



# Fuel volume control, Fuel metering valve, inlet metering valve, suction control valves



**By Clinton Brett**

Now we have injectors out of the way, part 5 of this series I am going to share my insight into the suction control valve (SCV). Well, that and the many abbreviations this type of valve can be labelled as- IMV, FMV, FVC, FCV and PCV all of which are a direct influence on the fuel flow in the common rail diesel (CRD) system.

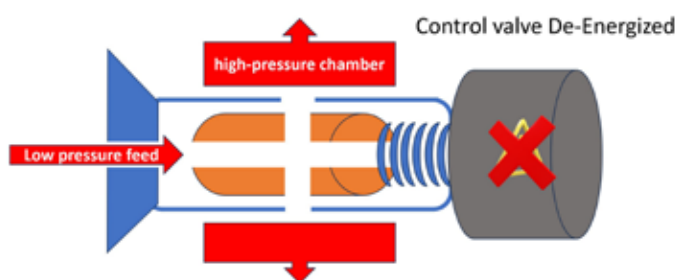
## Valve group

I like to refer these components as fuel volume control valves. This way you should have a better understanding of why and what you are testing. These types of valves do not create, nor do they regulate the fuel rail pressure. Their role is to influence the fuel pressure by altering the amount of fuel flow required for the pump to create the pressure, which is delivered to the injectors via the rail, and distributing the same amount of fuel flow and pressure to each injector. As well as the outlet fittings, every rail also has the fuel pressure rail sensor mounted and some rails in addition, are fitted with a pressure regulator.

I'll go into more depth about fuel rail pressure regulators in the next part. For now, back to valves.

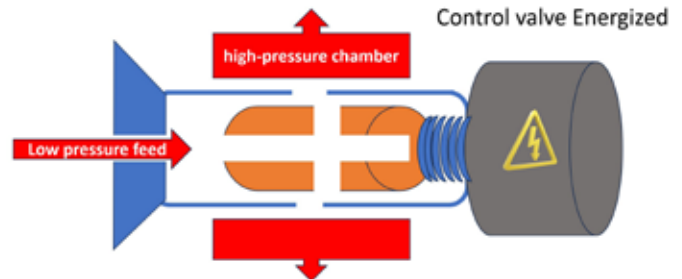
The fuel control valves we're discussing are located on the high pressure pumps. They are electronically controlled using Pulse Width Module (PWM) otherwise known as duty cycle. There are 2 operating methods of fuel volume control valves- Normally open and normally closed. Normally open means that without any electronic current supplied to the control valve, it can be in the open position allowing fuel to enter the fuel pump. A normally closed type means that the valve requires electronic current to move, allowing the ports to be exposed and fuel can pass through it.

## 2 types of operation- Normally open



**Normally open type fuel control valve**

## Normally closed type 1



**Normally closed type fuel control valve**

This valves' function is to control the volume of fuel from the fuel tank to the fuel pump. This pump, which is often referred to as the high-pressure pump, is not to be confused with the fuel pump in the vehicles fuel tank. It is a component that creates a much higher-pressure fuel delivery from the lower pressure feed into the rail which is then distributed to all the injector evenly at the same time. This high-pressure pump is located on the engine and driven by gears, belts, chains or a flywheel.

## DENSO Suction Control Valves

### Denso SCV

This design and named control valve is the most recognisable terminology in all sectors of the automotive industry. Suction Control Valve (SCV) as they are commonly referred to, are fitted to the Denso CRD fuel systems found on Toyota Hilux, Mitsubishi Triton, Nissan Navara, and Holden Colorado. At the same time in 2005 when dual cab Utes became the highest selling diesels, so did the attraction from the light vehicle automotive repair industry to start taking on diesel work.



Unfortunately, this was also where I have witnessed the most common misdiagnosis of the CRD system. Simply because most mechanics think this is an on/off fuel solenoid and without the correct diagnostic pathway, they just end up throwing one on without any prior testing of fuel supply. One of the many reasons I started Diesel Help, to educate those who didn't sign up for diesels at the beginning of their apprenticeships.

A popular fault code has been P0089 SCV stuck. Many scan tool manufacturers adapt this terminology to most of the fuel system errors category but also use the abbreviation SCV when reporting fault codes and specified fuel valve data. By the way, P0089 SCV stuck is often to do with an alteration or replacement of an individual component of the CRD fuel system. Often has been a simple fuel filter replacement. A process most overlook when replacing a fuel filter, is performing a relearn which can reduce further complications.

Other SCV related faults have been caused by the replacement with the incorrect part number. We have seen this a lot on Nissan Navara YD25. There are 3 different designs of SCV fitted to the Navara and as it is now a 20-year-old vehicle, most are onto a



second or third engine and no assurance it's the original engine let alone ECU. The best way to determine everything matches up, is to order directly from the dealership and confirm the VIN number matches the pump and SCV part numbers.

BUT- in a case of where the vehicle has reached more than 200,000kms, if contemplating replacing only a SCV, I strongly advise to replace the entire CRD system. When one weak link is replaced, the next becomes more vulnerable.

When the SCV is the actual failure, often it is worn out or contamination- water, petrol, dirt or even the filter paper. Due to the direct exposure to fuel supply immediately after the fuel filter, as a result of the breakdown with fuel filters- An issue experienced from both OEM and some aftermarket fuel filters, the SCV is common to clog up with micro size filter fibres. These fibres can become stuck between hydraulic piston valve and the walls and often a result of overdue fuel filter replacement, fuel additives, or poorly engineered and designed filtration. From my experience, probably the best developed and evolving aftermarket fuel filter I have seen and worked closely with, is RYCO.



Ryco fuel filter

Over the past 8 years I have developed a strong relationship with the filter manufacturer. We find it is invaluable to approach any current issue experienced in the industry. Remember, an issue won't be resolved if nobody is informing of any issues. RYCO have been very upfront and transparent with any of the projects we've worked in the background, for a successful outcome and a better future for aftermarket filter replacement.



RYCO test lab

## Delphi Inlet Metering Valve (IMV)

This is when long term experience in a chosen field is priceless. When a fault code appears on the scan tool displaying Inlet Metering Valve, is all too often a technician has searched for a fault within the air intake system. The word Inlet refers to the fuel inlet of the high-pressure fuel pump. This Delphi design has been around in production since the early 2000's, though the fuel pumps design has changed slightly using a different pumping action, the IMV has remained very much the same.



Delphi IMV

The IMV is a normally open proportional solenoid valve. One side of the coil has a permanent 12 Volt feed. The other side is connected to the ground by the ECU with varying frequency and pulse width. This controls the piston position against the return spring which in turn controls the fuel flow through the filter screen and out of the valve end face. So pretty much when a normally open type is unplugged, the fuel continues to flow.

**Diagnostics-** The following engine performance conditions could indicate a failed IMV.

Symptoms Observed on Vehicle	Fault Type	Possible Causes
Does not start	Does not fill	IMV seized after immobilised
Engine stops	Pumping shut off	IMV broken/IMV blocked
Noise, smells, external fuel leaks	Sealing failure	Leaking between body and IMV



Damaged IMV internal piston.

**Testing-** The coil resistance is typically 5.3Ω at 20°C when checked with a multi-meter.

**Next time we will continue with control valves fitted to pumps and rails.**

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