



Fuel control valves ID diagnostics Part 3



By Clinton Brett

I trust you have enjoyed this series of articles with my comprehensive explanation of fuel control valves. I'm excited to share with you my valuable insight into the non-injector type pressure control valves, because I am still talking to technicians who mistaken these valves as sensors, therefore they are being misdiagnosed.

So whilst I am feeling fresh after last night's webinar of this subject, lets get into part 3 and look at a couple more injector manufacturers, their unique designs and common injector faults to cover in this next edition of Fuel control valves ID diagnostics.

Continental/Siemens piezo injectors

Pic 1 Early Continental Siemens injector

Originally developed by Siemens, the Continental injector has only been known to be a Piezo design injector. It is predominantly fitted to passenger vehicles although there are some found in commercial, just very few of them exist. Popular applications include Citroen, Ford (Ranger & Mazda BT50), Land Rover, Peugeot, later model Volvo- Most of which are made by the Ford/Peugeot engine design joint venture PSA. The continental injection system is also fitted to Renault engines who provide the platform for the popular Nissan NP300 Navara, Renault and Mitsubishi commercial vans, and the VAG group engines have a limited range using the continental injectors.



Pic 2 later continental injector Renault

Identifying features

The Continental Piezo injector has not changed much since its first release in the late 90's. You can see in Pic 2 and 4 there is a slight change in the shape of the actuator and the return remains outside the cast body, the difference between the two is the female outlet has been redesigned to a male outlet. One of the reasons I believe this change occurred, is the fitting design of the early type is prone to leaking but also the return outlet of the later design, means the OEM plastic return fittings are similar, reducing costs to the OEM.

The solenoid incorporates an air gap design which demonstrates how a very fine tolerance can be experienced in this unique injector design. Tolerances that fine, meaning this little margin for error. Especially when someone decides to loosen this solenoid

top. If this ever occurs, to avoid an engine expiry on your watch, replace the entire injector. Without the correct injector repair tools and test equipment, it is impossible to reset this air gap, even if the engine starts and runs, the result could destroy an engine.

Pic 3 Continental solenoid actuator



Pic 4 top view early Continental solenoid actuator

Delphi electromagnetic injectors

Delphi have been manufacturing electromagnetic solenoid injectors from the late 1990's. There are very few engines that are fitted with a Delphi Piezo design. Back in 2008 as an authorised Delphi agent, we were informed of an issue amongst a newly released Mercedes.

The OM651 engine experienced a major recall several years ago due to faulty injectors. This engine was fitted to the C220, C250, E220 and E250 cars.

Pic 5 Delphi injector



The Delphi injectors were defective and experienced a high failure rate. The vehicle would enter limp mode or fail completely. In our experience, the root issue is a problem with the Piezo design from Delphi. Several cars experienced a random over revving of the engine which of course could end badly. Finally, Mercedes-Benz bit the bullet scrapping the piezo injectors for all vehicles powered by the OM651, replacing them with the electromagnet actuated solenoid injectors. This also meant a change to most of the system, including an updated ECU.



Pic 6 Mercedes converted Delphi piezo to electromagnetic

Working with Delphi injectors on the engine

A common issue to occur with Delphi CRD injectors, is soon after installation. The injector develops an air lock within the valve system, preventing the engine from starting. In some cases, the engine will start but begin hunting, and/or stalling and has been known to log fault codes related to each cylinder. This is known to occur when fitting brand new models.



Witnessing the different bleeding difficulties between the manufacturers, Diesel Help Australia created several technical bulletins explaining the Delphi injector bleeding process. Each bulletin is specific to the OEM as they use different operating systems. These include Hyundai iLoad, Great Wall, Mercedes Vito, Sprinter, C class, TATA, Mahindra, SsangYong, and Holden Captiva.



Pic 7 Delphi fitted to Holden Captiva

The most popular downloaded- TB1163–Holden Captiva failure to start after removing injectors. (2013 Holden Captiva 2.2L engine). A common mistake is following Delphi's official installation process for all CRD injector replacements. Unlike most of the other Delphi systems, which recommends unplugging the Suction Control Valve, the Captiva instructions we developed are slightly different and recommends unplugging the rail sensor. This enables the fuel system to reach maximum rail pressure, thus assisting to purge air from the system. We also advise to leave the injector electrically connected but isolate the fuel return to prevent air returning to the fuel filter.

Identifying features- Early design Delphi injector

The early design used a wire clip to secure to the body of the injector. The harness connector contains a Dust Seal which also

assists to retain rigid connection. If this seal is damaged or missing, a short can occur in the wiring and leave a carbon deposit on the connector and injector. Do not clean these engines with water or chemicals. Use an evaporative non-corrosive cleaner. If in doubt, replace the connector as the seals are not available separately.

The later design Delphi has a distinctive change in the terminals. One is longer and the harness uses a secure lock feature. This has reduced the movement, but we have experienced issues after cleaning of the engine with water and detergents.



Pic 8 Delphi early design



Pic 9 Later design Delphi injector

Next time, we will cover Denso Injectors. Plus we've just found out some interesting new issues surrounding these, so watch out for the next edition. This will be Part 4 which will be a dedicated Denso fuel control valve article.

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