

Ferrari 328 CIS Fuel Pressure Check

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The 328 uses a Bosch K/KE-Jetronic mechanical fuel injection (lacks airflow plate pivot potentiometer on airflow meter of "true" KE system). The amount of fuel injected for a given RPM is dependent on a balance of system and control pressures acting on the fuel distributor metering piston and oxygen (lambda) sensor feedback control; see [Bosch Fuel Injection & Engine Management](#) for a full discussion of K-Jetronic theory and operation. For purposes of this article the control pressure regulator (also known as warm-up regulator or WUR) governs the amount of fuel injected (rich/lean) based on temperature of an internal bimetallic element that closely parallels engine temperature. Incorrect or erratic control pressure can thus influence fuel mixture & engine running from cold start to warm operating temperature. Fortunately with a relatively inexpensive gauge both system and control pressures are simple to check.

*Note: example is 1988.5 328, but this is applicable to 328 series, 308QV, Mondial QV/Mondial 3.2, and possibly the early injected 308s.
Conversion factor: 1 bar = 14.7psi.*

Tools required:

13,14,15,17mm combination wrenches
14,15mm 3/8" drive 6pt sockets with 6in extension and wrench
Paper towels

Special tools required

Bosch CIS pressure test gauge set (Shown is Star Products TU-447, but several similar are available)

Parts required (possibly):

Copper crush rings for fuel distributor-to-WUR line: NAPA#2-17447 \$1.39/each
Fuel pump: Bosch#0580254947/Ferrari # **I**\$222.
Fuel pump check valve: Bosch#1-587010532000 \$14.72
Accumulator: Bosch# 438170004/Ferrari #113978
Fuel filter: Bosch#71039(0450905601)/Ferrari #117792 \$16.15
Fuel filter upper copper gasket NAPA#1242 \$0.67/lower NAPA #1243 \$0.44
CIS fuel injectors (328): Bosch#437502010 (steel)/#437502047 (brass) \$30/each
WUR: Bosch#0438140116/Ferrari #121743 \$375

Sources:

Dennis McCann (www.allferrariparts.com)
Importec Parts (www.importec.com)
BAP-Geon Auto Parts
NAPA Auto Parts (www.napaonline.com)

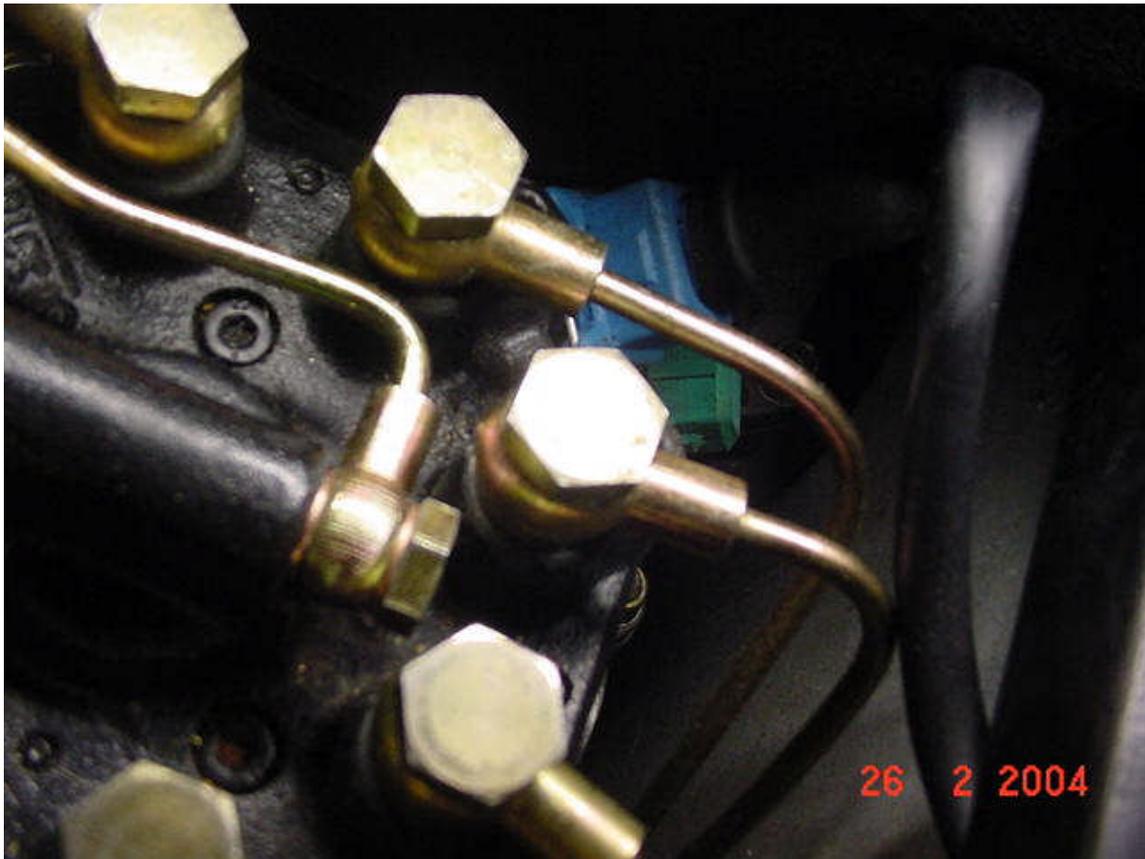
References:

Bosch Fuel Injection & Engine Management by Charles Probst 1991; ISBN#0-8376-0300-5

Ferrari Bosch KE3-Jetronic 3.2 Mondial/328 factory manual #539/89

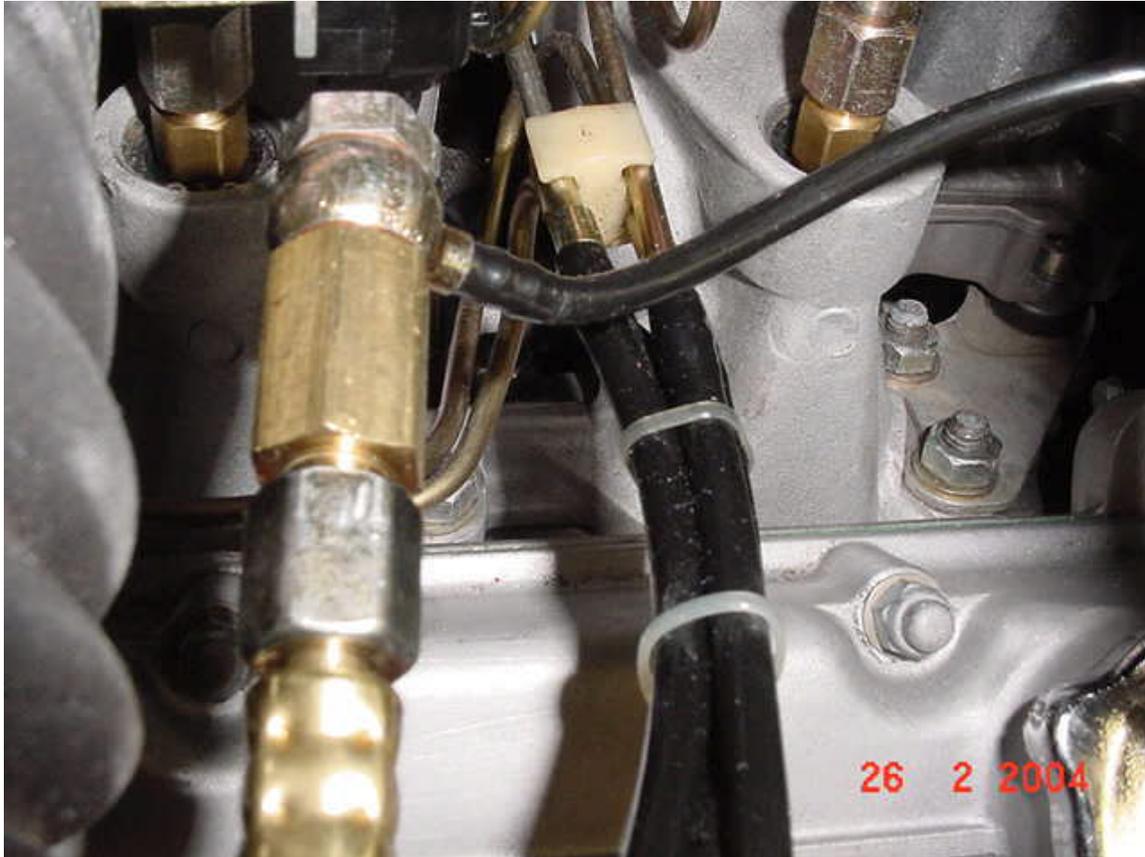
First, I found checking fuel pressures impossible to perform without spilling a small amount of gasoline. Consequently ensure the working area is well-ventilated with fire extinguisher nearby, wear safety goggles, and have plenty of paper towels to catch spills. Be careful – although the engine is cold, dropped tools can also cause sparks. Car must be cold (overnight) to accurately measure cold control pressure. Battery must remain connected to run fuel pump. Put the gearshift in neutral and apply parking brake or block wheels. Open the rear decklid and drape the fenders for protection.

Control & system pressures will be read from the fuel line running from the top center of the CIS fuel distributor to the WUR:



Surround the WUR with paper towels. Loosen the 14mm banjo bolt fitting from above with socket wrench. Two copper crush washers seal the fitting from both above & below; try not to lose the lower ring into the engine valley. A small amount of fuel will spill from the line (residual pressure from overnight).

The CIS tester apparatus consists of two hoses joined by a T-fitting with an on/off valve lever on one side. Using the supplied adaptors, rebuild the banjo bolt fitting (with copper gasket washers) onto the input hose (the hose without valve) and tighten. My particular set used a 15mm fitting and a 14mm coupler nut:



Next, attach a second adaptor to the input port of the WUR (15mm in my set). Connect the other main tester hose (side with valve) to this fitting:



My pressure gauge line then attached to the T-fitting using a snap-collar type lock:



Remove the blue fuel distributor safety switch connection from the rear of the mixture control unit to allow the fuel pump to run without actually starting the engine. I also disconnected the cold-start injector in case it was signaled, but this is probably unnecessary. Temporarily disconnect the input signal harness to the WUR:



Turn the ignition to “RUN” position (position II). The fuel pump will immediately start to run and build system pressure. Bleed the tester at the gauge by loosening slightly until a small amount of fuel runs past threads. Tighten gauge securely. Turn the valve lever (if not already) parallel to tester hose to open circuit.

Reconnect the WUR and cold-start injector electrical plugs. Start the engine and allow to warm; this will supply input vacuum to the WUR port and alter static (without engine running) pressures slightly. Gauge will now display cold control pressure, which is typically 1.4 bar (20psi). Allow the fuel pump to continue running and watch this pressure slowly build as the WUR bimetallic heats over the next five minutes. This is warm control pressure, which typically runs approximately 3.5 bar (my system read 51psi). Once warm, turn the tester valve lever to “close” position (perpendicular to hose) and note pressure increases; this is system pressure, which is approximately 4.9-5 bar (my system read 69psi). Apologies as most of pictures of gauge face at these pressures were obscured by glare from flash off glass:



Turn ignition off. Pressure will rapidly fall to approximately 40psi and hold. Allow car to stand for 20 minutes; the accumulator should hold a minimum of 3-3.5 bar (approximately 40psi) for minimum 10-20 minutes if functioning properly and injectors are not leaking.

Many variables influence these readings, so if yours differ significantly (and car is symptomatic) your FI system may not be functioning properly. My knowledge of particular faults of Ferrari CIS is limited, but common points of failure on the 328 include the fuel pump check valve, accumulator, injector leakage, fuel pump, and apparently occasionally intrinsic WUR failure. The input screen in the fuel tank can also become obstructed with debris or disintegrate. There is a side port on the fuel distributor to adjust system pressure using shims, and I have found descriptions of WUR disassembly and control pressure pin resetting on the Rennlist Porsche discussion forums. If system pressures are too high, remember to check the fuel return system (frequency valve & tank return lines) for obstruction.

After you have tested pressures, wrap the pressure gauge with paper towels, crack the input hose, and slowly allow the pressure/fuel to drain. The strange creaking sounds emanating from deep in the engine compartment is the accumulator spring uncoiling. Wrap each fitting in paper towels as you disconnect to catch fuel spill. Reconnect the fuel line to the WUR using two new

crush washers and tighten securely to 8-12 ft-lbs. At this point I turned the ignition back to RUN to purge the fuel system of as much air as possible. Reconnect the fuel distributor safety switch electrical plug. My car required approximately 20 seconds extended cranking (in 4-5 sec intervals) before it would restart.