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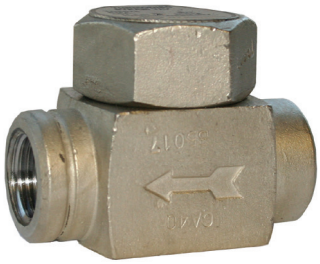
Series 2000 Regulator Troubleshooting

1. Make sure drip traps were installed first.

Installing drip traps ahead of regulators prevents accumulation of condensate that can cause water hammer and destroy the valve.



B&G Hoffman Specialty® Thermodisc Trap

2. Check for dead-end service.

The industry standard seat leakage rate for metal single seated valves is .01% of rated flow. Special lapping may be required in applications where .01% flow will cause pressure or temperature override.

3. What's the pressure relief valve setting?

McDonnell & Miller Relief Valve

Base the set point pressure for the relief valve opening on the downstream pressure from the regulator, which is controlled by the spring pressure pilot setting. As the chart shows, the actual relief valve set point pressure depends on the relationship of the flow (load) to the rated capacity of the main valve.

Determine the relief valve set point pressure as follows:

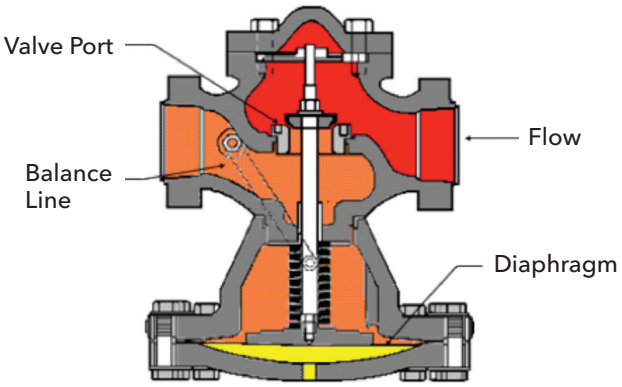
Downstream System Pressure (DSP)	Flow (Load) Condition	Relief valve opening set point pressure
< 35 psig	< 50% of capacity	DSP + 5 psig
< 35 psig	≥ 51% of capacity	(1.1 x DSP) + 5 psig
≥36 psig	< 50% of capacity	DSP + 10 psig
≥36 psig	≥ 51% of capacity	(1.1 x DSP) + 10 psig

4. Check lifts in the return line on heat exchanger applications.

This causes wide swings in temperature, because condensate can't drain from the heat exchanger shell until the pressure is sufficient to lift the condensate. The steam pressure in the heat exchanger shell required to lift the condensate can then cause a temperature overshoot.

5. Is the bleed orifice installed?

Without the bleed orifice properly installed, the main valve will not open completely or, with low pressure applications, may not open at all. Temperature applications must use the smaller 1/16 inch bleed orifice (factory installed).



6. Check regulator sizing.

Oversized valves will "hunt" and will also wear prematurely. Resist the temptation to size the valve to the pipe around it. The correct valve will normally be smaller.

7. Are steam traps undersized?

If condensate backs up in the heat exchanger shell, the regulator may be undersized. Condensate backed up into the heat exchanger shell covers some of the tubes, reducing the heat transfer surface. To avoid problems, size the trap based on ½ psi as suggested in the trap manual.

**B&G Hoffman Specialty®
Float and Thermodisc Trap**

8. Where is the sensing bulb (temperature pilot)?

Bulbs must be fully inserted in the fluid being controlled. If part of the tube is in a dead area, the sensing bulb will not respond properly.

9. Check pilot sensing line locations. Are sensing lines plugged?

Plugged or poorly located sensing lines send the wrong signal to the pilot. Locate the sensing line in an area with representative outlet pressure. With heat exchanger applications, you can install the sensing line on a tee connected to the vacuum breaker tapping.

Quick-test troubleshooting for Series 2000 pilot

CAUTION: The quick test involves steam. Use caution to prevent burns.

Spring Pilots

1. Isolate the main valve from the steam line. Make sure the internal pressure is 0 psig and let the valve cool to prevent injury.
2. Disconnect the copper tubing line from the main valve diaphragm. Point tubing in a direction to prevent damage or burns. Back off spring tension by unscrewing the adjusting screw. If a temperature pilot is in use, make the temperature setting higher than the bulb temperature.
3. Slightly open the shutoff valve in the steam supply to the main valve and allow pressure to build.
4. Increase the spring tension on the pilot until steam passes from the open end of the copper tubing line. Back off spring tension; the steam flow should stop. A slight leakage is OK. Repeat several times. If the pilot starts and stops the steam supply, it should be repaired or replaced.
5. If the pilot responds properly, the problem is elsewhere in the system.

Temperature Pilots

1. Isolate the main valve from the steam line. Make sure the internal pressure is 0 psig and let the valve cool to prevent injury.
2. Disconnect the copper tubing line from the main valve diaphragm. Point tubing in a direction to prevent damage or burns. Back off temperature setting by turning the temperature knob. A set screw in the adjusting knob locks in the setting. Loosen the set screw to turn the knob. If a spring pilot is in use, make sure the spring adjustment has the spring pilot open.
3. Slightly open the shutoff valve in the steam supply to the main valve and allow pressure to build.
4. Increase the temperature setting on the pilot until steam passes from the open end of the copper tubing line. Back off temperature setting; the steam flow should stop. A slight leakage is OK. Repeat several times. If the pilot starts and stops the steam supply, it should be repaired or replaced.
5. If the pilot responds properly, the problem is elsewhere in the system.

Diaphragm Replacement

A leak in the diaphragm means full steam pressure can't build up under the diaphragm, and the valve will not fully open.

Here's how to check if the diaphragm has a leak. Close off the steam supply to the main valve; remove the copper tubing line to the main valve diaphragm. Partially open the main valve bypass line and allow pressure to build downstream. If the diaphragms have a leak, steam will discharge from the diaphragm chamber.

To replace the diaphragms:

1. Isolate the main valve from the steam line. Make sure the internal pressure is 0 psig and let the valve cool to prevent injury.
2. Remove the copper tubing line that connects to the diaphragm cover.
3. Loosen bolts around the diameter of the diaphragm cover. Remove about 75% of the bolts completely, then back off the nuts on the remaining 25% to the point where you can remove the diaphragms using needle

nose pliers. Insert new diaphragms and replace the bolts. Tighten the diaphragm cover bolts using a star pattern.
4. Reinstall the copper tubing line and return valve to service. Inspect for leaks.

REMEMBER

- **Valve should operate between 50% and 100% of rated capacity**
- **Maximum recommended pressure drop across a single stage is 100 psi**
- **Pressure drop above 150 psi will reduce valve life**

Steve Almgreen
Assistant Product Line Manager –
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Making New Boilers Work With Old Systems

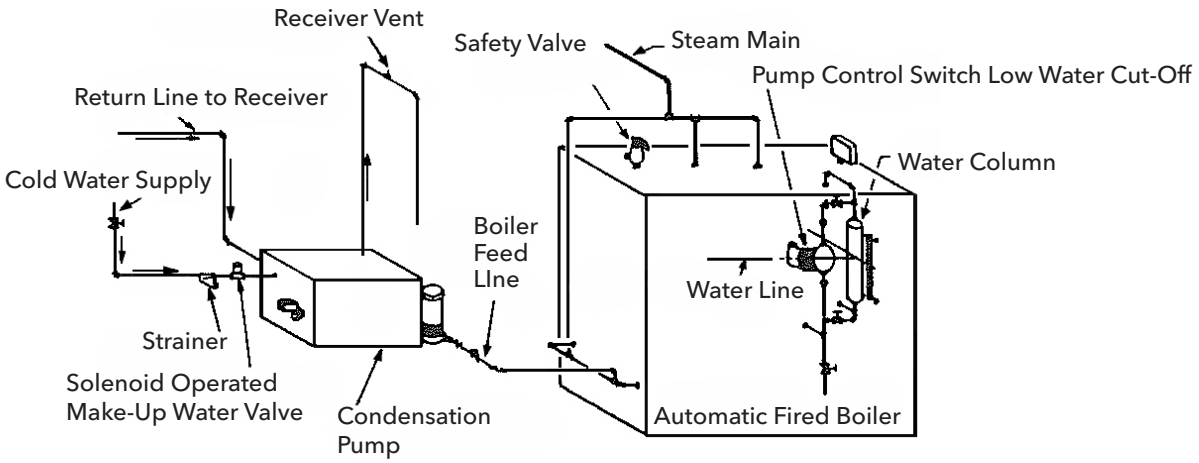
There's an art to replacing an old steam boiler with a new, low-water-content boiler. You must manage the intricacies of connecting a boiler that holds less water, has a smaller steam separating chamber and makes steam more violently with pipes and radiators that may be 70 to 80 years old.

The challenges start with the way the old system operates: Water in the boiler is converted to steam, heads out to the system, then condenses into water and gravity-drains back to the boiler. Old boilers hold so much water that, whether the condensate returns in five minutes or 20 minutes, the boiler water line never drops enough to start the make-up water feeder.

Today's smaller replacement boilers hold less water, and the chamber that separates the steam from the water in the boiler is smaller. This allows some water to leave the boiler prematurely, in a mist-like spray—which makes near-boiler piping critical.

It also means system lag suddenly matters. If it takes too long for the condensate to return to the boiler, the new boiler's low-water cutoff may shut off the

B&G Domestic® Pump CMED with B pumps



Typical feed pump and near boiler piping

burner, or the make-up feeder may start adding cold, untreated water to the systems. But once all the condensate finally returns, the water line is too high, and the boiler floods.

Apartment building, church and school steam systems with gravity returns and automatic feeders are infamous for system lag that causes replacement boilers to flood. The best way to solve this problem is to install a boiler feed unit.

Boiler feed units are sized based on the steaming rate of the boiler vs. system lag. Remember, we're focusing on the small amount of water between the boiler's water line and its low-water cutoff—not the total water in the boiler.

Feed units have larger receivers that act like reservoirs to hold the water needed by the new smaller boiler. Pumps attached to the feed units are typically controlled by a dedicated control on the boiler, such as the M&M 42 or M&M 150.

The pump controller activates the pump when the water line drops to low. When the water line returns to the right level, the controller turns the pump off, preventing flooding.

Installing a feed unit helps a new, more efficient boiler work with an old system—but realize that you're changing the way the system operates. It is no longer a closed gravity return system. Instead, the return lines all drain into the feed tank, which is vented to the atmosphere because it is not pressure vessel.

This means you must install float and thermostatic traps at the base of every riser that drips into a wet return line and at the end of every steam main. Without those traps, there's nothing to stop the steam from working its way through to the feed unit's vent pipe.

Before, when the returns drained directly into the boiler, the back pressure of the boiler created a balance between the pressures on the supply and the returns. With vented feed units, there is no back pressure from the supply. Steam will be more than happy to push through the water vapor seals and show up at the receiver vent pipe, creating water hammer all along the way.

If you're adding a boiler feed unit to a two-pipe system that already has radiator traps, be sure those traps work. Otherwise, steam will pass through the trap into the returns, creating water hammer and escaping out the vent pipe. That's because the dry returns also drain into the feed tank.

We're happy to help you perfect the art of making new boilers work with old systems. Contact your local Hoffman Specialty® / Domestic® Pump Representative for more on steam systems, feed units and steam condensate handling equipment.

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