GROUP 04

CONTENTS

DESCRIPTION

75 Twin Spark S

FUNCTIONAL DESCRIPTION

The fuel is pumped to the fuel injectors (17) passing through the pulse damper (14) and the filter (13), coming from the fuel tank (10), by means of two electric pumps (11) and (12).

The pressure regulator (16) regulates the pressure of the fuel in the fuel distributor tube (15) as a function of the pressure measured in the air intake box (8), in such a way as to maintain the difference between the fuel pressure and the pressure in the air intake box constant.

When the fuel pressure exceeds the maximum specified value (3 bar), the pressure regulator causes the return of the excess fuel to the fuel tank.

In this way the quantity of fuel injected depends exclusively on the injection time, which is decided by the electronic control unit (30) by means of the help of sensors designed to measure the data which characterise the functioning of the engine.

These data are: r.p.m., engine load, battery tension, engine temperature etc.

The quantity of air taken in is measured by the air flow gauge (2), which has the function of quantifying the air flow rate and consequently sending a signal to the electronic control unit. The exact dosaging of the fuel injected is determined on the basis of this signal.

Inside the air flow gauge, there is a sensor (3) which mearures the temperature of the air taken in. This sensor furnishes a signal to the electronic control unit and the unit is thus able to compensate the injection time according to the variation in the air weight - fuel weight ratio.

The engine temperature is measured by the special sensor (18), fitted with the sensing part immersed in the coolant liquid.

From the air flow gauge (2) the air enters the air intake duct (4) and then reaches the accelerator butterfly housing (5).

A switch (6) is fitted on the accelerator butterfly housing and it consists of two microswitches. One of these is the minimum opening switch, which furnishes a signal when the angle of the butterfly is from 0° to 1° (completely closed) and the other is the maximum opening switch, which furnishes a signal when the opening angle of the butterfly is greater than 60°.

The signals sent to the electronic control unit by these two microswitches permit respectively a command to cut the fuel supply during engine deceleration whenever the conditions of butterfly closed and r.p.m. greater than 1080 are recognised, and the control of the fuel enrichment during acceleration when, on a specific request for engine power, the air flow gauge signal exceeds a predetermined increment and commands, not only the fuel injection to meet the new requirement, but an additional increase to reach the required r.p.m. rapidly.

The constant idle actuator (7) is fitted in a tube which by-passes the accelerator butterfly housing. With the butterfly closed or slightly open the section of the passage of the actuator determines a flow of air which is not controlled by the accelerator but by a command from the electronic control unit.

The air passes from the accelerator butterfly housing into the air intake box (8) and then through the air intake manifold (9) into the cylinders.

During cold starting, the electronic control unit controls the ignition advance and the injection time.

The ignition advance depends exclusively on the r.p.m. and the engine temperature.

The injection time is determined by a value programmed into the electronic control unit and corrected according to the temperature of the air taken in, the engine temperature, the battery tension and the r.p.m.

The sensor designed to measure the engine r.p.m. and the engine timing (20) is of the inductive type and functions by means of the variation in the magnetic field generated by the passage of the teeth of the cog wheel (phonic wheel) fitted on the drive shaft of the engine.

The ignition advance is determined by a map programmed into the electronic control unit functioning on the basis of the r.p.m. and the engine load.

The value thus obtained is optimised as a function of the air intake temperature and the engine temperature.

If the value thus optimised differs greatly from the value obtained from the programmed map, the injection time is increased to guarantee a sufficient margin from the spark knock limit.

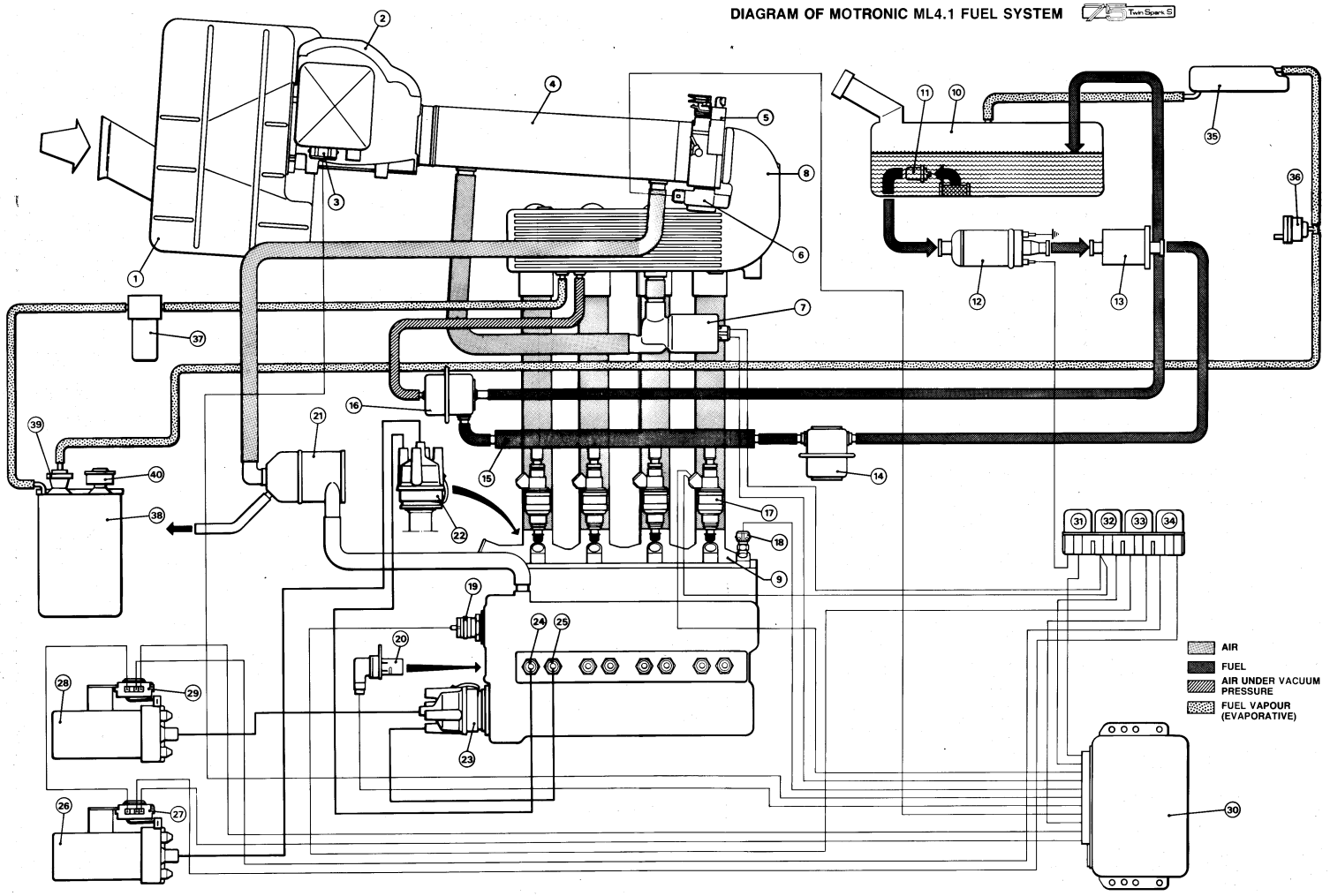
The cam shaft (air intake side) is equipped with an electromechanical-hydraulic type timing variator (19), which is able to modify the air intake timing (advance) so that a greater quantity of air is taken in.

The regulation of the idle running is controlled during all stages of functioning by means of the constant idle actuator (7).

When the engine is running on idle the function of the actuator is to bring the real r.p.m. to the nominal r.p.m. by acting on the accelerator butterfly by-pass.

As well as controlling the idle running of the engine, the actuator (7) also acts as an additional air box and regulator for the air conditioning system.

DIAGRAM OF MOTRONIC ML4.1 FUEL SYSTEM Twin Spark 8



1. Air filter
2. Air flow gauge
3. Air intake temperature sensor
4. Air intake duct
5. Accelerator butterfly housing
6. Minimum and maximum accelerator butterfly opening switch
7. Constant idle regulation actuator
8. Air intake box
9. Air intake manifold
10. Fuel tank
11. Auxiliary fuel pump
12. Main fuel pump
13. Fuel filter
14. Hammering damper
15. Fuel distributor tube
16. Fuel pressure regulator
17. Electric fuel injectors
18. Engine coolant temperature sensor
19. Timing variator
20. R.p.m. and timing sensor
21. Oil vapour trap
22. Front spark plugs ignition distributor
23. Rear spark plugs ignition distributor
24. Front spark plugs
25. Rear spark plugs
26. Front spark plugs ignition (coil B)
27. Coil B power module
28. Rear spark plugs ignition coil (coil A)
29. Coil A power module
30. Ignition and fuel injection electronic control unit (Motronic)
31. Fuel pump relay
32. Relay with diode
33. Timing variator relay
34. Main relay
35. Fuel vapour trap reservoir
36. Air inlet valve (compensation valve)
37. Solenoid valve
38. Carbon canister
39. One-way valve
40. Fuel vapour flow control valve (washing)

FUEL VAPOUR EMISSION CONTROL SYSTEM

The fuel vapours emanating from the tank are collected, through special tubing, into a trap (35) which thanks to its special design permits the return of the petrol condensate to the petrol tank.

To prevent the vapours from escaping into the atmosphere the tank is fitted with a sealed cap.

The fuel vapours which do not condense in the trap pass out of the upper fitting of the trap and, passing through the vapour breather tubing and the one-way valve (39), reach the active carbon filter (carbon canister) (38).

The vapour flow is controlled by a solenoid valve (37) which opens (or closes) on the basis of signals received from the electronic control unit (Motronic) (30).

If the vacuum pressure is less than a preset value (e.g.: with the engine not running or on idle) the solenoid valve remains closed and does not permit the vapour flow to enter the vapour cleaner.

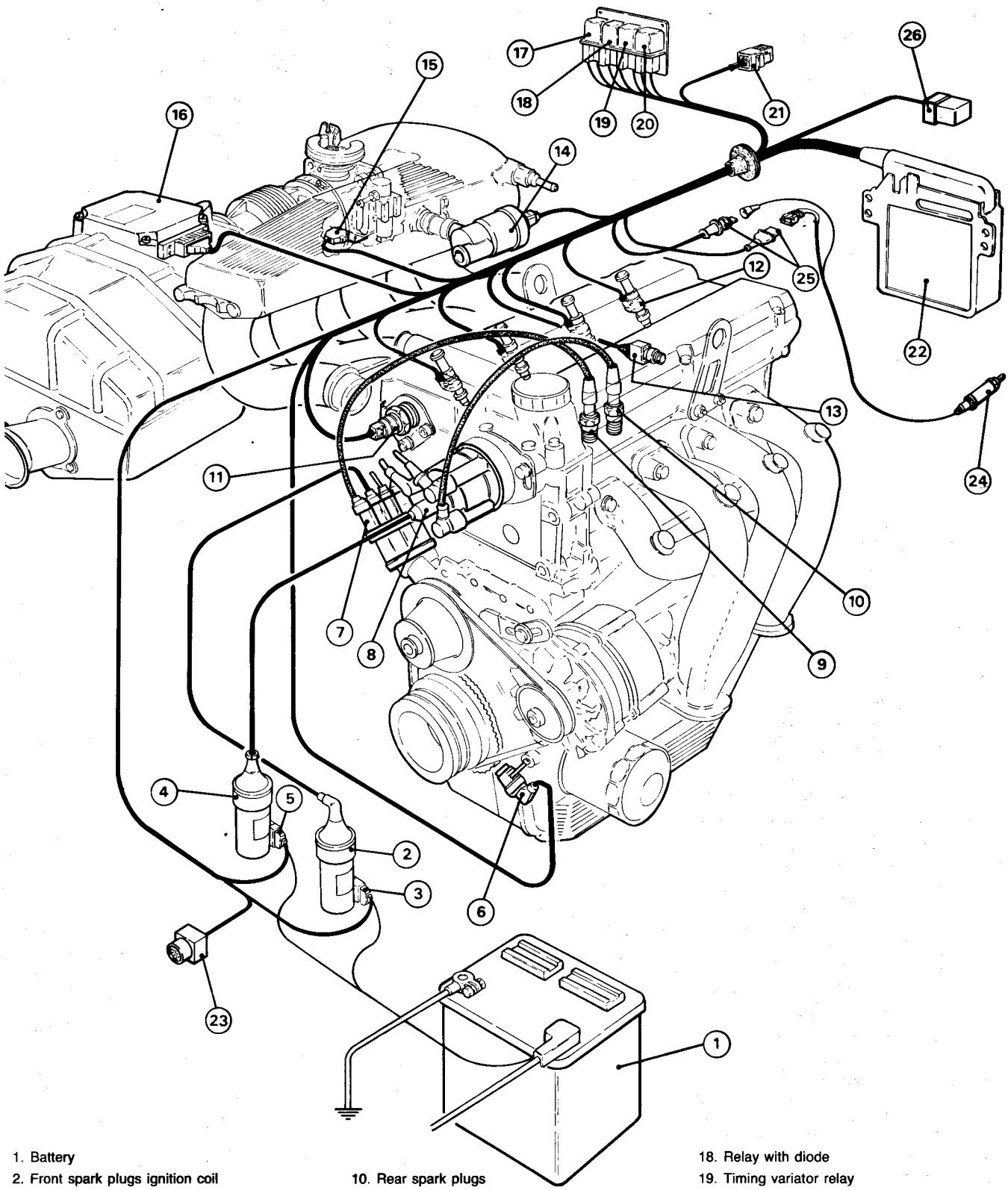
Under normal engine functioning conditions, the vapour flow gains access to the vapour cleaner and is absorbed by the activated carbon. Here, due to the effect of the pressure difference existing in the filter, the carbon is «washed» by the current of air which flows through the filter itself by means of the valve (40).

In the «washing» action, the petrol vapours and the atmospheric air mixed together, are conducted due to the effect of the vacuum pressure, to the air intake box where thery are added to the mixture.

There are two constrictions in the system: the first is located at the exit of the fuel vapour trap (diameter 3 mm); the second lies between the vapour cleaner and the air intake manifold (diameter 1 mm).

If, after the stopping of the engine, the pressure in the liquid- vapour trap tends to fall, due to a drop in temperature, a compensation valve (36), positioned in the vapour breather tubing, between the trap and the filter, permits the entrance of atmospheric air and maintains the pressure in the trap equal to the external atmospheric pressure.

WIRING AND MAIN COMPONENTS OF THE MOTRONIC ML4.1 SYSTEM



1. Battery
2. Front spark plugs ignition coil (coil B)
3. Power module (coil B)
4. Rear spark plugs ignition coil (coil A)
5. Power module (coil A)
6. R.p.m. and timing sensor
7. Front spark plugs ignition distributor
8. Rear spark plugs ignition distributor
9. Front spark plugs
10. Rear spark plugs
11. Timing variator
12. Electric fuel injectors
13. Engine coolant temperature sensor
14. Coolant idle regulation actuator
15. Minimum and maximum accelerator opening switch
16. Air flow gauge and air intake temperature sensor
17. Fuel pump relay
18. Relay with diode
19. Timing variator relay
20. Main relay
21. Body wiring connection
22. Ignition and fuel injection electronic control unit (Motronic)
23. Connector for self trouble diagnosis
24. Lambda sensor
25. Lambda sensor connectors
26. Motronic electronic control unit map switching device

IMPORTANT INFORMATION OF A GENERAL NATURE

- **Never disconnect the battery with the engine running or in any case with the ignition switched on (starting key in the position «Mar» (second do click). Failure to observe this precaution will result in serious and permanent damage to the electrical components and the electronics of the electronic control system.**
- Before starting the engine, make sure that the terminals of the battery are fully tightened.
- Do not use a «rapid charger» to start the engine.
- Completely disconnect the battery from the system before recharging it.
- Do not start the engine if the electrical connections are interrupted or components have been removed.
- Do not connect any low or high tension point to ground or interrupt any connections while the engine is running.
- Remove the electronic control unit when executing paintwork in furnace at temperatures of more than 80°.
- When fitting accessories on the vehicle, it is always advisable to disconnect the electronic control unit and proceed to check the functioning of the accessories with the control unit disconnected.
  The connection of leads to the connections of the electronic control system for accessories is very strongly not recommended.
- Before carrying out any operation on the various components of the system, make sure that there are no connectors disconnected, clips loosened or tubes torn or visibly obstructed.
- Never connect or disconnet the electrical plugs from the conductors of the electronic control unit with the ignition switched on.
- Do not connect the high or low tensione cables to earth in order to test them under any circumstances.
- Make sure that the connectors of the screened leads are correctly connected.
- Make sure that the ignition system is functioning efficiently by checking the spark plugs and checking that the distributor cap is not damp or cracked, that the leads between the coil and the distributors and between the distributors and the spark plugs are correctly connected and that the insulation does not present traces of burning or abrasions.
- When replacing fuses, remove the power supply first (disconnect the contact). If a fuse burns repeatedly, seek the cause of the short circuit.
  Never replace a fuse with a piece of wire.
  It is imperative that burnt fuses be replaced with fuses of the same amperage.

TEMPERATURE OF THE CATALYTIC SILENCER BOX

A too high temperature of the catalytic silencer box during driving can cause damage to the alumina monolith thus reducing its transformation capacity and damage the container or the vehicle resulting in a risk of fire.
The engine phenomena that can cause overheating of the catalytic silencer box are:

— Carbon deposits on the spark plugs of one or more cylinders.
— Fuel pump defective or fuel filter clogged (fuel pressure too low).
— Fuel injectors defective.
— Air filter cartridge very dirty.
— Accelerator control system not set and adjusted correctly.
— Engine and related components not set and adjusted to the manufacturers specified standards.
— Leaks in the exhaust tubing upstream from the exhaust gas sensor.
— Pressure regulator not functioning.
— Battery tension too low (or recharging circuit defective).

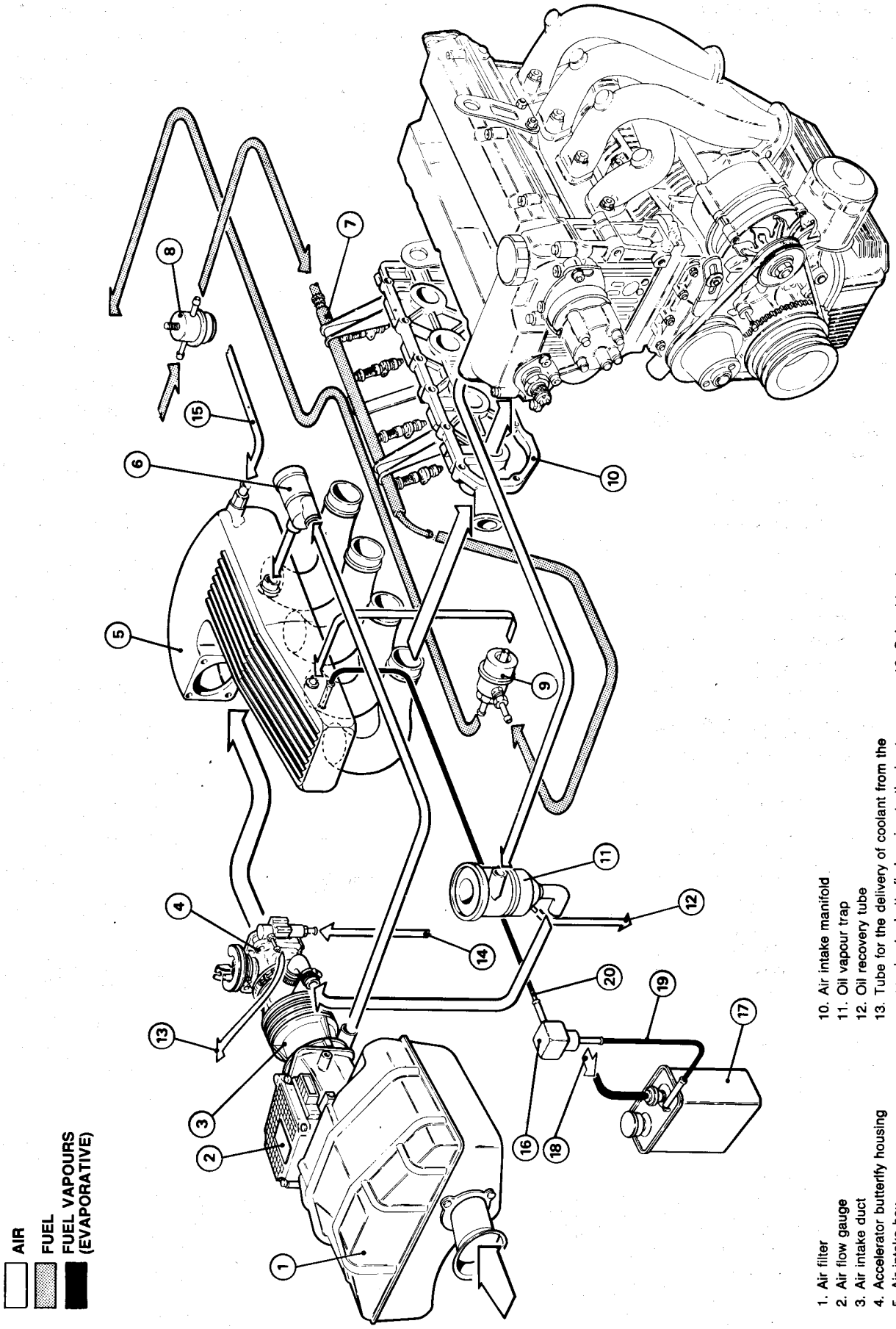
The driving conditions that can cause overheating of the silencer box are:

— Too little fuel in the tank.
— Overloading of the engine for long periods, for examle, when travelling at maximum speed, when bowing a trailer or climbing of ten.
— Travelling downhill with the engine switched off.

PRECAUTIONS TO BE TAKEN WITH VEHICLES FITTED WITH CATALYTIC SILENCER BOX

— Use only unleaded petrol.
— Avoid allowing the petrol tank to become empty.
— Do not run the engine with one of the spark plugs disconnected and never connect the spark plugs to ground.
— Do not overload the engine for prolonged periods. Pay particular attention when towing or climbing for long periods.
— Do not turn the engine off when driving down hill. First stop the vehicle and then stop the engine.
— Do not park on or near inflammable material such as dry grass, petrol soaked ground, dry leaves, rubbish etc.
— Never tamper with the exhaust emission control system: it is forbidden by law.
— Carry out the maintenance operations as described in the instruction booklet. Perfect engine maintenance is fundamental to the conservation of the catalytic silencer box.

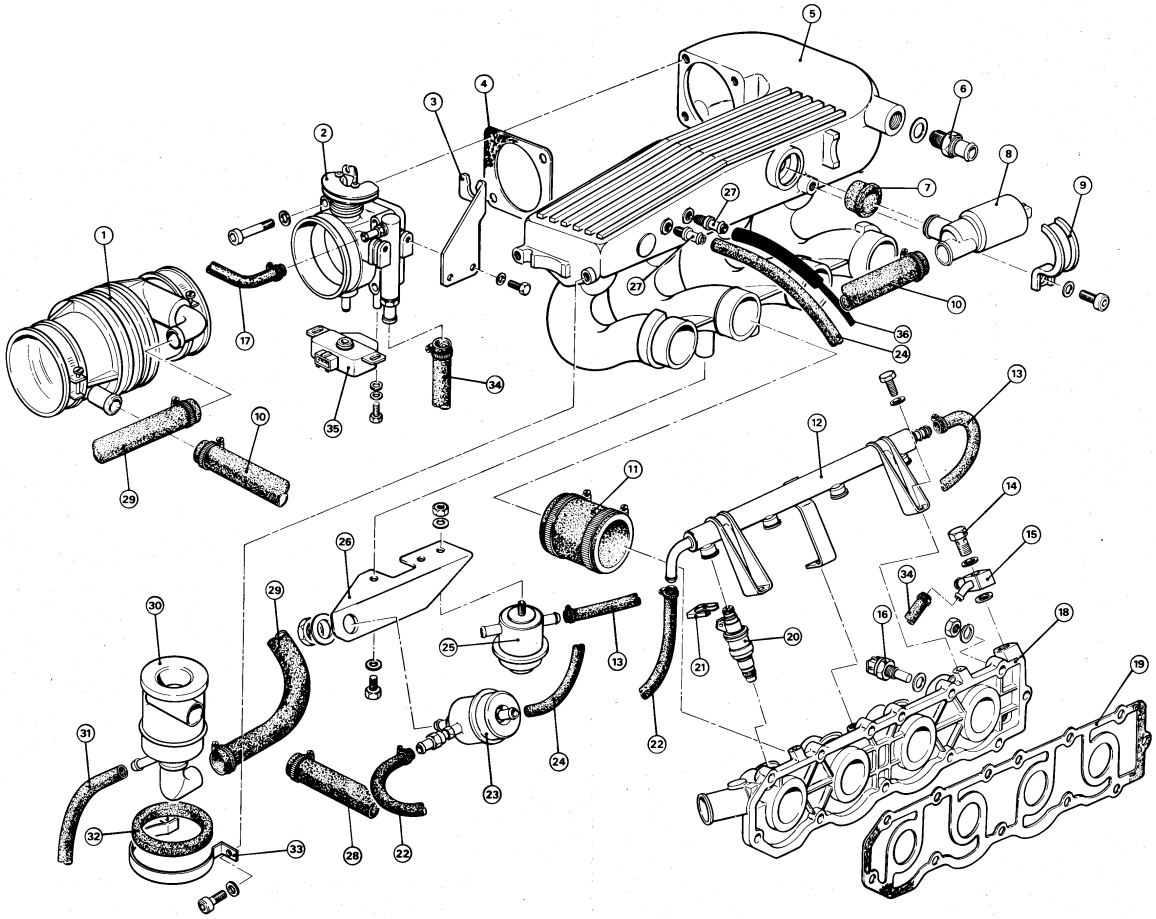
AIR INTAKE SYSTEM



1. Air filter
2. Air flow gauge
3. Air intake duct
4. Accelerator butterfly housing
5. Air intake box
6. Constant idle regulation actuator
7. Fuel distributor tube
8. Hammering damper
9. Fuel pressure regulator
10. Air intake manifold
11. Oil vapour trap
12. Oil recovery tube
13. Tube for the delivery of coolant from the accelerator butterfly housing to the heater
14. Tube for the delivery of coolant from the cylinder head to the accelerator butterfly housing
15. Servo-brake vacuum tube
16. Solenoid valve
17. Carbon canister
18. Tube for recycling of fuel vapours (from the petrol tank)
19. Tube for the recycling of fuel vapours (from the solenoid valve)
20. Tube for the recycling of fuel vapours (from the air intake box)

AIR INTAKE SYSTEM COMPONENTS

1. Air intake duct
2. Accelerator butterfly housing
3. Accelerator cable support bracket
4. Gasket
5. Air intake box
6. Pipe fitting for servo-brake vacuum tube
7. Actuator idle regulation actuator
8. Constant idle regulation actuator
9. Actuator securing bracket
10. Constant idle regulation tube
11. Coupling connecting the air intake box with the inlet manifold
12. Fuel distributor tube
13. Fuel delivery tube
14. Securing union for run-off fitting
15. Two way run-off fitting
16. Engine coolant temperature sensor
17. Tube for the delivery of coolant from the header tank to the accelerator butterfly housing
18. Inlet manifold
19. Gasket
20. Electric fuel injector
21. Electric fuel injector securing spring clip
22. Fuel return tube
23. Fuel pressure regulator
24. Vacuum tube for fuel pressure regulator
25. Hammering damper
26. Support bracket for hammering damper and fuel pressure regulator
27. Pipe fitting for vacuum tube
28. Oil vapour breather tube (from cylinder head)
29. Oil vapour recycling tube
30. Oil vapour trap
31. Oil recovery tube
32. Rubber ring
33. Oil vapour trap securing bracket
34. Tube for the delivery of coolant from the accelerator butterfly housing to the cylinder head
35. Minimum and maximum accelerator butterfly opening switch
36. Tube for the recycling of fuel-vapours from the solenoid valve to the air intake box

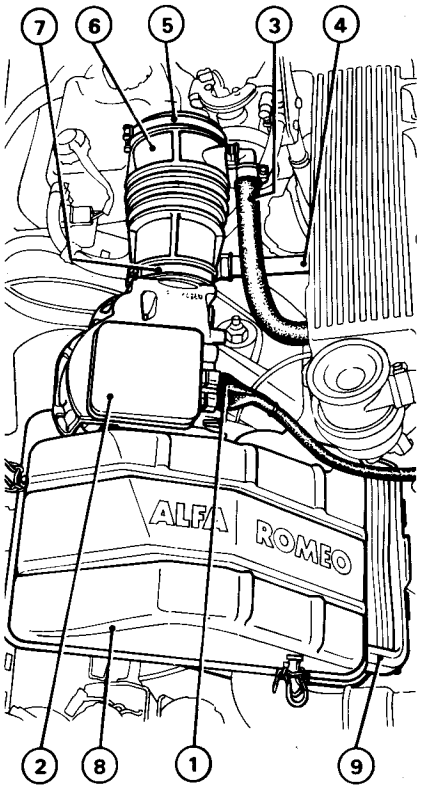


AIR FILTER

REMOVAL

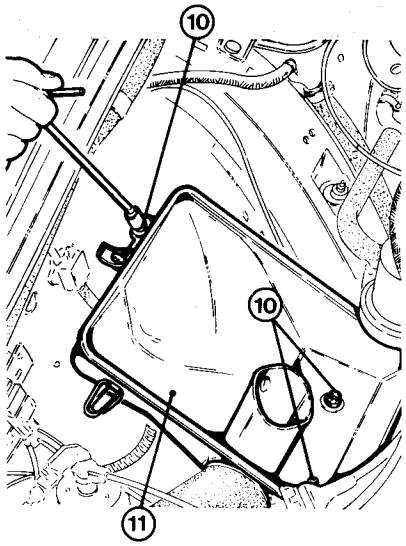
Proceed to the removal of the air filter operating as follows:

1. Disconnect the connector (1) from the air flow gauge (2).
2. Disconnect the following tubes from the air intake duct:
   - Tube for the recycling of oil vapours at peak r.p.m. (3).
   - By-pass tube for constant idle regulation (4).
3. Loosen the securing clip (5) and disconnect the air intake duct from the accelerator butterfly housing (6).
4. Loosen the securing clip (7) and remove the air intake duct (6) from the air flow gauge (2).
5. Unhook the four spring clips from the air filter cover (8) and remove it together with the air flow gauge. Also remove the filter element (9).



1. Connector
2. Air flow gauge
3. Peak r.p.m. oil vapour recycling tube
4. Constant idle regulation by-pass tube
5. Securing clip
6. Air intake duct
7. Securing clip
8. Air filter cover
9. Filter element

6. If necessary unscrew the three nuts (10) that secure the air filter container (11) to the body and remove it.



10. Securing nuts
11. Air filter container

INSPECTION AND ADJUSTMENT

1. Clean the filter element thoroughly blowing compressed air through it at low pressure. If necessary replace the filter element.

REFITTING

Proceed to the refitting of the air filter by reversing the order of removal.

NOTE:
When positioning the filter element in the container, be sure that the arrow, indicating the upper part, is facing upwards.

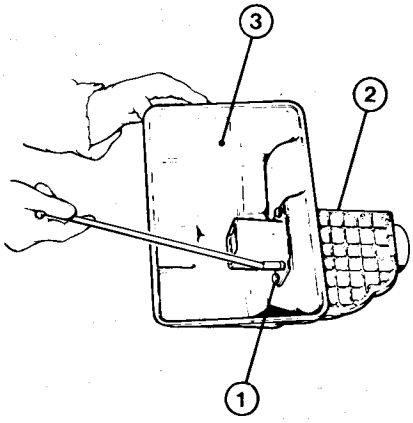
AIR FLOW GAUGE AND TEMPERATURE SENSOR

ELECTRICAL CHECKS

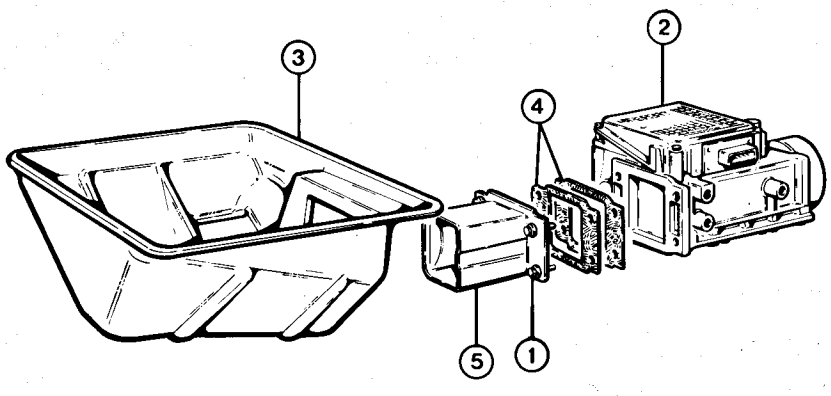
Refer to the paragraph «Electrical checks» of the Group 00.

REMOVAL

1. Remove the air filter assembly (see paragraph «Air filter - Removal»).
2. Unscrew the four screws (1) that secure the air flow gauge (2) to the filter cover (3).
3. Remove the air flow gauge (2) with the relative gaskets (4) and remove the inlet flange (5) from the filter cover (3).



1. Air flow gauge securing screws
2. Air flow gauge
3. Air filter cover



4. Gaskets
5. Inlet flange

INSPECTION AND ADJUSTMENT

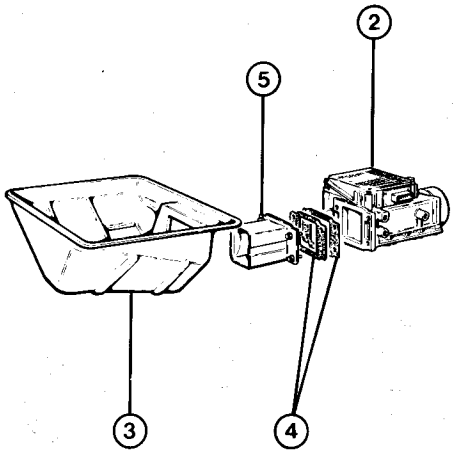
Press on the butterfly of the air flow gauge and check that it turns freely without sticking or catching and that it is not scored or dirty.

If necessary, clean the internal surfaces of the air flow gauge with a dry cloth.

REFITTING

1. Refit the air flow gauge (2), by reversing the order of removal.

Replace the gaskets (4).



2. Air flow gauge
3. Filter cover
4. Gaskets
5. Inlet flange

WARNING:

Pay particular attention to the tightening of the fittings so as to prevent air from being taken in other than through the filter.

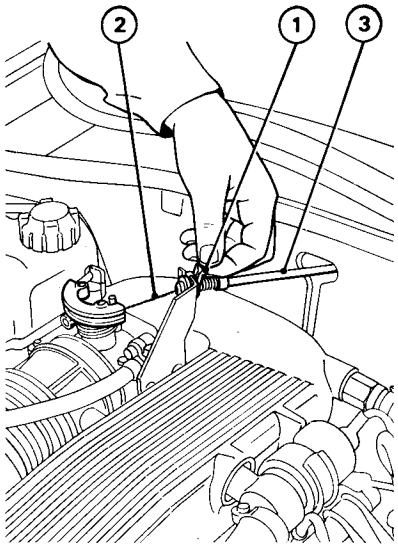
2. When the air flow gauge has been refitted, carry out the check and adjustment, if necessary, of the exhaust CO percentage (see paragraph «Settings and adjustment»).

COMPLETE ACCELERATOR BUTTERFLY ASSEMBLY AND HOUSING

REMOVAL

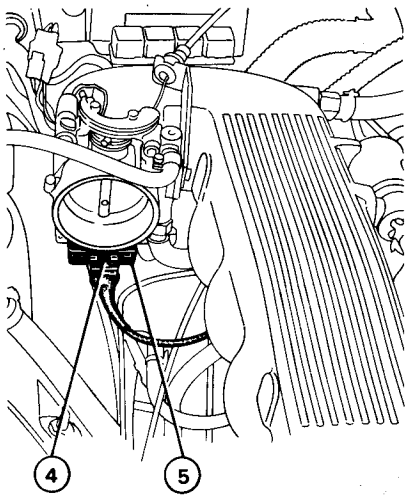
Remove the complete accelerator butterfly housing and assembly procceding as follows:

1. Disconnect the negative terminal of the battery.
2. Remove the air filter together with the air flow gauge and the relative air intake duct (see paragraph «Air filter - Removal»).
3. Remove the stop ring (1), disconnect the accelerator control cable (2) and slide back the sheating (3) from the relative support.



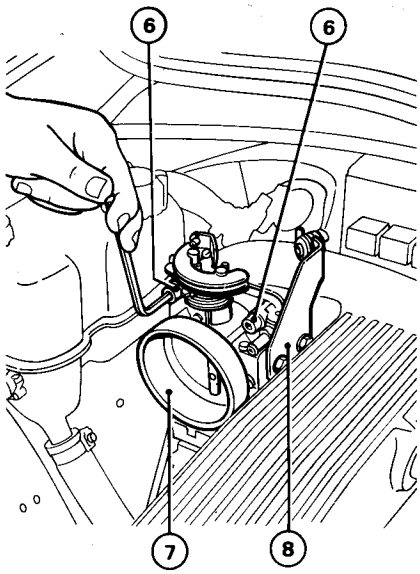
1. Stop ring
2. Accelerator control cable
3. Sheathing

4. Disconnect the connector (4) from the accelerator butterfly minimum and maximum opening switch (5).



4. Switch connector
5. Accelerator butterfly minimum and maximum opening switch

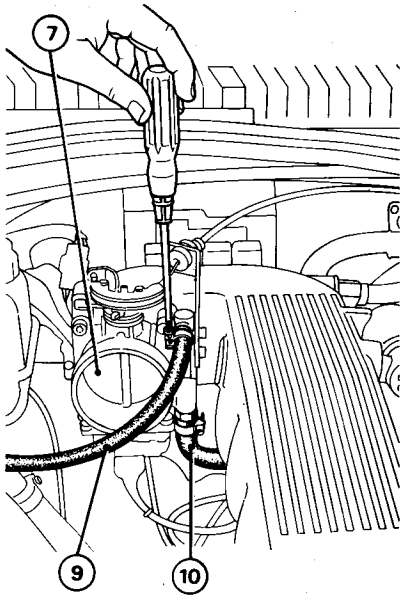
5. Unscrew the four securing screws (6), remove the accelerator housing (7) and recover the gasket and the accelerator cable support (8).



6. Accelerator butterfly housing securing screws
7. Accelerator butterfly housing
8. Accelerator cable support

6. Loosen the pipe clips and disconnect the following tubes from the accelerator butterfly housing (7):

- tube (9) for the delivery of coolant from the accelerator butterfly housing to the header tank.
- tube (10) for the delivery of coolant from the accelerator butterfly housing to the cylinder head.



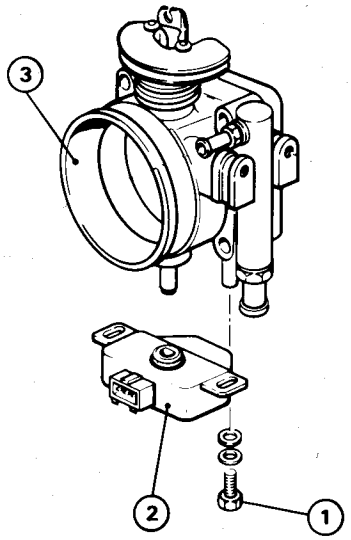
7. Accelerator butterfly housing
9. Tube for the delivery of coolant from the accelerator butterfly housing to the header tank
10. Tube for the delivery of coolant from the accelerator butterfly housing to the cylinder head

WARNING:

- **Maintain the tubes (9) and (10) above the level of the header tank and plug them appropriately so as to avoir the loss of coolant.**
- **Do not tamper with the accelerator butterfly assembly adjustments.**
- **Plug the inlet to the air intake box so as to prevent any foreign matter from entering.**

Removal of the accelerator butterfly assembly switch

1. Unscrew the two screws (1) and remove the accelerator butterfly minimum and maximum opening switch (2).



1. Switch securing screws
2. Accelerator butterfly minimum and maximum opening switch
3. Accelerator butterfly housing

Refitting of accelerator butterfly assembly switch

Proceed to the refitting of the accelerator butterfly assembly switch by reversing the order of removal and then adjust it as described in the paragraph «Settings and adjustment».

REFITTING

Proceed to the refitting of the complete accelerator butterfly housing and assembly by reversing the order of removal, taking care to restore all the electrical connections correctly, to fit a new gasket between the accelerator butterfly housing and the air intake box and to tighten the clips on the air intake box well.

If necessary, carry out the setting of the accelerator butterfly assembly (see paragraph «Setting and adjustment»).

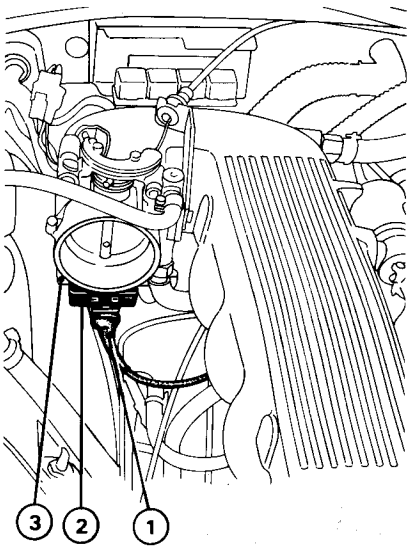
ACCELERATOR BUTTERFLY MAXIMUM AND MINIMUM OPENING SWITCH

ELECTRICAL CHECKS

Refer to the paragraph «Electrical checks» of Group 00.

REPLACEMENT

1. Disconnect the connector (1) of the switch (2).
2. Unscrew the two screws (3) and remove the switch.



1. Switch connector
2. Accelerator butterfly minimum and maximum opening switch
3. Switch securing screws

3. Fit a new switch and proceed to the setting of it (see paragraph «Setting and adjustment»).

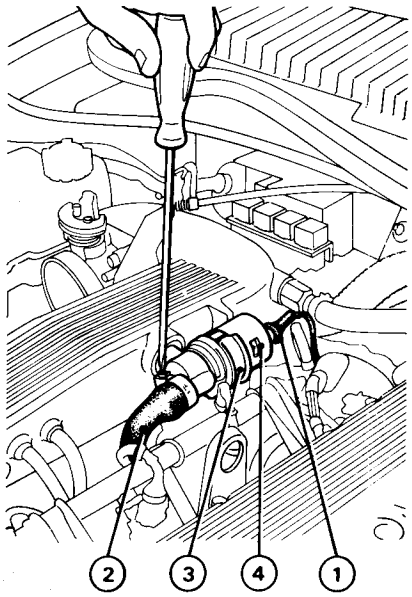
CONSTANT IDLE REGULATION ACTUATOR

ELECTRICAL CHECKS

Refer to the paragraph «Electrical checks» of Group 00.

REMOVAL

1. Disconnect the connector (1).
2. Loosen the pipe clip and disconnect the constant idle regulation by-pass tube (2).
3. Unscrew the securing screw of the clip (3) that holds the actuator to the air intake box.
4. Remove the actuator (4) complete with clip.



1. Connector
2. By-pass tube
3. Clip
4. Constant idle regulation actuator

REFITTING

Proceed to the refitting of the constant idle regulation actuator by reversing the order of removal and paying particular attention to the following:

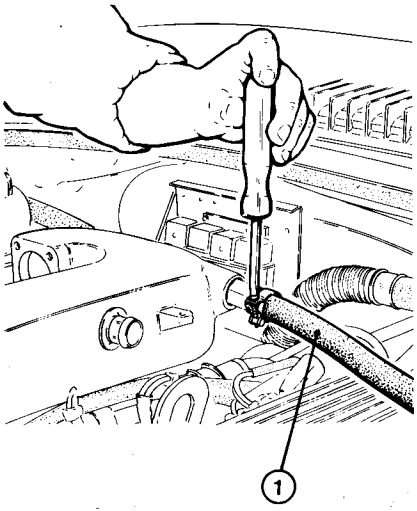
- The pipe clip (2) must be well tightened to prevent the leakage of air.
- The connector (1) must be pushed completely onto its seating on the actuator.

AIR INTAKE BOX

REMOVAL

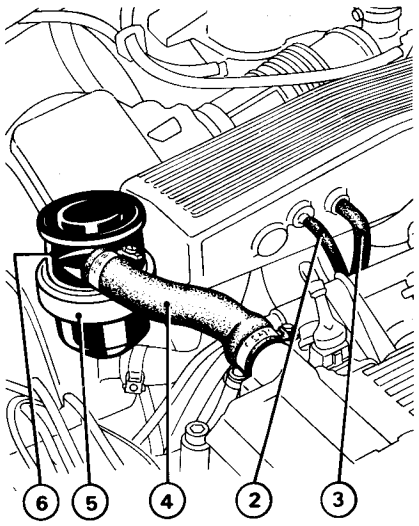
Proceed to the removal of the air intake box operating as follows:

1. Disconnect the battery terminals.
2. Remove the air filter together with the airflow gauge and the relative air intake duct (see paragraph «Air filter - Removal»).
3. Remove the accelerator butterfly housing (see paragraph «Complete accelerator butterfly housing and assembly - Removal»).
4. Loosen the pipe clip and disconnect the servo-brake vacuum tube (1) from the air intake box.



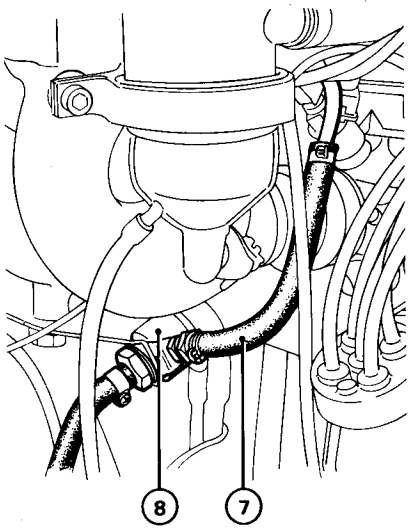
1. Servo-brake vacuum tube

5. Disconnect the vacuum tube for the pressure regulator (2) and the fuel vapour recycling tube (3) from the air intake box.
6. Loosen the pipe clip and disconnect the peak r.p.m. oil vapour recycling tube (4) from the oil vapour trap.
7. Unscrew the screw securing the clip (5) and remove the oil vapour trap (6) from the air intake box.



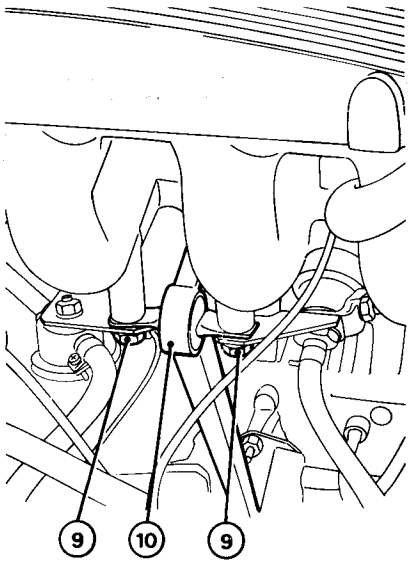
2. Vacuum tube for the fuel pressure regulator
3. Fuel vapour recycling tube
4. Peak r.p.m. oil vapour recycling tube
5. Clip
6. Oil vapour trap

8. Loosen the pipe clip and disconnect the petrol return tube (7) from the fuel pressure regulator (8).



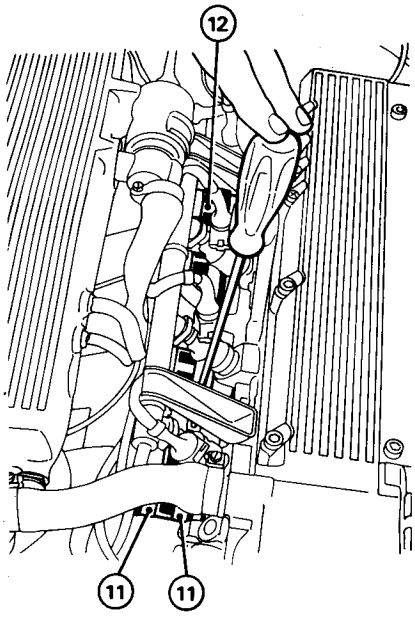
7. Petrol return tube
8. Fuel pressure regulator

9. Unscrew the screws (9) that secure the air intake box to the support (10).



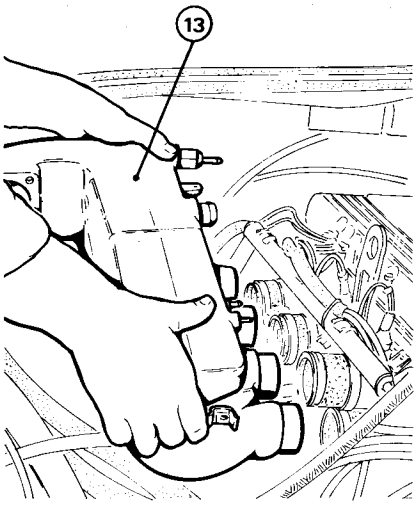
9. Securing screw
10. Support

10. Loosen the pipe clips (11) securing the rubber connectors (12) of the air inlet manifold to the air intake box.



11. Pipe clips
12. Rubber connectors

11. Remove the air intake box (13) withdrawing it from the rubber connectors of the air inlet manifold.



13. Air inlet manifold

INSPECTION AND ADJUSTMENT

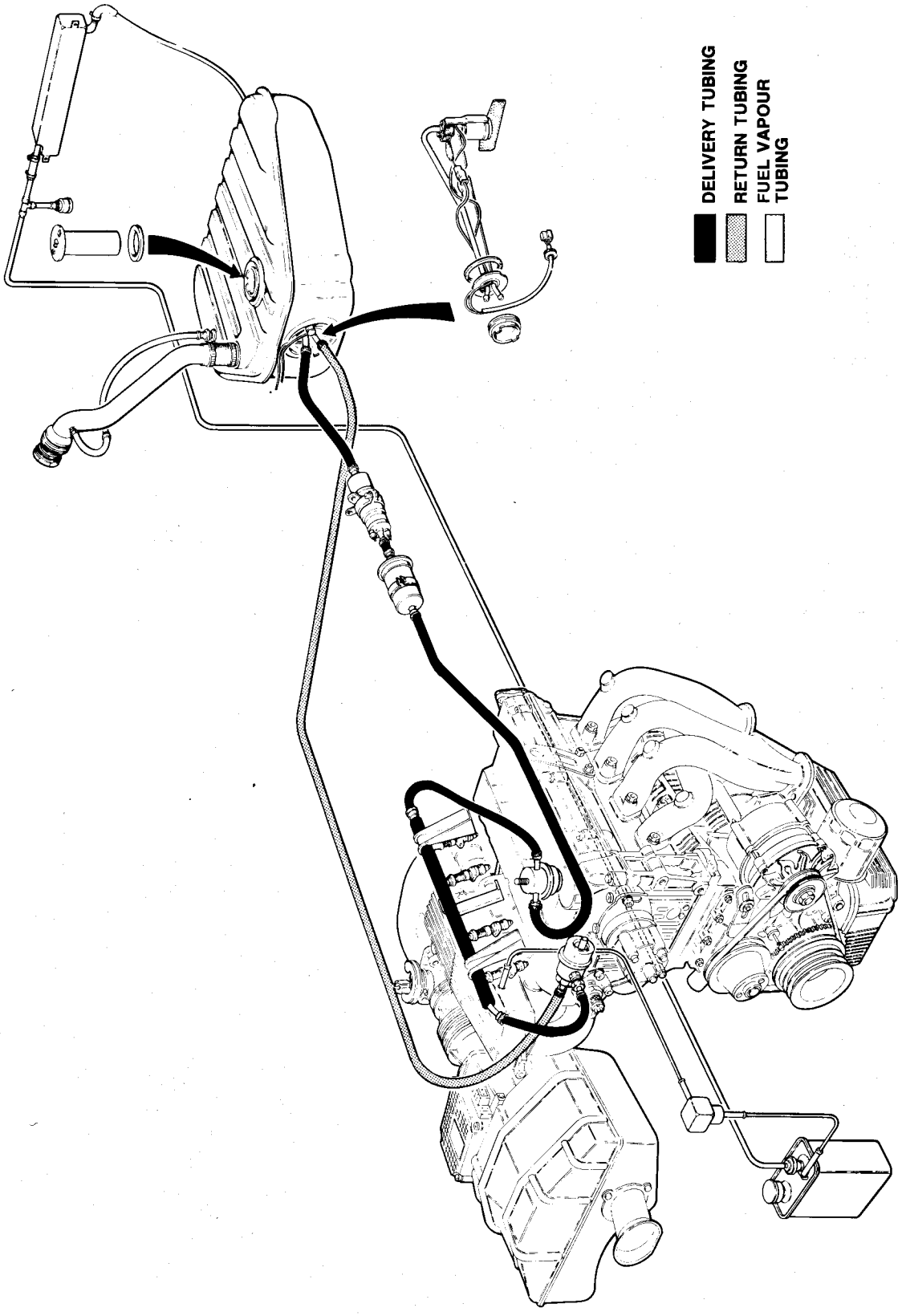
1. Clean the inside of the air intake box thoroughly, by blowing compressed air into it.

REFITTING

Proceed to the refitting of the air intake box by reversing the order of removal and paying particular attention to the following:

- The pipe clips (11) securing the rubber connectors (12) to the air intake box must be tightened well so as to avoid any leakage of air.
- If necessary replace the rubber connectors (12) between the air intake box and the air inlet manifold.
- Fit a new gasket between the accelerator butterfly housing and the air intake box.

FUEL AND FUEL VAPOUR SYSTEM



1. Fuel tank
2. Filler inlet
3. Breather tubes for filling
4. Fuel level gauge
5. Compensation valve
6. Immersed pump
7. Filter
8. Main pump
9. Fuel return tubing
10. Fuel delivery tubing
11. Hammering damper
12. Fuel distributor tube
13. Fuel pressure regulator
14. Electric fuel injector
15. Fuel vapour trap
16. Air inlet valve
17. Solenoid valve
18. Carbon canister
19. Fuel vapour return tube
20. Inlet tube for fuel vapours into the air intake box

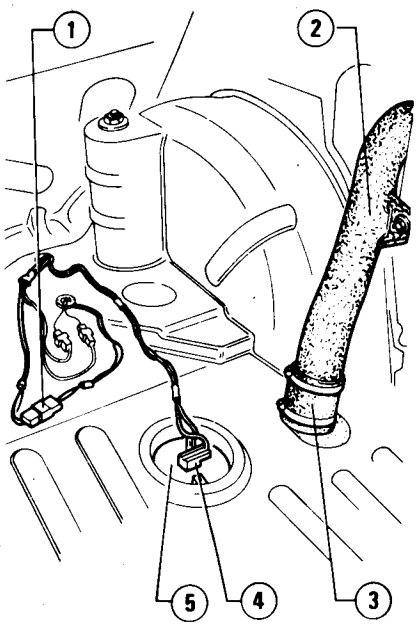
CAUTION:
Before replacing the components of the fuel system the following must be scrupulously observed:
a. Make sure that suitable safety equipment (fire extinguishers etc.) is available in the workshop.
b. Disconnect the ground terminal of the battery.
c. Place the fuel taken from the fuel tank in a suitable container with a safety lid.

WARNING:
After having refitted the components of the fuel system, check the tightness of the system to a pressure of 4 bar.

FUEL TANK

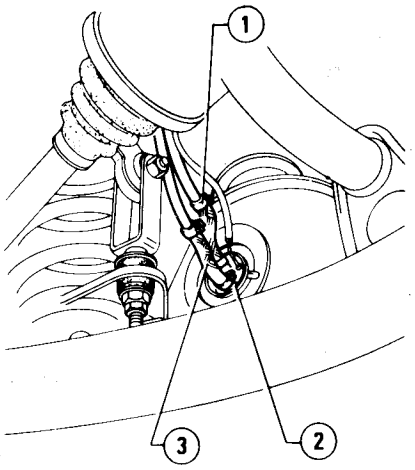
REMOVAL

1. Set the vehicle on a hydraulic lift, remove the filler cap and suck the fuel from the tank using a suitable pump.
2. Remove the lining of the floor of the luggage compartment, move aside the lining of the wall of the compartment (right side) and remove the cover of the fuel level gauge.
3. Disconnect the connectors (1) and (4) and then withdraw the connector (1) from its lead passage extracting it from beneath the vehicle.
4. Loosen the clip and detach the coupling (3) from the tank without damaging the rubber gasket under the coupling.



1. Immersed fuel pump connector
2. Filler inlet
3. Coupling connecting the inlet to the tank
4. Fuel level gauge connector
5. Fuel level gauge

5. Raise the vehicle on the lift and disconnect the tubes (1) and (3) from the flange (2).



1. Fuel return tube
2. Immersed fuel pump flange
3. Fuel delivery tube

6. Support the tank on a column type jack, unscrew the three screws securing the tank to the body and remove it.
7. If necessary, divide the tank into its various component parts.

INSPECTION AND ADJUSTMENT

Check that the tank is not cracked or deformed, replace if necessary.

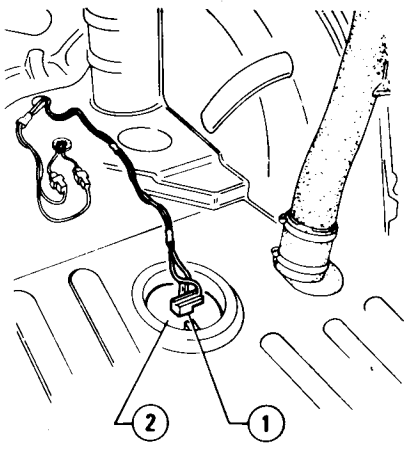
REFITTING

1. Fit the tank on the vehicle proceeding in the reverse order to that followed for the removal and paying particular attention to the correct positioning of the rubber gasket between the tank and the floor of the luggage compartment where the inlet filler pipe meets the tank.

FUEL LEVEL GAUGE

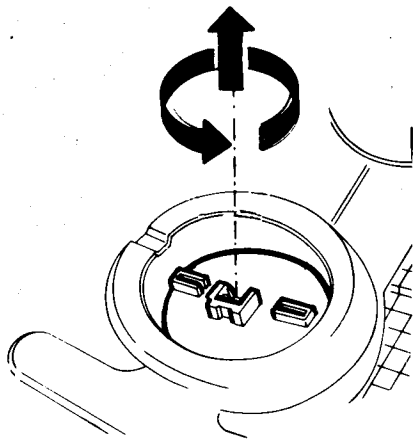
REPLACEMENT

1. Remove the lining of the floor of the luggage compartment.
2. Remove the fuel level gauge cover (2) and disconnect the connector (1).



1. Fuel level gauge connector
2. Fuel level gauge

3. Using a suitable tool, turn the fuel level gauge anti-clockwise and extract it from the fuel tank with the relative gasket.

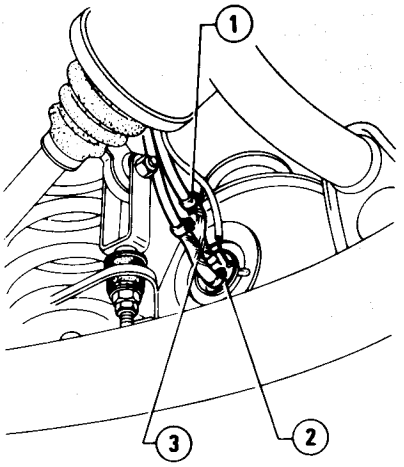


4. Replace the gasket before fitting the fuel level gauge on the tank.

AUXILIARY FUEL PUMP AND GAUZE-TYPE FILTER

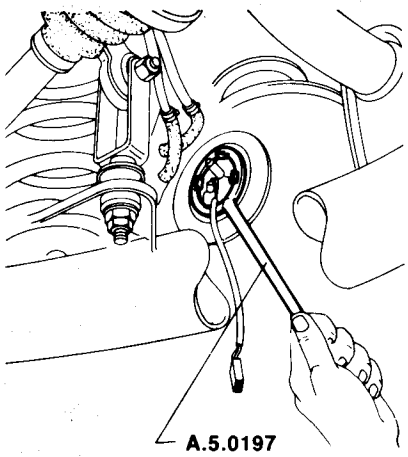
REPLACEMENT

1. Set the vehicle on a hydraulic lift, remove the filler cap and suck the fuel from the tank using a suitable pump.
2. Lift the lining of the floor of the luggage compartment, disconnect the immersed fuel pump connector, slide it through the relative lead passage and extract it from beneath the vehicle.
3. Raise the vehicle on the hydraulic lift and disconnect the tubes (1) and (3) from the flange (2).



1. Fuel return tube
2. Immersed fuel pump flange
3. Fuel delivery tube

4. Using special service tool **A.5.0197**, turn the immersed fuel pump flange anti-clockwise and extract the assembly from the tank with the relative gasket.



A.5.0197

5. **Replace** the gasket before fitting the immersed fuel pump assembly.
Proceed to refit it using the special service tool **A.5.0197**.

FUEL SYSTEM TUBING

REMOVAL

WARNING:
The tubing of the fuel system should only be removed if absolutely necessary.

1. Set the vehicle on a hydraulic lift.
2. Remove the fuel filler cap and using a suitable pump suck the fuel from the tank.
3. Loosen the pipe clips of the tubes to be removed.

WARNING:
Plug the ends of the tubes to prevent the entrance of foreign matter during disassembly (both rigid and flexible tubing).

4. In order to remove the tubing located on the floor inside the passenger compartment, first remove the lining of the floor on the right side.

INSPECTION AND ADJUSTMENT

1. Check that the flexible tubes are not porous or defective in any way. Replace any defective tubing.
2. Check that the rigid tubes are neither clogged nor dented and that they do not show signs of oxidation.

REFITTING

Refit the tubing with care by operating in the reverse order to that followed for the removal paying attention to the following warning.

WARNING:
a. Refit the pipe clips on the junctions of the system with care. Do not over tighten the pipe clips so as to avoid damaging the tubing.
b. Neither bend nor twist the rigid tubing while refitting these on the vehicle.
c. The tubing located inside the vehicle must be inserted in the relative tube passages as far as the red reference bands marked on each tube.
d. Start the engine and check that there are no leaks from the junctions.

COMPENSATOR VALVE

REPLACEMENT

1. Remove the lining of the floor of the luggage compartment.
2. Disconnect the filling breather tube with the attached compensation valve.

INSPECTION AND ADJUSTMENT

1. Blow a jet of air into the valve from the fitting on the petrol inlet sde.
Considerable resistance should be felt and a certain quantity of air should come out of the fitting on the atmosphere side.
2. Blow a jet of air into the valve from the fitting on the atmosphere side.
The jet of air should come straight out of the fitting on the petrol inlet side without any resistance being felt.
3. If the compensation valve does not present the above described characteristics, then it must be replaced.

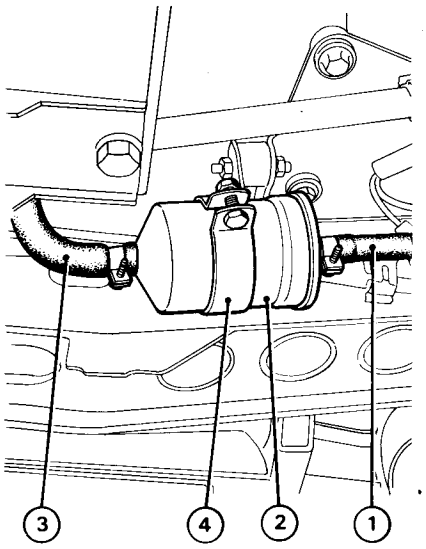
REFITTING

When refitting the compensation valve, take care to fit it the right way round, in the direction of its functioning.

FUEL FILTER

REPLACEMENT

a. Operating from beneath the vehicle pinch the tubes (1) and (3).
b. Loosen the pipe clips and detach the tubes (1) and (3) from the filter (2).
c. Loosen the support clip (4) and remove the filter.
d. Refit the new filter taking care to see that the arrow stamped on the casing of the filter is facing in the direction of the fuel delivery.
e. When the fitting is complete, remove the tube pinchers from the fuel delivery tubing.

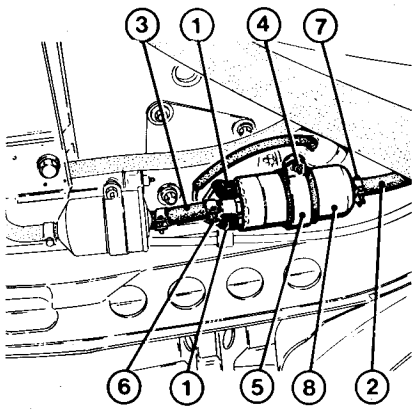


1. Fuel inlet tube
2. Fuel filter
3. Fuel outlet tube
4. Filter support clip

MAIN FUEL PUMP

REPLACEMENT

1. Set the vehicle on a hydraulic lift and disconnect the negative terminal of the battery.
2. Working from beneath the vehicle disconnect the pump power supply leads (1).
3. Pinch the tubes (2) and (3), unscrew the nut (4) that locks the pump clip (5), loosen the pipe clips (6) and (7) and then disconnect the tubes (2) and (3) from the pump (8).
4. Loosen the clip (5) and remove the pump (8).



1. Fuel pump power supply leads
2. Fuel pump inlet tube
3. Fuel pump outlet tube
4. Securing nut
5. Pump support clip
6. Pipe clip
7. Pipe clip
8. Fuel pump

5. Fit the new pump by reversing the order of removal and paying particular attention to the following:
- The replacement pump is supplied in a sealed packaging, filled with protective oil and with the pipe fittings closed with special plugs.
  When fitting it is not necessary to empty it.
- Take care not reverse the connections of the power supply leads (1).
- Tighten the following securing component to the specified torque:

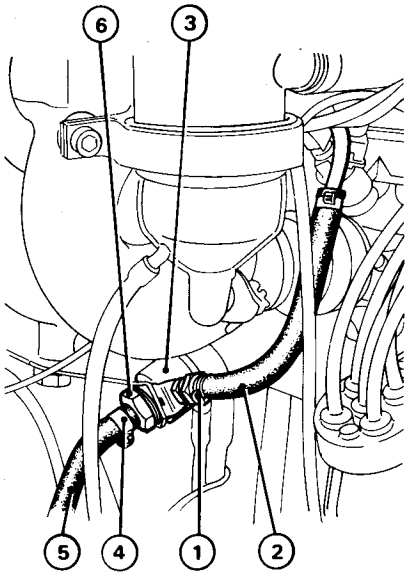
— Nut (4) for locking of pump securing clip (5).

(T) : **Tightening torque**
1.9 ÷ 2.4 N·m
(0.19 ÷ 0.24 kg·m)

FUEL PRESSURE REGULATOR

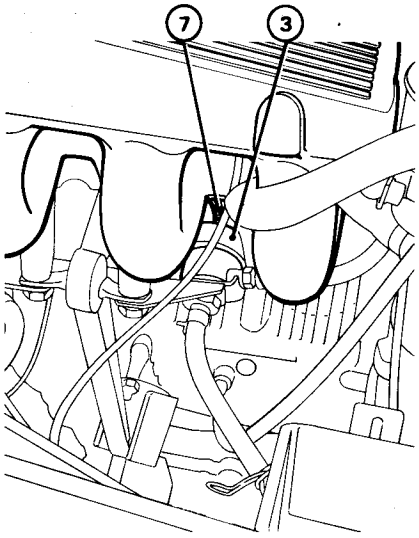
REPLACEMENT

1. Remove the air filter (see paragraph «Air filter - Removal»).
2. Paying attention for possible sprays of fuel, loosen the pipe clip (1) and disconnect the tube (2) from the fuel pressure regulator (3) plugging it appropriately.



1. Pipe clip
2. Tube for fuel return from the fuel distributor tube
3. Fuel pressure regulator
4. Pipe clip
5. Tube for fuel return to the tank
6. Securing nut

3. Loosen the pipe clip (4) and disconnect the fuel return tube (5) from the pressure regulator.
4. Unscrew the nut (6) that secures the pressure regulator to the bracket.
5. Withdraw the pressure regulator (3) from the bracket and disconnect the vacuum tube.



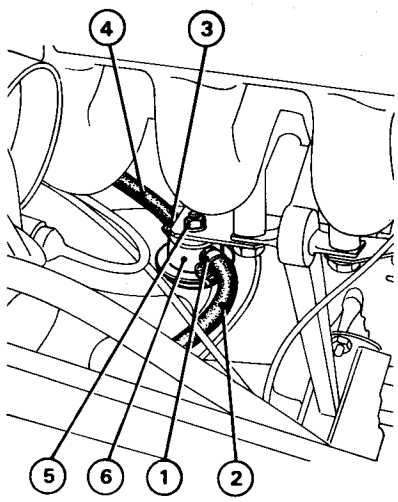
3. Pressure regulator
7. Pressure regulato vacuum tube

6. Refit the new pressure regulator by reversing the order of removal.
7. Refit the air filter (see paragraph «Air filter - Refitting»).

HAMMERING DAMPER

REPLACEMENT

1. Remove the air filter (see paragraph «Air filter - Removal»).
2. Paying attention for possible sprays of petrol, loosen the pipe clip (1) and disconnect the fuel delivery tube (2).
3. Loosen the pipe clip (3) and disconnect the fuel delivery tube (4) from the fuel distributor tube.
4. Unscrew the nut (5) that secures the hammering damper (6) to the bracket, recover the washer beneath, an remove the hammering damper.



1. Pipe clip
2. Fuel delivery tube
3. Pipe clip
4. Tube for delivery of fuel to the fuel injectors
5. Hammering damper securing nut
6. Hammering damper

5. Refit a new hammering damper by reversing the order of the removal.
6. Refit the air filter (see paragraph «Air filter - Refitting»).

ELECTRIC FUEL INJECTORS

INSPECTION AND ADJUSTMENT

1. Check electrical circuit continuity
Refer to the paragraph «Electrical checks» of Group 00.

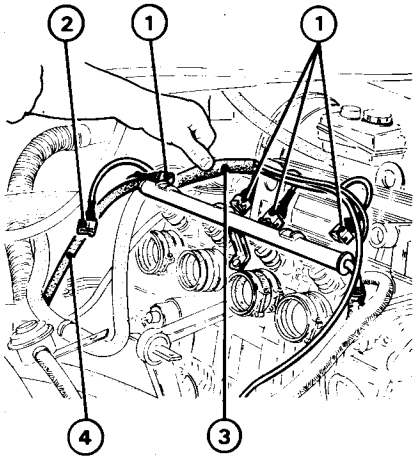
2. Check the correct opening of the fuel injectors
a. Measure the exhaust CO percentage (see paragraph «Setting and adjustment»).
b. Disconnect the fuel injector connectors one at a time; check the exhaust CO percentage each time and check that the value remains constant for each check.
c. If it does not remain constant, identify the faulty injector and replace it (see «Replacement»).
d. In any case a visual indication of the functioning of the fuel injectors is furnished by a comparison with the electrodes of the spark plugs:

— If the mixture is too rich the spark plugs will be black in colour.
— If the mixture is too lean the spark plugs will be light in colour.

3. Check fuel injectors for leaks
a. Remove the fuel injector assembly, complete with fuel distributor tube, from the inlet manifold, operating as indicated in «Removal». Keep the assembly connected to the fuel delivery system.
b. Disconnect the fuel injector connectors.
c. Operate the starter motor and check that there are no leaks of petrol from the fuel injectors. In the case of leaks, replace the defective injectors.

REMOVAL

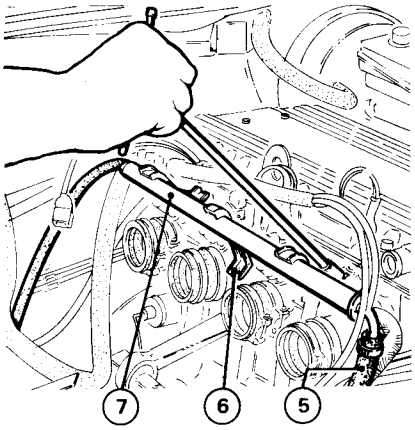
1. Remove the air intake box (see paragraph «Air intake box - Removal»).
2. Disconnect the power supply connectors (1) to the fuel injectors and the connector (2) of the engine temperature sensor.
3. Remove the clip (3) securing the electric wiring to the fuel distributor tube.
4. Loosen the clip and remove the tube (4) for the delivery of fuel from the hammering damper.



1. Electric fuel injectors
2. Engine temperature sensor connector
3. Electric wiring
4. Fuel delivery tube

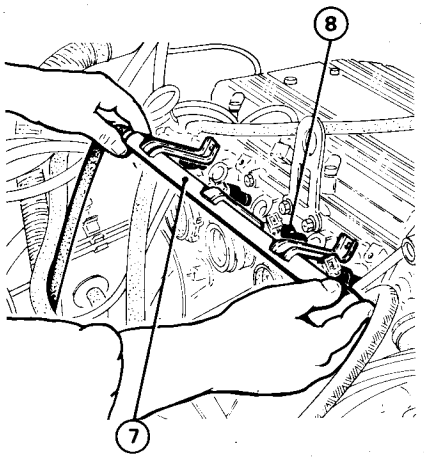
WARNING:
When disconnecting tube (4), be careful that the residual pressure in the tube does not cause sprays of petrol.

5. Loosen the pipe clip and disconnect the fuel return tube (5) from the fuel distributor tube.
6. Unscrew the three screws (6) that secure the fuel distributor tube (7) to the air inlet manifold.



5. Fuel return tube
6. Fuel distributor securing screws
7. Fuel distributor tube

7. Remove the fuel distributor tube (7) complete with the fuel injectors (8).

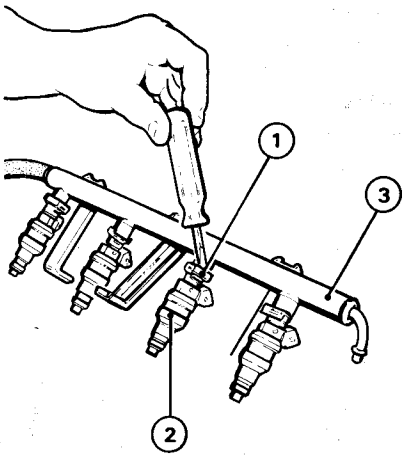


7. Fuel distributor tube
8. Electric fuel injectors

REPLACEMENT

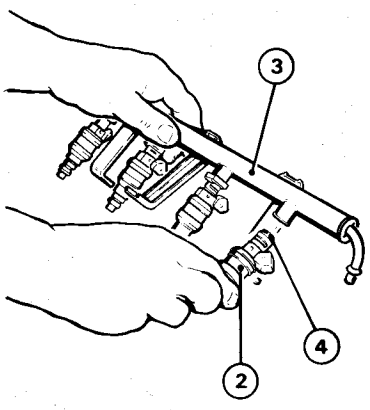
WARNING:
Before proceeding to the replacement of a fuel injector, check the positioning of the connector on the injector so as to be able to maintain the same positioning when fitting the new injector.

1. Withdraw the spring clip (1) that secures the fuel injector (2) to the fuel distributor tube (3).



1. Spring clip
2. Electric fuel injector
3. Fuel distributor tube

2. Withdraw the fuel injector (2) from the fuel distributor tube (3).



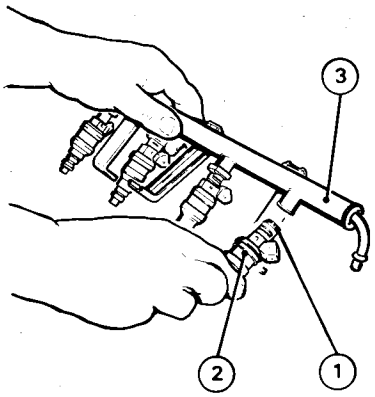
2. Electric fuel injector
3. Fuel distributor tube
4. O-Ring

3. Fit a **new electric fuel injector** slipping it onto to the fuel distributor tube and securing it with the relative spring clip.

WARNING:
- **Before fitting the fuel injector onto the fuel distributor tube, replace the O-Ring (4).**
- **The fuel injector should be fitted onto the fuel distributor tube with the relative connector pointing upwards as marked on removal.**

REFITTING

1. Replace the O-ring (1).
2. Fit the fuel injectors in their respective seatings, taking care that the O-rings (1) are correctly positioned.

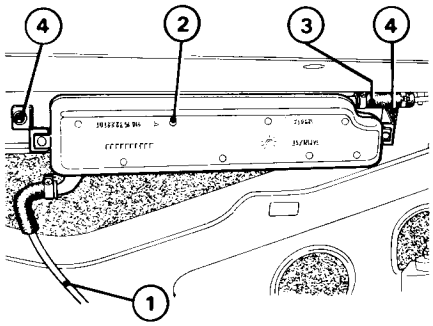


1. O-ring
2. Fuel injector
3. Fuel distributor tube

3. Refit the other components by reversing the order of removal.
4. Carry out the check of the exhaust CO percentage, if necessary proceeding to the adjustment (see paragraph «Setting and adjustment»).

FUEL VAPOUR TRAP

1. Remove the rear lining of the luggage compartment.
2. Loosen the pipe clips and disconnect the tubes (1) and (3) from the trap (2).
3. Unscrew the two nuts (4) that secure the trap (2) to the body and remove the trap itself.



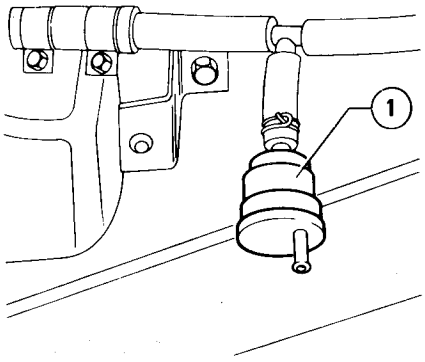
1. Fuel breather tube
2. Fuel vapour trap
3. Fuel vapour recycling tube
4. Securing nut

4. If necessary clean the trap by blowing in compressed air.
5. Fit the fuel vapour trap by reversing the order of removal.

AIR INLET VALVE

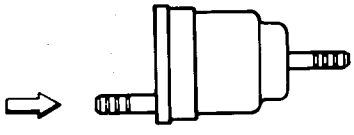
REMOVAL, INSPECTION AND ADJUSTMENT, REFITTING

1. Partially remove the rear lining of the luggage compartment in order to gain access to the air inlet valve (1).
2. Unfasten the securing spring clip and remove the valve (1).



1. Air inlet valve

3. Check that the valve is in correct working order by blowing compressed air into it. The air should be able to pass only in the direction indicated by the arrow.
If the valve is not funcionting correctly replace it.

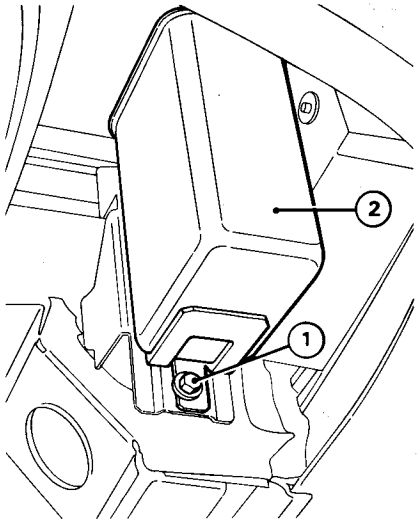


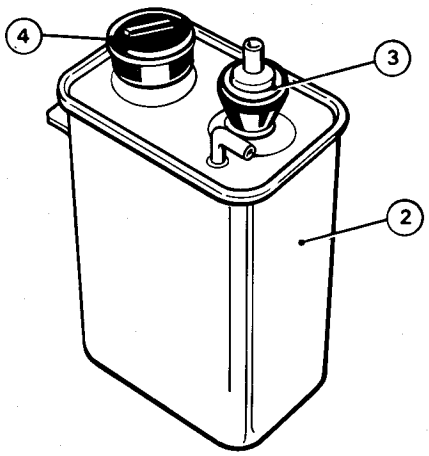
4. Carry out the refitting by reversing the order of removal, referring to the preceding figure for the correct positioning of the valve.

CARBON CANISTER

REMOVAL AND REFITTING

Working from beneath the vehicle, remove the screw (1) and dislodge the carbon canister (2) from its housing.
2. Lower the canister in order to be able to gain access to the vapour inlet and outlet tubes. Disconnect the tubing and remove the canister.
3. Check that the one-way valve (3) and the washing valve (4) are in correct working order.
4. Carry out the refitting by reversing the order of the removal.





1. Securing screw
2. Carbon canister
3. One-way valve
4. Washing valve

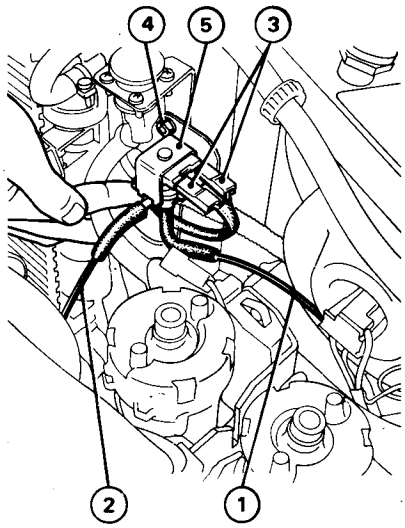
FUEL VAPOUR FLOW CONTROL SOLENOID VALVE

ELECTRICAL CHECK

Check the circuit continuity of the solenoid valve as described in the paragraph «Electrical checks with the use of the trouble diagnosis instrument» of the Group 00.

REMOVAL AND REFITTING

1. Disconnect the fuel vapour recycling tube (1) coming from the carbon cleaner.
2. Disconnect the fuel vapour recycling tube (2) that provides the inlet to the air intake box.
3. Disconnect the power supply connectors (3) to the solenoid valve.
4. Unscrew the screws (4) that secure the solenoid valve to the body.
5. Remove the solenoid valve (5).



1. Fuel vapour recycling tube (from the carbon cleaner)
2. Fuel vapour recycling tube (to the air intake box)
3. Power supply connectors
4. Securing screw
5. Solenoid valve

6. Carry out the refitting of the solenoid valve by reversing the order of the removal.

TIMING AND R.P.M. SENSOR

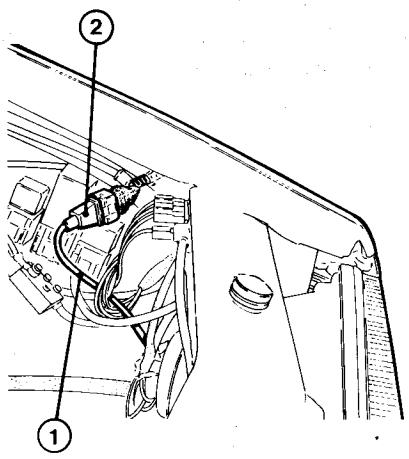
INSPECTION AND ADJUSTMENT

Refer to paragraph «Electrical checks» of the Group 00.

REPLACEMENT

For the replacement of the timing and r.p.m. sensor proceed as follows:

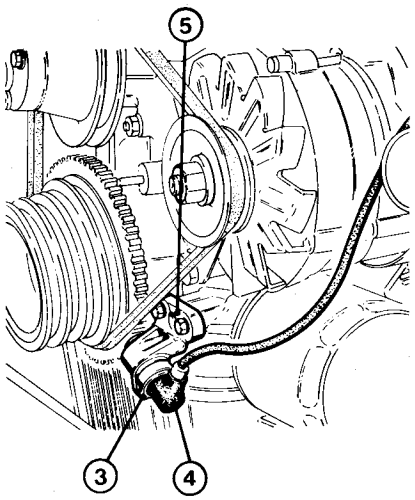
1. Disconnect the timing and r.p.m. sensor lead (1) from the flying connection (2) situated on the left side valance panel of the engine compartment.



1. Timing and r.p.m. sensor lead
2. Connection

2. Remove the screw (3) and extract the timing r.p.m. sensor (4) from its support (5).

NOTE:
It is advisable not to remove the support (5) of the timing and r.p.m. sensor.



3. Sensor securing screw
4. Timing and r.p.m. sensor
5. Sensor support

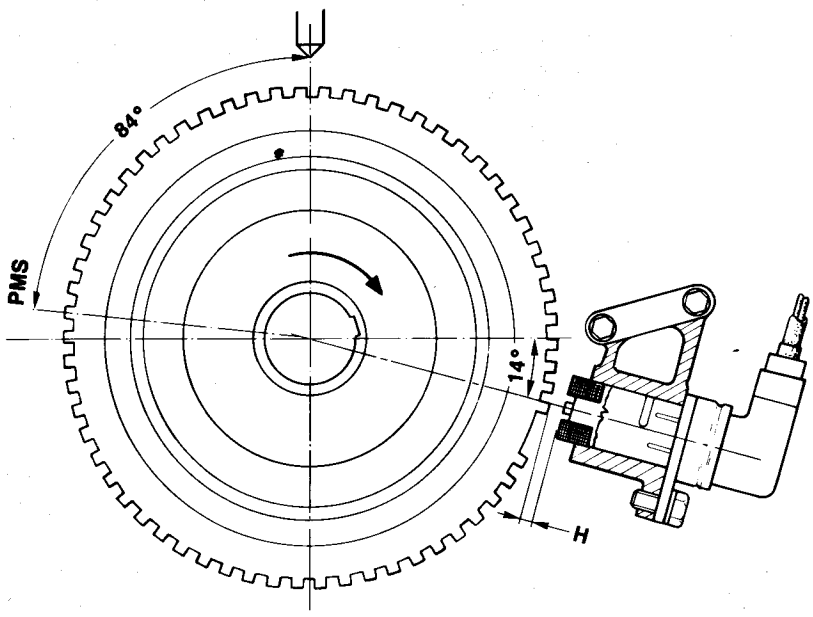
3. Refit a new timing and r.p.m. sensor by reversing the order of removal and taking care to observe the following fitting specifications:

- Remove the protection from the new sensor before fitting.
- Fit the new timing and r.p.m. sensor using hand pressure only. Do not use a mallet and do not strike the sensor.
- Tighten the sensor securing screw to the following tightening torque (the screw must be partially microencapsulated).

(T) : Tightening torque
8 N·m
(0.8 kg·m)

- Position the magnetic pole of the timing and r.p.m. sensor in such a way that its distance from the phonic wheel (cogged wheel) falls within the specified value.

H = distance of timing and r.p.m. sensor from the phonic wheel:
0.5 ÷ 1.5 mm



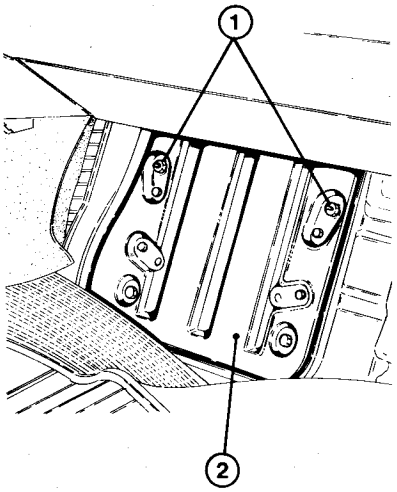
IGNITION AND FUEL INJECTION ELECTRONIC CONTROL UNIT (MOTRONIC)

INSPECTION AND ADJUSTMENT

Refer to the paragraph «Electrical checks» of the Group 00.

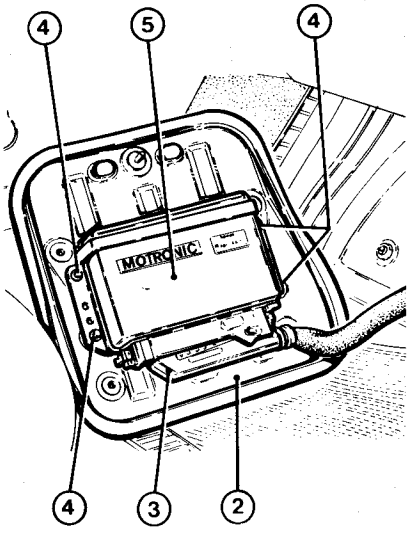
REMOVAL

1. Switch the ignition off.
2. Disconnect the negative terminal (—) of the battery.
3. Remove the lining of the front right floor of the passenger compartment (passenger side) in order to gain access to the sheet panel that supports the Motronic electronic control unit.
4. Unscrew the two nuts (1) that secure the support panel (2) of the Motronic electronic control unit to the passenger compartment floor.



1. Securing nuts
2. Motronic electronic control unit support panel

5. Disconnect the multiple connector (3) from the Motronic electronic control unit.
6. Remove the four screws (4) and separate the ignition and injection control unit (5) from the support panel (2).



2. Motronic electronic control unit support panel
3. Motronic electronic control unit multiple connector
4. Motronic electronic control unit securing screws
5. Ignition and injection control unit

REFITTING

1. Fit the ignition and injection control unit by reversing the order of removal and paying attention to the following warning.

WARNING:

a. The multiple connector (3) must be attached and then pressed as far as to will go, taking care not to damage the contact pins.

b. Check the correct positioning of the rubber gasket situated on the external profile of the Motronic electronic control unit support panel.

MAP SWITCHING DEVICE

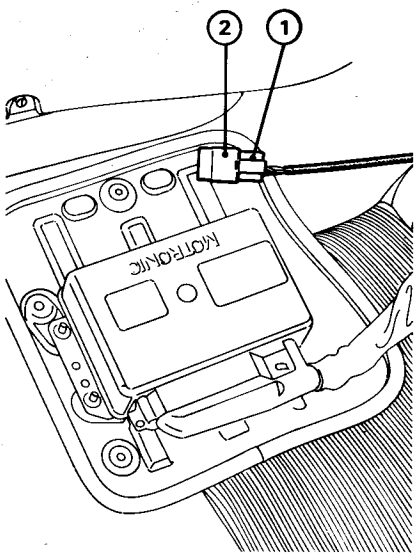
INSPECTION AND ADJUSTMENT

Refer to the paragraph «Electrical checks» of the Group 00.

REPLACEMENT

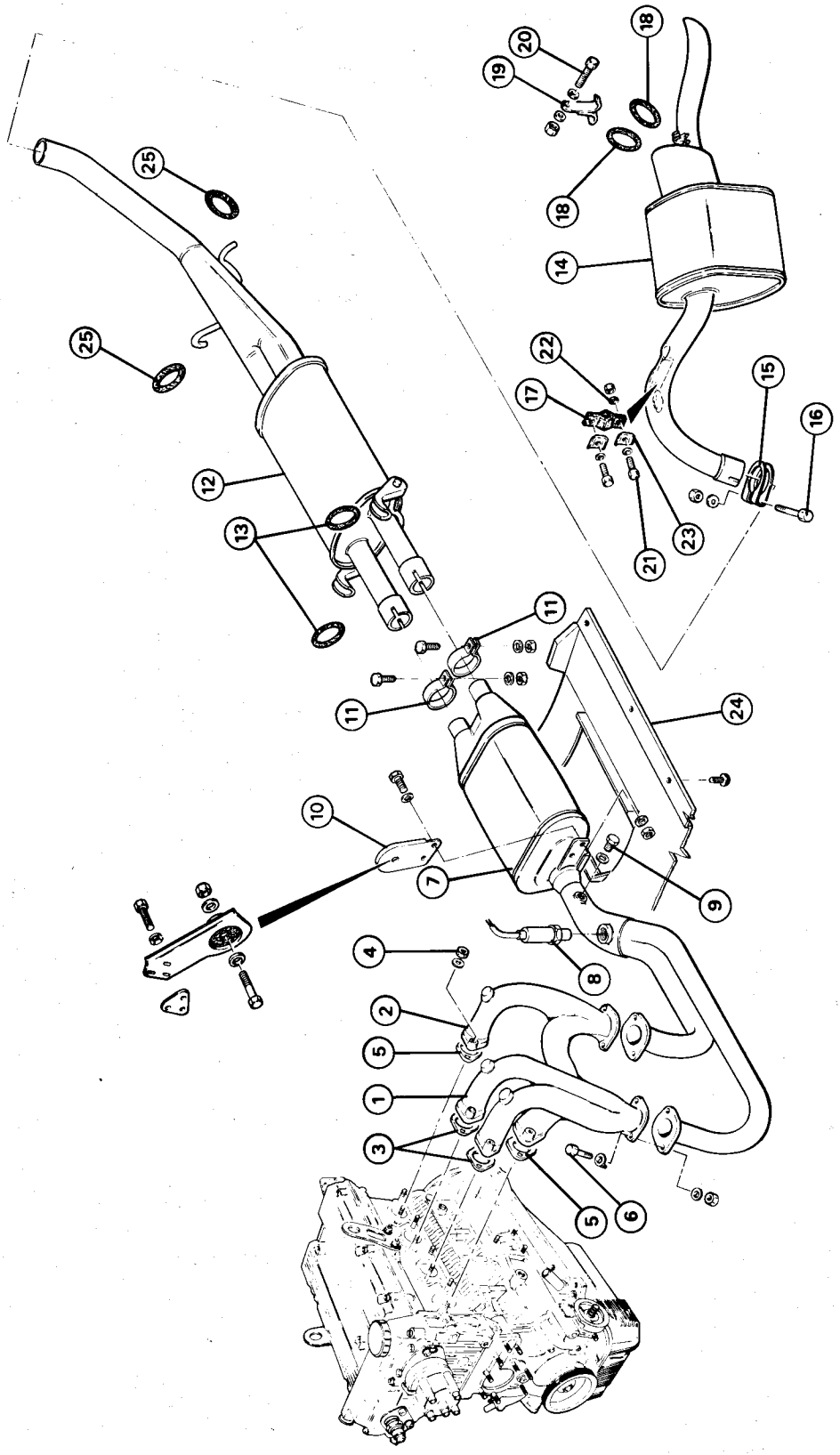
The device consists of a connector (1) and a relay (2) with a different coloured casing.

1. BRIGHT YELLOW coloured relay for lead free 95 OCTANE petrol.
2. SKY BLUE coloured relay for unleaded free 91 OCTANE petrol.



1. Connector (S30)
2. Map switching relay

EXHAUST SYSTEM



1. Exhaust manifold 2nd and 3rd cylinder
2. Exhaust manifold 1st and 4th cylinder
3. Gaskets
4. Manifold securing nuts
5. Gaskets
6. Bolt
7. Catalyser
8. Lambda sensor
9. Plug for measuring exhaust CO
10. Support
11. Clips
12. Silencer - Central element
13. Elastic support ring
14. Silencer - Rear element
15. Clamp for the union of the central silencer and the rear silencer
16. Bolt
17. Front elastic support tag
18. Rear elastic support ring
19. Support for elastic ring
20. Support securing bolt
21. Bolt for securing rear silencer with elastic tag
22. Spacer
23. Small plate
24. Catalytic silencer lower protection
25. Elastic ring

NOTE:
a. With the following procedures it is possible to remove single elements separately.
b. The method of removal can be modified as a function of the purpose of the operation.
c. In the case of the removal of the complete system, if necessary, resort to the assistance of a second operator.

The reference numbers of the following procedure refer to the figure «Exhaust System» of the vehicle in question.

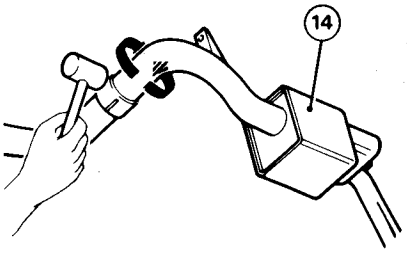
MANIFOLDS, SILENCERS AND CATALYSER

PRELIMINARY OPERATIONS

1. Set the vehicle on a hydraulic lift and raise it.
2. Remove the lower protection (24) of the catalytic silencer box.

REMOVAL OF THE REAR SILENCER

Remove the rear silencer of the exhaust system by operating as follows:
1. Loosen the bolt (16) that secures the clamp (15).
2. Unscrew and withdrawn the bolt (21) that secures the silencer with the elastic tag (17).
3. Unhook the rear silencer (14) from the rear elastic rings (18).
4. Tap lightly and repeatedly with a plastic mallet round the circumference of the tubing where the two sections join and then rotate the rear section backwards and forwards to facilitate the separation of the two sections.



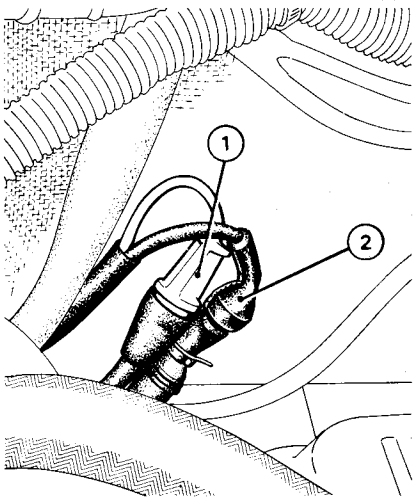
14. Silencer - Rear element

REMOVAL OF CENTRAL SILENCER

Remove the central silencer of the exhaust system operating as follows:
1. Loosen the bolts that secure the clips (11).
2. Loosen the bolt (16) that secures the clamp (15).
3. Unhook the central silencer from the elastic rings (13).
4. Detach the central silencer (12) from the catalytic silencer (7) by tapping lightly with a plastic mallet round the circumference of the joints.
5. Unhook the central silencer from the rear elastic rings (25).
6. Tap lightly and repeatedly with a plastic mallet round the circumference of the tubing where the two sections join and then rotate the central silencer backwards and forwards to facilitate the separation.

REMOVAL OF CATALYTIC SILENCER

Remove the catalytic silencer (catalyser) by operating as follows:
1. Working from the engine compartment, disconnect the connectors (1) and (2) illustrated in the figure below and detach the leads from any cable clips.



1. Lambda sensor resistance connector
2. Lambda sensor connector

2. Referring to the exploded view, unscrew the nuts of the bolts (6) and disconnect the manifolds of the catalytic silencer (7) from the exhaust manifolds (1) and (2).
3. Loosen the clip securing bolts (11).
4. Unscrew the bolts that secure the catalytic silencer to the support (10).
5. Remove the catalytic silencer (7) from the central silencer (12) by tapping lightly with a plastic mallet round the circumference of the joints.
6. If necessary, remove the Lambda sensor (8) from the catalytic silencer by unscrewing it using a suitable spanner.

REMOVAL OF THE EXHAUST MANIFOLDS

Remove the two exhaust manifolds by operating as follows:
1. Unscrew the nuts of the bolts (6) and disconnect the exhaust manifolds (1) and (2) from the catalytic silencer (7), recovering the gaskets (5).
2. Lower the hydraulic lift and working in the engine compartment, unscrew the nuts (4) that secure the manifolds to the cylinder head.
3. Remove the exhaust manifolds (1) and (2) together with the gaskets (3).

INSPECTION AND ADJUSTMENT

The catalytic silencer must be replaced after 100,000 km

1. Inspect the silencer and exhaust tubing and check that they are not damaged and that they neither present cracks nor traces of corrosion.
2. Inspect the rubber rings and supports and replace them if they present signs of cracks, porosity or aging.

REFITTING

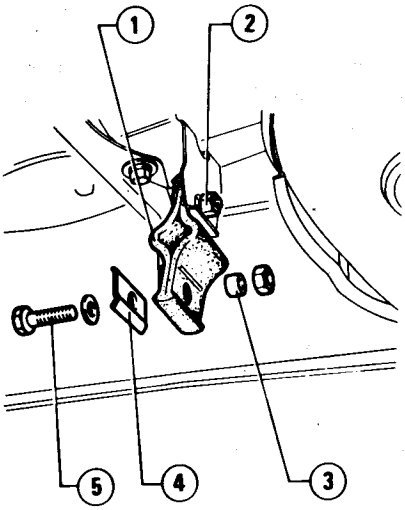
Carry out the refitting of the individual elements by reversing the order of the removal and taking into account the following:
a. Apply R. GORI Never Seez or BOSCH 5.964.080.105 grease to the thread of the Lambda sensor and secure it to the catalytic silencer using a suitable spanner.
b. Fit new gaskets (3) between the flange of the exhaust manifolds and the cylinder head.
c. Use new self-locking nuts (4) to secure the exhaust manifolds to the cylinder head.

d. Position the exhaust tube on the elastic supports (13) and (25) and then secure it to the central support (10).
e. Connect the central silencer of the exhaust tube to the rear silencer.
f. Fix the front ends of the catalytic silencer to the exhaust manifolds fitting new gaskets (5).
g. Shake the exhaust tubing a little so as to seat it properly.
h. Tighten all the securing bolts and screws.
i. Connect the Lambda sensor connectors in the engine compartment.
j. On completion of the fitting, check that the rubber support rings are able to swing freely and are not under tension.
k. With the engine running, check that there are no leaks of exhaust gases from the joints of the tubing and that the whole system is not excessively noisy.

RUBBER SUPPORTS

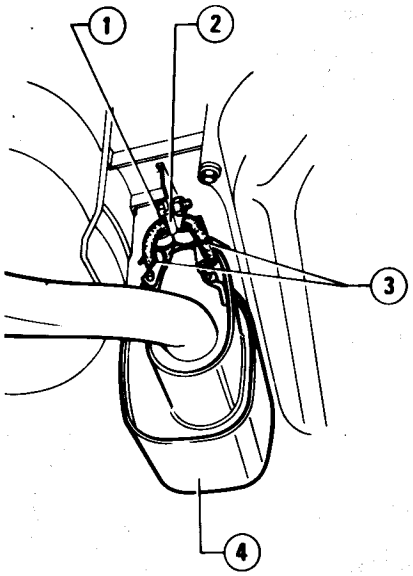
REPLACEMENT

1. Raise the vehicle on a hydraulic lift.
2. Unscrew the lower bolt (5), recovering the small plate (4) and the spacer (3).
3. Unscrew the bolt (2) and remove the support (1) with the relative small plate (4) and the spacer.



1. Rubber support
2. Bolt securing support to the body
3. Spacer
4. Small plate
5. Bolt securing exhaust tube to the support

4. For the ring supports, proceed by simply releasing the support from the hooks.
5. If necessary, unscrew the bolt (1) and remove the rear hook (2).
6. Carry out the refitting by reversing the order of the removal making sure that on completion of the fitting the supports are able to swing freely and are not under tension.



1. Bolt
2. Rear hook
3. Elastic rings
4. Silencer - Rear element

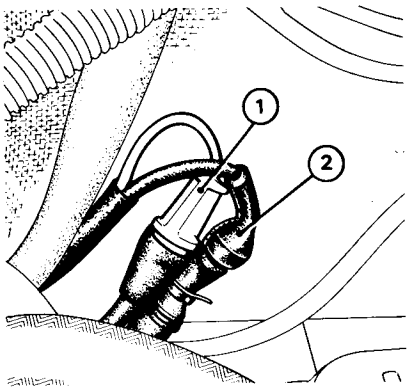
LAMBDA SENSOR

INSPECTION AND ADJUSTMENT

Refer to the paragraph «Electrical checks» of the Group 00.

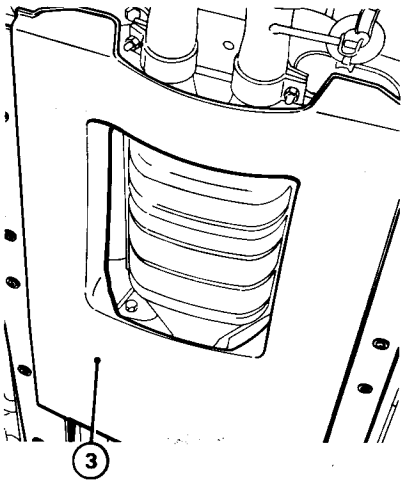
REMOVAL AND REFITTING

1. Set the vehicle on a hydraulic lift.
2. Working from the engine compartment, remove the rear protection and disconnect the connectors (1) and (2) of the Lambda sensor wiring.



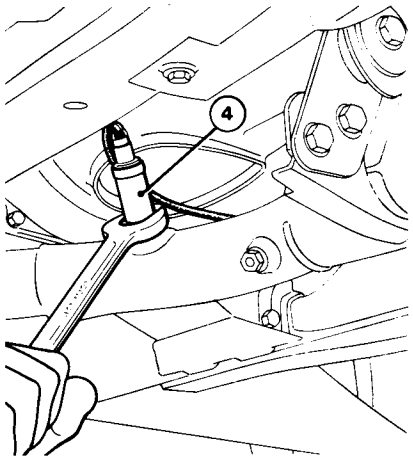
1. Lambda sensor resistance connector
2. Lambda sensor connector

3. Working from beneath the vehicle, remove the lower protection of the catalytic silencer (3).



3. Catalytic silencer protection

4. Remove the Lambda sensor (4) and the relative wiring using a suitable spanner.



4. Lambda sensor

5. On refitting apply R. GORI Never Seez or BOSCH 5.964.080.105 grease to the thread of the Lambda sensor.
6. Using a suitable spanner fit the Lambda sensor in the catalyser tightening it to a torque of:

0.5 ÷ 0.6 N·m (5 ÷ 6 kg·m)

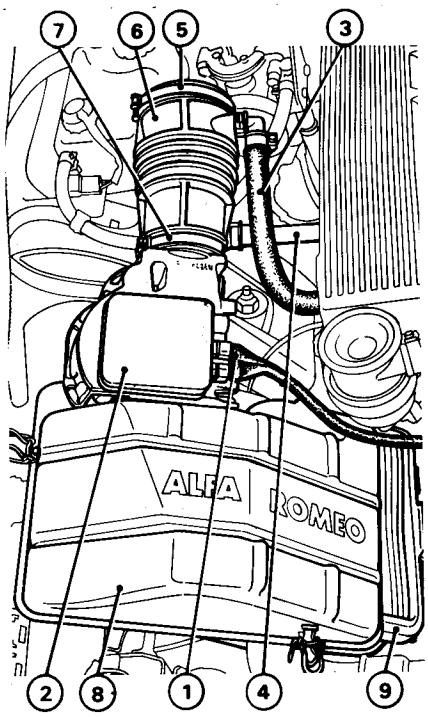
7. Reposition the wiring fixing it with the relative clips and connecting the connectors (1) and (2).
8. Refit the lower protection of the catalytic silencer (3).

SETTINGS AND ADJUSTMENTS

SETTING OF ACCELERATOR BUTTERFLY (Flow rate)

Check the tightness of the accelerator butterfly disk with the flow meter operating as follows:

1. Disconnect the connector (1) from the air flow gauge (2).
2. Disconnect the following tubing from the air intake duct:
   - Peak r.p.m. oil vapour recycling tube (3).
   - Constant idle regulation by-pass tube (4).
3. Loosen the clip (5) and disconnect the air intake duct (6) from the accelerator butterfly housing.
4. Loosen the clip (7) and remove the air intake duct (6) from the air flow gauge (2).
5. Unfasten the four spring clips securing the air filter cover (8) and remove it together with the air flow gauge.
   Also remove the filter element (9).

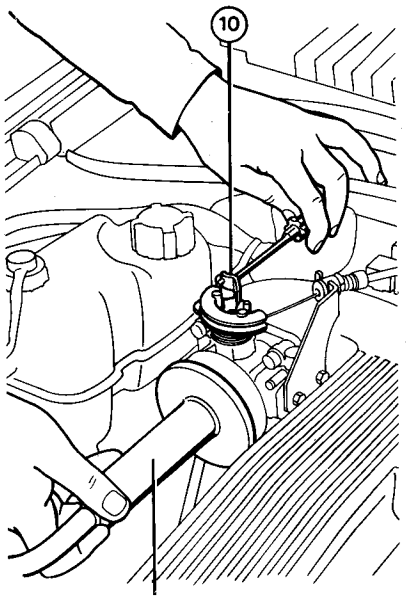


1. Connector
2. Air flow gauge
3. Peak r.p.m. oil vapour recycling tube
4. Constant idle regulation by-pass tube
5. Clip
6. Air intake duct
7. Clip
8. Air filter cover
9. Filter element

6. Place the buffer **C.2.0055** of the flow meter against the opening of the accelerator butterlfy housing.
7. Measure the flow of air through the accelerator butterfly housing and check that the value falls within the specified values.

Accelerator butterfly blow-by with butterfly in the closed position (Solex flow meter): 240 ÷ 260 on N scale

8. If the air flow rate does not fall within the specified limits, adjust the screw (10) until the correct value is obtained.



C.2.0055

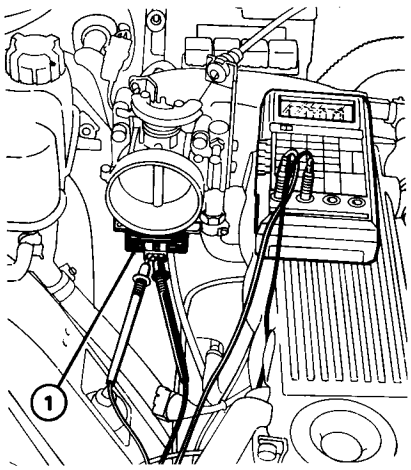
10. Accelerator butterfly position adjusting screw

9. Refit the disconnected components by reversing the order of their removal.
10. Carry out the check of the idle running and the exhaust emissions (see paragraph «Check of idle running and exhaust emissions (CO)»).

SETTING OF ACCELERATOR BUTTERFLY SWITCH

NOTE:
Before proceeding to the adjustment of the accelerator butterfly minimum and maximum opening switch, make sure that the accelerator butterfly setting is correct (see «Setting of the accelerator butterfly assembly»).

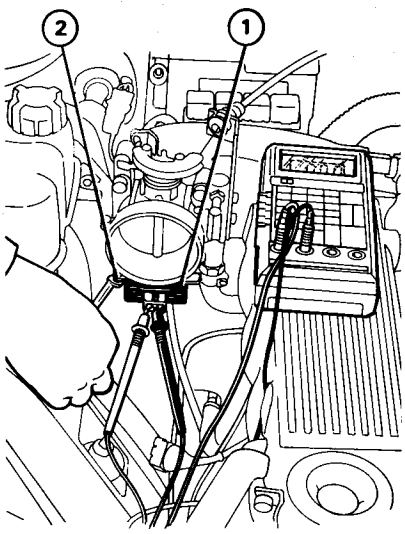
1. Disconnect the power supply connector from the accelerator butterfly switch.
2. Place the test prods of a multimeter across the terminals 2 and 18 of the accelerator butterfly switch (1).
3. In this position electrical continuity (0 Ω) should be read on the multimeter with the accelerator butterfly completely closed and accelerator pedal released (circuit closed).



1. Accelerator butterfly minimum and maximum opening switch

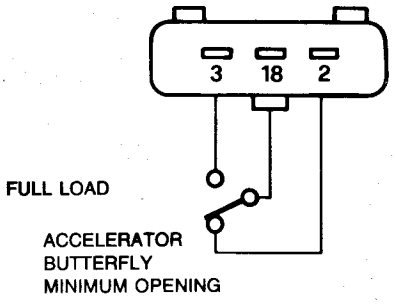
4. Turning the accelerator butterfly slowly and keeping the test prods of the multimeter on the terminals 2 and 18 of the accelerator butterfly switch (1), an infinite resistance should be read on the multimeter before the butterfly has turned through 1° from the completerly closed position.

5. If the correct value is not found, carry out the adjustment of the accelerator butterfly switch (1) by loosening the securing screws (2) and turning the switch until the value **0 Ω** is read on the multimeter as indicated at step 3.
6. Retighten the screws (2).



1. Accelerator butterfly switch
2. Securing screws

7. Turn the accelerator butterfly as far as it will go (accelerator pedal pressed down) and check that the power enrichment contact closes; read a value of **0 Ω** on the multimeter with the test prods of the multimeter on the terminals 3 and 18 of the accelerator butterfly switch.
8. If the specified values are not found, check the accelerator control or replace the switch.



2. Idle running terminal (corresponding to the accelerator butterfly closed positon)
3. Peak r.p.m. running (corresponding to the accelerator butterfly open position)

9. Reconnect the power supply connector to the accelerator butterfly switch.

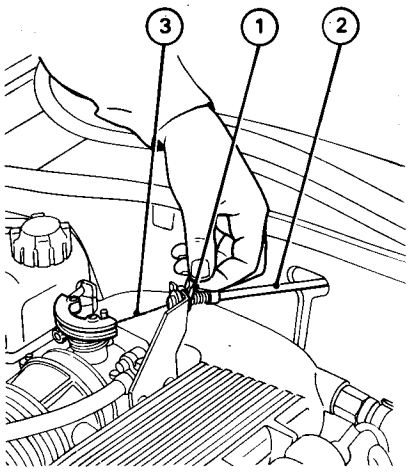
SETTING OF THE ACCELERATOR CONTROL

1. Check sliding of the cable
Check that the accelerator cable slides easily in its sheathing.

2. Setting of cable backlash
a. With the accelerator pedal up check that there is an axial play of the accelerator cable on the control lever of:

1 ÷ 2 mm

b. If necessary proceed to the adjustment of the cable backlash by withdrawing the adjusting spring (1) and moving the sheathing (2) so as to furnish the cable (3) with the specified backlash and then reinsert the adjusting spring in the new position.

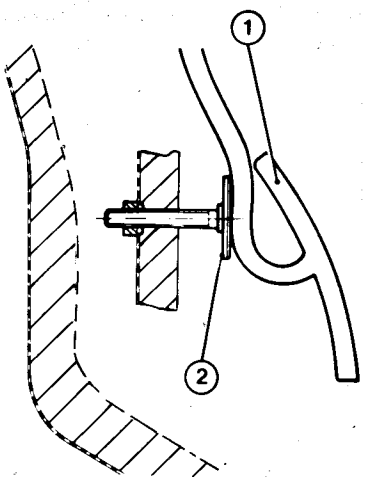


1. Adjusting spring
2. Accelerator cable sheathing
3. Accelerator cable

3. Check the maximum opening of the butterfly valve
a. With the accelerator control pedal in the end of travel position, check that the accelerator control cam can turn by:

1 ÷ 2 mm

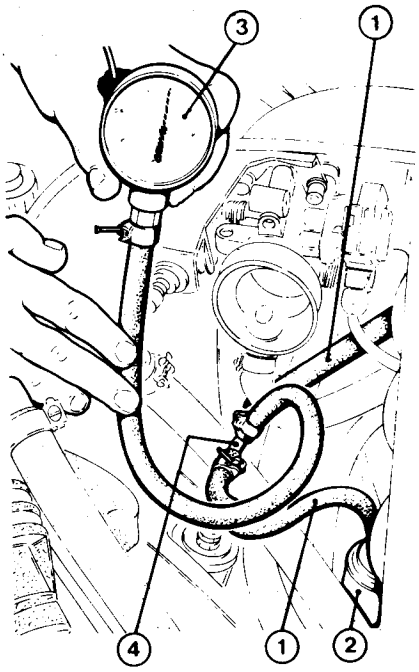
b. If necessary proceed to the adjustment by acting on the end of travel screw (2) under the accelerator pedal (1).



1. Accelerator pedal
2. End of travel screw

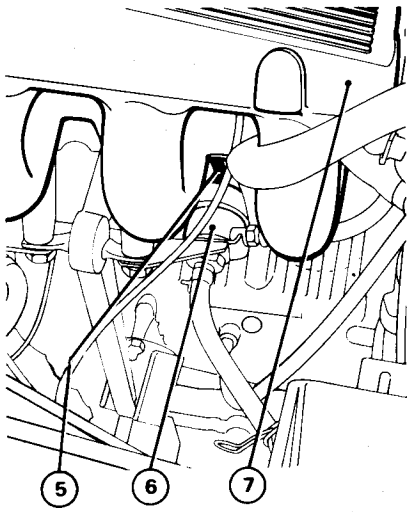
CHECK OF FUEL DELIVERY PRESSURE AND TIGHTNESS OF SYSTEM

1. Check fuel delivery pressure
Carry out the check operating as follows:
a. Connect the fuel delivery tube (1) and the hammering damper (2) to a pressure gauge (3) by means of a «T» adaptor (4).



1. Fuel delivery tube
2. Hammering damper
3. Pressure gauge
4. «T» adaptor

b. Disconect the tube (5) that connects the pressure regulator (6) with the air intake box (7) so as to prevent any irregularities in the idle running from causing irregular readings.



5. Vacuum tube
6. Pressure regulator
7. Air intake box

c. Start the engine and with the engine running on idle check that the value read on the pressure gauge is equal to the specified value:

Fuel pressure
284.3 ÷ 323.6 kPa
(2.8 ÷ 3.2 bar; 2.9 ÷ 3.3 kg/cm²)

d. Reconnect the tube (5) to the air intake box (7). With the engine on idle the pressure should fall to approximately **0.5 bar** and then rise again when the accelerator butterfly valve is opened.
If this does not occur search for possible leaks from the vacuum tube (5).

2. Checking the tightness of the system
a. Keeping the pressure gauge connected and with the engine running on idle, throttle the tube immediately downstream from the pressure regulator (6) and read an increase in the pressure on the pressure gauge up to **4 bar** (do not allow the pressure to exceed that value).
b. With the pressue at **4 bar**, check that the tubing and joints of the fuel delivery system do not present leaks.
c. If the pressure does not reach the value of **4 bar** and no leaks are found, check the filter and/or the functioning of the fuel pump.

TROUBLE DIAGNOSIS PROCEDURE FOR CHECKING THE TIGHTNESS OF THE FUEL DELIVERY SYSTEM

The procedure should be carried out at the intervals indicated in the «Vehicle maintenance schedule» and in the presence of the following symptoms:
— Smell of petrol
— Visible signs of leaks on the fittings and joints of the system.

The possible causes may be:
— Leakages of petrol from the fittings and the joints of the system.

Carry out the procedure described in the preceding paragraph for the «Check of the fuel pressure» and the «Check of tightness of the system» and in particular:
a. In order to be able to operate is safety, check that fire fighting equipment is available in the workshop.
b. Run the engine to normal running temperature.
c. Switch the ignition off.
d. Carry out a visual inspection of the components and fittings of the fuel system in order to locate the origin of the leak.
e. Check the entire system (connecting tubes, fittings, components) using an exhaust gas analyser (NDIR system).
f. A reaction of the pointer of the analyser with noticed in the vicinity of the leak.

The search with the analyser must be carried out slowly in order to compensate for the delay in the response of the instrument.

g. When the leak has been located, by following the procedure indicated in steps **d.** and/or **e.**, eliminate the leak by replacing the defective components of the system or tightening appropriately the loose pipe clips.
h. On the completion of the preceding step, start the engine, letting it run on idle for a few minutes and then switch the ignition off.
i. Repeat the search described in steps **c.** and **d.** to check the exactness of the diagnosis and the effectiveness of the repair.
l. On completion of the procedure described in the steps **a.** to **h.** carry out a road test of at least 30 minutes to be sure of the good working order of the system.

CHECK OF THE TIGHTNESS OF THE VAPOUR EMISSION SYSTEM (EVAPORATIVE)

The procedure described below must be carried out when checking the fuel pressure and in the presence of the smell of petrol.

The probable cause will be a blow-by of vapour from the tubing fittings or parts of the system.

PROCEDURE «A»

a. Disconnect the tube between the vapour cleaner and the fuel tank and connect it to a source of compressed air, connecting a pressure gauge between the source and the tube.
b. Pressurise the system with compressed air until a pressure of:
0.025 bar (2.49 kPa;
0.0255 kg/cm²; 254 mm H_2O)
is obtained and close the system.
If it is not possible to reach this value, open the compressed air system and check the tightness of the system (with an HC analyser or a «Snoop» leak detector).
c. Measure the fall in pressure in the system (it must not exceed:
0.00125 bar (0.125 kPa;
0.00127 kg/cm²; 12.7 mm H_2O)
after 10 minutes).
d. If after 10 minutes the fall in pressure exceeds the specified value, locate the leaks by smearing the tubing and fittings with soapy water or by using the «Snoop» leak detector.
e. Bubbles appear in the presence of blow-bys.
f. If the leak comes from the vicinity of the filler inlet/cap, replace the cap first of all.
If after the replacement of the cap the

tightness of the system is restored, it means that the cap was defective, otherwise replace the filler inlet.

g. Replace the parts that are thought to be defective and/or tighten the loose pipe clips etc.

h. Repeat the steps **b.** and **c.** to the check the exactness of the diagnosis.

ALTERNATIVE PROCEDURE «B»

To be carried out with the duel tank at least 3/4 full.

a. Disconnect the tube connecting the vapour cleaner and the fuel tank and connect it to a source of compressed air with a pressure gauge between the source and the tube.

b. Pressurise the system blowing propane into the vapour breather tubing until a pressure of:

0.025 bar (2.49 kPa
0.0255 kg/cm²; 254 mm H_2O)

is obtained.

c. Check for leaks of propane from the system using an HC sensor (probe) connected to an HC analyser.

d. Repair the leak (or if necessary tighten the pipe clips).

e. Repeat steps **b.** and **c.** to check the correctness of the diagnosis.

CHECK OF THE TIGHTNESS OF THE AIR INTAKE SYSTEM DOWNSTREAM FROM THE AIR FLOW GAUGE

In order to identify any air leakage from the entire air intake system, disconnect the flexible hose that connects the constant idle actuator and the corrugated air intake duct and blow in compressed air with a compressed air gun.

Open the accelerator butterly valve completely and spray or smear soapy water on all the joins of the system; the appearance of bubbles or foam will indicate the presence of a leak.

CHECKING OF THE IDLE RUNNING R.P.M.

Carry out the check of the idle running with the engine at normal running temperature, the gear lever in neutral and all the auxiliary devices excluded.

Idle r.p.m.
800 ±50 r.p.m.

The regulation of the idle r.p.m. is automatically piloted in all states of functioning by means of the constant idle actuator.

With the engine running on idle the function of the actuator is to bring the real r.p.m. to the nominal r.p.m. (800 ±50 r.p.m.) by acting on the accelerator butterfly by-pass.

As well as controlling the idle r.p.m. the actuator also functions as an additional air box and regulator for the operation of the air conditioning system.

When the compressor is activated, the electronic control unit acts, through the actuator, to maintain automatically the specified r.p.m.

NOTE:
With the Motronic system periodic adjustments of the idle r.p.m. are not possible. If this check furnishes values outside the specified values and the vehicle does not present any mechanical type faults, it is probable that there is a fault in the electronic circuits. In this case it will be necessary to resort to the trouble diagnosis procedure using the special tester. If the check does not furnish the specified values in this case also, it will be necessary to replace the defective components.

CHECK OF THE EXHASUT EMISSIONS (CO) WITH ENGINE ON IDLE R.P.M.

The check is carried out with NDIR type equipment, analysing the exhaust gases taken from the exhaust tubing upstream from the catalyser.

The check is carried out with the engine at normal running temperature (after the fan has come on and then gone off) and after havng carried out the check of the idle r.p.m. (see: «Check of the idle running r.p.m.»).

The following preliminary checks should also be carried out:

— Check the level of the engine oil.
— Clean the air filter cartridge.
— Check the efficiency of the ignition system.
— Check the ignition timing.

The CO value should fall within the following values:

% CO ≤0.2

NOTE:
With the Motronic ML4.1 system in this configuration, period adjustments of the CO emissions with idle r.p.m. are not possible.
If this check furnishes values which fall outside the specified limits and the vehicle does not present faults of a mechanical type, it is probable that there is a fault in the electronic circuits. In this case it will be necessary to resort to the trouble diagnosis procedure using the special tester. If the check does not furnish the specified values in this case also, it will be necessary to replace the defective components.

TECHNICAL DATA AND SPECIFICATIONS

TECHNICAL DATA

FUEL DELIVERY AND INJECTION SYSTEM COMPONENTS

Component	Part number ALFA ROMEO	Type
Main fuel pump — Rated voltage: 12 V — Operating tension: 7 ÷ 15 V — Operating pressure: ≤3.0 bar — Maximum admitted fuel temperature: ≤60°C — Maximum admitted difference in temperature between pump and tank: ≤2°C — Operating temperature: —30° ÷ +60°C — Rated delivery (temperature 20°C, tension 12 V, pressure 3.0 bar): 100 l/h (minimum) — Current input (temperature 20°C, tension 12 V, pressure 3.0 bar): ≤6.5 A	116.46.04.021.00	BOSCH 0.580.464.020
Auxiliary fuel pump — Rated voltage: 13.5 ±0.05 V — Rated delivery: ≥115 l/h at 160 mbar (*) ≥67 l/h at 230 mbar (*) 0 at 298 ÷ 436 mbar (*) (*) Pressure measured at pump level	115.41.32.009.00	GENERAL MOTORS 6441336
Fuel pressure regulator	195.00.32.045.00	BOSCH 0.280.160.213
Hammering damper — Operating pressure: 1.7 ÷ 3.0 bar — Temperature range on mounting: —30° ÷ +100°C	161.10.04.550.00	BOSCH 0.280.161.030
Electric fuel injectors	195.36.11.030.00	BOSCH 0.280.150.702
Air flow gauge	195.36.11.013.02	BOSCH 0.280.202.202
Constant idle regulation actuator — Rated voltage: 12 V — Operating tension: 7 ÷ 15 V — Temperature range on mounting: —30° ÷ +120°C — Rated ampage: 0,7 A — Air flow capacity with Δp = 50 mbar: ≥33 m^3/h — Control frequency: 100 Hz	195.32.11.017.01	BOSCH 0.280.140.516
Ignition and injection electronic control unit (Motronic)	162.24.11.042.02	BOSCH 0.261.200.108
Engine coolant temperature sensor — Rated resistance at 20°C: 2.28 ÷ 2.72 kΩ — Rated voltage: supply from control unit — Temperature range on mounting: —30° ÷ +130°C	195.32.11.010.00	BOSCH 0.280.130.026
Inductive impulse generator (timing and r.p.m. sensor)	195.32.11.019.00	BOSCH 0.261.210.036
Accelerator butterfly switch	195.36.11.022.01	BOSCH 0.280.120.315
Lambda sensor	161.24.11.016.11 162.28.11.016.00 (1)	BOSCH 0.258.003.061 BOSCH 0.258.003.006 (1)

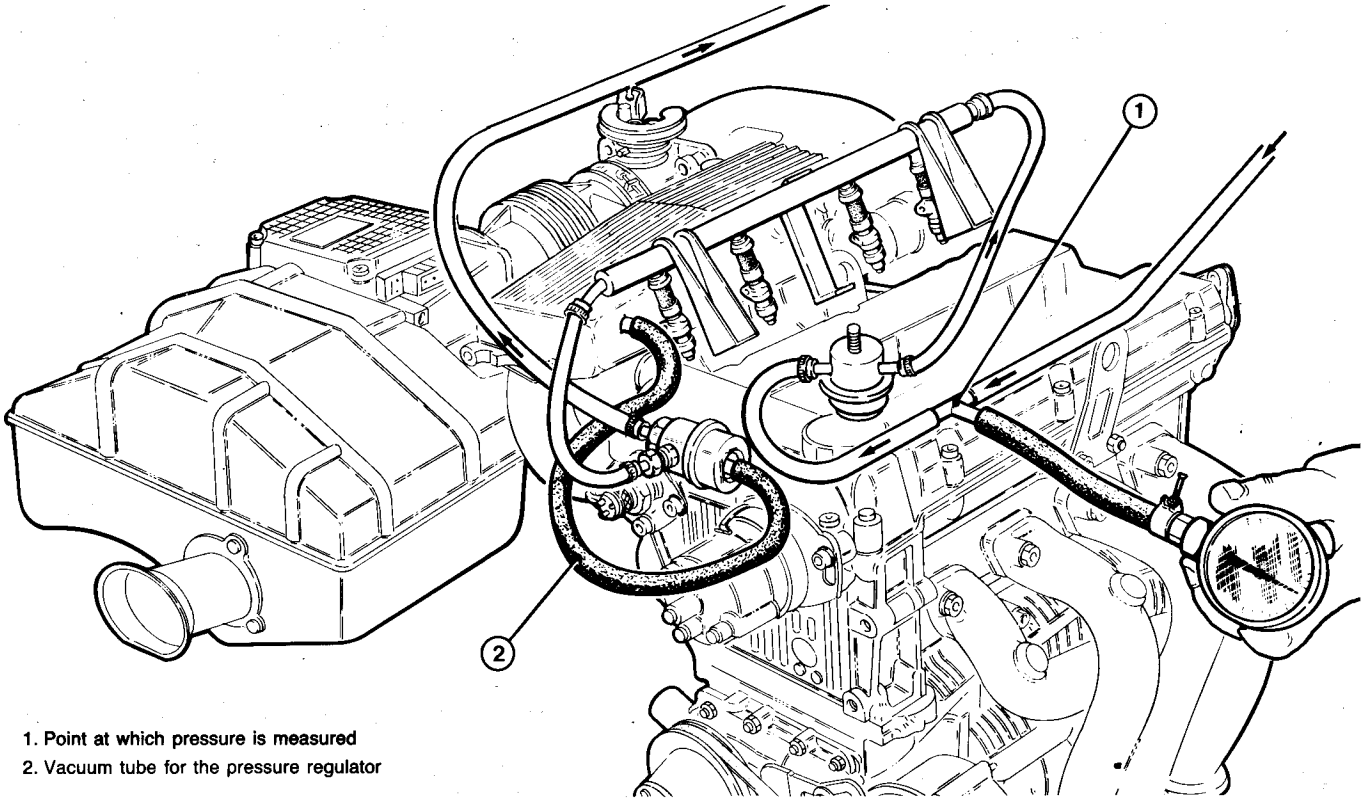
(1) Alternative

FUEL TANK

Features	Unit of measurement
	litres
Total capacity	49
Reserve	8

CHECKS AND ADJUSTMENTS

FUEL PRESSURE CHECK



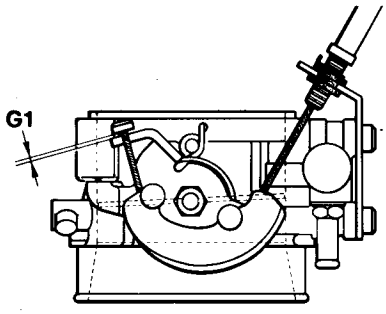
1. Point at which pressure is measured
2. Vacuum tube for the pressure regulator

Check	Values	
Operating pressure to be measured at the point (1) with the tube (2) disconnected and with the engine running at idle r.p.m.	kPa	284.3 ÷ 323.6
	bar	2.8 ÷ 3.2
	kg/cm²	2.9 ÷ 3.3

ACCELERATOR CONTROL CHECK

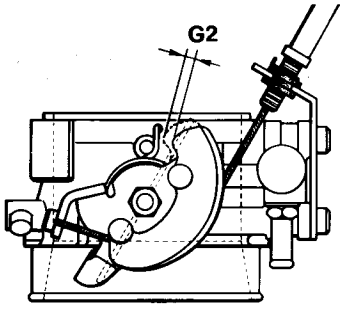
Accelerator cable backlash (with accelerator pedal released)

G_1 = 1 ÷ 2 mm

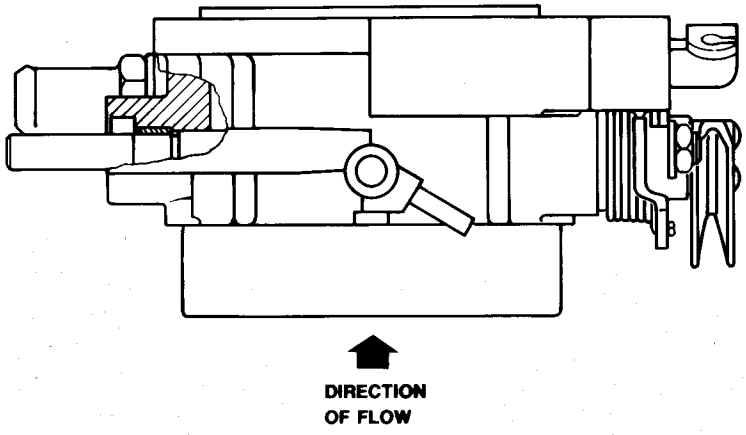


Play in accelerator control cam (with accelerator pedal pressed right down)

G_2 = 1 ÷ 2 mm



SETTING OF ACCELERATOR BUTTERFLY ASSEMBLY (Flow rate)

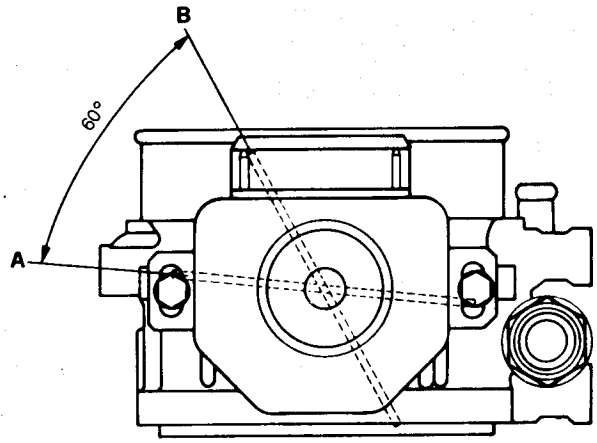


Check	Values
Blow by of air with accelerator in the closed position The reading of the values on the Solex flow meter must be carried out applying the buffer to the opening of the accelerator butterfly housing	(Solex Flow meter) Scale N 240 ÷ 260

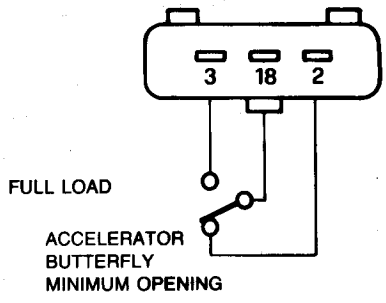
ENGINE IDLE R.P.M. AND EXHAUST CO %

Check	Values
Engine idle r.p.m. (engine warm, gear lever in neutral auxiliary devices excluded)	800 ±50 r.p.m.
CO % of exhaust emission at idle r.p.m.	≤0.2

SETTING OF ACCELERATOR BUTTERFLY SWITCH



2. Terminal for the idle r.p.m. check (corresponding to the position «**A**» accelerator butterfly closed)
3. Terminal for the check of the peak r.p.m. (corresponding to the position «**B**» accelerator butterfly completely open)



Check	Terminals 2 — 18	Terminals 3 — 18
Resistance between the terminals with the accelerator pedal released (accelerator butterfly completely closed)	0 Ω	∞
Resistance between the terminals with the accelerator pedal pressed (accelerator completely open equal to an angle $\alpha \simeq 60°$)	∞	0 Ω

GENERAL SPECIFICATIONS

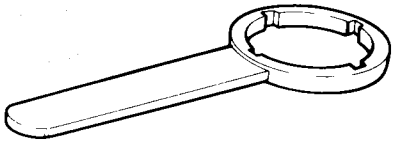
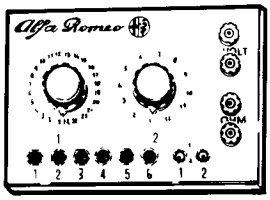
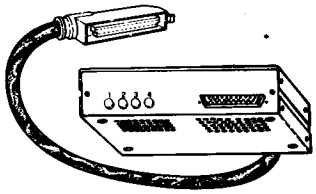
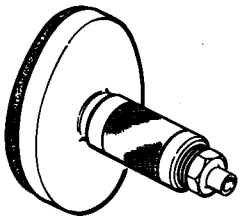
FLUIDS AND LUBRICANTS

Application	Type	Name	Q.ty
Accelerator pedal spindle (on rubber supports)	GREASE	ISECO Molykote Longterm n. 2 Std No. 3671-69831	—
Lambda sensor thread Engine temperature sensor	GREASE	BOSCH 5.964.080.105 R. GORI Never Seez Std No. 3671-69850	—

FUEL

Unleaded petrol with Octane Number (R.M.): ≥95 R.O.N.

SPECIAL SERVICE TOOLS

Identification number	Name
A.5.0197	Spanner for the auxiliary fuel pump securing ring nut 
C.1.0132	Universal trouble diagnosis instrument 
C.1.0136	Interface 
C.2.0055	Buffer for measuring accelerator butterfly housing flow rate 
C.9.0032	Interface - universal trouble diagnosis instrument connecting lead