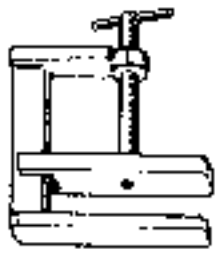
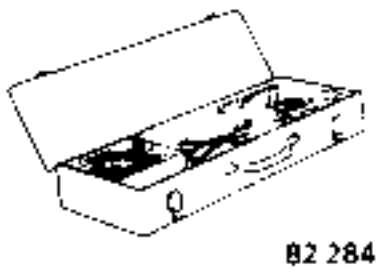
Illustration	Method Reference	Part Number	Description
 85 654	**Mot. 453-01**	00 00 045 301	Hose clamps.
 82 284	**Mot. 843**	00 00 084 300	Injection checking and operating kit. 0-6 bar pressure gauge.
 83 657	**Mot. 867**	00 00 086 700	Fuel feed circuit pressure measuring kit.
 92 336	**Mot. 1136**	00 00 113 600	Throttle casing Torx type screwdriver.
 87324	**Mot. 1155**	00 00 115 500	Wrench with long socket for removing and refitting acceleration sensor.
 90 028-1	**M.S. 1019-10**	00 00 101 910	XR25 micro-processor test box.
 89 024	**M.S. 1048**	00 00 104 800	Terminal checking "Bornier".

Suppliers' Reference	Supplier	Description
7059-2 465	NAUDER B.P. 740 * GARONOR 93613 AULNAY SOUS BOIS	Manual vacuum pump
Rar 37-089-80	TOUZARD et MATIGNON * 8, rue Henaff 94400 VITRY SUR SEINE Tel.: (1) 46 80 85 21	2,000 ml flask
NN5 102 A	AOIP * BP 31 - 75124 PARIS Cedex 13 Tel.: (1) 45 88 83 00	Voltmeter/ohmmeter Type 2,000 ohms/volts

* Not applicable to UK. Please contact your local after sales head office.

Vehicle	Engine						Gearbox	Injection type	Ignition type
	Type	Suffix	Bore (mm)	Stroke (mm)	Cubic capacity (cc)	C/R			
X 57 A X 57 R	E 7 F E 7 F	700 706	75.8 75.8	64.9 64.9	1171 1171	9.25/1 8.8/1	MG(1) MG(2)	Bendix Monopoint BOSCH throttle casing	Ignition power module without pinking sensor

Engine	Idling speed		Fuel	
	Engine speed (rpm)	Mixture (CO)	Special Point	Octane rating
E 7 F. 700 E 7 F. 706	750 ± 50*	0.5 max (not adjustable)	Unleaded petrol	min O.R. 95 min O.R. 91

* For a coolant temperature between 80° and 100°C.

Fuel supply type	Regulated monopoint injection
Fuel pump immersed in tank: BOSCH EKP 10.2	Voltage: 12 volts Pressure: 1.06 bars Delivery: 50 L/H minimum
Fuel filter secured at front of tank under vehicle.	Replace every 30,000 miles (50,000 km)
Monopoint throttle casing	BOSCH Ø 32
Pressure regulator incorporated in throttle casing.	Pressure: 1.06 ± 0.5 bars (not adjustable)
Electromagnetic injector	Voltage: 12 volts Resistance: approximately 1.2 ohms
Idling speed regulating micromotor with light throttle switch	Not adjustable
Throttle position potentiometer comprising an TA track and full load switch	Check using XR 25 # 17 Throttle butterfly closed: min 10 Throttle butterfly fully open: max 255 Engine stopped, ignition on value greater than or equal to 110.

Computer	Renix No.	Homologation No.	R.N.U.R. No.	Diagnostic Code
Bendix: housed in	S 101 729 102	77 00 854 160	77 00 856 141	159 - 3 (1)
engine compartment	S 101 729 103	77 00 851 758	77 00 856 142	160 - 3 (2)

Temperature in °C	0 ± 1	20 ± 1	40 ± 1	80 ± 1	90 ± 1
Air temperature sensor: BOSCH CTN Type: resistance in ohms	5290 to 6490	2400 to 2600	1270 to 1070	--	--
Coolant temperature sensor: BENDIX CTN Type: resistance in ohms	--	--	3060 to 4045	300 to 367	212 to 273

Oxygen sensor: BOSCH LS H 24 heated	to 850°C - Rich mixture: 625 to 1100 mV - Lean mixture: 0 to 80 mV
Catalytic convertor (located under floor panel)	◇ C 21
Paper type cartridge air filter Thermostat = 26° to 36°C	Replace: every 12,000 miles (20,000 km)
E.G.R.	
Anti-evaporation system: Canister	CAN 01
Ignition	Curves: Incorporated in injection computer Ignition Power Module without Pinking Sensor
Spark Plugs	EYQUEM NGK FC 42 LC BCP 5 ES Electrodes gap: 0.9 ± 0.05 mm

Vehicle	Engine						Gearbox	Injection type	Ignition type
	Type	Suffix	Bore (mm)	Stroke (mm)	Cubic capacity (cc)	C/R			
X57B X57B X57T X57T	E7J. E7J. E7J. E7J.	710 711 718 719	75,8	77	1390	9,5/1	MG (1) AT (2) MG (1) AT (2)	Bendix Monopoint BOSCH throttle casing	Ignition power module with pinking sensor

Engine	Idling speed		Fuel	
	Engine speed (rpm)	Mixture (CO)	Special Point	Octane rating
E7J 710 (1) 711 (2) 718 (1) 719 (2)	825 ± 50(1) 780 ± 50(2)	0.5 max (not adjustable)	Euro Super unleaded petrol	Min. O.R.95

(2) Engine speed obtained (AT in PARK.P., NEUTRAL.N., or DRIVE.D.)
* For a coolant temperature between 80° and 100°C.

Fuel supply type	Regulated monopoint injection
Fuel pump immersed in tank: BOSCH EKP 10.2	Voltage: 12 volts Pressure: 1.06 bars Delivery: 50 L/H minimum
Fuel filter secured at front of tank under vehicle.	Replace every 30,000 miles (50,000 km)
Monopoint throttle casing	BOSCH ∅ 36
Pressure regulator incorporated in throttle casing.	Pressure: 1.06 ± 0.5 bars (not adjustable)
Electromagnetic injector	Voltage: 12 volts Resistance: approximately 1.2
Idling speed regulating micromotor with light throttle switch	Not adjustable
Throttle position potentiometer comprising an TA track and full load switch Gr	Check using XR 25 # 17 Throttle butterfly closed: min 10 Throttle butterfly fully open: max 255 Engine stopped, ignition on value greater than or equal to 135

Computer	Renix No.	Homologation No.	R.N.U.R. No.	Diagnostic Code
Bendix: housed in engine compartment	S 101 718 101	77 00 749 946	77 00 856 047	157 - 3 (1)
	S 101 718 201	77 00 749 947	77 00 749 943	152 - 3 (2)

Temperature in°C	0 ± 1	20 ± 1	40 ± 1	80 ± 1	90 ± 1
Air temperature sensor: BOSCH CTN Type: resistance in ohms	5290 to 6490	2400 to 2600	1270 to 1070	--	--
Coolant temperature sensor: BENDIX CTN Type: resistance in ohms	--	--	3060 to 4045	300 to 367	212 to 273

Oxygen sensor: BOSCH LS II 24 heated	to 850°C - Rich mixture: 625 to 1100 mV - Lean mixture: 0 to 80 mV
Catalytic convertor (located under floor panel)	◊ C 10
Paper type cartridge air filter	Replace: every 12,000 miles (20,000 km)
E.G.R.	
Anti-evaporation system: Canister	CAN 01
Ignition	Curves: Incorporated in injection computer Ignition Power Module With Pinking Sensor
Spark Plugs	EYQUEM NGK FC 42 LC BCP 5 ES Electrodes gap: 0.9 ± 0.05 mm

COMPONENTS CONSTITUTING THE BENDIX MONOPOINT INJECTION SYSTEM

I - FUEL CIRCUIT

- Electric fuel pump (immersed in fuel tank)
- Fuel pressure regulator (incorporated in BOSCH throttle casing)
  Injector incorporated in BOSCH throttle casing

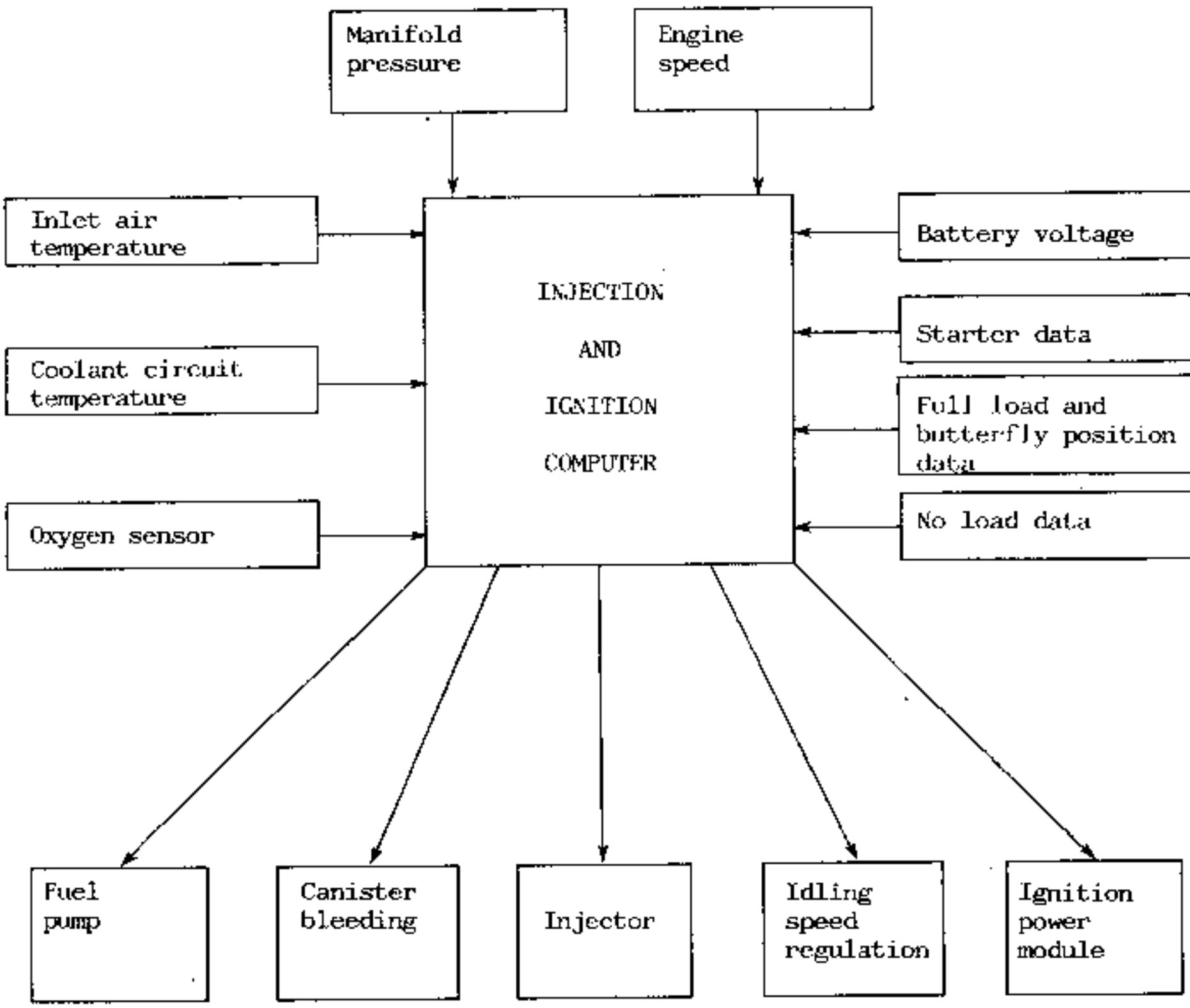
II - INJECTION COMPUTER AND ITS PERIPHERALS

- Injection and ignition computer
- Coolant temperature sensor
- Air temperature sensor
- Flywheel with sensor target
- Speed and position sensor
- Pressure sensor
- No load and full load switch
- Throttle position potentiometer
- Pinking sensor
- Oxygen sensor
- Anti evaporation system bleed solenoid valve (canister).

III - POWER

- Ignition power module
  Electromagnetic injector (injecting fuel into throttle casing up-stream of butterfly)
- Idling speed regulating motor incorporated in BOSCH throttle casing

BENDIX MONOPOINT INJECTION SYSTEM OPERATING PRINCIPLE



Injection and ignition computer

The computer mounted a printed circuit is of the digital type and has a micro-processor as its main component.

The injection computer integrates the 2 integrated circuits of the A.E.I. which are used as micro-processor peripherals.

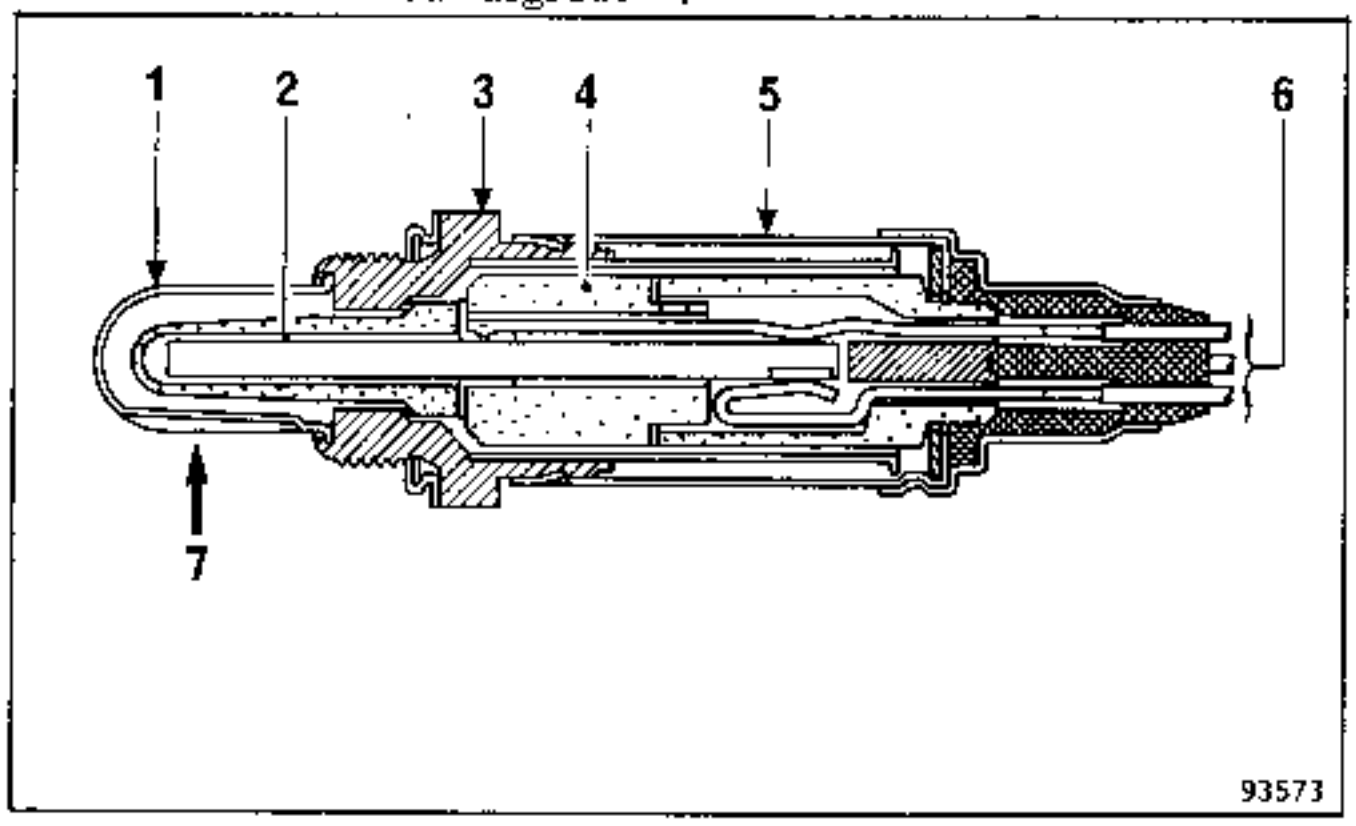
The injector computer is housed in the front compartment (righthand water box).

MIXTURE REGULATING PRINCIPLE USING AN OXYGEN OR LAMBDA SENSOR

The oxygen sensor determines the oxygen content of the exhaust gases of which the value varies depending on the mixture richness. The sensor has the following feature:
the variation in the composition of the air/fuel mixture, by comparison with the stoichiometric ratio (Lambda = 1), is manifested by a variation in its output voltage.

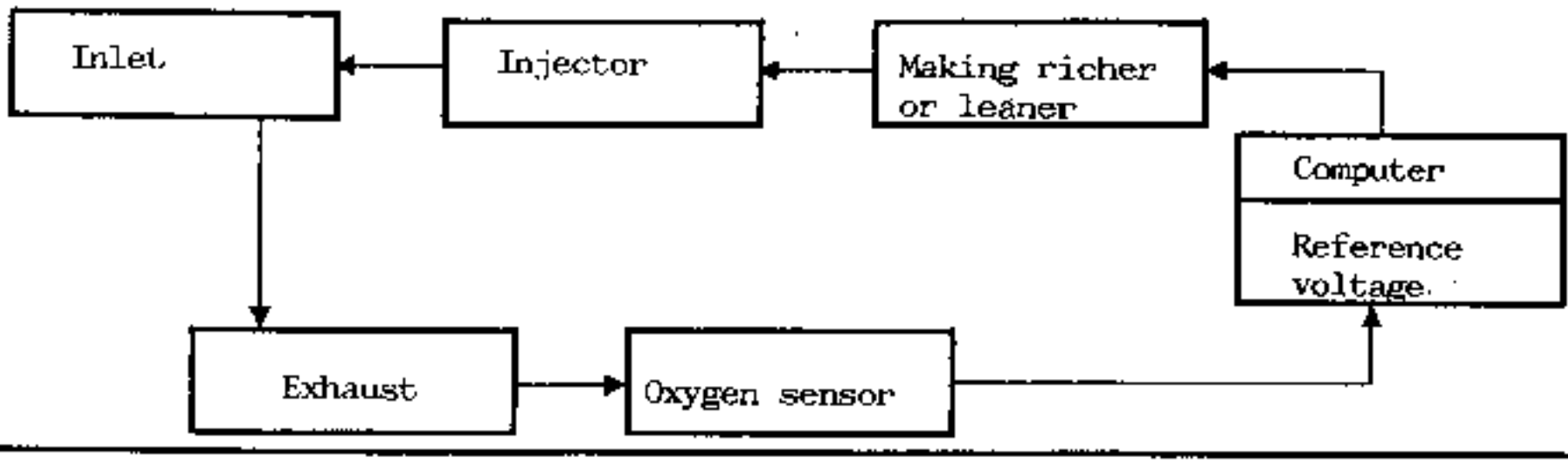
The computer corrects the air/fuel ratio in order that the air/fuel mixture is always as close as possible to the stoichiometric ratio (Lambda = 1) which, together with the use of catalytic convertors, enables the pollutants in the exhaust gases to be removed to an advanced degree.

The operating method is based on the property of the cermanic used of conducting oxygen ions from a temperature of approximately 250°C. If the oxygen content is not the same on both sides of the sensor, an electical voltage is established between the two limit surfaces by reason of the special property of the material used. This voltage enables the oxygen content on both sides of the sensor to be measured.

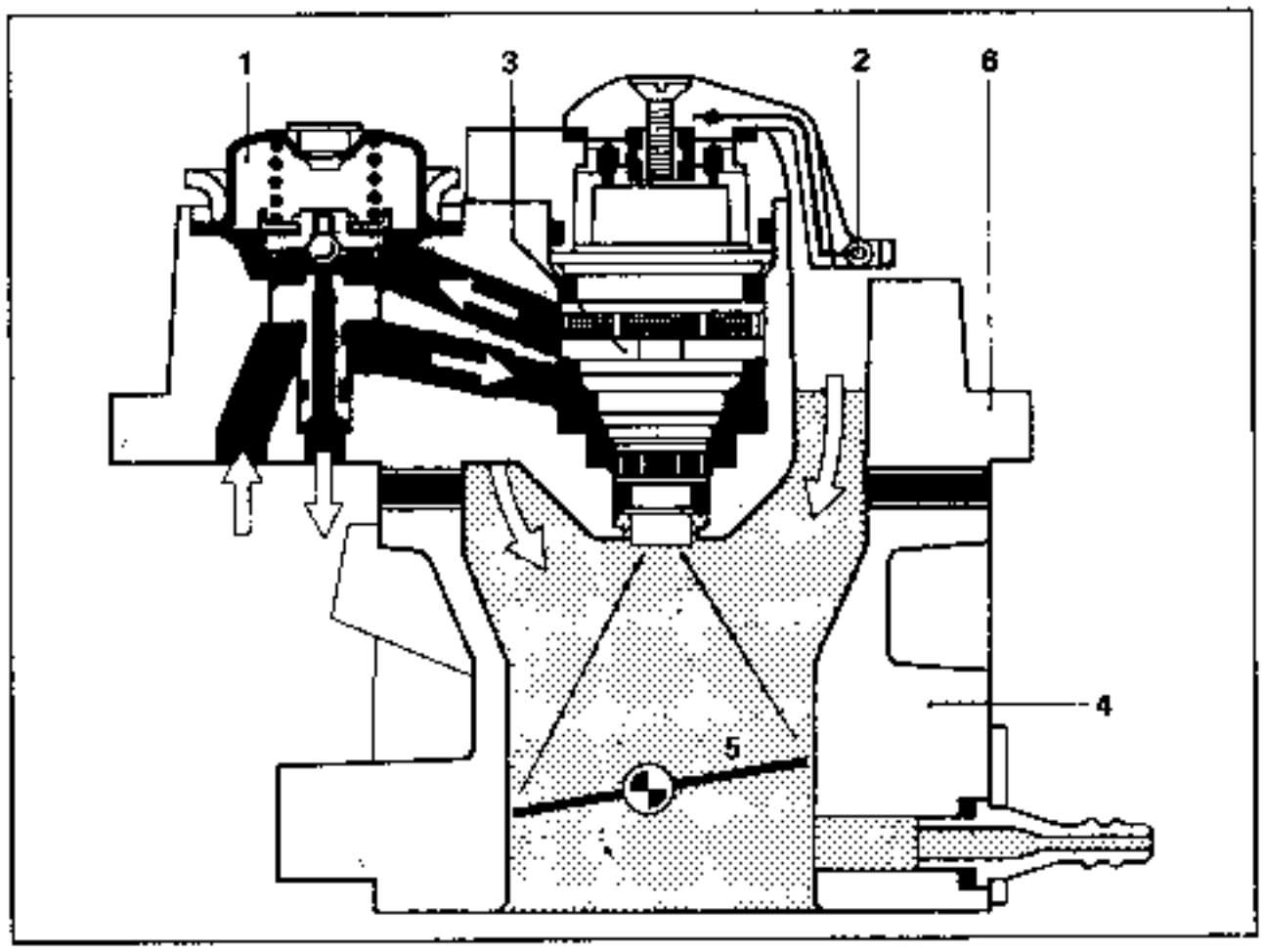


1 - Protective sheathing
2 - Ceramic sensor
3 - Base
4 - Contact bush
5 - Protective bush
6 - Electrical connection
7 - Exhaust gas

REGULATING PRINCIPLE USING OXYGEN ON LAMBDA SENSOR



BOSCH MONOPOINT THROTTLE CASING



1 - Pressure regulator

2 - Air temperature sensor

3 - Electromagnetic injector

4 - Throttle casing

5 - Butterfly

6 - Hydraulic section (throttle casing top)

Electric fuel pump

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

Monopoint injection unit

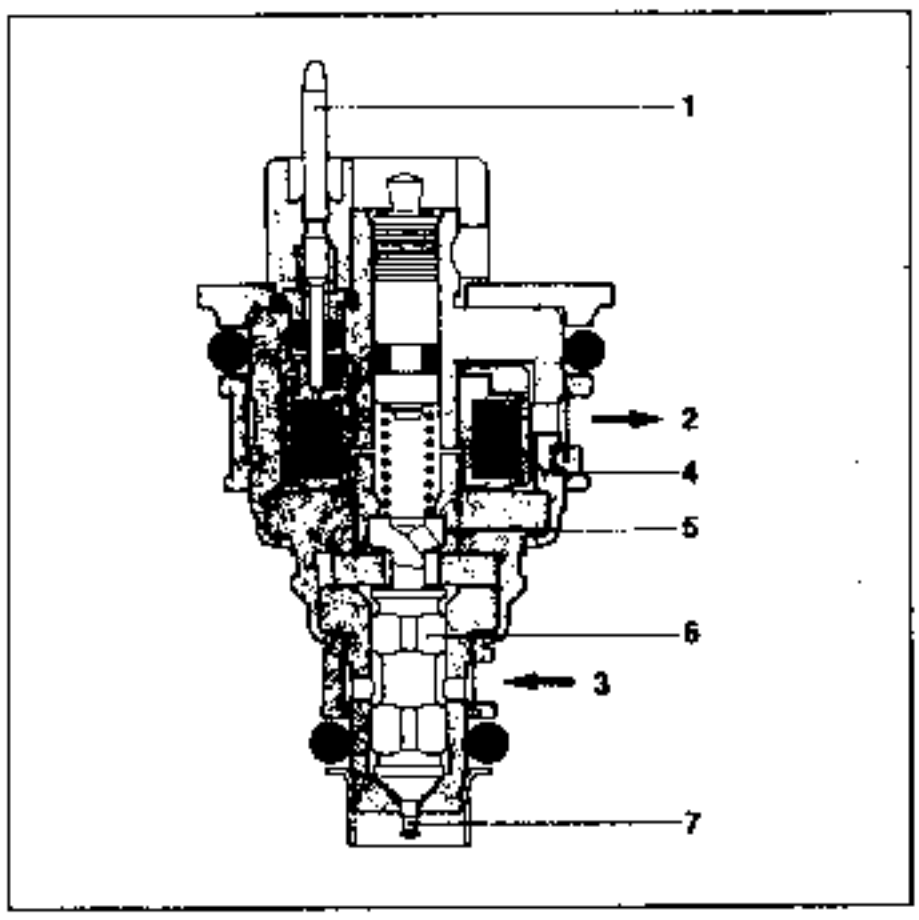
The monopoint injection unit is mounted directly on the inlet manifold and supplies the engine with atomized fuel. It consists of the throttle casing and the hydraulic section. The latter consists of an electro-magnetic injector and the pressure regulator which maintains the difference between the fuel pressure and the pressure at the metering point of the injector at a constant level. The injection delivery therefore depends solely on the length of time for which the injector is open.

Injector

The injector on this centralized injection system is arranged in the inlet air flow above the butterfly, in order to ensure that a uniform mixture is produced which is distributed correctly to the different cylinders. The device uses a needle type injector which meters the fuel delivery by means of an annular slot. The injection stud, located at the end of the needle, provides a conical jet and ensures that the fuel is sprayed correctly. In order to ensure that the minimumal amounts of fuel are metered accurately, the injector needle and rotor are very small which enables opening and closing times of far less then 1 millisecond to be obtained.

The injector is constantly supplied with fresh fuel which prevents bubbles of vapour forming in the metering zone in spite of the low feed pressure. This sweeping technique contributes to very good behaviour for starting and hot running.

Electromagnetic injector



1 - Electrical connection
2 - Fuel return
3 - Fuel inlet
4 - Coil
5 - Rotor
6 - Needle
7 - Injection stud

BOSCH MONOPOINT THROTTLE CASING

PARAMETER INPUT

Inlet air flow

When the butterfly is opened by the throttle pedal, the required operating point is imposed on the engine. A potentiometer measures the butterfly angle (α). The inlet air flow is defined by the position of the butterfly and the corresponding engine speed (n): system (α/n). The ignition system transmits the engine speed data to the control centre.

Load state

For full load enrichment and cut-off on deceleration, it is important to detect the idling and full load operating conditions in order to satisfy the various criteria for optimising these conditions. The full load condition is characterised by the fact that the throttle butterfly exceeds an angle of aperture of which the value is specific to the engine. The idling position is reached as soon as the throttle butterfly lever bears against the idling speed activator pin and activates the idling switch.

Engine temperature

The engine temperature has a considerable effect on the fuel requirement. A sensor incorporated in the cooling system measures the engine temperature and emits an electric signal to the control centre.

Inlet air temperature

The density of the inlet air depends on the temperature. Cold air is denser than hot air. The volume of air drawn in by the engine thus decreases as the air temperature increases. In order to compensate this phenomenon a temperature sensor is disposed in the injection unit inlet duct and indicates the temperature of the inlet air to the control centre.

Battery voltage

The attraction and release times of the electromagnetic injector vary according to battery voltage. In order to compensate the injector response delays, the computer corrects the variations in the limit voltage by modulating the injection time.

METERING THE FUEL

The injection computer processes the input signals and then calculates the injection time as a criteri of the injection delivery. For this purpose the computer has a micro-computer, a program and data memory as well as an analog-digital convertor.

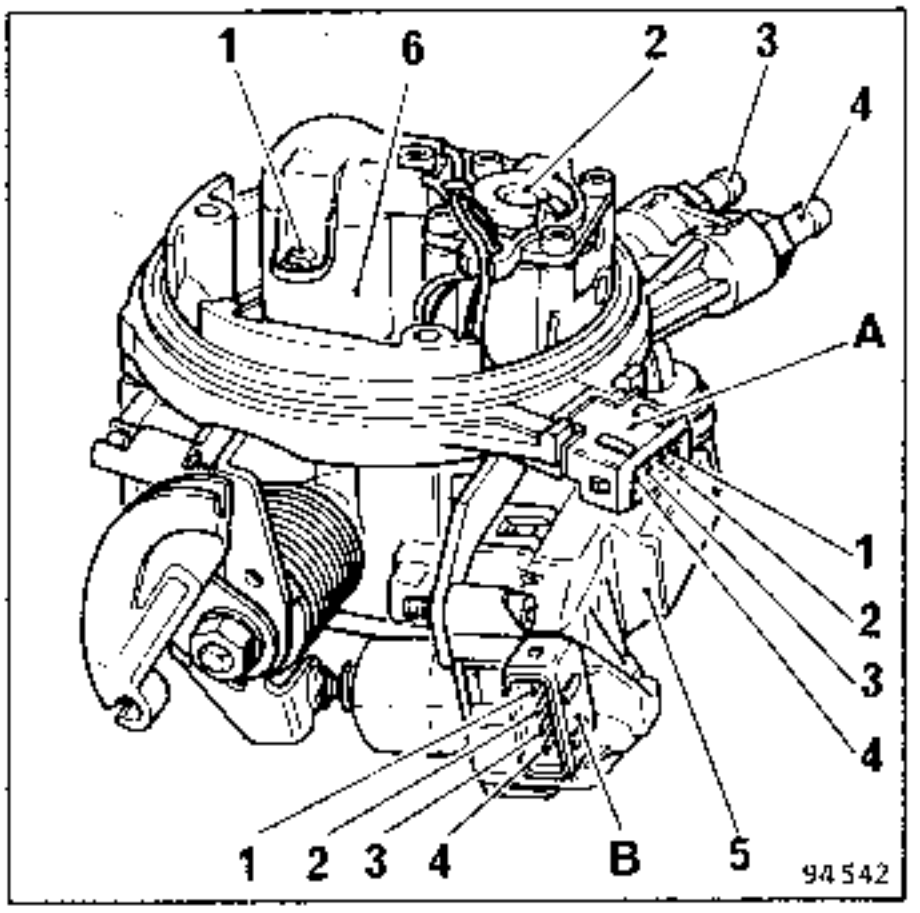
The computer determines the basic injection time from throttle butterfly angle and engine speed signals. To this end, a map of several positions of the throttle butterfly and engine speeds is stored in the memory. The various points on this map correspond to the specific injection times of the engine permitting air/fuel to be injected according to a stoichiometric ratio irrespective of the load conditions.

MIXTURE REGULATION

The Lambda sensor, exposed to the exhaust gas flow, permanently emits a signal enabling the control centre to control the air/fuel ratio instantaneously. As soon as a difference in relation to the stoichiometric value appears, the fuel injection time increases or decreases. This regulation enables the fuel to be metered exactly and consequently the composition of the mixture to be constantly optimised for efficient anti-pollution ($\lambda = 1$).

IDLING SPEED REGULATION

The self-adapting regulation of the idling speed enables the engine idling speed to be decreased and stabilised. An activator positions the throttle butterfly according to the difference between the engine idling speed at a given time and the reference value. The reference engine speed is defined by the control centre according to the engine temperature and the receivers in operation. The angular position of the throttle butterfly required for regulating the idling speed is consequently adapted. This system is maintenance free - since the engine speed and mixture do not have to be regulated on idling. The self adpting functions of the control centre compensate the variables, eg. altitude or long-term variations of the engine during the entire useful life of the system.



1 - Air temperature sensor
2 - Fuel pressure regulator
3 - Fuel return to tank
4 - Fuel feed
5 - Throttle opening motor
6 - Monopoint injector

Connector (A)

The injector and air temperature sensor function.

1 and 4	Air temperature sensor
2	Monopoint injector +
3	Monopoint injector -

Connector (B)

Idling speed regulation and light throttle switch function.

1	Engine feed + or -
2	Engine feed - or +
3 and 4	Light throttle switch

Connector (C)

Throttle butterfly potentiometer, automatic transmission potentiometer full throttle switch function.

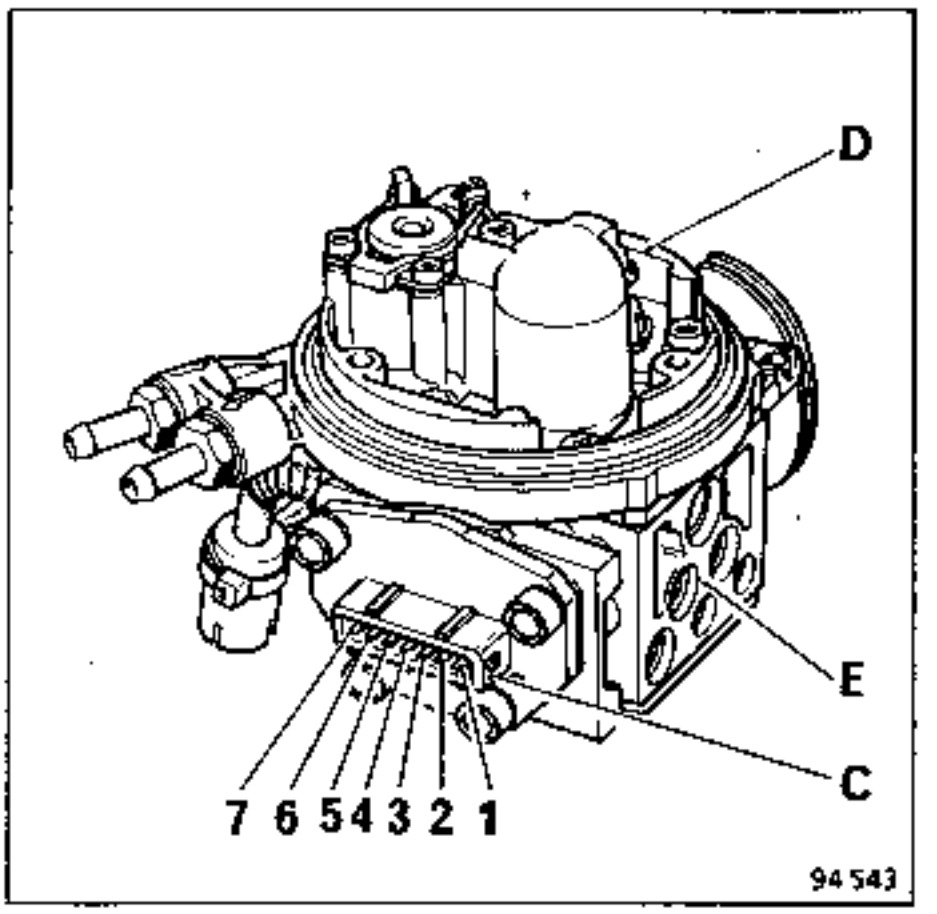
1	AT track +
5	AT track cursor
7	AT track -
3	Injection track -
2	Injection track cursor
6	Injection track +
3	Full load switch -
4	Full load cursor
6	Full load switch +

The throttle casing consists of two parts:

- D The upper part known as the injector body
- E The lower part known as the butterfly body

NOTE:

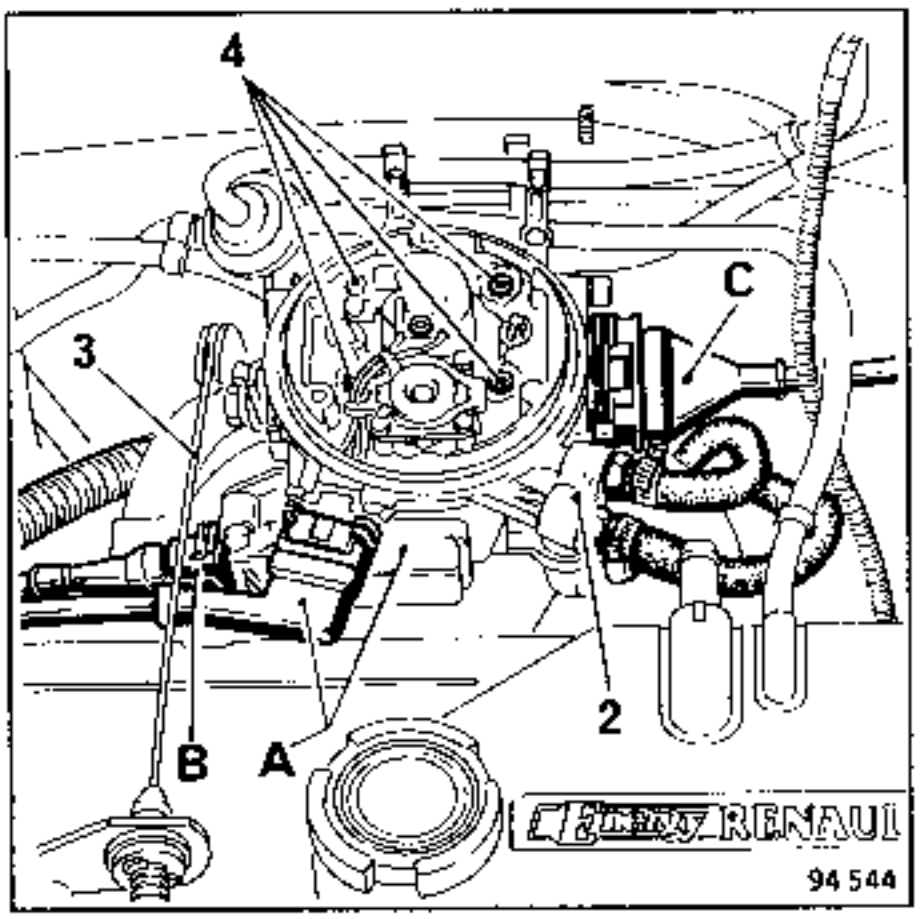
With the casing removed, the two parts are held in place by plastic connectors with pressure stud joining pieces. Press the pressure stud type joining pieces together to separate the two sections.



REMOVAL - REFITTING

Remove:

- the air filter;
- disconnect connectors (A), (B) and (C);
- disconnect the fuel feed (1) and return (2) lines;
- disconnect the accelerator control cable (3);
- remove the four mounting screws (4) and take out the throttle casing.



On reassembly:

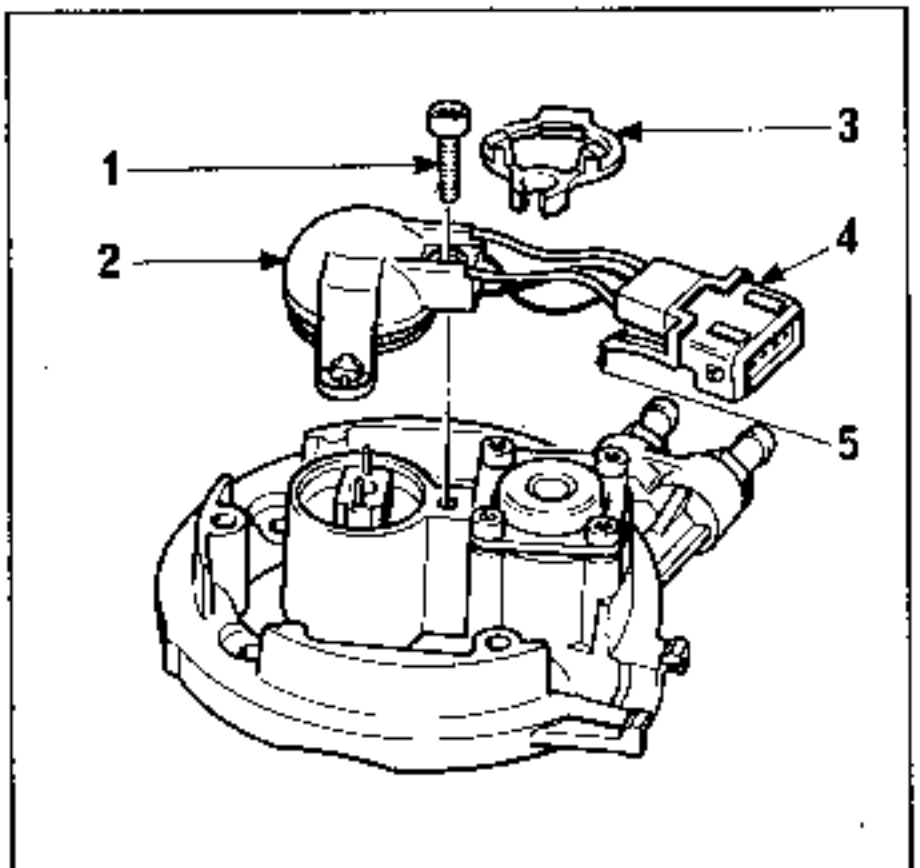
Change the seals between the manifold and casing.

Reconnect the fuel return and feed lines and check that the connectors are correctly clipped in place.

Reconnect the accelerator control and reassemble the air filter.

Removing the air temperature sensor:

- remove the air filter;
- disconnect the connector;
- remove screw (1) and raise the cover (2);
- release the leads from the mounting (3);
- take out connector (4) after first releasing hooks (5).



On reassembly:

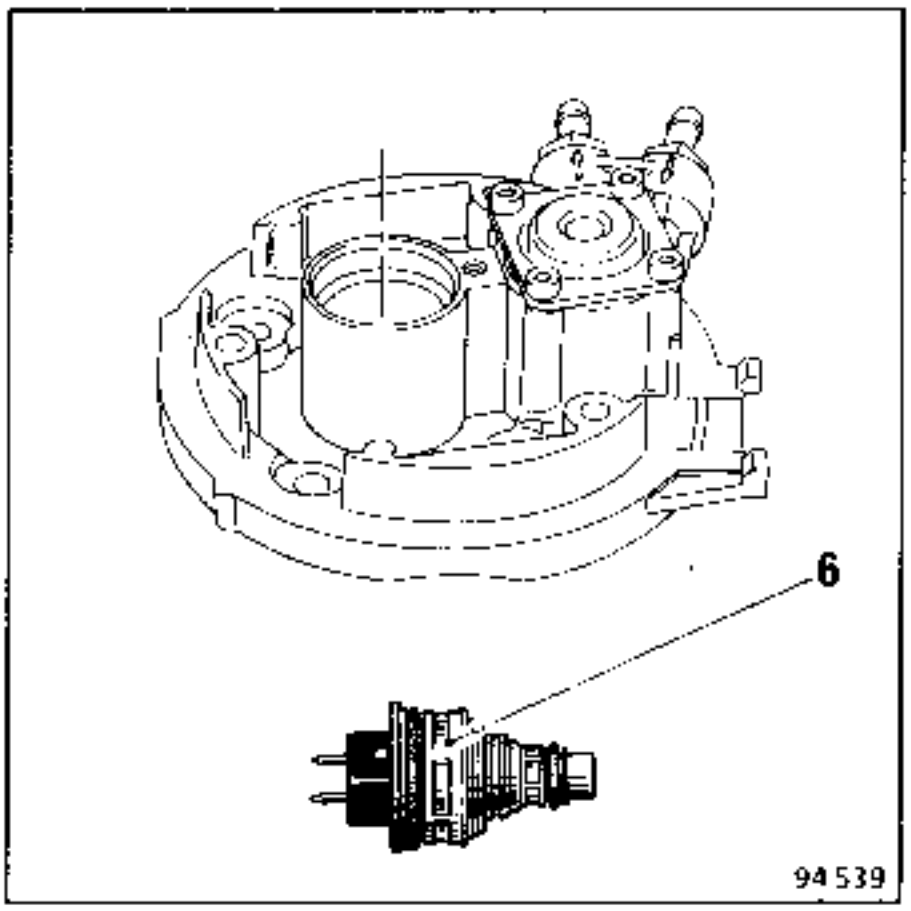
Check that the connectors are correctly clipped in place.

REMOVING - REFITTING INJECTORS

Remove the air filter.

Remove the air temperature sensor cover (see page 12-13).

Take out injector (6) from its housing.



On reassembly:

Replace the "O" ring seals and lubricate them.

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

NOTE:

The fuel pressure regulator cannot be regulated: if there is a defect, the upper part of the throttle casing must be replaced.

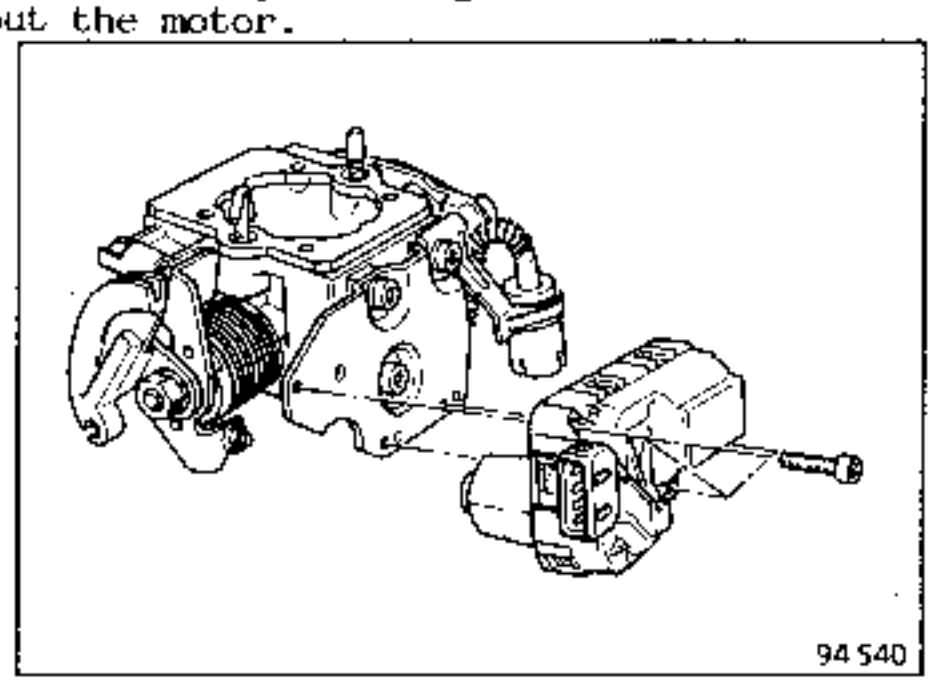
REMOVING - REFITTING THE IDLING SPEED REGULATING MOTOR

Remove the air filter.

The motor may be removed without removing the throttle casing, however access to the screws is facilitated by removing the throttle casing 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.



On reassembly:

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 micro-motor so as to obtain the no load switch setting Switch the ignition on then off and the micro-motor 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 engine stopped.

XR25 Test Box # 17

# 17 Value	Engine
approximately 110	E7F
approximately 135	E7J

REMOVING - REFITTING THE THROTTLE BUTTERFLY POTENTIOMETER

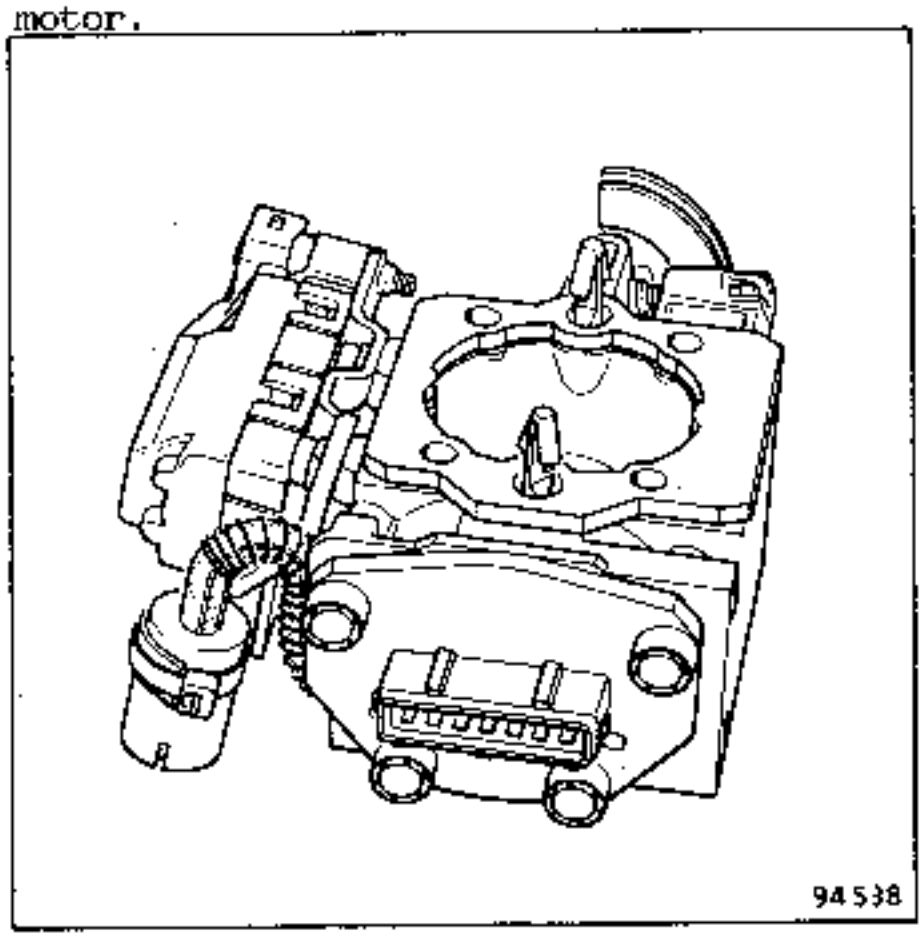
The throttle butterfly potentiometer is set in the factory and cannot be repaired.

If a defect occurs, replace the throttle casing body.

Removal

Remove the air filter and complete monopoint throttle casing assembly (see page 12-13).

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



On reassembly:

- Change the seals.

- Refit the throttle casing and ancillary units. Check that the connectors are correctly clipped in place.

- On the XR 25 test box check that the following bar graphs are present:

  . Light throttle
  . Full throttle

and check the cold start setting

  # 17: 110 E7F engine
  : 135 E7J engine

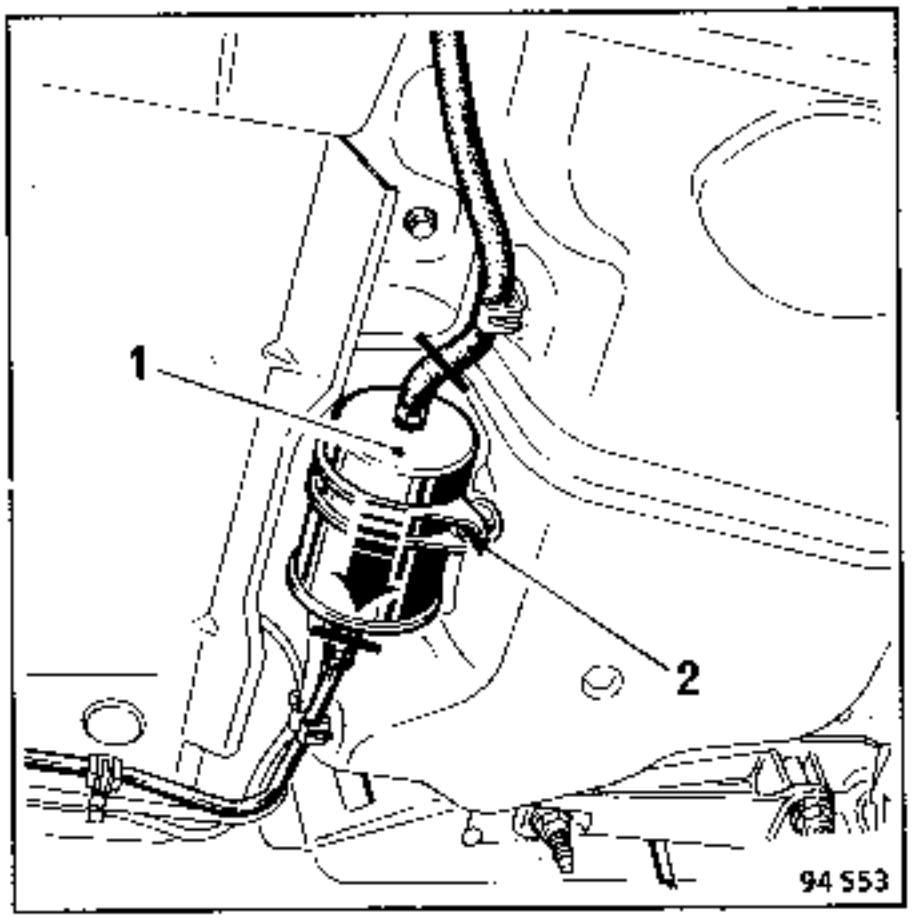
  Refit the air filter

REPLACING

Replace every 30,000 miles (50,000 km).

ESSENTIAL SPECIAL TOOLING	
Mot.453-01	Hose clamps

- The filter is located under the vehicle, in front of the fuel tank and is secured by a flange on the front part of the tank.



- Fit hose clamps Mot. 453-01 to the hoses.

- Remove the clips and disconnect the filter inlet and outlet hoses.

- Remove screw (2) and the fuel filter (1). On reassembly, take care to refit the parts in the correct direction of fuel flow (see arrow on filter).

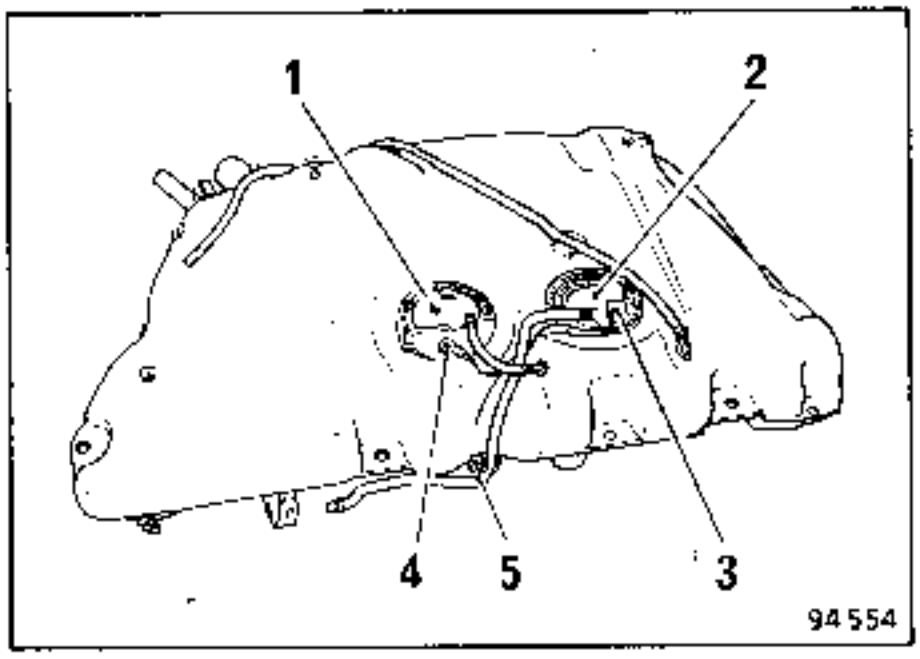
- Reconnect the hoses.

- Remove hose clamps Mot. 453-01.

REPLACING

NOTE:

The fuel pump is of the type which is immersed in the fuel tank. It is therefore necessary at present to remove the tank to reach the pump. For removal of the fuel tank see MR 295 page 19-15 .



1 - Fuel tank sender unit
2 - Immersed fuel pump
3 - Feed connector on fuel pump
4 - Connection harness to fuel flap
5 - Fuel feed hose

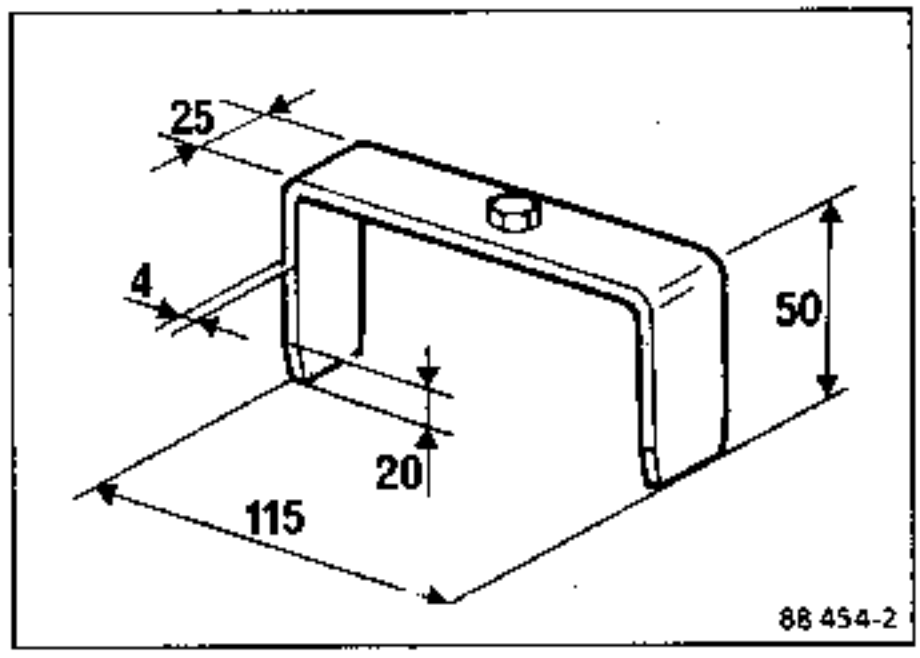
When the fuel tank has been removed, disconnect electrical connection (3) and feed hose (5).

It is prohibited to use a screwdriver or hammer as there is a risk of damaging the notches on the plastic nut and damaging the sender unit.

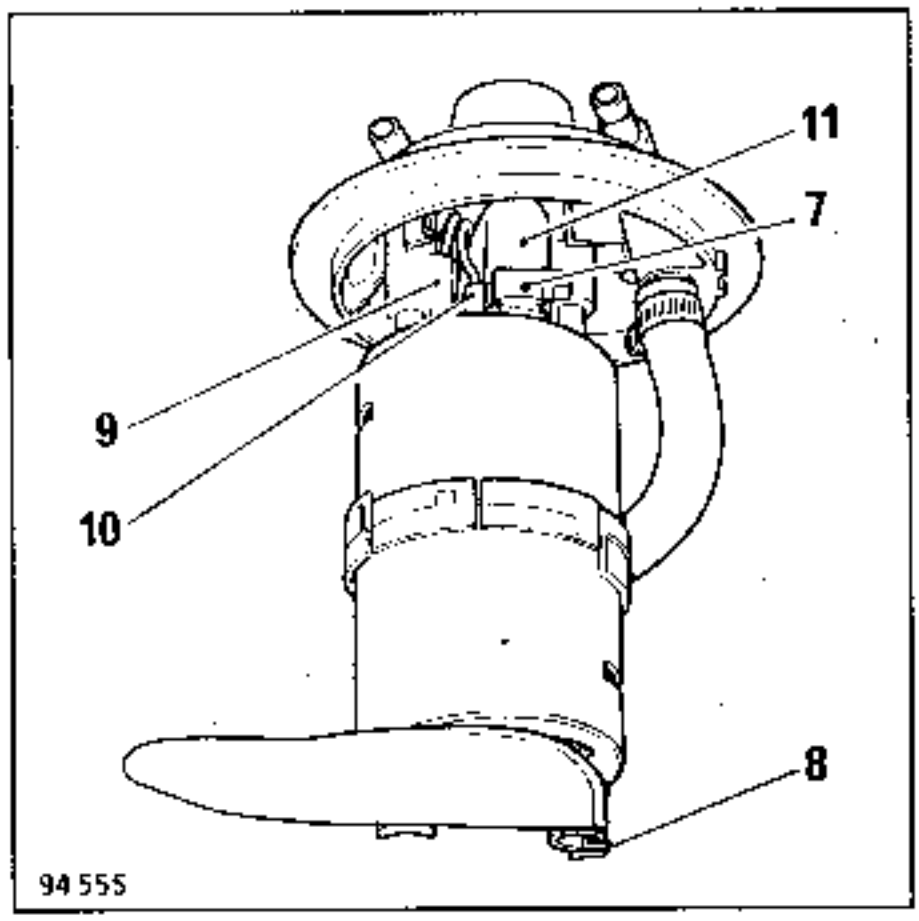
Make up a tool locally in order to ensure that the compulsory tightening torque of 3 daN.m is adhered to.

Drill a hole in the centre of a piece of flat iron bar 25 x 4 x 210 mm and weld on a hexagon head screw 13 mm across flats. Bend into a U shape. Adjust so that it fits into the notches on the plastic nut.

LOCALLY MADE UP TOOL



Using this tool, unscrew nut (6) and take out the fuel pump.



Slacken clip (7), remove clip (8) and separate the pump from the cover after disconnecting leads (9) and (10) and fuel hose (11).

On reassembly:

Respect the polarity of the leads, fit in place hose (7), leads (9) and (10) and clip (8) correctly.

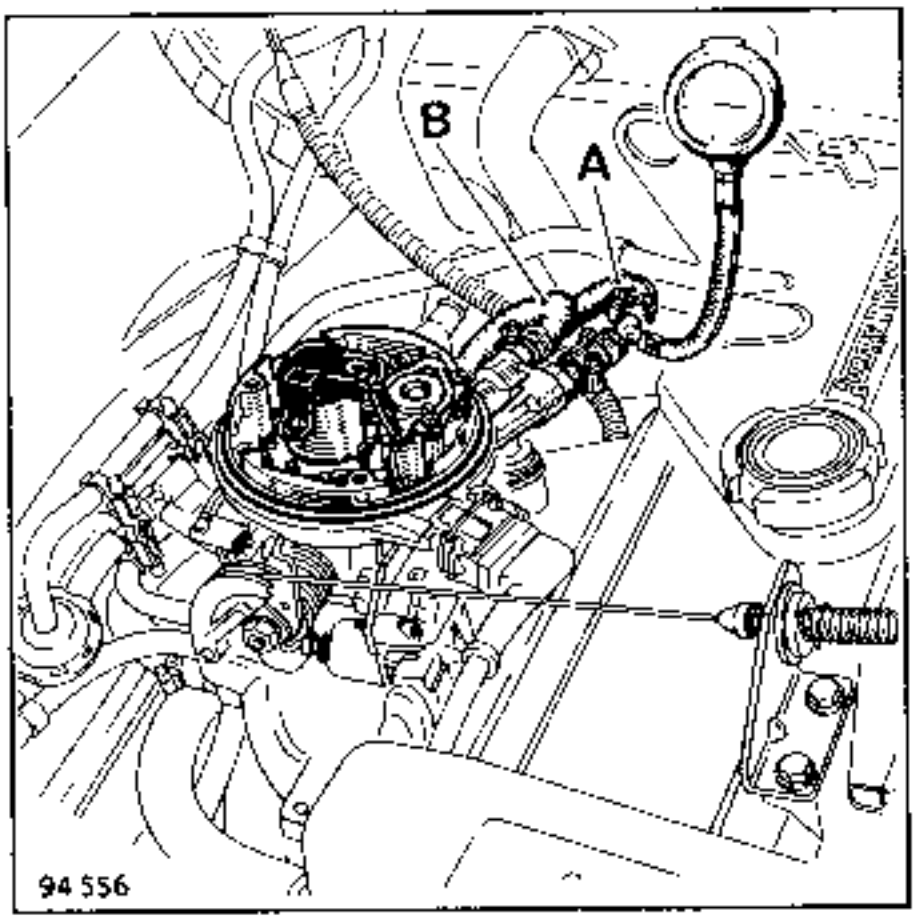
Fit a new seal and torque tighten the nut to 3 daN.m.

Checking the fuel pump delivery and fuel feed pressure

ESSENTIAL SPECIAL TOOLING	
Mot. 843	0-6 bar pressure gauge
Mot. 867	1 + 2 bar pressure gauge
Mot. 904	By-pass T - piece union for measuring pressure
1 manual vacuum pump	Nauder Approval 583 800
1 2000 ml graduated flask	

Remove the air filter

Disconnect fuel inlet hose (A), fit by-pass T - piece union Mot. 904 and connect it to the 1 + 2 bar pressure gauge Mot. 867, disconnect return hose (B) and replace it by a flexible hose leading into the 2000 ml graduated flask.



Measuring the pressure and delivery

Turn the fuel feed pump for 1 minute and read off the pressure and amount of fuel in the flask:

Pressure = 1.06 ± 0.05 bars
Minimum delivery - 0.83 L/min.

Briefly pinch return hose (B) and the pressure should stabilise at approximately 3 bars.

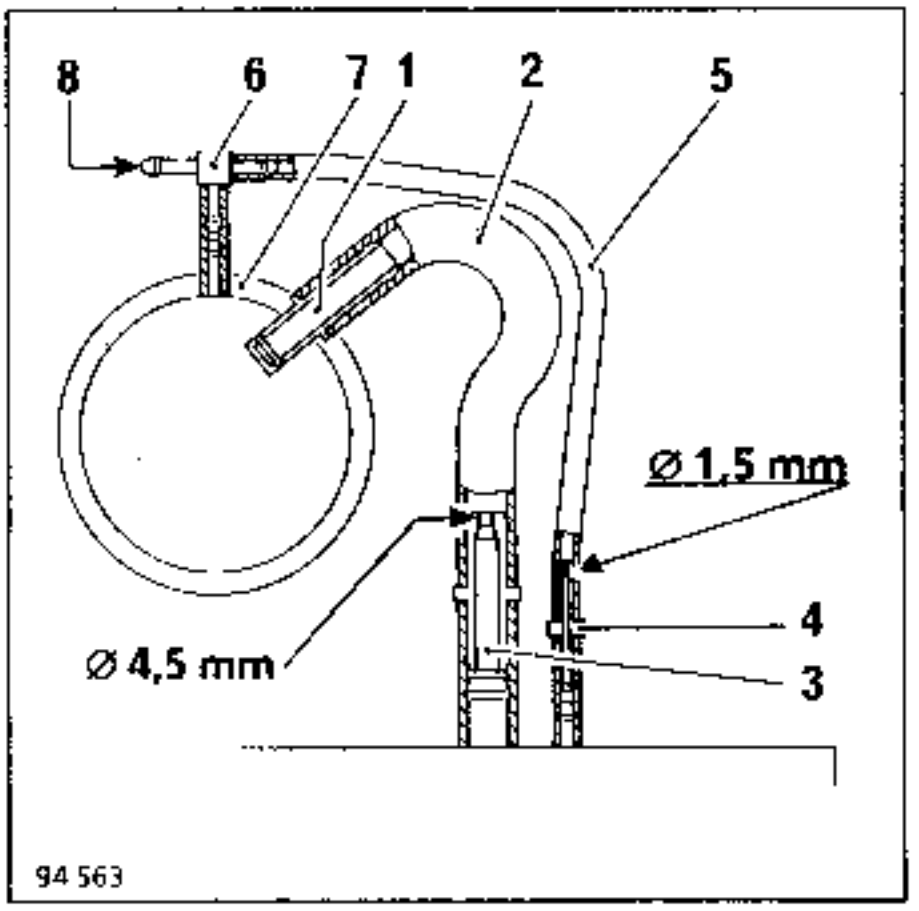
NOTE:

The measurements may be taken with the engine idling or stopped by shunting terminals (3) and (5) (large leads) of relay (236) located in the injection computer plastic casing.

ATTENTION:

If the delivery is low, check the pump feed voltage (there is a delivery loss of approximately 10% for a 1 volt drop in voltage).

With the engine hot and idling, the amount of fuel consumed by the engine is less than 2 litres/hour or 0.033 l/minute.



Upstream rebreathing circuit

1 - Air filter take-off
2 - Filter - restrictor connection hose
3 - 4.5 mm Ø restrictor E7J ... engine
    6.5 mm Ø restrictor E7F ... engine

Down-stream rebreathing circuit

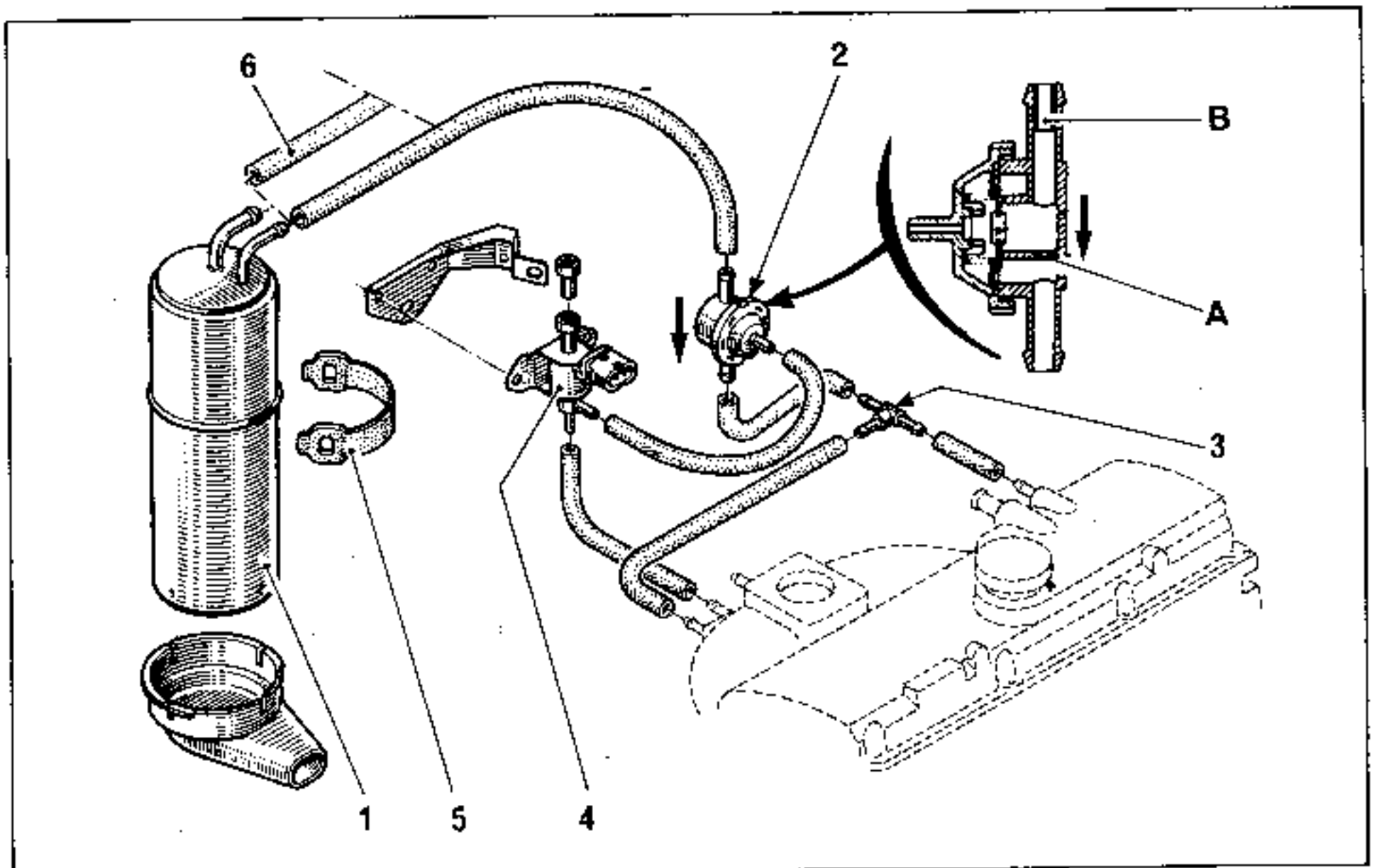
4 - 1.5 mm Ø restrictor E7J ... engine
    1.3 mm Ø restrictor E7F ... engine
5 - Restrictor - T-piece union connection hose
6 - T-piece union
7 - Take-off on inlet manifold
8 - To cansister bleeding system

CHECKING

In order to ensure that the anti-pollution system is operating correctly, the oil vapour rebreathing system must be maintained clean and in good condition.

Check that the restrictors are fitted and to specification.

CIRCUIT DIAGRAM



1 - Fuel vapour absorber (canister)

2 - Canister bleeding valve

A - 0.8 mm Ø restrictor (bleed delivery, solenoid valve not fed).

B - 2 mm Ø restrictor (bleed delivery, solenoid valve fed).

NOTE:

The arrow shows the direction of flow (canister to engine inlet manifold).

3 - T - piece union

4 - Control solenoid valve

5 - Canister mounting strap

6 - Connection hoses between fuel tank and canister

NOTE:

See page 17-9 for checking the operation of the canister and its circuit.

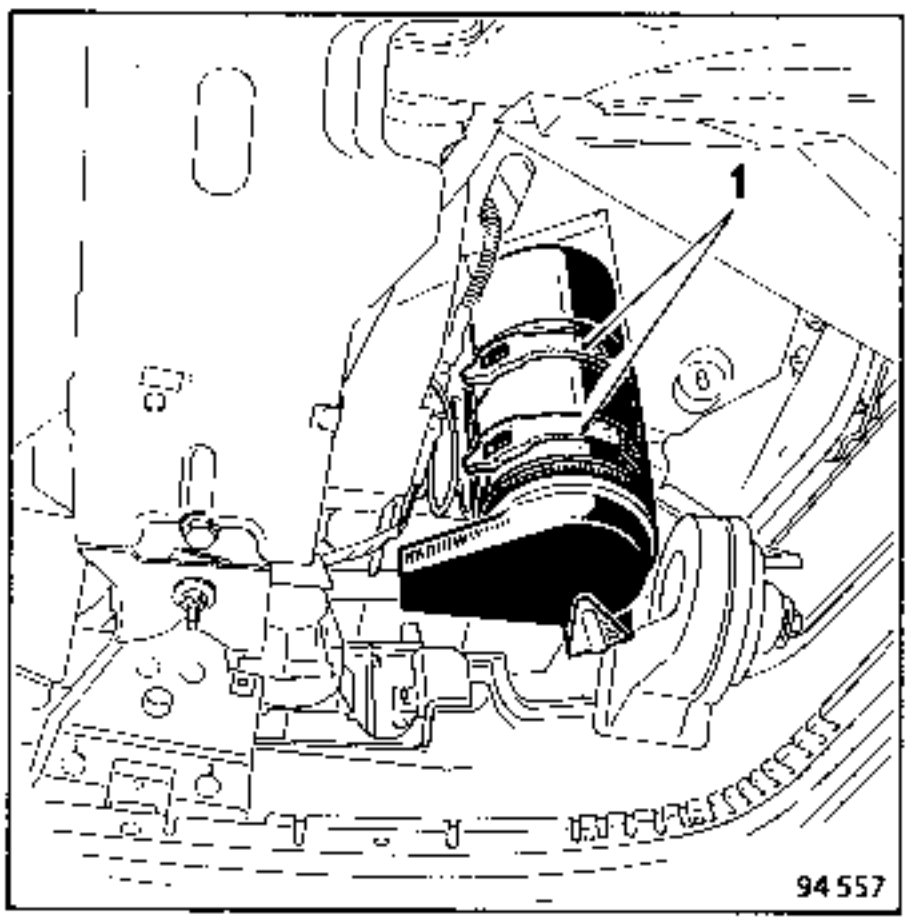
REMOVING - REFITTING THE CANISTER

The canister is housed under the right-hand head light inside the front shield.

To reach it, remove the two screws securing the mud flap and release it.

Under the righthand head light, disconnect the two lines.

Remove the two straps (1) and take out the canister.



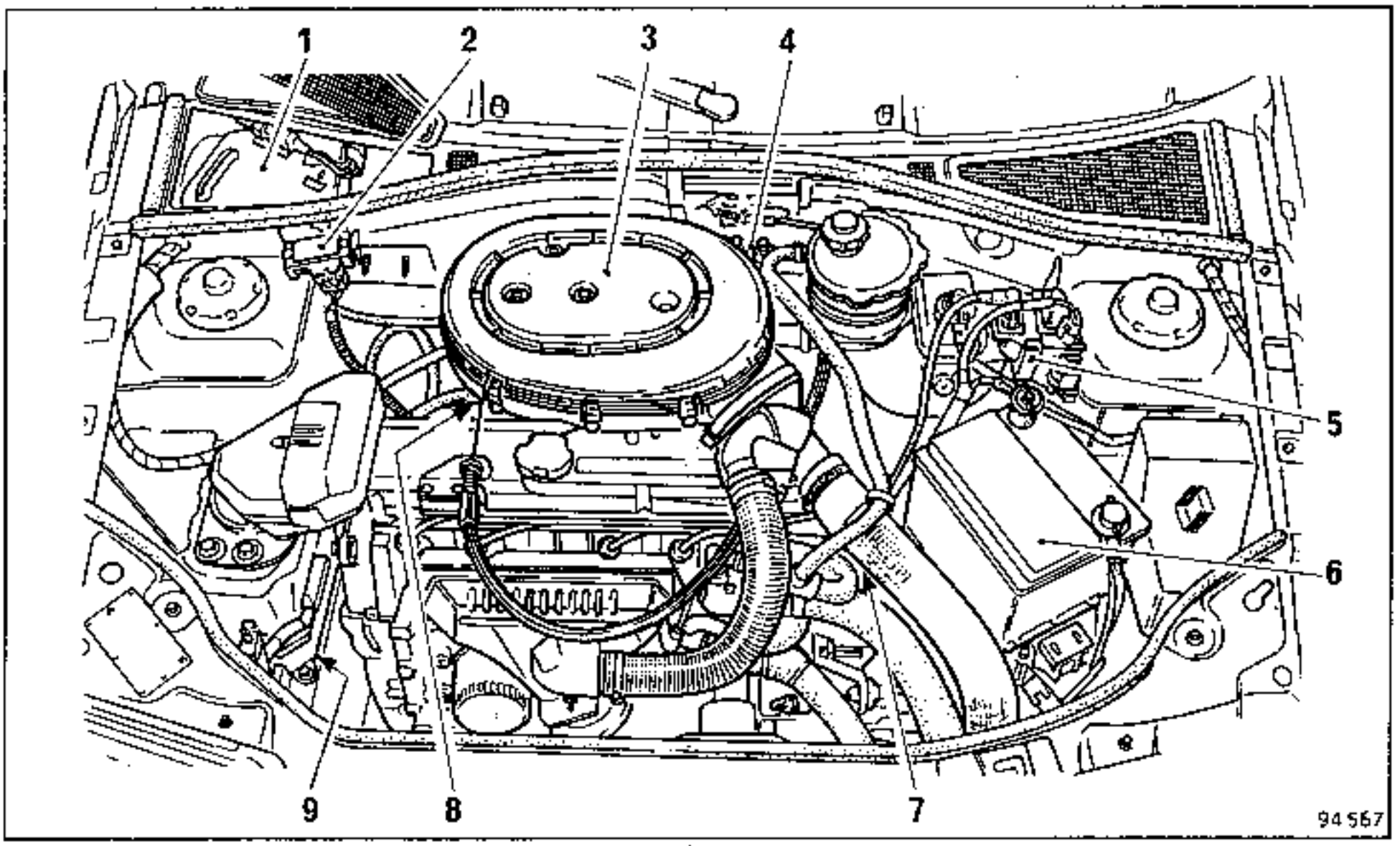
On reassembly:

Position the canister correctly such that the hoses are not stressed.

Ensure that the hoses are connected correctly (see operating diagram):

- Inlet (hose from tank with 8 mm Ø central take off).

- Outlet (hose going towards bleed valve 6 mm Ø offset outlet).



1 - Injector computer and relay

2 - Absolute pressure sensor

3 - Air filter

4 - Canister control solenoid valve

5 - Injection power module

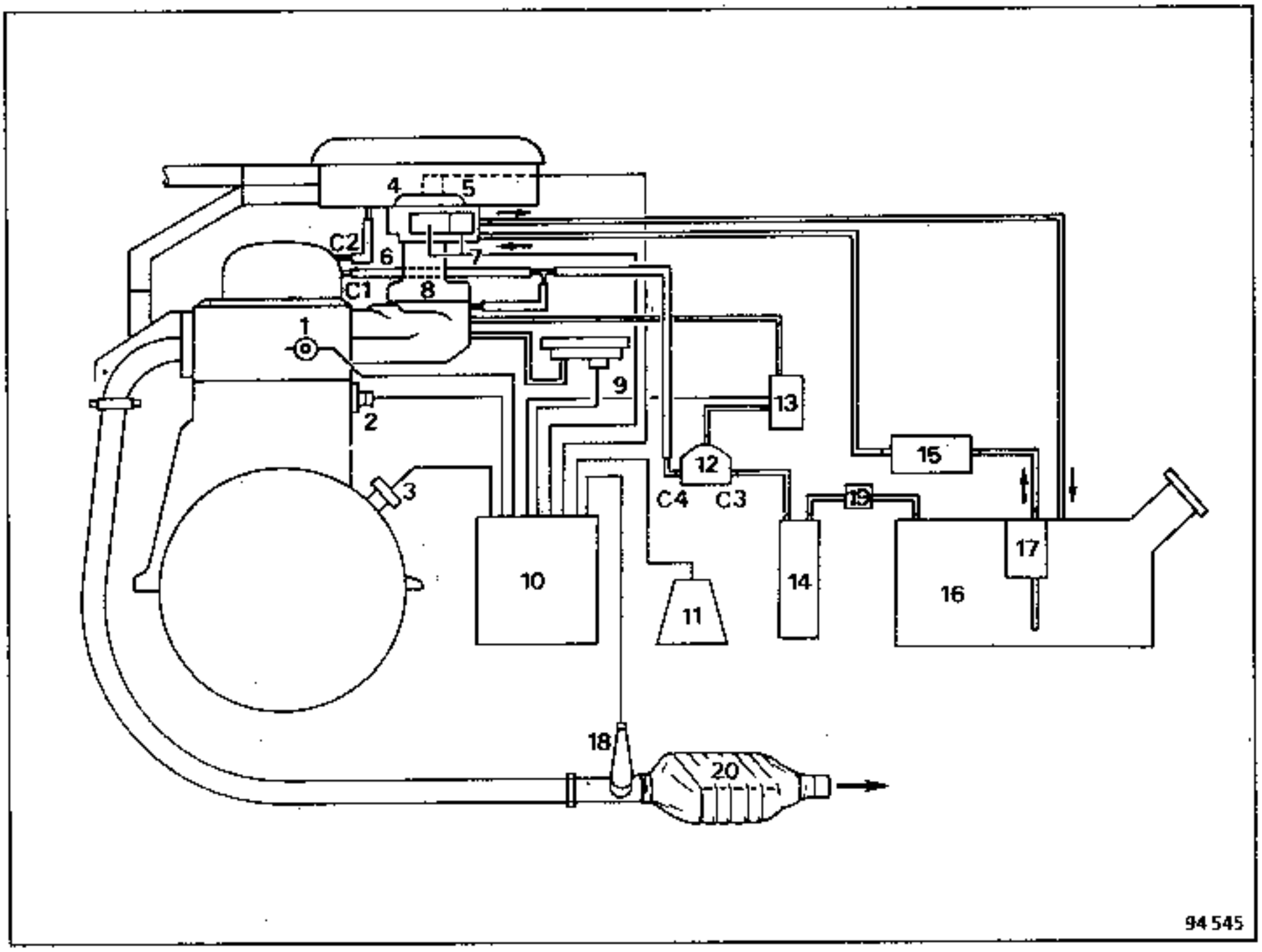
6 - Battery

7 - Speed sensor

8 - BOSCH monopoint throttle casing

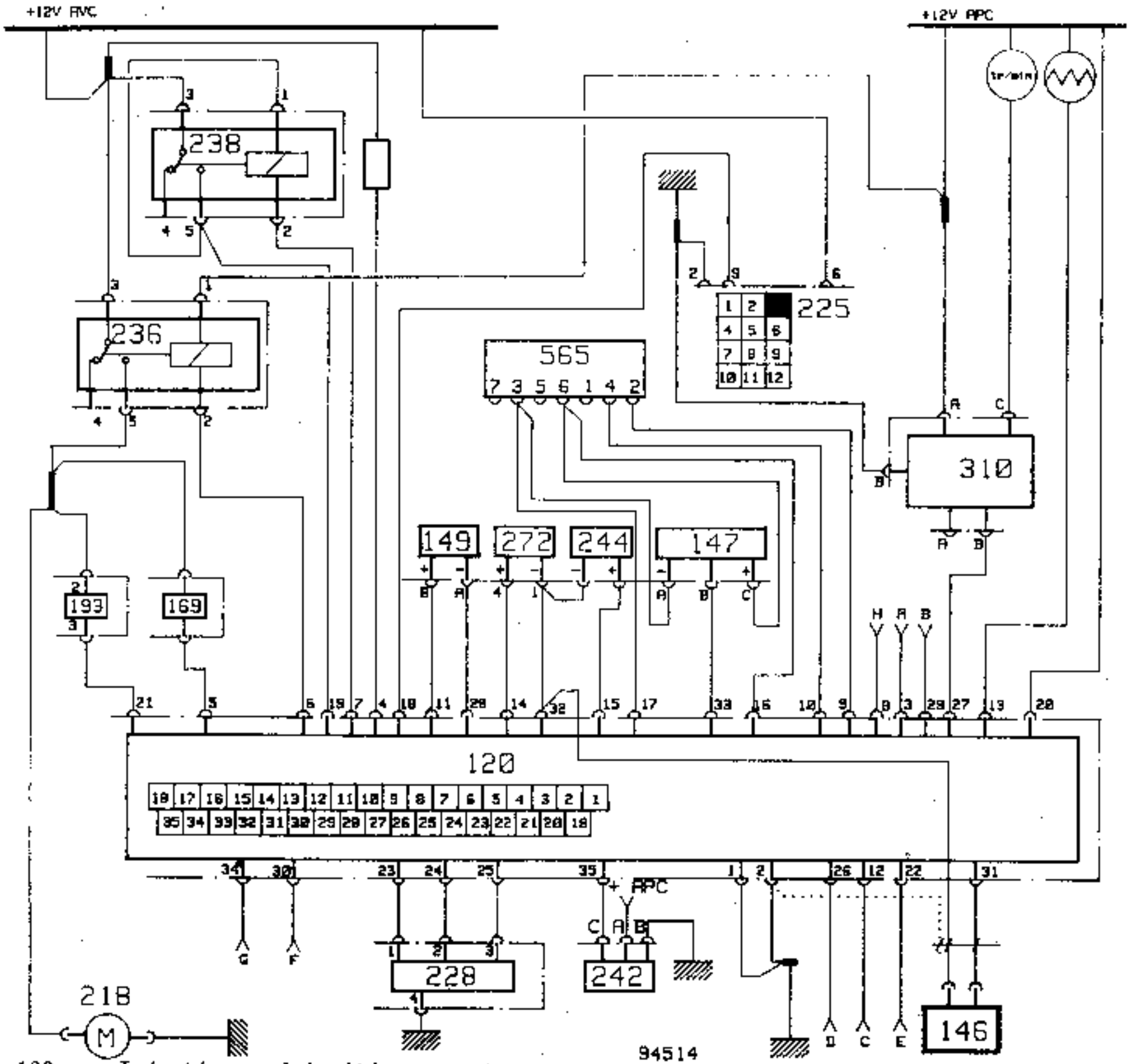
9 - Canister (housed inside front shield under headlight)

DIAGRAM SHOWING LOCATION OF COMPONENTS



1 - COOLANT SENSOR
2 - PINKING SENSOR
3 - TDC SENSOR
4 - INJECTOR
5 - AIR SENSOR
6 - THROTTLE POTENTIOMETER
7 - IDLING SPEED REGULATING MOTOR
8 - INJECTION CASING
9 - PRESSURE SENSOR
10 - COMPUTER
11 - IGNITION UNIT
12 - VACUUM BLEED VALVE
13 - SOLENOID VALVE
14 - FUEL VAPOUR ABSORBER (CANISTER)
15 - FUEL FILTER
16 - FUEL TANK
17 - IMMERSED FUEL PUMP
18 - LAMBDA (oxygen) SENSOR
19 - NON-RETURN VALVE
20 - CATALYTIC CONVERTOR
C1 - 6.5 mm Ø restrictor (E7F engine)
4.5 mm Ø restrictor (E7J engine)
C2 - 1.3 mm Ø restrictor (E7F engine)
1.5 mm Ø restrictor (E7J engine)
C3 - 0.8 mm Ø restrictor (internal) mm
C4 - 2 mm Ø restrictor

E7F...AND E7J...ENGINE OPERATING DIAGRAM



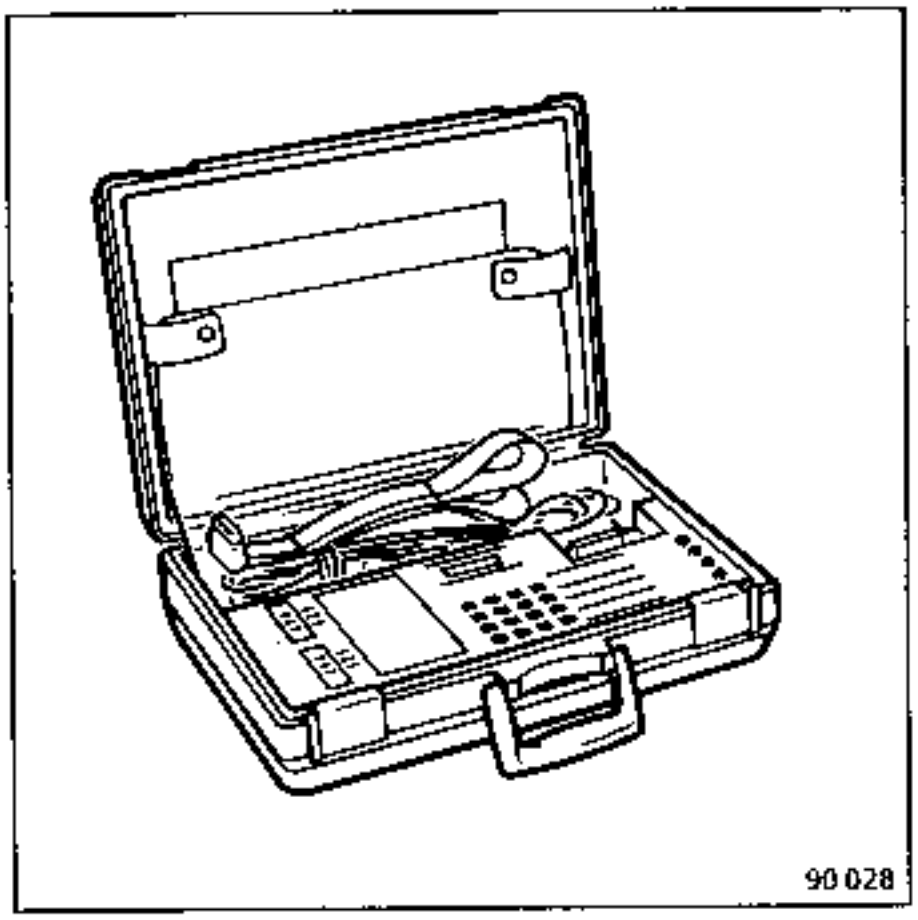
120 - Injection and ignition computer
146 - Pinking sensor
147 - Pressure sensor
149 - Flywheel sensor
169 - Anti-evaporation system (canister) bleeding solenoid valve
193 - Injector
218 - Fuel pump (motor)
225 - Diagnostic base (viewed from above)
228 - Idling speed regulating motor with no load switch
236 - Pump relay
238 - Protective relay
242 - Oxygen or Lambda sensor
244 - Coolant temperature sensor
272 - Air temperature sensor
310 - Ignition power module
565 - Load potentiometer on throttle casing
⌒ - Connectors

Computer inlet or outlet allocation
A - Vehicle speed data
B - Starter data
C - A4 A.T. injection TDC start
D - Flow meter data
E - Air conditioning compressor control relay
F - Air conditioning data (on/off)
G - Air conditioning thermostat data
H - *AT Neutral/Park data

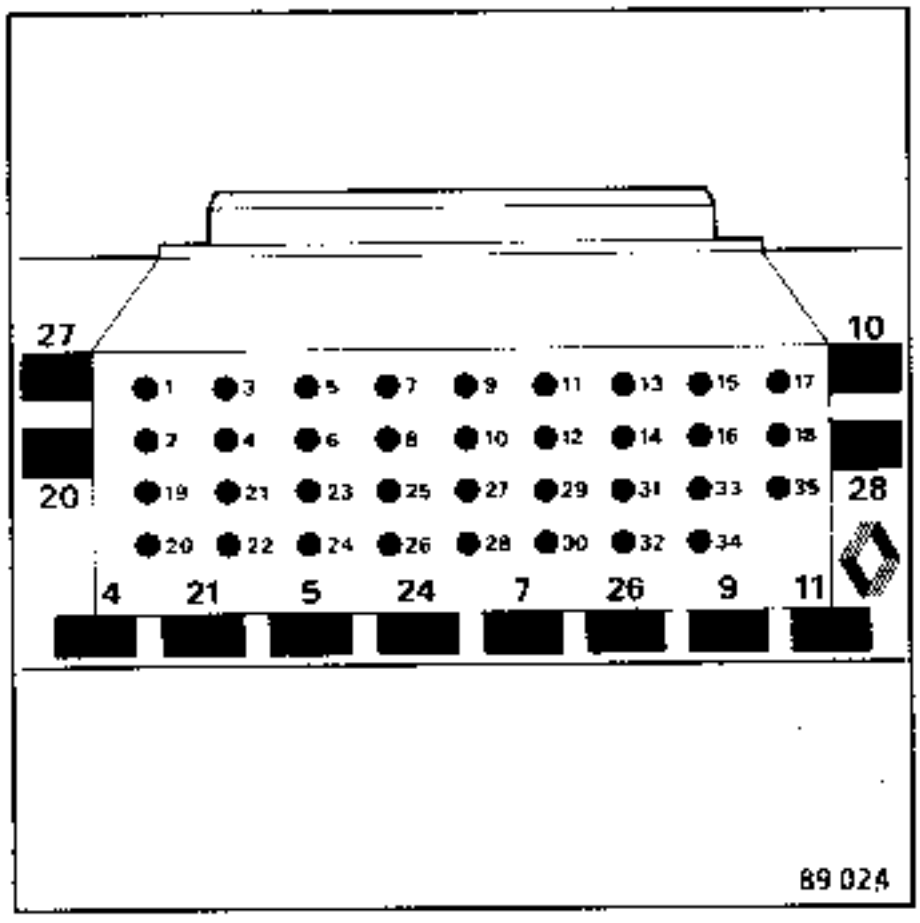
COOLING

The XR 25 micro-processor system test box has been developed which when connected to the diagnostic socket enables checking and fault finding to be carried rapidly by informing the operator of the state of the computer and the majority of its peripherals.

XR 25 test box



M.S. 1048 "Bornier"



PRECAUTIONS

The computer must be disconnected and no checks can be performed on the computer itself.

When performing electrical tests using the voltmeter /ohmmeter or shunting electrical terminals, take care not to make any errors when matching up the leads indicated in the wiring diagrams.

A connection error could result in damage to the injection system components.

Checking the inlet circuit for leaks

If the idling speed is unstable (pumping) check the condition of inlet circuit unions and hoses.

In addition, ensure that the no load switch and load potentiometer are operating correctly as these could cause similar defects.

NOTE:

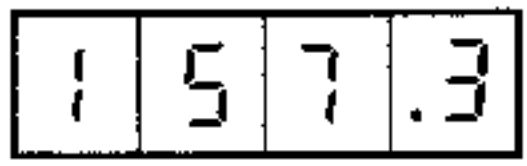
If the data obtained using the XR 25 require electrical continuity to be checked from the injection system main connector, connecting this tool to the connector will facilitate access for the probe tips to the various contacts.

M.S. 1048 consists of a 35 - track base integral with a printed circuit over which there are distributed 35 copper plated surfaces numbered from 1 to 35.

The diagnostic method and method of using the XR 25 test box are described in M.R. Injection R(E) - section 17.

IDENTIFICATION CODE:

Identification number read off on XR 25 centre display



TEST PERFORMED (according to number read off on XR25)	# Key		Units of measurement
Pressure sensor	01	X	Millibars
Coolant temperature	02	X	Degrees
Air temperature	03	X	Degrees
Feed voltage	04	X	Volts
CO Potentiometer	05		Ohms
O_2 sensor	05	X	Millivolts
Engine speed	06	X	Rpm
Turbo pressure RCO	11		Milliseconds
Idling speed regulating valve RCO	12		Milliseconds
Pinking sensor data	13	X	No units
Engine speed difference	14	X	Rpm
Pinking correction	15	X	No units
Atmospheric pressure correction	16	X	Millibars
No load - full load potentiometer value	17	X	No units
Vehicle speed	18	X	Km/h
Turbo pressure correction	20		Milliseconds
Mixture regulation	35	X	No units

NOTE:

The XR 25 test box must be equipped with cassette no. 9 or the following cassette.

The diagnostic sequence is permanently emitted and incidents stored.

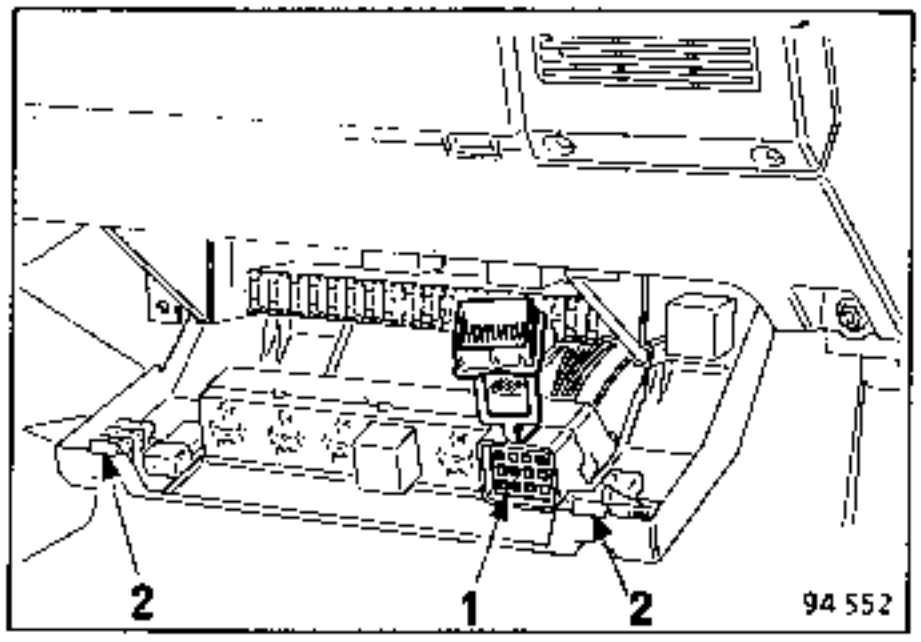
The injection warning light on the instrument panel is not operational.

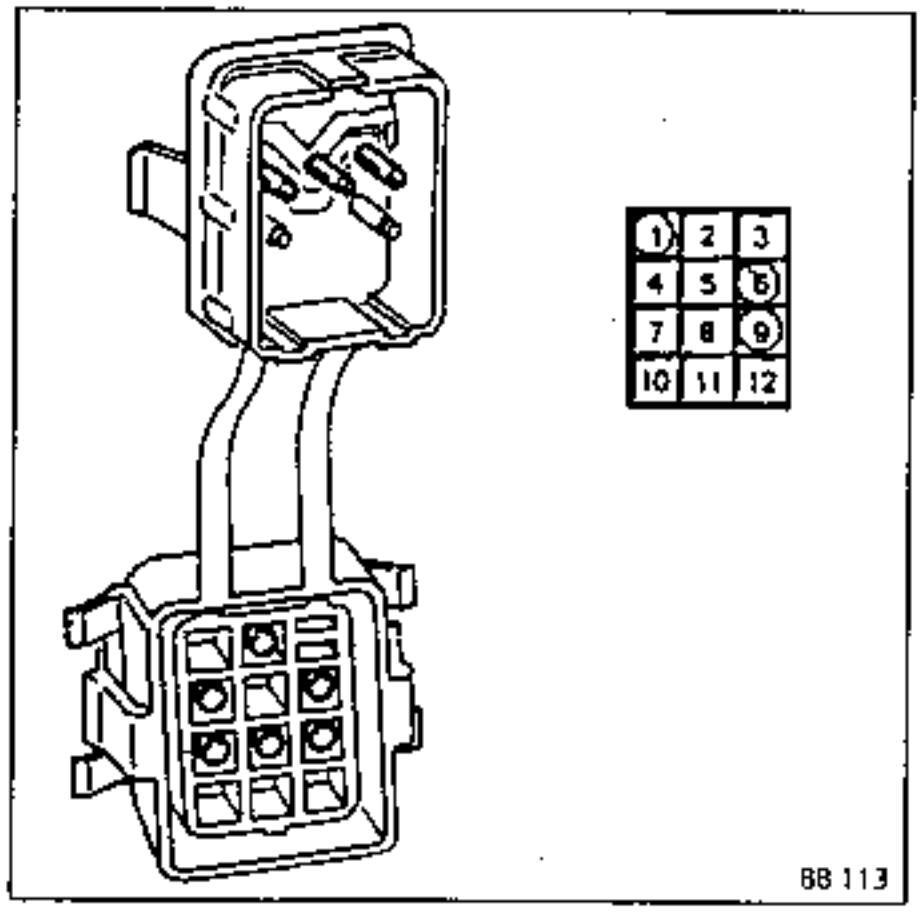
DIAGNOSTIC SOCKET

NOTE:

Diagnostic socket (1) is incorporated in the accessories plate mounting in the passenger compartment.

To open the plate, pull on the two tabs (2).





Allocation of diagnostic terminals

1 - A4 A.T. diagnostic data
2 - Earth
3 - Locating pin
4 - Not used
5 - ABS diagnostic data
6 - + 12 volts before ignition
7 - M A.T. diagnostic data
8 - To electronic incident warning light
9 - Injection diagnostic data
10, 11, 12 } Not used

The diagnostic socket enables the XR 25 test box connector to be connected for checking micro-processor systems.

NOTES ON XR 25

1 Must always be illuminated, ignition on, engine stopped or running

2 Must always be extinguished, if illuminated, computer faulty

3 – Illuminated on RH side, short circuit
– Flashing on RH side, short circuit memorised
– Illuminated on LH side, open circuit
– Flashing on LH side, open circuit memorised

4 Illuminated on RH side, short circuit
– Flashing on RH side, short circuit stored
– Illuminated on LH side, circuit open
– Flashing on LH side, short circuit memorised

5 – Illuminated on RH side, short circuit
– Flashing on RH side, short circuit stored
– Illuminated on LH side, open circuit
– Flashing on LH side, open circuit stored

7 Illuminated on RH side, sensor incident

8 Illuminated on RH side, should go out when starter activated
– Illuminated on LH side, sensor connection inverted

9 Illuminated on RH side, when starter activated injector circuit shorting or open

10 Illuminated on RH side, no load switch
– Illuminated on LH side, full throttle switch
– RH and LH extinguished, throttle butterfly open half way

11 Illuminated on RH side, defective cycle, sensor or sensor target

12 Illuminated on RH side, sensor break down

13 Illuminated on RH side, temporary or definitive sensor break down
– Illuminated on LH side, anti-pollution computer with O^2 sensor

14 Extinguished on RH and LH, AC not activated
– Illuminated on LH side, air conditioning switch on "ON"
– Illuminated on LH and RH, AC operating

15 Illuminated on RH side in road test, and # 18 = 0, sensor break down

17 Illuminated on LH side when starter activated ignition power module primary circuit faulty

19 Illuminated or extinguished on LH SIDE, P.N. or Drive (TA) data or # 22, change of state 0 or ¦

20 Illuminated on RH side, storing effective.

CARD 87-A

	■	1 ■■	Correct code	TEST 1: IGNITION ON (ENGINE STOPPED)
	□	2 ■	Computer diagnosis	
□	□	3 ■	Throttle potentiometer circuit	TEST 3: STARTER SPEED TEST (IF VEHICLE DOES NOT START)
□	□	4 ■	Air sensor circuit	
□	□	5 ■	Coolant sensor circuit*	
⊠	⊠	6 ■	C.O. potentiometer circuit	
	□	7 ■	Pressure sensor signal	TEST 2: ENGINE RUNNING
□	■	8 ■	Flywheel sensor circuit	
	□	9 ■	Injector feed	
□	■	10 ■	No load – full load switches	

INJECTION R TEST

CODE D03

	□	11 ■	Flywheel sensor	
	□	12 ■	Pinking sensor	
■	□	13 ■	Oxygen sensor*	
□	□	14 ■	Air conditioning data*	
	□	15 ■	Vehicle speed circuit	
□		17 ■	*A *B	
		18 ■	*C *D	
□		19 ■	*E *F	
	□	20 ■	MEMORY FUNCTION : 0	

KEY
01 PRESSURE
02 COOLANT TEMPERATURE
03 AIR TEMPERATURE
04 BATTERY VOLTAGE
05 CO POT
06 IGN ENGINE SPEED
11 TURBO PRESSURE REG
12 TIMING ROD
13 PINKING SENSOR DATA
14 ENGINE SPEED DIFFERENCE
15 PINKING CORRECTION
16 ATMOSPHERIC PRESSURE CORRECTION
17 NO LOAD/FULL LOAD VALUE
18 SPEED KM/H
20 TURBO PRESSURE CORRECTION

* See MR for test conditions

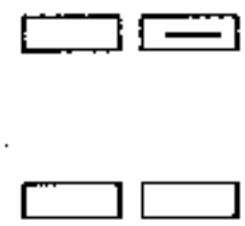
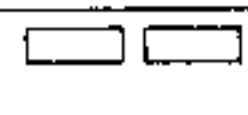
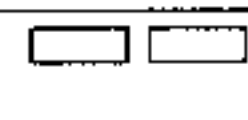
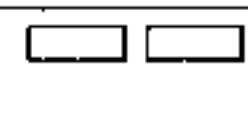
■ Bar graphs normally illuminated engine stopped, ignition on

□ Bar graphs which may illuminate when incidents occur or when activated

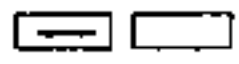
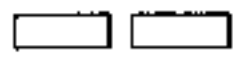
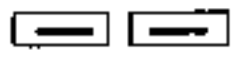
Abbreviations:

CC = Short Circuit
CA = Open Circuit
P = Park
N = Neutral
D = Righthand
G = Lefthand
CA = Air Conditioning

CHECKING THAT SYSTEM IS TO SPECIFICATION

Functions	Conditions	Testbox Selection	Bar graph line no.	Bar graph display	Display and comments
COMPUTER CONFORMITY	engine stopped ignition on	D03	L1 L8 L10 L13		x x x 3 Check computer to specification Correct code No TDC No load switch Computer ready to receive data from oxygen sensor
THROTTLE BUTTERFLY POTENTIO-METER	engine stopped ignition on no load throttle pedal slightly depressed full throttle	# 17	L10 L10 L10		Value should be greater than or equal to 100 - E7F ... engine 135 - E7J ... engine Otherwise check that computer is to specification Lefthand bar graph illuminates when butterfly angle greater than 70°.
ABSOLUTE PRESSURE SENSOR	engine stopped ignition on	# 01	L7		Value read off should be equal to atmsopheric pressure (between 950 and 1025 mb at sea level) otherwise check: -pressure sensor -harness and connections
COOLANT TEMPERATURE SENSOR	engine cold ignition on	# 02	L5		Value read off should be equal to ambient temperature : -If bar graph is illuminated check sensor, connector and harness -If value read off not ambient temperature, check sensor
AIR TEMPERATURE SENSOR	engine cold ignition on	# 03	L4		Value read off should be equal to ambient temper-ature: -If bar graph illuminated, check sensor, connector and harness -If value read off is not ambient temperature, check sensor.

CHECKING THAT SYSTEM IS TO SPECIFICATION

Functions	Conditions	Testbox Selection	Bar graph line no.	Bar graph display	Display and comments
BATTERY VOLTAGE	engine hot and idling	# 04			Value read off should be between 13 and 14.5 volts otherwise check battery and alternator.
MIXTURE REGULATOR	engine hot and idling after cooling fan has cut in at least once and at least 25 seconds since engine last started. AT in PARK-NEUTRAL	# 35	L13		The value should vary and be between 0 and 255 otherwise check: - Oxygen sensor harness and connection; - Oxygen sensor. NOTE: Oxygen sensor should be supplied with +12 volts
					Computer not processing oxygen sensor data; check computer is to specification.
					Sensor circuit or oxygen sensor faulty
IDLING SPEED REGULATION	-engine hot and idling after cooling fan has cut in at least once.	# 6 # 17			Check engine speed, value should be: N=750±50 rpm/E7F...engine N=825±50 rpm/E7J engine MG N=780±50 rpm/E7J engine AT If N ¯ different, check - any air leaks; - idling speed regulating motor connection. The value of the butterfly position should be : - 22 and 179 E7J..engine - 10 and 180 E7F..engine
NOISE MEASURING PINKING SENSOR	- engine hot unladen 3500 rpm	# 13	L12		Value read off should not be 0 and variable, otherwise check: sensor harness -pinking sensor
VEHICLE SPEED	- Vehicle moving	# 18	L15		Value read off should be approximately that indicated by speedometer.
CANISTER BLEEDING	- engine hot - handbrake applied and clutch pedal slightly depressed, maintain manifold pressure btwn 391 and 736 mb-at idling	# 01 # 01			Connect a 0 - 1000 mb pressure gauge between bleeding solenoid valve and Bailly Comte valve. Value should be between 264 and 609 mb (at sea level) Vacuum value should be 0.

NOTE:

The replacement of the following units:

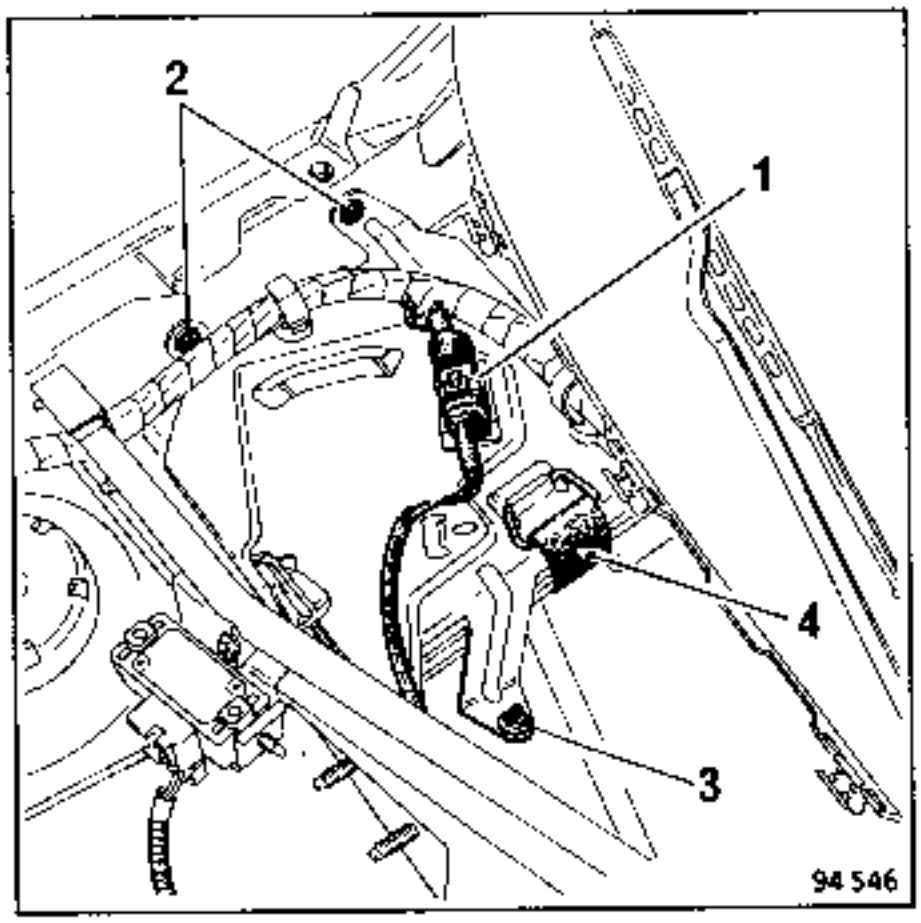
- injector
- air temperature sensor
- idling speed regulating motor
- load potentiometer

are dealt with in section 12 with the BOSCH monopoint throttle casing.

REPLACING THE COMPUTER AND RELAYS

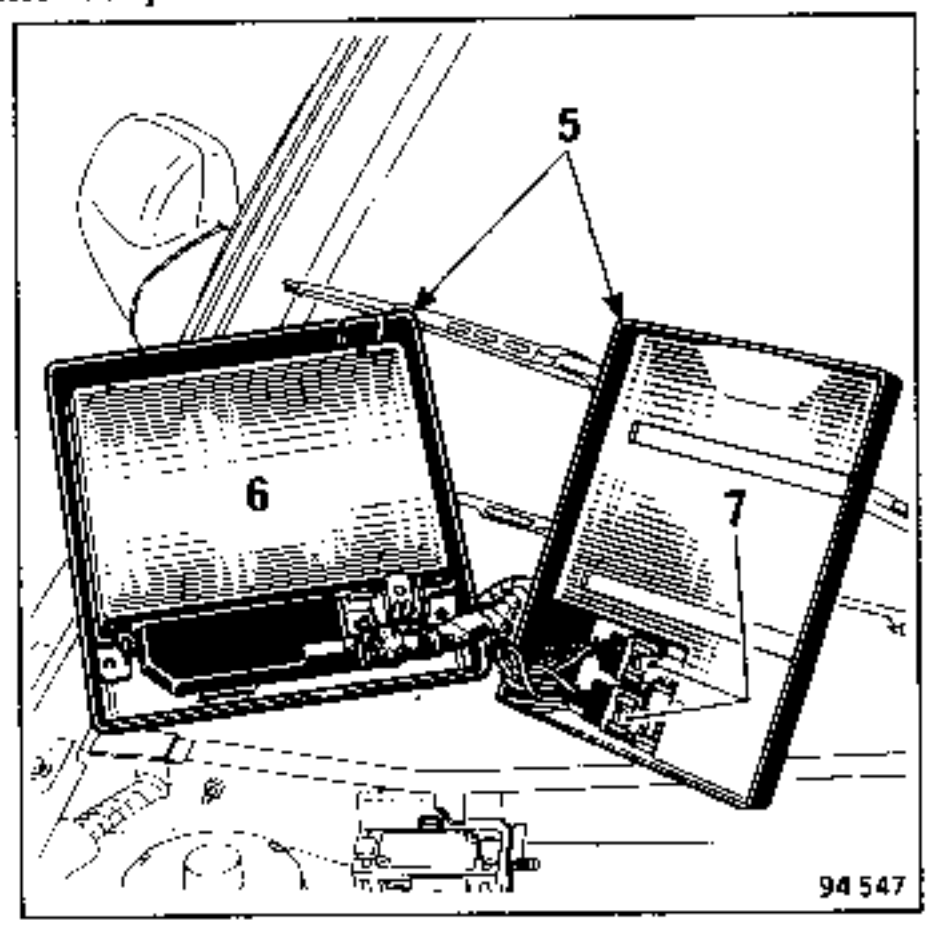
The computer is located at the rear of the engine compartment in the righthand water box.

- Remove the righthand water box grille and the jack.
- Disconnect connector (1).
- Remove screws (2) and nut (3) and strap (4).



Take out the computer mounting and plastic casing.

Open the plastic casing and release the the computer.



5 - Plastic casing
6 - Computer
7 - Injection and protection relays (marks 236 and 238)

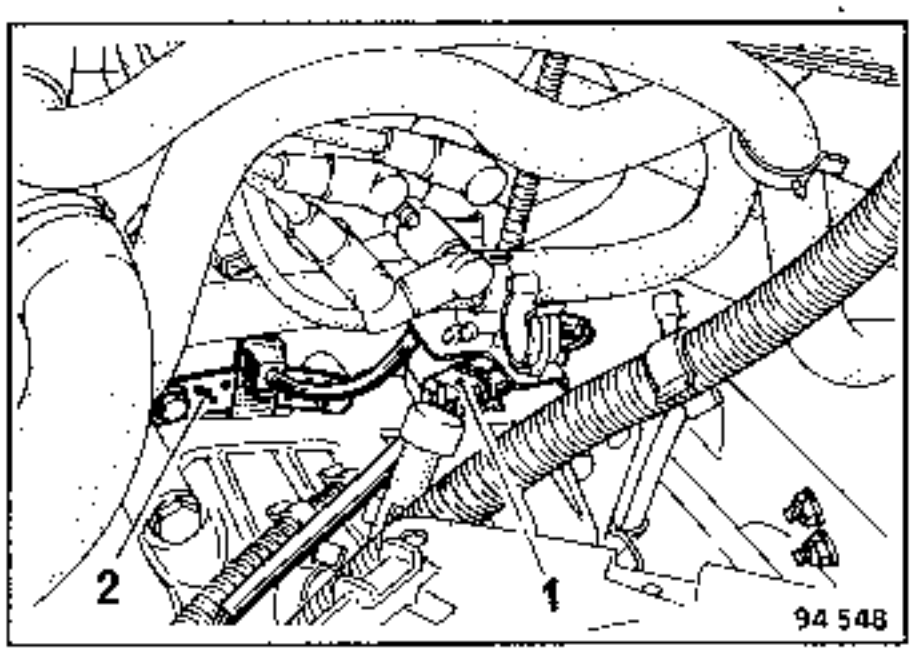
On reassembly:

Ensure that the connectors are correctly re-positioned and locked in place.

REPLACING

Free connector (1) and release it from its mounting.

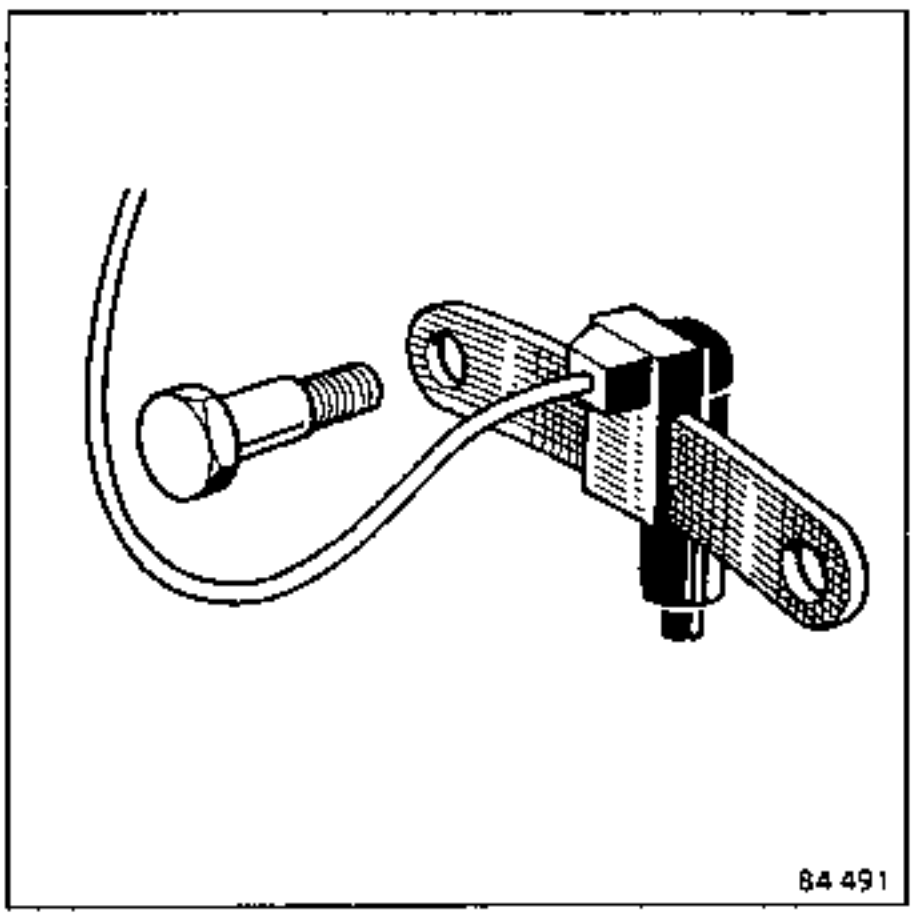
Remove screws (2) securing the sensor and remove it.



On reassembly:

Refit the sensor using shouldered screws and washers.

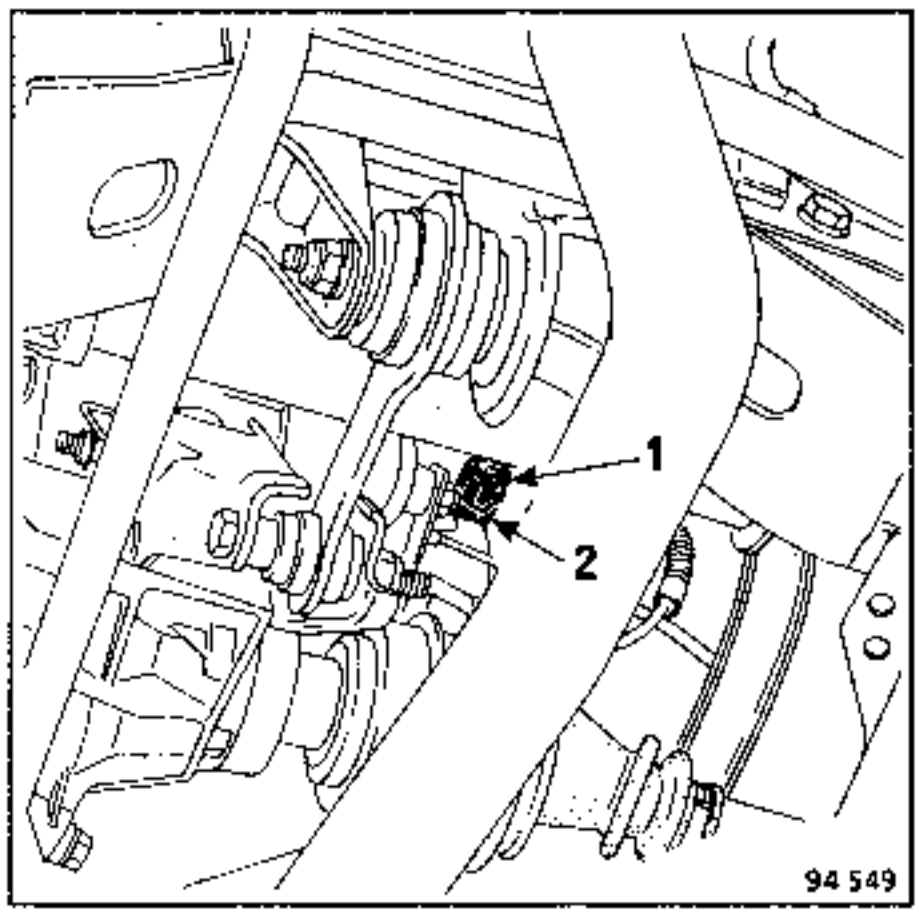
Ensure that the connector is correctly refitted and locked in place.



REPLACING

The sensor is located on the engine block between cylinders no. (2) and no. (3) under the inlet manifold.

Disconnect connector (1) and unscrew pinking sensor (2).



On reassembly:

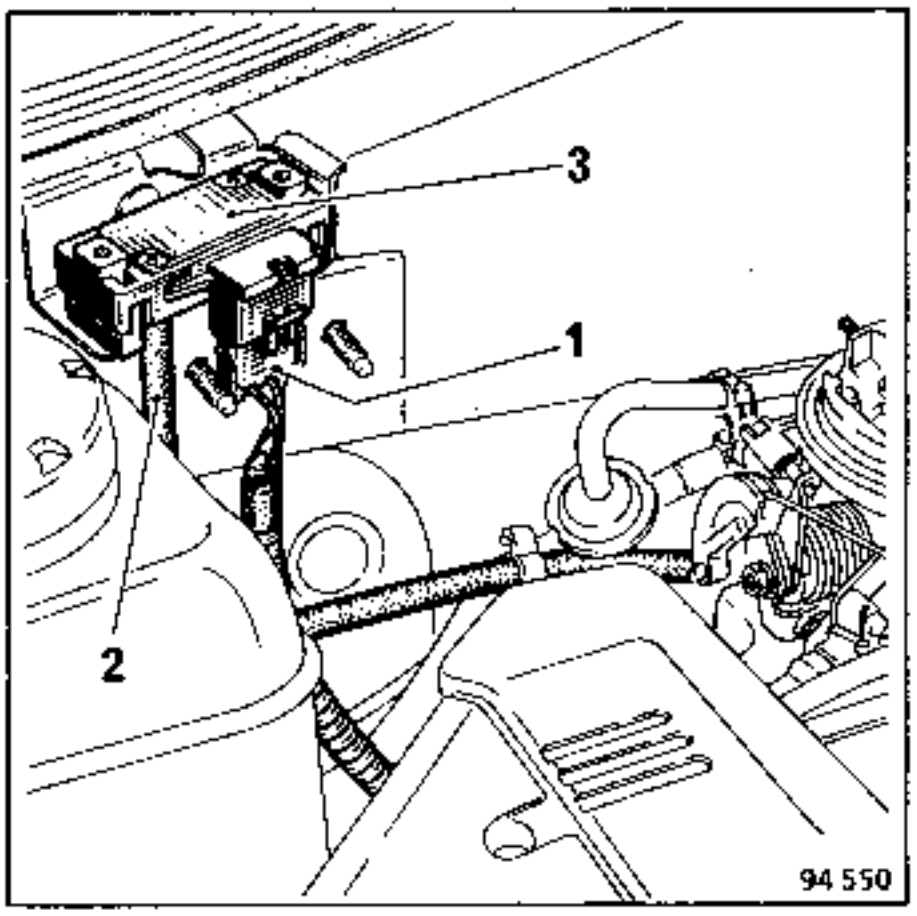
Ensure that the connector is correctly refitted and locked in place.

REPLACING

Disconnect the connector from wiring harness (1).

Disconnect vacuum hose (2).

Free pressure sensor (3) which is clipped onto its mounting.



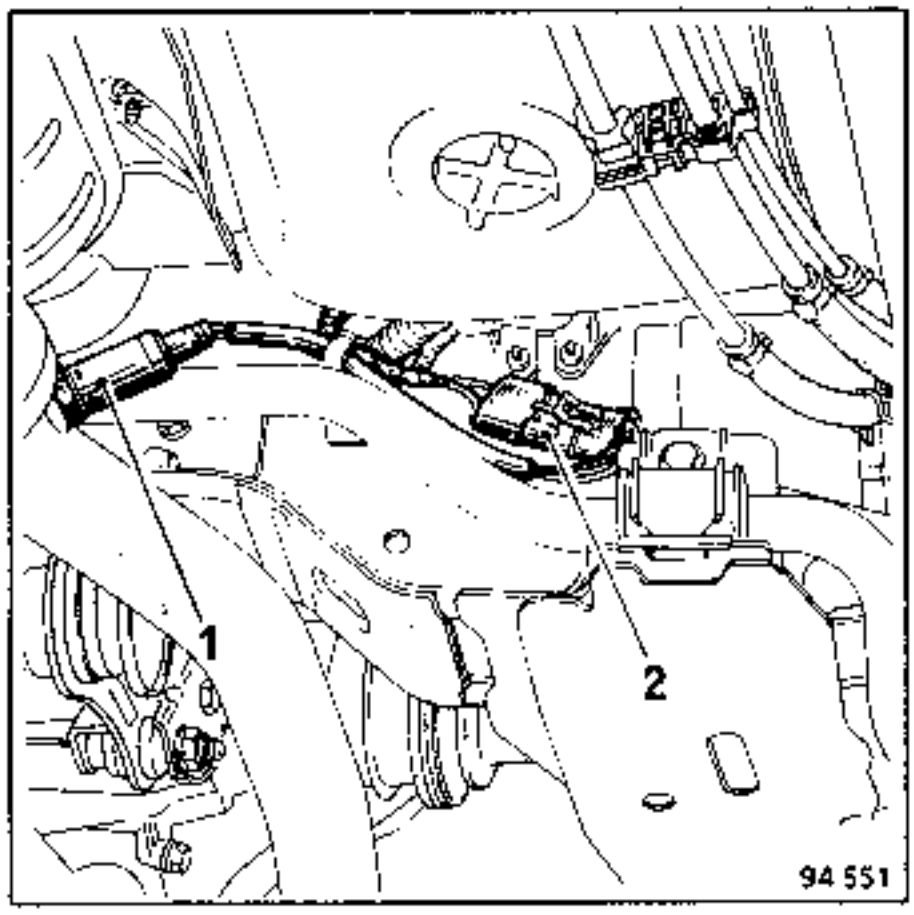
On reassembly:

Ensure that the connector is properly clipped in place and the sensor is clipped on its mounting.

REPLACING
Removal:

Disconnect the connector from the wiring harness.

Unscrew the oxygen sensor from its mounting at the inlet to the catalytic convertor and clean the threads.



1 - Oxygen sensor
2 - Connector

Refitting:

Only put (high temperature) anti-seizing grease on the oxygen sensor threads.

Screw the oxygen sensor up by hand.

Torque tighten it to 2.7 to 3.4 daN.m.

Reconnect the wiring harness connector.

NOTE:

The oxygen sensor leads cannot be joined or soldered. If these leads break, the sensor must be replaced.

REPLACING

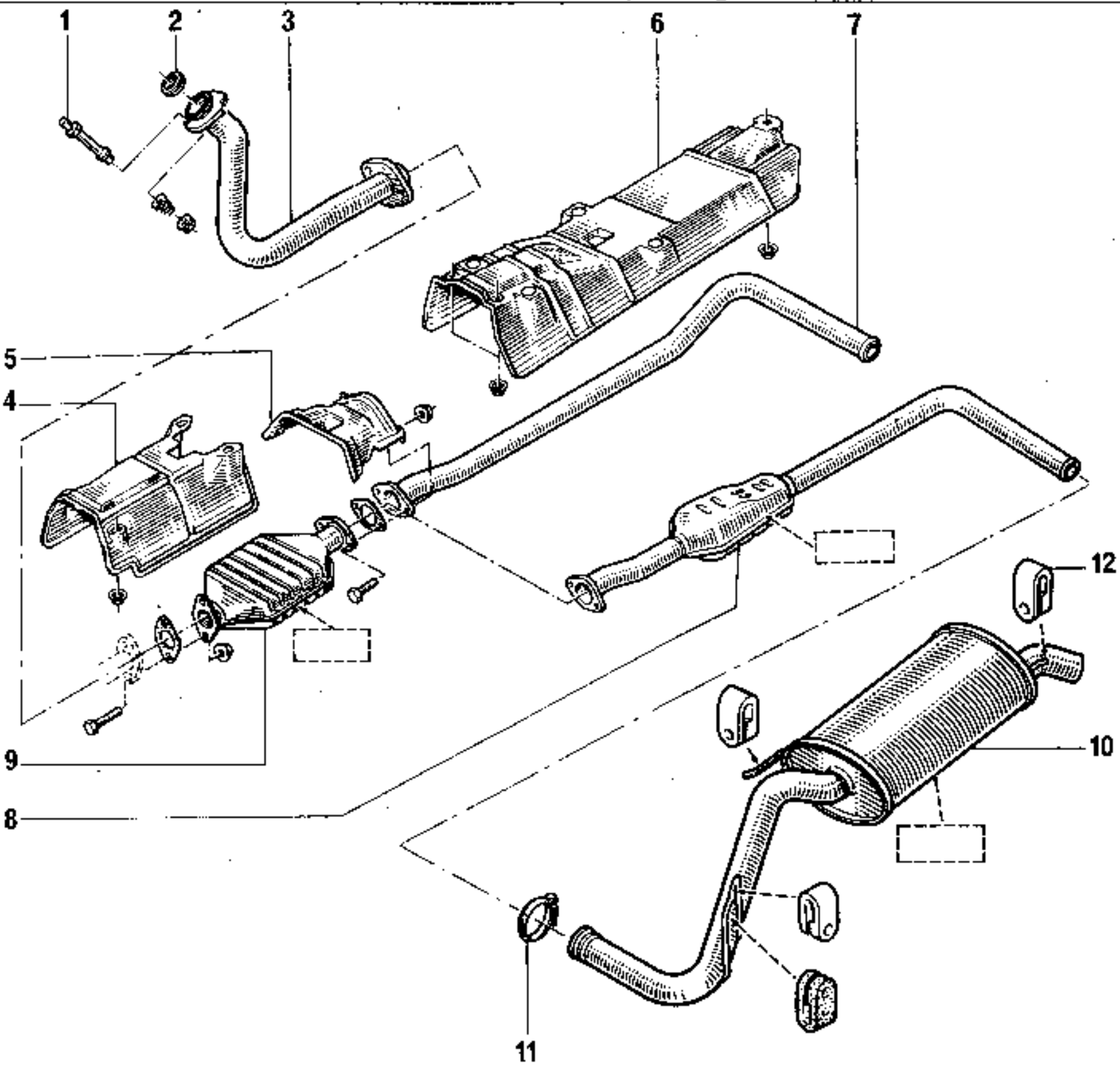
The repair methods use diagrams enabling the particular points to be dealt with to be noted immediately.

To avoid a surplus of these markings the conventional signs are used to indicate the details of the operation to be performed.

→ Unscrew completely for dismantling.

⊘ Cut:
- either using a flame cutter
- or using a tube cutter

Cut only using a flame cutter;
- clip
- outer tube of sleeving
- mounting flange tightening bolts



1 - Mounting spacer stud

2 - METEX sealing bush

3 - Primary down pipe

4 - Catalytic convertor heat shield

5 - E7J...auxiliary heat shield

6 - Intermediate pipe heat shield

7 - E7F...intermediate pipe

8 - E7J...expansion chamber

9 - Catalytic convertor

10 - Rear silencer

11 - Mounting clip

12 - Silencer mounting silentbloc bushes

Vehicles with catalytic convertor:

IMPORTANT:

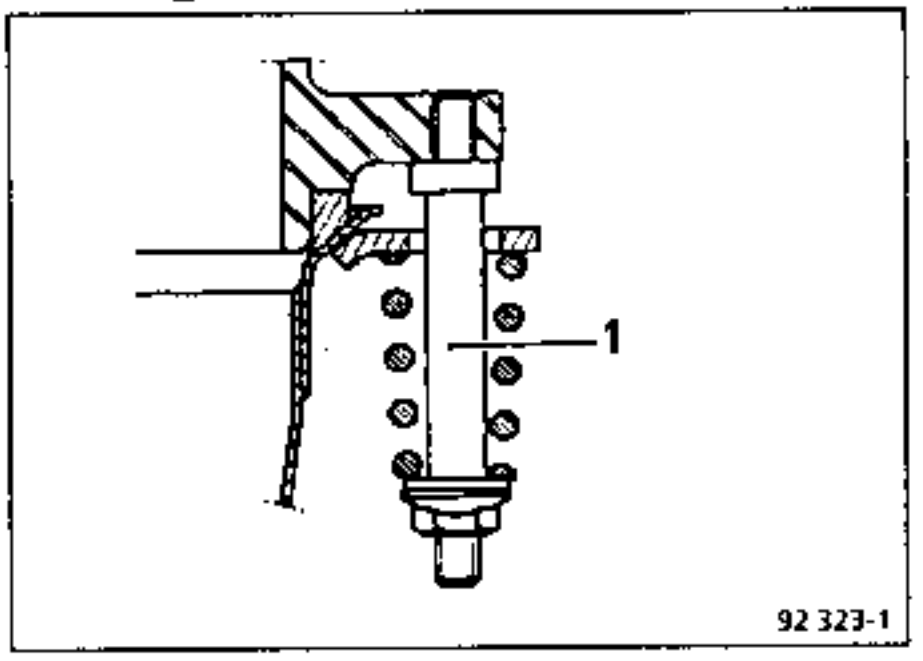
- The sealing from the exhaust manifold face up to and including the catalytic convertor must be perfect.

- Any seal or gasket which is dismantled MUST be replaced.

- On removal and refitting, the catalytic convertor must not be subjected to any mechanical impact which might damage it if repeated.

In order to align the exhaust assembly correctly and tighten the clips correctly:

tighten the various connections in order starting with the exhaust manifold and ending with the silencer.

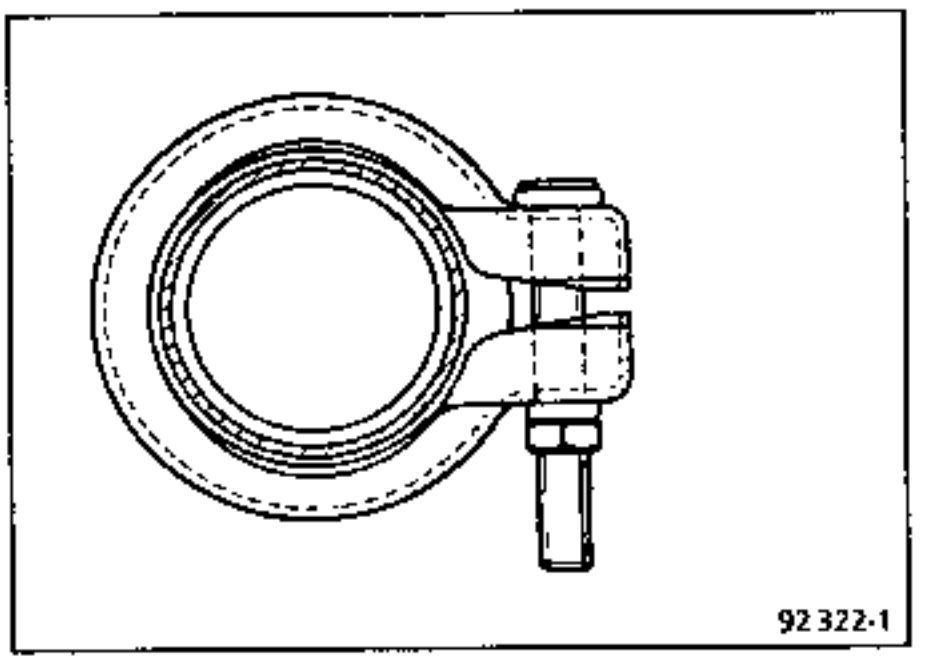


NOTE:

The exhaust down pipe flanges are provided with spacer studs (1) which determine the spring tension.

Tighten them until they are up against the spacers.

Position the clips so that their tightening surface bears equally on the two pipes to be tightened.



Ensure that the clip screws are tightened corectly: 8 mm diameter screws: 2 daN.m, to avoid deforming the hoses and clips which could cause leakages.

CHECKING THE CATALYTIC CONVERTOR:

Warm up the engine until the engine coolant fan has cut in twice.

Connect a CO TESTER at the rear of the vehicle on the exhaust outlet.

Read off the values of the pollutants at an engine speed between 2000 and 2500 rpm (wait for the speed to stabilize):

- If the CO is greater than 0.5%, disconnect the oxygen sensor.

- If there is no variation in CO when the sensor is connected or disconnected, ensure that the sensor is operating using the XR 25 test box.

- Check the bar graph on line 13 and variations of # 05 (engine speed steady at 2000 and 2500 rpm with sensor connected).

Before replacing parts, a check must be performed to ensure that the petrol in the fuel supply system does not contain any lead. (Test for presence of lead at exhaust). (See NT 1529).

Before changing the sensor or catalytic convertor, flush out the system with unleaded petrol by making the vehicle consume several tanks full of unleaded petrol.

- If, using a new oxygen sensor, the CO percentage is still greater than 0.5%:

Ensure:

that the catalytic convertor does make any noise by shaking it when the vehicle has stopped (confirm this with vehicle moving);

that when the catalytic convertor has been removed:

. no visible damage is noticeable
. that no noise is heard when the catalytic convertor is shaken;
. that nothing is partially or totally blocking the catalytic convertor;

- that the catalytic convertor has not been polluted with leaded petrol.

ATTENTION:

Before changing a catalytic convertor unnecessarily, ensure that:

- The vehicle is in perfect running order :

  fuel supply system, ignition, mixture regulation via oxygen sensor (using XR 25 test box and test for lead) and air filter;

- The vehicle is performing correctly by carrying out a road test;

- No localised noise coming from catalytic convertor during road test;

- Exhaust system is in perfect condition by performing the appropriate test;

- Values of pollutants measured:

  . Engine temperature
  . Measure the values at idling speed and at a speed between 2500 and 3000 rpm.

The variations in the various pollutants are not always immediate, they may be transitory and irregular since their readings vary according to the specifications of the exhaust gas analyser used (sensitivity, response time, condensation in circuits, condition of filters, length of hoses, etc.).

- Ensure that the apparatus is perfectly calibrated after the necessary warming up time.

IMPORTANT NOTE:

Do not park and do not run the engine in locations where combustible material might come into contact with the very hot exhaust pipe.

In certain conditions these materials can ignite.

IMPORTANT: AVOID OVERHEATING

- The engine must be good condition (fuel supply, injection and ignition must be in perfect condition) in order that the catalytic convertor is not running in abnormal conditions.

- The vehicle must be stopped if there is misfiring on ignition, fuel supply defects or a loss of power (engine overheating resulting in the catalytic convertor overheating).

- Overheating may also be caused by using the starter for long periods or attempting to start the car by towing (circumstances in which the engine receives a rich mixture which only ignites occasionally).