# Fault Code P0089 – The Highs & Lows Of Diagnosis

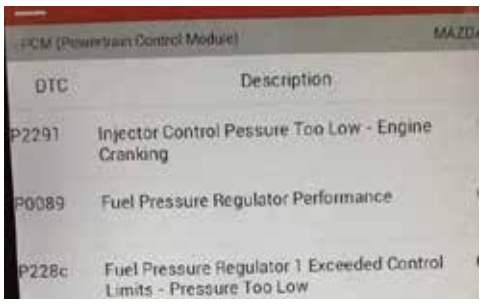
## By Clinton Brett

Fault code P0089 often causes technicians to pull their hair out, it's one of my favorites - because it has the ability to show up in a common rail diesel for more than 20 different failures that I am aware of, there may be more!

One of the key problems in diagnosing these "easy" faults is the inability of the scan tool to communicate with the vehicle or the many descriptions available from tool to tool of this fault code. Some of the most expensive scan tools will not diagnose this fault without you doing the diagnosis.

This is where some mechanics come unstuck when it comes to diagnostics. You're lowering your standards by beginning to think like your customer. Many think by just plugging in a scan tool it's going to instantly tell you what component has failed. Wrong!

You must continue to keep yourself up to date attending training courses, teaching yourself and learning from others who know diesel. One of the key factors often forgotten is that the common rail remains a combustion engine that has pistons, valves, intake and exhaust just like a diesel engine did 80 years ago. All they've done is change how the fuel and air enters the engine.




**Pic 1 Scan shows fault codes**

What do you do if there is not a fault code present? Nah, who needs 'em. They can be very misleading and can take away our valuable thought pattern. The scan tool has many other valuable benefits including the data, actuator activation, reset, adaptation of components- electrical and mechanical and some scan tools have a scope function. If they don't, then I'm sure you've got one stashed away or you better get yourself one.

When a surging, loss of power, stalling, starting, or even fuel economy symptoms occur the most common component replaced on many diesels is the Suction Control Valve (SCV). Most of the time it isn't the SCV that is actually failing and

if you recall back to one of our previous articles about the SCV then you will take my advice seriously.

In this edition I am going to share how to diagnose ONE of multiple failures which brings on the P0089 code in the Mazda BT50 and Ford Ranger 2.2 4 cylinder, 3.2 5 cylinder diesel engines.

In this scenario, the vehicle has a complaint of poor performance, engine light on (Code P0089) yet starts and idles ok.

The actual failing component is the breakage of one 1 of 3 plunger springs located within the Siemens/Continental high pressure pump. These springs enable tension to seat the plunger hard against the eccentric cam which rotates as it is driven by the timing belt or chain. This allows a full plunger stroke to take place, thus creating enough rail pressure to maintain stable delivery of pressure to the electronic operating injectors which are

**Pic shows plunger spring broken**

**Pic shows plunger spring broken & separated**

injecting fuel at the correct time into each cylinder.

So, lets begin diagnosis by connecting some clear line to a separate fuel supply. Why use clear line when diagnosing diesel fuel system faults? Many who have attended my training or have called me for Diesel Help, know the answer to this.

Clear fuel line enables you to see the air bubbles if present. Air within the diesel fuel system is one of its greatest enemy. Most vehicles run black hoses and tubing and therefor you cannot see what is going on inside. Even the ones that do have clear low pressure lines are often old and faded which can be difficult to see.

Many ask me this question- If there was such a leak where air was entering the system, wouldn't you have an external leak? Often you don't. On many occasions when there is a leak present on the low pressure side (between the high pressure pump and the fuel tank), the suction of the fuel created from the internal transfer/ feed pump of the high pressure CRD pump, does not allow for an external leak. (This is why you can run a separate fuel supply). If it was under pressure such as when an electric pump is fitted in line on the low pressure side, then yes an external leak can occur. Or within the high pressure pump, fuel can leak externally but often does not cause a fault, it just leaks all over the engine.

Have a think about this- If the vehicle is stationary overnight or several hours and a pin hole is present on the low pressure

**Clear fuel-line test**

side, what happens to the diesel within the fuel system? I'm not going to give it all away, you'll have to attend one of my courses to find out more.

I have seen diesel leak from the low pressure system and that was from the fuel filter drain tap or the water sensor itself. Because it is a reservoir and the drain tap is at the bottom, the weight of the fuel causes the leaks occur- yes if you've just read this sentence, the drain tap o-ring can be a great source of the air entering. A drain tap o-ring often gets overlooked for replacement during services.

Why run the separate fuel supply?

It's really a simple answer which many in experienced mechanics working on diesels have asked me. The time saved concentrating on one of the 2 systems can eliminate hours of wasted diagnostics time. Just because this registers as a high pressure fault doesn't mean it is not a failure of the low pressure side.

Often on this vehicle the scan tool will display P0089, fuel pressure regulator performance outside parameters.

Here is a list of components I have witnessed having been replaced and still not rectified the fault-

- Complete rail (the rail is only a rail with a rail sensor).
- Rail pressure sensor (not to be replaced as a single item).
- Fuel filter
- Injectors
- Suction control valve (not available but have used a s/hand part)
- Electric in tank pump

All these above parts including labour time spent replacing can add up to approximately $10000 and the vehicle still has a fault.

I mentioned the SCV not being available for this pump, but many will try a second hand valve, fit it and if it is free of metal, it may run for a short time before failing. One of the key areas of the failure is the metal from the spring jamming the SCV.

Now of course the failure is only a spring, but do not think at any time about replacing just the spring. A diesel fuel pump is not component that should be dismantled (other than inspecting the internals). Without the correct equipment, it is not possible to successfully reassemble and test before fitting to an engine which is going to be started and operated. If something internal let go, the end result could not only be costly for you, it is also very dangerous for the person driving the vehicle at the time it fails.

Once you have connected and test driven the vehicle with an eliminator tank and confirmed there is no air within the fuel system and the vehicle continues to fault, you can now concentrate on the high pressure side. If the vehicle did run well then you can start tracing back through the low pressure side to diagnose the fault.

Now we are going to focus on the fault at hand- A high pressure failure.

First of all let's just read what rail pressure we are getting on the scan tool when starting the engine. Ideally a CRD system should get a minimum of 200 bar pressure when cranking- instantly. Now this fault is not affecting the starting ability, so this should be a good reading.

Often the fault occurs immediately when the engine is under load (driving under full acceleration whilst moving). In some cases the code has logged when free revving not moving. If this occurs then what is actually happening, the suction control valve (SCV) is stuck. What is sticking the SCV is the fine metal fragments becoming caught in the piston of the valve. This prevents the valve from moving at all when demanded by the ECU. This is where you dismantle the fuel filter in which you have already removed from the vehicle when you were running the separate fuel supply. At this point of time I would have had all the fuel drained from the fuel filter into a clean container. By letting it settle for ½ hour gives you a good indication of how much metal or other contaminates are present- including excessive water.


**Contaminated fuel & metal**

If there is excessive water present- approx maybe filled more than half the container, this is where water is the likely cause and thinking that a diesel fuel system operated on water- you should reconsider your career options.

If there is excessive metal but minimal water, then there is a good chance the metal is from the spring rubbing internally. When the spring breaks, often it will remain intact for a while and continue to operate for some time before beginning to log the fault code.

Other early signs of the failure happening before a code logs is an injector failure. Once the metal leaves the pump in a very fine particle form, it continues to flow through the pipe to the rail, rail to the injector pipes and then through the injector. Eventually the injector becomes blocked internally in one of its tiny galleries and then a misfire, knock or complete failure develops. The problem with this is that not only does it go into the injector, the metal also flows back to the tank and recirculates to the filter (that's how it works its way back to the filter).

Yes I get asked that question. A diesel fuel system will not operate without return fuel. If it did not return, then the system would itself hydraulic lock. Most systems return about 80% from both the injectors and the high pressure pump back to the fuel filter and tank.

If an injector does fail in these engines, make sure you investigate for metal within the fuel filter before replacing the injectors. Replacing a set of injectors in a system which has metal re-circulating is going to cost another set of injectors in the not too distant future. It would also be beneficial if the customer was aware that the metal was coming from the pump therefore giving them the option of having the pump done at the same time.

**Siemens injector**

A great way to confirm the failure is to connect your scan tool and read the demand and feedback of the rail pressure. If the demand is relatively higher than that of the feedback, then you are getting closer to determining the fault.

To determine if it is the pump, would be to connect an AMP clamp to the wiring loom of the SCV. When the feedback pressure begins to drop off as the engine is under load, if the amperage increases (increased current draw) then you've found the fault.

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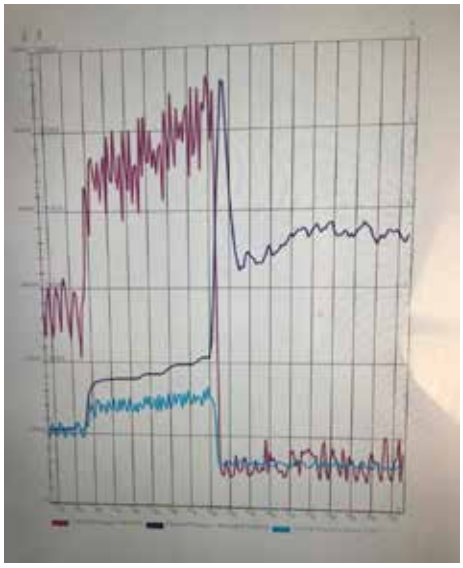
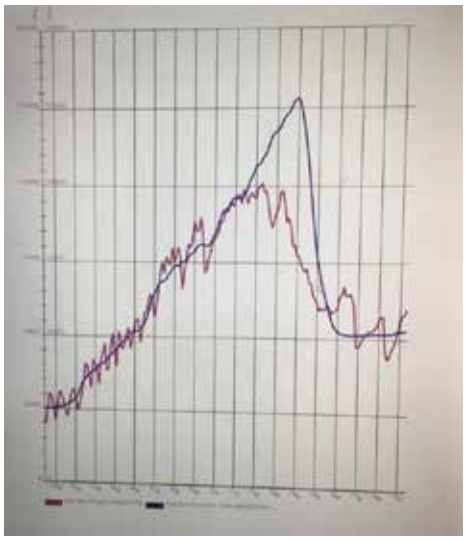
The other 2 plungers are working to their maximum ability but you have one plunger with a fully collapsed spring that is preventing the plunger from returning to the cam, thus no movement resulting in no output from that delivery port. The ECU is having to increase voltage supply to the SCV without the result and will continue to increasing the amps. The SCV valve is not a sensor with a known stop point when it reaches the maximum.


**SCV location on the pump**



**Before repair scan data**



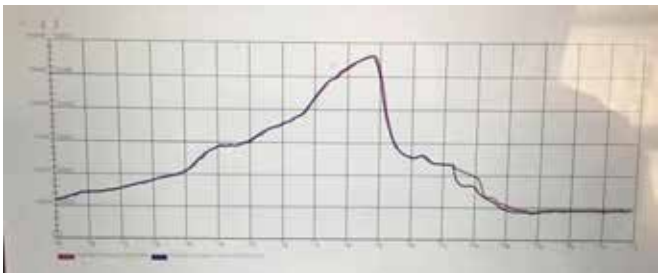
**Before replacement bad scan**

This failure is very well known throughout the dealerships and diesel fuel injection specialists. It is a very common practice to remove the entire fuel system and thoroughly clean including the tank. The metal is very fine and becomes stuck in every part of the system. At any given time metal may dislodge and flow to another injector causing a failure.

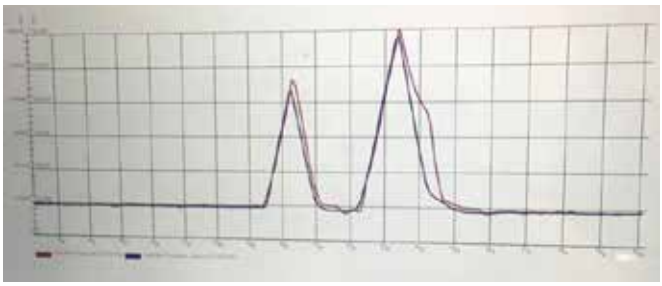
I have been involved with many diagnostics on this vehicle model with km's ranging anywhere from 40,000kms up to 150,000kms being the average life of this pump.

Would I recommend injectors be replaced at the same time if the pump has a broken spring?

Yes only if you have had them removed and tested first to find out if they are damaged or not. It is best you have your injectors tested by a diesel fuel injection specialist that has an actual test bench for CRD injectors. This will help determine all the internal settings are correct. Knowing that the spring has broken means that there may be metal building up in the tiny nooks and crannies of the high pressure system which will eventually become stuck elsewhere.



**After repair good scan**



**After replacement good scan**

How to determine the spring is broken once you have removed the pump?

See the picture below to determine what component you are looking to remove. It is really quite simple to dismantle this section of the pump. There are 3 to remove and don't worry,

**Plunger assembly dismantled**

**Revealed broken spring**

the spring is not too high tension so it's not going to fly out at high speed and take your eye out.

Why not attend one of my training courses? Later in this issue you will find where my next courses will be held, or I can possibly conduct training at your workplace. Contact me by visiting my website, www.diseledoat.com