1974-79 FUEL SYSTEMS
Alfa Romeo (Spica) Fuel Injection

Alfa Romeo: 1974-75 2000

DESCRIPTION

The Spica fuel injection system consists of fuel tank, tank fuel filter, fuel pump, main fuel filter, injector pump, injectors, air intake ducts, throttle valves, idle by-pass air ducts and crankcase ventilating system.

Fuel is supplied from the fuel tank through the fuel filters and fuel pump to the injector pump. Fuel is compressed in the injector pump and fed through the injectors into the intake air ducts (near intake valves).

Air (at idle) is furnished through the idle by-pass air ducts on the engine side of each throttle valve. This air/fuel mixture enters the cylinder when the intake valve opens. Above idle position, idle by-pass air ducts cease to operate and air is drawn in through main air ducts, according to position of each throttle valve. At both idle and above idle positions, fuel is controlled and supplied by injection pump and its sensors.

TROUBLE SHOOTING

INJECTOR SYSTEM

Engine Misfires; Rough Idle - Defective injector. Injector pipe fitting leak. Injection pipes cracked.
Rough Idle - Lean mixture. Idle adjuster out of adjustment.
Fast Idle & Smoky Exhaust - Faulty thermostatic actuator.
Idle Too Fast - Accelerator linkage failing to return properly.
Unsatisfactory Performance; Hesitation - Control linkage out of adjustment. Defective injector or defective injection pump. Improper temperature setting. Fuel outlet pressure too low (warning light on at high speed).
Excessive Fuel Consumption - Fuel feed circuit leaks. Thermostatic actuator defective. Injector pump out of adjustment. Accelerator linkage failing to return properly.
Engine Stalls In Positions Other Than Idle - Defective altitude compensator. Injector pump vibrating excessively.
Noisy Fuel Pump - Line between pump and main filter distorted or forced in rubber mounting or against recovery pipe. Tank filter and hoses improperly fitted.

Detonations In Tail Pipe On Deceleration - Fuse No. 6 blown. Feed wire disconnected from fuel cut-off solenoid. Defective fuel cut-off solenoid. Defective fuel cut-off device micro switch.
Engine Stops - Fuel cut-off solenoid stuck in cut-off position or sluggish in operation.

ADJUSTMENTS

THROTTLE CONTROL LINKAGE

1) Disconnect both throttle rods, accelerator cable, and negative battery cable. With Adjustment Gauge (A.4.0121) attached to clamp studs, adjust idle stop screw until ball joint just touches reference plane of gauge and set lock nut. *See Fig. 1.*
2) Adjust full throttle stop screw in same manner. Remove gauge and connect throttle cable. Check that clearance between accelerator arm and bolt is .040-.060" (1.0-1.5 mm) with pedal at rest. Adjust bolt if necessary.
3) Depress accelerator to floor and check that clearance between relay crank lug and full throttle stop screw is .080" (2.0 mm). Adjust pedal stop on floor if necessary.
4) Reconnect relay crank-to-throttle rod and adjust length so throttles are just closed when relay crank is resting on idle limit stop. Just closed posisiton can be verified by opening and closing throttles by hand (very slowly).

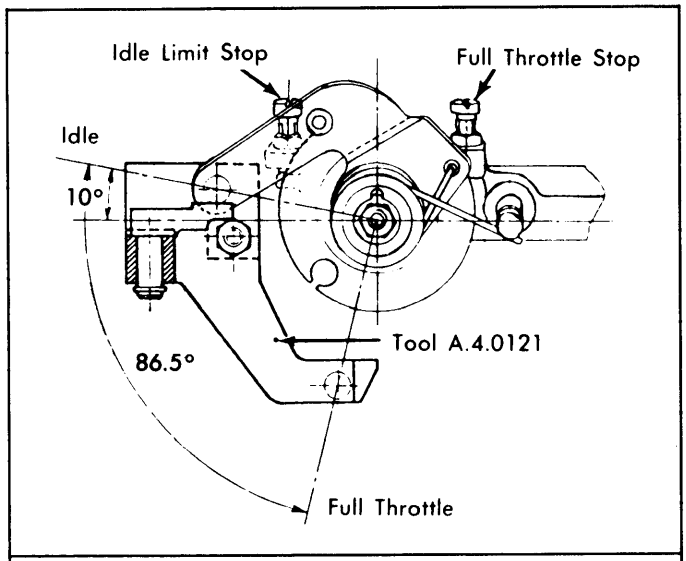

Fig. 1: Adjusting Throttle Control Linkage

5) Throttle plates will be felt touching their bores as they close. When relay crank is opened slightly and allowed to close under its own spring pressure there will be a "click" as the crank hits the limit stop.
6) Reconnect crank-to-control unit rod and battery cable. Start and warm engine to 170°F (77°C). Check that clearance between control unit arm and its reference screw is as close to .019" (.48 mm) as possible. Adjust length of rod as required. Twisting rod ends 30 degrees off a common plane is permitted to obtain desired clearance.

NOTE: Never tamper with sealed reference screw on control unit.

THROTTLE VALVES

1) Remove air cleaner and hoses to inlet port of each cylinder. Using Adapter (C.2.0012) attach Mercury Manometer (C.2.0014). *See Fig. 2.*
2) Start and warm engine until coolant temperature is at least 158°F (70°C). Check that clearance between control unit lever and its reference screw is as close to .019" (.48 mm) as possible with thermostat actuator fitted.
3) Check that readings on mercury manometer columns are about the same. Maximum difference between columns should not exceed .40" (1.0 mm). If difference is greater, go to next step.
4) If reading in front pair of cylinders is higher, unscrew throttle coupling adjusting screw to close rear pair of throttle valves. If front pair of cylinders is lower than rear pair, disconnect relay crank-to-throttle rod.
5) Set throttle coupling screw in such a way as to close front pair of throttle valves. Reconnect relay crank-to-throttle rod and adjust its length so that throttle valves are in just closed position.
6) Remove adapter and manometer. Install air cleaner, blow-by tube, 4 idle air tubes, and air cleaner-to-equalizer tube.

THERMOSTATIC ACTUATOR

Install 19 mm dummy thermostat. Standard Dummy Thermostat (A.4.0120) is 29 mm long and must be shortened to 19 mm for this operation. Measure clearance between pin, on solenoid actuated lever, and arm which it actuates. Clearance must be .010" (.25 mm). Screw solenoid in or out to decrease or increase clearance. Tighten lock nut and install side cover.

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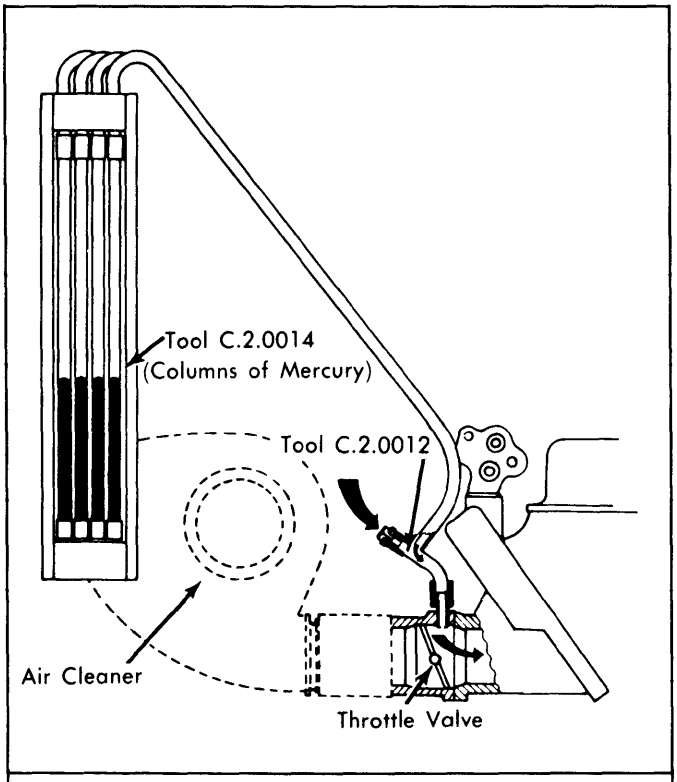

Fig. 2: Throttle Valve Adjustment

TESTING

INJECTORS

1) Use tester, like that for testing Diesel injectors, but supplied with gasoline and provided with a pressure gauge with a top reading of 700-1000 psi (50-70 kg/cm²).

2) Disconnect test pump pipe to injector inlet fitting and pump quickly to prime pump and injector. Pump slowly until injector nozzle opens. Injector must open at 360-400 psi (25-28 kg/cm²) for new injector, and at no less than 260 psi (18 kg/cm²) for used injectors.

3) Again pump slowly to bring pressure to 15-30 psi (1-2 kg/cm²) below injector opening pressure. Make sure that there is no drip from nozzle within 5 seconds.

4) Pump quickly and check that spray is narrow and has good vaporization even at minimum delivery. At a distance of 4 inches from nozzle orifice, the spray cone should be about .8" (20 mm). If injector does not meet these requirements, it must be replaced.

REMOVAL & INSTALLATION

INJECTION PUMP

Removal - **1)** Disconnect negative battery cable. Remove air cleaner. Disconnect lead from cold start device solenoid. Remove 2 screws on thermostatic actuator mounting flange.

2) Remove 2 screws clamping actuator pipe anchoring grommet. Withdraw actuator from control unit. Disconnect fuel lines from injector pump and detach rod from control unit. DO NOT remove thermostatic bulb.

3) Bring piston in cylinder No. 1 its injection stroke by aligning "I" mark (70° BTDC) in crankshaft pulley with pointer on front cover. This will facilitate re-installation of injection pump.

4) Unscrew 3 attaching nuts and remove drive belt cover. Remove drive belt from pulley. Loosen injection pipe nuts on pump outlet fittings. Using Wrench (A.5.0164), unscrew nuts on 2 bolts attaching pipe cluster plate and injection pump slanting bracket.

5) Loosen 2 screws attaching control unit to bracket at engine mount. Remove six 10 mm nuts attaching injection pump to support. Remove injection pump by tilting it as necessary.

Installation - **1)** Check that crankshaft pulley has remained in position set on disassembly. Pointer on engine should still be aligned with "I" mark on crankshaft pulley.

2) Now check that mark on injection pump pulley is aligned with reference on injection pump itself (to gain access to reference on injection pump remove protective cover).

3) If pump is out of alignment, remove drive belt and line up reference marks of injection pump and refit drive belt by rotating pulley in either direction to engage nearest spline. After alignment, replace protective cover.

NOTE: Reference marks can be out of alignment within a tolerance of about 3/16" (5 mm) corresponding to half pitch of pulley splines.

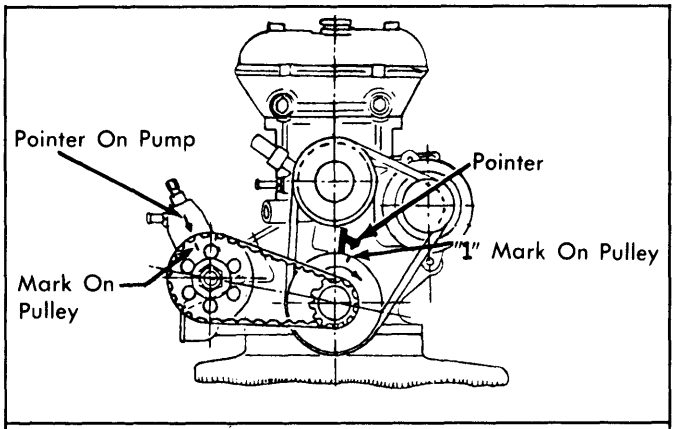

Fig. 3: Injection Pump Timing Marks

THERMOSTATIC ACTUATOR

Removal & Installation - **1)** Remove air cleaner. Drain coolant from cooling system. Remove thermostat assembly. Before installing new actuator, check position of screw in control unit upon which the actuator acts.

2) Install new thermostat assembly, taking care not to distort small pipe. Replace "O" ring, if necessary. After installation, refill cooling system. Check that clearance between control unit lever and reference screw is .019" (.48 mm) when engine is at normal operating temperature. If not, turn adjuster screw.

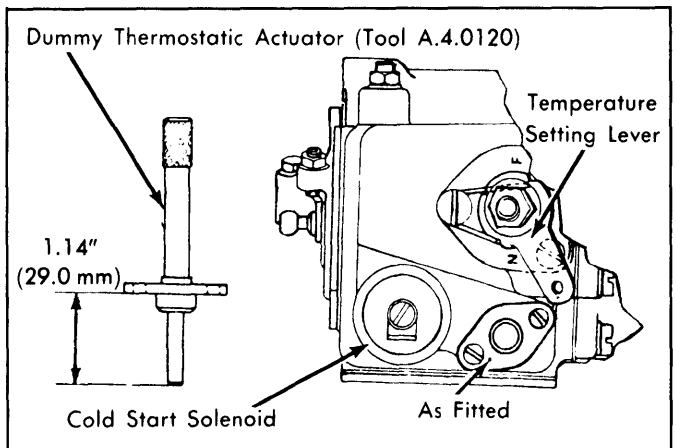

Fig. 4: Dummy Thermostatic Actuator

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FUEL CUT-OFF SOLENOID

Removal & Installation - **1)** Remove air cleaner and disconnect terminal of solenoid feed wire. Measure and record distance "A" of solenoid body from ring nut top. *See Fig. 5.*

2) Slacken ring nut with Wrench (A.5.0177) taking care not to cock solenoid. Unscrew solenoid by hand and remove. Before installing new solenoid it should be checked.

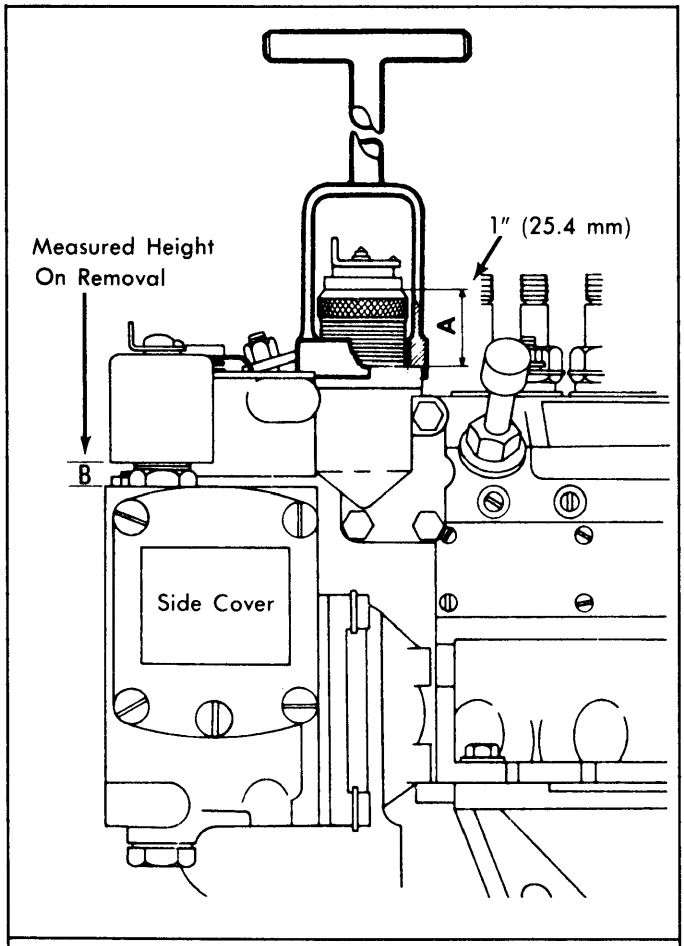

Fig. 5: Cold Start & Fuel Cut-Off Solenoids

COLD START SOLENOID

Removal - **1)** Remove injection pump. Remove side and rear inspection plates from control unit. Remove cotter key and clevis pin attaching solenoid to plunger shaft. Measure distance from bottom of solenoid to control unit.

2) Loosen solenoid lock nut and unscrew solenoid. Check that plunger moves up and down freely. If necessary to remove plunger shaft, unscrew plug from underneath and withdraw plunger shaft.

3) Check that diameter of plastic plunger is .53" (13.5 mm). Replace or reduce diameter if required. The height of cold start solenoid above control unit housing governs operation of cold start device.

Installation - **1)** Fit plunger, shaft, and plug in reverse order of removal. Install solenoid and lock nut to same height as measured in step **1)** of removal procedure.

2) Connect plunger shaft to solenoid with clevis pin and install cotter key. Tighten solenoid lock nut and install inspection plates. Install fuel inejction pump.

ALTITUDE COMPENSATOR

Removal - **1)** Remove air cleaner and relay crank-to-control unit rod. Remove rear inspection cover from control unit and altitude compensator with its mounting flange. *See Fig. 6.*

2) Measure and record dimension "A" at altitude compensator. Loosen lock nut and unscrew capsule, taking care not to rotate setting lever with respect to mounting flange.

NOTE: Do not move control unit input lever (tape in place) or disturb internal components as serious damage may result.

Installation - Screw in new capsule to same height as measured in step **2)** of removal procedure. Lightly tighten lock nut. Install capsule and mounting flange on control unit, making sure setting lever spring is properly positioned and setting lever is in "N" position. Install rear cover and control rod.

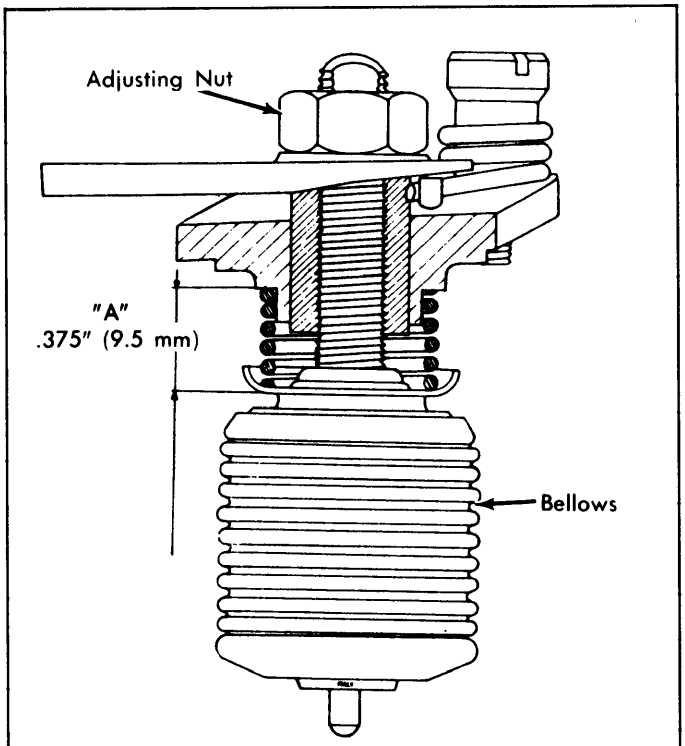

Fig. 6: Assembled View of Altitude Compensator