AMBIENT

Monobloc Air-to-Water Heat Pump

For Cold Climate

Installation, Operation and Service Manual

Model Number: HPS-5T60-DF ☐ HPS-5T60 ☐

Date Installed: _____

C ETL LISTED US
Intertek
9700609

AHRI CERTIFIED®
C www.ahridirectory.org

TO THE INSTALLER:
Affix these instructions adjacent to heat pump controller inside home.
Provide model number and serial number when seeking information and support.

TO THE HOMEOWNER:
Retain these instructions for future reference.
Contact installer or technician for all issues and support.

U.S. Boiler Company

⚠ WARNING

This unit must only be installed, serviced, or repaired by a qualified installer or service agency. Improper installation, adjustment, alteration, service or maintenance can cause severe personal injury, death, or substantial property damage. For assistance or additional information, consult a qualified installer or service agency. Read these instructions before installing.

112480-03 - 4/25

1 Read Before Proceeding

Read and understand this document before proceeding with installation or maintenance. Perform installation in accordance with local and national codes.

Hazard Definitions

The following terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning product life.

⚠ DANGER

Indicates a hazardous situation that, if not avoided, will result in death or serious injury.

⚠ WARNING

Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

⚠ CAUTION

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

NOTICE: Indicates special instructions on installation, operation, or service which are important but not related to personal injury hazards.

UL60335-2-40 Hazard Notifications

1. Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.
2. The appliance shall be stored in a room without continuously operating source (for example open flames, an operating gas appliance or an operating electric heater).
3. Be aware that refrigerants may not contain an odor. Do not pierce or burn.

⚠ WARNING

- Carefully read all instructions in literature packet furnished with heat pump before installation, startup, or service of this unit. Perform steps in order given. Failure to follow all instructions in proper order could result in severe personal injury, death or substantial property damage.
- If any controls are replaced, they must be replaced with identical models.
- If any electrical wires are disconnected during service, clearly label wires, and assure that the wires are connected properly.
- Never jump out or bypass any safety or operating control or components of this heat pump.
- Assure that all safety and operating controls and components are operating properly before placing heat pump back in service.

2 Introduction

Product Features

Ambient is an air-to-water heat pump designed for space heating applications and outdoor installation. Monobloc unit features an enclosed R-32 refrigerant circuit and uses inverter technology to match heating load accurately based on outdoor temperature and design conditions. Refer to Table 4-2 for Heating Capacity Data.

Advanced Control

A microprocessor manages unit function, allowing on-site adjustment to match specific operating requirements.

Enhanced Vapor Injection (EVI)

EVI improves overall system efficiency by increasing energy transfer and reducing compressor discharge temperature in cold climates application, -13°F (-25°C).

Intelligent Defrosting Technology

Control initiates a defrost cycle based on programmable parameters such as running time, ambient, coil, and inlet water temperature to ensure energy efficiency and comfort.

Easy Installation

Monobloc configuration keeps all refrigerant outdoors without refrigeration connection or on-site handling. Only water/antifreeze mixture is plumbed indoors.

Quiet Operation

Insulated housing, an advanced fan profile, and variable speed fans and compressors combine to achieve a low noise level of 47dBA to 57dBA from 10 ft. (3 m).

Efficient Energy Transfer

Ambient 5 Ton Hydronic Heat Pump has a high efficiency, larger surface area energy exchanger for air-to-refrigerant heat transfer and refrigerant-to-water transfer.

Outdoor Coils

Outdoor coils have been tested in accordance with GB/T 2432.17 salt spray test.

Description of Two HP Offerings

Two hydronic heat pump packages are available for purchase, depending on application and system requirements.

Standard Low Temperature AWHP (HPS-5T60)

1. Suitable for low-temperature system applications that require less than 140°F and do not have an installed standard gas/oil boiler. A hydronic heat pump would be the primary means of space heating. See Application Guide Section.
2. Components Included:
   - 5 Ton Monobloc Air to Water Heat Pump.
   - 40 Gallon Buffer Tank with 6kW (20 MBH) electric elements for backup capacity.
   - Taco 240V 0013 Circulator for Primary Loop.
   - Taco Flat Plate Heat Exchanger.
   - Electric Boost Interface Relay (240V Rating).
   - Resideo 889A Interface Relay (24V thermostat power/interface, 120V system circulator power).
   - 30 PSI pressure relief valve.

Dual Fuel Low Temperature AWHP (HPS-5T60-DF)

1. Suitable for installations that require supplementary heating for the following reasons:
   - Application that requires 60MBH or more.
   - Cold climates where outdoor temperature drops below 20°F for an extended period.
   - Retrofit application with existing heating source designed for high temperature system.
   - Domestic hot water via indirect water heater.
2. Components Included:
   - 5 Ton Monobloc Air to Water Heat Pump.
   - 40 Gallon Buffer Tank with 6kW (20 MBH) electric elements for backup capacity.
   - Taco 240V 0013 Circulator for Primary Loop.
   - Taco Flat Plate Heat Exchanger.
   - Dual Fuel Control Box (with Instructions).
   - 30 PSI pressure relief valve.

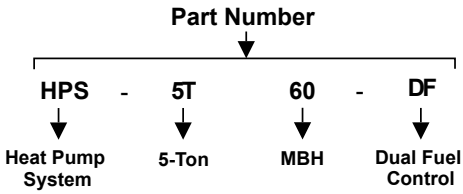


Figure 2-1: Nomenclature

2 Introduction *(continued)*

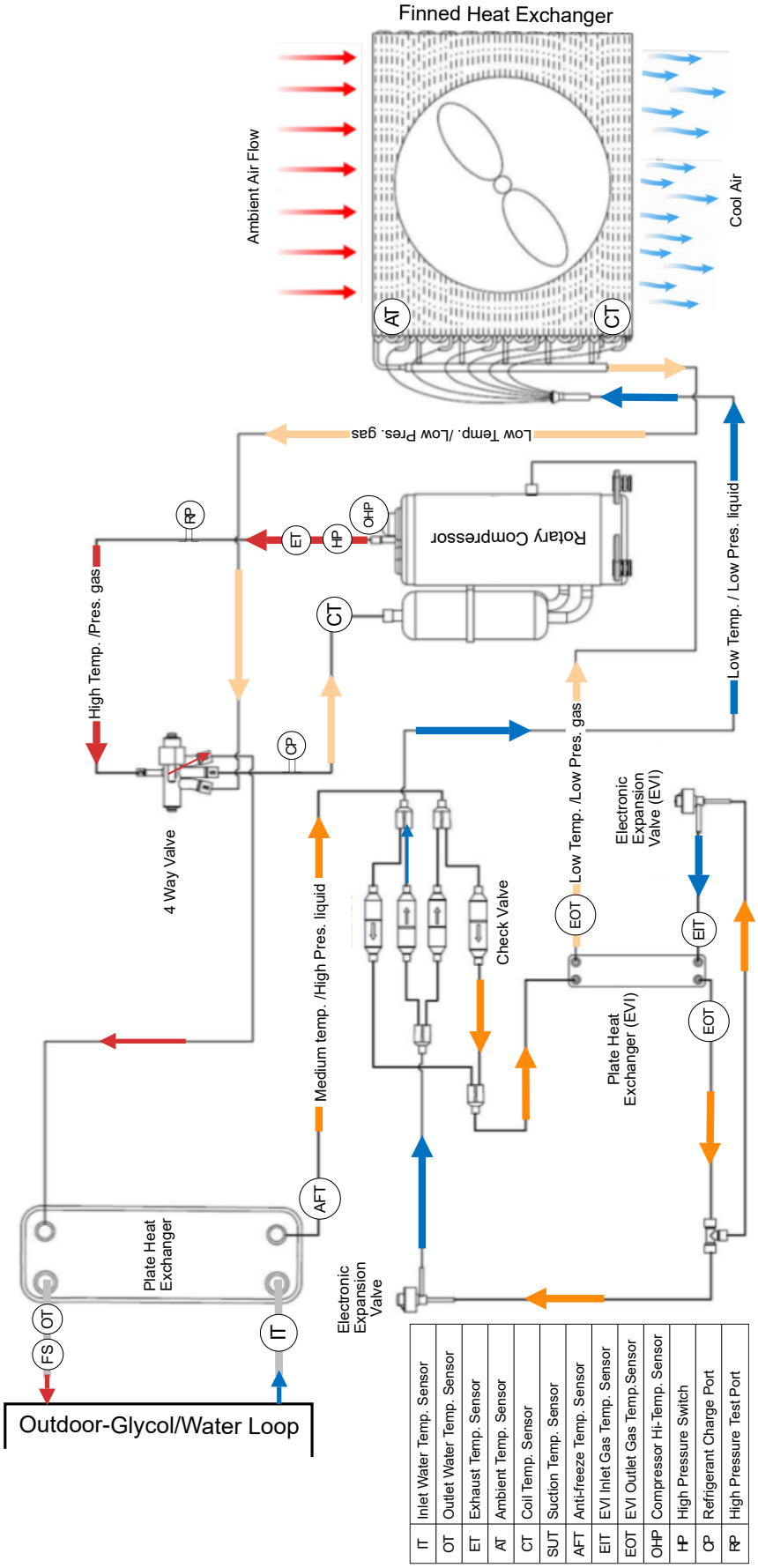


Figure 2-2: Monobloc-Refrigerant Heating Cycle and Components

3 Unpacking and Transporting

1. Upon receiving unit, visually inspect for signs of damage, such as dents and scratches.
2. Any claim for damage or shortage in shipment must be filed immediately against carrier by consignee. No claims for variances will be allowed by manufacturer, unless presented within 60 days after receipt of equipment.
3. Move heat pump crate to installation site via forklift or overhead crane.
4. Lift unit with straps attached to four points to minimize pressure applied to jacket. Refer to Figure 3-1 for proper lifting method.

⚠ WARNING

Use lifting straps capable of lifting 500 pounds.

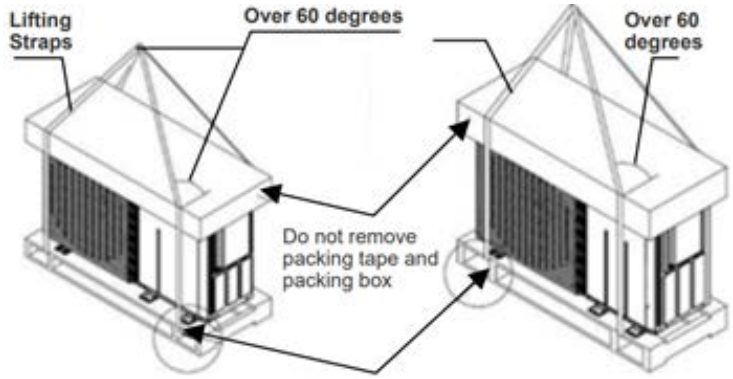


Figure 3-1: Hoisting Method

5. Attach straps to unit at angle of 60 degrees or less and lift at its center of gravity.
6. Locate a clear area near installation site to unpack.
7. Unpack heat pump using a utility knife or scissors to cut through packaging tape securing carton sleeve.
8. Compare received components to shipping packing list.
9. Heat pump accessory kit contains these items:

Table 3-2: Heat Pump Accessory Kit

Item	Components	Qty.
1	Display	1
2	Display Mounting Plate	1
3	Display Wiring	1
4	Condensate Drain Connection	1
5	Mounting Rubber Feet	4
6	Thermistor*	1

* Not used

Unit Storage

1. Store unit upright in a clean and dry area.
2. If stacking is necessary, stack up to two units high.
3. Do not remove unit or accessory components from shipping carton for safekeeping until installation.

NOTICE: Warranty does not cover any damage caused by incorrect handling or storage of unit.

4 Specifications

Table 4-1: Ambient Heat Pump Performance and Dimensional Data

Electrical Ratings					
Power	Fan Motor	Compressor Motor	MCA*	MOP**	SCCR***
240V / 1 / 60	1.6 A	33.5 A	44 A	50 A	5.0 kA

Heating Performance	Units	Range
Air Temperature (DB/WB): 44.6/44.8°F, Water Temperature (In/Out): 86/95°F		
Capacity Range	MBH	23.8 – 78.5
Efficiency Range	COP	2.28 - 3.95
Delivered Water Temp Range	Deg. °F	95 - 140
Heating Power Input Range	MBH	5.0 - 20.1
Heating Current Input Range	A	6.50 - 25.90
Ambient Temperature Range	Deg. °F	(-13 -110)
Air Temperature (DB/WB): 68/59°F, Water Temperature (In/Out): 59/131°F		
Capacity Range	MBH	30 - 89.4
Efficiency Range	COP	2.58 - 4.48
Delivered Water Temp Range	Deg. °F	95 - 140
Heating Power Input Range	kW	7.2 - 21.5
Heating Current Input Range	A	9.22 – 27.60
Ambient Temperature Range	Deg. °F	(-13 -110)

Refrigerant			
Type	Factory Charge	Pressure High Side	Pressure Low Side
R32	4.4 Lbs.	638 psig	305 psig

Hydronic Circuit			
Flow Rate	Max. Water Temperature	Pressure Drop	Inlet/Outlet Connection
12.8 GPM	140°F	15 Ft.-Hd	1.0 in. NPT

Dimensions (in.)			
Net (in.)	Shipping (in.)	Net Weight (Lbs.)	Shipping Weight (Lbs.)
49.1 x 19.8 x 52.3	54.3 x 22.4 x 58.3	450	465

eBoost Relay				
Coil Voltage (V)	Max. Switching (V)	Current (A)	Avg. Consumption (W)	Contact Arrangement
240	300	25	1.9	DPST-NO

***MCA**-Minimum Circuit Ampacity (MCA) is a calculated value that specifies minimum primary power wire size to determine minimum wire size required for field wiring a product. The specification is necessary to guarantee wire will not overheat under expected operating conditions. The wire size takes into account normal current draw, aging of components and anticipated faults. When operating correctly, MCA is the highest steady-state electrical current unit should see.

****MOP**-Maximum Over-Current Protection (MOP) is a calculated value that determines maximum size of over-current protection device (fuse or breaker). Depending on your application, there are different MOP equations to determine maximum breaker size required to adequately protect equipment under anticipated fault conditions. In addition, MOP takes into account startup surges and components.

*****SCCR**-Short-Circuit Current Rating (SCCR) is a maximum amount of RMS current an electrical component can handle when using an overcurrent protection device, such as a fuse, or for a given amount of time at a specified voltage.

Table 4-2: Ambient Heat Pump Heating Capacity Data

Heating Capacity (Btu/hr.)																
Outdoor Air Temperature (°F)																
Water Outlet (°F)	-22	-13	-4	5	14	19	23	32	36	41	45	50	59	68	77	86
95	18,767	26,512	34,258	42,038	54,870	57,870	60,020	66,093	71,894	73,361	78,479	82,164	89,603	94,721	95,642	82,267
106	15,935	24,909	33,883	42,822	52,649	56,232	58,655	64,967	70,222	72,201	73,600	76,773	79,912	85,645	85,133	82,062
113	14,058	23,817	33,610	42,038	49,578	52,138	53,898	59,849	69,069	69,915	70,461	73,361	78,684	84,689	76,841	80,663
122	-	20,814	28,560	36,681	40,639	44,324	46,883	51,694	58,586	60,907	62,374	64,694	73,395	82,437	68,823	70,768
131	-	17,811	23,544	33,132	34,667	39,103	42,208	46,269	51,216	54,458	56,642	59,883	65,274	70,665	56,027	63,978
140	-	-	18,118	28,662	30,846	34,497	38,011	41,389	44,801	48,691	51,421	57,290	58,041	60,770	59,405	62,613

Power Input (BTU/Hr.)																
Outdoor Air Temperature (°F)																
Water Outlet (°F)	-22	-13	-4	5	14	19	23	32	36	41	45	50	59	68	77	86
95	11,089	15,048	18,664	19,142	19,347	19,347	20,063	20,541	20,473	19,927	19,859	19,893	20,029	19,552	17,334	13,000
106	10,339	15,525	20,268	21,428	21,496	21,974	22,281	22,554	21,531	21,531	21,701	21,735	19,893	18,903	16,788	14,604
113	9,793	15,901	21,531	22,520	22,520	22,520	22,520	22,520	22,350	22,315	22,350	22,350	20,712	19,176	15,686	15,048
122	-	16,822	21,940	22,520	22,520	22,520	22,520	22,520	22,520	22,520	22,520	22,250	22,520	22,588	17,027	15,935
131	-	16,788	20,814	22,520	22,520	22,520	22,520	22,520	22,520	22,520	22,520	22,250	22,520	22,520	16,105	16,719
140	-	-	18,426	22,520	22,520	22,520	22,520	22,520	22,520	22,520	22,520	22,250	22,520	22,520	19,825	18,972

COP																
Outdoor Air Temperature (°F)																
Water Outlet (°F)	-22	-13	-4	5	14	19	23	32	36	41	45	50	59	68	77	86
95	1.69	1.76	1.84	2.20	2.82.	2.92	2.99	3.22	3.51	3.68	3.95	4.13	4.48	4.48	5.52	6.32
106	1.54	1.60	1.67	2.00	2.45	2.56	2.63	2.88	3.26	3.35	3.39	3.53	4.02	4.53	5.08	5.56
113	1.44	1.50	1.56	1.87	2.20	2.31	2.39	2.66	3.09	3.13	3.15	3.28	3.80	4.42	4.89	5.36
122	-	1.24	1.30	1.63	1.80	1.97	2.08	2.30	2.60	2.71	2.77	2.87	3.26	3.65	4.04	4.44
131	-	1.06	1.13	1.47	1.54	1.74	1.87	2.05	2.27	2.42	2.51	2.66	2.90	3.14	3.48	3.83
140	-	-	0.98	1.27	1.37	1.53	1.69	1.84	1.99	2.16	2.28	2.54	2.58	2.70	3.00	3.30

Performance information above is measured based on heat pump outlet temperature. It does not account for heat losses from piping, plate heat exchangers, or exposed piping from outdoor unit.

4 Specifications *(continued)*

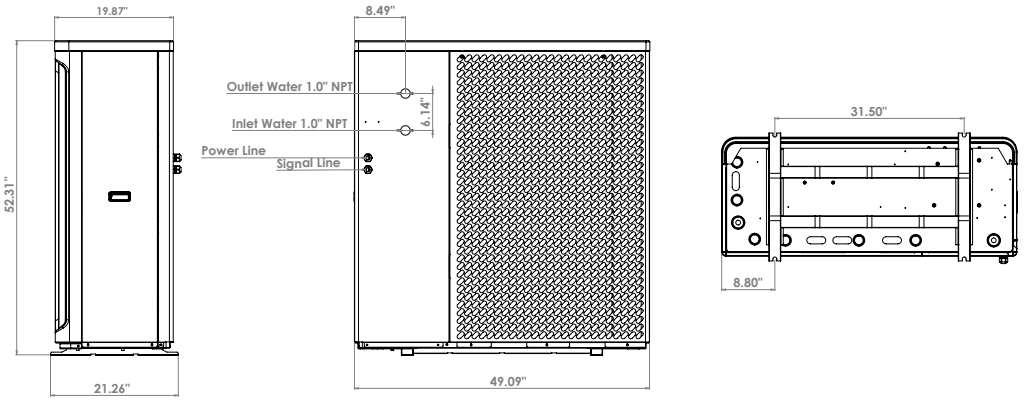


Figure 4-3: Dimensions (In.)

5 Service Clearances

Table 5-1: Clearances

Distance	Recommended Service (in.)	Absolute Minumum (in.)
A	40	12
B	40	20
C	20	12
D	20	8
E	40	20

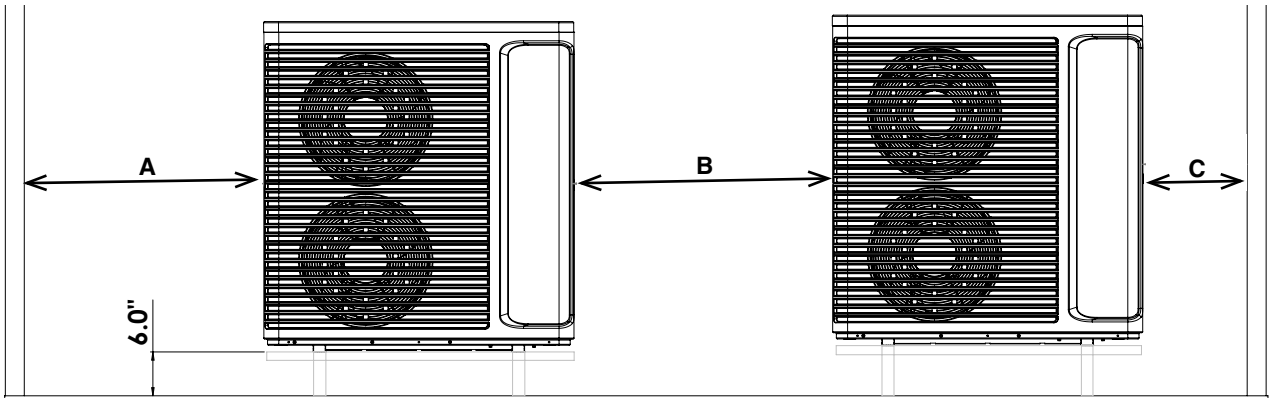


Figure 5-2: Minimum Service Clearances

1. Clearances shown in Figure 5-3 assume no wall extends more than 6 in. above roof top of heat pump. There is no overhead roof and no more than two barrier walls on either side.
2. Install 6 in. above ground to allow proper condensate drainage.
3. Heat pump's bottom pan has drain holes that must be clear for proper drainage.
4. Maintain a minimum 20-inch clearance between heat pump's rear and adjacent building.

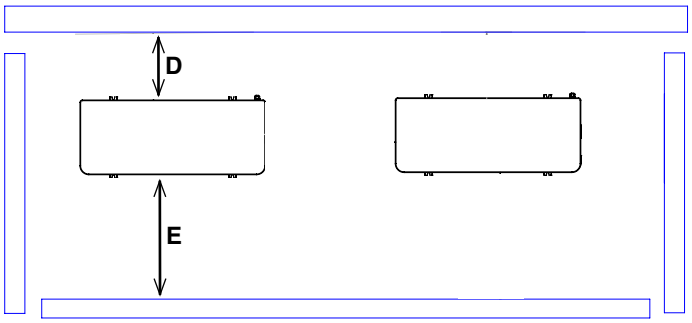


Figure 5-3: Minimum Clearances and Air Flow

6 Installation

Sizing Heat Pump

⚠ WARNING

Installation and Service must be performed only by a qualified installer or service agency. Improper installation could result in severe personal injury, death or substantial property damage. Perform installation in accordance with local and national codes.

NOTICE: Improper sizing and poor installation will lead to excessive cycling, lower efficiency and potential damage to unit not covered by warranty.

1. It is critical to size heat pump as closely as possible to design demand to optimize efficiency and comfort.
2. Calculate building's required heating load at lowest expected outdoor temperature.
3. Room-by-room load calculation is preferred compared to other simplified methods.
4. Perform heat loss calculation element, i.e., loss through walls, roof, windows, floor, and ventilation.
5. Review heat pump's heating capacity at various outdoor temperatures from Table 4-2 to determine if it meets required heating load.
6. Cold climate installations and large buildings may require additional heating sources.
7. For new or retrofit applications, correctly size an auxiliary heating source to meet required load.
8. Dual fuel control can operate heat pump and supplementary heating source such as hot water boiler. Refer to page 10, Dual Fuel Section, for more details.
9. Heat pump's efficiency can be calculated using following equations.
   A. Coefficient of performance (COP) based on operating conditions.

$$COP = \frac{\textit{Heating delivered (Btu/Hr.)}}{\textit{Seasonal electricity (Btu/Hr.)}}$$

   B. Heating seasonal performance factor (HSPF) average efficiency over a typical heating season under standard operation, including defrost cycle.

$$HSPF = \frac{\textit{Seasonal heating delivered (Btu.)}}{\textit{Seasonal electricity (W-hr.)}}$$

Installation Location

NOTICE: Before installation, check with local building codes and other guidelines.

1. Install unit outdoors with sufficient clearance for airflow into inlet and discharge air openings and adequate service access. Refer to Figures 5-2 and 5-3 for minimum clearances.
2. Select a location that is shaded from direct sunlight most of the time, if possible.
3. Install unit away from sources of heat or moisture such as combustion vents, dryer vents, building exhaust, etc.
4. Position unit to avoid direct water, snow, or ice from a roof line overhead.
5. Consider operational sound level when selecting installation site. Avoid installing near sleeping quarters or study rooms.
6. Sound change occurs during defrost cycle, which lasts 5 minutes.
7. Ensure free drainage of condensate from defrost cycle to prevent ice accumulation.
8. Install unit on a sturdy base, such as concrete platform or metal frame that is level and capable of supporting total weight. Table 6-1 provides suggested stand manufacturers.

Table 6-1: Suggested Stand Manufacturers

Manufacturers	HP Wt. (lb)
Diversitech	450
Rector Seal	

9. Elevate heat pump above snowline in areas with prolonged temperatures below freezing and snowfall.
10. Mount unit 12 inches above surface for flat rooftop installations.
11. Ensure unit is adequately secured to withstand wind or seismic conditions without shifting or tipping.

⚠ CAUTION

Failure to provide sufficient condensate drainage may result in slip hazards and damage to walkways.

6 Installation *(continued)*

12. Install unit near central indoor system to minimize installation costs and reduce heat loss through pipes.
13. Properly insulate all outdoor pipes and seal all wall, floor, or ceiling penetrations.
14. Installation altitude affects unit performance. Refer to Table 6-2 for an approximate multiplier to apply to determine capacity and efficiency.

Table 6-2: Altitude Heating Capacity Multiplier

Elevation Above Sea Level		Effect on Heating	
Feet	Meters	Capacity	EER/COP
0	0	1.0	1.0
500	152	0.99	1.0
1,000	305	0.89	0.99
2,000	610	0.96	0.98
3,000	914	0.94	0.97
4,000	1,219	0.91	0.96
5,000	1,524	0.89	0.95
6,000	1,829	0.87	0.94
7,000	2,134	0.86	0.93
8,000	2,438	0.84	0.92
9,000	2,743	0.82	0.91
10,000	3,048	0.80	0.91
11,000	3,353	0.78	0.90
12,000	3,658	0.77	0.89
13,000	3,962	0.75	0.89
14,000	4,267	0.73	0.88

Dual Fuel Control Installation

⚠ WARNING

Electrical Shock Hazard.
Improper installation, adjustment, alteration, service, or maintenance can cause severe personal injury, death or substantial property damage.

Installation and service must be performed by a licensed installer or a service agency. Follow NEC or Canadian Electrical Code, CSA C22.1 Part 1, and all applicable electrical codes when wiring.

1. Dual fuel control manages heat pump or boiler operation based on chosen outdoor temperature, maximum run time, and heating priority.
2. Users can select outdoor temperature between -5°F and 45°F to determine when system switches from heat pump to boiler, as well as to set maximum runtime for heat pump, which ensures control switches to boiler if heat pump cannot meet heating demand.
3. Factory default for switching from heat pump to boiler occurs when outdoor temperature is below 20°F, and runtime exceeds 30 minutes.
4. Dual fuel control comes standard with 5 Ton Hydronic Heat Pump offering, HPS-5T60-DF.
5. Choose a dry indoor location free of moisture and condensation.

⚠ CAUTION

Low outdoor temperature setting and long heat pump runtime could cause low inside temperatures and even freezing. Refer to Table 4-2 for heat pump capacity reduction as a function of outdoor temperature.

6. Use control box as a template to mark location for mounting holes.
7. Install control box vertically on a solid wall or partition close to outdoor heat pump and boiler with easy wiring access.
8. Follow NEC or Canadian Electrical Code, CSA C22.1 Part 1, and all applicable electrical codes when wiring.
9. Before making electrical connections, disconnect power from main breaker.
10. Install factory-supplied outdoor temperature sensor in areas not exposed to direct sunlight, other heat sources, and excessive vibrations.
11. Keep electrical wiring as short as possible to minimize temperature reading errors.
12. Outdoor sensors must be routed to avoid touching or being close to high voltage wires. Exposure to high voltage wire affects resistance readings and causes electrical noise.

NOTICE: Factory provided outdoor sensor must be installed cable inlet facing down as shown in Figure 6-3.

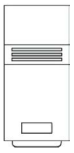


Figure 6-3: Outdoor Sensor

13. Refer to wiring diagram 6-4 for more details.

NOTICE: Find replacement part numbers for Dual Fuel control components and accessory parts in Service Parts Section.

6 Installation *(continued)*

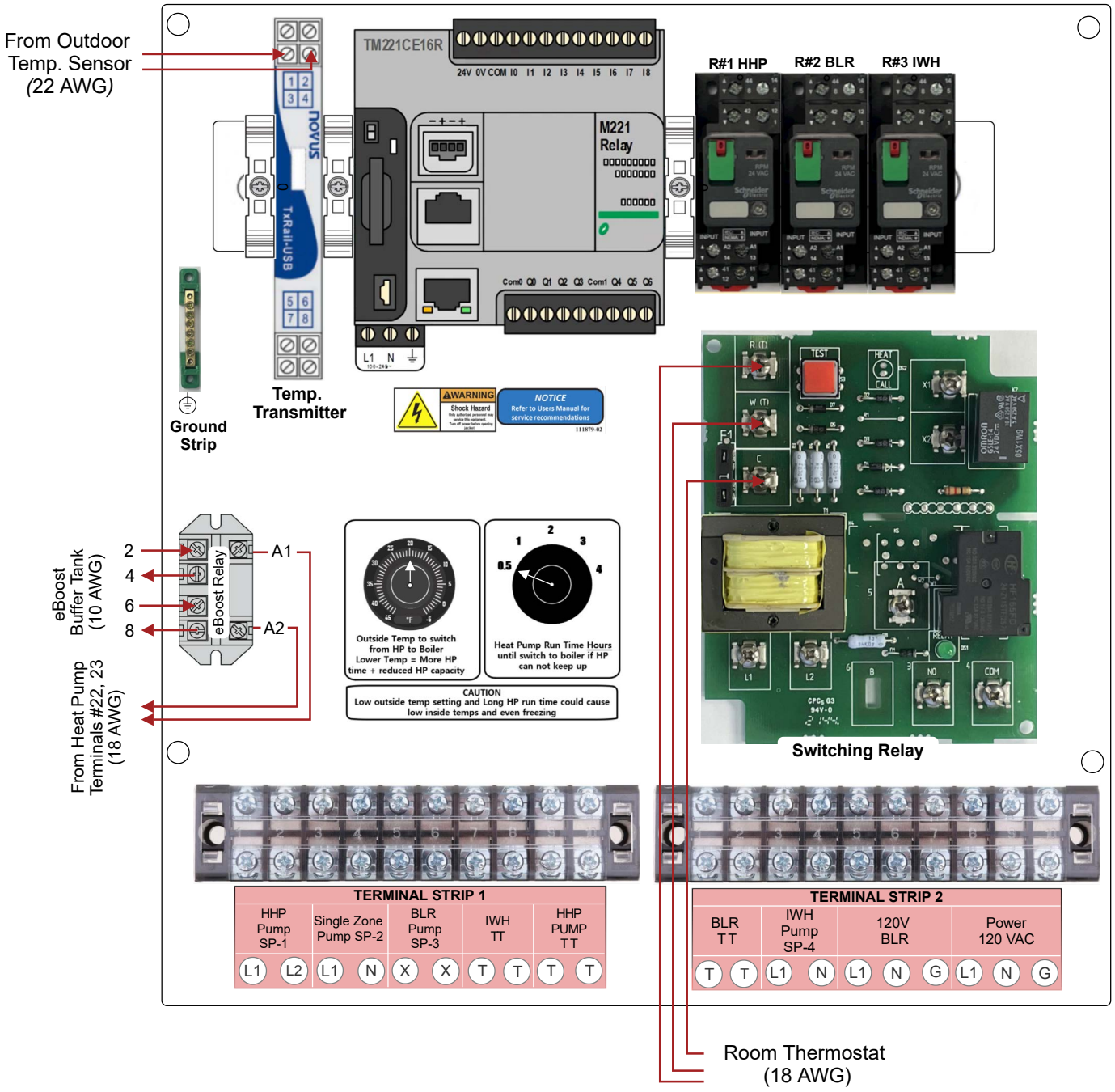


Figure 6-4: Dual Fuel Control Wiring Diagram

7 Electrical Connections

⚠ WARNING

Electrical Shock Hazard.
All wiring and grounding must conform to requirements of authority having jurisdiction or, in absence of such requirements, to National Electric Code/NFPA 70 or Canadian Electrical Code, Part 1 (CSA C22.1-latest edition)

- Make electrical connections according to wiring diagram and instructions. Failure to properly wire electrical connections may result in severe personal injury, death or substantial property damage.
- Protect each heat pump circuit with a properly sized over-current device.
- Never jump out or bypass any safety or operating control or component.

Power Connections

1. Power connection must include a Protective Earth Ground and a properly sized neutral as two separate conductors in accordance with NEC and all local codes.
2. Insert power cable through right side jacket panel cutout.
3. Remove front cover panel and connect L1 to Black, L2 to White, and Ground to Green/Yellow on power supply terminals. Refer to wiring diagram 7-3 for more details.

NOTICE: Unit requires a minimum 50-amp double-pole breaker and 6 AWG wires for power connections.

4. Double-check to ensure wires are properly tightened.

Display

1. Connect display connector to five-conductor female plug located in top compartment.

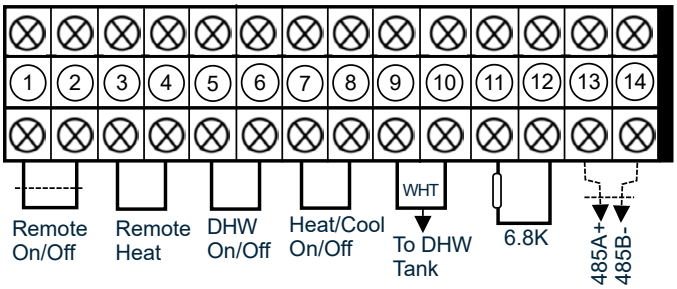


Figure 7-1: Low Voltage Field Connections

2. Display can be directly mounted to unit or installed indoors. Display cable can be extended up to 600 ft. by splicing 24 AWG shielded five-conductor cables.

Thermostat Connections

1. Remove front cover panel to access external connection terminals on right-hand side.
2. Install a jumper between terminals 3 and 4 (Remote Heat) to power heat pump via switching relay dry contact closure terminals 1 and 2.
3. A call for heat is initiated when thermostat via RA889 dry contact closes terminals 1 and 2, Remote On/Off, which is a master enabler.

NOTICE: No voltage should be introduced to control input connections. Doing so will destroy control, which is not covered under warranty.

7 Electrical Connections *(continued)*

System Pump

1. Remove unit front cover panel to access external connection terminals on top center.
2. Power 240V primary circulator installed between heat pump and buffer tank from terminals 20 and 21.
3. Primary circulator should draw less than 2.5A at 240V. Provide separate power source if circulator draws more than 5 amps.

NOTICE: If circulator is remotely powered, it must be capable of operating during a call for heat and freeze protection cycle. This failure is not covered under warranty.

4. For installation that requires a 120V primary circulator, choose a relay based on the pump's maximum current draw.
5. Connect 240V (high side) from heat pump terminals 20 and 21 to coil side of relay and connect 120V from building to Normal Open (N.O.) relay contact.
6. When there is a call for heat, heat pump control energizes primary circulator from terminals 20 and 21. Refer to wiring diagram 7-1 for guidance.

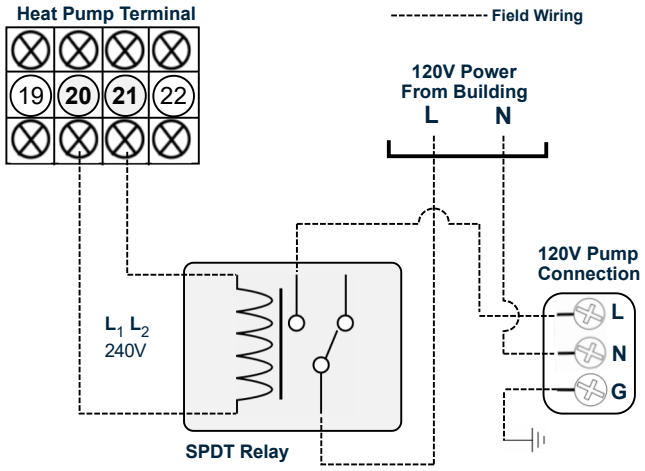


Figure 7-2: Field Wiring 120V Primary Pump

Buffer Tank

1. Buffer tank provides 6kW (20 MBH) of backup heat capacity, if used.
2. Connect buffer tank relay to terminals 22 and 23 on the front panel terminal block (top-center).
3. Connect buffer tank relay to eBoost relay 240V terminals if utilizing dual fuel control. Refer to heat pump application guide for wiring via relay.

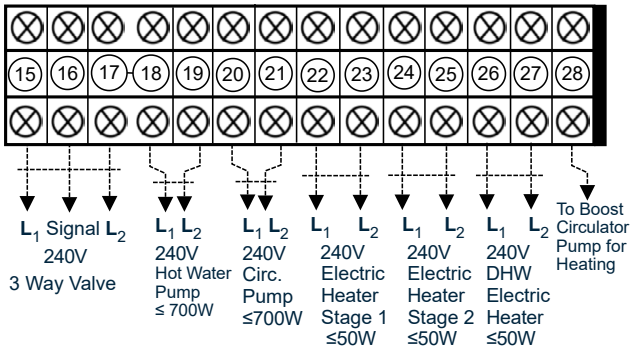


Figure 7-3: High Voltage Field Connections

4. Restore power from main circuit breaker and monitor heat pump for abnormal activity.

7 Electrical Connections *(continued)*

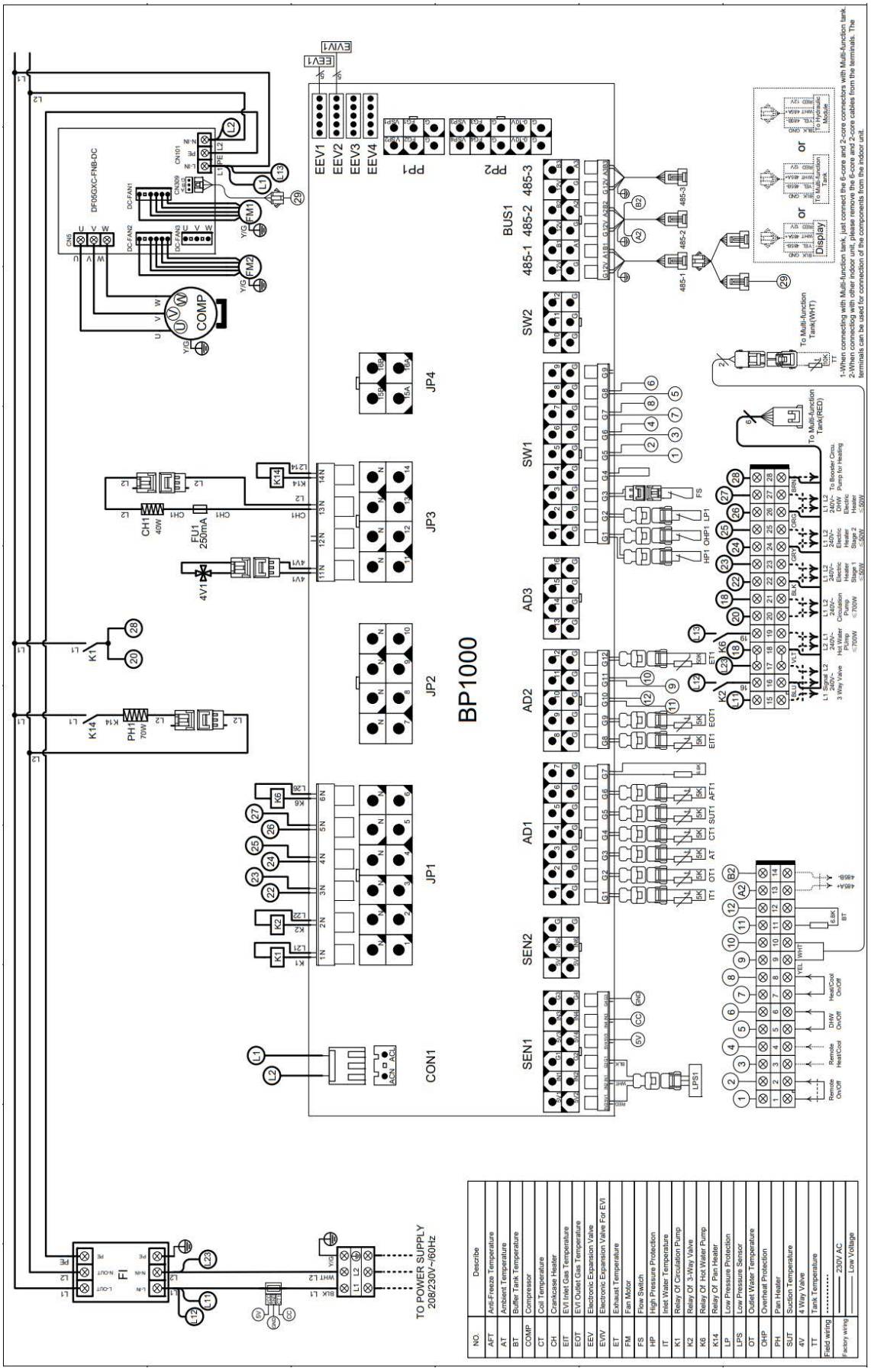


Figure 7-4: Heat Pump Factory Wiring

NOTICE: Follow wiring in Application Guide Section.

7 Electrical Connections *(continued)*

Main Board Input and Output Connections		
Terminal Name	**Terminal Number**	**Terminal Definition**
AD1	AD1-1	Inlet Water Temperature
	AD1-2	Outlet Water Temperature
	AD1-3	Ambient Temperature
	AD1-4	Coil Temperature
	AD1-5	Suction Temperature
	AD1-6	Antifreeze Temperature
	AD1-7	Outlet Coil Temperature
AD2	AD2-8	EVI Inlet Temperature
	AD2-9	EVI Outlet Temperature
	AD2-12	Exhaust Temperature
AD3	AD3-13	Reserved
	AD3-14	
	AD3-15	
	AD3-16	
SW1	SW1-1	High Pressure Switch
	SW1-2	Low Pressure Switch
	SW1-3	Water Flow Switch
	SW1-4	Electric Heater Overload Protection
	SW1-5	Emergency Unit
	SW1-6	AC Mode Switch
	SW1-7	AC Switch
	SW1-9	Reserved
SW2	SW2-10	Reserved
	SW2-11	
	SW2-12	
CON1	CON1	220V Input
JP1	JP1-1	Water Pump
JP2	JP2-7	Compressor
	JP2-8	Alarm Output
	JP2-9	Fan High Speed
	JP2-10	Fan Low Speed

7 Electrical Connections *(continued)*

Main Board Input and Output Connections (continued)			
Terminal Name	**Terminal Number**	**Terminal Definition**	
JP3	JP3-11	4-Way Valve	
	JP3-12	2-Way Valve	
	JP3-13	Crankshaft Heating Belt Output	
	JP3-14	Chassis Heater Output	
EEV	EEV1	Electronic Expansion Valve	
	EEV2	Electronic Expansion Valve of EVI	
	EEV3	Reserved	
	EEV4		
PP2	PP2	Reserved	
SEN2	SEN2	Current Transformer 3	
Terminal Name	**Terminal Number**	**Terminal Definition**	**Pins**
PP1	PP1-1	Pump Speed Regulator	VSP1, FG1, GND
	PP1-2	Reserved	VSP2, FG2, GND
SEN1	SEN1-1	Low Pressure Sensor	5VI, IN1, GND
	SEN1-2	High Pressure Sensor	5V2, IN2, GND
	SEN1-3	Current Transformer 1	5V3, IN3, GND
	SEN1-4	Current Transformer 2	s 5V4, IN4, GND
BUS1	BUS1-3	DTU	+12V, 485 A3, 485 B3, GND
	BUS1-2	Centralized Control Comm. Port	+12V, 485 A2, 485 B2, GND
	BUS1-1	5 Inch color display/DC fan speed regulation module/frequency conversion board/calibration tooling	+12V, 485 A1, 485 B1, GND

8 Hydronic Piping

General System Piping

⚠ WARNING

Failure to install unit with correct piping configuration could damage unit and may resulting in severe personal injury, death or substantial property damage. Maintain clearances specified in Figure 5-2.

1. To determine correct piping configuration and components for installation, refer to Application Guide Section.
2. It is recommended to keep length of pipework to a minimum whenever possible.
3. It is recommended to install a properly sized Y- strainer on the inlet side of heating system. This will help protect internal components of heat pump against sediment, contaminants, and fouling buildup.
4. Provided anti-freeze loop circulator is sized based on maximum glycol concentration per Table 8-2.

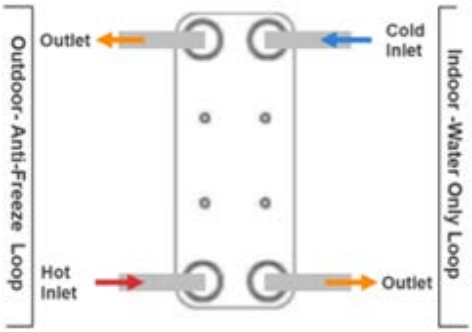


Figure 8-1: Plate Heat Exchanger Piping

5. Unit and anti-freeze loop requires a minimum flow rate of 12 GPM and shuts down if it drops below this level.
6. System pump(s) selection must consider pressure loss through plumbing system and other safety components for design heating demand.
7. Provided plate heat exchanger separates outdoor antifreeze and indoor water heating loops.
8. Temperature difference between fluid entering and leaving heat exchanger should not exceed 10 °F for optimal heat transfer.
9. Heat exchanger should be piped in counter-flow orientation as shown in Figure 8-1.
10. Heat exchanger may be installed in either a vertical or horizontal position.
11. Use Teflon tape or other sealant on male threaded connections to prevent leakage.
12. Use two wrenches when installing piping to heat exchanger connections to prevent thread damage when tightening.
13. Protect heating system components with a 30 psi relief valve.

⚠ WARNING

Burn Hazard. Pressure relief valve discharge piping must be piped near floor to eliminate potential of severe burns. Do not pipe any shutoff valve between pressure relief valve and heat pump, discharge and buffer tank. Keep children and pets away from hot surfaces of heat pump and piping.

NOTICE: Never expose Hydronic loop to pressure more than 30 PSI. Loss of coolant, property and/or equipment damage may result.

14. Connect heat pump to system piping after cleaning and purging air as described below.
    - Connect a hose from a fresh water supply to a system fill hose bib. Note: Drain hose port can be used for this purpose. Hose bib purge/drain valve should be located low in system and close to heat pump return connection.
    - Open high point purge valve, while slowly filling system. Close valve when air is removed from system and water begins to flow out of valve.
    - Fill system with fresh water and run water until system has been thoroughly flushed clean.
15. Ensure pipe penetration and securing methods allow for thermal expansion.
16. Establish a water loop by connecting supply line to heat pump's inlet and return line from heat pump's outlet. See Figure 4-3 for water connection location and pipe size.
17. Add water to system to raise pressure to 25 PSIG and double-check all fittings are leak-free.
18. Insulate pipes to minimize heat loss and prevent condensation buildup. Wrap insulation with UV-resistant tape or coating to protect it against sunlight and abrasion.
19. Before commissioning unit, verify that all safety and operating controls are functioning correctly.

⚠ WARNING

Do not use heat pump for direct heating of potable water. Internal components are not suitable for this application. Do not use heat pump for direct heating of pool, open process water, untreated well or municipal water, or any working fluid other than aqueous Ethylene Glycol or Propylene Glycol solutions circulating in sealed, pressurized, and oxygen-free system.

8 Hydronic Piping *(continued)*

Glycol/Water System

NOTICE: Installing contractor must maintain sufficient anti-freeze concentration in outdoor hydronic loop to provide freeze protection in all ambient conditions. Damage due to freezing is not covered by warranty.

Before determining antifreeze solution concentration, consider these:

1. Freeze-point temperature of an anti-freeze solution is minimum temperature at which solutions remain flowable. This temperature is well below normal operating temperature. Antifreeze solutions should have a freeze-point temperature as low as the minimum ambient temperature for a cold start.
2. Burst-point temperature of an anti-freeze solution is lowest temperature at which piping and components that contain solutions will not be subjected to expansion forces that could rupture them.
3. Unit has a minimum flow rate requirement of 12 GPM with a corresponding pressure drop of 15 ft. W.C.
4. Pressure drops will vary for different concentrations of anti-freeze mixture applications. Refer to Table 8-2 for multipliers to correct for ant-freeze solutions.
5. To prevent short cycling, maintain at least 12.5 gallons of water/glycol solution in anti-freeze loop.
6. Confirm charge of expansion tank is 12-15 PSIG without water or in a non-pressurized system.

NOTICE: Do not use Automotive glycol. It is unsuitable for use in heat pump system. Over time, it will leave deposits damaging pumps or other devices in the heating system. Only use ethylene glycol or propylene glycol mixtures listed for boiler or HVAC use. Do not use galvanized pipe in the system since it will react with glycol and cause glycol degradation and sludge buildup in heating system.

7. Add glycol to heating loop through a designated supply line using a filling pump to ensure proper mixing. Maintain minimum pressure of 15 PSIG.
8. An autofill system is optional but recommended. If local code requires autofill, it must draw from a pre-mix glycol/water solution in case of a system leak.

NOTICE: Automatic Fill-when utilizing autofill, glycol/water mixture must be inspected at least every 3 months, or whenever a leak is detected to ensure proper glycol concentration is maintained. Warranty does not cover any damage to equipment caused by poor water quality. Heat pump may leak at the end of its useful life. Be sure to protect walls, floors, and valuables from water that could leak from heat pump.

8 Hydronic Piping *(continued)*

Glycol/Water System

NOTICE: This information is provided as a general guideline only and is not intended to cover all possible conditions. It is ultimately installer's responsibility to ensure that proper freeze protection is provided.

Table 8-2: Glycol Concentrations (10% Minimum, 50% Maximum)*

Ethylene Glycol%	10	20	30	40	50
Min Ambient Temp for Operation	23°F/-5°C	14°F/-10°C	2°F/-17°C	-13°F/-25°C	36°F/38°C
Ambient Heat Pump Capacity Multiplier	0.98	0.96	0.93	0.91	0.89
Pressure Drop Multiplier (Heating)	1.06	1.12	1.16	1.22	1.28
Minimum Expansion Volume / System Volume					
Heating only. HP only (Gallons)	1 gallon expansion per 20 gallons system volume				
Heating only, with Boiler (Gallons)	1 gallon expansion per 15 gallons system volume				

Propylene Glycol %	10	20	30	40	50
Min. Ambient Temp for Operation	23°F/-5°C	18°F/-8°C	8°F/-13°C	-7°F/-22°C	-29°F/-34°C
Ambient Heat Pump Capacity Multiplier	0.98	0.96	0.93	0.91	0.89
Pressure Drop Multiplier (Heating)	1.10	1.20	1.34	1.46	1.5
Minimum Expansion Volume / System Volume					
Heating only, HP only	1 gallon expansion per 20 gallons system volume				
Heating only, with Boiler	1 gallon expansion per 15 gallons system volume				

*** A 35% concentration will prevent solid freezing and protect from bursting, in most conditions. However, this solution will become a thick sludge at extremely low temperatures, possibly resulting in pump overloading, pump damage, or high pressures. Therefore, this concentration should only be used in systems that will remain inactive during the winter. Use the higher value for systems that must start and run at the coldest temperatures.**

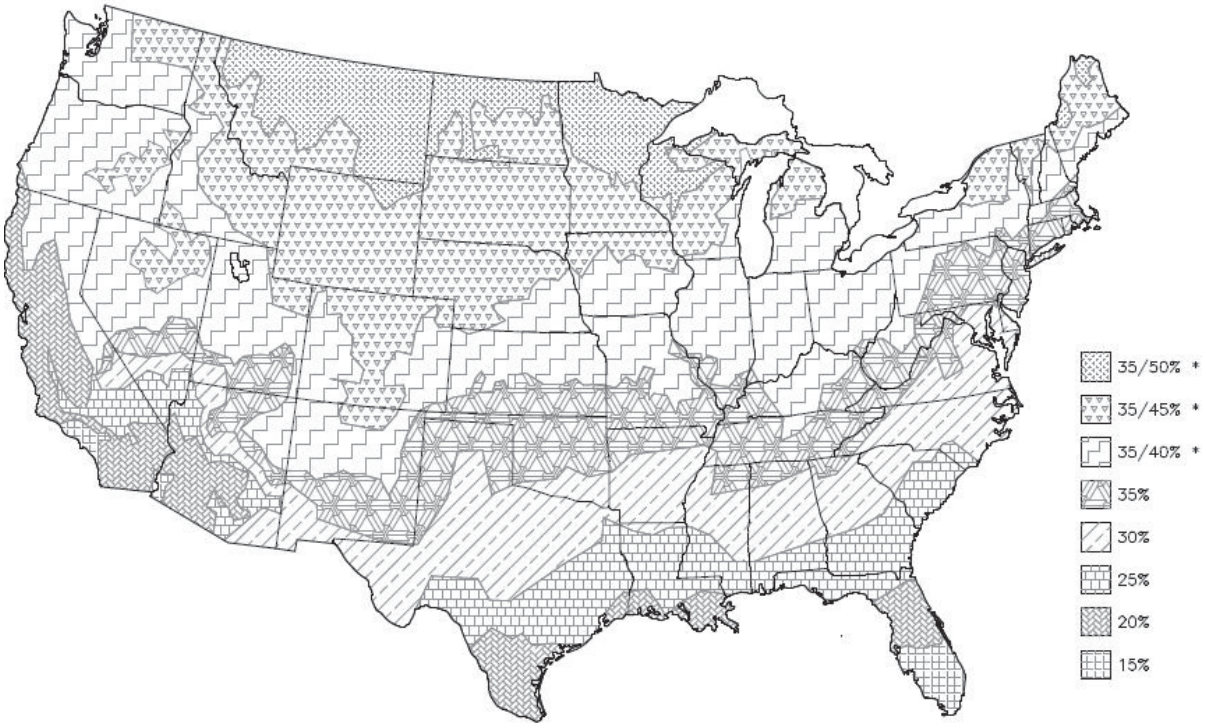


Figure 8-3: Regional Glycol Concentration Recommendation

9 Domestic Hot Water with Indirect Water Heater

⚠ WARNING

Electrical Shock Hazard.
All wiring and grounding must conform to requirements of authority having jurisdiction or, in absence of such requirements, to National Electrical Code/NFPA 70 or Canadian Electrical Code, Part 1 (CSA C22.1-latest edition).

- Make electrical connections according to wiring diagram and instructions provided in this manual. Also refer to instructions provided by indirect water heater manufacturer. Failure to properly wire electrical connections may result in severe personal injury, death or substantial property damage.
- Never jump out or bypass any safety or operating control or components.

How It Works

1. Indirect water heater (IWH) is a well-insulated storage tank with a coil heat exchanger piped to a boiler in a closed loop.
2. Boiler's hot water never directly contacts portable water in a storage tank. Instead, it circulates through tank coil transferring heat to potable water. This process continues until water reaches a set temperature.
3. Indirect water heating systems can be heated using a gas, oil, propane, or electric boiler. For your application, consider using Alta boiler with Burnham Alliance SL indirect water heater.

IWH Sizing

1. Proper sizing of IWH helps optimize efficiency and comfort.
2. Size and select IWH storage tank based on forecasted DHW consumption. For sizing and installation guidelines, refer to manual and instructions provided by IWH manufacturer.
3. Install an appropriately sized IHW circulator to achieve required flow through boiler and indirect water heater coil.

IWH General Guidelines

1. Refer to Application Guide section of this manual for wiring and piping configuration.
2. To ensure sanitary conditions, hot water in storage tanks should be maintained at a minimum of 140°F.
3. Install ASSE 1017or ASSE 1070-listed tempering valve to prevent scalding. Tempering valve mixes cold water with outgoing hot water, ensuring that hot water reaching a building fixture is at a safe temperature.
4. Refer to Table 9-1 to ensure correct valve type is selected and installed in an appropriate location. Install valve per manufacturer's instructions and applicable code.

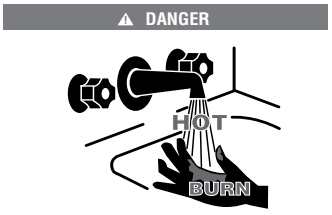
Table 9-1: Tempering Valve Classification

Standard Number	Scald Protection	Downstream Mixing Allowed	Installation Location	Final Temp. Adjustment	Application
ASSE1017	No	Yes	At, or near, source	No	Temperature control for hot water distribution systems ONLY. Additional downstream safety devices required.
ASSE1070	Yes	Yes	Near, or integral to, plumbing fixture fittings	No	Controls and limits outlet water temperature to fittings such as sinks, lavatories, bidets or bathtubs.

5. Input of heat into tank is controlled by an immersion thermostat or 10k ohm temperature sensor. Although these sensors are designed to meet industry standards, they can fail to control temperature properly without any notice, and therefore should be tested periodically.

⚠ DANGER

- Water temperature over 125°F can cause severe burns instantly or death from scalds. Appropriate caution must be taken when using hot water.



- Special supervision must be given to those who cannot act quickly such as children, disabled or elderly persons.
- If you discover extreme hot water coming from faucet, immediately shut off main switch to boiler and call competent service personnel.
- Any overheated water is a potential hazard to life and property. Do not operate until source of problem has been determined and eliminated.
- Feel water before bathing or showering.
- Water heated to a temperature suitable for laundry washing, dish washing, and other sanitizing needs may cause scalding and/or permanent injuries.
- Under no circumstance should boiler limit control be set above 210°F.

9 Domestic Hot Water with Indirect Water Heater *(continued)*

6. Table 9-2 below lists correlation between water temperature, time, and scalding injuries. It can serve as a reference for determining safest water temperature for your application.

Table 9-2: Tempering Valve Classification

Temp. (°F)	Time
120°F	More than 5 minutes
125°F	1 1/2 to 2 minutes
130°F	Less than 30 seconds
135°F	Less than 10 seconds
140°F	Less than 5 seconds
145°F	Less than 3 seconds
150°F	About 1 1/2 second
155°F	About 1 second

IWH with Dual Fuel Control

1. A retrofit application with an existing heating source or new installation with supplementary heating can be paired with IWH to provide domestic hot water (DWH).
2. Our low-temperature AWHP offering, HPS-5T60-DF, with dual fuel control monitors domestic hot water and space heating demand. Based on setpoint and heating priority, control switches between DHW and space heating to optimize efficiency and comfort.

⚠ CAUTION

Do not wire circulator to heat pump's DHW 240V terminals.

3. Control prioritizes DHW over space heating and interrupts space heating when DHW calls for heat. Once DHW is satisfied, control will switch to space heating via heat pump or boiler based on outdoor temperature.
4. If DHW demand is not satisfied after 30 minutes of continuous operation, control will temporarily pause hot water production for one hour to provide space heating.
5. If DHW demand is not satisfied after two continuous 30-minute heating cycles in 24 hours, control will lockout DHW and require a manual reset of (six flashing yellow) PLC inside dual fuel control box. To reset, cycle power to PLC.

IWH with Boiler Control

1. If boiler has a dedicated IWH control function, wire IWH thermostat to low-voltage IWH connections.
2. Connect boiler thermostat for space heating from dual fuel control to boiler TT connection.

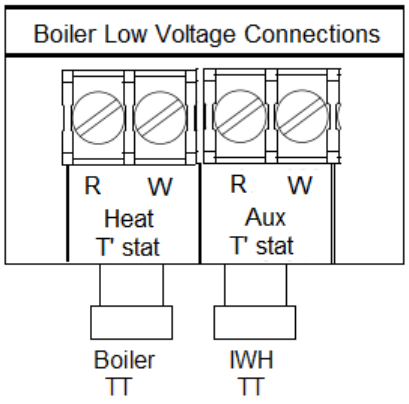


Figure 9-3: Typical Low-Voltage Connection

3. Wire IWH circulator to boiler's auxiliary pump connection if available. If boiler lacks a 120 VAC auxiliary pump output, use a dual fuel control to power circulator. For more details, refer to the Application Guide section.
4. Ensure IWH pump's maximum amp draw does not exceed boiler's auxiliary connection amp rating. Figure 9-4 shows a typical boiler field connection with auxiliary pump connection.

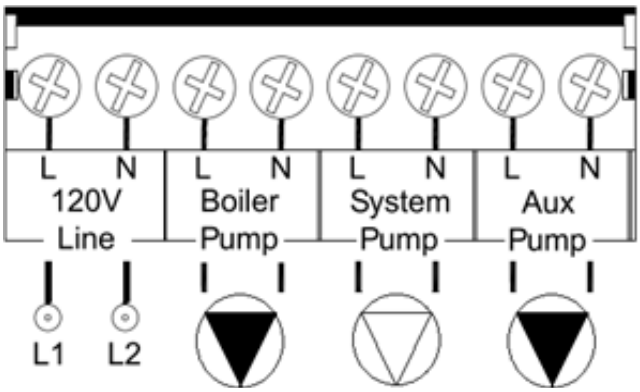


Figure 9-4: Typical Boiler 120V Connections

⚠ CAUTION

Do not connect another circulator to same terminals as boiler or DHW circulator. Current draw may exceed terminal rating.

10 Startup

Pre-Startup Inspection

⚠ WARNING

A licensed professional must perform startup and commissioning of this unit. Component damage due to improper startup is not covered by warranty.

1. Proper startup ensures optimal performance, extends product lifespan, and reduces frequency of repairs. It also helps to detect and rectify potential safety hazards before operating the unit.
2. Prior to commencing operation of unit, it is important to carry out a comprehensive inspection of the following:
   - All electrical connections are securely tightened, including display, Remote Heat jumper (see Figure 7-1), and thermostat dry contact.
   - Piping and components are installed correctly and in proper orientation. Refer to Application Guide Section for suggested piping configuration and components.
   - Outdoor inlet and outlet glycol piping are adequately insulated.
   - Provided condensate drain elbow is connected to drain pan. Refer to Figure 4-3 for location of condensate drain connection.
3. Ensure no air is trapped in heating system's loop.

⚠ WARNING

Incorrectly connected pipes can cause severe heating system disruptions and create hazardous situations.

Pre-Startup System Check

1. Restore power from main circuit breaker.
2. Display will show controller and display versions within a few seconds of startup.
3. Home Screen will appear and display operational status or faults, if there are any, after four seconds.
4. If a low flow fault occurs due to trapped air in system, operate system pump by accessing manual load control feature of display, without turning unit on. Follow these steps:
   - Go to Home Screen.
   - Select Parameters.
   - Enter password (22).
   - Choose Factory Settings.
   - Click on Manual Load Control.
   - Slide "System Pump" button to the right.
5. Run system pump for 5 minutes and check system pressure. Cycle power to check if fault has been cleared.

Field Adjusted Parameters

Figure 10-1: Manual Load Control

1. Change default values of parameters given in Table 9-2 below.
2. Swipe from right to left from Home Screen to access “Operation Parameter” Screen.

Table 10-2: Field Adjusted Parameters

Parameter Description	Parameter Code	Change	
		From[1]	To
Display/Remote Control	H07	0	1
Heating and Hot Water Function Enabled	H28	1	0
Main Circulator Pump	P01	2	1

[1]Default values

⚠ CAUTION

Failure to adjust parameters listed in Table 10-2 may cause improper operation of the unit.

Startup

1. Press “ON/OFF” key on display to start heat pump.
2. Adjust thermostat to initiate a call for heat.
3. Continue to monitor display for any faults for a few heating cycles before finalizing startup.

⚠ WARNING

Never jump out or bypass any safety or operating control or component of this unit. All cover plates, enclosures and guards must be in place when unit is left in operation.

NOTICE: This unit contains controls that may cause unit to shut down and not restart without service. If damage due to frozen pipes is a possibility, heating system should not be left unattended in cold weather; or appropriate safeguards and alarms should be installed on heating system to prevent damage if unit is inoperative.

11 User Interface Features and Function

1. Home screen displays real-time operational mode, temperature settings, and detected faults. Screen automatically enters sleep mode after two minutes of inactivity. Simply touch screen to wake it up.

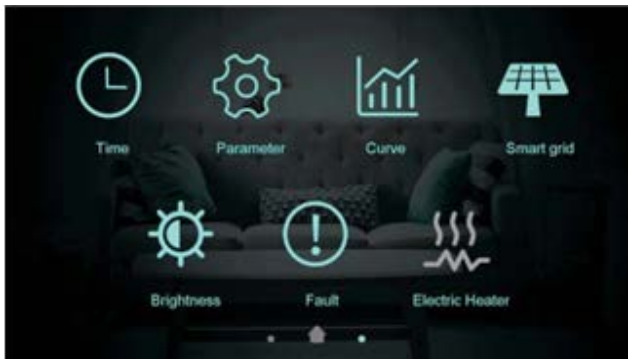
Key	Icon	Function
1	Screen Lock	When screen is unlocked, users can perform various operations on display. To unlock screen, press Screen Lock icon and enter “22”.
2	Heating Mode	Shows heating mode when unit is in operation.
3	Heating Temperature	Shows current indoor temperature.
4	On/Off	Press Icon to turn “On” and “Off” unit. Illuminates “blue” while “On” and illuminates “white” while "Off".
5	Target Temperature	Press to change target temperature.
6	Temperature Display	Press to view Inlet, Outlet, Room, and Buffer tank temperatures.
7	Target Temperature	Shows target temperature.
8	Fault	Will display when fault is detected. Press icon to view the fault message.
9	Defrost	Will display when unit enters defrost cycle.
10	Mute Timer	Will appear if “Mute Timer” is enabled.
11	Power On/Off Timer	Will appear when “Power On/Off Timer” is enabled.
12	Mode/Temp./ Power	Icon will display to indicate mode of operation.
13	SG Ready	“SG Ready” will appear when any of these “Solar Modes” are selected: Low, Medium, High or Normal.
14	Ambient Temperature	Displays ambient temperature.
15	System Time	Displays current time.
16	Run Mode	Shows unit operation mode, heating.
17	Mode	Shows operational mode.

11 User Interface Features and Function *(continued)*

2. Display is password protected. To unlock, press Lock Key  icon and enter "22" when prompted.

3. Swipe from right to left from “Home Screen” to access “Status” screen.

4. Swipe from right to left from "Home Screen" to access “Operation Parameter” screen.



Key	Icon	Function
1	Time	Press “Time” icon to view Warm Water Circuit, System, Power, and Mute Timer icons.
2	Parameter	Shows heating mode when unit is in operation.
3	Curve	Press “Curve” to view temperature curve.
4	Smart Grid*	Press “Smart Grid” to view.
5	Brightness	Press “Brightness” to view and adjust screen brightness.
6	Fault	Press “Fault” to view fault history.
7	Electric Heater	Press “Electric Heater” to turn On and Off buffer tank heating elements.
*Feature not utilized.		

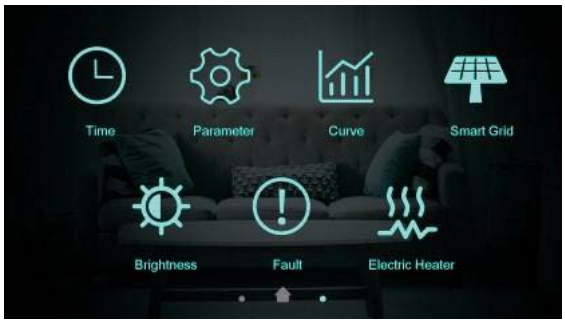
11 User Interface Features and Function *(continued)*

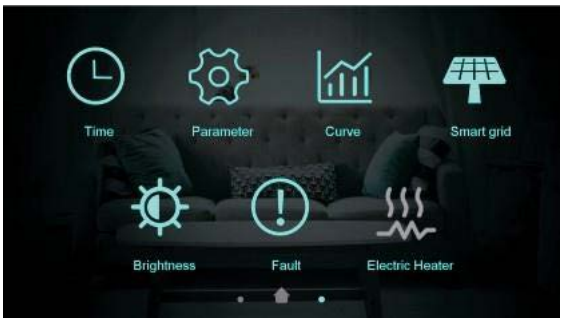
5. Press Fault  icon to view and clear fault records.

6. Press Time  icon to view and set timer.

Key	Icon	Function
1	System Time	Press "System Time" to set date, month, and year.
2	Power Timer	Press “Power Timer” to set time to turn On/Off unit.
3	Warm Water Cir. Control	Press “Warm Water Cir. Ctrl” to set pump run time.
4	Mute Timer	Press “Mute Timer” to set timed mute or hide icon.

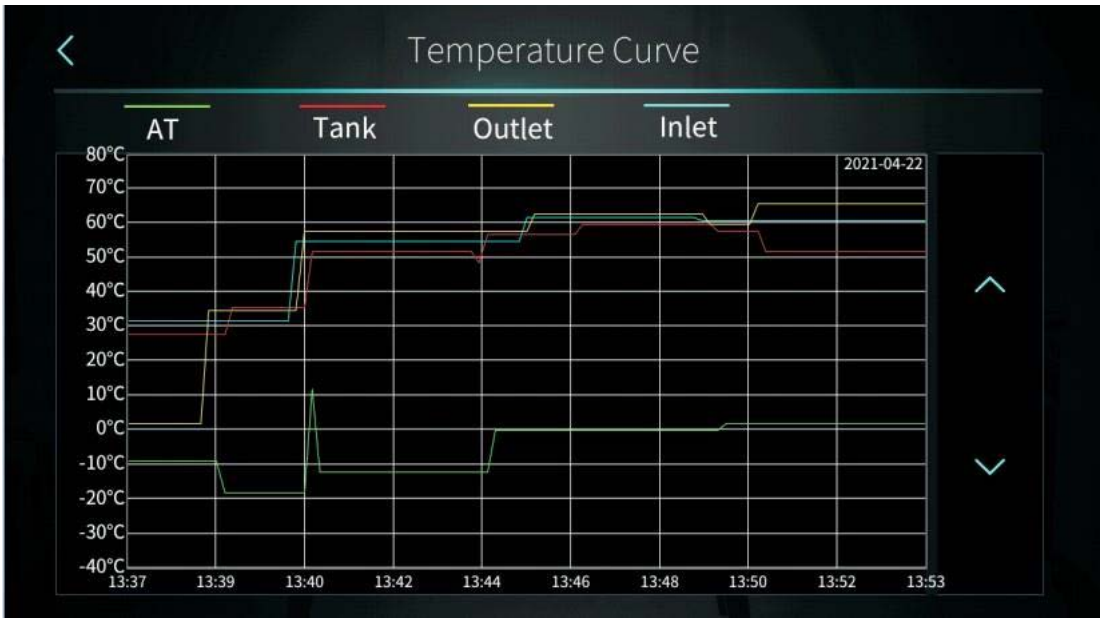
7. Press Electric Heater  icon to turn On or Off. On is bright blue and off is grey.





8. Press Temperature Curve  icon to view inlet, outlet, tank and ambient temperature.
9. Temperature data is collected and saved every five minutes.

11 User Interface Features and Function *(continued)*



10. Press Brightness  icon to adjust brightness level.
11. Drag or click to adjust screen brightness.
12. Screen has automatic On/Off function, if there is no operation for 30s, screen will enter half-time screen state.

12 Troubleshooting

⚠ WARNING

Electrical Shock Hazard. Turn off power to heat pump before working on wiring.

Sensors and Components				
Reset Methods: **A**=Automatic; **M**=manual; **A/M**=Restricted Automatic				
Fault		**Cause**	**Corrective Action**	**Reset Method**
Code	**Component/Condition**			
P01	Inlet Water Temp Sensor	Open or short circuit Damaged sensor	Check connection and resistance Replace faulty sensor	M
P02	Outlet Water Temp Sensor			
P04	Ambient Temp. Sensor			
P05	Coil Temp. Sensor			
P09	Antifreeze Temp. Sensor			
P013	Return Water Temp. Sensor			
P153	Coil Temp. Sensor			
P181	Exhaust Temp. Sensor			
P182	High Exhaust Temp. Sensor			
P191	Anti-freeze Temp. Sensor			
P02a	Mix Tube Outlet Water Sensor			
PP11	Pressure Sensor			
PP12	High Press. Sensor			
TP	Low AT Protection	Outdoor temperature is below A03 setpoint -13°F (-25°C)	For installations where outdoor temperature drops below 20°F, supplementary heating should be installed and monitored with dual fuel control. Refer to page 3 of this manual.	M
E04	Electric Heater Overheat	Open or short circuit Damaged sensor Insufficient water flow	Check connection and resistance. Electric heater temp. should be <302°F Replace faulty sensor.	A/M
E06	Excess Inlet & Outlet Temp. Diff.	Low flow condition	Check water flow switch and anti-freeze loop pump.	A/M
E08	Communication Fault	Poor connection between mainboard and control. Damaged mainboard communication port. Damaged display or display cable.	Check connection from mainboard to terminal block and from terminal block to display. Use voltmeter to check mainboard's voltage between pin A and B (terminal #13 and 14 on Fig. 7-3). If no voltage is detected, it indicates a damaged port. Directly connect display mainboard to check cable.	A
E19	Primary Freeze Protection	Inlet water temp. between 32 and 36 °F (0 and 2 °C) Ambient temp. below 32 °F (0 °C)	Check and, if damaged, replace anti-freeze or ambient temperature sensor.	A
E29	Secondary Freeze Protection	Inlet water temp. below 36 °F (2 °C) Ambient temp. below 32 °F (0 °C)		

12 Troubleshooting *(continued)*

Sensors and Components				
Reset Methods: **A**=Automatic; **M**=manual; **A/M**=Restricted Automatic				
Fault		**Cause**	**Corrective Action**	**Reset Method**
Code	**Component/Condition**			
E030	Low Defrost Water Flow	Insufficient water flow rate	Check water flow switch and pump operation	A
E032	Flow Switch			
E065	High Outlet Water Temp.			
E071	Low Outlet Water Temp.			

12 Troubleshooting *(continued)*

Frequency Conversion Board			
Fault		Cause	Corrective Action
Code	Component/Condition		
F00	IPM Module	IPM input current is high	Check and adjust current measurement
F01	Compressor driver	Out of phase or drive hardware damage	Check voltage and frequency conversion board
F03	Pre-Charge Failure	Circuit protection fault	Check PFC switch tube short circuit
F05	DC Power Bus	Overvoltage. Input is low, causing low input current.	Check input voltage measurement
F06	DC Power Bus	Overvoltage fault. DC bus voltage < DC bus Underload-voltage protection value	
F07	AC Power	Undervoltage. Input is low, causing low input current.	
F08	AC Power	Overcurrent. Input voltage is too high, higher than protection current RMS	
F09	Input Voltage Sampling	Input voltage sampling fault	Check and adjust current measurement
F12	DSP and PFC Communication	Comm. Fault between DSP and main board	Check input voltage measurement
F11	DSP and Comp. drive comm.	Comm. Fault between DSP and Inverter board	Check communication connection
F151	DSP and Mainboard Comm.	Comm. Fault between DSP and main board	
F13	IPM Overheat	IPM Module overheated	Check and adjust current measurement
E051	Comp. Overcurrent	Compressor overload	Check compressor operation
F15	Input Power Phase	Input voltage lost phase	Measure and adjust voltage
F18	IPM Current Sampling	IPM sampling fault	Measure and adjust current
F17	Comp. Drive Temperature	Transducer is overheated	
F20	IGBT Power Device	IGBT is overheated	
F16	Comp. Weak Magnetic	Weak compressor magnet	
F22	AC Input Current	Input current is too high	
F23	EEPROM	MCU error	
F24	EEPROM & No Active		Check micro-chip and replace if damaged
F25	Input Power Current Sample	V15V is overloaded or undervoltage	Check V15V input voltage is range between 13.5 and 16.5V
F33	Comp. Current Frequency	Compressor frequency reduced	Measure and adjust current
F10	AC Power	Overvoltage. Input voltage>Input overload voltage protection value	Check input voltage is higher 265V
F14	Compressor Phase	Lacking phase	
F29	EEPROM	Failed to read memory chip	Check frequency conversion board
F21	Compressor Overspeed	Compressor is running abnormally	Check compressor cable
F120	Fan Temp.	Damaged temp sensor	Check or change sensor

13 Programmable Parameters

No.	Parameter Description	Parameter Code	Default Value	Parameter Range
1	{Enable Power-off Memory}	H01	1	0- {NO} / 1- {YES}
2	{Display Control/Remote Control}	H07	0	0- {Display Control} 1- {Remote Control}
3	{Unit Address}	H10	1	1~32
4	{Electric Heater Stage}	H18	3	1- {Stage1} 2- {Stage2} 3- {Stage3}
6	{Temperature Unit}	H21	0	0- {°C / 1- {°F}
7	{Enable Silent Mode}	H22	1	0- {NO} / 1- {YES}
8	{Temp. Control Selection}	H25	0	0- {Outlet Water Temp.} 1- {Room Temp.}
9	{Enable EVI}	H27	3	0- {NO EVI} 1- {EVI for Cooling} 2- {EVI for Heating} 3- {All EVI}
10	{Heating and Hot Water Function Enabled}	H28	1	0- {NO} 1- {YES}
11	{Operation Code}	H29	0	0-20
12	{Enable Hydraulic Module}	H30	0	0- {NO} / 1- {Yes}
13	{Circulation Pump Type}	H31	0	0- {No Flow Detection} 1- {Grundfos(25~75)} 2- {Grundfos(25~105)} 3- {Grundfos(25~125)}
14	{Force Switch Mode Time}	H32	120	1~300 min
15	{Fan Motor Driver and Comp. Driver Integrated}	H33	0	0- {NO} / 1- {YES}
16	{ERP Testing Mode}	H34	0	0~3
17	{Enable Positive Weather Compensation}	H36	0	0- {NO} / 1- {YES}
18	{Language}	H38	0	0- {English} 1- {Polish}
19	{AT for Bottom Plate Heat Turned On}	H42	4	-4.0-68°F (-20°C~20°C)
20	{Normal/Eco	H43	0	0- {Normal} / 1- {Eco}
21	{Shutdown Ambient Temp.}	A03	-25	-40-50°F (-40.0~10.0°C)
22	{Antifreeze Temp.}	A04	4	A22- 14°F (A22~10°C)
23	{Ambient Temp. of Starting Defrosting}	D01	12.5	-34-113°F (-37~45°C)
24	{Heating Operation Time Before Defrosting}	D02	26	0~120 min.
25	{Interval Time Between Defrosting Cycles}	D03	45	10~90 min.
26	{Min. Defrost Time}	D29	0	0~20 min.
27	{Max. Defrost Time}	D19	8	0~20 min.

13 Programmable Parameters *(continued)*

No.	Parameter Description	Parameter Code	Default Value	Parameter Range
29	{Heating Target Temp.}	R02	45	R10-52°F (R10~R11°C)
31	{Temp. Diff. for Power-on in Heating}	R04	2	32-50°F (0~10°C)
32	{Temp. Diff. for Standby in Heating}	R05	1	32-50°F (0~10°C)
33	{Min. Heating Target Temp.}	R10	15	-22~R52°F (-30.0~R11°C)
34	{Max. Heating Target Temp.}	R11	60	R10~210°F (R10~99°C)
35	{Temp. Diff. of Exiting Overhigh Outlet Temp.}	R15	2	32-59°F (0~15°C)
37	{Max. Outlet Water Temp. in Heating}	R42		68-185°F (20~85°C)
38	{Max. Limit Target Water Temp. at High AT in Heating}	R43		68-185°F (20~85°C)
39	{Max. Limit Target Water Temp. at High AT}	R44	40	68-185°F (20~85°C)
41	{Main Circulation Pump Operation Mode}	P01	2	0- {Always On} 1- {Saving} 2- {Interval}
42	{Interval Time}	P02	30	1~120 min.
43	{Operation Duration Time}	P03	3	1~30 min.
45	{Main Circulation Pump Rated Power}	P08	0	0-2,000 W
46	{Circulation Pump Protection Period}	P09	0	0-30 days
47	{Speed of Circulation Pump}	P10	100	0-100%

14 Maintenance

⚠ WARNING

Electrical Shock Hazard.

- Disconnect electrical supply before installing or performing maintenance. Lock out all electrical boxes with padlock once power is turned off.
- Installation and service must be performed only by a qualified installer or service agency. Improper service or maintenance could result in severe personal injury, death or substantial property damage.
- Label all wires prior to disconnection when servicing controls. Wiring errors could cause improper and dangerous operation. Verify proper operation after servicing.
- This unit requires regular maintenance and service to operate safely.

NOTICE: Follow maintenance schedule below to achieve optimal efficiency and to prolong product's life.

Time Period	Task	Descriptions
Annually	Maintain Glycol Percentage	• Over time, glycol percentage in system fluid can degrade, leading to freezing and contamination of heating loop. Therefore, it is crucial to test glycol percentage annually using approved test strips. Access port on heat pump's heat exchanger to perform test. • If glycol level falls below designed concentration, add more glycol to restore it. For recommended glycol concentration, refer to Table 8-2. • Sometimes, system may need to be completely flushed out and refilled with a fresh glycol and water mixture. If an autofill system is used, it must be filled with the appropriate concentration.
Pre-heating Season	Clean Coil	• Clean exposed coil of outdoor unit using only appropriate HVAC coil cleaning solvents at least once a season. • Using non-accepted solvents can severely damage system and impact warranty eligibility.
	Check for loose wires	• Ensure all wires are intact and properly connected. Repair if necessary.
	Check condensate	• There are drain holes underneath outdoor coil to allow condensate runoff. Ensure path is clear to prevent blockages and potential freezing in cold weather.
As Needed	Clear debris	• Remove any debris and leaves that impede airflow into unit. • Trim any vegetation that could obstruct airflow.
	Rodent damage	• Inspect all wiring, components, and panels for rodent damage. Repair or replace as needed and take measures to keep rodents out of heat pump cabinets.

15 Service Parts

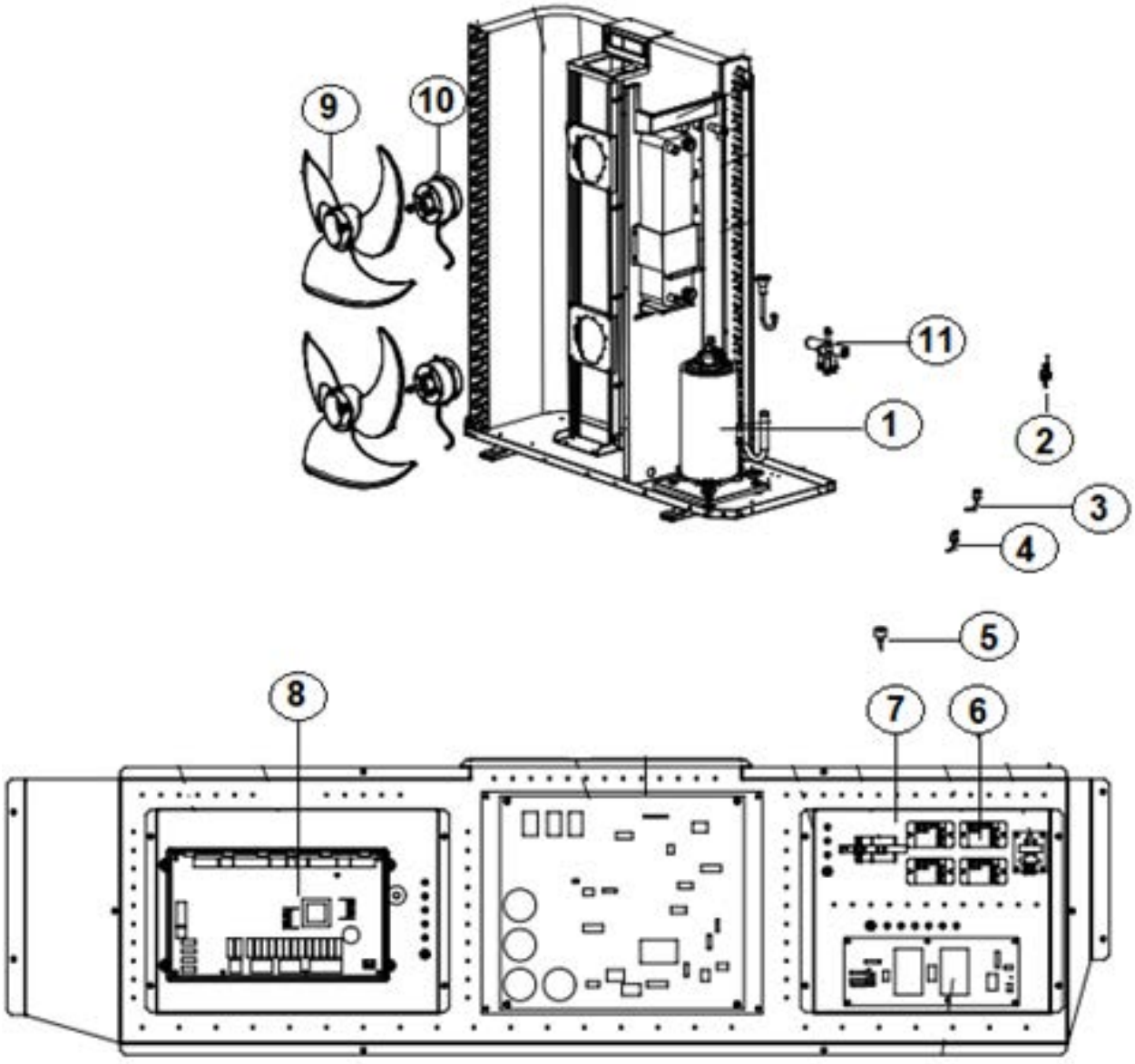


Figure 15-1: Service Parts

15 Service Parts *(continued)*

Number	Name	Part Number	Qty
Heat Pump Service Parts			
1	Compressor	112689-01	1
2	Water Flow Switch	112690-01	1
3	High Pressure Switch	112691-01	1
4	Low Pressure Switch	112692-01	1
5	Electronic Expansion Valve	112693-01	1
6	Reactor/Relay	112694-01	1
7	Inverter Board	112695-01	1
8	BP1000-G Main Board	112696-01	1
9	Axial Fan Blade	112697-01	1
10	DC Fan Motor	112698-01	1
11	Reversing Valve	112699-01	1
12	Display*	112700-01	1
13	Four-way Valve*	112701-01	1
Dual Fuel Service Parts*			
14	PLC	112702-01	1
15	Temperature Transmitter	112703-01	1
16	Resideo-Interface Relay	112704-01	1
17	eBoost Relay	112705-01	1
18	Relay - 120V	112706-01	3
19	Relay Socket	112707-01	3
Accessory Parts*			
20	Buffer Tank with 6kW Element	112269-01	1
21	Taco-Flat Plate Heat Exchanger	112708-01	1
22	Taco 240V 00013 Circulator	112709-01	1

* Not Shown

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16 Application Guide

Heat Pumps can be very efficient and reduce 'on site' carbon footprint. Unlike conventional heating products Heat Pumps do not create heat using combustion or electric resistance power.

Heat pumps 'pump' or transfer energy from one location to another. Example, a Hydronic Heat Pump is operating with a COP of 3. This indicates for every watt of electricity consumed, three watts of power are moved from the outside to heating the living space.

Residential Heat Pumps do have limitations that are important to consider when choosing a system configuration:

1. Heat pumps have limited capacity. The 5 ton Ambient heat pump has a capacity of 60 MBH with an additional 20 MBH using eBoost for a total of 82 MBH. [Note: Driven by design outside ambient conditions]
2. As outside temperatures go down HHP capacity, COP and water temperature are reduced.
3. Heat Pumps currently have limited high water temperature capability.

When choosing a heat pump system it is important to consider the HHP performance shown below
Table 15-1

Heating Capacity (BTU x 1000)														COP											
Outlet	*Outside Ambient Temperature (°F)*													*Outside Ambient Temperature (°F)*											
Water °F	*-13*	*-4*	*5*	*14*	*19*	*23*	*32*	*36*	*41*	*45*	*50*	*59*	*68*	*-13*	*-4*	*5*	*14*	*19*	*23*	*32*	*36*	*41*	*45*	*50*	*59*	*68*
95	27	34	42	55	58	60	66	72	73	78	82	90	95	1.76	1.84	2.20	2.82	2.92	2.99	3.22	3.51	3.68	3.95	4.13	4.48	4.84
106	25	34	43	53	56	59	65	70	72	74	77	80	86	1.60	1.67	2.00	2.45	2.56	2.63	2.88	3.26	3.35	3.39	3.53	4.02	4.53
113	24	34	42	50	52	54	60	69	70	70	73	79	85	1.50	1.56	1.87	2.20	2.31	2.39	2.66	3.09	3.13	3.15	3.28	3.80	4.42
122	21	29	37	41	44	47	52	59	61	62	65	73	82	1.24	1.30	1.63	1.80	1.97	2.08	2.30	2.60	2.71	2.77	2.87	3.26	3.65
131	18	24	33	35	39	42	46	51	54	57	60	65	71	1.06	1.13	1.47	1.54	1.74	1.87	2.05	2.27	2.42	2.51	2.66	2.90	3.14
140	-	18	29	31	34	38	41	45	49	51	57	58	61	-	0.98	1.27	1.37	1.53	1.69	1.84	1.99	2.16	2.28	2.54	2.58	2.70

HPS PACKAGES		HPS Package Contents												
		5 Ton Monobloc AWHP [140˚F max temp]	40 Gal Buffer Tank with 6 kW *eBoost* Capability	240 VAC Circulator [HPS]	Flat Plate Heat Exchanger	Relay Interface RA889A	Relay Interface for *eBoost*	30 PSI Pressure Relief Valve	Dual Fuel Control	120 VAC Pump [SP1]	Expansion Tank sized for system and Air Separator	T&P relief valve when eBoost is used	120 VAC Pump [SP2]	Appropriate Zone Panel using Pumps or Valves
HPS-5T60 Note 1	Low Temperature Single Zone	☑	☑	☑	☑	☑	☑	☑	NA	☒	☒	☒	☒	NA
	Low Temperature Multi-Zone w/Pumps												Note 3	☒
	Low Temperature Multi-Zone w/Valves													
HPS-5T60-DF Note 2	Dual Fuel Single Zone	☑	☑	☑	☑	Note 4		☑	☑	☒	☒	☒	☒	NA
	Dual Fuel Multi-Zone w/Pumps												Note 3	☒
	Dual Fuel Multi-Zone w/Valves													

Note 1	System using only HPS with temperatures up to 140˚F
Note 2	System using HPS in conjunction with a boiler, gas, oil or electric
Note 3	System Pumps or Valves as required for system design
Note 4	Included with Dual Fuel Control
Note	☑Provided with Package. ☒Provided by others. NA Not applicable

16 Application Guide *(continued)*

SYSTEM SELECTION

Hydronic heating systems have two variations:

Low temperature systems [Generally below 140˚ F]

High temperature systems [Generally with design condition greater than 170˚ F]

Hydronic Heat Pump Systems [HPS Systems] are very efficient and offer zero on site carbons emissions but have limitations when used with residential electrical supply.
As outside temperatures go down the capacity and available water temperatures go down.

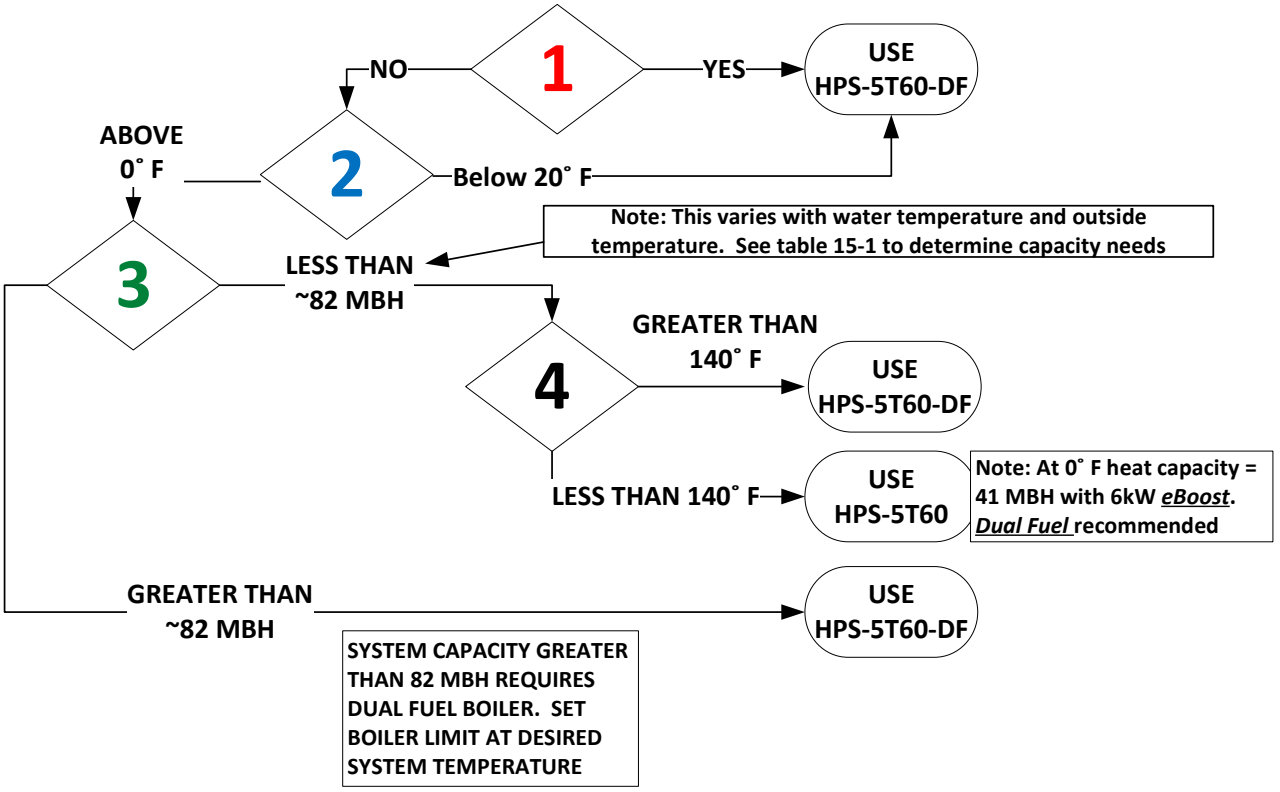
Looking at decision tree below stand alone HHP Systems are limited to low water temperature systems with design conditions of 80 MBH. [Note: Driven by outside ambient conditions]

Dual fuel with conventional gas, electric and even oil offer an opportunity to maintain living space comfort and still offer significant on site carbon emissions reduction.

QUESTIONS TO ASK WHEN DESIGNING A SYSTEM:

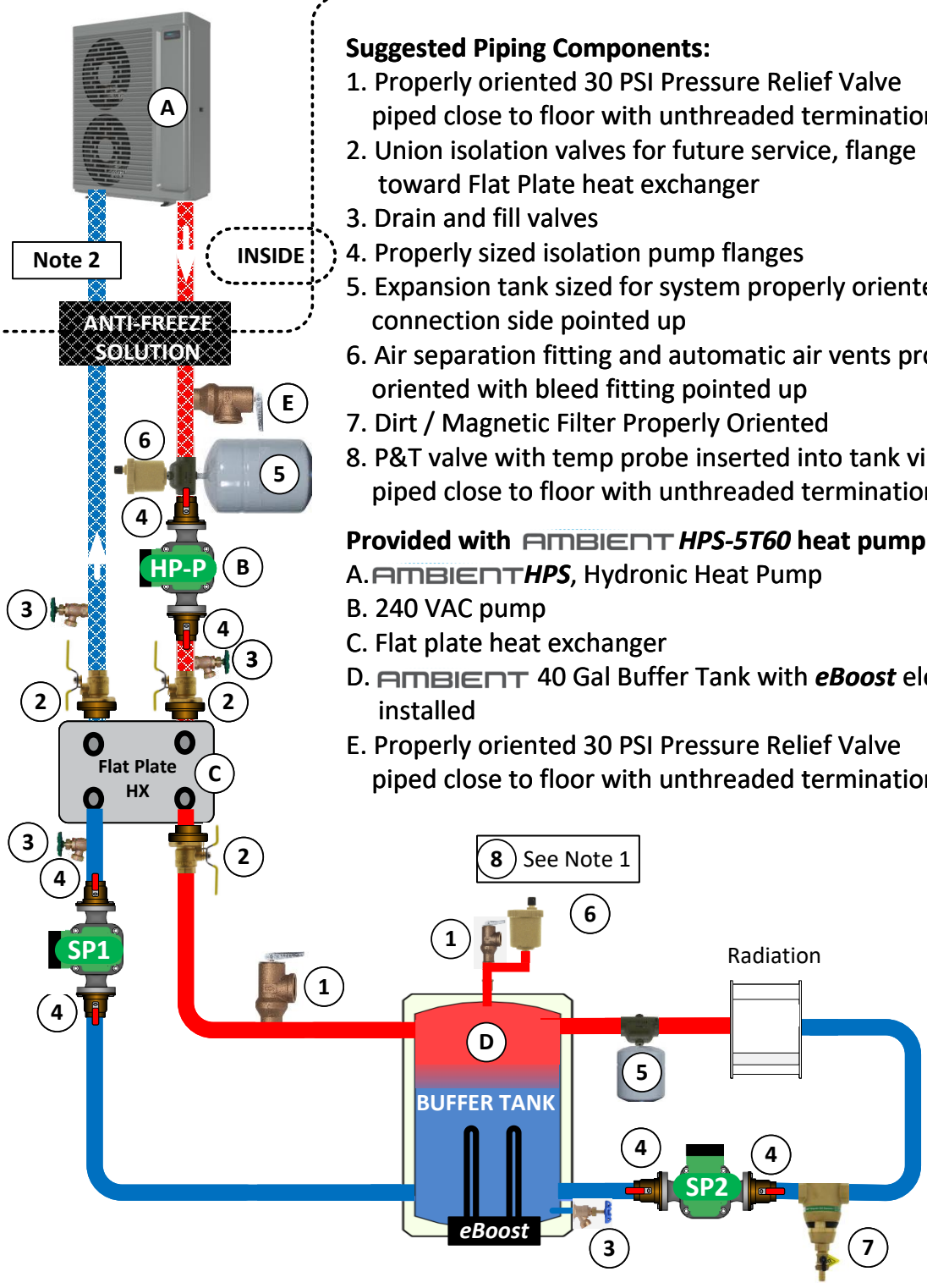
1. **Are you adding the heat pump to an existing hydronic boiler heating system?**
2. **What are outside design condition temperatures?**
3. **How many BTUs of heat are needed at design conditions?**
4. **What type of radiation, high temperature [>140˚ F] or low temperature [< 140˚ F]?**

PERFORMANCE CONSIDERATIONS



16 Application Guide *(continued)*

LOW TEMPERATURE SINGLE ZONE PIPING



Suggested Piping Components:

1. Properly oriented 30 PSI Pressure Relief Valve piped close to floor with unthreaded termination
2. Union isolation valves for future service, flange toward Flat Plate heat exchanger
3. Drain and fill valves
4. Properly sized isolation pump flanges
5. Expansion tank sized for system properly oriented, connection side pointed up
6. Air separation fitting and automatic air vents properly oriented with bleed fitting pointed up
7. Dirt / Magnetic Filter Properly Oriented
8. P&T valve with temp probe inserted into tank via cross piped close to floor with unthreaded termination Note 1

Provided with AMBIENT *HPS-5T60* heat pump package:

A. AMBIENT ***HPS***, Hydronic Heat Pump
B. 240 VAC pump
C. Flat plate heat exchanger
D. AMBIENT 40 Gal Buffer Tank with ***eBoost*** elements installed
E. Properly oriented 30 PSI Pressure Relief Valve piped close to floor with unthreaded termination

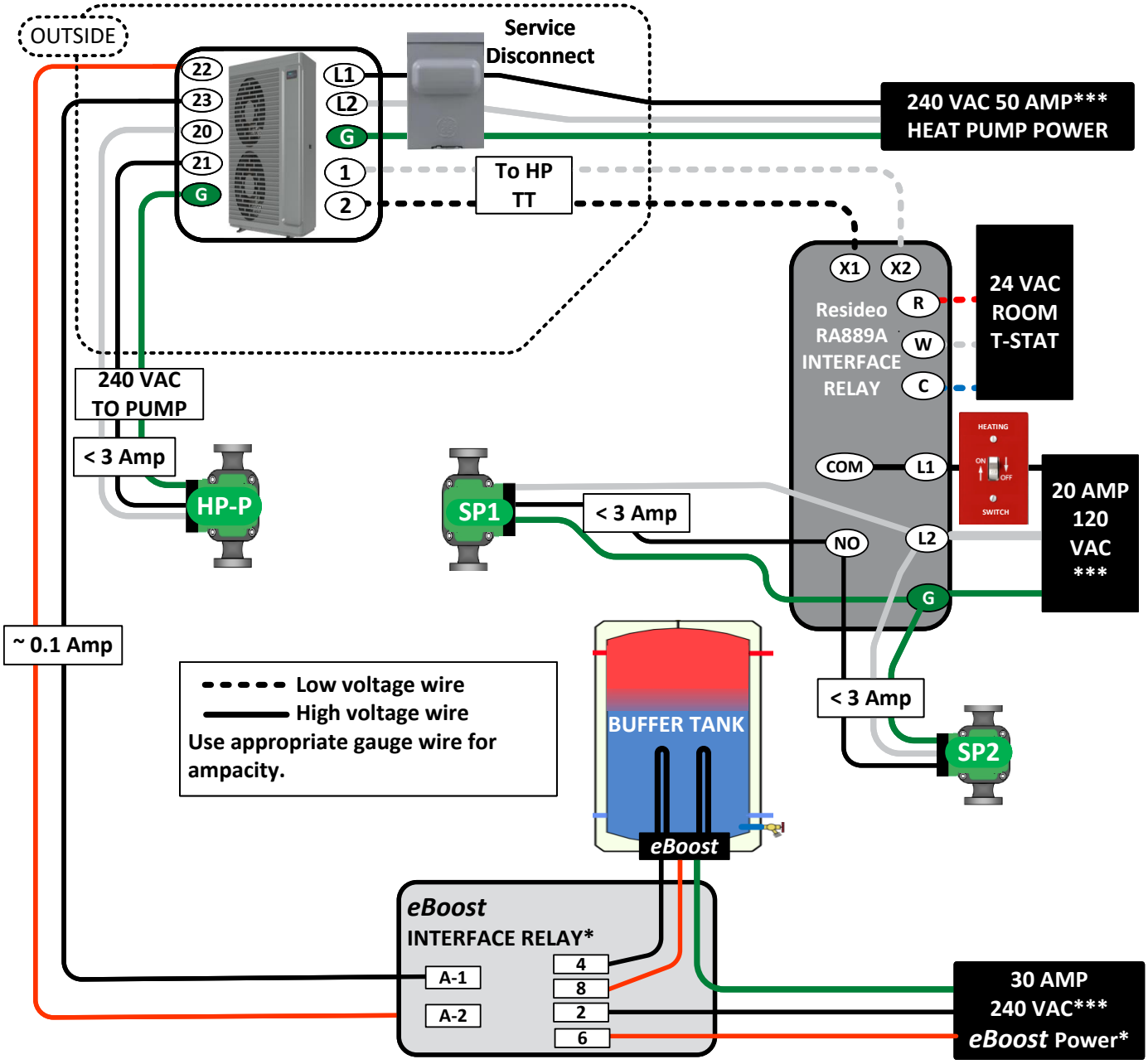
⚠ WARNING

Note 1: When ***eBoost*** is used, a 210°F T&P relief valve "8" must be used in addition to 30 PSI relief valve to monitor potential over temperature conditions.

Note 2: Isolation valve must NOT be placed between Pressure Relief Valve "E" and the heat pump.

16 Application Guide *(continued)*

LOW TEMPERATURE SINGLE ZONE FIELD WIRING



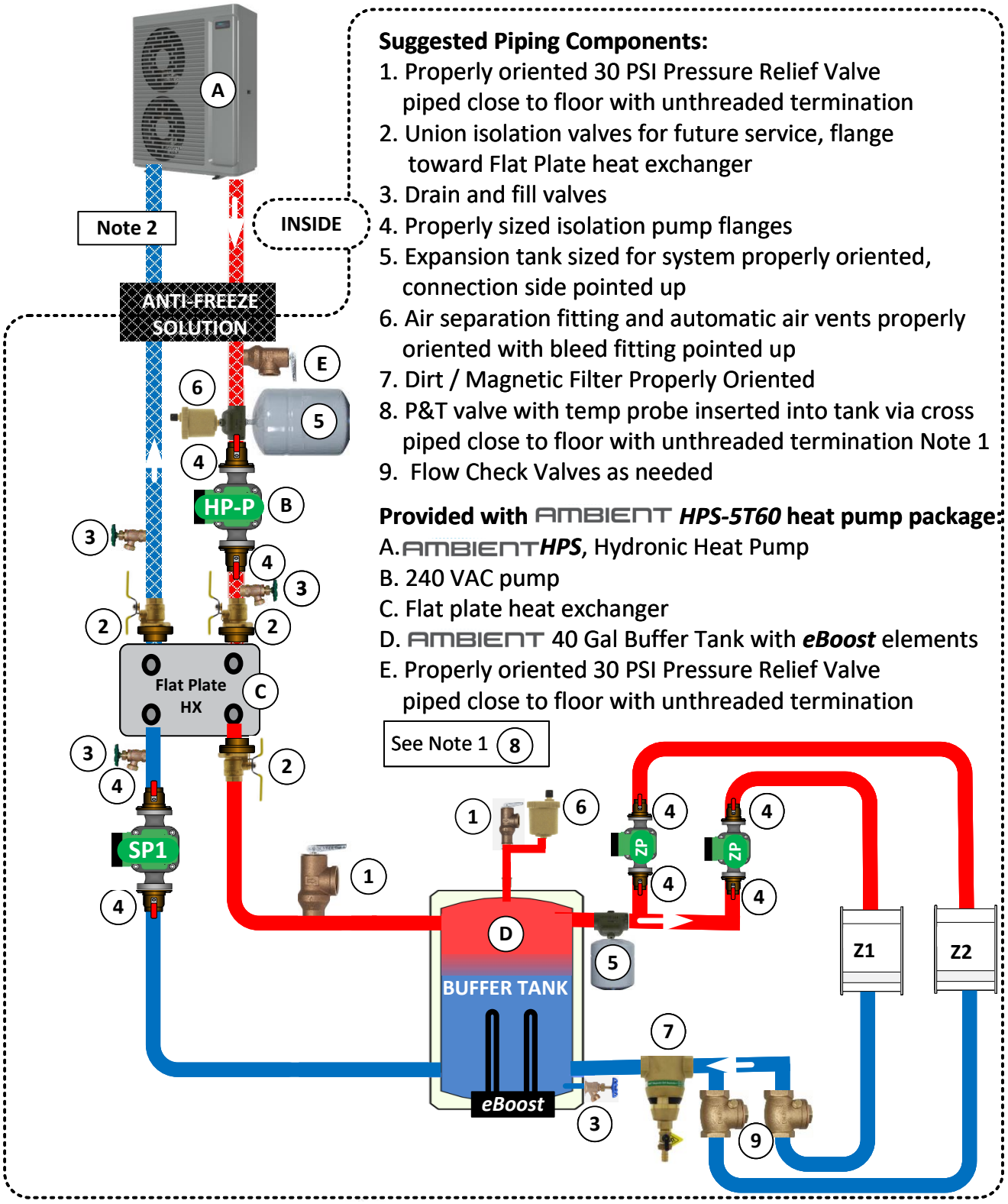
⚠ WARNING

Follow all local plumbing and electrical codes.
* Only if ***eBoost*** is used
** Follow installation instructions provided with Heat Pump.
*** Over Current Protection Installer Provided.

NOTICE: This diagram represents a general component layout for typical installations. Designer or installer is responsible for proper sizing, additional required components, location, and installation. Follow all dangers, warnings, cautions and notices.

16 Application Guide *(continued)*

LOW TEMPERATURE MULTI-ZONE WITH PUMPS PIPING



Suggested Piping Components:

1. Properly oriented 30 PSI Pressure Relief Valve piped close to floor with unthreaded termination
2. Union isolation valves for future service, flange toward Flat Plate heat exchanger
3. Drain and fill valves
4. Properly sized isolation pump flanges
5. Expansion tank sized for system properly oriented, connection side pointed up
6. Air separation fitting and automatic air vents properly oriented with bleed fitting pointed up
7. Dirt / Magnetic Filter Properly Oriented
8. P&T valve with temp probe inserted into tank via cross piped close to floor with unthreaded termination Note 1
9. Flow Check Valves as needed

Provided with AMBIENT *HPS-5T60* heat pump package:

A. AMBIENT ***HPS***, Hydronic Heat Pump
B. 240 VAC pump
C. Flat plate heat exchanger
D. AMBIENT 40 Gal Buffer Tank with ***eBoost*** elements
E. Properly oriented 30 PSI Pressure Relief Valve piped close to floor with unthreaded termination

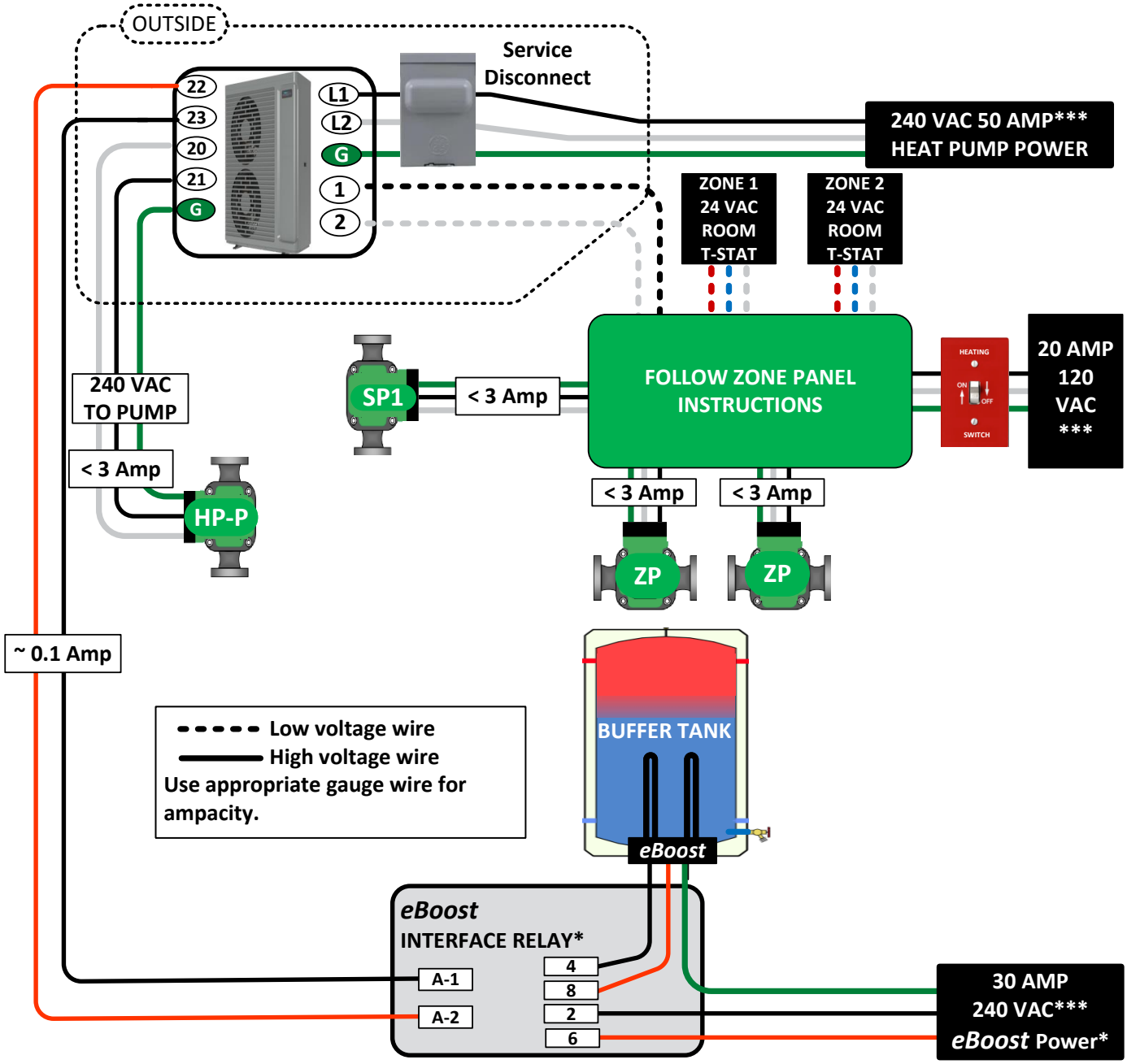
⚠ WARNING

Note 1: When ***eBoost*** is used, a 210°F T&P relief valve "8" must be used in addition to 30 PSI relief valve to monitor potential over temperature conditions.

Note 2: Isolation valve must NOT be placed between Pressure Relief Valve "E" and the heat pump.

16 Application Guide *(continued)*

LOW TEMPERATURE MULTI-ZONES WITH PUMPS FIELD WIRING



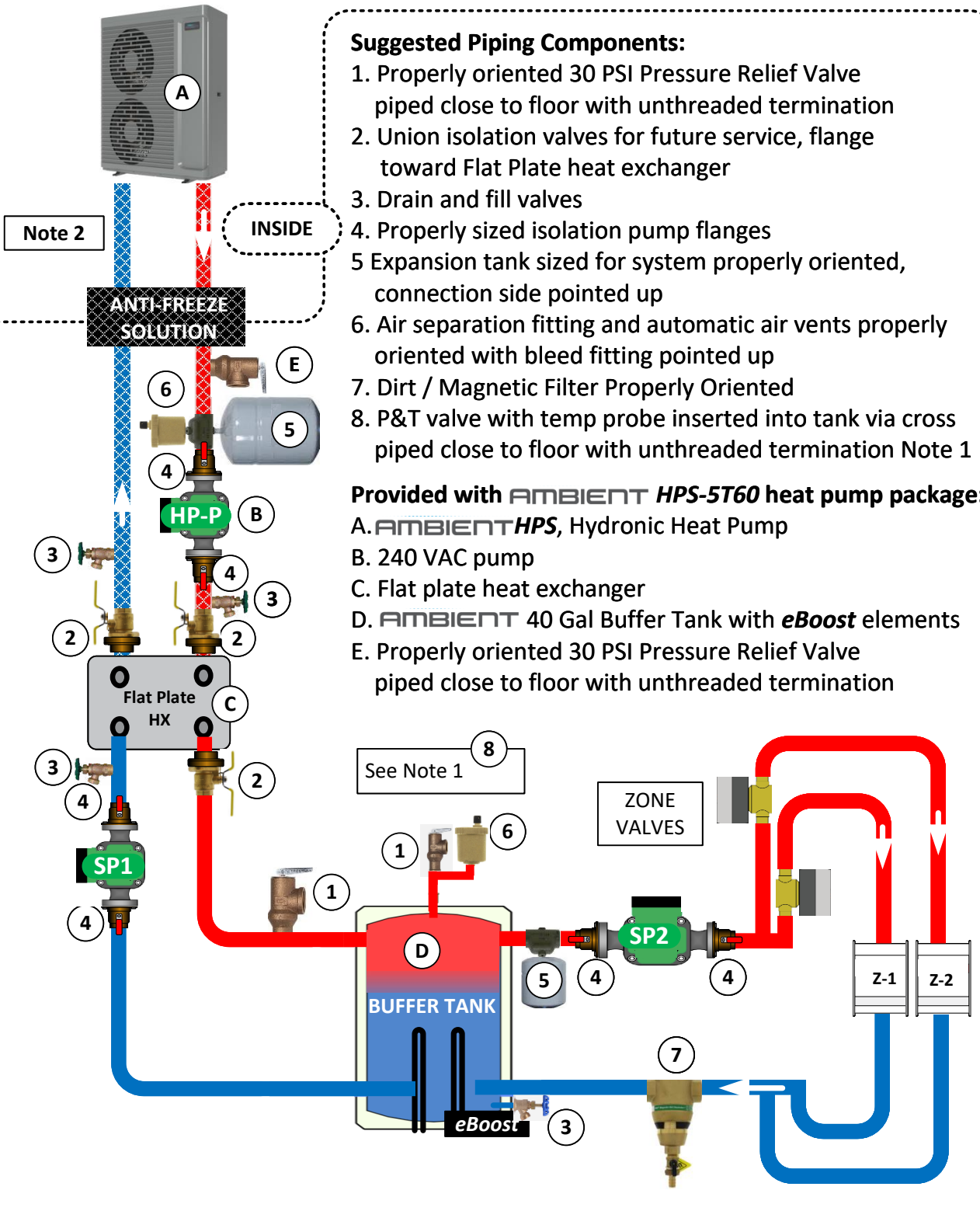
⚠ WARNING

Follow all local plumbing and electrical codes.
* Only if ***eBoost*** is used
** Follow installation instructions provided with Heat Pump.
*** Over Current Protection provided by installer.

NOTICE: This diagram represents a general component layout for typical installations. Designer or installer is responsible for proper sizing, additional required components, location, and installation. Follow all dangers, warnings, cautions and notices.

16 Application Guide *(continued)*

LOW TEMPERATURE MULTI-ZONE WITH VALVES PIPING



Suggested Piping Components:

1. Properly oriented 30 PSI Pressure Relief Valve piped close to floor with unthreaded termination
2. Union isolation valves for future service, flange toward Flat Plate heat exchanger
3. Drain and fill valves
4. Properly sized isolation pump flanges
5 Expansion tank sized for system properly oriented, connection side pointed up
6. Air separation fitting and automatic air vents properly oriented with bleed fitting pointed up
7. Dirt / Magnetic Filter Properly Oriented
8. P&T valve with temp probe inserted into tank via cross piped close to floor with unthreaded termination Note 1

Provided with AMBIENT *HPS-5T60* heat pump package:

A. AMBIENT ***HPS***, Hydronic Heat Pump
B. 240 VAC pump
C. Flat plate heat exchanger
D. AMBIENT 40 Gal Buffer Tank with ***eBoost*** elements
E. Properly oriented 30 PSI Pressure Relief Valve piped close to floor with unthreaded termination

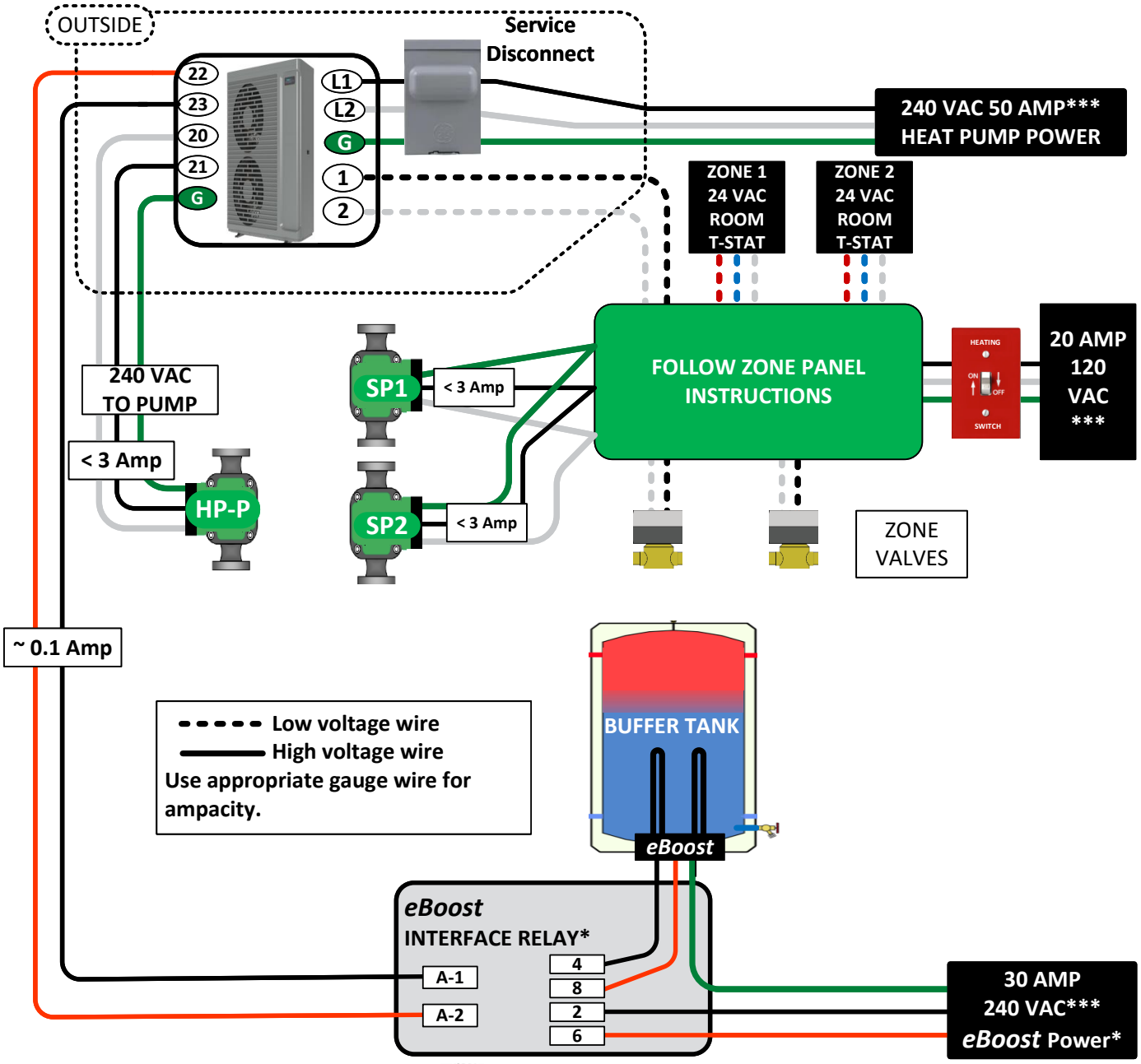
⚠ WARNING

Note 1: When ***eBoost*** is used, a 210°F T&P relief valve "8" must be used in addition to 30 PSI relief valve to monitor potential over temperature conditions.

Note 2: Isolation valve must NOT be placed between Pressure Relief Valve "E" and the heat pump.

16 Application Guide *(continued)*

LOW TEMPERATURE MULTI-ZONE WITH VALVES WIRING



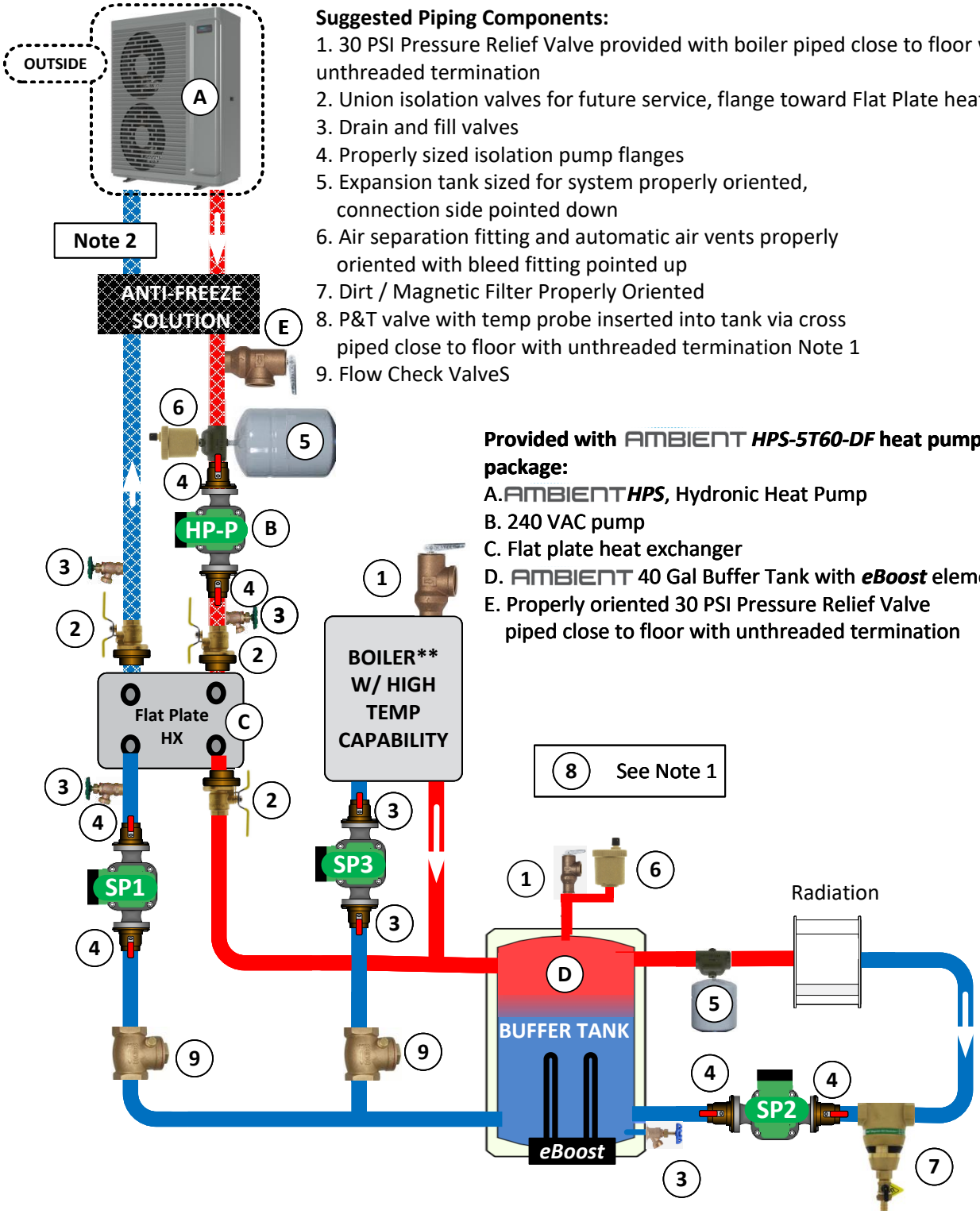
⚠ WARNING

Follow all local plumbing and electrical codes.
* Only if ***eBoost*** is used
** Follow installation instructions provided with Heat Pump.
*** Over Current Protection provided by installing contractor.

NOTICE: This diagram represents a general component layout for typical installations. Designer or installer is responsible for proper sizing, additional required components, location, and installation. Follow all dangers, warnings, cautions and notices.

16 Application Guide *(continued)*

DUAL FUEL SINGLE ZONE PIPING



Suggested Piping Components:

1. 30 PSI Pressure Relief Valve provided with boiler piped close to floor with unthreaded termination
2. Union isolation valves for future service, flange toward Flat Plate heat exchanger
3. Drain and fill valves
4. Properly sized isolation pump flanges
5. Expansion tank sized for system properly oriented, connection side pointed down
6. Air separation fitting and automatic air vents properly oriented with bleed fitting pointed up
7. Dirt / Magnetic Filter Properly Oriented
8. P&T valve with temp probe inserted into tank via cross piped close to floor with unthreaded termination Note 1
9. Flow Check ValveS

Provided with AMBIENT *HPS-5T60-DF* heat pump package:

A. AMBIENT ***HPS***, Hydronic Heat Pump
B. 240 VAC pump
C. Flat plate heat exchanger
D. AMBIENT 40 Gal Buffer Tank with ***eBoost*** elements
E. Properly oriented 30 PSI Pressure Relief Valve piped close to floor with unthreaded termination

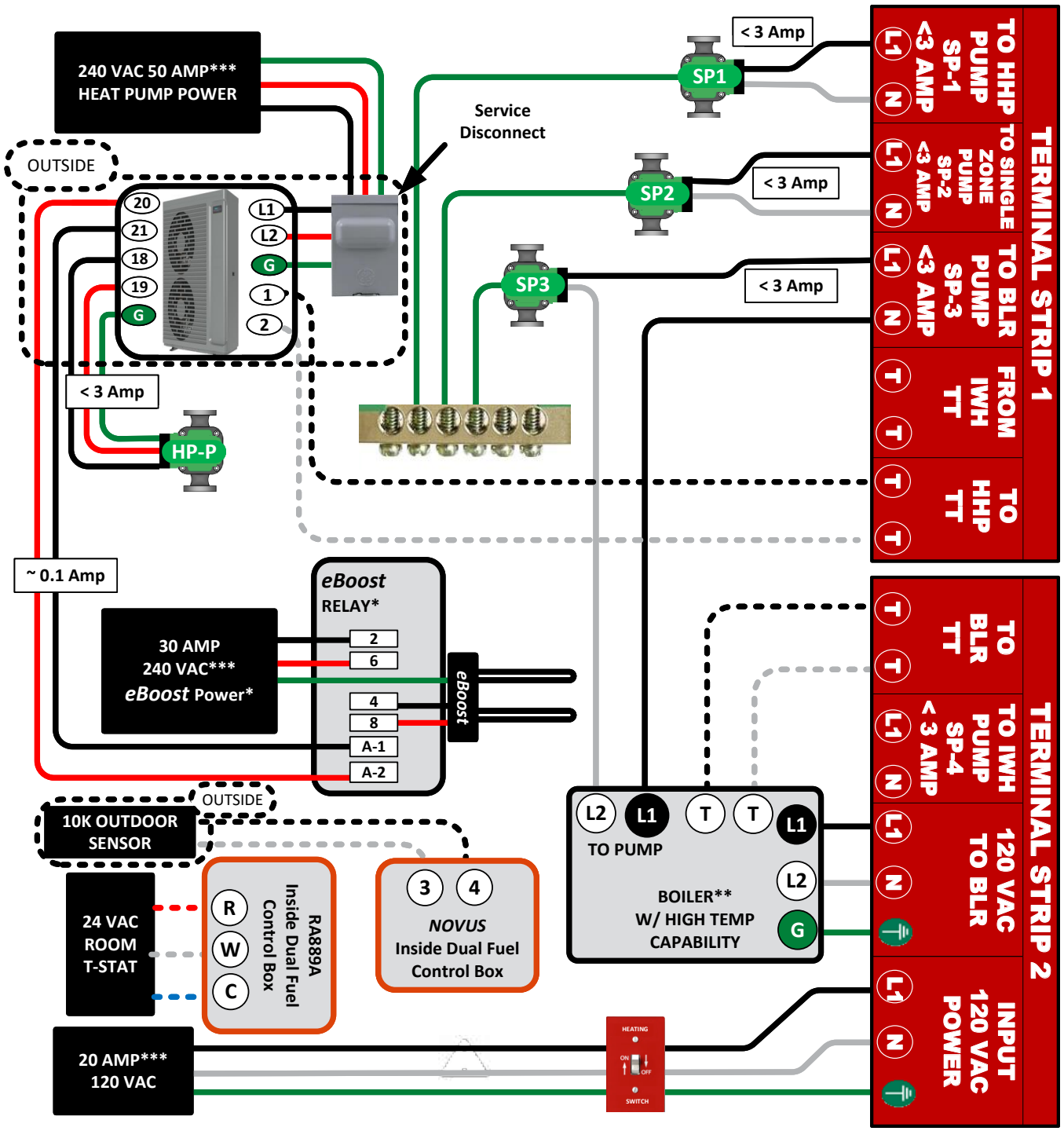
⚠ WARNING

Note 1: When ***eBoost*** is used, a 210°F T&P relief valve "8" must be used in addition to 30 PSI relief valve to monitor potential over temperature conditions.

Note 2: Isolation valve must NOT be placed between Pressure Relief Valve "E" and the heat pump.

16 Application Guide *(continued)*

DUAL FUEL SINGLE ZONE FIELD WIRING



⚠ WARNING

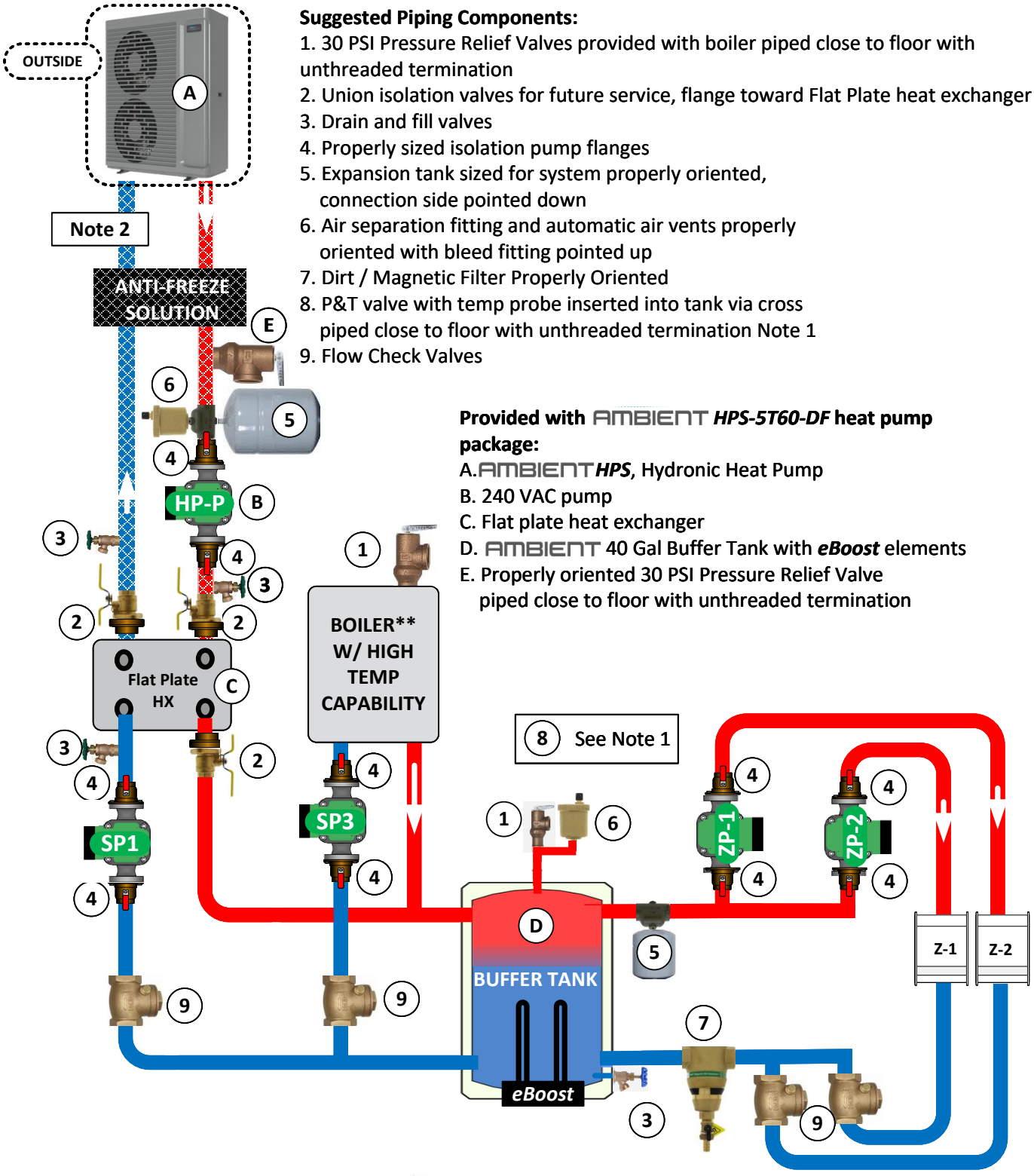
Follow all local plumbing and electrical codes.
* Only if ***eBoost*** is used
** Follow installation instructions provided with Heat Pump.
*** Over Current Protection provided by contractor.

Low voltage wire
High voltage wire
Use appropriate gauge wire for ampacity.

NOTICE: This diagram represents a general component layout for typical installations. Designer or installer is responsible for proper sizing, additional required components, location, and installation. Follow all dangers, warnings, cautions and notices.

16 Application Guide *(continued)*

DUAL FUEL MULTI ZONE W/ PUMPS PIPING



Suggested Piping Components:

1. 30 PSI Pressure Relief Valves provided with boiler piped close to floor with unthreaded termination
2. Union isolation valves for future service, flange toward Flat Plate heat exchanger
3. Drain and fill valves
4. Properly sized isolation pump flanges
5. Expansion tank sized for system properly oriented, connection side pointed down
6. Air separation fitting and automatic air vents properly oriented with bleed fitting pointed up
7. Dirt / Magnetic Filter Properly Oriented
8. P&T valve with temp probe inserted into tank via cross piped close to floor with unthreaded termination Note 1
9. Flow Check Valves

Provided with AMBIENT *HPS-5T60-DF* heat pump package:

A. AMBIENT ***HPS***, Hydronic Heat Pump
B. 240 VAC pump
C. Flat plate heat exchanger
D. AMBIENT 40 Gal Buffer Tank with ***eBoost*** elements
E. Properly oriented 30 PSI Pressure Relief Valve piped close to floor with unthreaded termination

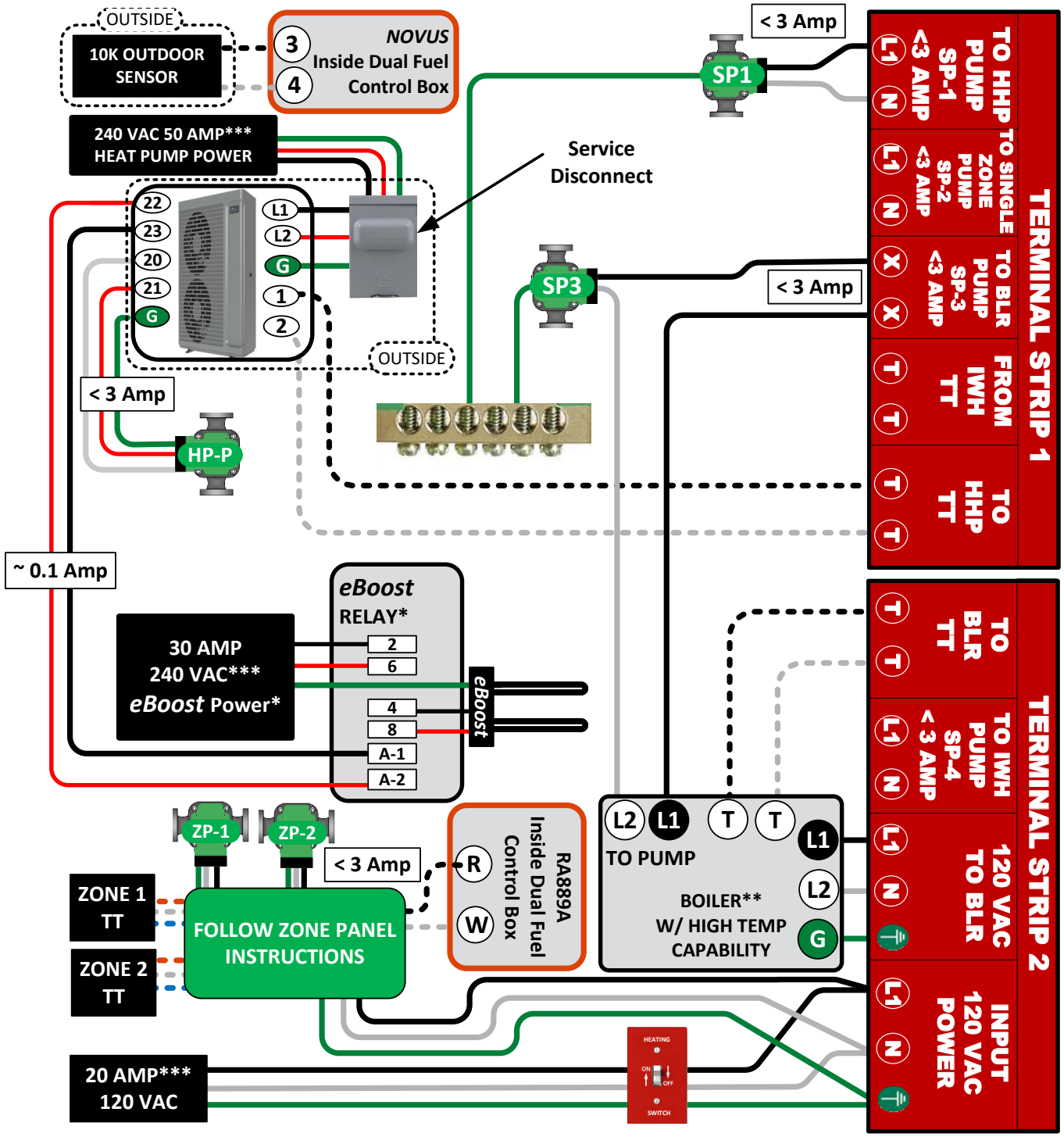
⚠ WARNING

Note 1: When ***eBoost*** is used, a 210°F T&P relief valve "8" must be used in addition to 30 PSI relief valve to monitor potential over temperature conditions.

Note 2: Isolation valve must NOT be placed between Pressure Relief Valve "E" and the heat pump.

16 Application Guide *(continued)*

DUAL FUEL MULTI ZONE W/ PUMPS FIELD WIRING



WARNING

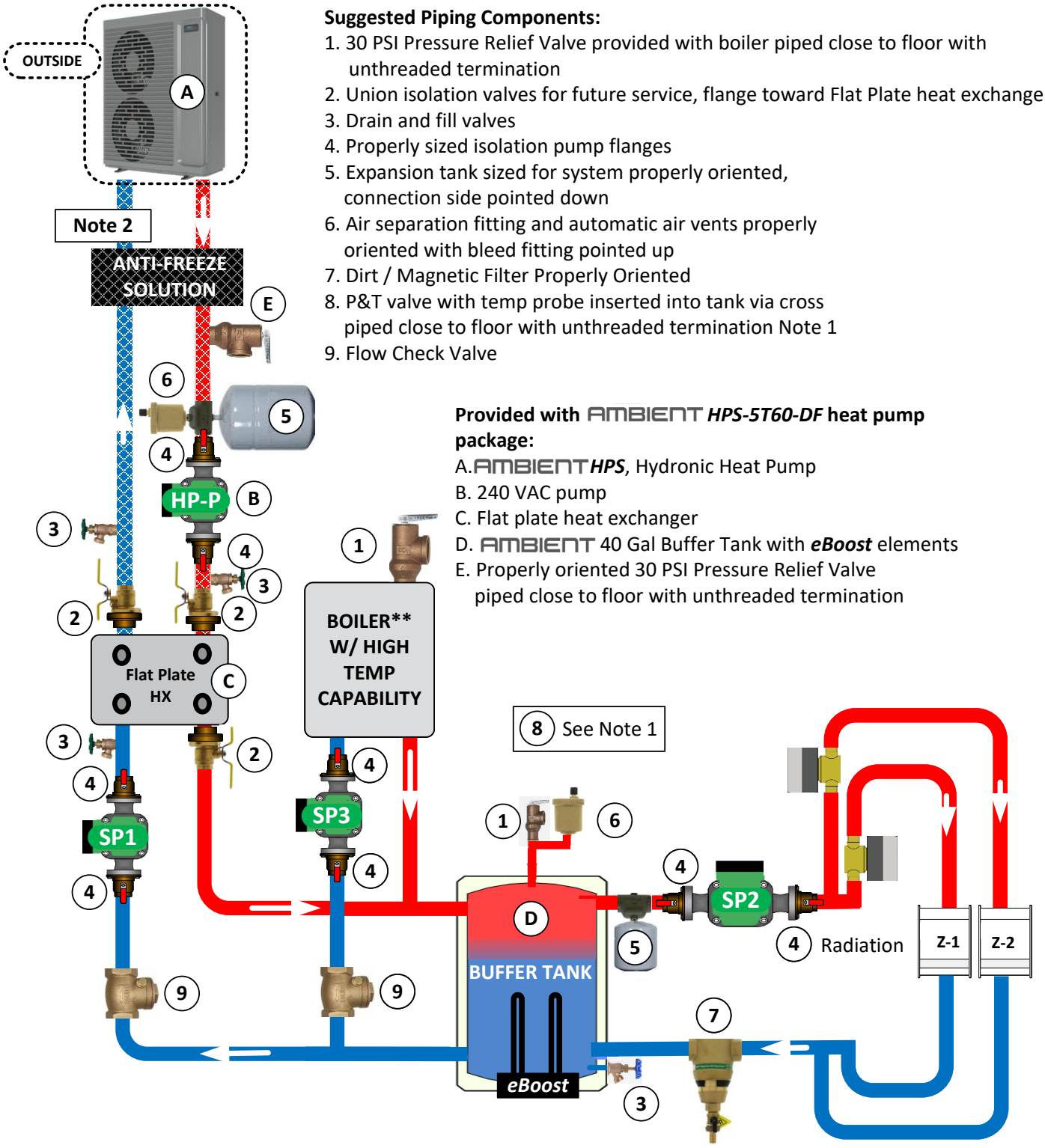
Follow all local plumbing and electrical codes.
* Only if ***eBoost*** is used
** Follow installation instructions provided with Heat Pump
*** Over Current Protection provided by installing contractor

Low voltage wire
High voltage wire
Use appropriate gauge wire for ampacity.

NOTICE: This diagram represents a general component layout for typical installations. Designer or installer is responsible for proper sizing, additional required components, location, and installation. Follow all dangers, warnings, cautions and notices.

16 Application Guide *(continued)*

DUAL FUEL MULTI ZONE W/ VALVES PIPING



Suggested Piping Components:

1. 30 PSI Pressure Relief Valve provided with boiler piped close to floor with unthreaded termination
2. Union isolation valves for future service, flange toward Flat Plate heat exchanger
3. Drain and fill valves
4. Properly sized isolation pump flanges
5. Expansion tank sized for system properly oriented, connection side pointed down
6. Air separation fitting and automatic air vents properly oriented with bleed fitting pointed up
7. Dirt / Magnetic Filter Properly Oriented
8. P&T valve with temp probe inserted into tank via cross piped close to floor with unthreaded termination Note 1
9. Flow Check Valve

Provided with AMBIENT *HPS-5T60-DF* heat pump package:

A. AMBIENT ***HPS***, Hydronic Heat Pump
B. 240 VAC pump
C. Flat plate heat exchanger
D. AMBIENT 40 Gal Buffer Tank with ***eBoost*** elements
E. Properly oriented 30 PSI Pressure Relief Valve piped close to floor with unthreaded termination

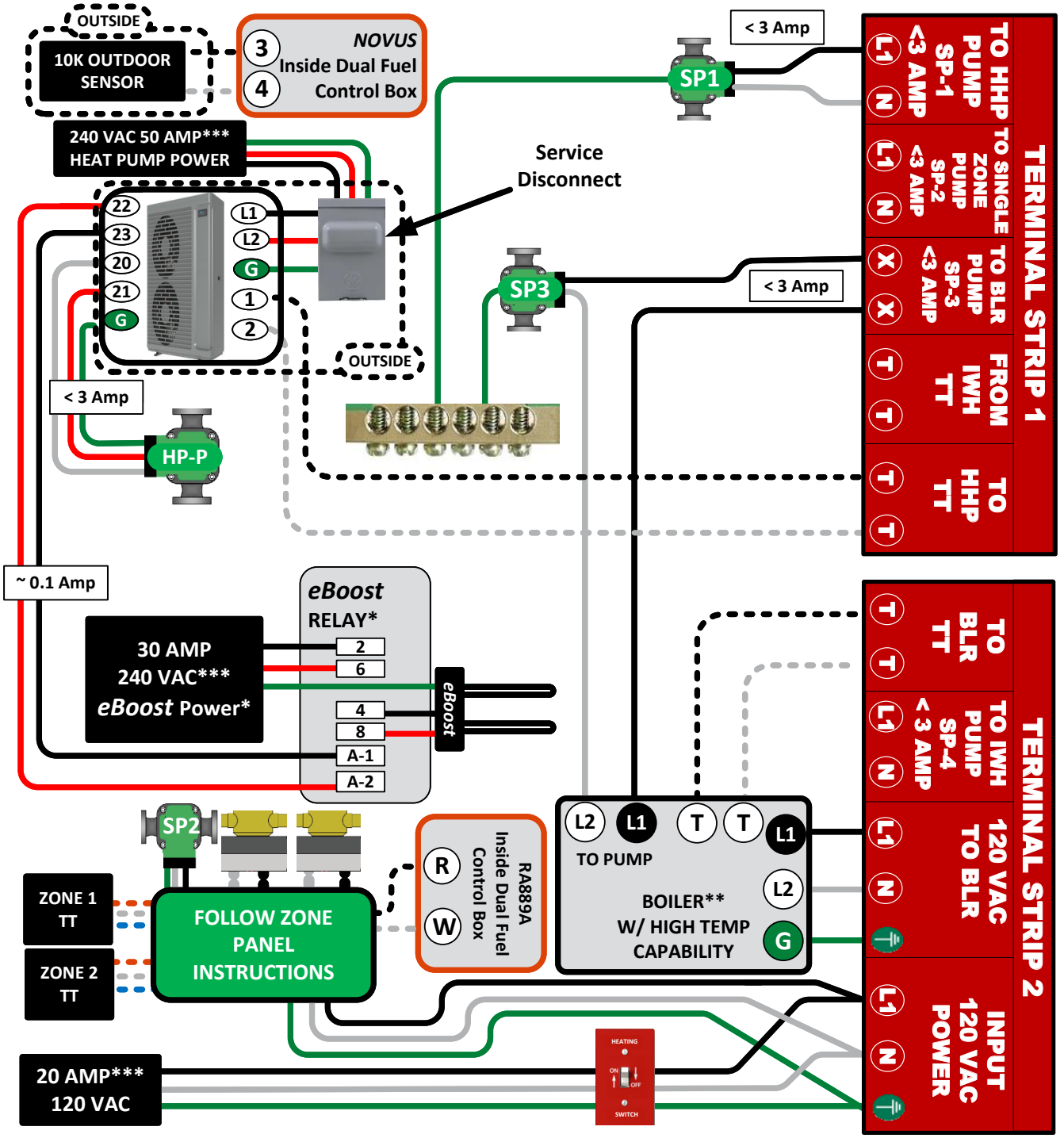
⚠ WARNING

Note 1: When ***eBoost*** is used, a 210°F T&P relief valve "8" must be used in addition to 30 PSI relief valve to monitor potential over temperature conditions.

Note 2: Isolation valve must NOT be placed between Pressure Relief Valve "E" and the heat pump.

16 Application Guide *(continued)*

DUAL FUEL MULTI ZONE W/ VALVES FIELD WIRING



⚠ WARNING

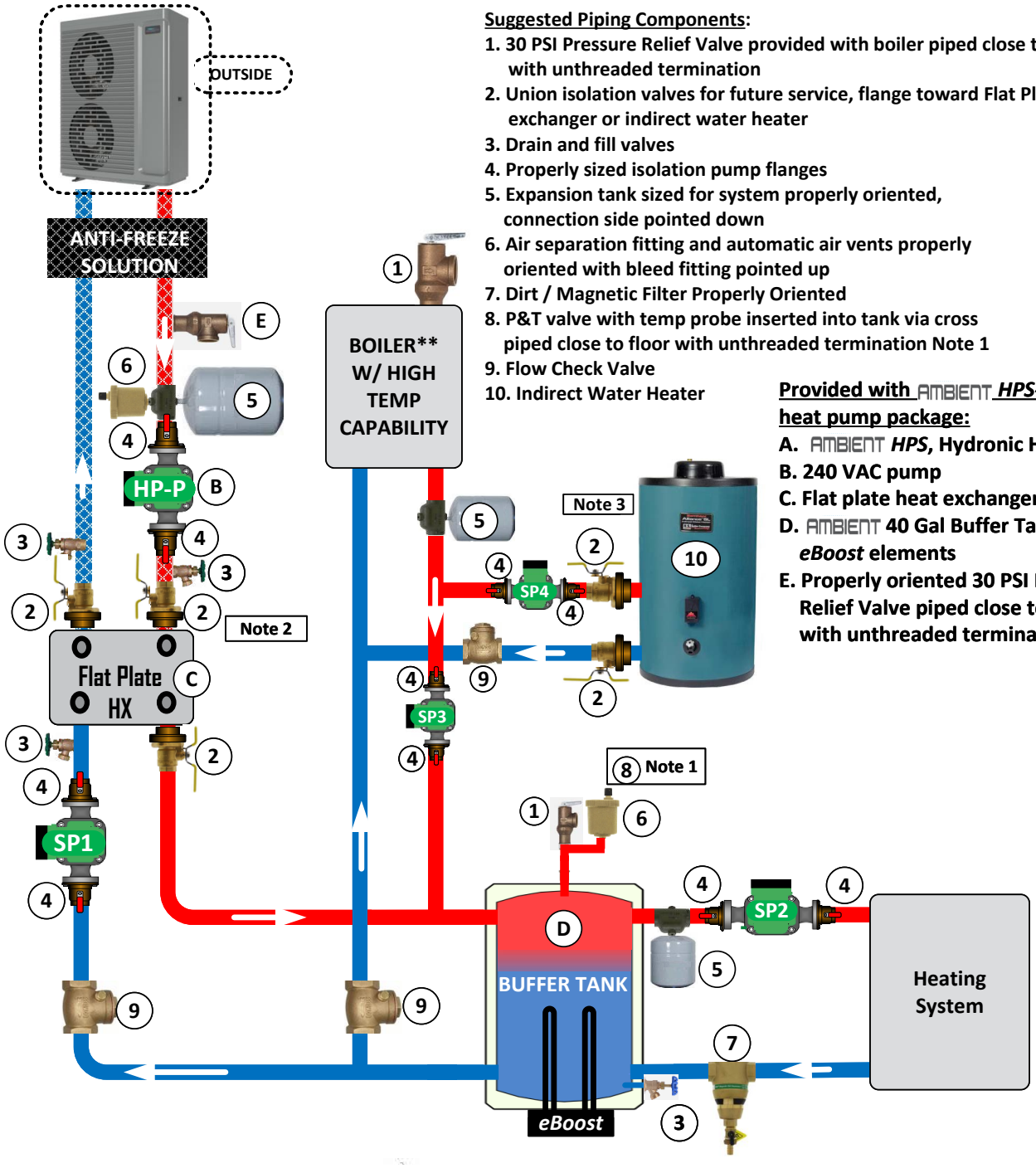
Follow all local plumbing and electrical codes.
* Only if ***eBoost*** is used
** Follow installation instructions provided with heat pump and boiler.
*** Over Current Protection provided by installer.

Low voltage wire
High voltage wire
Use appropriate gauge wire for ampacity.

NOTICE: This diagram represents a general component layout for typical installations. Designer or installer is responsible for proper sizing, additional required components, location, and installation. Follow all dangers, warnings, cautions and notices.

16 Application Guide *(continued)*

DUAL FUEL W/ INDIRECT WATER HEATER PIPING
WHEN BOILER DOES NOT HAVE IWH DEDICATED CONTROL FUNCTION



Suggested Piping Components:

1. 30 PSI Pressure Relief Valve provided with boiler piped close to floor with unthreaded termination
2. Union isolation valves for future service, flange toward Flat Plate heat exchanger or indirect water heater
3. Drain and fill valves
4. Properly sized isolation pump flanges
5. Expansion tank sized for system properly oriented, connection side pointed down
6. Air separation fitting and automatic air vents properly oriented with bleed fitting pointed up
7. Dirt / Magnetic Filter Properly Oriented
8. P&T valve with temp probe inserted into tank via cross piped close to floor with unthreaded termination Note 1
9. Flow Check Valve
10. Indirect Water Heater

Provided with AMBIENT *HPS-5T60-DF* heat pump package:

A. AMBIENT *HPS*, Hydronic Heat Pump
B. 240 VAC pump
C. Flat plate heat exchanger
D. AMBIENT 40 Gal Buffer Tank with *eBoost* elements
E. Properly oriented 30 PSI Pressure Relief Valve piped close to floor with unthreaded termination

⚠ WARNING

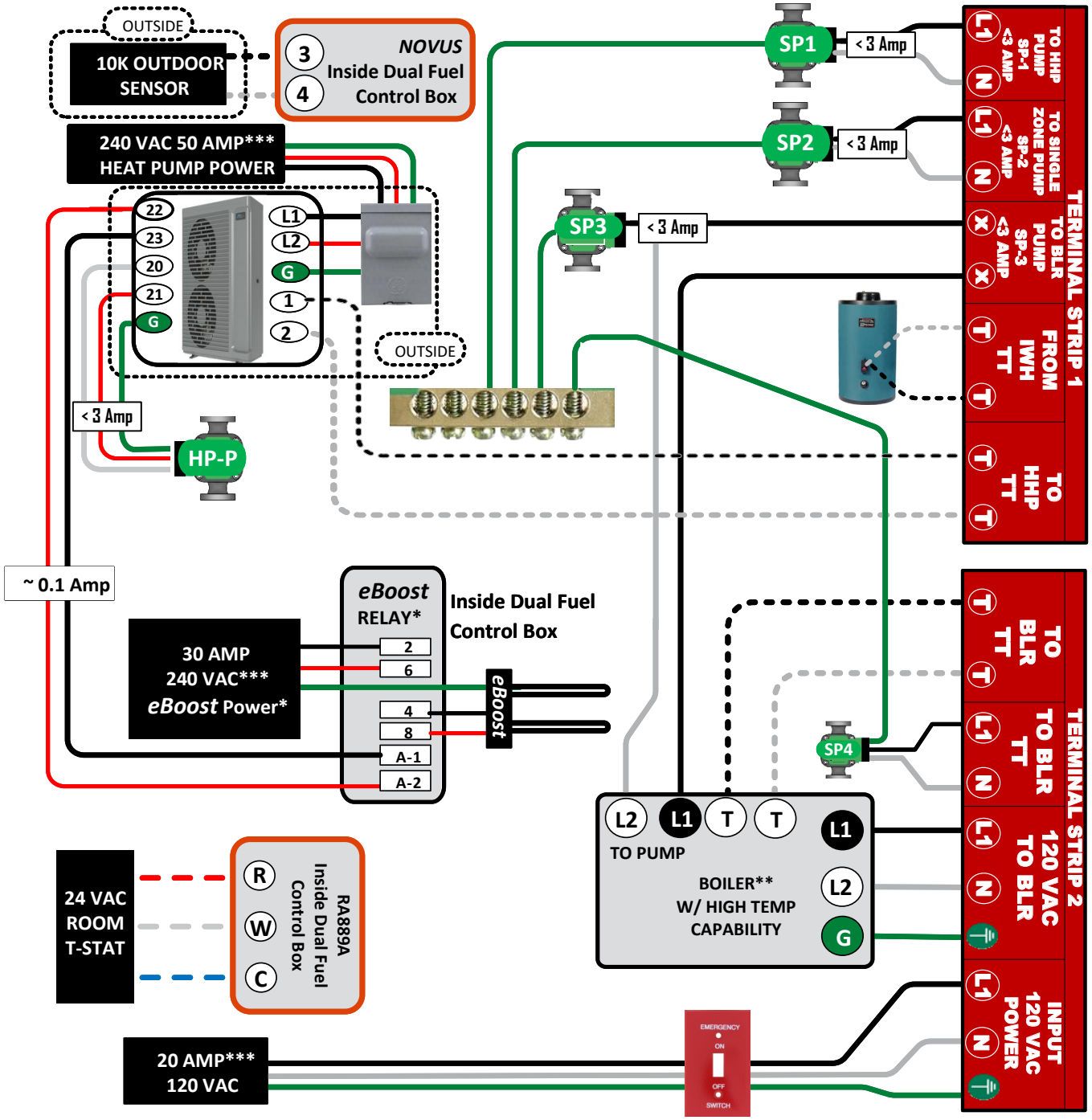
Note 1: When ***eBoost*** is used, a 210°F T&P relief valve "8" must be used in addition to 30 PSI relief valve to monitor potential over temperature conditions.

Note 2: Isolation valve must NOT be placed between Pressure Relief Valve "E" and the heat pump.

Note 3: Anti-scald mixing valve is recommended. Follow all applicable codes for potable hot water.

16 Application Guide *(continued)*

DUAL FUEL W/ INDIRECT WATER HEATER FIELD WIRING
WHEN BOILER DOES NOT HAVE IWH DEDICATED CONTROL FUNCTION



⚠ WARNING

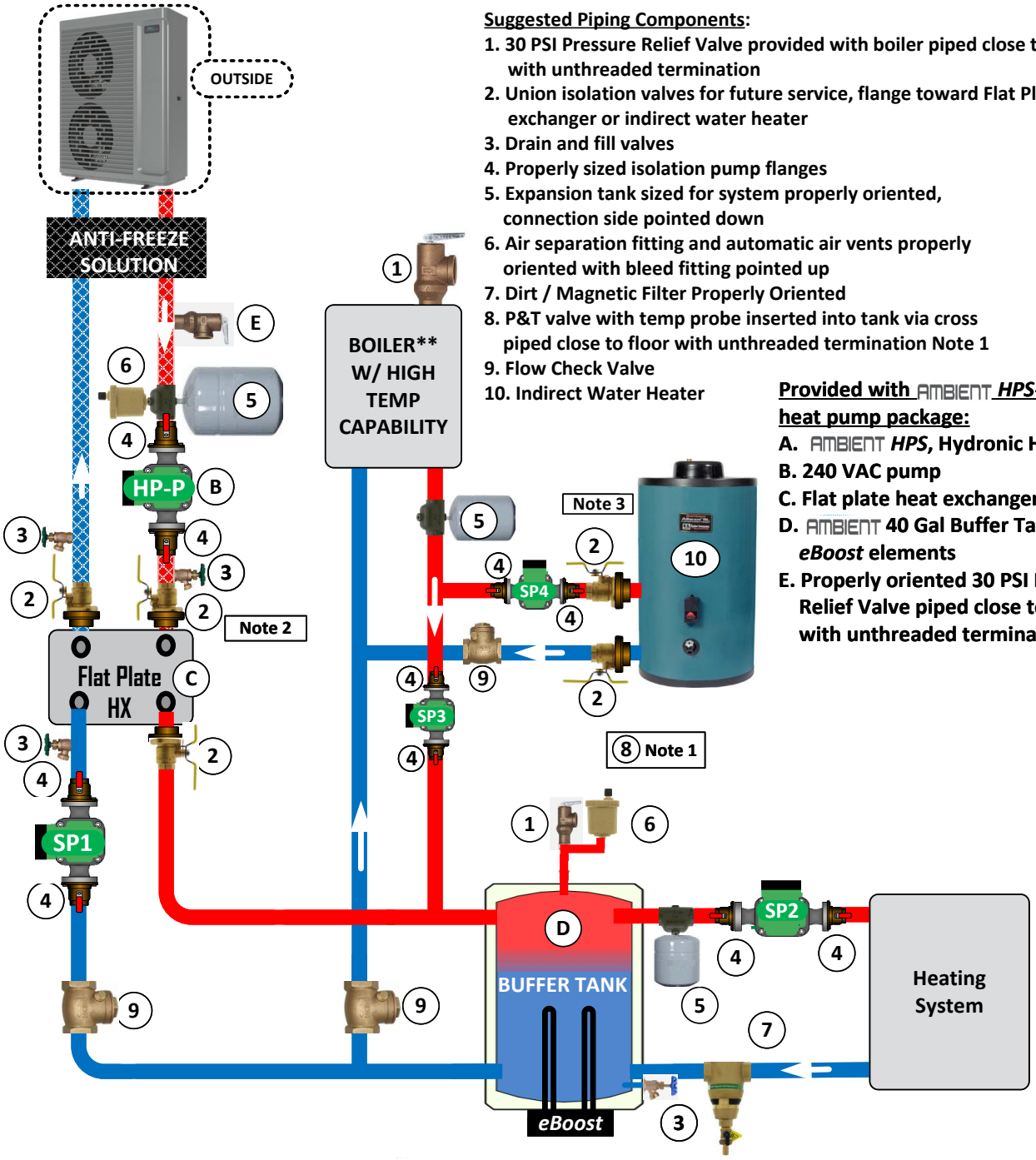
Follow all local plumbing and electrical codes.
* Only if ***eBoost*** is used
** Follow installation instructions provided with heat pump and boiler.
*** Over Current Protection provided by installer.

Low voltage wire
High voltage wire
Use appropriate gauge wire for ampacity.

NOTICE: This diagram represents a general component layout for typical installations. Designer or installer is responsible for proper sizing, additional required components, location, and installation. Follow all dangers, warnings, cautions and notices.

16 Application Guide *(continued)*

DUAL FUEL W/ INDIRECT WATER HEATER PIPING
WHEN BOILER HAS IWH DEDICATED CONTROL FUNCTION



Suggested Piping Components:

1. 30 PSI Pressure Relief Valve provided with boiler piped close to floor with unthreaded termination
2. Union isolation valves for future service, flange toward Flat Plate heat exchanger or indirect water heater
3. Drain and fill valves
4. Properly sized isolation pump flanges
5. Expansion tank sized for system properly oriented, connection side pointed down
6. Air separation fitting and automatic air vents properly oriented with bleed fitting pointed up
7. Dirt / Magnetic Filter Properly Oriented
8. P&T valve with temp probe inserted into tank via cross piped close to floor with unthreaded termination Note 1
9. Flow Check Valve
10. Indirect Water Heater

Provided with AMBIENT *HPS-5T60-DF* heat pump package:

A. AMBIENT ***HPS***, Hydronic Heat Pump
B. 240 VAC pump
C. Flat plate heat exchanger
D. AMBIENT 40 Gal Buffer Tank with ***eBoost*** elements
E. Properly oriented 30 PSI Pressure Relief Valve piped close to floor with unthreaded termination

⚠ WARNING

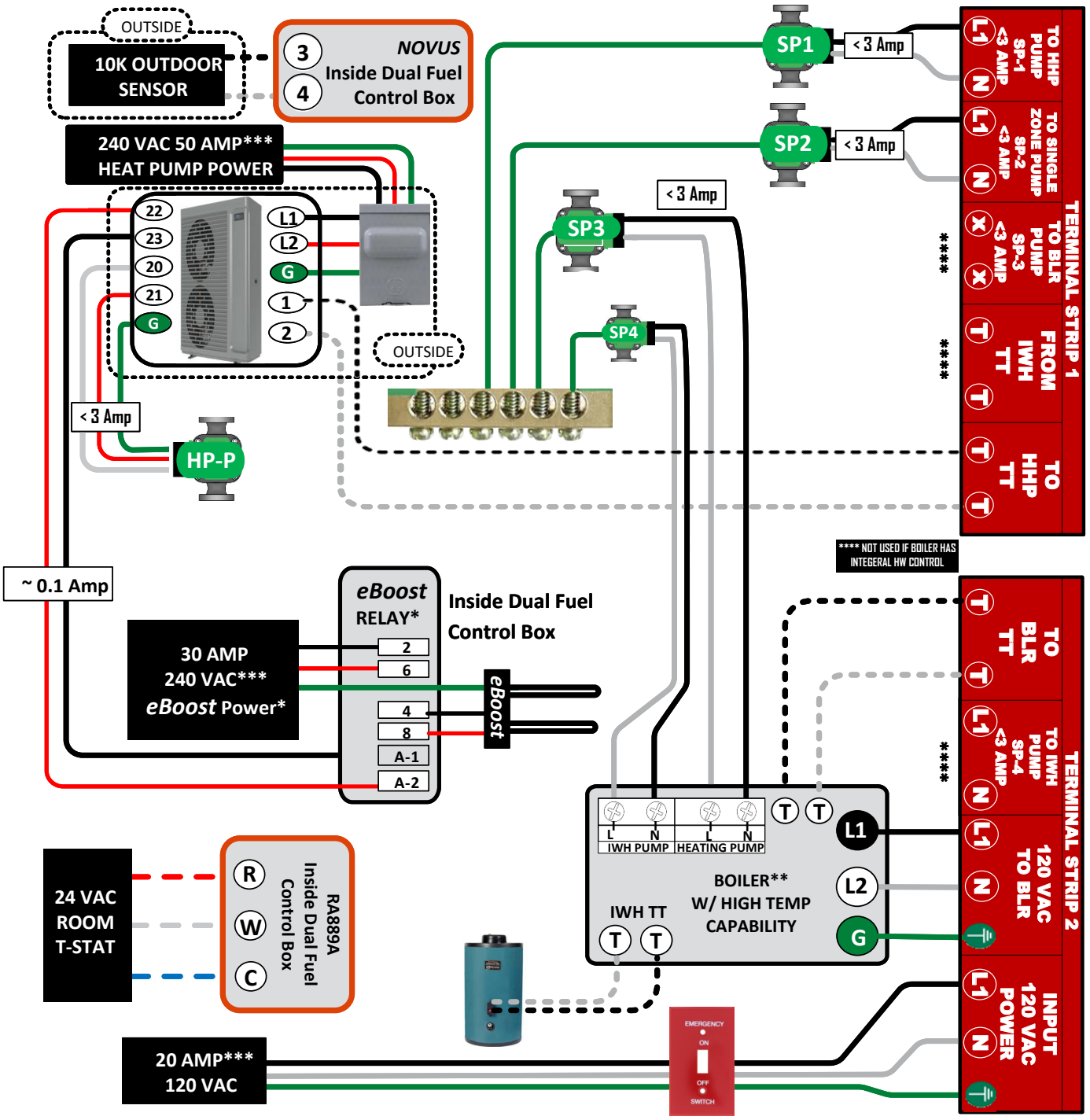
Note 1: When ***eBoost*** is used, a 210°F T&P relief valve "8" must be used in addition to 30 PSI relief valve to monitor potential over temperature conditions.

Note 2: Isolation valve must NOT be placed between Pressure Relief Valve "E" and the heat pump.

Note 3: Anti-scald mixing valve is recommended. Follow all applicable codes for potable hot water.

16 Application Guide *(continued)*

DUAL FUEL W/ INDIRECT WATER HEATER FIELD WIRING
WHEN BOILER HAS IWH DEDICATED CONTROL FUNCTION



⚠ WARNING

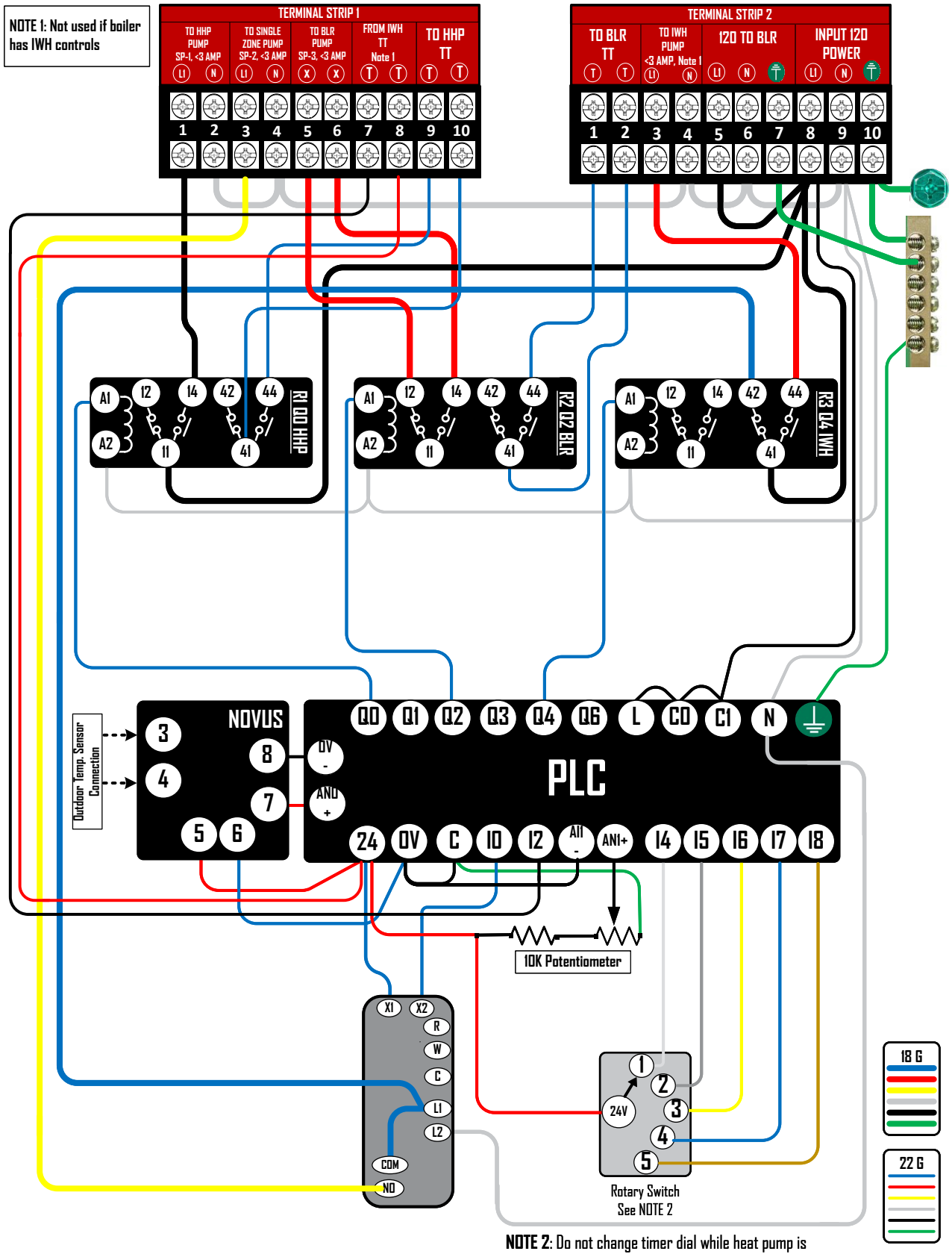
Follow all local plumbing and electrical codes.
* Only if ***eBoost*** is used
** Follow installation instructions provided with heat pump and boiler.
*** Over Current Protection provided by installer.

Low voltage wire
High voltage wire
Use appropriate gauge wire for ampacity.

NOTICE: This diagram represents a general component layout for typical installations. Designer or installer is responsible for proper sizing, additional required components, location, and installation. Follow all dangers, warnings, cautions and notices.

16 Application Guide *(continued)*

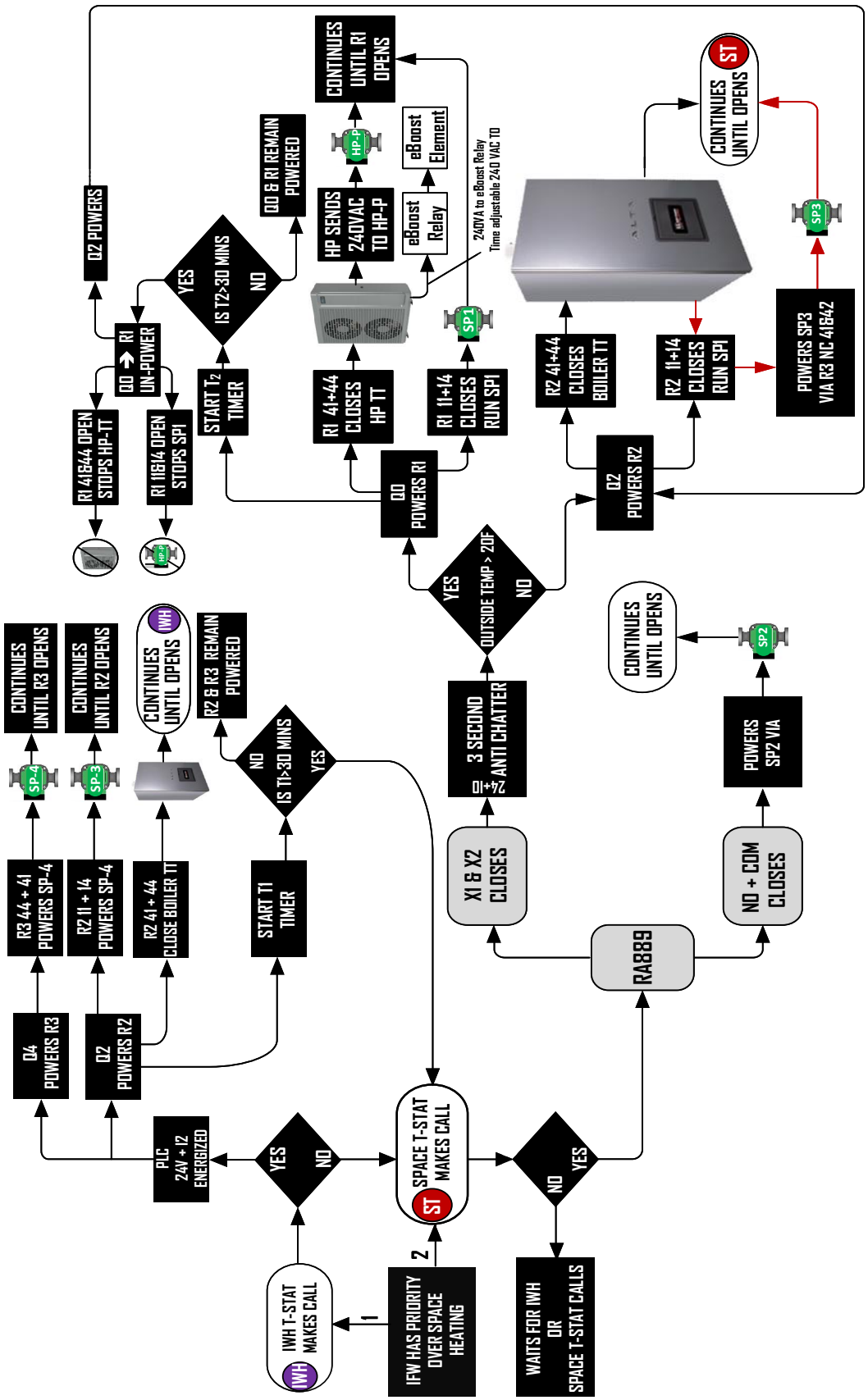
DUAL FUEL CONTROL FACTORY WIRING



NOTE 2: Do not change timer dial while heat pump is running. Changing dial will reset the timer.

17 How It Works

DUAL FUEL CONTROL LOGIC



AMBIENT

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