**The Glitch & The Fix, November 2015**



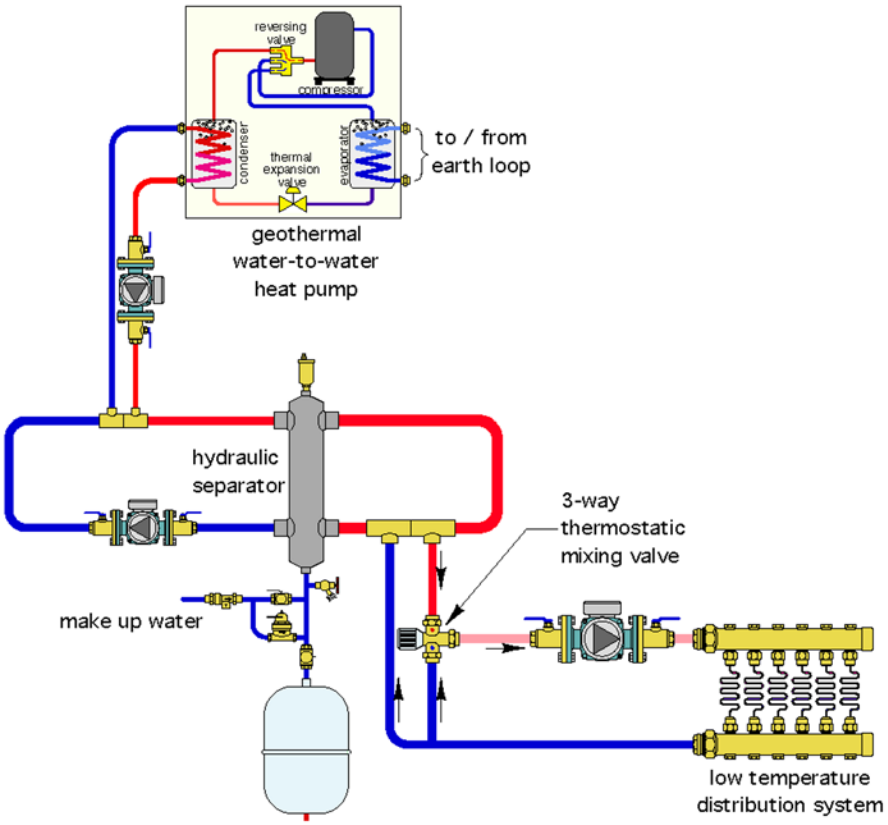
## No U-turns allowed

### The Glitch

An installer is asked to provide a relatively simple single-zone, slab-type floor heating system supplied by a geothermal water-to-water heat pump. He's heard that a hydraulic separator is a good component in such systems, and designs the layout shown below. He sets the high limit controller for the heat pump at 125° F and the thermostatic mixing valve to 105°.

When the system operates, it only delivers a tiny amount of heat to the building, even when all the circulators are operating. This heat pump only runs for two minutes at a time, then shuts off and locks itself out based on a high pressure fault.

Can you spot several details that are incorrect, and recommend ways to make the system work as intended?

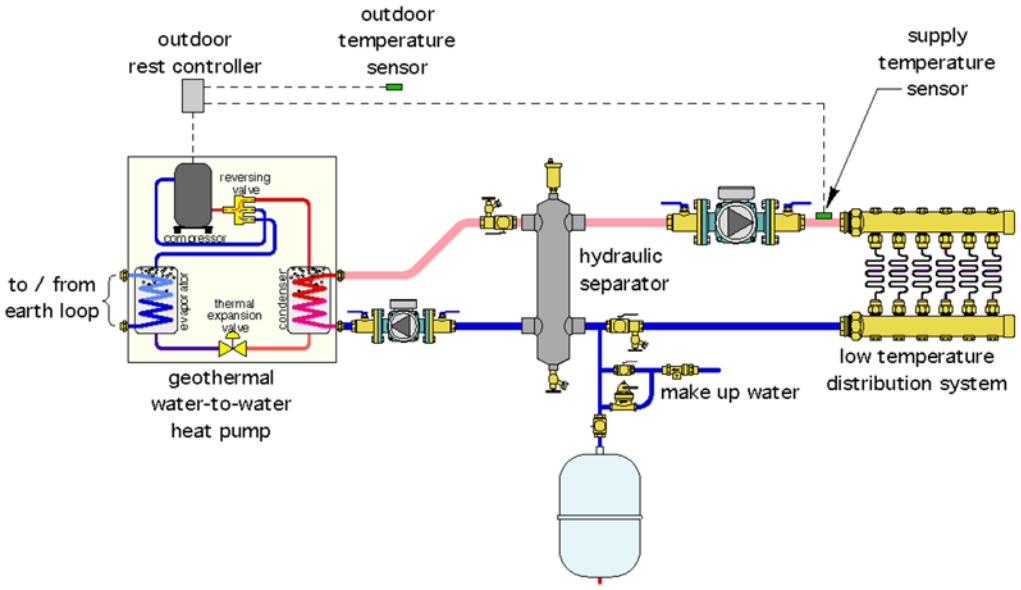


**The Fix**

This system contains many more components than necessary. It also bottlenecks and penalizes the performance potential for the heat pump. Here's the list of changes.

1. There will be very little circulation on the load side of the hydraulic separator. The circulator supplying the radiant floor circuits may provide adequate flow through those circuits, but that flow is just going to do a U-turn at the closely spaced tees to the right of the hydraulic separator. The only flow that would develop on the right side of this separator will be a tiny momentum-induced flow created by the circulator on the left of the separator.

Don't blame the hydraulic separator. It's doing exactly what it is designed to do (e.g., prevent flow in one circuit from inducing flow in a connected circuit). If you're going to create a circuit and expect more than a trickle of flow through that circuit, it needs to have a circulator.




2. It makes no sense to operate the geothermal heat pump above the temperature necessary to meet the current heating load. Operating the heat pump at 125° F and mixing down the water temperature to the floor circuits just reduces the COP and heating capacity of the heat pump. This scenario also "wastes" the potential of outdoor reset control.

Although the floor might need 105° supply water on a design load day, there are many other days when the water temperature could be lowered and still meet the load. The heat pump should be set up to operate based on outdoor reset control. This will reduce the water temperature in the system under most conditions, and allow the heat pump to operate at the highest possible COP and capacity.

3. It’s not a good idea to install the expansion tank straight down from the bottom connection on the hydraulic separator. Any dirt separated from the flow stream will just land on top of the diaphragm in the tank. Just move the tank connection point to the right of the separator as shown in the Fix drawing on the previous page.

4. The piping connections on the heat pump in the Glitch drawing are reversed from what they should be relative to the top-to-bottom flow of refrigerant in the heat pump’s condenser. Always pay attention to the flow direction through the heat exchangers in heat pumps.

5. It’s totally unnecessary to have two circulators on the left side of the hydraulic separator. Just pipe in the heat pump as shown on the Fix drawing, and be sure the circulator can produce the necessary flow and head required by this circuit.

6. It’s good to include a means of readily filling and purging the boiler circuit as well as the distribution system. The purge valve shown in the Fix drawing allow for this. Why spend hours trying to coax bulk air out of the system when you can flush it out in a couple of minutes?

Less parts, lower cost, faster installation, much better performance. Don’t overcomplicate your systems.