

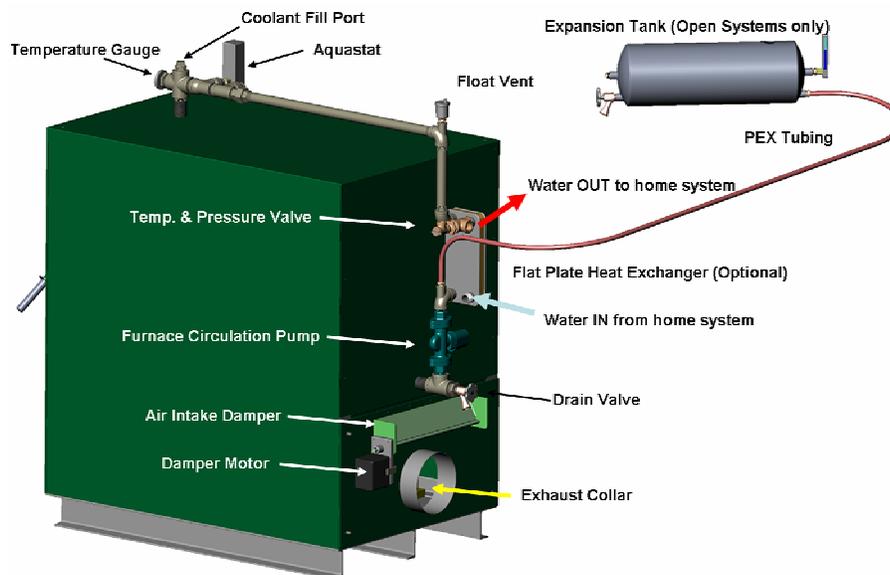
## Technical Bulletin #4

# PLUMBING CONFIGURATIONS

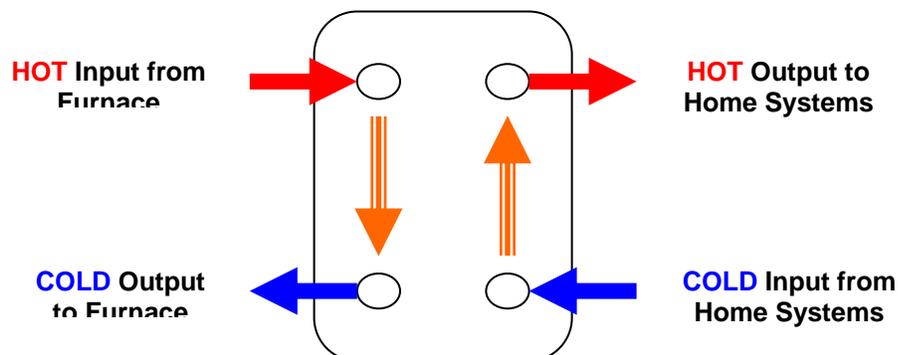
The Greenwood furnace is a clean-burning, high-efficiency, wood-fired furnace. It provides a steady flow of high-temperature heat transfer fluid (“coolant”) to various devices in your hydronic heating system, including hot water tanks and heaters, baseboard or free-standing radiators, radiant panels, in-floor radiant heat loops, and many others. You can supplement an existing hydronic or forced-air central heating system; produce domestic hot water; heat your greenhouse, garage, outbuilding, and/or swimming pool; and even furnish warm water to a snowmelt system.

The furnace can be configured in either a “closed system or “open system” configuration. One option for an open system installation is to use a flat-plate heat exchanger on back of the furnace. A wide variety of heat exchangers is available to match your system’s requirements for flow rate, pressure drop, and temperature. If you have heat loss calculations for your home, and some basic information on the components in your existing system, Greenwood can help you select the appropriate heat exchanger for your application. In many cases, we can install the heat exchanger at the factory. If the homeowner or system designer wishes to provide their own heat exchanger, Greenwood ships the furnace with the proper connections.

### Model 100 Greenwood Furnace



### Flat Plate Heat Exchanger Ports (Optional)



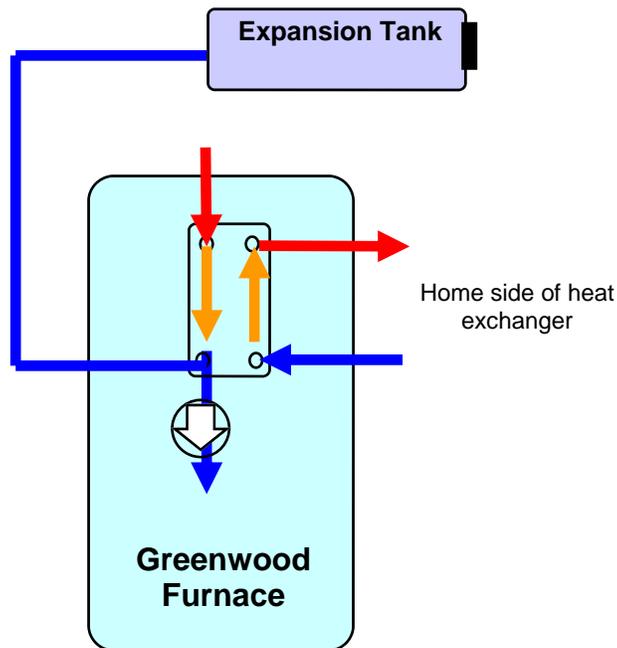
**IMPORTANT NOTE:** The Greenwood furnace operates independently or as an add-on to an existing central furnace or boiler. If used as an add-on, the home system must be in good operating condition; meet all local building codes, ordinances, and safety standards; and be installed with required controls and in accordance with appropriate standards of the National Fire Protection Association.

**IMPORTANT NOTE:** Installation of the Greenwood furnace must conform to the same standards and codes described above for a central heating system and meet the minimum clearances specified on the furnace nameplate.

The following examples illustrate ways to configure the system as a closed or open system to meet everyday heating needs. Please consult your HVAC professional to determine the configuration required to meet your specific needs.

### **Basic “Open System” Configuration**

An “open system” configuration means the circulation system is open to the environment. In this illustration, a mixture of propylene glycol and water flows through the manifold on the furnace side of the heat exchanger. This fluid does not mix with the water or fluid flowing through the home side of the heat exchanger. This configuration offers the greatest plumbing flexibility, and the water/glycol mixture protects the furnace from corrosion and freezing.

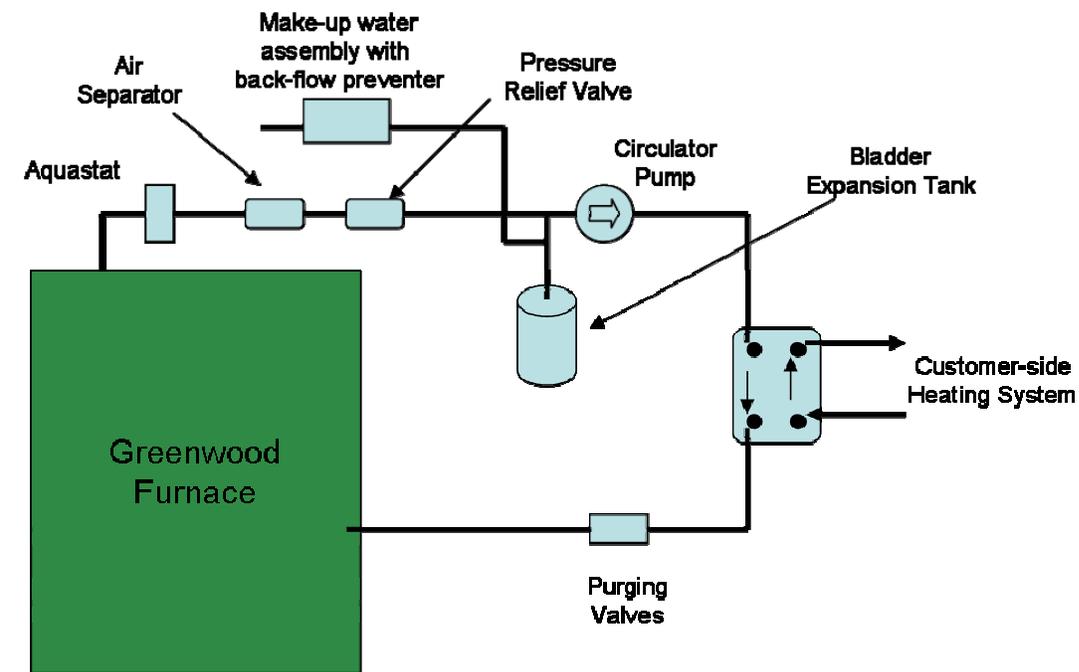


## **Basic “Closed System” Configuration**

A “closed system” configuration means the circulation system is closed to the environment. The components of a closed loop configuration include a continuous source of make-up water coupled to the system with a mixing valve and backflow preventer, pressure relief valve, bladder-type expansion tank, air separator, purge valve, fluid level sensor and shutdown switch and a y-strainer or filter.

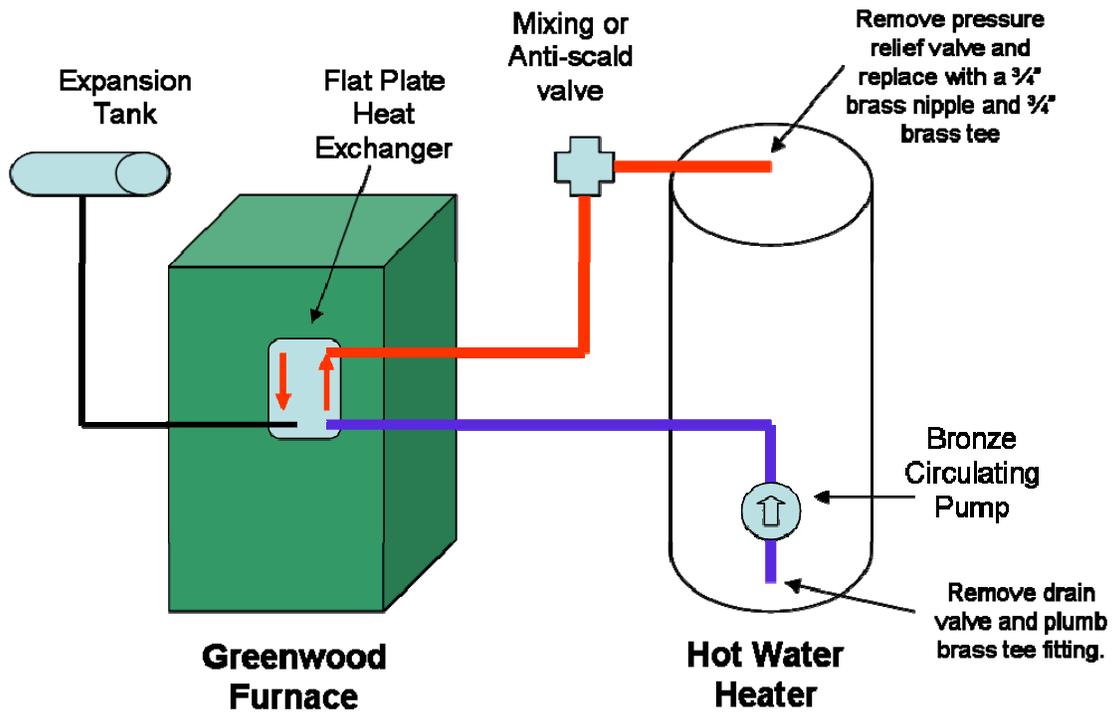
The fluid circulating through the system should still be a mixture of propylene glycol and water to provide protection against corrosion and freezing. This fluid does not mix with the water or fluid flowing through the home side of the heat exchanger. Failure to protect the system will void the warranty.

We highly recommend that a licensed professional HVAC installer or contractor and designer be hired to aid in this installation.



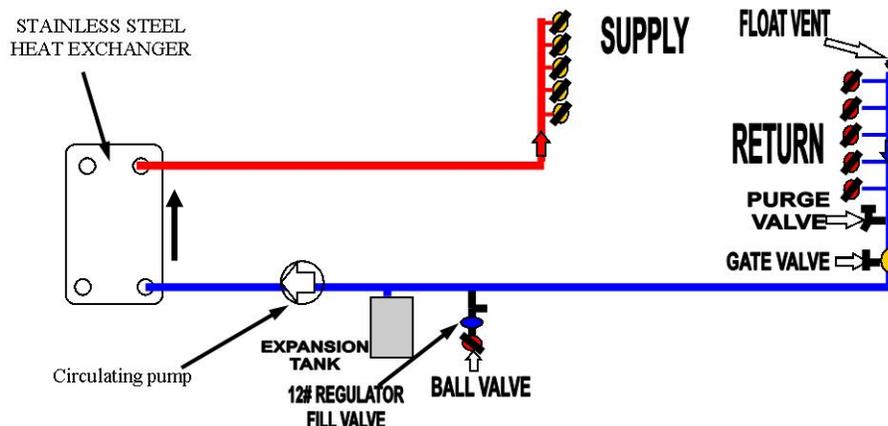
## Connecting to an existing water heater – Open System

Use the following configuration when a high efficiency water heater (gas, oil or electric) is the primary source of heat for the home. The Greenwood furnace pre-heats the water so that the water heater burner only fires when needed as backup. The water heater drives the hydronic heating system and provides domestic hot water. (Note: a mixing valve is typically required to reduce the water temperature from 165 degrees to approximately 120 degrees for domestic hot water).



## Connecting directly to a radiant heating system – Closed System

Use the closed system configuration below when connecting the Greenwood furnace directly to a radiant heating system. This type of loop can also heat a greenhouse or operate a snowmelt system.



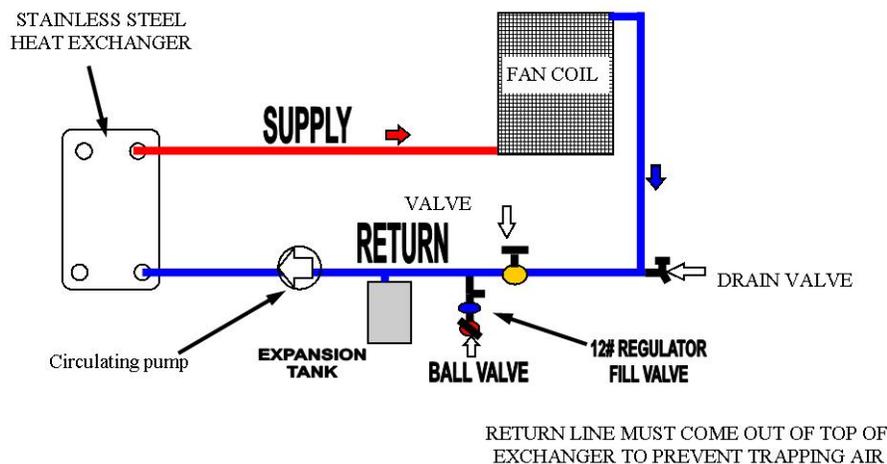
## Connecting to a forced-air heating system – Closed System

The configuration below illustrates a closed system design where the Greenwood furnace is added to a forced-air heating system using a water-to-air heat exchanger mounted in the plenum of the forced-air system. This same type of loop can be used with hydronic space heaters (water-to-air heat exchanger with a fan) to heat a garage or outbuilding.

Correctly size the water-to-air heat exchanger for the plenum (duct) and install it normal (90 degrees) to the air flow on the hot air side of the fan. Keep all four sides level so that air passes through the finned area of the heat exchanger evenly. The hot water line from the furnace enters the bottom fitting of the heat exchanger and exits the top.

After installing the plenum heat exchanger, it may be necessary to increase the airflow by changing the pulleys on a belt drive system or adjusting the speed of the motor on a direct drive system.

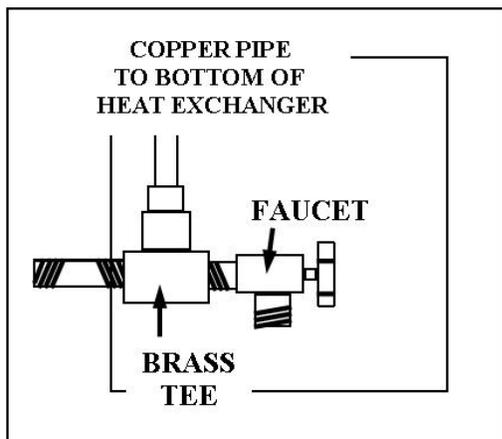
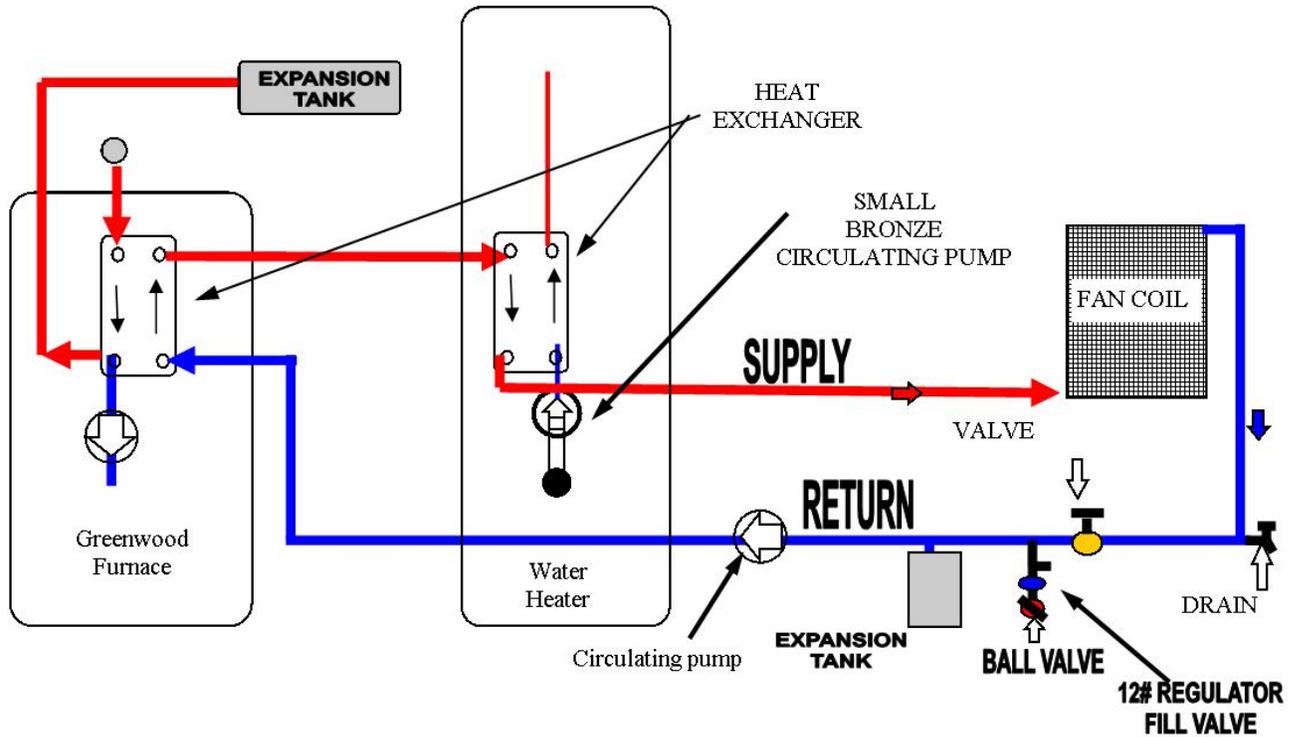
Do not tamper with the existing controls when installing heat exchangers, Hire a qualified electrician or HVAC professional and follow all state and local codes. Wire thermostats according to directions provided by the manufacturer.



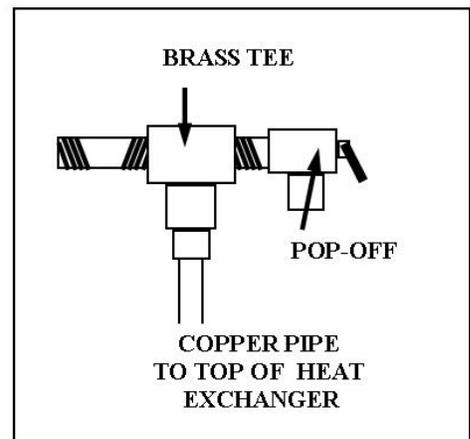
**WARNING:** Install the water-to-air heat exchanger on the warm-air side of the central furnace fan. Installing the exchanger on the cold-air return inlet may overheat components of the furnace and cause them to operate other than as intended.

## Connecting to a forced-air heating system with domestic hot water loop – Open System

The configuration below illustrates a two-loop system using two water-to-water heat exchangers. The main loop provides heat to the water-to-air heat exchanger mounted in the plenum. A secondary loop provides hot water to the existing water heater. (Note: a mixing valve is typically required to reduce the water temperature from 165 degrees to approximately 120 degrees for domestic hot water).



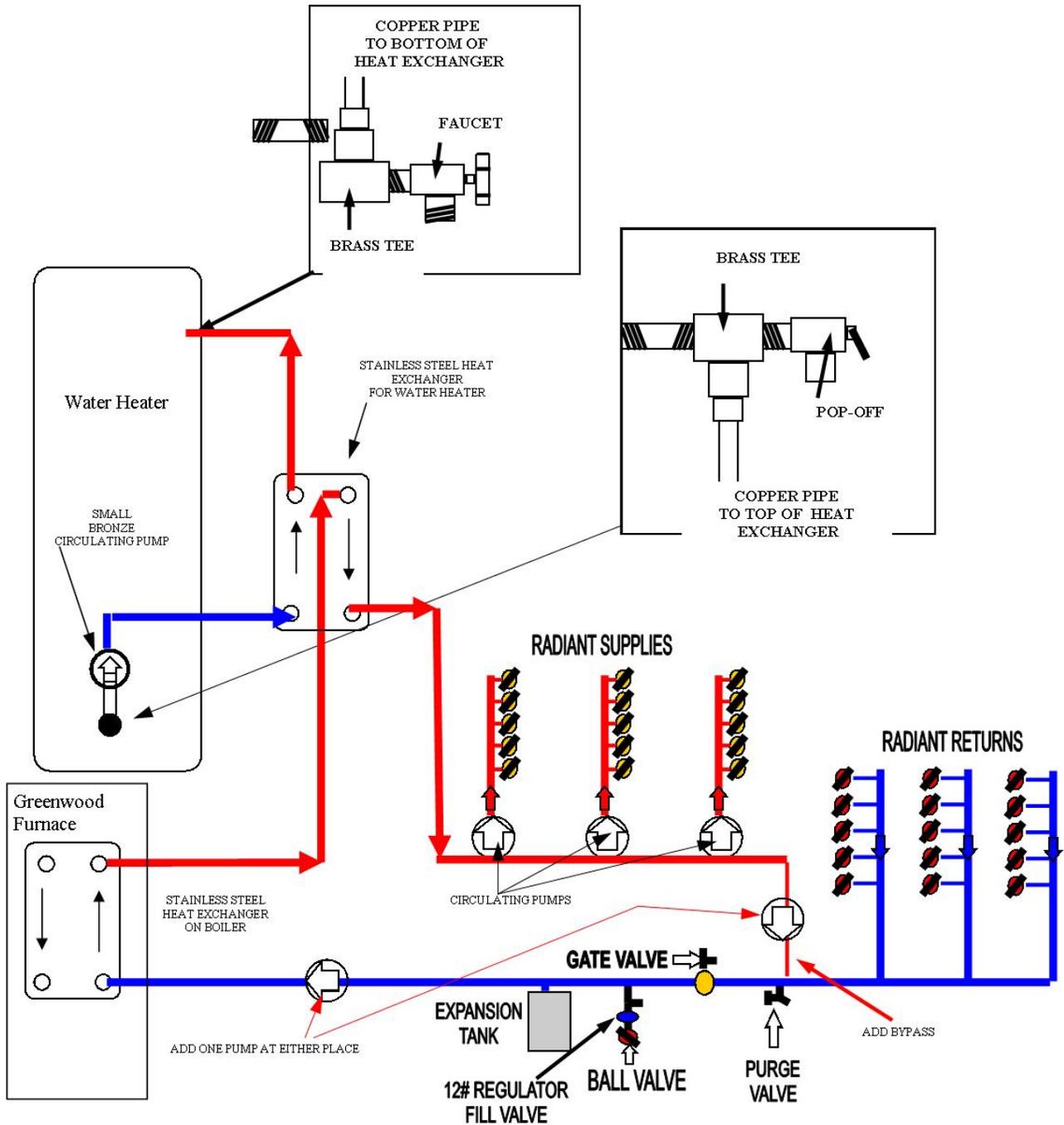
HOW TO PLUMB HEAT EXCHANGER TO WATER HEATER



**WARNING:** Install the water-to-air heat exchanger on the warm-air side of the central furnace fan. Installing the exchanger on the cold-air return inlet may overheat components of the furnace and cause them to operate other than as intended.

## Connecting to a radiant heating system with domestic hot water loop

The configuration below illustrates a two-loop system using two water-to-water heat exchangers. The main loop provides heat to the radiant heating system. A secondary loop provides hot water to the existing water heater. (Note: depending on the system configuration, a mixing valve may be required to reduce the water temperature from 165 degrees to approximately 120 degrees for domestic hot water).



## Connecting a three loop system

The configuration below illustrates a three-loop system.

- The first loop provides hot water to an existing boiler in the house for use in heating and domestic hot water. The boiler itself fires only as backup.
- The second loop provides hot water to a fan-driven water-to-air heat exchanger (“fan coil”) in the shop.
- The third loop provides heat for the swimming pool.

