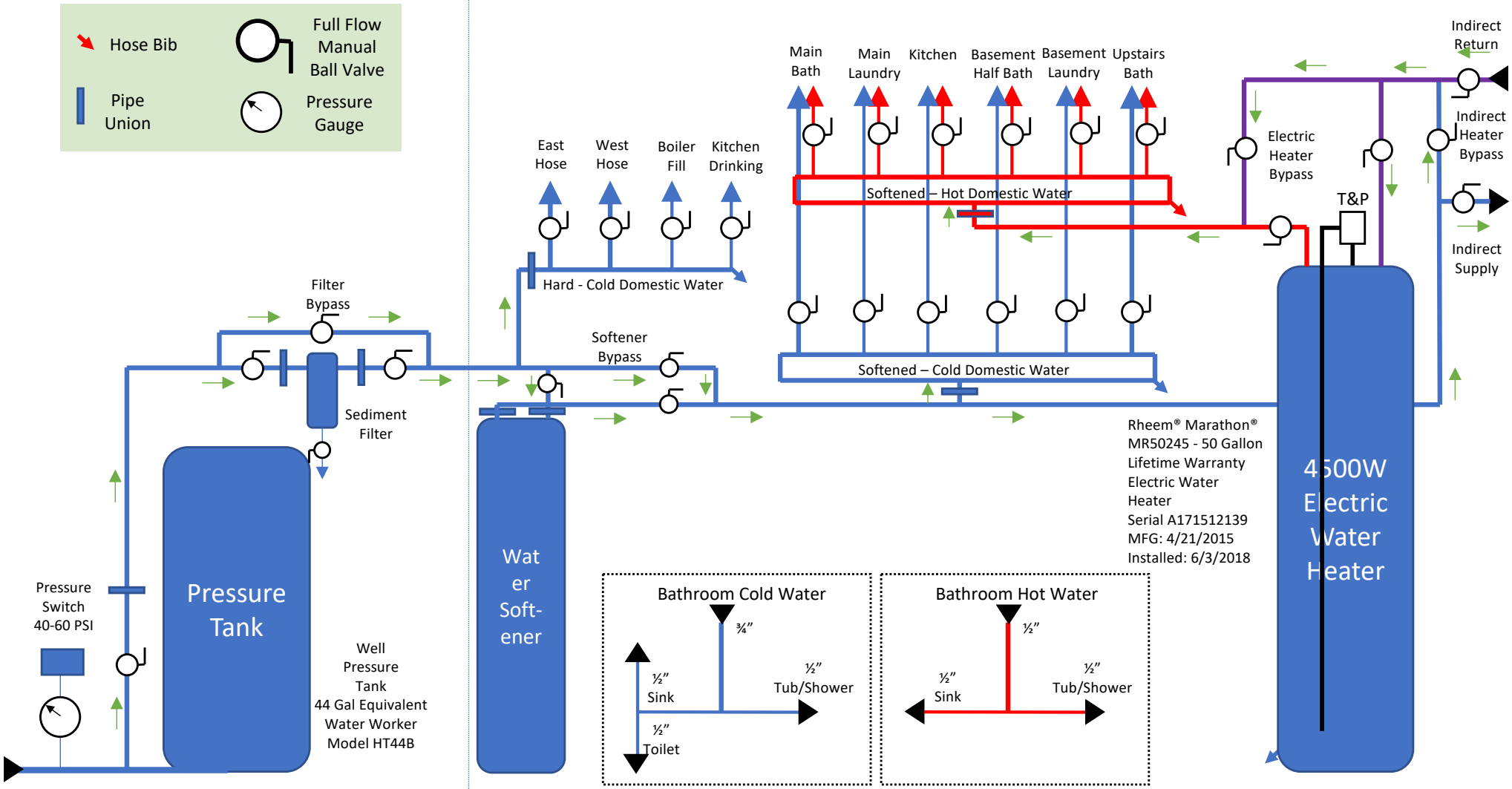
Potable Water System



Design notes:

Incoming well line is via plastic piping. It transitions to galvanized pipe for the well control and pressure tank system. A dielectric union is used to transition from galvanized to copper for the remainder of the system as described.

Copper lines are to be ¾" type L. Manifolds transition to PEX A – Expansion Type for runs to individual usage areas. Hot water lines are to be insulated for energy efficiency.

Potable water design including layout, valves, unions, etc. as implemented.		
Designed/Drawn by Mark Hatle		
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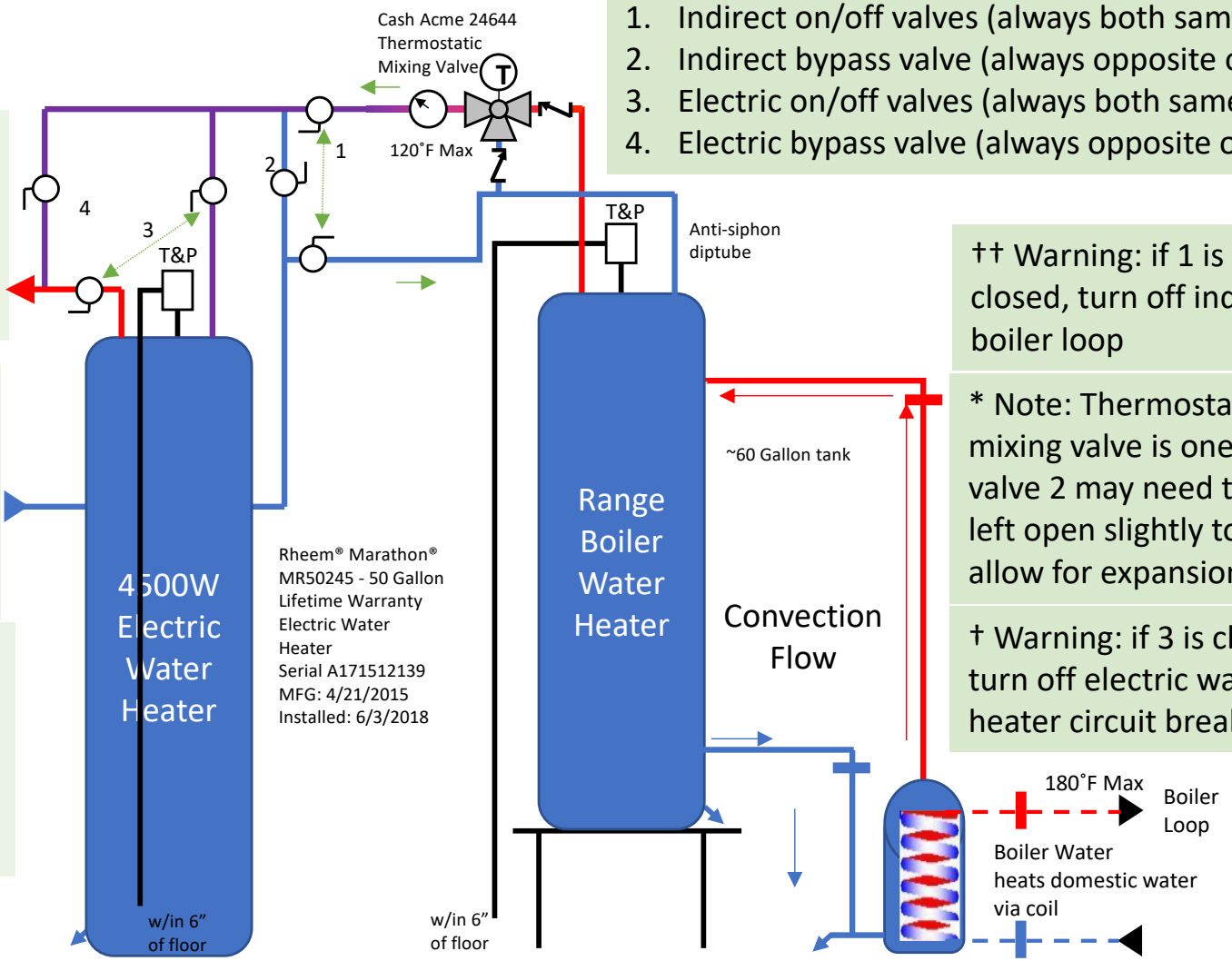
Domestic Water Heating

Indirect Preheat w/ Electric (std)
Open both to indirect (1)
Close indirect bypass (2) See Note *
Open both to electric (3)
Close electric bypass (4)

Indirect Only
Open both to indirect (1)
Close indirect bypass (2)
Close both to electric (3) See Warning †
Open electric bypass (4)

Electric Only
Close both to Indirect (1) See Warning ††
Open indirect bypass (2)
Open both to electric (3)
Close electric bypass (4)



1. Indirect on/off valves (always both same) †
2. Indirect bypass valve (always opposite of 1) *
3. Electric on/off valves (always both same) ††
4. Electric bypass valve (always opposite of 3)

†† Warning: if 1 is closed, turn off indirect boiler loop

* Note: Thermostatic mixing valve is one way, valve 2 may need to be left open slightly to allow for expansion.

† Warning: if 3 is closed, turn off electric water heater circuit breaker

Design notes:

https://inspectapedia.com/plumbing/Range_Boiler_Hot_Water.php
https://www.sustainablepreparedness.com/index.php/blog/hot-water-for-free-from-the-wood-cook-stove

"For every 2 horizontal feet of run away from the stove, there should be at least 1 foot of vertical fall from the cold water outlet on ranger boiler to the cold water inlet on the water coil."

Domestic water heating, including water heaters, valves, etc. as impl'ed.		
Designed/Drawn by Mark Hatle		
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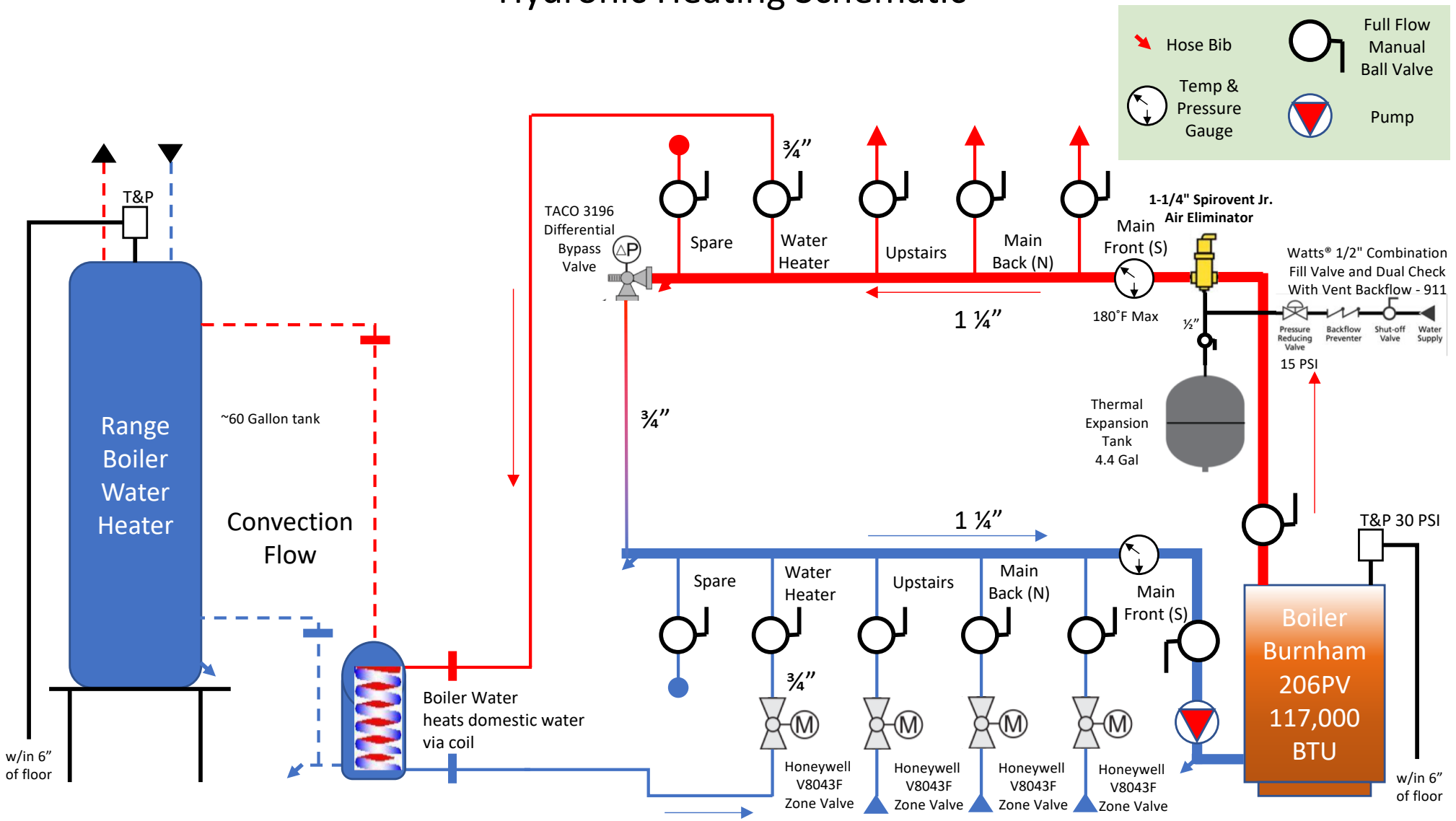
Hydronic Heating Schematic



Design notes:

https://inspectapedia.com/plumbing/Range_Boiler_Hot_Water.php
https://www.sustainablepreparedness.com/index.php/blog/hot-water-for-free-from-the-wood-cook-stove

"For every 2 horizontal feet of run away from the stove, there should be at least 1 foot of vertical fall from the cold water outlet on ranger boiler to the cold water inlet on the water coil."

Hydronic heating Schematic including indirect water heating		
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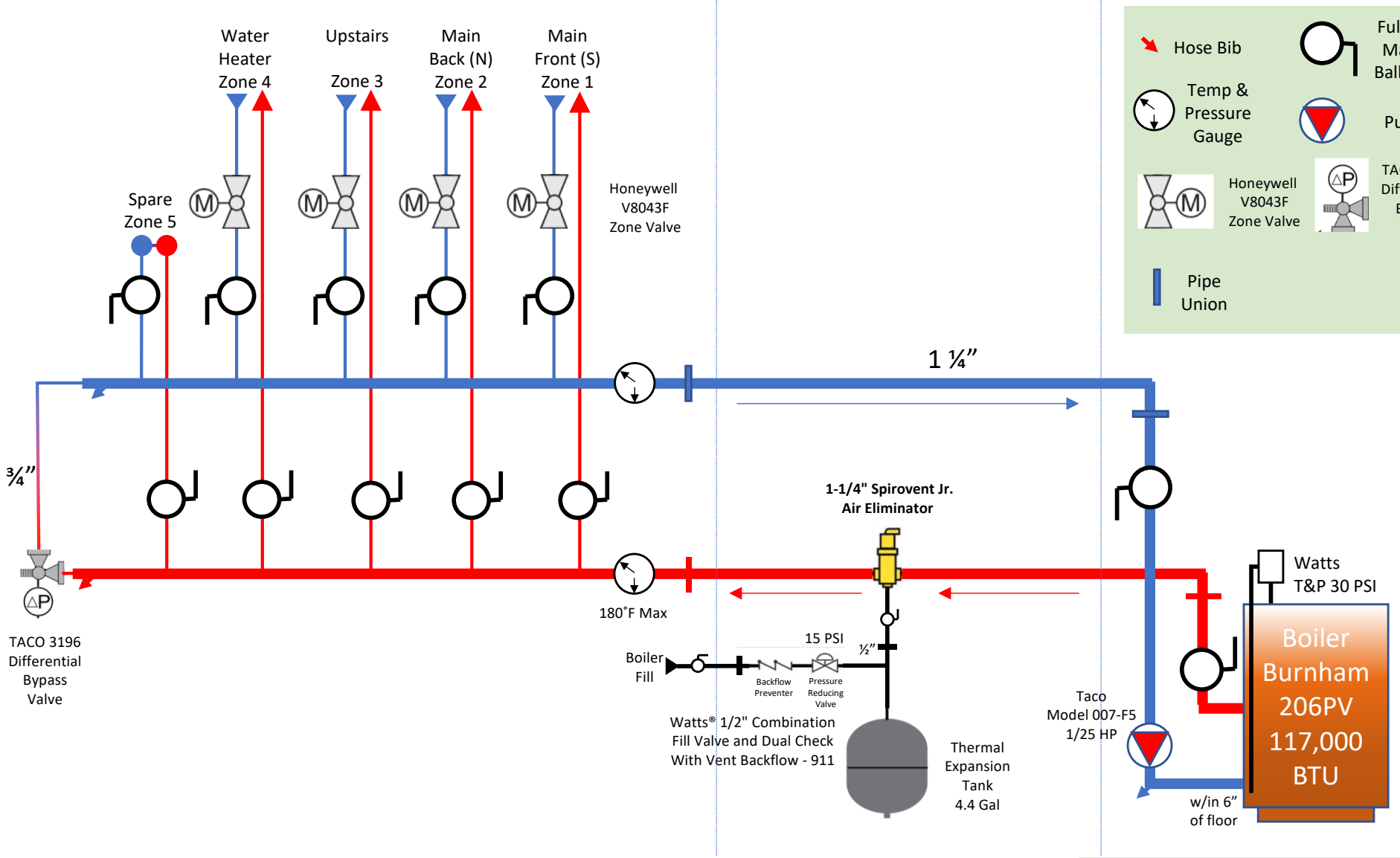
Hydronic Manifold/Boiler Layout



Design notes:

1 ¼” Type M copper lines are used to connect the boiler and manifolds. The manifolds are similarly 1 ¼” that transition To ¾” for each zone. Individual zones, including the pressure bypass, are ¾” Type M copper.

System may be pressure balanced using the various per zone ball valves.

Hydronic heating manifold and boiler layout, including valves, unions, etc.		
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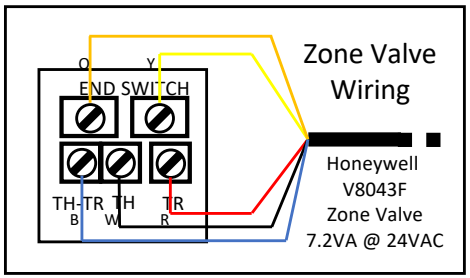
Heating and Cooling Wiring Diagram

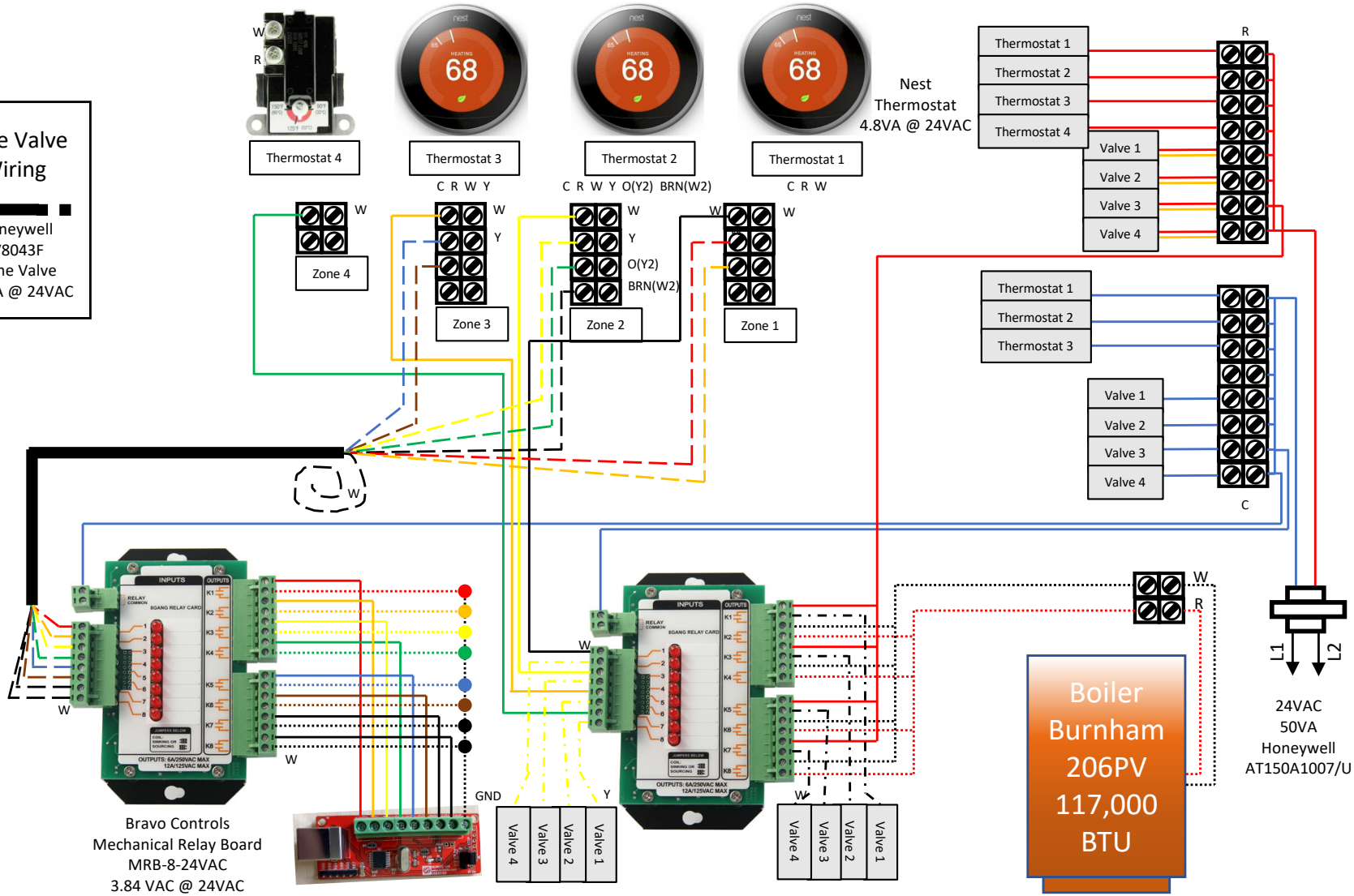


Max Calculated Current
28.80 VA - Zone Valves
14.40 VA – Nest Them
03.84 VA – Relay Board
03.84 VA – Relay Board

50.88VA @ 24VAC

Note: all relays would never be on at the same time. Maximum real world less then 50VA.

C – Blue - Common
R – Red – Power
W – White – Heat
Y – Yellow – Cool
G - Green – Fan
O – Orange
BRN – Brown
BLK - Black



Design notes:
Two relay systems are in this design, a primary heating relay and an auxiliary control relay.
The relay on the right, closest to the boiler, is the heating relay which controls and monitors the zone valves and boiler. It is wired for two relay/led per zone. The top LED will indicate the thermostat calling for heat, while the LED immediately below it will indicate the zone valve is open and requesting heat from the boiler. This can be used to diagnose malfunctions in either the thermostat or zone valves.
The relay on the left, handles auxiliary control via the GPIO module connected to the computer system. Note: The aux relay output side is NOT 24VAC. It is limited to the computer grounding, and 24VAC could damage the GPIO module and computer.
The extra white wire on the auxiliary wiring may be attached, as needed to one of the thermostats.

24VAC heating and cooling wiring and component diagram, as impl'ed.		
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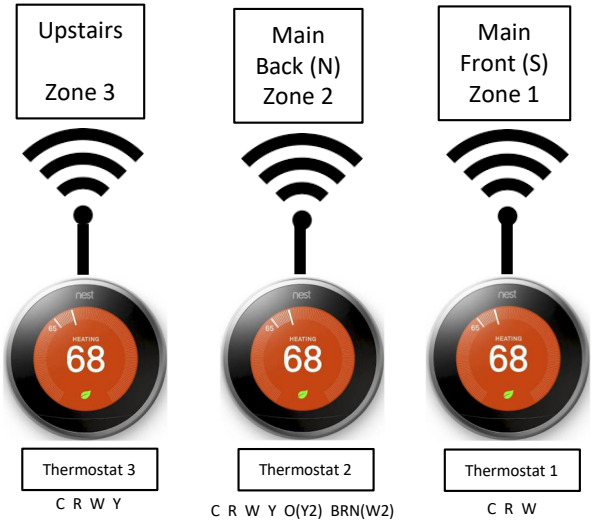
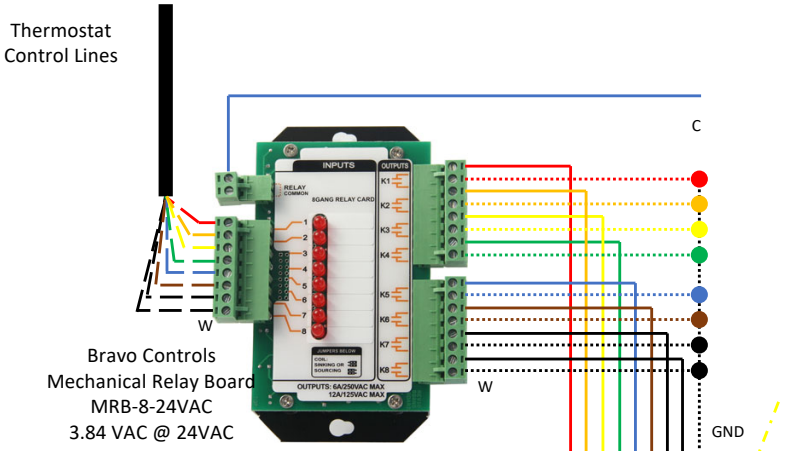
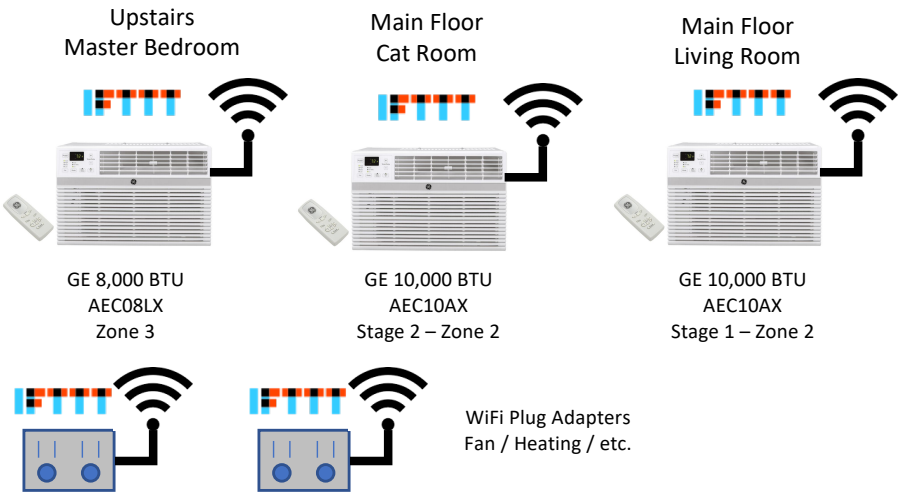
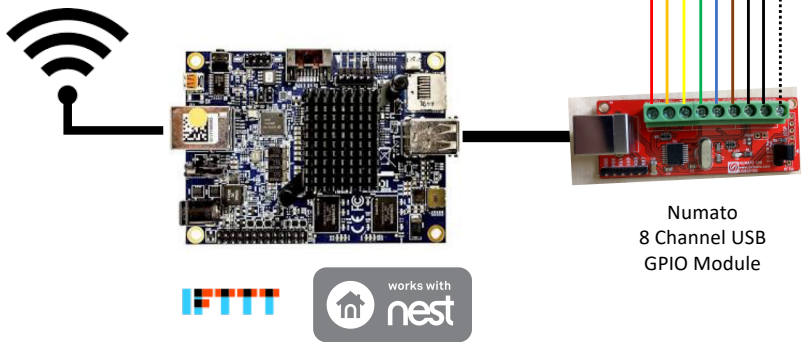
Heating and Cooling Aux Control









WiFi Plug Adapters
Fan / Heating / etc.

Software to link GPIO, Nest, IFTTT
https://github.com/mhatle/hvac-control

Components of auxiliary heating and cooling systems, computer controlled.		
Designed/Drawn by Mark Hatle		
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