FUEL MIXTURE
General

SIEMENS COMPUTER

Vehicle	Rénix No.	Homologation No.	R.N.U.R. No.	Diagnostic code
X53 Y	S 101 728 101	77 00 851 755	77 00 862 136	186-3
X57 C - X57 U	S 101 728 102	77 00 851 755	77 00 860 651	183-3
X57 C - X57 U	S 101 728 102	77 00 851 755	77 00 861 454	185-3
X57 C - X57 U - X53 Y	S 101 728 101	77 00 851 755	77 00 863 556	189-3
X53 Y (automatic)	S 101 728 201	77 00 851 756	77 00 863 557	188-3

Temperature in °C	0 ± 1	20 ± 1	40 ± 1	80 ± 1	90 ± 1
Air temperature sensor: Type **CTN BOSCH** : resistance in Ω	5290 to 6490	2400 to 2600	1070 to 1270	--	--
Coolant temperature sensor: Type **CTN SIEMENS** : resistance in Ω	--	3060 to 4045	1315 to 1600	300 to 370	210 to 270

Oxygen sensor: BOSCH LS H 24 reheated	to 850 °C - Rich mixture : **625 to 1100 mV** - Lean mixture : **0 to 80 mV**
Catalytic converter (located under floor)	◇ C 10
Paper cartridge air filter Thermostat and control pneumatic	Replacement : **12,000 miles (20,000 km)**
E.G.R.	
Anti-evaporation system: Canister	CAN 01
Ignition	- Advance settings in injection computer. - Ignition power module (MPA) - Pinking sensor.
Plugs	BOSCH W7 DC Gap: **0.9 ± 0.05 mm** (adjustable)

FUEL MIXTURE
General

Vehicle	Engine						Gearbox	Type of injection
	Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cc)	Comp. Ratio		
X53 W	E7F	730	75.8	64.9	1171	9.25/1	Manual	Monopoint BOSCH throttle body
X57 A		700				9.25/1		
X57 R		706				8.8/1		

Engine	Idle adjustment		Fuel	
	Speed (rpm)	Richness (CO)	Special note	Minimum octane rating
E7F 730	750 ± 50*	VC : 0.3 max. VL : 0.5 max.	Unleaded petrol	I.O. 91
E7F 700				
E7F 706				

* For coolant temperature between **80°** and **100°C**
VC : Test value
VL : Legal value

TYPE OF FUEL SUPPLY	REGULATED MONOPOINT INJECTION
Fuel pump submerged in fuel tank: BOSCH	Voltage : **12 volts** Pressure : **1.06 bar** Flow : **50 l/h minimum**
Fuel filter located under the vehicle in front of fuel tank.	Replacement every **30,000 miles (50,000 km)**
Monopoint throttle body	BOSCH **32 mm dia.**
Pressure regulator integrated in throttle body	Pressure : **1.06 ± 0.05 bar** (not adjustable)
Solenoid injector	Voltage : **12 volts** Resistance : **Approx. 1.2 Ω**
Idle speed regulation micromotor for light throttle.	Not adjustable
Throttle position potentiometer with full load switch.	Test using **XR 25 # 17** Idle speed regulation: **10 to 180** Throttle fully open : **255 max.** Engine stopped, ignition on, equal to or greater than **110**

FUEL MIXTURE
General

SIEMENS COMPUTER

Vehicle	Rénix No.	Homologation No.	R.N.U.R. No.	Diagnostic code
X53 W	S 101 729 101	77 00 854 160	77 00 862 139	173-3
X57 A	S 101 729 102	77 00 854 160	77 00 856 141	159-3
X57 A	S 101 729 102	77 00 854 160	77 00 858 257	163-3
X57 A	S 101 729 102	77 00 854 160	77 00 860 916	171-3
X57 A	S 101 729 102	77 00 854 160	77 00 863 541	177-3
X57 R	S 101 729 103	77 00 851 758	77 00 856 142	160-3
X57 R	S 101 729 103	77 00 851 758	77 00 858 258	164-3
X57 R	S 101 729 103	77 00 851 758	77 00 860 917	172-3
X57 R	S 101 729 103	77 00 851 758	77 00 863 542	178-3
X57 R	S 101 729 103	77 00 851 758	77 00 863 560	179-3

Temperature in °C	0 ± 1	20 ± 1	40 ± 1	80 ± 1	90 ± 1
Air temperature sensor: Type **CTN BOSCH** : resistance in Ω	5290 to 6490	2400 to 2600	1070 to 1270	--	--
Coolant temperature sensor: Type **CTN SIEMENS** : resistance in Ω	--	3060 to 4045	1315 to 1600	300 to 370	210 to 270

Oxygen sensor: BOSCH LS H 24 reheated	to 850 °C - Rich mixture : **625 to 1100 mV** - Lean mixture : **0 to 80 mV**
Catalytic converter (located under floor)	◇ X53 W : C27 , X57 A and X57 R : C21
Paper cartridge air filter Temperature controlled from 26° to 36°C	Replacement : **12,000 miles (20,000 km)**
E.G.R.	
Anti-evaporation system: Canister	CAN 01
Ignition	- Advance settings in injection computer. - Ignition power module (MPA).
Plugs	EYQUEM NGK FC 42 LS BCP 5ES Gap: **0.9 ± 0.05 mm** (adjustable)

FUEL MIXTURE
General

Vehicle	Engine						Gearbox	Type of injection
	Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cc)	Comp. Ratio		
F40 V	E7J	720	75.8	77	1390	9.25/1	Manual	Monopoint BOSCH throttle body
F40 U		724				9.25/1	Manual	
X53 A		700				9.5/1	Manual	
X53 A		702				9.5/1	Manual	
X57 B		710				9.5/1	Manual	
X57 T		718				9.5/1	Manual	
X57 B		711				9.5/1	Automatic	
X57 T		719				9.5/1	Automatic	

Suffix	Idle adjustment		Fuel	
	Speed (rpm)	Richness (CO)	Special note	Minimum octane rating
710 - 718 - 720 - 724	825 ± 50*	VC : 0.3 max. VL : 0.5 max.	Eurosuper Unleaded	I.O. 95
700 - 702	800 ± 50*			
711 - 719	780 ± 50* (1)			

* For coolant temperature between **80°** and **100°C**
VC : Test value - **VL** : Legal value
(1) Engine speed obtained irrespective of the position of the automatic gear lever.

TYPE OF FUEL SUPPLY	REGULATED MONOPOINT INJECTION
Fuel pump submerged in the fuel tank : BOSCH.	Voltage : **12 volts** Pressure : **1.06 bar** Flow : **50 l/h minimum**
Fuel filter located under the vehicle in front of the tank	Replacement every **30,000 miles (50,000 km)**
Monopoint throttle body	BOSCH **36 mm dia.**
Pressure regulator integrated in throttle body	Pressure : **1.06 ± 0.05 bar** (not adjustable)
Solenoid injector	Voltage : **12 volts** Resistance : **Approx. 1.2 Ω**
Idle speed regulation micromotor for light throttle.	Not adjustable.
Throttle position potentiometer with automatic transmission track and full load switch.	Test using **XR 25 # 17** Idle speed regulation: **10 to 180** Throttle fully open : **255 max.** Engine stopped, ignition on, equal to or greater than **135**.

FUEL MIXTURE
General

SIEMENS COMPUTER

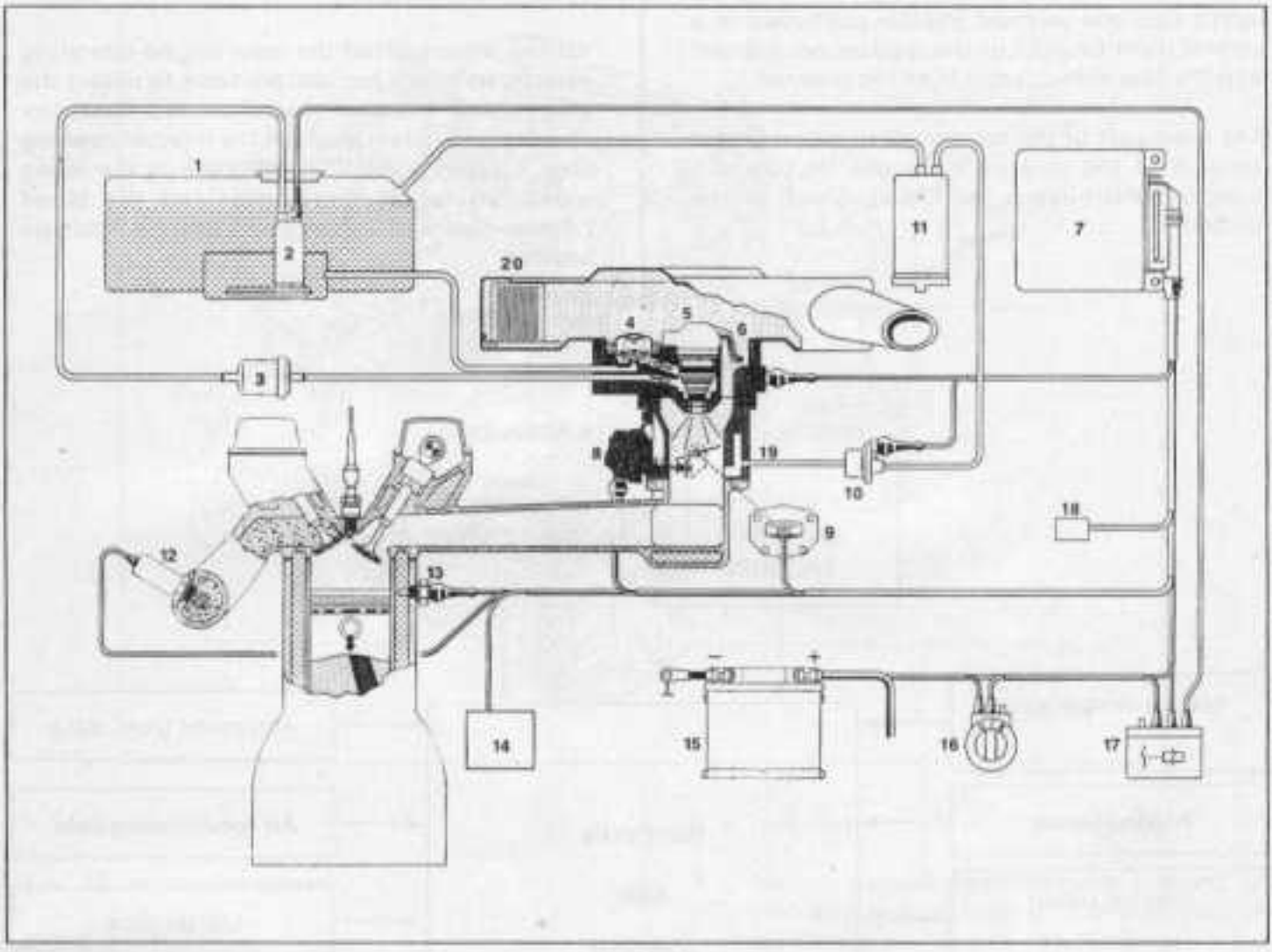
Vehicle	Rénix No.	Homologation No.	R.N.U.R. No.	Diagnostic code
F40 U - F40 V	S 101 708 101	77 00 749 946	77 00 860 650	168-3
F40 U - F40 V	S 101 708 101	77 00 749 946	77 00 860 920	176-3
X53 A	S 101 719 101	77 00 749 946	77 00 856 884	158-3
X53 A	S 101 718 102	77 00 749 946	77 00 858 259	165-3
X53 A	S 101 718 103	77 00 749 946	77 00 862 148	174-3
X57 B - X57 T (Man.)	S 101 718 101	77 00 749 946	77 00 856 047	157-3
X57 B - X57 T (Man.)	S 101 718 102	77 00 749 946	77 00 858 259	165-3
X57 B - X57 T (Man.)	S 101 718 102	77 00 749 946	77 00 860 918	175-3
X57 B - X57 T (Aut.)	S 101 718 201	77 00 749 947	77 00 749 943	152-3
X57 B - X57 T (Aut.)	S 101 718 202	77 00 749 947	77 00 855 565	166-3
X57 B - X57 T (Aut.)	S 101 718 202	77 00 749 947	77 00 860 919	169-3

Temperature in °C	0 ± 1	20 ± 1	40 ± 1	80 ± 1	90 ± 1
Air temperature sensor: Type **CTN BOSCH** : resistance in Ω	5290 to 6490	2400 to 2600	1070 to 1270	--	--
Coolant temperature sensor: Type **CTN SIEMENS** : resistance in Ω	--	3060 to 4045	1315 to 1600	300 to 370	210 to 270

Oxygen sensor : BOSCH LS H 24 reheated	to 850 °C - Rich mixture : **625 to 1100 mV** - Lean mixture : **0 to 80 mV**
Catalytic converter (situated under the floor)	◇ C10
Paper cartridge air filter Temperature controlled from 26° to 36°C	Replacement : **12,000 miles (20,000 km)**
E.G.R.	
Anti-evaporation system : Canister	CAN 01
Ignition	- Advance settings in injection computer. - Ignition power module (MPA). - Pinking sensor.
Plugs	EYQUEM NGK FC 52 LS BCP 5ES Gap: **0.9 ± 0.05 mm** (adjustable)

PRINCIPLE OF OPERATION OF THE BOSCH MONOPOINT INJECTION SYSTEM

OVERVIEW OF THE SYSTEM



1 - Fuel tank.
2 - Electric fuel pump.
3 - Fuel filter.
4 - Pressure regulator.
5 - Solenoid injector.
6 - Air temperature sensor.
7 - Injection computer.
8 - Idling speed regulation micromotor.
9 - Throttle position potentiometer.
10 - Canister bleeding control solenoid.
11 - Fuel vapour absorber (canister).
12 - Oxygen sensor.
13 - Coolant temperature sensor.
14 - Ignition power module (MPA).
15 - Battery.
16 - Ignition switch.
17 - Injection relay assembly - Fuel pump control relay.
18 - Diagnostic socket.
19 - Throttle body.
20 - Air filter.

INTRODUCTION TO THE SYSTEM

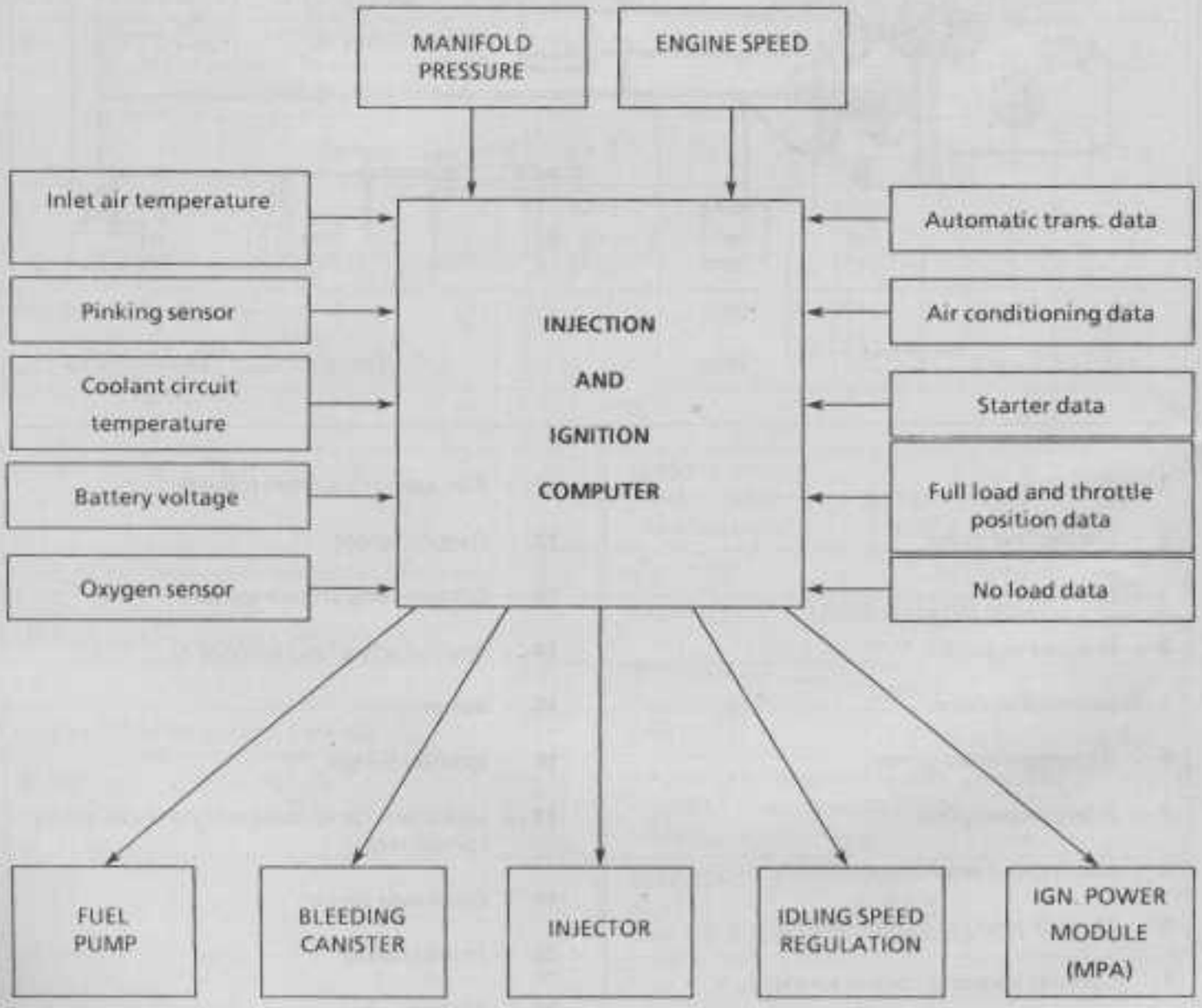
This is a low pressure monopoint injection system with electronic control for 4-cylinder engines which uses one solenoid injector positioned at a central point (instead of one injector per cylinder as is the case of multipoint injection systems).

The main part of the monopoint injection system consists of the throttle body and its solenoid injector, which injects the fuel upstream of the butterfly.

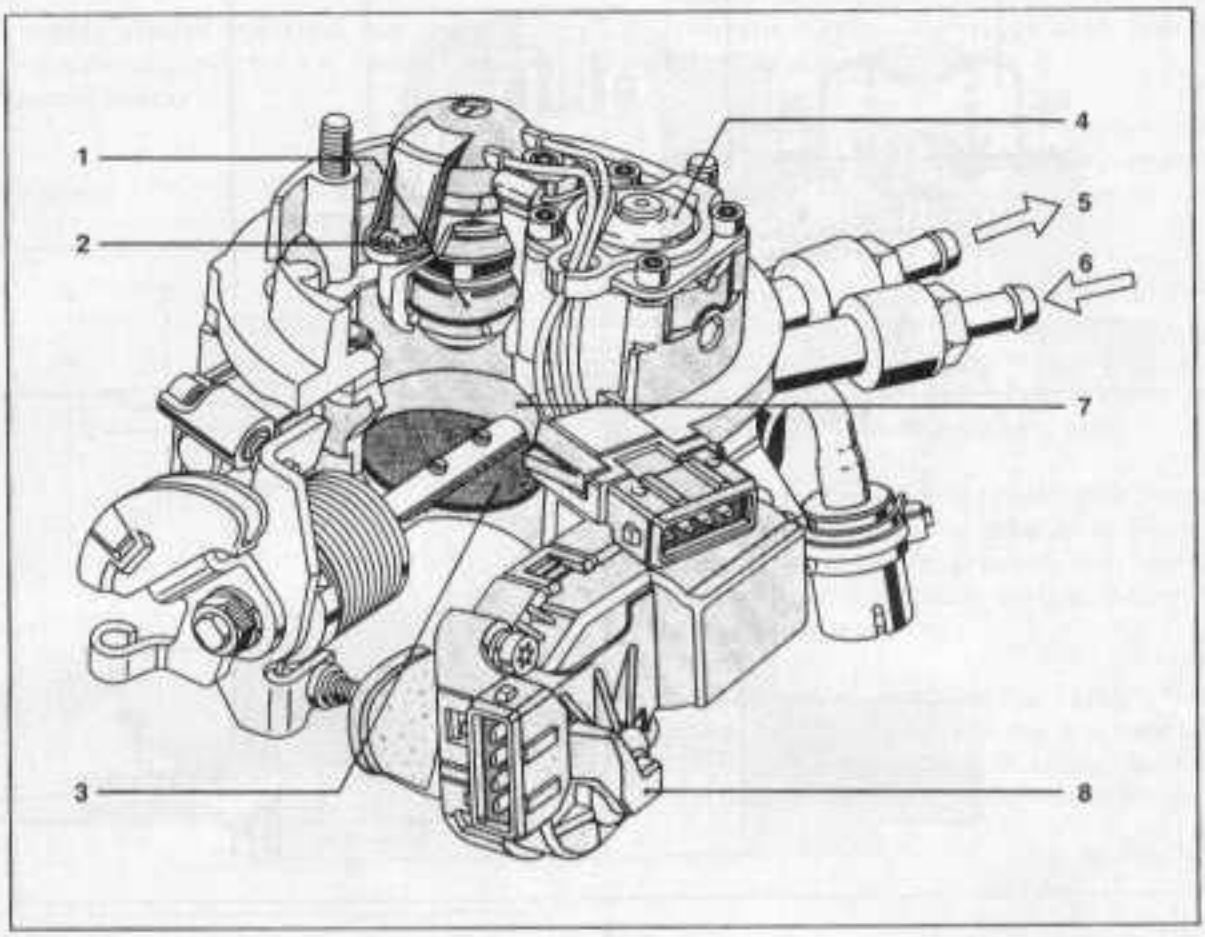
Fuel is distributed between the various cylinders by the inlet manifold.

Various sensors detect the main engine operating parameters which are indispensable to obtain the best possible mixture. Based on this data, the injection computer calculates the injector opening time, supplies power if appropriate to the idling speed regulation micromotor and the bleed canister solenoid valve, and controls ignition advance.

DIAGRAM OF COMPUTER PERIPHERALS



THROTTLE BODY



1 - Injector.

2 - Air temperature sensor.

3 - Butterfly.

4 - Pressure regulator.

5 - Fuel return.

6 - Fuel inlet.

7 - Throttle position potentiometer (cannot be seen as it is positioned on the extension of the throttle shaft).

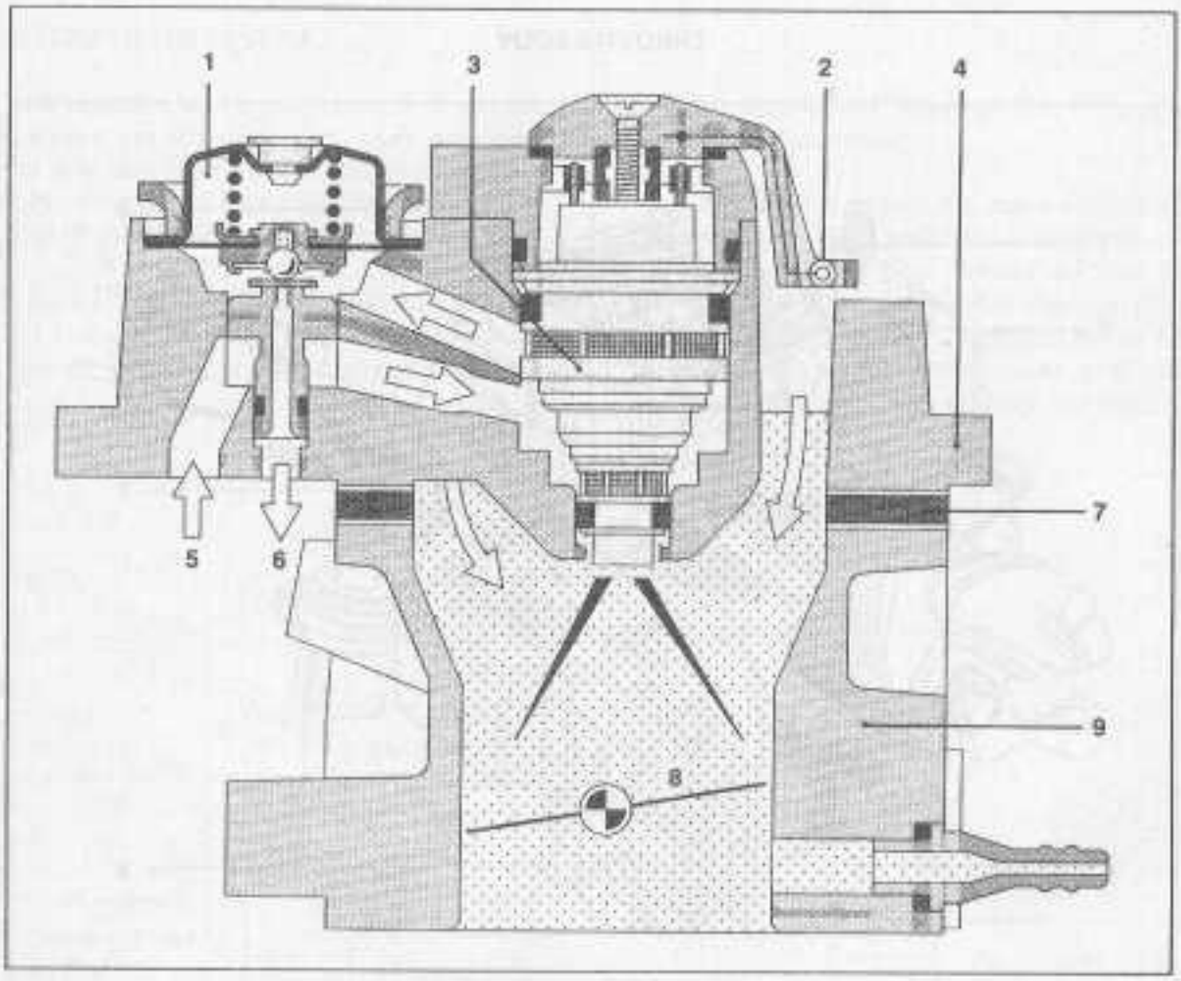
8 - Idling speed regulation micromotor.

The throttle body is directly on the inlet manifold and supplies the engine with atomised fuel. Its design is governed by the fact fuel is injected centrally and the amount of air sucked in by the engine is indirectly determined as a function of two parameters:
- butterfly angle,
- engine speed.

This injection unit can be divided into two sections:

Lower section

It consists of the butterfly and the throttle angular position potentiometer. The idling speed regulation micromotor is also secured to the lower section of the throttle body.



1 - Pressure regulator.

2 - Air temperature sensor.

3 - Injector.

4 - Upper section of the unit.

5 - Fuel inlet.

6 - Fuel return.

7 - Thermal spacer.

8 - Butterfly.

9 - Lower section of the unit.

Upper section

This is the entire fuel system which consists of the injector, the pressure regulator and the fuel pipes. Two oblique pipes lead to where the injector is fitted. The injector is supplied with fuel via the lower pipe and fuel returns to the tank via the upper pipe and the pressure regulator. This arrangement of fuel pipes ensures that there is sufficient fuel at the injector metering point and, as a result, the vehicle starts efficiently.

Fuel which is not injected is divided into two flows. One crosses the injector and the other shrouds the injector.

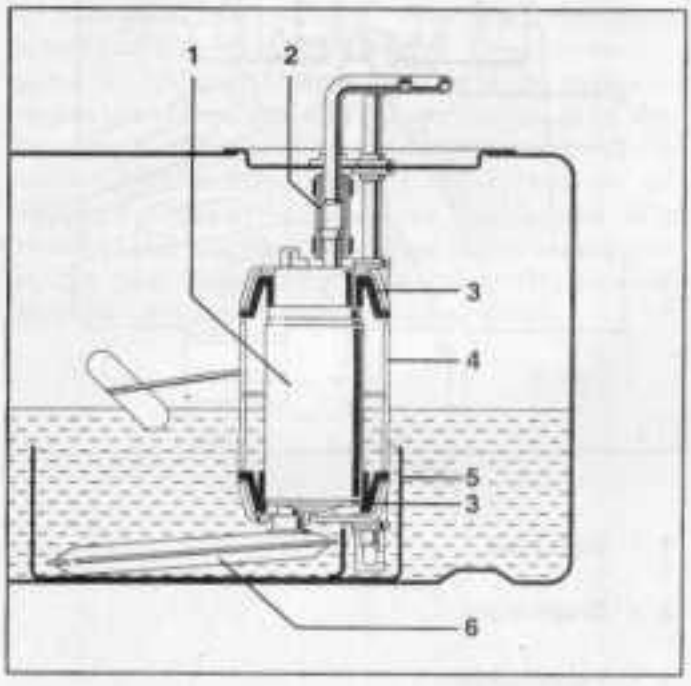
This solution ensures that the injector is continuously supplied with fresh fuel and that it is cooled rapidly. The excellent performance of the fuel system when the engine is hot is due to this system.

The intake air temperature sensor is also fitted on the protective casing of the upper section.

FUEL SUPPLY

The fuel supply system transfers fuel from the tank to the solenoid injector. It consists of the following components:

A) Electric pump



1 - Electric fuel pump.

2 - Rubber hose.

3 - Rubber packing.

4 - Plastic casing.

5 - Stabilising pan incorporated in the tank.

6 - Fuel strainer.

The electric fuel pump is incorporated in the fuel tank. It delivers fuel through a filter to the monopoint injection unit.

The electric motor and the pump unit in the electric fuel pump are located in the same casing. They are continually swept with fuel and are therefore always cooled.

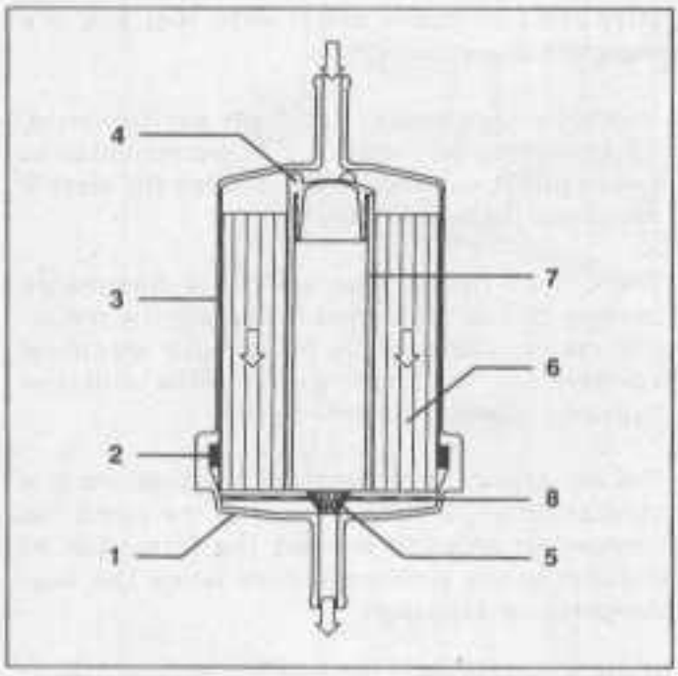
This technique makes for high performance, whilst limiting the methods of implementation to ensure that it remains sealed between the electric motor and the pumping unit.

There is no risk of explosion as a flammable mixture cannot be formed in the electric motor. The connecting cover is fitted with electrical connections, the non-return valve and the hydraulic union on the delivery side.

The non-return valve maintains the pressure at a constant level for some time after the pump has stopped in order to prevent the formation of bubbles in the delivery system when the fuel temperature is too high.

If the temperature of the fuel is high, this type of pump offers good delivery performance and efficient sound-damping, as vapour bubbles in the fuel have already been removed in the pump.

B) Fuel filter



1 - Filter cover.

2 - Sealing strip.

3 - Filter housing.

4 - Sealing plug.

5 - Supporting ribs.

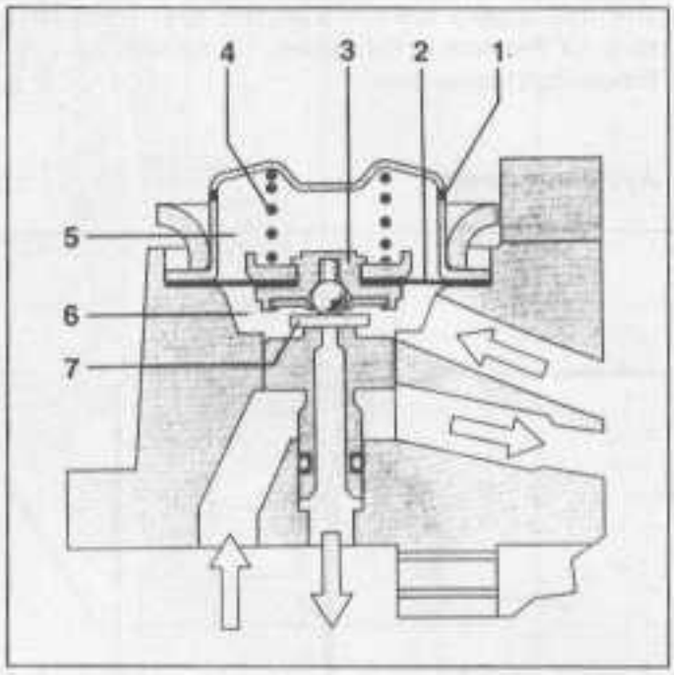
6 - Paper.

7 - Paper support.

8 - Strainer.

Impurities in the fuel may have a detrimental effect on the operation of the injector and pressure regulator. To remove impurities from the fuel, a filter is fitted in the fuel line between the pump and injector. This is situated under the vehicle near to the reservoir. It contains a strainer which traps any paper which may become detached. This is why it is imperative to keep to the direction of flow shown on the filter.

C) Pressure regulator



1 - Vent hole.

2 - Diaphragm.

3 - Valve holder.

4 - Compression spring.

5 - Upper chamber.

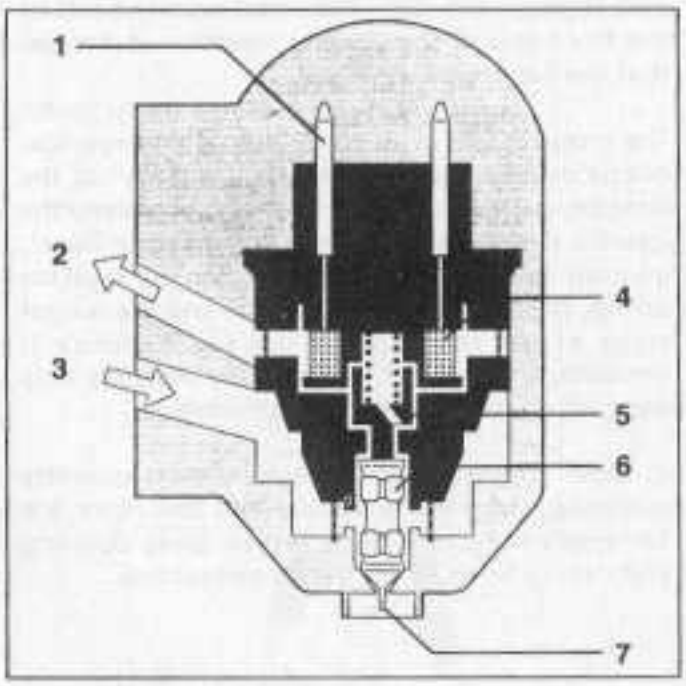
6 - Lower chamber.

7 - Valve plate.

A diaphragm divides the regulator into a lower chamber, subject to the effect of the fuel pressure, and an upper chamber, where a calibrated helical spring rests on the diaphragm. A moving valve plate, permanently connected to the diaphragm by the valve holder, is pressed against the valve seat by the action of the spring.

As soon as the pressure, which results from the pressure of the fuel and the surface of the diaphragm, exceeds the opposing force from the spring, the valve plate is lifted slightly from its seat and the fuel can then return to the tank via the part of the pipe which is opened up in this way. The compensating pressure between the upper and lower chambers is approx. **1 bar**. The valve plate travel varies depending on the amount of fuel delivered and used. Fuel is not delivered when the engine is not running. The non-return valve on the electric fuel pump and the pressure regulator valve close the circuit, thus causing the pressure in the system to be maintained for some time. This facility prevents the formation of vapour bubbles after the engine has stopped, as a result of the fuel being reheated in the supply line by the heat radiated by the engine. This ensures that the vehicle will start up again reliably.

SOLENOID INJECTOR



1 - Connection.

2 - Fuel return.

3 - Fuel intake.

4 - Coil.

5 - Rotor.

6 - Needle.

7 - Injection nozzle.

The injector consists of a coil, electrical connection, and a metallic body which guides the injector needle with a rotor on top.

When the coil is not supplied with power, a helix spring, assisted by the fuel pressure, presses the injector needle on to its seat.

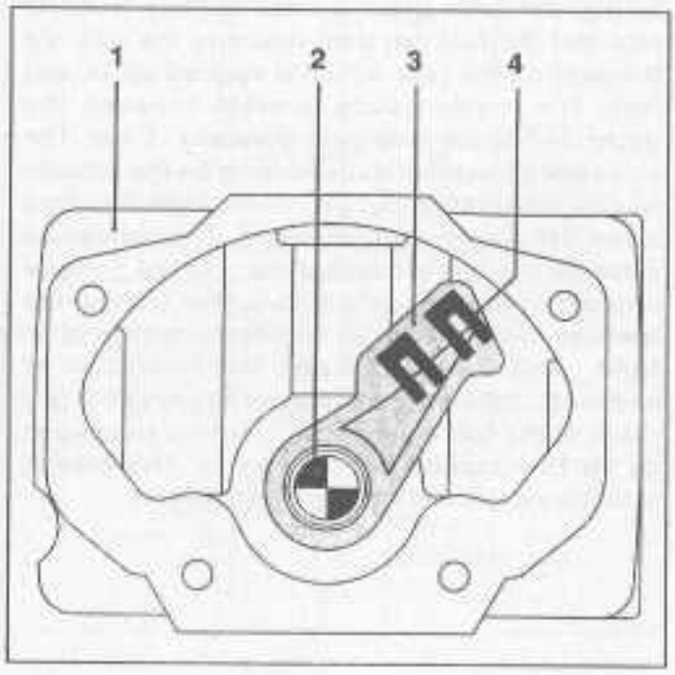
As soon as the coil is excited, the needle lifts approx. **0.06 mm** off its seat; the fuel can then pass through the slot. The injection nozzle is at the front end of the injector needle and ensures that the fuel is well atomised.

The cross-section of the fuel pipe at the injection nozzle determines the "statistical capacity" of the injector, i.e. the maximum flow of fuel to keep the injector permanently open. The "dynamic flow", injected intermittently, depends on the injector spring, the needle weight, the coil and the output stage of the computer. If the fuel pressure is constant, the flow of fuel actually injected only depends on the time the injector is open.

In order to ensure accurate minimum quantity metering, the injector needle and the rotor are extremely light in weight, which gives opening and closing times of less than a millisecond.

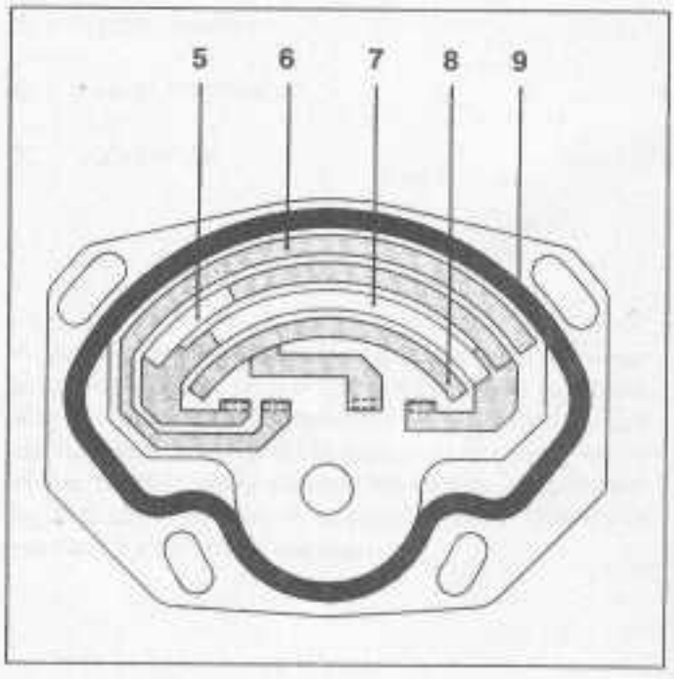
THROTTLE POSITION POTENTIOMETER

Body with cursor



1 - Lower section of throttle body.
2 - Throttle shaft.
3 - Bush.
4 - Cursors.

Throttle body cover with potentiometer track



5 - 7 - Resistance track.
6 - 8 - Collector track.
9 - O ring.

The potentiometer brush is mounted directly on the throttle shaft. The resistance tracks and the electrical connectors are on a plastic plate screwed to the lower part of the throttle body. The screws are protected by anti-tamper caps. Voltage will be supplied from a stabilised 5 V supply

To obtain greater accuracy, the range of throttle angles between idling speed and full load is divided between two resistance tracks. A parallel conductive track (collector track) is allocated to each of the two resistance tracks.

The brush is fitted with four cursors, each of which is matched to a potentiometer track. A conductor links the resistance track and the corresponding collector track of each cursor which allows a signal to be transmitted from the resistance track to the collector track.

The first track covers the range of angles from 0° to 24°, and the second is from 18° to 90°. The angular position signals are converted and interpreted by the injection calculator.

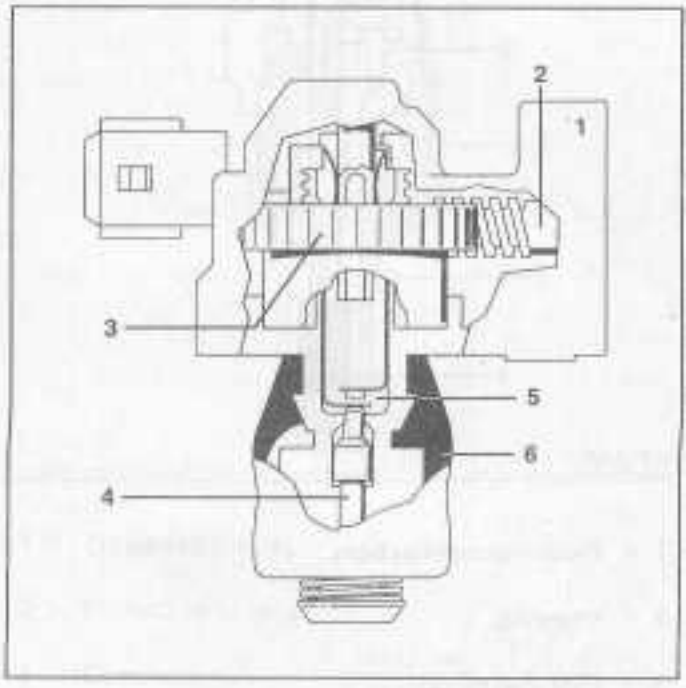
The computer makes use of voltage ratios so that there is no effect on metering accuracy when the potentiometer is old or if there are temperature variations. To prevent the ingress of moisture and foreign bodies, an O ring is located in a groove on the outside of the potentiometer base plate. The potentiometer chamber is connected to the ambient air by a vent or upstream of the throttle butterfly by a special duct.

IDLING SPEED REGULATION

This system of regulation allows the idling speed to be reduced and stabilised. It ensures that the idling speed is kept at the predetermined limit under all conditions by means of a micromotor which controls throttle opening. In order to reduce the tendency of vehicles with automatic transmissions to creep, the idling speed decreases when a gear is selected. The idling speed is often increased (initiation of minimum engine speed) when the air conditioning is activated, so that adequate cooling performance is obtained.

To avoid fluctuations in engine speed when the compressor is activated, the engine keeps running at the higher speed, even if the compressor is not activated.

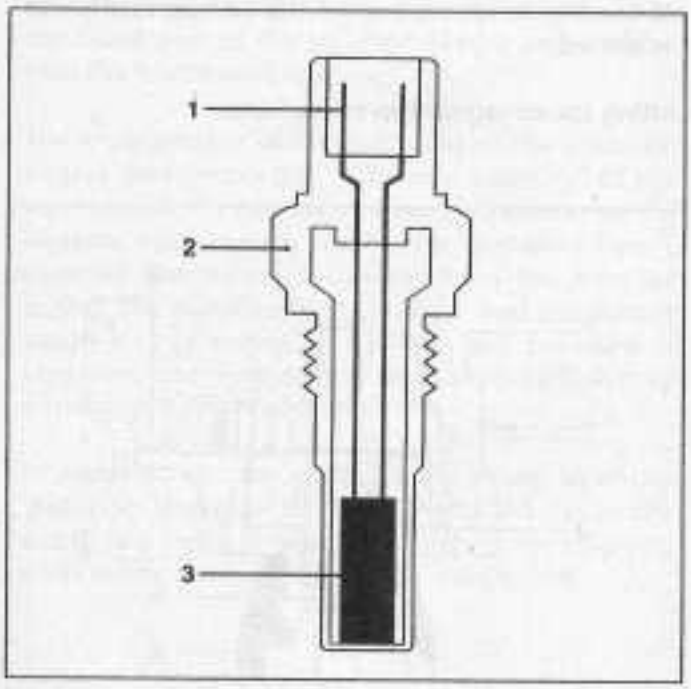
Idling speed regulation micromotor



1 - Body and electric motor.
2 - Pinion.
3 - Helical toothed wheel.
4 - Positioning shaft.
5 - Light throttle switch.
6 - Rubber bellows.

The positioning shaft acts on the throttle lever and can therefore influence the flow of air to the engine. It is equipped with a DC motor which acts on the positioning shaft via a pinion and a helical toothed wheel. Depending on the direction of rotation of an electric motor, the positioning shaft protrudes and thus opens or reduces the butterfly opening angle as soon as the polarity of the motor is reversed. A switching contact, which is closed when the positioning shaft touches the throttle lever and thus indicates the light throttle position on the computer, is incorporated in the positioning shaft. A rubber bellows, located between the positioning shaft and the micromotor casing, prevents the ingress of moisture and dust.

COOLANT TEMPERATURE SENSOR



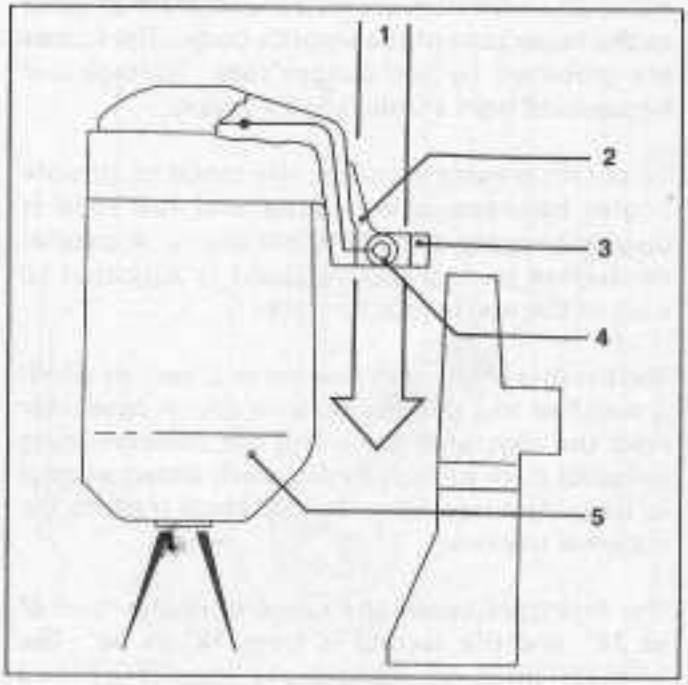
1 - Electrical connection.

2 - Housing.

3 - CTN thermistor.

The engine temperature has a considerable influence on fuel consumption. A temperature sensor incorporated in the cooling system measures the temperature of the engine and transmits an electrical signal to the computer. It has a threaded bush which shrouds a CTN (Negative Temperature Coefficient) semi-conductor resistor (thermistor). The computer makes calculations using the resistance which varies as a function of temperature.

INTAKE AIR TEMPERATURE SENSOR



1 - Intake air.

2 - Moulding.

3 - Protection against contact

4 - CTN thermistor.

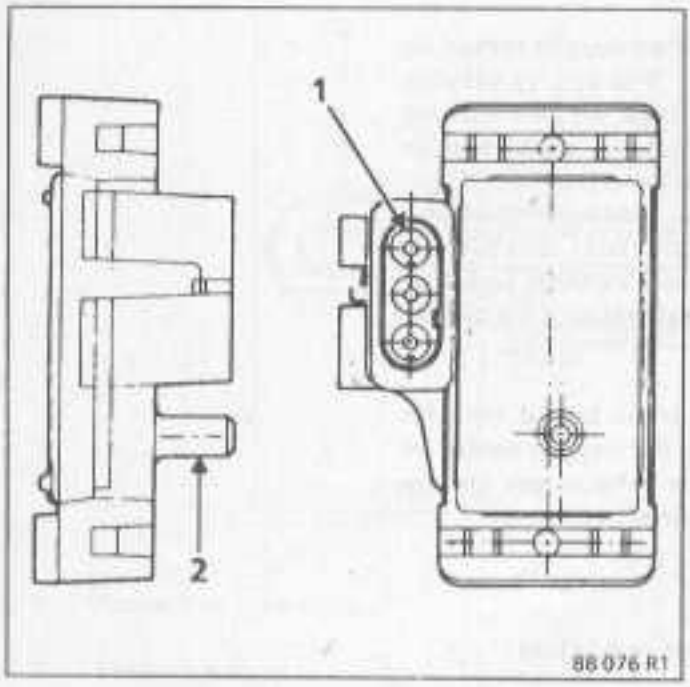
5 - Injector.

The density of the intake air depends on its temperature. To counteract this phenomenon, a temperature sensor is mounted in the injection unit intake pipe and indicates on the computer the temperature of the air sucked in by the engine.

The sensor consists of an **CTN** thermistor. The thermistor is located at the end of a moulding at the point where the intake air flows quickly, so that temperature variations can be detected as quickly as possible.

The electrical connection for the sensor and the injector are fitted with a 4-track connector.

ABSOLUTE PRESSURE SENSOR



1 - Connector.

2 - Inlet manifold pressure tapping tube.

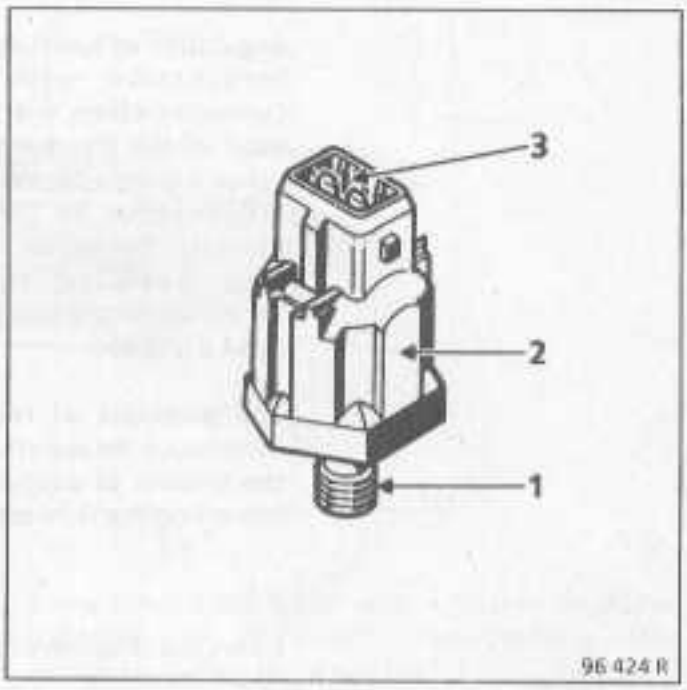
The pressure in the inlet manifold is measured by a sensor which provides an electrical reflection of the pressure in the intake manifold.

This signal is one of the main parameters for calculating injection and ignition times.

This is a piezo-resistive sensor. The pressure modifies the resistance of zones with a silicon crystal.

The sensor, supplied with **5 V**, indicates on the computer an electrical reflection of the pressure using variations in resistance. It is connected to the inlet manifold by a rubber hose and must be fitted as closely to the intake manifold as possible, to reduce the response time of the injection system.

PINKING SENSOR



1 - Threaded socket.

2 - Protective casing.

3 - Connection.

The pinking sensor consists of a threaded socket in the cylinder head or block and a casing containing a piezo-electric ceramic disc compressed by a metallic weight held in place by a flexible washer.

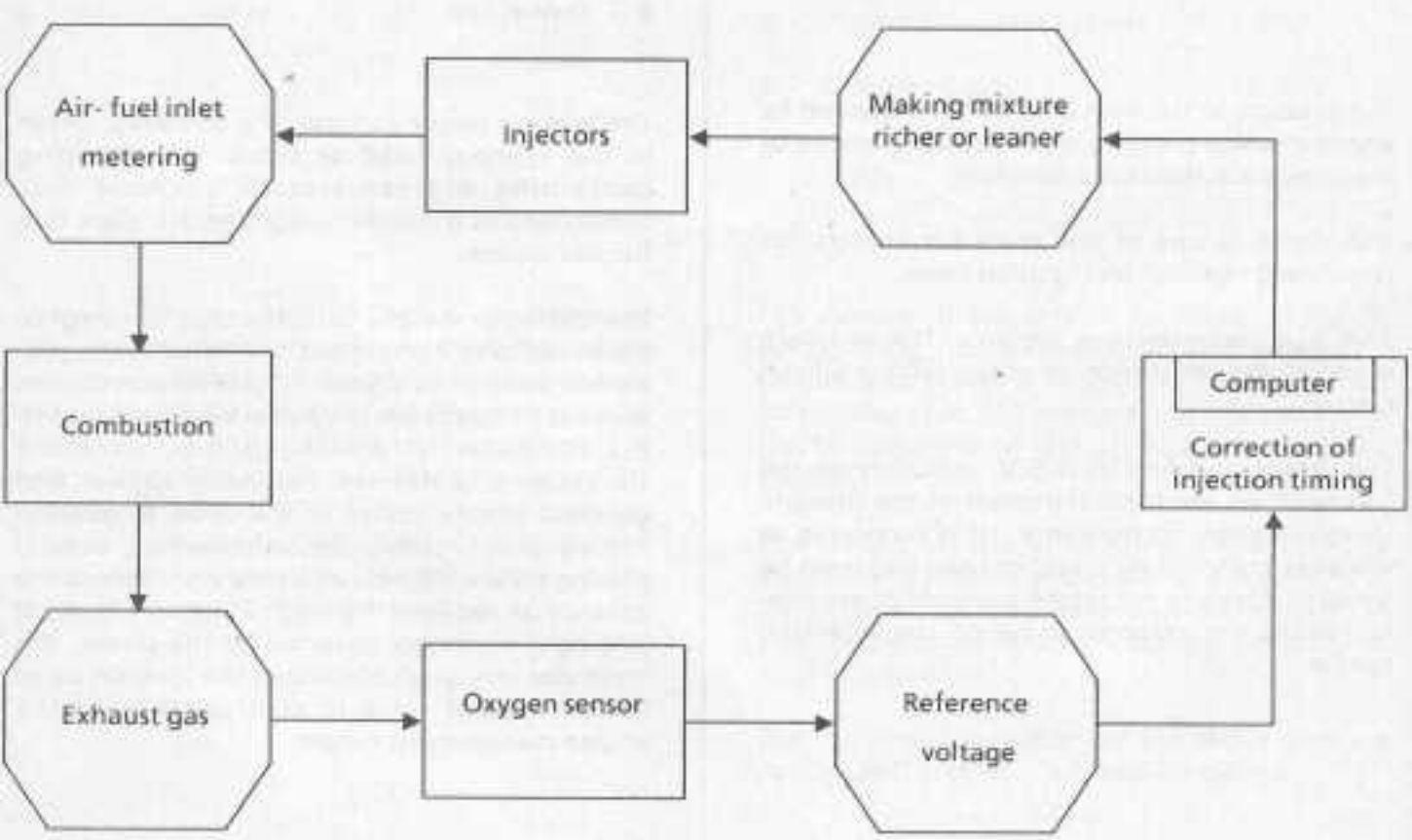
The metallic weight is subjected to engine vibrations and compresses the sensitive piezo-electric element to a lesser or greater extent. This element transmits electric pulses which are sent to the computer. If pinking occurs, parasitic vibrations of a defined frequency appear and generate electric pulses of the same frequency. The computer receives this information, detects pinking on one cylinder at a time and corrects the advance as required for each cylinder. Then, if pinking is no longer detected by the sensor, the computer very gradually moves the ignition point to the mapped value in accordance with the engine management system.

REGULATING FUEL RICHNESS BY LAMBDA SENSOR

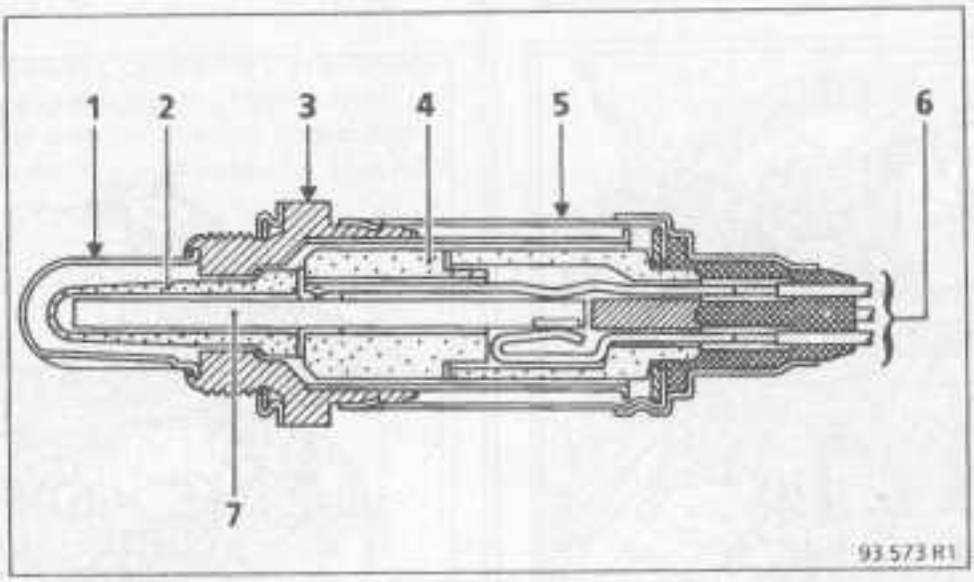
Regulation of fuel richness by an oxygen sensor, in conjunction with the 3-way catalytic converter, offers the advantage of eliminating most of the three main pollutants contained in exhaust gases **(CO, HC, NOx)**.
It is essential for the good functioning of the catalytic converter that the fuel mixture is metered very precisely to give a richness factor of **1** (i.e. near to the stoichiometric ratio of **1 g** of fuel to **14.8 g** of air).

The principle of regulation is based on the continuous measurement by the oxygen sensor of the amount of oxygen in the exhaust gas and by correcting the richness measured in this way.

Overview diagram of richness regulation



Oxygen sensor



1 - Protective sheathing.

2 - Ceramic sensor.

3 - Metallic base.

4 - Ceramic contact bush.

5 - Protective bush.

6 - Electrical connection.

7 - Heating element.

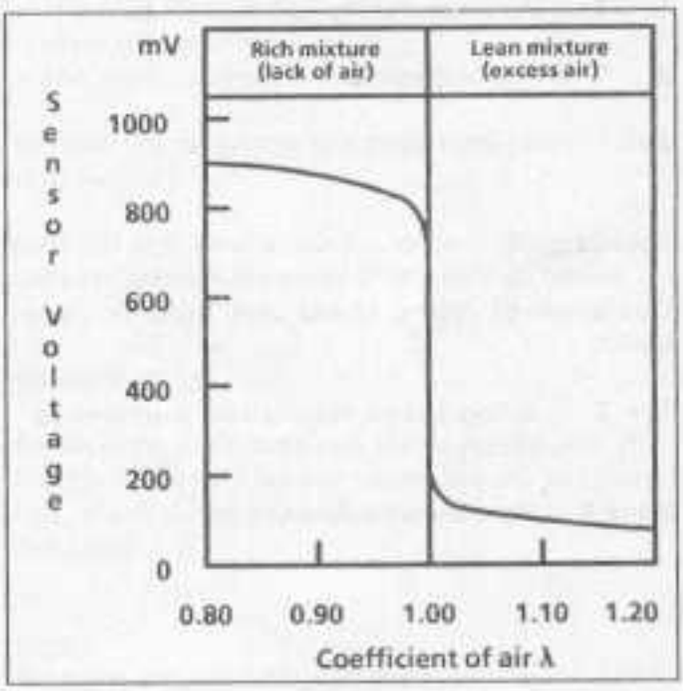
Fitted in the exhaust downpipe, the oxygen sensor transmits alternating rich mixture - lean mixture data to the computer in line with the mixture richness. The exterior of the ceramic part of the sensor is in contact with the exhaust gas (via the protective sheathing) and the exterior part is in contact with the ambient air (via an air vent in protective bush).

The operating method of this sensor is based on the capacity of the ceramics used to conduct oxygen ions from a temperature of approx. **250°C**.

If the oxygen content is not the same at both sides of the ceramic section, an electrical voltage is established between the two limit surfaces. This voltage, which is an electrical reflection of the oxygen content of the exhaust gas, is therefore transmitted to the computer which corrects the injection timing.

Some sensors are fitted with a heater resistance supplied with power after the ignition. This primes the sensor more quickly.

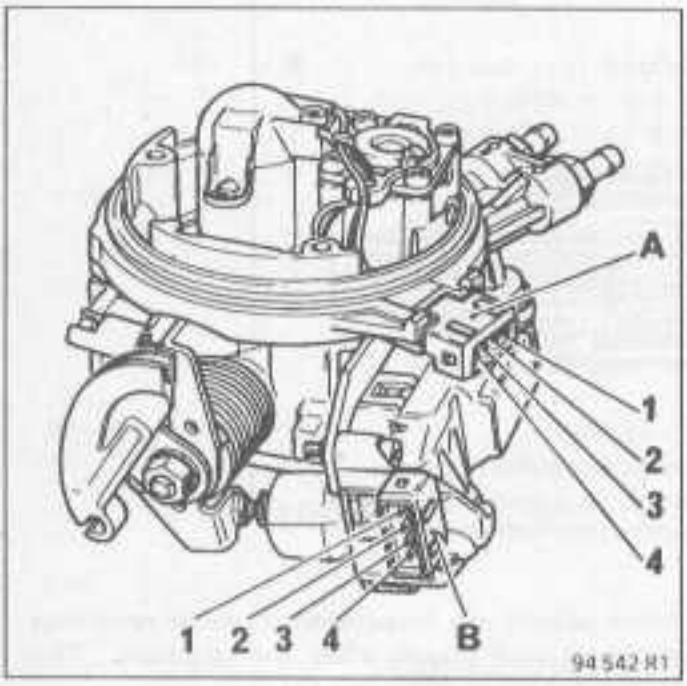
Electrical reflection of the sensor as a function of the ratio of excess air entering the engine (λ) :

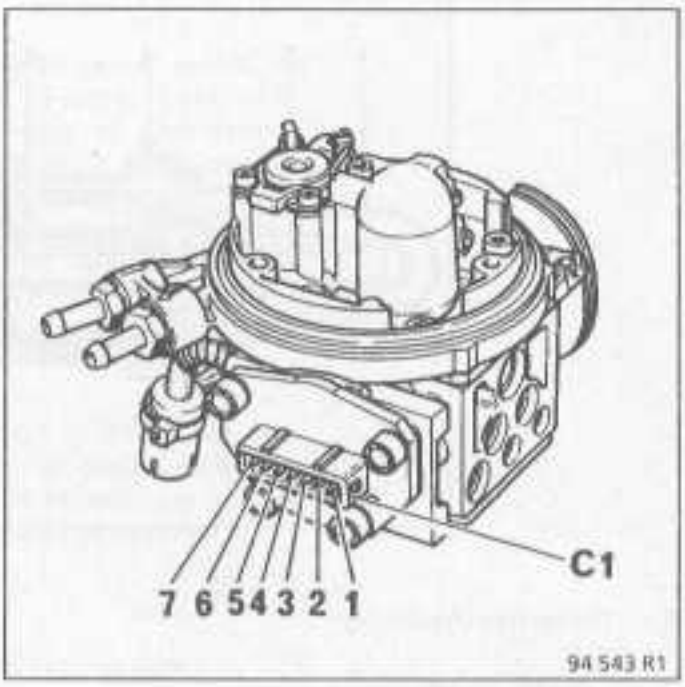


$$\lambda = \frac{\text{Amount of air actually taken in}}{\text{Amount of air theoretically necessary}}$$

$$= \frac{1}{\text{Richness}}$$

DIAGRAM OF CONNECTORS





Connector (A)

Operation of injector and air temperature sensor.

1 + 4 - Air temperature sensor.

2 - + Injector.

3 - Injector earth.

Connector (B)

Operation of idling speed and light throttle switch.

1 + 2 - Idling speed regulation micromotor supply.

3 and 4 - Light throttle switch.

Connector (C1)

Operation of throttle position potentiometer, full throttle switch and automatic transmission potentiometer.

1 - + Automatic transmission track.

2 - Throttle position information for injection.

3 - Injection track earth.

4 - Full load switch.

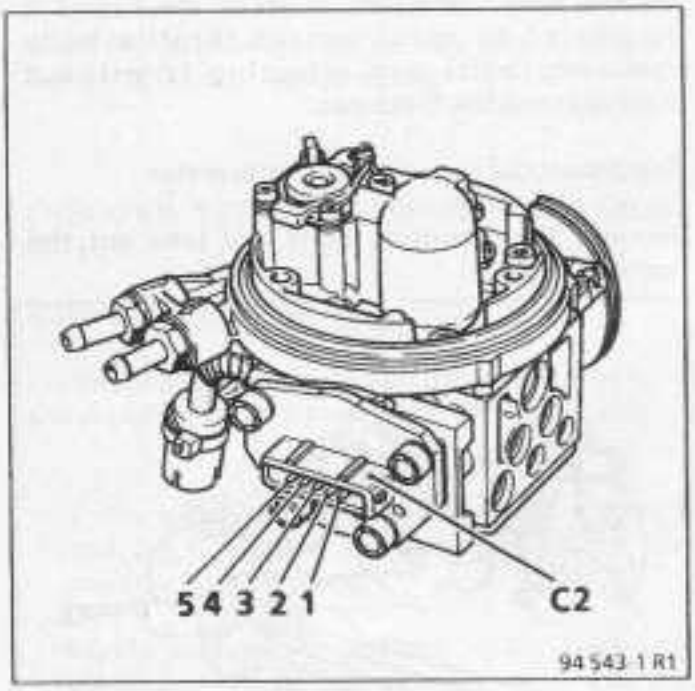
5 - Throttle position information for automatic transmission.

6 - + injection track and full load switch.

7 - Automatic transmission track earth.

Development

Throttle potentiometer connectors are being replaced by 5-track connectors. The AT track is now removed. The throttle position information is sent by the injection computer to the AT computer.



Connector (C2)

Throttle position potentiometer and full load switch.

1 - Earth.

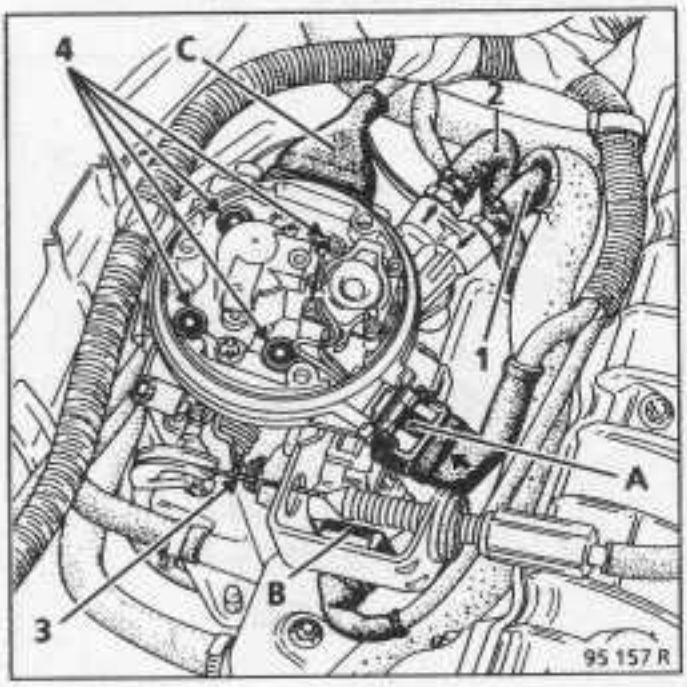
2 - Throttle position information.

3 - Not used.

4 - Potentiometer feed and full load switch.

5 - Full load information.

REMOVING - REFITTING THE THROTTLE BODY



Remove the air intake cover **(F Engines)** or the air filter **(E Engines)**.

Disconnect:
- the connectors **(A)**, **(B)** and **(C)**,
- the feed **(1)** and the fuel return **(2)** pipes (mark prior to removing),
- the accelerator control cable **(3)**.

Remove the mounting screws **(4)** and take out the throttle body.

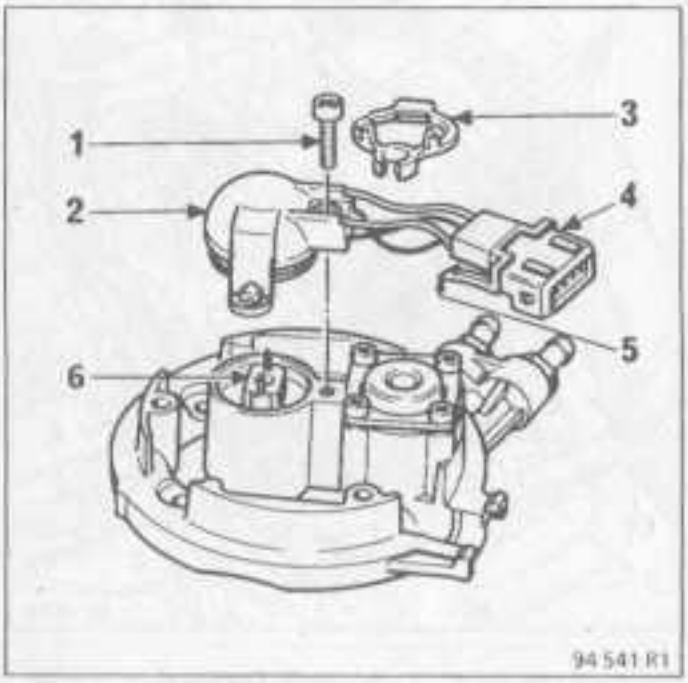
Seal off the intake manifold opening (with a cloth) to prevent the entry of any foreign bodies.

When refitting

Replace the seals between the manifold and the throttle body. If a rubber spacer is used to secure this, check it visually and only replace it if it is deformed.

Note :
With the throttle body removed, the two sections are held by plastic connections with firtree clips. Pinch together the ends of the firtree clips to separate the two parts.

REMOVING - REFITTING THE INJECTOR AND THE AIR TEMPERATURE SENSOR



It is not necessary to remove the throttle body to remove these components.

Remove the air intake cover (F Engines) or the air filter (E engines).

Disconnect the connector (4).

Remove screw (1) and raise the cover (2).

Release the leads from the mounting (3).

Take out
- The connector (4) after first releasing the hooks (5).
- The injector (6) from its housing. (It is only held in place by O rings.)

When refitting

Replace the injector O ring seals and lubricate them.

Refit the injector equipped with the cover such that it can be correctly fitted and secure the assembly in place.

Check that the connector are correctly fitted.

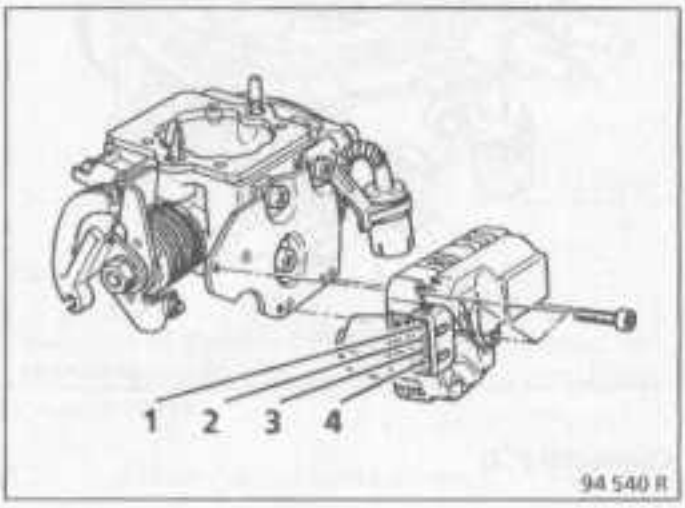
REMOVING - REFITTING THE IDLING SPEED REGULATING MOTOR

Remove the air filter (E Engines) or the air intake cover (F Engine).

The motor may be removed without removing the throttle body. However, access to the screws is facilitated by removing the throttle body mounting bolts and releasing it without disconnecting the fuel pipes.

Disconnect the connector from the motor.

Remove the mounting bolts and take out the motor.



When refitting:

No readjustment is to be performed. However, with the ignition on, if the light throttle switch on the XR25 test box is not illuminated, place a shim between the throttle stop and micromotor so as to obtain the no load switch setting. Switch the ignition on then off and the micromotor should be positioned in the cold start setting. Repeat the operation without the shim, then check the position of the throttle butterfly with the ignition on and the engine stopped.

TEST BOX XR 25 # 17

Value # 17	Engine
135 min.	E7J
110 min.	E7F
125 min.	F3P

CHECKING THE NO LOAD SWITCH

Disconnect the motor connector.

Without operating the accelerator, check the resistance between terminals **3 and 4**. This must be zero (switch closed).

With the accelerator depressed, the resistance should be infinite (switch open).

CHECKING THE IDLING SPEED REGULATING MOTOR

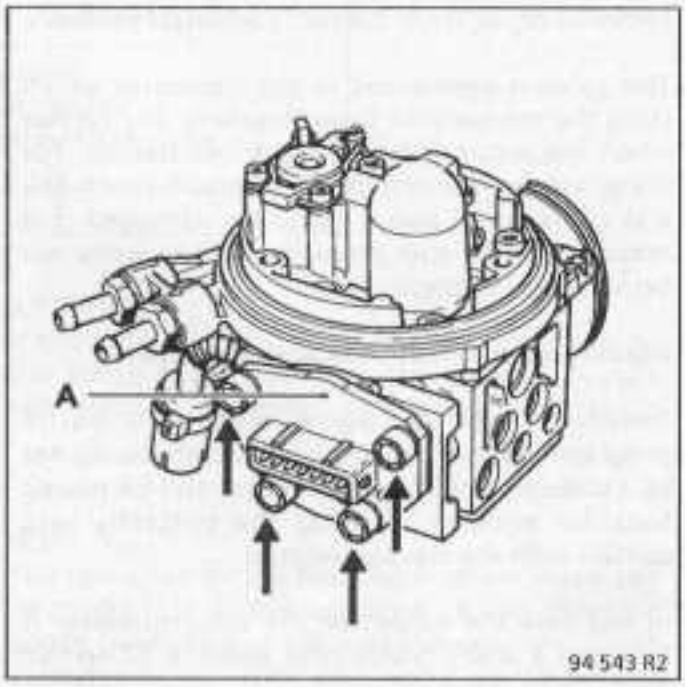
Disconnect the connector.

Check the resistance between terminals **1 and 2** ; it should be between **5 and 50 Ω**.

- Briefly supply power to the motor (terminals **1 and 2**); it should be possible to see the positioning shaft move.
- Supply power to the motor again, reversing polarity; the direction of rotation is reversed and the shaft also moves.

Note :
If resistance is zero or infinite or if the positioning shaft does not move when the motor is supplied with power, fit a new motor.

REMOVING - REFITTING THE THROTTLE POTENTIOMETER



The throttle position potentiometer **(A)** is set at the factory; the mounting screws are fitted with anti-tamper caps. Under no circumstances should these be destroyed to adjust the potentiometer.

If a defect occurs, replace the throttle body casing.

Removing

Remove the air intake cover or the air filter and the complete throttle body assembly.

Remove the upper part of the throttle body and the idling speed regulating motor.

When refitting

Change the seals.

Refit the throttle body and ancillary units.

On the **XR 25** test box check :
- that the part load and full load bar graphs are present and
- the cold start position **(#17)**.

POTENTIOMETER CONTROL

The minimum value **10**, which is specified in the technical notes, is not a directly adjustable value.

This value is memorised in the computer which stops the micromotor from returning any further when the potentiometer value reaches **10**. For lower values, the micromotor would reach the end of its travel and it could be damaged if it remained in the stop position too long while still being fed (example: air lock).

Reading minimum throttle position values

Despite there being a minimum value programmed into the computer which should not be exceeded, the micromotor may still be moved back far enough to bring the butterfly into contact with the mechanical stop.

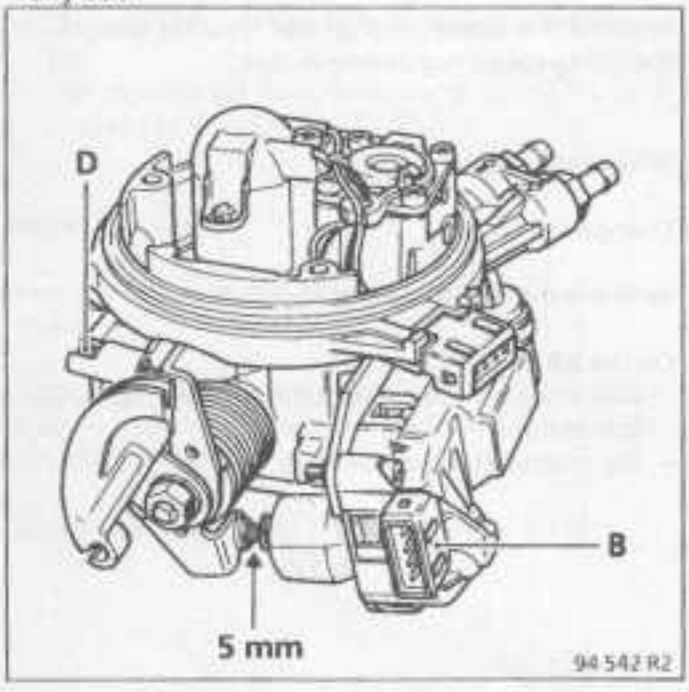
In this case the value for the potentiometer is between **5** and **7** (value read under **# 17** on **XR 25**).

Test method

Conditions : Engine hot, at idle speed.

Fit a **5 mm** shim between the micromotor piston and the throttle control.

No load information is retained, but the idle speed is incorrect; the computer therefore reduces the idle speed and moves the micromotor fully back.



At the most 5 seconds after fitting the shim, disconnect the **4**-track connector **(B)** and remove the shim.

The throttle control then moves back to rest on the mechanical stop (not adjustable) **(D)**. (The engine speed drops to below **500 rpm** and the engine may stall.)

In this position the value read under **# 17** on the **XR 25** is between **5** and **7**.

(Switch the ignition off then on again so that the regulation system can operate normally after reconnecting the **4**-track connector.)

Reading the full load value

Conditions : Engine stopped, ignition on.

Fully depress the accelerator pedal and check the throttle fully opens.

The value read under **# 17** on the **XR 25** should be greater than **230**.

Bar graph **10**, left-hand side, should illuminate.

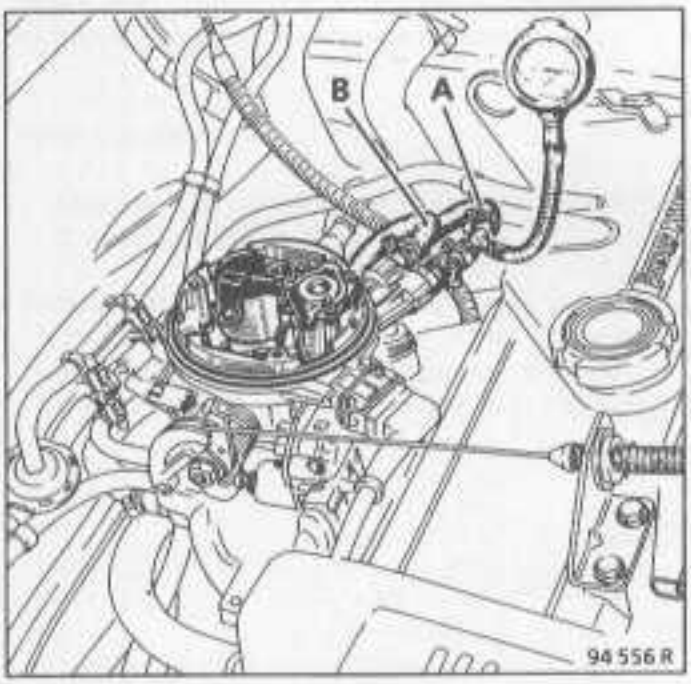
NOTES:

- The maximum value under **# 17** is obtained before reaching the full load position on the pedal (for 3/4 of pedal travel),
- If there are problems with engine speed regulation, check that the accelerator cable is adjusted correctly for the no load position so that the no load switch is operating correctly,
- When turning the ignition off, the micromotor is fed in the "advance" direction in order to position the throttle correctly for the next time the engine is started. (Only for monopoint injection engines.)

CHECKING THE FUEL PRESSURE AND THE FUEL PUMP OUTPUT

ESSENTIAL SPECIAL TOOLING	
Mot. 843	0 - 6 bar pressure gauge
Mot. 867	-1 to + 2 bar pressure gauge
Mot. 904	T union for measuring the pressure
1 x 2,000 ml graduated flask.	

The readings can be taken with the engine running at idling speed or with the engine stopped by interconnecting terminals **3** and **5** (thick wires) on pump relay **(236)**.



Remove the air filter or intake cover.

Disconnect the fuel feed pipe **(A)**.

Fit the T union in position **(Mot. 904)** and connect up the **-1 +2** bars pressure gauge **(Mot. 867)**.

Disconnect the return pipe **(B)**. In its place fit a hose with the other end in a **2,000 ml** graduated flask.

Run the fuel pump for **1** minute and measure the pressure and the quantity of fuel that has been pumped into the flask.

- Pressure: **1.06 ± 0.05 bars** (E and F Engines)
- Minimum output: **0.83 l/min.** (E engine)
  1.08 l/min. (F engine)

ATTENTION :
If the output is low, check the voltage supply to the pump (**1 volt** drop in the voltage supply represents approximately **10 %** loss of output).

NOTE :
The operation of the fuel pump safety valve can be checked; to do this, use the **0 - 6 bars pressure gauge (Mot. 843)** in place of the pressure gauge used above.

Run the fuel pump, pinch flat the return pipe **(B)** briefly: the pressure should stabilise at approx. 3 bar.

Checking

The speed sensor can be checked using the **XR 25** test box or a multimeter.

Using test box XR 25

It is possible to display if the computer is receiving the signal from the sensor using line 8 of the right-hand bar graph of the diagnostic fiche. This should go out when the engine is cranked.

The polarity of the speed sensor can be checked in the same way using the left-hand bar graph of the same line. This will light up when the engine is cranked if the sensor wires are interchanged

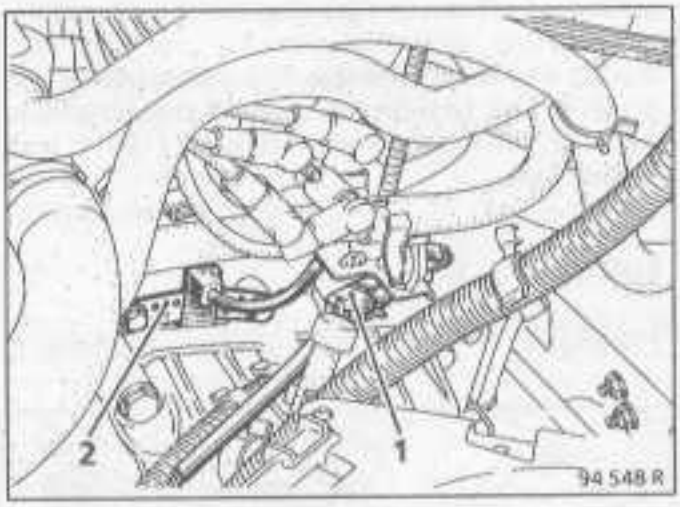
With a multimeter

- Measure the resistance at the sensor connector. It should be **200 ± 50 Ω**.
- Read off the voltage supplied by the sensor. To do this, use the multimeter in the alternating voltmeter position. When starting, this voltage should vary alternately (greater than **150 mV**).

REPLACING

Disconnect the connector **(1)** and free it from its support.

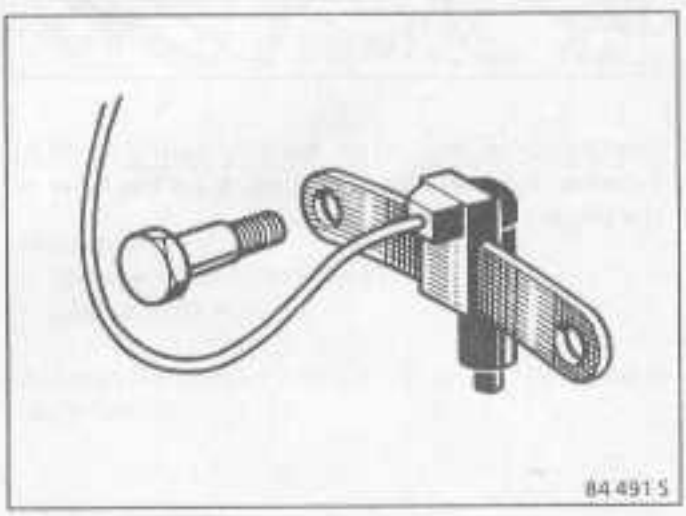
Remove the sensor securing screws **(2)** and remove the sensor.



WHEN REFITTING

Resecure the sensor with the shouldered screw and the washers.

Ensure that the connector is correctly reconnected and is locked in place.



CHECKING

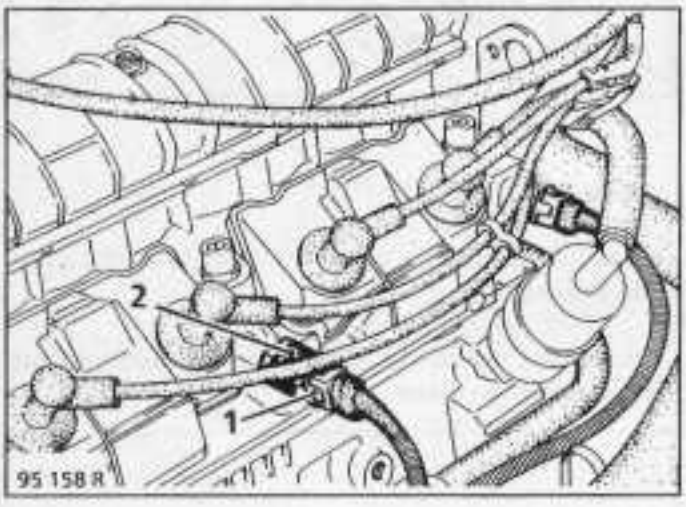
The pinking sensor can only be checked using the **XR 25** test box.

It is possible to display if the computer is receiving information from the pinking sensor using **# 13** of the XR25. At a speed of approx. **3,000 rpm**, the value read off must not be zero and should vary.

During a road test the right-hand illuminated bar graph on **line 12** indicates whether there is a fault on the pinking sensor circuit (fault not memorised).

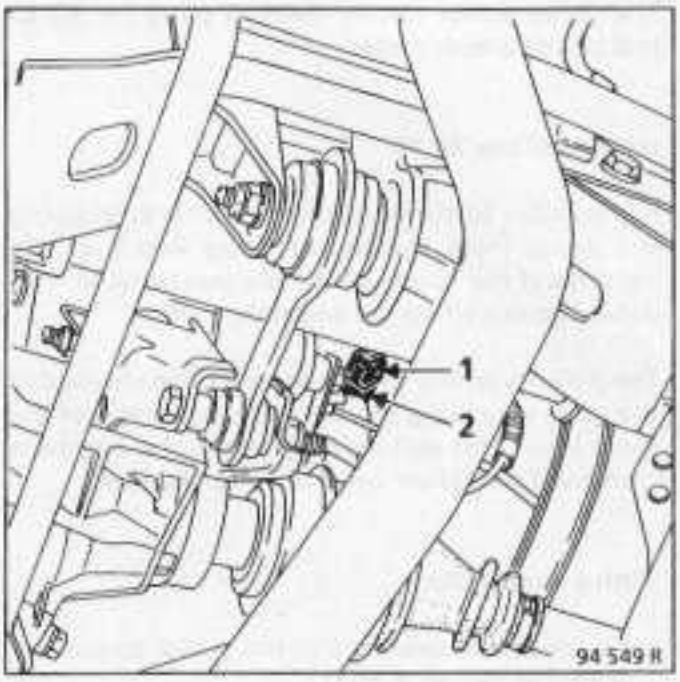
POSITION

F3P Engine



The sensor is mounted on the cylinder head between cylinders **no. 2 and no. 3**, on the level of the plugs.

E7J Engine



The sensor is mounted on the cylinder block between cylinders **no. 2 and no. 3**, under the inlet manifold.

REPLACEMENT

Disconnect the connector **(1)** and unscrew the pinking sensor **(2)** using a tool **(Mot. 1155)**.

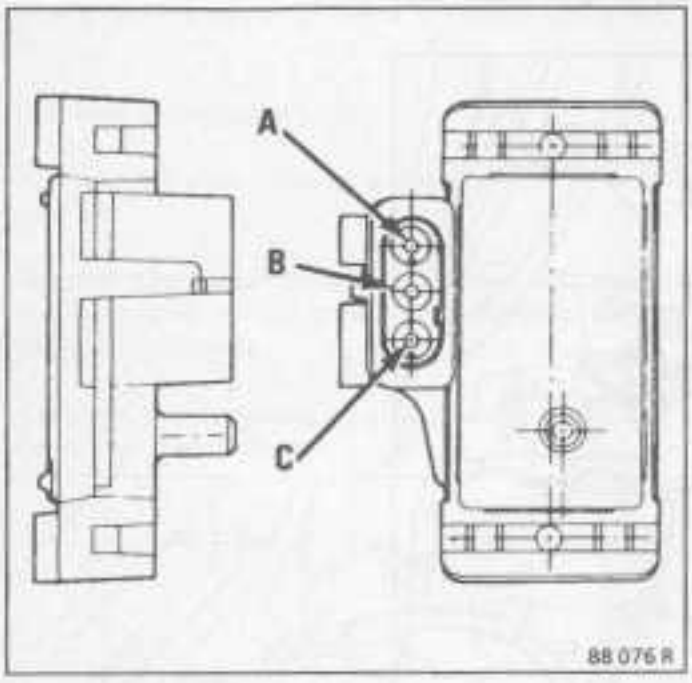
WHEN REFITTING

Ensure that the connector is correctly refitted and locked in place.

NOTE :
The tightening torque for the sensor is **1 daN.m**.

The absolute pressure sensor is secured to the scuttle next to the **MPA** ignition power module.

CHECKING



A - Earth.

B - Output voltage.

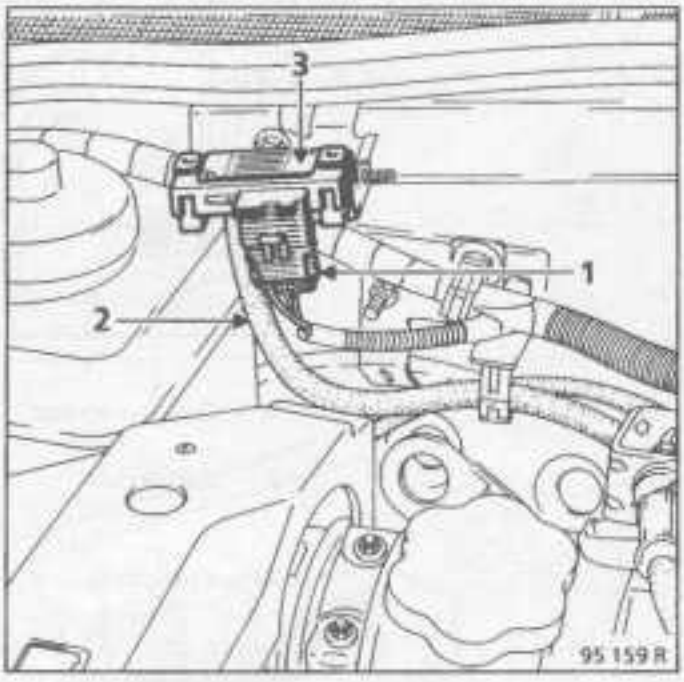
C - Power supply.

Check :
- the condition of the pipe connecting the sensor the the intake manifold,
- the sensor power supply between terminals **(A)** and **(C) (Voltage = 5 Volts)**,
- the sensor output voltage between terminals **(A)** and **(B)**. (It must be between **0** and **5 volts**.) The variation of voltage can also be checked in situ by acting on the vacuum hose with a manual vacuum pump.

The voltage should drop as the vacuum increases (or increase as the pressure increases).

NOTE :
The **XR 25** can display if the computer is receiving information from the sensor using **# 01** (manifold pressure as an absolute value). If the computer is not receiving the pressure information, **line 7** of the bar graph is illuminated and the pressure read at **# 01** is then **103 millibars**. This fault is not stored by the computer.

REPLACING



Disconnect:
- the electrical connector **(1)**,
- the vacuum hose **(2)**.

Release the pressure sensor **(3)** which is clipped to its mounting.

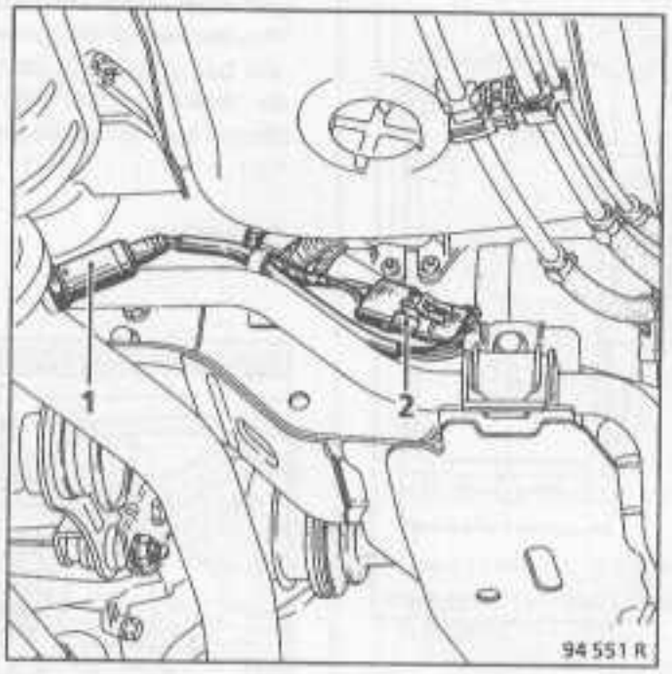
When refitting

Ensure that the connector and the sensor are properly fitted on the mounting.

REPLACING

Disconnect the connector from the electrical wiring.

Unscrew the oxygen sensor from its support at the entry to the catalytic converter and clean the thread.



1 - Oxygen sensor.

2 - Connector.

When refitting

Apply anti-stick lubricant (high temperatures) to the oxygen sensor thread only.

Hand tighten the oxygen sensor.

Torque tighten to **2.7 to 3.4 daN.m.**

Reconnect the electrical wiring connector.

NOTE:
The wires for the oxygen sensor cannot be joined or soldered. If one of these wires breaks, replace the sensor.

REPLACING THE COMPUTER

RENAULT 19

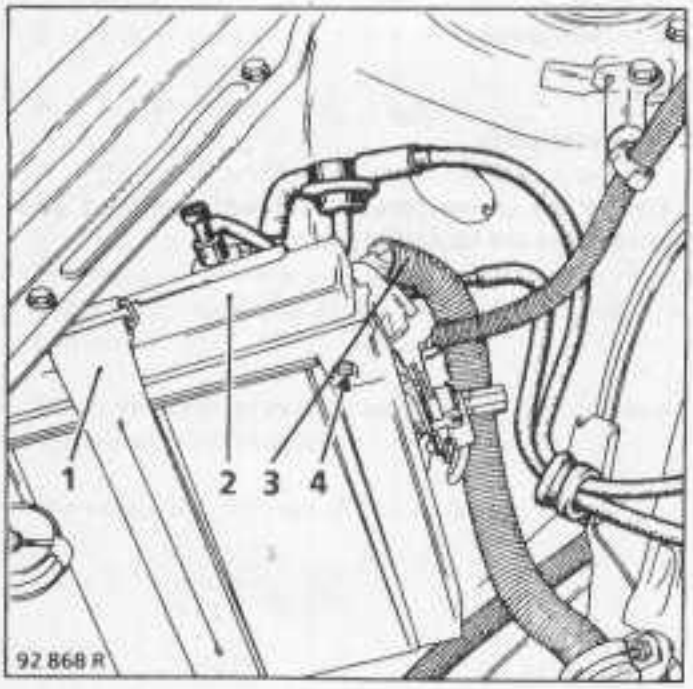
The computer is mounted in the engine compartment, on the right-hand inner wing, in a plastic casing which protects it against splashing etc.

Disconnect the battery.

Remove the strap and take out the case from its location.

Remove the cover from the case and disconnect the connector which connects the computer to the wiring harness.

Remove the securing screws and take out the computer from its case.



1 - Strap.

2 - Cover.

3 - Wiring harness.

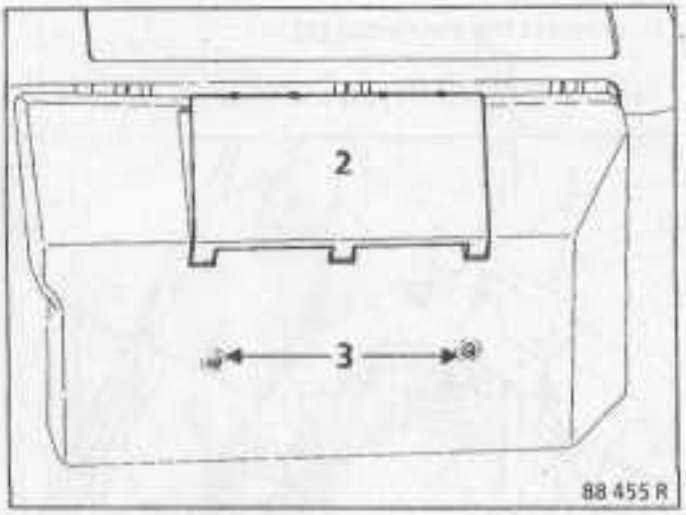
4 - Mounting screw.

EXTRA

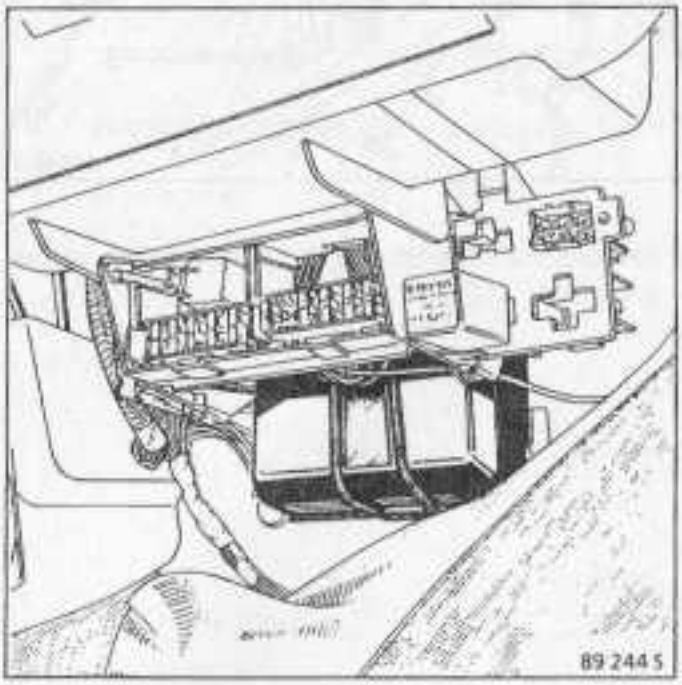
It is in the passenger compartment, on the right-hand side of the vehicle, under the glove box.

Disconnect the battery.

Remove the fuse box (2), (2 torx screws (3)).



Remove the trim.



Undo the strap holding the computer in place and release it from the mounting plate.

CLIO

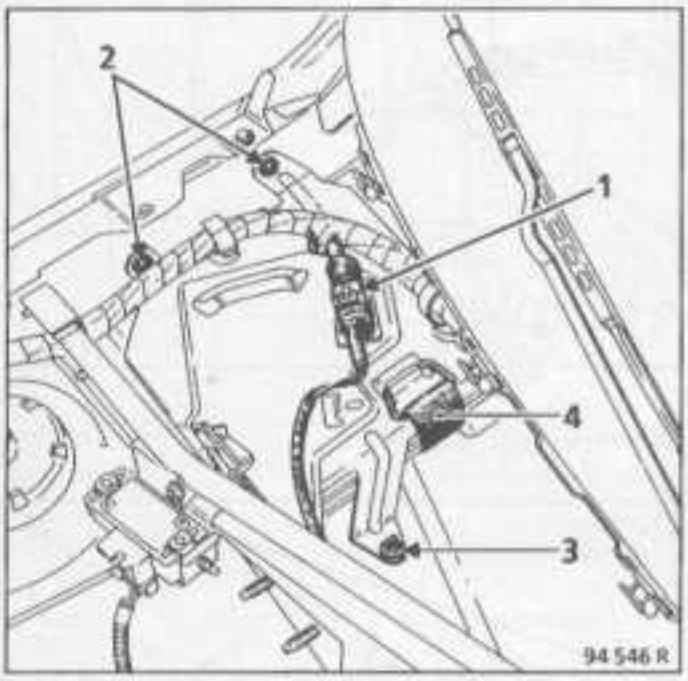
The computer is located at the rear of the engine compartment in the right-hand plenum chamber.

Disconnect the battery.

Remove the right-hand plenum chamber grille and the jack.

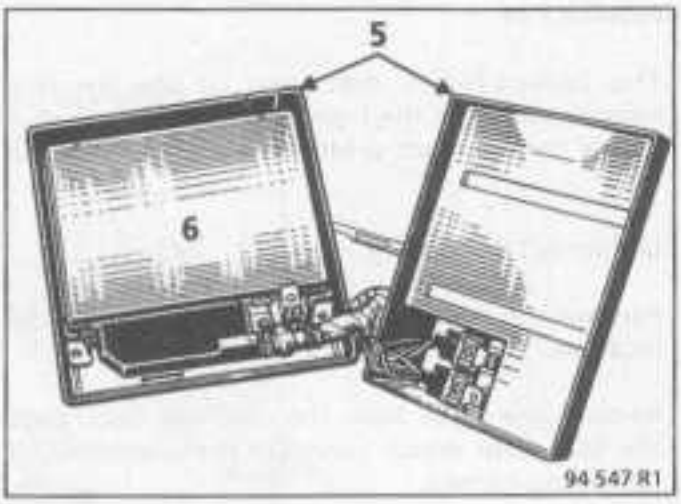
Disconnect the connector **(1)**.

Remove bolts **(2)**, nut **(3)** and strap **(4)**.



Remove the support and the plastic casing of the computer.

Open the plastic casing and remove the computer.



5 - Plastic casing.

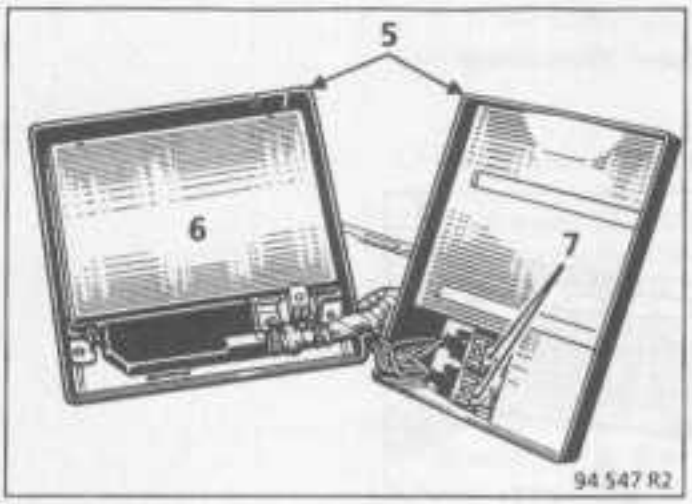
6 - Computer.

When refitting

Ensure the connectors are correctly refitted and check they are locked in place.

REMOVING THE RELAYS

CLIO



5 - Plastic casing.

6 - Computer.

7 - Injection and fuel pump relays (thick wire).

The relays are in the plenum chamber at the right-hand side inside the plastic casing protecting the computer.

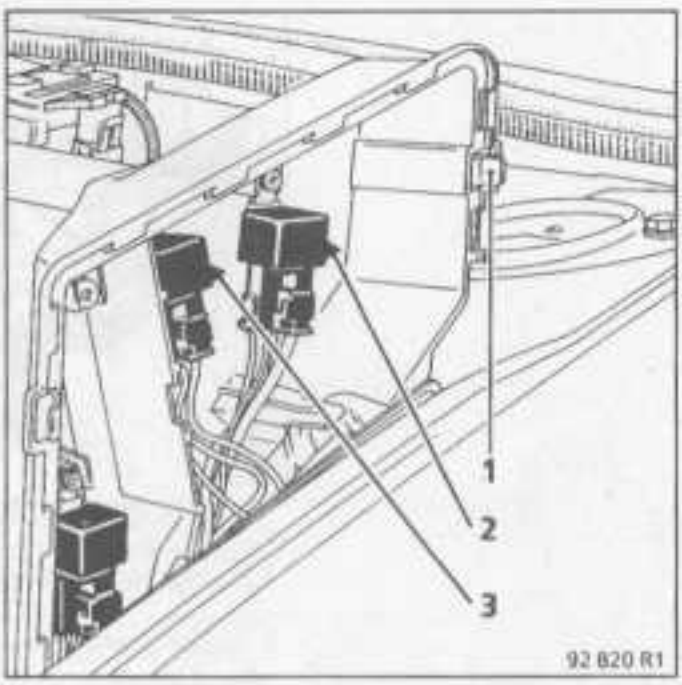
Remove the plastic casing see "Removing computer") and open it.

The relays are secured to the cover.

RENAULT 19

Release tab (1) and lift the cover of the protective casing (front left-hand wheel arch).

The relays are in the top part of the cover.



2 - Pump relay (the one with the thicker wire).

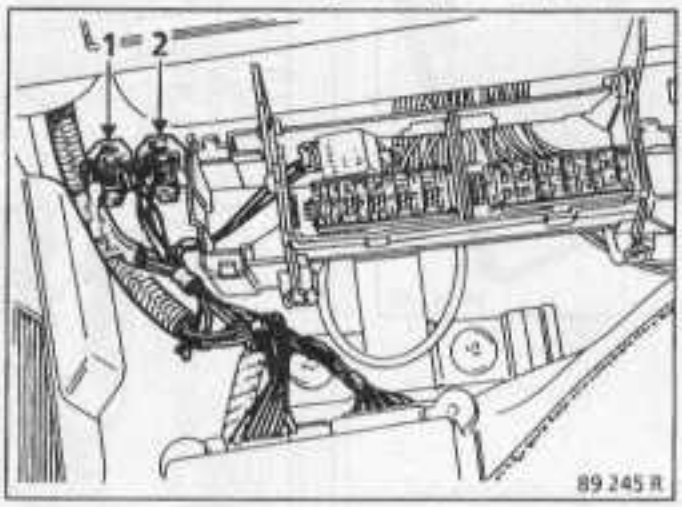
3 - Supply relay.

EXTRA

They are fitted in the passenger compartment, under the glove box, on the computer mounting plate.

Disconnect the battery (see "Removing the computer").

Undo the screw securing the relay to the plate.



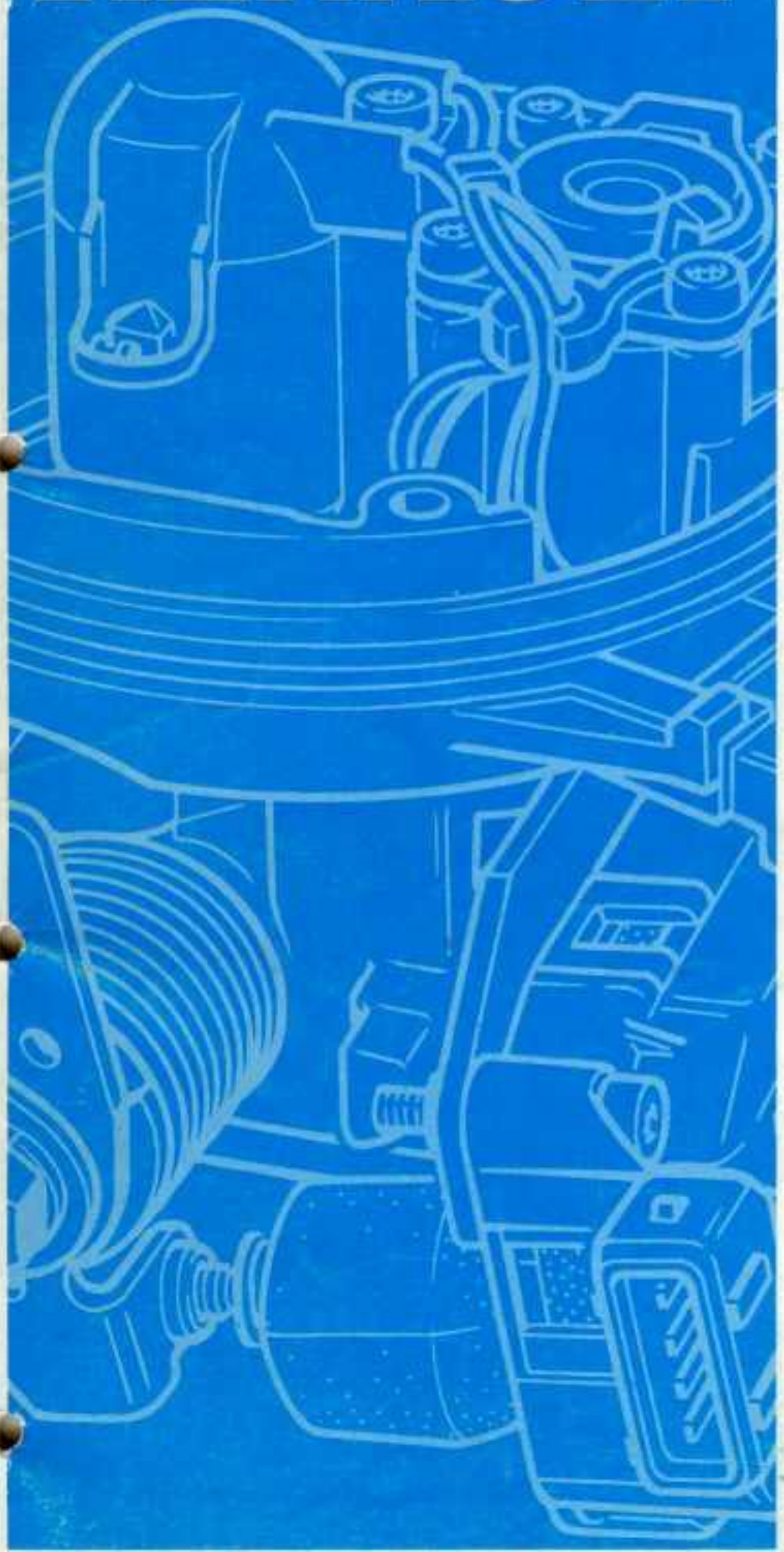
1 - Supply and injection locking relay.

2 - Fuel pump relay (heavy wire).

When refitting

Ensure that the connectors and those adjacent are properly fitted.

RENAULT



INJ

Monopoint Injection (Petrol) BOSCH

Edition Anglaise

77 11 095 672

FUEL MIXTURE
General

Vehicle	Engine						Gearbox	Type of injection
	Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cc)	Comp. Ratio		
X53 Y	F3P	704-706	82.7	83.5	1794	9.7/1	Manual	Monopoint BOSCH throttle body
X53 Y	F3P	705-707					Automatic	
X57 C	F3P	710					Manual	
X57 U	F3P	714						

Engine	Idle adjustment		Fuel	
	Speed (rpm)	Richness (CO)	Special notes	Octane rating (minimum)
F3P 704-706	750 ± 50*	VC : 0.3 max. VL : 0.5 max.	Eurosuper	I.O. 95
F3P 705-707	850 ± 50*		Eurosuper	I.O. 95
F3P 710	750 ± 50*		Eurosuper	I.O. 95
F3P 714			Unleaded petrol	I.O. 91

* For coolant temperature between **80°** and **100°C**
VC : Test value
VL : Legal value

TYPE OF FUEL SUPPLY	REGULATED MONOPOINT INJECTION
Fuel pump submerged in tank: BOSCH.	Voltage : **12 volts** Pressure : **1.06 bar** Flow : **65 l/h minimum**
Fuel filter located under the vehicle in front of the tank.	Replacement every **30,000 miles (50,000 km)**
Monopoint throttle body	BOSCH **38 mm** dia.
Pressure regulator integrated in throttle body	Pressure: **1.06 ± 0.05 bar** (not adjustable)
Solenoid injector	Voltage : **12 volts** Resistance : **approx. 1.2 Ω**
Idle speed regulation micromotor for light throttle.	Not adjustable.
Throttle position potentiometer with full load switch.	Test using **XR 25 # 17** Idle speed regulation: **10 to 180** Throttle fully open: **255 max.** Engine stopped, ignition on, equal to or greater than **125**.