

Installation & Operations Manual

WV (R-454B) MODELS WATER-TO-WATER HEAT PUMPS

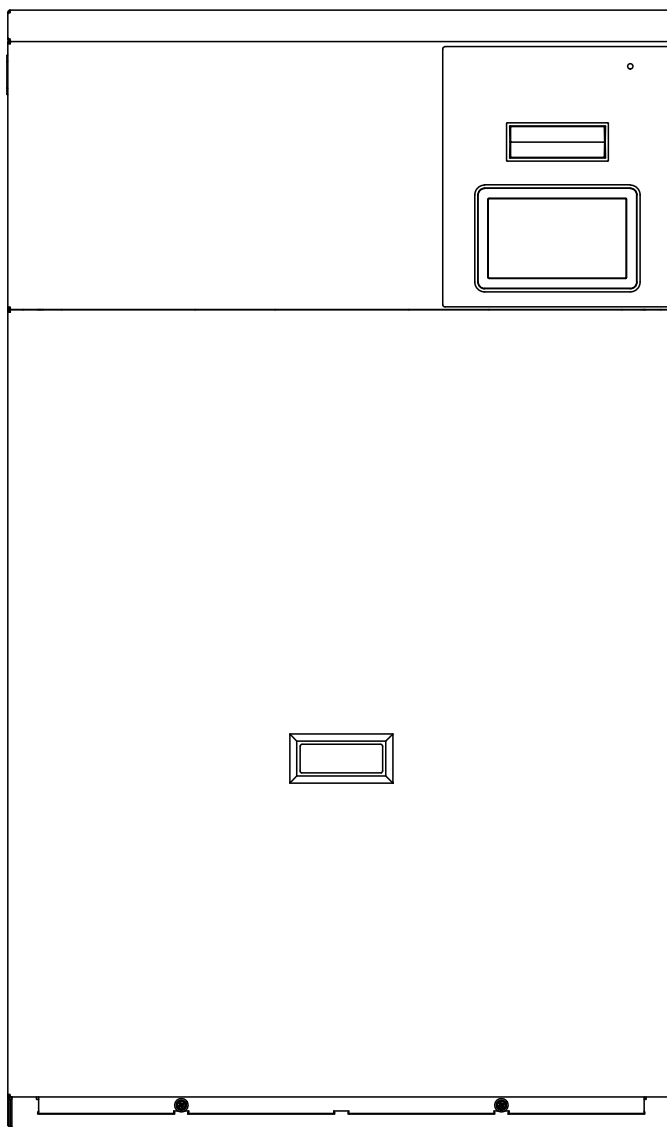


Table of Contents

Section 1: Model Nomenclature

Nomenclature Decoder	4
----------------------------	---

Section 2: Introduction & Operational Considerations

Introduction	5
Inspection	5
Pre-Installation Steps	6
Unit Placement	6
Components	6
Consumer Instructions	7
Operating Conditions	8

Section 3: Product & Unit Data

Unit Dimensional Data	9
Unit Electrical Data	10
Unit AHRI Performance Data	10
Physical Data : TurboMax	11

Section 4: Unit Piping

Water Quality	13
Flow Rates and Piping Sizing	14
Interior Piping	15
Flow Center	15
Load Side Installation	16
Bypass Valve	16
System Accessories Selection Table	17
Pump Mounting	17
Piping Diagrams	17
Piping Diagram - Flow Rates and Piping Sizing	18
Anti-Scald Valve Piping Connections	18
Piping Diagram - Heating and Cooling - with Hot Water Fan Coil/Hydronic Air Handler(s) - 2 tons or larger	19
Piping Diagram - Heating and Cooling - No Hot Water Fan Coil/Hydronic Air Handler(s) - 2 tons or larger	20
Piping Diagram - Heating ONLY - with Hot Water	21
Piping Diagram - Dual Fuel Boiler Connection	22

Section 5: Antifreeze

Overview	23
Charging	23
Antifreeze Percentages by Volume Table	23
Antifreeze Specific Gravity Table	24

Section 6: Field Wiring

Introduction	25
Outdoor Air Temperature (OAT)	26
Field Wiring Connections	27
HMI - Field Requirements	28
Diagram: Heating/Cooling - Radiant - One Zone Control Per Fan Coil (fan coil is Enertech EAH series)	29
Diagram: Radiant Heating + Fan Coil Heating/Cooling - Two Stage Operation, 1-Radiant/2-Fan - One Zone Control Per Fan Coil (fan coil is Enertech EAH series)	30
Converting Control Box	31

Table of Contents

Section 7: Equipment Start-Up

Flush Cart Design	33
Flushing Process	33
Startup Wizard - Filling, Flushing, Flow Tests	34
Startup Wizard - Initial Settings	36
Connected Controls	38
Equipment Start-Up Form	39
WPD Tables	40

Section 8: Controls

Sequence of Operations	41
Alternative Operating Modes	41
Components	42
Wiring Diagram - Electric Heat	43
Wiring Diagram - Dual Fuel	44
User Interface	45
Screens	45
Faults	46
Menu System	47

Section 9: Maintenance, Repair, & Troubleshooting

A2L Servicing Requirements	49
Fault Codes : Alarm	51
Fault Codes : Inverter (Variable Speed) Drive	54
Fault Codes : HMI Display	55
QR Codes for Enertechician App Download and Troubleshooting Videos	56

Section 10: Decommissioning

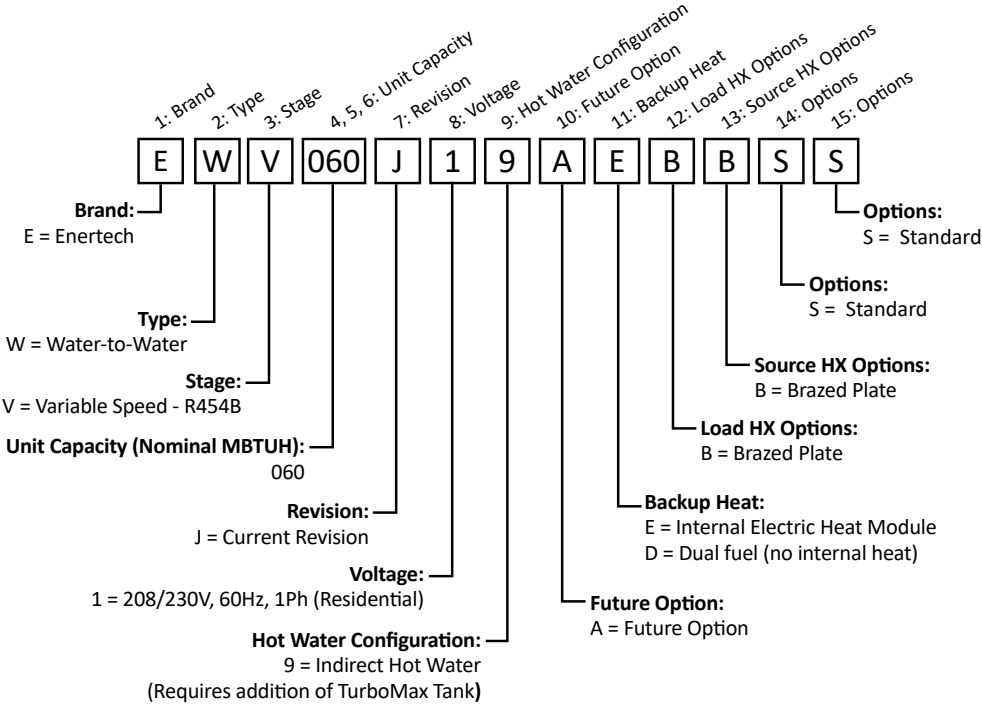
A2L Recovery	57
--------------------	----

Section 11: Warranty Form and Revision table

Warranty Registration Form	58
Revision Table	60

Section 1: Model Nomenclature

Nomenclature Decoder



	
	REFRIGERANT SAFETY GROUP A2L
	

Section 2: Introduction & Operational Considerations

Introduction

Engineering and quality control is built into every geothermal unit. Good performance depends on proper application and correct installation.

This geothermal heat pump provides heated and cooled air as well as optional domestic water heating.

Notices, Cautions, Warnings, & Dangers:

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

"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.

"WARNING" Indicates potentially hazardous situation which, if not avoided, COULD result in death or serious injury.

"DANGER" Indicates an immediate hazardous situation which, if not avoided, WILL result in death or serious injury.

Introduction Notes

Installation above 2000 meters will cause degradation of capacity and efficiency. Declared maximum altitude is 3500 meters.

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure they do not play with the appliance.

Units rated at 208/230V are factory wired to 230V. To change to 208V, the red transformer wire (capped from factory) will need to be connected to the contactor at the connection point of the current orange wire. The orange wire will need to be capped off. Refer to wire diagrams for details.

Inspection

Upon receipt of any geothermal equipment, carefully check the shipment against the packing slip and the freight company bill of lading. Verify all units and packages have been received. Inspect the packaging of each package and each unit for damages. Ensure the carrier makes proper notation of all damages or shortage on all bill of lading papers. Concealed damage should be reported to the freight company within 5 days. If not filed within 5 days the freight company can deny all claims.

Note: Notify Enertech Global, LLC shipping department of all damages within 5 days. It is the responsibility of the purchaser to file all necessary claims with the freight company.

⚠ CAUTION ⚠
DO NOT PIERCE OR BURN.
BEFORE DRILLING OR DRIVING ANY SCREWS INTO
CABINET, CHECK TO BE SURE THE SCREW WILL NOT HIT
ANY INTERNAL PARTS OR REFRIGERANT LINES.

⚠ MISE EN GARDE ⚠
NE PAS PERCER NI BRÛLER.
AVANT DE PERCER OU DE VISSER À TRAVERS L'ARMOIRE,
S'ASSURER QUE LA VIS N'ENTRERA EN CONTACT AVEC
AUCUNE PIÈCE INTERNE NI AUCUNE CONDUITE DE FLUIDE
FRIGORIGÈNE.

⚠ CAUTION ⚠
DO NOT OPERATE THE GEOTHERMAL HEAT PUMP UNIT
DURING BUILDING CONSTRUCTION PHASE
⚠ MISE EN GARDE ⚠
NE PAS FAIRE FONCTIONNER LA THERMOPOMPE
GÉOTHERMIQUE PENDANT LA PHASE DE CONSTRUCTION
DU BÂTIMENT

⚠ WARNING ⚠
DO NOT USE MEANS TO ACCELERATE THE DEFROSTING
PROCESS OR TO CLEAN, OTHER THAN THOSE
RECOMMENDED BY THE MANUFACTURER.
THE APPLIANCE SHALL BE STORED IN A ROOM WITHOUT
CONTINUOUSLY OPERATING IGNITION SOURCES. (FOR
EXAMPLE: OPEN FLAMES, AN OPERATING GAS APPLIANCE
OR AND OPERATING ELECTRIC HEATER)
BE AWARE THAT REFRIGERANTS MAY NOT CONTAIN AN
ODOR.
⚠ AVERTISSEMENT ⚠
NE PAS RECOURIR À D'AUTRES MOYENS POUR ACCÉLÉRER
LE PROCESSUS DE DÉGIVRAGE OU LE NETTOYAGE, À
L'EXCEPTION DE
CEUX RECOMMANDÉES PAR LE FABRICANT.
ENTREPOSER L'APPAREIL DANS UNE PIÈCE OÙ IL N'Y A
AUCUNE SOURCE D'INFLAMMATION
EN FONCTIONNEMENT CONTINU. (PAR EXEMPLE :
FLAMMES NUES, APPAREIL À GAZ EN FONCTIONNEMENT
OU APPAREIL DE CHAUFFAGE ÉLECTRIQUE EN
FONCTIONNEMENT)
À NOTER QUE LES FRIGORIGÈNES PEUVENT NE PAS AVOIR
D'ODEUR.

Un-packaging

Enertech units are mounted to wooden pallets for easy handling during shipment and installation. Units are protected during shipment with durable cardboard corner posts and top. Shrink wrap is applied covering the entire unit and attachment to the pallet.

Upon receipt of the unit, carefully remove the shrink wrap. Using a box cutter, slit the shrink wrap on the cardboard top and corner posts. Use caution to not damage the finished surface of the unit. Keep all cardboard or other packaging material for safe storage and transport to the job site prior to installation.

Remove the front service panel to locate technical documents; manuals, bulletins or instructions and accessory items; HWG piping kits, and strainers.

Unit Protection

Protect units from damage and contamination due to plastering (spraying), painting and all other foreign materials potentially used at the job site. Keep all units covered on the job site with either the original packaging or equivalent protective covering. Cap or recap unit connections and all piping until unit is installed. Precautions must be taken to avoid physical damage and contamination which may prevent proper start-up and may result in costly equipment repair.

Storage

All geothermal units should be stored inside in the original packaging in a clean, dry location. Units should be stored in an upright position at all times. Units should not be stacked unless specially noted on the packaging.

Section 2: Introduction & Operational Considerations

Removal and Disposal

All geothermal units removed from service should have all components, oils, antifreeze and refrigerants properly disposed of according to local and national environmental recycling codes, regulations, standards and rules.

Pre-Installation Steps

Before you fully install the geothermal equipment, it is recommended you do the following:

1. Fully inspect the unit after unpacking
2. Compare the electrical data on the unit nameplate with packing slip and ordering information to verify the correct unit has been shipped.
3. Inspect all electrical connections and wires. Connections must be clean and tight at the terminals, and wires should not touch any sharp edges or copper pipe.
4. Verify all refrigerant tubing is free of dents and kinks. Refrigerant tubing should not be touching other unit components.
5. Before unit start-up, read all manuals and become familiar with unit components and operation. Thoroughly check the unit before operating.
6. Locate the Unit Start-Up Form from this manual and have it available as the unit installation proceeds.

Equipment Installation

All units should be located in an indoor area where the ambient temperature will remain above 55°F and should be located in a way that piping and ductwork or other permanently installed fixtures do not have to be removed for servicing and filter replacement. For appliances containing more than 62.4oz of mildly flammable refrigerant and installed in an unventilated area, the room area shall be sufficiently constructed or modified to not allow any refrigerant leak to stagnate and create a fire or explosion hazard.

Unit Placement

When installing a geothermal heating and cooling unit, there are items the installer should consider before placing the equipment.

- **Service Access.** Is there enough space for service access? A general rule of thumb is at least 2 feet in the front and 2 feet on at least one side.
- **Unit Air Pad.** All geothermal heating and cooling equipment should be placed on either a formed plastic, dense rubber or a high density, closed cell polyethylene pad. This helps eliminate vibration noise from transmitting through the floor. The use of corner pads alone is not recommended.
- **Unit Racking:** If units are being placed on racking, the unit must be placed on a solid foundation covering the full base of the unit. Also, utilize a foam pad between the unit and the rack.
- The installer must verify all applicable wiring, piping, and accessories are correct and on the job site.

Electrical

All wiring, line and low voltage, should comply with the manufacturer's recommendations, The National Electrical Code, and all local codes and ordinances. The equipment main disconnect must be incorporated in the field wiring in accordance with NEC code.

Thermostat

Thermostats should be installed approximately 54 inches off the floor on an inside wall in the return air pattern and where they are not in direct sunlight at anytime.

⚠ CAUTION ⚠
GEOTHERMAL EQUIPMENT IS DESIGNED FOR INDOOR INSTALLATION ONLY. DO NOT INSTALL OR STORE UNIT IN A CORROSIVE ENVIRONMENT OR IN A LOCATION WHERE TEMPERATURE AND HUMIDITY ARE SUBJECT TO EXTREMES. EQUIPMENT IS NOT CERTIFIED FOR OUTDOOR APPLICATIONS. SUCH INSTALLATION WILL VOID ALL WARRANTIES.

⚠ MISE EN GARDE ⚠
L'ÉQUIPEMENT GÉOTHERMIQUE EST CONÇU POUR UNE INSTALLATION À L'INTÉRIEUR SEULEMENT. NE PAS INSTALLER OU ENTREPOSER L'APPAREIL DANS UN ENVIRONNEMENT CORROSIF OU DANS UN ENDROIT OÙ IL SERAIT EXPOSÉ À UNE TEMPÉRATURE ET UNE HUMIDITÉ EXTRÊMES. L'ÉQUIPEMENT N'EST PAS CERTIFIÉ POUR UNE INSTALLATION À L'EXTÉRIEUR. UNE TELLE INSTALLATION ANNULERA TOUTES LES GARANTIES.

Loop Pumping Modules

Must be wired to the heat pump's electric control box. A pump module connection block (connected to the master contactor) and circuit breaker is provided to connect the pump module wiring.

Components

Logic Controls: Logic Controls operate the compressor, pumps, electronic expansion valve and other electrical components. Also, protecting the unit by locking out when safety switches are engaged.

Field Connection Board: Provides connection to the external low voltage controls.

Transformer: Converts incoming (source) voltage to 24V AC.

Low Voltage Breaker: 3 Amp resettable breaker built into the transformer, protects the transformer and low voltage circuit.

Reversing Valve: Controls the cycle of the refrigerant system (heating or cooling). Energized in cooling mode.

High Pressure Switch: Protects the refrigerant system from high refrigerant pressure by locking unit out if pressure exceeds setting.

Low Pressure Transducer: Protects the refrigerant system from low suction pressure if suction pressure falls below setting.

High Voltage Breaker: 7 Amp resettable breaker to protect the desuperheater pump and external pumps.

Compressor (Scroll): Pumps refrigerant through the heat exchangers and pressurizes the refrigerant, which increases the temperature of the refrigerant.

Electronic Expansion Valve (EXV): A step valve able to open and close in microsteps based on the signals from the EXV control board.

Low Pressure Switch: Protects the refrigerant system from low refrigerant pressure by locking unit out if pressure drops below setting.

Consumer Instructions

Dealer should instruct the consumer in proper operation, maintenance, filter replacements, thermostat and indicator lights. Also provide the consumer with the manufacturer's

Section 2: Introduction & Operational Considerations

Owner's Manual for the equipment being installed.

Enertech Global D-I-Y Policy

Enertech Global's geothermal heat pumps and system installations may include electrical, refrigerant and/or water connections. Federal, state and local codes and regulations apply to various aspects of the installation. Improperly installed equipment can lead to equipment failure and health/safety concerns. For these reasons, only qualified technicians should install an Enertech Global built geothermal system.

Because of the importance of proper installation, Enertech Global does not sell equipment direct to homeowners. Internet websites and HVAC outlets may allow for purchases directly by homeowners and do-it-yourselfers, but Enertech Global offers no warranty on equipment purchased via the internet or installed by persons without proper training.

Enertech Global has set forth this policy to ensure installations of Enertech Global geothermal systems are done safely and properly. The use of well-trained, qualified technicians helps ensure your system provides many years of comfort and savings.

Heating Mode Operation Guidelines

Enertech recommends the heating set point not be set above 130°F for the storage tank temperature. Excessive vibration and part failure can occur at higher than recommended temperature settings. The higher operating temperatures cause substantial efficiency and capacity reductions.

The performance is negatively affected as the unit operates at the higher water temperatures and it benefits the unit and the homeowner to operate at or below the recommended water temperature of 130°F.

With the lower efficiency created by higher water temperatures, the output capacity of the unit is decreased

along with the efficiency. When operating at the higher entering water temperature the heat of extraction is significantly reduced, as well. In order to maintain the needed capacity, more of the heat is coming from the compressor working harder to compress the refrigerant.

The illustration below shows the parameters which are safe for compressor operation. Based on the leaving load water of 130 - 135°F, the loop would have to maintain 20-25°F to operate within the acceptable operating conditions for the compressor. Once your loop temperatures changes from 25°F, the acceptable leaving load temperature drops. The recommended maximum leaving load temperature for designing the system is 130°F.

Because the water-to-water machines have become so popular for providing heated water for a multitude of uses, we've provided the below chart for reference. The obvious correlation is the warmer the Source Entering Water Temperature, the hotter the Load Leaving Water Temperature can be, to a point. Actual usage, and choices of heat distribution devices need to follow the acceptable operating conditions presented in the chart. If a question arises, please consult the Technical Services Department.

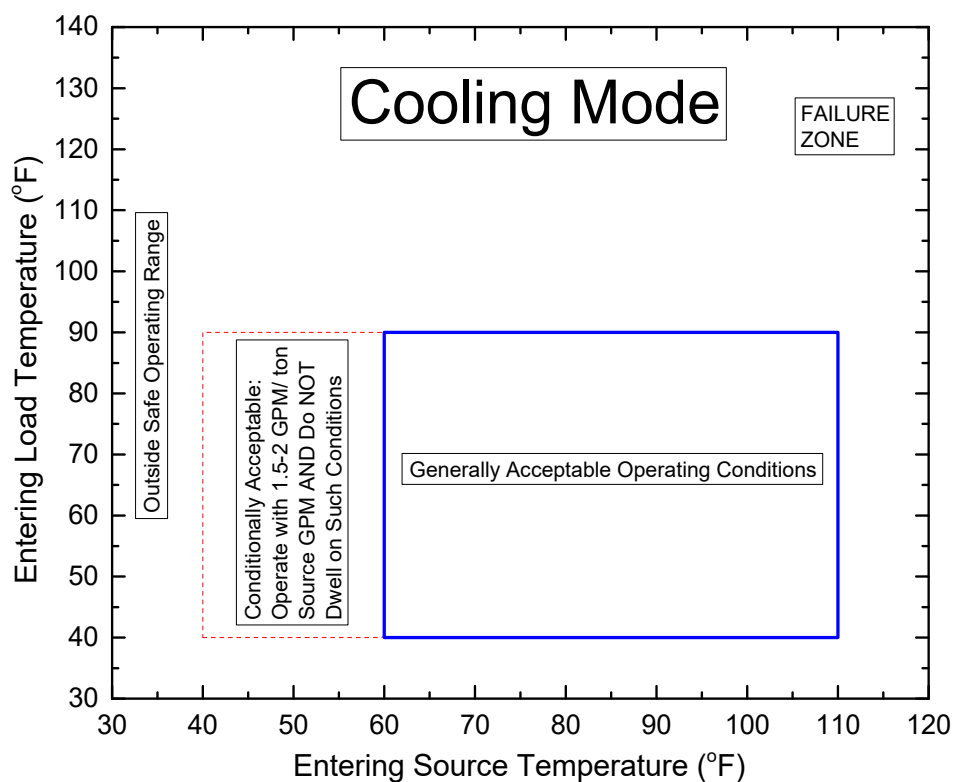
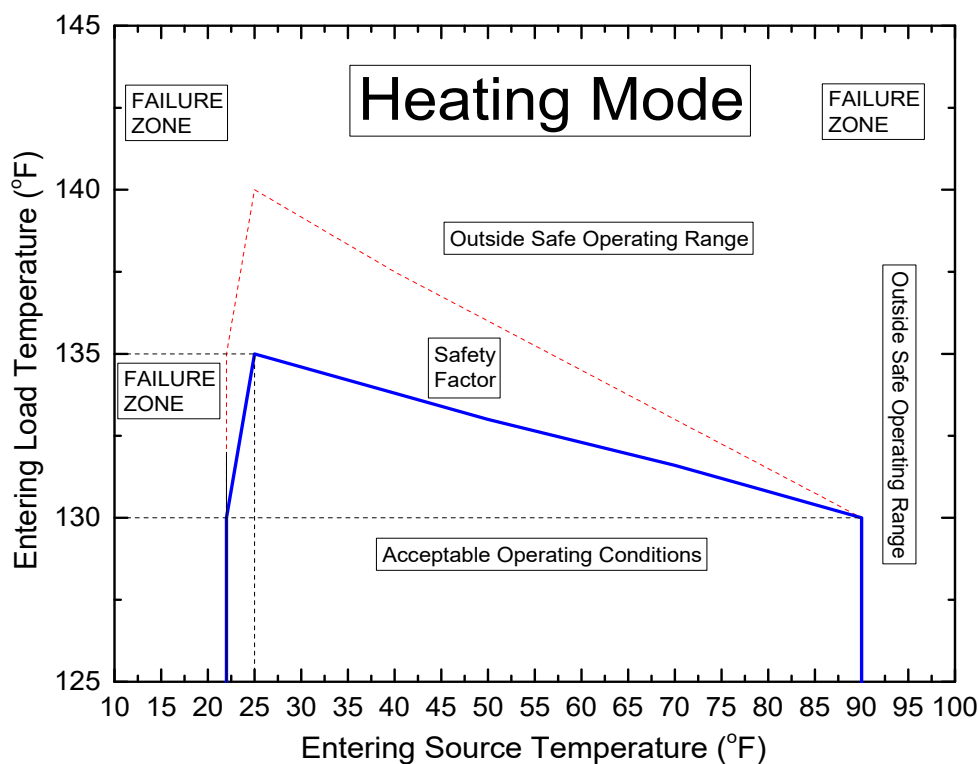
⚠ NOTICE ⚠
ALL WARNING LABELS AND UNIT NAMEPLATE MUST BE
VISIBLE AFTER INSTALLATION IS COMPLETE

⚠ WARNING ⚠
FAILURE TO FOLLOW THIS CAUTION MAY RESULT IN
PERSONAL INJURY. USE CARE AND WEAR APPROPRIATE
PROTECTIVE CLOTHING, SAFETY GLASSES AND PROTECTIVE
GLOVES WHEN SERVICING UNIT AND HANDLING PARTS.

⚠ AVERTISSEMENT ⚠
LE NON-RESPECT DE CETTE MISE EN GARDE PEUT
ENTRAÎNER DES BLESSURES. FAIRE PREUVE DE PRUDENCE
ET PORTER DES VÊTEMENTS DE PROTECTION, DES
LUNETTES DE SÉCURITÉ ET DES GANTS DE PROTECTION
APPROPRIÉS LORS DE L'ENTRETIEN DE L'APPAREIL ET DE LA
MANIPULATION DES PIÈCES.

Section 2: Introduction & Operational Considerations

Operating Conditions

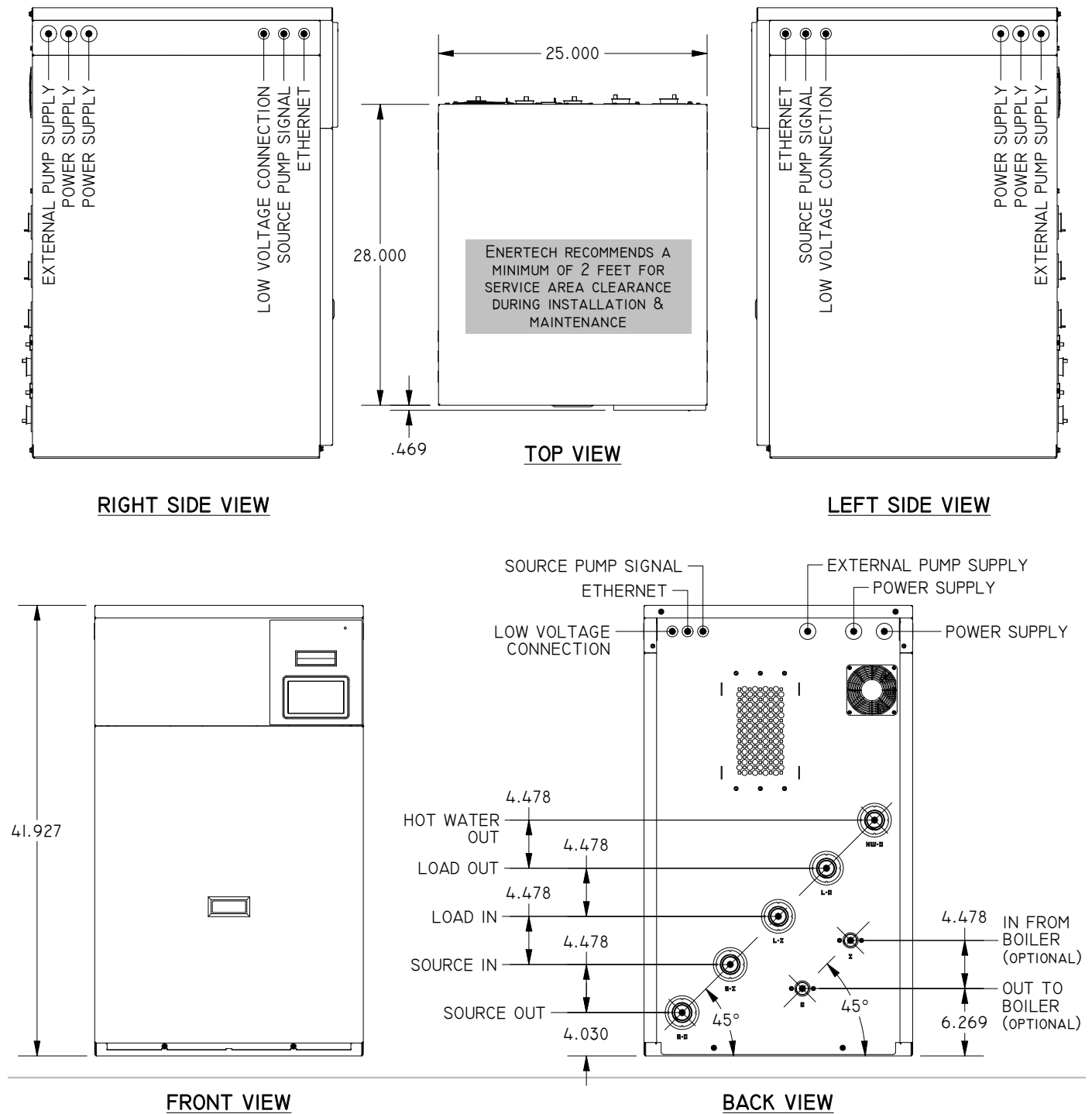


Notes:

1. Water temperatures are required not to exceed the acceptable operating conditions.
2. Despite not shown in the heating mode graph, the WV series allows the minimum entering water temperature to be 50 °F for the cold start of a water tank.
3. The minimum air handler size is 2 tons.

Section 3: Product & Unit Data

Unit Dimensional Data



Variable Speed Compressor Unit								
MODEL	SOURCE Water: D/O*		LOAD Water: D/O*		HWG Water: D/O*	BOILER: FPT	Factory Charge	Shipping Weight
	IN	OUT	IN	OUT	OUT	IN/OUT		
060	1"	1"	1"	1"	1"	1"	62 oz	355 Lbs
Notes: *D/O = Double O-ring connections. (requires double o-ring hose kit or adapters) - Electrical connections are 1" DIA for high voltage, & 1/2" DIA for low voltage.								

Section 3: Product & Unit Data

Unit Electrical Data

Model	Voltage Code/ Back-Up Heat Option	60 Hz Power		Supply Circuit A ¹⁻⁴							Supply Circuit B ¹⁻⁴					
				Compressor & Drive ⁵			Int. Pump FLA	Ext. Loop Pump FLA	Total FLA	Min Circuit AMPS	Max Brkr HACR	Immersion Heater			Min Circuit AMPS	MOCP
		Volts	Phase	MRC	RIC	MOC						Volts	kW	FLA		
WV060	1*D	208/230	1	40.0	31.0	45.0	1.7/ 1.5	5.1/ 4.5	37.8/ 37.0	45.6/ 44.8	70/ 70					
	1*E	208/230	1	40.0	31.0	45.0	1.7/ 1.5	5.1/ 4.5	37.8/ 37.0	45.6/ 44.8	70/ 70	208/230	7.4/ 9	35.4/ 39.1	44.3/ 48.9	45/ 50

Notes:

1. All line and low voltage wiring must adhere to the National Electrical Code and local codes, whichever is the most stringent.
2. In determining the correct supply wire size and maximum length, reference NFPA 70, Section 310. If the calculation is close to the maximum allowable ampacity of a particular wire size, use the next size up. This will ensure that no adverse effects occur, such as light dimming and/or shortened compressor life.
3. Min/Max Voltage: 208/230/60 = 187-252
4. Units rated at 208/230V are factory wired for 230V. To change to 208V, the red transformer wire (with wire nut) will need to be hooked to the contactor in the position the current orange (230V) wire is. The orange wire will need to be capped off. Refer to wire diagram for details.
5. MRC (Maximum Rated Current) is the maximum steady state current limit (peak) of the drive before overcurrent trip (software limit). MOC is the maximum transient output current limit (peak) of the drive before overcurrent trip (hardware limit). Although this data is not significant to the installation (RIC / Rated Input Current is all that is necessary for breaker/wire sizing), the values are a required listing for unit electrical data.

Unit AHRI Performance Data

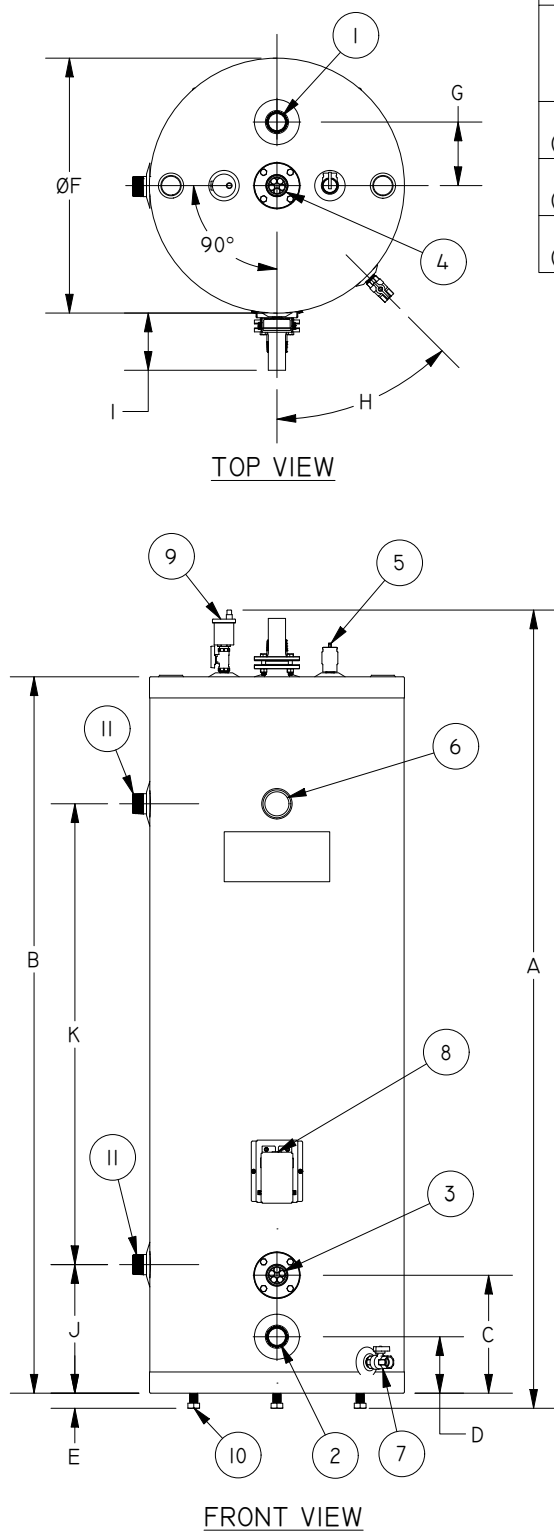
Model	Type	Cooling BTU				Heating BTU			
		Full Load	EER	Part Load	EER	Full Load	COP	Part Load	COP
WV060	Ground Loop	41,100	17.6	20,900	21.6	53,900	3.2	29,100	3.8

Ground Loop (GL) Notes:

Rated in accordance with ISO 13256-2 which includes pump penalties
 Heating Full Load capacities based on 32F EST & 104F ELT
 Heating Part Load capacities based on 41F EST and 104F ELT
 Cooling Full Load capacities based on 77F EST and 53.6F ELT
 Cooling Part Load capacities based on 68F EST & 53.6 ELT
 Entering load temps over 120F heating and under 45F cooling is not permissible
 Floor heating is generally designed for 85F entering load temp

Section 3: Product & Unit Data

Physical Data : TurboMax

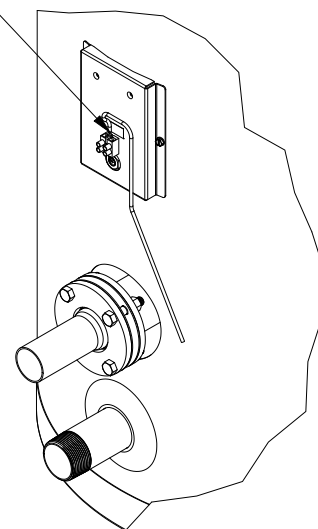


TECHNICAL DATA				
MODEL	TANK VOLUME	HEAT TRANSFER AREA (SQ. FT.)	EQUIPMENT WEIGHT	SHIPPING WEIGHT
01A011-02NN (THERMISTOR VERSION)	50 GAL. U.S.	32.7 SQFT	230 LBS.	268 LBS.
01A012-02NN (THERMISTOR VERSION)	80 GAL. U.S.	32.7 SQFT	308 LBS.	353 LBS.
01A013-02NN (THERMISTOR VERSION)	120 GAL. U.S.	59.8 SQFT	430 LBS.	480 LBS.

COMPONENT IDENTIFICATION

- Boiler Water Supply (Inlet)
- Boiler Water Return (Outlet)
- Domestic Water Inlet (1-1/2" I.D. Copper)
- Domestic Water Outlet (1-1/2" I.D. Copper)
- Pressure Relief Valve - 3/4 NPTF
- Temp. and Press. Indicator - 1/2 NPTM
- Tank Drain Valve - 3/4 NPTF
- Temperature Control - Remove cover and connect thermistor wire.
- Automatic Air Vent - 1/2 NPTM
- Adjustable Leg
- Extra Tappings - be sure to close with provided caps or attach to your system.*

Remove cover (2 screws), Strip and connect wire to top of terminal strip. Feed wire thru plastic bushing on cover. Replace cover.

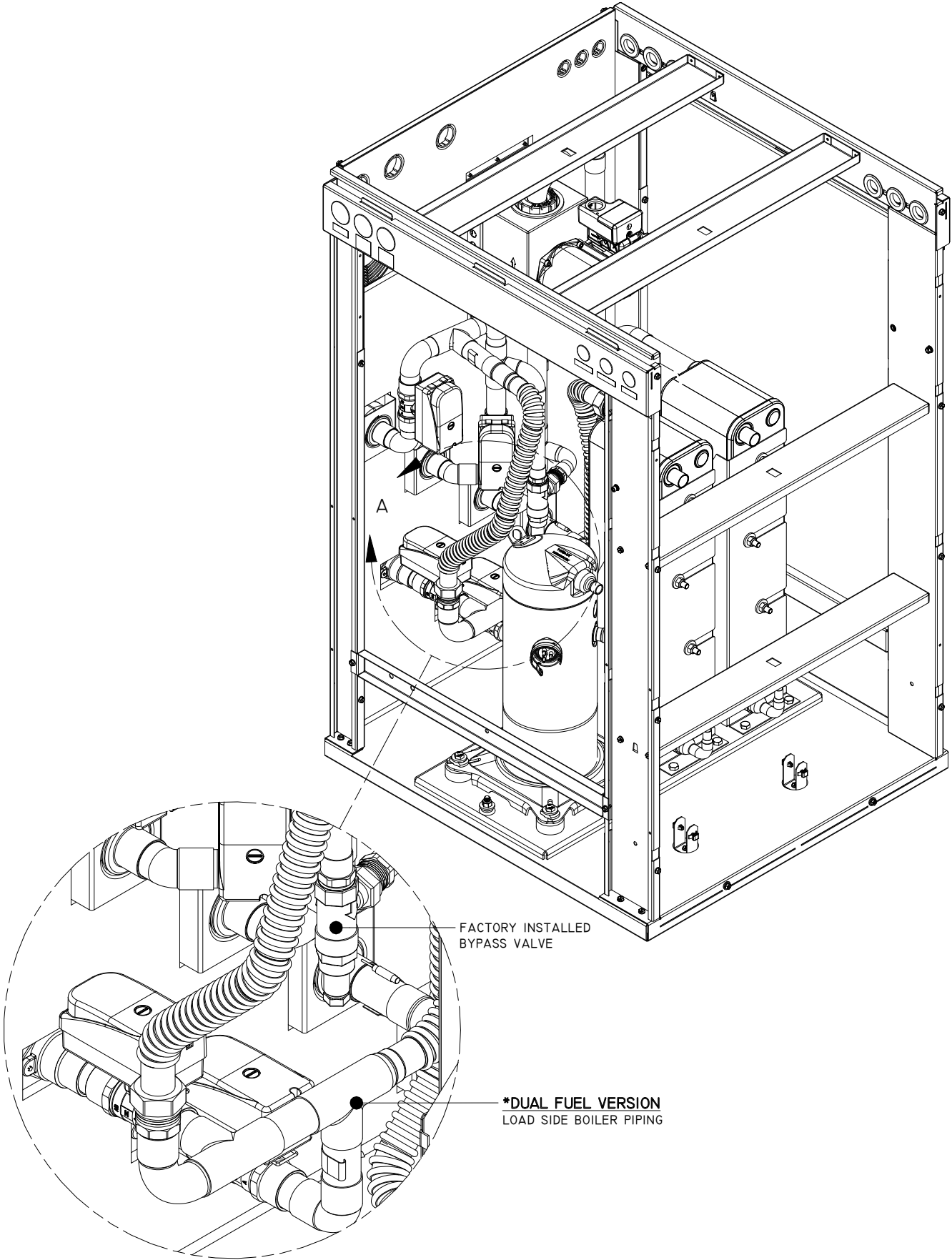


NOTE:

Review and utilize TurboMax Use and Care Manual during installation. Once unit is installed, properly store manual.

TURBOMAX WITH THERMISTOR												
MODEL	GAL.	A (IN.)	B (IN.)	C (IN.)	D (IN.)	E (IN.)	F (IN.)	G (IN.)	H (DEG.)	I (IN.)	J (IN.)	K (IN.)
01A011-02NN	50 GAL.	60 11/16	52 13/16	11 13/32	7 13/32	1 1/2	22 1/16	4	45	5 1/4	7 13/32	38
01A012-02NN	80 GAL.	75 3/8	67 5/8	11 1/8	5 5/16	1 1/2	24 1/16	6	45	5 3/8	12 1/8	43 1/2
01A013-02NN	120 GAL.	77 7/16	69 9/16	12 1/8	6 5/16	1 1/2	28 1/16	6	45	5 3/16	13 1/8	43 1/2

*Extra Tapping Sizes - 120G: 2" NPT M, 80G: 1-1/2" NPT M, 50G: 1-1/4" NPT M



Section 4: Unit Piping

Water Quality Table

Potential	Problem Chemical(s) or Condition	Range for Stainless Steel BPHE
Scaling	Calcium & Magnesium	Less than 0.1 ppm
	pH Range	7.5-9
Corrosion	Total Dissolved Solids	No rigid setpoint
	Ammonia, Ammonium Hydroxide	Not allowed
	Ammonium Chloride, Ammonium	Less than 2-20 ppm
	Calcium Chloride/ Sodium	Not allowed
	Chlorine	Not allowed
	Hydrogen Sulfide	Less than 0.05 ppm
	Sulfates	Less than 100 ppm
	Hydrogen Carbonate	Between 60 ppm and 200 ppm
	Hydrogen Carbonate/ Sulfates	More than 1.5 ppm
	Calcium & Magnesium/Hydrogen Carbonate	More than 0.5 ppm
	Conductivity	Less than 500 micros/cm
Biological	Iron Bacteria	Not allowed
	Iron Oxide	Less than 0.2 ppm
Erosion	Suspended Solids	40 mesh strainer required
	Water Velocity	Less than 5.5 m/s in the port

Notes:

1. Hardness in ppm is equivalent to hardness in mg/l.
2. Grains/ gallon = ppm divided by 17.1.
3. Unit internal heat exchangers are not recommended for pool applications or water outside the range of the table. Secondary heat exchangers are required for pool or other applications not meeting the requirements shown above.
4. Saltwater applications (approx. 25,000 ppm) require secondary heat exchangers due to copper piping between the heat exchanger.
5. Filter for maximum of 600 micron size.

Water Quality

Enertech recommends that all hydronic systems water be tested prior to being used in any installation.

Water quality is important for the Load side of the system. Due to use of dissimilar metals throughout the system (i.e. stainless braze plates, cast iron pump volutes, etc.) certain minerals or chemicals may build up and become detrimental to system operation and longevity. Filling the system with good quality water that meets the specifications outlined in table above.

The quality of the water used in hydronic systems is very important. In closed loop systems the dilution water (water mixed with antifreeze) must be of high quality to ensure adequate corrosion protection. Water of poor quality contains ions that make the fluid “hard” and corrosive. Calcium and magnesium hardness ions build up as scale on the walls of the system and reduce heat transfer. These ions may also react with the corrosion inhibitors in glycol based heat transfer fluids, causing them to precipitate out of the solution and rendering the inhibitors ineffective in protecting against corrosion. In addition, high concentrations of corrosive ions, such as chloride and sulfate, will eat through any protective layer that the corrosion inhibitors form on the walls of the system.

Enertech Global, LLC

Ideally, de-ionized water should be used for dilution with antifreeze solutions since de-ionizing removes both corrosive and hardness ions. Distilled water and zeolite softened water are also acceptable. Softened water, although free of hardness ions, may actually have increased concentrations of corrosive ions and, therefore, its quality must be monitored. The Department of Natural Resources or your local municipality can direct you to the proper testing agency.

Note: Failure to adhere to the water quality guidelines may result in loss of warranty.

Note: Once the system has been flushed and filled, Enertech recommends the use of Fernox F1 (Enertech P/N: F-57880) water treatment products in order to keep the system clean and running smooth for years to come.

Section 4: Unit Piping

Flow Rates and Piping Sizing

Successful design of the system must also include pipe diameter and layout. The following guidelines should be considered for all hydronic designs:

- **Proper Flow Rate:** There could be two different flow rates on each side of the hydraulic separator, depending upon the size and number of zones and the size of the heat pump. Supply/return lines for the heat pump size of the hydraulic separator must be sized for the heat pump flow rate; supply/return lines on the system pump side of the hydraulic separator must be sized based upon the number and size of connected zones.
- **Supply/Return Pipe Diameter:** Any hydronic system with parallel piping to various zones requires large enough piping diameter to provide sufficient flow to all zone, but also to assist in purging air from the system. The flow rate though the supply/return lines must be high enough to achieve 2 feet per second velocity in all of the parallel branches. "Home Run" style piping, as mentioned below, is helpful in purging air, as well.
- **Low Pressure Drop:** Selecting Pipe diameter for supply/return lines will help ensure low pressure drop and good performance.

"Home Run" Style Piping (Page #19)

Enertech recommends "Home Run" style piping to help facilitate air removal, but also for ease of access to the zone valves. In the "Branch" style piping, branches can be difficult to purge, depending upon the size of the supply/return lines feeding the branches, especially if fan coils are piped in this manner.

Note: Purging air from the system is one of biggest challenges for hydronic systems. Flow Sensors installed in this equipment are extremely sensitive to micro-bubbles.

Piping Design Flow Capacities

Pipe Diameter/Type	Maximum Flow Rate (GPM)	
	Radiant Floor Loop*	Supply/Return**
1/2" PEX	0.75	N/A
5/8" PEX	1	
3/4" PEX	1.25	4
3/4" Copper or 1" PEX	N/A	7
1" Copper or 1-1/4" PEX		12
1-1/4" Copper or 1-1/2" PEX		17
1-1/2" Copper		25
2" Copper		45
* Based upon 300 ft. circuits.		
**Based upon 25ft. length (one-way) and 4 elbows with water. When using antifreeze, increase pipe size to the next size if close to the maximum flow rate.		

Example (steps for sizing typical residential system piping)

System includes a model 060 heat pump with one 3 ton fan coil and 3 radiant zones. Two radiant zones each have 5 circuits and one radiant zone has 3 circuits (13 total circuits). All circuits are 1/2" PEX piping.

The radiant heating calculations determined that the PEX loops will be at 9" O.C. spacing and that the flow rate per circuit will be 0.42 GPM (5.5 GPM total). The system will use 25% Fernox Alphi-11 propylene glycol antifreeze. The following steps should be used to determine pipe sizing:

1. Determine flow rate and pipe diameter for piping from Indoor Module to the "Home Run" hydronic zones. The fan coil needs 9 GPM, and the 1/2" radiant tubing could be up to 0.75 GPM per circuit, but since 0.42 GPM was specified, the application will use the specified flow rate (13 x 0.42 = 5.5 GPM). Total flow rate is 14.5 GPM (9 + 5.5). The supply/return lines from the Indoor Module to the zones should be 1-1/4" copper or 1-1/2" PEX.
2. Similar calculations should be done for each zone. For the fan coil zone (9 GPM), 1" copper or 1-1/4" PEX should be run to the fan coil; for the 5 circuit manifold, 3/4" PEX may be used (same for the 3 circuit manifold).

Recommended Flow Rates

Heat Pump	
WV060 – 15 GPM	
EAH Hydronic Air Handlers & EEH Hydronic Cased Coils	
EAH/EEH024 – 6 GPM	
EAH/EEH036 – 9 GPM	
EAH/EEH048 – 12 GPM	
EAH/EEH060 – 15 GPM	
Multi-Aqua Fan Coils	
High-wall units	Console Units
MHQWW-9 – 3 GPM	CFFWA-3 – 3 GPM
MHQWW-12 – 6 GPM	CFFWA-6 – 4.5 GPM
MHQWW-18 – 6 GPM	CFFWA-8 – 5.5 GPM
MHQWW-24 – 7 GPM	CFFWA-12 – 8 GPM
MHQWW-36 – 10 GPM	CFFWA-16 – 10.5 GPM
	CFFWA-20 – 12.5 GPM
Radiant Floor	
1/2" PEX – 0.5 to 0.75 GPM per circuit	
5/8" PEX – 0.75 to 1 GPM per circuit	
3/4" PEX - 1 to 1.25 GPM per circuit	
Example: A 5 loop manifold with 1/2" PEX circuits would need supply/return piping capable of supplying 2.5 to 3.75 GPM	
DHW Piping	
Use flow rate for heat pump	

Section 4: Unit Piping

Interior Piping

All interior piping must be sized for proper flow rates and pressure loss. Insulation should be used on all inside piping when minimum loop temperatures are expected to be less than 50°F. Use the table below for insulation sizes with different pipe sizes. All pipe insulation should be a closed cell and have a minimum wall thickness of 3/8". All piping insulation should be glued and sealed to prevent condensation and dripping. Interior piping may consist of the following materials: HDPE, copper, brass, or rubber hose (hose kit only). **PVC is not allowed on pressurized systems.**

Table: Pipe Insulation

Piping Material	Insulation Description
1" IPS Hose	1-3/8" ID - 3/8" Wall
1" IPS PE	1-1/4" ID - 3/8" Wall
1-1/4" IPS PE	1-5/8" ID - 3/8" Wall
2" IPS PD	2-1/8" ID - 3/8" Wall

Flow Center

Typical Pressurized Flow Center Installation

The flow centers are insulated and contain all flushing and circulation connections for residential and light commercial earth loops that require a flow rate of no more than 20 gpm. 1-1/4" fusion x 1" double o-ring fittings (AGA6PES) are furnished with the double o-ring flow centers for HDPE loop connections. Various fittings are available for the double o-ring flow centers for different connections. See figure 6 for connection options. A typical installation will require the use of a hose kit. Matching hose kits come with double o-ring adapters to transition to 1" hose connection.

Note: Threaded flow centers all have 1" FPT connections. Matching hose kits come with the AGBA55 adapter needed to transition from 1" FPT to 1" hose.

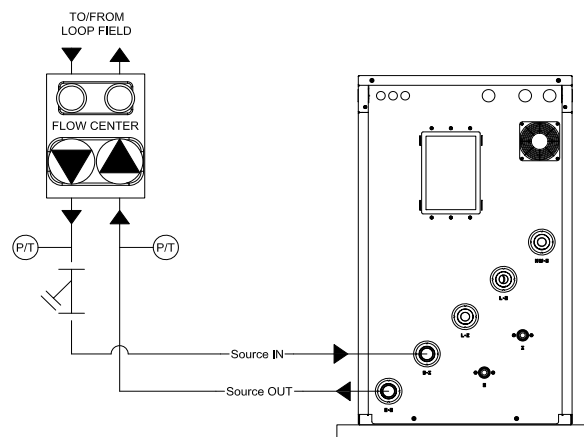
⚠ NOTICE ⚠
THE WV MONITORS FEEDBACK FROM THE CONNECTED VARIABLE SPEED PUMP AND WILL NOT OPERATE WITHOUT IT. A FLOW FAULT WILL OCCUR.

Flushing & Charging a Pressurized Flow Center

Once piping is completed between the unit, flow center, and the earth loop, final purging and charging of the system is needed. A flush cart (at least a minimum of 1.5 hp pump motor or larger) is needed to achieve adequate flow velocity (2 fps in all piping) in the loop to purge air and debris from the loop piping (unless the header manifold is located inside and has isolation valves). All air and debris must be removed from the system before operation or pump failure could result. The flush ports located on the flow center are access to the piping system for the flush cart. See below for connection details.

The 3-way valves on the flow center include direction indicators on the valves which determine the flow path (see figure 8). A 3/8" socket drive is required to operate the 3-way valves. The valves will turn in either direction, 360 degrees. Make sure during this process that the valves are in the same position so that air does not become trapped in the system.

Typical Single Unit Piping Connection (Pressurized Flow Center)



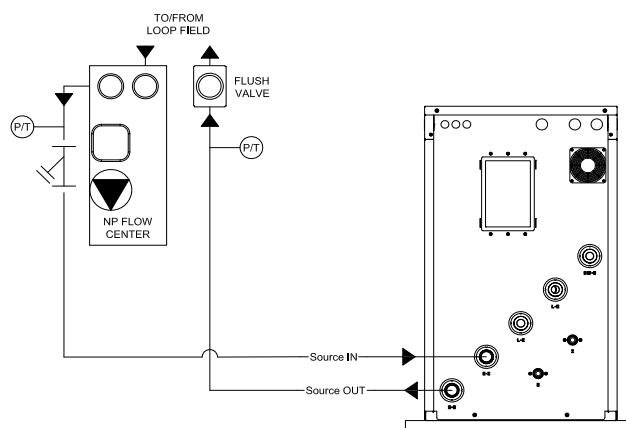
Typical Non-Pressurized Flow Center Installation

Standing column flow centers are designed to operate with no static pressure on the earth loop. The design is such that the column of water in the flow center is enough pressure to prime the pumps for proper system operation and pump reliability. The flow center does have a cap/seal, so it is still a closed system where the fluid will not evaporate. If the earth loop header is external, the loop system will still need to be flushed with a purge cart. The non-pressurized flow center needs to be isolated from the flush cart during flushing because the flow center is not designed to handle pressure. Since this is a non-pressurized system, the interior piping can incorporate all the above-mentioned pipe material options (see interior piping), including PVC. The flow center can be mounted to the wall with the included bracket or mounted on the floor as long as it is properly supported.

Flushing the Interior Piping (Non-Pressurized)

Do not use the flush cart to purge the interior piping and flow center in a non-pressurized system. Once the loop has been flushed the ball valves may be opened above the flush ports. Take a garden hose from the flush port connected to the water out to the loop pipe, and run the other end of the hose into the top of the canister. Fill the canister with water and turn the pumps on. Continue to fill the canister until the water level stays above the dip tube. Once filling is complete, remove the hose and close the flush port. Turn the system on. Any air that may still be in the system will burp itself out of the top of the canister. Leave the top open for the first 1/2 hour of run time to ensure that all of the air is bled out. Tighten the cap on the flow center to complete the flushing and filling procedure (hand tighten only -- do not use a wrench).

Typical Single Unit Piping Connection (Non-Pressurized Flow Center)

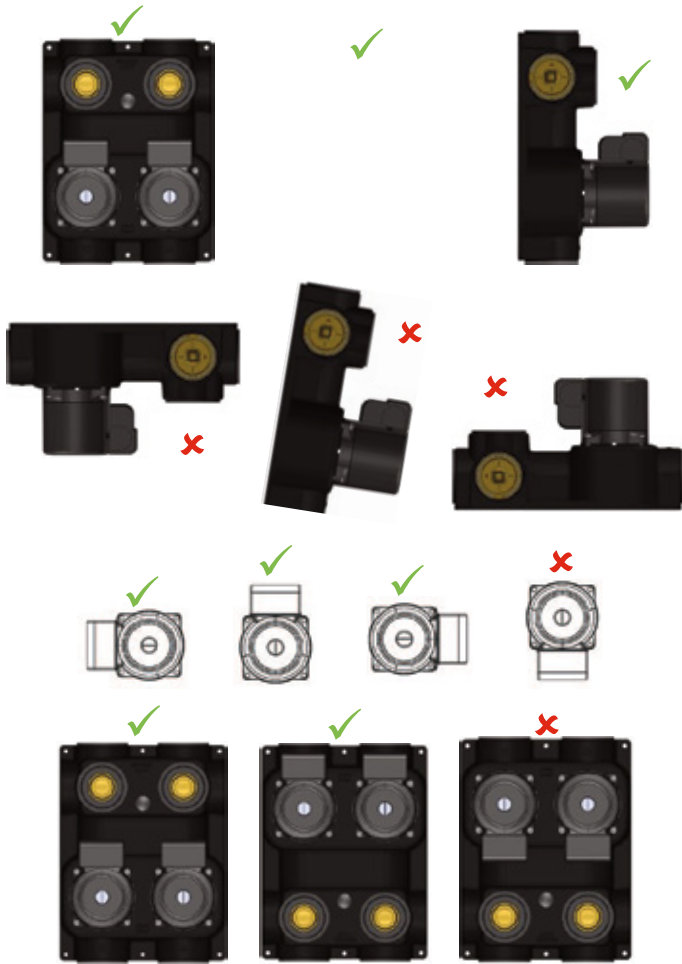


Section 4: Unit Piping

Pressurized Flow Center and Pump Mounting

The flow center can be mounted with the flow paths either vertical or horizontal (see Acceptable mounting positions for Flo-Link and GPM series flow centers). However, the flow center cannot be mounted on its back, upside down, or at an angle, as premature pump failure will occur when the pump shaft is not in the horizontal position.

Equally important to pump longevity is terminal box orientation. The pump terminal box must be located in a position to avoid condensation running into the control box, and also to take advantage of the “weep holes” designed to drain any condensation that may have formed. “Weep holes” are located on three sides of the pump.

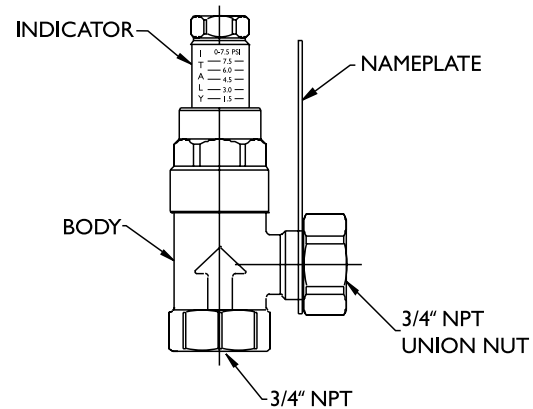


Load Side Installation

It is important that the load side piping of the WV system is sized properly for the required flow rates and is flushed and filled with good quality water and treatment. This will help ensure that the longevity of the pump(s), braze plates, and other water side components.

Per the installation diagrams shown in this section, boiler drains and isolation valves need to be integrated into the load piping for proper flushing of the system at start up, as well as for future service. Full port isolation valves should be used in order to ensure low pressure drop throughout the system.

Zone valves should be utilized on each circuit to control the water flow to each manifold/zone/circuit or distribution device. Enertech recommends zone valves have a CV rating of 8.9 or higher to help guarantee proper flow and low pressure drop throughout the system. All zone valves must be on/off style valves. **A pressure differential bypass valve (installed in the heat pump) is required for proper unit operation.**



Bypass Valve

Follow the steps below for valve settings.

1. The bypass valve is factory set to 7.5 PSI and will typically not need to be adjusted in the field.
2. The minimum pumps speed is factory defaulted to 30%. The advanced flow control algorithms mean that no adjustment is required in the field.

Other Hydronic Components

Most local codes require certain components be installed within the system. Local codes should be followed when determining the exact requirements. A pressure relief valve may be required, which should be rated for 30 PSI and terminated 6" from the floor surface. Additionally, back-flow preventer may be required and should be installed if a make-up water line is connected from the water source to the load side piping of the system.

Note: Even if a back-flow preventer is not required, it is highly recommended.

Recommendations for All WV Unit Applications

Following is a detailed list of recommendations for WV variable speed water-to-water heat pumps:

Zone Piping: All zone piping should be direct to load “Home Run” style to assist with purging air and to maintain lower pressure drop.

Hydronic Components: System should include expansion tank, air separator/automatic air vent, and system feeder. In addition, an automatic air vent should be located at the highest point in the piping system.

Antifreeze: All systems must include antifreeze and Fernox F1 inhibitor, or approved alternate, in the hydronic piping (this is a warranty requirement). Source Piping (ground loop) must also include antifreeze.

Flush Valves: System should include flush valves to facilitate purging of air.

Strainers: Strainers must be installed on the load and source piping (this is a warranty requirement). Unions, Adapters, Misc Fittings: All necessary unions, adapters and fittings should be installed to allow ease of service and to meet any local code requirements.

Section 4: Unit Piping

System Accessories Selection Table

Accessories	Notes
Flow Center	Order separately; Must use a Variable Speed Flow Center Provided by Enertech.
TurboMax Indirect Water Heater	Order separately *Includes Pressure Relief Valve & Pressure Gauge.
Hose Kit	Order separately
Plumbing Kit	Included with unit. Includes: (2) Y-Strainers, brass nipple, (2) 3/4" Boiler Drains

Suggested Accessories	Notes
AGFV1A	(2) Single insulated flush valves (load side flushing)
AGA5FPT	(2) Sets of Double O-ring X 1" FPT (flush valve adapters)
1" Taco Geo-Sentry Zone Valve	One per radiant manifold and one per fan coil.
Axiom System Feeder	For maintaining pressure on the hydronic loop.
Automatic Air Vent	Install at highest point in hydronic system for air removal.
Antifreeze	For both source and load sides to prevent freezing.
Fernox F1 Protector	For both source and load sides to ensure longevity of hydronic components.
Rubber Equipment Pad	For sound deadening.
Expansion Tank	To allow for expansion on the hydronic loop.
Secondary Pump Kit (P/N 28K092-02NN)	Insulated Pump Module, UPMXL 25-124, 208-230V, with 1" Isolation Valves for systems with a higher pressure drop.
Radiant Tubing/Accessories	Review Enertech price books for Mr. Pex radiant products.
Air Handler(s)	Review Enertech price books for ducted or ductless air handlers.
Optional Backup Water Heater	Supplied by contractor.
Ball Valves, Adapters, Fittings	Supplied by contractor.

Pump Mounting

It is important to follow best practices for mounting the system pump to provide long life, serviceability, and the ability to purge air out of the system. Following are two important tips for ensuring a good installation:

- **Pumping Direction:** Pumping up is the best way to mount the pump. If there is air in the system, it will have the best chance of the air getting through the pump, to the air separator, and out of the system. If the pump air locks, turn the pump off and the air will go up out of the impeller and will be replaced with water. Restart the pump to resume pumping. The air will flow to the air separator. In most cases the air will go through the pump. Pumping horizontally will work as long as there are small pockets of air in the system. They will keep moving around the system with the water to the air separator. If there are big pockets of air in the system, this will create problems for horizontal mounting. The pump will cavitate, lose water flow, overheat, and fail. If the pump does get air locked, there will need to be a purge port so that the air can be flushed out of the pump and system. Pumping down is the poorest way to mount a pump. If there is air in the system it will get trapped in the pump, causing it to cavitate, lose water flow, overheat, and fail. The air creates resistance in the down flowing water because the air wants to flow up. If the pump loses flow or stops, the air comes back up the pipe into the impeller, amplifying the problem. If the pump gets air locked, there will need to be a purge port so that the air can be flushed out of the pump and system.

- **Motor/Electrical Box:** The pump is a wet rotor pump. The motor shaft must be horizontal to keep the bearings properly lubricated. Do not put the pump on its back or pointing down (vertical shaft) because this orientation can cause premature pump failure. In most cases, the direction of the electrical box is important to keep any condensation out of the windings. Some pumps have a yellow sticker that is on the head of the pump, indicating the proper direction.

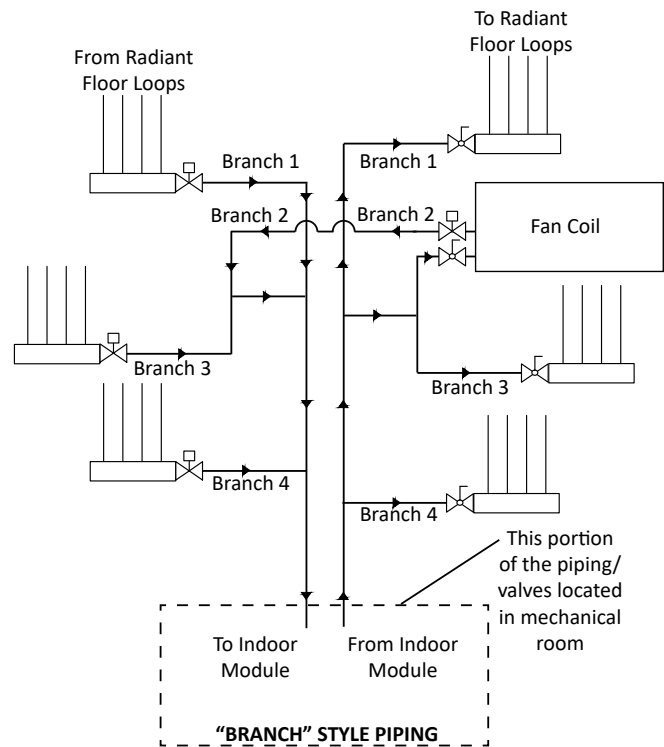
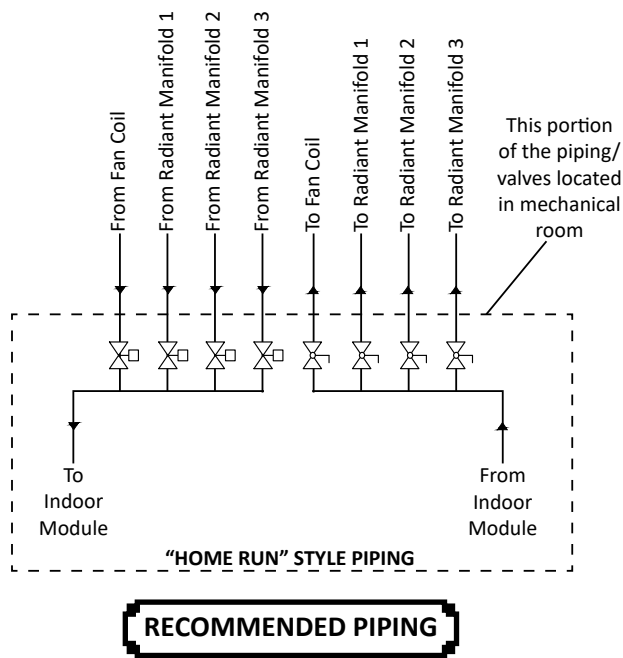
Piping Diagrams

Not all components are shown, such as union fittings, piping adapters/reducers, and other components. Schematics are designed for illustrating the arrangement/function of the components. Always use best practices when considering the location of the various components. For example, the expansion tank must always be on the suction side of the pump; check valves (if applicable) must always be on discharge of the pump.

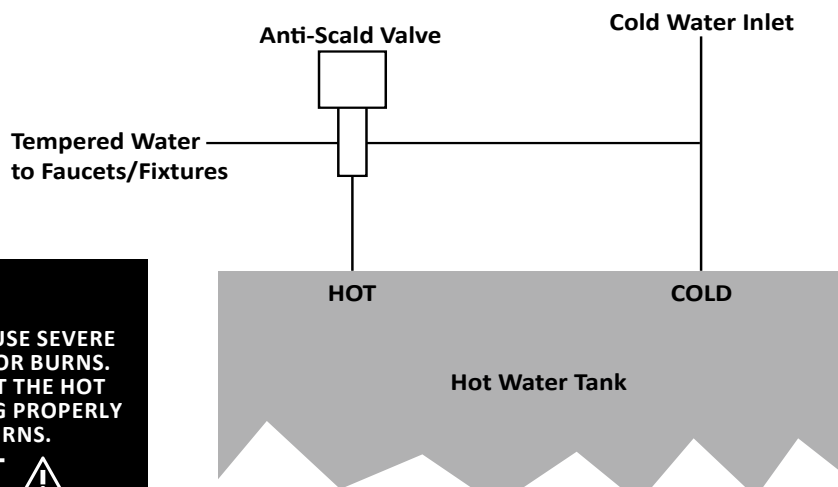
Two Y-Strainers are supplied with the unit. One must be installed on the 'Source Water In' connection of the WV. See the installation diagrams for the recommended location and orientation.

Section 4: Unit Piping

Piping Diagram - Flow Rates and Piping Sizing



Anti-Scald Valve Piping Connections

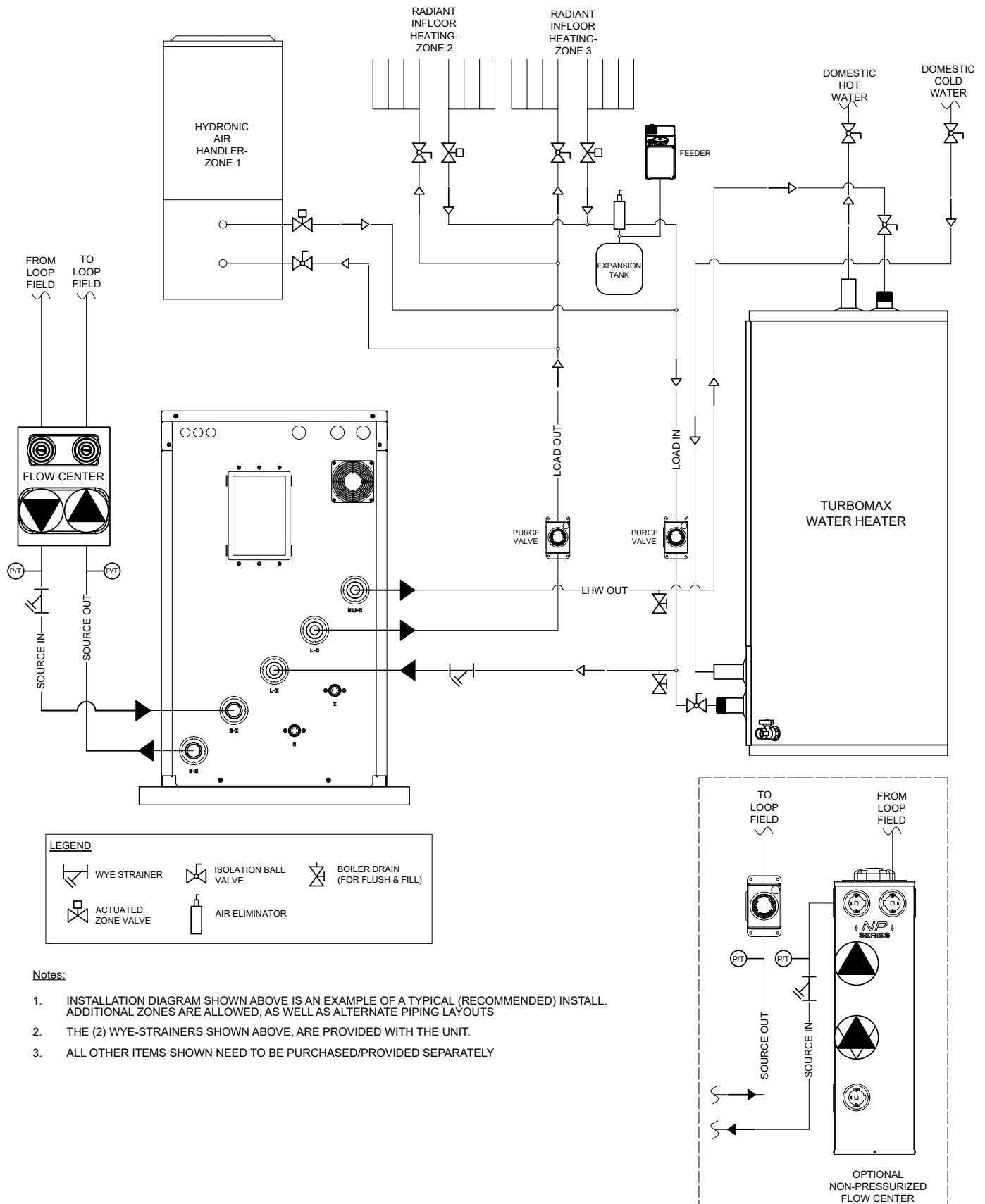


⚠ WARNING ⚠
WATER TEMPERATURES ABOVE 120° F CAN CAUSE SEVERE PHYSICAL INJURY IN THE FORM OF SCALDING OR BURNS. AN ANTI-SCALD VALVE MUST BE INSTALLED AT THE HOT WATER TANK OUTLET WITH THE VALVE SETTING PROPERLY ADJUSTED TO PREVENT SCALDING OR BURNS.

⚠ AVERTISSEMENT ⚠
DES TEMPÉRATURES D'EAU SUPÉRIEURES À 120°F PEUVENT CAUSER DE GRAVES BLESSURES PHYSIQUES SOUS FORME DE BRÛLURES. UN MITIGEUR ANTIBRÛLURES DOIT ÊTRE INSTALLÉ À LA SORTIE DU RÉSERVOIR D'EAU CHAUDE ET SON RÉGLAGE DOIT ÊTRE CORRECTEMENT EFFECTUÉ POUR ÉVITER LES BRÛLURES.

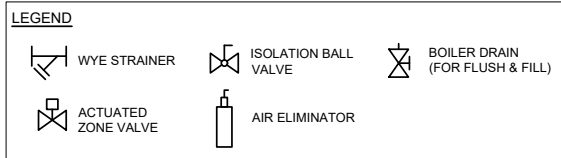
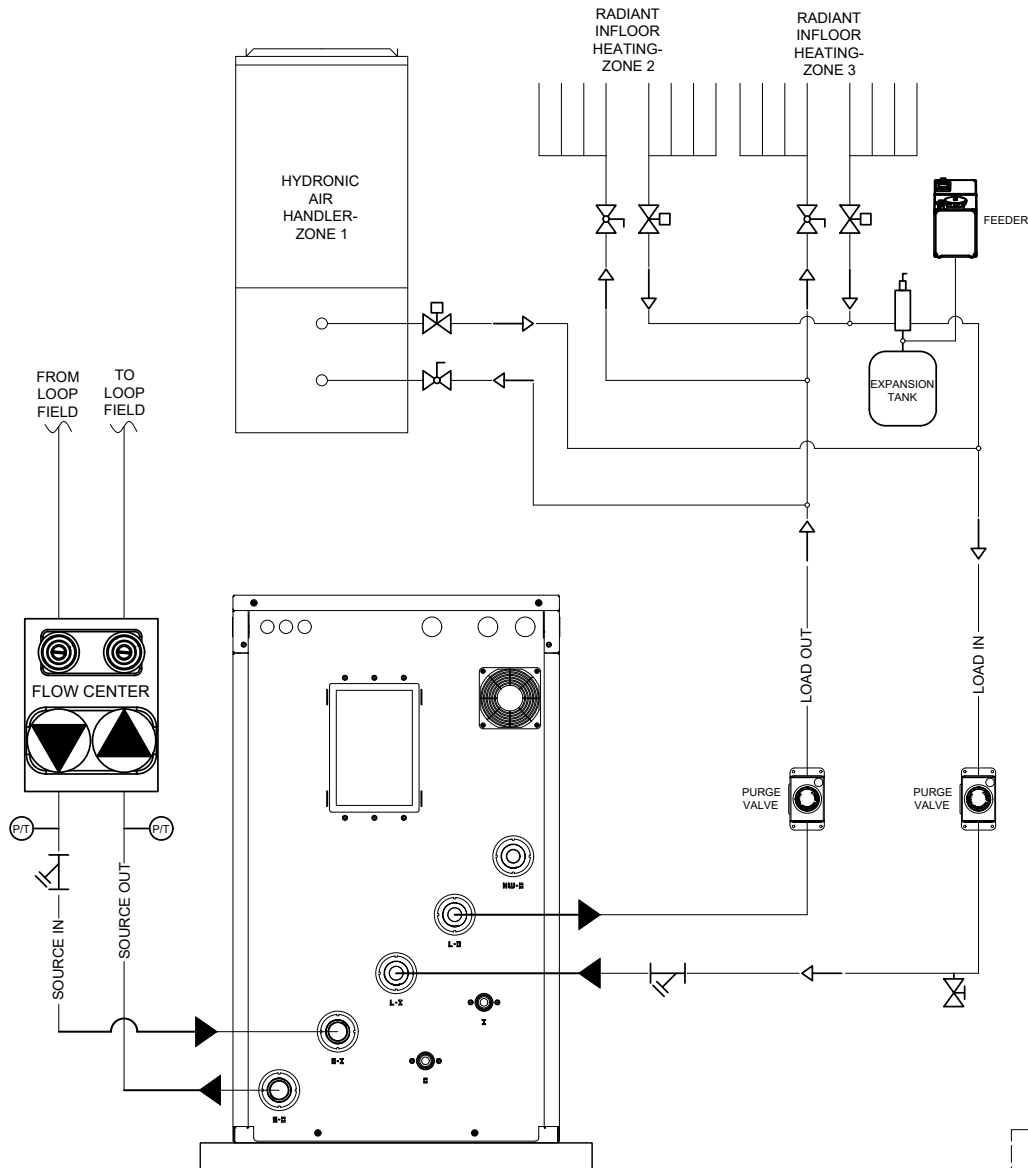
Section 4: Unit Piping

Piping Diagram - Heating and Cooling - with Hot Water Fan Coil/Hydronic Air Handler(s) - 2 tons or larger



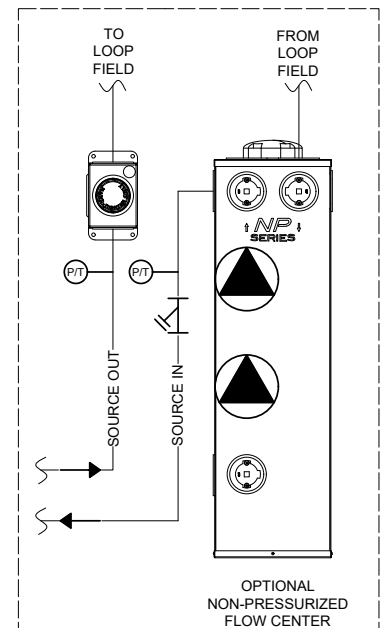
Section 4: Unit Piping

Piping Diagram - Heating and Cooling - No Hot Water Fan Coil/Hydronic Air Handler(s) - 2 tons or larger



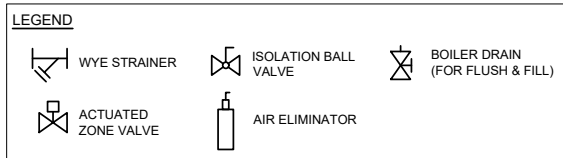
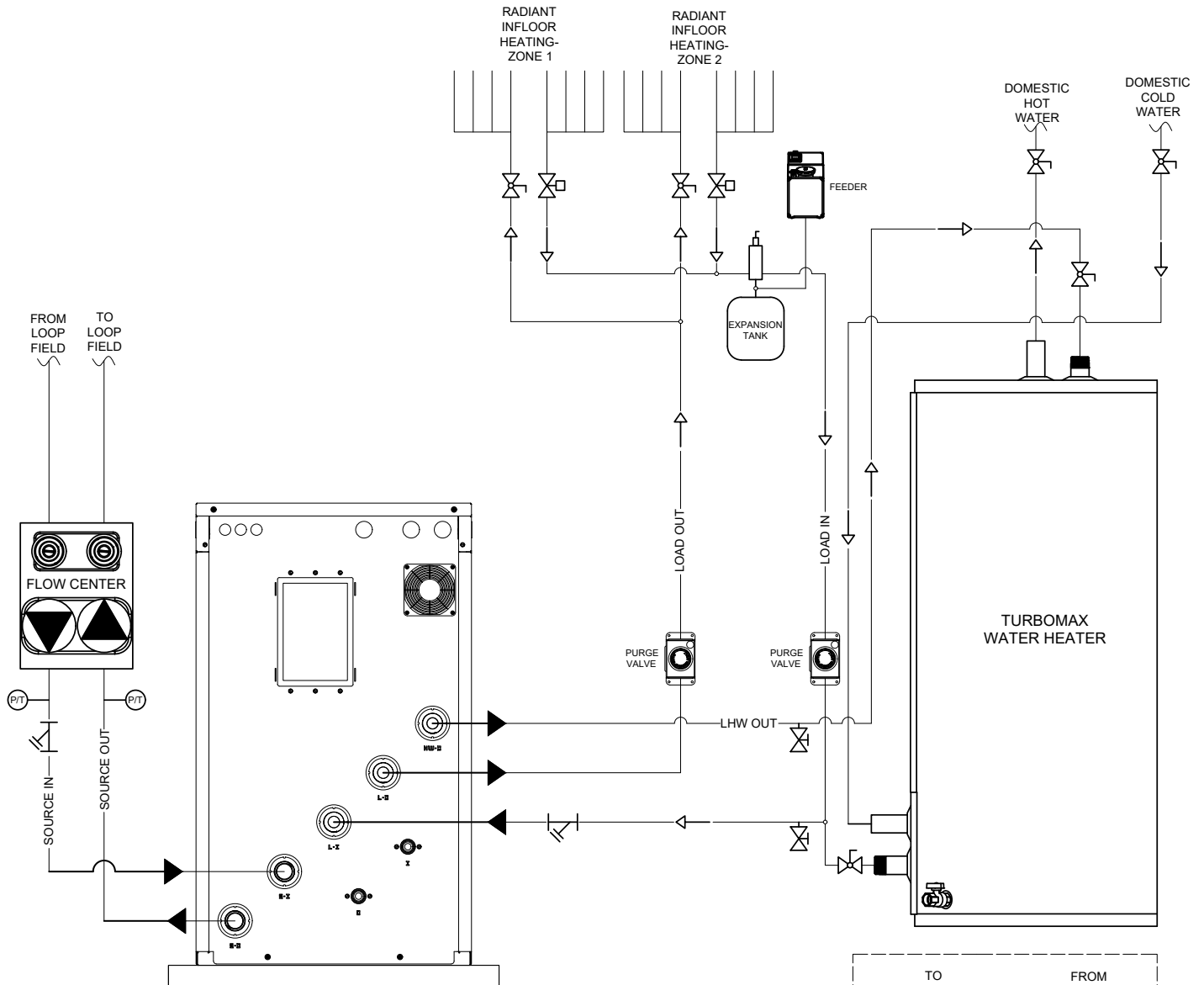
Notes:

1. INSTALLATION DIAGRAM SHOWN ABOVE IS AN EXAMPLE OF A TYPICAL (RECOMMENDED) INSTALL. ADDITIONAL ZONES ARE ALLOWED, AS WELL AS ALTERNATE PIPING LAYOUTS
2. THE (2) WYE-STRAINERS SHOWN ABOVE, ARE PROVIDED WITH THE UNIT.
3. ALL OTHER ITEMS SHOWN NEED TO BE PURCHASED/PROVIDED SEPARATELY



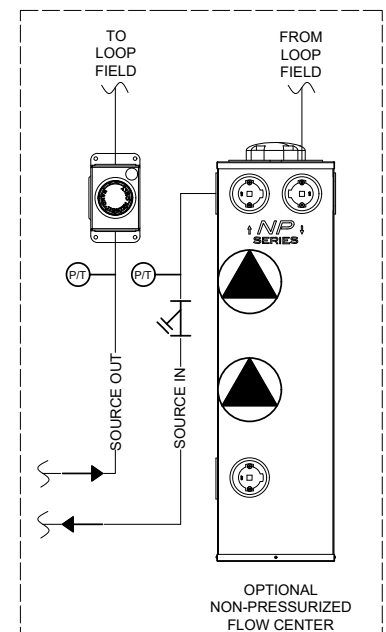
Section 4: Unit Piping

Piping Diagram - Heating ONLY - with Hot Water



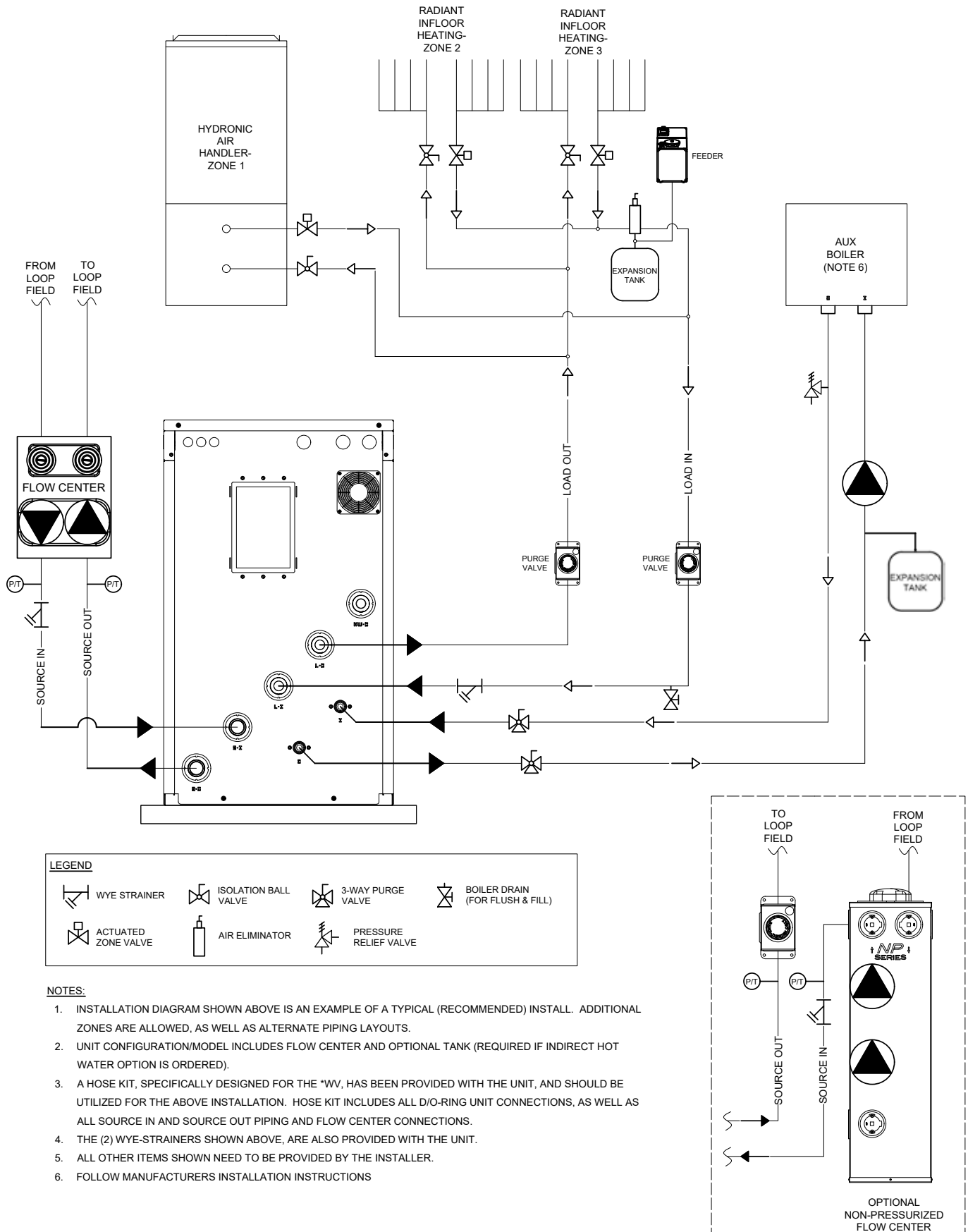
Notes:

1. INSTALLATION DIAGRAM SHOWN ABOVE IS AN EXAMPLE OF A TYPICAL (RECOMMENDED) INSTALL. ADDITIONAL ZONES ARE ALLOWED, AS WELL AS ALTERNATE PIPING LAYOUTS
2. THE (2) WYE-STRAINERS SHOWN ABOVE, ARE PROVIDED WITH THE UNIT.
3. ALL OTHER ITEMS SHOWN NEED TO BE PURCHASED/PROVIDED SEPARATELY



Section 4: Unit Piping

Piping Diagram - Dual Fuel Boiler Connection



Section 5: Antifreeze

Overview

In areas where minimum entering loop temperatures drop below 40°F, or where piping will be routed through areas subject to freezing, antifreeze is required. Alcohols and glycols are commonly used as antifreeze. However, local and state/provincial codes supersede any instructions in this document. The system needs antifreeze to protect the heat exchanger from freezing and rupturing. Freeze protection should be maintained to 15°F below the lowest expected entering loop temperature. For example, if 30°F is the minimum expected entering loop temperature, the leaving loop temperature could be 22 to 25°F. Freeze protection should be set at 15°F (30-15 = 15°F). To determine antifreeze requirements, calculate how much volume the system holds. Then, calculate how much antifreeze will be needed by determining the percentage of antifreeze required for proper freeze protection. See Pipe Fluid Volume and Antifreeze Percentages by Volume Tables for volumes and percentages. The freeze protection should be checked during installation using the proper hydrometer to measure the specific gravity and freeze protection level of the solution.

Characteristics

Selection of the antifreeze solution for closed loop systems require the consideration of many important factors, which have long-term implications on the performance and life of the equipment. Each area of concern leads to a different “best choice” of antifreeze. There is no “perfect” antifreeze. Some of the factors to consider are as follows (Brine = antifreeze solution including water):

- **Safety:** The toxicity and flammability of the brine (especially in a pure form).
- **Cost:** Prices vary widely.
- **Thermal Performance:** The heat transfer and viscosity effect of the brine.
- **Corrosiveness:** The brine must be compatible with the system materials.
- **Stability:** Will the brine require periodic change out or maintenance?
- **Convenience:** Is the antifreeze available and easy to transport and install?
- **Codes:** Will the brine meet local and state/provincial codes?

The following are some general observations about the types of brines presently being used:

Methanol: Wood grain alcohol that is considered toxic in pure form. It has good heat transfer, low viscosity, is non-corrosive, and is mid to low price. The biggest down side, it is flammable in concentrations greater than 25%.

Ethanol: Grain alcohol, which by the ATF (Alcohol, Tobacco, Firearms) department of the U.S. government, is required to be denatured and rendered unfit to drink. It has good heat transfer, mid to high price, is non-corrosive, non-toxic even in its pure form, and has medium viscosity. It is also flammable with concentrations greater than 25%. Note that the brand of ethanol is very important. Make sure it has been formulated for the geothermal industry. Some of the denaturants are not compatible with HDPE pipe (for example, solutions denatured with gasoline).

Propylene Glycol: Non-toxic, non-corrosive, mid to high price, poor heat transfer in high concentrations, and potential for high viscosity when cold (in high concentrations). It has also been known to form a “slime-type” coating inside the pipe when inhibitors are not used. Do not use food grade glycol, since it does not include inhibitors. A 25% to 30% brine solution is a minimum concentration for required inhibitors, depending upon brand of glycol. If using a lower concentration (e.g. 20% provides 19°F freeze protection), additional inhibitors must be added. Note that some states/provinces have toxicity requirements that must be verified based upon the chemical composition of the inhibitors.

Ethylene Glycol: Considered toxic and is not recommended for use in earth loop applications.

Charging

Calculate the total amount of pipe in the system and use the following **Pipe Fluid Volume Table** to calculate the amount of volume for each specific section of the system. Add the entire volume together, and multiply that volume by the proper antifreeze percentage needed (**See Antifreeze Percentages by Volume**) for the freeze protection required in your area. Then double check calculations during installation with the proper hydrometer and specific gravity chart (**See Antifreeze Specific Gravity Table**) to determine if the correct amount of antifreeze was added.

⚠ CAUTION ⚠
GROUND LOOPS AND/OR HYDRONIC LOOPS MUST BE ANTIFREEZE PROTECTED. HYDRONIC LOOP ANTIFREEZE MUST BE NON-FLAMMABLE. INSUFFICIENT AMOUNTS OF ANTIFREEZE MAY CAUSE SEVERE DAMAGE AND MAY VOID WARRANTY.

⚠ MISE EN GARDE ⚠
LES BOUCLES DE MASSE ET/OU LES BOUCLES HYDRONIQUES DOIVENT ÊTRE PROTÉGÉES CONTRE L'ANTIGEL. L'ANTIGEL POUR BOUCLES HYDRONIQUES DOIT ÊTRE ININFLAMMABLE. UNE QUANTITÉ INSUFFISANTE D'ANTIGEL PEUT CAUSER DE GRAVES DOMMAGES ET ANNULER LA GARANTIE.

Antifreeze Percentages by Volume Table

Type of Antifreeze	Minimum Temperature for Freeze Protection			
	10°F (-12.2°C)	15°F (-9.4°C)	20°F (-6.7°C)	25°F (-3.9°C)
Propylene Glycol	30%	25%	*20%	*13%
Methanol	21%	17%	13%	5%
Ethanol	26%	23%	18%	13%
Heat Transfer Fluid (HTF)	Mix according to manufacturer’s directions on container label			
Note: Antifreeze solutions are shown in pure form - not premixed HTF is a premixed Methanol Solution *Concentrations below 25-30% (consult manufacturer) typically require additional inhibitors.				

Section 5: Antifreeze

Pipe Fluid Volume Table		
Type	Size	Volume Per 100ft US Gallons
Copper	1" CTS	4.1
Copper	1.25" CTS	6.4
Copper	1.5" CTS	9.2
HDPE	.75" SDR11	3.0
HDPE	1" SDR11	4.7
HDPE	1.25" SDR11	7.5
HDPE	1.5" SDR11	9.8
HDPE	2" SDR11	15.4

Notes:
Unit coaxial heat exchanger = 1 Gallon
Flush Cart = 8-10 Gallons
10' of 1" Rubber Hose = 0.4 Gallons

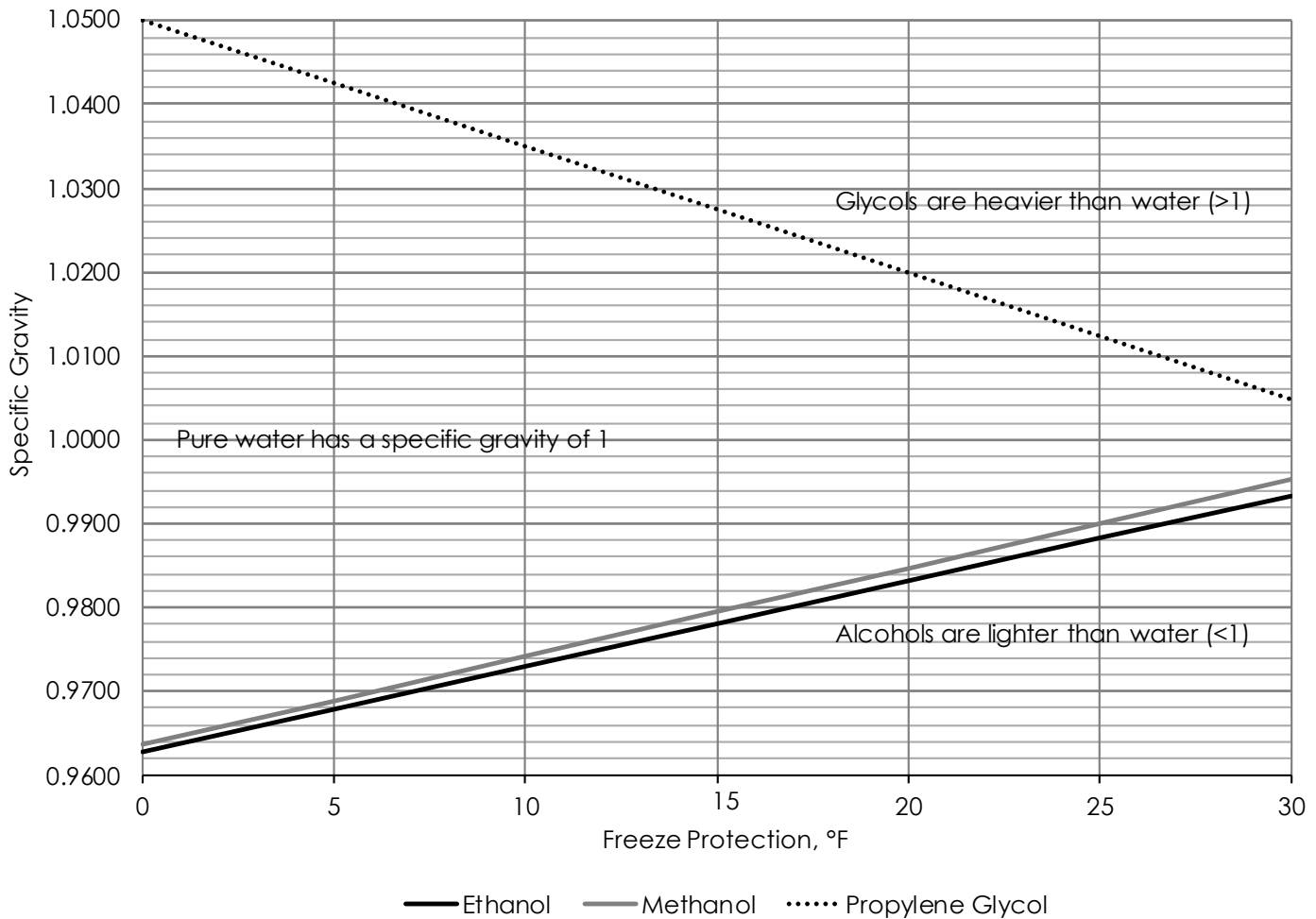
⚠ WARNING ⚠

USE EXTREME CARE WHEN OPENING, POURING, AND MIXING FLAMMABLE ANTIFREEZE SOLUTIONS. REMOTE FLAMES OR ELECTRICAL SPARKS CAN IGNITE UNDILUTED ANTIFREEZES AND VAPORS. DO NOT SMOKE WHEN HANDLING FLAMMABLE SOLUTIONS AND USED ONLY IN A WELL VENTILATED AREA. FAILURE TO OBSERVE SAFETY PRECAUTIONS MAY RESULT IN FIRE, INJURY, OR DEATH. NEVER WORK WITH 100% ALCOHOL SOLUTIONS.

⚠ AVERTISSEMENT ⚠

FAIRE TRÈS ATTENTION LORS DE L'OUVERTURE, DU DÉVERSEMENT OU DU MÉLANGE DE SOLUTIONS ANTIGEL INFLAMMABLES. LES FLAMMES DISTANTES OU LES ÉTINCELLES ÉLECTRIQUES PEUVENT ENFLAMMER L'ANTIGEL NON DILUÉ OU LES VAPEURS. UTILISER UNIQUEMENT DANS UN ENDROIT BIEN VENTILÉ. NE PAS FUMER LORS DE LA MANIPULATION DES SOLUTIONS INFLAMMABLES. LE NON-RESPECT DES CONSIGNES DE SÉCURITÉ PEUT ENTRAÎNER UN INCENDIE, DES BLESSURES, VOIRE LA MORT. NE JAMAIS TRAVAILLER AVEC DES SOLUTIONS D'ALCOOL À 100 %.

Antifreeze Specific Gravity Table



Notes:

1. Consult with your representative or distributor if you have any questions regarding antifreeze selection or use.
2. Some antifreeze suppliers and manufacturers recommend the use of either de-ionized or distilled water with their products. Some brands are designed to work with tap water. Consult the antifreeze manufacturer's technical data.

Section 6: Field Wiring

Introduction

- The WV does not include a circuit breaker on the incoming power supply. The heat pump's supply cable must be connected to a circuit breaker. A disconnect must be installed near the unit per local code requirements.
- The routing of cables for heavy current and signals should be made out through the cable openings according to the labels on the left, right, or back side of the unit.

Note: Electrical installation and wiring must be carried out in accordance with local code by a qualified technician.

Line Voltage

A power block is provided for incoming power to the WV. This circuit supplies power to all of the controls, internal pump, and immersion heater (if equipped).

Note: Shall be installed following National Wiring Regulations, reference the electrical data for circuit sizing.

Low Voltage

The WV field wiring provides dry contact inputs to interface directly with industry standard zone controllers and aquastats. These are indicated with the following input pairs:

Heat: Radiant heating demand input

HHeat: Air handler heating demand input (125°F outlet temperature)

Cool: Air handler cooling demand input (low temperature water)

DHW: Domestic hot water thermistor (connect to thermistor that is pre-installed in Turbomax tank)

OAT: Outdoor Air Temperature Sensor for outdoor reset curves

M IN +/-: Modulating input. Controls temperature outlet from the WV

M OUT +/- (Dual Fuel Only): Modulating output. Controls temperature outlet from connected boiler. Boiler signal must be configured in Boiler Settings menu.

T T (Dual Fuel Only): Contact closure output. Controls activation signal to connected boiler.

ES: Emergency Shutdown. If common is supplied to the input of ES, we will enter the Load Shutdown (ES) state. This state will: Turn off the compressor and pumps until the signal is removed.

LS: Load Shed. If common is supplied to the input of LS, we will enter the Load Shed state. For the electric backup version of the WV, this state will: Turn off the compressor, electric heater, and pumps. For the dual fuel version of the WV, this state will: Turn off the compressor, but will continue to service heating calls using the boiler backup.

Optional Field Wiring Connections

C 24V: This is a 24 VAC signal that is present when the compressor is running, but off when the compressor is not running. This is intended for controlling an external pump.

THM: These are connections for a thermistor that measures the temperature of the refrigerant entering the load side heat exchanger. Its intended for use with the HBX zone-600 for improved zone handling.

Space Conditioning Controls

The WV has been developed to easily interface with zone control modules that can be used with zone control valves. Enertech recommends the HBX ZON-0600 which requires HBX THM-0600 thermostats. HBX ZON-0600 is a good fit when there are one or more fan coils/air handlers, and multiple radiant zones. If there are only fan coils (no radiant), it is possible to use an EWC UZ4 zone panel.

Zone valves are recommended to have a CV of at least 8.9 and have 24VAC actuators. These valves can be powered through the zone controller via the "R" and "C" terminals on the WV field terminal strip, as long as the demand at any time is less than 50VA (approximately 5 valves opening at once). If the load will exceed this amount, an external transformer is required.

WV Input Requirements from Zone Panel

The WV field wiring terminal strip requires the following dry contact input pairs:

HEAT: Radiant heating demand input (outdoor reset controlled temperature)

HHEAT: Air handler heating demand input (120°F outlet temperature)

COOL: Air handler cooling demand input (low temperature water)



Section 6: Field Wiring

Outdoor Air Temperature (OAT)

A pair of terminals are dedicated to connecting the included outdoor temperature sensor. This is a 10K type thermistor and does not have polarity (it can be connected in either orientation to the OAT terminals).

OAT Terminals: Outdoor air temperature for outdoor reset used with radiant heating.

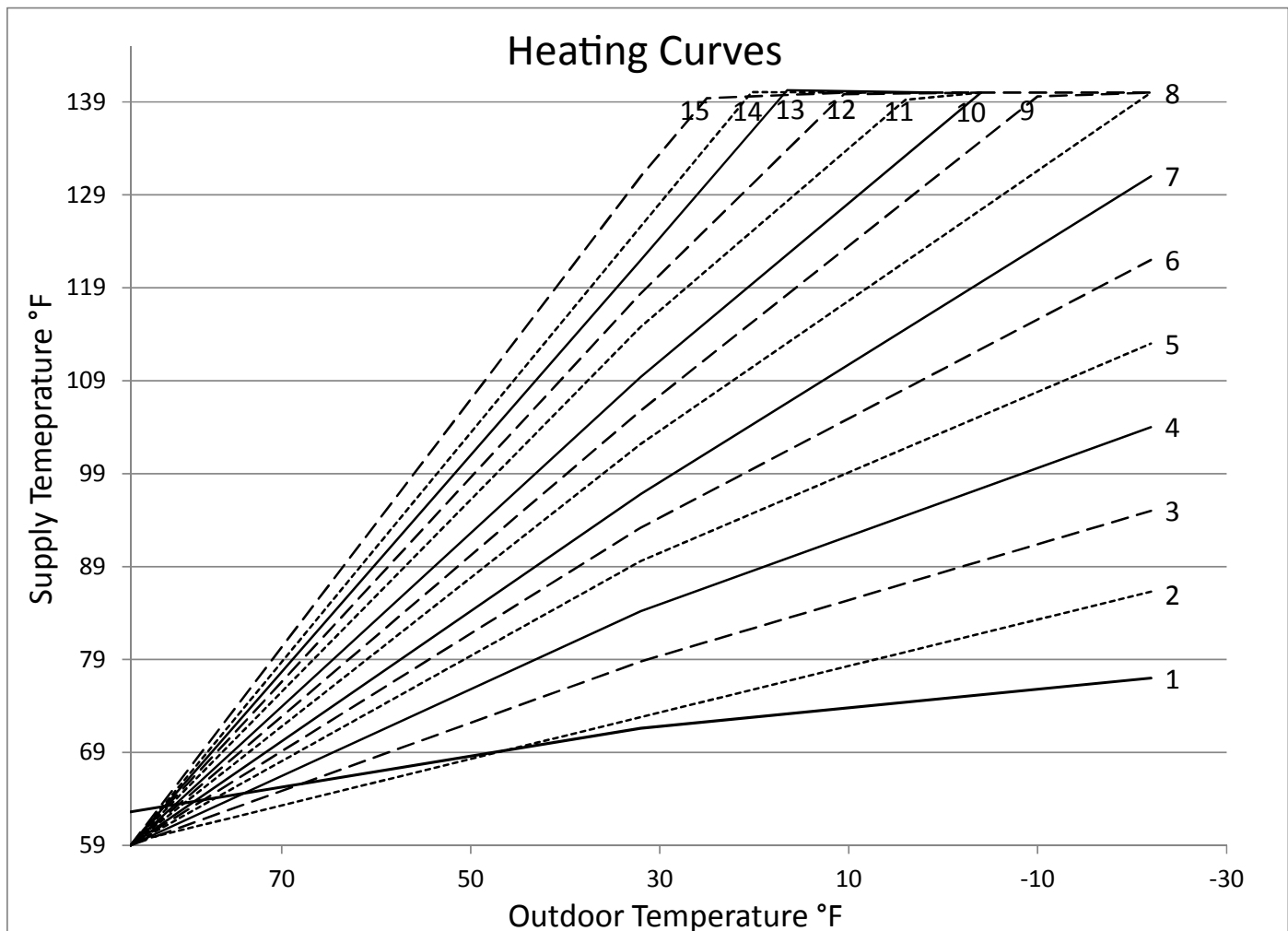
Outdoor reset control will vary the design load temperature based on outdoor temperature. The colder the outside temperature, the warmer the load water temperature. This offers several advantages. The COP of the system is improved by targeting the lowest outlet temperatures possible. Additionally, user comfort is improved by maintaining ideal temperatures for the current outdoor conditions. If necessary, the WV can operate without outdoor reset by setting a static load water temperature.

Note: The outdoor temperature is a running one hour average to avoid dramatic shifts.

The WV utilizes a set of temperature curves as seen below. The default curve is #3 and has been found to work in many installations. Depending on the load calculation and environmental requirements, a different curve may be preferable: The higher numbered curves produce higher radiant floor temperatures for a given outdoor temperature while the lower numbered curves produce lower temperatures. For example, at 30°F outdoor temperature, curve #3 will produce 79°F outlet temperature. Changing to curve #4 would produce 84°F outlet at that same condition.

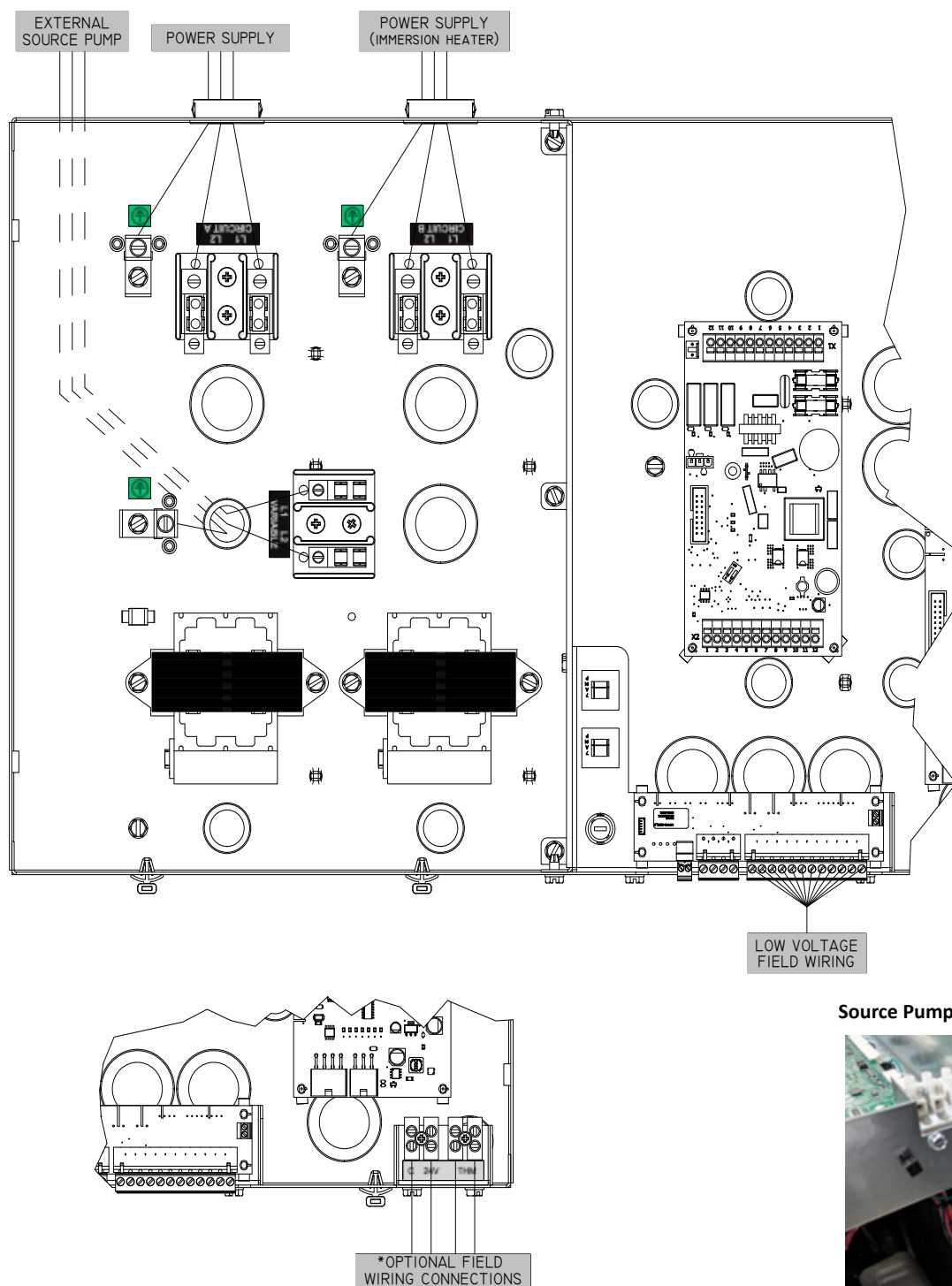
Note: Flooring manufacturers may have maximum recommended temperatures for radiant heat. This can be established on the HMI to cap the highest possible load temperature, regardless of outdoor temperatures.

Note: Position the sensor on the North side of the home. Avoid sun exposure!



Section 6: Field Wiring

Field Wiring Connections



Source Pump Harness Location:



Line Voltage Connections

Two power blocks are provided for incoming power to the WV. The primary circuit, "Circuit A", supplies power to all of the controls and refrigeration components. "Circuit B" supplies power to the electric immersion heater (if equipped), utilized for auxiliary and/or emergency heat. Reference the electrical data for circuit sizing.

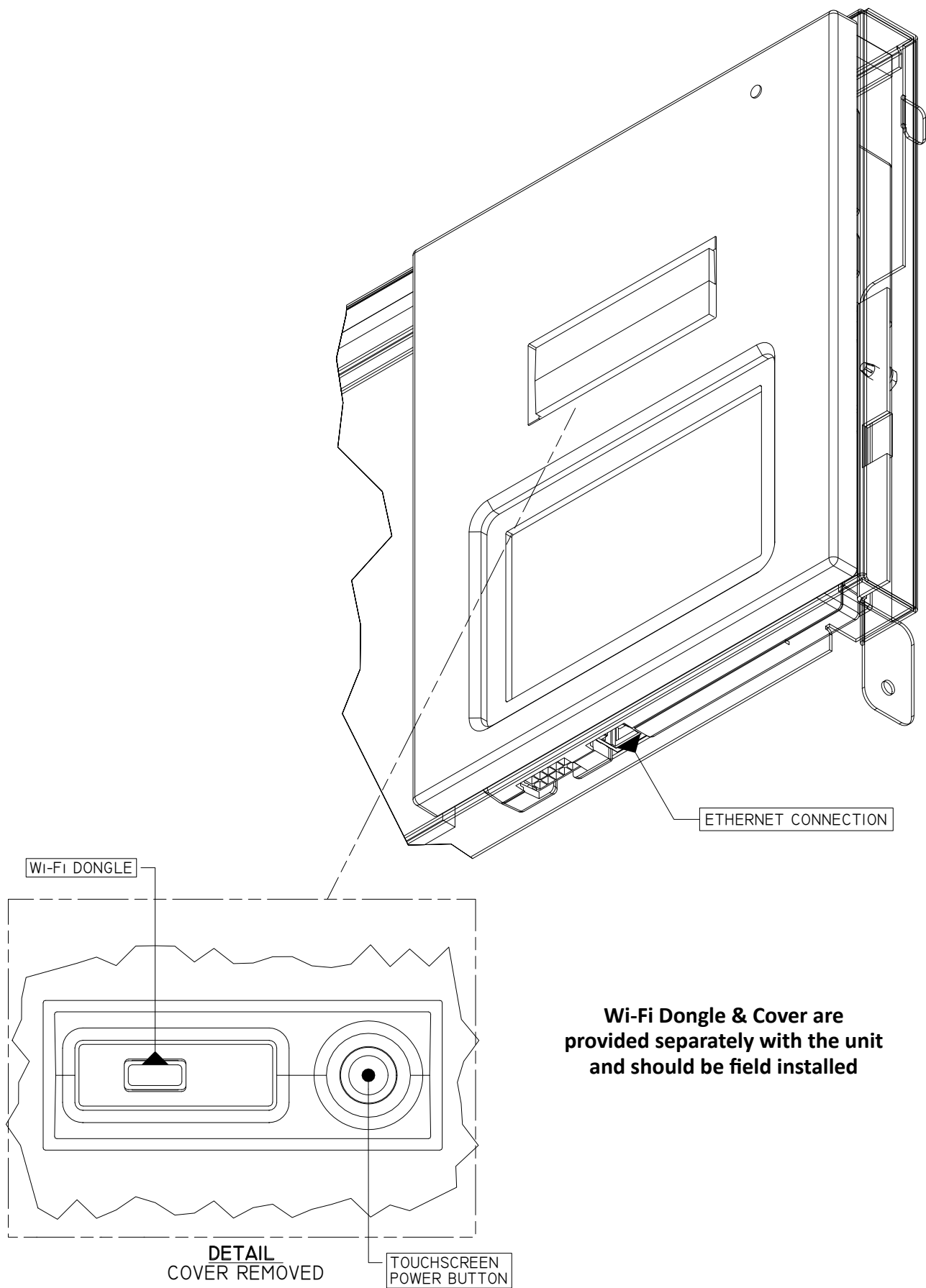
One pump block labelled "Variable" is also provided for the connection of the source water external flow center. This block is constantly energized as required for variable speed pumps.

Note: The WV has built in surge protection. The system may also be protected as part of a whole house surge protector.

Note: The WV also provides plug and play field wiring for the low voltage signal to a variable speed flow center. The variable speed signal wire **MUST** be connected to the flow center or the pumps will constantly run at max speed.

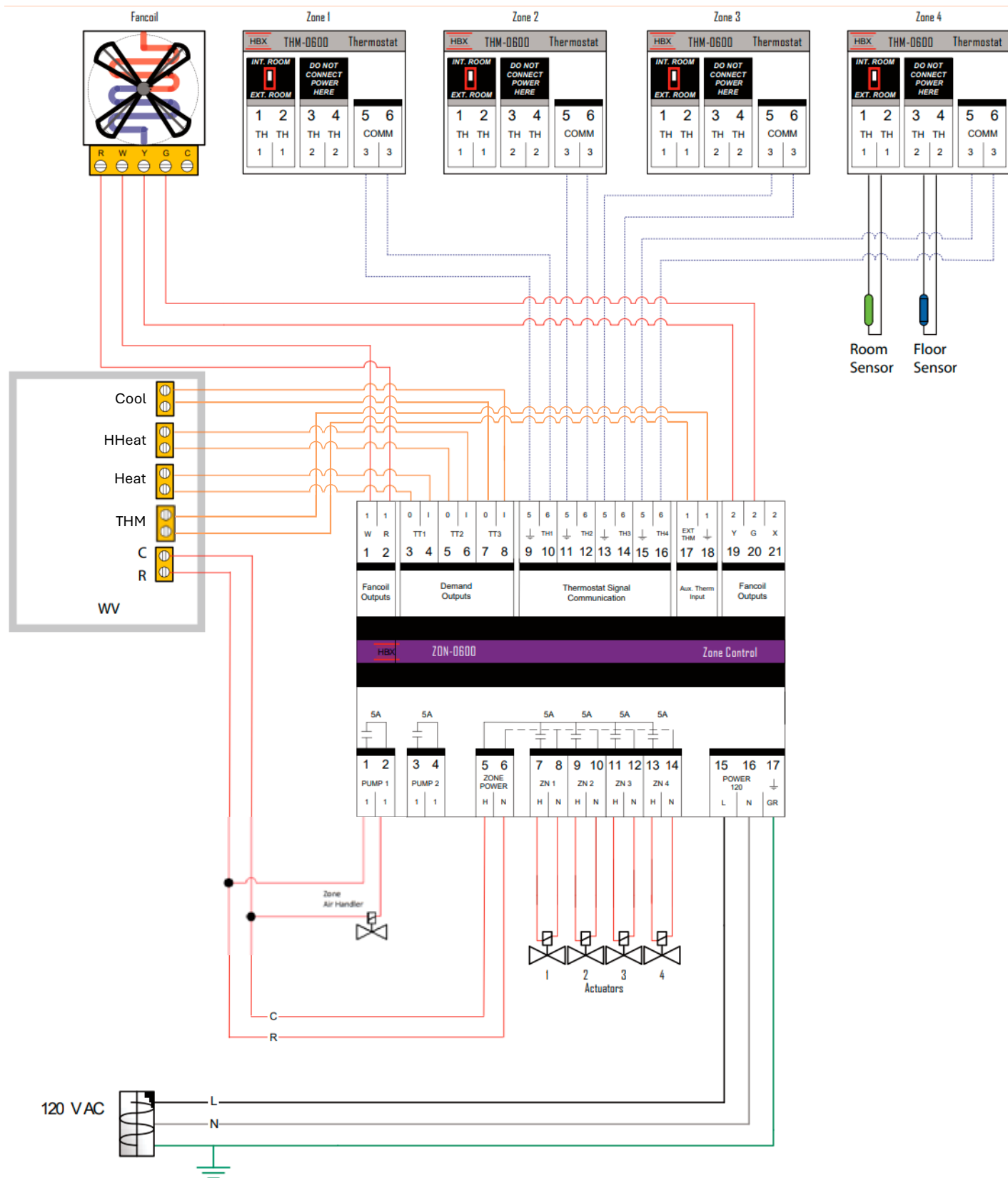
Section 6: Field Wiring

HMI - Field Requirements



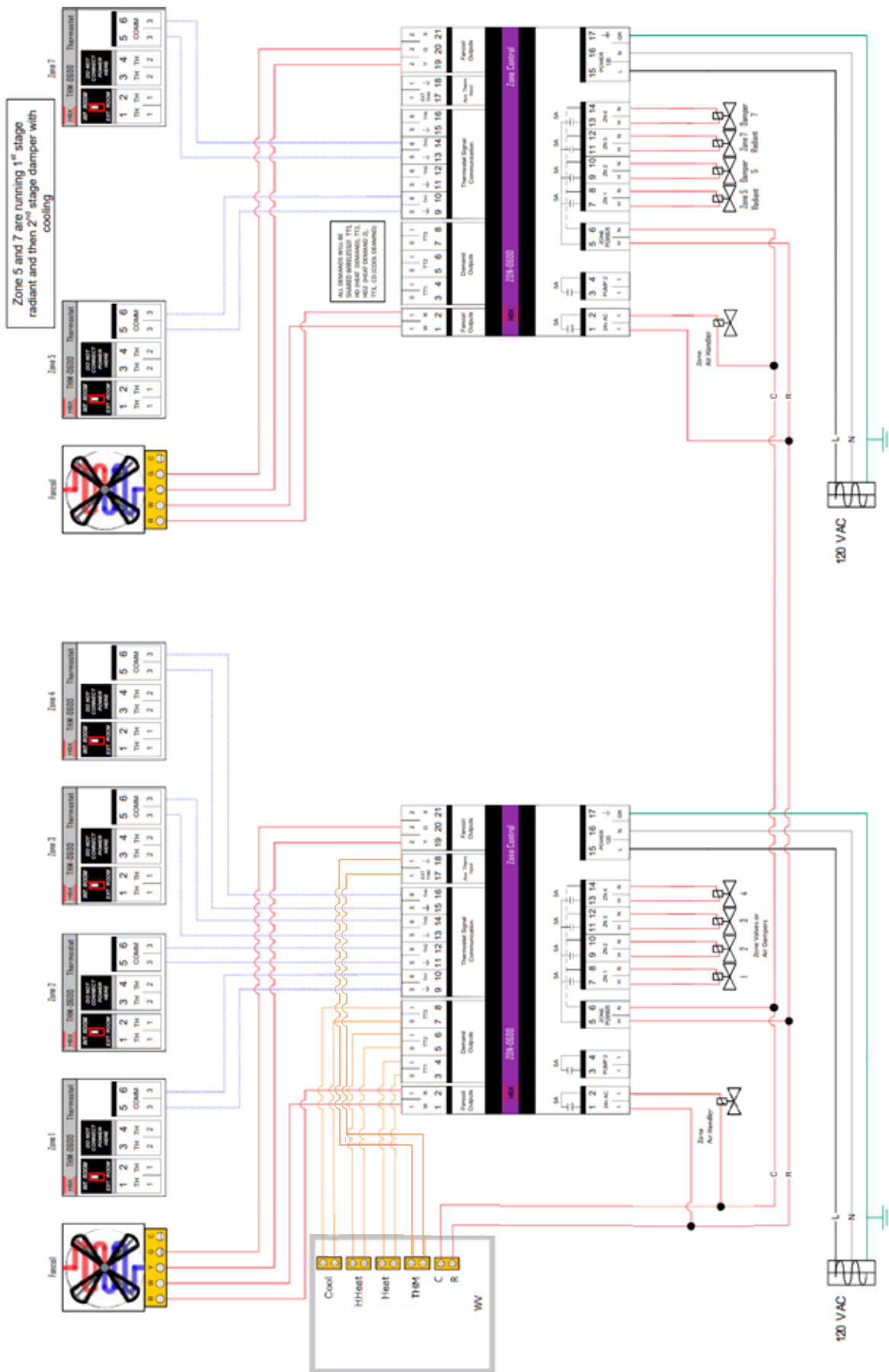
Section 6: Field Wiring

Diagram: Heating/Cooling - Radiant - One Zone Control Per Fan Coil (fan coil is Enertech EAH series)



Section 6: Field Wiring

Diagram: Radiant Heating + Fan Coil Heating/Cooling - Two Stage Operation, 1-Radiant/2-Fan - One Zone Control Per Fan Coil (fan coil is Enertech EAH series)



Section 6: Field Wiring

Converting Control Box

The WV features a field adjustable control box for application flexibility. The controls box will come factory installed in the "top mounted" orientation. If needed, the control box can be moved to the front of the unit by following the steps below:



Remove 2 screws at the bottom of the door to remove the front door.



Pull out the bottom and slightly lower to clear the top panel.



Remove three screws from the front panel to remove the side panels.



Pull out the front of the panel and slide to the rear.



Slide to the rear and remove the panel. Do this on both sides.



Removed Panels



To remove the top, take the two screws out of the rear of the unit.



Slide the top towards the rear and remove it.



Remove the center Braces (x2, 8 screws).

Section 6: Field Wiring



Remove two screws from the front panel/corner post.



Disconnect the Molex plug in the bottom of the HMI.



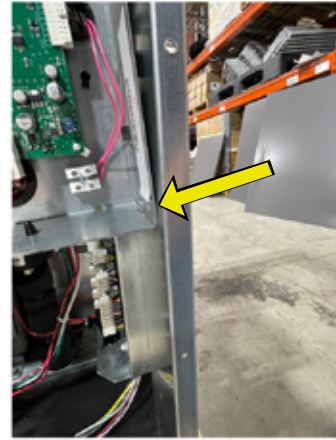
Remove the front HMI Panel.



Remove four screws from the control box.



Pull up on the control box and move to the front of the unit.



Place the corner of the control box on this locking tab and install screws from the side.



Add four screws into control box on both sides.



Add the previously removed bracing to the top where the control box was.



Reverse the disassembly to put the unit back together.

Section 7: Equipment Start-Up

Flush Cart Design

The Enertech Manufacturing flush cart has been designed to effectively and efficiently flush the earth loop and to facilitate injecting and mixing of the antifreeze. The single most important element in flow center reliability is the ability to remove all the air and debris from the loop and to provide the proper working pressure.

Removing Debris During Flushing

Most flow center or pump failures are a result of poor water quality or debris. Debris entering the loop during fusion and installation can cause noise and premature pump failure. Enertech recommends a double flush filtering method during purging. When purging, use a 100 micron bag filter until air bubbles are removed. Remove the 100 micron bag, replace it with a 1 micron bag and restart the flushing.

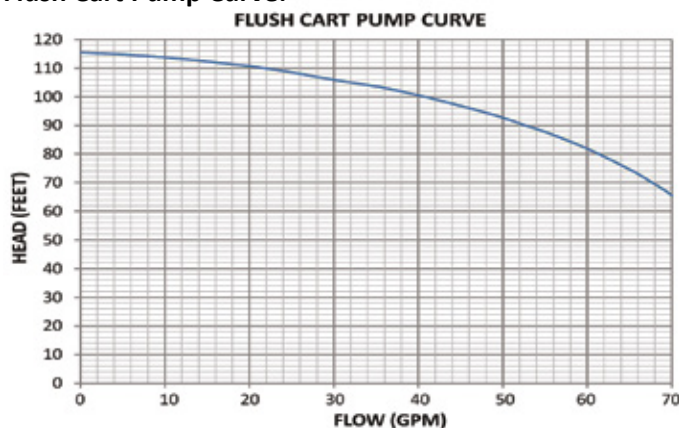
Features of the Flush Cart:

- Cylinder: HDPE, SDR15.5, 10" dia. (10 Gallons)
- Pump: Myers High Head QP15, 1.5hp, 115V
- Hose connections: Cam Lock quick connects - 1-1/2" hoses
- Hand Truck: 600lb rating with pneumatic tires
- Wiring: Liquid Tight metal on/off switch
- Tubing: SDR11 HDPE
- Connections: 2 - 3/4" connections for antifreeze and discharge
- Drain: one on the pump and the tank

Enertech Flush Cart:



Flush Cart Pump Curve:



Flushing Process

Step 1: Flushing the Earth Loop

1. Connect flush cart hoses to flow center flush ports using proper adapters #AGAFP.
2. Connect water supply to hose connection on return line of flush cart.
3. Turn both 3-way valves on flow center to flush ports and loop position.
4. Turn on water supply (make sure water is of proper quality).
5. As the reservoir fills up, turn the pump on and off, sucking the water level down. Do not allow the water level to drop below intake fitting to the pump.
6. Once the water level remains above the water outlet in the reservoir leave the pump running continuously.
7. Once the water level stays above the "T" in the reservoir, turn off the water supply (this also allows observation of air bubbles).
8. Run the pump for a minimum of 2 hours for proper flushing and purging (depending on system size it may take longer).
9. "Dead head" the pump every so often and watch the water level in the reservoir. Once all the air is removed there should not be more than a 1" to 2" drop in water level in the reservoir. If there is more than a 2" drop, air is still trapped in the system. This is the only way to tell if air is still trapped in the system.
10. To dead head the pump, shut off the return side ball valve on the flush cart. This will provide a surge in pressure to the system piping, helping to get the air bubbles moving. Do not reverse flow during flushing.

⚠ CAUTION ⚠
USING JUST THE ON-SITE CITY OR WELL WATER PRESSURE,
WILL NOT PROPERLY FLUSH THE AIR AND DEBRIS OUT
FROM THE SYSTEM.

⚠ MISE EN GARDE ⚠
L'UTILISATION DE LA PRESSION DE L'EAU DE LA VILLE
OU DU PUIT SUR PLACE NE PERMET PAS DE PURGER
CORRECTEMENT L'AIR ET LES DÉBRIS DU SYSTÈME.

Section 7: Equipment Start-Up

Flushing and Filling

The system needs to be flushed of air and debris, and filled before it is put into service. All systems have dirt and debris from the piping, soldering, etc. Enertech recommends using a flush cart to the purge the system. The flush cart should utilize a ½ HP pump, which is sufficient for almost all residential hydronic systems, as long as each circuit is isolated and flushed one at a time.

Note: If any small amount of air is still in the system, the air elimination device will remove it and the System Feeder, as well as the expansion tank, will keep pressure on the system. Recommended pressure setting is 15-25 PSI.

⚠ WARNING ⚠
MAKE SURE TO ISOLATE THE DOMESTIC WATER TANK
BECAUSE THE RELIEF VALVE INSTALLED IN THE TANK WILL
PURGE WATER AS THE SYSTEM IS FLUSHED.

⚠ AVERTISSEMENT ⚠
ASSUREZ-VOUS D'ISOLER LE RÉSERVOIR D'EAU
DOMESTIQUE, CAR LA SOUPAPE DE SÉCURITÉ INSTALLÉE
DANS LE RÉSERVOIR PURGERA L'EAU AU FUR ET À MESURE
QUE LE SYSTÈME SERA RINCÉ.

Water flow direction is crucial during Purging. If the water flow is backwards, the Wye Strainer is not protecting the braze plate heat exchangers from the miscellaneous debris that hasn't been flushed out into the flush cart. Remember to clean the Wye strainer after purging.

1. Isolate each circuit, including the heat pump and DHW tank (if equipped). Then, flush each zone of air, and fill each zone with water (radiant tubing, air handler, etc.).
2. Open the isolation valves and flush/ fill the hot water tank (if equipped), making sure to keep the system between 15 and 25 PSI. Once this step is complete, close the isolation valves.

This step can be skipped if the unit is not equipped with hot water capability.

3. Open the isolation valves and flush/ fill the heat pump, making sure that the water flow direction is as it would be in normal operation.

Note: Water flow direction is crucial during this step. If the water flow is backwards, the Wye Strainer is not protecting the braze plate heat exchangers from the miscellaneous debris that hasn't been flushed out into the flush cart.

4. Once the entire system has been flushed and filled, the antifreeze and water treatment can be added, using the flush cart to add and mix the treatment. All zones should be open during this process, so that proper mixing can take place.

Take multiple readings, and check the antifreeze percentage, as the system is being mixed.

5. Go through the Startup Wizard on the controller (HMI) to energize the diverting valve (if equipped) and verify that the last bit of air is removed from the system. **See Controls Section for additional details.** Once completed, the flush cart can be removed from the system.

Startup Wizard - Filling, Flushing, Flow Tests

In order to complete critical settings and ensure the pumps do not run until the loop is completely flushed, a startup wizard will guide you through the first start of the system. It keeps the pumps off and guides the installer through flushing and flow tests. The startup wizard sequence is described below. Start by pressing **Confirm**.

Welcome to the Start Guide. Please press **Confirm** to begin.

Confirm

Step 1: The first screen of the startup wizard requires the source piping to be flushed until all air is removed. This ensures the source pumps can operate properly and provide adequate flow for the unit operation. Once the flushing is complete press **Confirm** on the HMI screen. The second screen on this step is to confirm the starting of the source side pumps. After flushing of the source side is complete, we can proceed to the next screen. In the next step, the pumps will be energized, so we need to be sure flushing is complete.

Flush the source piping and heat exchanger until all air is removed. Press **Confirm** when done.

Source Flow Rate 0.0gpm

Confirm

WARNING: Source pump will run in the next step. Confirm source is flushed of all air.

Confirm

NOTICE: After flushing the source piping, you **MUST** press **Confirm** for the change to occur.

Section 7: Equipment Start-Up

Step 2: The source pumps will be energized and running and we are able to view the flow rate and status of the flow test. A minimum flow rate of 10 GPM is required to pass the flow test. Press **Next** to move to the next step of the wizard.

Testing that source is purged of air and meets minimum flow requirements. Please wait.

Source Flow Rate 10.6gpm

5%

The source flush test has passed!

Next

Step 3: The next step is to confirm the load side piping to the hot water tank is completed and flushed. The completion of the piping can be confirmed by selecting **Yes** on the first screen of this step. After flushing the hot water tank and piping, press **Confirm** on the second screen of this test. In the next step, the pumps will be energized, so we need to be sure flushing is complete.

Is the unit going to heat a domestic hot water tank?

Yes

No

Flush the hot water tank until all air is removed. Press **Confirm** when done.

Load Flow Rate 11.4gpm

Confirm

Back

Step 4: The load pump will be energized and running and we are able to view the flow rate and status of the flow test. A minimum flow rate of 10 GPM is required to pass the flow test. Press **Next** to move to the next step of the wizard.

Testing that hot water tank is purged of air and meets minimum flow requirements. Please wait.

Load Flow Rate 11.4gpm

22%

Hot Water Load flush test has passed!

Next

Step 5: The next step is to confirm the load side piping to the home and boiler are completed and flushed. In the first step, the boiler circuit must be open to confirm flushing of the boiler circuit. The second step is to confirm the flushing of the load side piping to the home. After each flushing step is complete, press **Confirm** on the screens.

Flush the home load until all air is removed. Press **Confirm** when done.

Load Flow Rate 11.5gpm

Open boiler valves now to remove air.

Confirm

Back

Flush the home load until all air is removed. Press **Confirm** when done.

Load Flow Rate 11.5gpm

Close boiler valves.

Confirm

Back

Section 7: Equipment Start-Up

Step 5 (continued): After flushing of the piping to the home and boiler is complete, we can proceed to the next screen. In the next step, the pump will be energized, so we need to be sure flushing is complete.

WARNING: Load pump will run in the next step. Confirm the piping to the home load is flushed of all air.

Confirm

Step 6: The load pump will be energized and running and we are able to view the flow rate and status of the flow test. Make sure your zone valves to the home are A minimum flow rate of 10 GPM is required to pass the flow test. Press **Next** to move to the next step of the wizard.

Testing that the home load is purged of air and meets minimum flow requirements. Please wait.

Load Flow Rate

11.3gpm

1%

Home Load flush test has passed!

Next

Startup Wizard - Initial Settings

This section of the startup wizard will guide you through some initial settings for the pump settings and critical heat settings. Press **Next** to move to the next step of the wizard.

Setup tests complete! Now we will walk through some initial settings.

Next

Step 7: The first screen below will allow you to choose to use the outdoor reset for the Heat temperature setting. This will adjust the Heat temperature setpoint higher based on a lower outside air temperature. The second screen allows for use of the sensor or the internet for the outdoor temperature reading. On the third screen the default curve is 3. See the chart for all the curves in Section 7: Field Wiring. After selecting the curve, press **Next** to move to the next step of the wizard.

Would you like to enable Outdoor Reset?

Outdoor Air Temperature

56°

Yes

No

Would you like to use the forecast from the internet or the local sensor value?

Outdoor Air Temperature

56°

Internet Weather

Sensor

Refer to the manual for the proper reset curve.

Heat Curve

3

Low Heat Max Temp

95 °F

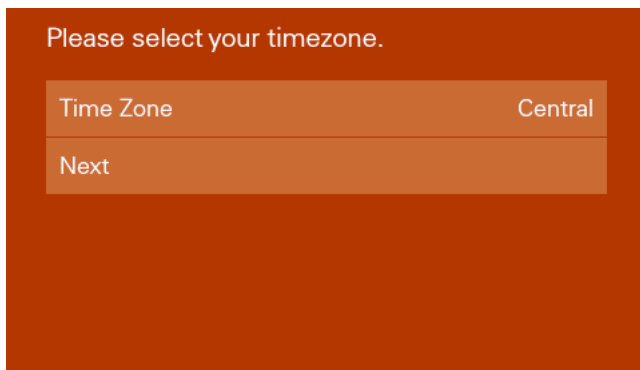
Low Heat Min Temp

80 °F

Next

Section 7: Equipment Start-Up

Step 8: Select the correct time zone for your area. Press **Next** to move to the next step of the wizard.

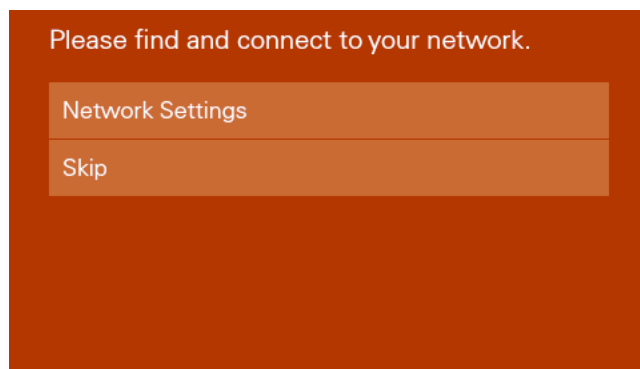


Please select your timezone.

Time Zone	Central
Next	

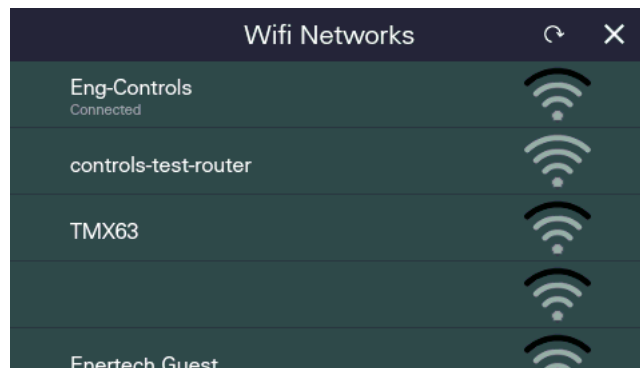


Step 9: Select Network Settings in the first screen. The second screen will allow you to select your Wi-Fi Network. The password will be required for a secure Wi-Fi Network.



Please find and connect to your network.

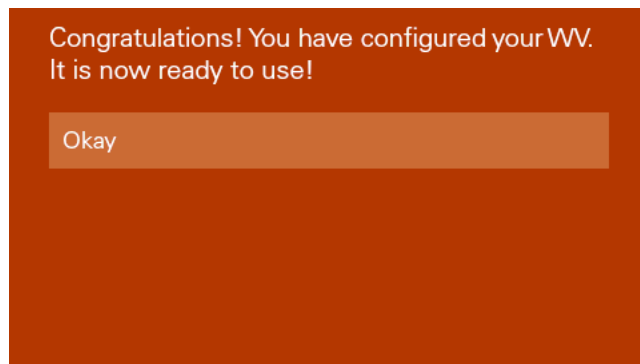
Network Settings
Skip



Wifi Networks

Eng-Controls Connected	
controls-test-router	
TMX63	
	
Enertech Guest	

Step 10: After you have successfully connected the Network. The final screen will show up to congratulate you on the completion of the startup wizard. Press **Okay** to complete the wizard.



Congratulations! You have configured your WV.
It is now ready to use!

Okay

Section 7: Equipment Start-Up

Connected Controls

Overview

Connected Controls provide diagnostics based upon water temperatures, refrigerant temperatures, and control board faults. The WV utilizes the HMI to connect to the owner's Wi-Fi router to allow data to be transmitted to the cloud for access by the owner and installing/servicing technician.

Software Setup

Enertech Connected Controls provide multiple ways to access the control system and data. There are two smartphone apps, as well as access via a web browser. To protect customer privacy and to ensure the best experience for both the end user and the installing/servicing technician, it is important to understand how the various access tools operate. Below is a summary of each access method.

- **myUplink smartphone app:** The myUplink smartphone app is for use by the end user as the main interface to the Connected Controls. It may be downloaded from the app store for the brand of phone used. **IMPORTANT:** This app must be used for commissioning the system. The Pro app cannot be used to commission the system; the system also cannot be commissioned via a web browser.
- **myUplink Pro smartphone app:** The Pro smartphone app is for use by the installing and servicing technician. It provides additional information to the technician if the end user gives permission to view the system. It may also be used to access the system while on site without the need to access the owner's WiFi network. In other words, it can connect directly to the system, avoiding the need to ask for the owner's WiFi password.

⚠ NOTICE ⚠

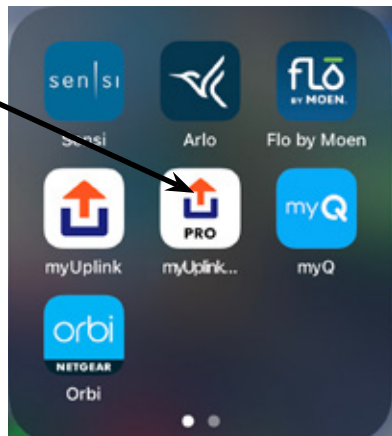
***THE MYUPLINK APP MUST BE USED FOR COMMISSIONING.**

***THE MYUPLINK PRO APP OR A WEB BROWSER CANNOT COMMISSION A SYSTEM.**

- **Web browser:** The system may be accessed via a web browser at <https://myuplink.com/login> (owner) or <https://pro.myuplink.com> (dealer). This is helpful if the owner does not want to use a smartphone to access the system. **IMPORTANT:** The myUplink app must be used for commissioning the system. A web browser may be used to access the system after it is commissioned, but it cannot be used to commission the system.

**myUplink Pro
(technician use)**

**myUplink app
(owner use)
MUST BE
USED FOR
COMMISSIONING**



Add App to Owner's Phone

Once the USB Wi-Fi Dongle is installed and the unit is operational, re-attach all unit access panels and control box panel, ensuring that no high voltage is accessible. It is important that the customer is available with his/her smartphone before proceeding with the steps below. **IMPORTANT:** The owner's phone must be connected to the same WiFi network that the controls will be using.:

1. Ask the owner to Install the myUplink app from the Apple App Store or the Google Play Store. Follow in App instructions to register for an account.
2. Ensure your WV is connected to the internet via Ethernet or Wi-Fi (this can be done in the Menu → System → Network Settings → Wifi Networks), open myUplink and click Add System.
3. Verify the phone and system are on the same network.
4. Select "Find Connected Devices", and select the system on the network with the correct serial number (i.e. ENERTECH-G25061234).
5. The new system can now be customized for the owner. Tap on the "Connect" button once the owner's information has been completed.
6. To connect a PRO user, they can request to connect to the system via the PRO app by using the email address used to commission the system. The email account used to register the system will receive an email notification with a prompt to grant access to the requesting PRO user.

If you cannot find the system on the network in the myUplink app, but the HMI is connected to the internet, you can alternatively commission the HMI by following the outlined steps.

1. Navigate to Menu → myUplink Settings.
2. Click Request New Connection String and wait for the Connection String to be populated.
3. Open myUplink, select Add System → Find Connected Devices. If there are existing systems, navigate to the system name in the top left, select it, and then choose "add new".
4. Enter details manually, and enter connection details.
5. Enter the serial number and the connection string from the HMI's screen.
6. The new system can now be customized for the owner. Tap on the "Connect" button once the owner's information has been completed.
7. To connect a PRO user, they can request to connect to the system via the PRO app by using the email address used to commission the system. The email account used to register the system will receive an email notification with a prompt to grant access to the requesting PRO user.

Section 7: Equipment Start-Up

Equipment Start-Up Form

Customer Name: _____
 Customer Address: _____
 Model #: _____ Serial #: _____
 Dealer Name: _____
 Distributor Name: _____ Start-up Date: _____

Loop Type: Open / Closed (circle one)					
FLOW	COOLING		HEATING		
Source IN Water Pressure		PSI		PSI	
Source OUT Water Pressure		PSI		PSI	
Source Water Pressure DROP		PSI		PSI	
Flow Rate		GPM		GPM	
*Check pressure drop chart for GPM					
ELECTRICAL DATA		COOLING		HEATING	
Line Voltage				V	
Total Unit AMPS				A	
Compressor AMPS				A	
Wire Size				GA	
Circuit Breaker Size				A	
Source Water					
COOLING		HEATING			
Source IN Water Temp.		°F		°F	
Source OUT Water Temp.		°F		°F	
Source Water Temp. Diff.		°F		°F	
HE/HR					
COOLING		HEATING			
Heat of Rejection		BTU/HR			
Heat of Extraction				BTU/HR	
Notes: HE/HR = GPM x Water Temp. Diff. x 500 (Water – Open Loop) HE/HR = GPM x Water Temp. Diff. x 485 (Water/Antifreeze – Closed Loop)					

Load Water	COOLING		HEATING	
Load IN Water Temp.		°F		°F
Load OUT Water Temp.		°F		°F
Load Water Temp. Diff.		°F		°F
Air Coil				
COOLING		HEATING		
Supply Air Temp.		°F		°F
Return Air Temp.		°F		°F
Air Temp. Diff.		°F		°F
*Confirm auxiliary heat is de-energized for the above readings.				

Auxiliary Heat Operation	HEATING	
Supply Air Temp.		°F
Return Air Temp.		°F
Air Temp. Diff.		°F
Auxiliary Heat Elec. Data		
HEATING		
Line Voltage		V
Total AMPS (Full KW – All Stages)		A
Wire Size		GA
Breaker Size		A
CFM = (Watts x 3.413) ÷ (Air Temp. Diff. x 1.08) Watts = Volts x Auxiliary Heat AMPS		

Installer / Technician: _____

Date: _____

Section 7: Equipment Start-Up

WPD Tables

Model	Compressor RPM	Source GPM	Source Pressure Drop with Antifreeze									
			30 °F		50 °F		70 °F		90 °F		110 °F	
			PSI	FT HD	PSI	FT HD	PSI	FT HD	PSI	FT HD	PSI	FT HD
WV060 Part Load Heating	2600	4	0.3	0.7	0.3	0.7	0.2	0.5	0.2	0.5	N/A	N/A
		5	0.5	1.2	0.4	0.9	0.4	0.9	0.4	0.9	N/A	N/A
		6	0.8	1.8	0.7	1.6	0.6	1.4	0.6	1.4	N/A	N/A
		8	1.4	3.2	1.2	2.8	1.1	2.5	1.1	2.5	N/A	N/A
WV060 Part Load Cooling	1800	4	N/A	N/A	0.4	0.9	0.3	0.7	0.3	0.7	0.3	0.7
		5	N/A	N/A	0.6	1.4	0.5	1.2	0.5	1.2	0.5	1.2
		6	N/A	N/A	0.9	2.1	0.8	1.8	0.7	1.6	0.7	1.6
		8	N/A	N/A	1.5	3.5	1.4	3.2	1.3	3.0	1.2	2.8
WV060 Full Load Heating	6000	10	2.3	5.3	2.2	5.1	2.1	4.8	2.0	4.6	N/A	N/A
		11.3	2.9	6.7	2.8	6.5	2.6	6.0	2.5	5.8	N/A	N/A
		15	4.9	11.3	4.6	10.6	4.5	10.4	4.3	9.9	N/A	N/A
		18	6.8	15.7	6.4	14.8	6.2	14.3	5.9	13.6	N/A	N/A
WV060 Full Load Cooling	3750	7	N/A	N/A	1.0	2.3	0.9	2.1	0.9	2.1	0.9	2.1
		8	N/A	N/A	1.3	3.0	1.3	2.9	1.2	2.8	1.2	2.8
		10.5	N/A	N/A	2.3	5.3	2.2	5.1	2.1	4.8	2.0	4.6
		12.0	N/A	N/A	3.0	6.9	2.8	6.5	2.7	6.2	2.6	6.0

1. Source WPD data are based on 15% (by volume) methanol solution while the unit is operating.
2. Pressure drop data accurate within $\pm 25\%$.
3. Unit test is run without hot water generation.
4. Interpolation of unit pressure drop data is permissible; extrapolation is not.
5. Due to variations in installation, actual unit performance may vary from the tabulated data.

Model	Load GPM	Load Side Pressure Drop with Antifreeze							
		50 °F		80 °F		100 °F		110 °F	
		PSI	FT HD	PSI	FT HD	PSI	FT HD	PSI	FT HD
WV060	5.0	1.8	4.1	1.6	3.8	1.6	3.6	1.5	3.5
	6.0	2.4	5.4	2.2	5.1	2.1	4.9	2.1	4.8
	8.0	4.1	9.5	3.9	9.0	3.8	8.7	3.7	8.6
	10.0	6.4	14.6	6.0	13.7	5.8	13.4	5.7	13.2
	12.0	8.8	20.2	8.3	19.1	8.1	18.7	8.1	18.6
	15.0	13.3	30.7	12.8	29.4	12.6	28.9	12.5	28.7
	18.0	18.9	43.7	18.4	42.4	17.9	41.3	17.8	41.1
	20.0	23.3	53.8	22.6	52.2	22.0	50.7	21.7	50.1

1. Load WPD data are based on 15% (by volume) methanol solution while the unit and the load-side pump are off.
2. Pressure drop data accurate within $\pm 25\%$.
3. Unit test is run without hot water generation.
4. Interpolation of unit pressure drop data is permissible; extrapolation is not.
5. Due to variations in installation, actual unit performance may vary from the tabulated data.
6. This table is for use in design the hydronic piping system. DO NOT use this table for troubleshooting (refer to the flow rate at the HMI (display). The pump is located at the inlet of the heat exchanger (pumping towards the heat exchanger). Therefore checking pressure drop at the P/T plugs will provide pressure drop of the piping system, not the pressure drop across the heat exchanger.

Section 8: Controls

Sequence of Operations

Summary

When the unit receives a call, it will enter a startup sequence opening valves and ramping up the pumps. After the startup sequence completes, the compressor is allowed to operate until the call is removed. When the call is removed, the unit enters the Shutdown sequence by ramping down the compressor and pumps. The unit will also go through its shutdown and startup sequence when transitioning between any type of heating call to a cooling call and vice versa.

Startup

The startup sequence opens the appropriate valves and ramps up the pumps to establish water flow.

Shutdown

After all calls have been removed, the compressor ramps down gradually to off. After the compressor is off, the pumps will ramp down to off.

Idle

When entering idle, an Anti-Short Cycle (ASC) will be enforced for 30 seconds before it can begin its startup sequence. After the Anti-Short cycle is completed, the unit will remain in Idle until it receives a call.

Run

After the startup sequence completes, the compressor runs at the start speed of 2700RPM for 10 seconds. The compressor then modulates speed according to the required load. During the first two minutes of running, the compressor has a minimum speed of 1800RPM.

The EXV modulates as needed to maintain 15°F superheat in heating and 12°F in Cooling. The pumps modulate to maintain ΔT across the heat exchangers.

Soft Idle

Soft idle prevents thermal runaway when the compressor cannot run slow enough to load match an undersized zone.

While in Soft Idle, the compressor will shut off and the pumps will continue to circulate water. The compressor will turn on again when the outlet temperature is back within 2 degrees (adjustable in settings) of the target temperature. All priorities are still obeyed during this time. If the call becomes satisfied, the system will shut down normally.

To enter Soft Idle, the load water outlet temperature over/under shoots its target by 3°F in Cooling or 5°F in heating. During Domestic Hot Water, the system will enter Soft Idle if the outlet temperature is over 145°F.

Compressor

Control of the compressor is based on the target outlet temperature of the system. The system monitors the current load out water temperature and compares it to the target temperature. Using the control algorithm, the system seeks to maintain the exact target outlet temperature. Outlet temperature above or below the target temperature causes the compressor to throttle faster or slower as needed.

In radiant floor heating, if using outdoor reset, the outdoor temperature dictates the targeted load water temperature. In cooling and High Heat, the static menu settings control the target temperature. This control allows the system to react to changing conditions. As zone valves open and close, the compressor speed is adjusted to meet the current demand.

Note: In some small load situations, such as very small radiant zones, the system may not be able to run slow enough to avoid thermal runaway. To accommodate this situation, the unit will enter soft Idle. It is recommended to size zones to avoid this cycling condition. It is preferred to avoid compressor cycling and improve efficiency.

EXV

When the compressor is running, the EXV modulates as needed to maintain superheat. Temperatures above the setpoint cause the EXV to open and temperatures below cause it to close. The EXV remains completely closed when the system is idle. EXV position can be observed on the screen of the HMI.

Note: In some conditions, it is normal for the EXV to open 100% and the superheat to be above the target.

Alternative Operating Modes

Limp Mode

The unit has encountered a fault but was able to adjust its operating behavior and continue to safely run. If additional faults occur that prevent us from safely running, the unit will enter either Emergency Mode or Lockout mode.

Emergency Mode

The unit has encountered a fault or combination of faults that prevents it from running the compressor safely. In this mode, the pumps and auxiliary heating will continue to service heating calls.

Lockout

The unit has encountered a critical fault that prevents it from safely operating the compressor, pumps, or auxiliary heating.

Section 8: Controls

Pumps

When the pumps are in “auto” mode, they control to maintain ΔT (Default 5°F) across the heat exchangers. To do so, water entering and leaving temperatures are continually monitored. A sensed ΔT above the 5°F setpoint will cause the pump to run faster. Below the setpoint causes the pump to run slower – down to the set minimum speed. The variable speed pumps on both the load and source water operate in this manner.

Note: If, after setup, the WV detects the minimum flow rate allows less than 4.5 GPM, it will attempt to increase the minimum flow percentage until 4.5 GPM is achieved. This will overwrite the previous minimum setting.

At conditions in which the source water is below 30°F, the source pump will increase speed to ensure adequate flow (80% or higher, depending upon temperature and pressure drop).

Note: If, after setup, the WV detects the minimum flow rate allows less than 4.0 GPM, it will attempt to increase the minimum flow percentage until 4.0 GPM is achieved. This will overwrite the previous minimum setting.

Components

Human Machine Interface (HMI)

Touch screen where current status can be observed and settings of the system can be changed, described in additional detail in this section. This is the master controller for the heat pump.

With the installed WIFI USB dongle, this unit also provides connection to the owner's WiFi router to allow data to be transmitted to the cloud for access by the owner and installing/servicing technician.

- Connected Controls provide diagnostics based upon water temperatures, refrigerant temperatures, and control board faults.

Field Wiring

The field wiring board provides dry contact inputs for connection to zone controllers (see Section 6). These inputs provide calls for Heating, Cooling, High Heating, Hot Water, as well as additional signal connections.

Actuator Sensor Board (ASB)

The ASB is a secondary controller to the HMI (primary controller) and provides inputs for sensors and outputs to actuators. The inputs include thermistors, flow meter, pressure transducers, and pump feedback. It controls actuators, including pump speed (via PWM), electric heater stages, reversing valve, two way water valves, inverter cooling fan speed, and EXV. 24VAC from the transformer is fed into the ASB for use on these outputs.

Companion Board (ACB)

The Companion Board is an IO expander for the ASB. The dry contact inputs on the field wiring in input into this board. Additionally, it provides stable 12VDC supply for the ASB and HMI from input line voltage.

Thermistors

The WV includes multiple thermistors. These are used for both normal operation control, such as targeting load leaving water temperatures or maintaining the proper pump speeds, but also for faults and alarms. The thermistors are color coded and plug into the Actuator Sensor Boards. These are standard 10k thermistors and can be checked with an ohm meter to verify operation.

Pressure Transducers

The WV contains both discharge and suction pressure transducers. These are used for monitoring the system for faults and alarms, modulation of the EXV, as well as maintaining the compressor within the operational map.

Flow Sensors

Flow meters provide accurate measurement of GPM through the source and load water circuits. These are used for modulation of pumps, ensuring minimum flow in all conditions. They are also used for simple readouts on the HMI as well as flow faults and alarms.

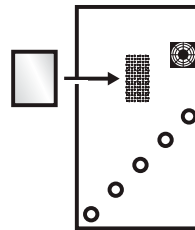
Air Filters

The WV has two air filters for the inverter cooling fan air intake. These filters are mounted magnetically.

The primary filter is located externally on the rear of the unit. This filter undergoes regular cleaning as prompted by an HMI pop-up every 3 months.

A secondary filter is located internally near the inverter. This secondary filter should be accessed and cleaned by a technician in the case of the drive overheating after the external filter has already been cleaned.

Air Filter Location:



Type 1 Thermistor	
°F	k Ohms
-25	202
-20	171
-15	144
-10	121
-5	102
0	87
5	74
10	63
15	55
20	47
25	41
30	35
35	30
40	26
45	23
50	20
55	18
60	15
65	13
70	12
75	10
80	9.3
85	8.3
90	7.4
95	6.6
100	5.8
105	5.1
110	4.6
115	4.2

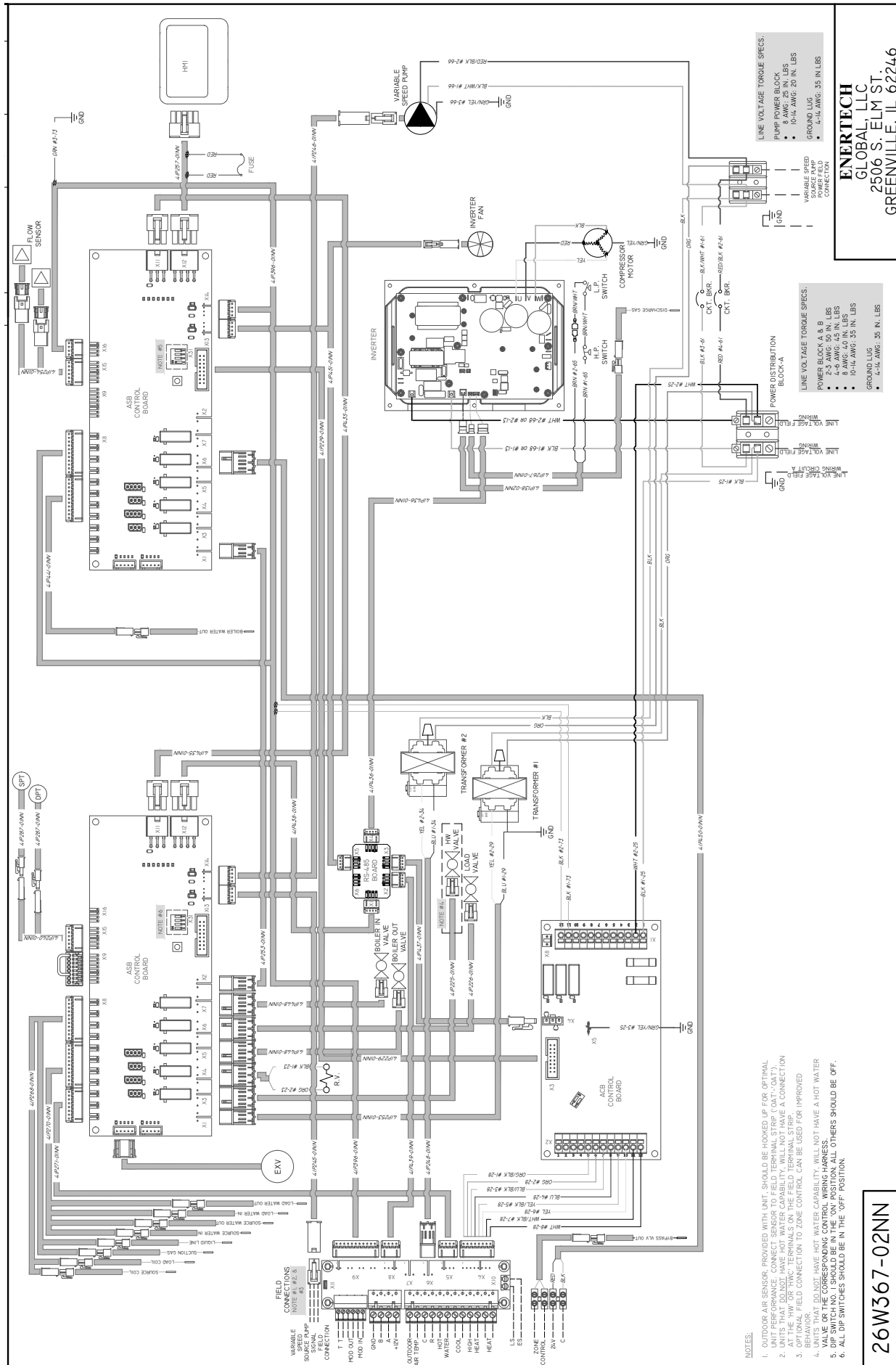
Type 1 Thermistor	
°F	k Ohms
120	3.8
125	3.4
130	3.1
135	2.8
140	2.5
145	2.3
150	2.0
155	1.8
160	1.7
165	1.5
170	1.4
175	1.2
180	1.1
185	1.0
190	0.95
195	0.87
200	0.81
205	0.75
210	0.70
215	0.66
220	0.62
225	0.58
230	0.54
235	0.50
240	0.46
245	0.41
250	0.35
255	0.29
260	0.23

Wiring Diagram - Electric Heat



Section 8: Controls

Wiring Diagram - Dual Fuel



Section 8: Controls

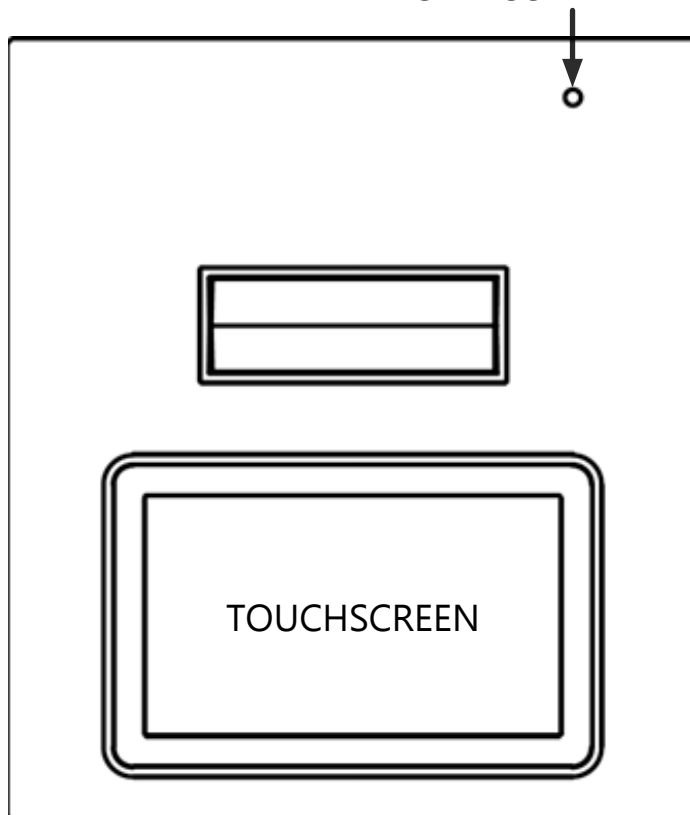
User Interface

The WV includes a Human Machine Interface (HMI) on the front of the unit for immediate access to information such as system activity, sensor data, and faults. The touchscreen allows navigation through pages, menus, and settings.

The status light provides at-a-glance information about the system.

COLOR	BEHAVIOR	SYSTEM STATE
GREEN	SOLID	UNIT RUNNING
YELLOW	SOLID	FAULT (MAINTAINS NORMAL OPERATION)
YELLOW	FLASHING	LIMP MODE
RED	SOLID	EMERGENCY MODE
RED	FLASHING	UNIT LOCKED OUT

STATUS LED



Screens

Swipe vertically to navigate between the status Pages. Swipe horizontally to navigate between Home Pages and the Hot Water Page. Select the menu hamburger to find additional menu pages.

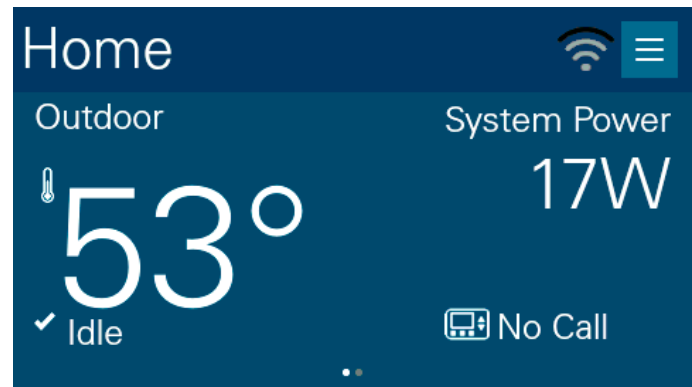
The top status bar shows information across home pages and the Hot Water page.

- Page Name
- Internet Connection Signal Type and Strength
- Menu

Home Page #1

General Status

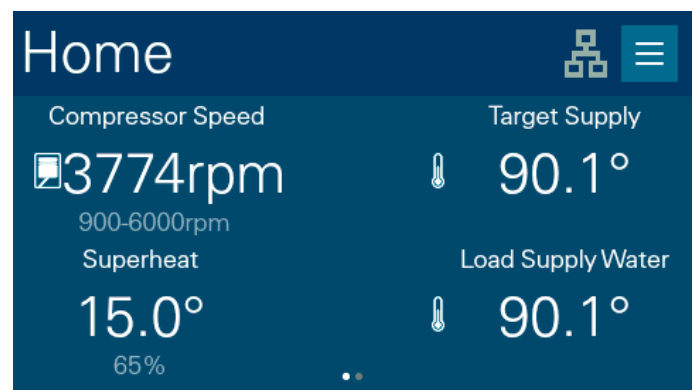
- Outdoor Air Temperature
- Status
- Call
- System Power



Home Page #2

Compressor Information

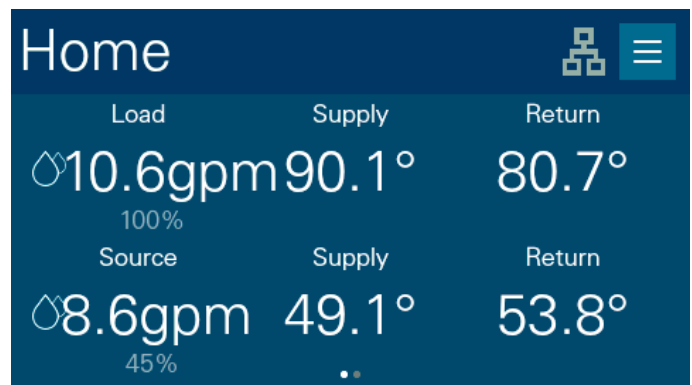
- Compressor Speed
- Superheat
- Target Supply
- Load Supply Water
- EXV open percentage



Home Page #3

Water Information

- Load Water Flow Rate
- Source Water Flow Rate
- Load Supply Temperature
- Load Return Temperature
- Source Entering Temperature
- Source Leaving Temperature

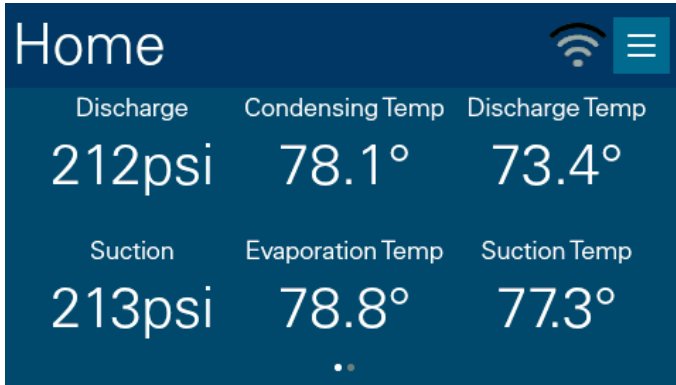


Section 8: Controls

Home Page #4

Refrigeration Information

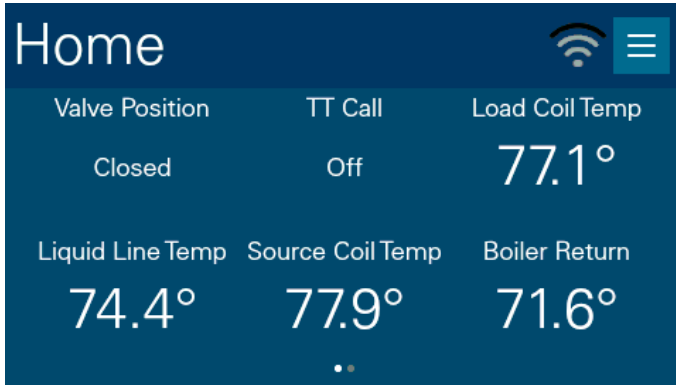
- Discharge Pressure
- Suction Pressure
- Condensing Temperature
- Discharge Temperature
- Evaporation Temperature
- Suction Temperature



Home Page #5

Additional System Information

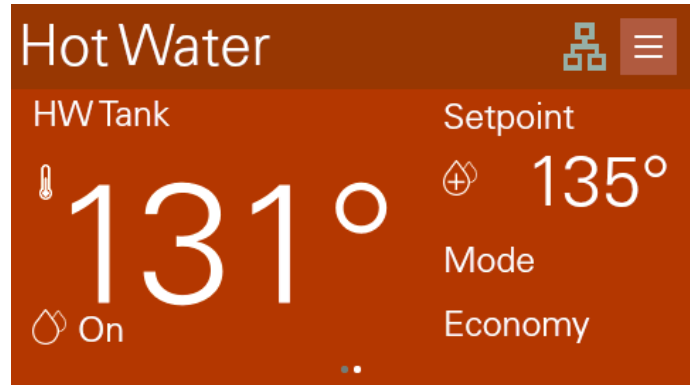
- Valve Position
- TT Call Status
- Load Coil Temperature
- Liquid Line Temperature
- Source Coil Temperature
- Boiler Return Temperature



Hot Water Page

Hot Water Information

- HW Tank Temperature
- HW Call Status
- Temperature Setpoint
- Mode: Economy, Normal, Priority

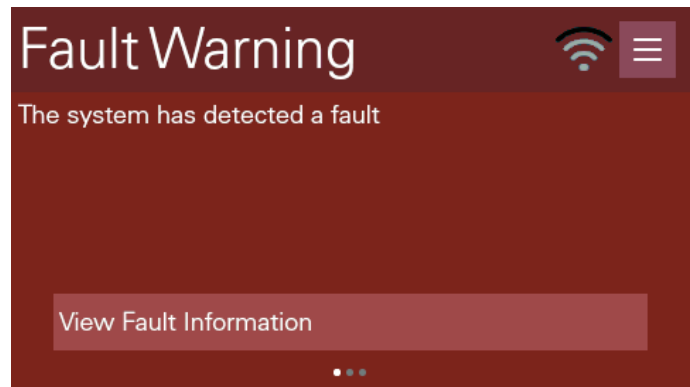


Faults

When the system experiences a fault there will be a Fault Warning page pushed to the HMI. The user can swipe horizontally back to the Home and Hot Water pages, or view more fault information.

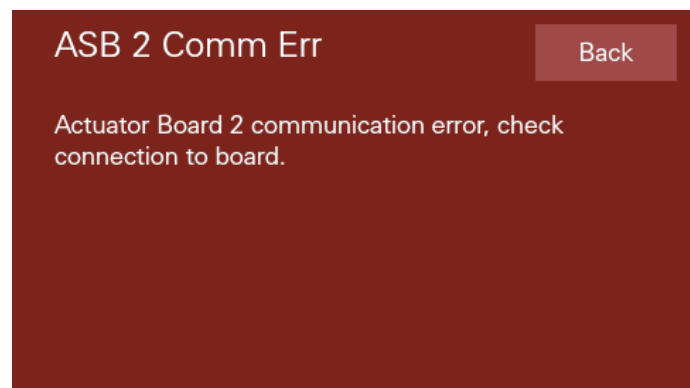
Fault Warning Page

Alerts user that a fault has occurred



Fault Information Page

Gives a description of the detected fault



Section 8: Controls

Menu System

Gives access to menus and submenus for viewing information about the system and adjusting various settings.

Indoor Climate		
	Auxiliary Heat	Normal – Allows auxiliary heating Economy - Doesn't allow auxiliary heating
	Aux Heat Delay	Time before Aux Heater Turns on
	Heat Priority	Set heat or cool priority (excludes Hot water)
	Cool Setpoint	Target Supply temperature for cooling calls
	Low Heat Mode	Fixed → Low Heat calls set target supply temperature from Heat Setpoint setting Modulating Input → Low Heat calls will use the Modulating Input to map to a temperature (typically used if a boiler controller is controlling our unit) Outdoor Reset (Sensor) → Low Heat calls will use a Heat Curve to find their temperature based on the Outdoor Air Thermistor Outdoor Reset (Internet) → Low Heat calls will use a Heat Curve to find their temperature based on the Internet Weather report
	Heat Curve	Selects the heat curve used for Low Heat call target supply
	Low Heat Max Temp	Limits the maximum temperature the Heat Curve or Modulating Input can select
	Low Heat Min Temp	Limits the minimum temperature the Heat Curve or Modulating Input can select
	Soft Idle Deadband	Temperature deadband for which the Load Supply temperature must be below the target supply temperature to exit soft idle and return to running
	High Heat Setpoint	The temperature targeted for High Heat calls
Domestic Hot Water		
	Hot Water Economy	Normal → Aux Heat will turn on for Hot Water calls after Aux HW Delay has completed Economy → No Aux Heat for Hot Water calls Luxury → Immediately turn on Aux Heat for Hot Water calls
	Hot Water Deadband	deadband used to determine when to turn off Hot Water
	Aux HW Delay	Number of minutes the compressor must target maximum compressor speed before unlocking auxiliary heat (electric or boiler)
	Hot Water Priority	Hot Water → Hot Water calls will be serviced before any other Space Conditioning → Cooling and other Heating calls will be serviced before Hot Water
	HW Max Flow	The Load Pump will run at max speed when servicing a Hot Water call
	Hot Water Setpoint	The HW tank temperature to maintain

Section 8: Controls

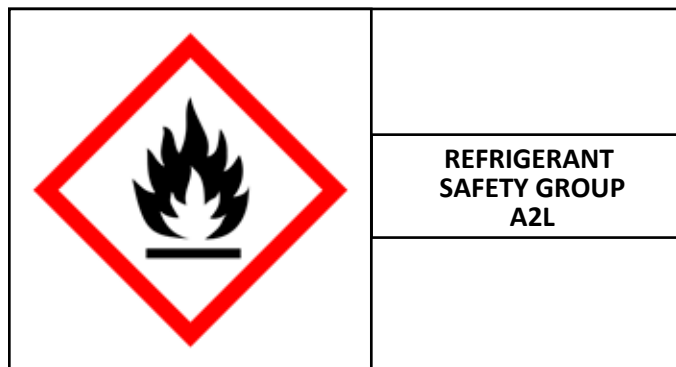
Pumps		
	Load Pump Minimum Speed	Minimum speed that the pump will run at Note: For the Load Pump, there is a second minimum (75%) that it will run at when the valves are closed. This is necessary to overcome the pressure drop required for the bypass valve to open.
	Load Pump Max Speed	Maximum speed that the pump will run at
	Load Delta T Heat Setpoint	
	Load Delta T Cool Setpoint	
	Source Pump Min Speed	Minimum speed that the pump will run at
	Source Pump Max Speed	Maximum speed that the pump will run at
	Source Delta T Setpoint	
Faults		
	Logged Faults	Unit fault history
System		
	Mode	Change unit operation to Manual or Off instead of Normal
	Modbus TCP	Enables a Modbus TCP server on the HMI. Allows sensors and settings to be read from another device on the network
	Update from USB	Allows the user to select an update file (.swu) to update with from their USB drive
	Network Settings	Allows the user to select a WiFi network and to display network settings / info
	Language	Select language
	Measurement System	Change from Imperial units to Metric units
	Time Zone	Select time zone
	Version Information	Displays software version number of various components
	Open Source Licenses	Displays Open Source Licenses
	Check For Updates	Updates components if there are new versions available
	Startup Guide	Lets User go through the startup guide
	Factory Reset	Restores unit to default settings
myUplink Settings		
	Status	Indicates if the device is communicating with myUplink
	Connection String	Used to commission the device if the “Find Local Devices” ability in the app is not working

Section 9: Maintenance, Repair, & Troubleshooting

A2L Servicing Requirements

Technicians must be qualified for the work being performed. The use of A2L refrigerants requires careful consideration to the safety of the technician and others in the vicinity. Examples of service activities requiring increased qualifications include breaking into the refrigerant circuit, opening of sealed components, opening of ventilated enclosures. As such, it is recommended to have the EPA 608 Type I & II certification from an accredited institution.

Note: This unit is equipped with electrically powered safety measures. To be effective, the unit must be electrically powered at all times after installation, unless servicing.



⚠ CAUTION ⚠
DO NOT USE MEANS TO ACCELERATE THE DEFROSTING PROCESS OR TO CLEAN, OTHER THAN THOSE RECOMMENDED BY THE MANUFACTURER.
THE APPLIANCE SHALL BE STORED IN A ROOM WITHOUT CONTINUOUSLY OPERATING IGNITION SOURCES. (FOR EXAMPLE: OPEN FLAMES, AN OPERATING GAS APPLIANCE OR AND OPERATING ELECTRIC HEATER)
DO NOT PIERCE OR BURN
BE AWARE THAT REFRIGERANTS MAY NOT CONTAIN AN ODOR.

⚠ MISE EN GARDE ⚠
NE PAS RECOURIR À D'AUTRES MOYENS POUR ACCÉLÉRER LE PROCESSUS DE DÉGIVRAGE OU LE NETTOYAGE, À L'EXCEPTION DE CEUX RECOMMANDÉS PAR LE FABRICANT.
ENTREPOSER L'APPAREIL DANS UNE PIÈCE OÙ IL N'Y A AUCUNE SOURCE D'INFLAMMATION EN FONCTIONNEMENT CONTINU. (PAR EXEMPLE : FLAMMES NUES, APPAREIL À GAZ EN FONCTIONNEMENT OU APPAREIL DE CHAUFFAGE ÉLECTRIQUE EN FONCTIONNEMENT)
NE PAS PERCER NI BRÛLER.
À NOTER QUE LES FRIGORIGÈNES PEUVENT NE PAS AVOIR D'ODEUR.

Work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed. Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

The area shall be checked with a refrigerant detector compatible for detection of A2L refrigerants, prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.

If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.

Safety Checks

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure the risk of ignition is minimized. For repair to the refrigerating system, work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed. No person carrying out work in relation to a refrigerating system which involves exposing any pipe work shall use any sources of ignition in such a manner leading to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, during repairing, removing, disposal and any other times which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure no flammable hazards or ignition risks are present. Smoking is bad for your health and the health of those around you. "No smoking" signs shall be displayed.

Leak Checks

Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used. The following leak detection methods are deemed acceptable for all refrigerant systems.

Electronic leak detectors - These may be used to detect refrigerant leaks. For electronic detectors used for flammable refrigerants, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free-area.) Ensure the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25% maximum) is confirmed.

Section 9: Maintenance, Repair, & Troubleshooting

Leak detection fluids - These are suitable for use with most refrigerants, but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

Leak detection fluid examples:

- bubble method
- fluorescent method agents.

If a leak is suspected, all naked flames shall be removed or extinguished.

If leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Recovery of refrigerant shall be carried out according to the Decommissioning section of this manual.

Refrigeration Components

Where refrigeration components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturers technical department for assistance. The following checks apply to installations using flammable refrigerants:

- The ventilation machinery and outlets are operating adequately and are not obstructed;
- The actual refrigerant charge is in accordance with the room size within which the refrigerant containing parts are installed;
- If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant;
- Marking to the equipment continues to be visible and legible. Illegible marking and signs shall be corrected.
- Refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being corroded.

Electrical Components

Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists compromising the technicians safety, no electrical supply shall be connected to the circuit until the fault is satisfactorily repaired. Initial safety checks shall include:

- Discharging of the capacitors with main power verified to be de-energized. Discharging shall be done in a safe manner to avoid a possibility of sparking. Use insulated clips and a 5 W 20 kohm resistor to short across the capacitor terminals. Verify voltage drops to 0V.
- Ensure no live electrical components and wiring are exposed while charging, recovering, or purging the system.
- Check for the presence of continuity to earth bonding.

Check to make sure cabling will not be subject to wear, corrosion, excessive pressure, excessive vibration, sharp edges or any other adverse environmental conditions. During the check take into account effects of aging or continual vibration from sources such as compressors or fans. Sealed electrical components and intrinsically safe components shall be replaced and shall not be repaired.

Removal/Evacuation

When breaking into the refrigerant circuit to make repairs, or for any other purpose, conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration. The following procedure shall be adhered to:

- safely remove refrigerant following location and national regulations
1. evacuate
 2. purge the circuit with inert gas (optional for A2L)
 3. evacuate (optional for A2L)
 4. continuously flush or purge with inert gas when using flame to open circuit
 5. open the circuit.

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging the refrigerant systems.

For appliances containing flammable refrigerants, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum (optional for A2L). This process shall be repeated until no refrigerant is within the system (optional for A2L). When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. The outlet for the vacuum pump shall not be close to any potential ignition sources, and ventilation shall be available.

Charging

In addition to conventional charging procedures, the following requirements shall be followed:

- Ensure cross contamination of different refrigerants does not occur when using charging equipment.
- Hoses or lines shall be as short as possible to minimize the amount of refrigerant in each hose.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Refrigeration system must be earth grounded prior to charging the system with refrigerant.
- Label the total charge on the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigeration system.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas (inert nitrogen). The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site. See the proper procedures under the leak checks section in this section of the manual.

IOM WV alarm table

Alarm Number	Alarm Name	Possible Cause(s)
1	Low Pressure	Low water flow rate, Cold loop temperature, Too little anti-freeze, Low on refrigerant, Transducer failure
3	High Pressure	Low water flow rate, Hot loop temperature, Zone valves closed
5	Load Flow Fault	Air in load loop, Pump not running, Check pump circuit breaker in unit, Flow meter is clogged/bad/ASB not grounded
7	Source Flow Fault	Air in source loop, Pump not running, Check pump circuit breaker in unit, Flow meter is clogged/bad/ASB not grounded
9	Bad LCT Sensor	Check thermistor
11	Bad SCT Sensor	Check thermistor
13	Bad SGT Sensor	Check thermistor
15	Bad LLH Sensor	Check thermistor
17	Bad Source Return Sensor	Check thermistor
19	Bad Suction Pressure Sensor	Check pressure with gauges, Check 5V to transducer, Check signal voltage to ASB
21	Bad Discharge Pressure Sensor	Check pressure with gauges, Check 5V to transducer, Check signal voltage to ASB
23	Bad Source Supply Sensor	Check thermistor
25	Bad Load Return Sensor	Check thermistor
27	Bad Load Supply Sensor	Check thermistor
29	Source Pump Feedback	Pump is blocked, Air in source loop
31	Load Pump Feedback	Pump is blocked, Air in load loop
40	Source Supply Temperature	Low water flow rate, Air in source loop, Check thermistor, Too little Anti-freeze, Pump not running, Check pump circuit breaker in unit

Section 9: Maintenance, Repair, & Troubleshooting

Fault Codes : Alarm

43	Load Supply Thermistor	Zone valves closed, Auxiliary heat (electric, boiler, third-party furnace), Low water flow rate, Air in load loop, Check thermistor, Too little Anti-freeze, Pump not running, Check pump circuit breaker in unit
46	Load Coil Thermistor	Low water flow rate, Air in load loop, Check thermistor, Hot loop temperature
49	Source Coil Thermistor	Low water flow rate, Air in source loop, Check thermistor, Cold loop temperature, Too little Anti-freeze
54	No Auxiliary Heat Fault	Electric heat isn't wired to line voltage, Electric current switch broken, Electric heat relays malfunctioning, Boiler not connected/powered
56	Boiler Temperature Sensor Fault	Check thermistor
500	Envelope Fault	Check discharge & suction pressure transducers, Check if drive is folding back (myUplink)
502	ASB 1 Comm Err	Check if ASB powered (LEDs ON/blinking), Check if ASB 2 has DIP 1 ON, Check modbus harness
504	ASB 2 Comm Err	Check if ASB powered (LEDs ON/blinking), Check if ASB 2 has DIP 1 ON, Check modbus harness
506	EVA3 Serial Comm Err	Check if EVA3 powered (LED ON/blinking), Check modbus harness
508	Superheat Fault	Check suction pressure transducer, Check SGT thermistor location & resistance,
510	Source Temps Fault	Check source supply and return thermistor locations & resistance, Check reversing valve
512	Load Temps Fault	Check load supply and return thermistor locations & resistance, Check reversing valve
514	Leak Detected	Check with pressure gauges
1000	Phase Over Current	Check compressor U/V/W wiring to drive
1002	AC Input Over Current	Check voltage > 187VAC
1004	DC Bus Over Voltage	Check voltage < 265VAC
1006	DC Bus Under Voltage	Check voltage > 187VAC

Section 9: Maintenance, Repair, & Troubleshooting

Fault Codes : Alarm

1008	AC Input Over Voltage	Check voltage < 265VAC
1010	AC Input Under Voltage	Check voltage >187VAC
1012	PFC Desaturation	
1014	High or Low Pressure Switch Open	Check for open circuit in wiring, -check continuity of switches, Verify against gauges or system sensors to ensure switch is not faulty
1016	Compressor Loss of Phase	Check compressor U/V/W wiring, Measure compressor windings
1018	Loss of Motor Control	Check compressor U/V/W wiring, Measure compressor windings
1020	Power Module Over Temp	Check for air filter blockage
1022	PFC Over Temp	Check for air filter blockage
1024	Compressor Startup Fault	Check compressor U/V/W wiring, Measure compressor windings
1026	Pre-Charge Relay Open	
1028	DC Bus Voltage Low	Check voltage > 187VAC
1030	Envelope Limit Timeout	
1032	Inverter Temperature Too High	Check for air filter blockage, Check fan wiring
1034	Modbus Communication Lost	
1036	DLT Temperature High	Hot loop temperature, Low water flow rate, Charge slowly leaking
1038	Board Temperature High	Check for air filter blockage, Check fan wiring
1040	Power Module Temp High	Check for air filter blockage, Check fan wiring
1042	PFC Temperature High	Check for air filter blockage, Check fan wiring
1044	Phase Current Imbalance	Check for air filter blockage, Check fan wiring
1046	Microelectronic Fault	
1048	Drive Config Fault	
1050	Compressor Model Config	
1052	HP Sensor Config Error	
1054	U-Phase Over Current	Check compressor U/V/W wiring
1056	V-Phase Over Current	Check compressor U/V/W wiring
1058	W-Phase Over Current	Check compressor U/V/W wiring
1060	Module Over Current	Check compressor U/V/W wiring

Charge slowly leaking

Section 9: Maintenance, Repair, & Troubleshooting

Fault Codes : Inverter (Variable Speed) Drive

1062	DLT Temperature Low	Check thermistor location and resistance
1064	Board Temperature Low	
1066	Compressor Power Module Temperature Low	
1068	PFC Temperature Low	
1070	External Sensor Lost	Check high pressure switch
1072	Stator Heat Overcurrent	Check compressor U/V/W wiring
1074	Fault Limit Lockout	

Section 9: Maintenance, Repair, & Troubleshooting

Fault Codes : HMI Display

HMI Overview	
Display	Notes
Faults, Alarms, Lockouts, Warnings	Faults (also called a Warning) occur when unit is not operating within the limits (for example low pressure). An alarm is also called a Lockout. Depending upon the fault, it will either result in an alarm (lockout) after 3 tries or will lockout immediately).
Orange triangle: Will light up with no lock out on the unit. The unit may cycle on a warning 2 times and then lockout on the 3rd time. If the call satisfies before it hits 3 times the lockout count will start over.	Refer to Codes to see what the issue is.
A Lockout will show an Orange triangle and sound the Buzzer.	Refer to Codes to see what the issue is. Cycle power to reset the Lockout.
How to turn off the Alarm during a lockout	Push the Alarm Button (typically 2 to 4 times) until the hour glass is displayed.
Having a problem changing set points during ASC?	Adjustments cannot be made at the HMI while the unit is in ASC (Time Delay).
HMI, Human Machine Interface	This is the Screen on the Heat Pump where where unit status can be reviewed.
Main Screen, Status Button	OFF - There is not call Strt - Compressor is starting ASC - Anti Short Cycle (Compressor is in time delay) Run - Compressor is on Shdn - Compressor is shutting down Lkout - Compressor has locked out
DHW	Domestic Hot Water



Download this app to make installation and service easier.



View these videos for geothermal troubleshooting.



Section 10: Decommissioning

A2L Recovery

Before carrying out this procedure, it is essential for the technician to be completely familiar with the equipment and all its detail. It is recommended good practice to recover all refrigerants safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. Ensure safe electrical power is available for recovery equipment before the task is commenced. Complete these steps:

- A. Become familiar with the equipment and its operation.
- B. Isolate system electrically.
- C. Before attempting the procedure, ensure that:
 - Mechanical handling equipment is available, if required, for handling refrigerant cylinders;
 - All personal protective equipment is available and being used correctly;
 - The recovery process is supervised at all times by a competent person;
 - Recovery equipment and cylinders must conform to the appropriate standards for mildly flammable, A2L refrigerants.
- D. Make sure the cylinder is situated on the scales before recovery takes place.
- E. Start the recovery machine and operate in accordance with instructions.
- F. Pump down refrigerant system, if possible.
- G. If a vacuum is not possible, make a manifold connection to allow refrigerant to be removed from all sections of the system.
- H. Do not overfill cylinders (no more than 80% volume liquid charge).
- I. Do not exceed the maximum working pressure of the cylinder, even temporarily.
- J. When the cylinders have been filled correctly and the process completed, make sure the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
- K. Recovered refrigerant shall not be charged into another refrigerating system unless it has been cleaned and checked.

Equipment shall be labeled stating it has been decommissioned and emptied of refrigerant. The label shall be dated and signed. For appliances containing flammable refrigerants, ensure labels on the equipment state the equipment contains flammable refrigerant.

When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice for all refrigerants to be removed safely.

When transferring refrigerant into cylinders ensure only appropriate refrigerant recovery cylinders are employed. Ensure the correct number of cylinders for holding the total system charge are available. All cylinders to be used are designated for the recovered refrigerant and labeled for refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment at hand and shall be suitable for the recovery of the mildly flammable, A2L refrigerant. If in doubt, the manufacturer should be consulted. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition.

The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure it has been evacuated to an acceptable level to make certain flammable refrigerant does not remain within the lubricant. The compressor body shall **not** be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

Removal and Disposal

All geothermal units removed from service should have all components, oils, antifreeze and refrigerants properly disposed of according to local and national environmental recycling codes, regulations, standards and rules.

This page left blank for Warranty Form detachment.

Section 11: Warranty Form and Revision table

Warranty Registration Form



WARRANTY REGISTRATION

NOW REGISTER ONLINE AT [SUPPORT.ENERTECHUSA.COM/WARRANTY-REGISTRATION](https://support.enertechusa.com/warranty-registration)

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@ENERTECHUSA.COM

FAX THIS FORM TO:

ENERTECH GLOBAL LLC
618.664.4597

REGISTER ONLINE AT: support.enertechusa.com/warranty-registration

QMS-CSF-007
Rev 7.05.2023

This page left blank for Warranty Form detachment.

Revision Table

Date	Description of Revision	Page
14MAR2025	WV Unit Revision J IOM created.	ALL
22MAY2025	Updated for release	ALL
28MAY2025	Updated electrical data and wiring diagram for new 12V fan	ALL
15JULY2025	Corrected grammatical errors and adjusted notes on pg. 16-19 to reflect changes to provided accessories.	ALL
14NOV2025	Updated Wiring Diagrams for LP Switch	ALL
1DEC2025	Added low pressure switch definition and updated fault codes	ALL
28AUG2026	Added notice for label requirements	7



enertechusa.com



Enertech Global is continually working to improve its products. As a result, the price, design and specifications of each product may change without notice and may not be as described herein. For the most up-to-date information, please visit our website, or contact our Customer Service department at info@enertechgeo.com. Statements and other information contained herein are not express warranties and do not form the basis of any bargain between the parties, but are merely Enertech Global's opinion or commendation of its products.