GROUP 04

CONTENTS

(*) Refer to GROUP 00

DESCRIPTION

GENERAL DESCRIPTION

The L-JETRONIC electronic system consists of indirect-intermittent fuel injection and is fitted with a control unit.
Ignition occurs through an electronic injection system fitted with an electronic power module.
The parameters required to actuate the various controls are picked up by suitable sensors and changed into electric signals. Parameters are as follows:

- battery voltage
- accelerator throttle position signal (fully open/closed)
- engine coolant temperature
- quantity of air sucked by engine
- starting motor operation signal
- engine rev number (from distributor)
- quantity of oxygen in the air and in the exhaust gases
- intake air pressure in relation to the altitude.

The electronic control unit (ECU) collects the data and calculates the opening time of injectors, in relation to the instantaneous r.p.m. and load conditions of the engine. After calculating, the control unit opens the injectors for the period required. Since the difference between fuel pressure and air pressure in the manifold is kept constant by a regulator, the amount of fuel injected is proportional to the period of delivery time.
The injection control unit is also capable of executing, as the occasion arises, the most suitable operations according to engine requirements (i.e., cold start injector, fuel delivery cut off during deceleration).

L-JETRONIC INJECTION SYSTEM

The system, composed of an air supply system and a fuel supply system, includes:

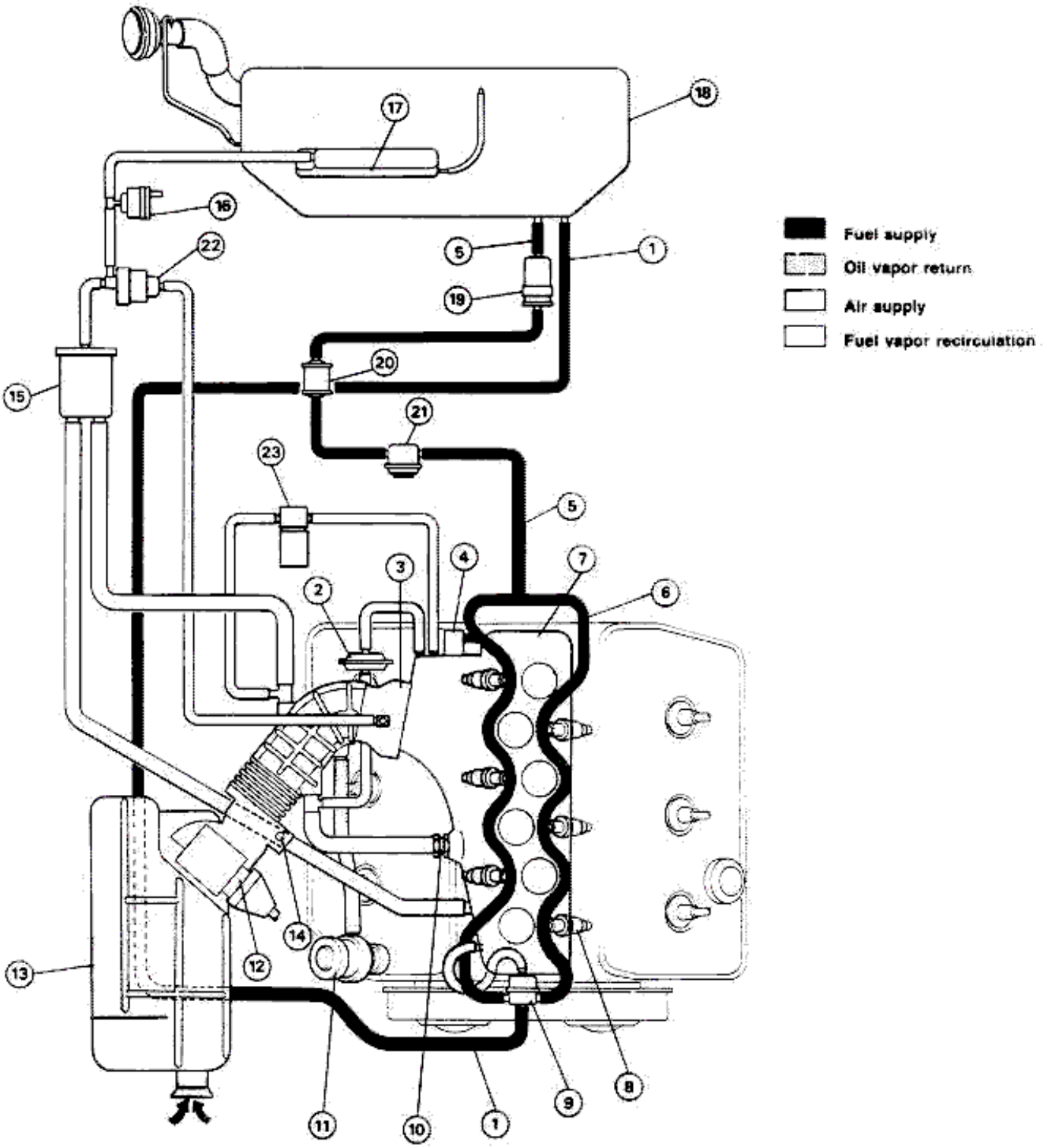
- a pump with the related filter, for the fuel delivery;
- a pressure regulator to keep the pressure between fuel system and intake manifold constant;
- a dashpot; its purpose is to eliminate throbbing caused by pressure peaks
- six injectors which, thanks to the regulator, inject an amount of fuel in relation to their opening period;
- a cold start injector that injects a very fine spray of fuel controlled by a thermo-time switch;
- an air-flow sensor; it measures the quantity of air sucked by the engine (regulated in relation to air temperature), fitted with an idle r.p.m. CO regulator;
- an auxiliary air device to supply auxiliary air when engine is cold;
- a device for idle r.p.m. adjustment
- a switch on the accelerator throttle which senses both positions of the throttle (i.e. fully open/closed);
- a sensor for the engine coolant temperature;
- a sensor for rotation speed;
- piping and wiring; the latter including control relays and control unit;
- a Lambda sensor that detects the difference in the amount of oxygen in the exhaust gases in relation to the air.
- an altitude compensation device that measures the altitude and varies the supply of the air-fuel mixture by altering the injection timing.

IGNITION SYSTEM

The system is composed of:

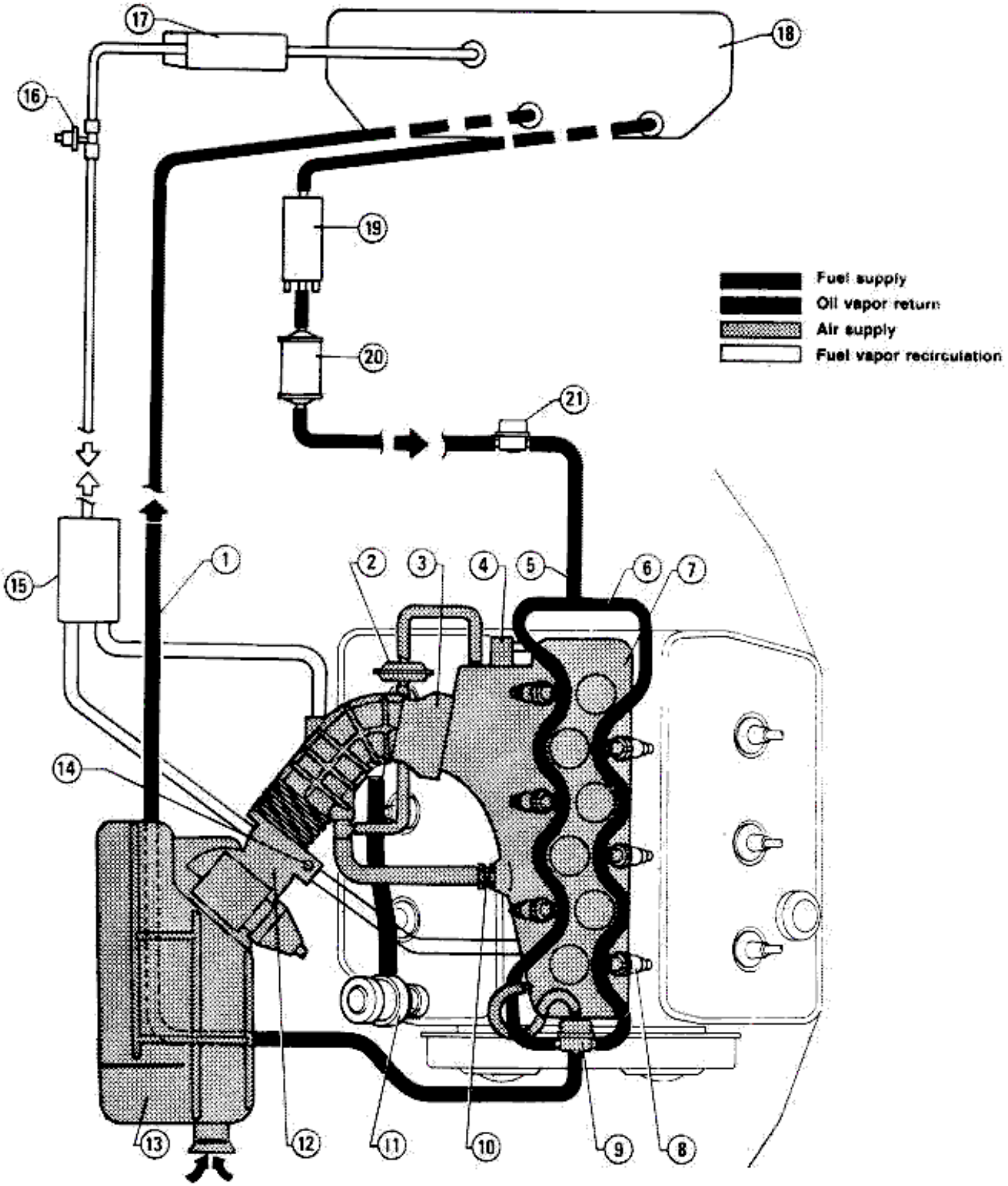
- an electronic power module integrated with the coil for the generation of the high voltage discharge
- a high voltage distributor which sends current to the spark plugs
- an ignition advance E.C.U.
- six ignition spark plugs
- high/low voltage wiring

AIR/FUEL SUPPLY SYSTEM DIAGRAM V6 2.0 milano



1 Fuel return line
2 Auxiliary air device
3 Throttle body
4 Cold start injector
5 Fuel delivery piping
6 Fuel system manifold
7 Intake air box
8 Injector
9 Pressure regulator
10 Idle r.p.m. adjusting device
11 Oil vapor separator
12 Air-flow sensor
13 Air cleaner
14 Exhaust CO% adjusting screw
15 Carbon canister
16 Air inlet valve
17 Fuel vapor separator
18 Tank
19 Fuel pump
20 Fuel filter
21 Dashpot
22 Purge control valve
23 Air conditioner solenoid

AIR/FUEL SUPPLY SYSTEM DIAGRAM V.8 milano



1 Fuel return line
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5 Fuel delivery piping
6 Fuel system manifold
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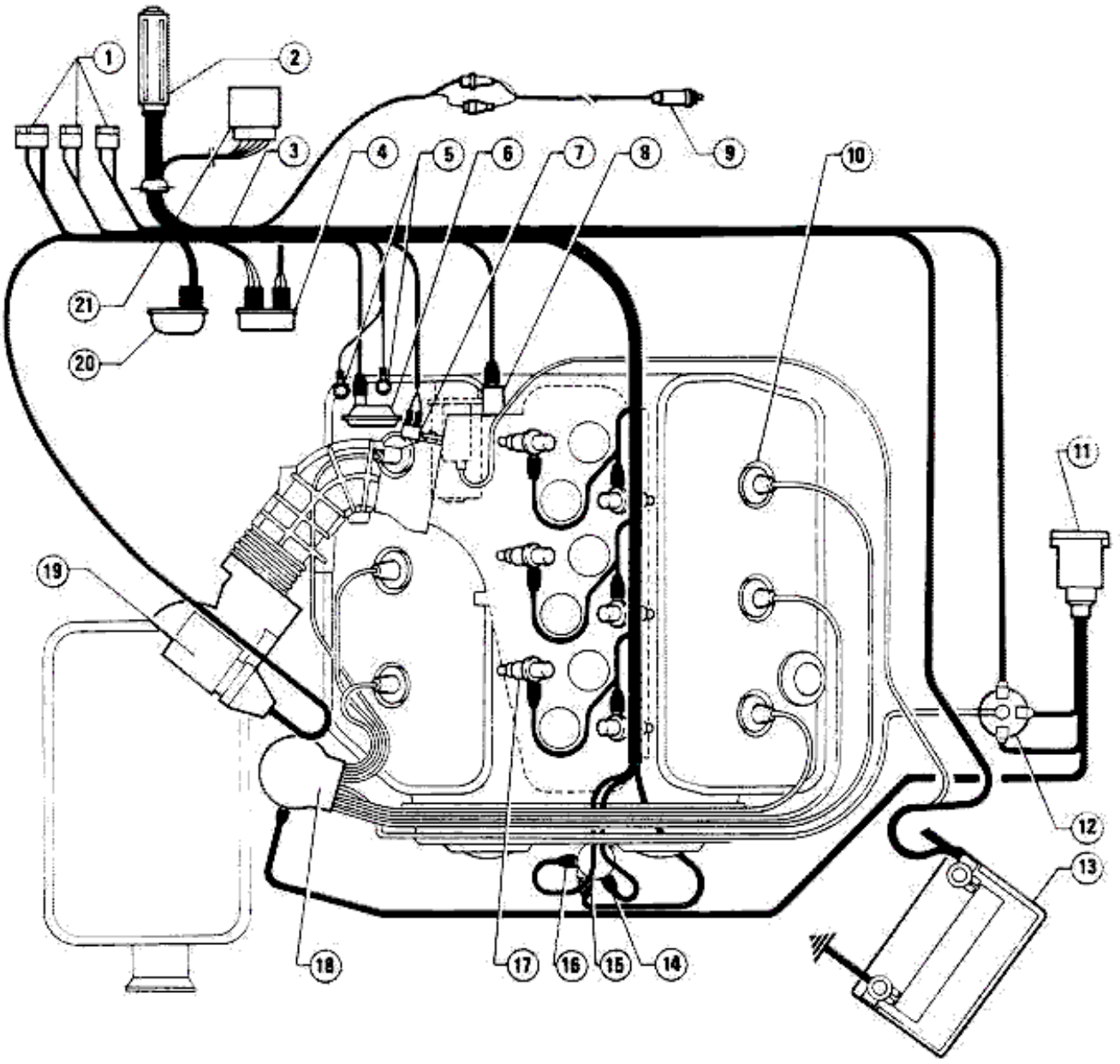
8 Injector
9 Pressure regulator
10 Idle r.p.m. adjusting device
11 Oil vapor separator
12 Air-flow sensor
13 Air cleaner
14 Exhaust CO% adjusting screw
15 Carbon canister
16 Air inlet valve
17 Fuel vapor separator
18 Tank
19 Fuel pump
20 Fuel filter
21 Dashpot

L-JETRONIC SYSTEM MAIN COMPONENTS AND WIRING

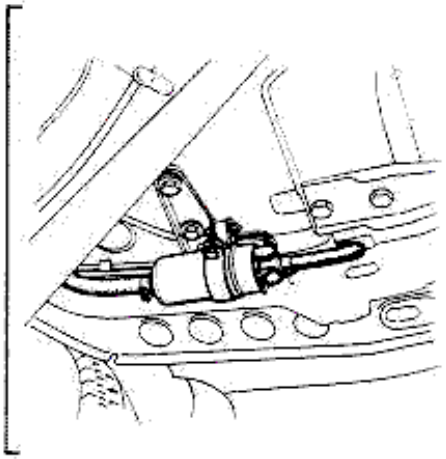


1 Vehicle wiring connectors
2 Electronic control unit
3 L-Jetronic wiring
4 Relay set
5 Ground terminals (common)
6 Auxiliary air device
7 Accelerator throttle switch
8 Cold starting
9 Lambda sensor
10 Spark plug
11 Electronic power module
12 Ignition coil
13 Battery
14 Engine coolant temperature sensor
15 Thermal contact for ignition advance control unit
16 Thermo-time switch
17 Injector
18 Ignition distributor
19 Air-flow sensor
20 Altitude compensation device
21 Ignition advance control unit

MAIN COMPONENTS

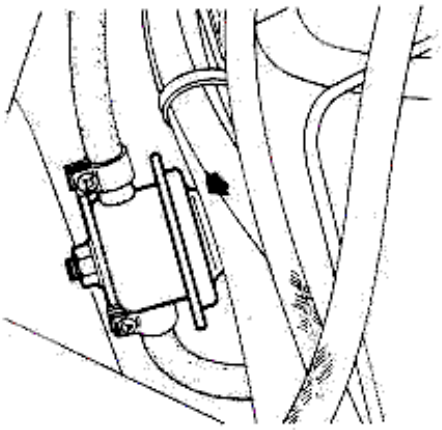
ELECTRIC FUEL PUMP

This pump is of the rotary cell and roller type; it is driven by a small motor sub merged in the pressurized fuel after the pump set.
A lower noise level is achieved by this solution; the pressurized fuel also acts as a hydraulic bearing for the motor shaft on its bushings.
The pump delivers more fuel than the actual maximum required by the engine so as to keep the fuel system under pressure during any operating condition.
Inserting the ignition key (position 1) into the ignition switch and rotating it to position 2 (ignition "on") does not feed the electrical fuel pump; in position 3 (starting), since the engine is cranked, the sucked in air causes the air-flow sensor floating flap to rotate, thus switching on the fuel pump feed circuit. This electronic safety circuit prevents a cylinder filling with fuel, when the ignition is turned on, should its injector be faulty.



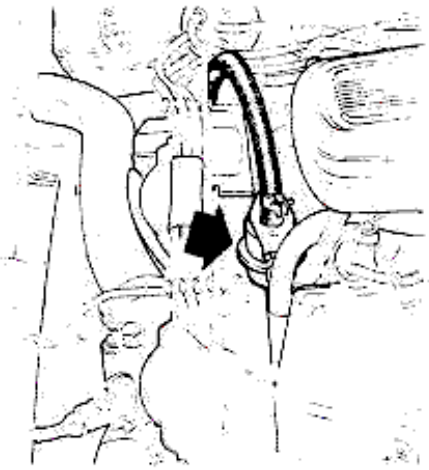
DASHPOT

The fuel under pressure passes through the dashpot before being sent to the fuel manifold.
The dashpot permits the elimination of the pressure peaks that occur in the fuel supply system due to injector opening and closing.



FUEL PRESSURE REGULATOR

The fuel under pressure enters the lower chamber and acts on the diaphragm; this overcomes the force of the spring and rises, together with the plate, thus opening the tank return connection. The regulating action of the fixed calibration spring is added to the action exerted by the pressure of the intake manifold air in the upper chamber.
When this pressure drops, the diaphragm rises, opens the return connection and thus correspondingly lowers the fuel pressure and viceversa. The purpose of this additional regulation is to hold the pressure drop between the fuel upstream of the injectors and the manifold air constant, so as to have the fuel flow rate depend exclusively on the injector's opening time.



FUEL INJECTORS

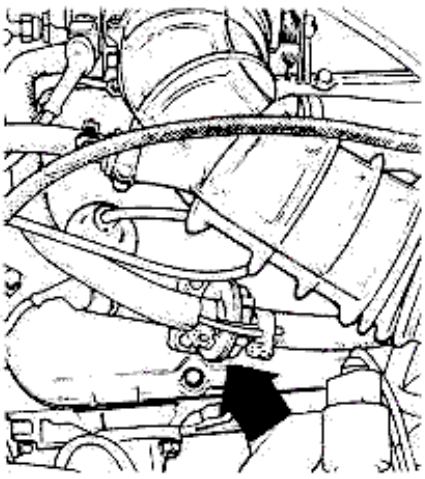
Each cylinder has its own electromagnetically operated injector; the injectors are electrically parallel-connected and simultaneously inject one-half of the required fuel flow rate at every crankshaft revolution. The injector mainly consists of a magnetic winding (coil), needle guide, magnetic core and needle. The magnetic core moves with the needle, which is pressed by a spring on its sealing seat on the body. The injector needle opens under the action of the magnetic field established by the coil upon an electric signal issuing from the electronic unit. The plunger core, and therefore the needle, has a very short stroke (some 0.15 mm) because of the disk stop which keeps the plunger from hitting the stationary inside part; needle opening time is 2-10 ms, according to the signal issued by the electronic unit. The tip of the injector is fitted with a Teflon heat protection to avoid fuel evaporation and the consequent build up of dry residuals on the needle. This bushing should not be removed when installing the injector.

FILLER NECK FOR UNLEADED FUEL ONLY

The filler neck of the tank prevents accidental filling with other than unleaded gasoline. This is obtained by providing the tank with special device.
Only the nozzle of an unleaded gasoline pump is allowed to pass in the filler neck and open the flap valve to refuel the tank.

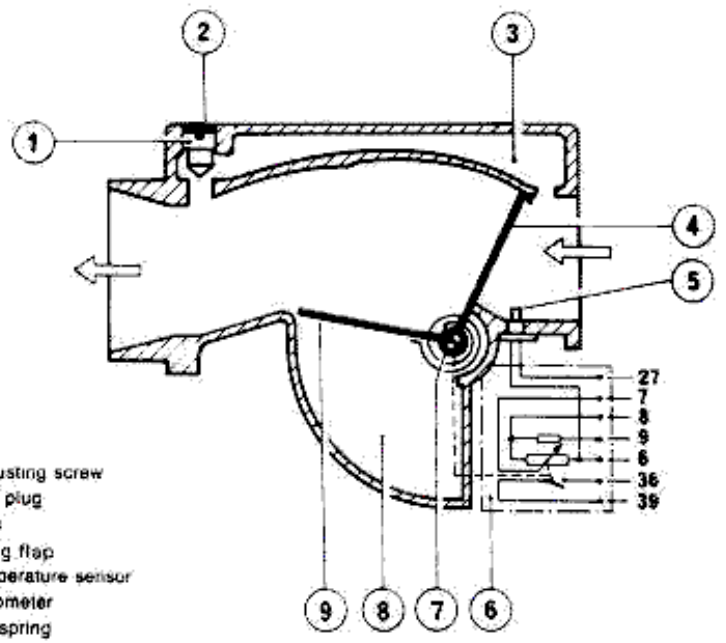
AUXILIARY AIR DEVICE

The auxiliary air device is located on a throttle valve bypass and delivers an additional air flow when the engine is cold.
The bimetallic strip is sensitive to cylinder head temperature and closes the bypass when the engine is warmed up. The heating coils also act on this strip so as to have the bypass close before the whole engine is warmed up.
This device ensures cold engine smooth running, by offsetting the higher friction by a greater flow.



 See Tec. Bulletin 05-87-01

AIR FLOW SENSOR (AFS)



1 CO adjusting screw
2 Sealing plug
3 By-pass
4 Floating flap
5 Air temperature sensor
6 Potentiometer
7 Return spring
8 Damping chamber
9 Compensating flap valve

The air-flow sensor's task is to issue an electric signal, depending on the engine air intake flow, to the electronic control unit by means of a potentiometer.
The signal is used to establish injection duration.
The sensing element is a floating flap valve which opens in proportion to the air intake flow; this in turn is a function of engine RPM and throttle valve setting. The angle setting of this flap valve is transferred to a potentiometer rigidly fastened to the valve shaft.
A compensating flap valve, coupled to the floating one, compensates any air column reflux pressure oscillations, so as to keep them from interfering with air flow sensing.
A bypass is placed across the floating flap valve and fitted with a screw and sealing plug. By acting on this screw, the CO value can be adjusted to the minimum as, while the total air intake flow remains the same, the percentage flow rate through the flap valve changes, thereby acting on its angle setting and on the fuel delivery from the injectors.
A fuel pump control switch is inserted on the potentiometer; this switch opens when the floating flap valve rests against its stop at idle, as a safety measure in case of engine shutdown with the ignition on. When starting up, the pump is parallel-connected to the starting motor as at this stage, at least at the beginning, there is no air-flow and the switch therefore stays open.
An air intake temperature sensor (temperature sensor I) is placed at the air-flow sensor inlet.

COLD START INJECTOR (START VALVE) AND THERMO-TIME SWITCH

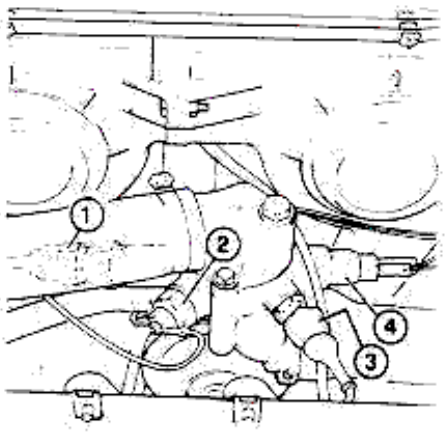
The cold start injector has the task of enriching the mixture in the intake manifold by injecting a fine fuel spray into it; it operates only when turning on the starting motor and if the thermo-time switch is closed.
The thermo-time switch consists of a bimetallic strip which opens the electric circuit when the temperature exceeds 35°C; under such conditions, the cold start injector is not energized and no extra gasoline fed. At the same time, the bimetallic strip is heated by its coil, and the circuit thus opens after a few seconds even through the starting motor is still running. This helps to avoid flooding the engine in the case of prolunged efforts to start the car.

ENGINE COOLANT TEMPERATURE THERMISTOR (TEMPERATURE SENSOR II)

During warm up after a cold start the engine requires a very rich mixture; this enrichment should be reduced as engine temperature increases and ceases when the normal operating temperature is attained. Such temperature variations are transmitted by the thermistor to the electronic unit which adjusts the injected fuel flow to the engine temperature.

THROTTLE POSITION SWITCH - DECELERATION FUEL CUT-OFF

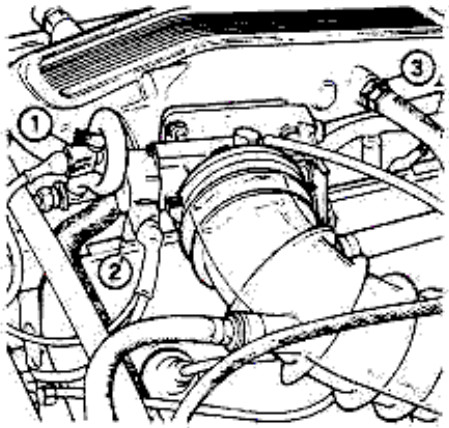
The throttle position switch, which is rigidly coupled to the throttle -valve shaft, contains one contact for the fuel-load position. In this way the engine operating conditions of full-load is signalled to the control unit in order to match the air-fuel ratio to the special requirements of this condition.
A deceleration fuel cut-off is provided by means of a switch activated by the throttle valve. When the throttle is released, with engine rpm above 1600, fuel delivery is stopped until approximately 1100 rpm when it is again restored. The main purpose of the deceleration fuel cut-off control is that fuel consumption is decreased along with an emission reduction of unburned hydro carbons during this mode.



1 Thermo-time switch
2 Ignition coolant temperature sensor
3 Injection coolant temperature sensor
4 Coolant temperature indicating device on dashboard

BY-PASS FOR IDLE SPEED ADJUSTMENT

A screw-adjustable bypass bypasses the throttle valve.
The screw adjusts the idle speed without changing the CO value. In fact, the change in engine air intake, as controlled by the screw, is sensed by the air-flow sensor which will also proportionally adjust the injected fuel rate.



1 Cold start injector (start valve)
2 Throttle switch
3 Nut for idle-speed adjustment on by-pass

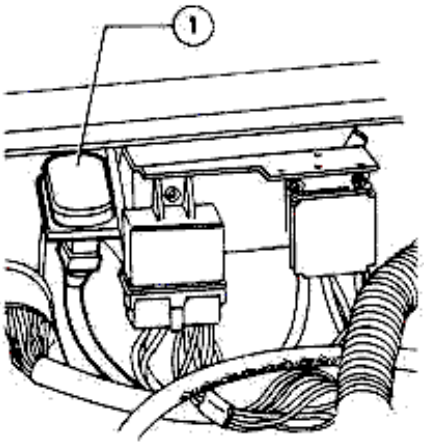
ALTITUDE COMPENSATION SYSTEM

High altitude adjustment of the air/fuel mixture is automatically made by a valve sensing the atmospheric pressure.

This valve is connected to the electric circuit of the fuel injection unit controlling the time during which the fuel is injected into the intake ducts.

The valve works by changing the value of an electric resistance according to the actual value of the atmospheric pressure. This in turn is converted into a voltage signal which is fed to the electronic unit. There is consequently a reduction of the injection time, namely, a proportional adjustment of the fuel supply to suit the altitude at which the vehicle is actually driven.

No manual adjustment or regular servicing is required when changing the altitude at which the vehicle is commonly used.



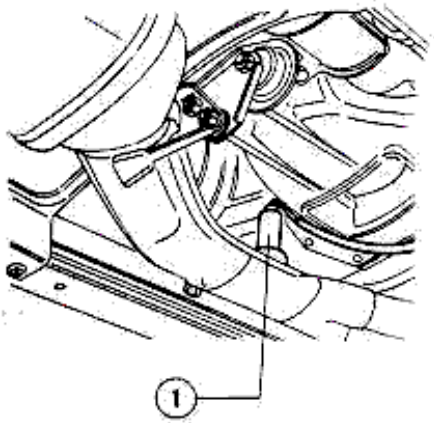
1 Altitude compensation device

EXHAUST GAS LAMBDA SENSOR

The sensor's sensitive element is a ceramic capsule coated with a platinum sponge on both sides; the outside is exposed to the exhaust gases while the inside is in contact with the atmosphere. The oxygen content differential between air and exhaust gases is converted into an electric potential differential across the capsule.

This electrical signals is fed to the electronic unit (ECU) which determines adjustments necessary to obtain the stoichiometric air fuel ratio required for maximum catalyst efficiency which results in minimal exhaust emissions.

The lambda sensor is electrically preheated so that shorter response times are involved.

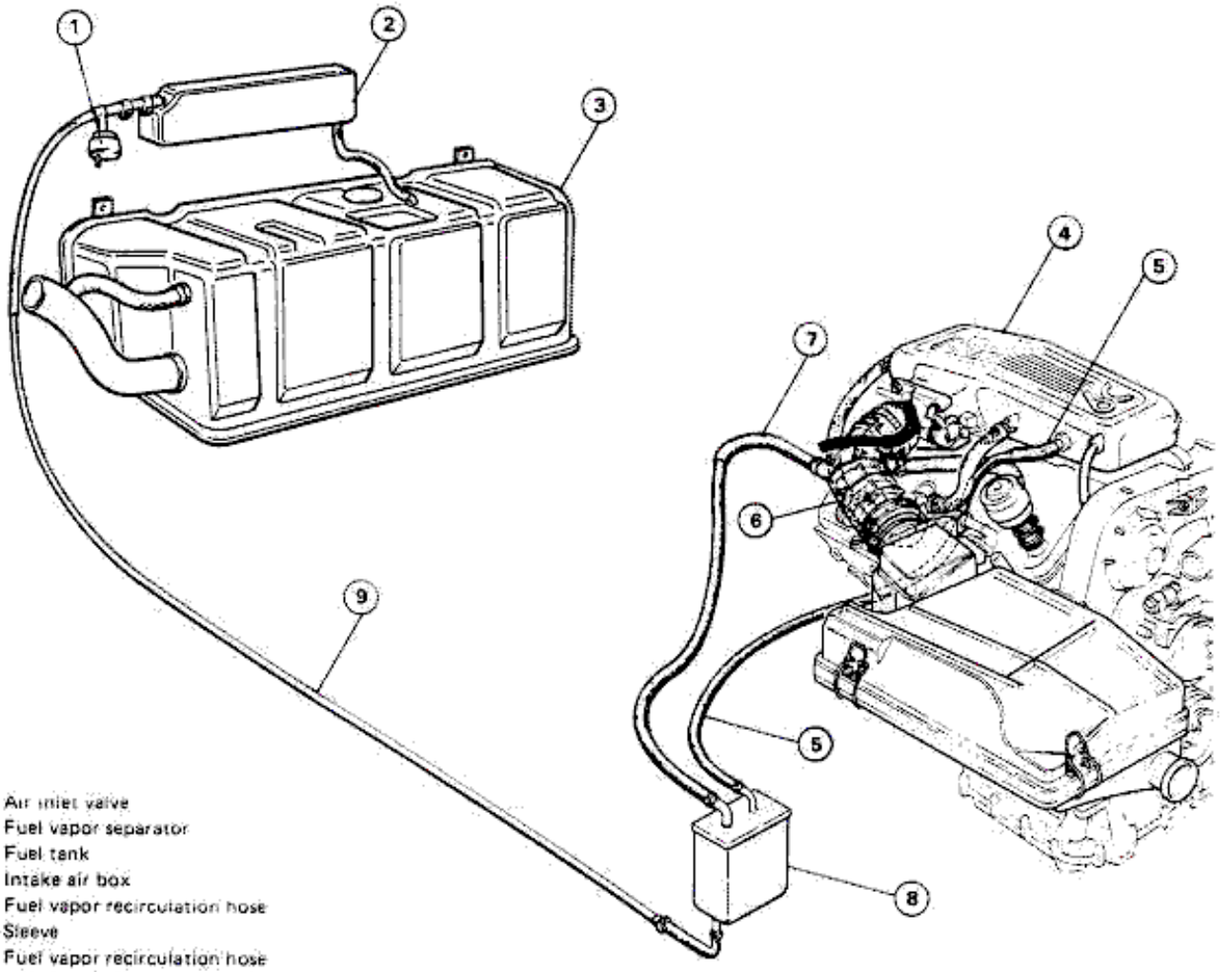


1 Lambda sensor

CATALYTIC CONVERTER

In order to reduce emissions, there is a catalytic converter in the exhaust system. It is made of an alumina monolith coated with an active material of noble metals in a special steel container for high temperature resistance. The system converts the HC and CO in the exhaust into water and CO_2, which are not harmful. The catalyst is efficient within a certain temperature range. At low temperature there is no catalytic conversion. High temperature can cause deformation on the metal container and deterioration of the alumina, with a subsequent loss of efficiency of the catalyst itself. High temperatures can be caused by an excessive quantity of unburned fuel going through the alumina, owing either to excessive loads on the engine or maladjustment of the engine.

EVAPORATIVE EMISSION CONTROL SYSTEM V8 milano



1 Air inlet valve
2 Fuel vapor separator
3 Fuel tank
4 Intake air box
5 Fuel vapor recirculation hose
6 Sleeve
7 Fuel vapor recirculation hose
8 Carbon canister
9 Fuel vapor recirculation hose

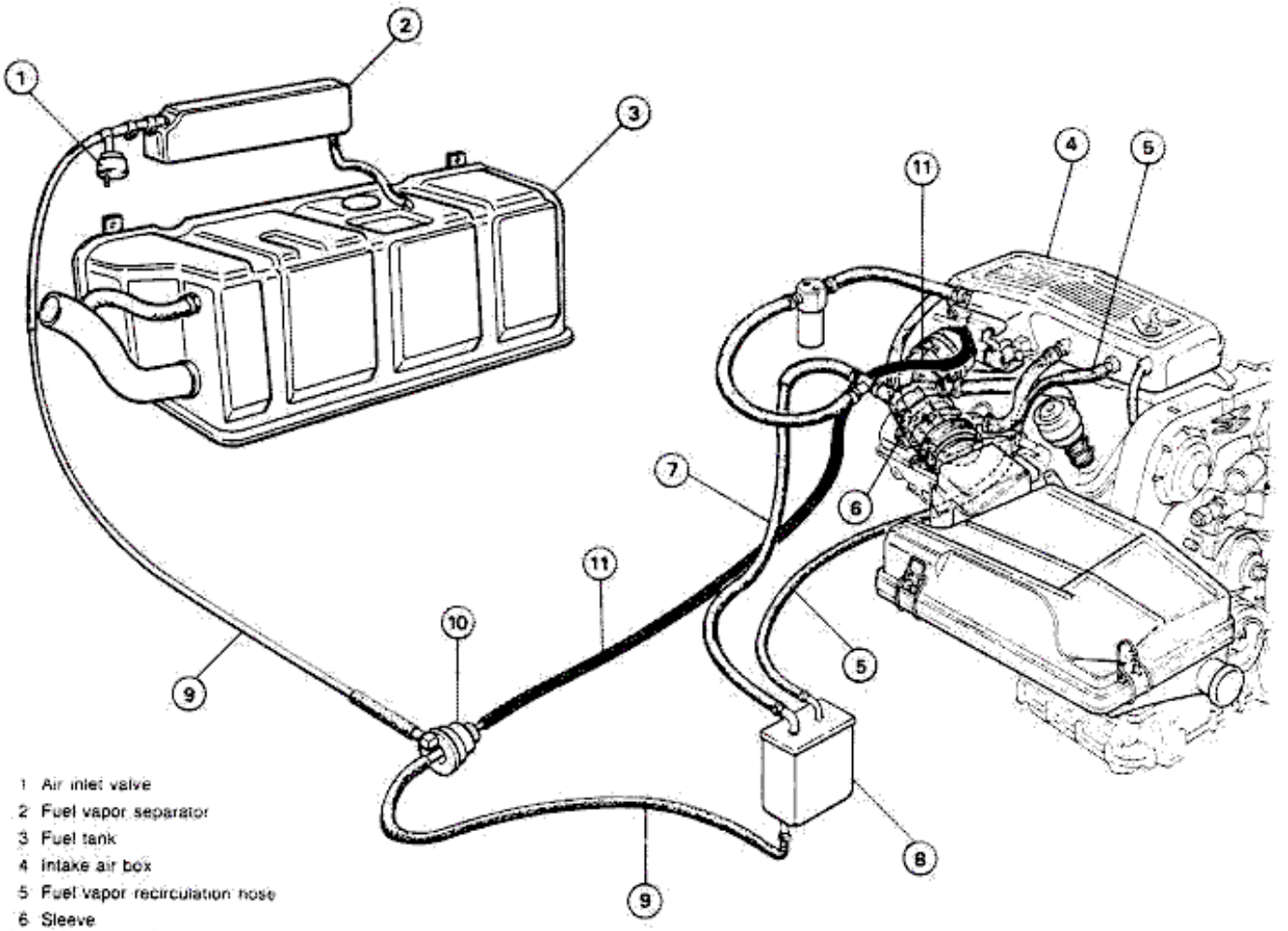
Gas vapors, emanating from fuel tank are collected through the fuel tank connection in the vapor/liquid separator, returning the condensate to the fuel tank via the same connection at the bottom of the vapor/liquid separator. To prevent vapors from being emitted in to the open air a sealed filler cap is provided.

Gas vapors coming to the vapor/liquid separator flow out of the separator from the top and passing through the vent pipe enter the carbon canister. When the engine is stopped they are absorbed by activated charcoal and stored.

With the engine running, fresh air is drawn into the carbon canister where it is mixed with the gasoline vapors which have been absorbed by the activated charcoal. Due to difference in pressure existing within the canister, charcoal is purged via air flowing through it. This pressure differential is accomplished by routing one connection upstream of the throttle valve and the other downstream. Purging causes the gas vapors and fresh air to enter the intake manifold where it is mixed with the intake charge.

In the event that after engine shut down, the pressure in the vapor/liquid separator tends to diminish as a result of a drop in temperature, an air inlet valve in the line between the separator and the canister allows ambient air to enter thus keeping the fuel and vapor liquid separator at atmospheric pressure.

EVAPORATIVE EMISSION CONTROL SYSTEM V6 3.0 milano



1 Air inlet valve
2 Fuel vapor separator
3 Fuel tank
4 Intake air box
5 Fuel vapor recirculation hose
6 Sleeve
7 Fuel vapor recirculation hose
8 Carbon canister
9 Fuel vapor recirculation hose
10 Purge control valve
11 Vacuum hose for purge control valve and ignition advance vacuum regulator

Gas vapors, emanating from fuel tank are collected through the fuel tank expansion connection in the expansion tank which acts also as a vapor liquid separator returning the condensate to the fuel tank via the same connection at the bottom of the expansion tank.

To prevent vapors from being emitted in the open air a sealed filler cap is provided.

Gas vapors coming to the expansion tank flow out of the separator from the top and passing through the vent pipe enter the carbon canister.

The vapor flow is controlled by a valve which opens (or closed) according to the vacuum existing in the intake pipe near the throttle valve.

When the vacuum is below a present limit (i.e. when the engine is stopped or at idle) the control valve is closed preventing vapors from entering the carbon trap. In the other case (engine in normal operating conditions) vapors enter the carbon canister where they are absorbed by activated charcoal. Due to the difference in pressure existing within the canister, it is purged via air flow through it. This pressure differential is accomplished by routing one canister connection upstream the throttle valve and the other downstream.

Purging causes the gas vapors and fresh air to enter the plenum chamber where it is mixed with the intake charge.

There are two restrictions: the first is positioned at the outlet of the vapor liquid separator; the other in the line between the canister and the intake manifold.

Dimensions are:

3 and 1 mm respectively

In the event that after engine shut down, the pressure in the vapor separator tends to diminish as a consequence of drop in temperature, an air inlet valve in the line between the separator and the canister allows ambient air to enter thus keeping the fuel and expansion tank at atmospheric pressure. The control valve has a spring which opens in case of excessive pressure in the tank. In this case vapors can be discharged into the canister and stored.

IMPORTANT GENERAL INFORMATION

- **Never start the engine when battery cables are connected incorrectly.**
- **Never use fast charging to start the engine.**
- **Never detach battery from the vehicle electronic system when engine is running.**
- **Never perform battery fast charging.**
- **Remove the electronic control unit if vehicle is to be furnace-painted at temperatures higher than 80°C (176°F).**
- **Check that the shielded wire connectors are correctly secured.**
- **Never attach/detach connector to/from the electronic control unit leads with ignition on.**
- **Never ground the high/low voltage cables for test purposes.**
- **In the event of installation of ancillary equipment on vehicle, always disconnect the electronic control unit in order to carry out functional test of ancillary equipment with ECU disconnected. Never connect other devices to ECU wiring.**

TEMPERATURE OF THE CATALYTIC CONVERTER

Excessive temperature in the catalytic converter during driving can cause damage to the alumina monolith thereby lowering its conversion efficiency as well as causing damage to the container and to the vehicle or possibly constituting a fire hazard. Engine malfunctions that can cause catalytic converter overtemperature are:

- Spark plug fouling on one or more cylinders.
- Defective electric fuel pump or fuel filter clogged fuel pressure (too low).
- Defective injectors.
- Air cleaner element very dirty.
- Engine accelerator control linkage out of setting.
- Engine and related devices not set to factory specifications.
- Leaks at the exhaust pipe upstream of the exhaust sensor.
- Faulty pressure regulator.
- Battery voltage (too low) (or defective charging circuit).

Driving methods that can cause catalyst overtemperature are:

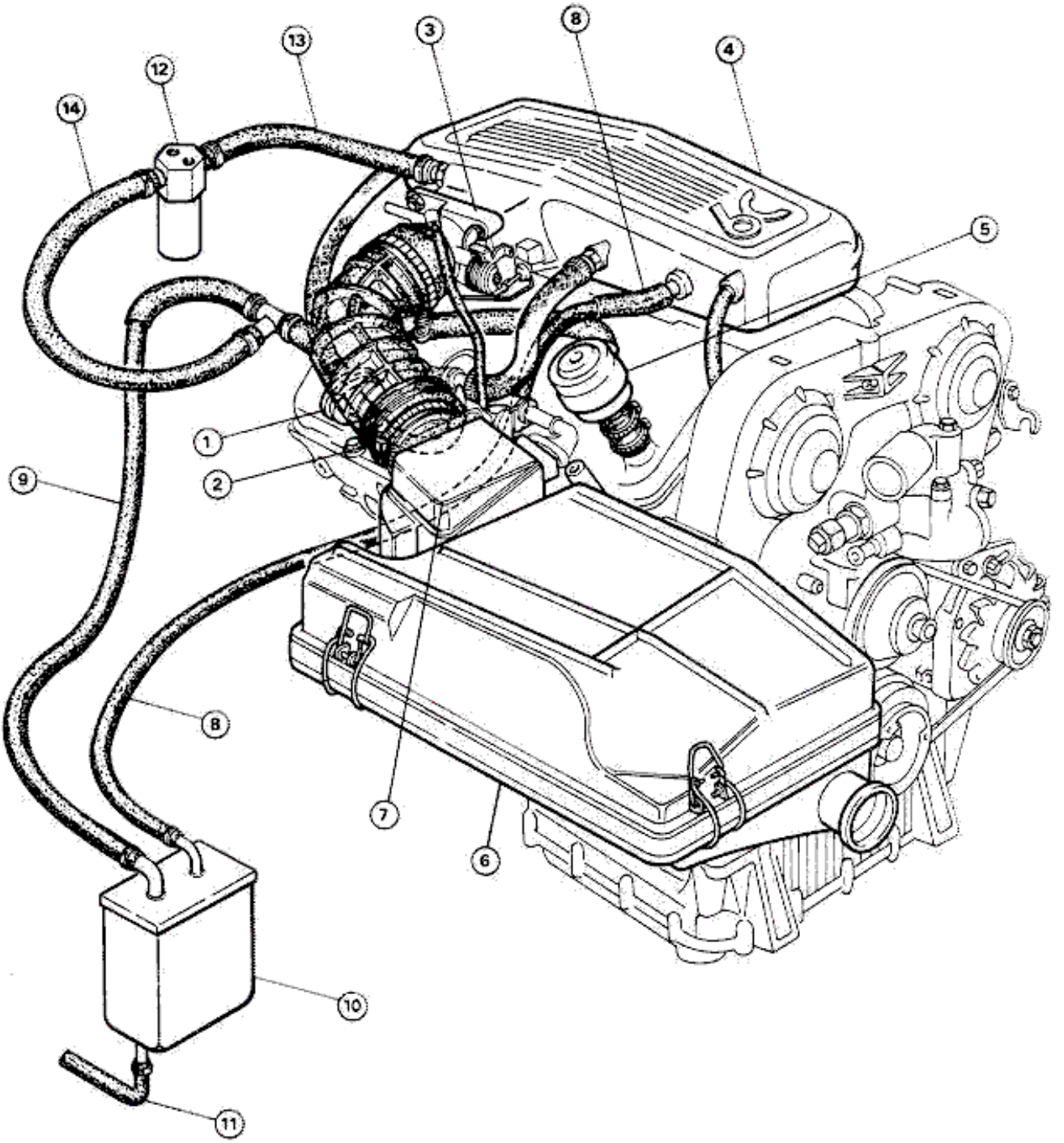
- Fuel tank too low.
- Engine overloading for prolonged period of time e.g. when racing the engine, pulling trailers or climbing long hills or grades.
- Driving or coasting with the ignition turned off.

PRECAUTIONS TO BE TAKEN IN CATALYTIC EQUIPPED MODELS

- Use only unleaded gasoline.
- Do not allow the fuel tank to become empty.
- Never operate the engine with a spark plug lead disconnected or ground the spark plug.
- Never overload the engine for a prolonged period. Be careful when pulling trailers or when climbing long hills or grades.
- Do not turn off ignition while driving in any condition or coasting. Vehicle must be stopped before shutdown.
- Avoid parking over or in vicinity of combustible materials such as; dry grass, spilled fuel, dry leaves, rubbish, etc.
- Do not tamper with any component of the emission control system. It is prohibited by law.
- Have maintenance operations performed as specified in the Owner's Operational Manual. The life of the catalytic converter is dependent on perfect engine maintenance.

AIR SUPPLY SYSTEM

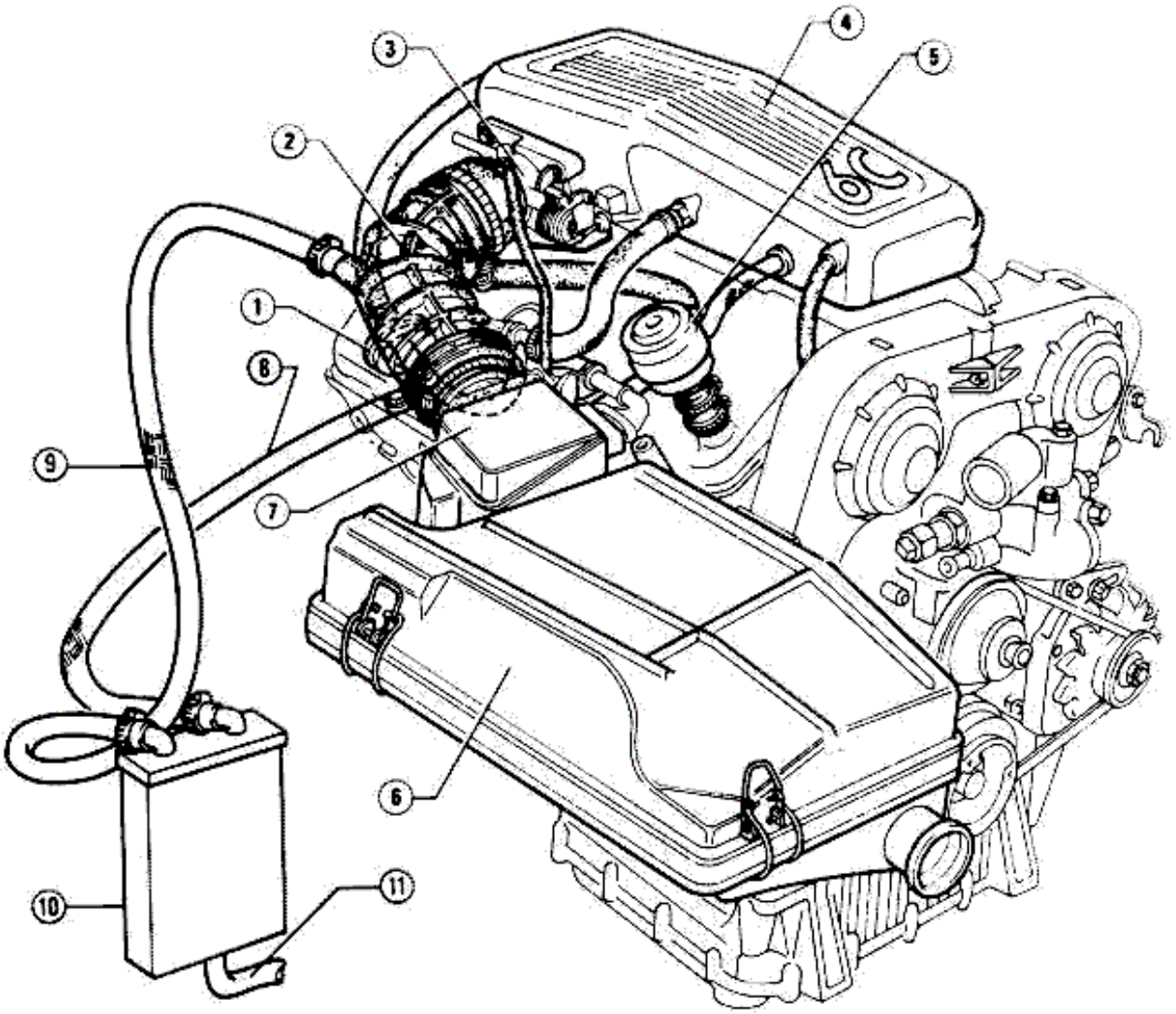
V6 3.0 milano



1 Auxiliary air device
2 Corrugated sleeve
3 Throttle body
4 Intake air box
5 Oil vapor separator
6 Air cleaner
7 Air-flow sensor
8 Fuel vapor recirculation hose
9 Fuel vapor recirculation hose
10 Carbon canister
11 Vapors from the tank recirculation hose
12 Air conditioner solenoid
13 Hose for air delivery to A.C. solenoid
14 Hose for air delivery to intake air box from A.C. solenoid

AIR SUPPLY SYSTEM

V8 milano

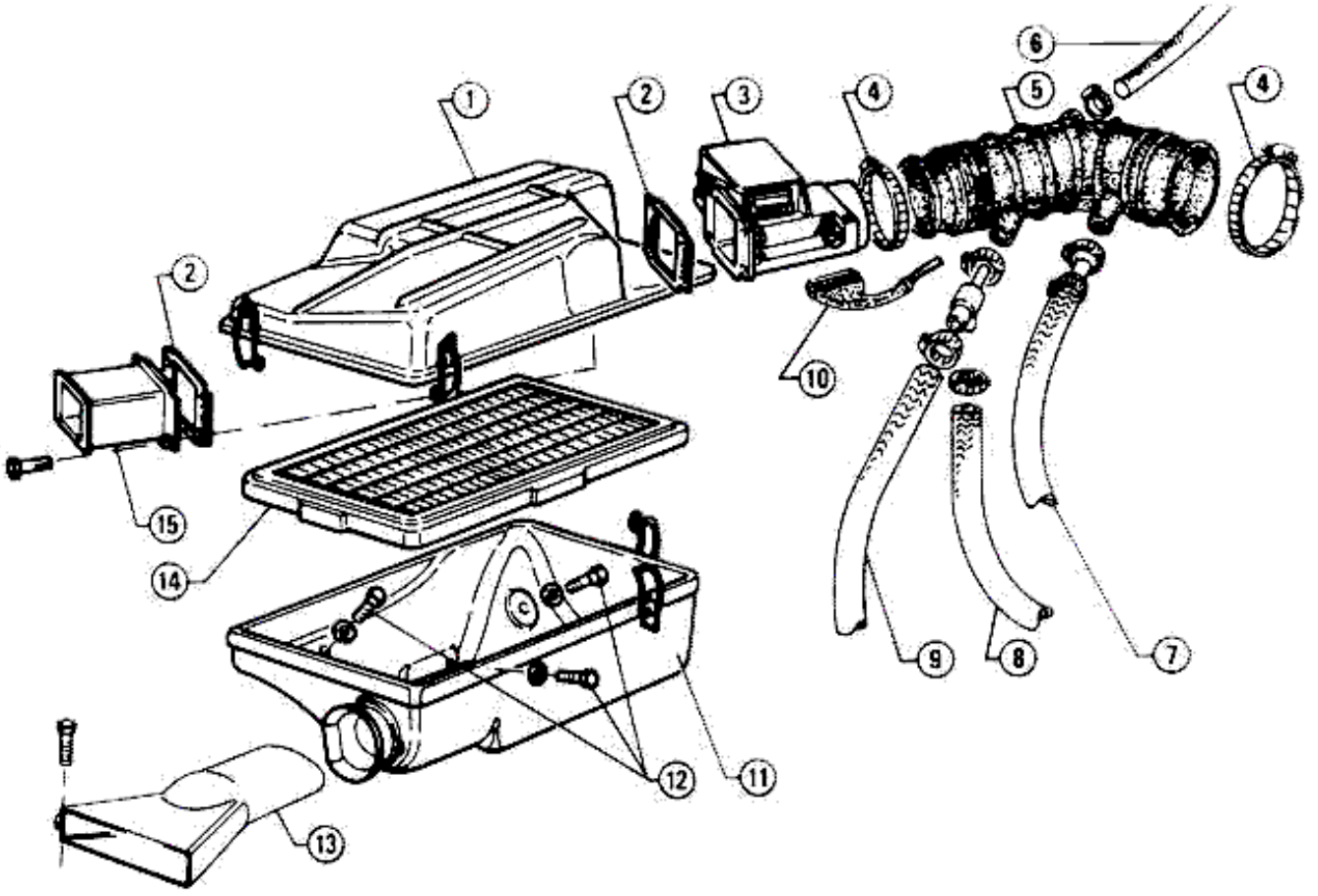


1 Auxiliary air device
2 Corrugated sleeve
3 Throttle body
4 Intake air box
5 Oil vapor separator
6 Air cleaner
7 Air-flow sensor
8 Fuel vapor recirculation hose
9 Fuel vapor recirculation hose
10 Carbon canister
11 Vapors from the tank recirculation hose

CAUTION:

- **After reassembling the air supply system components, check for system tightness downstream of air-flow sensor.**
- **Also check system connectors and grounds have been correctly attached.**

AIR CLEANER



1 Air cleaner cover
2 Gasket
3 Air-flow sensor
4 Clamp
5 Corrugated sleeve
6 Fuel vapor recirculation hose
7 Oil vapor return hose
8 Delivery hose to auxiliary air device
9 By-pass hose for idle r.p.m. adjustment
10 Air-flow sensor connector
11 Air cleaner container
12 Screws securing container to body
13 Air intake
14 Filtering element
15 Flange

REMOVAL

With reference to the exploded view, remove air cleaner unit as follows:
1. Detach sleeve (5) from air-flow sensor (3).
2. Detach connector (10) from air-flow sensor (3), and release cable from bracket.
3. Release the five clips which secure cover (1), and remove it together with the air-flow sensor. Also remove filtering element (14).
4. If necessary, unscrew screws (12) and remove container (11) from body.
5. If necessary, unscrew the securing screws and remove air-flow sensor from air cleaner cover.

CHECKS AND INSPECTIONS

1. Throughly check the filtering element by blowing in low-pressure compressed air. Replace the filtering element, if required.
2. Press the air-flow sensor floating flap, and check that it rotates without sticking. If necessary clean the internal surfaces of the air-flow sensor with a cloth.

INSTALLATION

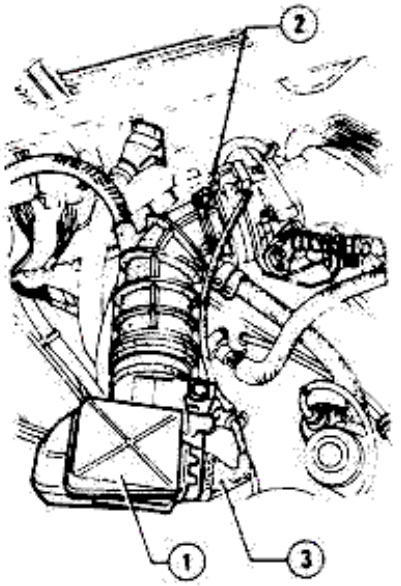
Install air cleaner by reversing the order of removal.

- Position the filtering element on air cleaner container complying with the mark indicating the upper part (on filtering element side).
- If the air-flow sensor has been separated from the air cleaner cover, when reassembling, replace the gaskets in between.

AIR-FLOW SENSOR

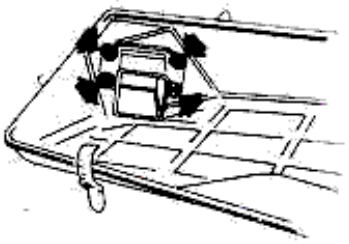
REMOVAL

1. Loosen securing clamp of sleeve (2) and disconnect it from air-flow sensor (1).
2. Detach connector (3) and withdraw the related cable from support bracket.
3. Release the clips which secure air-cleaner cover and remove it together with air-flow sensor (1).



1 Air-flow sensor
2 Corrugated sleeve
3 Air-flow sensor connector

4. Unscrew the screws shown in the figure, and remove the air-flow sensor from air cleaner cover.



CHECKS AND INSPECTIONS

Press the air-flow sensor floating flap, and check that it rotates without sticking. If necessary, clean the internal surfaces of the air-flow sensor with a clotch.

INSTALLATION

1. Install a new air-flow sensor by reversing the order of removal; replace gaskets.
2. Check (and adjust if necessary) the exhaust CO percentage (Refer to: Group 00 - Engine Maintenance - Check and Adjustment of Idle r.p.m. and Exhaust Emissions).

AUXILIARY AIR DEVICE

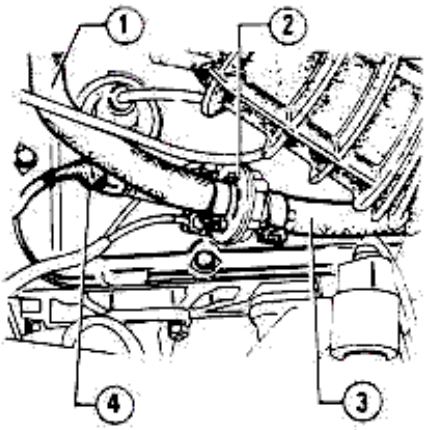
CHECKS AND INSPECTIONS

1. Auxiliary air device opening check.

a. Make sure that the engine is cold, then start it, and throttle outlet hose (1) of auxiliary air device (2) several times.
b. Check that engine r.p.m. gradually decreases (at **20 °C-68°F** ambient temperature, the r.p.m. decrease is no longer evident after about **3 minutes**).

2. Auxiliary air device closing check.

With the engine at normal running temperature, throttle outlet hose (1) of auxiliary air device, and check that engine r.p.m. does not decrease.

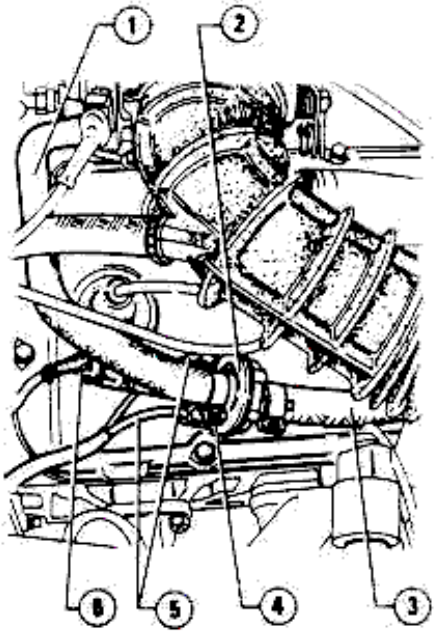


1 Air outlet hose
2 Auxiliary air device
3 Air inlet hose
4 Auxiliary air device control cable connector

REPLACEMENT

1. Detach connector (6).
2. Loosen clamps and detach hose (1) and (3) from auxiliary air device (2).
3. Unscrew screws (4) and remove auxiliary air device (2) from timing system cover, disconnecting ground cables (5).
4. Position the new auxiliary air device on the timing system cover and secure it to tappets cover, together with the ground cables of the L-JETRONIC injection system, using **new** washers.

Reconnect both inlet and outlet air hoses to device.

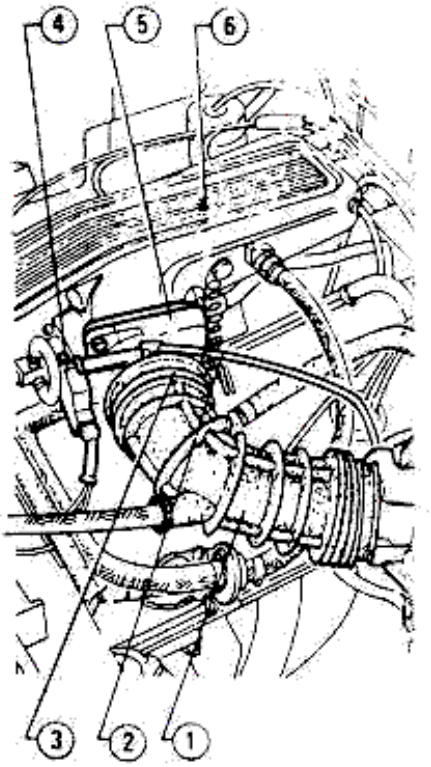


1 Air outlet hose
2 Auxiliary air device
3 Air inlet hose
4 Screw securing auxiliary air device to timing system cover
5 Ground cables
6 Auxiliary air device control cable connector

THROTTLE BODY

REMOVAL

1. Detach accelerator control cable from lever on throttle body and release sheath from bracket.
2. Unhook spring (7) from the lever on throttle body.
3. Detach hose (2) and sleeve (1) from throttle body (5).
4. Detach connector from switch (4).
5. Unscrew the nuts which secure throttle body (5) to air intake box (6), and remove throttle body and the related gasket.
6. If required, remove switch and the accelerator cable securing bracket, from throttle body.



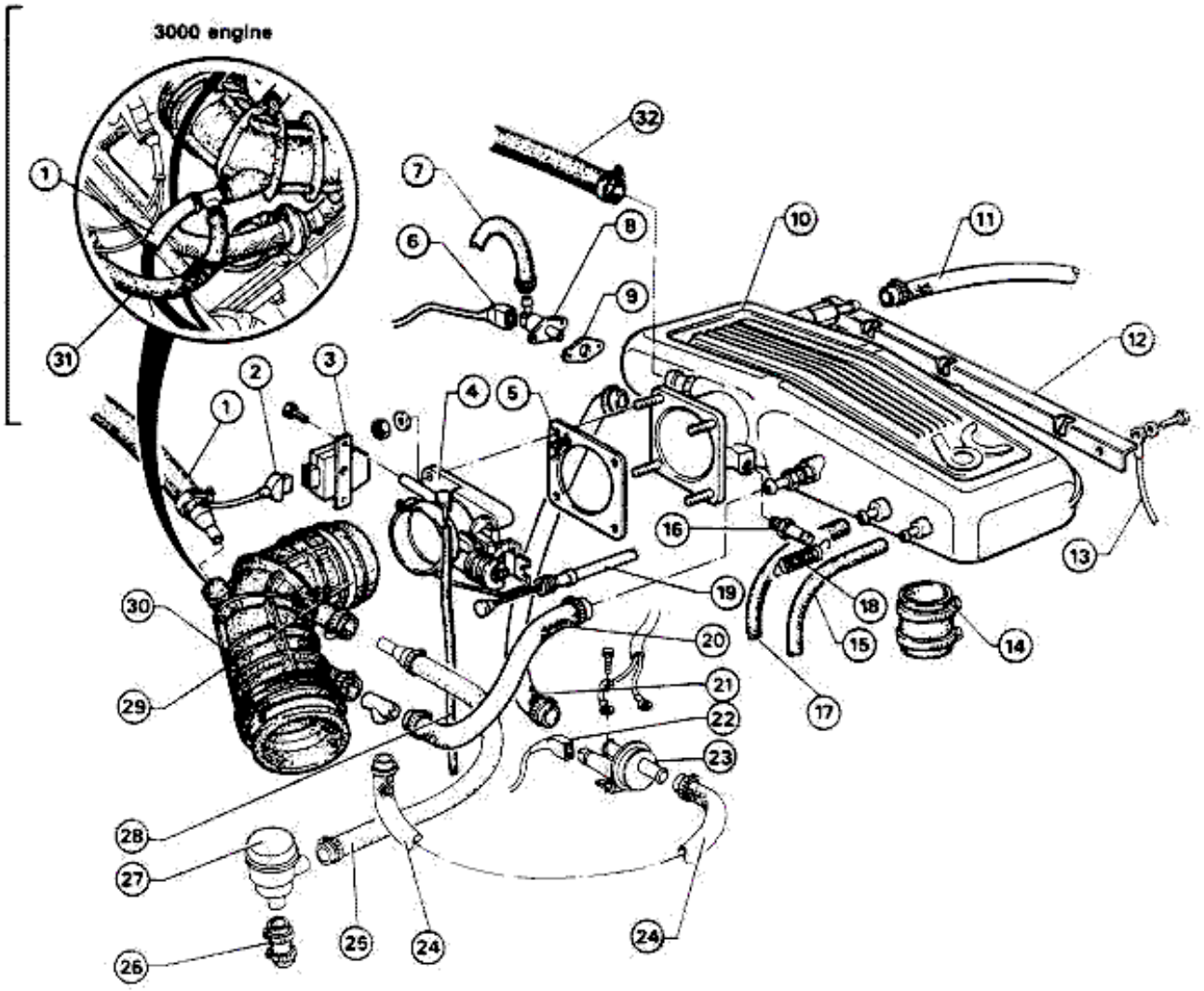
1 Corrugated sleeve
2 [2500 engine]: Vacuum intake hose for ignition advance vacuum regulator
[3000 engine]: Vacuum hose for purge control valve and ignition advance vacuum regulator
3 Clamp
4 Accelerator throttle switch
5 Throttle body
6 Intake air box
7 Spring

INSTALLATION

Carry out the installation by reversing the order of removal in accordance with the following indications:

- Interpose a **new** gasket between throttle body and intake air box
- Perform the tuning and adjustments (refer to: **Checks, Tuning and Adjustments**).

INTAKE AIR BOX



1 Fuel vapor recirculation hose
2 Connector
3 Throttle body switch
4 Throttle body
5 Gasket
6 Connector
7 Supply hose for cold start injector
8 Cold start injector
9 Gasket
10 Intake air box
11 Servo brake vacuum intake hose
12 Wiring protection
13 Intake air box earth braid
14 Sleeve connecting intake air box to intake manifold
15 Vacuum intake hose for pressure regulator
16 Pin for securing spring
17 Fuel vapor recirculation hose
18 Spring
19 Accelerator control cable
20 By-pass hose for idle r.p.m. adjustment
21 Hose for auxiliary air delivery to intake air box
22 Connector
23 Auxiliary air device
24 Hose for air delivery to auxiliary air device
25 Oil vapor return hose
26 Oil recovery hose
27 Oil vapor separator
28 [2500 engine]: Vacuum intake hose for ignition advance vacuum regulator
[3000 engine]: Vacuum hose for purge control valve and ignition advance vacuum regulator
29 Clamp
30 Corrugated sleeve
31 [3000 engine]: Hose for air delivery to intake air box from A.C. solenoid
32 [3000 engine]: Hose for air delivery to A.C. solenoid

REMOVAL

With reference to the exploded view, proceed as follows:

1. Loosen clamps and disconnect hoses (11) and (20) from intake air box, and sleeve (30) from throttle body.
2. Detach hose (28) from throttle body, and hoses (17) and (15) from intake air box.

2A. **[For 3000 engine]**: Detach hose (32) from intake air box.

3. Detach hose (21) from the auxiliary air device.
4. Unhook spring (18) from lever on throttle body and from pin (16).
5. Detach accelerator control cable (16) from the lever on throttle body, and release sheath from securing bracket.
6. Detach connector (2) from switch (3) on throttle body.
7. Detach connector (6) from injector (8).
8. Detach hose (7) from injector (8).

WARNING
Proceed with care fuel system may be under pressure.

9. Unscrew the screws which secure cover (12) and remove it. One of these screws secures earth braid (13).
10. Loosen the clamps which secure intake air box (10) to sleeves (14) of intake manifolds; remove intake air box (10) complete with throttle body (4).
11. If necessary, disassemble the intake air box at bench, by proceeding as follows:

a. Unscrew the nuts which secure throttle body (4) to intake air box (10); remove them and withdraw gasket (5).

b. Unscrew the screws which secure injector (8) and remove it together with the related gasket.

c. Remove the union for idle r.p.m. adjustment and the servo brake single-acting valve.

d. Detach the auxiliary air inlet hose (21).

e. Unscrew pin (16) securing spring.

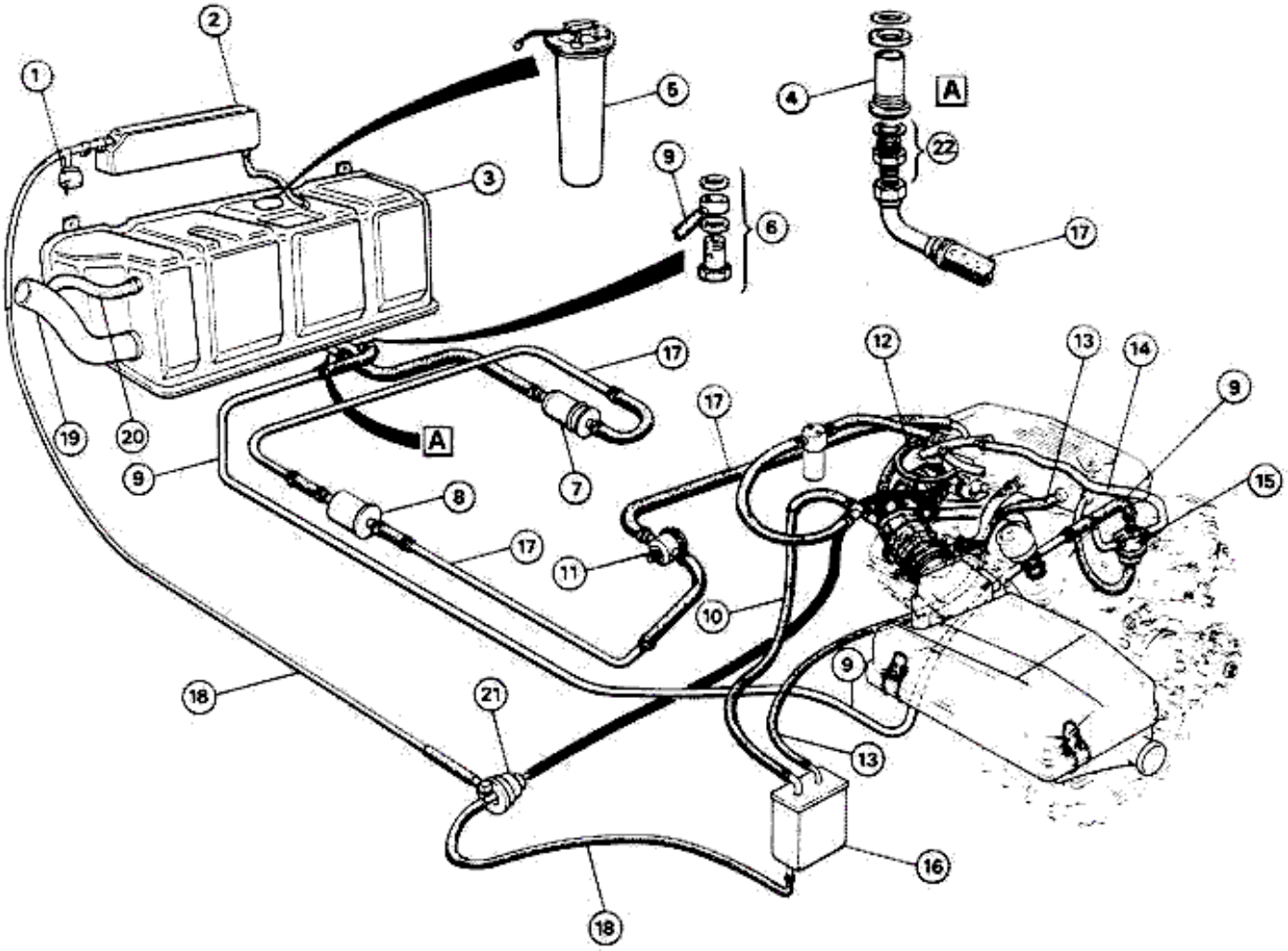
INSTALLATION

Carry out the installation by reversing the order of removal, in accordance with the following indications:

- If the intake air box has been disassembled, insert **new** gaskets between;
  - throttle body and intake air box
  - cold start injector and intake air box
  - single-acting valve, for servo brake vacuum intake, and intake air box.
- Install a **new** O-ring on the union for the idle r.p.m. adjustment.
- If required, replace the sleeves between intake air box and intake manifolds.
- Perform the checks and adjustments (refer to: Check, Tuning and Adjustments).

FUEL SUPPLY SYSTEM

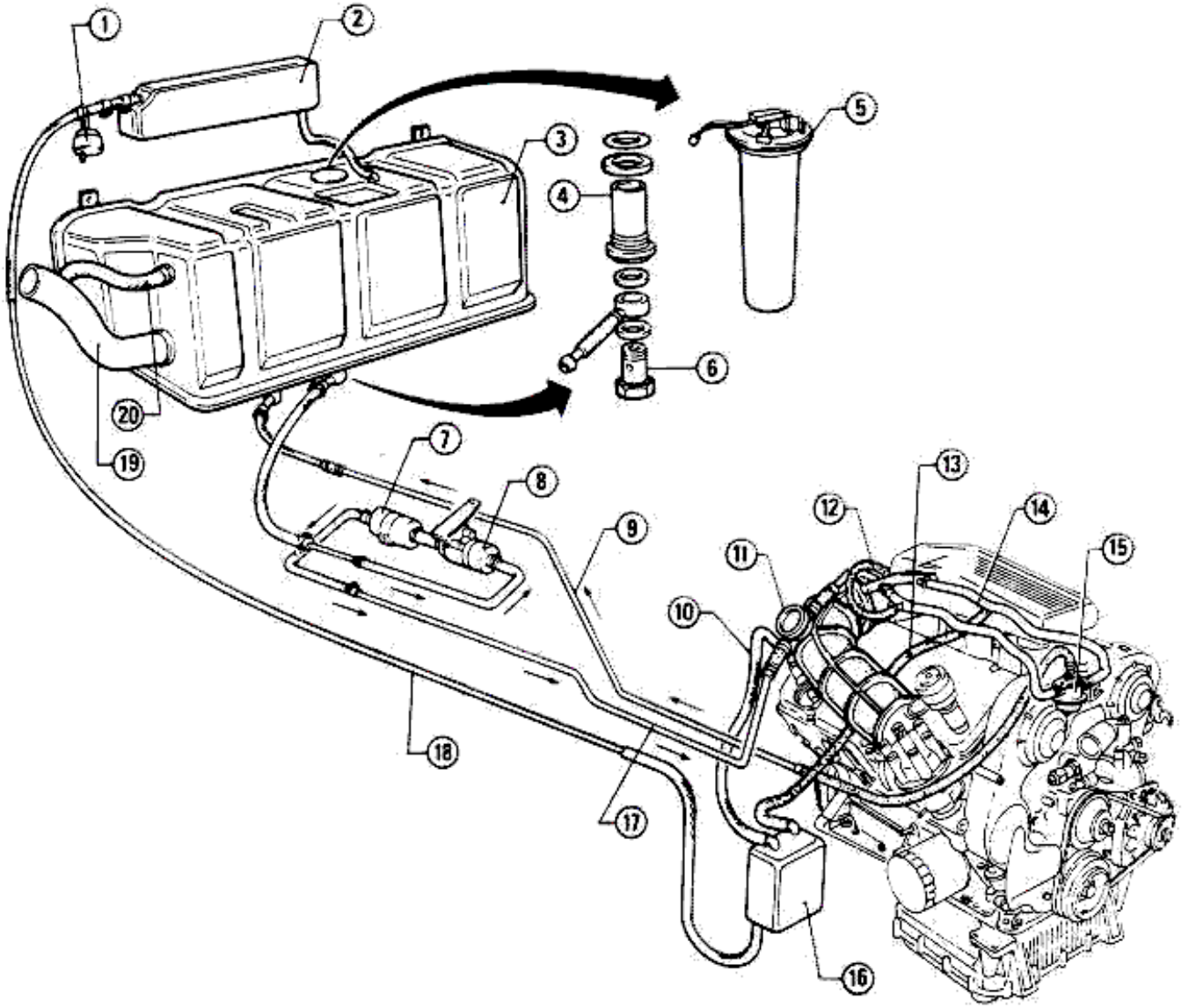
V6 milano



1 Air inlet valve
2 Fuel vapor separator
3 Fuel tank
4 Strainer
5 Fuel level gauge
6 Union with gaskets for fuel return line
7 Fuel pump
8 Filter
9 Excess fuel return line
10 Fuel vapor recirculation hose
11 Dashpot
12 Cold start injector supply hose
13 Fuel vapor recirculation hose
14 Fuel supply manifold
15 Pressure regulator
16 Carbon canister
17 Fuel delivery line
18 Fuel vapor recirculation hose
19 Filler
20 Fill-up breather hose
21 Purge control valve
22 Union with gasket for fuel delivery line

FUEL SUPPLY SYSTEM

Alfa Romeo milano



1. Air inlet valve
2. Fuel vapor separator
3. Fuel tank
4. Strainer
5. Fuel level gauge
6. Union with gaskets
7. Filter
8. Fuel pump
9. Excess fuel return line
10. Fuel vapor recirculation hose
11. Dashpot
12. Cold start injector supply hose
13. Fuel vapor recirculation hose
14. Fuel supply manifold
15. Pressure regulator
16. Carbon canister
17. Fuel delivery line
18. Fuel vapor recirculation hose
19. Filler
20. Fill-up breather hose

WARNING:
Strictly follow the indications below before replacing the fuel system components:
a. Ensure that the workshop is correctly equipped to enable operations to be performed safely (five extinguishers, etc.).
b. Detach the battery ground cable.
c. Pour the fuel drawn from the tank into a suitable container fitted with safety cover.

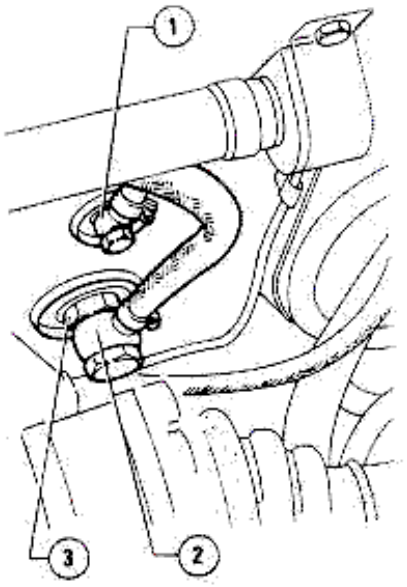
CAUTION:
After reassembling the fuel system components. Check system tightness when at 2.5 bar.

FUEL TANK

REMOVAL

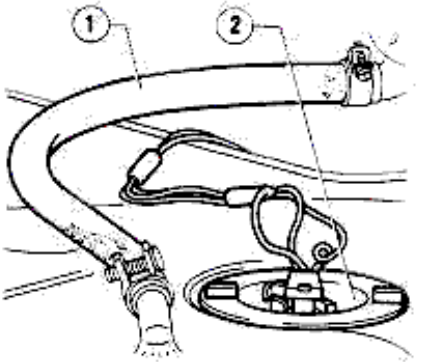
1. Set vehicle on a lift, remove filler plug and suck fuel from tank with a suitable pump.
2. Lift the vehicle, and working underneath, unscrew the two unions (1) and (2) and recover the copper gaskets.

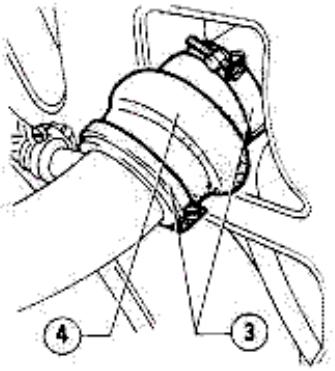
During the operation, use a holding wrench to prevent union (3) coming loose.

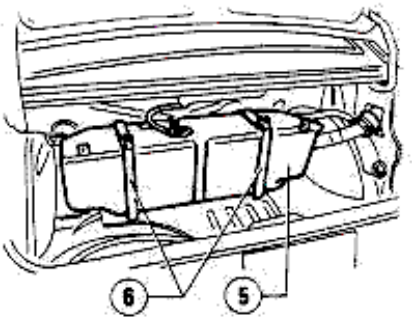


1 Excess fuel return hose union
2 Fuel delivery hose union
3 Strainer union

3. Lower the vehicle and remove the side trim of the luggage compartment.
4. Disconnect wiring from the fuel level gauge (2).
5. Loosen the securing clamp and disconnect hose (1) from tank.
6. Loosen the two clamps (3) and disconnect sleeve (4) from the tank filler.
7. Loosen the screws on tie rods (6), unhook the tie rods and remove tank (5).







1 Fuel vapor breather hose
2 Fuel level gauge
3 Clamps
4 Rubber sleeve
5 Fuel tank
6 Tie rods securing tank

8. If the tank must be replaced, remove the components that are still attached.
- Strainer
- Fuel level gauge
- Fill-up breather hose

CHECKS AND INSPECTIONS

Check for cracks or deformations in the tank; replace if required.

INSTALLATION

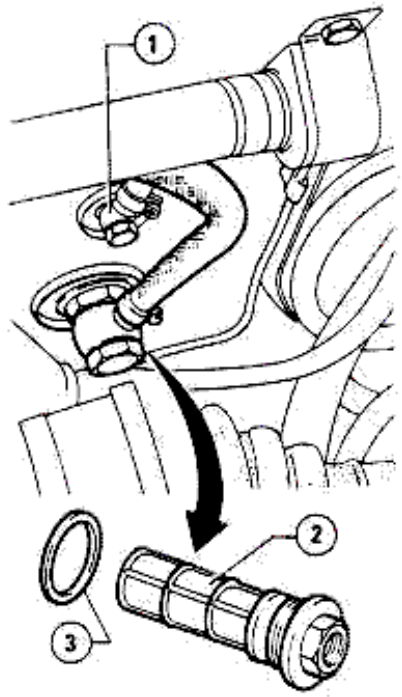
Install the tank on the vehicle by reversing the order of removal in accordance with the following indications:
- Check that the tank is correctly fitted before tightening the tie rod screws.
- Replace the copper gaskets of the fuel return and delivery line unions.
- Replace any other gasket that has been removed during disassembly.

STRAINER

REPLACEMENT

1. Set vehicle on lift, remove filler cap and suck, the fuel from tank by means of a suitable pump.
2. Working from under the vehicle, unscrew union (1) and recover corresponding gaskets.
3. Unscrew strainer union and remove it together with union (3).
4. Install the strainer by reversing the order of removal, remembering to replace all the removed gaskets.

WARNING
Even if the tanks has already been emptied, take care that no fuel comes out from the bottom of the tank.



1 Fuel delivery hose union
2 Strainer
3 Gasket

FUEL LINES

REMOVAL

CAUTION:
Disconnect fuel system lines only when absolutely necessary.

1. Set vehicle on lift.
2. Remove filler plug and, using a suitable pump, suck fuel from the tank.
3. Loosen the clamps which secure the ends of the hoses to be removed.

CAUTION:
When disassembling, plug both pipes and hoses to prevent dust or impurities from entering.

4. To remove the piping located on the floor inside the passenger compartment, remove the floor trim on the right-hand side.

CHECKS AND INSPECTIONS

1. Check for porosity and deterioration of hoses; replace the defective ones.
2. Check for oxidation, clogging and dents in pipes.

INSTALLATION

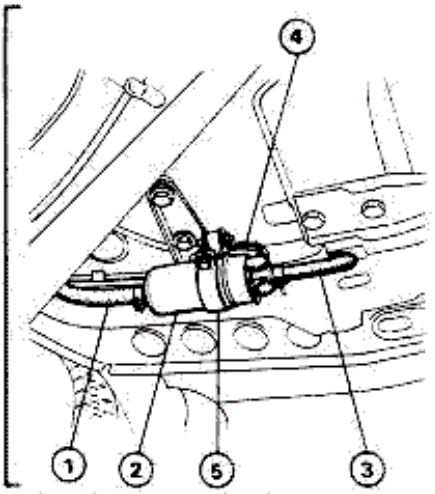
Carefully install piping by reversing the order of removal, in accordance with the following.

CAUTION:
a. **Carefully install clamps on system joints. Do not tighten clamps excessively prevent damaging piping.**
b. **Do not bend or twist pipes when installing them on vehicle.**
c. **The piping inside the vehicle must be inserted into the related pipe-race-way up to the red reference strips marked on each pipe/hose.**
d. **Start the engine and check joints for leaks.**

FUEL PUMP

REPLACEMENT

1. Set vehicle on a lift and detach the negative battery terminal.
2. Working from under the vehicle, detach pump supply cables (4).
3. Throttle hoses (1) and (3), then loosen clamps and detach hoses from pump.
4. Loosen clamp (5) and withdraw pump (2).



1 Fuel inlet hose to pump
2 Fuel pump
3 Fuel outlet hose from pump
4 Pump supply cables
5 Pump support clamp

5. Install the new fuel pump securing it with the related clamp; then reconnect hoses.

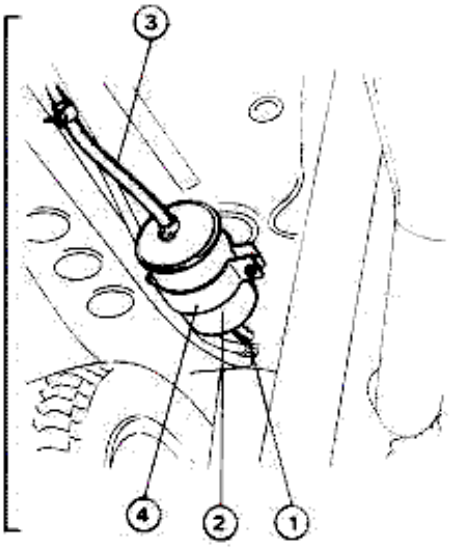
The pump is supplied as a spare part in a sealed pack, filled with protective oil and unions closed by caps. When installing the pump, it is not necessary to empty it.

6. Reconnect the pump supply cables, taking care not to exchange them.
7. After installation, remove the tools used to throttle hoses, and reconnect battery.

FUEL FILTER

REPLACEMENT

1. Working from under the vehicle, throttle hoses (1) and (3).
2. Loosen the clamps and disconnect hoses (1) and (3) from filter (2).
3. Loosen clamp (4) and remove filter.
4. Install the new filter checking that the arrow marked on filter body is in the fuel delivery direction.
5. Complete filter installation by reversing the order of removal, then remove the tools used to throttle the fuel supply hoses.



1 Fuel inlet hose
2 Fuel filter
3 Fuel outlet hose
4 Filter support clamp

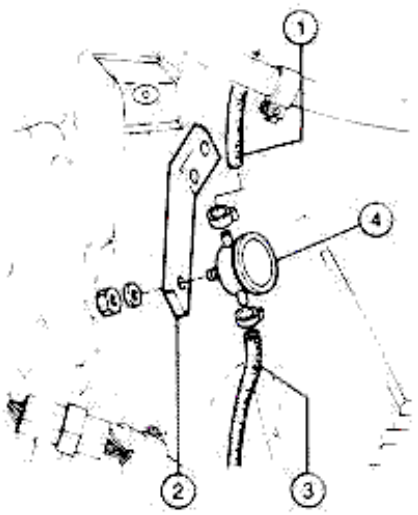
DASHPOT

REPLACEMENT

1. Back off nut retaining dashpot (4) to bracket (2).
2. Disconnect fuel-in hose (3) and fuel-out hose (1).

WARNING:
Proceed with care: fuel system may be under pressure.

3. Install a new dashpot by reversing the removal sequence.



1 Fuel-out hose
2 Bracket
3 Fuel-in hose
4 Dashpot

COLD START INJECTOR

CHECKS AND INSPECTIONS

1. Electric continuity check

Disconnect the connector and check that there is a resistance of approx. 4 Ω between the cold start injector contacts.

2. Functional test

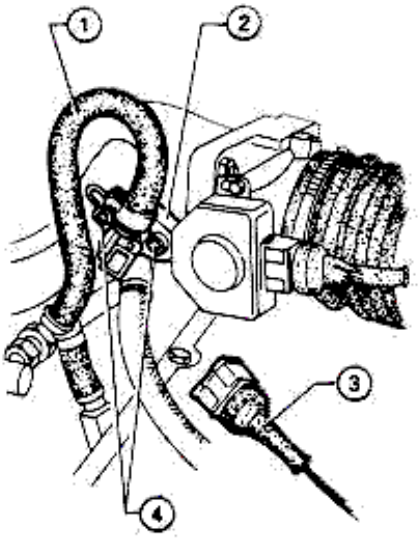
a. Unscrew the two screws which secure injector to intake air box; detach injector without disconnecting wiring.
b. With engine cold, operate starting motor and check that fuel is sprayed by the injector.
With engine at normal running temperature, check that no fuel is sprayed by the injector.
c. If the above conditions do not take place, replace the cold start injector (refer to: Replacement).

REPLACEMENT

1. Detach injector supply connector (3).
2. Loosen clamp and detach hose (1) from injector.

WARNING:
Proceed with care: fuel system may be under pressure.

3. Unscrew the two screws which secure injector to intake air box; remove injector together with the related gasket.



1 Fuel supply hose
2 Cold start injector
3 Supply connector
4 Screws securing injector to intake air box

4. Install injector by reversing the order of removal taking care to position a new gasket between injector and intake air box.

INJECTOR

CHECKS AND INSPECTIONS

1. Injector opening check

a. Measurement of exhaust CO emission. (Refer to Group 00 - Engine Maintenance - Check and Adjustment of Idle r.p.m. and Exhaust Emissions).
b. Detach injector connectors one at a time; check the CO percentage each time, and make sure that the value is constant at each check.
c. If not, identify the faulty injector and replace it (refer to Replacement).
d. Correct injector functioning can be ascertained simply by comparing the colors of the spark plug electrodes.

- Black indicates a too rich mixture,
- A light color indicates a too lean mixture.

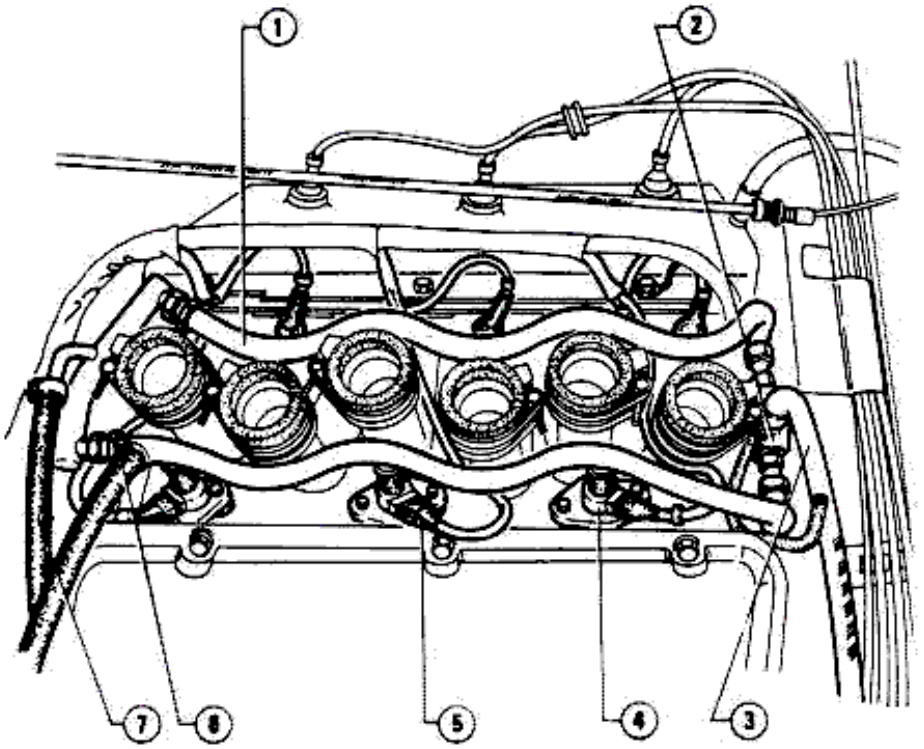
2. Injector tightness check

a. Detach the injector - fuel distributor manifold unit as indicated in "Replacement", keeping the fuel supply system connected.
b. Detach injector connectors and re-connect battery.
c. Operate starting motor and check injectors for fuel leaks; if leaking occurs, replace the faulty injector.

REPLACEMENT

Removal

1. Remove the intake air box (refer to: Air Supply System - Intake Air Box - Removal - step 1 to step 9).
2. Detach connectors (5) from injectors.
3. Detach hose (7) from supply manifold (1), and hose (3) from pressure regulator.
4. Unscrew the screws securing injectors (4) to air supply manifolds, then remove injectors together with manifold (1).

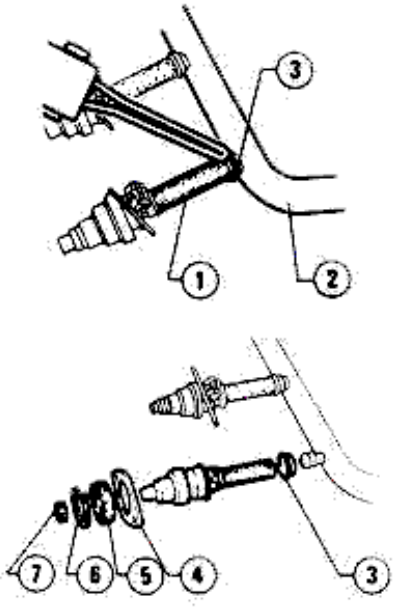


1 Fuel supply manifold
2 Pressure regulator
3 Excess fuel return hose
4 Injectors
5 Injector control cable connector
6 Supply hose for cold start injector
7 Fuel to - manifold delivery hose

5. Replace injectors as follows:

CAUTION:
Before replacing an injector, take note of connector position on injector so that it can be correctly re-positioned when installing the new injector.

a. Cut hose (1) with a welder, remove it from fuel manifold, and recover bush (3).



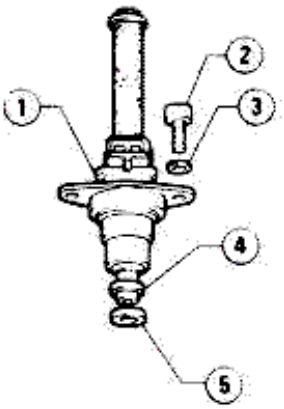
1 Injector supply hose
2 Fuel distributor manifold
3 Bush
4 Flange
5 Rubber gasket
6 Seeger ring
7 O-Ring

b. Install a new injector, fitting bush and supply hose on fuel distributor manifold until the hose fits against the bush.

CAUTION:
The injector must be fitted on fuel distributor manifold with the related connector facing cylinder heads. To fit the injector, it is advisable to wet the appropriate rubber hose with fuel. Never use grease or vaseline for this operation.

Installation

1. Replace O-ring (4).
2. Install injectors in their seats, taking care to position seal ring (5) correctly.



1 Flange
2 Injector securing screw
3 Washer
4 O-Ring
5 Seal ring

3. Install the other components by reversing the order or removal, in accordance with the following indications.

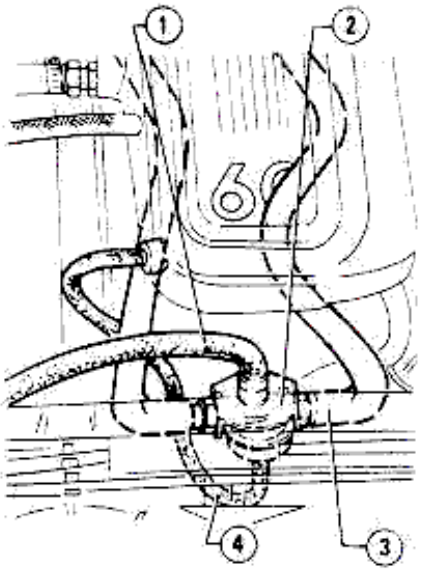
- Check the exhaust CO emission adjust if necessary.

FUEL PRESSURE REGULATOR

REPLACEMENT

WARNING:
Proceed with care: fuel system may be under pressure.

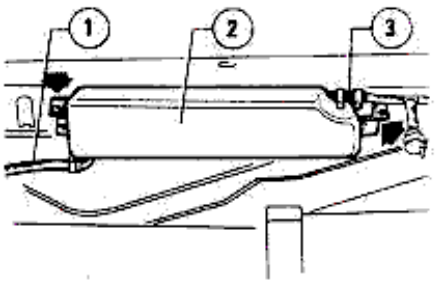
1. Detach hoses (1) and (4) from pressure regulator (2).
2. Unscrew the unions which secure regulator (2) to supply manifold (3); remove pressure regulator.
3. Carry out installation by reversing the order of removal.



1 Excess fuel return hose
2 Pressure regulator
3 Supply manifold
4 Pressure regulator vacuum intake

FUEL VAPOR SEPARATOR

1. Remove the side luggage compartment trimming.
2. Loosen the clamps and disconnect hoses (1) and (3) from fuel vapor separator (2).
3. Unscrew the two screws securing separator (2) to the body and remove it.



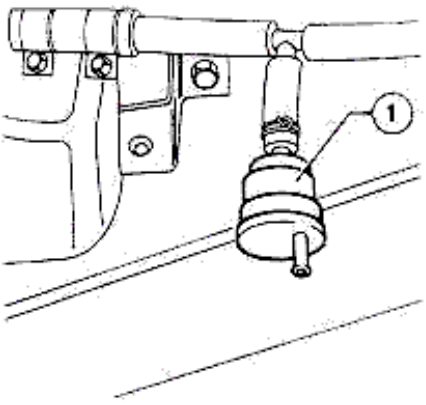
1 Fuel vapor breather hose
2 Fuel vapor separator
3 Fuel vapor recirculation hose

4. If necessary, blow compressed air into the separator body to clean it.
5. Install by reversing the order of removal.

AIR INLET VALVE

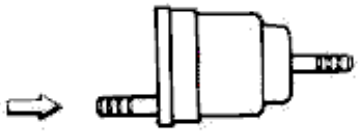
REMOVAL, CHECKS AND INSPECTIONS, INSTALLATION

1. Partially remove the right side of the luggage compartment trimming until air inlet valve (1) located on the right side of the tank can be seen. right side of the tank can be seen.
2. To remove valve (1), unhook the securing clip and disconnect it from the fuel vapor system hose.



1 Air inlet valve

3. Check the valve is operating correctly, i.e. blow in the direction indicated by the arrow, and check that the valve allows the air to pass only in this direction.

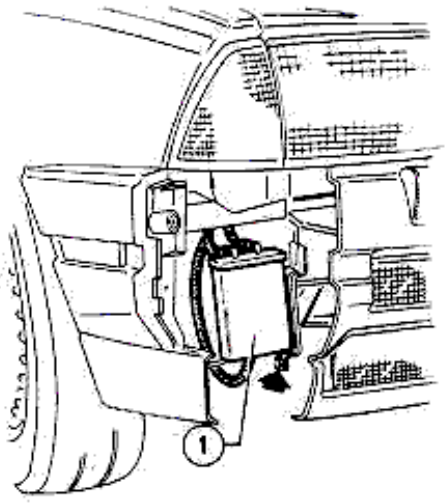


4. If the specified conditions are not obtained, replace the valve.
5. Install by reversing the order of removal, and positioning the valve as ndicated in the previous figures.

CARBON CANISTER

REMOVAL AND INSTALLATION

1. Working from under the vehicle, on the right side on the bumper curve, unscrew the screw indicated in the figure and unhook the canister (1) bracket from the body.
2. Lower carbon canister (1) to gain access to the three fuel vapor inlet/outlet lines; disconnect the lines and remove carbon canister (1).



1 Carbon canister

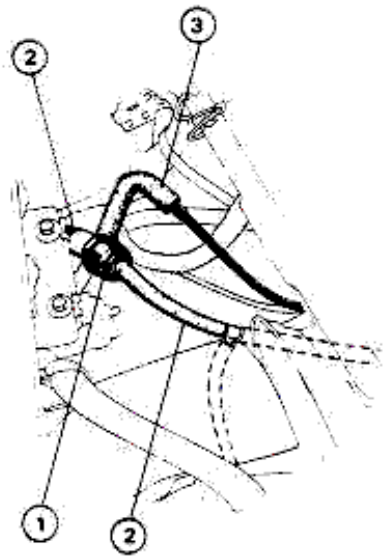
3. Install by reversing the order of removal.

PURGE CONTROL VALVE

V6 3.0 milano

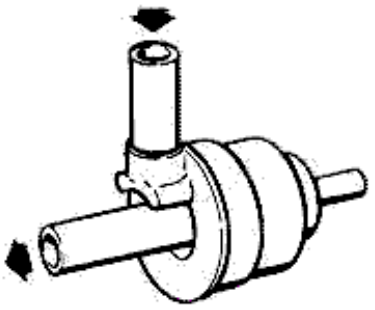
REMOVAL, CHECKS AND INSPECTIONS, INSTALLATION

1. To remove valve (1), located in the front right side of the engine compartment, disconnect it from the fuel vapor system hoses (2) and (3).



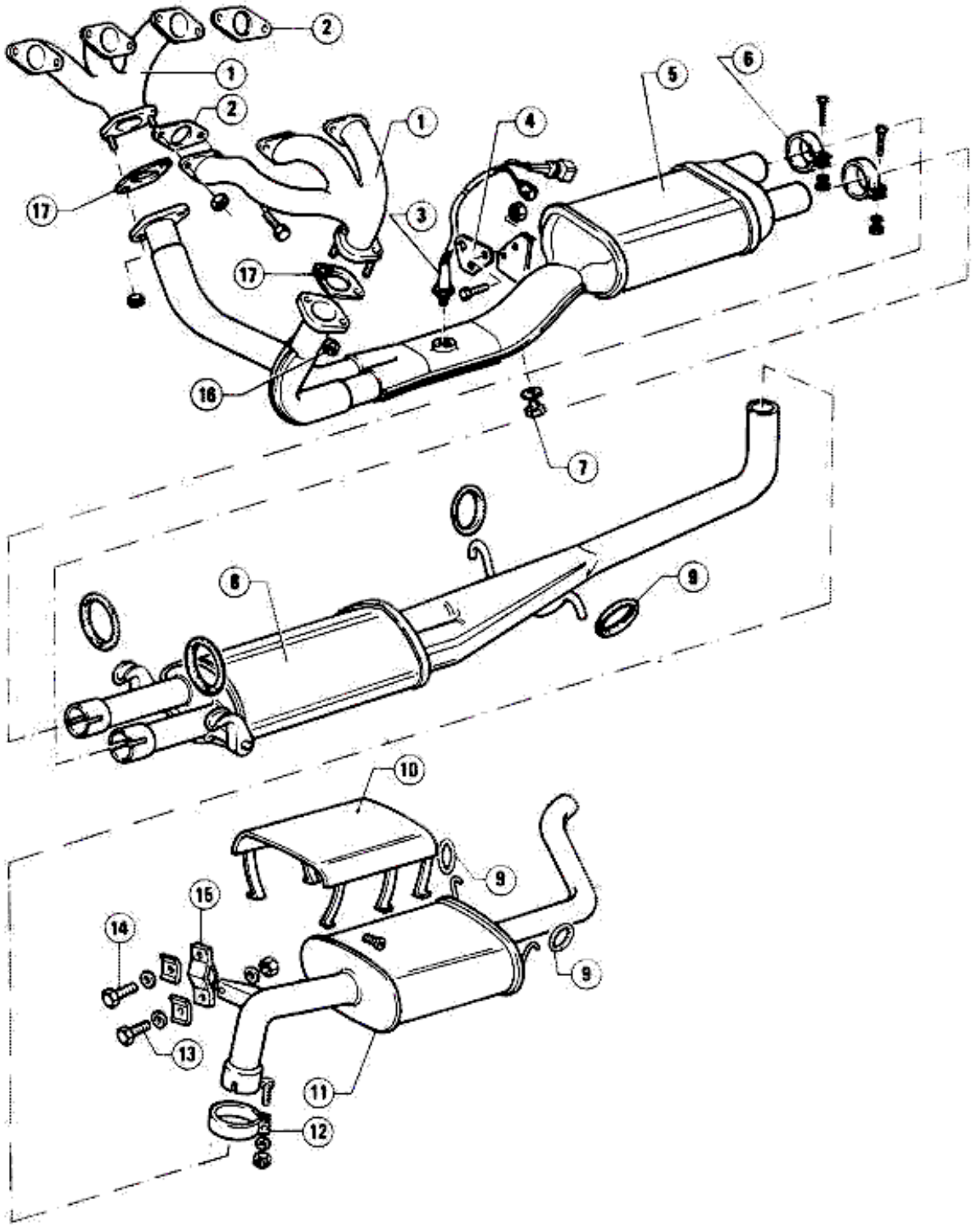
1 Purge control valve
2 Vacuum hose
3 Fuel vapor recirculation hose

2. Check the valve is operating correctly, i.e. blow in the direction indicated by the arrow.



3 If the specified conditions are not obtained, replace the valve.
4. Install by reversing the order of removal, and positioning the valve as indicated in the previous figures.

EXHAUST SYSTEM



1 Exhaust manifolds
2 Gaskets
3 Lambda sensor
4 Support
5 Catalytic converter
6 Clamp
7 Plug for measuring exhaust CO %
8 Muffler - center section
9 Rubber ring
10 Heatproof cover
11 Muffler - tail section
12 Clamp
13 Bolt securing rubber support to tail section
14 Screw securing rubber support to body
15 Rubber support
16 Nut securing catalytic coverter to manifold
17 Gasket

CAUTION

a. Procedures outlined are for removal of individual system components.

b. Procedure can be altered depending on purpose of removal.

c. If system is to be removed as a whole, employ a second operator as necessary.

MANIFOLDS, MUFFLERS AND CATALYTIC CONVERTER

REMOVAL

Refer to the exploded view and proceed as follows:

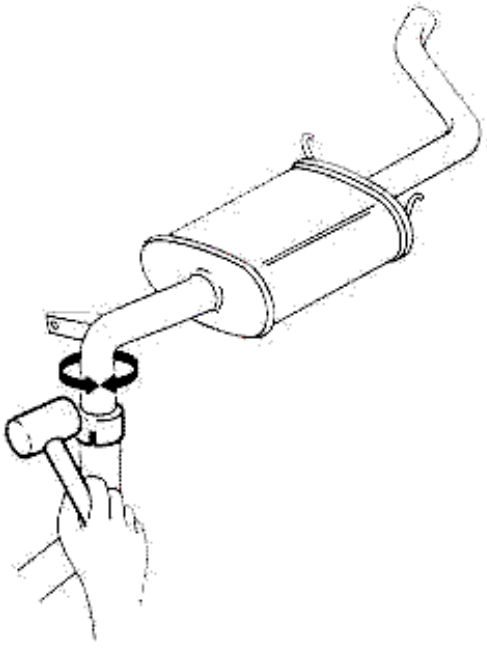
1. Raise vehicle on platform lift.
2. Take off rear muffler (11) as follows:

a. Slacken clamp (12).

b. Back off bolt (13) retaining support (15).

c. Release rear muffler (11) from retaining rings (9).

d. Lightly tap pipe junction all around with plastic mallet and turn rear muffler in both directions relative to center muffler to facilitate separation.



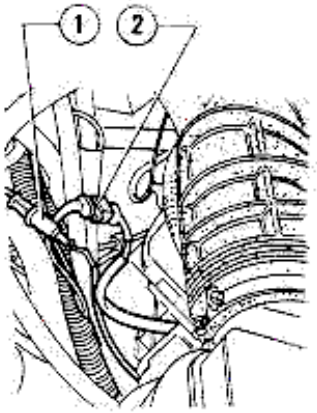
3. Disconnect center section (8) from the exhaust system as follows.

a. Loosen clamps (6) and release center section (8) from retaining rings (9).

b. Remove center section (8) by slightly tapping in correspondence with the converter connections; with a plastic hammer.

4. Remove converter (5) as follows:

a. Working from inside engine compartment undo connectors (1) and (2) shown in next figure and loosen wiring clips.



1. Lambda sensor connector
2. Sensor resistance connector

b. Referring to figure of page 04-21 back off nuts (16) and disconnect catalytic converter (5) from manifolds.

c. Back off bolts retaining converter to support (4) and remove converter.

d. If necessary, remove sensor (3) from converter using wrench A.5.0264.

5. Remove manifolds (1) as follows:

a. Disconnect battery. On right of engine take off air cleaner, air-flow sensor and sleeve (Refer to: Air Supply System - Air Cleaner - Removal).

b. Back off nuts and bolts retaining manifolds (1) to heads.

c. Lift off manifolds retrieving gaskets (2) in the process.

CHECKS AND INSPECTIONS

The catalytic converter and the Lambda sensor must however be replaced after 60,000 miles.

1. Check mufflers and exhaust piping for dents, cracks or corrosion spots and replace as necessary.
2. Check rings and rubber supports for cracks, porosity or aging and replace as necessary.

INSTALLATION

For installation reverse the removal sequence, noting the following points:

a. Apply R.GORI Never Seez or BOSCH 5.964.080.105 grease on the Lambda sensor threading, and tighten the catalytic converter on the sensor with tool A.5.0264.

b. Install new manifold gaskets.

c. Position exhaust pipe on rubber support and then clamp to center support.

d. Connect center pipe to tail pipe.

e. Install **new** pipe gaskets and tighten down pipe to manifolds.

f. Shake exhaust line to settle in correct alignment.

g. Tighten all fasteners.

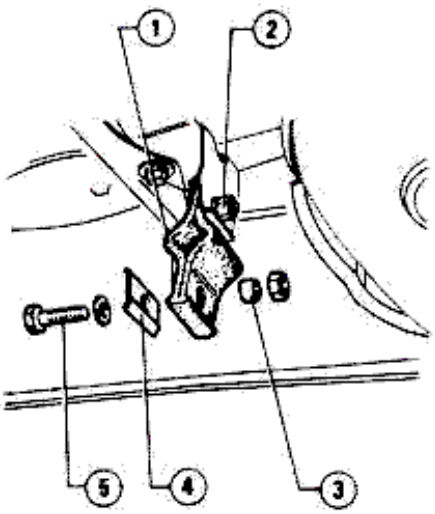
h. Reconnect the Lambda sensor connectors in the engine compartment.

i. Run engine and check all connections for gas leakage and undue noise.

RUBBER SUPPORTS

REPLACEMENT

1. Raise vehicle on lift.
2. Unscrew lower bolt (5), recover plate (4) and spacer (3).
3. Unscrew bolt (2) and remove support (1) with related plate (4) and spacer.



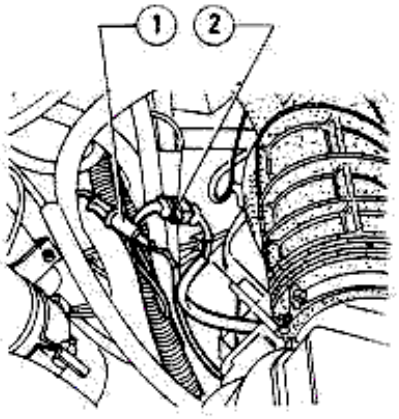
1 Rubber support
2 Bolt securing support to body
3 Spacer
4 Plate
5 Bolt securing exhaust pipe to support

4. For the supports with rubber ring, simply remove the ring from the hooks.
5. Carry out the installation by reversing the order of removal, making sure that, after installation, the supports can swing freely and are not taut.

LAMBDA SENSOR

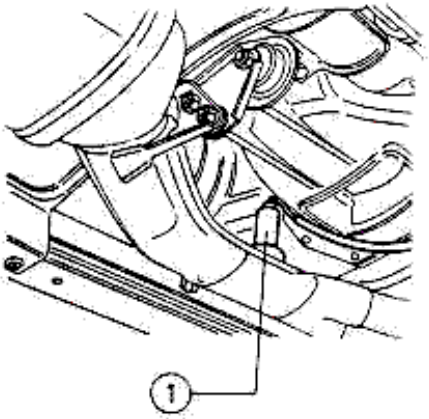
REMOVAL AND INSTALLATION

1. Raise vehicle on lift.
2. Working from the engine compartment, disconnect connectors (1) and (2) of the Lambda sensor electrical wiring.



1 Lambda sensor connector
2 Lambda sensor resistance connector

3. Working from under the vehicle and using tool **A.5.0264**, unscrew and remove Lambda sensor (1), and remove the corresponding wiring from the wiring clamps.



1 Lambda sensor

4. When installing, apply R. GORI Never Seez grease or BOSCH **5.964.080.105** grease on the sensor threading.
5. Using tool **A.5.0264**, tighten the Lambda sensor on the catalytic converter.
6. Reposition the wiring, secure it with the wiring clamps and reconnect it.

ELECTRICAL COMPONENTS

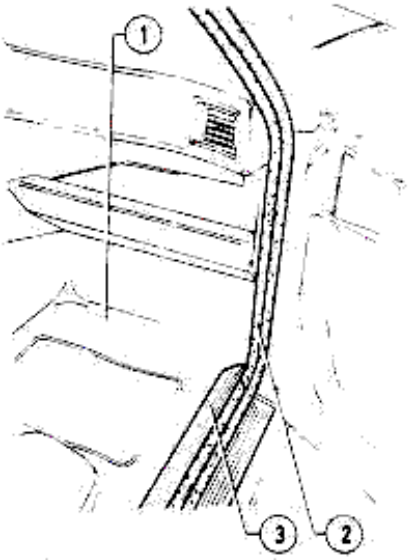
INJECTION CONTROL UNIT

LOCATION

It is located in the special compartment in the front of vehicle floor.

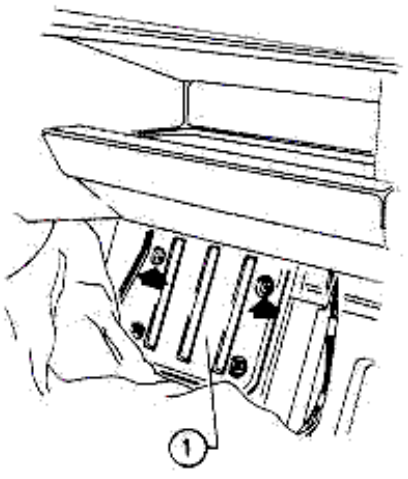
REMOVAL AND INSTALLATION

1. Lift the front left kickplate (3), unstick a portion of the door frame rubber sealing (2), and lift floor trim (1), to uncover the injection control unit housing lid.



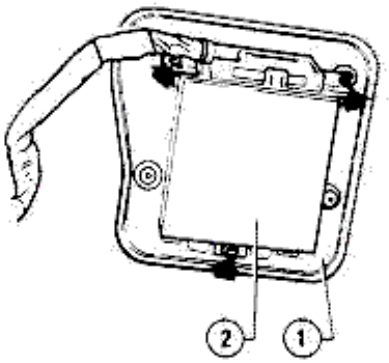
1 Floor trim
2 Door frame rubber sealing
3 Front left kickplate

2. Unscrew the two nuts securing lid (1), and overturn it to gain access to control unit.



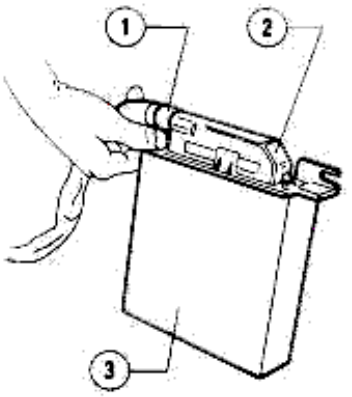
1 Lid

3. Unscrew the three nuts shown in the figure and remove injection control unit (2) from lid (1).



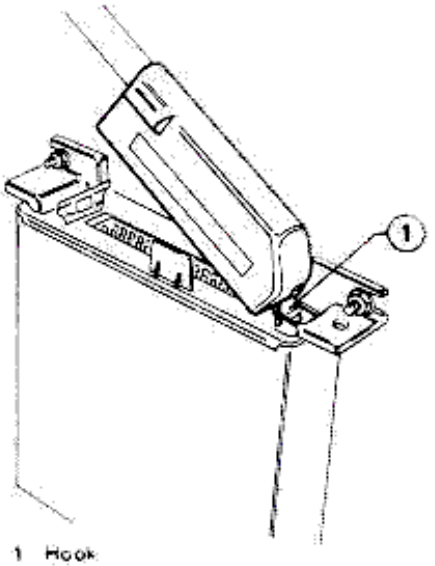
1 Lid
2 Injection control unit

4. Operate lever (1) and disconnect wiring (2) from injection control unit (3).



1 Lever
2 Wiring
3 Injection control unit

5. Install the injection control unit on vehicle, by reversing the order of removal, taking care to insert connector hook (1) correctly into its seat on the injection control unit.



1 Hook

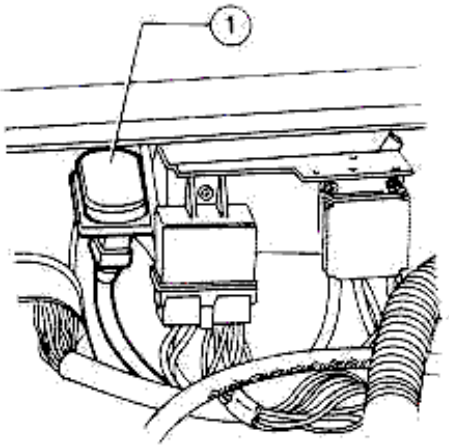
ALTITUDE COMPENSATION DEVICE

LOCATION

The altitude compensation device is secured on the relay holder bracket inside the engine compartment at the back on the right.

REMOVAL AND INSTALLATION

1. Open the hood and support it with the special rod.
2. Disconnect the electric wiring.
3. Unscrew the securing screw and remove the altitude compensation device (1).



1 Altitude compensation device

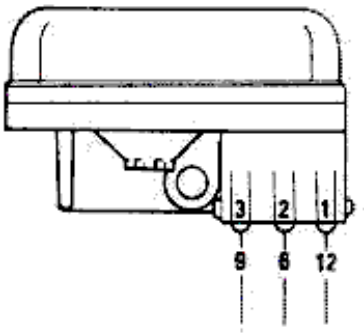
4. To install the altitude compensation device, reverse the order of removal.

CHECK

1. Disconnect the wiring from the altitude compensation device and check that the resistance between the terminals is within the values indicated in the following table.

Control unit connector terminals	Terminals on component	Resistance Ohms	Altitude m (ft)
6 - 9	2 - 3	2000 to 3000	–
12 - 6	1 - 2	500 to 4500	0 to 1200 (0 to 4000)
		2500 to 6000	> 1200 (> 4000)

2. If the values do not correspond to those specified, replace the altitude compensation device.



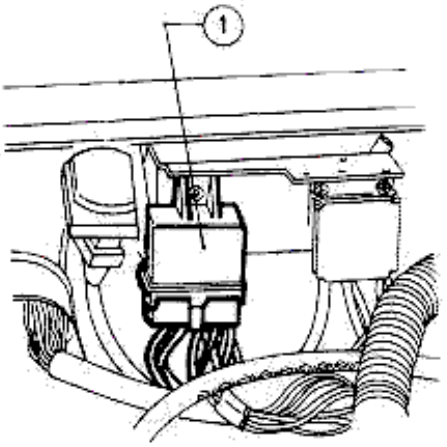
RELAY SET

LOCATION

The relay set is secured to the relay holder bracket inside the engine compartment, at the back on the right.

REMOVAL AND INSTALLATION

1. Open the hood and support it with the special rod.
2. Disconnect the electrical wiring.
3. Unscrew the securing screw and remove the relay set.

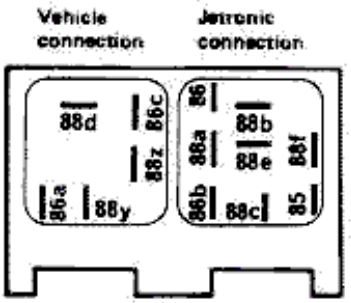


1 Relay set

4. To install, reverse the order of removal.

CHECK

Check that current reaches the injectors, switch on ignition, and using a test lamp or a voltmeter ensure there is voltage between the **88z** terminal and ground, and between the **88b** terminal and ground.



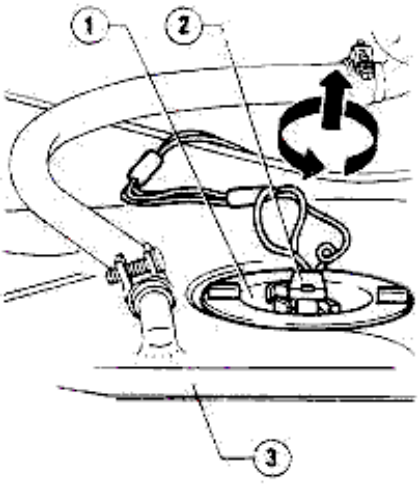
WARNING
Proceed with care in accordance with safety regulations due to the presence of fuel and fuel vapors.

FUEL LEVEL INDICATOR SENDER

REPLACEMENT

1. Remove the side trim from the luggage compartment.

2. Disconnect connector (2).
3. Using a suitable tool, turn fuel level gauge (1) counter clockwise and remove it from the tank with the corresponding gasket.



1 Fuel level indicator sender
2 Connector
3 Fuel tank

4. Install the fuel level gauge by reversing the order of removal and replacing the appropriate gasket. Reconnect the wiring connector.

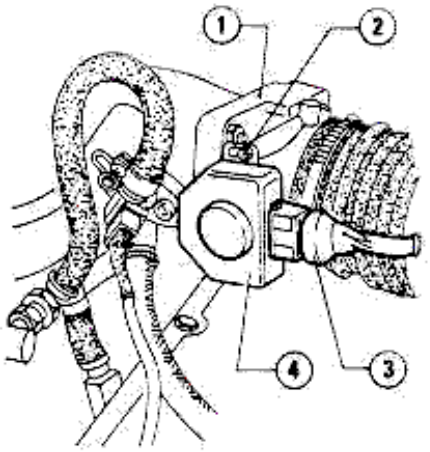
ACCELERATOR THROTTLE SWITCH

LOCATION

The switch is secured to the side of the accelerator throttle body.

REMOVAL AND INSTALLATION

1. Disconnect connector (3).
2. Unscrew the two screws (2) and remove switch (4) from the accelerator throttle shaft.



1 Throttle body
2 Screw securing switch to throttle body
3 Connector
4 Throttle body switch

3. Install by reversing the order of removal, and position the switch correctly (see: Checks - Tuning and Adjustments - Accelerator throttle switch tuning).

ENGINE TEMPERATURE SENSOR

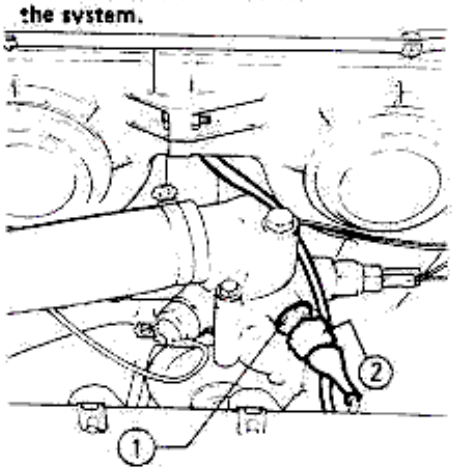
LOCATION

The engine temperature sensor is secured to the front side of the thermostat body.

REMOVAL AND INSTALLATION

1. Disconnect connector (2).
2. Unscrew sensor (1) from the thermostat body and remove it with the corresponding gasket.

Collect the coolant that drains from the system.



1 Engine temperature sensor
2 Connector

3. When installing, replace the gasket, apply R. GORI Never Seez grease to the threading and tighten the sensor to the specified torque

(T) : Tightening torque
Engine temperature sensor on thermostat body
15 N·m
(10.8 ft·lb; 1.5 kg·m)

4. Reconnect the wiring to the sensor and top up the coolant system with the specified liquid (see: Group 07).

ELECTRICAL CHECK

Check that the resistance between the sensor terminals is within the specified values (see: Service Data and Specifications - Electrical data).

THERMO-TIME SWITCH

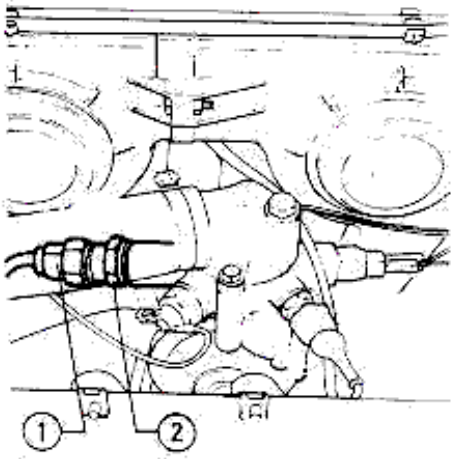
LOCATION

The thermo-time switch is secured on the right side of the thermostat body.

REMOVAL AND INSTALLATION

1. Disconnect connector (1).
2. Unscrew thermo-time switch (2) from the thermostat body and remove it with the corresponding gasket.

Collect the coolant that drains from the system.



1 Connector
2 Thermo-time switch

3. When installing, replace the gasket, apply R. GORI Never Seez grease to the threading and tighten the sensor to the specified torque

(T) : Tightening torque
Thermo-time switch on thermostat body
29 N·m
(21.7 ft·lb; 3 kg·m)

4. Reconnect the wiring to the sensor and top up the coolant system with the specified liquid (see Group 07).

ELECTRICAL CHECK

With switch mounted, check that the resistance between the thermo-time switch terminals is within the specified values (see: Service Data and Specifications - Electrical Data).

CHECKS, TUNING AND ADJUSTMENTS

THROTTLE BODY TUNING (check with air-flow sensor)

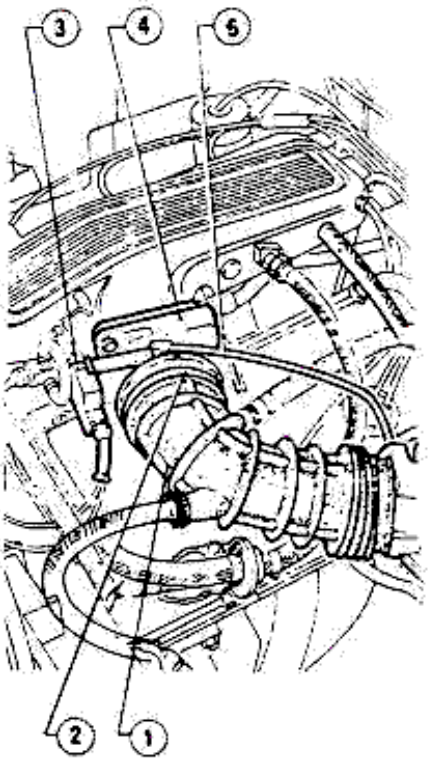
1. Loosen clamp (2) and disconnect sleeve (1) from throttle body (4).
2. Disconnect hose (5) and suitably plug the related union on throttle body.
3. Loosen the screws which secure switch (3) to throttle body.
4. Disconnect the accelerator control cable.
5. By means of an air-flow sensor, check the throttle body tuning as follows.

a. Rest the air-flow sensor tap on throttle body inlet.

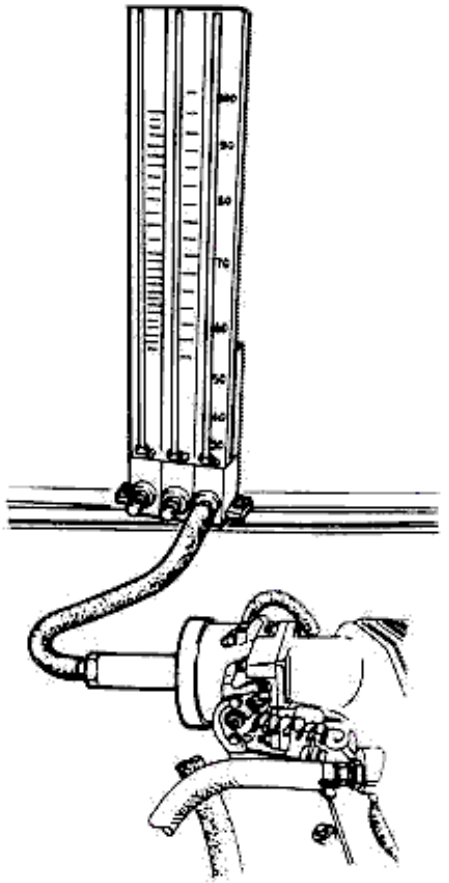
b. Measure the air flow through throttle and check that it is within the specified values.

Air flow from accelerator throttle in the closed position (air-flow sensor Solex):

300 ± 10 on N scale [For 2500 engine]
200 ± 10 on N scale [For 3000 engine]

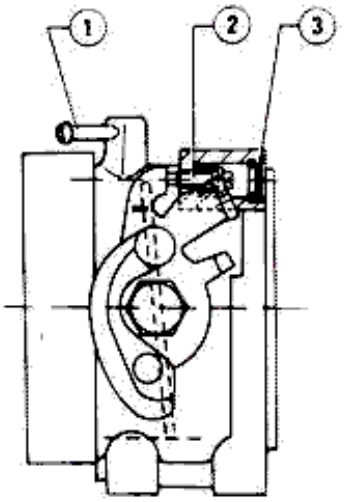


1 Corrugated sleeve
2 Clamp
3 Accelerator throttle switch
4 Throttle body
5 Vacuum intake hose for ignition advance vacuum regulator



6. If it is not correct, carry out the adjustment.

a. Remove seal (3) and operate on adjusting screw (2) until the specified flow value is obtained.



1 Vacuum intake union
2 Adjusting screw
3 Seal

b. Carry out the adjustment and seal the adjusting screw seat again by means of the suitable cap.

c. Install the detached components by reversing the order of removal, then carry out further adjustment.

ACCELERATOR THROTTLE SWITCH TUNING

1. Detach the female connector from throttle switch and, by means of a tester, check the following resistances on the male connector.

a. With throttle fully closed, 0 Ω resistance must be measured between terminals 2 and 18 .

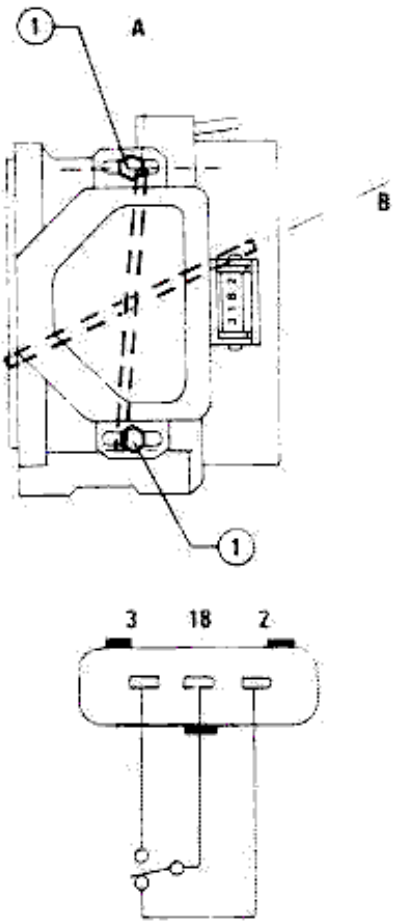
b. Rotate throttle slowly; with tester between terminals 2 and 18 , resistance must be measured before throttle is rotated by 1° with respect to the fully closed position.

2. If not so, loosen screws (1) and rotate switch until contact (≅ 0 Ω resistance) between terminals 2 and 18 is obtained, with throttle fully closed; re-tighten the screws.

3. Rotate throttle to fully open position and check that the full load contact closes, by measuring the following resistances with a tester on male connector.

– 0 Ω resistance (approx.) must be measured between terminals 3 and 18 , when accelerator throttle is completely open.

4. If the values measured are not those specified check accelerator control, or replace switch.



1 Screws securing switch to throttle body
2 Idle r.p.m. terminal (corresponding to position A; throttle closed)
3 Peak r.p.m. terminal (corresponding to position B; throttle open)

ACCELERATOR CONTROL CHECK AND ADJUSTMENT

1. Cable sliding check

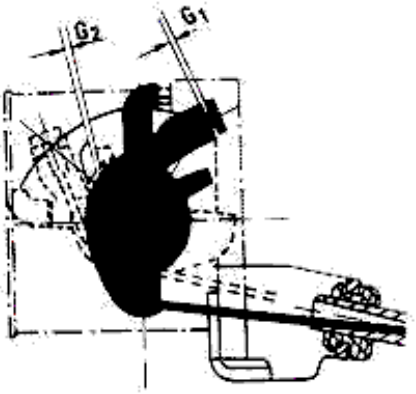
Check that the accelerator control cable slides freely in its sheath.

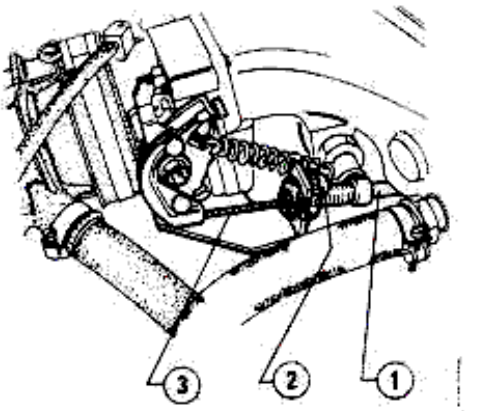
2. Cable backlash check

a. With the accelerator pedal released, check that the end play of accelerator cable on control levers is

G_1 = 1 to 2 mm (0.04 to 0.08 in).

b. If required, adjust cable backlash by withdrawing spring (2) so as to obtain the backlash specified; then insert spring in the new position.





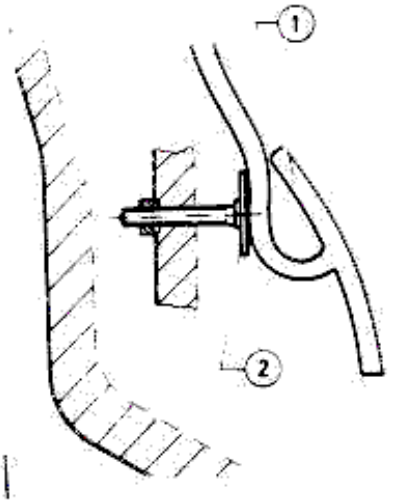
1 Accelerator cable sheath
2 Adjusting spring
3 Accelerator cable

3. Check on throttle valve max opening

a. With the accelerator pedal fully pressed, check that the accelerator control cam can still rotate by

G_2 = 1 to 2 mm (0.04 to 0.08 in).

If required, carry out the adjustment by operating on the end-of-travel screw (2) underneath accelerator pedal.



1 Accelerator pedal
2 End-of-travel screw

CHECK ON FUEL SYSTEM PRESSURE AND SYSTEM TIGHTNESS

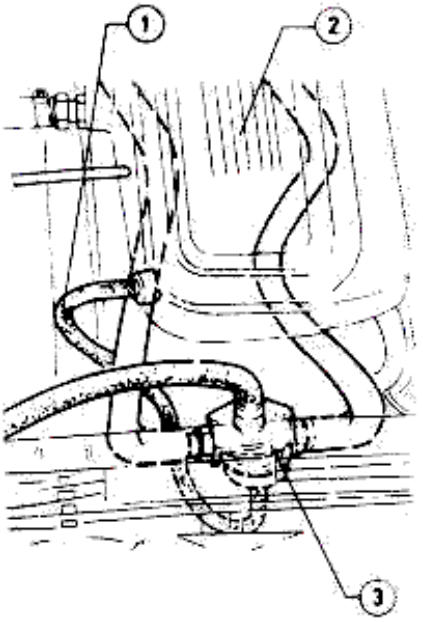
Carry out the check as follows:

1. System pressure check

a. Disconnect the fuel delivery hose from the injector fuel inlet manifold.

b. Connect a pressure gauge, through a union-tee, at the ends of the inlet line previously disconnected.

c. Detach hose (1) connecting pressure regulator (3) to intake air box (2). All this to prevent that any unevenness in the engine rotation can cause incorrect reading.



1 Hose
2 Intake air box
3 Pressure regulator

d. Run the engine to the idle r.p.m., and check that the fuel pressure value is

245.4 kPa (2.5 bar; 2.5 kg/cm²; 35.6 p.s.i.)

e. Reconnect the hose to intake air box; when at the minimum, the pressure will decrease by **50 kPa (0.5 bar; 0.51 kg/cm²; 7.3 p.s.i.)** approx., and then increase when the throttle valve opens.

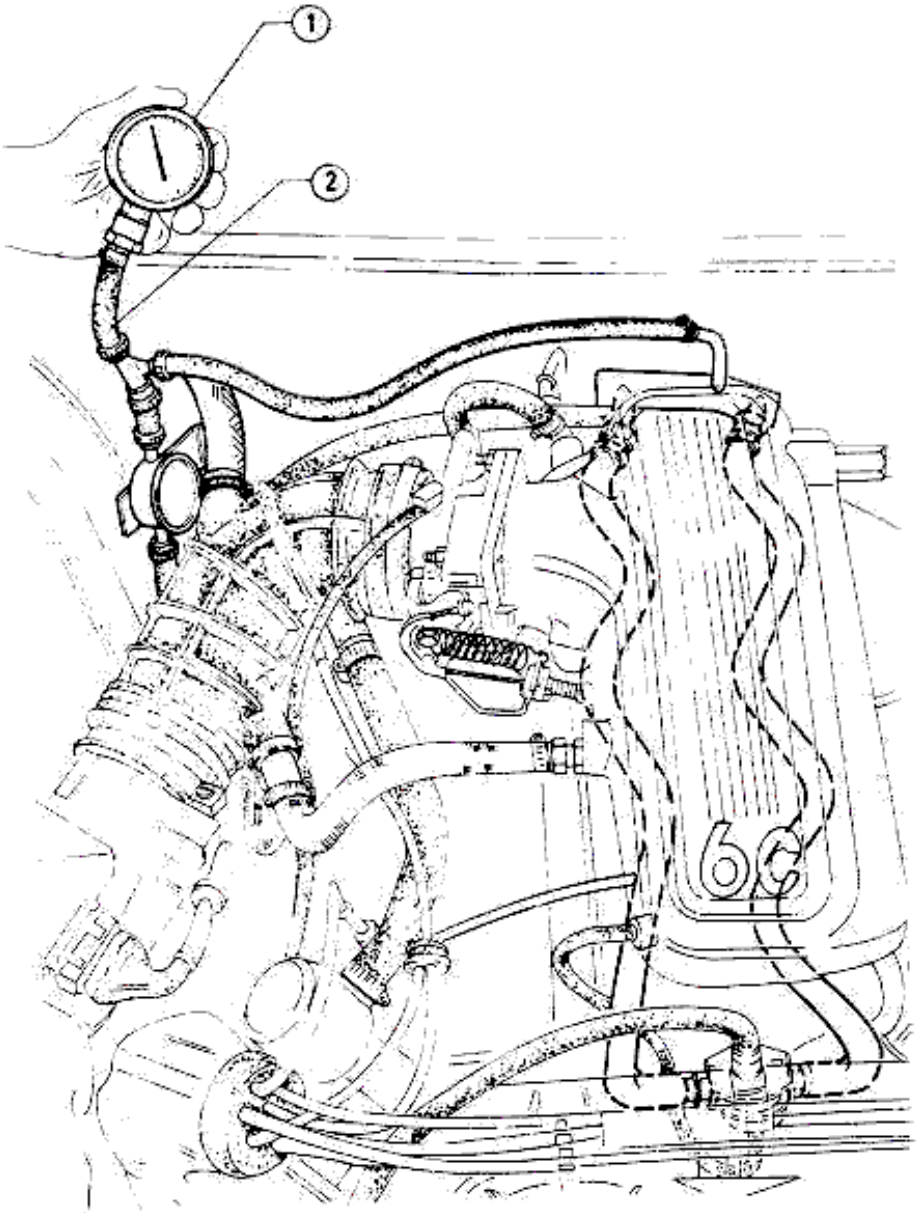
If it does not check for leaks in the vacuum hose.

2. System tightness check

a. Keeping the pressure gauge connected and with engine idling, throttle the delivery hose immediately after pressure regulator, and check that pressure increases up to **250 kPa (2.5 bar; 2.55 kg/cm²; 36.3 p.s.i.)** (prevent pressure from exceeding this value).

b. When **250 kPa (2.5 bar; 2.55 kg/cm²; 36.3 p.s.i.)** pressure are obtained, check for leaks in the fuel supply piping and unions.

c. If the fuel pressure does not reach the mentioned value and no leaks are present, check filter and/or pump functioning.



1 Pressure gauge
2 Test connection

CHECK ON AIR SUPPLY SYSTEM TIGHTNESS DOWNSTREAM OF AIR-FLOW SENSOR

To detect air leaks in the intake system, disconnect the hose after the auxiliary air device and blow in compressed air with a gun.

Open the throttle valve completely and apply or spray soap solution on all the seal points; the presence of foam bubbles indicates that there are leaks.

DIAGNOSTIC PROCEDURE FOR CHECKING TIGHTNESS OF FUEL INJECTION SUPPLY SYSTEM

This procedure is to be performed when the following symptoms are present:

- Smell of fuel
- Visible signs of leaks from unions and system connections.

The possible causes are:

- Fuel leaks from components, unions and system connections.

Perform the procedure described in the previous paragraph for the "System Pressure Check" and "System Tightness Check" in particular:

a. Make sure that the workshop is equipped with fire-fighting equipment so as to guarantee safe operations.

b. Run the engine to the normal running temperature.

c. Turn off the ignition key.

d. Visually inspect the fuel system components and unions in order to identify the source of the leak.

e. Check the system as a whole (connecting piping, unions, components) using an exhaust gas analyzer (NDIR system).

f. The analyzer pointer will move when near a leak.

The test with analyzer must be performed slowly to compensate for the delay of the instrument response time.

g. After locating the leak by following the procedure in steps **d.** and **e.**, eliminate it by replacing the faulty components or correcting tightening the loosened clamps.

h. Once the previous step has been executed, start the engine letting it idle for a few minutes, then switch the ignition off.

i. Repeat the test steps **c.** and **d.** to check precision of diagnosis and efficiency of repair.

l. Once the procedure from step **a.** to step **h.** has been completed,

perform a road test for at least **30 minutes** followed by a final check to ensure system is in good condition.

DIAGNOSTIC PROCEDURE FOR CHECKING TIGHTNESS OF FUEL VAPOR EMISSION CONTROL SYSTEM

V8 milano

This procedure is to be performed when checking the fuel supply pressure and when the following symptom is present.

- Smell of fuel

The probable causes are:

- Vapor leaks from components, accessories and connections of the system.

Procedure "A"

a. Disconnect the vapor breather hose from the oil vapor separator located on the right-hand side of engine. Connect a source of compressed air, with a pressure gauge in between to the disconnected vapor breather hose.

b. Pressurize the system with compressed air until the following pressure is obtained:

2.49 kPa (0.025 bar; 0.0255 kg/cm^2; 254 mm H_2O; 0.3555 p.s.i.)

then close the connection.

If this value can not be obtained, open the compressed air supply circuit and check system tightness (with HC analyzer or leak finder "Snoop").

c. Measure the pressure drop in the system (it must not exceed

0.125 kPa (0.00125 bar; 0.00127 kg/cm^2; 12.7 mm H_2O; 0.0178 p.s.i.)

in **10 minutes**).

d. If within **10 minutes** the pressure exceeds the above value, identify the leak by laying a coat of soap solution on piping and unions or using the leak finder "Snoop".

e. Soap bubbles will be present on the leak points.

f. If the leak comes from the tank filler/plug, replace the plug first of all. If after the plug replacement the tightness is restored, this means that the problem was due to the plug; if not, replace the filler.

g. Replace the components supposed to be defective, or correctly tighten the loose clamps.

h. Repeat procedures **b.** and **c.** to check the diagnosis precision.

i. If, after carrying out the above mentioned procedure the leaks are still present, perform the diagnostic procedure related to the tightness check of the fuel injection supply system.

Alternative procedure "B"

To be performed with fuel tank filled up to at least 3/4 of its capacity

a. Disconnect the vapor breather hose from the oil vapor separator located on the right-hand side of engine block.

Connect a source of compressed air, with pressure gauge in between to the disconnected vapor breather hose.

b. Pressurize the system introducing propane gas into the vapor breather piping until the following pressure is obtained:

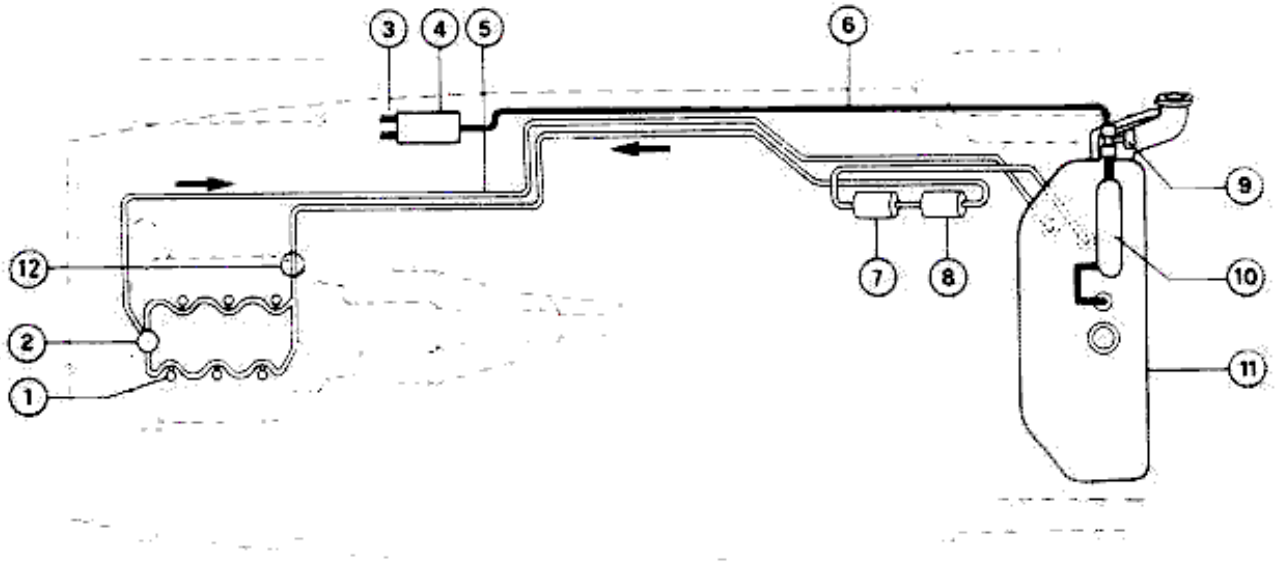
2.49 kPa (0.025 bar; 0.0255 kg/cm^2; 254 mm H_2O; 0.3555 p.s.i.)

c. Check for propane leaks from components, unions, or any parts of the system using an exhaust gas analyzer sensor (feeler).

d. Repair the leak by replacing the faulty components (or, if necessary, tighten the loose clamps).

e. Repeat steps **b.** and **c.** to check that diagnosis is correct.

f. If after performing the above tests, the problem is still present, perform the test cycle related to the tightness check of the fuel injection supply system.



1 Injectors
2 Fuel pressure regulator
3 For connection to engine (see diagram on page 04-15)
4 Carbon canister
5 Fuel return line
6 Fuel vapor recirculation hose
7 Fuel pump
8 Fuel filter
9 Air inlet valve
10 Vapor/liquid separator
11 Fuel tank
12 Dashpot

DIAGNOSTIC PROCEDURE FOR CHECKING TIGHTNESS OF FUEL VAPOR EMISSION CONTROL SYSTEM

V6 milano

This procedure is to be performed when checking the fuel supply pressure and when the following symptom is present.

– Smell of fuel

The probable causes are:

– Vapor leaks from components, accessories and connections of the system.

Procedure "A"

a. Disconnect the vapor breather hose from the oil vapor separator located on the right-hand side of engine. Connect a source of compressed air, with a pressure gauge in between to the disconnected vapor breather hose.

b. Pressurize the system with compressed air until the following pressure is obtained:

3.49 to 3.73 kPa
(0.035 to 0.037 bar;
0.0356 to 0.0380 kg/cm²;
356 to 380 mm H_2O;
0.5063 to 0.5405 psi)

then close the connection.

If this value can not be obtained, open the compressed air supply circuit and check system tightness (with HC analyzer or leak finder "Snoop").

c. Measure the pressure drop in the system (it must not exceed

3.00 to 3.23 kPa
(0.029 to 0.032 bar;
0.0305 to 0.033 kg/cm²;
306 to 330 mm H_2O;
0.4352 to 0.4693 psi)

in 5 minutes).

d. If within **5 minutes** the pressure exceeds the above value, identify the leak by laying a coat of soap solution on piping and unions or using the leak finder "Snoop".

e. Soap bubbles will be present on the leak points.

f. If the leak comes from the tank filler/plug, replace the plug first of all. If after the plug replacement the tightness is restored, this means that the problem was due to the plug; if not, replace the filler.

g. Replace the components supposed to be defective, or correctly tighten the loose clamps.

h. Repeat procedures b. and c. to check the diagnosis precision.

i. If after carrying out the above mentioned procedure the leaks are still present, perform the diagnostic procedure related to the tightness check of the fuel injection supply system.

Alternative procedure "B"

To be performed with fuel tank filled up to at least 3/4 of its capacity.

a. Disconnect the vapor breather hose from the oil vapor separator located on the right-hand side of engine block.

Connect a source of compressed air, with pressure gauge in between to the disconnected vapor breather hose.

b. Pressurize the system introducing propane gas into the vapor breather piping until the following pressure is obtained:

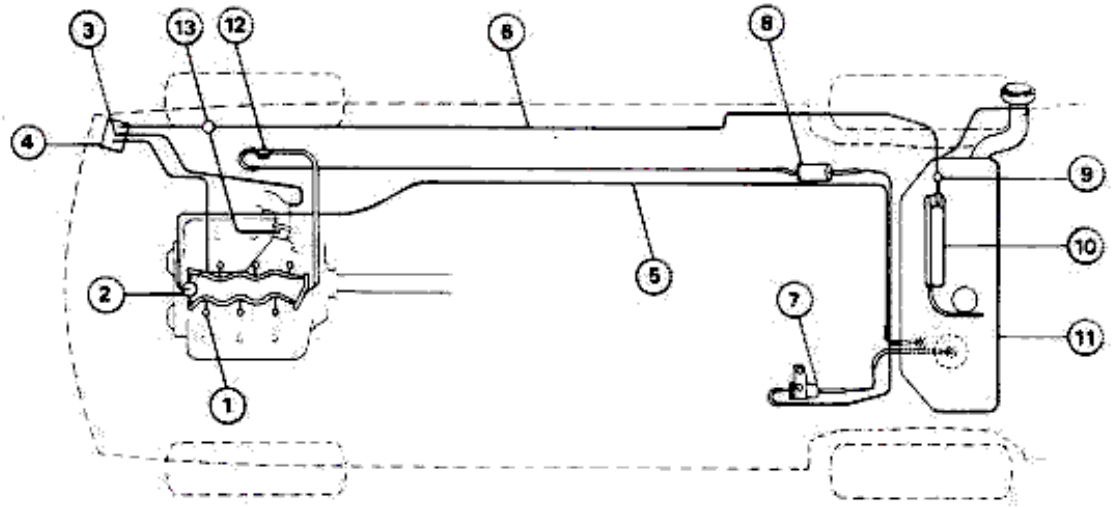
3.49 to 3.73 kPa
(0.035 to 0.037 bar;
0.0356 to 0.0380 kg/cm²;
356 to 380 mm H_2O;
0.5063 to 0.5405 psi)

c. Check for propane leaks from components, unions, or any parts of the system using an exhaust gas analyzer sensor (feeler).

d. Repair the leak by replacing the faulty components (or, if necessary, tighten the loose clamps).

e. Repeat steps b. and c. to check that diagnosis is correct.

f. If after performing the above tests, the problem is still present, perform the test cycle related to the tightness check of the fuel injection supply system.



1 Injectors
2 Fuel pressure regulator
3 For connection to engine (see diagram on page 04-14/1)
4 Carbon canister
5 Fuel return line
6 Fuel vapor recirculation hose
7 Fuel pump
8 Fuel filter
9 Air inlet valve
10 Vapor/liquid separator
11 Fuel tank
12 Dashpot
13 Purge control valve

SERVICE DATA AND SPECIFICATIONS

TECHNICAL DATA

SUPPLY AND INJECTION SYSTEM COMPONENTS

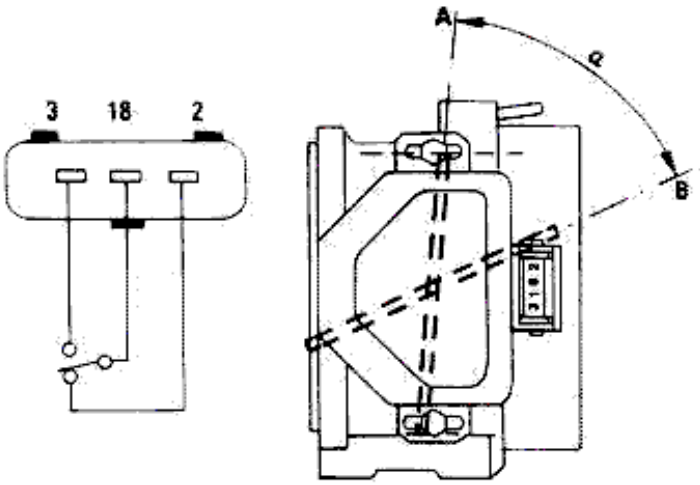
Component	ALFA ROMEO Std. Number	Type
Fuel pump	116.46.04.021.00	BOSCH 0.580.464.020
Fuel pressure regulator	119.11.32.045.00	BOSCH 0.280.160.210
Injectors	119.11.11.300.00	BOSCH 0.280.150.105
Air-flow sensor	119.11.11.013.00 (1) 195.50.11.013.00 (2)	BOSCH 0.280.202.010 BOSCH 0.280.202.108
Control unit	113.10.11.042.00 (1) 195.50.11.042.00 (2)	BOSCH 0.280.001.132 BOSCH 0.280.001.134
Lambda sensor	113.10.11.016.00 (1) 162.28.11.016.00 (2)	BOSCH 0.258.003.005 BOSCH 0.258.003.006
Auxiliary air device	116.46.11.017.00 (2)	BOSCH 0.280.140.124
Engine temperature sensor	119.11.11.010.00 (2)	BOSCH 0.280.130.023
Cold starter injector	119.11.11.011.00 (2)	BOSCH 0.280.170.039
Thermo-time switch	119.11.11.012.00 (2)	BOSCH 0.280.130.214
Throttle switch	116.85.11.022.00 (2)	BOSCH 0.280.120.304
Dashpot	161.10.04.550.00 (2)	BOSCH 0.280.161.030
Altitude compensation device	113.10.11.021.00 (2)	BOSCH 0.280.101.001

(1) For 2500 engine (2) For 3000 engine

FUEL TANK

Data	Unit of measurement	
	Litres	Gals
Overall capacity	67	17.7
Reserve	8 to 10	2.1 to 2.6

ACCELERATOR THROTTLE SWITCH TUNING



2 — Idle r.p.m. terminal (corresponding to position A, throttle closed)

3 — Peak r.p.m. terminal (corresponding to position B, throttle open)

α = 55° (For 3000 engine)

Unit: Ω

	Resistance	
	Terminals 2-18	Terminals 3-18
Accelerator throttle fully closed	0	∞
Accelerator throttle fully open	∞	0

SERVICE DATA AND SPECIFICATIONS

TECHNICAL DATA

SUPPLY AND INJECTION SYSTEM COMPONENTS

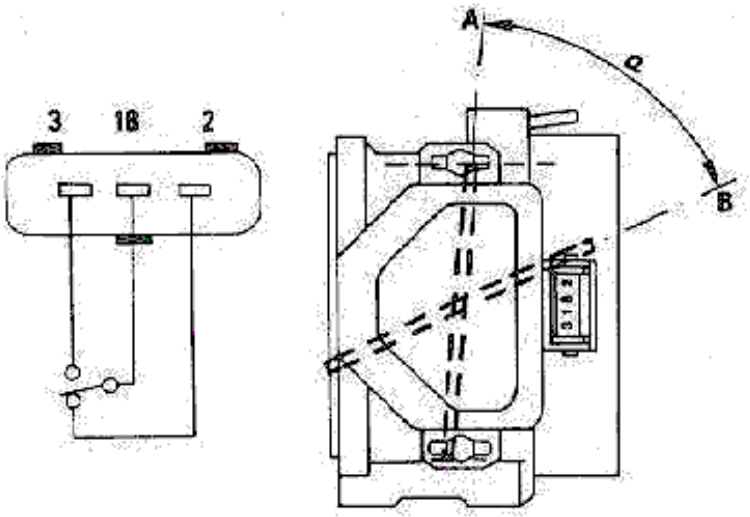
Component	ALFA ROMEO Std. Number	Type
Fuel pump	116.46.04.021.00	BOSCH 0.580.464.020
Fuel pressure regulator	119.11.32.045.00	BOSCH 0.280.160.210
Injectors	119.11.11.300.00	BOSCH 0.280.150.105
Air-flow sensor	119.11.11.013.00 (1) 195.50.11.013.00 (2)	BOSCH 0.280.202.010 BOSCH 0.280.202.106
Control unit	113.10.11.042.00 (1) 195.50.11.042.00 (2)	BOSCH 0.280.001.132 BOSCH 0.280.001.134
Lambda sensor	113.10.11.016.00 (1) 162.28.11.016.00 (2)	BOSCH 0.258.003.005 BOSCH 0.258.003.006
Auxiliary air device	116.46.11.017.00 (2)	BOSCH 0.280.140.124
Engine temperature sensor	119.11.11.010.00 (2)	BOSCH 0.280.130.023
Cold starter injector	119.11.11.011.00 (2)	BOSCH 0.280.170.039
Thermo-time switch	119.11.11.012.00 (2)	BOSCH 0.280.130.214
Throttle switch	116.85.11.022.00 (2)	BOSCH 0.280.120.304
Dashpot	161.10.04.550.00 (2)	BOSCH 0.280.161.030
Altitude compensation device	113.10.11.021.00 (2)	BOSCH 0.280.101.001

(1) For 2500 engine (2) For 3000 engine

FUEL TANK

Data	Unit of measurement	
	Litres	Gals
Overall capacity	67	17.7
Reserve	8 to 10	2.1 to 2.6

ACCELERATOR THROTTLE SWITCH TUNING



2 — Idle r.p.m. terminal (corresponding to postion A: throttle closed)

3 — Peak r.p.m. terminal (corresponding to position B: throttle open)

α = 55° (For 3000 engine)

Unit: Ω

	Resistance	
	Terminals 2-18	Terminals 3-18
Accelerator throttle fully closed	0	∞
Accelerator throttle fully open	∞	0

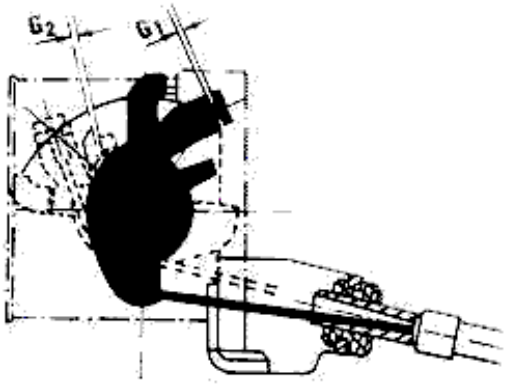
ACCELERATOR CONTROL

Backlash between throttle control lever and accelerator cable end (with accelerator pedal released).

G_1	mm	1 to 2
	(in)	(0.04 to 0.08)

Backlash between throttle control lever and end-of-travel (with accelerator pedal at end-of-travel).

G_2	mm	1 to 2
	(in)	(0.04 to 0.08)



ENGINE IDLE R.P.M. AND EXHAUST CO%

		2500 engine	3000 engine
Engine idle (1)	r.p.m.	950 ± 50 (2)	850 ± 50 (3)
Exhaust CO percentage at idle r.p.m., upstream of catalytic converter with Lambda sensor disconnected (1)	% in vol.	0.5 to 0.7	0.5 to 0.9

(1) With engine hot, gearbox in neutral, clutch engaged, auxiliary equipment off
(2) Over 1200 m (4000 ft) A.S.L. is acceptable 800 to 900 r.p.m.
(3) Over 1200 m (4000 ft) A.S.L. is acceptable 700 to 900 r.p.m.

GENERAL SPECIFICATIONS

FLUIDS AND LUBRICANTS

Application	Type	Name	Q.ty
Accelerator pedal shaft (on support rubbers)	GREASE	ISECO Molykote Longterm n. 2 Std. N. 3671-69831	—
Lambda sensor threading Thermo-time switch and engine temperature sensor	GREASE	Bosch 5.964.080.105 R. GORI Never Seez Std. N. 3671-69850	—

FUEL

CAUTION:
Use only lead-free fuel that corresponds to the following specifications:

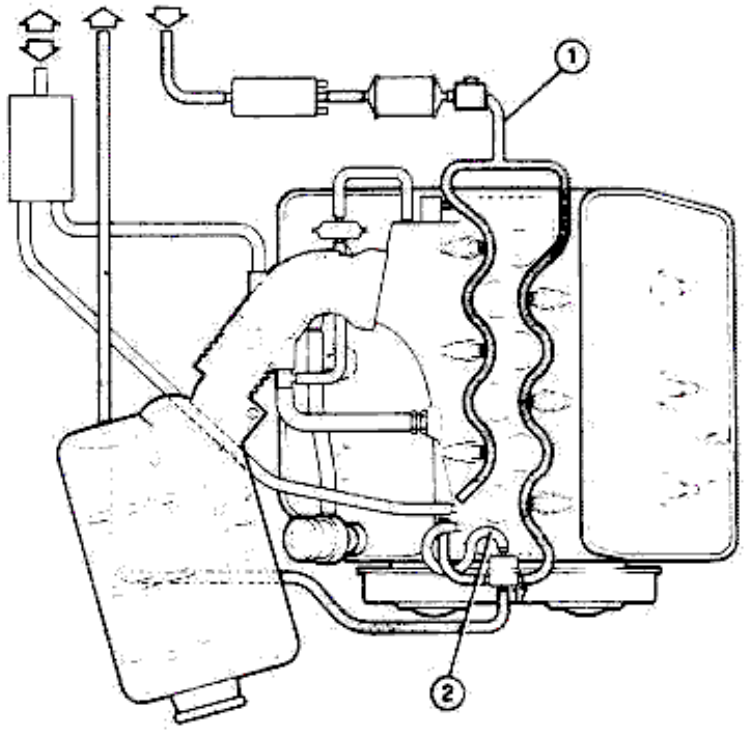
R.O.N. ≥91 (1); **≥95** (2)
P.O.N. ≥86 (1); **≥90** (2)

(1) For 2500 engine
(2) For 3000 engine

CHECKS AND ADJUSTMENTS

FUEL SUPPLY SYSTEM

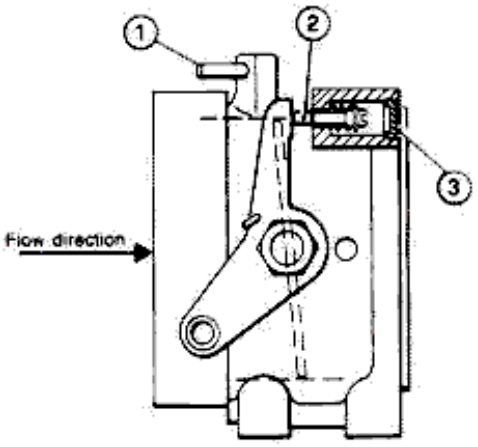
	Values	
Fuel delivery pressure (1)	kPa 245.4 bar 2.5 kg/cm² 2.5 psi 35.6	
Delivery at zero pressure	l/min 1.5 to 2 Gals/min 0.4 to 0.53	



1. Pressure measurement point
2. Pressure regulator vacuum hose

(1) To be measured at point (1) with hose (2) disconnected

THROTTLE BODY TUNING (CHECK WITH AIR-FLOW SENSOR)



1. Vacuum intake union
2. Adjusting screw
3. Seal

	Reading
Air passage with throttle valve in the closed position (Air-flow sensor Solex) (1)	300 ± 10 N scale (2) 200 ± 10 N scale (3)

(1) Plug the vacuum intake union down when carrying out the measurement
(2) For 2500 engine
(3) For 3000 engine

TIGHTENING TORQUES

Application \ Unit of measurement	N·m (ft·lb ; kg·m)
Engine temperature sensor on thermostat body (1)	15 (10.8 ; 1.5)
Thermo-time switch on thermostat body (1)	29 (21.7 ; 3)

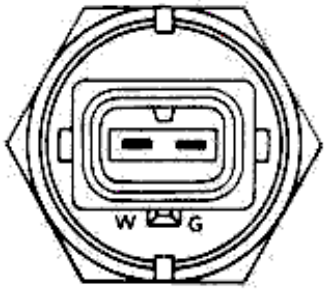
(1) With anti-seize: R. GORI Never Seez

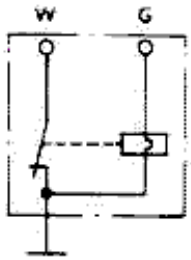
ELECTRICAL DATA

COLD START INJECTOR

Data \ Unit of measurement	Ω
Resistance between terminals	4

THERMO-TIME SWITCH





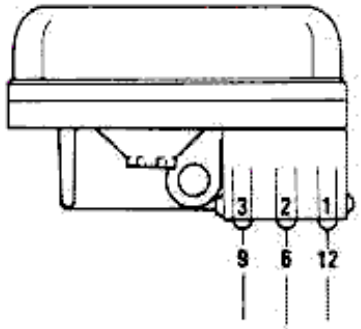
		Values
Triggering temperature	°C (°F)	30 to 40 (86 to 104)
Triggering max time (at −20 °C)	S	8

Resistance \ Temperature	< 30 °C (< 8 °F)	> 40 °C (> 104°F)
Between Terminal W and ground	0	100 to 160

ENGINE TEMPERATURE SENSOR

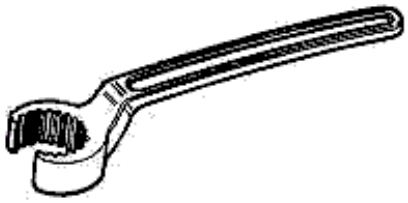
Resistance between terminals	Temperature
7 to 12 K Ω	– 10 °C (14 °F)
2 to 3 K Ω	20 °C (68°F)
250 to 400 Ω	80 °C (176 °F)

ALTITUDE COMPENSATION DEVICE



Control unit connector terminals	Terminals on component	Resistance Ohms	Altitude m (ft)
6 - 9	2 - 3	2000 to 3000	–
12-6	1 - 2	500 to 4500	0 to 1200 (0 to 4000)
		2500 to 6000	> 1200 (> 4000)
12-9	1-3	2.5K Ω	

SPECIAL SERVICE TOOLS

Identification number	Name	Page reference
A.5.0264	Lambda sensor wrench 	04-22 04-23