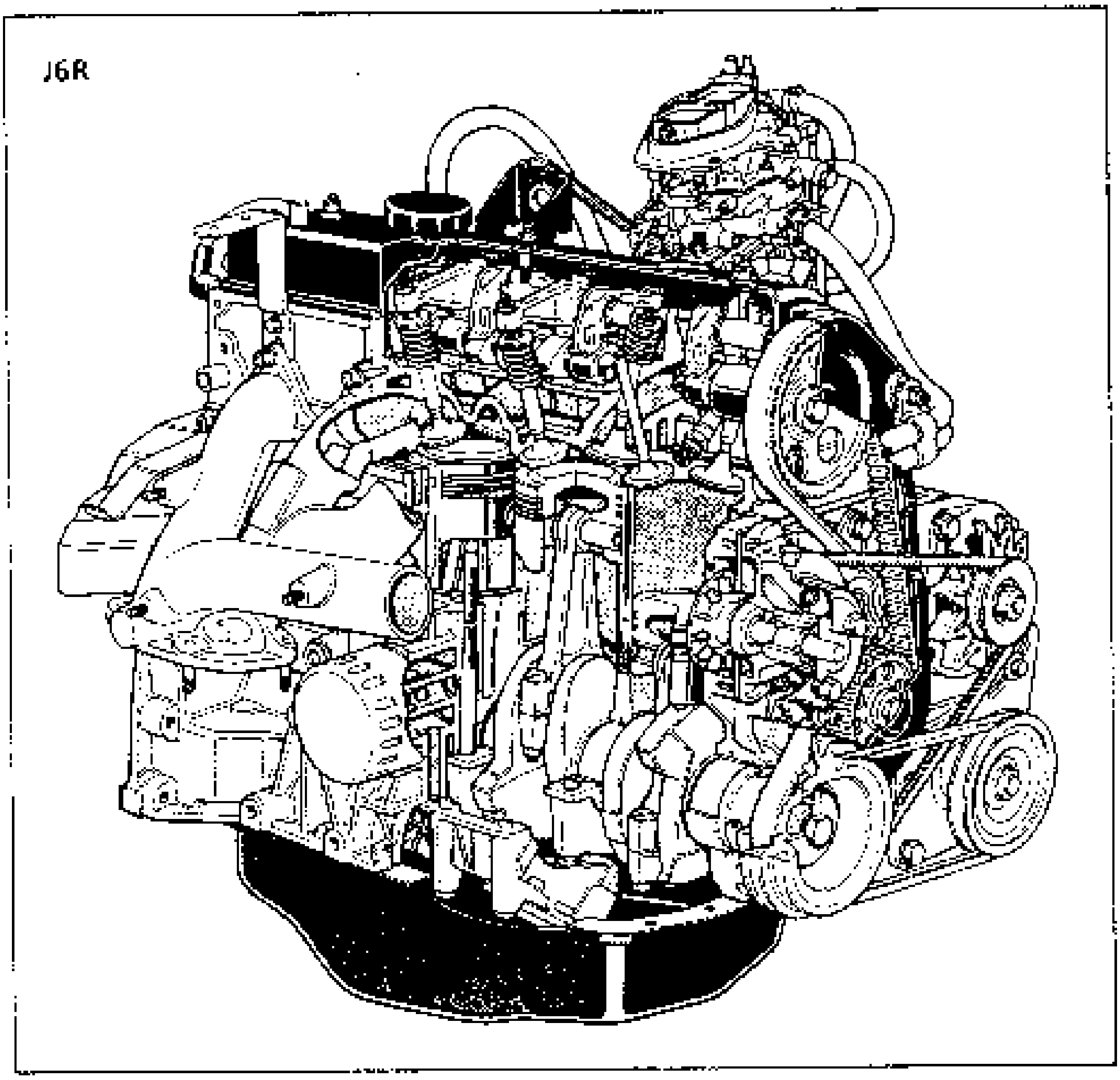
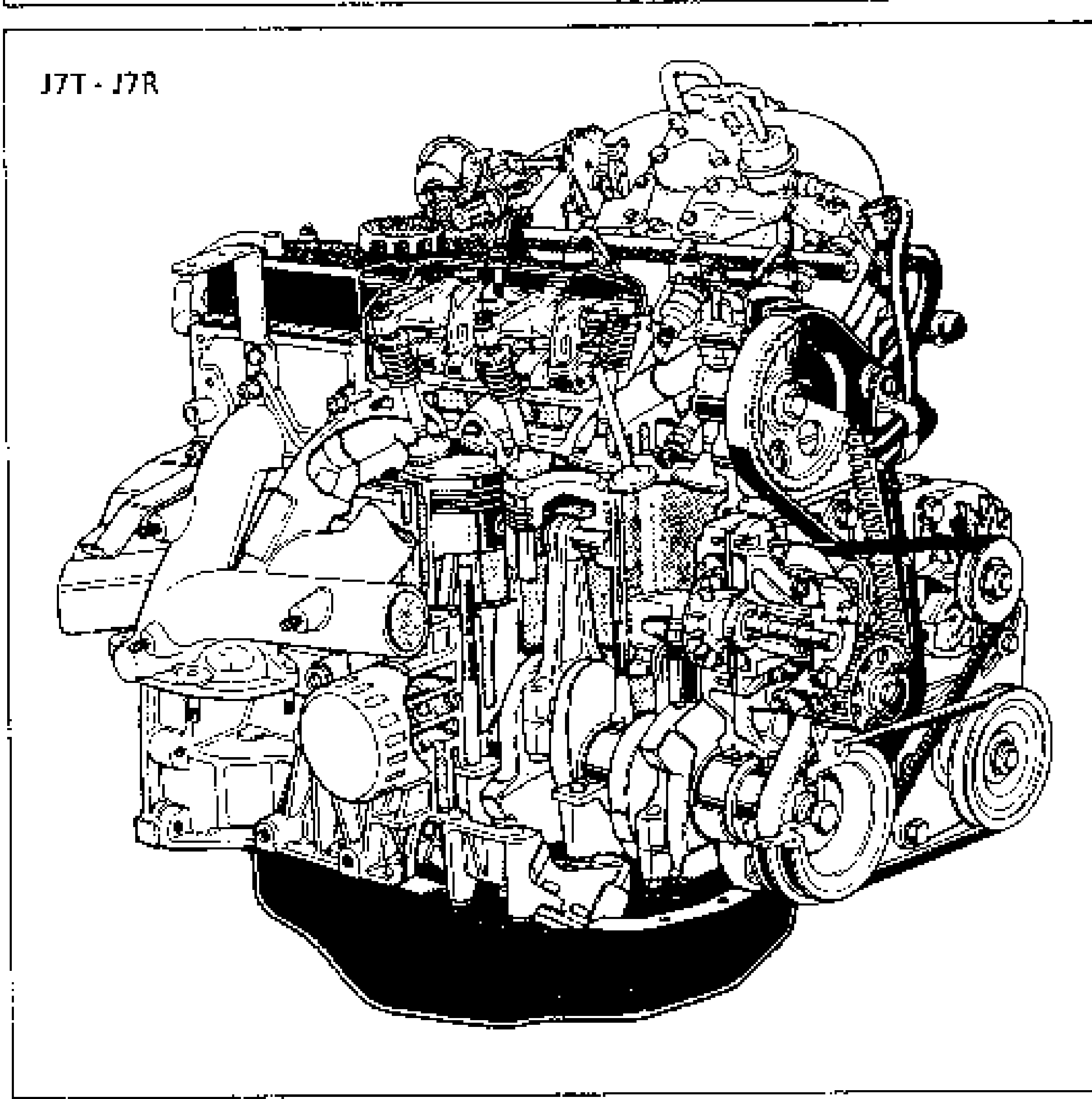
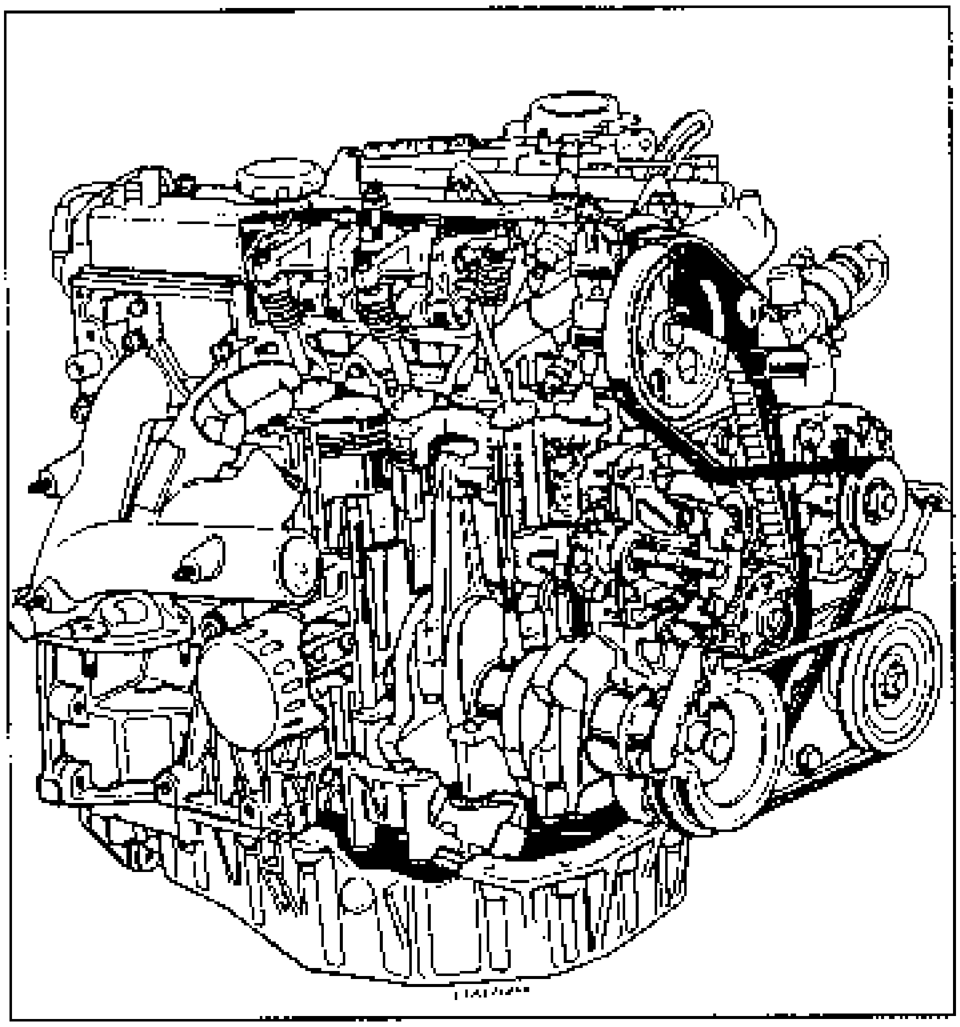
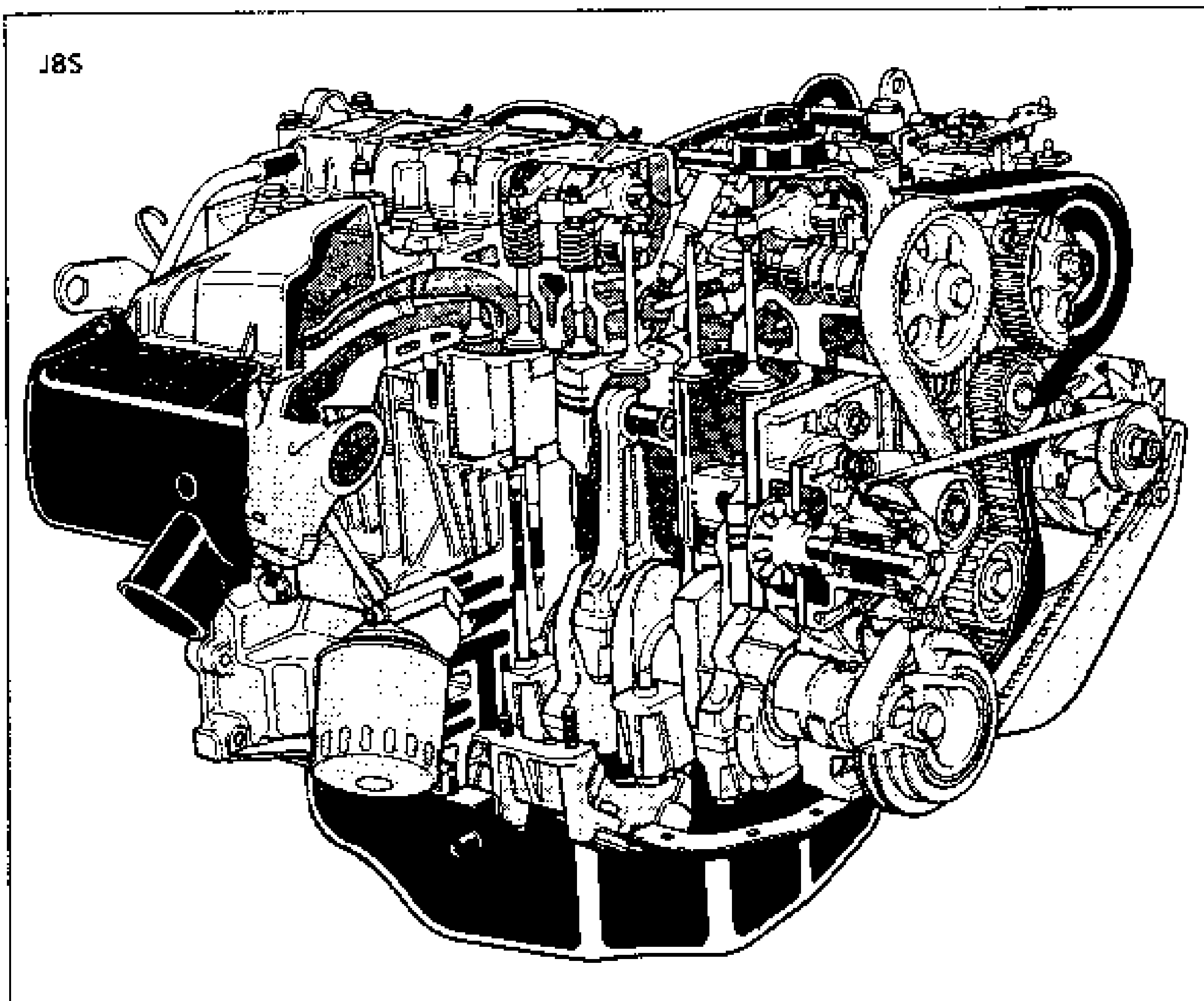

J6R

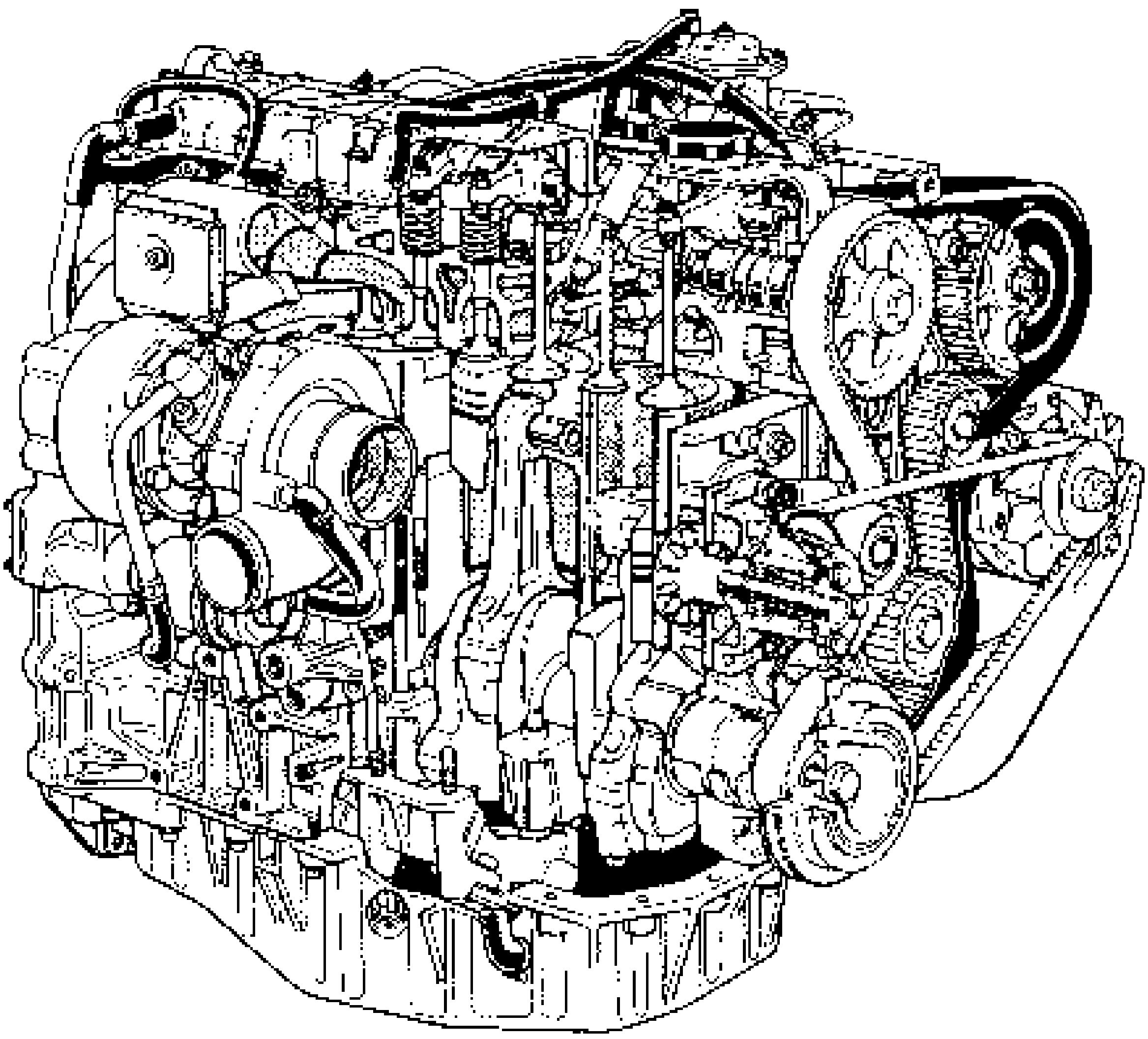

J7T - J7R

J7R 720 Engine
12-valve

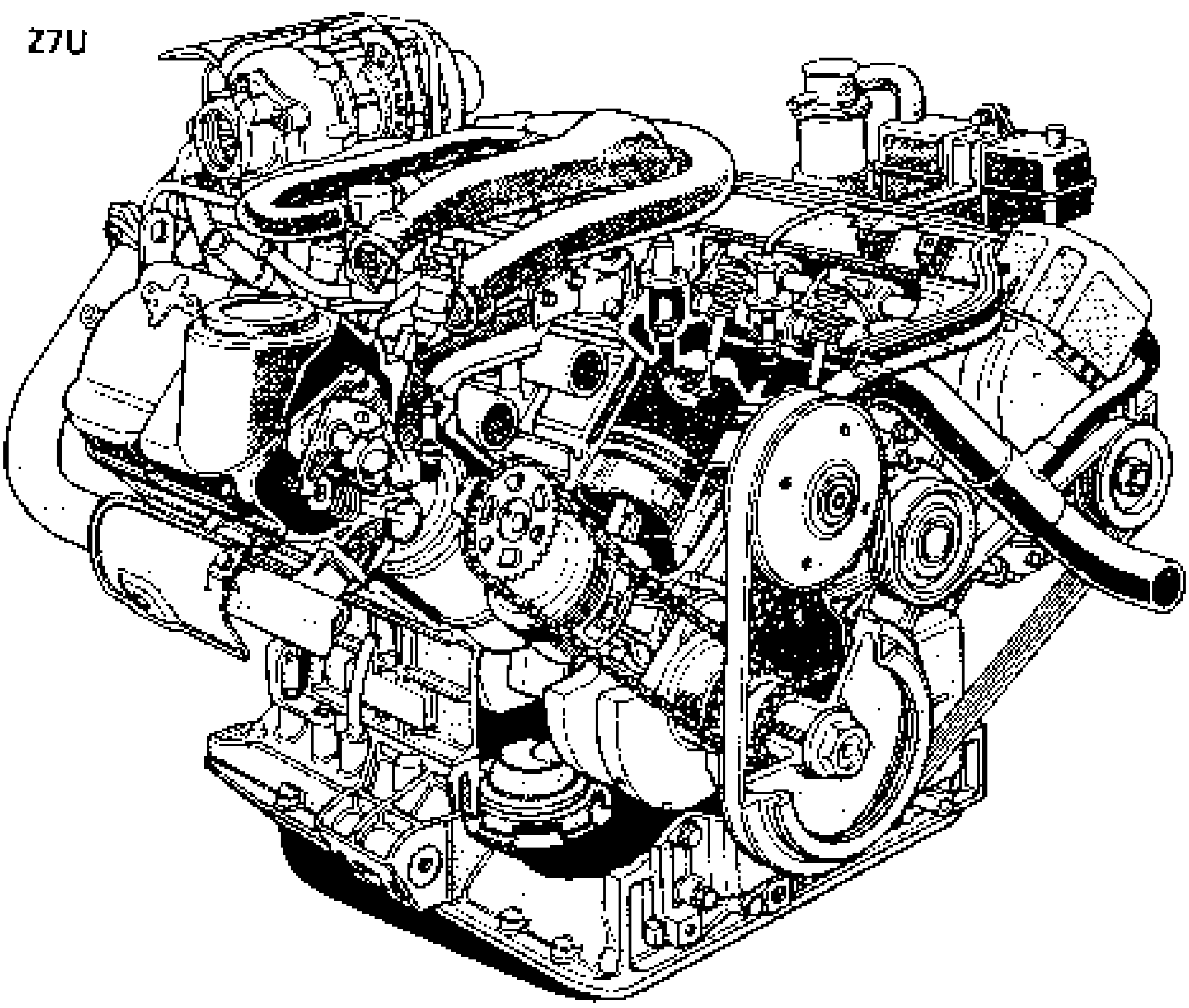




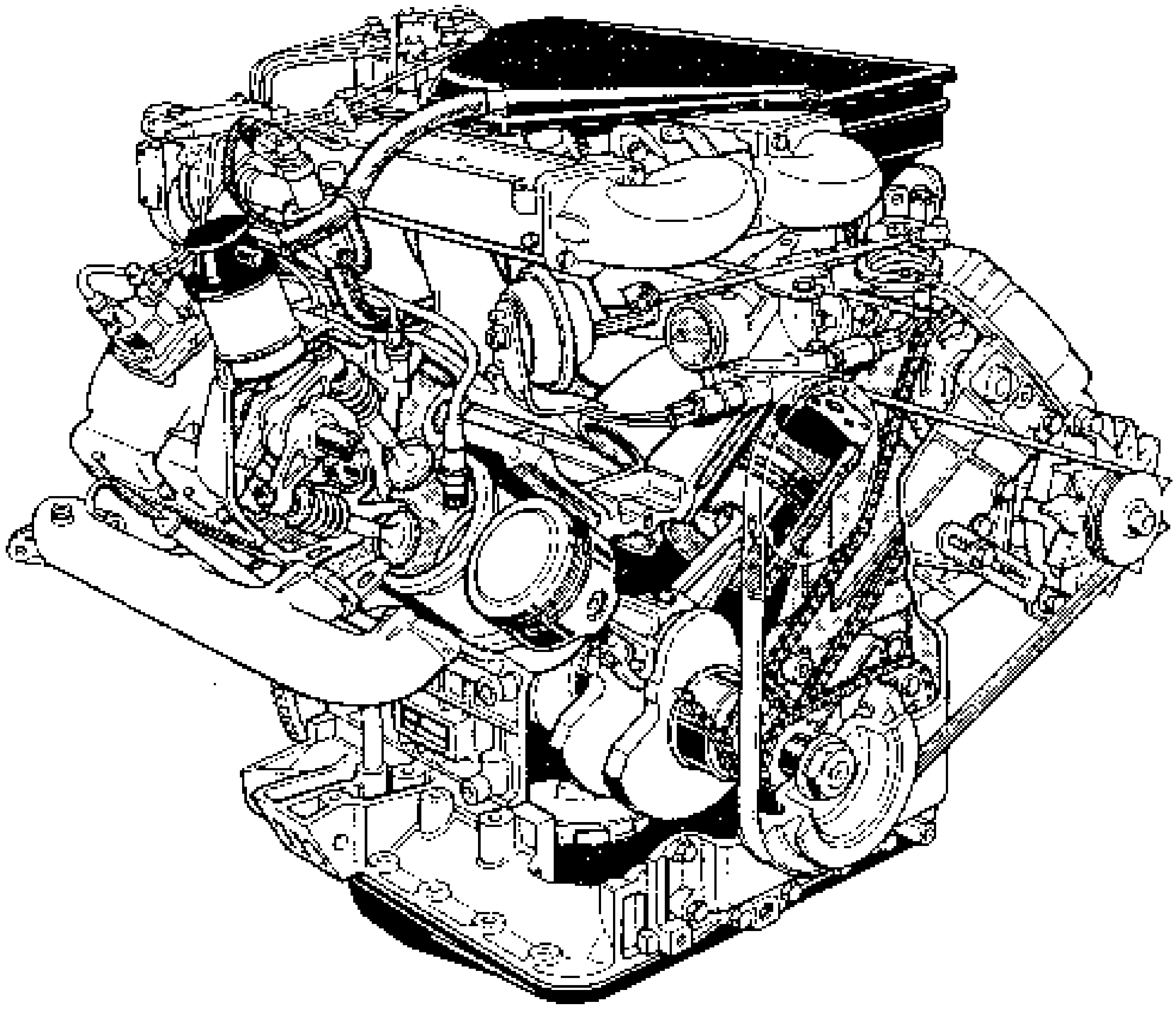
J8S Turbo



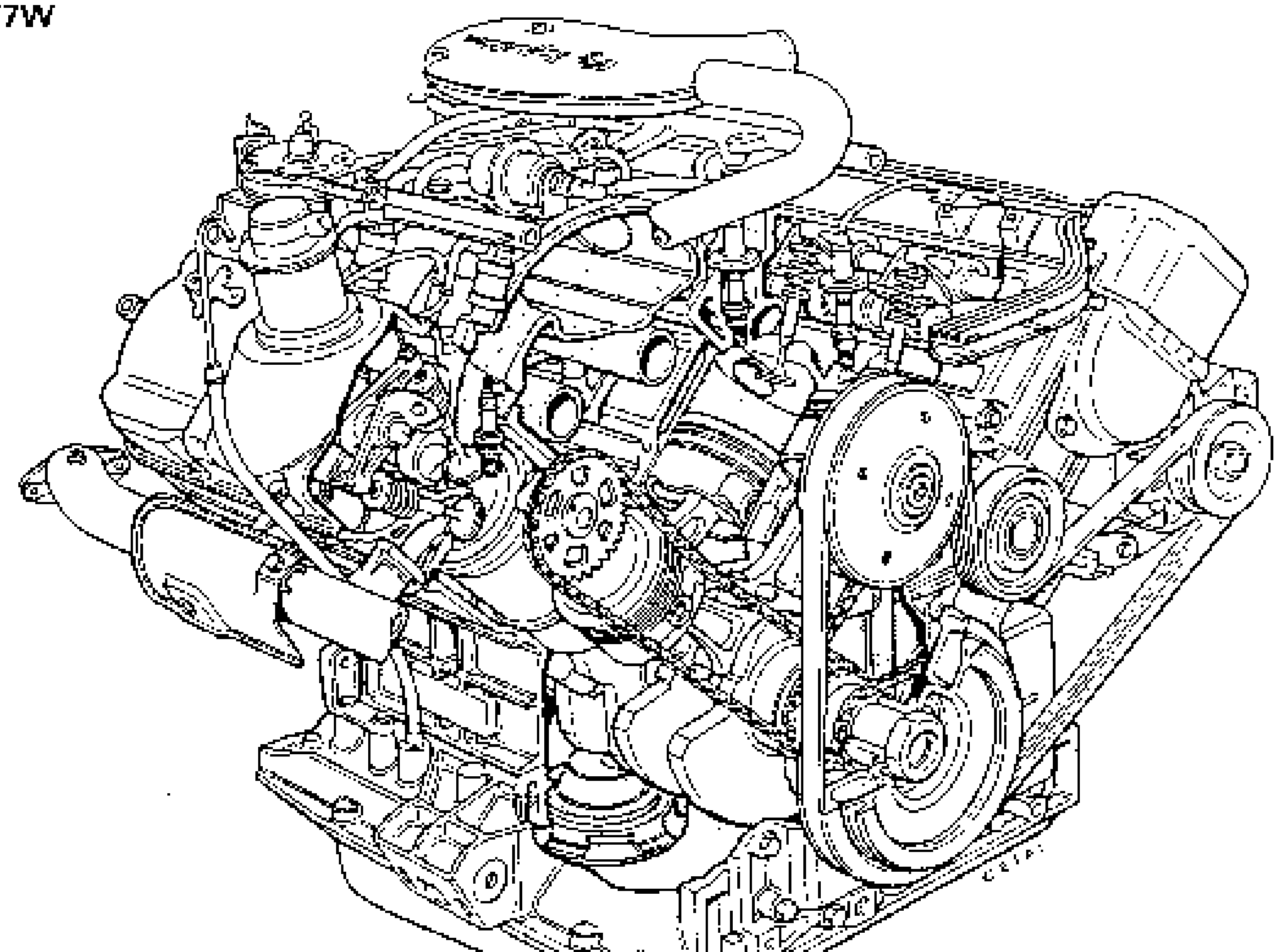
Z7U



Z7V



Z7W



Vehicle type	Engine	Manual gearbox	Automatic transmission	Capacity (cc)	Bore (mm)	Stroke (mm)	Comp. ratio
B 290	J8S 708	X		2068	86	89	21
B 292	J7R 720 / 721	X	X	1995	88	82	9.3
B 293	Z7W 700 / 701	X	X	2842	91	73	9.5
B 294	J7R 726	X		2458	91	63	8.6
B 295	Z7U 702	X		2068	86	89	21
B 296	J8S 736	X		1995	88	82	9.2
B 297	J6R 706 / 707	X	X	1995	88	82	9.2
B 297	J6R 762 / 763	X	X	1995	88	82	8.6
B 298	Z7V 708 / 709	X	X	2664	88	73	9.2
B 29 A	Z7W 702	X		2849	91	73	8.8
B 29 B	J7T 732 / 733	X	X	2165	88	89	9.2
B 29 B	J7T 708	X		2165	88	89	8.7
B 29 E	J7T (*)	X	X	2165	88	89	9.9
B 29 F	Z7W 706 / 707	X	X	2849	91	73	9.5
B 29 G	Z7U 700	X		2458	91	63	8
B 29 H	J7R 722 / 723	X	X	1995	88	82	10
B 29 W	J8S 738	X		2068	86	89	21

(*) J7T 706 / 707 / 714 / 715 / 730 / 731

Consult engine repair manuals in accordance with type of engine to be repaired.

Repair manual \ Engine	J6R	J7R - J7T	J8S	Z7U - Z7V - Z7W
Mot. J (E)	X	X		
Mot. J (D)			X	
Mot. Z (E)				X

PRECAUTIONS WHEN STOPPING THE ENGINE (vehicles with turbocharger)

Allow the engine to run at idling speed for approximately 30 seconds, before switching off the ignition.

Under other circumstances, engine acceleration, leading to the activation of the turbocharger and switching off of the ignition, the turbocharger continues to function due to its inertia without lubrication (engine stopped) and there is a risk of the turbine shaft seizing.

ATTENTION:

- The turbocharger cooling fan motors are activated after the engine has stopped.

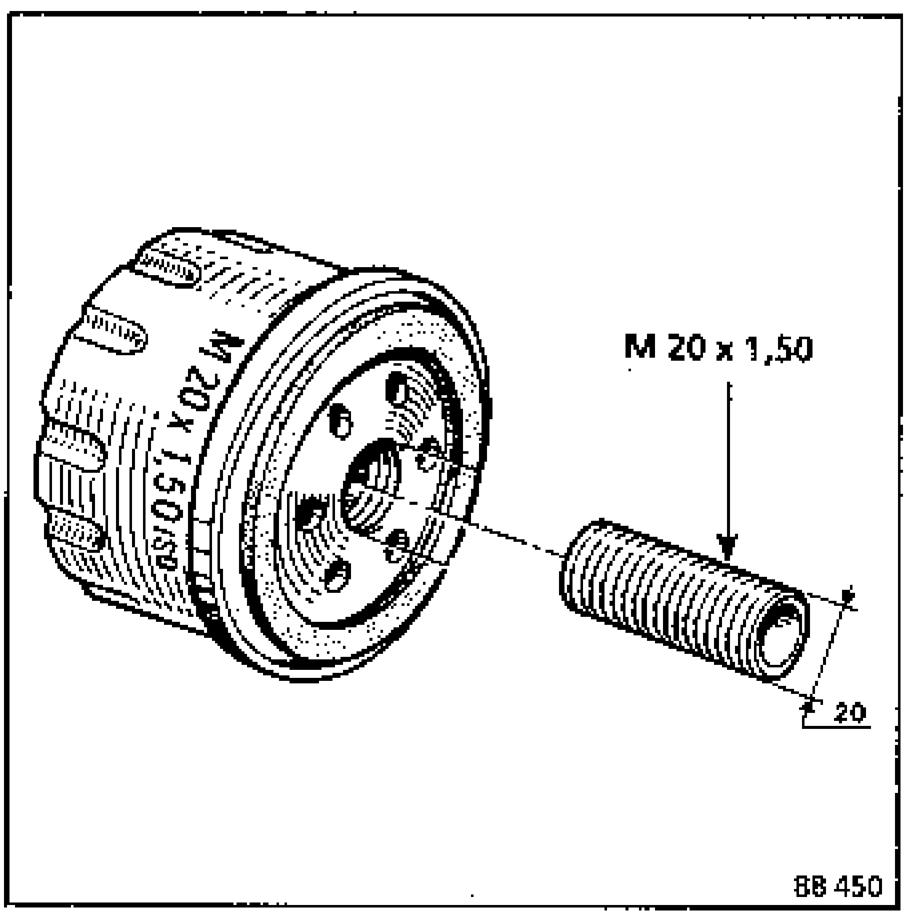
- When working under the bonnet, be aware that some parts in the engine compartment are at extremely high temperatures .

OIL FILTER MOUNTINGS

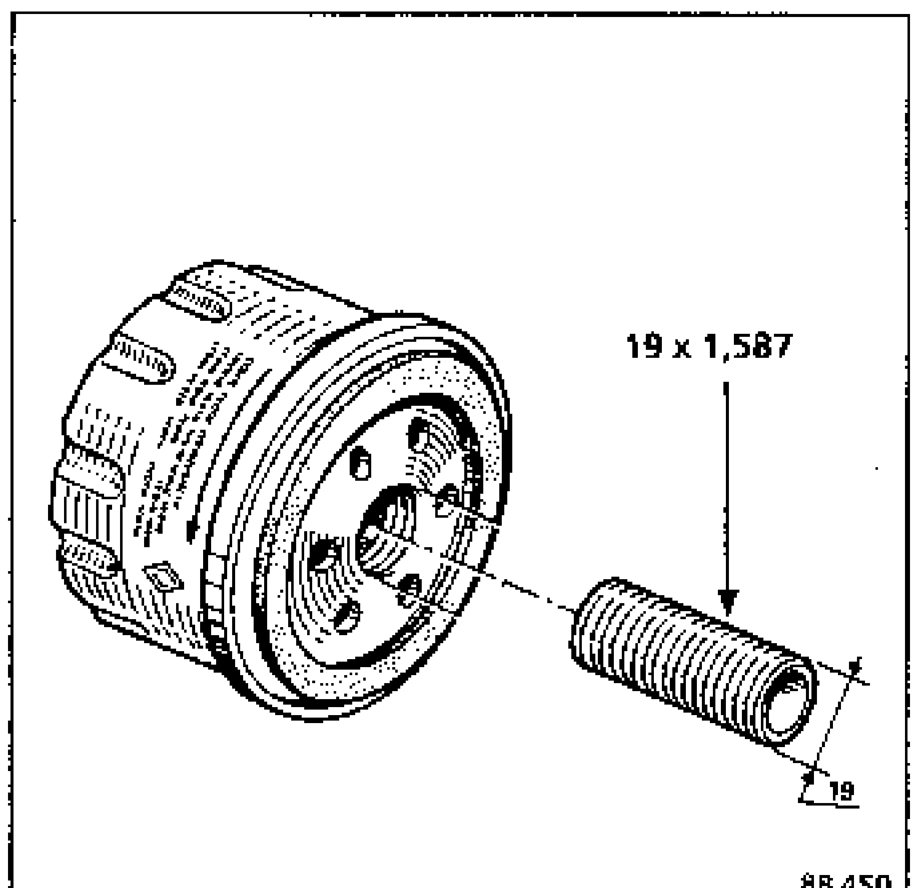
TWO POSSIBLE MOUNTINGS, VISUALLY IDENTIFIABLE

The filter bearing the legend "20 x 1.50" is fitted on a metric pitch thread **20 x 1.50**.

Visual filter identification



The oil filter which does not have this legend is fitted on a **19 x 1.587** thread (3/4 inch, pitch 16 threads per inch).



ATTENTION : It is possible accidentally to fit a 20 x 1.50 oil filter to a 19 x 1.587thread. In this event, the oil filter loosens through vibration. Furthermore, under these circumstances there will be abnormal clearance of the assembly before it seats on the engine block.

REMEMBER: Never fit a petrol engine oil filter to a diesel engine or vice versa.

CHECKING METHOD

An engine oil consumption of **1 litre per 600 miles** (1000 km) is acceptable.

Check that there is no external leakage of engine oil.

For the check to be effective, certain engine oil drainage conditions must be observed:

- the engine must be hot;
- position the crankshaft of cylinder n° 1 at top dead centre - firing stroke;
- remove the oil dipstick and the filler cap.

Then drain the engine and leave it to drip for at least **15 minutes**.

Refit the drain cap and "seal" it (spot of paint on both the cap and the sump) so as to check later that it has not been removed.

Using a test tube, measure the quantity of oil required for filling.

Engine type :	Z7U	:	7.5 litres
	Z7W	:	6.0 litres
	Z7V	:	5.0 litres
	J7T	:	5.0 litres
	J7R	:	6.0 litres
	J7R 12-valve	:	5.0 litres
	J6R	:	5.7 litres
	J8S	:	4.8 litres
	J8S (1)	:	5.5 litres

(1) With stiffener base.

Refit and seal the filler cap.

Ask the vehicle user to come back after having covered **600 miles** (1000 km) in the vehicle, having regularly checked the oil level using the dipstick.

When the vehicle is returned, check that the drain and filling caps have not been removed.

Under the same conditions:

- engine hot;
- crankshaft of cylinder n° 1 at top dead centre - firing stroke;
- dipstick and filler cap removed;

drain the engine oil and measure the amount of oil required using the test tube.

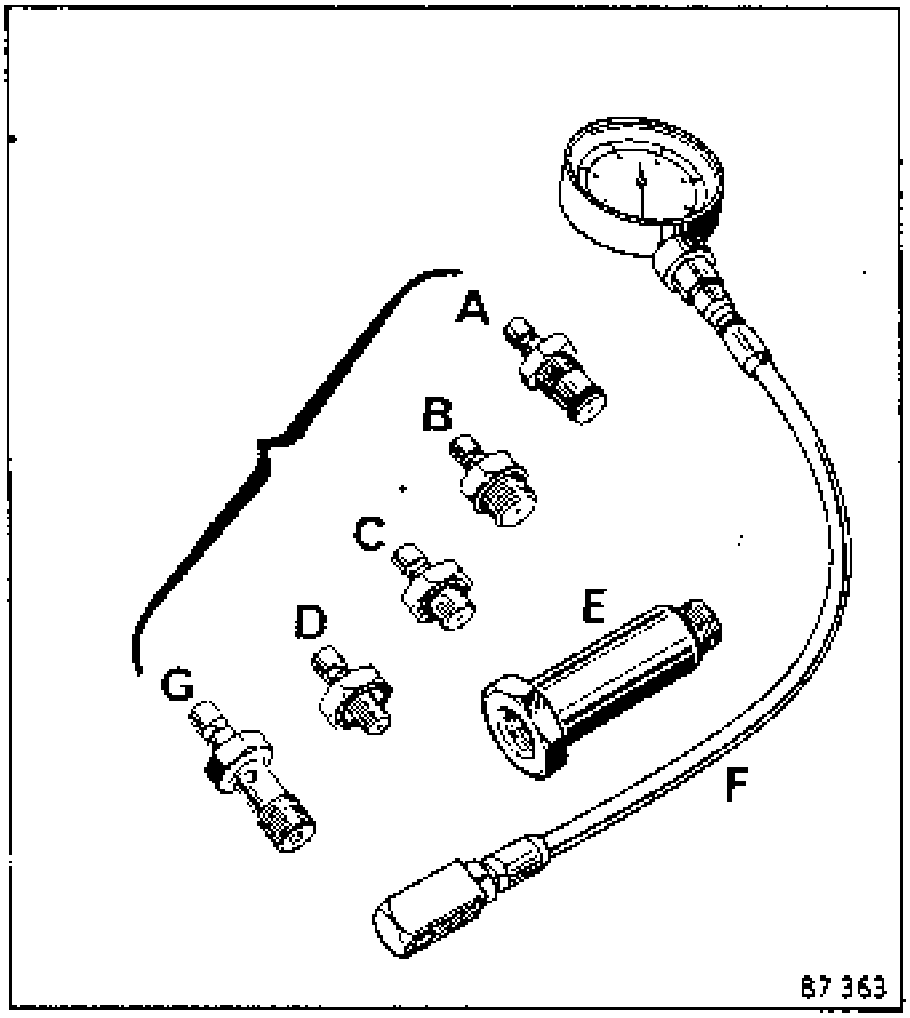
calculate oil consumption in litres per **600 miles** (1000 km) if the kilometre counter does not show exactly **600 miles** (1000 km).

CHECKING

ESSENTIAL SPECIAL TOOLING
Mot. 836-05 Boxed oil pressure testing kit

The oil pressure must be checked when the engine is hot (approximately 80 °C).

Contents of kit **Mot. 836-05**.

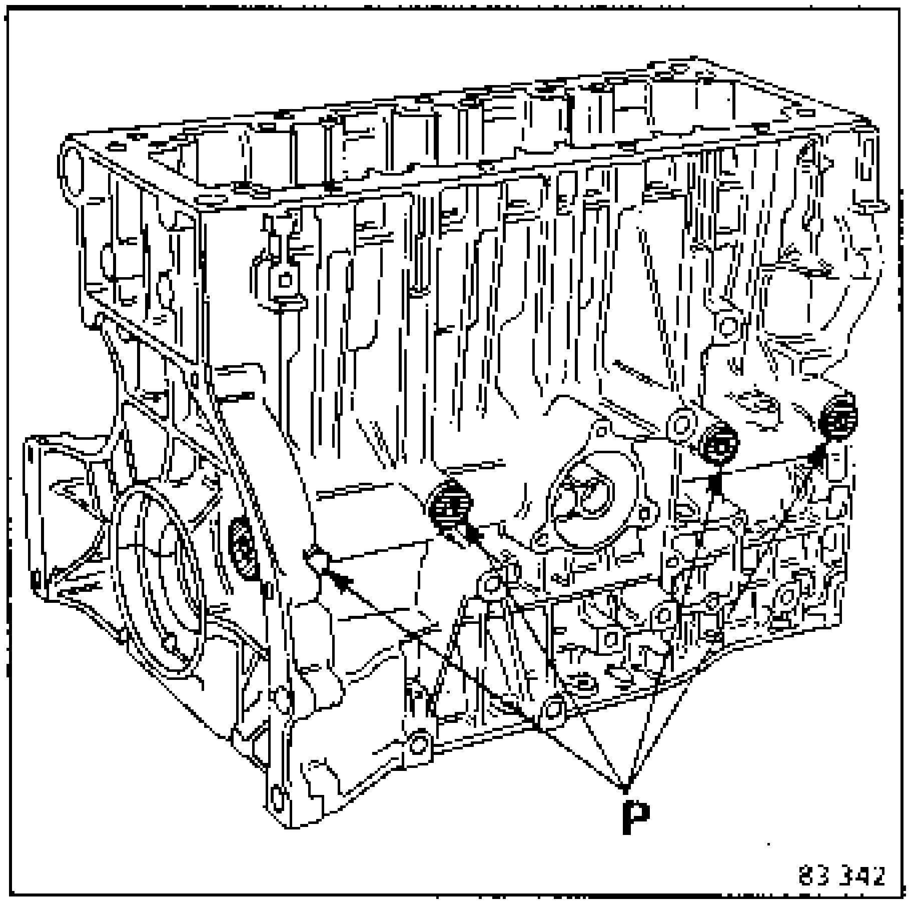


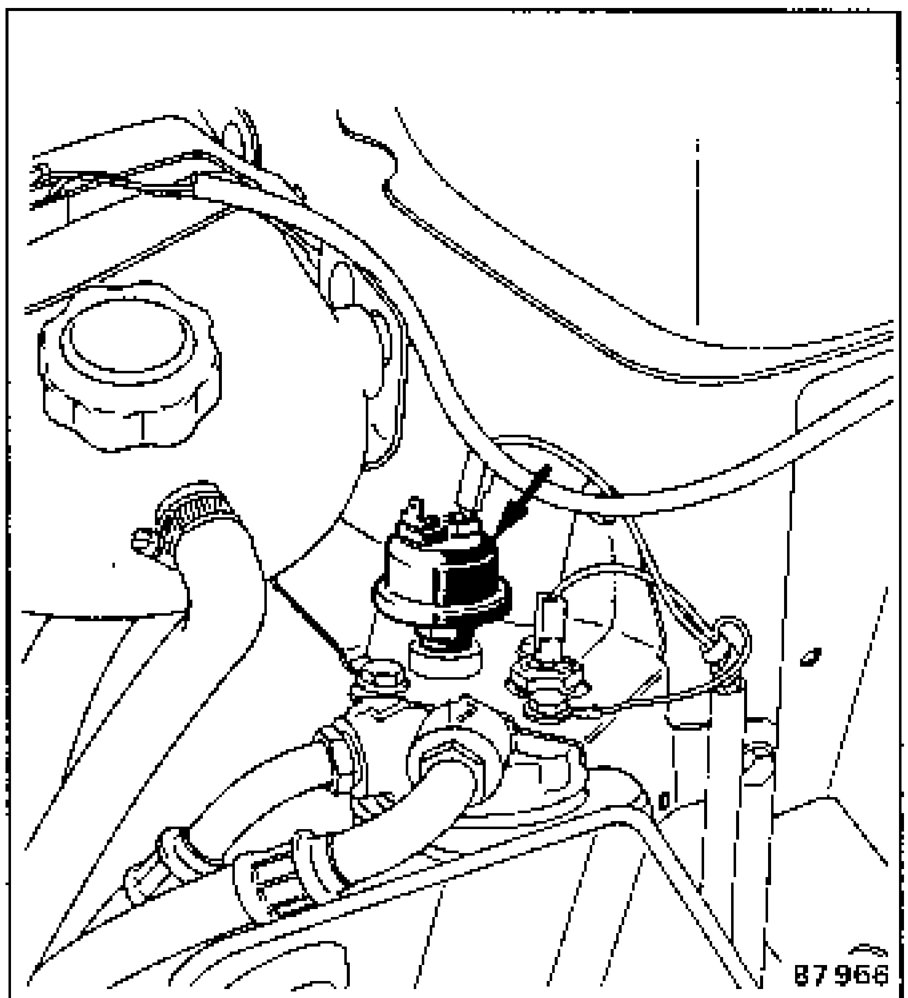
USE

- **Z Engines: F + B**
- **Jxx Engines: B or C + F**

The oil pressure can either be taken:

- from the engine (**P**);
- from the oil cooler if the vehicle is fitted with one.





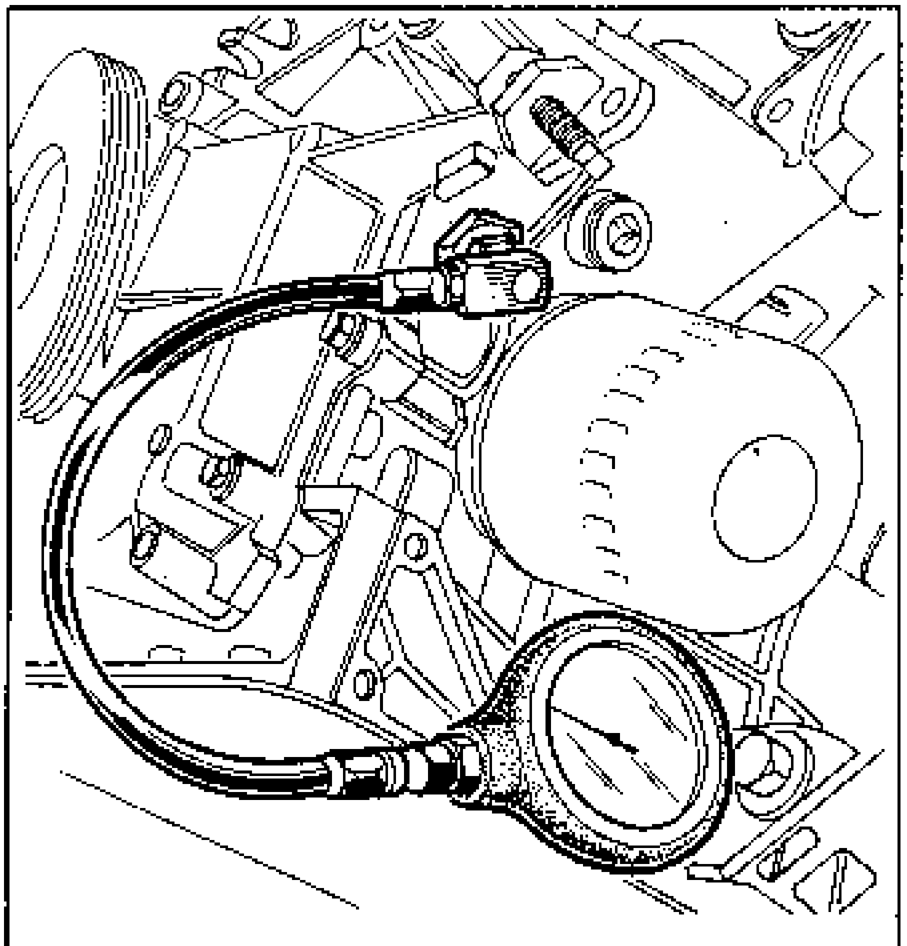
J petrol engine

Min. oil pressure at 80 °C		
- Idling	0.8	bar min
- Engine idling (J7R 12-valve)	1.25	bar min
- 3000 rpm	3	bar min

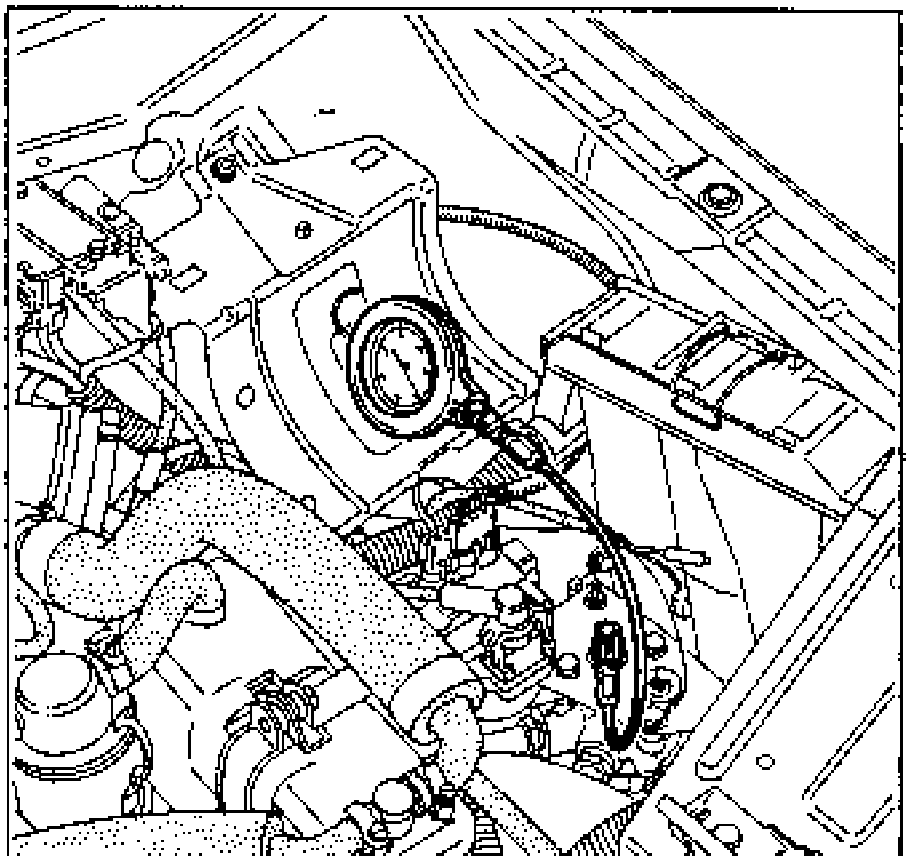
J diesel engine

Engine type	Normally aspirated	Turbo
Min. oil pressure at 80 °C - idling (bar) - at 3000 rpm (bar)	 0.8 3.5	 0.8 3.0

Z7V - Z7W Engines


87 659

Z7U Engine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Z Engines

Min. oil pressure at 80 °C		
- at 900 rpm	2.2	bar min
- at 4000 rpm	4.4	bar min
Z7W Engine :		
- at 750 rpm	1	bar min
- at 5500 rpm	4	bar min

ESSENTIAL SPECIAL TOOLING		
B. Vi.	465	Tool for changing converter seal (automatic transmission)
Mot.	582	Flywheel locking tool
SEFAC	689	Load spreader

TIGHTENING TORQUES (in daNm)	
Bolts around gearbox	5
Engine mounting nuts	3
Mounting support bracket screws	4
Mounting support bracket bolts	2.5

The engine can only be removed by releasing it from the front of the vehicle. Lifting rings are fitted to facilitate this operation.

REMOVING

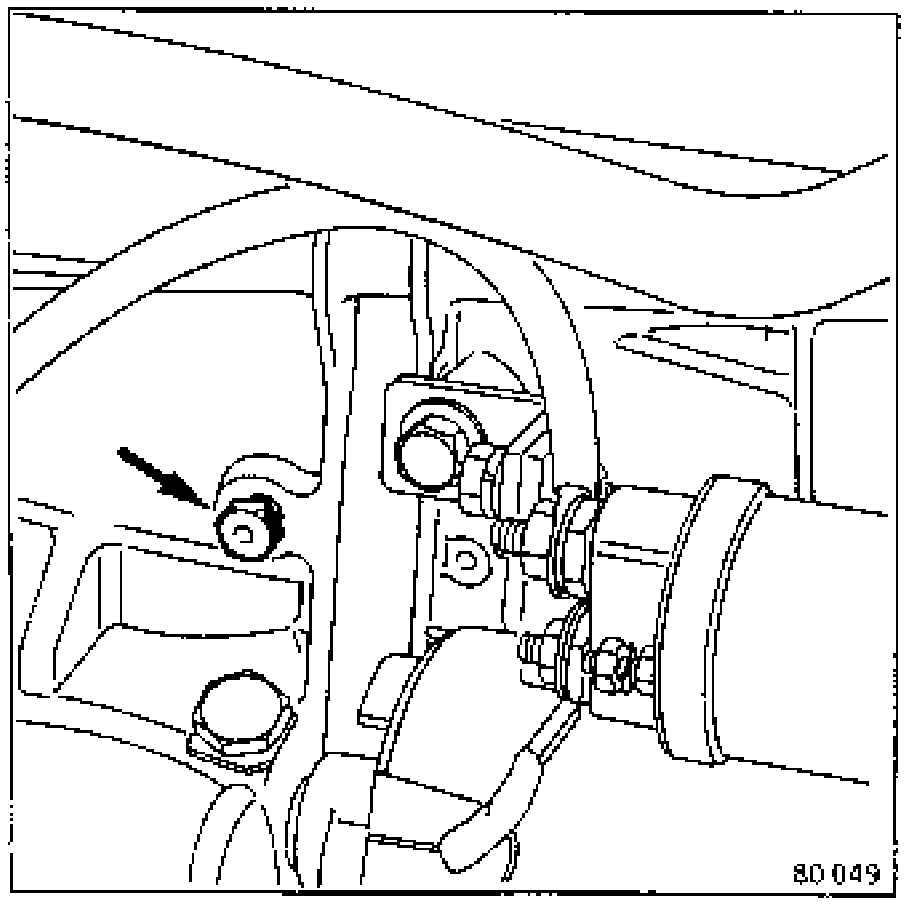
It is not necessary to remove the scuttle

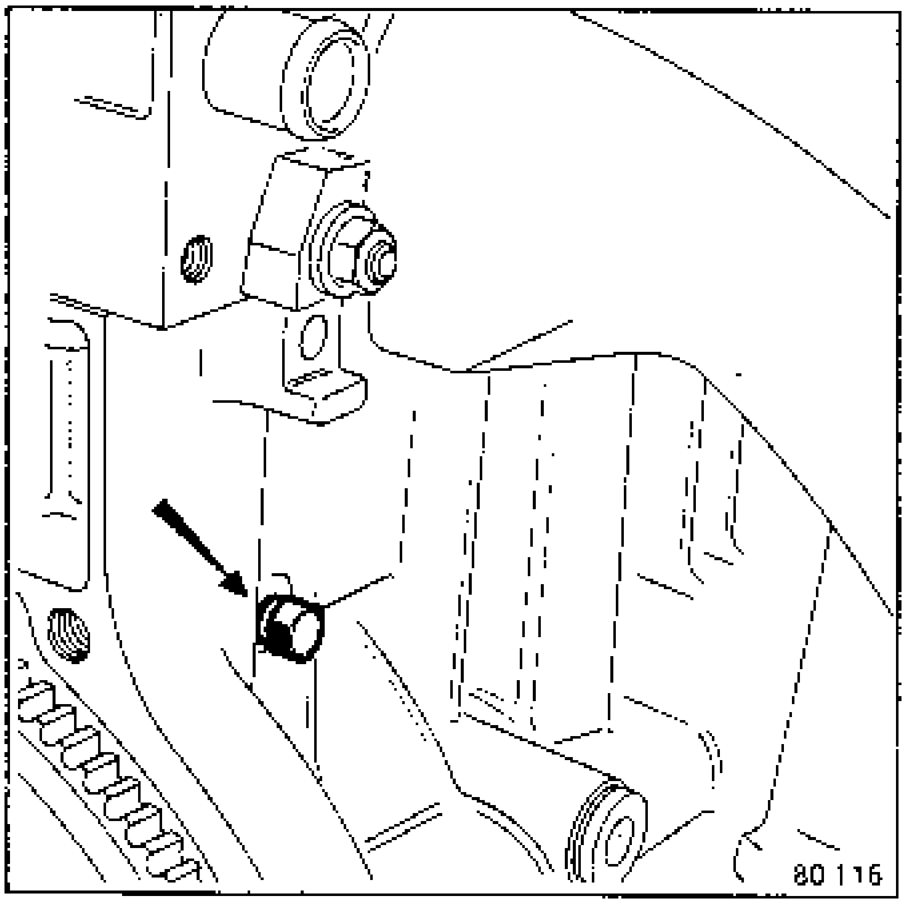
Disconnect the battery.

Drain the cooling circuit:

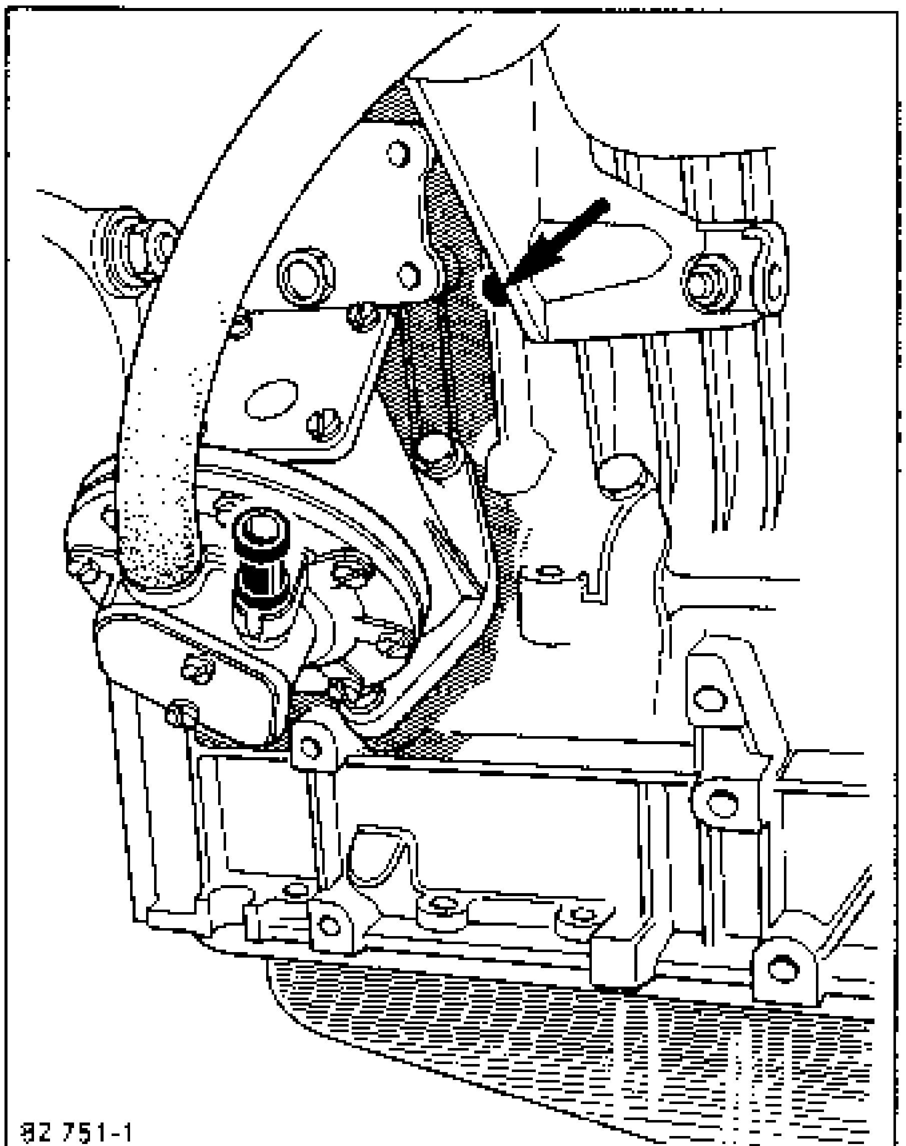
- at the radiator lower hose;
- at the crankcase

J6R - J7T - J7R Engines





J8S Engine

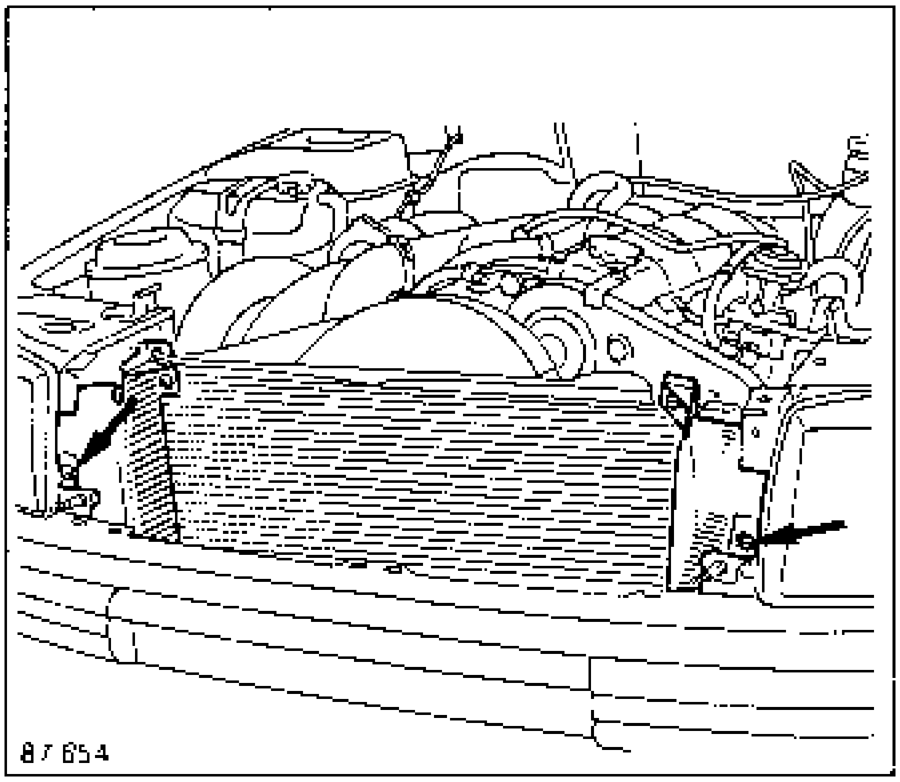


Remove:

- the radiator grille
- the headlight wipers if the vehicle has them.

Release:

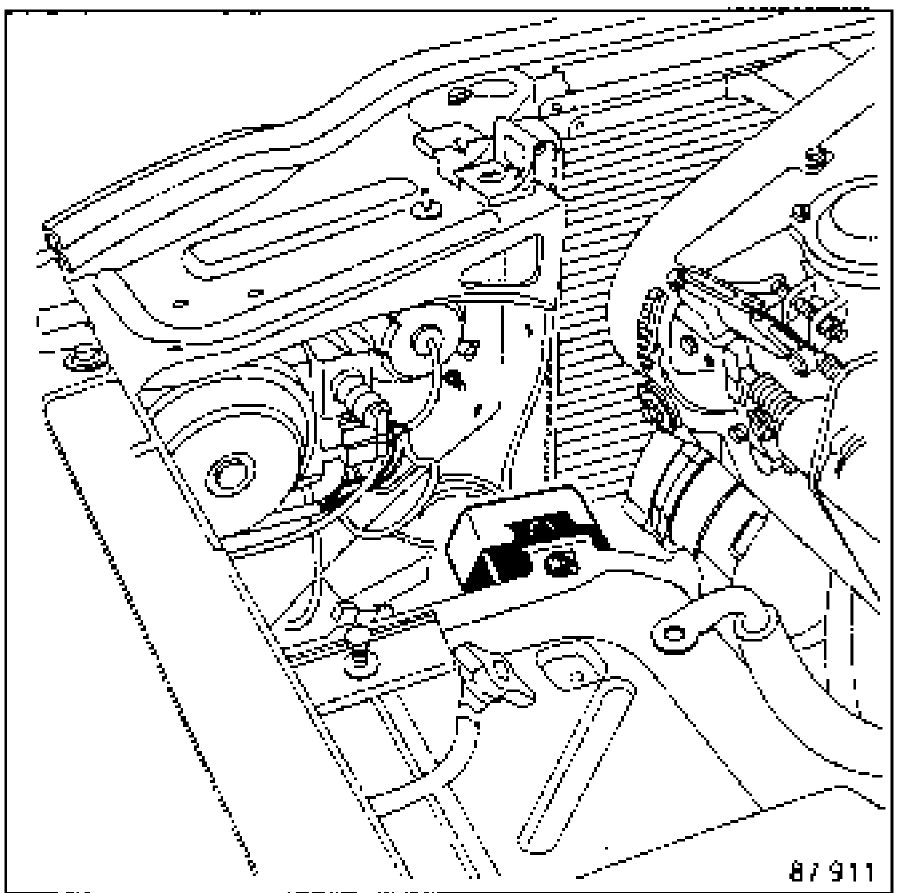
- the radiator grille by tilting it forwards;
- the upper cross member;
- the side mudguard mountings.



The radiator fitted with side shields.

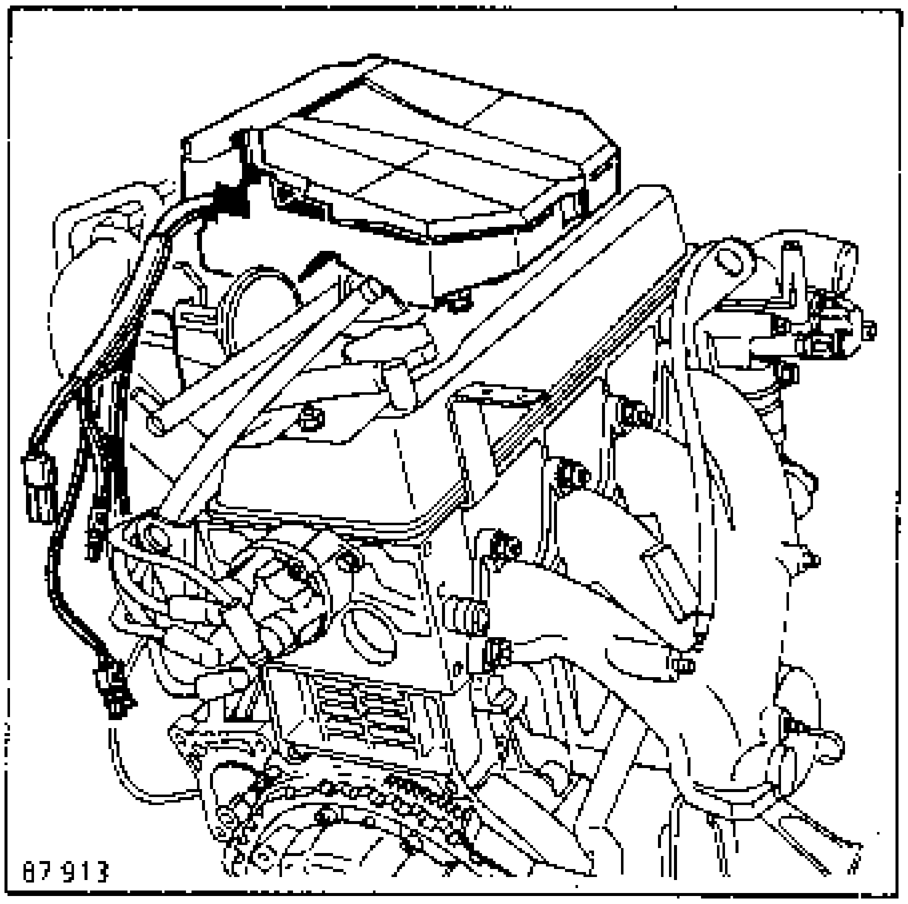
J8S Engine

The preheater unit and the harness are to be placed on the engine.



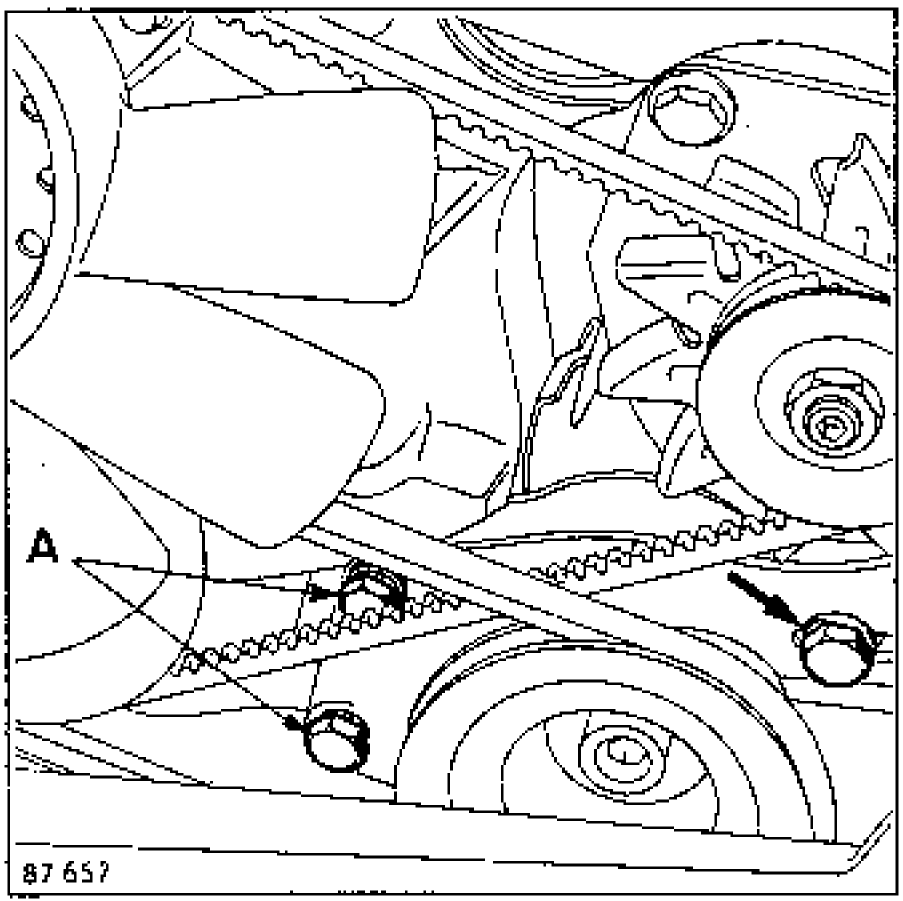
J7T Engine

The electronic module is to be placed on the engine.



J Engines, all types

The power assisted steering pump is to be uncoupled from the engine at **(A)** and attached to the body shell.

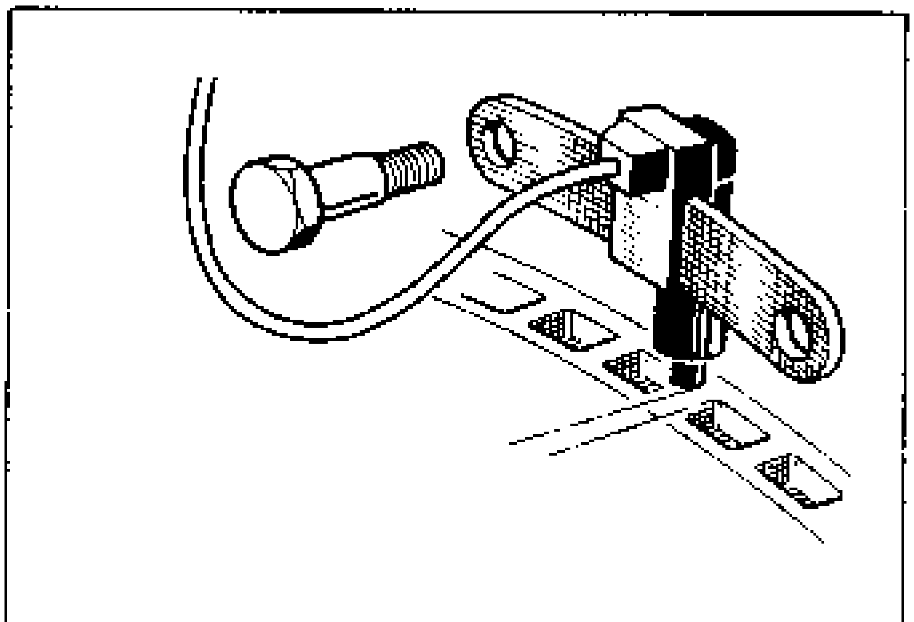


Remove:

- the exhaust pipe at the manifold and at the balljoint;

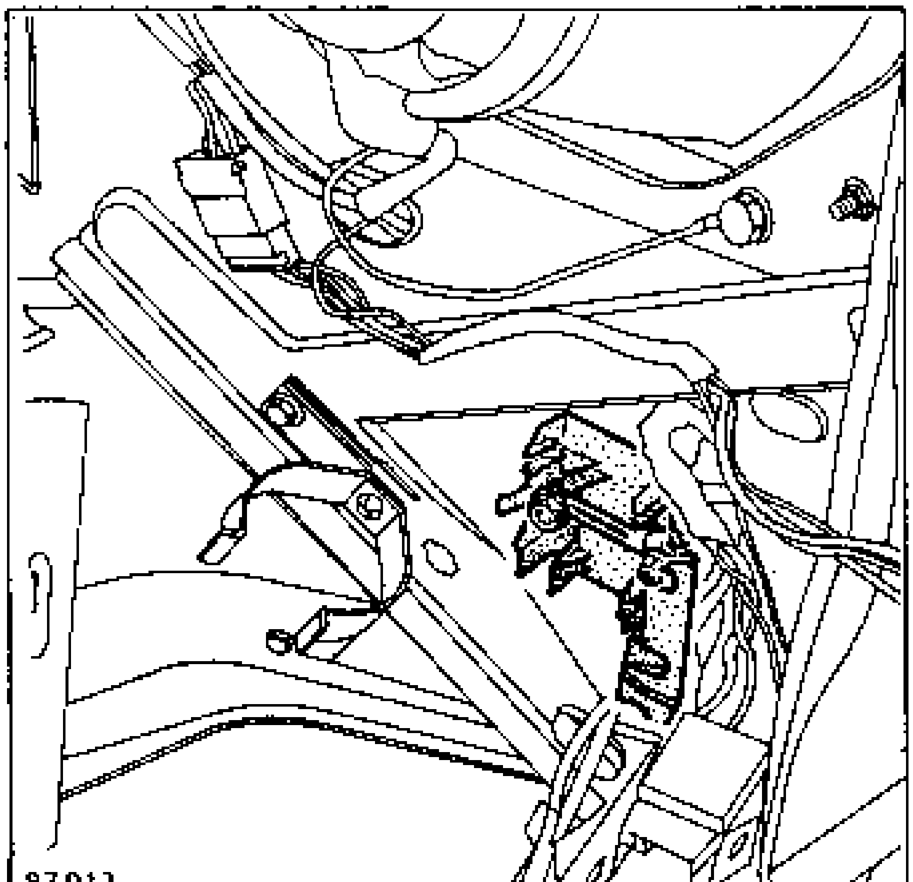
- the fixing bolts:
  . around the gearbox;
  . from the starter;
  . from the engine flywheel protective cover, which remains on the engine;

- the position sensor;



84 491

- the electrical junction blocks and the current supply cable shunts (if necessary, locate the junction blocks);



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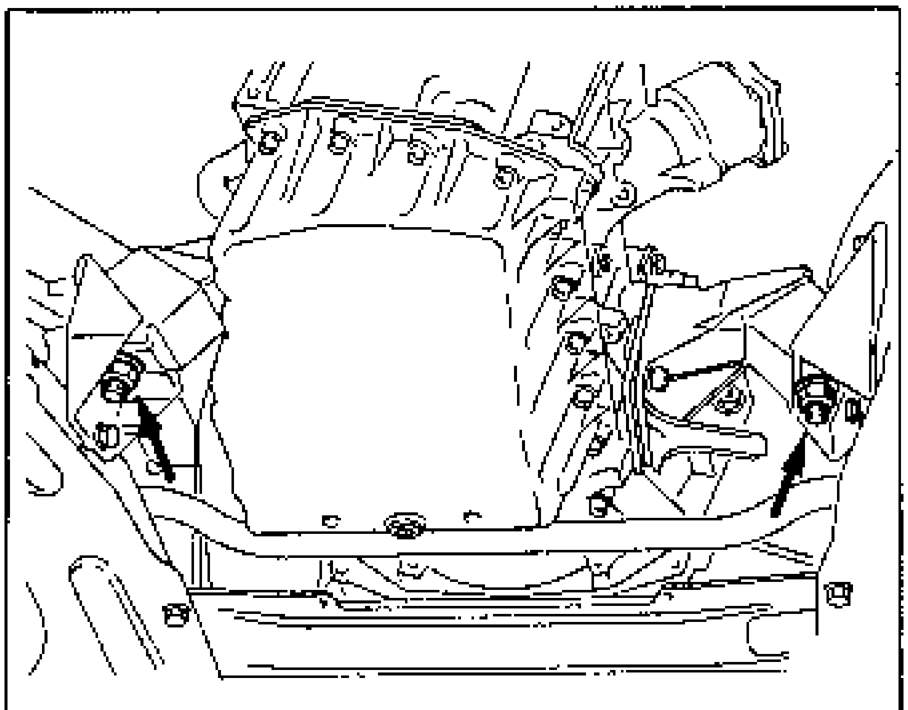
- the engine support bracket fixing nuts;



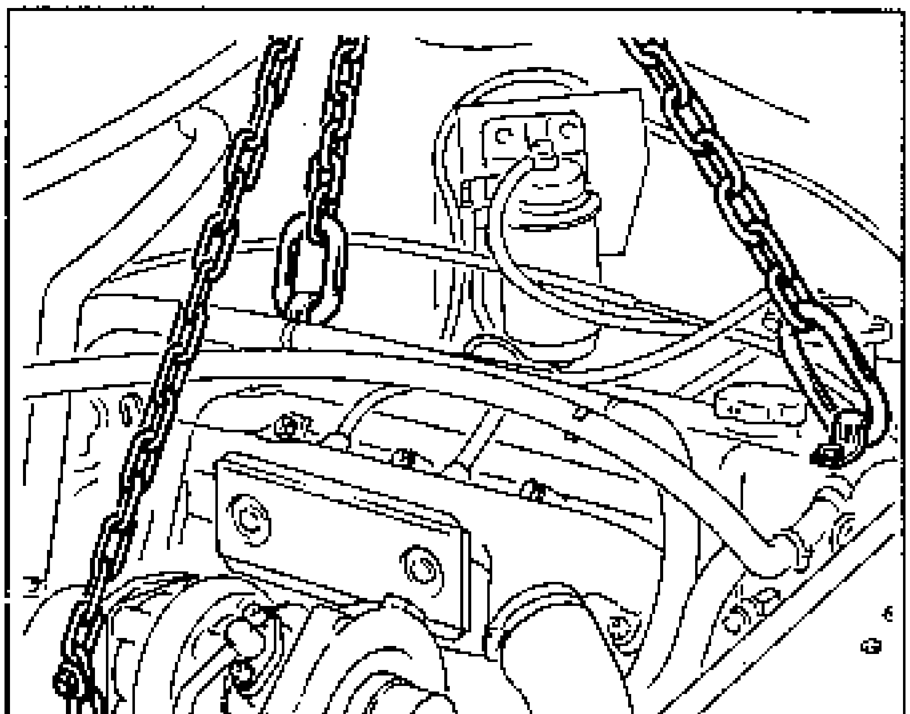
87 852

- the clutch cable or the hydraulic slave cylinder.

Use tool **SEFAC 689** and hook the engine by its lifting rings.

J8S Turbo engine special feature

To stop the assembly rotating, fit an additional chain, attached to the exhaust manifold.



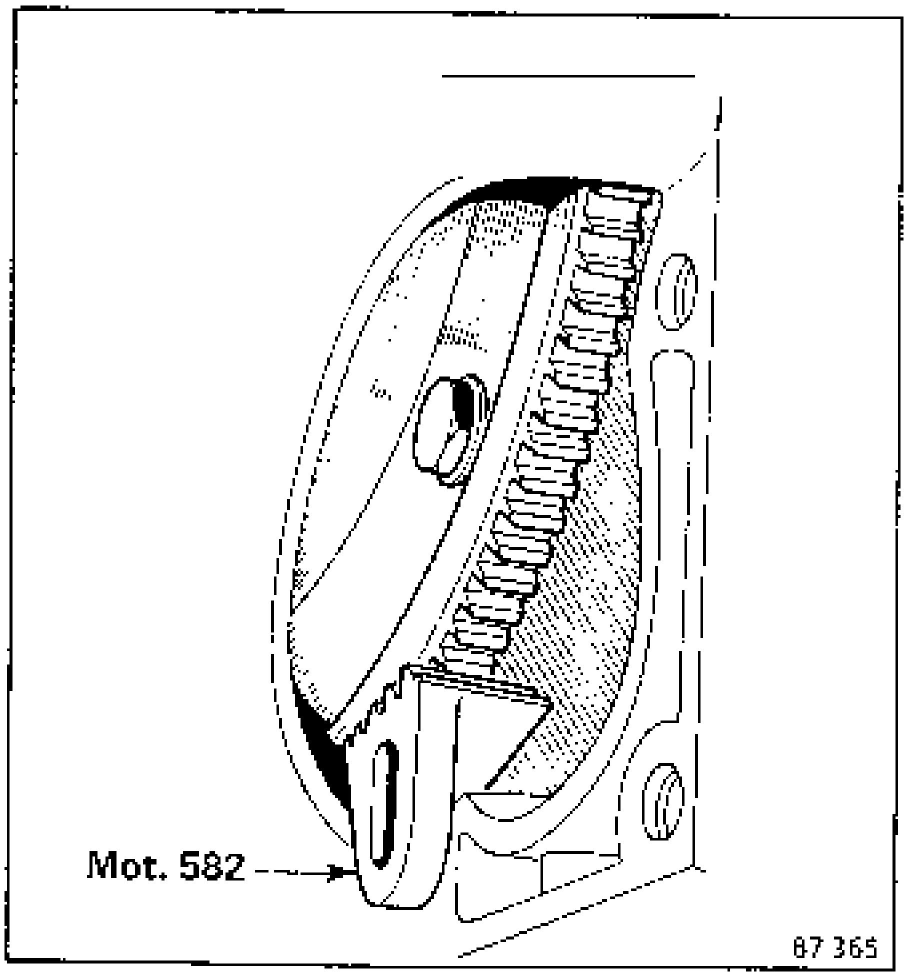
86 879

Place a jack under the gearbox and block it on the steering cross member.

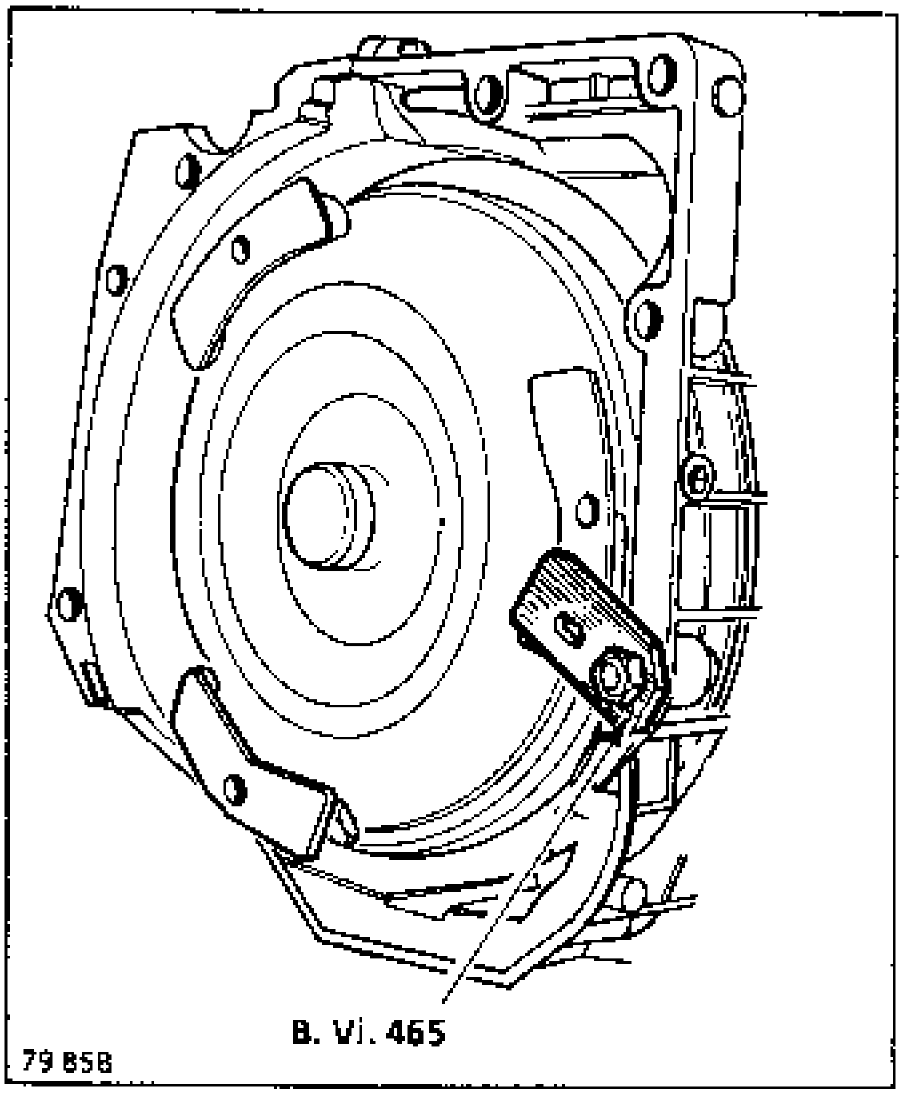
Automatic transmission

Push back the starter to gain access to the **flywheel**.

Fit the flywheel locking tool, **Mot. 582**, and remove the drive plate bolts on the converter through the starter housing.



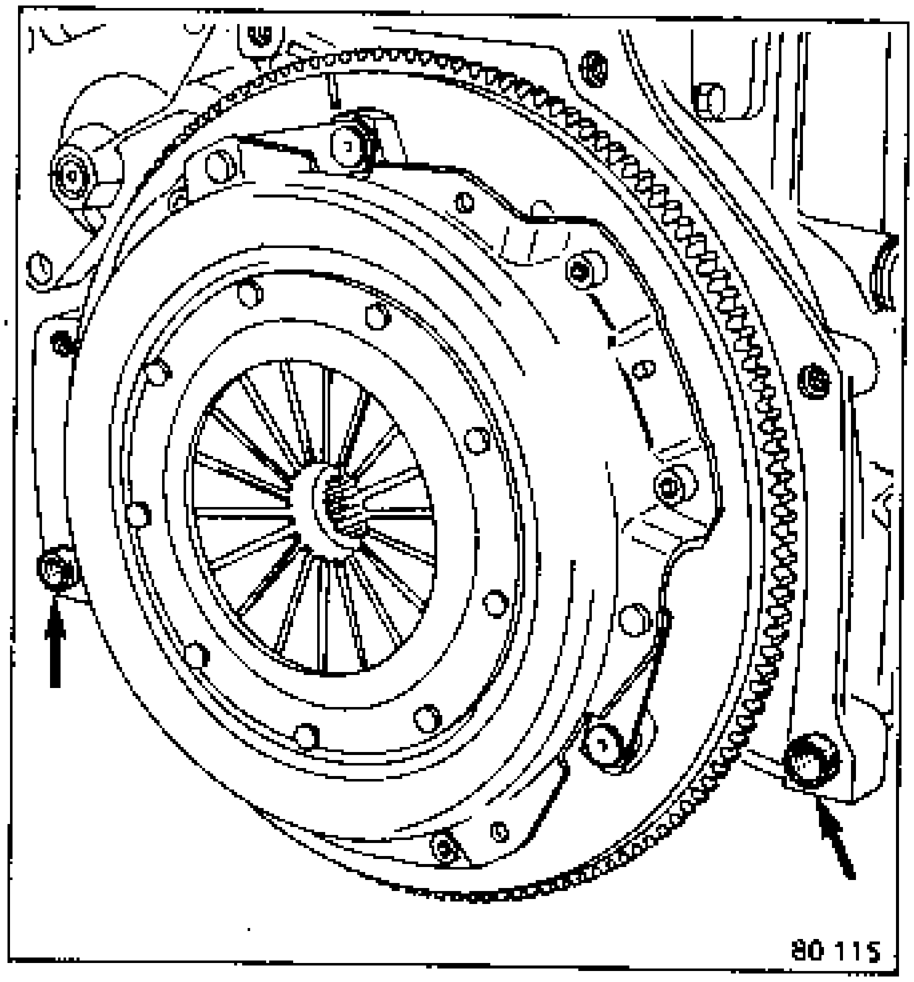
Remove the engine. Immediately after uncoupling, prevent the converter dislodging by holding it with clamp **B.Vi. 465**.



REFITTING

(Special features)

Check for the presence of locating dowels on the clutch and starter housings.



Lightly grease the converter location housing in the crankshaft using **Molykote BR2** grease.

Automatic transmission

Check that the clutch housing upper bolts fixing to the crankcase are in place (it is impossible to fit them with the engine in place).

If necessary, loosen the rear starter mountings on the crankcase so that the starter does not obstruct the crankcase/clutch housing assembly.

Adjust the travel:

- of the accelerator cable;

- of the governor/computer cable for 4141 automatic transmission.

Maintain the correct tightness of the exhaust flange (see chapter 19).

- Fill the engine, if necessary;
- fill and drain the cooling circuit.

Adjust the accelerator cable.

ESSENTIAL SPECIAL TOOLING		
SEFAC	689	Load spreader

TIGHTENING TORQUES (in daNm)	
Bolts around gearbox	5
Engine mounting nuts	3
Mounting support bracket screws	4
Mounting support bracket bolts	2.5

REMOVING-REFITTING

The engine can only be removed by releasing it from the front of the vehicle.

It has lifting rings to facilitate this operation.

REMOVING

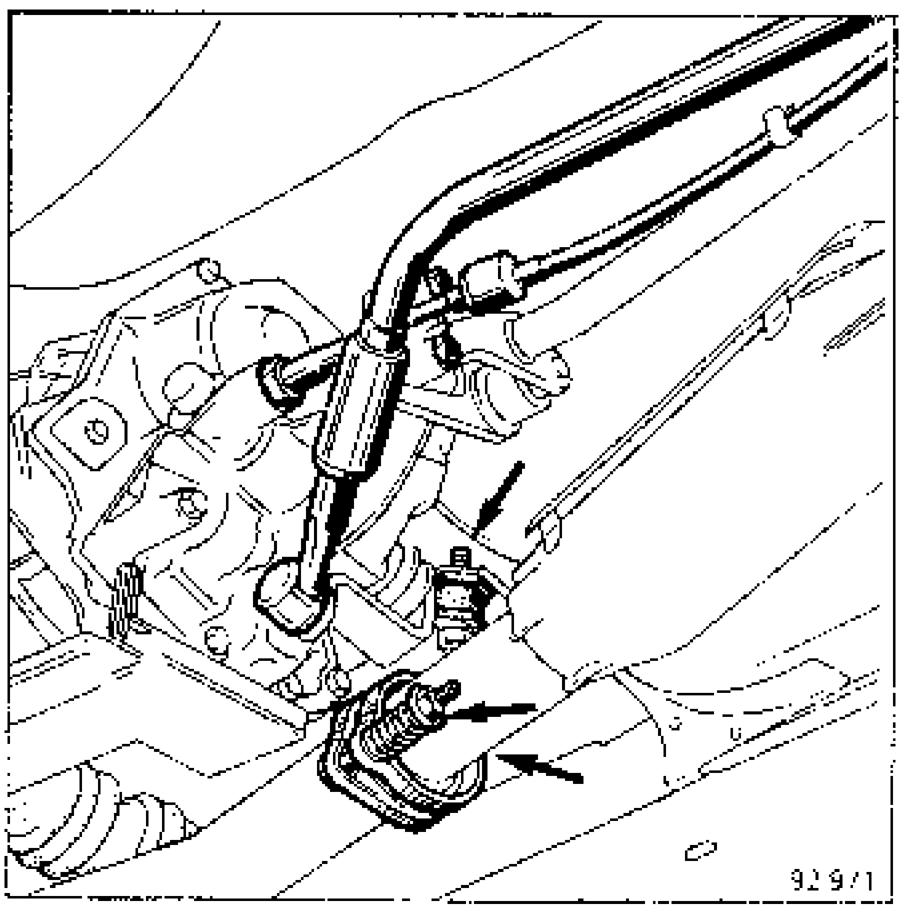
Place the vehicle on a 4-post lift.

Disconnect the battery.

Remove the protective plate under the engine

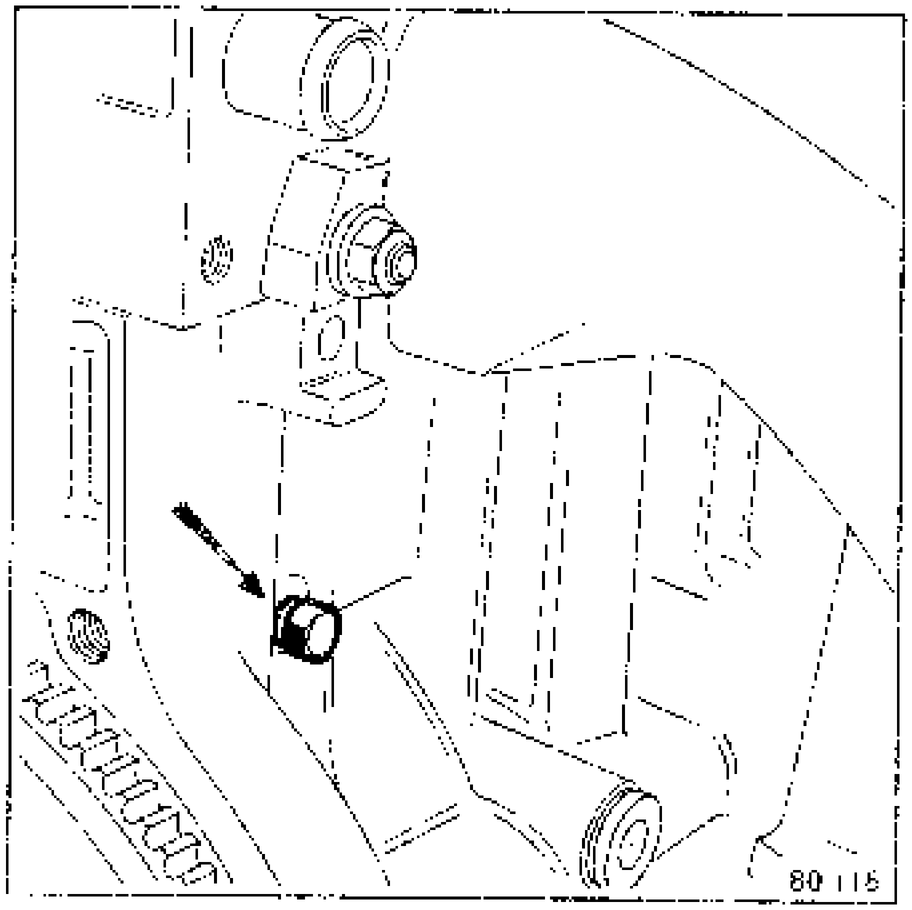
Loosen the 2 exhaust balljoint bolts (without removing them).

Remove the upper exhaust shock mount nut.



Drain the cooling circuit;
- at the lower radiator hose.

On the water pump side:
- at the crankcase.

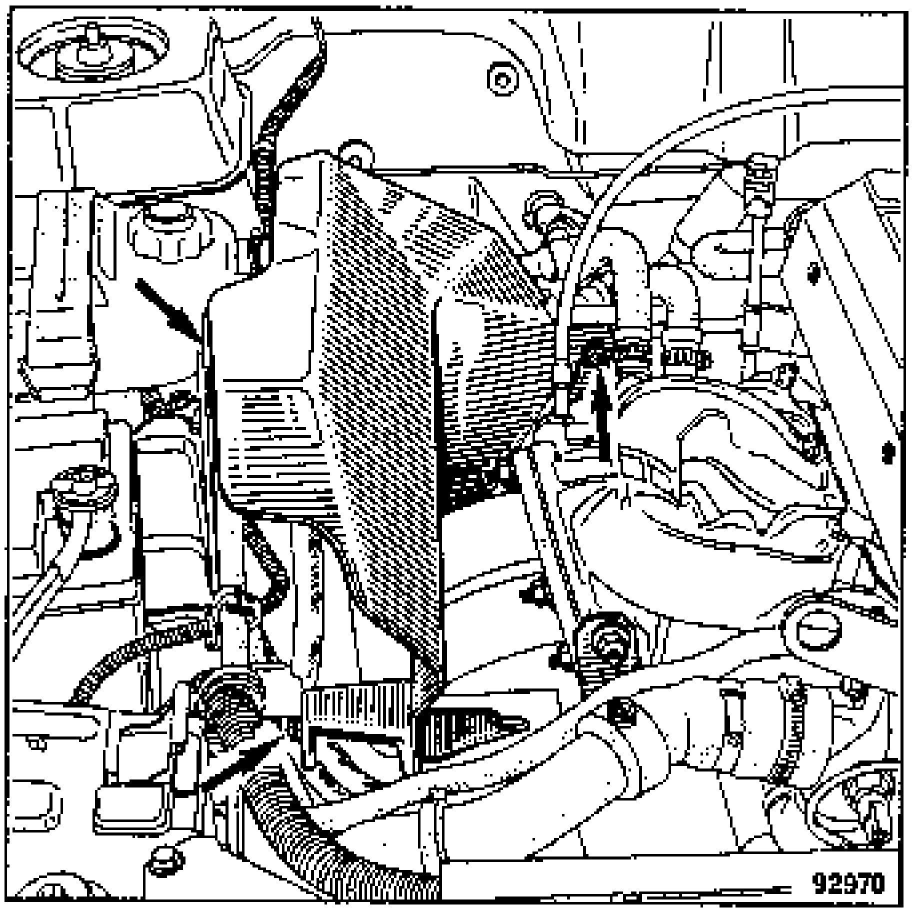


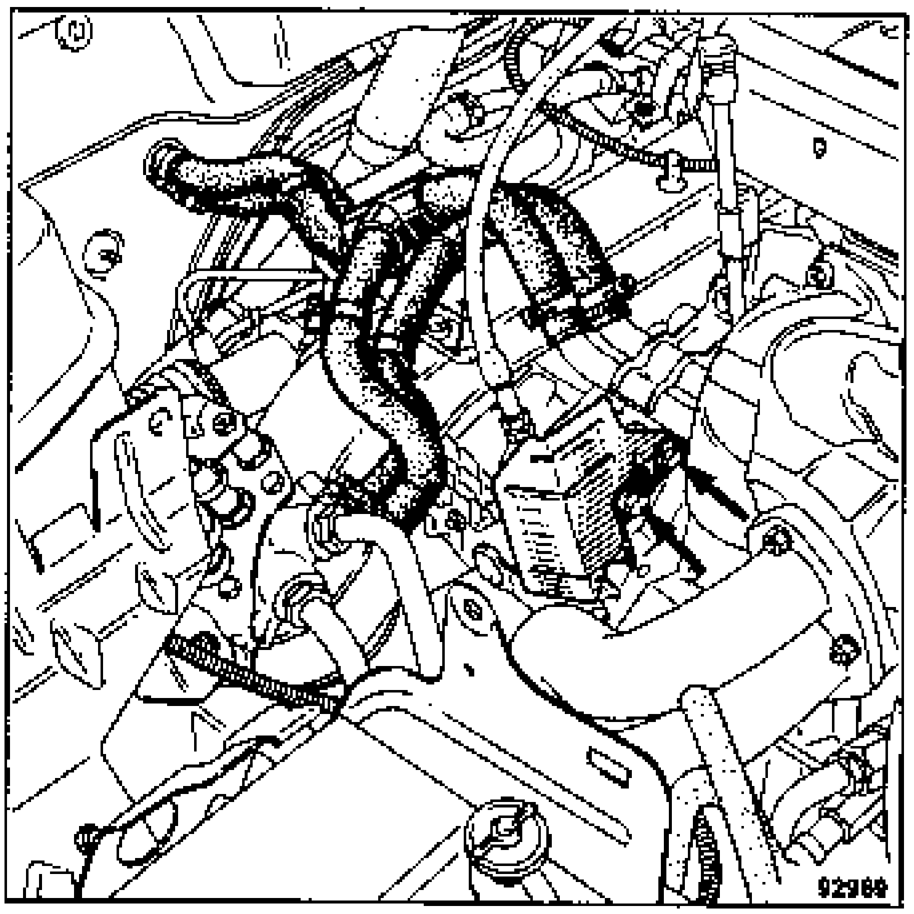
Remove:

- the upper radiator hose on the water pipe side;
- the radiator grille,
- the front upper cross member;
- the cooling radiator with its harness (connector in the front right hand wing and the 2 fuse panel nuts in the front left-hand wing);
- the 3 fixing bolts from the exhaust manifold shield (see next page)

Loosen the 2 clutch control shield fixing bolts, without removing the shield (see next page).

Remove the clutch and accelerator control cables.





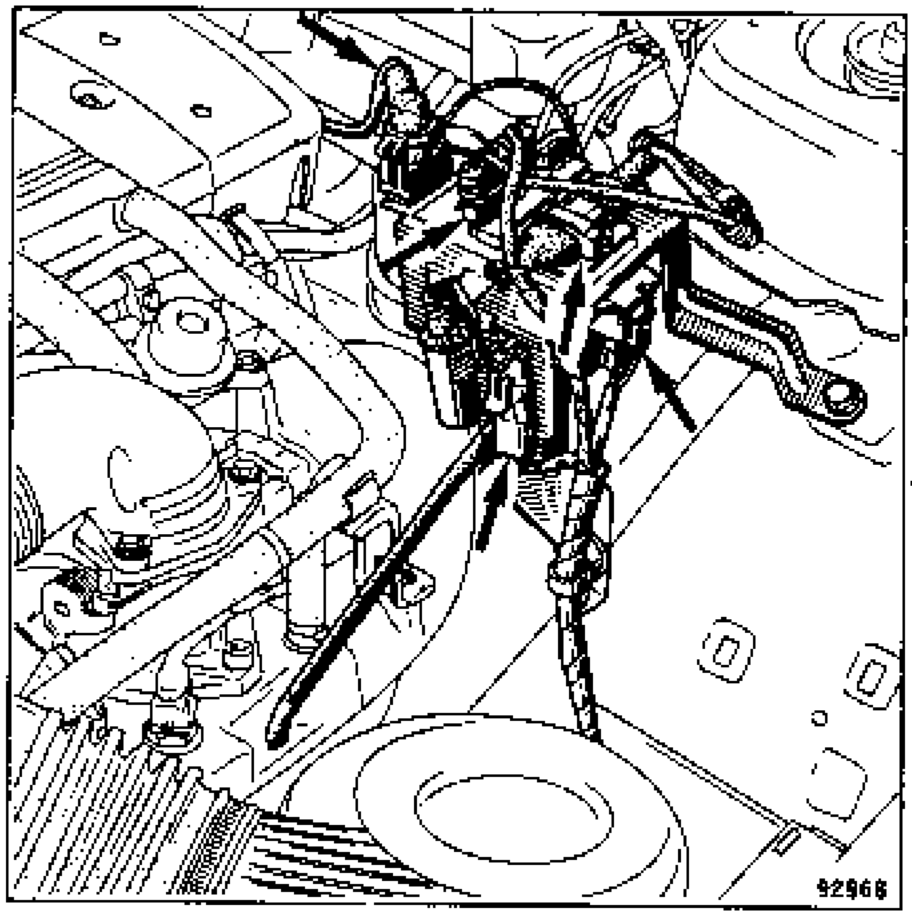
Remove:

- the 4 exhaust pipe fixing bolts;
- the ignition sensor;
- the ignition module and its harness;
- the vacuum pipes;
- the air filter.

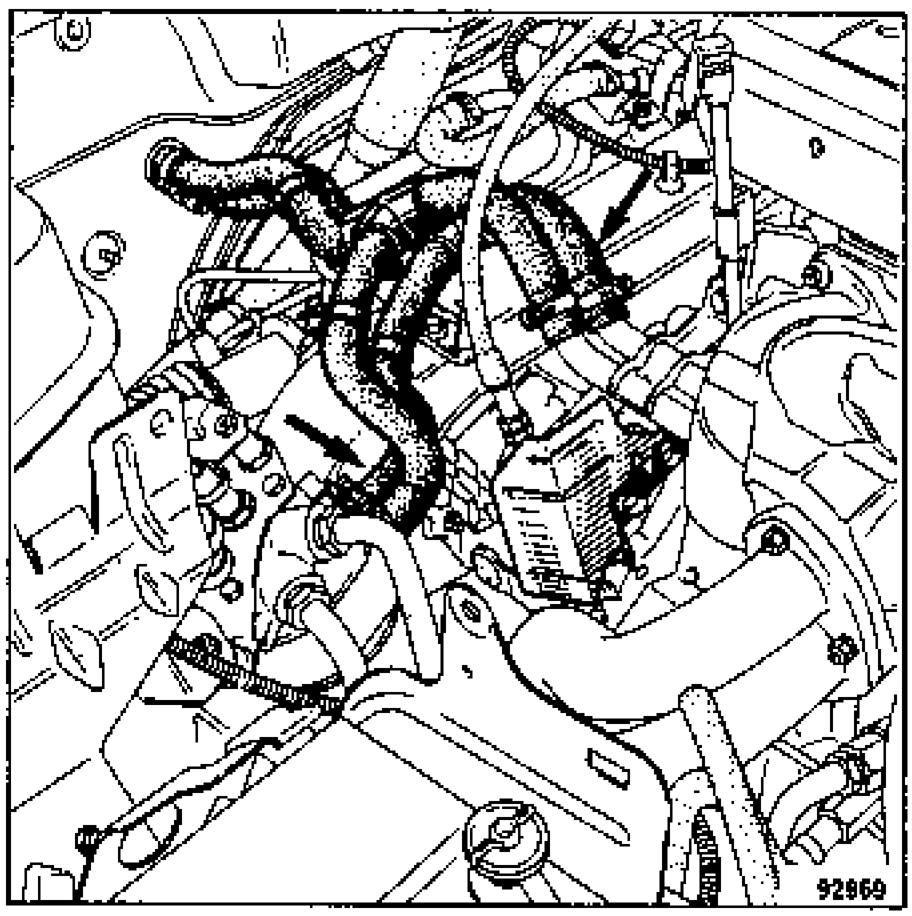
Unclip the computer.

Disconnect the engine harness located in the front left-hand wing.

Disconnect the petrol supply and return piping at the connection under the brake fluid reservoir.



Disconnect the oil pipes and hoses.



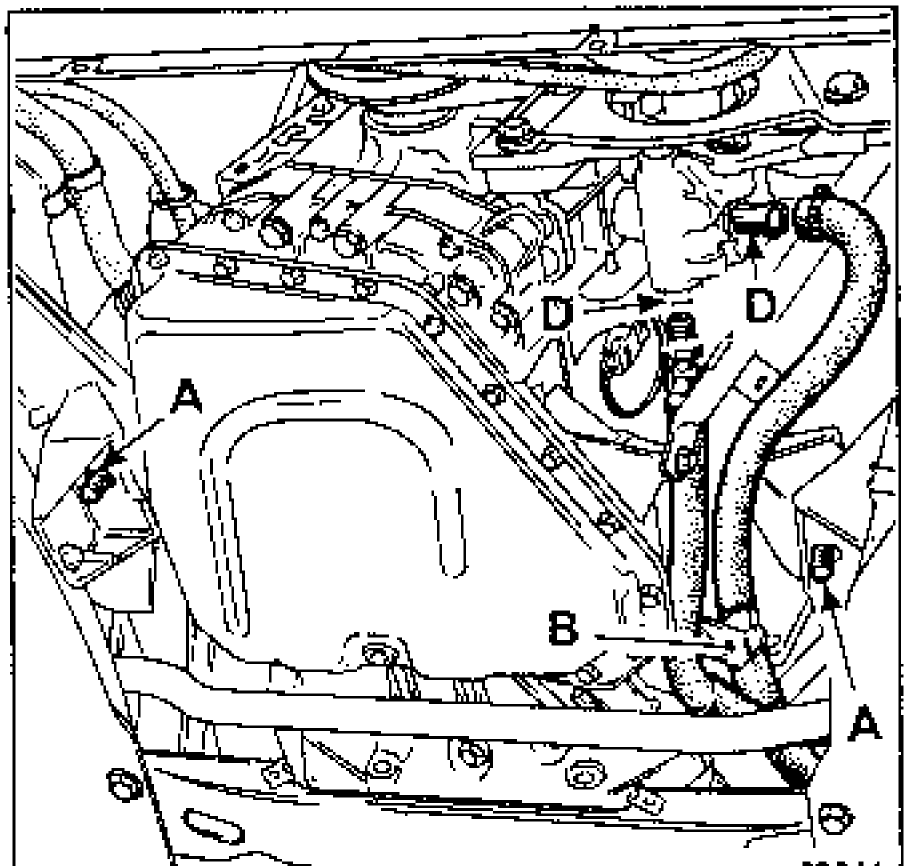
Unscrew the oil filter support bracket and remove it from the exhaust manifold.

Unscrew the gearbox surrounds, accessible from above.

Disconnect the power-assisted steering pump pipes (**D**) and drain the circuit.

Remove:

- the power-assisted steering pump pipe fixing clamp (**B**);



92944

- the 2 engine fixing nuts (**A**);

- the lower gearbox surrounds screws and bolts.

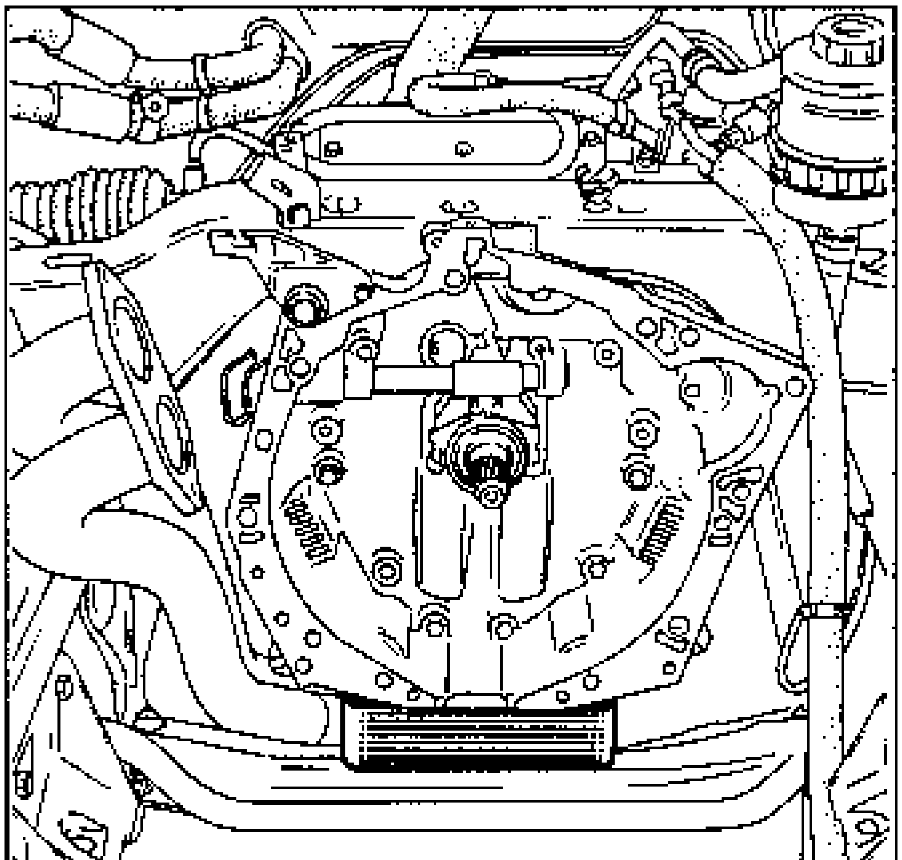
Attach the load spreader (**SEFAC 689**) to the 2 engine lifting rings .

Position the computer and the oil filter on the engine.

Raise the engine/gearbox assembly.

Place a spacer under the clutch housing hard against the steering cross member.

Take out the engine.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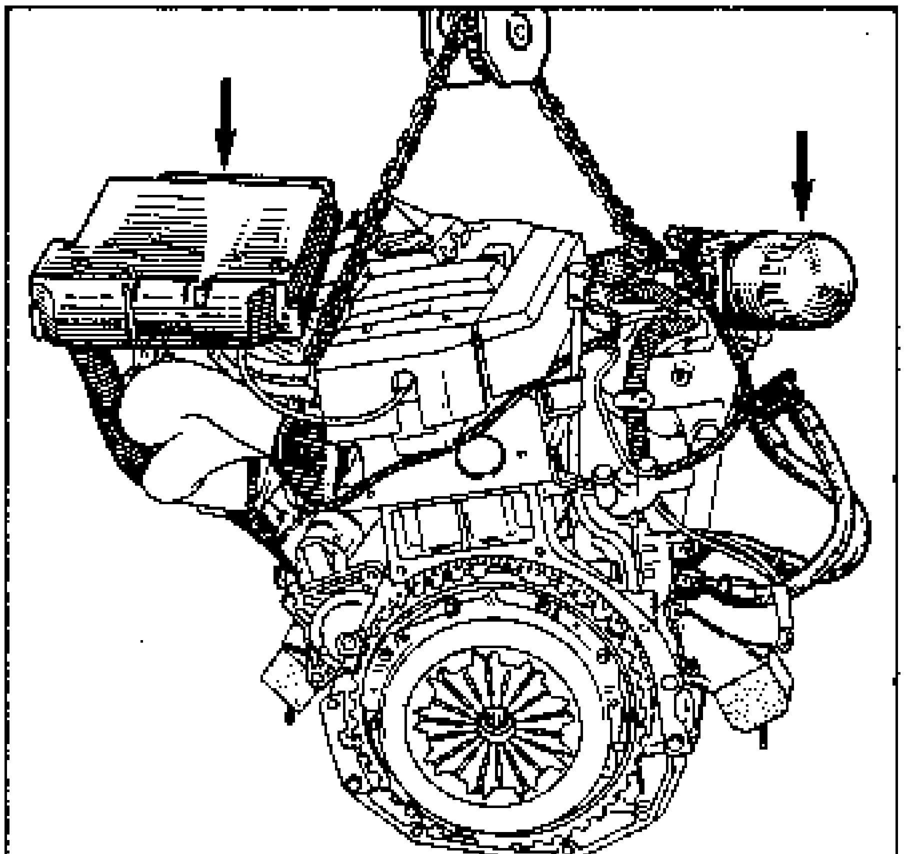
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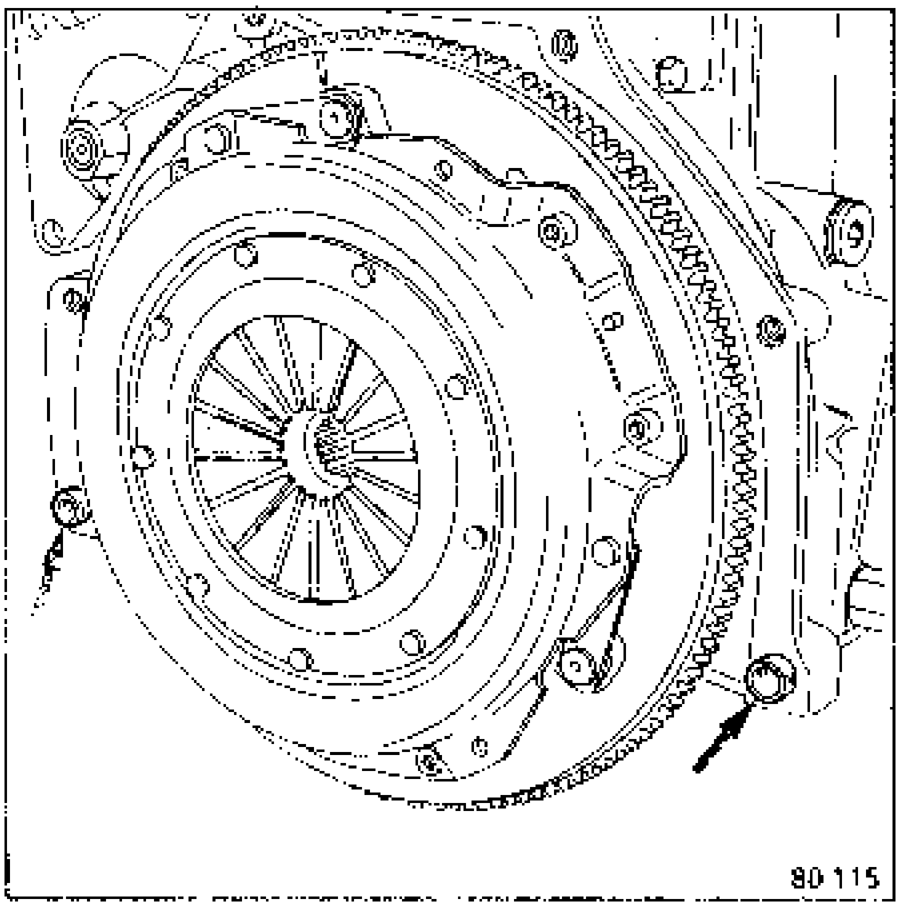
REFITTING

Special features:

Check for the presence of clutch and starter housing locating dowels.



Retighten:

- the engine mounting fixing nuts to **4 daNm**;
- the gearbox surrounds bolts to **5 daNm**.

Fill and drain:

- the power-assisted steering circuit;
- the cooling circuit.

(For draining, see the relevant chapters.)

Adjust:

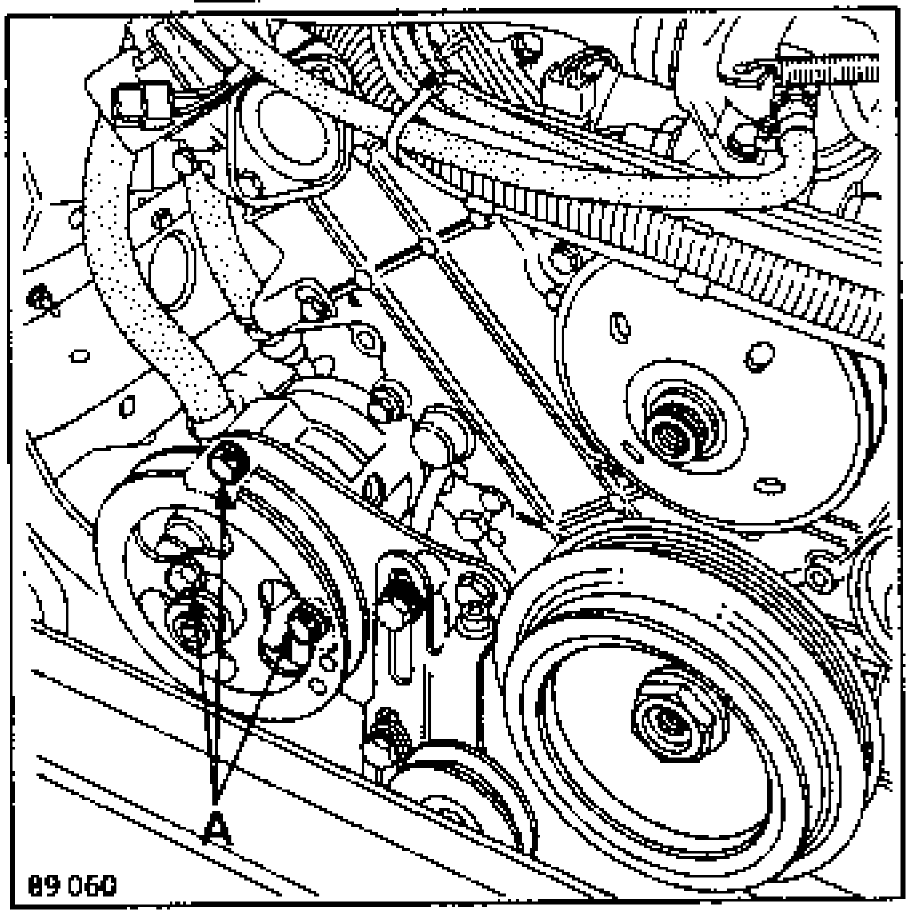
- the clutch clearance;
- the accelerator cable.

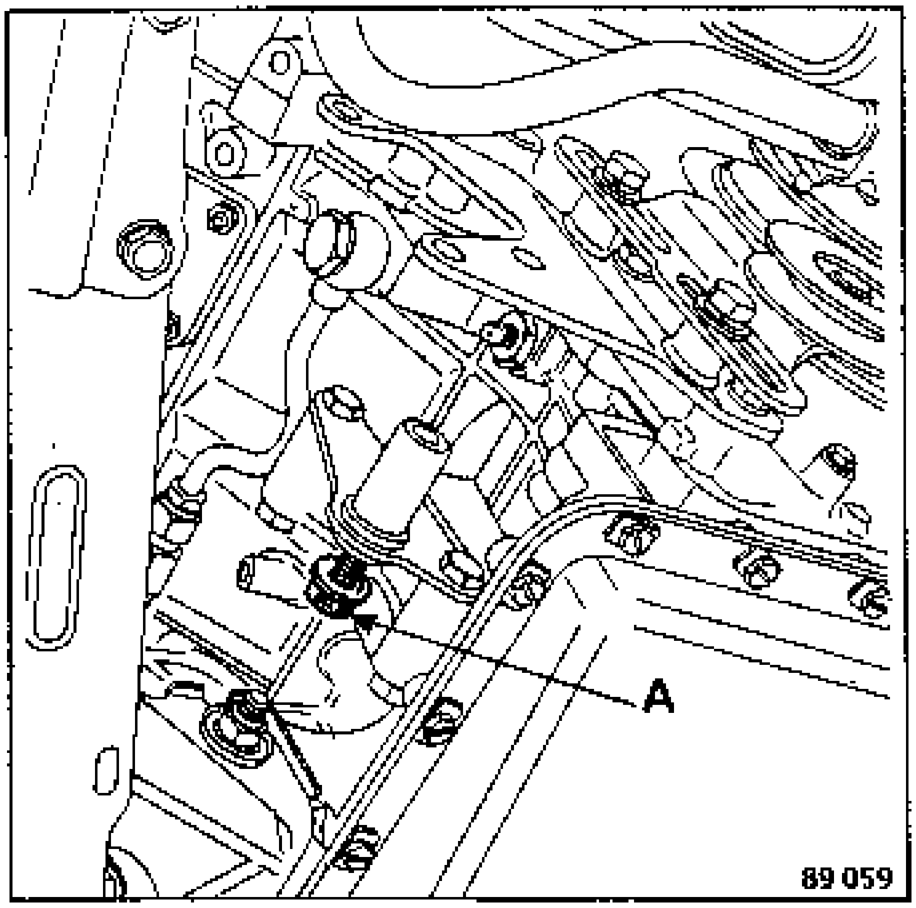
ESSENTIAL SPECIAL TOOLING		
Mot.	597	Z engine lifting tool

TIGHTENING TORQUES (in daNm)	
Bolts around gearbox	5
Engine mounting nuts	3
Mounting support bracket screws	4
Mounting support bracket bolts	2.5

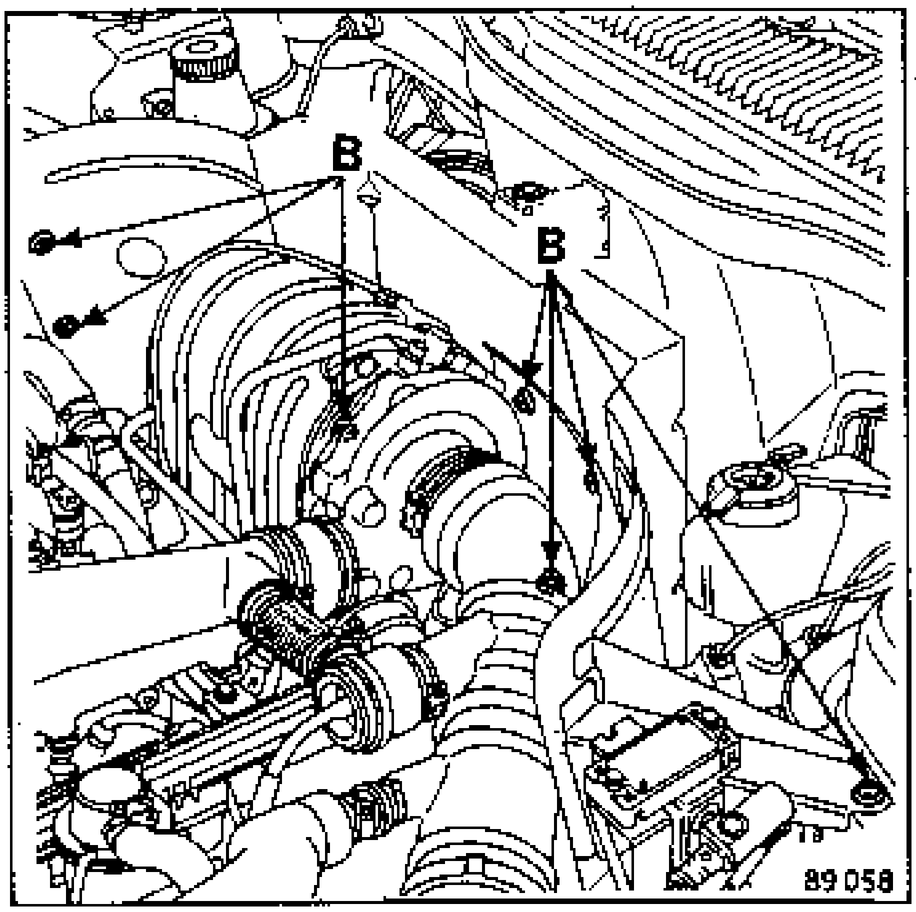
REMOVING

Remove:
- the air filter;
- the alternator;
- the power-assisted steering pump is to be uncoupled from the engine at (A) and attached to the bodywork without disconnecting its pipes.





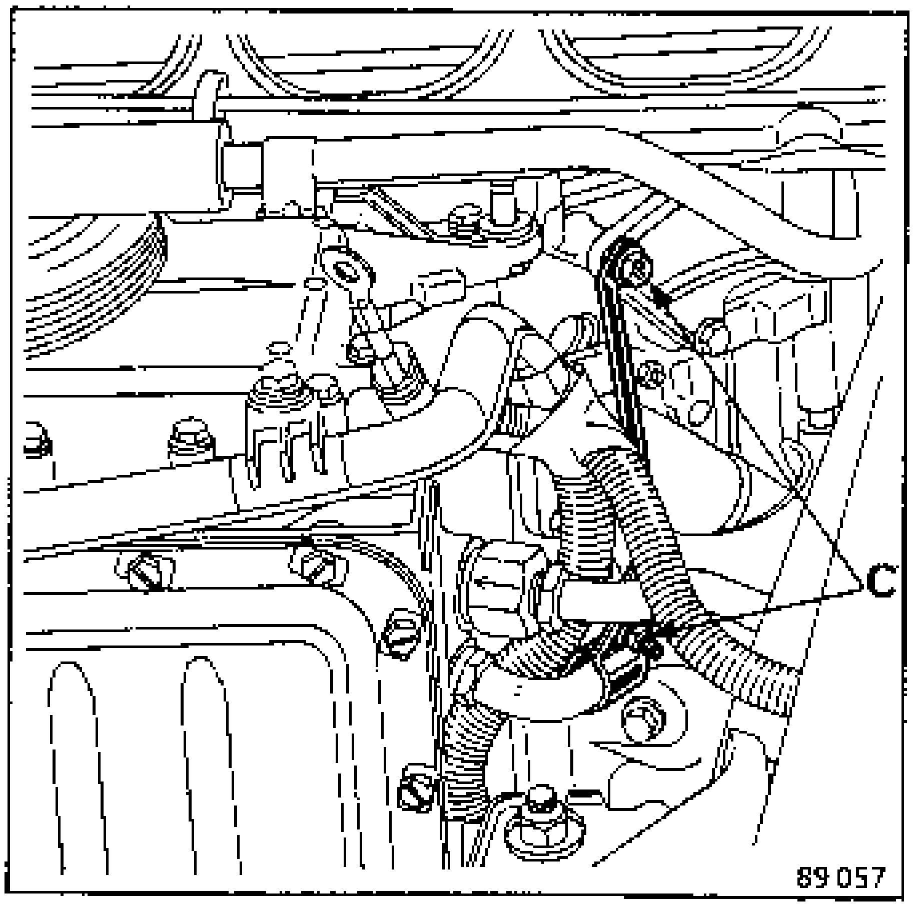
- the heat shield from the turbocharger at (B) and its intake trunking.



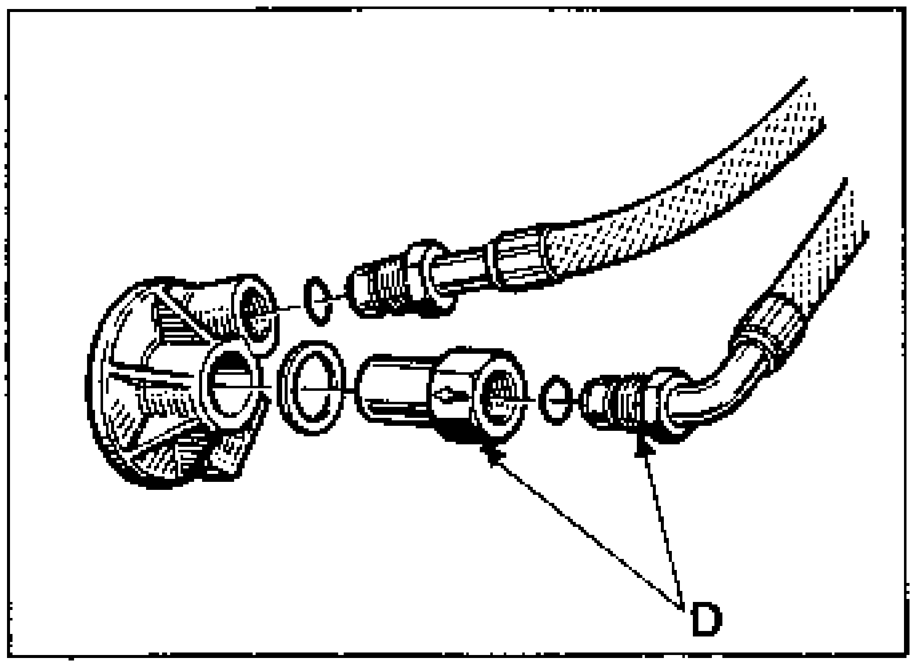
- the heat shield from the clutch slave cylinder;

- the exhaust pipe from the turbocharger;

- the fixing clamp from the oil by-pass pipes at bracket (C);



- the oil by-pass plate to the engine block at (D).

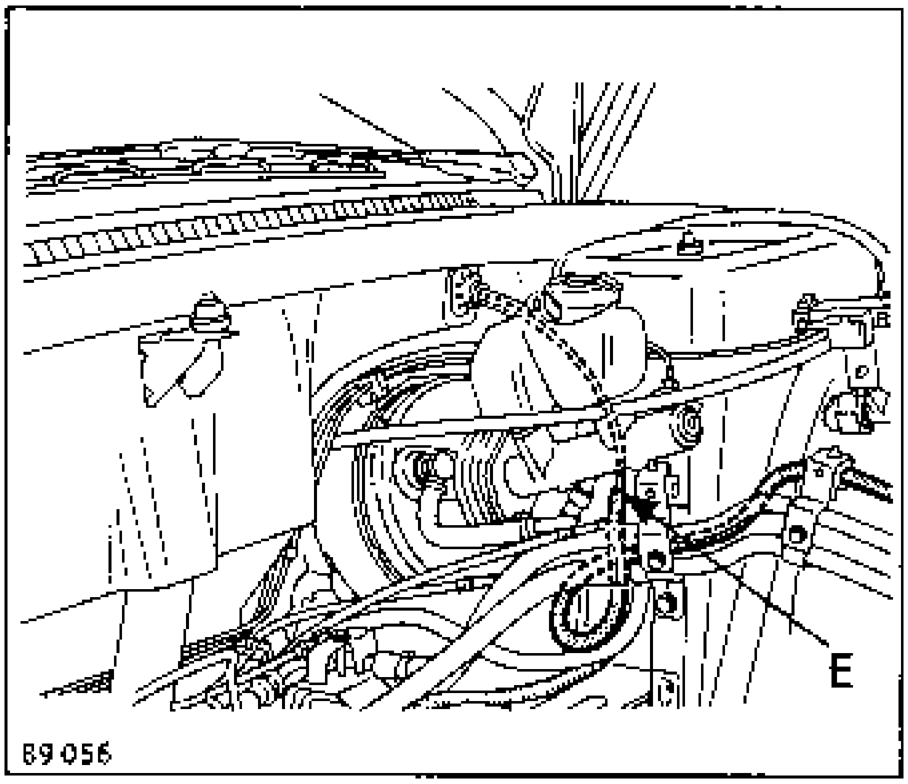


Disconnect:

- the computer and place it on the engine;

- the absolute pressure sensor pipe;

- the turbocharger pressure indicator connector positioned on the shock absorber turret at (E).



Remove the engine using tool **Mot. 597**.

REFITTING

It is essential to replace the starter in its housing while the engine/gearbox assembly is raised.

To refit the exhaust pipe, see the chapter on the exhaust system.

ESSENTIAL SPECIAL TOOLING		
B. Vi.	465	Tooling for changing converter seal (automatic transmission)
Mot.	582	Flywheel locking tool
Mot.	597	Z Engine lifting tool

TIGHTENING TORQUES (in daNm)	
Bolts around gearbox	5
Engine mounting nuts	3
Mounting support bracket screws	4
Mounting support bracket bolts	2.5

This chapter only covers details linked to removing-refitting Z engines.

The engine can only be removed by releasing it from the front of the vehicle. Lifting rings are fitted to facilitate this operation.

REMOVING

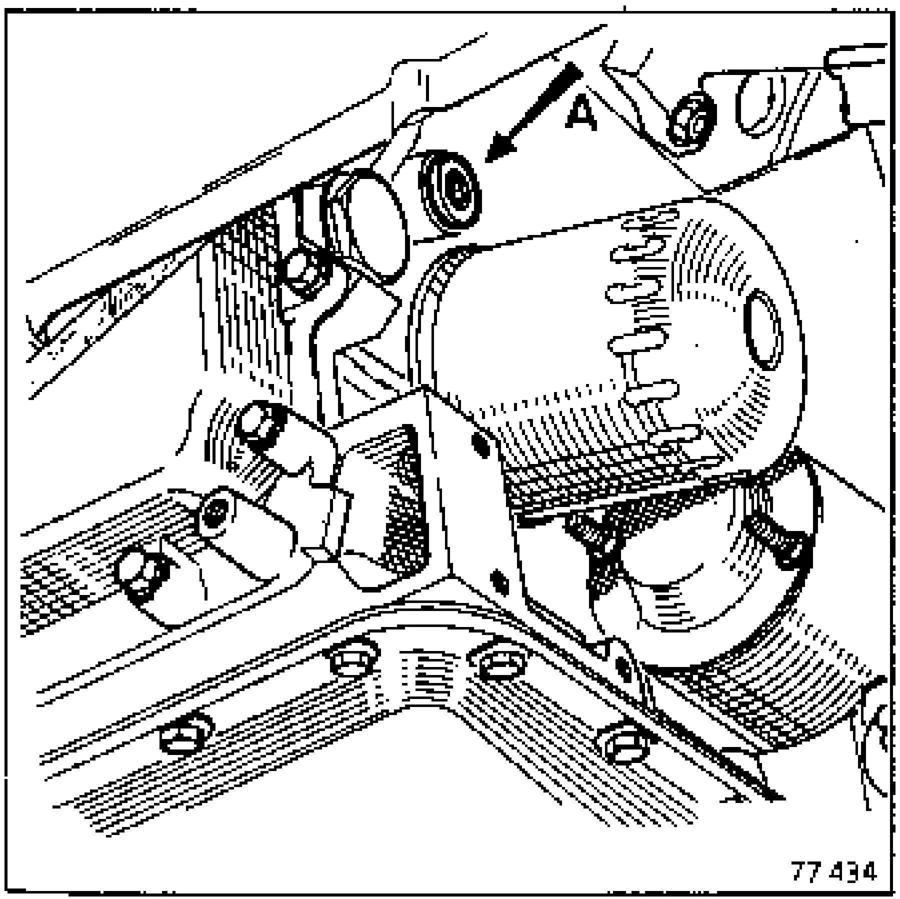
It is not necessary to remove the shield.

Disconnect the battery.

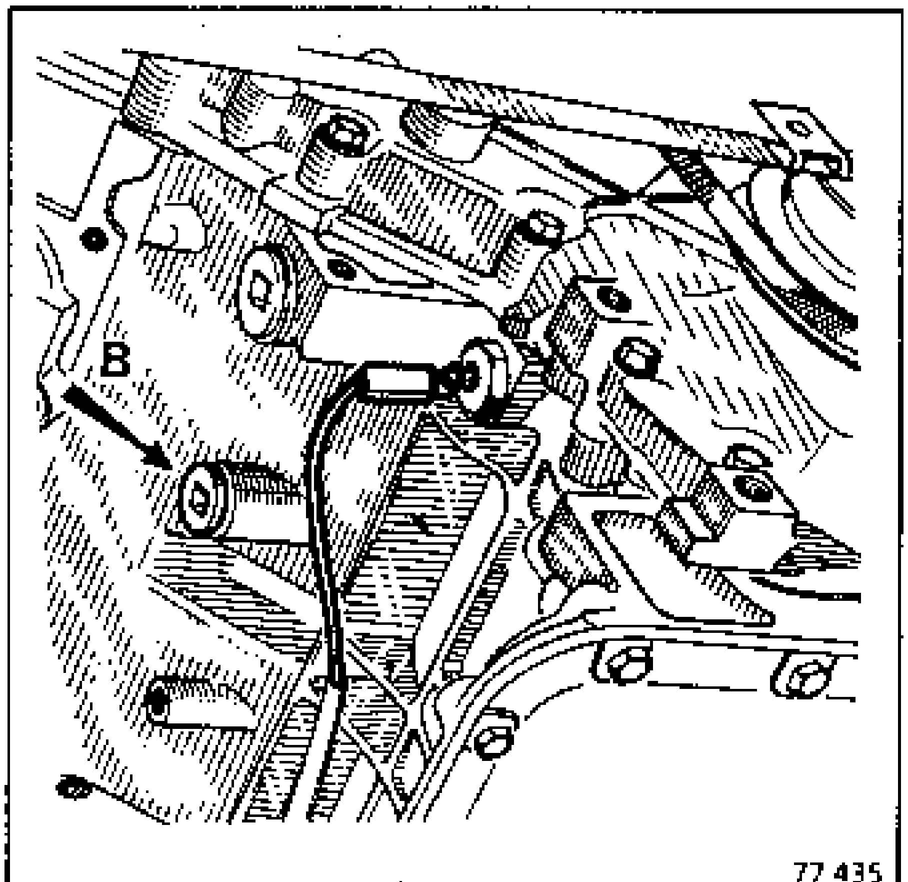
Drain the cooling circuit:

- at the lower radiator hose;
- at the crankcase.

Remove (A) and (B).



77 434



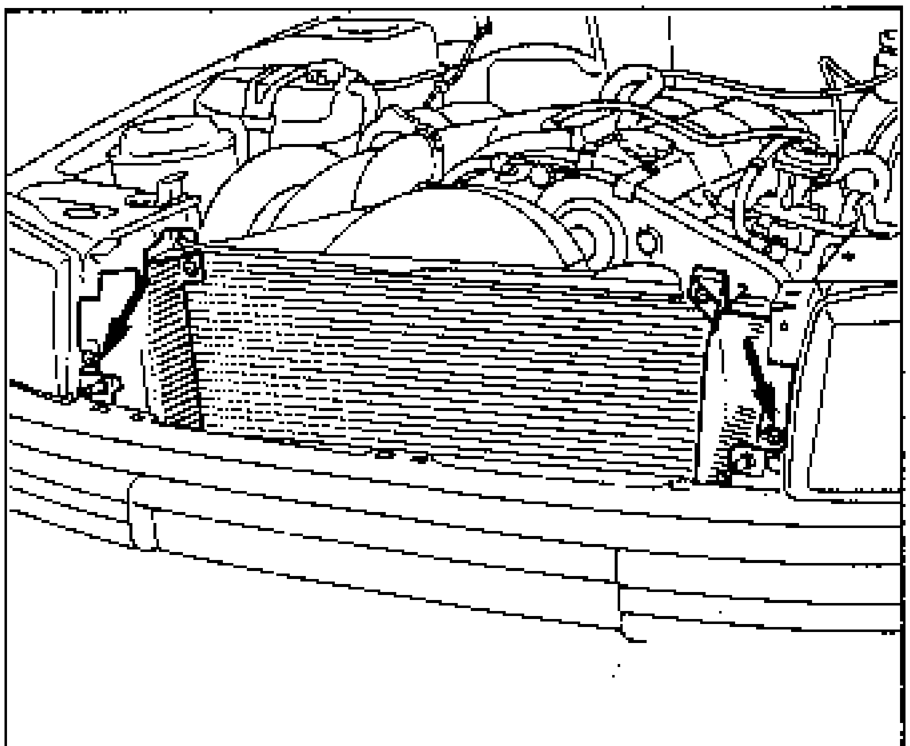
77 435

Remove:

- the radiator grille;
- the headlight wipers if the vehicle has them.

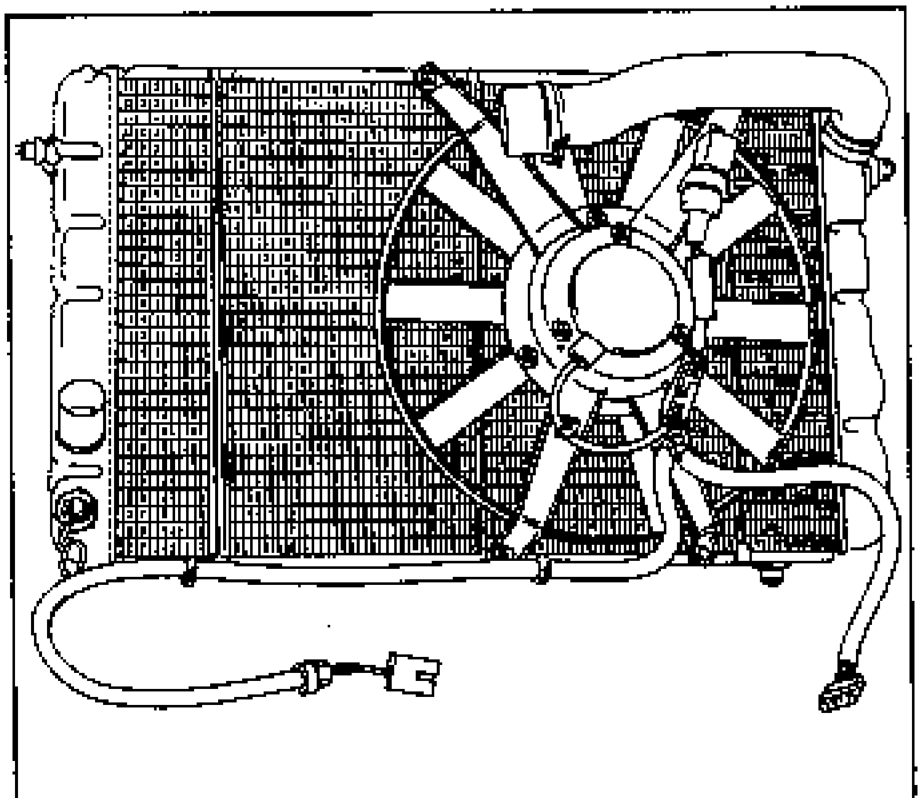
Release:

- the radiator grille by tilting it forwards;
- the upper cross member
- the side mudguard mountings.



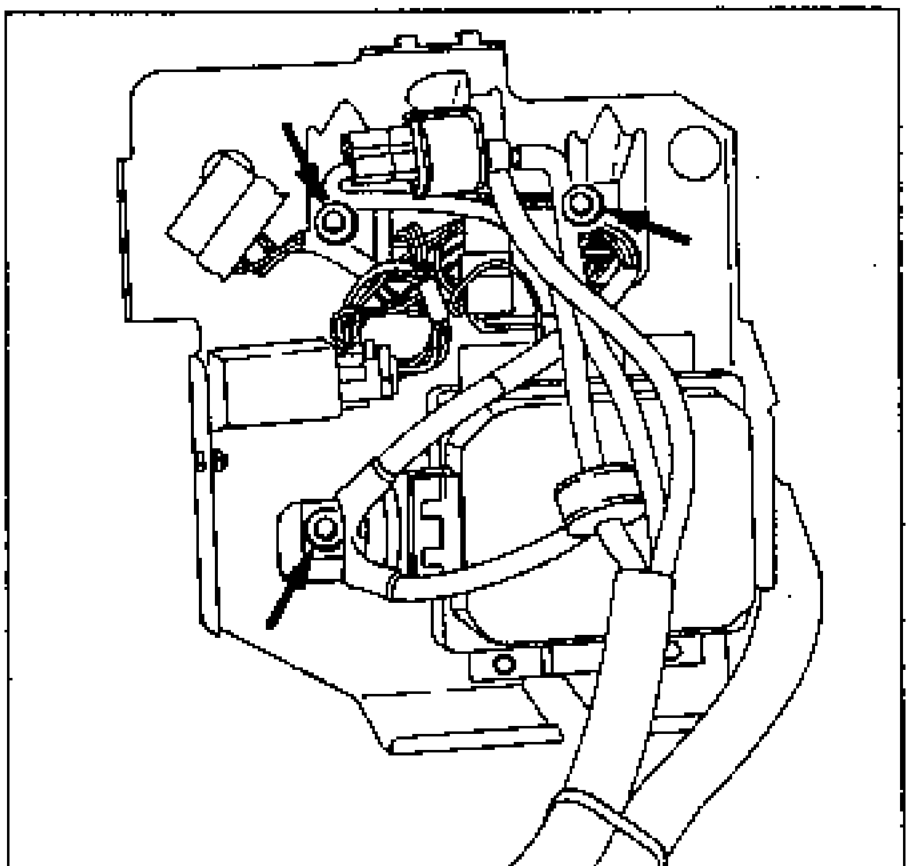
87 654

The radiator is to be removed with the wiring.



87 658

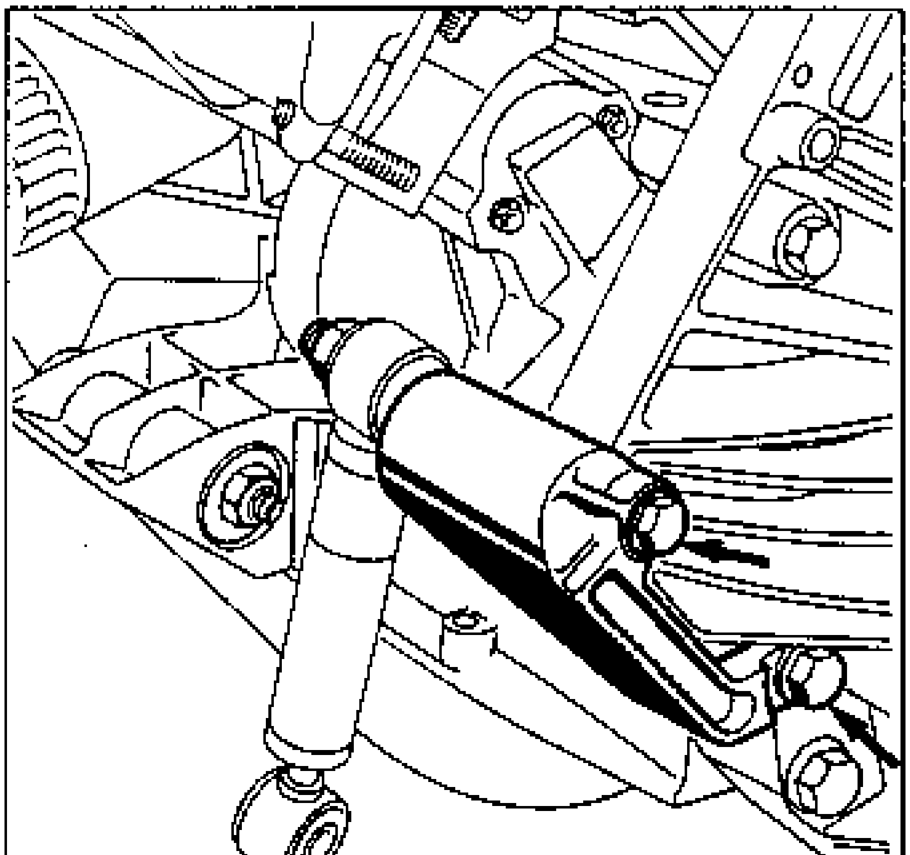
The ignition module support plate is to be removed and placed on the engine.



87 832

Remove:

- the petrol supply pipe at the base of the petrol filter;
- the left-hand engine shock absorber and its support bracket.



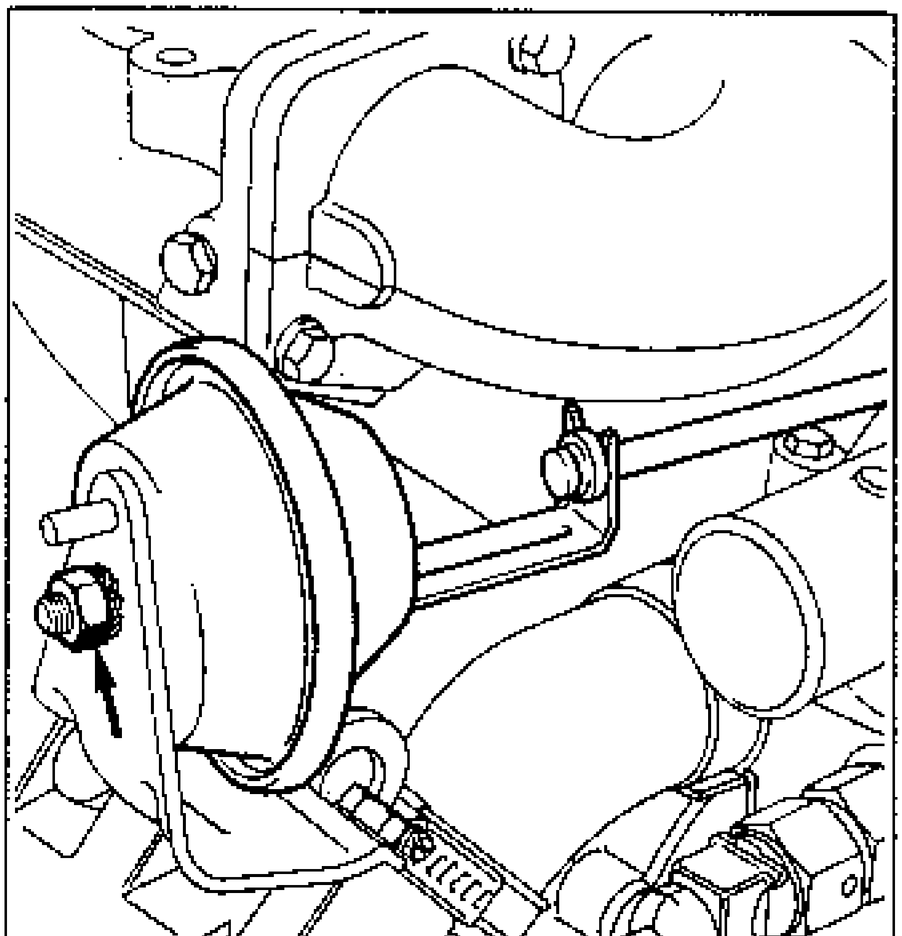
87 676

On the right-hand side:

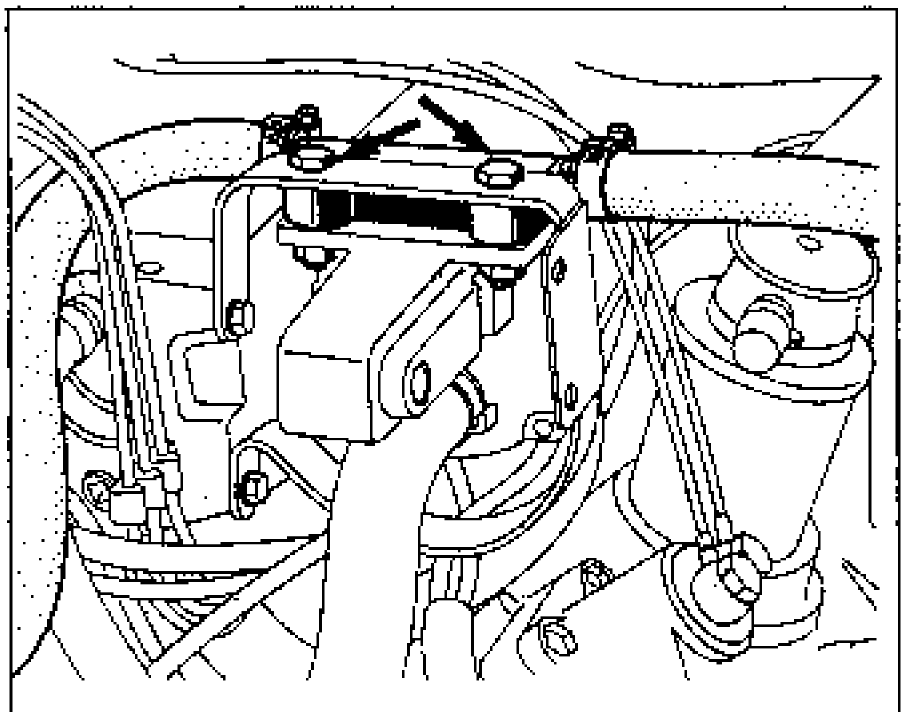
Only disconnect the lower section of the engine shock absorber.

Disconnect the supply pipe connection to the clutch slave cylinder.

The cruise control capsule(if fitted);


87 655

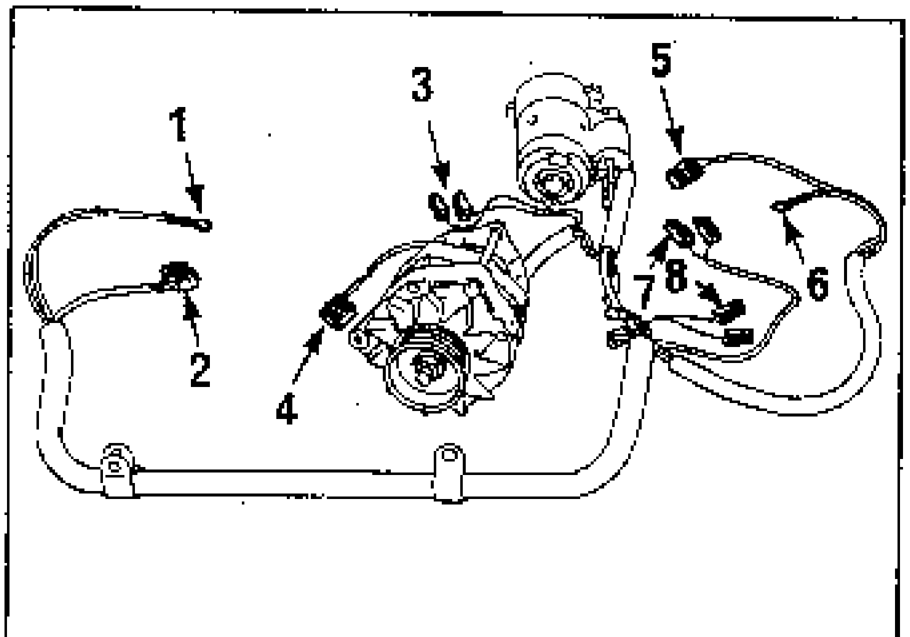
The additional air valve (V6 INJ. K).


87 653

The engine harness, comprising:

- the connection blocks;
- the alternator;
- the starter.

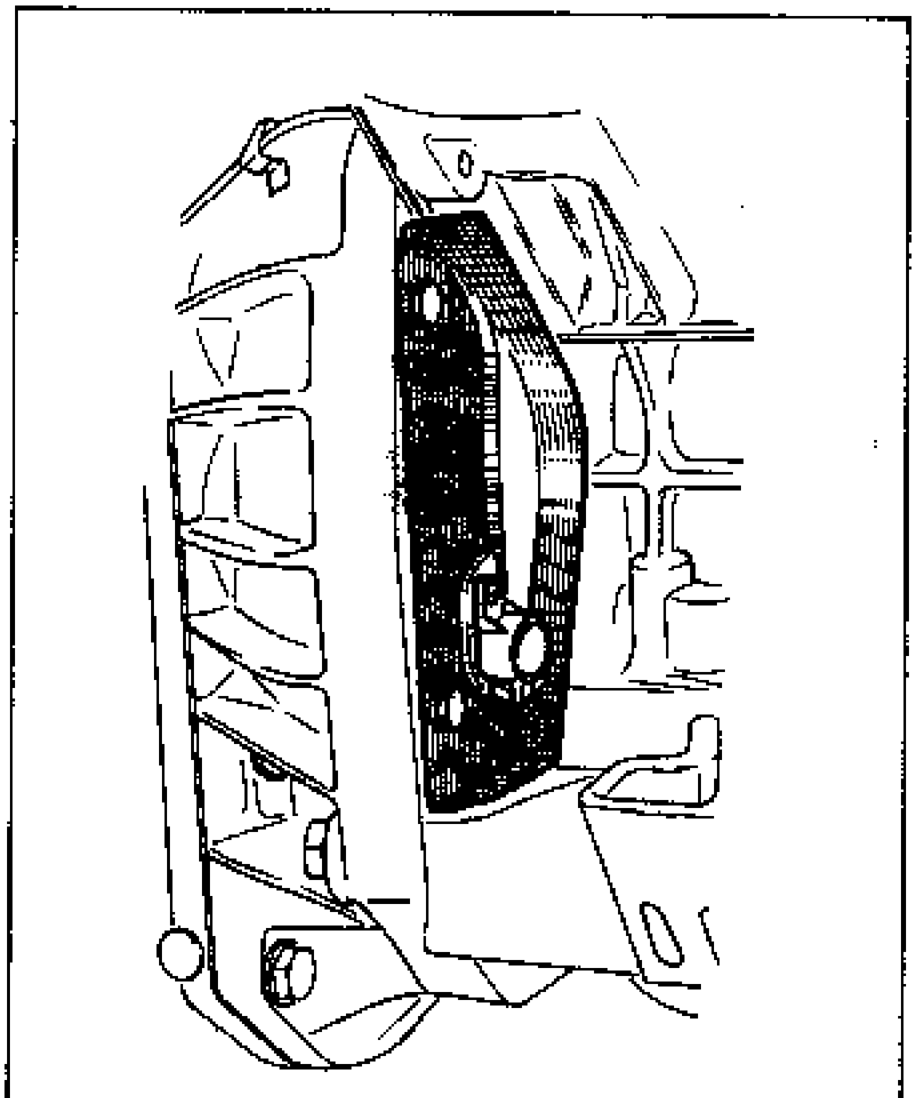
The assembly is to be removed when the engine is raised.



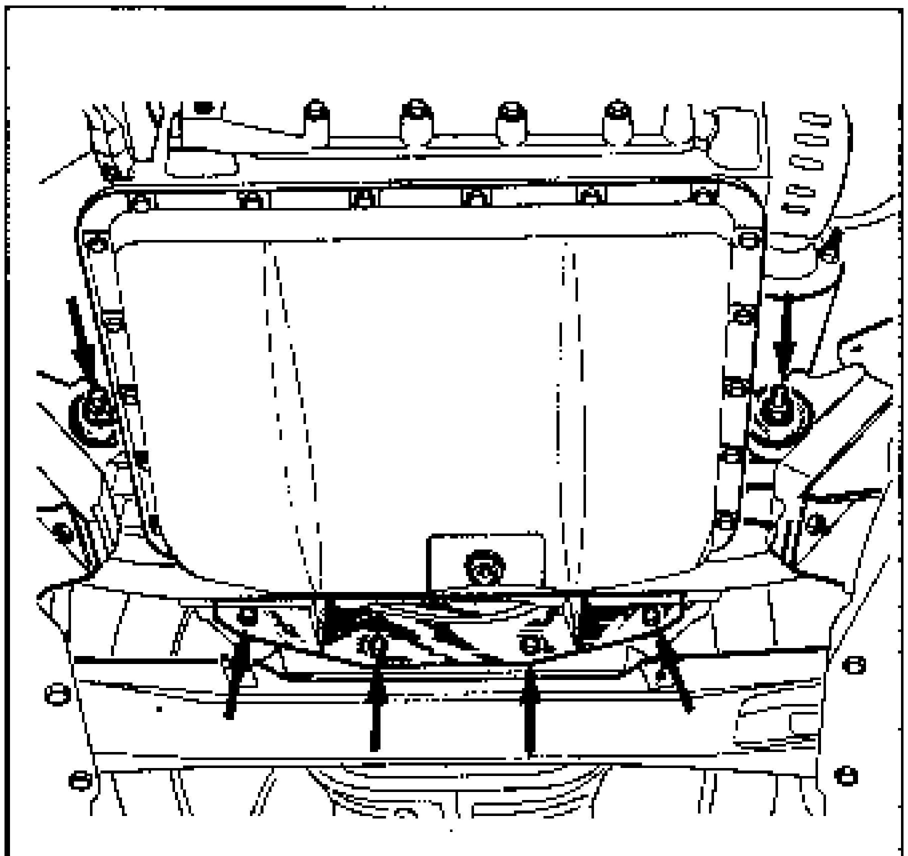
87 768

1 - Battery
2 - Oil pressure and water temperature connectors
3 - Oil level sensor
4 - Oil level and starter connectors
5 - Starter information connector (ballast resistor)
6 - Current supply terminal
7 - Water temperature switch
8 - Oil pressure switch

The flywheel protective covers.


77 436-1

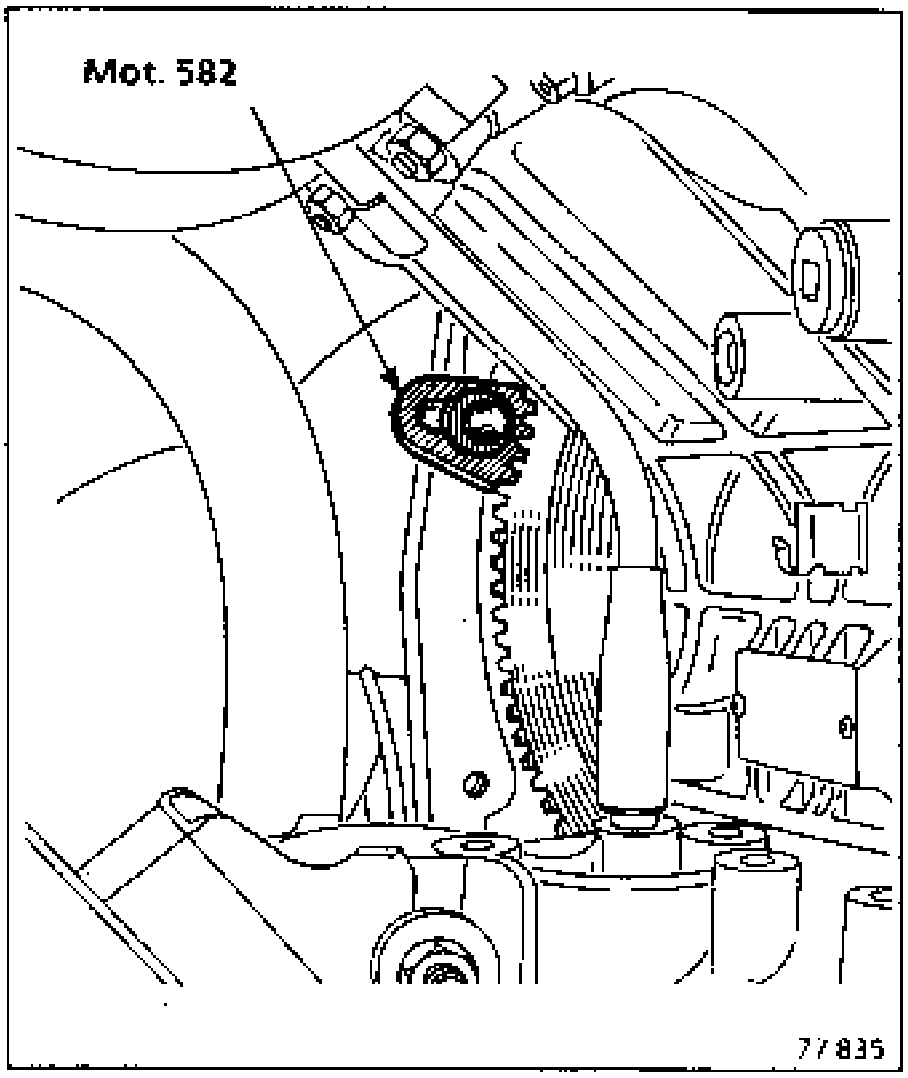
Loosen the engine support bracket fixing stud nuts.



77 437-1

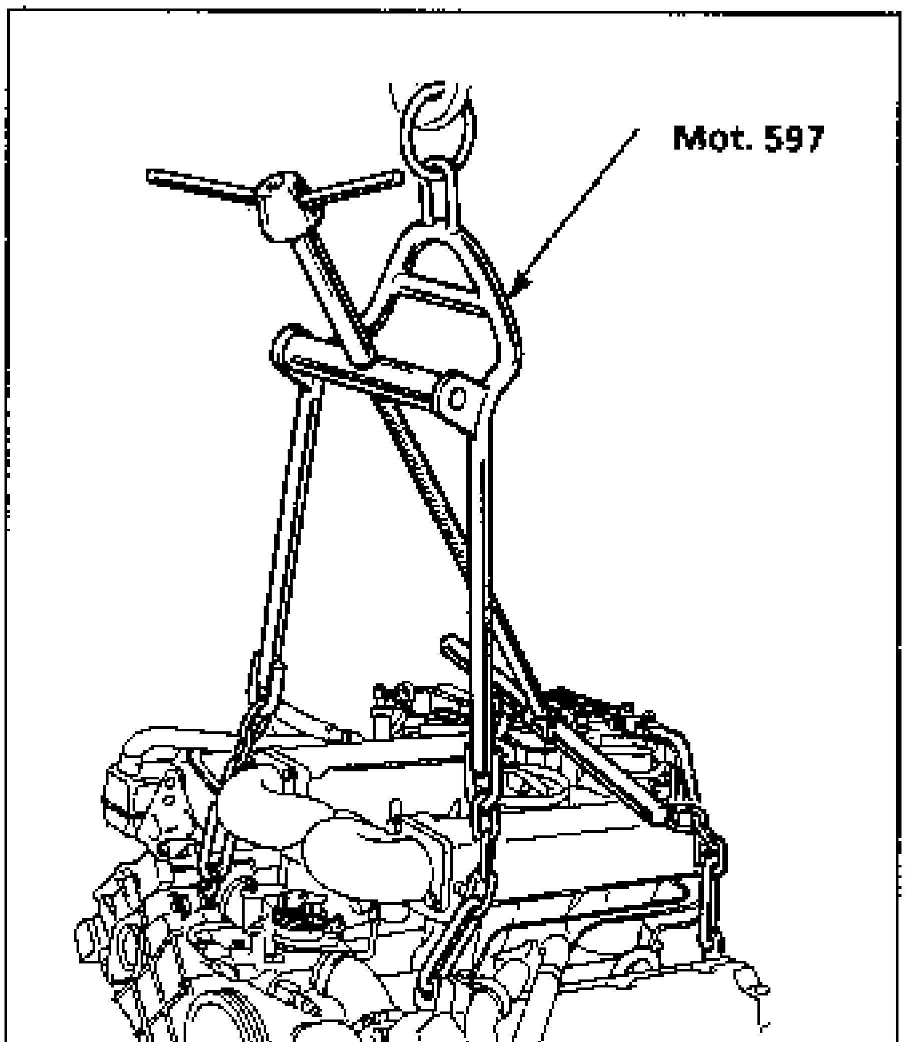
Automatic transmission

*To loosen and remove the converter drive plate fixing bolts, lock the plate using **Mot. 582**.*



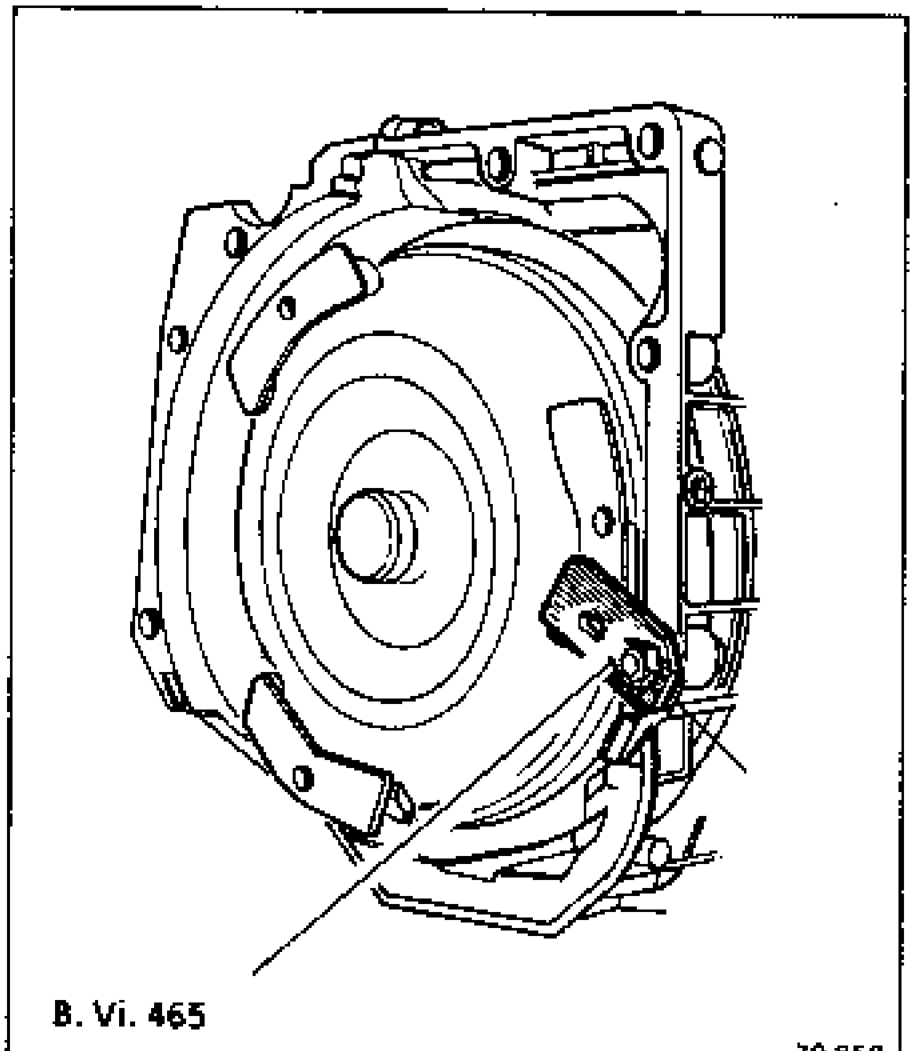
77 835

Fit tool **Mot. 597**; raise the engine to release the wiring assembly.



87 652

Remove the engine. Immediately after uncoupling it, prevent the converter dislocating by retaining it with clamp **B.Vi. 465**.

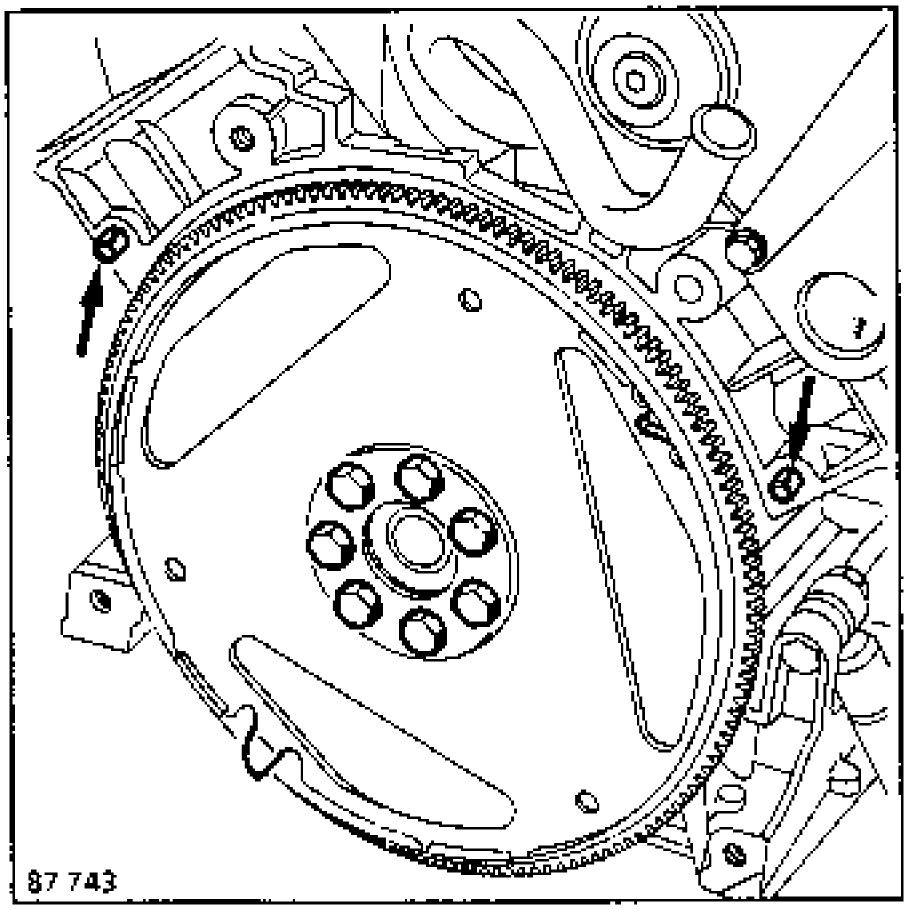


79 858

REFITTING

Special features

Check for the presence of locating dowels on the clutch and starter housings.



87 743

Lightly grease the converter centring housing in the crankshaft using **Molykote BR2** grease.

For automatic transmission

Check that the upper clutch housing fixing bolts on the crankcases are in place (it is impossible to fit them with the engine in place).

If necessary, loosen the rear starter mountings on the crankcase so that the starter does not obstruct crankcase/clutch housing assembly.

Adjust the travel:

- of the accelerator cable;
- of the governor/computer cable for 4141 automatic transmission.
- Fill the engine, if necessary;
- fill and bleed the cooling circuit.

Tighten the exhaust (see chapter 19).

ESSENTIAL SPECIAL TOOLING		
Mot.	597	Z Engine lifting tool
B. Vi.	31-01	Spring pin punches (NG)
B. Vi.	606	Spring pin drift set (UN)
T. Av.	476	Ball joint extractor
T.Av.	509-01	Retaining spacer legs
SEFAC	689	Load spreader

TIGHTENING TORQUES (in daNm)	
Upper suspension ball joint	6.5
Steering ball joints	4
Support bracket fixing bolts	4
Wheel bolts	10

Repeat the same operations as for removing the engine on its own (without unscrewing the gearbox surrounds).

The engine/gearbox assembly is removed from the front of the vehicle.

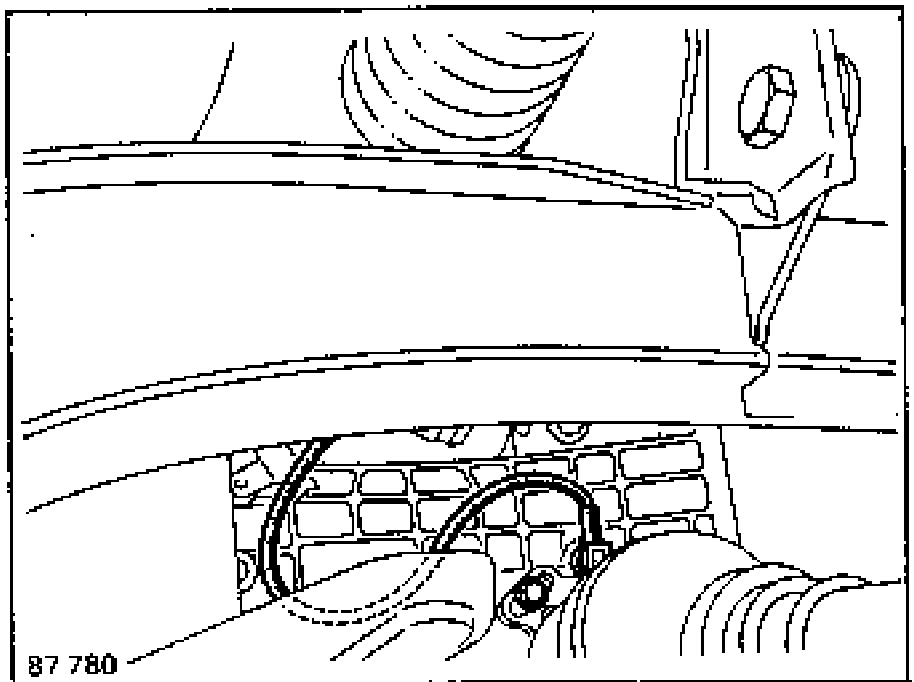
SPECIAL FEATURES

It is necessary to drain the **UN** gearbox (transmission sealing).

Remove the reverse gear positive locking control cable:

- NG Gbx.: at the lever to avoid having to drain the gearbox;
- UN Gbx.; on the rear sump.

Remove the speed sensor before extracting the right-hand driveshaft rollpin (risk of damaging the sensor).



87 780

Uncouple the driveshafts (see chapter on the gearbox) and the gear controls.

Automatic transmission:

Remove the oil dipstick from the automatic transmission.

REFITTING

Carry out the same operations as for removing, but in reverse.

Fill and drain the cooling circuit and the power-assisted steering circuit.

Adjust the accelerator cable and the clutch pedal clearance.

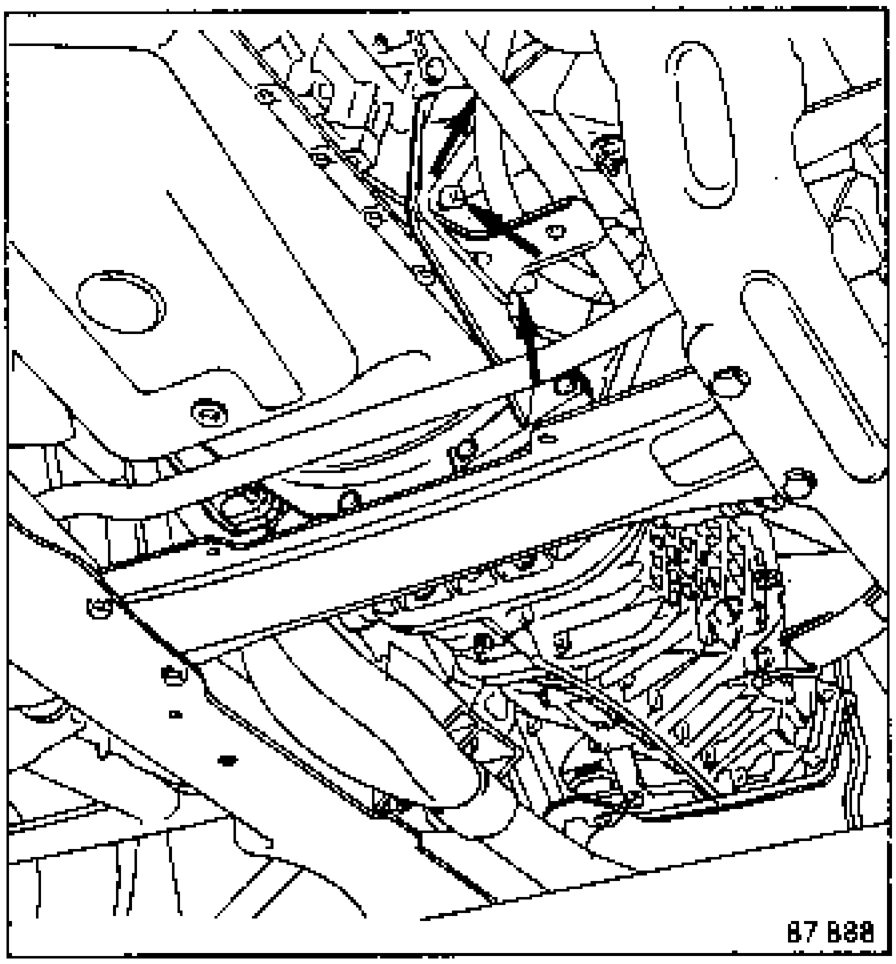
REMOVING - SPECIAL FEATURES

Drain the engine oil.

Uncouple the front wiring ducting from the crankcase.

Remove:

- the oil level sensor;
- the fixing nuts from the engine support brackets and raise the engine;
- the right-hand engine strut;
- the three bolts (arrowed) of the left-hand engine strut. Loosen the fourth and tilt the strut.



Release the engine flywheel protective cover.

Remove the sump.

REFITTING- SPECIAL FEATURES

The gasket is fitted dry.

REMOVING - REFITTING

ESSENTIAL SPECIAL TOOLING
Mot. 1063 Articulated wrench for sump

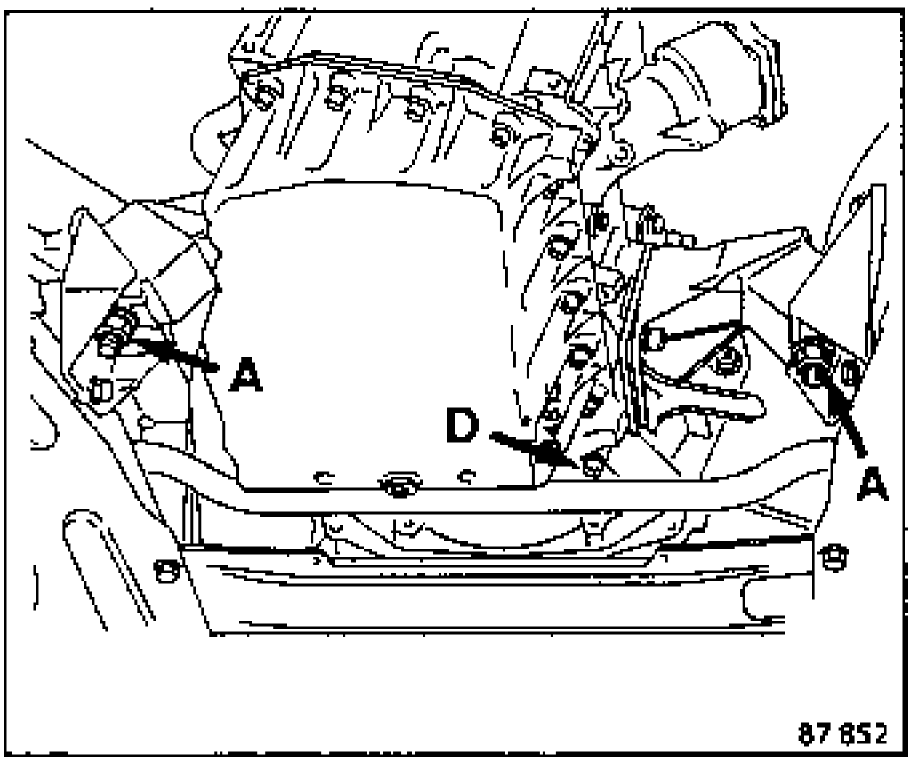
TIGHTENING TORQUES (in daNm)	
Sump bolts	1.4 to 1.7

REMOVING

Disconnect the battery.

Drain the engine.

Remove the two nuts (A) and raise the engine to remove the sump.

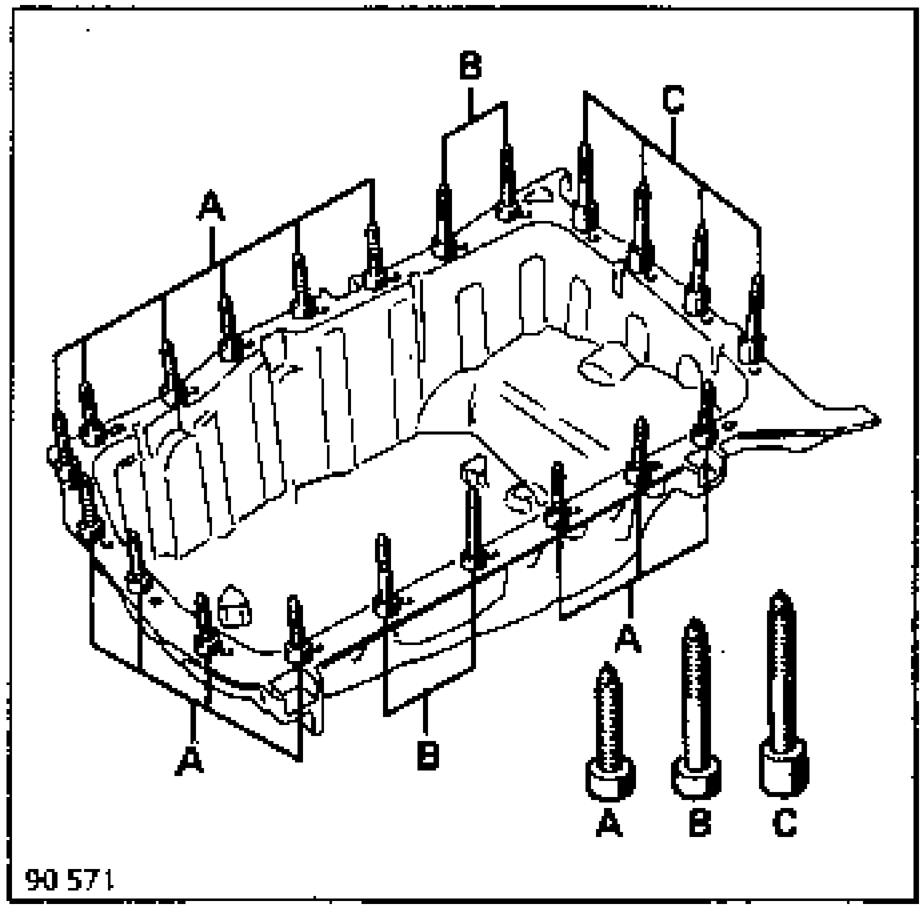


REFITTING

Replace the gasket, which is fitted dry.

Identification of sump bolts:

- 3 types of bolts (A, B, C).



Do not refit the engine before having tightened the sump bolts.

Do not forget to position the bolt (D) before fitting the sump.

Tighten the three clutch housing bolts, the sump first.

Top up with engine oil.

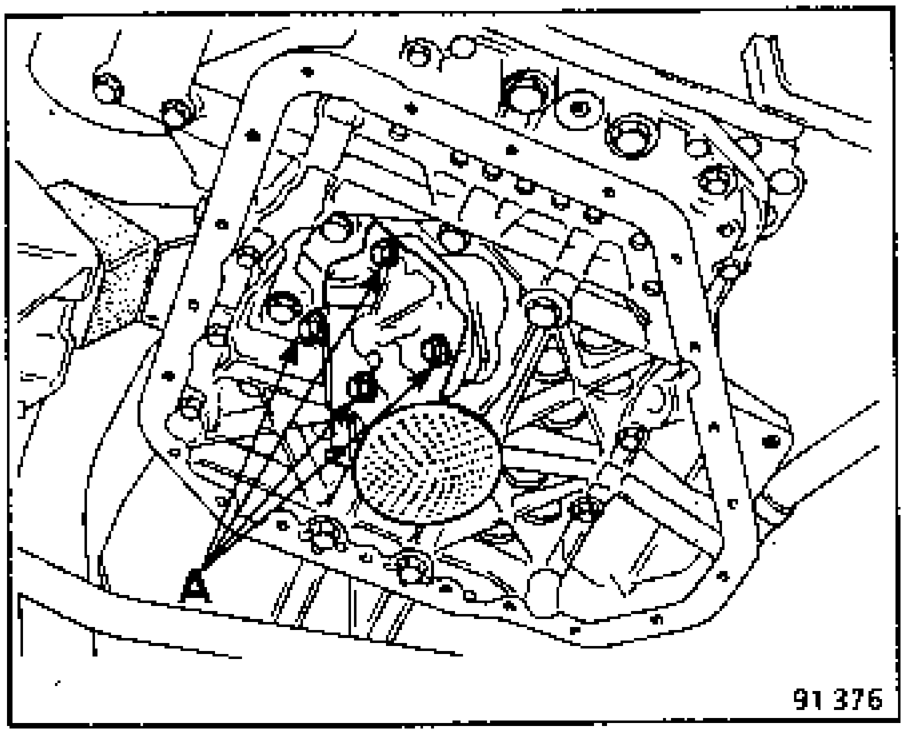
This operation can be carried out on the vehicle.

REMOVING

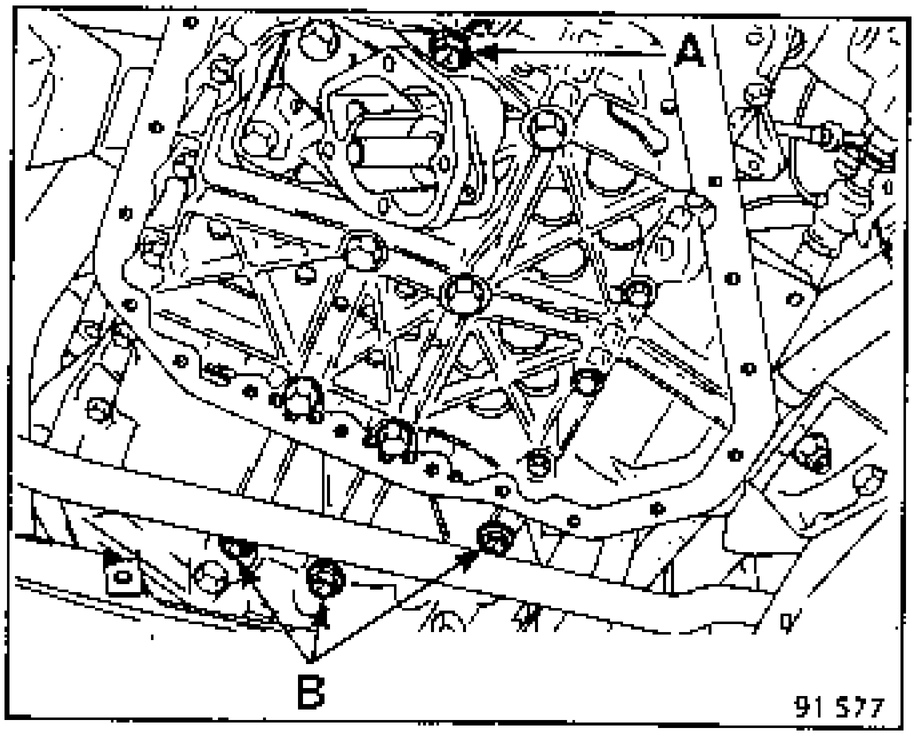
Drain the engine.

Remove:

- the sheet metal sump;
- the oil pump strainer, bolt (A); retain the pump gears;



- the 2 oil pump body bolts;
- the oil pump body;
- the oil level sensor (if necessary);
- the base fixing bolts (see identification of bolts and torques);
- the 3 bolts (B) are removed with the base.

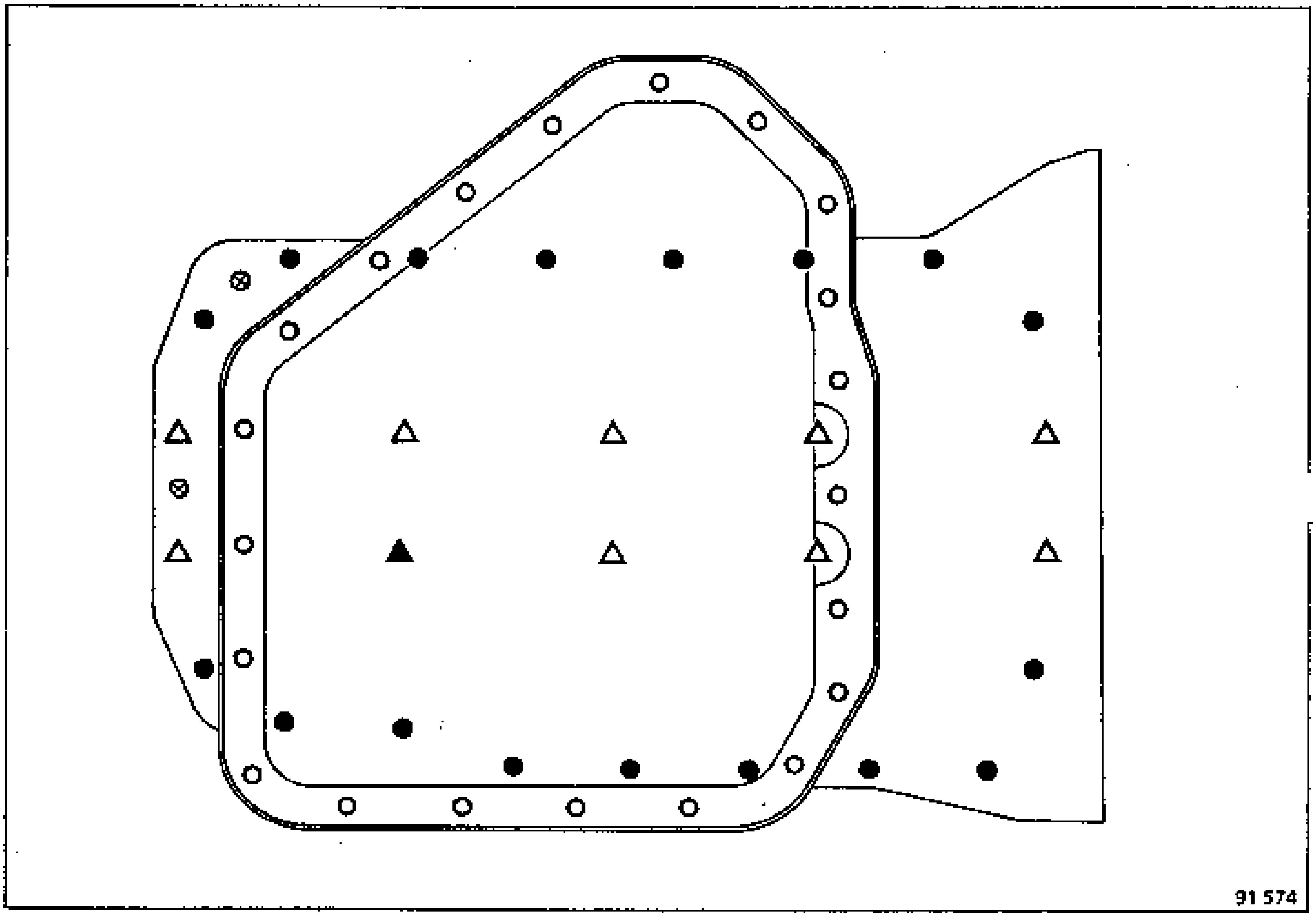


REFITTING

Clean the sumps thoroughly:

- hold the gasket on the base using a few dabs of **CAF 4/60 THIXO**;
- position the oil pump control shaft with the circlip on the pump side;
- tighten the base bolts (see identification and torque table below);
- fit and tighten the oil pump body (**4 to 4.5 daNm**) (make sure the drive shaft is in the correct position);
- refit the pump body pinions and cover and tighten to the specified torque;
- refit the sheet metal sump and tighten the bolts to the specified torque.

Identification of screws securing the base to the crankcase and the sump to the base.



4 types of screws can be identified as follows:

● : 17 screws (M7 x 100-50), tightening torque: **1.2 to 1.8 daNm.**

○ : 21 screws (M6 x 100-16), tightening torque: **0.7 to 1.1 daNm.**

▲ : 1 screws (M10 x 150-40), tightening torque: **3.2 to 4.8 daNm.**

△ : 9 screws (M10 x 150-75), tightening torque: **3.2 to 4.8 daNm.**

⊗ : screw not used.

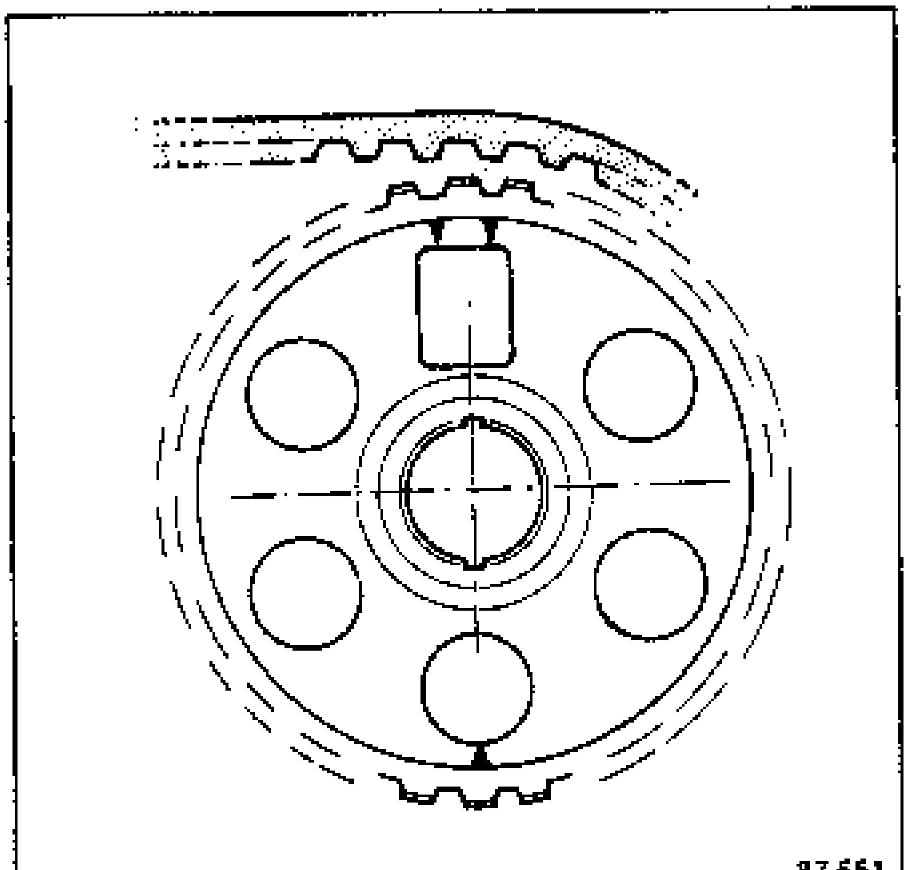
REMOVING-REFITTING TIMING BELT

All types except J7R (12-valve)

ESSENTIAL SPECIAL TOOLING		
Ele.	346-04	Belt tension checking tool
Mot.	861	Top dead centre rod

ATTENTION : Development of tooth profile.

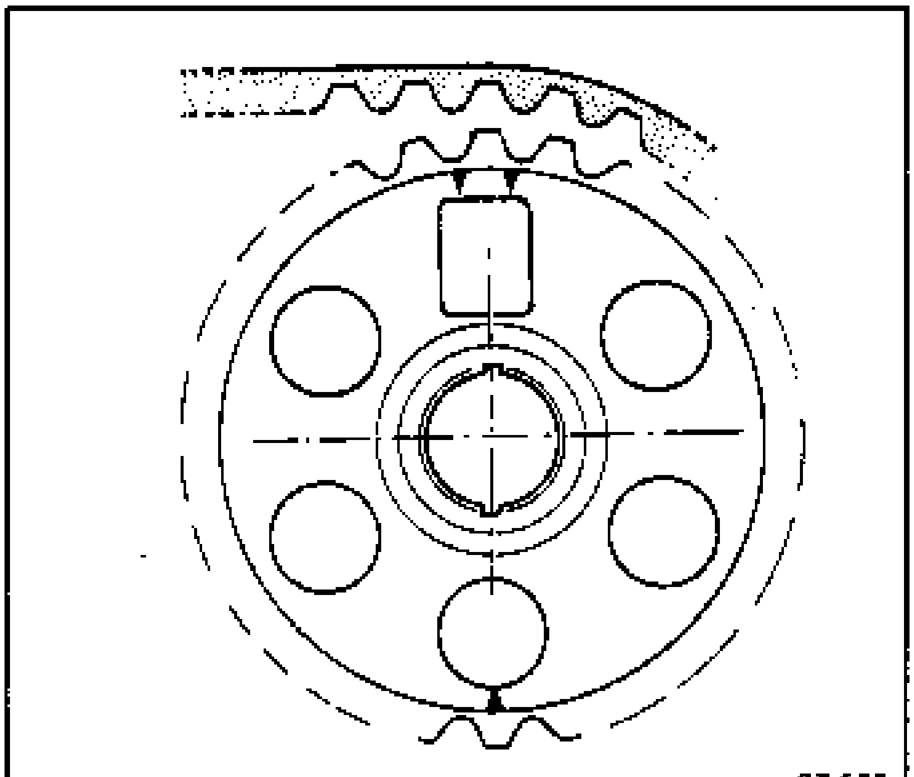
1st model - 2nd model



87 661

None of the parts comprising the 1st or 2nd model profile timing can be mixed with the 3rd model (including the sump which has a cutaway in the 2nd assembly version).

3rd model

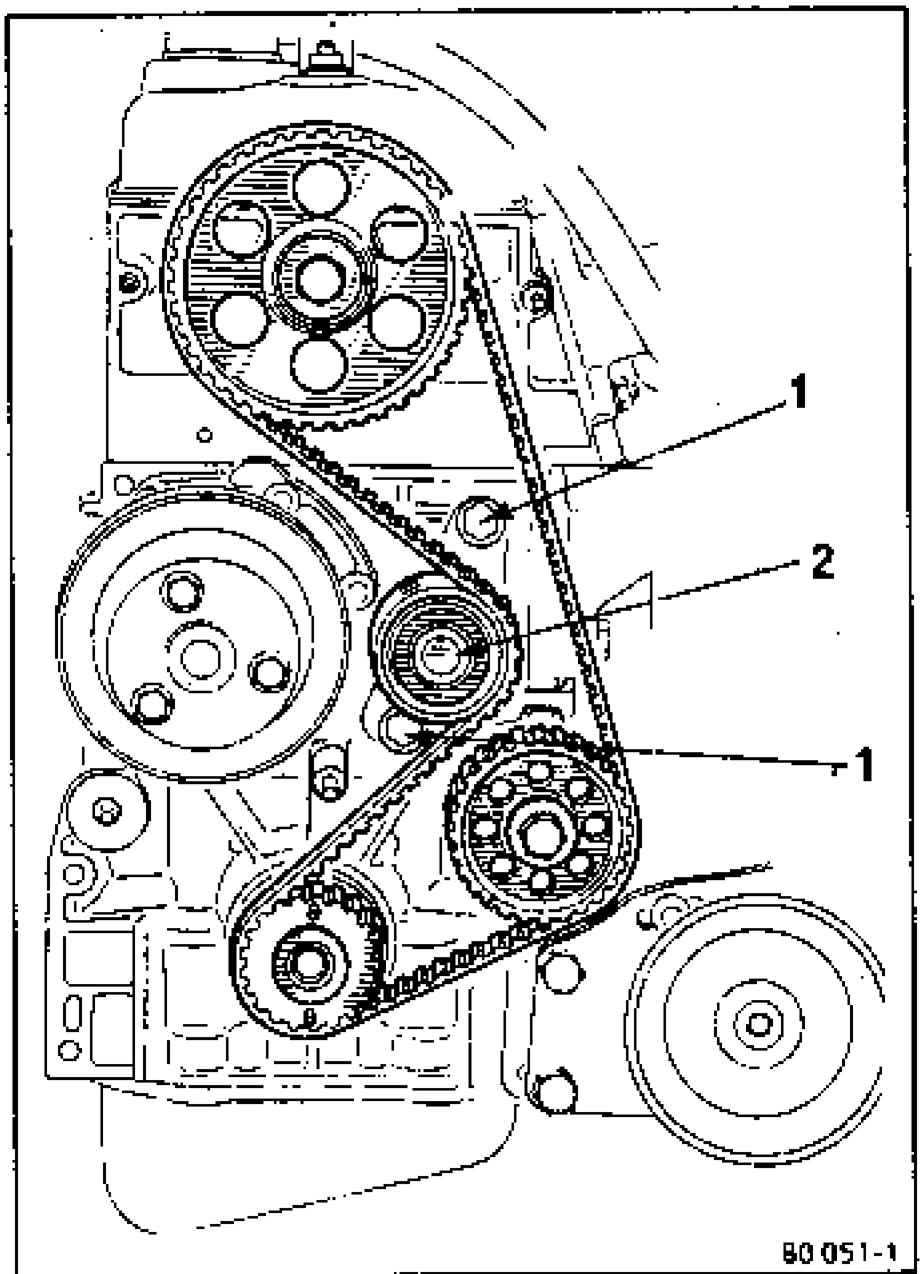


87 662

REMOVING

Position the timing marks (rod and AAC mark).

Remove:
- the timing belt;
- Loosen the nuts (1);
- tilt the tensioner (2) and retighten the nuts (1).



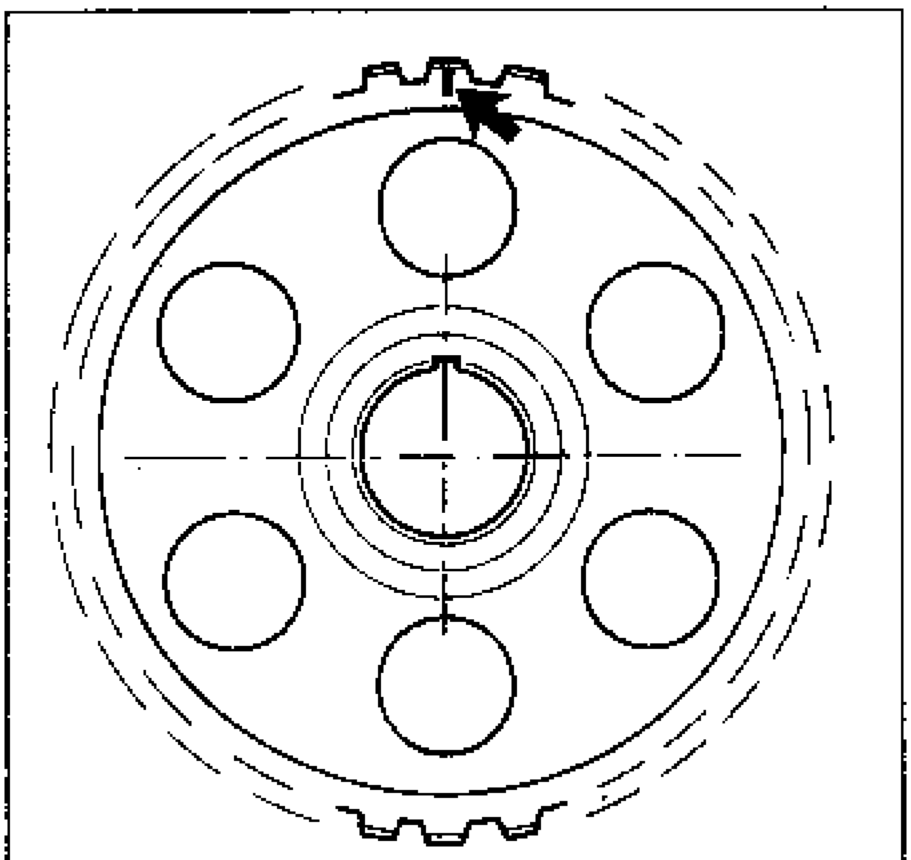
80 051-1

REFITTING

- **Camshaft timing sprocket**

1st model: J5R, J6R, 829 engines

- The timing sprocket only has one mark for the timing setting.



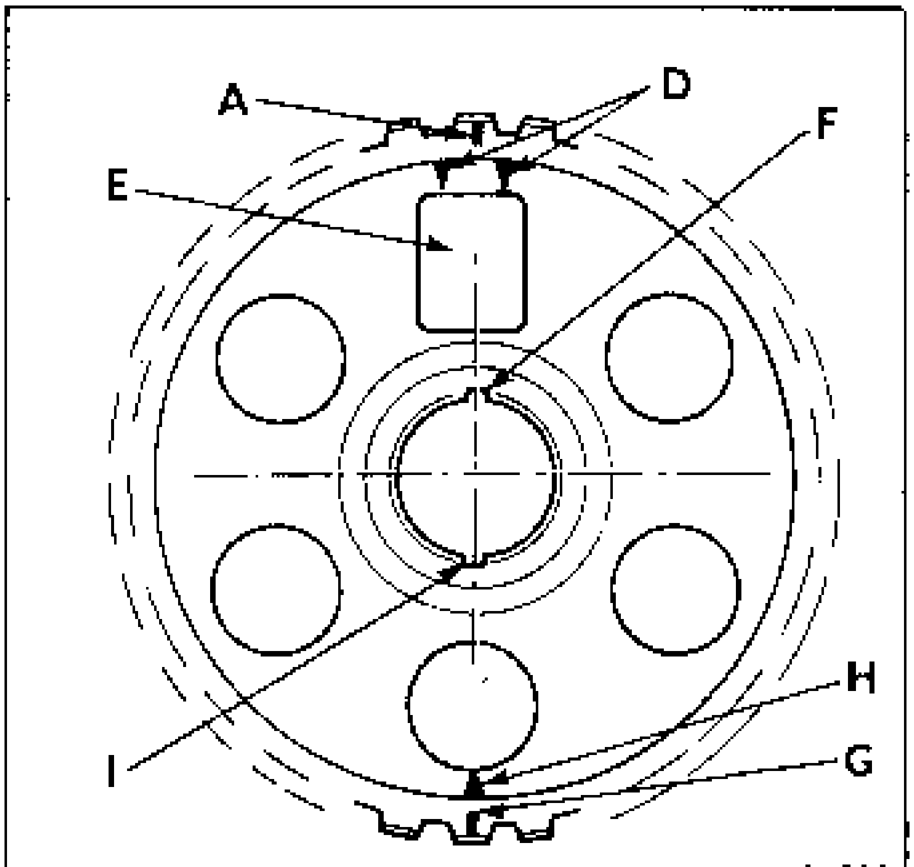
84 308-1

2nd and 3rd models; J5R, J6R, 851, 829, J7T and J7R engines.

- It is essential to observe the keyway, depending on the engine type.

This comprises:

- a mark (A), two castings (D), a rectangular opening (E) and a keyway (F) for the timing setting of engines **851** and **J7T**;
- a mark (G), a casting (H) and a keyway (I) for the timing setting of engines **J6R, J5R, 829** and **J7R**.

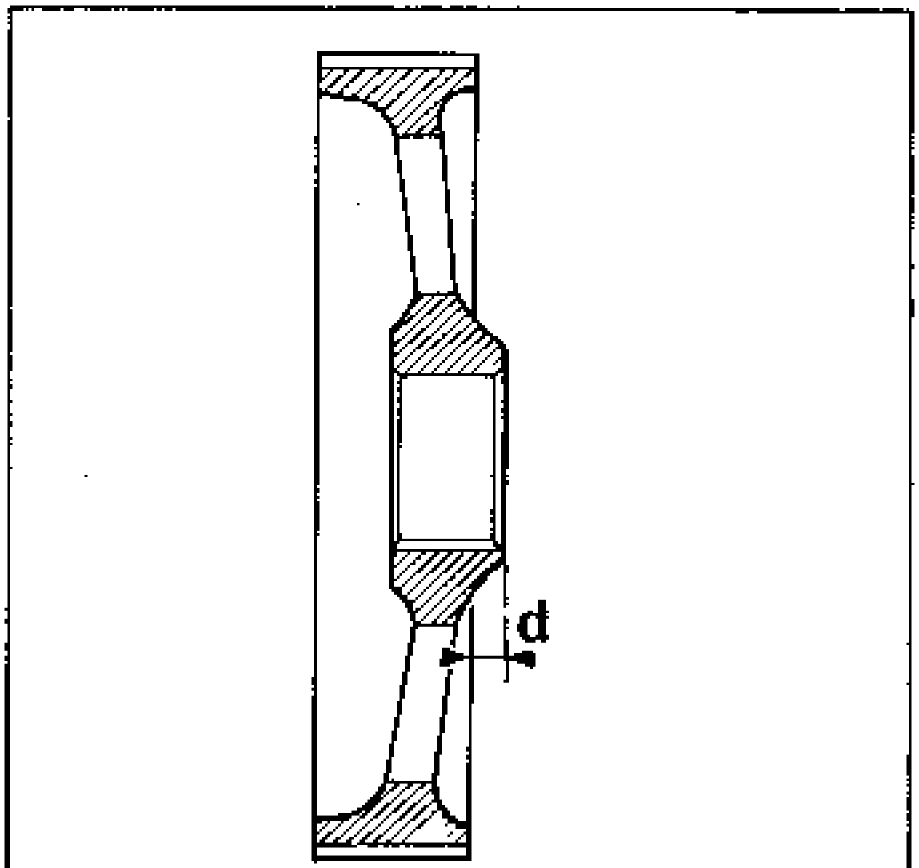


84 308

Fit the timing sprocket:

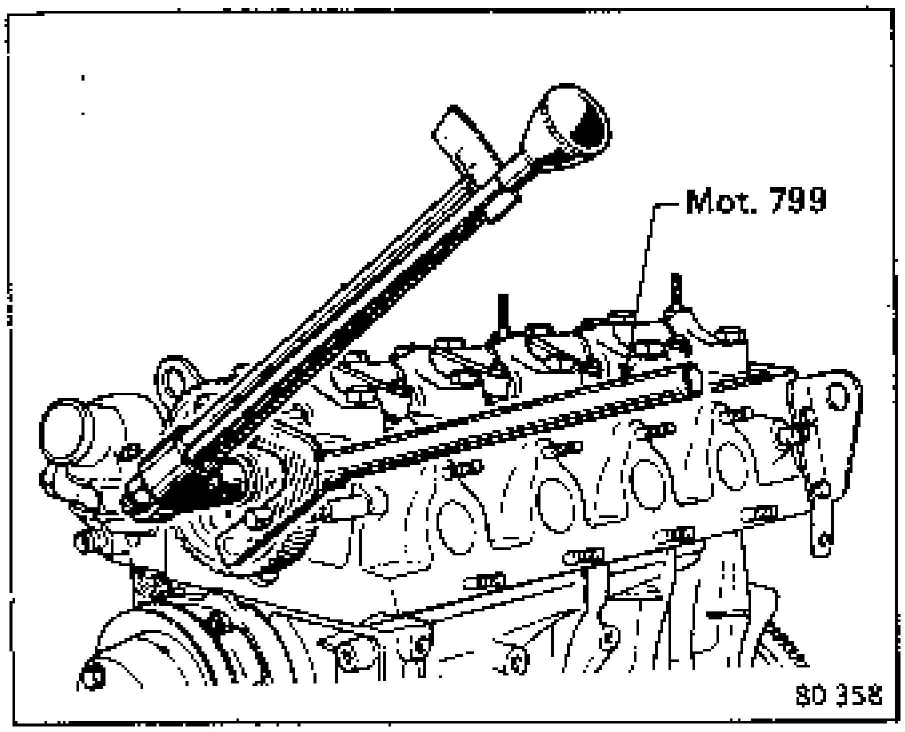
- keyway (I) for engines: **829, J6R, J5R and J7R**
- keyway (F) for engines: **J7R and 851**.

The sprocket is to be fitted offset (d) from the hub on the cylinder head side.



80 373

Use tool **Mot. 799** or tool **Mot. 855** and tighten the timing wheel (threads smeared with Loctite **FRENBLOC**).
- Tightening torque: .... **5 daNm**

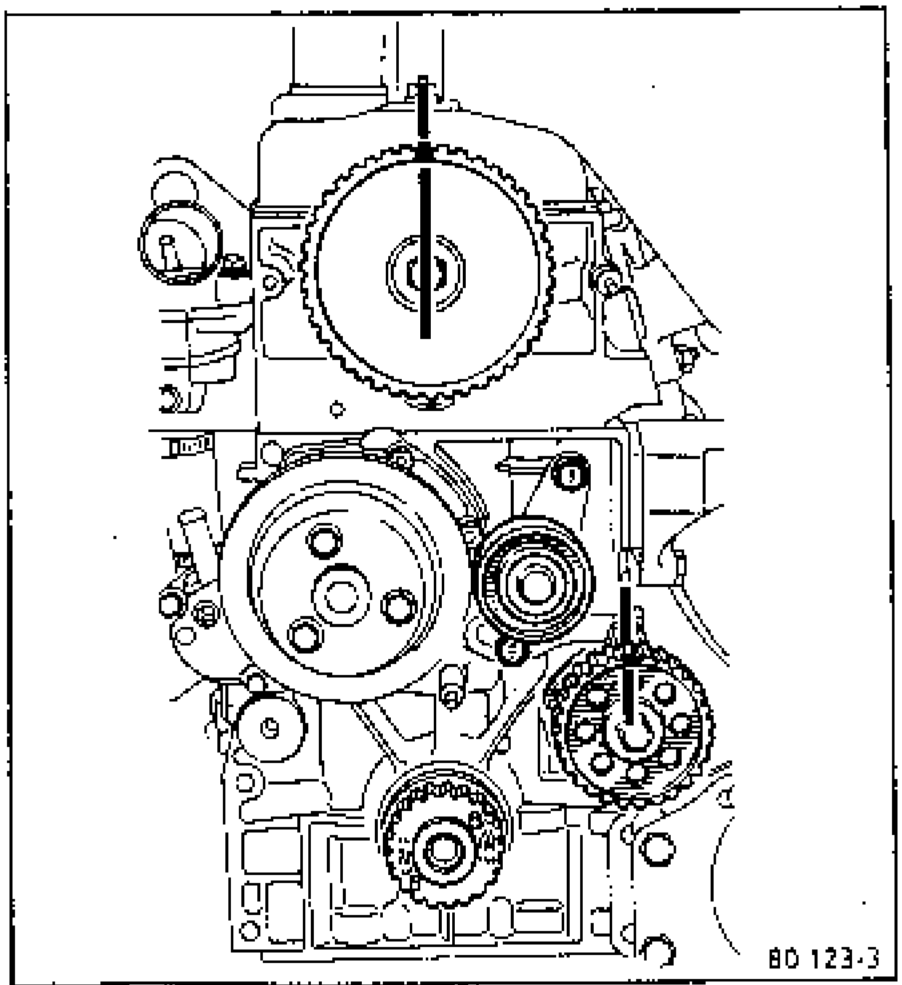


- **Belt**

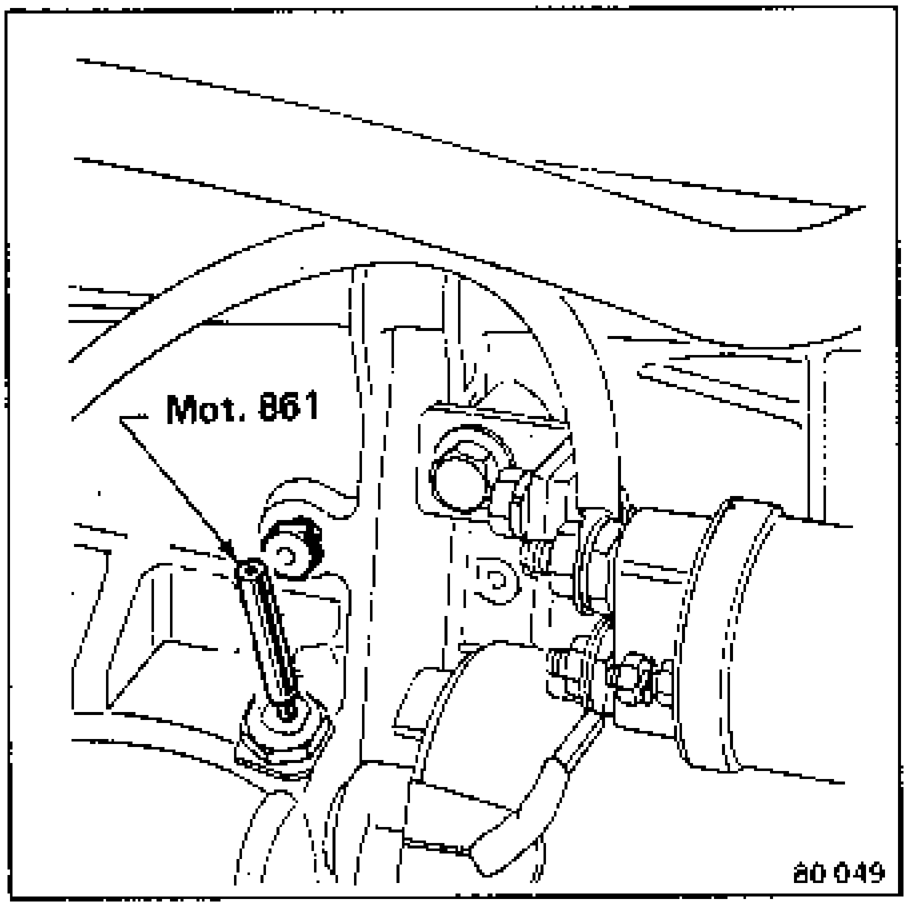
- engines **J7T** and **851**: this has **118 teeth**;
- engines **829, J5R, J6R** and **J7R**: this has **116 teeth**.

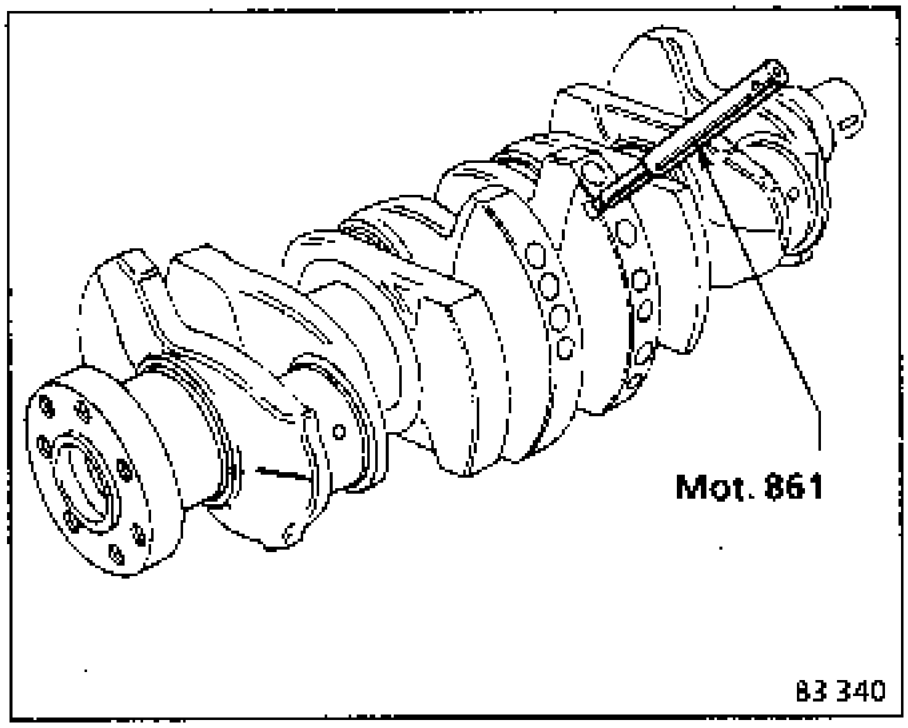
Fitting the belt:

Position the camshaft sprocket and the intermediate shaft sprocket using the marks.



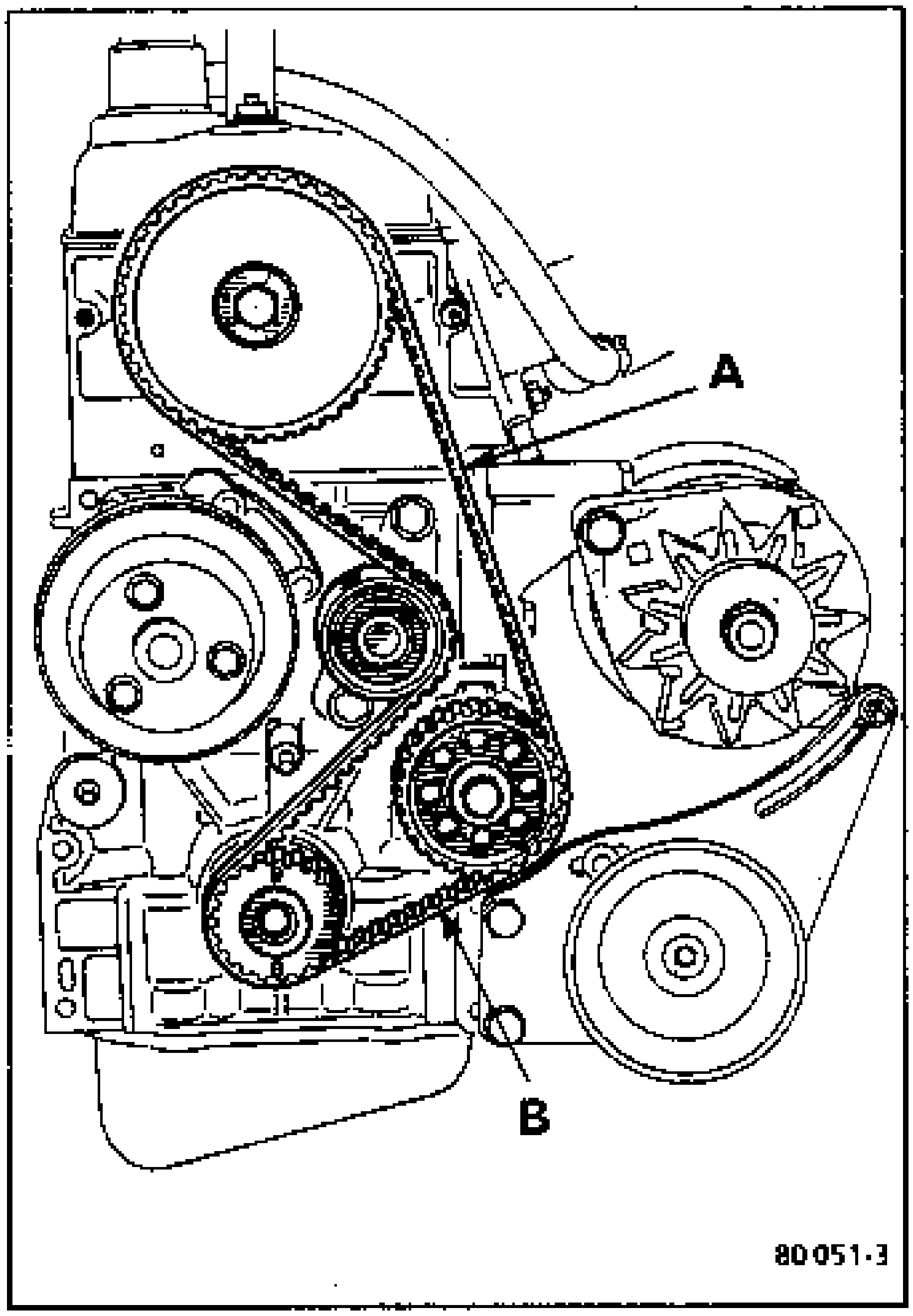
Position the crankshaft (piston n° 1 at TDC) using rod **Mot. 861**.



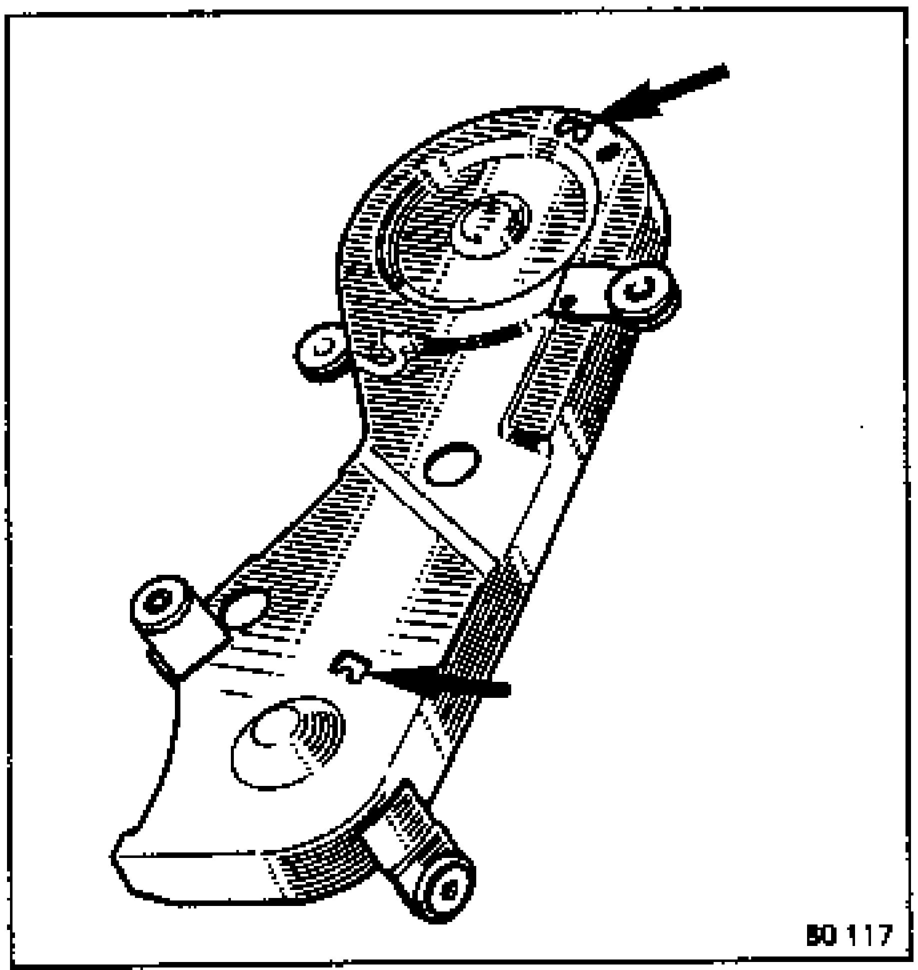


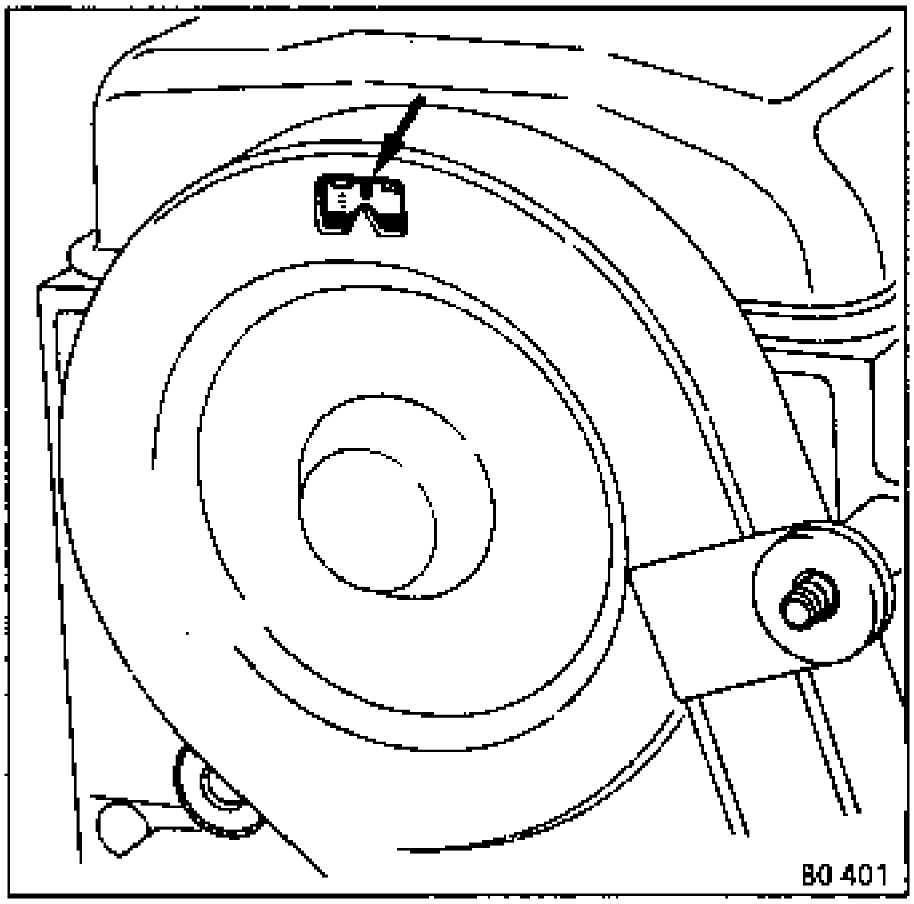
Do not use this rod to lock the rotation of the crankshaft in order to loosen the bolts.

Fit the toothed belt, with runs (A) and (B) tensioned: do not take into account the marks on the belt (except running direction ➡).



Check the timing with the timing cover windows.





Loosen the tensioner mountings by 1/4 of a revolution; this will automatically be affected by its spring when it comes into contact with the belt.

Relock the tensioner mountings.

Checking the belt tension

Remove rod **Mot. 861** and refit the plug. Using the crankshaft pulley bolt, rotate by two revolutions in the running direction of the engine (clockwise, the operator in front of the crankshaft pulley).

NOTE: If a new belt tensioner is being fitted (see development of assembly at the end of the chapter), the timing stays the same, only the tension adjustment changes (see procedure for **J7R engine, 12-valve**).

Never turn engine backwards

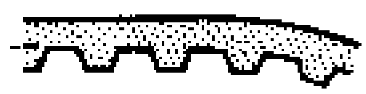
Retighten the two tensioner bracket fixing bolts by 1/4 of a revolution.

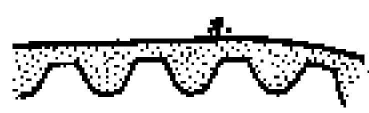
Retighten the 2 tensioner roller fixing bolts, starting with the lower bolt:

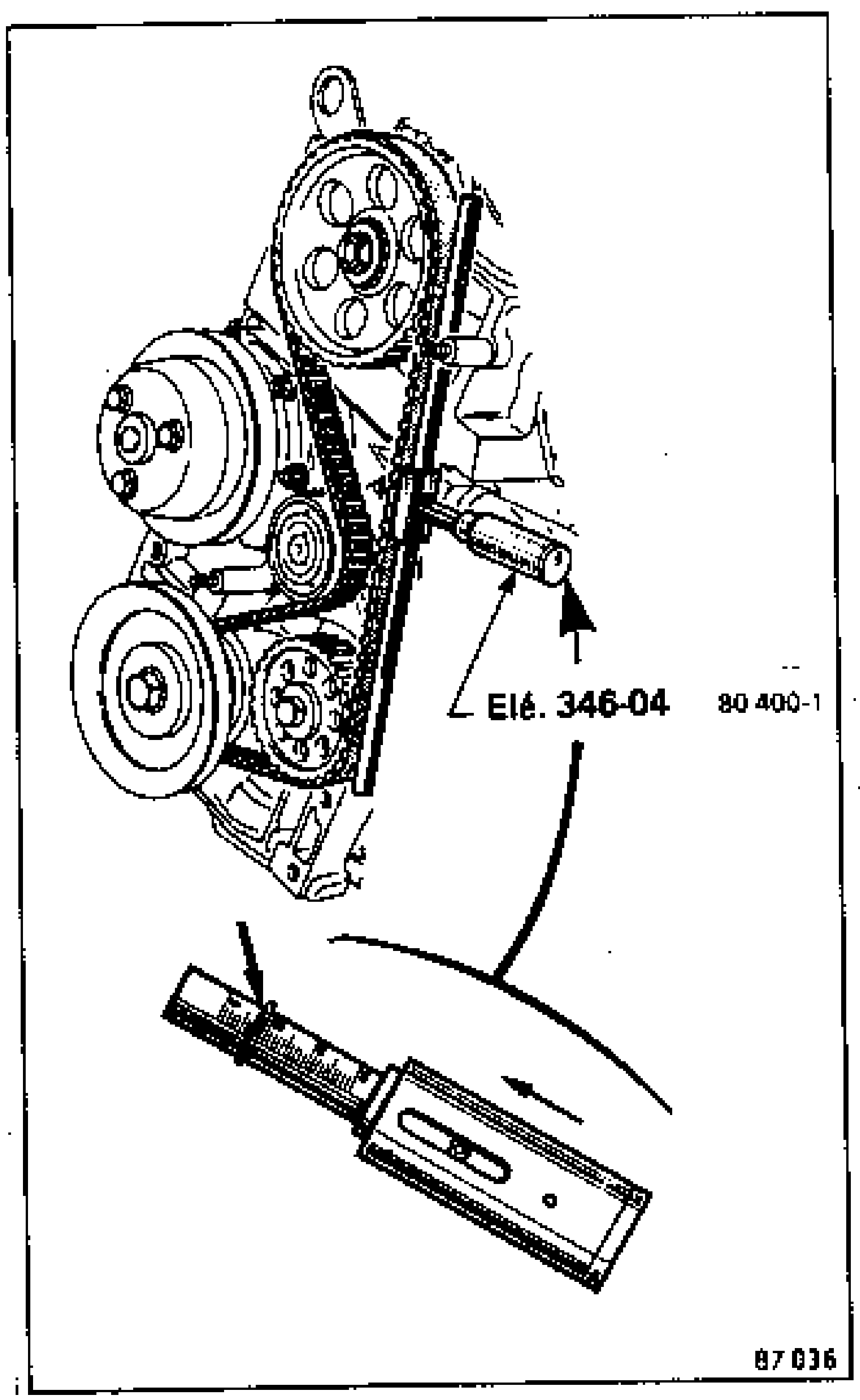
- Torque .... **2.5 daNm**

Check the belt tension using **Ele. 346-04.**

Arrow (mm) :


.... **5.5 to 7**


.... **6 to 8**



Refit the timing cover

REPLACING

ESSENTIAL SPECIAL TOOLING		
Mot.	251-01	Clock gauge support
Mot.	799	Sprocket holding tool
Mot.	1135	Timing belt tensioner
Ele.	346-04	Tool for checking belt tensioning

TIGHTENING TORQUES (in daNm)	
Shaft pulley bolt	5
Tensioner support bracket nut	2.5
Tensioner nut	5
Crankshaft pulley bolt	8 ± 0.5

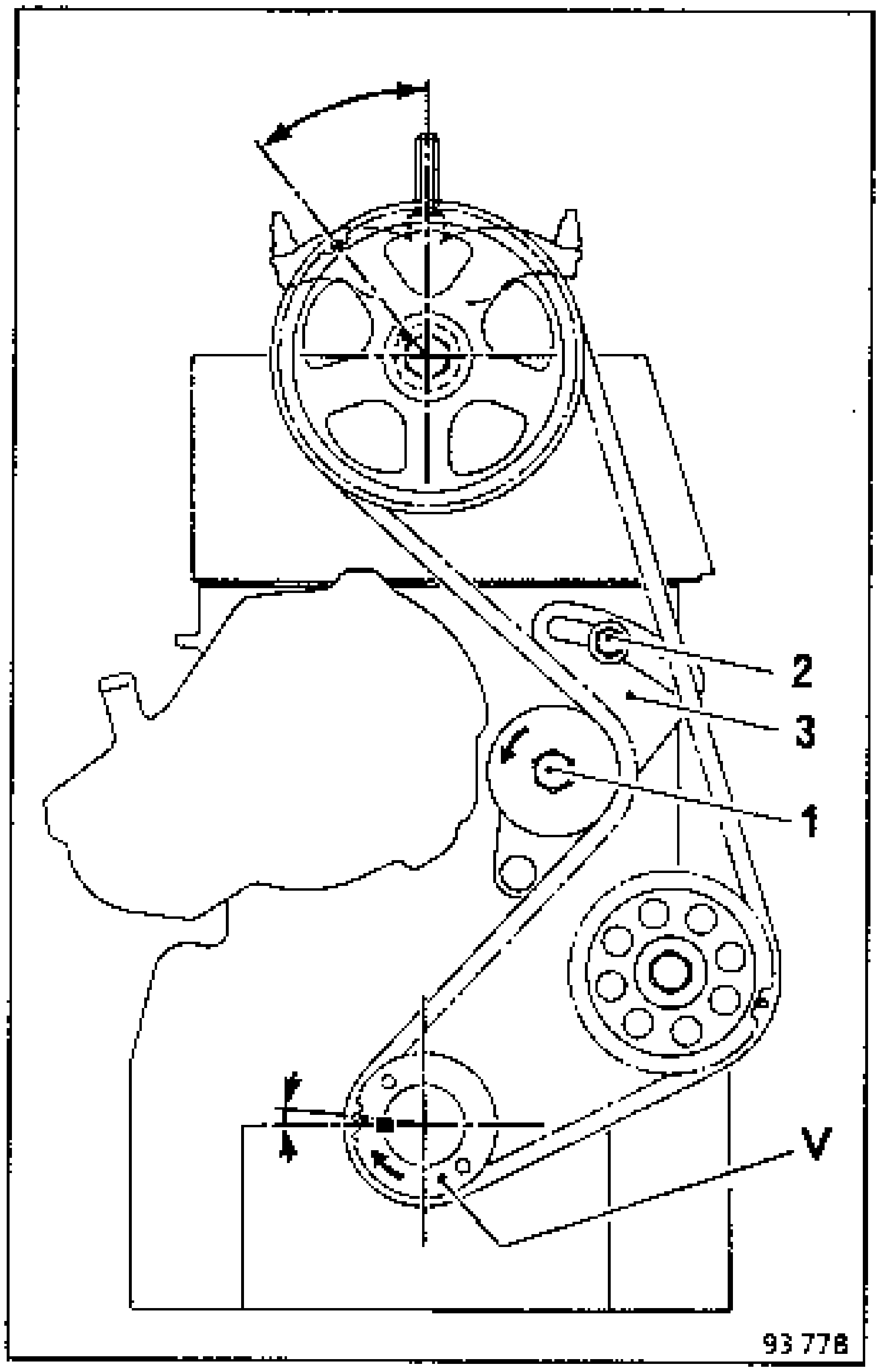
REMOVING

Disconnect:

- the battery;
- the water temperature sensors.

Remove:

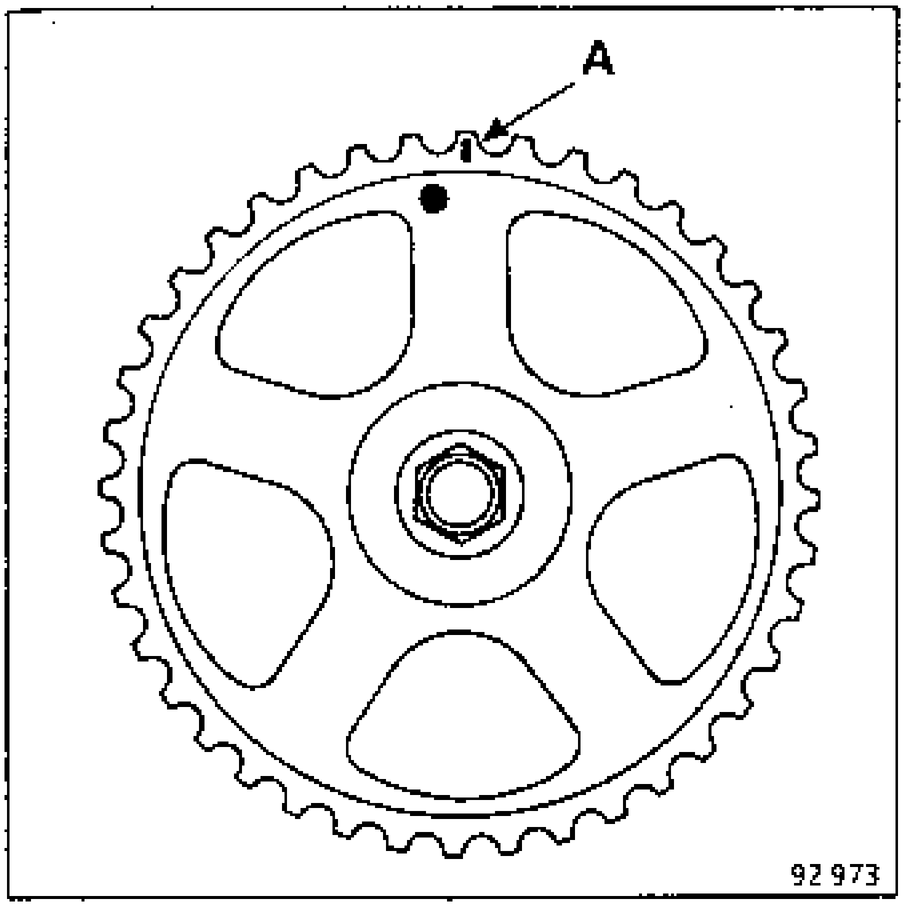
- the belts (alternator, power-assisted steering, air conditioning compressor, if fitted);
- the alternator pulley from the crankshaft;
- the timing covers; bring the four pistons to the same level by positioning the crankshaft (V) timing sprocket keyway horizontally, pointing to the left.



Unlock nut (1), then (2); withdraw the tensioner support bracket (3).

Remove the timing belt.

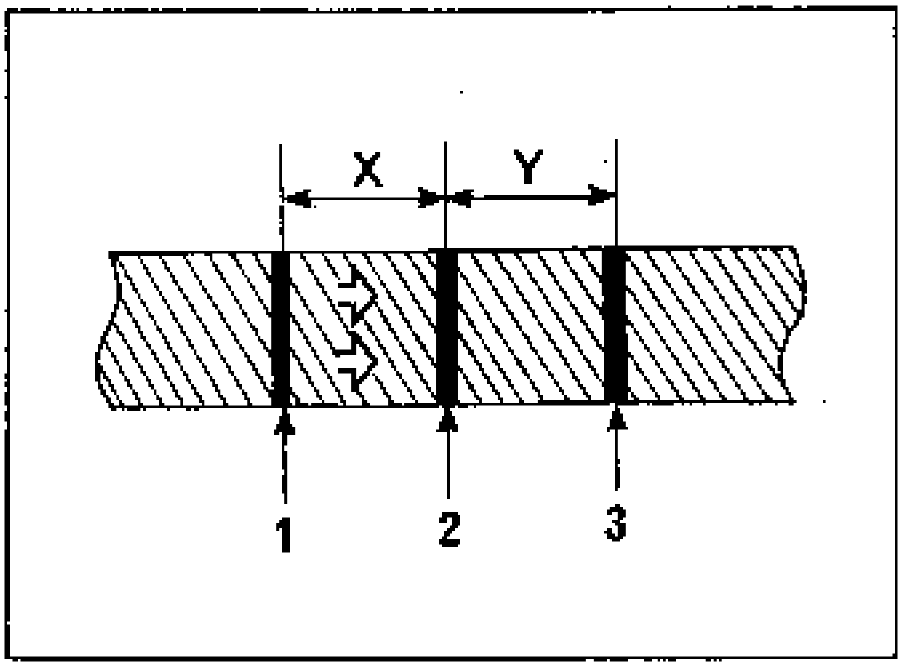
Camshaft sprocket



Mark: (**A**) for fitting belt sprocket.

BELT: This has 116 teeth.

Rear view of belt



X = 44 teeth
Y = 23 teeth

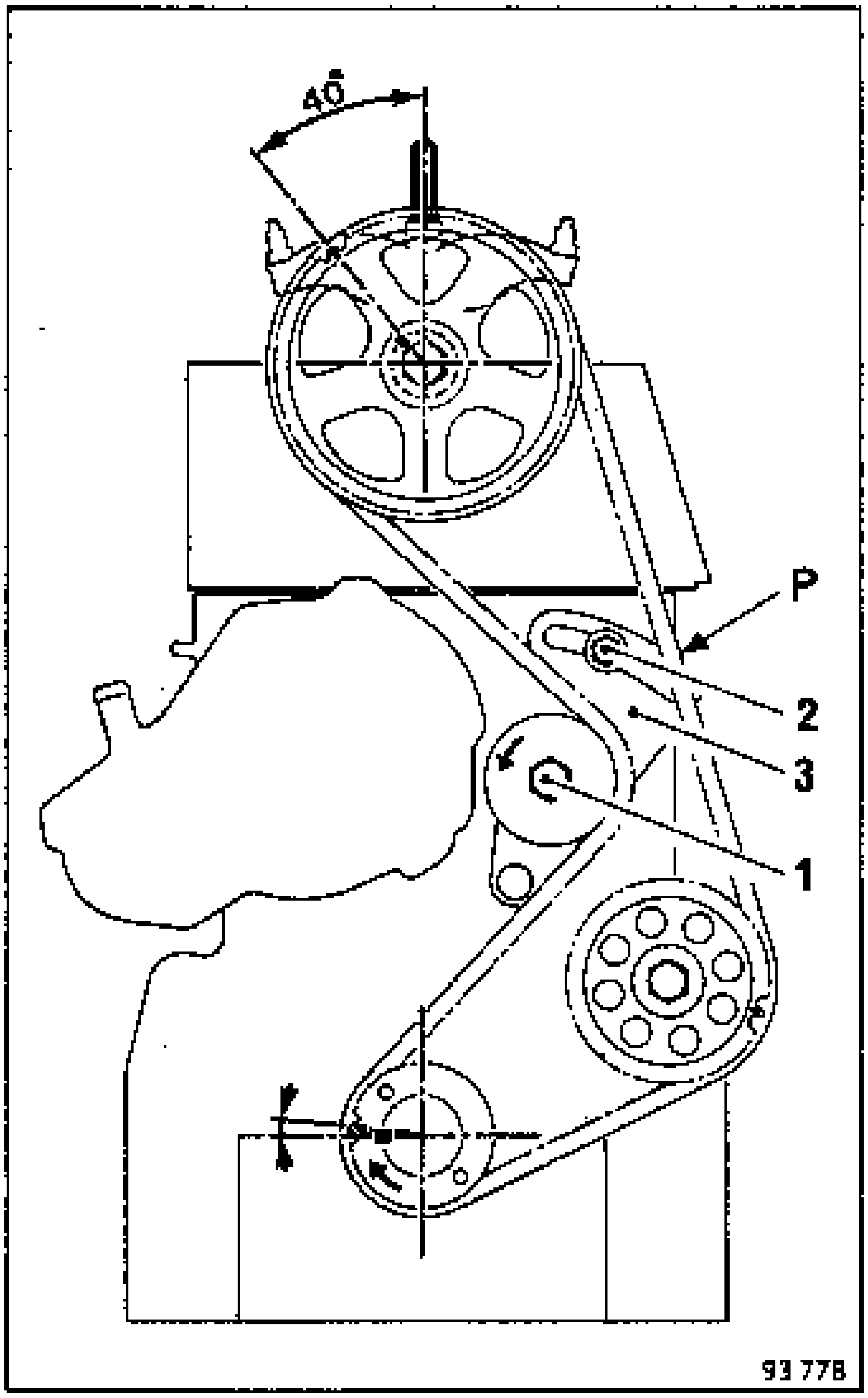
(1) A mark on the sprocket tooth, which is marked on the camshaft sprocket.

(2) A mark on the sprocket tooth, which is marked on the intermediate shaft sprocket.

(3) A mark on the sprocket tooth, which is marked on the crankshaft sprocket.

Since the crankshaft keyway is always horizontal and pointing to the left, position the camshaft (mark on the sprocket (**A**) approximately 40 ° to the left with respect to the vertical).

Fit the toothed belt, in the correct assembly direction (➡) (arrows pointing to the right) and lining up the crankshaft-sprocket belt marks of the intermediate shaft and the camshaft.



Lock nut (2) in the centre of the support bracket slot (3) (at 2.5 daNm).

With the tensioner roller in the slack position, **press hard with your thumb on the belt at (P)** (to tighten the slack run).

Using **Mot. 1135**, turn the tensioner roller anti-clockwise to **obtain deflection of 10 ± 1 mm** using tool **Ele. 346-04**.

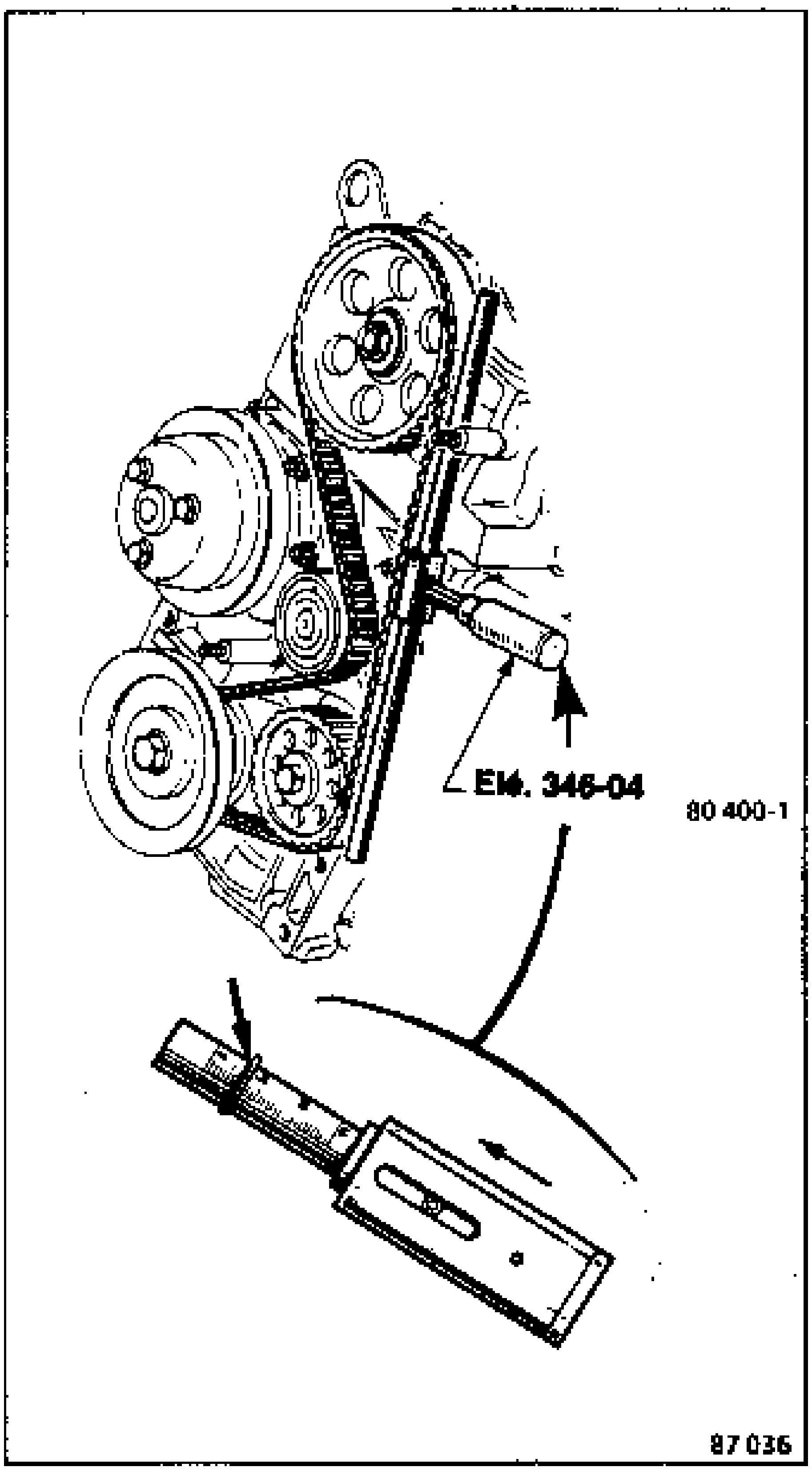
It is essential to tighten nut (1) of the tensioner roller to torque **5 daNm** to avoid any loosening which may lead to engine damage.

Refit the alternator belt pulley and lock the bolt.

Rotate twice in the direction of operation of the engine (clockwise, with the operator in front of the crankshaft pulley).

Reposition the camshaft deflection mark approximately 40 ° from the vertical and press hard with your thumb at (P).

Check the belt tension using tool **Ele. 346-04**. The deflection must be **10 ± 1 mm.**



Make sure the tension checking tool is correctly calibrated (see page 11-10).

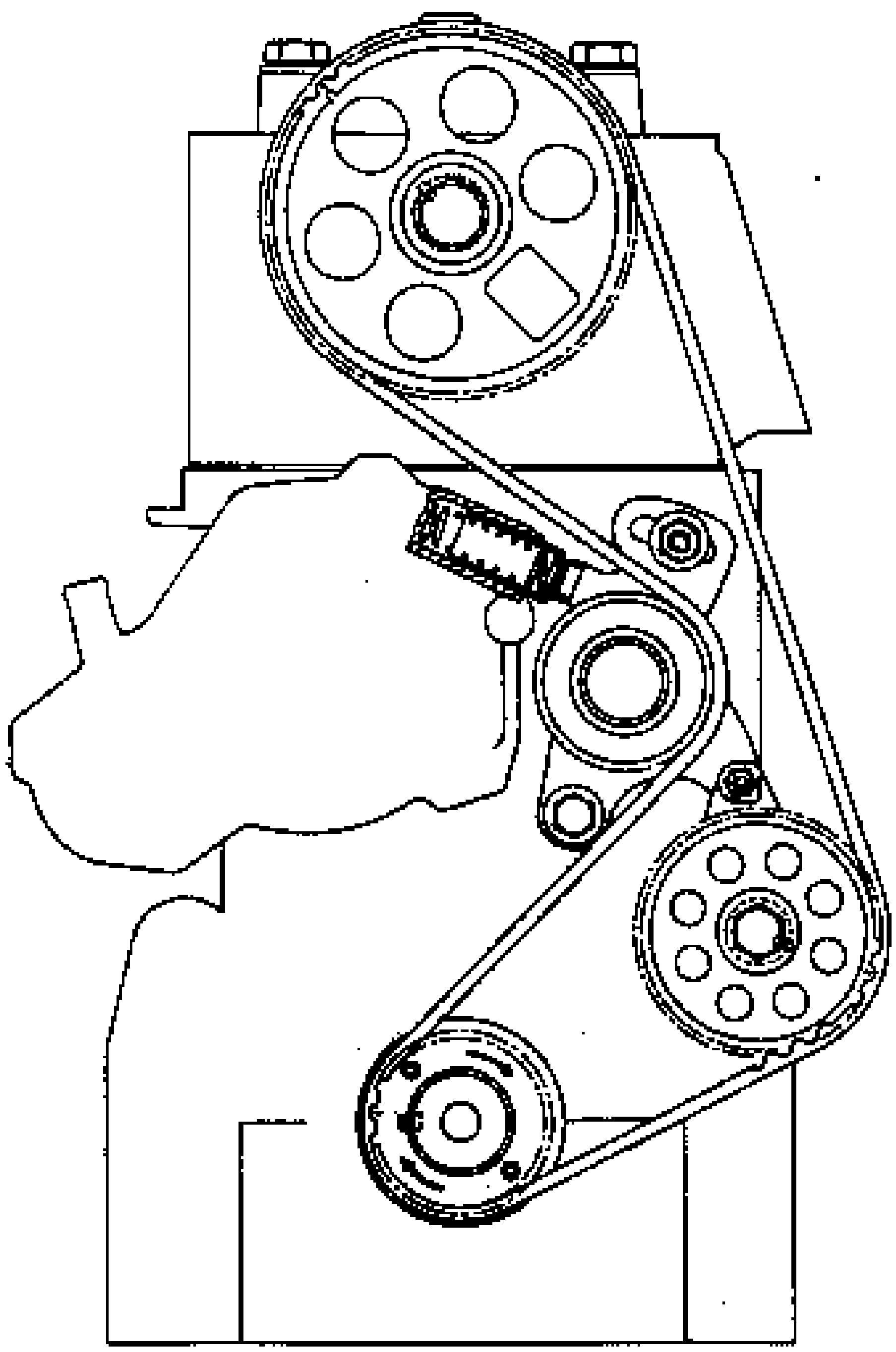
Refit the timing covers and the belts which have been removed.

NOTE: never use the window in the upper timing cover for setting or checking setting; only the belt-sprocket marks are to be used.

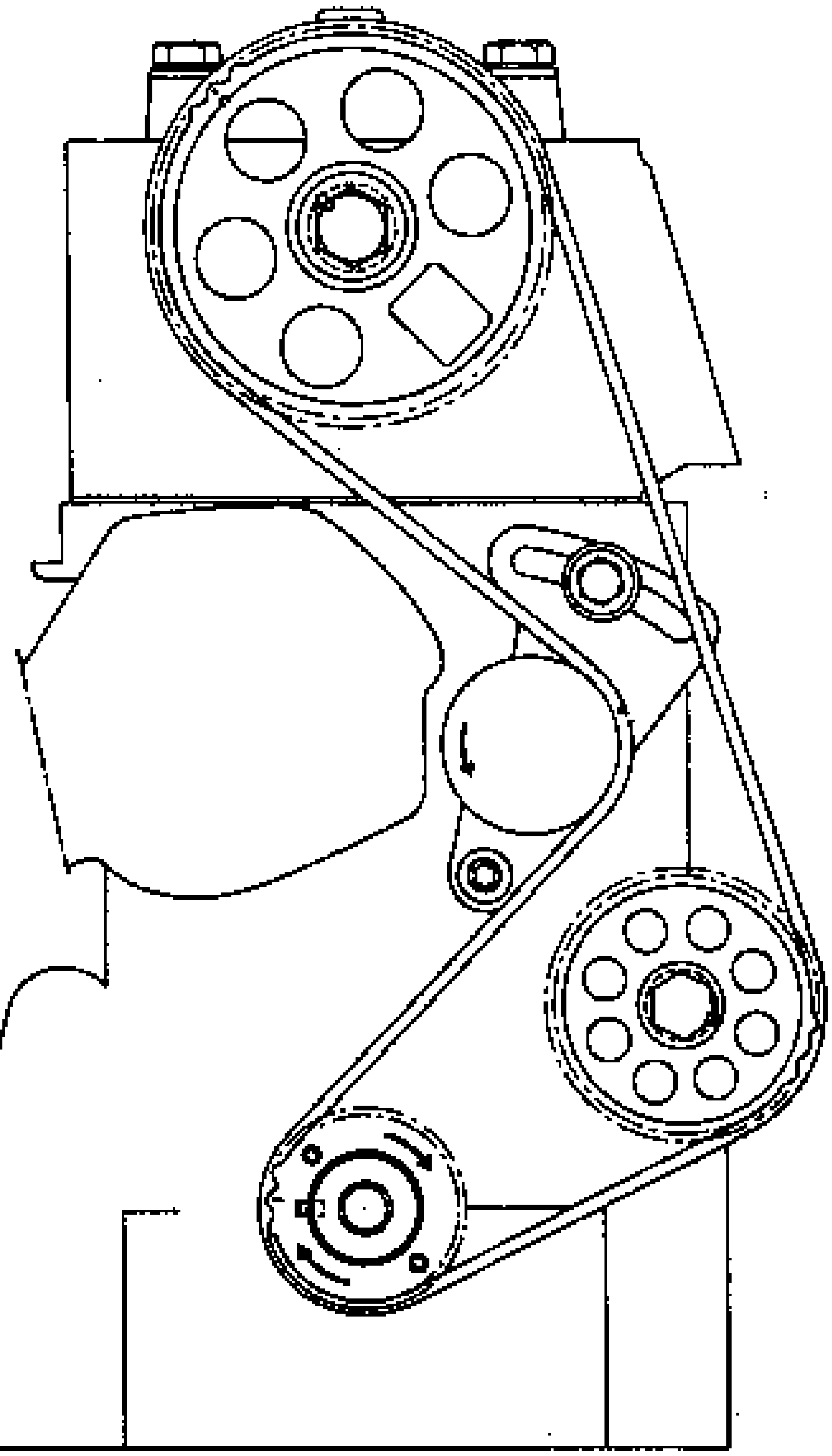
Refit in reverse order to removing.

Development in assembly of the toothed timing belt tensioner

1st assembly



2nd assembly



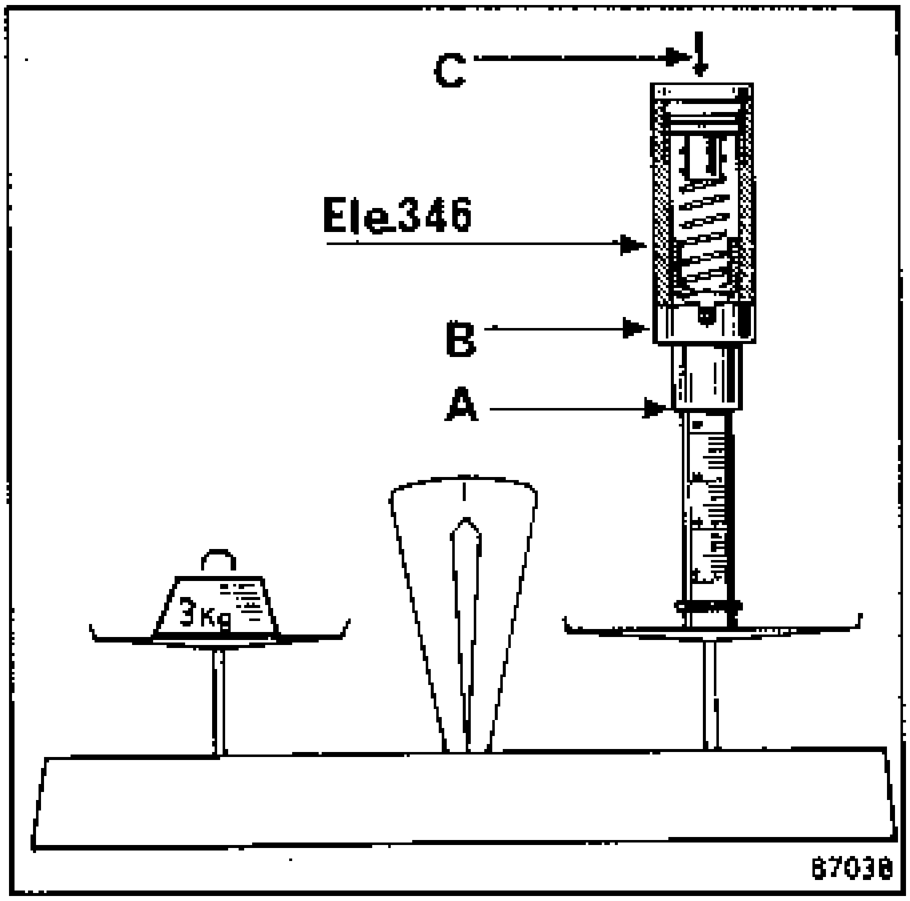
ESSENTIAL SPECIAL TOOLING		
Ele.	346-04	Belt tensioner checking tool
B. Vi.	906	Torque gauge

CALIBRATING TOOL Ele. 346

There are two methods:

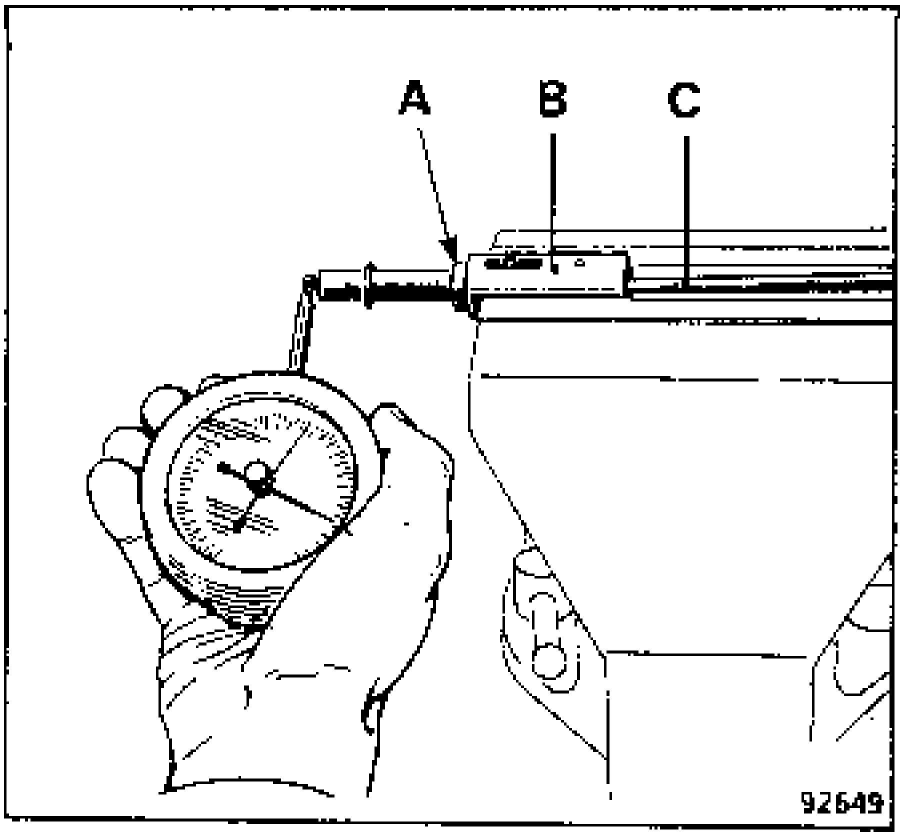
It is essential to check the calibration of tool **Ele. 346** before it is first used (new tool) and then at regular intervals.

1st method:



Apply a force of **3 daNm** to the tool (weight of **3 kg**). The shoulder **(A)** should be flush with the plunger body **(B)**. If it is not, turn the screw **(C)** to increase or decrease the spring calibration.

2nd method:



Secure tool **Ele. 346** in a vice after having removed its cover. Fit the cylindrical part of tool **B.Vi. 906** to the end of the sliding part. The shoulder **(A)** should be flush with the plunger body **(B)** when the needle shows **3 daNm**. If it is not, turn screw **(C)** to increase or decrease the spring calibration.

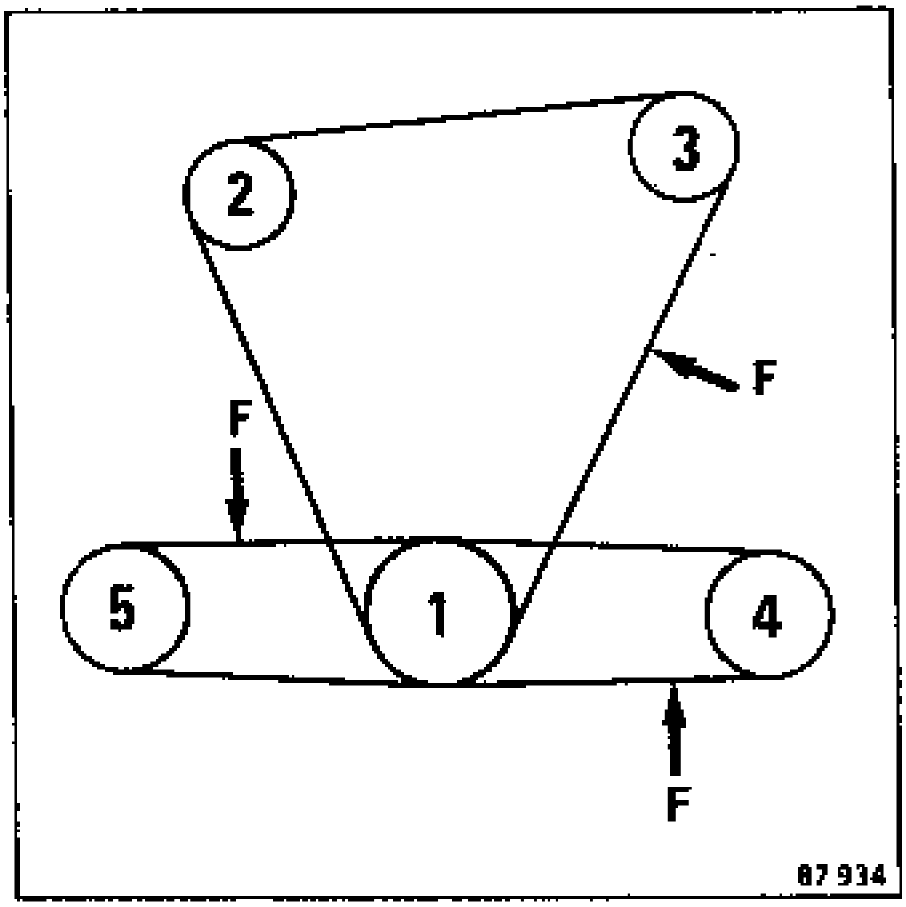
Belt tensions (1)

Type	Alternator belts		Power steering belts		Air conditioning belts (2)	
	Trapezoid	Multi-tooth	Trapezoid	Multi-tooth	Trapezoid	Multi-tooth
J6R	5.5 ... 6.5	–	4.5 ... 5.5	–	5 ... 6	4.5 ... 5.5
J7R	5.5 ... 6.5	–	4.5 ... 5.5	–	–	4.5 ... 5.5
J7R 12S	5.5 ... 6.5	–	4.5 ... 5.5	–	–	4.5 ... 5.5
J7T	5.5 ... 6.5	–	4.5 ... 5.5	–	5 ... 6	4.5 ... 5.5
J8S	5.5 ... 6.5	–	4.5 ... 5.5	–	–	4.5 ... 5.5
Z7U	–	3	3.5 ... 4.5	–	5 ... 5.5	–
Z7V	–	3 ... 3.5	3 ... 3.5	–	3.5 ... 4.5	–
Z7W	–	3	2.5 ... 3	–	3.5 ... 4.5	–

(1) To be checked after 10 minutes' operation
(2) Depending on assembly.

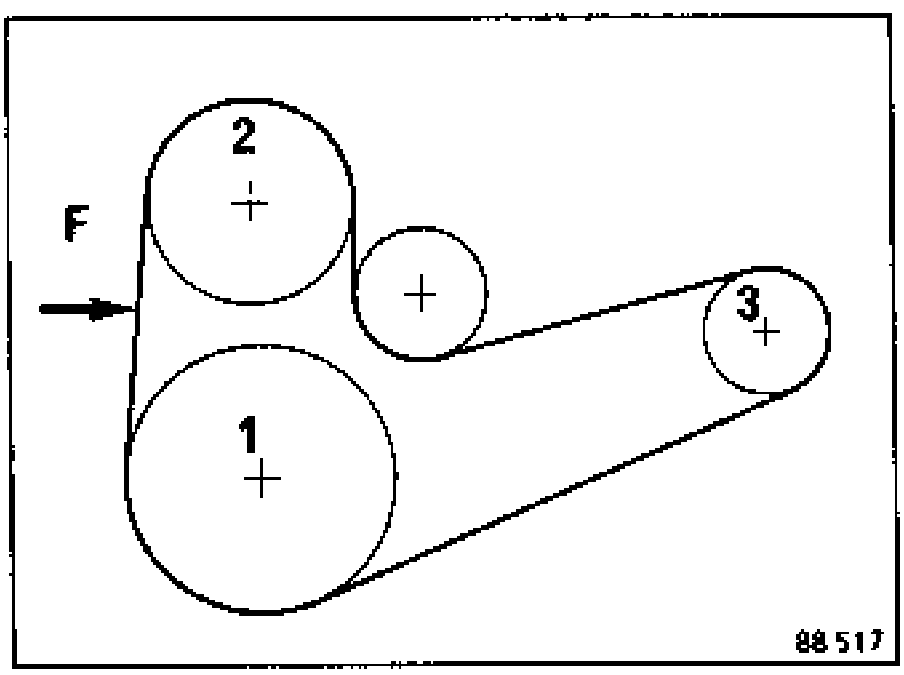
Belt tension checking points.

Engines : J6R - J7R - J7T - J8S



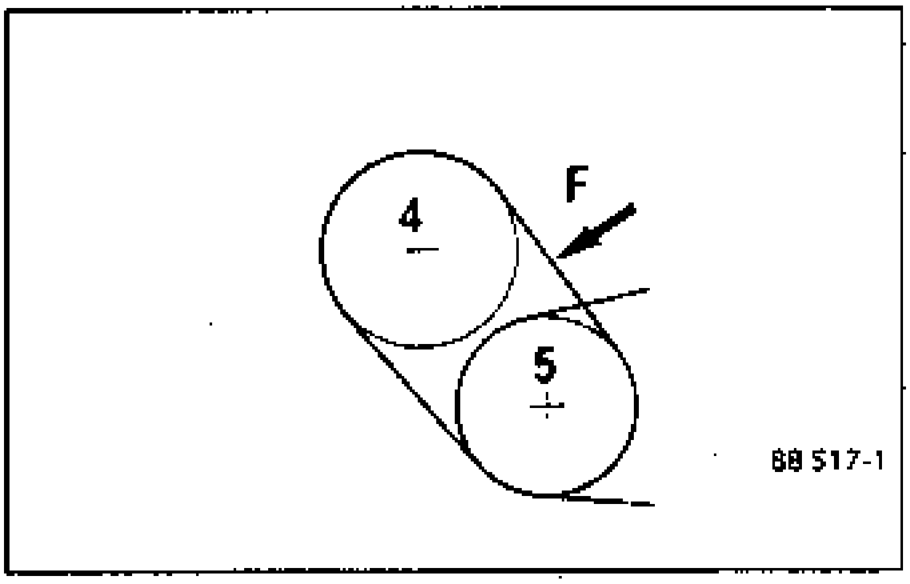
1 - Crankshaft
2 - Water pump
3 - Alternator
4 - Power-assisted steering pump
5 - Air conditioning compressor

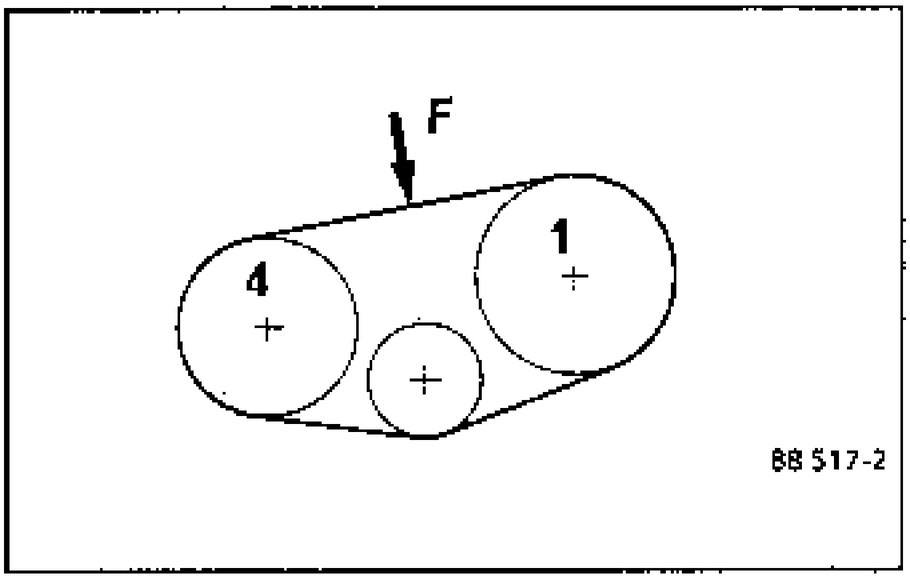
Engines : Z7U



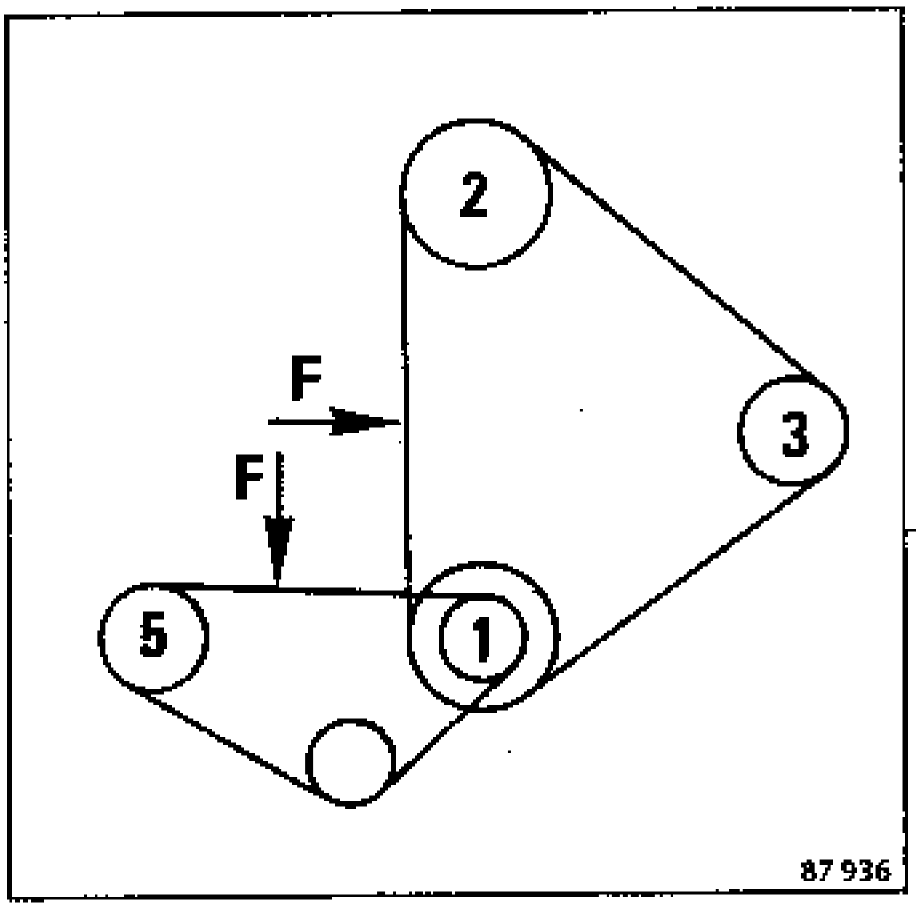
1 - Crankshaft
2 - Water pump
3 - Alternator

Engine : Z7U (continued)

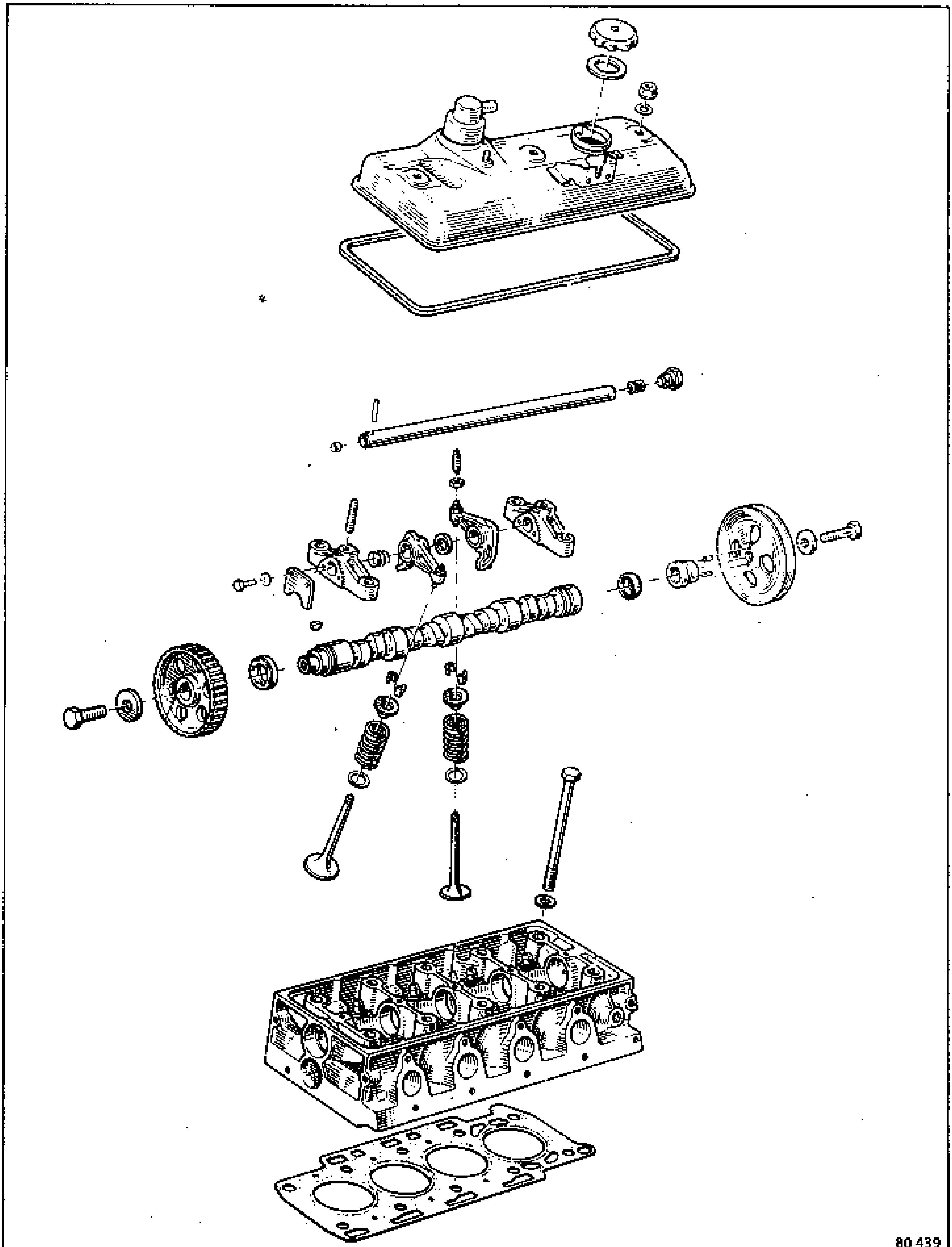


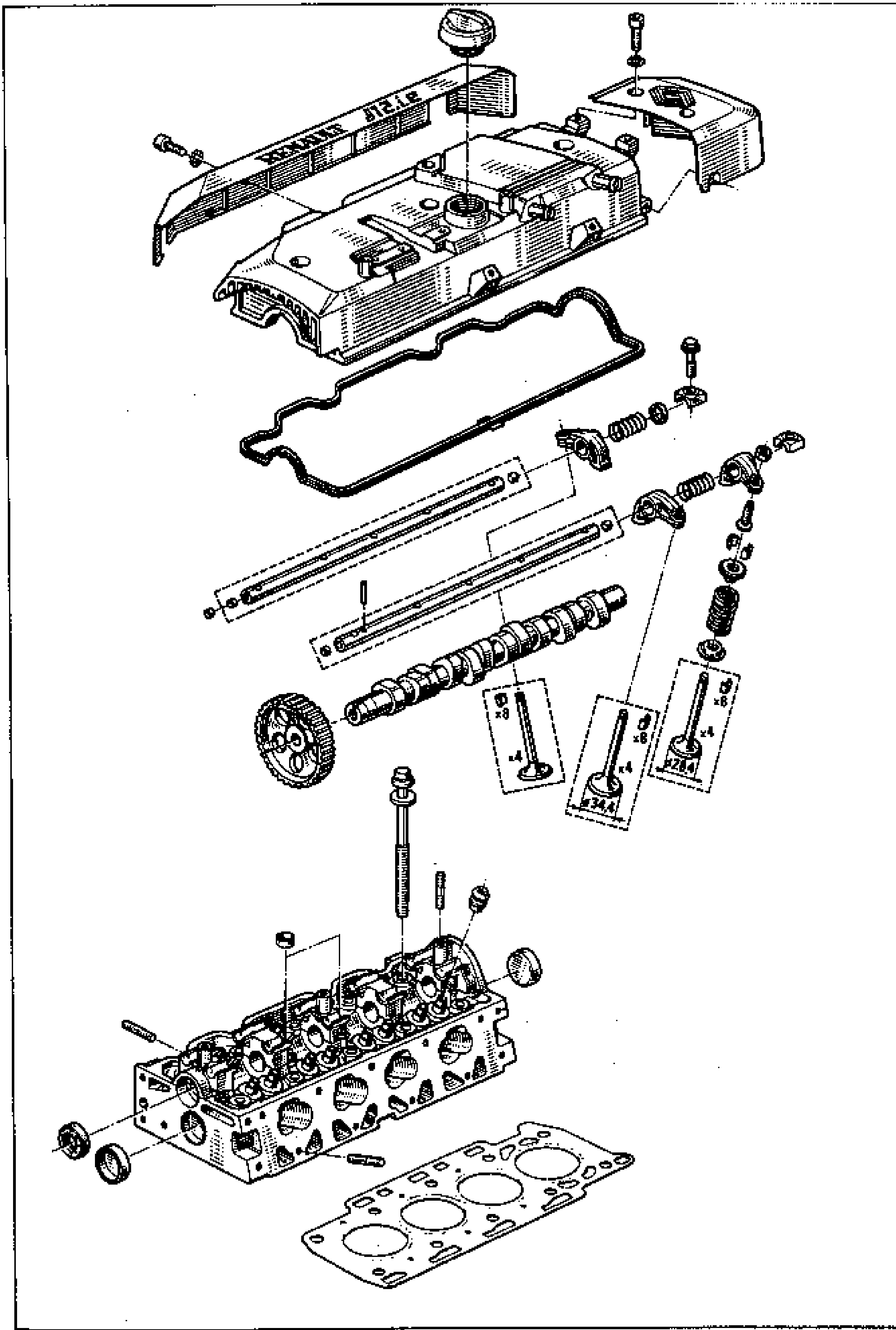


Engine : Z7V



1 - Crankshaft
2 - Water pump
3 - Alternator
4 - Power-assisted steering pump
5 - Air conditioning compressor


80 439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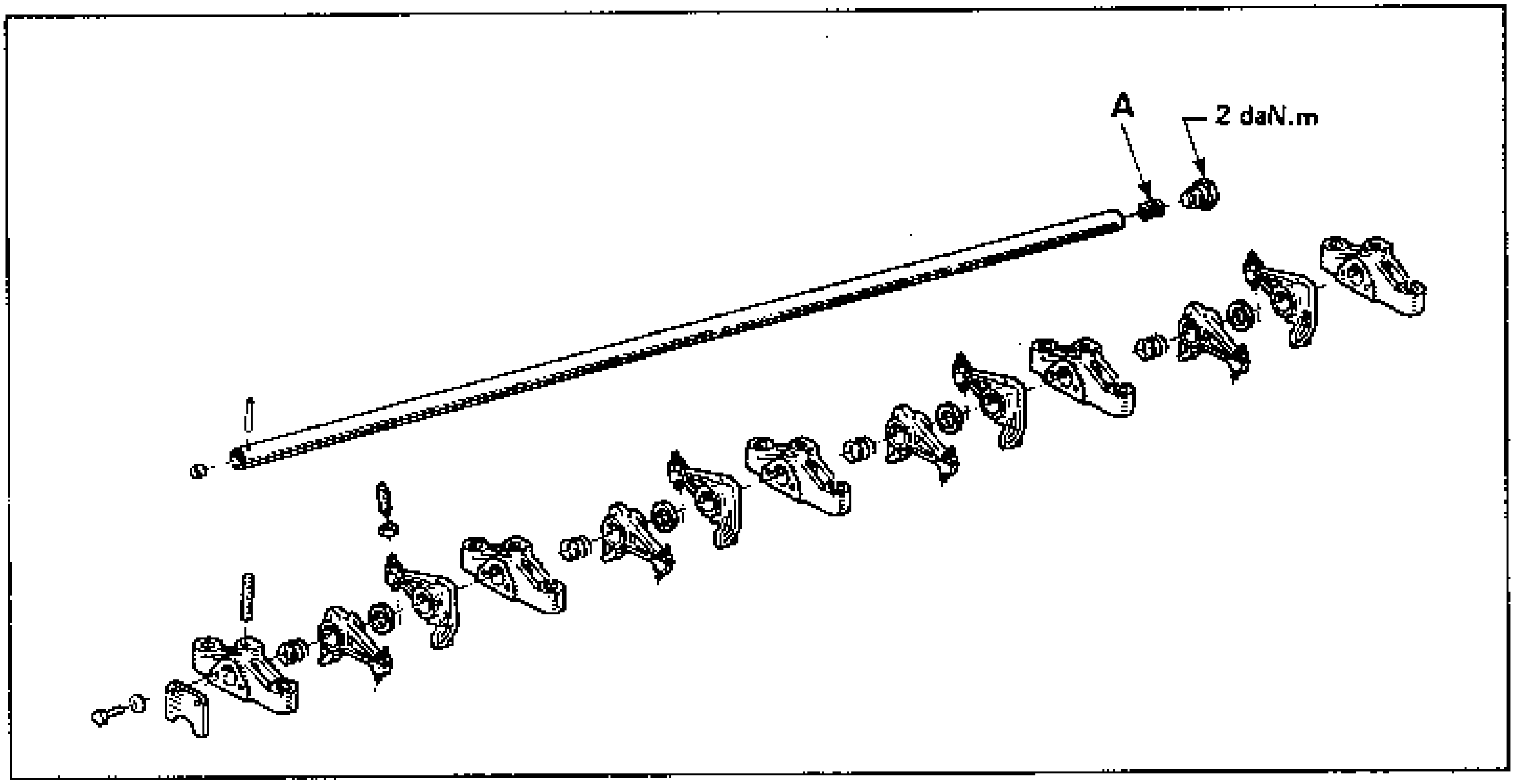
x4
x8
x4
ø34,4
x8
x4
ø28,4

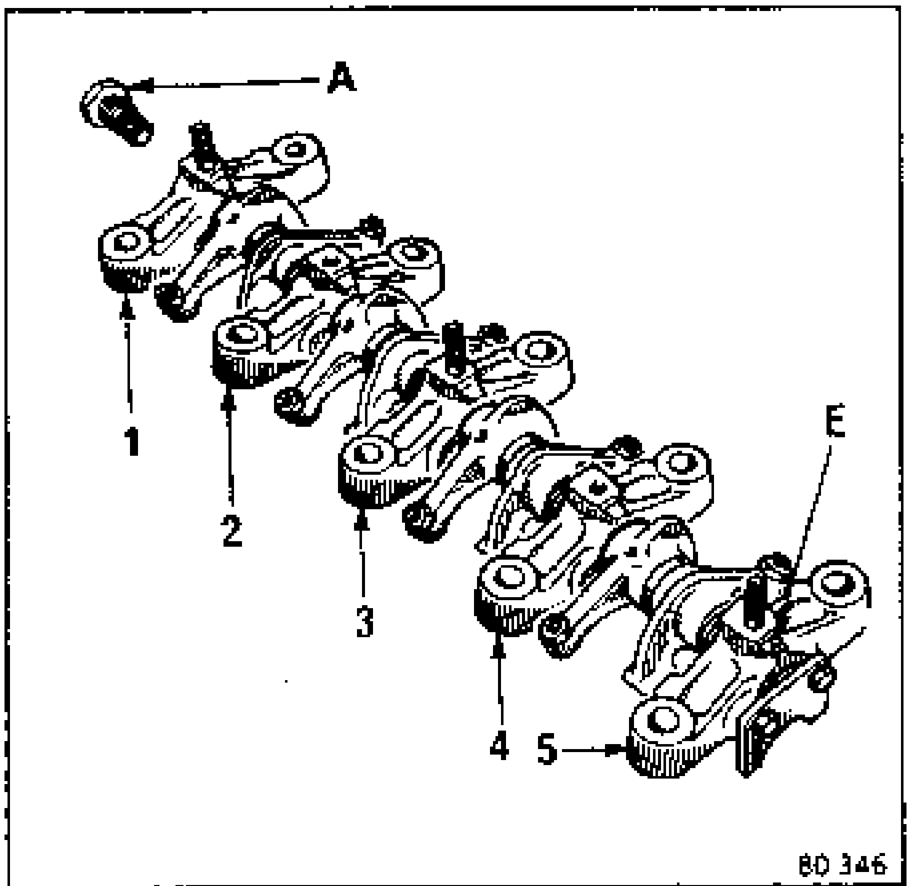
ROCKER ARM ASSEMBLY - All types except J7R 12-valve



To remove the rocker arm assembly, it is not necessary to remove the cylinder head.

Proceed as follows:
- Remove the timing belt (see CYLINDER HEAD chapter, "Replacing the gasket").
- Remove the cylinder head bolts.
- Remove the rocker arm assembly.

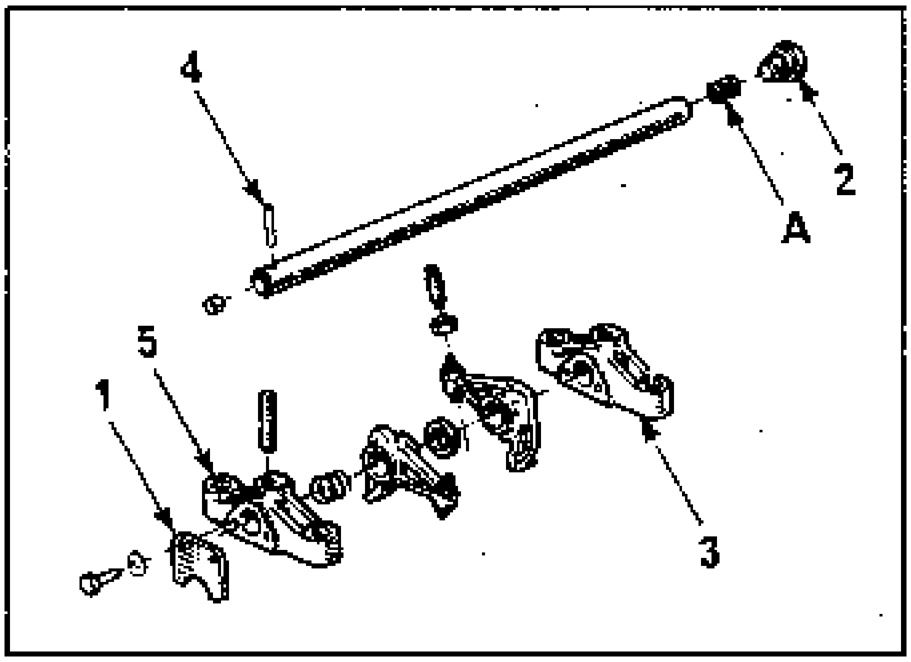
Before taking any action, make sure that there is a solid pin at (E).



If not, take out the existing pin and fit a solid pin.

REMOVING

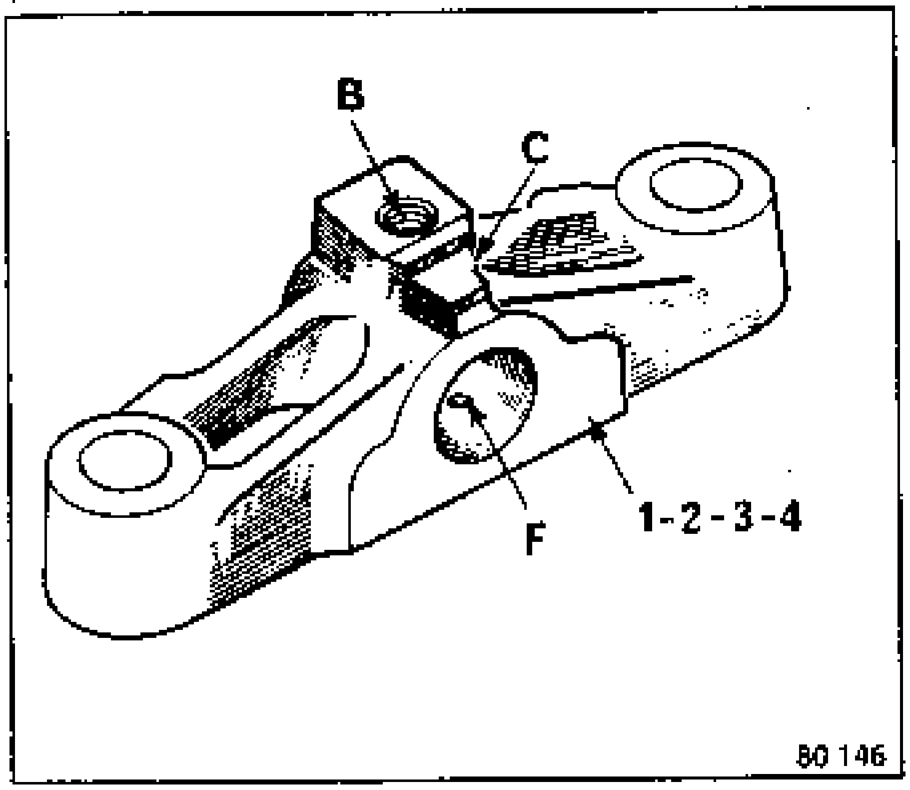
Remove in ascending numerical order:



REFITTING

Identification of parts

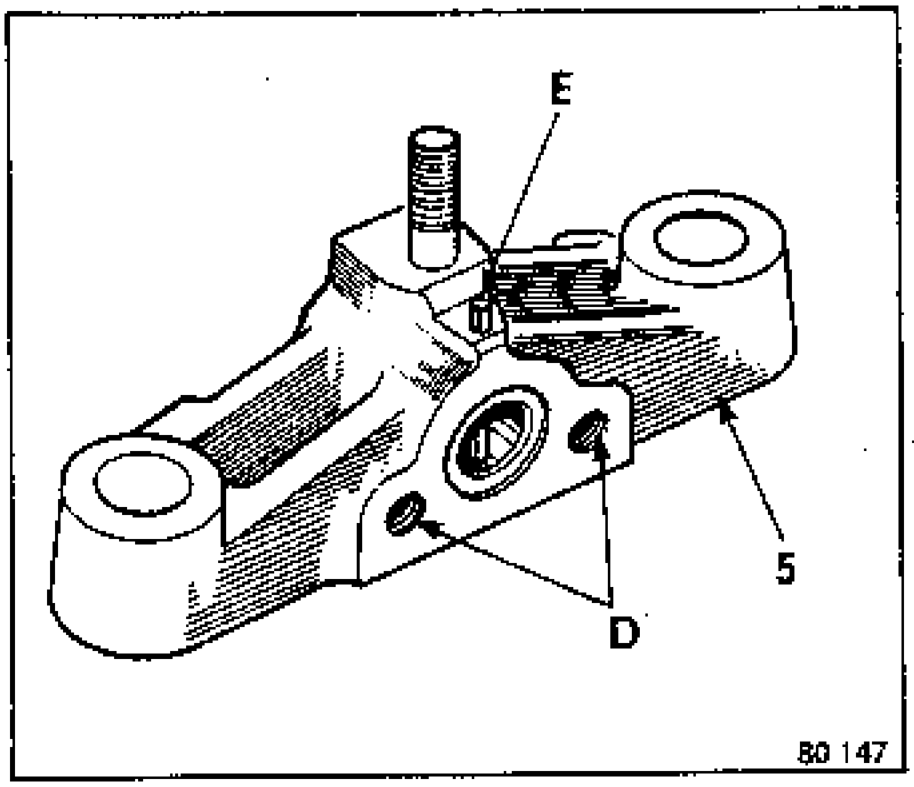
Bearings 1, 2, 3 and 4 are identical.



F : Lubrication hole

B : Cylinder head cover fixing stud adaptation.

C : Locating notch pointing towards timing.

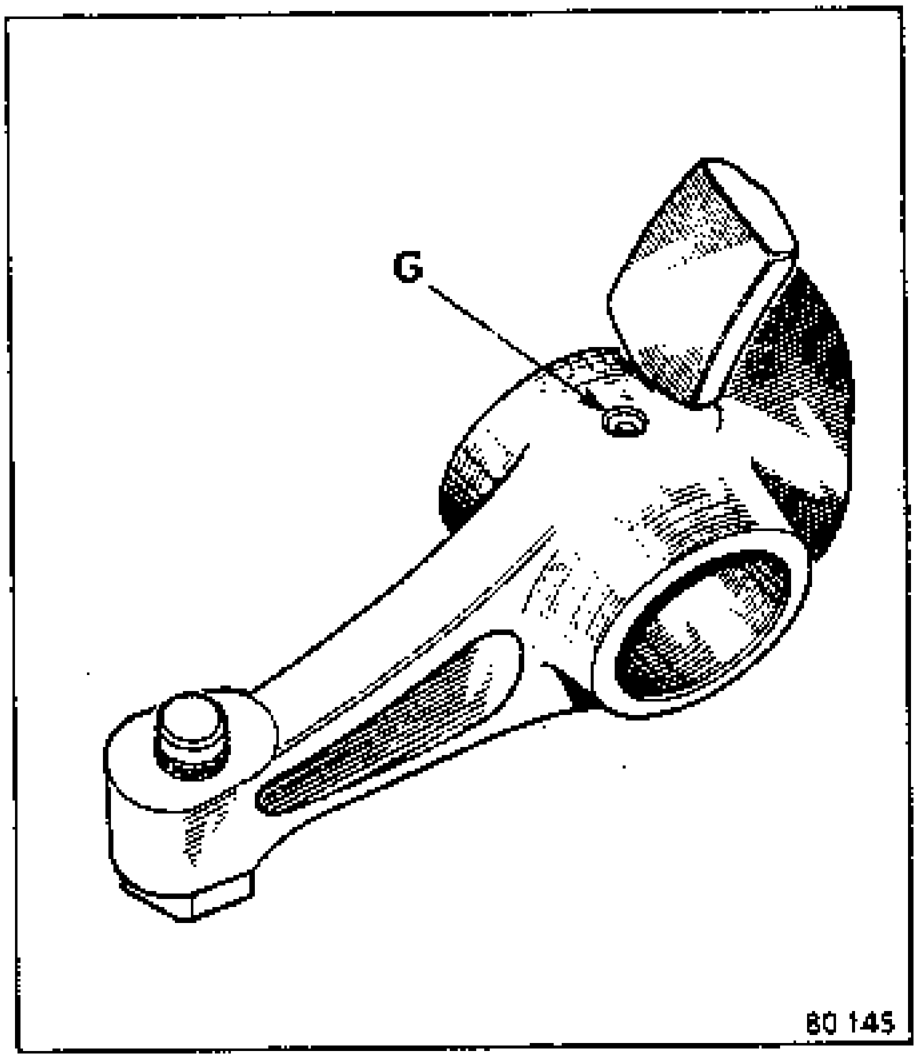


- Bearing n° 5

D : Camshaft lateral clearance shim mounting.

E : Location of solid pin.

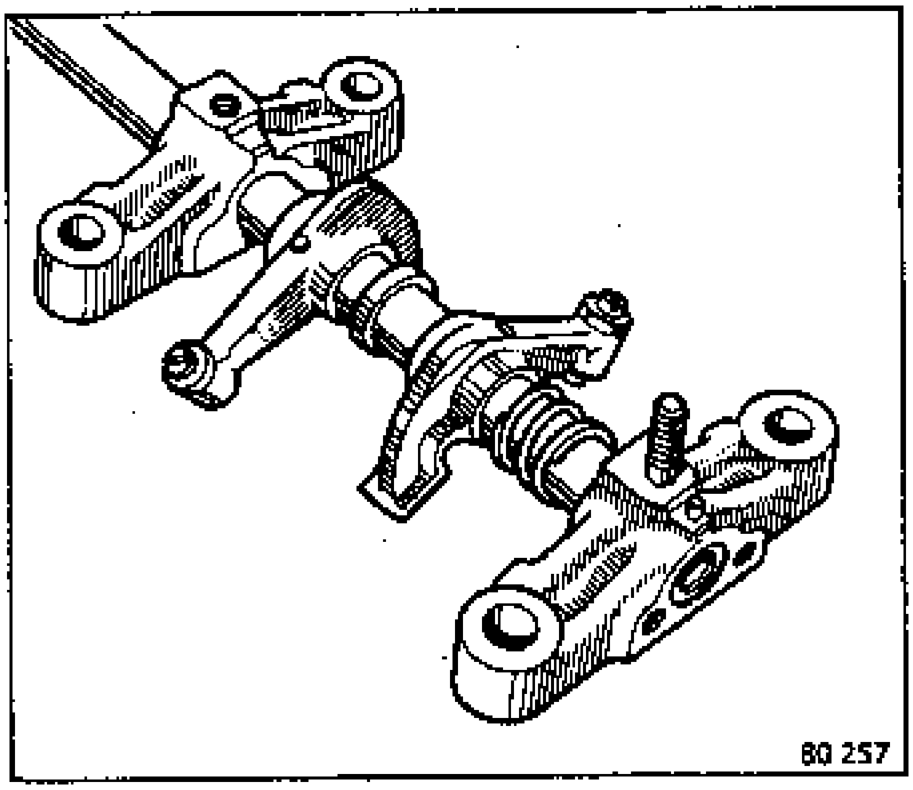
The exhaust intake rocker arms are identical.



G : Oil jet for lubricating cams.

Rocker arm cover

Repeat the removing operations in reverse order.



The filter (A) located in the rocker arm assembly is to be changed with each removing operation.

(See rocker arm assembly exploded view)

- Cap tightening .... **2 daNm**

REMOVING-REFITTING cylinder head

ESSENTIAL SPECIAL TOOLING		
Mot.	799 or	Timing wheel locking tools
Mot.	855	
Mot.	1157	Camshaft gasket fitting tool
Facom	U43L	Valve compressor
Mot.	1169	Rocker arm retaining fork

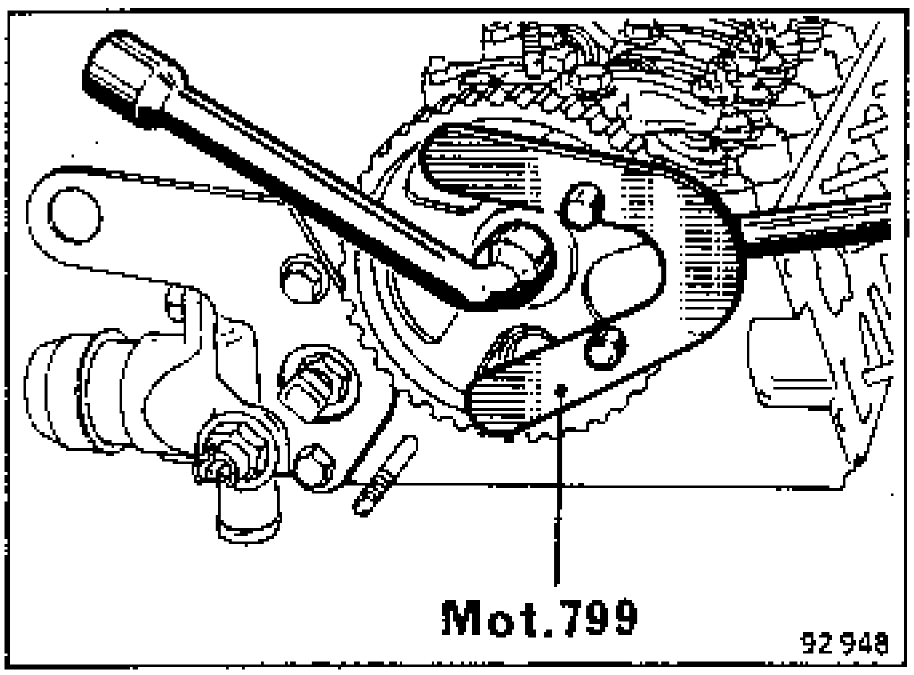
TIGHTENING TORQUES (in daNm)	
Timing wheel bolts	5
Rocker arm assembly bearing bolts	2.2 to 2.6
Spark plugs	2.4 to 3

Remove the cylinder head and the timing belt (see chapter on replacing the cylinder head gasket).

REMOVING

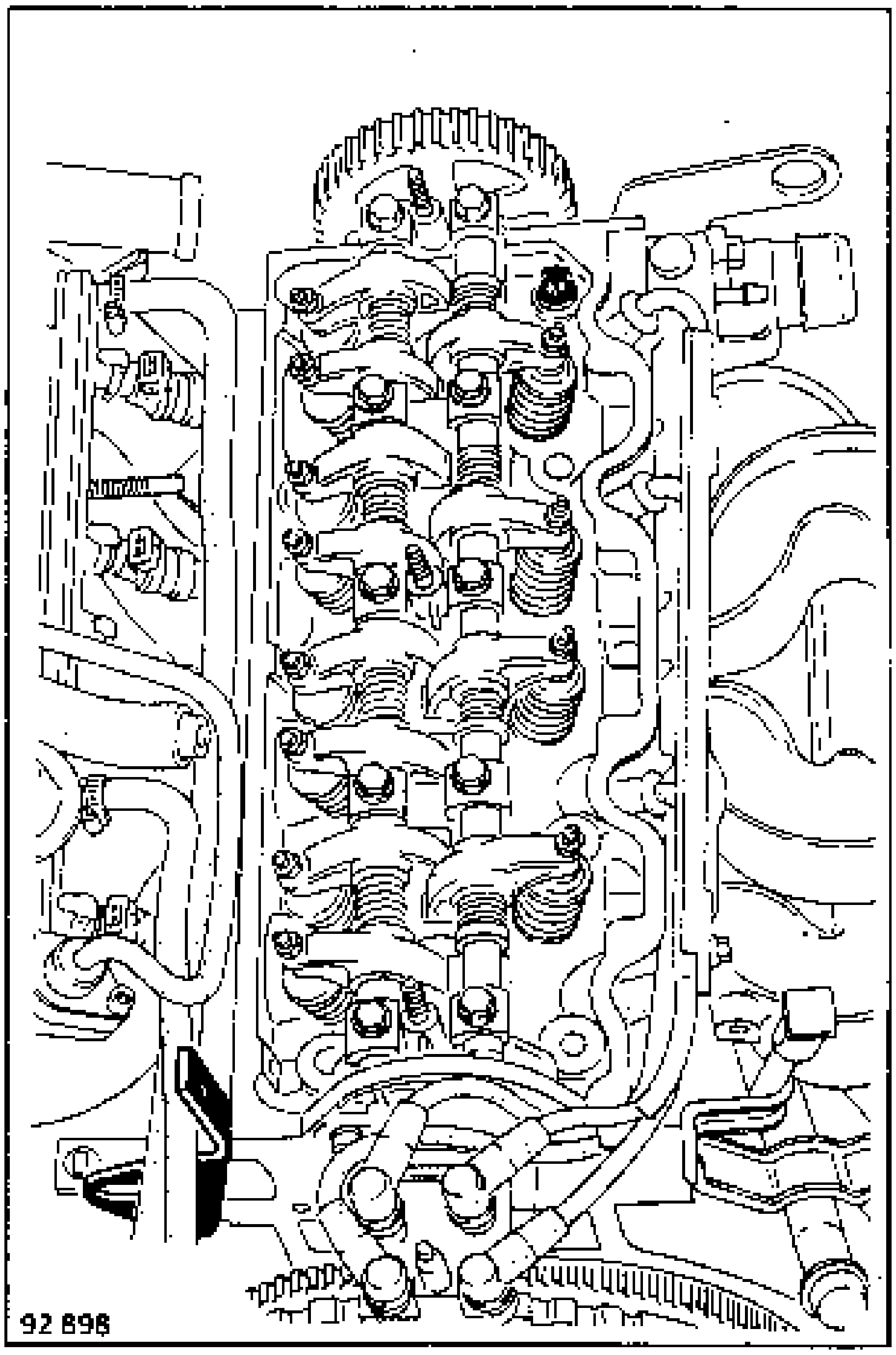
Remove:

- the distributor and the pinking detector;
- the intake and exhaust manifolds;
- the timing sprocket using **Mot. 799**.



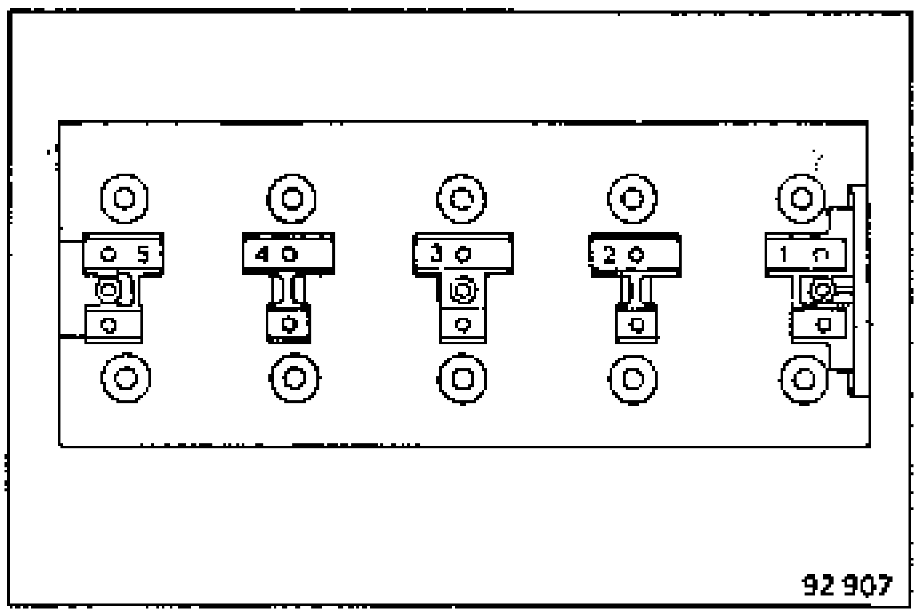
Loosen:

- the rocker arm adjustment nuts and bolts;
- the rocker arm assembly fixing bolts.



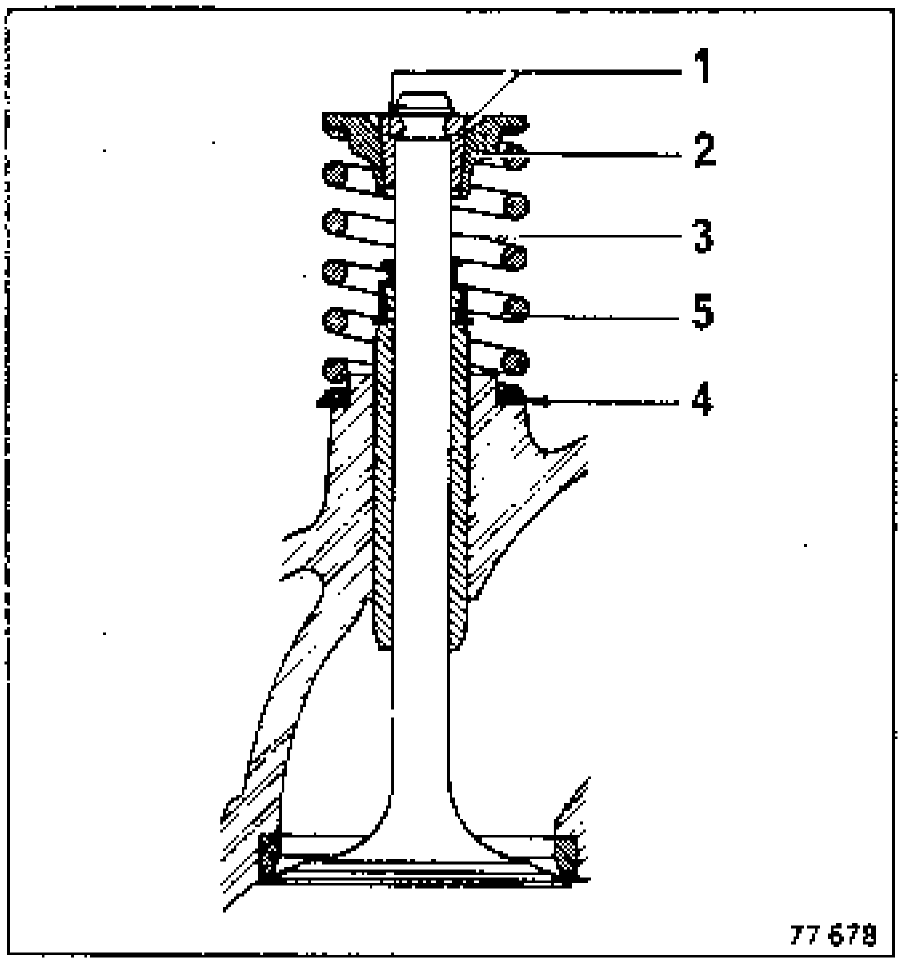
Remove:

- the rocker arm assembly;
- the rocker arm assembly bearings, marking the position of bearings 2 and 4;
- the camshaft and its gasket;



- the intake and exhaust valves using the valve compressor, type **Facom U43L**.

Remove in ascending numerical order.



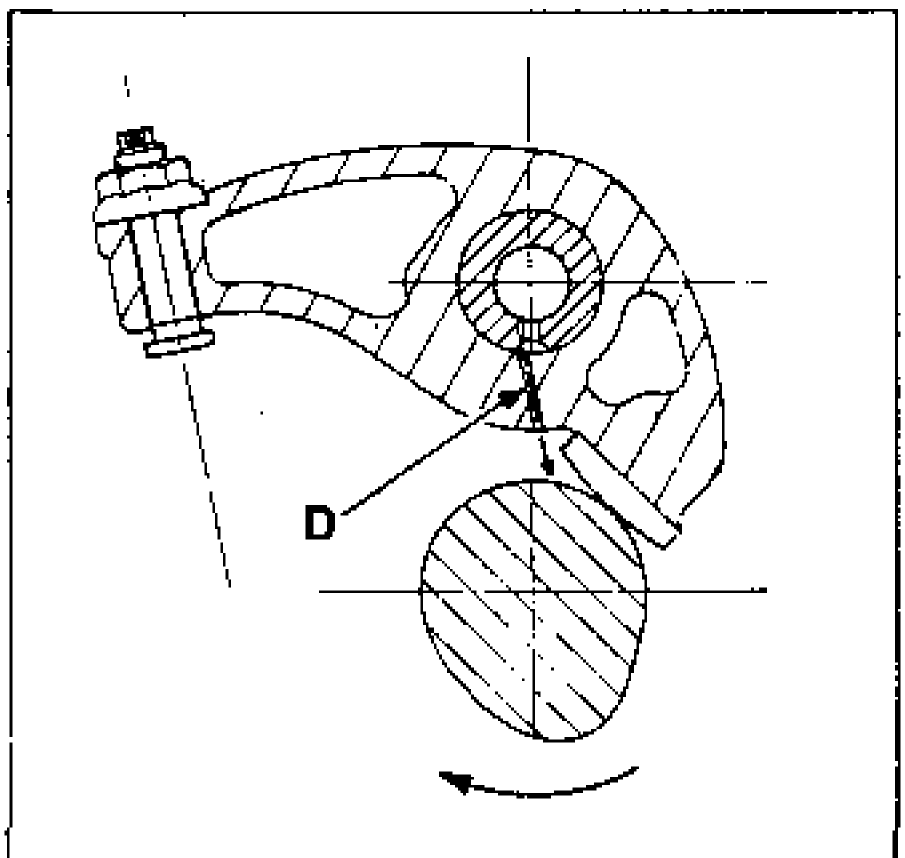
INSPECTION AND REPAIR OF ROCKER ARM ASSEMBLY

Dismantle the rocker arm assembly, taking care to mark the position of the rocker arms on the assembly.

Examine the surface condition of the rocker arm pads and screws.

Check that the cam-pad lubrication holes (D) are not obstructed.

Replace worn parts.



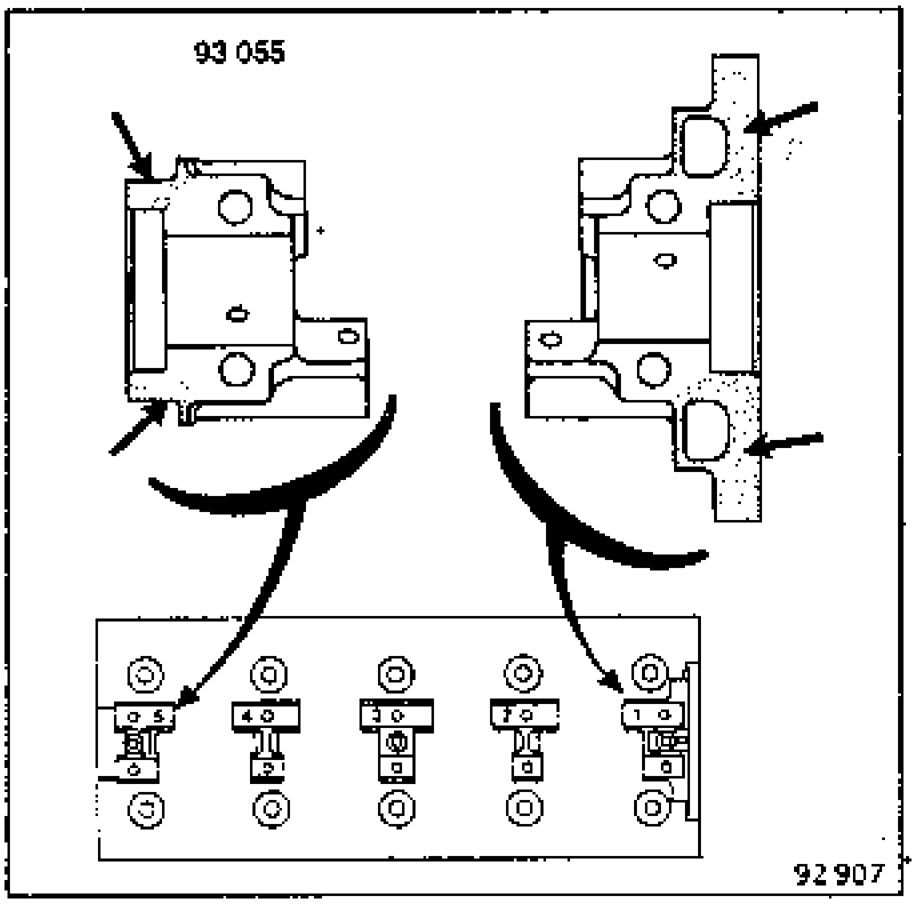
REFITTING (Special features)

Replace the valve stem seal (5), using a 10 mm tubular key (type Nervus).

Refit the valves (making sure that the seals (5) have not moved).

Fit the camshaft and the rocker arm assembly bearings 2, 3, and 4, maintaining the position of bearings 2 and 4.

Smear the bearing surfaces of bearings 1 and 5 with **Loctite 518** (as shown below).



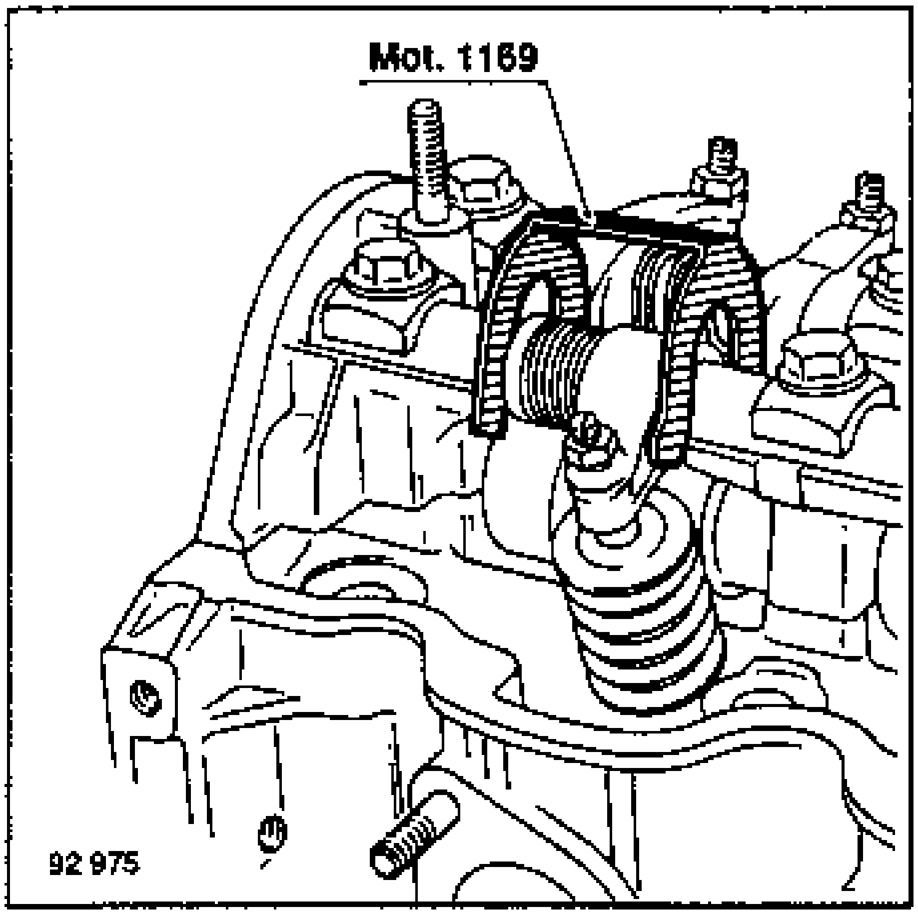
Prepare the rocker arm assemblies by positioning the rocker arm retaining forks (tool **Mot. 1169**).

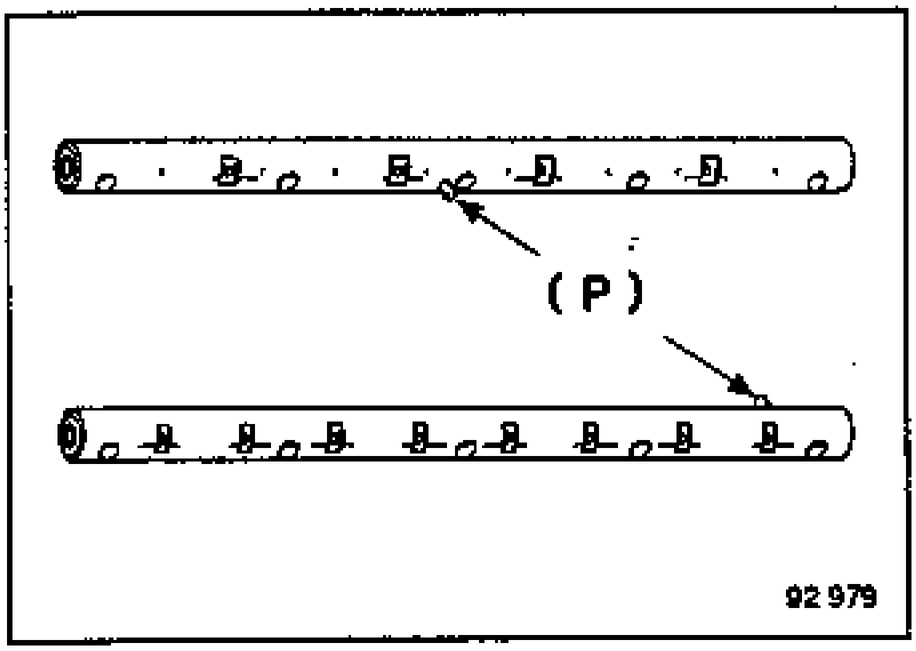
Fit bearings 1 and 5.

Refit the rocker arm assemblies by locating the dowels (P) (see next page):

- Exhaust side - the connection fits into a centre bearing hole;

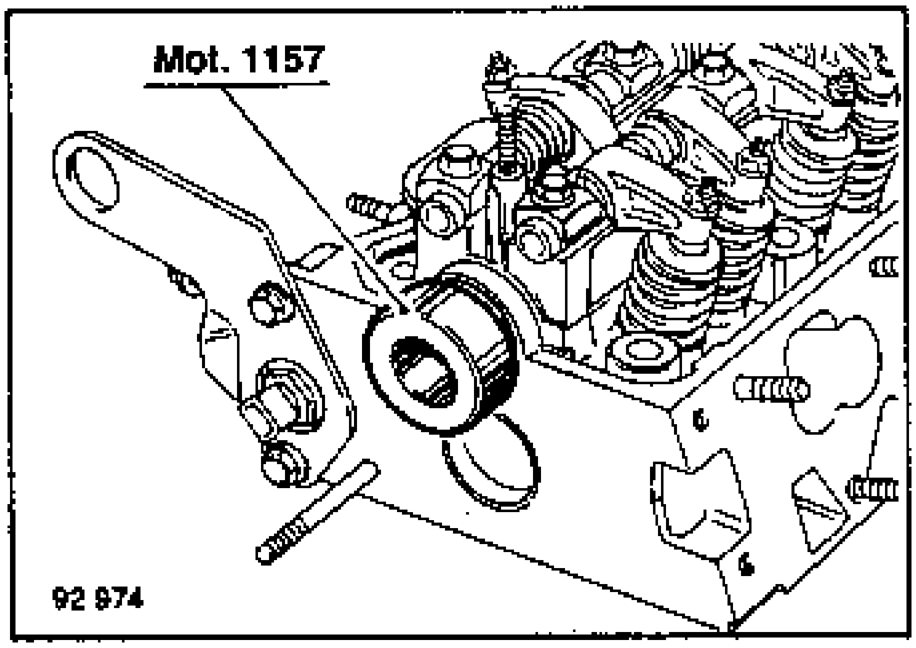
- Intake side - the connection points upwards on the timing side.





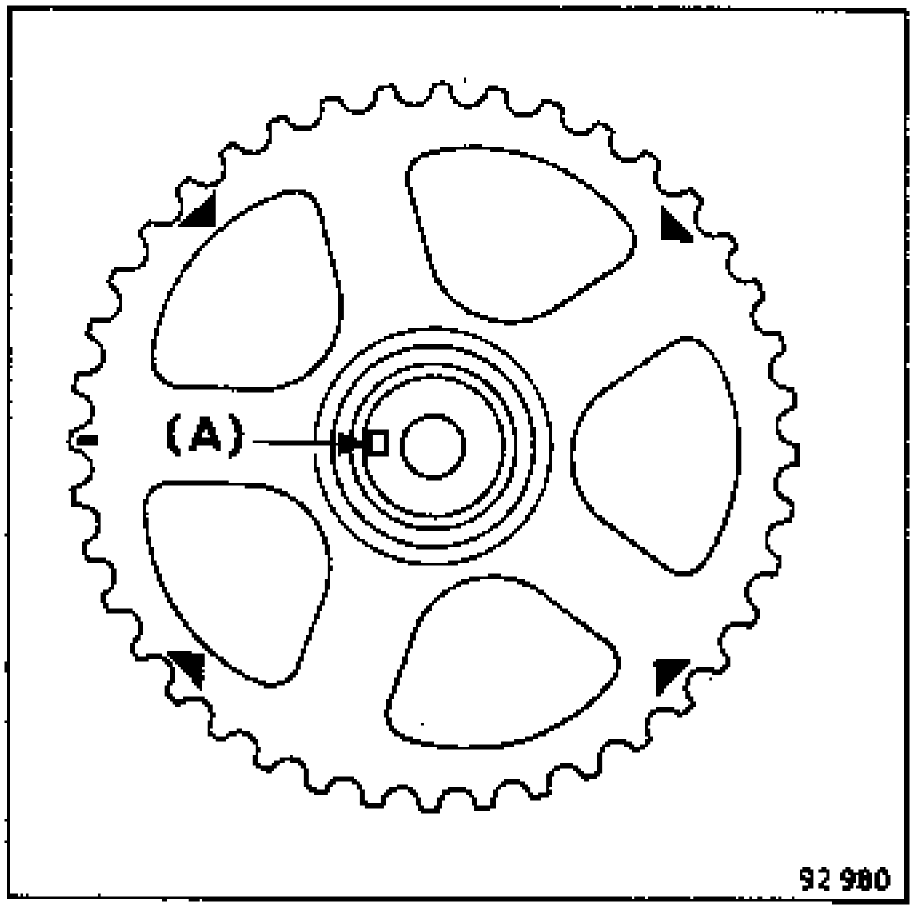
Retighten the rocker arm assembly fixing bolts to the specified torque (2.2 to 2.6 daNm), starting with the bolts of bearings 1 and 5 (the time allowed for fitting and tightening bearings 1 and 5 is very limited due to the rapid polymerisation speed of LOCTITE 518).

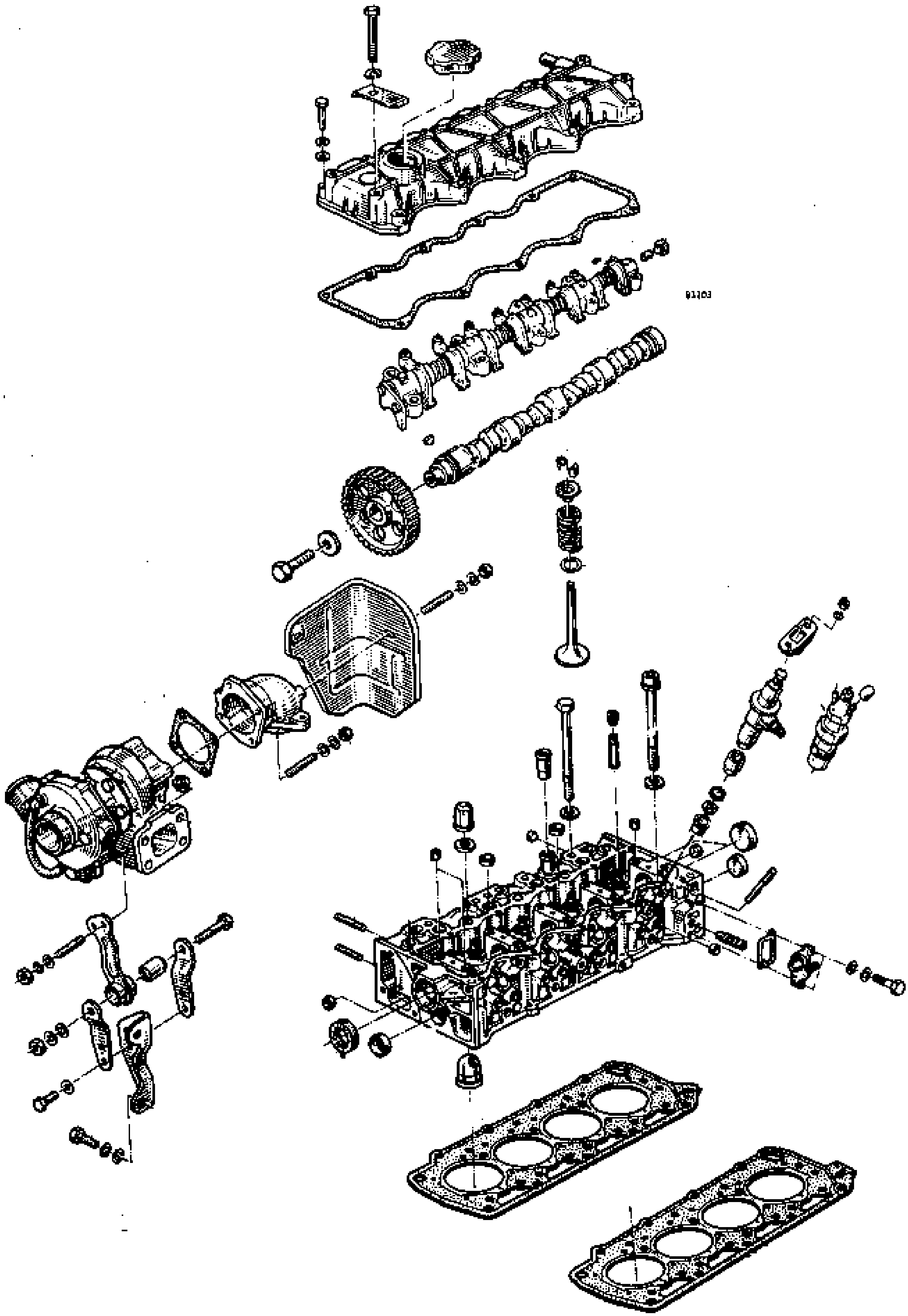
Clean the contact surface of the camshaft and fit the seal using **Mot. 1157**.



When refitting the timing sprocket, make sure that the key (A) moulded into the sprocket is correctly positioned opposite its housing in the camshaft.

Smear the sprocket bolt with **Loctite FRENBLOC** and tighten to the specified torque by locking the sprocket using **Mot. 799, without turning the camshaft** (the key may break).





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INSPECTION AND REPAIR OF THE ROCKER ARM ASSEMBLY

The filter **(24)**, located in the rocker arm assembly **(17)**, is to be replaced whenever action is taken as a result of incidents which have caused a suspension of metallic particles in the oil.

In such an event, replace the engine oil and the oil filter on the main oil gallery (key **Mot. 445**).

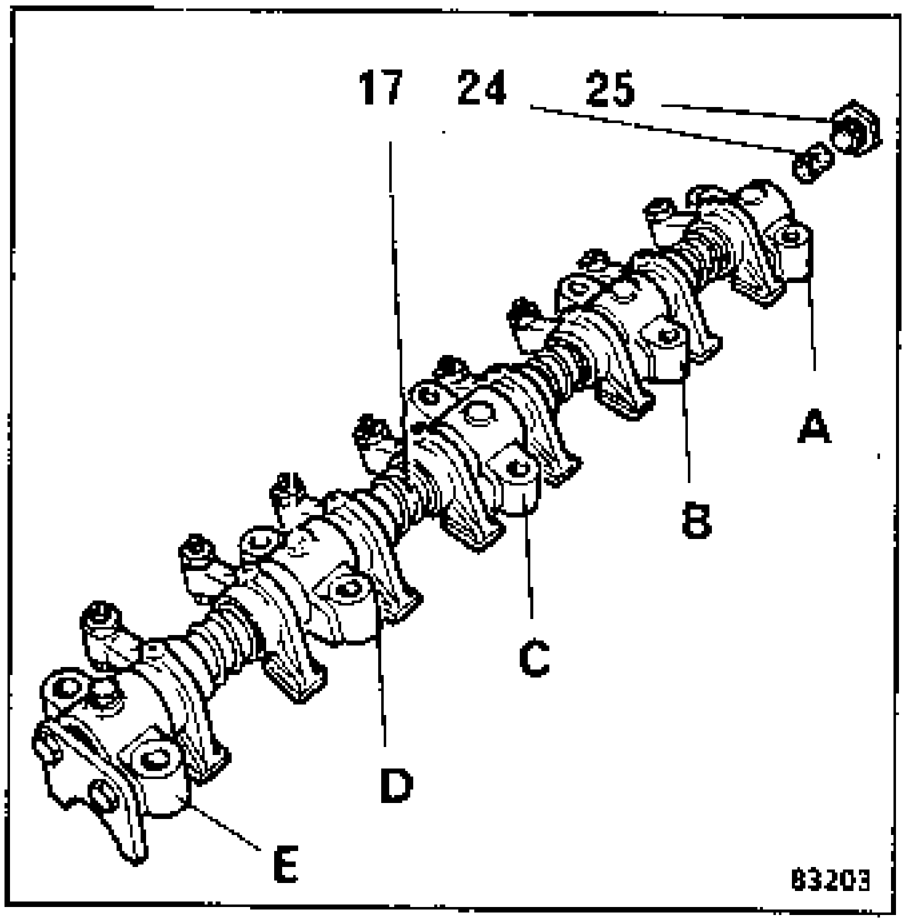
TIGHTENING TORQUE

- Rocker arm assembly plug **(25)** ..... **2 daNm**

REMOVING

Remove the plug at the end of the rocker arm shaft and the filter. Separate the various parts and clean them. Store them in sequence.

Identification of parts:



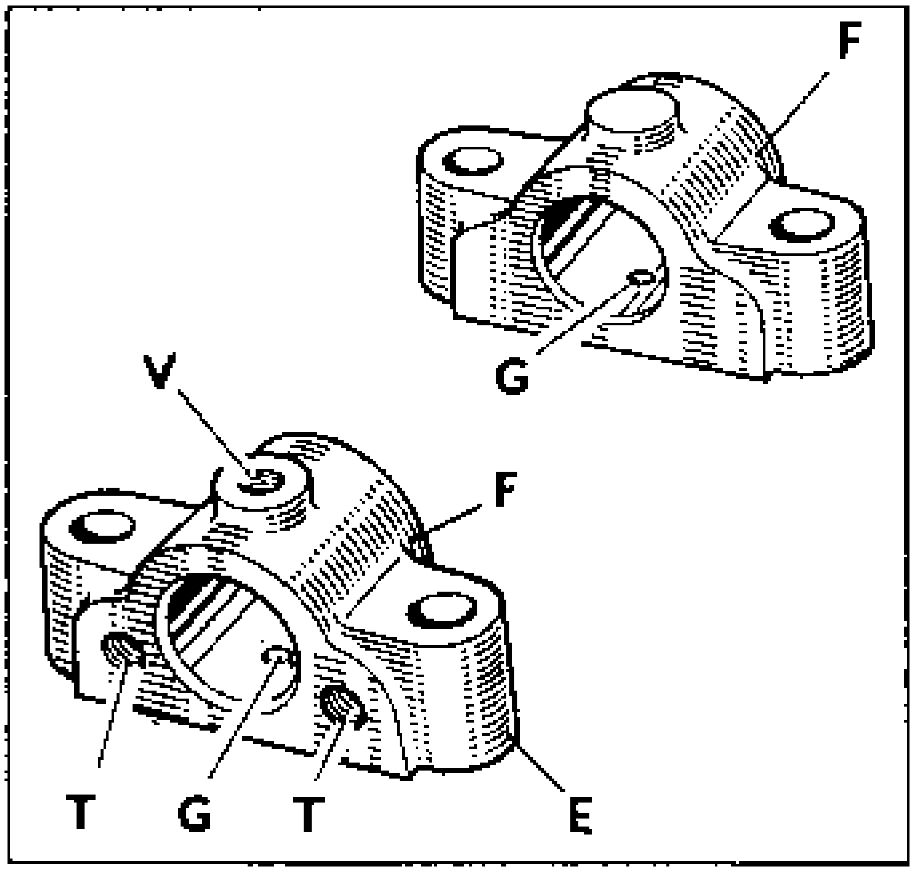
Rocker arm shaft bearings:

Bearings A, B, C and D are identical. They comprise:

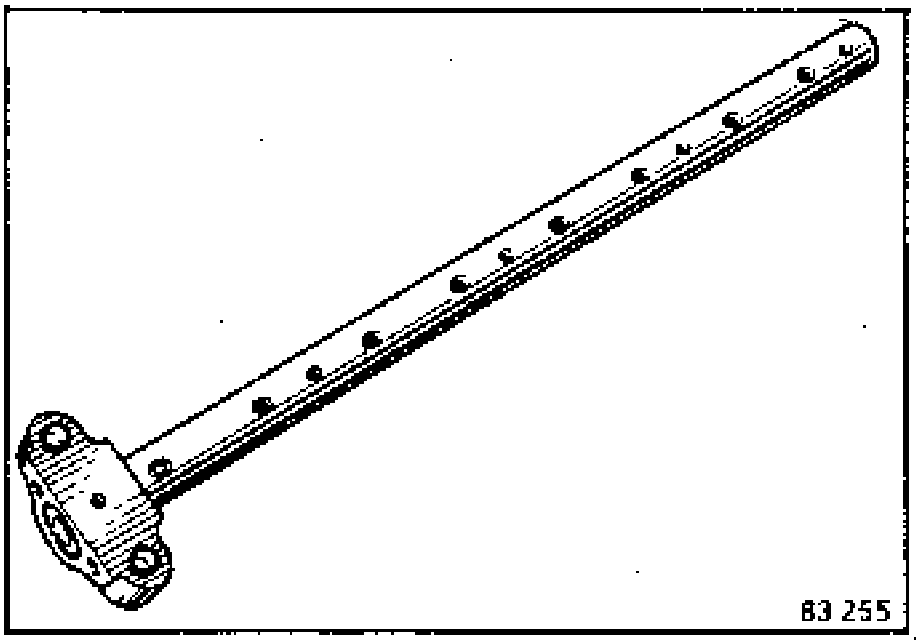
- a lubrication hole (G) for the corresponding camshaft bearings;
- an offset (F) pointing towards the engine flywheel.

Furthermore, the bearing (E) comprises:

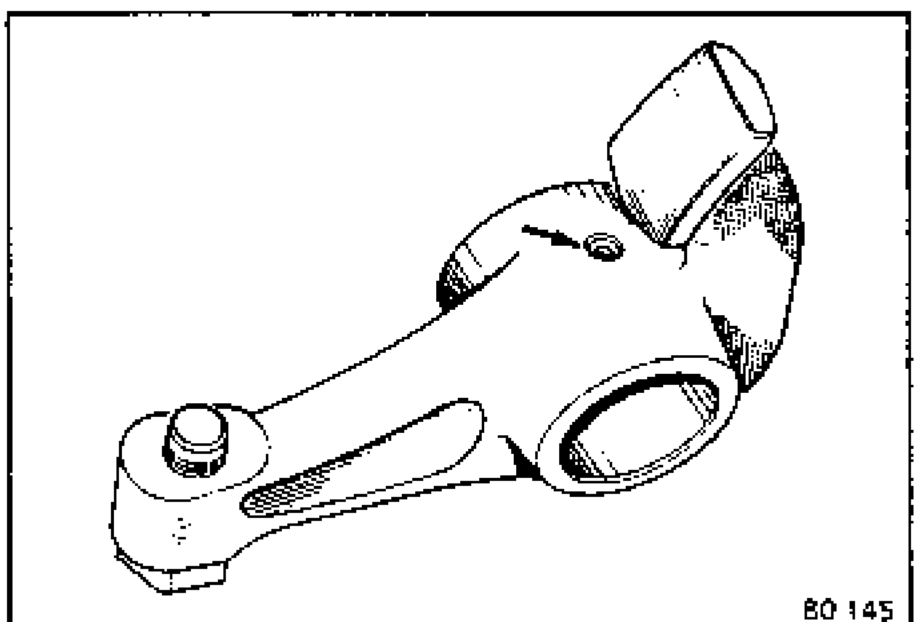
- two tapped holes (T) for fixing the shim limiting the camshaft lateral clearance;
- a tapped hole (V) for the bolt mounting giving the direction of the rocker shafts.



The rocker shafts are positioned by a dowel pin on the locating screw.
The camshaft bearing lubrication holes point towards the camshaft (the oil passes through the rocker shaft bearings).



Rocker arms: the intake and exhaust rocker arms are identical: they include an oil jet for lubricating the camshaft.



REFITTING

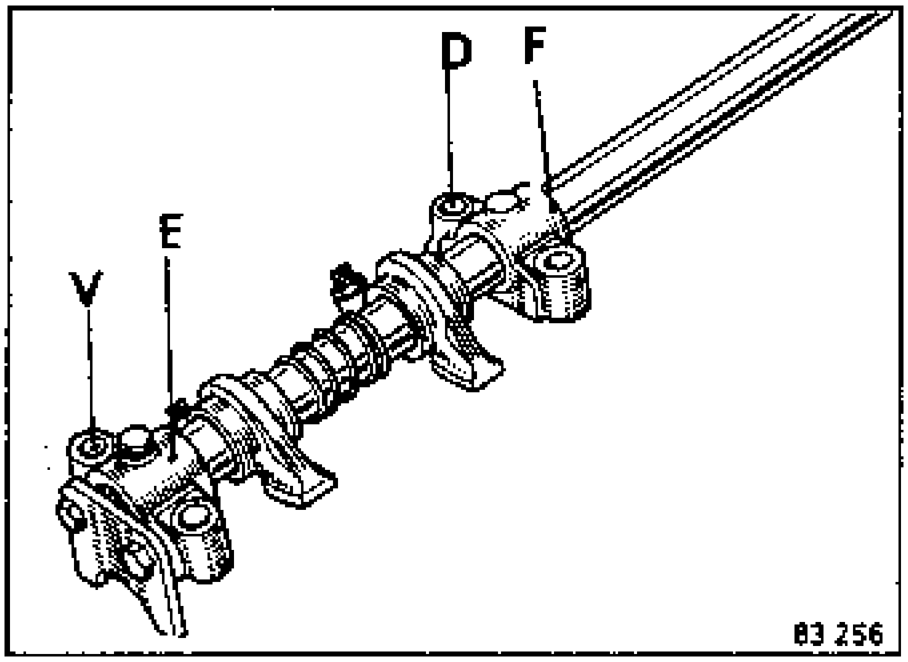
Place the bearing (E) on the shaft and lock it so that the lubrication holes are pointing towards the bearing base.

Then position:

- one rocker arm;
- one spring;
- one rocker arm;
- one intermediate bearing, offset (F) pointing towards the engine flywheel.

Continue assembly in the same order, fit the cap with the oil filter and tighten to torque **2 daNm**.

This torque should be adhered to since the rocker arm shaft is only kept from rotating by the dowel pin of the locating screw on the bearing (E).



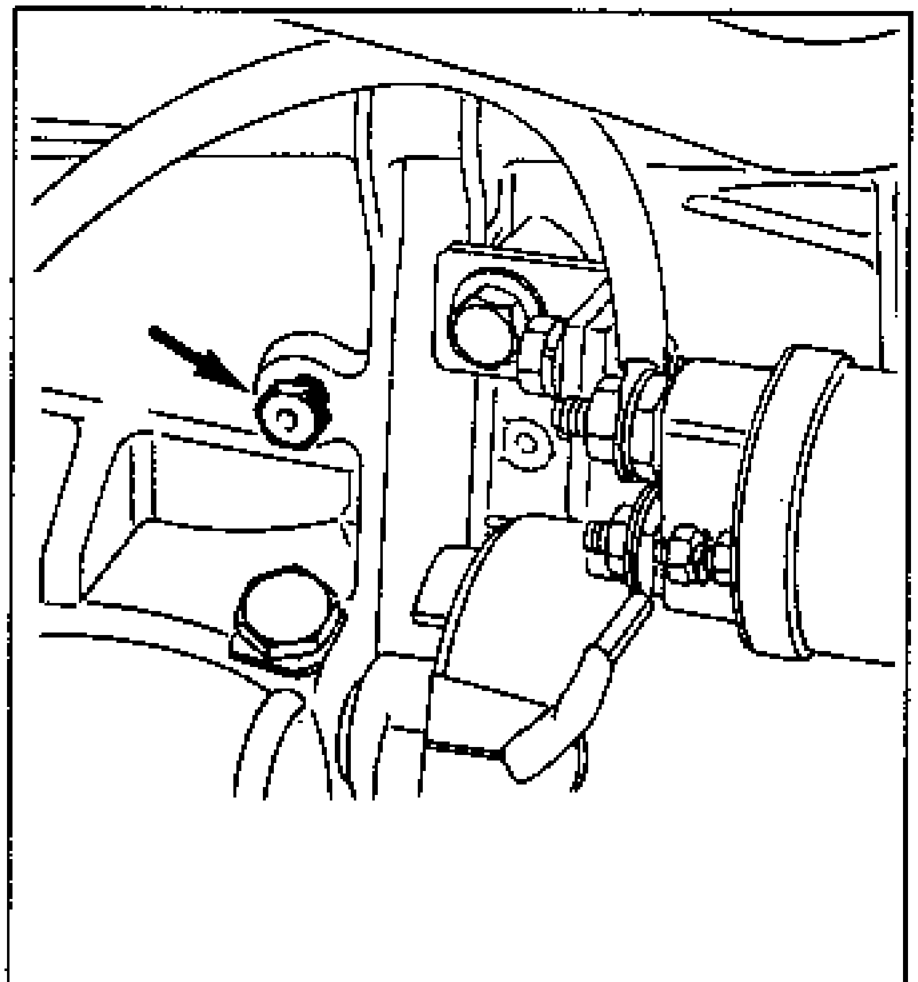
REPLACING THE CYLINDER HEAD GASKET

ESSENTIAL SPECIAL TOOLING		
Ele.	346-04	Belt tension checking tool
Mot.	251-01	Clock gauge support
Mot.	252-01	Thrust plate
Mot.	588	Liner clamps
Mot.	720	Cylinder head locating tool

CONSUMABLES
DECAPJOINT : Cleaning gasket faces

REMOVING

Drain the cooling circuit at the crankcase.



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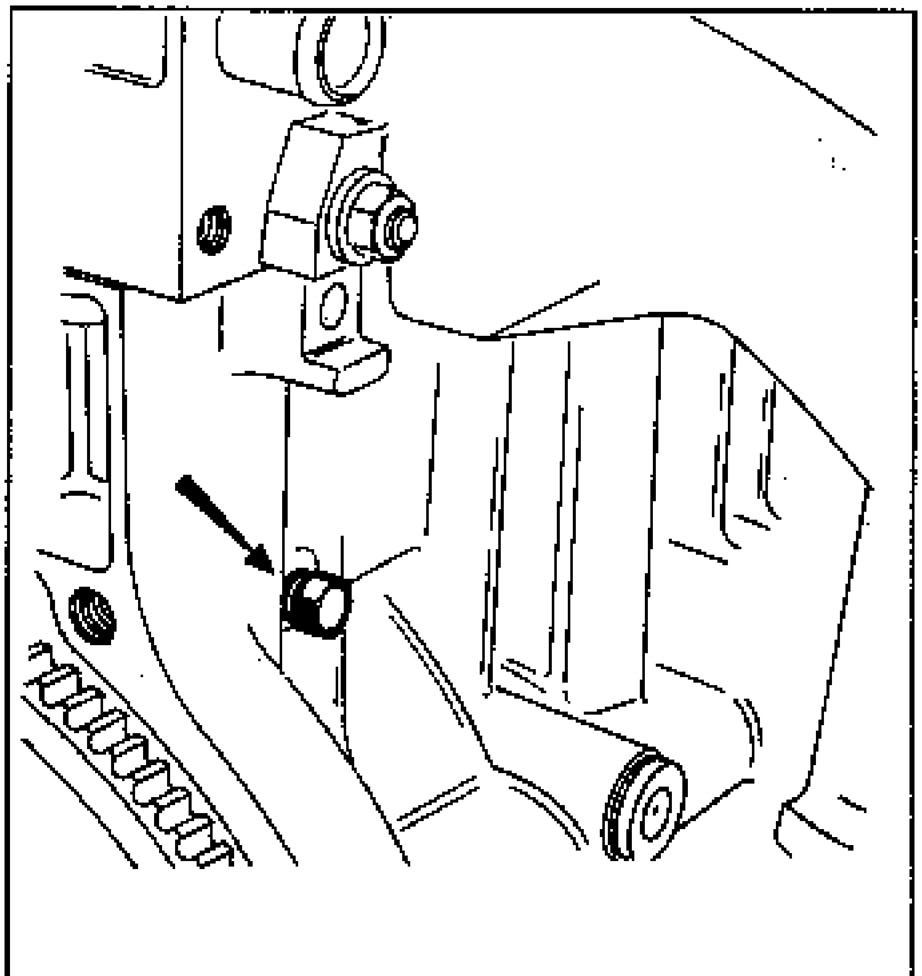

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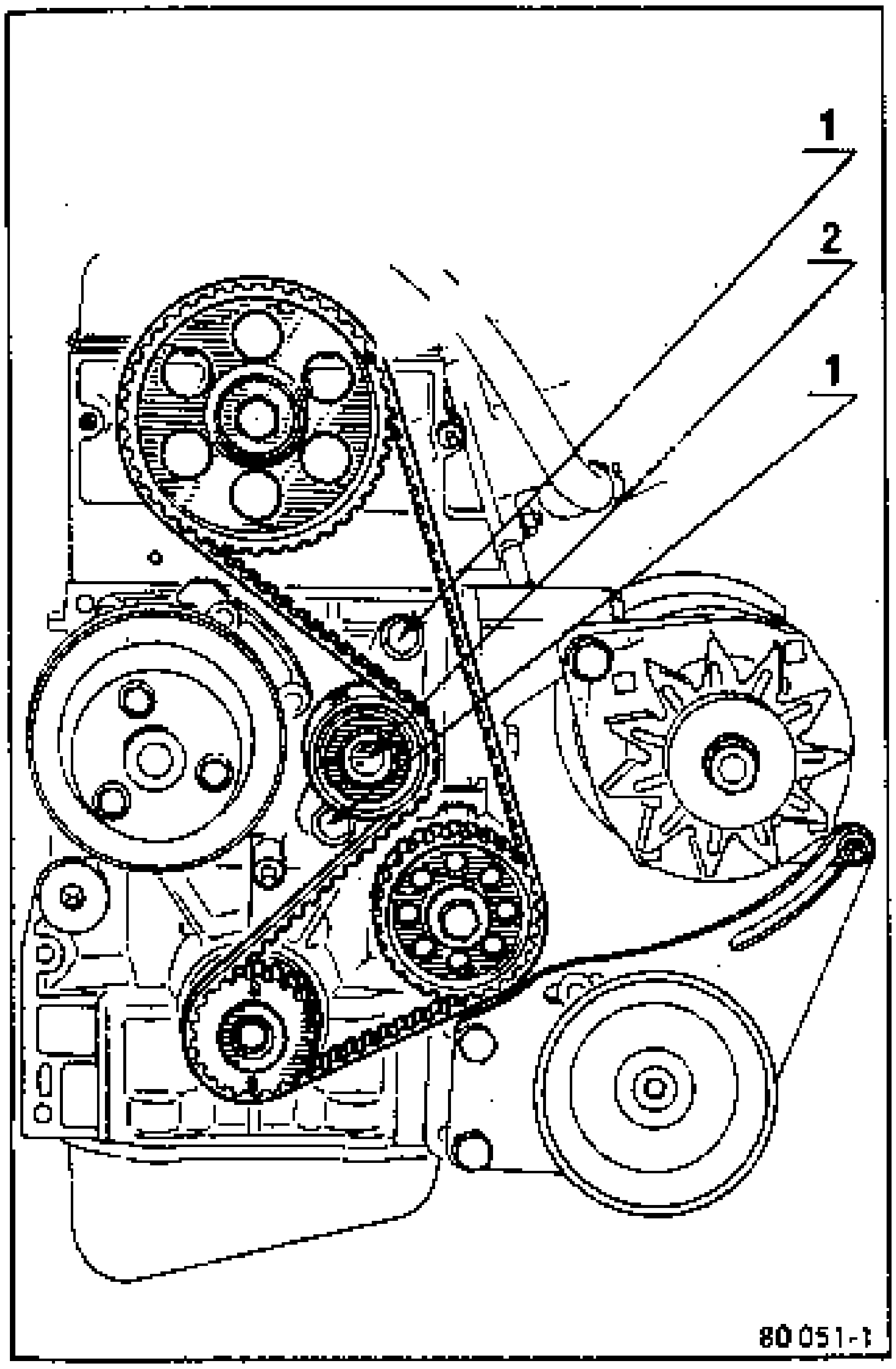
Remove the cylinder head ancillaries.

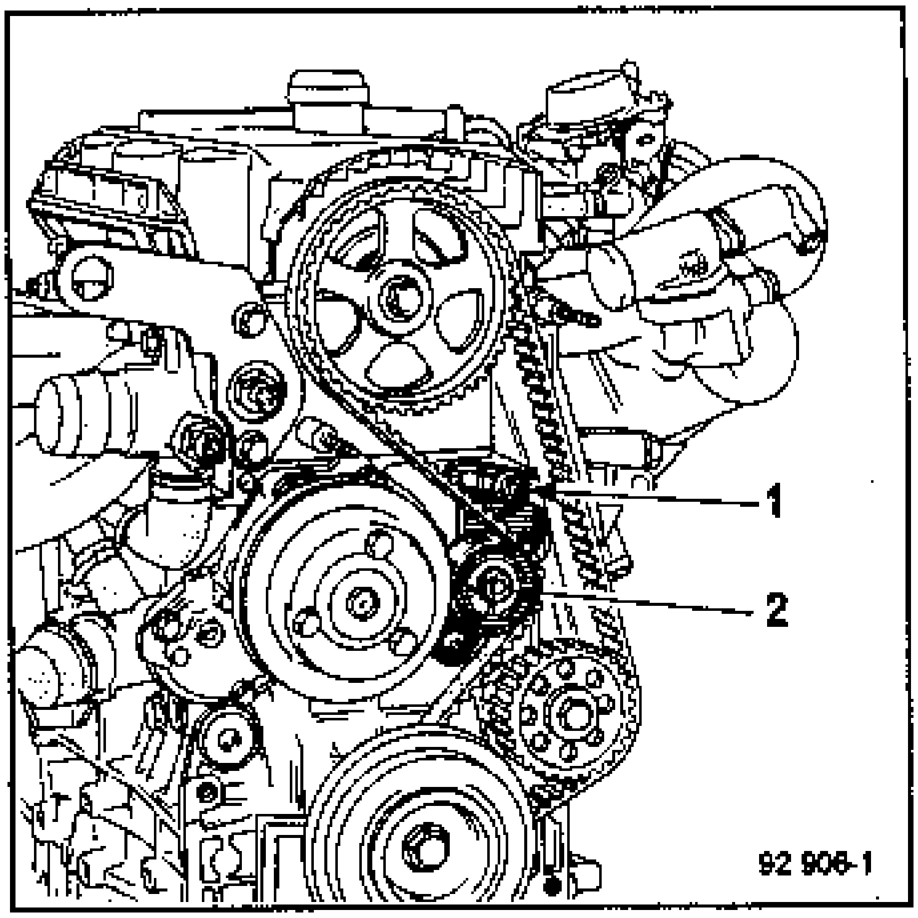
Remove the timing belt.

All types except J7R, 12-valve.



- Loosen the nuts (1).
- Release the tensioner (2).

J7R engine, 12-valve

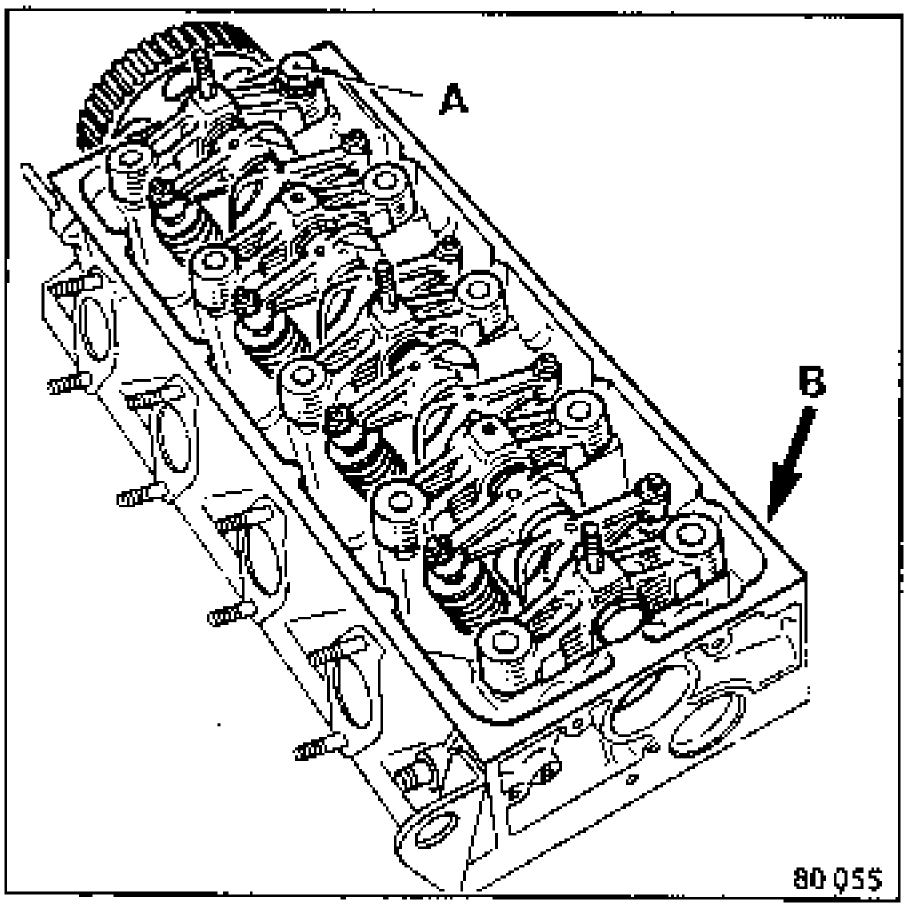


- Loosen nut (2), then (1).
- Release the tensioner.
- Turn the eccentric shaft.

Loosen the cylinder head bolts.

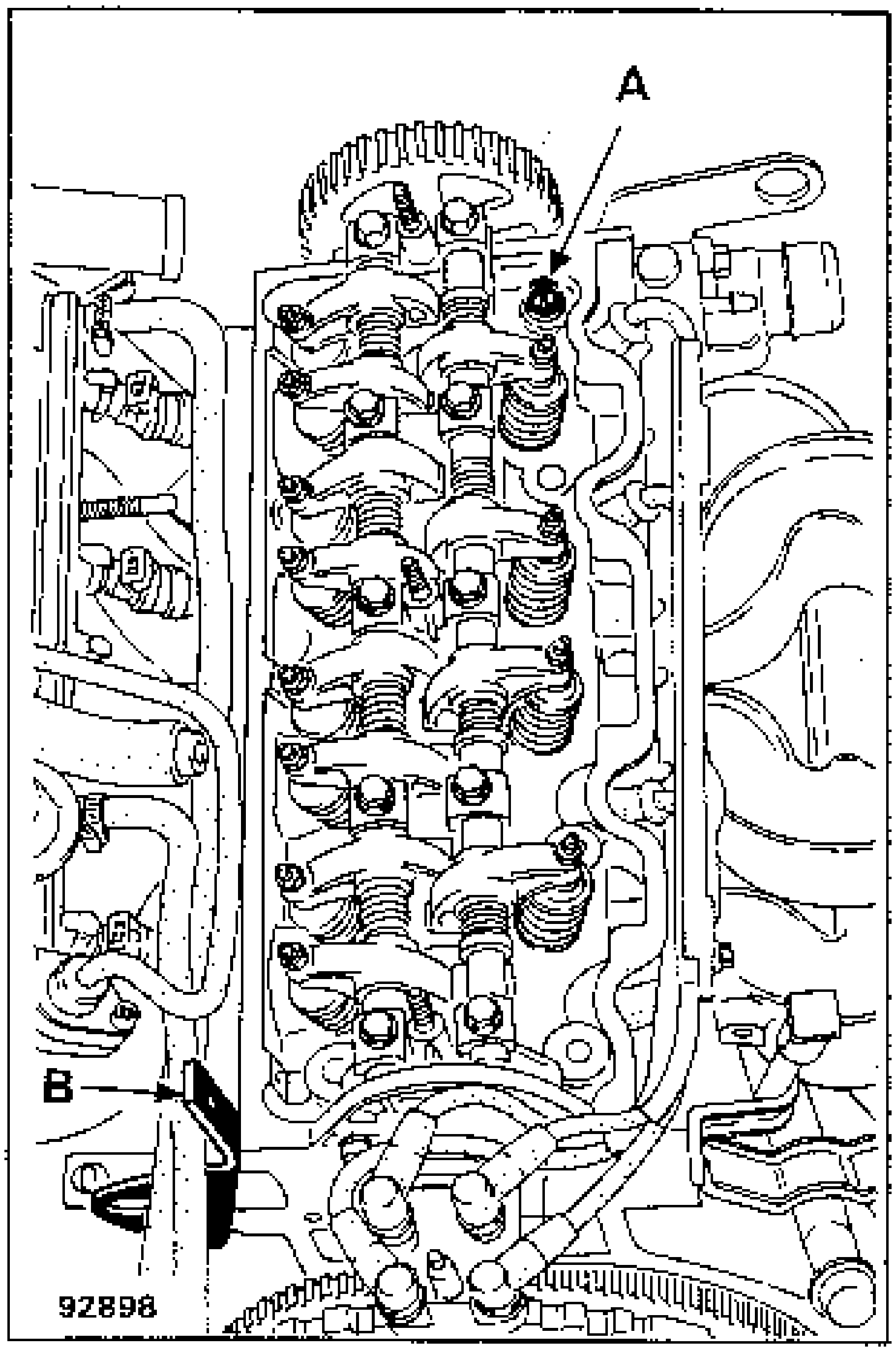
The cylinder head is located on the crankcase by a dowel at (A).

Remove all the cylinder head bolts except bolt (A), then pivot the cylinder head around this bolt by tapping at (B), using a wooden block.



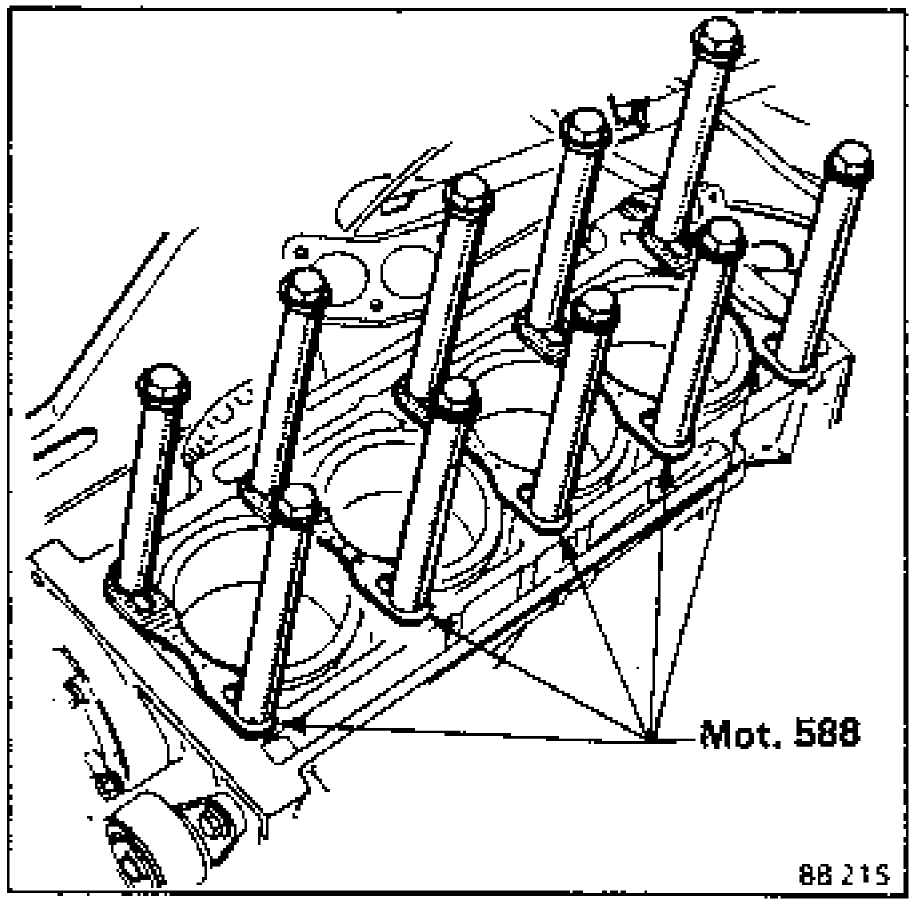
Remove the rocker arm assembly.

J7R Engine, 12-valve.



It is not necessary to remove the rocker arm assembly when replacing the cylinder head gasket alone.

When fitting liner retaining clamps **Mot. 588**, remove the cylinder head locating dowel.



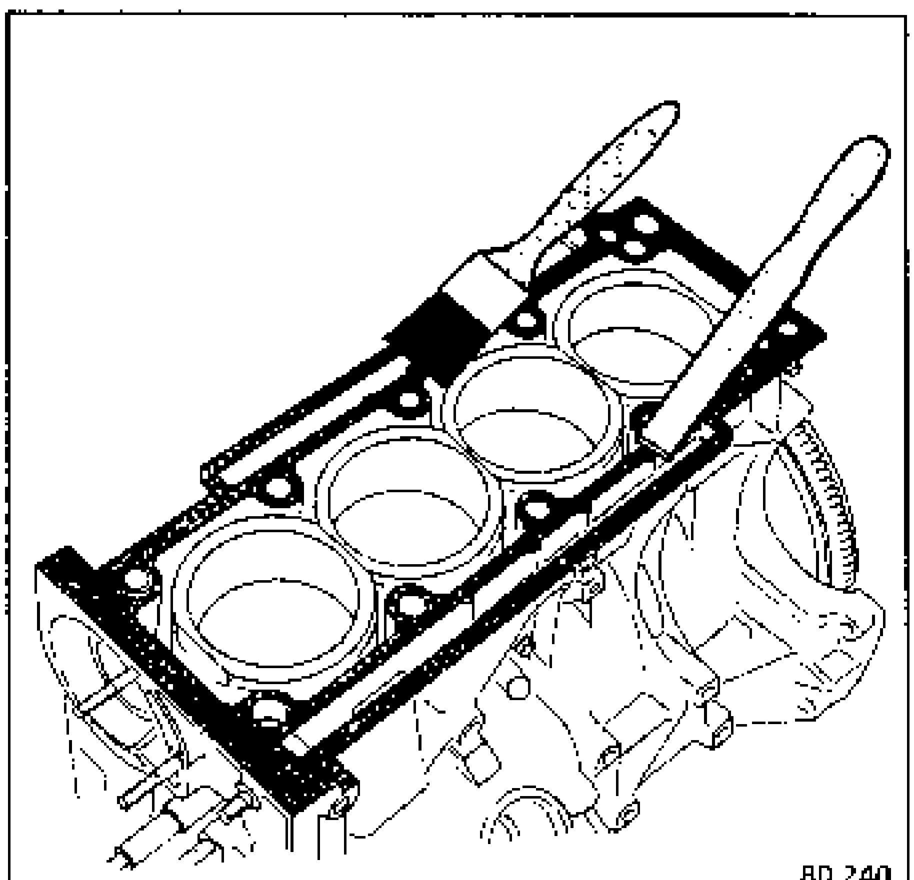
The liner protrusion is checked with the liner seals compressed. Position clamps **Mot. 588** in accordance with the drawing below.

CLEANING

It is very important not to scratch the gasket faces of aluminium parts.

Use **Decapjoint** for dissolving the part of the gasket which remains stuck

Apply the product to the part to be cleaned; wait approximately 10 minutes, then remove using a wooden spatula.



You are advised to wear gloves during this operation.

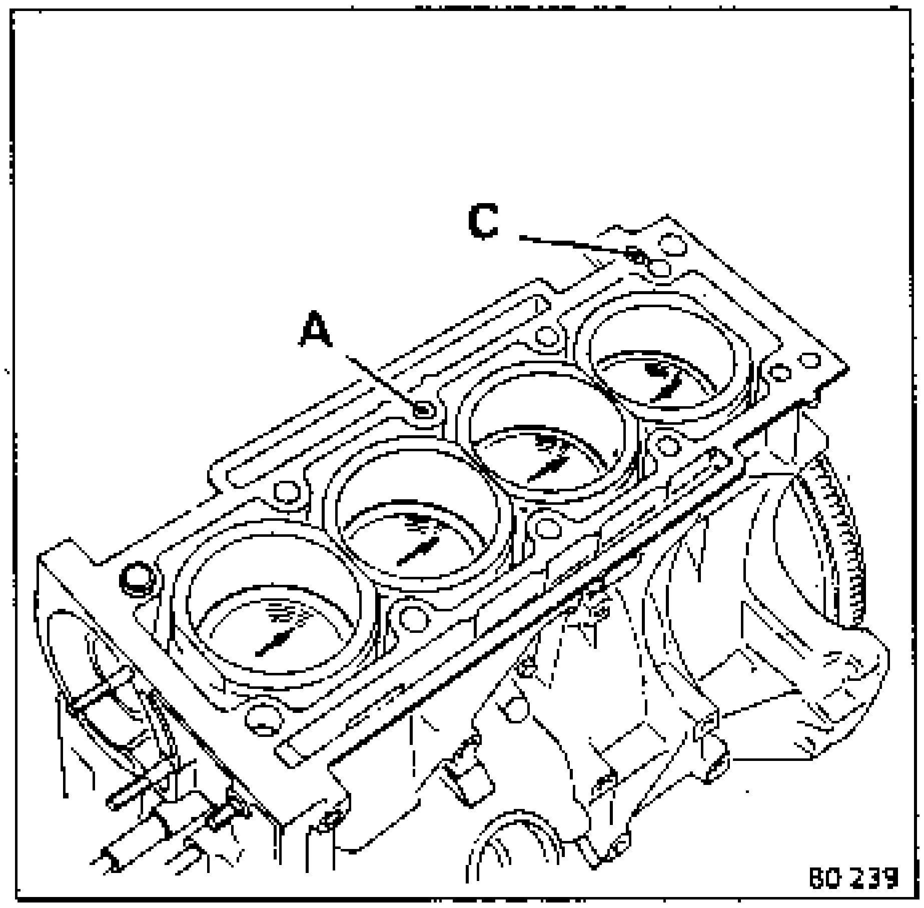
Do not allow product to drip onto the paintwork.

We would draw your attention to the care which should be taken over this operation so as to avoid foreign bodies entering the pressurised oil supply passage to the rocker arm assembly (passages located in both the crankcase and in the cylinder head).

If these instructions are not observed, the filter located in the rocker arm assembly or jets may become blocked, which would rapidly cause damage to the rocker arm cams and pads.

Using a syringe, remove the oil left in the cylinder head fixing holes, especially in the upwardsoil passage (C) (except J7R, 12-valve), (A) (for J7R 12-valve).

This is necessary in order to achieve the correct bolt tightness.

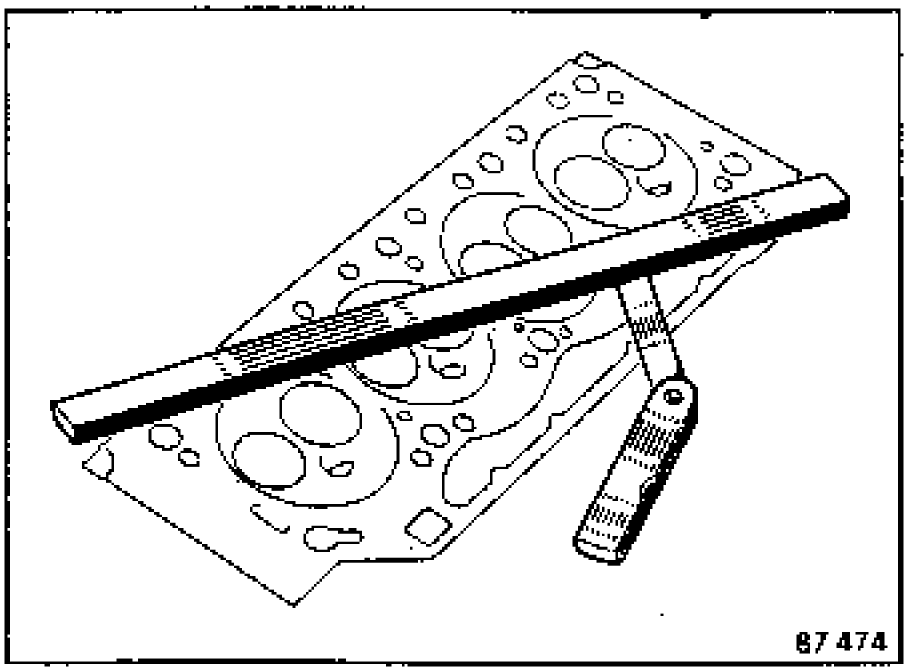


CHECKING THE GASKET FACE

Using a ruler and a set of feeler gauges, check whether the gasket face is distorted.

- Maximum distortion .... **0.05 mm**

Cylinder head machining is not permitted.



CHECKING LINER PROTRUSION

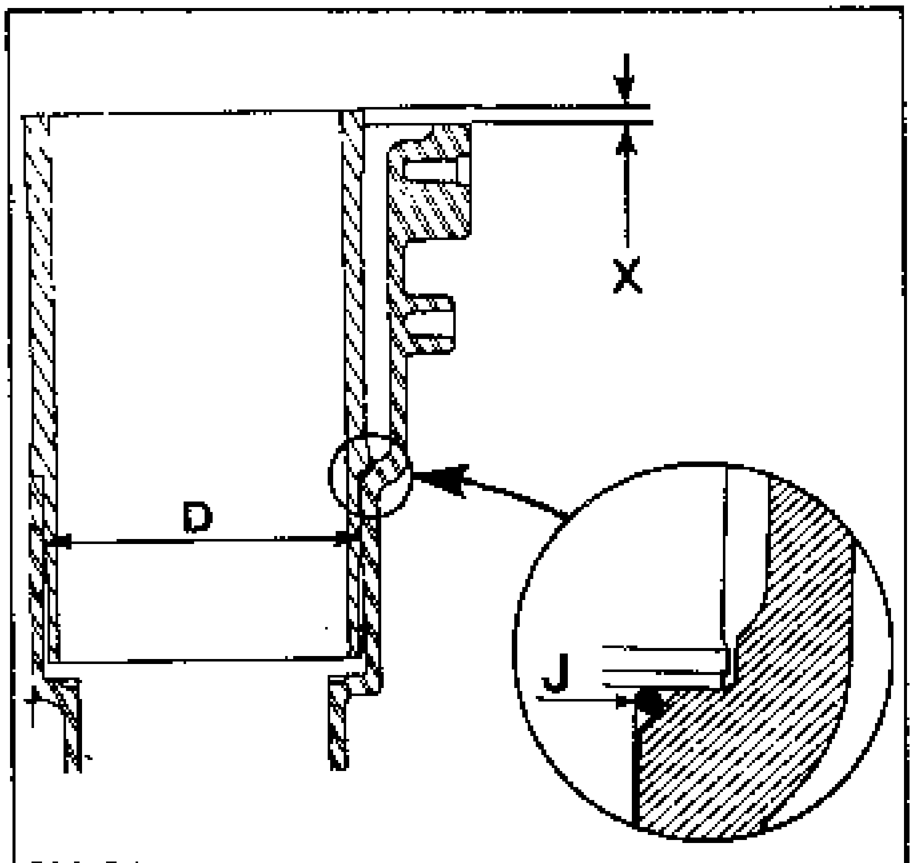
The O-rings (J) only provide a seal.

The liner rests directly on the cylinder housing and the liner protrusion is produced by the manufacturing clearances.

The protrusion (x) is measured with the liner compressed.

- Protrusion (x) (mm) .... **0.08 to 0.15**

Check the protrusion using tools **Mot. 251-01** and **Mot. 252-01**, with clamps **Mot. 588** in place.



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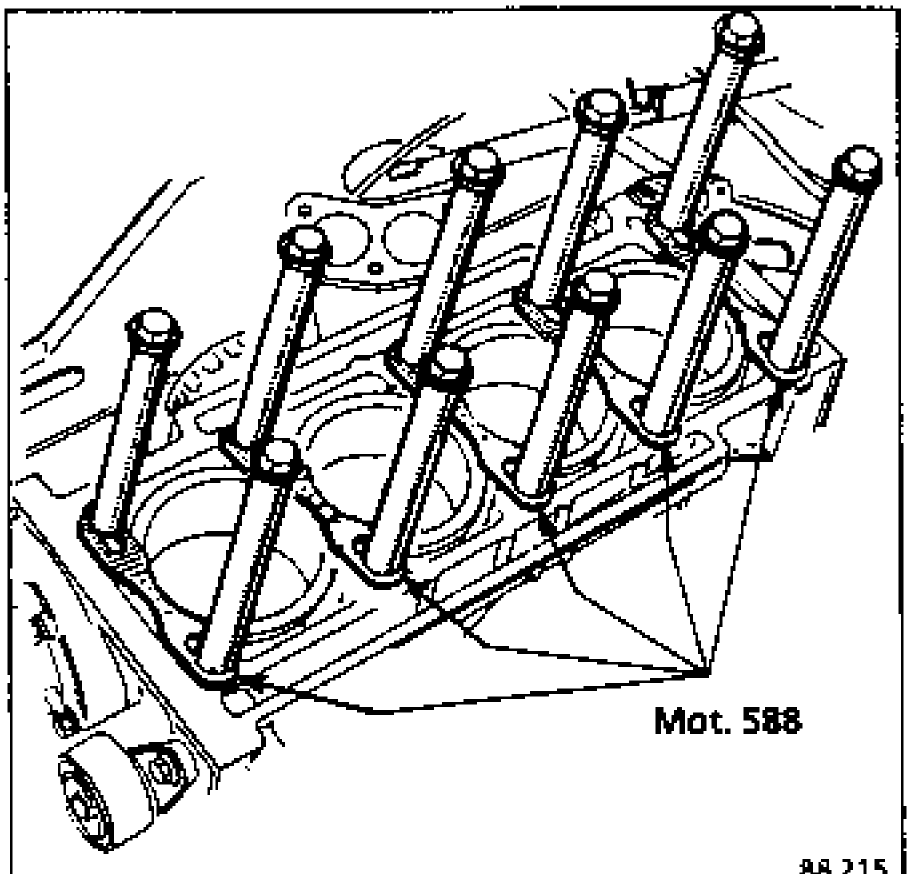
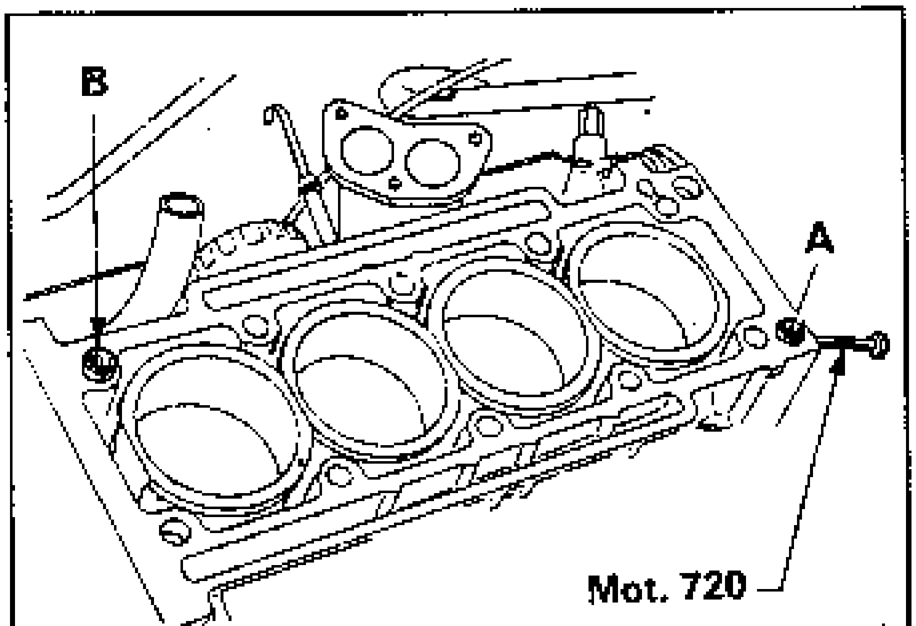


88 215

If the protrusion is incorrect, please refer to the Manual Mot. J (E).

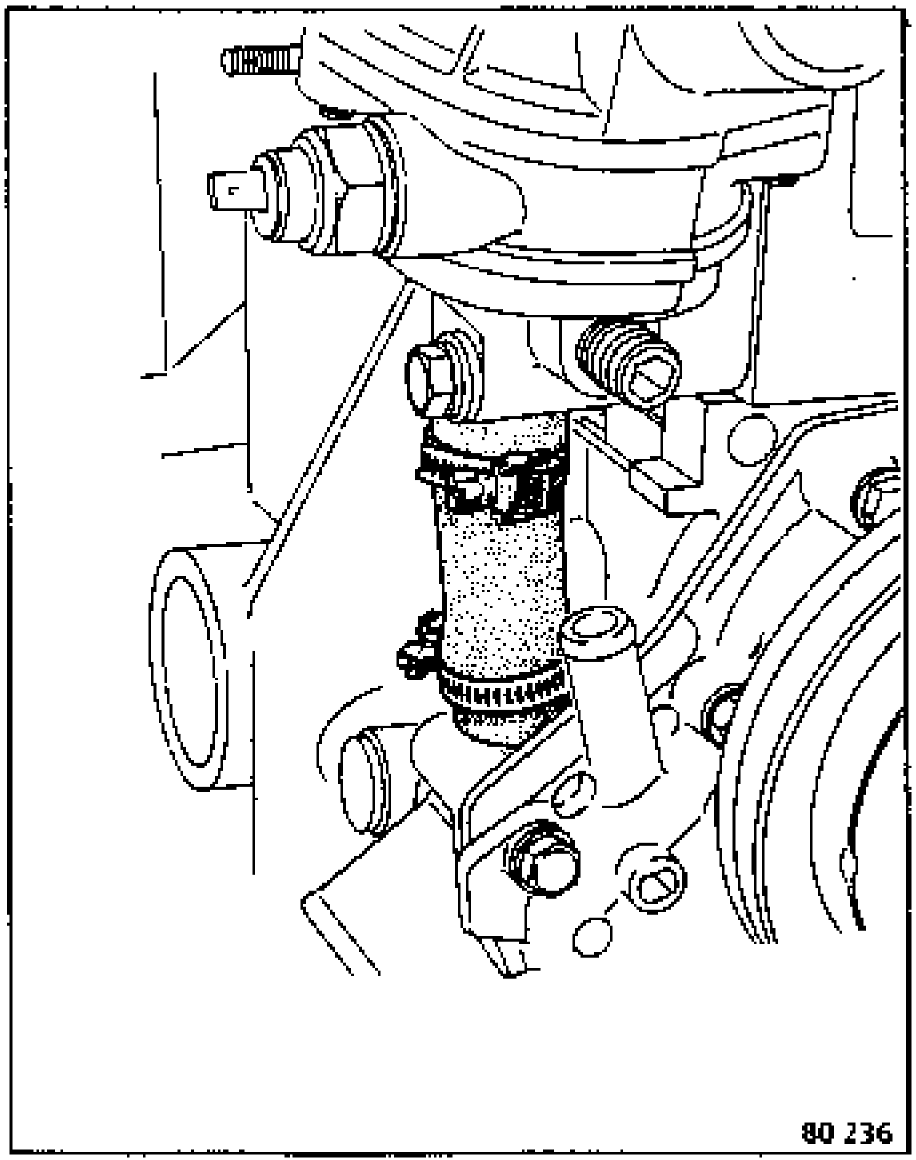
REFITTING

To locate the cylinder head and its gasket, use the locating dowel **(B)** on the crankcase and position tool **Mot. 720** at **(A)**.



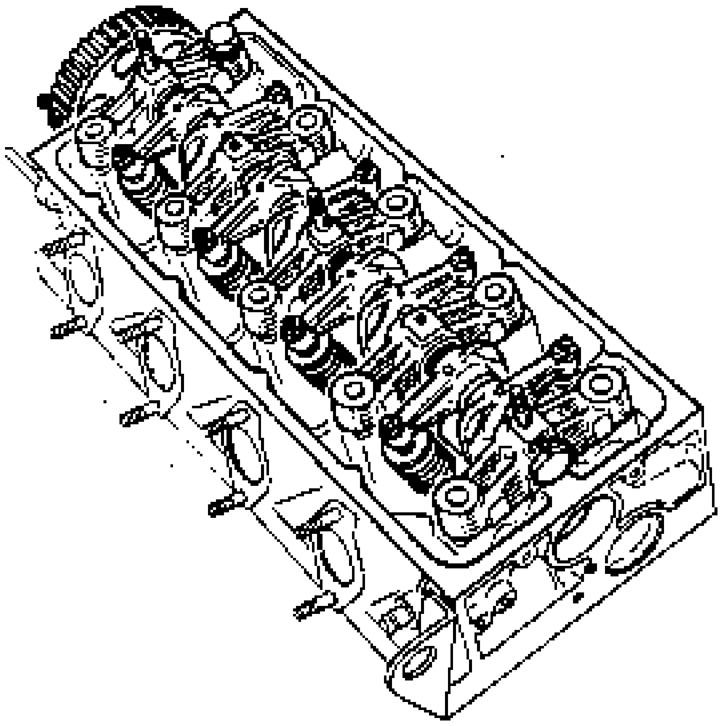
80 052

When refitting the cylinder head, fit the hose located between the water intake and output pipes.


80 236

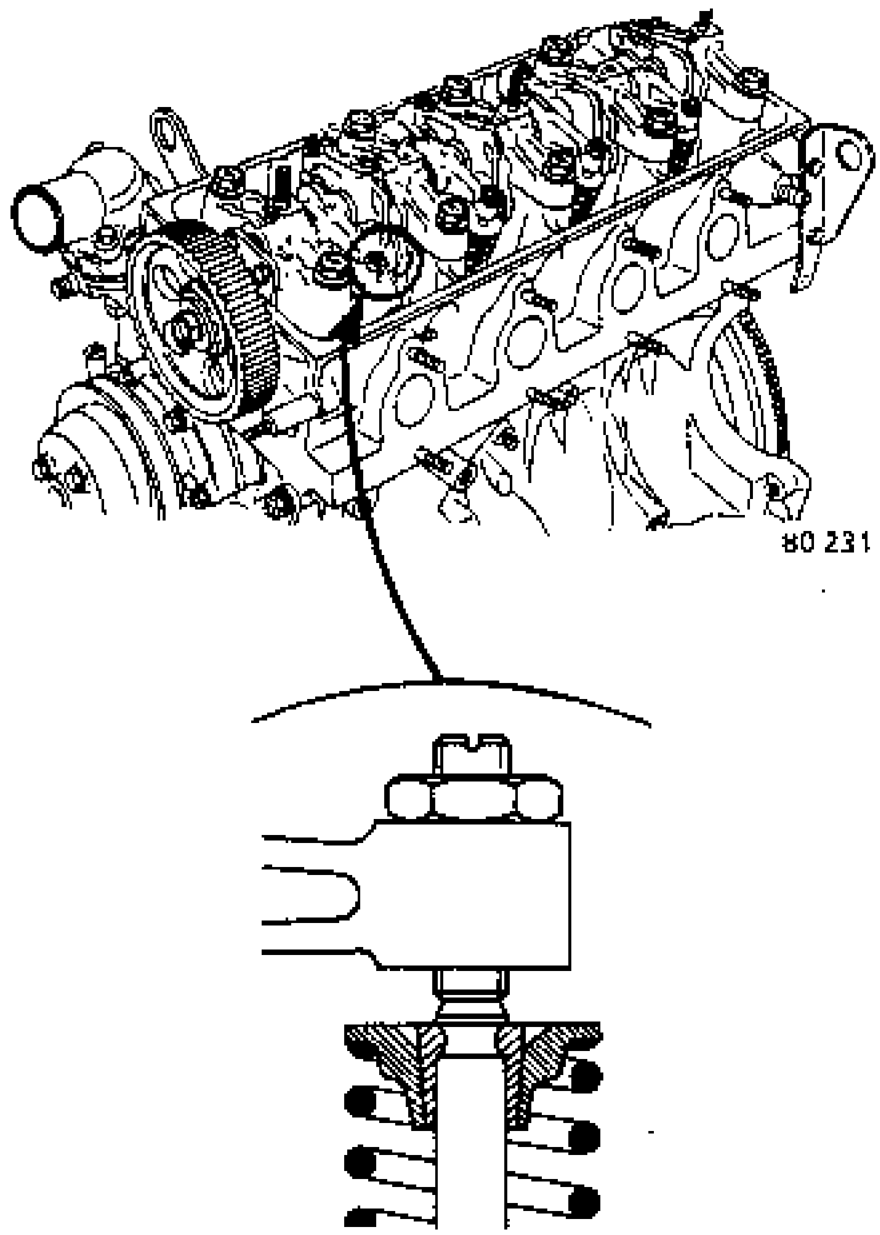
All types except J7R 12-valve

Refit the rocker arm assembly and the cylinder head bolts.



80 054

When tightening the cylinder head bolts, make sure that the rocker arm pads are resting correctly against the valve stems (there is a risk of forcing and bending the valve stem).



80 231

86 330

All types

For tightening the cylinder head bolts (please see the following pages, "tightening-retightening").

Refit the rocker cover and the ancillaries.

Refit the crankcase drainage plug.

Do not forget to remove tool **Mot. 720**.

Set the timing (see chapter entitled "Timing belt").

TIGHTENING-RETIGHTENING

The cylinder head is not tightened nor is the valve clearance adjusted during "Maintenance and Checking" between 600 and 1800 miles (1000 and 3000 km).

CYLINDER HEAD TIGHTENING (in daNm)

- Pretightening 5
- Tightening 8
- Loosen 1/2 revolution
  and tighten .... 8.75 to 9.75 daNm

CYLINDER HEAD RETIGHTENING

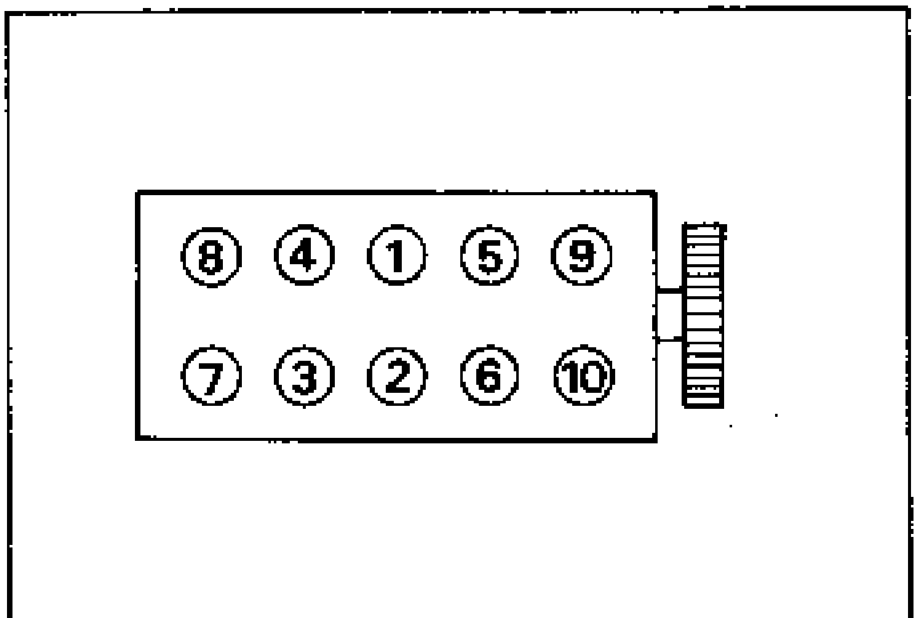
This operation is carried out with the engine cold.

Let the engine run for 20 minutes, allow it to cool for a minimum of 2 1/2 hours and retighten.

Loosen bolt n° 1 by 1/2 revolution.

- Tightening .... 8.75 to 9.75 daNm

Proceed in the same way for the other bolts, following the recommended order.



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TIGHTENING-RETIGHTENING

ESSENTIAL SPECIAL TOOLING		
Dowel	Torx 14	(Dir. 980)
Mot.	591-04	Angle wrench for tightening cylinder head

The cylinder head is not tightened nor is the valve clearance adjusted during "Maintenance and Checking" between 600 and 1800 miles (1000 and 3000 km).

CYLINDER HEAD TIGHTENING METHOD

a) Precompressing the gasket:

Tightening all the bolts to **2 daNm** in the order given opposite.

b) Cylinder head tightening:

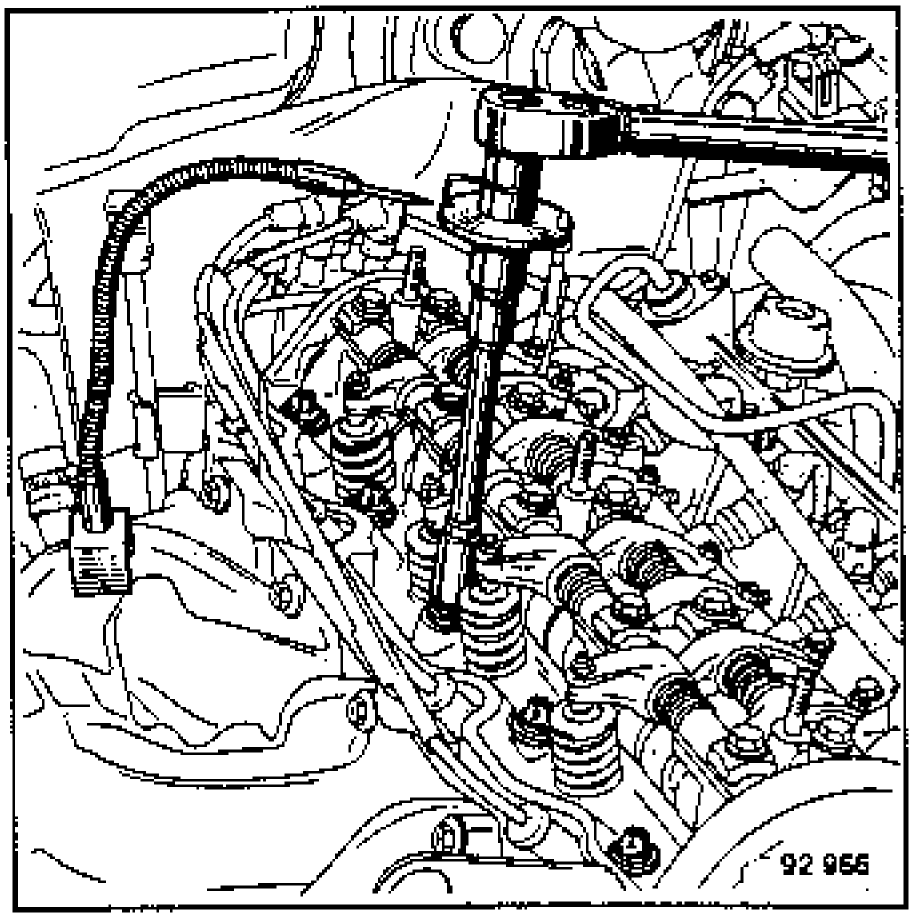
Turn through 93 ° in the order given opposite (using **Mot. 591-04**).

Turn again through 93 ° in the order given opposite.

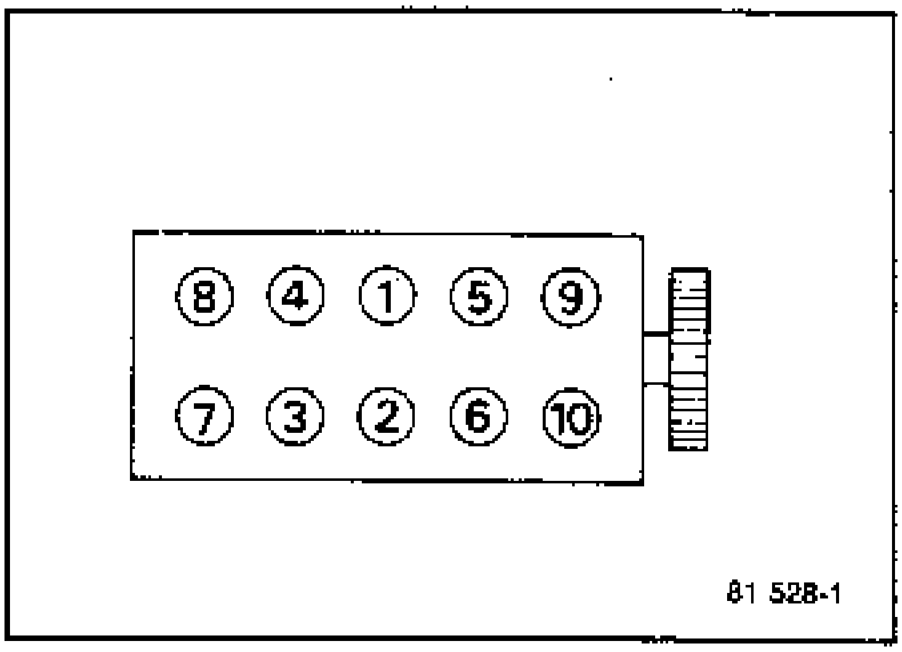
Let the engine run for **15 minutes**.

Finish tightening by turning through 20 °.

Angle wrench for tightening cylinder head with its index probe.



Tightening sequence



REPLACING THE CYLINDER HEAD GASKET

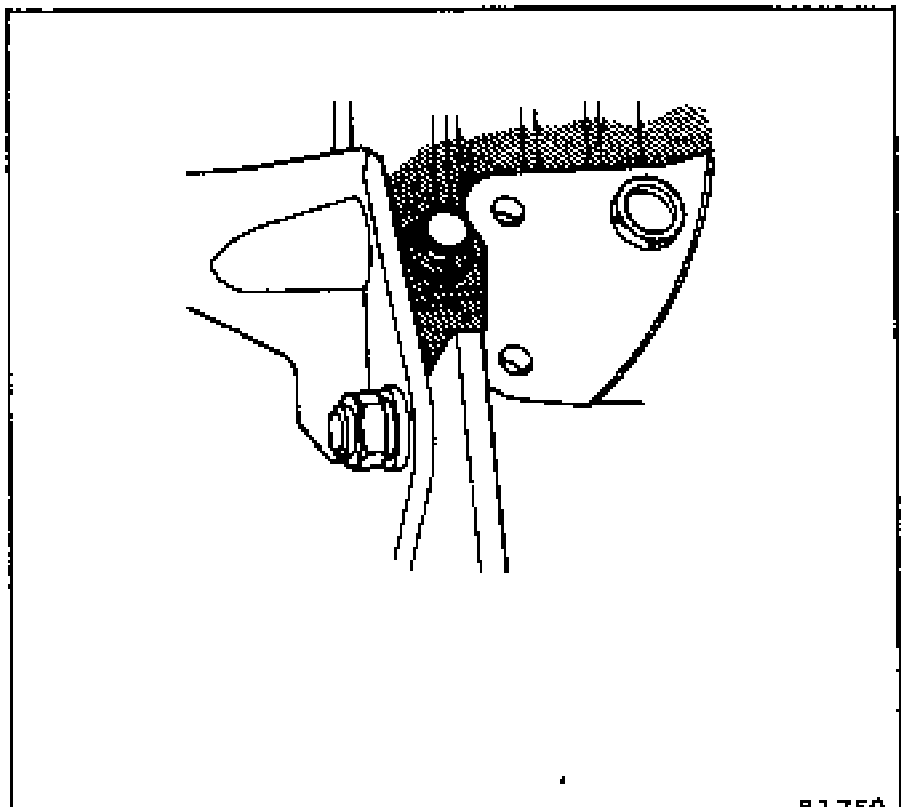
ESSENTIAL SPECIAL TOOLING		
Ele.	346-04	Belt tension checking tool
Mot.	251-01	Clock gauge support
Mot.	252-01	Thrust plate
Mot.	588	Liner clamps
Mot.	720	Cylinder head locating tool
Mot.	799	Sprocket locking tool for toothed timing belt
Mot.	854	Injection pump sprocket locking tool
Mot.	861	TDC rod

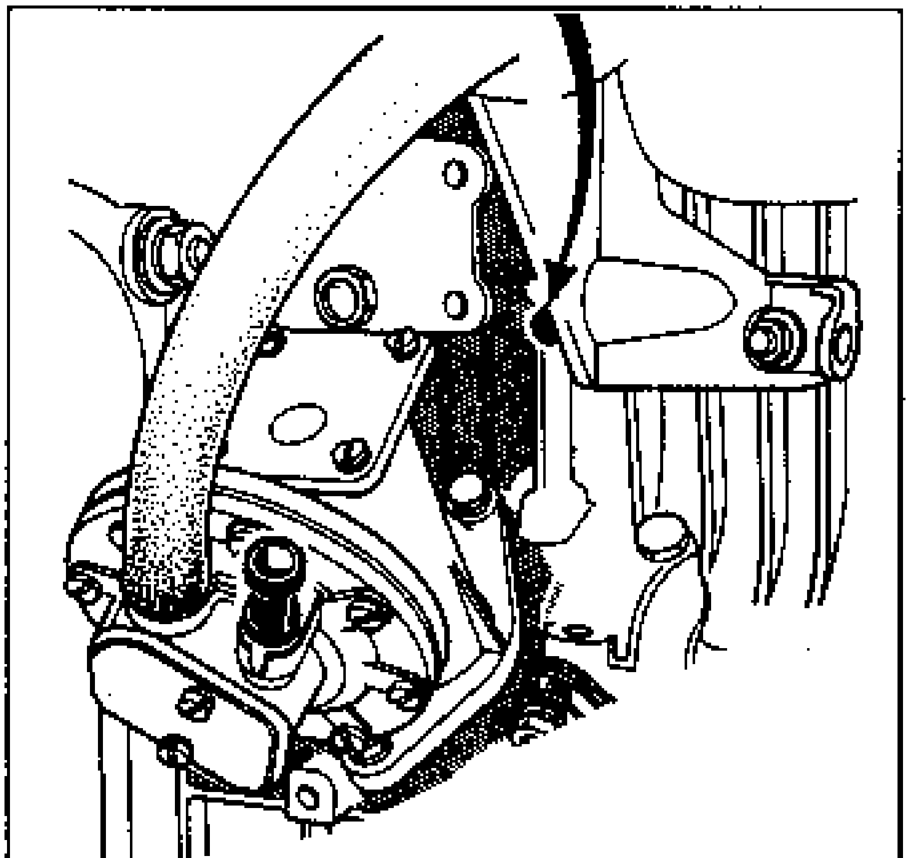
CONSUMABLES
DECAPJOINT : Cleaning the gasket faces

REMOVING

Drain:

- the engine oil (if necessary);
- the coolant.


82 750

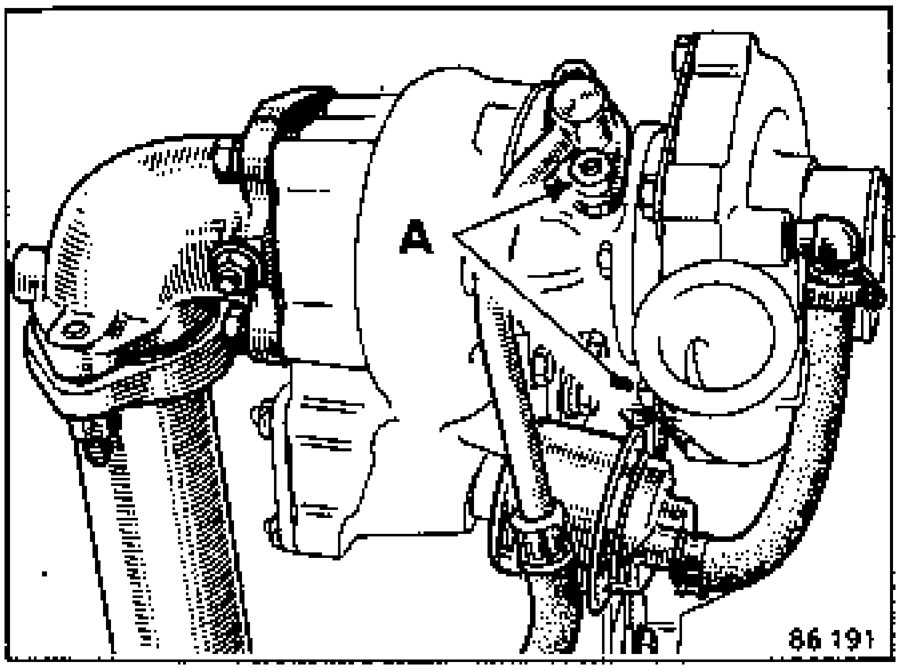

82 751

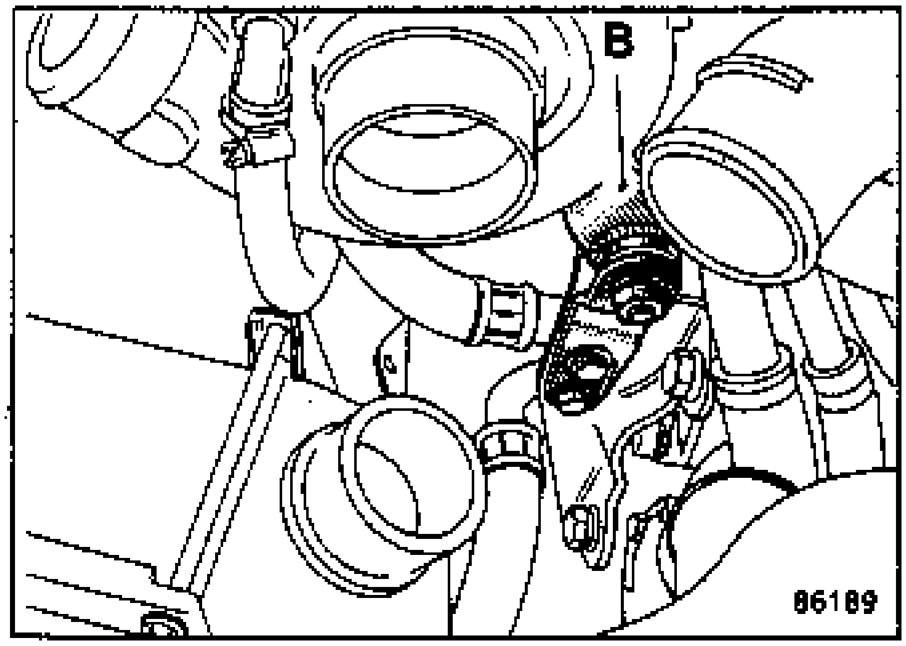
Remove the cylinder head accessories.

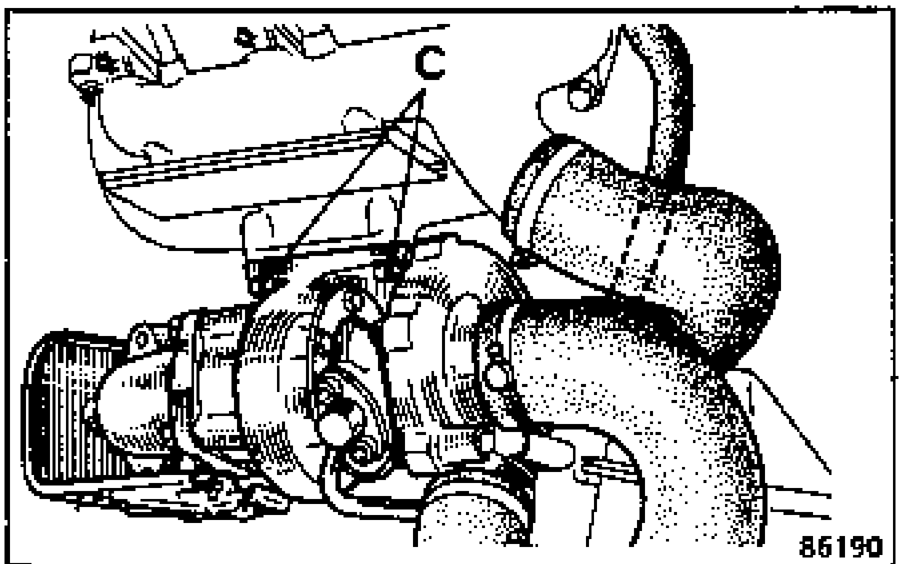
For turbo engines, the turbocharger must be removed.

Remove:

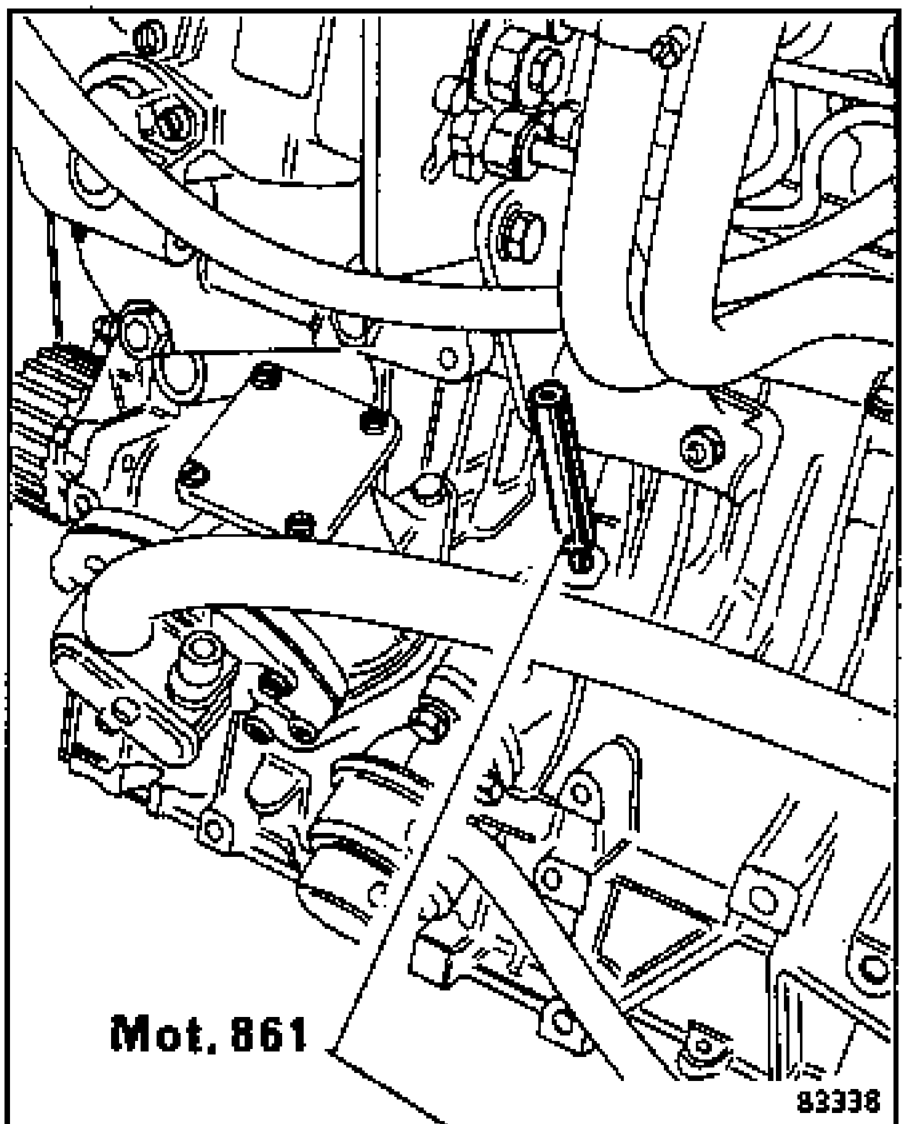
- the oil supply and return ducting (A);
- the support bracket (B)
- the turbocharger fixing bolt (C).

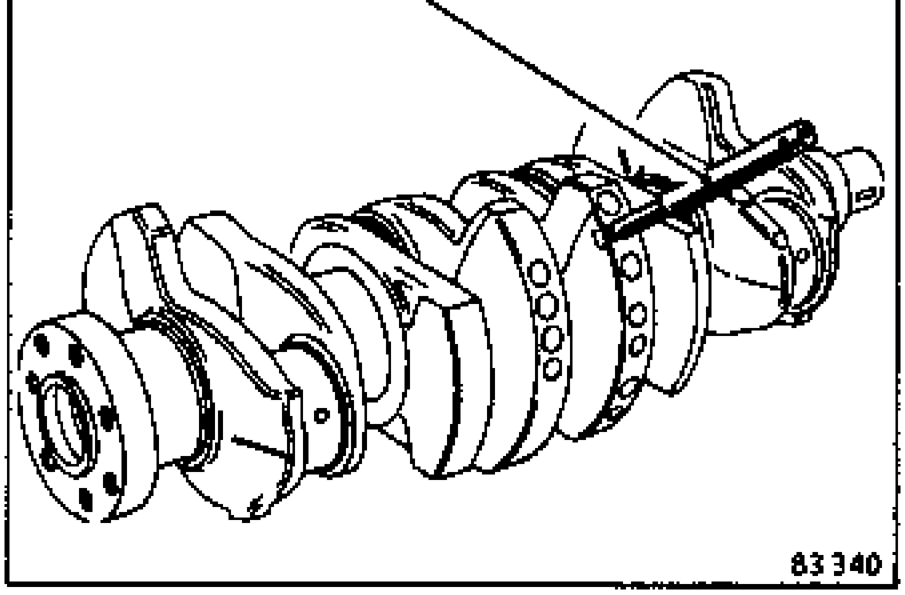




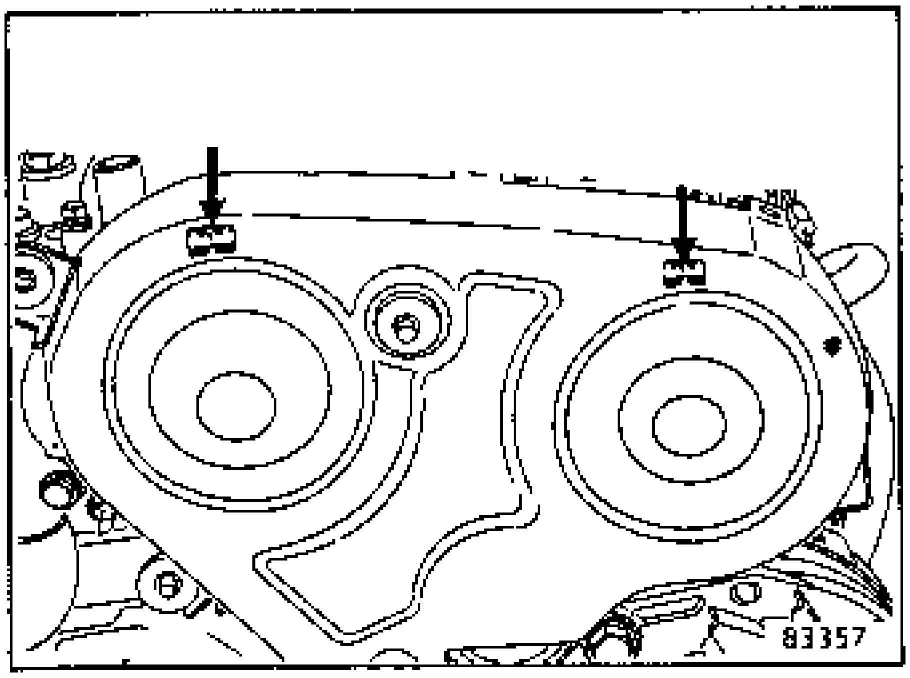


Turn the crankshaft in order to fit the TDC rod **Mot .861 (be careful not to insert it into a balance hole and check by rotation forwards and backwards that the crankshaft is not turning).**





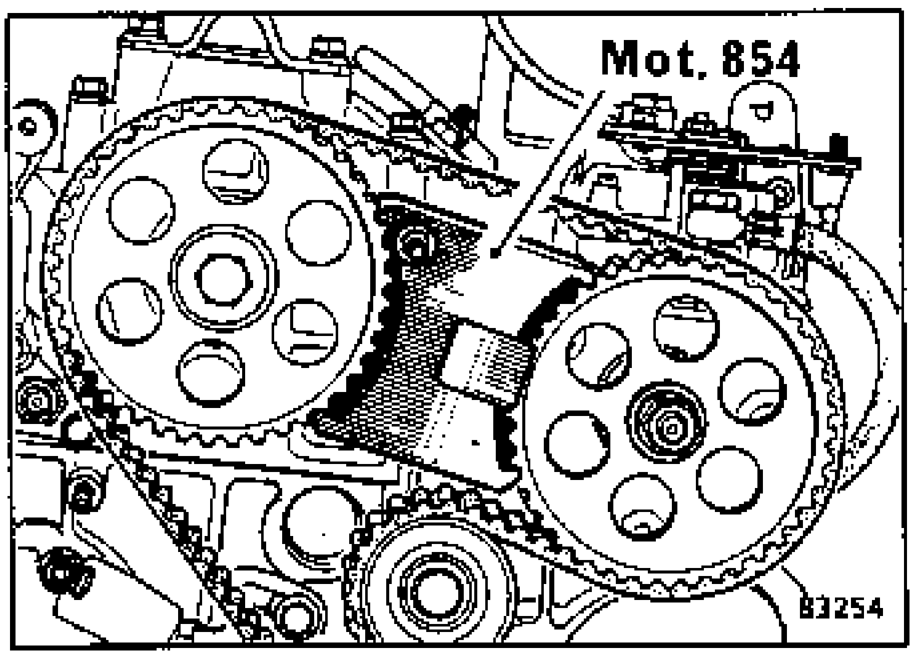
Check the setting of the camshaft and injection pump sprockets.



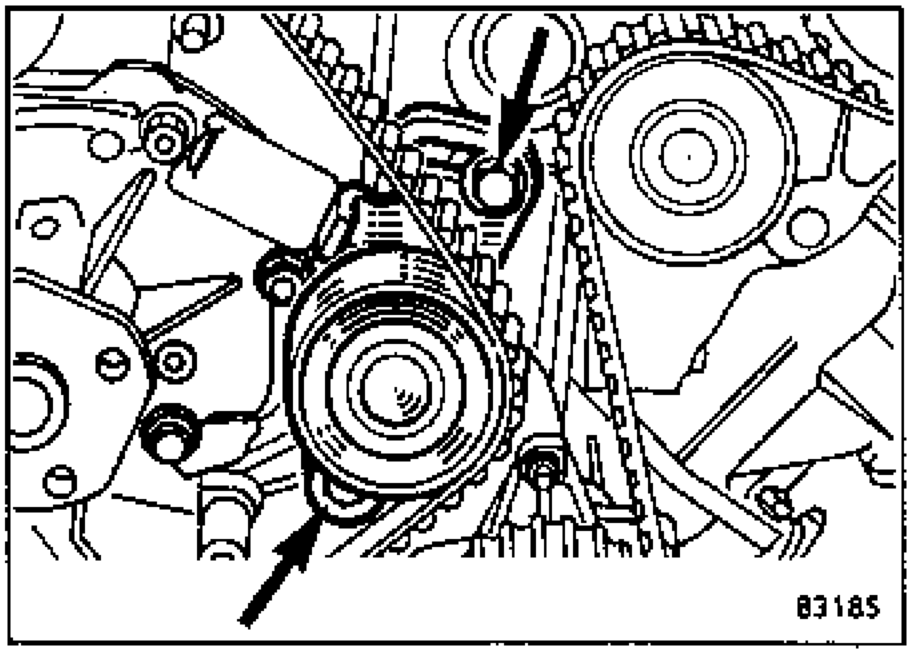
Remove the timing housing.

In order not to move the camshaft and injection pump sprockets, position locking tool **Mot. 854** between them, only when replacing:

- the timing belt alone;
- the power-assisted steering belt (located between the cylinder housing and the toothed belt);
- the intermediate shaft.



Slacken the timing belt by releasing the tensioner after having loosened and retightened the tensioner fixing screws, in the slack position.

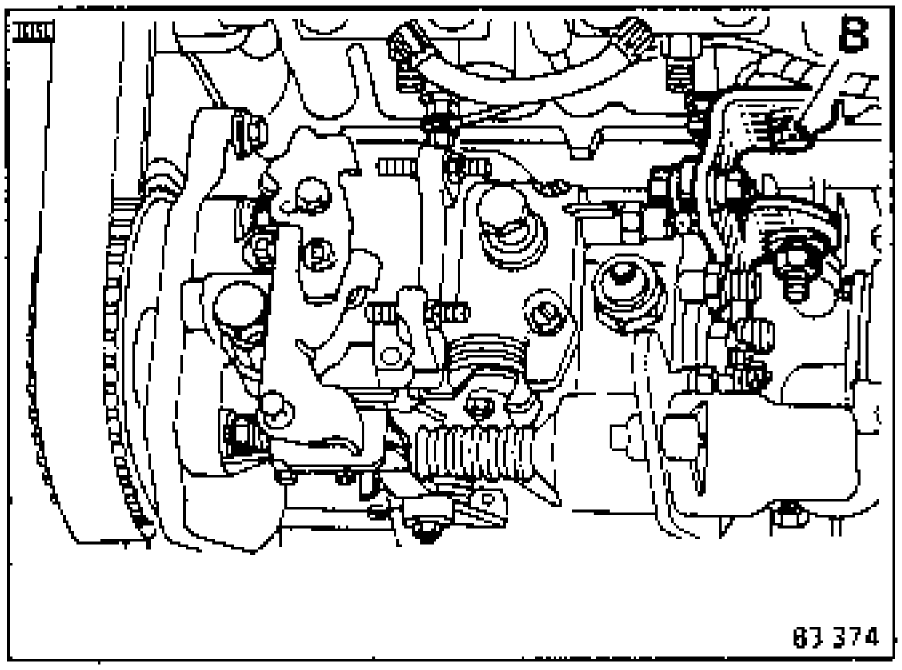


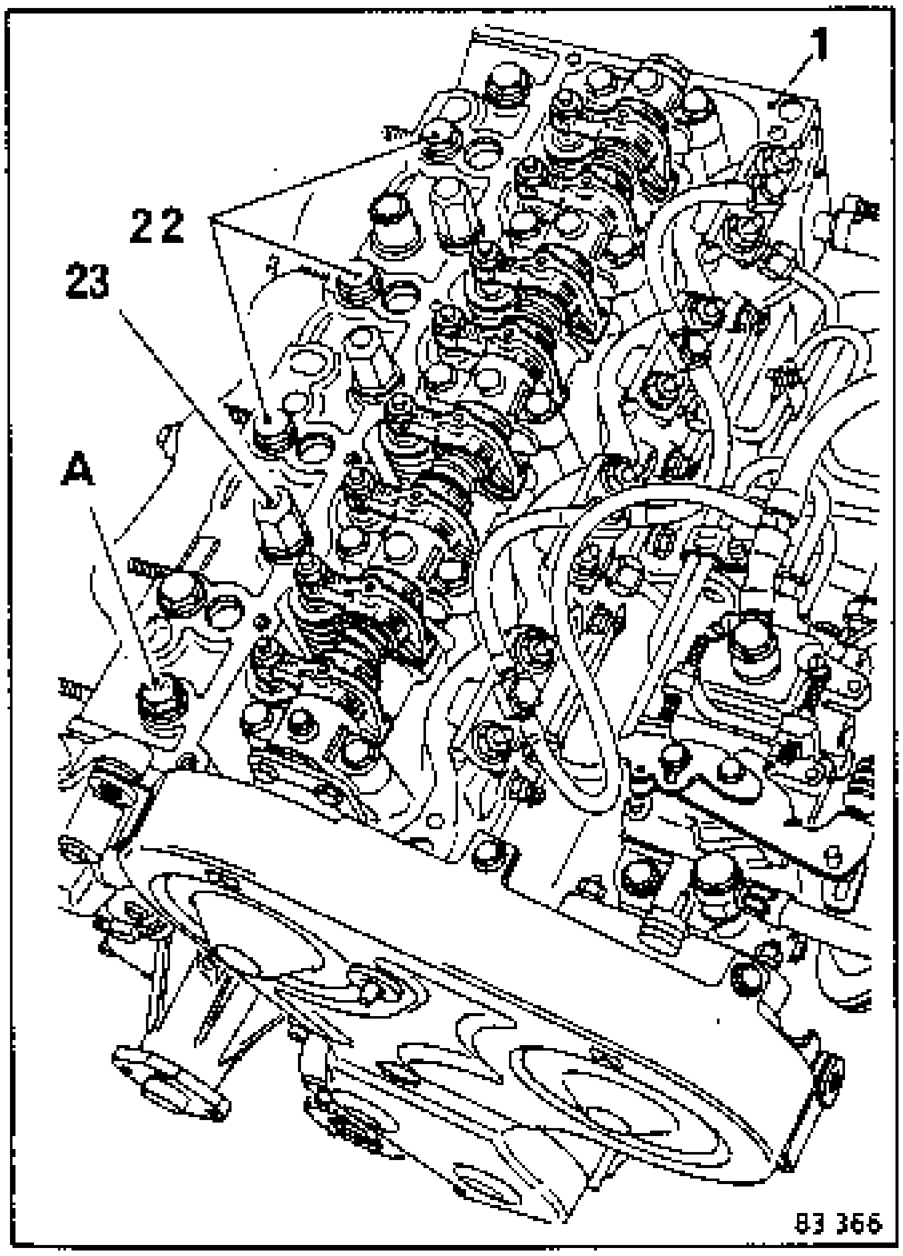
Remove the timing belt.

Remove the rocker cover:

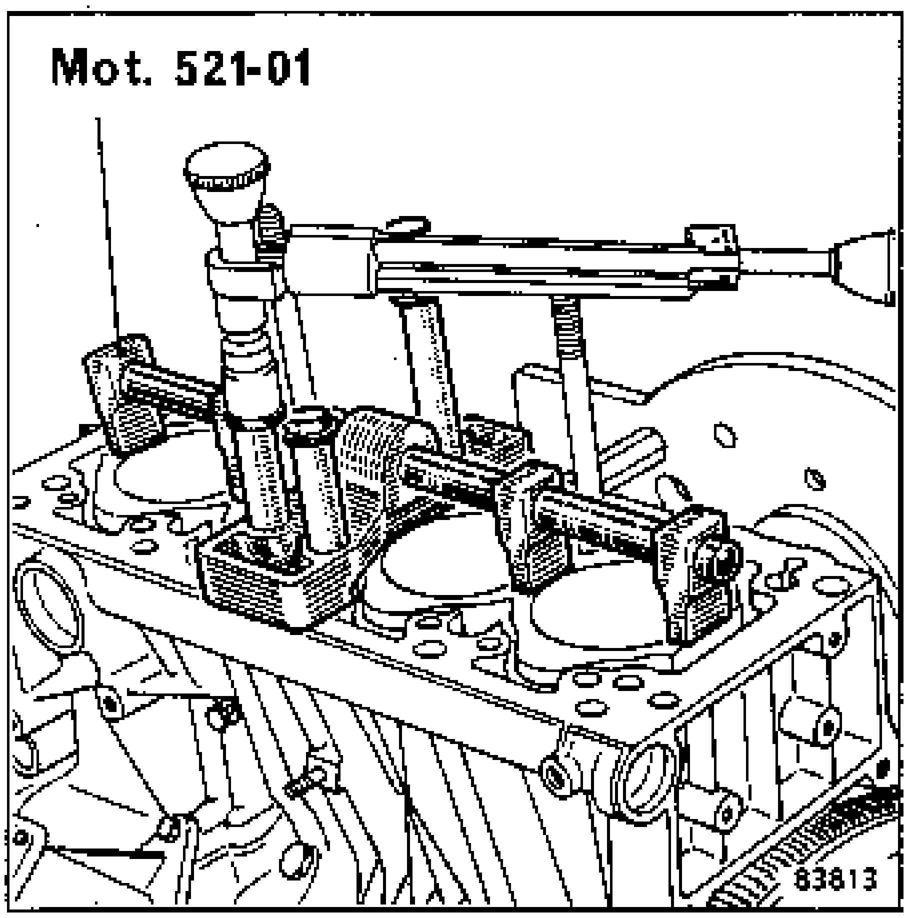
- the cylinder head (1) fixing bolts (22) and nuts (23) except bolt (A) (located beside the locating dowel) which will be loosened and left in place;

- the fixing bolt (B) of the injection pump on the cylinder head.





Use a wooden block to hit the cylinder head in order to dislodge it from its gasket face **within the limit of the clearance between the cylinder head and the studs**. Since the cylinder head gasket is stuck to the cylinder head, the crankcase and the liners, it is very important not to raise the cylinder head, which would cause the liners to come unstuck from their base and allow foreign bodies to enter.



CLEANING

It is very important not to scratch the gasket faces of aluminium parts.

Use Decapjoint to dissolve the part of the gasket which remains stuck.

Apply the product to the part to be cleaned; wait approximately ten minutes, then remove using a wooden spatula.

You are advised to wear gloves during this operation.

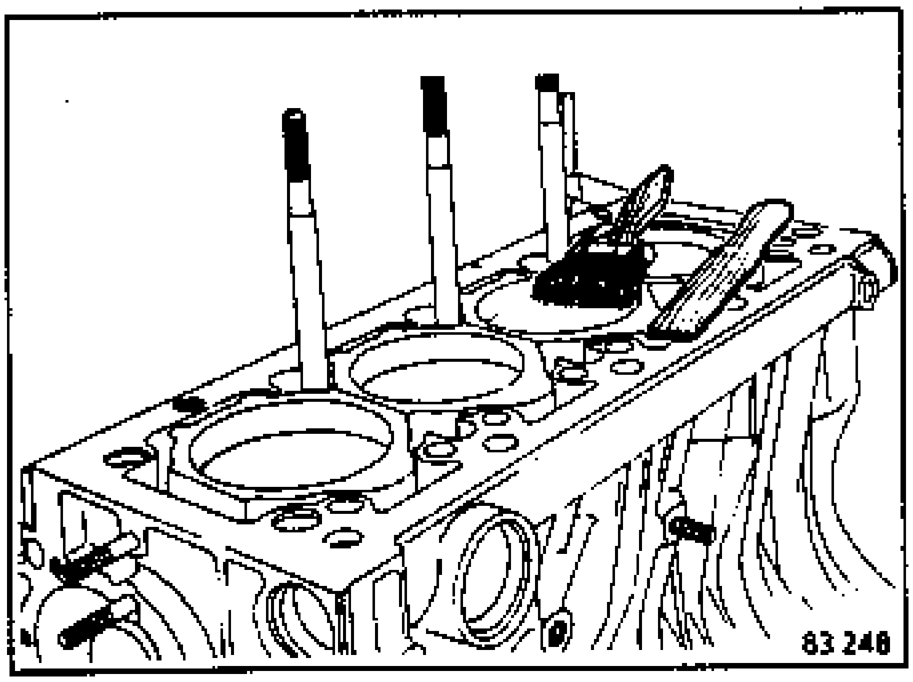
Do not allow the product to drip onto paintwork.

We would draw your attention to the care which should be taken over this operation so as to avoid foreign bodies entering the pressurised oil supply passage to the rocker arm assembly (passages located in both the crankcase and in the cylinder head).

If these instructions are not observed, the filter located in the rocker arm assembly or jets may become blocked, which would rapidly cause damage to the rocker arm cams and pads.

Using a syringe, remove the oil left in the cylinder head fixing holes, especially in the upwards?? oil passage holes which take hollow hexagonal fixing bolts.

This is necessary to obtain the correct bolt tightening.



REMOVING

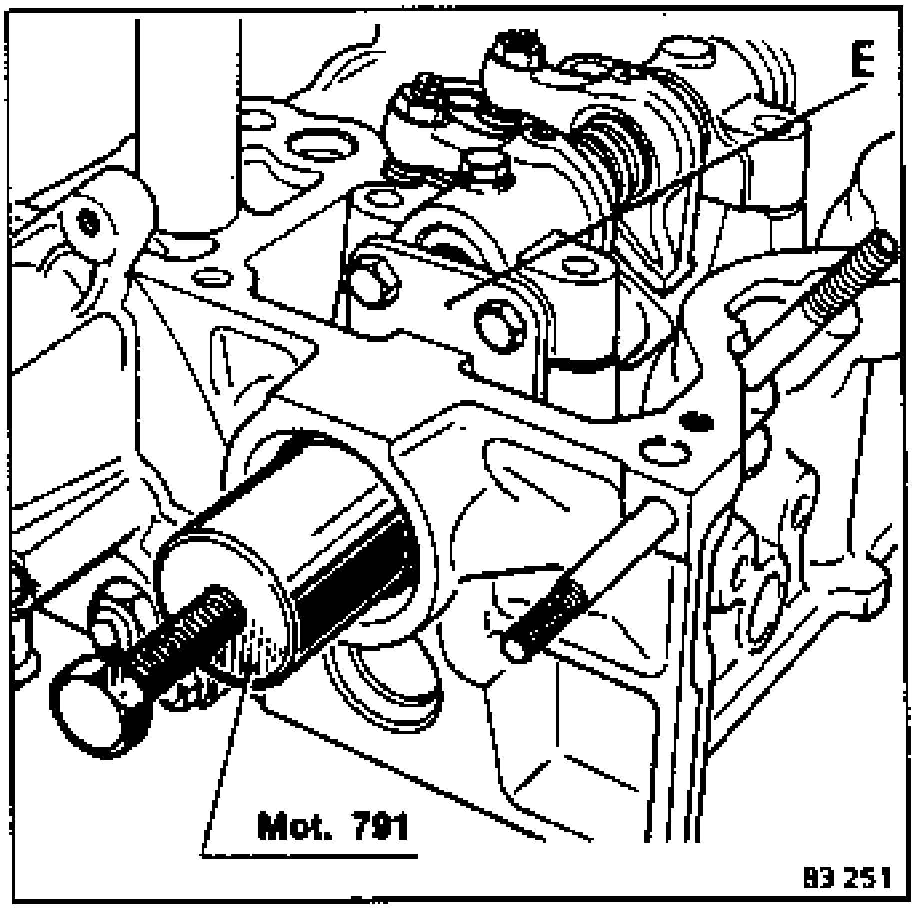
Remove:

- the injection pump;
- the timing sprocket.

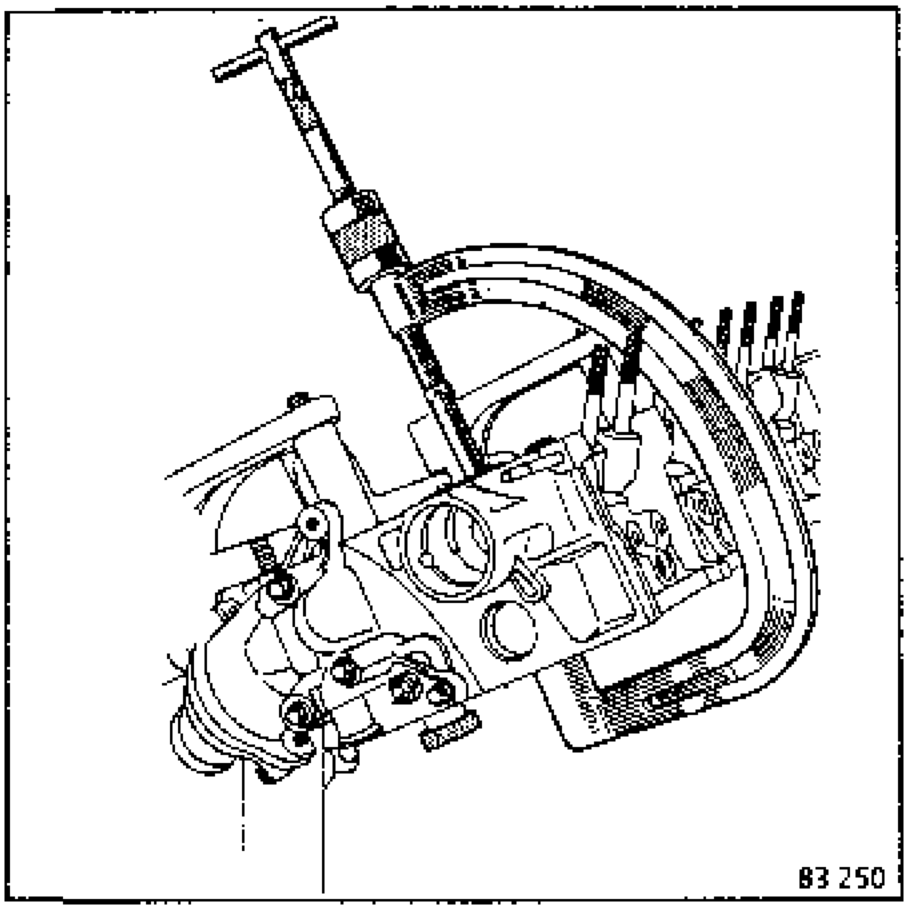
  These sintered metal sprockets are very fragile.

  Dismantling and handling should be carried out with great care. If burs form when dismantling using extractor **B.Vi. 28-01**, for example, these must be removed using a fine file.

- the seal using tool **Mot. 791**, while the block **(E)** stays in place.



Compress the valve springs using **Facom U43L**.



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Remove the half-rings, the upper cup washers, the springs, the lower cup washers, the valves and the valve guide seals.

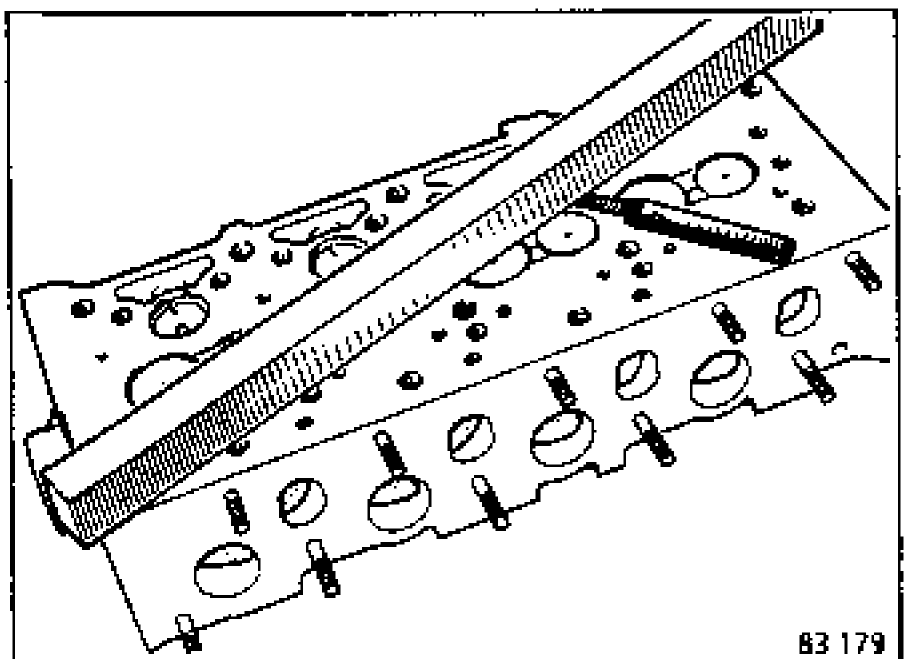
Place the parts in the correct sequence.

CHECKING THE GASKET FACE

Using a straight edge and a set of feeler gauges, check whether the gasket face is distorted.

- Maximum distortion .... **0.05 mm**

The cylinder head may not be machined.



83 179

Take the following steps in order to determine and check the thickness of the cylinder head gasket:

- the liner protrusion;
- the piston protrusion;
- the valve recess;
- the cylinder head/piston clearance.

For these values, see Manual **Mot. J (D)**.

Positioning the cylinder head gasket:

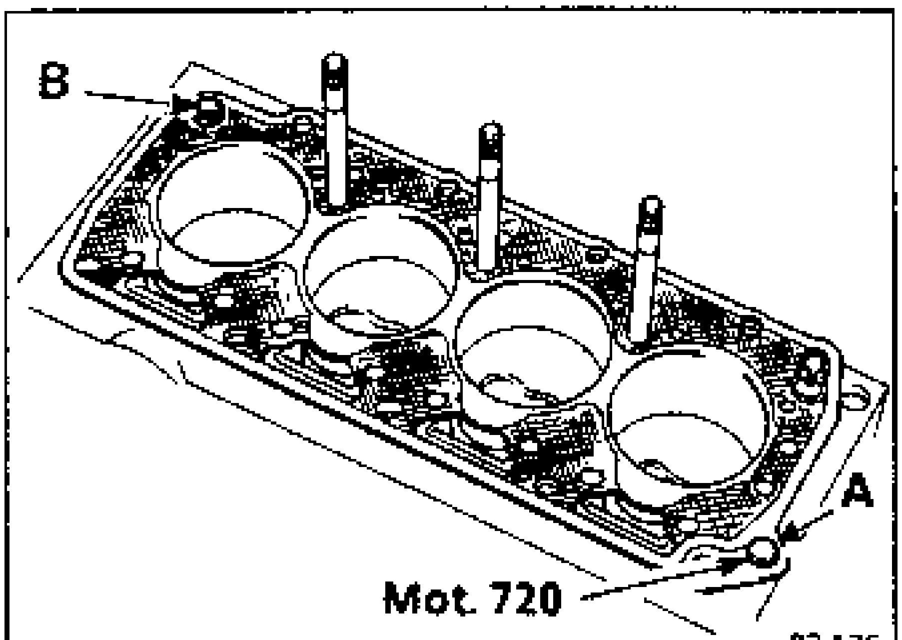
Tool **Mot. 720** must be used, inserted in the crankcase hole **(A)**. Check for the presence of the locating dowel.

Fit:

- the cylinder head gasket;
- the cylinder head, after having removed the rocker arm assembly, which enables contact between the valves and the pistons to be avoided during the cylinder head refitting operation.

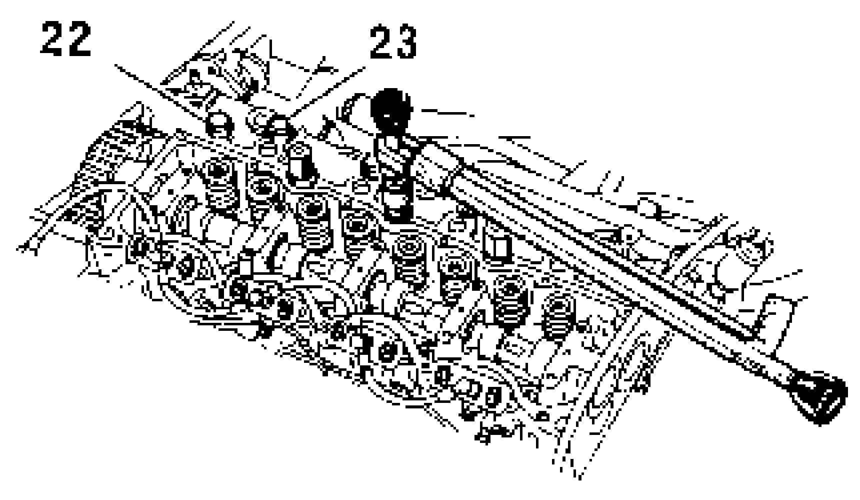
Centre the cylinder head on the studs.

Lubricate the fixing bolt threads and the washers under the bolt heads with engine oil.

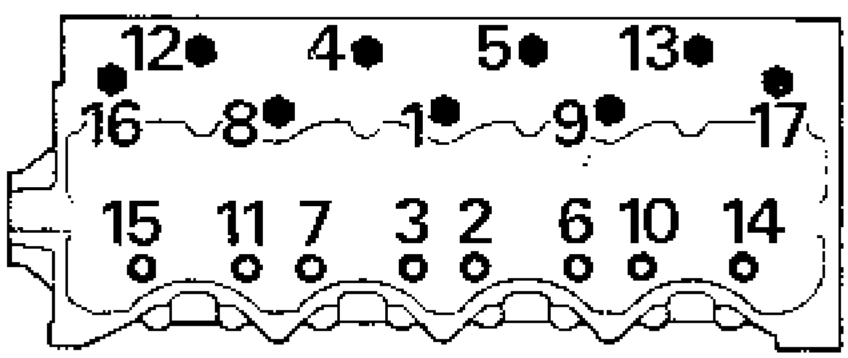


83 176

Position the fixing nuts **(22)** and **(23)** and tighten them to torque, following the tightening sequence.



B3 175

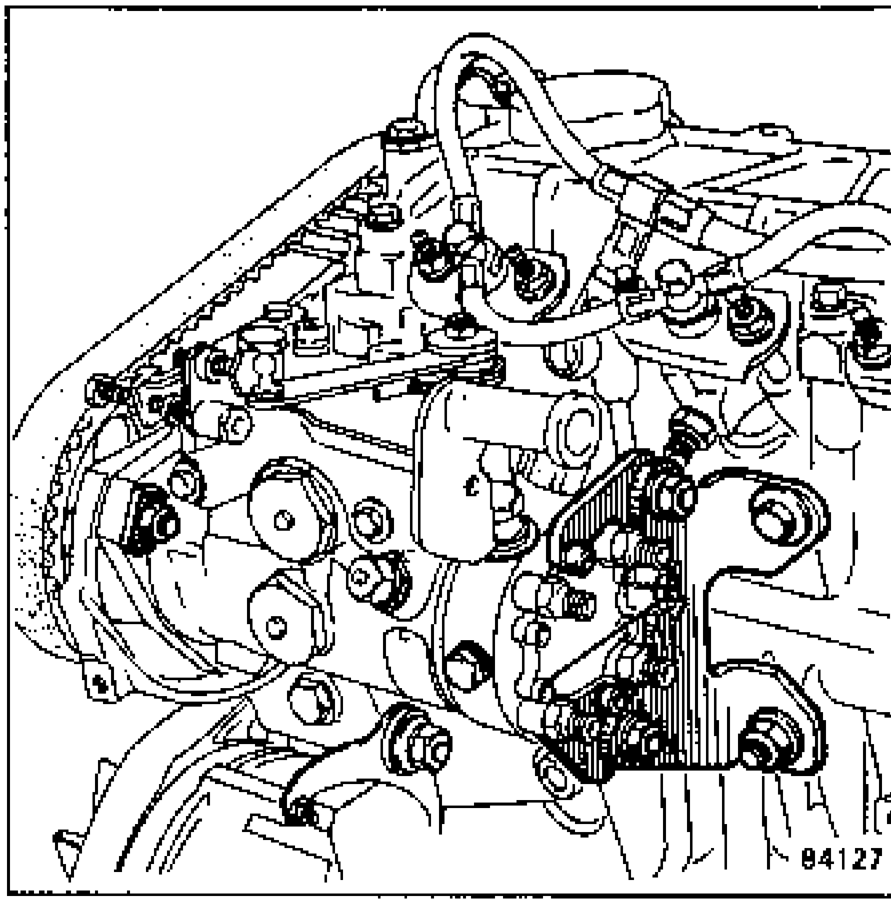


B3 174

TIGHTENING

This operation is carried out when the cylinder head is refitted.

Remember: in order to obtain the correct tightening of lubricated bolts, remove any oil in the cylinder head fixing holes using a syringe, especially from the holes which take hollow hexagonal cylinder head bolts.



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Ensure that the rear mounting of the injection pump on the cylinder head is loosened. In the following order carry out:

- first pretightening to **3 daNm**;
- second pretightening to **5 daNm**;
- first tightening to **9.5 to 10.5 daNm**;
- Second tightening (without previous tightening) from **9.5 to 10.5 daNm**;
- Retighten the injection pump rear mounting to the cylinder head;
- Adjust the rocker arms;
- Let the engine run for **20 minutes**, then let the engine cool for a minimum of **2 1/2 hours**;
- Retighten the cylinder head, following the instructions on the next page.

RETIGHTENING

This operation is performed with the engine cold, after it has been stopped for a minimum of 2 1/2 hours and after **loosening the rear injection pump mounting to the cylinder head**:

1 - **During maintenance and checking between 600 and 2000** miles (1000 and 3000 km) (only for turbo engines);

2 - **During work involving changing the cylinder head gasket** (after having run the engine for 20 minutes);

3 - **During standard engine replacement** (while the engine is on its delivery pallet and is therefore easily accessible).

With this method, it is not necessary to bring back the vehicle to retighten the cylinder head after **600 - 2000 miles** (1000 - 3000 km).

Method:

Remember: loosen the rear injection pump mounting to the cylinder head.

Loosen bolt n° 1 by 1/2 revolution and retighten it to the specified torque, i. e. **9.5 to 10.5 daNm**.

Do the same for the other fixing bolts, following the sequence given.

Tighten a second time to **9.5 to 10.5 daNm, without previous loosening.**

Retighten the rear injection pump mounting to the cylinder head.

SUMMARY TABLE

Vehicle	Engine	Capacity (ratio)	Fuel	Fuel supply system	Idling (rpm)	C.O. (%)
B 290	J8S 708	2068 (21)	Diesel	BOSCH Injection Pump VE ... R69 Pump VE ... R153 Pump VE ... R345 (with pre-post heating)	 750 ± 50 750 ± 50 800 ± 50	-
B 292	J7R 720 (man.) J7R 721 (auto.)	1995 (9.3)	O.R. 98 (1)	BENDIX multipoint injection	850 ± 50 (2)	1.8 ± 0.2
B 293	Z7W 700 (man.) Z7W 701 (auto.) Z7W 709 (auto).	2849 (9.5)	O.R. 98 (1)	BENDIX multipoint injection	700 ± 50 (2)	1.5 ± 0.5
B 294	J7R 726	1995 (9.3)	O.R. 95 unleaded minimum	BENDIX multipoint injection	900 ± 50 (2)	0.5 max. (2)
B 295	Z7U 702	2458 (8.6)	O.R. 98	BENDIX multipoint injection	700 ± 50 (2)	1 ± 0.25
B 296	J8S 706 J8S 736	2068 (21)	Diesel	BOSCH Injection Pump VE ... R41 Pump VE ... R158 Pump VE ... R309	 750 ± 50 750 ± 50 800 ± 50	-
B 297	 J6R 706 (man.) J6R 707 (auto.) J6R 762 (man.) J6R 763 (auto.) J6R 760 (man.)	1995 (9.2) (9.2) (8.6) (3) (8.6) (3) (8.5) (4)	 O.R. 98 O.R. 89 minimum O.R. 98	WEBER 28/36 DARA Mark 0-C/8-C Mark 1-C/4-C WEBER 32 DARA Mark 48-C/59 Mark 49-C Mark 60 WEBER 32 DARA Mark 53	 800 ± 50 800 ± 50 800 ± 50 900 ± 50 800 ± 50 800 ± 50	 1.5 ± 0.5 1.5 ± 0.5 1.5 ± 0.5 1 ± 0.5 1 ± 0.5 1.5 ± 0.5
B 298	Z7V 708 (man.) Z7V 709 (auto.) Z7V 711 (auto.) (4)	2664 (9.2)	O.R. 98	BOSCH Injection "K" JETRONIC	900 ± 50 700 ± 50 in Drive 900 ± 50 in Neutral	1 ± 0.5 1 ± 0.5 2 ± 0.5

(1) Compatible with Eurosuper unleaded (O.R. = octane rating)
(2) Nonadjustable
(3) DAI vehicles
(4) Swiss vehicle

SUMMARY TABLE (continued)

Vehicle	Engine	Capacity (ratios)	Fuel	Fuel supply system	Idling speed (rpm)	C.O. (%)
B 29A	Z7W 702	2849 (8.8)	O.R. 91 unleaded minimum	BOSCH Injection "K" JETRONIC	900 ± 50	1 max.
B 29B	J7T 708	2165 (8.7)	O.R. 91 unleaded minimum	BOSCH Injection "L" JETRONIC	800 ± 50 (2)	0.5 max. (2)
	J7T 732 (man.) J7T 733 (auto.)	2165 (9.2)	O.R. 91 unleaded minimum	BENDIX multipoint injection	800 ± 50 (2)	0.5 max. (2)
B 29E	J7T 706 (man.) J7T 707 (auto.) J7T 730 (man.) J7T 731 (auto.)	2165 (9.9)	O.R. 98	BENDIX multipoint injection	800 ± 50 (2) (transmission in neutral)	2 ± 0.5
	J7T 714 (man.) J7T 715 (auto.)	2165 (9.9)	O.R. 98	BENDIX multipoint injection	800 ± 50 (2) (transmission in neutral)	1.5 ± 0.5
B 29F	Z7W 706 (man.) Z7W 707 (auto.)	2849 (9.5)	O.R. 95 unleaded minimum	BENDIX multipoint injection	800 ± 50 (2)	0.5 max. (2)
B 29G	Z7U 700	2458 (8.8)	O.R. 95 unleaded minimum	BENDIX multipoint injection	750 ± 50 (2)	0.5 max. (2)
B 29H	J7R 722 (man.) J7R 723 (auto.)	1995 (10)	O.R. 98	BENDIX multipoint injection	775 ± 50 (2)	1.5 ± 0.5
B 29W	J8S 738	2068 (21)	Diesel	BOSCH Injection Pump VE ... R153	750 ± 50	–

(2) Nonadjustable

NOTE: For breakdown fault-finding and other additional information concerning vehicles with "K" JETRONIC INJECTION and R INJECTION, refer to the INJ. K (E) and INJ. R (E) repair manuals.

Specification and adjustment values

Vehicle	Engine						Gear-box	Injection Type	Ignition Type
	Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cm^3)	Ratio			
B 292	J7R J7R	720 721	88	82	1995	9.3	(A) man. (B) auto.	Renix multipoint	MPA with pinking detector

Engine	Idling speed regulation		Fuel	
	Speed (rpm)	Mixture (CO)	Special features	Octane suffix
J7R 720 J7R 721	850 ± 75* (nonadjustable)	1.8 ± 0.2%	Super Eurosuper unleaded	O.R. 98 O.R. 95 min.

* At coolant temperature of 80 - 100 °C.

Fuel supply system	Regulated multipoint injection
Fuel supply pump: located against the right-hand rear side member	Voltage: 12 volts Pressure: 3 bar Delivery: 95 l/h min.
Petrol filter: located above the petrol pump	Replacement: 30,000 miles (50,000 km)
Fuel pressure regulator	Pressure: - at zero vacuum: 3.0 ± 0.2 bar - at 500 mbar vacuum: 2.5 ± 0.2 bar
Electromagnetic injectors	Operate only with computer: Voltage: 12 volts Resistance: 2.5 ± 0.5 Ω
Throttle housing	SOLEX: single-barrel Ø 55 mm Mark: 937 (automatic transmission 952)
Load potentiometer	A - Idling: XR 25 value = 4 to 10 (12 to 28 auto.) B - Partial load: XR 25 value = 20 to 190 C - Full throttle: XR 25 value = 225 min.
Idling speed regulator valve	HITACHI: Voltage: 12 volts Coil resistance: 9 to 30 Ω

Specification and adjustment values

Computer	Renix N°	Approval N°	R.N.U.R. N°	Diagnostic code
Renix or Bendix housed in engine compartment	S 101 265 101 S 101 265 102 S 101 265 201 S 101 265 201	77 00 745 983 77 00 745 983 77 00 745 984 77 00 745 984	77 00 744 405 77 00 851 544 77 00 744 406 77 00 855 563	80 - 3 (A) 89 - 3 (A) 81 - 3 (B) 94 - 3 (B)

Air temperature sensor	Bendix : type CTN
Coolant temperature sensor	Bendix : type CTN

Ignition	Curves: programmed into injection computer MPA: Ignition power module with pinking detector
Spark plugs : EYQUEM	FC 62LS3 gap 1.2 mm (nonadjustable)
Paper cartridge air filter	Replacement: 12,000 miles (20,000 km)

Specification and adjustment values

Vehicle	Engine						Gear-box	Injection type	Ignition type
	Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cm^3)	Ratio			
B293	Z7W Z7W Z7W	700 (A) 701 (B) 709 (C)	91	73	2849	9.5	man. auto. auto.	Renix Multipoint	MPA with pinking detector

Engine	Idling speed regulation		Fuel	
	Speed (rpm)	Mixture (CO)	Special features	Octane suffix
Z7W 700 Z7W 701 } Z7W 709 }	700 ± 50 * 700 ± 50 * (in N) (non adjustable)	1.5 ± 0.5 %	Eurosuper unleaded or Super leaded	O.R. 95 min. O.R. 98

* At a coolant temperature of 80 - 100 °C

Fuel supply system	Regulated multipoint injection
Fuel supply pump: located against right-hand rear side member	Voltage : 12 volts Pressure : 3 bar Delivery : 110 l/h min.
Petrol filter: located above petrol pump	Replacement: 30,000 miles (50 000 km)
Fuel pressure regulator	Pressure: - at zero vacuum: 3.0 ± 0.2 bar - at more than 500 mbar vacuum: 2.5 ± 0.2 bar
Electromagnetic injectors	Operate only with computer Voltage: 12 volts Resistance : 2.5 ± 0.5 Ω
Throttle housing	SOLEX: single barrel Ø 55 mm Mark: 919
Load potentiometer	Idling: XR 25 value = 5 to 10 and (12 to 28 [3]) Partial load: XR 25 value = 15 to 190 Full throttle: XR 25 value = 235 ± 15 and (176 min. [3])
Idling speed regulator valve	Bosch, voltage: 12 volts

Specification and adjustment values

Computer	Renix N°	Approval N°	° R.N.U.R. N	Diagnostic code
Renix or Bendix housed in engine compartment	S 101 260 101 S 101 260 101 S 101 260 101 S 101 260 201 S 101 260 201 S 101 260 201 S 101 260 203	77 00 740 745 77 00 740 745 77 00 740 745 77 00 738 575 77 00 738 575 77 00 738 575 77 00 738 575	77 00 739 226 77 00 739 226 77 00 853 433 77 00 739 227 77 00 853 303 77 00 853 434 77 00 854 087	110 - 3 (1) (A) 113 - 3 (2) (A) 115 - 3 (A) 111-3 or 112-3(3) (B) 114 (B) + (C) 116 (B) 117 (C)

(1) For Z7W 700 engine up to N° 10194
(2) For Z7W 700 engine from N° 10195
NOTE:
The computer with fault-finding code 113 may be fitted to the 1st engines (1), provided computer terminal N° 10 is earthed (connect 10 and 1 of the computer connector).
(3) AR4 automatic transmission

Air temperature sensor	Bendix : type CTN
Coolant temperature sensor	Bendix : type CTN

Ignition	Curves: Programmed into injection computer MPA: Injection power module with pinking detector
Spark plugs	EYQUEM : C72LJS Gap: 0.8 ± 0.05 mm
Paper cartridge air filter	Replacement: 12,000 miles (20,000 km)

Specification and adjustment values

Vehicle	Engine						Gear-box	Injection type	Ignition type
	Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cm^3)	Ratio			
B 294	J7R	726	88	82	1995	9.3	Manual	Bendix multipoint + mixture regulation	MPA with pinking detector

Engine	Idling speed regulation		Fuel	
	Speed (rpm)	Mixture (CO)	Special features	Octane rating
J7R 726	900 ± 50* (nonadjustable)	Max. 0.5% (nonadjustable)	Eurosuper unleaded	O.R. 95 min.

* At a coolant temperature of 80 - 100 °C

Fuel supply system	Regulated multipoint injection
Fuel supply pump: located against right-hand rear side member	Voltage: 12 volts Pressure: 3 bar Delivery: 95 l/h min.
Petrol filter: located above petrol pump	Replacement: 30,000 miles (50,000 km)
Fuel pressure regulator	Pressure: - at zero vacuum: 3.0 ± 0.2 bar - at 500 mbar vacuum: 2.5 ± 0.2 bar
Electromagnetic injectors	Operate only with computer Voltage: 12 volts Resistance: 2.5 ± 0.5 Ω
Throttle housing	SOLEX: Ø 55 x 1 Mark: 937
Load potentiometer	A - Idling: XR 25 value = 4 to 10 B - Partial load: XR 25 value = 20 to 190 C - Full throttle: XR 25 value = 240 to 255
Idling speed regulator valve	HITACHI : Voltage: 12 volts

Specification and adjustment values

Computer	Bendix N°	Approval N°	R.N.U.R. N°	Diagnostic code
Renix or Bendix housed in engine compartment	S 101 268 101	77 00 745 985	77 00 748 216	61 - 3

Air temperature sensor	Bendix : type CTN
Coolant temperature sensor	Bendix : type CTN

Oxygen sensor Specification:	Make: BOSCH At 850°C : - Rich mixture: Voltage ≥ 585 mV - Lean mixture: Voltage from 0 to 80 mV
Catalyser	◇ C 17
Paper cartridge air filter	Replacement: 12,000 miles (20,000 km)
Anti-evaporation system	CAN 06 Canister
Ignition	Curves: Programmed into injection computer MPA: Ignition power module with pinking detector
Spark plugs	EYQUEM : FC62LS3 Gap: 1.2 mm (nonadjustable)

Specification and adjustment values

Vehicle	Engine						Gear-box	Injection type	Ignition type
	Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cm^3)	Ratio			
B 295	Z7U	702	91	63	2458	8.6	Manual	Renix Multipoint	MPA with pinking detector

Engine	Idling speed regulation		Fuel	
	Speed (rpm)	Mixture (CO)	Special features	Octane suffix
Z7U 702	700 ± 50*	1 ± 0.5 %	Super	O.R. 98

* At a coolant temperature of 80 - 100 °C

Fuel supply system	Regulated multipoint injection
Fuel supply pump: located against right-hand rear side member	Voltage: 12 volts Pressure: 3 bar Delivery: 110 l/h min.
Petrol filter: located above petrol pump	Replacement: 30,000 miles (50,000 km)
Fuel pressure regulator	Pressure: - at zero vacuum: 3.0 ± 0.2 bar - at 500 mbar vacuum: 2.5 ± 0.2 bar
Electromagnetic injectors	Operate only with computer Voltage: 12 volts Resistance: 2.5 ± 0.5 Ω
Throttle housing	SOLEX: Single barrel Ø 55 mm Mark: 837
Three-wire full load/no load switch	A - Idling: throttle opening less than 1 ° B - Partial load: throttle opening greater than 1 ° C - Full load: throttle opening greater than 70 °
Idling speed regulator valve	Bosch, voltage: 12 volts

Specification and adjustment values

Computer	Renix N°	Approval N°	R.N.U.R. N°	Diagnostic code
Renix or Bendix housed in engine compartment	S 100 802 101	77 00 726 993	77 00 727 574	100 - 3

Air temperature sensor	Bendix : type CTP
Coolant temperature sensor	Bendix : type CTP

Ignition	Curves: programmed into injection computer MPA: Ignition power module with pinking detector
Spark plugs	EYQUEM 805 LJSP Gap: 0.65 ± 0.05 mm
Paper cartridge air filter	Replacement: 12,000 miles (20,000 km)

Specification and adjustment values

Vehicle	Engine	Fuel	Idling speed check	CO %
B 298 man.	Z7V.. 708 (1) N° 1 to Mod 85 / Mod 86 - ... (2)	SUPER O.R. 98	900 ± 50	1 ± 0.5
B 298 auto.	Z7V.. 709 (1) N° 1 to Mod 85 / Mod 86 - ... (2)	SUPER O.R. 98	700 ± 50 (in Neutral)	1 ± 0.5
B 298 auto. SWITZERLAND	Z7V.. 711 (1)	SUPER O.R. 98	900 ± 50 (in Neutral)	2 ± 0,5 (without air injection)

(1) With additional air valve.
(2) With idling speed regulator valve.

Additional air valve (1):
- after a maximum of 10 minutes' activation, it must be completely closed;
- with the engine cold, it must be partially open.

Idling speed regulator valve (2):
12 V nonadjustable supply voltage, controlled by a computer located in the engine compartment.

Petrol pumps:

- priming pump: (in petrol tank):
  - voltage: .... **12 volts**
  - pressure: .... **0.3 bar**
- Fuel supply pump: (against right-hand rear side member):
  - pressure: .... **5.0 bar**
  - delivery: .... **140 l/h**
- Injectors:
  - opening pressure: .... **3.5 to 4.1 bar**
  - fuel tight up to: .... **2.3 bar**
  - spraying angle: .... **35°**
- Cold start injector:
  - electromagnetic, voltage: **12 V**
- Fuel supply pressure:
  - checking: .... **4.5 to 5.2 bar**
  - adjusting: .... **4.7 to 4.9 bar**
- Minimum residual pressure:
  - after 10 minutes: .... **1.7 bar**
  - after 20 minutes: .... **1.5 bar**
- Control pressure, engine hot:
  - vacuum disconnected: .... **3 to 3.4 bar**
  - vacuum connected (idling): **3.6 to 4 bar**

Specification and adjustment values (supercalibrated injection)

Vehicle	Engine	Fuel	Idling speed check	CO %
B 298 man.	Z7V.. 708 (2) N° 23362 to - ...	SUPER O.R. 98	900 ± 50	1 ± 0.5
B 298 auto.	Z7V.. 709 (2) N° 23362 to - ...		750 ± 50 (in Neutral)	
B 298 auto. SWITZERLAND	Z7V.. 711 (1) N° 23362 to - ...		900 ± 50 (in Neutral)	2 ± 0.5 (without air injection)

(1) With additional air valve.
(2) With idling speed regulator valve.

Special features of supercalibrated injection:
From certain engine numbers, given above, the fuel supply pressure values have been raised. This involves modifications to the assembly of pressure accumulator, injectors, etc..

Additional air valve (1):
- after a maximum of 10 minutes' activation, it must be completely closed;
- engine cold, it must be partially open.

Idling speed regulator valve (2):
12 V nonadjustable supply voltage, controlled by a computer located in the engine compartment.

Petrol pumps:

- priming pump: (in petrol tank):
  - voltage: .... **12 volts**
  - pressure: .... **0.3 bar**
- Fuel supply pump: (against right-hand rear side member):
  - pressure: .... **5.0 bar**
  - delivery: .... **140 l/h**
- Injectors:
  - opening pressure: .... **3.9 to 4.5 bar**
  - fuel tight up to: .... **2.5 bar**
  - spraying angle: .... **35 °**
- Cold start injector:
  - electromagnetic, voltage: **12 V**
- Fuel supply pressure:
  - checking: .... **5.1 to 5.5 bar**
  - adjusting: .... **5.2 to 5.4 bar**
- Minimum residual pressure:
  - after 10 minutes: .... **2 bar**
  - after 20 minutes: .... **1.8 bar**
- Control pressure, engine hot:
  - vacuum disconnected: .... **3 to 3.4 bar**
  - vacuum connected (idling): **3.6 to 4 bar**

Specification and adjustment values

Vehicle	Engine	Fuel	Idling speed check	CO %
B 29 A (man.)	Z7W .. 702	Unleaded petrol O.R. 92 minimum	900 ± 50	

(*) CO measured before the catalytic converter.

Idling speed regulator valve:

12 V nonadjustable supply voltage, controlled by a computer in the engine compartment.

- Injectors:	- opening pressure:	**3.9 to 4.5 bar**
	- seal up to:	**2.5 bar**
	- spraying angle:	**35°**
- Cold start injector:	- electromagnetic, voltage:	**12 V**
- Fuel supply pressure:	- checking:	**5.1 to 5.5 bar**
	- adjusting:	**5.2 to 5.4 bar**
- Minimum residual pressure:	- after 10 minutes:	**2 bar**
	- after 20 minutes:	**1.8 bar**
- Control pressure, engine hot:	- idling and full throttle:	**3.4 to 3.8 bar**
	- altitude 1600 m:	**4.2 to 4.6 bar**

Petrol pumps:

- priming pump: (in petrol tank):	- voltage:	**12 volts**
	- pressure:	**0.3 bar**
- Fuel supply pump: (against right-hand rear side member):	- pressure:	**5.0 bar**
	- delivery:	**140 l/h**

As well as the idling speed regulator valve, these vehicles have an oxygen sensor and a catalytic converter.

Specification and adjustment values

Vehicle	Engine						Gear-box	Injection type	Ignition type
	Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cm³)	Ratio			
B 29 B	J7T	708	88	89	2165	8.7	Manual	Multipoint BOSCH "L" Jetronic + Mixture regulation	Integral Electronic Ignition

Engine	Idling speed regulation		Fuel	
	Speed (rpm)	Mixture (CO)	Special features	Octane suffix
J7T 708	800 ± 50*	0.5 % max.	Unleaded petrol	O.R. 91 minimum

* At a coolant temperature of 80 - 100 °C.

Fuel supply system	Regulated multipoint "L" injection
Petrol pump: located against the right-hand rear side member	Voltage: 12 volts Delivery: 130 l/h mini Pressure: 3 bar
Petrol filter: located above the petrol pump	Replacement: 30,000 miles (50 000 km)
Pressure regulator Make: BOSCH	Pressure: - at zero vacuum: 3.0 ± 0.2 bar - at 500 mbar vacuum: 2.5 ± 0.2 bar
Main injectors Make: BOSCH	Voltage: 12 volts Resistance: 2.5 ± 0.5 Ω
Throttle housing	WEBER 34 CFRO
Mixture regulation: By BOSCH oxygen sensor	- at 350°C rich mixture: 720 at 1160 mV - at 350°C lean mixture: 150 at 175 mV
Idling speed regulation (oxygen sensor connected and primed)	- Speed: 800 ± 50 rpm. - Mixture: combined voltage: U = 6 volts $^{+1V}_{-0V}$
Solenoid valve on idling by-pass	Make: PIERBURG

Specification and adjustment values

Computer	BOSCH N°	R.N.U.R. N°	Fault-finding
BOSCH housed in passenger compartment	02 80 000 317	77 00 720 060	Using diagnostic sockets D1 and D2

Coolant temperature sensor	BOSCH : Type CTN

Catalyser	- Make: A.C. - Type: TRIFUNCTIONAL - Location: Under vehicle floor frame
E.G.R. valve	Single effect: G.M.
E.G.R. control	Pressure control solenoid valve : BOSCH

Specification and adjustment values

Vehicle	Engine						Gear-box	Injection type	Ignition type
	Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cm^3)	Ratio			
B 29 B	J7T J7T	732 733	88	89	2165	9.2	manual auto.	Renix multipoint + mixture regulation	MPA with pinking detector

Engine	Idling speed regulation		Fuel	
	Speed (rpm)	Mixture (CO)	Special features	Octane suffix
J7T 732 J7T 733	800 ± 50* (nonadjustable)	0.5% max. (nonadjustable)	Unleaded petrol	O.R. 91 min.

* At a coolant temperature of 80 - 100 °C

Fuel supply system	Regulated multipoint injection
Fuel supply pump: located against the right-hand rear side member	Voltage: 12 volts Pressure: 3 bar Delivery: 95 l/h min.
Petrol filter: located above the petrol pump	Replacement: 30,000 miles (50,000 km)
Fuel pressure regulator	Pressure: - at zero vacuum: 2.5 ± 0.2 bar - at 500 mbar vacuum: 2.0 ± 0.2 bar
Electromagnetic injectors	Operate only with computer: Voltage: 12 volts Resistance: 2.5 ± 0.5 Ω
Throttle housing	SOLEX: Single barrel Ø 50 mm Mark: 863 man.; 864 auto.
Three-wire full load/no load switch	A - Idling: throttle opening less than 1 ° B - Partial load: throttle opening greater than 1 ° C - Full load: throttle opening greater than 70 °
Idling speed regulator valve	Bosch, voltage: 12 volts

Specification and adjustment values

Computer		Renix N°	Approval N°	R.N.U.R. N°	Diagnoscit code
Renix or		S 100 807 101	77 00 734 613	77 00 736 393	30 - 3
Bendix	man.	S 101 108 102	77 00 734 613	77 00 748 185	44 - 3
housed	man.	S 100 807 201	77 00 734 614	77 00 736 394	31 - 3
in the	auto.	S 100 108 202	77 00 734 614	77 00 748 186	46 - 3
engine	auto.	S 101 108 205	77 00 850 018	77 00 850 438	49 - 3 (A)
compart-ment	auto.				

(A) AR4 automatic transmission

Air temperature sensor	Bendix : type CTP
Coolant temperature sensor	Bendix : type CTP

Oxygen sensor	Make: BOSCH At 800°C : - Rich mixture: 625 at 1100 mV - Lean mixture: 0 at 150 mV
Catalyser (located under floor)	Type: Trifunctional Mark: ◇ CO1
Paper cartridge air filter	Replacement: 12,000 miles (20 000 km)
Anti-evaporation system	With GM Canister for some countries
Ignition	Curves: Programmes into injection computer MPA: Ignition power module with pinking detector
Spark plugs	A C CHAMPION C41CLTS S 7 YC Gap: 0.9 ± 0.05 mm

Specification and adjustment values

Vehicle	Engine						Gear-box	Injection type	Ignition type
	Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cm³)	Ratio			
B29 E	J7T J7T	730 731	88	89	2165	9.9	man.(1) auto.(2) (3)	Renix multipoint	MPA with pinking detector

Engine	Idling speed regulation		Fuel	
	Speed (rpm)	Mixture (CO)	Special features	Octane suffix
J7T 730 J7T 731	800 ± 25* 800 ± 25* (N) (nonadjustable)	1.5 ± 0.5 %	Super	O.R. 98 (1)

* At a coolant temperature of 80 - 100 °C
(1) Compatible with Eurosuper unleaded petrol, O.R. 95 min.

Fuel supply system	Regulated multipoint injection
Fuel supply pump: located against the right-hand rear side member	Voltage: 12 volts Pressure: 3 bar Delivery: 95 l/h min.
Petrol filter: located above the petrol pump	Replacement: 30,000 miles (50,000 km)
Fuel pressure regulator	Pressure: - at zero vacuum: 2.5 ± 0.2 bar - at 500 mbar pressure: 2.0 ± 0.2 bar
Electromagnetic injectors	Only operate with computer: Voltage: 12 volts Resistance: 2.5 ± 0.5 Ω
Throttle housing	SOLEX: Single barrel Ø 50 mm Mark: 863 man.; 864 auto.
Three-wire full load/no load switch	A - Idling: throttle opening less than 1° b - Partial load: throttle opening greater than 1° C - Full load: throttle opening greater than 70°
Idling speed regulator valve	Bosch, voltage: 12 volts

Specification and adjustment values

Computer	Renix N°	Approval N°	R.N.U.R. N°	Diagnostic code
Renix or Bendix housed in the engine compartment (1)	S 100 806 101	77 00 734 611	77 00 736 391	07 - 3
(2)	S 100 806 201	77 00 734 612	77 00 736 392	08 - 3
(3)	S 100 806 202	77 00 742 037	77 00 742 315	09 - 3

(3) AR4 automatic transmission

Air temperature sensor	Bendix : type CTP
Coolant temperature sensor	Bendix : type CTP

Paper cartridge air filter	Replacement: 12,000 miles (20,000 km)
Ignition	Curves: Programmed into injection computer MPA: Ignition power module with pinking detector
Spark plugs	AC: C 41 CL TS; CHAMPION: S 6YC; EYQUEM: C 82 LJS Gap: 0.9 ± 0.05 mm

Specification and adjustment values

Vehicle	Engine						Gear-box	Injection type	Ignition type
	Type	Index	Bore (mm)	Stroke (mm)	Capacity (cm^3)	Ratio			
B29 E (1) B29 E (2) B29 E (3) B29 E (4)	J7T J7T J7T J7T	706 707 714 715	88	89	2165	9.9	man. auto. man. auto.	Renix multipoint	MPA without pinking detector

1 and 2: Europe
3 and 4: Switzerland

Engine	Idling speed regulation		Fuel	
	Speed (rpm)	Mixture (CO)	Special features	Octane suffix
J7T 706 J7T 707 J7T 714 J7T 715	800 ± 25* 800 ± 25* (N) 800 ± 50* 800 ± 50* (N)	1.5 ± 0.5% 1.5 ± 0.5% 1.5 ± 0.5% (5) 1.5 ± 0.5% (5)	Super	O.R. 98

(N) neutral; (5) without air injection (Pulsair valves)
* At a coolant temperature of 80 - 100 °C

Fuel supply system	Regulated multipoint injection
Fuel supply pump: located against the right-hand rear side member	Voltage: 12 volts Pressure: 3 bar Delivery: 95 l/h min.
Petrol filter: located above the petrol pump	Replacement: 30,000 miles (50,000 km)
Pressure regulator	Pressure: - at zero vacuum: 2.5 ± 0.2 bar - at 500 mbar pressure: 2.0 ± 0.2 bar
Electromagnetic injectors	Only operate with computer: Voltage: 12 volts Resistance: 2.5 ± 0.5 Ω
Throttle housing	WEBER: 34 C FRA (A) | 34 C FR (B) Mark: 0 (1) 2 (3) | 2 (1) 1 (2) 3 (4) | 3 (2)
(A) Two-wire full load/no load switch (B) Three-wire full load/no load switch	A - Idling: throttle opening less than 1 ° b - Partial load: throttle opening greater than 1 ° C - Full load: throttle opening greater than 70 °
Idling speed regulator valve (B)	Bosch, voltage: 12 volts

Specification and adjustment values

Computer	Renix N°	Approval N°	R.N.U.R. N°	Diagnostic code
Renix or (1)	S 100 800 101	77 00 723 126	77 00 723 098	01 - 3 (A)
Bendix housed (1)	S 100 800 104	77 00 723 126	77 00 726 991	03 - 3 (B)
in the engine (2)	S 100 800 201	77 00 723 127	77 00 723 099	02 - 3 (A)
compartment (2)	S 100 800 204	77 00 723 127	77 00 726 992	04 - 3 (B)
(3)	S 100 800 103	77 00 726 383	77 00 726 381	05 - 3 (C)
(4)	S 100 800 203	77 00 726 384	77 00 726 382	06 - 3 (C)

(A) Without idling speed regulation
(B) With idling speed regulation
(C) EGR control without idling speed regulation

Air temperature sensor	Bendix : type CTP
Coolant temperature sensor	Bosch : type CTN

Ignition	Curves: Programmed into injection computer MPA: Ignition power module without pinking detector
Spark plugs	CHAMPION : S 379 YC Gap: 0.9 ± 0.05 mm
Paper cartridge air filter	Replacement: 12,000 miles (20,000 km)
E.G.R. and Pulsair valves	J7T 714 and J7T 715 engines

Specification and adjustment values

Vehicle	Engine						Gear-box	Injection type	Ignition type
	Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cm^3)	Ratio			
B 29 F	Z7W Z7W	706 707	91	73	2849	9.5	man.(1) auto. (2)	Renix multipoint + mixture regulation	MPA with pinking detector

Engine	Idling speed regulation		Fuel	
	Speed (rpm)	Mixture (CO)	Special features	Octane suffix
Z7W 706 Z7W 707	800 ± 50 * 800 ± 50 * (in N) (nonadjustable)	0.5% max. (nonadjustable)	Eurosuper Unleaded	O.R.95 min.

* At a coolant temperature of 80 - 100 °C

Fuel supply system	Regulated multipoint injection
Fuel supply pump: located against the right-hand rear side member	Voltage: 12 volts Pressure: 3 bar Delivery: 110 l/h min.
Petrol filter: located above the petrol pump	Replacement: 30,000 miles (50,000 km)
Fuel pressure regulator	Pressure: - at zero vacuum: 3.0 ± 0.2 bar - at 500 mbar vacuum: 2.5 ± 0.2 bar
Electromagnetic injectors	Operate only with computer: Voltage: 12 volts Resistance: 2.5 ± 0.5 Ω
Throttle housing	SOLEX: Single barrel Ø 50 mm Mark: 919
Load potentiometer	A - Idling: XR 25 value = 5 to 10 and (12 to 28 [2]) B - Partial load: XR 25 value = 15 to 190 C - Full load: XR 25 value = 235 ± 15 and (176 min. [2])
Idling speed regulator valve	Bosch, voltage: 12 volts

Specification and adjustment values

Computer	Renix N°	Approval N°	R.N.U.R.N°	Diagnostic code
Renix or Bendix housed in the engine compartment	S 101 260 102	77 00 740 746	77 00 739 228	120 - 3. 122 - 3 (1)
	S 101 260 102	77 00 740 746	77 00 853 435	126 - 3 (1)
	S 101 260 105	77 00 851 515	77 00 851 243	123 - 3 (1)
	S 101 260 105	77 00 851 515	77 00 853 436	125 - 3 (1)
	S 101 260 202	77 00 740 747	77 00 739 229	121 - 3 (2)
	S 101 260 202	77 00 740 747	77 00 853 304	124 - 3 (2)
	S 101 260 202	77 00 740 747	77 00 853 437	127 - 3 (2)
	S 101 260 205	77 00 851 911	77 00 852 359	127 - 3 (2)

Air temperature sensor	Bendix : type CTN
Coolant temperature sensor	Bendix : type CTN

Oxygen sensor	Make: BOSCH electrically heated At 800 °C: - Rich mixture: 625 to 1100 mV - Lean mixture: 0 to 150 mV
Catalyser (located under floor)	Type: Trifunctional Mark: ◇ C08
Paper cartridge air filter	Replacement: 12,000 miles (20,000 km)
E.G.R.	
Anti-evaporation system (depending on country)	Canister : GM
Ignition	Curves: Programmed into injection calculator MPA: Ignition power module with pinking detector
Spark plugs	EYQUEM : C 72 LJS Gap: 0.8 ± 0.05 mm

Specification and adjustment values

Vehicle	Engine						Gear-box	Injection type	Ignition type
	Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cm^3)	Ratio			
B 29 G	Z7U	700	91	63	2458	8/1	man.	Renix multipoint + mixture regulation	MPA with pinking detector

Engine	Idling speed regulation		Fuel	
	Speed (rpm)	Mixture (CO)	Special features	Octane rating
Z7U 700	750 ± 50 * (nonadjustable)	0.5% max. (nonadjustable)	Eurosuper Unleaded	O.R.95 min.

* At a coolant temperature of 80 - 100 °C

Fuel supply system	Regulated multipoint injection
Fuel supply pump: located against the right-hand rear side member	Voltage: 12 volts Pressure: 3 bar Delivery: 110 l/h min.
Petrol filter: located above the petrol pump	Replacement: 30,000 miles (50,000 km)
Fuel pressure regulator	Pressure: - at zero vacuum: 2.5 ± 0.2 bar - at 500 mbar vacuum: 2.0 ± 0.2 bar
Electromagnetic injectors	Operate only with computer: Voltage: 12 volts Resistance: 2.5 ± 0.5 Ω
Throttle housing	SOLEX: Single barrel Ø 50 mm Mark: 984
Load potentiometer	A - Idling: XR 25 value = 7 to 13 B - Partial load: XR 25 value = 20 to 190 C - Full load: XR 25 value = 225 to 252
Idling speed regulator valve	Bosch, voltage: 12 volts

Specification and adjustment values

Computer	Renix N°	Approval N°	R.N.U.R. N°	Diagnostic code
Renix or Bendix housed in the engine compartment	5 101 716 101	77 00 748 309	77 00 744 418	107 - 3

NOTE: the computer controls a turbocharging boost pressure regulator

Air temperature sensor	Bendix : type CTP
Coolant temperature sensor	Bendix : type CTP

Oxygen sensor	Make: BOSCH, electrically heated At 850 °C: - Rich mixture: 625 to 1100 mV - Lean mixture: 0 to 80 mV
Catalyser (located under floor)	Type: Trifunctional Mark: ◇ C 18
Paper cartridge air filter	Replacement: 12,000 miles (20,000 km)
E.G.R.	
Anti-evaporation system (depending on country)	Canister : ROCHESTER
Ignition	Curves: Programmed into injection computer MPA: Ignition power module with pinking detector
Spark plugs	EYQUEM : 805 L JSP Gap: 0.65 ± 0.05 mm

Specification and adjustment values

Vehicle	Engine						Gear-box	Injection type	Ignition type
	Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cm^3)	Ratio			
B 29 H	J7R J7R	722 723	[illegible]	82	1995	10	man.(A) auto.(B)	Renix multipoint	MPA with pinking detector

Engine	Idling speed regulation		Fuel	
	Speed (rpm)	Mixture (CO)	Special features	Octane rating
J7R 722 J7R 723	775 ± 50* (nonadjustable)	1.5 ± 0.5%	Super (1)	O.R. 98

* At a coolant temperature of 80 - 100 °C
(1) Compatible with Eurosuper unleaded, O.R. 95 min.

Fuel supply system	Regulated multipoint injection
Fuel supply pump: located against right-hand rear side member	Voltage: 12 volts Pressure: 3 bar Delivery: 95 l/h min.
Petrol filter: located above the petrol pump	Replacement: 30,000 miles (50,000 km)
Fuel pressure regulator	Pressure: - at zero vacuum: 2.5 ± 0.2 bar - at 500 mbar vacuum: 2.0 ± 0.2 bar
Electromagnetic injectors	Operate only with computer Voltage: 12 volts Resistance: 2.5 ± 0.5 Ω
Throttle housing	SOLEX: Single barrel Ø 55 mm Mark: 863 man.; 864 auto.
Three-wire full load/no load switch	A - Idling: throttle opening less than 1 ° B - Partial load: throttle opening greater than 1 ° C - Full load: throttle opening greater than 70 °
Idling speed regulator valve	Bosch, voltage: 12 volts

Specification and adjustment values

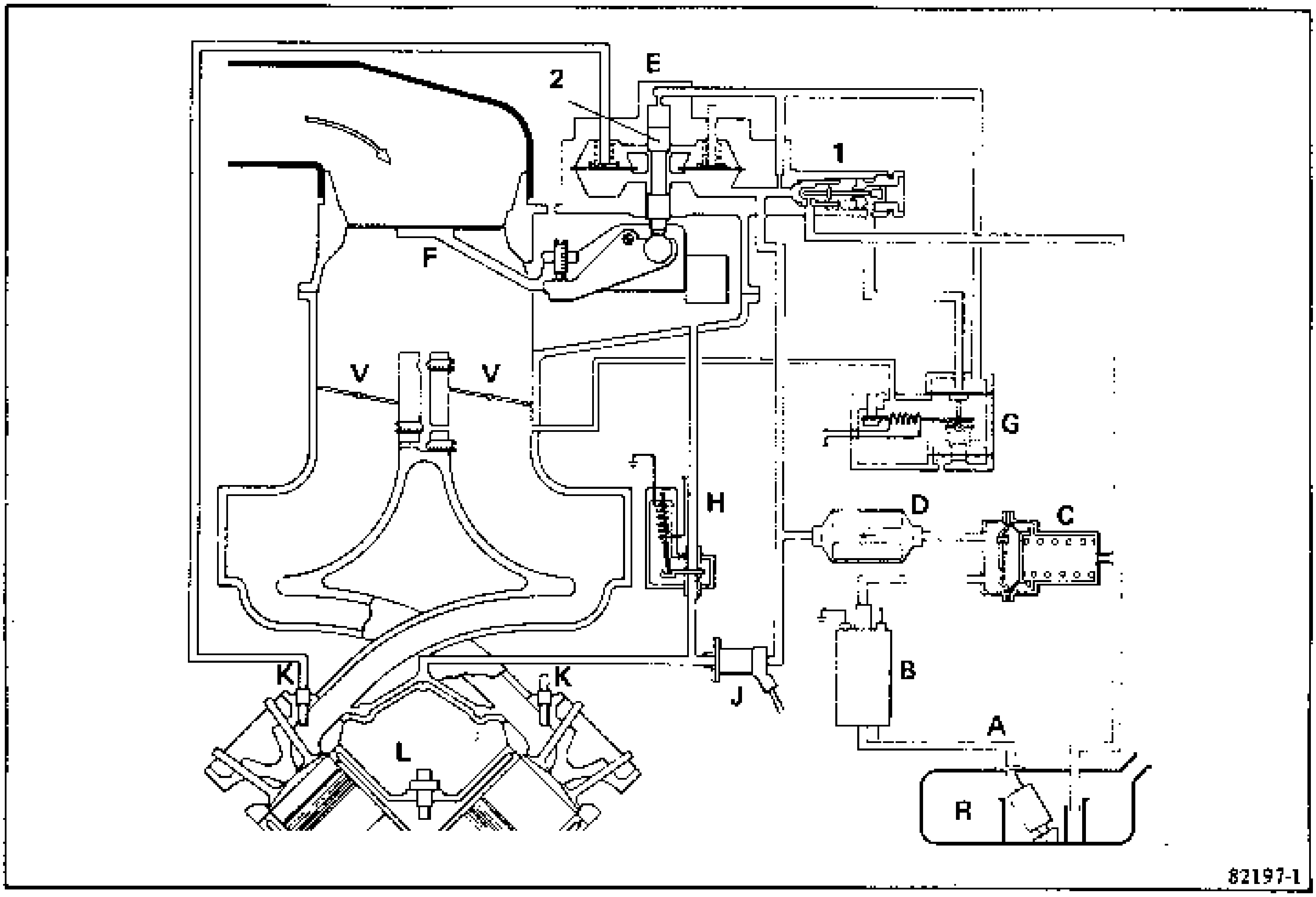
Computer	Renix N°	Approval N°	R.N.U.R. N°	Daignostic code
Renix or Bendix housed in the engine compartment	S 100 816 101 S 100 816 201	77 00 737 453 77 00 747 270	77 00 738 059 77 00 738 060	24 - 3 or 86 - 3 (A) 82 - 3 (B)

(B) AR4 automatic transmission

Air temperature sensor	Bendix : type CTP
Coolant temperature sensor	Bendix : type CTP

Ignition	Curves: Programmed into injection computer MPA: Ignition power module with pinking detector
Spark plugs	AC: C 41 CL TS CHAMPION: S 6YC EYQUEM: C 82 LJS Gap: 0.9 ± 0.05 mm
Paper cartridge air filter	Replacement: 12,000 miles (20,000 km)

"K" JETRONIC INJECTION



A - Priming pump
B - Main fuel pump
C - Pressure accumulator
D - Fuel filter
E - Metering head
F - Sensor plate
G - Control pressure regulator

H - Additional air control
J - Cold start injector
K - Main injectors
L - Coolant temperature sensor
R - Fuel tank
V - Throttle butterflies

1 - Fuel supply pressure regulator
2 - Metering piston

"K" INJECTION

Principle:

An electric priming pump (A), located in the petrol tank, sends the fuel to the main fuel pump (B).

This pump passes it to an accumulator (C), a filter (D) to the metering head (E) and the cold start injector (J).

The metering head (E) comprises a fuel supply pressure regulator (1). This is linked to the control pressure regulator (G) to form the control circuit, which acts on the metering piston (2) in opposition to the force applied by the air flow meter.

The metering head (E) divides the fuel among the engine cylinders via pipes which link it to the injectors (K). The fuel pressure causes these injectors to open.

An additional air circuit, which includes a cold start injector (J) and an additional air control (H), boosts cylinder filling during cold starting. This control (H) has an electrically heated bimetallic strip which regulates the air flow depending on the temperature.

This circuit is mounted in parallel to the butterflies (V). When hot, it is closed.

The cold start injector (J) is electromagnetically controlled, supplied with voltage in parallel with the starter solenoid and earthed by a timed temperature switch (L) located in the coolant circuit.

***NOTE:** In 1986 model vehicles, the additional air valve (H) is replaced by an idling regulator valve, controlled by a computer which takes into account various parameters such as coolant temperature, position of butterfly, engine speed, etc..*

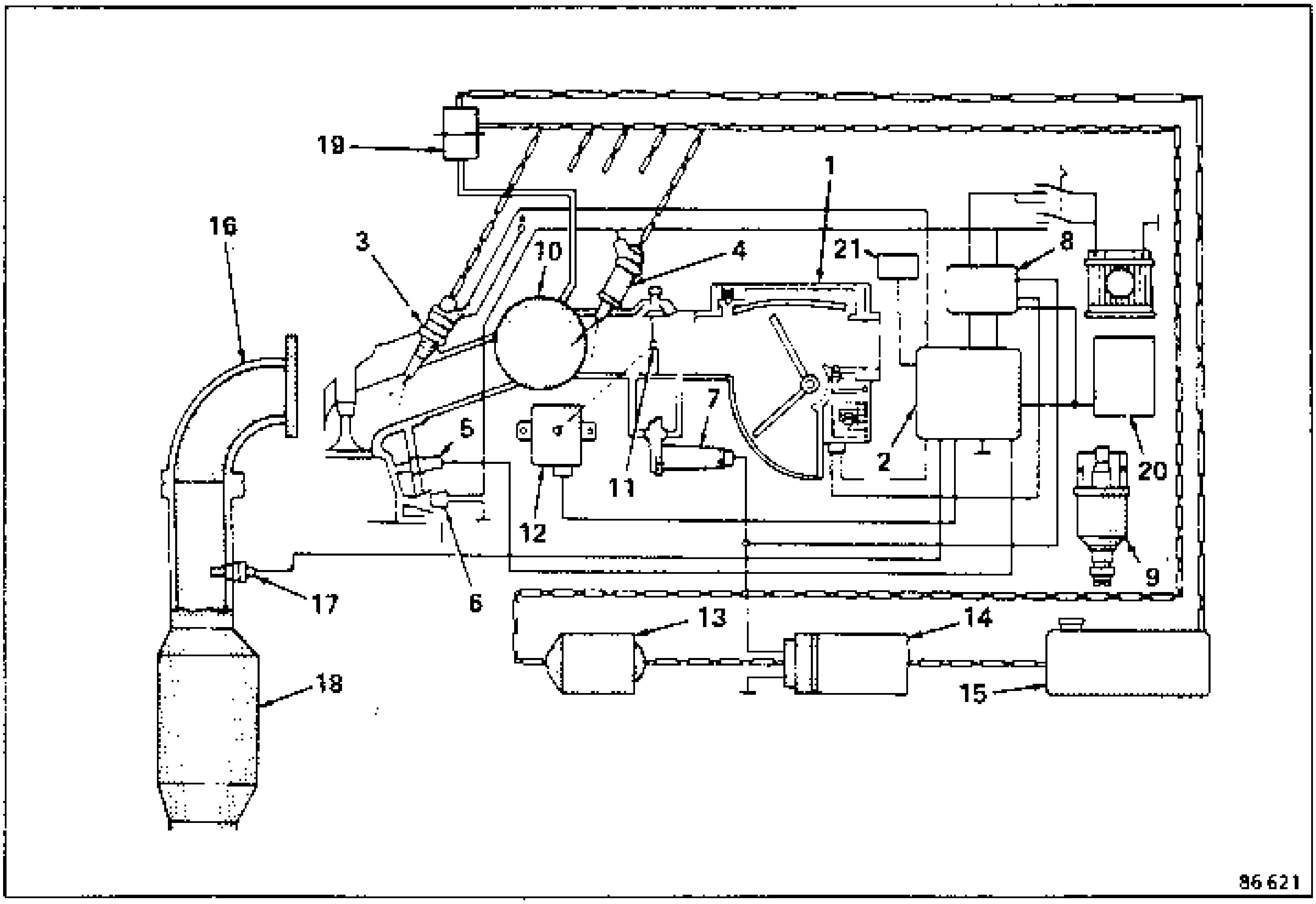
The control pressure regulator (G) is linked to the inlet manifold by a pipe, to make corrections depending on the load.

It comprises an electrical resistor which heats a bimetallic strip to make corrections depending on the temperature.

The bimetallic strip resistor is supplied by the + after ignition switch via the rpm relay.

NOTE: For any additional information concerning "K" JETRONIC injection, please refer to the INJ.K repair manual (E).

"L" JETRONIC INJECTION (B 29 B engine J7T 708)



DESCRIPTION

1 - Flow meter with temperature sensor
2 - Electronic computer
3 - Main injector
4 - Cold start injector
5 - Coolant temperature sensor
6 - Coolant timed temperature switch
7 - Additional air valve
8 - Control relay
9 - Ignition distributor
10 - Mixing chamber
11 - Butterfly shutter
12 - Butterfly position switch
13 - Fuel filter
14 - Fuel pump
15 - Fuel tank
16 - Exhaust manifold
17 - Oxygen sensor
18 - Trifunctional catalytic converter
19 - Fuel pressure regulator
20 - Ignition electronic module
21 - Altimetric corrector

NOTE: For this type of injection, the electronic computer does not incorporate the ignition advance curves.

"L" JETRONIC INJECTION

Components such as:

- the electric fuel pump;
- the fuel filter;
- the fuel pressure regulator;
- the main injectors;
- the valve switch;
- the coolant temperature sensor;

are identical in principle to those used for "R" injection.

For these components, please refer to the repair manual, "R" injection (E).

Special features concerning "L" JETRONIC injection:

- ***The cold start injector:***

The cold start injector is located near the butterfly. This injector enriches the fuel mixture by spraying extra fuel in a very fine spray into the inlet piping.

However, this injector only operates on receiving data from the starter and when the timed coolant temperature switch has simultaneously closed the electric circuit.

1 - Electrical connector

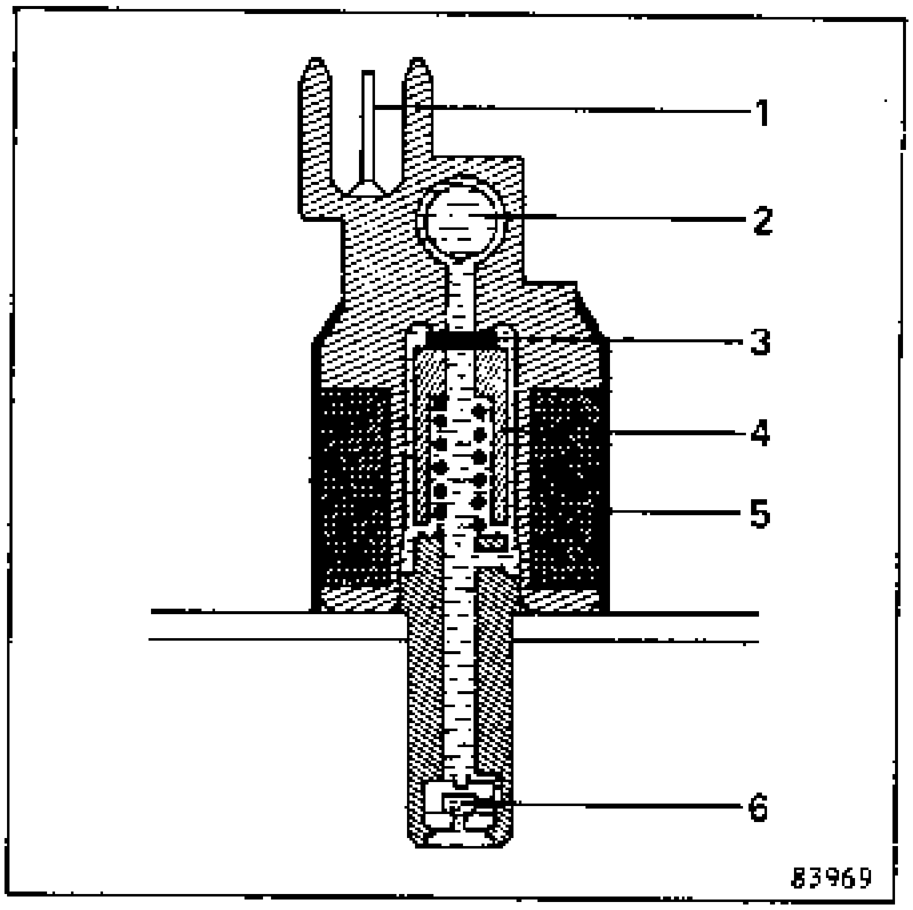
2 - Fuel inlet

3 - Gasket

4 - Solenoid valve armature

5 - Winding

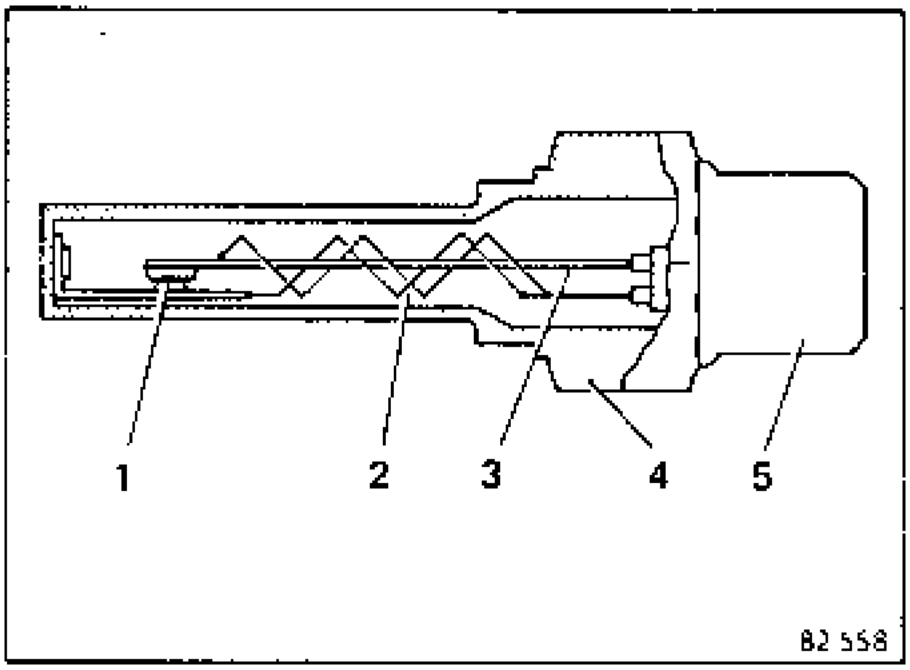
6 - Rotating nozzle



"L" JETRONIC INJECTION

● ***Timed coolant temperature switch***

This limits the time for which the cold start injector is activated. It is used for a maximum of 8 seconds when the engine is started and the coolant temperature is at -20 °C. It is not used when the coolant temperature has reached 35 °C.



1 - Contact

2 - Heating resistor

3 - Thermal bimetallic strip

4 - Housing

5 - Electrical connection

The duration of the injection given by the timed temperature switch during cold starting is obtained via an electrically-heated bimetallic element. The element opens the circuit, depending on its temperature, after a certain heating time and according to the temperature of the engine coolant.

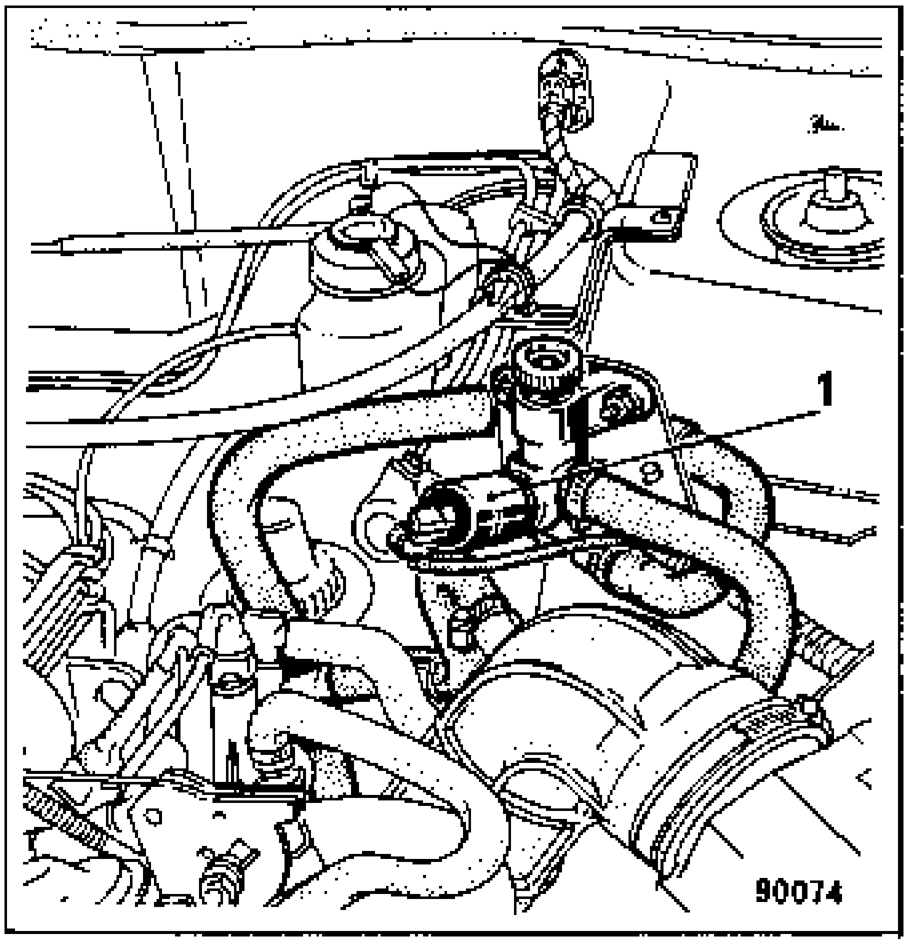
● ***Accelerated idling solenoid valve***

The accelerated idling solenoid valve is screwed to the bypass body near the idling regulating screw.

It supplies an additional amount of air to the engine to make up for the drop in engine idling speed when the air conditioning system is in operation.

The accelerated idling solenoid valve also operates when the starter is activated.

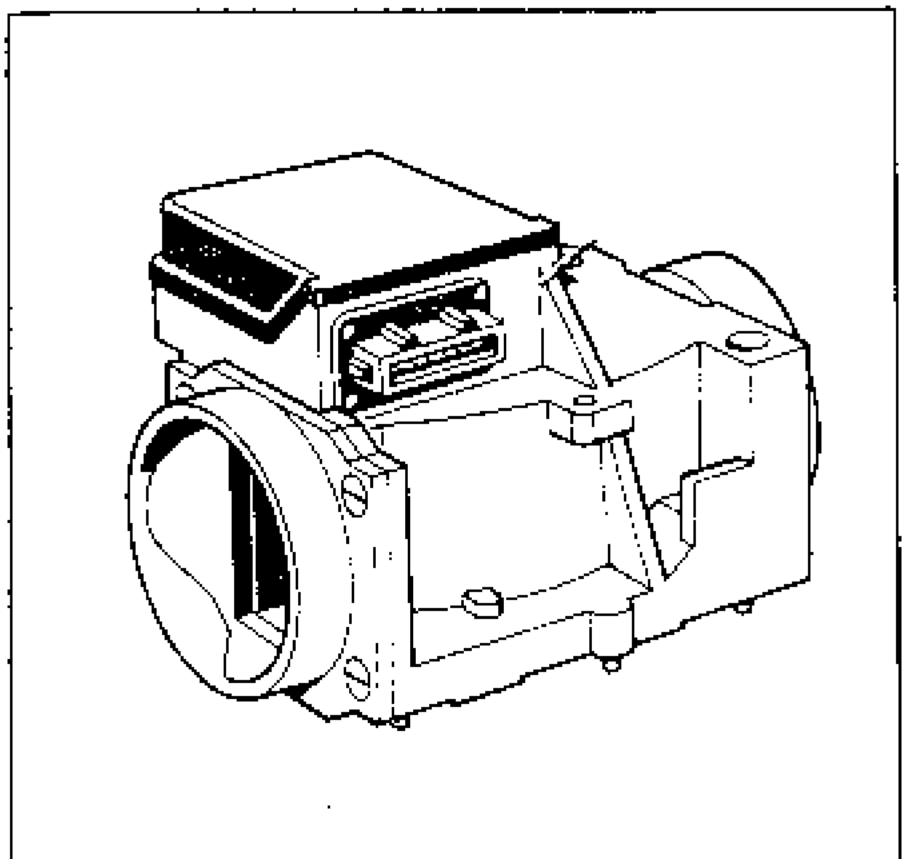
A timed relay extends its opening time for approximately 3 seconds after the engine has started.



"L" JETRONIC INJECTION

- ***The air flow meter***

The flow meter receives voltage from the computer and returns a voltage modified as a function of the quantity and temperature of the air sucked in by the engine.



88 077

The air displaces the sensor valve (2).

Under the effect of the intake air flow and the opposing action of a calibrated spring, the valve is displaced to a position which corresponds to the amount of air passing into the engine.

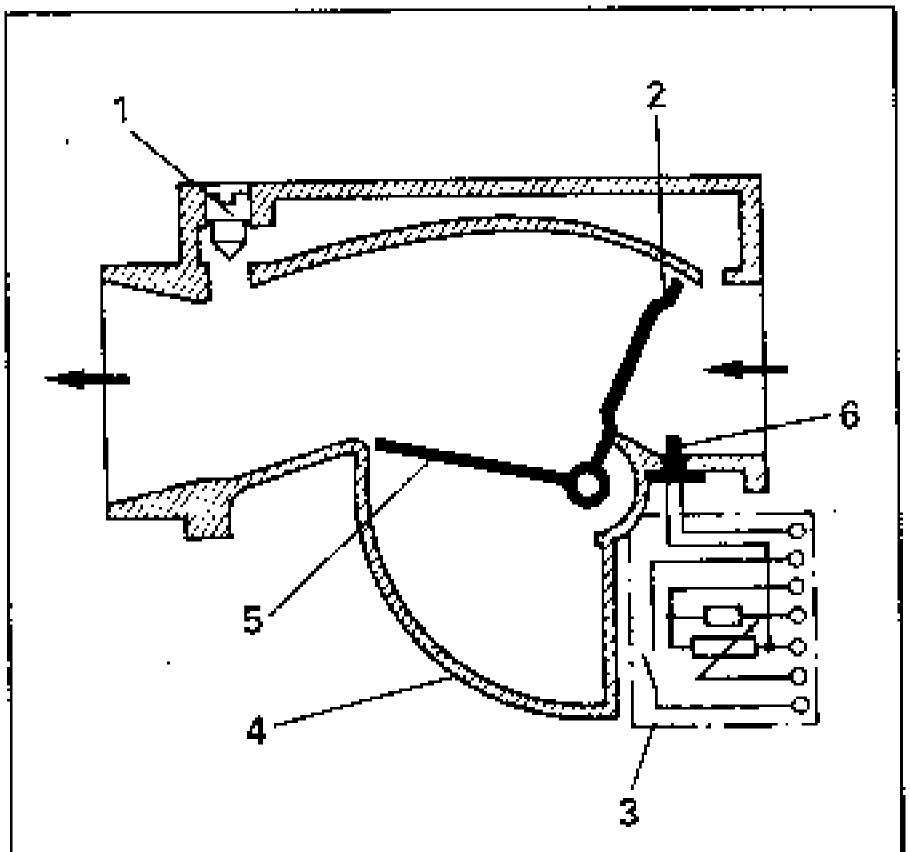
The potentiometer contact is displaced proportionately.

A compensating valve (5), attached to the detector valve, makes up (given that its effective surface area is the same as that of the detector valve) for the pulses caused by any counter pressure so that these pulses cannot affect the air flow measurement.

The potentiometer provides voltage to the electronic module proportional to the valve angle.

The air temperature sensor (6) is located in the flow meter.

The internal resistance of the sensor fluctuates in accordance with the air temperature and supplies a voltage in proportion to the air temperature. This voltage modifies the voltage of the air flow potentiometer, which emits an output voltage representing the density of the volume of air entering the combustion chambers.



83 971

1 - Air flow bypass regulating screw
2 - Sensor valve
3 - Electrical connector
4 - Damping chamber
5 - Compensation valve
6 - Temperature sensor

The flow meter bypass is factory regulated.

The regulating screw is then sealed with a tamper-proof cap.

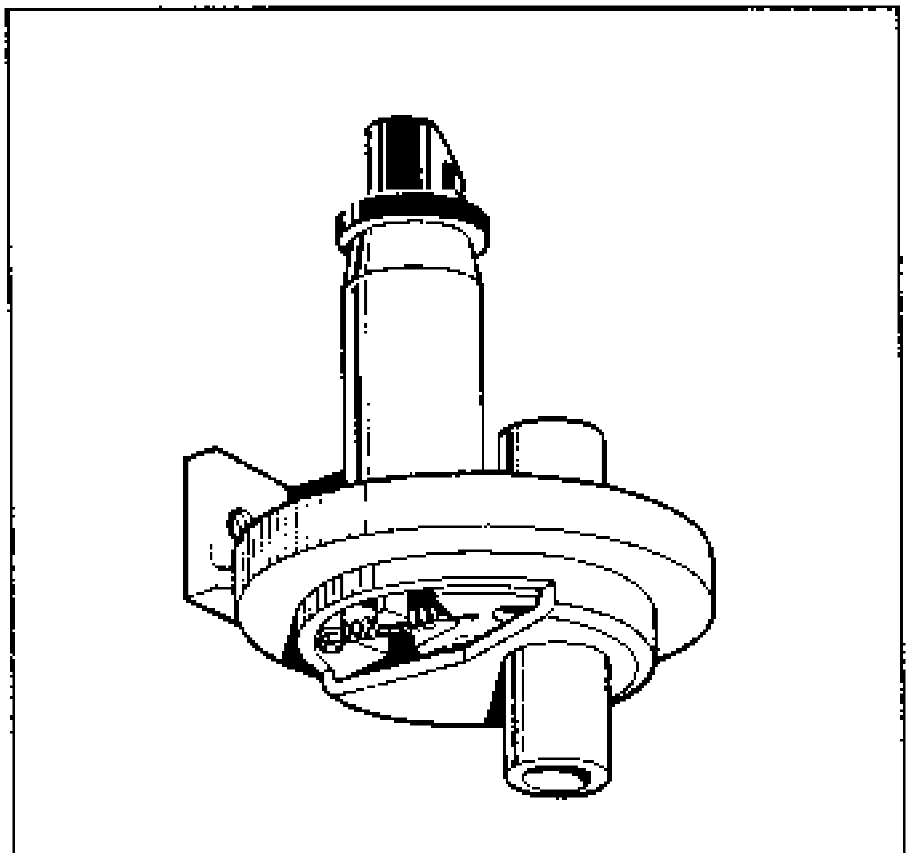
Never remove this cap or adjust the flow meter bypass screw unless carrying out major engine repairs or replacing the flow meter.

Only the idling speed regulating screw, which is easily accessible, may be regulated.

"L" JETRONIC INJECTION

● ***Additional air valve***

The amount of additional air required when the engine is cold is supplied by an additional air valve which supplies a bypass circuit to the throttle housing and to the idling bypass circuit.

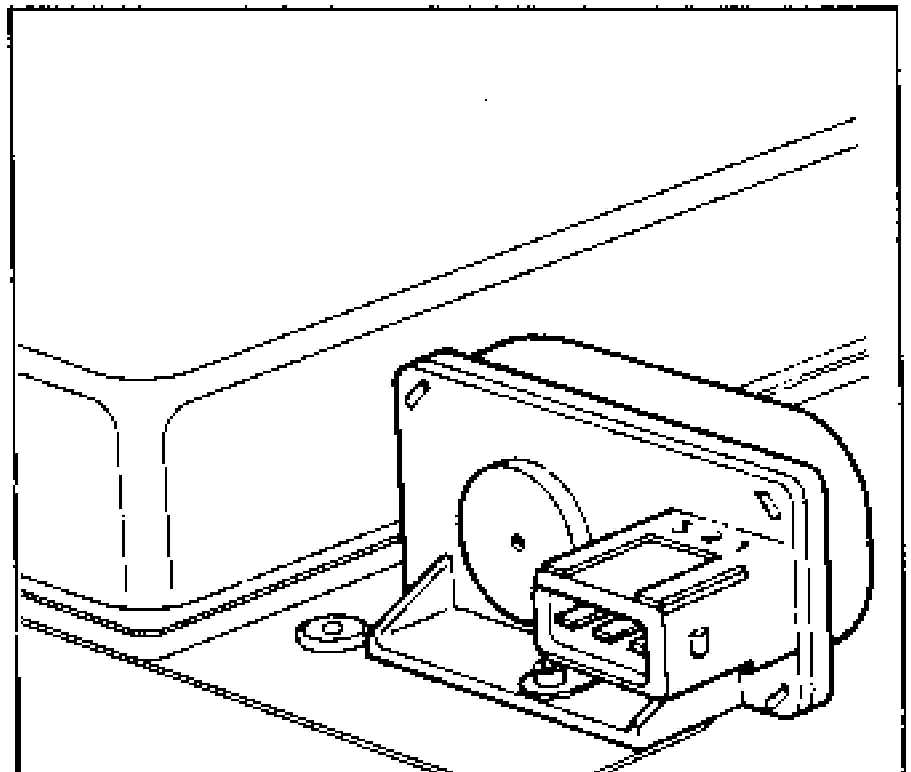


83 965

The additional air valve opening is automatically controlled by the temperature of the cylinder head to which it is attached and by an integral electric heating element.

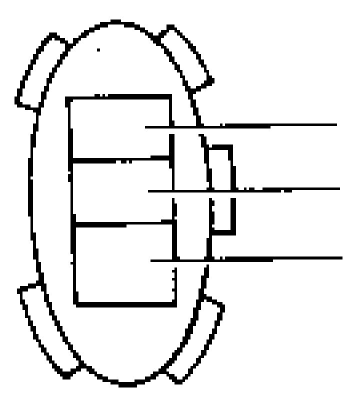
● ***Altimetric corrector***

The altimetric corrector comprises a body, housing a barometric capsule and a potentiometer.



86694

It transmits atmospheric pressure data to the electronic computer in the form of an electric voltage which fluctuates in accordance with the pressure. A 3-channel connector links it to the injection system:



Checking the altimetric corrector
(see chapter 17, "Injection")

It receives the + after relay voltage and sends a modified voltage to the electronic module, which reflects the atmospheric pressure.

- At sea level, the modified voltage is weak.
- At 4000 metres, the modified voltage is strong, almost 9/10 of the + after relay voltage.

"L" JETRONIC INJECTION

CONCLUSION :

The electronic computer checks the fuel injection duration and modifies it in accordance with the data received:

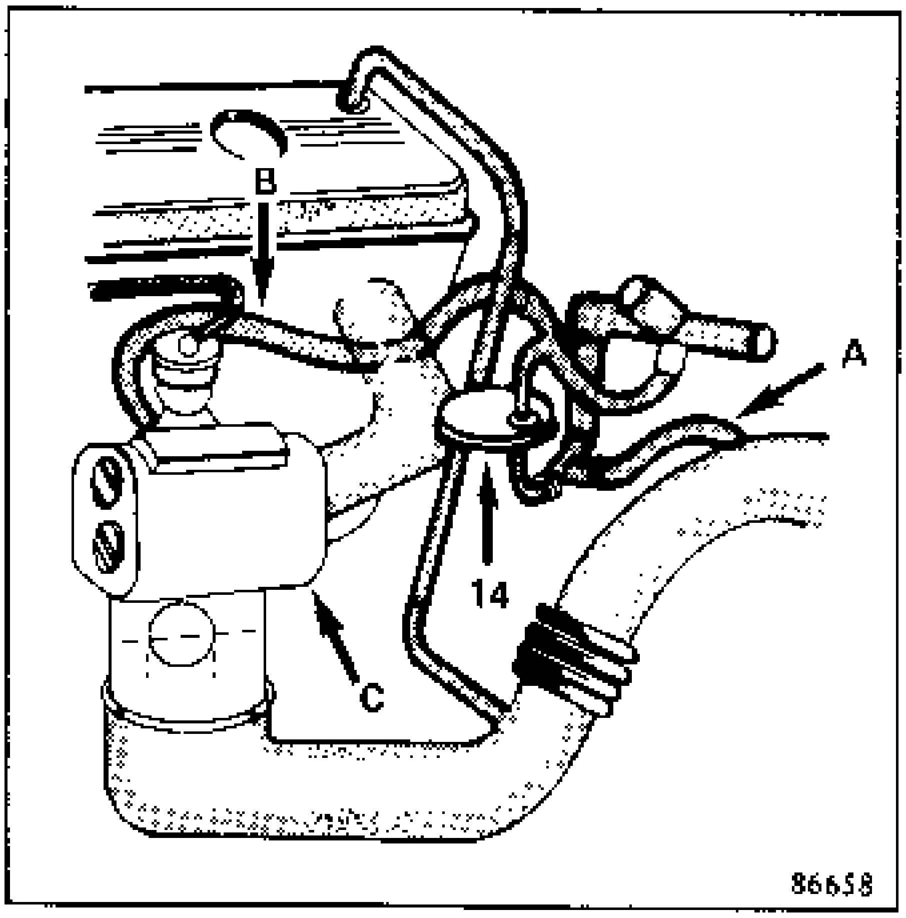
- From the flow meter, which permanently measures the volume and temperature of the air entering the engine, by a potentiometer (located at the end of the butterfly spindle) and a temperature sensor;
- From the ignition coil, where the primary winding voltage is used to determine the engine speed;
- The coolant temperature sensor (located on the cylinder head) enables the mixture to be enriched when the engine is cold;
- From the throttle switch located on the butterfly spindle, used to indicate the idling or full throttle positions;
- From the altimetric corrector.
- The cold start injector is controlled by a timed coolant temperature switch. When the starter is activated, it provides the necessary fuel enrichment for a cold start.
- The additional air valve is controlled by a bimetallic spring, heated by the ambient temperature of the engine and by an electrical resistor. It increases the amount of bypass air to enable accelerated idling when the engine is cold.
- The rpm relay, mounted under the coolant reservoir, controls the voltage to the fuel pump, the injectors, the computer, the additional air valve and the butterfly position switch.
- The oxygen sensor supplies variable voltage (mV) to the electronic module in accordance with the oxygen content in the exhaust gases.

NOTE:

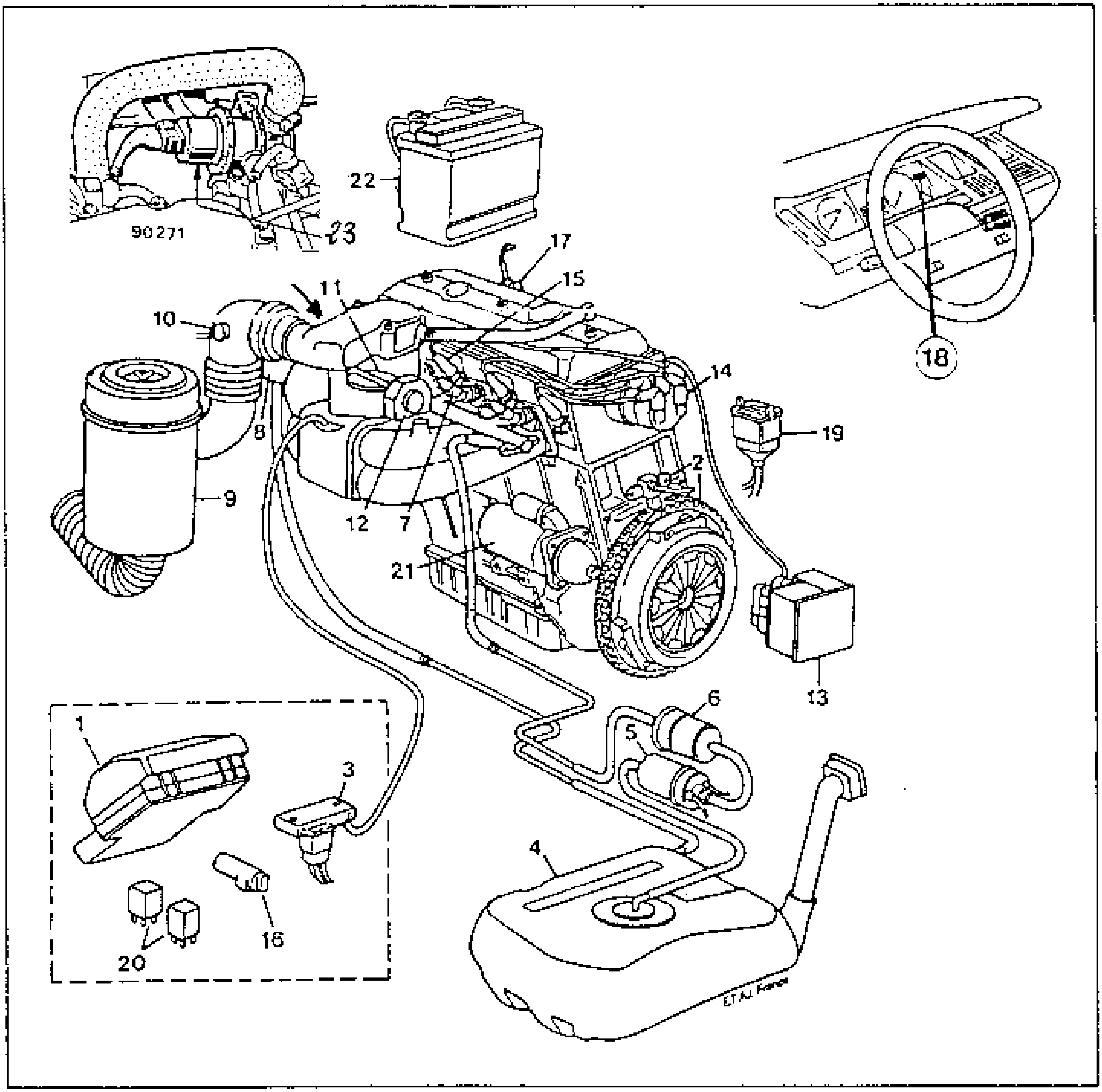
If the fuel mixture is "lean", the oxygen content of the exhaust gases will be higher. If the fuel mixture is "rich", the oxygen content of the exhaust gases will be lower. The perfect ratio is a mixture comprising 1 part fuel to 14.7 parts air.

The additional air valve (14) is connected by a tube (A) to the air duct upstream from the air/fuel throttle and by a second tube (B) to the mixing chamber (C).

The variable quantity of additional air required to operate a cold engine is provided by the additional air valve and passes via a circuit in parallel with the fuel/air throttle and the idling bypass.



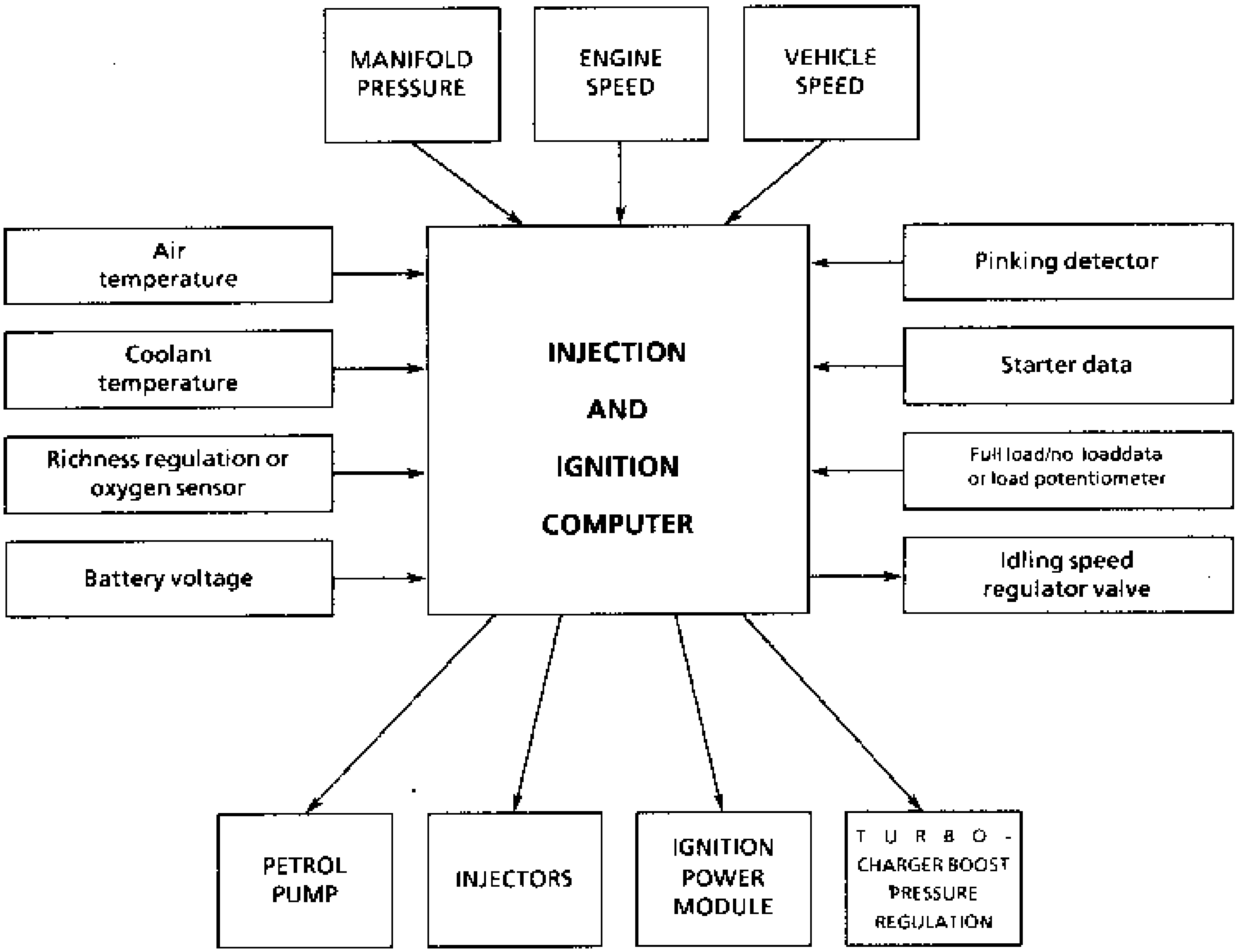
"R" INJECTION



1 - Electronic control computer
2 - Position/speed sensor and its target
3 - Pressure sensor
4 - Fuel tank
5 - Electric fuel pump
6 - Fuel filter
7 - Electromagnetic injectors
8 - Fuel pressure regulator
9 - Air filter
10 - Air temperature sensor
11 - Throttle housing
12 - Full load/no load switch
13 - Injection module and high-voltage coil
14 - Ignition distributor
15 - Spark plugs
16 - Idling mixture potentiometer
17 - Coolant temperature sensor
18 - Diagnostic warning light
19 - Diagnostic socket
20 - Relay
21 - Starter
22 - Battery
23 - Idling speed regulation valve

***NOTE:** The pinking detector, which is not visible on the diagram, is housed under the inlet manifold between cylinders 2 and 3.*

"R" INJECTION



Injection and ignition computer

This digital computer, mounted on a printed circuit board, includes a microprocessor as its main component.

The injection computer also comprises the two AEI integrated circuits, which are used as microprocessor peripherals.

The injection computer is housed in the engine compartment in a casing which protects it from impact.

NOTE:
For further information on "R" injection, please refer to the INJ. "R" (E) repair manual.

PRINCIPLE OF RICHNESS REGULATION BY OXYGEN SENSOR

Richness regulation by oxygen sensor, together with a trifunctional catalytic converter, has the advantage of suppressing, in the correct proportions, the three main pollutants contained in the exhaust gases (CO, HC, NOx).

The essential condition is that the fuel mixture must be metered with great accuracy to a metering close to richness 1 (close to the stoichiometric dose: 1 g of petrol to 14.8 g of air).

The regulation principle is based on permanently measuring the oxygen content of the exhaust gases, using the oxygen sensor, and correcting the richness based on the measurement taken.

The oxygen sensor, in the exhaust pipe, alternately transmits the rich mixture/poor mixture data , depending on the richness regulation.

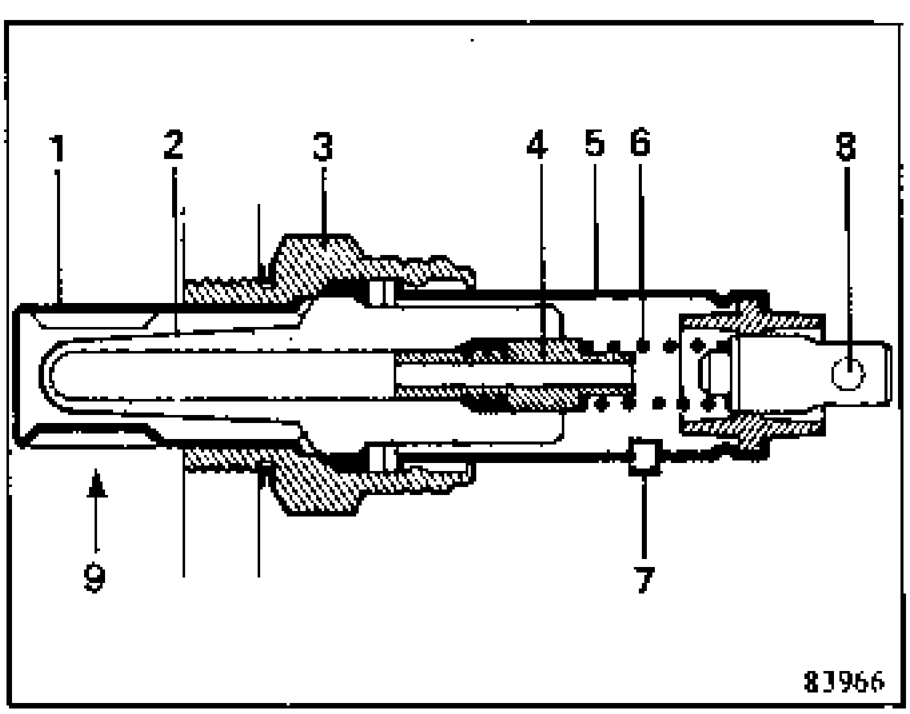
NOTE: The richness regulation does not work under the following conditions:
- at full throttle;
- during the starting and engine warm-up phase (timed start so that the sensor can reach its normal operating temperature).

OXYGEN SENSOR PRINCIPLE (Lambda sensor)

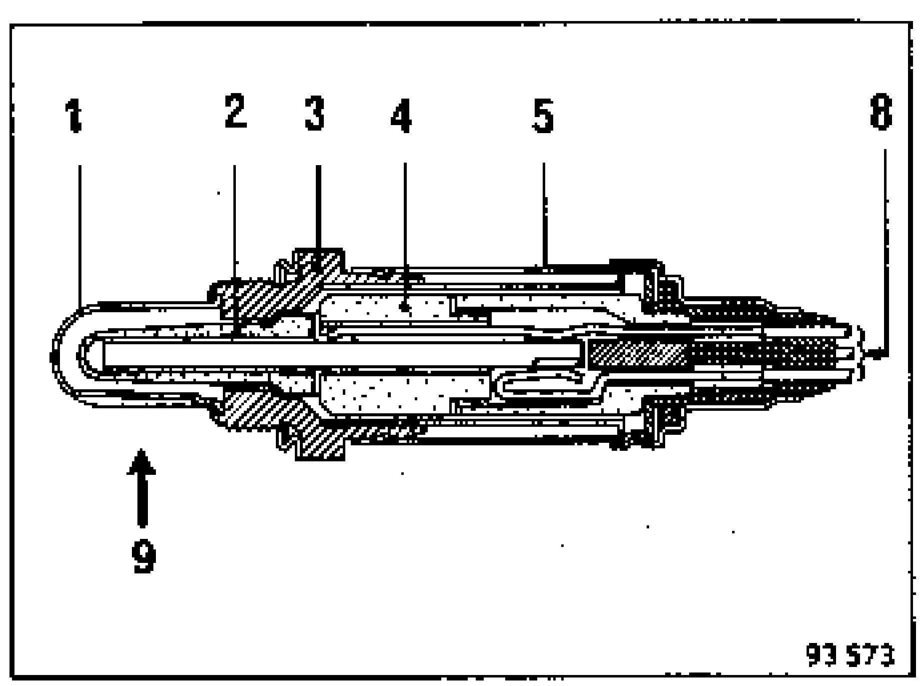
Its mode of operation is based on the capability of the ceramic used to conduct the oxygen ions from a temperature of approximately **250 °C**. If the oxygen content is not the same on both sides of the sensor, an electrical field forms between the two boundary layers precisely as a result of the particular property of the material used. This voltage enables the oxygen content on both sides of the sensor to be measured.

NOTE: The oxygen sensor can be fitted with a heating resistor with + feed after ignition. This heating enables faster priming of the sensor when the engine is started.

Non-heated sensor

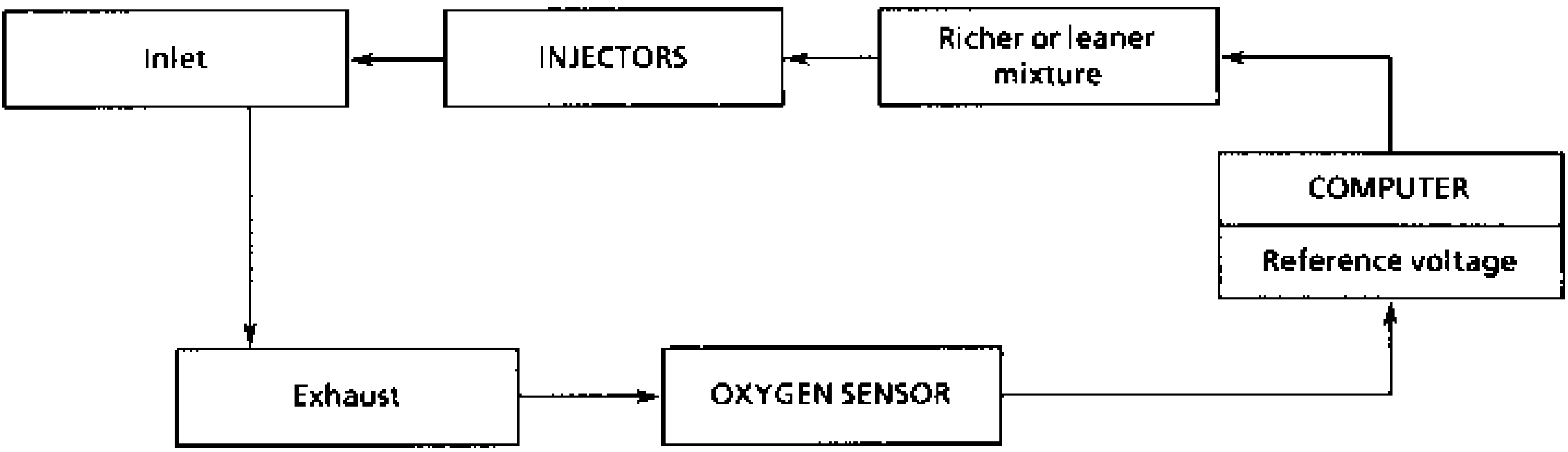


Heated sensor



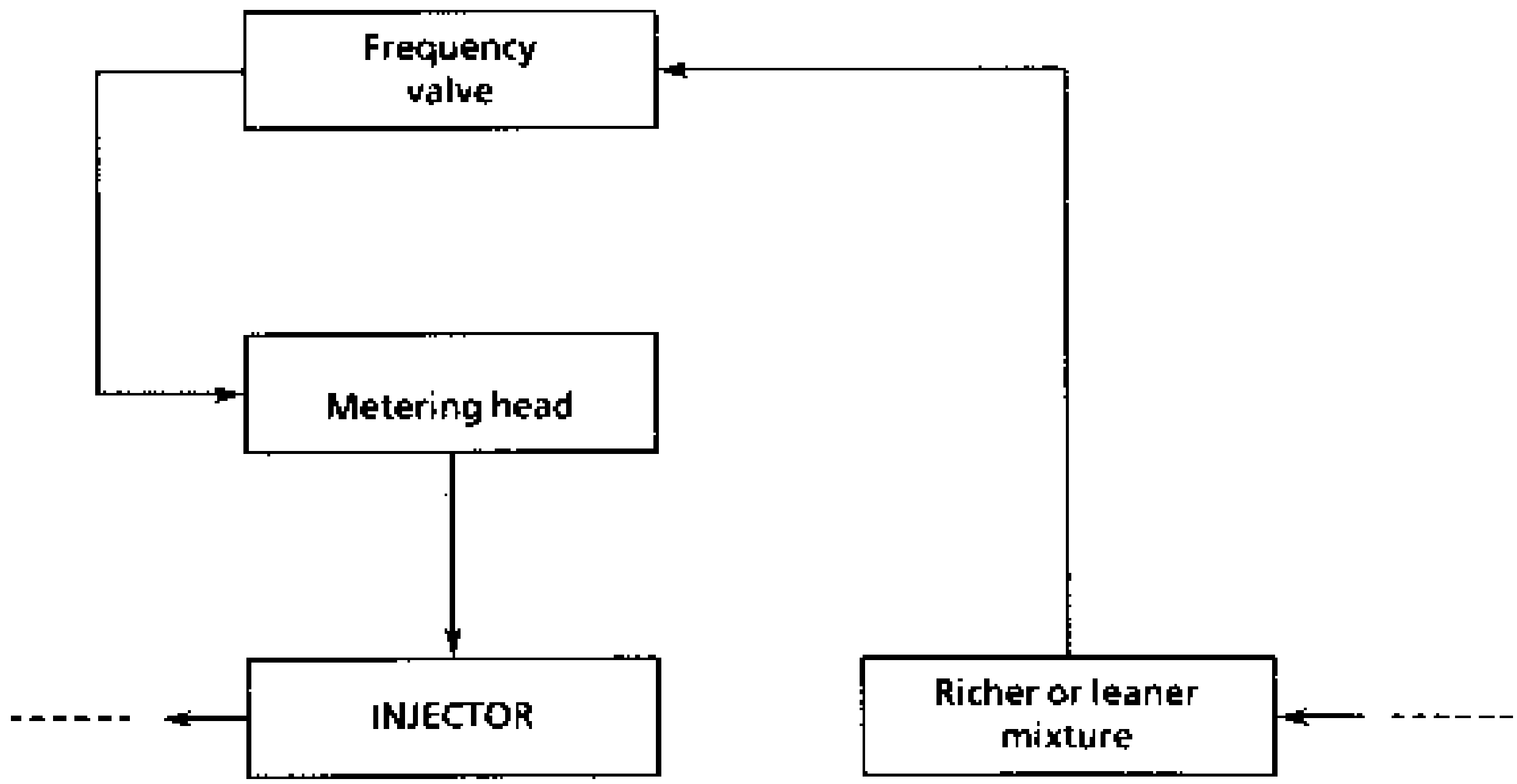
1 - Protective sleeve
2 - Ceramic sensor
3 - Body
4 - Contact element
5 - Protective casing
6 - Contact spring
7 - Ventilation opening
8 - Electrical connector
9 - Exhaust gases

RICHNESS REGULATION FLOW DIAGRAM



"K" INJECTION Special feature:

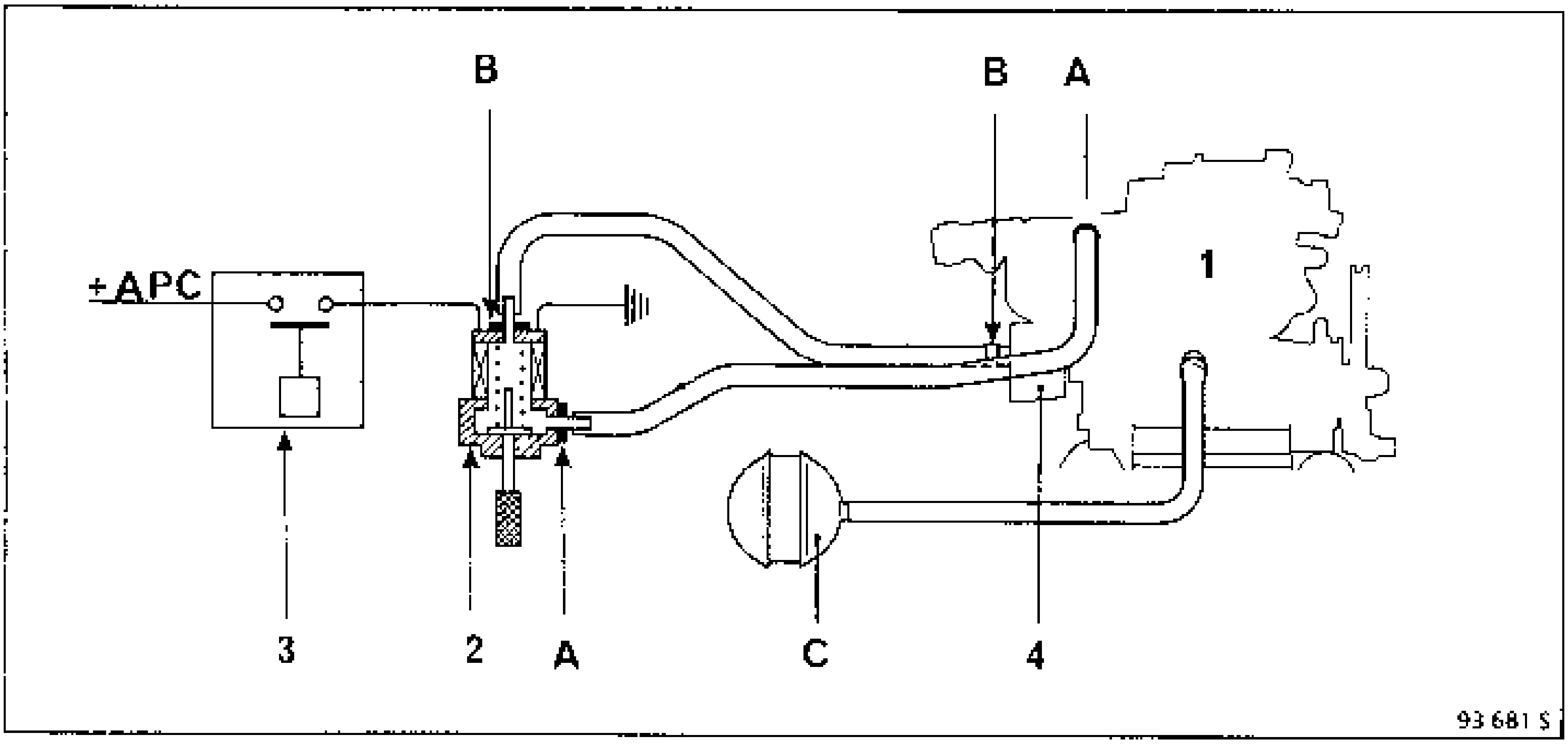
In this particular case, the injector delivery is not controlled by a calculated injection time, but by petrol pressure and by the position of the metering piston. The richness regulation is made possible by the frequency valve which affects the pressure at the injectors.



CARBURETTOR DEVELOPMENT (Model year 1990)

28 x 36 DARA 8 or 8C carburettors, fitted in B 297 vehicles, have a pneumatic cold enrichment system.

PNEUMATIC CIRCUIT



1 - Carburettor
2 - Solenoid valve
3 - Oil temperature switch
- circuit open above 40 °C ± 3 °C, temperature rising
- circuit closed below 15 °C ± 3 °C, temperature falling

4 - Pneumatic enrichener
A ring identification, green
B ring identification, brown
C Vacuum reservoir

The WEBER 28-36 DARA 8 carburettor includes the following:

- A vacuum reservoir (C):

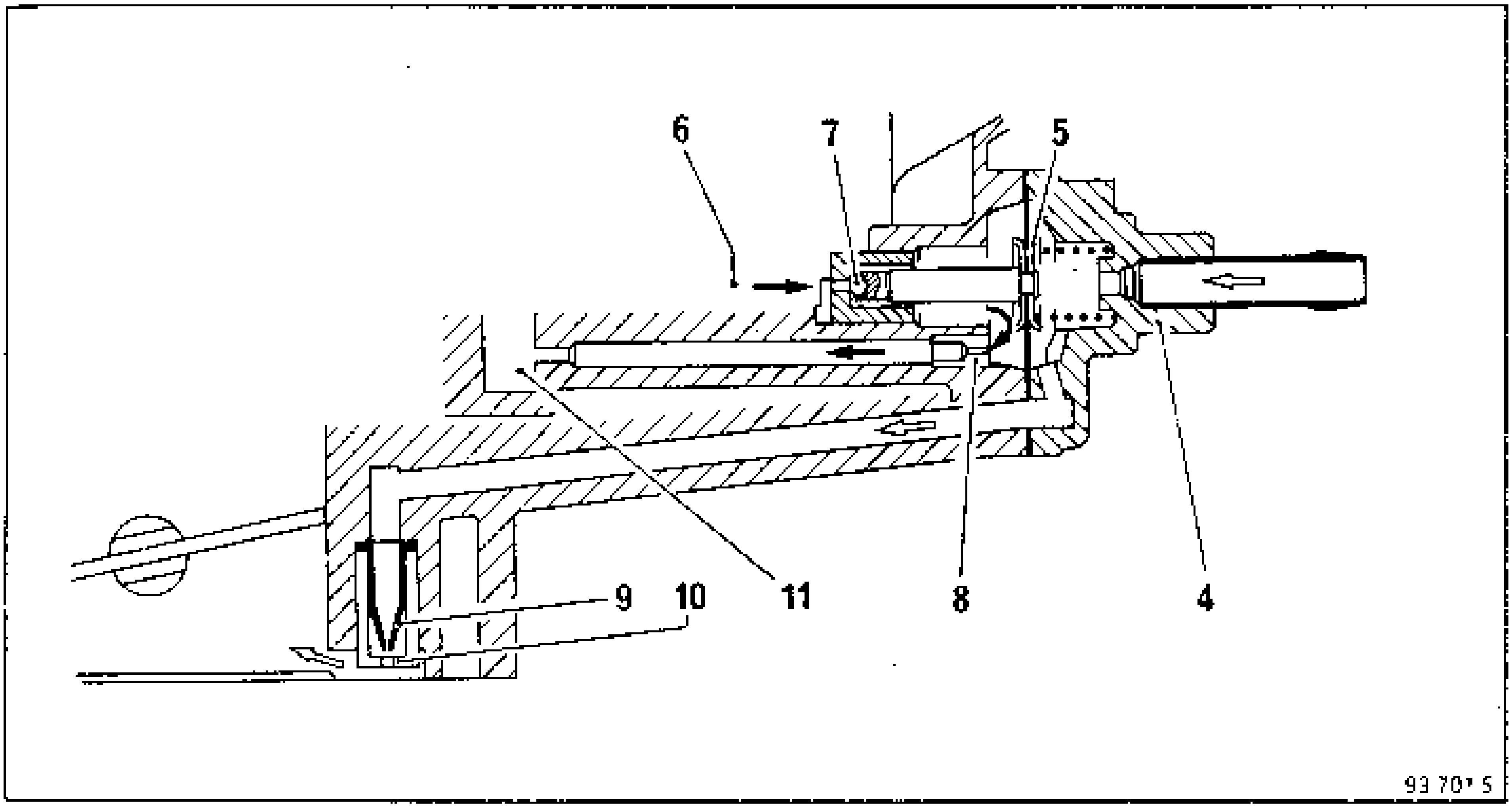
  The pneumatic choke flap opening control is linked to a vacuum reservoir (C).

  This reservoir acts as a damper; it slows down choke flap opening when the engine is started from cold.

- An enrichener (4), permanently activated when cold:

  The enrichener (4) is pneumatically controlled and comprises an internal carburettor circuit, a solenoid valve (2), an oil temperature switch (3) and two hoses (A) and (B), linking the float chamber top cover to the enrichener.

PNEUMATIC COLD START ENRICHENER



OPERATION

- **Starting from cold** (oil temperature below 15 °C)

The solenoid valve (2) is supplied with current and closes the vacuum circuit. The manifold vacuum causes the diaphragm (5) to open the valve (7); the petrol coming from the chamber (6) passes into the enrichener (4) and is sent to the emulsion tube (11) via the jet (8).

During acceleration, the manifold vacuum falls, the reed valve (9) closes, maintaining the vacuum on the diaphragm (5).

- **Engine hot** (oil temperature above 40 °C)

The solenoid valve (2) no longer has any power supply, and the vacuum circuit is open.

The jet (10) restricts the delivery of air into the circuit between the carburettor base and the chamber top (A); the vacuum upstream from the jet (10) falls and the valve (7) closes, cutting off the cold enrichener.

CHECKING THE COLD ENRICHMENT CIRCUIT

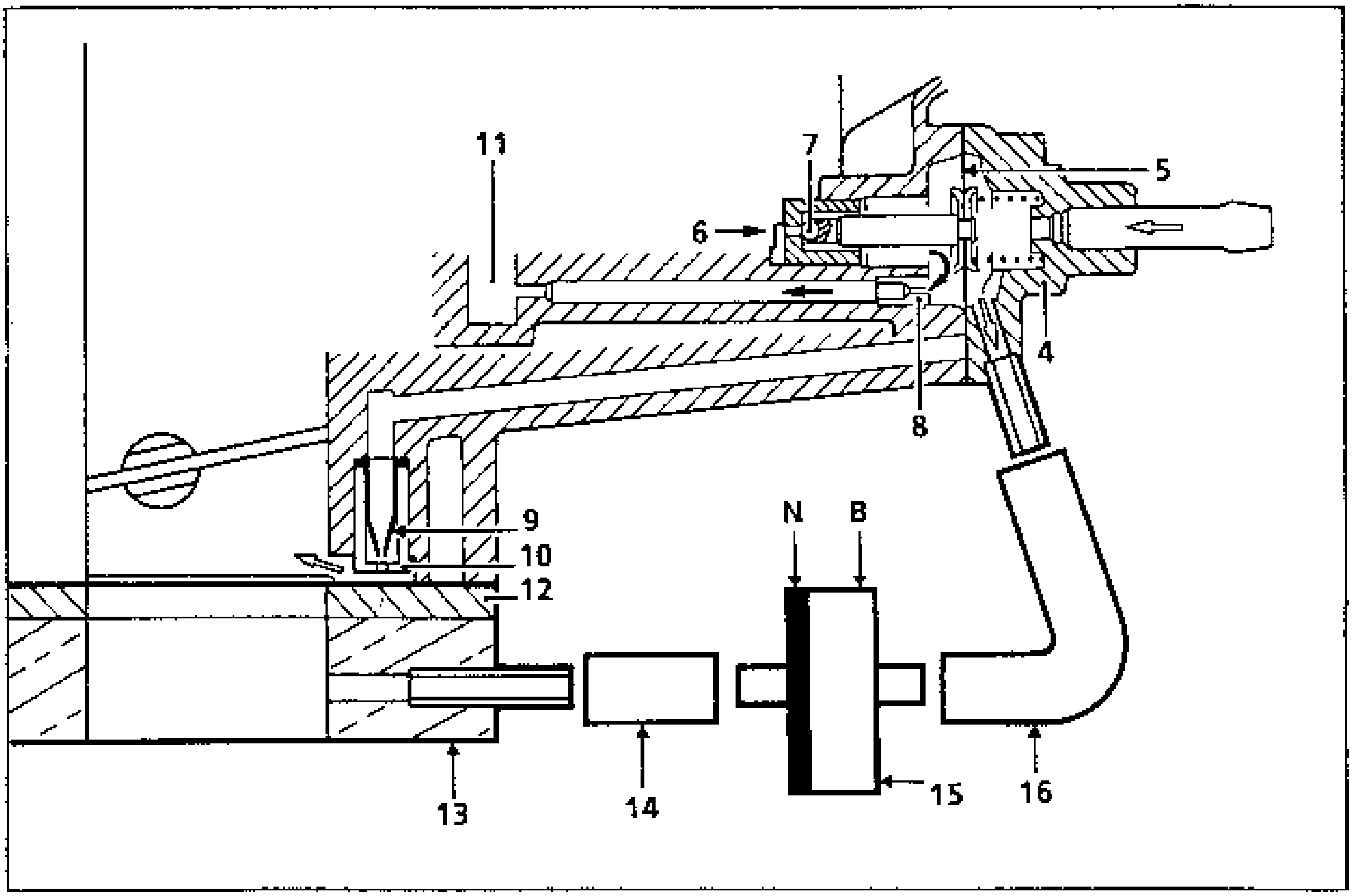
PARAMETERS	METHOD	OBSERVATIONS
Idling speed - Rev. counter - Gas analyser	The choke must be in its "off" position The engine speed and the CO must be adjusted without consumer (cooling fan motor, etc.) The engine must be hot → wait at least until the cooling fan motor is triggered. Adjust the idling speed to nominal, 800 rpm ± 50 and the CO to 1.5 ± 0.5%.	
Cold enrichener Check the operation of the solenoid valve controlling the cold enrichener, as well as the internal carburettor pneumatic circuit sealing. Rev. counter Vacuum pressure gauge **(Mot. 867)**	Engine idling: Connect a vacuum pressure gauge to the solenoid valve/enrichener pneumatic connection. To do this, disconnect the pneumatic line to the solenoid valve and position the pressure gauge at this level. Disconnect the oil sensor connector controlling the solenoid valve (on the oil gallery or on the remote oil filter support bracket on the version with air conditioning). Connect the two electric leads connected to the sensor using the electric shunt ----------------→	The vacuum read off on the pressure gauge must rise to a level of approximately 700 mbar.
	Depress the accelerator sharply up to approximately 3500/4000 rpm----------------------→	The vacuum level read off on the pressure gauge must only increase and never fall back.
	Disconnect the electric shunt --→	The vacuum must fall rapidly to 0.
	Reconnect the oil sensor connectorand remove the pressure gauge.	

FAULT-FINDING

PARAMETERS	METHOD	OBSERVATIONS
Increased consumption (cold start enrichener operating when the engine is hot)	Solenoid valve constantly supplied.	Oil temperature switch faulty. Replace. Electrical circuit faulty. Repair.
	Pneumatic circuit faulty.	Check pneumatic circuit connection to solenoid valve. Lines between enrichener and carburettor chamber blocked. Repair.
	Enrichener faulty.	Diaphragm spring broken or missing. Valve stuck open. Diaphragm holed. Repair enrichener.
Misfiring, lack of power (engine cold after starting)	Solenoid valve not supplied, engine cold, temperature below 15 °C	Oil temperature switch faulty. Replace. Electrical circuit faulty. Repair.
	Pneumatic circuit faulty.	Check connection of pneumatic circuit to solenoid valve. Lines between enrichener and solenoid valve disconnected or leaking.
	Lack of vacuum in enrichener or vacuum inadequate.	Carburettor pneumatic circuit not tight. Reed valve not tight.

As the result of a problem involving cold stalling, the cold enriching system is being developed and fitted with an additional pneumatic circuit. Consequently, the pneumatic circuit using the reed valve will be bypassed.

SYSTEM DEVELOPMENT



KEY:

- **4** - Enrichener cover
- **5** - Enrichener diaphragm
- **6** - Petrol from chamber
- **7** - Valve
- **8** - Jet
- **9** - Reed valve
- **10** - Vacuum restriction
- **11** - To emulsion tube
- **12** - Anti-percolation spacer
- **13** - Aluminium spacer
- **14** - Straight pipe
- **15** - Delay valve
- **16** - Preformed pipe

- **N** - Black
- **B** - White

Components 9 and 10 are no longer used for this new assembly.

SPECIAL FEATURES OF DELAY VALVE SYSTEM

The operation of the system is based on the same principle as that of the previous assembly.

The valve combines the functions fulfilled by the reed valve (9) and the vacuum restriction(10).

NOTE:

- When the engine is idling, the vacuum acts instantly on the diaphragm (5) via the delay valve.
- During acceleration (5), the vacuum at the level of the pipe (13) falls. The presence of the delay valve causes the vacuum in the enrichener chamber to fall slowly and gradually returns the enrichener to rest position.

Pay attention therefore to the direction in which this valve is fitted; this could cause the system to malfunction.

WEBER 28-36 DARA and 32 DARA CARBURETTORS

These must be adjusted accurately so as to achieve a stable CO percentage value between services; we would remind you that adjustment must be carried out under certain well-defined conditions:

1) The vehicle must have been run in to a minimum of 600 miles (1000 km) (any adjustment made to a vehicle which has not been run-in will quickly be cancelled out).

2) The cold start system must be non-operational (check it).

3) The engine must be at its normal operating temperature: to achieve this, run the engine at approximately 2000 rpm until the thermostat opens. However, do not leave the engine to heat on its own at idling speed, since when an engine has been running for several minutes at idling speed, the CO level measurement is no longer valid.

4) The idling speed must correspond to the manufacturer's instructions (see table).

5) The air filter must be in place and have a clean cartridge.

6) The ignition system must be in good condition and perfectly adjusted.

7) There must not be any additional air take-off (vacuum pipes, anti-pollution system, etc.).

8) The exhaust system assembly must not have any major leaks.

9) None of the major electricity consuming equipment must be running (cooling fan, headlights, heated rear window, etc).

Adjustment using exhaust gas analyser

In the countries concerned, remove the tamperproof cap from the mixture control screw (B).

Turn the screw (A) to obtain the average idling speed given in the table for the vehicle concerned.

Turn the screw (B) to obtain the CO percentage given in the table.

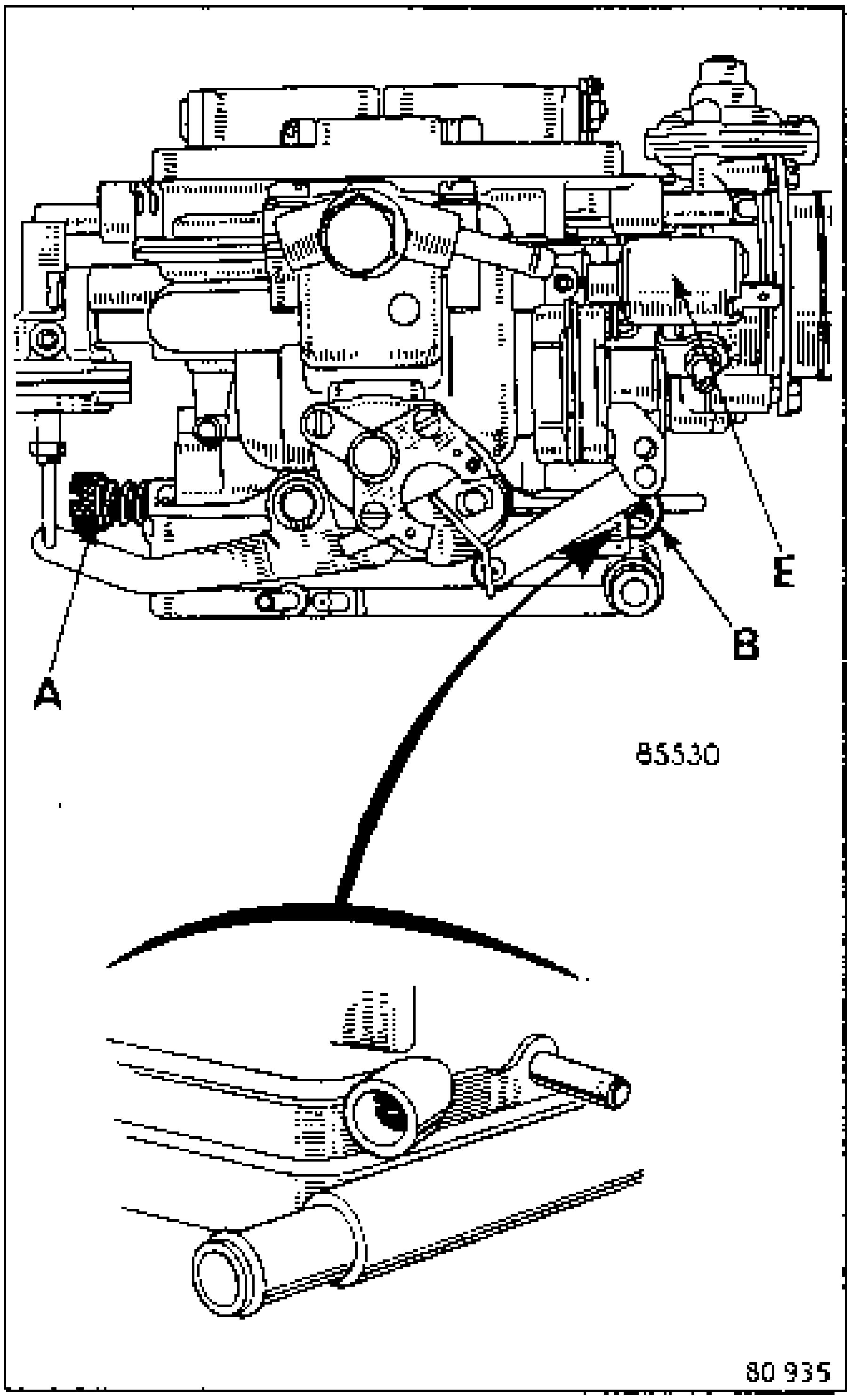
Turn the screw (A) to obtain the correct idling speed.

Repeat the two previous operations to achieve the correct CO percentage and idling speed.

In countries where legislation stipulates it, when the adjustment is finished, fit a tamperproof cap over the screw (B).

Tamperproof cap

CARBURETTOR	Tamperproof cap MPR Part N°.
WEBER 28 x 36 DARA WEBER 32 DARA	77 01 200 833



"K" JETRONIC INJECTION

ESSENTIAL SPECIAL TOOLING
Mot. 844 Exhaust gas sampling equipment

The engine must be run in and the air filter must be in place.

The ignition must be in good condition and correctly adjusted: there must be no additional air take-off (vacuum take-off for brakes, ignition, power supply, oil vapour recovery, automatic transmission).

Connect a tachometer to check the engine speed.

Bring the engine to its normal operating temperature by allowing it to run at approximately 2000 rpm until the thermostat for the radiator circuit opens.

For vehicles with automatic transmission:
Precheck with the gear selector lever in **Park**, to obtain the same values as vehicles fitted with a manual gearbox. Then, move the lever to **D** and adjust the final setting if necessary

This adjustment must be carried out using the exhaust gas analyser

Every manifold includes a boss with a blanking plug to connect the gas analyser.

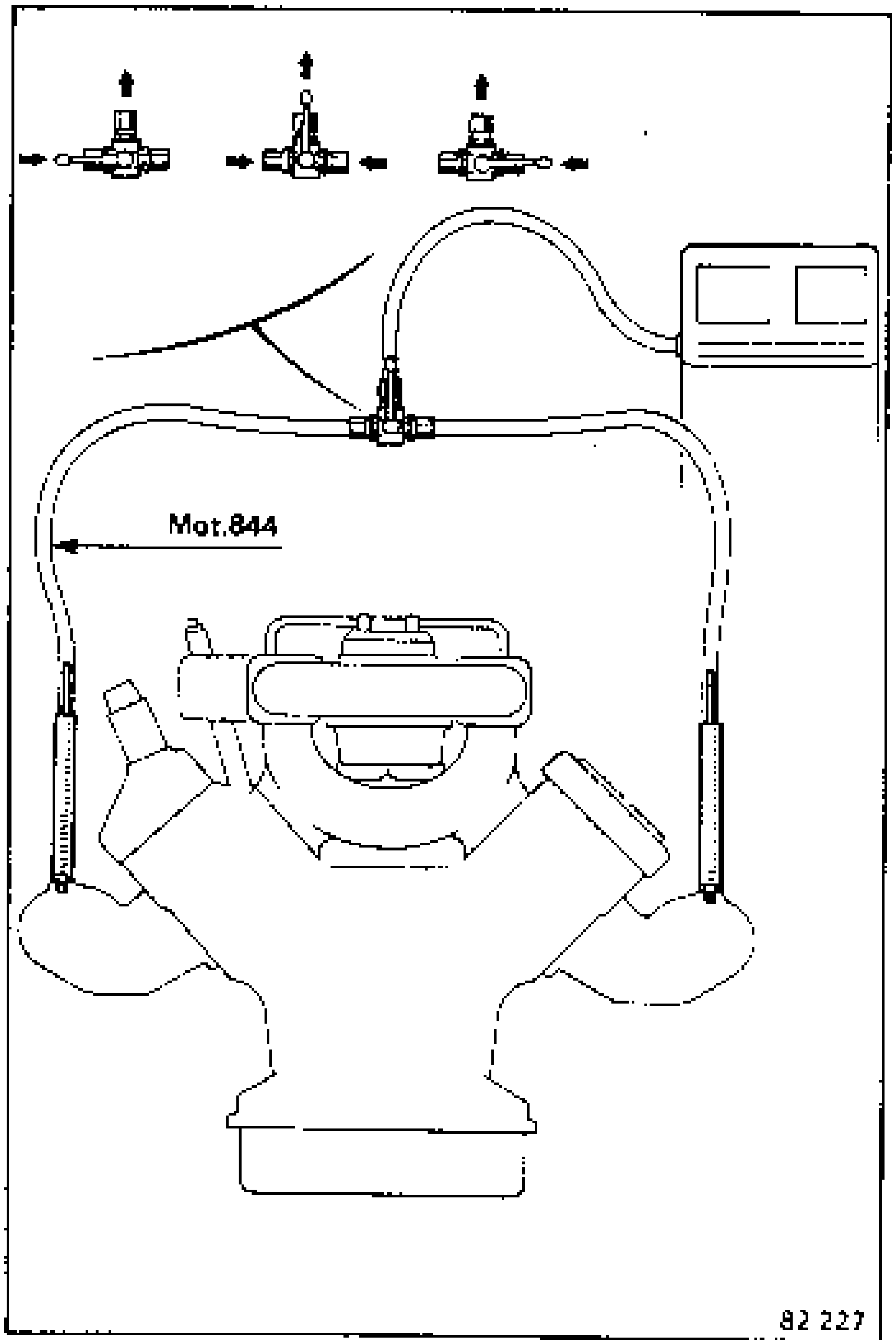
The exhaust gas sampling equipment **Mot. 844** comprises:

- two rigid pipes which are screwed to the manifolds instead of the plugs;

- a 3-way tap or 2 connected single taps: firstly to the two tubes by flexible pipes and, secondly, to the gas analyser.

The connection to the gas analyser must be sealed.

To do this, disconnect from the flexible hose the sensor which is usually placed in the exhaust line and connect this hose to the 3-way tap by a locally-made sealed connection, depending on the make of analyser.



"K" JETRONIC INJECTION

Method:

- Fully tighten the 3 screws (A), (B) and (C) and loosen screws (A) and (B) by 2 turns.

- Adjust the idling speed using the air bypass screw (C).

- Place the tap(s) so as to be able to check the CO % of the 2 cylinder banks simultaneously.

- If necessary, adjust the richness using screw (D), using a 3 mm hexagon key, without pressing on it. Mixture enrichment is achieved by tightening the screw and vice versa.

- Cover the hole of screw (D) to obtain a correct reading.

- Readjust the speed, if necessary, using screw (C).

- With the speed and CO % correctly adjusted, move the tap(s) to check the richness of each cylinder bank in turn.

- Balance the CO % if necessary and adjust the nominal setting using screws (A) for the right-hand side and (B) for the left-hand side.

- If necessary, readjust (C) and (D) to obtain the recommended CO % and idling speed simultaneously.

Precautions and special features:

Screws (A), (B) and (C) are covered with a cap.

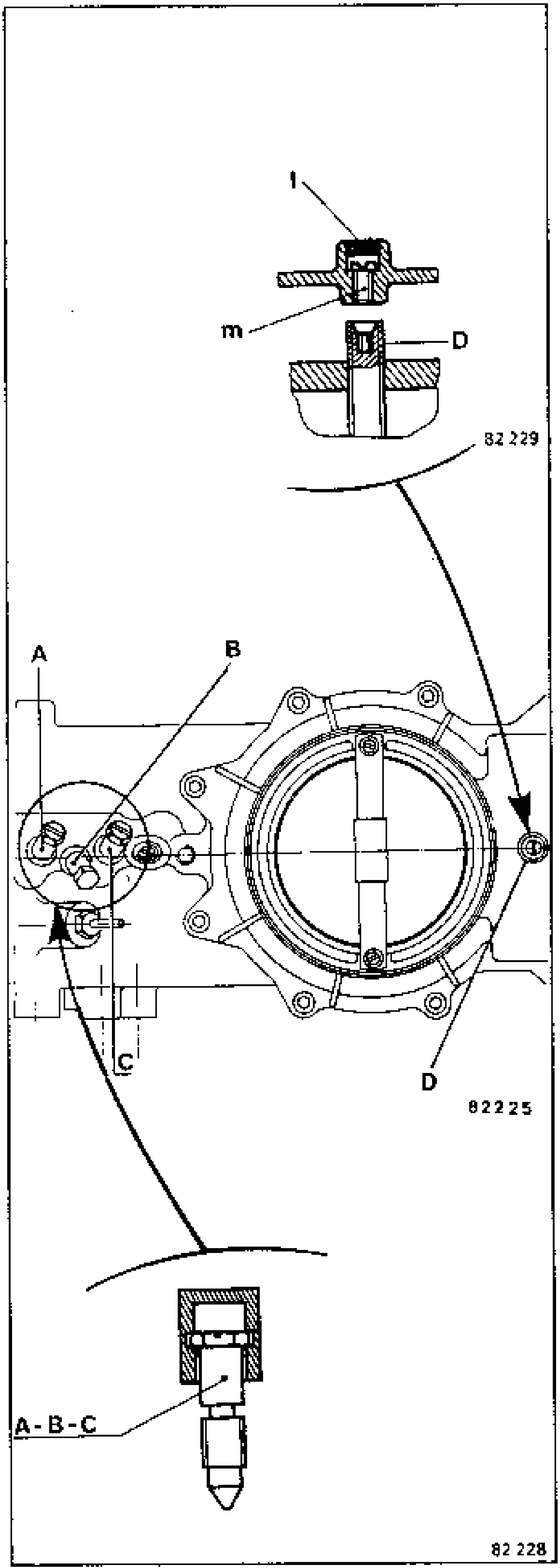
Screw (D) is only accessible after removing a tamperproof cap (l) and unscrewing a blanking screw (m).

They must be replaced after adjustment

The legislation in certain countries requires the presence of the tamperproof cap on screw (D).

IMPORTANT: The CO readings must always be taken with the blanking screw (m) in place or while blocking the opening with your finger.

Adjust screw (D) without pressing on the 3 mm hexagon key.



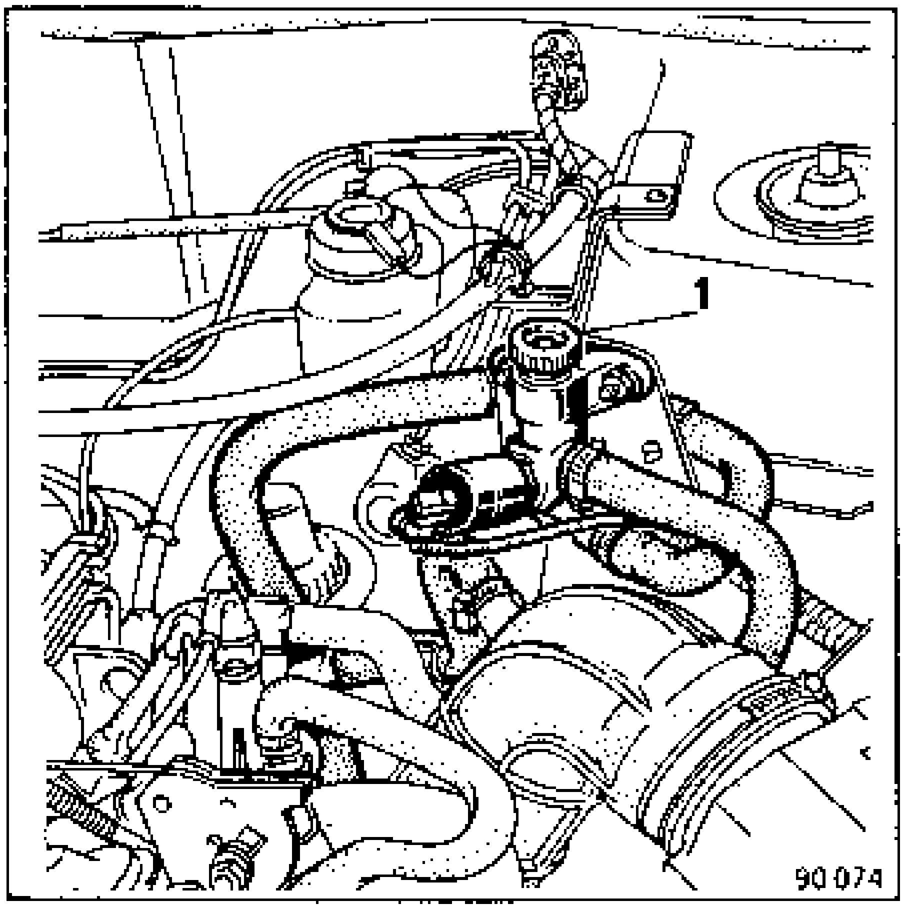
"L" JETRONIC INJECTION

Idling speed adjustment

Start the engine and allow it to reach its normal operating temperature. Connect a speedometer to the diagnostic sockets (D1-1 and D1-3). Do not switch on any accessories. Wait until the electric fan has completed a cycle and stopped. Adjust the bypass screw (1) as follows:

Manual gearbox;
800 ± 50 rpm.

The idling adjustment screw is located on the bypass body, attached to the left-hand shock absorber turret (1).

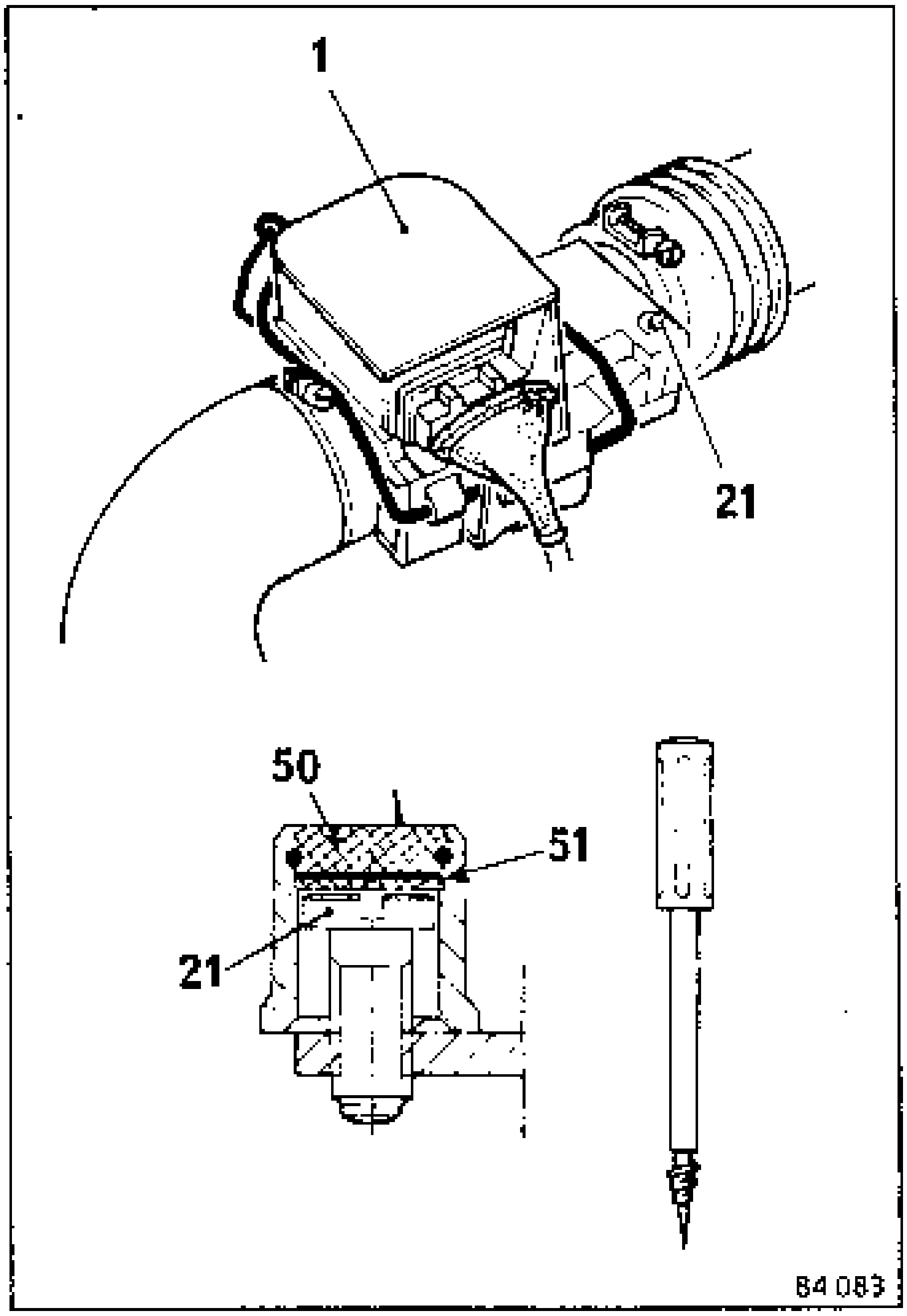


Adjusting the flow meter bypass

When carrying out general engine servicing or replacing the flow meter, the bypass adjusting screw (21) must be adjusted so as to obtain the correct fuel mixture.

With the engine hot:
- Adjust the idling speed to **800 ± 50 rpm.**

The bypass adjusting screw, which is factory set, is located on the flow meter body top.



Adjustment tamperproofing

The adjusting screw (21) is made tamperproof by a cap (50) set into the flow meter housing (1) above the screw (21).

To remove the cap:

- Push it in fully to stop it rotating;

- Drill it with a 3 mm bit; a special steel washer pressed into the cap stops the drill penetrating further;

- Screw a tamperproof cap removing tool into the hole and pull to remove the cap.

"L" JETRONIC INJECTION

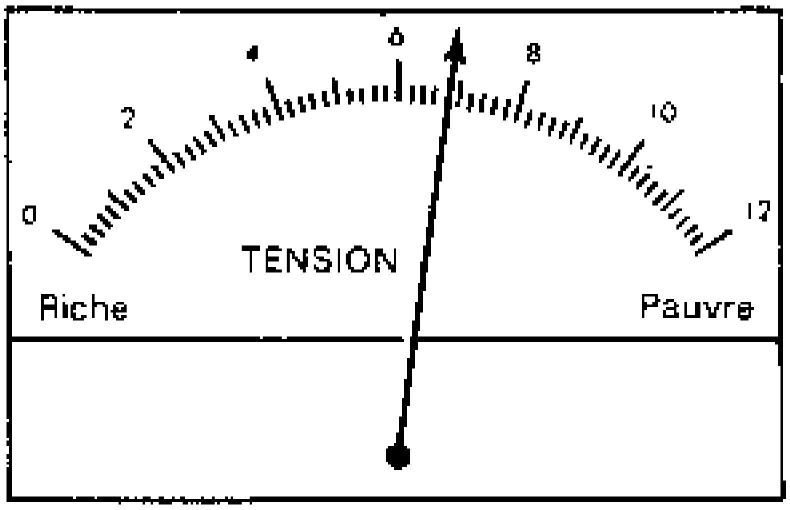
Idling speed adjustment(continued)

NOTE:
Never remove this cap or adjust the flow meter bypass screw unless you are carrying out major engine repairs, replacing the flow meter or unless there is a high CO percentage.

Remove the tamperproof cap to gain access to the screw (21).

Disconnect the oxygen (O_2) sensor lead connector.

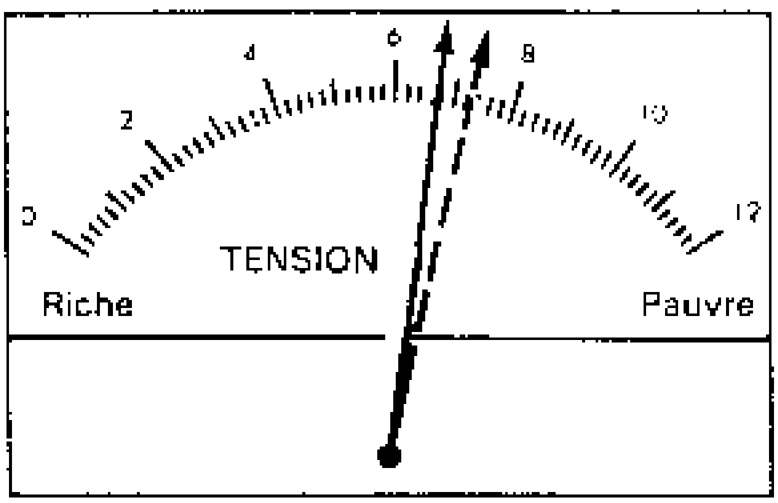
Connect a voltmeter to the diagnostic sockets (D2-2 and D2-7). Note the voltage. It should be approximately **6 to 7 volts**.



83076A

Reconnect the oxygen (O_2) sensor lead connector.

Watch the voltmeter and adjust the bypass screw to obtain the voltage noted above: **± 0.5 volts** (needle variation).



83076B

NOTE:
Incorrect bypass screw adjustment can cause a voltage fluctuation of **± 3 volts.**

After adjusting the bypass screw, check the idling speed and adjust if necessary. Replace the tamperproof cap.

The idling speed is checked using the adjusting screw (1); the idling bypass assembly is attached to the front left-hand shock absorber turret.

Idling speed - engine hot: **800 ± 50 rpm** for a vehicle with a manual gearbox.

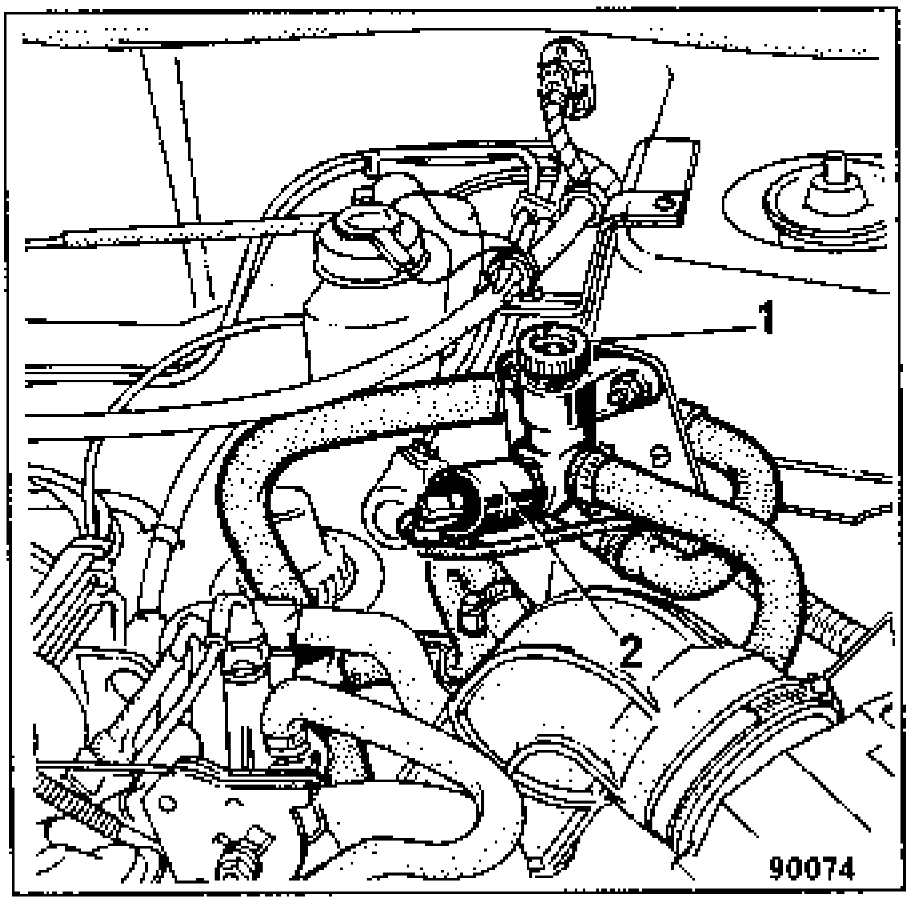
Accelerated idling system:

The accelerated idling solenoid valve (2) is screwed to the bypass module. It supplies an additional quantity of air to the engine when starting.

A timer relay supplies the accelerated idling solenoid valve while the starter is activated and maintains it for approximately 3 seconds after starter activation.

This relay receives a voltage after ignition.

On the B 29 B, all the EGR control elements and the timed relay are located on a plate above the steering rack.



1 - Idling speed regulation screw
2 - Accelerated idling solenoid valve

"R" INJECTION

The very first models with "R" injection were not fitted with idling speed regulation. Consequently, it will be necessary to adjust the CO using the potentiometer.

Adjustment using exhaust gas analyser

In the countries concerned, remove the tamperproof cap from screw (B) of the idling mixture potentiometer.

Turn the air bypass screw (A) to obtain the average idling speed shown in the table for the vehicle concerned.

Turn screw (B) to obtain the CO percentage shown in the table. Turn screw (A) to obtain the correct idling speed.

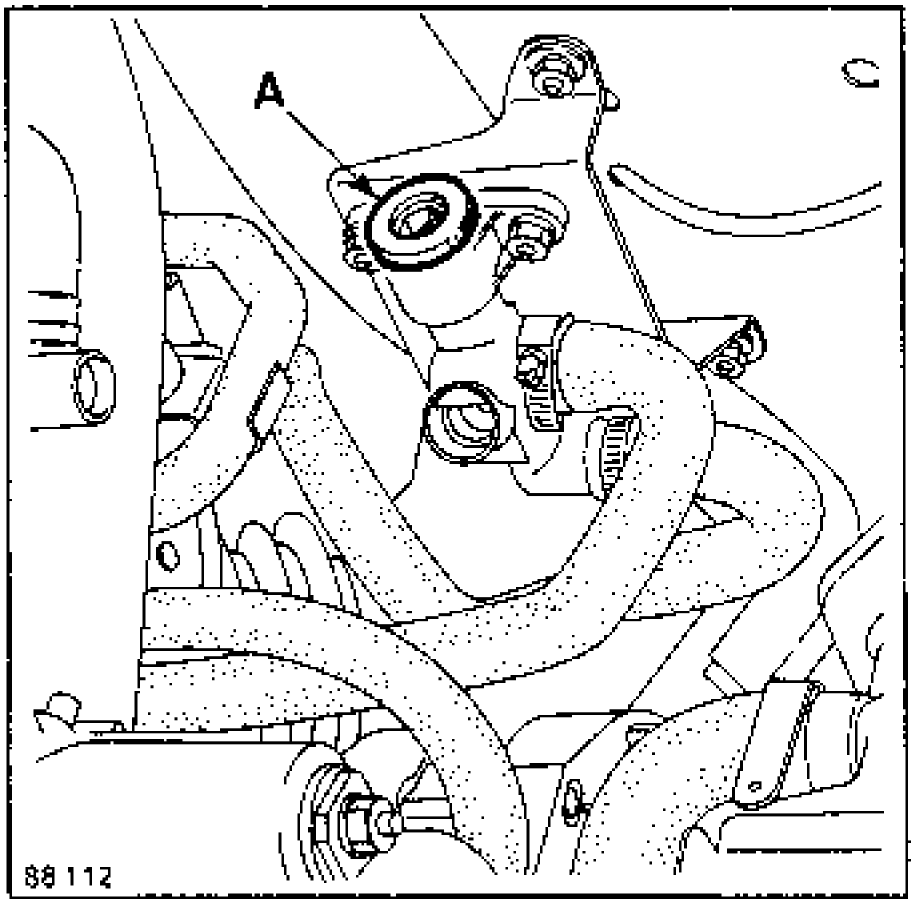
Repeat these two operations until the correct CO percentage and idling speed are achieved.

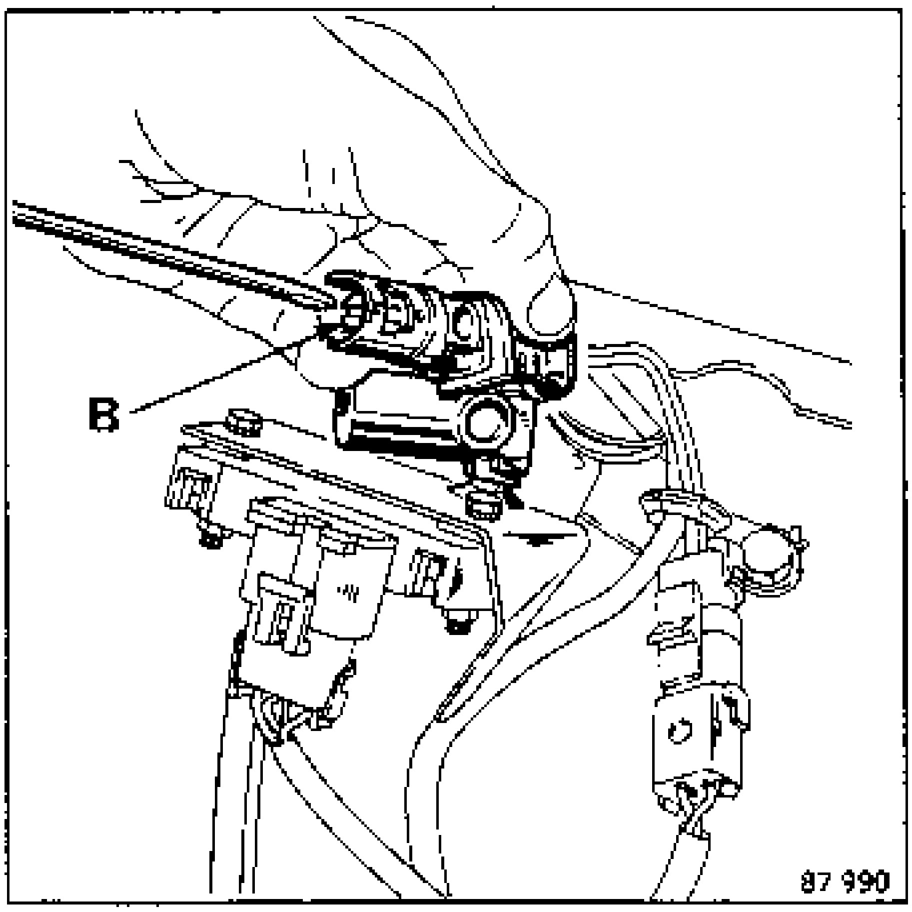
In countries where the legislation requires it, when the adjustment is finished, fit a tamperproof cap over the screw (B).

Tamperproof cap

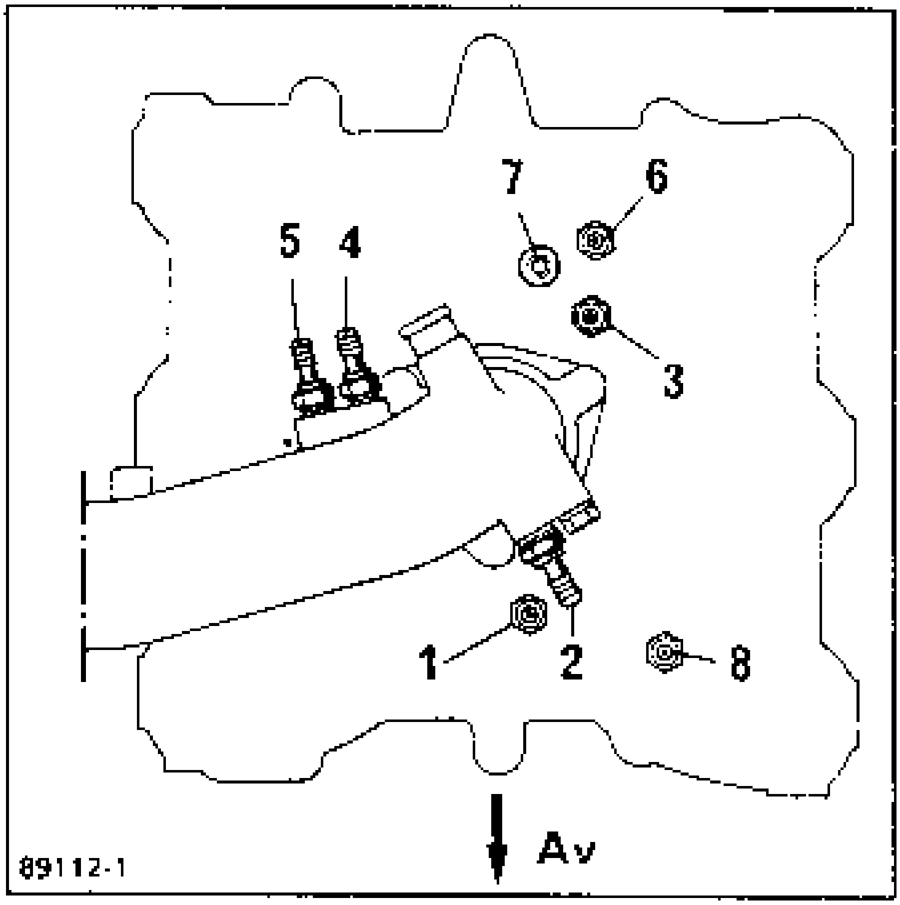
MPR Part N°.: 77 01 200 832

***NOTE:** If the correct richness cannot be obtained by min./max. rotation of the screw (B), disconnect the oil fume recirculation pipe from the rocker cover. If the richness falls by more than 1%, the engine oil must be replaced.*





Special features of turbo models (B 29 G - B 295)



Connections:

1 - Petrol pressure regulator

2 - Turbo pressure indicator on dashboard

3 - Bypass valve

4 - Safety pressure switch

5 - Turbocharger boost pressure control solenoid valve (B 29 G)

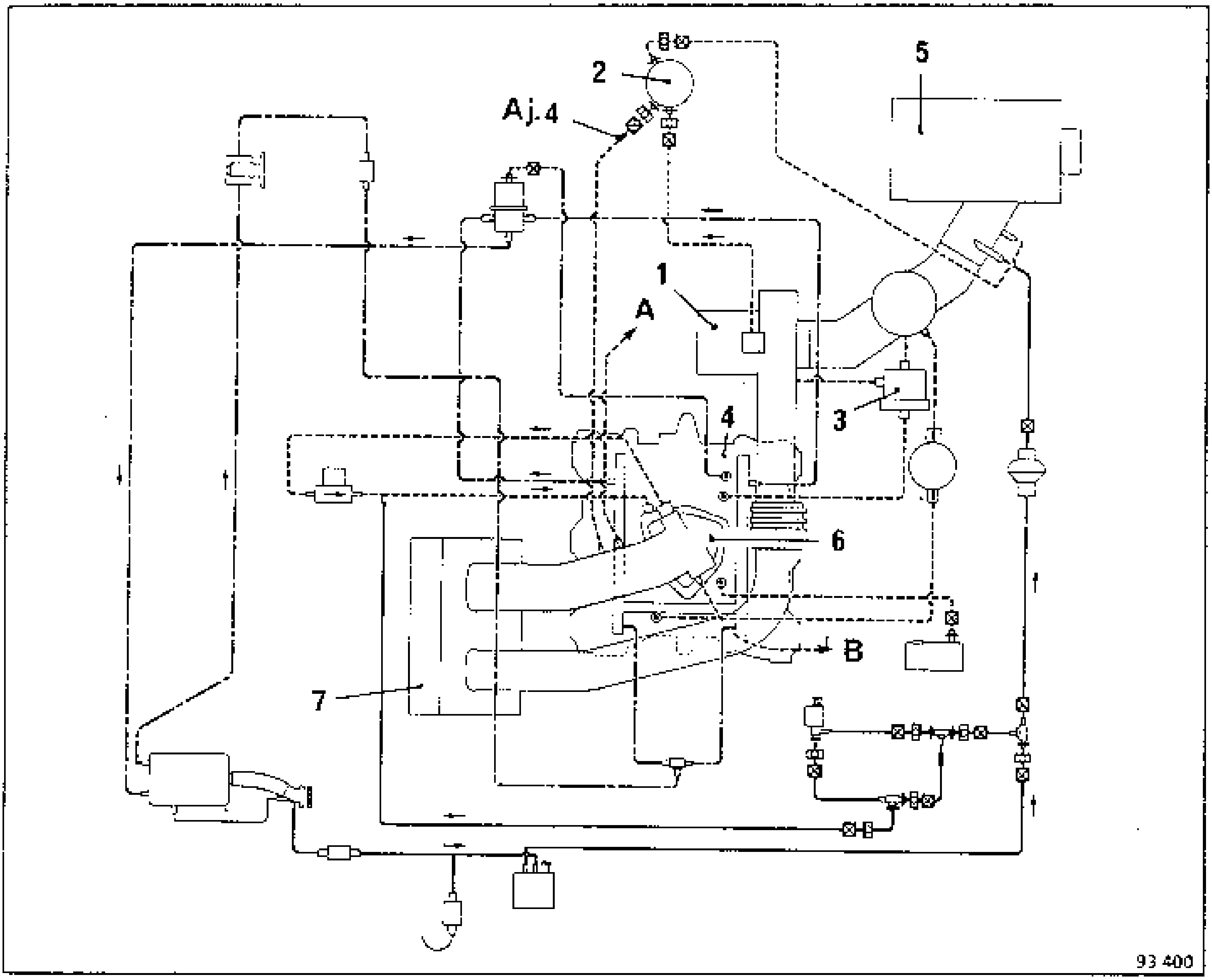
- Turbocharger boost pressure regulator (Waste gate) (B 295)

6 - Absolute pressure sensor

7 - Master-Vac

8 - Oil vapour recirculation (B 29 G)

Special features of vehicle B 29 G



Air/petrol circuit

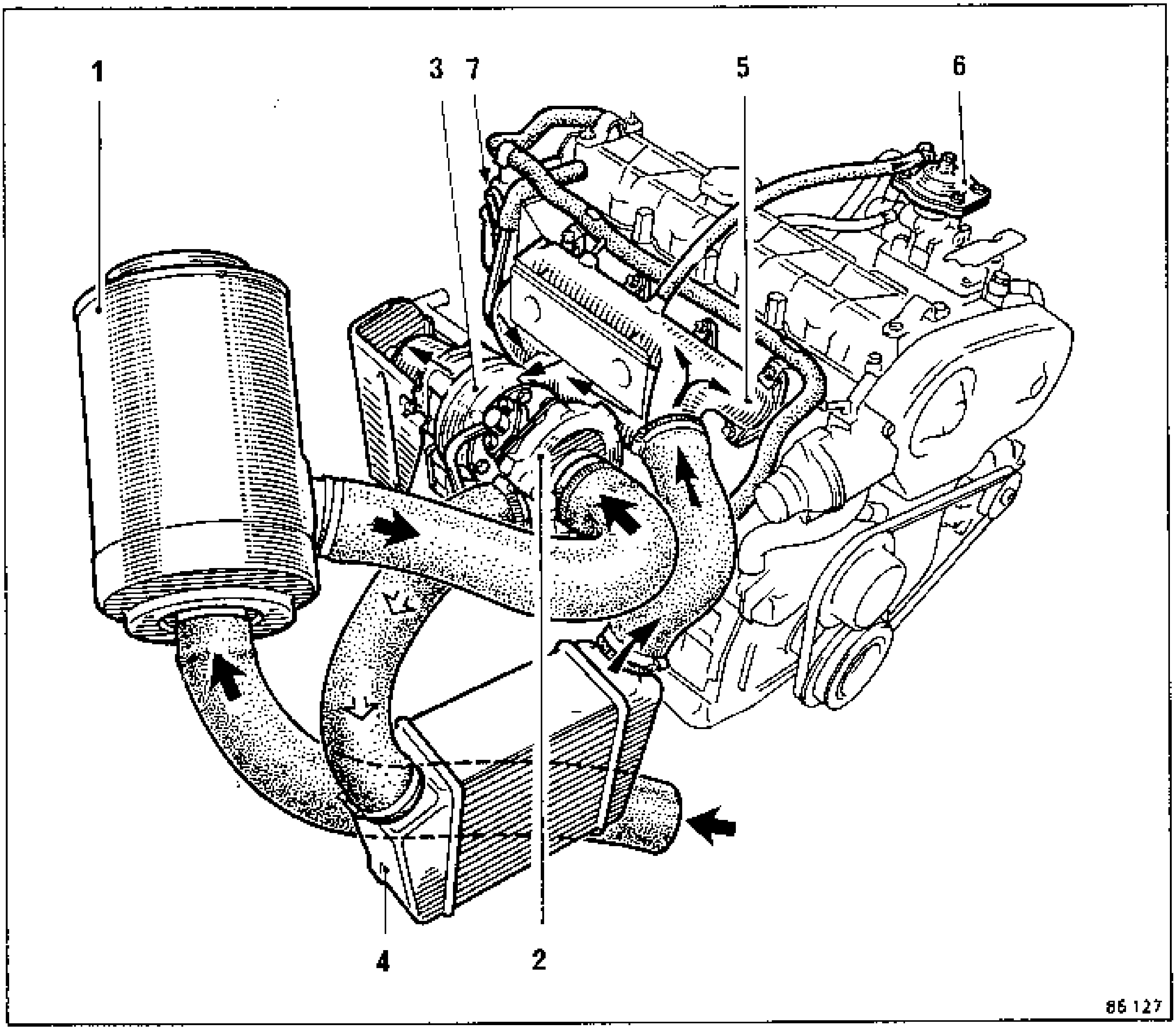
Petrol circuit

Air circuit

1 - Turbocharger
2 - Turbocharger boost pressure regulating solenoid valve
3 - Bypass valve
4 - Inlet manifold
5 - Air filter
6 - Throttle housing
7 - Air/air exchanger (intercooler)

→ **A** - To safety pressure switch (Ø 3 mm restrictor in the pipe)
→ **B** - To dashboard pressure gauge
AD4 - Ø 1.9 ± 0.1 mm restrictor

Symbols ; ; - ; will be identified in chapter 14.



1 - Air filter

2 - Intake air compressor

3 - Drive turbine activated by exhaust gases

4 - Compressed inlet air cooler (air/air exchanger)

5 - Compressed inlet air manifold

6 - Injection pump with "LDA" flow corrector

7 - Oil decanter

Air at atmospheric pressure

Compressed inlet air

Cooled compressed inlet air

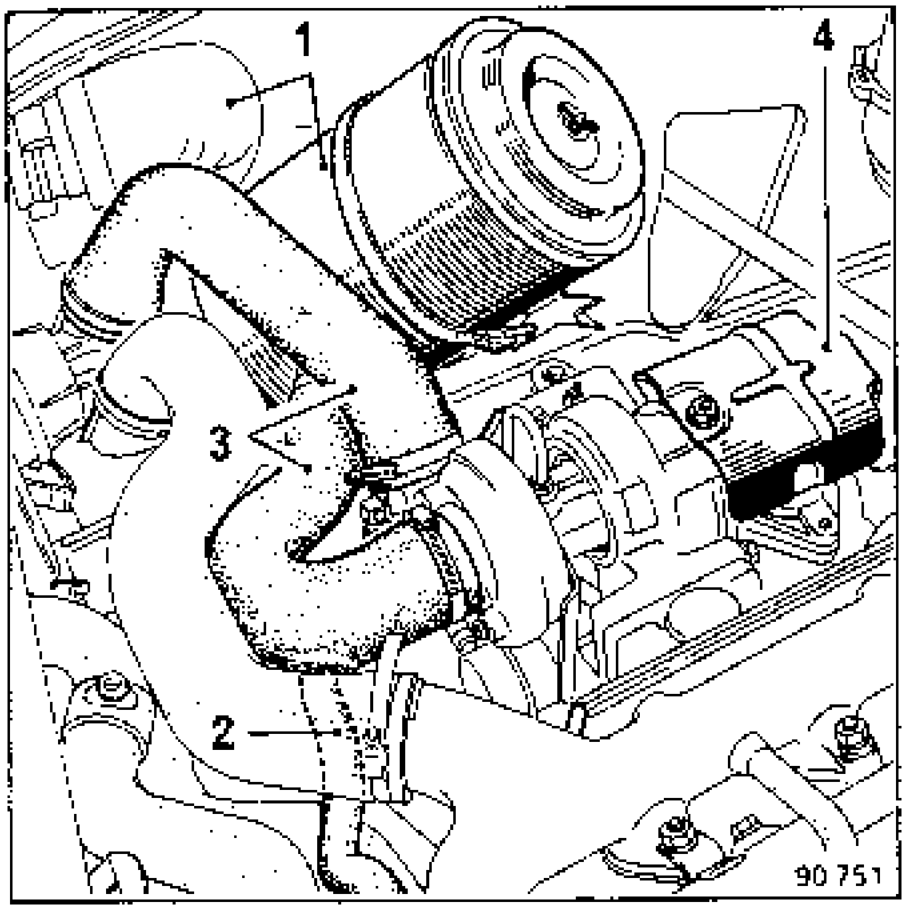
Exhaust gases

***NOTE:** The engine housing oil vapours are decanted in the unit (7) which is linked on the one hand to the oil sump and on the other hand to the inlet pipe in front of the turbocharger.*

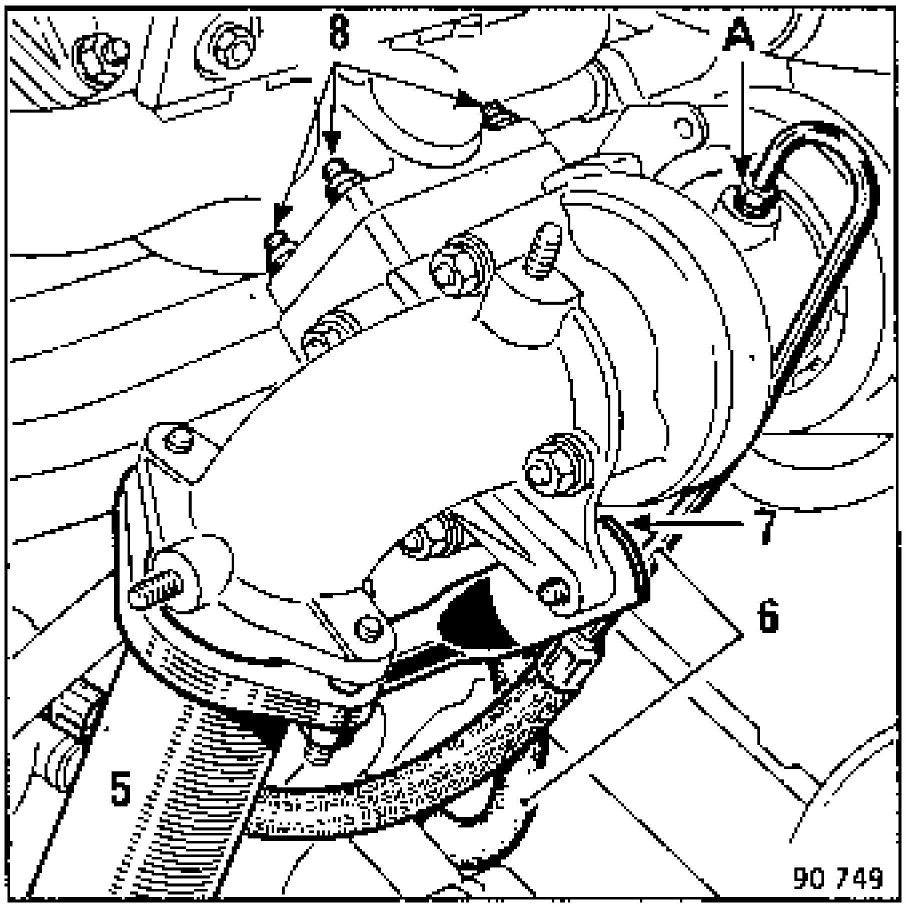
REMOVE-REFIT

In order, remove:

- the air inlet (3), compressor input and output hoses (disconnect the oil vapour recirculation hose);
- the heat shield (4);



- the exhaust pipe (5);
- the oil supply and return pipes to the turbocharger (6);
- the support bracket (7);
- the turbocharger fixing bolts on the exhaust manifold (8).



Refitting

Thoroughly clean the exhaust manifold and turbocharger gasket faces

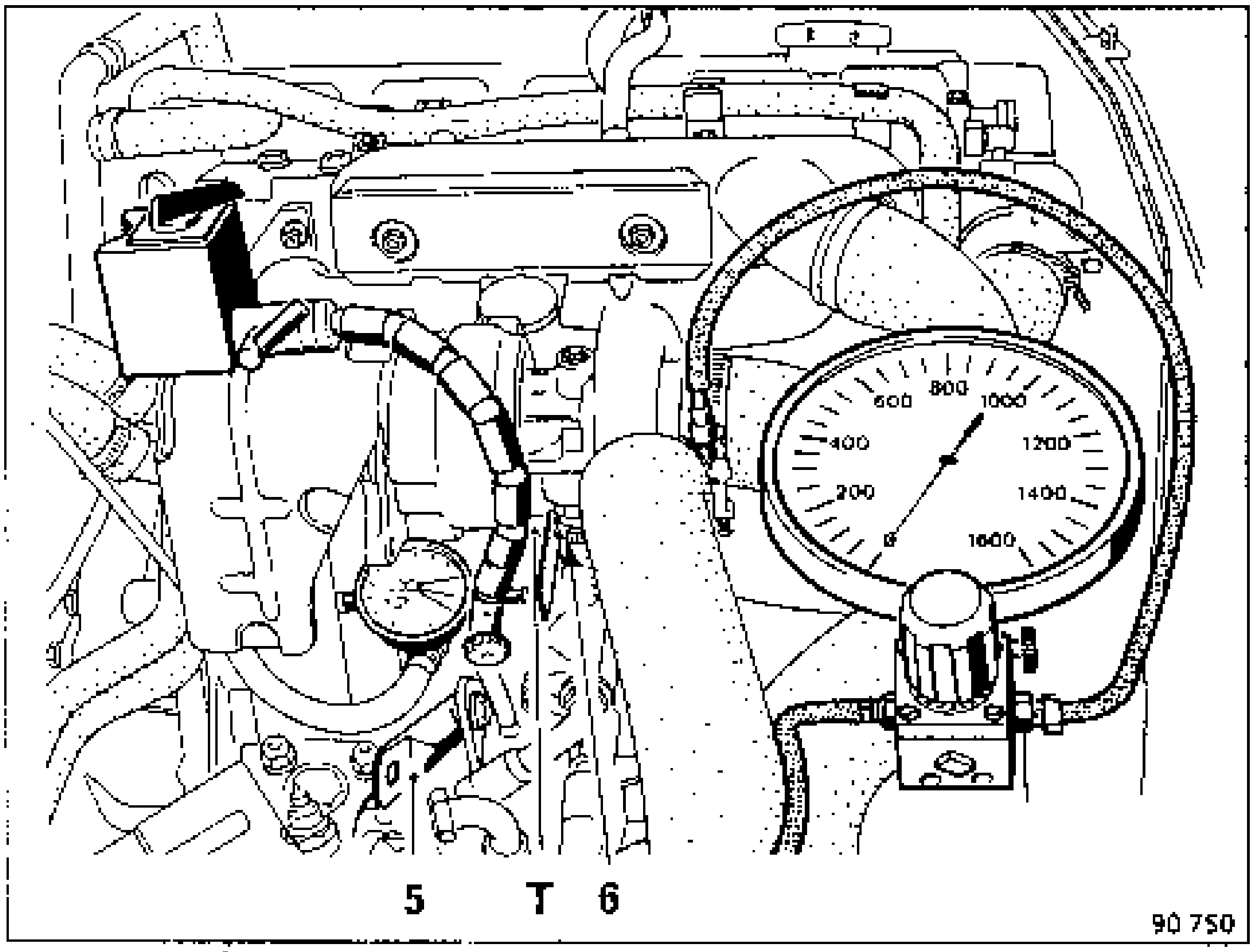
Replace the turbocharger to exhaust manifold fixing nuts using new nuts as shown on parts microfiche.

Connect the oil return and secure it using a new clip.

Top up the turbocharger with engine oil through the oil inlet (A).

Tighten the oil supply connection and allow the engine to idle to let the oil circulate.

CHECKING AND ADJUSTING THE STATIC PRESSURE SETTING

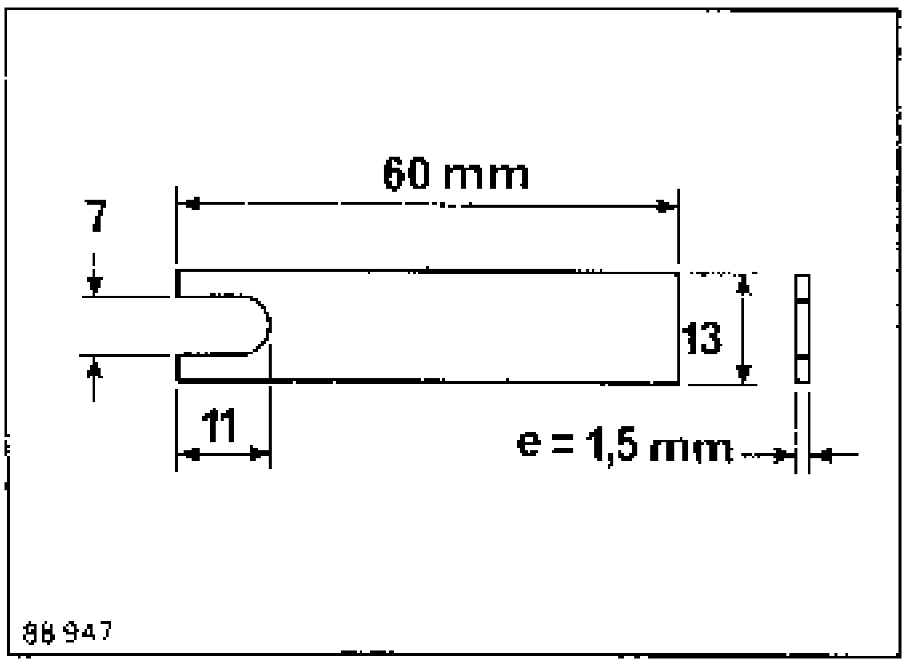


Disconnect the oil input and the turbocharger fixing bracket (5).

Disconnect the hose linked to the wastegate and connect kit **Mot. 1014**.

Make a spacer in accordance with the drawing below and tighten it between the rod (T) and the nut (6).

Against the spacer place a dial indicator attached by a magnetic stand to the exhaust heat shield.



Gradually increase the pressure until the wastegate rod is displaced by **0.38 ± 0.02 mm** and note the value read off from the pressure gauge, which must correspond to the reference values given.

If the static pressure setting is still outside the tolerances, replace the wastegate assembly ("punch locked" rod) or adjust (rod "sealed" by a drop of varnish)

SETTING PRESSURE VALUES

GARRETT Turbocharger	Type T2 with wastegate
• Static pressure	• 770 ± 30 mbar for a rod stroke of 0.38 ± 0.02 mm
• Boost pressure (at full throttle on the road)	• 600 ± 25 mbar for an engine speed of 2500 ± 250 rpm

IHI Turbocharger	with wastegate
• Static pressure	• 775 ± 30 mbar for a rod stroke of 2 mm • 970 ± 30 mbar for a rod stroke of 4 mm

TURBO VEHICLES

REMOVING-REFITTING THE AIR/AIR EXCHANGER (INTERCOOLER)

Removing

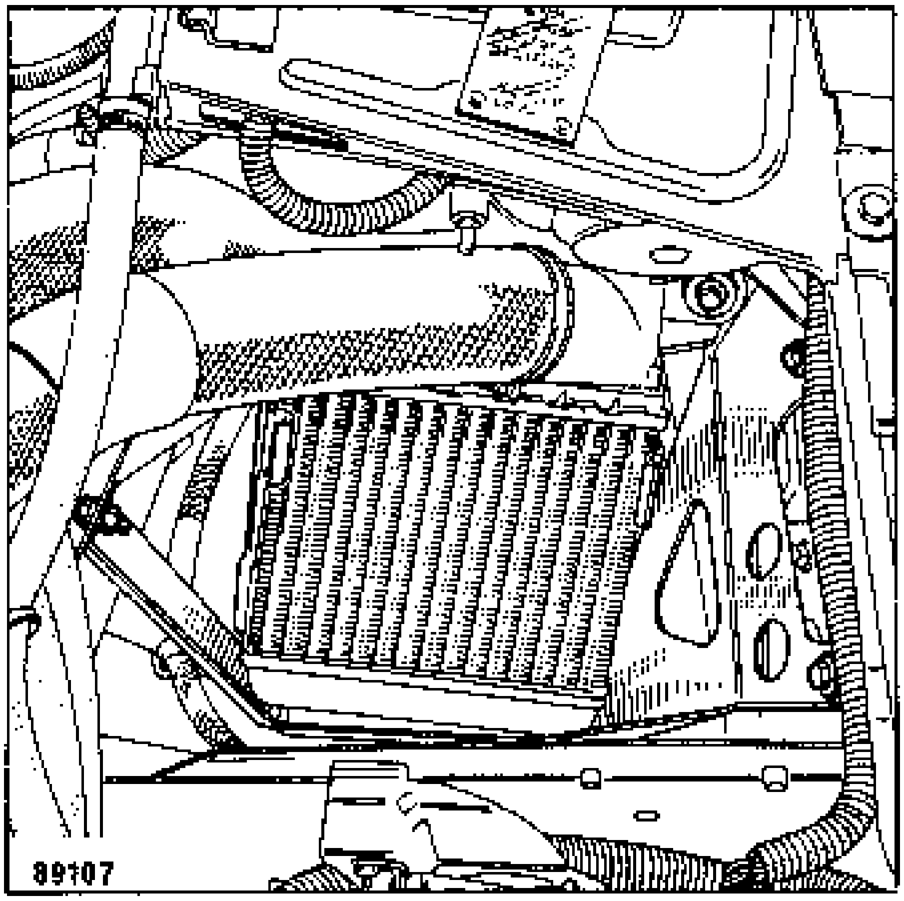
Disconnect and remove the battery.

Remove the ABS computer and the battery tray.

Disconnect the intercooler input and output hoses.

Remove the intercooler retaining band and bolts.

Remove the intercooler .



89107

Refitting

During refitting, make sure:

- that the intercooler is correctly positioned;
- that the ABS computer connector engages correctly ;
- that the air input and output hoses are tight.

B 295 and B 29 G vehicles

REMOVING-REFITTING THE TURBOCHARGER

Removing

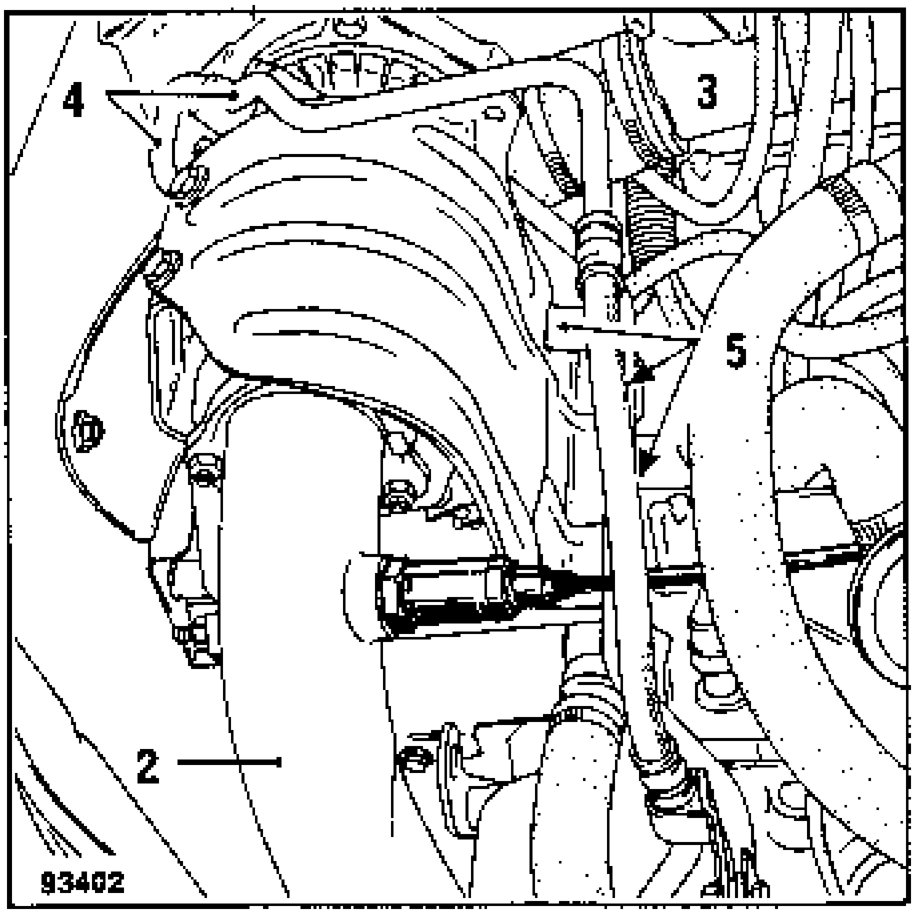
Remove the rear heat shield as well as the defelctor and the air intake sleeve.

Remove the heat shield attached to the turbocharger.

The bolts (5) which are difficult to reach can be unscrewed using **Mot. 909**.

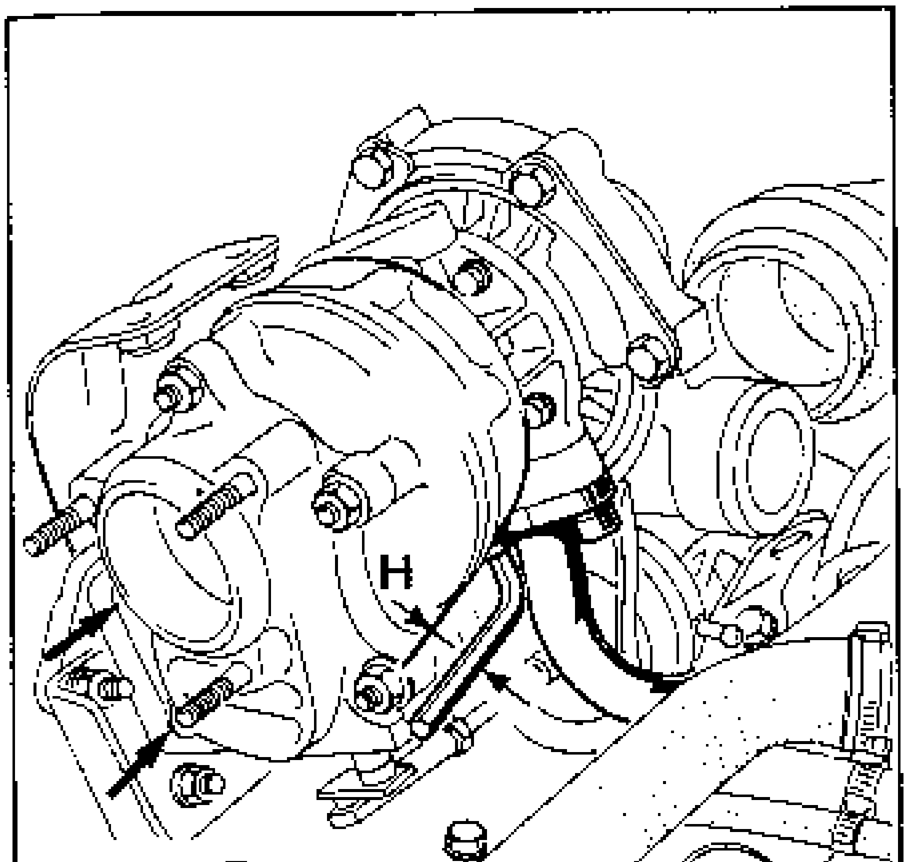
Disconnect the following piping:

- exhaust (2) and release it (be careful with the oxygen sensor - remove it if necessary);
- air inlet, and release it;
- air extraction (3) and release it;
- oil and water supply (4).



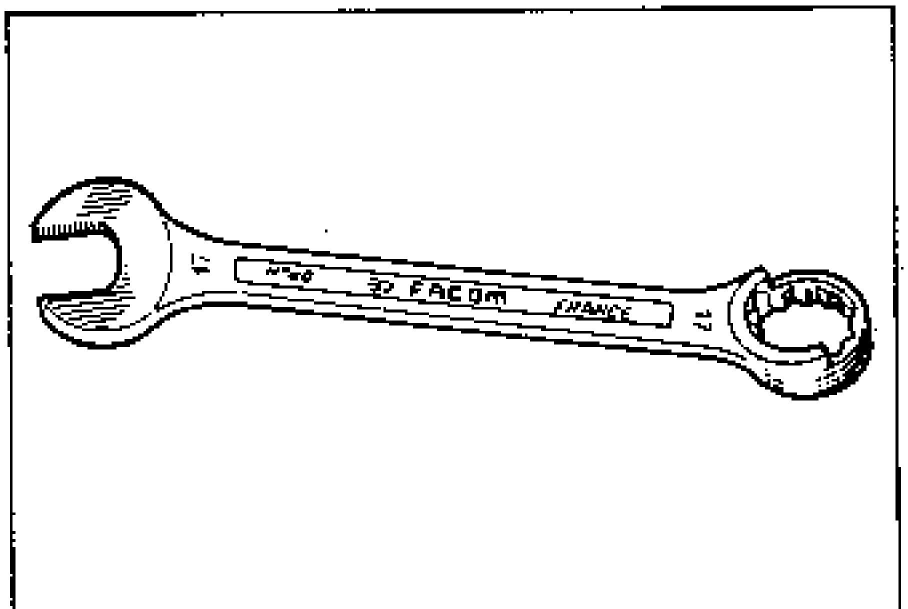
93402

In order to remove the oil return pipe, use an Allen key, dimensions (H) = 30 mm.

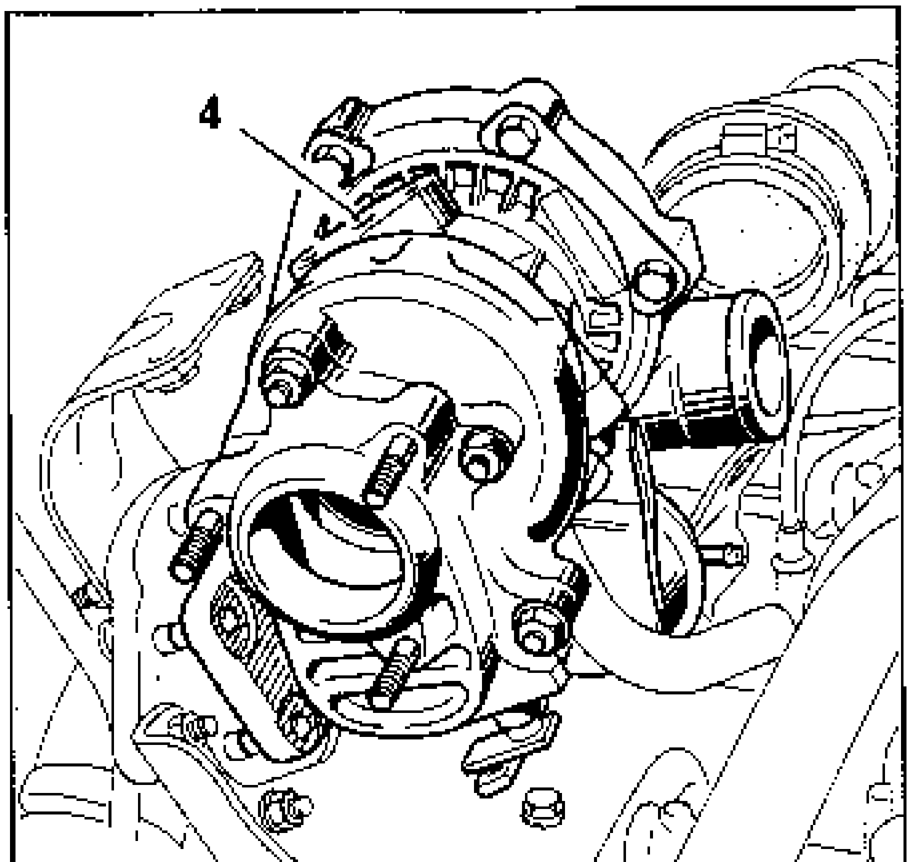


89099

Using a combination wrench **FACOM N° 40**, modified in accordance with the sketch below, unscrew the turbocharger fixing nuts (arrowed) and remove the turbocharger.



84 760



89100

Refitting

Thoroughly clean the exhaust manifold and turbocharger gasket faces.

Replace the self-locking fixing nuts, securing the turbocharger to the exhaust manifold, by new nuts as shown on parts microfiche.

Replace the oil supply and return pipe gaskets.

Top up the turbocharger with engine oil through the oil inlet (4).

Replace the coolant input and return pipe gaskets.

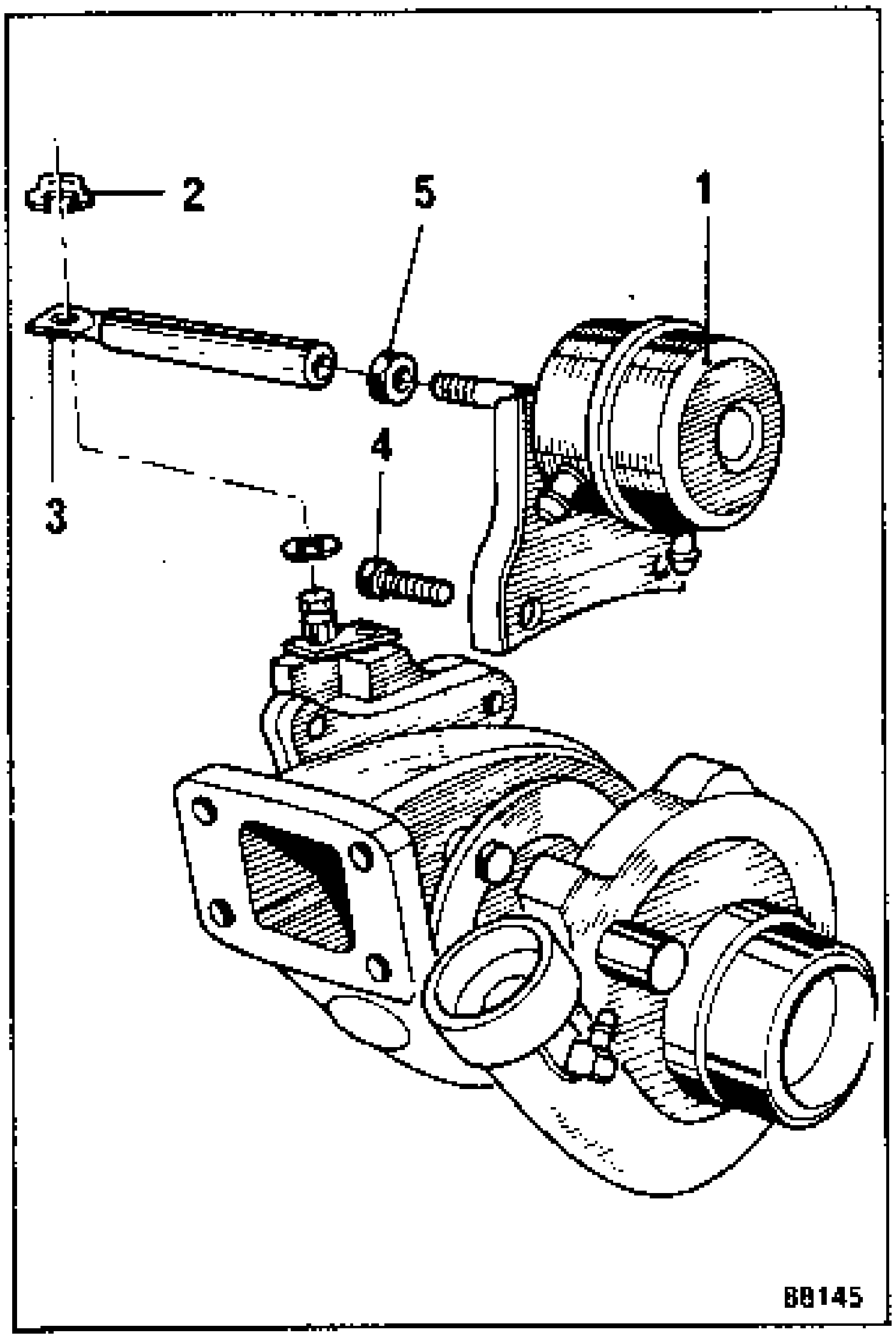
Disconnect the 3-way connector from the MPA and turn the engine using the starter until oil flows to the pipe (4).

Tighten the supply pipe (4). Reconnect the 3-way connector and allow the engine to idle to begin oil circulation.

Bleed the coolant circuit and top up the level if necessary.

***NOTE**: Never run the engine when the air inlet circuit is disconnected.*

REPLACING THE WASTEGATE (1)

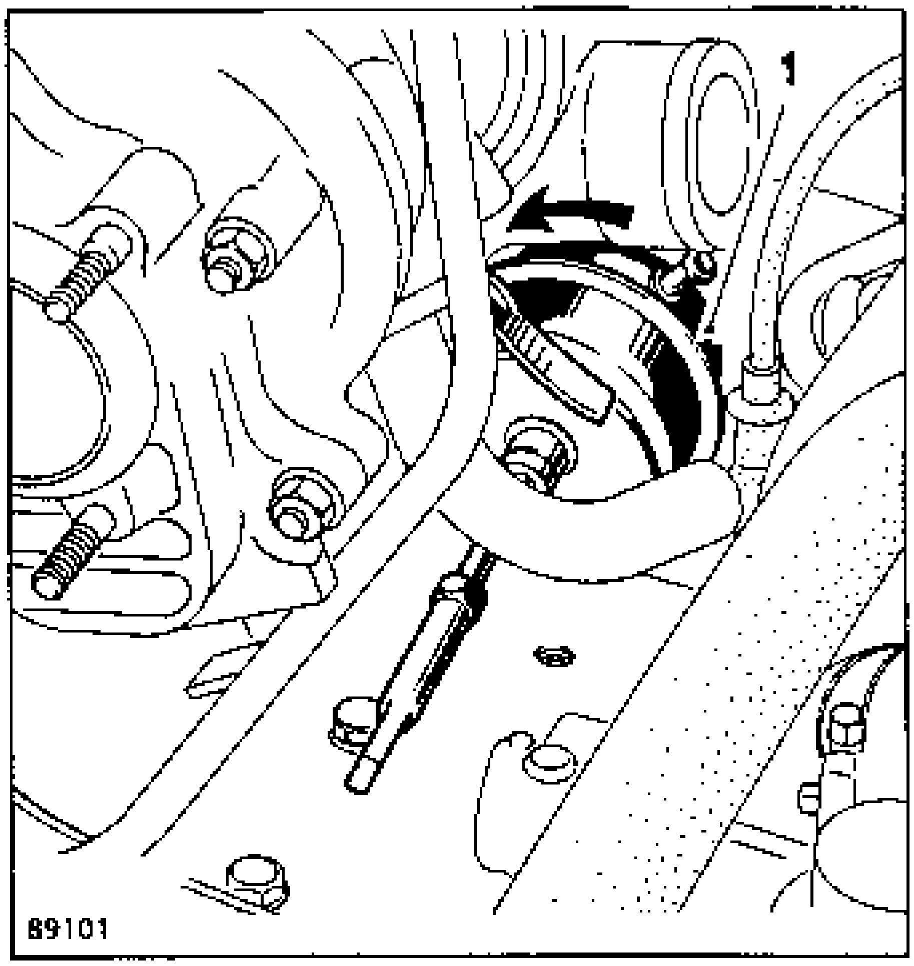


To reach the wastegate, the turbocharger oil input and return pipes must be disconnected.

Disconnect the hose to the wastegate (1).

Remove the circlip (2) and release the threaded sleeve (3).

Remove the fixing bolts (4) and remove the wastegate.



ATTENTION :

To remove the unit, turn it through 180 ° and release it from the turbocharger.

Refitting:

Line up the new unit and secure it using new bolts (tightening torque **1.65 to 1.85 daNm**).

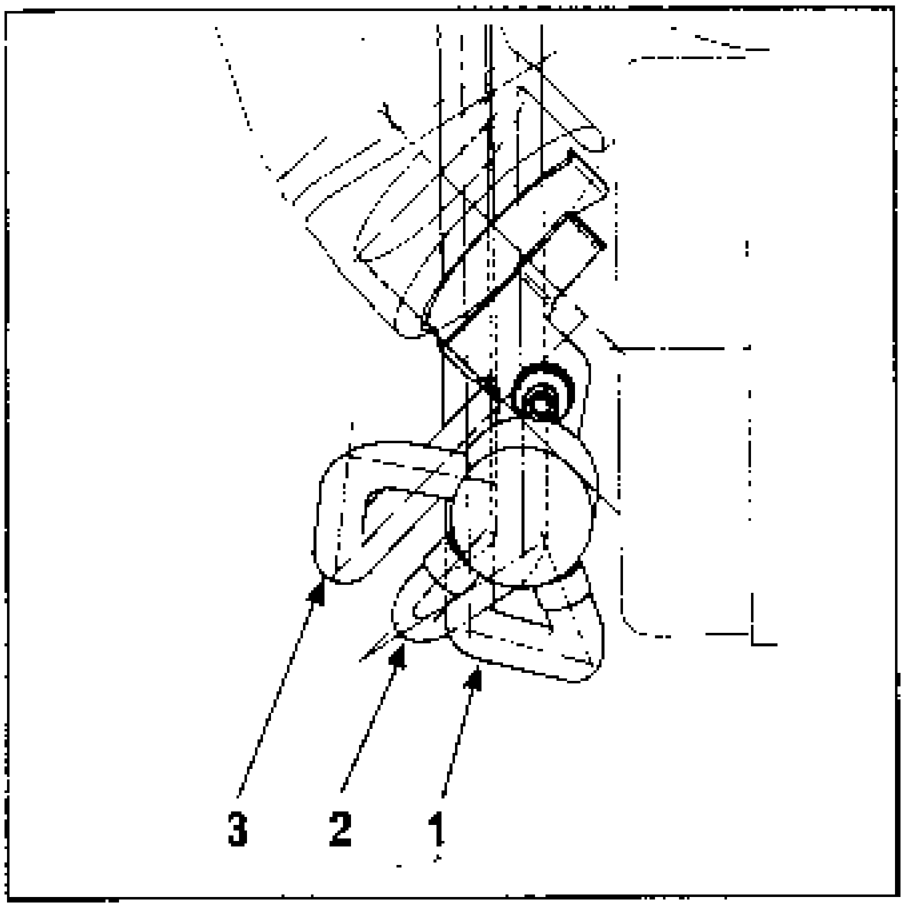
Screw the locknut (5) and the threaded sleeve (3) onto the rod.

TURBOCHARGER BOOST PRESSURE CONTROL SOLENOID VALVE

Remove-refit

Disconnect the solenoid valve.

Disconnect the pneumatic circuits linked to the solenoid valve.



When refitting, make sure the electrical connector engages correctly and that the pneumatic hoses are correctly positioned.

1 - Turbocharger boost pressure regulator unit connection.

2 - Throttle housing top connection.

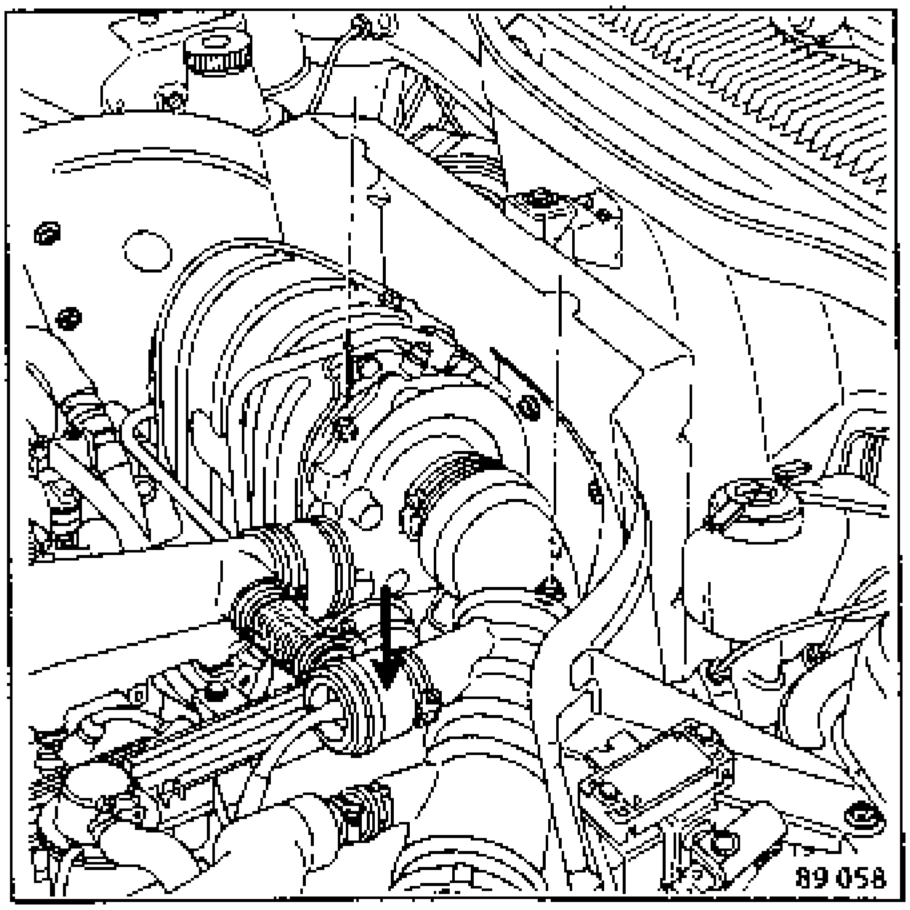
3 - Air filter output connection.

BYPASS VALVE

During rapid deceleration, this valve quickly closes to prevent the formation of back pressure upstream from the butterfly.

Under these circumstances, the bypass valve, which is controlled by the vacuum present in the inlet manifold, opens to allow air recirculation between the turbocharger compressor output and input. Furthermore, the system can sometimes maintain the speed of rotation of the compressor and, consequently, reduce response time during rapid reacceleration.

Valve opening vacuum: **200 ± 20 mbar**.
(Vacuum data downstream from the butterfly.)



CHECKING THE STATIC PRESSURE SETTING

Checking, adjusting or replacing the charging wastegate can be carried out on the vehicle, with the turbocharger in place, by removing a few adjacent parts.

(Heat screen, oil supply connection, oxygen sensor.)

For checking or adjusting:

- Disconnect the hose linked to the wastegate and connect tooling **Mot. 1014**.

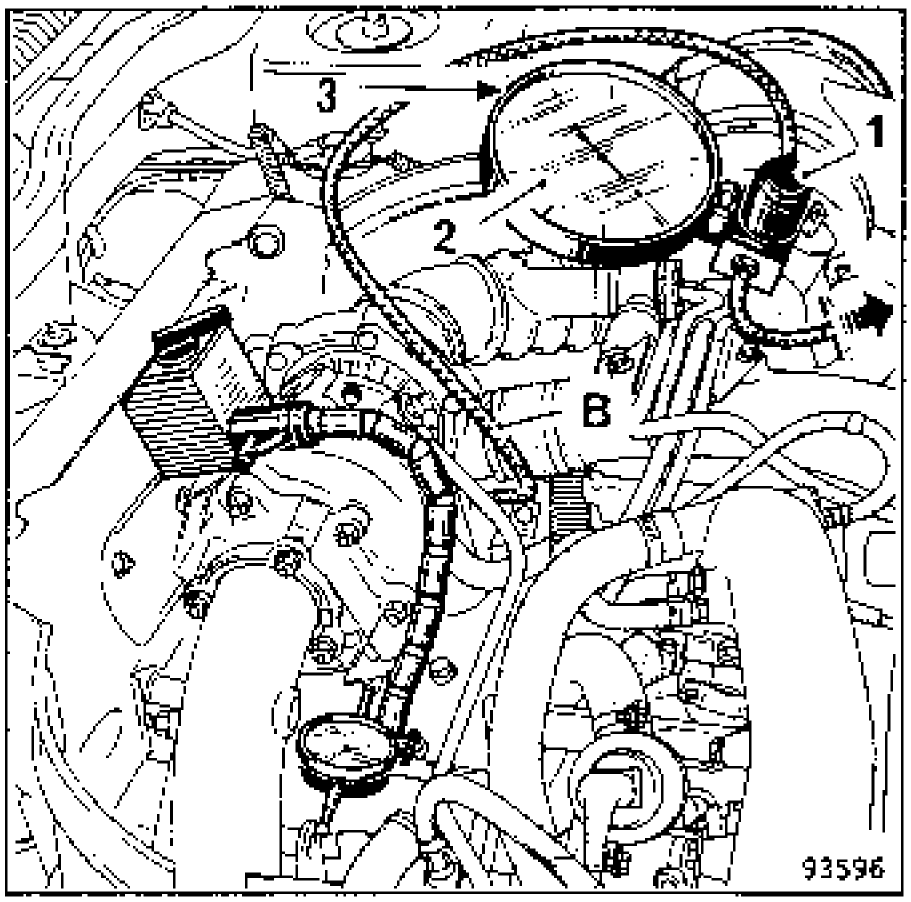
How to use tooling **Mot. 1014**

This equipment consists of an adjustable pressure valve (1), a pressure gauge (2), graduated from 0 to 1.6 bar, fitted with a zeroing screw (3) and a leak-off screw.

Before using the equipment, zero the pressure gauge (screw 3), fully unscrew the pressure valve as well as the leak-off screw and connect the inlet pipe (A) to the compressed air supply.

Connect the output pipe (B) to the turbocharger wastegate to be checked and tighten the leak-off valve.

Then slowly screw in the pressure valve (1) until the required air pressure or the recommended regulator rod stroke is obtained (the pressure can be stabilised by gently unscrewing screw (1)).



At the end of the wastegate rod, position a dial indicator, attached by a magnetic stand and zero the indicator.

Gradually increase the pressure until the wastegate rod is displaced by:

1 0.38 ± 0.05 mm
2 4 ± 0.05 mm

and note the pressures on the pressure gauge, which should correspond to the characteristic values given on page 12-65.

If the setting pressure is outside the tolerances, replace the wastegate ("punch locked" rod) or adjust (rod "sealed" with a drop of varnish).

ADJUSTING THE STATIC PRESSURESETTING

Connect tooling **Mot. 1014** to the connector (7) and apply air pressure equal to the regulating value (see table).

ATTENTION: Check that there is no air leak between the pressure gauge and the wastegate.

Apply force to the valve control arm (8) to keep the valve closed (see previous page).

Under these circumstances, adjust the position of the sleeve (3) so that the clevis hole just fits on the control arm (8) with the valve still in the closed position.

Bring the gauge pressure (7) to zero.

Attach a dial indicator to the end of the wastegate rod, using a magnetic stand, and zero the indicator.

Gradually increase the pressure until the wastegate rod is displaced by **0.38 ± 0.05 mm**, then by **4 ± 0.05 mm** and note the pressures read off on the pressure gauge.

- If the pressure is outside the tolerances, change the position of the threaded sleeve (3) (screw in to increase and unscrew to decrease the pressure) until the given regulating pressure is achieved.

Bring the locknut (5) into contact with the threaded sleeve (3) and lock it at **0.6 to 0.7 daNm**.

Apply a drop of paint to the locknut and the threaded endpiece.

ATTENTION: Do not remove paint from the smooth part of the wastegate rod.

SETTING PRESSURE VALUES

Vehicle B 29 G :

GARRETT turbocharger ● Static pressure	Type T3 with wastegate ● 320 ± 30 mbar for a rod stroke of 0.38 ± 0.05 mm ● 480 ± 30 mbar for a rod stroke of 4 ± 0.05 mm
● Boost pressure (at full throttle on the road)	Manifold pressure (measured using the XR 25) ● 1870 $^{+50}_{-10}$ mbar between 2750 and 3750 rpm. *NOTE: Apply full throttle at 2000 rpm, then, still at full throttle, take readings between 2750 and 3750 rpm for 3rd or 4th gear ratios.* ● 1840 $^{+50}_{-10}$ mbar at max speed 5500 rpm. in 2nd or 3rd gear ratio.

Vehicle B 295 :

GARRETT turbocharger ● Static pressure	Type T3 with wastegate ● **Checking:** 950 ± 30 mbar for a rod stroke of 0.38 ± 0.02 mm ● **Adjusting:** 965 ± 15 mbar for a rod stroke of 0.38 ± 0.02 mm.

CHECKING THE SAFETY PRESSURE SWITCH

Remove the safety pressure switch and connect it to tool **Mot. 1014**.

Then apply increasing pressure and check on the ohmmeter that:

B 29 G

P < 1300 mbar	R = 0 Ω
P ≥ 1300 mbar	R = ∞

B 295

P < 1000 mbar	R = ∞
P ≥ 1000 mbar	R = 0 Ω

NOTE: The safety pressure switch is attached under the air filter support bracket, near to the absolute pressure sensor.

TURBOCHARGING BOOST PRESSURE CONTROL SOLENOID VALVE ("SEM" VALVE)

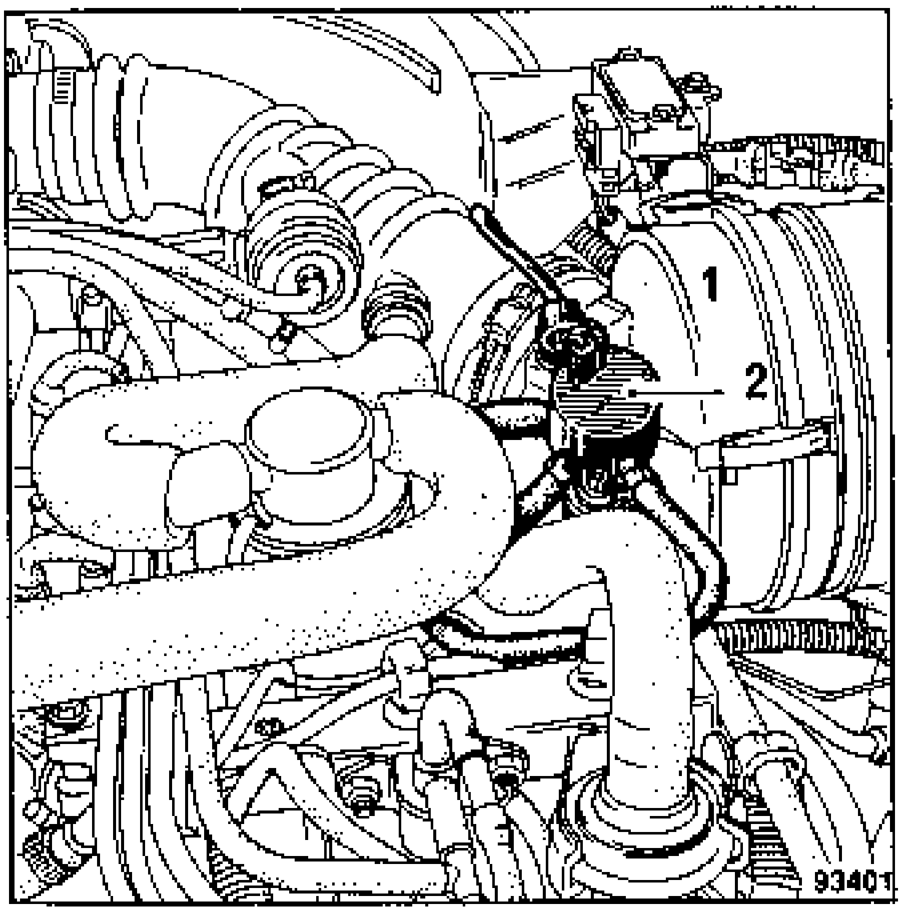
B 29 G pressure regulation

- **Operation**

The computer governs the maximum turbocharging boost pressure via a solenoid valve which operates at a frequency of 12 Hz. The solenoid valve therefore modifies the wastegate control pressure by creating a leak-off to the air filter inlet.

The computer memory contains the nominal turbocharging boost pressure, which it compares with the value supplied by the absolute pressure sensor.

Depending on the load speed and the pressure read off, the computer makes a positive or negative correction. This can be evaluated on the XR 25 (code # 20, turbocharger boost pressure correction).



1 - Air filter

2 - Turbocharging boost pressure control solenoid valve.

- **Checking the turbocharging boost pressure**

Apply full throttle from 2000 to 4000 rpm in 4th gear ratio. Note the maximum manifold pressure (# 01 on the XR 25).

This pressure must be less than 1920 mbar at the pressure peak. Immediately after the peak, the pressure must be below 1920 mbar at a speed of 3500 - 4000 rpm. (In this test, the turbocharging boost pressure must be greater than 1860 mbar.)

Note:

- If the boost pressure is greater than the nominal value, the computer limits the pressure. In this case, the correction is negative.

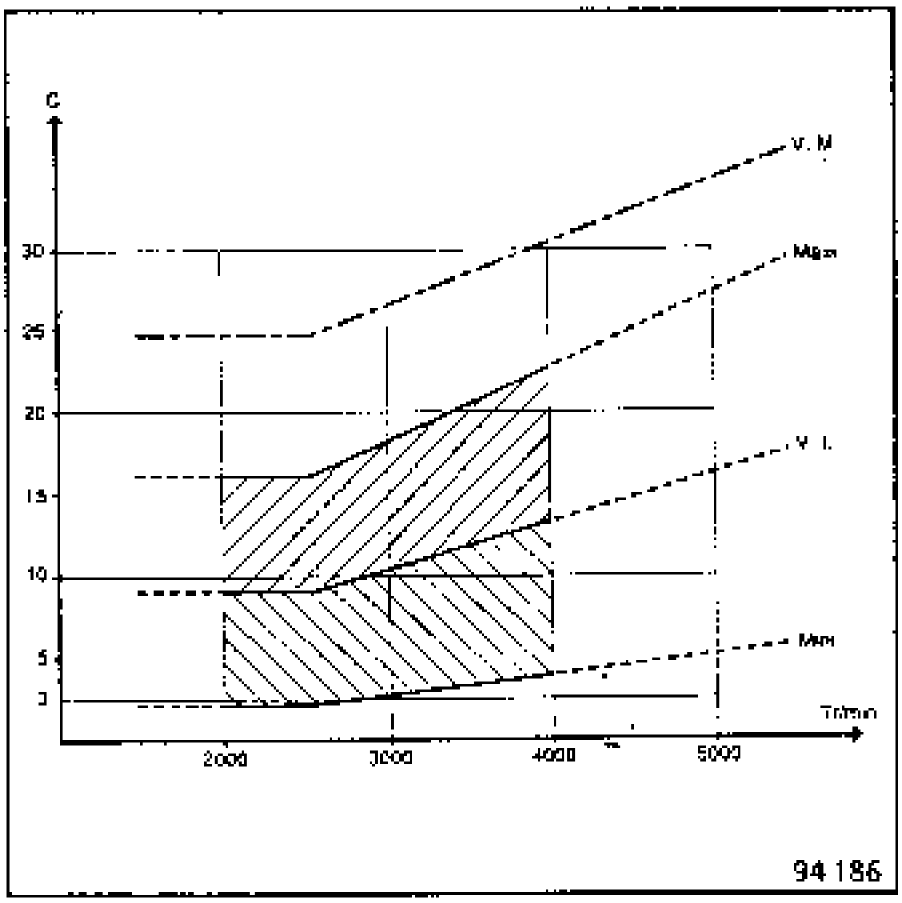
- If the boost pressure is below the nominal value, the computer tries to reestablish the nominal pressure value. In this case, the correction is positive.

INTERPRETING THE TURBOCHARGING BOOST PRESSURE CORRECTION VALUES (# 20)

B 29 G pressure regulation

- **Readings**

The value read off or stored in the XR 25 during a road test must be interpreted carefully. In fact, the correction varies depending on the engine speed.



C	=	Correction value
VM	=	Maximum readable value from XR 25
Max.	=	Maximum permissible value
VI	=	Intermediate value
Mini	=	Minimum permissible value

Taking the engine operating conditions into account, the turbocharging pressure correction value can fluctuate between the intermediate correction value and the minimum or maximum level.

However, the correction value should be within the zone between the min. and max. lines to be considered correct.

Any value outside these zones should be checked on the vehicle.

- If the value is below 4: (pressure too high), check the conformity, cleanliness and position of the Ø 1.9 mm restriction. Check the waste gate calibration if necessary.

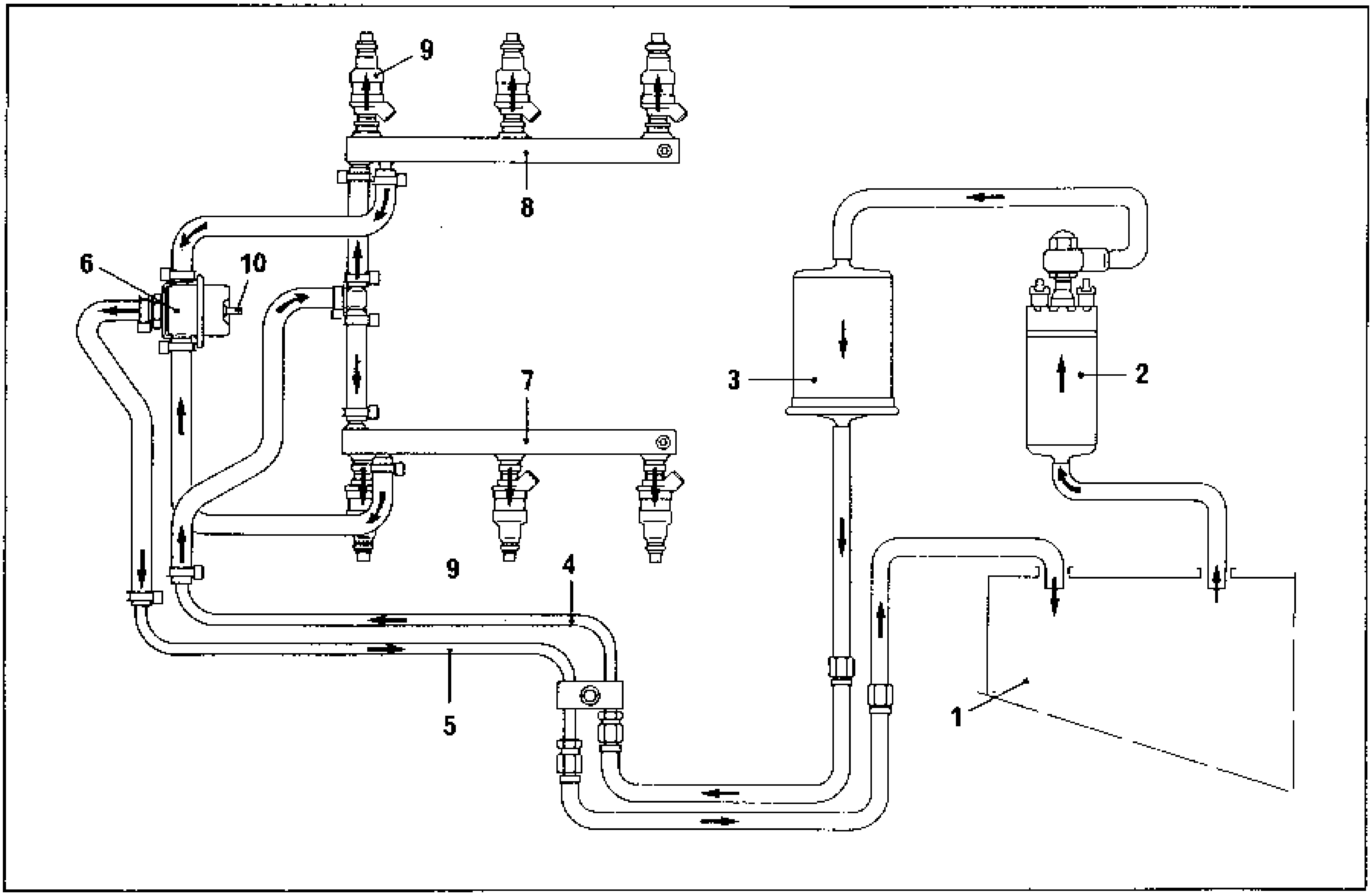
- If the value is above 23: (pressure too low), check the operation of the SEM valve, the hose connections, the restriction diameter and the waste gate calibration.

NOTE: Other examples of readings. Engine stopped, ignition on.

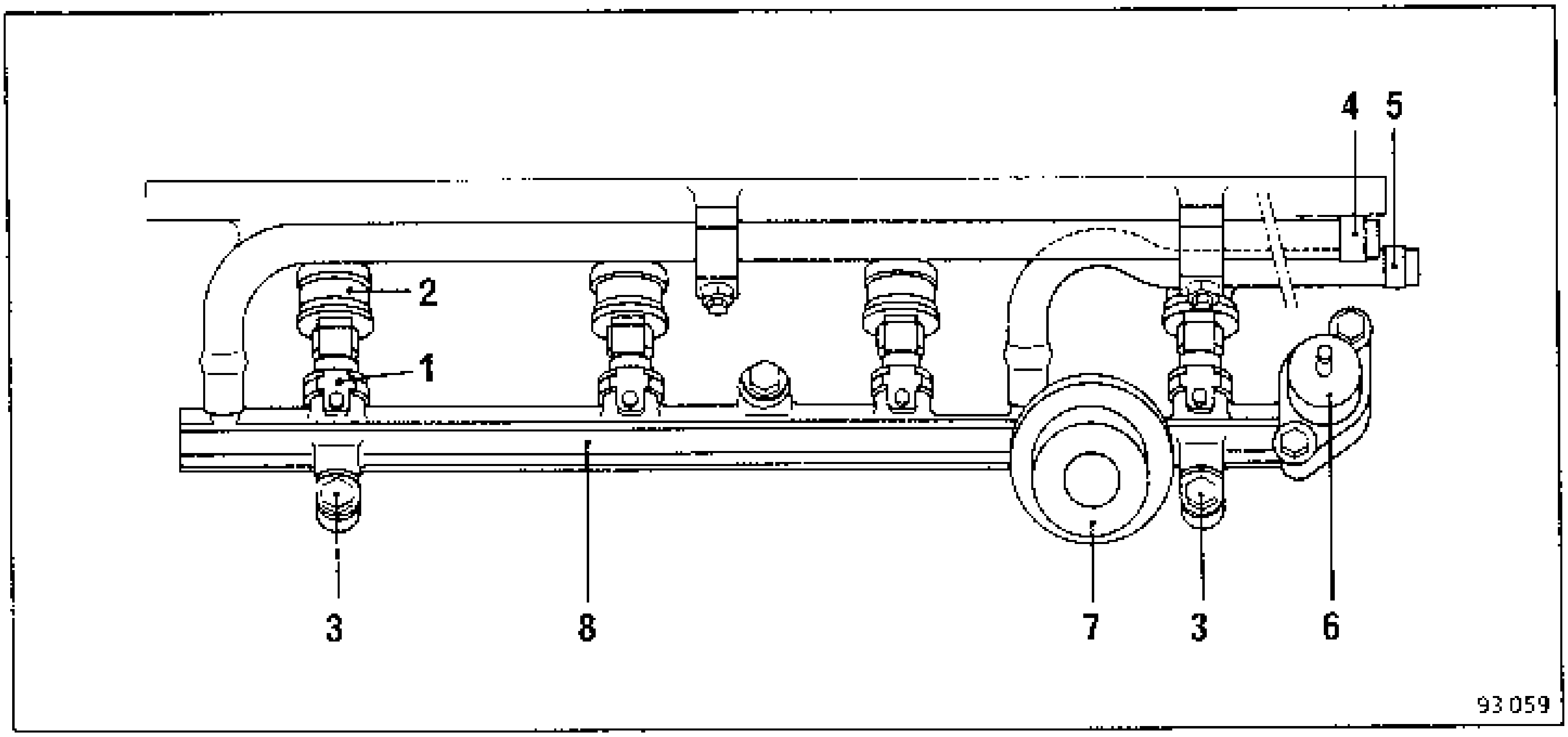
- Any erased memory computer (or one which has never been used) shows an intermediate correction value (# 20 = 0.65 ms: initialisation reference).

- the vehicle lacks power # 20 = 26.16 ms.

- The turbocharger pressure is too high, the correction is negative # 20 = 0.8 ms.



1 - Reservoir
2 - Fuel pump
3 - Fuel filter
4 - Fuel supply pipe
5 - Return pipe
6 - Pressure regulator
7 - Left-hand injection gallery
8 - Right-hand injection gallery
9 - Injectors
10 - Manifold air pressure data



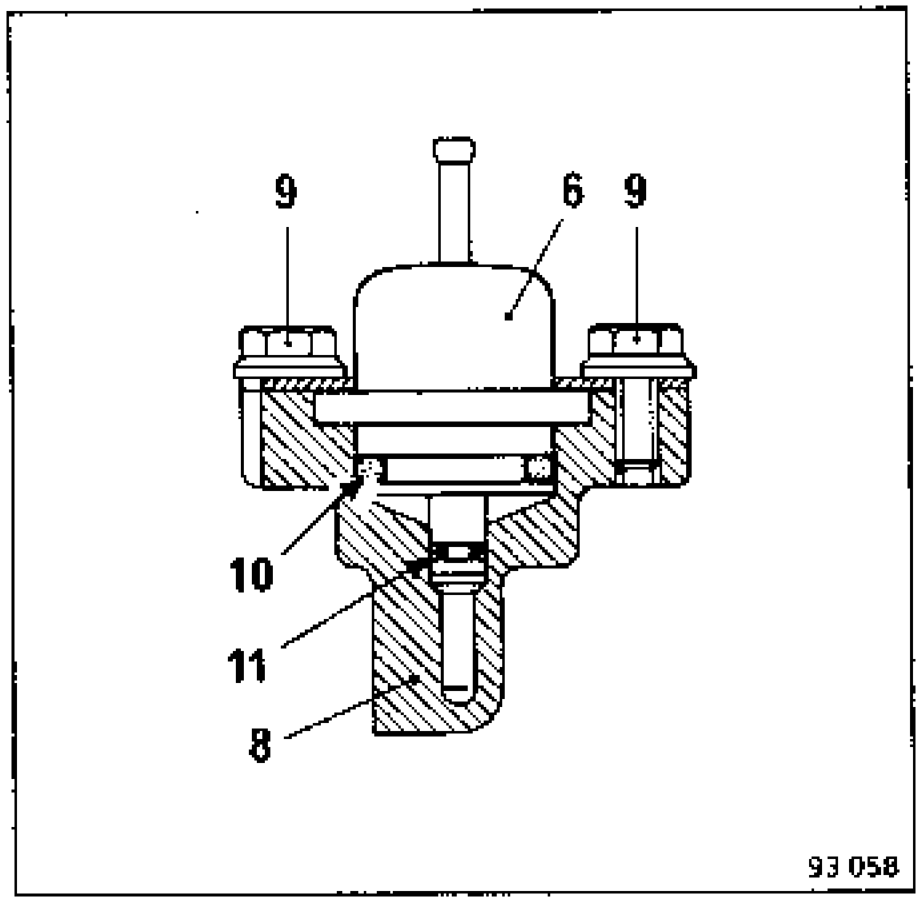
1 - Injector retaining clip.
2 - Injectors.
3 - Injection gallery fixing bolt.
4 - Petrol supply pipe (green mark).
5 - Petrol return pipe to fuel tank (pink mark)
6 - Petrol pressure regulator.
7 - Pulse damper.
8 - Injection gallery

The petrol pressure regulator is attached to the injection gallery by two bolts (9).

Its seal is provided by the O-rings (10 and 11).

Refitting:

Replace the O-rings (10 and 11) if necessary and fit the new seals greased (e.g. **MOLYKOTE 33 MEDIUM**).

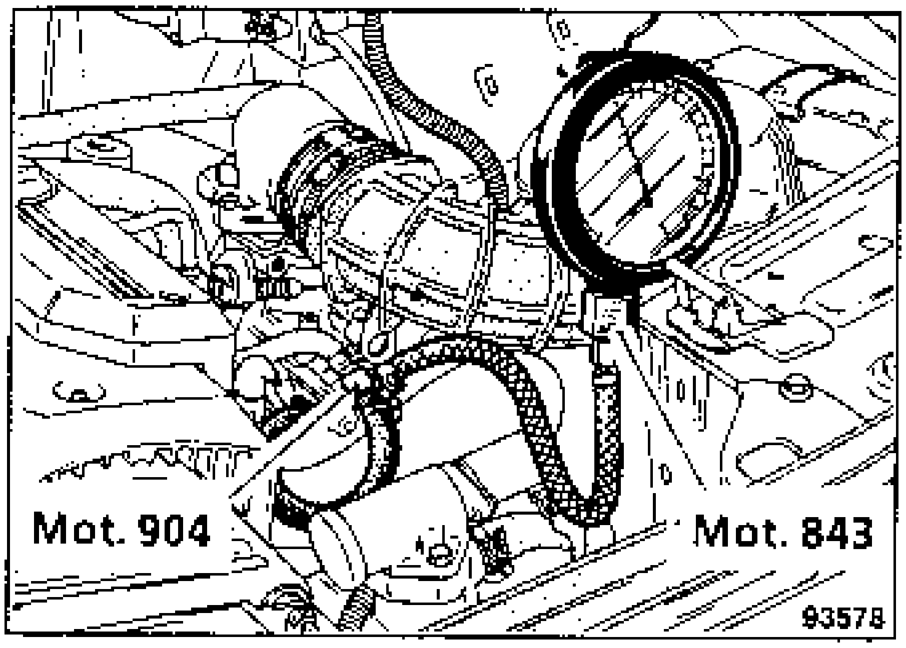


CHECKING THE SUPPLY PRESSURE AND THE DELIVERY OF THE PETROL PUMP

Checking the fuel pressure

Disconnect the fuel supply circuit from the injection gallery and fit hose **Mot. 904** fitted with a pressure gauge from **0 to 6 bar** from **Mot. 843**.

Connection to injection gallery



Start the engine.

Check the pressure and compare it to the given value (see "Vehicle specification").

Apply a vacuum of approximately **500 mbar** to the pressure regulator: the fuel pressure must fall by this same value.

Checking the pump pressure

Clamp the return line to the fuel tank (for a few seconds). The pressure must be greater than **5 bar**.

If not, check the electrical circuit, the petrol pump and the petrol filter.

Checking the pump delivery

Disconnect the flexible fuel tank return hose leading from the regulator, fit a flexible hose to this output and place it in a graduated **2000 ml** test tube.

Switch on the petrol pump: shunt terminals **3** and **5** of pump relay **236** (computer disconnected).

Minimum delivery: 95 l/h, in other words, slightly above **1.5 l/minute**.

Attention:
If the delivery is low, check the pump supply voltage (loss of delivery of about **10%** if the voltage drops by **1 volt**).

Checking the fuel supply pressure

Disconnect the flexible pipe to the T-piece which supplies the two injection galleries. Fit the by-pass "T" from Mot. 904 then the 0-6 bar pressure gauge from Mot. 843.

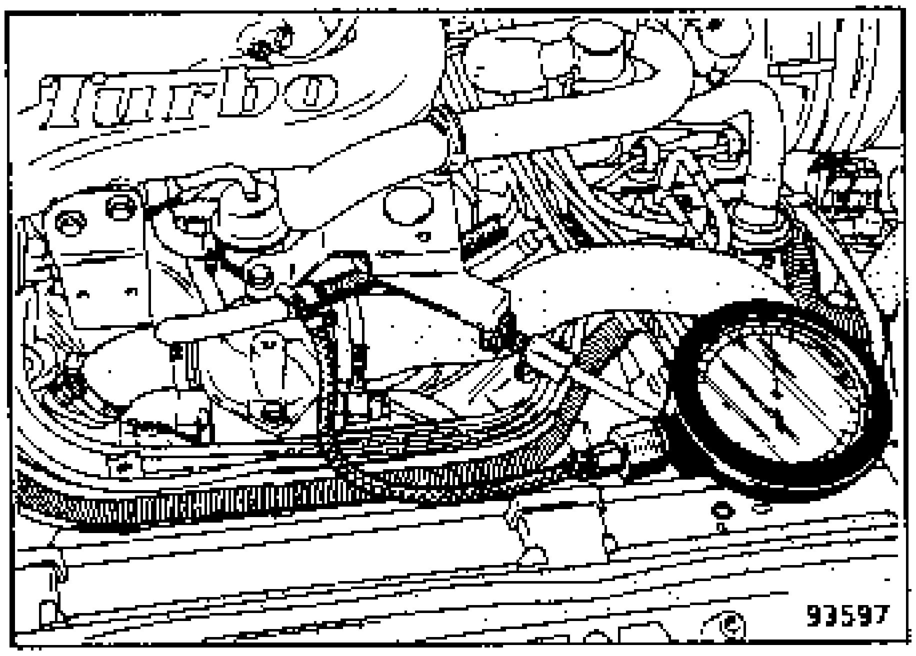
Start the engine

Check the pressure and compare it with the value given in the section on "Special features".

Apply a vacuum of approximately **500 mbar** to the pressure regulator; the fuel supply pressure must fall by this same value.

Checking the pump pressure

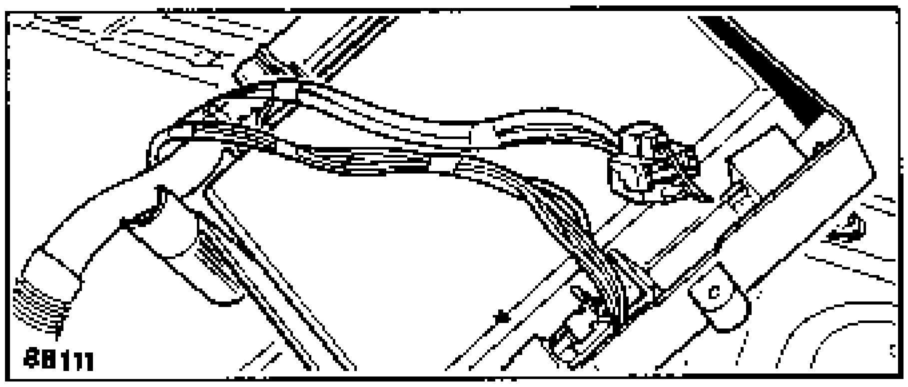
Clamp the return line to the fuel tank for a few seconds. The pressure must be greater than **5 bar**. If not, check the electrical circuit, the petrol pump and the petrol filter.



Checking the petrol pump delivery

On the fuel tank return line of the petrol pressure regulator, fit a flexible tube which is to be placed in a graduated test tube.

Start the petrol pump. To do this, shunt terminals 3 and 5 (thick leads) to the petrol pump relay connector (computer disconnected).



MIN. DELIVERY: **130 l/h**

Must be above **1 litre /30 s.**

If the delivery is low, check the pump supply voltage (loss of delivery of **10%** if voltage drops by **1 volt**).

NOTE: For any operation or fault-finding, see the "Diesel injection" workshop manual.

Vehicle	Engine	Injection equipment
B 290	J8S 7 08	BOSCH

Description	Make and type	Special remarks
Injection pump	BOSCH VE 4/9 F 2200 R 69	Single piston rotary pump with mechanical centrifugal governor, hydraulic automatic advance, cold starting and automatic accelerated idling system, solenoid shut-off, delivery corrector depending on turbocharging pressure (LDA)
Pump timing (pump piston travel, engine at TDC)	0.70 ± 0.02 mm	
Injector holders	BOSCH KBE 48 S7	
Injectors	BOSCH DN OSD 193	Setting 130 $^{+8}_{+0}$ bar, max. variation 8 bar
Fuel filter	BOSCH	Rapid fit filtration element with built-in coolant chamber.
Injection pipes		External Ø 6 mm Internal Ø 2 mm Length 275 mm
Turbocharger	GARRETT	Turbocharging pressure: 0.6 ± 0.025 bar at 2500 ± 250 rpm.

SETTINGS

Idling speed	750 ± 50rpm
Max. speed	4700 to 4800 rpm

Smoke density:

Approval value	1.6 m^{-1} : 48%
Legal maximum	2 m^{-1} : 55%

CHECKING THE TIMING (on diagnostic bay)

Injection pump	Idling speed rpm	Initial injection value Before TDC
BOSCH VE ... R69	750 ± 50	13.5 ± 1°

SPECIAL FEATURES

Vehicle	Engine	Injection equipment
B 290 B 29 W	J8S 708 J8S 738 (1)	BOSCH BOSCH + AVL anti-pollution kit

Description	Make and type	Special remarks
Injection pump	VE 4/9 F 2200 R 153 (1) VE 4/9 F 2200 R 345 (2) VE 4/9 F 2200 R 345 - 1 (2)	Single piston rotary pump with mechanical centrifugal governor, hydraulic automatic advance, cold starting and automatic accelerated idling system, solenoid shut-off, delivery corrector depending on turbocharging pressure (LDA)
Pump timing (pump piston travel, engine at TDC)	0.70 ± 0.02 mm	
Injector holders	BOSCH **KBE 48 S7**	
Injectors	BOSCH **DN OSD 264**	Setting 130 $^{+8}_{+0}$ bar max. variation 8 bar
Fuel filter	BOSCH or ROTODIESEL	With built-in priming pump. Since 1987, the Roto Diesel filter has been fitted with a heater via the engine coolant circuit.
Injection pipes		External Ø 6 mm Internal Ø 2 mm Length 275 mm
Thermostat (accelerated idling speed)	(2) VERNET (CALORSTAT)	Stroke 7 to 9.5 mm between 15° and 45° C.
Preheater unit	(2) CARTIER	With pre- and postheating function (max. 3 mins.)
Heater plugs	BERU	Current approx. 15 A after 8 s heating.
Heater plug postheating temperature switch	(2)	Circuit opens : 65° ± 2° C Circuit closes : 55° ± 2° C
Turbocharger	GARRETT T2	Turbocharging pressure: 0.6 ± 0.025 bar at 2500 ± 250 rpm Static opening pressure: 730 ± 30 mbar for 0.38 ± 0.02 mm of regulating rod stroke.

SETTINGS

Idling speed	750 ± 25 rpm (1) 800 ± 25 rpm (2)
Accelerated idling	1000 ± 50 rpm (2)
Max. speed	4700 to 4800 rpm

Smoke density:

Approval value	1.6 m^{-1} : 48%
Legal maximum	2 m^{-1} : 55%

CHECKING THE TIMING (on diagnostic bay)

Injection pump	Idling speed rpm	Initial injection value before TDC
BOSCH VE ...R153 VE .. R 345 VE ..R 345- 1	750 ± 50 (1) 800 ± 50 (2)	13.5 ± 1°

NOTE: For any operation or fault-finding, see the "Diesel injection" workshop manual.

Vehicle	Engine	Injection equipment
B 296	J8S 7 06	BOSCH

Description	Make and type	Special remarks
Injection pump	BOSCH VE 4/9 F 2250 R 41	Single piston rotary pump with mechanical centrifugal governor, hydraulic automatic advance, cold starting and automatic accelerated idling system and solenoid shut-off.
Pump timing (pump pistontravel, engine at TDC)	0.70 ± 0.02 mm	
Injection holders	BOSCH KBE 48 S 5/4	
Injectors	BOSCH DN OSD 189	Setting 130^{+8}_{+0} bar max. variation 8 bar
Fuel filter	BOSCH	Rapid fit filtering element with built-in coolant chamber
Injection pipes		External Ø 6 mm Internal Ø 2 mm Length 290 mm

SETTINGS

Idling speed	750 ± 25 rpm
Max. speed	4900 ± 100 rpm

Smoke density:

Approval value	1.11 m^{-1} : 36%
Legal maximum	2 m^{-1} : 55%

CHECKING THE TIMING (on diagnostic bay)

Injection pump	Idling speed rpm	Initial injection value Before TDC
BOSCH VE ... R41	750 ± 50	13.5 ± 1°

NOTE: For any operation or fault-finding, see the "Diesel injection" workshop manual.

Vehicle	Engine	Injection equipment
B 296	J8S 706	BOSCH

Description	Make and type	Special remarks
Injection pump	BOSCH VE 4/9 F 2250 R 158 **0,70 ± 0,02 mm**	Single piston rotary pump with mechanical centrifugal governor, hydraulic automatic advance, cold starting and automatic accelerated idling system and solenoid shut-off.
Pump timing (pump piston travel, engine at TDC)		
Injector holders	BOSCH **KBE 48 S 5/4**	
Injectors	BOSCH **DN OSD 189 /**	Setting 130^{+8}_{+0} bar max. variation 8 bar
Fuel filter	BOSCH or ROTO DIESEL	With built-in priming pump. Since 1987, the Roto Diesel filter has been fitted with a heater via the engine coolant circuit.
Injection pipes		External Ø 6 mm Internal Ø 2 mm Length 290 mm

SETTINGS

Idling speed	750 ± 25 rpm
Max. speed	4900 ± 100 rpm

Smoke density

Approval value	1.11 m^{-1} : 36%
Legal maximum	2 m^{-1} : 55%

CHECKING THE TIMING (on diagnostic bay)

Injection pump	Idling speed rpm	Initial injection value Before TDC
BOSCH VE ... R158	750 ± 50	13.5 ± 1°

Vehicle type	Engine	Injection equipment
B 296	J8S 736	BOSCH

Description	Make and type	Special remarks
Injection pump	BOSCH VE 4/9 F 2350 R 309 VE 4/9 F 2350 R 309-1 VE 4/9 F 2350 R 309-2	Single piston rotary pump with mechanical centrifugal governor, hydraulic automatic advance, cold starting and automatic accelerated idling system and solenoid shut-off.
Pump timing (pump piston raised, engine at TDC)	0.75 ± 0.02 mm	
Injector holders	BOSCH KCA 15S 66	
Injectors	BOSCH DN OSD 252 +	Setting 130 $^{+8}_{-5}$ bar max. variation 8 bar
Fuel filter	ROTO DIESEL	With built-in priming pump and diesel heater via engine coolant circuit.
Injection pipes		External Ø 6 mm Internal Ø 2.5 mm Length 400 mm
Thermostat (accelerated idling	VERNET (CALORSTAT)	Stroke 7 to 9.5 mm between 15° and 45° C.
Preheater unit	CARTIER	With pre- and postheating function (max. 3 mins.)
Heater plugs	BERU	Current approx. 15 A after 8 s heating.
Heater plug postheating temperature switch		Circuit opens : 65° ± 2°C Circuit closes : 55° ± 2°C

SETTINGS

Idling speed 800 ± 25 rpm
Accelerated idling 1000 ± 50 rpm
Max. speed 5200 ± 100 rpm

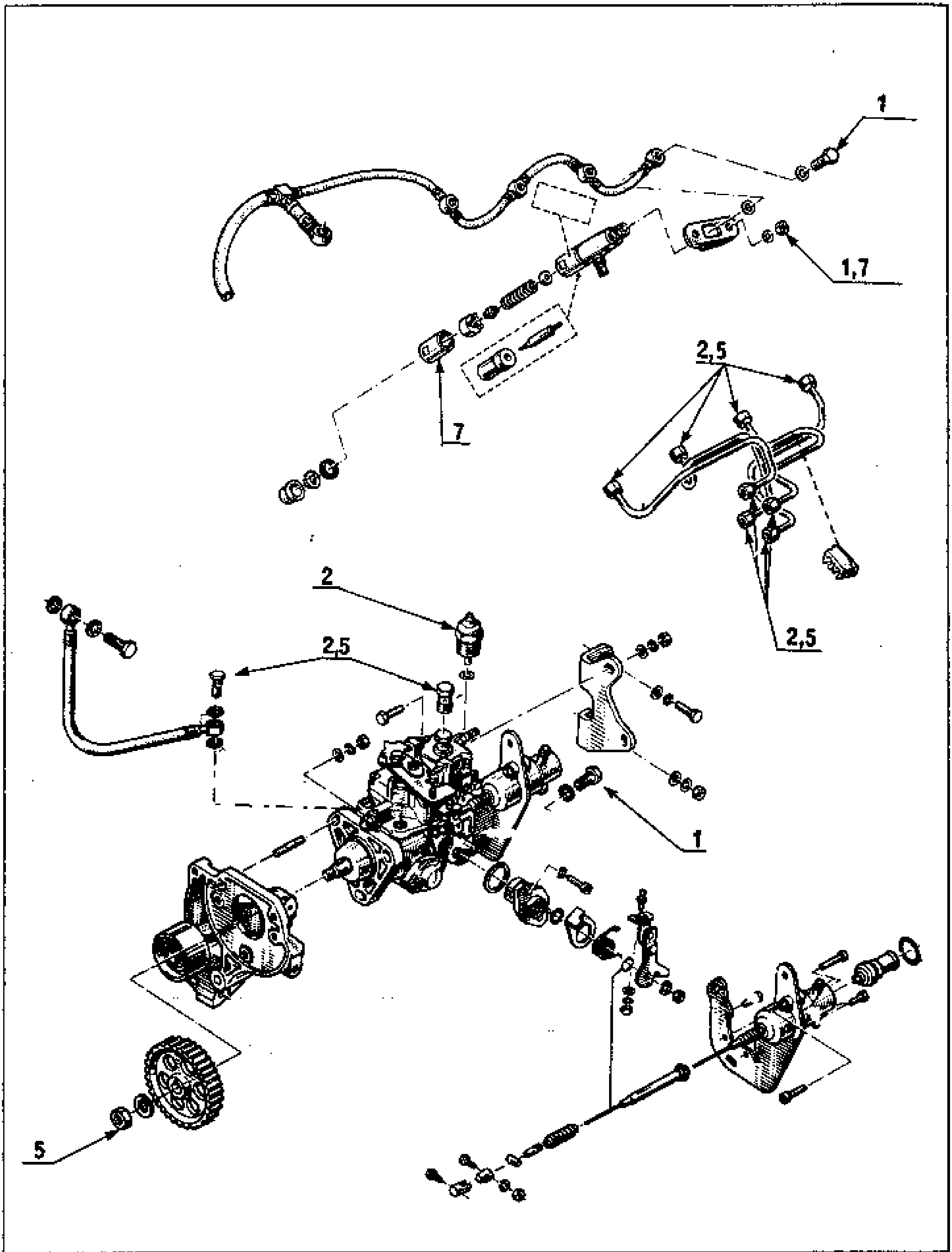
Smoke density

Approval value 0.77 m^{-1} : 28%
Legal maximum 2 m^{-1} : 55%

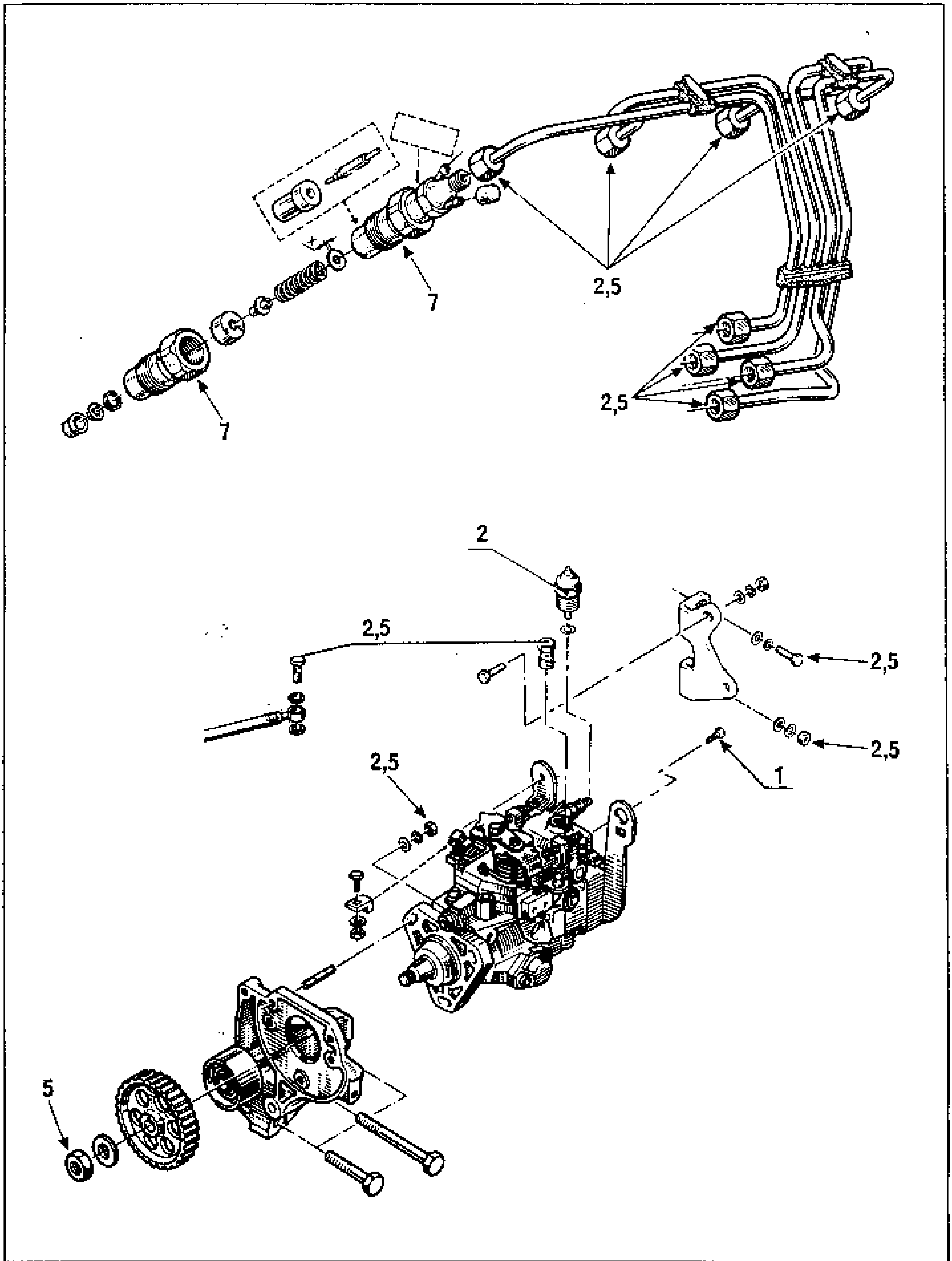
CHECKING THE TIMING (on diagnostic bay)

Injection pump	Idling speed rpm	Initial injection value Before TDC
BOSCH VE ... R309..	800 ± 50	14 ± 1°

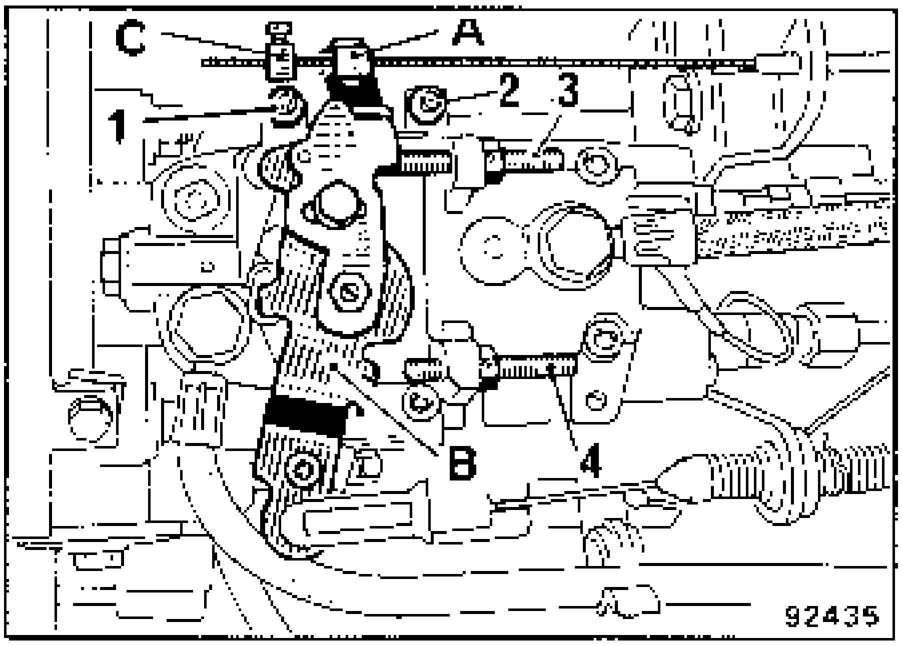
EXPLODED VIEWS - TIGHTENING TORQUES (in daNm)



EXPLODED VIEWS - TIGHTENING TORQUES (in daNm)



CHECKING THE SPEEDS



A - Idling lever and accelerated idling
B - Accelerator lever
1 - Accelerated idling adjustment stop screw
2 - Normal idling adjustment stop screw
3 - Residual delivery stop screw (anti stalling)
4 - Max. speed stop screw.

This screw is factory sealed with a drop of varnish. No adjustments are permitted, except by the injection centre specialist (CIR)

I - IDLING SPEED ADJUSTMENT - ACCELERATED IDLING AND ANTI-STALLING

NOTE:
All the adjustments described below are carried out with the engine hot and the coolant temperature above **80 °C**.

a - Check that the idling speed is at the value specified on the specification sheet.

NOTE:
If the speed is incorrect, complete adjustment is required (see (II)).

b - If the idling speed is correct, fit a **1 mm** shim between the stop screw (3) and the lever (B); the speed should increase by **10 - 20 rpm**.

- If the increase in speed is above **20 rpm**, complete adjustment is required (see (II)).

- If the increase in speed is less than **10 rpm**, only adjustment (II d) is required.

II - COMPLETE IDLING SPEED ADJUSTMENT

a - Loosen the locknut and unscrew the screw (3) until the drop in speed has been stabilised. Then loosen the screw (3) by 2 additional turns.

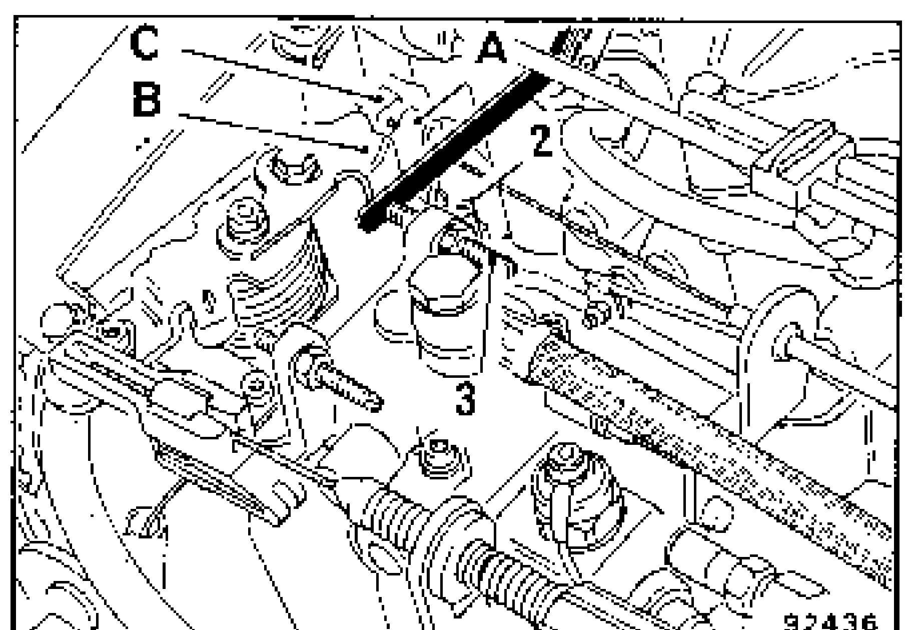
Check that the cable clamp (C) does not hinder the movement of lever (A).

b - Loosen the locknut and turn the screw to obtain the specified idling speed, then retighten the locknut.

c - Place a **1 mm** shim between the stop screw (3) and the lever (B). The idling speed must not increase, if it does, repeat adjustment **II a** and **II b**.

d - With the **1 mm** shim in place, tighten the stop screw (3) to increase the idling speed by **10 to 20 rpm**. Remove the **1 mm** shim; the idling speed should return to its initial level.

Accelerate sharply several times and allow the engine to return to idling speed.



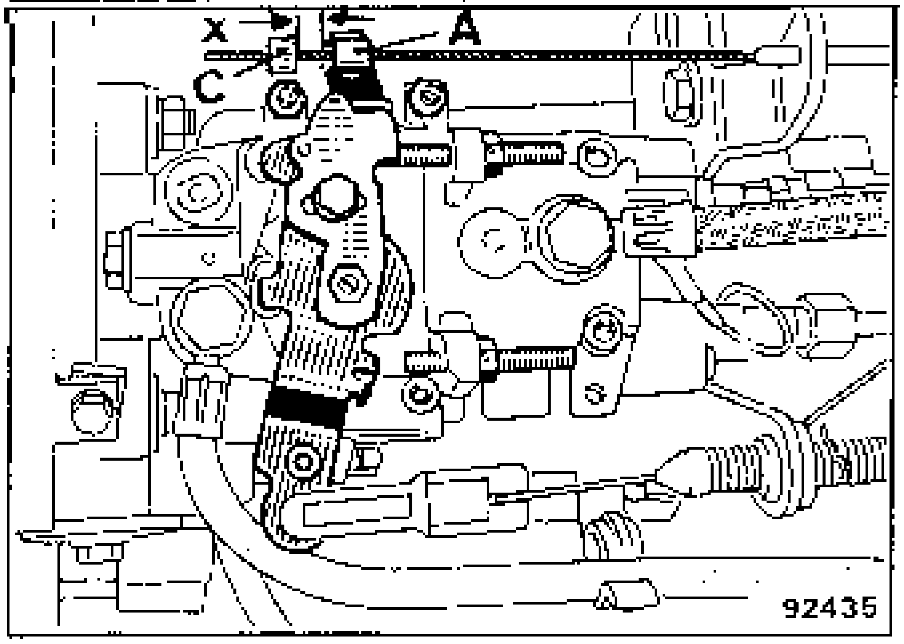
Check the initial idling speed settings with and without the **1 mm** shim. If the values have changed, repeat adjustments **b**, **c** and **d**.

III - ADJUSTING THE ACCELERATED IDLING SPEED

Rest lever (A) against the stop (1). Loosen the locknut and turn screw (1) to obtain an engine speed of **1000 ± 25 rpm.**, then tighten the locknut.

Check the accelerated idling speed again. If it is outside the tolerances, repeat operation **III**.

IV - ADJUSTING THE CABLE CLAMP OF THE ACCELERATED IDLING THERMOELEMENT



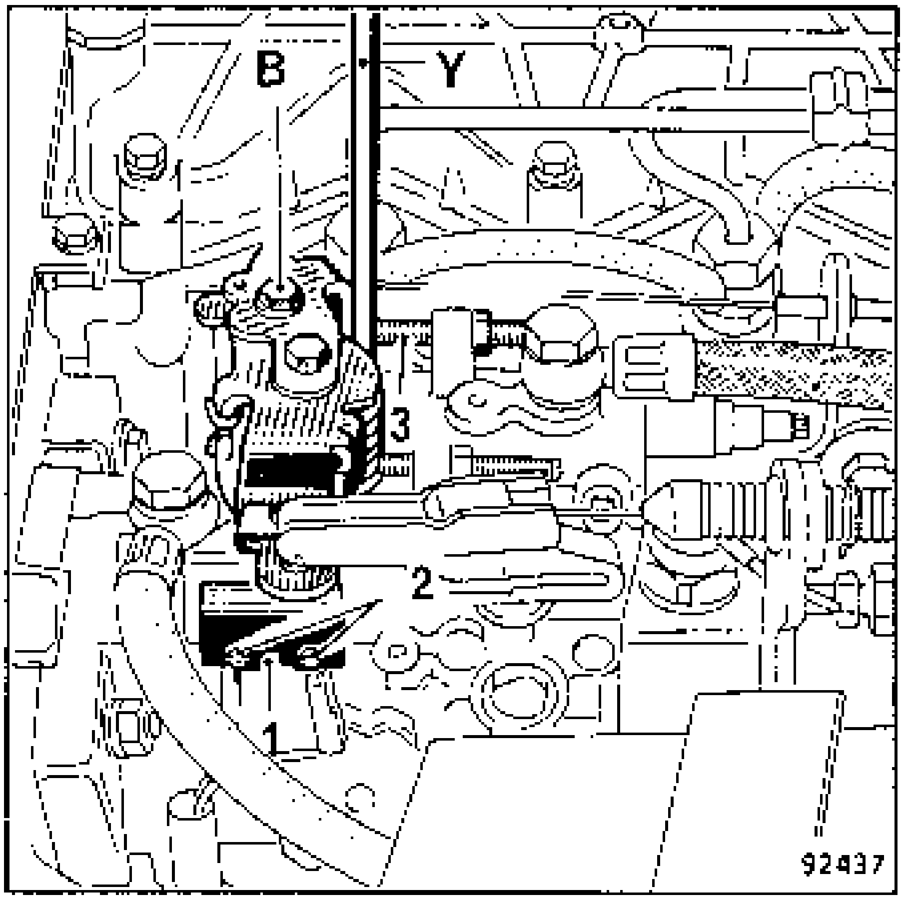
This operation must be carried out when the engine is hot, after having adjusted the idling and accelerated idling speeds.

Keep the cable taught and place the cable clamp **6 mm** (distance **X**) from the lever **(A)** in the idling position, then tighten the cable clamp screw **(C)**.

Load microswitch (1) of the pre/postheating device.

Adjusting or checking the microswitch is to be carried out:

- when the microswitch is being replaced;
- when burnt out heater plugs have been replaced;
- after replacement of the injection pump.



Use an ohmmeter.

Place a shim (Y) between the accelerator lever (B) and the anti-stalling stop (3):

Shim(Y) in mm	Micro-switch	Ohmmeter
11	Closed	0 Ω
12	Open	infinite

Adjustment is made by moving the microswitch (1) on its support bracket.

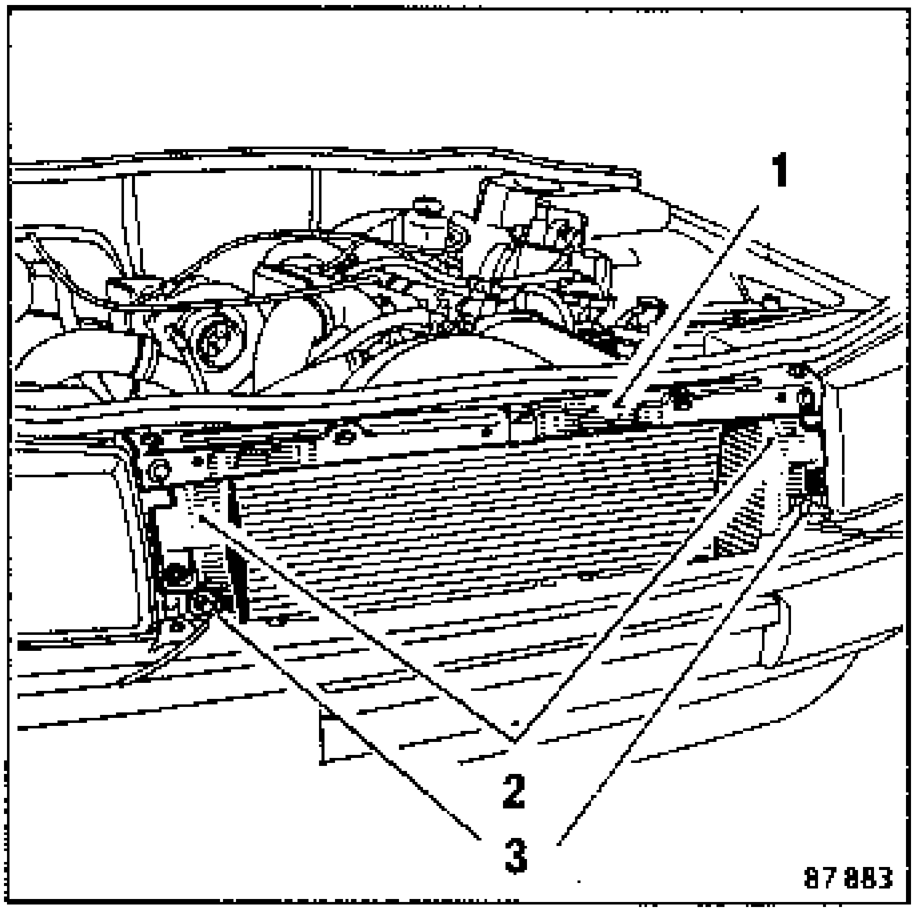
Unscrew the screws (2) and adjust the position of the microswitch to achieve the recommended values.

SPECIAL FEATURES OF REMOVING THE INJECTION PUMP

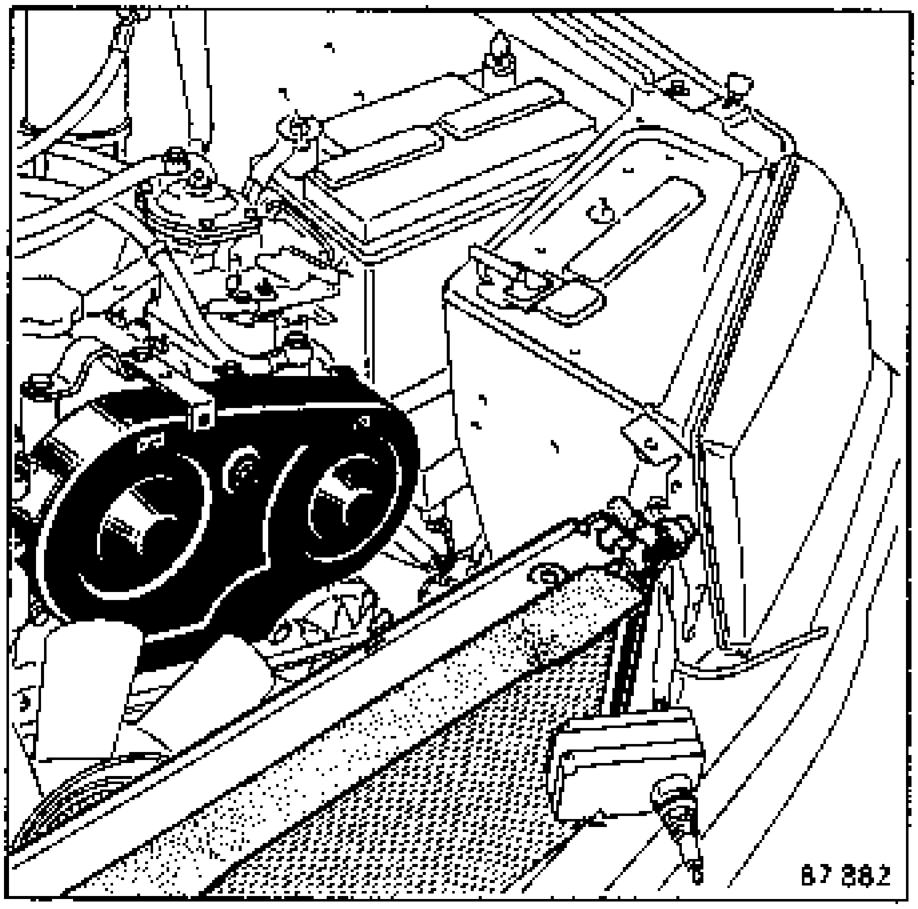
The method of removing-refitting and timing the pump is described in the "Diesel injection" workshop manual.

HOWEVER, access to the timing cover requires the removal of some components, depending on the vehicle's equipment:

- the two headlamp wiper blades;
- the radiator grille (two Torx T 20 screws on the top); then tilt it forwards slightly to remove the three lower pins;
- the cross member (1) (see drawing);



- the two air intake side deflectors(2) as well as the one clipped to the radiator top;
- the two headlamp wiper motors (3), by unscrewing the shaft of each motor (if fitted);
- gently raise the radiator to release it from its two lower pins; then pull it forwards (see drawing).



Remove the fan.

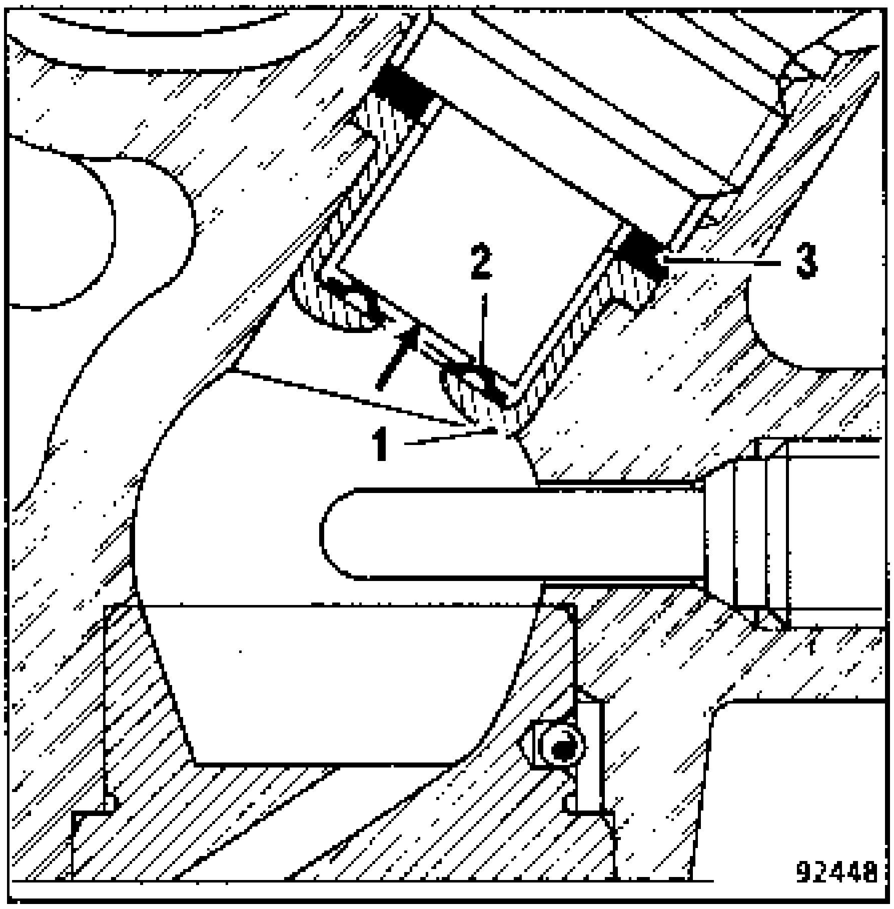
Remove, in this order:

- the power-assisted steering pump belt;
- the alternator belt.

Then remove the timing cover.

INJECTOR HOLDERS
SPECIAL FEATURES OF J8S 736 ENGINE

The cylinder head has been modified to take threaded injector holders, type **BOSCH "KCA"**.



1 - Flame shield cap.

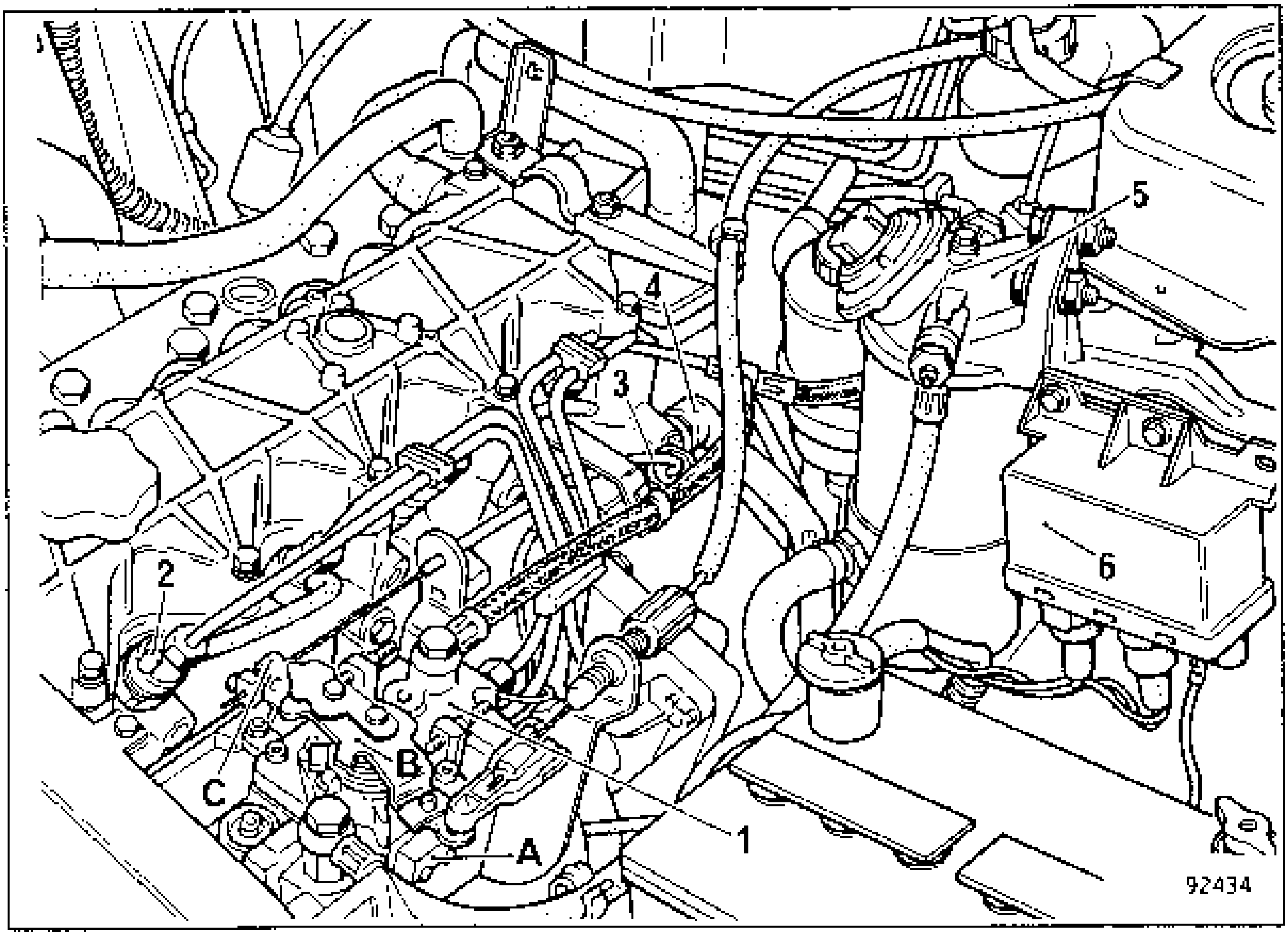
2 - Flame shield washer.

3 - Seal.

Each time the injector holder is refitted, fit a new seal (3) and a flame shield washer (2) (in the direction shown by the arrow).

Tighten the injector holder using tool **Mot. 997** to **7 daNm**.

COMPONENT LAYOUT



1 - Injection pump

A: Load microswitch
B: Accelerator lever.
C: Idling and accelerated idling lever.

2 – Injector holders

3 – Thermostat accelerated idling

4 – Postheating temperature switch

5 - Fuel filter.

6 - Heater plug preheating and postheating unit.

NOTE:
The injection pump removing and refitting method is unchanged (see **INJ "D"** workshop manual).

CHECKING

ESSENTIAL SPECIAL TOOLING	
Mot. 867	Vacuum gauge

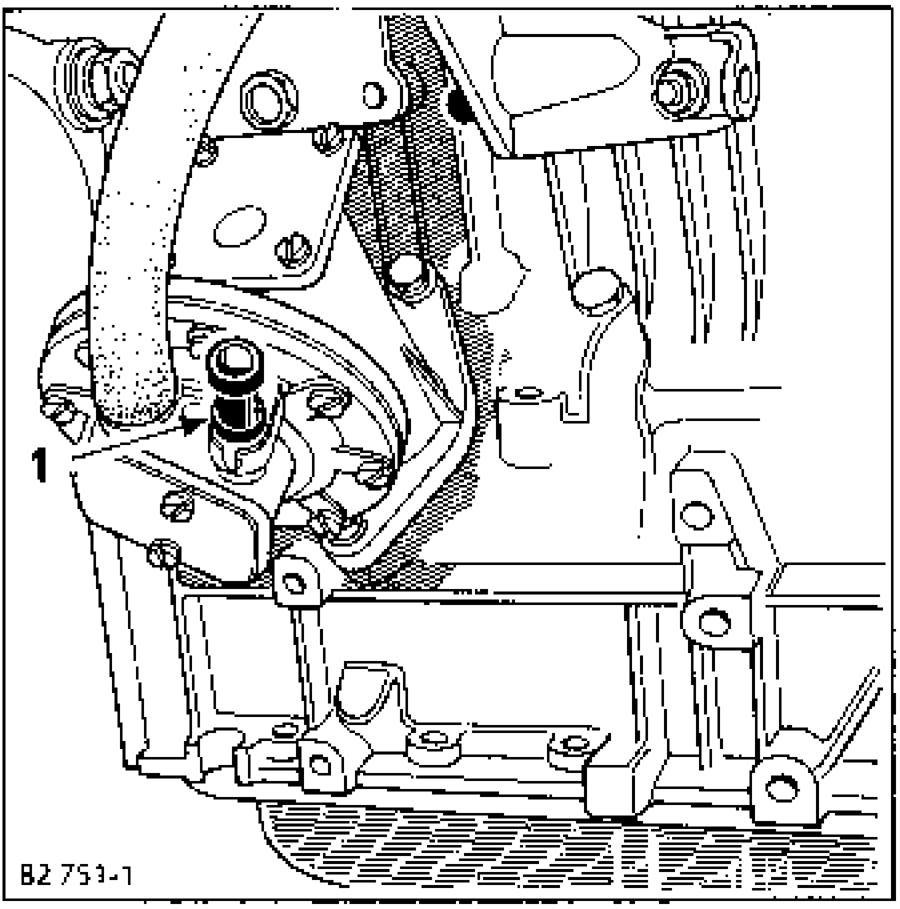
This operation is performed on the vehicle:

Disconnect the pump intake connection pipe (1) and connect the vacuum gauge **Mot. 867** in its place.

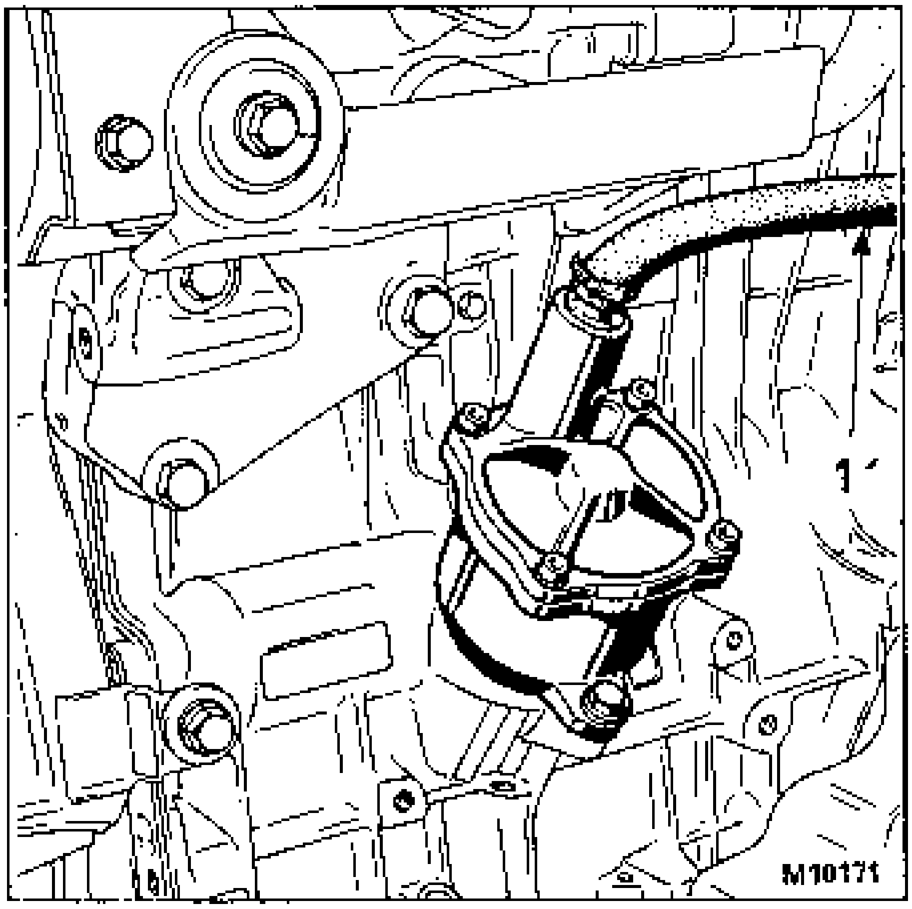
Allow the engine to run at a min. of **2000 rpm**.

The absolute vacuum level obtained must be greater than **770 mbar (570 mm Hg)**.

1st type



2nd type



NOTE:
To check the entire power-assistance assembly, the method is identical to that for the other vehicles in the range.

FILLING THE CIRCUIT

Oil quality to be used:

- ELF RENAULT MATIC D2 or
- MOBIL ATF 220.

CAPACITY

- **1.1 l** - separate reservoir;
- **0.7 l** - built-in reservoir.

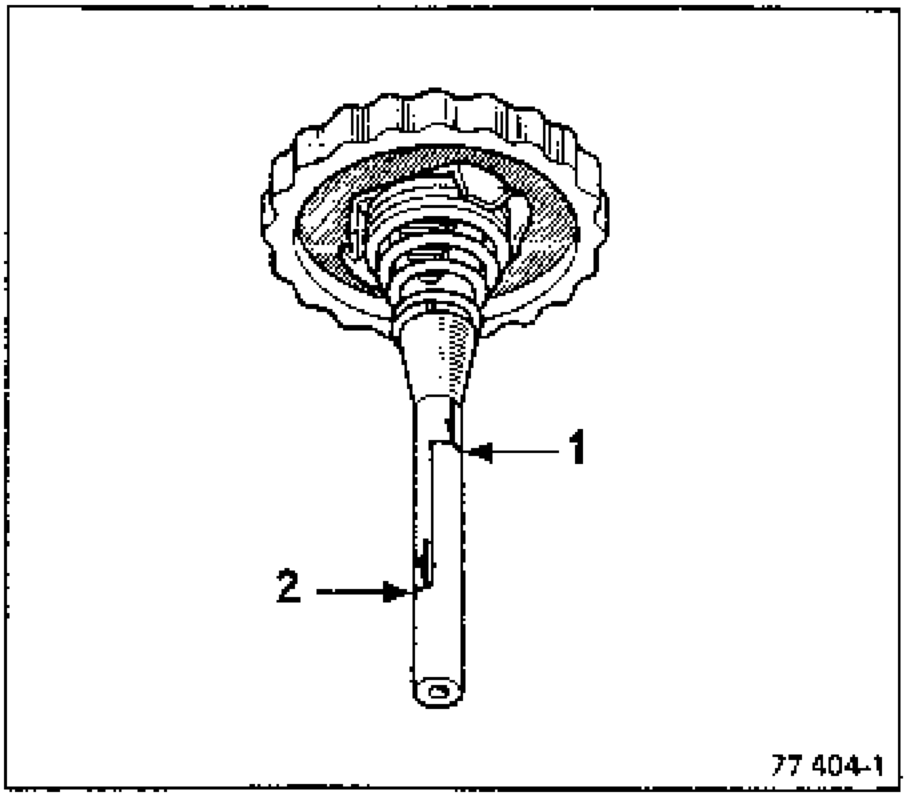
Filling the circuit

Fill up the reservoir.

Start the engine and gently turn the steering wheel between both full lock positions.

Top up the level.

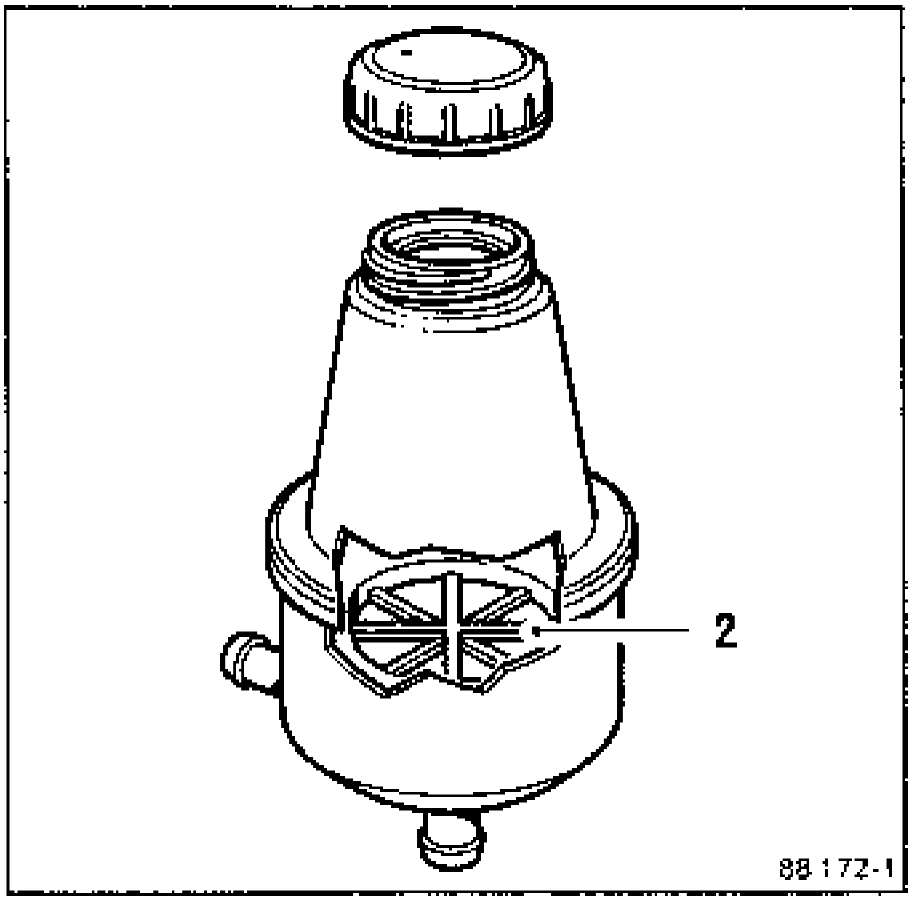
BUILT-IN RESERVOIR



- **Cold:** the level must be in line with mark **(2)**: "FULL COLD";
- **Hot:** the level may reach mark **(1)**: "FULL HOT".

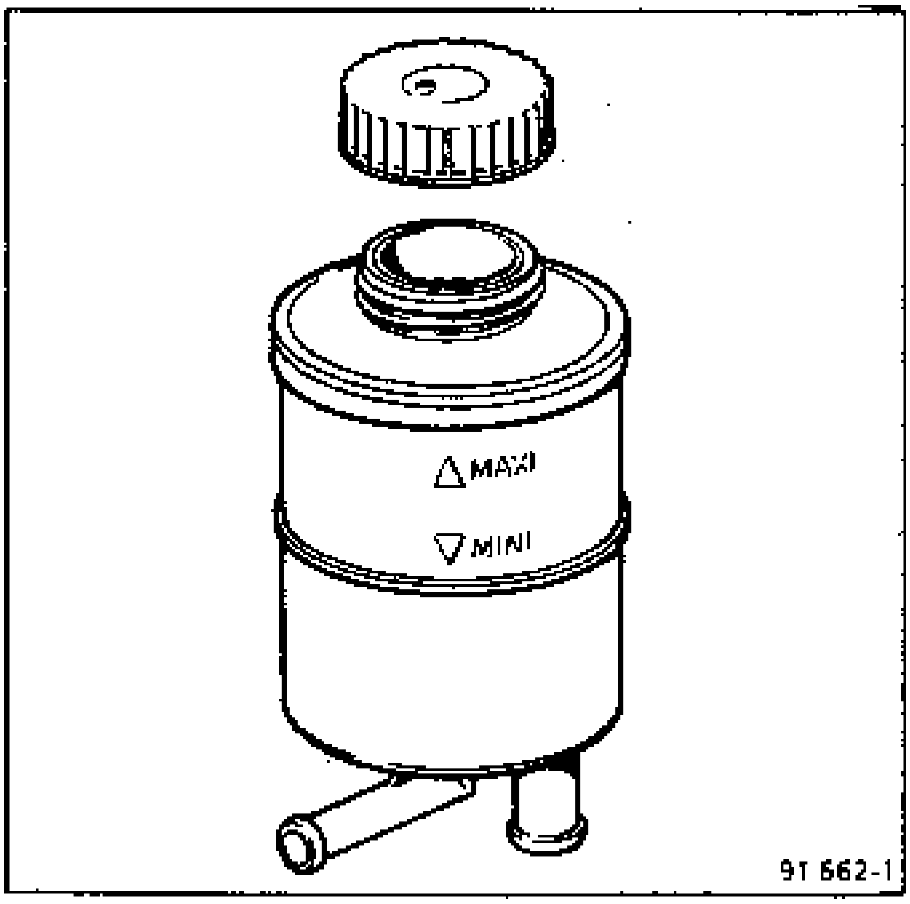
SEPARATE RESERVOIRS

I - 1ST TYPE



The oil must be visible at the grille height **(2)**.

II - 2nd TYPE



The oil must be visible level with the **MAXI** mark.

IDENTIFYING THE CAUSE OF FAULTS

The main fault is the lack of power-assistance.

The causes of this can be defined by checking the oil pressure under the following operational circumstances:

- no movement of the steering wheel;
- full lock.

1 - No movement of the steering wheel

Regardless of the engine speed, the pressure must not be higher than **5 to 7 bar**.

- Idling: pressure too high;
  ⇒ valve faulty.

- Accelerating: pressure too low;
  ⇒ regulator faulty.

2 - Full lock

This operation must not take too long, to avoid the oil temperature rising excessively.

By sustaining the movement of the steering wheel, the pressure must fall within a certain range of values (see table).

By turning to full lock on one side and then the other, the difference in pressure must not be greater than **5 bar.**

- Pressure too low and pressure gauge needle fluctuating:
  ⇒ regulator faulty .

- Pressure too low, no fluctuation of pressure gauge needle:
  ⇒ - belt slack;
    - valve faulty;
    - internal jack leak.

- Pressure difference at full lock on both sides:
  ⇒ valve faulty.

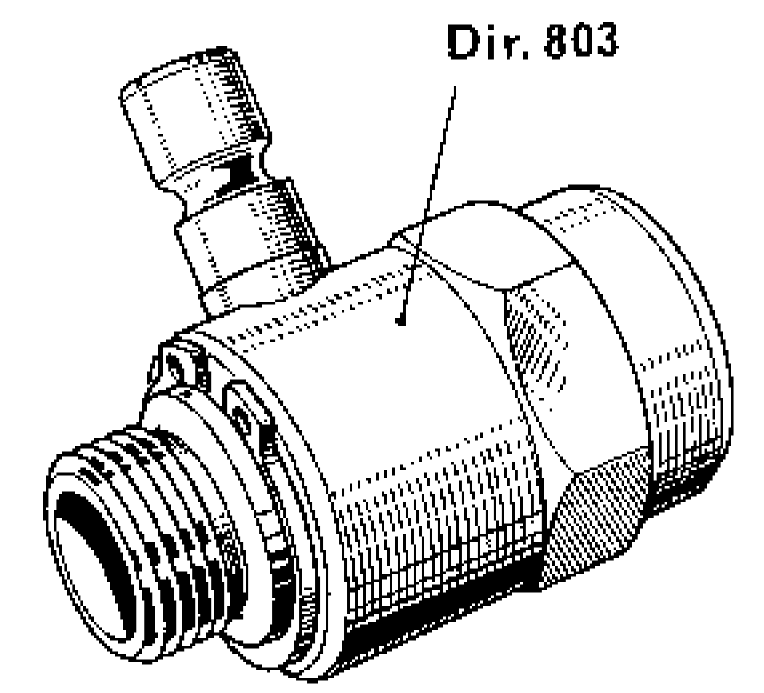
CHECKING THE OIL PRESSURE

ESSENTIAL SPECIAL TOOLING		
Dir.	803	Metric pitch union
Mot.	453 - 01	Flexible hose clamps
Fre.	1 085	Pressure testing gauge
	or	
Fre.	244 - 03	
Fre.	284 - 06	Connecting hose

Fit clamp **Mot. 453-01** to the pump low pressure flexible hose.

Disconnect the high-pressure pipe (be ready to catch the oil which flows out).

Fit union **Dir. 803** (metric pitch) between the hose and the pump.



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Connect pressure gauge **Fre. 1085** or **Fre. 244-04**.

Remove clamp **Mot. 453-01**.

Top up the pump level and allow the engine to run to check the pressure.

With the wheels straight and regardless of the engine speed, the pressure must not be higher than **5 to 7 bar**.

Wheels in full lock position to one side:

Hold the wheels in full lock on one side; the max. pressure must be:

4 cylinder engine type petrol or diesel	Engine types V6 and V6 Turbo
80 to 85 bar	95 to 100 bar

This operation must not take too long to avoid a sharp rise in oil temperature.

Remove union **Dir. 803** and pressure gauge **Fre. 1085** or **Fre. 244-04** using clamp **Mot. 453-01** to avoid oil loss.

Reconnect the high-pressure hose and remove clamp **Mot. 453-01**.

Top up the oil level in the reservoir.

ESSENTIAL SPECIAL TOOLING	
Mot. 453-01	Flexible hose clamp

REMOVING

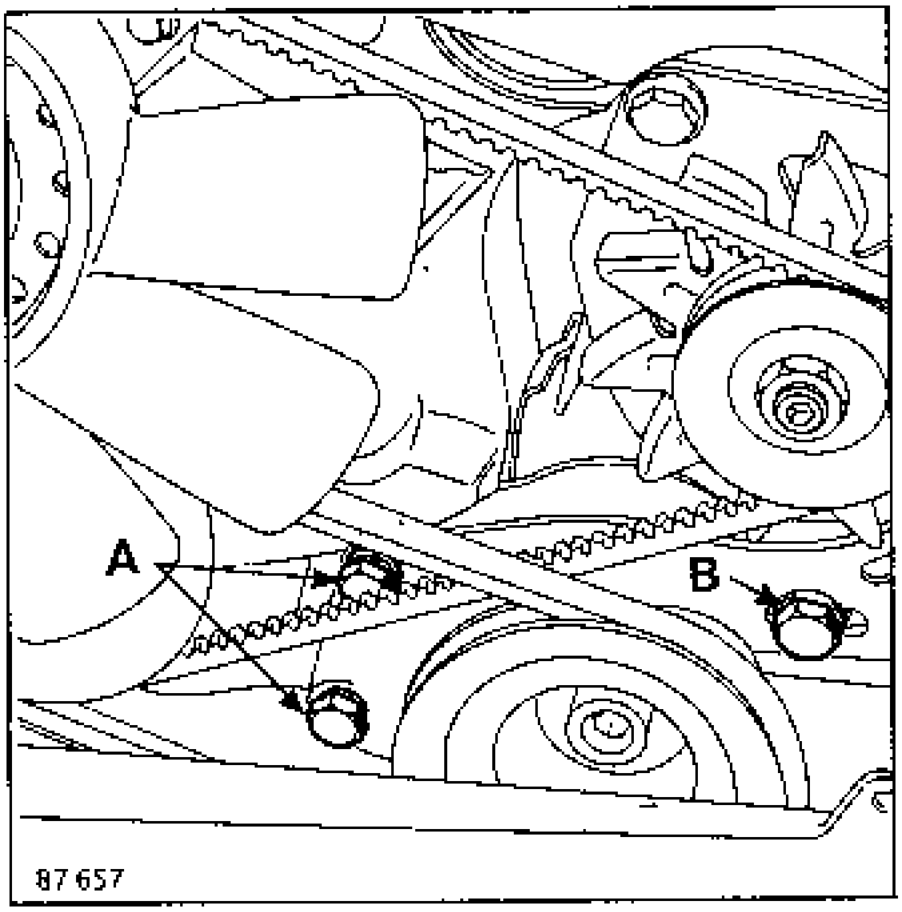
Fit clamp **Mot. 453-01** to the pump supply line.

Be ready to catch the oil.

Disconnect the following hoses:

- supply;
- high-pressure.

Loosen the two bolts (A) and the tensioner bolt (B).



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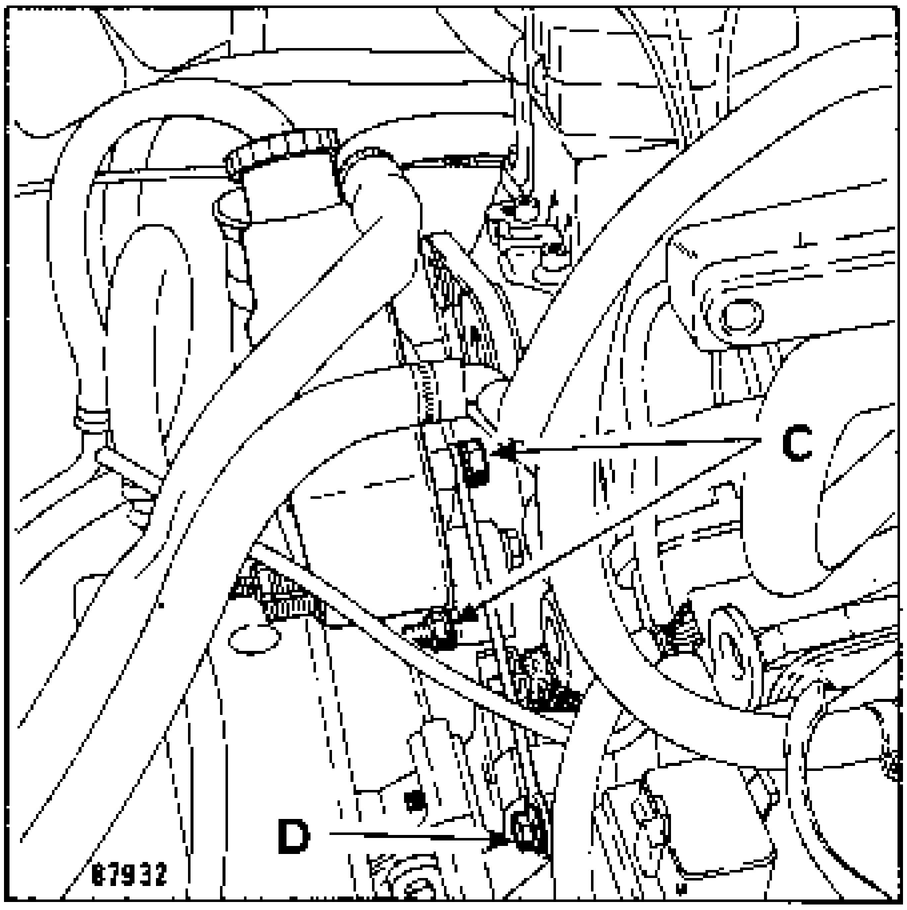
Release the belt.

Remove:

- the alternator tension bolt;
- the two bolts (A);
- the pump/support bracket assembly;
- the pulley (see next page);
- the support bracket;
- the pump fixing bolts;
- the pump.

Pump with built-in reservoir

Drain the pump reservoir using a syringe.



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Loosen the two bolts (C) and the tensioner bolt (D).

Release the belt.

Remove:

- the two bolts (C);
- the pump/support bracket assembly;
- the pulley (see next page);
- the support bracket fixing bolt;
- the support bracket.

REFITTING

Fit:

- the support bracket;
- the pulley (see next page);
- the pump/support bracket assembly.

Adjust the belt tension (see relevant paragraph).

Bleed and refill the circuit (see relevant paragraph).

REPLACING THE PULLEY

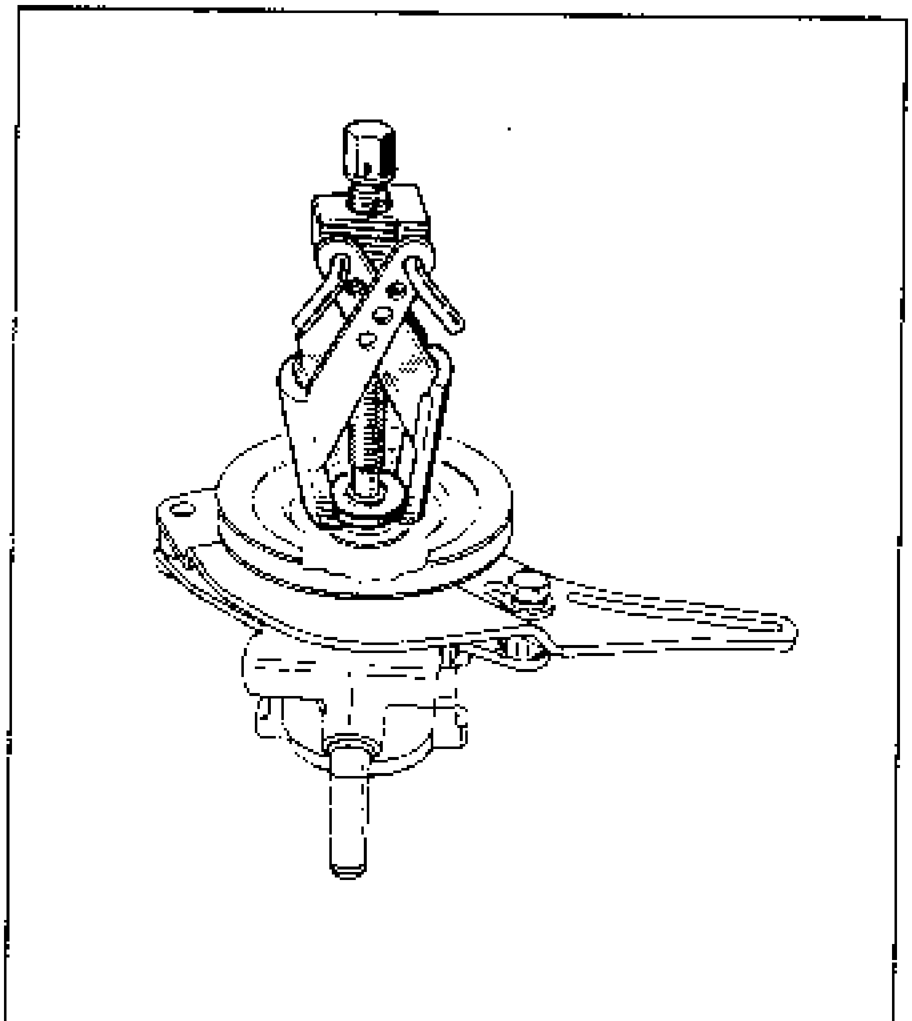
ESSENTIAL SPECIAL TOOLING	
Dir. 1 083	Tooling for refitting the steering pump pulley

REMOVING

Depending on the assembly, take out the pulley after having noted the distance with respect to the end of the shaft.

V-belt pulley

Use an extractor.



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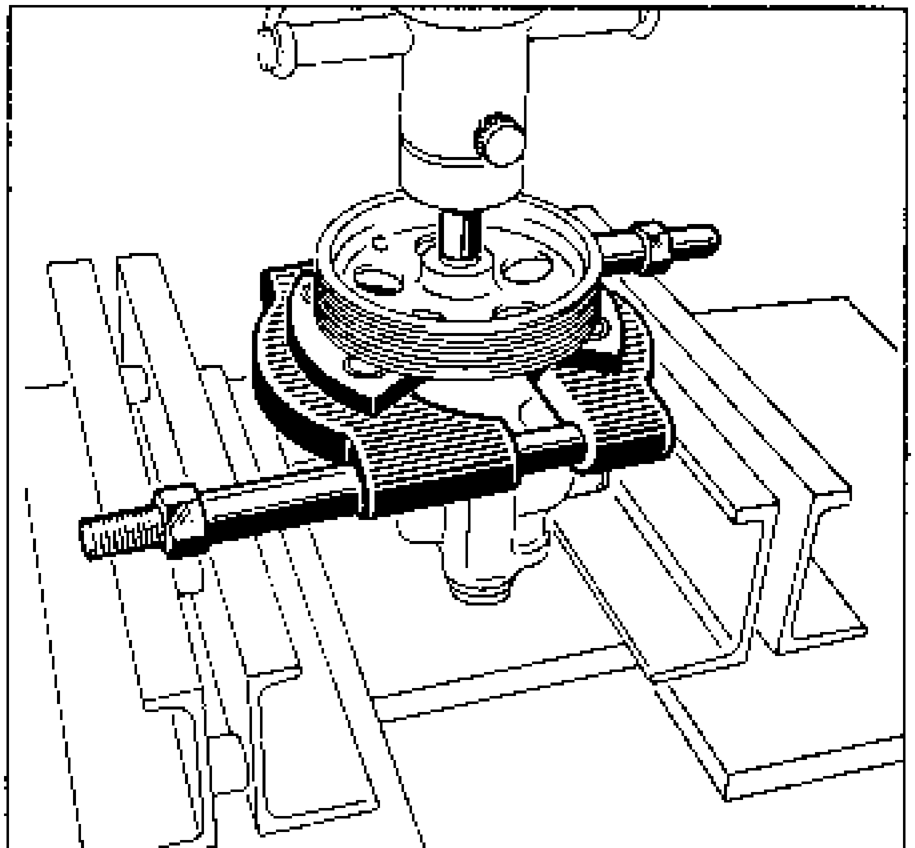
Non V-belt pulley

Use the press with an extractor, type **FACOM U 53 G**.



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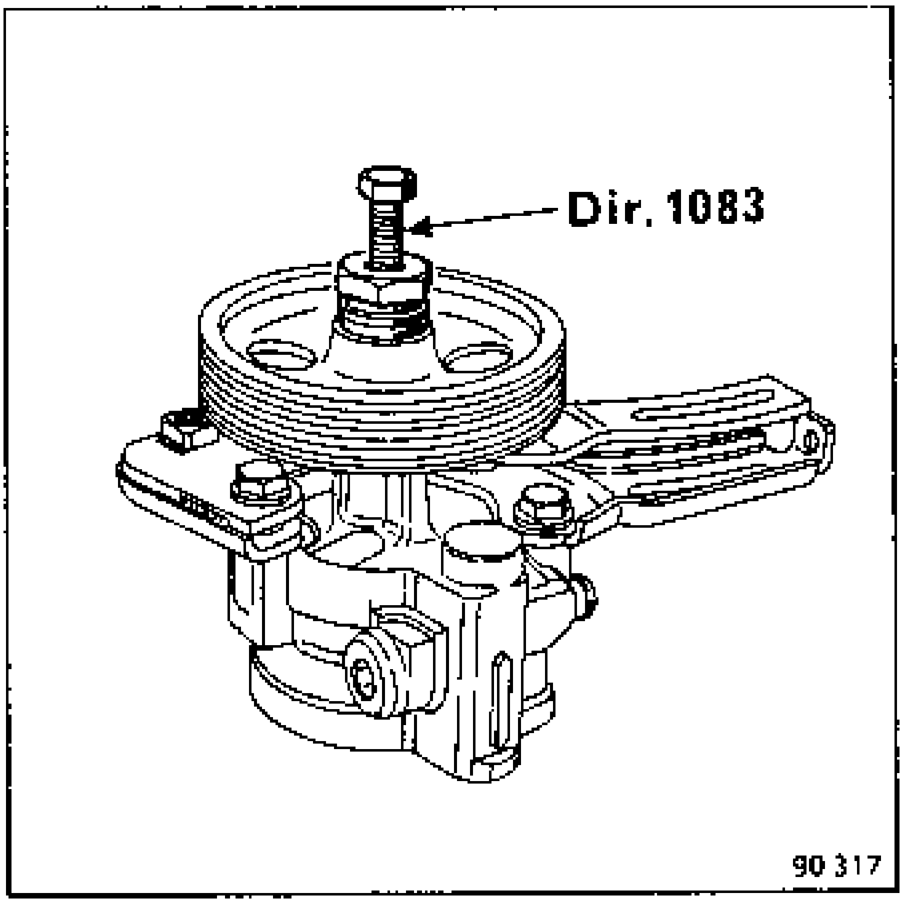
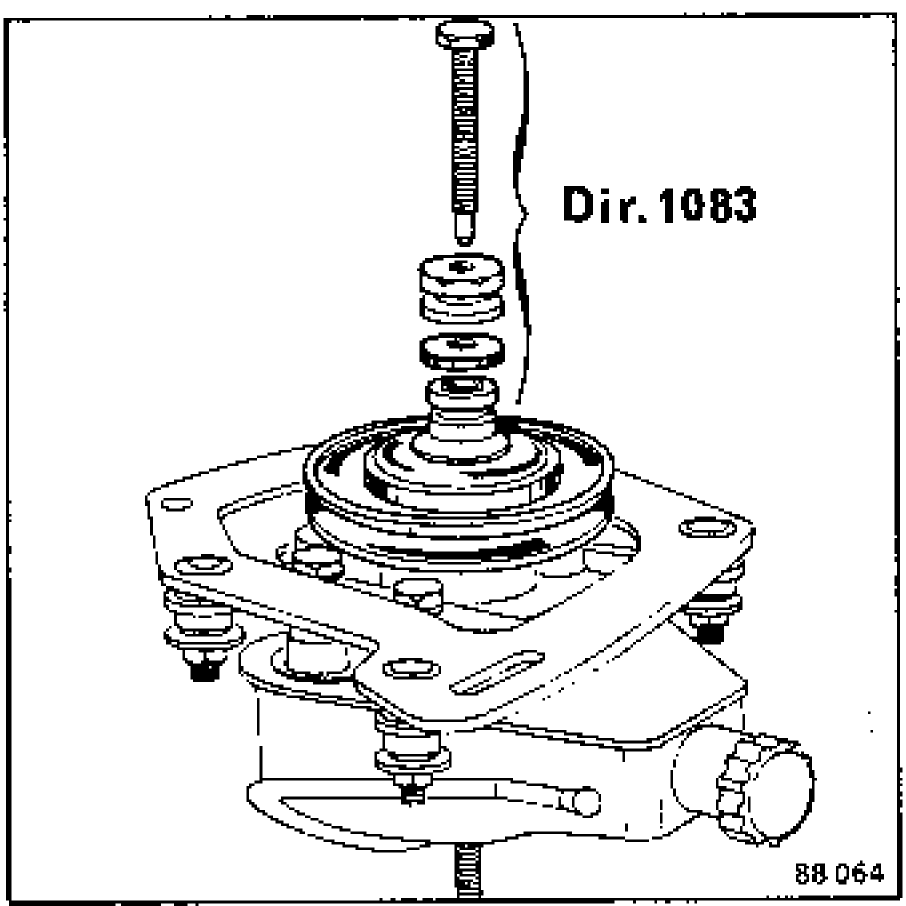
REFITTING

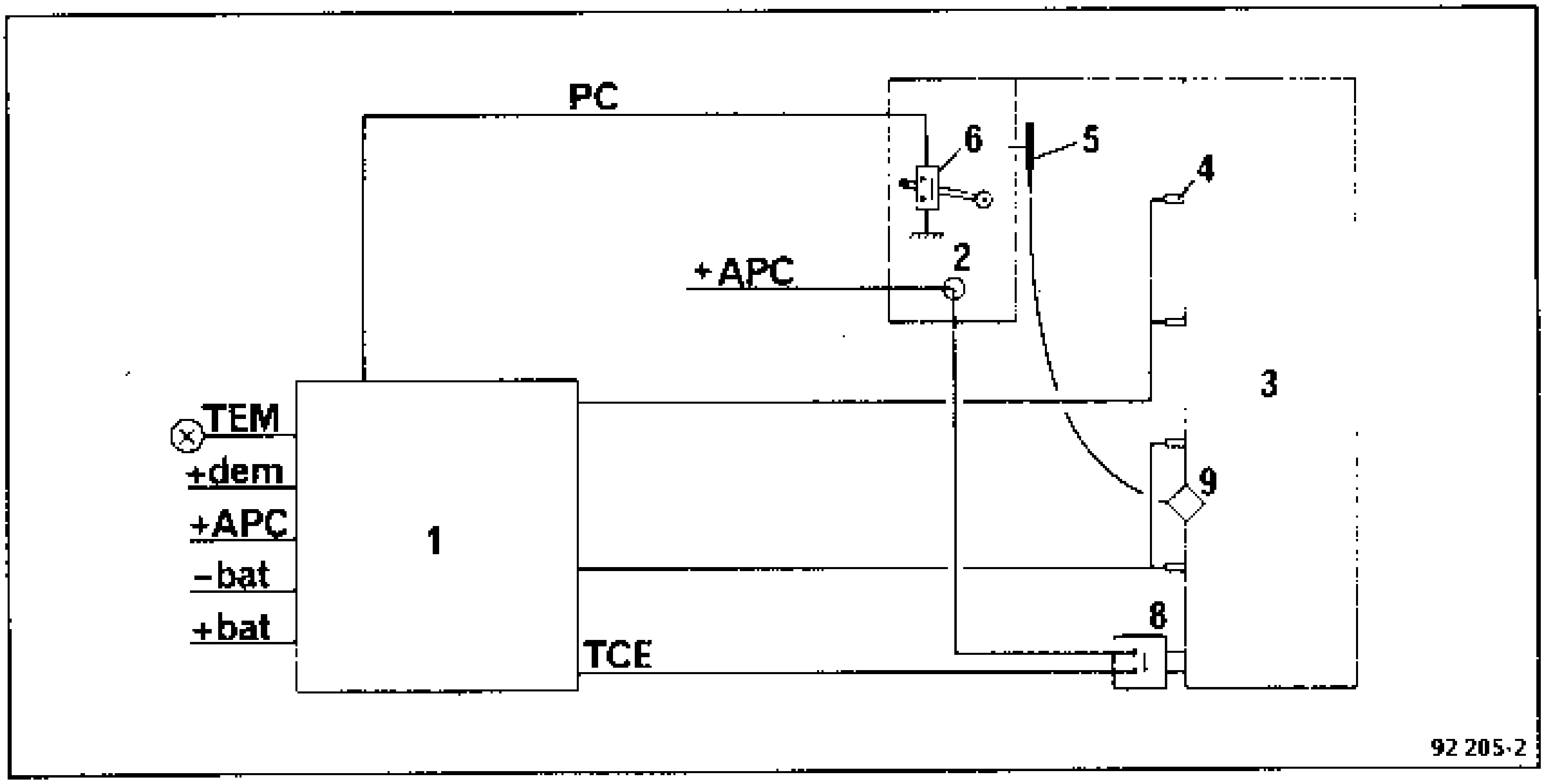
NOTE:
Before refitting the pulley, it is essential to make sure that the pump support bracket can be fitted afterwards. If not, position it before fitting.

Fit the pulley, using **Dir. 1083**, until the distance noted during removing is achieved (thoroughly grease the threads on the tool).





COLD STARTING SYSTEM OPERATING DIAGRAM



1 - Electronic preheating module.

2 - Injection pump.

3 - Engine.

4 - Heater plugs.

5 - Idling and accelerated idling lever.

6 - Solenoid valve (circuit established when idling).

8 - Temperature switch (circuit established for a temperature below 60 °C (approximately)).

9 - Thermoelement (enables accelerated idling, engine cold).

Operation of electronic preheating module.

A - Ignition (**T1**: heater plug heating time).

NOTE:
The illumination time of the warning light varies depending on the module temperature:

- approximately 20 seconds at -30 °C;
- immediate at 80 °C.

B - Heater plug heating cuts out (without use of starter, heater plug supply is cut off after **4.5 seconds T2**).

C - Engine starts (after using the starter, heater plugs remain **100%** supplied for **10 seconds T3**).

D - Heater plug postheating **T4**. This function may last a maximum of **3 minutes** during which time the heater plugs are supplied alternately in pairs.

NOTE:
Function **T3** may be interrupted:

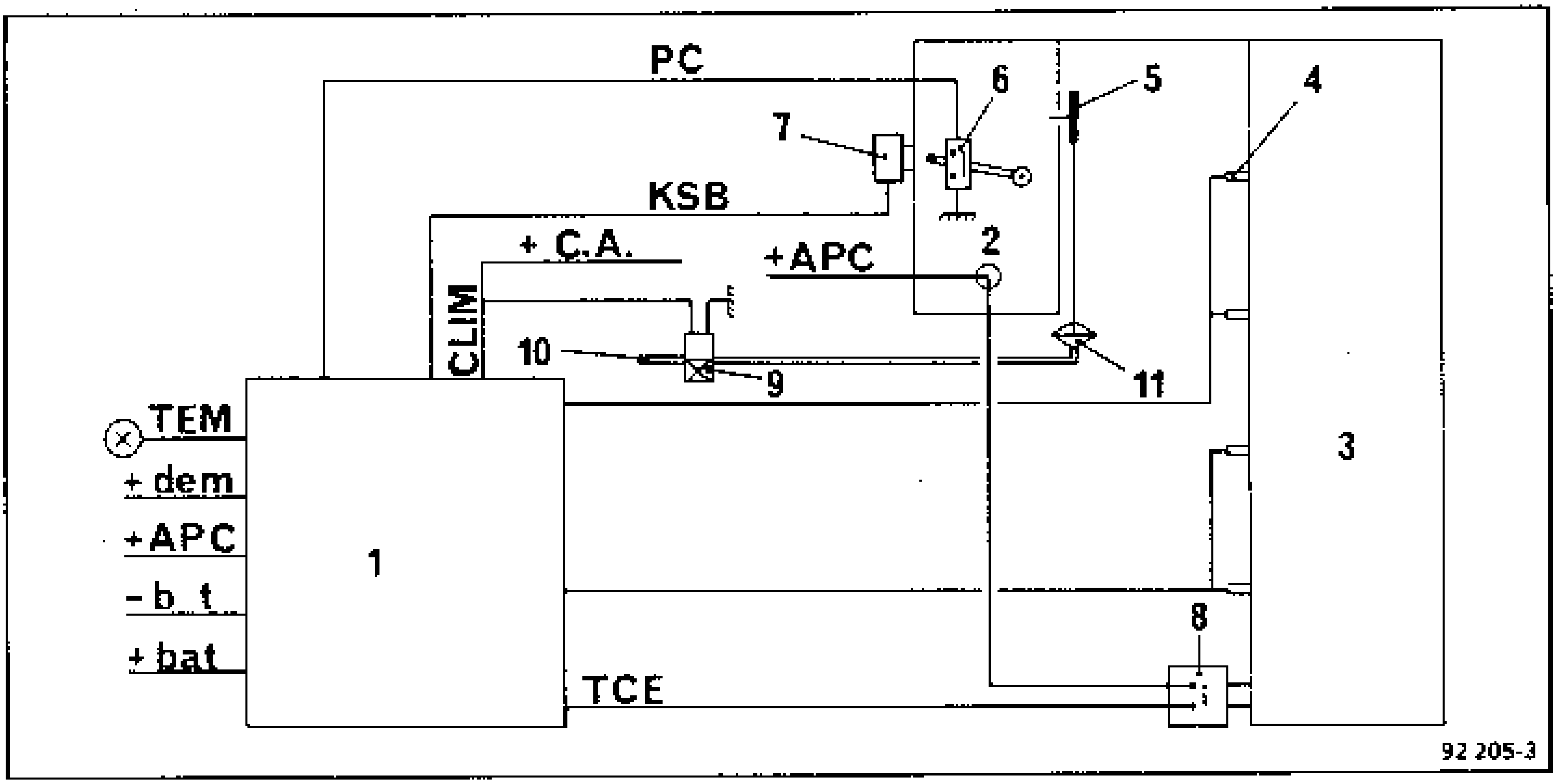
- once the coolant temperature is above approximately **60 °C** (temperature switch **(8)**);
- 3 seconds after the load switch **(6)** has cut out, heater plug heating is resumed once the preheating circuit is open.

Cold accelerated idling

A thermoelement **(9)** holds the idling lever **(5)** in the accelerated idling position.

When the temperature rises, the lever gradually returns to the normal idling position.

COLD START SYSTEM OPERATING DIAGRAM (AIR CONDITIONING)



1 - Electronic preheating module.

2 - Injection pump.

3 - Engine.

4 - Heater plugs.

5 - Idling and accelerated idling lever.

6 - Solenoid valve (circuit established when idling).

7 - Cold advance solenoid (KSB)

8 - Temperature switch (circuit established for a temperature below approximately 60 °C).

9 - Accelerated idling control solenoid valve (cold start and air conditioning).

10 - Vacuum.

11 - Accelerated idling pneumatic control capsule.

Operation of electronic preheating module.

A - Ignition (T1: heater plug heating time).

NOTE:
The illumination time of the warning light varies depending on the module temperature:

- approximately 20 seconds at -30 °C;
- immediate at 80 °C.

B - Heater plug heating cuts out (without use of starter, heater plug supply is cut off after 4.5 seconds T2).

C - Engine starts (after using the starter, heater plugs remain 100% supplied for 10 seconds T3).

D - Heater plug postheating T4 This function may last a maximum of 3 minutes during which time the heater plugs are supplied alternately in pairs.

NOTE:
Function T3 may be interrupted:

- once the coolant temperature is above approximately 60 °C (temperature switch (8));
- 3 seconds after the load switch (6) has cut out, heater plug heating is resumed once the preheating circuit is open.

E - Accelerated idling

For vehicles fitted with air conditioning, the accelerated idling (5) is controlled by a pneumatic vacuum capsule (11), connected to the vacuum pump circuit (10).

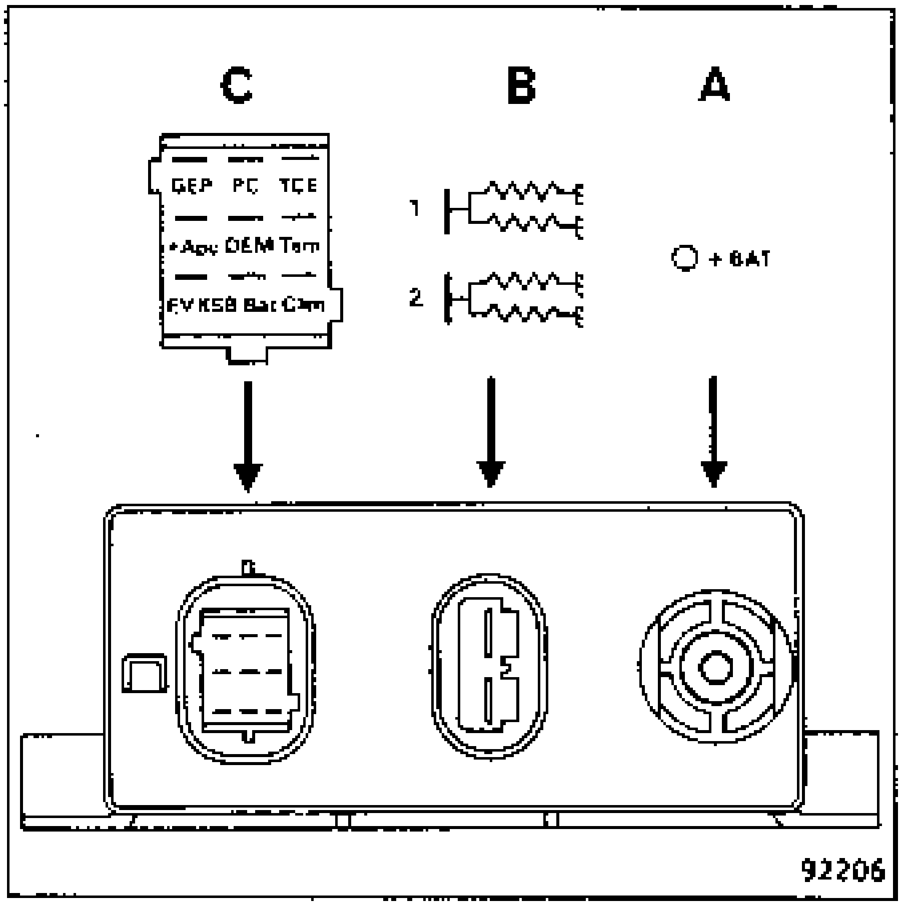
a - Cold accelerated idling

The solenoid valve (9) is supplied at the same time as the preheater spark plugs (T1 + T2 + T3 + T4).

b - Air conditioning

The solenoid valve (9) is supplied as soon as the air conditioning compressor is activated.

ELECTRONIC PREHEATING MODULE



Pin allocation

A - + BAT : + battery.

B - 1 : power supply heater plugs 1 and 2.
2 : power supply heater plugs 3 and 4.

C - GEP : not used (power-assisted steering electric pump motor).
P.C. : load switch on injection pump control lever (circuit established when idling).

TCE : coolant temperature switch (circuit cut out above approximately 60 °C)

+ APC : + after ignition.
DEM : + starter information.
TEM : preheating warning light.

EV KSB : cold start advance correction solenoid valve

- BAT : battery earth.

clim : + accelerated idling solenoid valve power supply, for utilisation of cold accelerated idling.

FAULT-FINDING

General

The pre- and postheating module is fitted with protectors which partially or totally prevent it from operating if:

- there is a heater plug or power circuit short circuit;
- the warning light output to instrument panel short circuits;
- the power supply is greater than 16 ± 1 volts.

NOTE:
The operation of the module returns to normal once the above faults have disappeared.

Causes of malfunction of the preheating module can be identified on the basis of the following observations:

1 - The preheating warning light does not work and the engine does not start from cold.

2 - The preheating warning light works and the engine does not start from cold.

3 - The preheating warning light does not work and the engine starts normally from cold after approximately 10 seconds of preheating.

4 - Preheating works normally and postheating does not work.

5 - Pre- and postheating work normally and the KSB cold starting advance system does not work.

6 - Cold accelerated idling (air conditioning option) does not work.

FAULT-FINDING

1 - The preheating warning light does not work and the engine does not start from cold.

CHECK	WHAT TO DO
Disconnect the heater plug power supply connector (B) and test the preheating system:	
- the warning light illuminates normally.	Check the heater plug wiring. If correct, check and replace the faulty heater plug(s).
- The warning light does not illuminate and there is voltage at the connector (B) outputs.	Check the heater plug circuit and the instrument panel warning light circuit. Repair if necessary.
- The warning light does not illuminate and there is no voltage at the connector (B) outputs.	Check: - the + battery of connector (A); - the + after ignition of connector (C); - the earth of connector (C); - whether the power supply is correct and replace the preheating module.

2 - the preheating module works and the engine does not start from cold.

CHECK	WHAT TO DO
Disconnect the connector (B) and test the preheating system.	
The warning light illuminates and there is voltage at the connector (B) outputs.	Check the heater plug circuit. If correct, check and replace the faulty heater plug(s).
The warning light illuminates and there is no voltage at the connector (B) outputs.	Replace the preheating module.

3 - The preheating warning light does not work and the engine starts normally from cold after approximately 10 seconds of preheating.

CHECK	WHAT TO DO
Earth the output (warning light) from connector (C) using a two-amp fuse, ignition on:	
- The fuse burns out	The instrument panel warning light wiring has short-circuited. Repair the wiring.
- The warning light does not illuminate	The bulb has burnt out or the wiring is faulty. Replace the bulb or repair the wiring.
- the warning light illuminates	Replace the preheating module.

FAULT-FINDING

4 - Preheating works normally and postheating does not work

CHECK	WHAT TO DO
Disconnect the connector (C) and check, using a voltmeter/ohmmeter:	
- The resistance between outputs (**PC** and **-Bat**).	
• accelerator in idling position: resistance = **0 ohms.**	If the circuit is open, check the wiring, the microswitch and its connectors. If faulty, repair them.
• accelerator fully depressed: resistance = infinite.	If the circuit is closed, check the conformity and adjustment of the microswitch.
- the voltage, ignition on, between outputs (**TCE** and **-Bat**).	
• engine cold, coolant temperature below **55 °C ± 2 °C = 12 volts.**	If there is no voltage: check the electrical harness, the temperature switch and its connector.
• engine hot, coolant temperature above **65 °C ± 2 °C = 0 volts.**	If there is voltage: check the harness and the conformity of the temperature switch.
- If the checks carried out are correct and postheating does not work after starting from cold.	Replace the preheating module.

5 - Pre- and postheating work normally and the KSB cold starting advance system does not work.

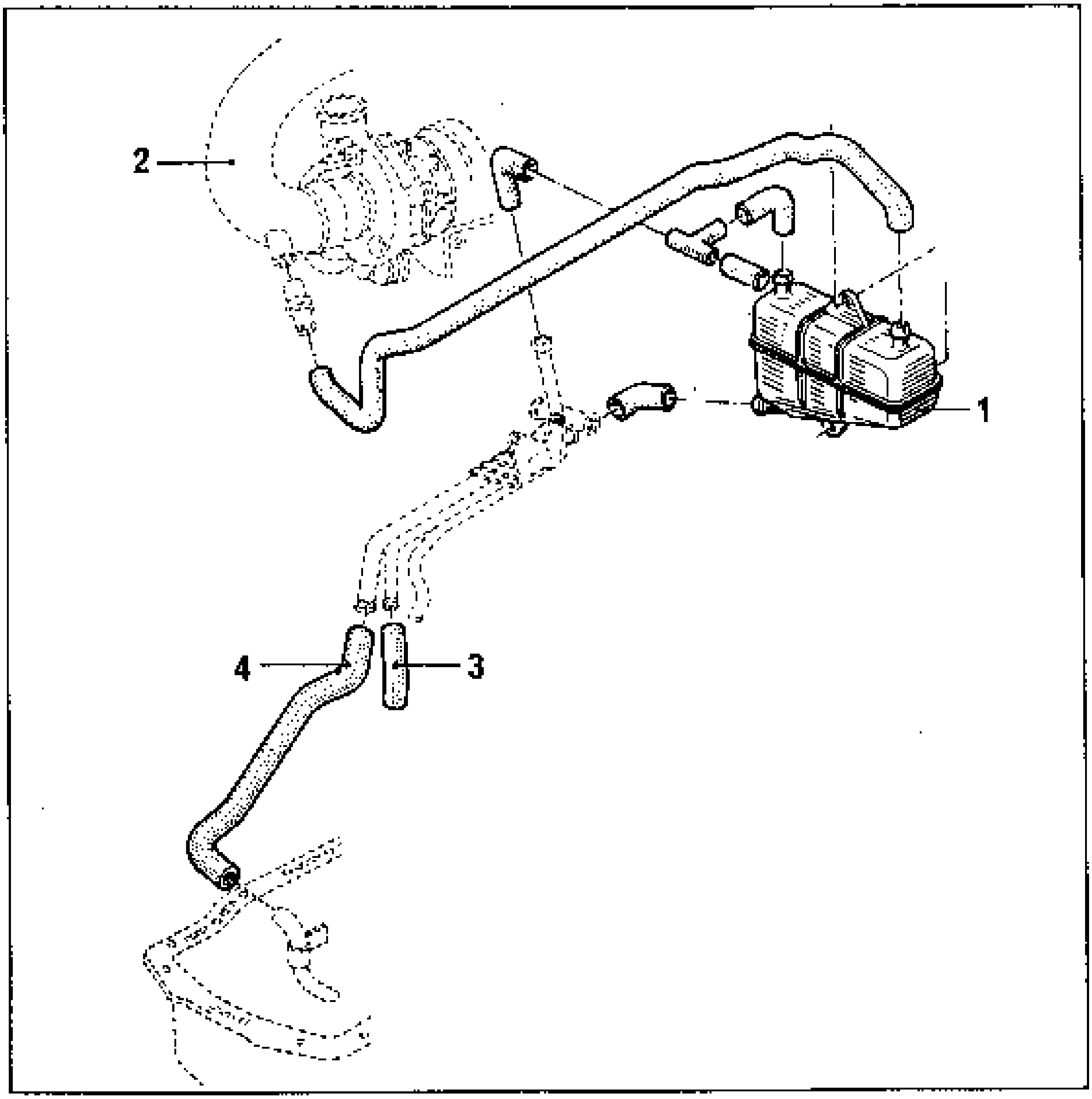
CHECK	WHAT TO DO
Disconnect connector (C) and measure the resistance between (**EV KSB** and **-Bat**).	
The resistance must be approximately **5 ohms**.	If it is incorrect, check the harness and the solenoid valve and repair.
With the engine idling, connector (C) disconnected, link (**+ APC and EV KSB**), there must be a slight change in the engine noise (dryer noise).	If the noise does not change, check that there is voltage (**12 V**) at the **KSB** solenoid valve and that it is correct. If the noise does change, the preheating module is at fault. **ATTENTION:** The **KSB** only operates for a very short time (**5 to 10** seconds after the engine starts).

FAULT-FINDING

6 - Accelerated cold idling (air conditioning option) does not work.

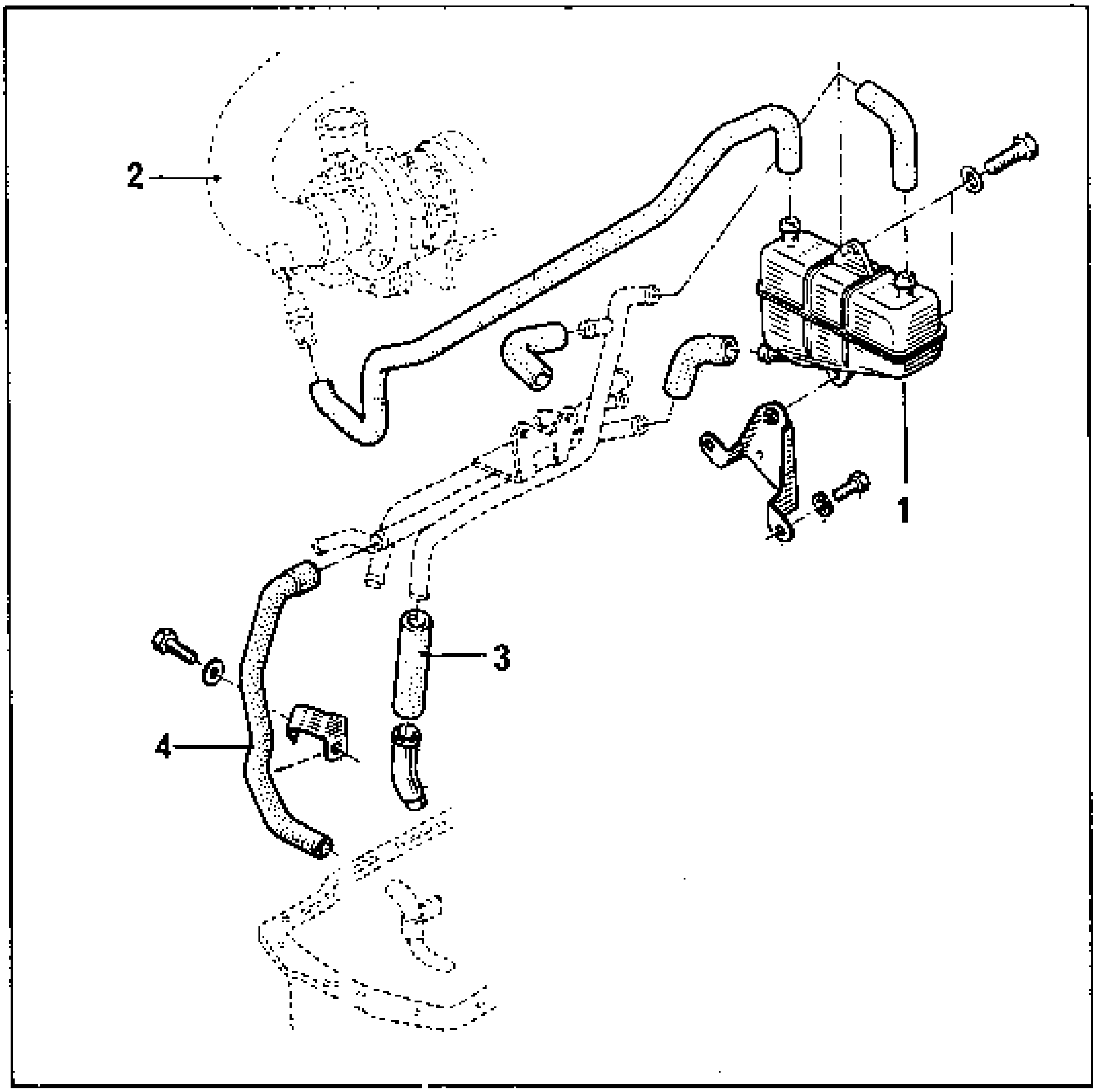
CHECK	WHAT TO DO
Switch on the air conditioning system:	
- The accelerated idling does not cut in.	Check that the solenoid valve (9) does open the pneumatic circuit. If not, check the electric harness and replace the solenoid valve if it is faulty.
- The accelerated idling does not cut in and the solenoid valve is activated.	Check the pneumatic circuit between the vacuum pump, the solenoid valve (9) and the capsule (11). Repair if faulty or incorrectly connected.
The accelerated idling is activated with the air conditioning but is not activated during cold starting (while the preheating warning light is illuminated).	Check the electric harness between the preheating module and the solenoid valve. If there is no voltage at the "CLIM" output while the preheating warning light is illuminated, replace the preheating module.
The accelerated idling works normally during preheating but switches off and on alternately during postheating.	The preheating module is faulty. Replace it.

B290 Vehicles (J8S 708 from N° 1 to N° 100313)



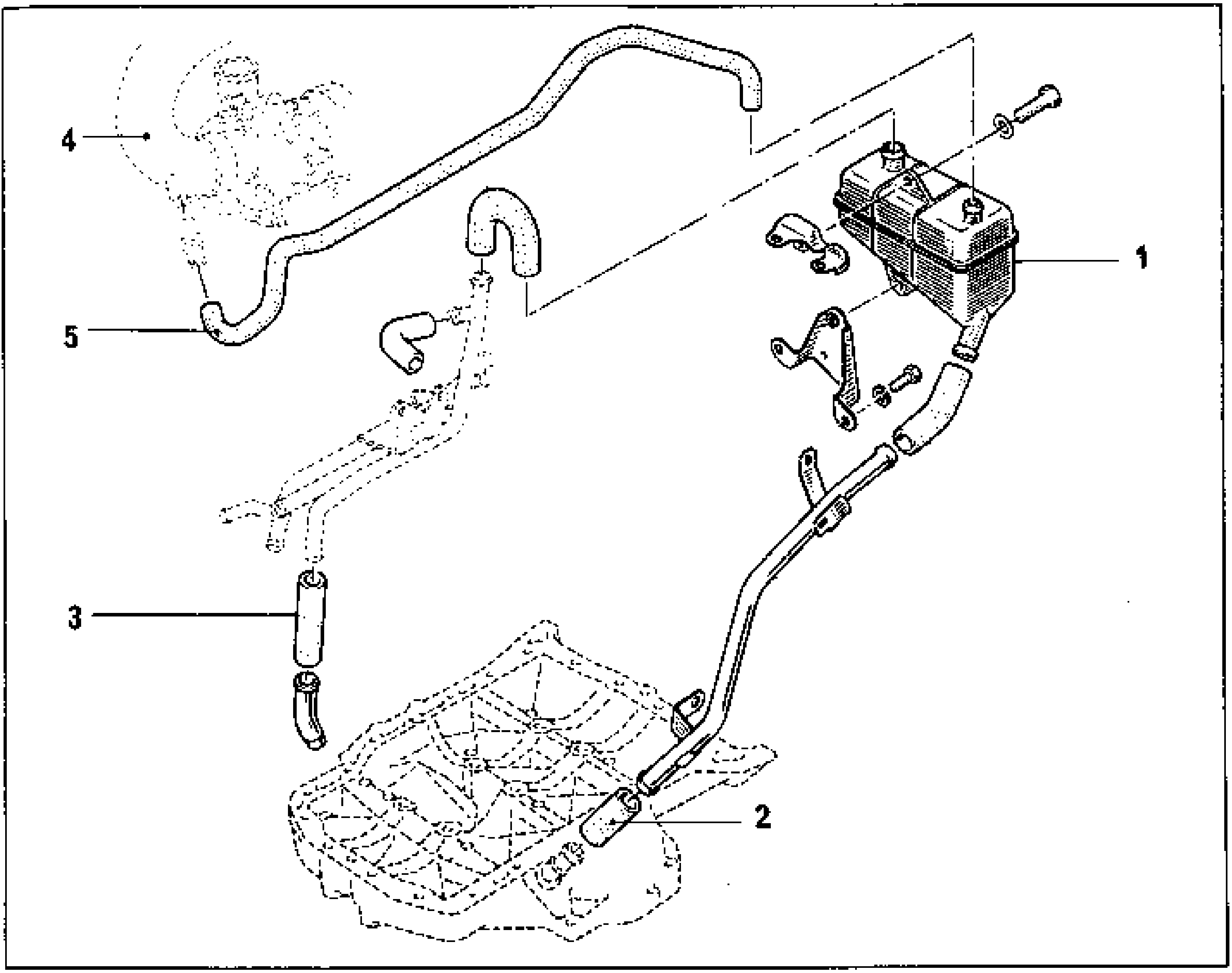
1 - Decanter
2 - Turbocharger air input duct
3 - Connection to cylinder block
4 - Connection to oil sump

B290 Vehicles (J8S 708 from N° 100314 to end of model year 1987).



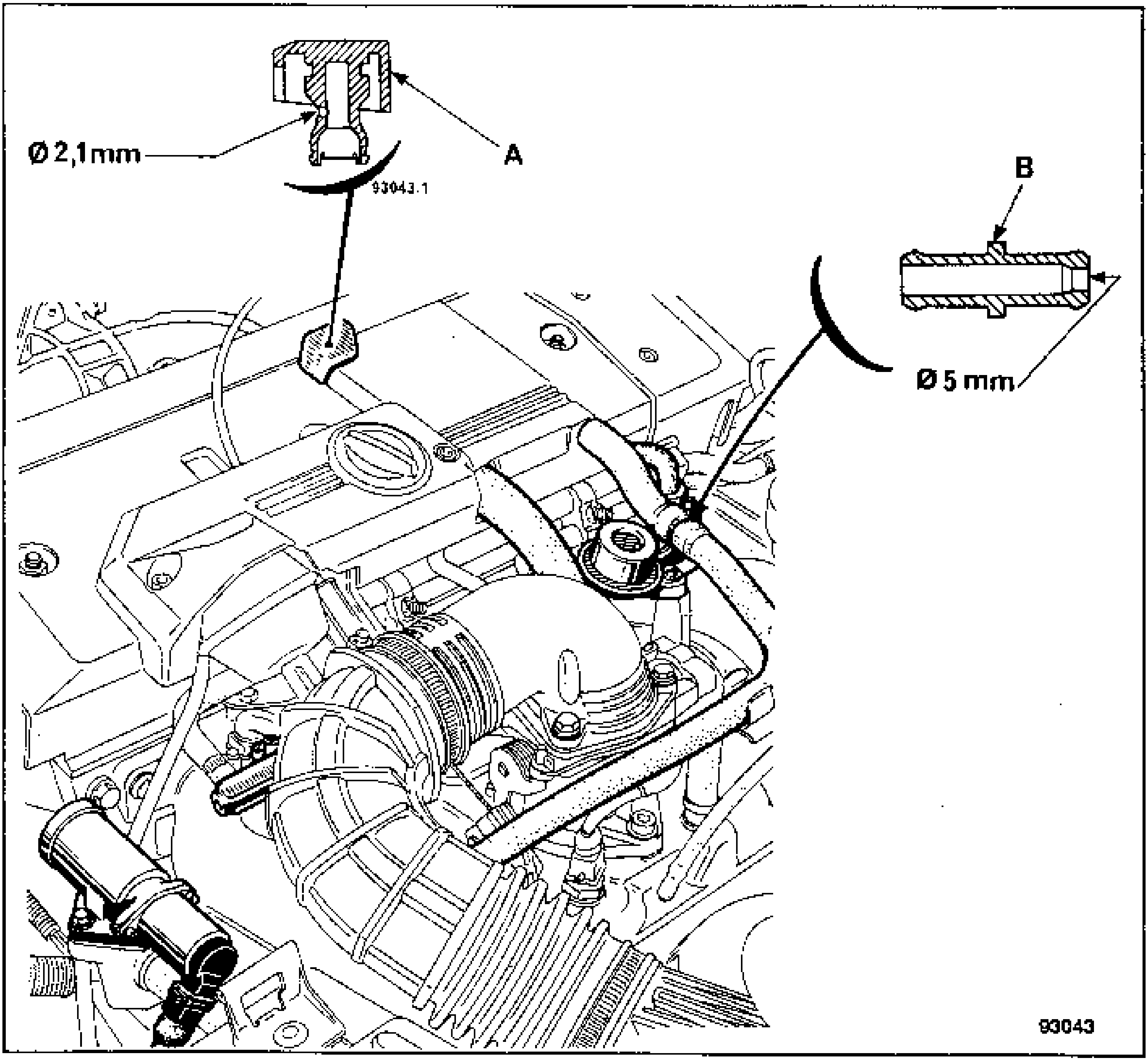
1 - Decanter
2 - Turbocharger air input duct
3 - Connection to cylinder block
4 - Connection to oil sump

Vehicles B290 and B29W (from model year 1988).



1 - Decanter
2 - Union with stiffener base (oil sump)
3 - Union with cylinder block
4 - Turbocharger air inlet pipe
5 - From model year 89, the centre section of this pipe will be metallic (B290)

Vehicles B292 and B294

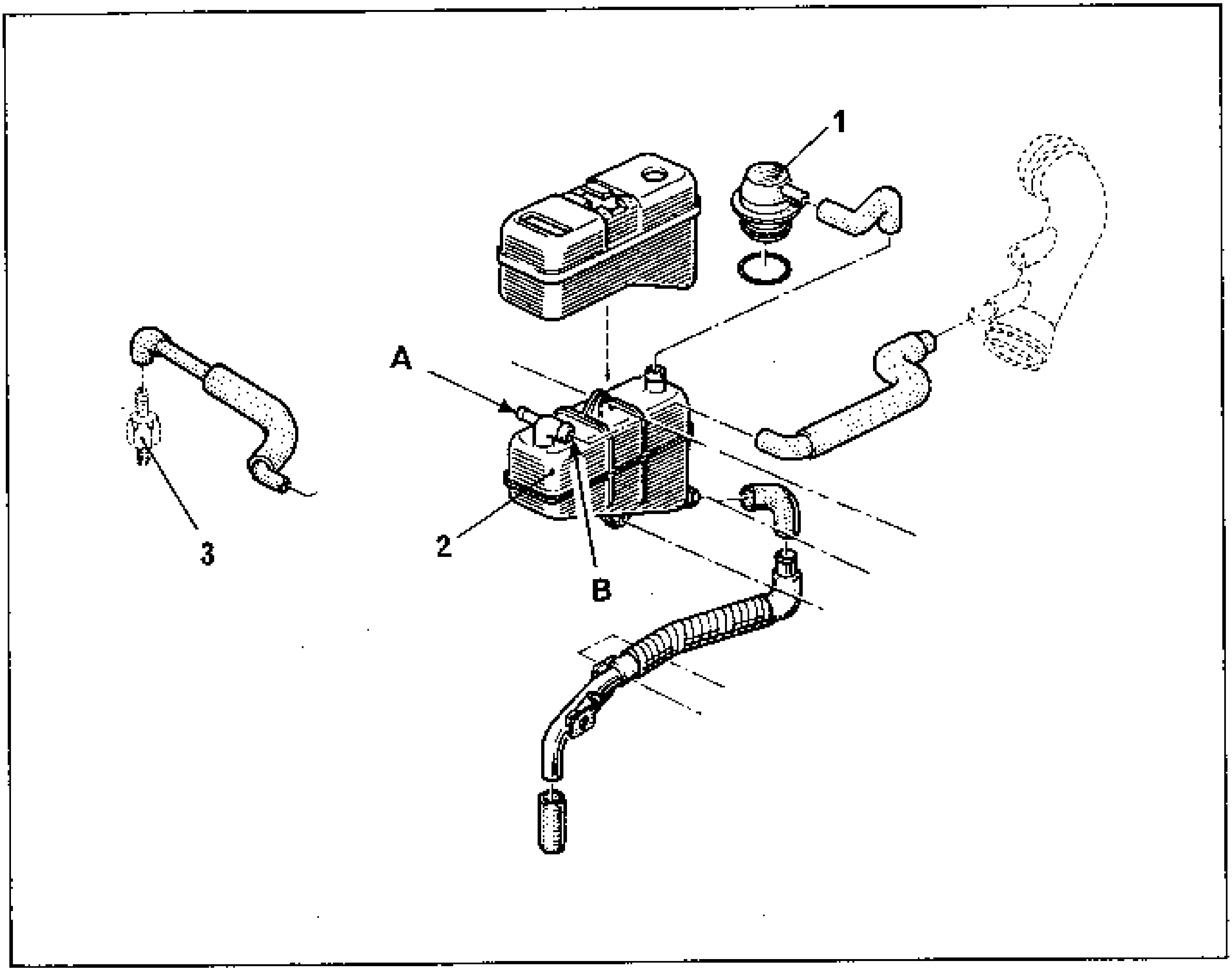


A - Output side rebreathing (restriction Ø 2.1 mm, yellow)
B - Input side rebreathing (restriction Ø 5 mm, yellow)

Check:
To ensure that the anti-pollution system operates correctly, the oil vapour rebreathing circuit must be kept clean and in good condition.

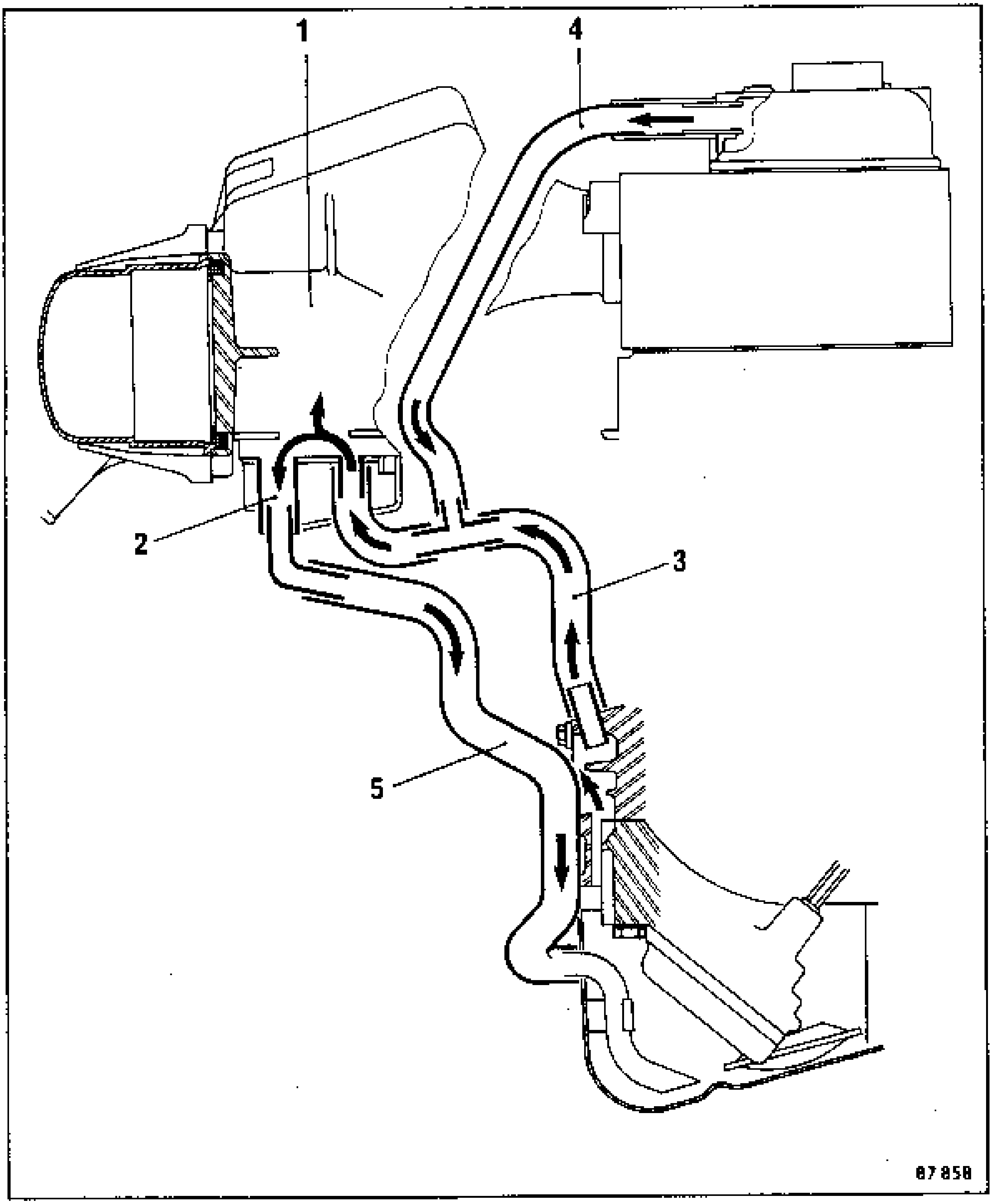
Check that the restrictors are in place and of the correct size.

Vehicle B295



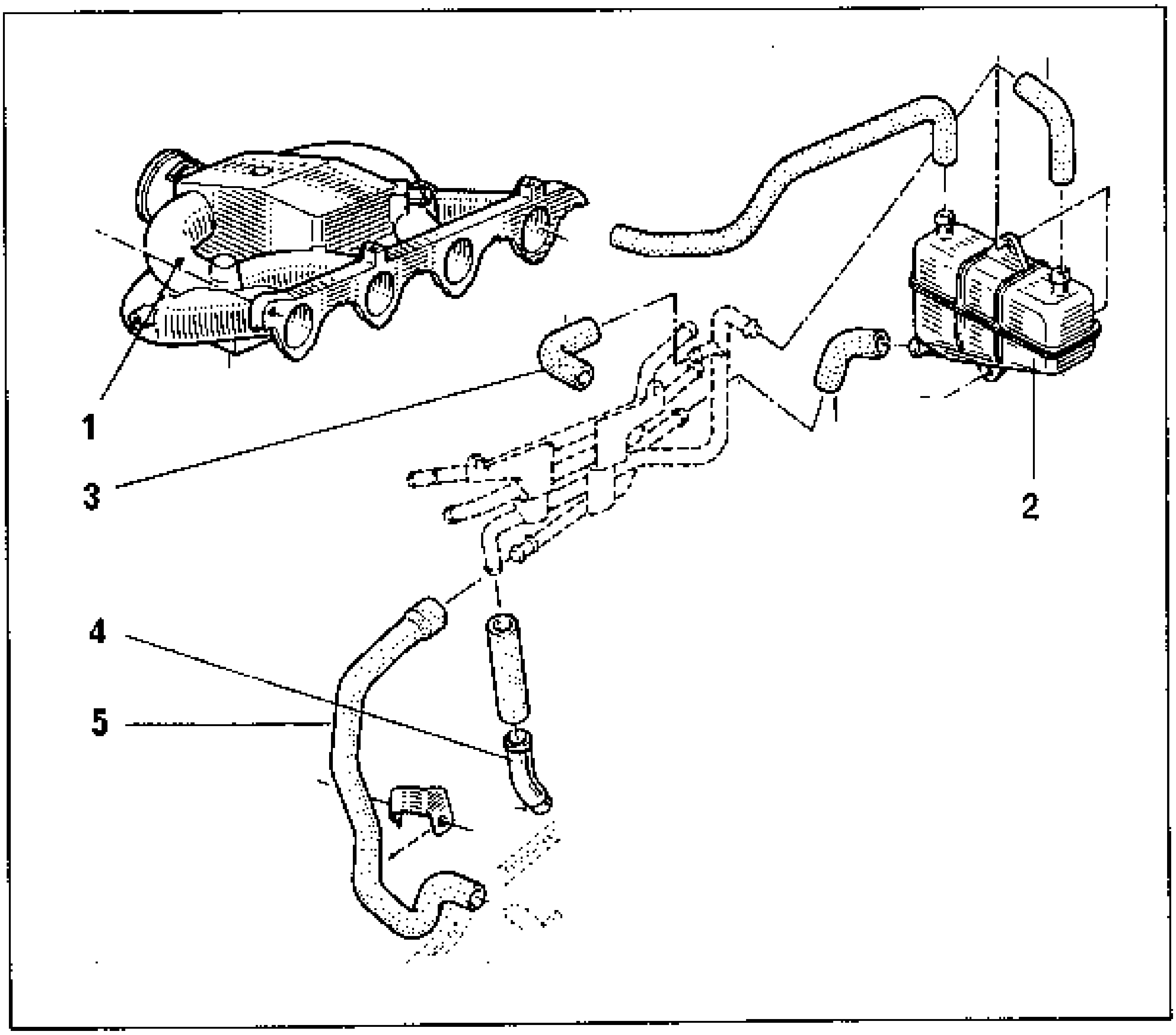
1 - Oil filler cap
2 - Decanter fitted with a bypass T joint, comprising restrictions:
   A - To inlet manifold Ø 2 mm
   B - To inlet piping between air filter and turbocharger Ø 8.5 mm.
3 - Inlet manifold check valve

B296 Vehicles (J8S 706 Engine).



1 - Air intake casing
2 - Decanter
3 - Oil vapour intake pipe (lower engine)
4 - Oil vapour intake pipe (upper engine)
5 - Sump return pipe

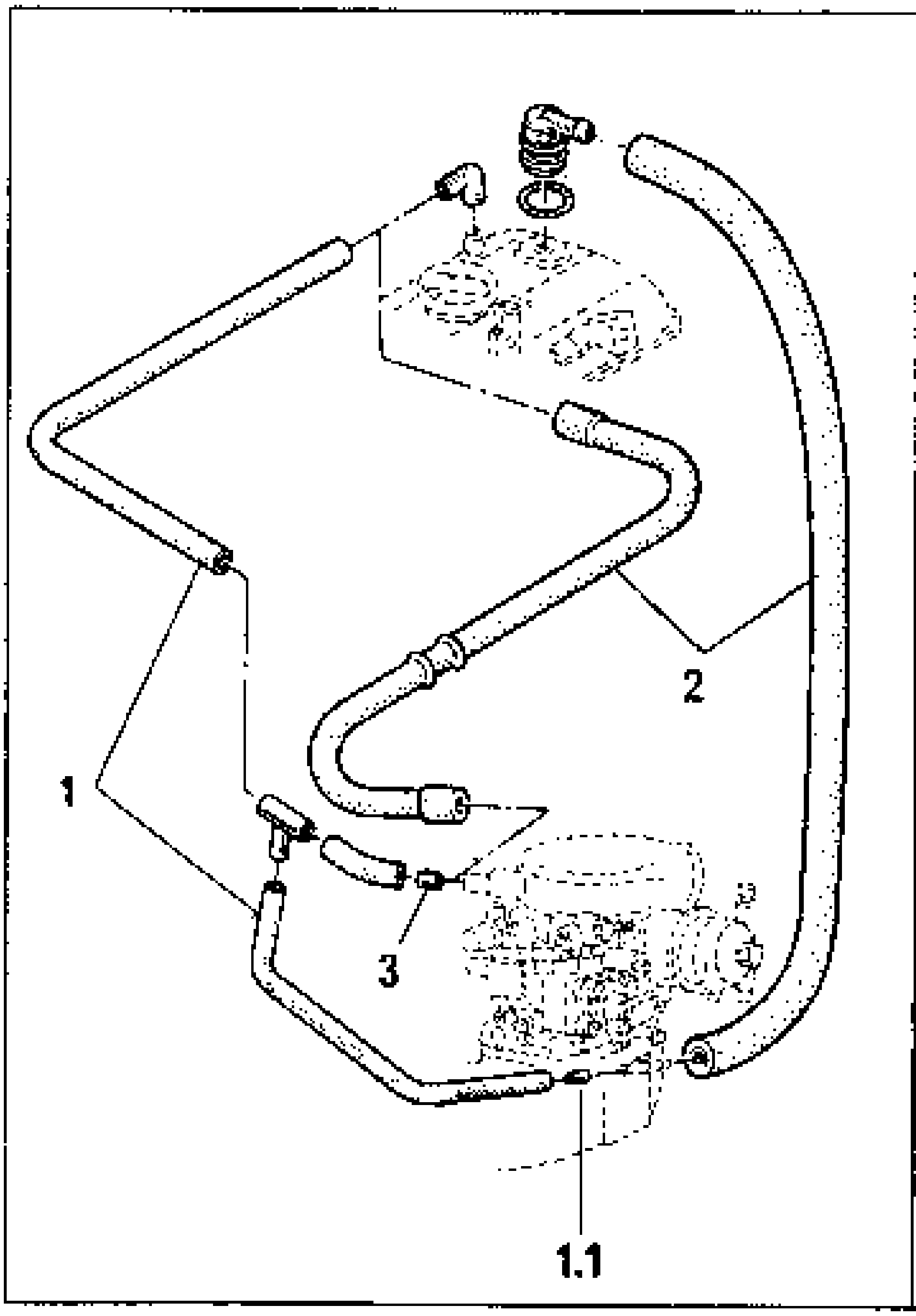
B296 Vehicles (J8S 736 Engines).



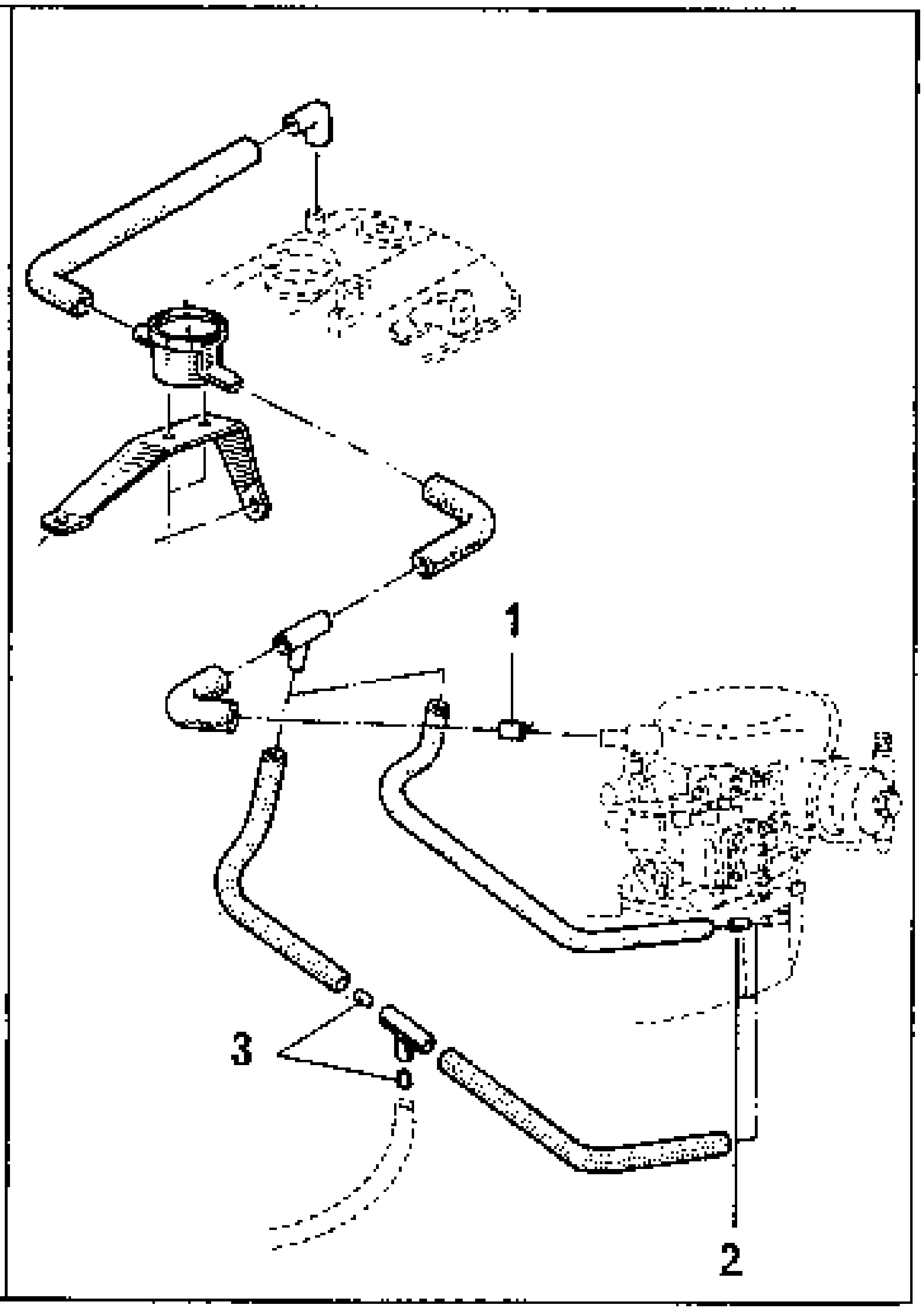
1 - Inlet manifold
2 - Decanter
3 - Rocker cover connection
4 - Cylinder block connection
5 - Oil sump connection

Vehicle B297

Engines J6R 706/707 and J6R 760



Engine J6R 762/763



Engines J6R 706/707 and J6R 760:

1 - Connections with carburettor (1st type up to N° F00308131)
1.1 - 1st type
restriction Ø 1.7 mm for J6R 760
restriction Ø 2 mm for J6R 706/707
2 - Connections with carburettor (2nd type from N° F00308132)
3 - Restriction Ø 5.5 mm

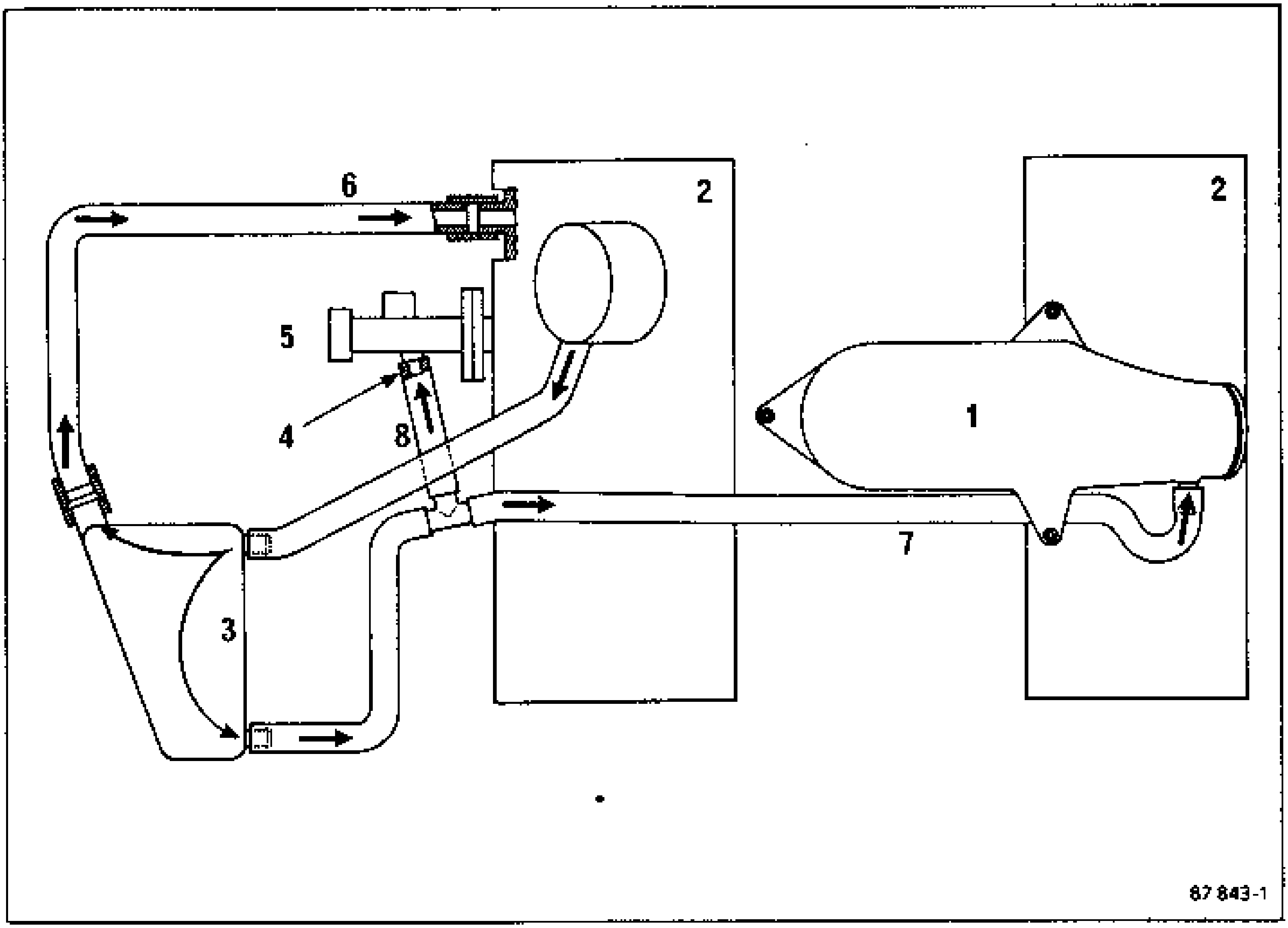
Engine J6R 762/763:

1 - Restriction Ø 5.5 mm
2 - Restriction Ø 1.7 mm
3 - Restrictions Ø 1.7 mm for special Saudi Arabian type.

Vehicles B29A and B29B

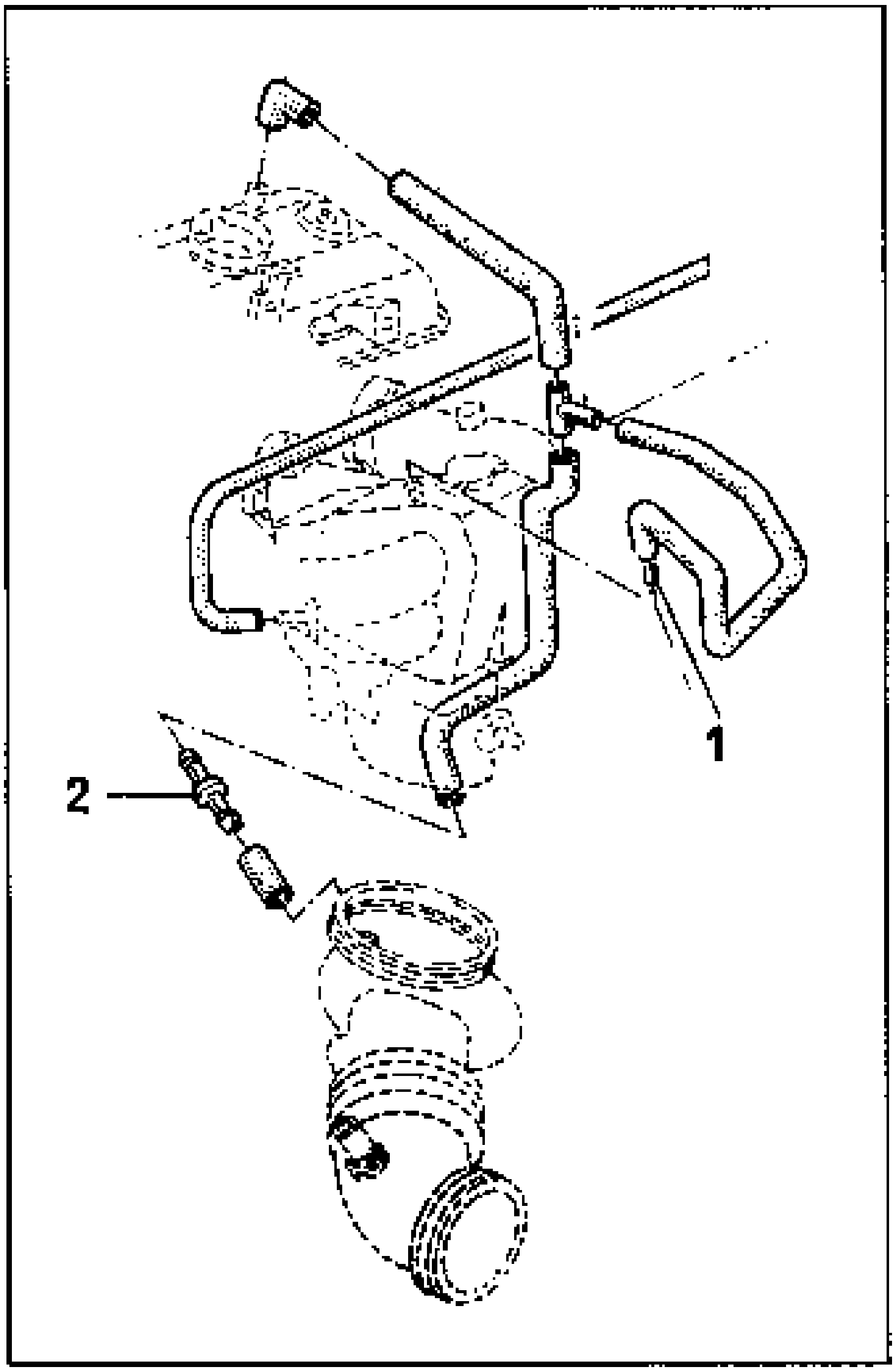
The rebreathing circuit has been modified as shown in the diagram below.

The crankcase gases are recirculated from the rocker cover to the inlet distributor by a dual circuit (output and input) and burned in the combustion chamber.



1 - Air intake trunking
2 - Rocker cover
3 - Decanter
4 - Jet Ø 2.20 mm
5 - Cold start injector
6 - Sump return pipe
7 - Pipe to air intake trunking (output circuit)
8 - Pipe to manifold (input circuit: manifold vacuum)

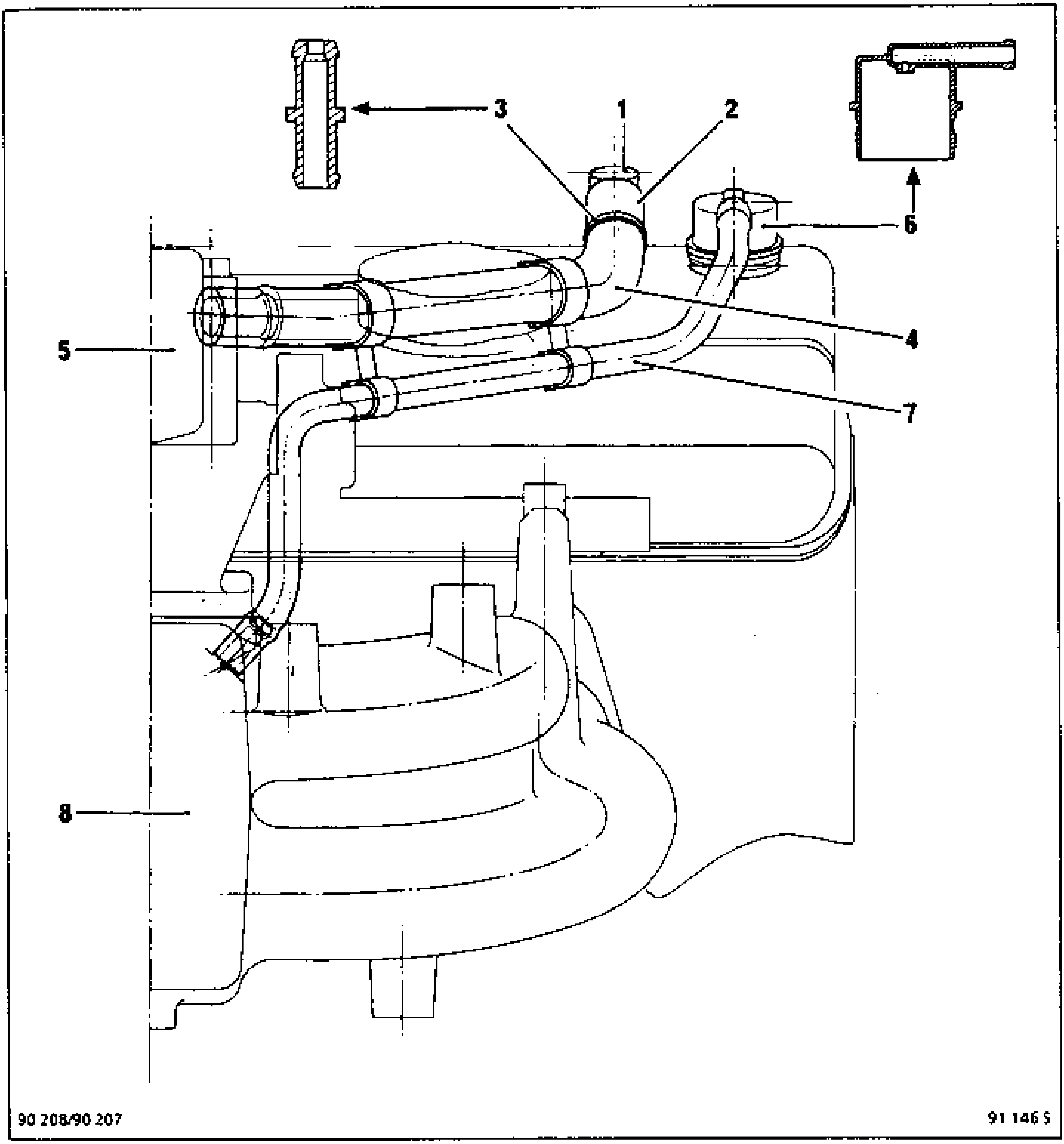
Vehicles B29B (Engine J7T 708) and **B29E** (Engine J7T 714/715)



1 - Restriction Ø 2 mm
2 - Restriction Ø 6.5 mm

Vehicles B29E (Engine J7T 730/731) **B29B** (Engine J7T 732/733) **and B29H** (Engine J7R 722/723)

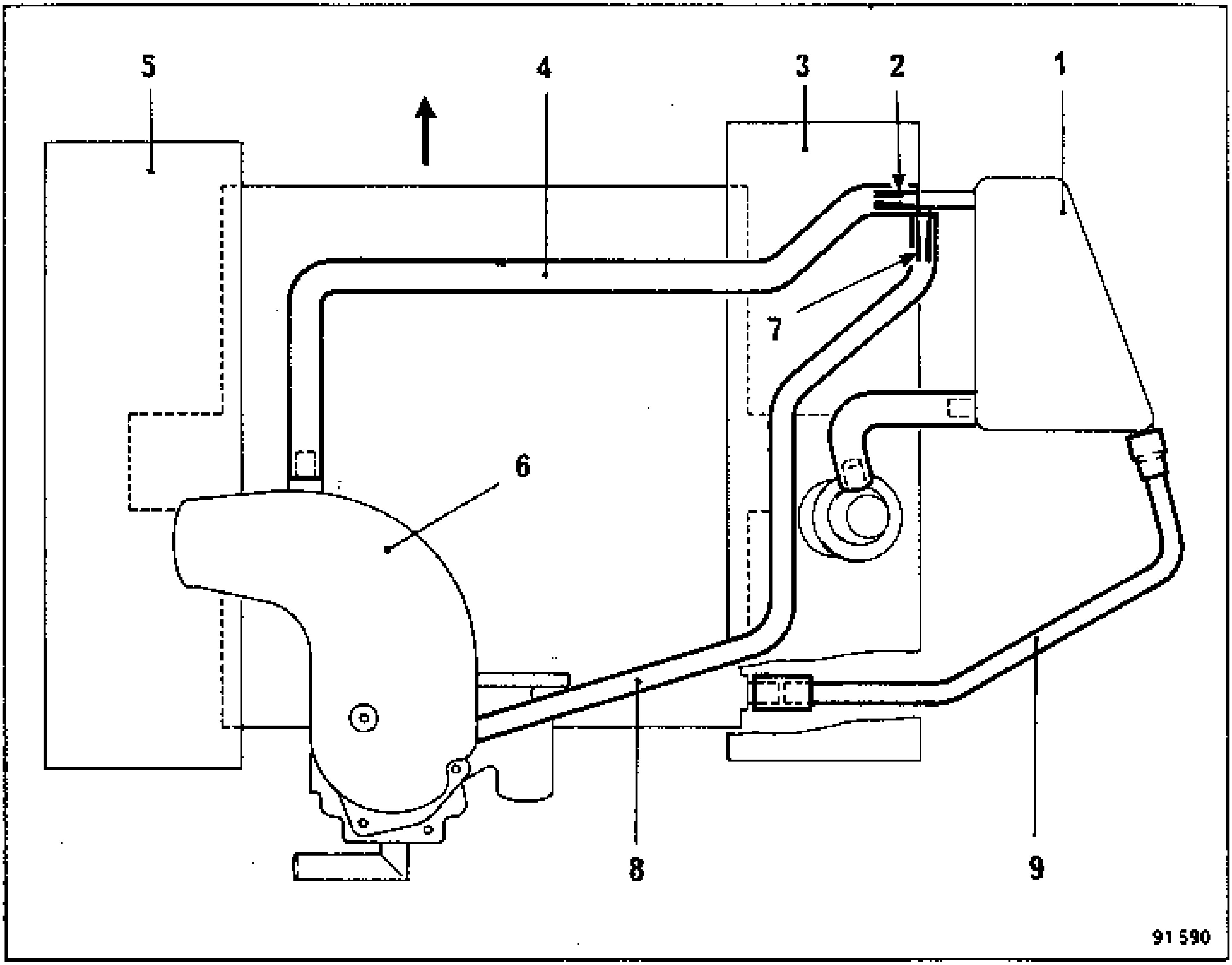
The crankcase gases are recirculated from the rocker cover to the inlet distributor by two circuits (input and output) and burned in the combustion chambers.



1 - 2-way union
2 - Restriction - 2-way union connecting pipe
3 - Restriction: Ø 6 mm - yellow
4 - Restriction - cap connecting pipe
5 - Air intake trunking
6 - 2-way union, internal restriction: Ø 2.2 mm
7 - 2-way union with restriction - manifold connecting pipe
8 - Manifold

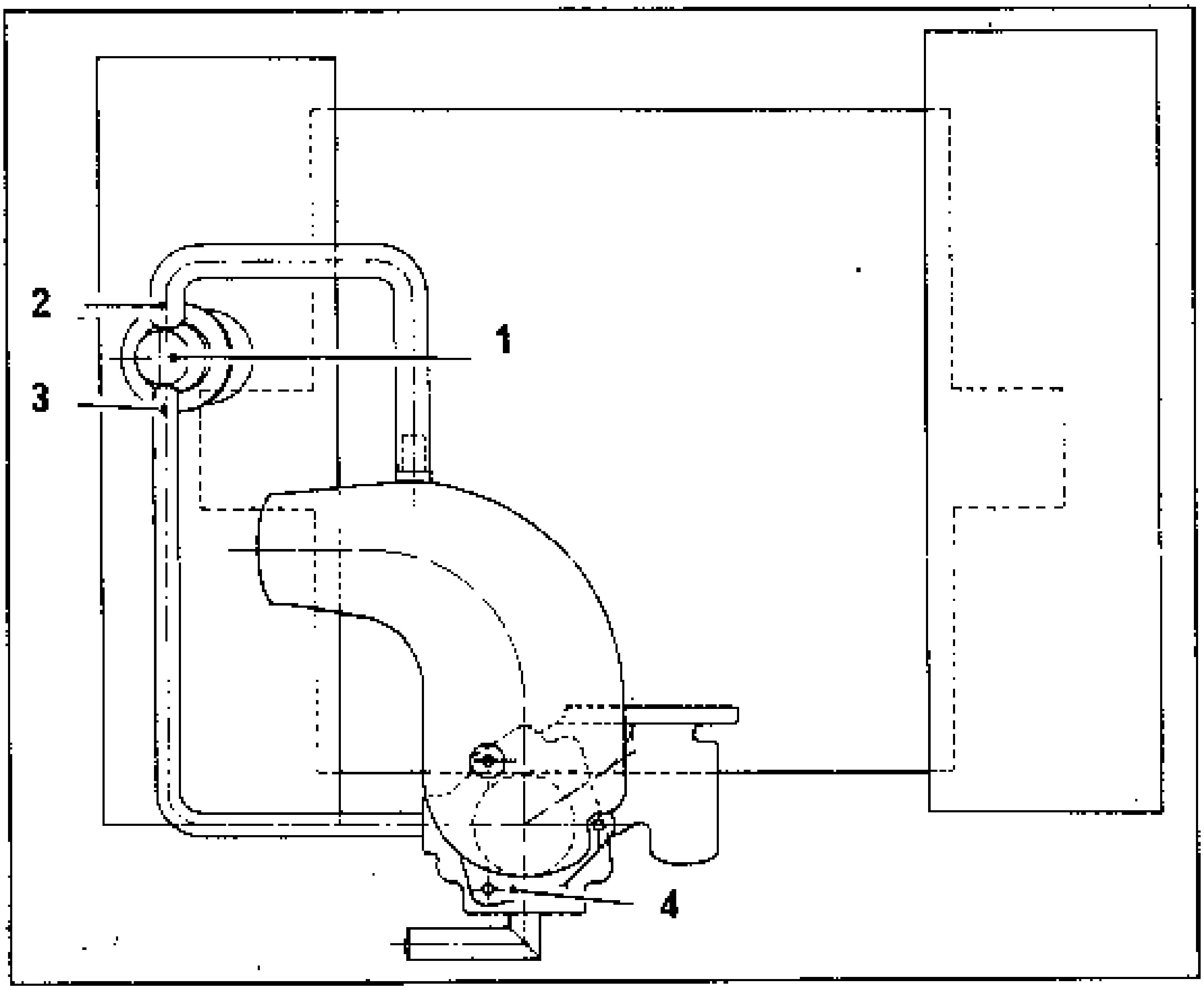
Vehicles B293 and B29F
(1st type: with drain unit)

The crankcase gases are recirculated from the right-hand rocker cover (driver's side) to the inlet manifold by a dual circuit (input and output) and burned in the combustion chambers.



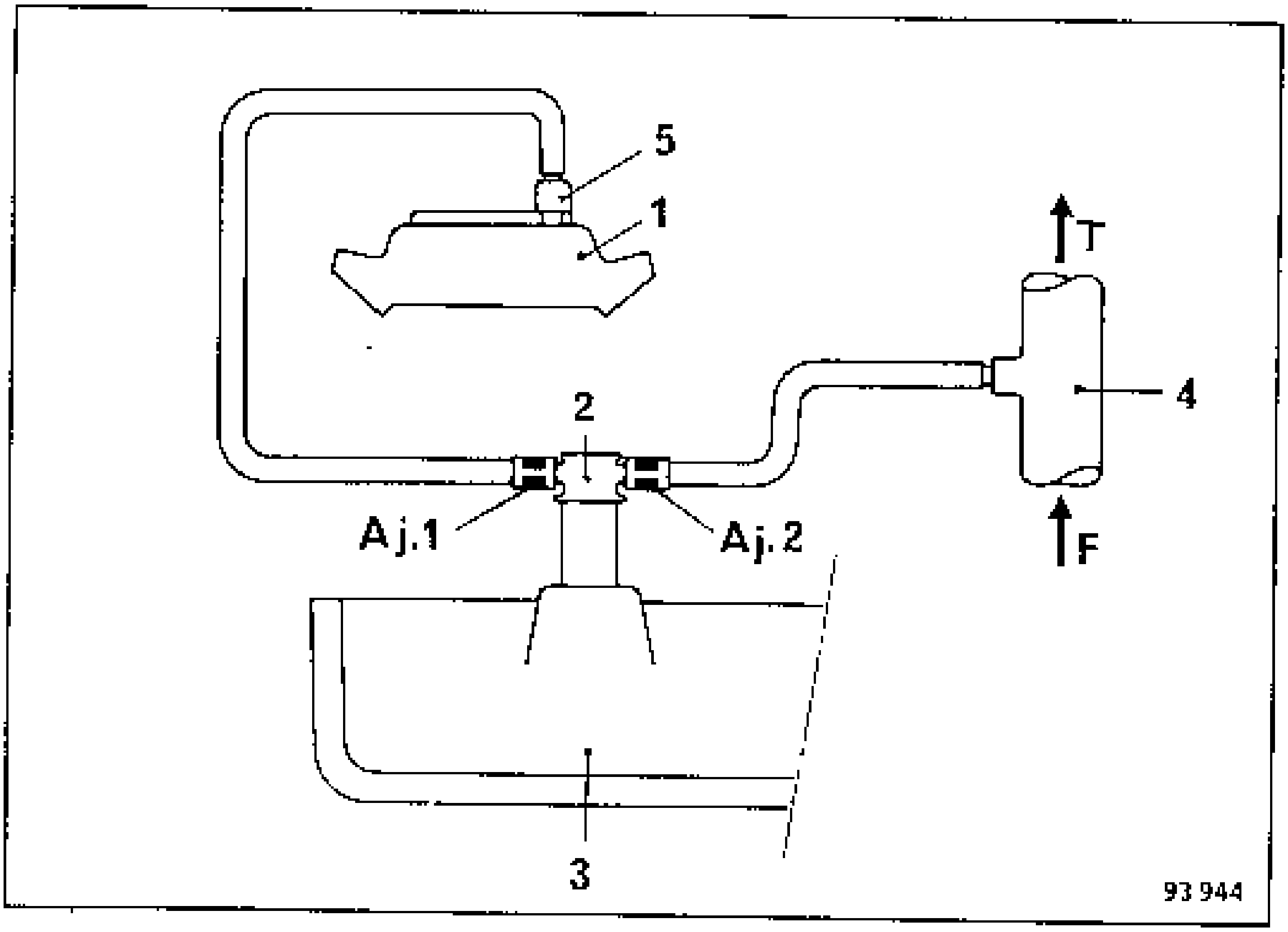
1 - Decanter
2 - Restriction Ø 7 mm
3 - right-hand rocker cover
4 - Pipe to air intake trunking (input circuit)
5 - Left-hand rocker arm cover
6 - Air intake trunking
7 - Restriction Ø 2 mm
8 - Pipe to inlet manifold (output circuit: manifold vacuum)
9 - Sump return pipe
▮ Front of vehicle

Vehicles B293 and B29F (2nd type)



1 - Engine oil filler cap
2 - Restriction Ø 7 mm
3 - Restriction Ø 2 mm
4 - Throttle module

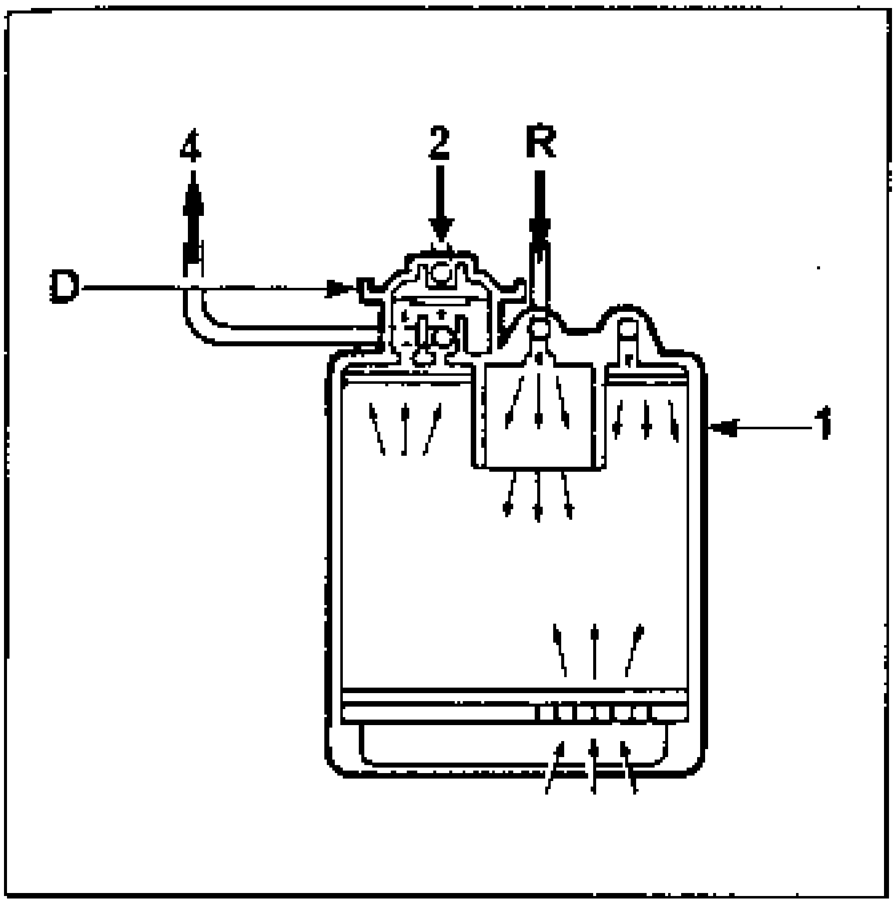
Vehicles B29G



1 - Inlet manifold
2 - Filler cap
3 - Rocker cover
4 - Connecting pipe
5 - Check valve
T - To turbocharger
F - Air filter
Aj1 - Restriction Ø 2 mm
Aj2 - Restriction Ø 6.5 mm

Principle of petrol vapour rebreathing by canister

- The circuit consists of a petrol vapour absorber (1) or canister, linked to the fuel tank by a pipe (R).



- The petrol vapour absorber contains active carbon. It includes a valve (D) linked to the throttle housing by tube (2) on the input side of the butterfly.

  The petrol vapour absorber is bled by the tube (4) connected to the manifold.

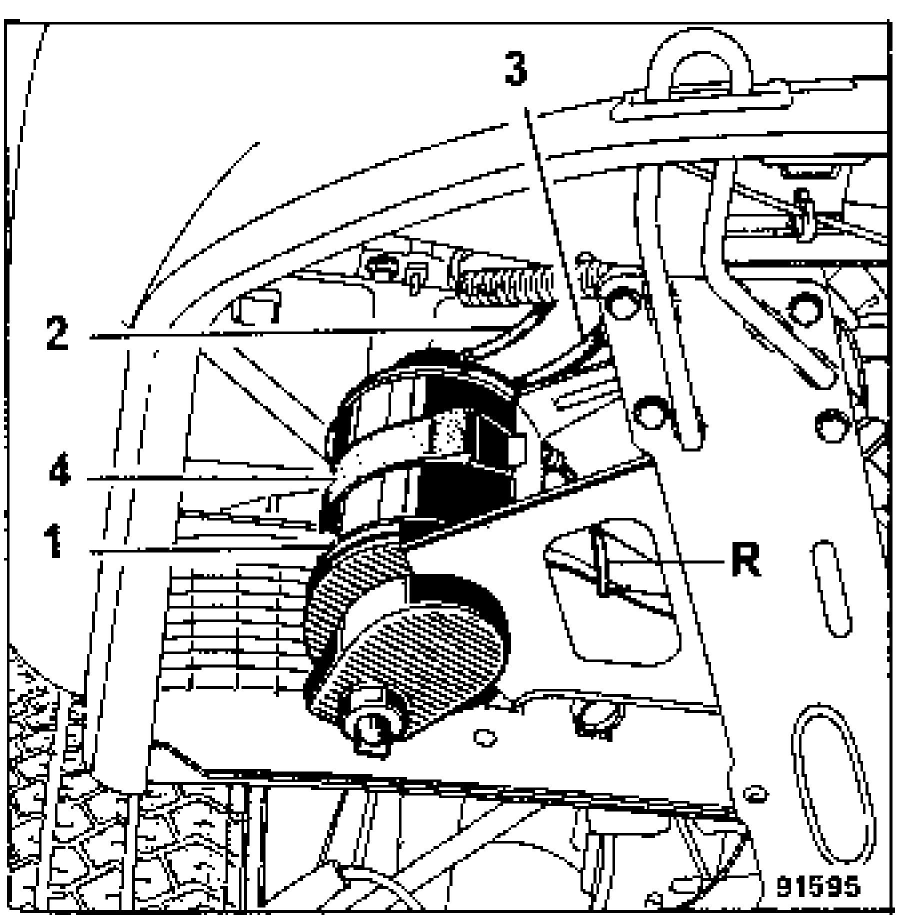
OPERATION

- With the engine stopped:
  The petrol tank vapours are stored in the petrol vapour absorber (canister) (1).

- With the engine running:
  When the air volume becomes high, the vacuum in the throttle housing above the butterfly raises the valve (D) via the pipe (2). The petrol vapour absorber is therefore bled via the tube (4) in the manifold.

Note: Canister location

In general, the petrol vapour absorber (canister) is fitted in the vehicle's front right-hand wheel arch. It is secured to its support bracket by a clip.

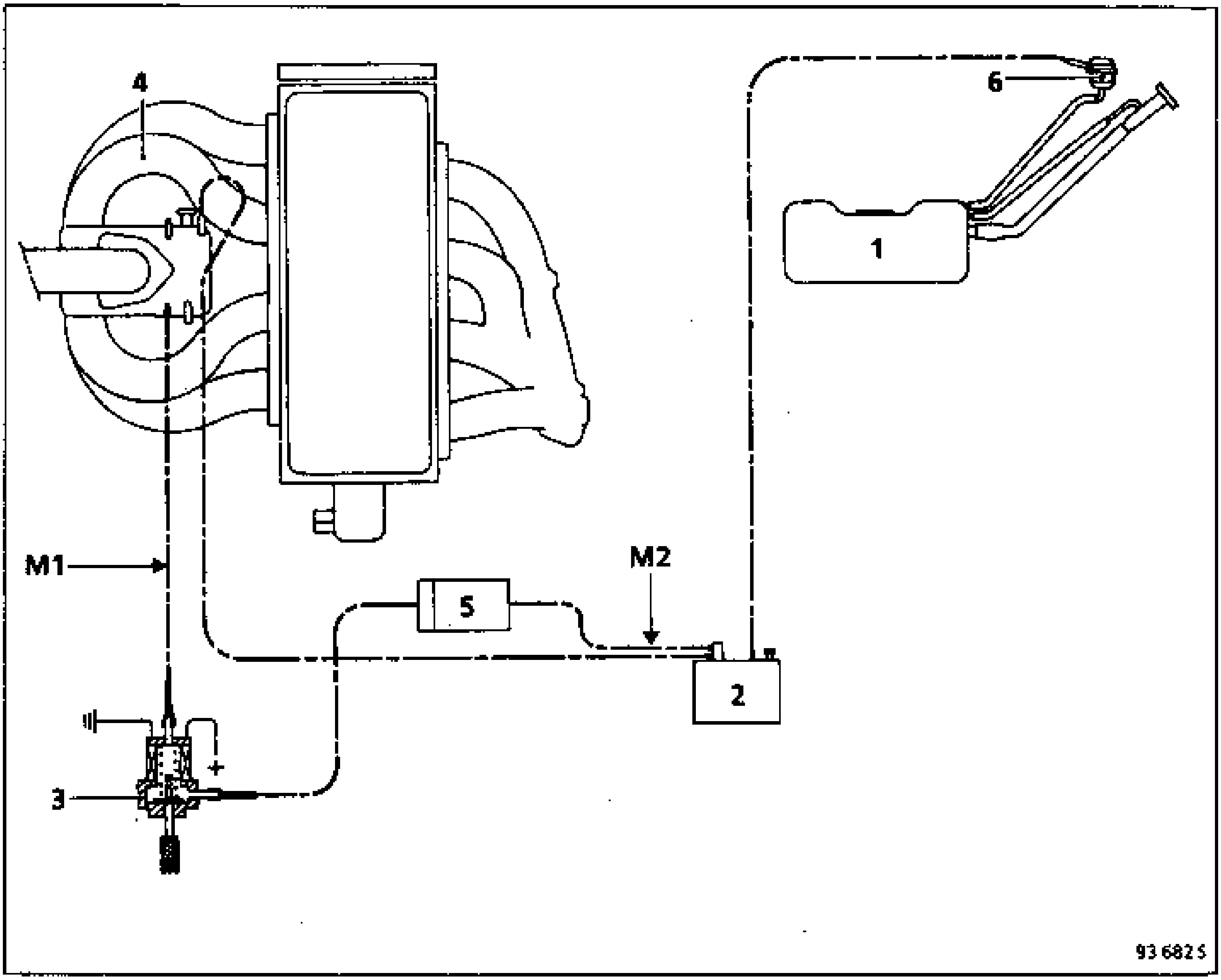


1 - Petrol vapour absorber
2 - Bleed tube to throttle housing
3 - Bleed tube to intermediate manifold
4 - Securing clip
R - Tube to petrol tank

(see **B29G** special features)

Note: The air vent must be directed towards the back of the vehicle.

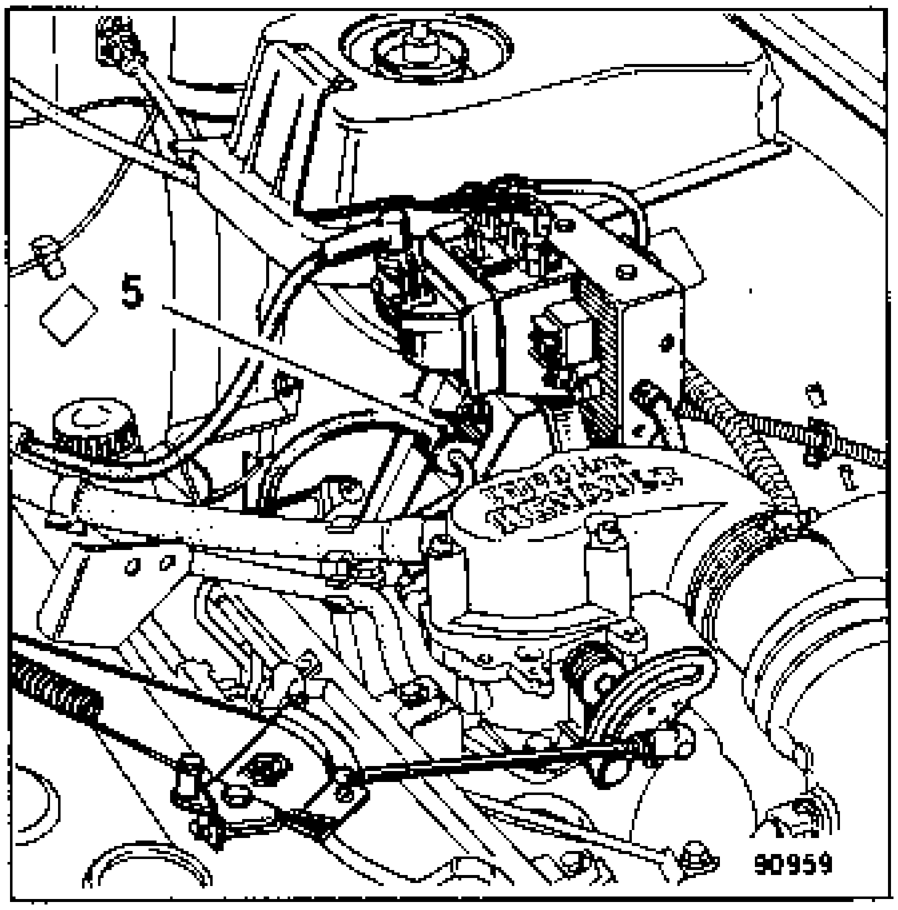
Assembly diagram of circuit fitted to B29B with engines J7T 732/733



1 - Petrol tank
2 - Petrol vapour absorber (canister)
3 - Solenoid valve controlling canister bleeding
4 - Inlet manifold
5 - Delay valve with green colour identification on solenoid valve side
6 - Non-return valve enabling evacuation of petrol vapour to canister (air vent from fuel tank through canister)

M1 - M2 - Vacuum pressure gauges 0 - 1000 mbar

Location of components on B29B

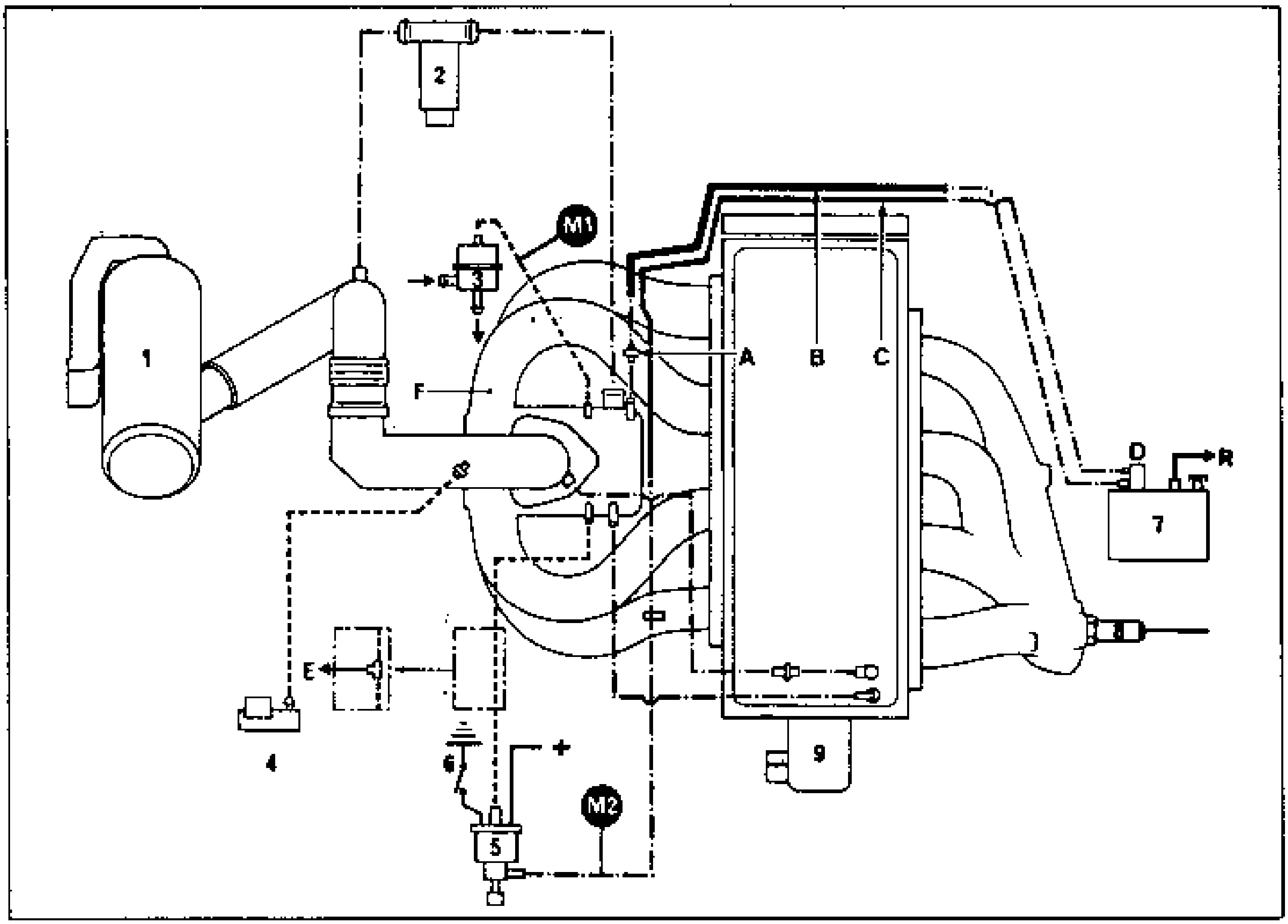


- the bleed solenoid valve (5) in the anti-evaporation circuit is located on the left-hand inner wheel arch, below the ignition power module. (It is possible to fit the solenoid valve to the shock absorber turret on the left-hand side of the MPA.)

- The delay valve is located behind the front right-hand headlight.

- The non-return valve is housed in the rear right-hand wheel arch, level with the shock absorber top.

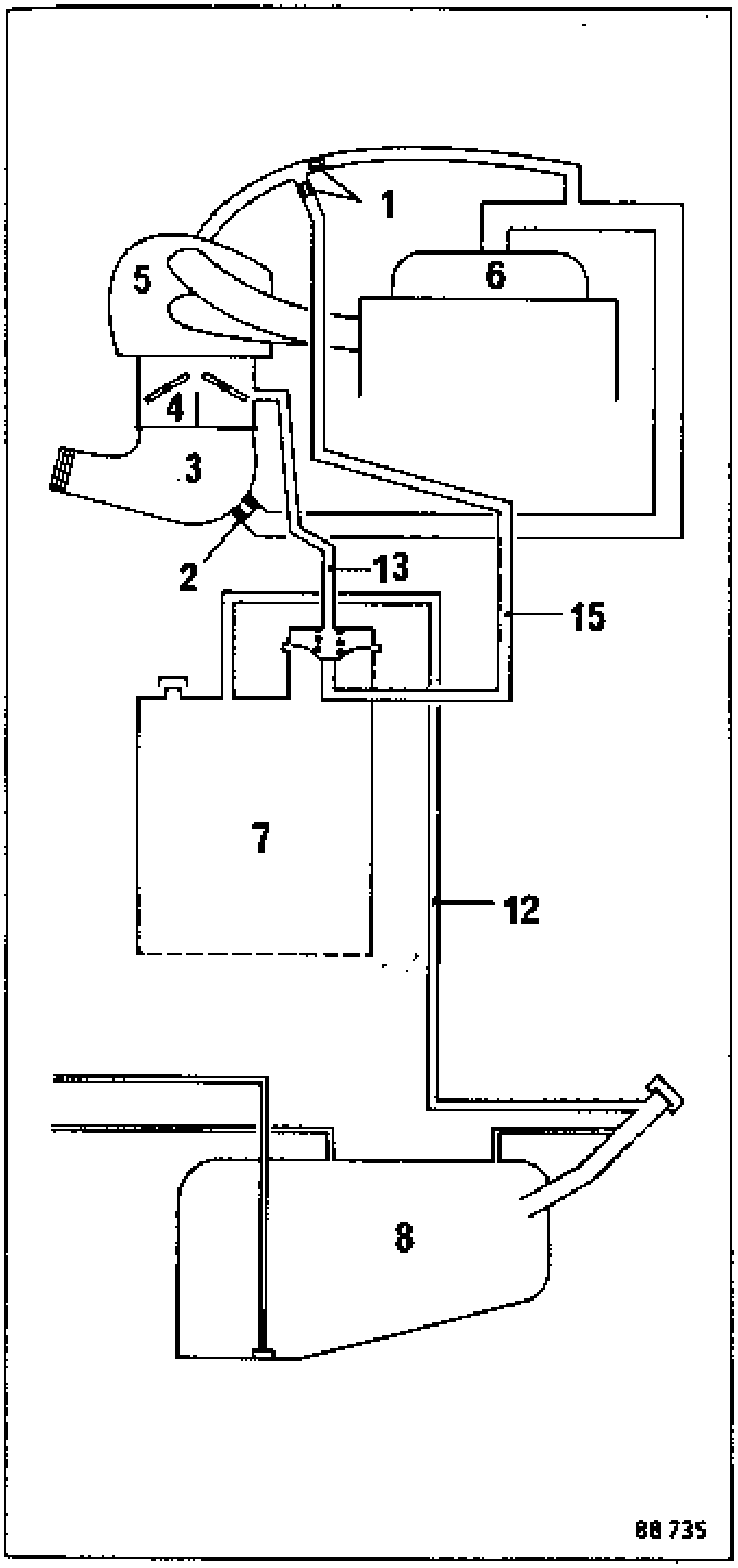
Special case:
Assembly diagram for B29B Australia



1 - Air filter
2 - Idling speed regulation valve
3 - Petrol pressure regulator
4 - Pressure sensor
5 - Petrol vapour canister bleed control solenoid valve
6 - Electronic computer
7 - Petrol vapour canister
8 - Oxygen sensor or Lambda sensor

A - Restriction Ø 1.8 mm: white
B - Petrol vapour canister bleed pipe (manifold-canister)
C - Petrol vapour canister bleed control pipe (canister-solenoid valve)
D - Petrol vapour canister valve
E - To automatic transmission
F - To fuel tank

Assembly diagram of circuit fitted to B29E with engine J7T 714/715



1 - Restrictions Ø 2 mm

2 - Restrictions Ø 6.5 mm

3 - Air intake trunking

4 - Throttle housing

5 - Inlet manifold

6 - Rocker cover

7 - Canister

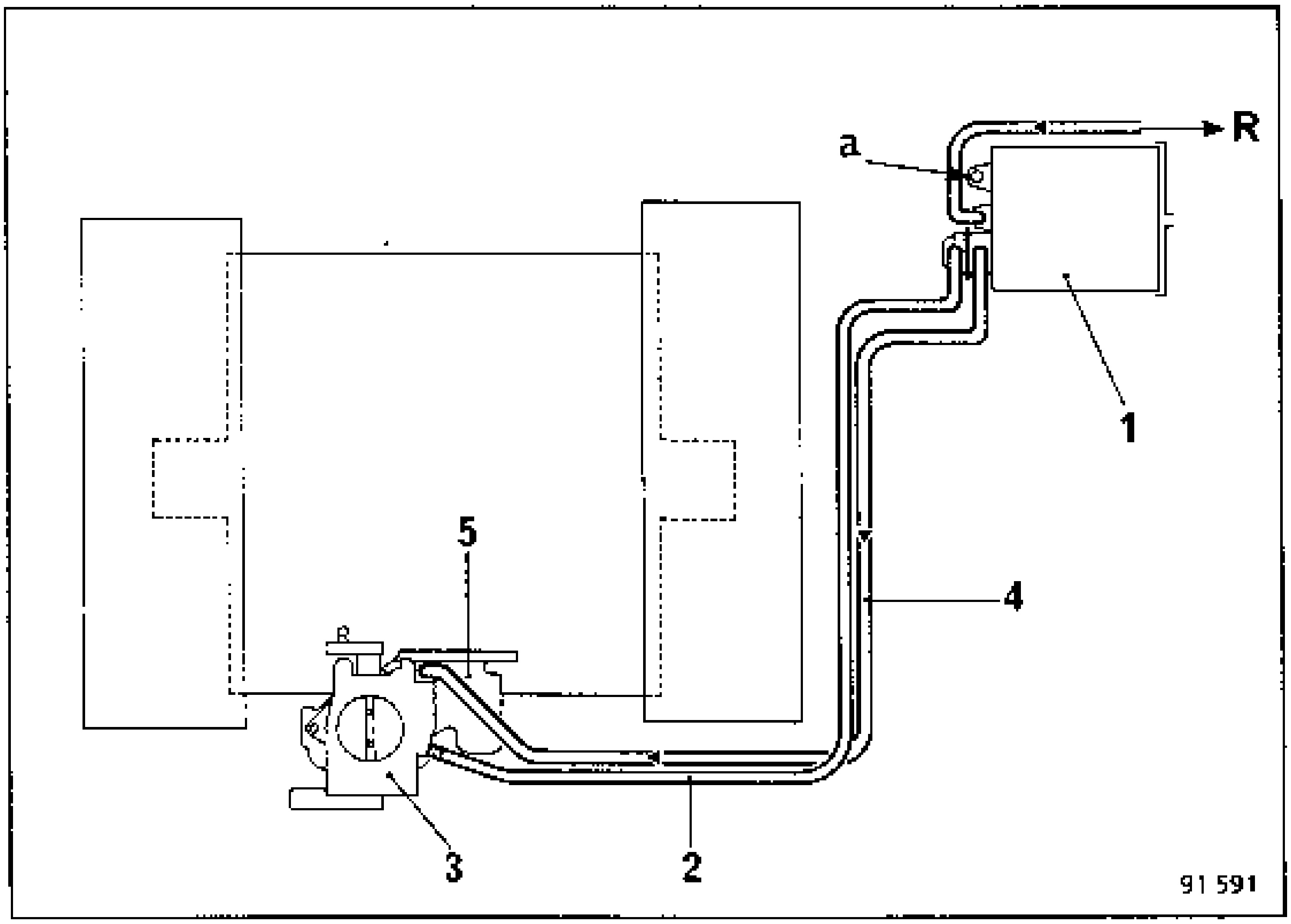
8 - Fuel tank

12 - Petrol vapour rebreathing pipe from fuel tank

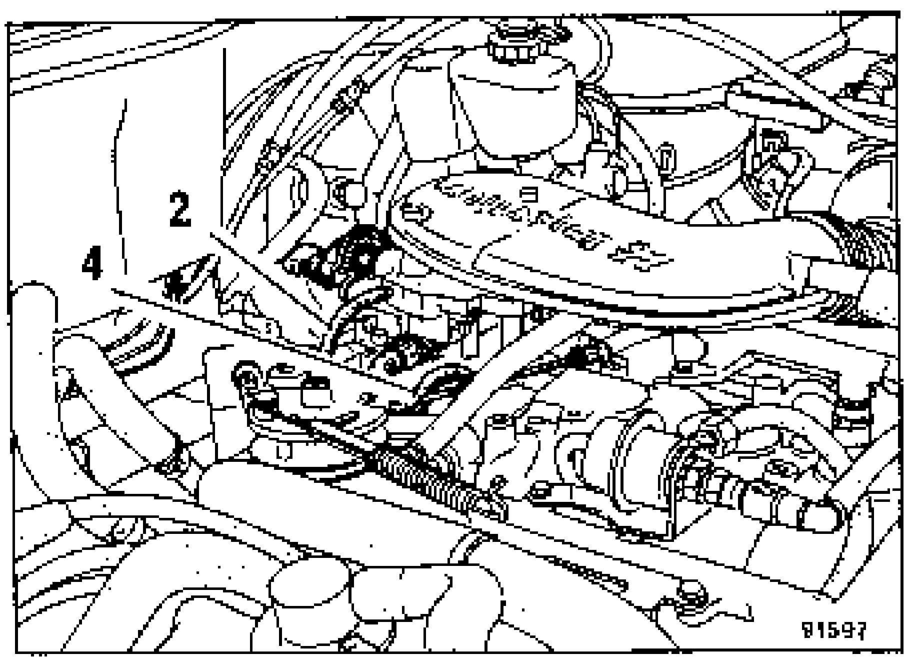
13 - Canister bleed control pipe

15 - Petrol vapour inlet recycling pipe

Assembly diagram of circuit fitted to B29F



1 - Canister
2 - Canister bleed control pipe (input side of throttle)
3 - Throttle housing
4 - Petrol vapour recycling pipe (output side of throttle)
5 - Intermediate manifold
R - Vapours from petrol tank



2 - Bleed pipe on throttle housing
4 - Bleed pipe on intermediate manifold

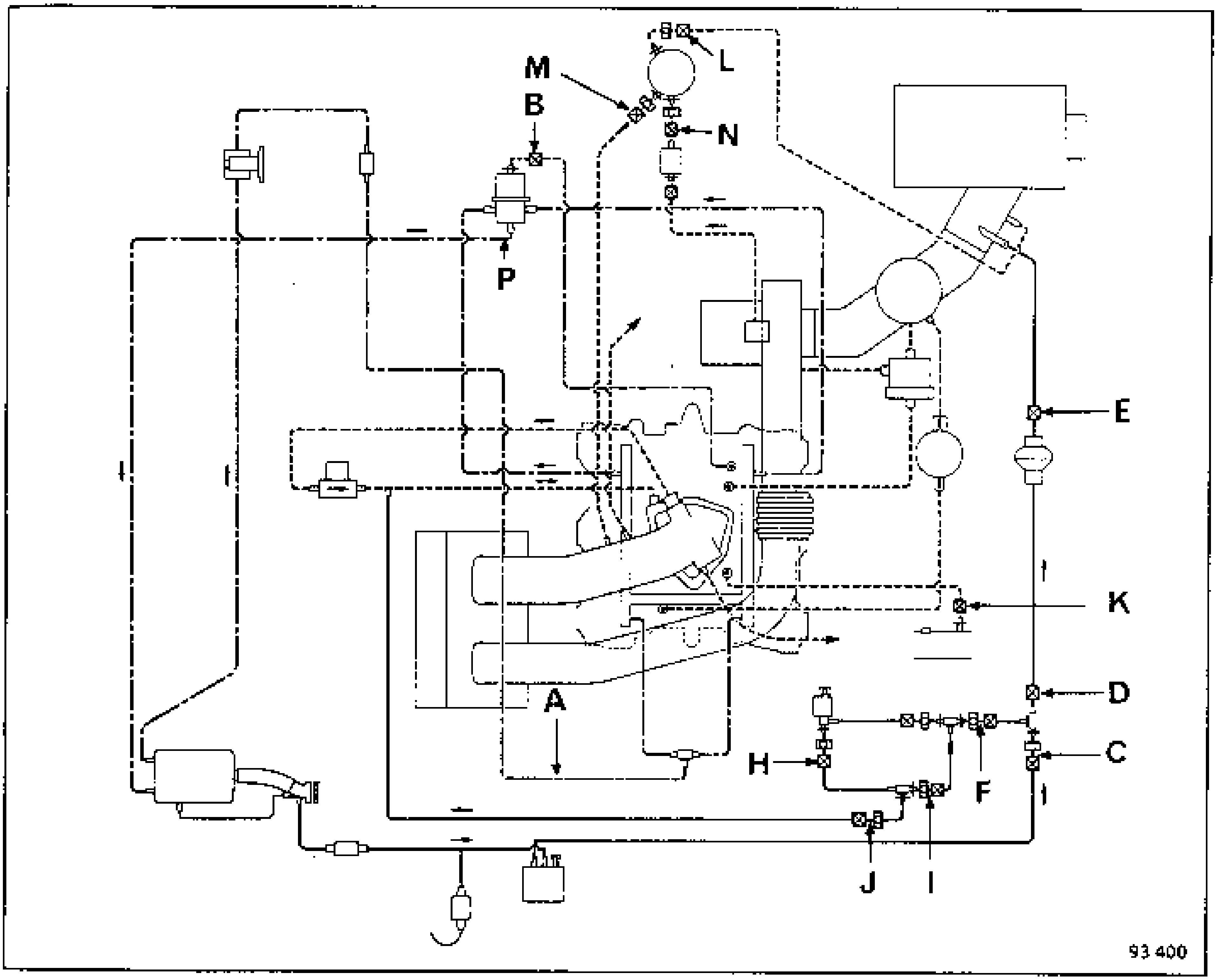
Checking the anti-evaporation system:

With the engine hot and at idling speed:

- Disconnect the canister bleed pipe from the throttle housing **(at 2)**;
- In its place, connect a manual vacuum pump;
- Apply a vacuum of **500 mbar** (minimum);
- Read off the speed using the **XR 25 - D.03** and **#06**.

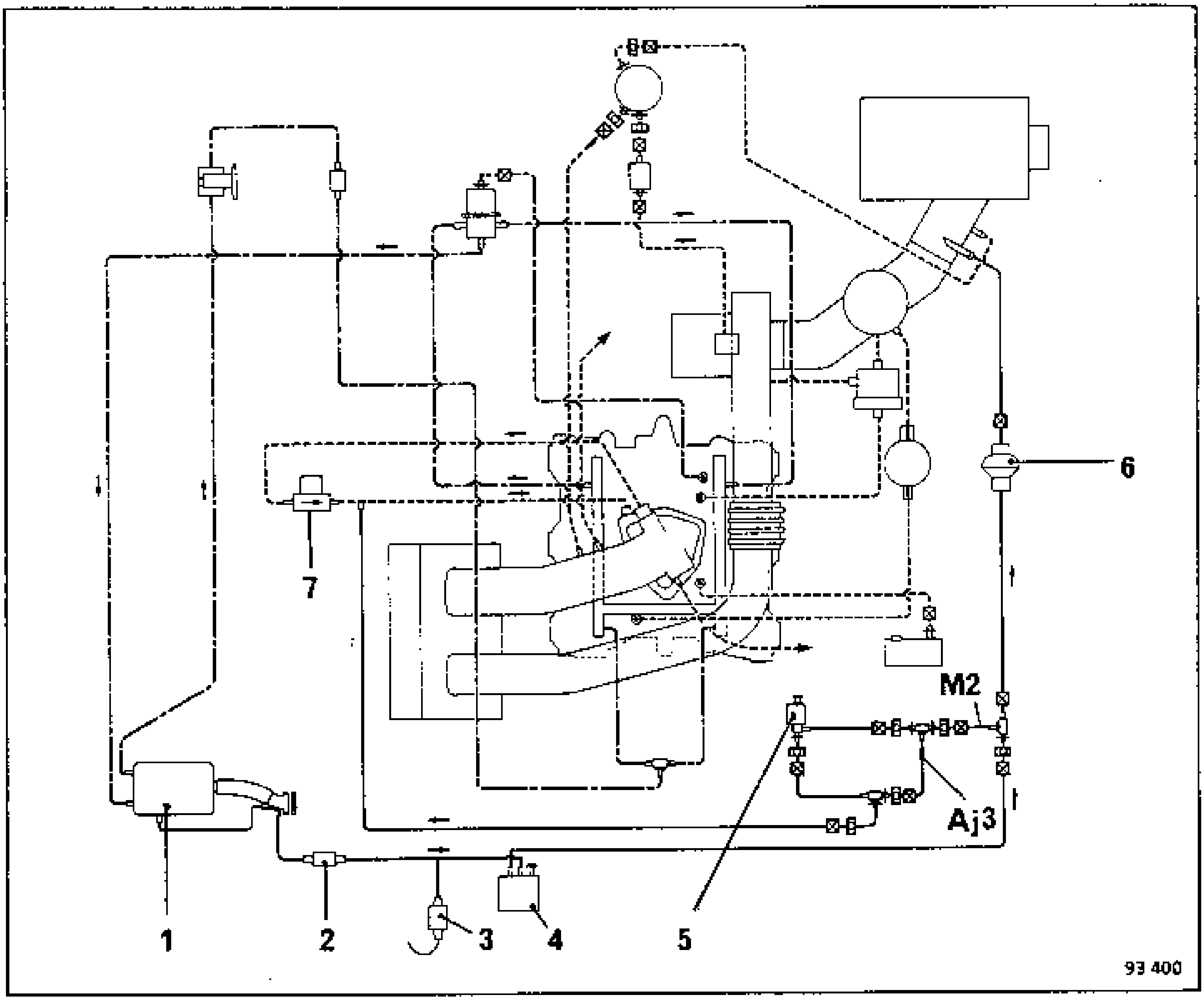
⇒ You should notice a change in the engine speed (engine speed increases) and a change in the RCO (RCO decreases).

Identification of circuit components on B29G



		Colour-coding	Mark	Function
Fuel Circuit	A	Yellow	Yellow	—
	B	Red	Red	—
	P	—	Green	—
Petrol Vapour Rebreathing Circuit	C	Orange	Orange	Yellow
	D	—	—	Yellow
	E	—	—	Yellow
	F	Brown	Brown	Yellow
	G	Green	Green	Yellow
	H	Grey	Grey	Yellow
	I	Blue	Blue	Yellow
	J	Purple	Purple	Yellow
Pressure sensor	K	Orange	—	Orange
Turbocharging pressure control	L	—	—	Blue
	M	Blue	Red	Blue
	N	—	Orange	Blue
Safety pressure switch		Yellow	Yellow	—
Bypass valve		Green	Green	Blue

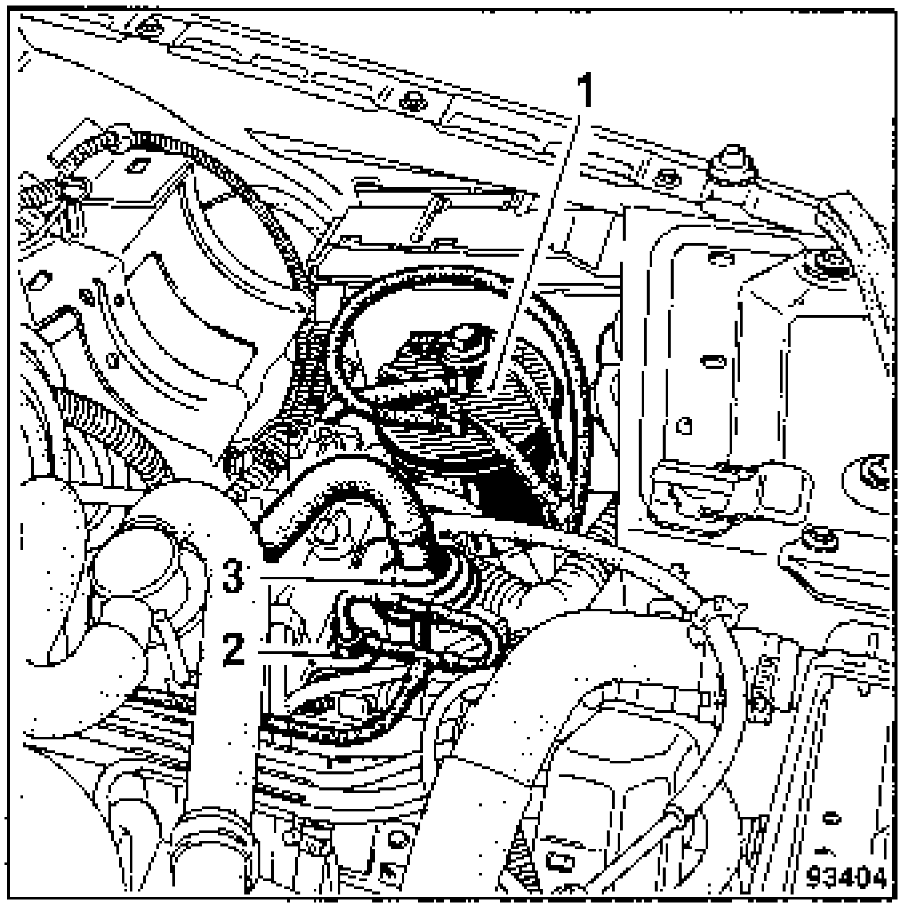
Assembly diagram



1 - Fuel tank
2 - Non-return valve
3 - Vacuum valve
4 - Canister
5 - Canister bleed control solenoid valve
6 - "Pierburg" non-return valve
7 - Idling speed regulation valve

Aj3 - Restriction Ø 0.5 mm
M2 - Pressure gauge assembly (0 - 1000 mbar) to check the circuit.

Solenoid valve - canister - non-return valve operation



1 - Canister
2 - Petrol vapour recycling control solenoid valve
3 - Non-return valve (Pierburg)

NOTE:
To gain access to the canister or to the solenoid valve, the air filter assembly must be removed.

This vehicle's petrol vapour recycling can be summarised in three sections:

1) - Constant but minimal bleeding of the canister through the restriction Ø 0.5 mm.

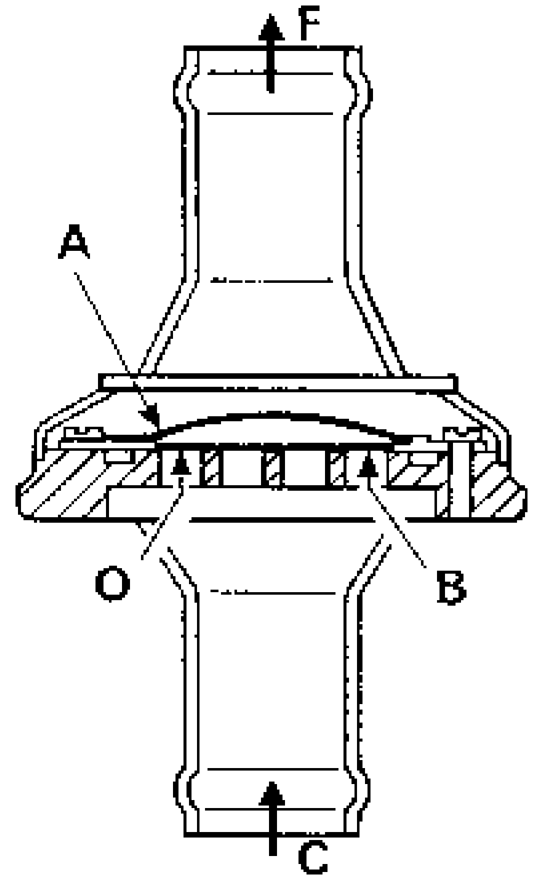
2) - Direct bleeding from the canister via the solenoid valve. This solenoid valve is controlled under certain conditions, i.e.:

- engine speed higher than 1200 rpm;
- coolant temperature above 60 °C
- manifold pressure stable and below 900 mbar.

3) - Bleeding in turbocharging phase via the non-return valve. (The solenoid valve is no longer controlled.)

Pierburg non-return valve

Valve principle



93 790

A - Stop restricting diaphragm travel

B - Flexible steel diaphragm (in rest position)

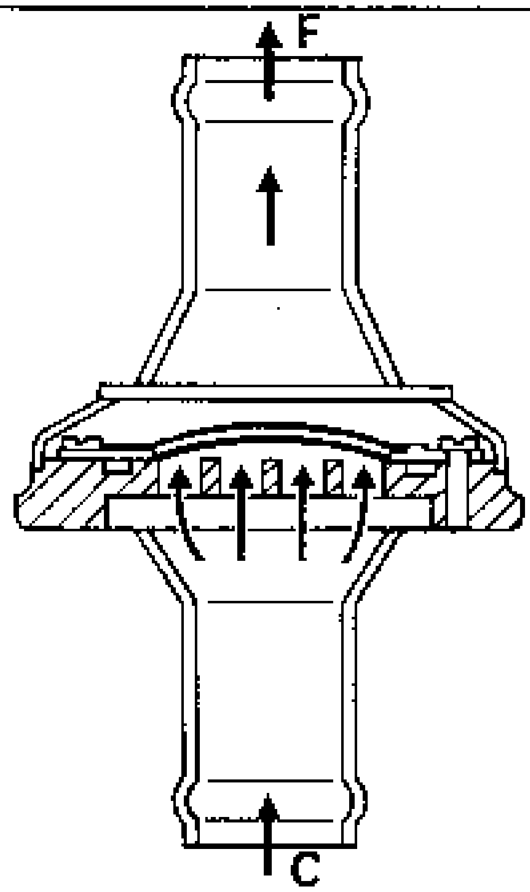
O - Air passage opening

C - Air + petrol vapour from canister

F - Petrol vapour recycling towards air filter output side

Principle of operation and use of valve

When adequate vacuum is applied to side (F), the diaphragm (B) is raised and rests against the stop (A), thereby opening the 4 air passages (O).



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Petrol vapour rebreathing can be broken down into two phases:

1 - Direct canister bleeding by the solenoid valve, controlled by the computer under well-defined conditions of operation.

2 - Canister bleeding during the turbocharging phases.

Phases during which the manifold pressure makes petrol vapour rebreathing impossible.

In this case, the recycling of petrol vapours is authorised via the non-return valve.

The vacuum created by the compressor during the turbocharging phase enables the Pulsair valve to open and the rebreathing of petrol vapours from the canister.

FAULT-FINDING: BLEEDING THE PETROL VAPOUR REBREATHING CIRCUIT

Use

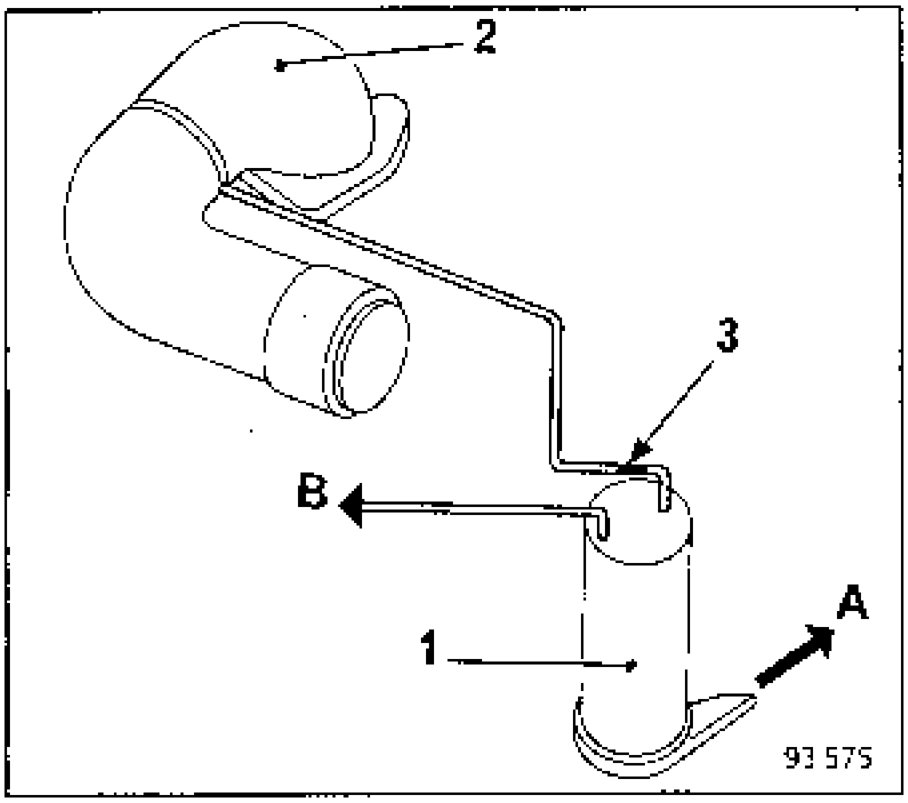
- of a pressure gauge 0 - 1000 mbar connect at M_2 (see assembly diagram)
- of a voltmeter connected to the solenoid valve terminals.

CONDITIONS	OBSERVATIONS	REMARKS
Engine hot after 1 cooling fan motor operation		
Idling	Reading at M_2 Vacuum very low Value read off ≈ 0 mbar (Voltage = 0 volts on solenoid valve terminals)	If vacuum at M2 is equal to the manifold pressure: Check conformity of restriction Aj3 or check connection of the solenoid valve.
During acceleration (medium acceleration)	Reading at M2 The vacuum changes from 0 to -150 -200 mbar; it stabilises for approximately 2 seconds and falls back to zero. (Voltage = 12 volts at solenoid valve terminals)	If not achieved: Check the pneumatic and electrical connections of the solenoid valve, check the connection of the petrol vapour rebreathing pipe.

Checking the non-return valve

By blowing into the bottom part (e.g. by mouth) an air flow from (C) to (F) will be observed and, by sucking, no air flow from (F) to (C)

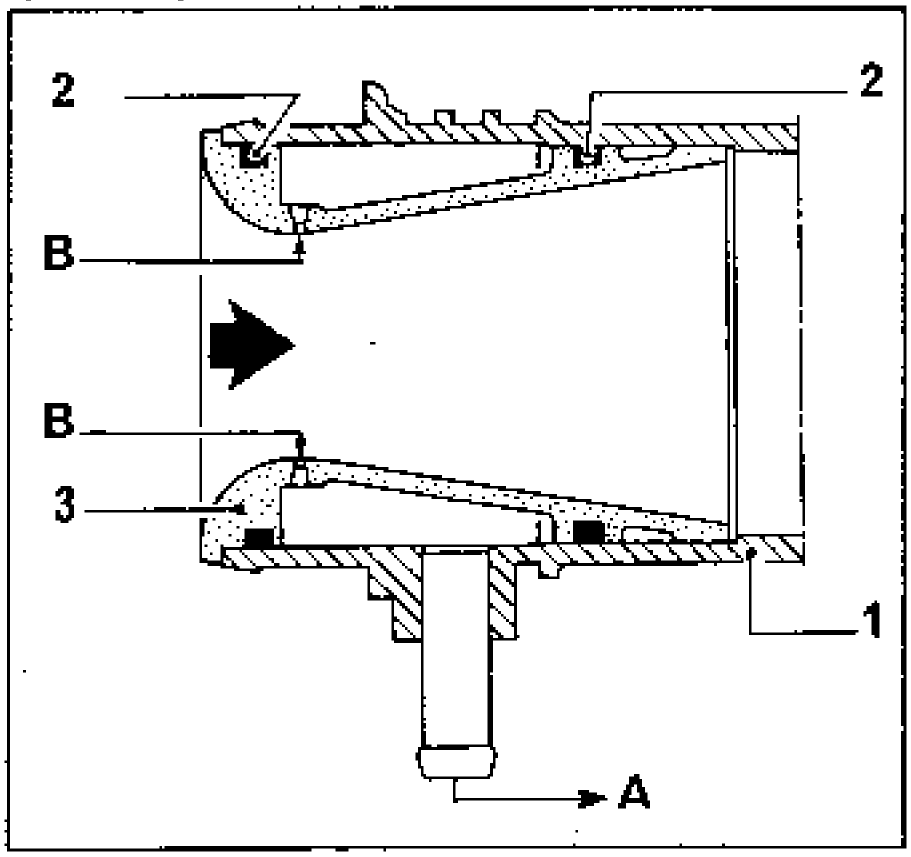
Assembly diagram on B294 (2-way canister)



1 - Canister
2 - Air intake trunking
3 - Restriction Ø 8 mm
A - Air vent
B - To petrol tank

Special features:
Check that the pipes to the canister are correctly fitted and in the correct place.

Detail of venturi tube assembly for recycling petrol vapours.



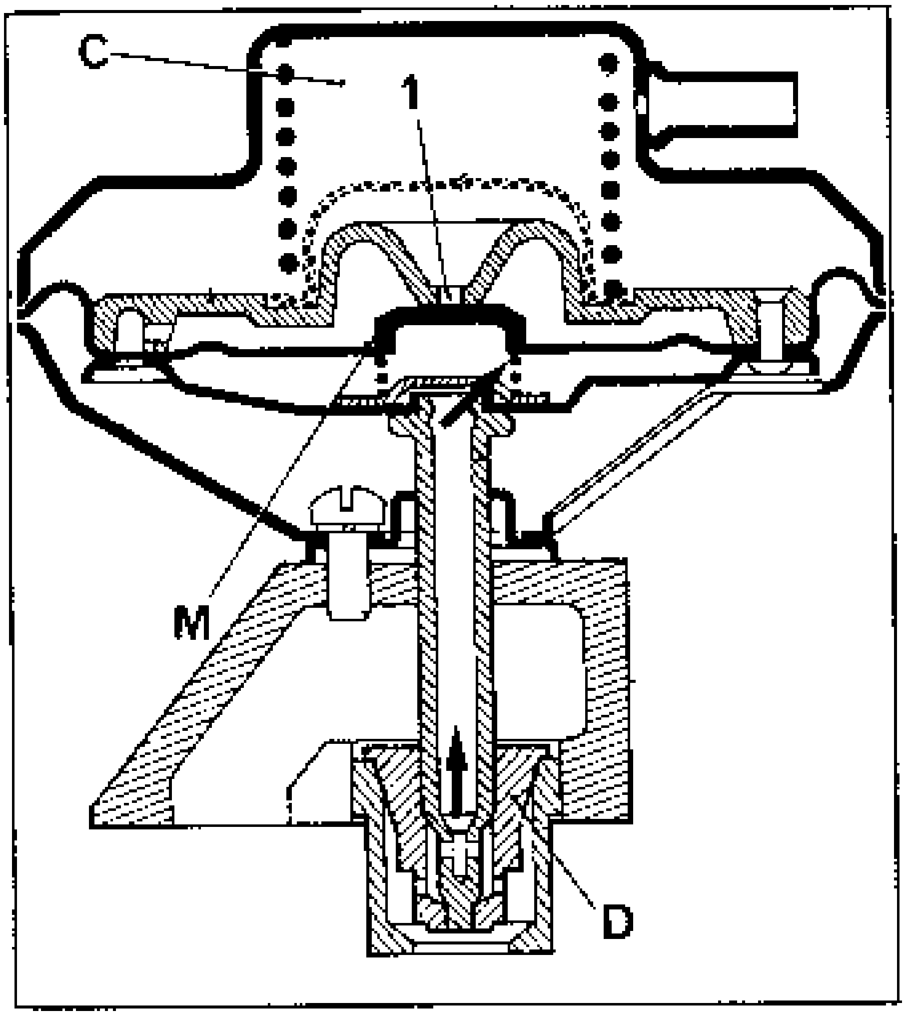
1 - Air intake trunking
2 - O-rings
3 - Venturi tube
A - To canister
B - Ports where the vacuum causes petrol vapour recycling.

Principle of exhaust gas recirculation

In order to reduce the formation of nitrous oxide during combustion, some of the exhaust gases are recirculated to the inlet side; this is intended to reduce the combustion temperature.

The principle is based on controlling a pneumatic valve (called an EGR valve) with the injection computer, via a solenoid valve. The injection computer decides on the correct time to authorise exhaust gas recycling.

Principle of the pneumatic valve (EGR)



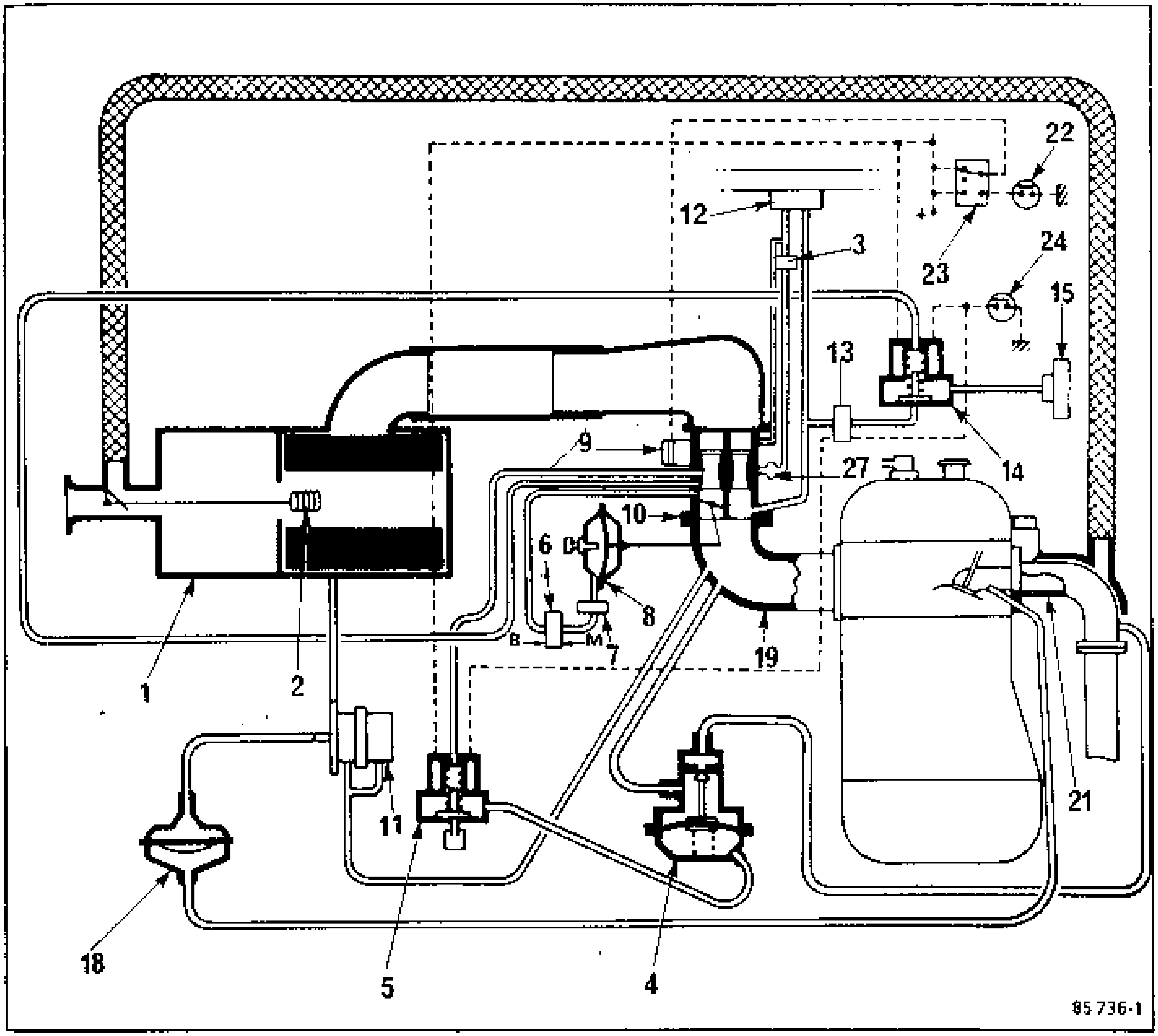
The action of the exhaust gas back pressure in the chamber (M), plus the action of the vacuum in the chamber (C), combine to raise the valve (D), allowing the recycling of exhaust gases to the inlet manifold.

Special features of B297 vehicles for Switzerland (Engine J6R 760)

The anti-pollution system includes the following special features:

- An automatic choke flap controlled by a heater resistor
- A pneumatic enriching device
- A throttle butterfly opening device
- An exhaust gas recirculation device
- An air injection system on the exhaust manifold.

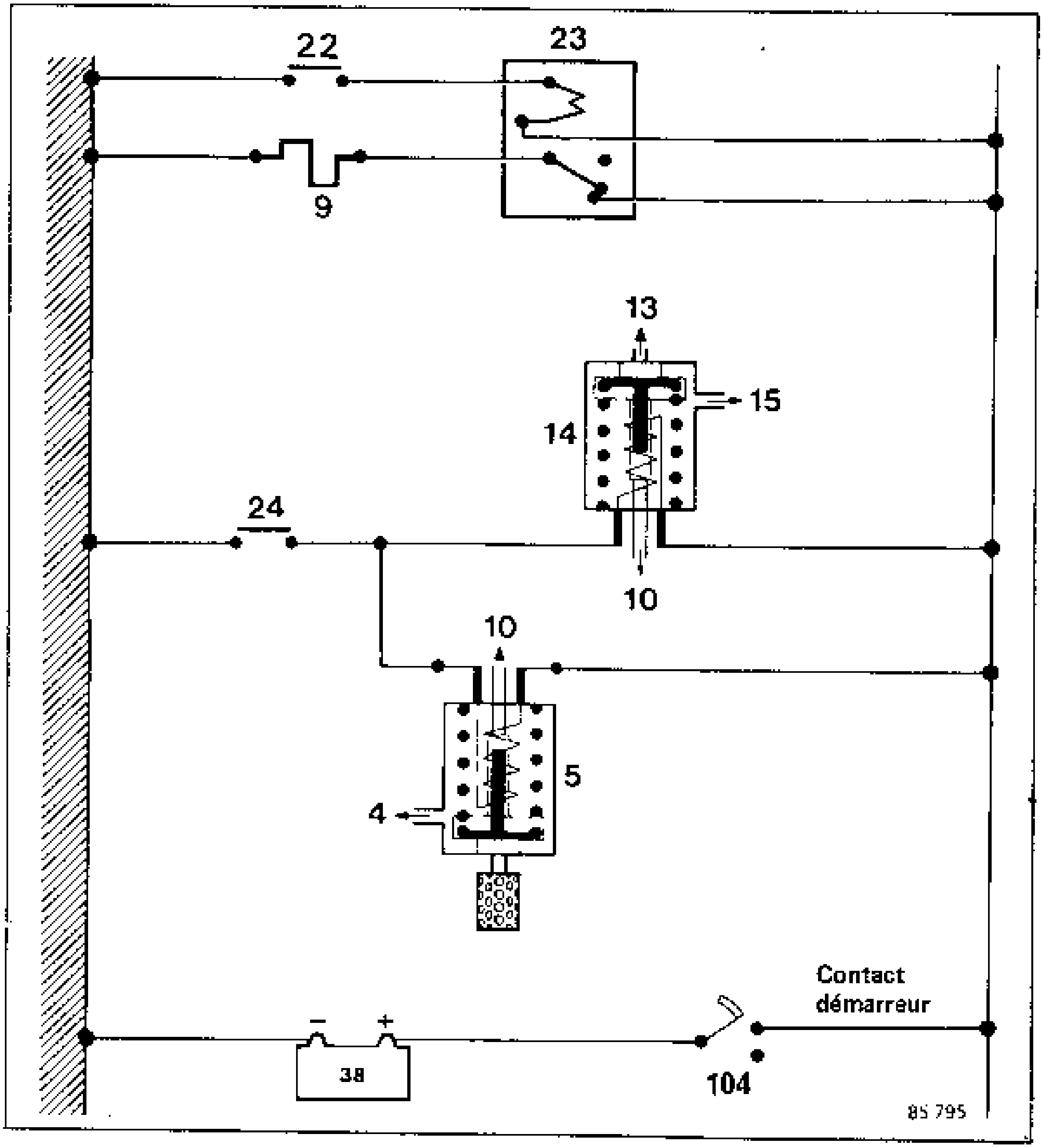
Assembly diagram of anti-pollution system



Vehicle with manual gearbox

1 - Thermostatic air filter
2 - Thermostatic capsule
3 - Grey delay valve
4 - EGR valve
5 - Solenoid valve
6 - Brown/white delay valve
7 - Chamber
8 - Throttle butterfly opening device
9 - Automatic choke
10 - Carburettor
11 - Bypass valve
12 - 15 °C thermovalve
13 - Green delay valve
14 - Solenoid valve
15 - Integral electronic ignition
18 - Air inlet valve
19 - Inlet manifold
20 - Restriction
21 - Exhaust manifold
22 - 15 °C ambient temperature switch
23 - Relay
24 - 60 °C temperature switch
27 - 2nd barrel inhibitor device

Operating wiring diagram



4 - To EGR valve
5 - Solenoid valve
9 - Automatic choke resistor
10 - To carburettor take-off
13 - To delay valve
14 - Solenoid valve
15 - To AEI module
22 - 15 °C temperature switch
23 - Relay
24 - 60 °C temperature switch
38 - Battery
104 - Ignition switch

COLD STARTING

Operation

A heater resistor (9), placed in the choke cover, is controlled by a relay (23), connected to an ambient temperature switch (22) which is closed above 15 °C.

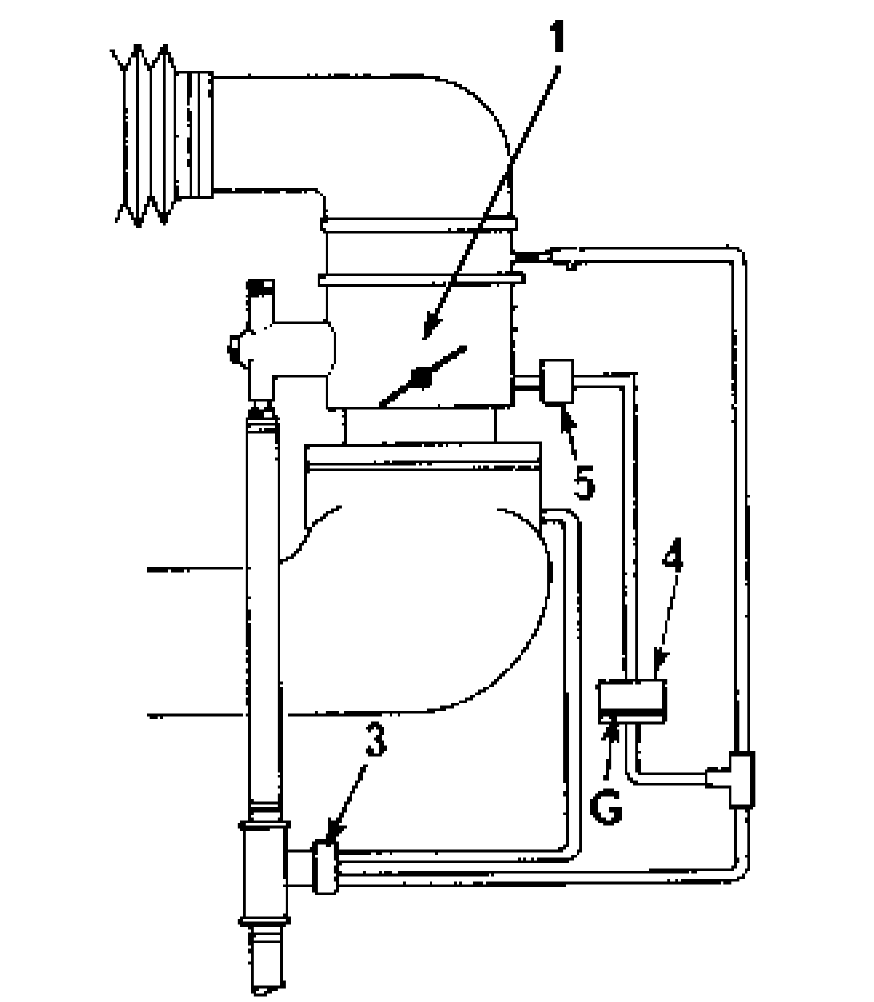
VACUUM SENSOR

Operation

The AEI capsule (15) is controlled by a solenoid valve (14), linked to a coolant temperature switch (24), open at coolant temperatures above 60 °C, linked:

- at carburettor temperatures below 60 °C, under the 1st barrel butterfly by a circuit with a delay valve (13) which maintains the advance;

- at temperatures above 60 °C, the connection is above the butterfly.



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OPERATION OF PNEUMATIC ENRICHER DEVICE

On the choke coolant circuit, a thermovalve (3) is connected to the inlet manifold.

At a coolant temperature below 15 °C, the thermovalve is open, the vacuum affects the 2nd barrel inhibitor (5) which prevents the butterfly from opening.

At a coolant temperature above 15 °C, the thermovalve is closed, cutting off the vacuum circuit. The circuit, the 2nd barrel inhibitor device (5) and the thermovalve are connected to the carburettor cover, which enables the vacuum in the circuit to fall when the thermovalve (3) closes.

A delay valve (4) (grey, thermovalve side) maintains the vacuum for a few seconds after the thermovalve (3) has closed.

OPERATION OF EGR SYSTEM

The EGR valve (4) is opened by the vacuum at the carburettor 1st barrel jet.

Up to a coolant temperature of 60 °C, the solenoid valve (5) controlled by the temperature switch (24) cuts off the vacuum information to the EGR valve.

The exhaust gases are therefore not recirculated.

Above 60 °C, the solenoid valve (5) controlled by the temperature switch (24) opens the vacuum circuit to the EGR valve.

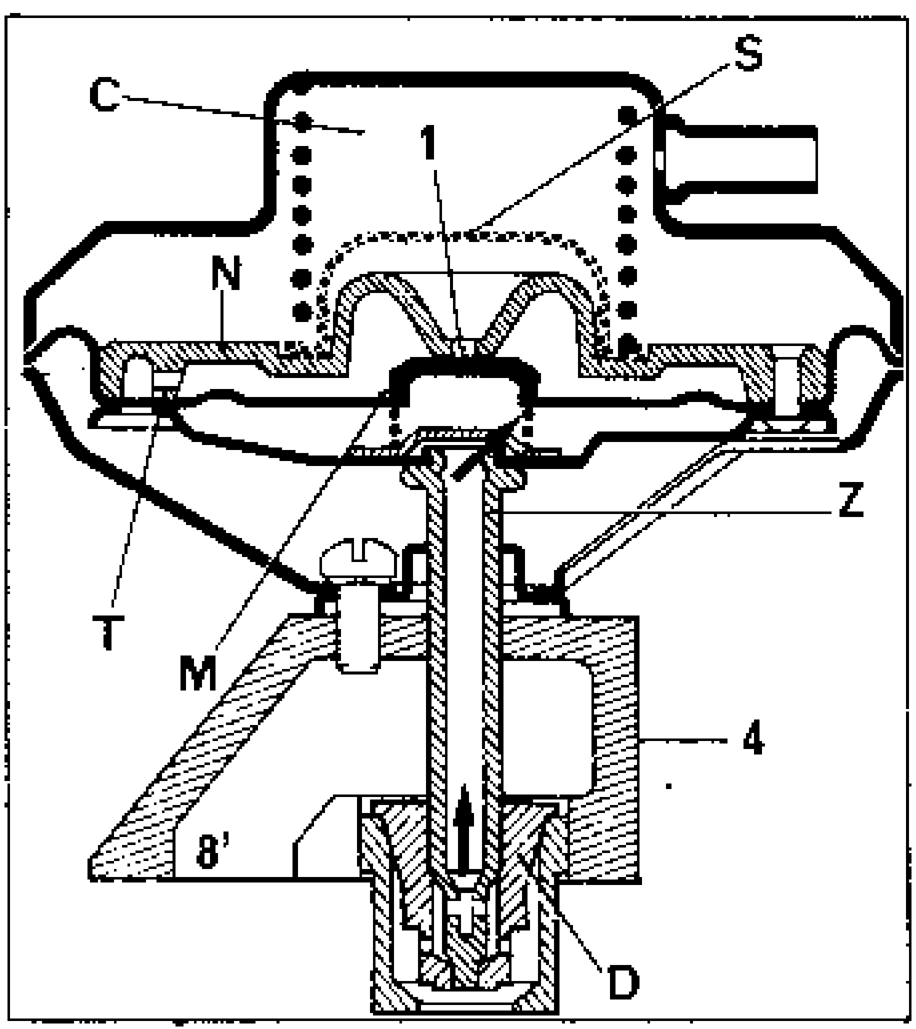
The vacuum from the inlet manifold (14) only affects the diaphragm (N) if the pressure from the exhaust manifold (13), following the course shown by the arrows, pushes back the membrane (M) which closes the hole (1).

The chamber (C) is vented to atmosphere through a screen (S), the hole (1) and the peripheral holes (T).

When the hole (1) is blocked, the vacuum attracts the assembly and opens the valve (D), enabling the exhaust gases to be recirculated to the inlet manifold (8).

This valve can therefore not be checked by applying a vacuum using a vacuum pump.

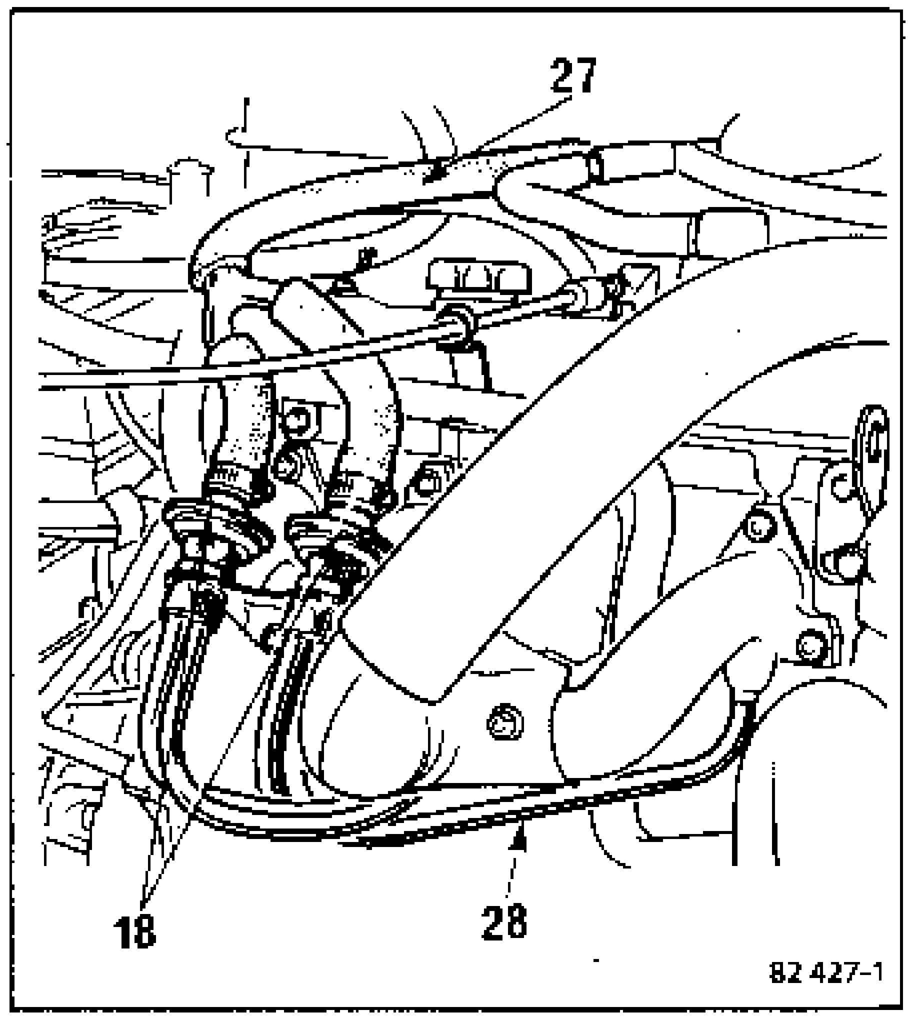
Checking: the valve guide (D) is visible in zone (Z); simply accelerate with the engine hot to check visually that it is moving.



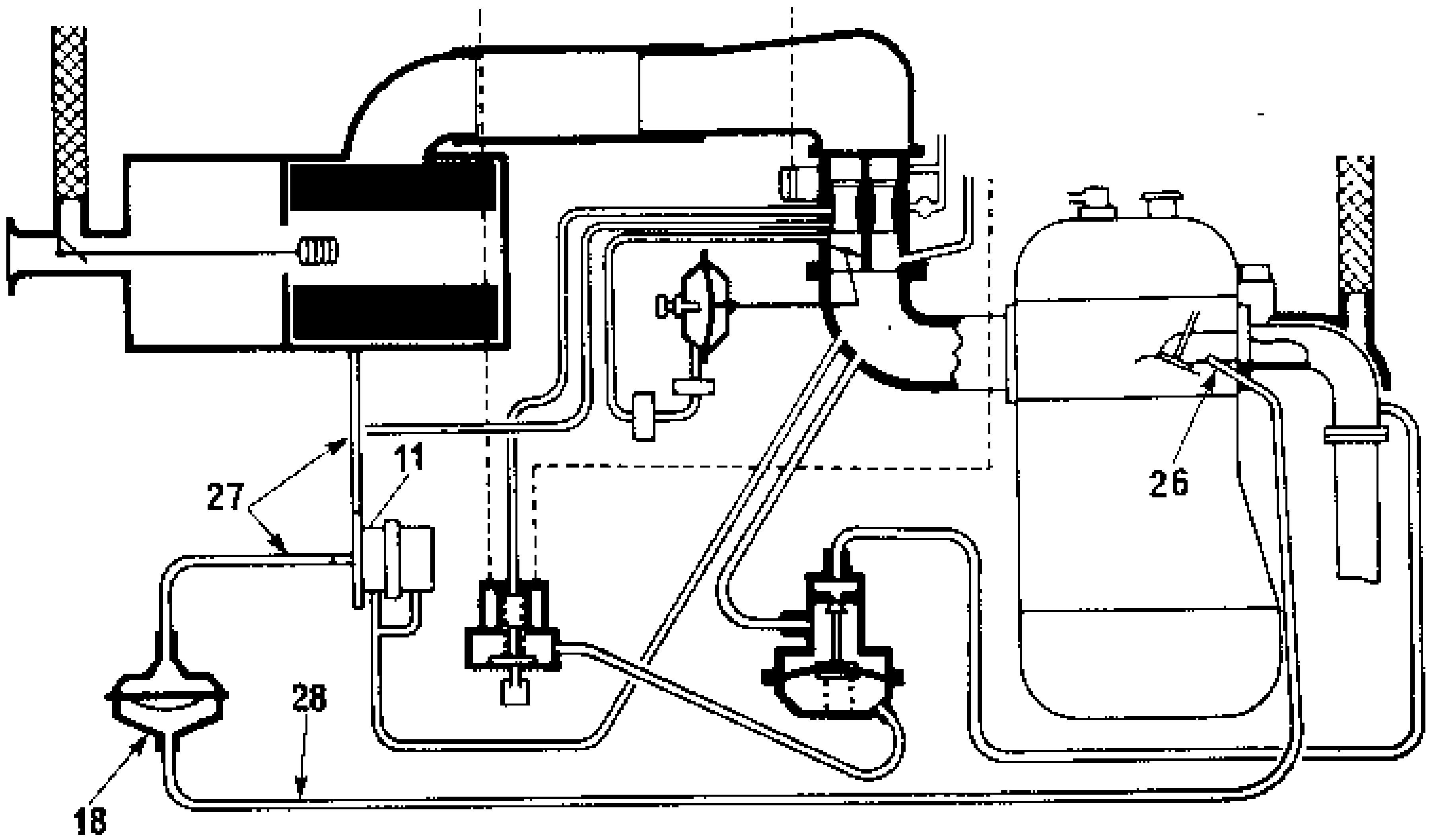
OPERATION OF THE EXHAUST AIR INJECTION SYSTEM

The air injection system comprises:

- two air injection valves (18);
- four injectors which open under the exhaust valves;
- a hose (27), connecting the air filter to the two valves (18) via a bypass valve (11) and pipes (28) connecting the air injection valves to the cylinders (1), (4), (2) and (3).



Air injection operating diagram



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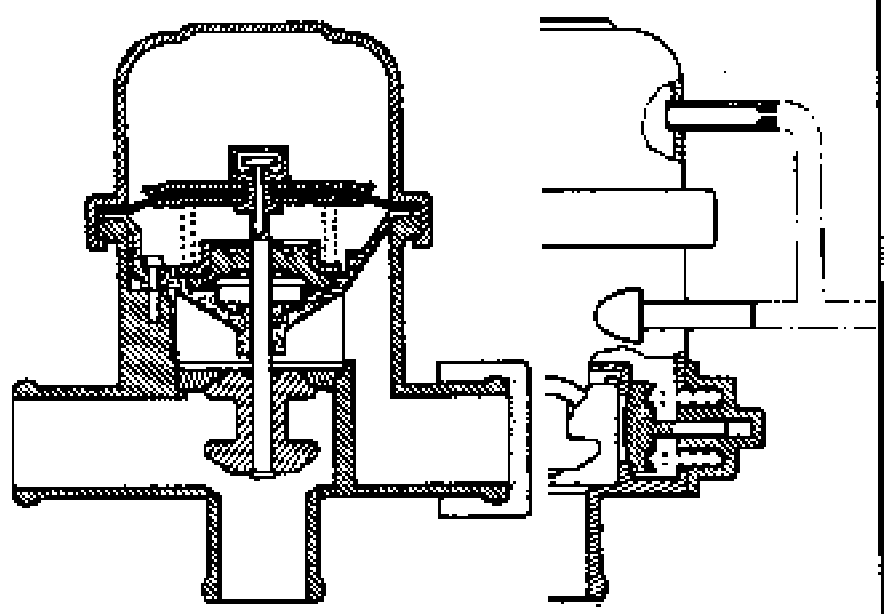

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Operation

After the exhaust valve closes, the exhaust gas inertia creates a vacuum in the exhaust port. As a result, ambient air from the air filter passes through the air injection valve into the exhaust port, to oxidise the unburned gases. When the pressure in the exhaust port is higher than atmospheric pressure, the air injection valve closes and prevents the gases from returning.

BYPASS VALVE

To prevent exhaust backfiring, a bypass valve (11) cuts off the air injection during deceleration.

Checking the operation of the anti-pollution system

FUNCTION CHECKED	CONDITIONS	NOMINAL VALUE TOLERANCE	REMARKS
Idling speed adjustment	- Engine hot - Piping clamped between air inlet valves and air filter.	800 ± 50 rpm CO 1.5 ± 0.5%	Allow the engine to reach operating temperature at 2000 rpm before carrying out any adjustments. **Note**: After removing the clamp on the air pipes, the speed increases by approximately 50 rpm.
Accelerated idling	- Engine hot. - After checking normal idling. - Connect butterfly opening device directly to manifold (600 mbar) - Accelerate briefly. - Wait approximately 4 s for the speed to stabilise.	1800 ± 100 rpm	If the speed observed is outside the tolerances, it must be adjusted using the butterfly opening screw. However, after adjustment, the engine must be brought to normal idling speed by disconnecting the butterfly opening device. Repeat the full checking operation.
Advance correction under vacuum in choke phase	- Engine hot - Disconnect the 2 leads from the 60 °C sensor **(24)** and connect them to each other	The engine speed increases (approximately 200 rpm) If the speed increases very gradually (200 rpm in approx 10 s)	If the speed does not change, check using a vacuum pressure gauge whether the AEI module is correctly vacuum fed. - If so, change the AEI module - If not, check the connection of the solenoid valve **(14)**. Check the direction of the green delay valve **(13)**.
Electrical power-assistance	- Engine cold, external ambient temperature above 15 °C - Disconnect electrical power-assistance lead and connect checking device.	- Warning light illuminates. - Voltage 12 - 14 V.	If the light does not illuminate, check the electrical circuit or 15 °C sensor **(22)**.
Recirculation valve power supply circuit (vacuum pressure gauge)	Engine hot. - Disconnect the vacuum pipe from the recirculation valve. In its place, connect a vacuum pressure gauge, 0 - 1000 mbar. Disconnect the 60 °C sensor leads **(24)** and connect them to each other. Keep the engine speed at approx. 2500 rpm.		If the pressure gauge shows a vacuum, check the solenoid valve **(5)** electrical and pneumatic connections.
	- Reconnect the 60 °C sensor **(24)** and keep the speed at approx. 2500 rpm.	The pressure gauge must show a vacuum greater than or equal to 100 mbar	If not, check the solenoid valve **(5)** electrical and pneumatic connections and that the temperature sensor **(24)** is operating correctly. It must be "closed" at coolant temperatures ≥ 60 °C.

Checking the operation of the anti-pollution system

FUNCTION CHECKED	CHECKING PARAMETER	CONDITIONS	OBSERVATIONS	REMARKS
Accelerated idling speed (butterfly opening device) with chamber + delay valve.	Accelerated idling - return to normal idling speed time	- Engine hot - Engine unloadedat a speed of approximately 3000 rpm, then suddenly release the accelerator control.	The engine speed gradually falls and returns to normal idling speed after a time less than or equal to 8 s.	If the return to normal idling speed takes place: - sharply, without falling gradually, check the direction in which the valve (6) is fitted; - within a period longer than 8 s, check the conformity of the brown/white valve (6).
Carburettor 2nd barrel inhibiting device.	Vacuum pressure gauge	- Engine hot - Disconnect the vacuum pipe level with the capsule positioned on the carburettor (accel-erator linkage side 27).		If the pressure gauge shows a vacuum, check the pneumatic valve connections (12).

Special features of B298 vehicles for Switzerland (Engine Z7V 711)

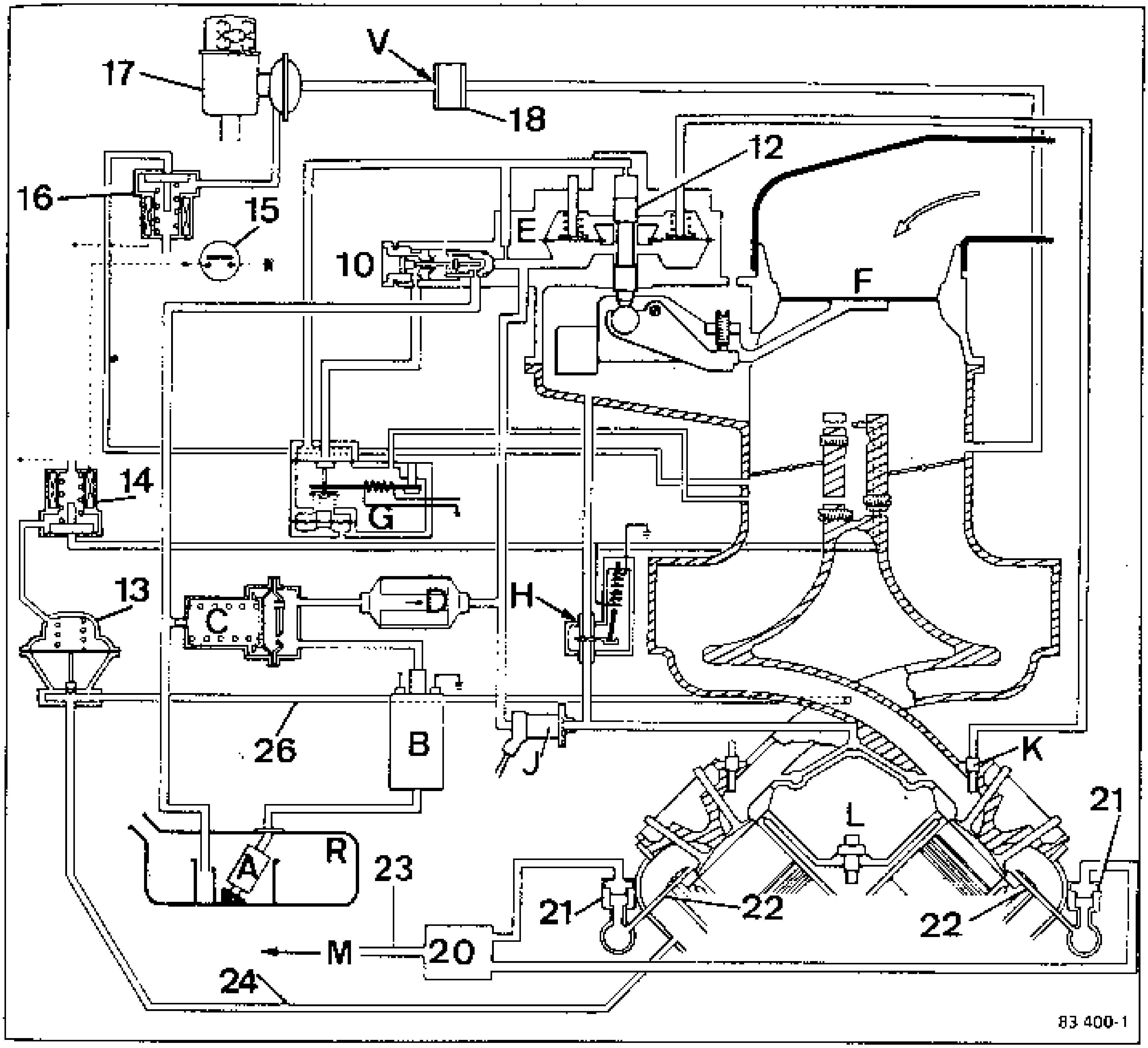
The anti-pollution system includes the following special features:

- An ignition advance correction device (by advance and retard capsule)

- An exhaust gas recirculation device.

- An exhaust air injection system.

Assembly diagram of anti-pollution device



A - Electric priming pump located in the petrol tank
B - Electric fuel pump located on the rear right-hand side member side
C - Pressure accumulator secured to fuel pump support bracket
D - Petrol filter
E - Fuel metering head
F - Air flow meter
G - Control pressure regulator
H - Additional air control
J - Cold start injector
K - 6 injectors
L - Timed temperature switch
M - To air filter
R - Petrol tank

10 - Fuel pressure regulator
12 - Metering piston
13 - Exhaust gas recycling (EGR) valve
14 - EGR solenoid valve
15 - Coolant temperature switch closed at coolant temperature above 45 °C
16 - Vacuum advance solenoid valve
17 - Starter
18 - Delay valve - V on white side
20 - Noise level reduction chamber
21 - Air injector valves
22 - Air injector
23 - Air take-off pipe from filter
24 - Exhaust gas sampling pipes
26 - Inlet gas recycling pipe

The exhaust gas recirculation device comprises:

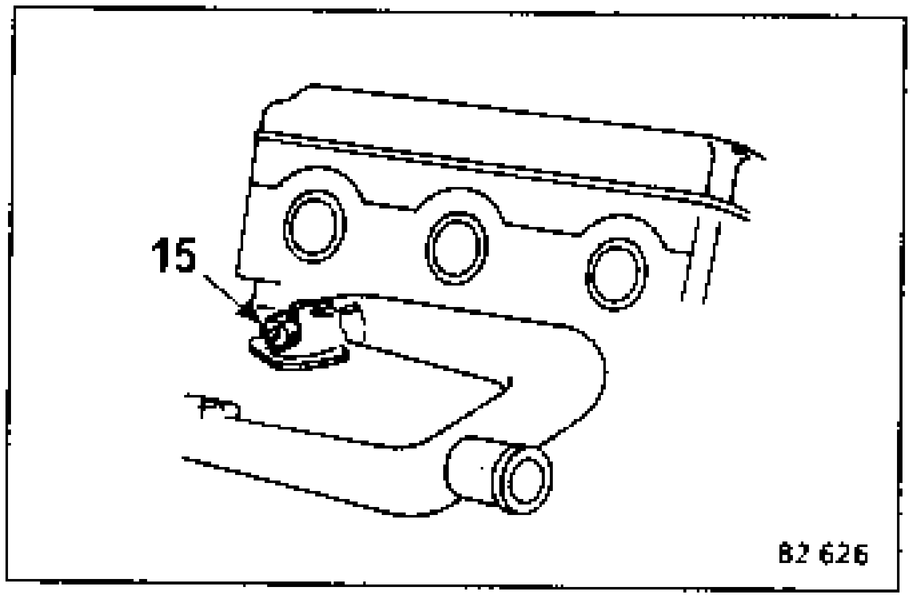
- A pipe (24) for sampling exhaust gases in the exhaust manifold on the right-hand side of the engine;
- An exhaust gas recirculation valve (13) controlled by the vacuum from above the butterflies;
- A pipe (26) for recirculating to the inlet manifold;
- A solenoid valve (14) which blocks the vacuum from above the butterflies;
- A temperature switch (15), closed at coolant temperatures above 45 °C.

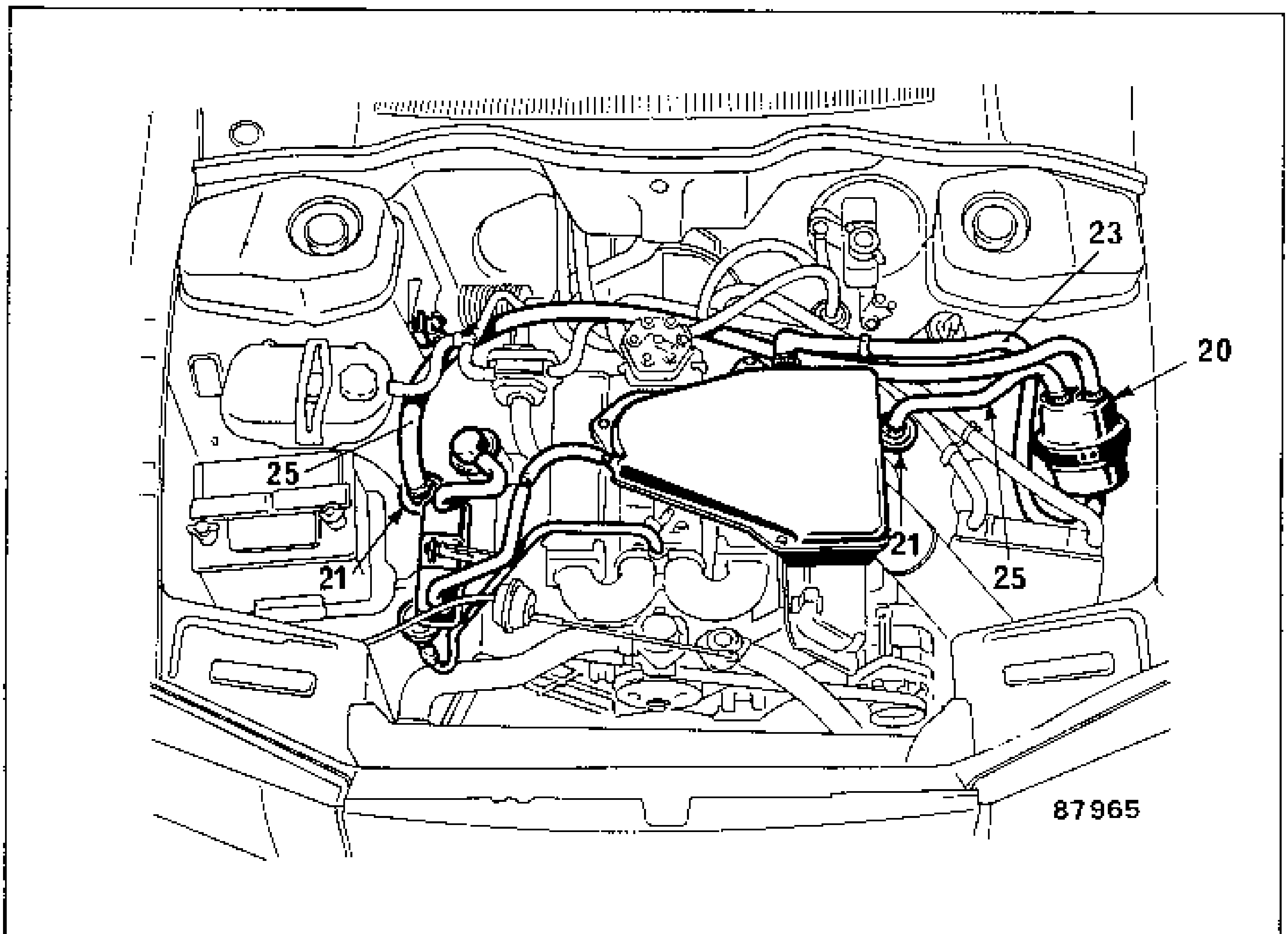
Exhaust gas recirculation can operate when the vacuum above the butterflies attracts the diaphragm of the exhaust gas recycling valve (13).

The exhaust gases are not recirculated:

a) At coolant temperatures below 45 °C (vacuum cut off to the recirculation valve (13) by the solenoid valve (14));

b) At idling speed, the vacuum is not sufficient to lift the recirculation valve diaphragm.





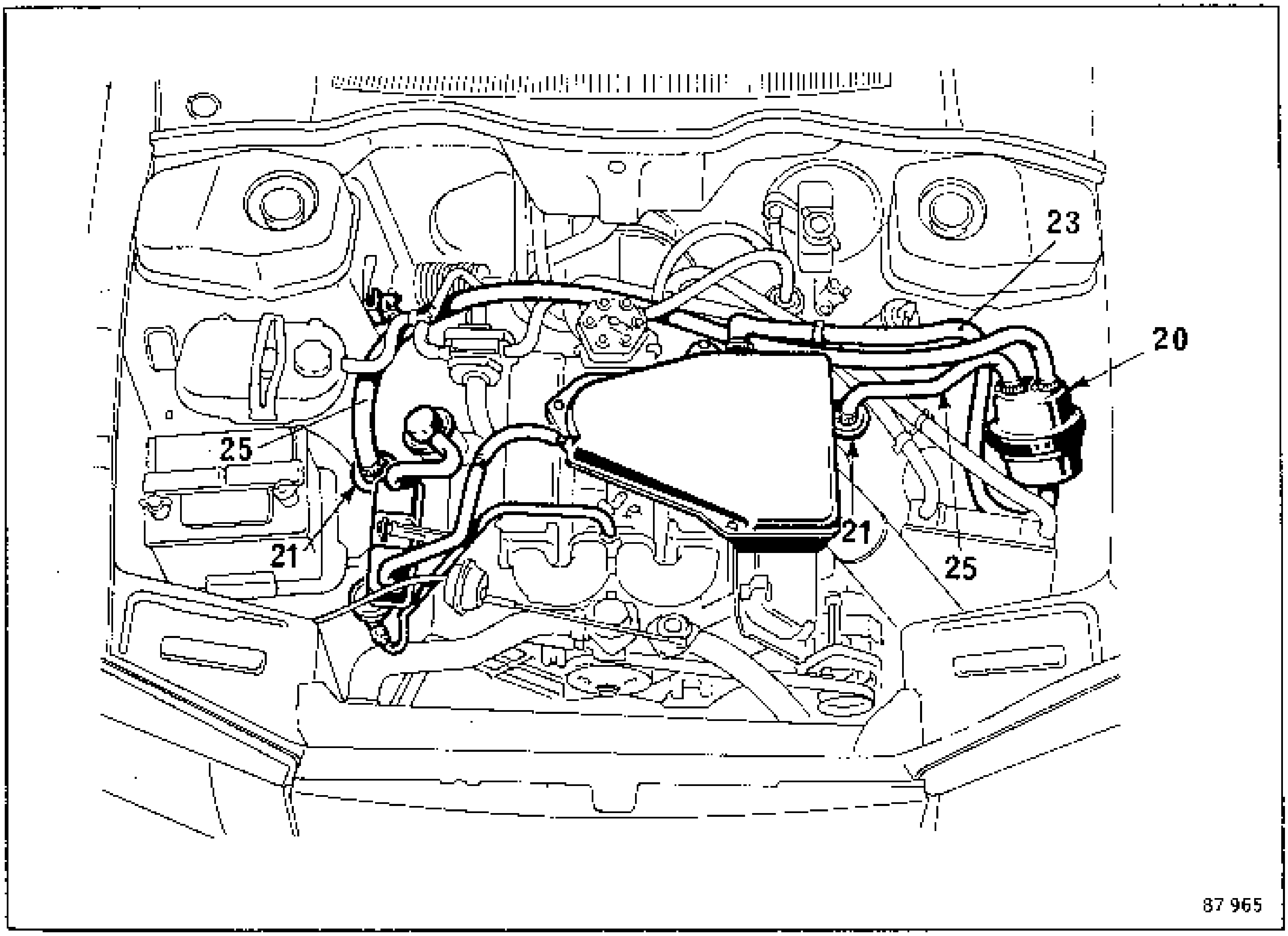
Air injection system

The air inlet system comprises:

- Two air injection valves (21); one per cylinder bank;
- Six air injectors (22); three per cylinder bank, located in each exhaust port behind the valve;
- A pipe (23) linking the air filter to the noise level reduction reservoir (20);
- Two pipes (25), connecting the chamber to the valves (21).

Operation

After the exhaust valve closes, the exhaust gas inertia creates a vacuum behind the valve. As a result, the ambient air coming from the air filter passes through the air injection valve to behind the exhaust valve to oxidise the unburned exhaust gases. When the pressure behind the exhaust valve is higher than atmospheric pressure, the air injection valve closes and prevents the gases passing.



Advance correction

Reatard function

At temperatures below 45 °C, the solenoid valve (16) closes the vacuum circuit under the butterfly.

The retard function does not operate.

At temperatures higher than 45 °C, the coolant temperature switch (15), located on the manifold, is closed.

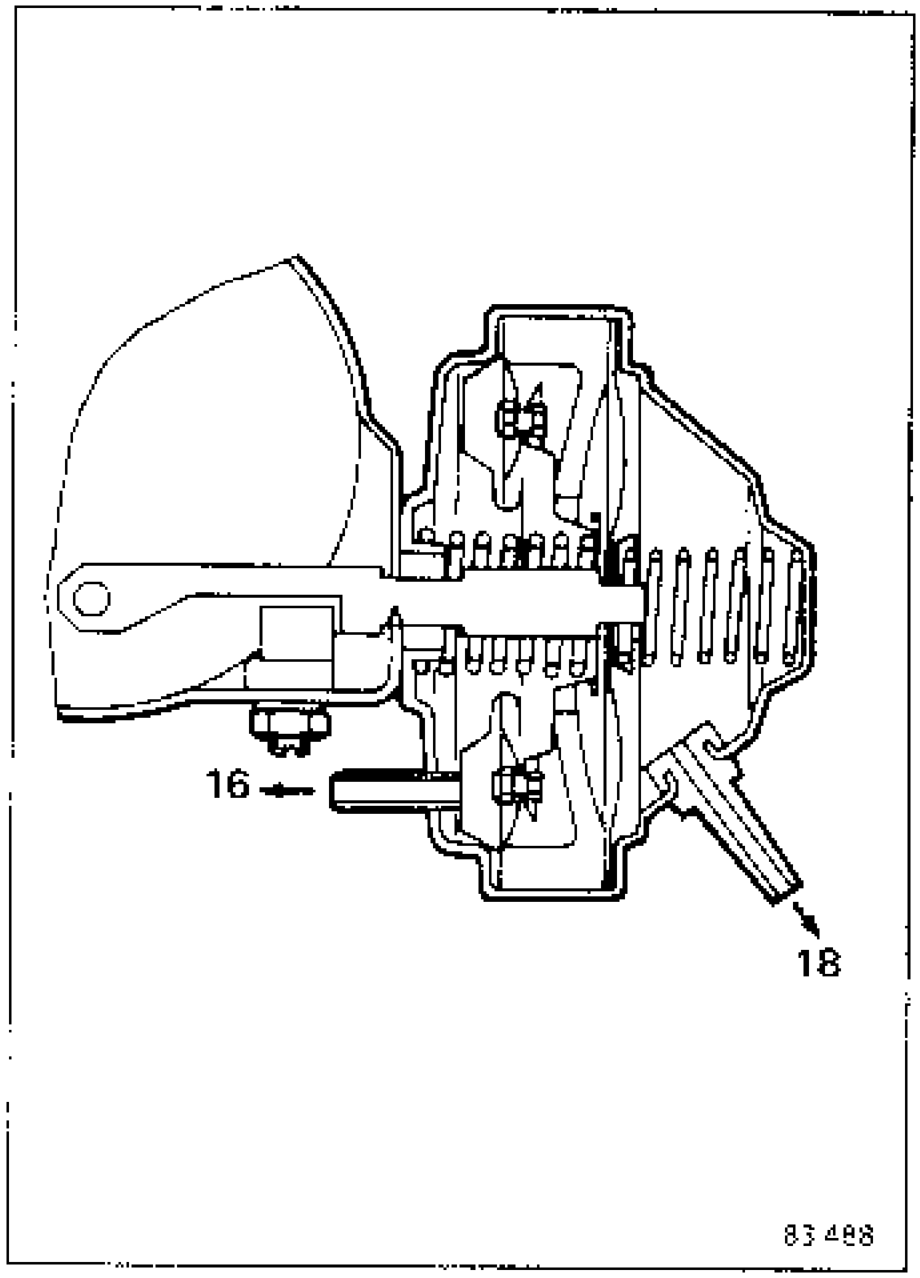
Advance function

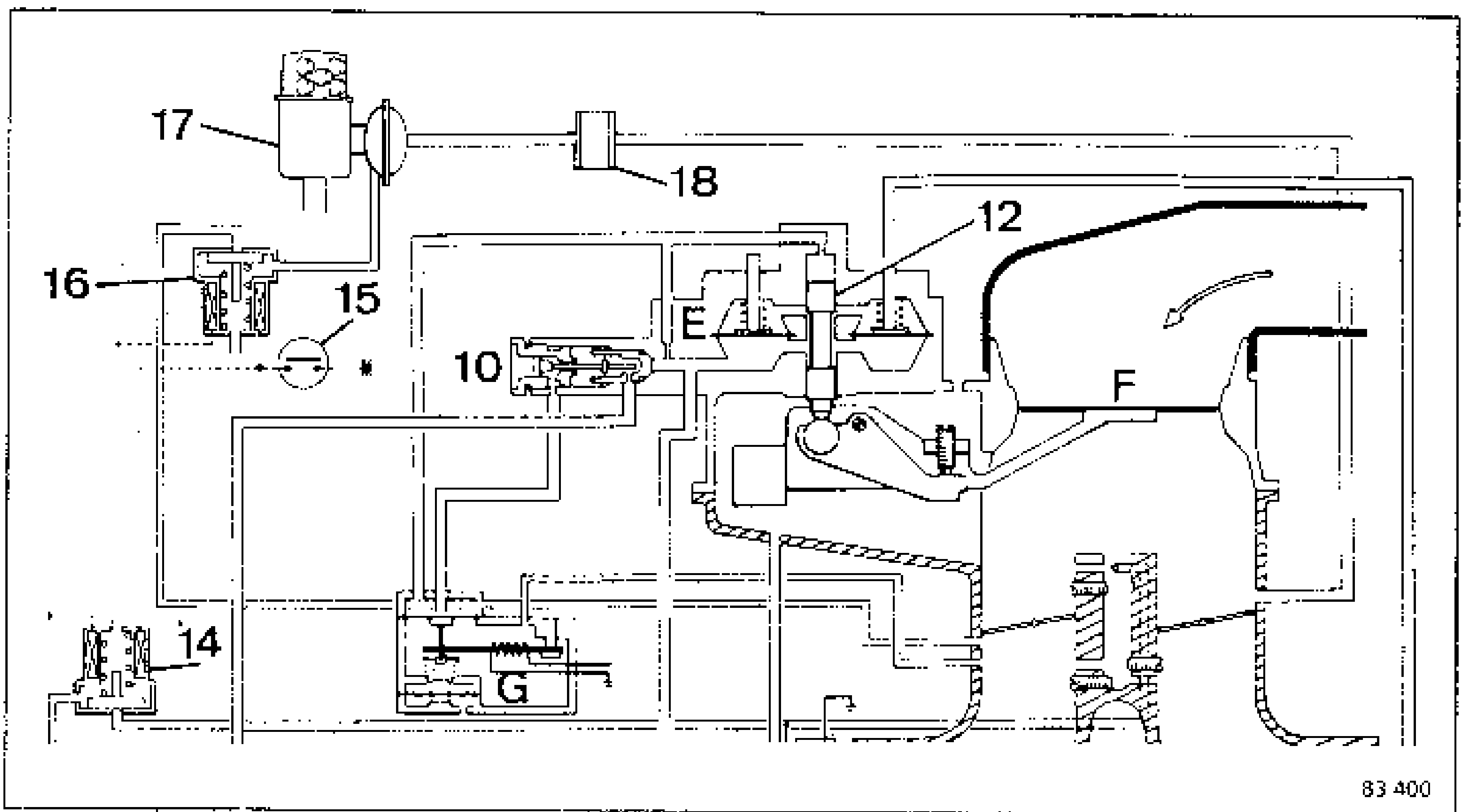
The vacuum on the upper side of the butterfly affects distributor vacuum the capsule on the advance side.

A delay valve (18) with its white side pointing towards the vacuum advance capsule, guarantees a gradual return when the vacuum drops.

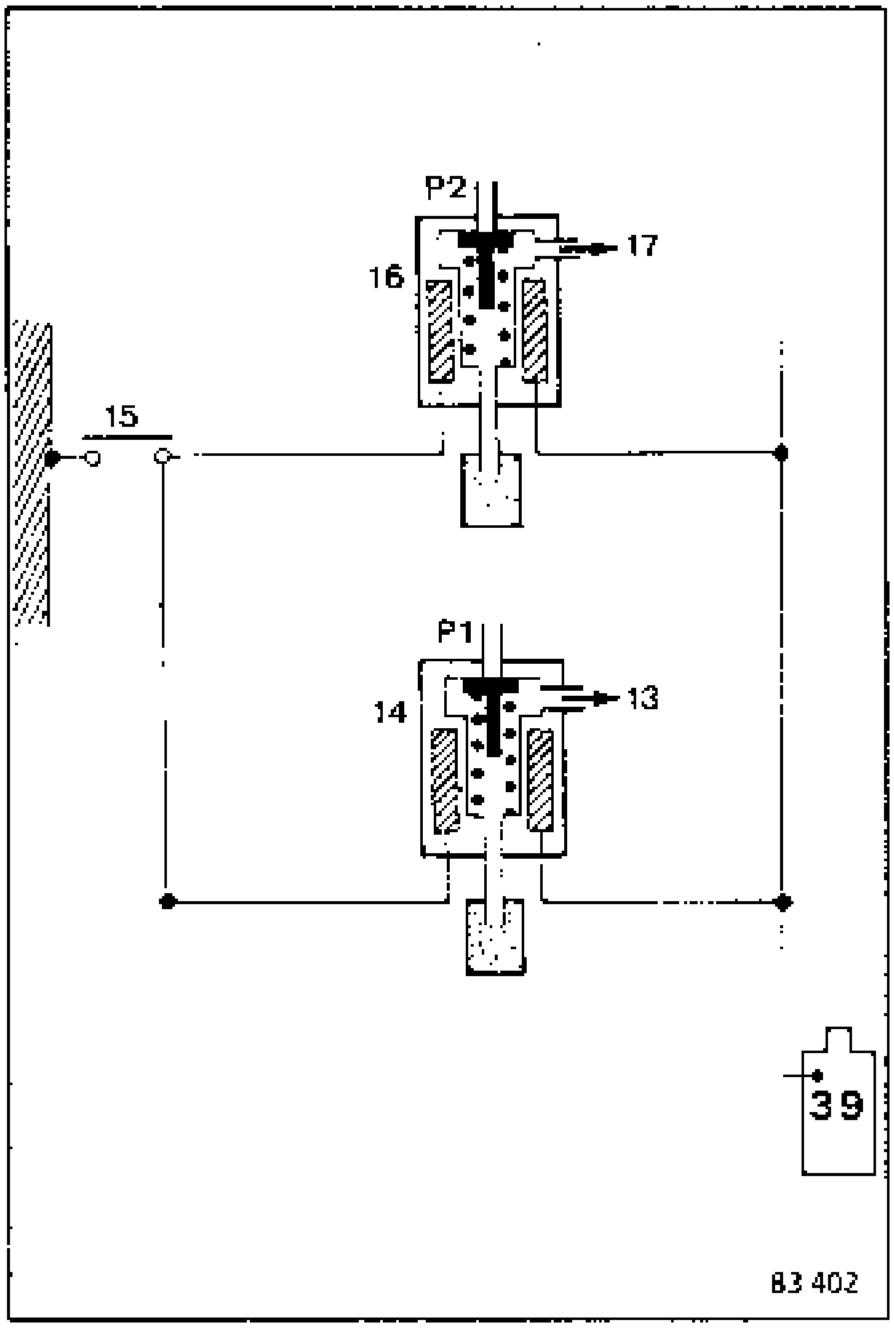
Initial timing

Vacuum advance capsule disconnected (retard and advance functions): **5° ± 2 at 900 ± 50 rpm.**





Advance correction operating diagram



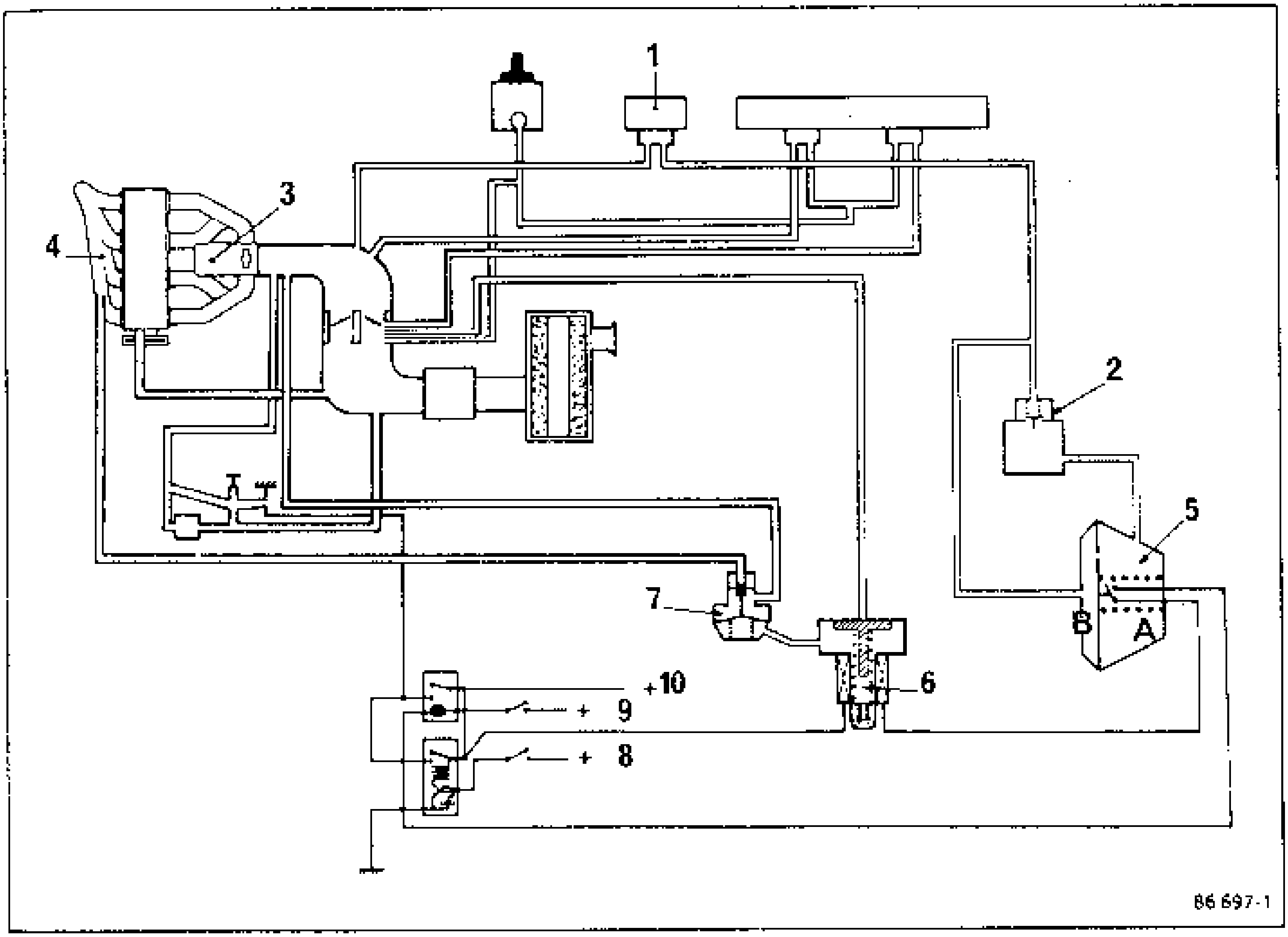
P1- To vacuum above throttle butterflies
P2- To vacuum below throttle butterflies
13- To exhaust gas recirculation (EGR) valve
14- EGR solenoid valve
15- Coolant temperature switch closed at coolant temperatures above 45 °C
16- Vacuum advance solenoid valve
17- To starter
39- Coil

Checking the operation of the anti-pollution system

FUNCTIONS	PARAMETERS	CONDITIONS	OBSERVATIONS	REMARKS
Operation Air injection valves	Concentration of CO at exhaust	- Idling speed - With air injection	CO less than or equal to 1%	Vented air valves 2%
Delay capsule	Engine speed	- Idling speed (coolant temperature higher than 45 °C) - Disconnect one of the 2 electric leads to the solenoid valve	The engine speed increases	
Exhaust gas recirculation, EGR valve	Visual inspection of EGR valve (13) diaphragm lifting	a) Accelerate between 2000 and 3000 rpm b) As above, but after disconnecting 1 of the 2 electrical leads to the solenoid valve (14)	EGR valve diaphragm lifts (13). The valve should not operate	Inspect the circuit and the EGR valve (13). Inspect the solenoid valve.

FUNCTIONS CHECKED	CHECKING CONDITIONS	OPERATIONAL VALUES	REMARKS
Initial timing (moment of ignition)	- Engine hot - Idling speed lower than 1000 rpm - Advance and retard correction capsule disconnected	5° ± 2°	After the cooling fan motor has cut out.
Idling speed and richness	- engine hot - Without air injection, clamp the filter-chamber connecting pipe.	900 rpm ± 50 CO = 2% ± 0.5, on the right and left	After the cooling fan motor has cut out. Gear selector lever in position N or P.

Special features of B29B vehicles (Engine J7T 708)



1 - Thermovalve (open at temp. above 15 °)
2 - Vacuum chamber
3 - Inlet manifold
4 - Exhaust manifold
5 - Differential vacuum switch
6 - EGR solenoid valve
7 - EGR valve
8 - + starter
9 - + after ignition
10- Air conditioning

Solenoid valve checking

- Connect in bypass, using a T-piece, a vacuum pressure gauge at the EGR valve (7).
- Disconnect the pipe connected to the throttle housing from the solenoid valve (6).
- Apply + 12 V current to one of the solenoid valve terminals and earth the others.
- Using a vacuum pump, apply a vacuum to the solenoid valve (6). The pressure gauge should show the vacuum level and the vacuum maintained.
- Disconnect the solenoid valve's electrical power supply: the vacuum should fall immediately.
If the vacuum does not fall or if it falls very slowly, reverse the solenoid valve pipes and repeat the checking operation.

Description of device operation

The EGR system comprises:

- the EGR valve **(7)** fitted to the inlet distributor;

- The solenoid valve **(6)** fitted to the left-hand shock absorber turret, the differential pressure switch **(5)** and the vacuum chamber **(2)**. (The differential pressure switch and the vacuum chamber are fitted, together with the AEI module, to a plate above the steering rack.)

- The thermovalve **15 °C (1)** located on the radiator degasser is capable of authorising the vacuum connection to the vacuum chamber and to the differential vacuum switch (5);

  - below **15 °C** the thermovalve is closed;

  - above **15 °C** the thermovalve is open, the vacuum affects the differential vacuum switch (5) and the vacuum chamber (2);

- The EGR valve (7) opens or closes the exhaust gas passage from the exhaust manifold (4) to the inlet manifold (3).

  The passage is opened when the vacuum acts on the EGR valve diaphragm (7).

  The vacuum take-off is located near the butterfly edge; the effect of the vacuum on the EGR valve diaphragm **(22)** depends on the solenoid valve **(6)** being activated.

- The solenoid valve **(6)** receives + voltage.

  It is earthed by the differential vacuum switch (5).

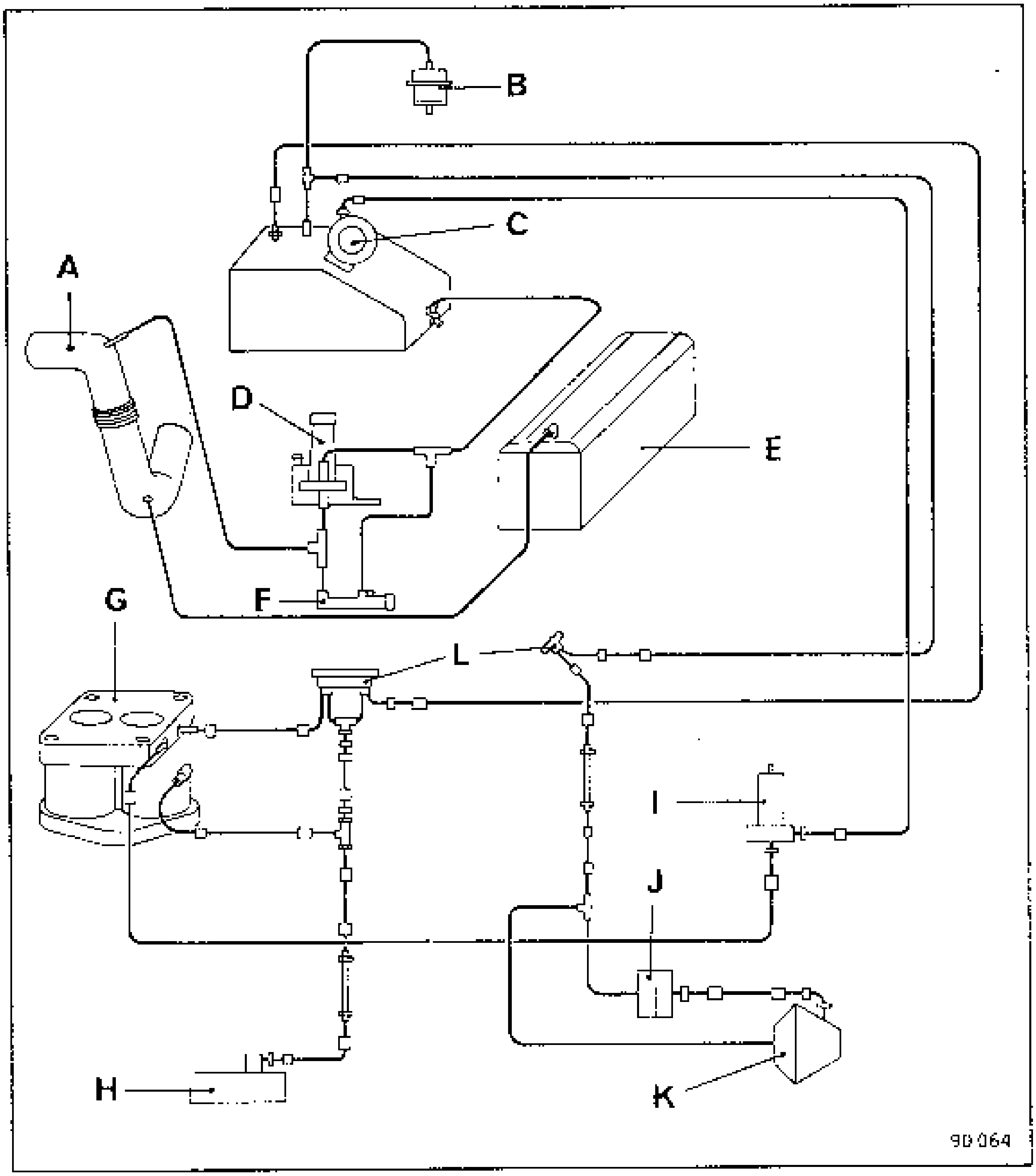
- The differential vacuum switch (5) comprises 2 chambers. A and B, separated by a diaphragm with a calibrated hole; on one side the diaphragm is loaded by a spring and a contact is connected to this diaphragm, which opens and closes in accordance with the position of the diaphragm.

  Above 15 °C, the thermovalve (1) is open, chamber B is connected to the inlet manifold and chamber A is connected to the vacuum reserve (2).

  At stabilised engine speed, the vacuum is equal on both sides of the diaphragm, the contact is open, the solenoid valve **(6)** is closed, as is the EGR valve **(7)**; there is therefore no exhaust gas recirculation.

  During acceleration, the vacuum in chamber B drops, while chamber A is still under the vacuum from the vacuum switch. This vacuum imbalance on the diaphragm causes the latter to move and closes the contact. The solenoid valve **(6)** is activated, the EGR valve **(7)** opens, the measured amount of exhaust gases enters the inlet manifold (3).

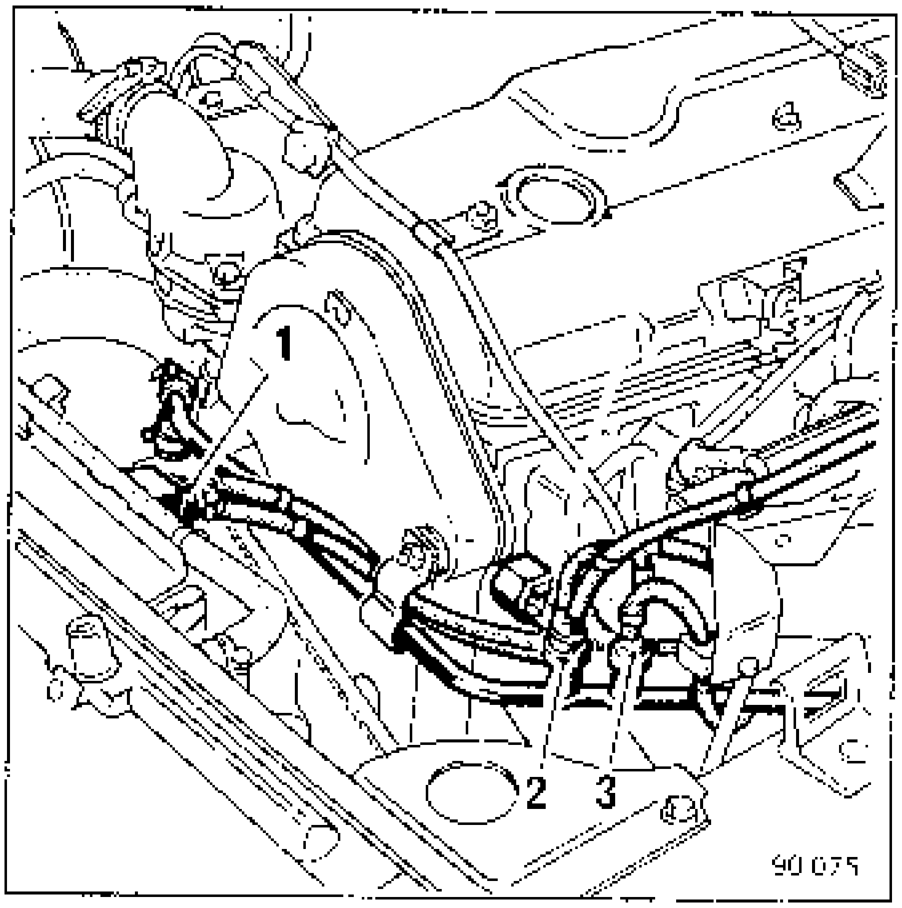
Assembly diagram of anti-pollution circuit



A - Air intake trunking
B - Petrol pressure regulator
C - EGR valve
D - Additional air valve
E - Rocker cover
F - Idling speed regulation bypass

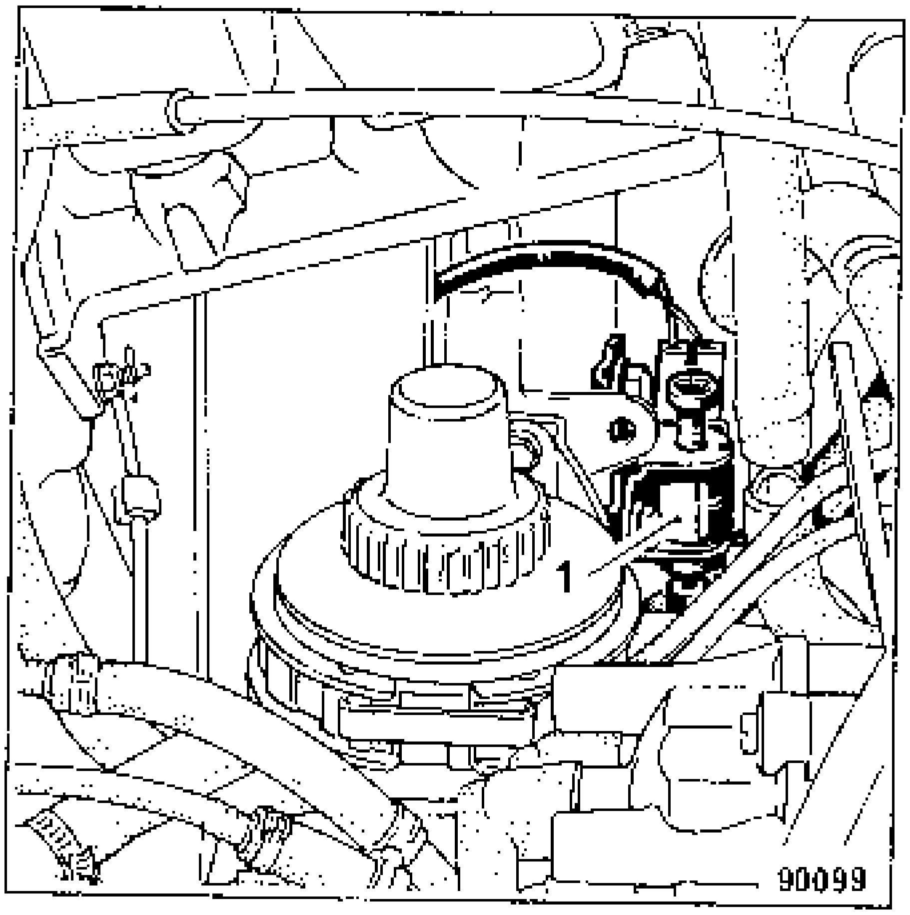
G - Throttle housing
H - AEI module
I - EGR control solenoid valve
J - Vacuum chamber
K - Differential pressure switch
L - Coolant circuit pipe thermovalve

Special features of the anti-pollution circuit



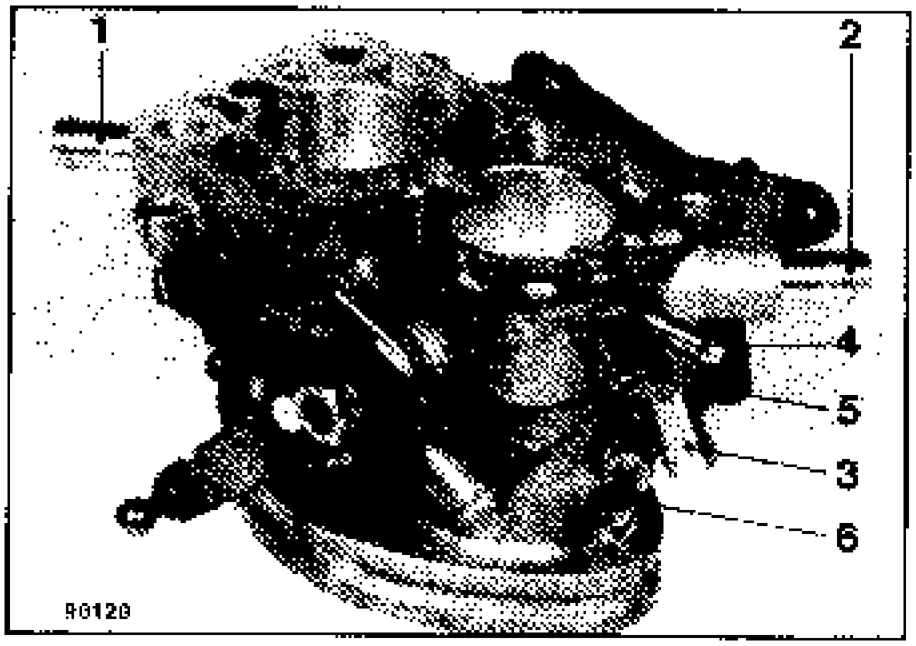
1 - 15 °C thermovalve, colour mark white
2 - 15 °C thermovalve, colour mark orange
3 - 45 °C thermovalve, colour mark black

Solenoid valve assembly



1 - Solenoid valve

Take-off points on throttle housing



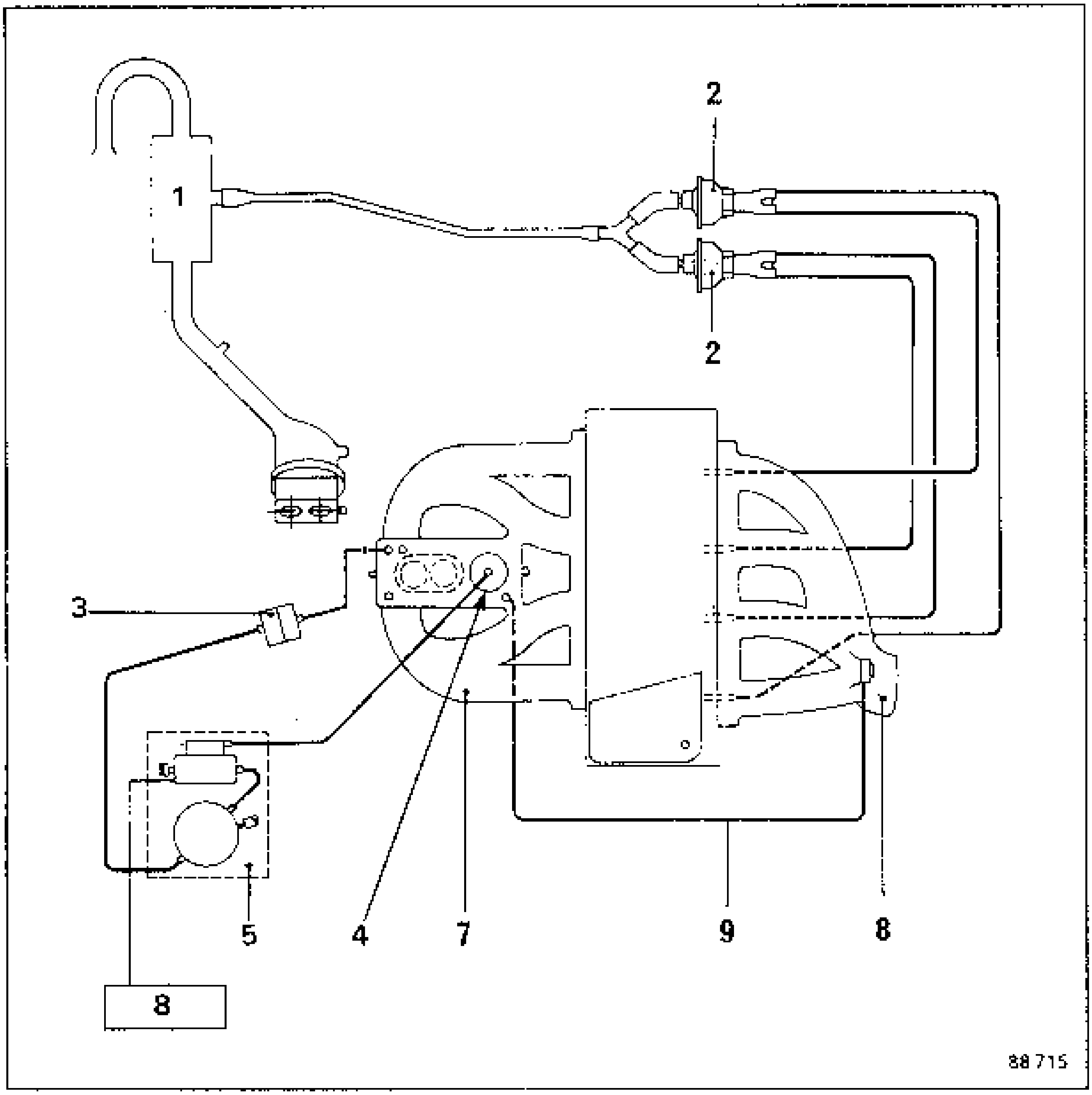
1 - Heating pipe
2 - Heating pipe
3 - Heating pipe
4 - T-pipe to 15 °C thermovalve (black mark on throttle housing)
5 - T-pipe to EGR solenoid valve (brown mark on throttle housing)
6 - T-pipe to T-connector (no colour mark on throttle housing)

Special features of B29E for Australia and Switzerland

B29E vehicles intended for Australia and Switzerland are fitted with:

- An exhaust gas recirculation system;
- An exhaust air injection system;
- A petrol vapour recycling system (see page 14-19).

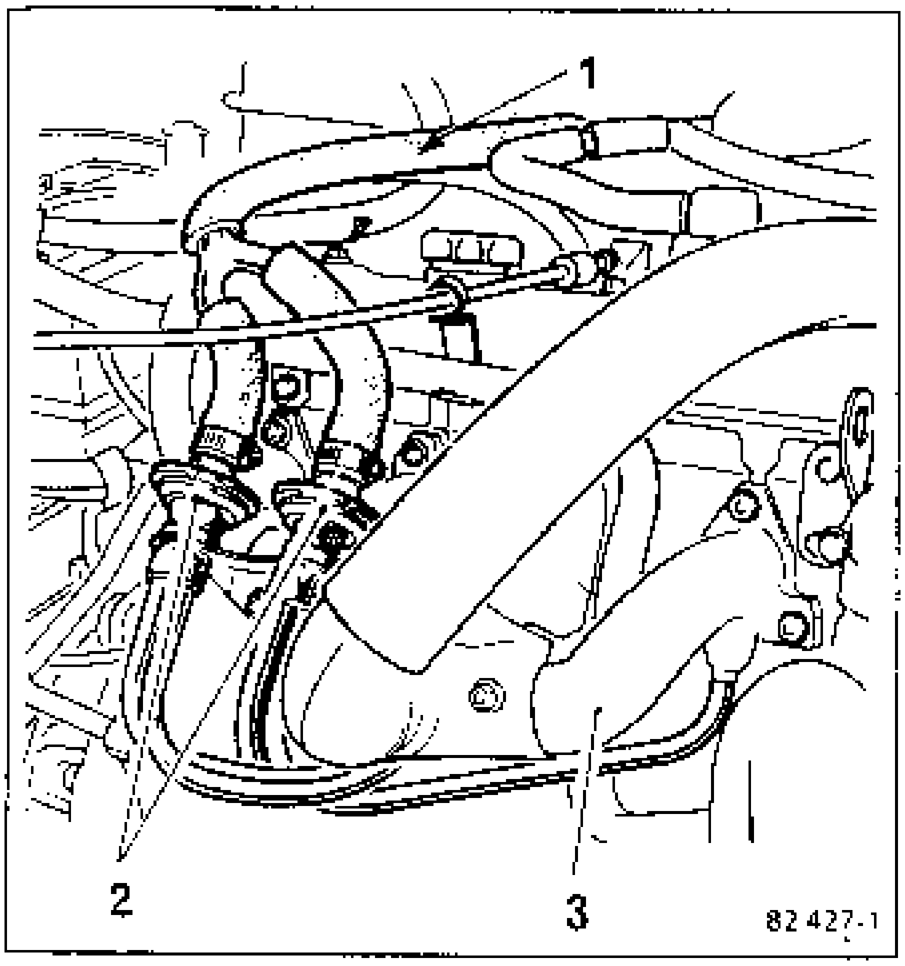
Special features of B29E for Australia and Switzerland



1 - Air filter
2 - Pulsair valves
3 - Delay valve
4 - EGR valve
5 - EGR valve control assembly
6 - Injection computer
7 - Inlet manifold
8 - Exhaust manifold
9 - Connecting pipe between EGR valve and exhaust manifold.

Special features of B29E for Australia and Switzerland (continued)

Exhaust air injection



1 - Pipe from air filter

2 - Air injection valves

3 - Exhaust manifold

IDENTIFICATION

VEHICLE	ENGINE	"PARIS-RHONE" TYPE	CURRENT
B290	J8S	A 14 N 73 A 13 N 88 A 14 N 62	100 A 60 A 70 A
B292	J7R	A 14 N 150 A 14 N 140	75 A 105 A
B293	Z7W	A 14 N 96 A 14 N 125 A 14 N 76 A 14 N 124	90 A 105 A 105 A 105 A
B295	Z7U	A 14 N 76 A 14 N 124 A 14 N 60 A 14 N 96 A 14 N 125	105 A 105 A 90 A 90 A 105 A
B296	J8S	A 13 N 88 A 13 N 171	60 A 70 A
B297	J6R	A 14 N 75 A 14 N 140 A 13 N 87 A 13 N 88	105 A 105 A 60 A 60 A
B298	Z7V	A 14 N 60 A 14 N 96 A 14 N 76	90 A 90 A 105 A
B29W	J8S	A 13 N 171	70 A
B29A	Z7W	A 14 N 76	105 A
B29B	J7T	A 14 N 134 A 14 N 75 A 14 N 140	75 A 105 A 105 A
B29E	J7T	A 14 N 64 A 14 N 62 A 14 N 134 A 14 N 75 A 14 N 140	70 A 70 A 75 A 105 A 105 A
B29F	Z7W	A 14 N 96 A 14 N 125 A 14 N 76 A 14 N 124	90 A 105 A 105 A 105 A
B29G	Z7U	A 14 N 124	105 A
B29H	J7R	A 14 N 134 A 14 N 75 A 14 N 140	75 A 105 A 105 A

CHECKING

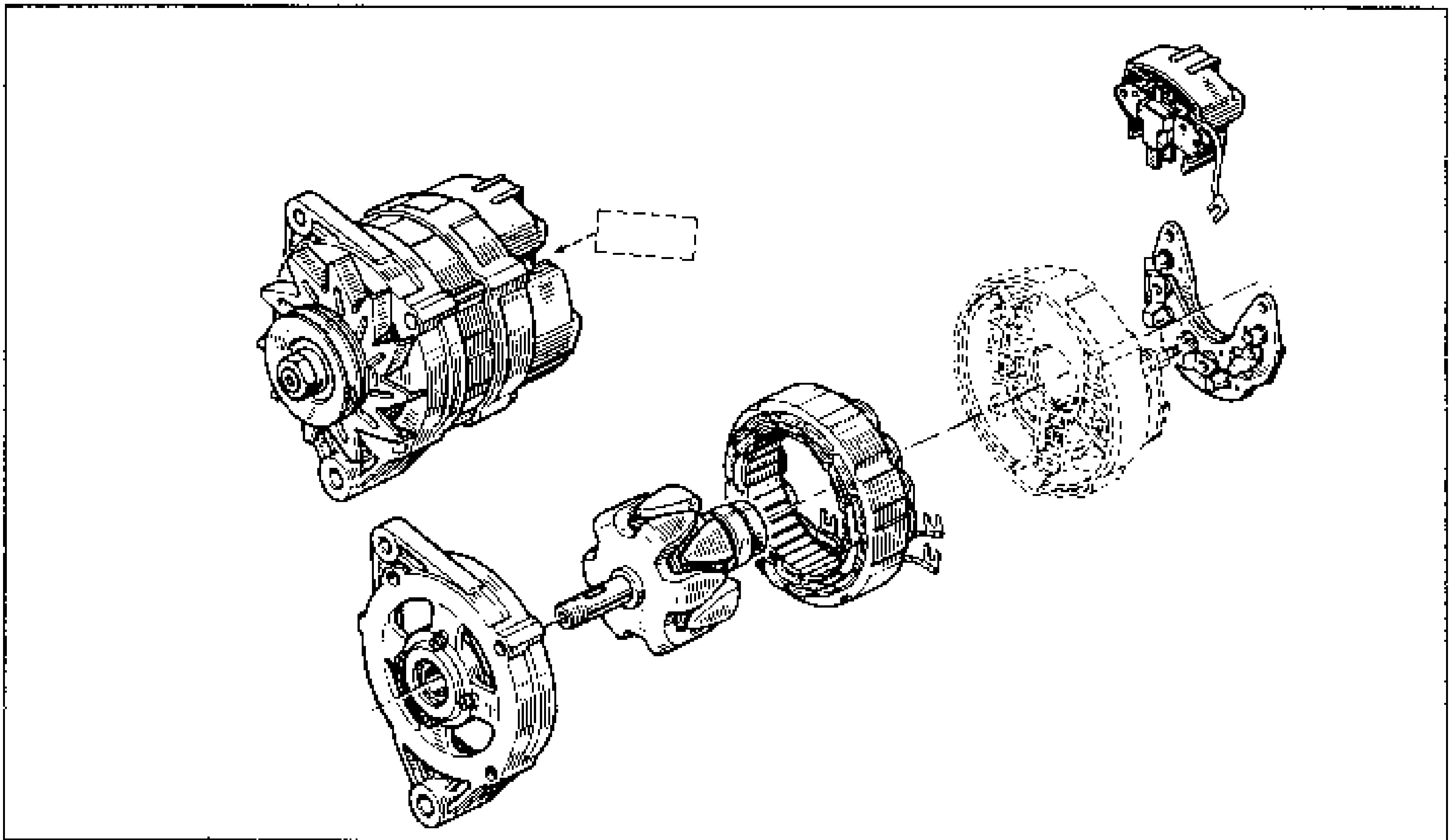
After 15 minutes' heating at 13.5 volts.

rpm	60 amps	70 amps	75 amps	90 amps	105 amps
1 250	5 A	12 A	---	---	30 A
3 000	53 A	61 A	61 A	76 A	82 A
6 000	60 A	70 A	72 A	90 A	105 A

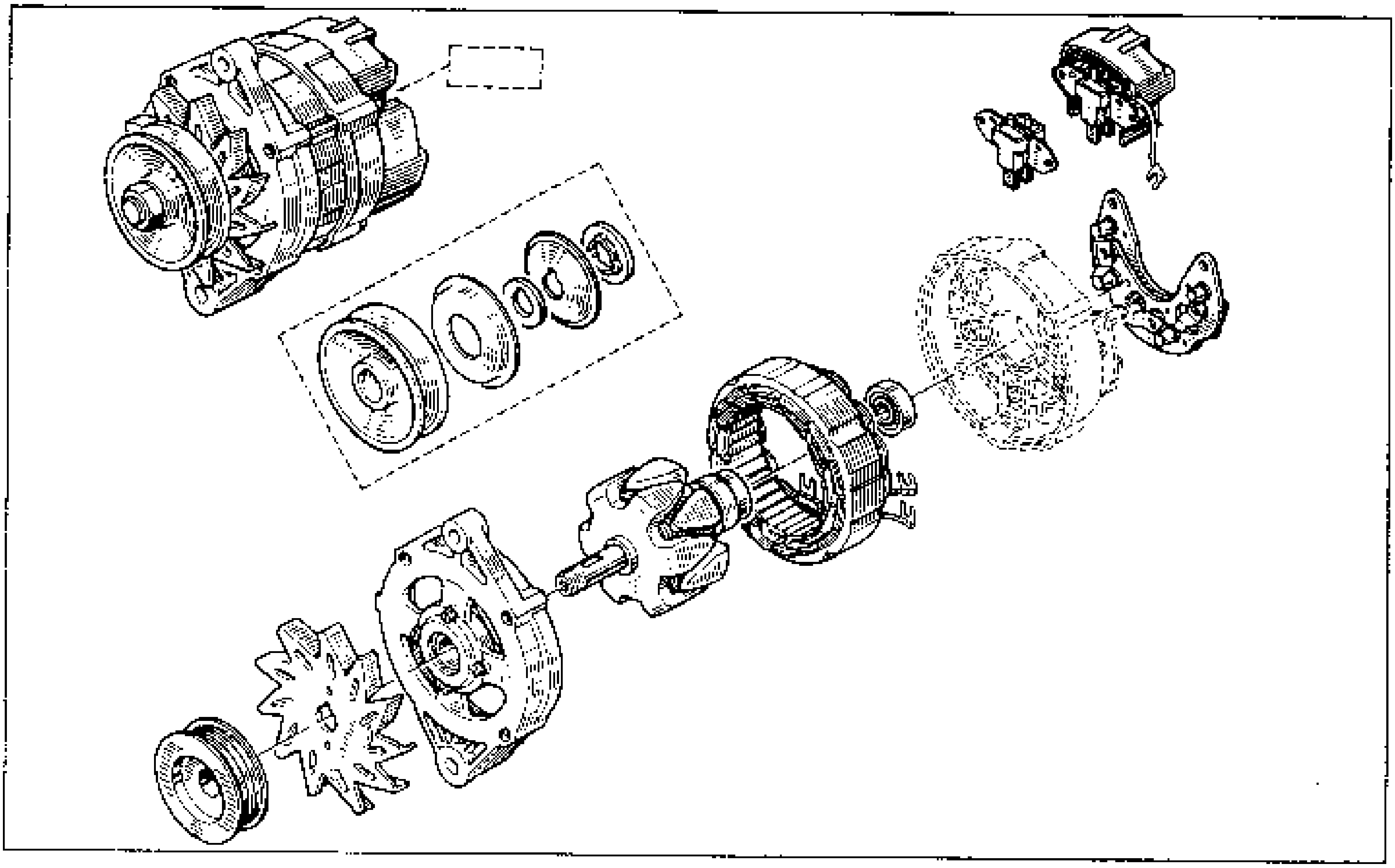
EXPLODED VIEW

PARIS-RHONE

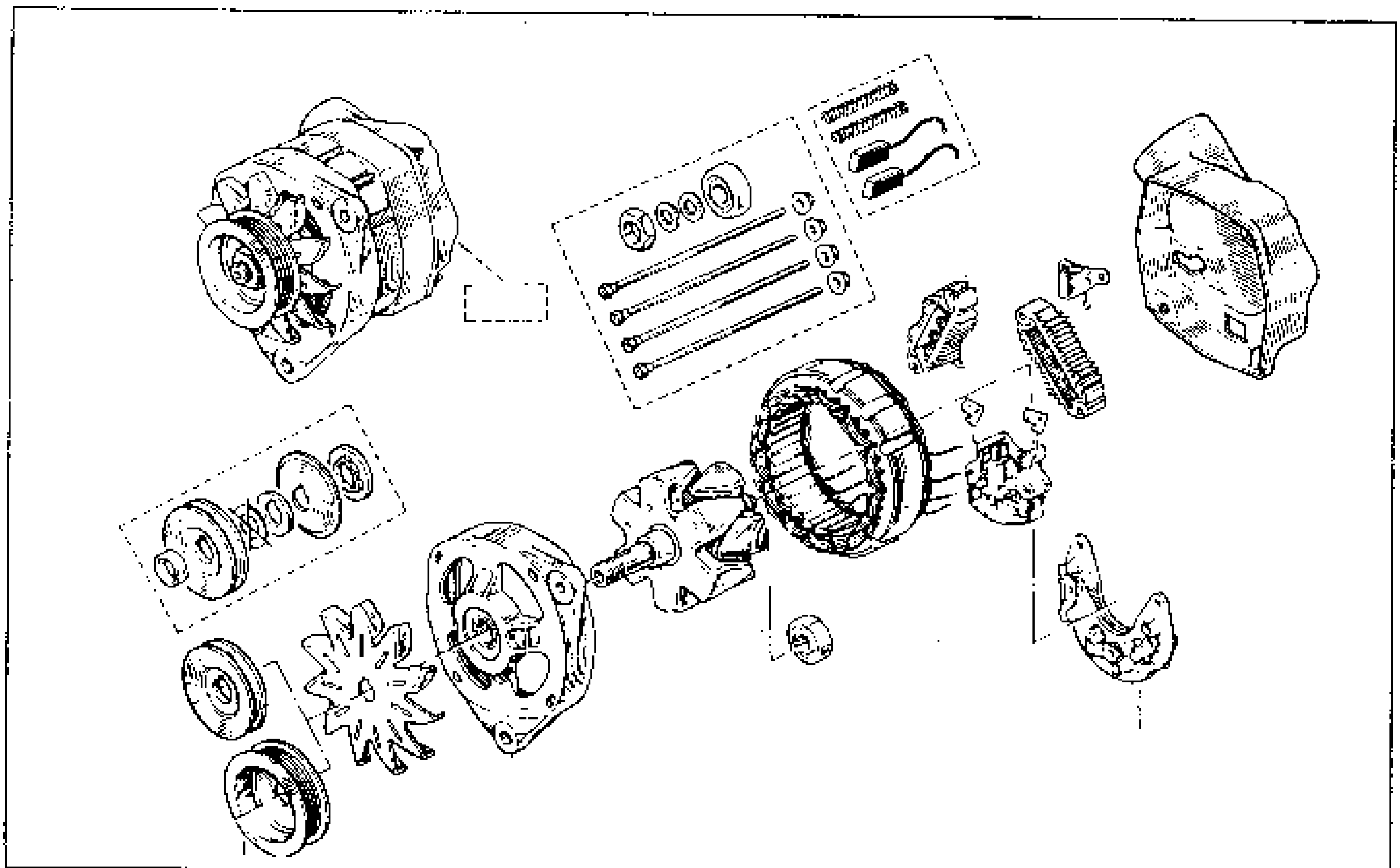
A 14 N 134 - A 14 N 125 - A 14 N 150
A 14 N 140 - A 14 N 124



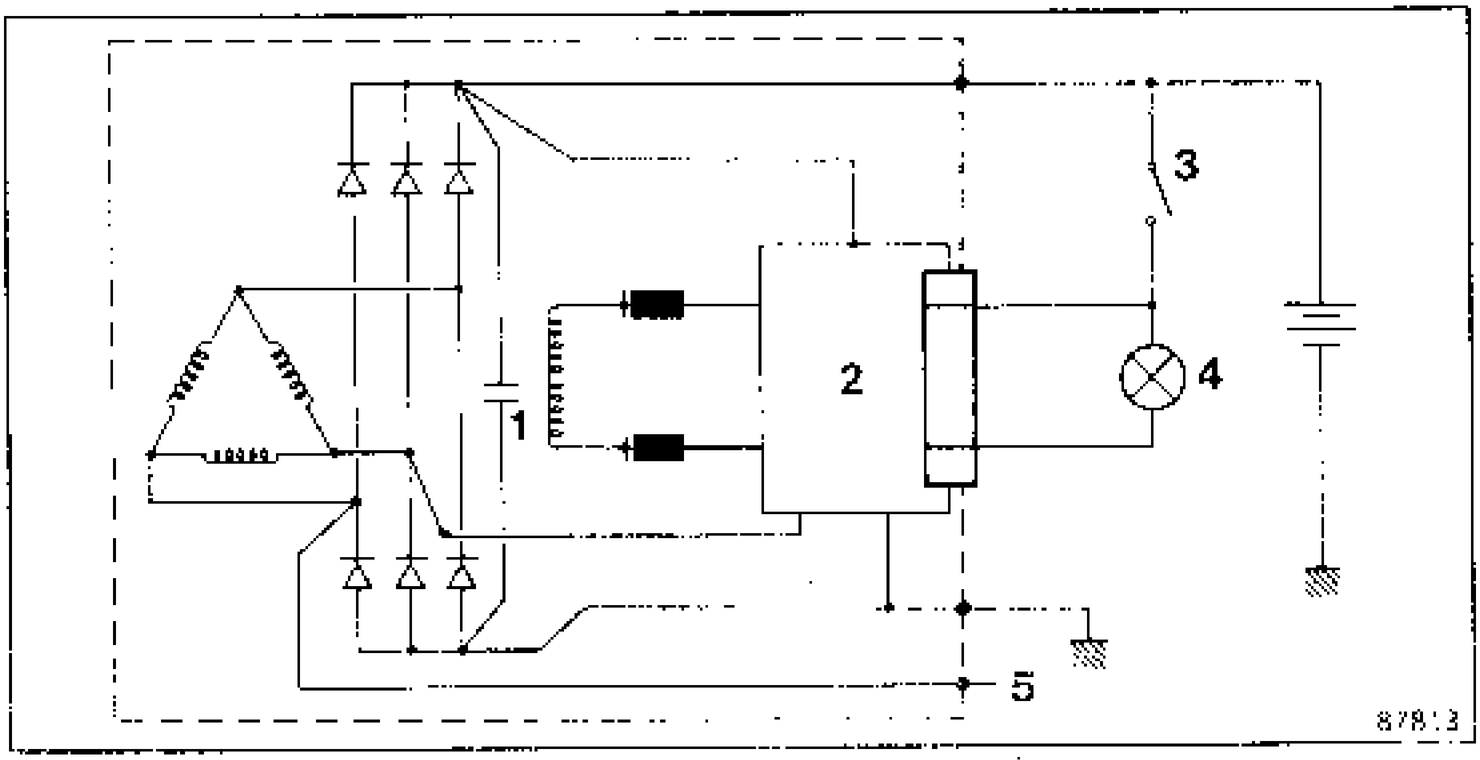
PARIS RHONE A 13 N 87 - A 13 N 88 - A 13 N 171
A 14 N 62 - A 14 N 60 - A 14 N 64

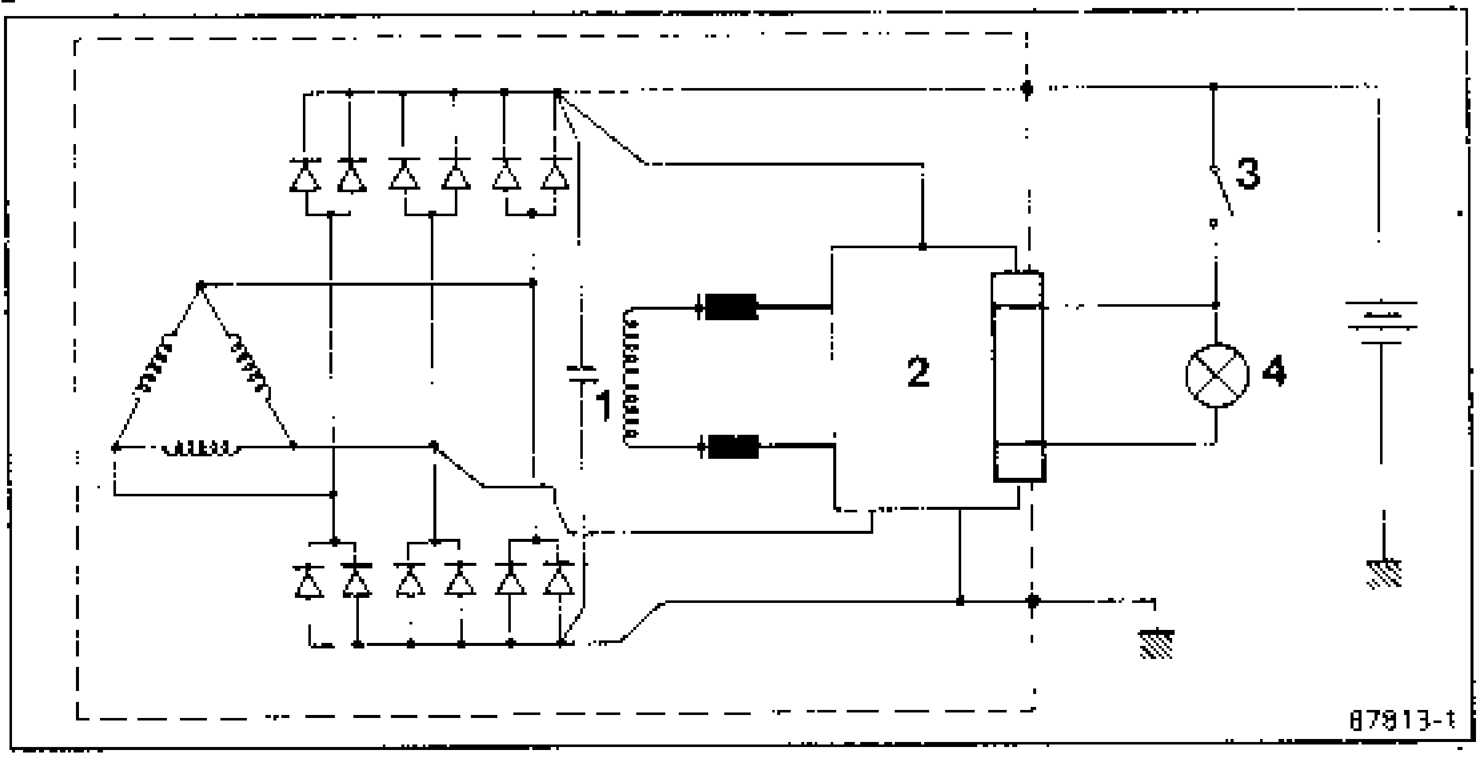


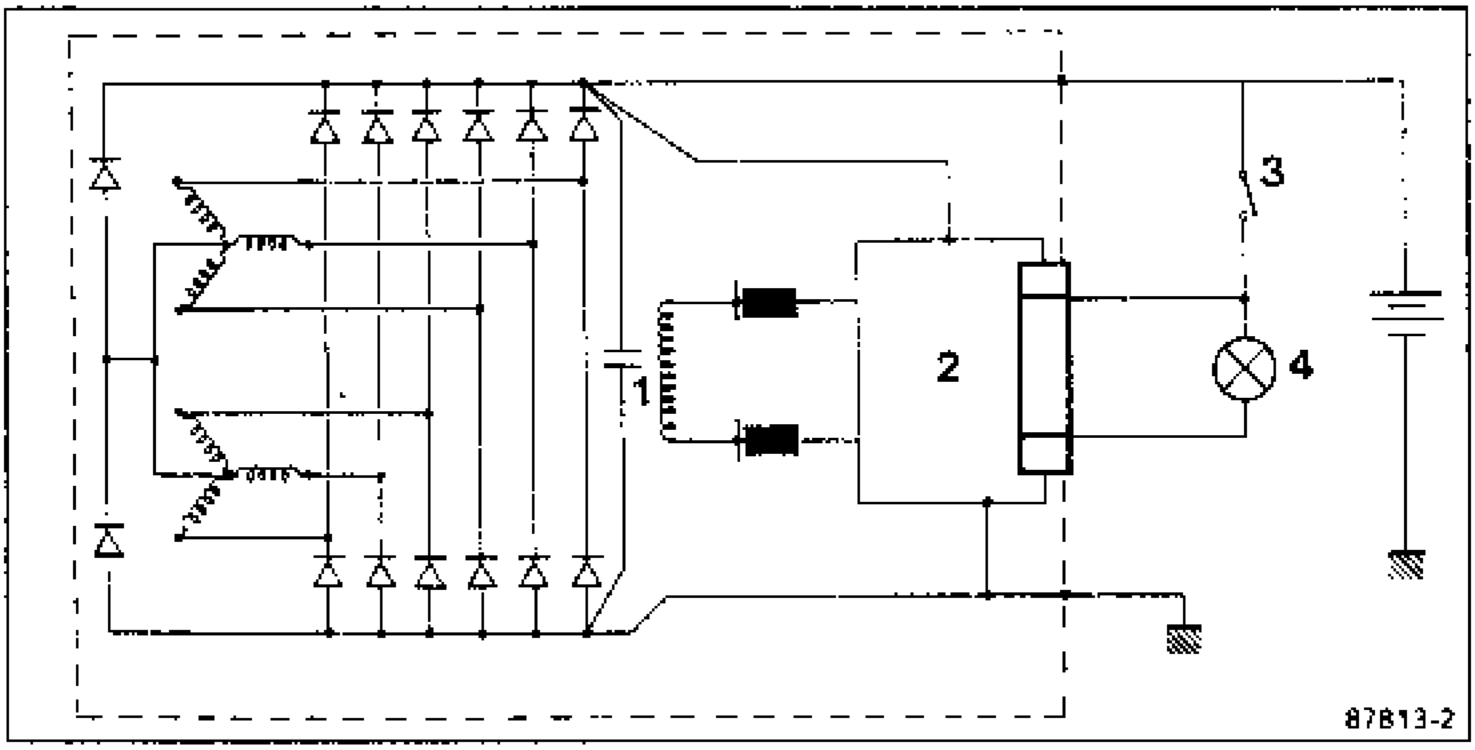
PARIS RHONE A 14 N 76 - A 14 N 75 - A 14 N 96 - A 14 N 73



OPERATING DIAGRAM







1 - Condenser 2,2 µF
2 - Regulator
3 - Ignition switch
4 - Warning light
5 - Diesel rev counter

OPERATION - FAULT-FINDING

These vehicles are fitted with alternators with a built-in regulator and a warning light on the dashboard, which operates as follows:

- when the ignition is switched on, the warning light illuminates;
- when the engine starts, the warning light goes out;
- if the warning light illuminates again while the engine is running, this indicates a charging fault.

FAULT-FINDING

The warning light does not illuminate when the ignition is switched on.

Check that the regulator connector is connected.

Check whether the bulb has blown (to do so, earth the **6.3 mm** connector pin; the bulb should illuminate).

- **The warning light illuminates while the engine is running:**

This indicates a charging fault, the origin of which may be:

- alternator belt broken, wiring open circuit;
- internal alternator damage (rotor, stator, diodes or brush);
- regulator fault;
- overcharging.

The customer complains that there is a charging fault and the warning light is working normally.

If the regulated voltage is below **13.5 V**, check the alternator. The fault may be due:

- to a faulty diode;
- to a broken circuit;
- to carbonisationor wear of the slip ring.

- **Checking the voltage**

Connect a voltmeter to the battery terminals and read off the battery voltage.

Start the engine and increase the speed until the voltmeter needle stabilises at the regulated voltage.

This voltage should be between **13.5 V** and **14.8 V**.

Connect the maximum number of consumer units: the regulated voltage should remain between **13.5 V** and **14.8 V**.

ATTENTION: When arc-welding is carriod out on the vehicle, the battery and the regulator must be disconnected.

REMOVING-REFITTING

REMOVING

Do not remove a belt using a screwdriver, since the belt is made of synthetic threads and is liable to be damaged

Disconnect:

- the battery;
- the electrical leads.

Unscrew screw **(B)** and remove the nut.

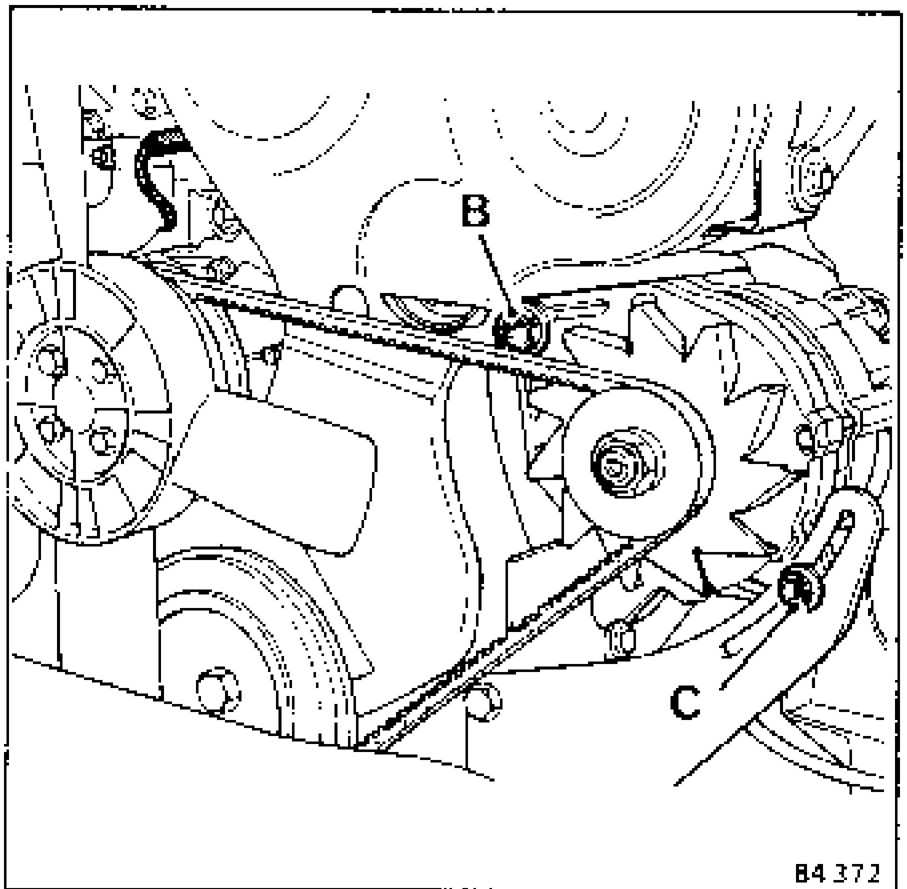
From above:

- remove the cover plate;
- remove the bolt **(C)**;
- remove the alternator fixing bolt **(B)**;
- remove the alternator.

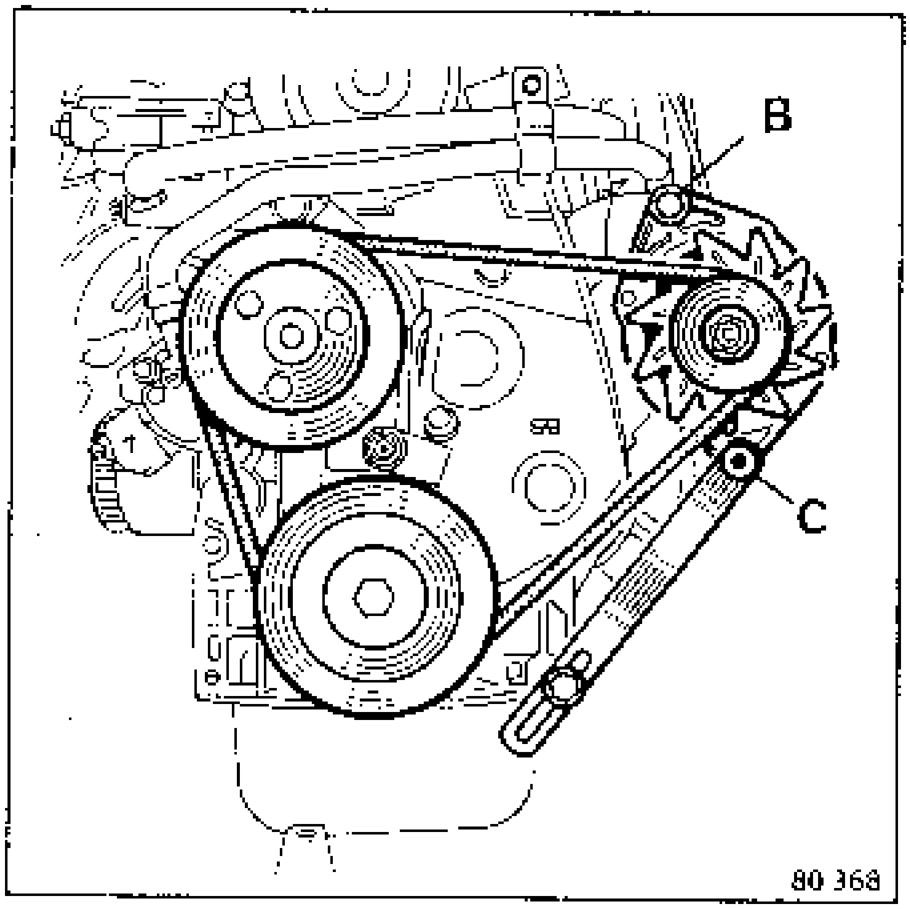
REFITTING

After having refitted the alternator, tighten the belt.

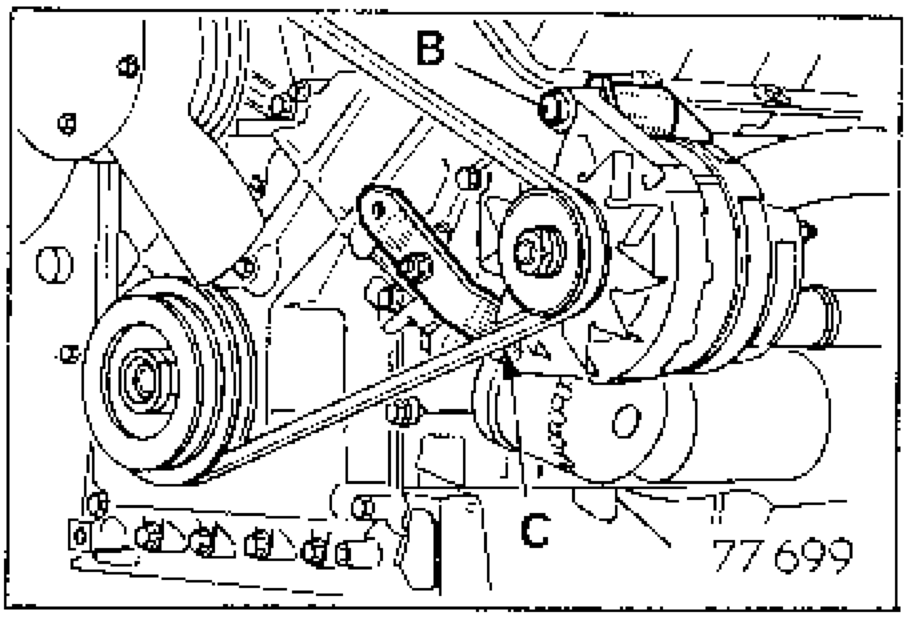
J8S engine



J petrol engine



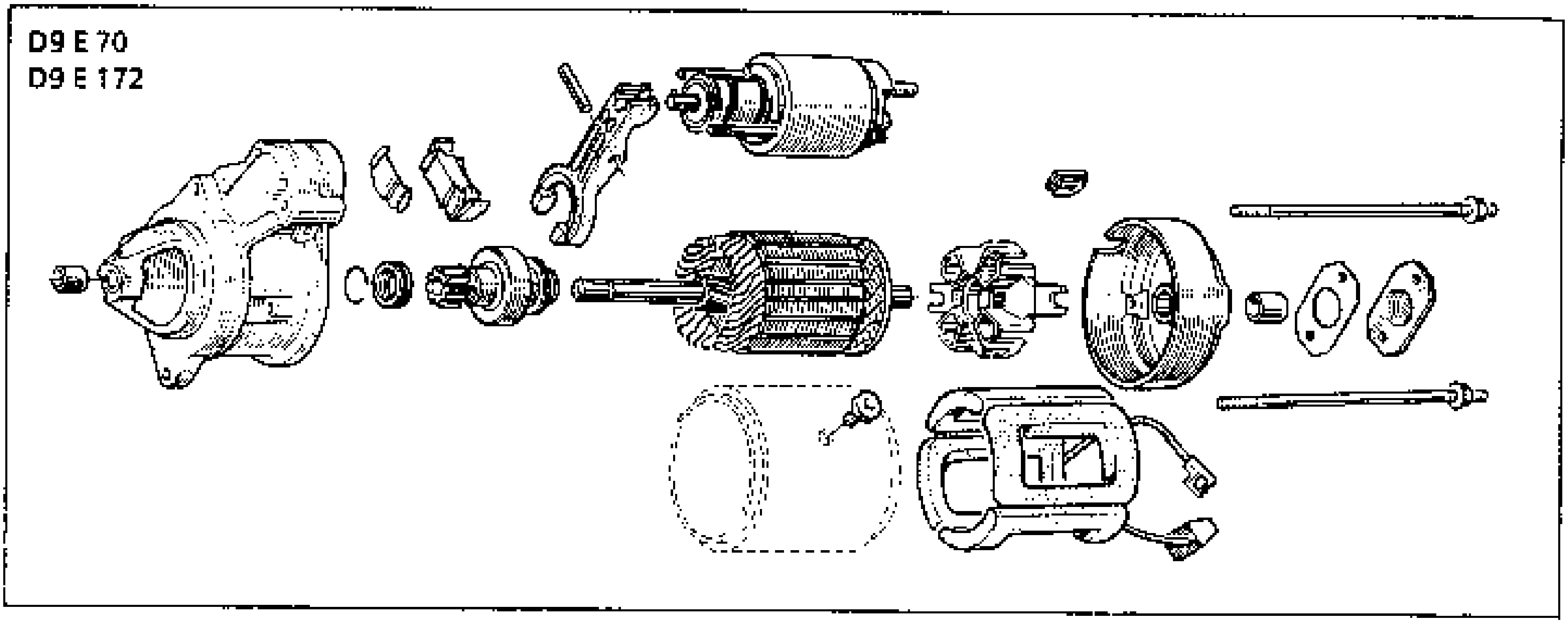
Z engine

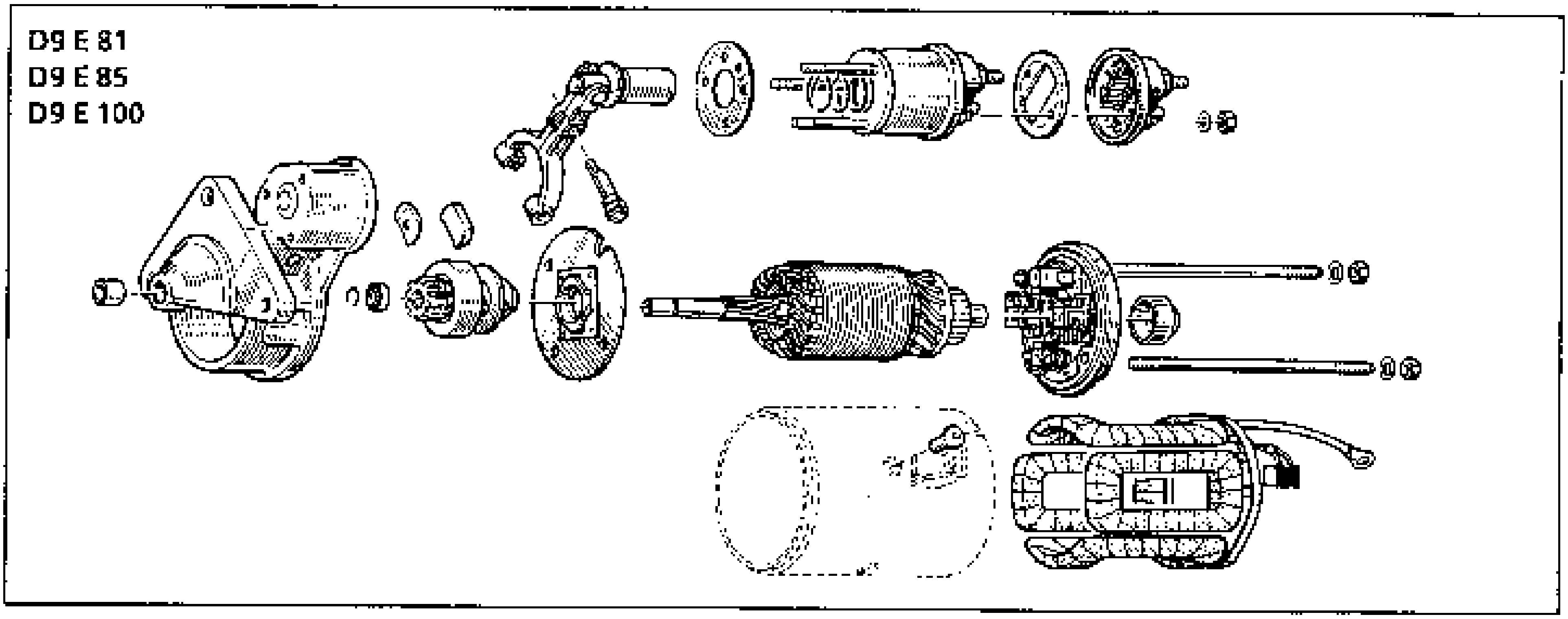


IDENTIFICATION

Vehicle	Engine	Starter		Torque (pinion locked)	Current (pinion locked)
B290 B296	J8S	PARIS RHONE VALEO	D 11 E 172 D 9 R 73	3 daNm 6 daNm	800 A 1350 A
B295 B298	Z7U Z7V	PARIS RHONE VALEO	D 9 E 81 D 9 E 100	0.8 daNm 1.1 daNm	400 A 600 A
B29E B29B	J7T	PARIS RHONE BOSCH	D 9 E 85 9 000 333 114	1.3 daNm 1.3 daNm	400 A 400 A
B297	J6R	PARIS RHONE PARIS RHONE BOSCH	D 9 E 70 D 9 E 85 9 000 333 114	0.8 daNm 1 3 daNm 1.3 daNm	400 A 400 A 400 A
B29H B292 B294	J7R	BOSCH	9 000 333 114	1.3 daNm	400 A
B29W	J8S	VALEO	D 9 R 73	6 daNm	1350 A
B293 B29A B29F B29G	Z7W Z7U	VALEO	D 9 E 100	1.1 daNm	600 A

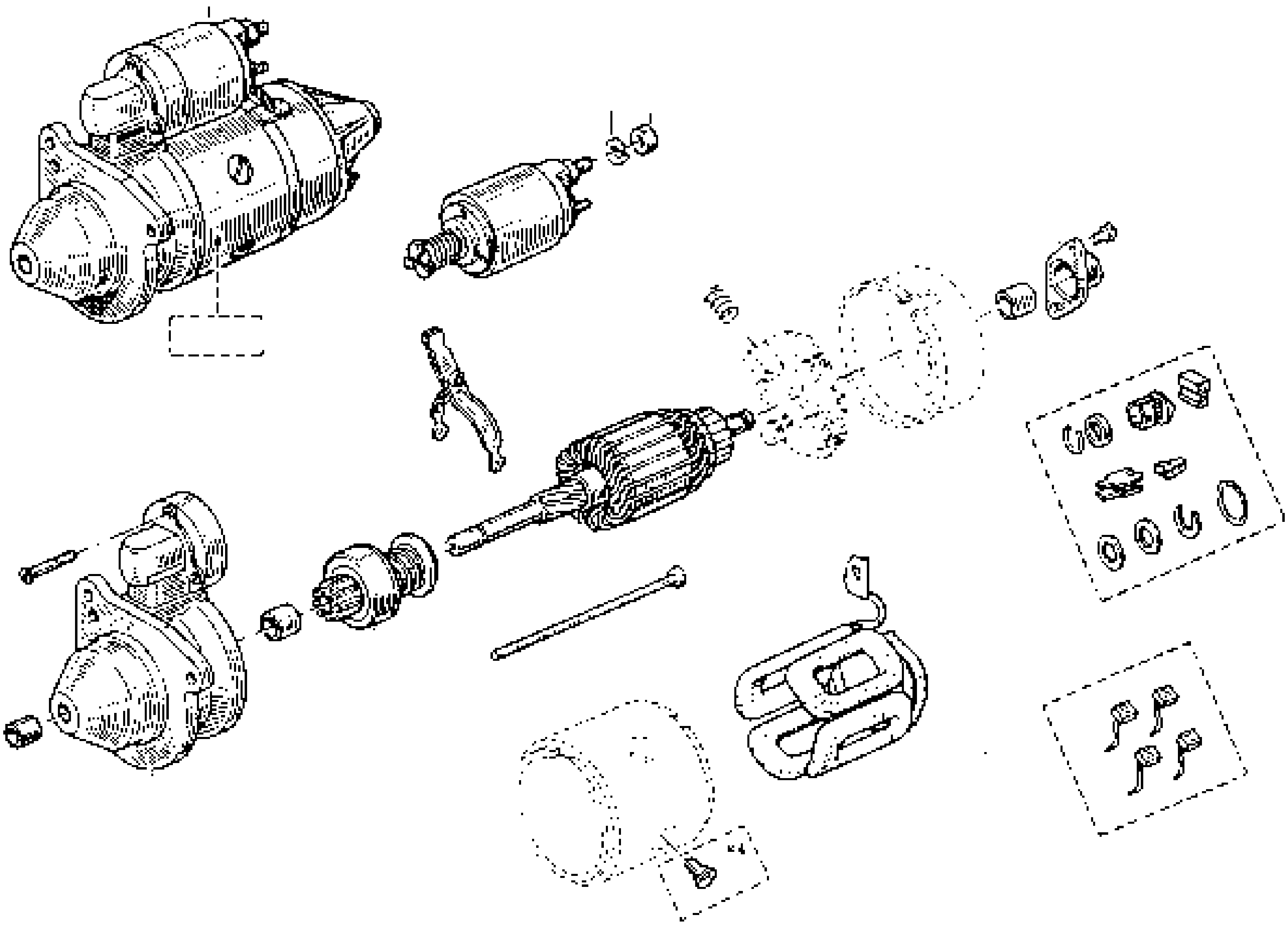
EXPLODED VIEW



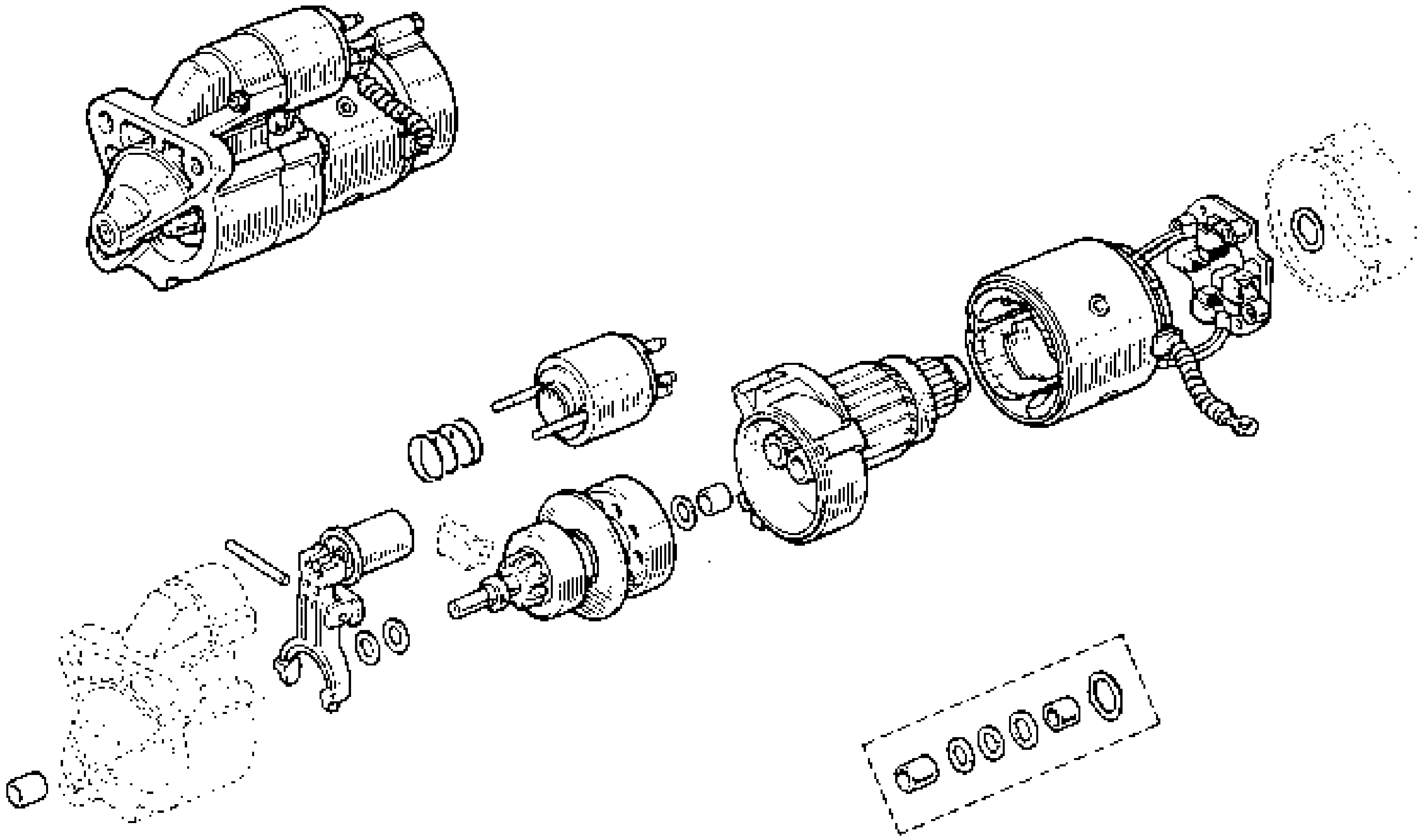


EXPLODED VIEW

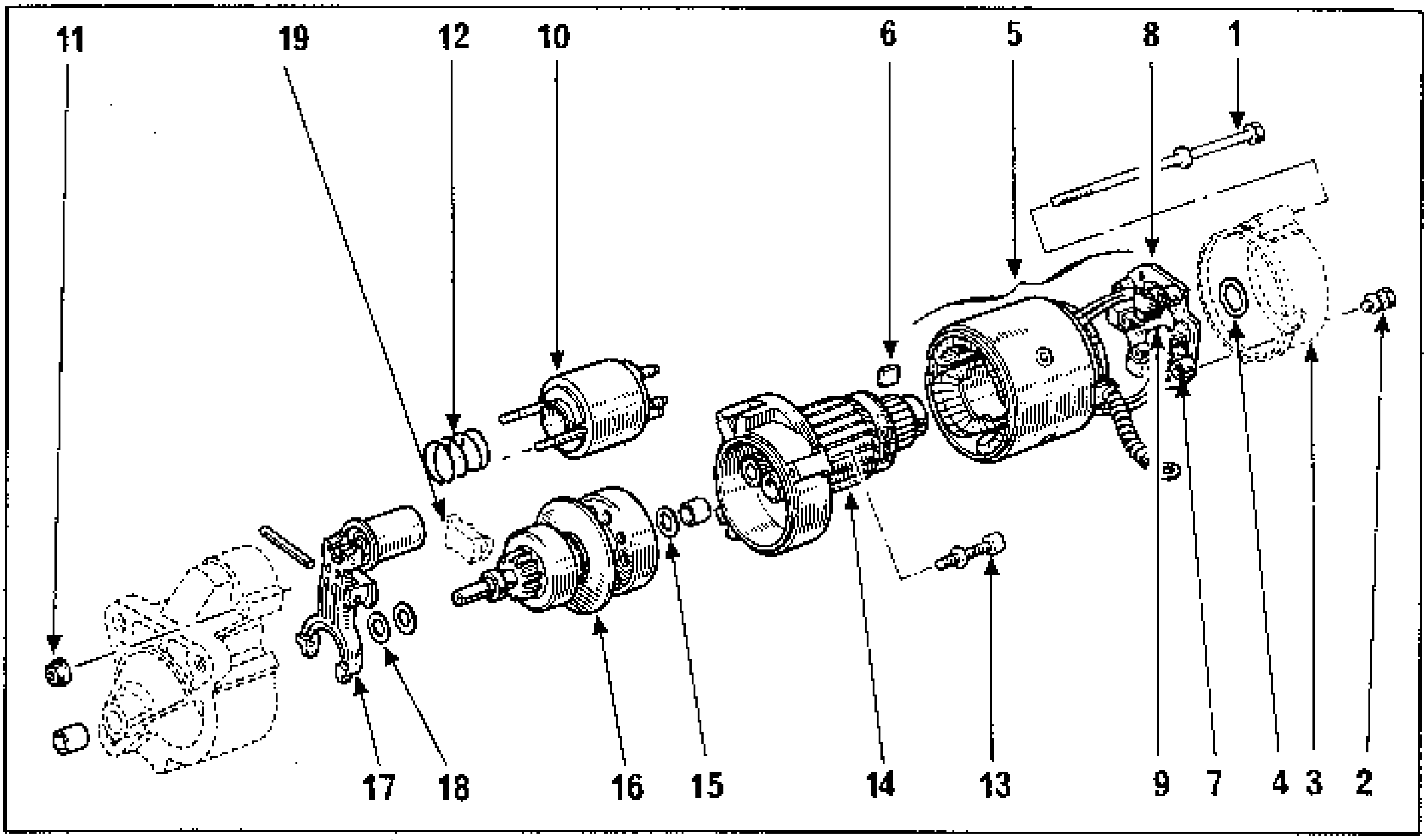
BOSCH 9 000 333 114



PARIS RHONE D 9 R 73



REPAIRING D 9 R 73



SPECIFICATION

- Reduced weight and bulk.
- Increased drive power.
- High armature speed (17,000 rpm).

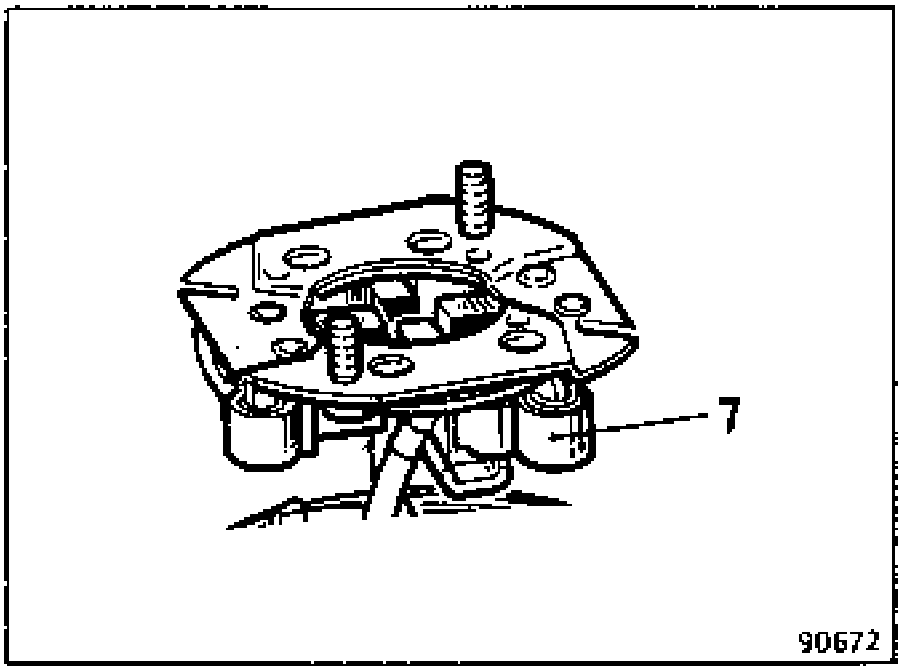
REMOVING

Remove:

- the assembly bolts (1);
- the brush holder fixing nuts (2);
- the housing (3);
- the washer (4);
- the starter field coil and brush holder assembly (5).

Remove the positioning plate (6).

ATTENTION:
You must not remove the brush springs (7). In fact, this type of starter has high-pressure brushes (force applied: 5.5 daNm) held by springs (7). Removing these could involve serious risks.



REPLACING THE BRUSHES

It is not possible to replace the brushes (9) alone.

Since the operating temperature around the brushes is important, the brushes must not be soldered.

As a result, the brushes are sold assembled on their plate (8) with the field coils.

REPAIRING D 9 R 73

Remove:

- the solenoid (10) using the nuts (11), with its spring (12);
- the reduction gear housing retaining bolt (13);
- the armature (14);
- the washer (15);
- the seal (19);
- the pinion assembly (16) and the control lever (17);
- The shim washers (18).

Special features

The armature and reduction gear housing assembly cannot be removed (pinion bonded to the armature).

The pinion and ring gear assembly cannot be removed (the ring gear is crimped on to the shaft).

REFITTING THE PINION ASSEMBLY

Refit the shim washers already removed .

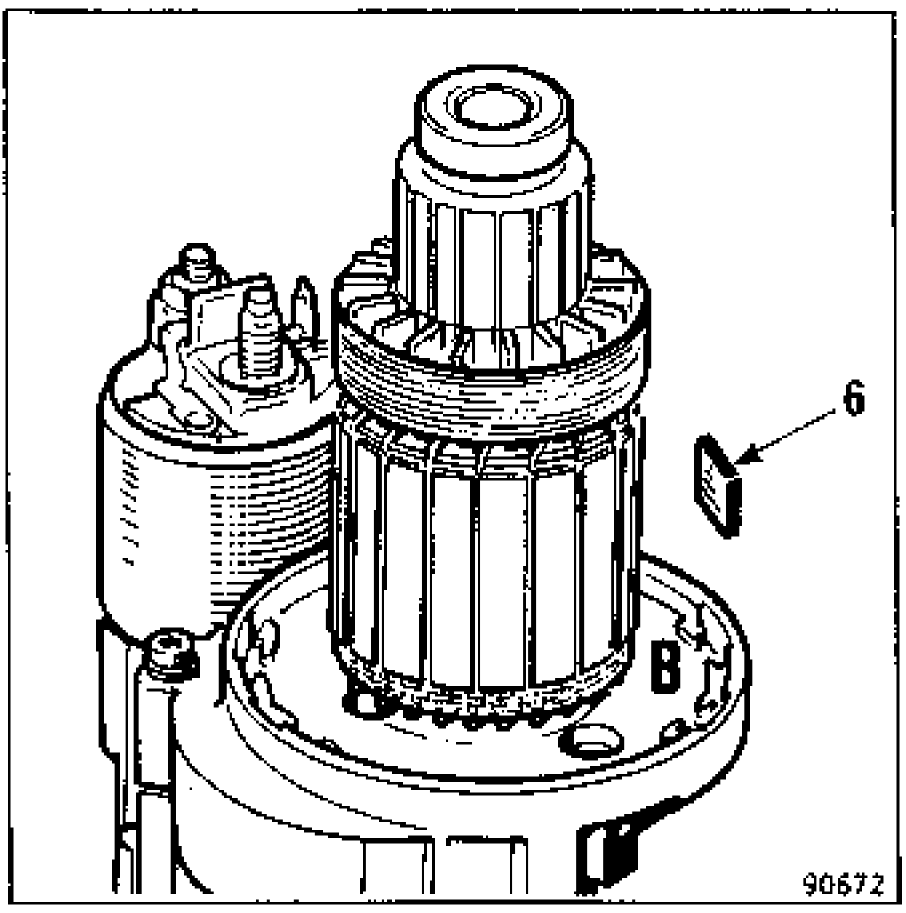
Lubricate the pinion assembly.

Refit in the same order as removing.

Special features

Refitting the field coil and the brushes.

Fit the positioning plate (6) at B.

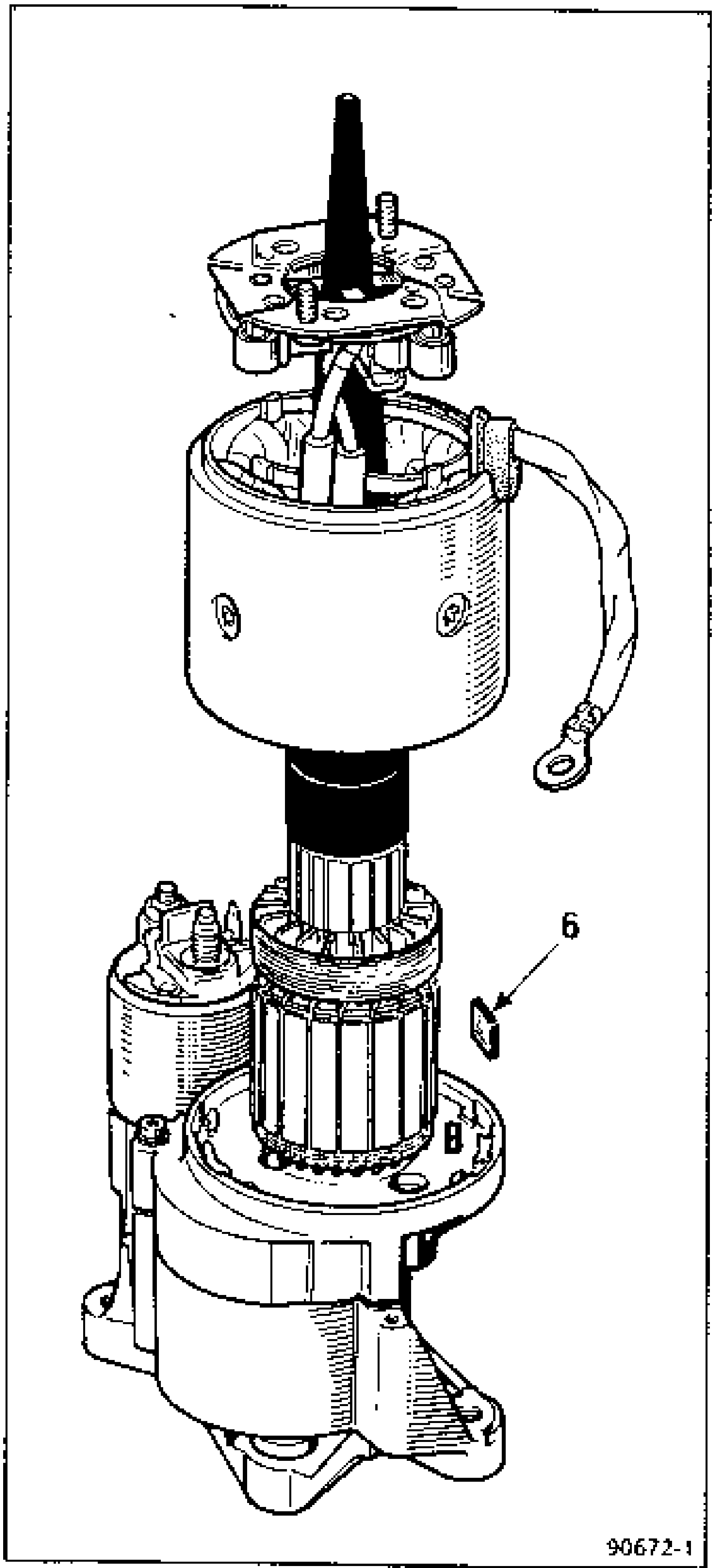


Position VALEO tool, part no. **182 144 M***, on the armature winding and place the field coil and brush carrier plate assembly on the tool. Slide it into place.

Position the field coil with respect to the positioning plate (6).

With the brushes in place, remove the tool.

(*) NOTE: Tool to be ordered from VALEO.



REMOVE-REFIT

PETROL ENGINE

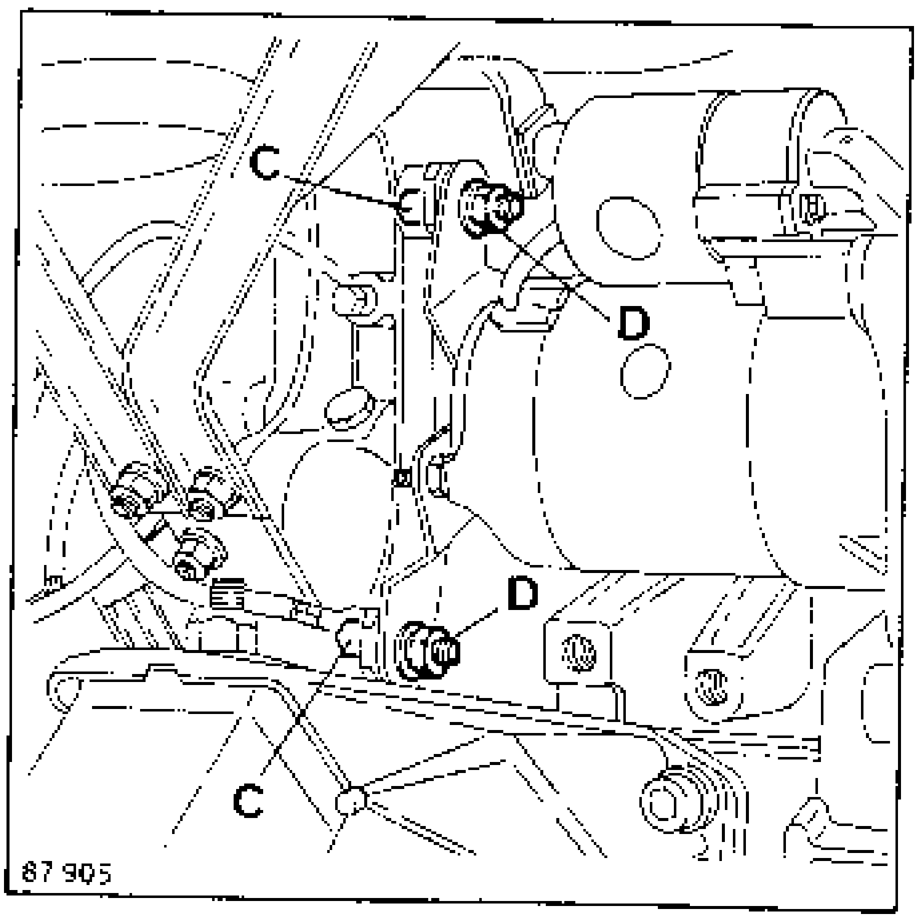
REMOVING

Disconnect the battery.

Disconnect the leads.

Remove:

- the two rear fixing bolts;
- the three fixing bolts on the clutch housing;
- the starter.



REFITTING

Special features

Fit and tighten the three bolts on the clutch housing.

Hand tighten the rear fixing bolts on the starter and on the crankcase.

Tighten the two bolts (C).

Tighten the two bolts (D).

DIESEL ENGINE

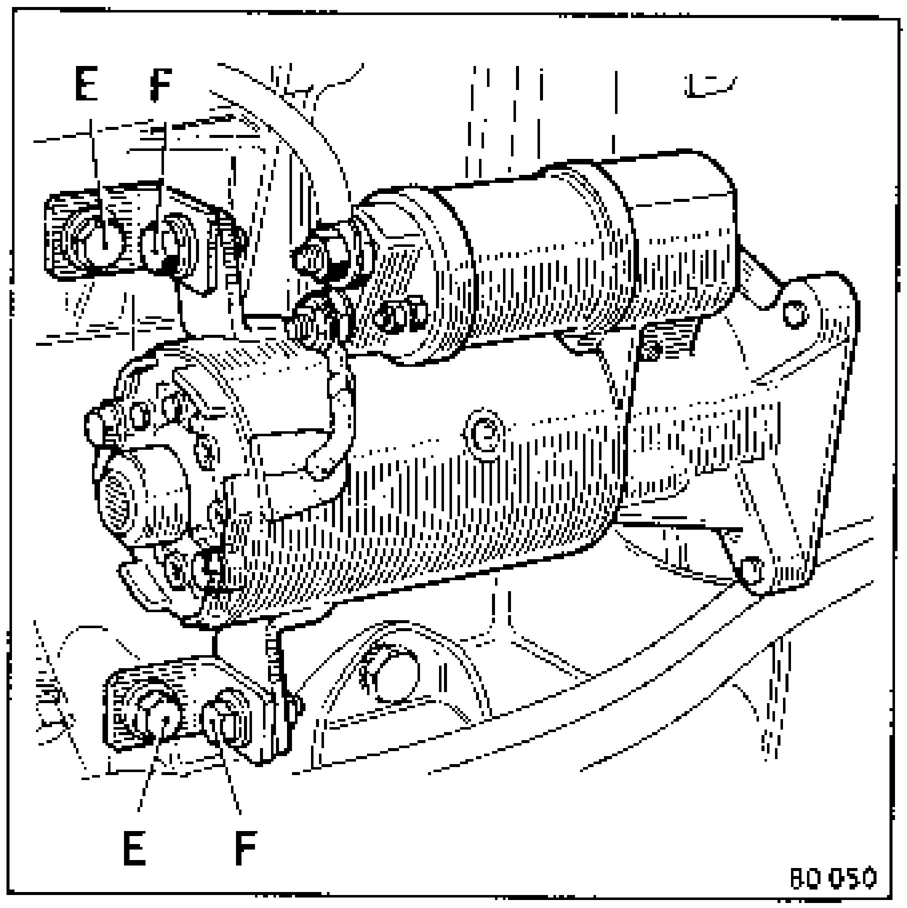
REMOVING

Disconnect the battery

Disconnect the leads.

Remove:

- the two rear fixing bolts;
- the three fixing bolts on the clutch housing;
- the starter.



REFITTING

Special features

Fit and tighten the three fixing bolts on the clutch housing.

Hand tighten the rear fixing bolts on the starter and the crankcase.

Tighten the two bolts (E).

Tighten the two bolts (F)

REMOVE-REFIT

REMOVING

Disconnect the battery.

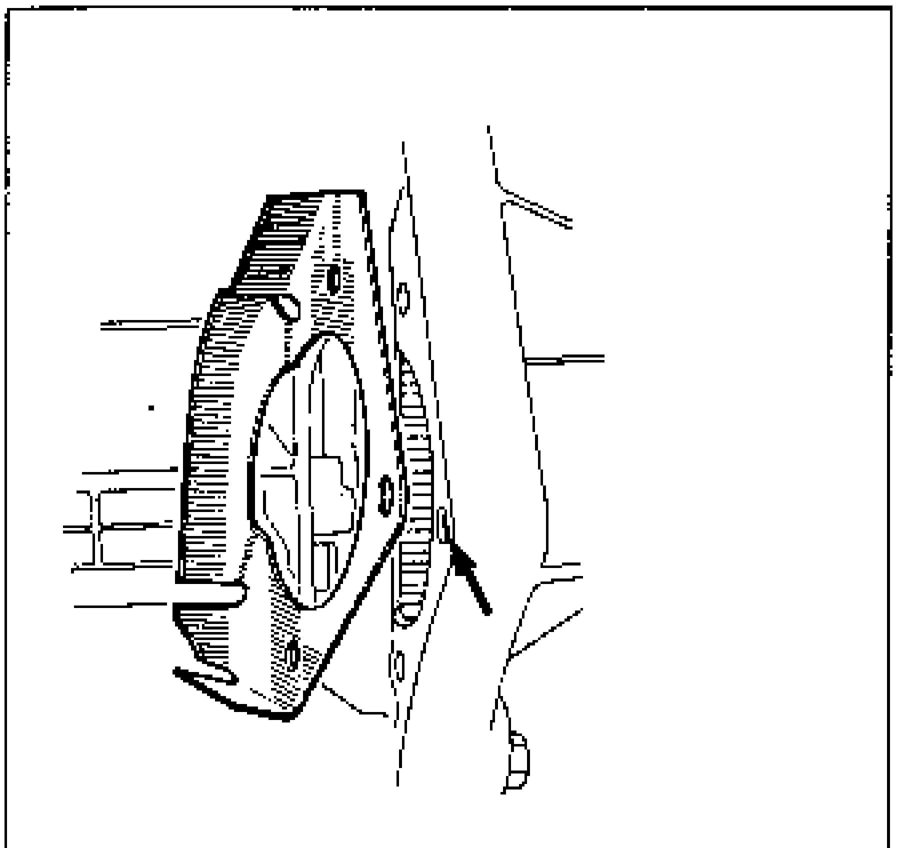
Remove the oil filter.

disconnect the leads.

Remove the three starter fixing bolts.

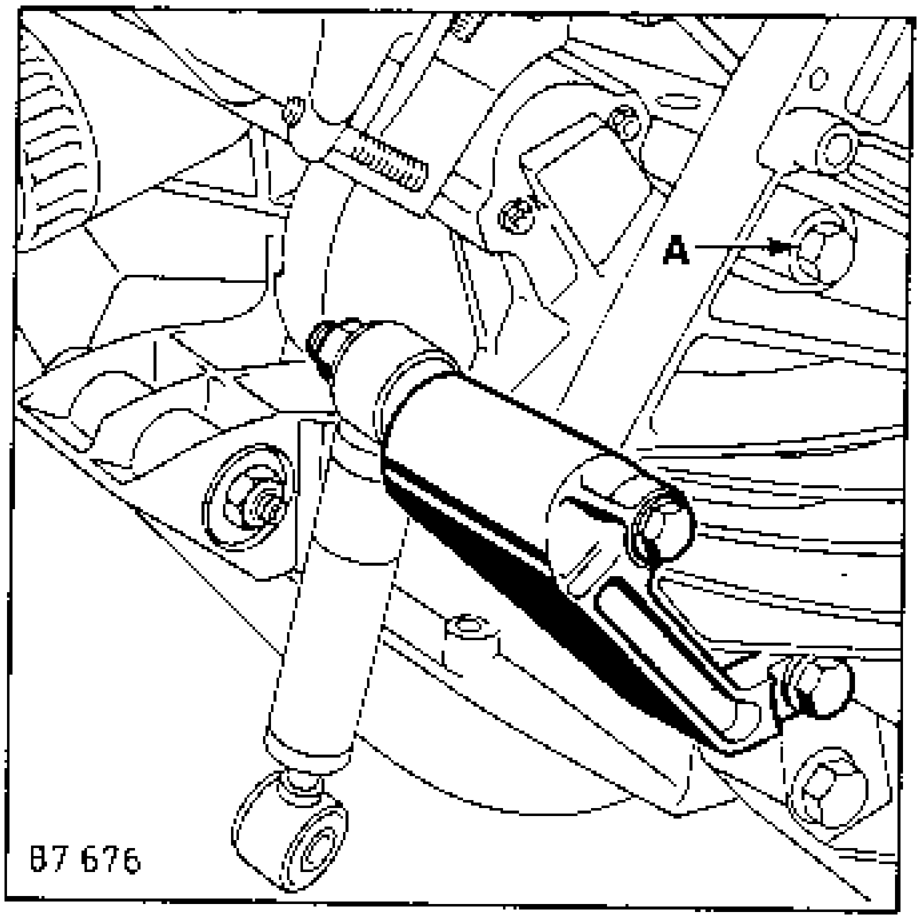
Take out the starter.

REFITTING


77701

Special features

Position the protective plate in the location on the clutch housing.



B7 676

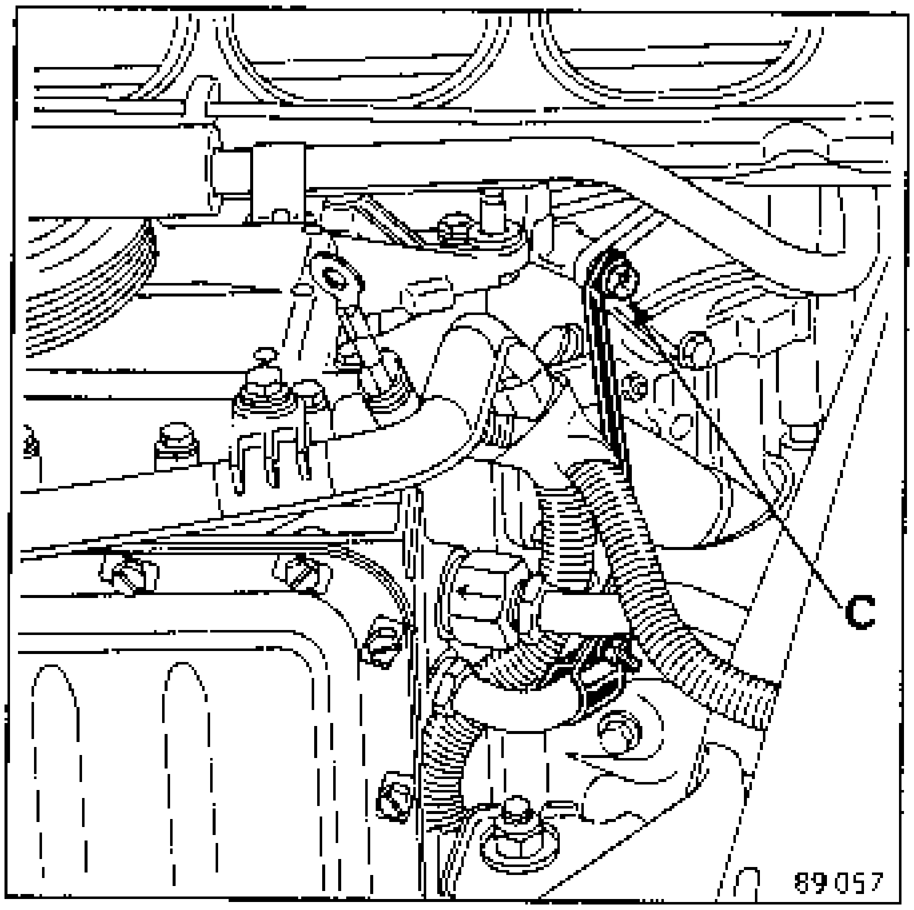
Fit and tighten the three fixing bolts on the clutch housing.

Screw (A) shorter.

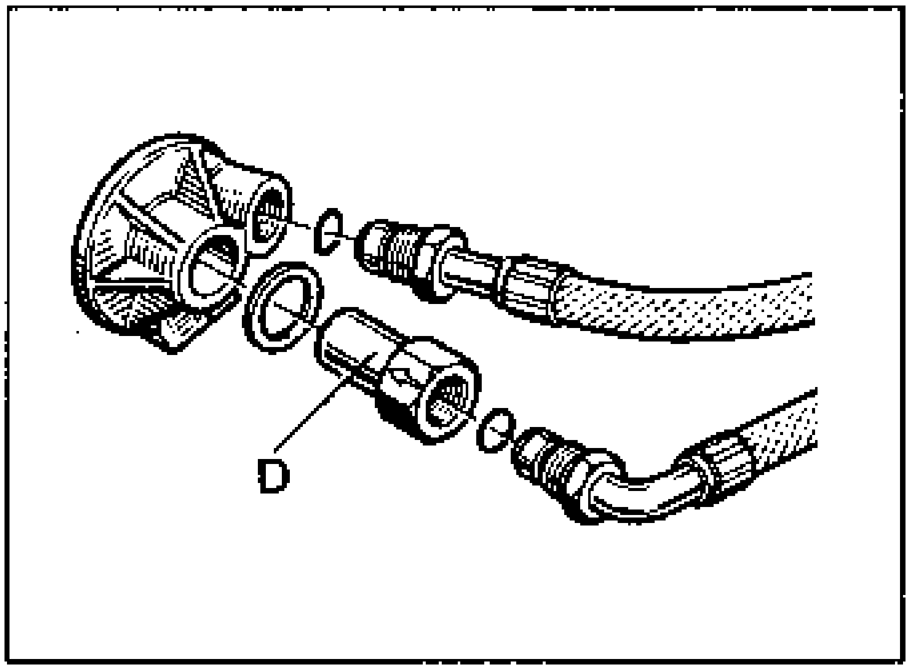
REMOVE-REFIT

Disconnect the battery.

- the fixing lug of the oil bypass piping to the modine at (C).



- The oil bypass plate to the engine block at (D).



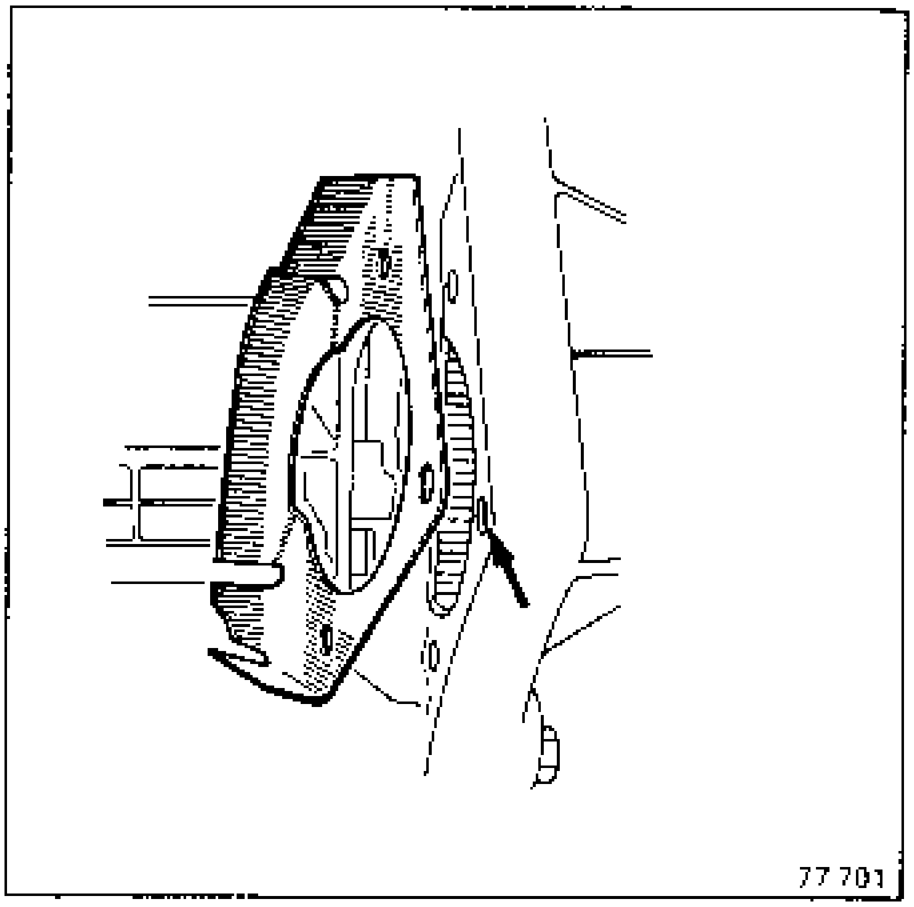
Disconnect the leads and release them.

Remove the three starter fixing bolts.

Loosen the front left-hand engine support bracket and raise the engine so that the starter can pass through.

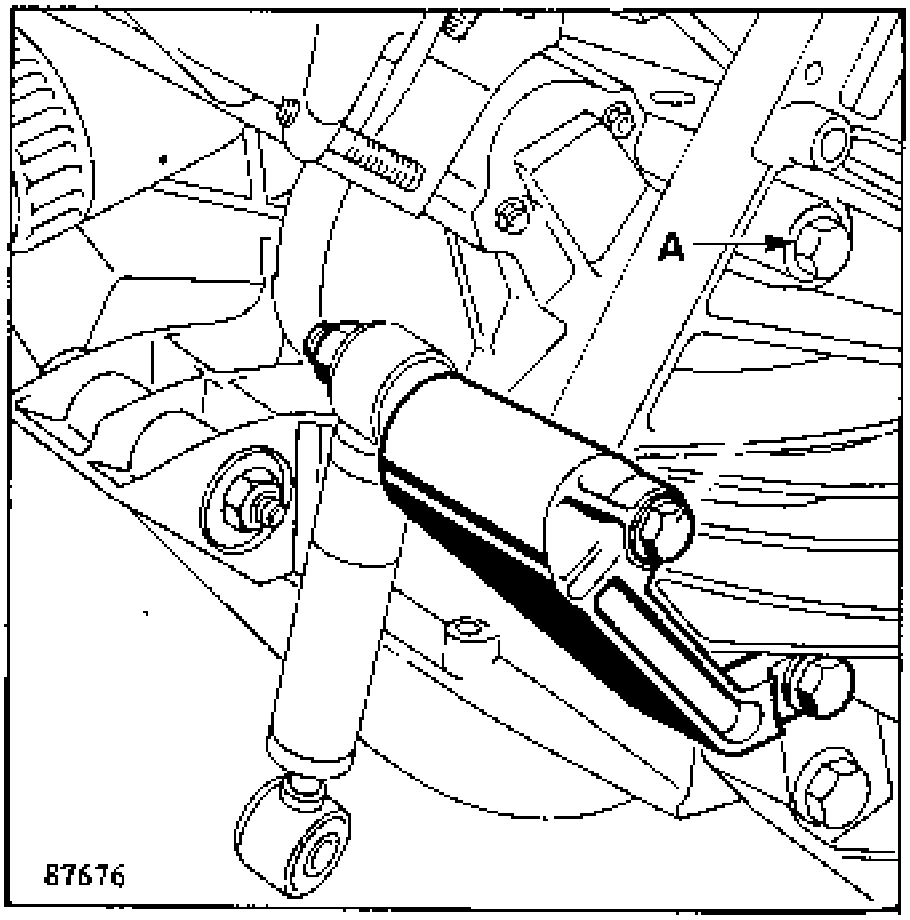
Take out the starter.

REFITTING



Special features

Position the protective plate in the location on the clutch housing.



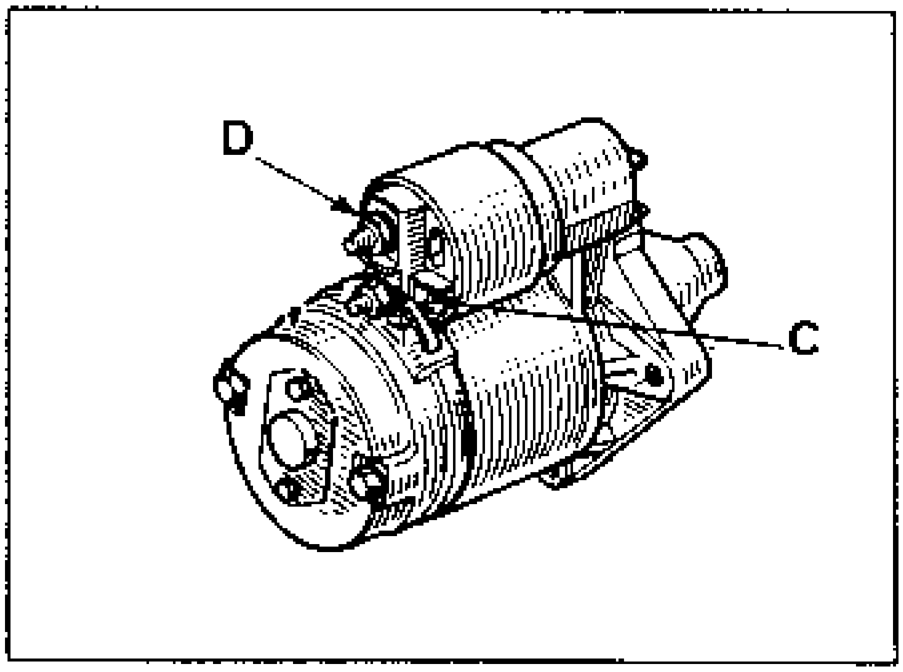
Fit the three fixing bolts to the housing (screw (A) the shortest).

REMOVE-REFIT

Connect starter terminals (C) and (D).

Refit the bracket.

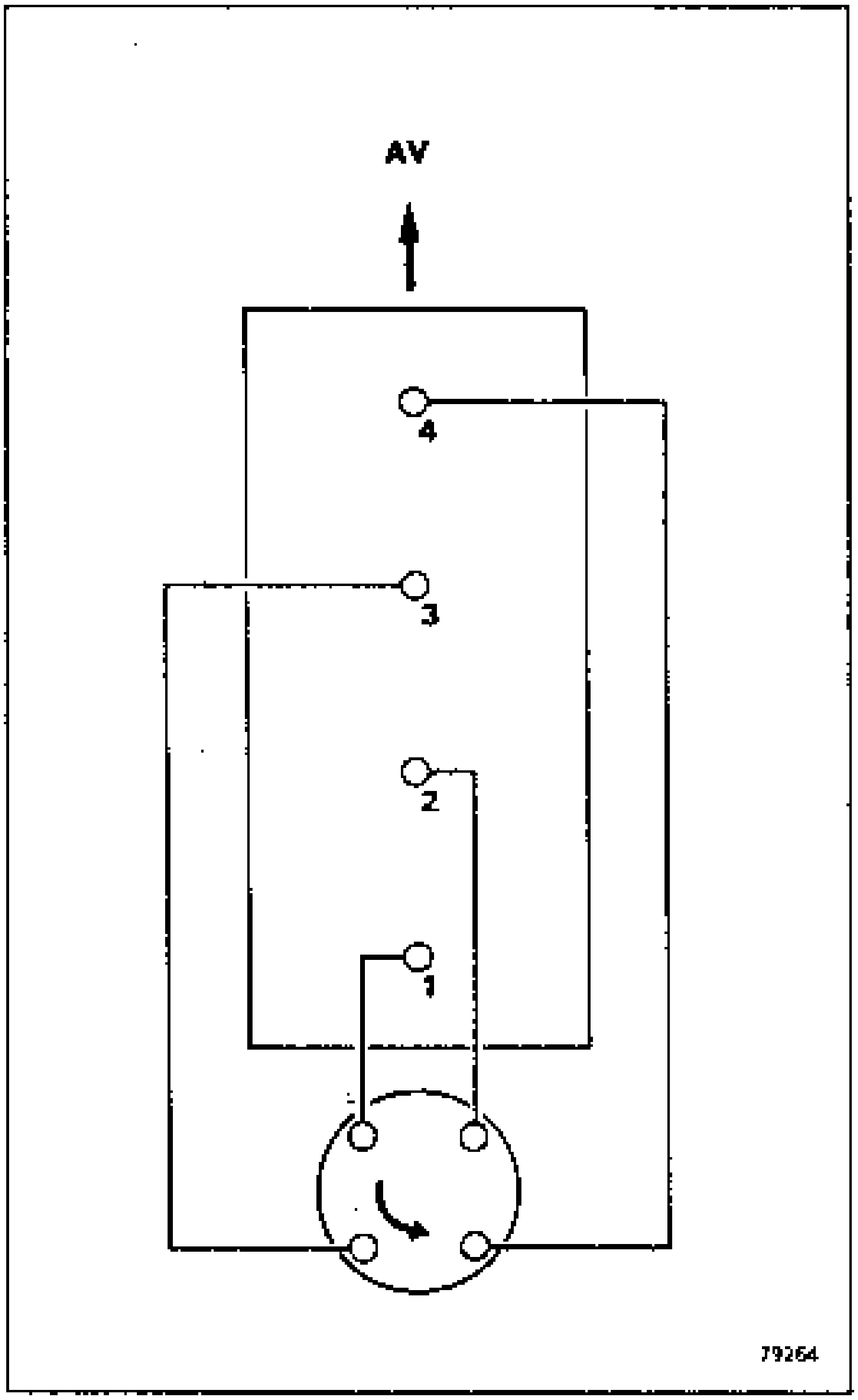
Check that the bracket is operating correctly and that it is well sealed.



Vehicle		Engine	Curves		Crankshaft position (degrees)
			Centrifugal	Vacuum	
B 298	Man.	Z7V 7 08	R 316	D 78	10° ± 1°
	Auto.	Z7V 7 09	R 316	D 78	10° ± 1°
	Auto.(Switzerland)	Z7V 7 11	R 329	J 11	5° ± 2°
B 29A		Z7W 702	0237402017		10° ± 1°

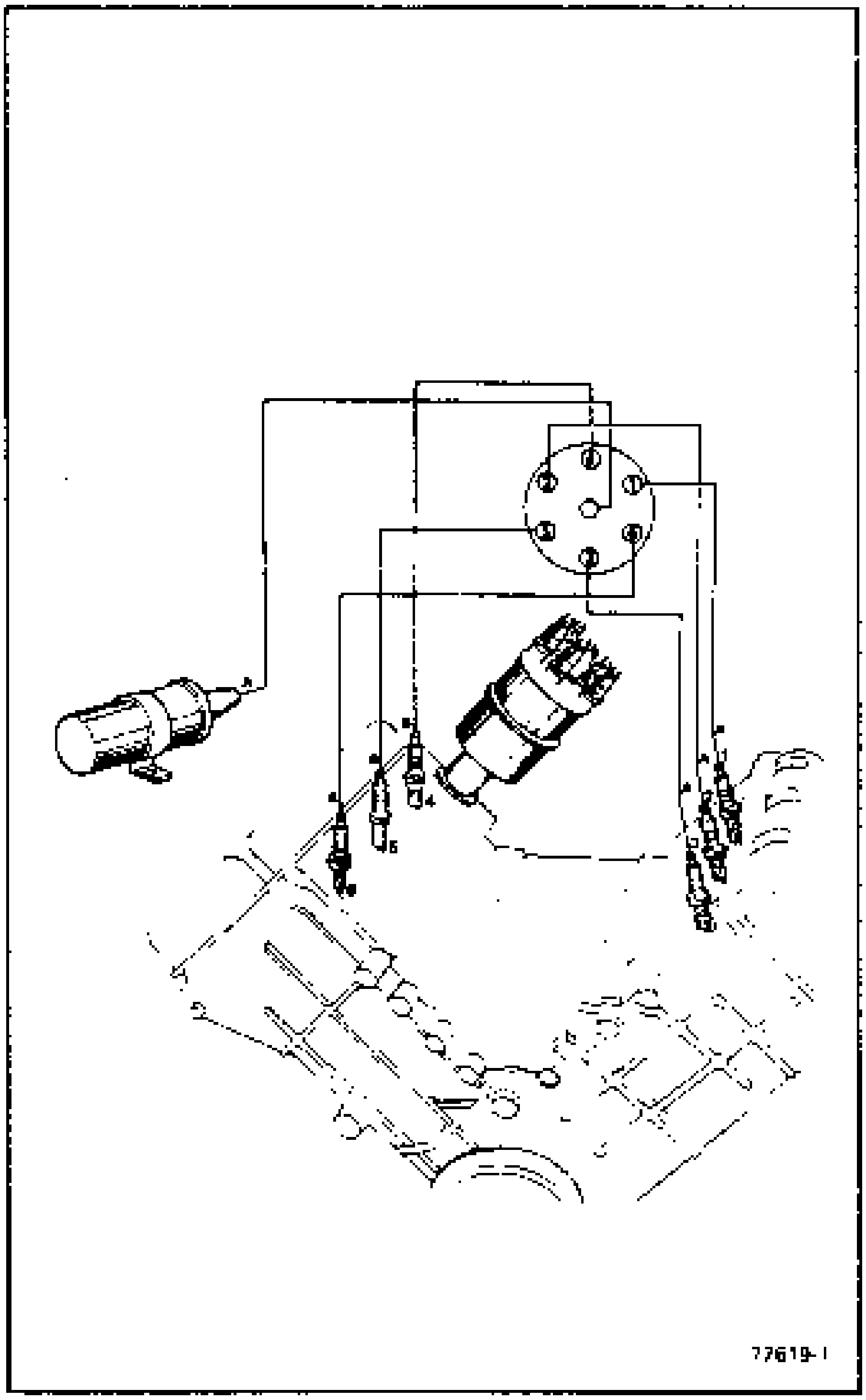
Vehicle	Engine	Curve	Housing type
B 297Switzerland	J6R 760	RE 020 / RE 220	D - F
B 297	J6R 706 / J6R 707	RE 291 / RE 243 / RE 276	E - F
B 297 DAI	J6R 762 / J6R 763	RE 201 / RE 001	F
B29B	J7T 708	RE 239	F

J Engine



Firing order: 1 - 3 - 4 - 2.

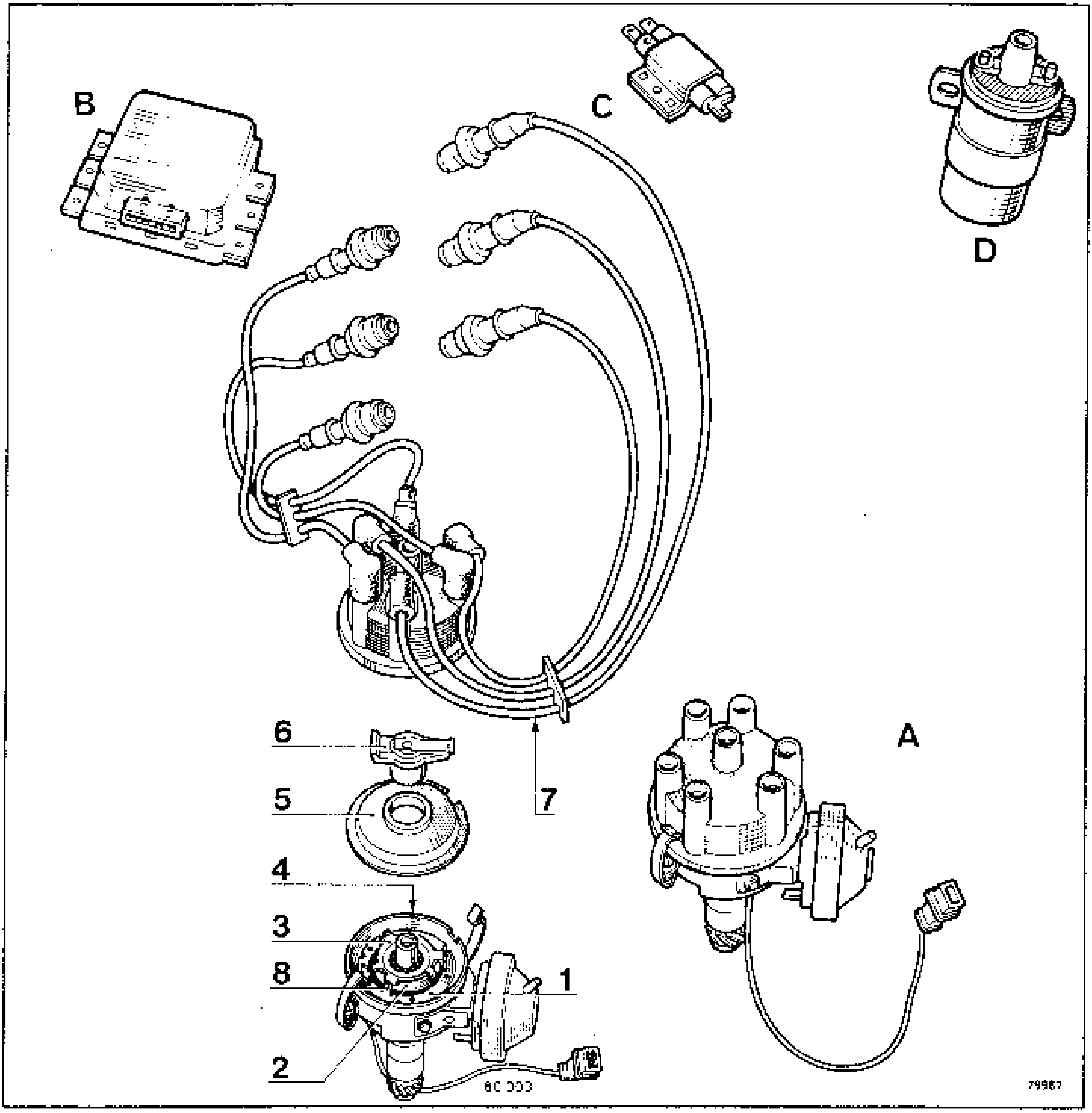
Z Engine



Firing order: 1 - 6 - 3 - 5 - 2 - 4.

COMPONENTS

The ignition system comprises a distributor with an inductive sensor (A), an electronic module (B) , a conventionally designed coil with particular specifications (D), and two resistors (C).



1 -	Permanent magnet	5 -	Seal
2 -	Coil	6 -	Distributor rotor
3 -	Rotor	7 -	Ignition harness
4 -	Cylinder N° 1 firing position mark	8 -	Ignition triggers (replacing conventional contacts)

The contact breaker has been replaced by a pulse generator which comprises:

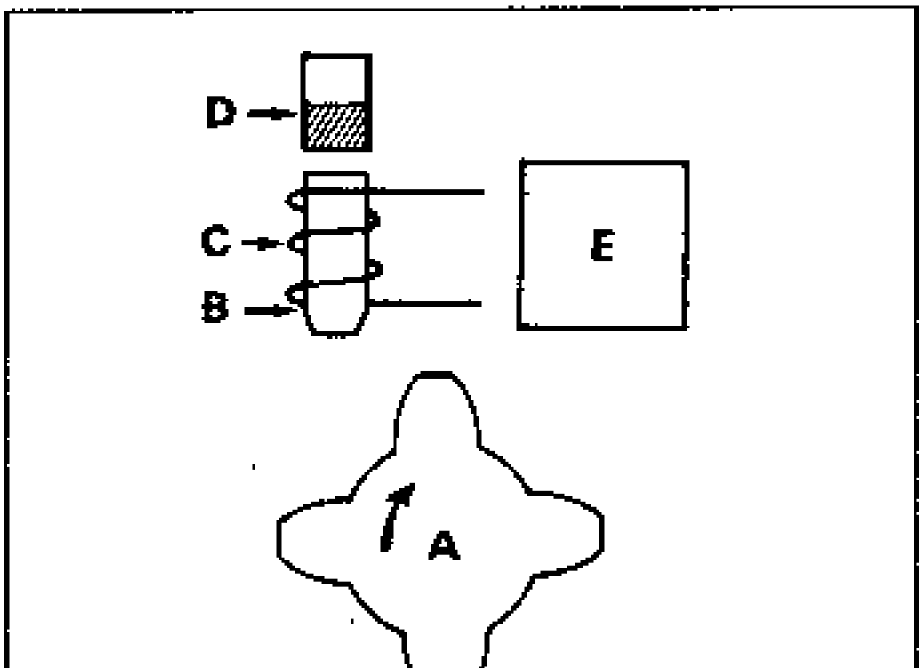
A - A steel rotor which has one blade per cylinder (6 in the RENAULT 25)

B - A magnetic core

C - A detector coil

D - A permanent magnet

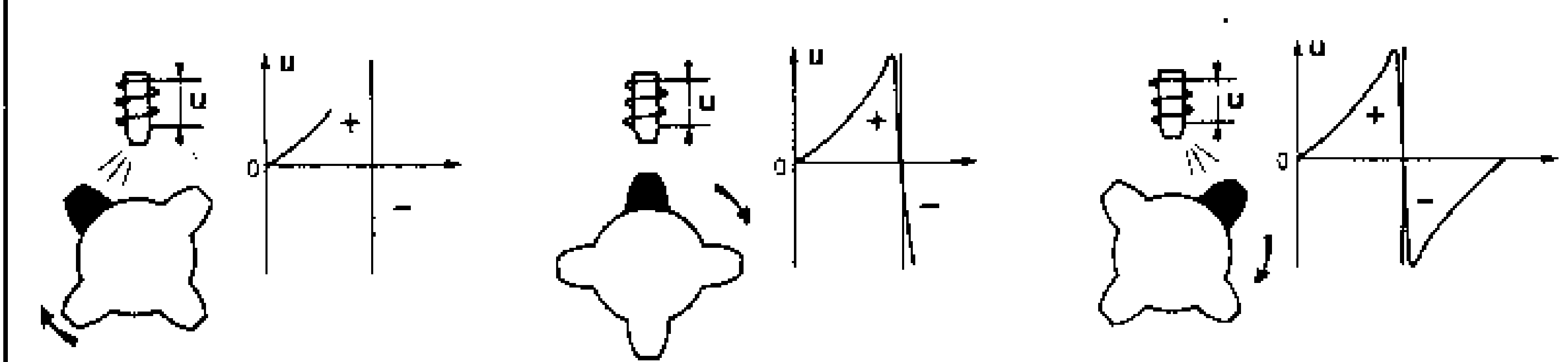
E - An electronic module



80017-1

PRINCIPLE OF OPERATION

The rotation of the rotor creates periodic variation of the air gap and therefore a variation in the magnetic flux. This then generates alternating control voltage in the detector coil.



80018-1

1) A rotor blade comes near the detector coil.

The control voltage increases more rapidly.

2) The rotor blade is immediately in front of the detector coil.

The control voltage reaches its maximum positive level.

3) The rotor blade moves away from the detector coil.

The control voltage suddenly changes direction and reaches its maximum negative level.

The control voltage generated in this way is transmitted to the electronic module which;

- interprets the signal received;
- produces a control current;
- immediately cuts off this current, to obtain high voltage at the coil output.

The high voltage is distributed to the spark plugs by the rotor (or distributor), as in a distributor with a contact breaker.

PRECAUTIONS

- **Never disconnect the high-voltage lead while the engine is running.**
- **Any high-voltage lead disconnected while checking an engine function must be earthed.**

If these precautions are not taken, the transistorised ignition system may be damaged.

FAULT-FINDING

The ignition system may be examined for one of two reasons:

1) The vehicle will not start

a) Checking test

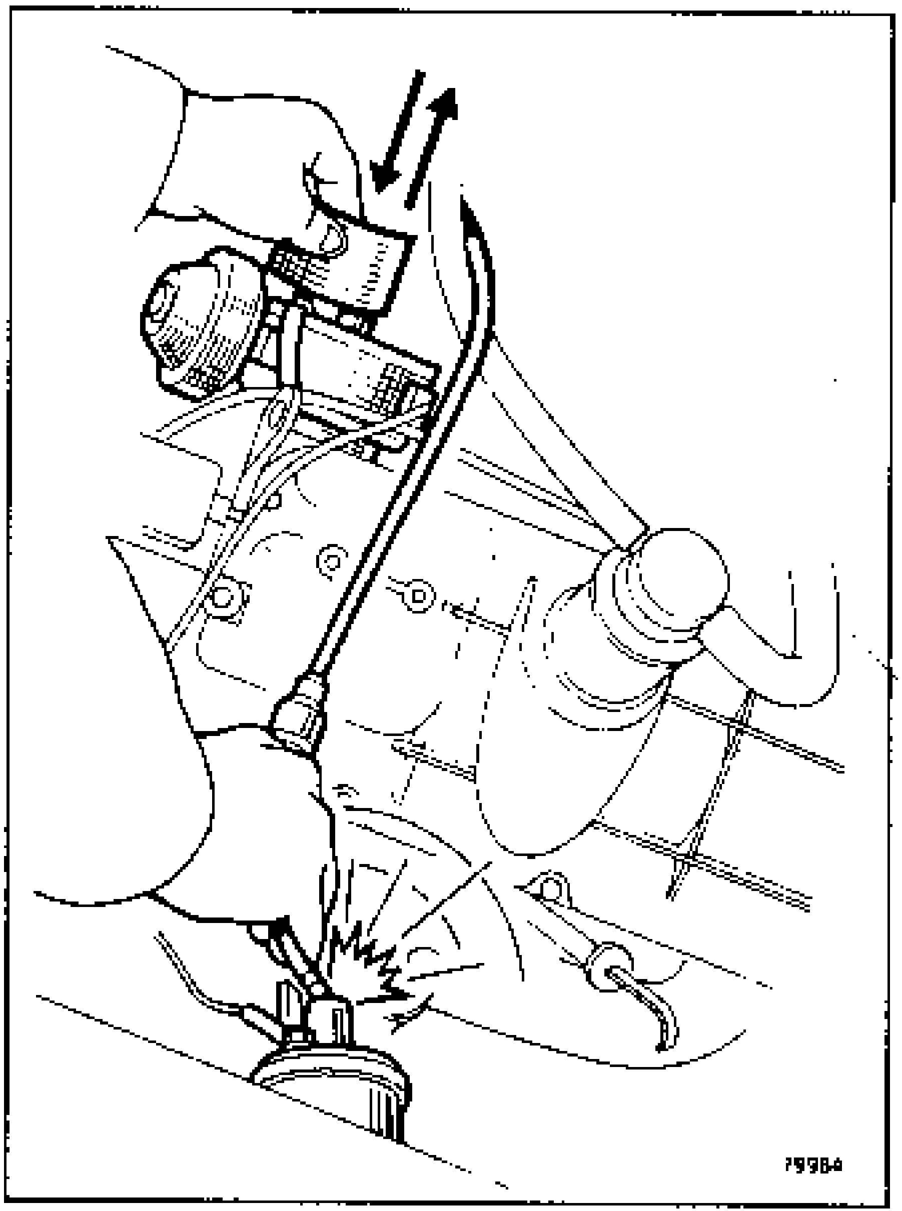
Switch on the ignition

Remove the distributor cap.

Disconnect the coil lead on the distributor and earth it.

Disconnect the output lead from the coil and hold it very close to the coil tower.

Quickly move a magnet towards the distributor winding: this should produce an electric arc to the coil tower.



If there is no electric arc, check the system components.

b) Checking the components

Checking the resistors:
Connect an ohmmeter to the terminals of the 2 resistors; there should be current flow (resistance 1 Ω).

Checking the coil

Primary circuit:
Connect the ohmmeter to the + battery and contact breaker connections. Current should flow.

Secondary circuit:
Connect the ohmmeter to the + battery and the high-voltage output. Current should flow.
(Warning! These resistances are very high)

Checking the distributor

Connect the ohmmeter to the connector terminals. Current should flow.
Connect the ohmmeter to one of the two connector terminals and to the distributor body. Current should not flow. If it does, there is a current leakage.

ATTENTION

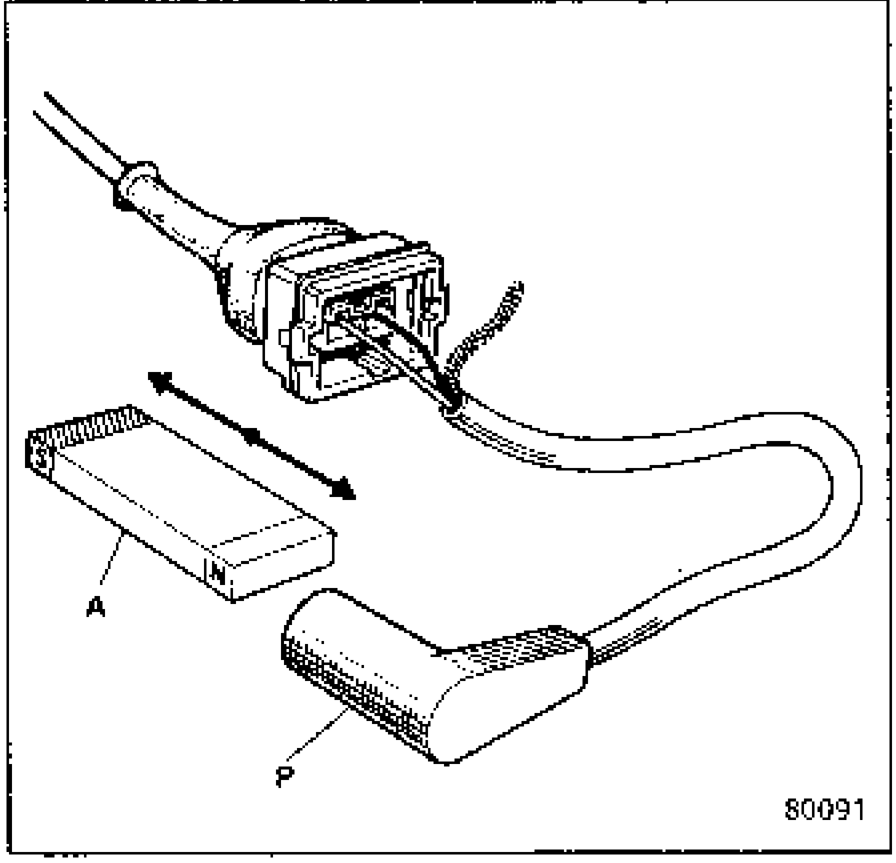
Do not use a test lamp to check the distributor winding; the current would be too great.

FAULT-FINDING (continued)

c) Confirming a distributor fault

If the distributor is in question, the following check may be carried out:

- Disconnect the connector from the distributor and connect the 2 leads of a "TDC sensor" to the connecting pins on the electronic module connector.



- Quickly move a magnet (**A**) towards the TDC sensor (**P**). This should produce an electric arc in the coil tower. If it does, the distributor should be replaced or repaired.

2) The vehicle demonstrates ignition faults during operation.

If the ignition misfires while the engine is running, do not replace the electronic module until the following have been checked:

- the spark plugs;
- the high-voltage leads;
- the location of the spark plug caps;
- the distributor;
- the coil.

Checking the curves using an oscilloscope.

The control curve cannot be checked using an oscilloscope and this voltage cannot be adjusted.

The high-voltage curve can only be checked in the same way as a conventional distributor with contact breaker.

Connecting to the diagnostic bay

The connection is the same as for conventional ignition:
simply connect the diagnostic socket.

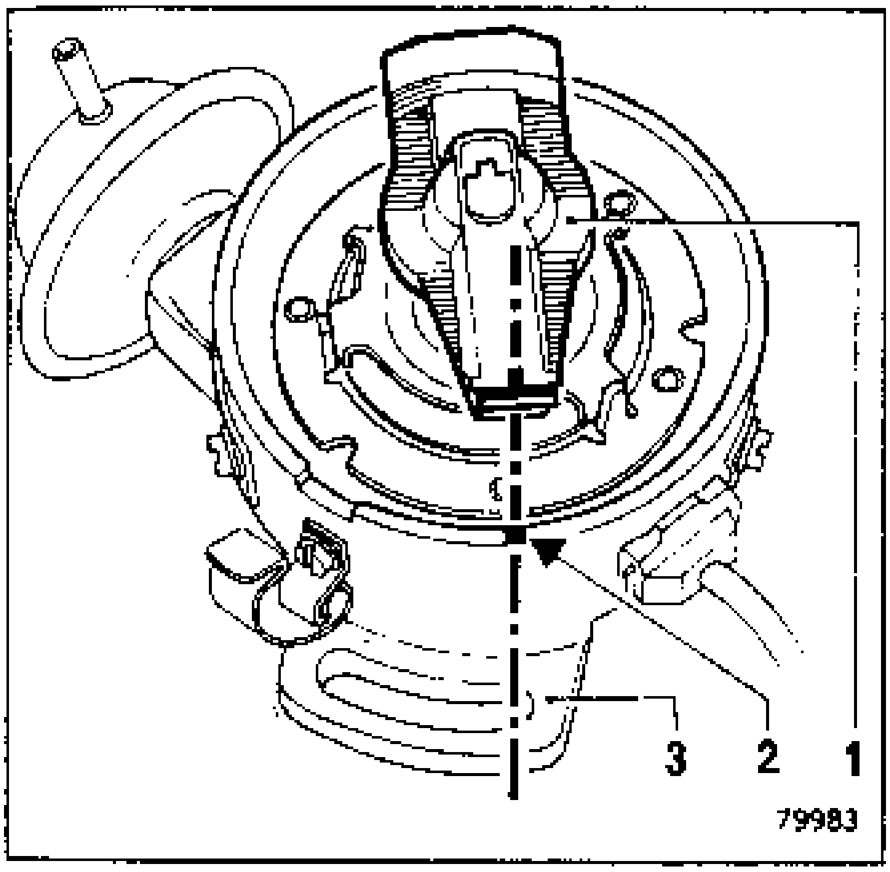
The dwell percentage cannot be read off or adjusted.

REMOVING

Before removing the distributor, locate:

- the position of the distributor body with respect to the cylinder head;
- the position of the distributor rotor with respect to the cylinder head.

This will make refitting easier and avoid the need for repositioning.



Disconnect the battery.

Remove the distributor cap.

Disconnect the connector.

Unscrew the nut and remove the distributor fixing plate.

Take out the distributor.

NOTE
The inlet manifold has to be removed to gain access to the distributor.

REFITTING

Refit the distributor in accordance with the locations noted during dismantling, then check the positioning and adjust if necessary.

If there is any doubt concerning the position of the distributor, proceed as follows to position approximately:

- Place cylinder N° 1 at TDC (right-hand index marker)
- Place the distributor rotor opposite the locating mark for cylinder N° 1 marked on the body of the distributor;
- Fit the distributor into its housing, taking into account the movement of the helicoidal drive gear and so that the tightening stud fits into the sector, enabling the advance point to be adjusted.

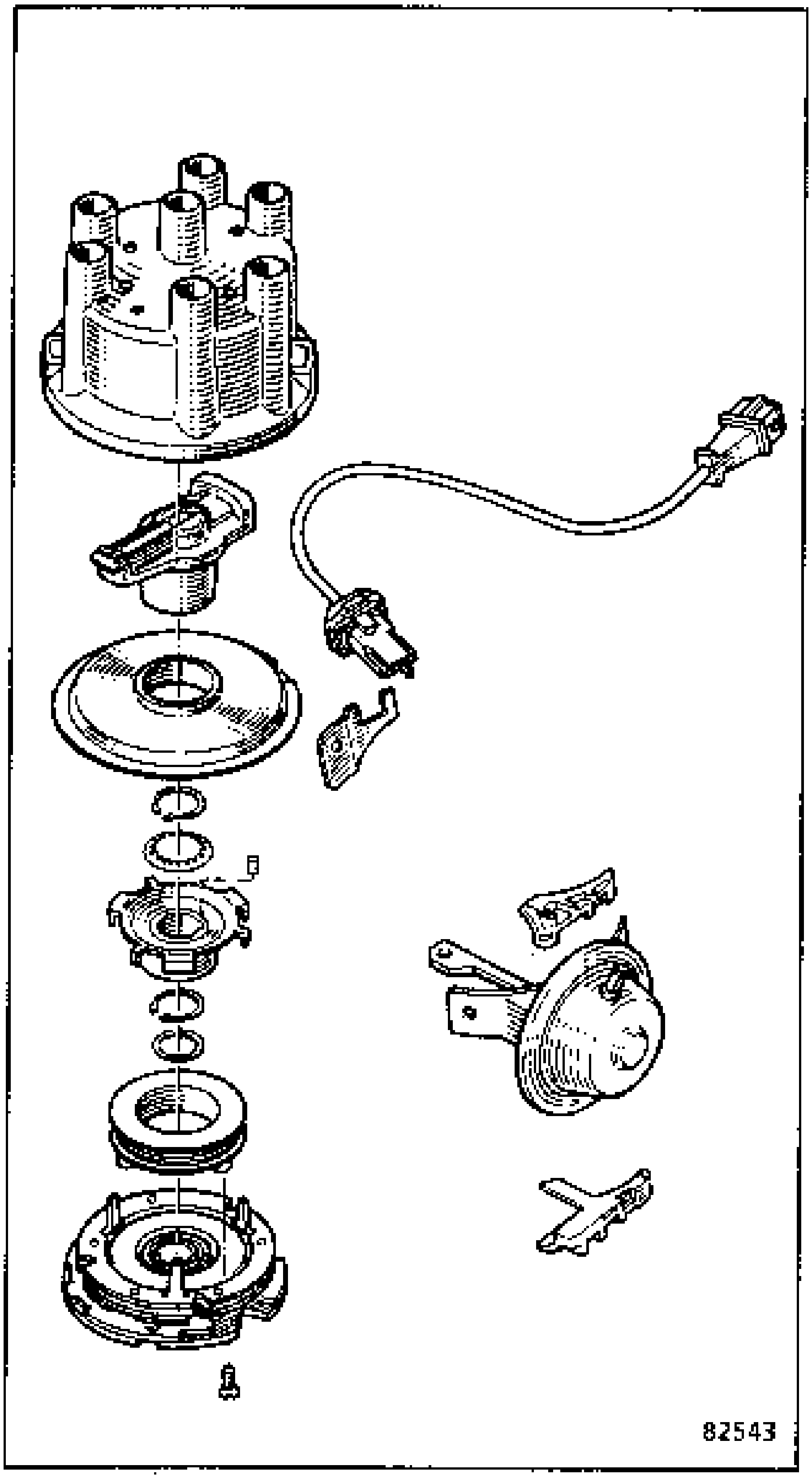
  (1) - Distributor rotor

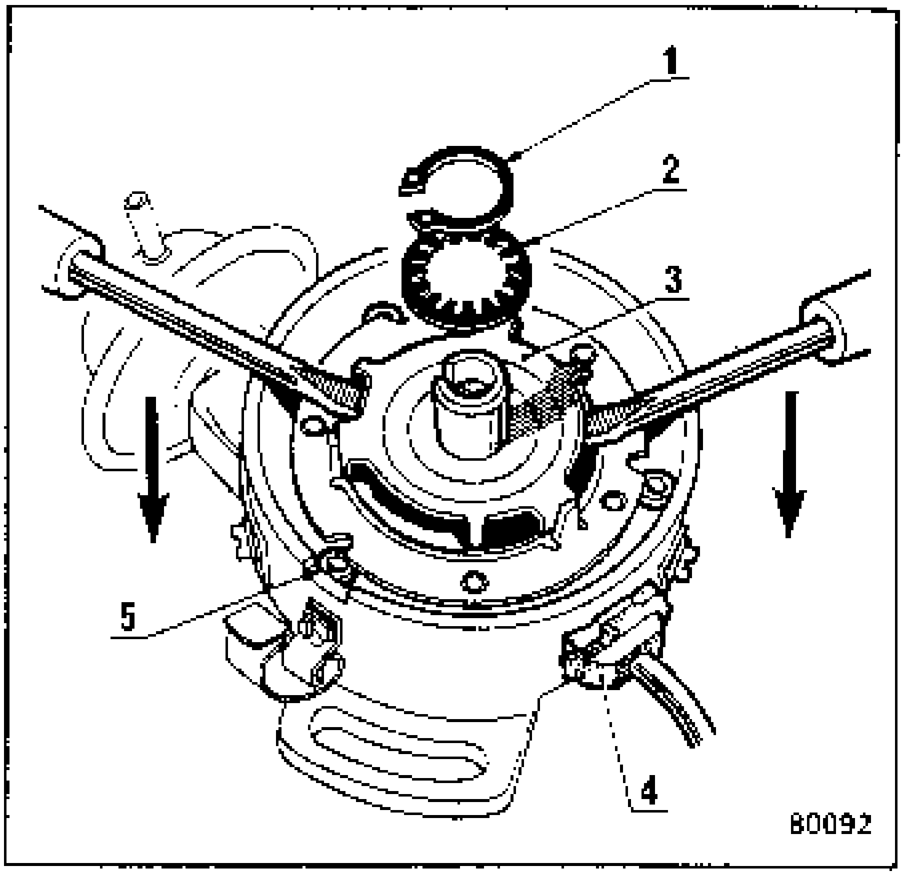
  (2) - Cylinder N° 1 ignition mark

  (3) - Distributor fixing flange.

- Then refit the inlet manifold (the seals should be replaced).

Removing the distributor





Remove the distributor cap, the distributor rotor and the sealing gasket.

Remove the distributor lead (4).

Remove the circlip (1) and the dished rotor retaining washer (2).

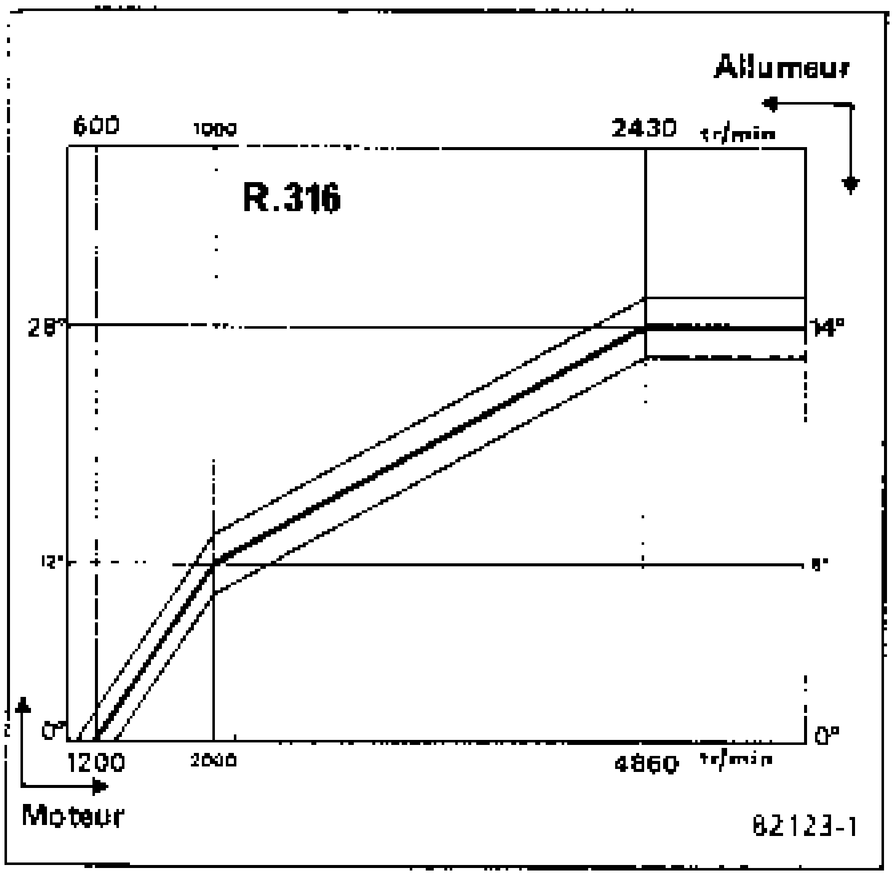
Remove the rotor (3), using 2 screwdrivers as levers.

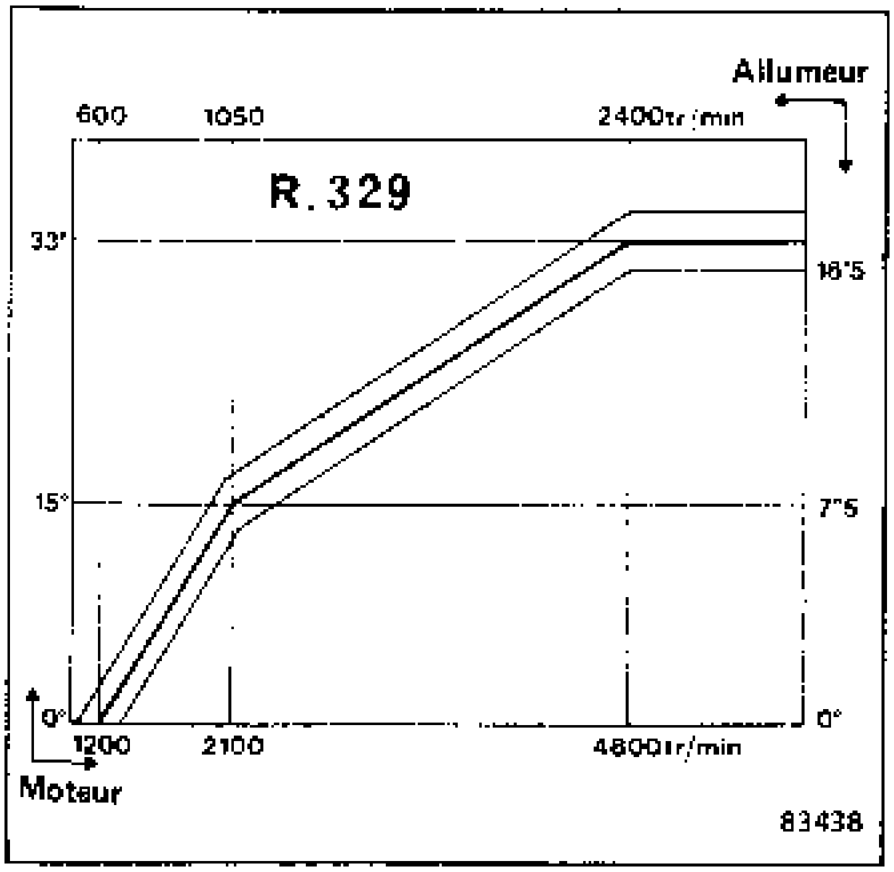
Remove the circlip under the rotor and remove the 3 fixing bolts from the magnet-coil assembly (5).

Be careful not to lose the rotor taper key.

CURVES

Centrifugal





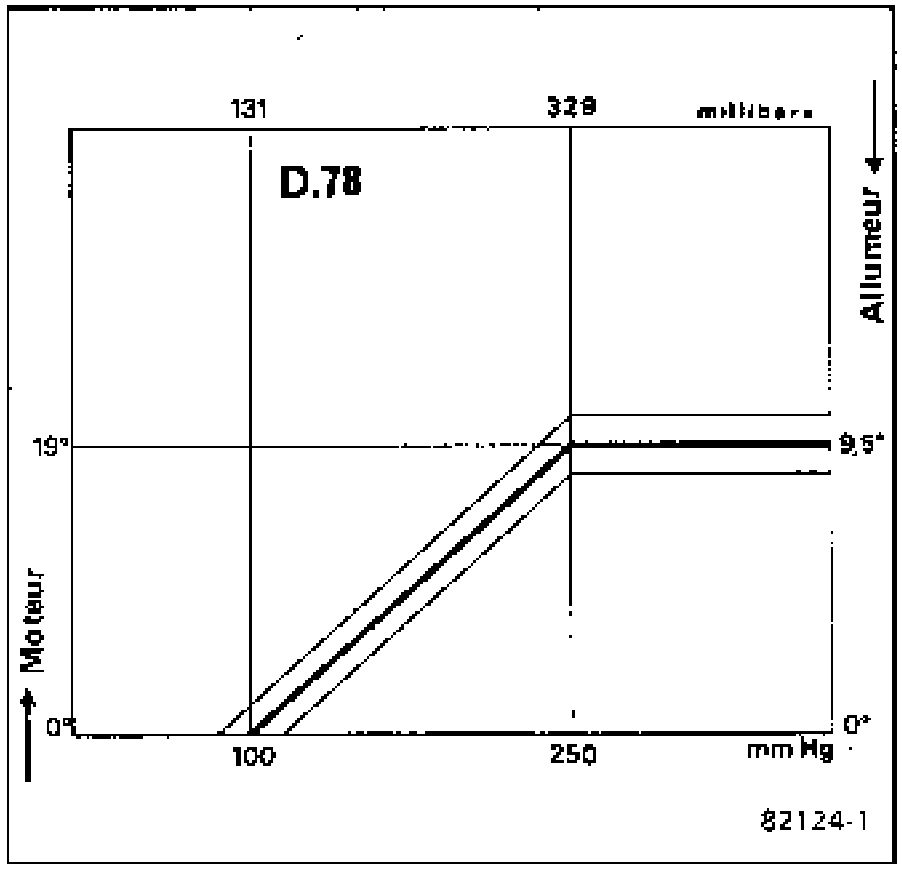
Curves established in engine degrees and engine rpm (for readings taken from engine).

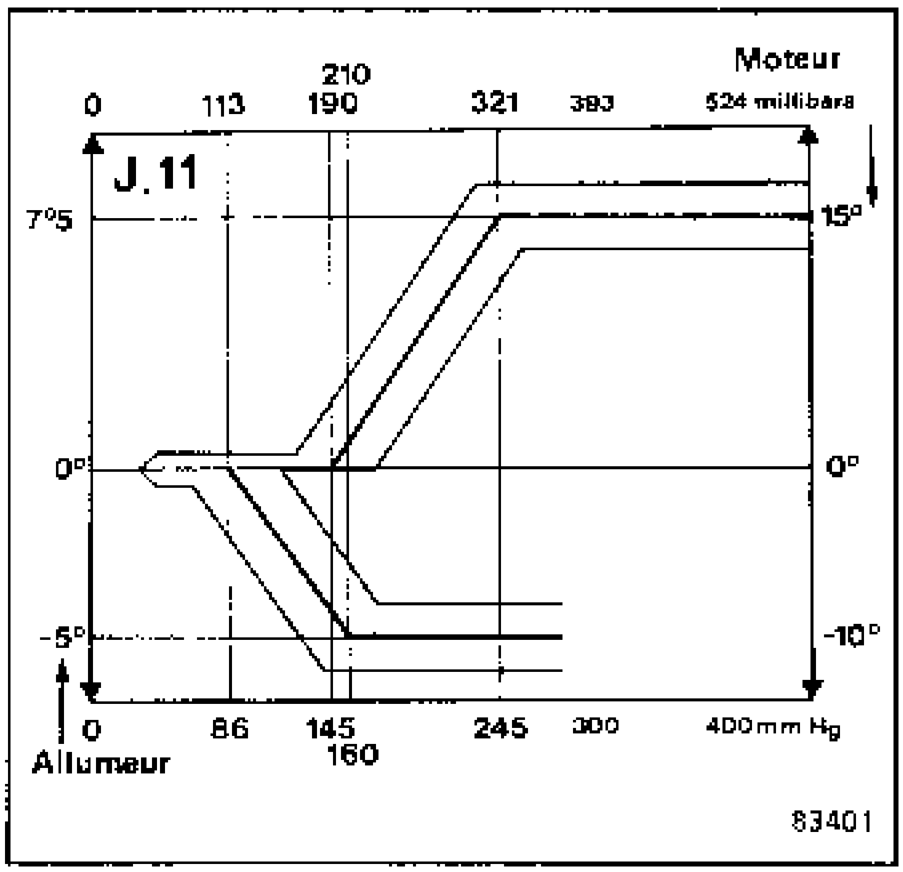
Curves also established in distributor degrees and distributor rpm (for checking on the bench).

Remember that:

- 2 engine degrees = 1 distributor degree
- 2 engine turns = 1 distributor turn

Vacuum



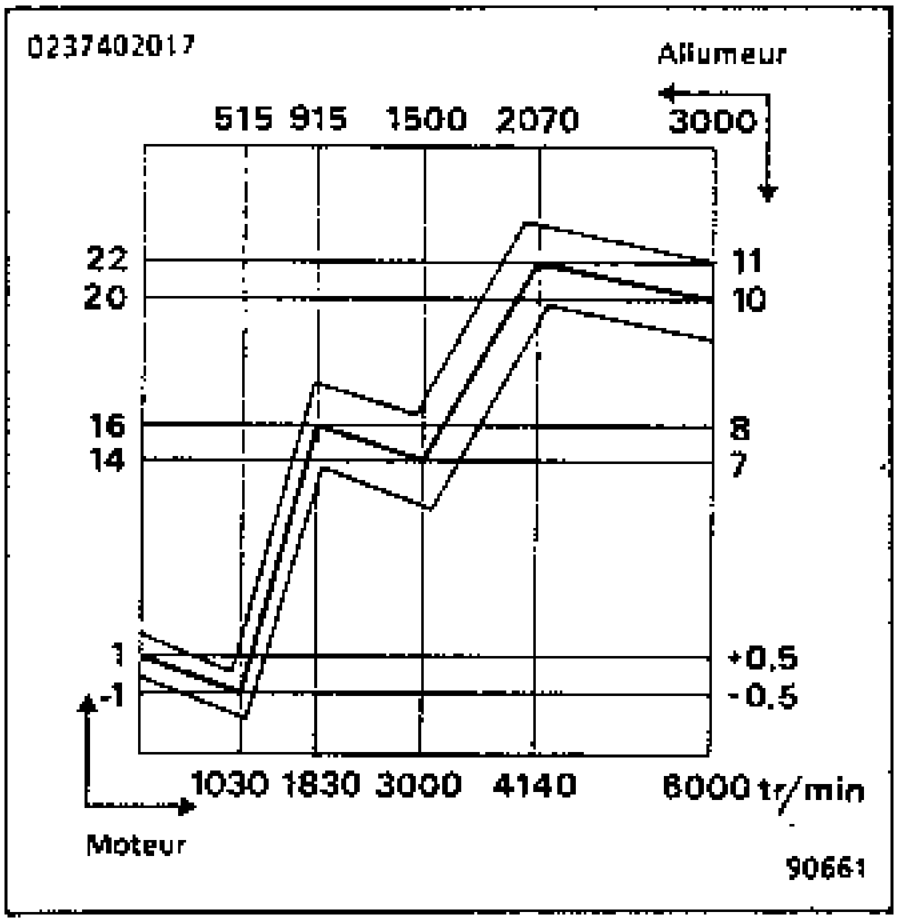


Curves established in millimetres of mercury or millibars, and engine degrees (for checking with engine running).

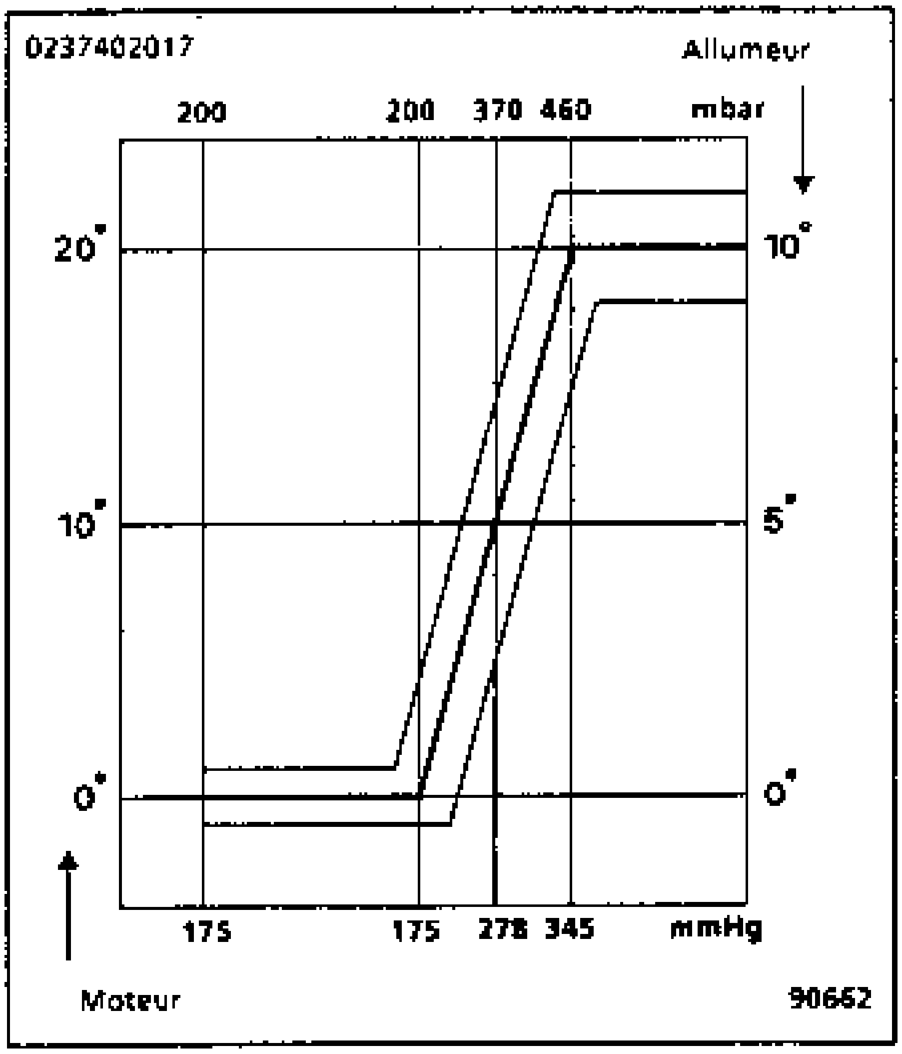
Curves established in millimetres of mercury or millibars, and distributor degrees (for checking on the bench).

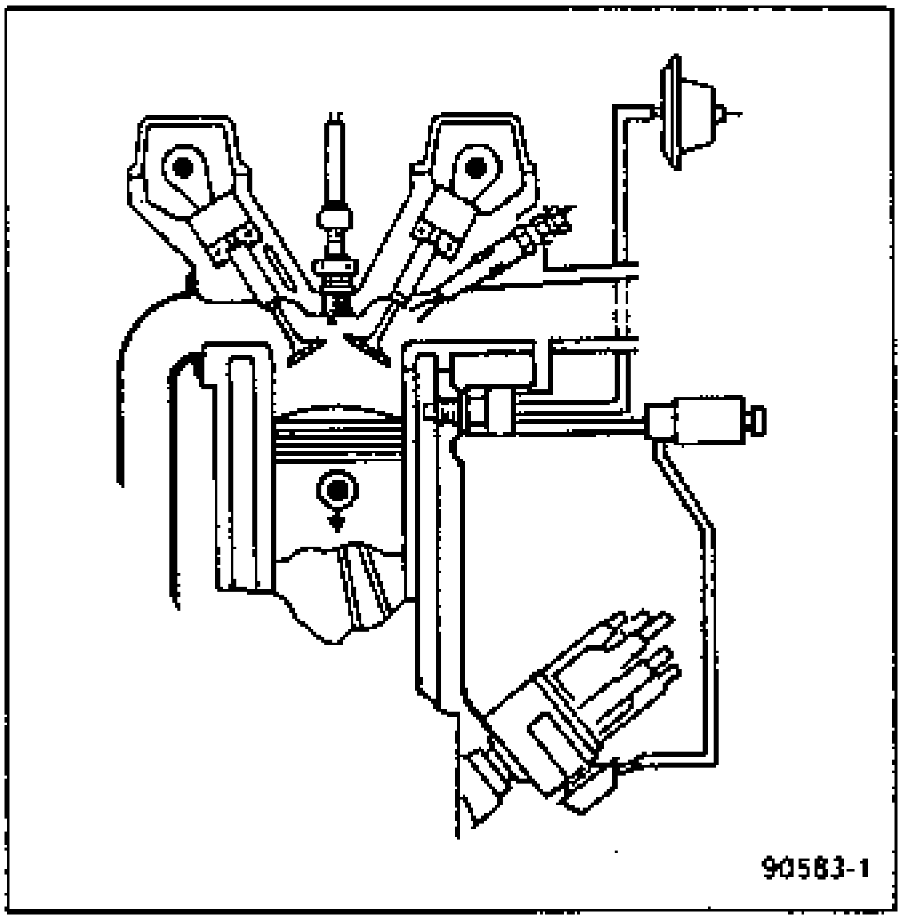
CURVES (continued)

Centrifugal



Vacuum





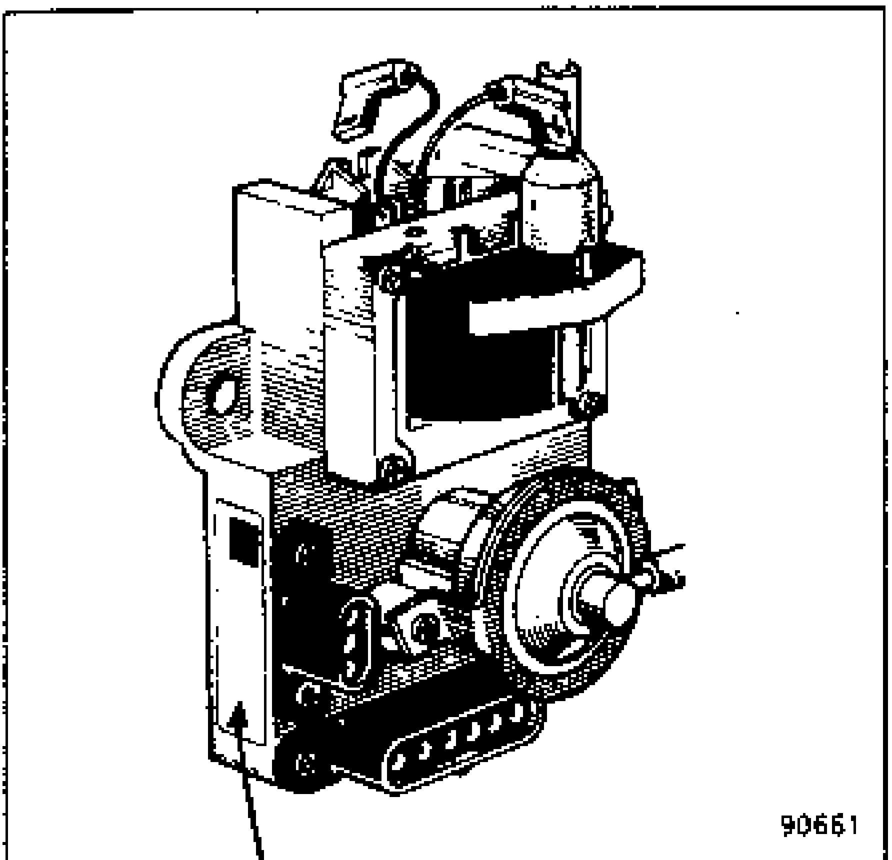
The **B 29A** is fitted with a breakerless ignition system with the following special features on the vacuum capsule control circuit:

- at temperatures below 55 $^{+4}_{-2}$ °C there is no vacuum advance correction;
- at temperatures above 55 $^{+4}_{-2}$ °C and for throttle valve openings greater than the idling speed, vacuum advance correction is active.

CHECKING THE AEI MODULE

IDENTIFICATION OF MODULES AND CURVES

MODULE TYPES D or E



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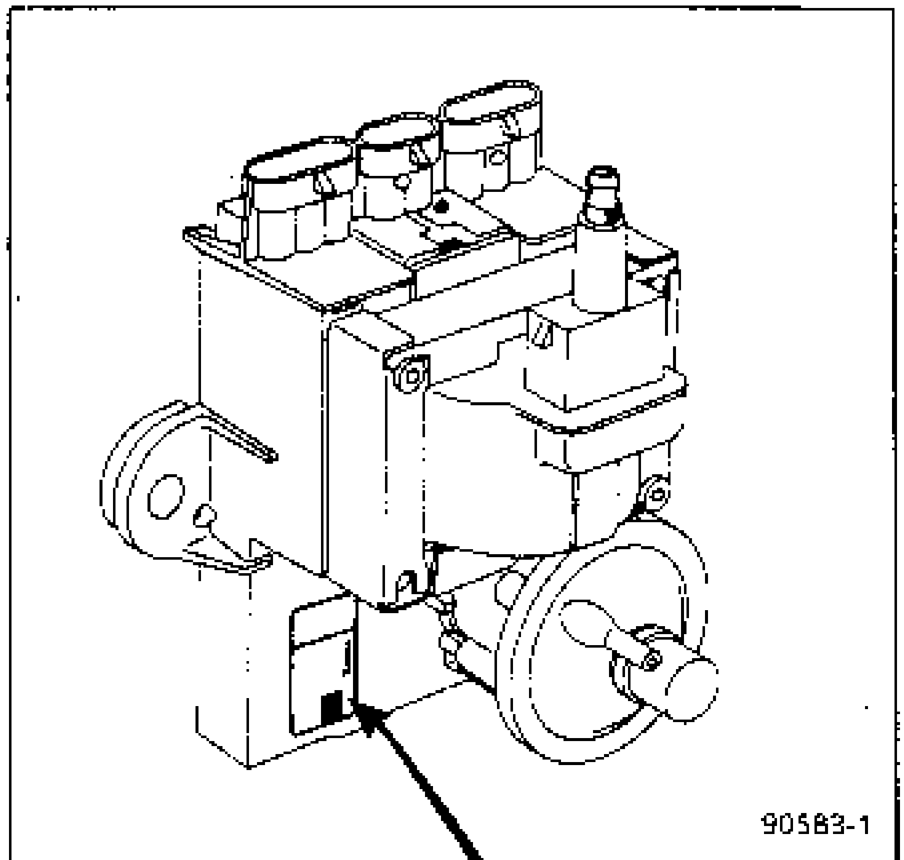
MODULE TYPE F



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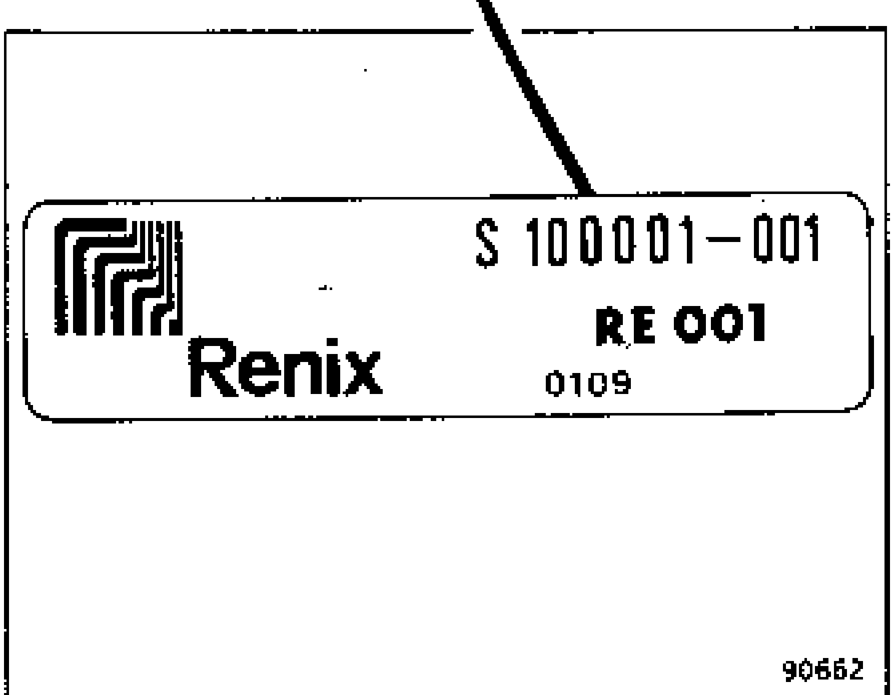
IDENTIFICATION OF CURVES

Identification is made using a label stuck to the body of the electronic computer.

EXAMPLE :
Advance curve RE 001



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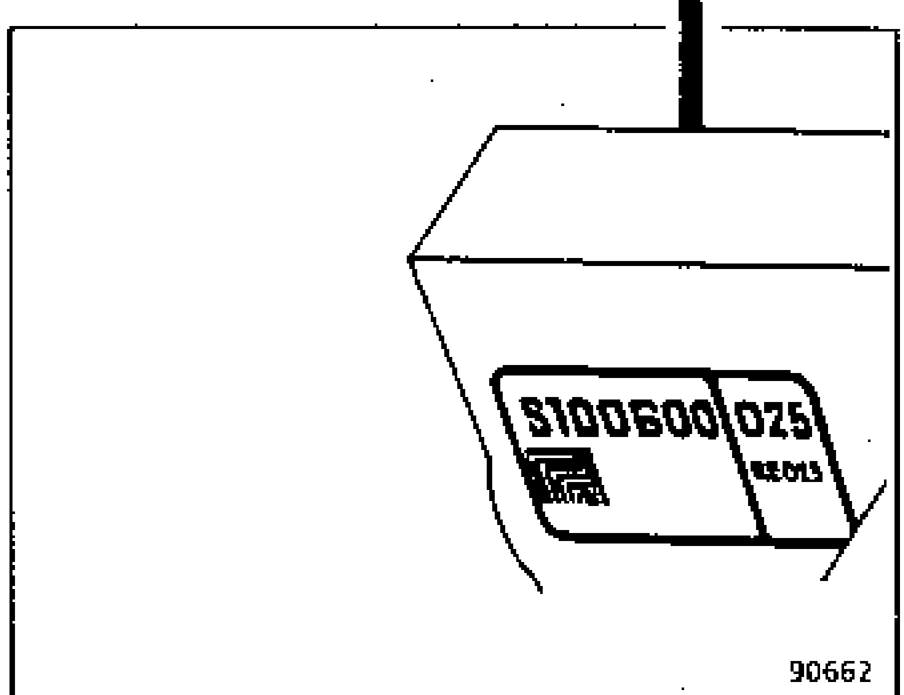
EXAMPLE : Advance curve RE 025



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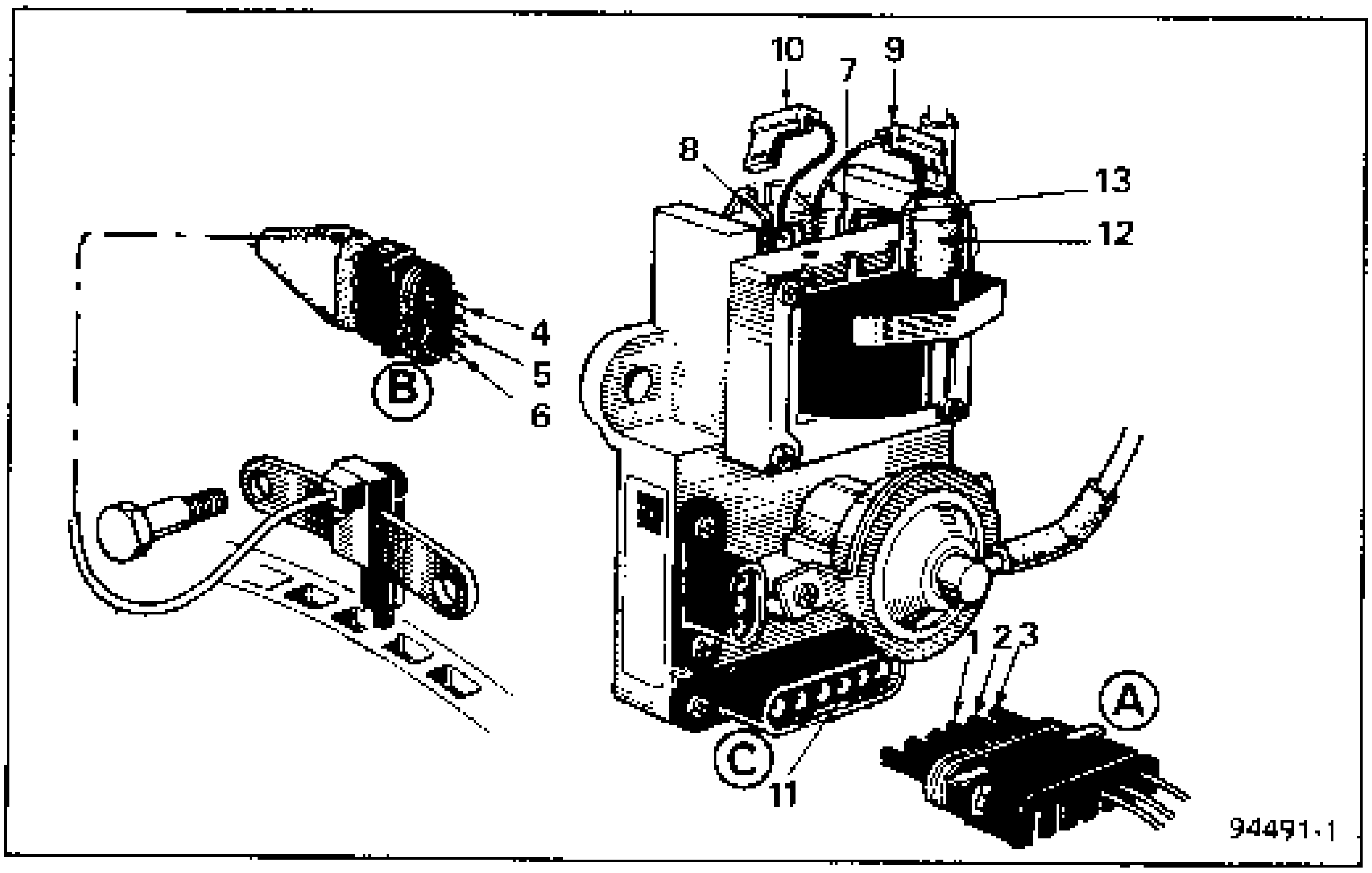
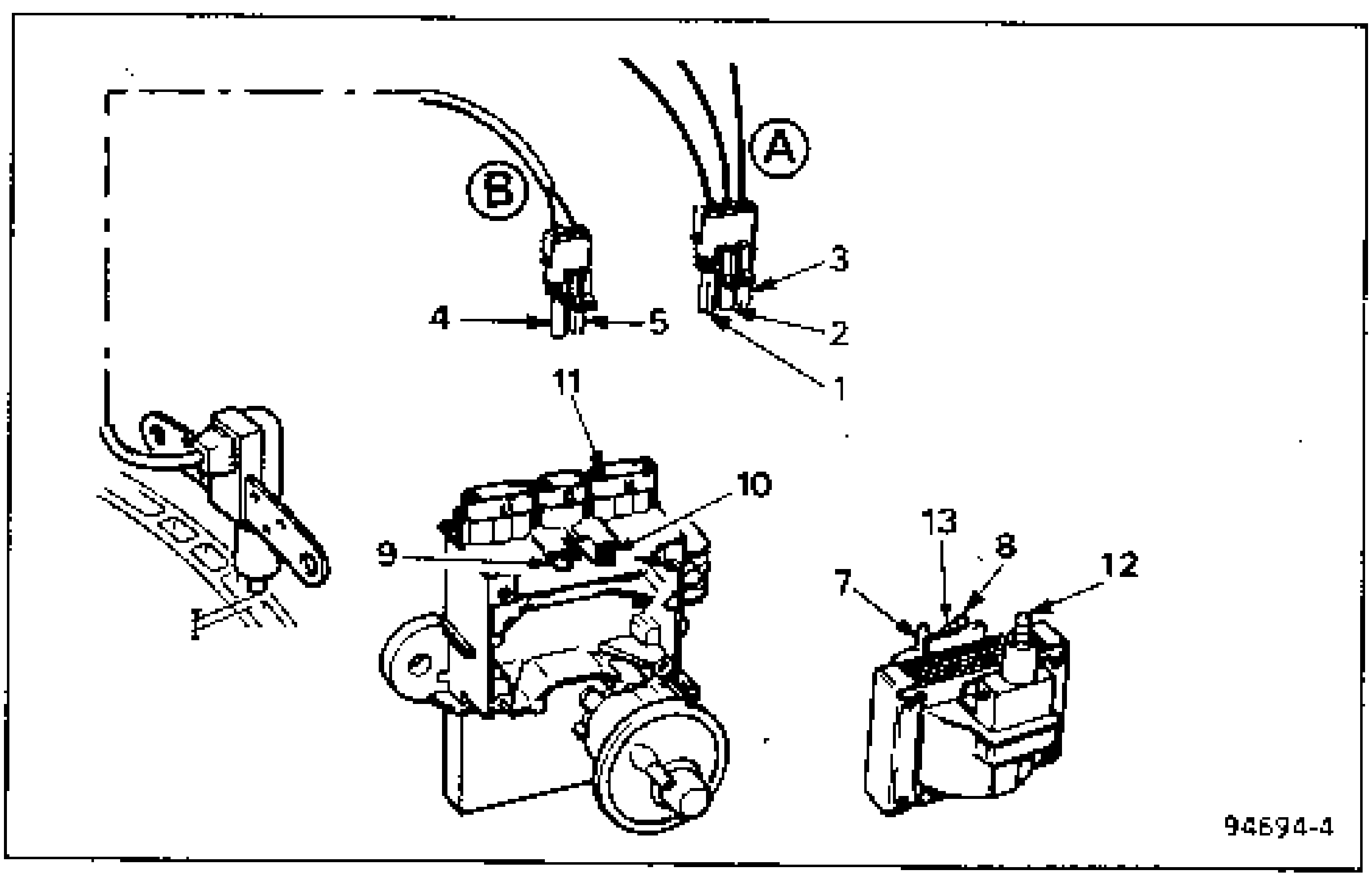
DESCRIPTION OF CONNECTIONS

MODULE TYPE D or E



MODULE TYPE F or ZD



1 - + Supply
2 - Earth
3 - Rev. counter
4 - Sensor coil
5 - Sensor coil
6 - Sensor screening (for modules D and E)
7 - + Coil terminal
8 - - Coil terminal
9 - + Coil contact
10 - - Coil contact
11 - + Module input
12 - Secondary connection
13 - + Coil terminal for radio interference condenser

Note: Terminals 9 and 11 are directly connected inside the module.

NO IGNITION

FAULT-FINDING

No ignition.
Visually check:
- the spark plugs;
- the spark plug leads;
- the distributor cap;
- the high-voltage leads.

Condition of connector contacts A and B:	- disconnect and reconnect the connectors several times; - Clean the terminals if necessary, before replacing any components.

PRELIMINARY CHECK

Between terminal **13** (+ coil supply to the radio interference condenser output) and the earth (ignition on) check that the voltage is **greater than 9.5 volts**.

MODULE D or E

FAULT-FINDING (continued)

TEST CONDITIONS	TESTS	FAULT-FINDING
Connector (A) disconnected Ignition on Starter turning	Module + supply terminal (1) and vehicle earth (voltmeter) > 9.5 volts	INCORR. → - Check battery voltage - Charge battery - Check module supply harness.
	GOOD ↓	
Connector (A) disconnected Ignition off	Terminal (2) connector earth and vehicle earth ohmmeter 0 Ω	INCORR. → Check module earth harness.
	GOOD ↓	
Connector (A) disconnected Ignition off	Coil supply terminals (9) and (11) ohmmeter 0 Ω	INCORR. → Change the electronic module. Check connections between coil terminals, (7-8) and terminals (9-10).
	GOOD ↓	
Connector (A) disconnected Ignition on	Lead (9) reconnected terminal (13) and vehicle earth (voltmeter) > 9.5 volts	INCORR. → If they are still incorrect, move assembly (A) and (C); if contacts are incorrect, replace terminals and connector (A) and electronic module.
	GOOD ↓	
Connector (B) disconnected Ignition off	Sensor resistor terminals (4) and (5) ohmmeter 200 Ω ± 50 Ω	INCORR. → Change the magnetic sensor.
	GOOD ↓ If accessible	
	Distance between sensor and flywheel (with feeler gauge) 1 mm ± 0.5	INCORR. → Check whether the sensor is mounted with shouldered screws.
	If inaccessible ↓	
HT leads disconnected, engine cranking. Battery voltage 9 to 10.5 V → Battery voltage 10.5 to 12 V →	Terminals (4) and (5) Flywheel sensor output voltage (with voltmeter switched to alternating current) - 150 mV at 800 mV - 200 mV at 900 mV	INCORR. → Check bore of sensor mounting holes. If still incorrect, replace the sensor.

MODULE D or E

FAULT-FINDING (continued)

TEST CONDITIONS	TEST		FAULT-FINDING
2 identical sensors opposite each other	Sensor polarity They should not attract one another	INCORR.	Replace the magnetic sensor
	GOOD		
Block connectors (A) and (B) connected:	Fit a test bulb (2 W max.) between (9) and (10). At starter speed, this should flash.	INCORR.	Change the electronic module
	GOOD		
HT lead disconnected Leads (9) and (10) disconnected Ignition off	HT coil secondary resistance terminals (7) and (12) ohmmeter 2000 to 12,000 Ω	INCORR.	Change the HT coil
	GOOD		
Leads (9) and (10) disconnected Ignition off	HT coil primary resistance terminals (7) and (8) ohmmeter 0.4 to 0.8 Ω	INCORR.	Change the HT coil
	GOOD		
Connector (A) disconnected Ignition off	Rev. counter insulation terminals (2) and (3) ohmmeter 20 kΩ	INCORR.	Repair harness or rev. counter
	GOOD		

No high tension: change electronic module

MODULE F or ZD

FAULT-FINDING (continued)

TEST CONDITIONS	TEST		FAULT-FINDING
Connector (A) disconnected Ignition on Starter turning	Module + supply terminal (1) and vehicle earth (voltmeter) > 9.5 volts	INCORR. →	- Check battery voltage - Charge battery - Check module supply harness.
	GOOD		
Connector (A) disconnected Ignition off	Terminal (2) connector earth and vehicle earth ohmmeter 0 Ω	INCORR. →	Check module earth harness.
	GOOD		
Connector (A) disconnected Ignition off	Coil feed terminals (9) and (11) ohmmeter 0 Ω	INCORR. →	Change the electronic module.
	GOOD		
Connector (A) connected Ignition on	Terminal (13) and vehicle earth (voltmeter) > 9.5 volts	INCORR. →	Check connections between coil terminals (7-8) and terminals (9-10).
	GOOD		
Connector (B) disconnected Ignition off	Sensor resistance terminals (4) and (5) ohmmeter 200 Ω ± 50 Ω	INCORR. →	Change the magnetic sensor.
	GOOD If accessible		
	Distance between sensor and flywheel (with feeler gauge) 1 mm ± 0.5	INCORR. →	Check whether the sensor is mounted with shouldered screws.
	If inaccessible		
HT lead disconnected, engine running at starter speed. Battery voltage 9 to 10.5 V → Battery voltage 10.5 to 12 V →	Terminals (4) and (5) Flywheel sensor output voltage (with voltmeter switched to alternating current) - 150 mV at 800 mV - 200 mV at 900 mV	INCORR. →	Check bore of sensor mounting holes. If still incorrect, replace the sensor.

MODULE F or ZD

FAULT-FINDING (continued)

TEST CONDITIONS	TESTS	FAULT-FINDING
2 identical sensors opposite each other	Sensor polarity They should not attract one another — INCORR. / GOOD	Replace the magnetic sensor
Block connectors (A) and (B) connected: coil removed	Fit a test bulb (2 W max.) between (9) and (10). At starter speed, this should flash. — INCORR. / GOOD	Change the electronic module
Coil removed	HT coil secondary resistance terminals (7) and (12) ohmmeter 2000 to 12,000 Ω — INCORR. / GOOD	Change the HT coil
Coil removed	HT coil primary resistance terminals (7) and (8) ohmmeter 0.4 to 0.8 Ω — INCORR. / GOOD	Change the HT coil
Connector (A) disconnected Ignition off	Rev. counter insulation terminals (2) and (3) ohmmeter 20 kΩ — INCORR. / GOOD	Repair harness or rev. counter

No high tension: change electronic module

ALL TYPES OF MODULES: **FAULT-FINDING (continued)**

DIFFICULT TO START BUT NO INCIDENTS WHEN ENGINE RUNNING

Check visually or with test apparatus:
- spark plugs
- spark plug leads
- distributor cap
- coil HT lead.

Check HT at starter speed:
- disconnect HT lead at distributor cap end;
- place the lead 2 cm away from the engine block.

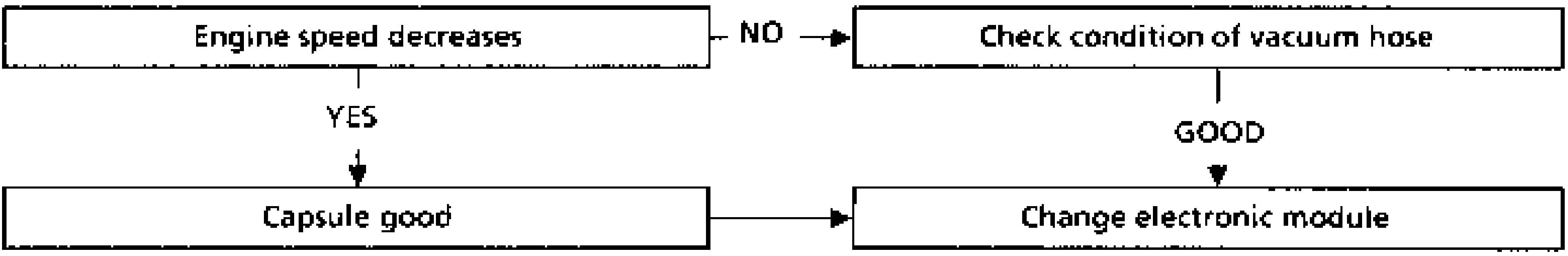
NOTE: DO NOT ALLOW THE HT LEAD TO TOUCH THE ELECTRONIC MODULE

	TEST		FAULT-FINDING
Activate starter	HT spark is regular	INCORR. →	Check module supply: > 9,5 volts Check battery charging **Charge battery**
	GOOD		GOOD
	Check: carburation, mechanical condition, engine, initial timing.		Measure sensor resistance at terminals (4) and(5) ohmmeter: 200 Ω ± 50 Ω If incorrect, replace it.
			GOOD
			If accessible
			Check distance between sensor and flywheel (with feeler gauge): 1mm ± 0.5. If incorrect, replace it.
			If inaccessible
			Check flywheel sensor output voltage: higher than 150 mV (on AC setting). If incorrect, replace it.
			GOOD
			Check flywheel sensor polarity (2 identical sensors should not attract one another). If incorrect, change sensor.
			GOOD
			Clean sensitive face of sensor
			GOOD
			Change sensor

FAULT-FINDING (continued)

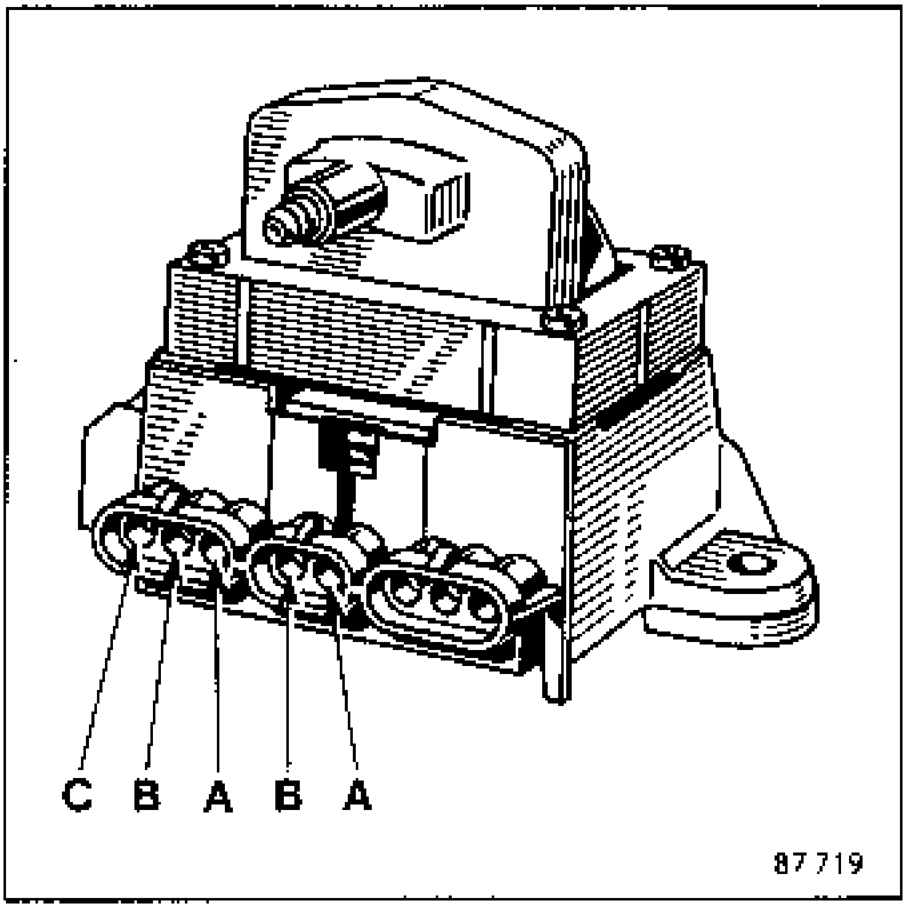
CHECKING THE MECHANICAL CONDITION OF THE VACUUM CAPSULE

- Let the engine run steadily at **3000 rpm.**
- Disconnect the vacuum hose from the capsule.



Description

The RENAULT injection module is programmed with the ignition advance curves and sends a control signal (5 volts) to the ignition power module.



3-way connector

A + battery
B Earth
C Rev. counter

2-way connector

A Control earth
B Control signal

VEHICLE	ENGINE	A C	CHAMPION	EYQUEM	BOSCH	Electrode gap (in mm ± 0.5)
B29H	J7R - 722 J7R - 723 J7T - 730 J7T - 731	C41 CLTS	S 6 YC	C 82 LJS		0.9
B29E	J7T - 706 J7T - 707 J7T - 714 J7T - 715		S 379 YC			0.9
B29B	J7T - 732 J7T - 733	C41 CLTS	S 7 YC			0.9
	J7T - 708	CR42 LTS	RS 9 YC			0.6
B292	J7R - 720 J7R - 721			FC 62LS3		1.2
B294	J7R - 726					
B297	J6R - 706 J6R - 760 J6R - 707		(1) S 279 YC			0.9
B29A	Z7W - 702				HR 6 DC	0.6
B293	Z7W - 700 Z7W - 701			C 72 LJS		0.8
B29F	Z7W - 706 Z7W - 707					
B295	Z7U - 702			805 LJSP		0.65
B29G	Z7U - 700					
B298	Z7V - 708 Z7V - 709 Z7V - 711		RBN 9 GY			0.6

(1) See label on rocker cover.

The Fenix 3A computer controls injection and ignition.

Diagnostic output is constant and temporary faults are stored.

The air and coolant temperature sensors are identical - they are of the Bendix negative temperature coefficient type (see Manual INJ R (E))

The Hitachi idling speed adjustment valve is fitted directly to the inlet manifold.

The injection cut-out speed is **6250 rpm**.

B292: The injection warning light on the dashboard is operational.

B294: The injection warning light on the dashboard is not operational.

VEHICLE B29G

The Bendix multipoint injection system fitted to the **Z7U 700** engine has the following special features:

- The computer, which controls the injection and the ignition. The cartographic advance may be modified by a pinking detector attached to the cylinder block under the fuel pressure regulator. The computer is located in the engine compartment on the left-hand inner wheel arch, and is protected by a plastic housing (beside the canister).

- The injection relays are located inside the protective plastic computer housing.

- The coolant and air temperature sensors are of the **CTP** type (positive temperature coefficient):

  ●The air sensor is fixed to the throttle housing;
  ●the coolant sensor is fixed to the right of the water pump.

- The diagnostic socket is located in the engine compartment, on the left in the scuttle panel.

- the computer data is permanently emitted and temporary faults are stored.

- The warning light on the dashboard is not operational.

- The injection cut-off speed, to prevent over-revving is **6100 rpm** (**6300** instantaneous).

NOTES: On computer control of the air conditioning system

- Depending on the input received by computer channels **30** and **34**, the computer controls the activation (if appropriate) of the air conditioning compressor via channel **13**.

- Nevertheless, this control will only be possible after having adjusted the idling speed at least once (for a few seconds) after starting.
  For example if, after starting, the idling speed is not used, the injection computer will receive the request for air conditioning, but will certainly not authorise activation of the compressor.

- The computer only authorises compressor coupling approximately **20 seconds** after the engine starts.

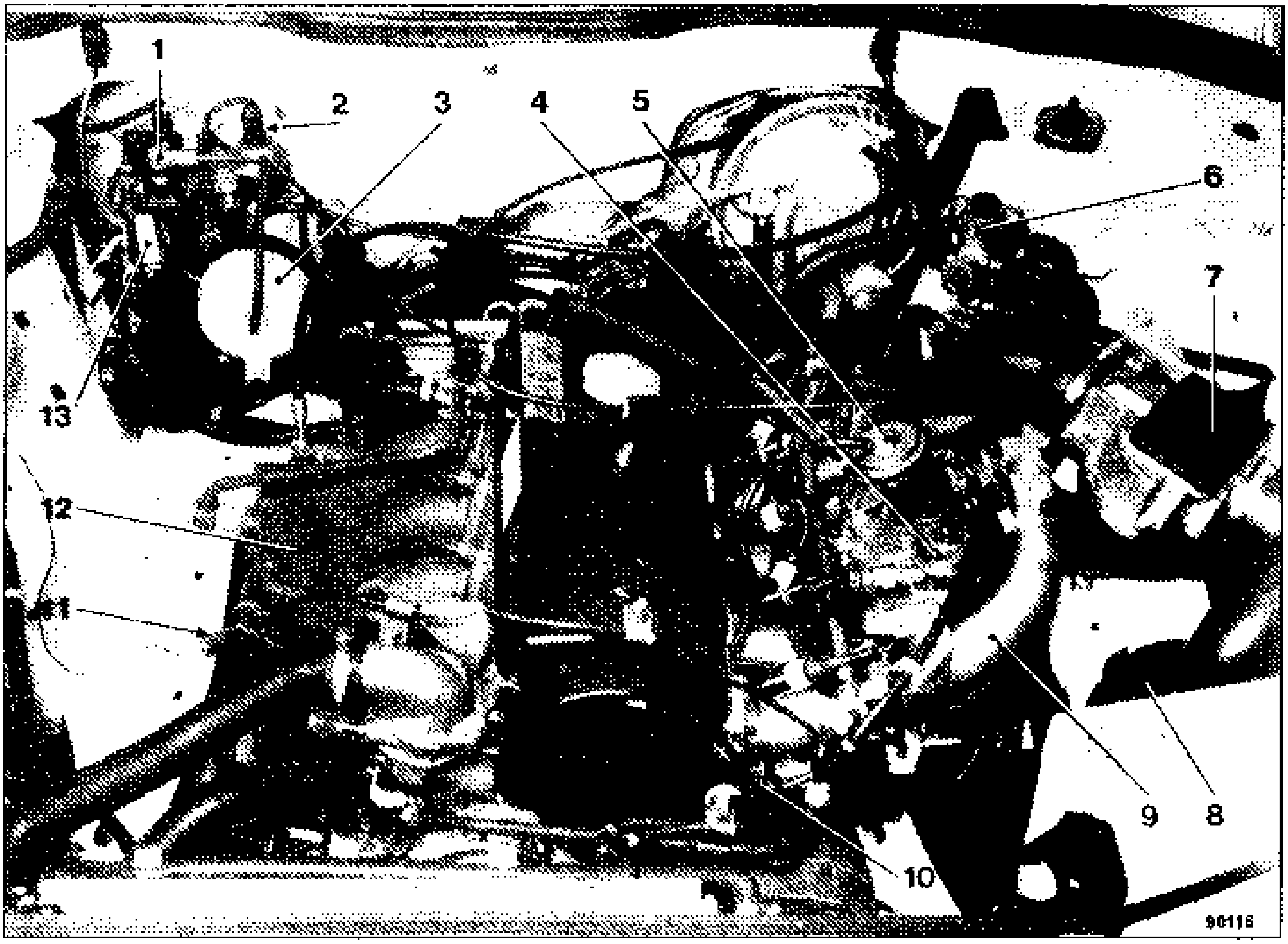
- In order to prevent the engine speed falling when the air conditioning compressor is engaged, the engine air flow is increased by the idling speed adjustment valve approximately **1** second before the compressor is activated. This produces a speed which increases from **750** to **900 rpm** when the request is made.

  Equally, when the compressor is disengaged, the air flow is reduced before disengagement.

- If the engine coolant temperature exceeds **115 °C**, the computer will not authorise activation of the compressor.

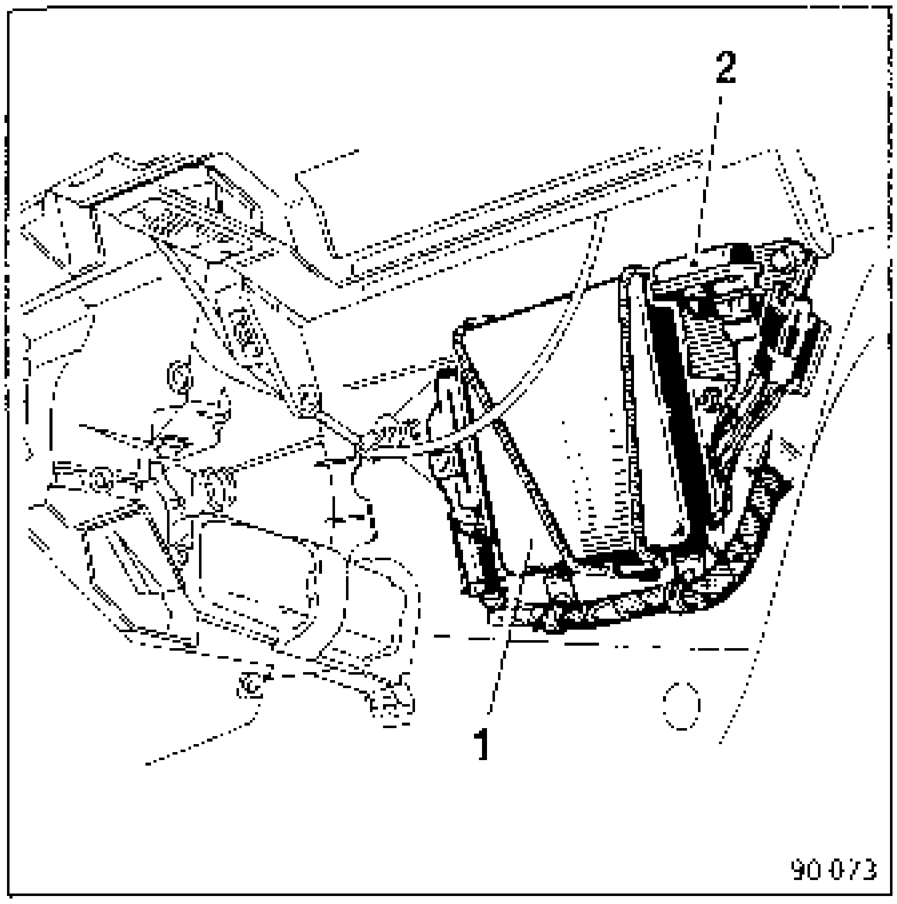
- Systematic activation of the cooling fan motors at half-speed when the request for air conditioning is made.

ENGINE J7T 708 - B 29 B



1 - Integral electronic ignition module.
2 - Differential pressure switch.
3 - Vacuum reserve (EGR valve control).
4 - Fuel pressure regulator.
5 - Exhaust gas recycling valve (EGR)
6 - Accelerated idling solenoid valve on bypass.
7 - Air flow meter.
8 - Air filter
9 - Inlet manifold.
10 - Timed temperature switch.
11 - Oxygen sensor
12 - Exhaust manifold.
13 - Diagnostic sockets.

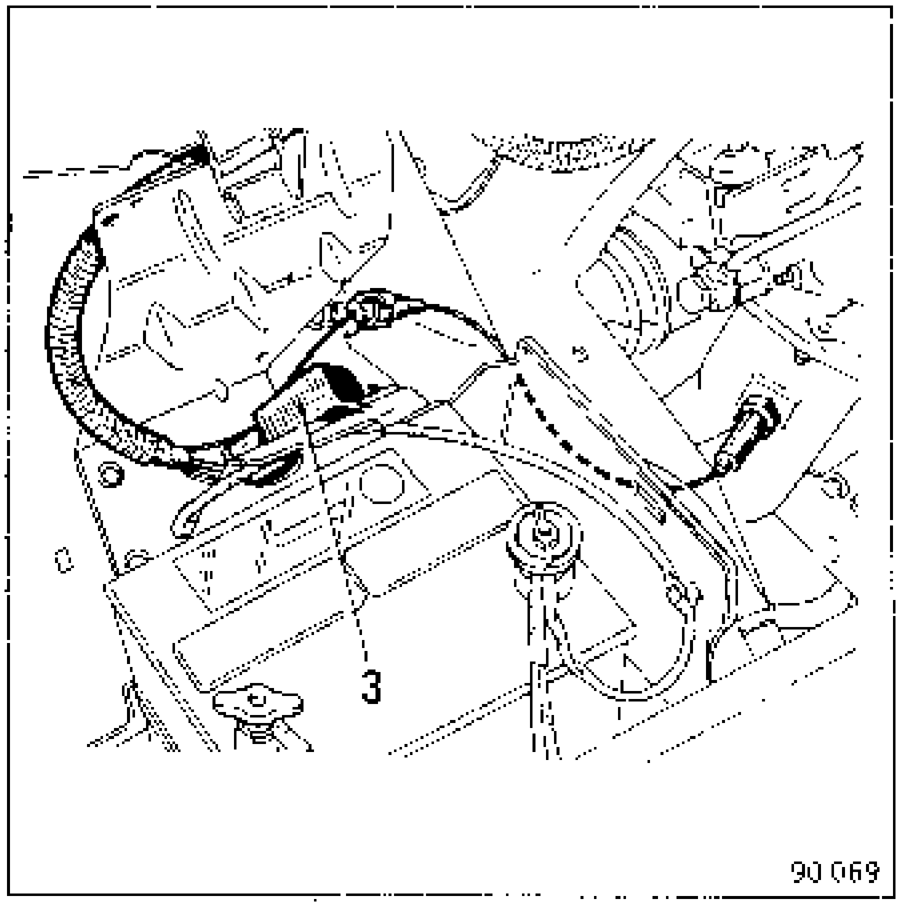
INJECTION COMPUTER



1 - The injection computer is housed in the passenger compartment, under the glove box, and is attached to a plate.

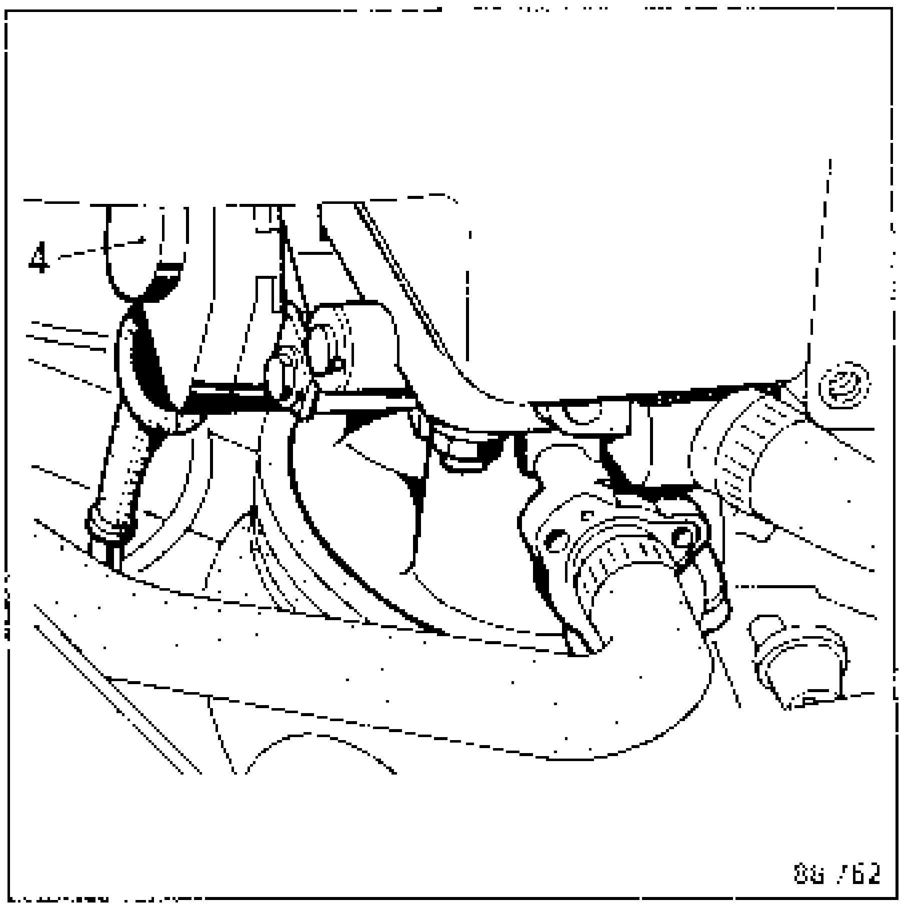
2 - Altimetric corrector

TACHOMETER INJECTION RELAY



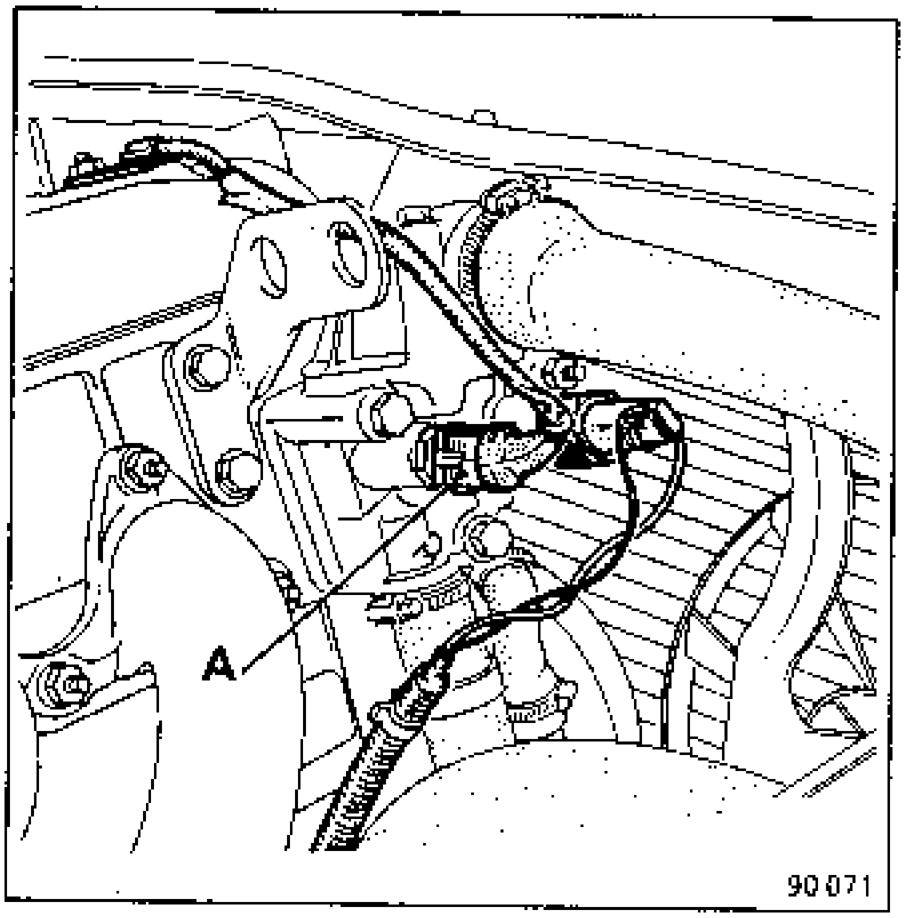
3 - The rpm relay is attached to a support bracket behind the battery.

FULL LOAD/NO LOAD SWITCH



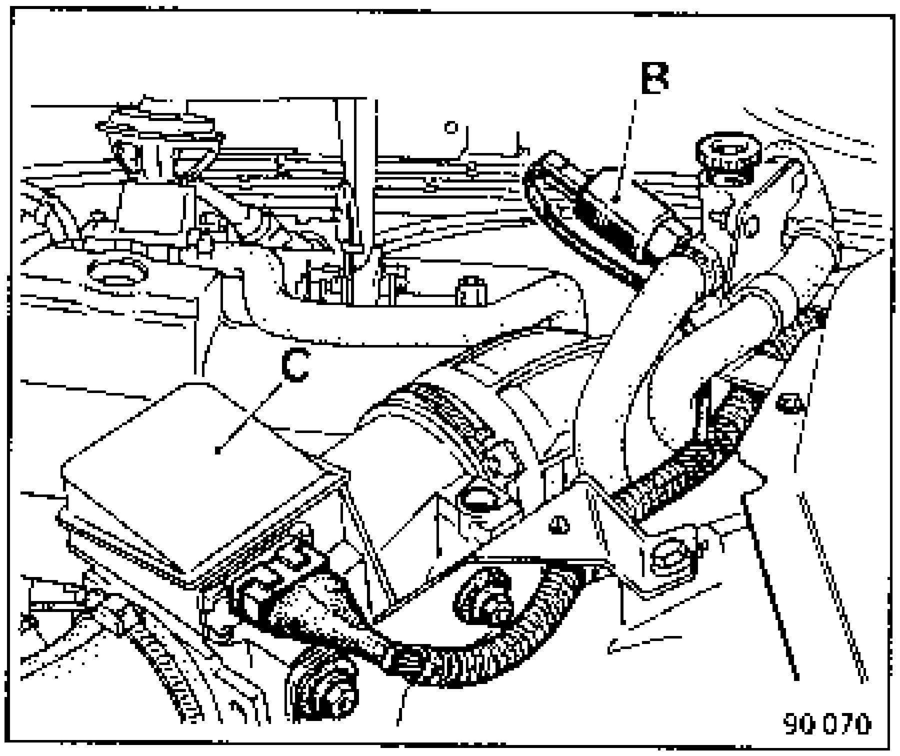
4 - The switch is attached to the throttle housing (see adjustment special features).

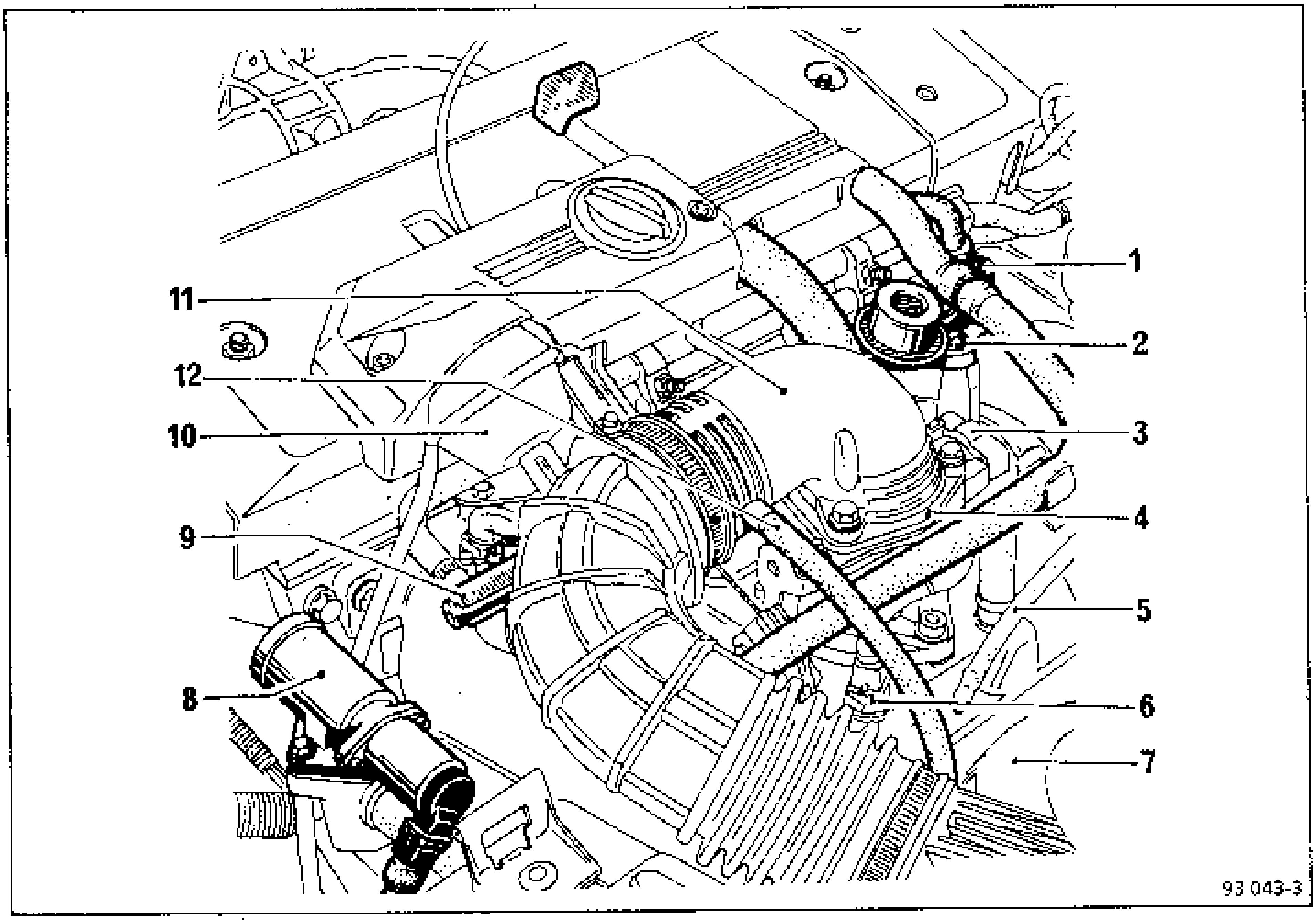
A) Coolant temperature sensor



B) Accelerated idling solenoid valve

C) Air flow meter





1 - Fuel pressure regulator

2 - Pulse damper

3 - Load potentiometer

4 - Throttle housing

5 - Pneumatic pipe to absolute pressure sensor with Ø 1.5 mm restriction.

6 - Air temperature sensor

7 - Air filter

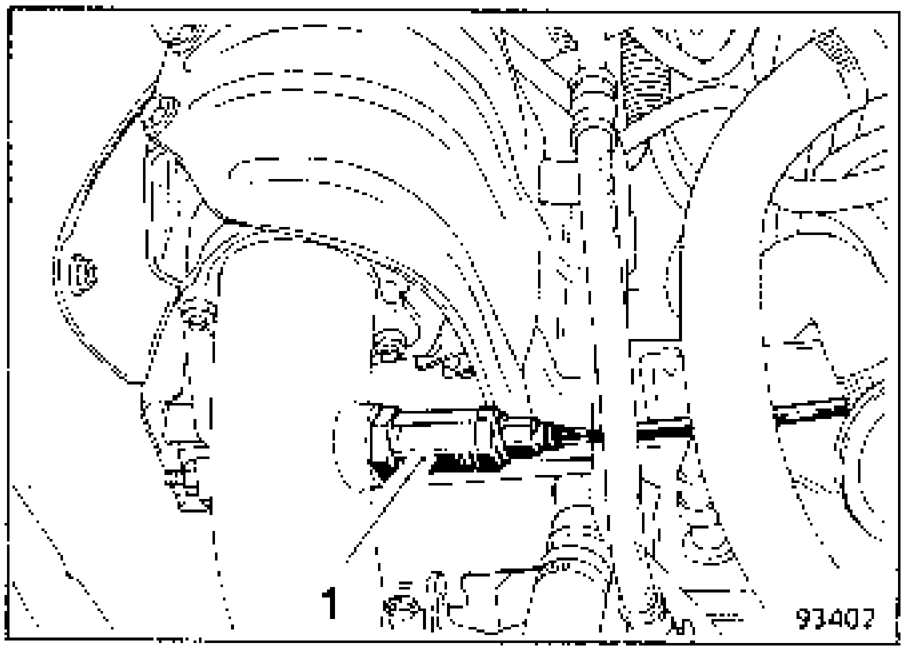
8 - Idling speed adjustment valve (Hitachi)

9 - Fuel injection gallery

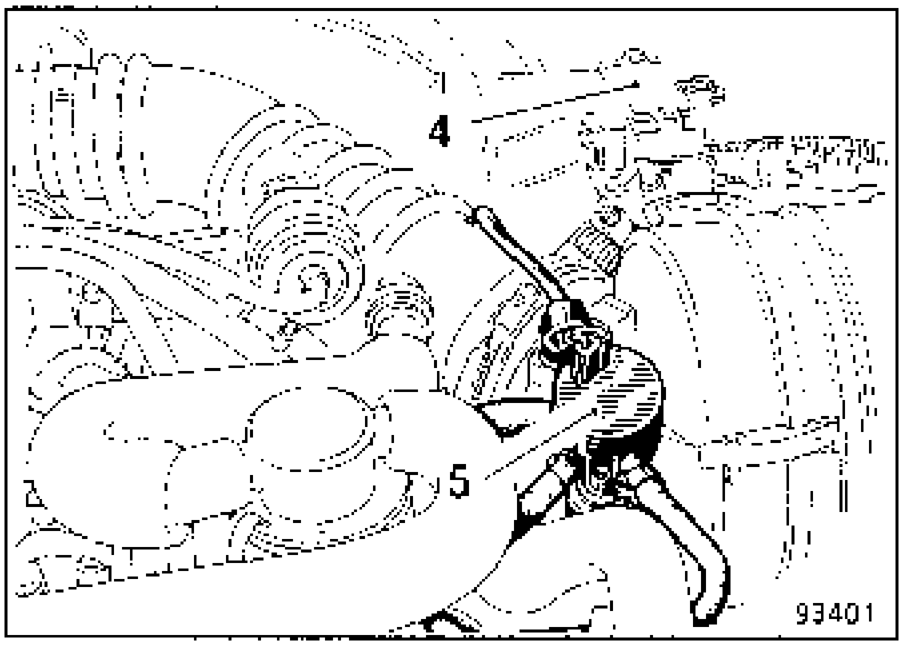
10 - Cruise control capsule (if fitted)

11 - Air inlet pipe

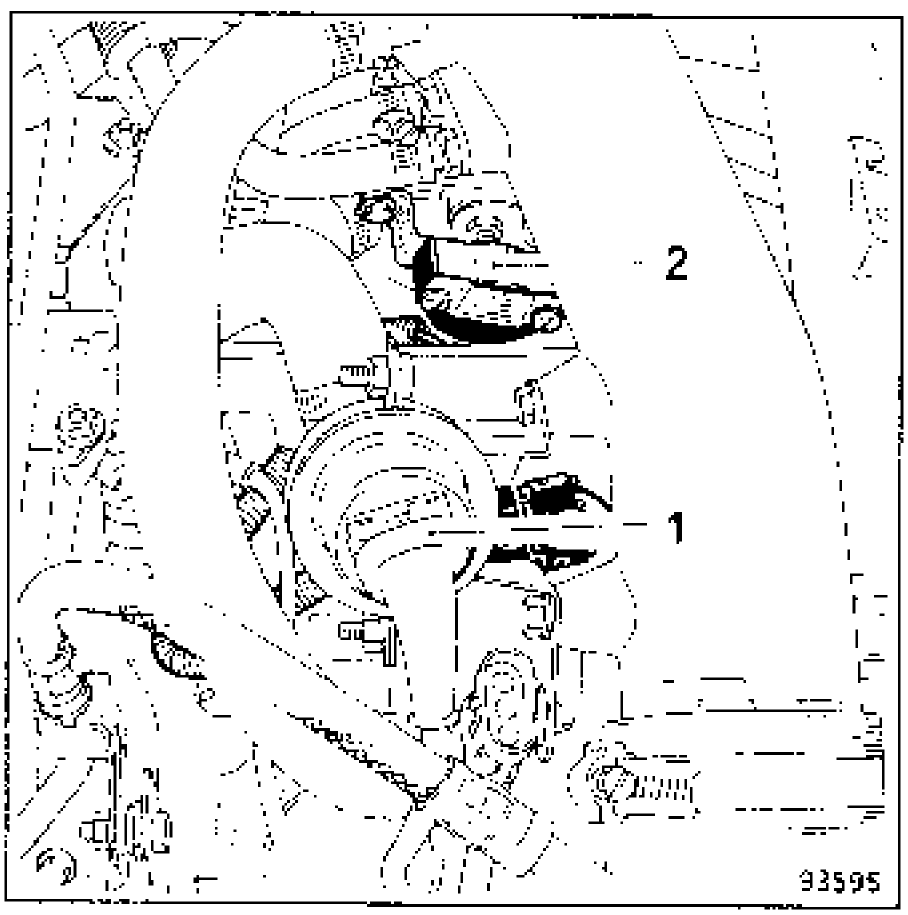
12 - Petrol vapour recycling pipe (B 294).



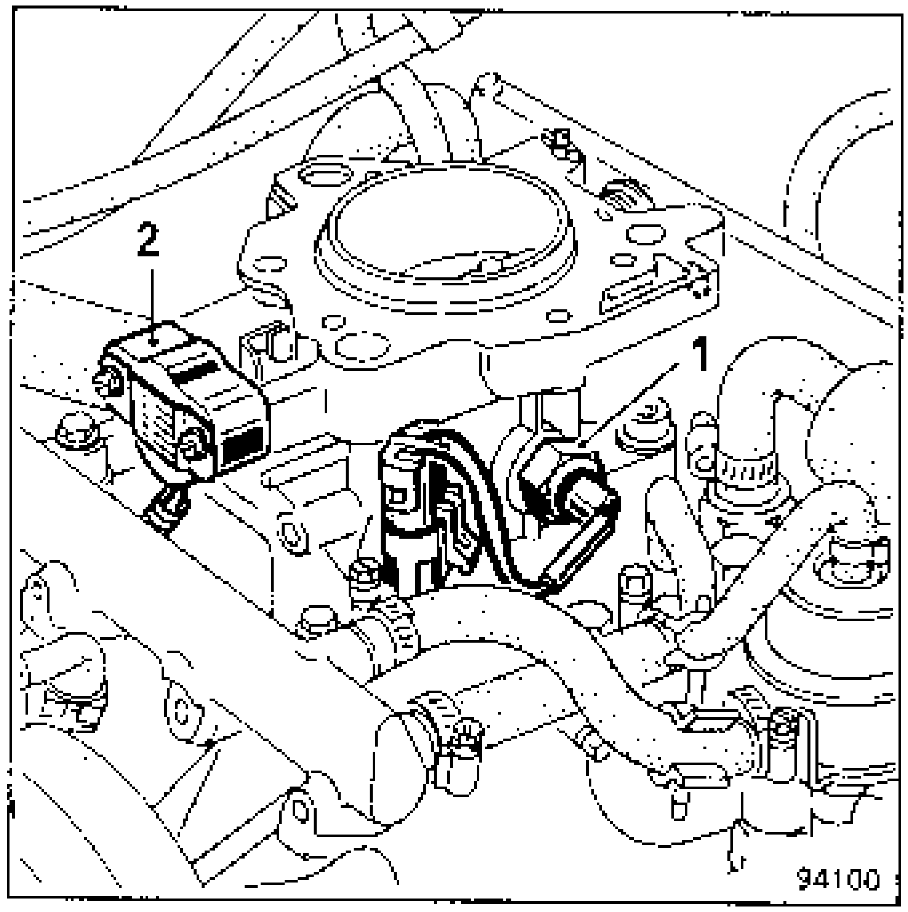
1 - Oxygen sensor or lambda sensor



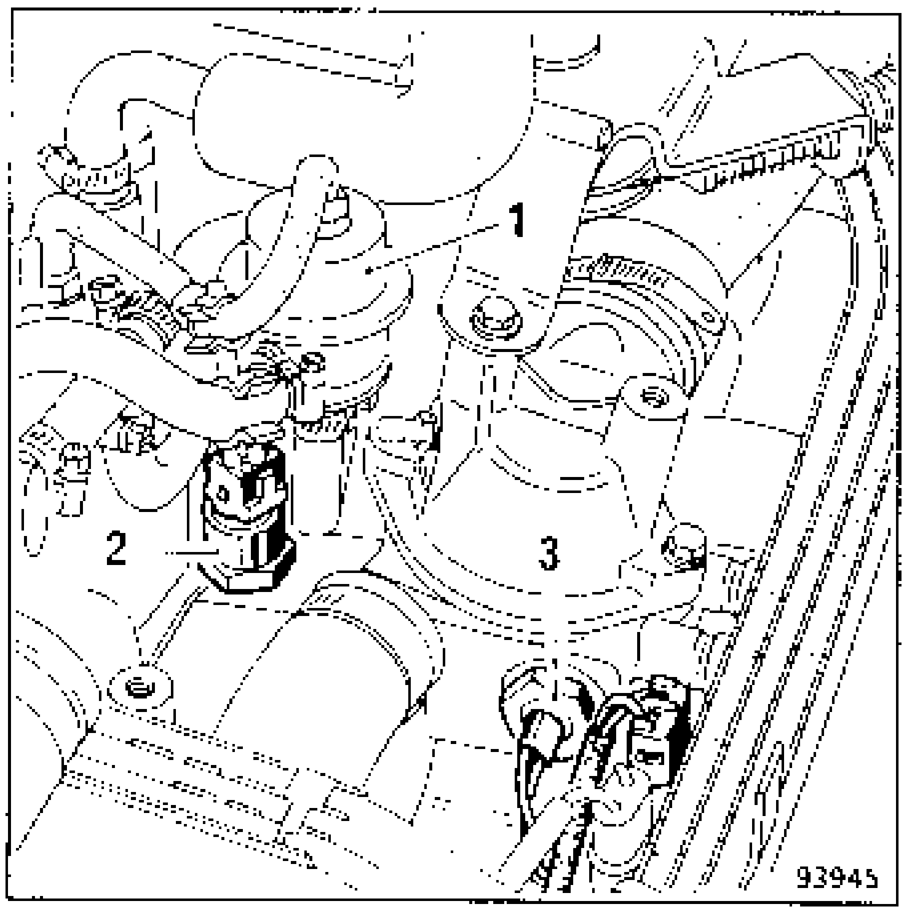
4 - Absolute pressure sensor
5 - Turbocharging pressure control solenoid valve



1 - Idling speed adjustment valve.
2 - Butterfly position potentiometer.

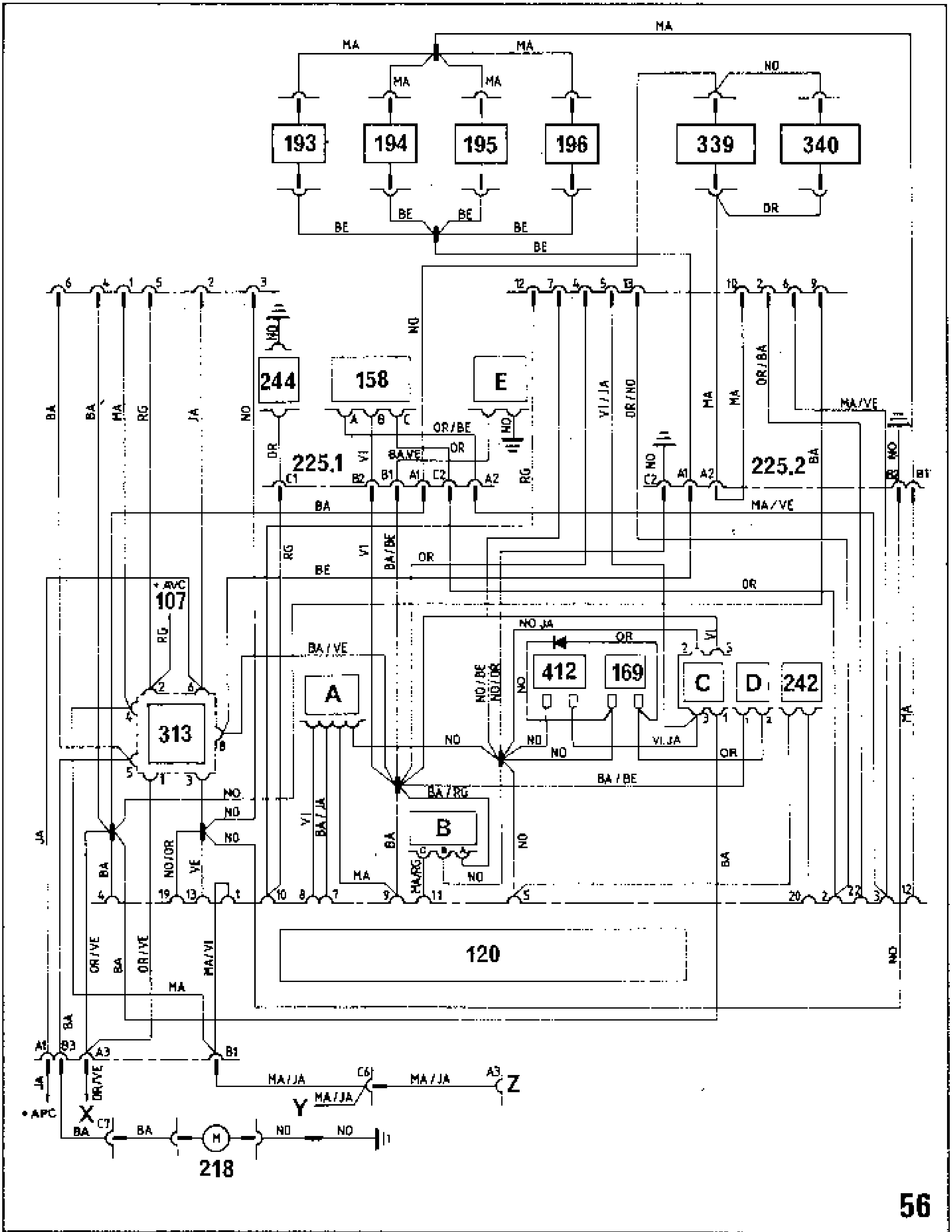


1 - Air temperature sensor
2 - Butterfly position potentiometer.



1 - Fuel pressure regulator
2 - Pinking detector
3 - Coolant temperature sensor.

"L" JETRONIC INJECTION OPERATING WIRING DIAGRAM.



"L" JETRONIC INJECTION - KEY - WIRING DIAGRAM

107 - Battery.

120 - Injection computer.

158 - Full load - no load switch

169 - Exhaust gas recycling solenoid valve.

193 to 196 - Injectors.

218 - Electric fuel pump.

225 - Diagnostic socket (D1 and D2).

313 - Injection control rpm relay.

242 - Oxygen sensor.

244 - Coolant temperature sensor.

339 - Cold start injector.

340 - Timed temperature switch.

412 - Accelerated idling solenoid valve.

A - Air flow meter

B - Altimetric corrector.

C - Timed relay.

D - Differential pressure switch.

E - Additional air valve.

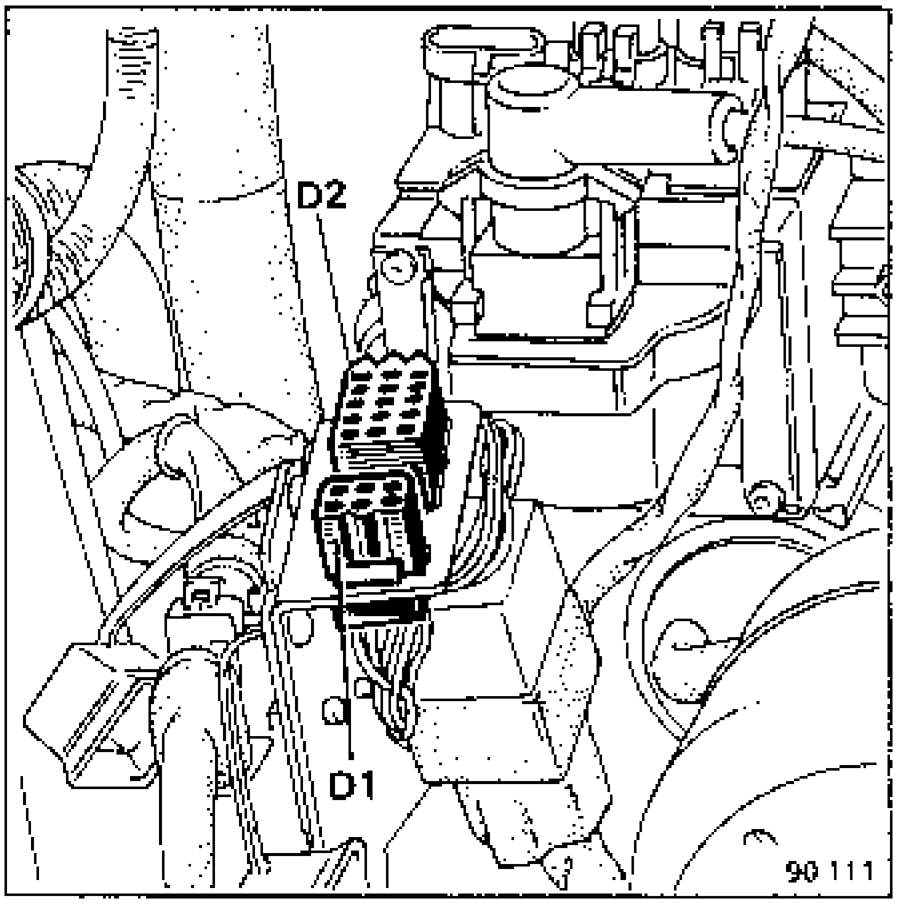
X - Ignition-starter data.

Y - Mechanical speedometer data.

Z - Rev. counter data.

DIAGNOSTIC SOCKET

The fuel injection system diagnostic sockets are located in the engine compartment, right beside the front right-hand shock absorber turret.



DIAGNOSTIC SOCKET CHANNEL ALLOCATION

Socket D1

1 - Tachometer (electronic ignition module)
2 - Ignition + after ignition
3 - Vehicle earth
4 - Starting (ignition contact breaker)
5 - Battery
6 - Fuel pump voltage

Diagnostic socket

D1 **D2** 82 094 A

Socket D2

1 - Not used
2 - Integrating voltage
3 - Not used
4 - Battery (+) from control relay
5 - Accelerated idling solenoid valve (depending on version)
6 - Full load switch (butterfly position)
7 - Vehicle earth
8 - Not used
9 - Timed temperature switch
10 - Cold start injector
11 - Not used
12 - Coolant temperature sensor
13 - Idling speed switch (butterfly position)
14 - Not used
15 - Not used

CHECKING THE FUEL SUPPLY SYSTEM

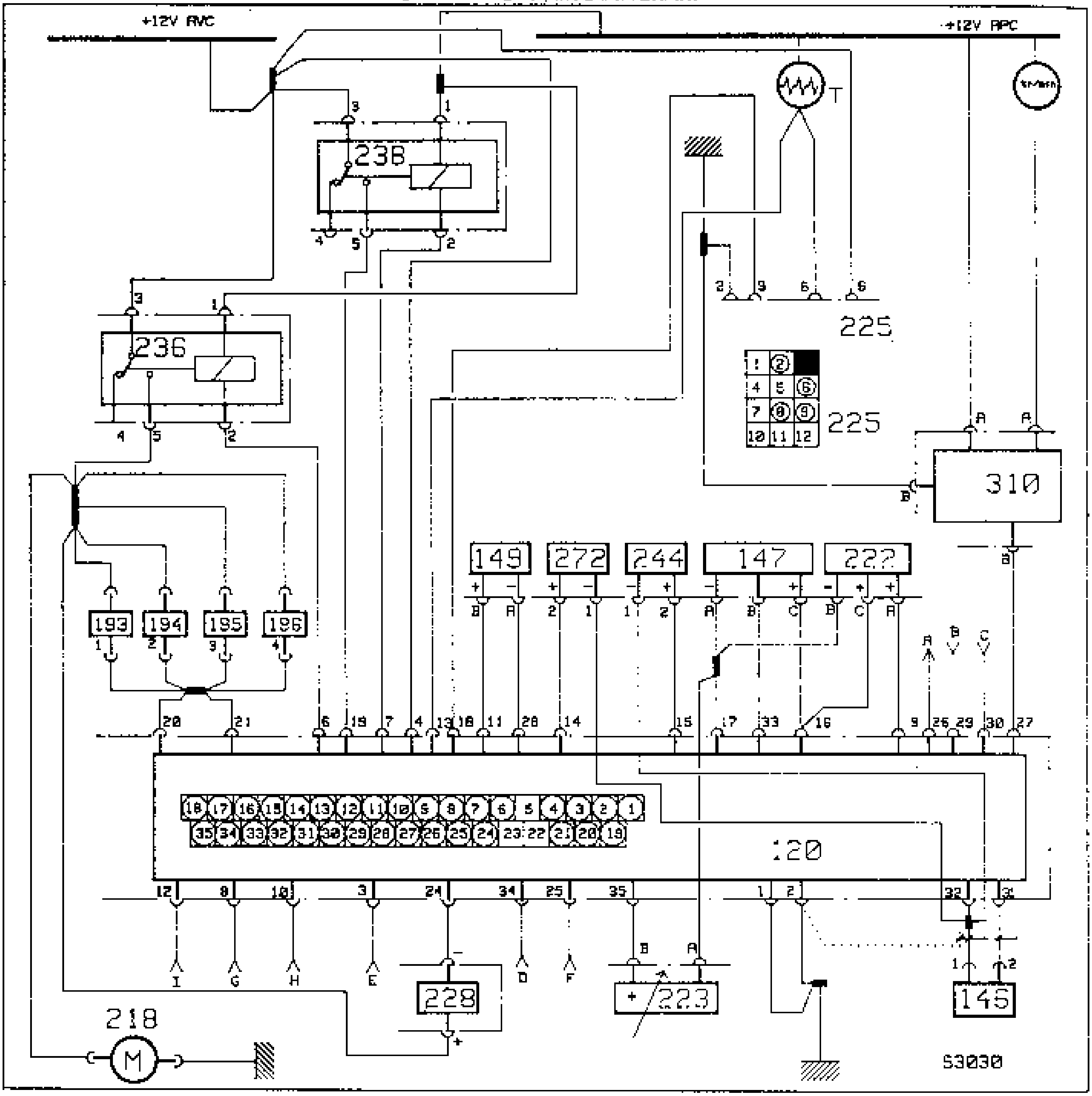
Order	Check	Test conditions	Correct result	Possible causes
1	Check the pressure of the fuel pump (engine stopped)	Remove the 2 regulator fixing bolts. Disconnect the fuel input pipe from the injector gallery to the pressure regulator and connect a pressure gauge using a T-connector. Shunt terminals D1-5 and D1-6 (small diagnostic socket). Briefly clamp the return pipe.	Approx 5 bar	Fuel pump Electrical circuit Fuel filter
2	Check the operation of the pressure regulator (engine stopped)	Use a vacuum pump and send approx. 530 mbar to the pressure regulator. Run the pump (see check 1).	2.5 bar ± 0.2	Pressure regulator
3	Check the injectors (engine stopped)	Disconnect the injector lead connectors. Remove the injection gallery with the injectors and the cold start injector Run the fuel pump (see check 1).	The injectors must not leak (slight dampness is permissible)	Injectors
4	Check the injector operation (engine stopped)	Position the injection gallery so that each injector can be placed in a container. Run the pump (see check 1) Send 12 volts and earth to each injector (only for a brief period).	Each live injector should spray. When the voltage is removed, there should be no output.	Injectors
5	Check the fuel pump delivery	Disconnect the fuel return pipe from the pressure regulator and place it in a 2 litre container. Run the fuel pump (see check 1).	Minimum 1 litre after 30 seconds' operation	Fuel filter Pressure regulator Fuel pump Electrical circuit

CHECKING THE OPERATION OF THE INJECTION SYSTEM

Note:
The voltage and resistance levels given are nominal levels. The effective value will vary slightly from one piece of equipment to another.

Condition	Check	Check points	Correct result
1. Ignition on 2. Engine stopped 3. Engine coolant temperature below 25° C.	1 Control relay. Earth and electronic module earth	Resistance between **D1-3** and **D2-7**	**0 ohm**
	2 Battery voltage	Voltage between **D1-5** (+) and **D1-3** (-)	**12 volts** (approx.)
	3. Ignition voltage	Voltage between **D1-2** (+) and **D1-3** (-)	**12 volts** (approx)
4. Computer disconnected	4 Coolant temperature sensor	Resistance between **D2-12** and **D2-7**	**2.5 kohms at 20° C** **320 ohms at 80° C**
5. Computer connected	4A. Temperature sensor		**1.5 kohms at 20° C**
	5. Injectors	Resistance between **A** and **B** of the injector harness connector	**16 ohms** (approx.)
5. Computer disconnected	6. Fuel pump	Shunt between **D1-5** and **D1-6**	Listen for any noise from the pump
	7. Butterfly contact	Ohmmeter between **D2-13** and **D2-6**	Infinite
		Ohmmeter between **D2-7** and **D2-13** (closed throttle)	**0 ohm**
		Ohmmeter between **D2-7** and **D2-6** (full throttle)	**0 ohm**
1 Starter engaged	8. Cold start injector and		
2. Coolant temperature below **25° C**	9. Coolant timed temperature switch	Voltage between **D2-9** and **D2-10**	**8 to 12 volts** initially then 0 volts after a few seconds. Duration variable depending on temperature.
	10. Tachometer voltage	Voltage between **D1-1** and **D1-3** (-)	Oscillating voltage (pulses)
1. Engine running 2. Coolant temperature below 25 °C 3. Oxygen (O_2) sensor temperature below 250 °C	11. Integrating voltage (circuit open)	Voltage between **D2-2** (+) and **D2-7** (-)	**6.8 volts** (approx.). Note the voltage for check **12** and check **13**.
1. Engine speed voltage 800 ± 50 rpm. 2. Coolant temperature above 40 °C. 3. Oxygen (O2) sensor temperature above 250 °C	12. Integrating voltage (circuit closed)	Voltage between **D2-2** (+) and **D2-7** (-)	The voltage obtained using check 11 varies by **± 0.5 volts** (e.g.: **6.3 - 7.3 volts**)
1. Increase engine speed to 3500 rpm and quickly close the throttle butterfly (idling)	13. Fuel input cut off during deceleration	Voltage between **D2-2** (+) and **D2-7** (-)	Voltage obtained with check **11** (e.g.: approx. **6.8 volts**)

OPERATING WIRING DIAGRAM

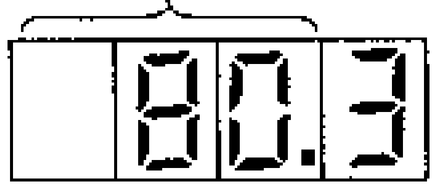


120	Computer.
146	Anti-pinking sensor.
147	Pressure testing sensor.
149	Flywheel sensor.
193 to 196	Injectors.
218	Petrol pump (engine).
222	Throttle housing potentiometer.
223	Regulating potentiometer.
225	Diagnostic socket (from above).
228	Idling speed adjustment solenoid valve.
236	Pump relay.
238	Fuel supply relay
244	Coolant temperature sensor.
272	Air temperature sensor.
310	Ignition power module (MPA)
	Connectors
T	Diagnostic warning light.
A	To flow meter.
B	Starter data.
C	Air conditioning on/off data
D	Air conditioning - clutch data.
E	Vehicle speed data.
F	PAS pressure switch data
G	Neutral and Park data (auto. trans.)
H	E3 equipment recognition earth.
I	Engine rpm bleep (auto. trans.)

NB: Since wiring diagrams are subject to modification, please refer to the electrical technical notes of the vehicles concerned for more accurate detail.

The method of fault-finding and use of the **XR 25** test box are described in **MR INJ R (E)**, chapter 17.

Identification number on the **XR 25** centre display

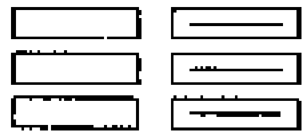


CHECKS CARRIED OUT (according to reading from XR 25)	Key #		
Pressure sensor	01	X	Millibars
Coolant temperature	02	X	Degrees
Air temperature	03	X	Degrees
Supply voltage	04	X	Volts
CO potentiometer	05	X	Ohms
O_2 sensor	05		Millivolts
Engine speed	06	X	rpm
Turbo pressure RCO	11		Milliseconds
Idling speed adjustment valve RCO	12	X	mseconds %
Pinking detector data	13	X	No units
Engine speed variation	14	X	rpm
Pinking corrector	15	X	No units
Atmospheric pressure corrector	16	X	Millibars
No load/full load potentiometer reading	17	X	No units
Vehicle speed	18	X	km/h
Turbo pressure correction	20		Milliseconds

NOTE:
The checks and data described below must be carried out using the **XR 25**, fitted with the latest cassette and checking chart **N° 87A**.

The computer is of the type which stores temporary faults. The diagnostic output is constant and the diagnostic warning light on the dashboard is operational.

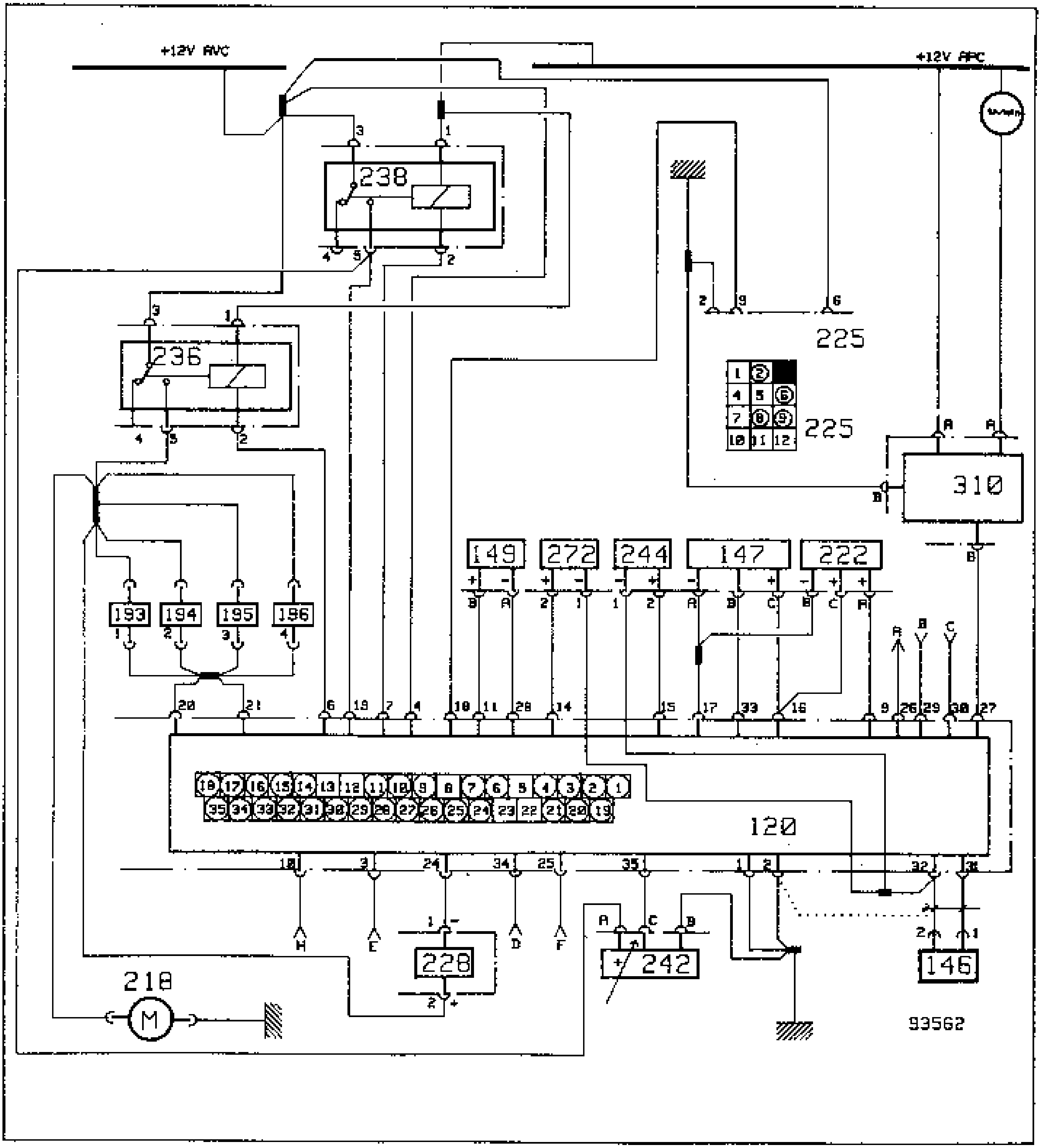
SPECIFICATION CHECK

Function to be checked	Conditions	Test box selection	Bar graph line nº.	Bar graph display	Digital display Notes
Injection diagnostic position	Engine stopped Ignition on	D03	L1 L8 L10	 L1 : presence code L8 : TDC code L10 : no load	x x x x **80.3** 3 = injection diagnostic
Butterfly potentiometer check	Engine stopped. Ignition on - No load - slight load - Full load	# 17	L10 L10 L10		x x x x **3 to 12** min. 225
Checking absolute pressure sensor	Engine stopped. Ignition on	# 01			x x x x depending on local barometric pressure
Checking coolant temperature sensor	Engine cold - stopped - ignition on	# 02			x x x Ambient temperature ± 5°C
Checking air temperature sensor	Engine cold - stopped - Ignition on	# 03			x x x Ambient temperature ± 5°C
Battery voltage	Engine hot - idling	# 04			Reading x x x **13.2 to 14.4**
Checking coolant temperature sensor	Engine hot - idling - after activation of cooling fan	# 02			x x x **80° C to 110° C**

SPECIFICATION CHECK

Function to be checked	Conditions	Test box selection	Bar graph line n°.	Bar graph display	Digital display Notes
Checking CO % and idling speed adjustment	Engine hot, idling No current consumer active Example - electric fan - headlights - steering lock	# 06 # 12			x x x x Idling speed: **850 ± 75 rpm.** **C.O. = 1.8 ± 0.2%** **R.C.O. = 28 to 35**
Checking idling speed with air conditioning	Engine hot, idling - air conditioning control on	# 06	L14		Note speed x x x **900 to 1000 rpm.**
	- compressor activated	# 06	L14		Note speed x x x **900 to 1000 rpm.**
Checking anti-pinking system Noise measurement	Engine hot, unloaded 3500 rpm.	# 13	L12		Note the min. and max. levels over approx. 10 seconds x x x The level must be above zero and variable
Vehicle speed	Vehicle moving	# 18	L15		x x x The reading should be the vehicle speed

OPERATING WIRING DIAGRAM



NB: Since wiring diagrams are subject to modification, please refer to the electrical technical notes of the vehicles concerned for more accurate detail.

KEY:

120 - Computer.

146 - Pinking detector.

147 - Absolute pressure sensor.

149 - TDC sensor.

193 to 196 - Injectors.

218 - Fuel pump.

222 - Butterfly potentiometer.

225 - Diagnostic socket.

228 - Idling speed adjustment valve.

236 - Fuel pump relay.

238 - Injection locking relay.

242 - Oxygen sensor.

244 - Coolant temperature sensor

272 - Air temperature sensor.

310 - Ignition power module.

A - Data for flow meter.

B - Starter data.

C - Air conditioning On/Off data.

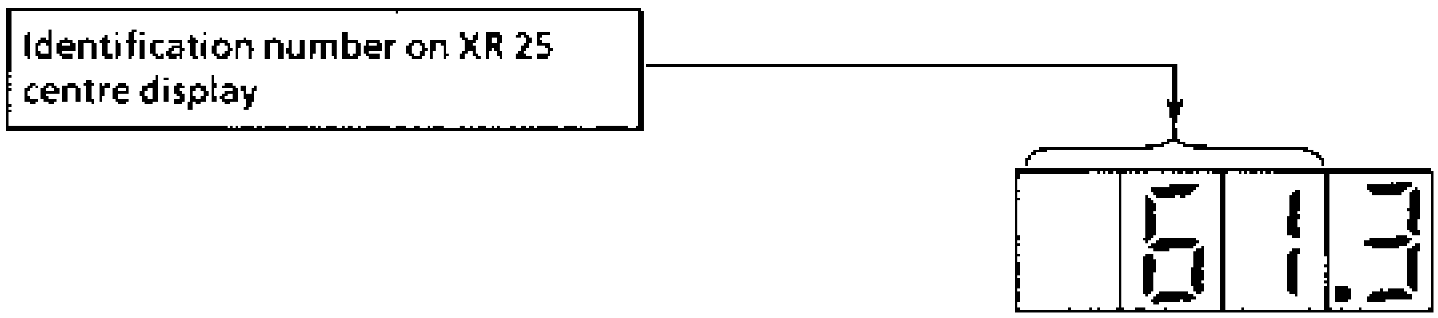
D - Air conditioning magnetic activation data.

E - Speed data.

F - PAS pressure switch data.

H - E_3 equipment recognition earth

The method of fault-finding and use of the **XR 25** test box are described in **MR INJ R (E)**, chapter 17.



CHECKS CARRIED OUT (according to reading on XR 25)	Key #		
Pressure sensor	01	X	Millibars
Coolant temperature	02	X	Degrees
Air temperature	03	X	Degrees
Supply 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 adjustment valve RCO	12	X	mseconds %
Pinking sensor data	13	X	No units
Engine speed variation	14	X	rpm
Pinking correction	15	X	No units
Atmospheric pressure correction	16	X	Millibars
Full load/no load potentiometer reading	17	X	No units
Vehicle speed	18	X	km/h
Turbo pressure correction	20		Milliseconds
Mixture adjustment correction	35	X	No units

OTE:
e checks and data described below must be rried out using the **XR 25**, fitted with the latest ssette and checking chart **N° 87A.**

The computer is of the type which stores temporary faults. The diagnostic output is constant and the diagnostic warning light on the dashboard is operational.

SPECIFICATION CHECK

Function to be checked	Conditions	Test box selection	Bar graph line n°	Bar graph display	Digital display Remarks
Injection diagnostic position	Engine stopped Ignition on	D03	L1 L8 L10 L13	L1 : presence code L8 : TDC code L10 : no load L13 : oxygen sensor	X X X X 61.3 3 = injection diagnostic
Checking butterfly potentiometer	Engine stopped Ignition on. - No load - Slight load - Full load	# 17	 L10 L10 L10		X X X X 4 to 10 240 > XXX > 255
Checking absolute pressure sensor	Engine stopped Ignition on	# 01			X X X X depending on local barometric pressure
Checking coolant temperature sensor	Engine cold - stopped - Ignition on	# 02			X X X Ambient temperature ± 5°C
Checking air temperature sensor	Engine cold - stopped - Ignition on	# 03			X X X Ambient temperature ± 5°C
Battery voltage	Engine hot - idling	# 04			Reading X X X 13.2 to 14.4
Checking coolant temperature sensor	Engine hot - idling - after activation of cooling fan	# 02			X X X 80° C to 110° C

SPECIFICATION CHECK

Function to be checked	Conditions	Test box selection	Bar graph line n°.	Bar graph display	Digital display Remarks
Checking idling speed adjustment %	Engine hot, idling No consumer units active e.g. - cooling fan - steering lock	# 06 # 12			x x x x Idling speed 900 ± 50 rpm. R.C.O. = 33 to 38
Checking idling speed with air conditioning	Engine hot, idling - air conditioning control compressor activated	# 06	L14		Note speed x x x 900 ± 50 rpm.
Anti-pinking system check Noise measurement	Engine hot, unloaded 3600 rpm	# 13	L12		Note min. and max. levels over approx 10 seconds x x x The reading should be above zero and variable
Vehicle speed	Vehicle moving	# 18	L15		x x x The reading should be the vehicle speed
Ignition power module	Open circuit when starter activated		L17		

OXYGEN SENSOR FAULT-FINDING

I - Oxygen sensor voltage (or lambda sensor)

Reading **# 05** on **XR 25** test box: the reading represents the voltage supplied to the computer by the oxygen sensor and is expressed in volts. (In fact, the value varies between **0** and **1000 millivolts**.)

When the engine is running, the voltage reading should fluctuate rapidly between **200 ± 100 mV** (lean mixture) and **700 ± 50 mV** (rich mixture) and vice versa. (The smaller the max./min. variation, the poorer the sensor data.)

II - Mixture correction (reading **# 35** on the **XR 25**)

The reading at **# 35** on the **XR 25** represents the mixture correction made by the computer, depending on the richness of the mixture as perceived by the oxygen sensor. (The oxygen sensor analyses the oxygen content of the exhaust gases as a direct result of the richness of the mixture.)

With a maximum of **255** and a minimum of **0**, the mixture correction value normally fluctuates at around **128**.

- Value below **128**: Mixture should be leaner
- Value above **128**: Mixture should be richer.

III - Mixture adjustment (or closed loop)

When the engine is started, the computer does not immediately take into account the voltage supplied by the oxygen sensor (timed start) → the system is said to be in "open loop" (**# 35 = 128**).

During idling, when the coolant temperature reaches **75 - 80 °C**, the system (if in the closed loop condition: after timed start) will remain closed for **15 seconds**, while the computer notes the mixture correction values applied as required by the engine and calculates an average correction value.

The system then "open loops", maintaining this average value until the next closure (loss of no load, acceleration, etc.).

Due to the strategies of this type of motorisation, the oxygen sensor should be checked while the engine is hot and at a stabilised engine speed of **1500 - 2000 rpm** (after timed starting).

OXYGEN SENSOR FAULT-FINDING (lambda sensor)

IV - "Open loop"

The operating phases during which the computer takes no account of the voltage level supplied by the oxygen sensor are:

- Engine activation: **# 35 = 128** (timed starting = oxygen sensor heating time).
- Idling, above **75 - 80 °C** (after the **15 seconds** of closed loop); **# 35** = fixed value "learned" during the closure time.
- Sharp acceleration **# 35** = fixed value **(178)**
- Sharp deceleration **# 35 = 128**
- Oxygen sensor failure **# 35 = 128**.

V - Sensor failure and downgraded mode

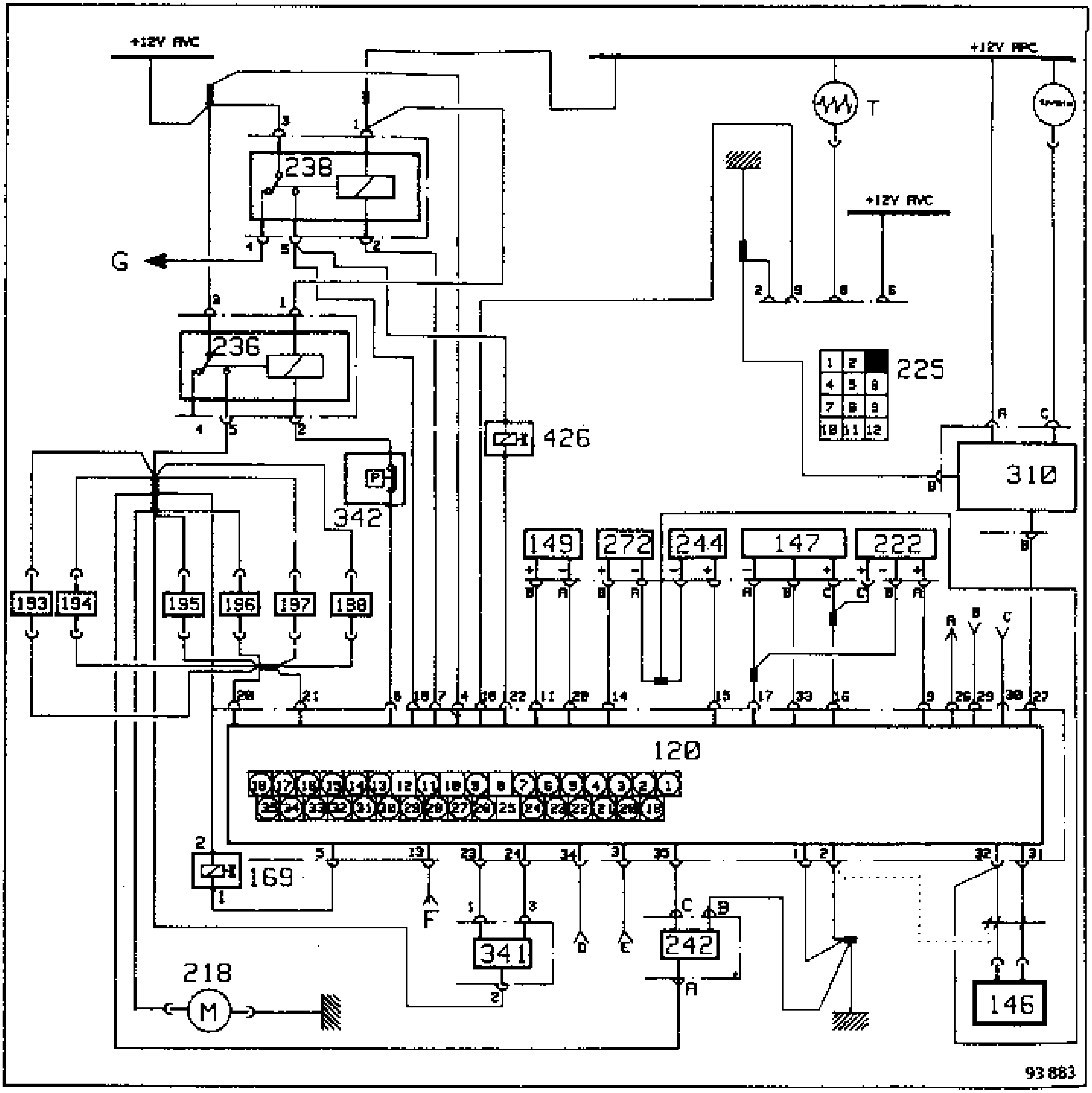
If the oxygen sensor is faulty (**# 05** fluctuates very weakly or not at all) during the closed loop phase, the computer generates several consecutive corrections.

After approximately ten corrections (**# 35** goes from **128** to **255**), the computer declares the sensor faulty and enters downgraded mode, in other words "open loop": **# 35 = 128** irrespective of the operating phase (except full load), the right-hand bar graph of line **13** on the **XR 25** changes status permanently until the next time the ignition is switched off.

CHECK CARRIED OUT USING CASSETTE N° 8 OR LATER

Function to be checked	Conditions	Bar graph line n°	Bar graph display	Test box selection	Digital display Remarks
Oxygen sensor operation	Engine hot after cooling fan triggered twice **Speed stabilised at approximately 1500 to 2000 rpm.**	L13		# 05 # 35	X X X X **XXXX** : The voltage value fluctuates around **450 mV** min: **20** to **100 mV** max: **800** to **900 mV** (approximate readings) X X X X The value fluctuates around 128
	Downgraded mode Sensor failure, leads cut, sensor disconnected	L13		# 05 # 35	X X X X The value is fixed X X X X **XXXX = 128**
	Faulty oxygen sensor operation	L13		# 05 # 35	X X X X **XXXX** : Value fluctuates weakly and/or slowly. Small max/min variation X X X X **XXXX** : The value is close to **0** or **255**.

INJECTION CIRCUIT OPERATING DIAGRAM



NB: Since wiring diagrams are subject to modifications, please refer to the electrical technical notes for the vehicles concerned.

INJECTION CIRCUIT WIRING DIAGRAM KEY

120 - Computer.

146 - Pinking detector.

147 - Absolute pressure sensor.

149 - TDC sensor.

169 - Fuel vapour recycling solenoid valve.

193 to 198 - Injectors.

218 - Fuel pump.

222 - Throttle potentiometer.

225 - Diagnostic socket.

236 - Fuel pump relay.

238 - Injection locking relay.

242 - Oxygen sensor.

244 - Coolant temperature sensor.

272 - Air temperature sensor.

310 - Ignition power module.

341 - Idling speed adjustment valve.

342 - Turbo safety pressure switch.

426 - Turbo circuit opening control solenoid valve.

A - Flow meter signal

B - Starter data.

C - Air conditioning request data (On/Off).

D - Data:
- air conditioning (pressure switch - thermostat)
- power-assisted steering (pressure switch)

E - Vehicle speed data.

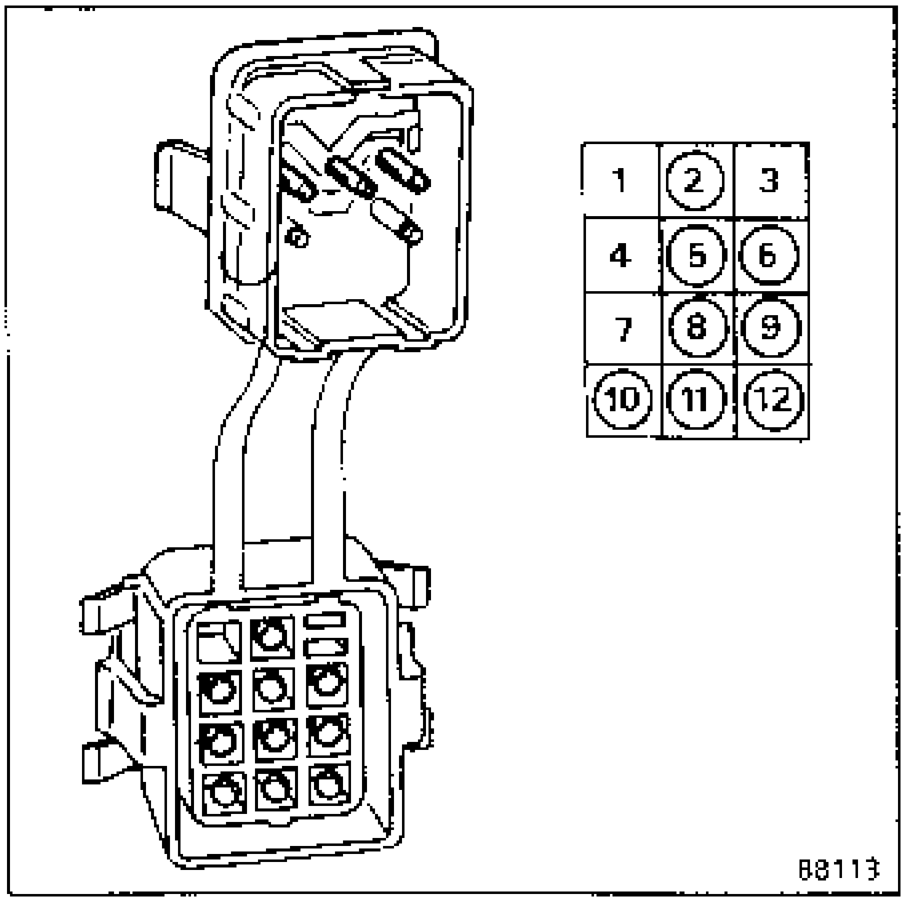
F - Air conditioning compressor engaging authorisation.

G - Anti-percolation relay pick-up.

NOTE:

The selection of data (air conditioning or power-assisted steering pressure switch) in channel 34 of the computer is made possible by two diode units. These are housed near the absolute pressure sensor and are green. Their configuration is identical to that of a relay.

ALLOCATION OF DIAGNOSTIC SOCKET TERMINALS



1 - Not used.
2 - Earth.
3 - Protection bar.
4 - Not connected.
5 - Variable assistance power steering data.
6 - + 12 volts before ignition.
7 - Not used.
8 - Injection warning light on dashboard.
9 - Injection information from computer.
10 - Diagnostic selection.
11 - Memory seat data at diagnostic socket.
12 - Memory seat diagnostic selection data.

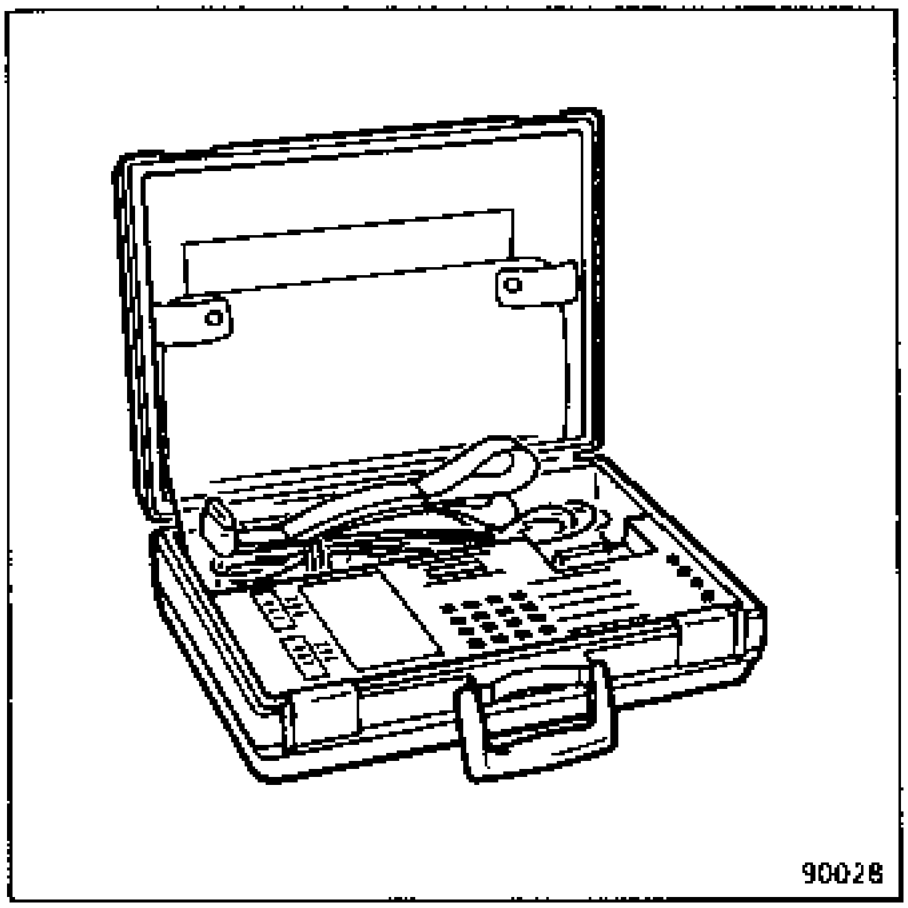
Note:

There is no shunt in the diagnostic socket cover and therefore no link between the injection computer and the dashboard warning light.

The **XR 25** test box, specially developed for a microprocessor system, is connected to the diagnostic socket.

This test box enables rapid checking and repair and provides information on the status of the computer and its peripheral equipment (See Inj. R (E)).

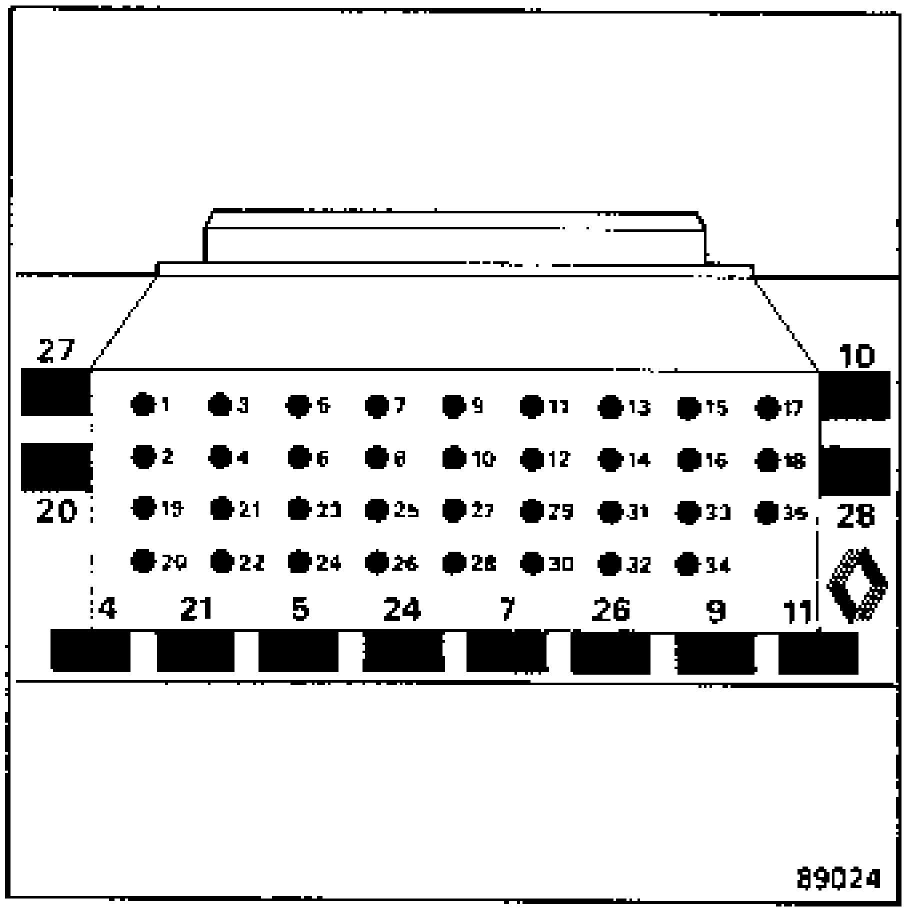
XR 25 test box



If the electrical continuities require checking as a result of the data supplied by the **XR 25**, by connecting bornier **MS 1048** instead of the injection computer connector, easier access can be provided to the terminals of the various contacts.

Attention: A connection error could cause damage to the injection circuit components.

M.S. 1048 Bornier



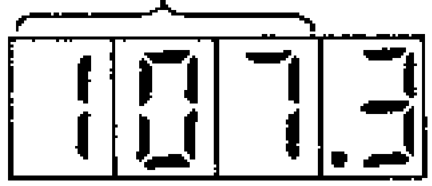
(The **MS 1048** comprises a **35**-channel base on a printed circuit board covered with **35** copper-plated surfaces, numbered from **1 to 35**.)

Note: Any operations other than those involving the **XR 25**, such as shunting electrical terminals or checking using the voltmeter, are prohibited when the computer is connected.

The fault-finding method and the use of the XR 25 test box are described in **MR Injection R (E)** chapter 17.

Identification code :

Identification number reading on **XR 25** centre display



CHECKS CARRIED OUT (according to n° read from XR 25)	Key #		Measuring units
Pressure sensor	01	X	Millibar
Coolant temperature	02	X	Degrees
Air temperature	03	X	Degrees
Supply voltage	04	X	Volts
CO Potentiometer	05		Ohms
O_2 sensor	05	X	Millivolts
Engine speed	06	X	rpm
Turbo pressure RCO	11	X	Millisec.
Idling speed adjustment valve RCO	12	X	Millisec.
Pinking detector data	13	X	No units
Engine speed variation	14	X	rpm
Pinking corrector	15	X	No units
Atmospheric pressure correction	16	X	Millibar
Full load/no load pot. value	17	X	No units
Vehicle speed	18	X	km/h
Turbo pressure correction	20	X	Millisec.
Mixture correction	35	X	No units

INJECTION CONFORMITY CHECK
TEST VEHICLE STATIONARY

Function to be checked	Conditions	Line n°	Bar graph display	XR 25 selection	Centre display reading Remarks
Assembly of idling speed adjustment valve	Engine stopped Visual check				Flow towards manifold in direction shown by arrow on body of valve
Location of injection diagnostic	Engine stopped Ignition on Key D03	L1 L8 L10 L13	L1 : present code L8 : TDC code L10 : no load switch L13 : presence of oxygen sensor		x x x 3 xxx = 107 3 = injection diagnostic
Coolant temperature sensor	Engine stopped and cold Ignition on	L5		# 02	Ambient temperature ± 5°C
Air temperature sensor	Engine stopped and cold Ignition on	L4		# 03	Ambient temperature ± 5°C
Absolute pressure sensor	Engine stopped Ignition on	L7		# 01	depending on local barometric pressure 950 < X < 1050 mb
Checking the butterfly potentiometer	Engine stopped. Ignition on. Positions: - no load - partial load - full load	 L10 L10 L10		 # 17 # 17 # 17	x x x 7 < X < 13 X increases 225 < X < 252
Turbocharging pressure control valve (cyclic opening ratio)	Engine stopped. Ignition on. - no load - full load		valve shuts	# 11 # 11	x x x x X = 2.28 X = 83.38

CHECKING INJECTION CONFORMITY
TEST VEHICLE STATIONARY

Function to be checked	Conditions	Line n°	Bar graph display	XR 25 selection	Centre display reading Remarks
Coolant temperature sensor	Engine idling after cooling fan triggered once	L5		# 02	X X X X = 80° C to 100 °C
Air temperature sensor	Engine idling	L4		# 03	X X X Temperature higher than ambient temperature
Battery voltage	Engine idling			# 04	X X X X = 11.5 V to 14.5 V
Engine idling	Engine idling and hot. No consumer units connected (see special features of accelerator control adjustment)		Idling speed RCO	# 06 # 12	X X X 700 ≤ X ≤ 800 rpm 3.23 ≤ X ≤ 3.7
Idling speed with air conditioning	Activate air conditioning	L14 L14	Air conditioning operating. Compressor deactivated. Air conditioning operating. Compressor activated.	# 06	Accelerated idling speed = 950 ± 100 rpm.
Manifold pressure	Engine hot, idling No consumer units.			# 01	X X X 350 < X < 450 mb
Power-assisted steering pressure switch.	Engine hot, idling. Steering locked (air conditioning deactivated).	L14		# 06	X X X X = 900 ± 100 rpm.

CHECKING INJECTION CONFORMITY
TEST VEHICLE STATIONARY

Function to be checked	Conditions	Line n°	Bar graph display	XR 25 selection	Centre display reading Remarks
Vehicle speed	Vehicle moving	L15		# 18	XXX X = counter speed
Pinking detector	Full load from 2000 to 4000 rpm in 4th.	L12		# 13	XXX X = not zero and variable
				# 15	X < 3
Turbocharging pressure adjustment	Full load from 2000 to 4000 rpm in 4th.		Max. pressure	# 01	XXX X ≤ 1950 mb
			Max. pressure level at N > 3500 rpm.		1860 < X < 1920 mb
	(same conditions)			# 20	4 < X < 23
Oxygen sensor	Engine hot Vehicle moving at between 30 - 50 mph (50 - 80 km/h) in 3rd (stabilised engine speed)	L13		# 05	XXX Value constantly varies between approximately 50 - 900 mvolt max-min > 540 mV
				# 35	20 < X < 230
	For	L13	with	# 05	Value varies slightly
			and/or	# 35	X = 128
			therefore oxygen sensor failure		

READING # 35: MIXTURE ADJUSTMENT

Depending on the voltage supplied by the oxygen sensor (which varies between approximately **50 - 900 mV**), the computer corrects the injection time (in fact, it influences air/petrol metering) so as to stay as close as possible to mixture richness **1**.
(Apart from special cases: cold starting, delay after starting, full load deceleration, sensor failure.)

The value read at **D03, # 35 (XR 25)** represents the mixture correction made by the computer.

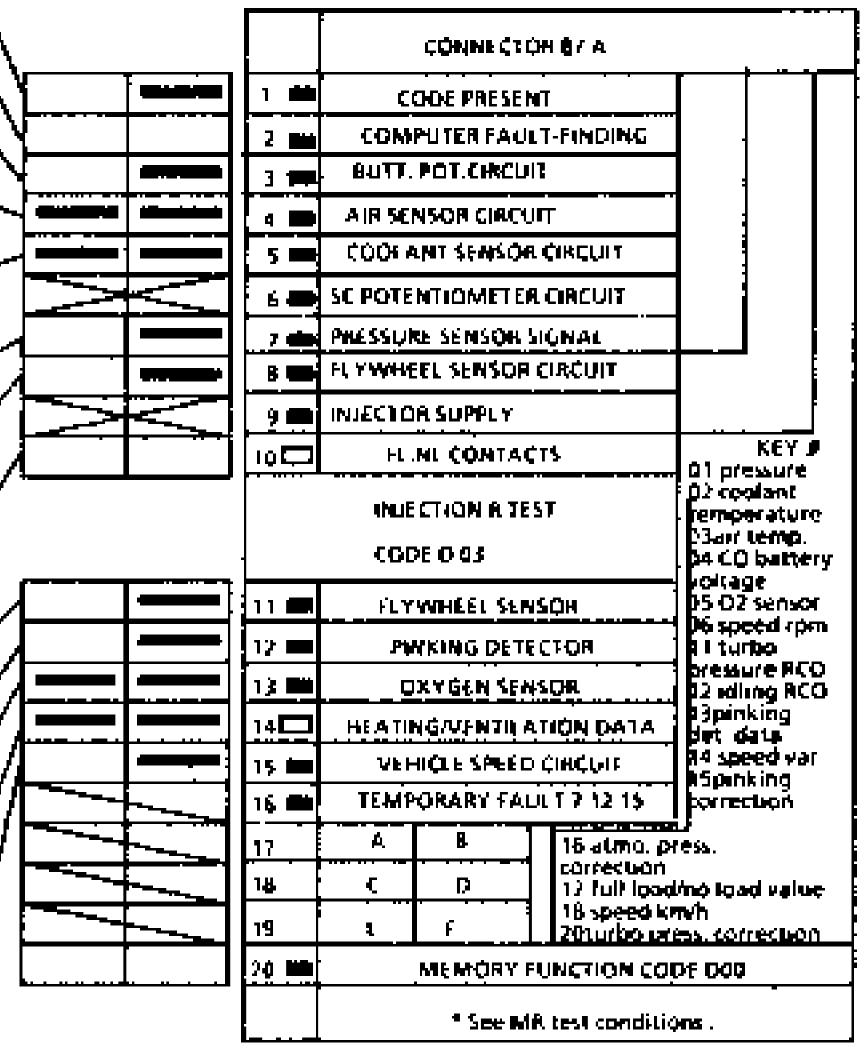
With a minimum of **0** and a maximum of **255**, the correction value normally fluctuates at around **128**.

Mixture correction around **128** to **255** represents a richer fuel mixture, while **120** to **0** represents a leaner fuel mixture (compared to mixture richness 1).

Value **128** is also the value shown by the computer when the oxygen sensor is faulty.

To sum up, during checks using the **XR 25, # 05** should show the regular movement from lean to rich and **# 35** the regular fluctuations around **128** (see test conditions in the conformity check).

REMARKS CONCERNING CHECKING USING THE XR 25



1 - Must always be illuminated, engine stopped or running.

2 - Always extinguished.

3 - For L3 illuminated on right and # 17 = 128. Potentiometer failure.

4 - For L4 illuminated on right ---> SC fault.
For L4 illuminated on left ---> OC fault.

5 - For L5 illuminated on right ---> SC fault.
For L5 illuminated on left ---> OC fault.

7 - For L7 illuminated on right ---> sensor failure.

8 - Extinguishes when starter activated.
If illuminated on left: connection reversed.

10 - See conformity check.

11 - Sensor target fault.

12 - Illuminated on right: sensor failure.

13 - Illuminated on right: sensor failure.

14 - With air conditioning activated:
- Illuminated on right: compressor deactivated
- Illuminated on left and right: compressor activated.

15 - Illuminated on right: sensor failure and # 18 = 0

SC - Short circuit.

OC - Open circuit.

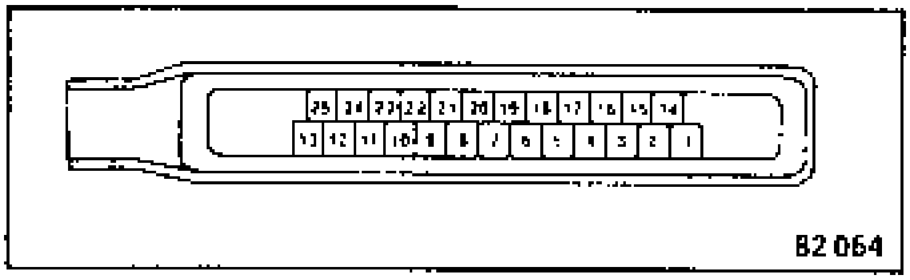
Remark:

The left-hand bar graph of line 14 shows that the power assisted steering pressure switch is working (air conditioning stopped) (see conformity check).

Note: For further information on certain elements of the injection circuit, please refer to MR INJ "R" (E).

COMPUTER OUTPUT ALLOCATION

The marks of the connector pin for the electronic module leads are shown in the injection system wiring diagram. They are not marked on the connector.



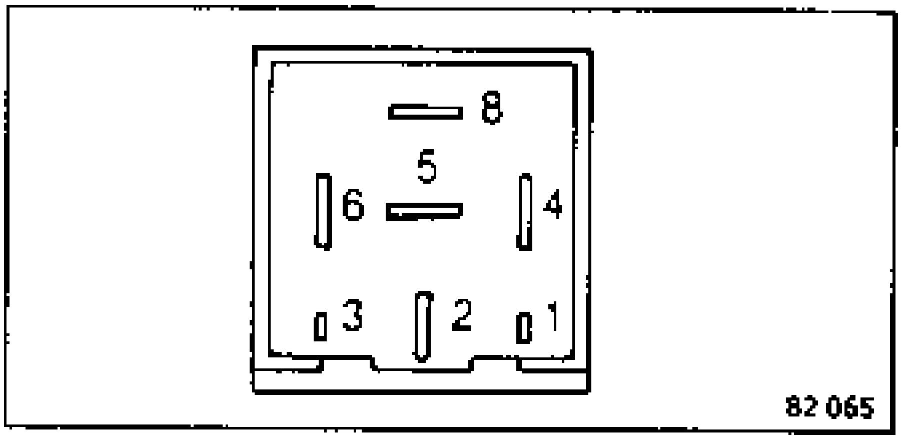
Electronic module connector

1 - Engine speed voltage.
2 - Butterfly switch idling contact.
3 - Butterfly switch full load contact.
4 - Ignition switch (starting).
5 - Vehicle earth (supply mark).
6 - Not used.
7 - Flow meter output voltage.
8 - Flow meter input voltage.
9 - Battery voltage.
10 - Coolant timed temperature switch.
11 - Not used.
12 - Injectors 1, 2, 3 and 4 (injection pulses).
13 - Vehicle earth for injectors.
14 - Not used.
15 - Not used.
16 - Not used.
17 - Not used.
18 - Not used.
19 - Not used.
20 - Oxygen sensor(O2).
21 - Not used.
22 - Output for diagnostic socket (integration voltage).
23 - Not used.
24 - Not used.
25 - Vehicle earth.

ELECTRICAL CHECKS ON INJECTION CONTROL RPM RELAY

1 - Ignition switch (starting).
2 - Battery voltage
3 - Vehicle earth.
4 - Pulse speed voltage or AEI
5 - Fuel pump.
6 - Ignition (electronic ignition module + after ignition).
8 - Battery voltage after relay.

Control relay connector



ALTIMETRIC CORRECTOR CHECKS (altitude 100 metres)

- Engine hot and idling
- Oxygen sensor primed.
- Measure the integrating voltage between terminals D2-2 and D2-7 (adjustment voltage value, see method on page 17-57)
- Disconnect the altimetric corrector; the integrating voltage should not change.

If it does:

- Check electrical harness;
- Check altimetric corrector.

INTEGRATION VOLTAGE

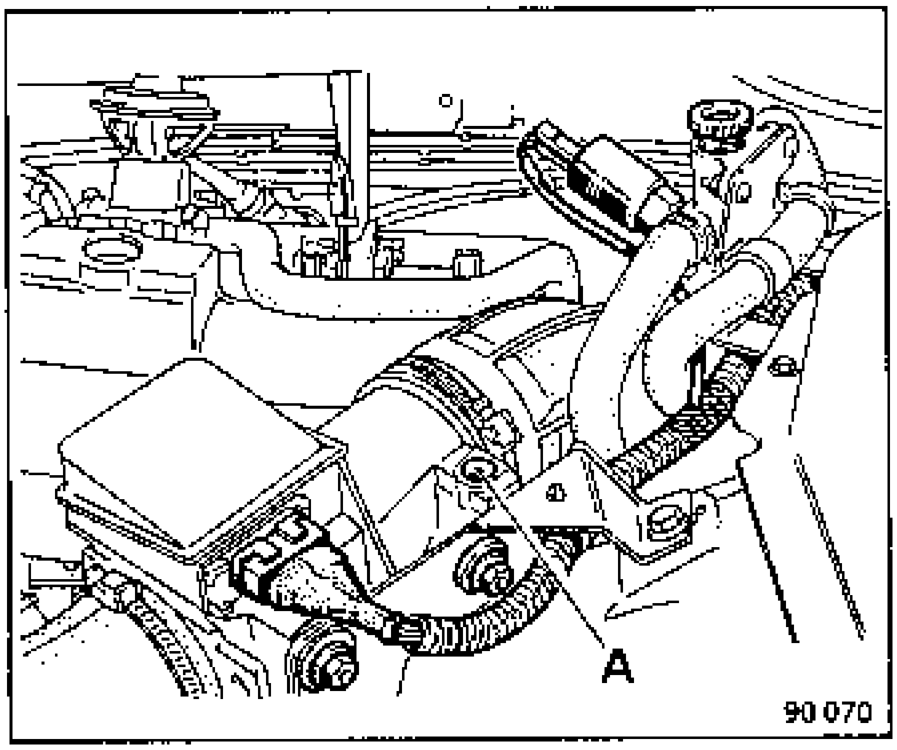
The adjustment of the integration voltage enables the injection mapping to be recentred so that mixture correction, depending on the oxygen sensor voltage, can be carried out under the correct conditions.

This adjustment should be carried out after:

- replacing the flow meter;
- overhauling the engine;
- replacing the engine.

Furthermore, care should be taken to ensure that there is no air leak between the flow meter and the inlet manifold or at the additional air valve.

Adjusting the integration voltage

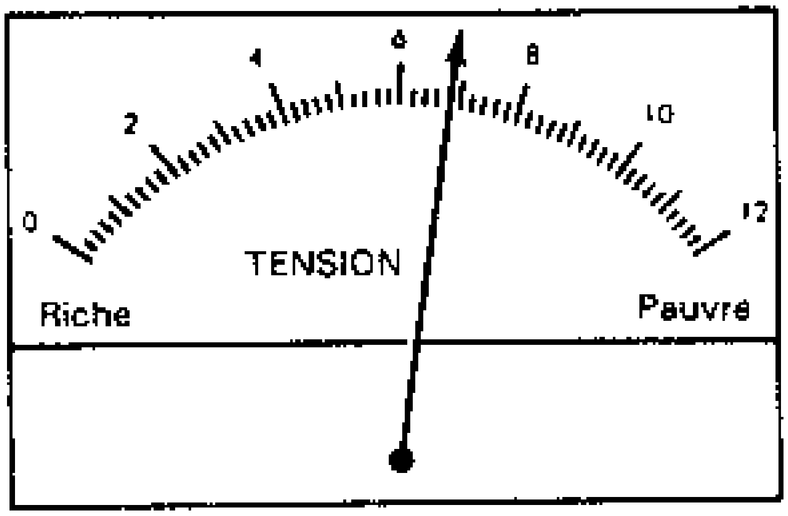


After removing the tamperproof cap (A), the air flow meter bypass adjustment screw can be turned.

Adjusting the integration voltage (continued)

Disconnect the connector from the oxygen sensor leads (O_2).

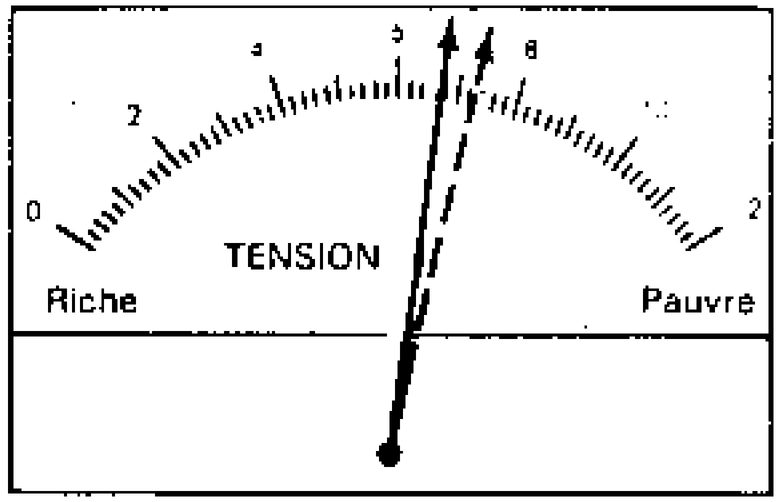
Connect a voltmeter to the diagnostic sockets (**D2-2** and **D2-7**). Note the voltage. It should be approximately **6 - 7 volts.**



83 076 A

Reconnect the oxygen (O_2) sensor lead connectors.

Watch the voltmeter and adjust the bypass screw to achieve the voltage obtained above **+ 0.5 volts** (needle fluctuation).



83 076 B

Note:

Incorrect adjustment of the bypass screw could cause the voltage to vary by **± 3 volts.**

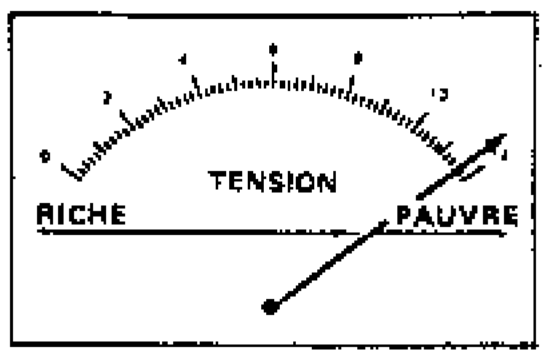
After adjusting the bypass screw, check the idling speed and adjust if necessary. Replace the tamperproof cap.

Checking the data return function

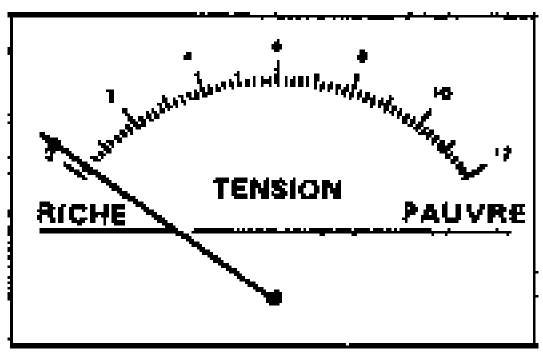
Condition: integration voltage approximately **12 volts** (mixture too lean).
Cause:
- O_2 sensor short circuited;
- Air not measured (air leak);
- Altimetric corrector.

Condition: integration voltage approximately zero (mixture too rich)
Causes:
- Temperature sensor faulty or not connected;
- Flow meter faulty.

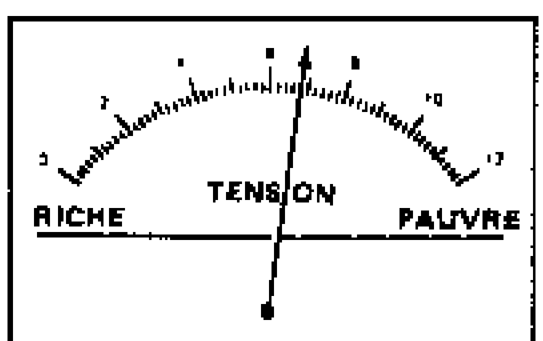
Condition: integration voltage indicates an open circuit (needle does not move)
Causes:
- O_2 sensor is not connected;
- Lead cut (circuit open).



82 073 A



82 073 B



82 073 C

Adjusting the full load/no load switch

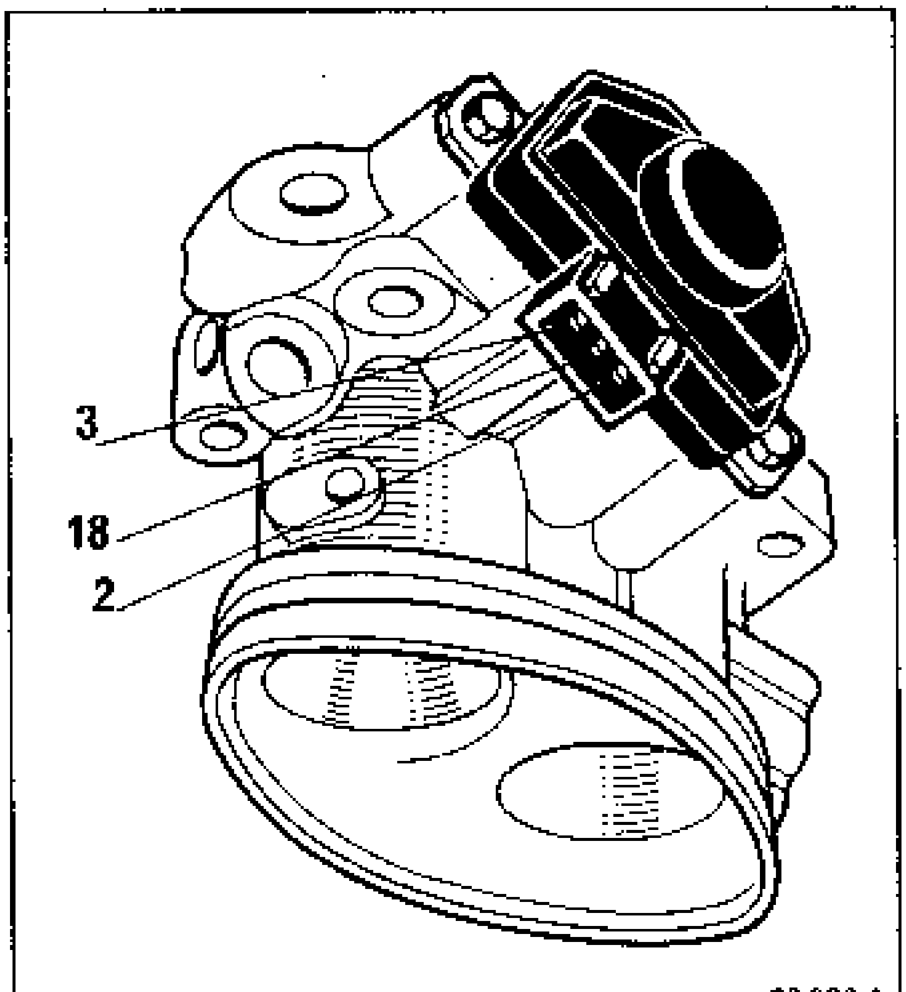
Using an ohmmeter, a set of feeler gauges and an angle gauge (if the module has been removed), check the position and correct operation of the following switches:

A Idling: no load (butterfly opening less than 1 °);

B Partial load: butterfly opening greater than 1 ° (**0.25 mm** feeler gauge on butterfly stop);

C Full load: (butterfly opening greater than **66 ± 4 °**).

Butterfly opening	Resistance between terminals in ohms (Ω)	
	2 and 18	18 and 3
A	0	infinite
B	infinite	infinite
C	infinite	0



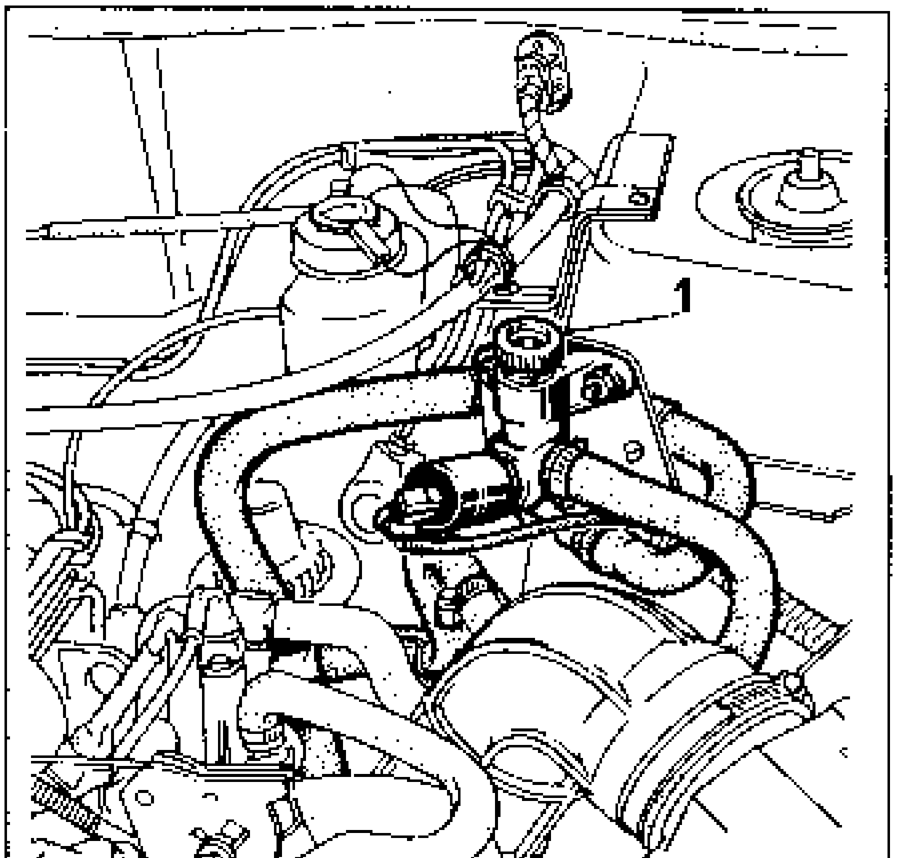
83 999-1

Checking the accelerated idling solenoid valve

- Disconnect the solenoid valve leads (1).

- Switch on the engine and allow it to idle.

- Directly supply **12 V** to the solenoid valve and earth it. The engine speed should increase.



90 074

Checking the accelerated idling solenoid valve power supply

- Connect a test lamp to the two solenoid valve input leads (1).

- Activate the starter; the lamp should be illuminated while the starter is activated and should remain illuminated for approximately 3 seconds after the end of the starter activation period (timed by the timed relay).

Checking the resistance of the additional air valve

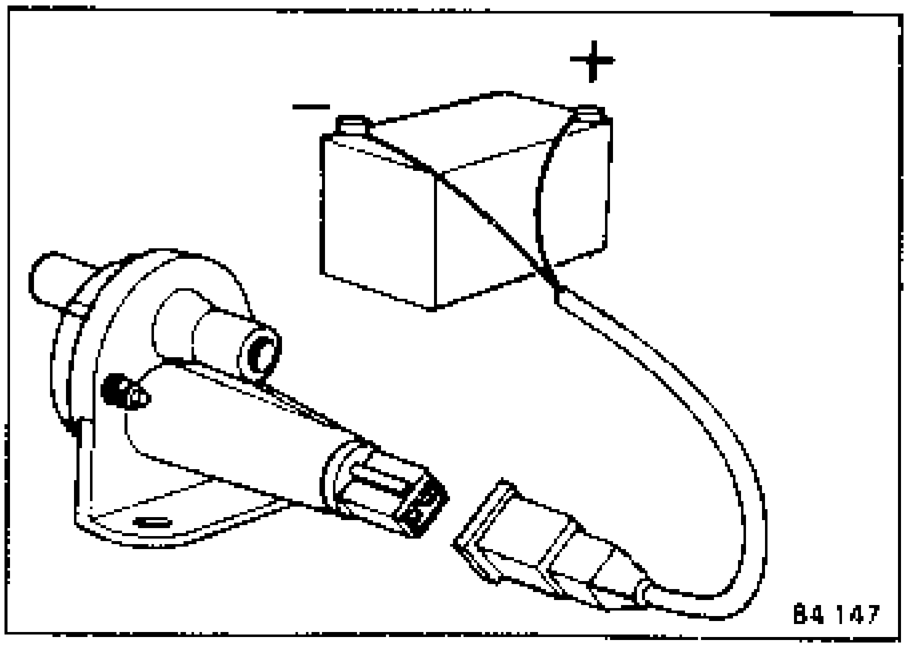
With the assembly at a temperature of approximately **20 °C**, the electrical wiring connector and the air pipes disconnected, check the interior of the air input and output to make sure that the diaphragm is partially open (visual check).

Use the test leads to connect the air valve heater resistor directly to the battery.

After approximately **10 minutes**, the diaphragm should be completely closed.

If it does not close, check the internal resistance **(49 Ω)**.

Otherwise, replace the air valve.

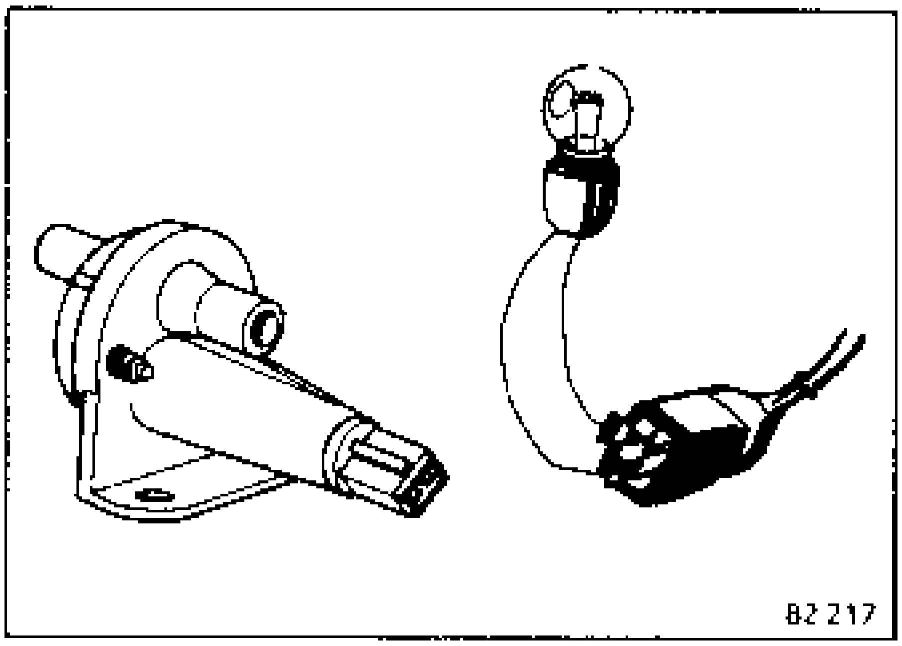


Checking the additional air valve wiring harness

The engine must be cold.

Connect a test lamp to the connector terminals.

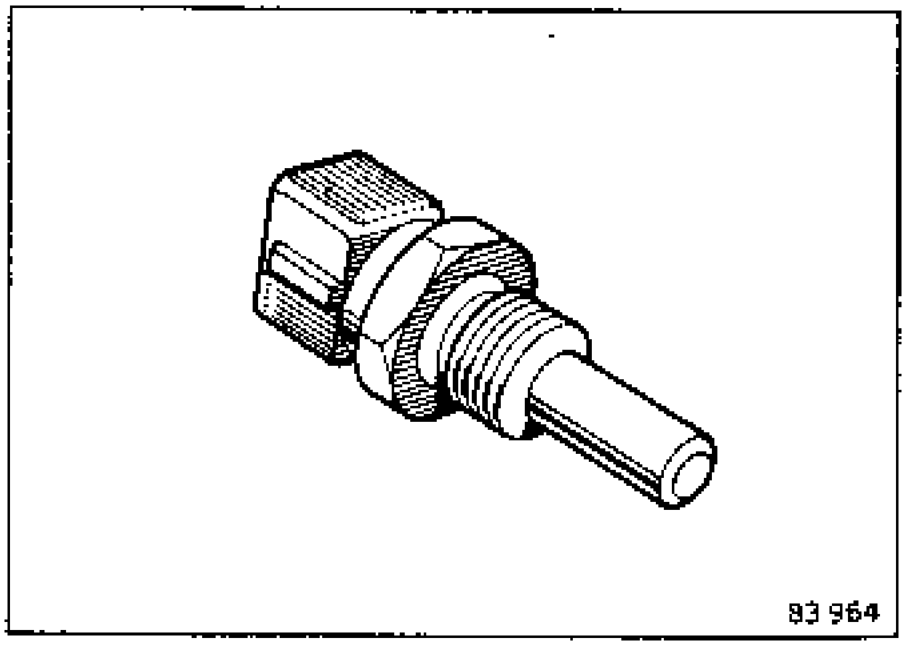
Start the engine. The test lamp should illuminate.



Checking the coolant sensor

Remove the sensor and replace it by a plug so as not to loose any coolant.

Using an ohmmeter, measure the sensor's resistance as a function of the temperature, after allowing the temperature to stabilise for at least **10 minutes**.



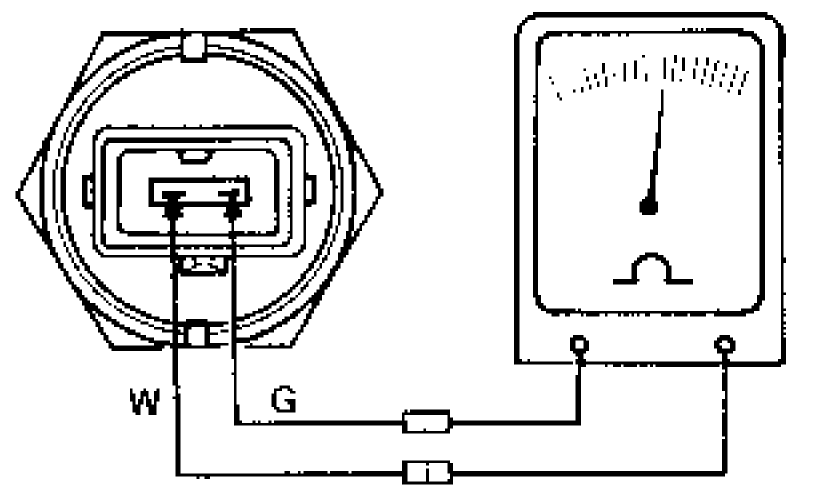
Please refer to the table below

Temperature	+ 20 ± 1° C	+ 80 ± 1° C
Resistance	2.1 to 2.9 kohms	250 to 390 ohms

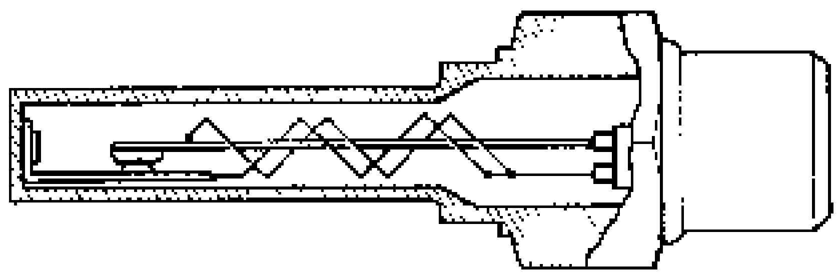
Checking the timed temperature switch

The nominal values of the timed temperature switch are marked on the side of the barrel, for example 35 ° C/8 (8 s 35 °C).

Check the resistance values between the pins (W and G) of the temperature switch and the earth for coolant temperatures below 30 °C and higher than 40 °C.



86 662

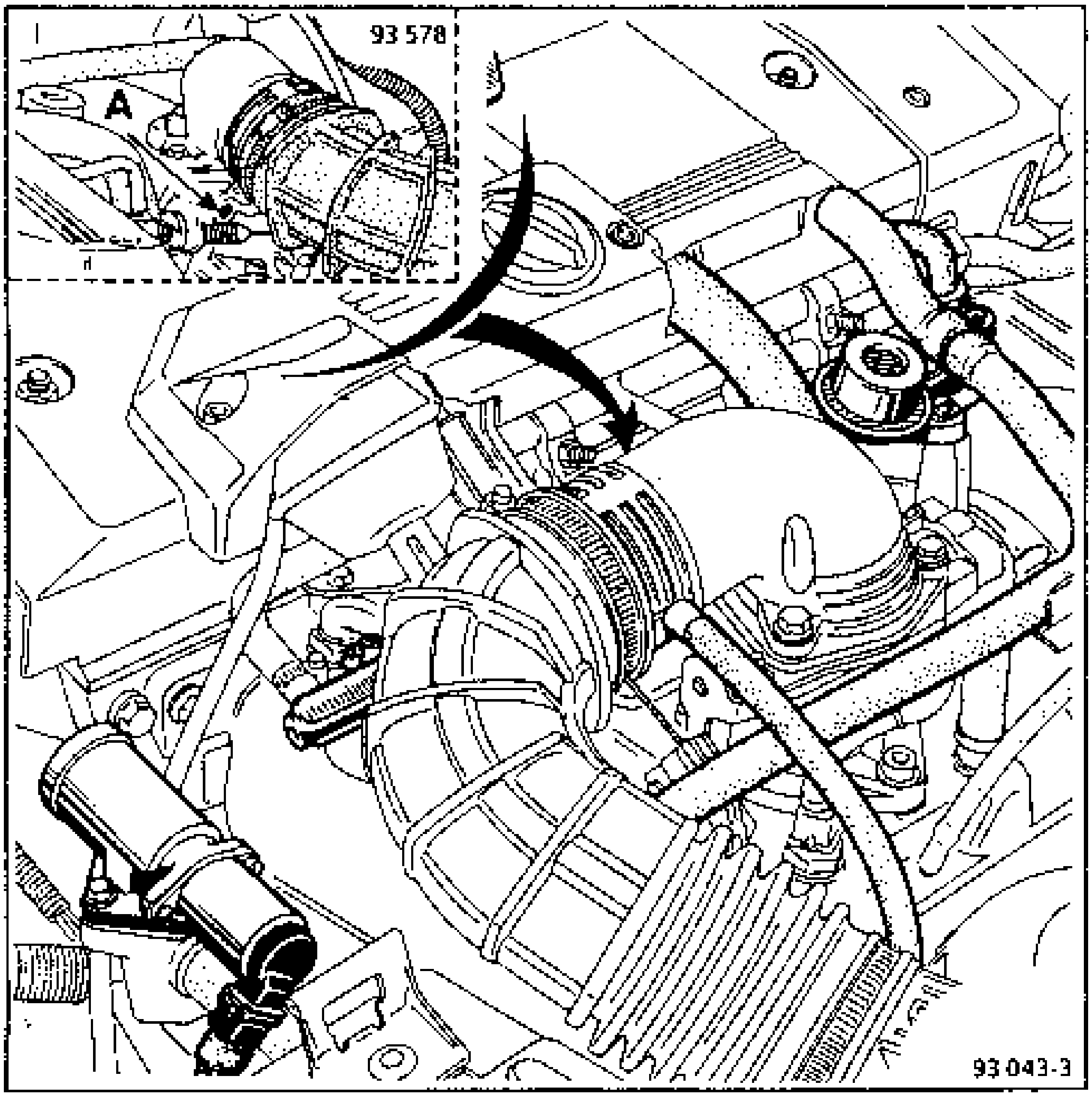


82 558

Please refer to the table below.

Type	At a coolant temperature below	above	Pin G and earth (module)	Resistance measured between Pin W and earth (module)	Pin G and pin W
35° C / 8s	+ 30° C		25 to 40 ohms	0	25 to 40 ohms
		+ 40° C	50 to 80 ohms	100 to 160 ohms	50 to 80 ohms

ADJUSTING THE IDLING BYPASS



Connect the **XR 25** fitted with the latest edition cassette (engine hot and idling).

Key **D03 # 12** and note the value on the centre display.

If the value reading is higher than the maximum value permitted by the conformity check:

- Clean the throttle housing;

- Attempt to reach the minimum correction value by unscrewing screw **(A)** until the idling speed increases (when the valve closes completely - RCO minimum reading).

Then rescrew the screw so as to increase the minimum value reading to **4 - 5%**.

Example:
Minimum value reading = **30.4%**; adjust to **35%**.

If the value read off at **# 17** is below the minimum permitted value, check and repair the air leak or sticking accelerator cable, as appropriate.

ADJUSTING THE LOAD POTENTIOMETER

Use the **XR 25** test box, fitted with the latest version of the cassette.

The ignition should be on with the engine stopped.

Enter **D03, # 17** and note the values on the centre display.

No load position:

B 292: Value between **3** and **12**.
B 294: Value between **4** and **10**.

Intermediate position:

The value increases
Value between **20** and **190**.

Full load position:

B 292: **225** minimum
B 294: **240** to **255**.

Adjust the position of the potentiometer so that, in the no load position, the value falls in the middle of the range of values given (for **B 292** and **B 294** adjust to **7** in no load position).

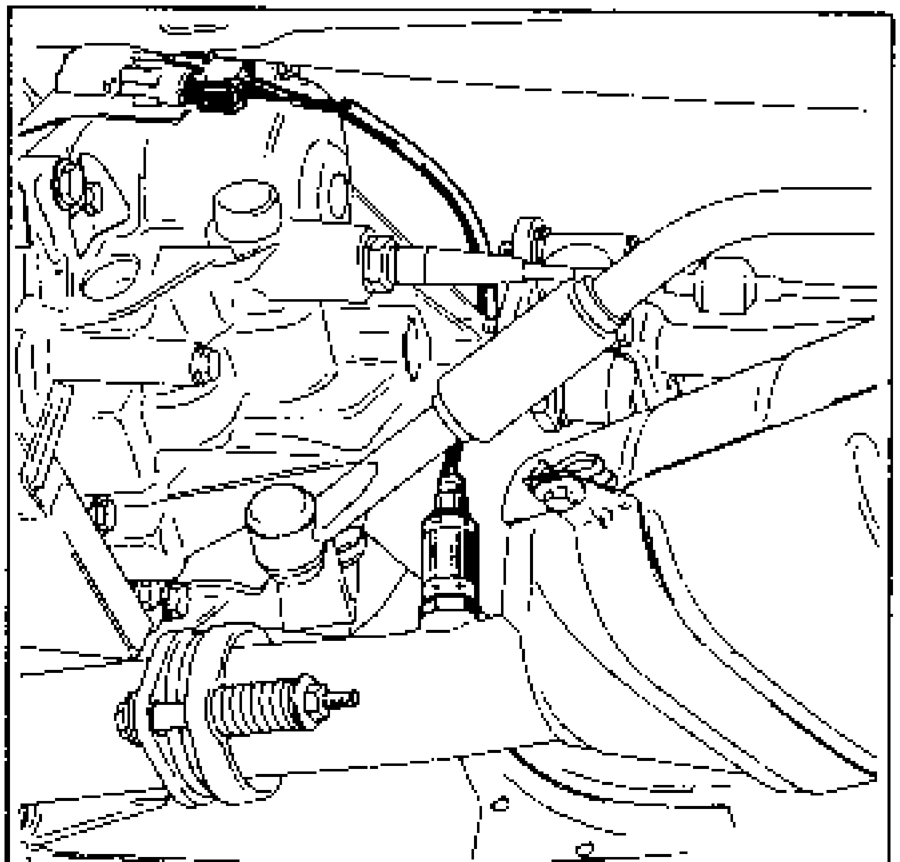
When making this adjustment, ignore bar graph **10 R**.

- Tighten the potentiometer fixing bolts.
- Switch the ignition off and then back on.
- Check for the presence of the correct values at **# 17** and for the presence of the bar graphs.

OXYGEN SENSOR

The oxygen sensor is fitted immediately inside the catalytic converter inlet.

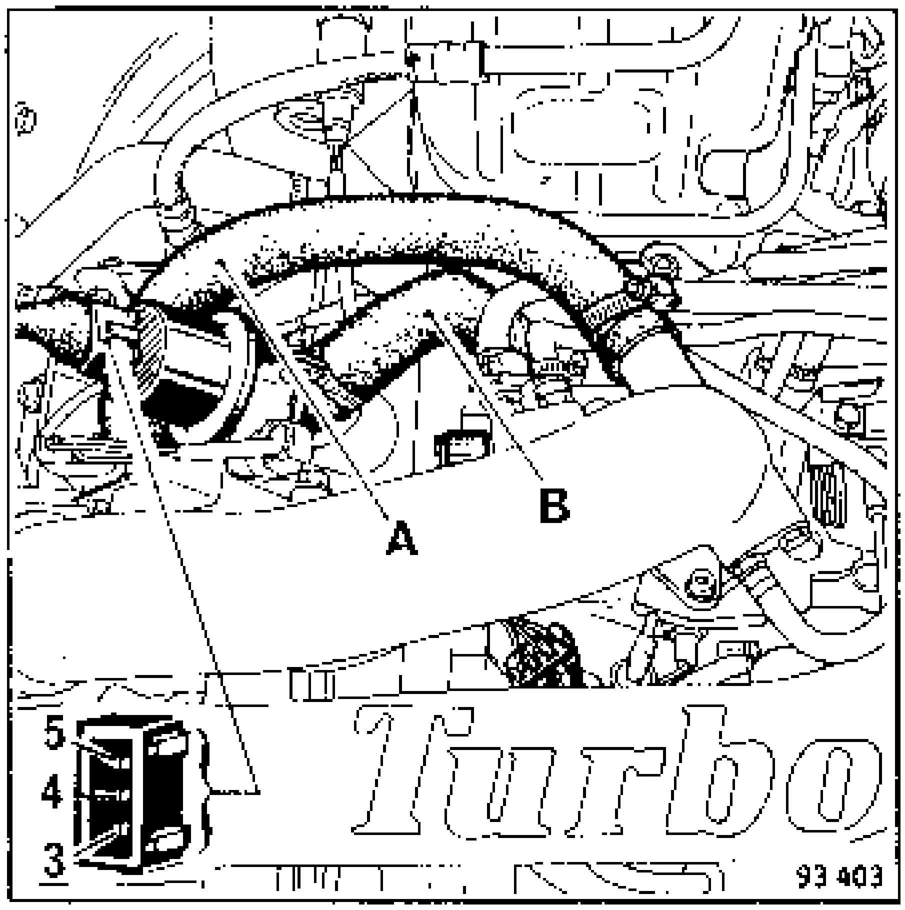
It is of the heated type and the 3-channel connector is fitted to the gearbox.


93 577

When removing-refitting the sensor, take care to:

- Clean the threads on the exhaust pipe;
- Apply anti-seize grease (**Molykote CU7439**) to the sensor threads only;
- Tighten the sensor to torque **2.7 - 3.4 daNm**;
- Click the electrical connector correctly into place;
- Refit the protective shield (clipped) correctly on to the sensor.

IDLING SPEED ADJUSTMENT VALVE



The idling speed adjustment valve can be checked in three different ways.

INPUT CHECK - ENGINE RUNNING

1 - Visual check:

If the idling adjustment is correct, by disconnecting the air input pipe (A) to the valve, it is possible to check that:

- the valve closes if an air leak is created in the inlet manifold;
- the valve opens if the air pipe (B) between the valve and the manifold is clamped.

(In order to check visually the rotation of the valve spool, it may be necessary on certain models to remove the valve from its mounting.)

CHECKING THE VALVE INPUT - ENGINE RUNNING

2 - Electrical check (using the XR 25)

2.1 - Voltage check

Test lead connected at "V in".
Enter V (volts).

Raise the rubber protector on the valve connector.

→ On terminal **4**:
The voltage observed = battery voltage.

→ On terminals **3** and **5**:
The voltage observed varies constantly between 0 and battery voltage.

CHECKING THE VALVE INPUT - ENGINE RUNNING (continued)

2.2 - Idling speed control valve sequential earthing time value readings

Control point connected at "**V in**".
Enter **G.0** (pulse detector function).

Raise the rubber protector from the valve connector.

→ On terminal **3**:
The sequential time noted must be approximately **3.7** $\pm$ 0.3 **ms** (engine hot and idling).

→ On terminal **5**:
The sequential time noted must be approximately **6.3** $\pm$ 0.3 **ms** (engine hot and idling).

Concept of sequential earthing time:

Since the valve is composed of two windings with opposing magnetic fields, the balance position of the air passage spool is obtained by earthing each of the two windings for a relatively long or short time.

(Channel **4** permanently receives + battery.)

This time is therefore called sequential earthing time and is expressed in milliseconds.

The total sequential earthing time must be **10 ms** (result obtained by adding the values obtained from terminals **3** and **5** of the valve).

3 - Checking idling RCO using the XR 25 test box

Enter the code **D03; # 12**

The RCO valve control values can therefore be read off on the **XR 25** centre display.

The value read off varies constantly around the nominal value ± **0.2 ms** when idling adjustment is active.

The cyclic opening ratio (RCO) in fact represents the valve opening percentage compared to the maximum possible opening.

Example of a reading using the XR 25 # 12

Engine stopped Ignition on	Engine idling	Engine idling, lights and heating on	Engine idling + inlet manifold air leak
8.2 ms (or 82%)	3.5 ms (or 35%)	3.8 ms (or 38%)	3.2 ms (or 32%)

The minimum RCO represents the maximum closure of the valve controlled by the computer.

CHECKING THE VALVE INPUT - ENGINE RUNNING (continued)

As a general rule:

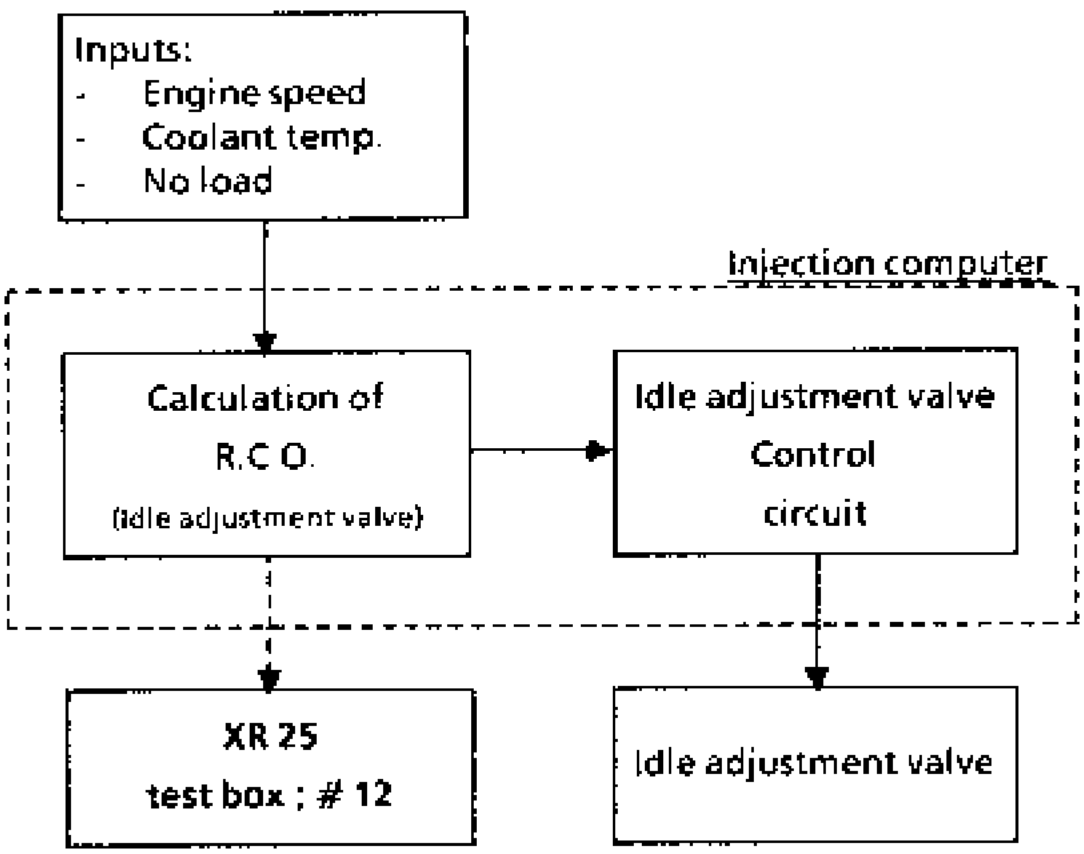
The minimum RCO varies mainly as a function of:

- the coolant temperature;
- the type of adjustment.

This can be achieved immediately by creating a large air leak (increasing the speed which the valve will try to compensate) or by adjusting the throttle housing bypass (see method).

Remark:

If the idling speed adjustment is not correct, the presence of values at # 12 does not mean that the computer is not at fault.



In fact, it may be that the control circuit is damaged. In this case, the computer no longer controls the valve and, using the pulse detector, there are no values at terminals (3) or (5) of the valve connector.

The **XR 25** takes the values of **# 12** at the calculation stage and values are still obtained from the **XR 25**.

(This type of abnormality mainly occurs when the valve windings are short circuited.)

ADJUSTING THE LOAD POTENTIOMETER

Use the **XR 25** fitted with the latest version cassette.

Ignition on, engine stopped.

Enter **D03 # 17** and note the values on the centre display.

Position A:

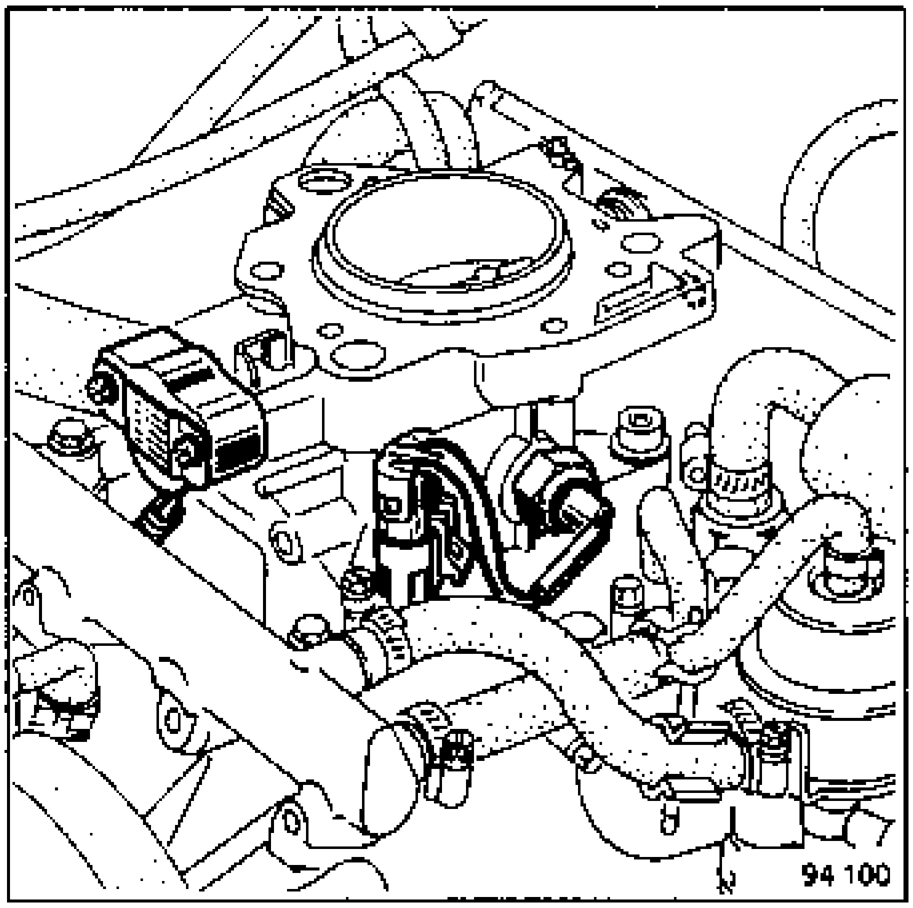
Idling.
The value must be between **7** and **13**.
Bar graph **PL** illuminated.

Position B:

Partial load.
Value between **20** and **190**.
(Bar graphs extinguished.)

Position C:

Full load.
The value must be between **225** and **252**.
Bar graph **PF** illuminated.



Before adjusting the potentiometer, make sure that the accelerator control is correctly adjusted.

Adjustment procedure

- Potentiometer slightly loosened;
- Enter **D03; # 17** on the **XR 25;**
- Adjust the potentiometer so that the value shown on the **XR 25** is approximately in the centre of the range of values given (e.g. values given from **7** to **13**; adjust to **10**).

  Ignore bar graph **10 D.**
- Tighten the fixing bolts;
- Switch the ignition off then on;
- Then check, at no load, that **# 17** is correctly adjusted and that bar graph **10 D** is present.

  Depress the accelerator two or three times and check its return to the no load position and the full load value.

NOTE:

If the value shown at **# 17** is **128** and bar graph line **3** is illuminated, a fault has been detected.

Check the potentiometer, the setting and its mounting on the throttle housing.

Precaution:

For the check to be correctly carried out the values at **# 17** for no load and full load should be read off while depressing the accelerator pedal rather than activating the control in the engine compartment.

ADJUSTING THE IDLING BYPASS

Connect the **XR 25** fitted with the latest version cassette.

The check is to be carried out with the engine hot, coolant temperature = **85 $^{\pm 5}$ °C**

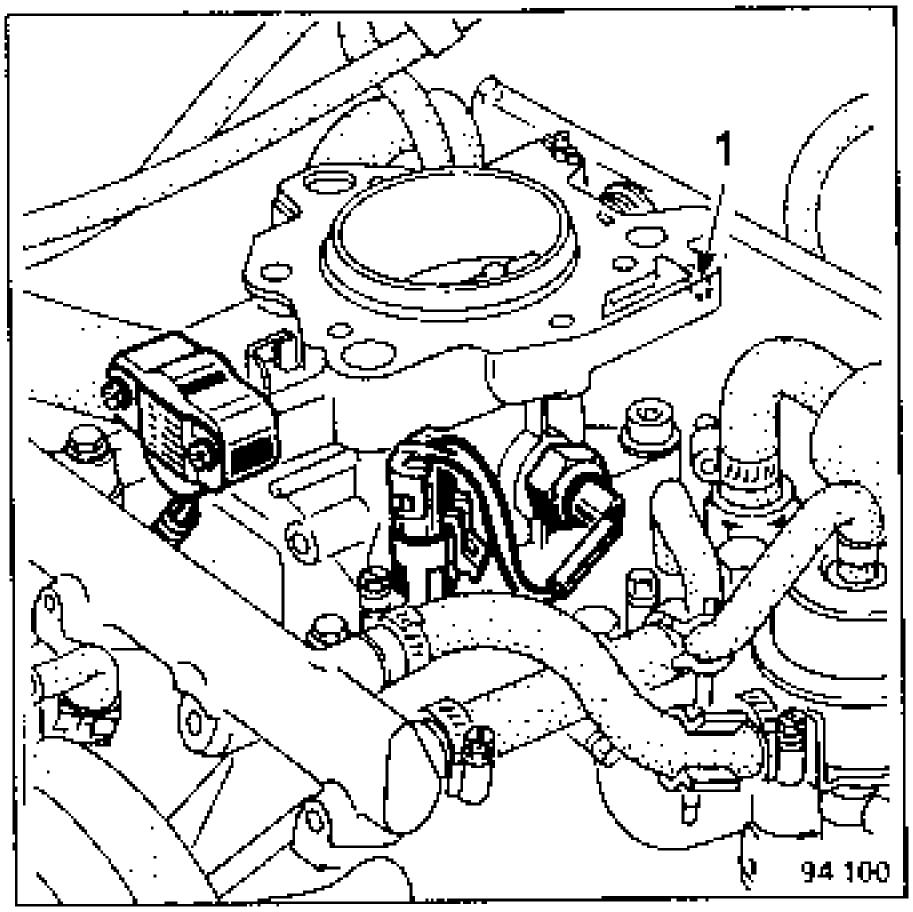
Enter **D03 # 12** and note the value shown on the centre display.

- If the value shown is **greater than** the maximum value permitted by the conformity check:

  - Clean the throttle housing, check the injectors and the ignition.
  - Find the minimum correction value by unscrewing screw **(A)** until the idling speed increases ("RCO mini" is obtained).

    Then tighten this screw to increase the value by **0.2 - 0.3 ms**.

    For example: "RCO mini" value = **3.23 ms**; adjust to **3.4 ms**.



1 - Opening providing access to the bypass adjustment screw.

- If the value shown at **# 12** is lower than the minimum permissible value, check and rectify any air leaks and check whether the accelerator cable or control on the throttle housing is obstructed (see page 17-72: Adjusting the accelerator control).

- Check:

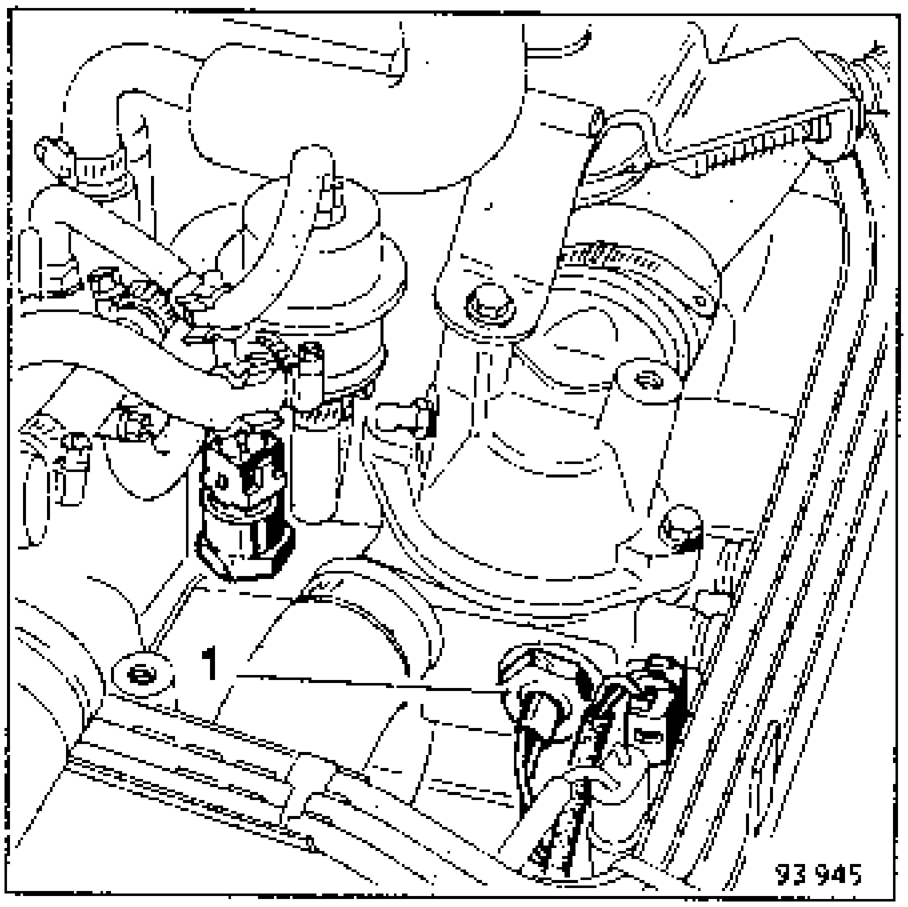
  - the canister bleed solenoid valve closure;
  - the conformity of the throttle housing;
  - the electrical connections of the idling speed adjustment valve;
  - the absence of a fault in the butterfly potentiometer circuit.

COOLANT TEMPERATURE SENSOR

Sensor specification (1)

(Positive temperature coefficient)

Temperature °C	20 ± 1	80 ± 1	90 ± 1
Resistance Ω	283 to 297	383 to 397	403 to 417



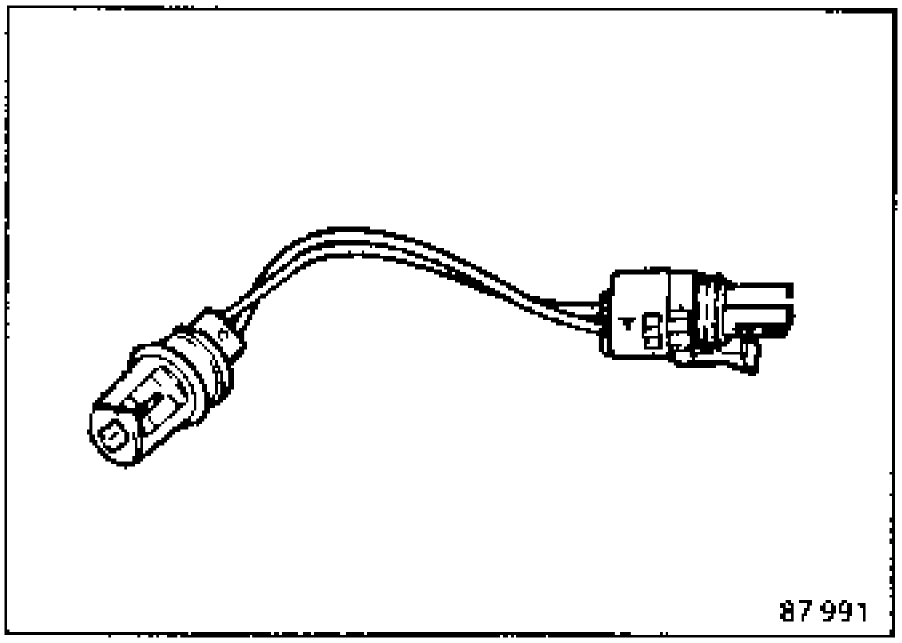
93 945

AIR TEMPERATURE SENSOR

Sensor specification

(Positive temperature coefficient)

Temperature °C	0 ± 1	20 ± 1	40 ± 1
Resistance Ω	254 to 266	283 to 297	315 to 329



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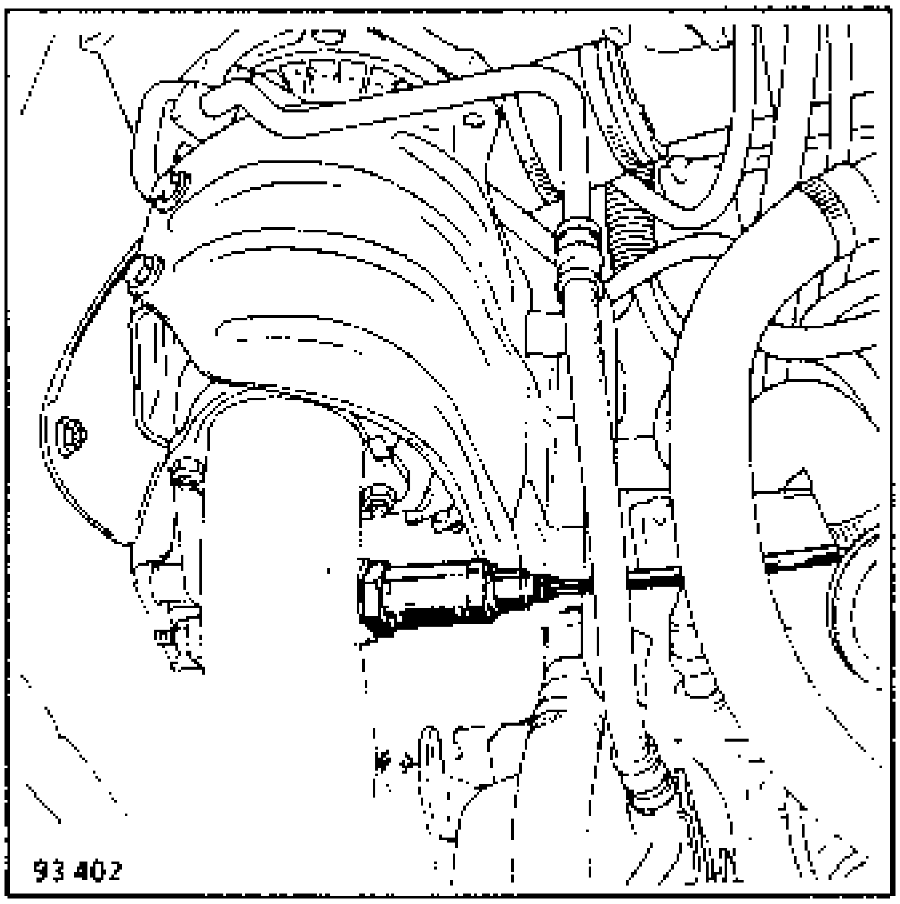
REMOVING-REFITTING THE OXYGEN SENSOR

The sensor is located on the bend of the exhaust downpipe at the turbocharger output.



Removing

Disconnect the electrical harness connector.

Unscrew the sensor and its support bracket at the turbocharger output and clean the threads.

Refitting

Only apply anti-seize grease (high-temperature) to the oxygen sensor thread. Screw in the sensor by hand, then tighten to torque **2.7 to 3.4 daNm**.

Reconnect the electrical harness connector.

Remark:

The sensor leads cannot be spliced or welded.
If these leads are cut, replace the sensor.

Note:

If the idling speed is unstable or surges, using a voltmeter check that **12 V** are present on the oxygen sensor heating.

ADJUSTING THE ACCELERATOR CONTROL

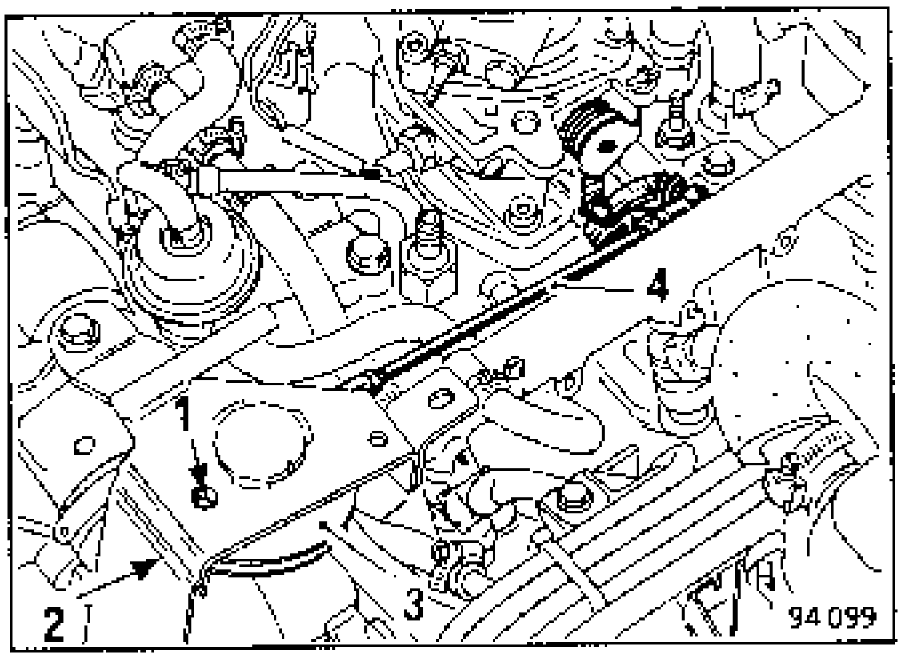
If the value shown at # 12 is minimal (= **3.23 ms**), first check the adjustment of the accelerator cable. (Butterfly not sufficiently closed in the rest position due to obstruction of the accelerator control.)

Check through opening **(1)** that the connector on the cable mechanism **(3)** is not resting on the metal support bracket **(2)**.

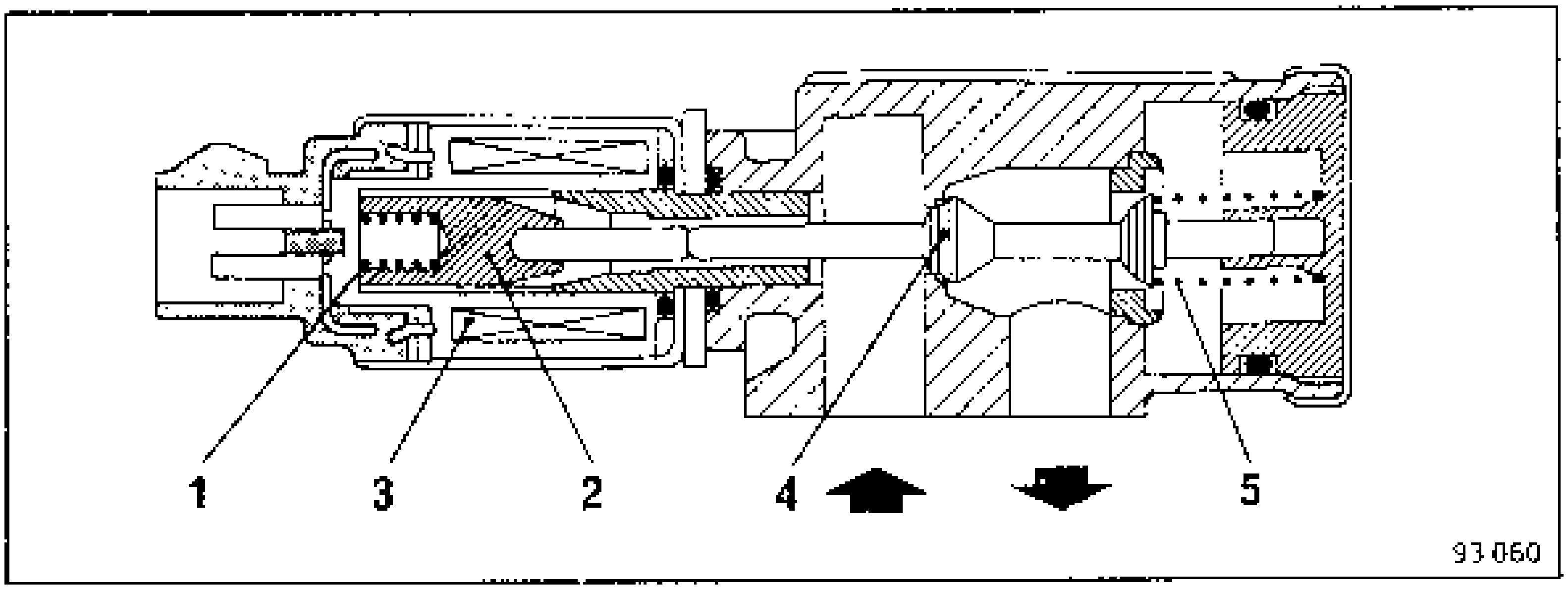
In fact, if the link rod **(4)** is the correct length, there should be at least 3 mm clearance between the connector and the metal support bracket.

To achieve this, a preadjustment value is given for the length of the link rod:

L - length between axes of the two ball joints = **185 mm**.



"HITACHI" ADJUSTMENT VALVE



OPERATION

The **HITACHI** adjustment valve has a single winding (2-lead connector).

In the rest position

The air circuit is closed, the spool **(4)** is pushed in towards the winding **(3)** by the spring **(5)**, the core is kept in contact with the valve by the small spring **(1)**.

Ignition on, engine stopped.

(Petrol pump operating period.) The winding has current supply, the magnetic field attracts the core **(2)**, the spool **(4)** moves and opens the valve:

RCO 0% = valve closed
RCO 100% = valve open

Ignition on, engine idling

The computer maintains a cyclic opening ratio (RCO) corresponding to the air flow which maintains the idling speed programmed in the computer.

CHECKING USING THE XR 25

Special features:

The **HITACHI** valve total sequence time is approximately **6 ms**.

Example of readings on the XR 25

	Diag. output # 12	Voltmeter output connector GO (1)
Valve closed	0%	6 ms
Valve open	100%	0.3 ms
Engine hot Idling speed adjustment	37%	3.9 ms

(1) This time corresponds to the earthing cut-off time with respect to the maximum sequential earthing time

FAULT-FINDING

If there is an idling speed adjustment fault, the engine stalls at no load:

Check:

The winding resistance **(9 to 30 ohms)**.

The presence of + after ignition on the connector supply lead (voltage present, engine stopped, for 1 second after ignition).

Check the continuity of the circuit between:
- channel n° **24** of the computer connector (computer disconnected and replaced by bornier **M.S. 1048)** and channel n° **5** of the petrol pump relay connector **(236)**. See wiring diagram in chapter 17.

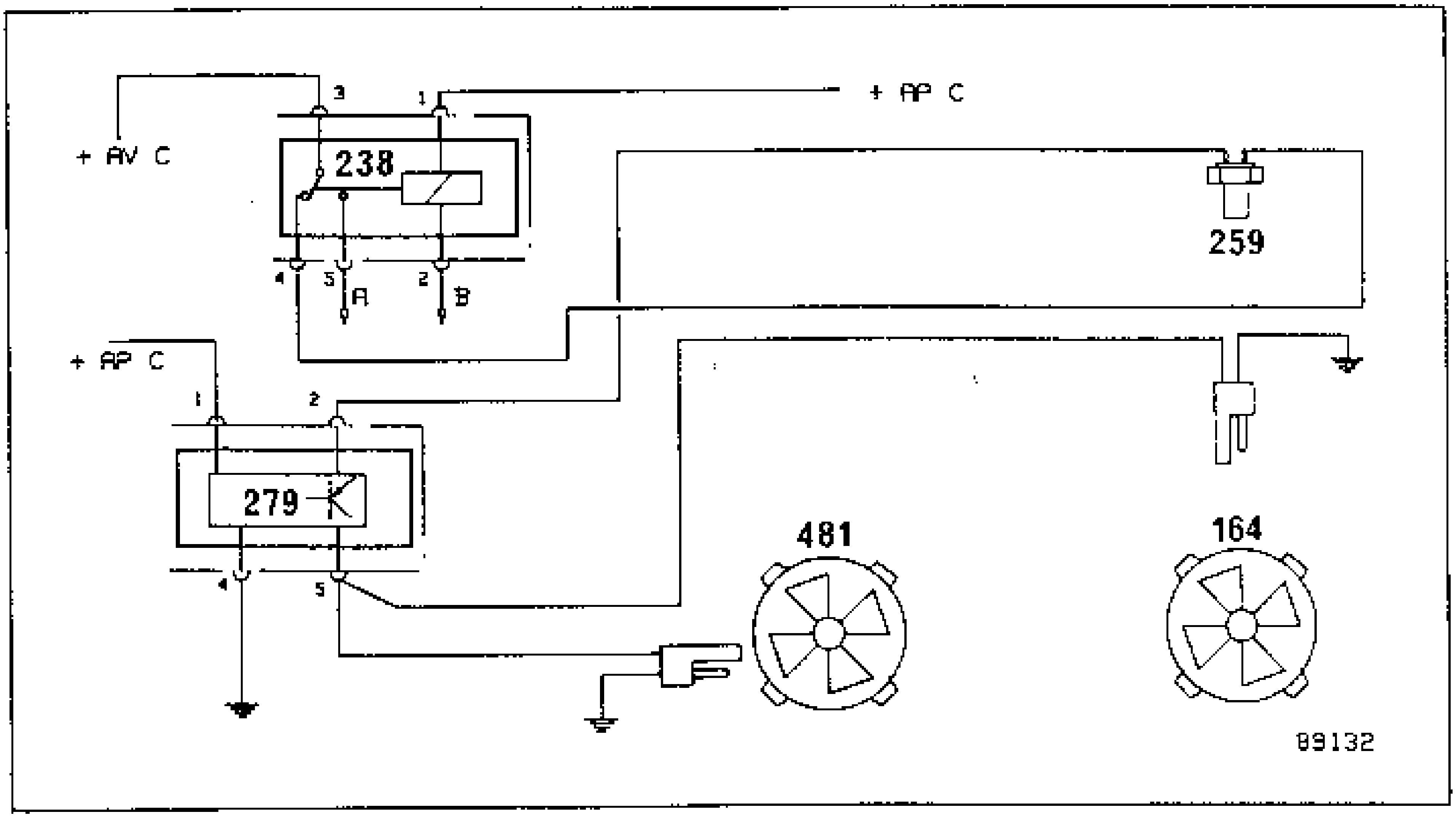
PRINCIPLE OF OPERATION

The two engine cooling fans (**164** and **481**) operate together when the ignition is off.

They are triggered by a temperature switch when the coolant temperature reaches **107 °C** (this temperature is often reached several minutes after the engine has been switched off).

The timed relay (**279**) ensures that they operate for approximately **14** minutes.

OPERATING DIAGRAM



164 - Cold air blower.

238 - Injection computer relay.

259 - "**107° C**" temperature switch.

279 - Timed anti-percolation relay.

481 - Hot air extractor.

COMPONENT LAYOUT

The cold air blowing fan assembly (**164**) is located on the front right-hand side of the vehicle, under the headlight.

The hot air extraction fan assembly is located on the front left-hand side of the vehicle, under the headlight.

The timed relay (**279**) is attached to the left flitch between the headlight and the wheel arch.

Three methods are used to limit the rise in temperature in the engine compartment after the vehicle has been stopped.

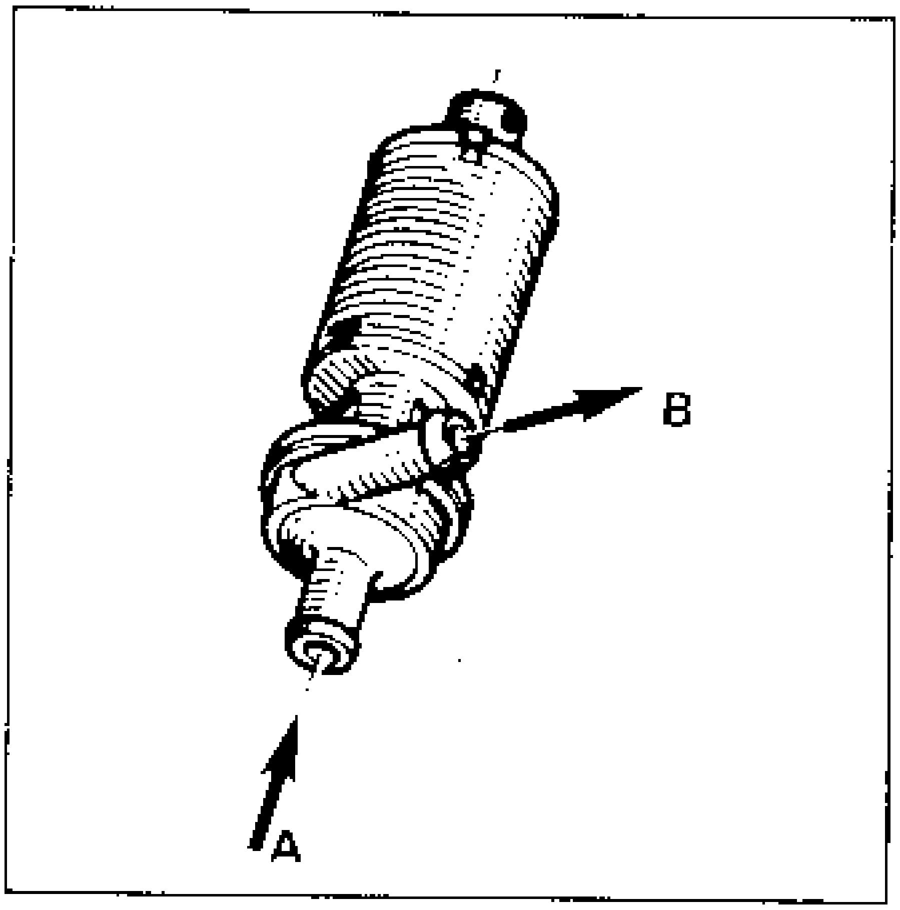
- cooling the turbocharger bearings;

- extraction of hot air from the turbocharger environment;

- operation of the main cooling fan assemblies.

TURBOCHARGER BEARING COOLING

After the engine has been stopped and the ignition switched off, the electric coolant pump is automatically controlled by a timed relay for approximately 12 minutes, causing coolant to circulate in the turbocharger bearings.



A - Extraction

B - Expulsion

This pump is mounted on the bulkhead in the engine compartment, behind the turbocharger heat shield.

After the ignition has been switched off, the turbocharger radiates heat to the surrounding parts

To prevent the temperature in the engine compartment from rising excessively, a deflector is fitted opposite the turbocharger, which is linked to an air extraction fan assembly (evacuator).

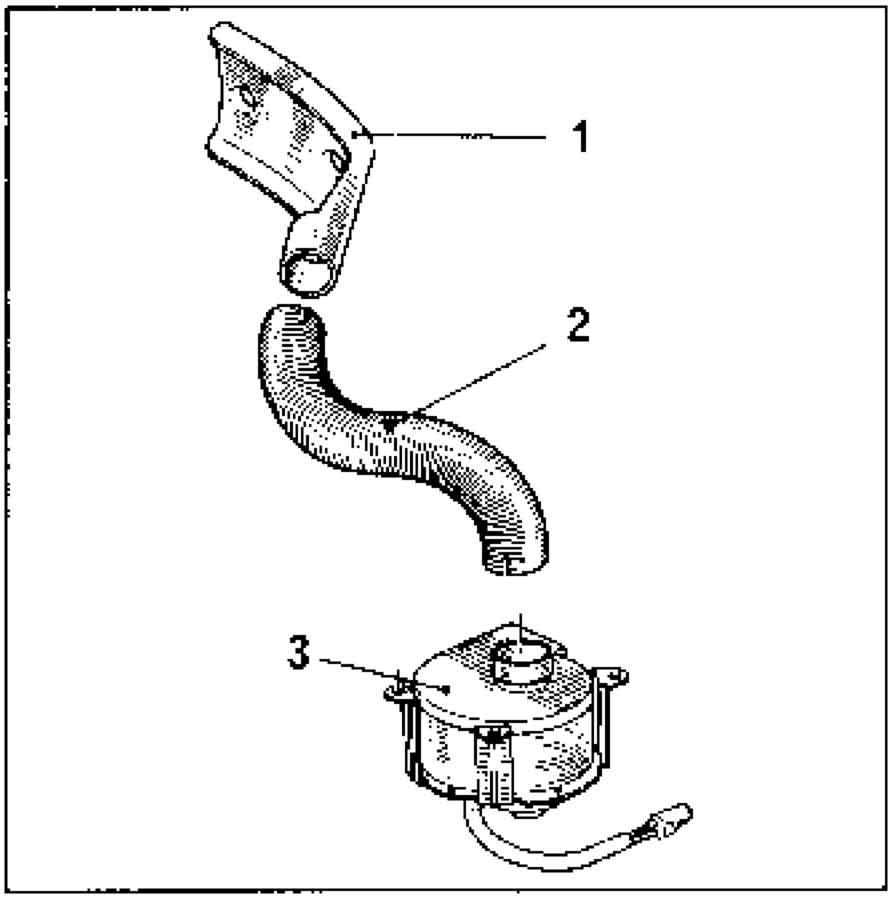
PRINCIPLE OF OPERATION

The air extraction fan assembly (located under the front left-hand headlight) is controlled by a temperature switch (mounted on the turbocharger heat shield).

When the temperature caused by the radiant heat reaches **100 °C**, the evacuator is activated.

This evacuator remains supplied with current until the temperature at the sensor on the shield falls to **90 °C**.

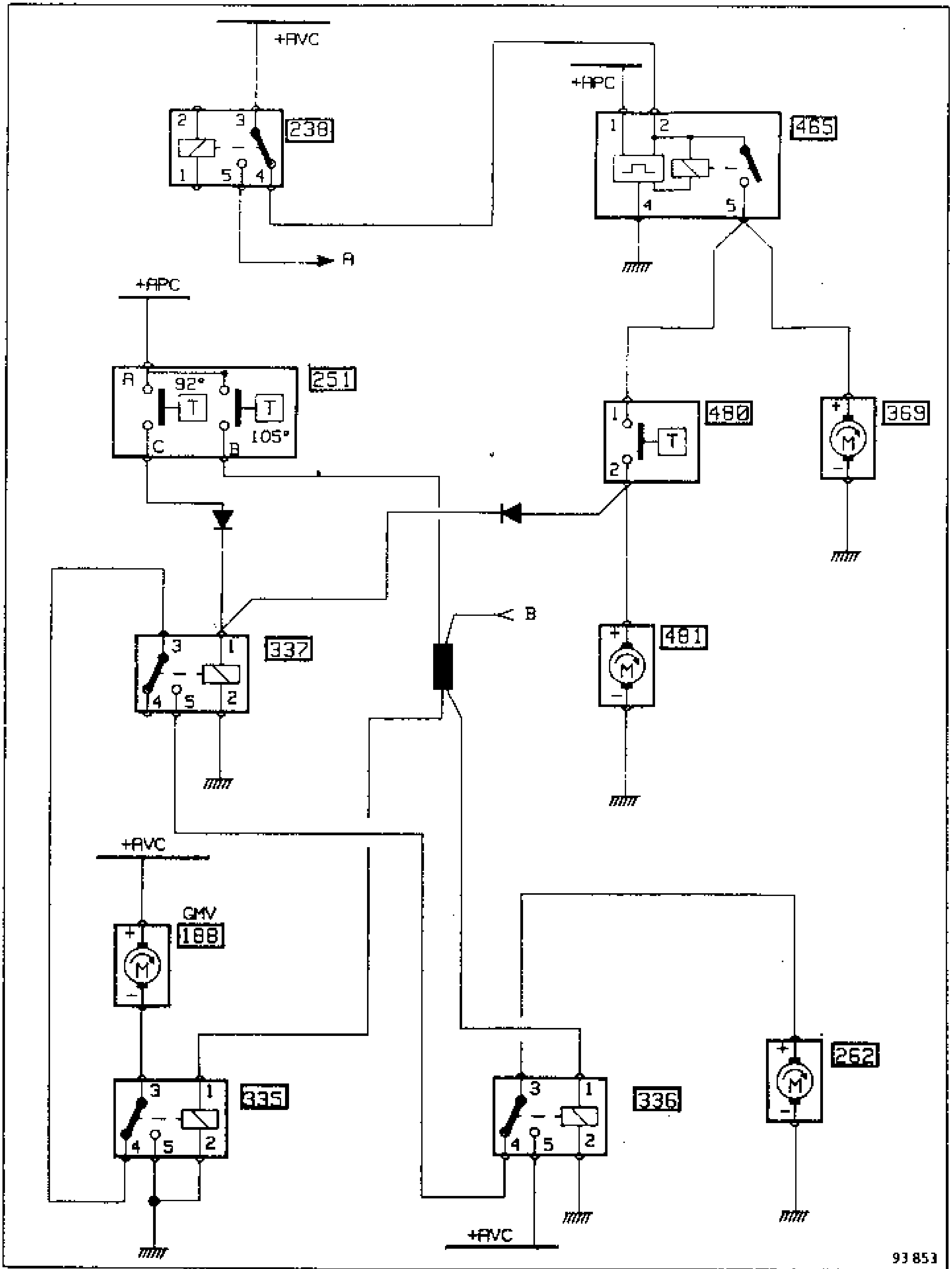
The evacuator can only operate for the period of 12 minutes permitted by the timed relay.



1 - Hot air recuperation trunking.

2 - Pipe.

3 - Air extraction fan (evacuator).


+AVC
238
2
3
1
5
4
+APC
465
1
2
4
5
A
+APC
251
A
92°
T
T
105°
C
B
480
1
2
T
369
M
337
3
1
4
5
2
B
481
M
+AVC
GMV
188
M
335
3
1
4
5
2
336
3
1
4
5
2
262
M
+AVC
93 853

KEY

188 - GMV N° 1.

238 - Injection computer relay.

248 - Coolant dual function temperature switch.

262 - GMV N° 2.

335 - 1st speed GMV relay.

336 - 2nd speed GMV relay

337 - 3rd speed GMV relay

369 - Electric coolant pump

465 - Electric coolant pump timed relay.

480 - Hot air extractor sensor.

481 - Hot air extractor.

A - To computer.

B - **22 bar** - **air conditioning** data from triple function pressure switch.

Operation of the main cooling fan cooling fan assemblies (GMVs)

Operation of the hot air extractor and the main GMVs is authorised by the timed relay for 12 minutes after the ignition has been switched off.

In fact, the hot air extractor and the GMVs will only operate if the sensor **480** detects an engine compartment temperature of **100 °C**.

In this case, the hot air extractor and channel **1** of relay **337** are supplied with current.

This permits series power supply to the GMVs and enables them to operate at half-speed until the temperature recorded by the sensor falls to **95 °C** or the timer cuts off the power supply after twelve minutes.

QUANTITY AND GRADE OF ANTIFREEZE

Engine	Quantity (in litres)	Grade	Special features
J6R J7R J7R12S J7T J8S Z7U Z7V Z7W	7.5 7.8 7.1 8.0 7.5 9.7 9.5 9.5	GLACEOL AL (type C) only use coolant	Protection down to -23 °C for hot. temperate and cold countries Protection down to -40 °C for very cold countries.

THERMOSTAT

Engine type	Starts to open (in °C)	Fully open (in °C)	Travel (in mm)
J6R 706 (1) J7R 720 / 721 / 726	89	101	7.5
J6R 706 (2) / 707 J7R 722 / 723 J7T	88	100	7.5
J8S	81	93	7.5
Z7U / Z7V / Z7W	86	98	7.5

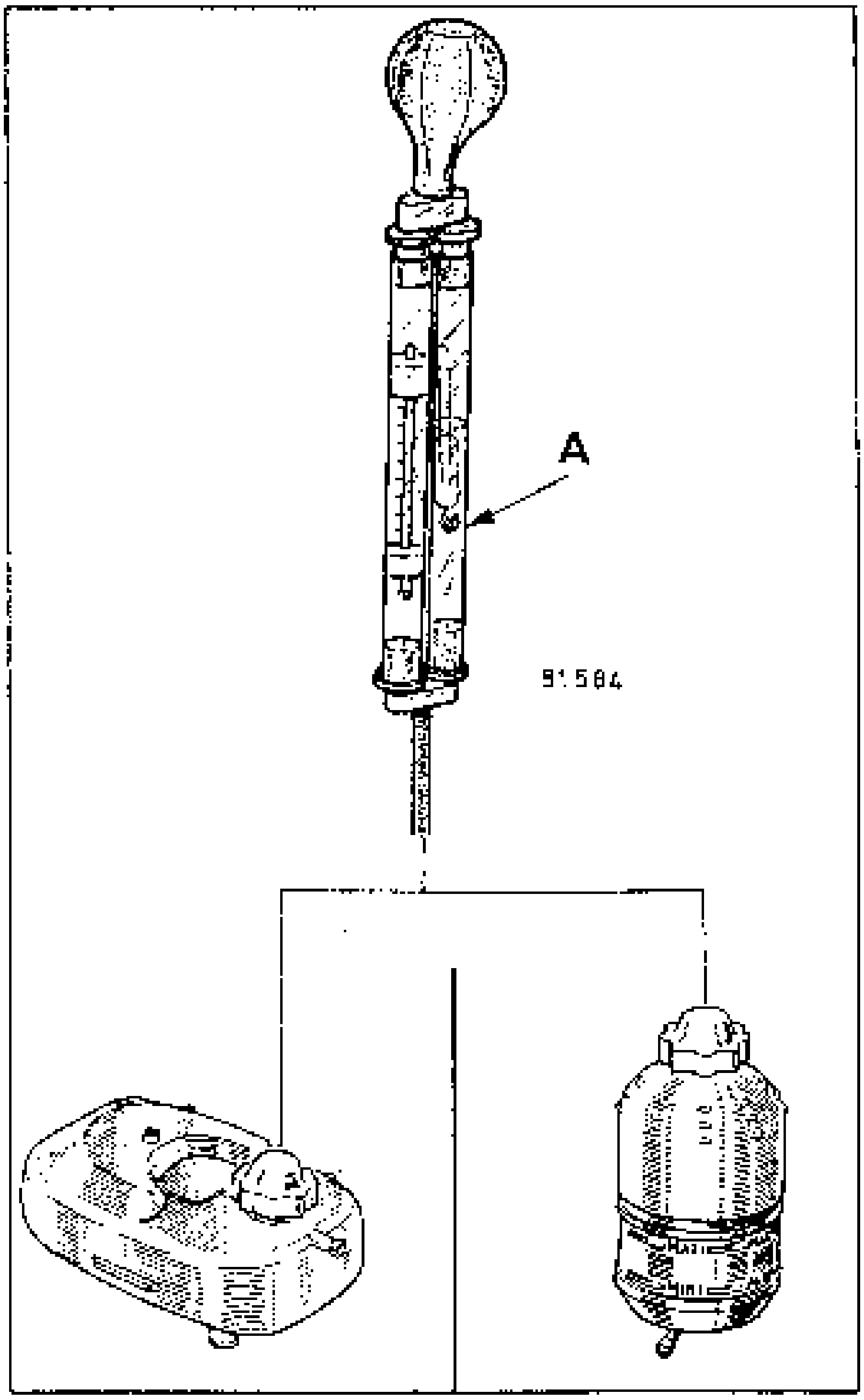
(1) n° F 00308132 ⟶ n°....

(2) n° 1 ⟶ n° F 00308131

ANTIFREEZE CONCENTRATION

SPECIFIC GRAVITY METER 778*

Suck in coolant until it surrounds the base of the thermometer and allows the specific gravity meter to float freely.



(A) Specific gravity meter 78

* Specific gravity meter

Supplier:
- FACOM
  6 - 8, rue Gustave Eiffel-BP 99
  91423 MORANGIS

OR

Refractometer

Supplier:
- CEPAC
  33, rue Jules Auffret-BP 55
  93130 NOISY LE SEC

(1) See equipment instructions for how to use

Check that the specific gravity meter:

Is not jammed against the upper end of the tube (too much coolant);

Is not stuck to the side of the tube; if necessary, tap gently to free it.

Read off:

the coolant temperature;

the specific gravity of the coolant.

See the correction table for the actual protection level provided by the coolant.

LECTURE AU THERMOMETRE	LECTURE AU DENSIMETRE 3	5	10	15	20	30	40
10	0	0	5	8	11	14	18
20	1	2	6	10	14	18	24
30	2	3	8	12	17	24	33
40	3	5	10	15	20	30	40
50	4	7	12	18	24	35	
60	6	9	15	22	28	40	
70	8	12	18	25	32		
80	10	14	22	32	37		

CENTIGRADES AU DESSOUS DE 0°

PROTECTION CORRIGEE EN DEGRES

EXAMPLE { Thermometer reading: 60 / Spec. grav. meter reading: 10 } PROTECTION down to MINUS 15° C

Hot, temperate and cold countries

-23 °C protection (**35%** antifreeze mixture)

Very cold countries

-40 °C protection (**50%** antifreeze mixture)

The protection decreases if the antifreeze concentration exceeds **60%**.

The levels of protection in the tables are valid for a coolant temperature of 40 °C.

How to use the table

For vehicles with a coolant capacity of 6 litres and protection of -15 °C.

To increase the protection to -23 °C, replace 0.7 litres of the mixture in the circuit by 0.7 litres of pure antifreeze.

To increase the protection to -40 °C, replace 1.9 litres of the mixture in the circuit by 1.9 litres of pure antifreeze.

PURE ANTIFREEZE TO BE ADDED

-23 °C Hot, temperate and cold countries					
Protection at 40 °C (coolant temperature)	Circuit capacity (litres)				
	5	6	7	8	9
-5 °C	1.3	1.6	1.8	2.1	2.4
-10 °C	1	1.1	1.3	1.5	1.7
-15 °C	0.6	0.7	0.9	1	1.1
-20 °C	0.2	0.2	0.2	0.3	0.3

-40 °C Very cold countries					
Protection at 40 °C (coolant temperature)	Circuit capacity (litres)				
	5	6	7	8	9
-5 °C	2.2	2.6	3.1	3.5	3.6
-10 °C	1.9	2.3	2.7	3	3.4
-15 °C	1.6	1.9	2.2	2.6	3
-20 °C	1.3	1.6	1.8	2	2.3
-25 °C	1	1.2	1.4	1.7	1.9
-30 °C	0.9	1	1 2	1.4	1.5
-35 °C	0.5	0.5	0.6	0.7	0.8

ALUMINIUM MATRIX RADIATOR

Some vehicles are fitted with aluminium matrix cooling radiators.

Flushing out.

Do not flush out these radiators or the cooling circuit with caustic soda or alkaline products (which may corrode the light alloy components and cause leaks).

Storage

Dismantled radiators can be stored for a **maximum of 48 hours** without taking any special precautions.

If stored for longer than this, particles of brazing flux used in the radiator during its manufacture and dichlorides in the coolant which was in the radiator cause the aluminium elements of the radiator to oxidise when they come into contact with the air, which leads to leaks.

Therefore, if a radiator is removed from the vehicle for longer than **48** hours, it must be:

- either **THOROUGHLY FLUSHED OUT** with water, **BLOWN THROUGH** with compressed air and all the orifices **PLUGGED**;

- or kept filled with coolant if possible.

Antifreeze

The correct antifreeze must be used with these aluminium radiators.

AL C type antifreeze, marketed by the RENAULT network, is in accordance with the specifications implemented by our Design Office, especially concerning:

- the fact that they are harmless to the various aluminium and cast iron components;

- the fact that their alkaline content is specially adapted to the particular requirements of light alloys;

- **their special additives which guarantee efficient protection from the acidic products of combustion, found in both high-speed diesel engines and petrol engines;**

- their concentration, which provides protection and ensures smooth operation at all temperatures.

There is no heater unit tap.
Circulation is continuous inside the unit heater, which contributes to engine cooling.

FILLING

Check the tightness of the drain plug(s).

Open the bleed screw(s).

Fill the circuit via the expansion bottle opening.

Close the bleed screws once the coolant flows in a continuous stream.

Start the engine (**1500 rpm**).

Adjust the level to overflowing for approximately **4 minutes**.

Close the bottle.

BLEEDING

Allow the engine to run for **10 minutes** at **1500 rpm** until the cooling fan(s) cut in (time required for automatic degassing).

Check that the coolant level is near the "**Maxi**" mark.

DO NOT OPEN THE BLEED SCREW(S) WHILE THE ENGINE IS RUNNING.

TIGHTEN THE EXPANSION BOTTLE PLUG WHILE THE ENGINE IS HOT.

ESSENTIAL SPECIAL TOOLING	
M.S. 554-05	Cooling system leak test equipment
M.S. 554-01	Adaptor for M.S.554-05
M.S. 554-04	Adaptor for M.S.554-05

1 - Checking the system for leaks

Replace the valve on the expansion bottle by adaptor **M.S. 554-01**

Connect tool **M.S. 554-05** to it

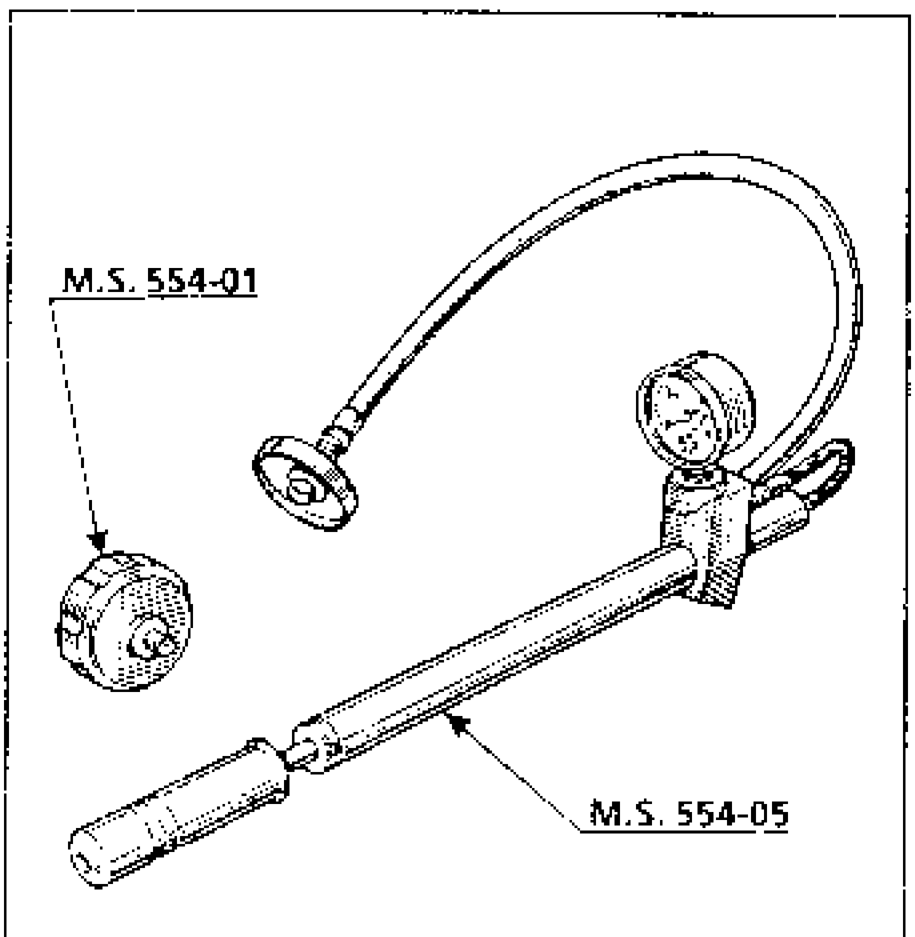
Allow the engine to warm up, then switch it off.

Pump to pressurise the circuit

Stop pumping at **0.1 bar** below the valve calibration value

The pressure should not drop; if it does, find the leak.

Gradually unscrew the connector of tool **M.S. 554-05** to decompress the cooling circuit, then remove tool **M.S. 554-01** and refit the expansion bottle valve, fitted with a new seal



82 999-1

2 - Checking the valve calibration

If coolant has passed through the expansion bottle valve, the valve must be replaced

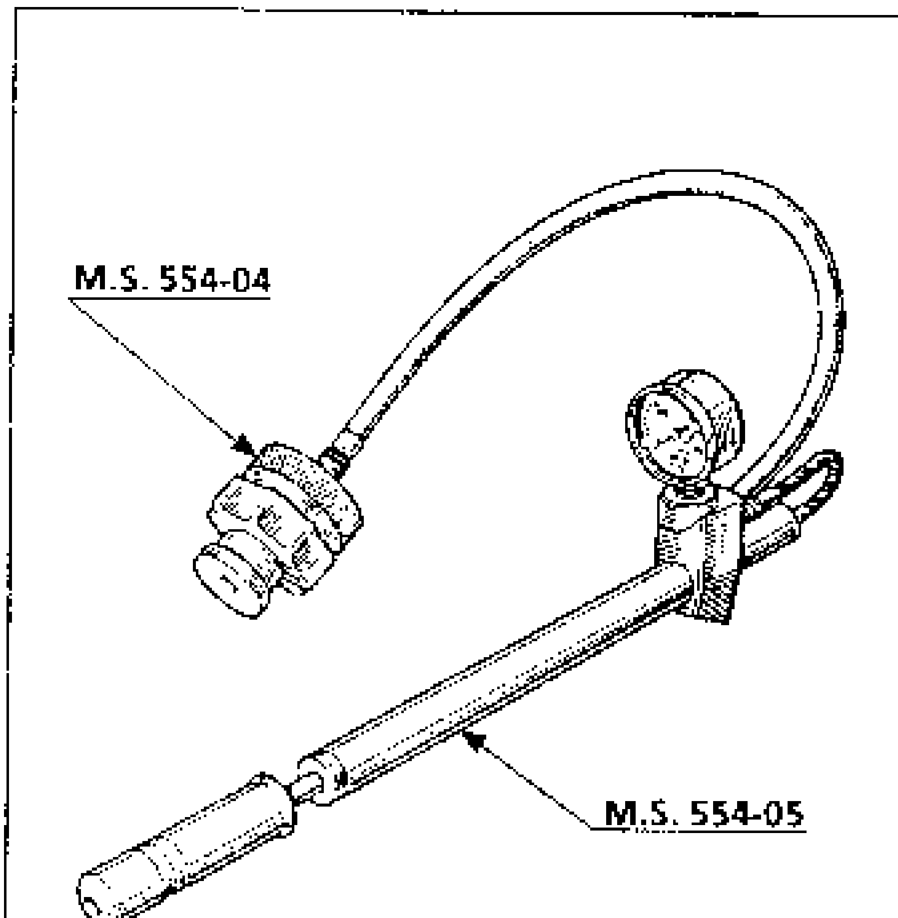
Fit tool **M.S. 554-04** to the pump **M.S. 554-05** and attach to it the valve to be checked.

Increase the pressure; it should stabilise at the valve calibration value: tolerance **± 0.1 bar.**

Valve calibration value:

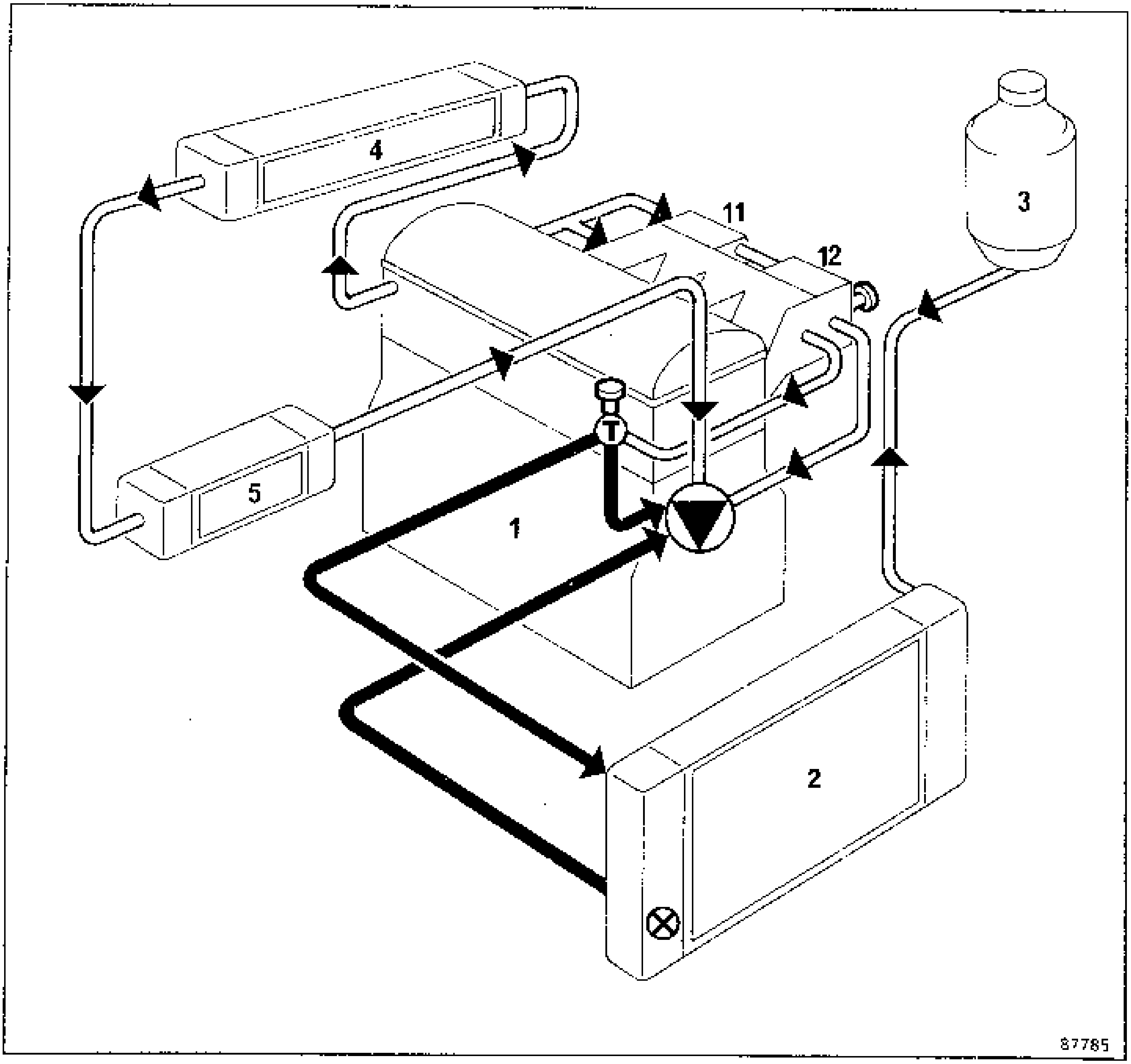
Plastic valve, colour brown: **1.2 bar**

Plastic valve, colour blue: **1.6 bar.**



82 999-1

*   Assembly with "cold" bottle



1. Engine
2. Radiator
3. "Cold" bottle
4. Heater unit
5. Heat exchanger automatic transmission
11. Carburettor base or throttle housing heater
12. Automatic choke

Coolant pump

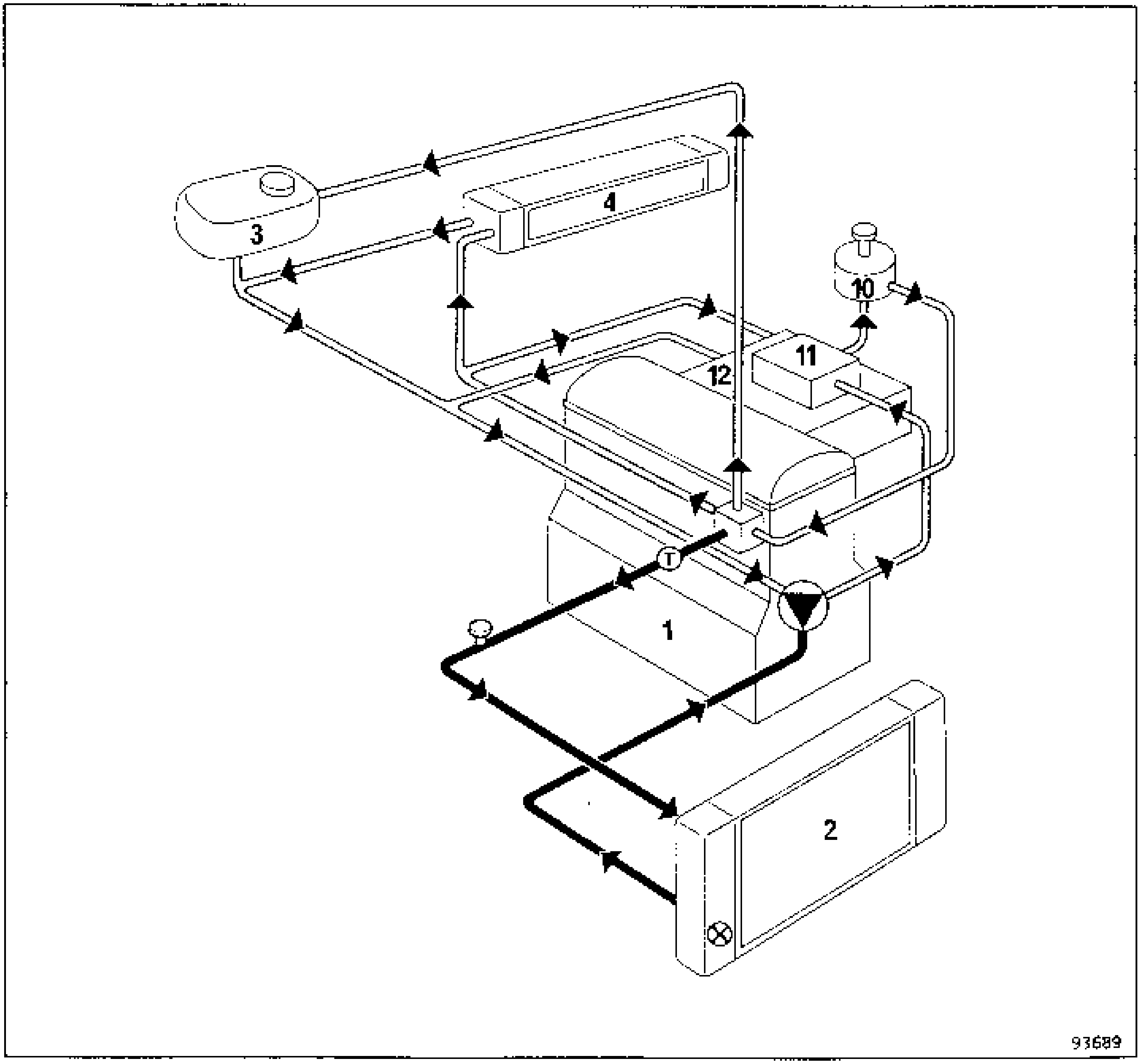
Thermostat

Bleed screw

Temperature switch

The expansion bottle valve is brown, calibration value **1.2 bar**.

* With "hot" bottle



1. Engine
2. Radiator
3. "Hot" bottle
4. Heater unit
10. Cold start choke flap
11. Carburettor base heater
12. Manifold heater

Coolant pump

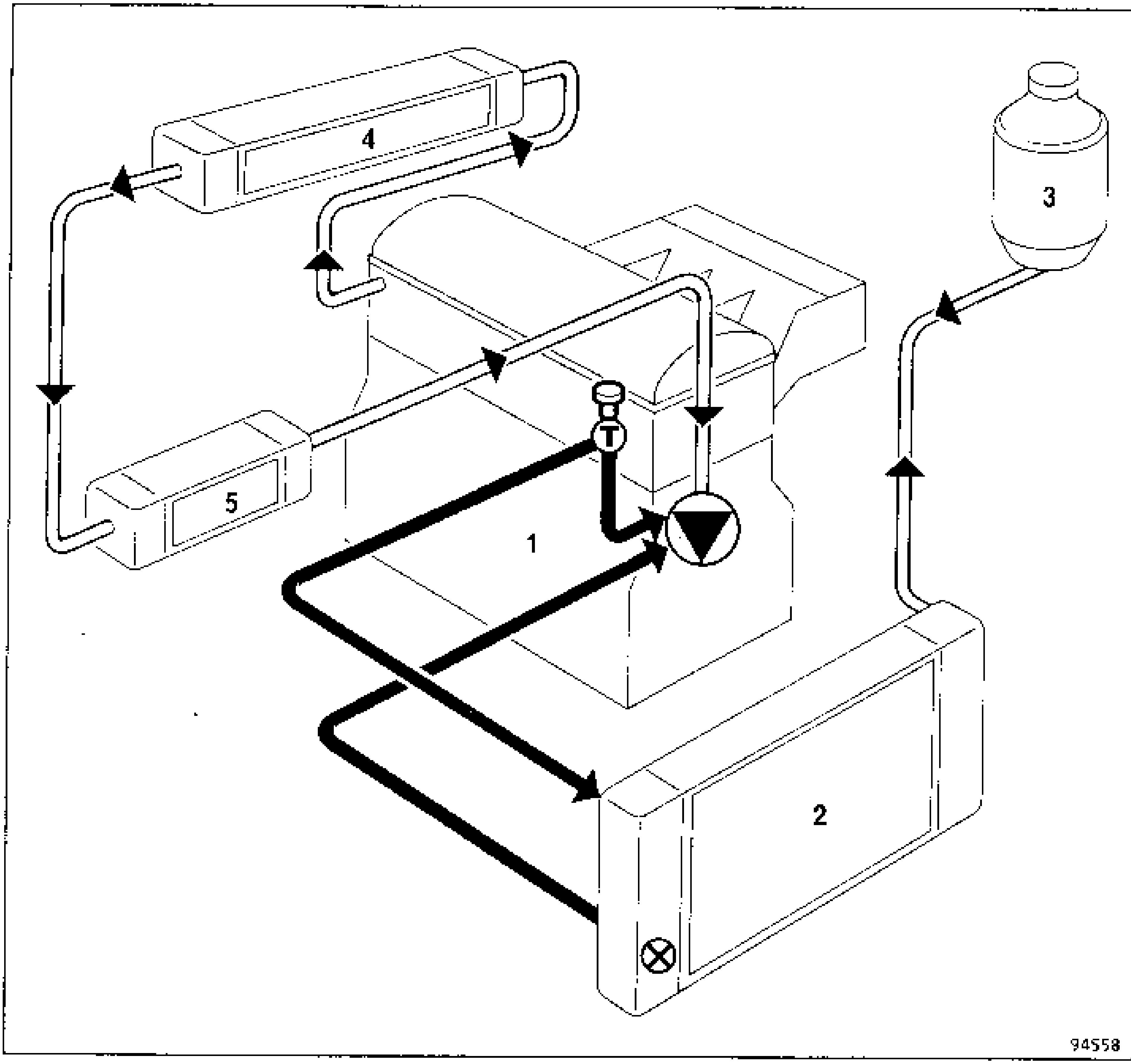
Thermostat

Bleed screws (2)

Temperature switch

The expansion bottle valve is brown; calibration value **1.2 bar**.

* Except J7R 12-valve



1. Engine
2. Radiator
3. "Cold" bottle
4. Heater unit
5. Heat exchanger automatic transmission

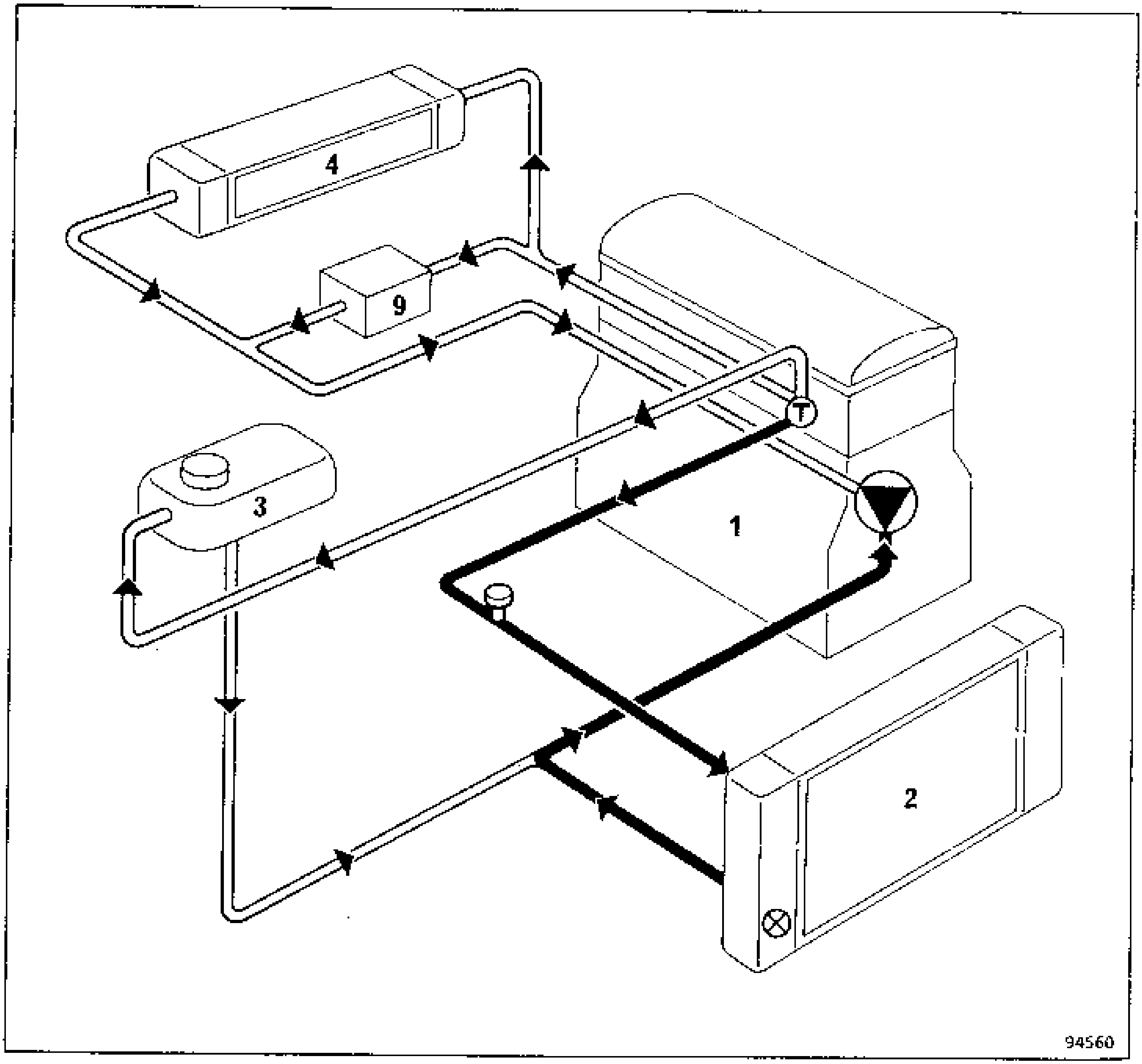
Coolant pump

Thermostat

Bleed screw

Temperature switch

The expansion bottle valve is brown; calibration value **1.2 bar.**



1. Engine
2. Radiator
3. "Hot" bottle
4. Heater unit
9. Engine oil heat exchanger

Coolant pump

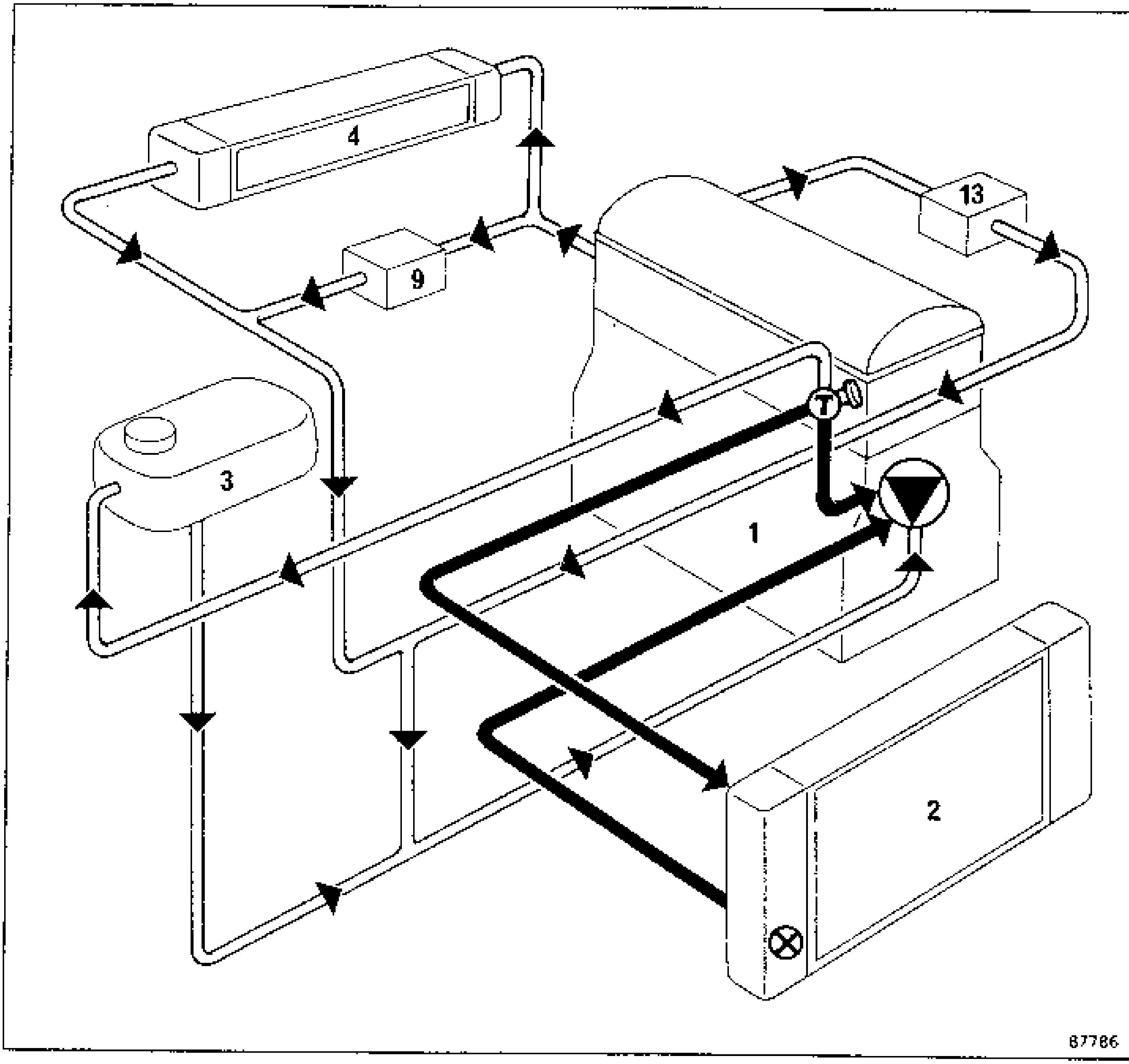
Thermostat

Bleed screw

Temperature switch

The expansion bottle valve is brown: calibration value **1.2 bar.**

* Except J8S 736



1. Engine
2. Radiator
3. "Hot" bottle
4. Heater unit
9. Engine oil heat exchanger
13. Diesel fuel heater

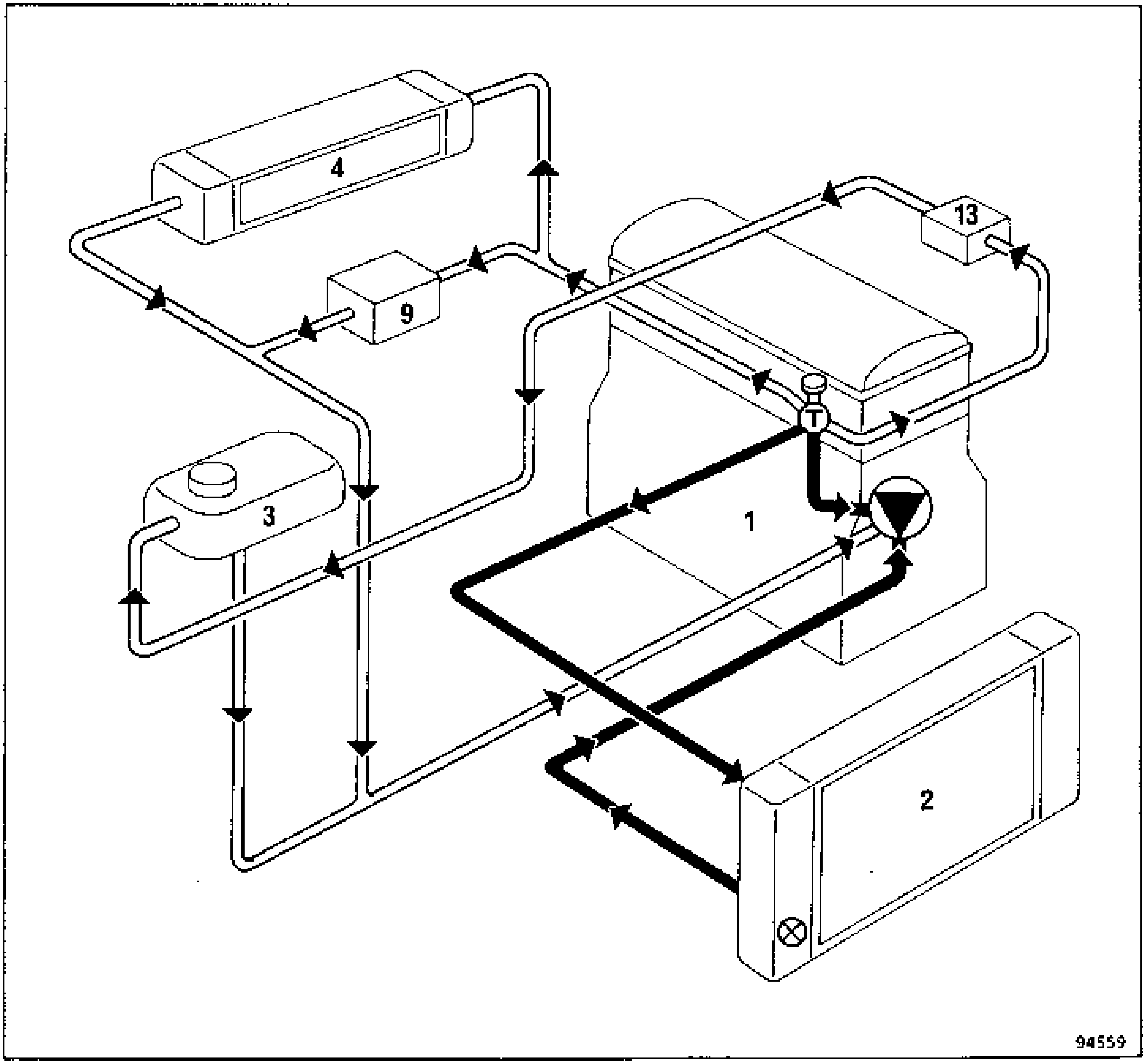
Coolant pump

Thermostat

Bleed screw

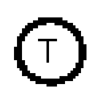
Temperature switch

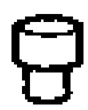
The expansion bottle valve is brown; calibration value **1,2 bar**.

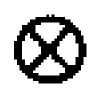


1. Engine
2. Radiator
3. "Hot" bottle
4. Heater unit
9. Engine oil heat exchanger
13. Diesel fuel heater


Coolant pump

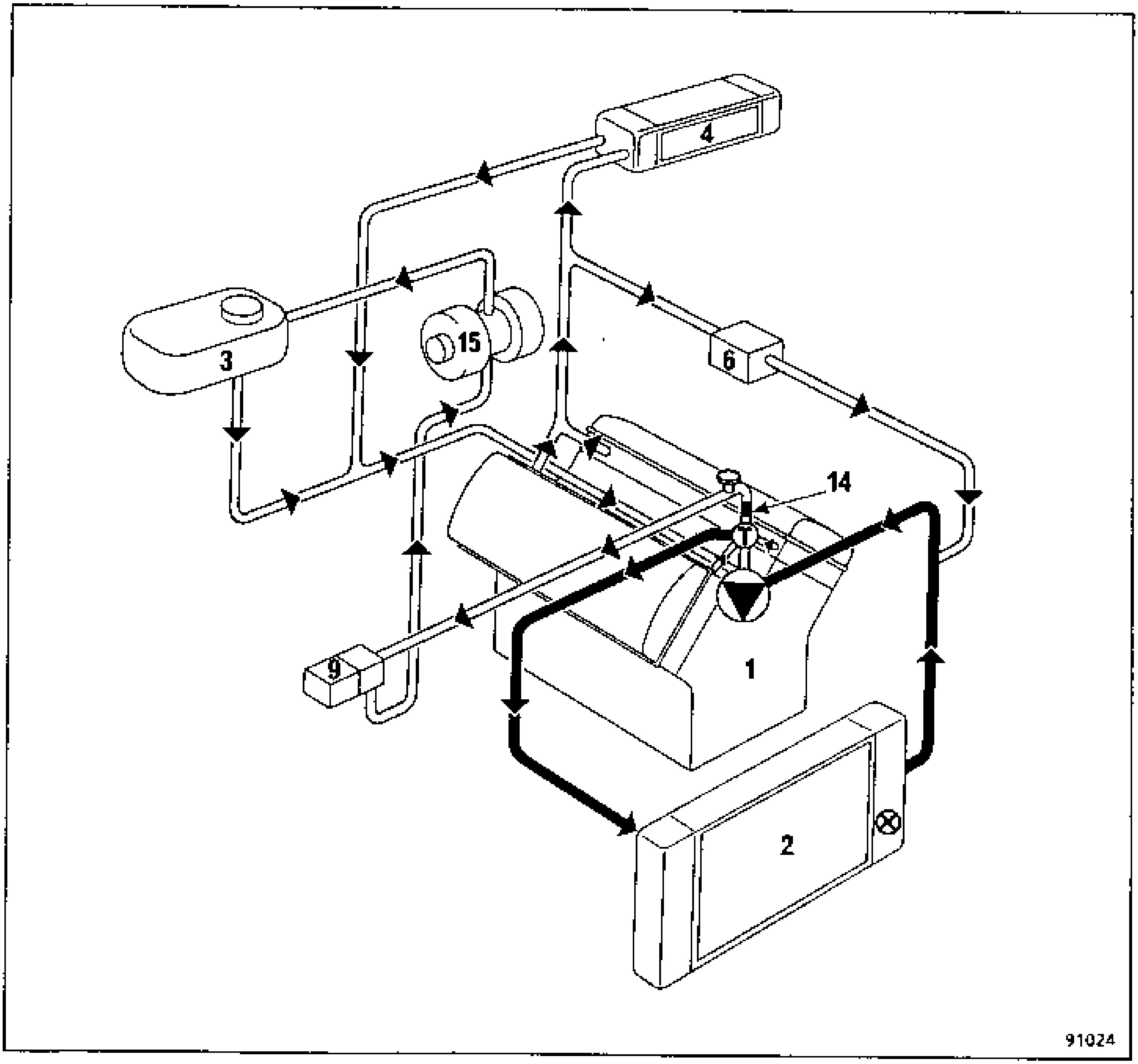

Thermostat


Bleed screw

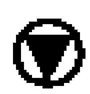

Temperature switch

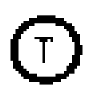
The expansion bottle valve is brown; calibration value **1.2 bar**.

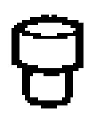
* With watercooled turbocharger

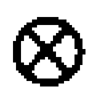


1. Engine
2. Radiator
3. "Hot" bottle
4. Heater unit
6. Engine oil-coolant exchanger
9. Electric coolant pump
14. Restriction Ø 3.5 mm.
15. Turbocharger

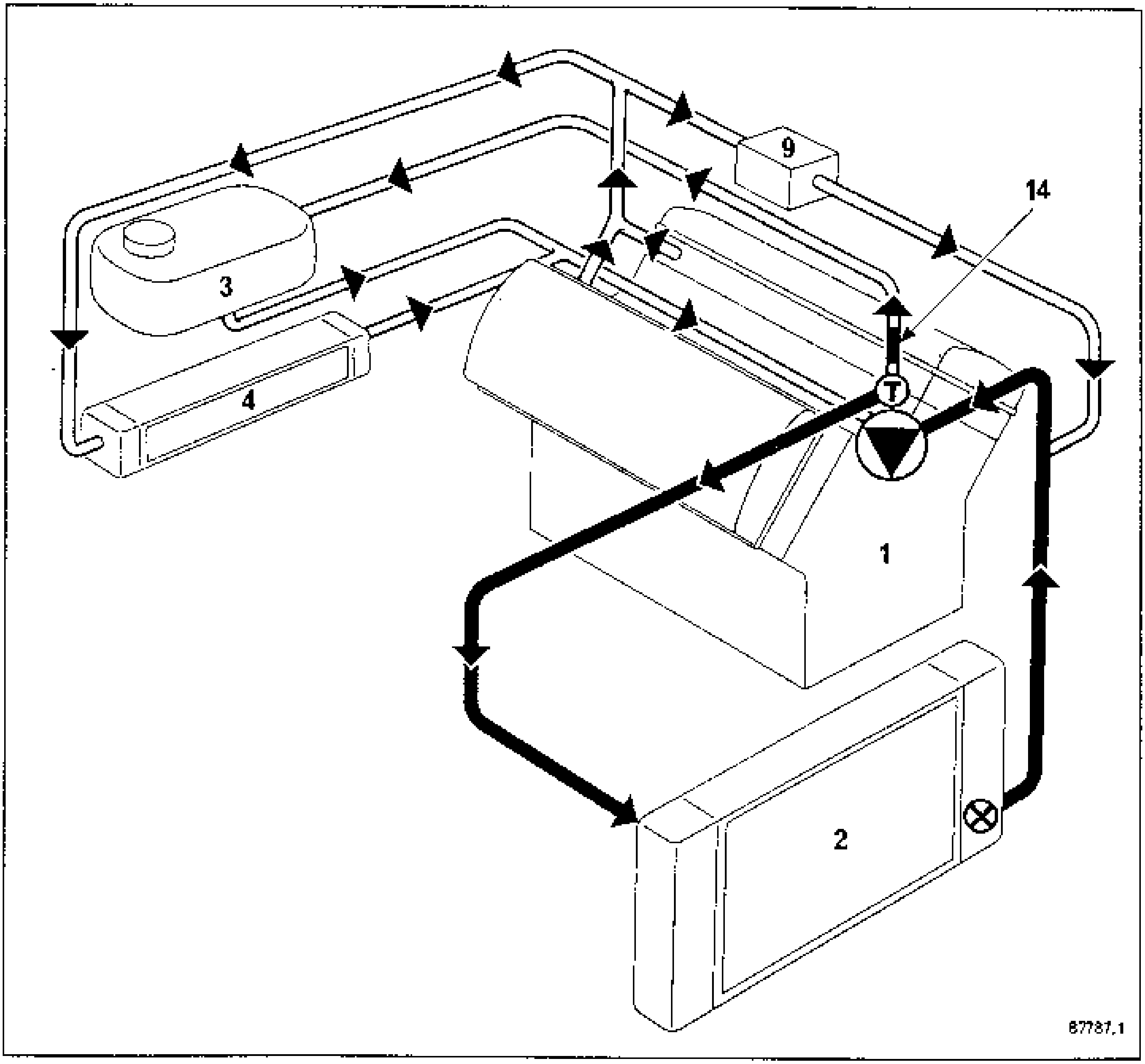
 Coolant pump

 Thermostat

 Bleed screw (1)

 Temperature switch

The expansion bottle valve is blue; calibration value 1.6 bar.



1. Engine
2. Radiator
3. "Hot" bottle
4. Heater unit
9. Engine oil heat exchanger
14. Restriction

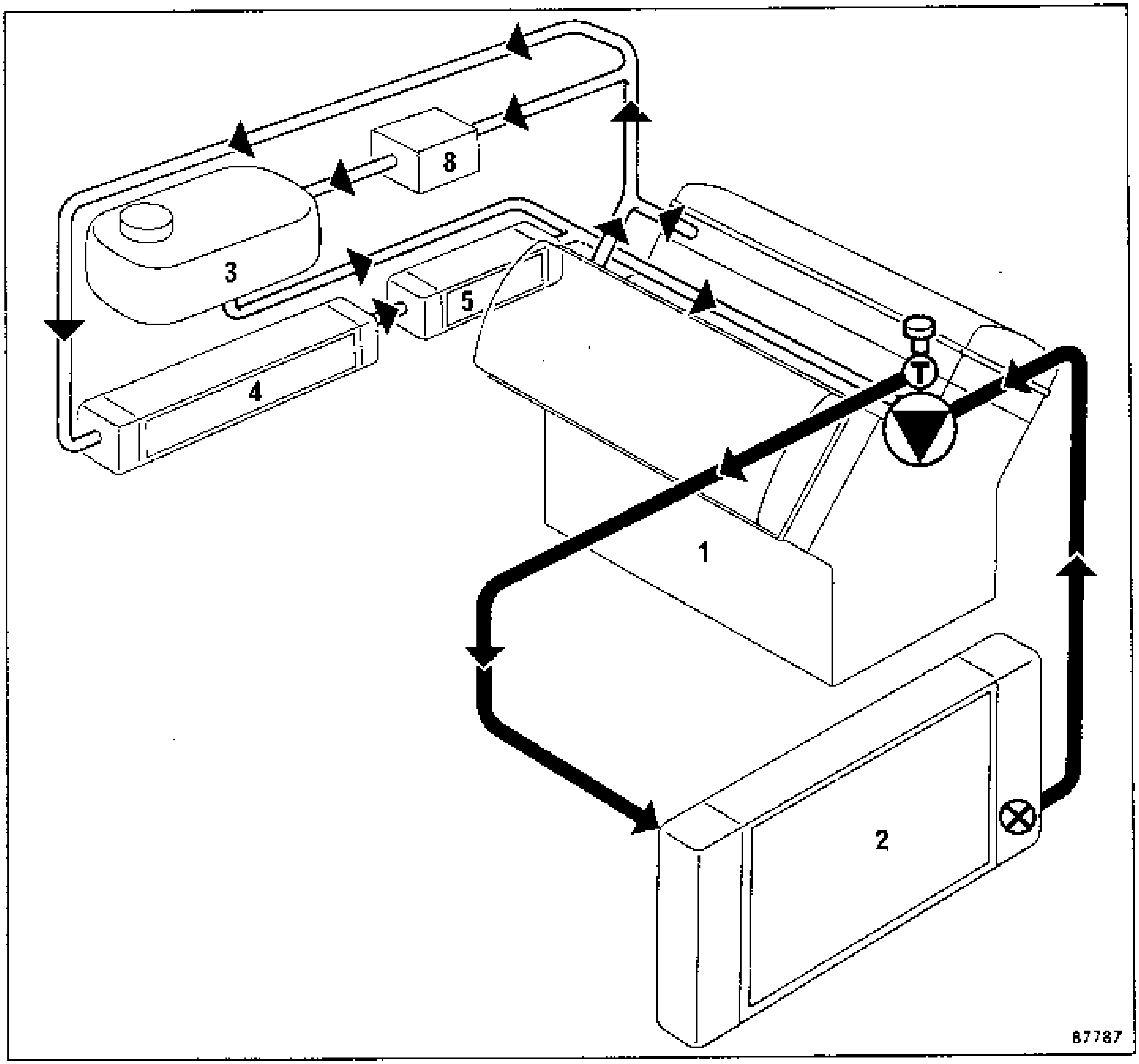
Coolant pump

Thermostat

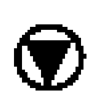
Bleed screw

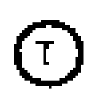
Temperature switch

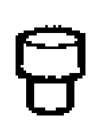
The expansion bottle valve is blue; calibration value **1.6 bar**.

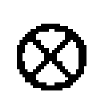


1. Engine
2. Radiator
3. "Hot" bottle
4. Heater unit
5. Heat exchanger
   automatic transmission
8. Additional air valve

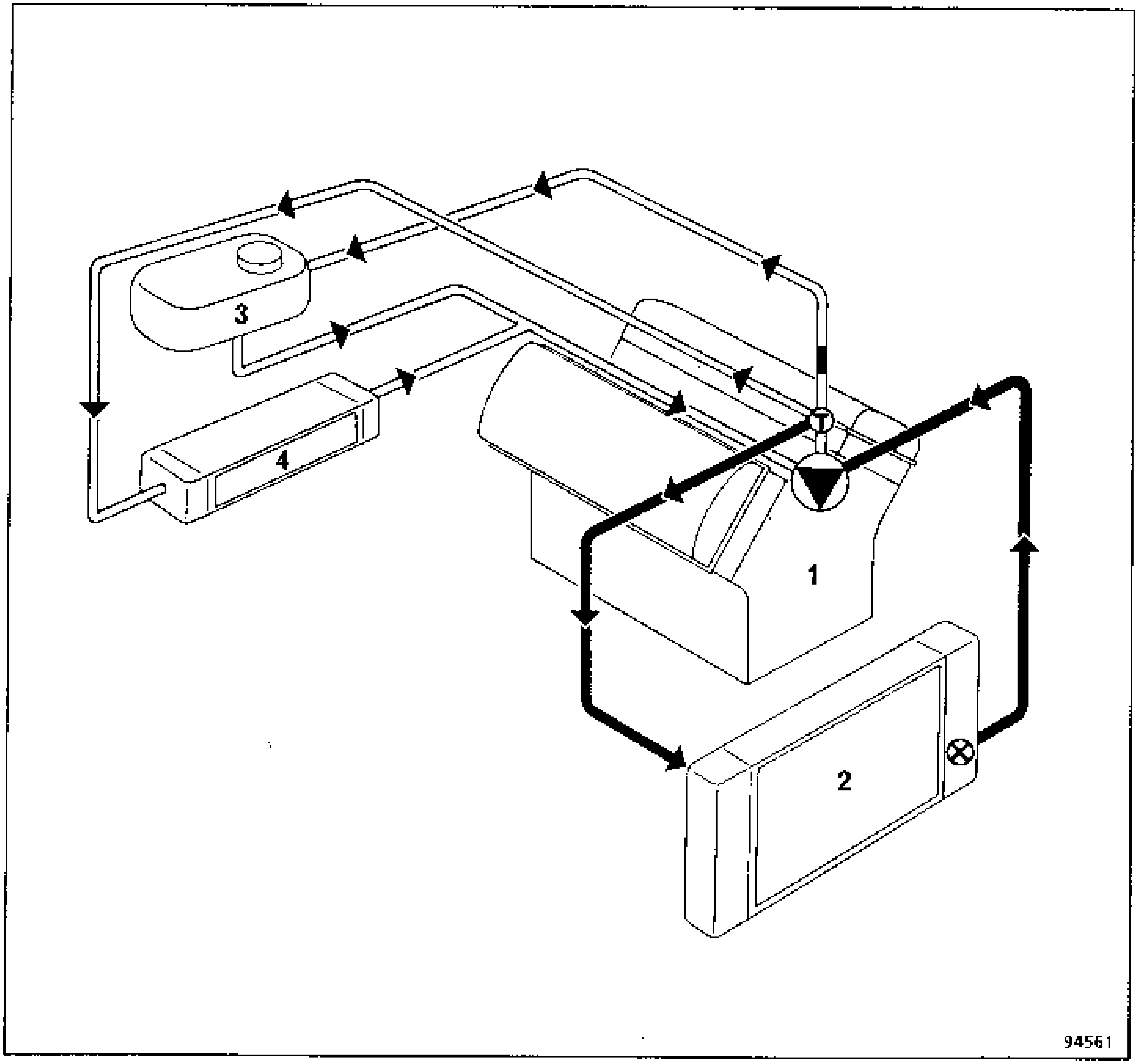
 Coolant pump

 Thermostat

 Bleed screw

 Temperature switch

The expansion bottle valve is brown; calibration value 1.2 bar.



1.Engine

2. Radiator

3. "Hot" bottle

4. Heater unit

Coolant pump

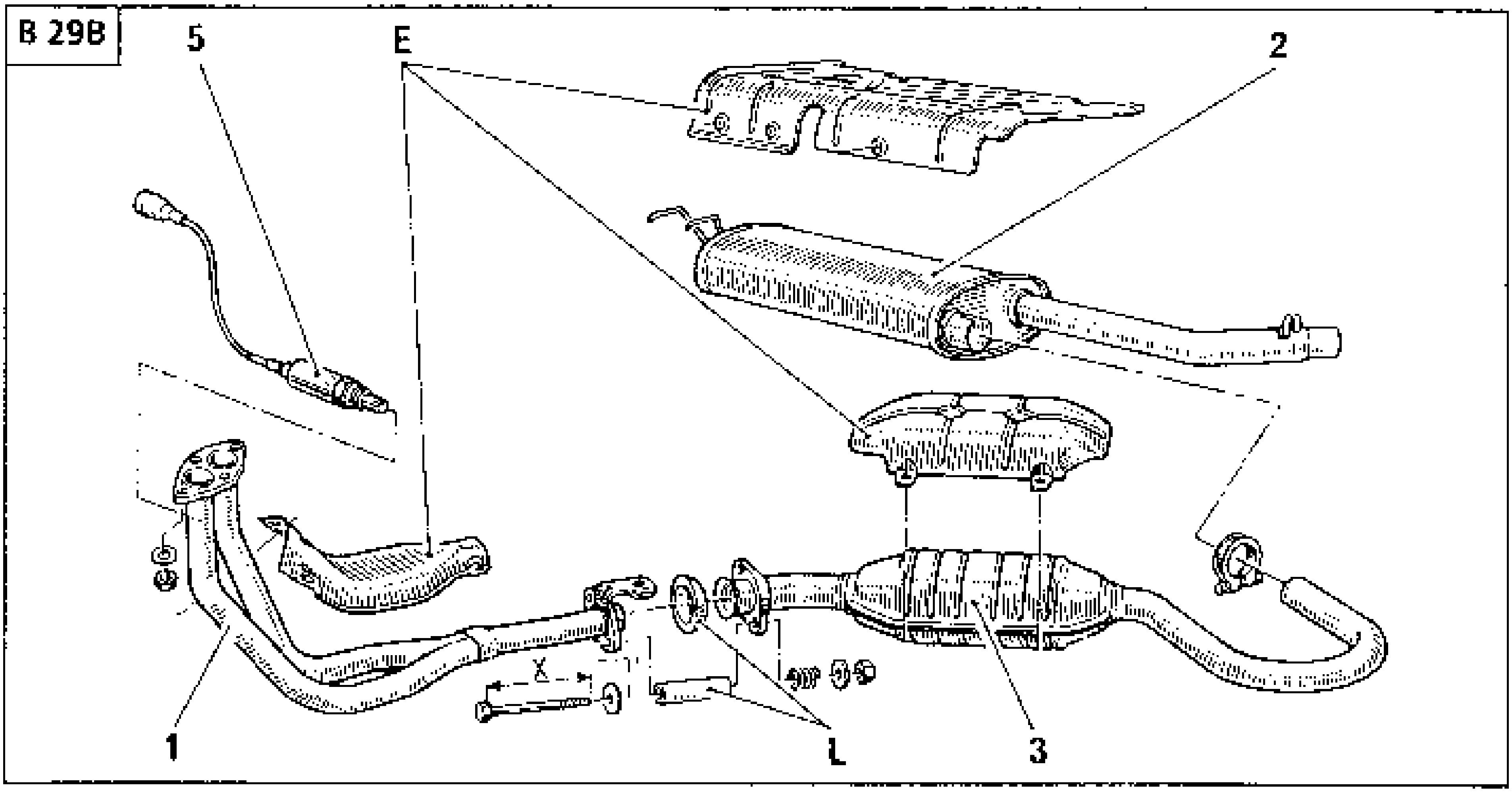
Thermostat

Bleed screw

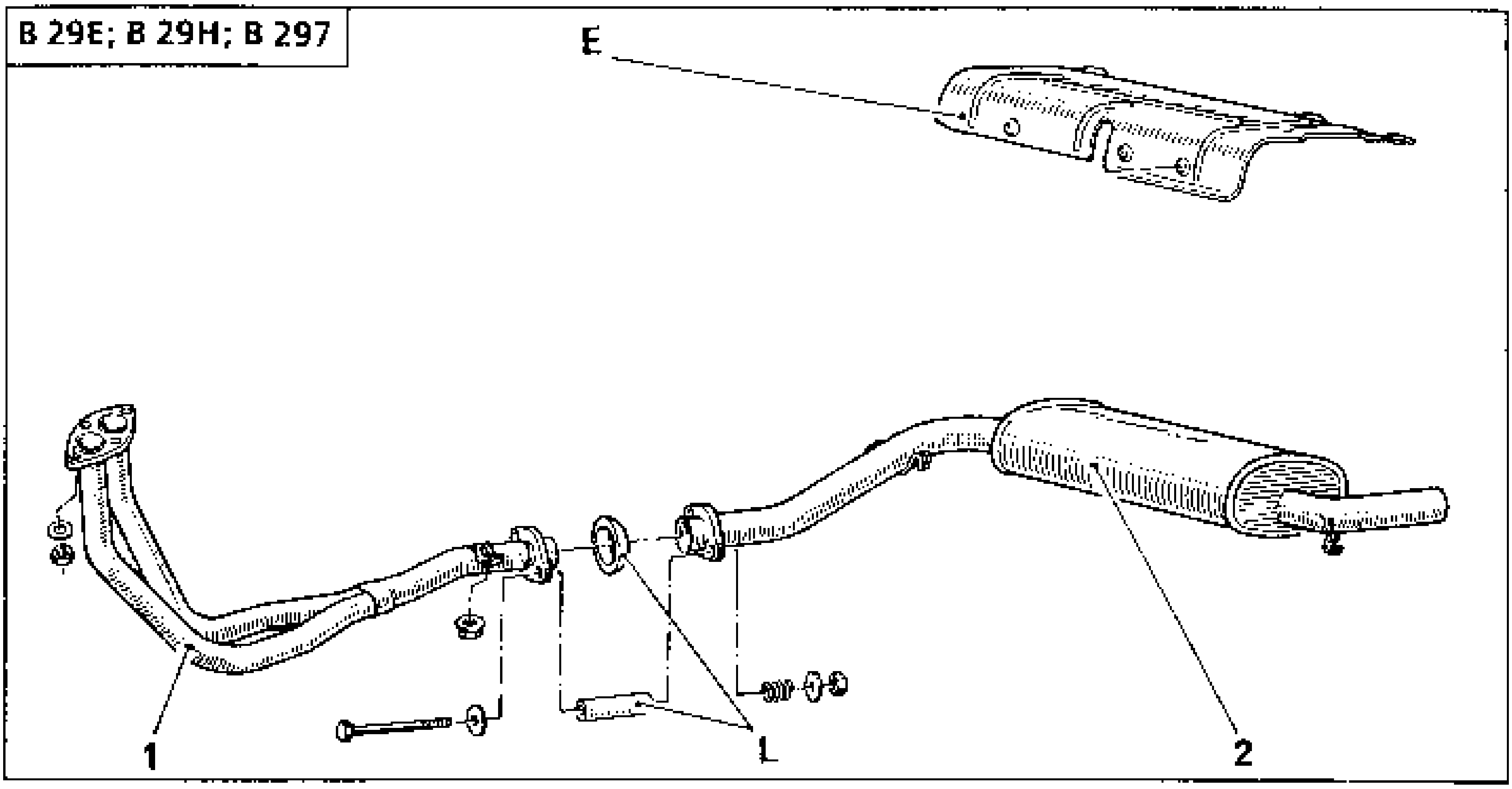
Temperature switch

The expansion bottle valve is brown; calibration value **1.2 bar**.

B 29B



B 29E; B 29H; B 297

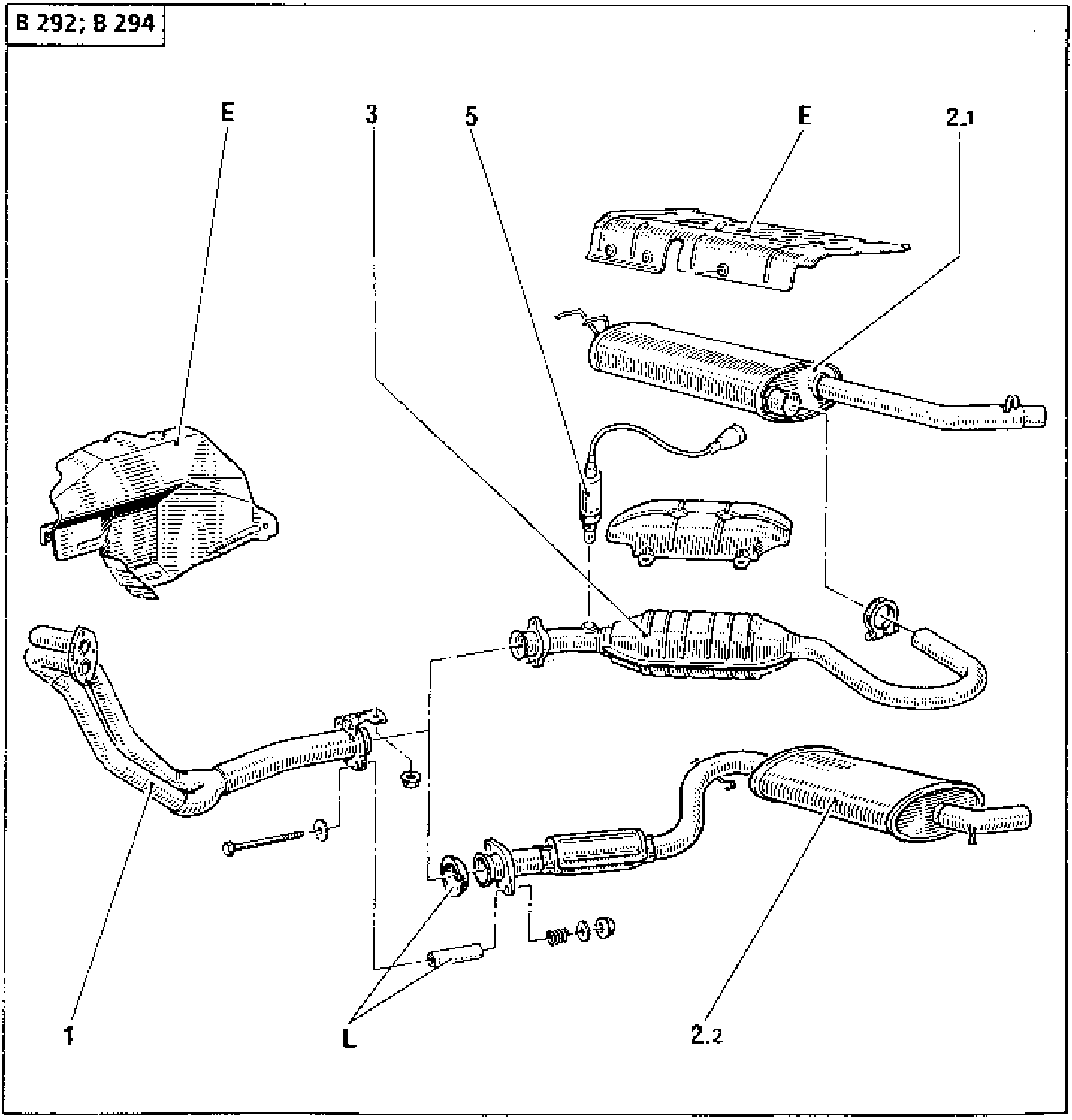


1 - Exhaust downpipe
2 - Centre silencer
3 - Catalytic converter
5 - Oxygen sensor

E - Protective heat shields
L - Connection by limited tightness "METEX" ring

B 29B: Distance "X": X = 70 mm of n°.... ⟶ n°S00003334

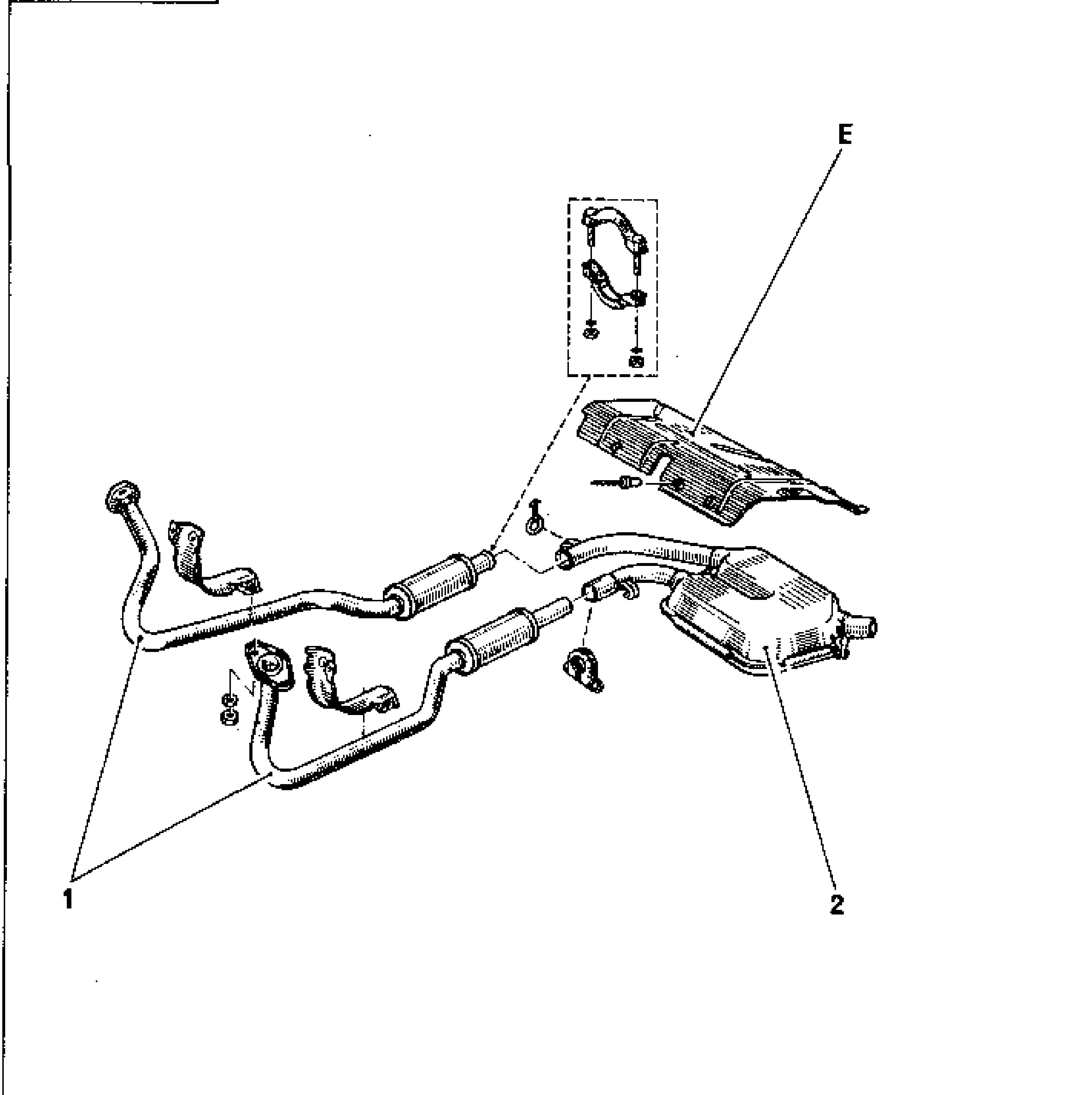
X = 97 mm of n°S00003335 ⟶ n°....



1 - Exhaust downpipe
2-1 - Centre silencer (B 294)
2-2 - Centre silencer (B 292)
3 - Catalytic converter
5 - Oxygen sensor

E - Protective heat shields
L - Connection by limited tightness "METEX" ring

B 293 BM; B 298

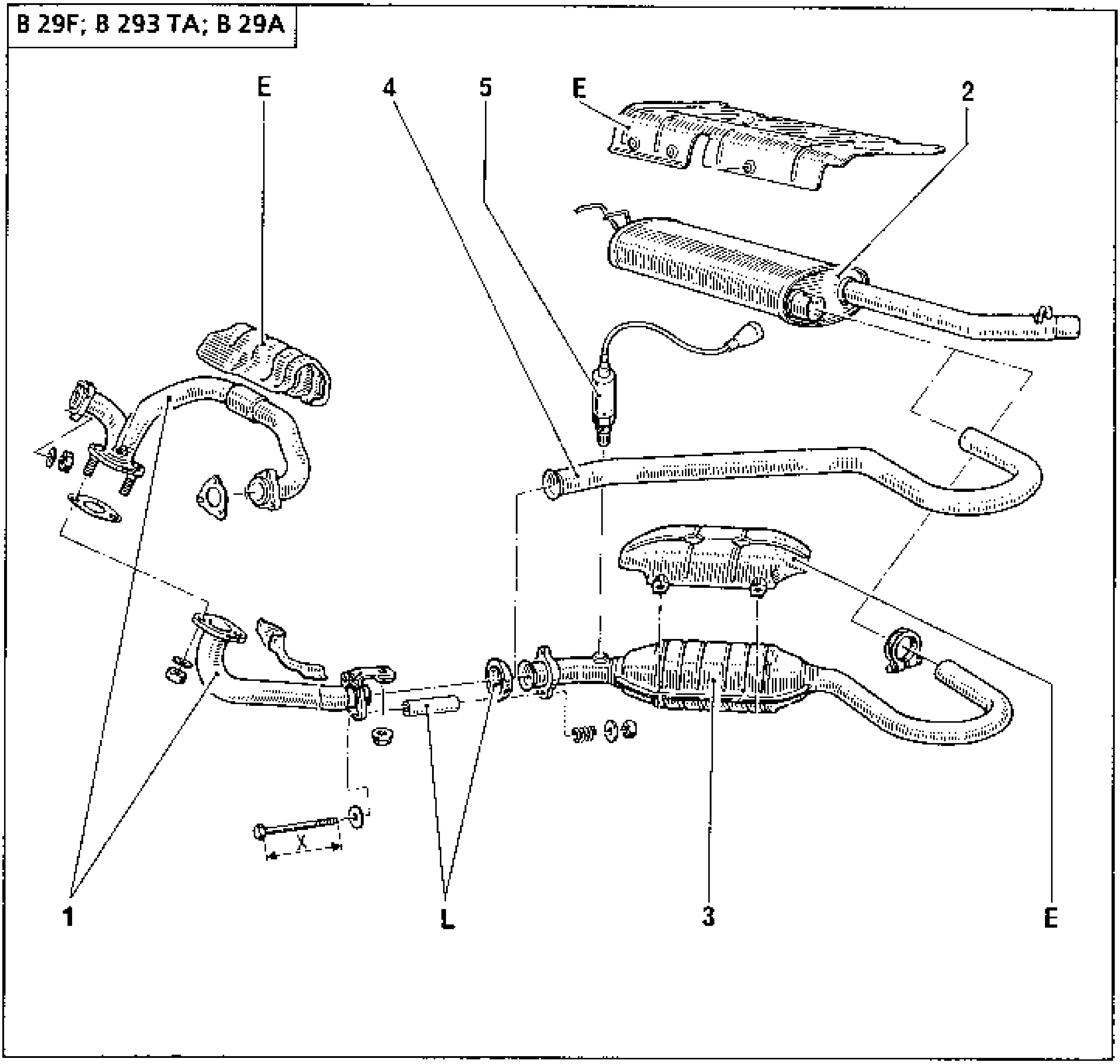


1 - Exhaust downpipes (with integrated centre silencers)

2 - Intermediate pipe

The exhaust gas silencing is ensured by both the centre silencers and the intermediate pipe.

E - Protective heat shields



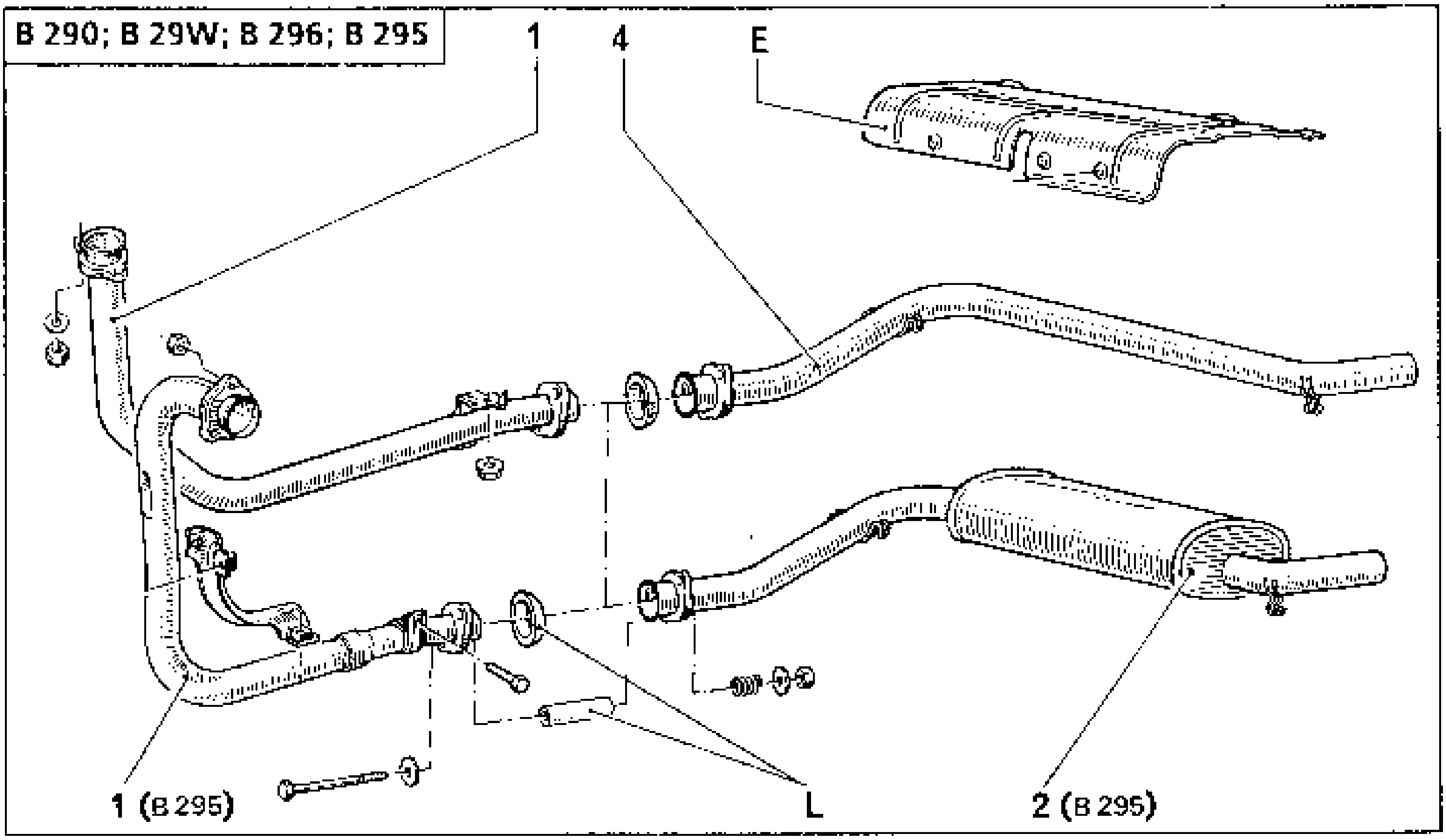
1 - Exhaust downpipes
2 - Centre silencer
3 - Catalytic converter (B 29F)
4 - Intermediate pipe (B 293)
5 - Oxygen sensor

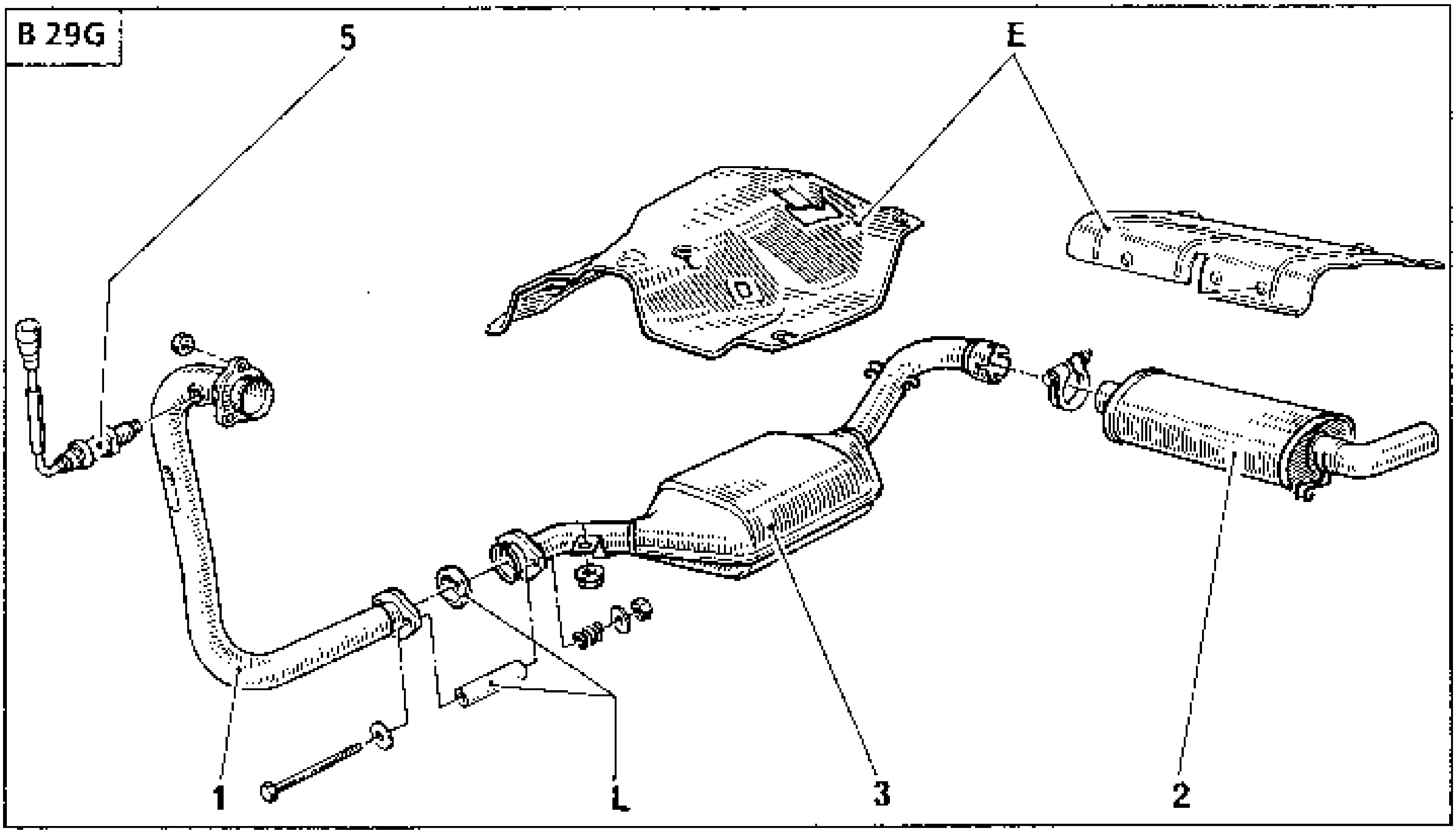
E - Protective heat shields
L - Connection by limited tightness "METEX" ring

Distance "X": X = 70 mm for B 29A ⟶ n°S00001036

X = 97 mm for B 29A n°S00001037 ⟶ n°....

for B 29F and B 293 TA

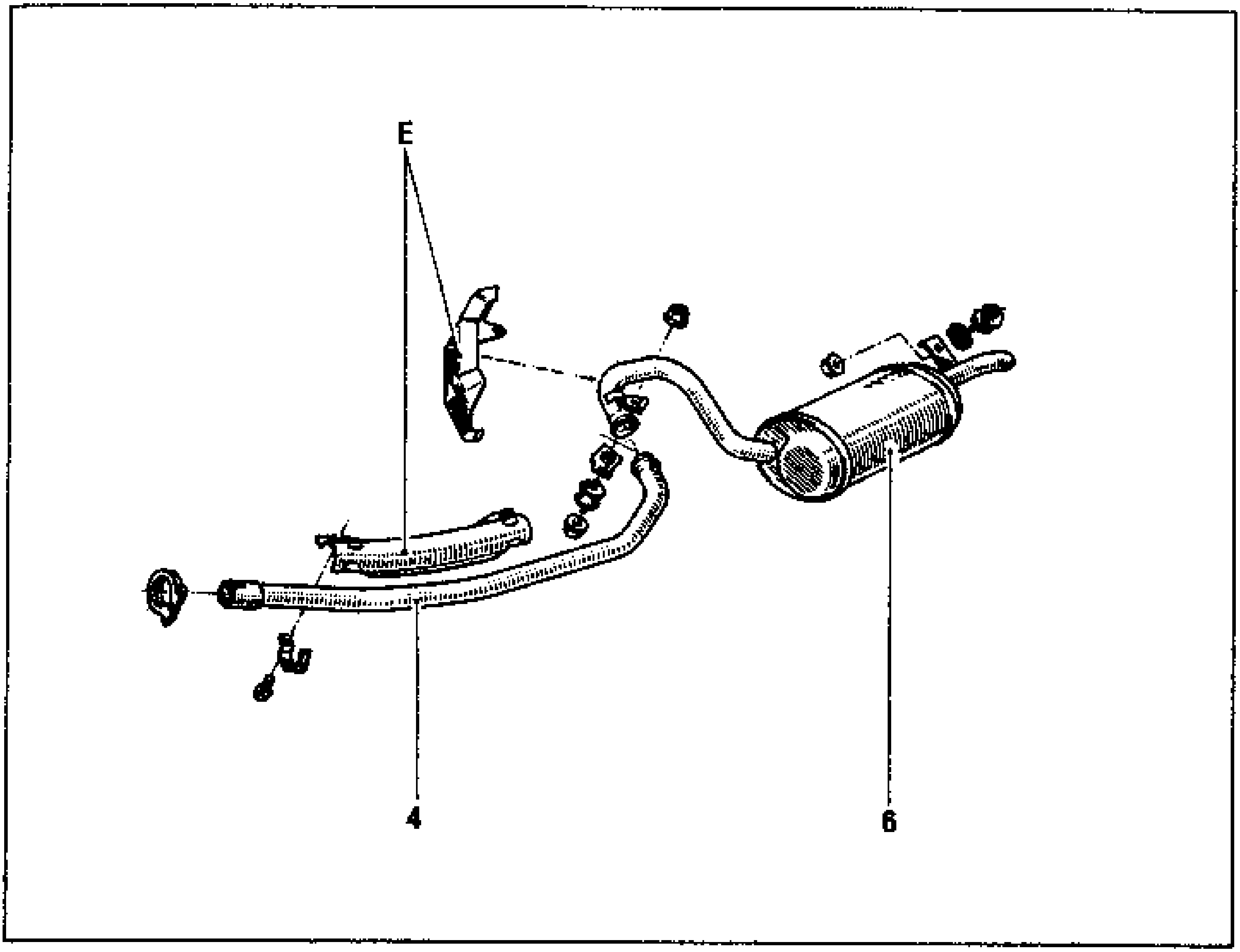




1 - Exhaust downpipes
2 - Centre silencer
3 - Catalytic converter
4 - Intermediate pipe
5 - Oxygen sensor

E - Protective heat shields
L - Connection by limited tightness "METEX" ring

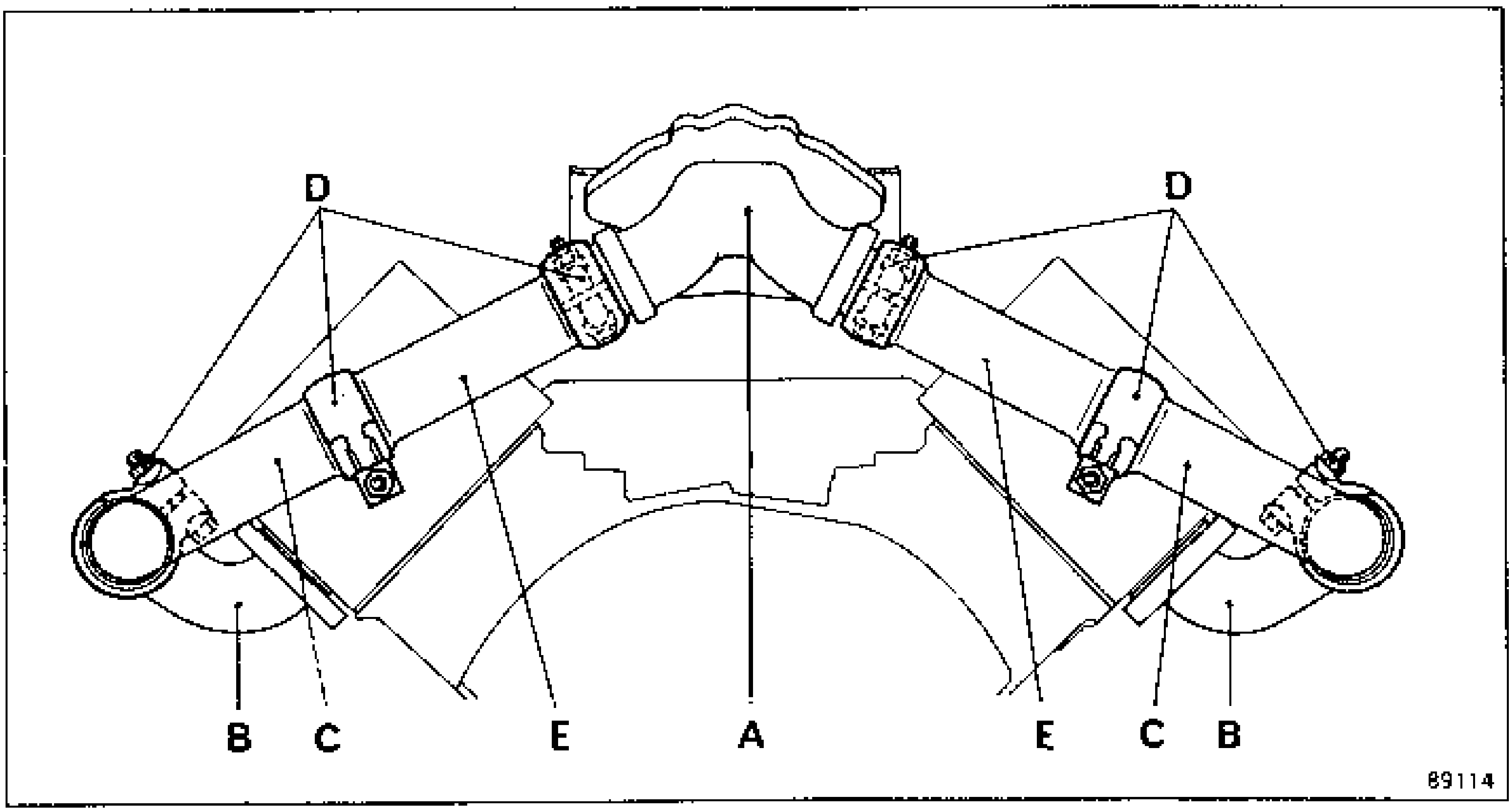
Exhaust output - All types



4 - Rear intermediate pipe
6 - Silencer

E - Protective heat shields

Special features of V6 Turbo vehicles



REMOVING-REFITTING

In order to limit stresses, it is essential to observe the fitting instructions for the manifold and connection assembly.

1 - Fit and attach the centre manifold (A).

2 - Fit manifolds (B), fitted with new seals and locate the fixing bolts without tightening them.

3 - Fit and line up the connecting pipes (C) and (E), maintaining the correct position of the clips (D).

4 - Gradually tighten the mountings to **2.5 daNm**.

5 - Run the engine for a quarter of an hour and retighten (without previously loosening) the fixing clips (D) to **2.5 daNm**.

NOTE:

If the nuts required loosening, they should be systematically replaced when carrying out subsequent work. In fact, the self-locking thread system is damaged every time the nuts are loosened.

REMARK:

The connecting pipes (E) are delivered to the MPR in four different lengths.

As appropriate, select the most suitable pipe for the fitting:

Connecting pipe (E)

Colour mark		Length (mm)
Yellow	11	134.5
Blue	6	136.5
White	3	138.5
Green	8	140.5

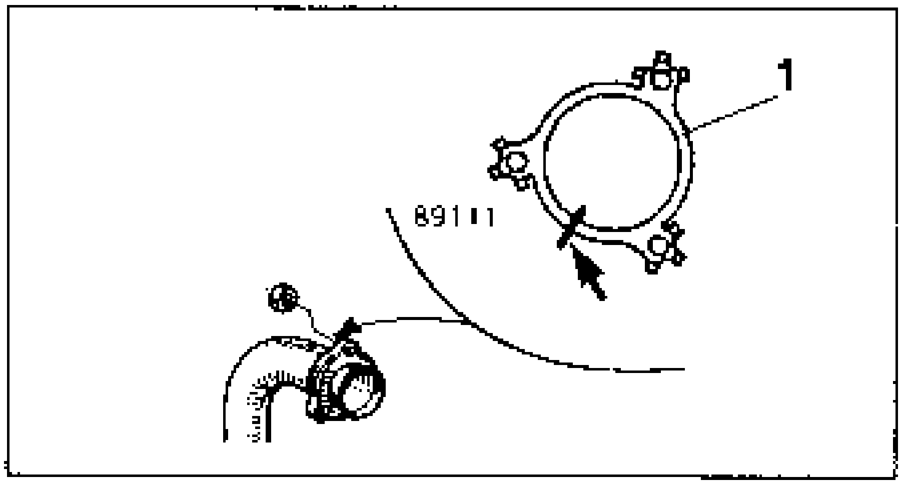
IMPORTANT :
"Bischoff" clamps can be easily removed and refitted using special pliers **Mot. 1214, part no. 0000 121400.**

Special features of V6 Turbo vehicles (continued)

The exhaust downpipe is attached to the turbocharger by a flange with 3 holes, with nuts locked by a sheet metal lockwasher.

Every time the pipe is dismantled, this lockwasher must be replaced.

To fit, cut it to slide it over the pipe.
(See arrow on diagram.)



All vehicles

To line up the exhaust assembly correctly and achieve effective tightness of the clamps:

- Tighten the various connections in the correct order, starting with the exhaust manifold and ending with the silencer.

- Position the clamps so that their clamping surface is against the split ends of the pipes and their opening between two slots in the piping.

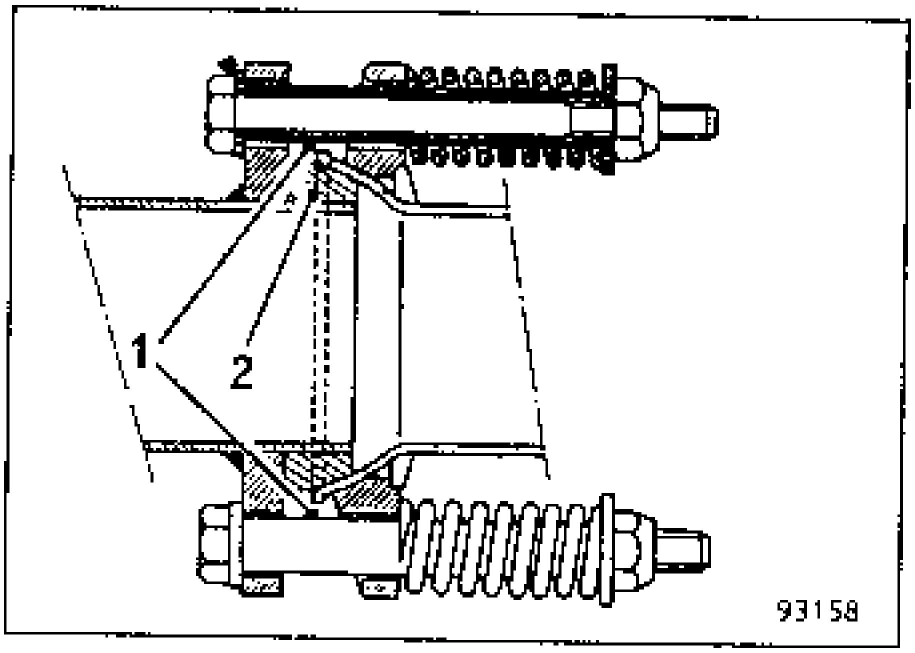
- Tighten the clamp bolts to the specified torque: 8 mm Ø bolt: 2 daNm, to avoid distorting the pipes and the clamps, which could cause leakage.

IMPORTANT :

- The seal between the exhaust manifold gasket face and the catalytic converter must be perfect.

- If any seals are removed, it is absolutely essential to **REPLACE** them

- When removing refitting, the catalytic converter must not be subjected to repeated mechanical impacts, which could damage it.



The exhaust downpipe flanges are fitted with spacers **(1)** which determine the spring tension. Tighten until contact is made with the spacers.

The seal is created by a "Metex" friction ring **(2)**.

CHECKING THE CATALYTIC CONVERTER

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

Connect an exhaust gas analyser to the exhaust output at the rear of the vehicle.

Note the pollutant readings at an engine speed of 2000 - 2500 rpm (wait for the readings to stabilise).

The reading should be below 0.5%.

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

- If the CO level does not change irrespective of whether the sensor is connected or not, check the operation of the sensor using the XR 25.

  Check bar graphs line 13 and the variations in # 5 (speed stabilised at 2000 - 2500 rpm, sensor connected).
  Replace the sensor if check shows a fault, then repeat the test at 2000 - 2500 rpm, as well as the test for the presence of lead in the exhaust gases.

- If the sensor check shows no fault and if the CO percentage is still greater than 0.5% after a new sensor has been fitted:

  Check:

  - that the catalytic converter makes no noise when shaken while the engine is stationary (confirm this while driving the vehicle);

  - that after the catalytic converter has been removed:

    - there is no visible damage;
    - the the catalytic converter makes no noise when shaken;
    - nothing is partially or totally blocking the catalytic converter;

  - that the catalytic converter has not been polluted by leaded petrol.

Before replacing a catalytic converter or oxygen sensor:
check that the petrol in the fuel supply system does not contain lead (test for the presence of lead in the exhaust gases) (see NT 1529)

If the lead test is positive, the circuit must be flushed out with unleaded petrol by making the vehicle consume at least two full tanks of unleaded petrol.

ATTENTION

Before unnecessarily replacing the catalytic converter, check:

- that the vehicle is in perfect working order;
  Check the fuel supply, ignition, mixture regulation by oxygen sensor (using the XR 25 and the lead test) and the air filter;

- the vehicle performance in a road test;

- that no local noises are produced by the catalytic converter during the road test;

- that the exhaust system is perfectly sealed;

- the pollutant values:

  - engine temperature;

  - readings at idling speed and at an engine speed of 2000 - 2500 rpm.

The variations in different pollutant levels are not always immediate; they may be temporary and irregular since the reading varies depending on the specifications of the exhaust gas analyser used (sensitivity, response time, condensation in the circuits, filter condition, length of pipes, etc.).

- Ensure that the equipment is correctly calibrated after its required warming up period.

IMPORTANT: AVOID OVERHEATING THE ENGINE

- The engine must be in good condition (carburation, injection and ignition must all be in perfect working order) so that the catalytic converter is not operating under abnormal conditions.

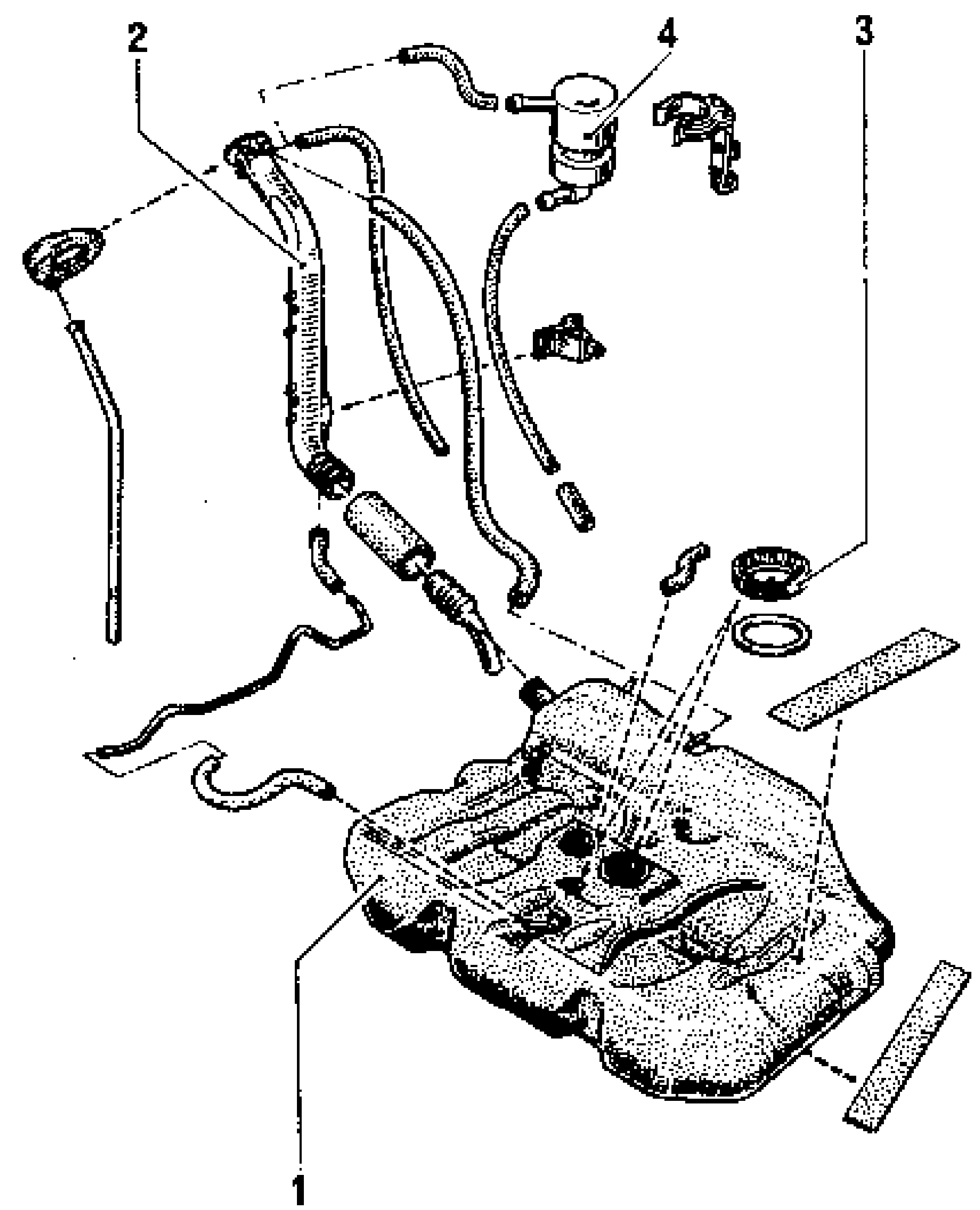
- The vehicle must be stopped if the ignition misfires, if there are fuel supply faults or a loss of power (engine overheating leading to catalytic converter overheating).

- Overheating may also be caused by prolonged use of the starter or attempting to start by towing (circumstances under which the engine receives a rich mixture but only starts occasionally).

IMPORTANT NOTE:

Do not park or leave the engine running in places where combustible materials could come into contact with a hot exhaust pipe.

Under certain circumstances, these materials could ignite.



1 - Fuel tank

2 - Filler neck

3 - Tank plug

4 - Return anti-leak valve

REMARK:

- Petrol engined vehicles are fitted with a plastic fuel tank, while diesel engines vehicles have a smaller, sheet metal fuel tank.
- The valve (4) is mounted in the wheel arch on the shock absorber.

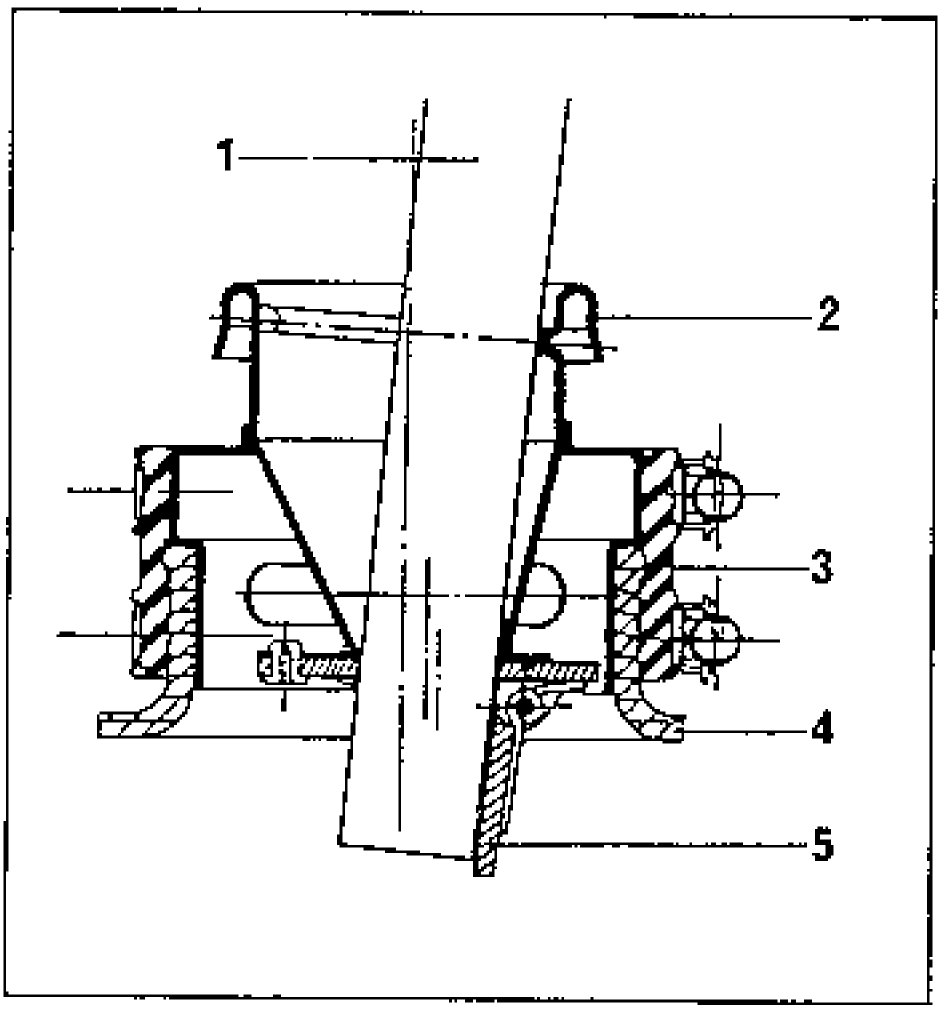
(Make sure it is fitted the correct way up.)

Vehicles with anti-pollution system

- The fuel tank has a "sealed" type cap and a ventilation circuit.

- The cap is of the limited torque type.
  Furthermore, the unleaded fuel filler neck has:
  - a filler opening of a smaller diameter, making it incompatible with a conventional fill nozzle.
  - (The lead would pollute the anti-pollution system - the oxygen sensor and the catalytic converter.)

- a valve blocking the filler opening (so as to avoid petrol vapour emission or a reverse flow of petrol)



1 - Filler spout

2 - Filler neck

3 - Connecting sleeve

4 - Fuel tank

5 - Valve

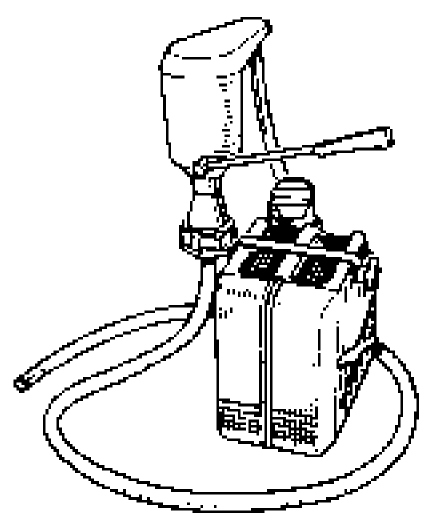
REMOVING-REFITTING

- Place the vehicle on a hydraulic lift.

Before raising the vehicle:

- Disconnect the battery;
- Drain the fuel from the fuel tank using, for example, the "piston pump 3000", supplied by:

La Compagnie des Pompes et Distributeurs
7, rue J.-Macé
92150 Suresnes
France
Tel. 010-44-1-45.06.23.95



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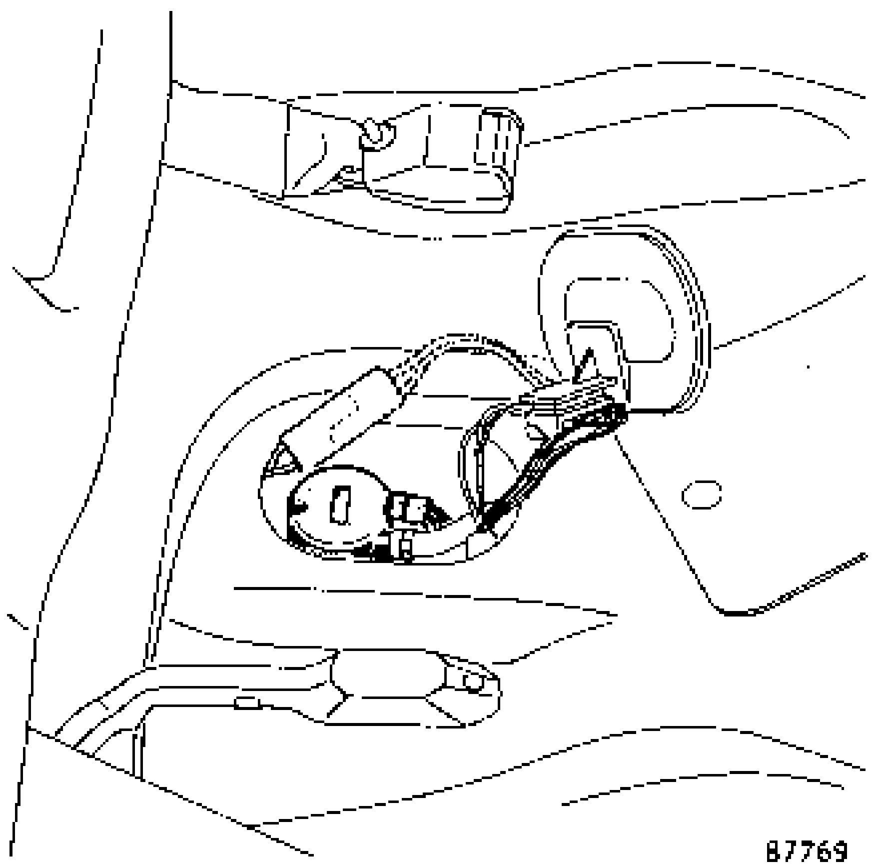
IMPORTANT :
Do not smoke and do not bring a naked flame or red hot parts near to the working area.

- Detach the seatback from the rear bench seat (two plastic bolts on the pivot bracket)
- Disconnect the dipstick connector through the access flap, as well as the priming pump connector on **B 298** vehicles



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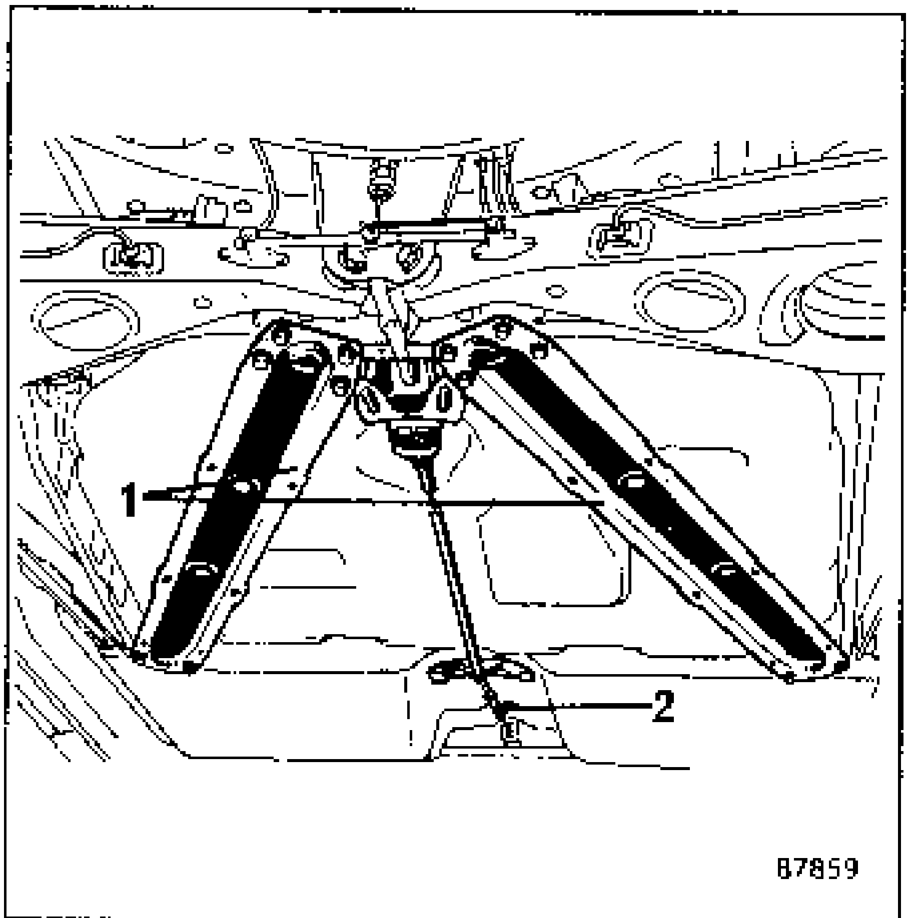
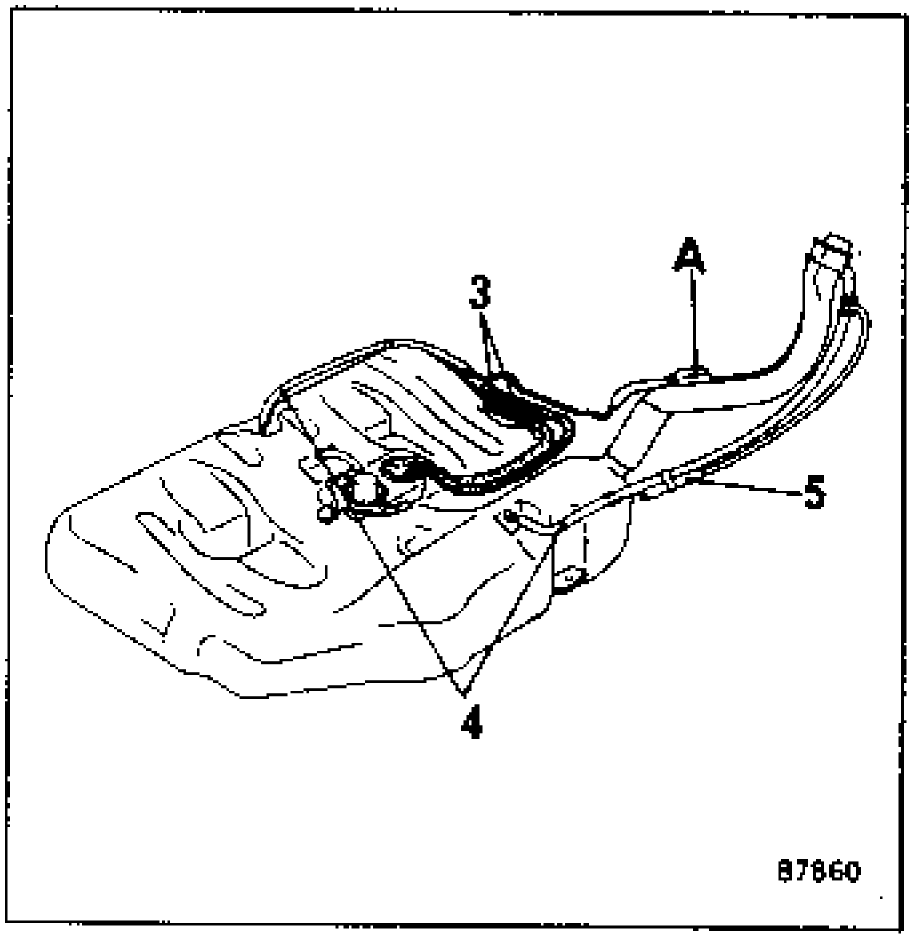
Removing-Refitting (continued)

Raise the vehicle and remove:
- the rear bumper;
- the two connecting rods (1) between the bodywork and the suspension arm.



- Disconnect the handbrake (at adjuster 2) and secure it under the emergency wheel.
- Remove the tightening clamp from the filler neck.
- Remove the fuel tank mountings and, using **Desvil V 710** stand (for example), lower the tank slowly.



- Then disconnect the various flexible pipes:
  - fuel supply and return (3);
  - anti-expulsion, degassing (4).

Note:

The upper part of the fuel tank has two raised sections at the front and at the back.

To allow proper degassing and to fill the tank to its full capacity, the front pipe is connected to a small housing (A) on the filler neck: this housing is located at the rear and is connected to the upper section of the filler neck.

Furthermore, the fuel tank cap is of the sealed type; venting is ensured by the pipe (5).

REFITTING

Perform the operations in reverse order.

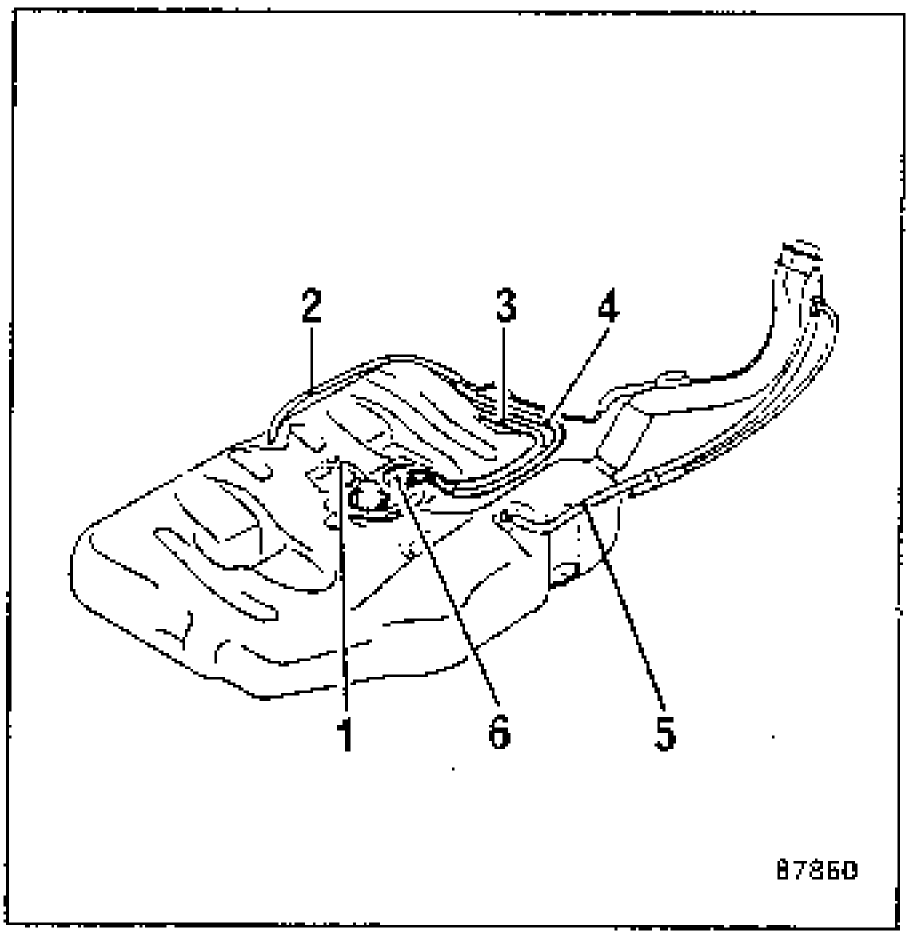
HOWEVER, when fitting the fuel tank to the vehicle, take care not to trap the fuel supply and return pipes between the cross member and the fuel tank.

FITTING A PLASTIC FUEL TANK

RENAULT 25 TS and **GTS (B 297)** have always been fitted with a sheet metal fuel tank.
During model year 1985, all petrol engined versions were fitted with plastic fuel tanks.

As a result, the MPR no longer supplies replacement sheet metal fuel tanks for **RENAULT 25 TS** and **GTS** models.

When replacing a sheet metal fuel tank with a plastic fuel tank, the following pipes and related parts will require adaptation.



DESCRIPTION	LENGTH (in mm)
PIPE (1)	110
PIPE (2)	630
PIPE (3)	1000
PIPE (4)	1000
PIPE (5)	1060
STRAINER (6)	-
2 SEALS	-