

FUEL INJECTOR MAINTENANCE

Mechanical injectors

The 1969-1973 mechanical injection system was used on 911E and 911S cars and also on the 1972 and early 1973 911T. The system was also used on a number of Porsche race cars and has always been considered a responsive, high performance system, but one that today is not widely understood or simple to repair, although there are still many on the road. The fuel pickup portion of the system uses an electric pump of low to intermediate pressure (approximately 12-14 psi) to bring the fuel to the injection pump. The injection pump, which is belt driven off a pulley on the front of the left-hand camshaft, has six small, cam-driven, reciprocating pistons that each deliver fuel to one cylinder. The pistons are designed to be rotated in their barrels by a rack geared at the lower end of the piston that rotates all six pistons simultaneously as it is moved longitudinally. Each piston has a helical step that progresses around the outside so that on each piston stroke, depending upon the rotational position of the piston, a different quantity of fuel can be picked up at the intake port and pushed out through the exit check valve to the injector line and injector. The fuel pressure output of the pump and the opening pressure of the injector is very high at 15 -18 bar (213-256 psi). The injector has a spring-loaded valve that opens at the high pressure and sprays the pulse of fuel delivered to it from the injection pump. Essentially the injector is a nearly constant pressure nozzle and the fuel pulse quantity is determined by the injection pump piston. The injectors are threaded into each cylinder head.

Primary injector maintenance on the 911 mechanical injection system involves checking the injector opening pressure, spray pattern and leakage under pressure. The mechanical injectors are one-piece metal units for which there are no replaceable or repairable parts. The factory manuals describe, and most Porsche shops have, a Bosch or similar mechanical injection nozzle tester that consists of a hand pump, test fluid supply and pressure gauge. A special non-hazardous test oil with the same physical characteristics as petrol is used for the testing. The hand pump is moved slowly and the pressure checked when the valve opens to make sure it is between 15 and 18 bar. Leaks are checked by holding the pressure at 2 bar lower than the opening pressure and watching for any drops forming. The valve is OK if no drops form within 15 seconds. The spray pattern should be atomized and not a tight spray, although the factory manual indicates a one-sided spray pattern of 35 degrees is permissible.

Failure of any of the factory tests is normally a signal for replacement. Because of the small number of these systems on the road compared to later designs, many of the current commercial testing machines do not include provisions for the higher pressure operations of the injectors. However, companies such as Pacific Fuel Injector in South San Francisco that specialize in rebuilding mechanical injection pumps, can provide a cleaning service for the high pressure injectors.