The Glitch and The Fix, October 2013

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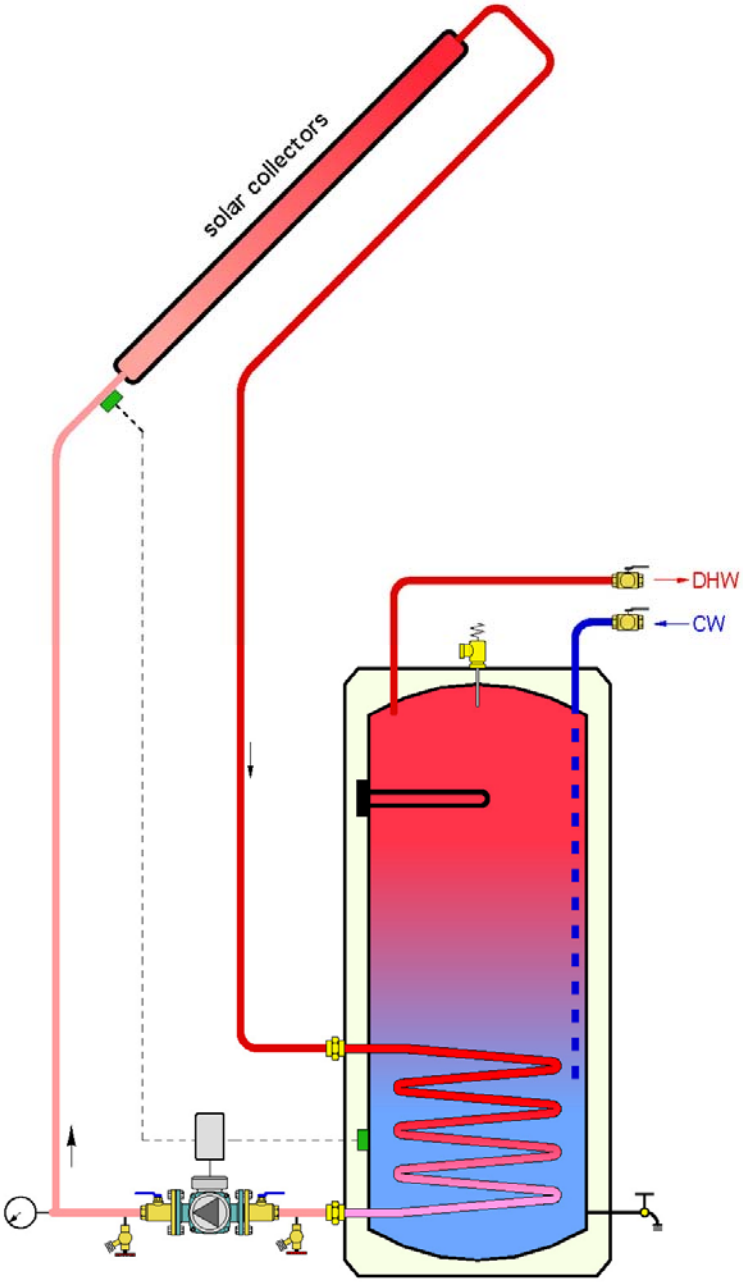
Pieced together

The Glitch

Joe Wrenchturner gets a call to install solar water heating for a longtime customer. He buys some flat-plate collectors through an online source and decides to assemble the remainder of the system using hardware he installs for other hydronic systems.

The system he assembles is shown below. Can you spot a few details that should be changed before the sun shines on this installation?



The Fix

1. All closed-loop piping circuits with a heat source must contain a pressure-relief valve and an expansion tank. Without them, you're going to have a mess when the weakest piping component in the circuit lets go with superheated glycol ready to blast out.

2. The collector circuit must include a check valve to prevent nocturnal cooling caused by cool glycol in the collectors descending down the supply pipe as warm glycol from the heat exchanger rises up the return. Trust me, this can dump an entire tank's worth of heat back to the atmosphere in a few short hours.

Note the check valve has been mounted between a pair of purging valves on the Fix schematic. Add glycol solution to the circuit using the left side valve and remove purging flow through the right side valve. The differential pressure associated with purging keeps the swing check back-seated and eliminates the need for installing a ball valve.

Also note that the position of the check valve allows the collector to empty from both directions should a vapor flash occur under stagnation conditions.

3. The Point Of No Pressure Change is still applied in solar circuits. Mount the circulator to pump away from the expansion tank location.

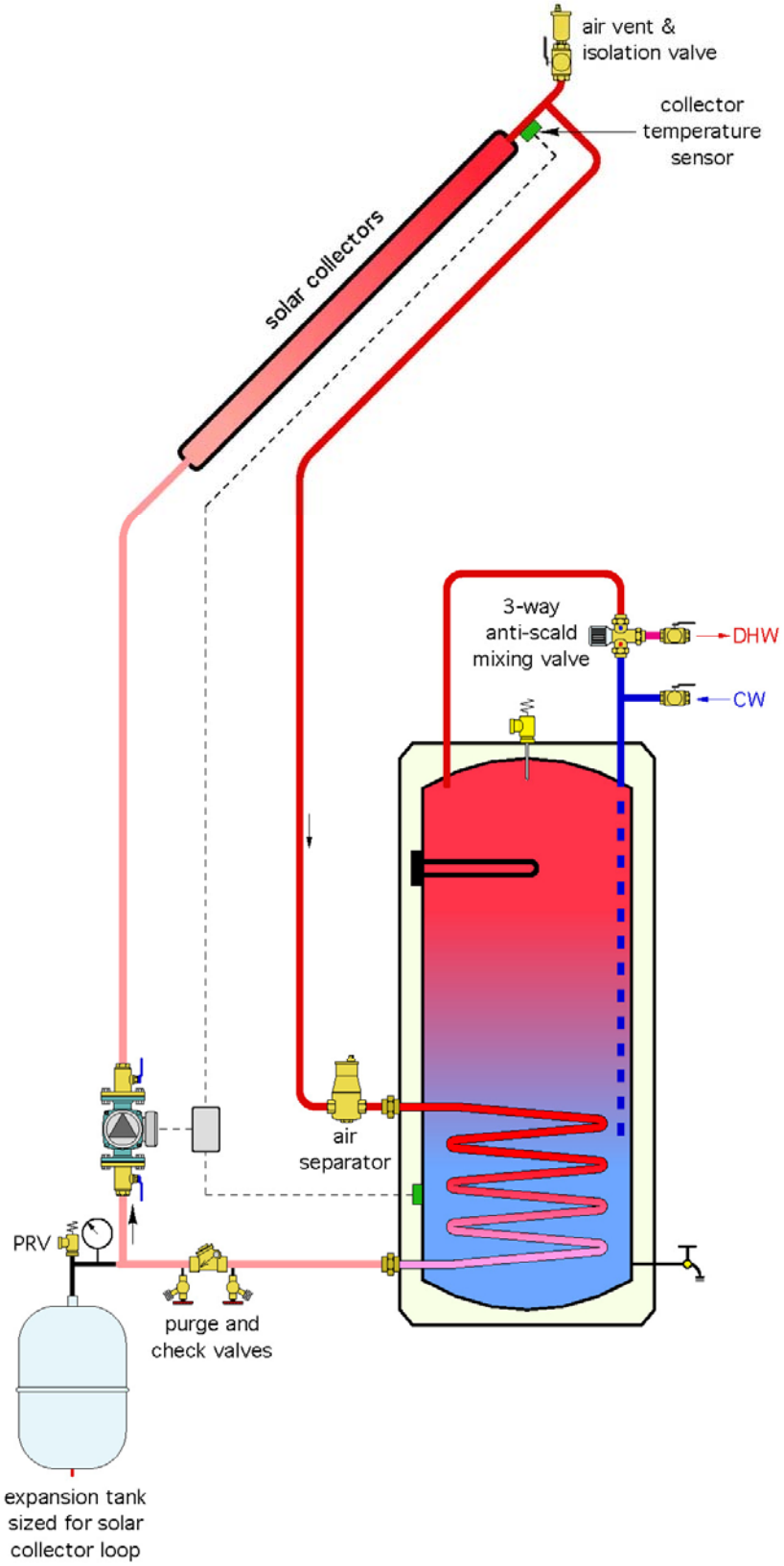
4. Although the Glitch system may operate, it's not going to perform well with the collector temperature sensor mounted on the inlet rather than the outlet of the collector. This sensor should be as close as possible to the collector outlet. Mount it tight and be sure it's wrapped with insulation.

Also be sure that no moisture can get into the wiring splice between the collector sensor and the cable back to the controller. Moisture leads to corrosion, corrosion leads to resistance change, and resistance change in a thermistor sensor circuit leads to inaccurate temperature information and poor control.

5. *Never* install a solar domestic water heating system without an anti-scald-rated thermostatic tempering valve between it and the plumbing fixtures.

6. I would also recommend a microbubble air separator in the collector circuit and an expansion tank sized specifically to absorb the liquid volume of the collectors (during stagnation), plus the expansion volume of the remaining fluid at the maximum anticipated system operating temperature..

7. Finally, install a good-quality, float-type air vent, one that's rated for "solar duty," at the top of the system. Set it on top of a ball valve that can be closed after the system is deareated. This protects the vent mechanism from potentially high temperatures (350+° F) and high pressure when the collectors stagnate.


air vent &
isolation valve
collector
temperature
sensor
solar collectors
3-way
anti-scald
mixing valve
DHW
CW
air
separator
PRV
purge and
check valves
expansion tank
sized for solar
collector loop