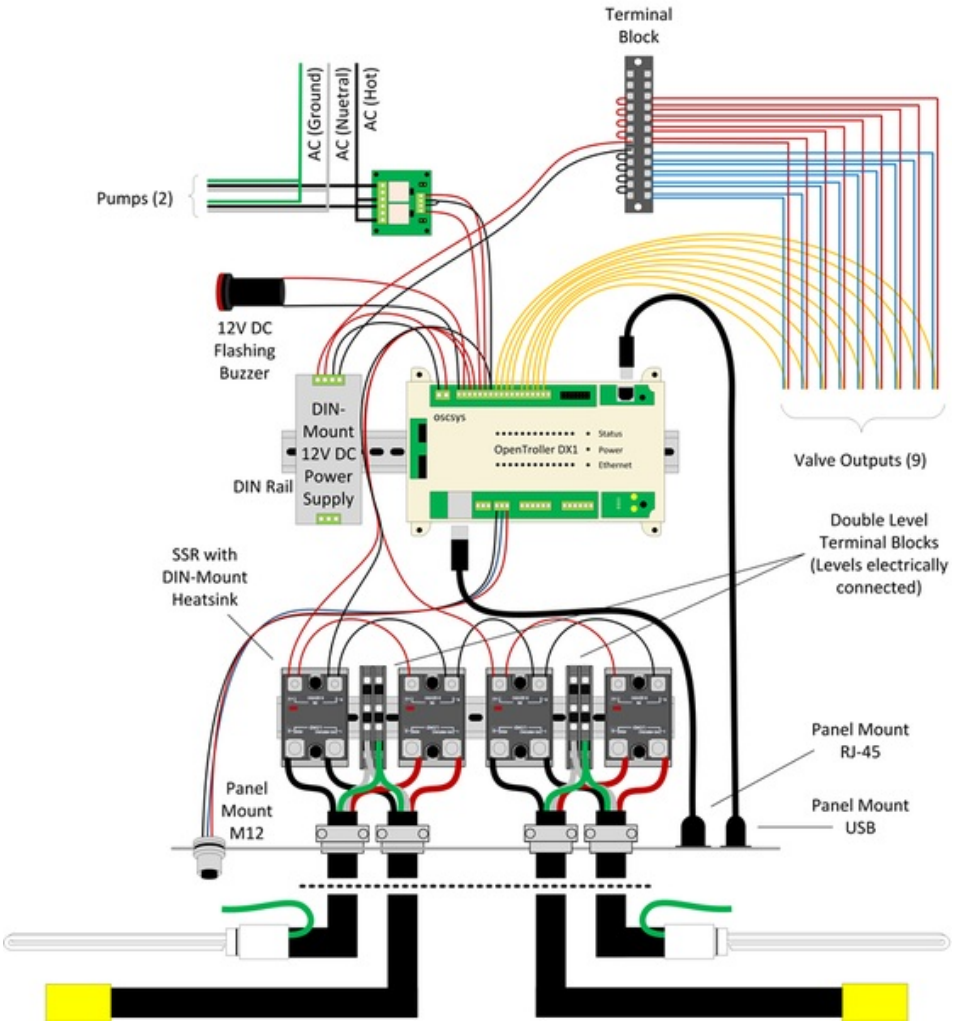
Recirculated Mash 2 Tier

The diagram below shows an example control panel layout for a 3-Vessel HERMS system with 240V electric HLT and Kettle controlled by the Brewtroller Phoenix.



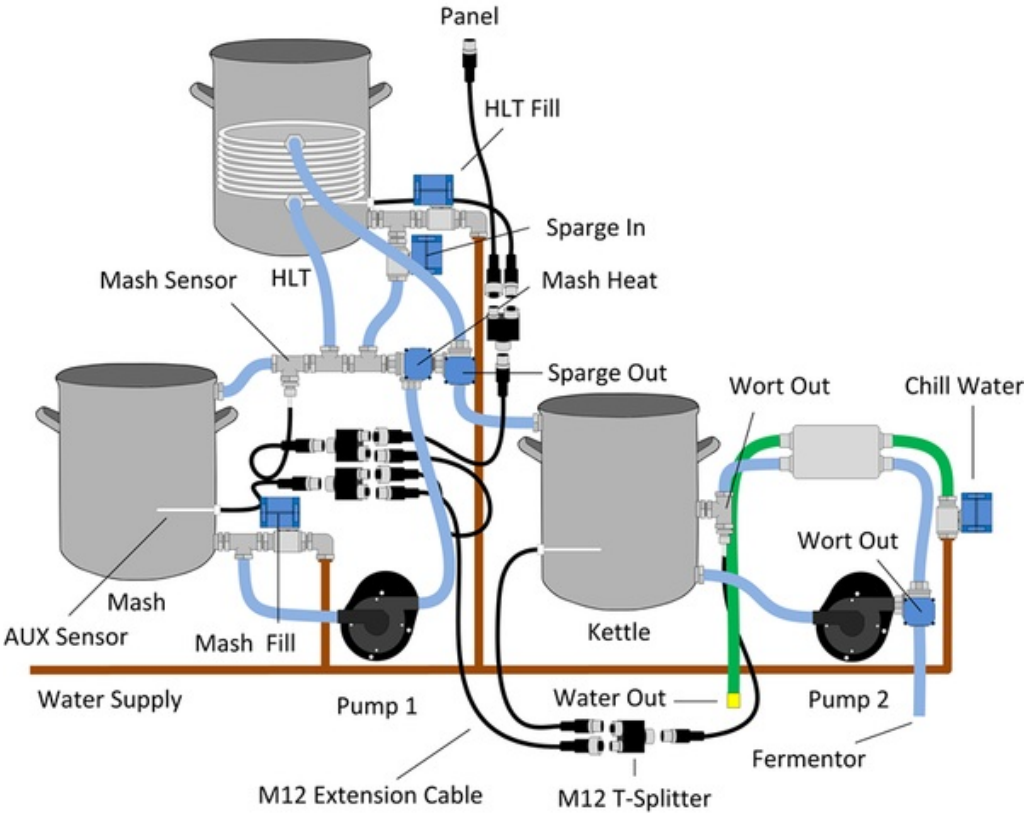
Notes:

- Always use GFCI protection devices for all circuits used in your system
- Electric heating elements should be permanently mounted in the vessel; A "heatstick" configuration is not recommended
- Wiring connections for electric heating elements must be enclosed to act as a barrier preventing people and liquids from making contact with dangerous voltages
- Vessels with electric heating elements should be grounded as shown by the green wire extending from the back of the electric element; In the event of an element malfunction the grounded vessel should immediately trigger GFCI or circuit breaker devices and prevent a person from becoming a path to ground
- Control of heating elements is provided by a pair of SSRs for each output as required to switch both hot leads of a US 240V AC circuit; A single SSR per circuit will switch the 240V AC circuit but leaves one lead hot at all times
- Always fully disconnect heating elements from the electrical source prior to making contact with element wiring

connections. Never rely on the controller to disconnect the circuit when personal safety is at risk.

- SSRs should be used instead of mechanical relays to support Pulse Width Modulation (PWM). When heat outputs are configured for PID Mode the output will be pulsed for a percentage of a user-configurable cycle time (1s is recommended for AC heating elements) allowing 0-100% variable output rather than simple On/Off.
- This system is based on the HERMS hardware profile for the DX1 providing two heat outputs (HLT and Kettle), one alarm output and eleven pump/valve outputs
- A RIMS system is similarly configured but trades one pump/valve output for a third heat output; Additional SSR(s) required for the RIMS element
- DIN mounted terminal blocks are shown to simplify wiring; A double level terminal block internally jumpered to interconnect the levels allows source and load connections on the bottom side of the DIN rail without requiring additional cable to route one side to the top of the DIN rail
- A terminal block is used to simplify wiring required to supply each valve output with constant 12V DC and ground required for operation (Note: All current valves offered by BrewTroller require only a single control wire but some valves sold previously and valves obtained form other sources may require a SPDT relay)

The following diagram shows a possible plumbing configuration for a two-tier HERMS system:



Notes:

- This system uses seven of the nine available pump outputs shown in the panel design above
- This system is designed for constant recirculation of the mash liquor. Pump 1 is active in both Mash Heat and Mash Idle valve profiles. The mash Heat 3-way valve is active in the Mash Heat valve profile which diverts the flow through the Heat Exchange (HEX) Coil in the HLT.
- Using a temperature sensor at the return to the Mash Tun as the Mash sensor is recommended for systems using constant recirculation. This sensor will be used to control whether the Mash Heat or Mash Idle valve profile is active whenever a Mash setpoint is enabled. A sensor in the Mash Tun can be assigned as an Auxiliary sensor (AUX 1/2/3) to monitor actual mash temperature.
- The Mash Heat Output should be configured for On/Off Mode. A larger hystersis value (1C or 2F) is recommended to reduce oscillating between Mash Heat and Mash Idle. Use the AUX Sensor in the mash to monitor and tune the system to provide consistent Mash temperatures.

- The Sparge In valve profile should activate the Mash Heat 3-way valve in addition to the Sparge In valve to force Sparge Liquor to flow through the sparge manifold and prevent liquor from flowing in reverse through the pump to the bottom of the Mash Tun
- The Sparge Out profile should enable Pump 1, the Mash Heat 3-way valve and the Sparge Out 3-way valve to allow Mash liquor to flow into the kettle.
- The use of a 3-way valve on the Kettle output in this system design allows wort in the Boil Kettle to flow through the pump and chiller during the Sparge and through out the boil. This will require recirculation during the last 20 minutes of the boil to sanitize these components. Pump 2 should be enabled as part of the Boil Recirc valve profile. Additional boil power may be required due to heat loss when this profile is first started (Manual control of boil power is available via the Encoder input during the Boil Step).
- The Wort Out sensor allows the temperature of the wort exiting the chiller to be monitored during the Chill Step. Chiller Water In and Out can also be monitored but are not shown in this system design.
- This system chills wort by means of a whirlpool back to the kettle. This is highly recommended as it allows cold break to collect in the kettle rather than transferring to the fermentor.
- Positioning the 3-Way Wort Out valve at the output of Pump 2 allows cooled wort in the Kettle to be pumped to the fermentation vessel. In this way brewers can avoid moving fermentors full of wort to where fermentation will take place.