	130-140	329-349	9-14	10-15	9.6-11.6	18-24	145-155	397-417	11-16	6-11	6.5-8.5	34-40
90	1.5	140-150	410-430	6-11	15-20	19.9-21.9	17-23	162-172	421-441	14-19	8-13	17.5-19.5	39-45
	2.25	139-149	427-447	6-11	13-18	14.6-16.6	17-23	170-180	430-450	14-19	8-13	12.7-14.7	39-45
	3	138-148	444-464	7-12	11-16	9.4-11.4	17-23	178-188	440-460	14-19	8-13	9-11	41-47
110	1.5	144-154	490-510	5-10	16-21	19.8-21.8	16-22						
	2.25	143-153	500-520	5-10	14-19	14.45-16.45	16-22						
	3	143-153	513-533	5-10	13-18	9-11	16-22						

\*Based on 15% Methanol antifreeze solution

030		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							65-75	311-331	9-14	9-14	8.0-10.0	19-24
	2.25							67-77	315-335	9-14	9-14	6.2-8.2	20-25
	3							72-82	319-339	9-14	9-14	4.3-6.3	21-26
50	1.5	122-132	240-260	10-15	11-16	19.5-21.5	18-23	95-105	353-373	11-16	10-15	10.5-12.5	26-31
	2.25	121-131	213-233	11-16	9-14	15.0-17.0	19-24	100-110	358-378	11-16	10-15	8.2-10.2	26-31
	3	121-131	186-206	11-16	7-12	10.3-12.3	19-24	105-115	362-382	12-17	10-15	5.8-7.8	27-32
70	1.5	122-132	316-336	9-14	12-17	18.8-20.8	17-22	124-134	390-410	13-18	10-15	13.5-15.5	33-38
	2.25	121-131	298-318	9-14	11-16	14.3-16.3	17-22	130-140	398-418	14-19	9-14	10.5-12.5	33-38
	3	121-131	280-300	9-14	9-14	9.8-11.8	17-22	137-147	405-425	15-20	9-14	7.5-9.5	34-39
90	1.5	133-143	438-458	8-13	14-19	17.8-19.8	15-20	156-166	430-450	16-21	8-13	16.5-18.5	37-42
	2.25	133-143	420-440	8-13	13-18	13.5-15.5	15-20	163-173	459-479	17-22	8-13	12.8-14.8	37-42
	3	132-142	401-421	8-13	11-16	9.2-11.2	15-20	170-180	448-468	18-23	8-13	9.0-11.0	40-45
110	1.5	137-147	507-527	6-11	16-21	17.2-19.2	15-20						
	2.25	136-146	490-510	7-12	14-19	13.0-15.0	15-20						
	3	135-145	473-493	7-12	13-18	8.8-10.8	15-20						

\*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 Drop °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							60-70	315-335	6-11	11-16	10.0-12.0	18-23
	2.25							65-75	319-339	6-11	11-16	6.7-8.7	19-24
	3							70-80	325-345	6-11	11-16	3.4-5.4	20-25
50	1.5	123-133	232-252	11-16	12-17	19.9-21.9	19-24	88-98	353-373	9-14	14-19	13.2-15.2	24-29
	2.25	122-132	232-252	12-17	10-15	14.3-16.3	19-24	96-106	361-381	10-15	14-19	9.0-11.0	25-30
	3	121-131	232-252	13-18	7-12	9.6-11.6	19-24	105-115	370-390	10-15	14-19	4.8-6.8	26-31
70	1.5	128-138	310-330	10-15	11-16	19-21	18-23	116-126	390-410	11-16	15-20	17.0-19.0	29-34
	2.25	124-134	290-310	10-15	10-15	14.1-16.1	18-23	128-138	406-426	12-17	15-20	11.6-13.6	31-36
	3	119-129	270-290	11-16	8-13	9.2-11.2	18-23	139-149	419-439	14-19	15-20	6.1-8.1	32-37
90	1.5	135-145	420-440	7-12	11-16	18.1-20.1	17-22	148-158	436-456	14-19	15-20	20.9-22.9	35-40
	2.25	134-144	410-430	8-13	9-14	13.4-15.4	17-22	160-170	451-471	16-21	15-20	14.2-16.2	37-42
	3	132-142	390-410	8-13	8-13	8.7-10.7	17-22	173-183	466-486	17-22	15-20	7.4-9.4	39-44
110	1.5	139-149	490-510	6-11	10-15	17.8-19.8	16-21						
	2.25	138-148	480-500	6-11	9-14	13.2-15.2	16-21						
	3	137-147	470-490	6-11	8-13	8.6-10.6	16-21						

\*Based on 15% Methanol antifreeze solution

# Unit Operating Conditions, Cont'd.

**Table 16, Cont'd.: TZ Series Typical Unit Operating Pressures and Temperatures**

042		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							64-74	314-334	6-11	9-14	8.0-10.0	20-25
	2.25							67-77	317-337	6-11	9-14	6.0-8.0	20-25
	3							71-81	321-341	7-12	9-14	4.0-6.0	21-26
50	1.5	121-131	230-250	10-15	10-15	20.5-22.5	22-27	95-105	351-371	8-13	9-14	10.7-12.7	26-31
	2.25	120-130	200-240	11-16	8-13	15.2-17.2	22-27	100-110	356-376	9-14	9-14	8.1-10.1	27-32
	3	120-130	164-184	11-16	6-11	9.8-11.8	22-27	104-114	361-381	10-15	9-14	5.4-7.4	27-32
70	1.5	127-137	305-325	8-13	10-15	19.8-21.8	20-25	124-134	386-406	11-16	8-13	13.8-15.8	32-37
	2.25	125-135	290-310	9-13	9-14	14.7-16.7	21-26	131-141	390-410	12-17	8-13	10.4-12.4	33-37
	3	125-135	263-283	10-15	7-12	9.5-11.5	21-26	138-148	400-420	13-18	7-12	7.0-9.0	34-39
90	1.5	133-143	426-446	7-12	11-16	19-21	19-24	157-167	423-443	13-18	5-10	16.8-18.8	38-43
	2.25	132-142	406-426	7-12	9-14	14-16	19-24	164-174	432-452	15-20	5-10	12.7-14.7	40-45
	3	132-142	390-410	7-12	8-13	9-11	19-24	172-182	441-461	16-21	5-10	8.5-10.5	41-46
110	1.5	137-147	494-514	5-10	11-16	18-20	18-23						
	2.25	136-146	477-497	6-11	10-15	14-16	18-23						
	3	136-146	460-480	6-11	8-13	9-11	18-23						

\*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 Drop °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							61-71	290-310	9-14	5-10	7.7-9.7	18-23
	2.25							64-74	293-313	9-14	5-10	5.7-7.7	18-23
	3							68-78	296-316	10-15	5-10	3.7-5.7	18-23
50	1.5	124-134	250-270	11-16	13-18	20.1-22.1	19-24	88-98	319-339	11-16	6-11	10.3-12.3	24-29
	2.25	123-133	212-232	12-17	10-15	14.8-16.8	19-24	94-104	324-344	11-16	6-11	7.8-9.8	25-30
	3	121-131	173-193	13-18	7-12	9.5-11.5	19-24	100-110	330-350	12-17	6-11	5.3-7.3	25-30
70	1.5	129-139	334-354	9-14	16-21	19.6-21.6	18-23	117-127	349-369	13-18	5-10	13.4-15.4	29-34
	2.25	128-138	309-329	10-15	13-18	14.4-16.4	18-23	125-135	357-377	14-19	5-10	10.2-12.2	30-35
	3	127-137	284-304	10-15	10-15	9.3-11.3	18-23	133-143	365-385	15-20	4-11	6.9-8.9	31-36
90	1.5	135-145	470-490	7-12	20-25	18.9-20.9	16-21	150-160	384-404	15-20	3-8	16.6-18.6	35-40
	2.25	134-144	446-466	7-12	17-22	13.8-15.8	16-21	158-168	391-411	16-21	2-7	12.6-14.6	36-41
	3	132-142	422-442	8-13	15-20	8.8-10.8	16-21	166-176	399-419	17-22	2-7	8.5-10.5	37-42
110	1.5	138-148	548-568	6-11	22-27	18.6-20.6	15-20						
	2.25	138-148	526-546	6-11	19-24	13.6-15.6	15-20						
	3	137-147	505-525	6-11	17-22	8.6-10.6	15-20						

\*Based on 15% Methanol antifreeze solution

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 Drop °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							64-74	309-329	7-12	10-15	8.4-10.4	19-24
	2.25							68-78	313-333	7-12	10-15	6.0-8.0	20-25
	3							71-81	317-337	8-13	10-15	3.6-5.6	20-25
50	1.5	120-130	225-245	9-14	13-18	21.8-23.8	20-25	94-104	343-363	9-14	12-18	11.3-13.3	25-30
	2.25	120-130	222-242	9-14	10-15	14.7-16.7	20-25	100-110	350-270	10-15	11-16	8.2-10.2	26-31
	3	118-128	220-240	9-14	9-14	8.7-10.7	20-25	105-115	356-376	10-15	10-15	5.0-8.0	26-31
70	1.5	124-134	300-320	8-13	14-19	19.9-21.9	19-24	122-132	377-397	11-16	9-14	14.2-16.2	31-36
	2.25	124-134	278-298	8-13	11-16	14.1-16.1	19-24	130-140	386-406	12-17	8-13	10.3-12.3	31-36
	3	123-133	256-276	8-13	9-14	8.3-10.3	19-24	137-147	394-414	13-18	7-12	6.5-8.5	33-38
90	1.5	130-140	420-440	7-12	16-21	19.0-21.0	17-22	155-165	412-432	14-19	6-11	17.2-19.2	36-41
	2.25	129-139	400-420	7-12	12-17	13.4-15.4	17-22	165-175	423-443	15-20	5-10	12.6-14.6	37-42
	3	129-139	390-410	7-12	9-14	7.9-9.9	17-22	175-185	423-443	16-21	4-9	7.9-9.9	39-44
110	1.5	133-143	495-515	6-11	16-21	18.5-20.5	16-21						
	2.25	132-142	475-495	6-11	13-18	13.1-15.1	16-21						
	3	132-142	454-474	6-11	9-14	7.6-9.6	16-21						

\*Based on 15% Methanol antifreeze solution

# Performance Data – Model 024 Part Load with vFlow®

Performance capacities shown in thousands of Btu/h

Cooling - EAT 80/67°F												Heating - EAT 70°F										
EWT °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	1.2	0.3	0.7	480	22.0	13.9	0.68	32.4	24.3	60.0	0.9	5.0	3.7	8.4	480	10.6	1.16	2.7	6.7	90.5	17.3	2.0
	1.2	0.3	0.7	600	22.4	15.2	0.71	31.6	24.9	60.0	0.9	5.0	3.7	8.4	600	10.9	1.12	2.8	7.0	86.7	17.2	1.9
30	1.7	0.3	0.6	480	22.0	13.9	0.68	32.4	24.3	60.0	0.9	2.5	0.8	1.9	480	12.2	1.18	3.0	8.1	93.5	23.5	2.0
	1.7	0.3	0.6	600	22.4	15.2	0.71	31.6	24.9	60.0	0.9	2.5	0.8	1.9	600	12.4	1.14	3.2	8.5	89.2	23.2	1.9
	1.7	0.3	0.6	480	22.0	13.9	0.68	32.4	24.3	60.0	0.9	3.8	1.8	4.2	480	12.7	1.19	3.1	8.7	94.5	25.4	2.0
	1.7	0.3	0.6	600	22.4	15.2	0.71	31.6	24.9	60.0	0.9	3.8	1.8	4.2	600	13.0	1.15	3.3	9.1	90.0	25.2	1.9
	1.7	0.3	0.6	480	22.0	13.9	0.68	32.4	24.3	60.0	0.9	5.0	2.9	6.7	480	13.0	1.19	3.2	9.0	95.1	26.4	2.1
	1.7	0.3	0.6	600	22.4	15.2	0.71	31.6	24.9	60.0	0.9	5.0	2.9	6.7	600	13.3	1.15	3.4	9.4	90.5	26.3	2.0
40	2.5	0.5	1.2	480	22.0	13.9	0.68	32.4	24.3	60.0	0.9	2.5	0.5	1.2	480	14.5	1.21	3.5	10.3	97.9	31.7	2.1
	2.5	0.5	1.2	600	22.4	15.2	0.71	31.6	24.9	60.0	0.9	2.5	0.5	1.2	600	14.8	1.17	3.7	10.8	92.8	31.4	2.0
	2.5	0.5	1.2	480	22.0	13.9	0.68	32.4	24.3	60.0	0.9	3.8	1.4	3.2	480	15.2	1.22	3.6	11.0	99.3	34.1	2.2
	2.5	0.5	1.2	600	22.4	15.2	0.71	31.6	24.9	60.0	0.9	3.8	1.4	3.2	600	15.5	1.18	3.8	11.5	93.9	33.9	2.1
	2.5	0.5	1.2	480	22.0	13.9	0.68	32.4	24.3	60.0	0.9	5.0	2.4	5.4	480	15.6	1.22	3.7	11.4	100.0	35.4	2.2
	2.5	0.5	1.2	600	22.4	15.2	0.71	31.6	24.9	60.0	0.9	5.0	2.4	5.4	600	15.9	1.18	3.9	11.9	94.5	35.2	2.1
50	2.5	0.3	0.8	480	21.3	13.6	0.76	27.8	23.9	69.1	1.1	2.5	0.3	0.8	480	16.8	1.23	4.0	12.6	102.4	39.9	2.3
	2.5	0.3	0.8	600	21.7	14.8	0.80	27.1	24.4	69.6	1.1	2.5	0.3	0.8	600	17.2	1.19	4.2	13.1	96.5	39.5	2.2
	3.8	1.1	2.5	480	21.8	13.8	0.71	30.8	24.2	62.9	0.9	3.8	1.1	2.6	480	17.7	1.24	4.2	13.4	104.1	42.8	2.3
	3.8	1.1	2.5	600	22.2	15.1	0.74	30.0	24.7	63.2	0.9	3.8	1.1	2.6	600	18.0	1.20	4.4	13.9	97.8	42.6	2.2
	5.0	2.0	4.5	480	22.0	13.9	0.68	32.4	24.3	60.0	0.9	5.0	2.0	4.5	480	18.1	1.25	4.2	13.9	105.0	44.4	2.4
	5.0	2.0	4.5	600	22.4	15.2	0.71	31.6	24.9	60.0	0.9	5.0	2.0	4.5	600	18.5	1.21	4.5	14.4	98.6	44.2	2.3
60	2.5	0.3	0.6	480	20.4	13.2	0.88	23.3	23.4	78.7	1.6	2.5	0.3	0.6	480	19.1	1.26	4.4	14.8	106.8	48.2	2.4
	2.5	0.3	0.6	600	20.9	14.4	0.92	22.7	24.0	79.2	1.6	2.5	0.3	0.6	600	19.5	1.22	4.7	15.3	100.1	47.7	2.3
	3.8	0.9	2.2	480	21.0	13.4	0.80	26.2	23.7	72.7	1.3	3.8	0.9	2.2	480	20.0	1.27	4.6	15.7	108.6	51.6	2.5
	3.8	0.9	2.2	600	21.4	14.7	0.84	25.5	24.3	73.0	1.3	3.8	0.9	2.2	600	20.4	1.23	4.9	16.2	101.5	51.3	2.4
	5.0	1.7	3.9	480	21.3	13.6	0.76	27.8	23.9	69.5	1.1	5.0	1.7	3.9	480	20.5	1.28	4.7	16.1	109.6	53.5	2.6
	5.0	1.7	3.9	600	21.7	14.8	0.80	27.1	24.4	69.8	1.1	5.0	1.7	3.9	600	20.9	1.24	5.0	16.7	102.3	53.3	2.5
70	2.5	0.2	0.6	480	19.5	12.7	1.01	19.2	22.9	88.3	2.1	2.5	0.2	0.6	480	21.2	1.29	4.8	16.8	110.9	56.6	2.6
	2.5	0.2	0.6	600	19.9	13.9	1.06	18.7	23.5	88.8	2.2	2.5	0.2	0.6	600	21.6	1.25	5.1	17.4	103.4	56.1	2.5
	3.8	0.9	2.0	480	20.1	13.0	0.92	21.9	23.2	82.4	1.8	3.8	0.9	2.0	480	22.1	1.30	5.0	17.6	112.6	60.6	2.8
	3.8	0.9	2.0	600	20.5	14.2	0.96	21.4	23.8	82.7	1.8	3.8	0.9	2.0	600	22.6	1.26	5.2	18.3	104.8	60.3	2.7
	5.0	1.6	3.6	480	20.4	13.1	0.88	23.2	23.4	79.4	1.6	5.0	1.6	3.6	480	22.5	1.31	5.0	18.1	113.5	62.8	2.8
	5.0	1.6	3.6	600	20.8	14.3	0.92	22.6	24.0	79.6	1.6	5.0	1.6	3.6	600	23.0	1.27	5.3	18.7	105.5	62.5	2.7
80	2.5	0.3	0.6	480	18.3	12.3	1.18	15.6	22.3	97.9	2.9	2.5	0.3	0.6	480	22.9	1.32	5.1	18.4	114.3	65.3	2.9
	2.5	0.3	0.6	600	18.7	13.4	1.23	15.2	22.9	98.3	3.0	2.5	0.3	0.6	600	23.4	1.28	5.4	19.1	106.2	64.8	2.8
	3.8	0.8	1.9	480	19.1	12.5	1.07	17.8	22.7	92.1	2.4	3.8	0.8	1.9	480	23.7	1.35	5.2	19.1	115.7	69.8	3.1
	3.8	0.8	1.9	600	19.4	13.7	1.12	17.4	23.3	92.4	2.5	3.8	0.8	1.9	600	24.2	1.30	5.5	19.7	103.4	69.5	3.0
	5.0	1.5	3.4	480	19.1	12.6	1.06	18.0	22.7	89.1	2.1	4.0	0.9	2.1	480	23.7	1.35	5.2	19.2	115.8	70.0	3.1
	5.0	1.5	3.4	600	19.5	13.7	1.11	17.6	23.3	91.8	2.2	4.0	0.9	2.1	600	24.2	1.30	5.5	19.8	107.4	70.0	3.0
90	2.5	0.3	0.7	480	17.1	11.8	1.36	12.6	21.7	107.4	3.9	2.0	0.2	0.5	480	23.7	1.35	5.2	19.2	115.8	70.0	3.1
	2.5	0.3	0.7	600	18.2	13.2	1.30	14.0	22.7	107.8	3.4	2.0	0.2	0.5	600	24.2	1.30	5.5	19.8	107.4	70.0	3.0
	3.8	0.8	1.9	480	17.9	12.1	1.24	14.4	22.1	101.8	3.3	2.0	0.2	0.5	480	23.7	1.35	5.2	19.2	115.8	70.0	3.1
	3.8	0.8	1.9	600	18.2	13.2	1.30	14.0	22.7	102.1	3.4	2.0	0.2	0.5	600	24.2	1.30	5.5	19.8	107.4	70.0	3.0
	5.0	1.4	3.3	480	18.2	12.2	1.18	15.4	22.3	98.9	3.0	2.0	0.2	0.5	480	23.7	1.35	5.2	19.2	115.8	70.0	3.1
	5.0	1.4	3.3	600	18.6	13.3	1.24	15.0	22.8	99.1	3.1	2.0	0.2	0.5	600	24.2	1.30	5.5	19.8	107.4	70.0	3.0
100	2.5	0.3	0.7	480	15.7	11.4	1.57	10.0	21.0	116.8	5.1	1.3	0.2	0.5	480	23.7	1.35	5.2	19.2	115.8	70.0	3.1
	2.5	0.3	0.7	600	16.0	12.4	1.64	9.7	21.6	117.3	5.2	1.3	0.2	0.5	600	24.2	1.30	5.5	19.8	107.4	70.0	3.0
	3.8	0.8	1.9	480	16.5	11.6	1.44	11.4	21.4	111.4	4.3	1.3	0.2	0.5	480	23.7	1.35	5.2	19.2	115.8	70.0	3.1
	3.8	0.8	1.9	600	16.9	12.7	1.51	11.2	22.0	111.7	4.4	1.3	0.2	0.5	600	24.2	1.30	5.5	19.8	107.4	70.0	3.0
	5.0	1.4	3.2	480	16.9	11.8	1.39	12.2	21.7	108.7	4.0	1.3	0.2	0.5	480	23.7	1.35	5.2	19.2	115.8	70.0	3.1
	5.0	1.4	3.2	600	17.3	12.8	1.45	11.9	22.2	108.9	4.1	1.3	0.2	0.5	600	24.2	1.30	5.5	19.8	107.4	70.0	3.0
110	2.5	0.3	0.6	480	14.1	10.9	1.81	7.8	20.3	126.2	6.3	1.0	0.1	0.2	480	23.7	1.35	5.2	19.2	115.8	70.0	3.1
	2.5	0.3	0.6	600	14.4	11.9	1.89	7.6	20.8	126.7	6.5	1.0	0.1	0.2	600	24.2	1.30	5.5	19.8	107.4	70.0	3.0
	3.8	0.8	1.8	480	15.0	11.2	1.67	9.0	20.7	121.0	5.6	1.0	0.1	0.2	480	23.7	1.35	5.2	19.2	115.8	70.0	3.1
	3.8	0.8	1.8	600	15.3	12.2	1.75	8.7	21.3	121.3	5.7	1.0	0.1	0.2	600	24.2	1.30	5.5	19.8	107.4	70.0	3.0
	5.0	1.4	3.1	480	15.5	11.3	1.60	9.6	20.9	118.4	5.2	1.0	0.1	0.2	480	23.7	1.35	5.2	19.2	115.8	70.0	3.1
	5.0	1.4	3.1	600	15.8	12.3	1.68	9.4	21.5	118.6	5.3	1.0	0.1	0.2	600	24.2	1.30	5.5	19.8	107.4	70.0	3.0
120	2.5	0.1	0.3	480	12.4	10.3	2.06	6.0	19.4	135.5	7.8	0.8	0.1	0.2	480	23.7	1.35	5.2	19.2	115.8	70.0	3.1
	2.5	0.1	0.3	600	12.6	11.3	2.16	5.8	20.0	136.0	8.0	0.8	0.1	0.2	600	24.2	1.30	5.5	19.8	107.4	70.0	3.0
	3.8	0.7	1.5	480	13.3	10.6	1.92	6.9	19.9	130.6	7.0	0.8	0.1	0.2	480	23.7	1.35	5.2	19.2	115.8	70.0	3.1
	3.8	0.7	1.5	600	13.6	11.6	2.01	6.8	20.5	130.9	7.2	0.8	0.1	0.2	600	24.2	1.30	5.5	19.8	107.4		

# Performance Data – Model 024 Full Load with vFlow®

Performance capacities shown in thousands of Btu/h

Cooling - EAT 80/67°F												Heating - EAT 70°F										
EWT °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	1.7	0.7	1.5	600	28.6	17.6	1.11	25.8	32.4	60.0	1.3	6.0	4.8	11.1	600	15.4	1.55	2.9	10.2	93.8	16.6	2.4
	1.7	0.7	1.5	750	29.3	19.2	1.18	24.8	33.3	60.0	1.3	6.0	4.8	11.1	750	15.7	1.49	3.1	10.6	89.4	16.5	2.3
30	2.2	0.6	1.4	600	28.6	17.6	1.11	25.8	32.4	60.0	1.3	3.0	1.2	2.7	600	17.1	1.59	3.2	11.7	96.4	22.2	2.5
	2.2	0.6	1.4	750	29.3	19.2	1.18	24.8	33.3	60.0	1.3	3.0	1.2	2.7	750	17.4	1.53	3.3	12.2	91.5	21.9	2.4
	2.2	0.6	1.4	600	28.6	17.6	1.11	25.8	32.4	60.0	1.3	4.5	2.4	5.6	600	17.9	1.62	3.2	12.4	97.7	24.5	2.6
	2.2	0.6	1.4	750	29.3	19.2	1.18	24.8	33.3	60.0	1.3	4.5	2.4	5.6	750	18.2	1.56	3.4	12.9	92.5	24.3	2.5
	2.2	0.6	1.4	600	28.6	17.6	1.11	25.8	32.4	60.0	1.3	6.0	3.9	9.1	600	18.4	1.63	3.3	12.8	98.4	25.7	2.6
	2.2	0.6	1.4	750	29.3	19.2	1.18	24.8	33.3	60.0	1.3	6.0	3.9	9.1	750	18.7	1.57	3.5	13.3	93.1	25.6	2.5
40	3.0	0.8	1.9	600	28.4	17.5	1.13	25.2	32.2	61.5	1.4	3.0	0.8	1.9	600	20.0	1.67	3.5	14.3	100.8	30.5	2.7
	3.0	0.8	1.9	750	29.1	19.1	1.20	24.2	33.2	62.1	1.4	3.0	0.8	1.9	750	20.3	1.61	3.7	14.8	95.1	30.1	2.6
	3.3	1.0	2.4	600	28.6	17.6	1.11	25.8	32.4	60.0	1.3	4.5	1.9	4.5	600	21.0	1.70	3.6	15.2	102.5	33.2	2.8
	3.3	1.0	2.4	750	29.3	19.2	1.18	24.8	33.3	60.0	1.3	4.5	1.9	4.5	750	21.4	1.63	3.8	15.8	96.4	33.0	2.7
	3.3	1.0	2.4	600	28.6	17.6	1.11	25.8	32.4	60.0	1.3	6.0	3.3	7.6	600	21.6	1.72	3.7	15.8	103.3	34.7	2.9
	3.3	1.0	2.4	750	29.3	19.2	1.18	24.8	33.3	60.0	1.3	6.0	3.3	7.6	750	22.0	1.65	3.9	16.4	97.1	34.5	2.8
50	3.0	0.6	1.4	600	27.4	17.2	1.24	22.1	31.6	71.1	1.7	3.0	0.6	1.4	600	23.0	1.75	3.9	17.0	105.5	38.7	3.0
	3.0	0.6	1.4	750	28.1	18.7	1.32	21.3	32.6	71.7	1.8	3.0	0.6	1.4	750	23.4	1.68	4.1	17.6	98.9	38.2	2.9
	4.5	1.6	3.7	600	28.1	17.5	1.15	24.3	32.1	64.2	1.5	4.5	1.6	3.7	600	24.2	1.78	4.0	18.2	107.4	41.9	3.1
	4.5	1.6	3.7	750	28.8	19.0	1.23	23.4	33.0	64.7	1.5	4.5	1.6	3.7	750	24.6	1.71	4.2	18.8	100.4	41.6	3.0
	6.0	2.8	6.4	600	28.5	17.6	1.12	25.5	32.3	60.8	1.3	6.0	2.8	6.5	600	24.9	1.80	4.1	18.8	108.4	43.7	3.2
	6.0	2.8	6.4	750	29.2	19.1	1.19	24.5	33.2	61.1	1.3	6.0	2.8	6.5	750	25.3	1.73	4.3	19.4	101.3	43.5	3.1
60	3.0	0.5	1.2	600	26.4	16.7	1.36	19.4	31.0	80.7	2.3	3.0	0.5	1.2	600	25.9	1.82	4.2	19.7	110.0	46.9	3.3
	3.0	0.5	1.2	750	27.0	18.2	1.45	18.6	32.0	81.3	2.4	3.0	0.5	1.2	750	26.4	1.75	4.4	20.4	102.6	46.4	3.2
	4.5	1.4	3.2	600	27.1	17.0	1.27	21.4	31.4	74.0	1.9	4.5	1.4	3.2	600	27.3	1.86	4.3	20.9	112.1	50.7	3.5
	4.5	1.4	3.2	750	27.8	18.5	1.35	20.6	32.4	74.4	2.0	4.5	1.4	3.2	750	27.7	1.79	4.5	21.6	104.2	50.4	3.4
	6.0	2.5	5.7	600	27.5	17.2	1.23	22.3	31.7	70.6	1.7	6.0	2.5	5.7	600	28.0	1.88	4.4	21.6	113.2	52.8	3.5
	6.0	2.5	5.7	750	28.2	18.7	1.31	21.5	32.6	70.9	1.8	6.0	2.5	5.7	750	28.5	1.81	4.6	22.3	105.1	52.6	3.4
70	3.0	0.5	1.1	600	25.2	16.2	1.52	16.6	30.4	90.3	3.0	3.0	0.5	1.1	600	28.6	1.90	4.4	22.2	114.2	55.2	3.6
	3.0	0.5	1.1	750	25.8	17.7	1.62	15.9	31.4	90.9	3.1	3.0	0.5	1.1	750	29.1	1.83	4.7	22.9	106.0	54.7	3.5
	4.5	1.2	2.9	600	26.0	16.6	1.41	18.5	30.8	83.7	2.5	4.5	1.2	2.9	600	29.9	1.96	4.5	23.3	116.2	59.7	3.8
	4.5	1.2	2.9	750	26.7	18.0	1.50	17.8	31.8	84.1	2.6	4.5	1.2	2.9	750	30.5	1.88	4.7	24.1	107.6	59.3	3.7
	6.0	2.2	5.2	600	26.4	16.7	1.35	19.5	31.0	80.3	2.3	6.0	2.2	5.2	600	30.6	1.98	4.5	23.8	117.2	62.1	3.9
	6.0	2.2	5.2	750	27.1	18.2	1.44	18.8	32.0	80.7	2.4	6.0	2.2	5.2	750	31.1	1.90	4.8	24.6	108.4	61.8	3.8
80	3.0	0.5	1.1	600	23.9	15.8	1.72	13.9	29.8	99.8	3.9	3.0	0.5	1.1	600	30.9	1.99	4.6	24.2	117.8	63.9	4.0
	3.0	0.5	1.1	750	24.5	17.1	1.83	13.4	30.7	100.5	4.0	3.0	0.5	1.1	750	31.5	1.91	4.8	25.0	108.9	63.4	3.9
	4.5	1.2	2.7	600	24.8	16.1	1.58	15.7	30.2	93.4	3.3	4.5	1.2	2.7	600	32.0	2.05	4.6	25.0	119.3	68.9	4.3
	4.5	1.2	2.7	750	25.4	17.5	1.68	15.1	31.2	93.8	3.4	4.5	1.2	2.7	750	32.5	1.97	4.8	25.8	110.1	68.5	4.2
	6.0	2.1	4.9	600	25.3	16.3	1.51	16.7	30.4	90.1	3.0	5.2	1.6	3.7	600	32.2	2.06	4.6	25.2	119.7	70.0	4.3
	6.0	2.1	4.9	750	25.9	17.7	1.61	16.1	31.4	90.5	3.1	5.2	1.6	3.7	750	32.8	1.98	4.8	26.0	110.4	70.0	4.2
90	3.0	0.5	1.1	600	22.4	15.2	1.99	11.2	29.1	109.4	4.8	2.6	0.3	0.8	600	32.2	2.06	4.6	25.2	119.7	70.0	4.3
	3.0	0.5	1.1	750	24.0	17.0	1.92	12.5	30.6	110.1	4.3	2.6	0.3	0.8	750	32.8	1.98	4.8	26.0	110.4	70.0	4.2
	4.5	1.2	2.7	600	23.4	15.6	1.80	13.0	29.6	103.1	4.2	2.6	0.3	0.8	600	32.2	2.06	4.6	25.2	119.7	70.0	4.3
	4.5	1.2	2.7	750	24.0	17.0	1.92	12.5	30.6	103.6	4.3	2.6	0.3	0.8	750	32.8	1.98	4.8	26.0	110.4	70.0	4.2
	6.0	2.0	4.7	600	23.9	15.8	1.72	13.9	29.8	99.9	3.8	2.6	0.3	0.8	600	32.2	2.06	4.6	25.2	119.7	70.0	4.3
	6.0	2.0	4.7	750	24.5	17.2	1.83	13.4	30.8	100.3	3.9	2.6	0.3	0.8	750	32.8	1.98	4.8	26.0	110.4	70.0	4.2
100	3.0	0.5	1.1	600	20.5	14.7	2.34	8.8	28.5	119.0	5.9	1.7	0.2	0.5	600	32.2	2.06	4.6	25.2	119.7	70.0	4.3
	3.0	0.5	1.1	750	21.0	16.0	2.49	8.4	29.5	119.7	6.1	1.7	0.2	0.5	750	32.8	1.98	4.8	26.0	110.4	70.0	4.2
	4.5	1.2	2.7	600	21.8	15.1	2.09	10.4	28.9	112.9	5.1	1.7	0.2	0.5	600	32.2	2.06	4.6	25.2	119.7	70.0	4.3
	4.5	1.2	2.7	750	22.3	16.4	2.23	10.0	29.9	113.3	5.3	1.7	0.2	0.5	750	32.8	1.98	4.8	26.0	110.4	70.0	4.2
	6.0	2.0	4.6	600	22.4	15.2	1.99	11.2	29.2	109.7	4.8	1.7	0.2	0.5	600	32.2	2.06	4.6	25.2	119.7	70.0	4.3
	6.0	2.0	4.6	750	22.9	16.6	2.12	10.8	30.1	110.0	5.0	1.7	0.2	0.5	750	32.8	1.98	4.8	26.0	110.4	70.0	4.2
110	3.0	0.5	1.0	600	18.3	14.0	2.79	6.6	27.9	128.6	7.2	1.3	0.1	0.2	600	32.2	2.06	4.6	25.2	119.7	70.0	4.3
	3.0	0.5	1.0	750	18.8	15.2	2.97	6.3	28.9	129.3	7.4	1.3	0.1	0.2	750	32.8	1.98	4.8	26.0	110.4	70.0	4.2
	4.5	1.1	2.5	600	19.8	14.4	2.49	8.0	28.3	122.6	6.3	1.3	0.1	0.2	600	32.2	2.06	4.6	25.2	119.7	70.0	4.3
	4.5	1.1	2.5	750	20.3	15.7	2.65	7.7	29.3	123.0	6.5	1.3	0.1	0.2	750	32.8	1.98	4.8	26.0	110.4	70.0	4.2
	6.0	1.9	4.4	600	20.5	14.7	2.35	8.7	28.5	119.5	5.9	1.3	0.1	0.2	600	32.2	2.06	4.6	25.2	119.7	70.0	4.3
	6.0	1.9	4.4	750	21.0	16.0	2.50	8.4	29.5	119.8	6.1	1.3	0.1	0.2	750	32.8	1.98	4.8	26.0	110.4	70.0	4.2
120	3.0	0.3	0.8	600	15.8	13.0	3.36	4.7	27.2	138.2	8.5	1.0	0.1	0.2	600	32.2	2.06	4.6	25.2	119.7	70.0	4.3
	3.0	0.3	0.8	750	16.2	14.1	3.58	4.5	28.4	138.9	8.8	1.0	0.1	0.2	750	32.8	1.98	4.8	26.0	110.4	70.0	4.2
	4.5	1.0	2.3	600	17.5	13.7	2.98	5.9	27.6	132.3	7.7	1.0	0.1	0.2	600	32.2	2.06	4.6	25.2	119.7	70.0	4.3
	4.5	1.0	2.3	750	17.9	14.9	3.17	5.6	28.7	132.8	7.9	1.0	0.1	0.2	750	32.8	1.98	4.8	26.0			



# Performance Data – Model 030 Part Load with vFlow®

Performance capacities shown in thousands of Btu/h

Cooling - EAT 80/67°F												Heating - EAT 70°F																				
EWT °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	1.5	1.2	2.8	600	26.0	16.0	0.9	28.3	29.1	60.0	1.0	6.0	4.3	9.9	600	15.4	1.5	2.9	10.1	94	16.6	2.1										
	1.5	1.2	2.8	750	26.5	17.4	1.0	27.6	29.8	60.0	1.0	6.0	4.3	9.9	750	15.7	1.5	3.1	10.6	89	16.5	2.1										
30	2.0	1.0	2.4	600	26.0	16.0	0.9	28.3	29.1	60.0	1.0	3.0	1.7	4.0	600	16.8	1.6	3.1	11.5	96	22.4	2.2										
	2.0	1.0	2.4	750	26.5	17.4	1.0	27.6	29.8	60.0	1.0	3.0	1.7	4.0	750	17.2	1.5	3.3	12.0	91	22.0	2.1										
	2.0	1.0	2.4	600	26.0	16.0	0.9	28.3	29.1	60.0	1.0	4.5	2.7	6.3	600	17.4	1.6	3.2	12.1	97	24.6	2.2										
	2.0	1.0	2.4	750	26.5	17.4	1.0	27.6	29.8	60.0	1.0	4.5	2.7	6.3	750	17.8	1.5	3.4	12.6	92	24.4	2.2										
	2.0	1.0	2.4	600	26.0	16.0	0.9	28.3	29.1	60.0	1.0	6.0	3.8	8.9	600	17.8	1.6	3.3	12.4	97	25.9	2.3										
	2.0	1.0	2.4	750	26.5	17.4	1.0	27.6	29.8	60.0	1.0	6.0	3.8	8.9	750	18.2	1.5	3.5	13.0	92	25.7	2.2										
40	3.0	1.2	2.8	600	26.0	16.0	0.9	28.3	29.1	60.0	1.0	3.0	1.3	3.0	600	19.1	1.6	3.5	13.6	99	30.9	2.3										
	3.0	1.2	2.8	750	26.5	17.4	1.0	27.6	29.8	60.0	1.0	3.0	1.3	3.0	750	19.5	1.5	3.7	14.2	94	30.5	2.3										
	3.0	1.2	2.8	600	26.0	16.0	0.9	28.3	29.1	60.0	1.0	4.5	2.2	5.0	600	19.8	1.6	3.6	14.3	101	33.6	2.4										
	3.0	1.2	2.8	750	26.5	17.4	1.0	27.6	29.8	60.0	1.0	4.5	2.2	5.0	750	20.3	1.6	3.8	14.9	95	33.4	2.3										
	3.0	1.2	2.8	600	26.0	16.0	0.9	28.3	29.1	60.0	1.0	6.0	3.1	7.3	600	20.2	1.6	3.7	14.7	101	35.1	2.4										
	3.0	1.2	2.8	750	26.5	17.4	1.0	27.6	29.8	60.0	1.0	6.0	3.1	7.3	750	20.7	1.6	3.9	15.3	96	34.9	2.4										
50	3.0	0.9	2.0	600	25.1	15.7	1.0	24.3	28.7	69.1	1.3	3.0	0.9	2.0	600	21.4	1.6	3.8	15.8	103	39.5	2.5										
	3.0	0.9	2.0	750	25.7	17.1	1.1	23.6	29.1	69.6	1.3	3.0	0.9	2.0	750	21.8	1.6	4.0	16.4	97	39.1	2.4										
	4.5	1.6	3.6	600	25.7	15.9	1.0	27.0	29.0	62.9	1.1	4.5	1.6	3.6	600	22.3	1.7	3.9	16.6	104	42.6	2.6										
	4.5	1.6	3.6	750	26.3	17.3	1.0	26.3	29.7	63.2	1.1	4.5	1.6	3.6	750	22.7	1.6	4.2	17.3	98	42.3	2.5										
	6.0	2.4	5.5	600	26.0	16.0	0.9	28.3	29.1	60.0	1.0	6.0	2.4	5.6	600	22.7	1.7	4.0	17.1	105	44.3	2.6										
	6.0	2.4	5.5	750	26.5	17.4	1.0	27.6	29.8	60.0	1.0	6.0	2.4	5.6	750	23.2	1.6	4.2	17.7	99	44.1	2.6										
60	3.0	0.8	1.9	600	24.1	15.2	1.2	20.4	28.1	78.7	1.8	3.0	0.8	1.9	600	23.7	1.7	4.1	18.0	107	48.0	2.7										
	3.0	0.8	1.9	750	24.6	16.6	1.2	19.9	28.8	79.2	1.8	3.0	0.8	1.9	750	24.2	1.6	4.4	18.6	100	47.6	2.6										
	4.5	1.5	3.4	600	24.8	15.5	1.1	22.9	28.5	72.7	1.4	4.5	1.5	3.4	600	24.7	1.7	4.3	18.9	108	51.6	2.8										
	4.5	1.5	3.4	750	25.3	16.9	1.1	22.3	29.2	73.0	1.5	4.5	1.5	3.4	750	25.2	1.6	4.5	19.6	101	51.3	2.7										
	6.0	2.3	5.3	600	25.1	15.6	1.0	24.2	28.7	69.6	1.3	6.0	2.3	5.3	600	25.3	1.7	4.3	19.4	109	53.5	2.9										
	6.0	2.3	5.3	750	25.6	17.1	1.1	23.6	29.4	69.8	1.3	6.0	2.3	5.3	750	25.8	1.7	4.6	20.2	102	53.3	2.8										
70	3.0	0.8	1.8	600	22.9	14.8	1.3	17.1	27.5	88.3	2.4	3.0	0.8	1.8	600	26.0	1.7	4.4	20.1	110	56.6	2.9										
	3.0	0.8	1.8	750	23.4	16.1	1.4	16.7	28.2	88.8	2.5	3.0	0.8	1.8	750	26.6	1.7	4.7	20.9	103	56.1	2.9										
	4.5	1.4	3.2	600	23.7	15.1	1.2	19.2	27.9	82.4	2.0	4.5	1.4	3.2	600	27.2	1.7	4.6	21.2	112	60.6	3.1										
	4.5	1.4	3.2	750	24.2	16.4	1.3	18.7	28.6	82.7	2.0	4.5	1.4	3.2	750	27.7	1.7	4.8	22.0	104	60.2	3.0										
	6.0	2.2	5.0	600	24.1	15.2	1.2	20.3	28.1	79.4	1.8	6.0	2.2	5.0	600	27.8	1.8	4.7	21.8	113	62.7	3.1										
	6.0	2.2	5.0	750	24.5	16.6	1.2	19.8	28.8	79.6	1.8	6.0	2.2	5.0	750	28.4	1.7	4.9	22.6	105	62.5	3.0										
80	3.0	0.8	1.8	600	21.6	14.2	1.5	14.2	26.8	97.9	3.2	3.0	0.8	1.8	600	28.4	1.8	4.7	22.4	114	65.1	3.2										
	3.0	0.8	1.8	750	22.1	15.5	1.6	13.9	27.5	98.3	3.3	3.0	0.8	1.8	750	29.0	1.7	5.0	23.2	106	64.6	3.1										
	4.5	1.4	3.2	600	22.4	14.6	1.4	15.9	27.2	92.1	2.7	4.5	1.4	3.2	600	29.6	1.8	4.9	23.6	116	69.5	3.3										
	4.5	1.4	3.2	750	22.9	15.9	1.5	15.5	27.9	92.4	2.8	4.5	1.4	3.2	750	30.2	1.7	5.2	24.4	107	69.2	3.2										
	6.0	2.1	4.9	600	22.8	14.7	1.4	16.9	27.4	89.1	2.5	4.9	1.6	3.6	600	29.9	1.8	4.9	23.8	116	70.0	3.3										
	6.0	2.1	4.9	750	23.3	16.1	1.4	16.5	28.1	89.4	2.5	4.9	1.6	3.6	750	30.5	1.7	5.2	24.6	108	70.0	3.2										
90	3.0	0.8	1.8	600	20.3	13.7	1.7	11.8	26.2	107.4	4.2	2.5	0.6	1.5	600	29.9	1.8	4.9	23.8	116	70.0	3.3										
	3.0	0.8	1.8	750	21.5	15.3	1.7	12.9	27.2	107.9	3.7	2.5	0.6	1.5	750	30.5	1.7	5.2	24.6	108	70.0	3.2										
	4.5	1.4	3.2	600	21.1	14.0	1.6	13.2	26.5	101.8	3.6	2.5	0.6	1.5	600	29.9	1.8	4.9	23.8	116	70.0	3.3										
	4.5	1.4	3.2	750	21.5	15.3	1.7	12.9	27.2	102.1	3.7	2.5	0.6	1.5	750	30.5	1.7	5.2	24.6	108	70.0	3.2										
	6.0	2.1	4.8	600	21.5	14.2	1.5	14.0	26.7	98.9	3.3	2.5	0.6	1.5	600	29.9	1.8	4.9	23.8	116	70.0	3.3										
	6.0	2.1	4.8	750	21.9	15.5	1.6	13.6	27.4	99.1	3.4	2.5	0.6	1.5	750	30.5	1.7	5.2	24.6	108	70.0	3.2										
100	3.0	0.7	1.7	600	18.9	13.1	1.9	9.8	25.6	117.0	5.3	1.6	0.4	0.9	600	29.9	1.8	4.9	23.8	116	70.0	3.3										
	3.0	0.7	1.7	750	19.3	14.3	2.0	9.5	26.3	117.5	5.5	1.6	0.4	0.9	750	30.5	1.7	5.2	24.6	108	70.0	3.2										
	4.5	1.3	3.0	600	19.7	13.4	1.8	10.9	25.9	111.5	4.6	1.6	0.4	0.9	600	29.9	1.8	4.9	23.8	116	70.0	3.3										
	4.5	1.3	3.0	750	20.1	14.7	1.9	10.6	26.6	111.8	4.8	1.6	0.4	0.9	750	30.5	1.7	5.2	24.6	108	70.0	3.2										
	6.0	2.0	4.6	600	20.1	13.6	1.7	11.5	26.1	108.7	4.3	1.6	0.4	0.9	600	29.9	1.8	4.9	23.8	116	70.0	3.3										
	6.0	2.0	4.6	750	20.5	14.8	1.8	11.3	26.8	108.9	4.4	1.6	0.4	0.9	750	30.5	1.7	5.2	24.6	108	70.0	3.2										
110	3.0	0.7	1.5	600	17.7	12.6	2.2	8.1	25.1	126.7	6.7	1.2	0.2	0.6	600	29.9	1.8	4.9	23.8	116	70.0	3.3										
	3.0	0.7	1.5	750	18.0	13.7	2.3	7.9	25.8	127.2	6.8	1.2	0.2	0.6	750	30.5	1.7	5.2	24.6	108	70.0	3.2										
	4.5	1.2	2.8	600	18.4	12.9	2.0	9.0	25.4	121.3	5.9	1.2	0.2	0.6	600	29.9	1.8	4.9	23.8	116	70.0	3.3										
	4.5	1.2	2.8	750	18.8	14.0	2.1	8.8	26.1	121.6	6.0	1.2	0.2	0.6	750	30.5	1.7	5.2	24.6	108	70.0	3.2										
	6.0	1.9	4.4	600	18.8	13.0	2.0	9.5	25.5	118.5	5.5	1.2	0.2	0.6	600	29.9	1.8	4.9	23.8	116	70.0	3.3										
	6.0	1.9	4.4	750	19.2	14.2	2.1	9.3	26.2	118.7	5.6	1.2	0.2	0.6	750	30.5	1.7	5.2	24.6	108	70.0	3.2										
120												1.0	0.1	0.2	600	29.9	1.8	4.9	23.8	116	70.0	3.3										
												1.0	0.1	0.2	750	30.5	1.7	5.2	24.6	108	70.0	3.2										
	4.5	1.1	2.6	600	17.1	12.3	2.3	7.5	25.0	131.1	7.3	1.0	0.1	0.2	600	29.9	1.8	4.9	23.8	116	70.0	3.3										
	4.5	1.1	2.6	750	17.5	13.5	2.4	7.3	25.7	131.4	7.5	1.0	0.1	0.2	750	30.5	1.7	5.2	24.6	108	70.0	3.2										
											6.0	1.8	4.1	600	17.5	12.5	2.2	7.9	25.1	128.4	6.9	1.0	0.1	0.2	600	29.9	1.8	4.9	23.8	116	70.0	3.3
											6.0	1.8	4.1	750	17.9	13.6	2.3	7.7	25.8	128.6	7.0	1.0	0.1	0.2	750	30.5	1.7	5.2	24.6	108		

# Performance Data – Model 030 Full Load with vFlow®

Performance capacities shown in thousands of Btu/h

Cooling - EAT 80/67°F												Heating - EAT 70°F																				
EWT °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	1.5	3.4	720	33.8	19.8	1.4	23.9	38.7	60.0	1.6	7.5	5.7	13.3	720	21.4	2.0	3.1	14.5	98	16.1	2.8										
	2.0	1.5	3.4	900	34.7	21.5	1.5	23.0	39.8	60.0	1.7	7.5	5.7	13.3	900	21.8	1.9	3.3	15.2	92	16.0	2.7										
30	2.7	1.4	3.2	720	33.8	19.8	1.4	23.9	38.7	60.0	1.6	3.8	2.3	5.2	720	23.1	2.1	3.3	16.1	100	21.4	2.9										
	2.7	1.4	3.2	900	34.7	21.5	1.5	23.0	39.8	60.0	1.7	3.8	2.3	5.2	900	23.5	2.0	3.5	16.7	94	21.1	2.8										
	2.7	1.4	3.2	720	33.8	19.8	1.4	23.9	38.7	60.0	1.6	5.6	3.5	8.1	720	24.0	2.1	3.4	16.9	101	24.0	3.0										
	2.7	1.4	3.2	900	34.7	21.5	1.5	23.0	39.8	60.0	1.7	5.6	3.5	8.1	900	24.5	2.0	3.6	17.6	95	23.7	2.9										
	2.7	1.4	3.2	720	33.8	19.8	1.4	23.9	38.7	60.0	1.6	7.5	5.1	11.8	720	24.6	2.1	3.4	17.3	102	25.4	3.0										
	2.7	1.4	3.2	900	34.7	21.5	1.5	23.0	39.8	60.0	1.7	7.5	5.1	11.8	900	25.0	2.0	3.6	18.0	96	25.2	2.9										
40	3.8	1.7	4.0	720	33.7	19.7	1.4	23.5	38.6	60.6	1.6	3.8	1.7	4.0	720	26.1	2.2	3.5	18.7	104	30.0	3.1										
	3.8	1.7	4.0	900	34.5	21.5	1.5	22.6	39.7	61.2	1.7	3.8	1.7	4.0	900	26.6	2.1	3.7	19.5	97	29.6	3.0										
	4.0	1.8	4.2	720	33.8	19.8	1.4	23.9	38.7	60.0	1.6	5.6	2.9	6.6	720	27.2	2.2	3.6	19.7	105	33.0	3.2										
	4.0	1.8	4.2	900	34.7	21.5	1.5	23.0	39.8	60.0	1.7	5.6	2.9	6.6	900	27.7	2.1	3.8	20.5	98	32.7	3.1										
	4.0	1.8	4.2	720	33.8	19.8	1.4	23.9	38.7	60.0	1.6	7.5	4.3	10.0	720	27.8	2.2	3.7	20.3	106	34.6	3.3										
	4.0	1.8	4.2	900	34.7	21.5	1.5	23.0	39.8	60.0	1.7	7.5	4.3	10.0	900	28.3	2.1	3.9	21.0	99	34.4	3.2										
50	3.8	1.2	2.8	720	32.7	19.3	1.6	20.8	38.0	70.3	2.2	3.8	1.2	2.8	720	29.2	2.3	3.8	21.5	108	38.5	3.4										
	3.8	1.2	2.8	900	33.5	21.0	1.7	20.0	39.2	70.9	2.2	3.8	1.2	2.8	900	29.7	2.2	4.0	22.3	101	38.1	3.3										
	5.6	2.2	5.1	720	33.4	19.6	1.5	22.7	38.4	63.7	1.8	5.6	2.2	5.1	720	30.5	2.3	3.9	22.6	109	42.0	3.6										
	5.6	2.2	5.1	900	34.2	21.4	1.6	21.8	39.6	64.1	1.8	5.6	2.2	5.1	900	31.0	2.2	4.1	23.5	102	41.7	3.5										
	7.5	3.5	8.1	720	33.8	19.8	1.4	23.7	38.6	60.3	1.6	7.5	3.5	8.1	720	31.2	2.3	3.9	23.3	110	43.8	3.6										
	7.5	3.5	8.1	900	34.6	21.5	1.5	22.8	39.8	60.6	1.7	7.5	3.5	8.1	900	31.7	2.2	4.2	24.1	103	43.6	3.5										
60	3.8	1.2	2.7	720	31.4	18.9	1.7	18.2	37.3	79.9	2.8	3.8	1.2	2.7	720	32.3	2.4	4.0	24.3	112	47.1	3.8										
	3.8	1.2	2.7	900	32.1	20.5	1.8	17.5	38.4	80.5	2.9	3.8	1.2	2.7	900	32.9	2.3	4.2	25.1	104	46.6	3.7										
	5.6	2.0	4.6	720	32.3	19.2	1.6	20.0	37.8	73.4	2.3	5.6	2.0	4.6	720	33.8	2.4	4.1	25.6	113	50.9	4.0										
	5.6	2.0	4.6	900	33.1	20.9	1.7	19.2	38.9	73.8	2.4	5.6	2.0	4.6	900	34.4	2.3	4.4	26.5	105	50.6	3.9										
	7.5	3.3	7.6	720	32.7	19.4	1.6	20.9	38.0	70.1	2.1	7.5	3.3	7.6	720	34.6	2.4	4.2	26.3	114	53.0	4.1										
	7.5	3.3	7.6	900	33.5	21.1	1.7	20.1	39.2	70.5	2.2	7.5	3.3	7.6	900	35.2	2.3	4.4	27.2	106	52.8	4.0										
70	3.8	1.1	2.5	720	29.9	18.3	1.9	15.7	36.4	89.4	3.5	3.8	1.1	2.5	720	35.4	2.5	4.2	27.0	116	55.6	4.2										
	3.8	1.1	2.5	900	30.7	19.9	2.0	15.1	37.6	90.0	3.7	3.8	1.1	2.5	900	36.0	2.4	4.5	28.0	107	55.1	4.1										
	5.6	1.9	4.5	720	30.9	18.7	1.8	17.4	37.0	83.2	3.0	5.6	1.9	4.5	720	37.0	2.5	4.3	28.5	118	59.9	4.5										
	5.6	1.9	4.5	900	31.7	20.3	1.9	16.7	38.1	83.6	3.1	5.6	1.9	4.5	900	37.7	2.4	4.6	29.4	109	59.5	4.4										
	7.5	3.1	7.2	720	31.4	18.9	1.7	18.2	37.3	79.9	2.8	7.5	3.1	7.2	720	37.9	2.5	4.4	29.2	119	62.2	4.6										
	7.5	3.1	7.2	900	32.2	20.5	1.8	17.6	38.4	80.2	2.9	7.5	3.1	7.2	900	38.6	2.4	4.6	30.2	110	61.9	4.5										
80	3.8	1.1	2.5	720	28.3	17.7	2.1	13.5	35.5	98.9	4.4	3.8	1.1	2.5	720	38.5	2.6	4.4	29.8	120	64.1	4.7										
	3.8	1.1	2.5	900	29.0	19.2	2.2	13.0	36.7	99.6	4.6	3.8	1.1	2.5	900	39.2	2.5	4.7	30.8	110	63.6	4.6										
	5.6	1.9	4.4	720	29.4	18.1	2.0	14.9	36.1	92.8	3.8	5.6	1.9	4.4	720	40.3	2.6	4.5	31.3	122	68.9	5.1										
	5.6	1.9	4.4	900	30.1	19.7	2.1	14.4	37.3	93.2	3.9	5.6	1.9	4.4	900	40.9	2.5	4.8	32.4	112	68.5	4.9										
	7.5	3.0	7.0	720	29.9	18.3	1.9	15.7	36.4	89.7	3.5	6.6	2.4	5.5	720	40.8	2.6	4.5	31.8	122	70.0	5.3										
	7.5	3.0	7.0	900	30.7	19.9	2.0	15.1	37.6	90.0	3.7	6.6	2.4	5.5	900	41.5	2.5	4.8	32.8	113	70.0	5.1										
90	3.8	1.1	2.5	720	26.7	17.0	2.3	11.4	34.6	108.5	5.4	3.3	0.9	2.0	720	40.8	2.6	4.5	31.8	122	70.0	5.3										
	3.8	1.1	2.5	900	28.4	19.0	2.3	12.2	36.4	109.1	4.9	3.3	0.9	2.0	900	41.5	2.5	4.8	32.8	113	70.0	5.1										
	5.6	1.9	4.3	720	27.8	17.4	2.2	12.7	35.2	102.5	4.7	3.3	0.9	2.0	720	40.8	2.6	4.5	31.8	122	70.0	5.3										
	5.6	1.9	4.3	900	28.4	19.0	2.3	12.2	36.4	102.9	4.9	3.3	0.9	2.0	900	41.5	2.5	4.8	32.8	113	70.0	5.1										
	7.5	2.9	6.8	720	28.3	17.6	2.1	13.4	35.5	99.5	4.4	3.3	0.9	2.0	720	40.8	2.6	4.5	31.8	122	70.0	5.3										
	7.5	2.9	6.8	900	29.0	19.2	2.2	12.9	36.7	99.8	4.6	3.3	0.9	2.0	900	41.5	2.5	4.8	32.8	113	70.0	5.1										
100	3.8	1.0	2.3	720	25.0	16.2	2.6	9.6	33.8	118.0	6.5	2.2	0.5	1.2	720	40.8	2.6	4.5	31.8	122	70.0	5.3										
	3.8	1.0	2.3	900	25.6	17.7	2.8	9.2	35.0	118.7	6.7	2.2	0.5	1.2	900	41.5	2.5	4.8	32.8	113	70.0	5.1										
	5.6	1.8	4.1	720	26.0	16.7	2.4	10.7	34.3	112.2	5.8	2.2	0.5	1.2	720	40.8	2.6	4.5	31.8	122	70.0	5.3										
	5.6	1.8	4.1	900	26.7	18.2	2.6	10.3	35.5	112.6	6.0	2.2	0.5	1.2	900	41.5	2.5	4.8	32.8	113	70.0	5.1										
	7.5	2.8	6.5	720	26.6	16.9	2.3	11.3	34.6	109.2	5.4	2.2	0.5	1.2	720	40.8	2.6	4.5	31.8	122	70.0	5.3										
	7.5	2.8	6.5	900	27.2	18.4	2.5	10.9	35.8	109.5	5.6	2.2	0.5	1.2	900	41.5	2.5	4.8	32.8	113	70.0	5.1										
110	3.8	0.9	2.2	720	23.2	15.5	2.9	8.0	33.2	127.7	7.7	1.6	0.3	0.8	720	40.8	2.6	4.5	31.8	122	70.0	5.3										
	3.8	0.9	2.2	900	23.8	16.9	3.1	7.7	34.4	128.3	8.0	1.6	0.3	0.8	900	41.5	2.5	4.8	32.8	113	70.0	5.1										
	5.6	1.7	3.9	720	24.3	16.0	2.7	8.9	33.6	121.9	7.0	1.6	0.3	0.8	720	40.8	2.6	4.5	31.8	122	70.0	5.3										
	5.6	1.7	3.9	900	24.9	17.4	2.9	8.6	34.8	122.4	7.2	1.6	0.3	0.8	900	41.5	2.5	4.8	32.8	113	70.0	5.1										
	7.5	2.7	6.2	720	24.8	16.2	2.6	9.5	33.8	119.0	6.6	1.6	0.3	0.8	720	40.8	2.6	4.5	31.8	122	70.0	5.3										
	7.5	2.7	6.2	900	25.5	17.6	2.8	9.1	35.0	119.3	6.8	1.6	0.3	0.8	900	41.5	2.5	4.8	32.8	113	70.0	5.1										
120												1.3	0.1	0.2	720	40.8	2.6	4.5	31.8	122	70.0	5.3										
												1.3	0.1	0.2	900	41.5	2.5	4.8	32.8	113	70.0	5.1										
	5.6	1.6	3.7	720	22.6	15.2	3.0	7.4	33.0	131.7	8.3	1.3	0.1	0.2	720	40.8	2.6	4.5	31.8	122	70.0	5.3										
	5.6	1.6	3.7	900	23.1	16.5	3.2	7.1	34.2	132.2	8.5	1.3	0.1	0.2	900	41.5	2.5	4.8	32.8	113	70.0	5.1										
											7.5	2.6	6.0	720	23.1	15.4	2.9	7.9	33.1	128.8	7.8	1.3	0.1	0.2	720	40.8	2.6	4.5	31.8	122	70.0	5.3
											7.5	2.6	6.0	900	23.7	16.8	3.1	7.6	34.4	129.2	8.1	1.3	0.1	0.2	900	41.5	2.5	4.8	32			

# Performance Data – Model 036 Part Load with vFlow®

Performance capacities shown in thousands of Btu/h

Cooling - EAT 80/67°F												Heating - EAT 70°F										
EWT °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	1.7	0.1	0.2	760	30.5	20.2	0.94	32.6	33.7	60.0	1.2	8.0	4.1	9.4	760	16.8	1.72	2.9	11.0	90.5	17.3	2.6
	1.7	0.1	0.2	950	31.1	22.0	0.98	31.8	34.5	60.0	1.2	8.0	4.1	9.4	950	17.2	1.66	3.0	11.5	86.8	17.1	2.5
30	2.3	0.1	0.2	760	30.5	20.2	0.94	32.6	33.7	60.0	1.2	4.0	0.6	1.3	760	18.7	1.73	3.2	12.8	92.8	23.6	2.8
	2.3	0.1	0.2	950	31.1	22.0	0.98	31.8	34.5	60.0	1.2	4.0	0.6	1.3	950	19.1	1.67	3.3	13.4	88.6	23.3	2.7
	2.3	0.1	0.2	760	30.5	20.2	0.94	32.6	33.7	60.0	1.2	6.0	1.8	4.1	760	19.4	1.73	3.3	13.5	93.6	25.5	2.8
	2.3	0.1	0.2	950	31.1	22.0	0.98	31.8	34.5	60.0	1.2	6.0	1.8	4.1	950	19.8	1.67	3.5	14.1	89.3	25.3	2.7
	2.3	0.1	0.2	760	30.5	20.2	0.94	32.6	33.7	60.0	1.2	8.0	3.2	7.5	760	19.7	1.74	3.3	13.8	94.0	26.6	2.8
	2.3	0.1	0.2	950	31.1	22.0	0.98	31.8	34.5	60.0	1.2	8.0	3.2	7.5	950	20.1	1.68	3.5	14.4	89.6	26.4	2.7
40	3.5	0.1	0.2	760	30.5	20.2	0.94	32.6	33.7	60.0	1.2	4.0	0.2	0.5	760	21.7	1.75	3.6	15.7	96.4	32.1	2.9
	3.5	0.1	0.2	950	31.1	22.0	0.98	31.8	34.5	60.0	1.2	4.0	0.2	0.5	950	22.2	1.69	3.8	16.4	91.6	31.8	2.8
	3.5	0.1	0.2	760	30.5	20.2	0.94	32.6	33.7	60.0	1.2	6.0	1.3	3.0	760	22.6	1.76	3.8	16.6	97.6	34.5	3.0
	3.5	0.1	0.2	950	31.1	22.0	0.98	31.8	34.5	60.0	1.2	6.0	1.3	3.0	950	23.1	1.70	4.0	17.3	92.5	34.2	2.9
	3.5	0.1	0.2	760	30.5	20.2	0.94	32.6	33.7	60.0	1.2	8.0	2.6	6.1	760	23.1	1.77	3.8	17.1	98.2	35.7	3.0
50	4.0	0.1	0.2	950	31.1	22.0	0.98	31.8	34.5	60.0	1.2	8.0	2.6	6.1	950	23.6	1.71	4.0	17.8	93.0	35.6	2.9
	4.0	0.1	0.2	760	29.7	20.2	1.03	28.8	33.3	66.6	1.4	4.0	0.1	0.1	760	24.9	1.78	4.1	18.8	100.4	40.6	3.1
	4.0	0.1	0.2	950	30.3	22.0	1.08	28.1	34.0	67.0	1.4	4.0	0.1	0.1	950	25.4	1.72	4.3	19.6	94.8	40.2	3.0
	6.0	1.0	2.3	760	30.4	20.2	0.96	31.8	33.6	61.2	1.2	6.0	1.0	2.3	760	26.0	1.80	4.2	19.9	101.7	43.4	3.2
	6.0	1.0	2.3	950	31.0	22.0	1.00	31.0	34.4	61.5	1.2	6.0	1.0	2.3	950	26.6	1.74	4.5	20.6	95.9	43.1	3.1
	6.9	1.5	3.5	760	30.5	20.2	0.94	32.6	33.7	60.0	1.2	8.0	2.2	5.1	760	26.6	1.80	4.3	20.5	102.4	44.9	3.3
60	6.9	1.5	3.5	950	31.1	22.0	0.98	31.8	34.5	60.0	1.2	8.0	2.2	5.1	950	27.2	1.74	4.6	21.2	96.5	44.7	3.2
	4.0	0.1	0.2	760	28.6	19.9	1.18	24.4	32.6	76.3	1.9	4.0	0.1	0.2	760	28.1	1.82	4.5	21.9	104.2	49.1	3.4
	4.0	0.1	0.2	950	29.2	21.7	1.23	23.8	33.4	76.7	1.9	4.0	0.1	0.2	950	28.7	1.76	4.8	22.7	98.0	48.7	3.3
	6.0	0.8	1.9	760	29.3	20.1	1.09	26.9	33.0	71.0	1.6	6.0	0.8	1.9	760	29.3	1.83	4.7	23.0	105.7	52.3	3.5
	6.0	0.8	1.9	950	29.9	21.9	1.14	26.2	33.8	71.3	1.6	6.0	0.8	1.9	950	29.9	1.77	4.9	23.8	99.1	52.1	3.4
70	8.0	1.9	4.5	760	29.6	20.1	1.05	28.1	33.2	68.3	1.5	8.0	1.9	4.5	760	29.9	1.84	4.8	23.6	106.4	54.1	3.5
	8.0	1.9	4.5	950	30.2	22.0	1.10	27.4	33.9	68.5	1.5	8.0	1.9	4.5	950	30.5	1.78	5.0	24.4	99.7	53.9	3.4
	4.0	0.1	0.2	760	27.5	19.3	1.36	20.3	32.1	86.1	2.5	4.0	0.1	0.2	760	30.9	1.85	4.9	24.6	107.7	57.7	3.7
	4.0	0.1	0.2	950	28.0	21.1	1.42	19.8	32.9	86.4	2.6	4.0	0.1	0.2	950	31.6	1.79	5.2	25.5	100.8	57.3	3.6
	6.0	0.7	1.7	760	28.1	19.6	1.25	22.5	32.4	80.8	2.1	6.0	0.7	1.7	760	32.0	1.87	5.0	25.6	109.0	61.5	3.8
80	6.0	0.7	1.7	950	28.7	21.4	1.31	21.9	33.2	81.1	2.2	6.0	0.7	1.7	950	32.6	1.81	5.3	26.5	101.8	61.2	3.7
	8.0	1.8	4.1	760	28.5	19.8	1.20	23.6	32.6	78.1	2.0	8.0	1.8	4.1	760	32.5	1.87	5.1	26.1	109.6	63.5	3.9
	8.0	1.8	4.1	950	29.0	21.6	1.26	23.0	33.3	78.3	2.0	8.0	1.8	4.1	950	33.2	1.81	5.4	27.0	102.3	63.3	3.8
	4.0	0.1	0.2	760	26.2	18.7	1.57	16.7	31.6	95.8	3.3	4.0	0.1	0.2	760	33.1	1.88	5.1	26.6	110.3	66.7	4.0
	4.0	0.1	0.2	950	26.8	20.4	1.64	16.3	32.3	96.2	3.4	4.0	0.1	0.2	950	33.8	1.82	5.4	27.6	102.9	66.2	3.9
90	6.0	0.7	1.6	760	26.9	19.0	1.44	18.7	31.8	90.6	2.9	5.6	0.5	1.3	760	33.6	1.88	5.2	27.2	111.0	70.0	4.1
	6.0	0.7	1.6	950	27.5	20.8	1.51	18.2	32.6	90.9	3.0	5.6	0.5	1.3	950	34.3	1.82	5.5	28.1	103.5	70.0	4.0
	8.0	1.7	4.0	760	27.3	19.2	1.39	19.5	32.0	88.0	2.6	5.6	0.5	1.3	760	33.6	1.88	5.2	27.2	111.0	70.0	4.1
	8.0	1.7	4.0	950	27.8	20.9	1.46	19.1	32.8	88.2	2.7	5.6	0.5	1.3	950	34.3	1.82	5.5	28.1	103.5	70.0	4.0
	4.0	0.1	0.1	760	24.8	18.0	1.81	13.7	31.0	105.5	4.3	2.8	0.1	0.2	760	33.6	1.88	5.2	27.2	111.0	70.0	4.1
100	4.0	0.1	0.1	950	26.1	20.0	1.75	14.9	32.1	105.9	3.9	2.8	0.1	0.2	950	34.3	1.82	5.5	28.1	103.5	70.0	4.0
	6.0	0.7	1.7	760	25.6	18.3	1.67	15.3	31.3	100.4	3.8	2.8	0.1	0.2	760	33.6	1.88	5.2	27.2	111.0	70.0	4.1
	6.0	0.7	1.7	950	26.1	20.0	1.75	14.9	32.1	100.7	3.9	2.8	0.1	0.2	950	34.3	1.82	5.5	28.1	103.5	70.0	4.0
	8.0	1.7	3.9	760	26.0	18.5	1.60	16.2	31.4	97.9	3.5	2.8	0.1	0.2	760	33.6	1.88	5.2	27.2	111.0	70.0	4.1
	8.0	1.7	3.9	950	26.5	20.2	1.68	15.8	32.2	98.1	3.6	2.8	0.1	0.2	950	34.3	1.82	5.5	28.1	103.5	70.0	4.0
110	4.0	0.1	0.2	760	23.2	17.3	2.07	11.2	30.2	115.1	5.5	1.9	0.1	0.2	760	33.6	1.88	5.2	27.2	111.0	70.0	4.1
	4.0	0.1	0.2	950	23.6	18.8	2.17	10.9	31.0	115.5	5.6	1.9	0.1	0.2	950	34.3	1.82	5.5	28.1	103.5	70.0	4.0
	6.0	0.7	1.7	760	24.0	17.6	1.93	12.5	30.6	110.2	4.8	1.9	0.1	0.2	760	33.6	1.88	5.2	27.2	111.0	70.0	4.1
	6.0	0.7	1.7	950	24.5	19.2	2.02	12.1	31.4	110.5	4.9	1.9	0.1	0.2	950	34.3	1.82	5.5	28.1	103.5	70.0	4.0
	8.0	1.7	3.9	760	24.5	17.8	1.85	13.2	30.8	107.7	4.5	1.9	0.1	0.2	760	33.6	1.88	5.2	27.2	111.0	70.0	4.1
120	8.0	1.7	3.9	950	25.0	19.4	1.94	12.9	31.6	107.9	4.6	1.9	0.1	0.2	950	34.3	1.82	5.5	28.1	103.5	70.0	4.0
	4.0	0.1	0.1	760	21.3	16.6	2.37	9.0	29.4	124.7	6.6	1.4	0.1	0.2	760	33.6	1.88	5.2	27.2	111.0	70.0	4.1
	4.0	0.1	0.1	950	21.7	18.1	2.48	8.8	30.2	125.1	6.8	1.4	0.1	0.2	950	34.3	1.82	5.5	28.1	103.5	70.0	4.0
	6.0	0.7	1.6	760	22.3	16.9	2.21	10.1	29.8	119.9	6.0	1.4	0.1	0.2	760	33.6	1.88	5.2	27.2	111.0	70.0	4.1
	6.0	0.7	1.6	950	22.7	18.5	2.31	9.8	30.6	120.2	6.2	1.4	0.1	0.2	950	34.3	1.82	5.5	28.1	103.5	70.0	4.0
120	8.0	1.7	3.9	760	22.8	17.1	2.13	10.7	30.0	117.5	5.7	1.4	0.1	0.2	760	33.6	1.88	5.2	27.2	111.0	70.0	4.1
	8.0	1.7	3.9	950	23.2	18.7	2.23	10.4	30.8	117.7	5.8	1.4	0.1	0.2	950	34.3	1.82	5.5	28.1	103.5	70.0	4.0
	4.0	0.1	0.2	760	19.1	15.9	2.69	7.1	28.3	134.2	8.1	1.1	0.1	0.2	760	33.6	1.88	5.2	27.2	111.0	70.0	4.1
	4.0	0.1	0.2	950	19.5	17.3	2.82	6.9	29.2	134.6	8.3	1.1	0.1	0.2	950	34.3	1.82	5.5	28.1	103.5	70.0	4.0
120	6.0	0.6	1.4	760	20.3	16.2	2.53	8.0	28.9	129.6	7.4	1.1	0.1	0.2	760	33.6	1.88	5.2	27.2	111.0	70.0	4.1
	6.0	0.6	1.4	950	20.7	17.7	2.65	7.8	29.7	129.9	7.6	1.1	0.1	0.2	950	34.3	1					

# Performance Data – Model 036 Full Load with vFlow®

Performance capacities shown in thousands of Btu/h

Cooling - EAT 80/67°F												Heating - EAT 70°F										
EWT °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	2.3	0.2	0.4	920	39.8	25.3	1.59	25.1	45.2	60.0	1.7	9.0	4.9	11.4	920	24.7	2.40	3.0	16.5	94.8	16.3	3.4
	2.3	0.2	0.4	1150	40.8	27.6	1.69	24.2	46.6	60.0	1.8	9.0	4.9	11.4	1150	25.1	2.31	3.2	17.2	90.2	16.2	3.3
30	3.1	0.1	0.3	920	39.8	25.3	1.59	25.1	45.2	60.0	1.7	4.5	0.8	1.9	920	26.8	2.45	3.2	18.4	97.0	21.8	3.5
	3.1	0.1	0.3	1150	40.8	27.6	1.69	24.2	46.6	60.0	1.8	4.5	0.8	1.9	1150	27.3	2.36	3.4	19.2	92.0	21.5	3.4
	3.1	0.1	0.3	920	39.8	25.3	1.59	25.1	45.2	60.0	1.7	6.8	2.3	5.4	920	27.9	2.48	3.3	19.5	98.1	24.2	3.6
	3.1	0.1	0.3	1150	40.8	27.6	1.69	24.2	46.6	60.0	1.8	6.8	2.3	5.4	1150	28.4	2.38	3.5	20.3	92.9	24.0	3.5
	3.1	0.1	0.3	920	39.8	25.3	1.59	25.1	45.2	60.0	1.7	9.0	4.0	9.3	920	28.5	2.50	3.4	20.0	98.7	25.6	3.6
	3.1	0.1	0.3	1150	40.8	27.6	1.69	24.2	46.6	60.0	1.8	9.0	4.0	9.3	1150	29.0	2.40	3.5	20.8	93.4	25.4	3.5
40	4.5	0.5	1.1	920	39.8	25.3	1.60	24.9	45.2	60.1	1.7	4.5	0.5	1.1	920	30.6	2.54	3.5	22.0	100.8	30.2	3.8
	4.5	0.5	1.1	1150	40.8	27.6	1.70	24.0	46.6	60.7	1.8	4.5	0.5	1.1	1150	31.1	2.44	3.7	22.8	95.1	29.9	3.7
	4.7	0.6	1.3	920	39.8	25.3	1.59	25.1	45.2	60.0	1.7	6.8	1.8	4.2	920	32.0	2.57	3.7	23.3	102.2	33.1	3.9
	4.7	0.6	1.3	1150	40.8	27.6	1.69	24.2	46.6	60.0	1.8	6.8	1.8	4.2	1150	32.6	2.47	3.9	24.2	92.0	32.8	3.8
	4.7	0.6	1.3	920	39.8	25.3	1.59	25.1	45.2	60.0	1.7	9.0	3.4	7.8	920	32.8	2.59	3.7	24.0	103.0	34.7	4.0
	4.7	0.6	1.3	1150	40.8	27.6	1.69	24.2	46.6	60.0	1.8	9.0	3.4	7.8	1150	33.4	2.49	3.9	24.9	96.9	34.5	3.9
50	4.5	0.2	0.5	920	39.0	25.2	1.73	22.6	44.9	70.0	2.3	4.5	0.2	0.5	920	34.6	2.63	3.9	25.7	104.9	38.6	4.2
	4.5	0.2	0.5	1150	40.8	27.4	1.84	21.7	46.2	70.6	2.4	4.5	0.2	0.5	1150	35.2	2.53	4.1	26.6	98.4	38.2	4.1
	6.8	1.5	3.3	920	39.6	25.3	1.63	24.2	45.2	63.4	1.9	6.8	1.5	3.4	920	36.3	2.66	4.0	27.2	106.6	41.9	4.3
	6.8	1.5	3.3	1150	40.6	27.5	1.74	23.3	46.5	63.8	2.0	6.8	1.5	3.4	1150	37.0	2.56	4.2	28.2	99.8	41.6	4.2
	9.0	2.9	6.7	920	39.8	25.3	1.60	24.9	45.3	60.1	1.7	9.0	2.9	6.7	920	37.3	2.69	4.1	28.1	107.5	43.8	4.4
	9.0	2.9	6.7	1150	40.8	27.6	1.70	24.0	46.6	60.4	1.8	9.0	2.9	6.7	1150	37.9	2.59	4.3	29.1	100.5	43.5	4.3
60	4.5	0.1	0.3	920	37.8	24.7	1.90	19.9	44.3	79.7	3.1	4.5	0.1	0.3	920	38.7	2.72	4.2	29.4	108.9	46.9	4.6
	4.5	0.1	0.3	1150	38.8	26.9	2.02	19.2	45.7	80.3	3.2	4.5	0.1	0.3	1150	39.3	2.62	4.4	30.4	101.7	46.5	4.5
	6.8	1.2	2.8	920	38.7	25.0	1.78	21.7	44.8	73.3	2.5	6.8	1.2	2.9	920	40.5	2.79	4.3	31.0	110.8	50.8	4.9
	6.8	1.2	2.8	1150	39.6	27.2	1.90	20.9	46.1	73.7	2.6	6.8	1.2	2.9	1150	41.2	2.68	4.5	32.1	103.2	50.5	4.8
	9.0	2.6	5.9	920	39.0	25.2	1.73	22.6	44.9	70.0	2.3	9.0	2.6	5.9	920	41.5	2.82	4.3	31.9	111.8	52.9	5.0
	9.0	2.6	5.9	1150	40.0	27.4	1.84	21.7	46.3	70.3	2.4	9.0	2.6	5.9	1150	42.2	2.71	4.6	33.0	104.0	52.7	4.9
70	4.5	0.1	0.3	920	36.4	24.1	2.10	17.3	43.6	89.4	4.1	4.5	0.1	0.3	920	42.5	2.86	4.4	32.7	112.8	55.5	5.2
	4.5	0.1	0.3	1150	37.3	26.3	2.24	16.6	44.9	90.0	4.2	4.5	0.1	0.3	1150	43.2	2.75	4.6	33.8	104.8	55.0	5.0
	6.8	1.1	2.6	920	37.4	24.6	1.96	19.1	44.1	83.1	3.4	6.8	1.1	2.6	920	44.3	2.94	4.4	34.3	114.6	59.8	5.6
	6.8	1.1	2.6	1150	38.3	26.7	2.09	18.3	45.4	83.5	3.5	6.8	1.1	2.6	1150	45.1	2.83	4.7	35.4	106.3	59.5	5.4
	9.0	2.4	5.5	920	37.9	24.7	1.90	20.0	44.3	79.9	3.0	9.0	2.4	5.5	920	45.2	2.98	4.4	35.0	115.5	62.2	5.7
	9.0	2.4	5.5	1150	38.8	26.9	2.02	19.2	45.7	80.2	3.1	9.0	2.4	5.5	1150	46.0	2.87	4.7	36.2	107.0	62.0	5.5
80	4.5	0.1	0.3	920	34.7	23.4	2.36	14.7	42.7	99.0	5.2	4.5	0.1	0.3	920	45.8	3.03	4.4	35.5	116.1	64.2	5.9
	4.5	0.1	0.3	1150	35.5	25.5	2.51	14.1	44.1	99.6	5.4	4.5	0.1	0.3	1150	46.6	2.91	4.7	36.7	107.5	63.7	5.7
	6.8	1.1	2.5	920	35.8	23.9	2.19	16.4	43.3	92.8	4.5	6.8	1.1	2.5	920	47.4	3.14	4.4	36.7	117.7	69.2	6.3
	6.8	1.1	2.5	1150	36.7	26.0	2.33	15.7	44.6	93.2	4.6	6.8	1.1	2.5	1150	48.2	3.02	4.7	37.9	108.8	68.8	6.1
	9.0	2.3	5.3	920	36.4	24.1	2.10	17.3	43.5	89.7	4.1	7.6	1.5	3.5	920	47.7	3.17	4.4	36.9	118.0	70.0	6.4
	9.0	2.3	5.3	1150	37.3	26.3	2.24	16.6	44.9	90.0	4.2	7.6	1.5	3.5	1150	48.5	3.05	4.7	38.1	109.1	70.0	6.2
90	4.5	0.2	0.4	920	32.7	22.6	2.65	12.4	41.8	108.6	6.6	3.8	0.1	0.2	920	47.7	3.17	4.4	36.9	118.0	70.0	6.4
	4.5	0.2	0.4	1150	34.8	25.2	2.61	13.3	43.7	109.2	5.9	3.8	0.1	0.2	1150	48.5	3.05	4.7	38.1	109.1	70.0	6.2
	6.8	1.1	2.5	920	34.0	23.2	2.45	13.9	42.4	102.6	5.7	3.8	0.1	0.2	920	47.7	3.17	4.4	36.9	118.0	70.0	6.4
	6.8	1.1	2.5	1150	34.8	25.2	2.61	13.3	43.7	103.0	5.9	3.8	0.1	0.2	1150	48.5	3.05	4.7	38.1	109.1	70.0	6.2
	9.0	2.3	5.2	920	34.6	23.4	2.36	14.7	42.7	99.5	5.2	3.8	0.1	0.2	920	47.7	3.17	4.4	36.9	118.0	70.0	6.4
	9.0	2.3	5.2	1150	35.5	25.5	2.51	14.1	44.0	99.8	5.4	3.8	0.1	0.2	1150	48.5	3.05	4.7	38.1	109.1	70.0	6.2
100	4.5	0.2	0.5	920	30.6	21.8	2.99	10.3	40.8	118.1	8.2	2.5	0.1	0.2	920	47.7	3.17	4.4	36.9	118.0	70.0	6.4
	4.5	0.2	0.5	1150	31.4	23.7	3.18	9.9	42.2	118.8	8.5	2.5	0.1	0.2	1150	48.5	3.05	4.7	38.1	109.1	70.0	6.2
	6.8	1.1	2.5	920	32.0	22.3	2.76	11.6	41.4	112.3	7.2	2.5	0.1	0.2	920	47.7	3.17	4.4	36.9	118.0	70.0	6.4
	6.8	1.1	2.5	1150	32.8	24.3	2.94	11.1	42.8	112.7	7.4	2.5	0.1	0.2	1150	48.5	3.05	4.7	38.1	109.1	70.0	6.2
	9.0	2.3	5.2	920	32.6	22.6	2.66	12.3	41.7	109.3	6.7	2.5	0.1	0.2	920	47.7	3.17	4.4	36.9	118.0	70.0	6.4
	9.0	2.3	5.2	1150	33.4	24.6	2.83	11.8	43.1	109.6	6.9	2.5	0.1	0.2	1150	48.5	3.05	4.7	38.1	109.1	70.0	6.2
110	4.5	0.2	0.4	920	28.4	20.9	3.38	8.4	40.0	127.8	10.1	1.9	0.1	0.2	920	47.7	3.17	4.4	36.9	118.0	70.0	6.4
	4.5	0.2	0.4	1150	29.1	22.8	3.60	8.1	41.4	128.4	10.4	1.9	0.1	0.2	1150	48.5	3.05	4.7	38.1	109.1	70.0	6.2
	6.8	1.1	2.5	920	29.8	21.5	3.13	9.5	40.5	122.0	8.9	1.9	0.1	0.2	920	47.7	3.17	4.4	36.9	118.0	70.0	6.4
	6.8	1.1	2.5	1150	30.5	23.4	3.33	9.2	41.9	122.4	9.2	1.9	0.1	0.2	1150	48.5	3.05	4.7	38.1	109.1	70.0	6.2
	9.0	2.3	5.2	920	30.5	21.7	3.01	10.1	40.8	119.1	8.3	1.9	0.1	0.2	920	47.7	3.17	4.4	36.9	118.0	70.0	6.4
	9.0	2.3	5.2	1150	31.2	23.7	3.21	9.7	42.2	119.4	8.6	1.9	0.1	0.2	1150	48.5	3.05	4.7	38.1	109.1	70.0	6.2
120												1.5	0.1	0.2	920	47.7	3.17	4.4	36.9	118.0	70.0	6.4
												1.5	0.1	0.2	1150	48.5	3.05	4.7	38.1	109.1	70.0	6.2
	6.8	1.0	2.3	920	27.5	20.6	3.56	7.7	39.7	131.8	10.9	1.5	0.1	0.2	920	47.7	3.17	4.4	36.9	118.0	70.0	6.4
	6.8	1.0	2.3	1150	28.2	22.4	3.79	7.4	41.1	132.2	11.2	1.5	0.1	0.2	1150	48.5	3.05	4.7	38.1	109.1	70.0	6.2
											1.5	0.1	0.2	920	47.7	3.17	4.4	3				

# Performance Data – Model 042 Part Load with vFlow®

Performance capacities shown in thousands of Btuh												Antifreeze use recommended in this range. Also Clip JW3 on DXM2.5 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	2.1	1.1	2.6	880	36.8	25.9	1.2	30.5	41.0	60.0	1.2	7.5	5.0	11.7	880	19.4	2.2	2.6	12.0	90	16.8	2.6
	2.1	1.1	2.6	1100	37.6	28.3	1.3	29.8	41.9	60.0	1.2	7.5	5.0	11.7	1,100	19.8	2.1	2.8	12.7	87	16.6	2.5
30	2.8	1.1	2.5	880	36.8	25.9	1.2	30.5	41.0	60.0	1.2	3.8	1.7	3.9	880	21.7	2.2	2.9	14.2	93	22.4	2.7
	2.8	1.1	2.5	1100	37.6	28.3	1.3	29.8	41.9	60.0	1.2	3.8	1.7	3.9	1,100	22.1	2.1	3.1	14.9	89	22.1	2.6
	2.8	1.1	2.5	880	36.8	25.9	1.2	30.5	41.0	60.0	1.2	5.6	2.9	6.7	880	22.6	2.2	3.0	15.1	94	24.6	2.8
	2.8	1.1	2.5	1100	37.6	28.3	1.3	29.8	41.9	60.0	1.2	5.6	2.9	6.7	1,100	23.1	2.1	3.2	15.8	89	24.4	2.7
	2.8	1.1	2.5	880	36.8	25.9	1.2	30.5	41.0	60.0	1.2	7.5	4.5	10.3	880	23.2	2.2	3.1	15.6	94	25.8	2.8
	2.8	1.1	2.5	1100	37.6	28.3	1.3	29.8	41.9	60.0	1.2	7.5	4.5	10.3	1,100	23.7	2.1	3.2	16.4	90	25.6	2.7
40	3.8	1.4	3.2	880	36.6	26.1	1.2	29.4	40.9	61.8	1.2	3.8	1.4	3.2	880	25.1	2.2	3.3	17.5	96	30.7	2.9
	3.8	1.4	3.2	1100	37.4	28.5	1.3	28.6	41.8	62.3	1.2	3.8	1.4	3.2	1,100	25.6	2.2	3.5	18.3	92	30.3	2.8
	4.2	1.6	3.7	880	36.8	25.9	1.2	30.5	41.0	60.0	1.2	5.6	2.4	5.6	880	26.3	2.2	3.4	18.6	98	33.4	3.0
	4.2	1.6	3.7	1100	37.6	28.3	1.3	29.8	41.9	60.0	1.2	5.6	2.4	5.6	1,100	26.8	2.2	3.6	19.4	93	33.1	2.9
	4.2	1.6	3.7	880	36.8	25.9	1.2	30.5	41.0	60.0	1.2	7.5	3.8	8.8	880	26.9	2.3	3.5	19.3	98	34.9	3.0
	4.2	1.6	3.7	1100	37.6	28.3	1.3	29.8	41.9	60.0	1.2	7.5	3.8	8.8	1,100	27.5	2.2	3.7	20.1	93	34.6	2.9
50	3.8	1.0	2.4	880	35.5	25.6	1.4	24.9	40.4	71.6	1.6	3.8	1.0	2.4	880	28.5	2.3	3.7	20.8	100	38.9	3.1
	3.8	1.0	2.4	1100	36.3	27.9	1.5	24.3	41.4	72.1	1.6	3.8	1.0	2.4	1,100	29.1	2.2	3.9	21.6	95	38.5	3.0
	5.6	2.0	4.5	880	36.4	26.0	1.3	28.2	40.8	64.5	1.3	5.6	2.0	4.5	880	29.9	2.3	3.8	22.1	101	42.1	3.2
	5.6	2.0	4.5	1100	37.1	28.4	1.4	27.5	41.7	64.8	1.3	5.6	2.0	4.5	1,100	30.5	2.2	4.1	23.0	96	41.8	3.1
	7.5	3.1	7.2	880	36.7	26.2	1.2	29.9	40.9	60.9	1.1	7.5	3.1	7.2	880	30.6	2.3	3.9	22.8	102	43.9	3.2
7.5	3.1	7.2	1100	37.5	28.6	1.3	29.2	41.9	61.2	1.2	7.5	3.1	7.2	1,100	31.3	2.2	4.2	23.8	96	43.7	3.1	
60	3.8	1.0	2.3	880	34.1	24.8	1.6	20.9	39.7	81.2	2.2	3.8	1.0	2.3	880	31.9	2.3	4.1	24.0	104	47.2	3.3
	3.8	1.0	2.3	1100	34.8	27.1	1.7	20.4	40.7	81.7	2.2	3.8	1.0	2.3	1,100	32.5	2.2	4.3	25.0	97	46.7	3.2
	5.6	1.8	4.2	880	35.2	25.4	1.5	23.8	40.2	74.3	1.7	5.6	1.8	4.2	880	33.4	2.3	4.2	25.5	105	50.9	3.5
	5.6	1.8	4.2	1100	35.9	27.7	1.5	23.2	41.2	74.6	1.8	5.6	1.8	4.2	1,100	34.1	2.2	4.5	26.5	99	50.6	3.4
	7.5	3.0	6.9	880	35.7	25.6	1.4	25.4	40.5	70.8	1.5	7.5	3.0	6.9	880	34.3	2.3	4.3	26.4	106	53.0	3.5
7.5	3.0	6.9	1100	36.4	28.0	1.5	24.7	41.4	71.0	1.6	7.5	3.0	6.9	1,100	35.0	2.2	4.6	27.3	99	52.7	3.4	
70	3.8	0.9	2.1	880	32.4	24.0	1.9	17.4	38.8	90.7	3.0	3.8	0.9	2.1	880	35.1	2.3	4.4	27.2	107	55.5	3.6
	3.8	0.9	2.1	1100	33.1	26.2	2.0	16.9	39.8	91.2	3.0	3.8	0.9	2.1	1,100	35.9	2.2	4.7	28.2	100	54.9	3.5
	5.6	1.7	4.0	880	33.7	24.6	1.7	19.8	39.5	84.0	2.4	5.6	1.7	4.0	880	36.8	2.3	4.6	28.9	109	59.7	3.8
	5.6	1.7	4.0	1100	34.4	26.8	1.8	19.3	40.4	84.4	2.4	5.6	1.7	4.0	1,100	37.6	2.3	4.9	29.9	102	59.4	3.6
	7.5	2.8	6.5	880	34.3	24.9	1.6	21.2	39.8	80.6	2.1	7.5	2.8	6.5	880	37.8	2.3	4.7	29.8	110	62.1	3.8
7.5	2.8	6.5	1100	35.0	27.2	1.7	20.7	40.7	80.9	2.2	7.5	2.8	6.5	1,100	38.6	2.3	5.0	30.8	102	61.8	3.7	
80	3.8	0.9	2.1	880	30.5	23.2	2.1	14.4	37.8	100.1	3.9	3.8	0.9	2.1	880	38.3	2.3	4.8	30.3	110	63.8	3.9
	3.8	0.9	2.1	1100	31.1	25.3	2.2	14.0	38.7	100.7	4.0	3.8	0.9	2.1	1,100	39.1	2.3	5.1	31.4	103	63.3	3.8
	5.6	1.7	3.9	880	31.9	23.8	1.9	16.4	38.5	93.7	3.2	5.6	1.7	3.9	880	40.1	2.4	5.0	32.1	112	68.6	4.1
	5.6	1.7	3.9	1100	32.5	25.9	2.0	16.0	39.5	94.0	3.3	5.6	1.7	3.9	1,100	41.0	2.3	5.3	33.2	104	68.2	4.0
	7.5	2.7	6.3	880	32.5	24.1	1.9	17.6	38.9	90.4	2.9	6.8	2.2	5.2	880	40.7	2.4	5.0	32.7	113	70.0	4.2
7.5	2.7	6.3	1100	33.2	26.2	1.9	17.1	39.8	90.6	3.0	6.8	2.2	5.2	1,100	41.6	2.3	5.3	33.8	105	70.0	4.1	
90	3.8	0.9	2.0	880	28.4	22.3	2.4	11.8	36.6	109.5	5.1	3.4	0.9	2.0	880	40.7	2.4	5.0	32.7	113	70.0	4.2
	3.8	0.9	2.0	1100	30.5	25.0	2.3	13.2	38.4	110.1	4.4	3.4	0.9	2.0	1,100	41.6	2.3	5.3	33.8	105	70.0	4.1
	5.6	1.6	3.8	880	29.9	22.9	2.2	13.5	37.4	103.3	4.3	3.4	0.9	2.0	880	40.7	2.4	5.0	32.7	113	70.0	4.2
	5.6	1.6	3.8	1100	30.5	25.0	2.3	13.2	38.4	103.6	4.4	3.4	0.9	2.0	1,100	41.6	2.3	5.3	33.8	105	70.0	4.1
	7.5	2.6	6.1	880	30.6	23.2	2.1	14.5	37.8	100.1	3.9	3.4	0.9	2.0	880	40.7	2.4	5.0	32.7	113	70.0	4.2
7.5	2.6	6.1	1100	31.2	25.3	2.2	14.1	38.8	100.3	4.0	3.4	0.9	2.0	1,100	41.6	2.3	5.3	33.8	105	70.0	4.1	
100	3.8	0.9	2.0	880	26.3	21.6	2.7	9.7	35.5	118.9	6.4	2.3	0.6	1.5	880	40.7	2.4	5.0	32.7	113	70.0	4.2
	3.8	0.9	2.0	1100	26.8	23.5	2.8	9.5	36.4	119.4	6.5	2.3	0.6	1.5	1,100	41.6	2.3	5.3	33.8	105	70.0	4.1
	5.6	1.6	3.6	880	27.7	22.1	2.5	11.1	36.2	112.9	5.5	2.3	0.6	1.5	880	40.7	2.4	5.0	32.7	113	70.0	4.2
	5.6	1.6	3.6	1100	28.3	24.1	2.6	10.8	37.2	113.2	5.6	2.3	0.6	1.5	1,100	41.6	2.3	5.3	33.8	105	70.0	4.1
	7.5	2.6	5.9	880	28.5	22.3	2.4	11.8	36.6	109.8	5.0	2.3	0.6	1.5	880	40.7	2.4	5.0	32.7	113	70.0	4.2
7.5	2.6	5.9	1100	29.0	24.4	2.5	11.5	37.6	110.0	5.2	2.3	0.6	1.5	1,100	41.6	2.3	5.3	33.8	105	70.0	4.1	
110	3.8	0.8	1.9	880	24.0	20.8	3.0	7.9	34.3	128.3	7.9	1.7	0.5	1.2	880	40.7	2.4	5.0	32.7	113	70.0	4.2
	3.8	0.8	1.9	1100	24.5	22.7	3.2	7.7	35.3	128.8	8.1	1.7	0.5	1.2	1,100	41.6	2.3	5.3	33.8	105	70.0	4.1
	5.6	1.5	3.5	880	25.4	21.3	2.8	9.0	35.0	122.5	6.9	1.7	0.5	1.2	880	40.7	2.4	5.0	32.7	113	70.0	4.2
	5.6	1.5	3.5	1100	26.0	23.2	2.9	8.8	36.0	122.8	7.1	1.7	0.5	1.2	1,100	41.6	2.3	5.3	33.8	105	70.0	4.1
	7.5	2.5	5.7	880	26.2	21.5	2.7	9.7	35.4	119.4	6.4	1.7	0.5	1.2	880	40.7	2.4	5.0	32.7	113	70.0	4.2
7.5	2.5	5.7	1100	26.7	23.5	2.8	9.4	36.4	119.7	6.6	1.7	0.5	1.2	1,100	41.6	2.3	5.3	33.8	105	70.0	4.1	
120												1.4	0.3	0.7	880	40.7	2.4	5.0	32.7	113	70.0	4.2
												1.4	0.3	0.7	1,100	41.6	2.3	5.3	33.8	105	70.0	4.1
	5.6	1.5	3.4	880	23.1	20.5	3.1	7.3	33.8	132.0	8.5	1.4	0.3	0.7	880	40.7	2.4	5.0	32.7	113	70.0	4.2
	5.6	1.5	3.4	1100	23.6	22.4	3.3	7.2	34.8	132.4	8.7	1.4	0.3	0.7	1,100	41.6	2.3	5.3	33.8	105	70.0	4.1
	7.5	2.4	5.5	880	23.8	20.8	3.0	7.8	34.2	129.1	7.9	1.4	0.3	0.7	880	40.7	2.4	5.0	32.7	113	70.0	4.2
	7.5	2.4	5.5	1100	24																	

# Performance Data – Model 042 Full Load with vFlow®

Performance capacities shown in thousands of Btu/h												Antifreeze use recommended in this range. Also Clip JW3 on DXM2.5 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
PSI		FT	FT	PSI										FT	FT								
20	2.8	1.5	3.4	1040	48.2	33.2	2.0	24.6	54.9	60.0	1.6	10.5	8.4	19.4	1,040	29.1	2.9	2.9	19.0	96	16.4	3.4	
	2.8	1.5	3.4	1300	49.4	36.1	2.1	23.6	56.6	60.0	1.7	10.5	8.4	19.4	1,300	29.6	2.8	3.1	19.9	91	16.2	3.3	
30	3.8	1.6	3.6	1040	48.2	33.2	2.0	24.6	54.9	60.0	1.6	5.3	2.7	6.2	1,040	31.8	3.0	3.1	21.5	98	21.8	3.6	
	3.8	1.6	3.6	1300	49.4	36.1	2.1	23.6	56.6	60.0	1.7	5.3	2.7	6.2	1,300	32.4	2.9	3.3	22.5	93	21.4	3.4	
	3.8	1.6	3.6	1040	48.2	33.2	2.0	24.6	54.9	60.0	1.6	7.9	4.8	11.1	1,040	33.1	3.0	3.2	22.8	100	24.2	3.6	
	3.8	1.6	3.6	1300	49.4	36.1	2.1	23.6	56.6	60.0	1.7	7.9	4.8	11.1	1,300	33.7	2.9	3.4	23.7	94	24.0	3.5	
	3.8	1.6	3.6	1040	48.2	33.2	2.0	24.6	54.9	60.0	1.6	10.5	7.4	17.0	1,040	33.9	3.1	3.2	23.4	100	25.5	3.7	
	3.8	1.6	3.6	1300	49.4	36.1	2.1	23.6	56.6	60.0	1.7	10.5	7.4	17.0	1,300	34.4	2.9	3.4	24.4	95	25.4	3.6	
40	5.3	1.8	4.1	1040	48.0	33.0	2.0	24.1	54.8	60.9	1.7	5.3	1.8	4.1	1,040	36.2	3.1	3.4	25.6	102	30.3	3.8	
	5.3	1.8	4.1	1300	49.2	35.9	2.1	23.2	56.4	61.5	1.8	5.3	1.8	4.1	1,300	36.9	3.0	3.6	26.6	96	29.9	3.7	
	5.7	2.2	5.1	1040	48.2	33.2	2.0	24.6	54.9	60.0	1.6	7.9	4.1	9.5	1,040	37.8	3.2	3.5	27.0	104	33.1	3.9	
	5.7	2.2	5.1	1300	49.4	36.1	2.1	23.6	56.6	60.0	1.7	7.9	4.1	9.5	1,300	38.5	3.0	3.7	28.1	97	32.9	3.8	
	5.7	2.2	5.1	1040	48.2	33.2	2.0	24.6	54.9	60.0	1.6	10.5	6.4	14.7	1,040	38.6	3.2	3.6	27.8	104	34.7	4.0	
	5.7	2.2	5.1	1300	49.4	36.1	2.1	23.6	56.6	60.0	1.7	10.5	6.4	14.7	1,300	39.3	3.1	3.8	28.9	98	34.5	3.9	
50	5.3	1.8	4.1	1040	46.6	32.2	2.2	21.4	54.0	70.6	2.2	5.3	1.8	4.1	1,040	40.6	3.2	3.7	29.6	106	38.7	4.2	
	5.3	1.8	4.1	1300	47.8	35.0	2.3	20.6	55.7	71.2	2.3	5.3	1.8	4.1	1,300	41.3	3.1	3.9	30.7	99	38.3	4.1	
	7.9	3.4	7.9	1040	47.7	32.8	2.0	23.3	54.6	63.9	1.8	7.9	3.4	7.9	1,040	42.4	3.3	3.8	31.2	108	42.1	4.4	
	7.9	3.4	7.9	1300	48.8	35.7	2.2	22.5	56.2	64.3	1.9	7.9	3.4	7.9	1,300	43.2	3.2	4.0	32.4	101	41.8	4.2	
	10.5	5.4	12.5	1040	48.1	33.1	2.0	24.3	54.9	60.5	1.7	10.5	5.4	12.5	1,040	43.4	3.3	3.8	32.1	109	43.9	4.5	
10.5	5.4	12.5	1300	49.3	36.0	2.1	23.4	56.5	60.8	1.7	10.5	5.4	12.5	1,300	44.1	3.2	4.1	33.3	101	43.7	4.3		
60	5.3	1.7	3.9	1040	45.0	31.3	2.4	18.8	53.1	80.2	2.9	5.3	1.7	3.9	1,040	45.0	3.3	3.9	33.6	110	47.2	4.6	
	5.3	1.7	3.9	1300	46.1	34.1	2.5	18.1	54.7	80.9	3.0	5.3	1.7	3.9	1,300	45.8	3.2	4.2	34.8	103	46.7	4.5	
	7.9	3.2	7.5	1040	46.1	31.9	2.2	20.6	53.8	73.7	2.4	7.9	3.2	7.5	1,040	47.0	3.4	4.0	35.4	112	51.0	4.9	
	7.9	3.2	7.5	1300	47.3	34.8	2.4	19.8	55.4	74.1	2.5	7.9	3.2	7.5	1,300	47.8	3.3	4.3	36.6	104	50.7	4.7	
	10.5	5.2	11.9	1040	46.7	32.3	2.2	21.6	54.1	70.3	2.2	10.5	5.2	11.9	1,040	48.1	3.4	4.1	36.4	113	53.1	5.0	
10.5	5.2	11.9	1300	47.9	35.1	2.3	20.7	55.7	70.6	2.3	10.5	5.2	11.9	1,300	48.9	3.3	4.3	37.6	105	52.8	4.9		
70	5.3	1.6	3.6	1040	43.1	30.4	2.6	16.3	52.1	89.8	3.7	5.3	1.6	3.6	1,040	49.3	3.5	4.2	37.5	114	55.7	5.2	
	5.3	1.6	3.6	1300	44.1	33.1	2.8	15.7	53.7	90.5	3.8	5.3	1.6	3.6	1,300	50.1	3.3	4.4	38.8	106	55.2	5.0	
	7.9	3.1	7.1	1040	44.4	31.0	2.5	18.0	52.8	83.4	3.1	7.9	3.1	7.1	1,040	51.5	3.5	4.3	39.4	116	60.0	5.5	
	7.9	3.1	7.1	1300	45.5	33.8	2.6	17.3	54.4	83.8	3.2	7.9	3.1	7.1	1,300	52.4	3.4	4.5	40.8	107	59.6	5.3	
	10.5	4.9	11.3	1040	45.0	31.4	2.4	18.9	53.2	80.1	2.9	10.5	4.9	11.3	1,040	52.6	3.6	4.3	40.5	117	62.3	5.7	
10.5	4.9	11.3	1300	46.1	34.1	2.5	18.2	54.8	80.4	3.0	10.5	4.9	11.3	1,300	53.5	3.4	4.6	41.9	108	62.0	5.5		
80	5.3	1.5	3.5	1040	41.0	29.5	2.9	14.1	50.9	99.4	4.6	5.3	1.5	3.5	1,040	53.5	3.6	4.4	41.2	118	64.3	5.8	
	5.3	1.5	3.5	1300	42.0	32.2	3.1	13.5	52.6	100.0	4.7	5.3	1.5	3.5	1,300	54.4	3.4	4.6	42.6	109	63.8	5.6	
	7.9	3.0	6.9	1040	42.4	30.1	2.7	15.6	51.7	93.1	4.0	7.9	3.0	6.9	1,040	55.8	3.7	4.5	43.3	120	69.0	6.2	
	7.9	3.0	6.9	1300	43.5	32.8	2.9	15.0	53.3	93.5	4.1	7.9	3.0	6.9	1,300	56.8	3.5	4.7	44.8	110	68.6	6.0	
	10.5	4.8	11.0	1040	43.1	30.4	2.6	16.4	52.1	89.9	3.7	9.1	3.7	8.5	1,040	56.4	3.7	4.5	43.9	120	70.0	6.3	
10.5	4.8	11.0	1300	44.2	33.1	2.8	15.8	53.7	90.2	3.8	9.1	3.7	8.5	1,300	57.4	3.5	4.8	45.4	111	70.0	6.1		
90	5.3	1.5	3.4	1040	38.7	28.7	3.2	12.0	49.7	108.9	5.6	4.5	1.2	2.8	1,040	56.4	3.7	4.5	43.9	120	70.0	6.3	
	5.3	1.5	3.4	1300	41.2	31.8	3.2	12.8	52.2	109.6	5.1	4.5	1.2	2.8	1,300	57.4	3.5	4.8	45.4	111	70.0	6.1	
	7.9	2.9	6.6	1040	40.2	29.3	3.0	13.3	50.5	102.8	4.9	4.5	1.2	2.8	1,040	56.4	3.7	4.5	43.9	120	70.0	6.3	
	7.9	2.9	6.6	1300	41.2	31.8	3.2	12.8	52.2	103.3	5.1	4.5	1.2	2.8	1,300	57.4	3.5	4.8	45.4	111	70.0	6.1	
	10.5	4.7	10.7	1040	41.0	29.5	2.9	14.1	50.9	99.7	4.6	4.5	1.2	2.8	1,040	56.4	3.7	4.5	43.9	120	70.0	6.3	
10.5	4.7	10.7	1300	42.0	32.2	3.1	13.5	52.6	100.0	4.7	4.5	1.2	2.8	1,300	57.4	3.5	4.8	45.4	111	70.0	6.1		
100	5.3	1.4	3.3	1040	36.2	27.9	3.6	10.1	48.5	118.5	6.7	3.0	0.8	1.8	1,040	56.4	3.7	4.5	43.9	120	70.0	6.3	
	5.3	1.4	3.3	1300	37.1	30.4	3.8	9.7	50.2	119.1	6.9	3.0	0.8	1.8	1,300	57.4	3.5	4.8	45.4	111	70.0	6.1	
	7.9	2.8	6.4	1040	37.8	28.4	3.4	11.3	49.3	112.5	6.0	3.0	0.8	1.8	1,040	56.4	3.7	4.5	43.9	120	70.0	6.3	
	7.9	2.8	6.4	1300	38.8	31.0	3.6	10.9	51.0	112.9	6.2	3.0	0.8	1.8	1,300	57.4	3.5	4.8	45.4	111	70.0	6.1	
	10.5	4.5	10.4	1040	38.6	28.7	3.2	11.9	49.7	109.5	5.6	3.0	0.8	1.8	1,040	56.4	3.7	4.5	43.9	120	70.0	6.3	
10.5	4.5	10.4	1300	39.6	31.2	3.4	11.5	51.4	109.8	5.8	3.0	0.8	1.8	1,300	57.4	3.5	4.8	45.4	111	70.0	6.1		
110	5.3	1.4	3.2	1040	33.6	27.2	4.0	8.4	47.3	128.0	8.0	2.3	0.6	1.3	1,040	56.4	3.7	4.5	43.9	120	70.0	6.3	
	5.3	1.4	3.2	1300	34.5	29.6	4.3	8.1	49.0	128.7	8.2	2.3	0.6	1.3	1,300	57.4	3.5	4.8	45.4	111	70.0	6.1	
	7.9	2.7	6.2	1040	35.3	27.7	3.7	9.4	48.0	122.2	7.2	2.3	0.6	1.3	1,040	56.4	3.7	4.5	43.9	120	70.0	6.3	
	7.9	2.7	6.2	1300	36.2	30.1	4.0	9.1	49.7	122.6	7.4	2.3	0.6	1.3	1,300	57.4	3.5	4.8	45.4	111	70.0	6.1	
	10.5	4.4	10.1	1040	36.1	27.9	3.6	10.0	48.4	119.2	6.8	2.3	0.6	1.3	1,040	56.4	3.7	4.5	43.9	120	70.0	6.3	
10.5	4.4	10.1	1300	37.0	30.4	3.8	9.6	50.1	119.5	7.0	2.3	0.6	1.3	1,300	57.4	3.5	4.8	45.4	111	70.0	6.1		
120												1.8	0.3	0.8	1,040	56.4	3.7	4.5	43.9	120	70.0	6.3	
												1.8	0.3	0.8	1,300	57.4	3.5	4.8	45.4	111	70.0	6.1	
	7.9	2.6	6.0	1040	32.6	26.9	4.2	7.8	46.8	131.9	8.5	1.8	0.3	0.8	1,040	56.4	3.7	4.5	43.9	120	70.0	6.3	
	7.9	2.6	6.0	1300	33.4	29.3	4.4	7.5	48.5	132.3	8.8	1.8	0.3	0.8	1,300	57.4	3.5	4.8	45.4	111	70.0	6.1	
	10.																						

# Performance Data – Model 048 Part Load with vFlow®

Performance capacities shown in thousands of Btu/h

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	FT										PSI	FT	FT								
20	2.3	0.7	1.6	1000	40.4	26.0	1.4	28.2	45.2	60.0	1.5	9.0	5.2	12.1	1,000	22.6	2.3	2.9	14.9	91	16.7	3.1		
	2.3	0.7	1.6	1250	41.2	28.3	1.5	27.5	46.3	60.0	1.5	9.0	5.2	12.1	1,250	23.0	2.2	3.1	15.6	87	16.5	3.0		
30	3.1	0.7	1.7	1000	40.4	26.0	1.4	28.2	45.2	60.0	1.5	4.5	1.4	3.2	1,000	24.8	2.3	3.2	17.0	93	22.4	3.1		
	3.1	0.7	1.7	1250	41.2	28.3	1.5	27.5	46.3	60.0	1.5	4.5	1.4	3.2	1,250	25.3	2.2	3.4	17.8	89	22.1	3.0		
	3.1	0.7	1.7	1000	40.4	26.0	1.4	28.2	45.2	60.0	1.5	6.8	2.5	5.7	1,000	25.7	2.3	3.3	17.9	94	24.7	3.1		
	3.1	0.7	1.7	1250	41.2	28.3	1.5	27.5	46.3	60.0	1.5	6.8	2.5	5.7	1,250	26.3	2.2	3.5	18.8	89	24.4	3.1		
	3.1	0.7	1.7	1000	40.4	26.0	1.4	28.2	45.2	60.0	1.5	9.0	4.0	9.2	1,000	26.2	2.3	3.4	18.5	94	25.9	3.2		
	3.1	0.7	1.7	1250	41.2	28.3	1.5	27.5	46.3	60.0	1.5	9.0	4.0	9.2	1,250	26.8	2.2	3.6	19.3	90	25.7	3.1		
40	4.5	1.2	2.8	1000	40.3	25.9	1.4	28.0	45.2	60.1	1.5	4.5	1.2	2.8	1,000	28.2	2.3	3.6	20.4	96	30.9	3.2		
	4.5	1.2	2.8	1250	41.1	28.3	1.5	27.3	46.3	60.6	1.5	4.5	1.2	2.8	1,250	28.8	2.2	3.8	21.3	91	30.5	3.1		
	4.6	1.3	2.9	1000	40.4	26.0	1.4	28.2	45.2	60.0	1.5	6.8	2.4	5.5	1,000	29.4	2.3	3.7	21.5	97	33.6	3.3		
	4.6	1.3	2.9	1250	41.2	28.3	1.5	27.5	46.3	60.0	1.5	6.8	2.4	5.5	1,250	30.0	2.2	4.0	22.4	92	33.4	3.2		
	4.6	1.3	2.9	1000	40.4	26.0	1.4	28.2	45.2	60.0	1.5	9.0	3.8	8.7	1,000	30.0	2.3	3.8	22.2	98	35.1	3.3		
	4.6	1.3	2.9	1250	41.2	28.3	1.5	27.5	46.3	60.0	1.5	9.0	3.8	8.7	1,250	30.7	2.2	4.0	23.1	93	34.9	3.2		
50	4.5	1.1	2.5	1000	39.1	25.5	1.6	23.8	44.7	69.9	2.1	4.5	1.1	2.5	1,000	31.8	2.3	4.0	23.9	99	39.4	3.4		
	4.5	1.1	2.5	1250	39.9	27.8	1.7	23.3	45.7	70.3	2.1	4.5	1.1	2.5	1,250	32.4	2.2	4.3	24.8	94	39.0	3.3		
	6.8	2.1	4.9	1000	40.0	25.8	1.5	26.7	45.1	63.4	1.7	6.8	2.1	4.9	1,000	33.1	2.3	4.2	25.2	101	42.5	3.5		
	6.8	2.1	4.9	1250	40.8	28.2	1.6	26.0	46.1	63.7	1.7	6.8	2.1	4.9	1,250	33.8	2.2	4.4	26.2	95	42.2	3.4		
	9.0	3.4	7.9	1000	40.3	25.9	1.4	28.1	45.2	60.1	1.5	9.0	3.4	7.9	1,000	33.9	2.3	4.3	26.0	101	44.2	3.5		
	9.0	3.4	7.9	1250	41.2	28.3	1.5	27.4	46.3	60.3	1.5	9.0	3.4	7.9	1,250	34.6	2.2	4.5	26.9	96	44.0	3.4		
60	4.5	1.0	2.3	1000	37.5	24.9	1.9	19.9	44.0	79.5	2.8	4.5	1.0	2.3	1,000	35.3	2.3	4.4	27.4	103	47.8	3.6		
	4.5	1.0	2.3	1250	38.3	27.2	2.0	19.4	45.1	80.0	2.9	4.5	1.0	2.3	1,250	36.1	2.3	4.7	28.4	97	47.4	3.5		
	6.8	2.0	4.6	1000	38.6	25.3	1.7	22.5	44.5	73.2	2.3	6.8	2.0	4.6	1,000	36.9	2.3	4.6	28.9	104	51.4	3.7		
	6.8	2.0	4.6	1250	39.4	27.6	1.8	22.0	45.5	73.5	2.4	6.8	2.0	4.6	1,250	37.7	2.3	4.9	29.9	98	51.1	3.6		
	9.0	3.2	7.5	1000	39.1	25.5	1.6	23.9	44.7	69.9	2.1	9.0	3.2	7.5	1,000	37.7	2.3	4.7	29.7	105	53.4	3.8		
	9.0	3.2	7.5	1250	39.9	27.9	1.7	23.3	45.8	70.2	2.1	9.0	3.2	7.5	1,250	38.5	2.3	5.0	30.8	99	53.2	3.7		
70	4.5	0.9	2.0	1000	35.7	24.1	2.2	16.4	43.2	89.2	3.8	4.5	0.9	2.0	1,000	38.8	2.3	4.8	30.8	106	56.3	3.9		
	4.5	0.9	2.0	1250	36.5	26.3	2.3	16.0	44.2	89.7	3.9	4.5	0.9	2.0	1,250	39.7	2.3	5.1	31.9	99	55.8	3.7		
	6.8	1.8	4.2	1000	37.0	24.7	2.0	18.7	43.7	83.0	3.1	6.8	1.8	4.2	1,000	40.6	2.4	5.0	32.5	108	60.4	4.0		
	6.8	1.8	4.2	1250	37.7	26.9	2.1	18.2	44.8	83.3	3.2	6.8	1.8	4.2	1,250	41.4	2.3	5.3	33.7	101	60.0	3.9		
	9.0	3.0	6.9	1000	37.6	24.9	1.9	19.9	44.0	79.8	2.8	9.0	3.0	6.9	1,000	41.5	2.4	5.2	33.5	108	62.6	4.1		
	9.0	3.0	6.9	1250	38.3	27.2	2.0	19.4	45.1	80.0	2.9	9.0	3.0	6.9	1,250	42.4	2.3	5.4	34.6	101	62.3	4.0		
80	4.5	0.9	2.0	1000	33.7	23.3	2.5	13.4	42.2	98.8	4.9	4.5	0.9	2.0	1,000	42.3	2.4	5.2	34.2	109	64.8	4.2		
	4.5	0.9	2.0	1250	34.4	25.4	2.6	13.1	43.3	99.3	5.1	4.5	0.9	2.0	1,250	43.2	2.3	5.5	35.4	102	64.3	4.0		
	6.8	1.8	4.0	1000	35.0	23.8	2.3	15.3	42.9	92.7	4.2	6.8	1.8	4.0	1,000	44.2	2.4	5.5	36.1	111	69.3	4.3		
	6.8	1.8	4.0	1250	35.8	26.0	2.4	14.9	43.9	93.0	4.3	6.8	1.8	4.0	1,250	45.1	2.3	5.8	37.3	103	68.9	4.2		
	9.0	2.9	6.7	1000	35.7	24.1	2.2	16.3	43.1	89.6	3.8	7.5	2.1	4.8	1,000	44.6	2.4	5.5	36.5	111	70.0	4.5		
	9.0	2.9	6.7	1250	36.4	26.3	2.3	15.9	44.2	89.8	3.9	7.5	2.1	4.8	1,250	45.5	2.3	5.8	37.7	104	70.0	4.3		
90	4.5	0.8	1.8	1000	31.5	22.4	2.9	11.0	41.3	108.3	6.3	3.8	0.7	1.6	1,000	44.6	2.4	5.5	36.5	111	70.0	4.5		
	4.5	0.8	1.8	1250	33.6	25.1	2.8	12.2	43.0	108.8	5.5	3.8	0.7	1.6	1,250	45.5	2.3	5.8	37.7	104	70.0	4.3		
	6.8	1.7	3.9	1000	32.9	23.0	2.6	12.5	41.9	102.4	5.4	3.8	0.7	1.6	1,000	44.6	2.4	5.5	36.5	111	70.0	4.5		
	6.8	1.7	3.9	1250	33.6	25.1	2.8	12.2	43.0	102.7	5.5	3.8	0.7	1.6	1,250	45.5	2.3	5.8	37.7	104	70.0	4.3		
	9.0	2.8	6.5	1000	33.6	23.3	2.5	13.3	42.2	99.4	5.0	3.8	0.7	1.6	1,000	44.6	2.4	5.5	36.5	111	70.0	4.5		
	9.0	2.8	6.5	1250	34.3	25.4	2.6	13.0	43.3	99.6	5.1	3.8	0.7	1.6	1,250	45.5	2.3	5.8	37.7	104	70.0	4.3		
100	4.5	0.8	1.8	1000	29.1	21.6	3.3	8.9	40.3	117.9	7.8	2.5	0.4	1.0	1,000	44.6	2.4	5.5	36.5	111	70.0	4.5		
	4.5	0.8	1.8	1250	29.7	23.5	3.4	8.7	41.4	118.4	8.0	2.5	0.4	1.0	1,250	45.5	2.3	5.8	37.7	104	70.0	4.3		
	6.8	1.6	3.7	1000	30.6	22.1	3.0	10.1	40.9	112.1	6.8	2.5	0.4	1.0	1,000	44.6	2.4	5.5	36.5	111	70.0	4.5		
	6.8	1.6	3.7	1250	31.2	24.1	3.2	9.9	42.0	112.4	7.0	2.5	0.4	1.0	1,250	45.5	2.3	5.8	37.7	104	70.0	4.3		
	9.0	2.7	6.1	1000	31.3	22.4	2.9	10.8	41.2	109.2	6.4	2.5	0.4	1.0	1,000	44.6	2.4	5.5	36.5	111	70.0	4.5		
	9.0	2.7	6.1	1250	32.0	24.4	3.0	10.5	42.3	109.4	6.5	2.5	0.4	1.0	1,250	45.5	2.3	5.8	37.7	104	70.0	4.3		
110	4.5	0.7	1.7	1000	26.7	20.7	3.7	7.3	39.3	127.5	9.6	1.9	0.3	0.7	1,000	44.6	2.4	5.5	36.5	111	70.0	4.5		
	4.5	0.7	1.7	1250	27.3	22.6	3.9	7.1	40.4	128.0	9.8	1.9	0.3	0.7	1,250	45.5	2.3	5.8	37.7	104	70.0	4.3		
	6.8	1.5	3.5	1000	28.2	21.2	3.4	8.2	39.9	121.8	8.5	1.9	0.3	0.7	1,000	44.6	2.4	5.5	36.5	111	70.0	4.5		
	6.8	1.5	3.5	1250	28.8	23.2	3.6	8.0	41.0	122.2	8.7	1.9	0.3	0.7	1,250	45.5	2.3	5.8	37.7	104	70.0	4.3		
	9.0	2.6	5.9	1000	28.9	21.5	3.3	8.8	40.2	118.9	8.0	1.9	0.3	0.7	1,000	44.6	2.4	5.5	36.5	111	70.0	4.5		
	9.0	2.6	5.9	1250	29.5	23.4	3.5	8.5	41.3	119.2	8.2	1.9	0.3	0.7	1,250	45.5	2.3	5.8	37.7	104	70.0	4.3		
120	4.5	0.7	1.7	1000	24.3	20.0	4.1	5.9	38.4	137.1	11.5	1.5	0.1	0.3	1,000	44.6	2.4	5.5	36.5	111	70.0	4.5		
	4.5	0.7	1.7	1250	24.8	21.8	4.3	5.8	39.5	137.6	11.8	1.5	0.1	0.3	1,250	45.5	2.3	5.8	37.7	104	70.0	4.3		
	6.8	1.5	3.5	1000	25.8	20.4	3.9	6.7	38.9	131.5	10.3	1.5	0.1	0.3	1,000	44.6	2.4	5.5	36.5	111	70.0	4.5		
	6.8	1.5	3.5	1250	26.3	22.3	4.0	6.5	40.1	131.9	10.6	1.5	0.1	0.3	1,250	45.5	2.3	5.8	37.7	104	70.0	4.3		
	9.0	2.5	5.9	1000	26.5	20.7	3.7	7.1	39.2	128.7	9.8	1.5	0.1	0.3	1,000	44.6	2.4	5.5	36.5	111	70.0	4.5		
	9.0	2.5</																						

# Performance Data – Model 048 Full Load with vFlow®

Performance capacities shown in thousands of Btu/h

Antifreeze use recommended in this range.  
Also Clip JW3 on DXM2.5 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	3.1	1.1	2.5	1200	52.8	33.2	2.2	23.9	60.4	60.0	2.4	12.0	7.7	17.8	1,200	31.9	3.0	3.1	21.7	95	16.4	3.6
	3.1	1.1	2.5	1500	54.1	36.1	2.4	23.0	62.2	60.0	2.5	12.0	7.7	17.8	1,500	32.4	2.9	3.3	22.6	90	16.2	3.5
30	4.1	1.2	2.8	1200	52.8	33.2	2.2	23.9	60.4	60.0	2.4	6.0	2.0	4.6	1,200	34.6	3.0	3.3	24.1	97	22.0	3.8
	4.1	1.2	2.8	1500	54.1	36.1	2.4	23.0	62.2	60.0	2.5	6.0	2.0	4.6	1,500	35.2	2.9	3.5	25.1	92	21.6	3.6
	4.1	1.2	2.8	1200	52.8	33.2	2.2	23.9	60.4	60.0	2.4	9.0	4.0	9.2	1,200	35.8	3.1	3.4	25.3	98	24.4	3.8
	4.1	1.2	2.8	1500	54.1	36.1	2.4	23.0	62.2	60.0	2.5	9.0	4.0	9.2	1,500	36.5	3.0	3.6	26.4	93	24.1	3.7
	4.1	1.2	2.8	1200	52.8	33.2	2.2	23.9	60.4	60.0	2.4	12.0	6.5	15.1	1,200	36.6	3.1	3.5	26.0	98	25.7	3.9
	4.1	1.2	2.8	1500	54.1	36.1	2.4	23.0	62.2	60.0	2.5	12.0	6.5	15.1	1,500	37.2	3.0	3.7	27.0	93	25.5	3.8
40	6.0	1.9	4.4	1200	52.8	33.1	2.2	23.7	60.4	60.1	2.5	6.0	1.9	4.4	1,200	39.1	3.1	3.6	28.3	100	30.6	4.0
	6.0	1.9	4.4	1500	54.1	36.1	2.4	22.8	62.2	60.7	2.5	6.0	1.9	4.4	1,500	39.7	3.0	3.9	29.4	95	30.2	3.9
	6.2	2.0	4.7	1200	52.8	33.2	2.2	23.9	60.4	60.0	2.4	9.0	3.8	8.7	1,200	40.7	3.2	3.8	29.8	101	33.4	4.1
	6.2	2.0	4.7	1500	54.1	36.1	2.4	23.0	62.2	60.0	2.5	9.0	3.8	8.7	1,500	41.4	3.1	4.0	30.9	96	33.1	4.0
	6.2	2.0	4.7	1200	52.8	33.2	2.2	23.9	60.4	60.0	2.4	12.0	6.0	13.9	1,200	41.5	3.2	3.8	30.6	102	34.9	4.2
	6.2	2.0	4.7	1500	54.1	36.1	2.4	23.0	62.2	60.0	2.5	12.0	6.0	13.9	1,500	42.3	3.1	4.0	31.8	96	34.7	4.1
50	6.0	1.7	4.0	1200	51.7	32.7	2.4	21.4	60.0	70.0	3.1	6.0	1.7	4.0	1,200	43.8	3.2	4.0	32.7	104	39.1	4.4
	6.0	1.7	4.0	1500	53.0	35.6	2.6	20.5	61.8	70.6	3.2	6.0	1.7	4.0	1,500	44.6	3.1	4.2	33.9	98	38.7	4.2
	9.0	3.4	7.9	1200	52.5	33.0	2.3	23.0	60.3	63.4	2.6	9.0	3.4	7.9	1,200	45.7	3.3	4.1	34.5	105	42.3	4.5
	9.0	3.4	7.9	1500	53.8	36.0	2.4	22.2	62.1	63.8	2.7	9.0	3.4	7.9	1,500	46.5	3.2	4.3	35.7	99	42.1	4.4
	12.0	5.5	12.7	1200	52.8	33.2	2.2	23.8	60.4	60.1	2.4	12.0	5.5	12.7	1,200	46.8	3.3	4.1	35.5	106	44.1	4.6
	12.0	5.5	12.7	1500	54.1	36.1	2.4	22.9	62.2	60.4	2.5	12.0	5.5	12.7	1,500	47.6	3.2	4.4	36.7	99	43.9	4.5
60	6.0	1.6	3.7	1200	50.0	32.1	2.7	18.6	59.2	79.7	3.9	6.0	1.6	3.7	1,200	48.7	3.3	4.3	37.3	108	47.6	4.7
	6.0	1.6	3.7	1500	51.3	34.9	2.9	17.9	61.0	80.3	4.0	6.0	1.6	3.7	1,500	49.5	3.2	4.5	38.5	101	47.2	4.6
	9.0	3.2	7.5	1200	51.2	32.6	2.5	20.5	59.8	73.3	3.3	9.0	3.2	7.5	1,200	50.9	3.4	4.4	39.3	109	51.3	4.9
	9.0	3.2	7.5	1500	52.5	35.4	2.7	19.7	61.6	73.7	3.4	9.0	3.2	7.5	1,500	51.8	3.3	4.7	40.7	102	51.0	4.8
	12.0	5.3	12.2	1200	51.8	32.7	2.4	21.4	60.0	70.0	3.0	12.0	5.3	12.2	1,200	52.1	3.4	4.5	40.5	110	53.3	5.0
	12.0	5.3	12.2	1500	53.0	35.6	2.6	20.6	61.8	70.3	3.1	12.0	5.3	12.2	1,500	53.0	3.3	4.7	41.8	103	53.0	4.9
70	6.0	1.4	3.3	1200	47.9	31.3	3.0	15.9	58.1	89.4	4.8	6.0	1.4	3.3	1,200	53.7	3.5	4.6	41.9	111	56.0	5.2
	6.0	1.4	3.3	1500	49.1	34.0	3.2	15.3	60.0	90.0	5.0	6.0	1.4	3.3	1,500	54.6	3.3	4.8	43.2	104	55.6	5.0
	9.0	3.0	6.9	1200	49.4	31.8	2.8	17.7	58.9	83.1	4.2	9.0	3.0	6.9	1,200	56.2	3.5	4.7	44.2	113	60.2	5.4
	9.0	3.0	6.9	1500	50.6	34.7	3.0	17.1	60.7	83.5	4.3	9.0	3.0	6.9	1,500	57.2	3.4	5.0	45.6	105	59.9	5.3
	12.0	4.9	11.3	1200	50.1	32.1	2.7	18.7	59.2	79.9	3.8	12.0	4.9	11.3	1,200	57.6	3.5	4.8	45.5	114	62.4	5.6
	12.0	4.9	11.3	1500	51.3	34.9	2.9	18.0	61.0	80.2	4.0	12.0	4.9	11.3	1,500	58.6	3.4	5.0	46.9	106	62.2	5.4
80	6.0	1.4	3.3	1200	45.4	30.3	3.4	13.3	57.0	99.0	6.0	6.0	1.4	3.3	1,200	58.6	3.6	4.8	46.5	115	64.5	5.7
	6.0	1.4	3.3	1500	46.5	33.0	3.6	12.8	58.9	99.6	6.2	6.0	1.4	3.3	1,500	59.7	3.4	5.1	47.9	107	64.0	5.5
	9.0	2.9	6.7	1200	47.1	31.0	3.1	15.0	57.8	92.8	5.2	9.0	2.9	6.7	1,200	61.4	3.6	4.9	49.0	117	69.1	6.0
	9.0	2.9	6.7	1500	48.2	33.7	3.3	14.4	59.6	93.2	5.4	9.0	2.9	6.7	1,500	62.5	3.5	5.2	50.5	109	68.8	5.8
	12.0	4.8	11.1	1200	47.9	31.3	3.0	15.9	58.1	89.7	4.8	10.2	3.6	8.3	1,200	62.1	3.7	5.0	49.6	118	70.0	6.1
	12.0	4.8	11.1	1500	49.1	34.0	3.2	15.3	60.0	90.0	5.0	10.2	3.6	8.3	1,500	63.2	3.5	5.3	51.2	109	70.0	5.9
90	6.0	1.3	3.1	1200	42.8	29.3	3.9	11.1	55.9	108.6	7.3	5.1	1.1	2.5	1,200	62.1	3.7	5.0	49.6	118	70.0	6.1
	6.0	1.3	3.1	1500	45.6	32.6	3.8	12.0	58.5	109.3	6.6	5.1	1.1	2.5	1,500	63.2	3.5	5.3	51.2	109	70.0	5.9
	9.0	2.8	6.5	1200	44.5	30.0	3.6	12.5	56.6	102.6	6.4	5.1	1.1	2.5	1,200	62.1	3.7	5.0	49.6	118	70.0	6.1
	9.0	2.8	6.5	1500	45.6	32.6	3.8	12.0	58.5	103.0	6.6	5.1	1.1	2.5	1,500	63.2	3.5	5.3	51.2	109	70.0	5.9
	12.0	4.7	10.9	1200	45.4	30.3	3.4	13.3	57.0	99.5	6.0	5.1	1.1	2.5	1,200	62.1	3.7	5.0	49.6	118	70.0	6.1
	12.0	4.7	10.9	1500	46.5	33.0	3.6	12.8	58.9	99.8	6.2	5.1	1.1	2.5	1,500	63.2	3.5	5.3	51.2	109	70.0	5.9
100	6.0	1.3	3.0	1200	40.0	28.2	4.4	9.1	55.0	118.3	8.9	3.4	0.6	1.4	1,200	62.1	3.7	5.0	49.6	118	70.0	6.1
	6.0	1.3	3.0	1500	41.0	30.7	4.7	8.8	57.0	119.0	9.2	3.4	0.6	1.4	1,500	63.2	3.5	5.3	51.2	109	70.0	5.9
	9.0	2.7	6.1	1200	41.8	28.9	4.0	10.3	55.6	112.3	7.9	3.4	0.6	1.4	1,200	62.1	3.7	5.0	49.6	118	70.0	6.1
	9.0	2.7	6.1	1500	42.8	31.5	4.3	9.9	57.5	112.8	8.1	3.4	0.6	1.4	1,500	63.2	3.5	5.3	51.2	109	70.0	5.9
	12.0	4.5	10.4	1200	42.7	29.3	3.9	11.0	55.9	109.3	7.4	3.4	0.6	1.4	1,200	62.1	3.7	5.0	49.6	118	70.0	6.1
	12.0	4.5	10.4	1500	43.7	31.8	4.1	10.6	57.8	109.6	7.6	3.4	0.6	1.4	1,500	63.2	3.5	5.3	51.2	109	70.0	5.9
110	6.0	1.2	2.8	1200	37.4	27.2	5.0	7.5	54.4	128.1	10.6	2.6	0.4	0.9	1,200	62.1	3.7	5.0	49.6	118	70.0	6.1
	6.0	1.2	2.8	1500	38.3	29.5	5.3	7.2	56.5	128.8	11.0	2.6	0.4	0.9	1,500	63.2	3.5	5.3	51.2	109	70.0	5.9
	9.0	2.6	5.9	1200	39.0	27.8	4.6	8.5	54.7	122.2	9.5	2.6	0.4	0.9	1,200	62.1	3.7	5.0	49.6	118	70.0	6.1
	9.0	2.6	5.9	1500	40.0	30.3	4.9	8.2	56.7	122.6	9.8	2.6	0.4	0.9	1,500	63.2	3.5	5.3	51.2	109	70.0	5.9
	12.0	4.4	10.1	1200	39.9	28.2	4.4	9.0	55.0	119.2	9.0	2.6	0.4	0.9	1,200	62.1	3.7	5.0	49.6	118	70.0	6.1
	12.0	4.4	10.1	1500	40.9	30.6	4.7	8.7	56.9	119.5	9.2	2.6	0.4	0.9	1,500	63.2	3.5	5.3	51.2	109	70.0	5.9
120												2.0	0.2	0.4	1,200	62.1	3.7	5.0	49.6	118	70.0	6.1
												2.0	0.2	0.4	1,500	63.2	3.5	5.3	51.2	109	70.0	5.9
												2.0	0.2	0.4	1,200	62.1	3.7	5.0	49.6	118	70.0	6.1
												2.0	0.2	0.4	1,500	63.2	3.5	5.3	51.2	109	70.0	5.9
120	12.0	4.3	10.0	1200	37.2	27.1	5.0	7.4	54.4	129.1	10.7	2.0	0.2	0.4	1,200	62.1	3.7	5.0	49.6	118	70.0	6.1
	12.0	4.3	10.0	1500	38.2	29.5	5.4	7.1	56.4	129.4	11.1	2.0	0.2	0.4	1,500	63.2	3.5	5.3	51.2	109	70.0	5.9

Interpolation is permissible; extrapolation is not. All performance is based upon the lower voltage of dual voltage rated units.  
 Flow is controlled to maintain minimum L



# Performance Data – Model 060 Part Load with vFlow®

Performance capacities shown in thousands of Btu/h

Cooling - EAT 80/67°F												Heating - EAT 70°F										
EWT °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	3.0	0.1	0.1	1280	52.6	33.4	1.59	33.2	58.0	60.0	1.5	12.0	6.0	13.8	1280	26.8	2.78	2.8	17.3	89.4	17.1	3.8
	3.0	0.1	0.1	1600	53.7	36.4	1.66	32.3	59.3	60.0	1.5	12.0	6.0	13.8	1600	27.4	2.69	3.0	18.2	85.8	17.0	3.7
30	4.0	0.2	0.5	1280	52.6	33.4	1.59	33.2	58.0	60.0	1.5	6.0	1.2	2.8	1280	29.8	2.82	3.1	20.2	91.6	23.3	3.9
	4.0	0.2	0.5	1600	53.7	36.4	1.66	32.3	59.3	60.0	1.5	6.0	1.2	2.8	1600	30.4	2.72	3.3	21.1	87.6	23.0	3.8
	4.0	0.2	0.5	1280	52.6	33.4	1.59	33.2	58.0	60.0	1.5	9.0	3.1	7.1	1280	30.9	2.84	3.2	21.2	92.3	25.3	3.9
	4.0	0.2	0.5	1600	53.7	36.4	1.66	32.3	59.3	60.0	1.5	9.0	3.1	7.1	1600	31.5	2.74	3.4	22.2	88.2	25.1	3.8
	4.0	0.2	0.5	1280	52.6	33.4	1.59	33.2	58.0	60.0	1.5	12.0	5.4	12.5	1280	31.5	2.84	3.3	21.8	92.8	26.4	3.9
	4.0	0.2	0.5	1600	53.7	36.4	1.66	32.3	59.3	60.0	1.5	12.0	5.4	12.5	1600	32.1	2.74	3.4	22.8	88.6	26.2	3.8
40	5.9	1.0	2.2	1280	52.6	33.4	1.59	33.2	58.0	60.0	1.5	6.0	1.0	2.3	1280	34.2	2.88	3.5	24.4	94.8	31.9	4.0
	5.9	1.0	2.2	1600	53.7	36.4	1.66	32.3	59.3	60.0	1.5	6.0	1.0	2.3	1600	35.0	2.78	3.7	25.5	90.2	31.5	3.9
	5.9	1.0	2.2	1280	52.6	33.4	1.59	33.2	58.0	60.0	1.5	9.0	2.8	6.4	1280	35.6	2.89	3.6	25.8	95.8	34.3	4.1
	5.9	1.0	2.2	1600	53.7	36.4	1.66	32.3	59.3	60.0	1.5	9.0	2.8	6.4	1600	36.4	2.79	3.8	26.8	91.0	34.0	4.0
	5.9	1.0	2.2	1280	52.6	33.4	1.59	33.2	58.0	60.0	1.5	12.0	4.9	11.4	1280	36.3	2.90	3.7	26.5	96.3	35.6	4.1
	5.9	1.0	2.2	1600	53.7	36.4	1.66	32.3	59.3	60.0	1.5	12.0	4.9	11.4	1600	37.1	2.80	3.9	27.6	91.5	35.4	4.0
50	6.0	0.9	2.1	1280	51.0	32.8	1.82	28.0	57.3	69.1	2.0	6.0	0.9	2.1	1280	38.8	2.92	3.9	28.9	98.1	40.4	4.2
	6.0	0.9	2.1	1600	51.0	35.7	1.91	27.3	58.6	69.5	2.0	6.0	0.9	2.1	1600	39.6	2.82	4.1	30.0	92.9	39.9	4.1
	9.0	2.5	5.8	1280	52.1	33.2	1.66	31.3	57.8	62.8	1.6	9.0	2.5	5.9	1280	40.5	2.94	4.0	30.4	99.3	43.2	4.3
	9.0	2.5	5.8	1600	53.2	36.2	1.74	30.5	59.1	63.1	1.6	9.0	2.5	5.9	1600	41.3	2.84	4.3	31.6	93.9	42.9	4.2
	12.0	4.6	10.6	1280	52.6	33.4	1.59	33.2	58.0	60.0	1.5	12.0	4.6	10.6	1280	41.4	2.95	4.1	31.3	99.9	44.8	4.3
	12.0	4.6	10.6	1600	53.7	36.4	1.66	32.3	59.3	60.0	1.5	12.0	4.6	10.6	1600	42.2	2.85	4.3	32.5	94.4	44.5	4.2
60	6.0	0.8	1.9	1280	49.3	32.1	2.08	23.7	56.4	78.8	2.6	6.0	0.8	1.9	1280	43.6	2.98	4.3	33.4	101.5	48.9	4.5
	6.0	0.8	1.9	1600	50.3	35.0	2.18	23.1	57.8	79.3	2.7	6.0	0.8	1.9	1600	44.5	2.88	4.5	34.7	95.7	48.4	4.4
	9.0	2.4	5.5	1280	50.4	32.5	1.91	26.4	57.0	72.7	2.1	9.0	2.4	5.5	1280	45.5	3.00	4.4	35.3	102.9	52.2	4.6
	9.0	2.4	5.5	1600	51.5	35.5	2.00	25.7	58.3	73.0	2.2	9.0	2.4	5.5	1600	46.5	2.90	4.7	36.6	96.9	51.9	4.5
	12.0	4.3	10.0	1280	51.0	32.7	1.83	27.8	57.2	69.5	2.0	12.0	4.3	10.0	1280	46.6	3.01	4.5	36.3	103.7	54.0	4.6
	12.0	4.3	10.0	1600	52.0	35.7	1.92	27.1	58.6	69.8	2.0	12.0	4.3	10.0	1600	47.5	2.91	4.8	37.6	97.5	53.7	4.5
70	6.0	0.8	1.8	1280	47.3	31.4	2.38	19.9	55.4	88.5	3.5	6.0	0.8	1.9	1280	48.4	3.03	4.7	38.0	105.0	57.3	4.8
	6.0	0.8	1.8	1600	48.3	34.3	2.49	19.4	56.8	88.9	3.6	6.0	0.8	1.9	1600	49.4	2.93	4.9	39.4	98.6	56.9	4.7
	9.0	2.3	5.3	1280	48.6	31.9	2.19	22.2	56.1	82.5	2.9	9.0	2.3	5.3	1280	50.6	3.05	4.9	40.2	106.6	61.1	4.9
	9.0	2.3	5.3	1600	49.6	34.8	2.29	21.7	57.4	82.8	3.0	9.0	2.3	5.3	1600	51.7	2.95	5.1	41.6	99.9	60.8	4.8
	12.0	4.2	9.6	1280	49.2	32.1	2.09	23.5	56.4	79.4	2.7	12.0	4.2	9.6	1280	51.8	3.07	4.9	41.3	107.5	63.1	5.0
	12.0	4.2	9.6	1600	50.2	35.0	2.19	22.9	57.7	79.6	2.8	12.0	4.2	9.6	1600	52.9	2.97	5.2	42.8	100.6	62.9	4.9
80	6.0	0.8	1.8	1280	45.0	30.7	2.70	16.6	54.2	98.1	4.7	6.0	0.8	1.8	1280	53.2	3.08	5.1	42.7	108.5	65.8	5.2
	6.0	0.8	1.8	1600	45.9	33.4	2.83	16.2	55.6	98.5	4.8	6.0	0.8	1.8	1600	54.3	2.98	5.3	44.1	101.4	65.3	5.0
	9.0	2.2	5.1	1280	46.5	31.2	2.49	18.7	55.0	92.2	4.0	9.0	2.2	5.1	1280	55.7	3.12	5.2	45.0	110.3	70.0	5.5
	9.0	2.2	5.1	1600	47.5	34.0	2.61	18.2	56.4	92.5	4.1	9.0	2.2	5.1	1600	56.9	3.01	5.5	46.6	102.9	69.6	5.3
	12.0	4.0	9.3	1280	47.2	31.4	2.39	19.8	55.4	89.2	3.6	9.4	2.4	5.6	1280	55.9	3.12	5.3	45.3	110.4	70.0	5.5
	12.0	4.0	9.3	1600	48.2	34.2	2.50	19.3	56.7	89.5	3.7	9.4	2.4	5.6	1600	57.1	3.01	5.6	46.8	103.0	70.0	5.3
90	6.0	0.8	1.8	1280	42.2	29.7	3.09	13.7	52.8	107.6	5.9	4.7	0.3	0.7	1280	55.9	3.12	5.3	45.3	110.4	70.0	5.5
	6.0	0.8	1.8	1600	44.9	33.1	2.98	15.1	55.1	108.0	5.3	4.7	0.3	0.7	1600	57.1	3.01	5.6	46.8	103.0	70.0	5.3
	9.0	2.2	5.0	1280	44.0	30.3	2.85	15.5	53.7	101.9	5.2	4.7	0.3	0.7	1280	55.9	3.12	5.3	45.3	110.4	70.0	5.5
	9.0	2.2	5.0	1600	44.9	33.1	2.98	15.1	55.1	102.2	5.3	4.7	0.3	0.7	1600	57.1	3.01	5.6	46.8	103.0	70.0	5.3
	12.0	3.9	9.1	1280	44.8	30.6	2.73	16.4	54.1	99.0	4.8	4.7	0.3	0.7	1280	55.9	3.12	5.3	45.3	110.4	70.0	5.5
	12.0	3.9	9.1	1600	45.7	33.4	2.86	16.0	55.5	99.2	4.9	4.7	0.3	0.7	1600	57.1	3.01	5.6	46.8	103.0	70.0	5.3
100	6.0	0.7	1.6	1280	38.9	28.6	3.52	11.1	50.9	117.0	7.4	3.1	0.1	0.2	1280	55.9	3.12	5.3	45.3	110.4	70.0	5.5
	6.0	0.7	1.6	1600	39.7	31.1	3.68	10.8	52.3	117.4	7.6	3.1	0.1	0.2	1600	57.1	3.01	5.6	46.8	103.0	70.0	5.3
	9.0	2.1	4.8	1280	41.0	29.3	3.25	12.6	52.0	111.6	6.5	3.1	0.1	0.2	1280	55.9	3.12	5.3	45.3	110.4	70.0	5.5
	9.0	2.1	4.8	1600	41.8	31.9	3.40	12.3	53.4	111.9	6.7	3.1	0.1	0.2	1600	57.1	3.01	5.6	46.8	103.0	70.0	5.3
	12.0	3.9	8.9	1280	41.9	29.6	3.12	13.4	52.6	108.8	6.1	3.1	0.1	0.2	1280	55.9	3.12	5.3	45.3	110.4	70.0	5.5
	12.0	3.9	8.9	1600	42.8	32.3	3.27	13.1	53.9	109.0	6.3	3.1	0.1	0.2	1600	57.1	3.01	5.6	46.8	103.0	70.0	5.3
110	6.0	0.6	1.4	1280	35.0	27.0	4.03	8.7	48.8	126.3	9.1	2.3	0.1	0.2	1280	55.9	3.12	5.3	45.3	110.4	70.0	5.5
	6.0	0.6	1.4	1600	35.7	29.4	4.22	8.5	50.1	126.7	9.3	2.3	0.1	0.2	1600	57.1	3.01	5.6	46.8	103.0	70.0	5.3
	9.0	2.0	4.6	1280	37.3	27.9	3.73	10.0	50.0	121.1	8.1	2.3	0.1	0.2	1280	55.9	3.12	5.3	45.3	110.4	70.0	5.5
	9.0	2.0	4.6	1600	38.1	30.5	3.90	9.8	51.4	121.4	8.3	2.3	0.1	0.2	1600	57.1	3.01	5.6	46.8	103.0	70.0	5.3
	12.0	3.8	8.7	1280	38.4	28.4	3.58	10.7	50.7	118.4	7.6	2.3	0.1	0.2	1280	55.9	3.12	5.3	45.3	110.4	70.0	5.5
	12.0	3.8	8.7	1600	39.2	30.9	3.75	10.5	52.0	118.7	7.8	2.3	0.1	0.2	1600	57.1	3.01	5.6	46.8	103.0	70.0	5.3
120	6.0	0.4	1.0	1280	30.4	24.8	4.61	6.6	46.1	135.4	11.0	1.9	0.1	0.2	1280	55.9	3.12	5.3	45.3	110.4	70.0	5.5
	6.0	0.4	1.0	1600	31.0	27.1	4.83	6.4	47.5	135.8	11.3	1.9	0.1	0.2	1600	57.1	3.01	5.6	46.8	103.0	70.0	5.3
	9.0	1.9	4.3	1280	33.0	26.1	4.28	7.7	47.6	130.6	9.9	1.9	0.1	0.2	1280	55.9	3.12	5.3	45.3	110.4	70.0	5.5
	9.0																					

# Performance Data – Model 060 Full Load with vFlow®

Performance capacities shown in thousands of Btu/h

Cooling - EAT 80/67°F												Heating - EAT 70°F										
EWT °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	4.1	0.5	1.1	1520	70.3	43.4	2.71	25.9	79.5	60.0	2.4	14.0	7.9	18.2	1520	39.3	3.81	3.0	26.3	93.9	16.2	4.6
	4.1	0.5	1.1	1900	72.0	47.3	2.89	24.9	81.9	60.0	2.5	14.0	7.9	18.2	1900	39.9	3.66	3.2	27.5	89.5	16.1	4.5
30	5.5	0.9	2.2	1520	70.3	43.4	2.71	25.9	79.5	60.0	2.4	7.0	1.8	4.1	1520	42.3	3.87	3.2	29.1	95.8	21.7	4.8
	5.5	0.9	2.2	1900	72.0	47.3	2.89	24.9	81.9	60.0	2.5	7.0	1.8	4.1	1900	43.0	3.72	3.4	30.3	91.0	21.3	4.7
	5.5	0.9	2.2	1520	70.3	43.4	2.71	25.9	79.5	60.0	2.4	10.5	4.2	9.7	1520	43.9	3.90	3.3	30.6	96.8	24.2	4.9
	5.5	0.9	2.2	1900	72.0	47.3	2.89	24.9	81.9	60.0	2.5	10.5	4.2	9.7	1900	44.7	3.75	3.5	31.9	91.8	23.9	4.8
	5.5	0.9	2.2	1520	70.3	43.4	2.71	25.9	79.5	60.0	2.4	14.0	7.2	16.5	1520	44.8	3.92	3.3	31.4	97.3	25.5	4.9
	5.5	0.9	2.2	1900	72.0	47.3	2.89	24.9	81.9	60.0	2.5	14.0	7.2	16.5	1900	45.6	3.77	3.5	32.7	92.2	25.3	4.8
40	7.0	1.6	3.6	1520	69.6	43.2	2.80	24.9	79.2	62.6	2.5	7.0	1.5	3.6	1520	47.8	3.99	3.5	34.2	99.1	30.2	5.2
	7.0	1.6	3.6	1900	71.4	47.0	2.98	23.9	81.5	63.3	2.6	7.0	1.5	3.6	1900	48.6	3.84	3.7	35.5	93.7	29.8	5.0
	8.2	2.3	5.2	1520	70.3	43.4	2.71	25.9	79.5	60.0	2.4	10.5	3.8	8.8	1520	49.9	4.04	3.6	36.1	100.4	33.1	5.4
	8.2	2.3	5.2	1900	72.0	47.3	2.89	24.9	81.9	60.0	2.5	10.5	3.8	8.8	1900	50.7	3.88	3.8	37.5	94.7	32.9	5.2
	8.2	2.3	5.2	1520	70.3	43.4	2.71	25.9	79.5	60.0	2.4	14.0	6.6	15.2	1520	51.0	4.07	3.7	37.2	101.1	34.7	5.4
	8.2	2.3	5.2	1900	72.0	47.3	2.89	24.9	81.9	60.0	2.5	14.0	6.6	15.2	1900	51.9	3.91	3.9	38.6	95.3	34.5	5.2
50	7.0	1.4	3.2	1520	67.8	42.5	3.06	22.2	78.3	72.4	3.2	7.0	1.4	3.2	1520	53.7	4.13	3.8	39.7	102.7	38.7	5.6
	7.0	1.4	3.2	1900	69.5	46.3	3.26	21.3	80.6	73.0	3.3	7.0	1.4	3.2	1900	54.7	3.97	4.0	41.1	96.6	38.3	5.4
	10.5	3.5	8.1	1520	69.2	43.0	2.86	24.2	79.0	65.0	2.7	10.5	3.5	8.1	1520	56.3	4.20	3.9	42.0	104.3	42.0	5.8
	10.5	3.5	8.1	1900	70.9	46.8	3.05	23.3	81.3	65.5	2.8	10.5	3.5	8.1	1900	57.3	4.04	4.2	43.5	97.9	41.7	5.6
	14.0	6.2	14.3	1520	70.0	43.3	2.76	25.3	79.4	61.3	2.5	14.0	6.2	14.3	1520	57.7	4.23	4.0	43.2	105.1	43.8	5.9
	14.0	6.2	14.3	1900	71.7	47.1	2.94	24.4	81.7	61.7	2.6	14.0	6.2	14.3	1900	58.7	4.07	4.2	44.8	98.6	43.6	5.7
60	7.0	1.3	3.0	1520	65.9	41.8	3.34	19.7	77.3	82.1	4.0	7.0	1.3	3.0	1520	59.9	4.30	4.1	45.3	106.5	47.1	6.1
	7.0	1.3	3.0	1900	67.5	45.5	3.56	19.0	79.6	82.7	4.1	7.0	1.3	3.0	1900	61.0	4.13	4.3	46.9	99.7	46.6	5.9
	10.5	3.3	7.6	1520	67.4	42.3	3.13	21.5	78.0	74.9	3.4	10.5	3.3	7.6	1520	62.9	4.37	4.2	48.0	108.3	50.9	6.3
	10.5	3.3	7.6	1900	69.0	46.1	3.33	20.7	80.4	75.3	3.5	10.5	3.3	7.6	1900	64.0	4.20	4.5	49.7	101.2	50.5	6.1
	14.0	5.9	13.5	1520	68.1	42.6	3.02	22.5	78.4	71.2	3.1	14.0	5.8	13.5	1520	64.6	4.42	4.3	49.5	109.3	52.9	6.5
	14.0	5.9	13.5	1900	69.8	46.4	3.22	21.7	80.8	71.5	3.2	14.0	5.8	13.5	1900	65.7	4.25	4.5	51.2	102.0	52.7	6.3
70	7.0	1.2	2.8	1520	63.7	41.0	3.65	17.4	76.1	91.7	5.0	7.0	1.2	2.9	1520	66.3	4.46	4.4	51.0	110.4	55.4	6.6
	7.0	1.2	2.8	1900	65.2	44.6	3.89	16.8	78.5	92.4	5.2	7.0	1.2	2.9	1900	67.4	4.29	4.6	52.8	102.9	54.9	6.4
	10.5	3.2	7.3	1520	65.3	41.6	3.41	19.2	77.0	84.7	4.3	10.5	3.2	7.3	1520	69.6	4.56	4.5	54.1	112.4	59.7	6.9
	10.5	3.2	7.3	1900	67.0	45.3	3.63	18.4	79.3	85.1	4.4	10.5	3.2	7.3	1900	70.8	4.38	4.7	55.9	104.5	59.4	6.7
	14.0	5.6	13.0	1520	66.1	41.9	3.30	20.1	77.4	81.1	4.0	14.0	5.6	13.0	1520	71.4	4.61	4.5	55.7	113.5	62.0	7.1
	14.0	5.6	13.0	1900	67.8	45.6	3.51	19.3	79.7	81.4	4.1	14.0	5.6	13.0	1900	72.7	4.43	4.8	57.6	105.4	61.8	6.9
80	7.0	1.2	2.8	1520	61.1	40.1	4.03	15.2	74.8	101.4	6.2	7.0	1.2	2.8	1520	72.5	4.64	4.6	56.7	114.2	63.8	7.2
	7.0	1.2	2.8	1900	62.6	43.6	4.29	14.6	77.2	102.1	6.4	7.0	1.2	2.8	1900	73.8	4.46	4.8	58.6	106.0	63.3	7.0
	10.5	3.1	7.1	1520	63.0	40.8	3.75	16.8	75.8	94.4	5.3	10.5	3.1	7.1	1520	76.2	4.75	4.7	60.0	116.4	68.6	7.6
	10.5	3.1	7.1	1900	64.6	44.4	3.99	16.2	78.2	94.9	5.5	10.5	3.1	7.1	1900	77.5	4.57	5.0	61.9	107.8	68.2	7.4
	14.0	5.4	12.5	1520	63.9	41.1	3.62	17.7	76.3	90.9	4.9	14.0	5.4	12.6	1520	77.4	4.78	4.7	61.1	117.2	70.0	7.7
	14.0	5.4	12.5	1900	65.5	44.7	3.85	17.0	78.7	91.2	5.1	14.0	5.4	12.6	1900	78.8	4.60	5.0	63.1	108.4	70.0	7.5
90	7.0	1.2	2.7	1520	57.9	39.0	4.48	12.9	73.2	110.9	7.6	6.3	0.9	2.0	1520	77.4	4.78	4.7	61.1	117.2	70.0	7.7
	7.0	1.2	2.7	1900	61.8	43.3	4.41	14.0	76.8	111.6	6.8	6.3	0.9	2.0	1900	78.8	4.60	5.0	63.1	108.4	70.0	7.5
	10.5	3.0	6.9	1520	60.3	39.8	4.14	14.6	74.4	104.2	6.6	6.3	0.9	2.0	1520	77.4	4.78	4.7	61.1	117.2	70.0	7.7
	10.5	3.0	6.9	1900	61.8	43.3	4.41	14.0	76.8	104.6	6.8	6.3	0.9	2.0	1900	78.8	4.60	5.0	63.1	108.4	70.0	7.5
	14.0	5.3	12.3	1520	61.4	40.2	3.99	15.4	75.0	100.7	6.1	6.3	0.9	2.0	1520	77.4	4.78	4.7	61.1	117.2	70.0	7.7
	14.0	5.3	12.3	1900	62.9	43.7	4.25	14.8	77.4	101.0	6.3	6.3	0.9	2.0	1900	78.8	4.60	5.0	63.1	108.4	70.0	7.5
100	7.0	1.1	2.6	1520	54.2	37.6	5.02	10.8	71.3	120.4	9.1	4.2	0.1	0.1	1520	77.4	4.78	4.7	61.1	117.2	70.0	7.7
	7.0	1.1	2.6	1900	55.5	40.9	5.35	10.4	73.8	121.1	9.4	4.2	0.1	0.1	1900	78.8	4.60	5.0	63.1	108.4	70.0	7.5
	10.5	2.9	6.8	1520	56.9	38.6	4.62	12.3	72.7	113.8	8.0	4.2	0.1	0.1	1520	77.4	4.78	4.7	61.1	117.2	70.0	7.7
	10.5	2.9	6.8	1900	58.3	42.0	4.92	11.9	75.1	114.3	8.3	4.2	0.1	0.1	1900	78.8	4.60	5.0	63.1	108.4	70.0	7.5
	14.0	5.2	12.1	1520	58.2	39.1	4.44	13.1	73.4	110.5	7.5	4.2	0.1	0.1	1520	77.4	4.78	4.7	61.1	117.2	70.0	7.7
	14.0	5.2	12.1	1900	59.7	42.5	4.73	12.6	75.8	110.8	7.7	4.2	0.1	0.1	1900	78.8	4.60	5.0	63.1	108.4	70.0	7.5
110	7.0	1.0	2.4	1520	49.7	35.9	5.67	8.8	69.0	129.7	10.9	3.2	0.1	0.1	1520	77.4	4.78	4.7	61.1	117.2	70.0	7.7
	7.0	1.0	2.4	1900	50.9	39.0	6.04	8.4	71.5	130.4	11.2	3.2	0.1	0.1	1900	78.8	4.60	5.0	63.1	108.4	70.0	7.5
	10.5	2.8	6.6	1520	52.9	37.1	5.21	10.2	70.7	123.5	9.7	3.2	0.1	0.1	1520	77.4	4.78	4.7	61.1	117.2	70.0	7.7
	10.5	2.8	6.6	1900	54.2	40.4	5.55	9.8	73.1	123.9	10.0	3.2	0.1	0.1	1900	78.8	4.60	5.0	63.1	108.4	70.0	7.5
	14.0	5.1	11.9	1520	54.4	37.7	4.99	10.9	71.4	120.2	9.1	3.2	0.1	0.1	1520	77.4	4.78	4.7	61.1	117.2	70.0	7.7
	14.0	5.1	11.9	1900	55.8	41.0	5.31	10.5	73.9	120.6	9.4	3.2	0.1	0.1	1900	78.8	4.60	5.0	63.1	108.4	70.0	7.5
120	7.0	0.9	2.0	1520	44.3	33.5	6.44	6.9	66.3	139.0	12.8	2.5	0.1	0.1	1520	77.4	4.78	4.7	61.1	117.2	70.0	7.7
	7.0	0.9	2.0	1900	45.4	36.5	6.86	6.6	68.8	139.7	13.2	2.5	0.1	0.1	1900	78.8	4.60	5.0	63.1	108.4	70.0	7.5
	10.5	2.7	6.3	1520	48.0	35.2	5.91	8.1	68.2	133.0	11.5	2.5	0.1	0.1	1520	77.4	4.78					

## 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 algacide 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 “DXM2.5 Functional Troubleshooting Flow Chart” or “Functional Troubleshooting Chart.”

## DXM2.5 BOARD

DXM2.5 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 DXM2.5 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 DXM2.5 board.

Proper communications with a thermostat can be verified using the Fault LED on the DXM2.5. 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 DXM2.5 will flash very slowly (1 second on, 5 seconds off), if the DXM2.5 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 17. An ice bath can be used to check the calibration of the thermistor.

Table 17: Nominal resistance at various temperatures

Temp (°C)	Temp (°F)	Resistance (kOhm)	Temp (°C)	Temp (°F)	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, Cont'd.

### OUTPUTS

The compressor and reversing valve relays are 24VAC and can be verified using a voltmeter. For units with ECM blower motors, the DXM2.5 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 DXM2.5 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 DXM2.5 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 push button. The DXM2.5 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 DXM2.5, activate the DXM2.5 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 DXM2.5 control switch inputs, values of all temperature sensor inputs, control voltage, ECM blower, internal flow center, and proportional valve operating status and parameters.

**DIP Switch Configuration** – The DIP Switch Configuration menus allow the installer to easily see the current DXM2.5 control configuration.

**Fault History** – In addition to the fault code, the DXM2.5 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 DXM2.5. 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 DXM2.5 temperature and voltage values when the lockout occurred.

**Fault Flow Conditions** – This option displays the DXM2.5 ECM blower, pump, and valve operating parameters when the lockout occurred.

**Fault I/O Conditions** – This option displays the status of the DXM2.5 physical and communicated inputs and the relay outputs when the lockout occurred.

**Fault Configuration Conditions** – This option displays the status of the DXM2.5 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 DXM2.5 to be cleared.

### DXM2.5 FUNCTIONAL TROUBLESHOOTING FLOW CHART

The “DXM2.5 Functional Troubleshooting Flow Chart” is a quick overview of how to start diagnosing a suspected problem, using the fault recognition features of the DXM2.5 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 DXM2.5 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.**

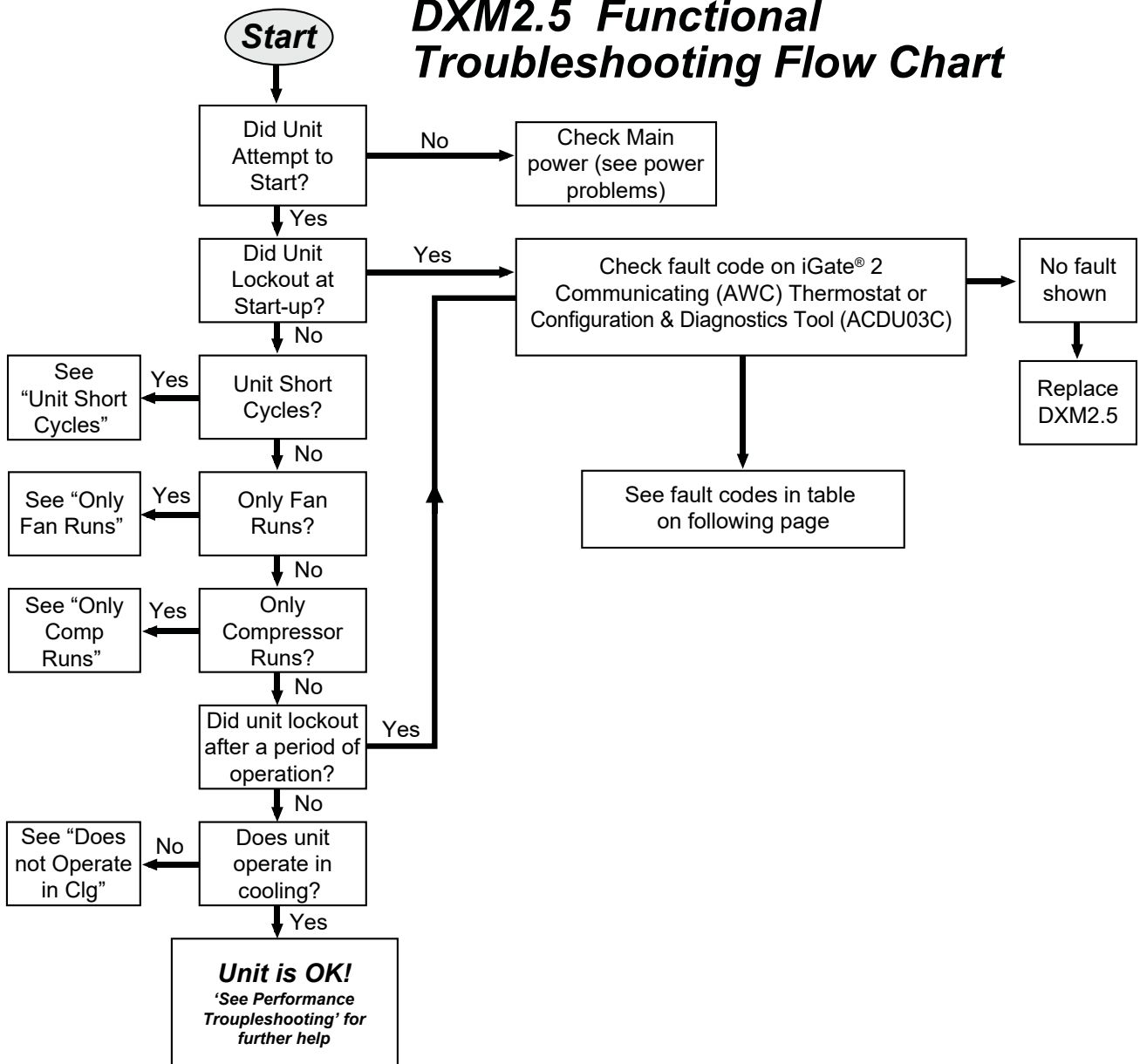
Failure to disconnect power before servicing can cause severe personal injury or death.

# DXM2.5 Functional Troubleshooting Flow Chart

**⚠ 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.

## DXM2.5 Functional Troubleshooting Flow Chart



## Functional Troubleshooting

Fault	Htg	Clg	Possible Cause	Solution
<b>Main Power Problems</b>	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 DXM2.5
				Check primary/secondary voltage on transformer.
<b>HP Fault Code 2 High Pressure</b>		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 airflow 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.	
<b>LP/LOC Fault Code 3 Low Pressure / Loss of Charge</b>	X	X	Insufficient charge	Check for refrigerant leaks
	X		Compressor pump down at start-up	Check charge and start-up water flow.
<b>LT1 Fault Code 4 Water Low Temperature</b>	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 antifreeze 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.	
<b>LT2 Fault Code 5 Low Air Temperature</b>		X	Reduced or no airflow in cooling	Check for dirty air filter and clean or replace.
		X		Check fan motor operation and airflow restrictions.
		X		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	Improper low temperature setting (30°F vs 10°F)	Normal airside applications will require 30°F only.
<b>Condensate Fault Code 6 High Condensate Level</b>	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.
		X		Check slope of unit toward outlet.
		X		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 airflow	Find and eliminate restriction. Increase return duct and/or grille size.	

Table continued on next page.

## Functional Troubleshooting, Cont'd.

Table continued from previous page.

Fault	Htg	Clg	Possible Cause	Solution
<b>Over/Under Voltage Code 7</b> (Auto resetting)	X	X	Under voltage	Check power supply and 24VAC voltage before and during operation.
				Check power supply wire size.
	X	X	Over voltage	Check compressor starting. Need hard start kit?
				Check 24VAC and unit transformer. Tap for correct power supply voltage.
<b>Unit Performance Sentinel Code 8</b>	X		Heating mode LT2 > 125°F	Check for poor airflow or overcharged unit.
		X	Cooling Mode LT1 > 125°F OR LT2 < 40°F	Check for poor water flow or airflow.
<b>Unit Performance Test/ Swapped Thermistor Code 9</b>	X	X	LT1 and LT2 swapped	Reverse position of thermistors
<b>ECM Fault Code 10</b>	X	X	Blower does not operate	Check blower line voltage.
				Check blower low voltage wiring.
	X	X	Blower operating with incorrect airflow	Wrong unit size selection.
				Wrong unit family selection.
<b>Low Air Coil Pressure Fault (ClimaDry® II) Code 11</b>		X	Reduced or no airflow in cooling or ClimaDry® II	Wrong motor size.
				Incorrect blower selection.
				Check for dirty air filter and clean or replace.
		X	Air temperature out of range	Check fan motor operation and airflow restrictions.
	X	Bad pressure switch	Too high of external static? Check static vs blower table.	
<b>Low Air Coil Temperature Fault (ClimaDry® II) Code 12</b>		X	Reduced airflow in cooling, ClimaDry® II, or constant fan	Too much cold vent air? Bring entering air temp within design parameters.
				Check switch continuity and operation. Replace.
				Check for dirty air filter and clean or replace.
		X	Air temperature out of range	Check fan motor operation and airflow restrictions.
	X	Bad thermistor	Too high of external static? Check static vs blower table.	
<b>IFC Fault Code 13</b> <b>Internal Flow Controller Fault</b>	X	X	No pump output signal	Too much cold vent air? Bring entering air temp within design parameters.
				Check DC voltage between A02 and GND. Voltage should be between 0.5 and 10 VDC with pump active.
	X	X	Low pump voltage	Check line voltage to the pump.
				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 pump ON.
<b>ESD - ERV Fault (DXM2.5 Only) Green Status LED Code 3</b>	X	X	ERV unit has fault (Rooftop units only)	Replace pump if the line voltage and control signals are present at the pump and the pump does not operate.
				Troubleshoot ERV unit fault.
<b>No Fault Code Shown</b>	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.
<b>Unit Short Cycles</b>	X	X	Dirty air filter	Check and clean air filter.
	X	X	Unit in "Test Mode"	Reset power or wait 20 minutes for auto exit.
	X	X	Unit selection	Unit may be oversized for space. Check sizing for actual load of space.
	X	X	Compressor overload	Check and replace if necessary
<b>Only Fan Runs</b>	X	X	Thermostat position	Ensure 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 DXM2.5. Put in test mode and jumper Y1 and R to give call for compressor.



## Performance Troubleshooting

Symptom	Htg	Clg	Possible Cause	Solution
<b>Insufficient Capacity/ Not Cooling or Heating Properly</b>	X	X	Dirty filter	Replace or clean.
	X		Reduced or no airflow 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 airflow 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 cooling 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 too cold	Check load, loop sizing, loop backfill, ground moisture.	
<b>High Head Pressure</b>	X		Reduced or no airflow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and air flow 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 temperature within design parameters.
		X	Scaling in water heat exchanger	Perform scaling check and clean if necessary.
X	X	Unit overcharged	Check superheat and subcooling. Re-weigh in charge.	
X	X	Non-condensables in system	Vacuum system and re-weigh in charge.	
X	X	Restricted metering device	Check superheat and subcooling per chart. Replace.	
<b>Low Suction Pressure</b>	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 temperature within design parameters.
		X	Reduced airflow 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 temperature within design parameters.	
X	X	Insufficient charge	Check for refrigerant leaks.	
<b>Low Discharge Air Temperature in Heating</b>	X		Too high of airflow	Check fan motor speed selection and airflow chart.
	X		Poor performance	See 'Insufficient Capacity'.
<b>High humidity</b>		X	Too high of airflow	Check fan motor speed selection and airflow chart.
		X	Unit oversized	Recheck loads & sizing. Check sensible cooling load and heat pump capacity.

Table continued on next page.

## Performance Troubleshooting, Cont'd.

Table continued from previous page.

Symptom	Htg	Clg	Possible Cause	Solution
Only Compressor Runs	X	X	Thermostat wiring	Check G wiring at heat pump. Jumper G and R for fan operation. Check thermostat wiring at DXM2.5. Put in test mode and then jumper Y1 and W1 to R to give call for fan, compressor, and electric heat.
	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.
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 DXM2.5, check for "O" RV setup, not "B".
		X	Thermostat wiring	Check O wiring at heat pump. DXM2.5 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.
	X	X	No valve output signal	Check DC voltage between AO2 and GND. Should be 0 when valve is OFF and between 3.3v and 10v when valve is ON.
	X	X	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

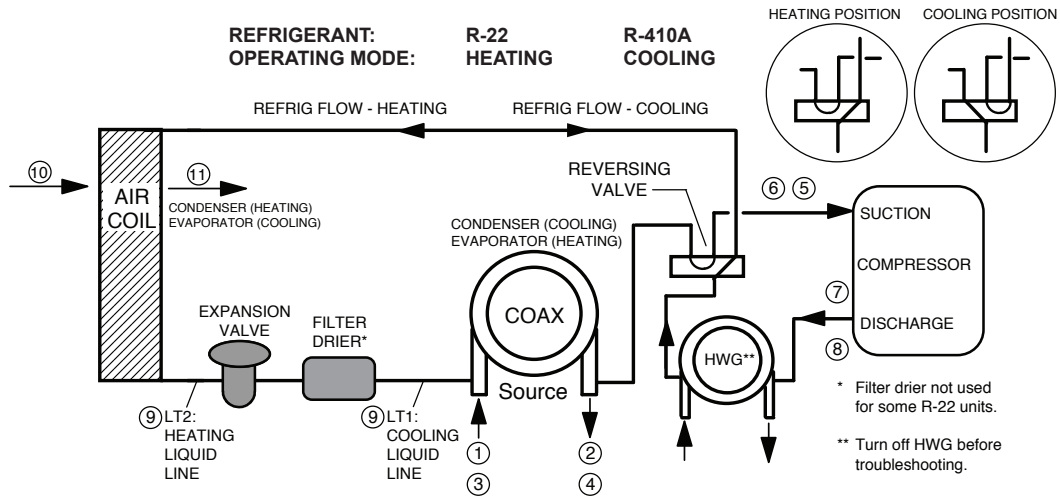
## Packaged Water-to-Air Troubleshooting Form

RP929

Customer: \_\_\_\_\_ Loop Type: \_\_\_\_\_ Startup Date: \_\_\_\_\_

Model #: \_\_\_\_\_ Serial #: \_\_\_\_\_ Antifreeze Type & %: \_\_\_\_\_

Complaint: \_\_\_\_\_



Description	Heating	Cooling	Notes
<b>Water Side Analysis</b>			
1 Water In Temp.			Temp. Diff. =
2 Water Out Temp.			
3 Water In Pressure			
4 Water Out Pressure			
4a Pressure Drop			
4b GPM			
<b>Heat of Extraction (Absorption) or Heat of Rejection:</b>			<b>Fluid Factor:</b> 500 (Water); 485 (Antifreeze)
HE or HR (Btuh) = _____ Enter HE or HR: _____ _____ Flow Rate (GPM) x _____ Temp. Diff (deg F) x _____ Fluid Factor			
<b>Refrigerant Analysis</b>			
5 Suction Temp.			
6 Suction Pressure			
6a Saturation Temp.			
6b Superheat			
7 Discharge Temp.			
8 Discharge Pressure			
8a Saturation Temp.			
8b Subcooling			
9 Liquid Line Temp			
10 Return Air Temp.			Temp. Diff. =
11 Supply Air Temp.			
Voltage			
Compress Amps			

**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.

# Warranty

## CLIMATE MASTER, INC. LIMITED EXPRESS WARRANTY AND LIMITATION OF LIABILITY AND REMEDIES FOR RESIDENTIAL CLASS PRODUCTS WITH LABOR ALLOWANCE



**This Limited Express Warranty And Remedies Affects Your Legal Rights And Should Be Read Carefully In Its Entirety.** Subject to the terms and conditions below, Climate Master, Inc. ("CM") extends a limited warranty ("Limited Warranty") for Residential Class heating and cooling equipment manufactured or sold by CM ("Products"), that was purchased on or after May 1, 2010 (this would generally include CM Units with serial numbers beginning with "N118" and higher), and installed in a one or two family residential dwelling, for personal, household or family purposes in the United States of America or Canada, ("Application"), to be free from defects and workmanship under normal use and maintenance. If you are unsure if this Limited Warranty applies to a Product you have purchased, contact CM at the phone number or address reflected below.

This Limited Warranty DOES NOT cover commercial applications of the Products. Commercial applications include any application other than installation in a one or two family residential dwelling for personal, household or family purposes. Refer to ClimateMaster Commercial Limited Express Warranty for details. Full copies are available for download at ClimateMaster.com.

This Limited Warranty provides a complete statement of CM's responsibilities to purchasers of the Products. No oral or written statement made by CM, any person or entity associated with CM, or by any person or entity claiming to be associated with CM, including but not limited to statements made in sales literature, catalogs, or agreements to purchase or install the Products, is intended to provide an express or implied warranty, or to modify, alter or extend the scope or terms of this Limited Warranty.

**EXCEPT AS SPECIFICALLY SET FORTH HEREIN, THERE IS NO EXPRESS WARRANTY AS TO ANY OF CM'S PRODUCTS. CM MAKES NO WARRANTY AGAINST LATENT DEFECTS, OF MERCHANTABILITY OF THE PRODUCTS OR OF THE FITNESS FOR ANY PARTICULAR PURPOSE.**

**TERM:** This Limited Warranty shall commence on the earliest to occur of the following dates: (i) proof of date of off-site occupancy; (ii) proof of date of start-up of the Product by a qualified and trained HVAC contractor; or (iii) six (6) months from the shipment date of the Product from CM. Items (i) or (ii) are not available ("Warranty Inception Date"). The Limited Warranty shall extend as follows:

- Costs of Repair or Replacement of Covered Product Parts**
- (1) Ten (10) years from the Warranty Inception Date for air conditioning, heating and/or heat pump units built or sold by CM ("CM Units");
  - (2) Ten (10) years from the Warranty Inception Date for thermostats, auxiliary electric heaters, water storage tanks, and geothermal pumping modules built or sold by CM, when installed with CM Units;
  - (3) One (1) year from the date of shipment from CM for any other accessories or parts built or sold by CM, when installed with CM Units; and
  - (4) Ninety (90) days from the date of shipment from CM for all repair or replacement parts that are not supplied under this warranty.

- Costs of Labor to Install, Repair or Replace Covered Product Parts**
- (1) Five (5) years from the Warranty Inception Date for CM Units;
  - (2) Five (5) years from the Warranty Inception Date for thermostats, auxiliary electric heaters, water storage tanks, and geothermal pumping modules built or sold by CM, when installed with CM Units;
  - (3) Five (5) years from the Warranty Inception Date for any other accessories or parts built or sold by CM or any repair or replacement parts that are not supplied under this Limited Warranty.

**WHO IS COVERED:** This Limited Warranty is provided only to the original owner of the one or two family residential dwelling in which the Products are first installed. This Limited Warranty is not transferable. CM reserves the right to request any documentation necessary in its sole discretion to determine the date of purchase and occupancy of the residential dwelling or the date of installation and start-up of the Product(s). For the avoidance of any doubt, this Limited Warranty shall not extend to and shall provide no remedies whatsoever for any distributor or installer of the Products.

**CLAIM PROCESS:** To make a claim under this warranty, the Product or parts must be returned to CM in Oklahoma City, Oklahoma, at eight prepaid, no later than ninety (90) days after the date of the failure of the part. If CM determines the Product or part to be defective and covered by this Limited Warranty, CM will either repair or replace the Product or part and send it to a CM-recognized distributor, dealer or service organization, FOB CM, Oklahoma City, Oklahoma, freight prepaid. The Limited Warranty on any Product or part repaired or replaced under this Limited Warranty extends only through the original warranty period.

**WHAT IS COVERED:** Subject to the terms, this Limited Express Warranty covers the (i) the cost of repair or replacement of any covered Product or Product parts; and (ii) the cost of labor incurred by CM authorized service personnel in connection with the installation of a repaired or replaced covered Product or Product part.

If a Product part is not available, CM will, at its option, provide a free suitable substitute part or provide a credit in the amount of the then factory selling price for a new suitable substitute part to be used by the claimant towards the retail purchase price of a new CM product. All labor costs are subject and limited to amounts specifically set forth in the then existing labor allowance schedule provided by CM's Warranty Department. Actual labor costs are not covered by this Limited Warranty to the extent they: (i) exceed the amount allowed under the allowance schedule; (ii) are not specifically provided for in the allowance schedule; (iii) are not performed by CM authorized service personnel; (iv) are incurred in connection with installation of a part not covered by this Limited Warranty; or (v) are incurred outside the Term.

**WHAT IS NOT COVERED:** This Limited Warranty does not cover and does not apply to: (1) air filters, fuses, refrigerant, fluids, oil; (2) Products relocated after initial installation; (3) any portion or component of any system that is not supplied by CM, regardless of the cause of the failure of such portion or component; (4) Products on which the unit identification tags or labels, or rating labels, have been removed or defaced; (5) Products subjected to accident, misuse, negligence, abuse, fire, flood, freezing, lightning, unauthorized alteration, misapplication, contaminated or corrosive air or liquid supply, operation at abnormal air or liquid temperatures or flow rates, or opening of the refrigerant circuit by unqualified personnel; (6) mold, fungus or bacteria damages; (7) corrosion or abrasion of the Product; (8) products supplied by others; (9) mold, fungus or bacteria damages; (10) corrosion or abrasion of the Product; (11) products supplied by others; (12) Products that have been operated in a manner contrary to CM's printed instructions; (13) Products which have insufficient performance as a result of improper system design, sizing or the improper application, installation, or use of CM's products; (14) electricity or fuel costs, or any increases or unrealized savings in same, for any reason whatsoever; or (15) operating any water storage tanks when they are empty or partially empty (i.e. dry firing), at temperatures exceeding the maximum setting of the operating or high limit controls, at pressures greater than those shown on the rating label, with non-potable water, with alterations or attachments (including energy savings devices) not specifically authorized in writing by CM, or without the free circulation of water. CM may request written documentation showing compliance with the above limitations in connection with repair or replacement of covered Product parts. CM is not responsible for: (1) the costs of any fluids, refrigerant or system components supplied by others, or associated labor to repair or replace the same, which is incurred as a result of repair or replacement of a covered Product part; (2) the costs of labor, refrigerant, materials or service incurred in diagnosis and removal of a covered Product part subject to repair or replacement under this Limited Warranty; (3) shipping costs incurred in sending a claimed defective part from the installation site to CM; (4) shipping costs to return a claimed defective part from CM to the installation site if the part is not covered by this Limited Warranty; (5) removal or disposal costs associated with the repair or replacement of covered Product Parts; or (6) the costs of normal maintenance.

**OTHER WARRANTY LIMITATIONS:** This Limited Warranty is given in lieu of all other warranties express or implied, in law or in fact. If, notwithstanding the disclaimers contained herein, it is determined that other warranties apply, any such warranty, including without limitation any express warranties or any implied warranties of fitness for particular purpose and merchantability, shall be limited in time to the term of this Limited Warranty.

**LIMITATIONS OF REMEDIES:** In the event of a breach of the Limited Warranty, a claimant's remedies will be limited to repair or replacement of a part or unit, or to furnish a new or rebuilt part or unit in exchange for the part or unit which has failed. If after written notice to CM's factory in Oklahoma City, Oklahoma of each defect, malfunction or other failure, and a reasonable number of attempts by CM to correct the defect, malfunction or other failure, the remedy fails of its essential purpose, CM shall refund the purchase price paid to CM in exchange for the return of the sold goods). Said refund shall be the maximum liability of CM. THIS REMEDY IS THE SOLE AND EXCLUSIVE REMEDY OF THE BUYER OR THEIR PURCHASER AGAINST CM FOR ANY ACTION FOR BREACH OF CONTRACT, BREACH OF ANY WARRANTY, PATENT INFRINGEMENT OR FOR CM'S NEGLIGENCE OR STRICT LIABILITY. NO ACTION ARISING OUT OF ANY CLAIMED BREACH OF THIS LIMITED WARRANTY MAY BE BROUGHT MORE THAN ONE (1) YEAR AFTER THE CAUSE OF ACTION HAS ARISEN.

**LIMITATIONS OF LIABILITY:** CM shall have no liability for any damages if CM's performance is delayed for any reason or is prevented to any extent by any event such as, but not limited to any war, civil unrest, government restrictions or restraints, strikes, or work stoppages, fire, flood, accident, shortages of transportation, fuel, material, or labor, acts of God or any other reason beyond the sole control of CM.

CM EXPRESSLY DISCLAIMS ANY LIABILITY FOR CONSEQUENTIAL, INCIDENTAL, SPECIAL, AND/OR PUNITIVE DAMAGES BASED ON ANY THEORY IN CONTRACT, BREACH OF ANY EXPRESS OR IMPLIED WARRANTY, PATENT INFRINGEMENT OR IN TORT, WHETHER FOR CM'S NEGLIGENCE OR AS STRICT LIABILITY AND REGARDLESS OF WHETHER CM IS ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

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

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

NOTE: Some states or Canadian provinces do not allow the exclusion or limitation of implied warranties or the limitation of consequential damages for certain products supplied to consumers, or the limitation of liability for personal injury, so the above limitations and exclusions may be limited in their application to you. Where the implied warranties are not allowed to be excluded in their entirety, they will be limited to the duration of the applicable written warranty. This warranty gives you specific legal rights, which may vary depending on local law. IF ANY PRODUCT TO WHICH THIS LIMITED WARRANTY APPLIES IS DETERMINED TO BE A "CONSUMER PRODUCT" UNDER THE MAGNUSON-MOSS WARRANTY ACT (15 U.S.C.A. § 2301, ET SEQ.) OR OTHER APPLICABLE LAW, THE FOREGOING DISCLAIMER OF IMPLIED WARRANTIES SHALL NOT APPLY TO YOU, AND ALL IMPLIED WARRANTIES ON THIS PRODUCT, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR THE PARTICULAR PURPOSE, SHALL APPLY FOR THE SAME TERM SET FORTH ABOVE (ONE YEAR) AS PROVIDED UNDER APPLICABLE LAW. The portions of this Limited Warranty and limitation of liability shall be considered fully severable, and all portions which are not disallowed by applicable law shall remain in full force and effect.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state and from Canadian province to Canadian province. Refer to your local laws for your specific rights under this Limited Warranty. Please refer to the CM Installation, Operation and Maintenance Manual for operating and maintenance instructions.

Part No.: RP851  
Rev.: 3/20

Notes:

Notes:

Notes:

## Revision History

Date:	Item:	Action:
18 Nov., 22	ALL	Upgraded DXM2 to DXM2.5 unit controls and replaced the ATC thermostat with the AWC thermostat
05 Oct., 21	24-27	Updated Water Quality Requirements table
8 July, 21	3	Update Digit 13 on Decoder
29 Oct., 19	3, 13, 17, 36	Decoder and Pump Curve updates, misc. text edits
23 Jan., 19	13, 29	High Head variable pump update
12 Dec., 18	All	Added performance data pages
21 Aug., 18	4	Added Warning
25 July, 17	6	Updated hanger mounting instructions
07 Oct., 16	7	Text Update
6 Jan., 2016	60	Replaced certification logos and new AHRI c logo
18 Dec., 15	10	Updated Text - Removed Standard for vFlow
25 Aug., 15	3	Decoder Updated
15 Oct., 14	All 58	Updated to Include no vFlow® Unit Updated Troubleshooting Form
28 Aug., 14	9, 21	Polyolester Oil Information
17 Jan., 13	23-25	Hot Water Generator Section Added
19 Nov., 12	Various	Content Revised
17 April, 12	All	First Published



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