Troubleshooting a Gas-Fired Hot Water Boiler

Boiler Basics

Modern boiler systems for home heating are hydronic systems, in which the boiler heats water for circulation throughout the house. They are closely related to [steam boiler systems](https://www.thespruce.com/residential-steam-boilers-1824732), but rather than circulating actual steam, hydronic systems have pipes carrying the hot water that radiates heat through either steel radiators or baseboard convectors (sometimes called "fin-tubes"). In these hot water systems, once the radiator or baseboard convector is heated with the hot water, the cooled water is returned back to the boiler to be reheated, and the water circulation loop continues.

Understanding the components of a hot water boiler helps you with basic troubleshooting steps.

Components of a Hot Water Boiler

A boiler is a bit more complex than a forced air furnace in that it has more parts, valves, and controls. However, gas-fired boilers are fairly reliable and, when problems do occur, they are usually related to the expansion tank or water circulation pump(s).

Here are the major components of the boiler for a hot water (hydronic) system:

Hot Water Supply Side

Aquastat: A thermostat that regulates the boiler's temperature

Gas valve and burners: The combustion assembly that heats the water chamber

Combination pressure/temperature gauge (tridicator): Monitors water temperature and pressure

Water feed valve: Controls water flow to the boiler

Pressure-reducing valve: Automatically maintains correct water level and pressure at about 12 to 15 psi (pounds per square inch)

Air vent: Automatically purges unwanted air from the hydronic system

Pressure-relief valve: Safety valve that automatically opens if the pressure gets too high inside the boiler

Expansion tank: Allows expansion of water as it heats; there are two types of expansion tank: horizontal-style (older, larger) and diaphragm-style (newer, smaller)

Flow control valve: Regulates the flow of hot water to the system

Hot Water Return Side

Circulation pump: The electric pump that circulates water through the system

Drain valve: A valve that opens to allow for draining the boiler

These are the common problems that may be occurring if your boiler doesn't produce heat:

The boiler has no power: The circuit breaker or fuse controlling the furnace may have tripped or blown. [Reset the tripped circuit breaker](https://www.thespruce.com/reset-a-tripped-breaker-4134193) or replace a blown fuse.

Water level low: Maintain water level in the boiler at half-full. The boiler's automatic filling system, controlled by the pressure-reducing valve, should maintain the proper water level at 12 to 15 psi of pressure. If there is no pressure-reducing valve, you can manually feed the boiler by opening up the water feed valve until the boiler pressure reaches 12 psi.

Natural gas or propane control valve for burner is closed: Make sure the valve is open.

Pilot light out or malfunctioning: Relight the standing pilot.

Electronic burner ignition malfunctioning: On boilers with no standing pilot, troubleshoot the electronic ignition system.

Thermostat malfunctioning: Check that thermostat is in heat mode and has an appropriate temperature setting. Try moving the thermostat setting for the temperature up or down a few degrees. If this does not work, [troubleshoot the thermostat](https://www.thespruce.com/troubleshooting-thermostat-1824780).

### If Boiler Heats Poorly

These are the common problems for a poorly heated boiler:

Improper water level: This is the more likely cause if the change in heating capacity has been sudden. Check the reading of the tridcator (combination pressure/ temperature gauge). If the water pressure is low (below 12 psi), the system needs to have water added. The boiler's automatic filling system controlled by the pressure-reducing valve should maintain the proper water level at 12 to 15 psi. If there is no pressure-reducing valve, you can manually feed the boiler by opening up the water feed valve until boiler pressure reaches 12 psi.

Mineral deposits accumulating in boiler and heat exchanger: This is the likely cause if the change has been gradual. Flush the boiler or call a boiler pro.

The expansion tank has too much or too little water. The tank must be properly charged with air to prevent boiling.

This is usually due to an improperly charged [expansion tank](https://www.thespruce.com/water-heater-expansion-tank-information-2719063). In older boiler systems, the steel expansion tank may be found in the attic or suspended between joists in the basement. In newer systems, the diaphragm expansion tank may be attached to the boiler piping near the boiler. The expansion tank must be properly [charged with air](https://www.thespruce.com/recharge-boiler-expansion-tank-4134203) to prevent water in the system from boiling and exceeding the desired 12 psi of pressure. The expansion tank provides a cushion of air to accommodate expansion and contraction of water in the system, and without the cushion, the water may stop circulating and begin to boil.

If Water Leaks Around the Boiler

​If you find a leak around your boiler then you may have a:

Faulty circulator (pump): Most repairs to the circulator require a service technician

Leaking circulator: It may be possible to replace the pump seal.

Leaking pressure-relief valve: This can be caused by the expansion tank being filled with water. Otherwise, the valve may have sediment preventing it from closing. To check this, turn the boiler off and let it cool. Lift the manual pressure relief lever and discharge some water for 3 seconds, then allow it to snap back into the closed position. The water should discharge strongly and be relatively clean. If the valve leaks slightly afterward, this could be due to sediment trapped in the seat. Open the valve again and discharge a second time.

Faulty pressure-relief valve: If no water at all discharges from the valve, or if the valve will not close at all, shut off the boiler water feed valve and replace the pressure-relief valve.

Leaking water pipe connection: If water is leaking or dripping from a pipe, follow the leak back to its source and repair the connection where the leak is originating. This requires [turning off the water supply](https://www.thespruce.com/where-to-shut-off-the-water-2718723) to the house and draining the boiler system.

If Some Radiators Do Not Heat

These are the common reasons for your radiator not heating:

Air trapped in lines or in the radiator: Bleed air from a cool radiator by opening the radiator bleed valve at top of the radiator. When water squirts from the radiator, close the valve.

Faulty zone valve: Check zone valve for proper operation. Water pipe should be hot up to and beyond the zone valve. If the valve is faulty or stuck, lines will be hot up to the valve but will cool off slightly beyond the valve. Have a faulty valve replaced by a pro.

Faulty circulator: Check circulator for proper operation (make sure motor runs). There may be dedicated circulators for different heating zones in the home. Have the circulator replaced if it is faulty.

If Pipes Are Noisy

These are the common problems of noisy pipes:

Faulty circulator: Check the circulator. There is a spring-loaded coupling that connects the pump to the motor; when it breaks after the pump jams, the coupling will make a loud noise as the motor runs. A bad circulator pump will need to be replaced by a technician.

Water trapped in return lines: Check to make sure the pitch of the return lines slopes back toward the boiler. Adjust pitch with new pipe hangers, if necessary. You may also need to adjust the pitch of the radiator [with a shim](https://www.thespruce.com/shim-uses-1822862) so that it slopes back toward the return pipe.