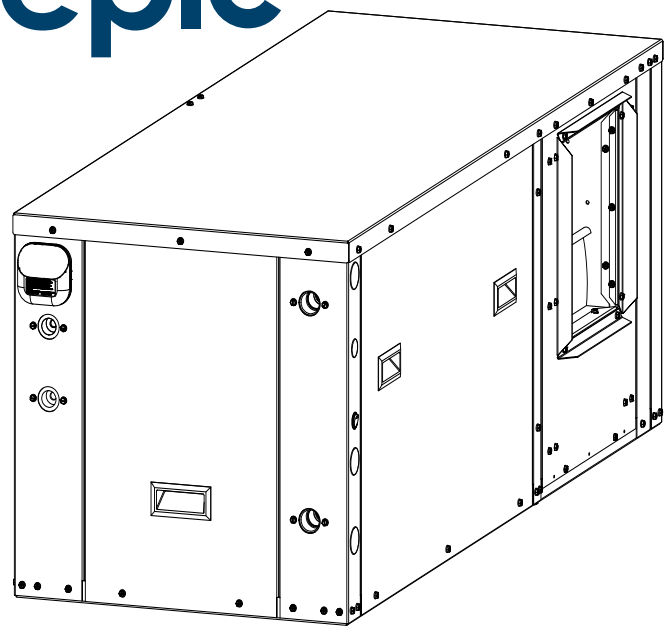
ENERTECH
ENERGY + TECHNOLOGY

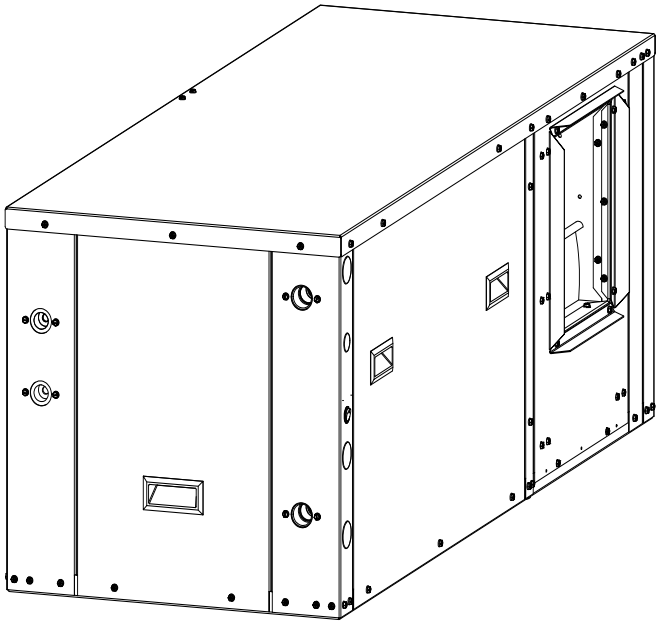
Installation & Operations Manual

ZS/ZT with Connected Controls Models
Packaged Water-to-Air Multi-Positional Heat Pumps

ZT Model with
EPIC Connected Controls



ZS/ZT Models <u>without</u>
EPIC Connected Controls



20D218-46NN

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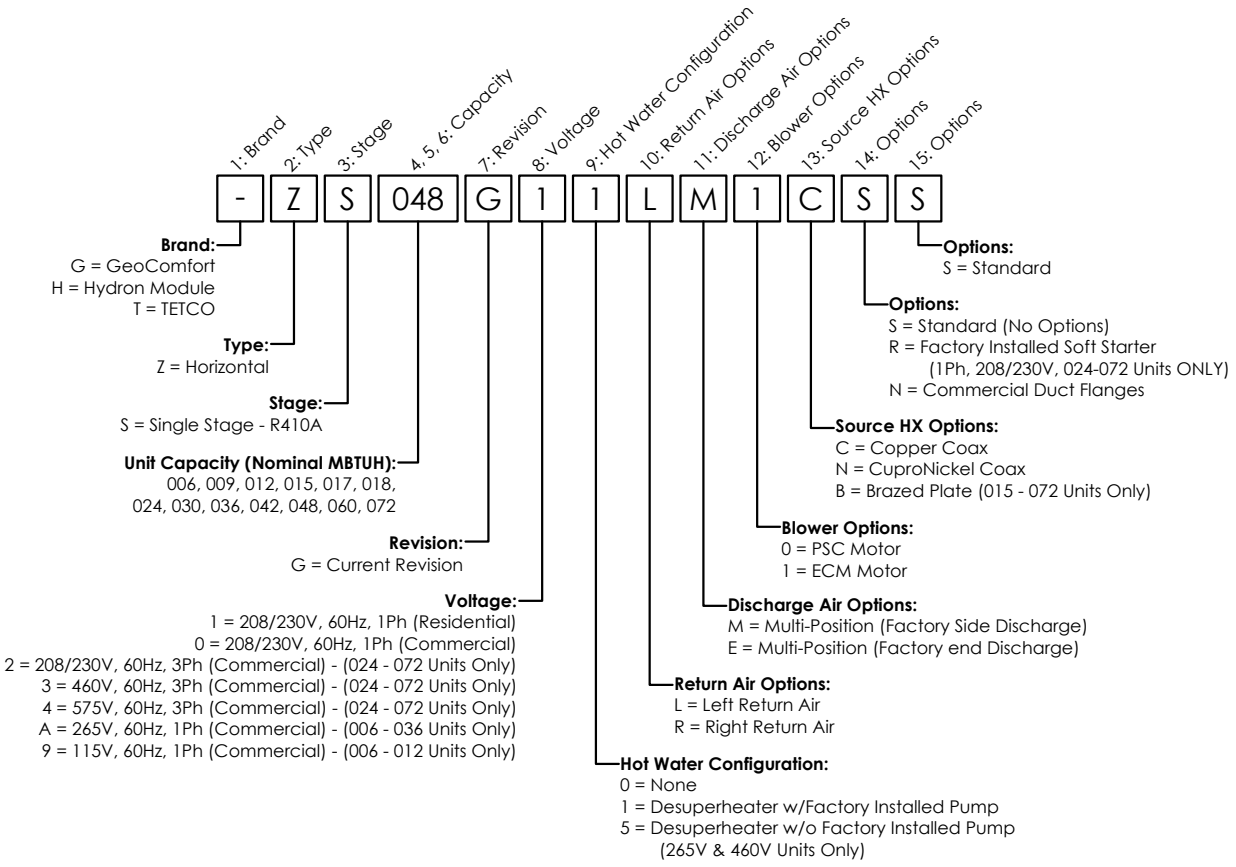
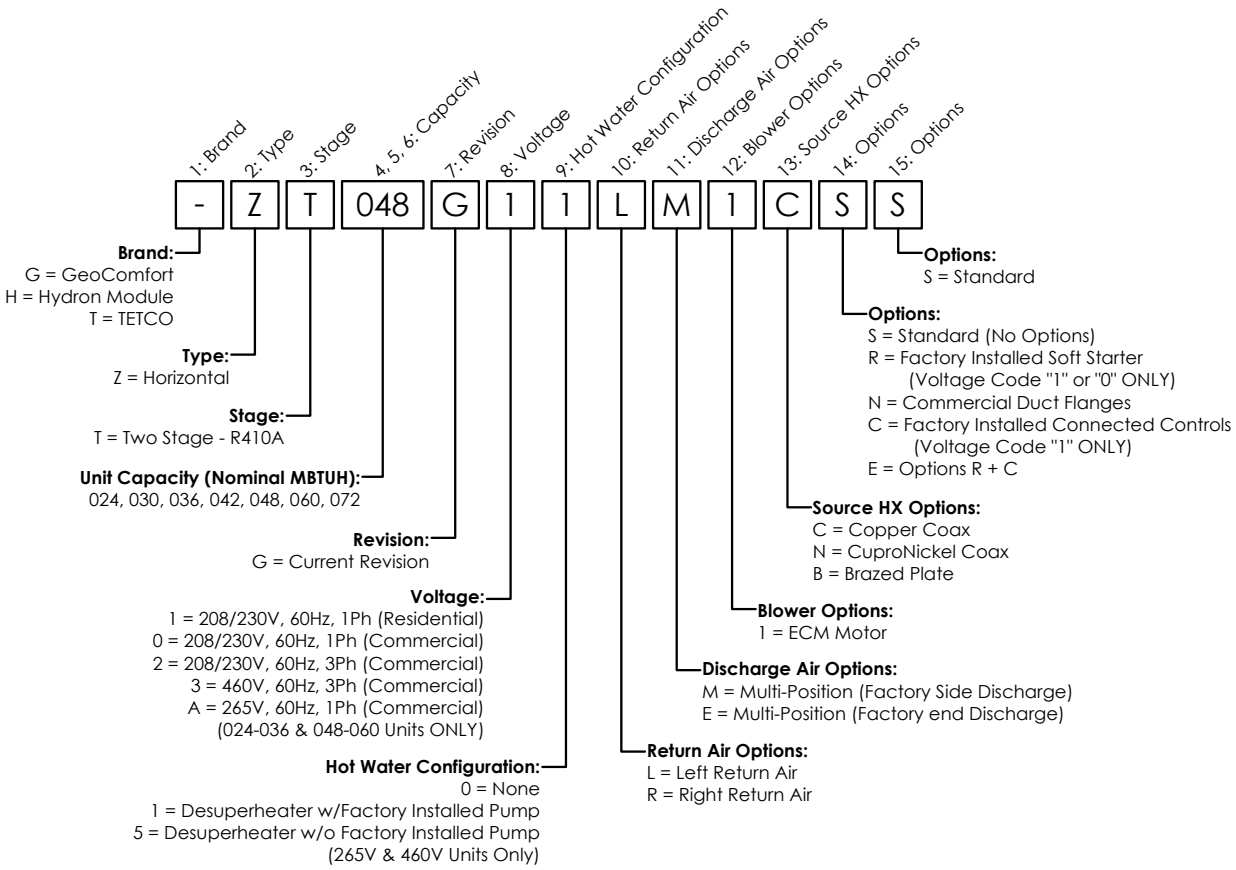
Section 1: Model Nomenclature

Nomenclature Decoder





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 water and chilled water as well as optional domestic water heating capability.

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.

Inspection

Upon receipt of any geothermal equipment, carefully check the shipment against the packing slip and the freight company bill of lading. Verify that all units and packages have been received. Inspect the packaging of each package and each unit for damages. Ensure that 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.

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, top and air coil panels. 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.

⚠ CAUTION ⚠

DO NOT OPERATE THE GEOTHERMAL HEAT PUMP UNIT DURING BUILDING CONSTRUCTION PHASE

⚠ CAUTION ⚠

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

Unit Protection

Protect units from damage and contamination due to plastering (spraying), painting and all other foreign materials that may be 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.

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 that 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. Remove any packaging used to support or hold the blower during shipping. Remove and discard the blower support bracket (if equipped) and motor armature shaft shipping bracket from the rear of the blower.
5. Remove and discard the air coil protective shipping cover (if equipped).
6. Verify that all refrigerant tubing is free of dents and kinks. Refrigerant tubing should not be touching other unit components.
7. Before unit start-up, read all manuals and become familiar with unit components and operation. Thoroughly check the unit before operating.
8. Locate the Unit Start-Up Form from this manual and have it available as the unit installation proceeds.
9. Determine discharge and return air patterns prior to unit assembly and installation

Equipment Installation

All units should be located in an indoor area were 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.

⚠ 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.

Section 2: Introduction & Operational Considerations

Unit Placement

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

- Service Access and Installation Space. Is there enough space for service access? A general rule of thumb is at least 2 to 2 1/2 feet on the front and air coil sides depending on return ductwork size.
- Unit Air Pad. All vertical geothermal heating and cooling equipment should be placed on either a formed plastic air pad, or a high density, closed cell polyethylene pad. This helps eliminate vibration noise that could be transmitted through the floor. The use of corner pads alone is not recommended.
- Determine left or right side return air pattern prior to unit assembly and installation.
- The installer must verify that all applicable wiring, piping, and accessories are correct and on the job site.

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

Electrical

All wiring, line and low voltage, should comply with the manufacturer's recommendations, The National Electrical Code, and all local codes and ordinances.

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.

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.

Desuperheater

The Desuperheater package can make up to 60% (depending on heat pump usage) of most domestic water needs, but a water heater is still recommended.

Desuperheater Piping

All copper tubes & fittings should be 5/8" O.D (1/2" nom) minimum with a maximum of 50ft separation. Piping should be insulated with 3/8" wall closed cell insulation.

Note: Copper is the only approved material for piping the desuperheater.

UV Light Usage: The use of a UV light in the unit return air plenum should be such that the light does not have a direct line of sight to the air coil of the unit. UV lights could cause internal wiring, foam insulation, or other components to deteriorate. It would be better to place the UV light in the supply air plenum, or ductwork. This also helps keep the light cleaner. Additionally, if a humidifier is installed and in line of the sight of the UV light, consult the humidifier install manual for indication of whether the light will deteriorate any parts of the humidifier (like the pad).

⚠ WARNING ⚠

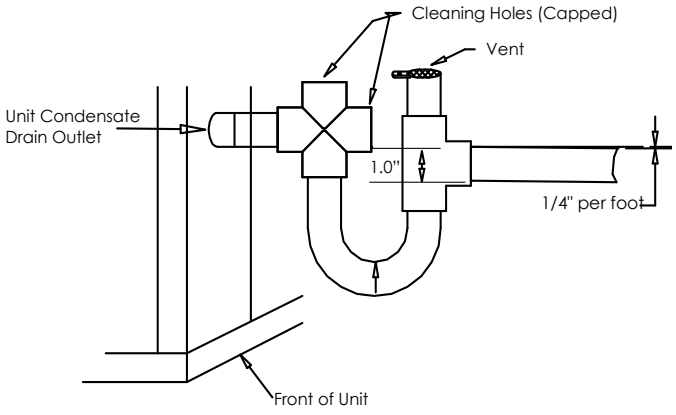
FAILURE TO FOLLOW THIS CAUTION MAY RESULT IN PERSONAL INJURY. USE CARE AND WEAR APPROPRIATE PROTECTIVE CLOTHING, SAFETY GLASSES AND PROTECTIVE GLOVES WHEN SERVICING UNIT AND HANDLING PARTS.

Condensation Drain Connection

Connect the EZ-Trap to the 3/4" equipment condensate drain connection as shown below. The condensate line must be trapped a minimum of 1.0" as shown in the diagram. The condensate line should be pitched away from the unit a minimum of 1/4" per foot. The condensate line from the unit drain connection to the P-trap should be sloped downward. For more information on installing EZ-Trap, see installation sheet that comes with the EZ-Trap Kit. Always install the air vent after the trap.

Note: Connect drain through the trap to the condensation drain system in conformance to local plumbing codes.

Part Number Description
ACDT1A - EZ-Trap ¾" Kit
ACDT2A - EZ-Trap 1" Kit (customer must provide a 1" S x 3/4" Mips adapter)



Components

Master Contactor: Energizes Compressor and optional Hydronic Pump and/or Desuperheater pump package.

Logic Board: Logic Board operates the compressor and protects unit by locking out when safety switches are engaged. It also provides fault indicator(s).

Terminal Strip: Provides connection to the thermostat or other accessories to the low voltage circuit.

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

Low Voltage Breaker: Attached directly to 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 Switch: Protects the refrigerant system from low suction pressure if suction pressure falls below setting.

Electric Heater: Provides auxiliary heat during cold temperatures and provides electric backup if unit malfunctions.

Blower Motor (ECM): ECM (Electronically Commutated Motor) for variable fan speeds.

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

Duct Work

All new ductwork shall be designed as outlined in Sheet Metal and Air Conditioning Contractors National Association (SMACNA) or Air Conditioning Contractors of America (ACCA) or American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) handbooks. All YT Models do not have more than 2% air leakage

All supply/return plenums should be isolated from the unit by a flexible connector (canvas) or equivalent to prevent transfer of vibration noise to the ductwork. The flex connector should be designed so as not to restrict airflow. Turning vanes should be used on any transition with airflow over 500 CFM. **All metal ductwork should be insulated on the inside** to prevent heat loss/gain, condensation and to absorb air noise. If the unit is being installed with existing ductwork, the ductwork must be designed to handle the air volume required by the unit being installed. When running a cooling or heating load on a building, size ductwork accordingly to the building design load and heat pump CFM.

Industry Standard: When sizing ducts use 400 CFM per Ton.

As a general rule, maximum recommended face velocity for a supply outlet used in a residential application is 750 FPM. Maximum recommended return grille velocity is 600 FPM. Systems with higher velocity, are likely to have noise problems.

In buildings where ceilings are 8 feet or more, at least 50 percent of the return air should be taken back to the heat pump from the ceiling or high sidewall location and not more than 50 percent from the floor or low sidewall location.

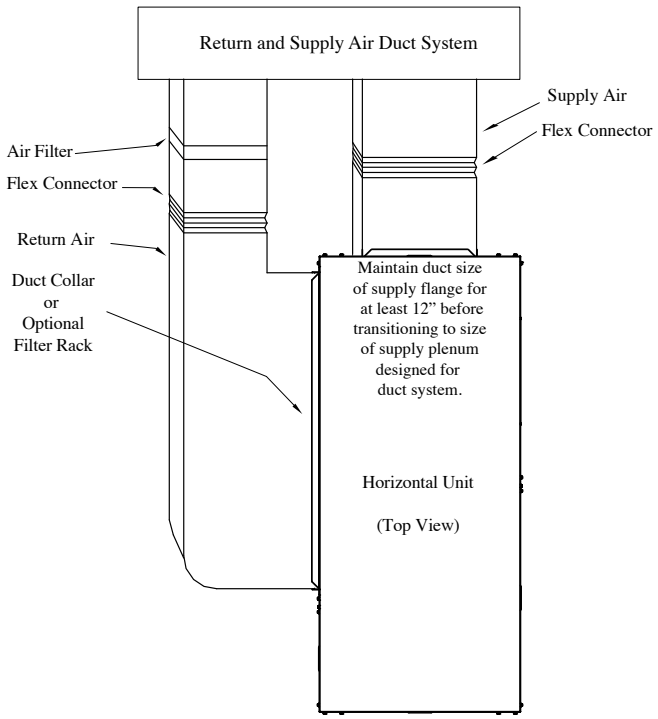
Maximum Air Velocities

Location	Supply	Return
Main Ducts	900 FPM	600 FPM
Branch Ducts	700 FPM	600 FPM
Grills, Registers, Diffusers	750 FPM	600 FPM

⚠ NOTICE ⚠

PRIOR TO OPERATING THE UNIT, REMOVE AND DISCARD THE BLOWER MOTOR ARMATURE SUPPORT BRACKET LOCATED ON THE BACK OF THE BLOWER. IF APPLICABLE, REMOVE AND DISCARD THE BLOWER SHIPPING BRACKET LOCATED ON THE BOTTOM OR SIDE OF THE BLOWER HOUSING. FAILURE TO REMOVE THESES BRACKETS COULD RESULT IN NOISY OPERATION AND EQUIPMENT DAMAGE.

Typical Supply and Return Ductwork Connections:



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 Owner's Manual for the equipment being installed.

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.

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.

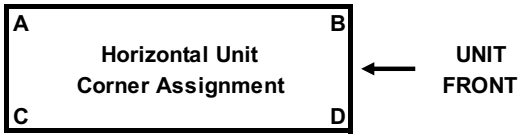
Due to the importance of proper installation, Enertech Global does not sell equipment direct to homeowners. Internet websites and HVAC outlets may allow for purchases directly by homeowners and do-it-yourselfers, but Enertech Global offers no warranty on equipment that is purchased via the internet or 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 that your system provides many years of comfort and savings.

Section 3: Unit Data

Unit Physical Data

UNIT WEIGHTS ZS-ZT MODELS	BTU SIZES - BPHE UNITS ONLY									
	015	017	018	024	030	036	042	048	060	072
Unit Weight (lbs)	173	173	236	236	236	263	263	263	303	303
Tare Weight (lbs)	32	32	37	37	37	37	37	37	37	37
Shipped Unit Weight (lbs)	205	205	273	273	273	300	300	300	340	340
Left Return Corner A (Unit Wt.)	35	35	47	47	47	53	53	53	61	61
Left Return Corner B (Unit Wt.)	61	61	83	83	83	92	92	92	106	106
Left Return Corner C (Unit Wt.)	26	26	35	35	35	39	39	39	45	45
Left Return Corner D (Unit Wt.)	52	52	71	71	71	79	79	79	91	91
Right Return Corner A (Unit Wt.)	26	26	35	35	35	39	39	39	45	45
Right Return Corner B (Unit Wt.)	52	52	71	71	71	79	79	79	91	91
Right Return Corner C (Unit Wt.)	35	35	47	47	47	53	53	53	61	61
Right Return Corner D (Unit Wt.)	61	61	83	83	83	92	92	92	106	106



SINGLE CAPACITY ZS MODELS	BTU SIZES - BPHE UNITS ONLY									
	015	017	018	024	030	036	042	048	060	072
Compressor Type	Rotary		Single Capacity Scroll							
Blower/Fan Wheel (in)	9 x 7T	9 x 7T	10 x 8T	10 x 8T	10 x 8T	10 x 8	10 x 8	10 x 8	11 x 10T	11 x 10T
Fan Motor ECM (HP)	1/2 hp	1/2 hp	1/2 hp	1/2 hp	1/2 hp	1/2 hp	1/2 hp	3/4 hp	1 hp	1 hp
Fan Motor PSC (HP)	1/4 hp	1/4 hp	1/4 hp	1/3 hp	1/3 hp	1/3 hp	1/2 hp	3/4 hp	1 hp	1 hp
Source Water Connection Size	3/4" FPT		1" FPT							
HWG Water (when available)	3/4" FPT									
Refrigerant Charge (oz)*	37	36	41	41	40	46	52	48	56	60
Air Coil Face Area (sq.ft.)	1.79 sq.ft.		3.26 sq.ft.			4.17 sq.ft.			4.76 sq.ft.	
Air Coil Dimesions (in)	20.5 x 12.6 x 1.26		30.3 x 15.5 x 1			34.5 x 17.4 x 1			39.4 x 17.4 x 1	
Air Coil Type	All Aluminum Microchannel Coil									

* Always check the unit data plate for specific refrigerant charge volume

DUAL CAPACITY ZT MODELS	BTU SIZES - BPHE UNITS ONLY						
	024	030	036	042	048	060	072
Compressor Type	Dual Capacity Scroll						
Blower/Fan Wheel (in)	10 x 8T	10 x 8T	10 x 8	10 x 8	10 x 8	11 x 10T	11 x 10T
Fan Motor ECM (HP)	1/2 hp	1/2 hp	1/2 hp	1/2 hp	3/4 hp	1 hp	1 hp
Fan Motor PSC (HP)	1/3 hp	1/3 hp	1/3 hp	1/2 hp	3/4 hp	1 hp	1 hp
Source Water Connection Size	1" FPT						
HWG Water (when available)	3/4" FPT						
Refrigerant Charge (oz)*	41	39	46	49	51	56	62
Air Coil Face Area (sq.ft.)	3.26 sq.ft.		4.17 sq.ft.			4.76 sq.ft.	
Air Coil Dimesions (in)	30.3 x 15.5 x 1		34.5 x 17.4 x 1			39.4 x 17.4 x 1	
Air Coil Type	All Aluminum Microchannel Coil						

* Always check the unit data plate for specific refrigerant charge volume

Section 3: Unit Data

Unit Physical Data

UNIT WEIGHTS ZS-ZT MODELS	BTU SIZES - COAX UNITS ONLY												
	006	009	012	015	017	018	024	030	036	042	048	060	072
Unit Weight (lbs)	140	140	140	175	175	246	246	255	278	292	306	342	344
Tare Weight (lbs)	32	32	32	32	32	37	37	37	37	37	37	37	37
Shipped Unit Weight (lbs)	172	172	172	207	207	283	283	292	315	329	343	379	381
Left Return Corner A (Unit Wt.)	28	28	28	35	35	49	49	51	55	58	61	67	67
Left Return Corner B (Unit Wt.)	49	49	49	62	62	90	90	92	102	106	110	130	130
Left Return Corner C (Unit Wt.)	21	21	21	26	26	35	35	37	39	42	44	46	46
Left Return Corner D (Unit Wt.)	42	42	42	52	52	72	72	75	82	86	91	99	101
Right Return Corner A (Unit Wt.)	21	21	21	26	26	35	35	37	39	42	44	46	46
Right Return Corner B (Unit Wt.)	42	42	42	52	52	72	72	75	82	86	91	99	101
Right Return Corner C (Unit Wt.)	28	28	28	35	35	49	49	51	55	58	61	67	67
Right Return Corner D (Unit Wt.)	49	49	49	62	62	90	90	92	102	106	110	130	130

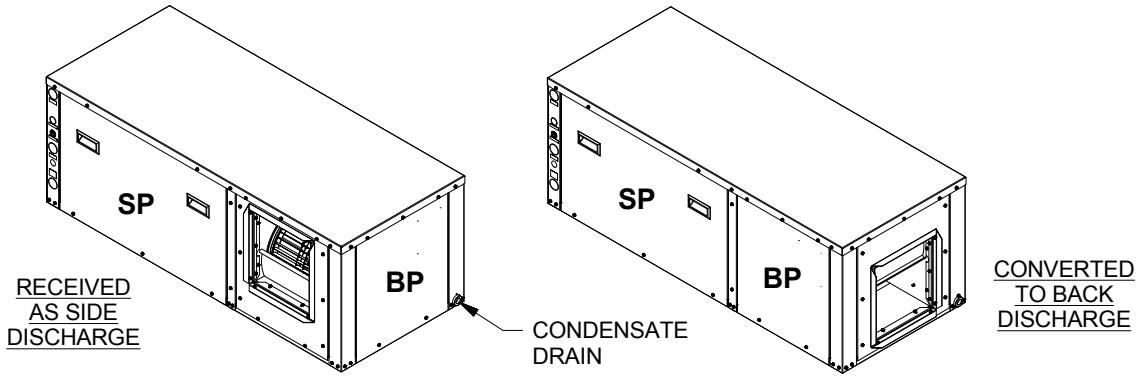
SINGLE CAPACITY ZS MODELS	BTU SIZES - COAX UNITS ONLY												
	006	009	012	015	017	018	024	030	036	042	048	060	072
Compressor Type	Rotary					Single Capacity Scroll							
Blower/Fan Wheel (in)	6 X 9	6 X 9	6 X 9	9 x 7T	9 x 7T	10 x 8T	10 x 8T	10 x 8T	10 x 8	10 x 8	10 x 8	11 x 10T	11 x 10T
Fan Motor ECM (HP)	N/A	N/A	N/A	1/2 hp	1/2 hp	1/2 hp	1/2 hp	1/2 hp	1/2 hp	1/2 hp	3/4 hp	1 hp	1 hp
Fan Motor PSC (HP)	1/16 hp	1/16 hp	1/16 hp	1/4 hp	1/4 hp	1/4 hp	1/3 hp	1/3 hp	1/3 hp	1/2 hp	3/4 hp	1 hp	1 hp
Source Water Connection Size	3/4" FPT					1" FPT							
HWG Water (when available)	N/A	N/A	N/A	3/4" FPT									
Refrigerant Charge (oz)*	32	31	31	39	39	54	52	45	60	63	61	74	77
Air Coil Face Area (sq.ft.)	1.08 sq.ft.			1.79 sq.ft.		3.26 sq.ft.			4.17 sq.ft.			4.76 sq.ft.	
Air Coil Dimesions (in)	20.5 x 7.6 x 1.26			20.5 x 12.6 x 1.26		30.3 x 15.5 x 1			34.5 x 17.4 x 1			39.4 x 17.4 x 1	
Air Coil Type	All Aluminum Microchannel Coil												

* Always check the unit data plate for specific refrigerant charge volume

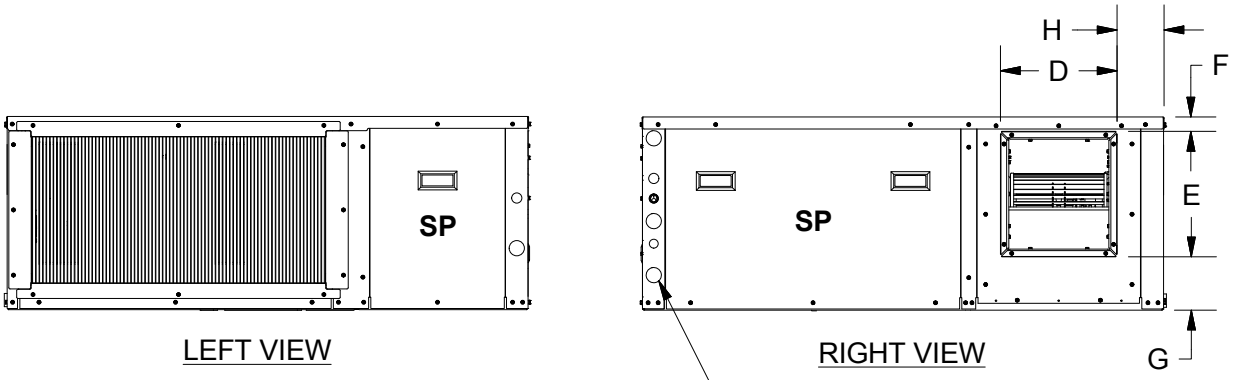
DUAL CAPACITY ZT MODELS	BTU SIZES - COAX UNITS ONLY						
	024	030	036	042	048	060	072
Compressor Type	Dual Capacity Scroll						
Blower/Fan Wheel (in)	10 x 8T	10 x 8T	10 x 8	10 x 8	10 x 8	11 x 10T	11 x 10T
Fan Motor ECM (HP)	1/2 hp	1/2 hp	1/2 hp	1/2 hp	3/4 hp	1 hp	1 hp
Fan Motor PSC (HP)	1/3 hp	1/3 hp	1/3 hp	1/2 hp	3/4 hp	1 hp	1 hp
Source Water Connection Size	1" FPT						
HWG Water (when available)	3/4" FPT						
Refrigerant Charge (oz)*	51	45	60	65	65	76	75
Air Coil Face Area (sq.ft.)	3.26 sq.ft.		4.17 sq.ft.			4.76 sq.ft.	
Air Coil Dimesions (in)	30.3 x 15.5 x 1		34.5 x 17.4 x 1			39.4 x 17.4 x 1	
Air Coil Type	All Aluminum Microchannel Coil						

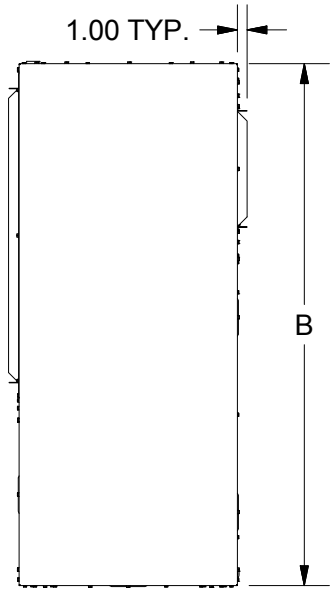
* Always check the unit data plate for specific refrigerant charge volume

Unit Dimensional Data : Left Hand Return

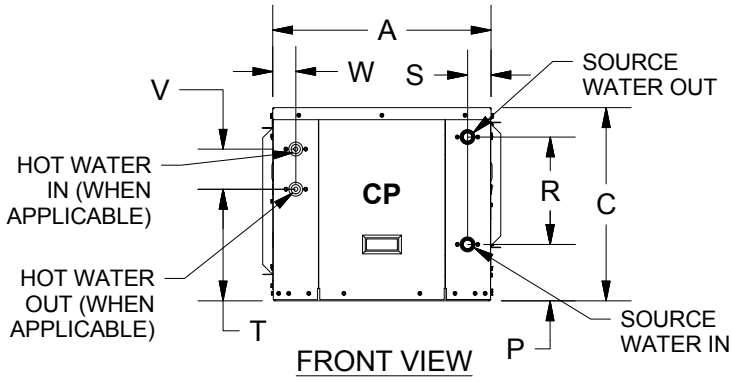


BACK ISOMETRIC VIEW





TOP VIEW



FRONT VIEW

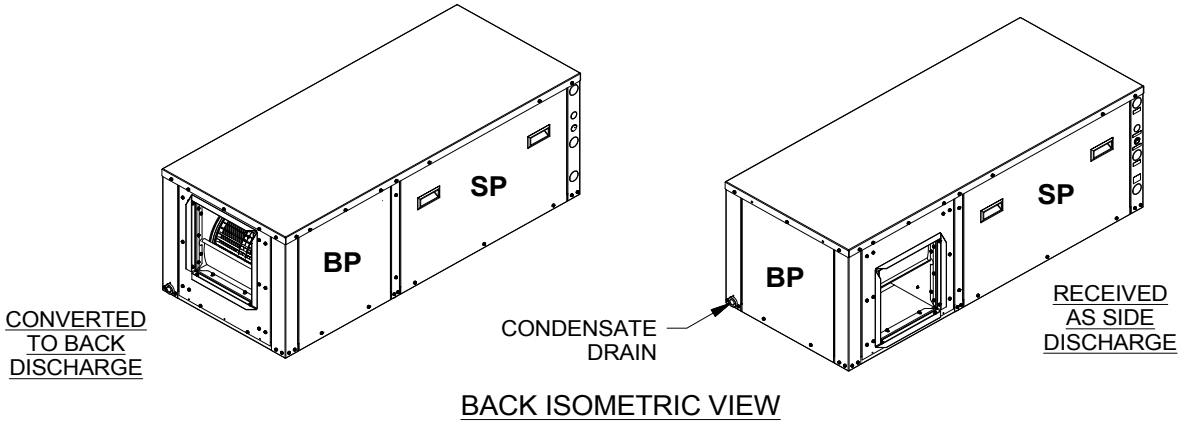
SHOWN IN LEFT HAND RETURN CONFIGURATION

LEGEND
SP = Service Panel
BP = Blower Service Panel
CP = Control Access Panel

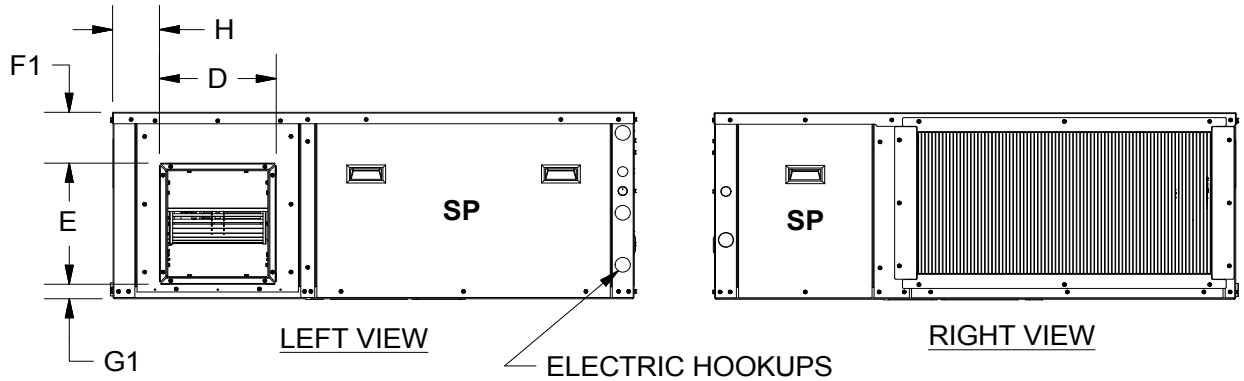
Reference dimensional data enclosed.
Units utilize FPT source water connections.
Units with Desuperheater utilize FPT connections.
Electrical knockouts are sized to 1/2" or 3/4" conduit.
All views are shown with flanges for reference.
Return duct flanges or 1" commercial filter rack are factory installed. See separate dimensional data sheet for further detail.

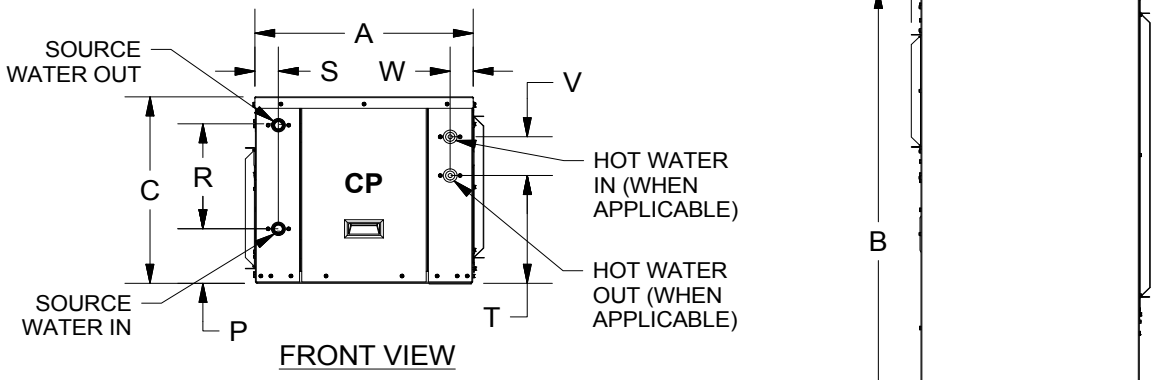
All measurements are in inches.
Drawings are typical, individual models may vary.
Optional filter rack kits are available as needed. See separate dinmensional data sheet for details.
Discharge flanges are field installed and are shipped inside of the unit.

Unit Dimensional Data : Right Hand Return



BACK ISOMETRIC VIEW





LEGEND
SP = Service Panel
BP = Blower Service Panel
CP = Control Access Panel

SHOWN IN RIGHT HAND RETURN CONFIGURATION

Reference dimensional data enclosed.
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Section 3: Unit Data

Unit Dimensional Data Sheet

MODEL	Overall Cabinet Size			Supply Air (Side Blower Discharge)						
	A (Width)	B (Depth)	C (Height)	D (Width)	E (Height)	F (LHR)	G (LHR)	F1 (RHR)	G1 (RHR)	H
006	20.0	40.0	12.0	11.6	7.5	1.6	2.9	2.9	1.6	3.8
009	20.0	40.0	12.0	11.6	7.5	1.6	2.9	2.9	1.6	3.8
012	20.0	40.0	12.0	11.6	7.5	1.6	2.9	2.9	1.6	3.8
015	21.0	40.0	17.0	11.6	12.5	1.4	3.1	3.1	1.4	3.8
017	21.0	40.0	17.0	11.6	12.5	1.4	3.1	3.1	1.4	3.8
018	21.7	52.0	19.2	11.6	12.5	1.4	5.3	5.3	1.4	4.7
024	21.7	52.0	19.2	11.6	12.5	1.4	5.3	5.3	1.4	4.7
030	21.7	52.0	19.2	11.6	12.5	1.4	5.3	5.3	1.4	4.7
036	21.7	56.0	21.2	11.6	12.5	1.4	7.3	7.3	1.4	7.2
042	21.7	56.0	21.2	11.6	12.5	1.4	7.3	7.3	1.4	7.2
048	21.7	56.0	21.2	11.6	12.5	1.4	7.3	7.3	1.4	7.2
060	24.0	61.0	21.2	16.0	16.0	1.4	3.8	3.8	1.4	6.7
072	24.0	61.0	21.2	16.0	16.0	1.4	3.8	3.8	1.4	6.7

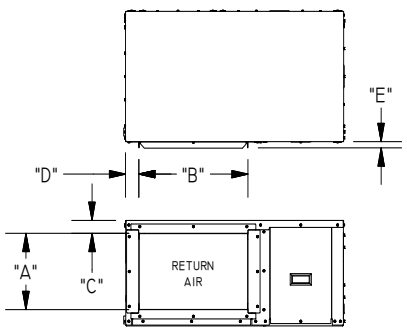
MODEL	Source Water			Hot Water (If Applicable)		
	P	R	S	T	V	W
006	3.6	6.0	2.1	N/A	N/A	N/A
009	3.6	6.0	2.1	N/A	N/A	N/A
012	3.6	6.0	2.1	N/A	N/A	N/A
015	5.6	8.0	2.1	8.6	4.0	2.1
017	5.6	8.0	2.1	8.6	4.0	2.1
018	5.6	10.7	2.3	9.4	4.0	2.3
024	5.6	10.7	2.3	9.4	4.0	2.3
030	5.6	10.7	2.3	9.4	4.0	2.3
036	5.6	12.0	2.5	11.1	4.0	2.3
042	5.6	12.0	2.5	11.1	4.0	2.3
048	5.6	12.0	2.5	11.1	4.0	2.3
060	5.6	12.0	2.5	11.1	4.0	2.3
072	5.6	12.0	2.5	11.1	4.0	2.3

MODEL	1”-2” Optional Deluxe Filter Rack
	Order Item Number
006	AFR0923A
009	AFR0923A
012	AFR0923A
015	AFR1423A
017	AFR1423A
018	AFR1632A
024	AFR1632A
030	AFR1632A
036	AFR1836A
042	AFR1836A
048	AFR1836A
060	AFR1841A
072	AFR1841A

Unit Dimensional Data : Return Flange / Filter Rack

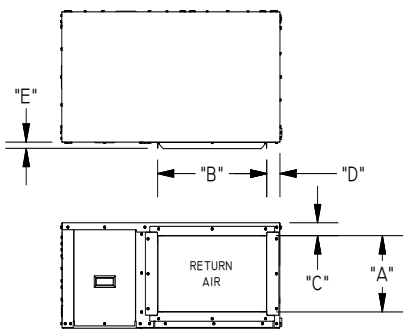
LEFT HAND RETURN MODELS

WITH RETURN FLANGES

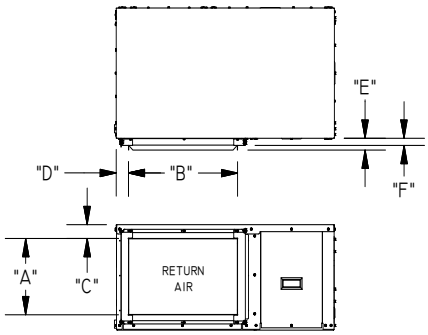


RIGHT HAND RETURN MODELS

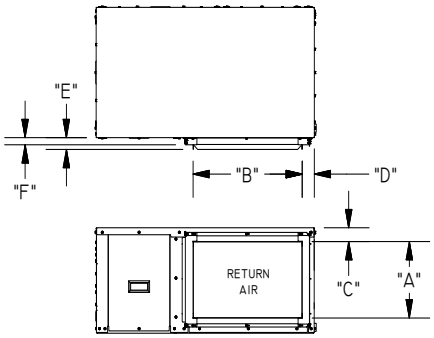
WITH RETURN FLANGES



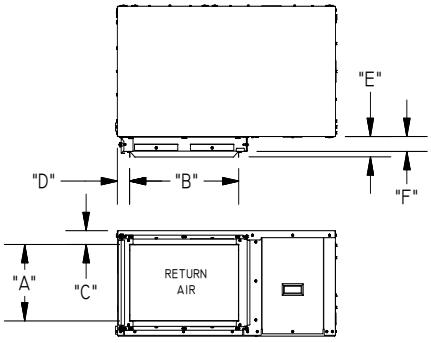
WITH 1" COMMERCIAL FILTER RACK



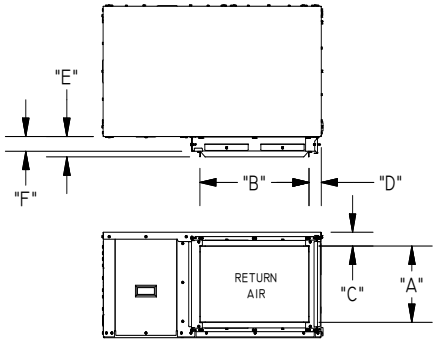
WITH 1" COMMERCIAL FILTER RACK



WITH 1"-2" DELUXE FILTER RACK



WITH 1"-2" DELUXE FILTER RACK



UNIT	DESCRIPTION	"A" HEIGHT	"B" WIDTH	"C"	"D'	"E"	"F"
006-009-012	RETURN DUCT FLANGES	7.31	20.00	2.06	2.44	1.00	N/A
	1" COMMERCIAL RACK	7.31	20.00	2.22	2.24	1.89	1.14
	1"-2" DELUXE RACK	7.31	20.00	2.22	2.24	3.30	2.39
015-017	RETURN DUCT FLANGES	12.31	20.00	2.06	2.44	1.00	N/A
	1" COMMERCIAL RACK	12.31	20.00	2.22	2.24	1.89	1.14
	1"-2" DELUXE RACK	12.31	20.00	2.22	2.24	3.30	2.39
018-024-030	RETURN DUCT FLANGES	14.64	29.35	1.99	2.44	1.00	N/A
	1" COMMERCIAL RACK	14.64	29.35	1.99	2.15	1.89	1.14
	1"-2" DELUXE RACK	14.64	29.35	1.99	2.44	3.30	2.39
036-048	RETURN DUCT FLANGES	16.64	33.35	1.99	2.44	1.00	N/A
	1" COMMERCIAL RACK	16.64	33.35	1.99	2.15	1.89	1.14
	1"-2" DELUXE RACK	16.64	33.35	1.99	2.44	3.30	2.39
060-072	RETURN DUCT FLANGES	16.64	38.25	1.99	2.44	1.00	N/A
	1" COMMERCIAL RACK	16.64	38.25	1.99	2.15	1.89	1.14
	1"-2" DELUXE RACK	16.64	38.25	1.99	2.44	3.30	2.39

Section 3: Unit Data

Unit Electrical Data : ZS006-030, PSC

Model	Voltage Code/ HWG Option	60 Hz Power		Compressor		Fan Motor FLA	HWG Pump FLA	Ext. Loop Pump FLA	Total Unit FLA	Min Circuit AMPS	Max Brkr HACR
		Volts	Phase	LRA	RLA						
ZS006	00	208/230	1	17.7	2.5	0.8	0.0	0.0	3.3	3.9	15
	10	208/230	1	17.7	2.5	0.8	0.0	4.0	7.3	7.9	15
	A0	265	1	13.5	2.1	0.7	0.0	0.0	2.8	3.3	15
	90	115	1	36.2	5.0	1.5	0.0	0.0	6.5	7.8	15
ZS009	00	208/230	1	22.2	3.6	0.8	0.0	0.0	4.4	5.3	15
	10	208/230	1	22.2	3.6	0.8	0.0	4.0	8.4	9.3	15
	A0	265	1	17.5	3.4	0.7	0.0	0.0	4.1	5.0	15
	90	115	1	45.6	7.7	1.5	0.0	0.0	9.2	11.1	15
ZS012	00	208/230	1	32.5	5.6	0.8	0.0	0.0	6.4	7.8	15
	10	208/230	1	32.5	5.6	0.8	0.0	4.0	10.4	11.8	15
	A0	265	1	22.2	3.8	0.7	0.0	0.0	4.5	5.5	15
	90	115	1	63.0	11.8	1.5	0.0	0.0	13.3	16.3	25
ZS015	00	208/230	1	26.0	5.5	1.5	0.0	0.0	7.0	8.4	15
	01	208/230	1	26.0	5.5	1.5	0.5	0.0	7.5	8.9	15
	10	208/230	1	26.0	5.5	1.5	0.0	4.0	11.0	12.4	15
	11	208/230	1	26.0	5.5	1.5	0.5	4.0	11.5	12.9	15
	A	265	1	28.0	5.0	2.0	0.0	0.0	7.0	8.3	15
ZS017	00	208/230	1	33.0	6.6	1.5	0.0	0.0	8.1	9.8	15
	01	208/230	1	33.0	6.6	1.5	0.5	0.0	8.6	10.3	15
	10	208/230	1	33.0	6.6	1.5	0.0	4.0	12.1	13.8	20
	11	208/230	1	33.0	6.6	1.5	0.5	4.0	12.6	14.3	20
	A	265	1	28.0	5.6	2.0	0.0	0.0	7.6	9.0	15
ZS018	00	208/230	1	48.0	9.0	1.5	0.0	0.0	10.5	12.8	20
	01	208/230	1	48.0	9.0	1.5	0.5	0.0	11.0	13.3	20
	10	208/230	1	48.0	9.0	1.5	0.0	4.0	14.5	16.8	25
	11	208/230	1	48.0	9.0	1.5	0.5	4.0	15.0	17.3	25
	A	265	1	43.0	7.1	2.0	0.0	0.0	9.1	10.9	15
ZS024	00	208/230	1	58.3	13.5	1.9	0.0	0.0	15.4	18.8	30
	01	208/230	1	58.3	13.5	1.9	0.5	0.0	15.9	19.3	30
	10	208/230	1	58.3	13.5	1.9	0.0	4.0	19.4	22.8	35
	11	208/230	1	58.3	13.5	1.9	0.5	4.0	19.9	23.3	35
	20	208/230	3	55.4	7.1	1.9	0.0	0.0	9.0	10.8	15
	21	208/230	3	55.4	7.1	1.9	0.5	0.0	9.5	11.3	15
	30/35	460	3	28.0	3.5	0.9	0.0	0.0	4.4	5.3	15
	40/45	575	3	24.5	2.9	1.1	0.0	0.0	4.0	4.7	15
	A	265	1	54.0	9.0	2.2	0.0	0.0	11.2	13.5	20
ZS030	00	208/230	1	64.0	12.8	1.9	0.0	0.0	14.7	17.9	30
	01	208/230	1	64.0	12.8	1.9	0.5	0.0	15.2	18.4	30
	10	208/230	1	64.0	12.8	1.9	0.0	4.0	18.7	21.9	35
	11	208/230	1	64.0	12.8	1.9	0.5	4.0	19.2	22.4	35
	20	208/230	3	58.0	8.3	1.9	0.0	0.0	10.2	12.3	20
	21	208/230	3	58.0	8.3	1.9	0.5	0.0	10.7	12.8	20
	30/35	460	3	28.0	5.1	0.9	0.0	0.0	6.0	7.3	15
	40/45	575	3	23.7	3.3	1.1	0.0	0.0	4.4	5.2	15
	A	265	1	60.0	10.9	2.2	0.0	0.0	13.1	15.8	25

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, 460/60 = 432-504, 265/60 = 249-291, 115/60 = 108/126
4. See Wiring Diagrams for proper 460V power.

*The external loop pump FLA is based on a maximum of three UP26-116F-230V pumps (1/2hp) for 048-072 and two pumps for 006-030.

Section 3: Unit Data

Unit Electrical Data : ZS036-072, PSC

Model	Voltage Code/ HWG Option	60 Hz Power		Compressor		Fan Motor FLA	HWG Pump FLA	Ext. Loop Pump FLA	Total Unit FLA	Min Circuit AMPS	Max Brkr HACR
		Volts	Phase	LRA	RLA						
ZS036	00	208/230	1	79.0	16.7	1.9	0.0	0.0	18.6	22.8	35
	01	208/230	1	79.0	16.7	1.9	0.5	0.0	19.1	23.3	40
	10	208/230	1	79.0	16.7	1.9	0.0	4.0	22.6	26.8	40
	11	208/230	1	79.0	16.7	1.9	0.5	4.0	23.1	27.3	40
	20	208/230	3	73.0	10.4	1.9	0.0	0.0	12.3	14.9	25
	21	208/230	3	73.0	10.4	1.9	0.5	0.0	12.8	15.4	25
	30/35	460	3	38.0	5.8	0.9	0.0	0.0	6.7	8.2	15
	40/45	575	3	36.5	3.8	1.1	0.0	0.0	4.9	5.9	15
	A	265	1	72.0	13.5	2.2	0.0	0.0	15.7	19.1	30
ZS042	00	208/230	1	109.0	16.7	2.9	0.0	0.0	19.6	23.8	40
	01	208/230	1	109.0	16.7	2.9	0.5	0.0	20.1	24.3	40
	10	208/230	1	109.0	16.7	2.9	0.0	5.5	25.1	29.3	45
	11	208/230	1	109.0	16.7	2.9	0.5	5.5	25.6	29.8	45
	20	208/230	3	84.0	11.2	2.9	0.0	0.0	14.1	16.9	25
	21	208/230	3	84.0	11.2	2.9	0.5	0.0	14.6	17.4	25
	30/35	460	3	44.0	5.6	1.2	0.0	0.0	6.8	8.2	15
	40/45	575	3	34.0	3.8	1.0	0.0	0.0	4.8	5.8	15
ZS048	00	208/230	1	130.0	19.6	4.0	0.0	0.0	23.6	28.5	45
	01	208/230	1	130.0	19.6	4.0	0.5	0.0	24.1	29.0	45
	10	208/230	1	130.0	19.6	4.0	0.0	5.5	29.1	34.0	50
	11	208/230	1	130.0	19.6	4.0	0.5	5.5	29.6	34.5	50
	20	208/230	3	83.1	13.7	4.0	0.0	0.0	17.7	21.1	35
	21	208/230	3	83.1	13.7	4.0	0.5	0.0	18.2	21.6	35
	30/35	460	3	41.0	6.2	2.1	0.0	0.0	8.3	9.9	15
	40/45	575	3	33.0	4.8	3.1	0.0	0.0	7.9	9.1	15
ZS060	00	208/230	1	144.2	24.4	5.6	0.0	0.0	30.0	36.1	60
	01	208/230	1	144.2	24.4	5.6	0.5	0.0	30.5	36.6	60
	10	208/230	1	144.2	24.4	5.6	0.0	5.5	35.5	41.6	60
	11	208/230	1	144.2	24.4	5.6	0.5	5.5	36.0	42.1	60
	20	208/230	3	110.0	16.0	5.6	0.0	0.0	21.6	25.6	40
	21	208/230	3	110.0	16.0	5.6	0.5	0.0	22.1	26.1	40
	30/35	460	3	52.0	7.8	2.6	0.0	0.0	10.4	12.4	20
	40/45	575	3	38.9	5.7	2.1	0.0	0.0	7.8	9.2	15
ZS072	00	208/230	1	178.0	30.8	5.6	0.0	0.0	36.4	44.1	70
	01	208/230	1	178.0	30.8	5.6	0.5	0.0	36.9	44.6	70
	10	208/230	1	178.0	30.8	5.6	0.0	5.5	41.9	49.6	80
	11	208/230	1	178.0	30.8	5.6	0.5	5.5	42.4	50.1	80
	20	208/230	3	136.0	19.6	5.6	0.0	0.0	25.2	30.1	50
	21	208/230	3	136.0	19.6	5.6	0.5	0.0	25.7	30.6	50
	30/35	460	3	66.1	8.2	2.6	0.0	0.0	10.8	12.9	20
	40/45	575	3	55.3	6.6	2.1	0.0	0.0	8.7	10.4	15

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, 460/60 = 432-504, 265/60 = 249-291, 115/60 = 108-126
4. See Wiring Diagrams for proper 460V power.

*The external loop pump FLA is based on a maximum of three UP26-116F-230V pumps (1/2hp) for 048-072 and two pumps for 006-036.

Section 3: Unit Data

Unit Electrical Data : ZS015-036, ECM

Model	Voltage Code/ HWG Option	60 Hz Power		Compressor		Fan Motor FLA	HWG Pump FLA	Ext. Loop Pump FLA	Total Unit FLA	Min Circuit AMPS	Max Brkr HACR
		Volts	Phase	LRA	RLA						
ZS015	00	208/230	1	26.0	5.5	3.9	0.0	0.0	9.4	10.8	15
	01	208/230	1	26.0	5.5	3.9	0.5	0.0	9.9	11.3	15
	10	208/230	1	26.0	5.5	3.9	0.0	4.0	13.4	14.8	20
	11	208/230	1	26.0	5.5	3.9	0.5	4.0	13.9	15.3	20
	A	265	1	28.0	5.0	3.3	0.0	0.0	8.3	9.6	15
ZS017	00	208/230	1	33.0	6.6	3.9	0.0	0.0	10.5	12.2	15
	01	208/230	1	33.0	6.6	3.9	0.5	0.0	11.0	12.7	15
	10	208/230	1	33.0	6.6	3.9	0.0	4.0	14.5	16.2	20
	11	208/230	1	33.0	6.6	3.9	0.5	4.0	15.0	16.7	20
	A	265	1	28.0	5.6	3.3	0.0	0.0	8.9	10.3	15
ZS018	00	208/230	1	48.0	9.0	3.9	0.0	0.0	12.9	15.2	20
	01	208/230	1	48.0	9.0	3.9	0.5	0.0	13.4	15.7	25
	10	208/230	1	48.0	9.0	3.9	0.0	4.0	16.9	19.2	25
	11	208/230	1	48.0	9.0	3.9	0.5	4.0	17.4	19.7	25
	A	265	1	43.0	7.1	3.3	0.0	0.0	10.4	12.2	15
ZS024	00	208/230	1	58.3	13.5	3.9	0.0	0.0	17.4	20.8	30
	01	208/230	1	58.3	13.5	3.9	0.5	0.0	17.9	21.3	35
	10	208/230	1	58.3	13.5	3.9	0.0	4.0	21.4	24.8	35
	11	208/230	1	58.3	13.5	3.9	0.5	4.0	21.9	25.3	35
	20	208/230	3	55.4	7.1	3.9	0.0	0.0	11.0	12.8	20
	21	208/230	3	55.4	7.1	3.9	0.5	0.0	11.5	13.3	20
	30/35	460	3	28.0	3.5	3.3	0.0	0.0	6.8	7.7	15
	A	265	1	54.0	9.0	3.3	0.0	0.0	12.3	14.6	20
ZS030	00	208/230	1	64.0	12.8	3.9	0.0	0.0	16.7	19.9	30
	01	208/230	1	64.0	12.8	3.9	0.5	0.0	17.2	20.4	30
	10	208/230	1	64.0	12.8	3.9	0.0	4.0	20.7	23.9	35
	11	208/230	1	64.0	12.8	3.9	0.5	4.0	21.2	24.4	35
	20	208/230	3	58.0	8.3	3.9	0.0	0.0	12.2	14.3	20
	21	208/230	3	58.0	8.3	3.9	0.5	0.0	12.7	14.8	20
	30/35	460	3	28.0	5.1	3.3	0.0	0.0	8.4	9.7	15
	A	265	1	60.0	10.9	3.3	0.0	0.0	14.2	16.9	25
ZS036	00	208/230	1	79.0	16.7	3.9	0.0	0.0	20.6	24.8	40
	01	208/230	1	79.0	16.7	3.9	0.5	0.0	21.1	25.3	40
	10	208/230	1	79.0	16.7	3.9	0.0	4.0	24.6	28.8	45
	11	208/230	1	79.0	16.7	3.9	0.5	4.0	25.1	29.3	45
	20	208/230	3	73.0	10.4	3.9	0.0	0.0	14.3	16.9	25
	21	208/230	3	73.0	10.4	3.9	0.5	0.0	14.8	17.4	25
	30/35	460	3	38.0	5.8	3.3	0.0	0.0	9.1	10.6	15
	A	265	1	72.0	13.5	3.3	0.0	0.0	16.8	20.2	30

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, 460/60 = 432-504, 265/60 = 249-291
4. See Wiring Diagrams for proper 460V power.
*The external loop pump FLA is based on a maximum of three UP26-116F-230V pumps (1/2hp) for 042-072 and two pumps for 015-036.

Section 3: Unit Data

Unit Electrical Data : ZS042-072, ECM

Model	Voltage Code/ HWG Option	60 Hz Power		Compressor		Fan Motor FLA	HWG Pump FLA	Ext. Loop Pump FLA	Total Unit FLA	Min Circuit AMPS	Max Brkr HACR
		Volts	Phase	LRA	RLA						
ZS042	00	208/230	1	109.0	16.7	5.9	0.0	0.0	22.6	26.8	40
	01	208/230	1	109.0	16.7	5.9	0.5	0.0	23.1	27.3	40
	10	208/230	1	109.0	16.7	5.9	0.0	5.5	28.1	32.3	45
	11	208/230	1	109.0	16.7	5.9	0.5	5.5	28.6	32.8	45
	20	208/230	3	84.0	11.2	5.9	0.0	0.0	17.1	19.9	30
	21	208/230	3	84.0	11.2	5.9	0.5	0.0	17.6	20.4	30
	30/35	460	3	44.0	5.6	4.8	0.0	0.0	10.4	11.8	15
ZS048	00	208/230	1	130.0	19.6	5.9	0.0	0.0	25.5	30.4	50
	01	208/230	1	130.0	19.6	5.9	0.5	0.0	26.0	30.9	50
	10	208/230	1	130.0	19.6	5.9	0.0	5.5	31.0	35.9	50
	11	208/230	1	130.0	19.6	5.9	0.5	5.5	31.5	36.4	50
	20	208/230	3	83.1	13.7	5.9	0.0	0.0	19.6	23.0	35
	21	208/230	3	83.1	13.7	5.9	0.5	0.0	20.1	23.5	35
	30/35	460	3	41.0	6.2	4.8	0.0	0.0	11.0	12.6	15
ZS060	00	208/230	1	144.2	24.4	7.4	0.0	0.0	31.8	37.9	60
	01	208/230	1	144.2	24.4	7.4	0.5	0.0	32.3	38.4	60
	10	208/230	1	144.2	24.4	7.4	0.0	5.5	37.3	43.4	60
	11	208/230	1	144.2	24.4	7.4	0.5	5.5	37.8	43.9	60
	20	208/230	3	110.0	16.0	7.4	0.0	0.0	23.4	27.4	40
	21	208/230	3	110.0	16.0	7.4	0.5	0.0	23.9	27.9	40
	30/35	460	3	52.0	7.8	6.0	0.0	0.0	13.8	15.8	20
ZS072	00	208/230	1	178.0	30.8	7.4	0.0	0.0	38.2	45.9	70
	01	208/230	1	178.0	30.8	7.4	0.5	0.0	38.7	46.4	70
	10	208/230	1	178.0	30.8	7.4	0.0	5.5	43.7	51.4	80
	11	208/230	1	178.0	30.8	7.4	0.5	5.5	44.2	51.9	80
	20	208/230	3	136.0	19.6	7.4	0.0	0.0	27.0	31.9	50
	21	208/230	3	136.0	19.6	7.4	0.5	0.0	27.5	32.4	50
	30/35	460	3	66.1	8.2	6.0	0.0	0.0	14.2	16.3	20

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, 460/60 = 432-504, 265/60 = 249-291
4. See Wiring Diagrams for proper 460V power.

*The external loop pump FLA is based on a maximum of three UP26-116F-230V pumps (1/2hp) for 042-072 and two pumps for 015-036.

Section 3: Unit Data

Unit Electrical Data : ZT024-048, ECM

Model	Voltage Code/ HWG Option	60 Hz Power		Compressor		Fan Motor FLA	HWG Pump FLA	Ext. Loop Pump FLA	Total Unit FLA	Min Circuit AMPS	Max Brkr HACR
		Volts	Phase	LRA	RLA						
ZT024	00	208/230	1	58.3	11.7	3.9	0.0	0.0	15.6	18.5	30
	01	208/230	1	58.3	11.7	3.9	0.5	0.0	16.1	19.0	30
	10	208/230	1	58.3	11.7	3.9	0.0	4.0	19.6	22.5	30
	11	208/230	1	58.3	11.7	3.9	0.5	4.0	20.1	23.0	35
	20	208/230	3	55.4	6.5	3.9	0.0	0.0	10.4	12.0	15
	21	208/230	3	55.4	6.5	3.9	0.5	0.0	10.9	12.5	15
	30/35	460	3	28.0	3.5	3.3	0.0	0.0	6.8	7.7	15
	A	265	1	54.0	9.1	3.3	0.0	0.0	12.4	14.7	20
ZT030	00	208/230	1	73.0	13.1	3.9	0.0	0.0	17.0	20.3	30
	01	208/230	1	73.0	13.1	3.9	0.5	0.0	17.5	20.8	30
	10	208/230	1	73.0	13.1	3.9	0.0	4.0	21.0	24.3	35
	11	208/230	1	73.0	13.1	3.9	0.5	4.0	21.5	24.8	35
	20	208/230	3	58.0	8.7	3.9	0.0	0.0	12.6	14.8	20
	21	208/230	3	58.0	8.7	3.9	0.5	0.0	13.1	15.3	20
	30/35	460	3	28.0	4.3	3.3	0.0	0.0	7.6	8.7	15
	A	265	1	60.0	10.2	3.3	0.0	0.0	13.5	16.1	25
ZT036	00	208/230	1	83.0	15.6	3.9	0.0	0.0	19.5	23.4	35
	01	208/230	1	83.0	15.6	3.9	0.5	0.0	20.0	23.9	40
	10	208/230	1	83.0	15.6	3.9	0.0	4.0	23.5	27.4	40
	11	208/230	1	83.0	15.6	3.9	0.5	4.0	24.0	27.9	40
	20	208/230	3	73.0	11.6	3.9	0.0	0.0	15.5	18.4	30
	21	208/230	3	73.0	11.6	3.9	0.5	0.0	16.0	18.9	30
	30/35	460	3	38.0	5.7	3.3	0.0	0.0	9.0	10.4	15
	A	265	1	72.0	13.0	3.3	0.0	0.0	16.3	19.6	30
ZT042	00	208/230	1	96.0	17.9	5.9	0.0	0.0	23.8	28.3	45
	01	208/230	1	96.0	17.9	5.9	0.5	0.0	24.3	28.8	45
	10	208/230	1	96.0	17.9	5.9	0.0	5.5	29.3	33.8	50
	11	208/230	1	96.0	17.9	5.9	0.5	5.5	29.8	34.3	50
	20	208/230	3	88.0	14.2	5.9	0.0	0.0	20.1	23.7	35
	21	208/230	3	88.0	14.2	5.9	0.5	0.0	20.6	24.2	35
	30/35	460	3	44.0	6.2	4.8	0.0	0.0	11.0	12.6	15
ZT048	00	208/230	1	104.0	21.2	5.9	0.0	0.0	27.1	32.4	50
	01	208/230	1	104.0	21.2	5.9	0.5	0.0	27.6	32.9	50
	10	208/230	1	104.0	21.2	5.9	0.0	5.5	32.6	37.9	50
	11	208/230	1	104.0	21.2	5.9	0.5	5.5	33.1	38.4	60
	20	208/230	3	83.1	14.0	5.9	0.0	0.0	19.9	23.4	35
	21	208/230	3	83.1	14.0	5.9	0.5	0.0	20.4	23.9	35
	30/35	460	3	41.0	6.4	4.8	0.0	0.0	11.2	12.8	15
	A	265	1	109.7	16.0	4.8	0.0	0.0	20.8	24.8	40

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, 460/60 = 432-504, 265/60 = 249-291
4. See Wiring Diagrams for proper 460V power.
*The external loop pump FLA is based on a maximum of three UP26-116F-230V pumps (1/2hp) for 042-072 and two pumps for 024-036.

Section 3: Unit Data

Unit Electrical Data : ZT060-072, ECM

Model	Voltage Code/ HWG Option	60 Hz Power		Compressor		Fan Motor FLA	HWG Pump FLA	Ext. Loop Pump FLA	Total Unit FLA	Min Circuit AMPS	Max Brkr HACR
		Volts	Phase	LRA	RLA						
ZT060	00	208/230	1	152.9	27.1	7.4	0.0	0.0	34.5	41.3	60
	01	208/230	1	152.9	27.1	7.4	0.5	0.0	35.0	41.8	60
	10	208/230	1	152.9	27.1	7.4	0.0	5.5	40.0	46.8	70
	11	208/230	1	152.9	27.1	7.4	0.5	5.5	40.5	47.3	70
	20	208/230	3	110.0	16.5	7.4	0.0	0.0	23.9	28.0	45
	21	208/230	3	110.0	16.5	7.4	0.5	0.0	24.4	28.5	45
	30/35	460	3	52.0	7.2	6.0	0.0	0.0	13.2	15.0	20
	A	265	1	130.0	22.4	6.0	0.0	0.0	28.4	34.0	50
ZT072	00	208/230	1	179.2	29.7	7.4	0.0	0.0	37.1	44.5	70
	01	208/230	1	179.2	29.7	7.4	0.5	0.0	37.6	45.0	70
	10	208/230	1	179.2	29.7	7.4	0.0	5.5	42.6	50.0	80
	11	208/230	1	179.2	29.7	7.4	0.5	5.5	43.1	50.5	80
	20	208/230	3	136.0	17.6	7.4	0.0	0.0	25.0	29.4	45
	21	208/230	3	136.0	17.6	7.4	0.5	0.0	25.5	29.9	45
	30/35	460	3	66.1	8.5	6.0	0.0	0.0	14.5	16.6	25

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, 460/60 = 432-504, 265/60 = 249-291
4. See Wiring Diagrams for proper 460V power.

*The external loop pump FLA is based on a maximum of three UP26-116F-230V pumps (1/2hp) for 042-072 and two pumps for 024-036.

Section 3: Unit Data

Fan Chart : PSC Performance Data

*ZS Series PSC Fan Performance Data														
Model	Motor Speed[1]	Blower Size	Motor HP	CFM Nominal	Static Pressure (inches w.c.)											
					0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.60	0.70	0.80
006/009/012	H	6 x 9	1/16	350 (009/012[2])	410	400	395	380	370	360	340	320	290			
	M/H				375	370	360	355	340	325	310	295	275			
	M/L			275 (006)	330	320	310	300	290	280	260	240	210			
	L				285	275	265	250	240	230	210	195	180			
015/017	H	9 x 7T	1/4	650 (017)	995	935	910	865	840	800	775	745	710	630	575	
	M			525 (015)	730	710	685	685	675	650	625	610	585	520	460	285
	L				615	605	600	580	575	555	535	510	495	450	340	230
018	H	10 x 8T	1/4		1050	1045	1040	1040	1035	1030	1025	1015	1000	965	925	875
	M			600 (018)	690	685	675	665	650	645	635	620	600	575	525	460
	L				600	590	580	570	555	535	515	510	500	445	410	380
024/030	H	10 x 8T	1/3	1000 (030)	1110	1125	1135	1140	1140	1140	1140	1135	1130	1110	1090	1055
	M			750 (024)	780	780	780	785	785	785	780	775	770	750	700	660
	L				660	655	650	650	645	640	635	620	600	585	570	510
036	H	10 x 8	1/3	1100	1210	1215	1220	1215	1210	1205	1195	1195	1190	1165	1135	1100
	M				865	870	870	875	875	875	870	865	860	845	825	790
	L				685	700	710	710	710	705	700	700	695	670	630	595
042	H	10 x 8	1/2	1400	1620	1620	1615	1610	1605	1600	1595	1580	1565	1520	1465	1405
	M				1000	1100	1015	1018	1020	1023	1025	1028	1030	1040	1025	990
	L				850	860	865	870	875	875	875	873	870	860	850	820
048	H	10 x 8	3/4		2090	2070	2050	2035	2015	1990	1965	1940	1910	1855	1790	1710
	M			1500	1740	1745	1750	1740	1730	1720	1710	1695	1675	1645	1600	1535
	L				1400	1410	1420	1430	1435	1440	1440	1440	1440	1420	1390	1330
060/072	H	11 x 10	1	2200 (072)	2560	2540	2515	2505	2495	2470	2445	2420	2390	2350	2290	2210
	M			1900 (060)	2000	2000	1995	1998	2000	2005	2010	2005	1995	1940	1935	1885
	L				1590	1605	1620	1630	1640	1645	1645	1645	1645	1640	1625	1600

Notes:

1. PSC Blower motors come with 3 or 4 speed taps. To change the speed of the motor to a higher or lower speed, remove the electric box cover that is mounted on the blower. Locate the label on the motor to identify the wire color for each speed. Remove the wire nut on the existing speed and replace with the wire of selected speed.
2. Running the ZS012 at the static/SCFM points highlighted in gray, is not recommended.

3. Max ESP and speed settings for ZS models with external electric heat is shown below. Exceeding the Max ESP may result in nuisance trips of the electric heat. Thermal limits are rated at 100,000 cycles.

*ZS Series-Electric Heat Limitations					
Model	Electric Heater	Speed			Max Static
		High	Med	Low	
018	AXCH051MB		X		0.7
		X			0.8
024/030	AXCH051MB		X		0.7
		X			0.8
	AXCH101MB	X			0.8
036	AXCH051MB		X		0.8
		X			0.9
	AXCH101MB	X			0.8
042	AXCH051MB	X	X	X	0.9
	AXCH101MB			X	0.7
			X		0.8
		X			0.9
048	AXCH101MB	X	X	X	0.9
	AXCH151MB	X	X		0.9
060/072	AXCH101LB	X	X	X	1.0
	AXCH151LB		X	X	0.9
		X			1.1

Section 3: Unit Data

Fan Chart : ECM Performance Data

***ZS/*ZT Series ECM Fan Performance Data: One & Two-Stage Compressor Units**

Model	Max ESP in. w.c.[2]	Program[3]	Heating Mode		Cooling Mode		Dehumidification Mode		Fan Only	AUX/ EMG Heat[4]	DIP Switch Settings							
			1st	2nd	1st	2nd	1st	2nd			S1	S2	S3	S4	S5	S6	S7	S8
015	1.0	A	-	620	-	620	-	490	295	N/A	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		B	**-**	**500**	**-**	**500**	**-**	**430**	**260**		**ON**	**OFF**	**OFF**	**OFF**	**ON**	**OFF**	**OFF**	**OFF**
		C	-	430	-	430	-		230		OFF	ON	OFF	OFF	OFF	ON	OFF	OFF
		D	-	360	-	370	-		200		ON	ON	OFF	OFF	ON	ON	OFF	OFF
017	1.0	A	-	670	-	690	-	600	355	N/A	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
		B	**-**	**620**	**-**	**620**	**-**	**490**	**295**		**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**
		C	-	500	-	500	-		260		ON	OFF	OFF	OFF	ON	OFF	OFF	OFF
		D	-	430	-	430	-		230		OFF	ON	OFF	OFF	OFF	ON	OFF	OFF
018	1.0	A	-	680	-	680	-	580	370	990	OFF	ON	ON	OFF	OFF	ON	OFF	OFF
		B	**-**	**630**	**-**	**630**	**-**	**520**	**340**	**900**	**OFF**	**ON**	**OFF**	**OFF**	**OFF**	**ON**	**OFF**	**OFF**
		C	-	560	-	570	-	480	290	800	ON	ON	ON	OFF	ON	ON	OFF	OFF
		D	-	500	-	510	-	430	260	720	ON	ON	OFF	OFF	ON	ON	OFF	OFF
024	1.1	A	700	930	740	930	610	800	500	1210	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
		B	**650**	**850**	**650**	**860**	**570**	**740**	**460**	**1100**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**
		C	600	780	620	780	520	690	400	990	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
		D	560	730	570	730	480	640	390	920	ON	OFF	ON	OFF	ON	OFF	OFF	OFF
030	1.1	A	920	1240	820	1060	730	960	610	1230	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		B	**840**	**1070**	**750**	**960**	**660**	**870**	**570**	**1130**	**OFF**	**OFF**	**OFF**	**ON**	**OFF**	**OFF**	**OFF**	**OFF**
		C	770	1050	680	830	610	780	480	1050	ON	OFF	ON	OFF	ON	OFF	OFF	OFF
		D	720	960	630	740			430	950	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF
036	0.9	A	1080	1380	990	1390	880	1190	850	1490	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		B	**980**	**1230**	**910**	**1260**	**870**	**1090**	**760**	**1450**	**ON**	**OFF**	**OFF**	**OFF**	**ON**	**OFF**	**OFF**	**OFF**
		C	870	1090	840	1100	830	960	670	1420	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF
		D	840	1020	820	960			550	1380	ON	ON	OFF	OFF	ON	ON	OFF	OFF
042	1.1	A	1120	1430	1330	1570	970	1290	740	1580	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF
		B	**1010**	**1270**	**1200**	**1410**	**870**	**1150**	**660**	**1430**	**ON**	**OFF**	**OFF**	**ON**	**ON**	**OFF**	**OFF**	**OFF**
		C	910	1140	1090	1270	810	1050	560	1250	ON	ON	OFF	OFF	ON	ON	OFF	OFF
		D	820	1030	1000	1130			470	1130	ON	ON	OFF	ON	ON	ON	OFF	OFF
048	1.1	A	1490	1900	1660	1880	1150	1550	890	1950	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		B	**1230**	**1580**	**1510**	**1710**	**1050**	**1420**	**810**	**1760**	**ON**	**OFF**	**ON**	**OFF**	**ON**	**OFF**	**OFF**	**OFF**
		C	1120	1420	1390	1580	950	1280	730	1600	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF
		D	1000	1260	1270	1420			650	1400	ON	ON	ON	OFF	ON	ON	OFF	OFF
060	1.1	A	1810	2290	1660	2090	1390	1750	1010	2410	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
		B	**1560**	**2000**	**1500**	**1900**	**1260**	**1590**	**910**	**2220**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**
		C	1470	1870	1390	1730			810	2000	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
		D	1420	1790	1310	1650			770	1990	ON	OFF	ON	OFF	ON	OFF	OFF	OFF
072	1.1	A	N/A															
		B	**1900**	**2200**	**1820**	**2230**	**1530**	**1870**	**1110**	**2430**	**OFF**	**OFF**	**ON**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**
		C	1760	2030	1650	2000			1020	2180	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		D	1590	1840	1480	1810			910	1960	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF

Notes:

1. Program **B (Bold Type)** is factory settings and rated CFM. CFM is controlled within 5% up to the Max ESP.

2. Max ESP includes allowance for wet coil and NO FILTER

3. Power must be off to the unit for at least 3 seconds before the ECM motor will recognize a program change.

4. Max ESP for ZS018 through ZS/ZT036 models with external electric heat is 0.8 in. w.c.; for ZS/ZT048 models it is 0.9 in. w.c.; and for ZS/ZT060 and ZS/ZT072 it is 1.1 in. w.c. Exceeding the Max ESP may result in nuisance trips of the electric heat. Thermal limits are rated at 100,000 cycles.

***ZS/*ZT Series Dehumidification Mode Options**

DIP Switch		Mode	Operation
S9	S10		
ON	OFF	Normal	Dehumidification mode disabled (Normal Htg/Clg CFM)-- Factory setting.
OFF	ON	ODD	On Demand Dehumidification mode (humidistat input at terminal ODD)-- Humidistat required.
OFF	OFF	Constant Dehum	Constant Dehumidification mode (always uses dehum CFM for cooling and normal CFM for heating)--No humidistat required.
ON	ON	Not Used	Not an applicable selection.

Notes:

1. To enter dehumidification mode, ODD input should be 0 VAC; for normal cooling CFM, ODD input should be 24 VAC.

2. Heating CFM is not affected by dehumidification mode. When in dehumidification mode, cooling CFM is 85% of normal CFM.

Filter Performance

The blower performance data in the ECM Blower Performance table is WITHOUT FILTER. To determine the approximate blower performance WITH FILTER apply the filter pressure drop value for the filter being used or calculate the pressure drop as follows:

Below is typical filter performance data and should only be used as a guideline. Actual performance may vary between manufacturers.

Model	Return Size		
	Height (in.)	Width (in.)	Area (ft^2)
024	26	21	3.8
036	28	26	5.1
048			
060	32	26	5.8
072			
Filter Type	Thickness (in.)	Rated Velocity (fpm)	Initial Resistance (in. w.c.)
MERV 8	1	300	0.21
MERV 11	2	500	0.24
MERV 13	3	500	0.43

To calculate filter pressure drop:

$$Filter\ \Delta P_s = \left[\frac{\left[\frac{CFM}{Area}\right]}{Rated\ Velocity}\right] X\ Initial\ Resistance$$

Applying Filter Pressure Drop to Determine Total ESP

To determine the Total ESP of a unit with the filter in place, follow the steps below:

1. Select the filter type and determine Rated Velocity and Initial Resistance
2. For the model being considered determine Max ESP, CFM and Return Area
3. Determine Filter pressure drop (ΔPs) using the equation above
4. Measure (or calculate) the ESP without filter in place
5. Calculate Total ESP = Measured ESP + Filter Pressure Drop
6. Total ESP should be less than or equal to Max ESP

Example:
For an YT060 at an air flow of 1960 CFM calculate the filter pressure drop with a 2" MERV 11 filter and determine Total ESP and compare to Max ESP.

CFM = 1960
Area = 5.8 ft2
Rated Velocity = 500 fpm
Initial Resistance = 0.24 in.w.c.
Measured ESP without filter = 0.53

1. 1960 CFM ÷ 5.8 ft2 = 338 fpm
2. 338 fpm ÷ 500 fpm = 0.676
3. 0.676 x 0.24 in.w.c. = 0.16 in.w.c. = Filter Pressure Drop
4. Total ESP is 0.53 + 0.16 = 0.69 in.w.c. which is less than the 1.2 in.w.c. Max ESP

Example:
For an YT036 at an air flow of 1420 CFM calculate the filter pressure drop with a 2" MERV 13 filter and determine Total ESP and compare to Max ESP.

CFM = 1420
Area = 5.1 ft2
Rated Velocity = 500 fpm
Initial Resistance = 0.43 in.w.c.
Measured ESP without filter = 0.53

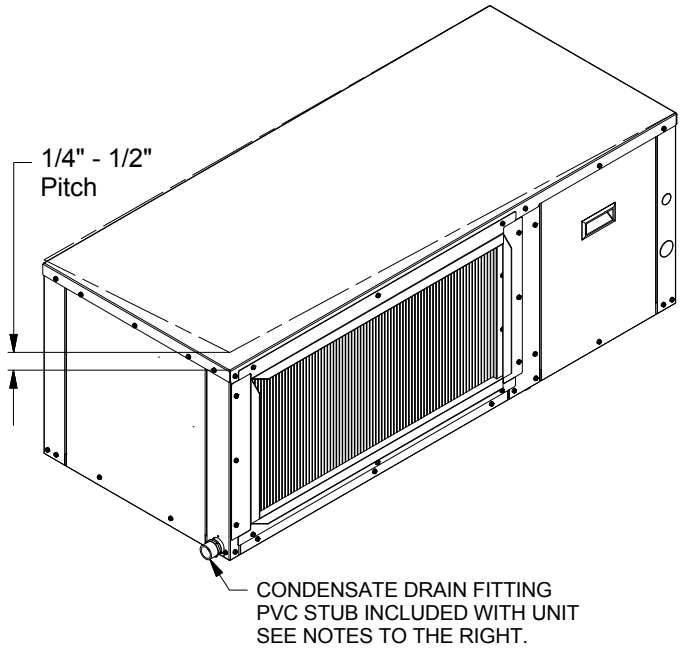
1. 1420 CFM ÷ 5.1 ft2 = 278 fpm
2. 278 fpm ÷ 500 fpm = 0.556
3. 0.556 x 0.43 in.w.c. = 0.24 in.w.c. = Filter Pressure Drop
4. Total ESP is 0.36 + 0.24 = 0.6 in.w.c. which is less than the 1.1 in.w.c. Max ESP

Section 4: General Unit Assembly

Unit Pitch - Proper Drainage

Condensate Drain Notes:

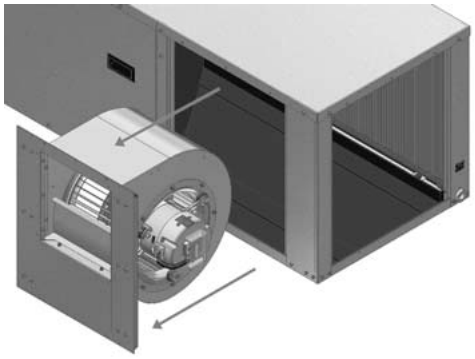
- Unit **MUST** pitch towards the condensate drain for proper drainage.
- Confirm that condensate drains properly from unit and that the amount of pitch does not cause condensate leaks inside of the unit.
- Units are equipped with overflow protection.
- Be sure to leave adequate height for the P-Trap in applications where clearance could be an issue.
- In some high humidity applications you may need to apply insulative tape around condensate drain fitting.

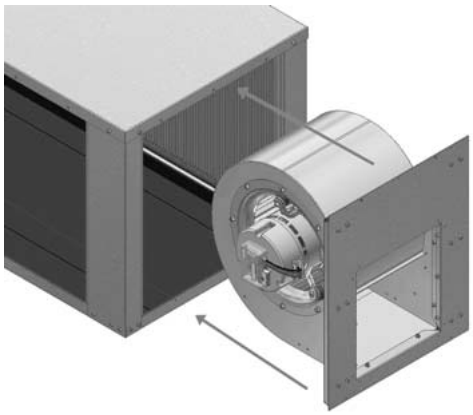


Field Selectable Discharge Air Pattern

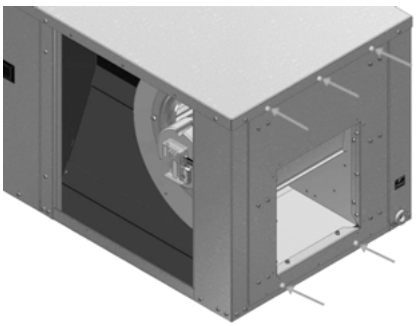
Retrofitting Unit Discharge from Side to End Discharge
You will need a 5/16 hex driver to complete what is described below. To ensure that you do not strip out screws use a manual driver.

1. Remove the end door from unit by removing (3) screws.
2. Disconnect the unit wiring harness from the motor.
3. On the discharge door asm. remove (5) screws (3 near the top, 2 near the bottom) then remove discharge door asm from the unit.
4. Carefully rotate the discharge door asm 180 deg. and place the door into the opening on the end. This will insure that when configured as end discharge that the motor is not on the air coil side and can be serviced via the side door.

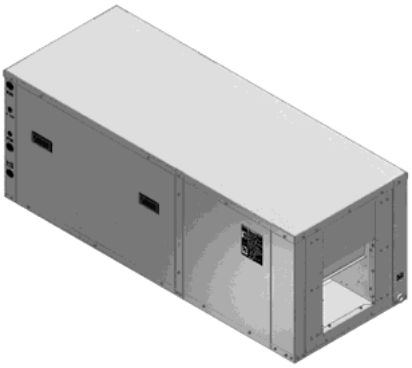




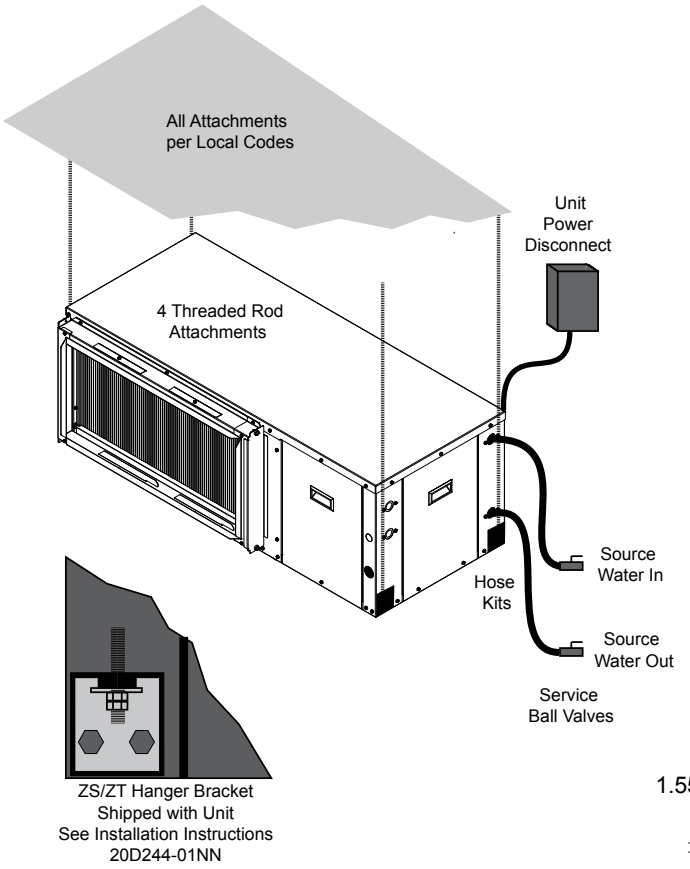
5. Reassemble the discharge door asm using the (5) screws from before, (3 near the top, 2 near the bottom).



6. Be sure to securely re-connect the motor wiring to the motor through the side door opening. Once this has been completed reassemble the side door using the (3) screws from before, (1 near the top, 2 near the bottom).



Unit Suspension



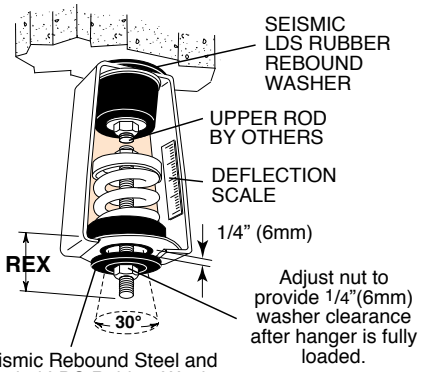
Note: Hanger shown in the preferred locations, but may be assembled to side of the unit as necessary.

Seismic Hanger Bracket

PC30N (Mason Industries) -- Available from mason-industries.com

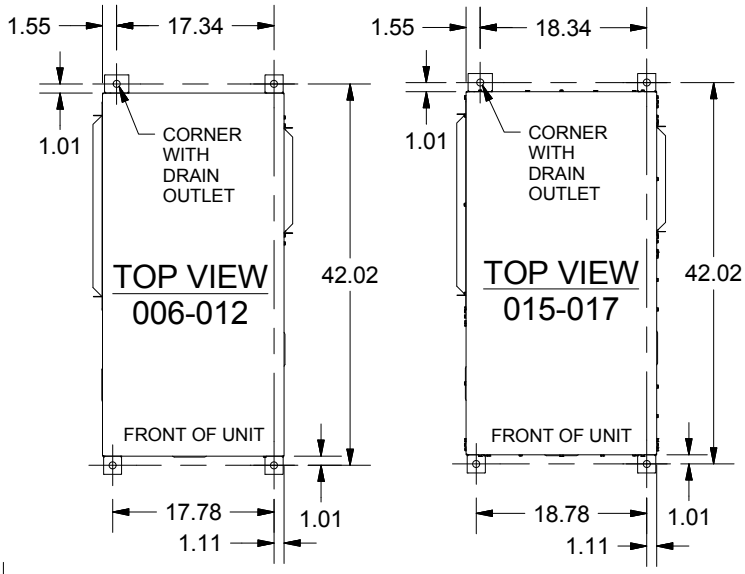
TYPE 30N PRECOMPRESSED & SEISMIC RESTRAINT

Install with hanger box snug to 1/4" (6mm) Seismic LDS Rubber Washer, so washer is tight to overhead surface. Upper hanger element deflects under load, leaving space on top. Washer cushions upward seismic travel.

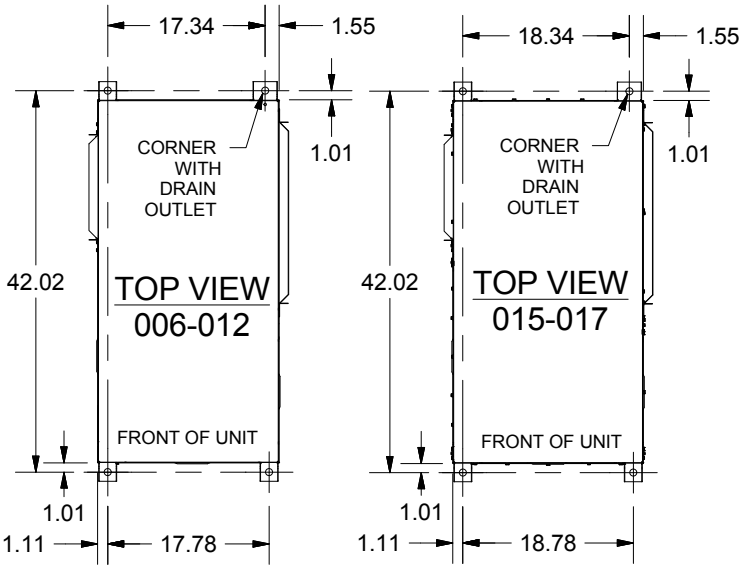


Seismic Rebound Steel and Bonded LDS Rubber Washer holds precompression and limits upward seismic motion. Hangers are precompressed to rated load or assigned load as required. Scale indicates deflection.

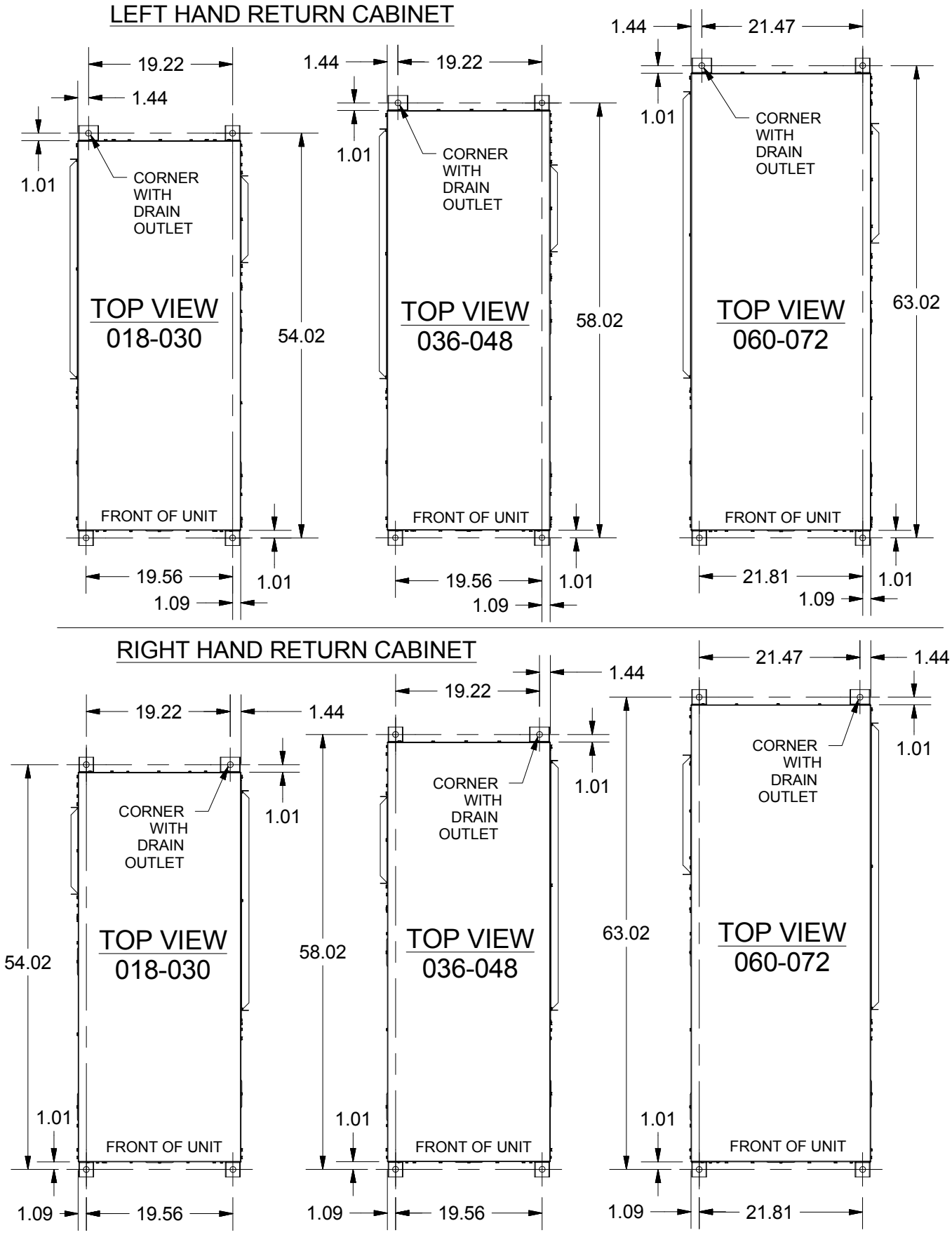
LEFT HAND RETURN CABINET



RIGHT HAND RETURN CABINET

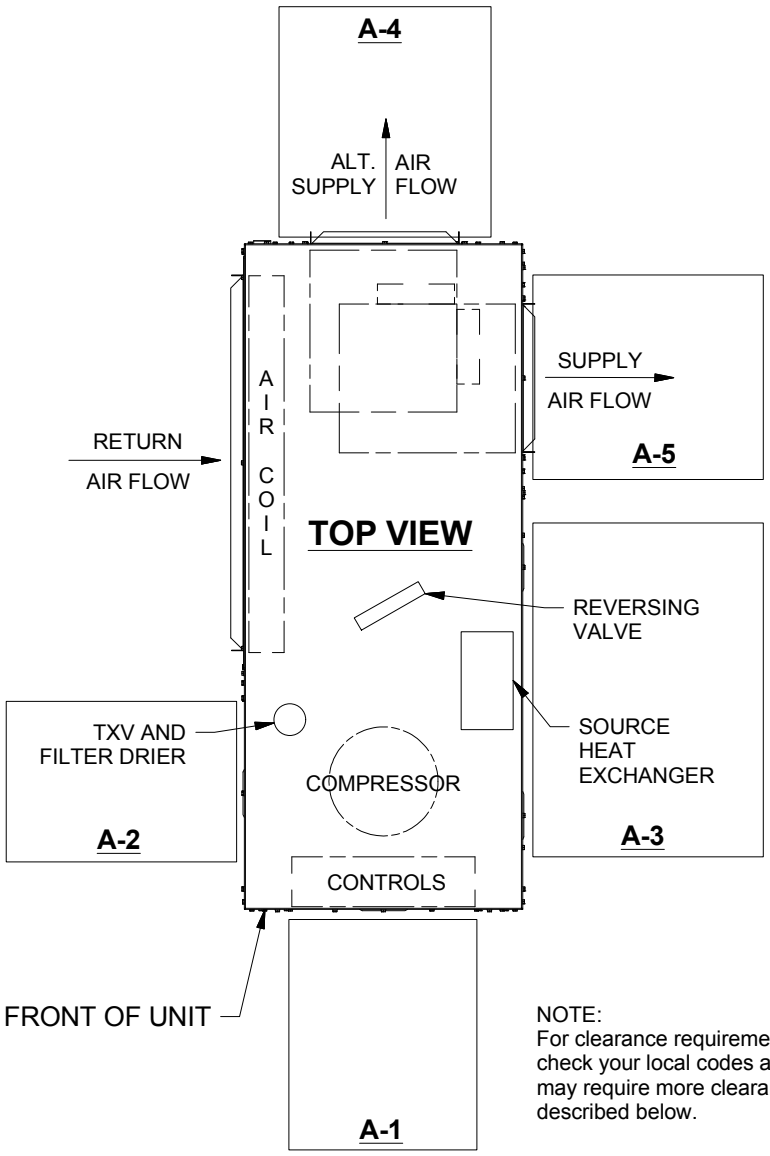


Unit Suspension



Note: Hanger shown in the preferred locations, but may be assembled to side of the unit as necessary.

Service Access Clearance



NOTE:
For clearance requirements be sure to check your local codes as they may require more clearance than what is described below.

LEGEND:

A-1: This is the main controls and compressor access panel. Requires 2 feet of clearance.

A-2: This is the txv-filter drier access area. Be sure to leave adequate clearance for any future maintenance if needed.

A-3: This is the source heat exchanger reversing valve access area. Be sure to leave adequate clearance for any future maintenance if needed.

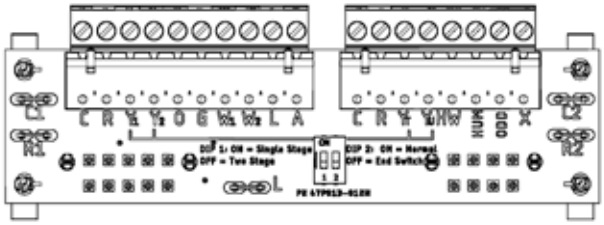
A-4: This is the blower motor access when the unit is configured as side discharge. This is the configutation that the unit is shipped in. When side discharge then this access area requires 2 feet of clearance.

ONLY FOR ALT. SUPPLY AIR

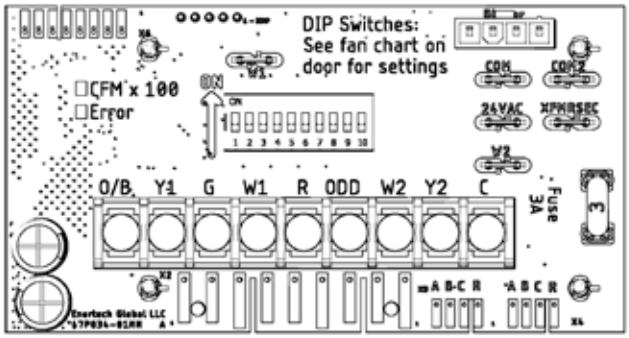
A-5: This is the blower motor access when the unit is configured as back discharge. When back discharge then this access area requires 2 feet of clearance.

Section 5: Controls

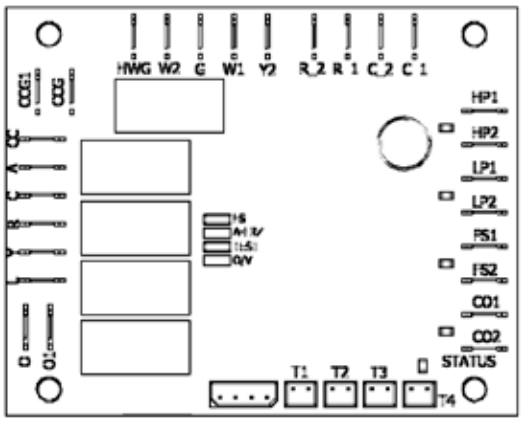
Thermostat Board



ECM Board



Lockout Board



Features

Enertech Global geothermal heat pump controls leverage a modular approach for controlling heat pump operation. The control system uses a combination of printed circuit boards, depending upon the features equipped in a particular unit. This approach simplifies installation and troubleshooting, and eliminates features that are not applicable for some units.

Microprocessor Features and Operations

Enertech Global geothermal heat pump controls provide a unique modular approach for controlling heat pump operation. The control system uses one, two, or three printed circuit boards, depending upon the features of a particular unit. This approach simplifies installation and troubleshooting, and eliminates features that are not applicable for some units.

A removable low voltage terminal strip provides the necessary terminals for thermostat connections. Some models offer an additional removable terminal strip for accessory wiring connections.

A microprocessor-based printed circuit board controls the inputs to the unit as well as outputs for status mode, faults, and diagnostics. A status LED and LED(s) for each fault are provided for diagnostics.

Startup/Random Start

The unit will not operate until all the inputs and safety controls are checked for normal conditions. A ten to twenty second random start delay is added at power up and whenever a Y1 call is received. This avoids multiple units from being energized at the same time after power loss or other situations.

Short Cycle Protection (ASC)

A built-in five minute anti-short cycle (ASC) timer provides short cycle protection of the compressor.

Component Sequencing Delays

Components are sequenced and delayed for optimum space conditioning performance and to make any startup noise less noticeable. There is a short delay between the blower motor and the compressor start up.

Test Mode

The microprocessor control allows the technician to shorten timing delays for faster diagnostics by removing the TEST jumper located on the lockout board. It should be reinstalled for normal operation after testing. The status LED will not be illuminated during the TEST mode.

Airflow Monitor

When provided, an LED on the ECM fan control board flashes one time per 100 CFM to indicate airflow during fan operation.

Resistance Heat Control

The resistance heat control module contains the appropriate high-voltage control relays. Low voltage control signals from the lockout board energize the relays in the resistance heat module to engage backup resistance heat when necessary. The lockout board offers a pass through W1 (1st Stage) and a relay output for W2 (2nd Stage). See staging in sequence of operation section.

Loop Pump Circuit Breakers

The loop pump(s) and HWG pump are protected by control box mounted circuit breakers for easy wiring of pumps during installation. Circuit breakers eliminate the need to replace fuses.

Safety Controls

The lockout board receives separate signals for high pressure, low pressure, low load heat exchanger freeze, source heat exchanger freeze, condensate overflow, and hot gas temperature limit faults. Upon a continuous 30-second measurement of all faults, except the high pressure fault, the compressor operation is suspended. The high pressure fault is immediate. The combination of LED(s) indicate each fault. Once the unit is locked out (see fault retry below), an output of 24VAC is energized on the “L” terminal for remote indication of a fault at the thermostat.

Low Pressure-LP: If the low pressure switch is open continuously for 30 seconds, the compressor operation will be interrupted, and the control will go into fault retry mode. At startup, the low pressure switch is not monitored for 30 seconds to avoid nuisance faults. (If the low pressure switch is open before startup then the unit will not start upon receiving an Y1 call and will lock out instead.)

High Pressure-HP: If the high pressure switch opens, the compressor operation will be interrupted, and the control will go into fault retry mode. There is no delay between the time the switch opens and the board entering into fault retry mode. There is also no delay of switch monitoring at startup. (If the high pressure switch is open before startup then the unit will not start upon receiving an Y1 call and will lock out instead.)

Electronic Condensate Overflow Protection (CO)
(If equipped - Packaged Units Only)
The control board utilizes an impedance sensing liquid sensor at the top of the drain pan. When water touches the sensor, CO fault occurs. If the fault is present for 30 continuous seconds, the lockout board indicates a condensate overflow fault has occurred.

If water touches the condensate overflow sensor for 30 continuous seconds, the compressor operation will be interrupted. The control will go into fault retry mode. There is no delay of switch monitoring at startup

Flow Switch - FS (If equipped - brazed plate only)
A flow switch ensures the source water maintains the minimum required flow rate. This ensures that pumps are working and water connections remain intact. The flow switch will also trip when the source water begins to freeze, providing additional protection. A Flow Switch is utilized on units with a BPHE source coil. A Flow Switch is not included on units utilizing a COAX source coil.

Load Heat Exchanger Freeze-T1
(If equipped - units with coaxial heat exchangers)
When in cooling mode, if the heat exchanger temperature is lower than 30°F for 30 continuous seconds, the compressor operation will be interrupted, and the control will go into fault retry mode. This sensor is located on the refrigerant line in between the heat exchanger and TXV (refrigerant inlet of heat exchanger in cooling mode).

Source Heat Exchanger Freeze -T4
(If equipped - units with coaxial heat exchangers)
When in heating mode, if the heat exchanger is lower than setpoint for 30 continuous seconds, the compressor operation will be interrupted, and the control will go into fault retry mode. The setpoint is 12°F for closed loop (A-FRZ jumper removed) and 30°F (A-FRZ jumper installed) for open loop. At startup, the flow sensor is not monitored for 30 seconds to avoid nuisance faults. This sensor is located on the refrigerant line in between the source heat exchanger and TXV (refrigerant inlet of heat exchanger in heating mode).

Hot Gas Line Temperature limit (T2>220°F)
When T2 is >220°F for 30 continuous seconds, the compressor operation will be interrupted. The control will go into fault retry mode.

Temperature Sensor Operating Range	
Sensor's Name	Range(°F)
T1	10 – 220
T2	20 – 257
T3	20 – 220
T4	10 – 220

Temperature vs Resistance Characteristics of Sensor				
Temp. (°F)	Rst. (KΩ)		Temp. (°F)	Rst. (KΩ)
10	46.95		130	3.60
15	41.39		200	1.16
20	36.50		220	0.87
30	28.61		250	0.59
77	10.00		257	0.54

Over/Under Voltage Protection
The lockout board protects the compressor from operating when an over/under voltage condition exists. The control monitors secondary voltage (24VAC) to determine an over/under voltage condition is occurring on the primary side of the transformer. For example, if the secondary voltage is 18VAC, the primary voltage for a 240V unit would be approximately 180V which is below the minimum voltage (197V) recommended by the compressor manufacturer. Under voltage (<18VAC) causes the compressor to disengage and restart when the voltage returns to >20VAC. Over voltage (>31VAC) causes the compressor to disengage and restart when the voltage returns to <29VAC.

When an O/U Voltage condition occurs, the board will initiate a fault, shut down the compressor, and start the five minute ASC period. All four fault LEDs will flash (HP + LP + FS + CO) and the thermostat "Call For Service" indicator will be illuminated. This feature is self-resetting and never retries or locks out. If voltage returns to normal range normal operation will resume if/when the ASC period is over. When normal operation is restored the four fault LED's will stop flashing and the "Call For Service" indicator will turn off.

Fault Retry
All faults (except O/U Voltage) are retried twice before finally locking the unit out. The fault retry feature is designed to prevent nuisance service calls. There is an anti-short cycle (ASC) period (5 min.) between fault retries. On the third fault within 30 minutes, the board will go into lockout mode and the "Call For Service" indicator on the thermostat will illuminate.

Intelligent Lockout Reset
If the thermostat is powered off for one minute then back on (soft reset), the board will reset and the last fault will be stored in memory for ease of troubleshooting. If power is interrupted to the board, the fault memory will be cleared.

Lockout with Emergency Heat
While in lockout mode, if the thermostat is calling for auxiliary heat (W1), emergency heat mode will energize. W2 is energized two minutes after W1 is energized.

Hot Water Generator (HWG) Pump Control
(If equipped with Desuperheater)
Controls check for HWG temperature (T3) and hot gas (compressor discharge) line (HGT) temperature (T2). The hot water generator pump is de-energized when the leaving water temperature (T3) is above 130°F or when the compressor discharge line (T2) is cooler than leaving water temperature (T3). Also when the hot gas line temperature (T2) is higher than 220°F, the HWG pump will be de-energized. All of the issues above will break the circuit of the HWG pump (via the HWG signal from the lockout board) and will not lockout the compressor except when T2>220°F. Units without a HWG also do not have sensors T2 and T3. The control ignores T2 and T3 and disables Faults 15 and 16, Sensor BAD.

Diagnostics
The lockout board includes five LEDs (Green-HP, Orange-LP, Red-FS, Yellow-CO, Green-Status) for fast and simple control board diagnosis. Refer to the LED Identification table for LED function.

Section 5: Controls

LED Identification Table

LOCKOUT BOARD LED IDENTIFICATION & L TERMINAL STATUS						
CONDITION	GREEN HP	ORANGE LP	RED FS	YELLOW CO	STATUS GREEN	L TERMINAL[1]
NORMAL MODE					FLASH	
TEST MODE[2]						
HP FAULT	FLASH				FLASH	
HP LOCKOUT	ON				FLASH	ON
LP FAULT		FLASH			FLASH	
LP LOCKOUT		ON			FLASH	ON
SOURCE COIL FRZ/ WF FAULT (T4/FS)[3]			FLASH		FLASH	
SOURCE COIL FRZ/ WF LOCKOUT (T4/FS)[3]			ON		FLASH	ON
LOAD/ AIR COIL FRZ FAULT (T1)[4,5]		FLASH	FLASH		FLASH	
LOAD/ AIR COIL FRZ LOCKOUT (T1)[4,5]		ON	ON		FLASH	ON
CO FAULT[5]				FLASH	FLASH	
CO LOCKOUT[5]				ON	FLASH	ON
O/ U VOLTAGE	FLASH	FLASH	FLASH	FLASH	FLASH	ON
T1 FAULTY[5,6]	FLASH			ON	FLASH	FLASH
T2 FAULTY[5,6]		FLASH		ON	FLASH	FLASH
T3 FAULTY[5,6]			FLASH	ON	FLASH	FLASH
T4 FAULTY[5,6]		ON		FLASH	FLASH	FLASH
T1 & T4 SWAPPED[7]	ON			ON		FLASH
HOT GAS LINE FAULT > 220˚F (T2)[8]	FLASH		FLASH	ON	FLASH	
HOT GAS LINE LOCKOUT > 220˚F (T2)[8]	ON		ON	ON	FLASH	ON

LOCKOUT BOARD JUMPERS		
JUMPER	INSTALLED	REMOVED
FS	T1 & T4 MONITORED FOR FLOW- 'FS' TERMINALS IGNORED	FS' TERMINALS USED FOR FLOW SWITCH- T1 & T4 IGNORED
A-FRZ	OPEN LOOP MODE- 30˚F SETTING FOR T4	CLOSED LOOP MODE- 12˚F SETTING FOR T4
TEST	OPERATES IN NORMAL MODE WITH STANDARD DELAYS	OPERATES IN TEST MODE WITH DELAYS SPED UP
O/ V	FEATURE IS ACTIVE	FEATURE IS INACTIVE

NOTES:

1. THE 'L' TERMINAL CONTROLS A FAULT LED AT THE THERMOSTAT OR DRIVES AN AUXILIARY FAULT RELAY.
2. WHEN THE TEST JUMPER IS PULLED, GREEN STATUS LED WILL BE OFF.
3. DEPENDING UPON MODEL, THE SOURCE COIL FRZ/ WATER FLOW FAULT OR LOCKOUT CAN BE AN INTERNAL OR EXTERNAL FLOW SWITCH (FS), OR A SENSOR (T4) LOCATED BETWEEEN THE TXV AND SOURCE COIL.
4. THE LOAD/ AIR COIL FREEZE PROTECTION SENSOR IS LOCATED BETWEEN THE TXV AND LOAD/ AIR COIL.
5. NOT ALL MODELS HAVE THIS FEATURE.
6. THIS FAULT INDICATES A BAD SENSOR (OPEN, SHORTED, OR DISCONNECTED).
7. THIS CAN ONLY BE CHECKED WHILE IN TEST MODE.
8. HOT GAS LINE IS TOO HOT.

Lockout Board Jumper Selection

The lockout board includes four jumpers for field selection of various board features.

Load/Source Temperature Sensing (FS)

When the FS jumper is installed (T1 and T4 monitored, FS terminals ignored), the board operates in the load and source heat exchanger temperature sensing mode. When the FS jumper is removed, the board monitors the flow switch to ensure adequate flow through the heat exchanger. **Factory set, NOT field selectable.**

Anti-Freeze (A-FRZ)

When the jumper is installed, the board operates in open loop mode. The setpoint for the source heat exchanger freeze sensor is 30°F. When the A-FRZ jumper is removed, the board operates in the closed loop mode. The setpoint for the source heat exchanger freeze sensor is 12°F.

Test Mode (TEST)

When the TEST jumper is installed, the board operates in the normal mode. When the jumper is removed, the board operates in test mode, which speeds up all delays for easier troubleshooting. While in the test mode the T1 & T4 sensors will be checked for the proper location based on temperature. Sensors are swapped if T1>T4 in cooling or T1<T4 in heating. This fault will only show up in the test mode. When service is complete, the jumper must be re-installed in order to make sure the unit operates with normal sequencing delays. While the test jumper is removed, the status light (bottom green) will remain off. If the test jumper is not re-installed the control will revert to normal mode after one (1) hour, green status light blinking.

Over/Under Voltage Disable (O/U)

When the O/U jumper is installed, the over/under voltage feature is active. When the jumper is removed, the over/under voltage feature is disabled. On rare occasions, variations in voltage will be outside the range of the over/under voltage feature, which may require removal of the jumper. However, removal of the jumper could cause the unit to run under adverse conditions, and therefore should not be removed without contacting technical services. An over/under voltage condition could cause premature component failure or damage to the unit controls. Any condition causing this fault must be thoroughly investigated before taking any action regarding the jumper removal.

Likely causes of an over/under voltage condition include power company transformer selection, insufficient entrance wire sizing, defective breaker panel, incorrect 24VAC transformer tap (unit control box), or other power-related issues.

Thermostat Board DIP Switch Selection

Verify that the switches are set correctly prior to starting the unit with the following options:

DIP #1 - Single Speed or Two Stage

- ON = Single Stage
- OFF = Two Stage (factory default)

Note: Setting this DIP switch ON connects Y1 to Y2 and provides full load capacity for single speed systems, or for two-stage systems that are used in single-stage mode (e.g. with a single stage buffer tank controller).

DIP #2 - Water Valve End Switch (terminals YT & YU)

- ON = No end switch (YT is jumpered to YU)
- OFF = Water valve has end switch (see wiring diagram)

Sequence of Operation

The description below is based on Water-to- Air Units, Two-Stage Compressor, with ECM Fan. Timings assume the ASC timer is expired. If the ASC timer is not expired the ECM fan will start immediately but the Accessory, compressor, and loop pump operation do not start until the ASC timer is expired.

Heating 1st Stage, (Y1, G) Two-Stage Units

The ECM fan immediately ramps up to 75% of 1st stage airflow (CFM) level (based on DIP switch settings), the Accessory (A) terminal output is energized after the random start timer (10s-20s) expires then first stage compressor and the loop pump(s) are energized 10 seconds after A. The ECM fan adjusts to 100% (of 1st stage operation) CFM level 90 seconds after the “Y1” input.

Heating 2nd Stage, (Y1, Y2, G) Two-Stage Units

The ECM fan adjusts to 2nd stage airflow (CFM) level (based on DIP switch settings), and the compressor full load solenoid is energized.

Heating 3rd Stage, (Y1, Y2, W1, G) Two-Stage Units

(If equipped with electric heat)

When provided, the ECM fan remains at 100% of 2nd stage airflow (CFM) level (based on DIP switch settings), and the first stage of electric resistance heat is energized. Second stage of electric resistance heat (W2) is energized ten minutes after first stage electric resistance heat (W1) is energized. (W2 is only available with 10kW, 15kW and 20kW electric heaters).

Emergency Heat (W1, G)

The fan is started immediately at 2nd stage airflow (CFM) level (based on DIP switch settings), and the electric resistance heat is energized. Second stage of electric heat (W2) is energized two minutes after first stage electric heat (W1) is energized. (W2 is only available with 10kW, 15kW and 20kW electric heaters)

Cooling Operation

The reversing valve is energized for cooling operation. Terminal “O” from the thermostat is connected to the reversing valve solenoid.

Cooling 1st stage (Y1, 0, G) Two-Stage Units

The ECM fan immediately ramps up to 75% of 1st stage airflow (CFM) level (based on DIP switch settings), the Accessory (A) terminal output is energized after the random start timer (10s-20s) expires then first stage compressor and the loop pump(s) are energized 10 seconds after A. The ECM fan adjusts to 100% (of 1st stage operation) CFM level 90 seconds after the “Y1” input.

Cooling 2nd Stage (Y1, Y2, O, G) Two-Stage Units

The ECM fan adjusts to 2nd stage airflow (CFM) level (based on DIP switch settings), and the compressor full load solenoid is energized.

Cooling, Dehumidification Mode

The ECM fan control board includes two types of dehumidification modes, Constant Dehumidification mode, and On Demand Dehumidification (ODD). If the ECM control board is set to Constant Dehumidification mode, the ECM fan runs at normal airflow (CFM) in all heating stages, but all cooling operation will be 85% of the current stage airflow (CFM) level (based on DIP switch settings). The dehumidification mode lowers the airflow (CFM) through the evaporator coil, to improve latent (dehumidification) capacity. In ODD mode, a humidistat or a thermostat with a dehumidification output (output must be reverse logic -- i.e. it must operate like a humidistat) is connected to the ODD terminal. When the module receives a call for dehumidification, the fan runs at 85% of the current stage airflow (CFM) in the cooling mode. Otherwise, the airflow is at the normal airflow (CFM) level. The signal is ignored in the heating mode. The signal is ignored in the heating mode.

Fan Only

When the ECM control module receives a “G” call without a call for heating or cooling, the fan operates at 50% of the full load airflow (CFM) level (based on DIP switch settings shown in following table).

DIP Switch		Mode	Operation
S9	S10		
ON	OFF	Normal	Dehumidification mode disabled (normal Htg/Clg CFM) - factory setting.
OFF	ON	ODD	On Demand Dehumidification mode (humidistat input at terminal ODD) -- Humidistat required.
OFF	OFF	Constant Dehum.	Constant Dehumidification mode (always uses dehum CFM for cooling and normal CFM for heating) -- No humidistat required.
ON	ON	Not Used	Not an applicable setting.

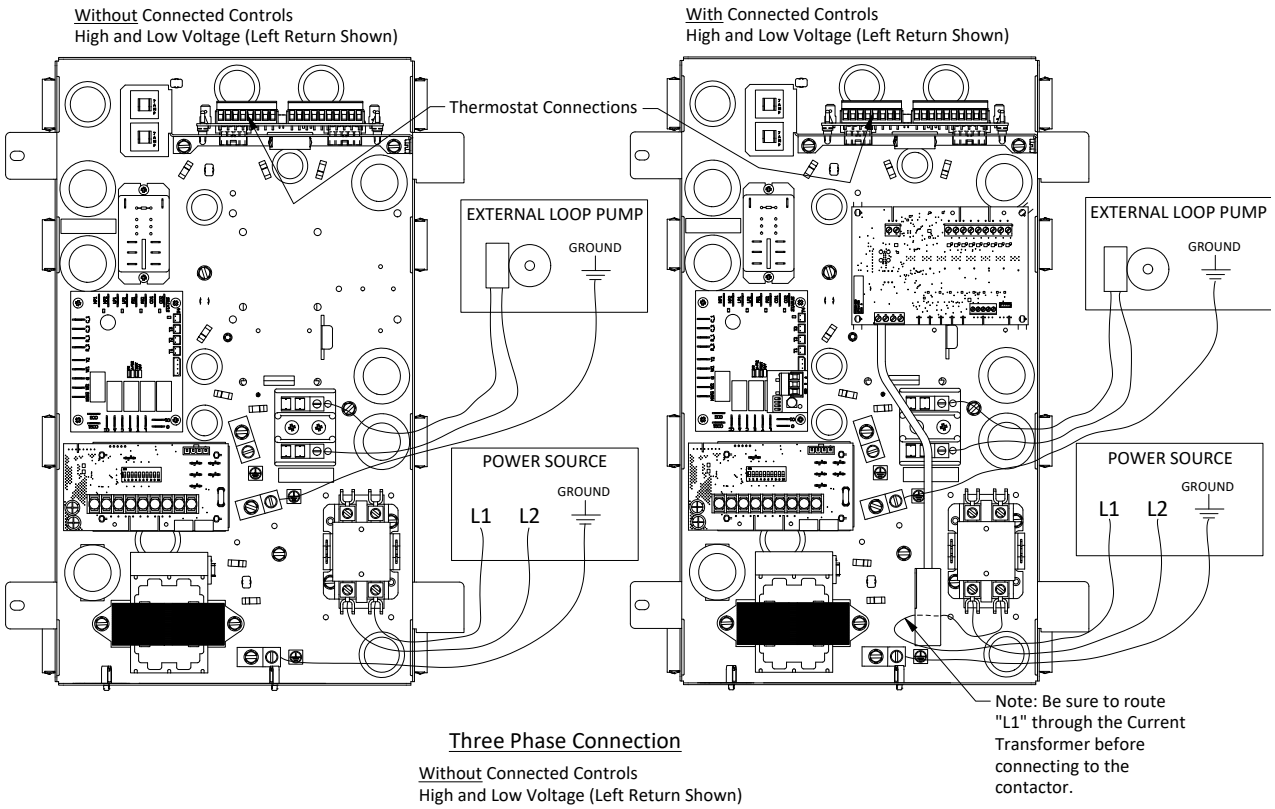
Notes:

1. To enter Dehumidification mode, ODD input should be 0 VAC; for normal cooling CFM, ODD input should be 24 VAC.
2. Heating CFM is not affected by dehumidification mode. When in dehumidification mode, cooling CFM is 85% of normal CFM

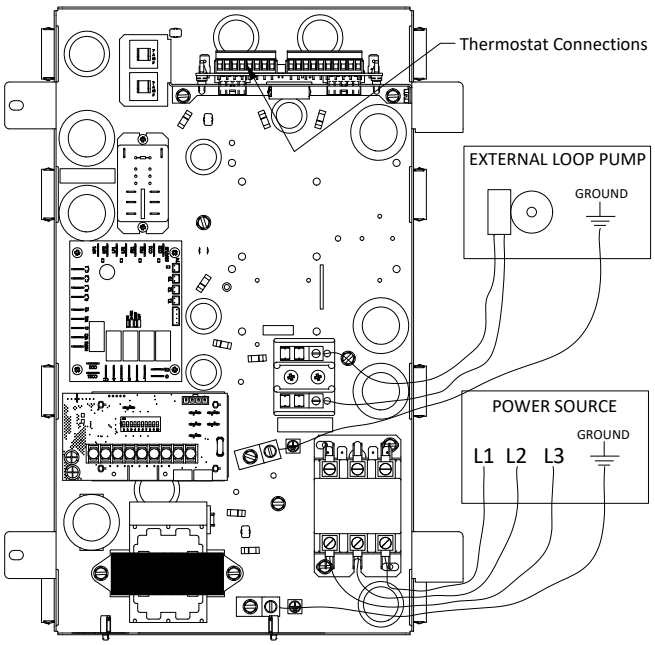
Section 5: Controls

Electrical Connections : Left Hand Return

Single Phase Connection



Three Phase Connection



Notes:

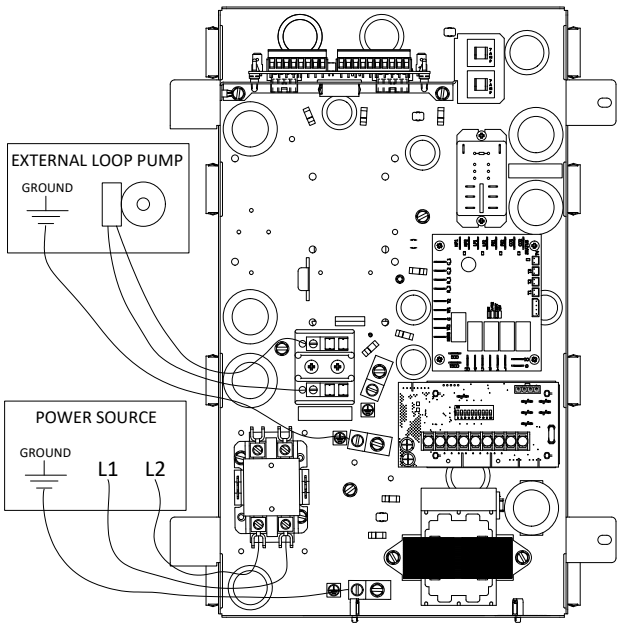
- All drawings are for reference only, models and revisions may change components and/or locations
- Drawings represent a typical installation using wiring input knockouts marked on the outside of the control box cover.
- National and local electrical codes must be followed during installation of this unit.
- Use caution to avoid damaging the wiring and components during installation.
- Wiring shall be routed to avoid contact with other connections and temperature sensitive components.
- Assure all connections are securely fastened and routed to their proper locations.
- Install the thermostat per the manufacturer's instructions provided with that unit.
- All wiring should enter through the side plastic bushings installed on the hinged side of the control box
- Route and trim wiring to leave enough slack to open, close or remove control box.

Section 5: Controls

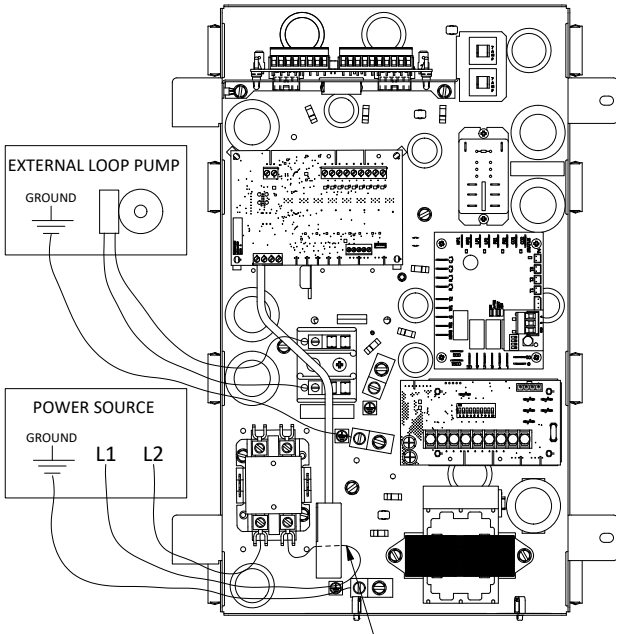
Electrical Connections : Right Hand Return

Single Phase Connection

Without Connected Controls
High and Low Voltage (Right Return Shown)



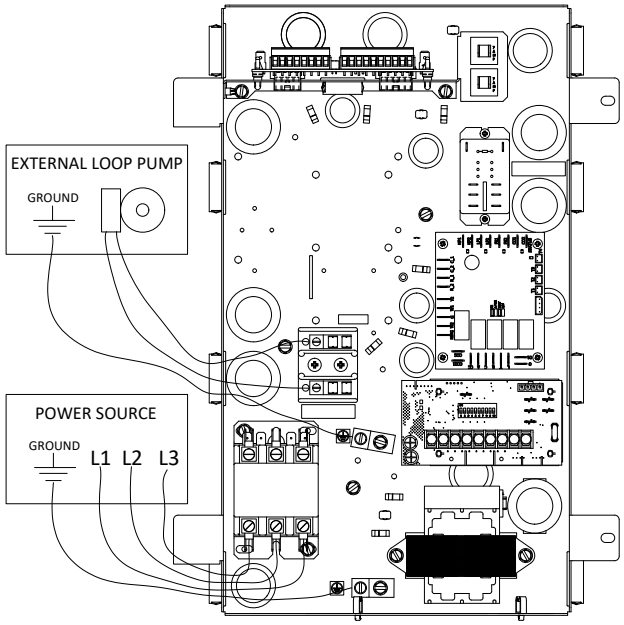
With Connected Controls
High and Low Voltage (Right Return Shown)



Note: Be sure to route "L1" through the Current Transformer before connecting to the contactor.

Three Phase Connection

Without Connected Controls
High and Low Voltage (Right Return Shown)



Notes:

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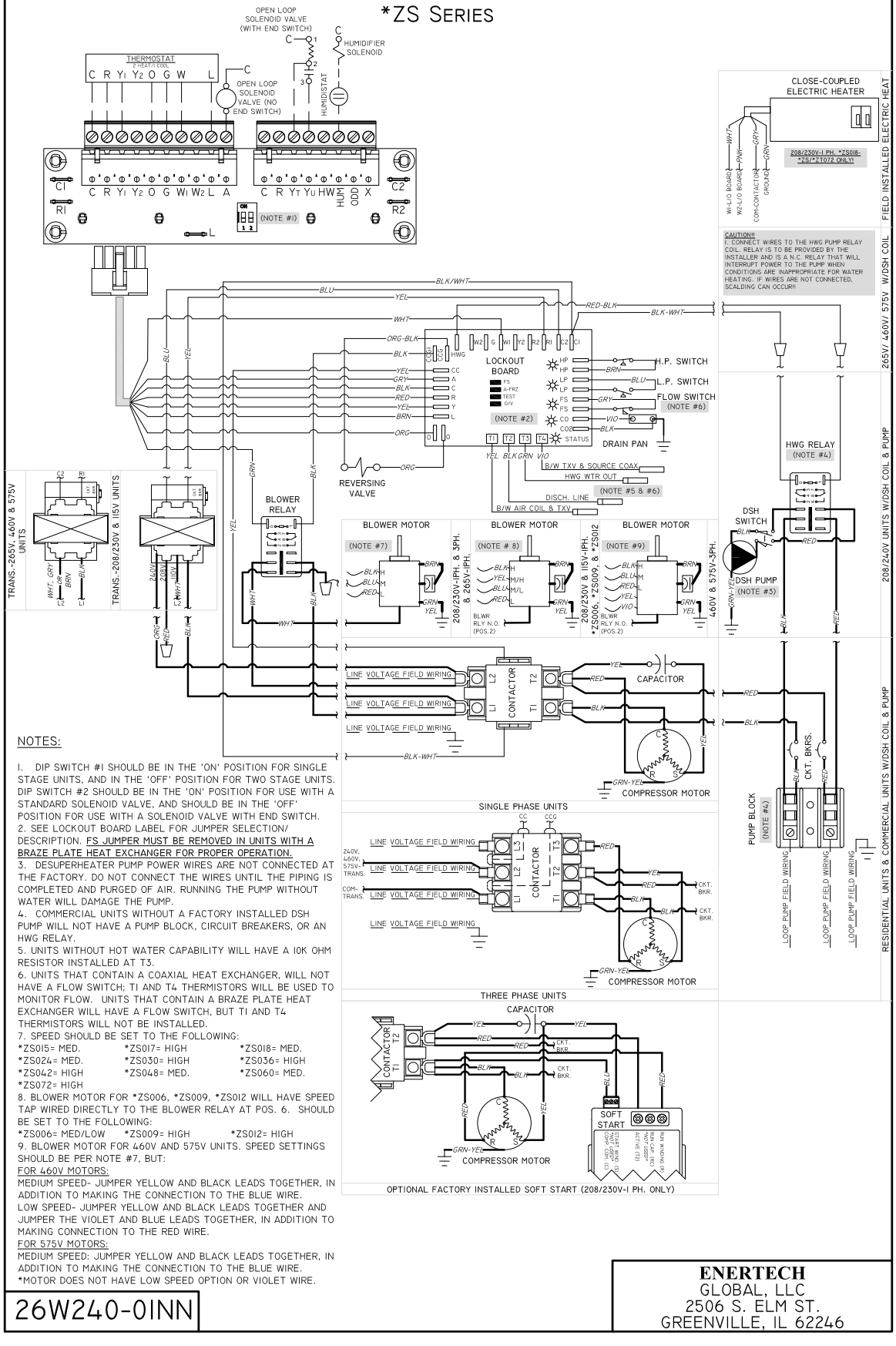
- Drawings represent a typical installation using wiring input knockouts marked on the outside of the control box cover.
- National and local electrical codes must be followed during installation of this unit.
- Use caution to avoid damaging the wiring and components during installation.
- Wiring shall be routed to avoid contact with other connections and temperature sensitive components.
- Assure all connections are securely fastened and routed to their proper locations.
- Install the thermostat per the manufacturer's instructions provided with that unit.
- All wiring should enter through the side plastic bushings installed on the hinged side of the control box
- Route and trim wiring to leave enough slack to open, close or remove control box.

Wiring Diagram : ZS Series, PSC

REVISION HISTORY				
REV	DESCRIPTION	DATE	ECN	APPD
A	INITIAL RELEASE	4/28/2020	20-121-N01	KW

WATER-TO-AIR UNIT, SINGLE STAGE, PSC FAN, RESIDENTIAL & COMMERCIAL
*ZS SERIES



NOTES:

1. DIP SWITCH #1 SHOULD BE IN THE 'ON' POSITION FOR SINGLE STAGE UNITS, AND IN THE 'OFF' POSITION FOR TWO STAGE UNITS. DIP SWITCH #2 SHOULD BE IN THE 'ON' POSITION FOR USE WITH A STANDARD SOLENOID VALVE, AND SHOULD BE IN THE 'OFF' POSITION FOR USE WITH A SOLENOID VALVE WITH END SWITCH.
2. SEE LOCKOUT BOARD LABEL FOR JUMPER SELECTION/ DESCRIPTION. FS JUMPER MUST BE REMOVED IN UNITS WITH A BRAZE PLATE HEAT EXCHANGER FOR PROPER OPERATION.
3. DESUPERHEATER PUMP POWER WIRES ARE NOT CONNECTED AT THE FACTORY. DO NOT CONNECT THE WIRES UNTIL THE PIPING IS COMPLETED AND PURGED OF AIR. RUNNING THE PUMP WITHOUT WATER WILL DAMAGE THE PUMP.
4. COMMERCIAL UNITS WITHOUT A FACTORY INSTALLED DSH PUMP WILL NOT HAVE A PUMP BLOCK, CIRCUIT BREAKERS, OR AN HWG RELAY.
5. UNITS WITHOUT HOT WATER CAPABILITY WILL HAVE A 10K OHM RESISTOR INSTALLED AT T3.
6. UNITS THAT CONTAIN A COAXIAL HEAT EXCHANGER, WILL NOT HAVE A FLOW SWITCH; TI AND T4 THERMISTORS WILL BE USED TO MONITOR FLOW. UNITS THAT CONTAIN A BRAZE PLATE HEAT EXCHANGER WILL HAVE A FLOW SWITCH, BUT TI AND T4 THERMISTORS WILL NOT BE INSTALLED.
7. SPEED SHOULD BE SET TO THE FOLLOWING:

*ZS015= MED.	*ZS017= HIGH	*ZS018= MED.
*ZS024= MED.	*ZS030= HIGH	*ZS036= HIGH
*ZS042= HIGH	*ZS048= MED.	*ZS060= MED.
*ZS072= HIGH		

8. BLOWER MOTOR FOR *ZS006, *ZS009, *ZS012 WILL HAVE SPEED TAP WIRED DIRECTLY TO THE BLOWER RELAY AT POS. 6. SHOULD BE SET TO THE FOLLOWING:
*ZS006= MED/LOW *ZS009= HIGH *ZS012= HIGH
9. BLOWER MOTOR FOR 460V AND 575V UNITS. SPEED SETTINGS SHOULD BE PER NOTE #7, BUT:
FOR 460V MOTORS:
MEDIUM SPEED- JUMPER YELLOW AND BLACK LEADS TOGETHER, IN ADDITION TO MAKING THE CONNECTION TO THE BLUE WIRE.
LOW SPEED- JUMPER YELLOW AND BLACK LEADS TOGETHER AND JUMPER THE VIOLET AND BLUE LEADS TOGETHER, IN ADDITION TO MAKING CONNECTION TO THE RED WIRE.
FOR 575V MOTORS:
MEDIUM SPEED: JUMPER YELLOW AND BLACK LEADS TOGETHER, IN ADDITION TO MAKING THE CONNECTION TO THE BLUE WIRE.
*MOTOR DOES NOT HAVE LOW SPEED OPTION OR VIOLET WIRE.

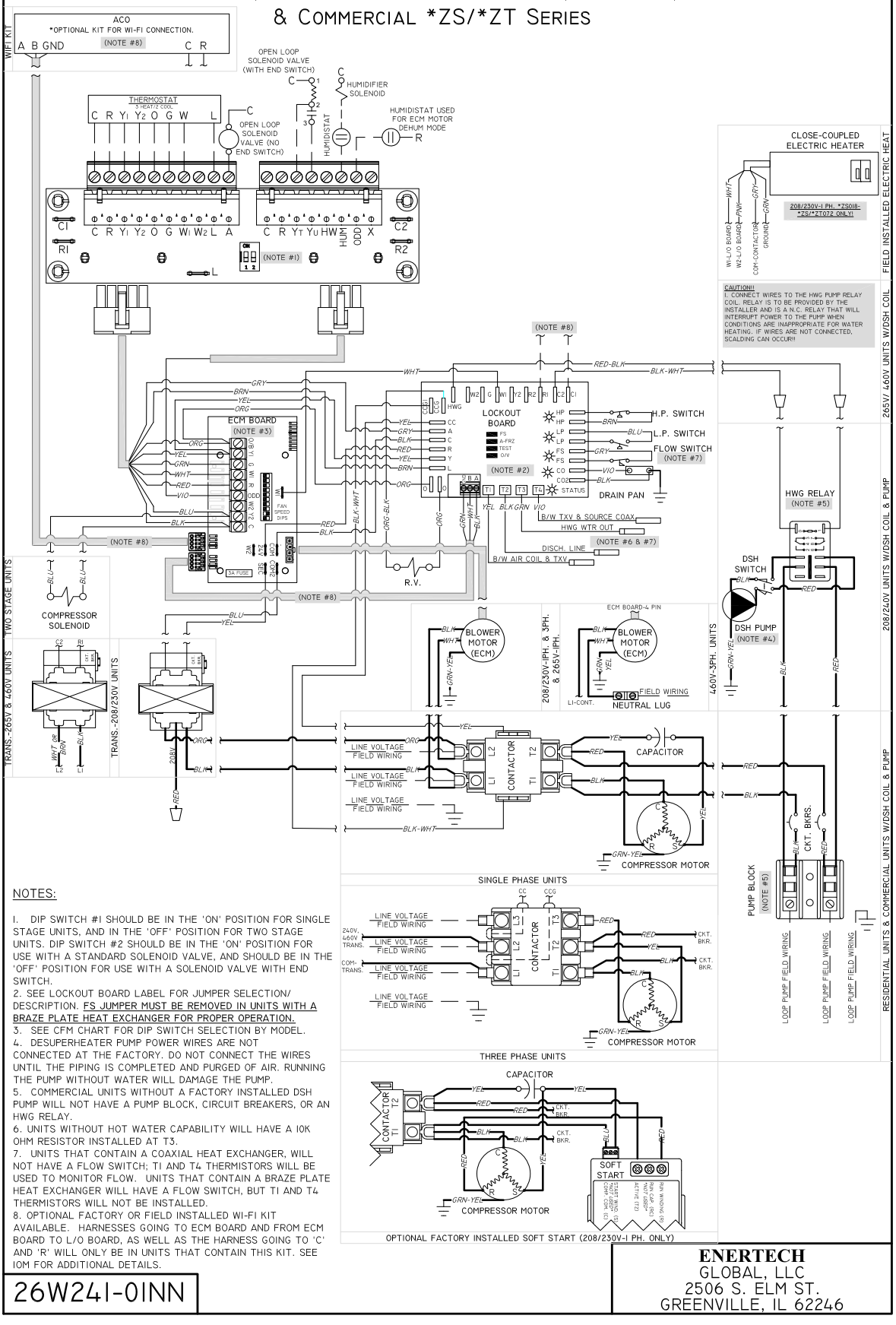
26W240-01NN

ENERTECH
GLOBAL, LLC
2506 S. ELM ST.
GREENVILLE, IL 62246

Wiring Diagram : ZS/ZT Series, ECM

REVISION HISTORY				
REV	DESCRIPTION	DATE	ECN	APPD
B	ADD COLORS ON RS-485 CONN. @ L/O BOARD	6/6/2022	22-145-N03	KW

WATER-TO-AIR UNIT, SINGLE STAGE OR TWO STAGE, ECM FAN, RESIDENTIAL & COMMERCIAL *ZS/*ZT SERIES



NOTES:

1. DIP SWITCH #1 SHOULD BE IN THE 'ON' POSITION FOR SINGLE STAGE UNITS, AND IN THE 'OFF' POSITION FOR TWO STAGE UNITS. DIP SWITCH #2 SHOULD BE IN THE 'ON' POSITION FOR USE WITH A STANDARD SOLENOID VALVE, AND SHOULD BE IN THE 'OFF' POSITION FOR USE WITH A SOLENOID VALVE WITH END SWITCH.
2. SEE LOCKOUT BOARD LABEL FOR JUMPER SELECTION/ DESCRIPTION. FS JUMPER MUST BE REMOVED IN UNITS WITH A BRAZE PLATE HEAT EXCHANGER FOR PROPER OPERATION.
3. SEE CFM CHART FOR DIP SWITCH SELECTION BY MODEL.
4. DESUPERHEATER PUMP POWER WIRES ARE NOT CONNECTED AT THE FACTORY. DO NOT CONNECT THE WIRES UNTIL THE PIPING IS COMPLETED AND PURGED OF AIR. RUNNING THE PUMP WITHOUT WATER WILL DAMAGE THE PUMP.
5. COMMERCIAL UNITS WITHOUT A FACTORY INSTALLED DSH PUMP WILL NOT HAVE A PUMP BLOCK, CIRCUIT BREAKERS, OR AN HWG RELAY.
6. UNITS WITHOUT HOT WATER CAPABILITY WILL HAVE A 10K OHM RESISTOR INSTALLED AT T3.
7. UNITS THAT CONTAIN A COAXIAL HEAT EXCHANGER, WILL NOT HAVE A FLOW SWITCH; TI AND T4 THERMISTORS WILL BE USED TO MONITOR FLOW. UNITS THAT CONTAIN A BRAZE PLATE HEAT EXCHANGER WILL HAVE A FLOW SWITCH, BUT TI AND T4 THERMISTORS WILL NOT BE INSTALLED.
8. OPTIONAL FACTORY OR FIELD INSTALLED WI-FI KIT AVAILABLE. HARNESSES GOING TO ECM BOARD AND FROM ECM BOARD TO L/O BOARD, AS WELL AS THE HARNESS GOING TO 'C' AND 'R' WILL ONLY BE IN UNITS THAT CONTAIN THIS KIT. SEE IOM FOR ADDITIONAL DETAILS.

26W241-01NN

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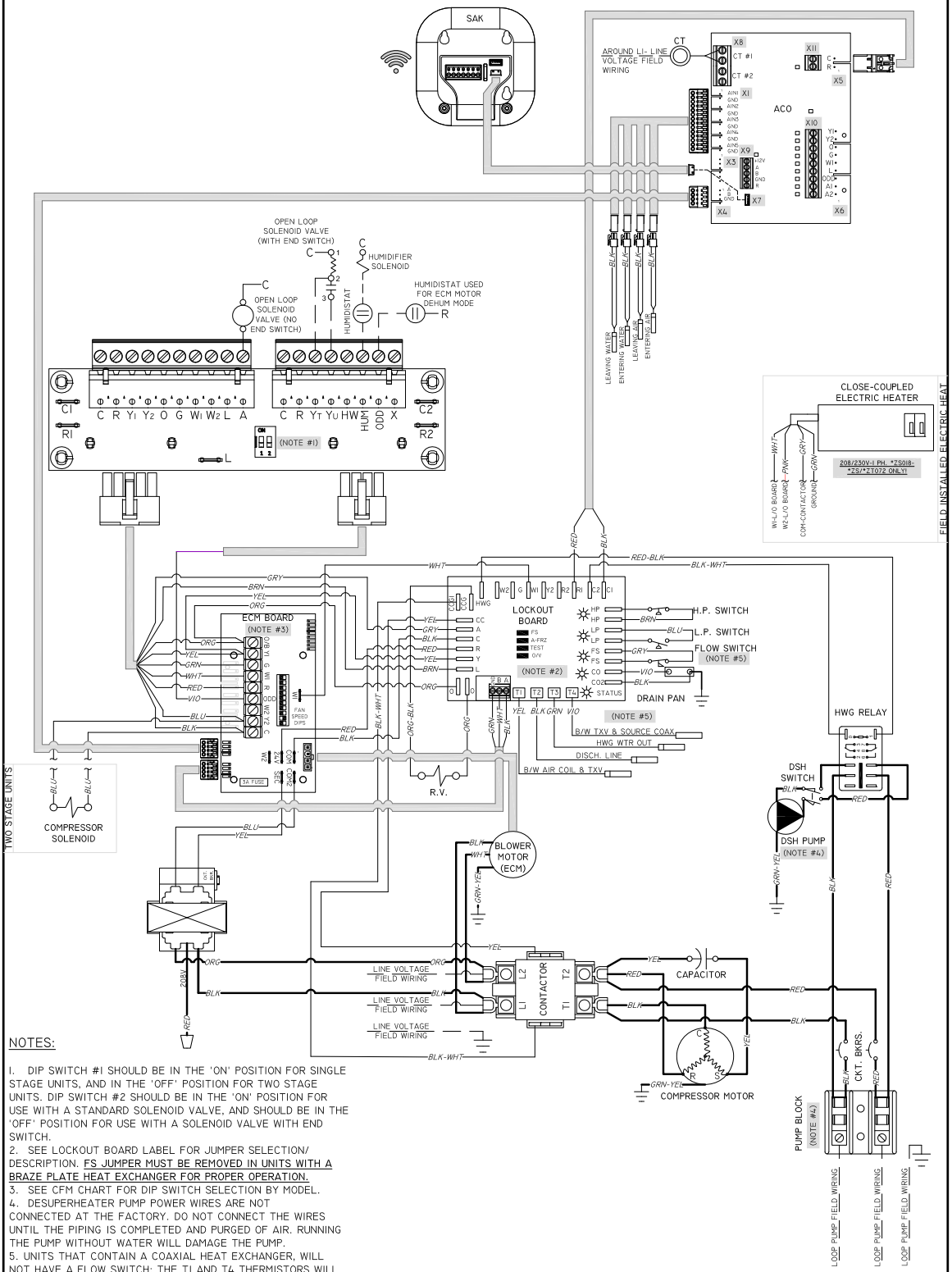
GLOBAL, LLC
2506 S. ELM ST.
GREENVILLE, IL 62246

Wiring Diagram : ZS/ZT Series, ECM, Connected Controls

REVISION HISTORY			
REV	DESCRIPTION	DATE	ECN	APPD
A	INITIAL RELEASE	3/20/2023	23-050-N01	KW

WATER-TO-AIR UNIT, SINGLE STAGE OR TWO STAGE, ECM FAN, RESIDENTIAL & COMMERCIAL *ZS/*ZT SERIES



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2. SEE LOCKOUT BOARD LABEL FOR JUMPER SELECTION/ DESCRIPTION. FS JUMPER MUST BE REMOVED IN UNITS WITH A BRAZE PLATE HEAT EXCHANGER FOR PROPER OPERATION.
3. SEE CFM CHART FOR DIP SWITCH SELECTION BY MODEL.
4. DESUPERHEATER PUMP POWER WIRES ARE NOT CONNECTED AT THE FACTORY. DO NOT CONNECT THE WIRES UNTIL THE PIPING IS COMPLETED AND PURGED OF AIR. RUNNING THE PUMP WITHOUT WATER WILL DAMAGE THE PUMP.
5. UNITS THAT CONTAIN A COAXIAL HEAT EXCHANGER, WILL NOT HAVE A FLOW SWITCH; THE T1 AND T4 THERMISTORS WILL BE USED TO MONITOR FLOW. UNITS THAT CONTAIN A BRAZE PLATE HEAT EXCHANGER WILL HAVE A FLOW SWITCH, BUT THE T1 AND T4 THERMISTORS WILL NOT BE INSTALLED.

26W314-01NN

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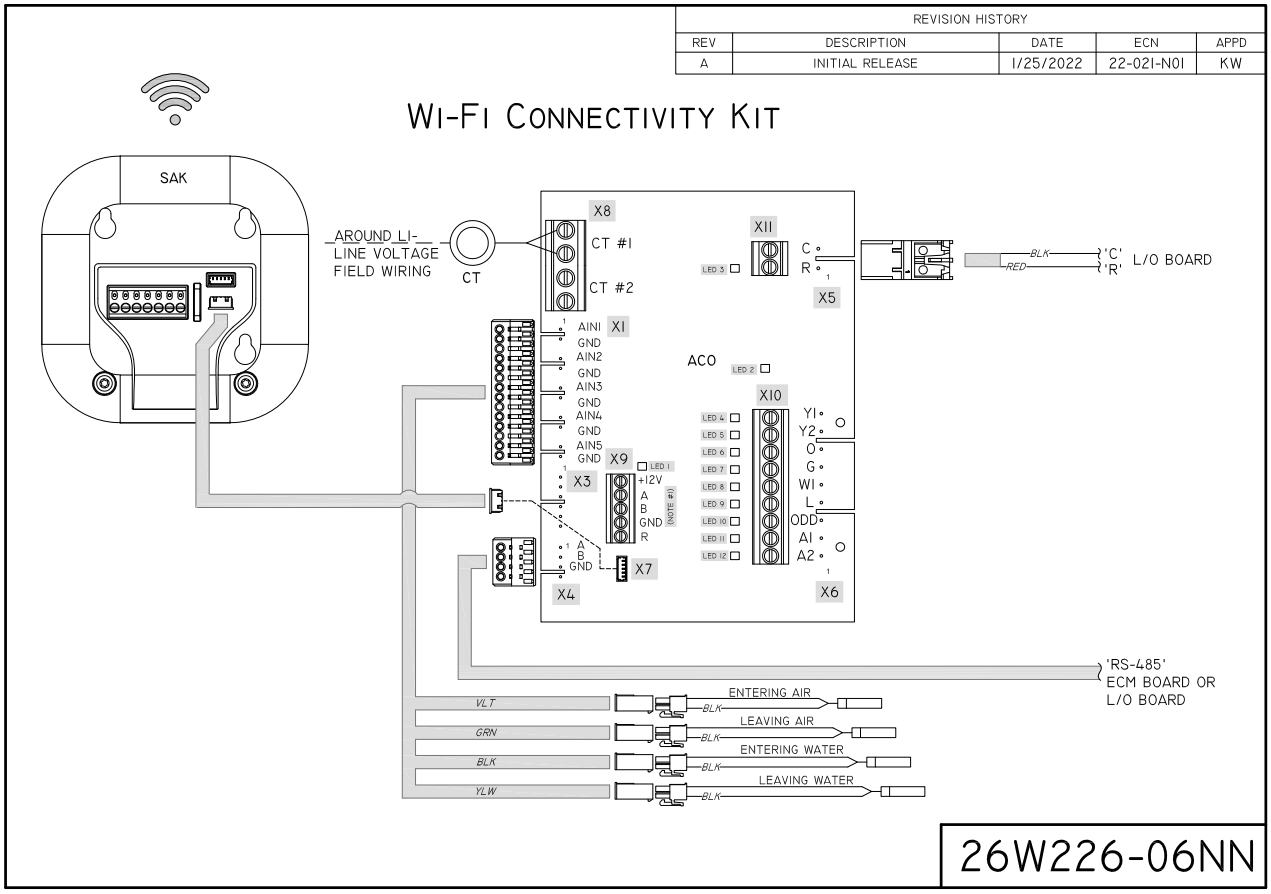
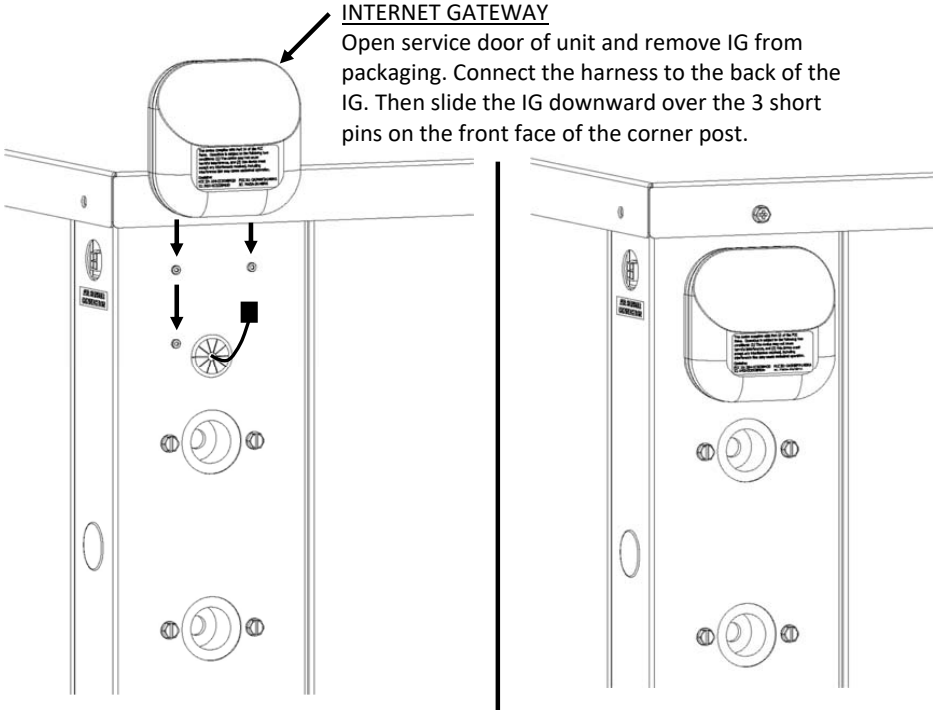
GREENVILLE, IL 62246

Wiring Diagram - Connected Controls





INTERNET GATEWAY

Open service door of unit and remove IG from packaging. Connect the harness to the back of the IG. Then slide the IG downward over the 3 short pins on the front face of the corner post.

BEFORE ASSEMBLY OF INTERNET GATEWAY

AFTER ASSEMBLY OF INTERNET GATEWAY

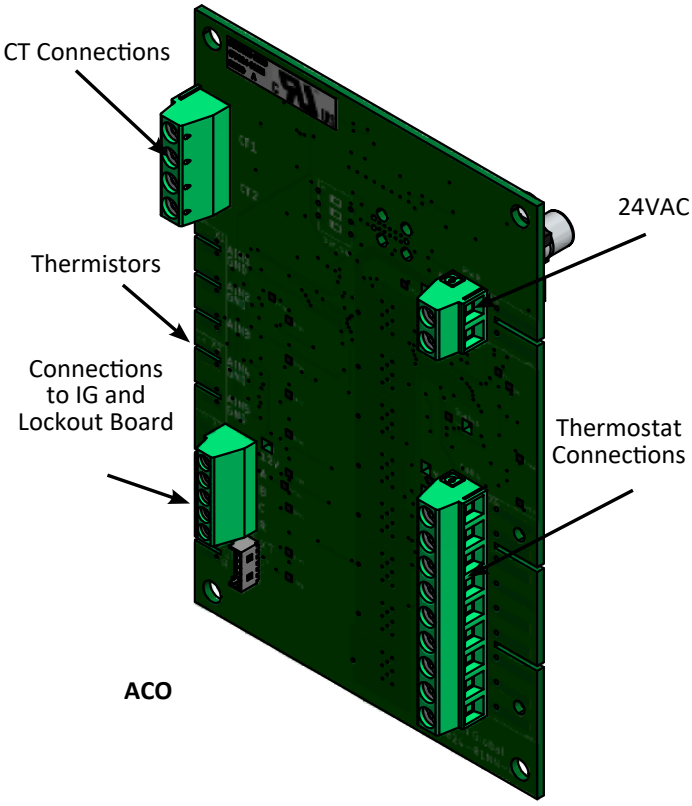
Section 5: Controls

Connected Controls

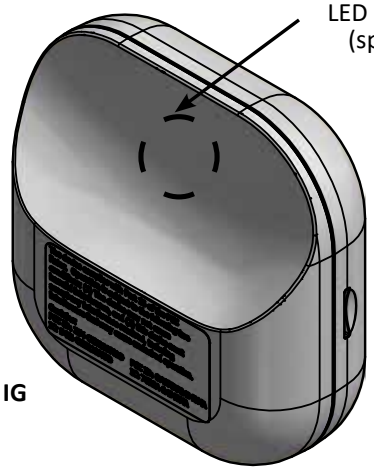
Overview

Connected Controls provide energy monitoring, as well as diagnostics based upon water temperatures, air temperatures, and lockout board faults. The controls utilize three main components to interface with the heat pump, as follows:

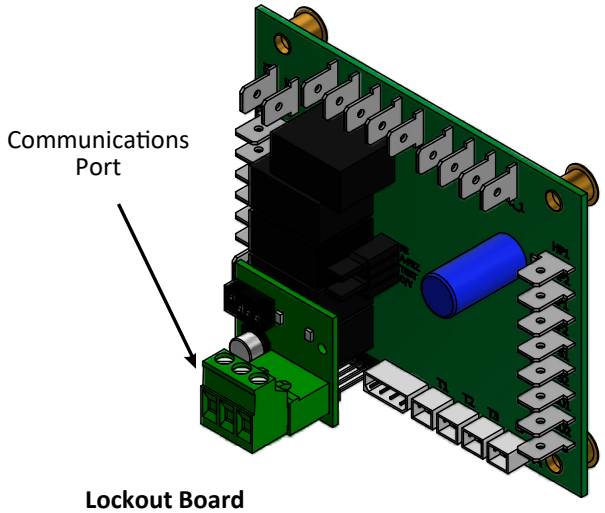
- **IG (Internet gateway) device:** The IG connects to the owner's WiFi router to allow data to be transmitted to the cloud for access by the owner and installing/servicing technician.
- **ACO (Accessory Controls Output) board:** The ACO board is a connection point between the heat pump lockout board and the IG. It allows 24VAC heat pump controls to interface with Internet connected controls.
- **Lockout board with communications capability:** The lockout board for Connected Controls has a RS-485 port that allows faults/lockouts and jumper position to be communicated to the cloud. All other features are the same as a lockout board without a communications port.



ACO



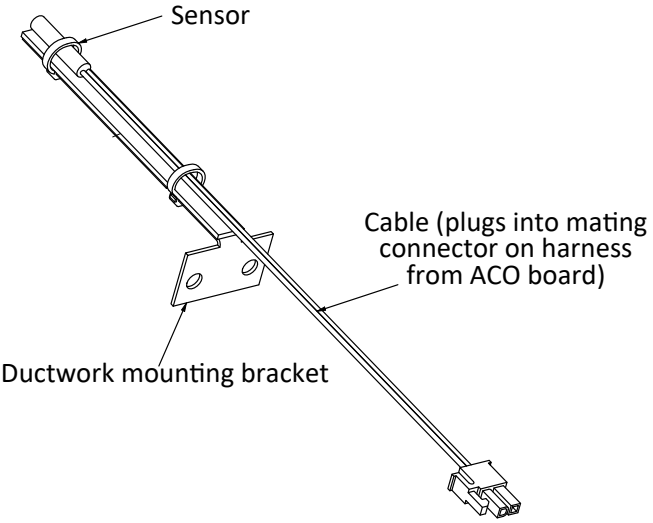
IG

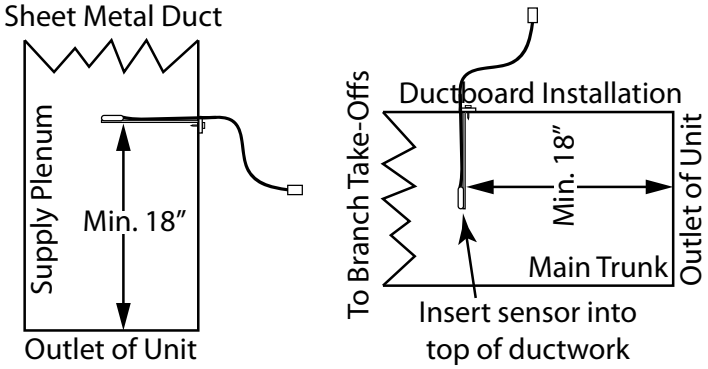


Lockout Board

Installation of Hardware

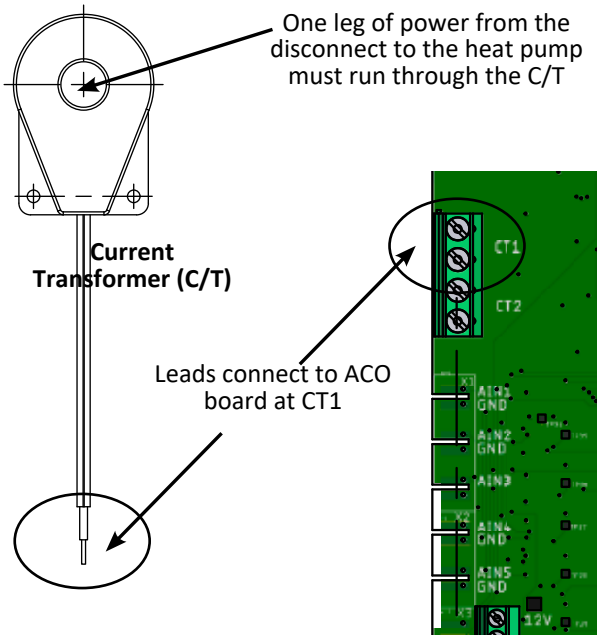
Controls hardware is factory installed except the C/T (current transformer) and the return/supply air sensors, which must be field installed. The air sensors must be at least 18" from the inlet/outlet of the air handler (farther away is better) to provide proper mixing. See drawings below.





Section 5: Controls

For current sensing (part of the energy monitoring feature), one leg of power from the disconnect to the heat pump must be run though the C/T (see below). The C/T leads connect to the ACO board at terminals CT1.



Software Setup

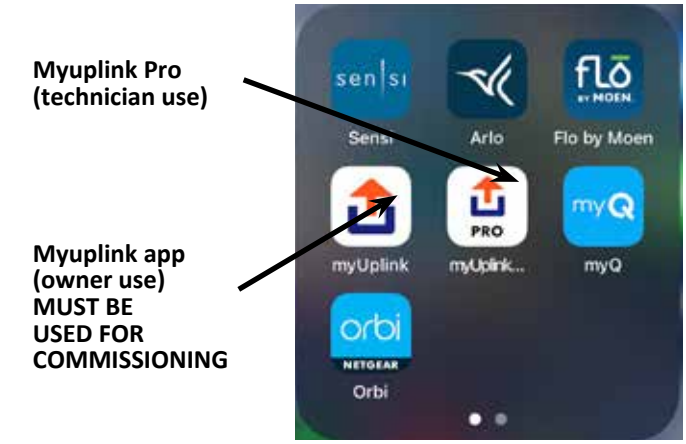
Enertech Connected Controls provide multiple ways to access the control system and data. There are two smartphone apps, as well as access via a web browser. To protect customer privacy and to ensure the best experience for both the end user and the installing/servicing technician, it is important to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



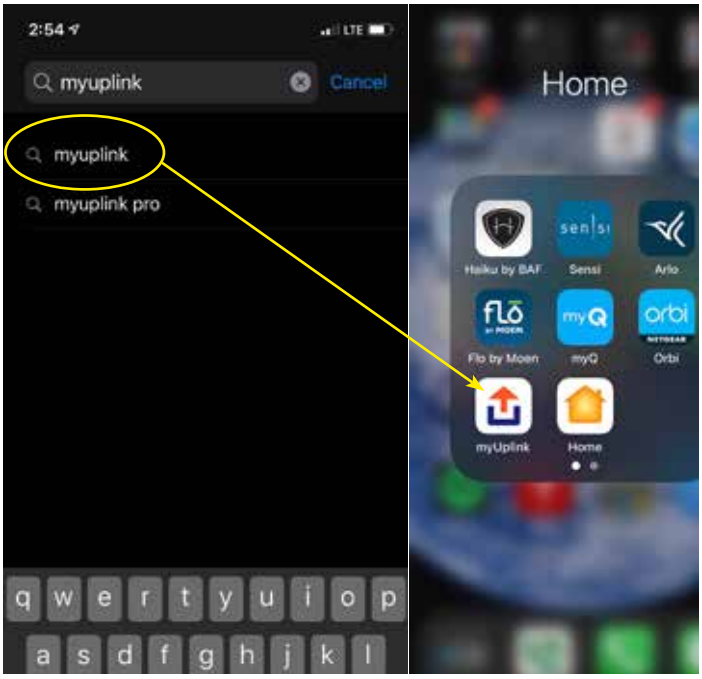
There are four scenarios for commissioning the system, depending upon the end user (owner) preference for accessing the system controls. Each of the four scenarios are outlined below.

Commissioning Scenario 1 - Add App to Owner's Phone

Once the hardware 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 owners phone must be connected to the same WiFi network that the controls will be using.:

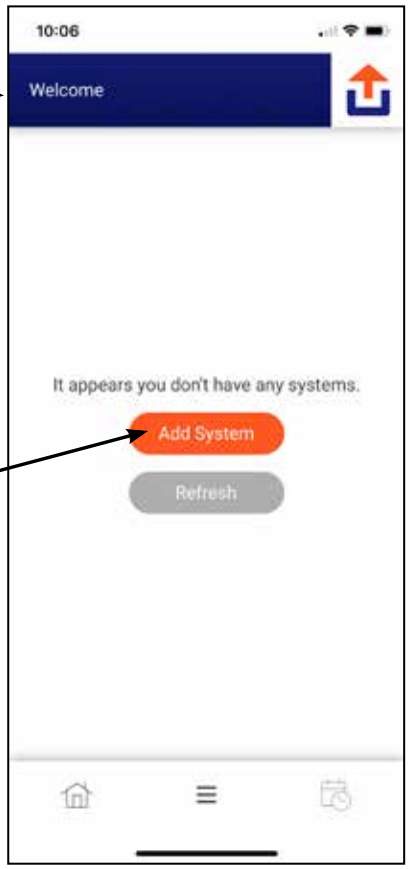
1. Ask the owner to Install the myUplink app from the Apple App Store or the Google Play Store (screen shots below) and register for an account.

Note: The myUplink Pro app cannot be used to commission the system.



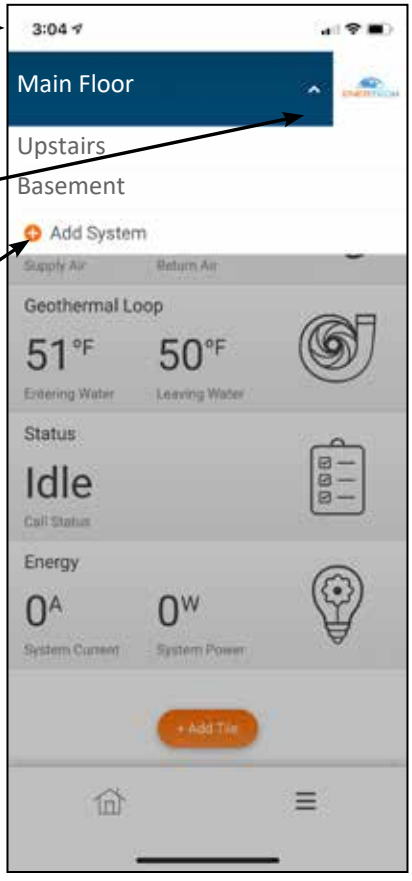
2. Open the myUplink app. If this is a new installation and this is the first system in the home, the screen will look like the graphic below. Tap on “Add System”. If there are multiple heat pumps, the screen will look like the second graphic below.

New system (before any heat pumps are added)



Tap “Add System”

New system (one or more heat pumps are already added)



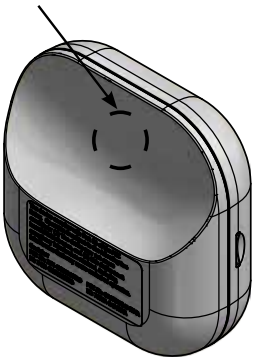
Tap the arrow to show systems already set up (if any)

Tap “Add System”

Note: The system shown at the top (blue bar) in this example is the one that is currently active (“Main Floor”). The ones listed below are other systems being monitored (already commissioned).

3. After choosing to add a system, the next screen will provide a choice of scanning for the device or setting up the device. For a new installation, tap “No, set up the device.” The “Yes” option will only be used for an IG that is already commissioned.

<u>IMPORTANT</u>: Before proceeding with step 3, ensure that the LED ring is spinning (not pulsing), indicating that it is ready for setup.

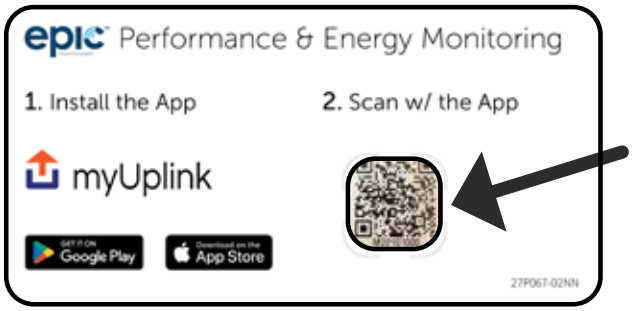


Tap “No, set up...”

4. The next screen will ask about a QR code. Tap “Yes, scan the sticker”.

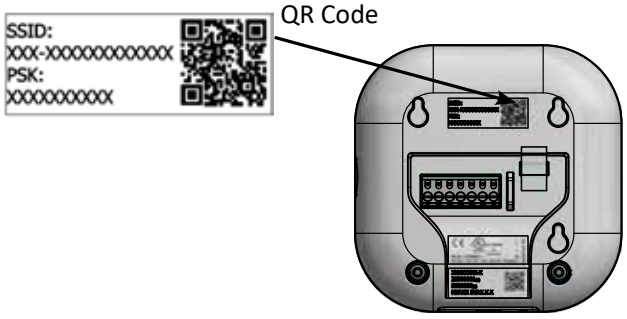
Tap “Yes, scan...”

5. From app, scan label on front of the unit during setup.



6. Alternately, turn the IG around to view back side of the device.

   - Gently push up on the IG to release it from the mounting screws. The control box has a shoulder type screw that allows the IG to attach via the "keyholes" molded into the IG case.



7. Position the smartphone to read the QR code. Once it reads the code, the app will ask to join the IG network. This will connect the phone directly to the IG. Tap "Join".

IMPORTANT: Do not scan the QR code from the phone's camera app. Only scan the code from the myUplink app. The QR code is part of the commissioning process. Scanning it outside of the app may cause the smartphone to try to connect directly to the IG, potentially creating connectivity issues.

8. After tapping "Join", the next screen will display "Connecting to device".

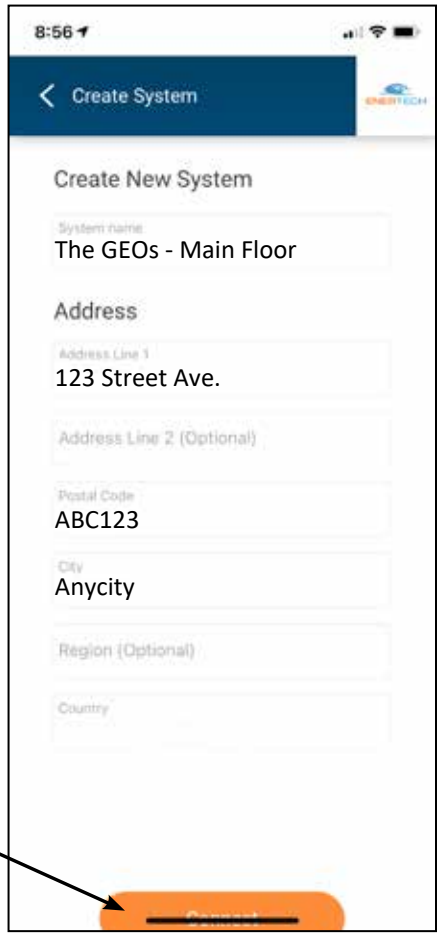
9. Once the device is paired, the IG is ready to join the WiFi network. Enter the name of the network and password. The owner will need to provide this information. "Passphrase" is the password for the network, provided by the owner. ***It is important to use the network name that the smartphone is using***.

10. Now that WiFi network has been identified, the IG will be able to join the network. "Network Name" is the name of the network from step 9.

Tap "Join"

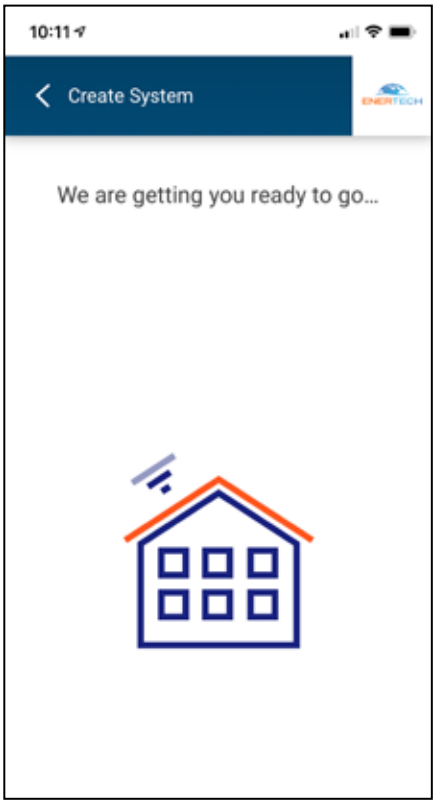
Note: While the IG is connecting to the network, the screen will display "Connecting to Network" until the screen in step 11 is displayed.

11. The new system can now be customized for the owner. Tap on the "Connect" button once the owner's information has been completed.



Enter system info. and click "Connect"

12. The next screen should display, "We are getting you ready to go...".



13. Once the system is commissioned, it will show up in the blue box at the top of the screen. As the system is operating, the temperatures and status will be displayed as shown below.

Commissioning Scenario 2 - Owner does not want app, but wants dealer to monitor system remotely

Once the hardware is installed and the unit is operational, re-attach all unit access panels and control box panel, ensuring that no high voltage is accessible. In order for the system to be monitored, the myUplink app must be used for commissioning, even if the owner does not plan to use the app for monitoring.

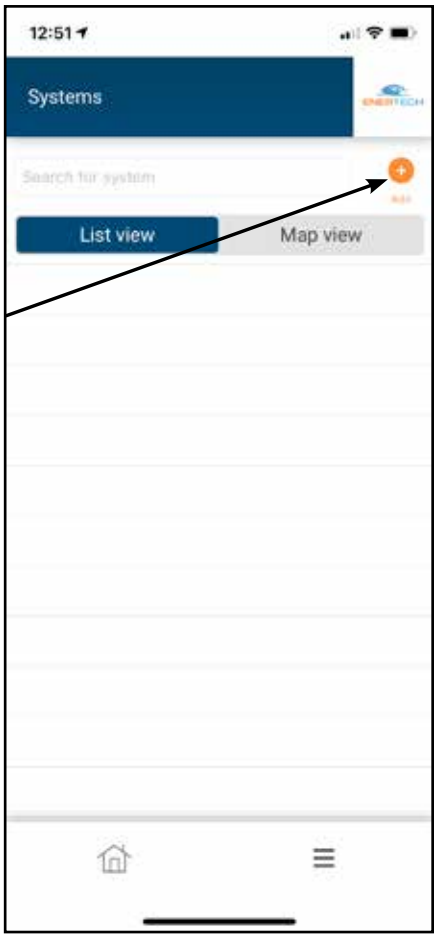
IMPORTANT: To provide remote monitoring, the IG will still need to connect to the owner's WiFi network, even if he/she does not plan to use the app.

The installing technician will need the network name (SSID) and password (Passphrase) for the WiFi network before proceeding with the following steps:

1. If not already on your smartphone, download the myUplink app from the Apple App Store or the Google Play Store. Register for an account if necessary.

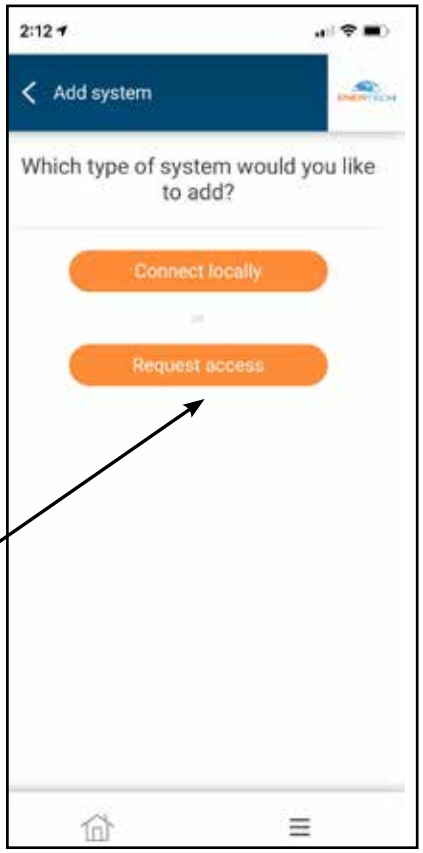
Note: The myUplink Pro app cannot be used to commission the system.

2. Follow steps 2 through 13 from Commissioning Scenario 1.
3. If not already on your smartphone, download the myUplink Pro app and register for an account if necessary.
4. Open the Pro app and tap on the plus symbol ("Add").



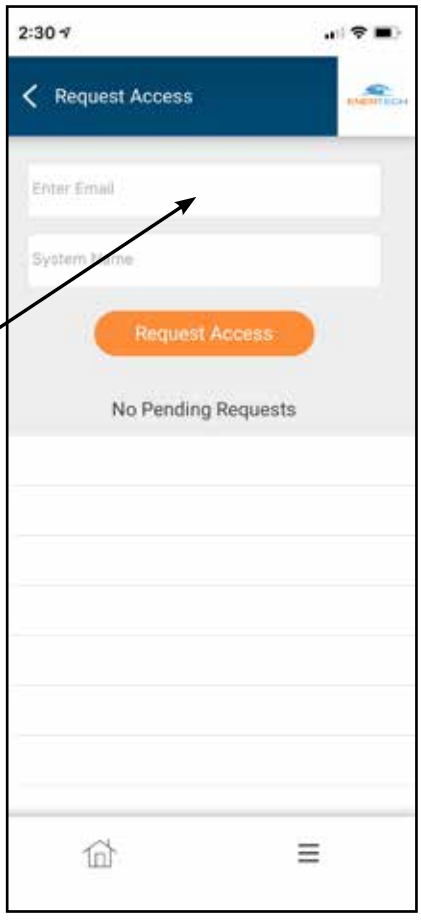
Tap plus symbol

5. Tap "Request access".



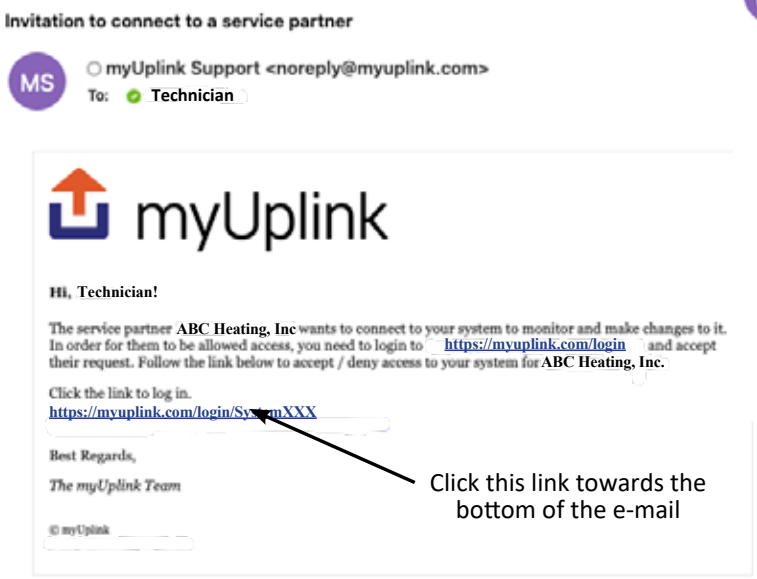
Tap "Request access"

6. Enter your (the dealer's) e-mail address and the system name that was just commissioned. Then tap "Request access".

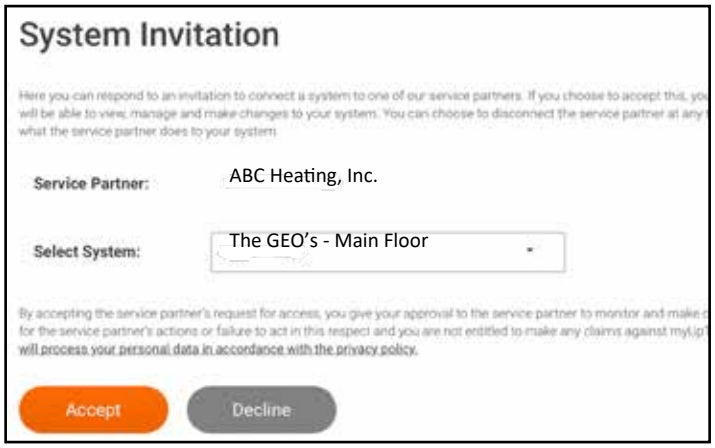


Enter e-mail address of the dealer monitoring the system and the system name. Then, tap "Request access".

7. Check e-mail for a message from myUplink Support. Click on the link just above the signature block.

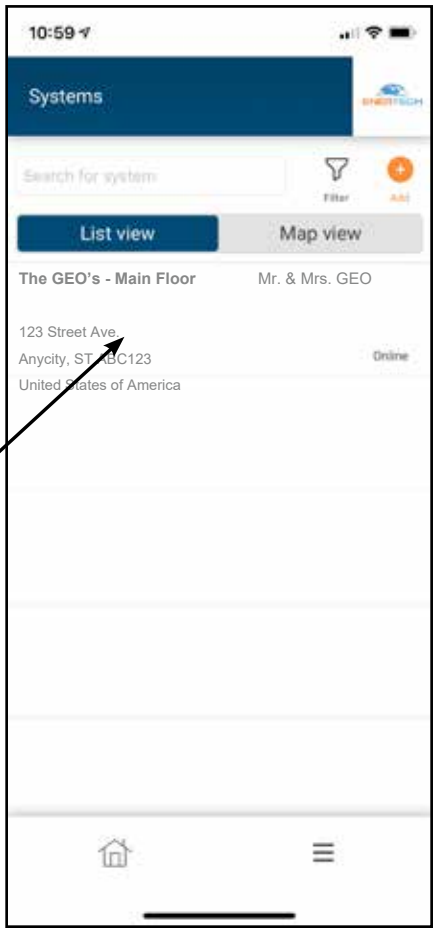


8. Log in to your account when prompted. Then scroll down to “System Invitation”.
9. Select the system from the drop-down menu and click “Accept”.



10. Two additional e-mails will be sent as shown below. Since the technician requested access in this scenario instead of the owner, both e-mails will go to the technician. Click the link below to accept the invitation.

11. Open the myUplink Pro app to verify that the system has been connected. The new system should show up in “List view” or “Map view”.



Commissioning Scenario 3 - Owner wants app AND owner wants dealer to monitor system remotely

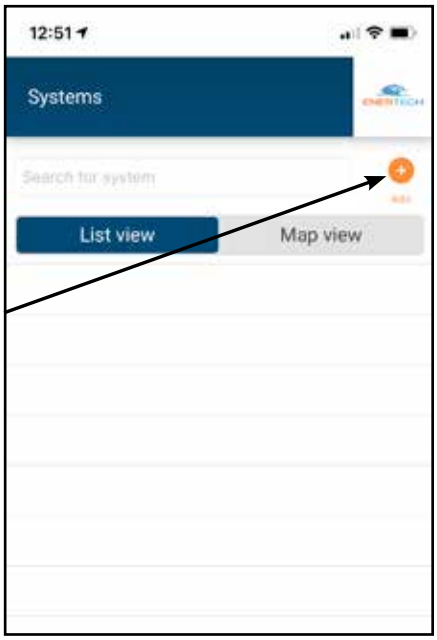
Once the hardware is installed and the unit is operational, re-attach all unit access panels and control box panel, ensuring that no high voltage is accessible. In order for the system to be monitored, the myUplink app must be used for commissioning. The installing technician will need the network name (SSID) and password (Passphrase) for the WiFi network before proceeding with the following steps: (**See next page for steps).**

Section 5: Controls

1. If not already on your smartphone, myUplink app from the Apple App Store or the Google Play Store. Register for an account if necessary.

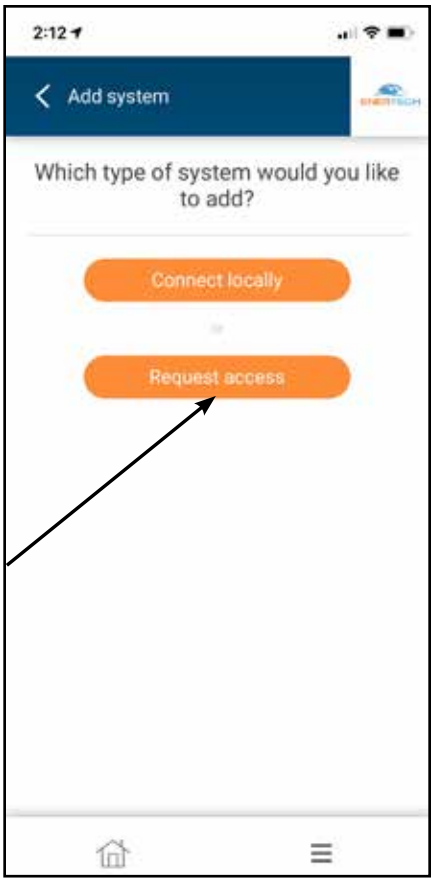
Note: The myUplink Pro app cannot be used to commission the system.

2. Follow steps 2 through 13 from Commissioning Scenario 1.
3. If not already on your smartphone, download the myUplink Pro app and register for an account if necessary.
4. Open the Pro app and tap on the plus symbol ("Add").



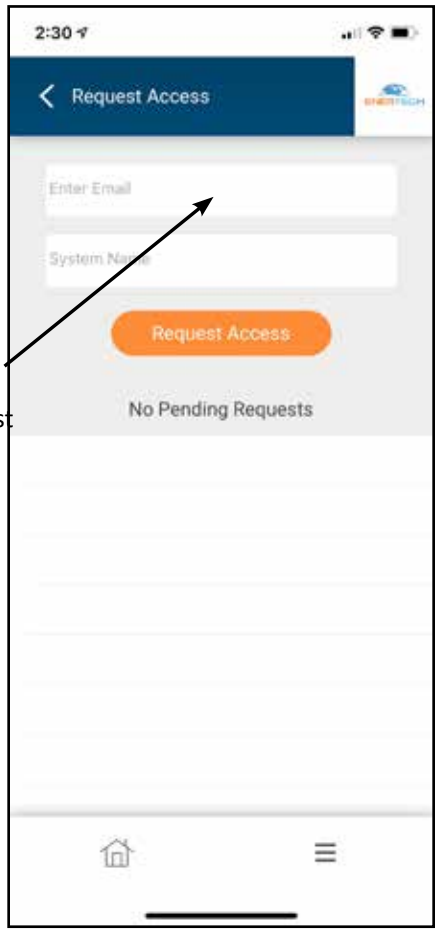
Tap plus symbol

5. Tap "Request access".



Tap "Request access"

6. Enter the owner's e-mail address and the system name that was just commissioned. Then tap "Request access".

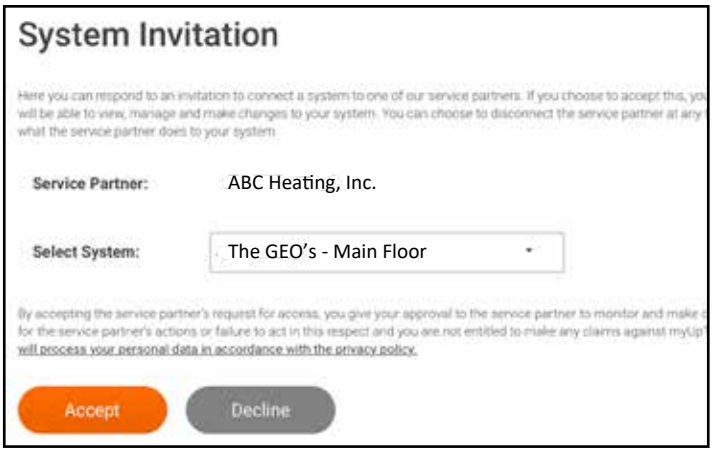


Enter owner's e-mail address and the system name. Then, tap "Request access".

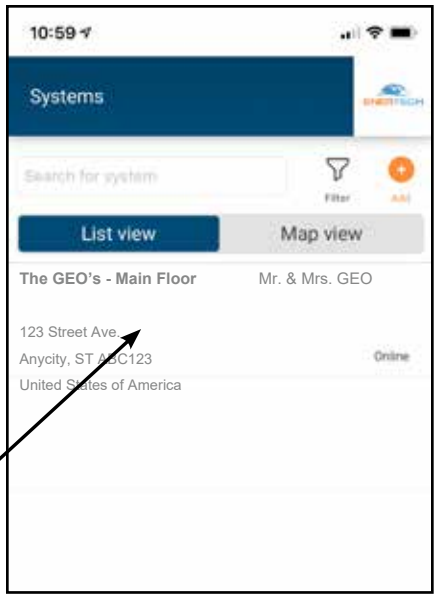
7. Ask the owner to check e-mail for a message from myUplink Support. Ask him/her to click on the link just above the signature block.

Ask to owner to click on this link from his/her smartphone

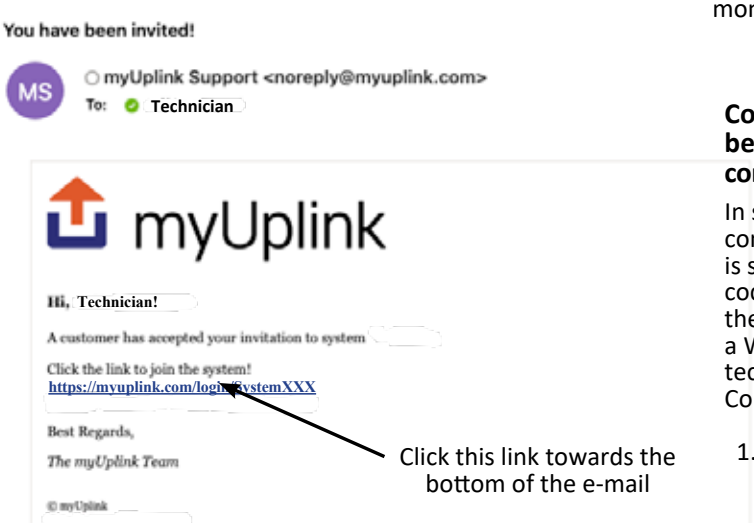
8. Once the owner logs in to his/her account, he/she will need to scroll down to "System Invitation".
9. The owner will need to select the system just commissioned from the drop-down menu and click "Accept".



10. An e-mail will be sent to the dealer as shown below. Click the link below to accept the invitation.



System just added for monitoring purposes



Click this link towards the bottom of the e-mail

11. The owner will receive an e-mail like the one below, indicating that a service partner has connected to the system.

12. Open the myUplink Pro app to verify that the system has been connected. The new system should show up in "List view" or "Map view".

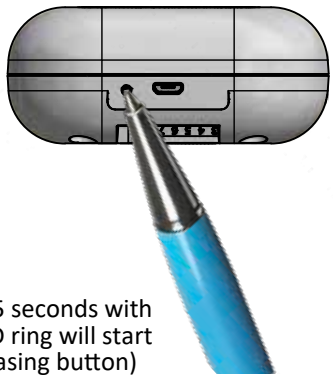
Commissioning Scenario 4 - Access to Connection will be only allowed when the technician is onsite (not connected to owner's WiFi)

In some cases, the owner may not want to add the heat pump controls to the network for security concerns. However, there is still a lot of valuable information for the technician (fault codes, temperatures, jumper settings, etc.) available using the myUplink Pro app. Connecting to the IG does not require a WiFi network or an Internet connection. However, the technician's phone must be within 10 feet of the IG device. Connecting to the IG involves the following steps:

1. If not already on your smartphone, download the myUplink Pro app and register for an account if necessary.

Note: The myUplink app cannot be used to connect locally to the system. The Pro app must be used.

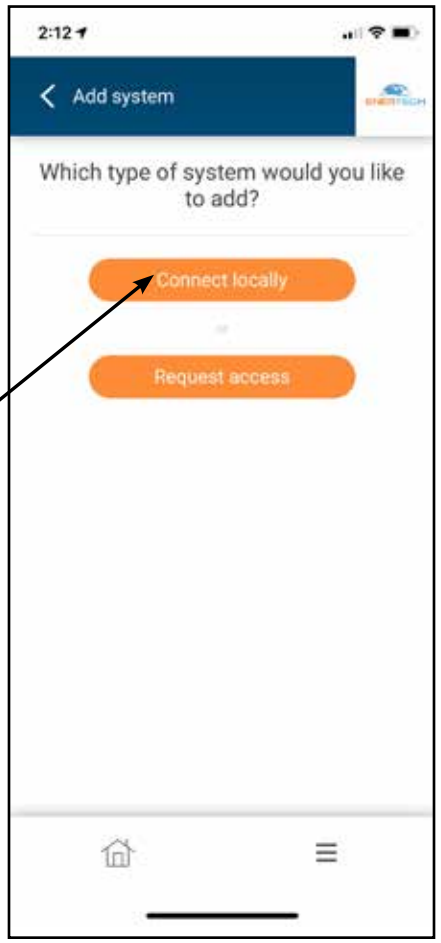
2. Using a ball point pen, push in on the button at the bottom of the IG for 5 seconds. The LED ring will start spinning, indicating that it is ready to connect.



Depress button for 5 seconds with a ball point pen (LED ring will start spinning after releasing button)

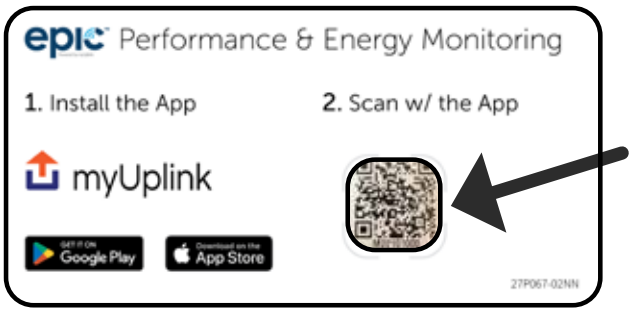
3. Open the Pro app and tap on the plus symbol (“Add”).

4. Tap “Connect locally” to connect the Pro app to the IG.



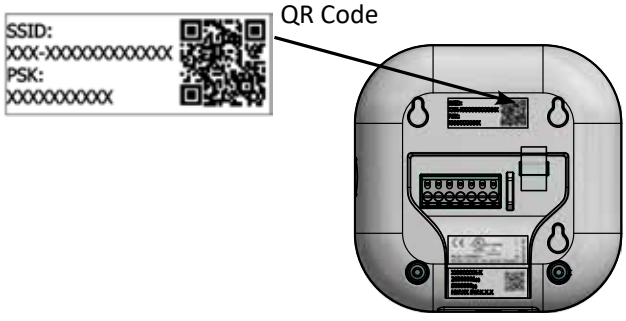
5. Tap “Scan QR code”.

6. From app, scan label on front of the unit during setup.



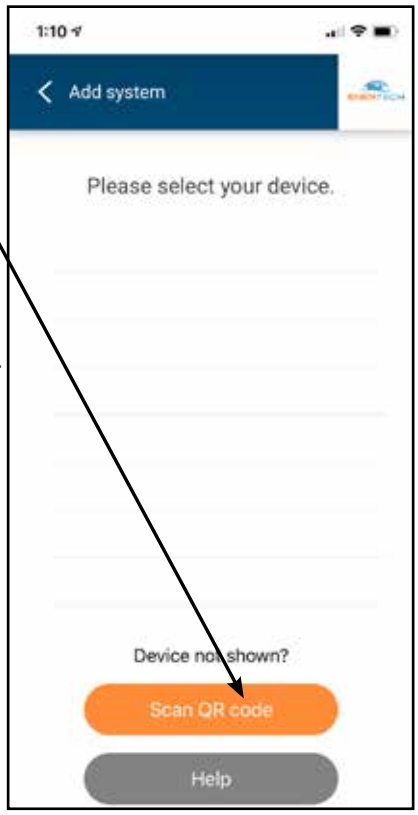
7. Alternately, turn the IG around to view back side of the device.

- Gently push up on the IG to release it from the mounting screws. The control box has a shoulder type screw that allows the IG to attach via the “keyholes” molded into the IG case.



8. Tap “Scan QR code” to connect the Pro app to the IG.

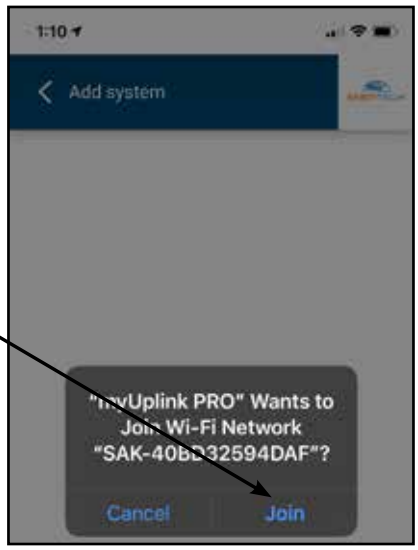
Tap “Scan QR code”



IMPORTANT: Do not scan the QR code from the phone’s camera app. Only scan the code from the myUplink app. The QR code is part of the commissioning process. Scanning it outside of the app may cause the smartphone to try to connect directly to the IG, potentially creating connectivity issues.

9. Position the smartphone to read the QR code. Once it reads the code, the app will ask to join the IG network. This will connect the phone directly to the IG. Tap “Join”.

Tap “Join”

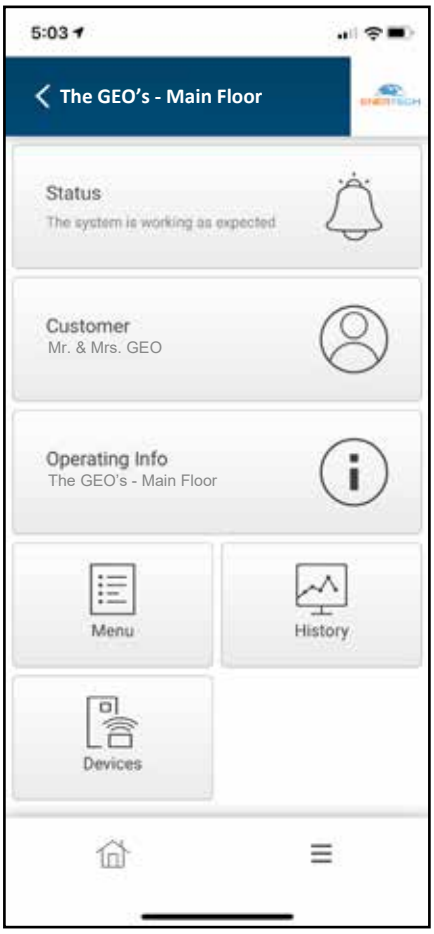


10. After tapping “Join”, the next screen will display “Connecting to device”.

11. Once connected, tap on “Show System”.

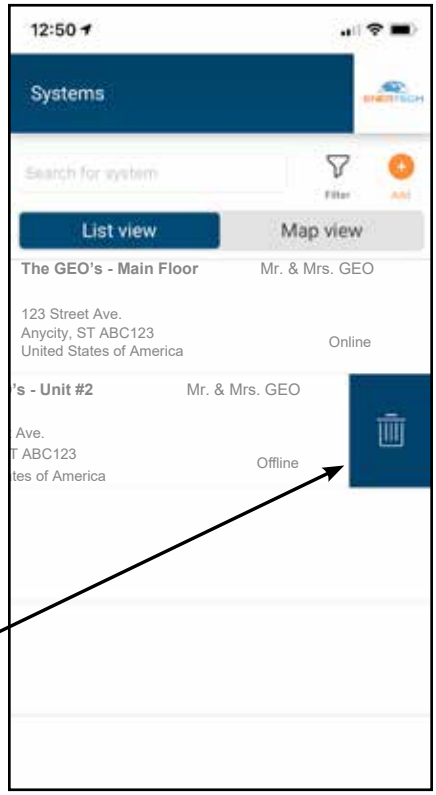
Tap “Show System”

12. The system will now be displayed in the Pro app.



Deleting a System from the Pro App

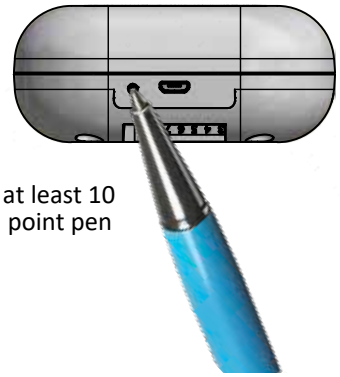
If a system needs to be deleted from the Pro app, simply swipe left on the system and tap on the trash can icon.



Swipe left. Then tap on the trash can icon.

Factory Reset

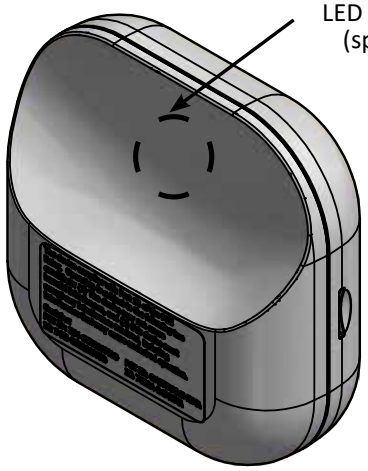
There may be a need to reset the Internet Gateway (IG) to factory settings. For example, if the owner installs a new router, the IG will need to be recommissioned. Resetting the IG simply involves holding the button at the bottom of the IG for at least 10 continuous seconds. Once the IG is reset, the LED ring will flash five times, indicating that it has been reset. Once the IG is reset, it may be recommissioned based upon the four scenarios mentioned earlier in the Connected Controls section.



Depress button for at least 10 seconds with a ball point pen

Internet Gateway (IG) LED Ring Display

The IG has an LED ring that displays the current state of the IG, indicating if it is connected to the WiFi network, ready for setup, etc. The table on the next page lists the various operating states of the LED ring.



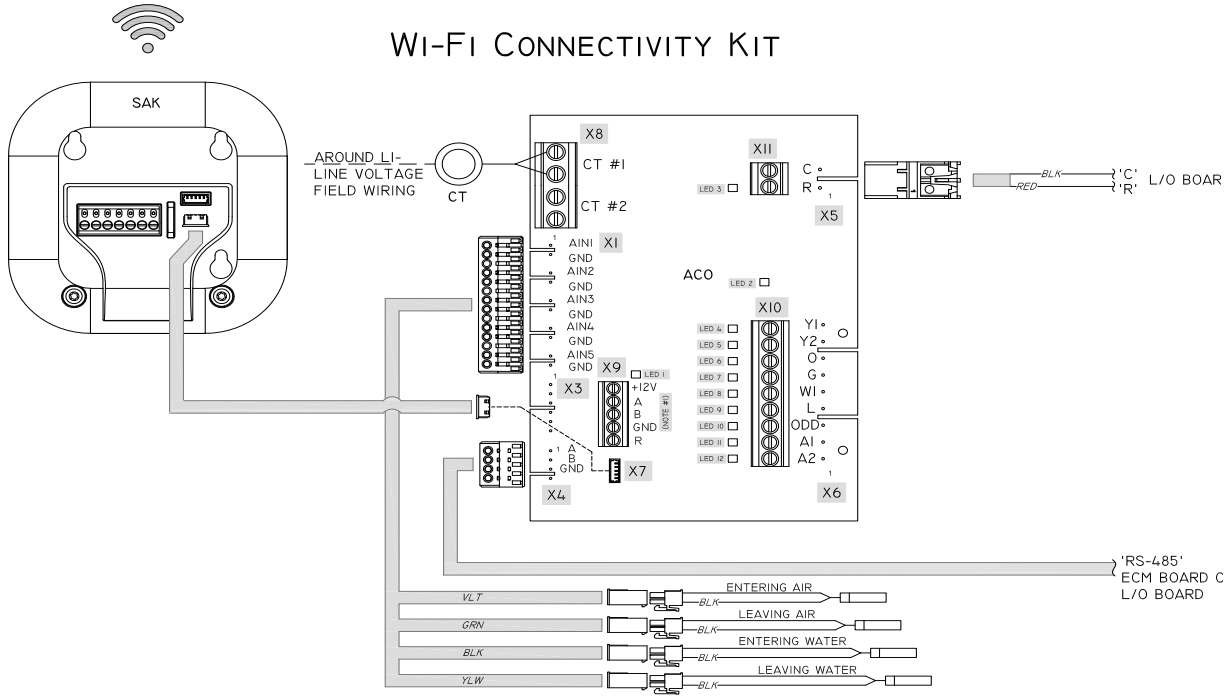
LED ring behind casing (spinning/flashing)

LED Status	Pattern
Booting (starting up after powering on)	Circle with 5 second delay in between
Waiting to be commissioned	Continuous circle with no delay
Idle	Pulsing (heartbeat) with no delay in between
Running in heating or cooling	Slower continuous circle with delay
Emergency Heat	Same as htg/clg but red center LED blinking twice followed by 5 sec delay
Lockout	Red center LED blinks twice, followed by 5 seccond delay
WiFi disconnected	Faster plulsing with 5 second delay in between
WiFi connected - connecting to Cloud	Circle with 5 second delay in between
During software update	LEDs bounce left and right, back and forth
Software update success	Circle LEDs blink 5 times
Factory reset	

Troubleshooting

Troubleshooting the controls primarily involves monitoring the LED status (see table above), reviewing the myUplink and myUplink Pro apps, and determining if the issue is with the connected controls or with the owner's WiFi network. The following steps will help determine how to troubleshoot the controls:

1. If the system is not online, try resetting power to the cable/DSL modem and WiFi router. Additional WiFi troubleshooting can be found at support.enertechusa.com/epic
2. Attempt to connect directly from the myUplink Pro app. If system connects to the app, the connectivity issue is with the WiFi network, not the connected controls.
3. Compare the current LED status to the table above to determine the state of the control.
4. Ensure that all connections are as shown in the wiring diagram to the right.



Soft Start Controls

Hyper Engineering SureStart Series is specifically targeted to reduce light flicker caused by the startup of fixed speed permanent split-capacitor motors (PSC). These motors are often of the scroll compressor types which are commonly used in air-conditioning and heat pump applications. The SureStart includes the following features:

- 60-70% reduction in direct on-line (DOL) or in-rush current.
- Sophisticated under voltage protection
- Motor reversal protection.
- Self-adjusting up to nominal 7 hp for optimal start performance.
- 50/60 Hz compatible.
- ETL, CE, EMC, and RoHs compliant.
- Tolerant to “dirty power” conditions.
- Versions available for retrofit installations or OEM production use.
- Fault LED
- Internal Current Limiting

Background

In air conditioning and heat pump applications, energy is moved through the system by a compressor which is an electrically driven pump that compresses refrigerant as it pumps to a heat exchanger. Compressors are the heart of air conditioning equipment so it is important to protect them against failure. Inside of every compressor is an electric motor that draws a significant electrical current at startup. This startup current is often referred to as the instantaneous current, in-rush current, locked-rotor amps (LRA), or direct-on-line (DOL) current. In-rush current is generally between 5-8 times higher than the current consumed by the compressor during normal operation.

As the name suggests, in-rush current is very brief lasting for a fraction of a second until the motor begins operating at normal speed. This time period may appear trivial; however, it is the cause of many issues for owners, power companies, and equipment manufacturers. Below is a list of common problems created by high in-rush current.

- Flickering of lights
- Nuisance trips on safety protection equipment
- Disrupts sensitive electronics such as computers
- Increased stress on the motor which reduces the reliability of the air conditioning equipment.
- Higher installation cost due to insufficient transformer sizing
- Increased noise and vibration at compressor startup

Most contractors install hard start kits to eliminate these problems. Unfortunately, hard start kits don’t provide a complete solution to the problem. Hard start kits do not reduce the startup current but only the startup time which may give a perceived improvement in light flicker, but still stress the compressor during every start. Mechanical shock is also increased to the compressor by use of a hard start device. Installing a SureStart corrects these problems by significantly reducing the start current, optimizing the start time to the compressor size, power supply and loading while providing vital protection to the compressor, and promoting improved reliability at startup.

In-Rush Current

Motor in-rush occurs due to low resistance in motor windings essentially acting like a short circuit. This temporary short circuit causes an immediate spike in current and simultaneous drop in supply Voltage. Voltage drops for air conditioning compressors are often 15% or more which is 3-4 times greater than what most electrical power distributors prefer. The more frequently the compressor starts, the more noticeable the problem becomes. For most homes in the US, air conditioners usually start at a rate of 6-10 starts per hour.

SureStart In-Rush Reduction

HVAC Tons	Compressor RLA	Before In-Rush	After SureStart	% Reduction
1.5	9	48	15	69
2.0	14	73	22	70
2.5	17	79	24	69
3.0	20	109	33	70
4.0	26	134	40	71
5.0	30	158	47	71
7.0	32	185	56	54

SureStart Operation

When the system control calls for compressor operation, the compressor contactor will energize. If the supply voltage to the SureStart is less than “Minimum Startup Voltage”, a 50 second delay is initiated. At the end of the delay, another attempt to start the compressor will begin unless the supply voltage remains unchanged.

SureStart uses an optimized starting process that learns the starting characteristics of the compressor to further refine the starting cycle on each recurring start. If the compressor fails to start, the module will terminate the start attempt after 1 second and initiate a 3 minute lockout before attempting a restart. If the supply voltage falls below “Shutdown on Low voltage” limit for 2 seconds or below 130 volts for 0.1 seconds while the compressor is running the module will stop the compressor and initiate a 3 minute lockout. A restart will be attempted after 3 minutes if the supply voltage is equal to “Minimum Startup Voltage” or higher. This is done to protect the compressor against a sudden drop in supply voltage.

SureStart is able to detect an interruption in power, when the interruption is 0.1 seconds or longer. When a power interrupt is detected, SureStart will shut down the compressor for 3 minutes. SureStart is also able to determine if the compressor is running backwards. If this condition is detected, SureStart will stop the compressor for 3 minutes before a restart is attempted. A power interrupt that is shorter duration than 0.1 seconds may result in a compressor running backwards, which the SureStart can detect and stop compressor operation.
If the run capacitor is faulty or has failed, SureStart will shutdown the compressor for 3 minutes before attempting a restart.

⚠ NOTICE ⚠

SureStart uses an optimized starting process that learns the starting characteristics of the compressor to further refine the starting cycle on each recurring start. It will usually optimize itself within the first (6) starts. For this reason, the first few starts should be ignored.

Section 5: Controls

Led Flash Codes

A Red LED indicator will flash under the following conditions.

Note: LED fault indicator is turned off in normal running mode.

A. Rapid Flash (10/sec) : Low Voltage
B. Triple Flash Every Three Seconds (3 / 3 secs): Lockout on Three Failed Starts
C. Slow Flash (1 / 3 secs): Lockout on Over Current
D. Slow Steady Flash (1/sec): Cycle Delay / Fault Mode

Flash Code (Rapid Flash (10/sec) : Low Voltage)

- Displayed for "Low supply voltage" before or after a softstart.
- If Low voltage is detected before a start, a re-start is attempted after 50 seconds.
- If Low voltage is detected after a start, a re-start is attempted after 3 minutes.

Flash Code (Triple Flash every three seconds (3/3 secs): Lockout on Three Failed Starts)

- Displayed after failure to start on "Three consecutive start attempts".
- Re-start is attempted after 50 minutes.
- Standard lockout period is revised to 3 minutes after a successful start.

In circumstances where the compressor may have seized or is unable to startup due to failure of other components in the HVAC system, the software will check for three consecutive failed starts. On the third sequential failed start, the program goes into Lockout for 50 mins. On failing to get a good start even after 50 mins, it will re-attempt start again after duration of 50 mins. Once a good start is eventually achieved, it will reset the hardstart counter and will require 3 failed starts again to force it back into Lockout mode. Lockout can be cleared anytime through a power reset of the SureStart device.

Flash Code (Slow Flash (1/3 secs): Lockout on Over current)

- Displayed for "Overcurrent" in running mode of the compressor motor.
- Overcurrent limit is "25A for 08-16A version" and "50A for 16-32A rated version".
- Also displayed, if internal Klixon of the compressor trips out on overheat.
- Re-start is attempted after 10 minutes.

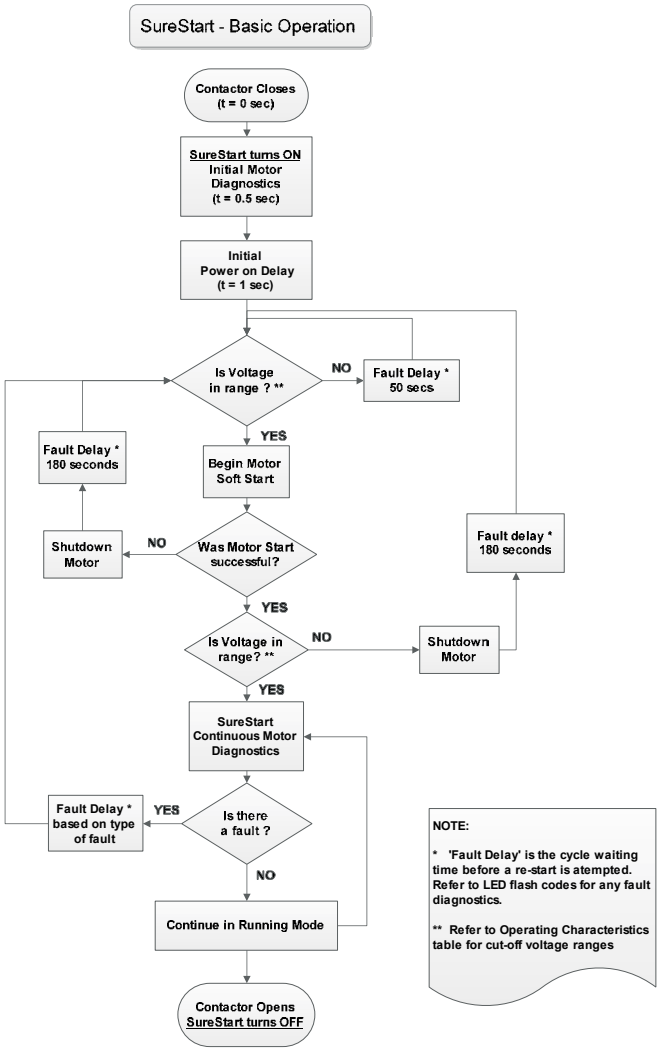
To limit the current in compressors from extending abnormally beyond its stated capacities, SureStart is also equipped with Overcurrent limit protection. For models rated from 16-32A, SureStart is designed to trip out in overload conditions exceeding 50A. In smaller models, it is designed to cutoff power to the compressor if the current drawn exceeds 25A. On overcurrent lockout, SureStart attempts a re-start automatically after 10 minutes.

Both failed start lockout and overcurrent limit protection have been designed to prevent the compressor from drawing abnormal currents in conditions not feasible for the compressor operation.

Flash Code (Slow Steady Flash (1/sec): Cycle Delay / Fault Mode)

- Displayed for "Cycle delay" between two consecutive softstarts or other faults mentioned below.
- Re-start is attempted after a default period of 3 minutes.
- Other possible reasons for this Fault mode indicator can be due to:
  - incorrect wiring during installation
  - a failed soft start attempt
  - intermittent power loss (duration longer than 100ms)
  - frequency out of range
  - failed run capacitor.

SureStart Basic Operation Chart:



Section 6: Unit Piping

Water Quality Table

Potential	Problem Chemical(s) or Condition	Range for Copper Heat Exchangers	Range for Cupro-Nickel Heat Exchangers	Range for Stainless Steel BPHE
Scaling	Calcium & Magnesium	Less than 350 ppm	Less than 350 ppm	Less than 0.1 ppm
	pH Range	7 - 9	5 - 9	7 - 9
Corrosion	Total Dissolved Solids	Less than 1000 ppm	Less than 1500 ppm	No rigid setpoint
	Ammonia, Ammonium Hydroxide	Less than 0.5 ppm	Less than 0.5 ppm	No Limit
	Ammonium Chloride, Ammonium	Less than 0.5 ppm	Less than 0.5 ppm	Less than 2-20 ppm
	Calcium Chloride / Sodium	Less than 125 ppm	Less than 125 ppm	Not Allowed
	Chlorine	Less than 0.5 ppm	Less than 0.5 ppm	Not Allowed
	Hydrogen Sulfide	None Allowed	None Allowed	Less than 0.05 ppm
Biological	Iron Bacteria	None Allowed	None Allowed	Not Allowed
	Iron Oxide	Less than 1 ppm	Less than 1 ppm	Less than 0.2 ppm
Erosion	Suspended Solids	Less than 10 ppm	Less than 10 ppm	16-20 mesh strainer recommended
	Water Velocity	Less than 8ft/s	Less than 12 ft/s	Less than 5.5 m/s in the port

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

The quality of the water used in geothermal systems is very important. Water quality is not only important for the source side of the system, but even more so 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 the table above.

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 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.

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.

In an open loop system the water quality is of no less importance. Due to the inherent variation of the supply water, it should be tested prior to making the decision to use an open loop system. Scaling of the heat exchanger and corrosion of the internal parts are two of the potential problems. The Department of Natural Resources or your local municipality can direct you to the proper testing agency. Please see Table 2 for guidelines.

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

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.

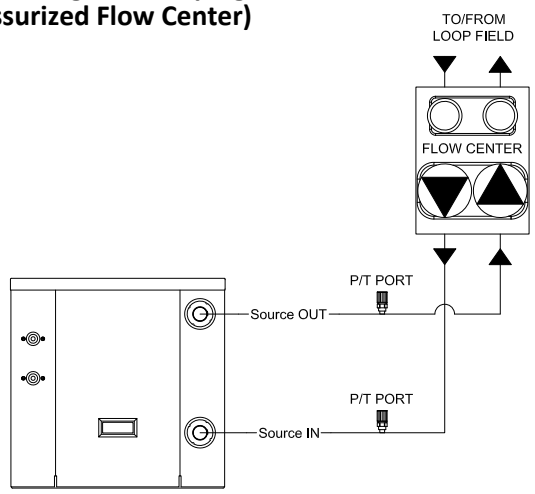
Section 6: Unit Piping

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)



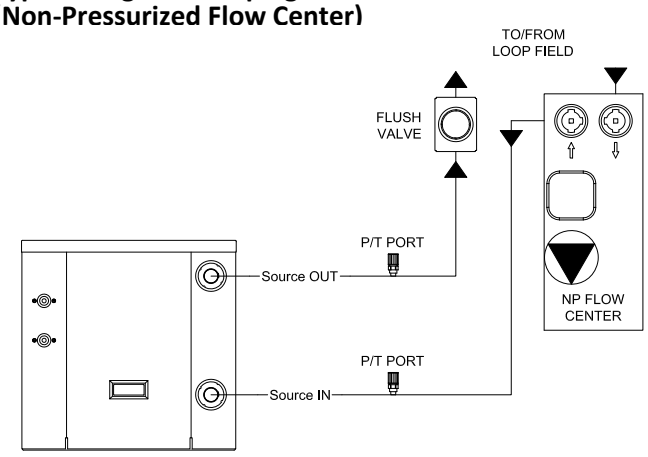
Typical Non-Pressurized Flow Center Installation

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).

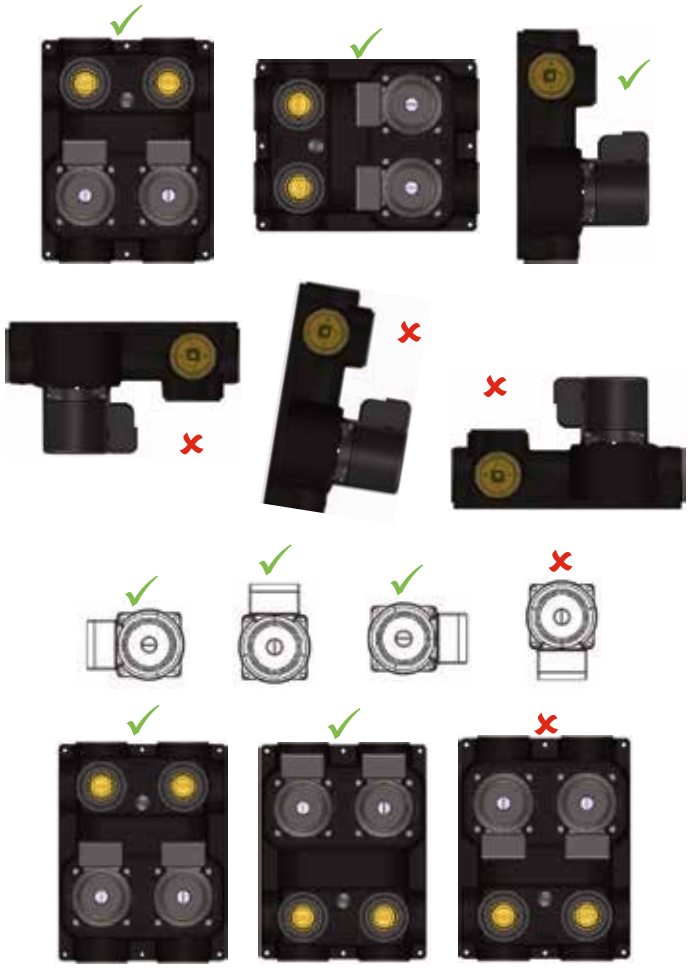
Typical Single Unit Piping Connection (Non-Pressurized Flow Center)



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 (See Acceptable terminal box locations for UPS26-99, UP26-99, and UP26-116 pumps) for proper control 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.

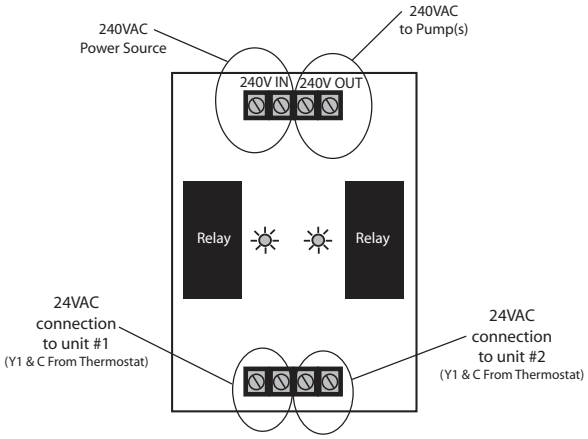


Section 6: Unit Piping

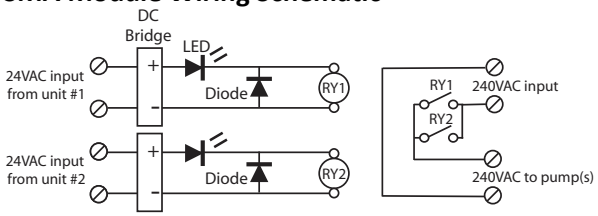
APSMA Pump Sharing Module

The pump sharing module, part number APSMA, is designed to allow two units to share one flow center. With the APSMA module, either unit can energize the pump(s). Connect the units and flow center as shown in APSMA Module Layout Diagram, below. The APSMA Module Wiring Schematic provides a layout of the board. The module must be mounted in a NEMA enclosure or inside the unit control box. Local code supersedes any recommendations in this document.

APSMA Module Layout



APSMA Module Wiring Schematic



Open Loop Piping

Placement of the components for an open loop system are important when considering water quality and long term maintenance. The water solenoid valve should always be placed on the outlet of the heat pump, which will keep the heat exchanger under pressure when the unit is not operating. If the heat exchanger is under pressure, minerals will stay in suspension. Water solenoid valves are also designed to close against the pressure, not with the pressure. Otherwise, they tend to be noisy when closing.

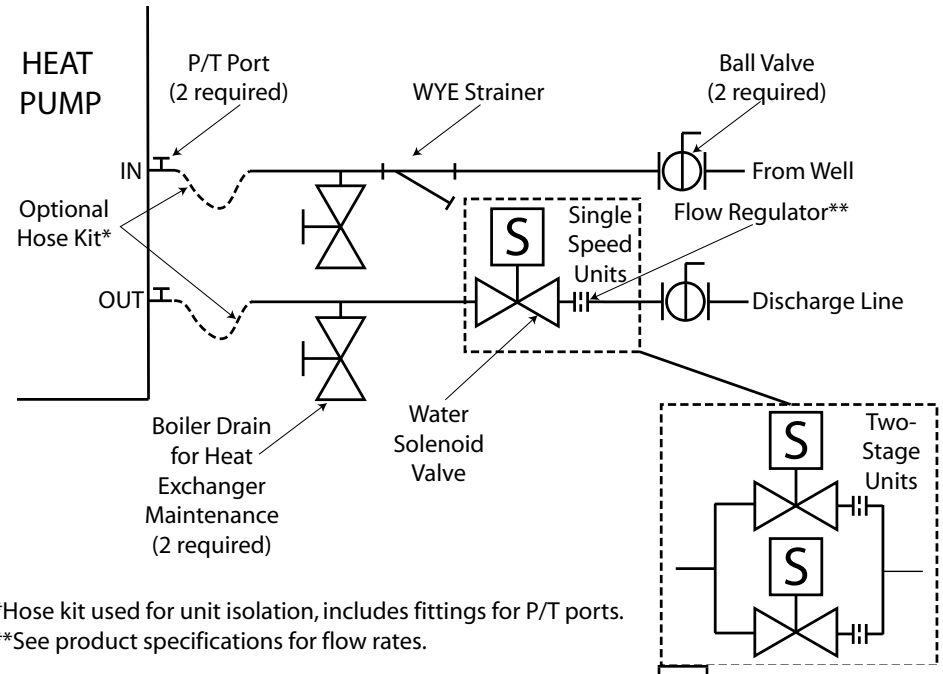
A flow regulator should be placed after the water solenoid valve. Always check the product specification catalog for proper flow rate. A calculation must be made to determine the flow rate, so that the leaving water temperature does not have the possibility of freezing.

Other necessary components include a strainer, boiler drains for heat exchanger flushing, P/T ports and ball valves. Ball valves allow the water to be shut off for service, and help when velocity noise is noticeable through the flow regulator. Spreading some of the pressure drop across the ball valves will lessen the velocity noise. Always double check flow rate at the P/T ports to make sure the ball valve adjustments have not lowered water flow too much, and essentially taken the flow regulator out of the equation. It's a good idea to remove the ball valve handles once the system is completed to avoid nuisance service calls.

Hose kits are optional, but make for an easier installation, since the P/T ports and connections are included. The hose also helps to isolate the heat pump from the piping system.

Since the heat pump can operate at lower waterflow on first stage, two stage units typically include two water solenoid valves to save water. The flow regulators should be sized so that when one valve is open the unit operates at first stage flow rate, and when both valves are open, the unit operates at full load flow rate. For example, a 4 ton unit needs approximately 4 GPM on first stage, and approximately 7 GPM at full load. The flow regulator after the first valve should be 4 GPM, and the flow regulator after the second valve should be 3 GPM. When both valves are open, the unit will operate at 7 GPM.

Open Loop Piping Example



Notes:

- When sizing the first stage flow regulator, be sure to allow enough flow to close the flow switch.
- Smaller tonnage two-stage units may only utilize one solenoid valve and flow regulator.

*Hose kit used for unit isolation, includes fittings for P/T ports.
**See product specifications for flow rates.

Section 6: Unit Piping

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

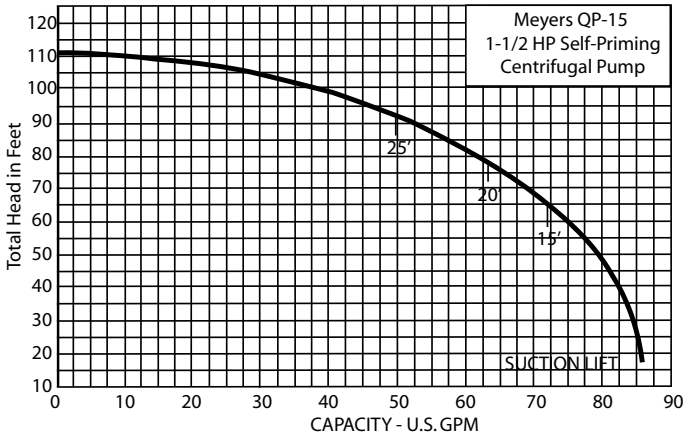
Most flow center or pump failures are a result of poor water quality or debris. Debris entering the loop during fusion and installation can cause noise and premature pump failure. Enertech recommends a double flush filtering method during purging. When purging, use a 100 micron bag filter until air bubbles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

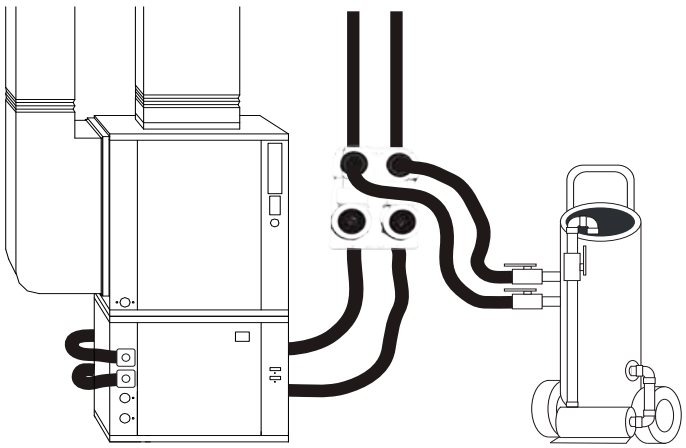


Flushing Process

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.

Flush Cart Connections



Section 6: Unit Piping

Water Quality: Even on a closed loop system water quality is an issue. The system needs to be filled with clean water. If the water on site has high iron content, high hardness, or the PH is out of balance, premature pump failure may result. Depending upon water quality, it may need to be brought in from off site.

Step 2: Flushing the Unit

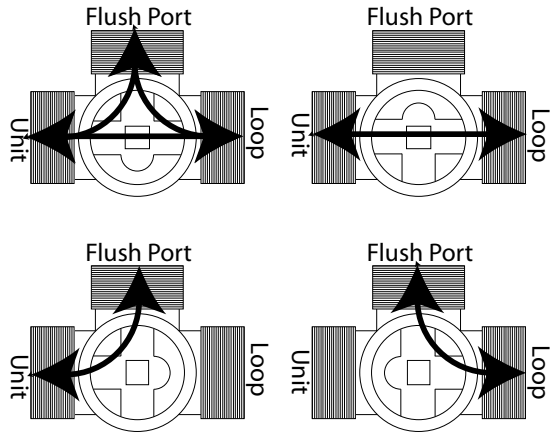
1. Turn off the pump on the flush cart.
2. Turn both 3-way valves to the unit and flush port position.
3. Turn the pump back on. It may be necessary to turn the water supply back on to keep the water level in the reservoir above the return tee.
4. This should only take 5 to 10 minutes to purge the unit.
5. Once this is done, the entire system is now full of water, and the flush cart pump may be turned off.

Step 3: Adding Antifreeze by Displacement

If the antifreeze was not added when the loop was being filled, it will be necessary to follow the next few steps.

1. Turn both 3-way "Ts" back to the original position for flushing the loop only.
2. Close the return side ball valve on the flush cart.
3. Connect hose to the return side discharge line and run it to a drain. Open the ball valve on discharge line on flush cart.
4. Turn pump on until water level is sucked down just above the water outlet in the reservoir, and turn pump off. Be sure not to suck air back into the system.
5. Fill the reservoir back up with the antifreeze.
6. Repeat steps 5 and 6 until all the antifreeze is in the system and reservoir.
7. Turn the discharge line ball valve off at the flush cart. Turn the return line ball valve back to the on position.
8. It may be necessary to add some water into the reservoir to keep the water level above the return tee so that the solution does not foam.
9. The system must be run for 3 to 4 hours to mix the antifreeze and water in the reservoir. The fluid will not mix inside the loop.
10. Check the antifreeze level every so often to insure that the proper amount was added to the system (see antifreeze charging section).

Flow Center 3-Way Valves



Step 4: Final Pressurization of System

Once all of the air and debris has been removed, and the antifreeze has been added and mixed, the system is ready for final pressurization.

1. Turn one of the 3-way valves so that it is open to all 3 ports, the unit, loop, and flush port. Turn the other valve so it is only open to the loop and flush port (pressure is also applied to the hose kit in this arrangement).
2. Turn the flush cart pump on and allow the system to start circulating.
3. With the pump running, turn the return line ball valve to the off position on the flush cart, "dead heading" the pump.
4. There should be a maximum of 1" to 2" inches of drop in the water level in the reservoir. This only takes about 3-5 seconds.
5. Next, turn the supply line ball valve to the off position on the flush cart (isolates the flow center from the flush cart).
6. Now that the system is isolated from the reservoir the pump can be turned off. Do not open the main flush cart ball valves yet.
7. Connect the water supply back to the discharge line hose connection, and open the ball valve. Turn on the water supply and leave it on for 20 to 30 minutes. This will stretch the pipe properly to insure that the system will not have a "flat" loop during cooling operation.
8. Once the loop is pressured (recommended pressure on initial start up is 50 to 70 psi), turn the water supply off. Turn off the discharge line ball valve, and disconnect the water supply. Maximum pressure should never exceed 100 psi under any circumstance!
9. Turn the 3-way valves on the flow center back to the normal operation mode, which closes the flush port connections.
10. Open the ball valves on the flush cart to relieve pressure on the hoses. Disconnect the hoses from the flow center.

Note: Pressurized flow centers and Grundfos UP series pumps need a minimum of 3psi on the suction side of the pump to operate. Maximum operating pressure is 100 psi.

Loop static pressure will fluctuate with the seasons. Pressures will be higher in the winter months than during the summer months. In the cooling mode the heat pump is rejecting heat, which relaxes the pipe. This fluctuation is normal and needs to be considered when charging and pressuring the system initially. Typical operating pressures of an earth loop are 15 to 50 psi.

Note: Burping pump(s): On flow center initial start up, the pumps must be bled of air. Start the system and remove the bleed screw from the back side of the pump(s). This allows any trapped air to bleed out. It also floods the pump shaft, and keeps the pump(s) cool. Failure to do this could result in premature pump failure.

Wye Strainer Installation

(MANDATORY ON UNITS WITH BPHE)

Enertech provides a Wye Strainer and 4" brass nipple which must be installed on the Source Side input. Failure to do so may cause fouling of the heat exchanger, shorten unit life expectancy and void the warranty. Always point the screen leg toward the unit and straight down. Use caution to assure clearance for strainer screen removal and hanger bracket use is maintained.

Section 7: Desuperheater Package

Desuperheater Package

Water heating is standard on all residential units (units may be ordered without). It uses excess heat during both heating and cooling cycles, to provide hot water for domestic needs. A vented double wall desuperheater exchanger (coil) located between the compressor and the reversing valve, extracts superheated vapor to heat domestic water; still satisfying its heating and cooling needs. The water circulation pump comes pre-mounted in all residential units.

Desuperheater Installation

Units that ship with the desuperheater function also ship with a connection kit. Installation of the kit and examples of connection to the potable water system is described in the following steps and drawings.

Notes:

- ALL Enertech Global products meet the requirements of NSF-372 (Lead Free).
- Desuperheater capacity is based on 0.4 GPM Flow per nominal ton at 90°F entering hot water temperature.
- Units that are shipped with a desuperheater do not have the desuperheater pump wires connected to the electrical circuit, to prevent accidentally running the pump while dry. Pump has to be connected to the electric circuit (master contactor) when the lines from the water heater are installed & air is removed.

TIP: Measure the distance above the floor or shelf that the water heater is sitting on, to where the drain valve is located. This distance must be greater than one-half the width of the tee you're about to install, or you won't be able to thread the tee on to the water heater.

⚠ WARNING ⚠

TO AVOID SERIOUS INJURY, IT IS RECOMMENDED THAT AN ANTI-SCALD MIXING VALVE IS INSTALLED ON THE HOT WATER SUPPLY LINE INTO THE HOME. EVEN THOUGH HOT WATER TANK TEMPERATURES COULD APPEAR TO BE SET AT LOWER LEVELS, HIGH TEMPERATURE WATER FROM THE DESUPERHEATER COULD RAISE TANK TEMPERATURES TO UNSAFE LEVELS.

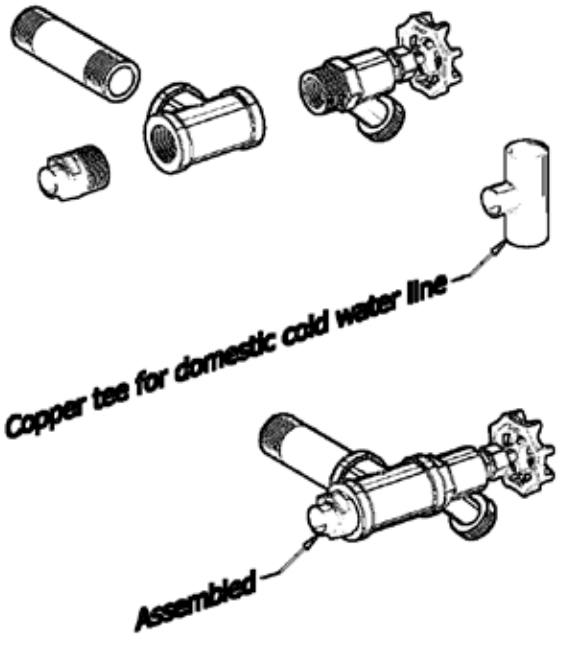
Plumbing Installation

All plumbing and piping connections must comply with local plumbing codes.

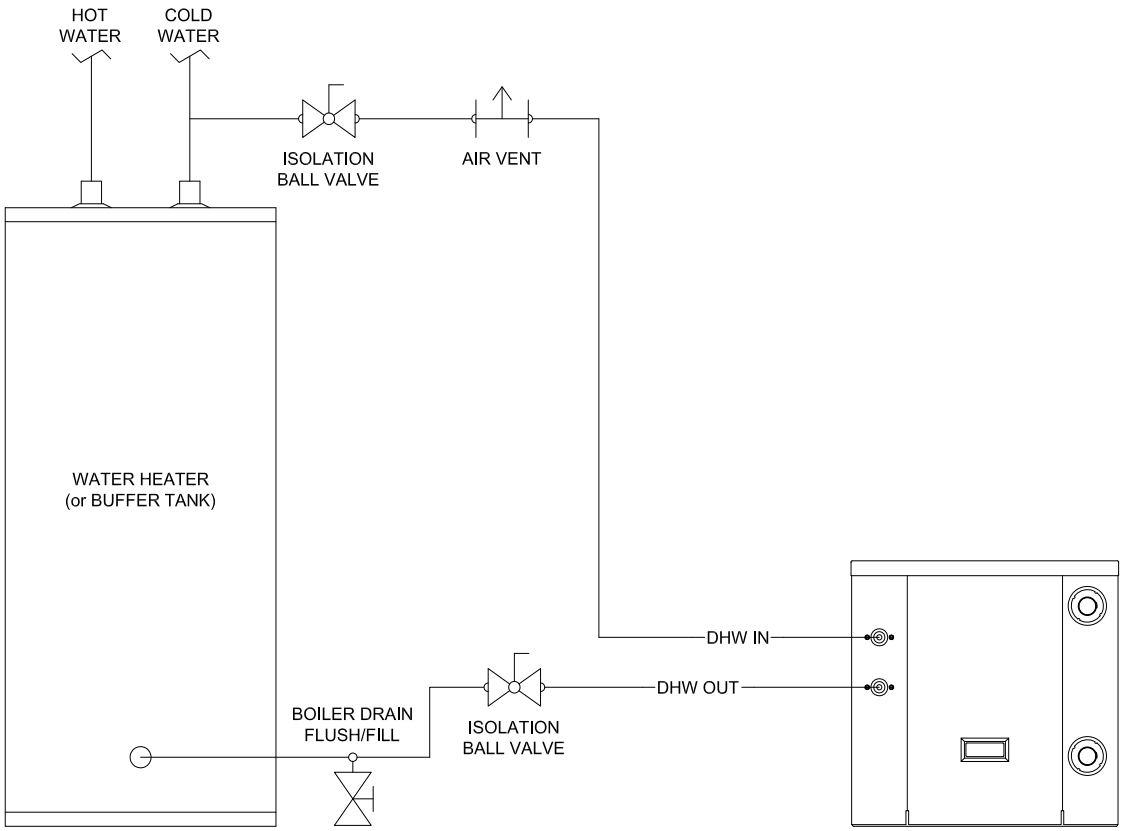
1. Disconnect electricity to water heater.
2. Turn off water supply to water heater.
3. Drain water heater. Open pressure relief valve.
4. Remove drain valve and fitting from water heater.
5. Thread the ¾" MPT x 3-1/2" nipple into the water heater drain port. Use Teflon tape, or pipe dope on threads.
6. Thread the center port of the ¾" brass tee to the other end of the nipple.
7. Thread one of the copper adaptors into the end of the tee closest to the heat pump.
8. Thread the drain valve into the other end of the nipple.
9. Above the water heater, cut the incoming cold water line. Remove a section of that line to enable the placement of the copper tee.
10. Insert the copper tee in the cold water line.
11. Thread the remaining two ½"SWT x ¾"MPT copper adaptors into the ¾" FPT fittings on the heat pump marked HWG IN and HWG OUT.
12. Run interconnecting ½" copper pipe from the HOT WATER OUT on the heat pump, to the copper adaptor located on the tee at the bottom of the water heater.
13. Run interconnecting ½" copper pipe from the HOT WATER IN on the heat pump, to the copper tee in the cold water line.
14. Install an air vent fitting at the highest point of the line from step 13 (assuming it's the higher of the two lines from the heat pump to the water heater).
15. Shut off the valve installed in the desuperheater line close to the tee in the cold water line. Open the air vent and all shut off valves installed in the "hot water out".
16. Turn the water supply to the water heater on. Fill water heater. Open highest hot water faucet to purge air from tank and piping.
17. Flush the interconnecting lines, and check for leaks. Make sure air vent is shut off when water begins to drip steadily from the vent.
18. Loosen the screw on the end of the despuerheater pump to purge the air from the pump's rotor housing. A steady drip of water will indicate the air is removed. Tighten the screw and the pump can be connected to the contactor or terminal block.
19. Install 3/8" closed cell insulation on the lines connecting the heat pump to the water heater.
20. Reconnect electricity to water heater.

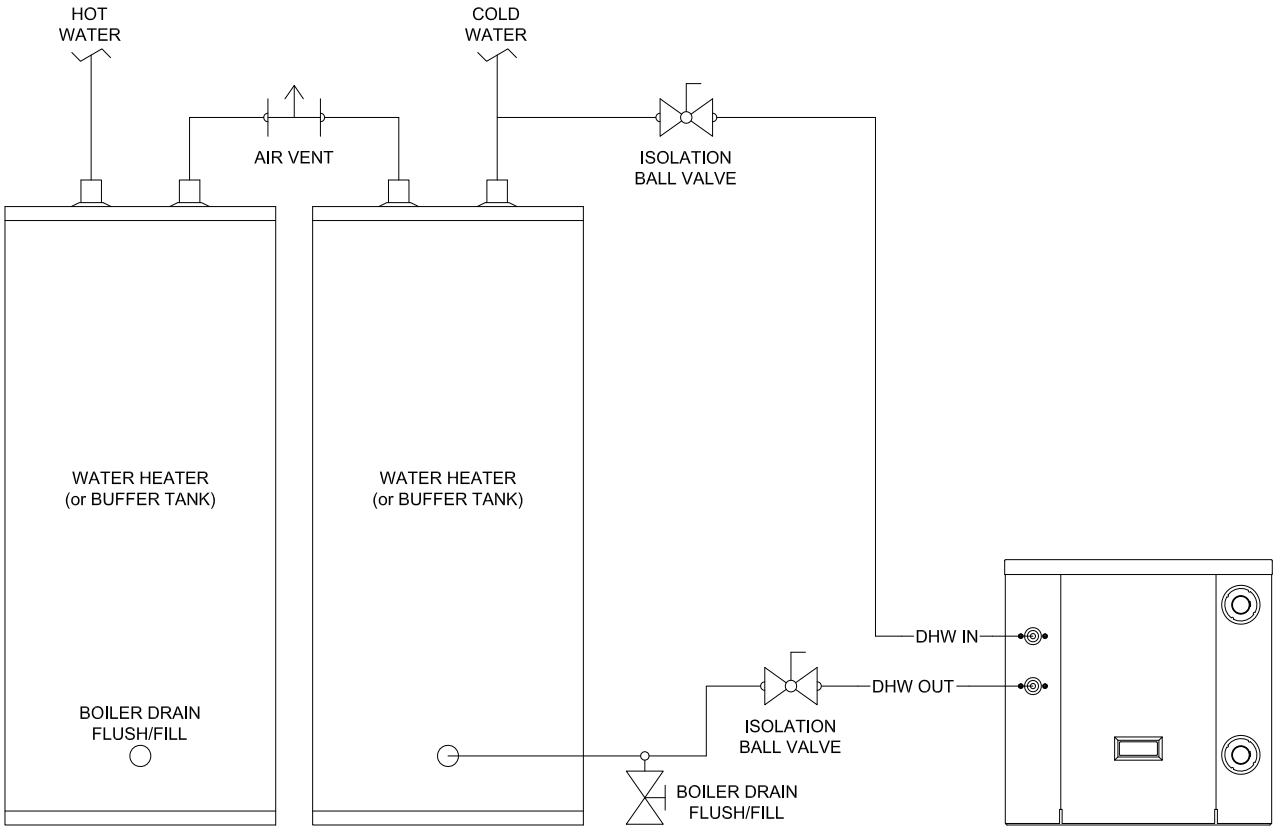
Contents of the Desuperheater Fitting Kit

- (1) p/n 20D052-01NN, Installation Instructions
- (1) p/n 33P211-01BN, 3/4"x 3/4"x 3/4" FPT Brass Tee
- (1) p/n 33P210-01NN, ¾" Boiler Drain Valve
- (1) p/n 11080005001, ¾" MPT x 3-1/2" Brass Nipple
- (3) p/n 11080006001, ½" SWT x ¾" MPT Copper Adaptor
- (1) p/n 11080007001, ¾" x ¾" x ½" SWT Copper Tee



Typical Desuperheater Installation Diagrams





Section 8: Antifreeze

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.

Antifreeze 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?

⚠ 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.

⚠ 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.

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.

Antifreeze 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.

Pipe Fluid Volume Table

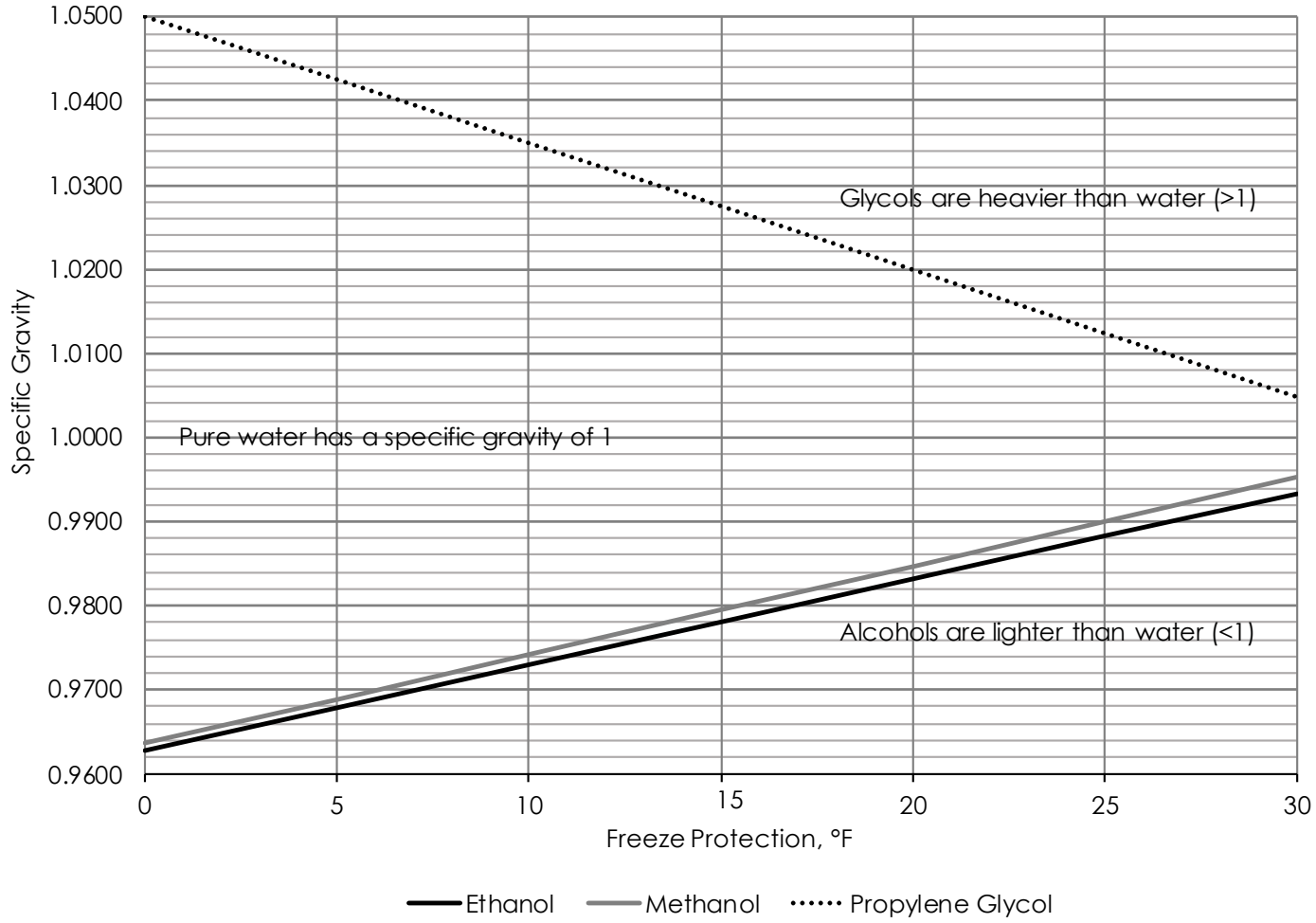
Type	Size	Volume Per 100ft US Gallons
Copper	1" CTS	4.1
Copper	1.25" CTS	6.4
Copper	1.5" CTS	9.2
HDPE	.75" SDR11	3.0
HDPE	1" SDR11	4.7
HDPE	1.25" SDR11	7.5
HDPE	1.5" SDR11	9.8
HDPE	2" SDR11	15.4

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

Section 8: Antifreeze

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.				

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.

⚠ CAUTION ⚠
DO NOT START-UP THE UNIT UNTIL THE NEW STRUCTURE IS READY TO BE OCCUPIED

⚠ CAUTION ⚠
CHECK THE FOLLOWING BEFORE POWER IS APPLIED TO THE EQUIPMENT

Equipment Start-Up Checklist

Electrical:
- ☐ High voltage wiring and breakers are properly sized and installed.
- ☐ Auxiliary electric heaters are wired and installed correctly.
- ☐ Circulator pumps are wired properly and connected to the proper terminal block.
- ☐ Low voltage wiring is correct and completely installed.
- ☐ Source voltage is correct and matches dataplate.
- ☐ HWG pump is not wired or is switched off until all piping is correct and air is purged from the system.
- ☐ Lockout board jumpers are properly selected for installation, i.e., A-FRZ jumper removed for closed loop.

Plumbing:
- ☐ Piping is completed, properly sized and purged of all air and debris, loop, HWG and load side.
- ☐ Pumps are properly sized and purged of all air.
- ☐ Correct amount of antifreeze has been added.
- ☐ All valves are open including flow center.
- ☐ Condensate is trapped and properly piped to drain.

Mechanical:
- ☐ Filter is installed and clean.
- ☐ Packaging and shipping brackets are removed from the blower assembly.
- ☐ Blower turns freely.
- ☐ Canvas connections installed on supply plenum & return drop.
- ☐ Replace all service panels and screws.

Equipment Start-Up:

1. Energize geothermal unit with high voltage.
2. Make sure secondary/low voltage is between 20V and 29V. Check the transformer's primary connections at the main contactor for the correct voltage (Orange & Black = 230V; Red & Black = 208V). Correct any possible voltage drops in the main voltage.
3. Set the thermostat to "Heat" or "Cool." Adjust set point to energize the unit. System will energize after delays expire (typically a five minute delay).
4. Check water flow with a flow meter (non-pressurized) or pressure drop conversion (pressurized). Pressure drop tables must be used to convert the pressure drop to GPM. The pressure drop can be obtained by checking water pressure in and water pressure out at the P/T ports. Check the geothermal unit's electrical readings listed in the Unit Electrical Data table.
5. Check the source water temperature in and out at the P/T ports (use insertion probe). Allow 10 minutes of operation before recording temperature drop.
6. Calculate the heat of extraction or heat of rejection.
7. Check the temperature difference of the load coax (water-to-water) or air coil (water-toair). P/T ports are recommended for use on the load side, but the line temperatures can be used to check the temperature difference.
8. Change the mode of the thermostat and adjust the set point to energize the unit. Check the data in opposite mode as the previous tests. Amp draws as well as temperature differences and flow rate should be recorded.
9. Check auxiliary heat operation by adjusting the thermostat set point 5°F above the room temperature in "Heat" mode or set thermostat to "Emergency." Record voltage, amperage, and air temperature difference.
10. Connect HWG wires or turn switch (if equipped) to on position.

Section 9: 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		ELECTRICAL DATA	COOLING		HEATING	
Source IN Water Pressure		PSI		PSI	Line Voltage		V		
Source OUT Water Pressure		PSI		PSI	Total Unit AMPS		A		A
Source Water Pressure DROP		PSI		PSI	Compressor AMPS		A		A
Flow Rate		GPM		GPM	Wire Size		GA		
*Check pressure drop chart for GPM					Circuit Breaker Size		A		

Source Water	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: _____

Water Flow Calculations and Selection

Proper flow rate is crucial for reliable operation of geothermal heat pumps. The performance data shows three flow rates for each entering water temperature (EWT column). The general "rule of thumb" when selecting flow rates is the following.

Top flow rate: Open loop systems (1.5 to 2.0 gpm per ton)

Middle flow rate: Minimum closed loop system flow rate (2.25 to 2.50 gpm/ton)

Bottom flow rate: Nominal (optimum) closed loop system flow rate (3.0 gpm/ton)

Performance Check

Heat of Extraction(HE)/Rejection(HR)
Record information on the Unit Start-up Form

Equipment should be in full load operation for a minimum of 10 minutes in either mode – WITH THE HOT WATER GENERATOR TURNED OFF.

1. **Determine flow rate in gallons per minute.**
   - Check entering water temperature
   - Check entering water pressure
   - Check leaving water pressure

2. **After information is recorded.**
   - Find corresponding entering water temperature column in the WPD Table
   - Find pressure differential in PSI column
   - Then read the GPM column to determine flow in GPM

3. **Check leaving water temperature of unit.**
   - FORMULA: GPM x water temp diff. x 485 (antifreeze) or 500 (fresh water) = HE or HR in BTU/HR

Note: A 10% variance from table is allowed. Always use the same pressure gauge & temperature measuring device. Water flow must be in range of table. If system has too much water flow, performance problems should be expected.

Section 9: Equipment Start-Up

HE / HR Tables : ZS, BPHE - PSC

Model (PSC Unit)	GPM	CFM (Heating/Cooling)	BPHE Unit - Heat of Extraction (MBtuh)				BPHE Unit - Heat of Rejection (MBtuh)			
			30 °F	50 °F	70 °F	90 °F	50 °F	70 °F	90 °F	110 °F
ZS015	3.8	525/525	8.0	11.2	14.5	18.0	19.9	19.1	18.3	17.0
	4.5		8.2	11.4	14.8	18.4	19.8	19.0	18.2	17.0
	5.0		8.3	11.6	15.0	18.5	19.8	19.0	18.2	16.9
ZS017	3.8	600/600	8.7	12.3	16.1	20.2	23.1	22.5	21.2	20.2
	4.5		9.0	12.6	16.6	20.8	23.1	22.5	21.2	20.1
	5.0		9.1	12.8	16.8	21.0	23.1	22.5	21.1	20.1
ZS018	3.8	600/600	9.5	13.5	17.9	21.4	25.5	25.6	24.5	23.5
	4.5		9.8	13.9	18.4	22.0	25.5	25.6	24.4	23.4
	5.0		9.9	14.1	18.6	22.3	25.4	25.5	24.4	23.4
ZS024	3.8	750/750	12.4	17.5	23.1	27.8	32.1	32.4	31.4	30.4
	5.0		13.0	18.3	24.0	29.0	32.0	32.3	31.2	30.1
	6.0		13.3	18.8	24.6	29.7	32.0	32.2	31.1	30.0
ZS030	5.8	1000/1000	14.9	21.1	26.9	32.4	37.2	37.9	36.3	35.0
	6.5		15.2	21.6	27.5	33.1	37.3	37.9	36.3	35.0
	7.5		15.6	22.2	28.2	33.9	37.3	37.9	36.3	34.9
ZS036	8.0	1100/1100	18.5	25.9	33.7	40.5	45.8	46.3	44.7	43.2
	8.5		18.6	26.1	34.0	40.8	45.8	46.3	44.7	43.2
	9.0		18.8	26.3	34.3	41.1	45.7	46.3	44.6	43.1
ZS042	9.3	1400/1400	22.7	31.2	40.3	50.0	53.4	53.4	50.9	49.2
	10.0		22.9	31.4	40.6	50.4	53.4	53.3	50.8	49.2
	10.5		23.0	31.6	40.8	50.6	53.4	53.3	50.8	49.1
ZS048	9.3	1500/1500	27.4	37.4	47.5	57.6	61.9	61.3	58.8	56.7
	11.0		27.9	38.1	48.3	58.5	61.9	61.2	58.6	56.5
	12.0		28.0	38.3	48.5	58.8	61.8	61.1	58.6	56.4
ZS060	11.7	1900/1900	33.5	46.2	58.7	71.9	74.6	75.5	74.1	72.8
	13.0		34.1	46.9	59.6	73.0	74.6	75.4	74.0	72.6
	15.0		34.7	47.8	60.7	74.3	74.5	75.3	73.8	72.4
ZS072	11.7	2200/2200	36.7	50.9	64.0	77.5	83.3	86.5	86.0	83.6
	15.0		38.3	53.0	66.6	80.5	83.1	86.2	85.6	83.1
	18.0		39.2	54.2	68.1	82.3	82.9	86.0	85.4	82.8

1. Capacity data is based on 15% (by mass) methanol antifreeze solution (multiplier: 485).
2. Heating data is based on 70°F EAT. Cooling data is based on 80/67°F EAT. Any condition outside performance table(s) requires correction factor(s).
3. Performance data accurate within ±15%.
4. Unit performance test is run without hot water generation.
5. Capacity data includes fan power but not pump power and it does not reflect fan or pump power correction for AHRI/ISO condition
6. Performance data is based upon the lower voltage of dual voltage rated units.
7. Interpolation of unit performance data is permissible; extrapolation is not.
8. Performance data is a result of lab testing and is not related to warranty.
9. Due to variations in installation, actual unit performance may vary from the tabulated data.

HE / HR Tables : ZS, Coax - PSC

Model (PSC Unit)	GPM	CFM (Heating/Cooling)	COAX Unit - Heat of Extraction (MBtuh)				COAX Unit - Heat of Rejection (MBtuh)			
			30 °F	50 °F	70 °F	90 °F	50 °F	70 °F	90 °F	110 °F
ZS006	0.8	275/275	3.2	4.5	6.1	7.5	9.3	8.9	8.5	7.8
	1.1		3.3	4.6	6.2	7.7	9.3	8.9	8.4	7.7
	1.5		3.4	4.8	6.4	7.9	9.4	8.9	8.4	7.7
ZS009	1.1	350/350	4.7	6.7	8.8	11.0	13.4	12.8	12.2	11.4
	1.7		5.0	7.2	9.4	11.8	13.5	12.8	12.2	11.3
	2.3		5.2	7.4	9.7	12.1	13.6	12.8	12.2	11.3
ZS012	1.5	350/350	5.6	7.7	9.8	10.9	14.9	14.4	14.2	13.9
	2.3		5.8	8.0	10.2	11.4	14.8	14.3	14.0	13.7
	3.0		6.0	8.3	10.4	11.7	14.8	14.2	14.0	13.7
ZS015	1.9	525/525	7.5	10.6	13.9	17.2	19.1	18.1	17.7	17.0
	2.8		7.9	11.1	14.5	18.0	19.2	18.1	17.6	16.8
	3.8		8.2	11.6	15.1	18.6	19.2	18.1	17.6	16.7
ZS017	2.3	600/600	8.5	12.1	15.9	19.8	23.1	22.3	21.5	20.7
	3.4		9.0	12.7	16.6	20.7	23.3	22.4	21.5	20.6
	4.5		9.3	13.2	17.2	21.4	23.3	22.3	21.4	20.5
ZS018	2.3	600/600	8.9	13.1	17.2	19.8	24.7	25.2	24.7	23.7
	3.4		9.4	13.8	18.1	20.8	24.7	25.2	24.5	23.4
	4.5		9.8	14.2	18.6	21.4	24.6	25.1	24.4	23.3
ZS024	3.0	750/750	12.0	17.2	22.7	27.6	32.8	32.3	31.3	30.3
	4.5		12.5	18.0	23.6	28.8	32.7	32.2	31.0	29.9
	6.0		12.9	18.5	24.3	29.6	32.7	32.1	30.9	29.7
ZS030	3.8	1000/1000	15.3	21.0	26.7	32.3	36.5	37.0	35.8	34.5
	5.6		16.2	22.1	28.0	33.8	36.6	37.1	35.7	34.3
	7.5		16.7	22.7	28.7	34.7	36.6	37.0	35.6	34.1
ZS036	4.5	1100/1100	17.6	24.2	32.3	39.7	47.0	46.8	45.1	43.6
	6.8		18.8	25.8	34.3	42.2	47.5	47.2	45.4	43.7
	9.0		19.5	26.8	35.6	43.7	46.9	46.5	44.6	42.8
ZS042	5.3	1400/1400	19.2	27.0	34.8	42.6	51.5	51.9	50.5	48.9
	7.9		20.3	28.4	36.5	44.7	51.5	51.8	50.3	48.5
	10.5		20.8	29.1	37.4	45.7	51.4	51.7	50.0	48.2
ZS048	6.0	1500/1500	23.3	31.9	40.8	50.2	61.9	62.0	60.1	58.2
	9.0		24.8	34.0	43.3	53.3	61.9	61.8	59.8	57.7
	12.0		25.6	35.0	44.5	54.7	62.0	61.9	59.7	57.5
ZS060	7.5	1900/1900	31.7	42.0	53.2	66.0	75.5	75.3	71.1	69.2
	11.3		33.5	44.2	56.0	69.4	75.5	75.1	70.7	68.6
	15.0		34.6	45.6	57.6	71.3	75.4	75.0	70.5	68.3
ZS072	9.0	2200/2200	33.8	47.0	60.4	74.8	87.8	88.4	84.5	80.7
	13.5		35.8	49.6	63.6	78.6	87.8	88.2	84.1	79.9
	18.0		36.9	51.0	65.4	80.9	87.5	87.8	83.6	79.3

1. Capacity data is based on 15% (by mass) methanol antifreeze solution (multiplier: 485).
2. Heating data is based on 70°F EAT. Cooling data is based on 80/67°F EAT. Any condition outside performance table(s) requires correction factor(s).
3. Performance data accurate within ±15%.
4. Unit performance test is run without hot water generation.
5. Capacity data includes fan power but not pump power and it does not reflect fan or pump power correction for AHRI/ISO conditions.
6. Performance data is based upon the lower voltage of dual voltage rated units.
7. Interpolation of unit performance data is permissible; extrapolation is not.
8. Performance data is a result of lab testing and is not related to warranty.
9. Due to variations in installation, actual unit performance may vary from the tabulated data.

Section 9: Equipment Start-Up

HE / HR Tables : ZS, BPHE - ECM

Model (ECM Unit)	GPM	CFM (Heating/Cooling)	BPHE Unit - Heat of Extraction (MBtuh)				BPHE Unit - Heat of Rejection (MBtuh)			
			30 °F	50 °F	70 °F	90 °F	50 °F	70 °F	90 °F	110 °F
ZS015	3.8	500/500	7.9	11.0	14.3	17.7	19.7	18.9	18.2	16.9
	4.5		8.1	11.3	14.7	18.1	19.7	18.9	18.1	16.9
	5.0		8.2	11.4	14.8	18.3	19.7	18.9	18.1	16.8
ZS017	3.8	620/620	8.8	12.4	16.2	20.4	23.2	22.6	21.3	20.3
	4.5		9.1	12.7	16.7	20.9	23.2	22.7	21.3	20.3
	5.0		9.2	12.9	16.9	21.2	23.2	22.6	21.3	20.2
ZS018	3.8	630/630	9.6	13.7	18.1	21.7	25.8	25.9	24.7	23.7
	4.5		9.9	14.1	18.6	22.2	25.7	25.8	24.7	23.6
	5.0		10.1	14.3	18.9	22.5	25.7	25.8	24.7	23.6
ZS024	3.8	850/860	12.7	17.8	23.4	28.2	32.5	32.8	31.8	30.8
	5.0		13.2	18.5	24.4	29.3	32.4	32.7	31.6	30.5
	6.0		13.6	19.0	25.0	30.1	32.3	32.6	31.5	30.4
ZS030	5.8	1070/960	15.0	21.3	27.2	32.6	37.0	37.7	36.1	34.8
	6.5		15.4	21.8	27.7	33.3	37.0	37.7	36.1	34.7
	7.5		15.8	22.4	28.5	34.1	37.1	37.7	36.1	34.7
ZS036	8.0	1230/1260	19.5	27.2	35.5	42.5	47.6	48.2	46.5	45.0
	8.5		19.7	27.5	35.7	42.8	47.5	48.1	46.4	44.9
	9.0		19.8	27.7	36.0	43.1	47.5	48.1	46.4	44.8
ZS042	9.3	1270/1410	22.3	30.7	39.7	49.3	53.5	53.4	51.0	49.3
	10.0		22.5	30.9	40.0	49.6	53.4	53.4	50.9	49.2
	10.5		22.6	31.1	40.2	49.9	53.4	53.4	50.9	49.2
ZS048	9.3	1580/1710	27.7	37.7	47.8	58.0	63.7	63.1	60.5	58.5
	11.0		28.1	38.3	48.6	58.9	63.6	63.0	60.4	58.3
	12.0		28.3	38.5	48.9	59.2	63.6	62.9	60.3	58.2
ZS060	11.7	2000/1900	33.7	46.4	58.9	72.2	74.6	75.5	74.1	72.8
	13.0		34.3	47.2	59.9	73.3	74.6	75.4	74.0	72.6
	15.0		34.9	48.1	61.0	74.6	74.5	75.3	73.8	72.4
ZS072	11.7	2200/2230	37.0	51.0	64.2	77.6	83.3	86.5	86.1	83.7
	15.0		38.6	53.1	66.8	80.7	83.1	86.2	85.7	83.1
	18.0		39.5	54.3	68.3	82.4	82.9	86.1	85.4	82.9

1. Capacity data is based on 15% (by mass) methanol antifreeze solution (multiplier: 485).
2. Heating data is based on 70°F EAT. Cooling data is based on 80/67°F EAT. Any condition outside performance table(s) requires correction factor(s).
3. Performance data accurate within ±15%.
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5. Capacity data includes fan power but not pump power and it does not reflect fan or pump power correction for AHRI/ISO conditions.
6. Performance data is based upon the lower voltage of dual voltage rated units.
7. Interpolation of unit performance data is permissible; extrapolation is not.
8. Performance data is a result of lab testing and is not related to warranty.
9. Due to variations in installation, actual unit performance may vary from the tabulated data.

Section 9: Equipment Start-Up

HE / HR Tables : ZS, Coax - ECM

Model (ECM Unit)	GPM	CFM (Heating/Cooling)	COAX Unit - Heat of Extraction (MBtuh)				COAX Unit - Heat of Rejection (MBtuh)			
			30 °F	50 °F	70 °F	90 °F	50 °F	70 °F	90 °F	110 °F
ZS015	1.9	500/500	7.2	10.3	13.5	16.7	18.2	17.3	17.0	16.3
	2.8		7.6	10.8	14.1	17.5	18.3	17.3	16.9	16.1
	3.8		8.0	11.3	14.7	18.2	18.4	17.4	16.9	16.1
ZS017	2.3	620/620	8.5	12.1	15.9	19.8	23.3	22.5	21.6	20.9
	3.4		9.0	12.8	16.7	20.8	23.5	22.6	21.6	20.8
	4.5		9.3	13.2	17.3	21.5	23.4	22.5	21.5	20.6
ZS018	2.3	630/630	9.0	13.2	17.3	19.8	25.1	25.7	25.2	24.2
	3.4		9.5	13.9	18.2	20.9	25.1	25.6	25.0	23.8
	4.5		9.8	14.3	18.7	21.5	25.1	25.6	24.9	23.8
ZS024	3.0	850/860	12.2	17.6	23.1	28.1	33.4	33.0	32.0	31.0
	4.5		12.8	18.3	24.0	29.2	33.4	32.9	31.7	30.6
	6.0		13.2	18.9	24.7	30.1	33.4	32.8	31.6	30.4
ZS030	3.8	1070/960	15.4	21.1	26.8	32.4	36.3	36.8	35.6	34.3
	5.6		16.3	22.2	28.1	33.9	36.4	36.8	35.5	34.1
	7.5		16.7	22.8	28.8	34.8	36.3	36.8	35.3	33.9
ZS036	4.5	1230/1260	17.8	24.4	32.4	39.9	47.4	47.3	45.6	44.2
	6.8		19.0	26.0	34.5	42.4	47.3	47.1	45.3	43.7
	9.0		19.7	27.0	35.7	43.9	47.2	46.9	45.1	43.3
ZS042	5.3	1270/1410	19.1	26.8	34.5	42.3	51.5	52.0	50.6	49.0
	7.9		20.1	28.2	36.3	44.4	51.6	51.9	50.3	48.5
	10.5		20.6	28.8	37.1	45.4	51.4	51.7	50.1	48.2
ZS048	6.0	1580/1710	23.6	32.4	41.3	50.8	63.1	63.1	61.4	59.8
	9.0		25.2	34.4	43.9	53.9	63.0	62.9	61.0	59.1
	12.0		25.9	35.4	45.1	55.4	62.8	62.6	60.7	58.7
ZS060	7.5	2000/1900	32.1	42.4	53.7	66.5	75.5	75.3	71.1	69.3
	11.3		33.9	44.7	56.6	70.0	75.5	75.1	70.7	68.6
	15.0		35.0	46.0	58.2	72.0	75.4	75.0	70.5	68.3
ZS072	9.0	2200/2230	33.9	47.0	60.4	74.7	87.9	88.5	84.7	80.9
	13.5		35.8	49.6	63.6	78.6	87.8	88.2	84.1	80.0
	18.0		36.9	51.0	65.4	80.9	87.5	87.9	83.7	79.4

1. Capacity data is based on 15% (by mass) methanol antifreeze solution (multiplier: 485).

2. Heating data is based on 70°F EAT. Cooling data is based on 80/67°F EAT. Any condition outside performance table(s) requires correction factor(s).
3. Performance data accurate within ±15%.
4. Unit performance test is run without hot water generation.
5. Capacity data includes fan power but not pump power and it does not reflect fan or pump power correction for AHRI/ISO conditions.
6. Performance data is based upon the lower voltage of dual voltage rated units.
7. Interpolation of unit performance data is permissible; extrapolation is not.
8. Performance data is a result of lab testing and is not related to warranty.
9. Due to variations in installation, actual unit performance may vary from the tabulated data.

Section 9: Equipment Start-Up

HE / HR Tables : ZT, BPHE

Model		GPM	CFM (Heating/Cooling)	BPHE Unit - Heat of Extraction (MBtuh)				BPHE Unit - Heat of Rejection (MBtuh)			
				30 °F	50 °F	70 °F	90 °F	50 °F	70 °F	90 °F	110 °F
ZT024	Part Load	3.8	650/650	8.3	12.2	16.7	21.9	24.3	23.8	23.0	21.7
		5.0		8.8	12.9	17.6	23.0	24.2	23.8	22.9	21.4
		6.0		9.1	13.2	18.1	23.7	24.2	23.7	22.8	21.3
	Full Load	3.8	850/860	11.8	16.3	22.5	27.6	33.2	33.4	32.5	31.3
		5.0		12.7	17.5	24.0	29.4	33.1	33.2	32.2	30.9
		6.0		13.2	18.1	24.9	30.5	33.0	33.1	32.1	30.7
ZT030	Part Load	5.8	840/750	12.1	17.6	23.4	29.4	31.0	30.2	28.9	27.5
		6.5		12.1	17.7	23.5	29.5	31.1	30.3	29.0	27.6
		7.5		12.0	17.5	23.3	29.3	31.6	30.7	29.4	28.0
	Full Load	5.8	1070/960	15.9	23.0	29.8	34.7	41.1	41.5	39.9	38.1
		6.5		16.3	23.5	30.4	35.3	41.2	41.5	39.9	38.1
		7.5		16.7	24.0	31.1	36.1	41.2	41.5	39.9	38.1
ZT036	Part Load	8.0	980/910	13.3	19.2	26.1	33.9	34.4	34.0	31.7	29.6
		8.5		13.4	19.3	26.2	34.0	34.3	34.0	31.7	29.6
		9.0		13.4	19.4	26.3	34.1	34.3	34.0	31.7	29.6
	Full Load	8.0	1230/1260	19.1	26.2	34.0	42.4	43.7	47.5	44.6	41.6
		8.5		19.3	26.5	34.3	42.8	43.7	47.5	44.6	41.6
		9.0		19.4	26.7	34.6	43.2	43.7	47.5	44.6	41.5
ZT042	Part Load	9.3	1010/1200	16.3	23.2	30.5	38.2	40.9	40.0	38.2	36.3
		10.0		16.2	23.0	30.3	38.0	41.3	40.5	38.6	36.7
		10.5		16.0	22.9	30.1	37.7	41.8	40.9	39.1	37.1
	Full Load	9.3	1270/1410	24.2	32.4	41.0	48.3	53.7	54.9	52.5	49.8
		10.0		24.4	32.7	41.4	48.8	53.6	54.8	52.4	49.7
		10.5		24.6	32.8	41.7	49.1	53.6	54.8	52.4	49.7
ZT048	Part Load	9.3	1230/1510	17.6	25.3	34.1	41.8	46.9	45.2	43.8	41.3
		11.0		18.2	26.1	35.2	43.0	47.2	45.5	44.1	41.6
		12.0		18.8	26.8	36.1	44.1	47.7	46.1	44.6	42.1
	Full Load	9.3	1580/1710	24.9	34.6	44.8	54.1	58.8	60.1	57.8	55.1
		11.0		25.5	35.3	45.7	55.2	58.8	60.1	57.7	55.0
		12.0		25.7	35.6	46.1	55.7	58.8	60.1	57.7	54.9
ZT060	Part Load	11.7	1560/1500	23.7	34.0	46.4	55.5	56.6	55.6	54.6	52.5
		13.0		23.9	34.2	46.7	55.9	56.5	55.5	54.5	52.3
		15.0		24.1	34.6	47.2	56.5	56.5	55.5	54.5	52.2
	Full Load	11.7	2000/1900	35.2	47.1	60.9	73.5	72.8	74.0	71.6	69.6
		13.0		35.9	48.1	62.1	74.9	72.8	73.9	71.4	69.4
		15.0		36.8	49.2	63.5	76.7	72.7	73.8	71.3	69.2
ZT072	Part Load	11.7	1900/1820	28.0	39.7	52.8	65.2	66.8	68.4	65.8	62.0
		15.0		29.0	41.1	54.5	67.2	66.8	68.3	65.6	61.6
		18.0		30.1	42.6	56.5	69.7	67.0	68.6	65.9	62.0
	Full Load	11.7	2200/2230	38.0	51.9	67.2	80.0	86.2	91.3	89.3	85.3
		15.0		39.5	53.8	69.6	82.8	86.0	91.1	89.0	84.8
		18.0		40.4	55.0	71.1	84.6	85.9	90.9	88.8	84.5

1. Capacity data is based on 15% (by mass) methanol antifreeze solution (multiplier: 485).
2. Heating data is based on 70°F EAT. Cooling data is based on 80/67°F EAT. Any condition outside performance table(s) requires correction factor(s).
3. Performance data accurate within ±15%.
4. Unit performance test is run without hot water generation.
5. Capacity data includes fan power but not pump power and it does not reflect fan or pump power correction for AHRI/ISO conditions.
6. Performance data is based upon the lower voltage of dual voltage rated units.
7. Interpolation of unit performance data is permissible; extrapolation is not.
8. Performance data is a result of lab testing and is not related to warranty.
9. Due to variations in installation, actual unit performance may vary from the tabulated data.
10. Continuous research and development may result in a change to the current product design and specifications without notice.

HE / HR Tables : ZT, Coax

Model		GPM	CFM (Heating/Cooling)	COAX Unit - Heat of Extraction (MBtuh)				COAX Unit - Heat of Rejection (MBtuh)			
				30 °F	50 °F	70 °F	90 °F	50 °F	70 °F	90 °F	110 °F
ZT024	Part Load	2.0	650/650	7.7	11.8	16.0	20.6	25.1	24.5	23.5	22.2
		3.0		8.2	12.4	16.9	21.6	25.3	24.6	23.5	21.9
		4.0		8.6	13.0	17.6	22.5	25.3	24.6	23.4	21.7
	Full Load	3.0	850/860	12.3	17.1	22.6	27.9	34.4	34.4	33.0	31.6
		4.5		13.0	18.0	23.7	29.2	34.5	34.4	32.9	31.3
		6.0		13.4	18.6	24.4	30.1	34.5	34.4	32.8	31.1
ZT030	Part Load	2.5	840/750	12.3	17.6	22.8	27.8	29.8	29.1	28.0	26.9
		3.8		12.9	18.3	23.6	28.9	29.8	29.0	27.9	26.7
		5.0		12.9	18.3	23.7	29.0	29.9	29.1	27.9	26.7
	Full Load	3.8	1070/960	16.6	22.7	28.2	33.0	38.4	39.6	38.6	36.7
		5.6		17.5	23.9	29.6	34.7	38.8	40.0	38.9	37.0
		7.5		17.9	24.4	30.2	35.4	38.9	40.1	39.0	37.1
ZT036	Part Load	3.0	980/910	12.3	17.2	22.8	29.2	35.3	34.3	33.5	32.3
		4.5		13.2	18.3	24.2	30.9	35.5	34.3	33.3	31.9
		6.0		13.7	19.0	25.1	32.1	35.6	34.3	33.1	31.5
	Full Load	4.5	1230/1260	17.4	24.3	31.6	39.1	48.3	47.6	45.8	44.2
		6.8		18.5	25.7	33.3	41.3	48.4	47.5	45.7	43.8
		9.0		19.0	26.5	34.3	42.5	48.3	47.4	45.5	43.6
ZT042	Part Load	3.5	1010/1200	15.6	21.4	27.7	34.5	41.3	40.0	38.6	37.8
		5.3		16.6	22.7	29.3	36.3	41.6	40.2	38.4	37.3
		7.0		17.0	23.2	29.9	37.2	41.6	40.0	38.2	36.8
	Full Load	5.3	1270/1410	22.6	30.2	38.4	47.2	54.3	54.3	52.7	51.1
		7.9		23.9	31.8	40.4	49.7	54.5	54.4	52.5	50.7
		10.5		24.4	32.5	41.3	50.7	54.7	54.5	52.6	50.6
ZT048	Part Load	4.0	1230/1510	15.7	23.3	31.3	37.4	47.7	45.8	44.1	43.2
		6.0		17.1	25.3	33.9	40.3	48.0	45.8	43.8	42.6
		8.0		18.5	27.2	36.3	43.2	47.9	45.6	43.5	42.1
	Full Load	6.0	1580/1710	26.2	35.3	44.1	53.2	63.5	62.1	60.2	58.8
		9.0		27.6	37.0	46.3	55.7	63.4	61.8	59.8	58.2
		12.0		28.5	38.2	47.6	57.4	63.2	61.6	59.5	57.8
ZT060	Part Load	5.0	1560/1500	21.3	29.0	38.0	47.3	53.8	53.9	51.3	48.4
		7.5		22.9	31.1	40.7	50.4	54.0	53.8	50.9	47.6
		10.0		23.8	32.3	42.2	52.2	54.0	53.8	50.7	47.2
	Full Load	7.5	2000/1900	33.5	44.0	56.9	67.9	73.7	75.6	73.5	70.4
		11.3		35.6	46.7	60.2	71.8	73.6	75.3	73.0	69.6
		15.0		36.3	47.6	61.4	73.3	73.4	75.1	72.7	69.2
ZT072	Part Load	6.0	1900/1820	21.7	33.3	45.2	56.9	65.1	64.7	61.6	57.4
		9.0		23.3	35.5	48.0	60.3	65.8	65.2	61.6	56.9
		12.0		24.1	36.6	49.4	62.0	66.2	65.4	61.6	56.6
	Full Load	9.0	2200/2230	34.0	47.6	61.5	73.9	84.0	86.7	83.6	78.4
		13.5		36.2	50.5	65.1	78.1	84.0	86.6	83.3	77.8
		18.0		38.1	52.9	68.2	81.8	83.9	86.4	83.0	77.4

1. Capacity data is based on 15% (by mass) methanol antifreeze solution (multiplier: 485).
2. Heating data is based on 70°F EAT. Cooling data is based on 80/67°F EAT. Any condition outside performance table(s) requires correction factor(s).
3. Performance data accurate within ±15%.
4. Unit performance test is run without hot water generation.
5. Capacity data includes fan power but not pump power and it does not reflect fan or pump power correction for AHRI/ISO conditions.
6. Performance data is based upon the lower voltage of dual voltage rated units.
7. Interpolation of unit performance data is permissible; extrapolation is not.
8. Performance data is a result of lab testing and is not related to warranty.
9. Due to variations in installation, actual unit performance may vary from the tabulated data.
10. Continuous research and development may result in a change to the current product design and specifications without notice.

Section 9: Equipment Start-Up

WPD Tables : ZS, BPHE

Model	GPM	BPHE Unit - Source Brine Pressure Drop							
		30 °F		50 °F		70 °F		90 °F	
		PSI	FT HD	PSI	FT HD	PSI	FT HD	PSI	FT HD
ZS015	3.8	0.8	1.8	0.7	1.6	0.7	1.6	0.7	1.6
	5.0	1.2	2.8	1.1	2.5	1.0	2.3	1.0	2.3
	6.0	1.5	3.5	1.4	3.2	1.3	3.0	1.3	3.0
	7.0	1.9	4.4	1.8	4.2	1.7	3.9	1.6	3.7
ZS017	3.8	0.8	1.9	0.8	1.8	0.7	1.7	0.7	1.7
	5.0	1.2	2.8	1.1	2.5	1.1	2.5	1.1	2.5
	6.0	1.6	3.7	1.5	3.5	1.4	3.2	1.4	3.2
	7.0	2.1	4.8	1.9	4.4	1.8	4.2	1.8	4.2
ZS018	3.8	0.7	1.7	0.7	1.6	0.7	1.5	0.6	1.5
	5.0	1.0	2.3	0.9	2.1	0.9	2.1	0.9	2.1
	6.0	1.3	3.0	1.2	2.8	1.2	2.8	1.1	2.5
	7.0	1.7	3.9	1.6	3.7	1.5	3.5	1.5	3.5
ZS024	3.8	0.8	1.7	0.7	1.6	0.6	1.5	0.6	1.4
	5.0	1.0	2.3	0.9	2.1	0.9	2.1	0.9	2.1
	6.0	1.3	3.0	1.2	2.8	1.1	2.5	1.1	2.5
	7.0	1.7	3.9	1.5	3.5	1.4	3.2	1.4	3.2
ZS030	5.8	1.3	3.0	1.2	2.8	1.1	2.5	1.1	2.5
	6.5	1.5	3.5	1.4	3.2	1.3	3.0	1.3	3.0
	7.5	1.8	4.2	1.7	3.9	1.6	3.7	1.5	3.5
	9.0	2.4	5.5	2.2	5.1	2.1	4.8	2.0	4.6
ZS036	8.0	1.4	3.2	1.3	3.0	1.2	2.8	1.2	2.8
	8.5	1.5	3.5	1.4	3.2	1.3	3.0	1.3	3.0
	9.0	1.6	3.7	1.5	3.5	1.4	3.2	1.3	3.0
	10.5	1.9	4.4	1.8	4.2	1.7	3.9	1.7	3.9
ZS042	9.3	1.6	3.7	1.5	3.5	1.5	3.5	1.4	3.2
	10.0	1.7	3.9	1.7	3.9	1.6	3.7	1.6	3.7
	10.5	1.9	4.4	1.8	4.2	1.7	3.9	1.7	3.9
	12.0	2.3	5.3	2.2	5.1	2.1	4.8	2.1	4.8
ZS048	9.3	1.7	3.9	1.5	3.5	1.4	3.2	1.3	3.0
	11.0	2.1	4.8	1.9	4.4	1.7	3.9	1.6	3.7
	12.0	2.3	5.3	2.1	4.8	1.9	4.4	1.9	4.4
	15.0	3.2	7.4	2.9	6.7	2.7	6.2	2.6	6.0
ZS060	11.7	1.8	4.2	1.7	3.9	1.6	3.7	1.6	3.7
	13.0	2.1	4.8	2.0	4.6	1.9	4.4	1.9	4.4
	15.0	2.6	6.0	2.5	5.8	2.4	5.5	2.4	5.5
	18.0	3.6	8.3	3.4	7.8	3.3	7.6	3.2	7.4
ZS072	11.7	1.8	4.2	1.8	4.2	1.7	3.9	1.6	3.7
	15.0	2.7	6.2	2.6	6.0	2.5	5.8	2.5	5.8
	18.0	3.7	8.5	3.5	8.1	3.4	7.8	3.3	7.6
	20.0	4.3	9.9	4.2	9.7	4.0	9.2	3.9	9.0

Section 9: Equipment Start-Up

WPD Tables : ZS, Coax

Model	GPM	COAX Unit - Source Brine Pressure Drop							
		30 °F		50 °F		70 °F		90 °F	
		PSI	FT HD	PSI	FT HD	PSI	FT HD	PSI	FT HD
ZS006	0.8	0.6	1.4	0.6	1.4	0.5	1.2	0.5	1.2
	1.1	0.9	2.1	0.8	1.8	0.7	1.6	0.7	1.6
	1.5	1.4	3.2	1.2	2.8	1.1	2.5	1.0	2.3
	3.0	3.8	8.8	3.3	7.6	2.9	6.7	2.7	6.2
ZS009	1.1	1.1	2.5	0.9	2.1	0.8	1.8	0.8	1.8
	1.7	1.9	4.4	1.6	3.7	1.5	3.5	1.3	3.0
	2.3	2.8	6.5	2.5	5.8	2.2	5.1	2.0	4.6
	3.5	5.1	11.8	4.5	10.4	4.0	9.2	3.6	8.3
ZS012	1.5	1.6	3.7	1.3	3.0	1.2	2.8	1.1	2.5
	2.3	2.8	6.5	2.4	5.5	2.2	5.1	1.9	4.4
	3.0	4.1	9.5	3.6	8.3	3.1	7.2	2.8	6.5
	4.0	6.3	14.5	5.5	12.7	4.8	11.1	4.4	10.1
ZS015	1.9	1.4	3.2	1.2	2.8	1.0	2.3	0.9	2.1
	2.8	2.3	5.3	2.0	4.6	1.7	3.9	1.5	3.5
	3.8	3.6	8.3	3.1	7.2	2.6	6.0	2.3	5.3
	5.0	5.5	12.7	4.7	10.8	4.0	9.2	3.6	8.3
ZS017	2.3	1.6	3.7	1.4	3.2	1.2	2.8	1.1	2.5
	3.4	3.0	6.9	2.6	6.0	2.2	5.1	2.0	4.6
	4.5	4.8	11.1	4.1	9.5	3.6	8.3	3.2	7.4
	6.0	7.4	17.1	6.4	14.8	5.6	12.9	5.0	11.5
ZS018	2.3	1.5	3.5	1.2	2.8	1.1	2.5	0.9	2.1
	3.4	2.3	5.3	1.9	4.4	1.7	3.9	1.5	3.5
	4.5	3.4	7.8	2.8	6.5	2.4	5.5	2.2	5.1
	6.0	5.0	11.5	4.2	9.7	3.6	8.3	3.2	7.4
ZS024	3.0	2.0	4.6	1.6	3.7	1.4	3.2	1.3	3.0
	4.5	3.5	8.1	2.9	6.7	2.5	5.8	2.2	5.1
	6.0	5.2	12.0	4.3	9.9	3.7	8.5	3.3	7.6
	7.5	7.2	16.6	6.0	13.8	5.2	12.0	4.6	10.6
ZS030	3.8	2.7	6.2	2.3	5.3	2.0	4.6	1.8	4.2
	5.6	4.5	10.4	3.8	8.8	3.4	7.8	3.0	6.9
	7.5	6.8	15.7	5.8	13.4	5.0	11.5	4.5	10.4
	9.0	8.9	20.5	7.5	17.3	6.6	15.2	5.9	13.6
ZS036	4.5	1.8	4.2	1.6	3.7	1.4	3.2	1.3	3.0
	6.8	3.0	6.9	2.6	6.0	2.4	5.5	2.1	4.8
	9.0	4.4	10.1	3.8	8.8	3.4	7.8	3.1	7.2
	10.5	5.4	12.5	4.8	11.1	4.3	9.9	3.9	9.0
ZS042	5.3	2.1	4.8	1.9	4.4	1.6	3.7	1.5	3.5
	7.9	3.6	8.3	3.1	7.2	2.8	6.5	2.5	5.8
	10.5	5.4	12.5	4.7	10.8	4.1	9.5	3.7	8.5
	12.0	6.5	15.0	5.7	13.1	5.0	11.5	4.6	10.6
ZS048	6.0	2.4	5.5	2.1	4.8	1.8	4.2	1.6	3.7
	9.0	4.3	9.9	3.7	8.5	3.3	7.6	3.0	6.9
	12.0	6.7	15.5	5.8	13.4	5.1	11.8	4.6	10.6
	15.0	9.5	21.9	8.2	18.9	7.2	16.6	6.5	15.0
ZS060	7.5	3.8	8.8	3.2	7.4	2.8	6.5	2.5	5.8
	11.3	6.6	15.2	5.6	12.9	4.9	11.3	4.4	10.1
	15.0	10.0	23.1	8.5	19.6	7.4	17.1	6.7	15.5
	18.0	13.2	30.4	11.2	25.8	9.7	22.4	8.8	20.3
ZS072	9.0	4.6	10.6	4.1	9.5	3.6	8.3	3.2	7.4
	13.5	8.3	19.1	7.3	16.8	6.4	14.8	5.8	13.4
	18.0	12.9	29.8	11.3	26.1	9.9	22.8	9.0	20.8
	20.0	15.2	35.1	13.3	30.7	11.7	27.0	10.5	24.2

Section 9: Equipment Start-Up

WPD Tables : ZT, BPHE

Model	GPM	BPHE Unit - Source Brine Pressure Drop							
		30 °F		50 °F		70 °F		90 °F	
		PSI	FT HD	PSI	FT HD	PSI	FT HD	PSI	FT HD
ZT024 Part Load	3.8	0.7	1.6	0.7	1.5	0.6	1.4	0.6	1.4
	5.0	1.0	2.3	1.0	2.3	0.9	2.1	0.9	2.1
	6.0	1.3	3.0	1.2	2.8	1.2	2.8	1.1	2.5
	7.0	1.7	3.9	1.5	3.5	1.5	3.5	1.4	3.2
ZT024 Full Load	3.8	0.8	1.8	0.7	1.6	0.6	1.5	0.6	1.4
	5.0	1.1	2.5	1.0	2.3	0.9	2.1	0.8	1.8
	6.0	1.3	3.0	1.2	2.8	1.1	2.5	1.1	2.5
	7.0	1.7	5.8	1.5	5.8	1.4	5.8	1.4	4.8
ZT030 Part Load	5.8	1.2	2.8	1.1	2.5	1.0	2.3	1.0	2.3
	6.5	1.5	3.5	1.4	3.2	1.3	3.0	1.2	2.8
	7.5	1.9	4.4	1.8	4.2	1.6	3.7	1.6	3.7
	9.0	2.7	6.2	2.5	5.8	2.3	5.3	2.2	5.1
ZT030 Full Load	5.8	1.2	2.8	1.1	2.5	1.1	2.5	1.0	2.3
	6.5	1.4	3.2	1.4	3.2	1.3	3.0	1.2	2.8
	7.5	1.8	4.2	1.7	3.9	1.6	3.7	1.6	3.7
	9.0	2.5	5.8	2.3	5.3	2.2	5.1	2.1	4.8
ZT036 Part Load	8.0	1.2	2.8	1.2	2.8	1.1	2.5	1.1	2.5
	8.5	1.3	3.0	1.3	3.0	1.3	3.0	1.2	2.8
	9.0	1.5	3.5	1.4	3.2	1.4	3.2	1.4	3.2
	10.5	2.0	4.6	2.0	4.6	1.9	4.4	1.9	4.4
ZT036 Full Load	8.0	1.4	3.2	1.3	3.0	1.2	2.8	1.2	2.8
	8.5	1.5	3.5	1.4	3.2	1.3	3.0	1.3	3.0
	9.0	1.5	3.5	1.5	3.5	1.4	3.2	1.3	3.0
	10.5	1.9	4.4	1.8	4.2	1.7	3.9	1.6	3.7
ZT042 Part Load	9.3	1.7	3.9	1.6	3.7	1.5	3.5	1.4	3.2
	10.0	1.8	4.2	1.7	3.9	1.7	3.9	1.6	3.7
	10.5	2.0	4.6	1.9	4.4	1.8	4.2	1.7	3.9
	12.0	2.5	5.8	2.3	5.3	2.2	5.1	2.1	4.8
ZT042 Full Load	9.3	1.7	3.9	1.6	3.7	1.5	3.5	1.5	3.5
	10.0	1.8	4.2	1.7	3.9	1.7	3.9	1.6	3.7
	10.5	1.9	4.4	1.9	4.4	1.8	4.2	1.7	3.9
	12.0	2.4	5.5	2.3	5.3	2.2	5.1	2.1	4.8
ZT048 Part Load	9.3	1.4	3.2	1.3	3.0	1.2	2.8	1.1	2.5
	11.0	1.7	3.9	1.6	3.7	1.5	3.5	1.4	3.2
	12.0	1.9	4.4	1.8	4.2	1.7	3.9	1.6	3.7
	15.0	2.7	6.2	2.5	5.8	2.3	5.3	2.2	5.1
ZT048 Full Load	9.3	1.7	3.9	1.6	3.7	1.5	3.5	1.3	3.0
	11.0	2.1	4.8	1.9	4.4	1.8	4.2	1.6	3.7
	12.0	2.3	5.3	2.2	5.1	2.0	4.6	1.8	4.2
	15.0	3.2	7.4	3.0	6.9	2.8	6.5	2.6	6.0
ZT060 Part Load	11.7	1.7	3.9	1.6	3.7	1.6	3.7	1.6	3.7
	13.0	2.0	4.6	1.9	4.4	1.9	4.4	1.9	4.4
	15.0	2.5	5.8	2.4	5.5	2.4	5.5	2.3	5.3
	18.0	3.5	8.1	3.4	7.8	3.3	7.6	3.3	7.6
ZT060 Full Load	11.7	1.7	3.9	1.7	3.9	1.6	3.7	1.6	3.7
	13.0	2.1	4.8	2.0	4.6	1.9	4.4	1.9	4.4
	15.0	2.6	6.0	2.5	5.8	2.4	5.5	2.3	5.3
	18.0	3.5	8.1	3.4	7.8	3.3	7.6	3.2	7.4
ZT072 Part Load	11.7	2.0	4.6	1.9	4.4	1.9	4.4	1.8	4.2
	15.0	2.9	6.7	2.8	6.5	2.7	6.2	2.6	6.0
	18.0	3.6	8.3	3.5	8.1	3.4	7.8	3.3	7.6
	20.0	4.0	9.2	3.8	8.8	3.7	8.5	3.6	8.3
ZT072 Full Load	11.7	1.9	4.4	1.8	4.2	1.7	3.9	1.7	3.9
	15.0	2.7	6.2	2.6	6.0	2.5	5.8	2.5	5.8
	18.0	3.7	8.5	3.5	8.1	3.4	7.8	3.3	7.6
	20.0	4.3	9.9	4.1	9.5	4.0	9.2	3.9	9.0

WPD Tables : ZT, Coax

Model	GPM	COAX Unit - Source Brine Pressure Drop							
		30 °F		50 °F		70 °F		90 °F	
		PSI	FT HD	PSI	FT HD	PSI	FT HD	PSI	FT HD
ZT024 Part Load	2.0	1.2	2.8	1.0	2.3	0.8	1.8	0.7	1.6
	3.0	1.9	4.4	1.6	3.7	1.4	3.2	1.2	2.8
	4.0	2.8	6.5	2.3	5.3	2.0	4.6	1.8	4.2
	5.0	3.8	8.8	3.2	7.4	2.8	6.5	2.4	5.5
ZT024 Full Load	3.0	2.0	4.6	1.7	3.9	1.4	3.2	1.3	3.0
	4.5	3.4	7.8	2.8	6.5	2.4	5.5	2.3	5.3
	6.0	5.1	11.8	4.2	9.7	3.6	8.3	3.4	7.8
	7.5	7.1	16.4	5.9	13.6	5.1	11.8	4.5	10.4
ZT030 Part Load	2.5	1.6	3.7	1.3	3.0	1.2	2.8	1.0	2.3
	3.8	2.6	6.0	2.2	5.1	1.9	4.4	1.7	3.9
	5.0	3.8	8.8	3.2	7.4	2.8	6.5	2.5	5.8
	6.0	4.9	11.3	4.2	9.7	3.6	8.3	3.2	7.4
ZT030 Full Load	3.8	2.7	6.2	2.3	5.3	2.0	4.6	1.8	4.2
	5.6	4.5	10.4	3.8	8.8	3.3	7.6	2.9	6.7
	7.5	6.8	15.7	5.7	13.1	5.0	11.5	4.5	10.4
	9.0	8.9	20.5	7.5	17.3	6.5	15.0	5.8	13.4
ZT036 Part Load	3.0	1.1	2.5	1.0	2.3	0.9	2.1	0.8	1.8
	4.5	1.7	3.9	1.5	3.5	1.4	3.2	1.3	3.0
	6.0	2.4	5.5	2.2	5.1	2.0	4.6	1.8	4.2
	7.0	2.9	6.7	2.6	6.0	2.4	5.5	2.2	5.1
ZT036 Full Load	4.5	1.7	3.9	1.5	3.5	1.4	3.2	1.2	2.8
	6.8	2.9	6.7	2.6	6.0	2.3	5.3	2.1	4.8
	9.0	4.3	9.9	3.8	8.8	3.4	7.8	3.1	7.2
	10.5	5.3	12.2	4.7	10.8	4.2	9.7	3.8	8.8
ZT042 Part Load	3.5	1.3	3.0	1.2	2.8	1.0	2.3	0.9	2.1
	5.3	2.1	4.8	1.8	4.2	1.6	3.7	1.5	3.5
	7.0	3.0	6.9	2.6	6.0	2.3	5.3	2.1	4.8
	8.0	3.5	8.1	3.1	7.2	2.8	6.5	2.5	5.8
ZT042 Full Load	5.3	2.1	4.8	1.8	4.2	1.6	3.7	1.5	3.5
	7.9	3.5	8.1	3.1	7.2	2.7	6.2	2.5	5.8
	10.5	5.3	12.2	4.6	10.6	4.1	9.5	3.7	8.5
	12.0	6.5	15.0	5.7	13.1	5.0	11.5	4.5	10.4
ZT048 Part Load	4.0	1.4	3.2	1.3	3.0	1.1	2.5	1.0	2.3
	6.0	2.4	5.5	2.1	4.8	1.8	4.2	1.6	3.7
	8.0	3.6	8.3	3.1	7.2	2.7	6.2	2.5	5.8
	10.0	4.9	11.3	4.3	9.9	3.8	8.8	3.4	7.8
ZT048 Full Load	6.0	2.5	5.8	2.1	4.8	1.9	4.4	1.7	3.9
	9.0	4.3	9.9	3.7	8.5	3.3	7.6	3.0	6.9
	12.0	6.5	15.0	5.6	12.9	5.0	11.5	4.5	10.4
	15.0	9.1	21.0	7.9	18.2	7.0	16.1	6.3	14.5
ZT060 Part Load	5.0	2.2	5.1	1.9	4.4	1.6	3.7	1.4	3.2
	7.5	3.7	8.5	3.1	7.2	2.7	6.2	2.4	5.5
	10.0	5.5	12.7	4.6	10.6	4.0	9.2	3.6	8.3
	12.0	7.1	16.4	6.0	13.8	5.2	12.0	4.7	10.8
ZT060 Full Load	7.5	3.7	8.5	3.1	7.2	2.7	6.2	2.5	5.8
	11.3	6.6	15.2	5.5	12.7	4.8	11.1	4.4	10.1
	15.0	10.0	23.1	8.4	19.4	7.3	16.8	6.6	15.2
	18.0	13.2	30.4	11.1	25.6	9.6	22.1	8.8	20.3
ZT072 Part Load	6.0	2.8	6.5	2.4	5.5	2.1	4.8	1.8	4.2
	9.0	4.8	11.1	4.0	9.2	3.5	8.1	3.2	7.4
	12.0	7.1	16.4	6.1	14.1	5.3	12.2	4.7	10.8
	15.0	9.9	22.8	8.4	19.4	7.3	16.8	6.6	15.2
ZT072 Full Load	9.0	4.7	10.8	4.0	9.2	3.5	8.1	3.2	7.4
	13.5	8.5	19.6	7.2	16.6	6.4	14.8	5.8	13.4
	18.0	13.1	30.2	11.1	25.6	9.8	22.6	8.9	20.5
	20.0	15.4	35.5	13.1	30.2	11.5	26.5	10.4	24.0

Section 10: Troubleshooting

Operating Parameter Tables : ZS, BPHE

EWT	Flow	BPHE Unit - Heating - No Hot Water Generation			
		Discharge	Suction	Water Temp Drop	Air Temp Rise
°F	GPM/Ton	PSIG	PSIG	°F	°F - DB
30	2-2.7*	233-360	63-87	2-10	12-30
	2.7-3**	239-367	65-90	1-6	12-30
50	2-2.7	261-389	93-118	4-14	16-38
	2.7-3	268-394	96-121	2-8	17-39
70	2-2.7	292-444	121-156	5-18	20-48
	2.7-3	300-452	132-162	3-10	22-48
90	2-2.7	327-489	136-198	7-22	25-55
	2.7-3	336-498	150-210	4-12	26-56

EWT	Flow	BPHE Unit - Cooling - No Hot Water Generation			
		Discharge	Suction	Water Temp Rise	Air Temp Drop
°F	GPM/Ton	PSIG	PSIG	°F	°F - DB
50	2-2.7*	164-234	102-144	7-27	15-27
	2.7-3**	147-206	100-144	5-14	15-27
70	2-2.7	232-316	108-156	7-26	15-27
	2.7-3	208-276	105-156	5-14	15-27
90	2-2.7	316-414	118-160	7-25	14-25
	2.7-3	285-361	116-160	4-13	14-25
110	2-2.7	415-530	125-165	6-23	12-24
	2.7-3	379-462	125-165	4-12	12-24

Heating data based on 70°F EAT. Cooling data based on 80/67°F EAT.

CFM is typically 300-500 CFM/Ton for heating and cooling.

*GPM/Ton is 2-2.7 for ZS024-072, 2.5-3.5 for ZS015-018.

**GPM/Ton is 2.7-3 for ZS024-072, 3.5-4 for ZS015-018.

Operating Parameter Tables : ZS, Coax

EWT	Flow	COAX Unit - Heating - No Hot Water Generation			
		Discharge	Suction	Water Temp Drop	Air Temp Rise
°F	GPM/Ton	PSIG	PSIG	°F	°F - DB
30	1.5	233-345	58-79	6-10	12-29
	3	239-354	64-85	3-6	12-32
50	1.5	261-379	85-107	9-14	16-37
	3	268-390	95-120	4-8	17-40
70	1.5	292-427	119-145	12-18	20-47
	3	300-439	132-162	6-10	22-50
90	1.5	327-486	136-187	13-22	25-56
	3	336-501	150-210	7-12	26-60

EWT	Flow	COAX Unit - Cooling - No Hot Water Generation			
		Discharge	Suction	Water Temp Rise	Air Temp Drop
°F	GPM/Ton	PSIG	PSIG	°F	°F - DB
50	1.5	192-248	102-145	18-27	16-27
	3	169-220	100-144	9-14	16-27
70	1.5	265-326	108-152	18-26	14-27
	3	234-290	105-152	8-14	14-27
90	1.5	356-419	118-157	18-25	14-25
	3	315-372	116-157	8-13	14-25
110	1.5	470-535	131-165	17-23	12-24
	3	417-472	128-162	8-12	12-24

Heating data based on 70°F EAT. Cooling data based on 80/67°F EAT.

CFM is typically 300-500 CFM/Ton for heating and cooling.

Section 10: Troubleshooting

Operating Parameter Tables : ZT, BPHE

EWT	Flow	BPHE Unit - Full Load Heating - No Hot Water Generation			
		Discharge	Suction	Water Temp Drop	Air Temp Rise
°F	GPM/Ton	PSIG	PSIG	°F	°F - DB
30	2.5-2.7*	259-334	64-83	4-7	17-27
	3**	263-337	65-85	3-6	17-28
50	2.5-2.7*	290-373	95-114	5-9	22-34
	3**	294-376	96-117	5-8	23-35
70	2.5-2.7*	330-429	130-152	7-11	30-43
	3**	334-433	134-156	7-10	30-43
90	2.5-2.7*	366-469	171-200	9-13	37-49
	3**	371-473	173-204	9-12	38-50

EWT	Flow	BPHE Unit - Full Load Cooling - No Hot Water Generation			
		Discharge	Suction	Water Temp Rise	Air Temp Drop
°F	GPM/Ton	PSIG	PSIG	°F	°F - DB
50	2.5-2.7*	176-216	110-138	9-15	17-27
	3**	174-214	110-138	9-12	17-27
70	2.5-2.7*	249-290	120-149	10-15	17-28
	3**	246-282	119-148	9-12	17-28
90	2.5-2.7*	336-380	124-152	10-14	16-27
	3**	331-368	124-152	9-12	16-27
110	2.5-2.7*	437-487	131-157	9-14	14-25
	3**	429-471	131-157	8-12	14-25

EWT	Flow	BPHE Unit - Part Load Heating - No Hot Water Generation			
		Discharge	Suction	Water Temp Drop	Air Temp Rise
°F	GPM/Ton	PSIG	PSIG	°F	°F - DB
30	3.75-4.05***	255-315	74-91	2-5	15-26
	4.5****	256-325	74-92	2-4	15-27
50	3.75-4.05***	283-343	104-125	4-7	21-33
	4.5****	283-354	103-126	3-6	21-34
70	3.75-4.05***	321-385	143-166	5-9	28-41
	4.5****	322-397	141-168	5-7	28-42
90	3.75-4.05***	363-424	188-215	7-10	36-48
	4.5****	365-438	188-218	7-9	36-49

EWT	Flow	BPHE Unit - Part Load Cooling - No Hot Water Generation			
		Discharge	Suction	Water Temp Rise	Air Temp Drop
°F	GPM/Ton	PSIG	PSIG	°F	°F - DB
50	3.75-4.05***	155-194	120-145	7-11	17-28
	4.5****	155-197	120-143	7-9	17-28
70	3.75-4.05***	220-260	128-151	7-11	16-28
	4.5****	220-264	128-151	7-9	16-28
90	3.75-4.05***	297-340	133-154	7-10	15-27
	4.5****	297-345	133-153	6-9	15-27
110	3.75-4.05***	386-435	139-159	6-10	14-26
	4.5****	386-441	139-159	6-8	14-26

Heating data based on 70°F EAT. Cooling data based on 80/67°F EAT.

CFM is 350-520 CFM/Ton for heating and cooling.

*Full-load GPM/Ton is 2.5-2.7 for ZT024-072.

**Full-load GPM/Ton is 3 for ZT024-072.

***Part-load GPM/Ton is 3.75-4.05 for ZT024-072.

****Part-load GPM/Ton is 4.5 for ZT024-072.

Section 10: Troubleshooting

Operating Parameter Tables : ZT, Coax

EWT	Flow	COAX Unit - Full Load Heating - No Hot Water Generation			
		Discharge	Suction	Water Temp Drop	Air Temp Rise
°F	GPM/Ton	PSIG	PSIG	°F	°F - DB
30	1.5	265-353	62-77	7-10	16-26
	3	271-365	70-85	3-6	18-27
50	1.5	291-382	91-106	10-13	22-32
	3	299-395	102-116	5-8	24-34
70	1.5	328-428	123-140	13-17	28-38
	3	337-443	137-155	7-9	30-41
90	1.5	367-468	158-177	16-20	35-45
	3	376-484	177-196	8-11	38-48

EWT	Flow	COAX Unit - Full Load Cooling - No Hot Water Generation			
		Discharge	Suction	Water Temp Rise	Air Temp Drop
°F	GPM/Ton	PSIG	PSIG	°F	°F - DB
50	1.5	216-256	114-141	18-25	18-27
	3	186-227	112-141	8-13	18-27
70	1.5	297-343	126-147	19-25	18-27
	3	256-297	124-147	9-13	18-27
90	1.5	385-448	134-151	18-24	17-26
	3	338-388	131-151	8-12	17-26
110	1.5	482-571	139-156	17-23	16-24
	3	427-494	136-156	8-12	16-24

EWT	Flow	COAX Unit - Part Load Heating - No Hot Water Generation			
		Discharge	Suction	Water Temp Drop	Air Temp Rise
°F	GPM/Ton	PSIG	PSIG	°F	°F - DB
30	1.5	248-302	65-82	6-10	14-24
	3	256-321	73-90	3-6	15-26
50	1.5	272-334	96-111	10-13	19-30
	3	280-355	107-122	5-8	21-33
70	1.5	307-367	128-146	14-18	25-37
	3	317-385	142-161	7-10	27-41
90	1.5	352-399	165-185	18-22	31-43
	3	362-419	183-205	10-13	34-47

EWT	Flow	COAX Unit - Part Load Cooling - No Hot Water Generation			
		Discharge	Suction	Water Temp Rise	Air Temp Drop
°F	GPM/Ton	PSIG	PSIG	°F	°F - DB
50	1.5	208-244	122-155	21-27	17-28
	3	175-213	119-154	10-14	17-29
70	1.5	288-325	131-160	21-26	16-27
	3	243-280	128-159	10-14	17-27
90	1.5	382-426	135-165	20-25	16-26
	3	323-366	133-163	9-13	16-27
110	1.5	486-544	142-169	18-24	15-25
	3	415-468	139-167	9-12	15-25

Heating data based on 70°F EAT. Cooling data based on 80/67°F EAT.
CFM is 350-520 CFM/Ton for heating and cooling.

Section 10: Troubleshooting

Troubleshooting Form

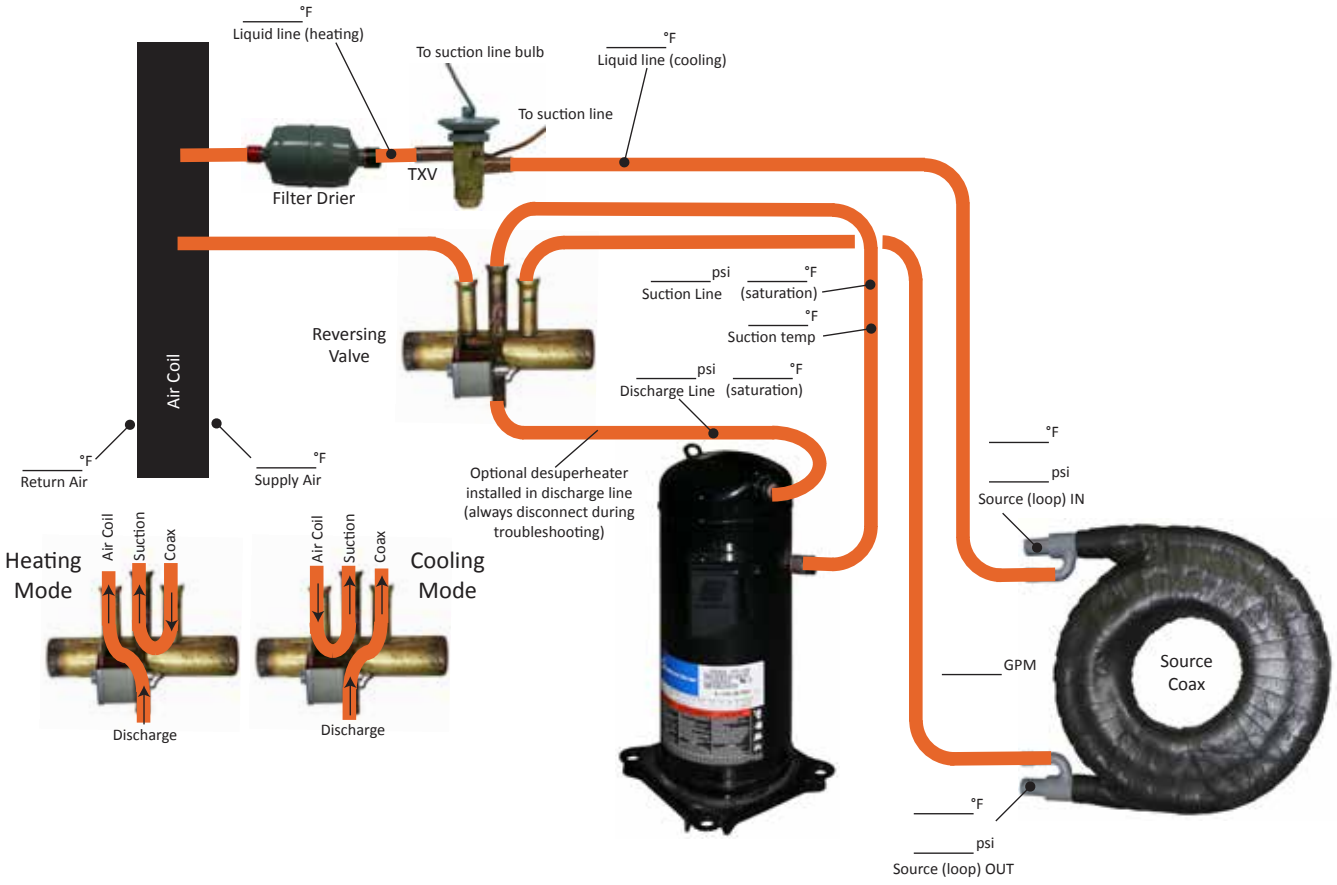
Customer/Job Name:_____ Date:_____

Model #:_____ Serial #:_____

Antifreeze Type:_____

HE or HR = GPM x TD x Fluid Factor
(Use 500 for water; 485 for antifreeze)

SH = Suction Temp. - Suction Sat.
SC = Disch. Sat. - Liq. Line Temp.



Section 10: Troubleshooting

QR Codes for Installation or Troubleshooting Tip Videos

	ECM Temporary Replacement
	ECM Motor Troubleshooting
	Troubleshooting a TXV
	Compressor Troubleshooting
	Variable Speed Flow Centers
	Return Conversion for and XT or CT
	Heat Of Extraction and Rejection

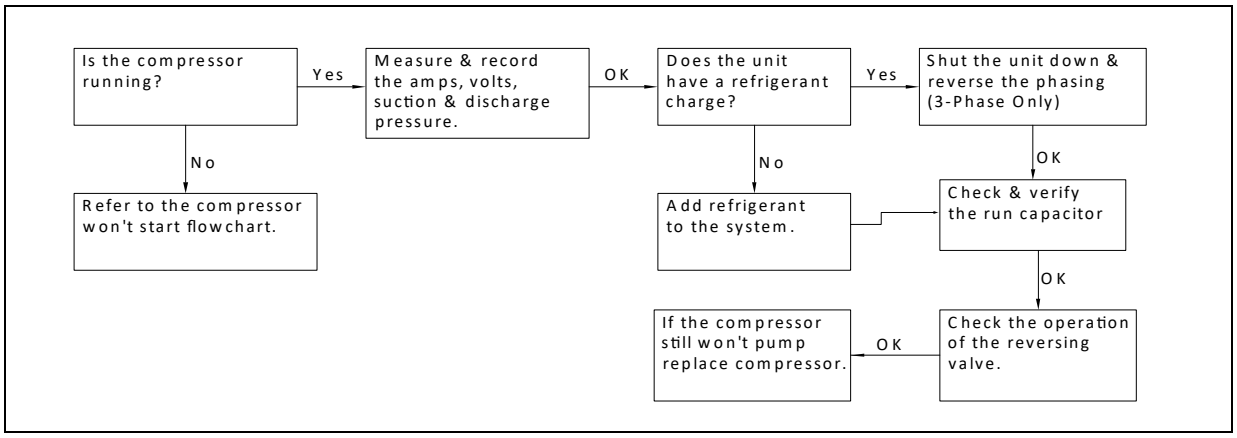
	Measuring Subcooling/Superheat
	Nitrogen Purge While Brazing
	Leak Testing an Air Coil
	Loop Flushing
	Repairing a Microchannel Air Coil
	Testing a Coaxial Heat Exchanger
	Troubleshooting a TXV

Section 10: Troubleshooting

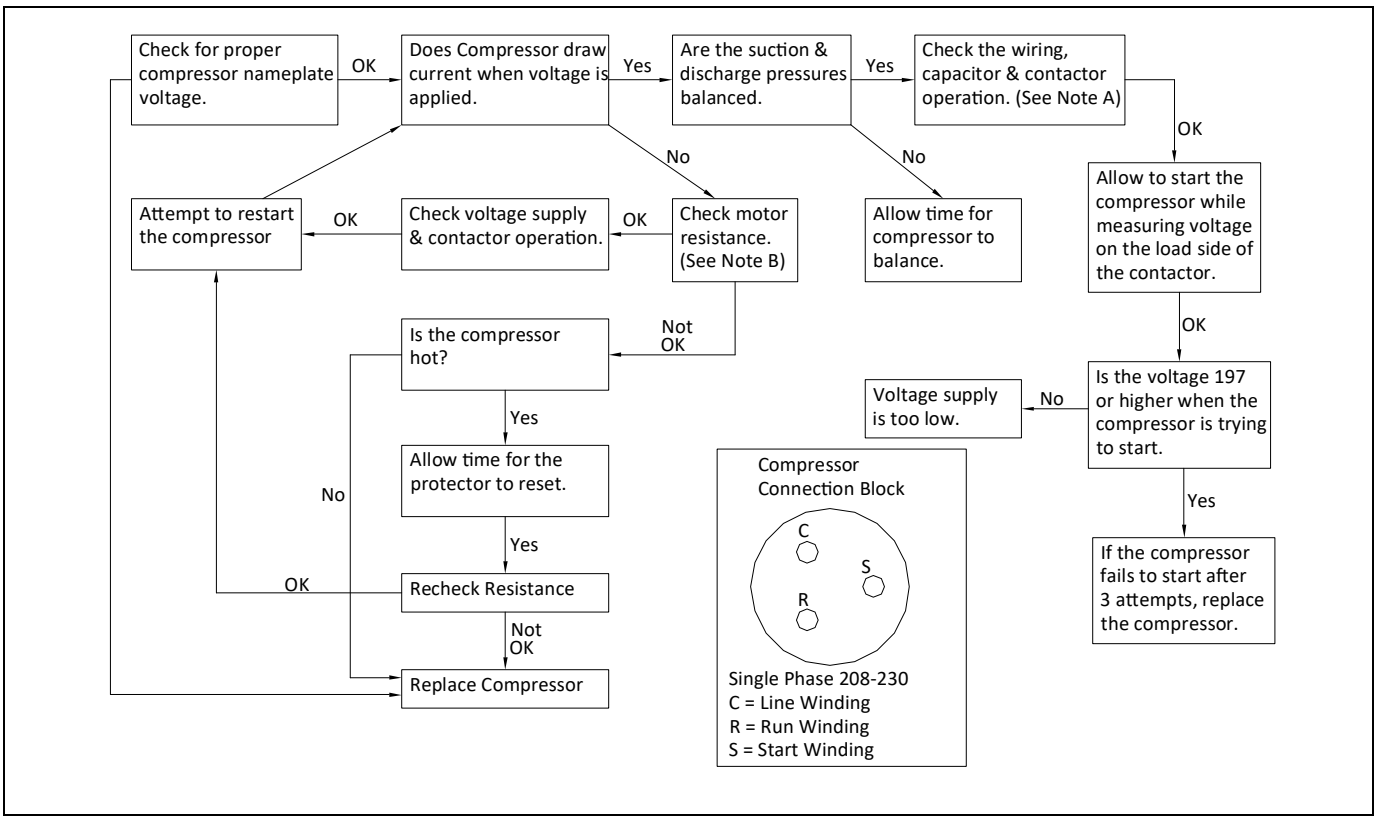
Compressor Troubleshooting

A: Check all terminals, wires & connections for loose or burned wires and connections. Check contactor and 24 Volt coil. Check capacitor connections & check capacitor with capacitor tester.

B: If ohm meter reads 0 (short) resistance from C to S, S to R, R to C or from anyone of one of these terminals to ground (shorted to ground), compressor is bad.



Compressor Won't Start:



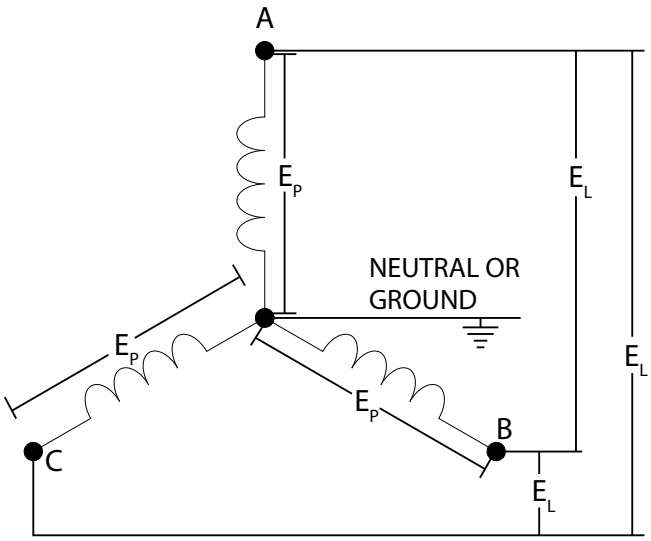
⚠ CAUTION ⚠

CHECK COMPRESSOR AMP DRAW TO VERIFY COMPRESSOR ROTATION ON THREE PHASE UNITS. COMPARE AGAINST UNIT ELECTRICAL TABLES. REVERSE ROTATION RESULTS IN HIGHER SOUND LEVELS, LOWER AMP DRAW, AND INCREASED COMPRESSOR WEAR. THE COMPRESSOR INTERNAL OVERLOAD WILL TRIP AFTER A SHORT PERIOD OF OPERATION.

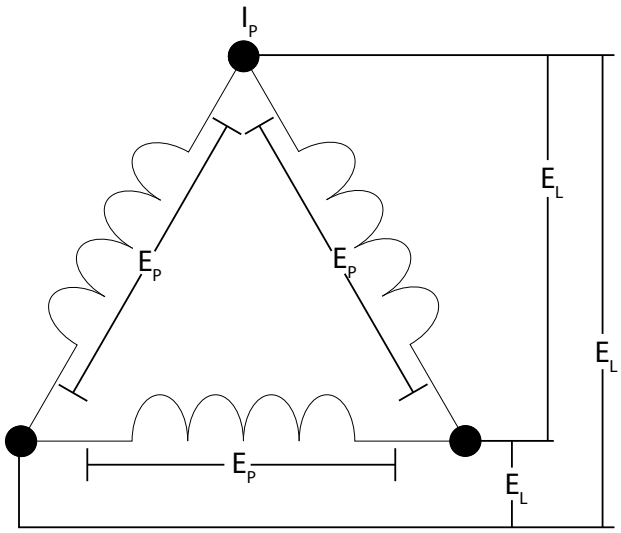
Proper Power Supply Evaluation

When any compressor bearing unit is connected to a weak power supply, starting current will generate a significant "sag" in the voltage which reduces the starting torque of the compressor motor and increases the start time. This will influence the rest of the electrical system in the building by lowering the voltage to the lights. This momentary low voltage causes "light dimming". The total electrical system should be evaluated with an electrician and HVAC technician. The evaluation should include all connections, sizes of wires, and size of the distribution panel between the unit and the utility's connection. The transformer connection and sizing should be evaluated by the electric utility provider.

Example 1: WYE (STAR) Electrical Circuit



Example 2: DELTA Electrical Circuit



⚠ CAUTION ⚠

ALL VOLTAGE CODE "3" 460V UNITS UTILIZE A 277V ECM MOTOR WHICH REQUIRES A NEUTRAL WIRE. THE MOTORS ARE WIRED BETWEEN THE NEUTRAL AND ONE HOT LEG OF THE CIRCUIT. SOURCE WIRING MUST BE WYE (STAR) CONFIGURATION. 3-PHASE DELTA CONNECTIONS WILL NOT PROVIDE THE CORRECT WIRING AND WILL CAUSE THE UNIT NOT TO OPERATE.

Refrigeration Troubleshooting Table								
Condition	Mode	Discharge Pressure	Suction Pressure	Superheat	Subcooling	Air TD	Water TD	Compressor Amps
Under Charge	Heat	Low	Low	High	Low	Low	Low	Low
	Cool	Low	Low	High	Low	Low	Low	Low
Over Charge	Heat	High	High/Normal	Normal	High	High	Normal	High
	Cool	High	High/Normal	Normal	High	Normal	High	High
Low Air Flow	Heat	High	High/Normal	Normal	High/Normal	High	Low	High
	Cool	Low	Low/Normal	Low	Normal	High	Low	High/Normal
Low Source Water Flow	Heat	Low	Low/Normal	Low	Normal	High	Low	High/Normal
	Cool	High	High/Normal	Normal	High/Normal	High	Low	High
Low Load Water Flow	Heat	High	High/Normal	Normal	High/Normal	High	Low	High
	Cool	Low	Low/Normal	Low	Normal	High	Low	High/Normal
Restricted TXV	Heat	High	Low	High	High	Low	Low	Low
	Cool	High	Low	High	High	Low	Low	Low
TXV Stuck Open	Heat	Low	High/Normal	Low	Low	Low	Low	High
	Cool	Low	High/Normal	Low	Low	Low	Low	High
Inadequate Compression	Heat	Low	High	High/Normal	Low/Normal	Low	Low	Low
	Cool	Low	High	High/Normal	Low/Normal	Low	Low	Low

Superheat/Subcooling Conditions

Superheat	Subcooling	Condition
Normal	Normal	Normal operation
Normal	High	Overcharged
High	Low	Undercharged
High	High	Restriction or TXV is stuck almost closed
Low	Low	TXV is stuck open

Section 10: Troubleshooting

TROUBLESHOOTING TIPS	
A: UNIT WILL NOT START IN EITHER CYCLE	
Thermostat	Set thermostat on heating and highest temperature setting. Unit should run. Set thermostat on cooling and lowest temperature setting. Unit should run. Set fan to On position. Fan should run. If unit does not run in any position, disconnect wires at heat pump terminal block and jump R, G, Y. Unit should run in heating. If unit runs, replace thermostat with correct thermostat only.
Loose or Broken Wires	Tighten or replace wires.
Blown Fuse/	Check fuse size, replace fuse or reset circuit breaker. Check low voltage circuit breaker.
Tripped Circuit Breakers	Check fuse size, replace fuse or reset circuit breaker.
Low Voltage Circuit	Check 24 volt transformer. If burned out or less than 24 volt, replace. Before replacing, verify tap setting and correct if necessary.
B: BLOWER RUNS BUT COMPRESSOR WILL NOT START (COMPRESSOR OVERLOAD, BAD CAPACITOR, HP FAULT)	
Logic Board	Check if status light is on and logic board is working properly. Check fault lights. See LED Identification chart in Controls Section.
Defective Sensors	Check status/fault lights. Sensor is out of normal range for resistance values, open, or shorted. Compare sensor resistance values with the charted resistance in Controls Section.
Defective Capacitor	Check capacitor. If defective, replace.
Failed Compressor	See charts M and N for compressor diagnostic. If compressor still doesn't run, replace it.
Low Pressure Switch	Low refrigerant charge. Check for pressure. Check for leaks.
C: BLOWER RUNS BUT COMPRESSOR SHORT CYCLES OR DOES NOT RUN	
Wiring	Loose or broken wires. Tighten or replace wires. See A: Unit will not start in either cycle.
Blown Fuse	Check fuse size. Check unit nameplate for correct sizing. Replace fuse or reset circuit breaker.
Check low voltage circuit breaker.	Temporarily bypass flow switch for a couple seconds. If compressor runs properly, check switch. If defective, replace. If switch is not defective, check for air in loop system. Make sure loop system is properly purged. Verify flow rate before changing switch.
Defective Sensors	Check status/fault lights. Sensor is out of normal range for resistance values, open, or shorted. Compare sensor resistance values with the charted resistance in Controls Section.
Water Flow (Source Heat Exchanger Freeze Fault)	Check status/fault lights. To check water flow remove the FS jumper (see Controls Section for location) and jumper the two FS terminals (located between blue and violet wires on the right side of the board) together to complete the flow switch circuit. Determine if the required water pressure drop is present. If required pressure drop is present, check the resistance of T4 source sensor (15°F=41.39kΩ; 30°F=28.61kΩ) and temperature of the refrigerant line between the source heat exchanger and TXV.
High or Low Pressure Switches	If heat pump is out on high or low-pressure cutout (lockout), check for faulty switches by jumping the high and low-pressure switches individually. If defective replace. Check airflow, filters, water flow, refrigerant pressures, and ambient temperature. WARNING: Only allow compressor to run for a couple of seconds with the high pressure switch jumped.
Defective Logic Board Relay	Jump R to Y directly on lockout board. Check for 24V at Y. If no operation and no faults occur, replace lockout board.
Hot Gas Temperature>220°F	Check status/fault lights. Check hot gas/discharge line temperature with a thermocouple type thermometer. WARNING: Let the unit remain off for several minutes and touch the thermocouple to the discharge line to check if it is cooled enough to strap/tape a thermocouple to it. Check the discharge line temperature during the next operation cycle to compare the temperature to the lockout temperature of 220°F. Check water/air flow. If water/air flow is present, check the refrigerant pressures.
Condensate Overflow (CO)	Check status/fault lights. Check sensors for contact with water, debris, or a loose sensor touching metal. Clean sensors if contacting debris. Flush drain lines if the drain pan is full. If no debris is present and drain pan is empty, remove violet wire from CO terminal on lockout board (lower right). If CO lockout occurs with violet wire removed replace the lockout board.
Over/Under Voltage	Make sure secondary/low voltage is between 20V and 29V. Check the transformer's primary connections for the correct voltage (Orange & Black = 230V; Red & Black = 208V). Correct any possible voltage drops in the main voltage.
Load Heat Exchanger Frozen	Check status/fault lights. Check for reduced air flow due to dirty filter, obstructions, or poor blower performance. Check T1 sensor for the proper resistance (30°F = 28.61kΩ).
D: UNIT RUNNING NORMAL, BUT SPACE TEMPERATURE IS UNSTABLE	
Thermostat	Thermostat is getting a draft of cold or warm air. Make sure that the wall or hole used to run thermostat wire from the ceiling or basement is sealed, so no draft can come to the thermostat. Faulty Thermostat (Replace).

E: NOISY BLOWER AND LOW AIR FLOW	
Noisy Blower	Blower wheel contacting housing—Readjust, Foreign material inside housing—Clean housing. Loose duct work—Secure properly.
Low air flow	Check speed setting, check nameplate or data manual for proper speed, and correct speed setting. Check for dirty air filter—Clean or replace; obstruction in system—Visually check. Balancing dampers closed, registers closed, leaks in ductwork. Repair. Ductwork too small. Resize ductwork.
F: NO WATER FLOW	
Pump Module	Make sure Pump Module is connected to the control box relay (check all electrical connections). For non-pressurized systems, check water level in Pump Module. If full of water, check pump. Close valve on the pump flanges and loosen pump. Take off pump and see if there is an obstruction in the pump. If pump is defective, replace. For pressurized systems, check loop pressure. Repressurize if necessary. May require re-flushing if there is air in the loop.
Solenoid valve	Make sure solenoid valve is connected. Check solenoid. If defective, replace.
G: IN HEATING OR COOLING MODE, UNIT OUTPUT IS LOW	
Water	Water flow & temperature insufficient.
Airflow	Check speed setting, check nameplate or data manual for proper speed, and correct speed setting. Check for dirty air filter—Clean or replace. Restricted or leaky ductwork. Repair.
Refrigerant charge	Refrigerant charge low, causing inefficient operation. Make adjustments only after airflow and water flow are checked.
Reversing valve	Defective reversing valve can create bypass of refrigerant to suction side of compressor. Switch reversing valve to heating and cooling mode rapidly. If problem is not resolved, replace valve. Wrap the valve with a wet cloth and direct the heat away from the valve. Excessive heat can damage the valve. Always use dry nitrogen when brazing. Replace filter/drier any time the circuit is opened.
Heat pump will not cool but will heat. Heat pump will not heat but will cool.	Reversing valve does not shift. Check reversing valve wiring. If wired wrong, correct wiring. If reversing valve is stuck, replace valve. Wrap the valve with a wet cloth and direct the heat away from the valve. Excessive heat can damage the valve. Always use dry nitrogen when brazing. Replace filter/drier any time the circuit is opened.
Water heat exchanger	Check for high-pressure drop, or low temperature drop across the coil. It could be scaled. If scaled, clean with condenser coil cleaner.
System undersized	Recalculate conditioning load.
H: WATER HEAT EXCHANGER FREEZES IN HEATING MODE	
Water flow	Low water flow. Increase flow. See F. No water flow.
Flow Switch	Check switch. If defective, replace.
I: EXCESSIVE HEAD PRESSURE IN COOLING MODE	
Inadequate water flow	Low water flow, increase flow.
J: EXCESSIVE HEAD PRESSURE IN HEATING MODE	
Low air flow	See E: Noisy blower and low air flow.
K: AIR COIL FREEZES OVER IN COOLING MODE	
Air flow	See E: Noisy blower and low air flow.
Blower motor	Motor not running or running too slow. Motor tripping off on overload. Check for overheated blower motor and tripped overload. Replace motor if defective.
Panels	Panels not in place.
Low air flow	See E: Noisy blower and low air flow.
L: WATER DRIPPING FROM UNIT	
Unit not level	Level unit.
Condensation drain line plugged	Unplug condensation line.
Water sucking off the air coil in cooling mode	Too much airflow. Duct work not completely installed. If duct work is not completely installed, finish duct work. Check static pressure and compare with air flow chart in spec manual under specific models section. If ductwork is completely installed it may be necessary to reduce CFM.
Water sucking out of the drain pan	Install an EZ-Trap or P-Trap on the drain outlet so blower cannot suck air back through the drain outlet.

Warranty Registration Form

ENERTECH
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WARRANTY REGISTRATION

NOW REGISTER ONLINE AT WARRANTY-REGISTRATION.ENERTECHGEO.COM

WARRANTY REGISTRATIONS SHOULD BE SUBMITTED WITHIN 60 DAYS OF INSTALLATION

Model Number _____ Serial Number _____ Install Date _____

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

_____

Purchaser/User Name _____ Phone _____

Address _____ City _____ State/Prov _____

Postal Code _____ Email _____

Installer Company Name _____

City _____ State/Prov _____ Email _____

Application

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

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

Use (check all that apply)

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

☐ Other _____

Loop Type

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

Demographics

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

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

Home Location ☐ Rural ☐ Urban ☐ Suburban

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

Customer Satisfaction

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

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

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

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

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

EMAIL THIS FORM TO:
WARRANTY@ENERTECHGEO.COM

FAX THIS FORM TO:
ENERTECH GLOBAL LLC
618.664.4597

REGISTER ONLINE AT: warranty-registration.enertechgeo.com

Rev 30 DEC 2013B

This page left blank for Warranty Form detachment.

Warranty Claim(s)
For warranty claims, the Installer/Dealer can visit: **http://warranty-claim.enertechgeo.com**

Revision Table

Date	Description of Revision	Page
30MAY2023	ZS/ZT Unit Revision G IOM created.	ALL

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