Fuel Pressure Relief Valve Leak, Bottle Test, Race Valve, Shim Mod

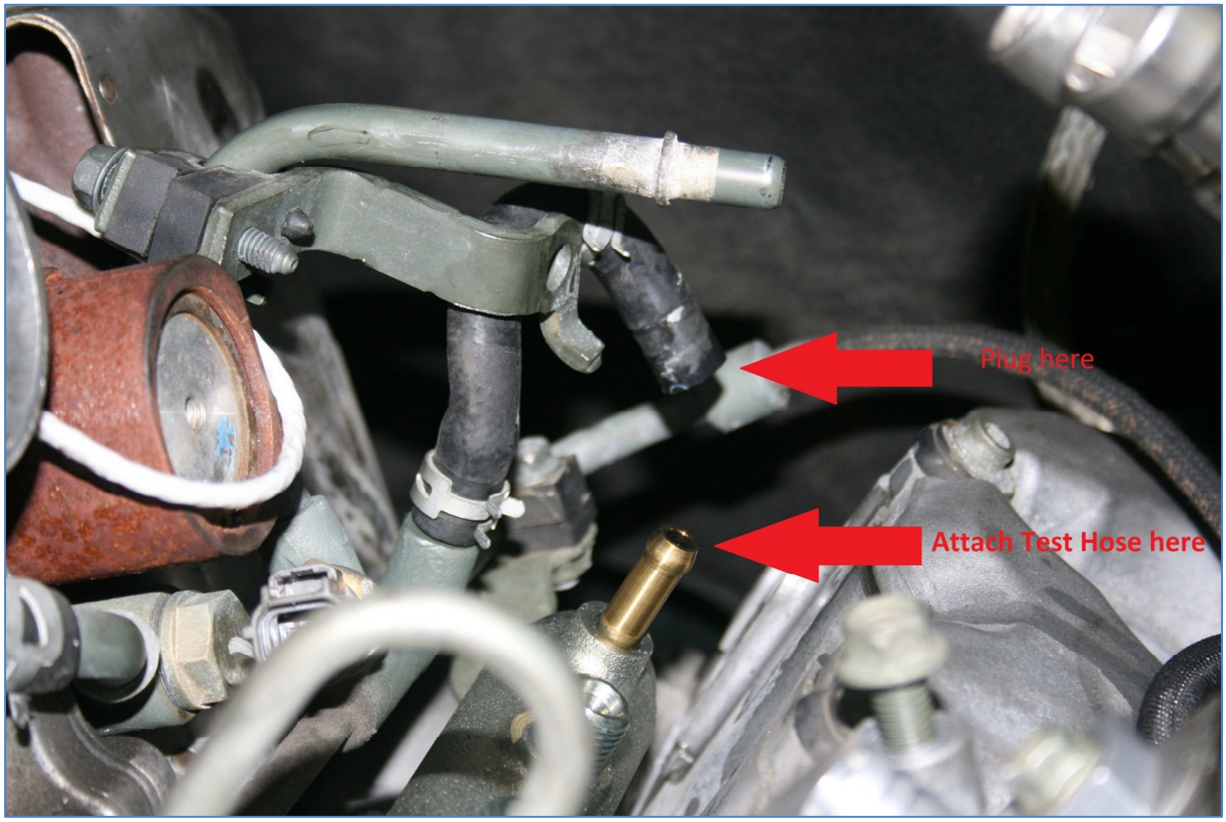
Most of this Tech Tip refers to the safety valve that is there to protect the system from a failure in pressure control. This valve often referred to as FPRV is located in the rear of the driver's side fuel rail on the LLY, LBZ, and LMM, and is buried in the valley on the LB7 and functions much like the Temp and Pressure valve on your water heater. It's there to protect, but should never have to act unless something goes wrong in pressure control. If your water heater dumped overflow out the Temp and Pressure valve would you A) replace it with a higher rated unit or a plug, or B) Find the cause and fix the cause?

The Cause

In normal operation the safety valve should never be activated. No fuel should ever escape past this valve unless there is an over pressure condition. What can happen is that flow demand can cause pressure cycling due to restriction in the system or increased demand from a performance program. The ECM has a hard time controlling the regulator precisely so the pressure starts to oscillate from under to over the desired pressure. Eventually the pressure spikes above the set point of the valve causing it to discharge fuel. This fuel comes out VERY hot and in turn tends to weaken the spring in this valve. Eventually the spring weakens to lower the set point to a pressure at or even below desired system pressure. Now you can't make sufficient rail pressure as the valve is bleeding off excessive amounts of fuel. I should note that the LB7 has really not been prone to facing this issue. This is likely due to the sheer size of the components of this relief valve plus the continual flow of system return fuel across the end of the valve assembly.

The Diagnosis

The test for a leaky valve is known as a "bottle test" and is relatively simple to do. The setup is illustrated below for the LLY, LBZ, LMM engines. Image 1 shows the hose that we are working with in its native state. Some parts removed for better photo detail. Image 2 shows the U shaped return hose removed from the fuel rail. This hose is then plugged. A new length of hose is attached to the now vacant port on the fuel rail and run to a bottle hence the name bottle test. The vehicle is started and the bottle observed for fuel discharge. If no fuel is present in the bottle then a test drive is performed and hard acceleration is used to command maximum rail pressure. If any fuel discharges to the bottle the valve is leaking.


Plug here
Attach Test Hose here

The Cure

Keep the rail pressure within normal operating limits and you'll not have issues. To do this you need to maintain adequate flow so as not to induce pressure cycling. Maintaining a clean fuel filter with minimal restriction is one key. Adding a lift pump to the supply side is the best thing that you can do. For this I recommend my Twin Pump Deluxe Kit . If you have already created a leaky relief valve then you need to replace it or fix it as outlined next.

Race Valve

This is simply a plug that installs in place of the relief valve. I've seen numerous cases where they actually physically leak upon installation due to poor construction. Usually reseating them will stop the leak, but you still have a potential bomb under the hood. Things won't necessarily come flying apart, but there is a serious risk of splitting components if pressures push past the yield point of a sealing joint, line, or fuel rail. This is just a bad idea.

Shim Mod

This mod is used to recover and/or increase the set pressure. The valve is simply disassembled and a series of shims are added behind the spring increasing the relief pressure back to or above the original set pressure. We do offer new Fuel Pressure Relief Valves at stock set pressure or shimmed for increased set pressure. They are located along with the appropriate injection pump listing.