ENERTECH®
Geothermal Made Better®

Engineering Data and Installation Manual

VC MODELS VERTICAL PACKAGED WATER-TO-AIR HEAT PUMPS

Revision: 28 July 2014G
20D152-01NN

I. CONTENTS

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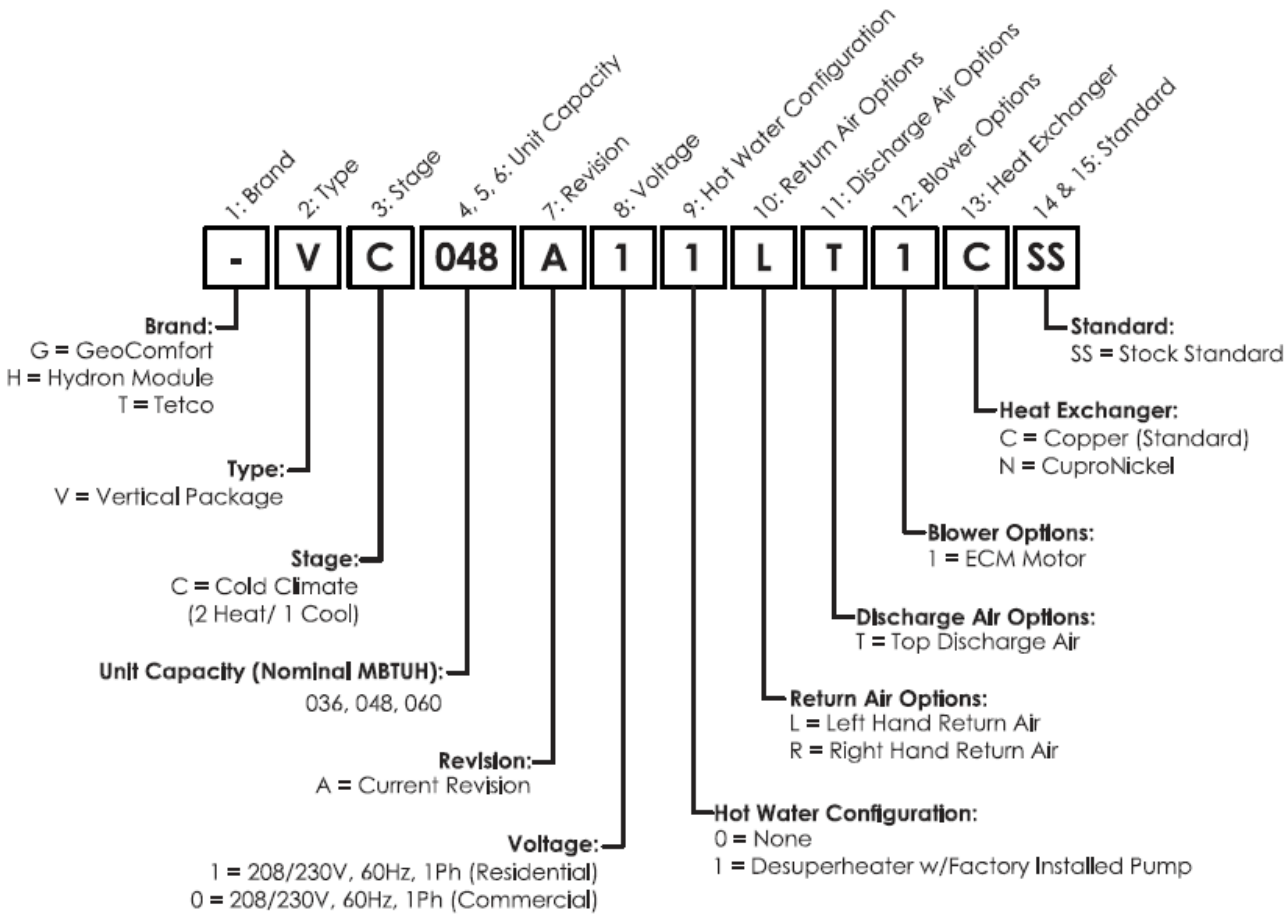
II. KEY & LEGEND

KEY TO MODEL NUMBERS



LEGEND FOR TABLES

BTU/hr	Heating or cooling capacity	GPM	Gallons Per Minute
CAP	Capacity	HE	Heat Extracted
COP	Coefficient of performance (BTU/hr out ÷ BTU/hr in)	HR	Heat Rejected
CFM	Cubic feet per minute	HYD	Hydronic
DB	Dry-bulb entering air temperature	kW	Kilowatt
DEWT	Demand Entering Water Temperature	LLTC	Liquid Line Temperature Cooling
DHW	Demand Hot Water	LLTH	Liquid Line Temperature Heating
DLWT	Demand Leaving Water Temperature	LRA	Locked-rotor amperage
dP	Pressure drop across heat pump	LWT	Leaving water temperature
DSH	Desuperheater	MBTU/hr	Btu/hr x 1000
EER	Energy efficient ratio (BTU/hr CAP ÷ watts in)	RLA	Rated-load amperage
EWT	Entering water temperature	SLT	Suction Line Temperature
FLA	Full-load amperage	VA	Volt-amperes
GND	Ground	WB	Wet-bulb entering air temperature

III.WARNINGS & CAUTIONS

☞ **Note** – Always refer to the inside of the lower front door for the **correct wiring diagram**, and always refer to the nameplate on the exterior of the cabinet for the **correct electrical specifications**.

☠**WARNING** – Service of refrigerant-based equipment can be hazardous due to elevated system pressures and hazardous voltages. Only trained and qualified personnel should install, repair or service. Installer is responsible to ensure that all local electrical, plumbing, heating and air conditioning codes are followed.

☠**WARNING – ELECTRICAL SHOCK CAN CAUSE PERSONAL INJURY OR DEATH.** Disconnect all power supplies before installing or servicing electrical devices. Only trained and qualified personnel should install, repair or service this equipment.

☠**WARNING – THE UNIT MUST BE PROPERLY GROUNDED!**
The main electrical service must be protected by a fuse or circuit breaker and be capable of providing the amperes required by the unit at nameplate voltage. All wiring must comply with the national electrical code and/or any local codes that may apply. Access to the line voltage contactor is through the knockouts provided on the side of the heat pump as labeled. Route EMT or flexible conduit with appropriate size and type of wire.

Ensure adequate supply wiring to minimize the level of dimming lights during compressor startup on single-phase installations. Some dimming is normal upon compressor start-up.

✋**CAUTION** – Route field electrical wiring to avoid contact with electrically live bare metal parts inside the electrical box.

✋**CAUTION** – Three-phase units must be wired properly to ensure proper compressor rotation. Improper rotation may result in compressor damage. An electronic phase sequence indicator must be used to check supply-wiring phases. Also, the "Wild" leg of the three-phase power must be connected to the middle leg on the contactor.

☠**WARNING** –Verify refrigerant type before servicing. The nameplate on the heat pump identifies the type and the amount of refrigerant. All refrigerant removed from these units must be reclaimed by following accepted industry and agency procedures.

✋**CAUTION** – Ground loop must be freeze protected. Insufficient amounts of antifreeze may cause severe damage and will **void warranty**. Loop antifreeze must be non-flammable. Never operate with ground loop flow rates less than specified. Continuous operation at low flow or no flow may cause severe damage and may **void warranty**.

☞ **Note** – These units feature braze-plate heat exchangers. Enertech requires that a strainer be installed on the water inlet of the source circuit. A strainer with a size of 16-20 mesh minimum should be used. **For your convenience a strainer and connection hardware have been included with the unit.**

IV. GENERAL INFORMATION

INSPECTION

Equipment should be inspected upon receipt to assure that damage has not occurred during shipment of the unit. Carefully check the shipping company bill of lading against the packing slip to verify that all units and accessory packages have been received. Inspect each package for physical damage and ensure that the carrier makes notation of any damage or missing packages on bill of lading records. Pictures of any damage are recommended. Concealed damage should be reported to the shipping company immediately.

STORAGE

Unit should be stored in a clean, dry location in the original shipping packaging. Units shall be stored in an upright position and should not be stacked unless noted on the shipping packaging.

PROTECTION

Units should be protected when on the building site from damage and contamination. Keep units covered or in original shipping packaging during job site construction. All physical connections (air supply and return, piping, electrical) should be protected and covered/capped prior to installation.

PRE-INSTALLATION PREPARATION

Care should be taken to assure that the installation of the geothermal unit is successful. Locate the unit where there is adequate ventilation and room for servicing. Units should be placed on a level surface on a vibration–absorbing pad slightly larger than the base of the unit. Care should be taken to use the proper duct size, piping is not hard-plumbed to the unit, and any sound or vibration is not transmitted into the surroundings.

Units are designed for indoor installation only where the ambient temperature remains above 45°F. Do not use the heat pump for initial heating of the building during construction. Operating the heat pump during construction or renovation will subject the unit to contamination, potentially resulting in failure of the unit. Starting the heat pump in a cold environment may flush lubricant from the compressor resulting in compressor damage and ultimately, unit failure.

- Review the electrical data on the nameplate to assure that the correct unit has been shipped
- Carefully remove any packing material from the outside and inside of the unit and inspect for any concealed damage
- Inspect electrical connections for cleanliness and attachment
- Inspect liquid connections to assure that any debris has been removed and caps are removed as appropriate.

V. BEST PRACTICES

SYSTEM SIZING

Selecting the unit capacity of a geothermal heat pump requires three things:

- Building Heat Loss / Heat Gain.
- Ground Sources and Design Water Temperatures.
- Temperature Limitations.

BUILDING HEAT LOSS/HEAT GAIN

The space load must be estimated accurately for any successful HVAC installation. There are many guides or computer programs available for estimating heat loss and gain, including the Manual J, and others. After the heat loss and gain analysis is completed, Entering Water Temperatures (EWT's) are established, and heating conditions are determined. The heat pump can now be selected using the heat pump data found in the Engineering Specifications section. Choose the capacity of the heat pump based on both heating and cooling loads.

GROUND SOURCES AND DESIGN WATER TEMPERATURES

Ground sources include the Ground Water (typically a well) and the Ground Loop varieties. Water flow-rate requirements vary based on configuration. The Engineering Specifications section provides capacities at different loop entering water temperatures and entering air temperatures.

GROUND LOOP SYSTEMS

Loop systems use high-density polyethylene pipe buried underground to supply a tempered water solution back to the heat pump. Ground loops operate at higher flow rates than ground water systems because the loop Entering Water Temperature (EWT) is lower. EWT affects the capacity of the unit in both heating and cooling modes, and loops in cold climates are normally sized to supply wintertime EWT to the heat pump down to 25˚F.

GROUND WATER SYSTEMS

See Figure 3

☞ **Note** – If a heat pump is installed with ground water, it should have a Cupro-Nickel (CuNi) water coil. Cupro-Nickel water coils withstand well water much better than standard copper water coils.

TEMPERATURE LIMITATIONS

Be aware of the operating range of the geothermal system when sizing the particular heat pump to avoid premature equipment failure. Operating outside of these limitations may cause severe damage to the equipment and may **void warranty**.

CAUTIONS: Reference tables in engineering section for acceptable operating conditions.

System design

GROUND SOURCE DESIGN

GROUND LOOP INSTALLATION

A Ground Loop system circulates the same antifreeze solution through a closed system of high-density underground polyethylene pipe. As the solution passes through the pipe, it collects energy (in the heating mode) from the relatively warm surrounding soil through the pipe and into the relatively cold solution. The solution circulates to the heat pump, which transfers energy with the solution, and then the solution circulates back through the ground to extract more energy.

CAUTION – Ground Loops **must** be properly freeze protected. Insufficient amounts of antifreeze may result in a freeze rupture of the unit or can cause unit shutdown problems during cold weather operation. Propylene glycol is a common antifreeze solution. Propylene glycol antifreeze solution should be mixed 25% with water to obtain a 15˚F freeze protection. Enertech's proprietary Geothermal Transfer Fluid (GTF) is methanol-based antifreeze and should be mixed 50% with water to achieve freeze protection of 12˚F.

Important – Do not mix more than 25% propylene glycol with water in an attempt to achieve lower than 15˚F freeze protection, since more concentrated mixtures of propylene glycol become too viscous at low temperatures and will become more difficult to pump through the earth loop. Horizontal loops typically use GTF, and vertical loops typically use propylene glycol.

Note – Always check State and Local codes for any special requirements on antifreeze solutions.

CAUTION – Never operate with flow rates less than specified. Low flow or no flow may cause the unit to shut down on a pressure lockout or may cause a freeze rupture of the heat exchanger.

Important– Installation of Pressure/Temperature (P/T) ports in the entering and leaving water line of the heat pump is recommended (see figure 2). A thermometer can be inserted into the P/T ports to check entering and leaving water temperatures. A pressure gauge can also be inserted into these P/T ports to determine the pressure differential between the entering and leaving water. This pressure differential can then be compared to the specification data on each particular heat pump to confirm the proper flow rate of the system.

An individually-sized Enertech Flow Center can supply pumping requirements for the Ground Loop fluid.

Note – Refer to instructions included with the Flow Center for properly purging the ground loop.

Filling and purging a loop system are very important steps to ensure proper heat pump operation. Each loop must be purged with enough flow to ensure two feet per second flow rate in each circuit in the loop. This normally requires a 1½ to 3 HP high-head pump to circulate fluid through the loop to remove all the air out of the loop. Allow the pump to run 10 to 15 minutes after the last air bubbles have been removed. After purging is completed, add the calculated proper amount of antifreeze to give a 12°F to 15°F freeze protection. Always pump away from coil or into the earth loop. After antifreeze has been installed and thoroughly circulated, it should be measured with a hydrometer (methanol), refractometer (propylene glycol), or Enertech methanol anti-freeze tester to determine the actual freezing point of the solution.

The purge pump can be used to pressurize the system for a final static pressure of 30-40 psig after the loop pipe has had enough time to stretch. In order to achieve the 30 to 40 psig final pressure, the loop may need to be initially pressurized to 60-65 psig. This static pressure may vary 10 psig from heating to cooling season, but the pressure should always remain above 20 psig, to ensure circulation pumps do not cavitate or pull air into the system. Contact your local installer, distributor or factory representative for more information.

GROUND WATER INSTALLATION

Since water is the source of energy in the winter and the energy sink in the summer, a good water supply is possibly the most important requirement of a geothermal heat pump system installation.

A Ground Water system gets its name from the open discharge of water after it has been used by the heat pump. A well must be available that can supply all of the water requirements of the heat pump for up to 24 hours/day on the coldest winter day plus any other water requirements drawing off of that same well. A bladder type pressure tank with a "draw down" of at least 1 ½ times the well pump capacity must be installed on the supply side of the heat pump.

☞ **Note** – These units feature braze-plate heat exchangers. Enertech requires that a strainer be installed on the water inlet of the source circuit. A strainer with a size of 16-20 mesh minimum should be used. **For your convenience a strainer and connection hardware have been included with the unit.**

☞ **Important** – It is highly recommended that Pressure/Temperature (P/T) ports be placed in the supply and discharge lines so that thermometers or pressure gauges can be inserted into the water stream.

☞ **Important** – It is highly recommended that a visual flow meter be installed to allow visual inspection of the flow. If flow meter appears cloudy the water coil may need to be cleaned.

A solenoid control valve must be installed on the water discharge side of the heat pump to regulate the flow through the unit.

Schedule 40 PVC piping, copper tubing, polyethylene or rubber hose can be used for supply and discharge water lines. Make sure line sizes are large enough to supply the required flow with a reasonable pressure drop (generally 1" diameter minimum). Consult local plumbing codes to ensure compliance.

✋ **CAUTION** – Never operate with flow rates less than specified. Low flow rates, or no flow, may cause the unit to shut down on a pressure lockout or may cause a freeze rupture of the heat exchanger. If unit is operated without flow warranty with be voided.

GROUND WATER FREEZE PROTECTION

✋ **CAUTION** – Only equipment ordered with a CuNi coil shall be used on ground water applications. These units are provided with freeze protection.

APPLICATION DIAGRAMS

Figures 1 through 4, show the components of a heat pump system discussed above used in some common applications. These figures by no means represent all the possible heat pump applications, but they do show important principles that can be applied to any system.

UNIT LOCATION/MOUNTING

✋ **CAUTION** – Units must be kept in an upright position during transportation or installation, or severe internal damage may occur. Never transport a heat pump on its side or back.

✋ **CAUTION** – Do not use this unit during construction. Dust and debris may contaminate electrical and mechanical components; resulting in damage.

☞ **Important** – To ensure easy removal and replacement of access panels, leave panels secured in place until the unit is set in place and

leveled.

☞ **Important** – Locate the unit indoors where ambient temperature remains above 45°F. Service is primarily from the front. Rear and side access should be provided when possible, 12" clearance on all sides is desirable.

☞ **Important** – A field installed drain pan is required under the entire unit if accidental water discharge could damage surrounding floors, walls or ceilings. Check local codes for compliance.

✋ **CAUTION** – Do not mount components or pipe to the exterior of the heat pump cabinet.

☞ **Important** – Units must be mounted on a vibration absorbing pad slightly larger than the base to provide isolation between unit and floor. Water supply pumps shall not be hard plumbed directly to the unit with copper pipe; this could transfer vibration from the water pump to the refrigeration circuit, causing a resonating sound. Flexible water connection use is recommended to eliminate transfer of vibration wherever possible.

✋ **CAUTION** – Always use plastic male fittings into plastic female or into metal female fittings. Never use metal male fittings into plastic female fittings. On metal-to-metal fittings; use pipe thread compound, do not use pipe thread tape. Hand tighten first, and then only tighten an additional ½ turn with a tool if necessary. On plastic fittings, always use 2 to 3 wraps of pipe thread tape, do not use pipe thread compound. Hand tighten first, then only an additional ½ turn with a tool if necessary. Do not over-tighten, as damage may occur.

☞ **Important** – Install with constant downward slope.

VI. ELECTRICAL

☞ **Note** – Always refer to the inside of the front panel for the **correct wiring diagram and guide to LEDs**.

☞ **Important** – If external controls require more power than shown in the engineering specification, external transformer & isolation relays should be used.

☞ **Important** – Miswiring of 24Vac control voltage on system controls can result in transformer burnout.

☞ **Important** – Units with dual voltage rating (example, 208/230) are factory-wired for the higher voltage (example, 230). If connected to power supply having the lower voltage, change wiring to transformer primary to the correct lead; otherwise premature failure, or inability to operate the control components may occur.

CONTROLLER

The controller is designed to provide high reliability in controlling numerous operating functions of geothermal heat pumps with space heating, space cooling, desuperheater and dedicated domestic water heating. This controller switches control devices by reviewing the various control inputs and temperature information, making decisions based on operation priority.

Power up Initialization

When system powers up, there is a random start up time of 30-90 seconds. Once per second, the controller will examine process inputs, execute the control algorithm for the system, and update the process outputs.

All Possible Combinations of Room Thermostat Inputs (24 VAC)

Mode	Operation Inputs					
	Y1	Y2	O	G	W1	W2
Fan Only				x		
Heating 1st Stage	x			x		
Heating 2nd Stage		x		x		
	x	x		x		
Heating Auxillary	x	x		x	x	
Heating 2nd Stage Auxiliary	x	x		x	x	x
Cooling		x	x	x		
	x	x	x	x		
1st Stage Emergency Heat				x	x	
2nd Stage Emergency Heat				x	x	x
				x		x

The heat pump will not run if there is an invalid thermostat call and the LEDs will be illuminated, see LED section.

Anti-Short Cycle

Every time the compressor relay is turned off, the time delay function will prevent the compressor relay from turning on for a period of 5 minutes.

Reset

A push button located on the control board called 'TEST' is used to shorten the anti-short cycle progress. The anti-short cycle time is shortened from 5 minutes to 1 minute. This button, intended for use only by a qualified service technician, eliminates the need to wait for the time out period when cycling in different modes of operation.

Fan Operation

The fan has an extended run time of 2 minutes. If the thermostat/fan has an internal fan extended run time, the fan could potentially run for longer than 2 minutes once the G call is satisfied.

ECM Fan Speed Control

The controller has the ability to change the ECM Fan Speed. Refer to the CFM table in the Engineering Specifications for specific CFM taps. Using +/- Taps will adjust all CFM values + or - 10%.

Reversing Valve Control

Every time the compressor relay output is turned off following cooling operation, reversing valve will stay energized 90 seconds. This allows system pressure to equalize prior to de-energizing reversing valve. After a heating call, reversing valve will be energized & de-energized 90 seconds after compressor output is turned off. Switching the reversing valve after each run cycle keeps it well lubricated and operational.

Desuperheater Operation

The controller monitors desuperheater temperatures allowing unit equipped with desuperheater to operate most efficiently. Refer to the Desuperheater section for more information about Desuperheater controls.

Dip Switches

The dip switches mounted on the controller board allow the installer to select various features for operating the unit. Once the dip switch position is changed, power must be reset in order for the change to register on the control board.
The dip switches are listed below.

Main Board

Designator	Description	Dipswitch On	Dipswitch Off
FRZ[2]	Freeze Protection (15°F or 33°F)	15°F	33°F[1]
STG[2]	Single Stage or Two Stage Compressor	Two Stage[3]	Single Stage
DSH[2]	Enable/Disable Desuperheater	Enabled[1]	Disabled
PMP	Loop Pumps	Together	Separate[1]
HYD[2]	Water-to-Water or Water-to-Air	Water-to-Water	Water-to-Air

[1] See Ground Loop Pump operation for more information.

[2] Used for internal software to verify board configuration w/model number.

Explanation of Dip Switch Settings

SMP - Sampling Mode

In the OFF position, this selection commands the hot water circulating pump to turn on every five minutes to circulate water from the hot water storage tank to the heat pump. At the end of a 2 minute period (sampling of the water temperature), if the temperature of the water entering the heat pump is equal to or less than the programmed cut-in temperature after 2 minutes of continuous circulation, water heating mode is initiated.

In the ON position, the pump will run continuously, similarly the water will be sampled continuously. See priority settings & operation for more information.

STG-Ground Loop Pump Operation

Water circulating pumps used to circulate an antifreeze solution can be staged by the controller to cycle on one or more pumps at different entering water temperatures.

Loop pump relay #1 is the primary pump control. It is energized whenever there is a call for space heating, space cooling, and water heating.

Staging Control

In the space heating mode, as fluid temperature declines in the winter, more flow (gpm) is required to provide more heat transfer from the ground to the heat pump. Likewise, in the space cooling mode, as fluid temperature increases, more flow (gpm) is required to remove heat from the heat pump to the ground.

Energy savings are increased because the heat pump can cycle off one or more pumps when they are not needed.

Heating Operation (Thermostat or DHW)
Ground loop pump #2 will turn on once the entering water temperature falls below 60°F. Pump #2 will turn off once the temperature rises to 65° F. Pump #2 will turn on/off "on the fly". EWT is continually checked during operation.

Cooling Operation
Ground loop pump #2 will turn on once the entering water temperature rises above 60°F. Pump #2 will turn off once the temperature falls to 55° F. Pump #2 will turn on/off "on the fly". EWT is continually checked during operation.

LED LIGHTS

PWR LED
Solid illumination of this light indicates that the control board is functioning properly. During the random start period the LED will be flashing. No light may indicate loss of power to board. Voltage must be 18VA - 32VA.

Mode of Operation LED Lights
Mode of Operation LED lights (three) in addition to the PWR LED, aid in troubleshooting and indicating the mode of operation. While a mode is running the LED will be illuminated solid. If a mode is waiting to run for the anti-short cycle period the LED will be flashing.

Heating - Space Heating or Electric Heat Operation

Cooling - Space Cooling Operation

Service LED Lights
Service LED lights (five) in addition to the PWR and Mode LEDs, aid in troubleshooting.

High DGT - Hot refrigerant gas

High Pressure - Excessive refrigerant pressure

Low Pressure - Refrigerant pressure too low

Freeze - LWT below setpoint

Overflow - Drain pan filled with water

Guide to LEDs

LED Illuminated	Action	Status
PWR	Flashing	Random Start Up Time - wait.
	Solid	Power to Unit
HEATING	Solid	Running Heating and/or Auxiliary Heat
	Flashing	1. Waiting to run Heating and/or Auxiliary Heat 2. Soft lockout - hold DIAG button for 2 seconds. Lockout LED will be illuminated if soft lockout.
COOLING	Solid	Running Cooling
	Flashing	1. Waiting to run Cooling 2. Soft lockout - hold DIAG button for 2 seconds. Lockout LED will be illuminated if soft lockout.
HEATING & COOLING & DEMAND HOT WATER	Flashing - *all*	Invalid Input from Thermostat
HEATING & Service LED	Solid - *both*	Hard Lockout - type of lockout LED Illuminated occurred while Heating was running.
COOLING & Service LED	Solid - *both*	Hard Lockout - type of lockout LED Illuminated occurred while Cooling was running.
Service LED	Flashing *Without Mode LEDs Flashing*	Thermistor Error 1. If FREEZE - LWT Error 2. If LOW PRESSURE - EWT Error 3. If High DGT - DGT Error 4. If OVERFLOW - DEWT Error

Soft and Hard Safety Lockouts
On occasion, the unit's operating conditions may exceed the parameters set for normal operation. This means that the unit could lock out on a safety control, thus preventing the unit from operating. To restore operation, a qualified service technician must service the unit.

To eliminate nuisance lockouts as a result of high or low pressure safety trips, the controller has the ability to allow more than one lockout (soft lockout) before it decides to permanently lock out (hard lockout) the mode of operation in which the lockout occurred.

For example, when the high pressure lockout occurs in heating mode for the third time in a

period less than 90 minutes, the heating mode will be disabled until a manual reset is performed.

High & Low Pressure Lockout
The High or Low Pressure LED is illuminated once a Hard Lockout occurs. A hard lockout is defined as; high or low pressure switch has been activated 3 times within 90 minutes. Once the high or low pressure switch is activated, the unit is shut down and soft lockout is triggered. The unit will be shut down for 15 minutes. At which time it will attempt to run again if there is a thermostat input. If a hard lockout occurs power must be reset in order to clear the lockout.

Discharge Gas Temperature (DGT) Lockout
The discharge gas refrigerant temperature is continually monitored and when hot gas temperature rises above 250°F a soft lockout is initiated and the unit is shut down. Unit will be shut down for 15 minutes, at which time it will attempt to run again if there is a thermostat input and the DGT temperature is below 200°F. If DGT reaches 250°F 3 times in a 90 minute period a hard lockout will be set requiring a manual power reset.

Overflow Lockout
Once the overflow sensor is triggered a hard lockout will be set requiring a manual power reset.

Freeze Lockout
Freeze protection lockout occurs when the leaving water temperature falls below the set point of LWT. At which time a soft lockout is initiated and the compressor is shut down. The ground loop pump remains on for 15 minutes. The unit will attempt to run again if there is a thermostat input and the LWT rises 7°F above set point. If a freeze lockout is initiated 3 times in a 90 minute period a hard lockout will be set requiring a manual power reset.

Active Control Panel
All LED lights are also located on the Membrane. The TEST button is located on the membrane at the top left corner or on the left below the service LEDs. The DIAG button is located on the membrane at the top right corner or on the right below the "t" in Enertech.

VII. HEAT PUMP COMMISSIONING

Before applying power to the heat pump, check the following items:

- Water supply plumbing to the heat pump is completed and operating. Manually open the water valve on well systems to check flow. Make sure all valves are open and air has been purged from a loop system. Never operate the system without correct water supply flow.

- All high voltage and all low voltage wiring is correct and checked out, including wire sizes, fuses and breakers. Set system to the "OFF" position.

☞ **Note** – The heat pump is located in a warm area (above 45°F). (Starting the system with low ambient temperature conditions is more difficult and may cause low-pressure lockout.) Do not leave the area until the space is brought up to operating temperatures.

Commissioning
The controller has the ability to perform a system check on all modes using the Commissioning process.
Run this process at the end of each installation - data will be stored in the controller.

1. Reset Power.
2. Hold the TEST button for 15 seconds. PWR & Cooling LED will begin flashing.
3. Cooling will be run for 15 minutes.
4. Unit idle for 3 minutes while Heating LED flashing.
5. Heating will be run for 15 minutes.
6. Unit idle for 3 minutes.
7. If equipped with Desuperheater - the Desuperheater will run for 15 minutes. Unit will run in Heating mode.
8. Once complete the following LEDs will be illuminated:
    a. Power – Off
    b. Heating – On
    c. Cooling - On
    d. Demand Hot Water – On
9. Hold TEST button for 5 seconds or power reset to resume normal operation.

MAINTENANCE

Properly installed, the Enertech heat pump requires only minor maintenance such as periodic cleaning of the ground water heat exchanger for heat pumps installed in ground-water applications. Setting up regular service checkups with your Enertech dealer should be considered. Any major problems with the heat pump system operation will be indicated on the lockout lights.

✋ **CAUTION** – During evacuation of refrigerant of a system not having antifreeze protection of the ground-side, water in the unprotected heat exchanger must be removed or continuously flowing to avoid a potential heat exchanger failure caused by freeze rupture.

☞ **Important** – Always install a new filter/drier after replacing a refrigeration component (compressor, etc.).

The Enertech controller (and a room thermostat, if part of the system installation) will display a system lockout. If lockout occurs, follow the procedure below:

1. Determine and record which indicator lights on the controller are illuminated. (Refer to Troubleshooting Section for more information on possible causes of Lockout Conditions.)
2. Check for correct water supply from the ground loop or ground water system.
3. Reset the system by disconnecting power at the circuit breaker for one minute and then reapplying.
4. If shutdown reoccurs, ☎ **C**all your Enertech dealer. **Do not continuously reset the lockout condition or serious damage may occur.**

☞ **Note – Improper fluid flows or incorrect antifreeze levels are the cause of almost all lockouts.**

VIII. ACCESSORIES

ROOM THERMOSTAT

Installations may include a wide variation of available electronic room thermostats, and most of them must be configured by the Installer and checked out after installation. For the number of wires required or other questions, please refer to the installation manual that was sent with the thermostat.

DESUPERHEATER

A heat pump equipped with a double-wall vented desuperheater can provide supplemental heating of domestic hot water by stripping some energy from the superheated gas leaving the compressor and transferring it to a hot water tank. A built in desuperheater pump circulates water from the domestic hot water tank, heats it and returns it to the tank.

The desuperheater only provides supplemental hot water when the compressor is running to condition space. Because the desuperheater is using some energy from the heat pump to heat water, the heat pump's capacity in the winter is about 10% less than a unit without a desuperheater. The desuperheater can be disabled with a dip switch on the control board.

The control board has the ability to control desuperheater operation. The desuperheater will operate once the entering desuperheater temperature is below 120°F and the compressor is energized. The desuperheater will continue to run until the DEWT reaches 130°F, at which point operation will end.

Desuperheater operation is ended once an auxiliary heat call is made.

The desuperheater can be enabled or disabled with a dipswitch on the control board. Refer to Control Section.

☠ **WARNING**– The desuperheater high temperature cutout switch is located on the return line from the water heater and is wired in series with the desuperheater pump to disable it from circulating at entering water temperatures above 140°F. If tank temperatures become uncomfortably hot, move this switch to the leaving water line, which will reduce the tank maximum temperatures 10°F to 15°F.

✋**CAUTION**– Running desuperheater pump without water flow will damage the pump. **A fuse is attached to the fuse holder and must be inserted in the fuse holder after the desuperheater is purged and operational.**

☞ **Important** – Do not insert the fuse until water flow is available and the desuperheater is completely purged of air, or the pump may be damaged.

All air must be purged from the desuperheater plumbing before the pump is engaged. To purge small amounts of air from the lines, loosen the desuperheater pump from its housing by turning the brass collar. Let water drip out of the housing until flow is established, and re-tighten the brass collar. Using 1/2-inch copper tubing or larger from the tank to the desuperheater inlet is recommended to allow proper water flow. An air vent in the inlet line can also help systems where air is a problem. If one is used, mount it near the desuperheater inlet roughly 2-1/2 inches above the horizontal pipe. Shutoff valves allow access to the desuperheater plumbing without draining the hot water tank. Keep the valves open when the pump is running.

Hot water tank maintenance includes periodically opening the drain on the hot water tank to remove deposits. If hard water, scale, or buildup causes regular problems in hot water tanks in your area, it may result in a loss of desuperheater effectiveness. Cleaning may be required.

✋**CAUTION** – Insulated copper tubing **must** be used to run from the water tank to the desuperheater connections on the side of the unit. Desuperheater must be plumbed in copper tubing.

The built-in desuperheater pump can provide the proper flow to the desuperheater if the total equivalent length of straight pipe and connections is kept to a maximum of 90 feet of 1/2-inch type L copper tubing (or a combination of approximately 60 feet with typical elbows and fittings). This tubing can be connected to the water tank in two ways:

METHOD 1

Using a desuperheater tee installed in the drain at the bottom of the water heater This is the preferred method for ease of installation, comfort and efficiency. The tee eliminates the need to tap into the domestic hot water lines and eliminates household water supply temperature variations that could occur from connecting to the hot water pipes. Poor water quality may restrict the effectiveness of the desuperheater tee by plugging it with scale or buildup from the bottom of the tank, restricting water flow.

METHOD 2

Taking water from the bottom drain and returning it to the cold water supply line This method maintains the same comfort and efficiency levels but increases installation time and cost.

☞ **Important** – This method requires a check valve in the return line to the cold water supply to prevent water from flowing backwards through the desuperheater when the tank is filling. Water passing through the pump backwards damages the rotor's bearing, which reduces pump life and causes noise problems in the pump. **Note** – A spring-type check valve with a pressure-drop rating of 1/2 psig or less is recommended.

IX. ENGINEERING SPECIFICATIONS

PERFORMANCE RATINGS

3 TON PERFORMANCE RATINGS

Heating Performance Data (Tested in accordance with ASHRAE/AHRI/ ISO Standard 13256-1)

Operating Mode	Application	Source EWT (°F)	Entering GPM (source)	Total Heat Output (MBH)	CFM	COP
Full Load	Ground Water	50°F	8	45,400	1100	3.9
	Ground Loop	32°F *		37,200	1100	3.6
Part Load	Ground Water	50°F		33,300	900	4.2
	Ground Loop	41°F		29,900	900	3.9

* Antifreeze required

Cooling Performance Data (Tested in accordance with ASHRAE/AHRI/ ISO Standard 13256-1)

Operating Mode	Application	Source EWT (°F)	Entering GPM (source)	Total Cooling Output (MBH)	CFM	EER
Full Load	Ground Water	59°F	8	35,600	900	27.0
	Ground Loop	77°F		34,700	900	21.5

4 TON PERFORMANCE DATA

Heating Performance Data (Tested in accordance with ASHRAE/AHRI/ ISO Standard 13256-1)

Operating Mode	Application	Source EWT (°F)	Entering GPM (source)	Total Heat Output (MBH)	CFM	COP
Full Load	Ground Water	50°F	10	54,000	1400	3.9
	Ground Loop	32°F *		43,300	1400	3.4
Part Load	Ground Water	50°F		37,900	1100	4.3
	Ground Loop	41°F		33,800	1100	3.8

* Antifreeze required

Cooling Performance Data (Tested in accordance with ASHRAE/AHRI/ ISO Standard 13256-1)

Operating Mode	Application	Source EWT (°F)	Entering GPM (source)	Total Cooling Output (MBH)	CFM	EER
Full Load	Ground Water	59°F	10	49,400	1100	25.9
	Ground Loop	77°F		46,800	1100	22

5 TON PERFORMANCE DATA

Heating Performance Data (Tested in accordance with ASHRAE/AHRI/ ISO Standard 13256-1)

Operating Mode	Application	Source EWT (°F)	Entering GPM (source)	Total Heat Output (MBH)	CFM	COP
Full Load	Ground Water	50°F	12	60,300	1700	4.0
	Ground Loop	32°F *		52,500	1700	3.5
Part Load	Ground Water	50°F		48,100	1400	4.2
	Ground Loop	41°F		43,000	1400	3.7

* Antifreeze required

Cooling Performance Data (Tested in accordance with ASHRAE/AHRI/ ISO Standard 13256-1)

Operating Mode	Application	Source EWT (°F)	Entering GPM (source)	Total Cooling Output (MBH)	CFM	EER
Full Load	Ground Water	59°F	12	51,300	1400	25.1
	Ground Loop	77°F		51,100	1400	19.6

3 TON FULL LOAD HEATING & COOLING PERFORMANCE DATA

Ground				Cooling EAT 80.6°F DB & 66.2°F WB							Heating EAT 68°F DB						
EWT °F	GPM	dP psig	dP ft	Airflow CFM	Total Capacity	Sensible Capacity	KW	EER	Suction Pressure	Discharge Pressure	Airflow CFM	Total Capacity	Sensible Capacity	KW	COP	Suction Pressure	Discharge Pressure
20	8	2.0	4.6	Operation Not Recommended							1100	31.1	23.4	2.6	3.3	65	330
	10	3.8	8.8								1100	31.4	23.6	2.6	3.4	70	335
	12	5.3	12.2								1100	31.8	23.9	2.7	3.4	70	340
30	8	2.0	4.6								1100	37.4	28.1	2.8	3.5	80	360
	10	3.8	8.8								1100	37.8	28.4	2.9	3.7	85	365
	12	5.3	12.2								1100	38.2	28.7	2.9	3.7	85	425
40*	8	2.0	4.6	900	39.2	27.1	1.0	36.5	105	145	1100	42.3	31.8	3.0	3.8	85	370
	10	3.8	8.8	900	39.7	27.4	1.0	39.8	100	145	1100	42.7	32.1	3.1	3.9	95	365
	12	5.3	12.2	900	40.0	27.6	1.0	39.9	100	120	1100	43.5	32.7	3.1	3.9	95	370
50	8	2.0	4.6	900	38.4	26.5	1.1	32.8	115	180	1100	45.7	34.3	3.2	4.0	110	420
	10	3.8	8.8	900	38.7	26.7	1.1	35.6	115	175	1100	46.1	35.8	3.3	4.0	110	425
	12	5.3	12.2	900	39.2	27.0	1.2	35.8	120	150	1100	47.0	36.5	3.3	4.1	120	470
60	8	2.0	4.6	900	37.5	25.7	1.2	28.9	120	215	1100	50.9	39.5	3.4	4.2	125	450
	10	3.8	8.8	900	37.9	26.3	1.2	31.6	125	210	1100	51.6	40.0	3.5	4.3	125	460
	12	5.3	12.2	900	38.2	26.2	1.3	31.6	125	185	1100	53.0	41.1	3.5	4.3	135	505
70	8	2.0	4.6	900	34.6	23.7	1.4	21.4	125	240	1100	56.3	43.7	3.5	4.4	140	480
	10	3.8	8.8	900	37.0	25.5	1.4	27.4	125	240	1100	57.0	44.3	3.6	4.6	145	485
	12	5.3	12.2	900	37.4	25.6	1.5	27.5	130	210	1100	58.9	45.8	3.6	4.6	150	530
80	8	2.0	4.6	900	34.5	23.6	1.7	19.8	135	245	1100	62.2	48.3	3.7	4.6	160	545
	10	3.8	8.8	900	34.8	23.9	1.7	20.2	135	240	1100	63.0	48.9	3.7	4.7	165	550
	12	5.3	12.2	900	35.1	24.0	1.7	20.6	140	235	1100	65.4	50.8	3.8	4.7	170	602
90	8	2.0	4.6	900	33.6	23.0	1.8	16.2	140	275	Operation Not Recommended						
	10	3.8	8.8	900	33.9	23.3	1.8	16.6	155	275							
	12	5.3	12.2	900	34.3	23.5	1.8	16.9	155	270							
100	8	2.0	4.6	Operation Not Recommended													
	10	3.8	8.8														
	12	5.3	12.2														
110	8	2.0	4.6														
	10	3.8	8.8														
	12	5.3	12.2														
120	8	2.0	4.6														
	10	3.8	8.8														
	12	5.3	12.2														

* Operation at 40° EWT for long periods of time in Cooling is not recommended, this is an extreme operating condition.

Data subject to change.

Pressure: Suction +/- 5 psig & Discharge P +/- 10 psig.

Pressure Drops with pure water.

3 TON PART LOAD HEATING PERFORMANCE DATA

Ground				Heating EAT 68°F DB						
EWT °F	GPM	dP psig	dP ft	Airflow CFM	Total Capacity	Sensible Capacity	KW	EER	Suction Pressure	Discharge Pressure
20	8	2.0	4.6	900	20.6	15.9	2.0	3.1	65	340
	10	3.8	8.8	900	21.7	16.7	2.0	3.2	65	345
	12	5.3	12.2	900	22.9	17.6	2.1	3.2	70	355
30	8	2.0	4.6	900	24.6	18.9	2.1	3.4	80	360
	10	3.8	8.8	900	25.9	19.9	2.1	3.4	85	365
	12	5.3	12.2	900	27.3	21.0	2.1	3.5	85	370
40*	8	2.0	4.6	900	28.8	22.2	2.2	3.8	95	370
	10	3.8	8.8	900	30.4	23.4	2.2	3.9	100	375
	12	5.3	12.2	900	31.9	24.6	2.3	4.0	100	385
50	8	2.0	4.6	900	32.1	24.7	2.3	4.3	105	380
	10	3.8	8.8	900	33.8	26.9	2.3	4.3	105	385
	12	5.3	12.2	900	35.6	28.3	2.4	4.5	110	395
60	8	2.0	4.6	900	36.0	28.6	2.4	4.6	120	395
	10	3.8	8.8	900	37.9	30.1	2.4	4.7	125	400
	12	5.3	12.2	900	39.9	31.7	2.4	4.8	130	415
70	8	2.0	4.6	900	40.0	31.8	2.4	5.0	135	415
	10	3.8	8.8	900	42.1	33.5	2.5	5.1	140	420
	12	5.3	12.2	900	44.3	35.2	2.5	5.2	140	430
80	8	2.0	4.6	900	44.4	35.3	2.5	5.2	150	460
	10	3.8	8.8	900	46.7	37.2	2.6	5.2	155	465
	12	5.3	12.2	900	49.1	39.0	2.6	5.2	160	480
90	8	2.0	4.6	Operation Not Recommended						
	10	3.8	8.8							
	12	5.3	12.2							
100	8	2.0	4.6							
	10	3.8	8.8							
	12	5.3	12.2							
110	8	2.0	4.6							
	10	3.8	8.8							
	12	5.3	12.2							
120	8	2.0	4.6							
	10	3.8	8.8							
	12	5.3	12.2							

* Operation at 40° EWT for long periods of time in Cooling is not recommended, this is an extreme operating condition.

Data subject to change.

Pressure: Suction +/- 5 psig & Discharge P +/- 10 psig.

Pressure Drops with pure water.

4 TON FULL LOAD HEATING & COOLING PERFORMANCE DATA

Ground				Cooling EAT 80.6°F DB & 66.2°F WB							Heating EAT 68°F DB						
EWT °F	GPM	dP psig	dP ft	Airflow CFM	Total Capacity	Sensible Capacity	KW	EER	Suction Pressure	Discharge Pressure	Airflow CFM	Total Capacity	Sensible Capacity	KW	EER	Suction Pressure	Discharge Pressure
20	8	2.0	4.6	Operation Not Recommended							1400	40.0	29.9	3.4	3.5	65	310
	10	3.8	8.8								1400	40.4	30.2	3.4	3.6	65	305
	12	5.3	12.2								1400	41.9	31.3	3.5	3.6	90	315
30	8	2.0	4.6								1400	46.3	34.6	3.6	3.8	80	335
	10	3.8	8.8								1400	46.8	35.0	3.6	3.8	80	330
	12	5.3	12.2								1400	48.6	36.3	3.7	3.9	80	340
40*	8	2.0	4.6	1100	52.8	35.5	1.1	40.8	140	185	1400	51.6	38.6	3.7	3.9	90	365
	10	3.8	8.8	1100	52.8	35.5	1.1	41.5	135	180	1400	52.1	39.0	3.8	4.0	90	360
	12	5.3	12.2	1100	53.3	35.9	1.2	43.3	135	170	1400	54.1	40.5	3.8	4.0	95	370
50	8	2.0	4.6	1100	50.5	34.0	1.4	36.0	140	210	1400	57.6	45.0	3.9	4.2	105	390
	10	3.8	8.8	1100	51.0	34.3	1.4	36.8	135	200	1400	58.2	45.5	4.0	4.2	105	385
	12	5.3	12.2	1100	51.4	34.6	1.5	38.3	130	190	1400	60.4	47.2	4.1	4.3	110	395
60	8	2.0	4.6	1100	48.2	32.4	1.5	31.3	135	235	1400	63.8	49.8	4.2	4.4	120	430
	10	3.8	8.8	1100	48.7	32.8	1.5	32.0	130	225	1400	64.4	50.3	4.2	4.5	120	425
	12	5.3	12.2	1100	49.1	33.1	1.6	33.3	130	215	1400	66.9	52.2	4.3	4.5	125	435
70	8	2.0	4.6	1100	44.8	31.5	2.0	22.7	135	260	1400	70.0	54.7	4.4	4.8	130	450
	10	3.8	8.8	1100	45.3	31.8	2.0	23.1	130	250	1400	70.8	55.3	4.4	4.8	130	440
	12	5.3	12.2	1100	45.5	31.9	2.1	24.1	130	240	1400	73.5	57.4	4.5	4.9	135	455
80	8	2.0	4.6	1100	41.4	29.1	2.1	20.2	130	285	1400	76.8	60.0	4.6	4.9	140	475
	10	3.8	8.8	1100	42.0	29.5	2.1	20.5	130	275	1400	77.8	60.8	4.6	4.9	145	470
	12	5.3	12.2	1100	44.4	31.2	2.1	21.0	125	260	1400	80.8	63.1	4.7	5.0	150	480
90	8	2.0	4.6	1100	40.9	28.7	2.2	15.9	130	310	Operation Not Recommended						
	10	3.8	8.8	1100	41.5	29.2	2.3	16.1	125	300							
	12	5.3	12.2	1100	42.0	29.5	2.3	16.4	125	285							
100	8	2.0	4.6	Operation Not Recommended													
	10	3.8	8.8														
	12	5.3	12.2														
110	8	2.0	4.6														
	10	3.8	8.8														
	12	5.3	12.2														
120	8	2.0	4.6														
	10	3.8	8.8														
	12	5.3	12.2														

* Operation at 40° EWT for long periods of time in Cooling is not recommended, this is an extreme operating condition.

Data subject to change.

Pressure: Suction +/- 5 psig & Discharge P +/- 10 psig.

Pressure Drops with pure water.

4 TON PART LOAD HEATING PERFORMANCE DATA

Ground				Heating EAT 68°F DB						
EWT °F	GPM	dP psig	dP ft	Airflow CFM	Total Capacity	Sensible Capacity	KW	EER	Suction Pressure	Discharge Pressure
20	8	2.0	4.6	1100	27.2	20.0	2.2	3.3	70	305
	10	3.8	8.8	1100	27.5	20.2	2.3	3.3	70	315
	12	5.3	12.2	1100	27.8	20.4	2.4	3.4	70	320
30	8	2.0	4.6	1100	32.3	23.7	2.4	3.5	90	330
	10	3.8	8.8	1100	32.6	23.9	2.5	3.6	90	335
	12	5.3	12.2	1100	32.9	24.2	2.5	3.6	90	335
40*	8	2.0	4.6	1100	35.6	26.2	2.6	3.7	110	345
	10	3.8	8.8	1100	37.7	27.7	2.7	3.9	110	350
	12	5.3	12.2	1100	38.1	28.0	2.7	4.0	115	360
50	8	2.0	4.6	1100	41.9	31.8	2.8	4.1	120	360
	10	3.8	8.8	1100	42.4	32.2	2.9	4.3	120	365
	12	5.3	12.2	1100	42.9	32.5	2.9	4.4	125	370
60	8	2.0	4.6	1100	46.9	35.6	2.8	4.1	140	375
	10	3.8	8.8	1100	47.4	35.9	2.7	4.3	140	380
	12	5.3	12.2	1100	48.3	36.7	2.7	4.4	145	385
70	8	2.0	4.6	1100	51.9	39.4	2.8	4.2	160	400
	10	3.8	8.8	1100	52.4	39.8	2.9	4.3	160	405
	12	5.3	12.2	1100	53.5	40.6	2.9	4.4	165	410
80	8	2.0	4.6	1100	57.0	43.3	3.0	4.2	190	420
	10	3.8	8.8	1100	57.9	43.9	3.1	4.4	190	425
	12	5.3	12.2	1100	59.1	44.9	3.1	4.4	195	430
90	8	2.0	4.6	Operation Not Recommended						
	10	3.8	8.8							
	12	5.3	12.2							
100	8	2.0	4.6							
	10	3.8	8.8							
	12	5.3	12.2							
110	8	2.0	4.6							
	10	3.8	8.8							
	12	5.3	12.2							
120	8	2.0	4.6							
	10	3.8	8.8							
	12	5.3	12.2							

* Operation at 40° EWT for long periods of time in Cooling is not recommended, this is an extreme operating condition.

Data subject to change.

Pressure: Suction +/- 5 psig & Discharge P +/- 10 psig.

Pressure Drops with pure water.

5 TON FULL LOAD HEATING & COOLING PERFORMANCE DATA

Ground				Cooling EAT 80.6°F DB & 66.2°F WB							Heating EAT 68°F DB						
EWT °F	GPM	dP psig	dP ft	Airflow CFM	Total Capacity	Sensible Capacity	KW	EER	Suction Pressure	Discharge Pressure	Airflow CFM	Total Capacity	Sensible Capacity	KW	EER	Suction Pressure	Discharge Pressure
20	8	2.0	4.6	Operation Not Recommended							1700	45.7	34.7	3.7	3.4	65	280
	10	3.8	8.8								1700	46.6	35.4	3.8	3.4	65	285
	12	5.3	12.2								1700	47.5	36.1	3.8	3.5	70	285
30	8	2.0	4.6								1700	51.1	38.8	3.9	3.6	80	305
	10	3.8	8.8								1700	52.2	39.4	4.1	3.7	80	305
	12	5.3	12.2								1700	53.1	40.4	4.2	3.7	80	315
40*	8	2.0	4.6	1400	65.0	44.7	1.7	33.2	100	155	1700	54.4	41.4	3.9	3.8	90	330
	10	3.8	8.8	1400	66.7	45.9	1.8	34.2	95	150	1700	55.6	42.3	4.0	3.9	90	330
	12	5.3	12.2	1400	67.3	46.3	1.8	34.9	90	140	1700	56.6	43.1	4.0	3.9	95	335
50	8	2.0	4.6	1400	60.9	41.9	1.9	31.7	115	185	1700	60.6	46.6	4.2	4.0	100	350
	10	3.8	8.8	1400	62.2	42.8	1.9	32.3	110	175	1700	61.9	49.2	4.4	4.0	100	355
	12	5.3	12.2	1400	62.8	43.2	1.9	32.3	100	165	1700	63.1	48.5	4.4	4.0	105	360
60	8	2.0	4.6	1400	56.6	38.9	2.0	28.7	130	215	1700	65.7	50.5	4.2	4.0	115	380
	10	3.8	8.8	1400	57.6	39.1	2.0	29.3	120	205	1700	67.0	51.5	4.4	4.0	115	385
	12	5.3	12.2	1400	58.2	40.0	2.0	29.9	110	190	1700	67.7	52.0	4.5	4.1	120	390
70	8	2.0	4.6	1400	52.3	36.7	2.0	26.3	130	230	1700	70.6	54.3	4.5	4.1	125	400
	10	3.8	8.8	1400	53.1	37.3	2.1	26.8	120	220	1700	72.1	55.4	4.6	4.3	125	400
	12	5.3	12.2	1400	53.6	37.6	2.1	27.3	110	205	1700	72.8	56.0	4.6	4.3	130	405
80	8	2.0	4.6	1400	52.2	36.7	2.2	20.4	150	275	1700	76.0	58.5	4.7	4.4	135	425
	10	3.8	8.8	1400	53.1	37.3	2.5	20.8	140	265	1700	77.6	59.7	4.8	4.4	135	425
	12	5.3	12.2	1400	53.6	37.7	2.5	21.3	130	250	1700	78.4	60.3	4.8	4.5	140	430
90	8	2.0	4.6	1400	47.4	33.3	2.5	18.4	130	310	Operation Not Recommended						
	10	3.8	8.8	1400	48.2	33.8	2.5	18.7	125	300							
	12	5.3	12.2	1400	48.6	34.1	2.5	19.1	125	285							
100	8	2.0	4.6	Operation Not Recommended													
	10	3.8	8.8														
	12	5.3	12.2														
110	8	2.0	4.6														
	10	3.8	8.8														
	12	5.3	12.2														
120	8	2.0	4.6														
	10	3.8	8.8														
	12	5.3	12.2														

* Operation at 40° EWT for long periods of time in Cooling is not recommended, this is an extreme operating condition.

Data subject to change.

Pressure: Suction +/- 5 psig & Discharge P +/- 10 psig.

Pressure Drops with pure water.

5 TON PART LOAD HEATING PERFORMANCE DATA

Ground				Heating EAT 68°F DB						
EWT °F	GPM	dP psig	dP ft	Airflow CFM	Total Capacity	Sensible Capacity	KW	EER	Suction Pressure	Discharge Pressure
20	8	2.0	4.6	1400	39.0	29.2	3.0	3.6	80	280
	10	3.8	8.8	1400	39.6	29.7	3.0	3.7	80	280
	12	5.3	12.2	1400	40.1	30.0	3.0	3.7	80	285
30	8	2.0	4.6	1400	42.6	31.9	3.1	3.6	85	295
	10	3.8	8.8	1400	43.3	32.4	3.2	3.7	85	300
	12	5.3	12.2	1400	43.7	33.2	3.2	3.7	90	305
40*	8	2.0	4.6	1400	44.4	33.7	3.2	3.8	95	315
	10	3.8	8.8	1400	45.8	34.8	3.3	3.9	95	320
	12	5.3	12.2	1400	46.2	33.2	3.3	3.9	95	325
50	8	2.0	4.6	1400	47.6	36.6	3.3	4.0	100	350
	10	3.8	8.8	1400	48.4	37.2	3.4	4.1	100	355
	12	5.3	12.2	1400	48.8	37.5	3.4	4.1	105	360
60	8	2.0	4.6	1400	50.8	39.0	3.2	4.1	110	370
	10	3.8	8.8	1400	51.6	39.6	3.3	4.2	110	375
	12	5.3	12.2	1400	52.1	40.1	3.3	4.1	115	380
70	8	2.0	4.6	1400	53.8	41.5	3.3	4.1	120	400
	10	3.8	8.8	1400	54.7	42.1	3.4	4.2	120	400
	12	5.3	12.2	1400	55.3	42.6	3.4	4.3	120	405
80	8	2.0	4.6	1400	57.0	43.9	3.4	4.1	125	425
	10	3.8	8.8	1400	57.9	44.6	3.5	4.2	130	430
	12	5.3	12.2	1400	58.4	45.0	3.5	4.2	135	435
90	8	2.0	4.6	Operation Not Recommended						
	10	3.8	8.8							
	12	5.3	12.2							
100	8	2.0	4.6							
	10	3.8	8.8							
	12	5.3	12.2							
110	8	2.0	4.6							
	10	3.8	8.8							
	12	5.3	12.2							
120	8	2.0	4.6							
	10	3.8	8.8							
	12	5.3	12.2							

* Operation at 40° EWT for long periods of time in Cooling is not recommended, this is an extreme operating condition.

Data subject to change.

Pressure: Suction +/- 5 psig & Discharge P +/- 10 psig.

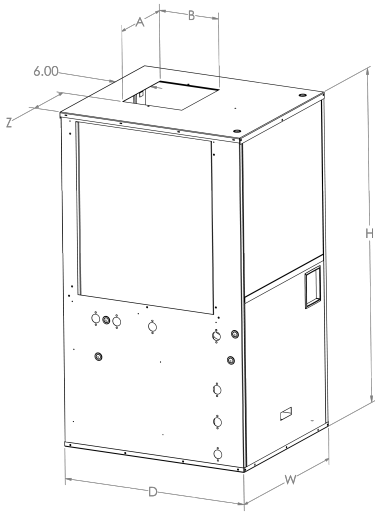
Pressure Drops with pure water.

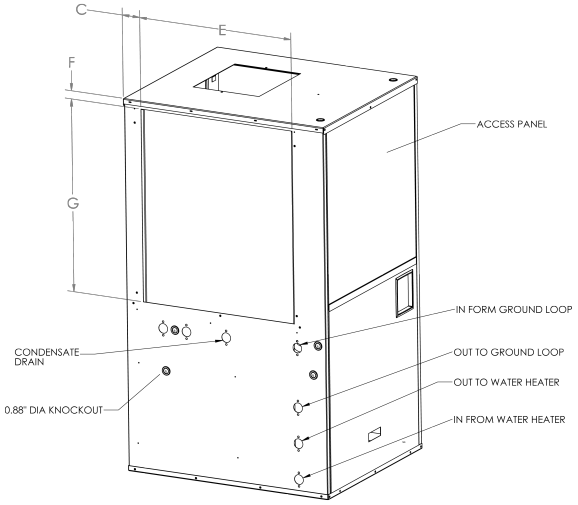
PHYSICAL DATA

	3 TON	4 TON	5 TON
Nominal Rated CFM	1100	1400	1700
Air Coil Face Area (ft2)	4.2	5.3	5.3
Tube O.D.	7/8 OD	7/8 OD	7/8 OD
Fins per Inch	14 FPI	14 FPI	14 FPI
Coil Rows	4	5	6
Filter Height and Width 1" Thick	21 5/8” x 29”	26 5/8” x 29”	26 5/8” x 29”
ECM Blower Motor HP	¾	¾	1
ECM Blower Wheel Size	10” x 8”	10” X 8”	10” X 8”
Source Connections	1” FPT	1” FPT	1” FPT
DSH/DHW (in) Connections	3/4” FPT	3/4” FPT	3/4” FPT

UNIT DIMENSIONS

Dimension	Measurement in Inches	
	3 Ton	4-5 Ton
Height	53.1	53.1
Width	27.0	27.0
Depth	31.1	31.1
A	12.0	12.0
B	10.25	10.25
C	0.6	0.6
E	21.9	26.9
F	1.3	1.3
G	28.5	28.5
I	7.0	7.0
Water Inlets	1.0 FPT	1.0 FPT
Water Outlets	1.0 FPT	1.0 FPT
Cond. Drain	¾” FPT	¾” FPT
Filter Size	21 5/8” x 29”	26 5/8” x 29”





ELECTRICAL DATA

Model	Voltage Code	60 Hz Power		Compressor		ECM Fan Motor FLA	HWG Pump FLA	Ext Pump FLA*	Total Unit FLA	Min Circuit AMPS	Max Fuse HACR	Min AWG	Max Ft
		Volts	Phase	LRA	RLA								
3 TON	1	208/230	1	104	21.2	6.8	0.3	4.0	32.0	37.3	50	8	80
	0	208/230	1	104	21.2	6.8	N/A	N/A	28.0	33.3	80	8	91
4 TON	1	208/230	1	152.9	27.1	6.8	0.3	5.5	39.7	46.5	70	6	102
	0	208/230	1	152.9	27.1	6.8	N/A	N/A	34.2	41.0	60	6	119
5 TON	1	208/230	1	179.2	29.7	9.1	0.3	5.5	44.6	52.0	80	6	91
	0	208/230	1	179.2	29.7	9.1	N/A	N/A	39.1	46.5	70	6	104

BLOWER PERFORMANCE

ECM BLOWER DATA

Model	Speed Tap	Fan Only	Full Load Heating	Auxiliary Heat	Full Load Cooling
3 TON	C[1]	450	1100	1200	900
	B	525	1200	1300	925
4 TON	C[1]	600	1400	1600	1100
	B	700	1600	1800	1250
5 TON	C[1]	750	1700	1900	1400
	B	850	1900	2100	1550

When part load is available CFM will be 76% of the full load rating.

Using the +/- Jumpers will result in + or - 10% of the ratings.

Test at .6 Static

[1]Indicates Factory Setting.

WATER COIL PRESSURE DROP RATINGS

Pressure drops (PSI) with pure water.

3 TON

GPM Water Flow	6	7	8	9	10	11
Source Water Pressure Drop(BPHE)	.7	1.0	1.3	1.7	2.2	2.5
Source Water Pressure Drop(CuNi)	2.0	2.3	2.9	n/a		

4 TON

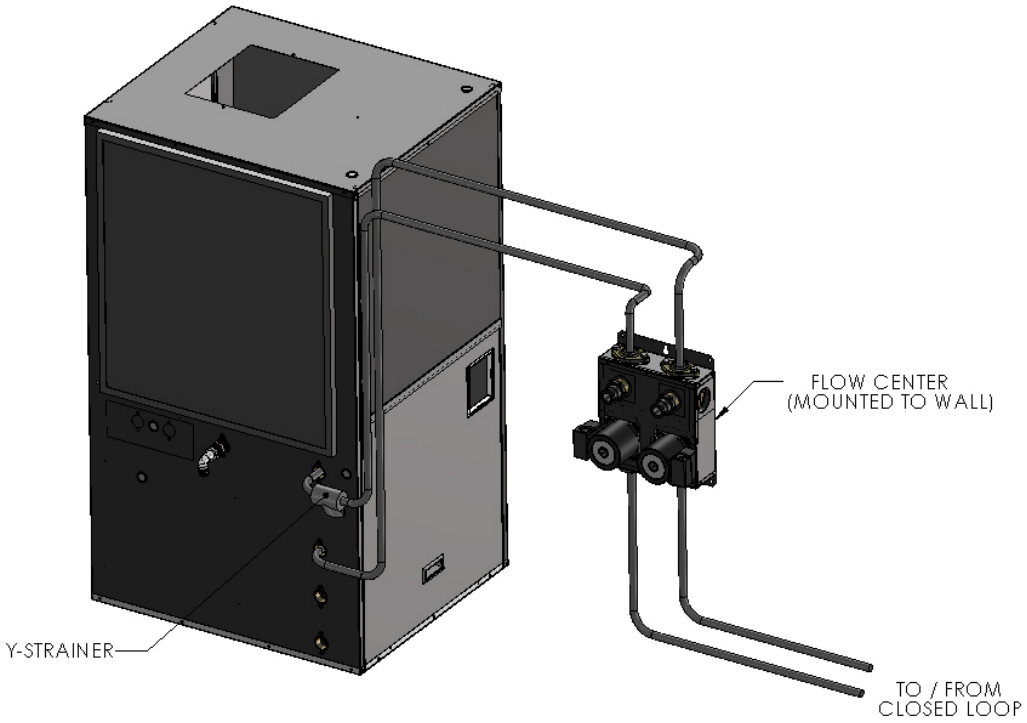
GPM Water Flow	8	9	10	11	12	13	14
Source Water Pressure Drop(BPHE)	1.4	1.6	2.3	2.4	2.8	3.1	3.3
Source Water Pressure Drop(CuNi)	2.9	3.1	3.5	4.1	n/a		

5 TON

GPM Water Flow	10	11	12	13	14	15
Source Water Pressure Drop(BPHE)	2.3	2.4	2.8	3.0	3.2	3.3
Source Water Pressure Drop(CuNi)	3.5	4.1	4.4	n/a		

X. FIGURE

FIGURE 1 – GROUND LOOP WATER PLUMBING



FNote – These units feature braze-plate heat exchangers. Enertech requires that a strainer be installed on the water inlet of the source circuit. A strainer with a size of 16-20 mesh minimum should be used. **For your convenience a strainer and connection hardware have been included with the unit.**

FIGURE 2 – GROUND WATER PLUMBING

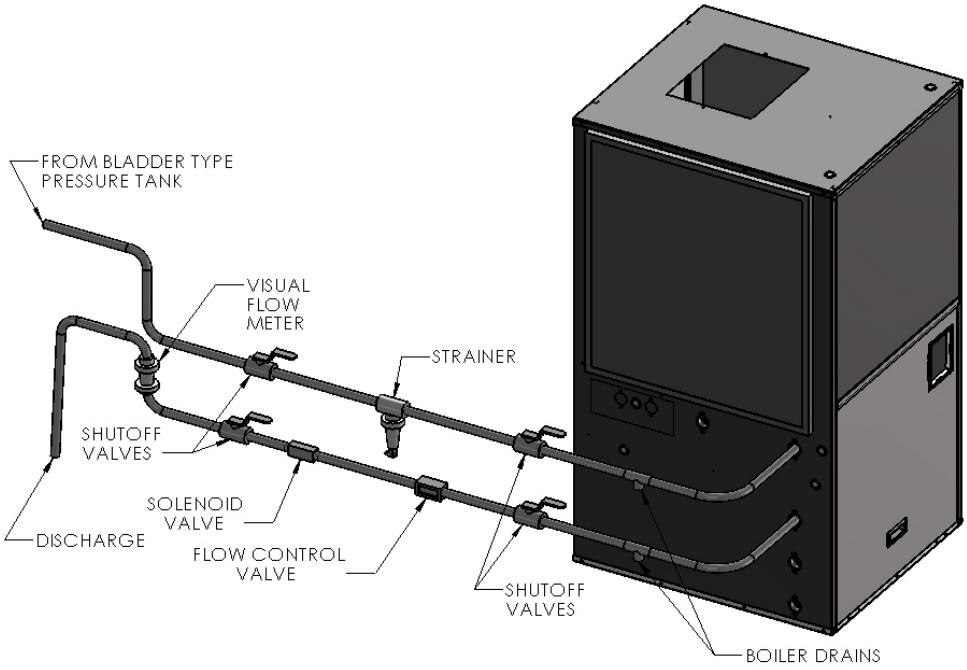


FIGURE 3 –DESUPERHEATER INSTALLATION

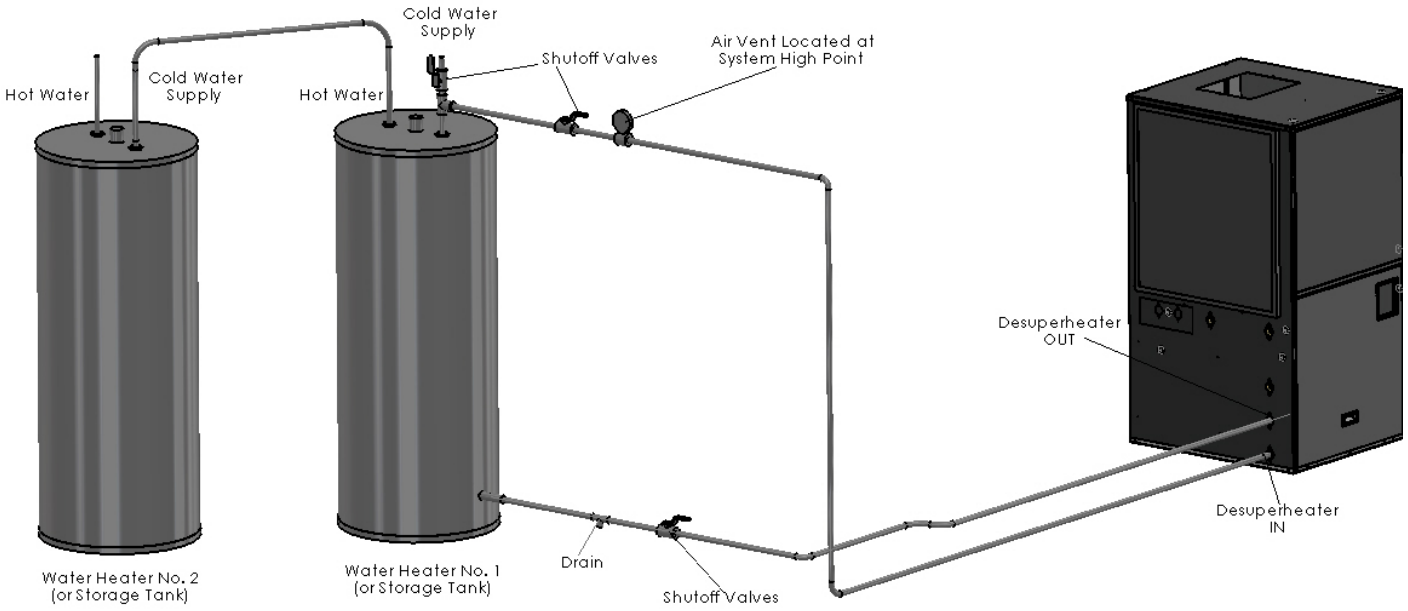
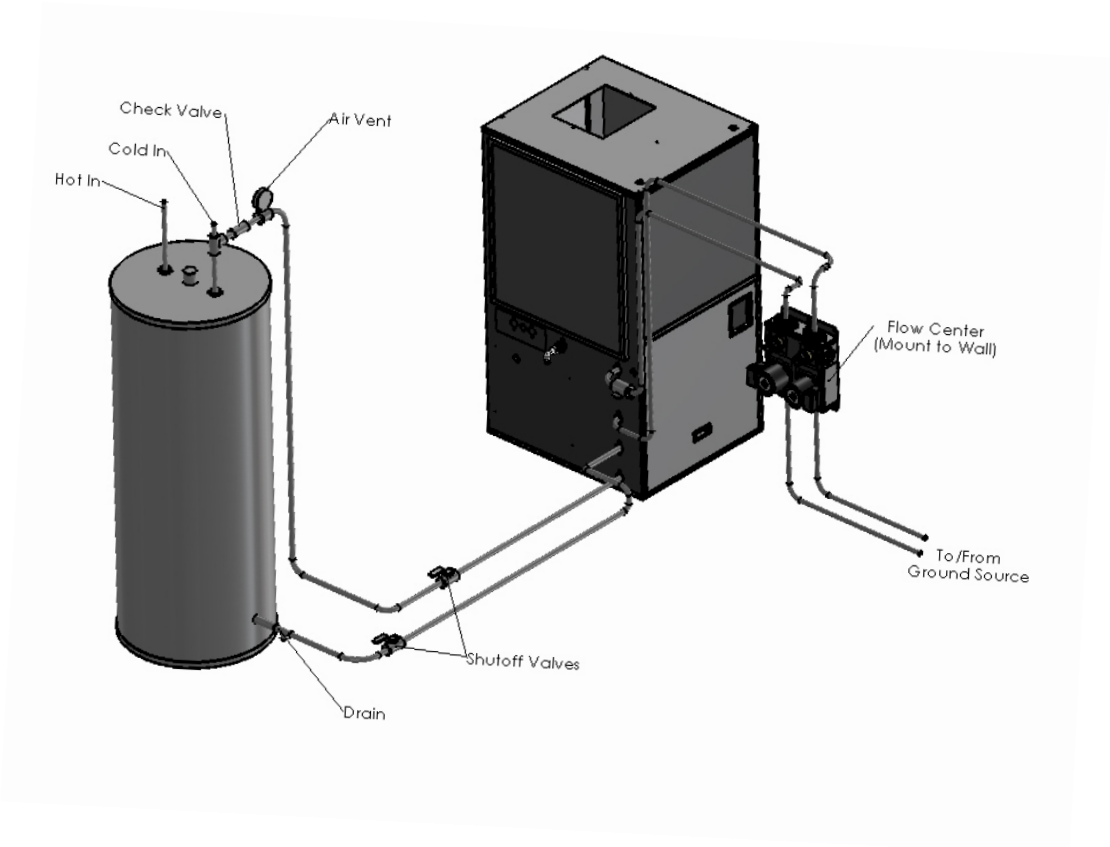


FIGURE 4 – ALTERNATE DESUPERHEATER INSTALLATION



XI. TROUBLESHOOTING

If the heat pump goes into lockout on a high or low pressure switch or discharge refrigerant temperature, the cause of the lockout can be narrowed down by knowing the operating mode and which switch the unit locked out on. The following table will help track down the problem once this information is known.

☞ **Important** – A lockout condition is a result of the heat pump shutting off to protect itself. Never bypass the lockout circuit. Serious damage can be caused by the system operating without lockout protection.

CONDITION	INICATOR LIGHTS									COMMENTS
	PWR	MODES			LOCKOUTS					
		HTG	CLG	DHW	FRZ	LP	HP	OFLW	DGT	
AC Power Applied	Off				Off	Off	Off	Off	Off	Power removed or incorrect voltage.
AC Power Applied	Blink				Off	Off	Off	Off	Off	Random start up time between 30-90 seconds on power initialization.
AC Power Applied	X	Blink	Blink	Blink						Power applied - unit running or waiting for a call to run.
FREEZE INDICATOR										
Thermostat Heating Mode	X	X			X					- Loss/lack of flow through ground side heat exchanger. - Low fluid temperature operation in ground heat exchanger. - Freezing fluid in ground side heat exchanger (lack of antifreeze)

Cooling Mode	X		X		X					- Loss/lack of flow through ground side heat exchanger. - Low fluid temperature operation in ground heat exchanger.
LOW PRESSURE INDICATOR										
Thermostat Heating Mode	X	X				X				- Loss/lack of flow through ground side heat exchanger. - Low fluid temperature operation in ground side heat exchanger. - Freezing fluid in ground side heat exchanger (lack of antifreeze) - Dirty ground side heat exchanger (on ground water systems) - Low ambient temperature at the heat pump. - Undercharged/ overcharged refrigerant circuit. - Expansion valve/sensing bulb malfunction.
Cooling Mode	X		X			X				- Low ambient temperature at the heat pump. - Undercharged/overcharged refrigerant circuit. - Expansion valve/sensing bulb malfunction. - Excessively low fluid temperature in the ground side heat exchanger.
HIGH PRESSURE INDICATOR										
Thermostat Heating Mode	X	X					X			- Check if High Pressure switch is open. - Check electrical connections between High Pressure switch and Controller.
Cooling Mode	X		X				X			- Loss/lack of flow through the ground-side heat exchanger. - High fluid temperature in the ground-side heat exchanger. - Dirty ground-side heat exchanger.(on ground water system). - Overcharged refrigerant circuit. - Expansion valve/sensing bulb malfunction.
OVERFLOW INDICATOR										
Thermostat Heating or Cooling Mode	X	X	X					X		- Drain pan is filled with water. - Overflow sensor has a short.
DISCHARGE REFRIGERANT TEMPERATURE INDICATOR (DGT)										
Thermostat Heating Mode	X	X							X	- Significantly low flow through ground-side heat exchanger. - Below minimum ground temperatures. - Significantly undercharged refrigerant circuit.
Cooling Mode	X		X						X	- Significantly low flow through ground-side heat exchanger. - Above maximum ground temperatures. - Significantly undercharged refrigerant circuit.

PROBLEM	POSSIBLE CAUSE	CHECKS AND CORRECTIONS
Entire unit does not run	Tripped Breaker	Reset circuit breaker (check for correct size).
	Broken or Loose Wires	Replace or tighten the wires.
	Voltage Supply Low	If voltage is below minimum voltage on data plate, contact power company.
	Low Voltage Circuit	Check 24-volt transformer for burnout, blown fuse or voltage less than 18 V.
	Room Thermostat	Set system to "Cool" and lowest temperature setting, unit should run. Set system to "Heat" and highest temperature setting, unit should run. If unit does not run in either case, the room thermostat could be faulty or incorrectly wired. To check, disconnect thermostat wires at the unit and jumper between "R", "Y1" and "G" terminals, and unit should run. Only replace with correct replacement. A substitute may not work properly.
	Interruptible Power	Check incoming supply voltage.
	Water	Lack of sufficient pressure, flow, temperature and/or quantity of water.
	Unit Undersized	Recalculate heat gains or losses for space to be conditioned. If excessive, rectify by adding insulation, shading, etc.
Insufficient cooling or heating	Loss of Conditioned Air by Leaks	Check for ductwork leaks or introduction of ambient air through doors and windows.
	Thermostat	Improperly located thermostat (e.g. near kitchen inaccurately sensing comfort level in living areas). If thermostat has anticipator, set at 1.0 or 1.2.
	Airflow (Across fan coil)	Lack of adequate airflow or improper distribution of air. Check the motor speed and duct sizing. Check the filter, it should be inspected every month and changed if dirty. Remove or add resistance accordingly.
	Refrigerant Charge	Low on refrigerant charge causing inefficient operation. Adjust only after checking CFM, GPM and inlet/outlet temperatures.
	Compressor	Check for defective compressor. If discharge pressure is too low and suction pressure too high, compressor is not pumping properly. Replace compressor.
	Reversing Valve	Defective reversing valve creating bypass of refrigerant from discharge to suction side of compressor. When necessary to replace reversing valve, wrap with wet cloth & direct heat away. Excessive heat can damage the valve.
	Desuperheater	The desuperheater could be disabled with dipswitch setting during cold weather to allow full heating load to house.
	High Pressure or Low Pressure Switch or Discharge Refrigerant Temp Switch	Unit could be off on high pressure, low-pressure or discharge refrigerant temp cutout. Check water GPM & temps, ambient temperature & loss of refrigerant. If unit still fails to run, check for faulty switches or wiring.
	Loss of Conditioned Air by Leaks	Check for leaks in ductwork or introduction of ambient air through doors/windows.
	Wiring	Check for loose or broken wires at compressor, capacitor, or contactor.

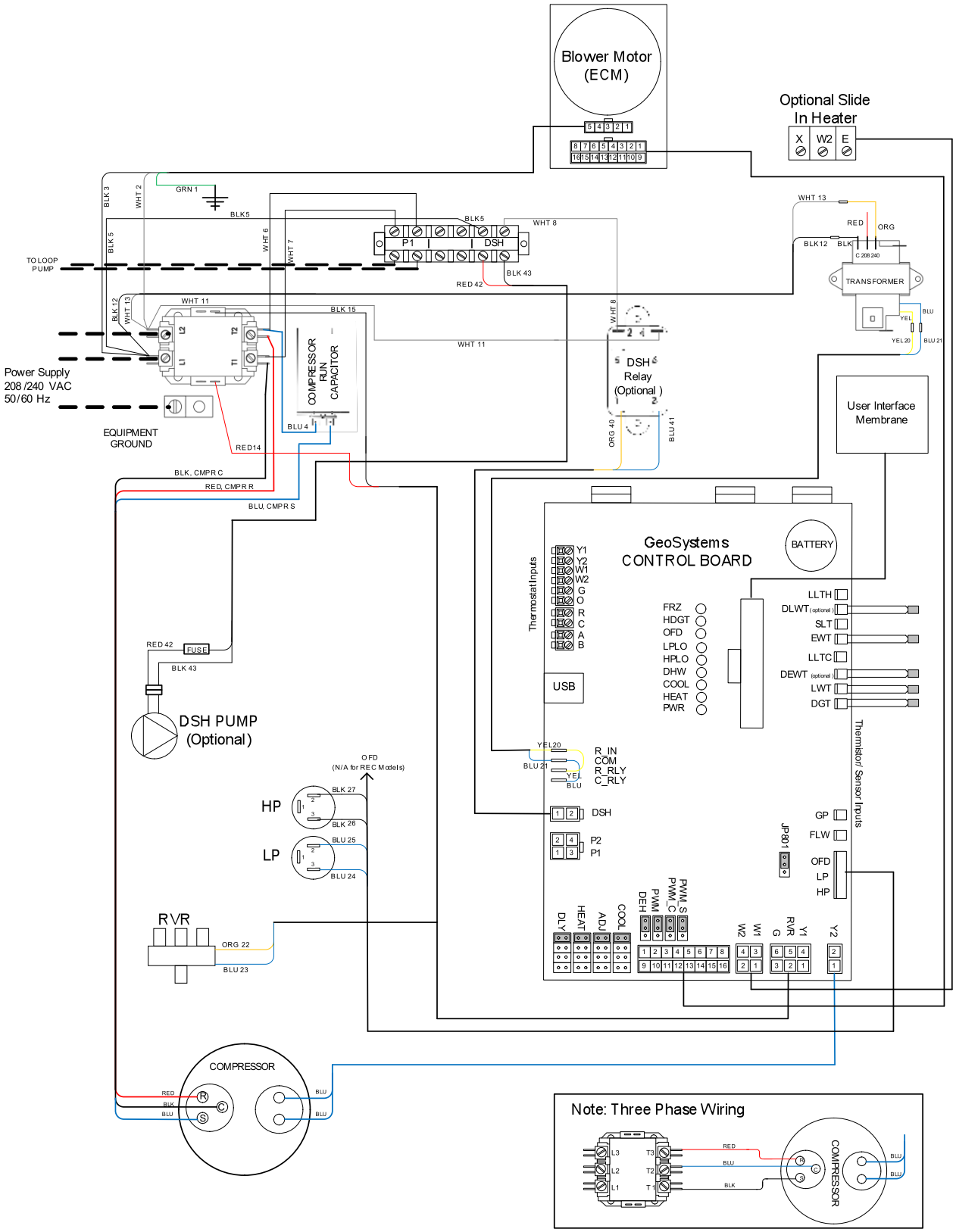
PROBLEM	POSSIBLE CAUSE	CHECKS AND CORRECTIONS
Compressor short cycles.	Defective Capacitor	Check capacitor, if defective remove, replace, and rewire correctly.
	Voltage Supply Low	If voltage is below minimum voltage specified on the data plate, contact local power company. Check voltage at compressor for possible open terminal.
	Low Voltage Circuit	Check 24-volt transformer for burn out or voltage less that 18 volts.
	Compressor Overload Open	In all cases an "internal" compressor overload is used. If the compressor motor is too hot, the overload will not reset until the compressor cools down. If the compressor is cool and the overload does not reset, there may be a defective or open overload. Replace the compressor.
	Compressor Motor Shorted to Ground	Internal winding grounded to the compressor shell. Replace the compressor. If compressor burnout replace the liquid line filter/drier.
	Compressor Windings Open	Check continuity of the compressor windings with an ohmmeter. If the windings are open, replace the compressor.
Compressor short cycles.	Seized Compressor	Try an auxiliary capacitor in parallel with the run capacitor momentarily. If the compressor still does not start, replace it.
	Room Thermostat	Improperly located thermostat (e.g. near kitchen, inaccurately sensing comfort level in living areas). If thermostat has an anticipator, set at 1.0 or 1.2.
	Compressor Overload	Defective compressor overload, check and replace if necessary. If the compressor runs too hot, it may be due to insufficient refrigerant charge.
	Wiring and Controls	Loose wiring connections, or control contactor defective.
Unit short cycles	Thermostat Improperly Set	Is it below room temperature? Check the thermostat setting.
	Defective Thermostat	Check thermostat operation. Replace if found defective.
	Incorrect Wiring	Check for broken, loose, or incorrect wires.
Unit will not run in 'Heating'	Dirty Air Filter	Check Filter, Clean or replace if found dirty.
	Room Thermostat	Ensure that these products are properly configured according to their own instructions for the “System Type” they are installed on.
	Reversing Valve doesn’t Shift	Defective solenoid valve will not energize. Replace solenoid coil.
	Reversing Valve does not Shift, the Valve is Stuck	- Solenoid valve is de-energized due to miswiring at the unit or remote control - correct wiring. - Replace if valve is tight or frozen and will not move. - Switch from heating to cooling a few times to loosen valve.
	Insufficient Antifreeze	Check antifreeze level and add antifreeze to obtain correct freeze protection.
	Compressor	Make sure compressor is not in direct contact with base or sides of cabinet. Cold surroundings can cause liquid slugging, increase ambient temp.
	Blower Motor Defective	Refer to Blower Motor Trouble Shooting. If it does not operate the compressor will go off on high head pressure.
Evaporator (air coil) ices over in cooling mode	Dirty Air Filter	Check filter. Clean or replace if found dirty.
	Airflow	Lack of adequate airflow or improper distribution of air. Check the motor speed and duct sizing. Check the filter, it should be inspected every month and changed if dirty. Check for closed registers. Remove or add resistance accordingly.
	Blower Speed Set Too Low	Verify blower speed jumpers are in factory settings.
	Low Air Temperature	Room temperatures below 65F may ice over the evaporator.
Unit does	Reversing Valve does not Shift	Defective solenoid valve will not energize. Replace solenoid coil.

PROBLEM	POSSIBLE CAUSE	CHECKS AND CORRECTIONS
not cool (Heats Only)	Room Thermostat	Ensure that it is properly configured according to their own instructions for the 'System Type' they are installed on.
Noisy Operation	Contactor	A "clattering" or "humming" noise in the contactor could be due to control voltage less than 18 volts. Check for low supply voltage, low transformer output or extra long runs of thermostat wires. If the contactor contacts are pitted or corroded or coil is defective, repair or replace.
	Rattles and Vibrations	Check for loose screws, panels, or internal components. Tighten and secure. Copper piping could be hitting the metal surfaces. Carefully readjust by bending slightly. Ensure hard plumbing is isolated from building structures.
	Water and Airborne Noises	Excessive water through water-cooled heat exchanger will cause squealing sound. Ensure adequate flow for good operation but eliminating the noise.
	Cavitating Pumps	Purge air from ground loop.
	Squealing Sound from Inside the Cabinet	Purge air from the water side of the desuperheater heat exchanger or defective desuperheater heat exchanger.
	Blower and Blower Motor	Blower wheel hitting the casing, adjust for clearance and alignment. Bent blower, check and replace if damaged. Loose blower wheel on shaft, check and tighten.
	Compressor	Make sure the compressor is not in direct contact with the base or side of the cabinet. Cold surroundings can cause liquid slugging, increase ambient temperature.
	Condensate Drain Line Kinked or Plugged	Clean condensate drain. Make sure external condensate drain is installed with adequate drop and pitch.
Noisy Operation	Unit not Level	Level vertical units.
	Reversing Valve	Defective reversing valve creating bypass of refrigerant from discharge to suction side of compressor. When it is necessary to replace the reversing valve, wrap it with a wet cloth and direct the heat away. Excessive heat can damage the valve.
	Desuperheater	The desuperheater circuit (in-line) fuse should be disconnected during cold weather to allow full heating load to house.
	Refrigerant Charge	Low on refrigerant charge causing inefficient operation. Adjust only after checking CFM, GPM, and inlet/outlet temperatures.
	Airflow	Lack of adequate airflow or improper distribution of air. Check the motor speed and duct sizing. Check the filter, it should be inspected every month and cleaned if dirty. Remove or add resistance accordingly.

ECM Motor PROBLEM	CHECKS AND CORRECTIONS
Motor rocks slightly when starting	This is normal start-up for ECM
Motor won't start •No movement	Wait for completion of ramp-up at start Check power at motor Check low voltage (24 VAC R to X) at motor Check low voltage connections (G, Y, W2, R, X) at motor Check for unseated pins in connectors on motor harness Test with a temporary jumper between R and G Check motor for a tight shaft Perform Moisture Check*
Motor rocks, but won't start	Check for loose or compliant motor mount Make sure blower wheel is tight on shaft
Motor starts, but runs erratically •Varies up and down or intermittent	Check line voltage for variation or "sag" Check low voltage connections (G, Y, W2, R, X) at motor, unseated pins in motor harness connectors Check out system controls, thermostat Perform Moisture Check*
"Hunts" or "puffs" at high CFM (speed)	Does removing panel or filter reduce puffing? Reduce restriction
Stays at low CFM despite call for higher speed	Check low voltage wires and connections Verify fan is not in delay mode; wait until delay complete "R" missing/not connected at motor
Stays at high CFM	Verify fan is not in delay mode; wait until delay complete "R" missing/not connected at motor
Blower won't change CFM after adjusting the speed control setting.	Power to the unit must be reset to enable the new settings Verify fan is not in delay mode; wait until delay complete "R" missing/not connected at motor
Blower won't shut off	Current leakage from controls into G, Y, or W?
Excessive noise	Determine if it's air noise, cabinet, duct or motor noise
Air noise	High static creating high blower speed?
	Does removing filter cause blower to slow down? Check filter Use low-pressure drop filter Check/correct duct restrictions
Noisy blower or cabinet	Check for loose blower housing, panels, etc. High static creating high blower speed? Check for air whistling through seams in ducts, cabinets, or panels Check for cabinet/duct deformation\
Moisture Check	Connectors are oriented as recommended by equipment manufacturer. Is condensate drain plugged? Check for low airflow (too much latent capacity) Check for undercharged conditions Check for plug leaks in return ducts, cabinet

XII. WIRING DIAGRAM

STANDARD MODELS WITH OPTIONAL DESUPERHEATER



XIII. WARRANTY CLAIM AND REGISTRATION FORMS

ENERTECH
Geothermal Made Better™

WARRANTY ORDER & CLAIM

PHONE: 618.664.9010 FAX: 618.664.4597 EMAIL: WARRANTY@ENERTECHGEO.COM

ALL WARRANTY REGISTRATIONS SHOULD BE SUBMITTED WITHIN 10 DAYS OF INSTALLATION

COMPANY NAME _____ (Form submitter) DATE _____

PHONE _____ FAX _____ EMAIL _____

ORDERED BY _____ JOB NAME/PO # _____

UNIT *Model #* _____ *Serial #* _____

FAILURE DATE _____

SHIP TO _____ (if different than company) _____

HOMEOWNER ADDRESS _____

_____

_____

Required if claim is for defective flow center

FLOW CENTER MODEL # _____ FLOW CENTER SERIAL # _____

FAILURE CODES, DESCRIPTION AND LABOR REIMBURSEMENT MUST BE FOUND IN WARRANTY MANUAL

FAILURE CODE	DESCRIPTION	PART NUMBER

LABOR REIMBURSEMENT REQUESTED ☐ NO ☐ YES

DO YOU NEED PARTS ORDERED? ☐ NO ☐ YES _____ _____

(If no, and replacement was purchased from another vendor, attach copy of bill if reimbursement is needed.)

OTHER NOTES _____

_____

FOR ENERTECH COMPANIES USE ONLY

SRO# _____ CREDIT MEMO# _____

1) See warranty coverage summary sheet for labor allowances, conditions and exclusions, etc. **2)** Warranty start date is ship date from Enertech facility unless proof of startup is presented. **3)** Outsourced warranty replacement parts will be reimbursed in the form of credit for the part only. Credit will be no more than the standard equivalent part cost through Enertech. **4)** Factory pre-approval is required for anything outside the scope of this document. **5)** Fuses, hose kits and items not mentioned on Warranty Coverage Summary are not covered under this program.

WARRANTY REGISTRATION

NOW REGISTER ONLINE AT WARRANTY-REGISTRATION.ENERTECHGEO.COM

WARRANTY REGISTRATIONS SHOULD BE SUBMITTED WITHIN 60 DAYS OF INSTALLATION

Model Number _____ Serial Number _____ Install Date _____

This unit is performing ☐ Satisfactorily ☐ Not Satisfactorily (please explain) _____

_____

Purchaser/User Name _____ Phone _____

Address _____ City _____ State/Prov _____

Postal Code _____ Email _____

Installer Company Name _____

City _____ State/Prov _____ Email _____

Application

☐ *Residential New Construction* ☐ *Residential Geo Replacement* ☐ *Residential Replacement of Electric, Gas or Other*

☐ *Multi-Family (Condo/Townhome/Multiplex)* ☐ *Commercial* ☐ *Other* _____

Use *(check all that apply)*

☐ *Space Conditioning* ☐ *Domestic Water Heating* ☐ *Radiant Heat* ☐ *Swimming Pool* ☐ *Snow/Ice Melt*

☐ *Other* _____

Loop Type

☐ *Horizontal Loop* ☐ *Vertical Loop* ☐ *Pond Loop* ☐ *Open Loop*

Demographics

Household Income ☐ *Under $30,000* ☐ *$30,000–$45,000* ☐ *$45,000–$60,000* ☐ *$60,000–$75,000* ☐ *$75,000–$100,000* ☐ *Over $100,000*

Home Size ☐ *Up to 1500 sq. ft.* ☐ *1501 to 2500 sq. ft.* ☐ *2501 to 4000 sq. ft.* ☐ *Over 4000 sq. ft.*

Home Location ☐ *Rural* ☐ *Urban* ☐ *Suburban*

Value of Home ☐ *Less than $100,000* ☐ *$100,000–$250,000* ☐ *$250,000–$500,000* ☐ *$500,000–$1 mil* ☐ *Over $1 mil*

Customer Satisfaction

How would you rate your overall satisfaction with your new geothermal system?

○ *1 (Very Dissatisfied)* ○ *2* ○ *3* ○ *4* ○ *5* ○ *6* ○ *7* ○ *8* ○ *9* ○ *10 (Very Satisfied)*

How would you rate your overall satisfaction with your installing geothermal contractor?

○ *1 (Very Dissatisfied)* ○ *2* ○ *3* ○ *4* ○ *5* ○ *6* ○ *7* ○ *8* ○ *9* ○ *10 (Very Satisfied)*

MAIL THIS FORM TO:
ENERTECH GLOBAL LLC
2506 SOUTH ELM STREET
GREENVILLE, IL 62246

EMAIL THIS FORM TO:
WARRANTY@ENERTECHGEO.COM

FAX THIS FORM TO:
ENERTECH GLOBAL LLC
618.664.4597

REGISTER ONLINE AT: warranty-registration.enertechgeo.com

Rev 30 DEC 2013B

XIV. EQUIPMENT START UP FORM AND PROCESS

EQUIPMENT START-UP FORM

Customer Name:_____

Customer Address:_____

Model #:_____ Serial #:_____

Dealer Name:_____

Distributor Name:_____ Start-up Date:_____

Loop Type: Open Closed (Circle One)								
Flow Rate	**Cooling**		**Heating**		**Unit Electrical Data**	**Cooling**		**Heating**
Source Water Pressure In		PSI		PSI	Line Voltage		V	
Source Water Pressure Out		PSI		PSI	Total Unit Amps		A	A
Source Water Pressure Drop		PSI		PSI	Compressor Amps		A	A
Flow Rate		GPM		GPM	Wire Size		GA	
*Check pressure drop chart for GPM					Circuit Breaker Size		A	

Source Water Temp. Difference	**Cooling**		**Heating**	
Source Water Temperature In		°F		°F
Source Water Temperature Out		°F		°F
Source Water Temperature Difference		°F		°F
Heat of Rejection/Extraction	**Cooling**		**Heating**	
Heat of Rejection		BTU/HR		
Heat Of Extraction				BTU/HR

Heat of Extraction/Rejection = GPM X Water Temp. Difference X 500 (Water - Open Loop)
Heat of Extraction/Rejection = GPM X Water Temp. Difference X 485 (Water & Antifreeze - Closed Loop)

Load Water Temp. Difference	**Cooling**		**Heating**	
Load Water Temperature In		°F		°F
Load Water Temperature Out		°F		°F
Load Water Temperature Difference		°F		°F
Air Temperature Difference	**Cooling**		**Heating**	
Supply Air Temperature		°F		°F
Return Air Temperature		°F		°F
Air Temp. Difference		°F		°F
*Confirm auxiliary heaters are de-energized for the above readings.				
Auxiliary Heat Operation Only			**Heating**	
Supply Air Temperature				°F
Return Air Temperature				°F
Air Temp. Difference				°F
Auxiliary Heat Electrical Data			**Heating**	
Line Voltage				V
Total Amperage (Full kW - All Stages)				A
Wire Size				GA
Breaker Size				A
CFM = (Watts X 3.413) ÷ (Air Temp. Difference X 1.08)				
Watts = Volts X Auxiliary Heater Amps				

Installer/Technician:_____ Date:_____

Equipment Start-Up Process

Check the following before power is applied to the equipment

Caution: Do not start-up the unit until the new structure is ready to be occupied

Electrical:

- ☐ Geothermal unit high voltage wiring is installed correctly
- ☐ Geothermal unit high voltage wiring and breaker are the correct size
- ☐ Auxiliary electric heaters are wired and installed correctly
- ☐ Circulating pumps are wired and fused (if necessary) correctly
- ☐ Desuperheater pump is NOT wired, unless piping is complete and all air is purged
- ☐ Low voltage wiring is correct and completely installed

Plumbing:

- ☐ Pipe and pump sizes are correct
- ☐ Air is purged from all lines
- ☐ Antifreeze is installed
- ☐ All valves are open, including those on the flow center
- ☐ Condensate is trapped and piped to the drain

Ductwork:

- ☐ Filter is installed and clean
- ☐ Packaging is removed from the blower assembly
- ☐ Blower turns freely
- ☐ Canvas connections installed on supply plenum & return drop

Equipment Start-Up

1. Energize geothermal unit with high voltage.
2. Set the thermostat to "Heat" or "Cool." Adjust set point to energize the unit. System will energize after delays expire (typically a five minute delay).
3. Check water flow with a flow meter (non-pressurized) or pressure drop conversion (pressurized). Pressure drop tables must be used to convert the pressure drop to GPM. The pressure drop can be obtained by checking water pressure in and water pressure out at the P/T ports.
4. Check the geothermal unit's electrical readings listed in the Unit Electrical Data table.
5. Check the source water temperature in and out at the P/T ports (use insertion probe). Allow 10 minutes of operation before recording temperature drop.
6. Calculate the heat of extraction or heat of rejection.
7. Check the temperature difference of the load coax (water-to-water) or air coil (water-to-air). P/T ports are recommended for use on the load side, but the line temperatures can be used to check the temperature difference.
8. Change the mode of the thermostat and adjust the set point to energize the unit. Check the data in opposite mode as the previous tests. Amp draws as well as temperature differences and flow rate should be recorded.
9. Check auxiliary heat operation by adjusting the thermostat set point 5°F above the room temperature in "Heat" mode or set thermostat to "Emergency." Record voltage, amperage, and air temperature difference.

Date:	By:	Page:	Description:
28 July 2014	GT	17	Changed CFM p/ECN14-090-N01
06 Feb 2015	GT	10, 33	Modified Main Board table on pg 10 and covered table on wiring diagram pg 33.

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