



# AMBIENT

## Heat Pump System

### HPS SELECTION AND APPLICATION GUIDE

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System Selection

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 Water °F	Outside Ambient Temperature (°F)													Outside Ambient Temperature (°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	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	Note 3	☑
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 3	☑
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													

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.

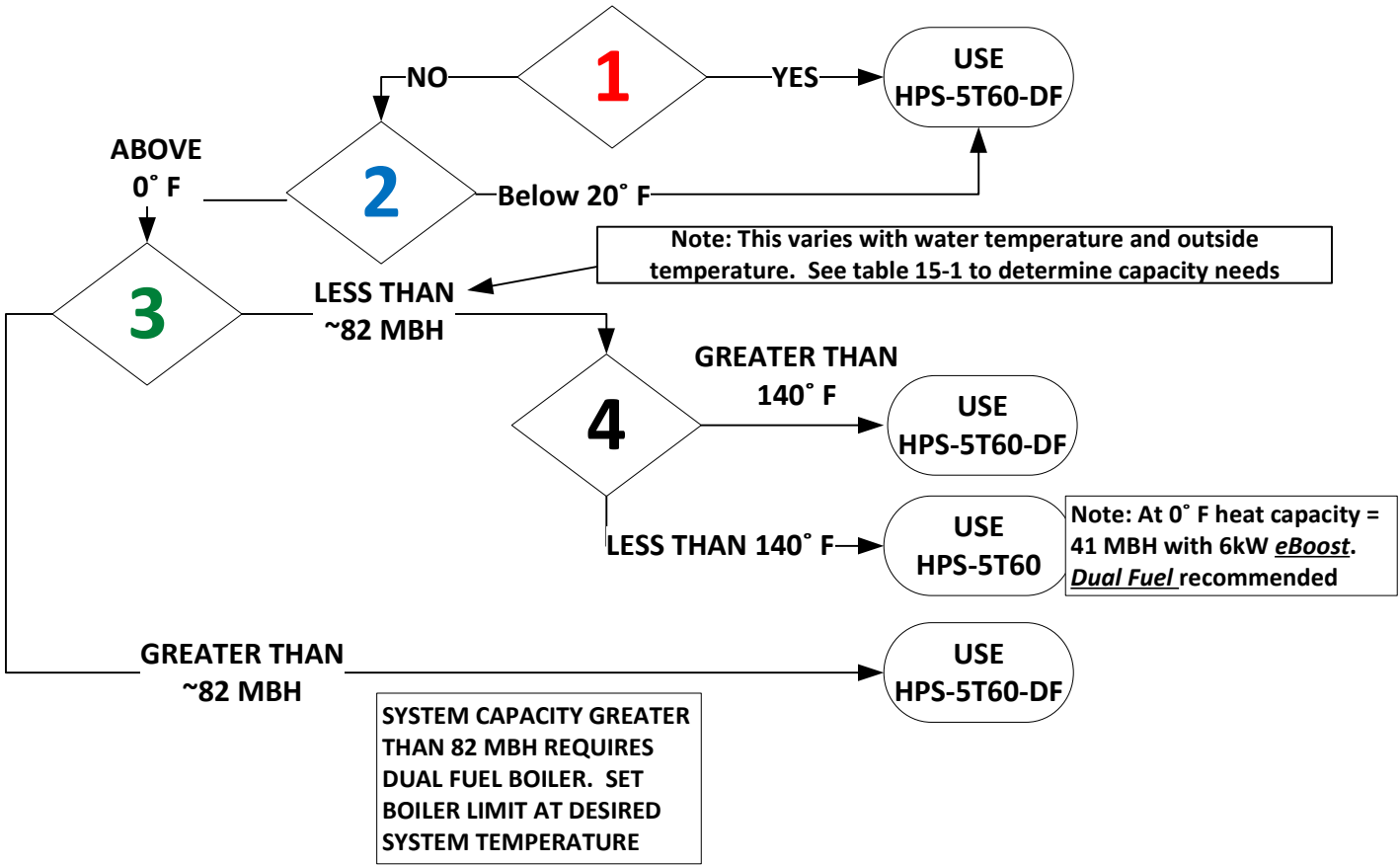
As outside temperatures go down the capacity and available water temperatures go down.

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]

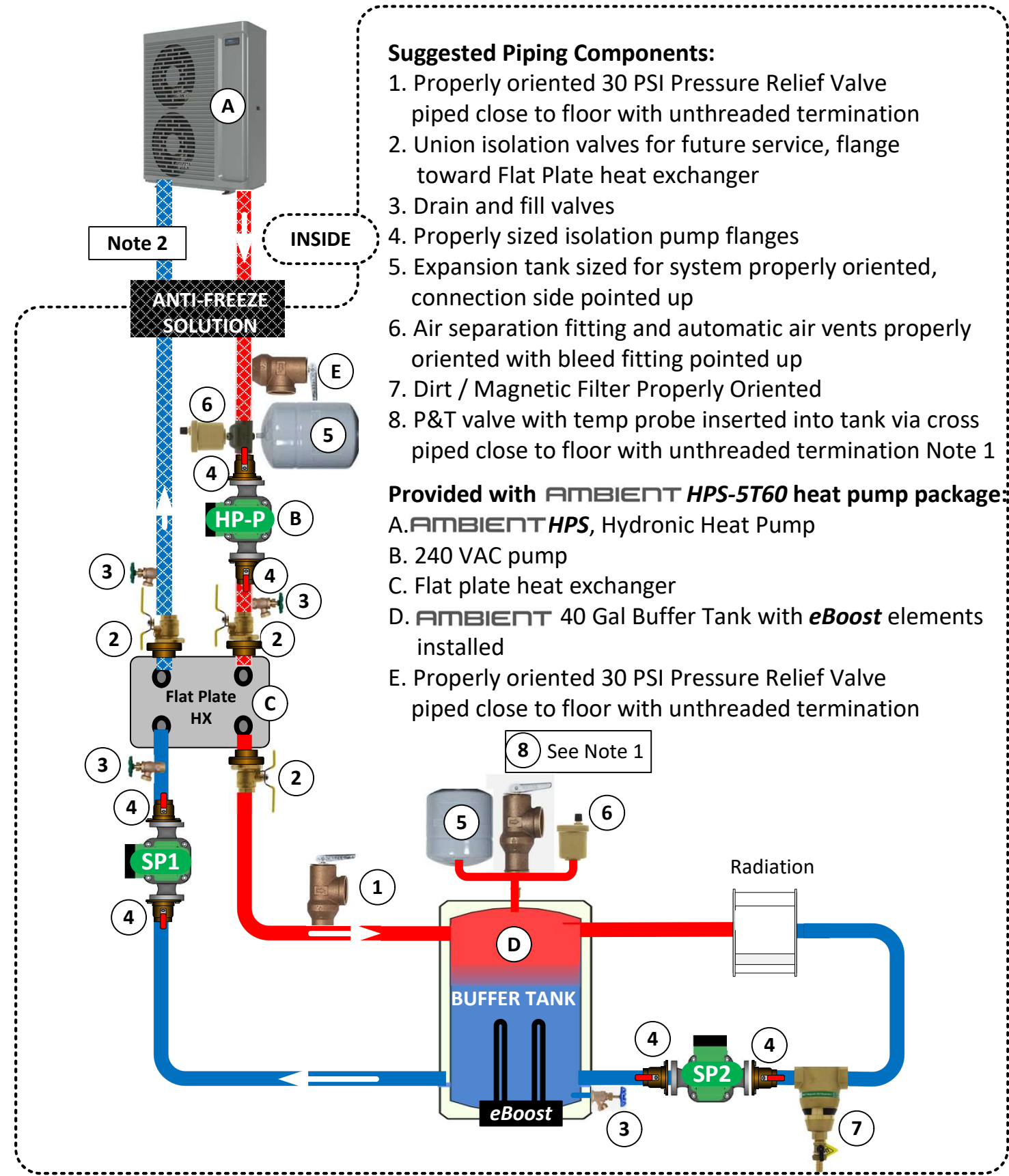
Dual fuel with conventional gas, electric and even oil offer an opportunity to maintain living space comfort and still offer significant on site carbon emissions reduction.

- 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



LOW TEMPERATURE SINGLE ZONE PIPING

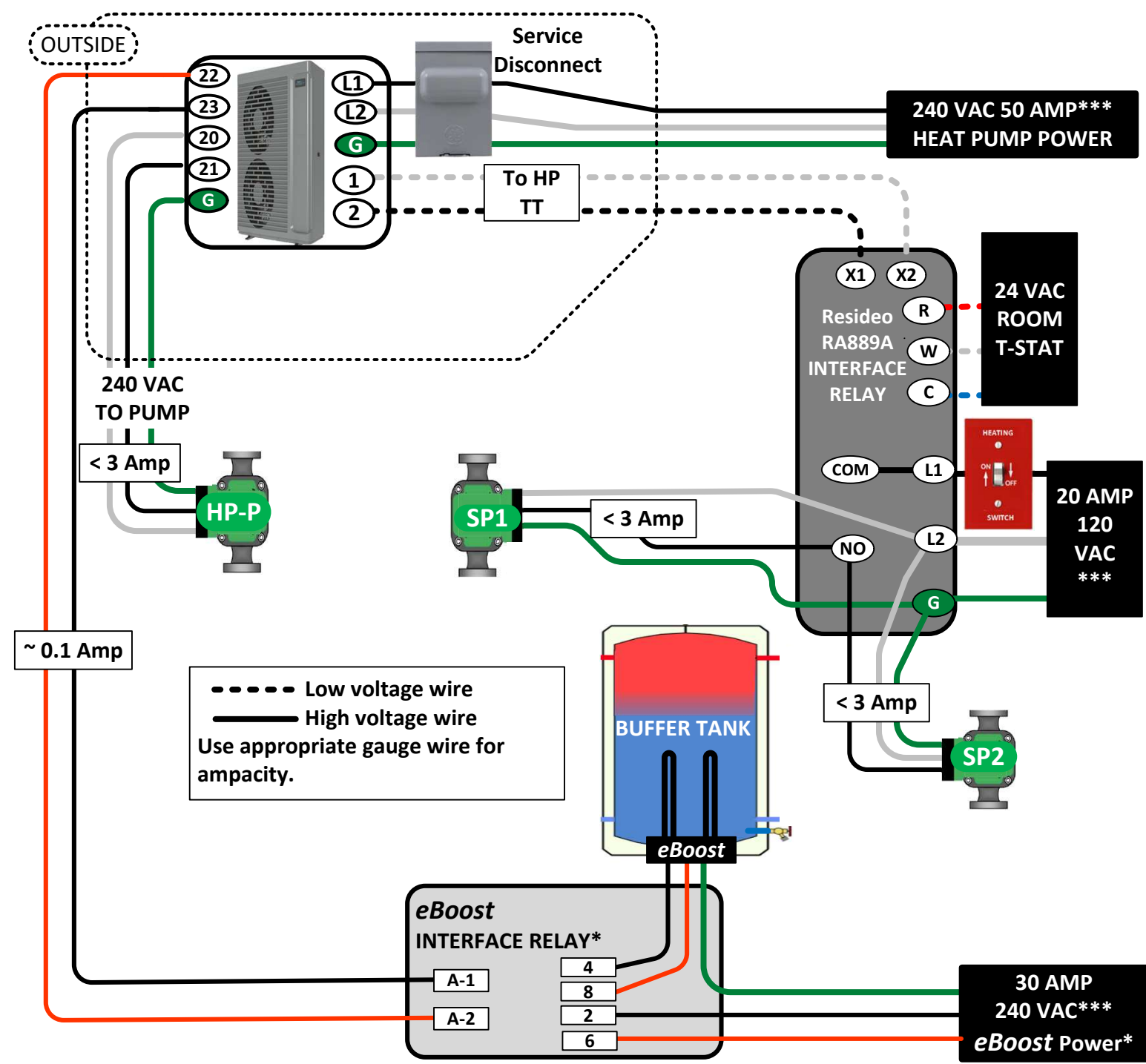


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**WARNING**

LOW TEMPERATURE SINGLE ZONE FIELD WIRING



**WARNING**

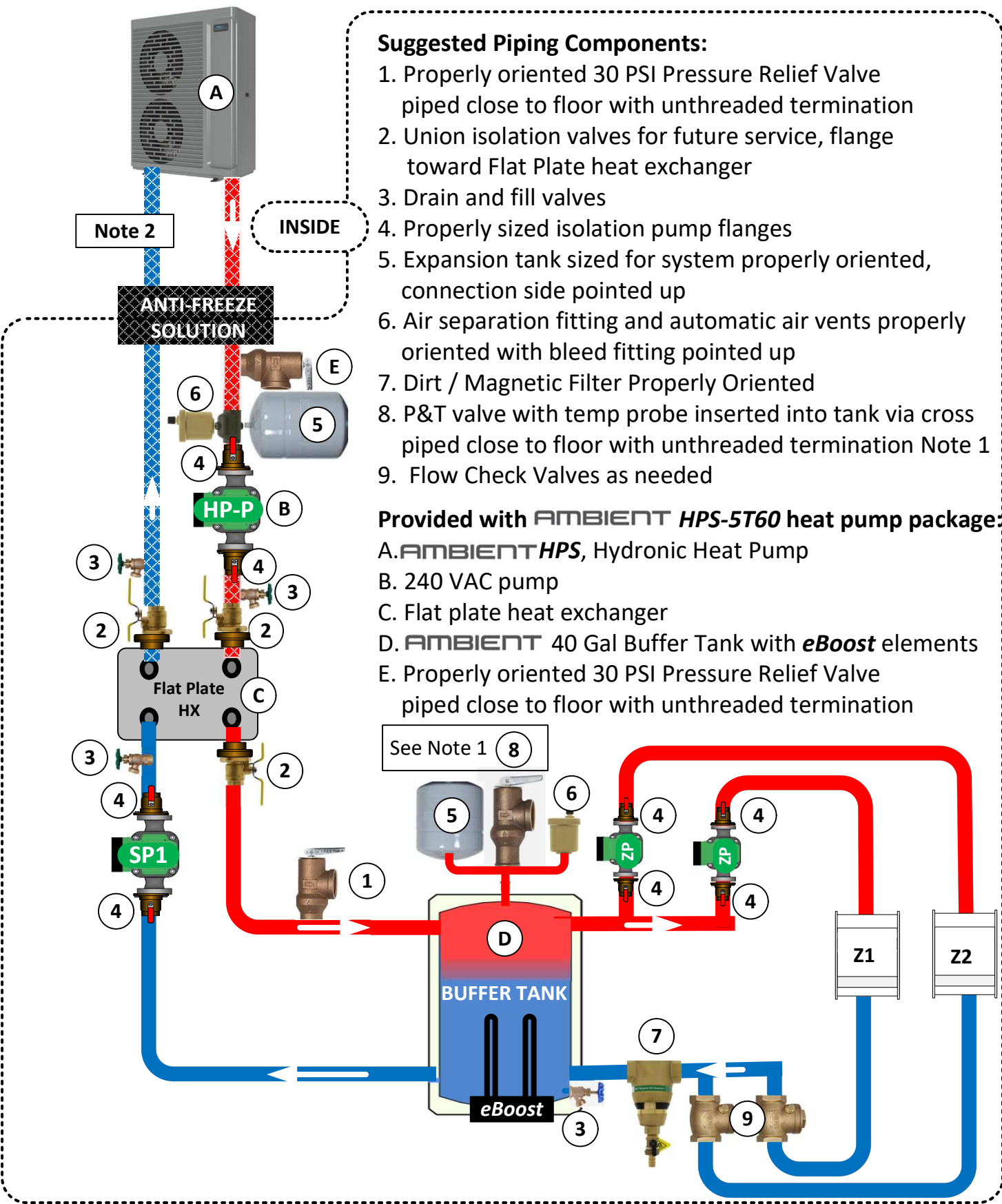
Follow all local plumbing and electrical codes.  
\* Only if eBoost is used  
\*\* Follow installation instructions provided with Heat Pump  
\*\*\* Over Current Protection Installer Provided

**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.

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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

See Note 1 (8)

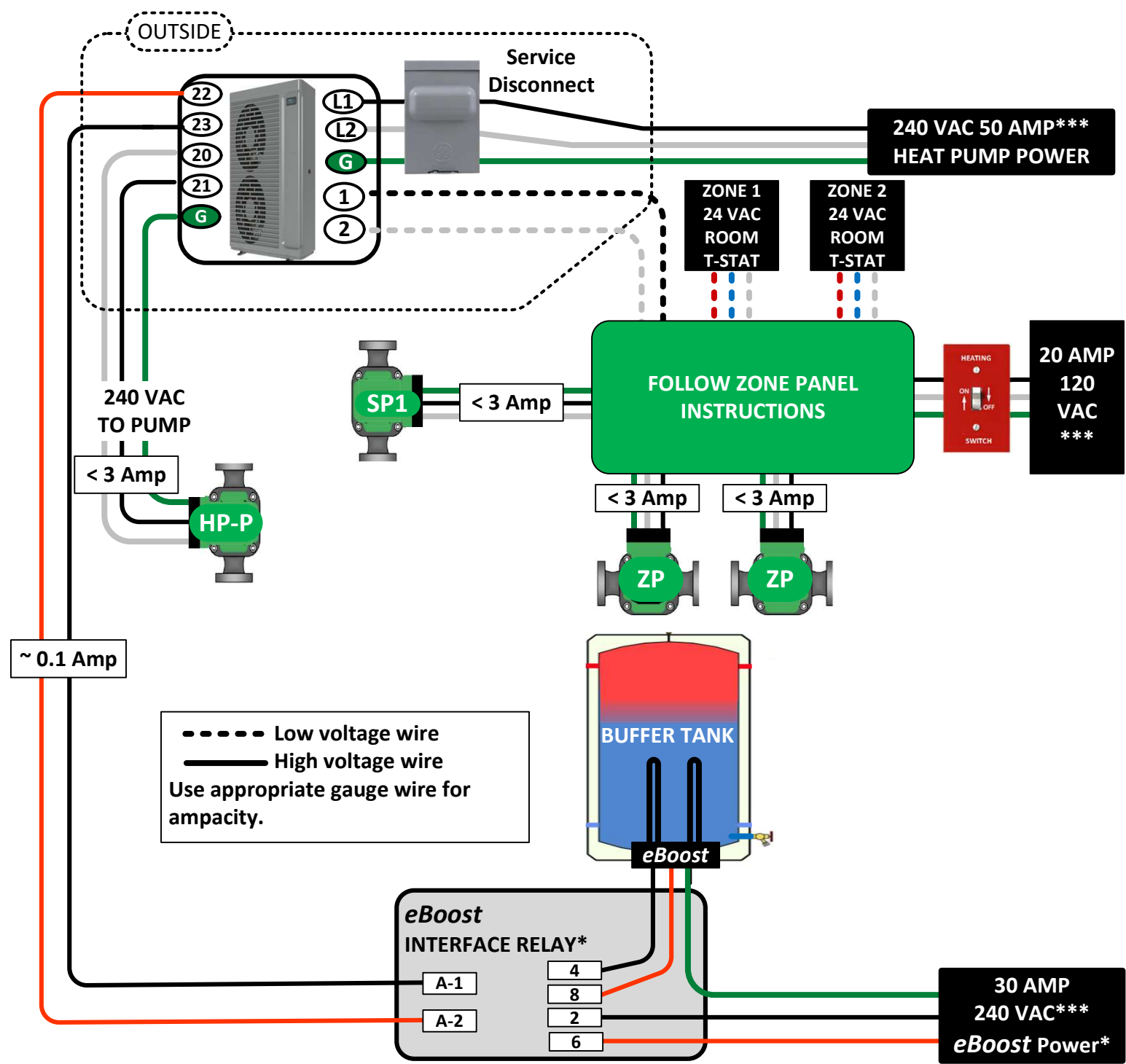


WARNING

Note 1: When eBoost is used a 210F 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.

LOW TEMPERATURE MULTI-ZONES WITH PUMPS FIELD WIRING



Follow all local plumbing and electrical codes.

\* Only if eBoost is used

\*\* Follow installation instructions provided with Heat Pump

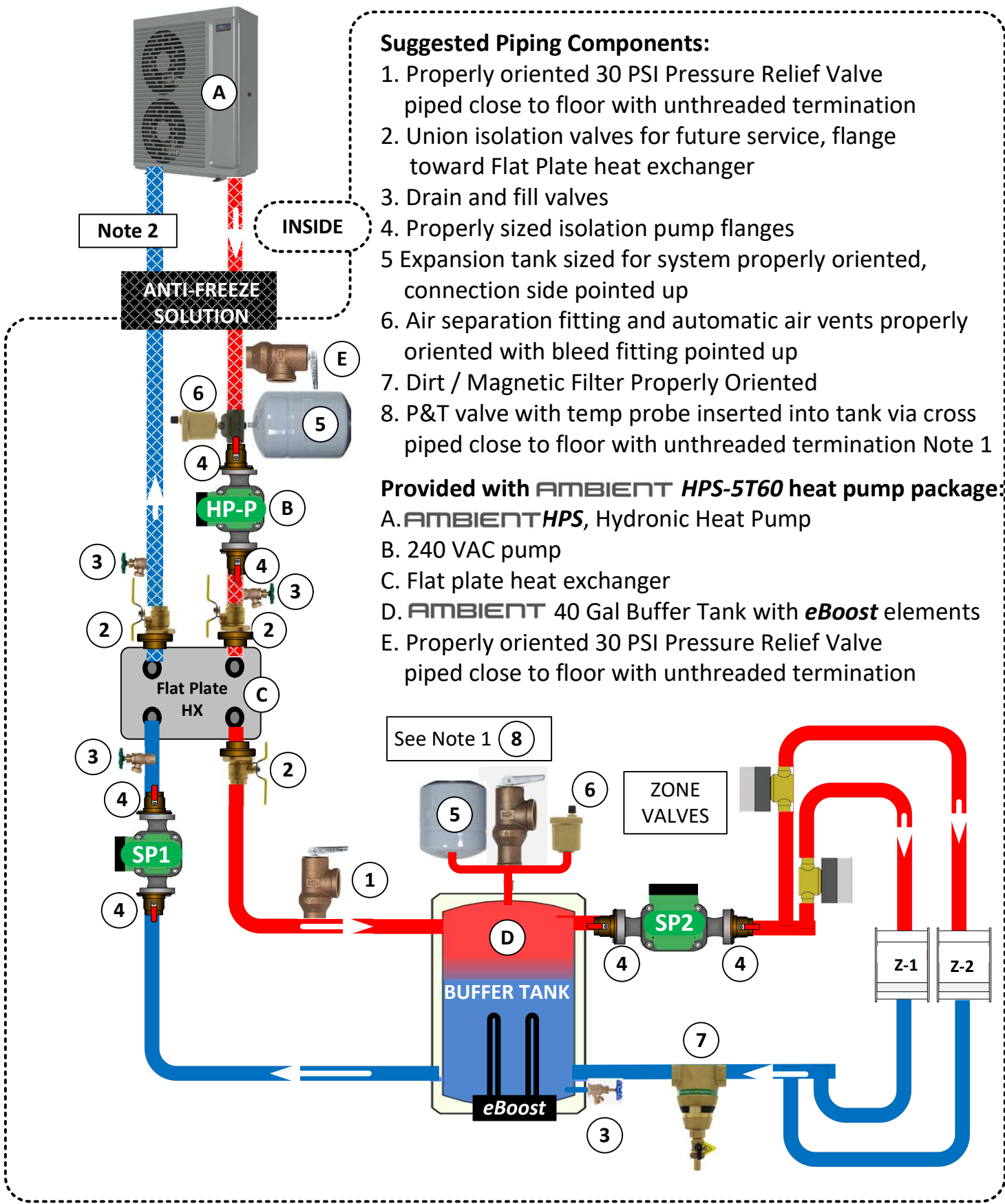
\*\*\* Over Current Protection provided by installer

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# LOW TEMPERATURE MULTI-ZONE WITH VALVES PIPING



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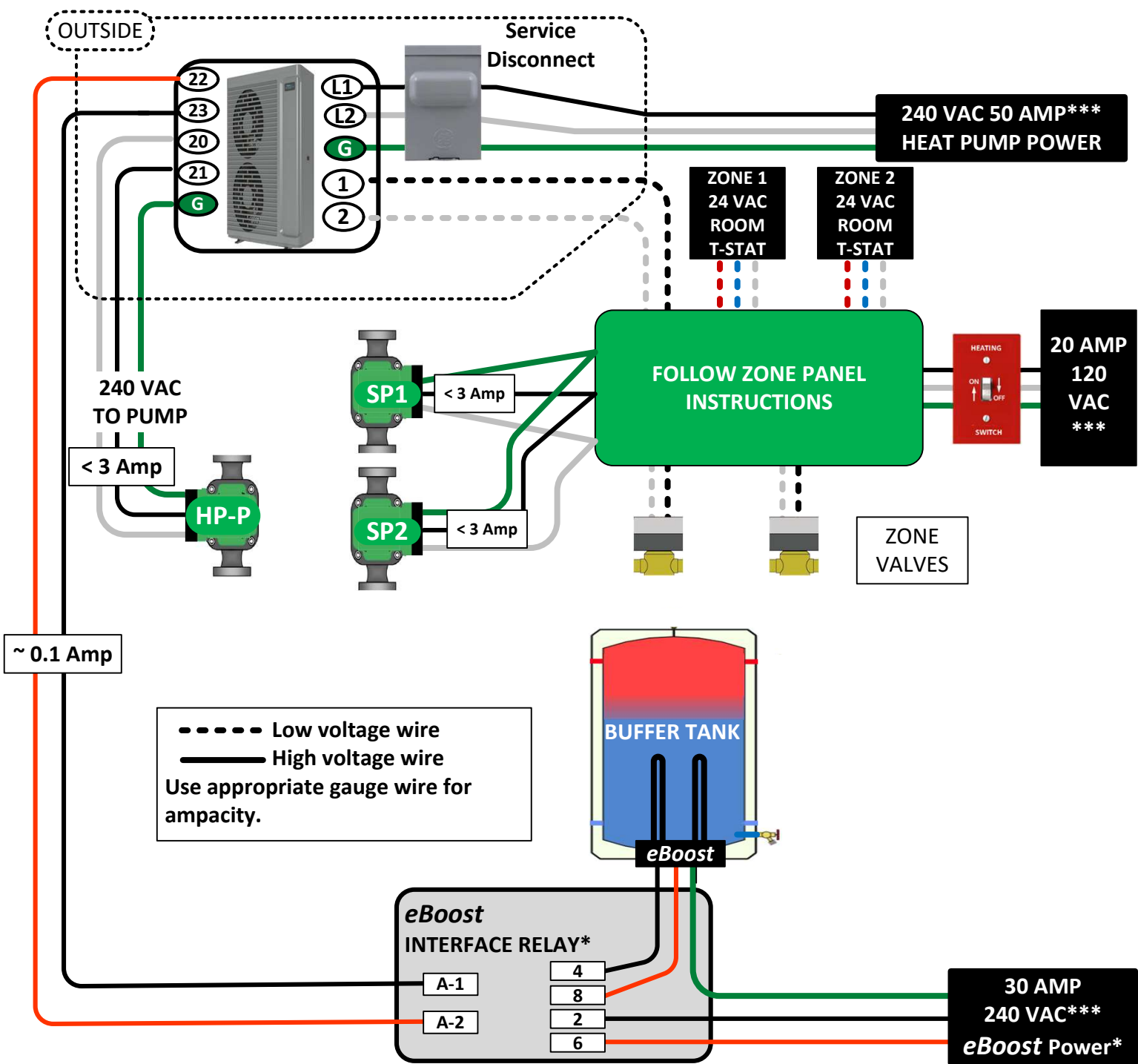


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# LOW TEMPERATURE MULTI-ZONE WITH VALVES WIRING



**WARNING**

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\*\* Follow installation instructions provided with Heat Pump

\*\*\* Over Current Protection provided by installing contractor

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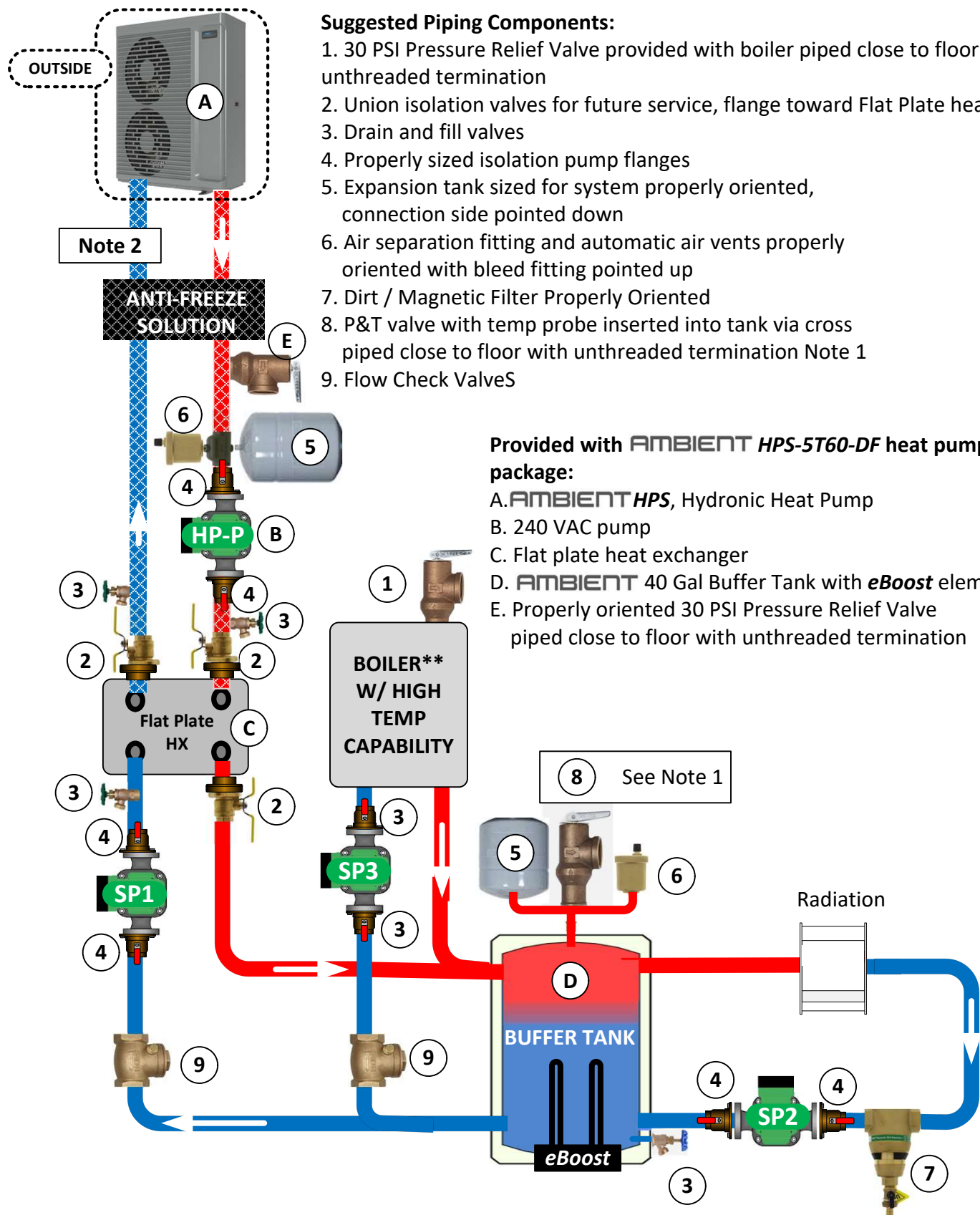
## DUAL FUEL SINGLE ZONE PIPING

### 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
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9. Flow Check Valves

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

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- B. 240 VAC pump
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- D. AMBIENT 40 Gal Buffer Tank with **eBoost** elements
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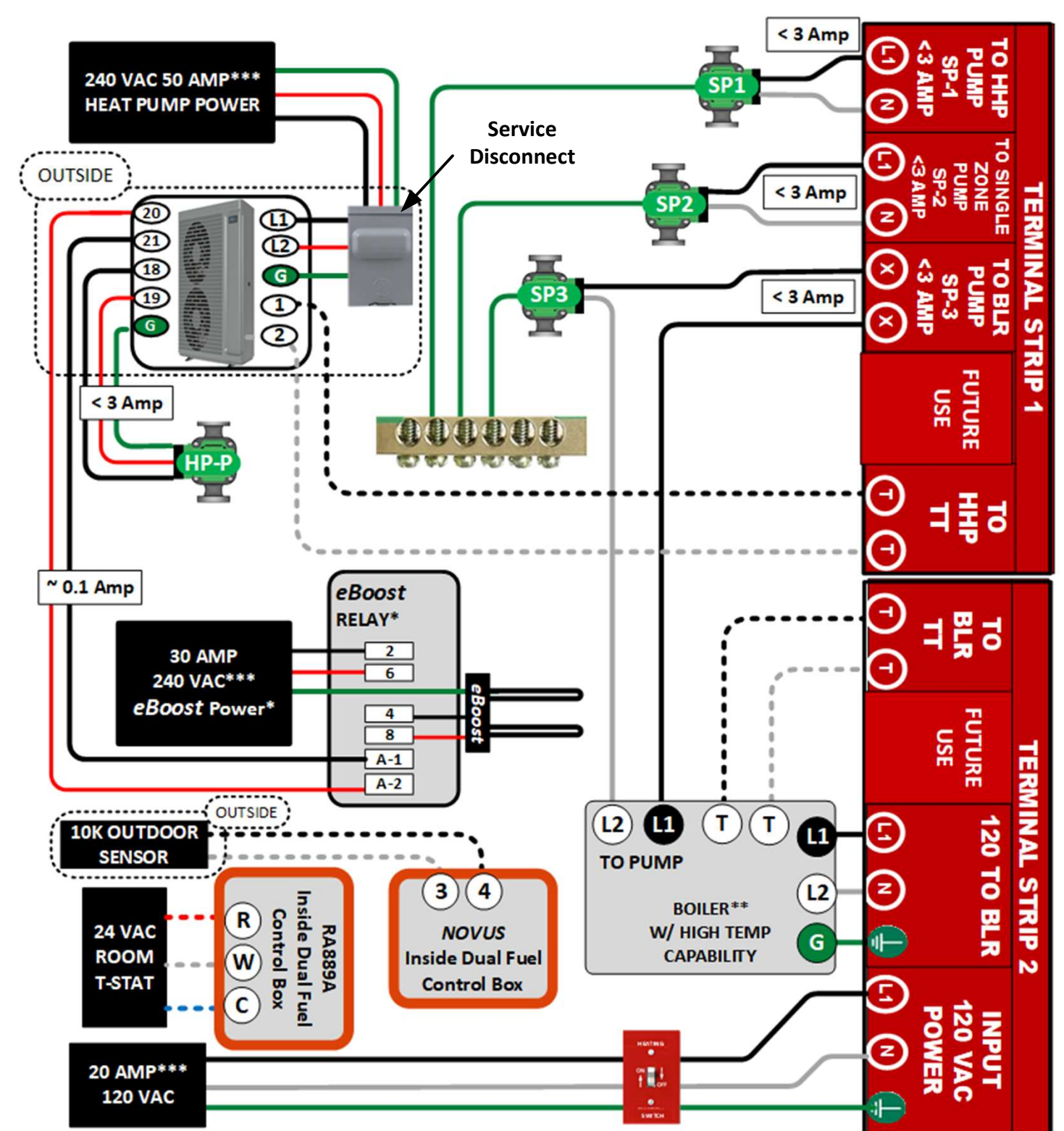


### WARNING

Note 1: When **eBoost** is used a 210F 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.

## DUAL FUEL SINGLE ZONE FIELD WIRING



### WARNING

Follow all local plumbing and electrical codes.

\* Only if **eBoost** is used

\*\* Follow installation instructions provided with Boiler

\*\*\* Over Current Protection provided by contractor

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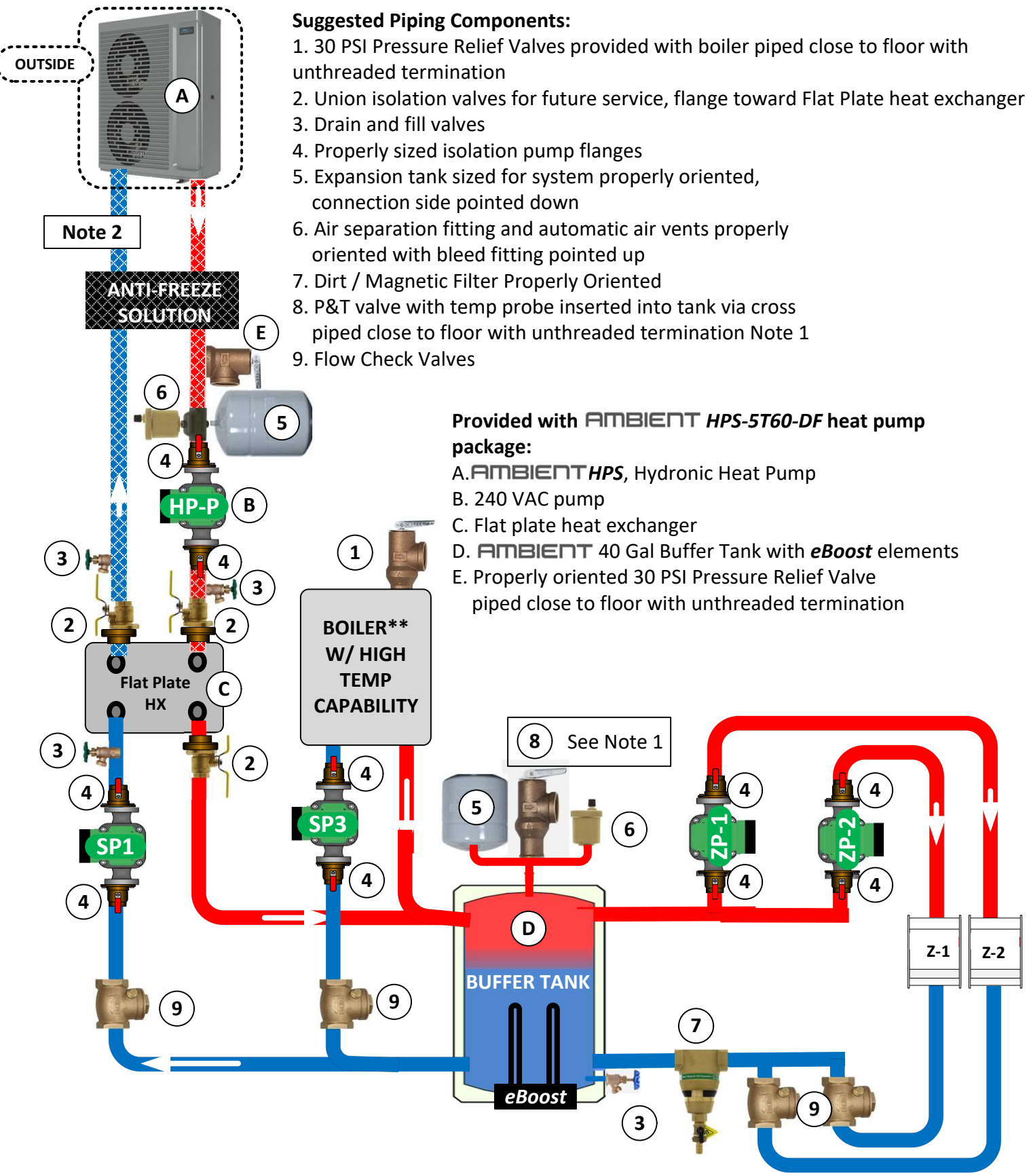
Designer or installer is responsible for proper sizing, additional required components, location, and installation.

Follow all warnings, cautions and notices.

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

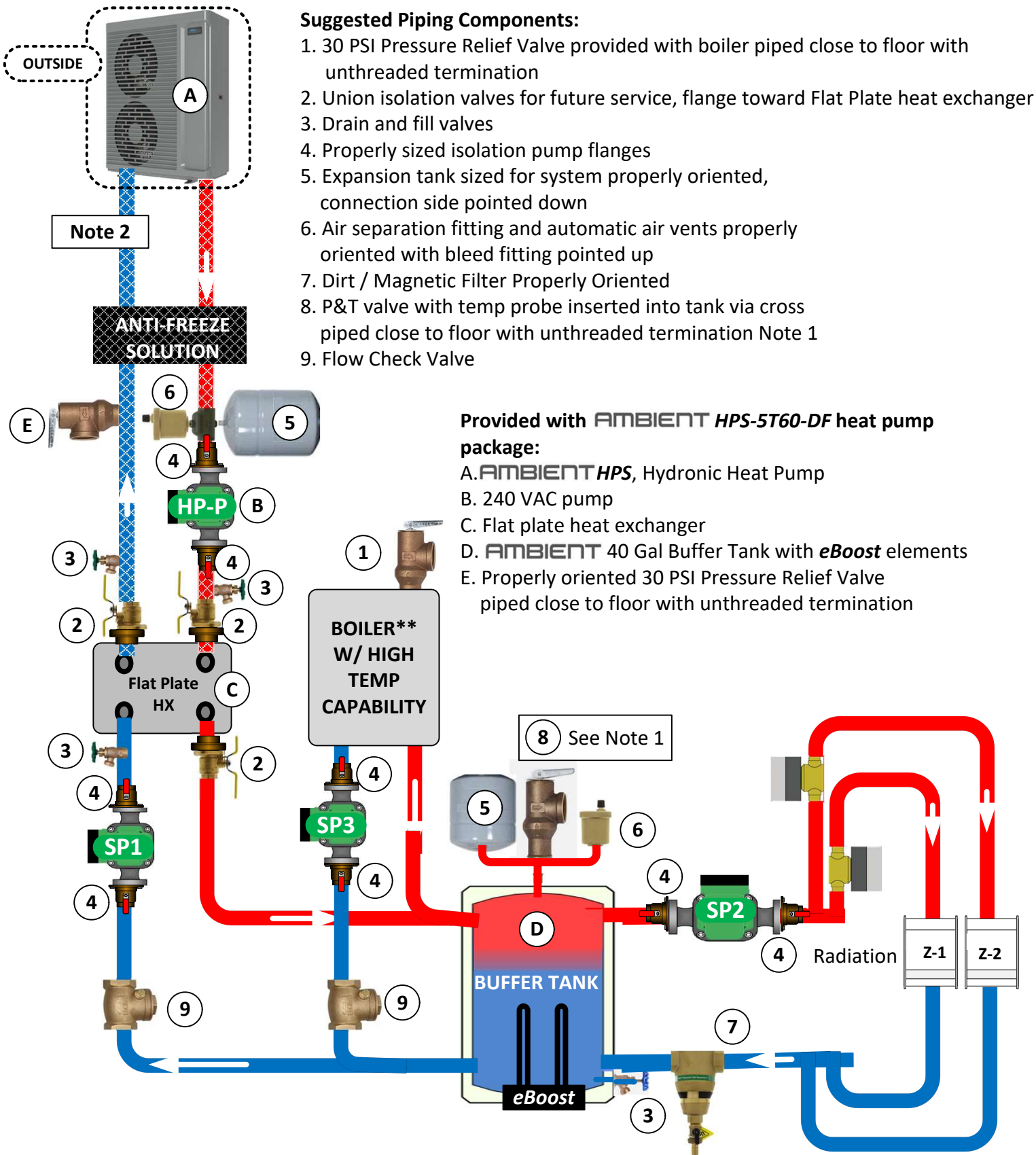


DUAL FUEL MULTI ZONE W/ PUMPS PIPING





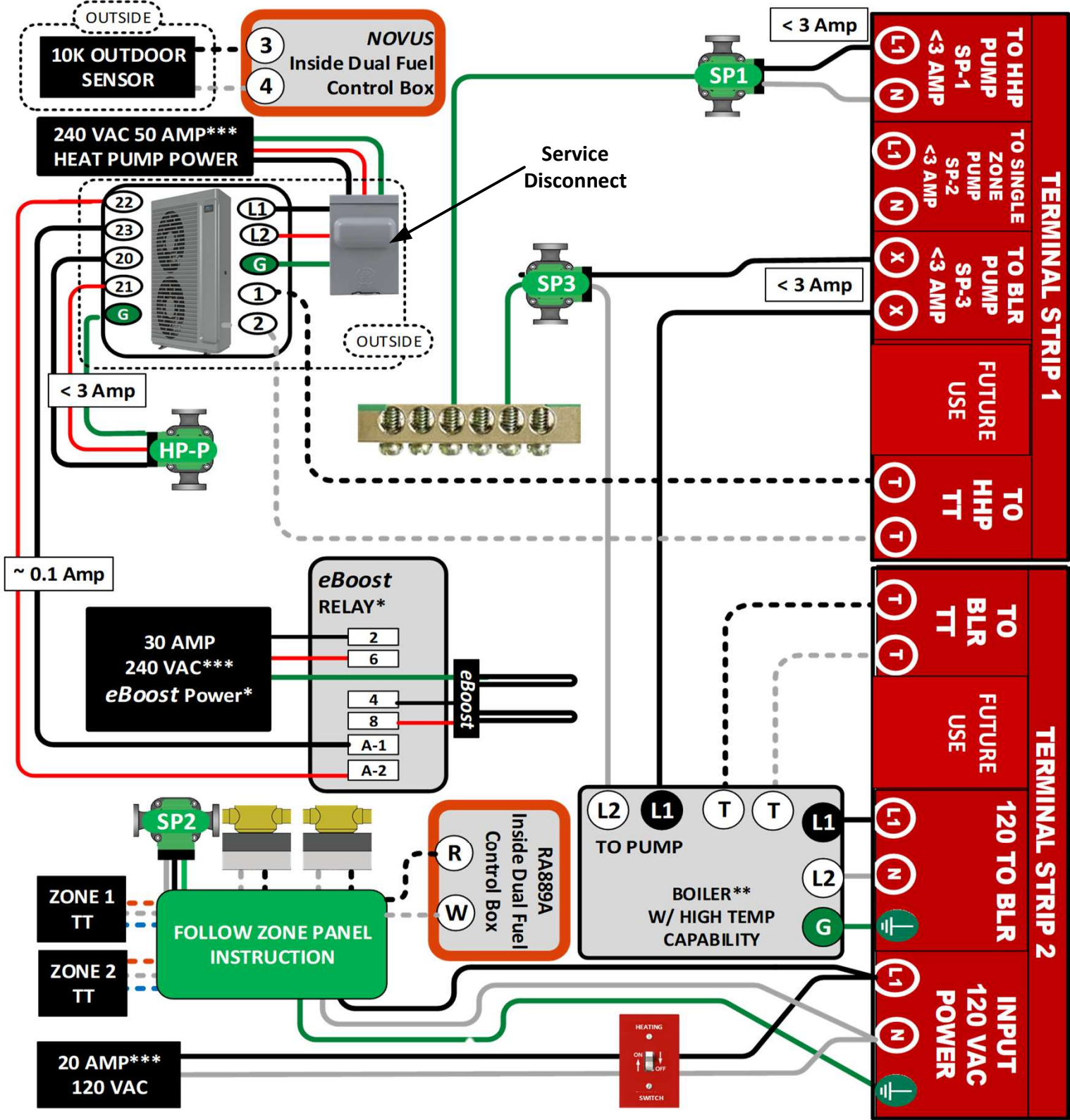
DUAL FUEL MULTI ZONE W/ VALVES PIPING



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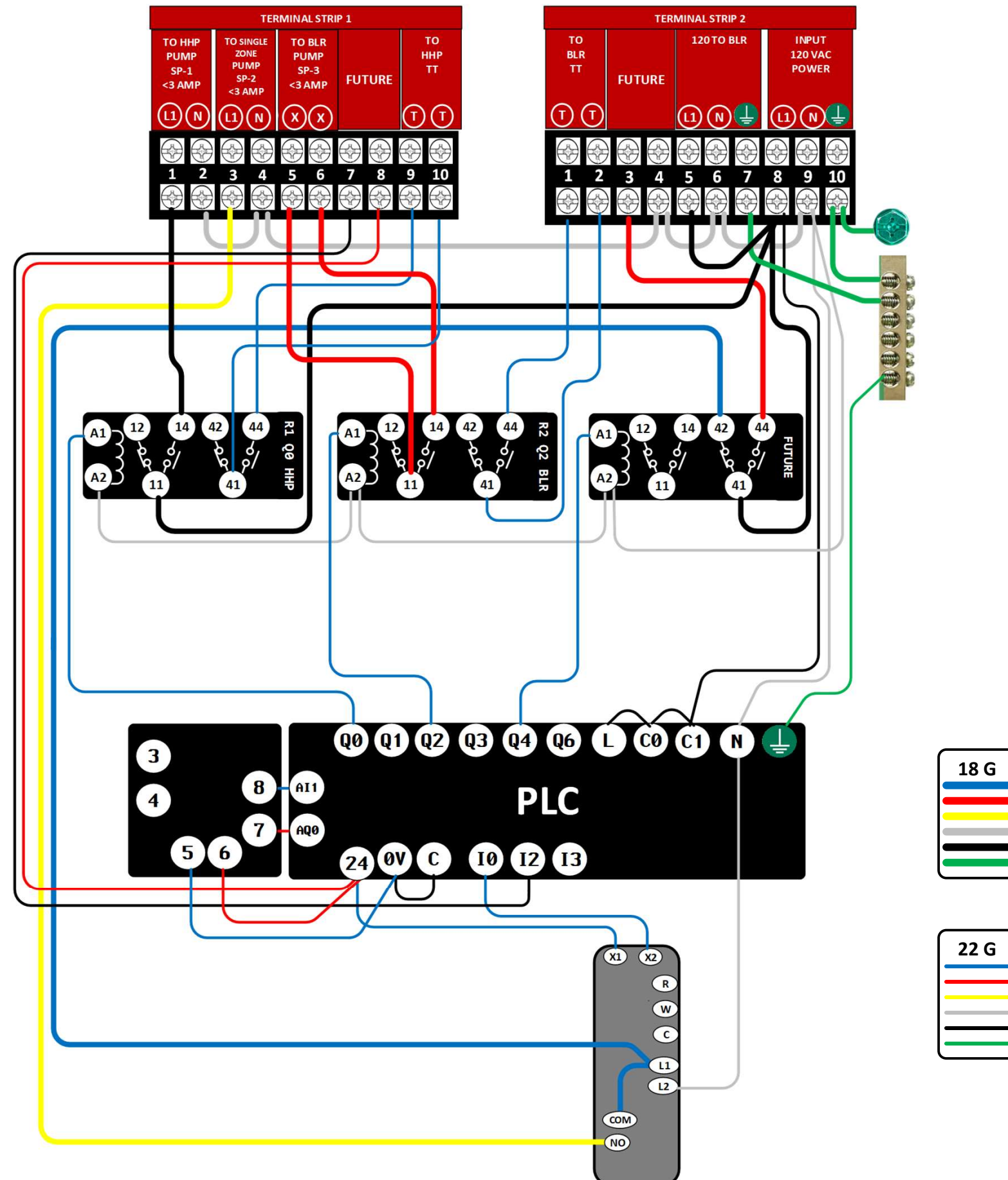
DUAL FUEL MULTI ZONE W/ VALVES FIELD WIRING



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# DUAL FUEL FACTORY WIRING



# DUAL FUEL CONTROL LOGIC

