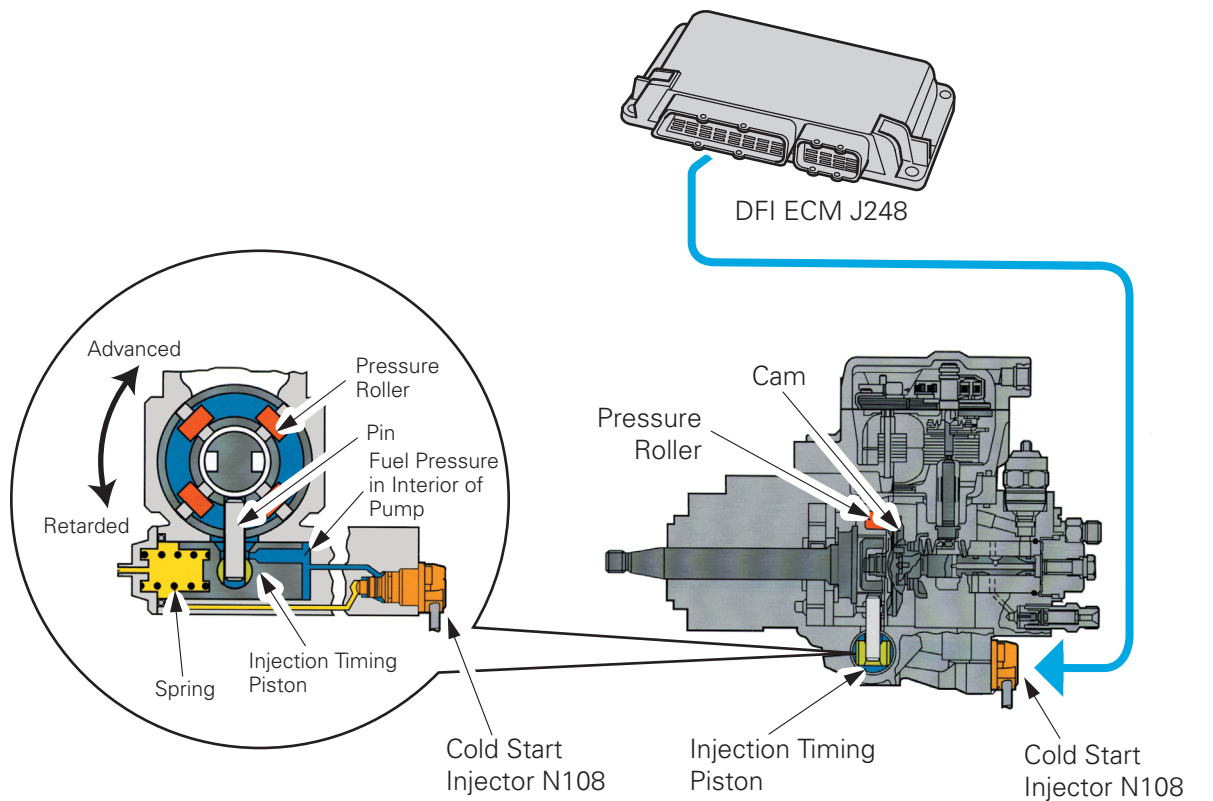


The TDI Diesel Engine

Injection timing advance

Near the end of each compression stroke, diesel fuel is injected directly into the combustion chamber. Injection must continue well past piston TDC to burn the necessary amount of fuel to provide engine power. As engine speed increases, stroke time becomes shorter and injection time becomes longer. Therefore, combustion must begin sooner to ensure that peak pressure still occurs at the most efficient point after TDC.



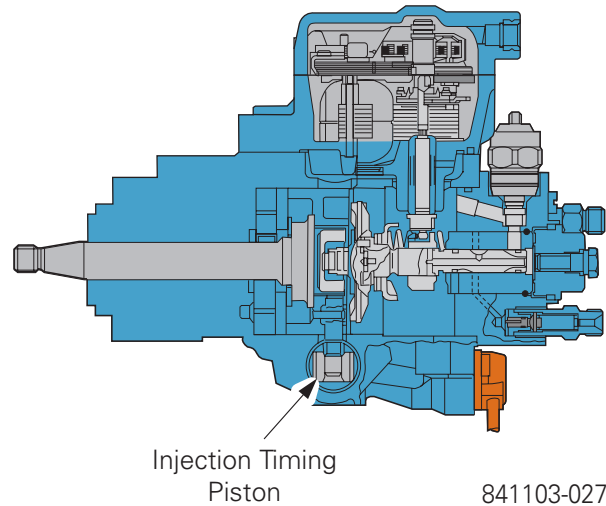
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The TDI Diesel Engine

A hydraulic piston in the injection pump advances injection timing.

As engine speed increases, fuel pressure from the vane pump also increases. Vane pump pressure pushes the injection advance piston to the left against the spring so that the roller housing turns slightly.

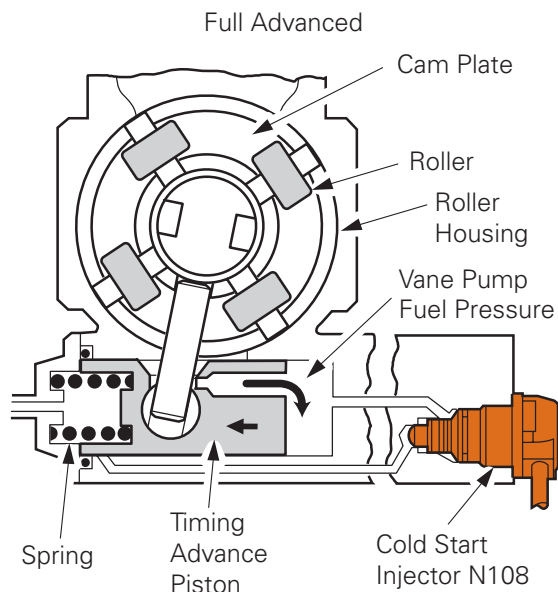
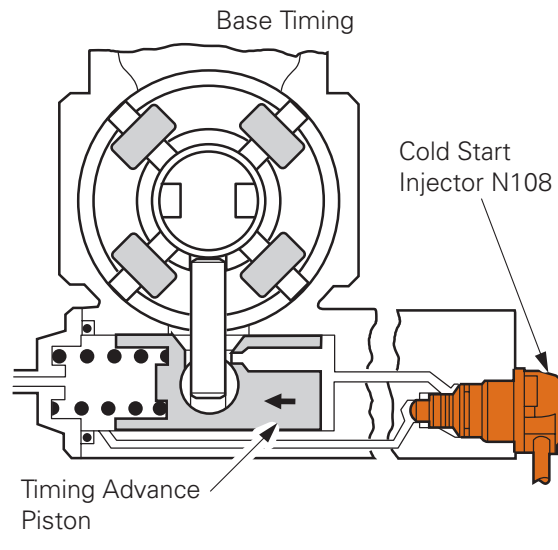
Since the cam plate is turning in the opposite direction, the ramps on the cam plate engage the roller sooner whenever the injection advance piston moves to the left. This means that the distributor plunger begins injection sooner.



When the engine is cold, the DFI ECM J248 will look at its cold start map to determine the injection timing advance. Based on engine load, rpm, and temperature inputs, the DFI ECM J248 will actuate the Cold Start Injector N108 to achieve the proper cold-start advance.

The Cold Start Injector N108 is an electrical solenoid that operates a pintle that, when open, allows fuel pressure to act on one side of the injection timing piston. This pressure is opposed by spring pressure. As the hydraulic pressure overcomes the spring pressure, the movement rotates the rollers and pump housing clockwise a maximum of 5 degrees. This injection advance provides more time for the fuel to burn, which improves cold engine performance and prevents smoking.

The Cold Start Injector N108 does not control the complete range of injection timing. Above 2200 rpm, the piston is no longer controlled by the DFI ECM J248.



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