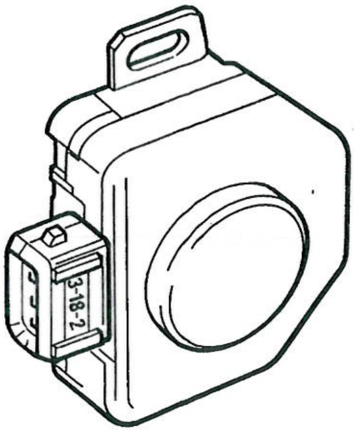
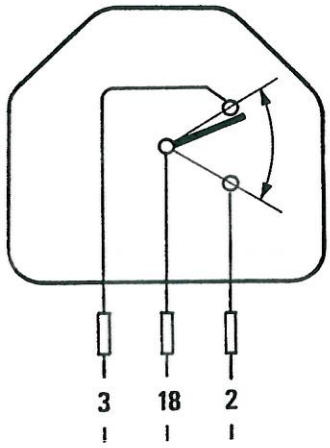
10.

This information is used to:

- provide full load enrichment
- correct the mixture strength when decelerating
- provide enrichment when the throttle valve is closed

It must be positioned after the idle speed has been adjusted so that there is a secure contact (18 and 3) without interfering mechanically with the thottle aperture.
It is also necessary to check that, when the throttle turns by more than 60°, it is completely open (contact between 18 and 2).





Solenoid servo pressure regulator

The servo pressure regulator modifies the fuel regulating pressure value and then varies the quantity delivered to the injectors, in relation to the current signals sent by the Bosch KE3.3–Jetronic injection ECU, to check the following functions:

- enrichment when the engine has been started;
- enrichment when warming up the engine;
- enrichment under a full load;
- enrichment when accelerating;
- correction of the mixture strength when decelerating;
- correction in all the engine's operating conditions, to adpate the mixture strength;
- reduction of the engine revs.

The servo regulator is situated between the main circuit and the inlet of the lower chambers (8) of the valves under differing pressure.
It receives the fuel at system pressure, through the channel (3) with the fixed diammeter. In the fuel entry point the displacement torque can be varied electromagnetically in relation to the intensity of the signal from the ECU.
The electromagnetic field creates a torsion effect on the strip valve (1) and, depending on the polarity and the intensity of the current, moves the valve away from or nearer to the fuel inlet hole, thus producing a variable passage.
The variation in pressure in the servo regulator causes corresponding variations in pressure in the lower chambers (8) of the valves under differing pressure.

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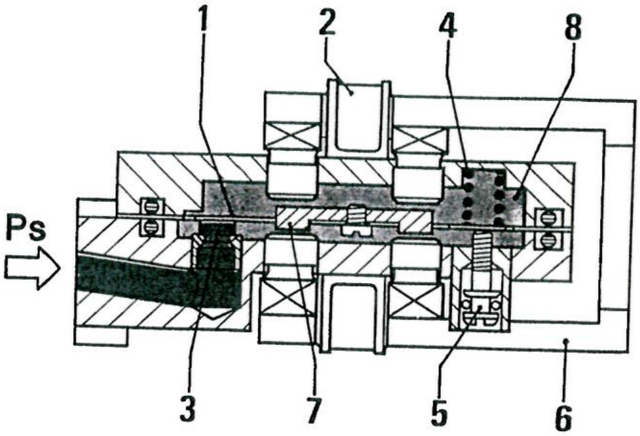
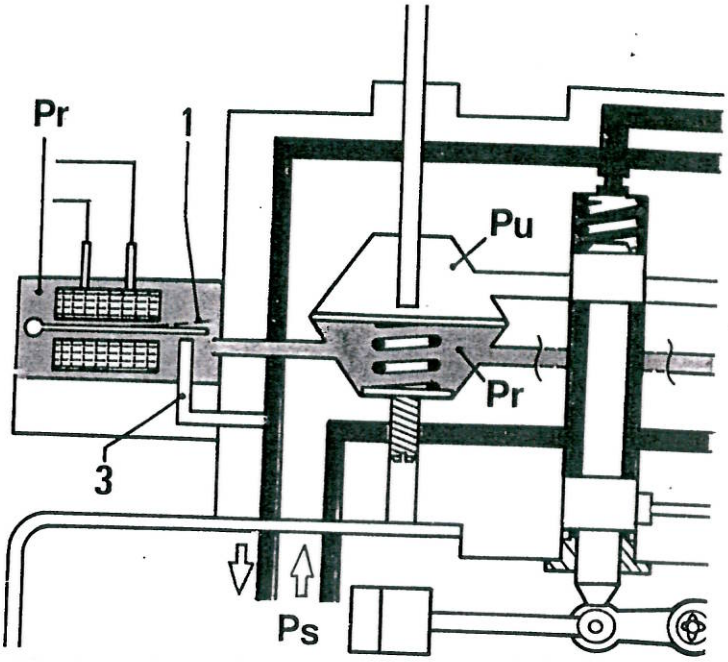
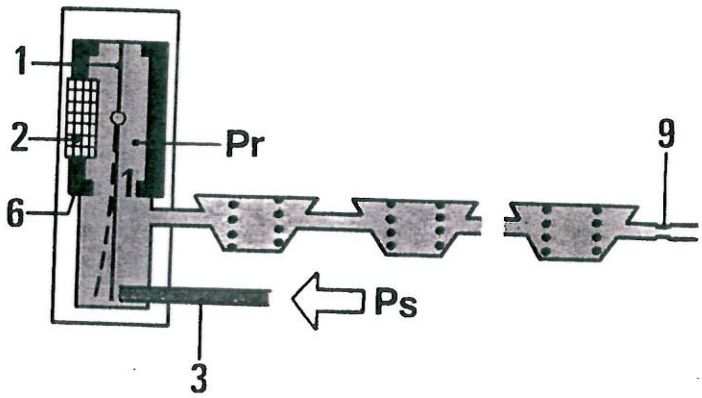




Servo pressure regulator components

1. Flat valve (steel strip), in the shape of a rocker on which an iron core is screwed in the centre)
2. Magnet winding (coil)
3. Fuel entry channel at system pressure (Ps)
4. Spring
5. Adjustment screw
6. Permanent magnet
7. Iron core
8. Lower chambers of the valves under differing pressure
9. Calibrated hole

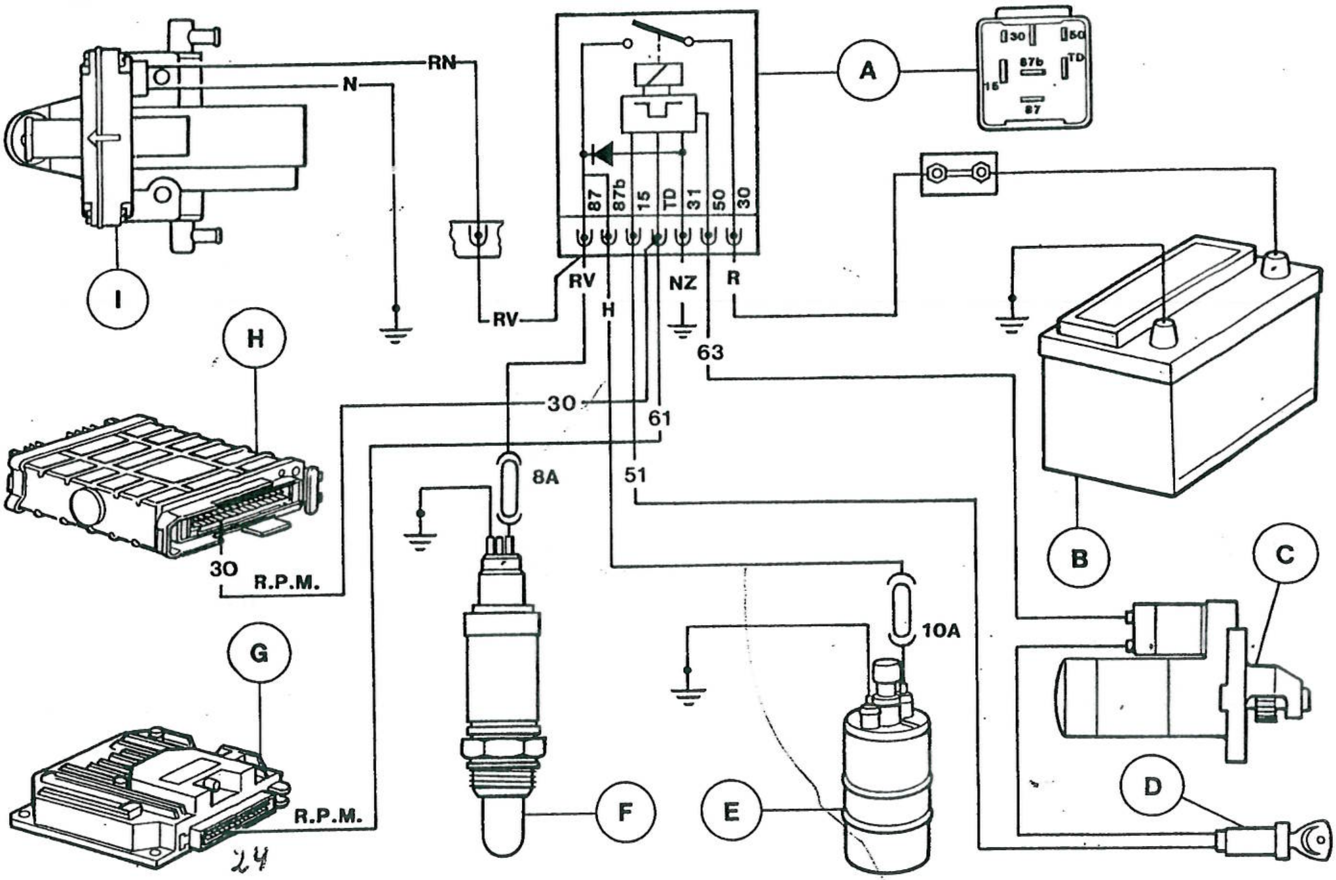
Ps. System pressure
Pr. Regulating pressure
Pu. Output pressure.



The eight lower chambers are connected to each other in series and a neck with a fixed diammeter for keeping the flow constant is situated in the exhaust pipe. The fuel then flows back, without any pressure, into the pressure regulator and from here to the fuel tank.
An electromagnetic field is generated by a current flow sent to the winding (2) by a command from the injection ECU. In the same area there is another permanent magnetic field which controls the strip valve (1), and these two fields together make it possible to regulate the pressure more precisely.
The servo pressure regulator strip valve (1) is set with a basic torque which means that a given constant regulating pressure value is obtained when the servo regulator is not supplied (ECU not operating).
Should the servo pressure regulator not be supplied, the fuel is metered only by the mechanical part (the fuel mixture strength is determined by the air flow gauge cone profile).
The servo pressure regulator is controlled by both "positive" and "negative" currents since the ECU signal can cause inversions in polarity.
The strip valve (1) tends to move closer to the fuel inlet hole (3) in the servo pressure regulator when currents are rising in a positive direction thus making the entry smaller and thus reducing the regulating pressure value. The opposite happens when values are decreasing in a negative direction; the strip moves to the maximum distance from the inlet hole and the fuel's regulating pressure value is at its greatest.

Tachometric relay

The tachometric relay (A), which can be identified by the Bosch number 0.280.230.009 and its light blue container, is specified for this model and, under no circumstances should be replaced by other types. The electronic circuit has, in fact, been modified so that it may be controlled by the pulses, which make up the rev signal, from terminal 24 of the Microplex ignition control unit (G), (signal peak value approx. 12 V), instead of from one of the two ignition coils (signal peak value approx. 400 V).



When the tachometric relay closes, the battery (B) can supply the electric fuel pump (E), the Lambda sensor heating resistor (F) and and the auxiliary air valve (I), in the following cases:

- by turning the ignition switch (D) to the "MAR" position and without starting the engine, current is sent to the tachometric relay electronic control circuit (A–terminal 15), which is grounded by connection 31. The Microplex control unit (G) generates an extra voltage pulse which is sent to terminal TD of the relay (A) and enables its electronic control circuit for 1 ÷ 2 secs. in order to ensure that the electric fuel pump (E) is supplied to put the fuel supply circuit under pressure before starting the engine;
- by further turning the ignition switch (D) to the "AVV" position current is sent to the starter motor (C) and t- terminal 50 of the tachometric relay (A), enabling the electronic control circuit (independently of the engi- rotation speed), and consequently supplying the loads (E–F–I);

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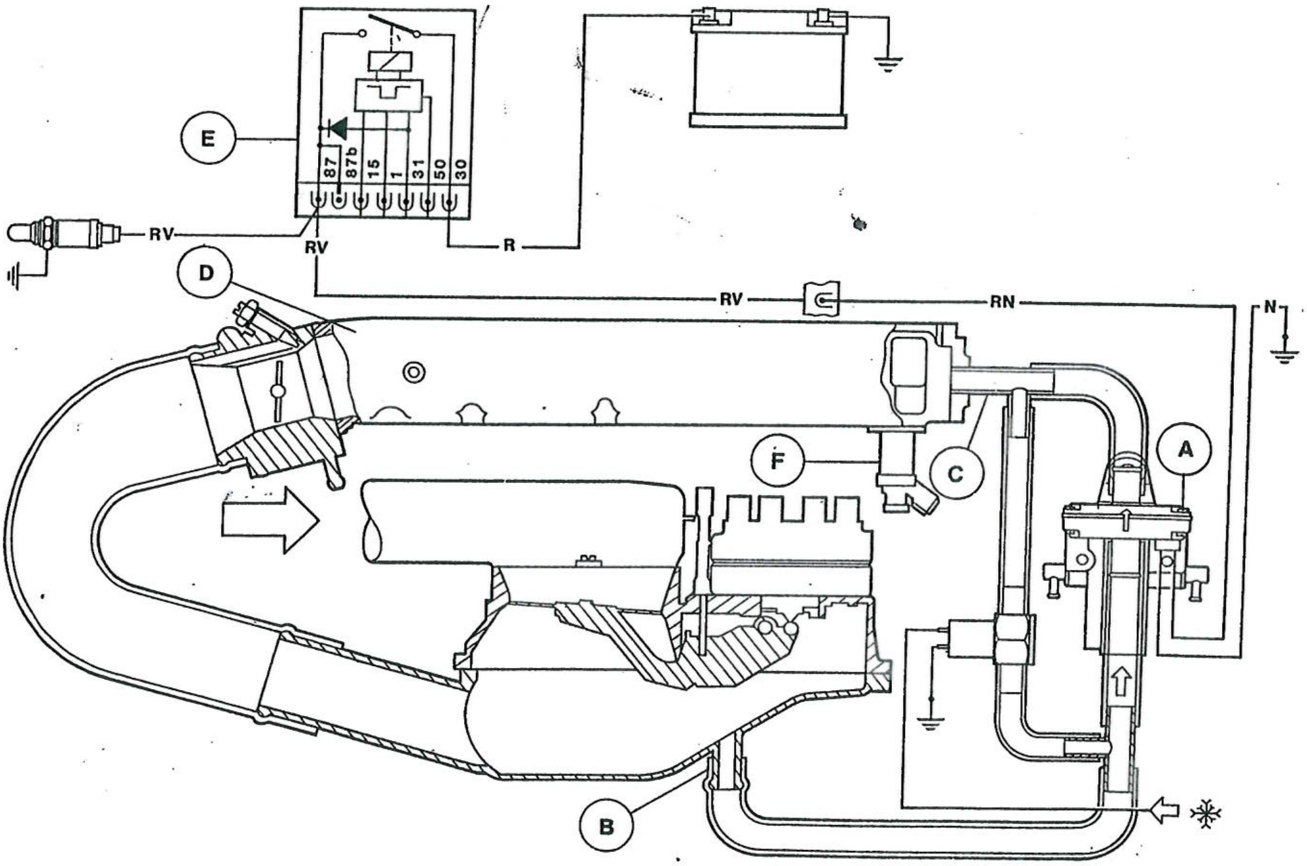
- as soon as the engine starts and passes 225/min, the rev signal picked up by the Microplex control unit (G), reaches terminal TD of the tachometric relay (A) and the Bosch KE3.3–Jetronic ECU (H). The relay electronic circuit remains enabled thus the loads (E–F–I) can be supplied with the engine on;
- below 225/min the ignition pulses are not sufficient to enable the electronic circuit and therefore the pins on the tachometric relay (A) are opened and the loads (E–F–I) are de–activated.

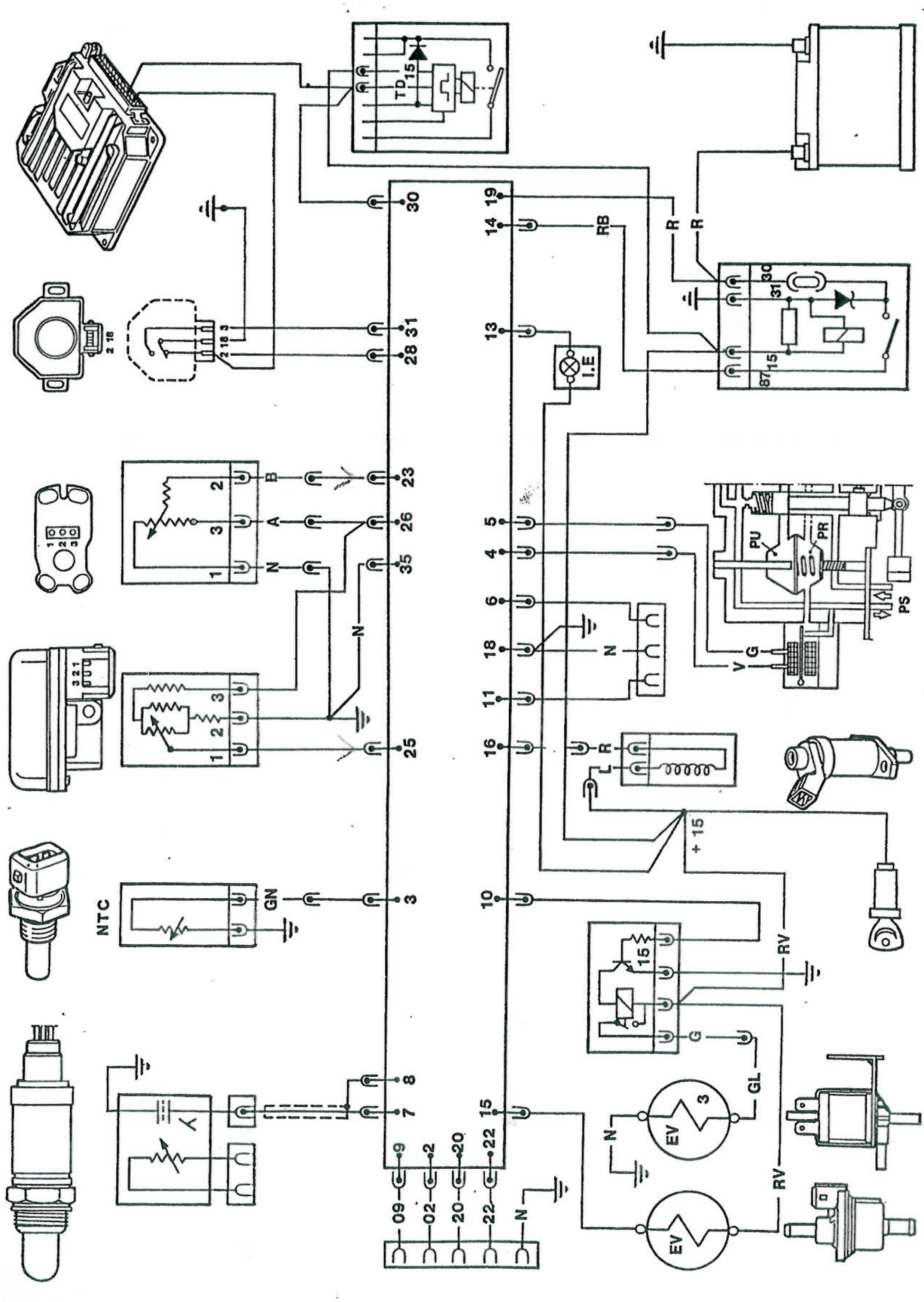
Auxiliary air valve

An auxiliary air valve (A) has been adopted to guarantee thequantity of air necessary to keep the engine running when idling during the warm up stage.
It is larger than those normally used in L–Jetronic systems in order to ensure an adequate flow of air to meet this engine's requirements. It is pneumatically connected between union (B) on the air flow gauge and union (C) on the air delivery box (D) to the intake manifolds. Union (C) is situated on the main bearing compensation pipe near the injection area of the cold start fuel injector (F).



The valve is in a vertical position, near the engine coolant pump. It is electrically connected to terminal 87 of the tachometric relay (E) and is grounded on the engine.
When the engine is cold, it is open and starts to close once the engine is started.
In addition, the engine coolant runs through the valve so that it remains closed when the engine is at normal operating temperature.

DIAGRAM SHOWING THE CONNECTION OF ELECTRICAL COMPONENTS TO THE BOSCH KE3.3–JETRONIC ELECTRONIC CONTROL UNIT



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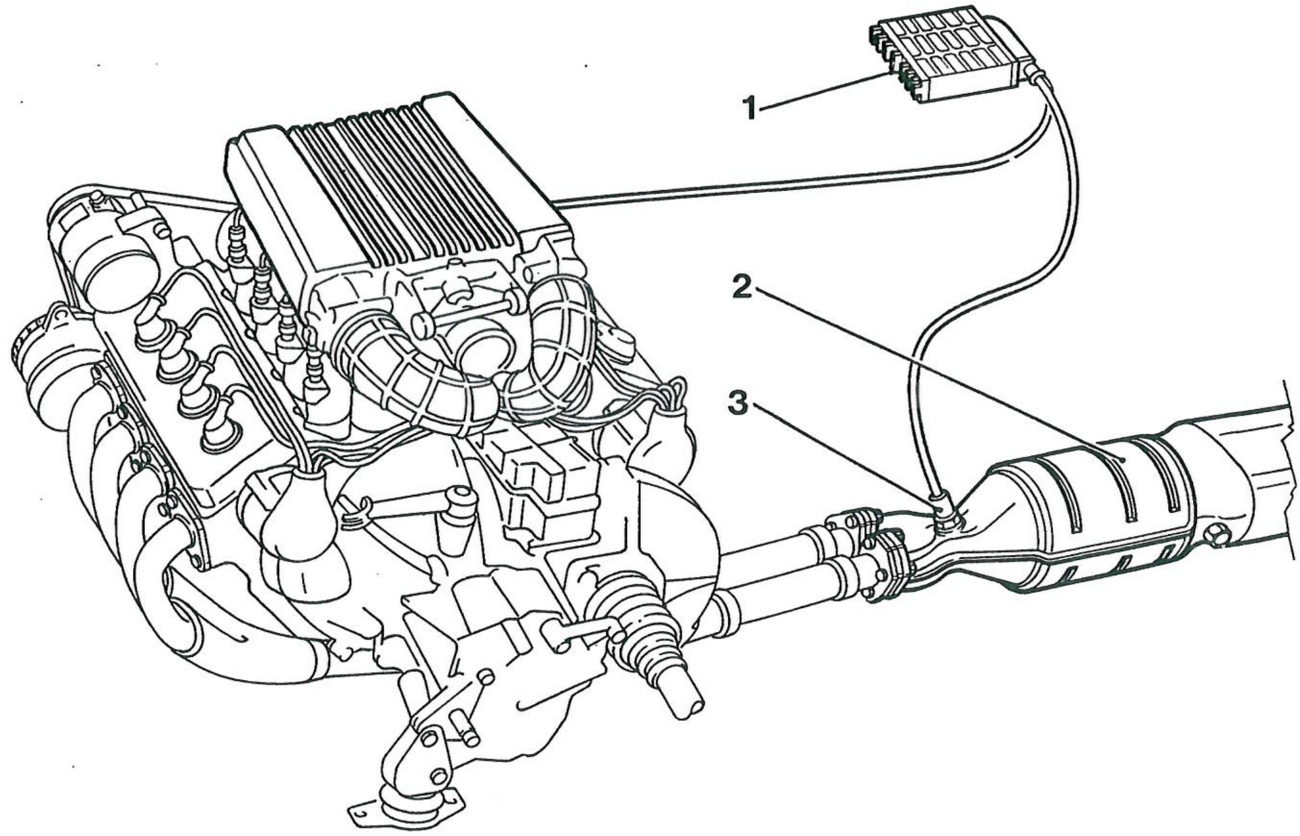
1 AVAILABLE. On the "EUROPA" version it is connected to the vehicle speed signal.
2 To encoding socket: NOT USED WHEN SERVICING.
3 Input signal from engine coolant temperature NTC sensor.
4 Output signal to servo pressure regulator.
5 Output signal to servo pressure regulator.
6 To diagnostics socket for FIAT–LANCIA Tester.
7 Input signal from Lambda sensor.
8 Lambda sensor shielded sheath ground point.
9 To encoding socket: it is used, by grounding it directly, to prevent Lambda adjustment whilst adjusting the CO.
10 Output signal to transistorized relay to control exhaust air induction solenoid valve.
11 To diagnostics socket for FIAT–LANCIA Tester.
12 AVAILABLE
13 Negative signal to switch on electronic injection warning lamp on instrument panel.
14 Positive supply voltage from main relay.
15 Output signal to control solenoid valve for fuel vapour recovery.
16 Output signal to control cold start fuel injector.
17 AVAILABLE. On the "EUROPA" version it is connected to servo idle regulator.
18 Engine ground point
19 Positive supply voltage to memories for diagnosis using FIAT–LANCIA Tester.
20 To encoding socket: NOT USED WHEN SERVICING.
21 AVAILABLE.
22 To encoding socket: NOT USED WHEN SERVICING.
23 Input signal from potentiometer on air flow gauge.
24 AVAILABLE.
25 Input signal from barometric pressure sender.
26 Output signal for supplying potentiometer and barometric pressure sender.
27 AVAILABLE.
28 Idle input signal (throttle closed) from switch on throttle valve body. .
29 AVAILABLE.
30 Engine rev input signal from MICROPLEX ignition control unit.
31 Full load input signal (throttle open) from switch on throttle valve body.
32 AVAILABLE. On "EUROPA" version it is connected to air conditioner relay.
33 AVAILABLE. On "EUROPA" version it is connected to air conditioner relay.
34 AVAILABLE.
35 Engine ground point.

EXHAUST EMISSION CONTROL SYSTEM

INTRODUCITON

The exhaust emission control system consists essentially of a Bosch KE3.3–Jetronic electro–mechanical injection system which is controlled by a control unit (1) which, by acquiring the necessary information, handles the engine fuel system in all its operating conditions.
The system on this "clean air" version, shown in the figure, ensures that the air/petrol mixture strength is close to the stoichiometric ratio, in all the engine's operating conditions for which this ratio is required.
The stoichiometric air/petrol ratio is the condition essentially needed to ensure the correct and lasting operation of the catalytic converter (2) fitted on this version in order to reduce pollutant emissions.
The stoichiometric strength is obtained by using a Lambda sensor (3) which, by constantly analyzing the amount of oxygen in the exhaust gases, allows the control unit (1) to correct the mixture strength, almost continuously, should it not be equal to the stoichiometric ratio, by constantly metering the quantity of fuel to be injected.
Therefore, if the Lambda sensor functions correctly and the corresponding control circuit in the control unit is operating, the composition of the exhaust gases and the percentages of pollutant substances will be as required and it will not be necessary to make further corrections to the level of CO when the engine idling.



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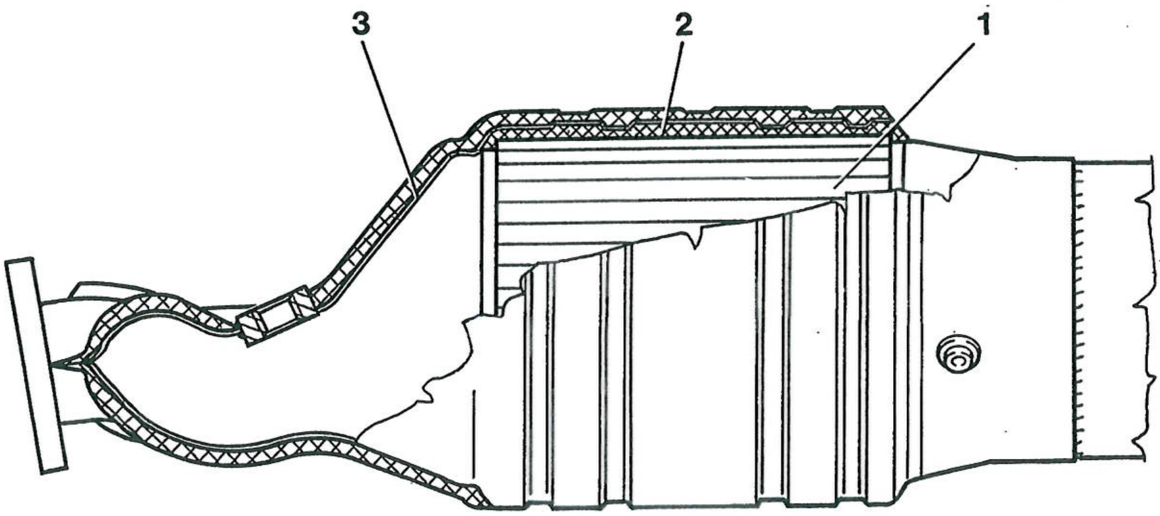
OPERATIONAL DESCRIPTION OF THE EXHAUST EMISSION CONTROL SYSTEM MAIN COMPONENTS

Trivalent catalytic converter

The trivalent type catalytic converter reduces the three pollutant substances (unburnt hydrocarbons (HC), carbon monoxide (CO), nitrogen oxide (NOx)), present in the exhaust gases.Two types of chemical reaction take place inside the converter:

- oxidization of the CO and HC, converted into carbon dioxide (CO_2) and water (H_2O)
- reduction of the NOx, converted into nitrogen (N_2).

The converter operates best if the air/petrol mixture supplied to the engine corresponds to the stoichiometric ratio.
The converter is made up of a core (1), a metal mesh support (2), used for protecting the core from shocks and vibrations, and an external stainless steel casing (3) which is resistant to high temperatures and atmospheric elements.
The core has a honeycomb–type structure made of a ceramic material covered with a thin layer of catalytically active sub tances (platinum or rhodium), which accelerate the chemical decomposition of the harmful substances contained in the exhaust gases. By passing through the core cells at temperatures of more than 300 ÷ 350 °C, these harmful substances activate the catalytic converter causing the oxidization and reduction reactions.



The converter can be quickly and irreparably put out of action due to:

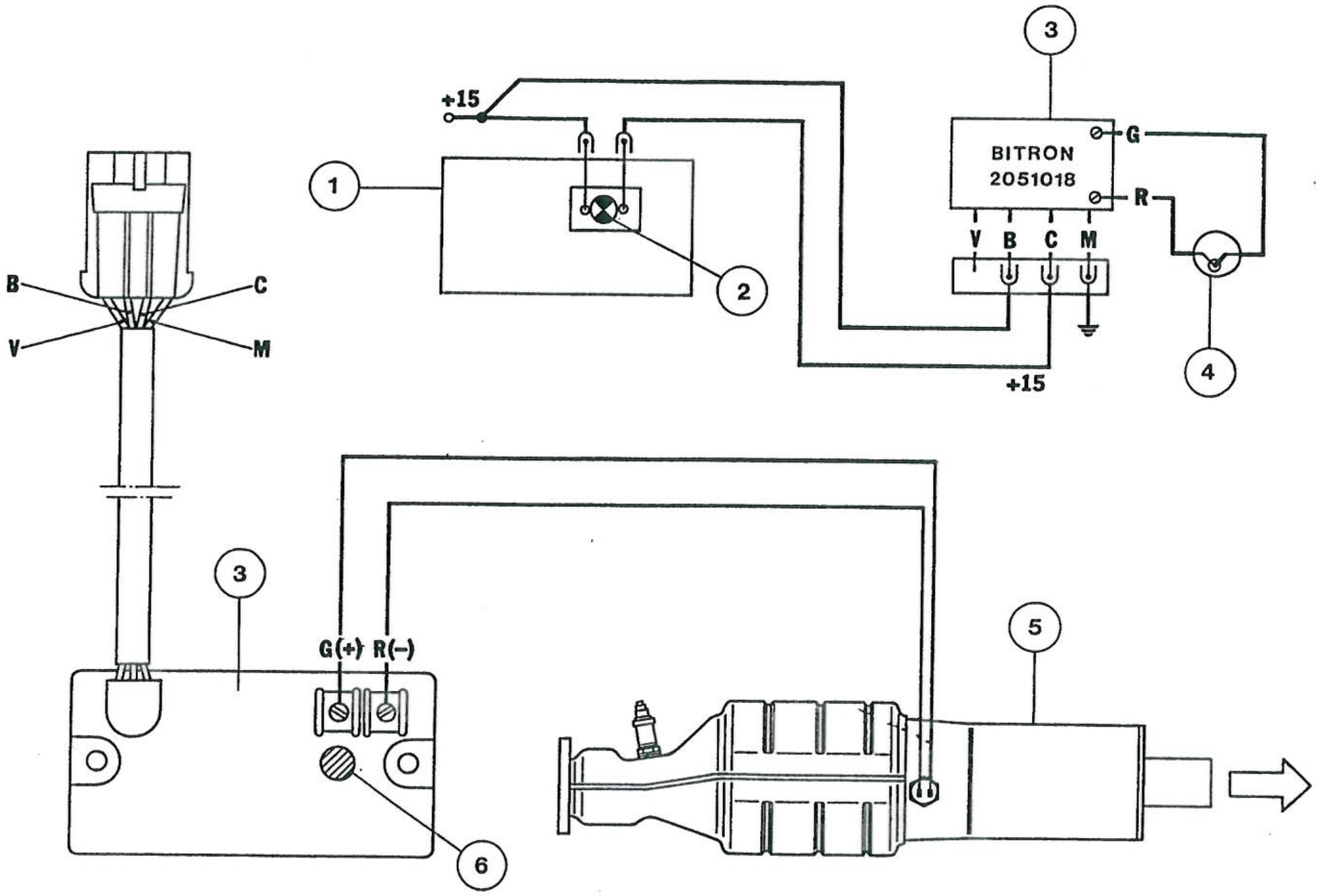
- *the presence of lead in the petrol which lowers the degree of conversion to levels which make it useless to the system;*
- *the presence of unburnt petrol in the converter: in fact, a flow of petrol lasting 30 seconds in an ambient of 800 °C (silencer internal temperature) is sufficient to cause the catalytic converter to fuse and break. It is essential that the ignition system is in perfect operating order, therefore under no circumstances should the spark plug cables be removed when the engine is running; consequently, the silencer should be replaced with an equivalent piece of piping when carrying out tests.*

If the catalytic converter is used correctly, it should last for no less than 80,000 km or for a period of at least five years.

Catalytic converter temperature control device

There is a warning light (2) on the vehicle's instrument panel with the words "SLOW DOWN".
It is controlled by a BITRON electronic control unit (3) which receives a signal from the thermo–couple (4) at the catalytic converter's outlet (5) and, if the engine is operating irregularly with consequent high temperature in the exhaust system, causes the warning lamp to flash or remain on:

- **If the warning lamp flashes,** it means that the temperature of the catalytic converter has risen too much reaching 900±20 °C (1652±36 °F).
  The driver should decelerate immediately and go to a servicing garage as soon as possible to have the cause of the problem eliminated.
- **If the warning lamp remains on,** the temperature of the catalytic converter has reached 940±20 °C (1724±36 °F) and may rise further with a high risk of damage.
  The driver should stop the engine immediately and have the vehicle towed to a servicing garage to have the problem eliminated.



NOTE *The thermo–couple is a DC voltage generating device when it is heated. Since it is a polarized element, the yellow cable connected to the thermo–couple (positive) should be connected to the BITRON control unit terminal which has a yellow label (6).*

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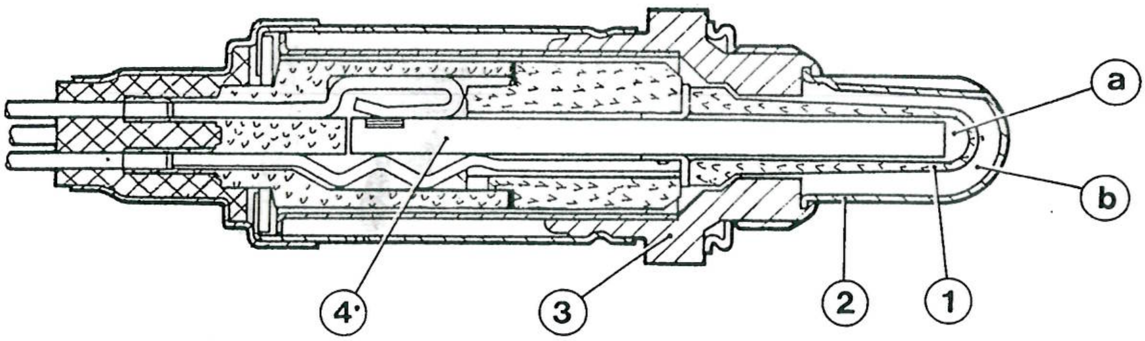
Lambda sensor

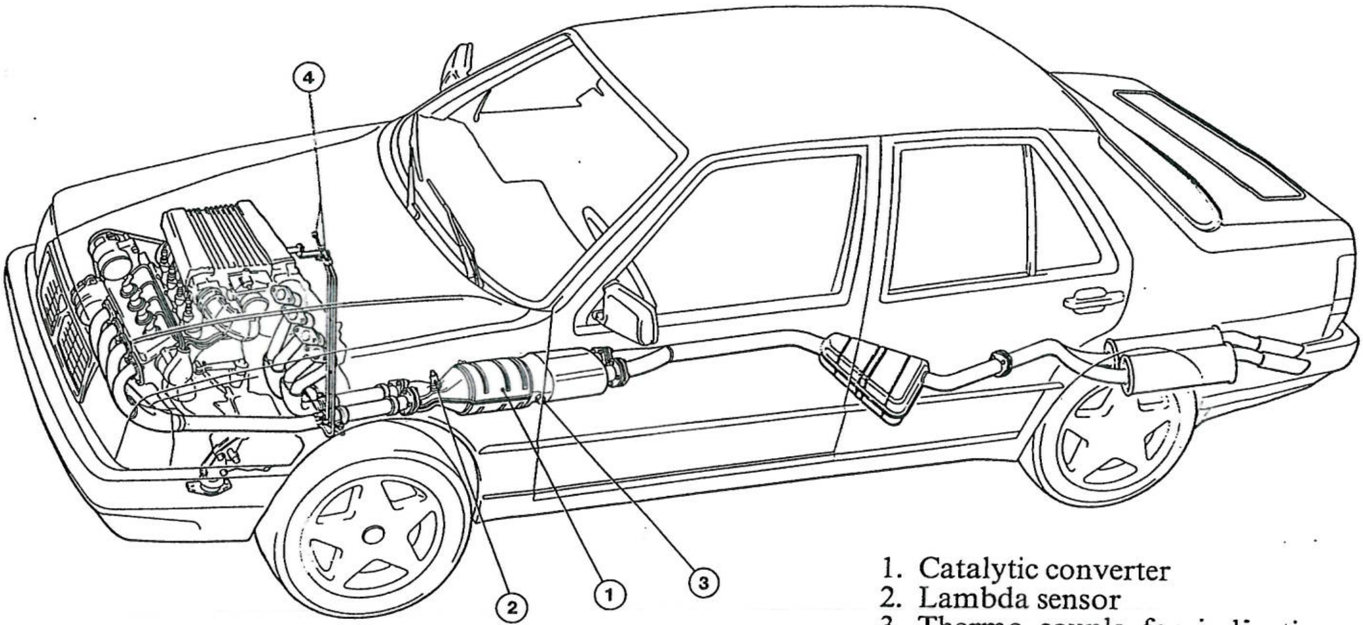
The Lambda sensor is mounted at the trivalent catalytic converter inlet and picks up the oxygen content of the exhaust gases.
Once operating temperature has been reached, the sensor sends the control unit a voltage signal, depending on the level of oxygen in the exhaust gases. This level is strictly proportional to the to the comburent/fuel ratio in the intake manifold or to the excess of air in the mixture.
The voltage signal from the Lambda sensor oscillates between approximately 100 and 900 mV and changes in steps when the air excess factor wavers about Lambda = 1 (air/fuel stoichiometric ratio 14:1).
The sensor's output signal is sent to the electronic control unit which corrects the quantity of injected fuel in order to keep the strength of the air/fuel mixture close to the stoichiometric mixture. This, in turn, makes it possible for the catalytic converter to operate at its best.



The Lambda sensor consists of a zirconium dioxide base ceramic casing (1) covered with a thin layer of platinum closed off at one end, inserted in a protective tube (2) and housed in a metal casing (3) which provides further protection and allows it to be mounted on the catalytic converter. The outer part (b) of the ceramic is exposed to the flow of exhaust gas, whilst the inner part (a) is in contact with the ambient air.
The sensor operates on the basis that, with temperatures of more than 300 °C, the ceramic material used becomes a conductor for oxygen ions. In such conditions, should the quantity of oxygen at either side (a–b) of the sensor have differing percentage values, a variation in voltage is generated between the two ends. This variation gives an indication of the difference in quantities of oxygen in the two sides (air side and exhaust gas side) and it informs the control unit that the oxygen residues in the exhaust gases do not meet the levels necessary to guarantee poor combustion of the harmful residues.
Below 300 °C, the ceramic material is not active and therefore the sensor does not send any significant signals and a particular circuit in the control unit stops the mixture from being adjusted when the engine is warming up.
To ensure that the sensor reaches operating temperature quickly, it has an electric resistor (4) which reduces the time that the ceramic needs before starting to conduct the ions when an electrical current passes through it, by allowing the sensor to be positioned in cooler areas of the exhaust pipe.

NOTE *The sensor can be easily put out of action merely due to the presence of very small amounts of lead in the petrol. It should be replaced every 80,000 ± 500 km as stipulated in the maintenance schedule.*

Engine exhaust system with catalytic converter



1. Catalytic converter
2. Lambda sensor
3. Thermo–couple for indication of high catalytic converter temperatures
4. Sockets for checking CO upstream of catalytic converter

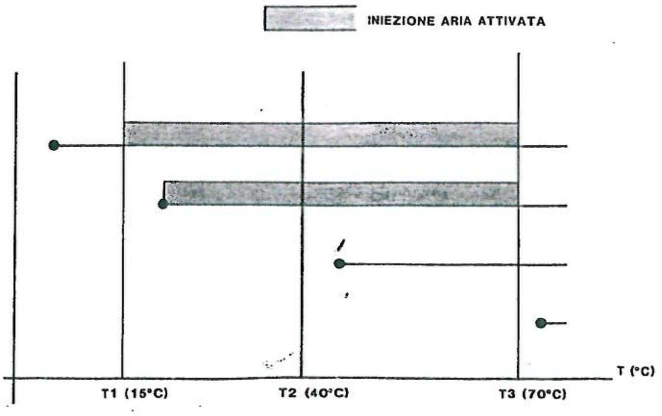
SECONDARY EXHAUST AIR INDUCTION SYSTEM

Air is introduced into the exhaust manifolds, immediately after the exhaust valves, with the aim of:

- reducing the time needed by the catalytic converter to reach operating temperature (light–off);
- reducing the pollutant emissions when operating with a cold engine, at which point the catalytic converter is not yet active.

These aims are achieved by means of "post–combustion" which comes into operation, upstream of the catalytic converter, by injecting fresh air into the exhaust pipe. The oxygen in the induction air combines with the unburnt hydrocarbons (HC) and the carbon monoxide (CO), reducing the quantity and producing heat and a consequent increase in the temperature of the exhaust gases which pass through the catalytic converter.
The air induction system operating cycle is determined by the temperature of the engine, for which the KE3.3–Jetronic ECU considers three reference values.

T_1 = approx. 15 °C T_2 = approx. 40 °C T_3 = approx. 70 °C



- **Starting the engine with coolant temperatures below T_1 (15 °C):**

  the exhaust air induction system is not activated because, in these conditions, the mixture is very rich and produces exhaust gases which contain a very high percentage of unburnt hydrocarbons. Mixing these with an extra supply of air would start a "post–combustion" proc ess which would cause definite damage to the first section of the exhaust pipe, including the catalytic converter.

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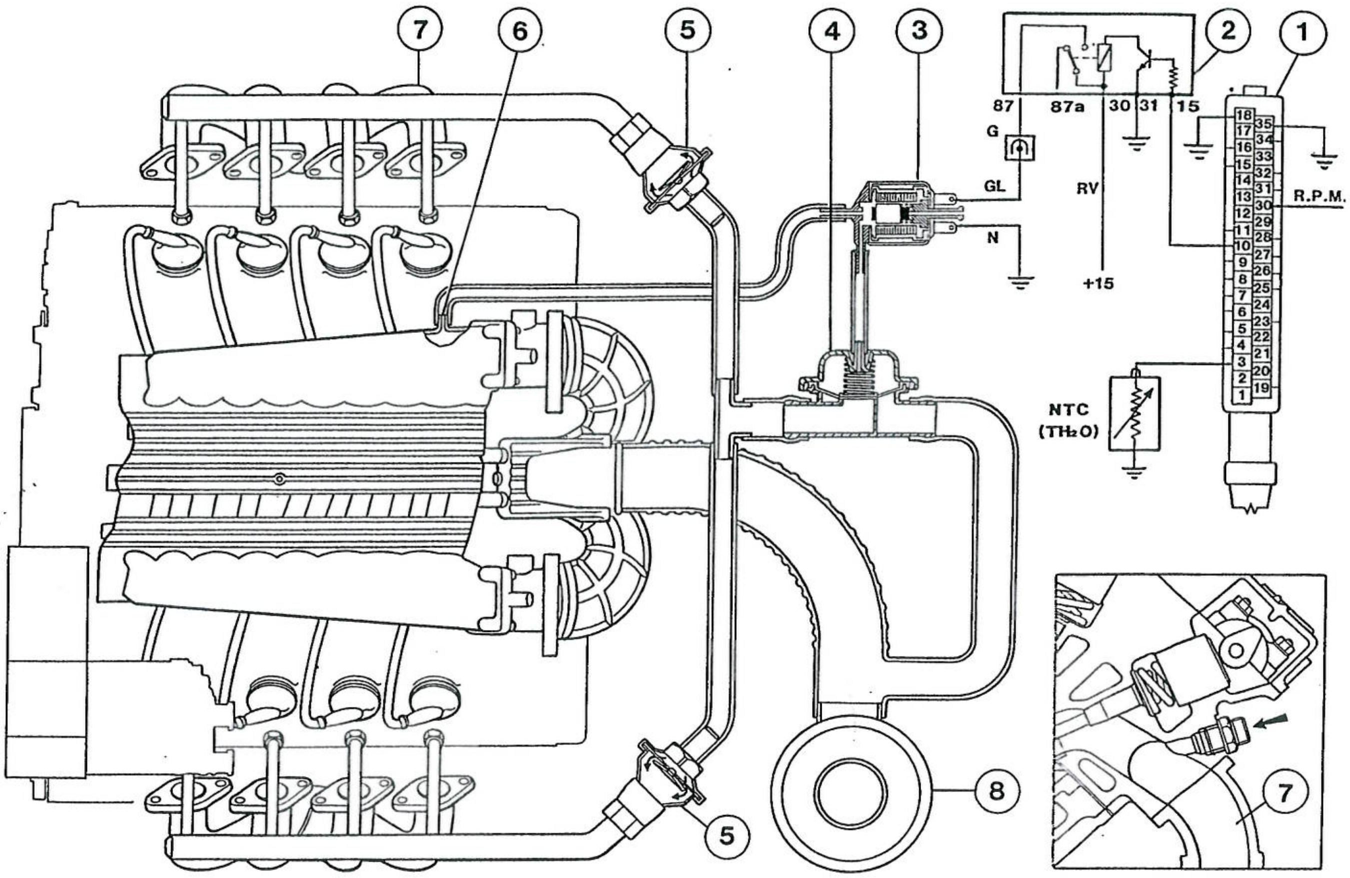


- **Starting the engine with coolant temperatures between T_1 (15 °C) and T_2 (40 °C):**

  in these conditions the electronic control unit (1), by means of the transistorized relay (2), controls the solenoid valve (3) which causes the air cut–off valve (4) to open. As a result, air is introduced into the exhaust until the engine coolant reaches a temperature of more than T_3 (70 °C).
  When the solenoid valve (3) is energized, the vacuum signal (determined by the revs and engine load), which is picked up at the intake manifold (6), reaches the air cut–off valve (4). This then opens, depending on the vacuum in the intake manifold, thus providing an area through which the induction air, which is taken from the air cleaner (8) in order to have a supply of filtered air and to reduce the system's noise level, reaches the Pulsair automatic check valves (5).
  These valves open, due to the pressure pulses caused by the exhaust gas flow, allowing fresh air to be injected into the cylinder heads, directly downstream of the exhaust valves.
  After "post–combustion", when the pressure in the exhaust manifolds (7) increases, the automatic check valves (5) close and prevent the "post–combustion" pressure from being able to be felt downstream, at the cut-off valve (4) and at the air cleaner (8).
  Since low loads are used when the engine is being warmed up, there is no possibility of damaging the the catalytic converter as a result of "post–combustion". This, on the other hand, could occur if increased engine loads are applied, but, in these conditions, the vacuum in the intake manifold (6) is not sufficient to open the cut–off valve (4), thus preventing induction air from being injected into the exhaust, and stopping "post–combustion" from taking place inside the catalytic converter and damaging it.

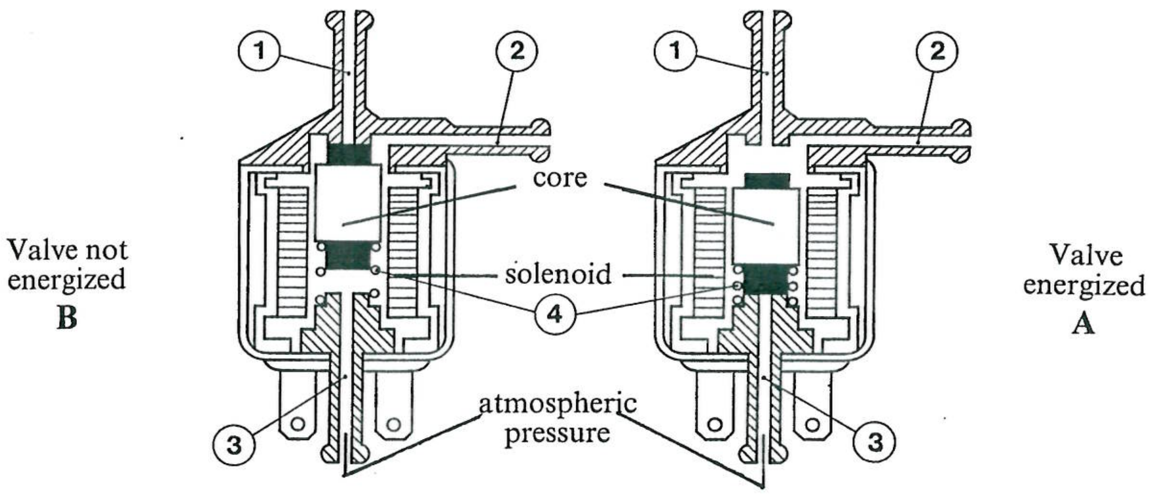
- **Starting the engine with coolant temperatures of more than T_2 (40 °C):**

the catalytic converter and the Lambda sensor are at the temperatures that they require to operate correctly. In these conditions, the solenoid valve (3) is de–energized, thus preventing the vacuum signal from the intake manifold (6), from reaching the air cut–off valve (4). This, in turn, remains closed, obstructing the passage of induction air since, by creating an increase in the level of oxygen in the exhaust gases, the value read by the Lambda sensor, which at this temperature is active, to alter.

When the revs pass 4000/min air induction at the exhaust is de–activated regardless of the engine temperature.

Three way solenoid valve

The solenoid valve is supplied by the electronic control unit in accordance with the engine coolant temperature picked up by the sensor.
As the current passes through the solenoid, it generates a magnetic field which attracts the core (position A) connecting duct (1), which is connected to the intake manifold, to duct (2), connected to the air cut–off valve and allowing the vacuum signal in the intake manifold to be transmitted to the air cut–off valve.
When the engine coolant temperature is more than 70 °C, the electronic control unit de–energizes the solenoid valve (position B). The core is pushed by the spring (4) and closes duct (1) and connects duct (3) at atmospheric pressure, to duct (2), and therefore to the air cut–off valve which then closes.



NOTE *The three way solenoid valve (3) is mounted under the air delivery box to the manifolds near the right throttle valve body.*

Automatic check valves

The vacuum produced by the flow of exhaust gases causes the valve to open due to the difference in pressure between chamber (1), which is usually at atmospheric pressure, and chamber (2) which is under a vacuum. When the valve is open (position A) the necessary induction air can pass through for "post–combustion".

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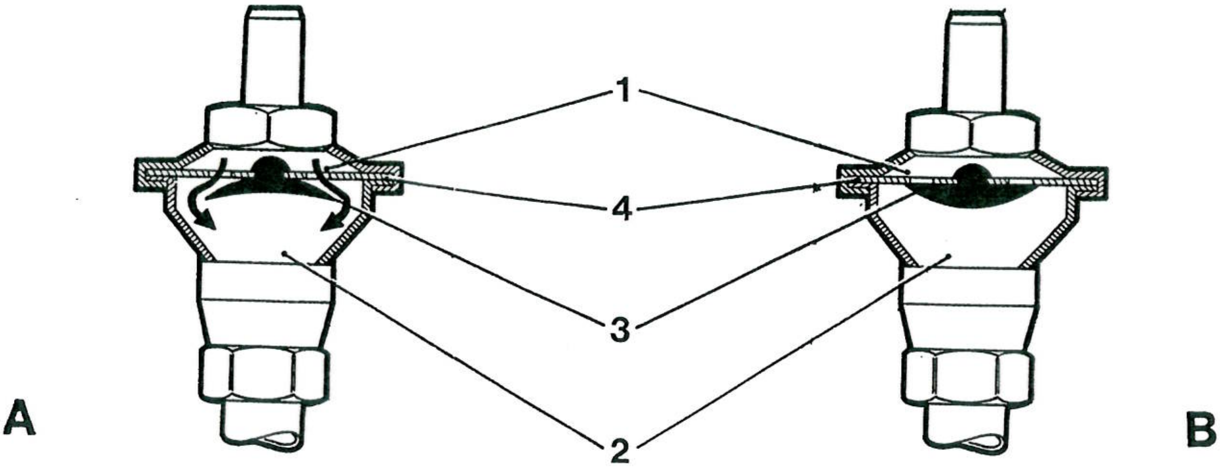
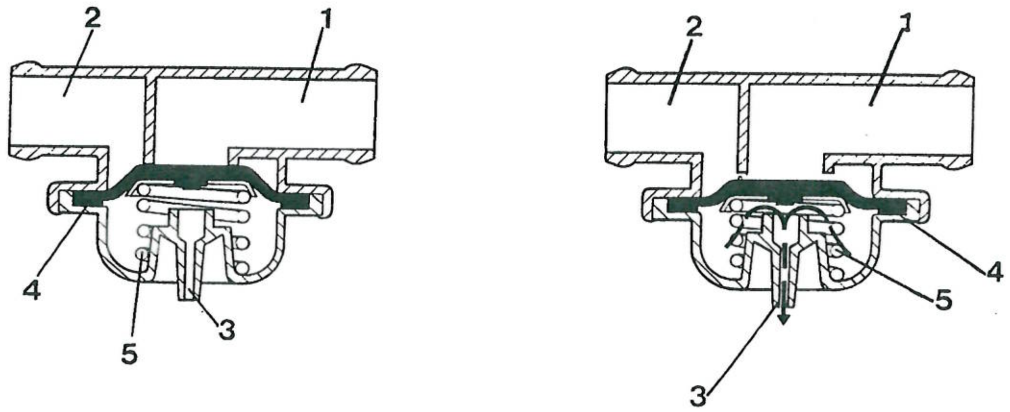


When the pressure in chamber (2) is greater than that in chamber (1) (a condition which occurs during "post–combustion" when an increase in pressure is registered in the exhaust pipe and therefore in the connecting chamber (2)), the disc (3) is pushed against the dividing ring (4) thus blocking the passage (position B) and therefore preventing burnt gases from escaping.

Air cut–out valve

The air cut–out valve, which is connected to the air cleaner on side (1) and to the automatic check valves on side (2), connects the two ducts if the vacuum signal transmitted through duct (3) reaches a high enough level. If the diaphragm (4) is pushed by the spring (5), it interrupts the connection between ducts (1) and (2) (position A).

Valve in closed position
A

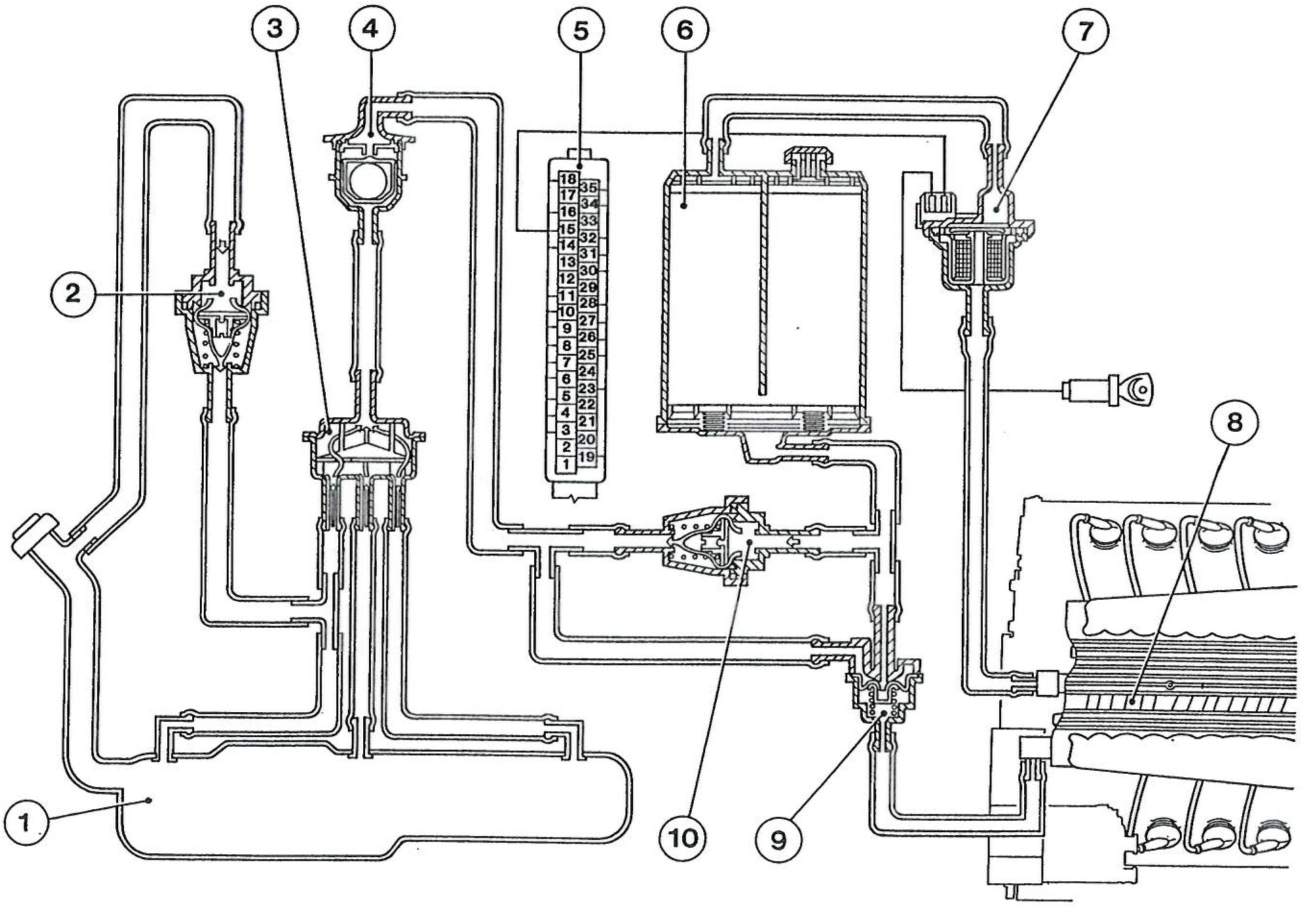


Valve in open position
B

When the vacuum signal reaches duct (3), the diaphragm (4) is recalled by the difference in pressure between ducts (1) and (2), (which are at atmospheric pressure), and duct (3) (which is under a vacuum) thus connecting (1) and (2) allowing the induction air to pass through (position B).

FUEL EVAPORATION CONTROL SYSTEM

The "closed" type system is used to ventilate the fuel tank.
Petrol vapours, with their light hydrocarbon (HC) content, form in the fuel tank and supply system. The fuel evaporation control system, therefore, prevents these pollutant substances from being released into the air. The system consists of a tank (1) with a filler cap without an air inlet hole, a balancing check valve (2), a petrol vapour separator (3), a safety valve (4), to stop petrol leaking should the vehicle over–turn, a three way breather valve (9) for controlling the flow of petrol vapours in the tank, a tank ventilation check valve (10), an active carbon filter (6), a petrol vapour cut–off valve (7) controlled by the electronic control unit (5) and the intake manifold (8).



With high external temperatures, and if the vehicle is stationary for a prolonged period, the system operates when the petrol temperature rises (since it is no longer cooled by the ventilation produced by the vehicle speed), creating a rise in the fuel tank internal pressure. In passing through the separator (3) and the safety valve (4), the petrol vapours reach the three way breather valve (9) which, with the engine off, controls the flow of vapours which may form in the tank, and sends them to the active carbon filter (6) when the engine is running.

NOTE *The petrol vapour separator (3) and the safety valve (4) prevent liquid fuel from reaching the active carbon filter (6) and thus damaging it.*

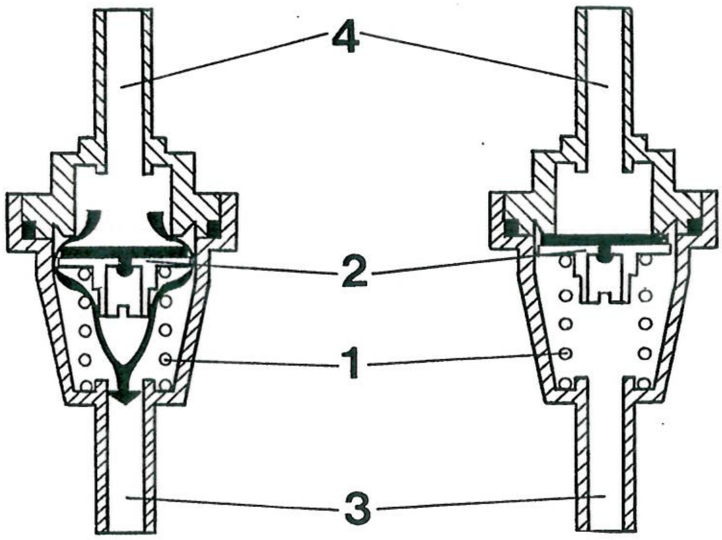
OPERATIONAL DESCRIPTION OF THE FUEL EVAPORATION CONTROL SYSTEM MAIN COMPONENTS

Check valves

Two check valves are mounted on this version.

A. **Tank ventilation check valve:** if, because of the consumption of fuel, a vacuum is created inside the tank, the valve opens to allow air into the tank.

B. **Balancing valve:** this relieves the increase in vapour pressure which may accumulate, if the tank is too full, between the cap andthe fuel in the tank cap. This prevents the possible phenomenon of capillarity which could cause the liquid petrol to reach the active carbon filter and so damage it.

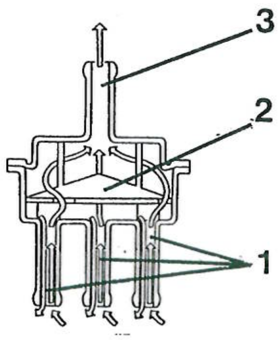


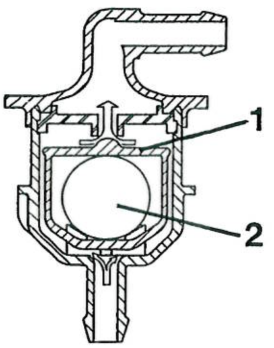
Under normal conditions, the spring (1), pushes the cap (2) fully home and the valve remains closed. If a vacuum is created in duct (3) or over–pressure in duct (4), in such a way that the difference in pressure between the two ducts exceeds 13mbar, the valve opens to allow the tank to be ventilated (A) or the pressure in the filler to be discharged if the tank is too full (B).

NOTE *The ventilation check valves are painted in two colours (white and black) and must be mounted in a particular way: the black side should be attached:*
- *towards the active carbon filter for the ventilation valve;*
- *towards the tank filler for the balancing valve.*

Petrol vapour separator

The part petrol vapours from the tank are condensed on the tapered disc (2) which they reach through three ducts (1). The drops of petrol return to the tank through the same ducts whilst the remaining vapours leave via the upper duct (3).



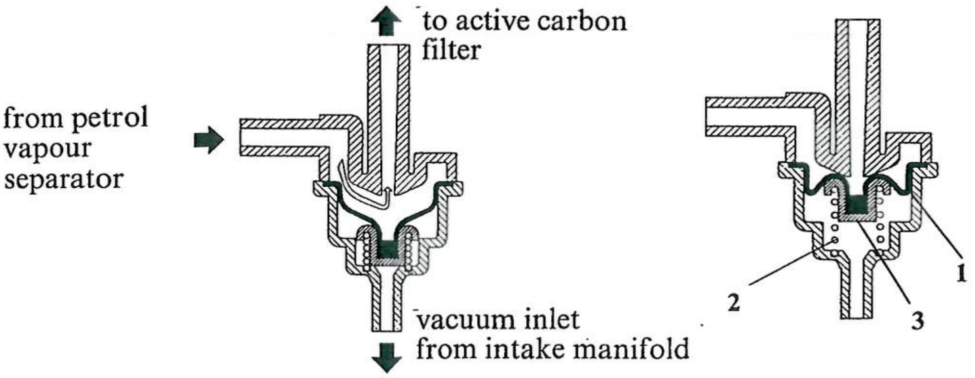


Safety valve

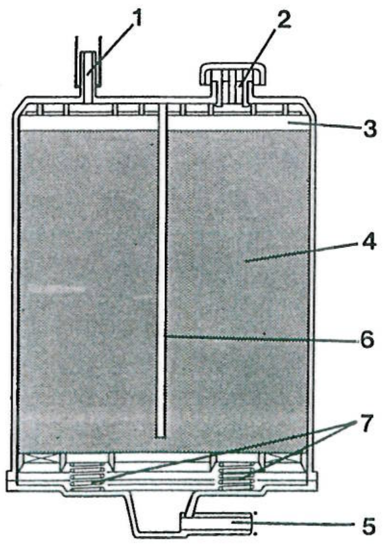
The vapours from the separator to the breather valve must pass through this valve which, at an angle of more than 40 °C, closes the duct because of the pressure from the petrol which attempts to escape (and the reduced pressure from the internal ball).

Breather valve

This valve is used to control the flow of petrol vapours from the tank to the active carbon filter and it is driven by the vacuum signal in the intake manifold.
When the engine is running, the vacuum pulls the cap (3), which is connected to the diaphragm (1), down, once the pre–load of the spring (2) has been overcome, thus allowing the petrol vapours to reach the active carbon filter freely.



There is no vacuum when the engine is not running and the spring (2) pushes the diaphragm (1) upwards and closes the duct.
At pressures of more than 0.04÷0.06 bar, the diaphragm bends and allows the passage of petrol vapours.



Active carbon filter

This is made up carbon granules (4) which retain the petrol vapours entering via the inlet (5).
The warm flush–out air, which enters via the inlet (2) through the paper filter (3), extracts the petrol vapours over the carbon granules and carries them to the outlet (1) and from here to the cut–off valve. On the other hand, it can be recalled by the vacuum in the tank to ventilate it. The division (6) ensures that the warm flush–out air flows over all the carbon granules so enabling the petrol vapours to be released into the intake manifold.
There are also two springs (7) which expand the mass of granules when the pressure increases.

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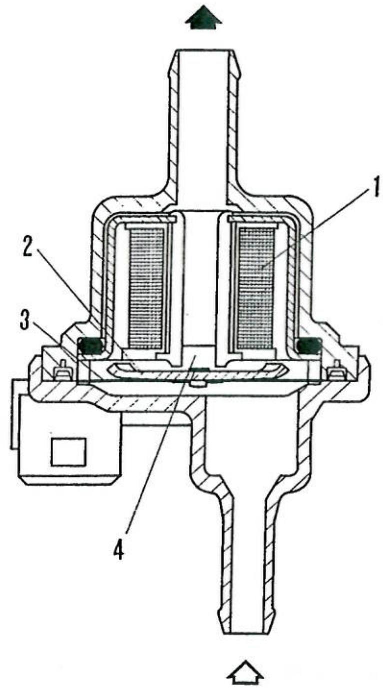
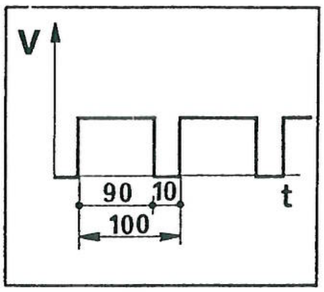
Petrol vapour cut–off solenoid valve (Bosch)

This valve controls the amount of petrol vapours drawn in by the active carbon filter and sent to the intake manifold.
When the ignition key is in the "MAR" position, the solenoid valve, which is normally open, closes to operate.
If the solenoid (1) is energized, it attracts the plunger (2) which, by overcoming the flat spring (3), closes the opening (4), thus stopping the passage of petrol vapours.
When starting the engine, the solenoid valve remains closed, thus preventing the petrol vapours from over–enriching the mixture.
About 40 seconds after starting up, the electronic control unit sends the solenoid valve a 10 Hz square wave signal, which modulates its aperture according to the signal's full/empty ratio:



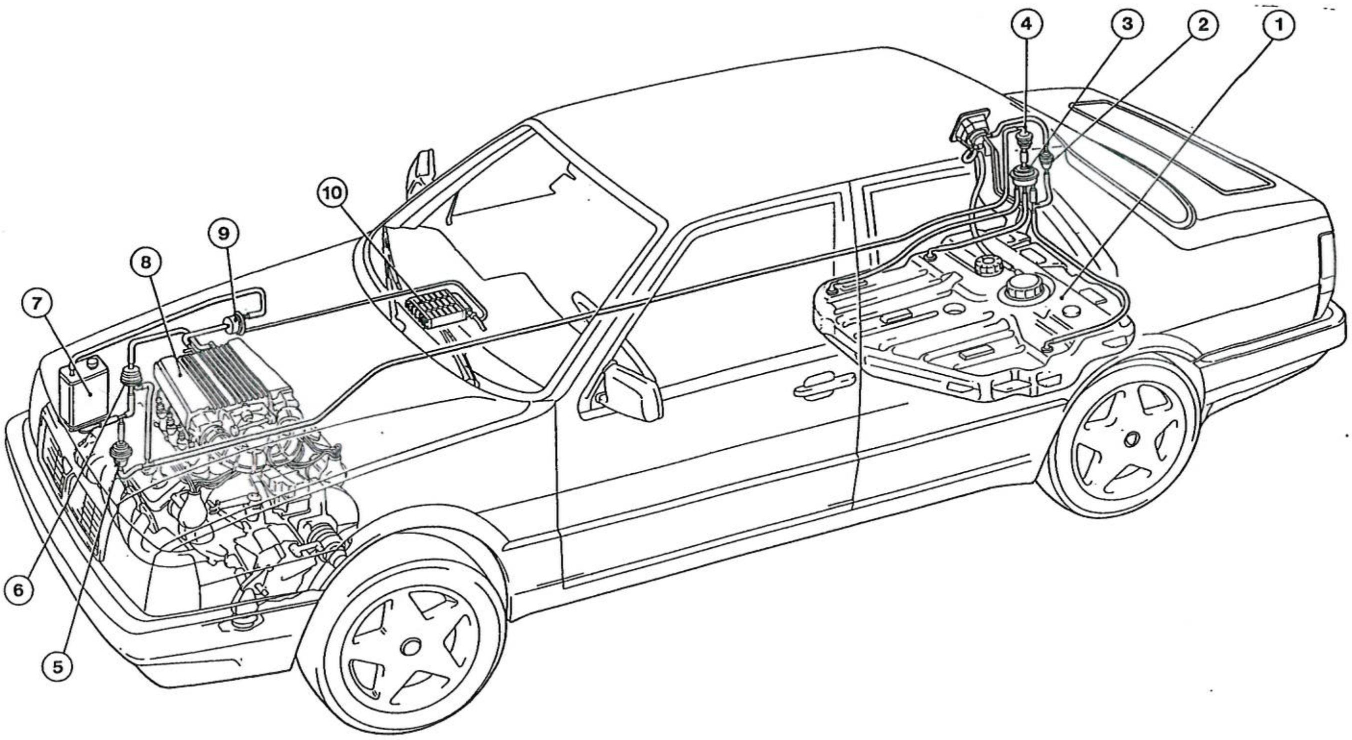
- when idling this ratio is 1/9, i.e. the valve remains open for 0.01 s and closed for 0.09 s per cycle;
- as the revs and engine load increase, the signal's full/empty ratio value rises and therefore the valve's aperture time increases in comparison with the closure time;
- with a full load, the signal is still present, therefore, the valve is still open to allow the petrol vapours to be completely drawn in and the active carbon filter to be well flushed out.



In this way, the control unit controls the amount of petrol vapours sent to the intake, preventing substantial variations (especially when idling) in the mixture strength.

NOTE *The BOSCH solenoid valve should be mounted in a particlular way: the black arrow on the body should face the vacuum inlet on the throttle valve body.*

Diagram showing the assembly of the fuel evaporation control system



1. Fuel tank
2. Balancing valve
3. Petrol vapour separator
4. Safety valve
5. Ventilation valve
6. Breather valve
7. Active carbon filter
8. Intake manifold
9. Petrol vapour cut–off valve
10. Electronic control unit

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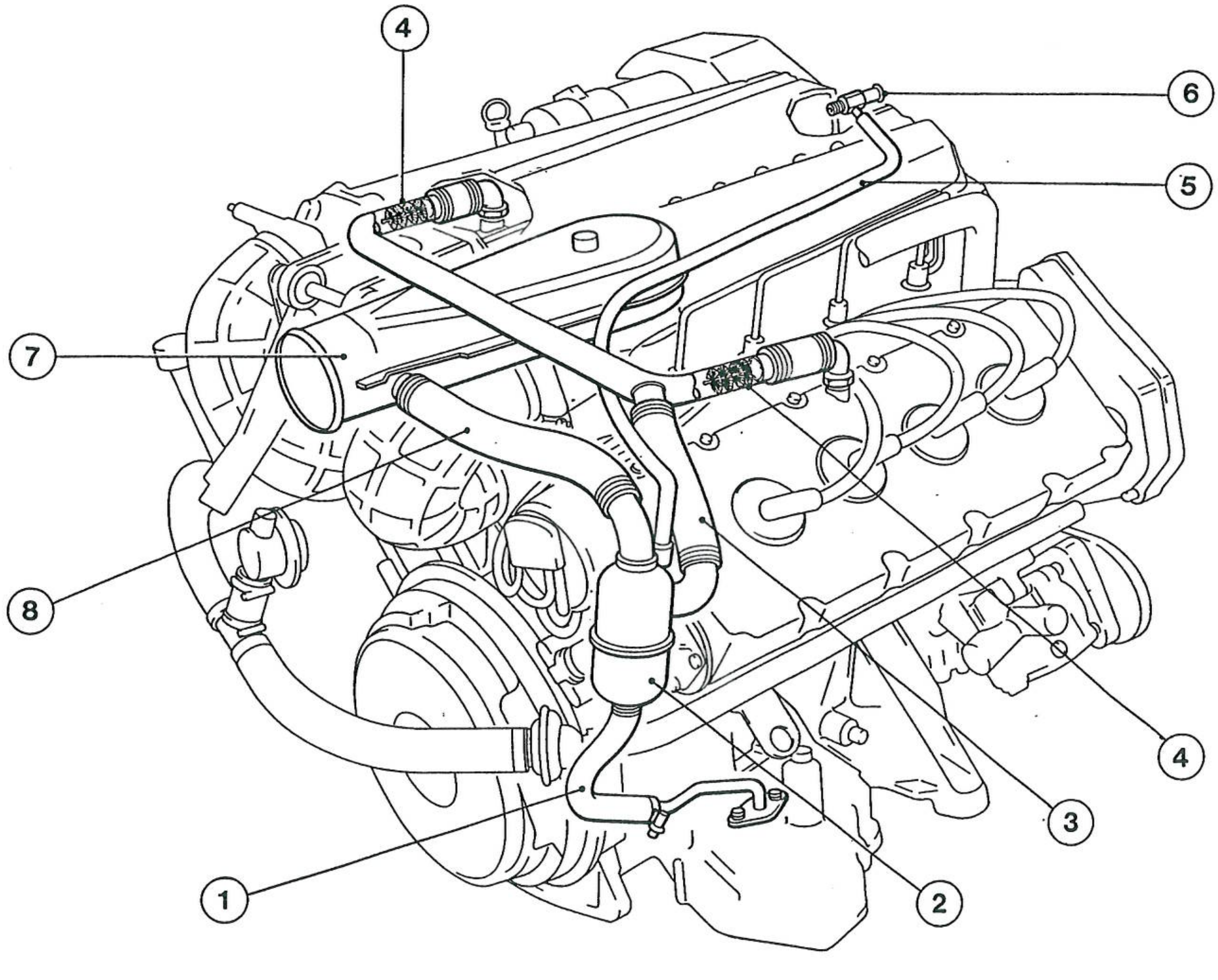
ENGINE CRANKCASE GASES RECIRCULATION SYSTEM

The emissions from the engine crankcase are made up of a mixture of air, petrol and burnt gases which escape through the rubber piston rings, as well as lubricant vapours.
These are known as "blow–by" or "breather" gases.
The breather gases from the crankcase reach the separator (2), via the pipe (1), where the oil vapours condense and flow back into the sump in the form of drops.
The gases from the cylinder heads reach the separator (2) via the pipe (3) in which there are two grids or a spark–out (4) near to the unions on the heads.
When the accelerator throttle is at a minimum, the blow–by gases are drawn in by the engine via the pipe (5) which, by means of the union (6) reaches the air delivery box to the manifolds near the two main bearings' compensation pipe.
When the accelerator is opened further, the gases are drawn in through the pipe (8) and pass to the duct (7) which joins the air cleaner to the air flow gauge.



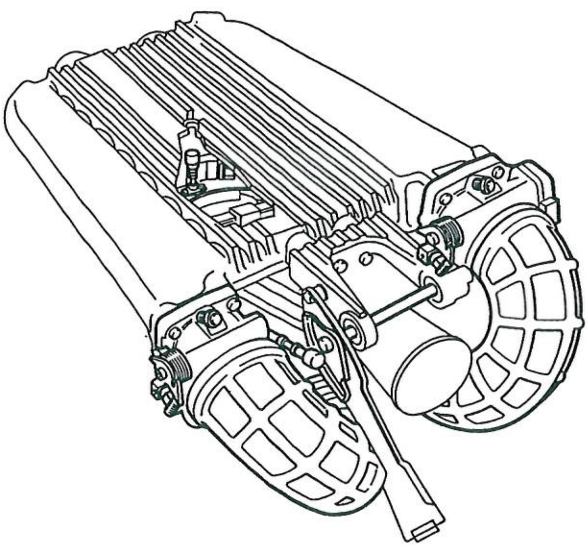
CHECKS AND ADJUSTMENTS

General information and preliminary checks

One of the principal differences which characterizes this engine version, as compared with the "EUROPA", version is the absence of the automatic idle adjustment. This means that the servo idle regulator and the related pipes, including the idle air supply chambers on each injector, (air chamber system) have been removed.
The chamber for mixing the idle air/fuel, injected by the cold start fuel injector, has also been eliminated. It is now mounted directly on the lower part of the air delivery box to the manifolds, near the compensation duct between the main bearings.
The idle speed, therefore, must be adjusted directly at the throttle valve bodies, by turning the relevant by–pass screws.
The engines are carburized and the main bearings synchronized after the on–bench run–in, and it should therefore be sufficient to check the CO level when idling after on–vehicle assembly.
There is only one injection system for both main bearings, whilst there is a double ignition system. It is essential, therefore, to check that both ignition modules are in perfect operational order, before carrying out any adjustments or checks. If the modules are faulty, ignition may not be possible and attempts to start the engine may damage the catalytic converter.
The following checks should be performed:

- check the whole ignition system carefully and replace the spark plugs if they have deteriorated;
- check, too, the integrity and the ground insulation of the high voltage cables and the control module supply cables;
- using the FIAT–LANCIA Tester, check that the Microplex control unit operates correctly;

When tuning up carburetion, it is essential to keep the engine revs and, independently, the operational order of the ignition modules under control.
It is therefore advisable to use a digital type rev counter with a tolerance of ± 100/min connected to the cable which corresponds to cylinder 5 spark plug. It is then possible to detect faulty ignition on the module corresponding to cylinders 5–8–2–3 whilst the module corresponding to cylinders 1–4–6–7 can be checked with the vehicle rev counter in comparison with the digital rev counter.
Also connect a CO–Tester to the two union pipes to analyze the exhaust gases upstream of the catalytic converter.



Adjustment procedures

To carry out the preliminary operations, mentioned above, it is possible to carry out the check on the main bearings' synchronization by operating as described below:

Procedure 1 (throttle valve body adjustment by means of air flow)

1. Bring the engine up to normal running temperature (approx. 80 °C).
2. Check that the by–pass screws (1) on the throttle valve bodies are loosened to an equal degree.

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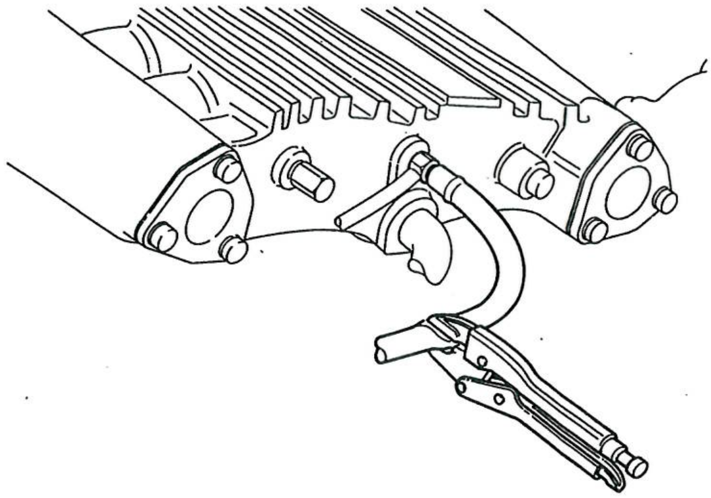
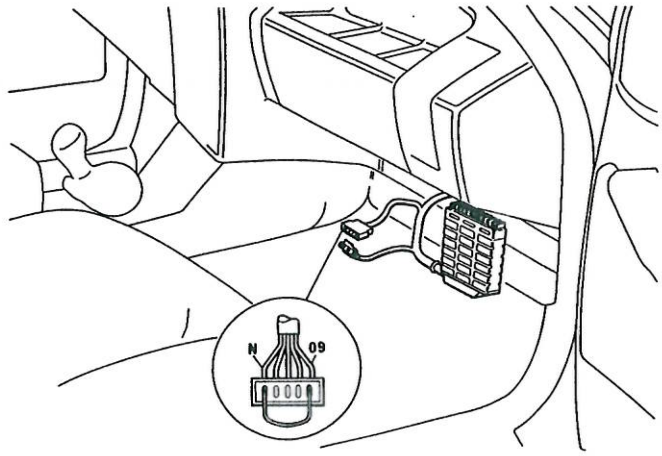
3. Close the pipe connecting the active carbon filter to the BOSCH petrol vapour cut–off valve using pliers. This stops fuel vapours from the tank altering the mixture strength and consequently the CO reading.

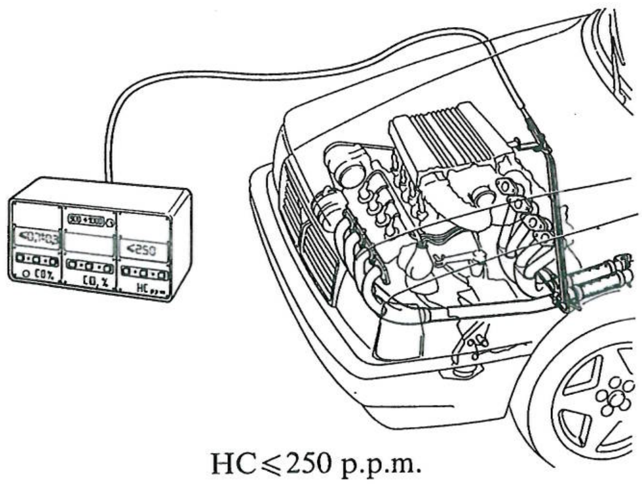


4. Ground terminal 09 of the Bosch KE3.3–Jetronic injection ECU to block the Lambda adjustment circuit. This can be done on the five way connector (encoding socket) situated near the ECU, underneath the instrument panel, by jumpering wire 09 with wire N (ground).



5. Adjust the revs at idle to a value of 970 ± 30/min, turning the by–pass screws (1) of the throttle valve bodies SYNCHRONOUSLY and very slowly (see illustration on the previous page).
6. Adjust the CO and HC values at idle, by turning the relevant adjustment screw (2 – see illustration on the previous page) so as to obtain the following values:

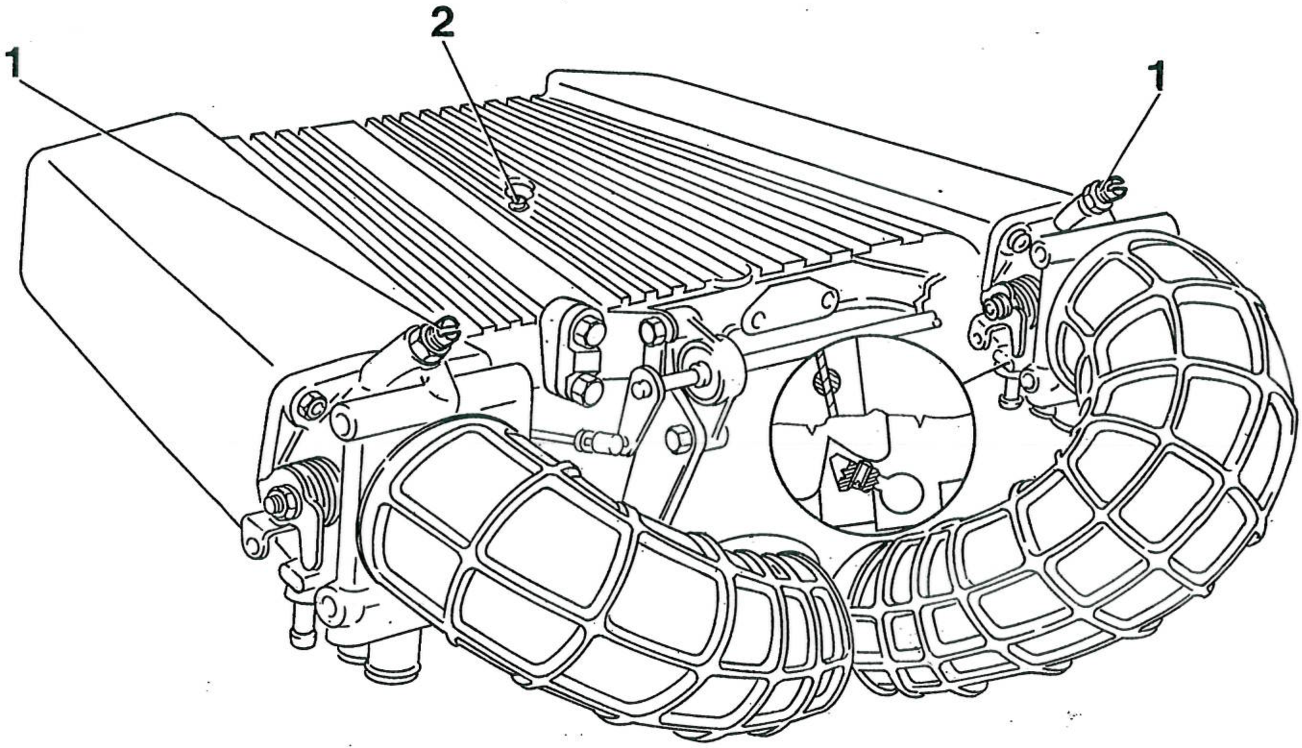
CO = 0.7 ± 0.15%



HC ≤ 250 p.p.m.

7. Remove the jumper from wires 9 and 60 of the encoding socket in order to re–activate the Lambda adjustment. Restore the connection between the active carbon filter and the petrol vapour cut–off valve and check that the engine idle speed remains at a value of approx. 900 ÷ 950/min.

Adjusting the CO may affect the idle speed. Therefore, if necessary, turn the by–pass screws (1) to restore the idle speed to the required value.
It should be remembered, however, that checking and adjusting the CO level has priority over all the other adjustment operations and therefore must be repeated at the end of each procedure.



NOTE *If the HC values are above 250 p.p.m., one or more cylinders have irregular combustion. It then becomes necessary to:*

- *Check the CO and HC emission values for each individual bearing by applying the probe of the CO–tester to the exhaust piping of cylinders 1–2–3–4 and 5–6–7–8 in turn.*
- *Check, and if necessary replace, the cylinder main bearings' spark plugs on which the HC value has been read.*
- *If the defect persists, check the ignition and then the injection systems using the FIAT–LANCIA Tester as shown in the repair manual.*

⚠ *On finishing the procedure, check the CO and HC values at the exhaust ($CO < 0.5\%$; $HC \leq 100$ p.p.m.) as outlined on page 63.*
If the values fail to meet the required levels, it means that the catalytic converter is not operating and should be replaced.

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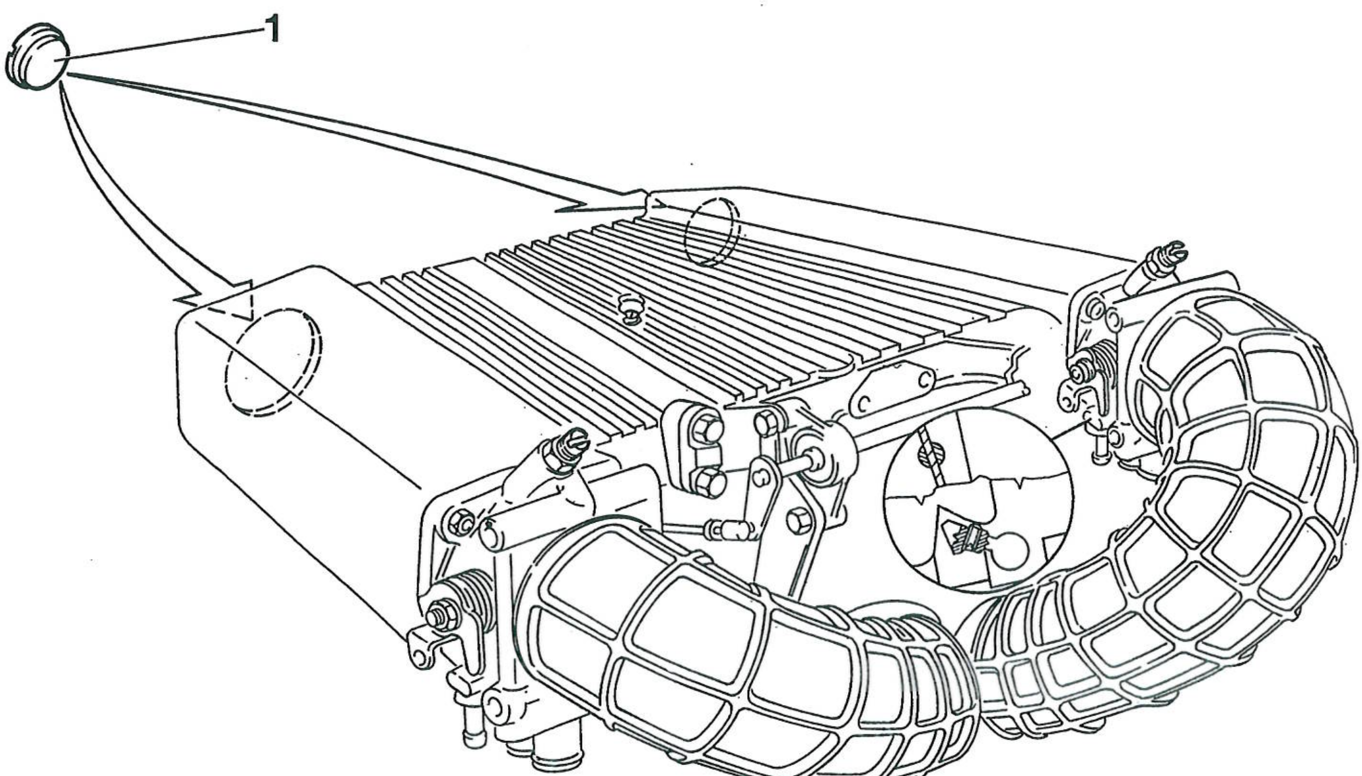
Procedure 2 (synchronizing the main bearings with the by–pass screws)

If it is particularly essential to adjust the idle performing the operations described in **Procedure 1,** it is necessary to check that the air flow when idling is the same for both main bearings. It is therefore necessary to ajdust the two by–pass screws SEPARATELY as follows:

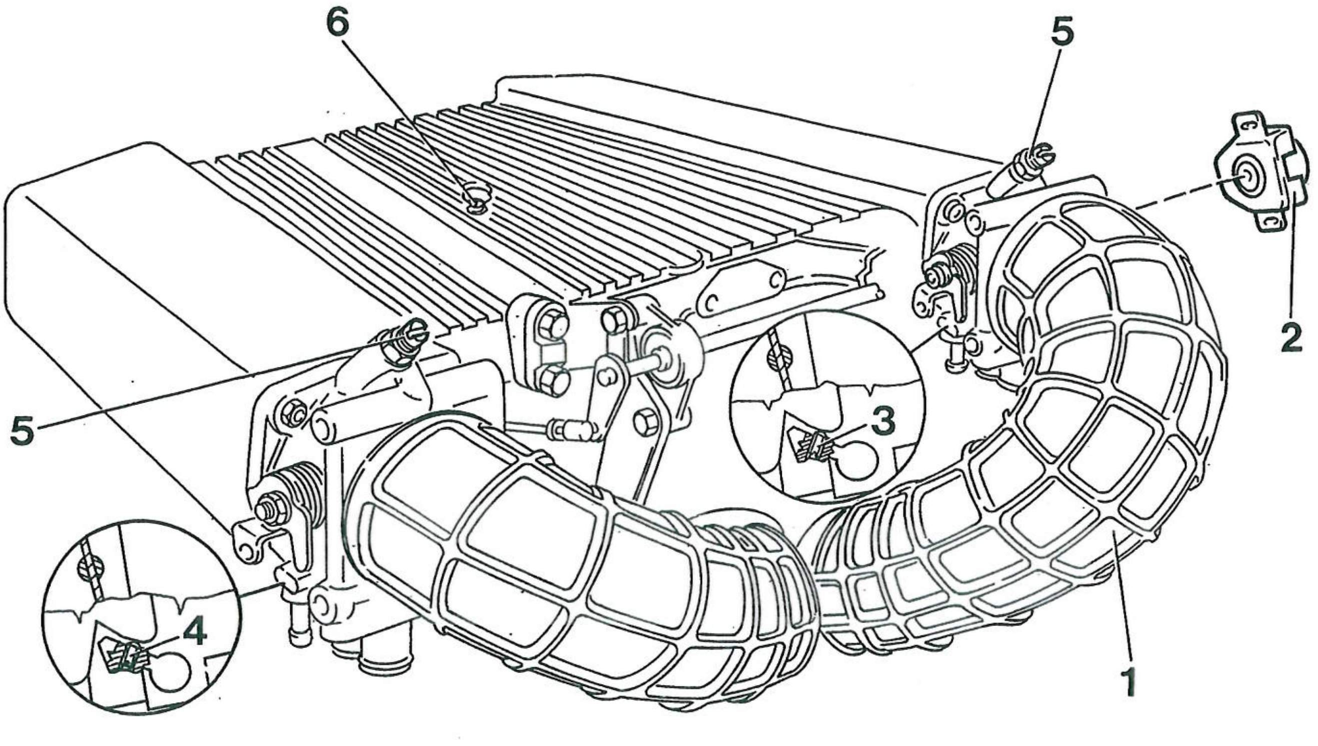
1. With the engine off, remove the two covers (1) from the air delivery box to the manifolds and insert the two specified tools with the union for connection to a vacuum gauge. By attaching these tools, it is possible to cut off the compensation pipe which connects the two main bearings, thus allowing the vacuum value of each main bearing to be read separately.
2. Disconnect the two throttle control rods and connect a mercury vacuum gauge, with a scale of not less than 600 mmHg, to the tools.
3. As described in points 3. and 4. of **Procedure 1,** close the pipe connecting the active carbon filter to the petrol vapour cut–off valve (BOSCH) using pliers, and jumper cable 9 with cable 60 on the five way connector (encoding socket) to stop Lambda adjustment.
4. Start the engine and bring it up to normal operating temperature. Turn the by–pass screw so as to obtain a pressure value in each main bearing of approx. 380 ÷ 400 mmHg with a maximum difference between the two bearings of approx. 2mmHg when the engine is idling.
   The idle speed must be about 900 ÷ 950/min.
5. Check again, and if necessary adjust, the CO value as described in **Procedure 1**.
6. If the idle speed alters from the recommended value (900 ÷ 950/min), turn the by–pass screws again as described in point 4.
7. Reconnect the throttle control rods and accelerate slowly and gradually, checking that whilst moving up, the difference between the two main bearings does not exceed 4 mmHg.
   If this is not the case, adjust the length of one of the control rods so that the pressure between the two main bearings in the progression stage, remains as balanced as possible. By adjusting the throttle control rods it is necessary to ensure that with the accelerator pedal completely released, both throttles return to the rest position perfectly and without any problems.
8. Finally, check the CO and HC at idle speed again, as described in **Procedure 1**.



Procedure 3 (throttle valve bodies back flow with throttle stop screw)

As has been previously described, whilst the vehicle is being built the main bearings are carburated and synchronized after the on–bench run–in procedure and before the engine is installed in the vehicle. The operation described should therefore be carried out only when it is not possible to synchronize the main bearings using the by–pass screws as described in **Procedure 2.**

1. Remove the throttle control rods, the rubber intake sleeve (1) which joins the throttle valve body on the RIGHT to the air flow gauge and loosen the two screws which hold the throttle valve switch (2).
2. Using a shim gauge, check that the throttle open position is equal to 0.1 mm.
   If this value is different it is necessary to disassemble the throttle valve body and adjust the throttle aperture by means of the throttle adjustment screw (3). Finally, re–assemble the throttle valve body, the intake sleeve and replace the throttle valve switch so that the idle contact remains closed when the throttle is in the rest position.
3. Tighten the by–pass screws of the two throttle valve bodies completely and start the engine. When warm the idle speed should stabilize at around 700÷750/min.
4. Check the pressure value in the two main bearings as described in point 4. of **Procedure N. 2** .
5. If the vacuum value established by the throttle valve body on the right is different from that on the left, it is necessary to turn the throttle adjustment screw (4) on the LEFT throttle valve body so as to balance the pressure between the two main bearings.
6. Adjust the CO value and if necessary turn the throttle adjustment screw (4) again to obtain a regular idle speed equal to 700÷750/min.
7. Reconnect the throttle control rods so that they fit freely on to the corresponding pins without any hindrance.
8. Restore the idle speed and the CO value by turning the by–pass screws (5) and the CO adjustment screw (6) as described in **Procedure 1.**



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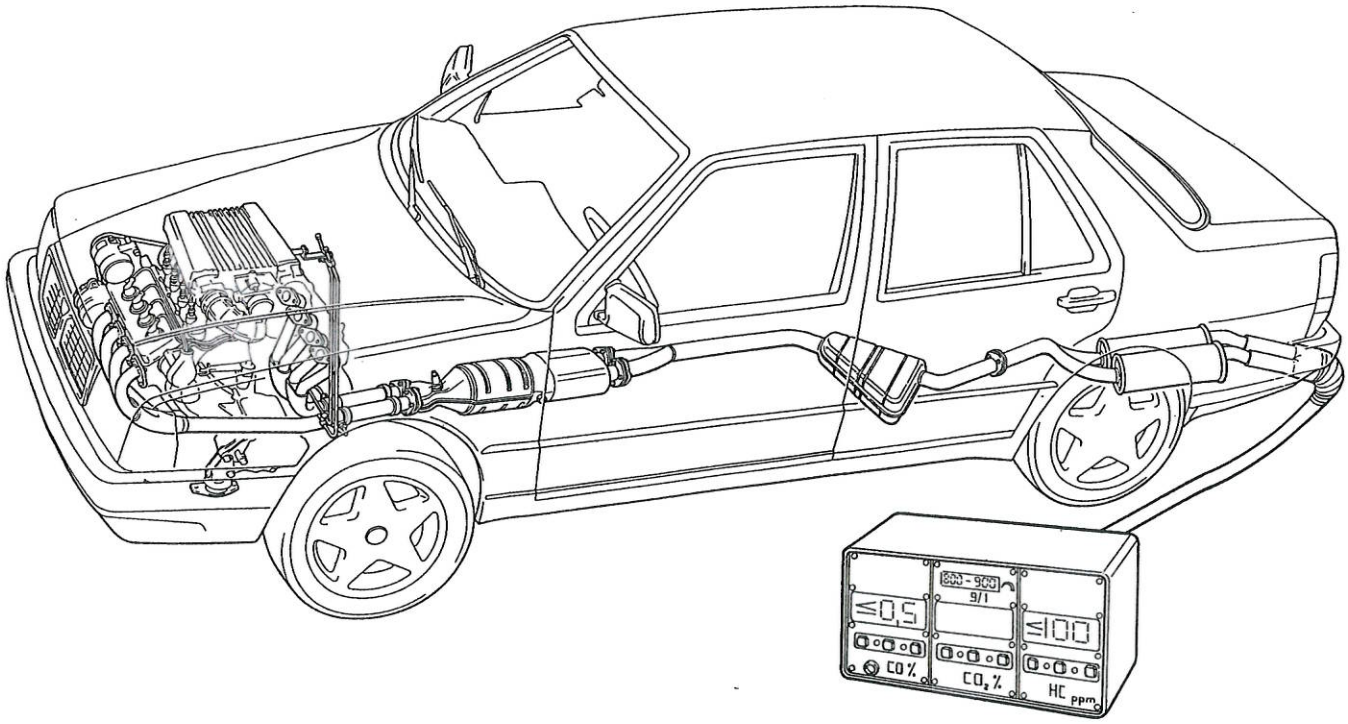
Checking the level of CO and HC at the exhaust

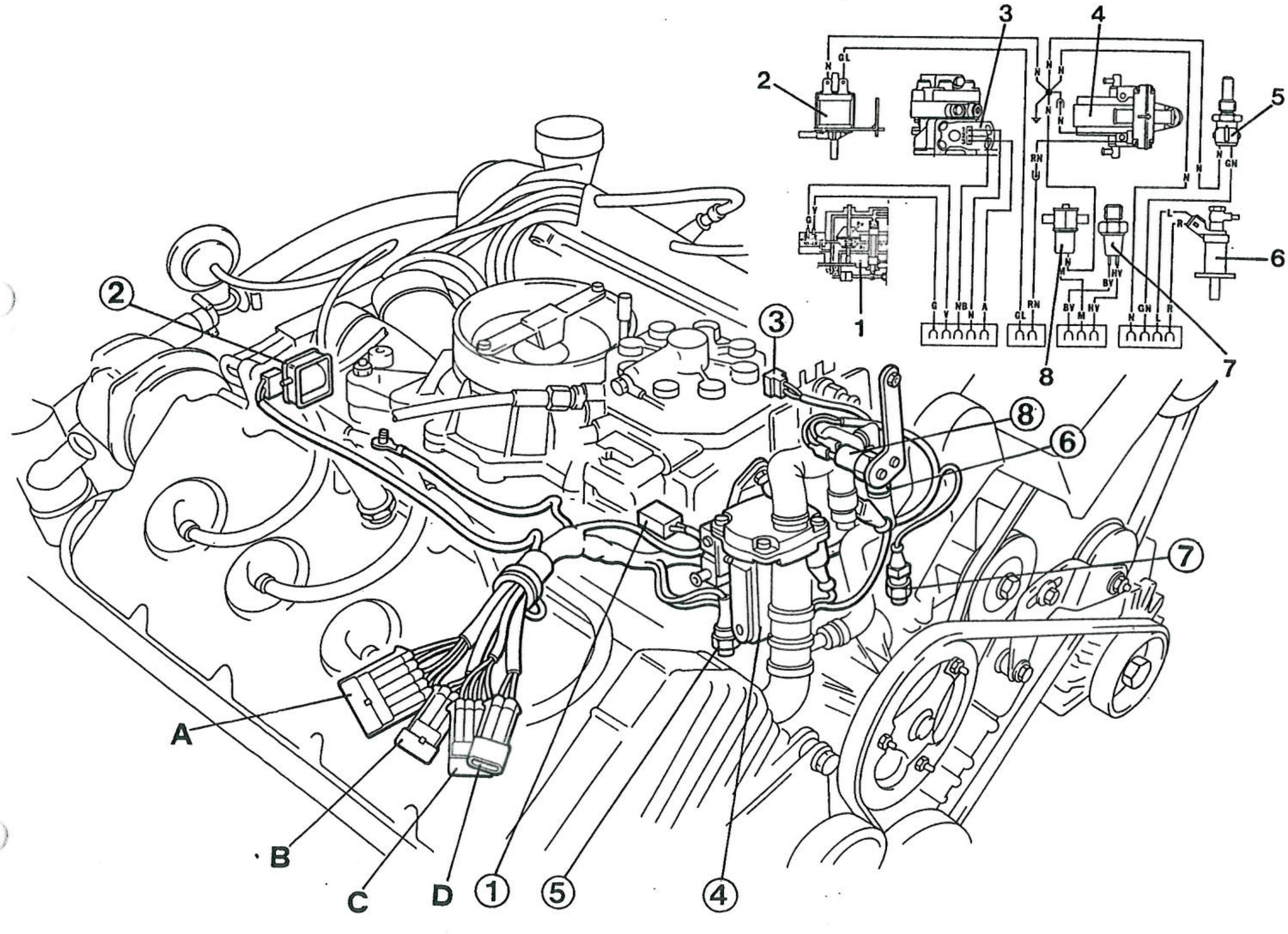
The CO and HC levels at the exhaust are measured by inserting the probe of a set tester into the end of the exhaust pipe to a depth of at least 30 cm as shown in the figure.
If the probe cannot be fully inserted into the exhaust pipe because of the shape of the end of the pipe itself, it is necessary to add an extension tube; the join between them must be air tight. To perform the check with all the correct emission control devices activated, follow the procedure below:

1. Start the engine and bring it up to operating temperature.
2. Check that the rev speed, when idling, is equal to 900 ÷ 950/min.
3. Check that the CO and HC levels are less than or equal to 0.5% and 100 p.p.m. respectively when the engine is idling.
   If the HC value is over the recommended limit, whilst the value previously read upstream of the catalytic converter was correct, the engine parameters can be considered correct and the fault lies in the reduced efficiency of the catalytic converter which should be replaced.



LAY OUT

Electrical wiring and parts of the injection and exhaust air induction



Key

1 Servo pressure regulator
2 Solenoid valve for air induction at the exhaust
3 Potentiometer on air flow gauge
4 Auxiliary air valve
5 Coolant temperature sensor (for injection)
6 Cold start solenoid valve
7 Engine coolant temperature sender
8 Fast idle solenoid valve
ABCD Electrical connectors

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