

## 1 Engine and peripherals

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**BA0A - BA0E - BA0F - BA0G - BA0L - BA0U**

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77 11 176 211

SEPTEMBER 1995

**Edition Anglaise**

"The repair methods given by the manufacturer in this document are based on the technical specifications current when it was prepared.

The methods may be modified as a result of changes introduced by the manufacturer in the production of the various component units and accessories from which his vehicles are constructed."

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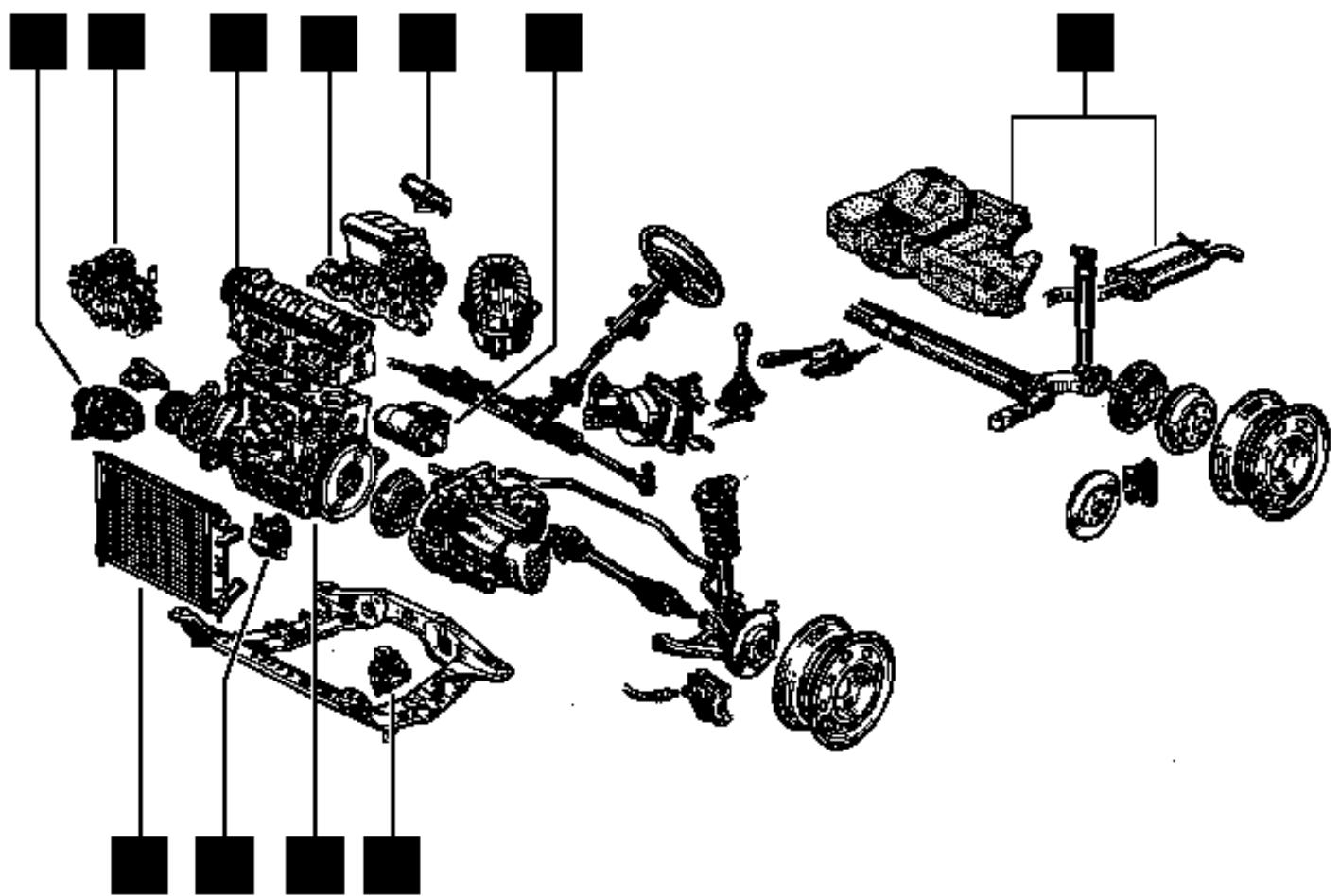
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Régie Nationale des Usines Renault S.A.1995

# EXPLODED VIEW

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PRJ1005

# Engine and peripherals

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Type	Quantity	Components
<b>RHODORSEAL 5661</b> e.g.- CAF 4/60 THIXO	Coat	Driveshaft roll pin holes
<b>Loctite FRENBLOC</b> Brake and sealing resin	Coat	Brake caliper mounting bolts
<b>Loctite FRENETANCH</b> Brake and sealing resin	Coat	Crankshaft pulley mounting bolts
<b>Paste for exhaust pipe</b>	Coat	Exhaust sealing

## Identification

Vehicle type	Engine	Manual gearbox	Capacity (cm <sup>3</sup> )	Bore (mm)	Stroke (mm)	Ratio
BA0E	E7J 764	JB1	1 390	75.8	77	9.5/1
BA0G	F3R 750	JB3	1 998	82.7	93	9.8/1
BA0F	K7M 803	AD4	1 598	79.5	80,5	9.7/1
BA0F BA0L	K7M 702 K7M 720	JB1	1 598	79.5	80,5	9.7/1 9.5/1
BA0A BA0U	F8Q 620	JB1	1 870	80	93	21.5/1

Refer to the correct engine Workshop Repair Manual for the type of engine to repaired:

Document	Engine E7J	F3R	K7M
E engine	X		
F engine (E)		X	
K engine (E) underway			X

### TESTING METHOD

Oil consumption of **1 litre for 1 000 km (620 miles)** is acceptable.

Check there is no external oil leak from the engine.

For accurate testing, certain conditions must be observed when draining the engine oil :

- the engine should be warm,
- the dipstick and filling plug should be removed.

Drain the engine and leave the oil running out for **15 minutes** minimum.

Refit the drain plug and "seal" it (spot of paint covering the plug and the sump) in order to check at a later date that it has not been removed.

Use a measuring cylinder to check the amount of oil required to fill the engine:

Engines:

E7J	2.75	litres
K7M	3	litres
F3R	5.5	litres
F8Q	5	litres

Refit the filling plug and seal it.

Ask the driver to return the vehicle after **1 000 km (620 miles)** during which time the oil level should be monitored regularly with the dipstick.

When the vehicle is returned, check the drain and filling plugs have not been tampered with.

Under the same conditions:

- engine warm,
- dipstick and filling plug removed.

Drain the oil and use a measuring cylinder to check the amount of oil collected.

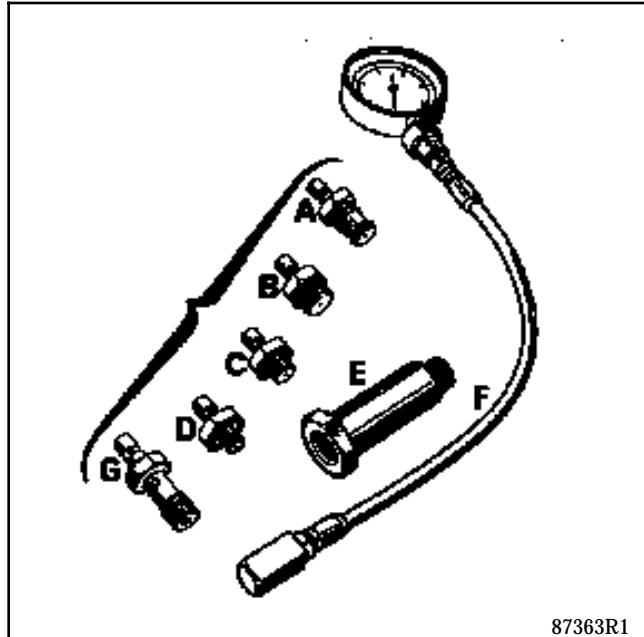
Calculate the oil consumption in litres per **1 000 km (620 miles)** if the mileage is different.

<b>SPECIAL TOOLING</b>
<b>Mot. 836 -05 Oil pressure testing kit</b>
<b>SPECIAL EQUIPMENT</b>
<b>Long 22 mm socket</b>

### CHECKING

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

Composition of the kit Mot. 836-05.



### ENGINE CHECK

#### E and K engines

Idle	1 bar
3 000 rpm.	3 bar

#### F engine

1 000 rpm.	1.2 bar
3 000 rpm.	3.5 bar.

### USE

<b>F engine</b>	<b>E and K engine</b>
<b>B + F</b>	<b>C + E + F</b>

<b>SPECIAL TOOLING</b>	
B.Vi. 31-01	Set of punches
Mot. 1202	Hose clip pliers
T.Av. 476	Ball joint extractor
<b>SPECIAL EQUIPMENT</b>	
Load positioning tool (example : NAUDER 1805)	

TIGHTENING TORQUES (in daN.m)		
<b>Brake caliper bolts</b>	3.5	
<b>Shock absorber base bolt</b>	17	
<b>Track rod end nut</b>	3.5	
<b>Driveshaft gaiter bolt</b>	2.5	
<b>Wheel bolts</b>	9	
<b>Engine tie-bar bolt :</b>		
- on the gearbox	6.5	
- on the sub-frame	7.5	
<b>Right hand engine mounting nut</b>	4.5	
<b>Left hand gearbox mounting nut</b>	4.5	

### REMOVAL

Put the vehicle on a 2 post lift.

Drain the gearbox.

Disconnect the battery.

Remove:

- the bonnet,
- the front wheels.

### ***Left hand side of the vehicle***

Remove:

- track rod end using tool T.Av. 476,
- the three bolts of the driveshaft gaiter,
- the two bolts from the shock absorber base,
- the two bolts from the brake caliper then secure it to the shock absorber spring,
- the bolt from the lower ball joint,
- the complete hub assembly and the driveshaft.

### ***Right hand side of the vehicle***

Remove the pins from the right hand driveshaft using tool B.Vi. 31-01.

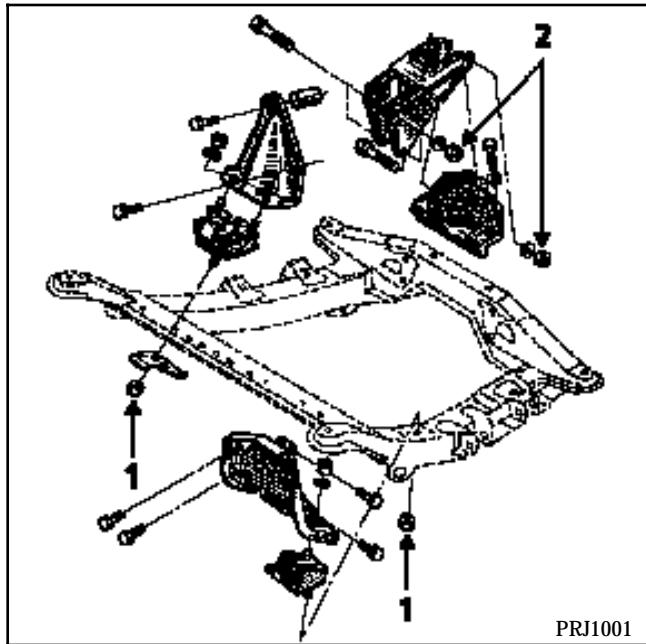
Remove:

- the track rod end using tool T.Av. 476,
- the upper shock absorber bolt and slacken the nut on the lower bolt without removing it.

Remove the driveshaft from the gearbox.

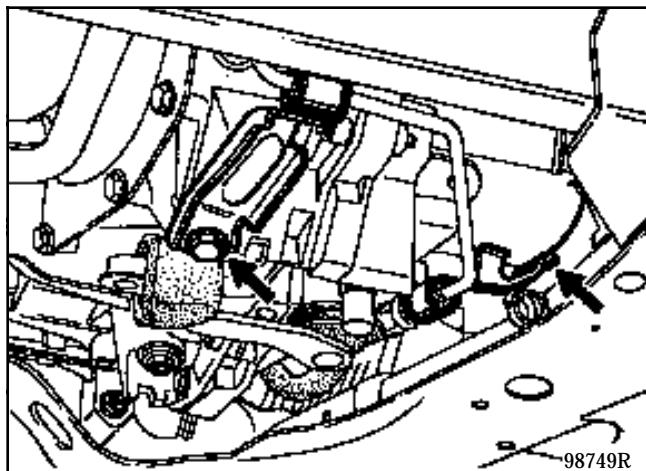
Remove:

- the catalytic converter,
- the gearbox selector rod,
- the nuts (1) from the engine and gearbox mountings,
- the nuts (2) engine tie-bar mounting,



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- the power assisted steering pipe mountings from the gearbox,



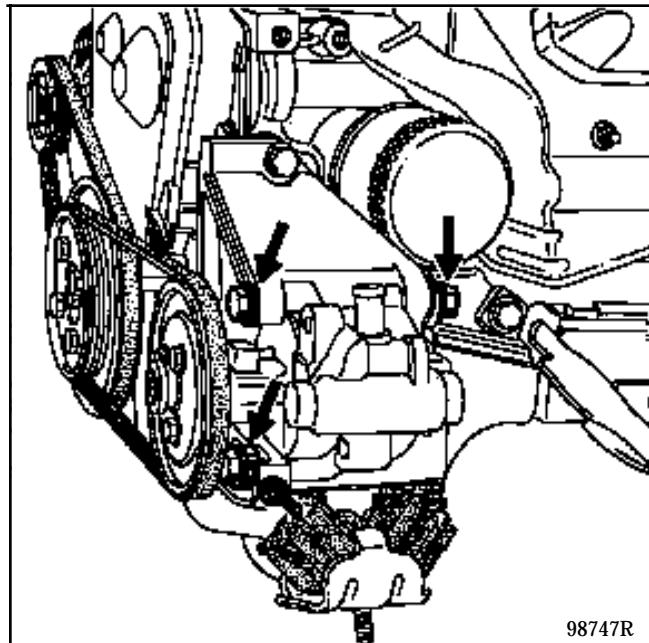
98749R

- the speedometer.

Disconnect the reversing light.

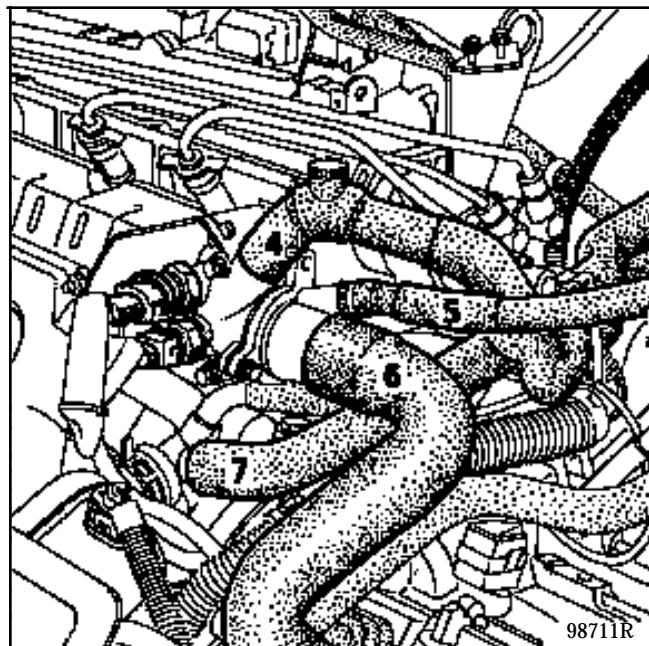
Remove:

- the power assisted steering pump,



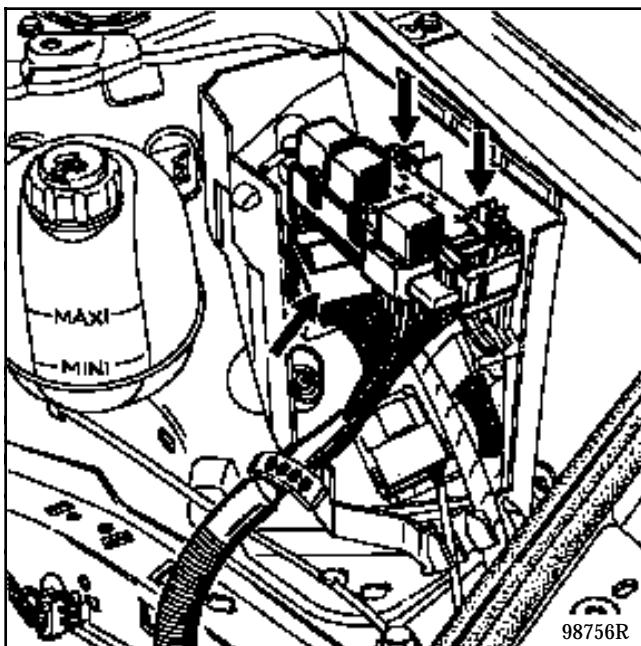
98747R

- the power assisted steering reservoir,
- the air filter,
- the accelerator cable from the throttle body,
- the clutch cable from the gearbox,
- hoses (4), (5), (6) and (7),



98711R

- the relay plate and the engine connection unit connector.

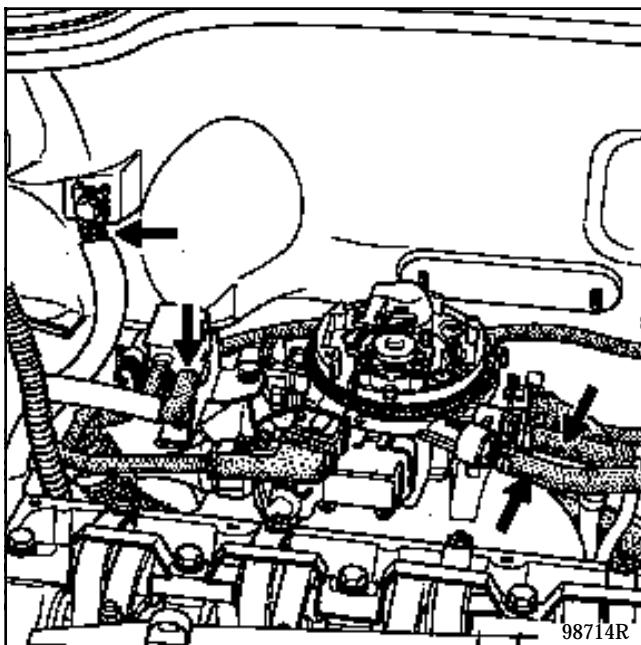


Remove the pipe from the brake servo.

Disconnect the thermistor and the fan unit feed.

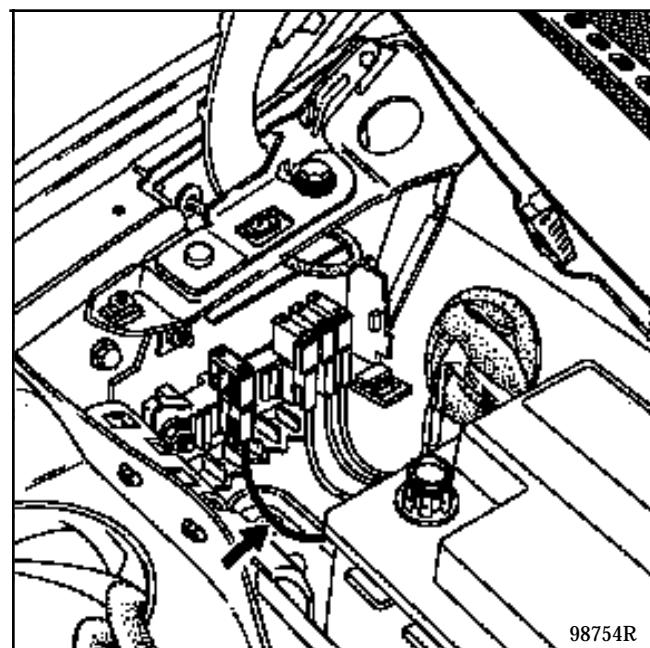
Remove:

- the absolute pressure sensor,
- the ignition module,
- the fuel pipes,



- the earth strap,
- the pipe from the canister solenoid valve,
- the injection computer and secure it to the engine,
- the starter feed wire from the battery.

Disconnect the injection feed wire located in the scuttle panel.



Position the load positioning tool.

Lift the engine to remove the three bolts and the engine tie-bar mounting.

Remove the engine.

### REFITTING

Refitting is the reverse of removal.

Fill the gearbox and the cooling circuit and bleed the circuit (see section 19).

**NOTE:** ensure the heat shields are correctly positioned.

SPECIAL TOOLING	
Mot. 1202	Hose clip pliers
T.Av. 476	Ball joint extractor
B.Vi. 31-01	Set of punches
SPECIAL EQUIPMENT	
Load positioning tool (example : NAUDER 1805)	

TIGHTENING TORQUES (in daN.m)		
Brake caliper mounting bolt	3.5	
Shock absorber base bolt	17	
Track rod end nut	3.5	
Driveshaft gaiter mounting bolt	2.5	
Wheel bolts	9	
Engine tie-bar bolt :		
- on the gearbox	6.5	
- on the sub-frame	7.5	
Right hand engine mounting nut	4.5	
Left hand gearbox mounting nut	4.5	

### REMOVAL

Put the vehicle on a 2 post lift.

Drain the gearbox.

Disconnect the battery.

Remove:

- the bonnet,
- the front wheels.

### ***Left hand side of the vehicle***

Remove:

- track rod end using tool T.Av. 476,
- the three bolts of the driveshaft gaiter,
- the two bolts from the shock absorber base,
- the two bolts from the brake caliper then secure it to the shock absorber spring,
- the bolt from the lower ball joint,
- the complete hub assembly and the driveshaft.

### ***Right hand side of the vehicle***

Remove the pins from the right hand driveshaft using tool B.Vi. 31-01.

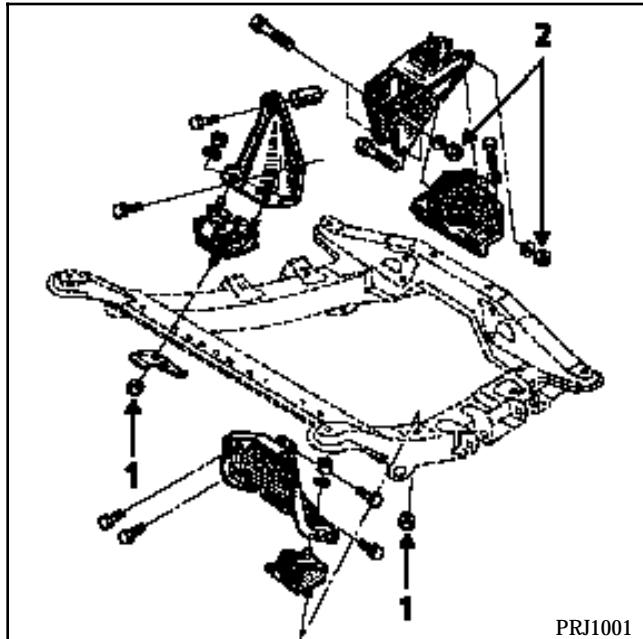
Remove:

- the track rod end using tool T.Av. 476,
- the upper shock absorber bolt and slacken the nut on the lower bolt without removing it.

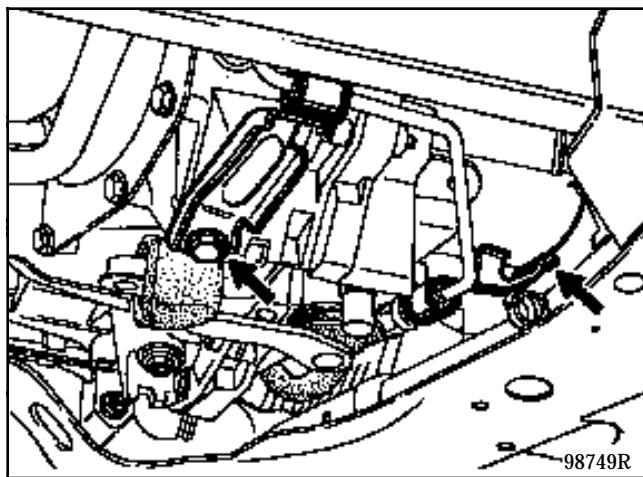
Remove the driveshaft from the gearbox.

**Remove:**

- the heat shield from the exhaust manifold
- the catalytic converter,
- the gearbox selector rod,
- the nuts (1) from the engine and gearbox mountings,
- the nuts (2) from the engine tie-bar mounting.



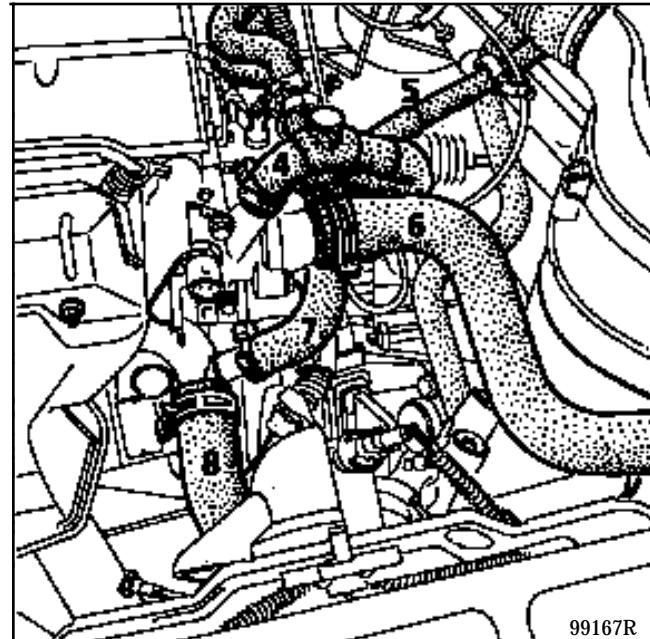
- the power assisted steering pipe mountings from the gearbox,



- the speedometer.

**Disconnect the reversing light.****Remove:**

- the acoustic tie-rod between the two shock absorber turrets,
- the air filter,
- the accelerator cable from the throttle body,
- the clutch cable from the gearbox,
- the hoses (4), (5), (6), (7) and (8),



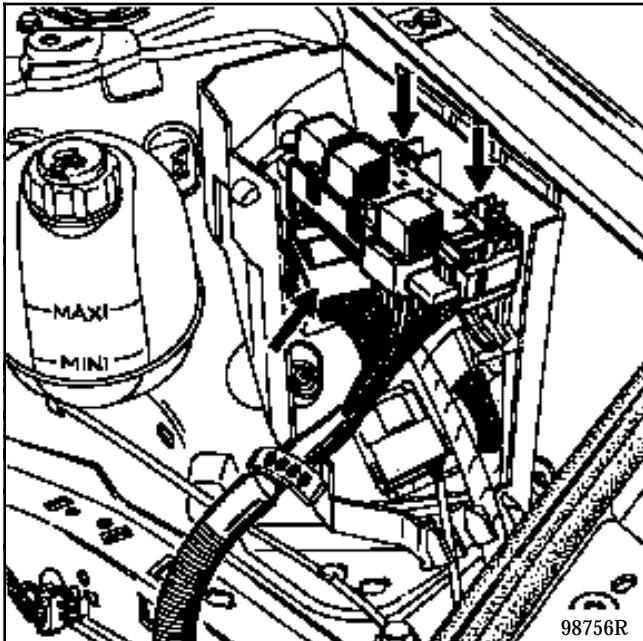
- the expansion bottle and secure it to the wheelarch,
- the fuel supply and return pipes,
- the brake servo pipe,
- the absolute pressure sensor,
- the earth strap.

**Disconnect:**

- the power assisted steering and air conditioning pressostats,
- the compressor supply and the fan unit supply,
- the temperature switch sensor.

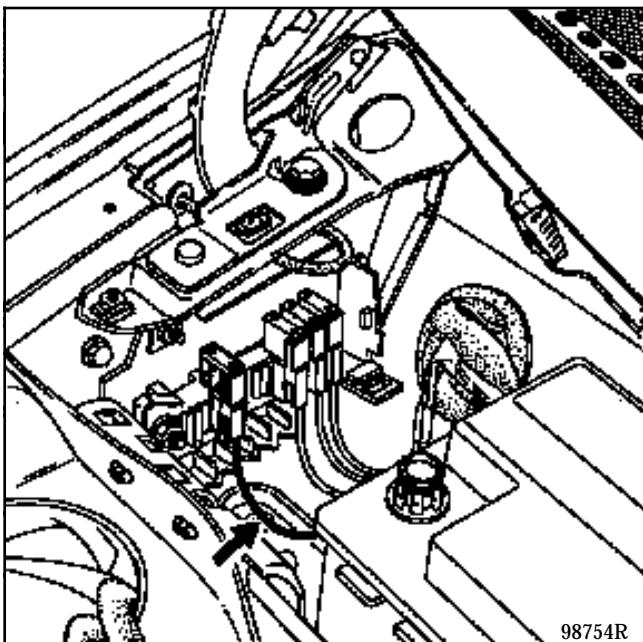
Remove:

- the relay plate and the engine connection unit connector,



- the pipe from the canister solenoid valve,
- the injection computer and secure it to the engine,
- the starter motor feed wire from the battery.

Disconnect the injection feed wire located in the scuttle panel.



Remove:

- the accessories belt,
- the power assisted steering pump pulley.

Move the power assisted steering pump and the air conditioning compressor away (without opening the circuits).

Secure the low pressure pipe for the compressor to the air filter mounting.

Position the load positioning tool.

Lift the engine to remove the three bolts, the engine tie-bar mounting and the gearbox mounting.

Remove the engine.

### REFITTING

Refitting is the reverse of removal.

Fill the gearbox and the cooling circuit and bleed the circuit (see section 19).



Fit the brake caliper bolts with **Loctite FRENBLOC** and tighten to the correct torque.

Press the brake pedal several times to bring the pistons back into contact with the pads.

**NOTE:** ensure the heat shields are correctly positioned.

SPECIAL TOOLING	
B. Vi. 31 -01	Roll pin punches
Mot. 1202	Hose clip pliers
Mot. 1273	Tool for checking belt tension
Mot. 1289 -03	Fork for centring suspended engine mounting limiter
T.Av. 476	Ball joint extractor

SPECIAL EQUIPMENT	
Load positioning tool (example: NAUDER 1805)	

TIGHTENING TORQUES (in daN.m)	
Brake caliper mounting bolts	3.5
Shock absorber base bolts	17
Driveshaft gaiter mounting bolts	2.5
Wheel bolts	9
Engine tie-bar bolt	4.5 to 6.5
Suspended engine mounting bolt on gearbox	4
Nut for suspended engine mounting pad on front left hand side member	7.5
Front right hand suspended engine mounting cover bolt on engine	4
Front right hand suspended engine mounting movement limiter bolt	6
Nut for engine mounting pad on front right hand suspended engine mounting cover	4.5

### REMOVAL

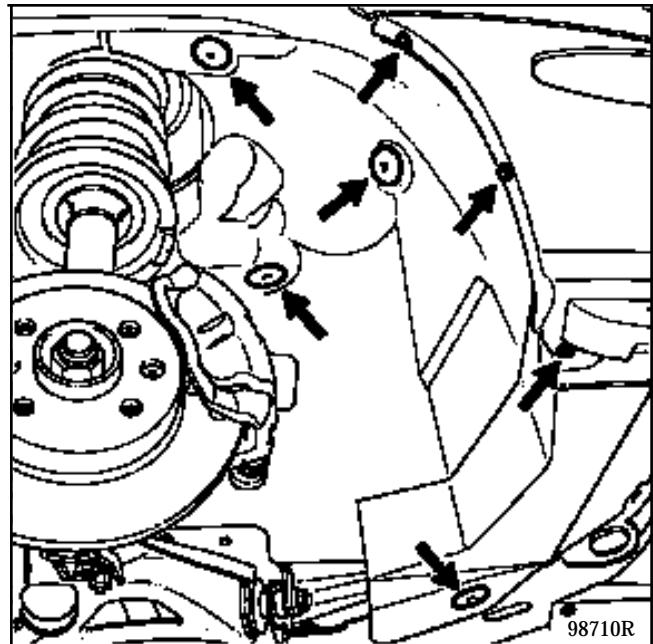
Put the vehicle on a two post lift.

Disconnect the battery.

Drain the gearbox.

Remove:

- the front wheels,
- the front right hand and left hand mudguards.



### **Left hand side of the vehicle**

Remove:

- track rod end using tool T.Av. 476,
- the three bolts for the driveshaft gaiter,
- the two bolts from the shock absorber base,
- the two bolts from the brake caliper then secure it to the shock absorber spring,
- the bolt from the lower ball joint,
- the complete hub assembly and the driveshaft.

### **Right hand side of the vehicle**

Remove the pins from the right hand driveshaft using tool B.Vi. 31-01.

Remove:

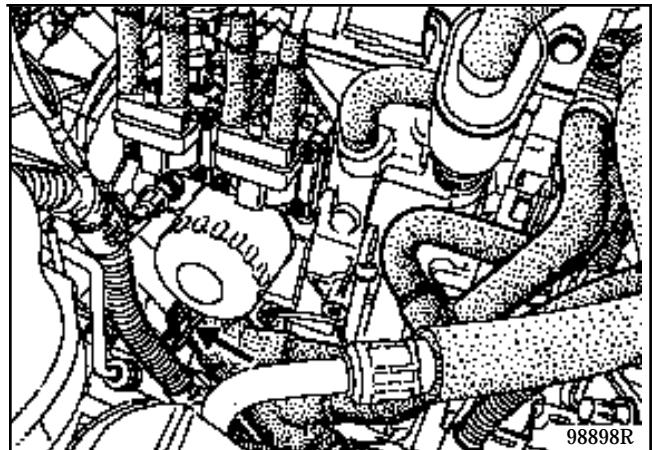
- the track rod end using tool T.Av. 476,
- the upper shock absorber bolt and slacken the nut on the lower bolt without removing it.

Remove the driveshaft from the gearbox.

Remove:

- the exhaust downpipe,
- the gearbox selector rod,
- the power assisted steering pipe mountings on the gearbox.

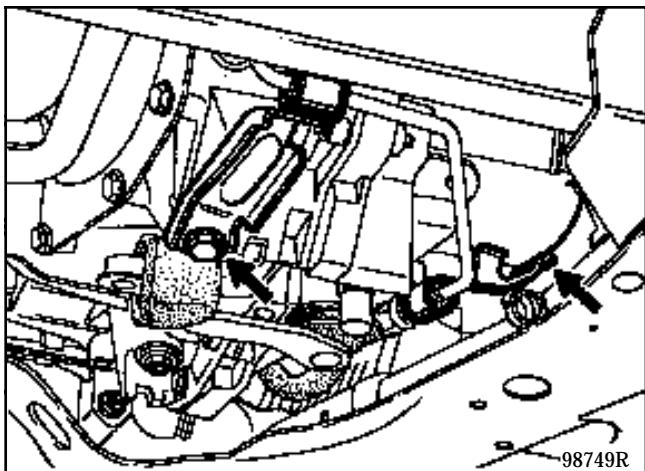
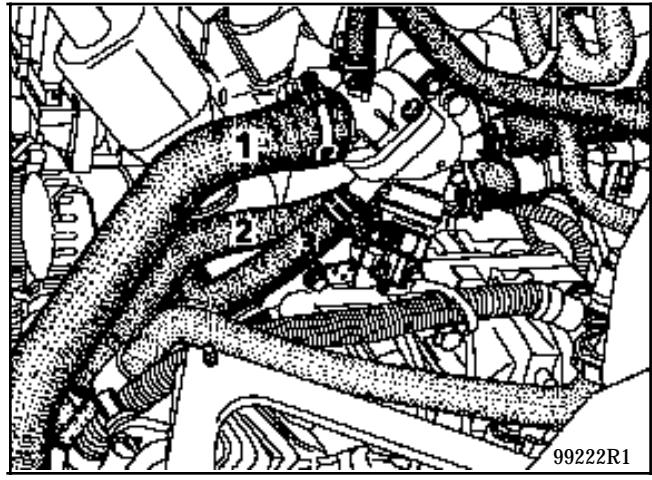
Unclip the reversing light wiring loom from the sub-frame.



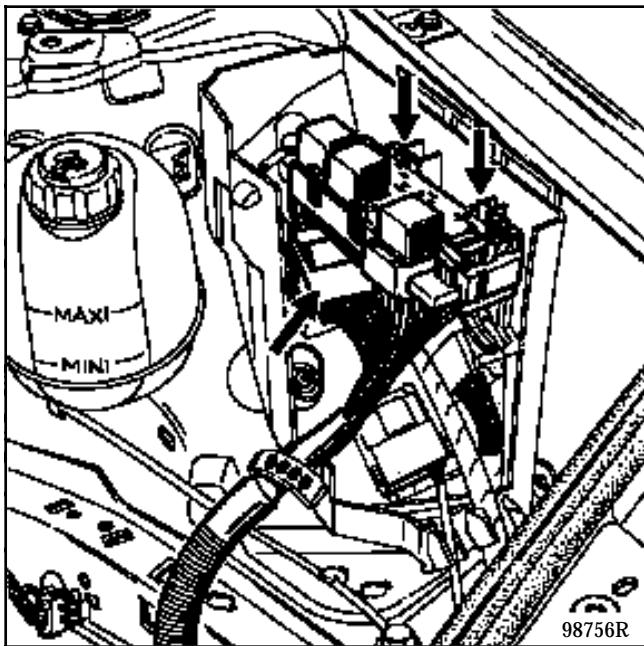
Drain the cooling circuit through the lower radiator hose at the water pump end.

Remove:

- the air filter as well as the sleeve and its mounting,
- the tie-bar between the shock absorber turrets,
- the accelerator and clutch cables,
- the brake servo pipe,
- the two heating hoses,
- the lower expansion bottle hose,
- hoses (1), (2) and (3),



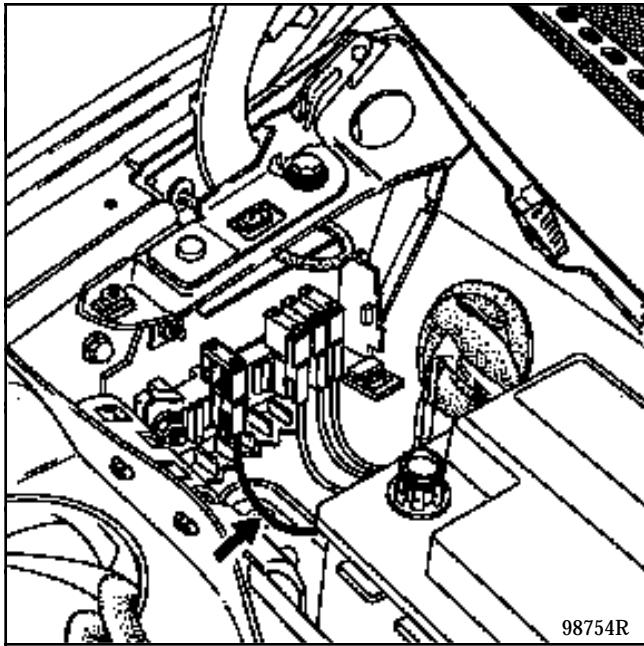
- the relay plate and the engine connection unit connector,



- the earth strap,
- the suspended engine mounting cover cap.

**Disconnect:**

- the injection computer and unclip it from the computer mounting,
- the injection feed wire located in the scuttle panel,
- the starter motor feed.



Remove the fuel supply and return pipes.

Remove the absolute pressure sensor.

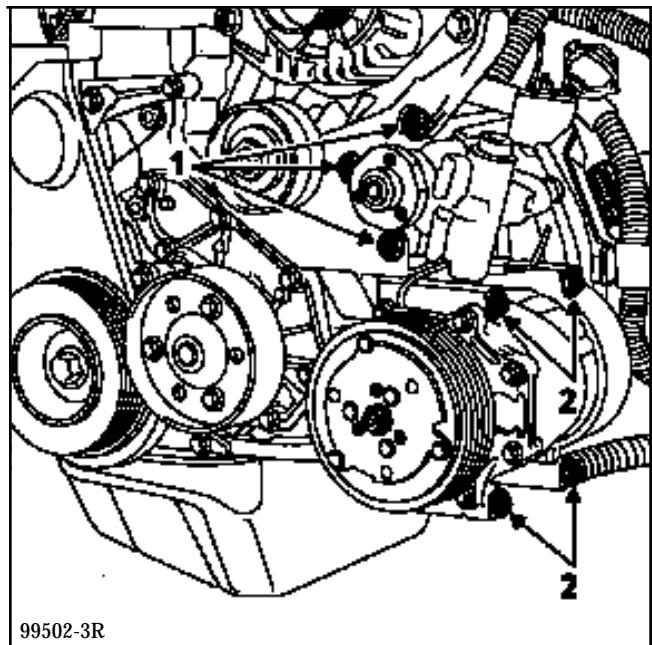
**Disconnect:**

- the air conditioning and power assisted steering pressostats,
- the compressor and fan unit supply,
- the temperature switch sensor and the oxygen sensor,
- the canister bleed pipe.

**Remove:**

- the expansion bottle,
- the injection computer mounting,
- the accessories belt (see section 11),
- the power assisted steering pulley.

Remove the three bolts (1) from the power assisted steering pump and the four bolts (2) from the air conditioning compressor.

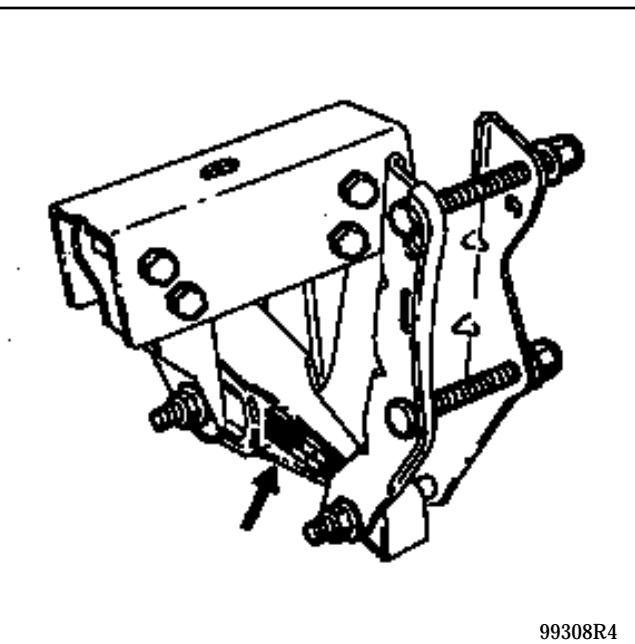


Move the power assisted steering pump and the air conditioning compressor away (without opening the circuits).

Remove the air conditioning low pressure pipe clip on the suspended gearbox mounting.

Remove the bonnet.

Remove the engine tie-bar.



Position the load positioning tool.

Lift the engine to remove the suspended engine mountings adn gearbox.

Remove the engine.

### REFITTING

Refitting is the reverse of removal.

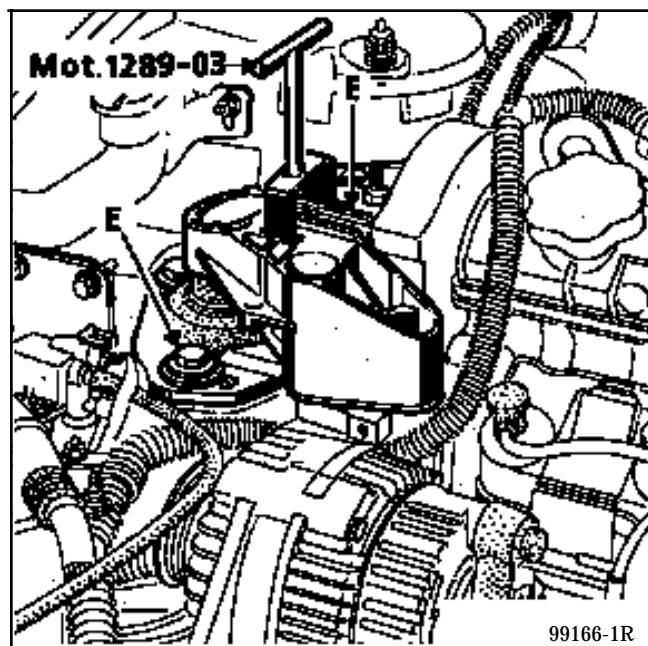
For the accessories belt tension (see section 07).

Fit the suspended engine mounting cover and the movement limiter assembly.

### ADJUSTING THE LONGITUDINAL MOVEMENT LIMITER

Slacken the two limiter bolts (E).

Insert the fork for centring the limiter Mot. 1289-03 into the openings in the suspended engine mounting cover.



Tighten the two limiter bolts (E) to a torque of **6 daN.m**.

Fill the gearbox and cooling circuit and bleed the circuit (see section 19).



Fit the brake caliper bolts with **Loctite FRENBLOC** and tighten to the correct torque.

Press the brake pedal several times to bring the pistons back into contact with the pads.

**NOTE:** ensure the heat shields are correctly positioned.

SPECIAL TOOLING	
B. Vi. 31 -01	Roll pin punches
Mot. 1202	Hose clip pliers
Mot. 1311-06	Tool for removing fuel pipes
T.Av. 476	Ball joint extractor
SPECIAL EQUIPMENT	
Load positioning tool (example : NAUDER 1805)	

TIGHTENING TORQUES (in daN.m)	
Brake caliper mounting bolt	3.5
Shock absorber base bolt	17
Track rod end	3.5
Lower ball joint nut	6.5
Driveshaft gaiter mounting bolt	2.5
Wheel bolts	9
Engine tie-bar bolt	6
Suspended engine mounting bolt on gearbox	5.5
Bolt for suspended engine mounting pad on front left hand side member	2.5
Front right hand suspended engine mounting cover bolt on engine	4
Front right hand suspended engine mounting movement limiter bolt	6

### REMOVAL

Put the vehicle on a two post lift.

Disconnect the battery.

Remove:

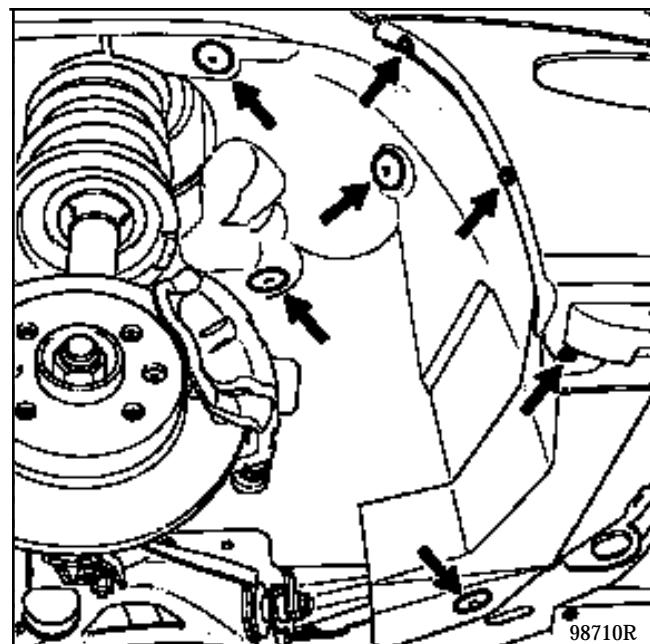
- the bonnet,
- the engine undertray.

Drain:

- the gearbox.
- the cooling circuit through the lower radiator hose (radiator end).

Remove:

- the front wheels,
- the front right hand and left hand mudguards.



- the air inlet sleeve, the air filter and its mounting,
- the cooling assembly (see section 19 "Radiator"),
- the alternator belt (see section 16 "Alternator").

Disconnect the compressor feed wire (if fitted).

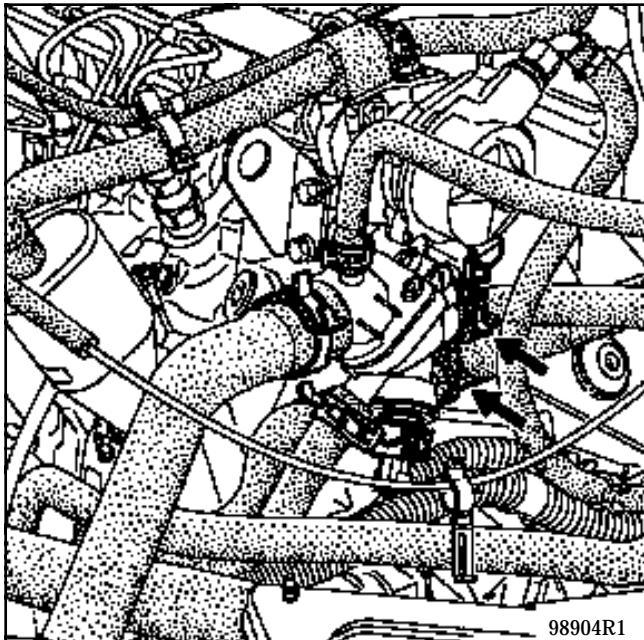
Remove:

- the compressor mounting bolts (if fitted) and secure it to the front cross member,
- the power assisted steering pump pulley,
- the oil filter,
- the power assisted steering pump mounting bolts as well as the power assisted steering pipe bracket bolt.

Move the pump away and secure it to the sub-frame.

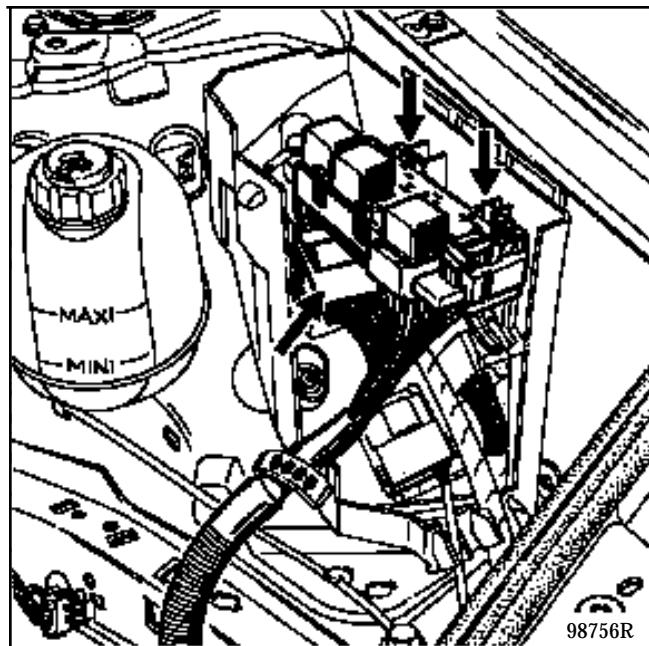
Disconnect:

- the heating hoses on the thermostat mounting,

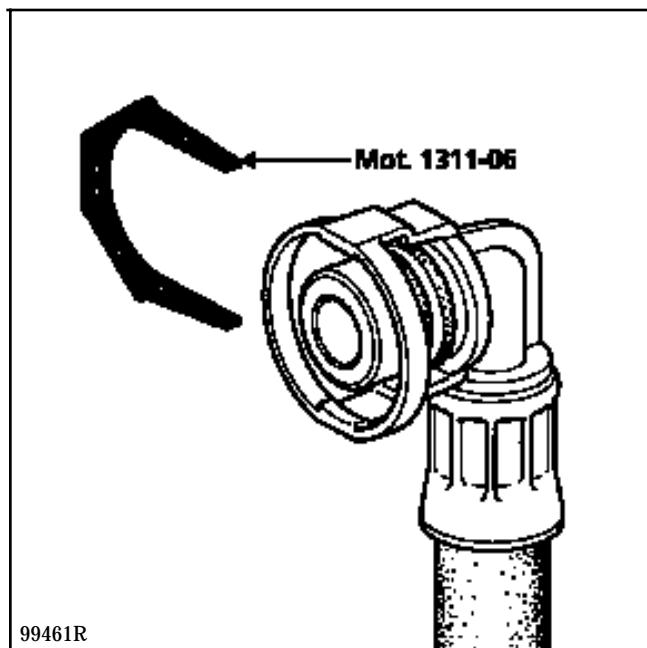


- the brake servo pipe,
- the pipes and connectors on the fast idle and EGR solenoid valves,

- the preheating unit (secure it to the engine),
- the accelerator and clutch cables,
- the altimetric sensor corrector,
- the relay plate and the engine connection unit electrical connector,



- the fuel supply pipe on the diesel filter using tool Mot. 1311-06,

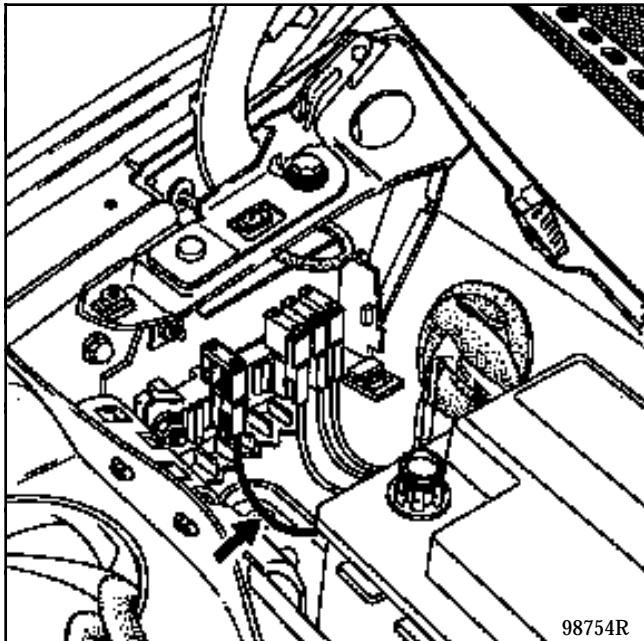


- the connector on the diesel filter.

**Remove:**

- the diesel return union on the injection pump,
- the earth strap,
- the tie-rod between the shock absorber turrets,
- the battery mounting bracket.

Disconnect the feed wire from the preheating unit in the scuttle panel as well as the starter motor feed.

**Left hand side of the vehicle****Remove:**

- track rod end using tool T.Av. 476,
- the three bolts for the driveshaft gaiter,
- the two bolts from the shock absorber base,
- the two bolts from the brake caliper then secure it to the shock absorber spring,
- the bolt from the lower ball joint,
- the complete hub assembly and the driveshaft.

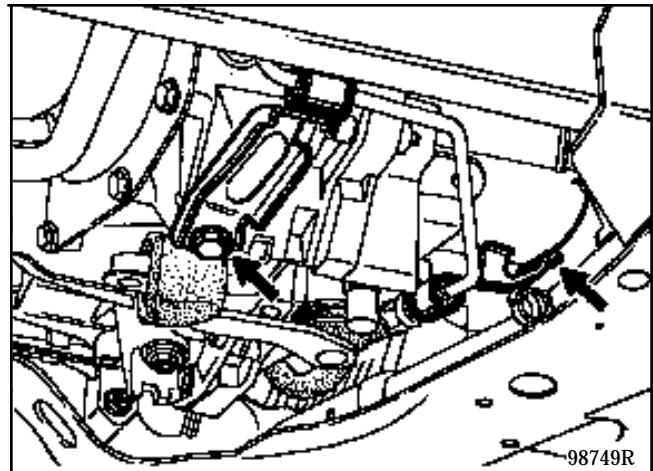
**Right hand side of the vehicle****Remove:**

- the pins from the driveshaft using tool **B.Vi. 31-01**,
- the upper bolt from the shock absorber base and slacken the lower bolt.

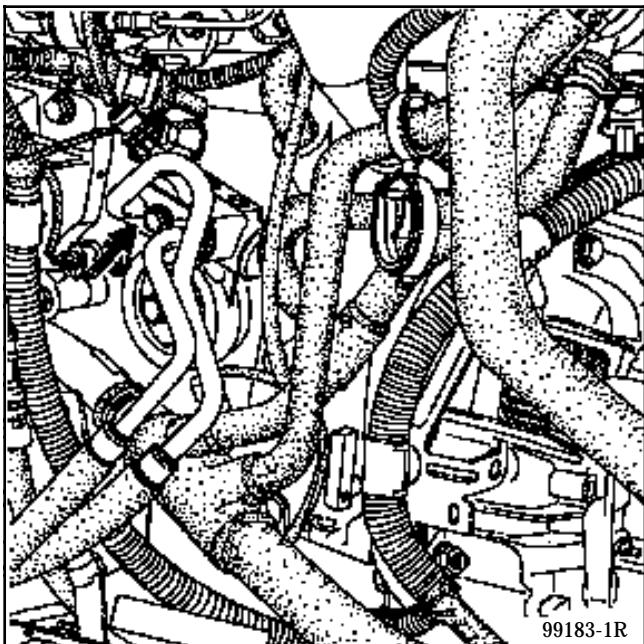
Tilt the stub axle carrier and release the driveshaft.

**Remove:**

- the exhaust pipe,
- the gear control on the gearbox side,
- the power assisted steering pipe mountings from the gearbox,

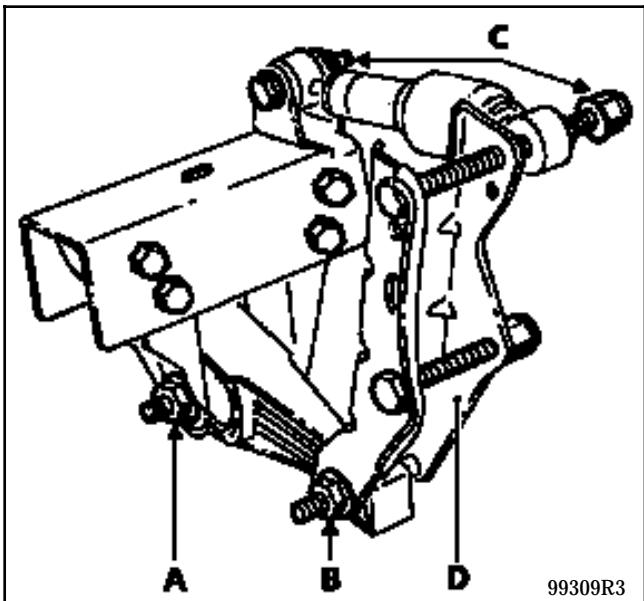


- the oil radiator pipes on the heat exchanger.



Slacken, without removing, bolt (A) and remove bolt (B) from the engine tie-bar.

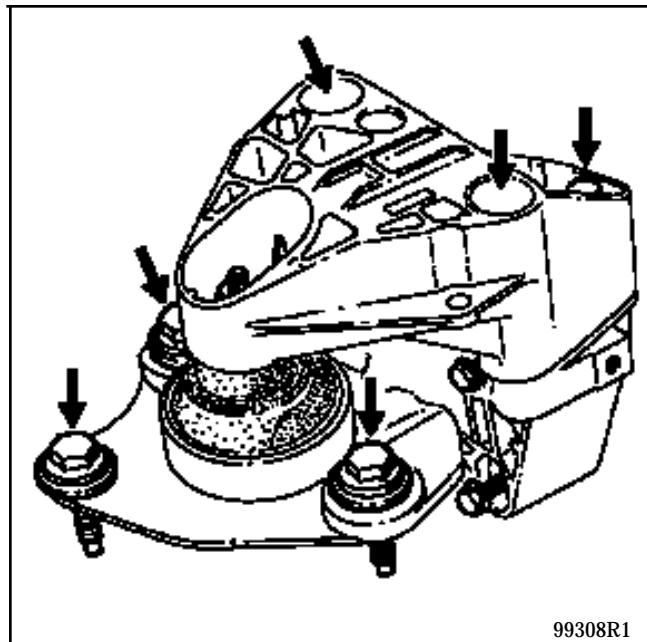
Remove the shock absorber (two bolts C) as well as the rear mounting (D) on the gearbox.



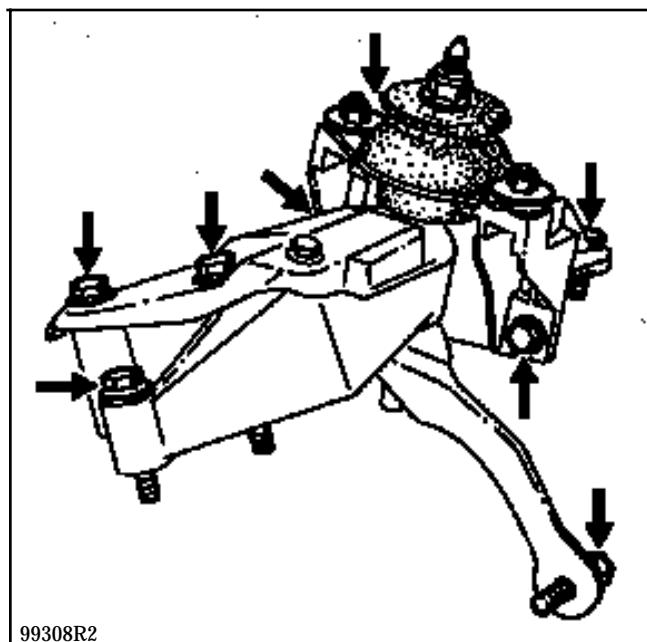
Position the load positioning tool on the engine lifting rings.

Remove:

- the cover cap as well as the front right hand suspended engine mounting cover and the movement limiter,



the gearbox mounting.



Remove the engine - gearbox assembly by tilting it slightly on the gearbox side using the load positioning tool.

**REFITTING**

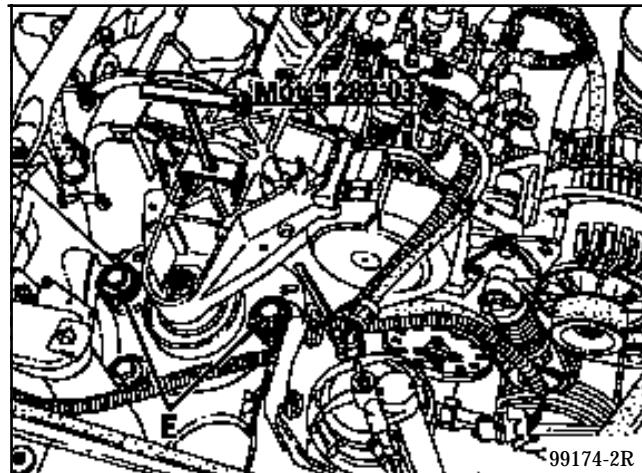
Refitting is the reverse of removal.

Fit the suspended engine mounting cover and movement limiter assembly.

**ADJUSTING THE LONGITUDINAL MOVEMENT LIMITER**

Slacken the two limiter bolts (E).

Insert the fork for centring the limiter **Mot. 1289-03** into the openings in the suspended engine mounting cover.



Tighten the two limiter bolts (E) to a torque of **6 daN.m.**

Fill the gearbox and cooling circuit and bleed the circuit (see section 19).

Apply RHODORSEAL 5661 (e.g.- **CAF 4/60 THIXO**) to the holes for the driveshaft roll pins.



Fit the brake caliper bolts with **Loctite FRENBLOC** and tighten to the correct torque.

Press the brake pedal several times to bring the pistons back into contact with the pads.

**NOTE:** ensure the heat shields are correctly positioned.

SPECIAL TOOLING	
<b>Mot. 1040-01</b>	Dummy cradle for removing and refitting the engine and transmission assembly
<b>Mot. 1202</b>	Hose clip pliers

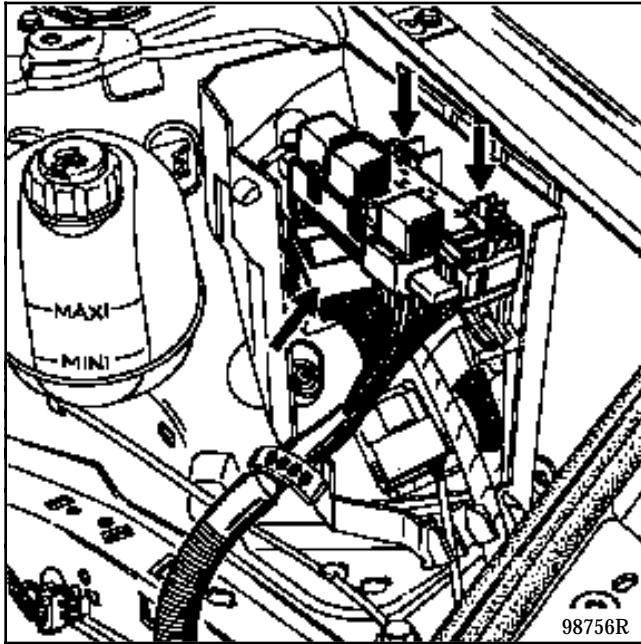
TIGHTENING TORQUES (in daN.m)	
<b>Front sub-frame mounting bolt</b>	6
<b>Rear sub-frame mounting bolt</b>	11
<b>Upper shock absorber cup mounting bolt</b>	3
<b>Wheel bolts</b>	9
<b>Brake caliper mounting bolt</b>	3.5
<b>Universal steering joint mounting bolt</b>	3.5

### REMOVAL

Put the vehicle on a 2 post lift.

Disconnect:

- the battery,
- the relay plate and the engine connection unit electrical connector,



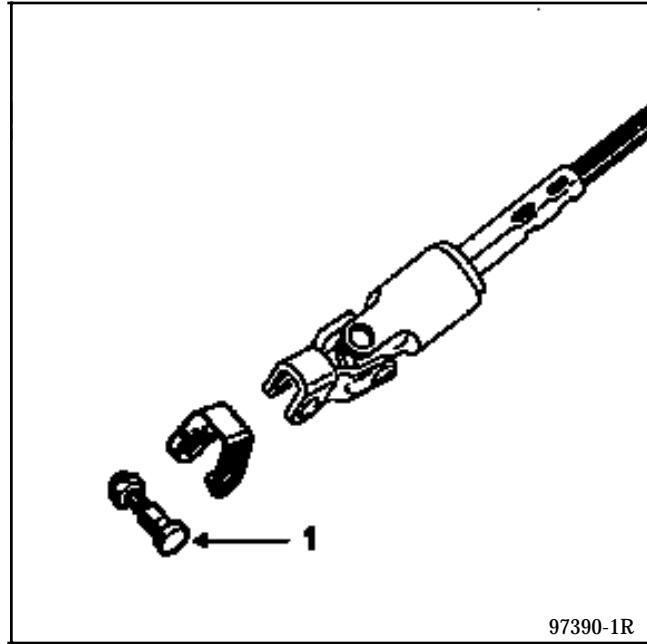
- the connectors of the ignition module and the HT coil wire,
- the oxygen sensor connector,
- the accelerator and clutch cables.

Drain:

- the cooling circuit,
- the engine if necessary,
- the gearbox (by removing the cover) if necessary.

Remove:

- the earth strap,
- the air filter,
- the nut and the eccentric bolt (1) (remove using a roll pin punch) from the steering shaft yoke after having pushed the protector back.



**SPECIAL NOTES FOR VEHICLES FITTED WITH A  
DRIVER'S AIRBAG**

**IMPORTANT**

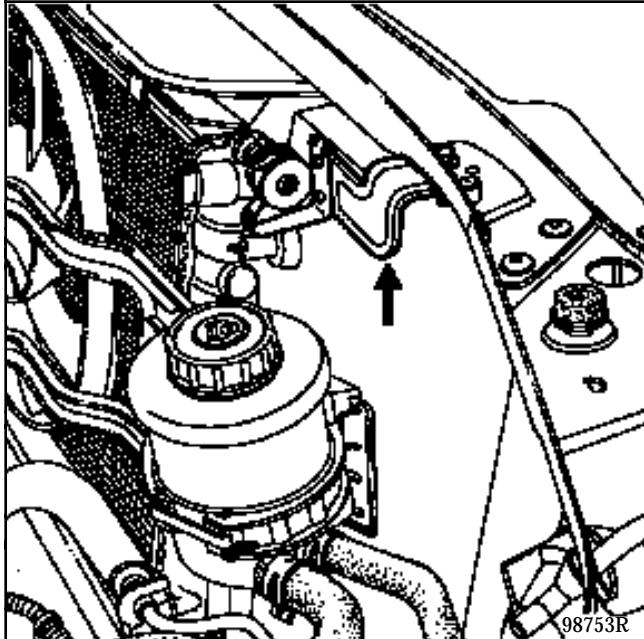
To avoid any risks of destroying the rotary switch under the steering wheel, comply with the following instructions:

- Before removing the steering column and the rack, the steering wheel MUST be immobilised with the wheels straight using a "steering wheel locking" tool, throughout the whole operation.
- Any doubts about whether the steering wheel is centred means that the steering wheel will have to be removed so that the centring method described in section 88 "Airbag" can be applied.

**REMINDER:** in this case, only qualified, trained staff can carry out this operation.

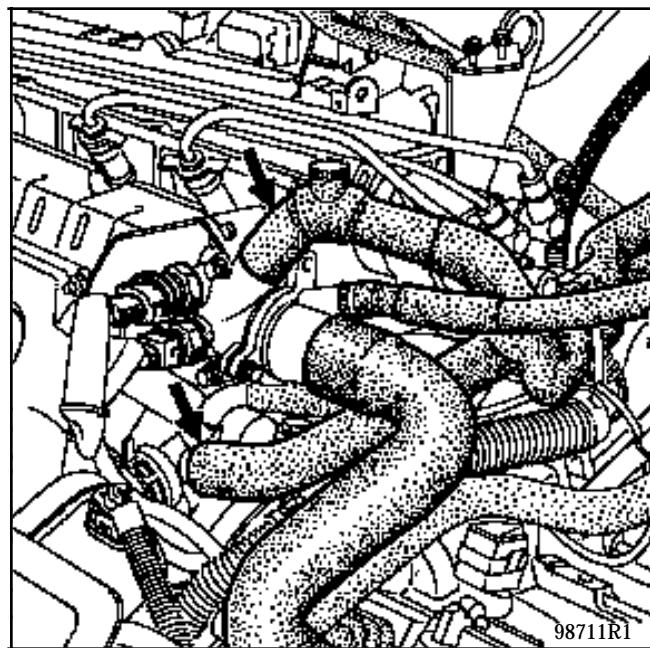
Remove:

- the expansion bottle (secure it to the engine),
- the upper right hand mounting bracket of the radiator and unclip it (left hand side), then keep it to one side by securing it to the engine.

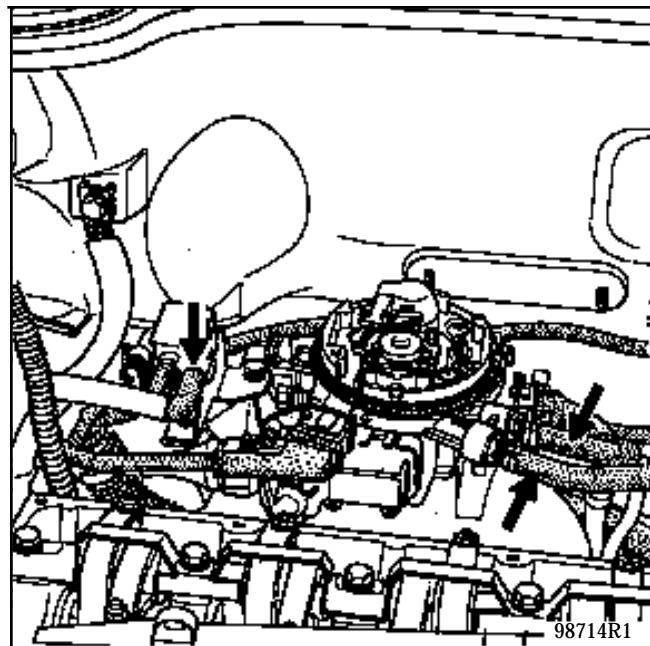


Disconnect:

- the heating hoses on the engine,



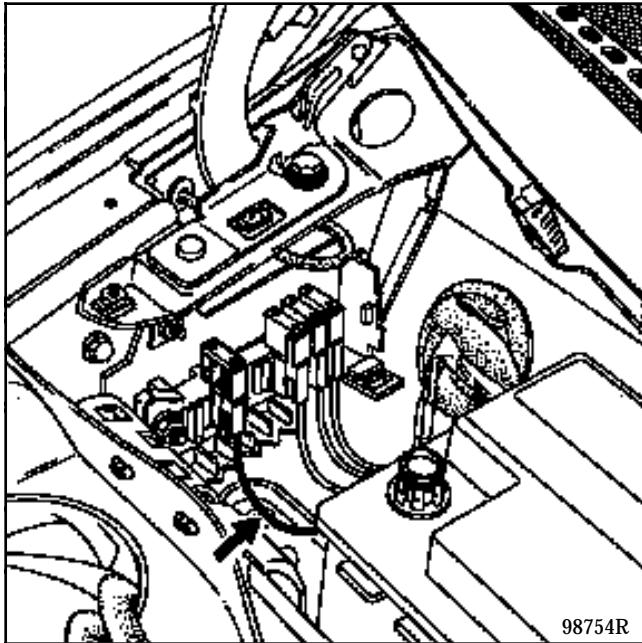
- the fuel, absolute pressure and canister pipes,



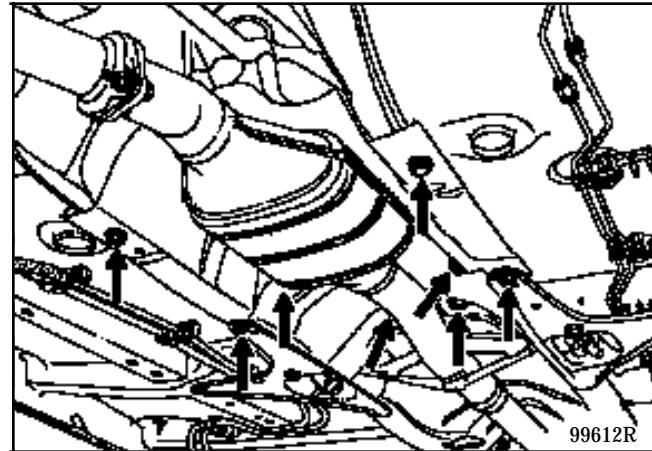
- the brake servo pipe.

Remove the battery mounting bracket.

Disconnect the injection feed wire in the scuttle panel as well as the starter motor feed.

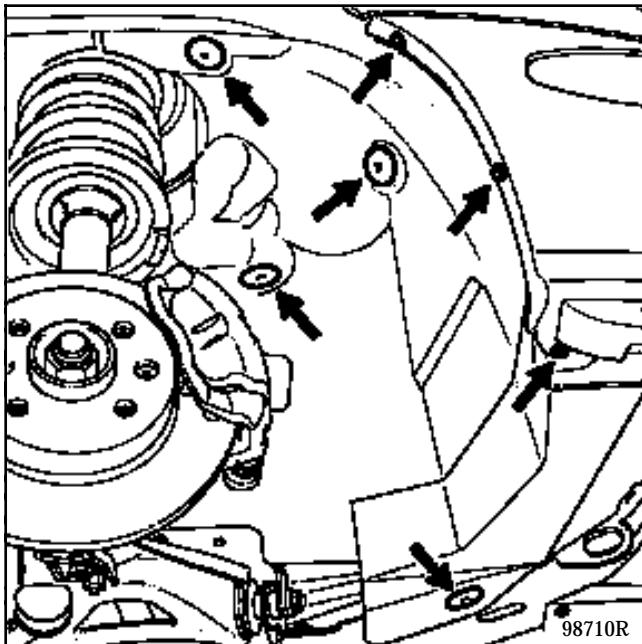


- the brake calipers and secure them to the body,
- catalytic converter,
- the two exhaust heat shields,

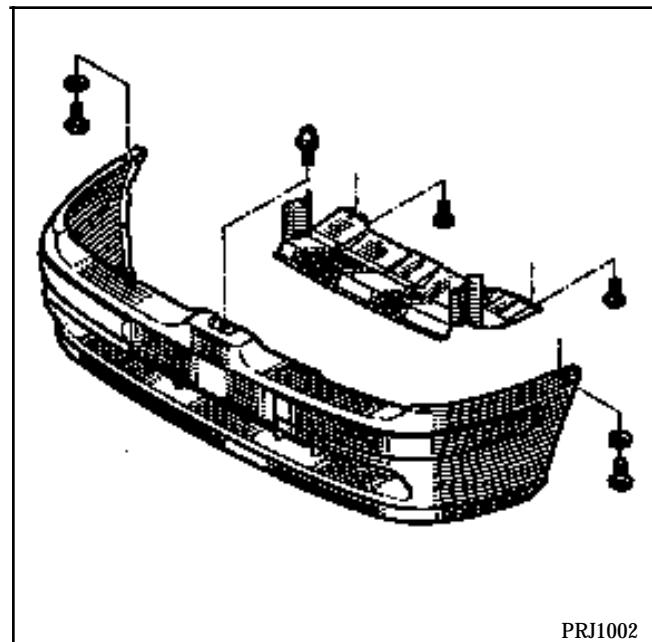


Remove:

- the computer strap and secure it to the engine,
- the wheels,
- the right hand and left hand mudguards,



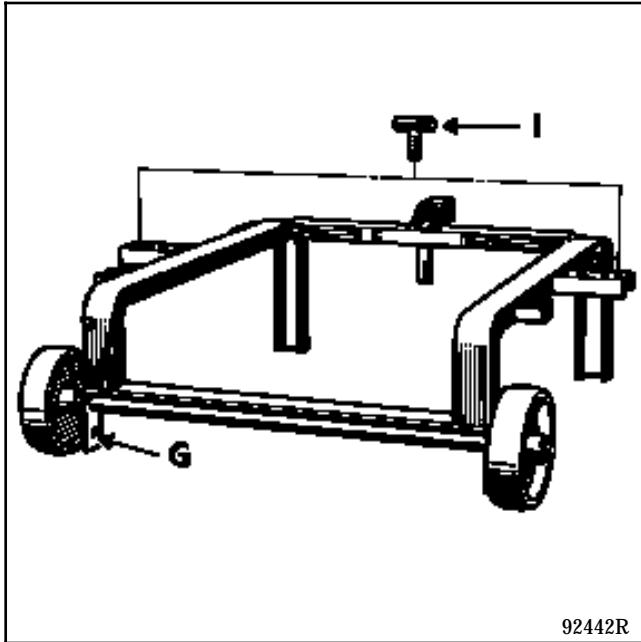
- the gear control on the gearbox side, turn it over and secure to the exhaust pipe,
- the horn,
- the sub-frame-body tie rods,
- the front bumper.



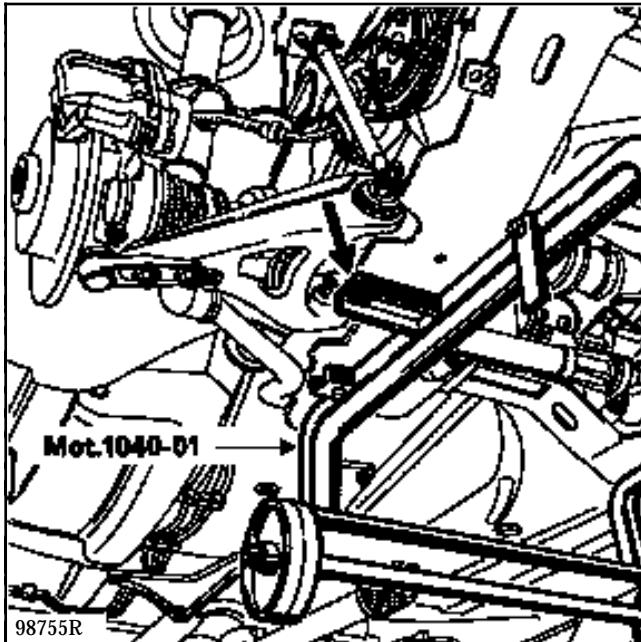
**PREPARATION OF TOOL MOT. 1040-01**

Fit the wheel pins into the lower holes (G).

This is secured to the sub-frame by hooks (I).



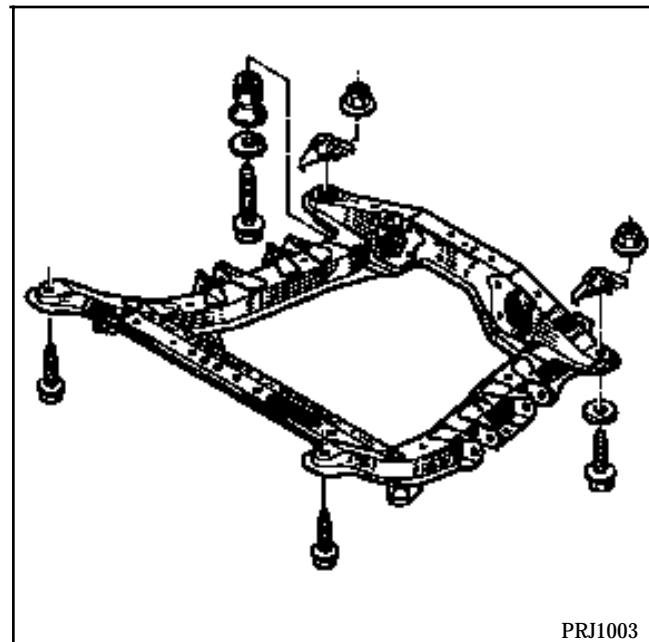
Secure tool Mot. 1040-01 underneath the sub-frame.



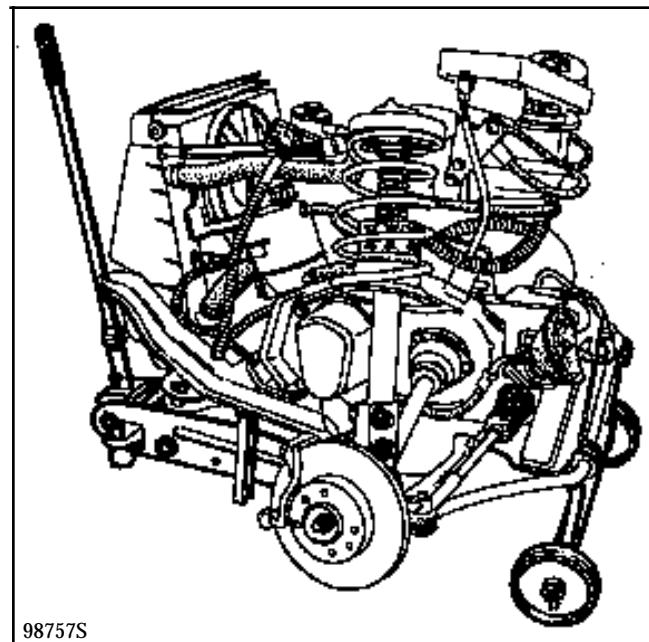
Lower the 2 post lift until the tool comes into contact with the floor.

Remove:

- the upper shock absorber bolts,
- the four sub-frame mounting bolts.



Remove the engine and transmission assembly by lifting the body.



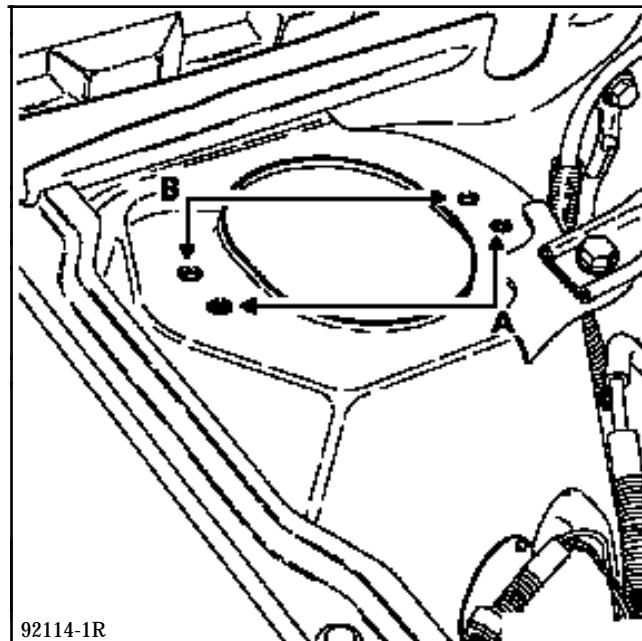
Tie the spring - shock absorber units together using rope.

**REFITTING**

The engine sub-frame can be easily aligned with the bodywork by positioning the two approximately **100 mm** long threaded rods into the two front mountings of the body sub-frame .

Refitting is the reverse of removal.

If the vehicle has manual steering, position the shock absorber mountings into the holes (A), and into holes (B) for power assisted steering.



Tighten all bolt, nuts and screws to the recommended torques.

Fit the caliper mounting bolts using **Loctite FRENBLOC** and tighten them to the correct torque.

Press the brake pedal several times to bring the pistons back into contact with the pads.

Fill:

- the cooling circuit and bleed it (see section 19),
- the engine and gearbox if required.

**NOTE:**

- check the steering shaft yoke spacer is in place when refitting,
- ensure the heat shields are correctly positioned.

SPECIAL TOOLING	
Mot. 1040-01	Dummy cradle for removing and refitting the engine and transmission assembly
Mot. 1202	Hose clip pliers
Mot. 1311-06	Tool for removing fuel pipes

TIGHTENING TORQUES (in daN.m)	
Front sub-frame mounting bolt	6
Rear sub-frame mounting bolt	11
Upper shock absorber cup mounting bolt	3
Wheel bolts	9
Brake caliper mounting bolt	3.5
Universal steering joint mounting bolt	3.5
Engine mounting pad nut on front left hand side member mounting	7.5

**REMOVAL**

Put the vehicle on a 2 post lift.

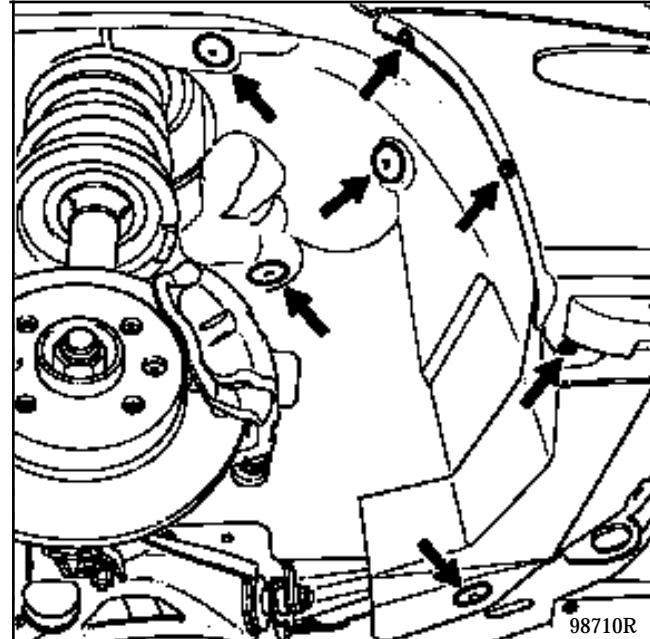
Disconnect the battery.

Drain:

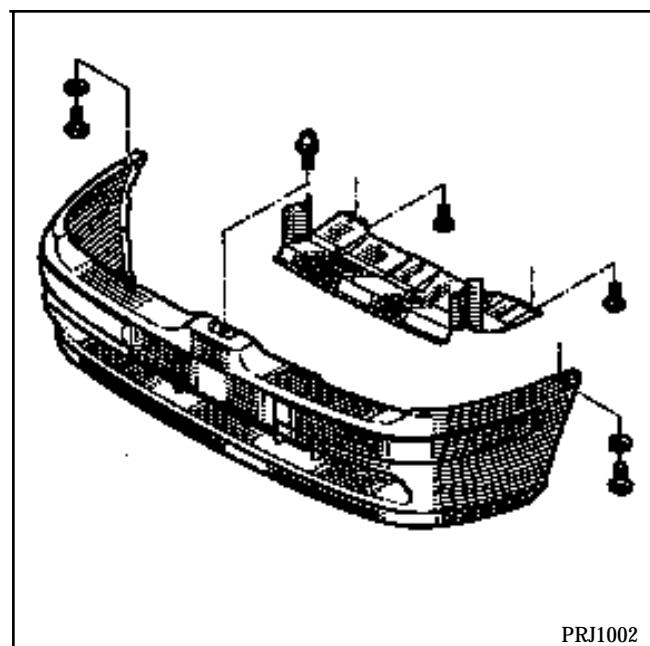
- the cooling circuit from the lower radiator hose,
- the engine if necessary.

Remove:

- the front wheels,
- the left and right hand mudguards,
- the sub-frame-body tie rods,
- the brake calipers and attach them to the body,



- the front bumper,

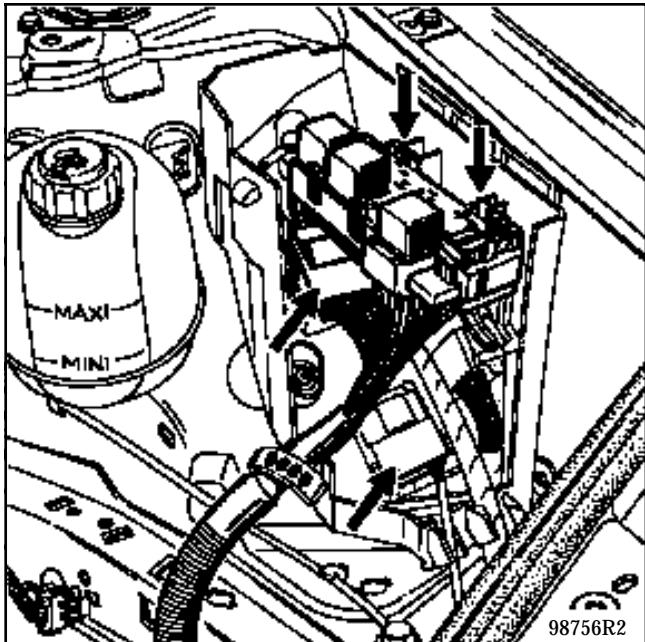


PRJ1002

- the heat shield from the exhaust manifold,
- the catalytic converter (disconnect the oxygen sensor) and attach the exhaust pipe to the body,
- the horn,
- the tie rod between the shock absorber turrets,
- the air filter,
- the earth strap,
- the absolute pressure sensor,
- the expansion bottle and attach it to the engine.

Disconnect:

- the accelerator cable and the kickdown switch connector,
- the brake servo pipe,
- the relay plate and the engine connection unit connectors,

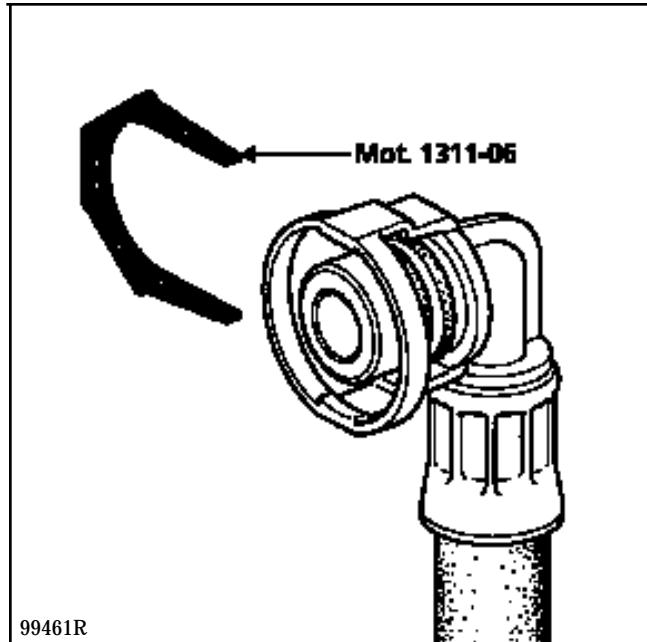


- the automatic transmission computer connector,
- the canister pipe.

Remove the battery mounting bracket.

Disconnect:

- the injection feed wire in the scuttle panel and the starter feed wire,
- the fuel supply and return pipes using tool **Mot. 1311-06**, unclipping them from their mounting.

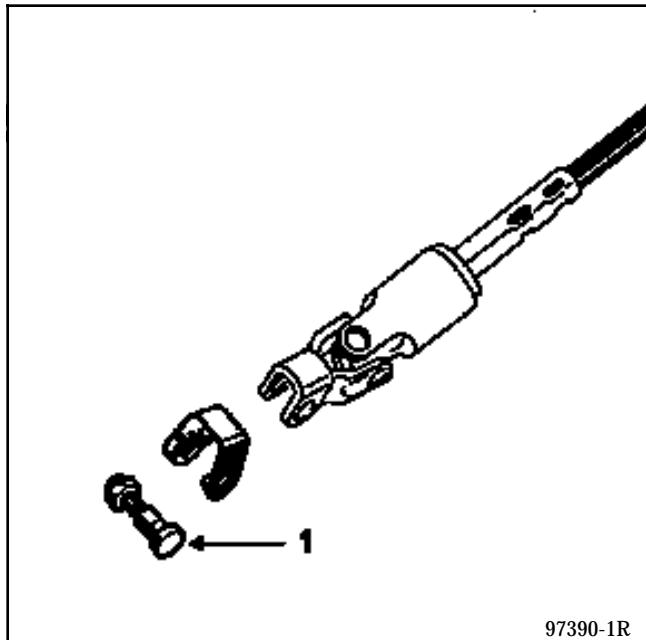


- the heater hoses on the thermostat.

Unclip the radiator and hold it to one side by attaching it to the engine.

Remove:

- the automatic transmission gear selector control,
- the nut and eccentric bolt (1) (use a roll pin punch) from the steering yoke after pushing the protector back.



#### SPECIAL NOTES FOR VEHICLES FITTED WITH A DRIVER'S AIRBAG

##### IMPORTANT

To avoid any risks of destroying the rotary switch under the steering wheel, comply with the following instructions:

- Before removing the steering column and the rack, the steering wheel MUST be immobilised with the wheels straight using a "steering wheel locking" tool, throughout the whole operation.
- Any doubts about whether the steering wheel is centred means that the steering wheel will have to be removed so that the centring method described in section 88 "Airbag" can be applied.

**REMINDER:** in this case, only qualified, trained staff can carry out this operation.

Fit a block between the automatic transmission and the left hand sub-frame.

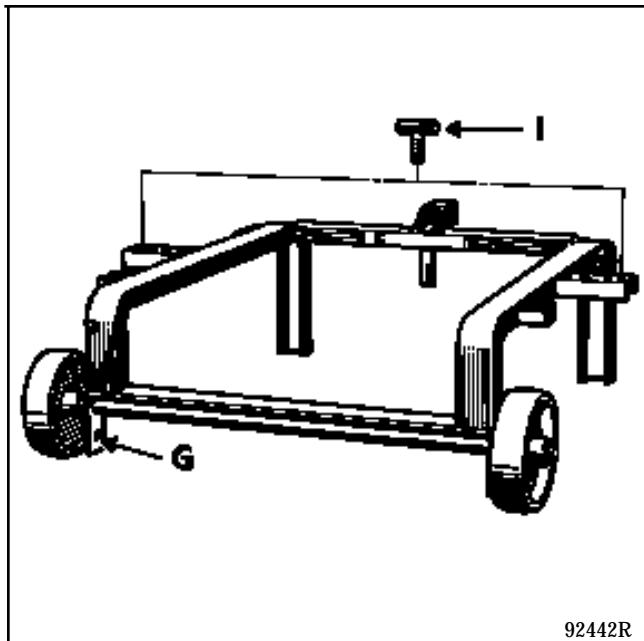
Remove the mounting nut for the rubber mounting pad on the front left hand side member mounting.

Using a copper hammer, tap the stud to release it from the suspended mounting on the left hand side.

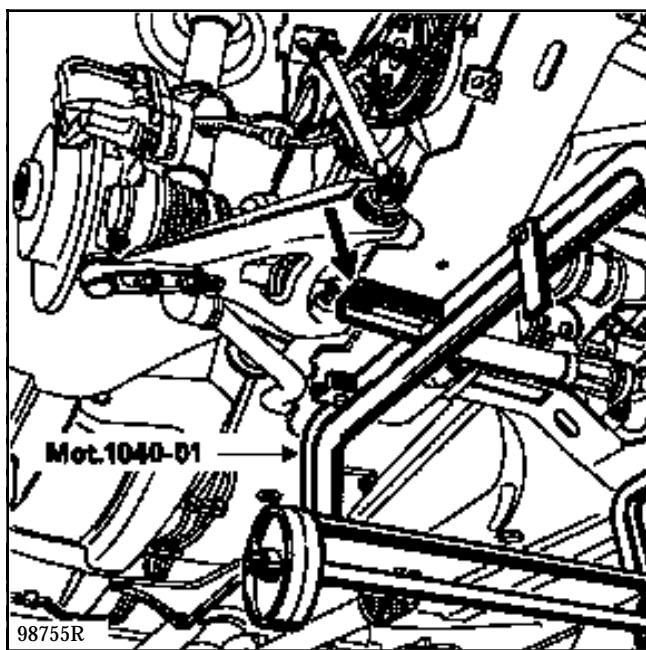
#### PREPARATION OF TOOL MOT. 1040-01

Fit the wheel pins into the lower holes (G).

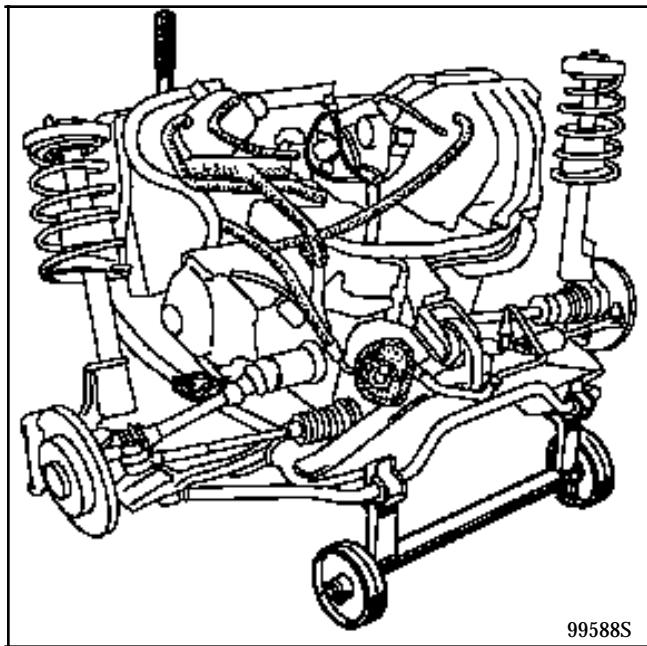
This is secured to the sub-frame by hooks (I).



Secure tool Mot. 1040-01 under the sub-frame.



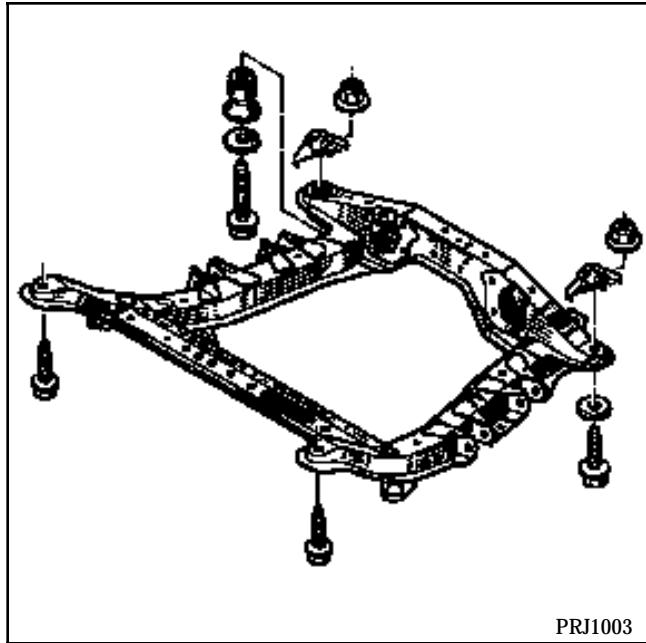
Remove the engine and transmission assembly by lifting the body.



Lower the 2 post lift until the tool comes into contact with the floor.

Remove:

- the upper shock absorber bolts,
- the four sub-frame mounting bolts.



Tie the spring - shock absorber units together using rope.

**REFITTING**

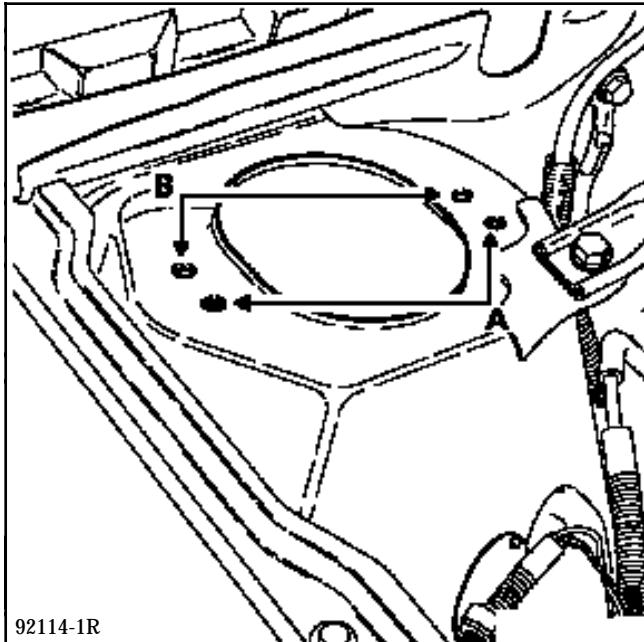
The engine sub-frame can be easily aligned with the bodywork by positioning the two approximately **100 mm** long threaded rods into the two front mountings of the body sub-frame .

Tighten the sub-frame mounting bolts to a torque of :

- **6 daN.m** at the front,
- **11 daN.m** at the rear.

Refitting is the reverse of removal.

If the vehicle has manual steering, position the shock absorber mountings into the holes (A), and into holes (B) for power assisted steering.



Tighten all bolt, nuts and screws to the recommended torques.

Fit the caliper mounting bolts using **Loctite FRENBLOC** and tighten them to the correct torque.

Press the brake pedal several times to bring the pistons back into contact with the pads.

Fill:

- the cooling circuit and bleed it (see section 19),
- the engine and gearbox if required.

**NOTE:**

- check the steering shaft yoke spacer is in place when refitting,
- ensure the heat shields are correctly positioned.

SPECIAL TOOLING	
<b>Mot. 1040-01</b>	<b>Dummy cradle for removing and refitting the engine and transmission assembly</b>
<b>Mot. 1159</b>	<b>Tool for securing the engine on the sub-frame</b>
<b>Mot. 1289-03</b>	<b>Fork for centring suspended engine mounting limiter</b>
<b>Mot. 1273</b>	<b>Tool for checking belt tension</b>

TIGHTENING TORQUES (in daN.m)	
<b>Front sub-frame mounting bolt</b>	6
<b>Rear sub-frame mounting bolt</b>	11
<b>Upper shock absorber cup mounting bolt</b>	3
<b>Wheel bolts</b>	9
<b>Brake caliper bolt</b>	3.5
<b>Universal steering joint mounting bolt</b>	3
<b>Nut for mounting rubber mounting pad on front left hand side member mounting</b>	7.5
<b>Bolt mounting front right hand suspended engine mounting cover on engine</b>	4
<b>Mounting bolt for front right hand suspended engine mounting movement limiter</b>	6

### REMOVAL

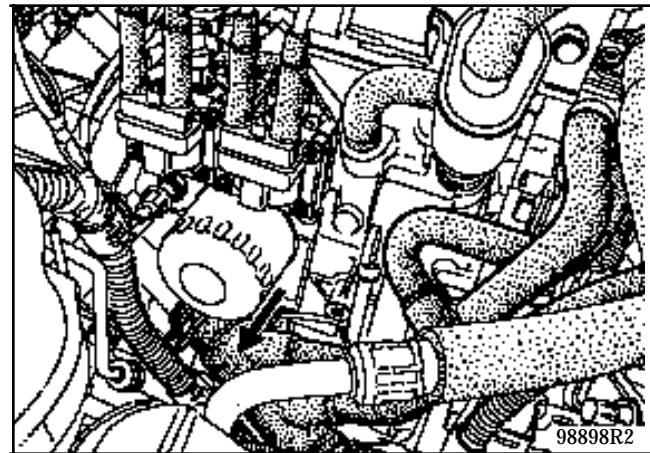
Put the vehicle on a 2 post lift.

Remove the engine undertray.

Disconnect the battery.

#### Drain:

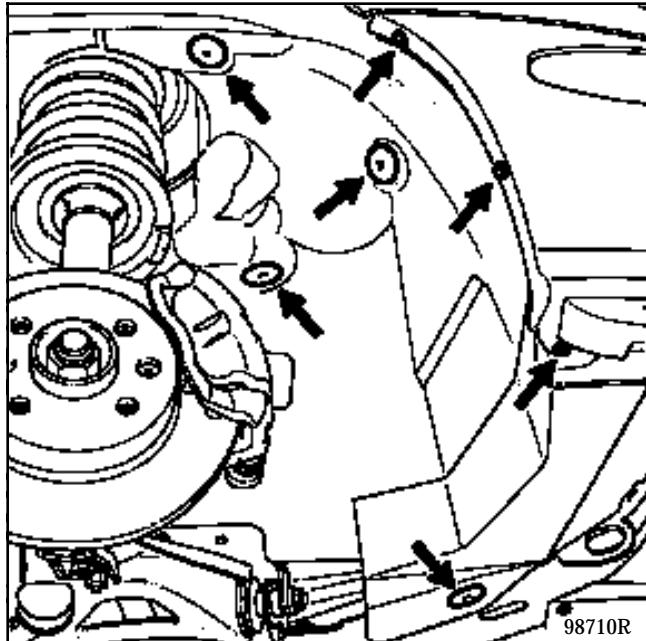
- the cooling circuit from the lower radiator hose, water pump end,



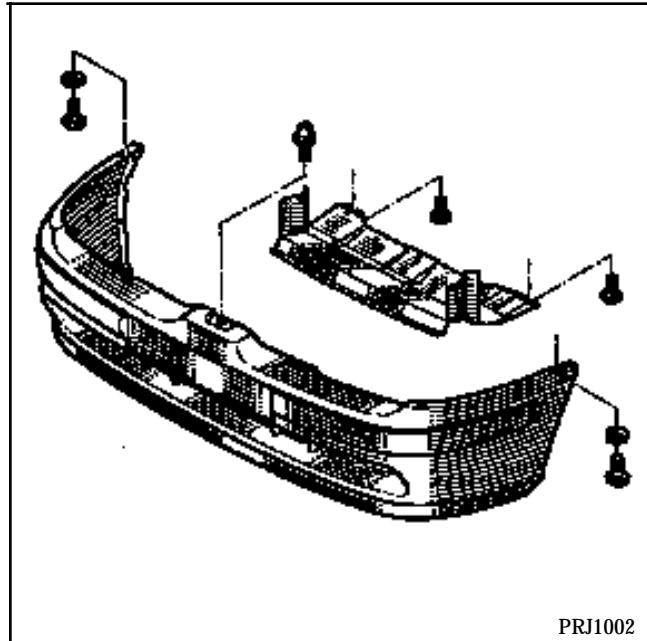
- the engine and gearbox if necessary.

Remove:

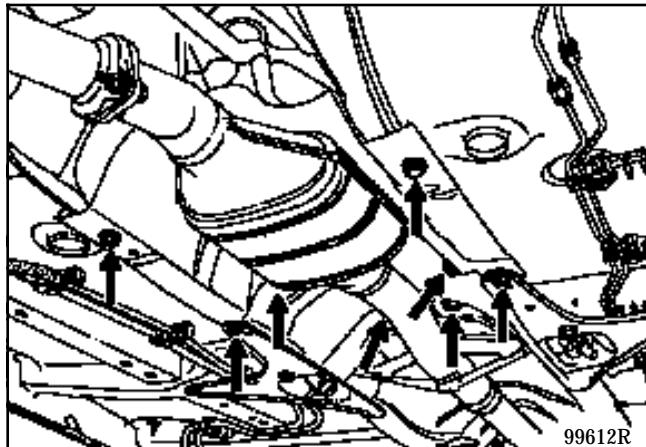
- the front wheels,
- the right and left hand mudguards,



- the gear control at the gearbox end (turn it over and attach it to the exhaust pipe),
- the front bumper,



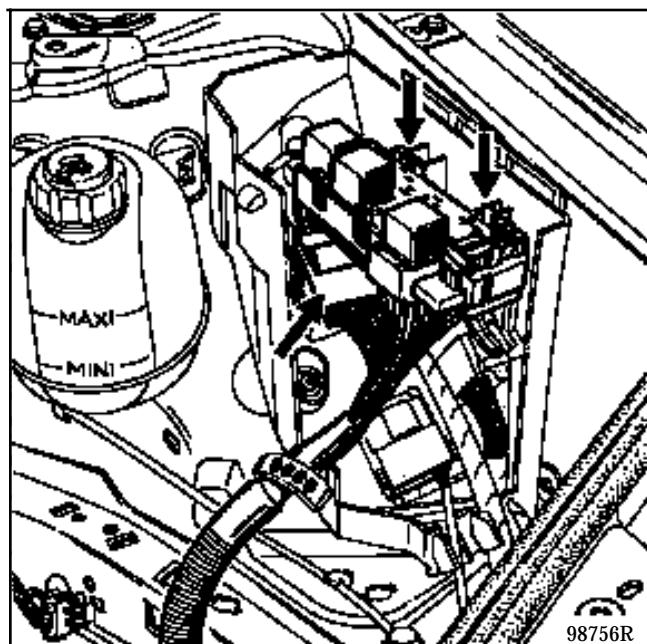
- the brake calipers and the ABS sensors (attach them to the body),
- the sub-frame-body tie rods,
- the exhaust downpipe (disconnect the oxygen sensor),
- the horn,
- the two exhaust heat shields,



- the air inlet sleeve, the air filter and its mounting.

Disconnect:

- the relay plate and the engine connection unit electrical connector,

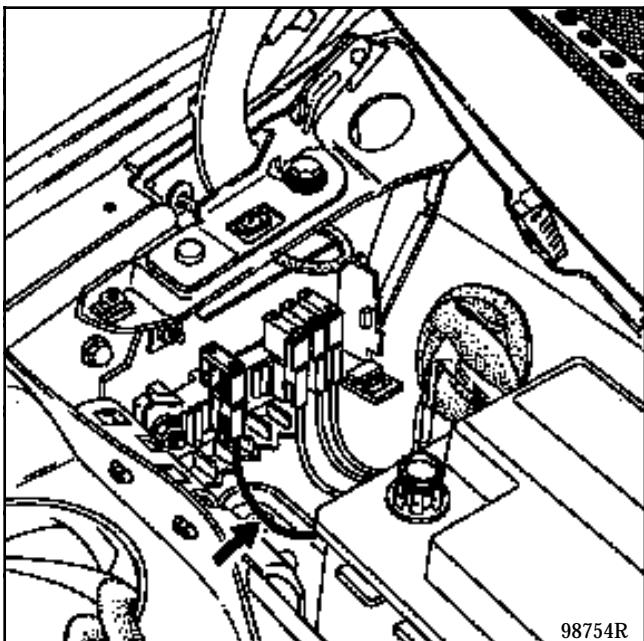


- the accelerator and clutch cables,
- the heater hoses on the thermostat mounting.

Remove the battery mounting bracket.

Disconnect:

- the injection feed wire in the scuttle panel and the starter feed,



- the brake servo pipe,
- the connectors for the fan, the relays, the thermistor and the pressostat,
- the pipe on the canister,
- the upper and lower radiator hoses,
- the fuel return and supply pipes, unclipping them from their mounting.

Remove:

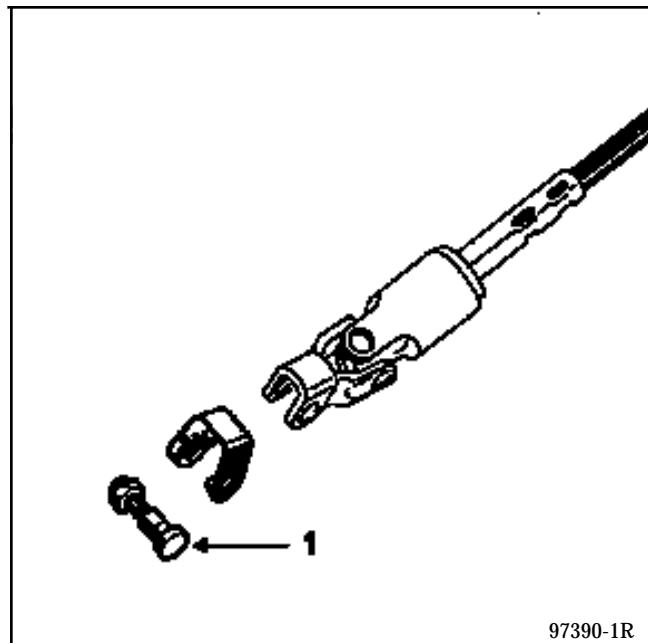
- the suspended engine mounting cap,
- the injection computer mounting and attach it to the engine,
- the expansion bottle and attach it to the engine,
- the absolute pressure sensor,
- the accessories belt (see section 11).

Unclip the power assisted steering reservoir.

Disconnect the compressor feed wire (if fitted).

Remove:

- the four mounting bolts for the air conditioning compressor (if fitted), move it to one side and attach it to the front of the vehicle,
- the earth strap,
- the nut and eccentric bolt (1) (use a roll pin punch) from the steering yoke after pushing the protector back.



**SPECIAL NOTES FOR VEHICLES FITTED WITH A  
DRIVER'S AIRBAG**

**IMPORTANT**

To avoid any risks of destroying the rotary switch under the steering wheel, comply with the following instructions:

- Before removing the steering column and the rack, the steering wheel MUST be immobilised with the wheels straight using a "steering wheel locking" tool, throughout the whole operation.
- Any doubts about whether the steering wheel is centred means that the steering wheel will have to be removed so that the centring method described in section 88 "Airbag" can be applied.

**REMINDER:** in this case, only qualified, trained staff can carry out this operation.

**NOTE:** cut the base of tool Mot. 1159 to 30 mm.

Fit tool Mot. 1159.

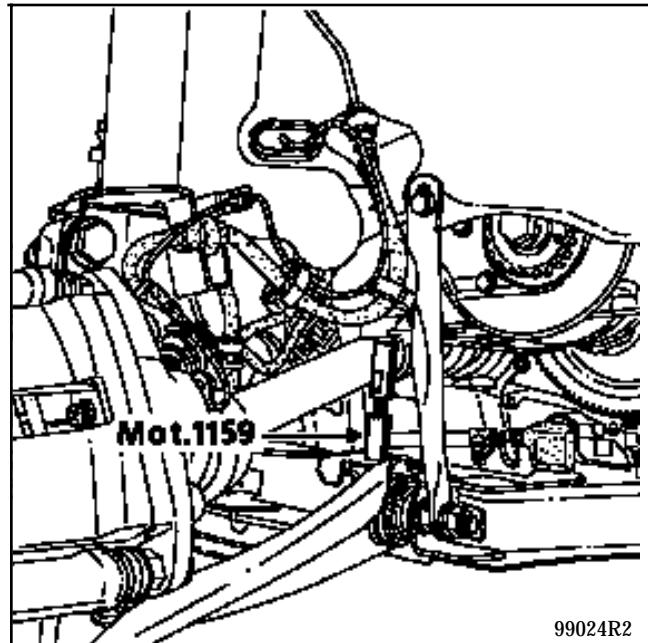
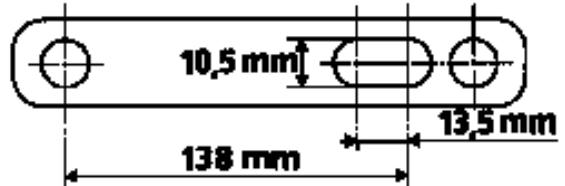
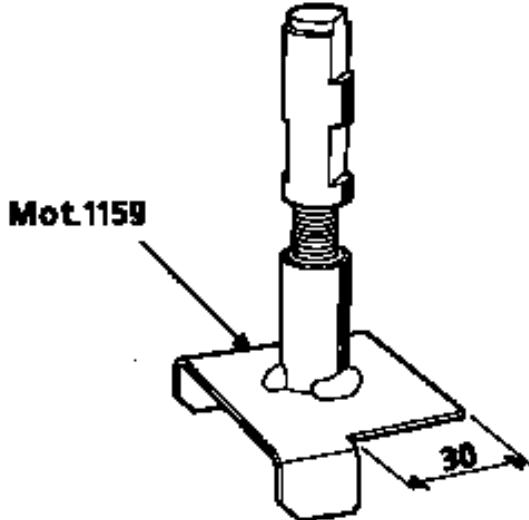
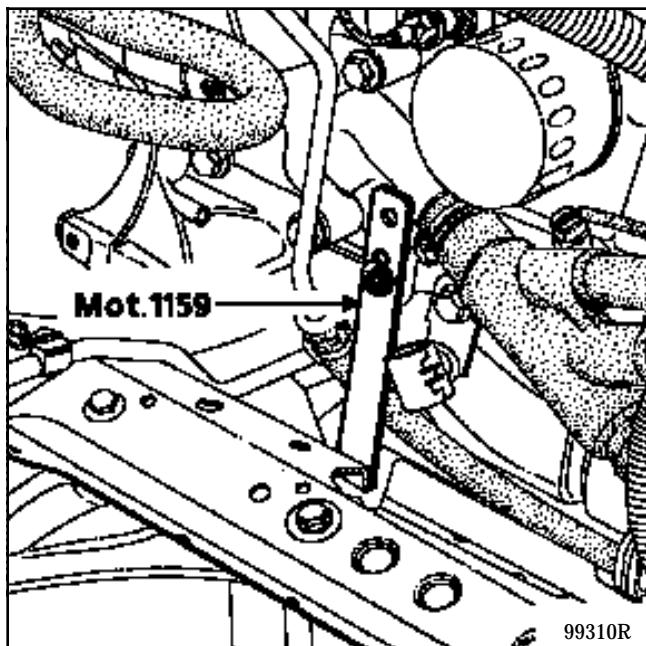


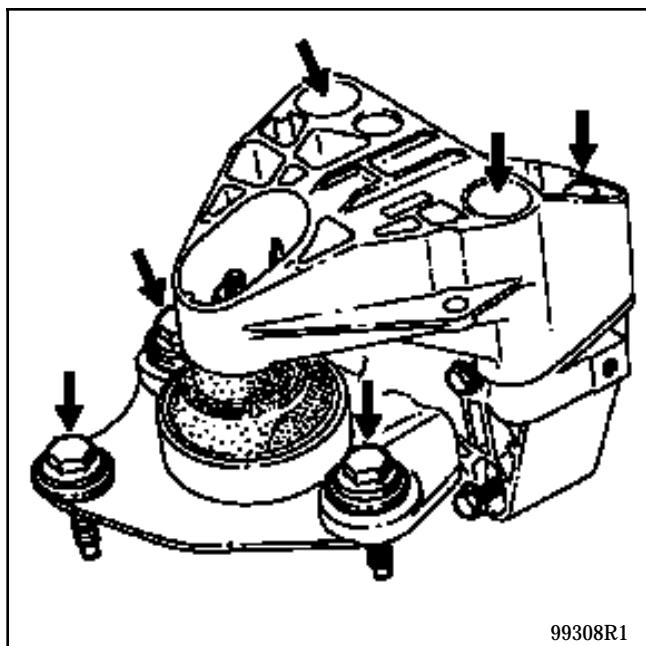
Diagram for drilling tool Mot. 1159. (For instructions on use, refer to page 10-33).



Fit the bracket of tool Mot. 1159 (water pipe mounting bolt).

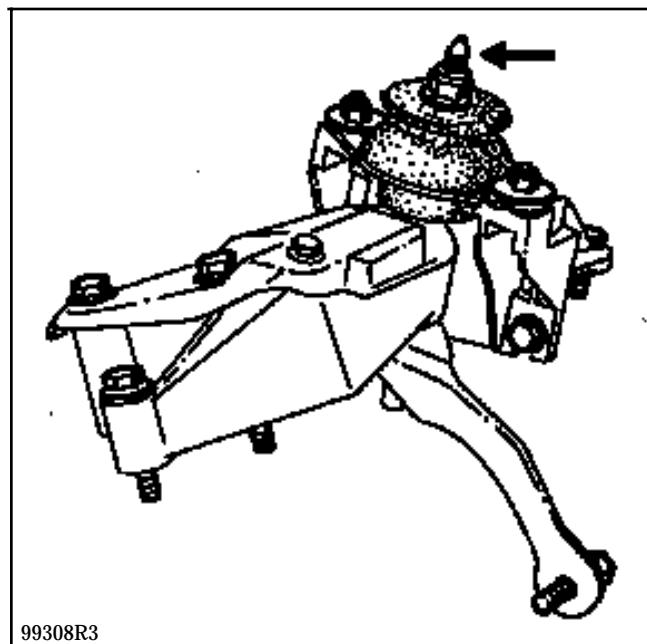


Remove the right hand suspended engine mounting cover and the movement limiter.



Fit a block between the gearbox and the left hand sub-frame.

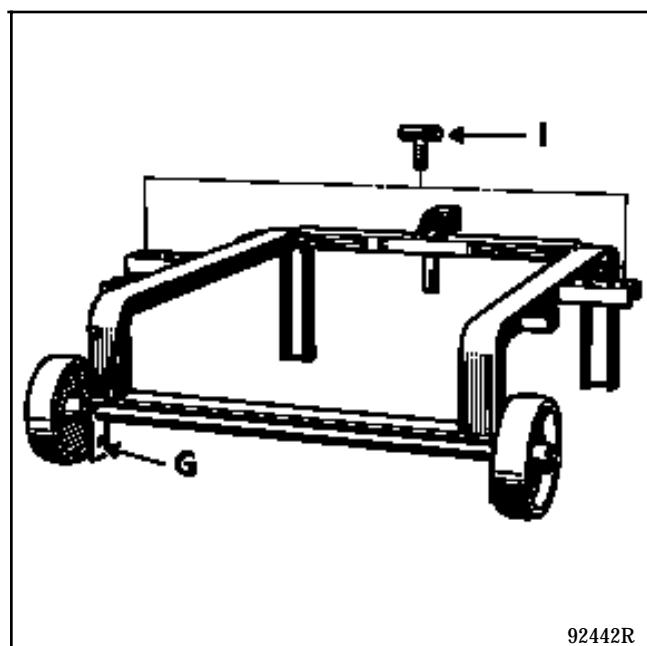
Remove the nut then using a copper hammer, tap the stud to release it from the suspended mounting on the left hand side.



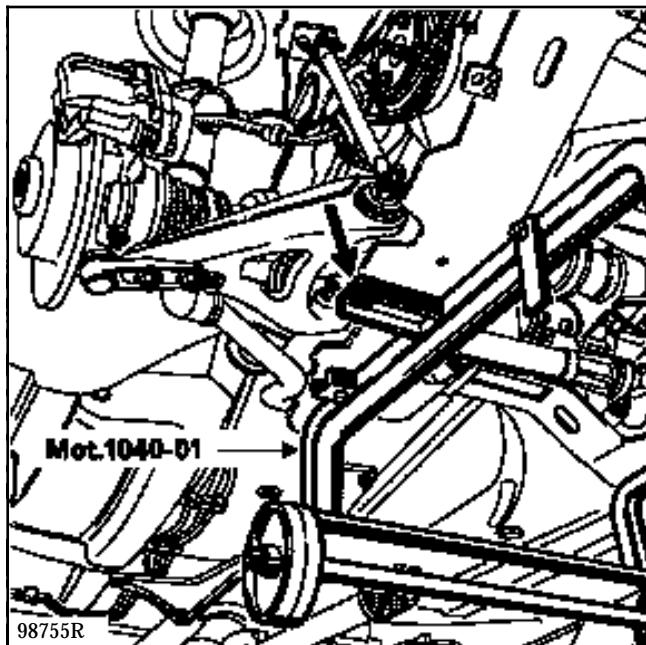
#### PREPARATION OF TOOL MOT. 1040-01

Fit the wheel pins into the lower holes (G).

This is secured to the sub-frame by hooks (I).



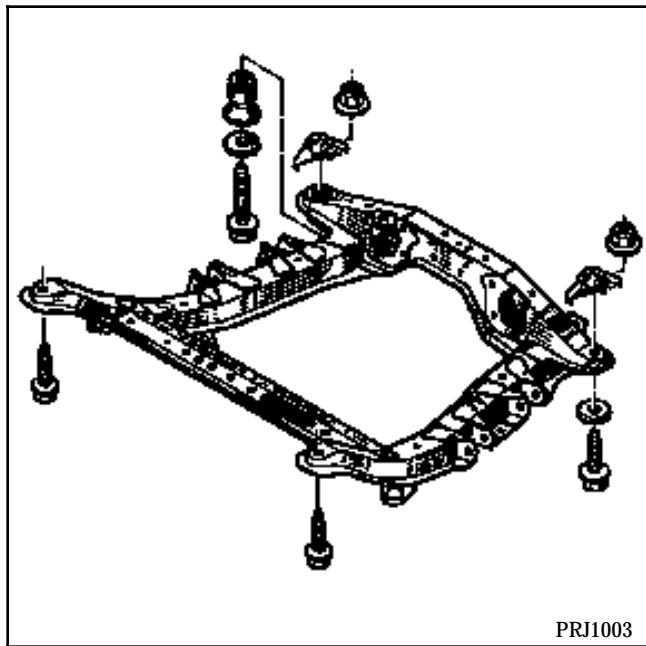
Secure tool Mot. 1040-01 under the sub-frame.



Lower the 2 post lift until the tool comes into contact with the floor.

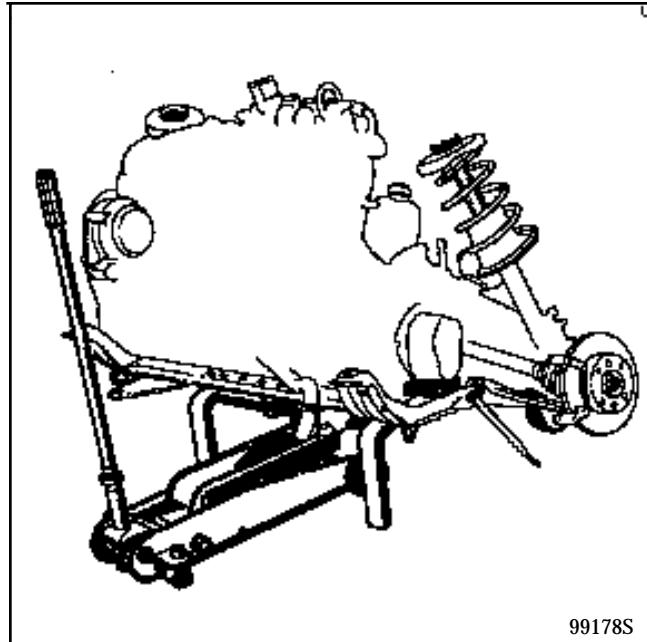
Remove:

- the upper shock absorber bolts,
- the four sub-frame mounting bolts.



Attach the cooling assembly to the front face.

Remove the engine and transmission assembly by lifting the body.



Tie the spring - shock absorber units together using rope.

**NOTE:** for an operation requiring separation of the engine - gearbox - sub-frame, note the position of tool Mot. 1159 carefully.

### REFITTING

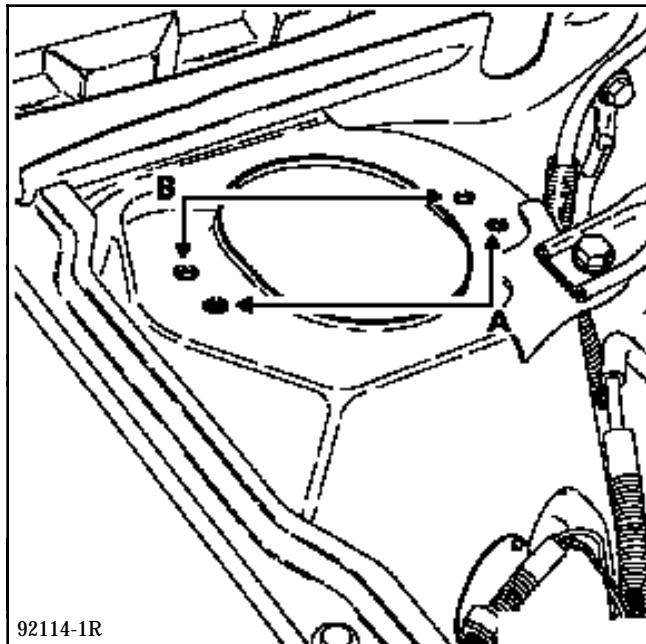
The engine sub-frame can be easily aligned with the bodywork by positioning the two approximately **100 mm** long threaded rods into the two front mountings of the body sub-frame .

Refitting is the reverse of removal.

Tighten the sub-frame mounting bolts to a torque of :

- **6 daN.m** at the front,
- **11 daN.m** at the rear.

If the vehicle has manual steering, position the shock absorber mountings into the holes (A), and into holes (B) for power assisted steering.

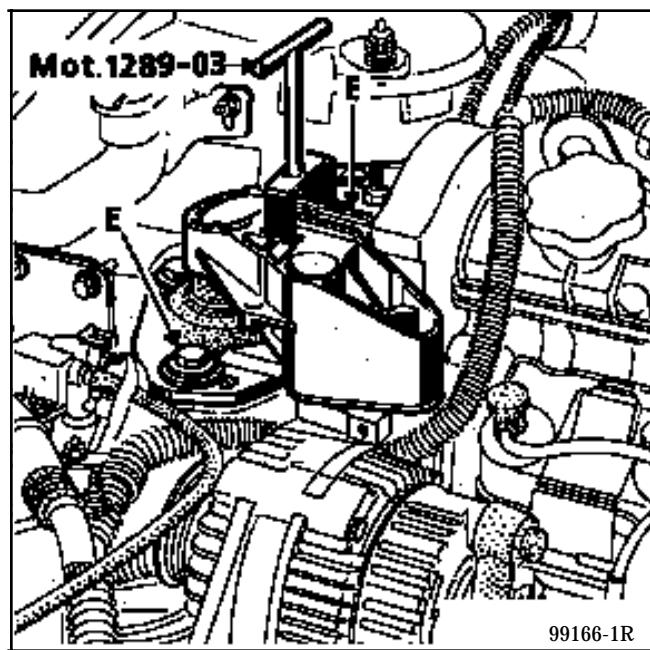


When the left and right hand suspended mountings are refitted, remember to remove the block under the gearbox and tool Mot. 1159

### ADJUSTING THE LONGITUDINAL MOVEMENT LIMITER

Slacken the two limiter bolts (E).

Insert the centring fork tool Mot. 1289-03 into the openings in the suspended mounting cover.



Tighten the two limiter mounting bolts (E) to a torque of **6 daN.m**.



Tighten all bolt, nuts and screws to the recommended torques.

Fit the caliper mounting bolts using **Loctite FRENBLOC** and tighten them to the correct torque.

Press the brake pedal several times to bring the pistons back into contact with the pads.

Fill:

- the cooling circuit and bleed it (see section 19),
- the engine and gearbox if required.

**NOTE:**

- check the steering shaft yoke spacer is in place when refitting,
- ensure the heat shields are correctly positioned.

SPECIAL TOOLING	
<b>Mot. 1040-01</b>	<b>Dummy cradle for removing and refitting the engine and transmission assembly</b>
<b>Mot. 1159</b>	<b>Tool for securing the engine on the sub-frame</b>
<b>Mot. 1311-06</b>	<b>Tool for removing the fuel pipe</b>

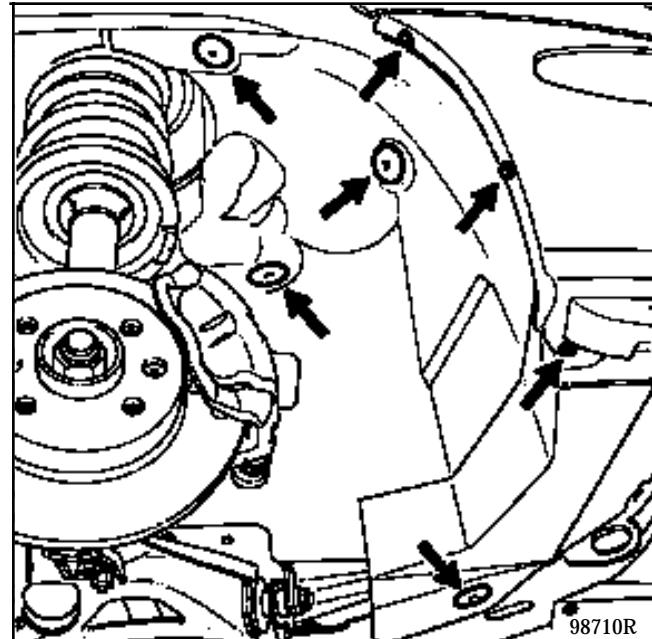
TIGHTENING TORQUES (in daN.m)	
<b>Front sub-frame mounting bolt</b>	<b>6</b>
<b>Rear sub-frame mounting bolt</b>	<b>11</b>
<b>Upper shock absorber cup mounting bolt</b>	<b>3</b>
<b>Wheel bolts</b>	<b>9</b>
<b>Brake caliper bolt</b>	<b>3.5</b>
<b>Universal steering joint mounting bolt</b>	<b>3</b>
<b>Nut for mounting rubber mounting pad on front left hand side member mounting</b>	<b>7.5</b>
<b>Bolt mounting front right hand suspended engine mounting cover on engine</b>	<b>4</b>
<b>Nut mounting suspended engine mounting cover on rubber mounting pad</b>	<b>4.5</b>

**Drain:**

- the cooling circuit from the lower radiator hose (radiator end),
- the engine and gearbox if necessary.

**Remove:**

- the front wheels,
- the right hand left hand mudguards,

**REMOVAL**

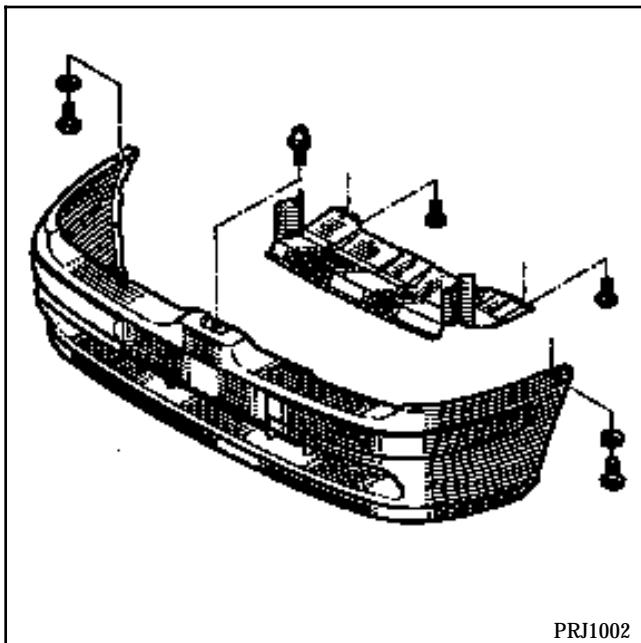
Put the vehicle on a 2 post lift.

Remove the engine undertray.

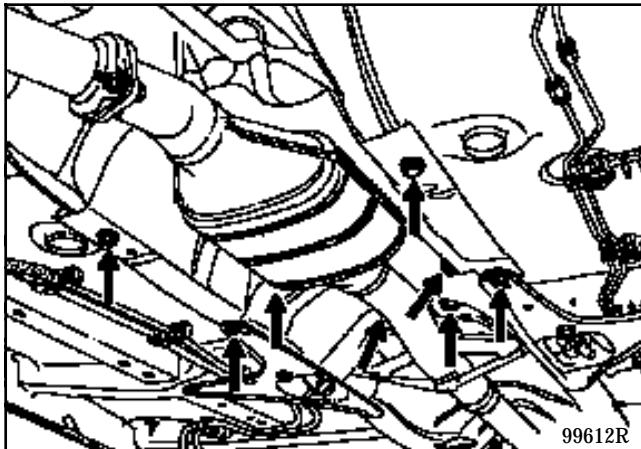
Disconnect the battery.

- the brake calipers and attach them to the body,
- the sub-frame-body tie rods,

- the front bumper,

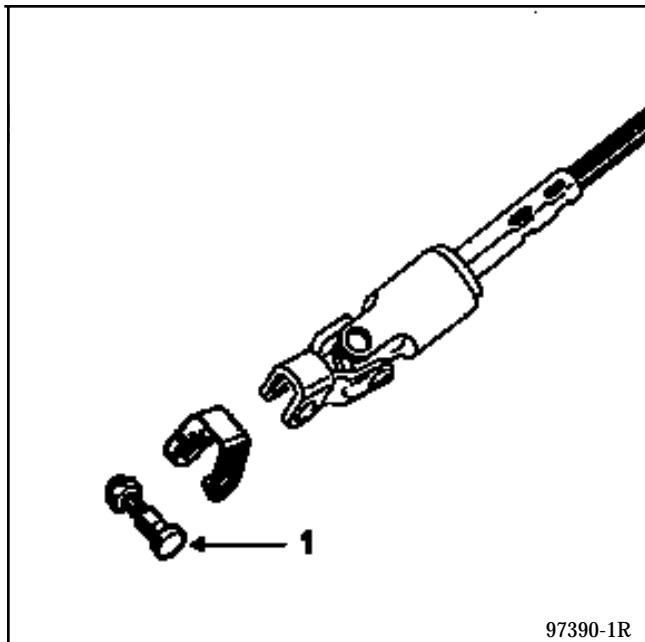


- the air inlet sleeve, the air filter and its mounting,
- the exhaust downpipe,
- the two exhaust heat shields,



- the gear control at the gearbox end (turn it over and attach it to the exhaust pipe),
- the horn
- the expansion bottle (attach it to the engine)
- the earth strap

- the nut and eccentric bolt (1) (use a roll pin punch) from the steering yoke after pushing the protector back.



#### SPECIAL NOTES FOR VEHICLES FITTED WITH A DRIVER'S AIRBAG

##### IMPORTANT

To avoid any risks of destroying the rotary switch under the steering wheel, comply with the following instructions:

- Before removing the steering column and the rack, the steering wheel MUST be immobilised with the wheels straight using a "steering wheel locking" tool, throughout the whole operation.
- Any doubts about whether the steering wheel is centred means that the steering wheel will have to be removed so that the centring method described in section 88 "Airbag" can be applied.

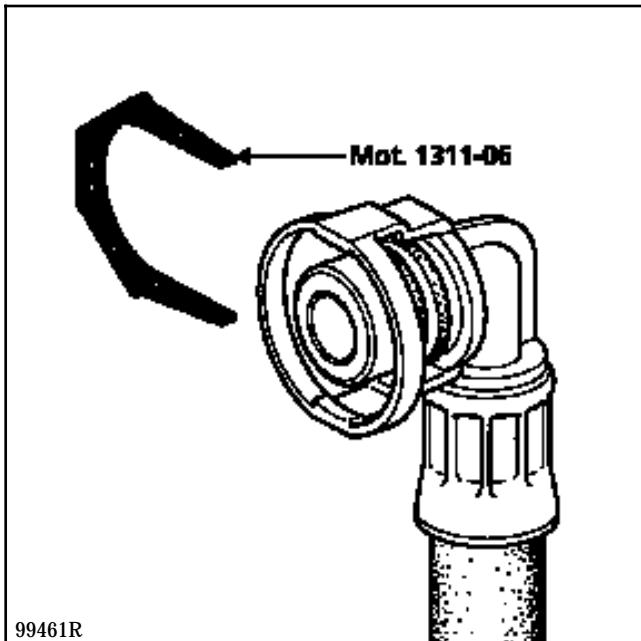
**REMINDER:** in this case, only qualified, trained staff can carry out this operation.

Remove:

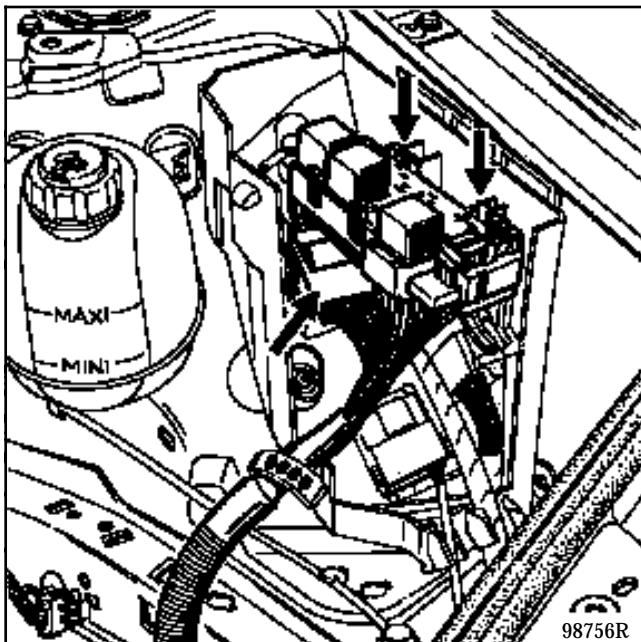
- the preheating unit (attach it to the engine),
- the fuel return union on the injection pump.

Disconnect:

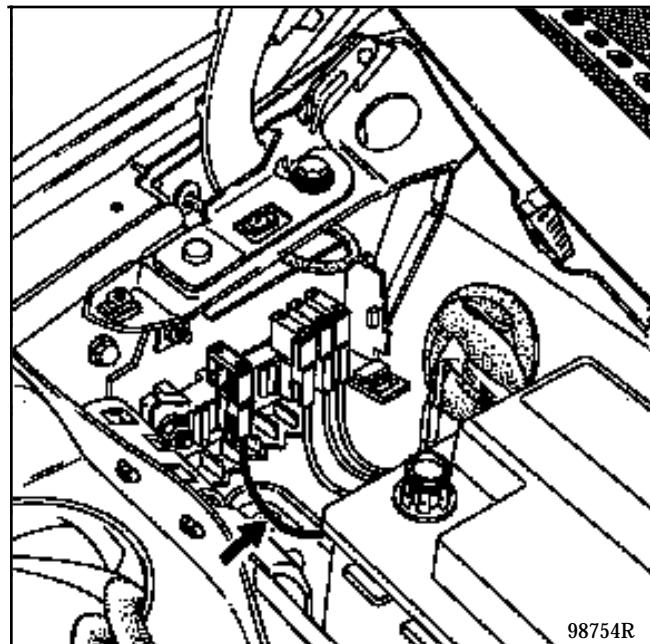
- the fuel supply pipe on the diesel fuel filter using tool Mot. 1311-06,



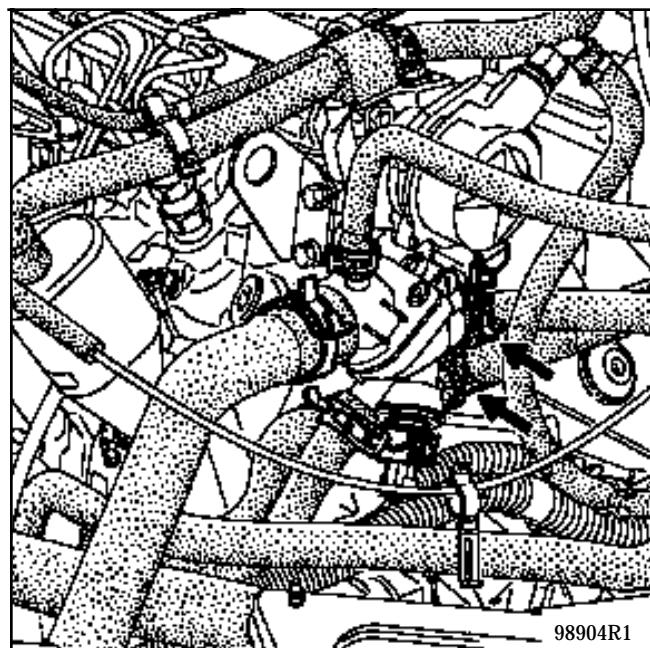
- the altimetric sensor connector,
- the relay plate and the engine connection unit electrical connector,



- the feed wire for the preheating unit in the scuttle panel and the starter feed.



- the heater hoses on the thermostat mounting,

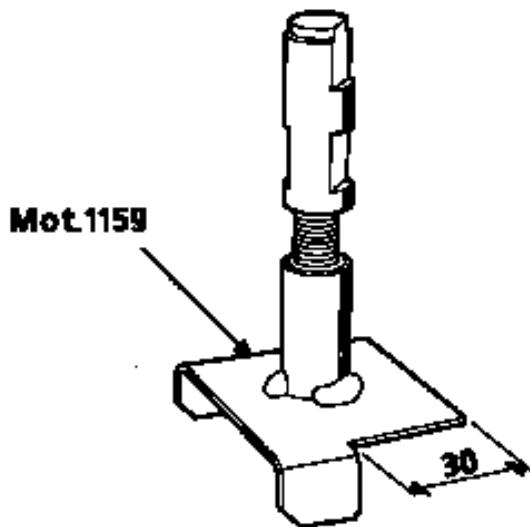


- the pipes and connectors for the fast idle and EGR solenoid valves,
- the brake servo pipe,
- the accelerator and clutch cables,
- the diesel fuel filter connector,
- the compressor feed wire (if fitted).

**Remove:**

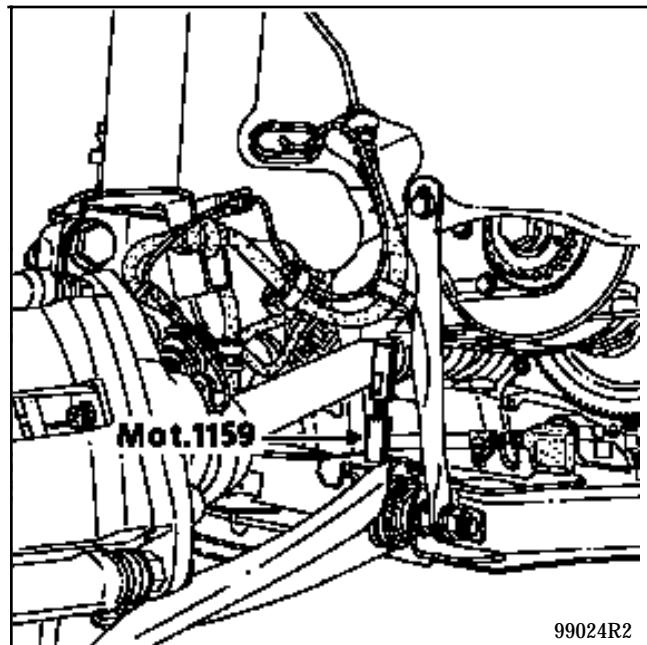
- the cooling assembly (see section 19 "Radiator"),
- the alternator belt (see section 16),
- the compressor mounting bolts (if fitted) and attach it to the front cross member.

**NOTE:** cut the base of tool Mot. 1159 to 30 mm.



99023R2

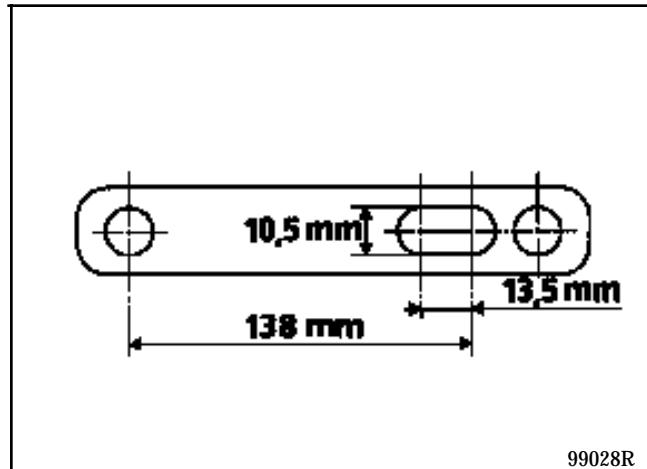
**Fit tool Mot. 1159.**



**Remove the oil filter.**

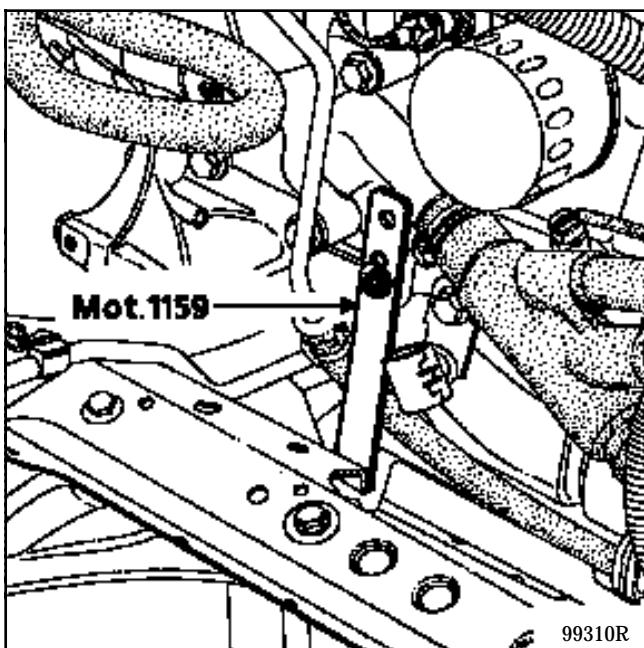
**Unclip the alternator wiring and move it to one side.**

**Diagram for drilling tool Mot. 1159.** (For instructions on use, refer to page 10-40).



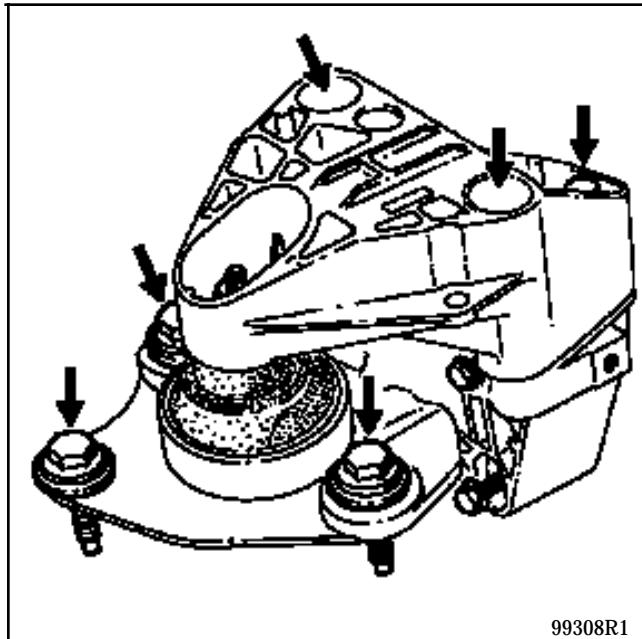
99028R

Fit the bracket of tool Mot. 1159.



99310R

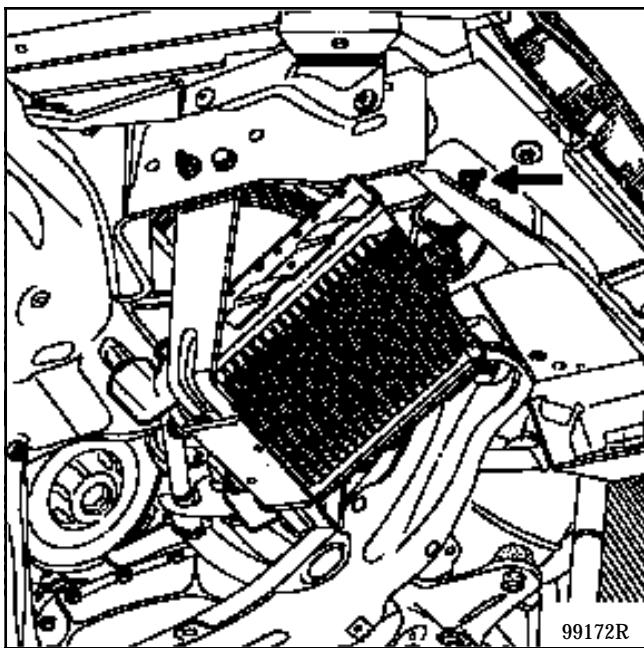
- the suspended engine mounting cover on the right hand side and the movement limiter.



99308R1

Remove:

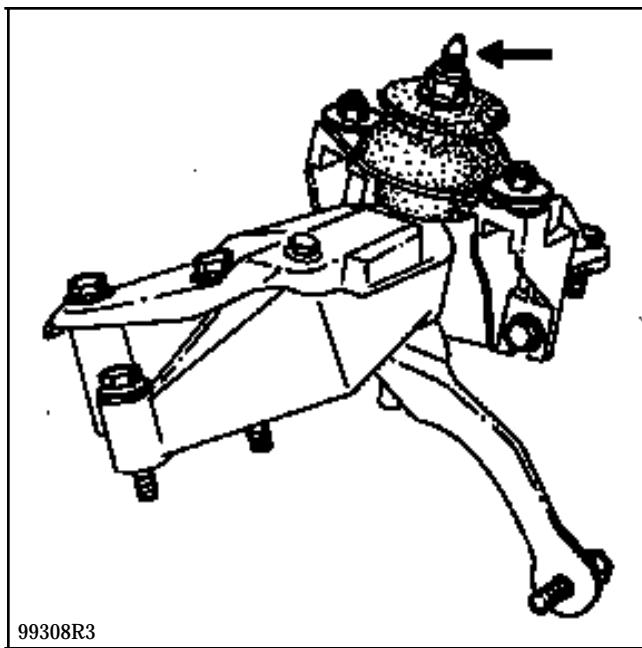
- the oil radiator deflector and the oil radiator and attach it to the engine,



99172R

Fit a block between the gearbox and the left hand sub-frame.

Remove the nut then using a copper hammer, tap the stud to release it from the suspended mounting on the left hand side.

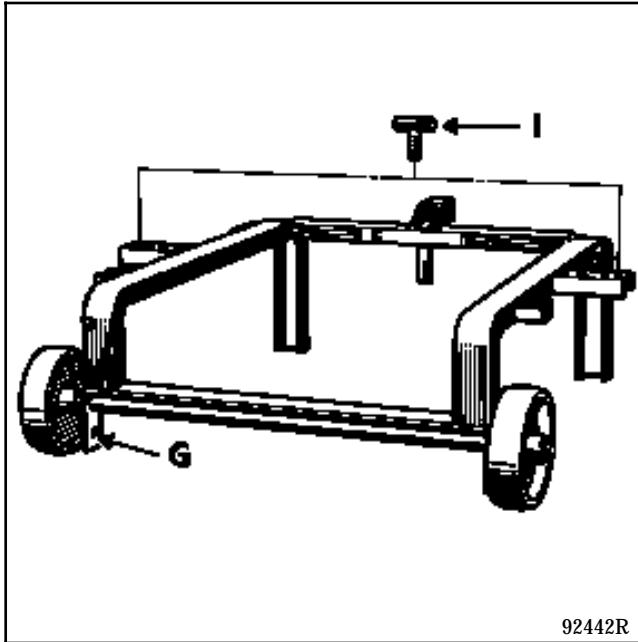


99308R3

**PREPARATION OF TOOL MOT. 1040-01**

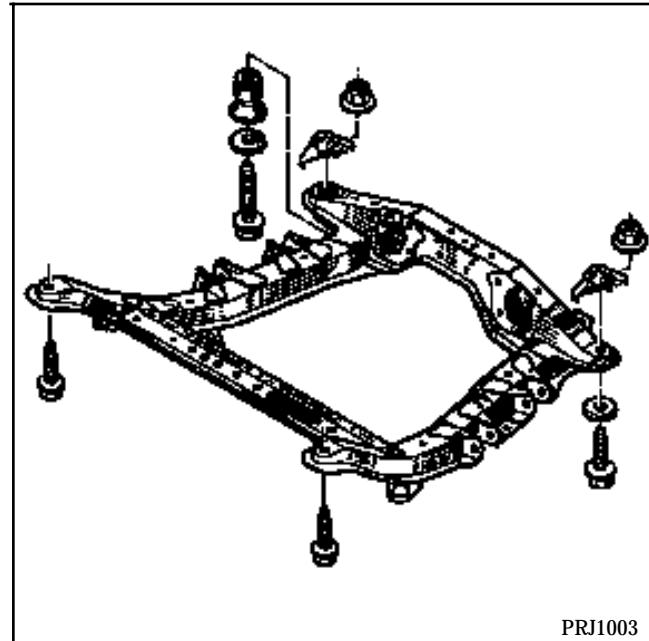
Fit the wheel pins into the lower holes (G).

This is secured to the sub-frame by hooks (I).

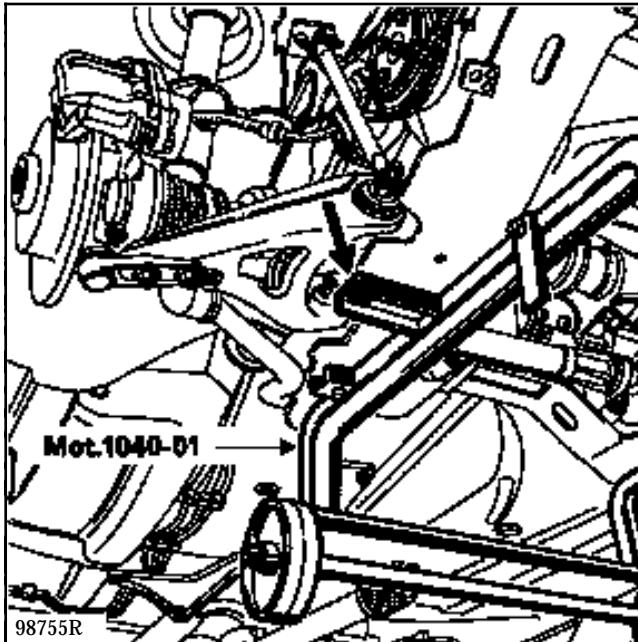


Remove:

- the upper shock absorber bolts,
- the four sub-frame mounting bolts.

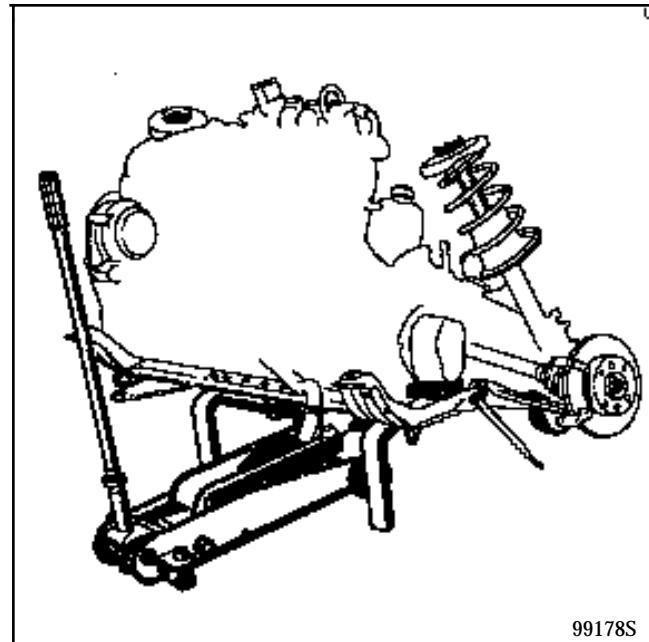


Secure tool Mot. 1040-01 under the sub-frame.



Lower the 2 post lift until the tool comes into contact with the floor.

Remove the engine and transmission assembly by lifting the body.



Tie the spring - shock absorber units together using rope.

### REFITTING

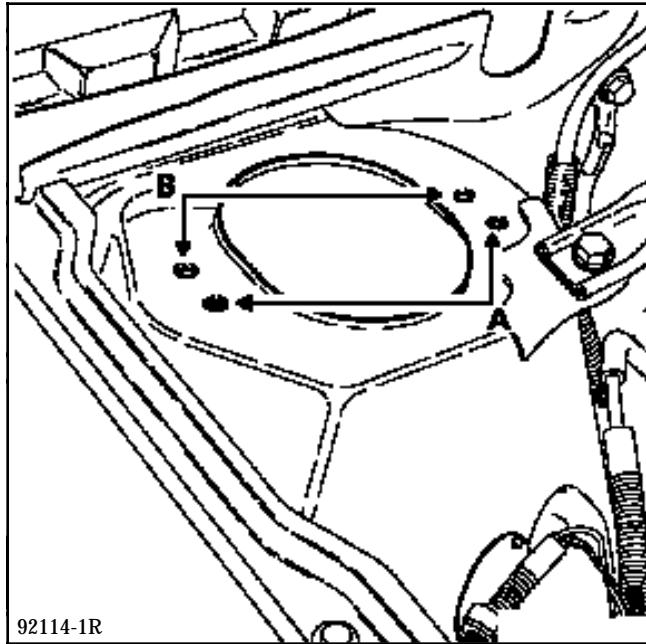
The engine sub-frame can be easily aligned with the bodywork by positioning the two approximately **100 mm** long threaded rods into the two front mountings of the body sub-frame .

Refitting is the reverse of removal.

Tighten the sub-frame mounting bolts to a torque of :

- **6 daN.m** at the front,
- **11 daN.m** at the rear.

If the vehicle has manual steering, position the shock absorber mountings into the holes (A), and into holes (B) for power assisted steering.

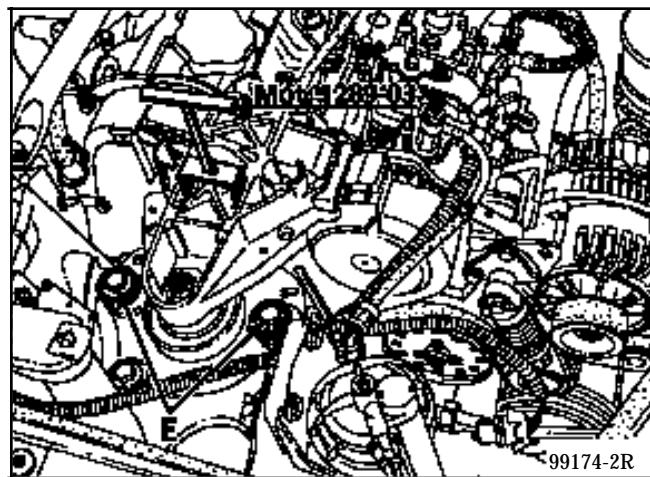


When the left and right hand suspended mountings are refitted, remember to remove the block under the gearbox and tool **Mot. 1159**

### ADJUSTING THE LONGITUDINAL MOVEMENT LIMITER

Slacken the two limiter bolts (E).

Insert the centring fork tool **Mot. 1289-03** into the openings in the suspended mounting cover.



Tighten the two limiter mounting bolts (E) to a torque of **6 daN.m**.



Tighten all bolt, nuts and screws to the recommended torques.

Fit the caliper mounting bolts using **Loctite FRENBLOC** and tighten them to the correct torque.

Press the brake pedal several times to bring the pistons back into contact with the pads.

Fill:

- the cooling circuit and bleed it (see section 19),
- the engine and gearbox if required.

**NOTE:**

- check the steering shaft yoke spacer is in place when refitting,
- ensure the heat shields are correctly positioned.

SPECIAL TOOLING REQUIRED	
T.Av. 476	Ball joint extractor
B.Vi. 31-01	Set of punches
EQUIPMENT REQUIRED	
Engine support tool (example : DESVIL M300)	

TIGHTENING TORQUES (in daN.m)	
Wheel bolt	9
Track rod end nut	3.5
Shock absorber base bolt	17
Engine tie bar bolt:	
- on gearbox	6.5
- on sub-frame	7.5
Right hand engine mounting nut	4.5
Left hand gearbox mounting nut	4.5
Sump bolt	0.7 to 0.9
Oil pump bolt	2.5
Tie bar bolt on gearbox	2.5
Tie bar bolt on engine	5

### REMOVAL

Put the vehicle on a 2 post lift.

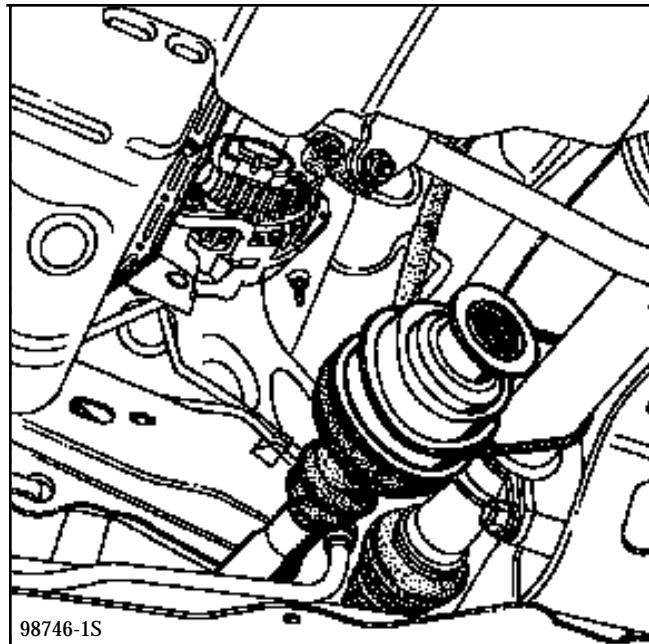
Disconnect the battery.

Drain the engine oil.

Remove:

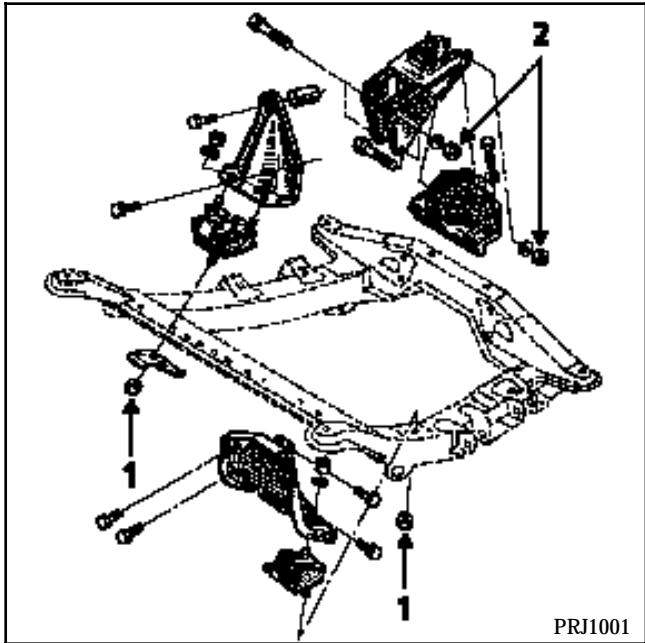
- the catalytic converter,
- the front right hand wheel,
- the track rod end using tool **T.Av. 476**,
- the upper shock absorber bolt and slacken the lower bolt (do not remove it),

- the right hand driveshaft pin using tool **B.Vi. 31-01**, then tilt the hub to release the driveshaft from the gearbox and attach it to the steering,



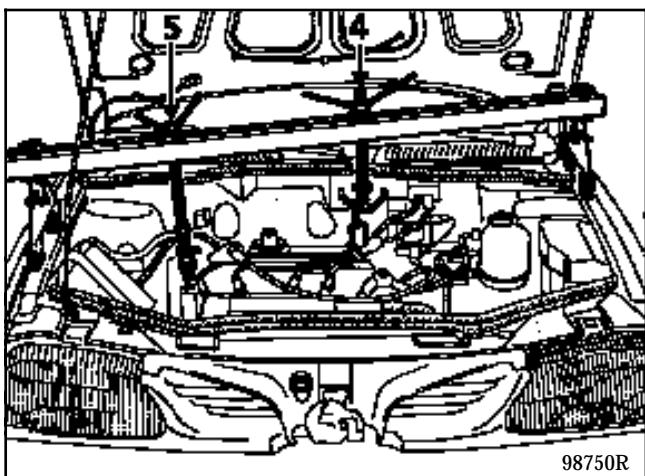
- the engine - gearbox tie bar,

- nuts (1) for the engine and gearbox mounting pads,
- nuts (2) for the tie bar mounting.



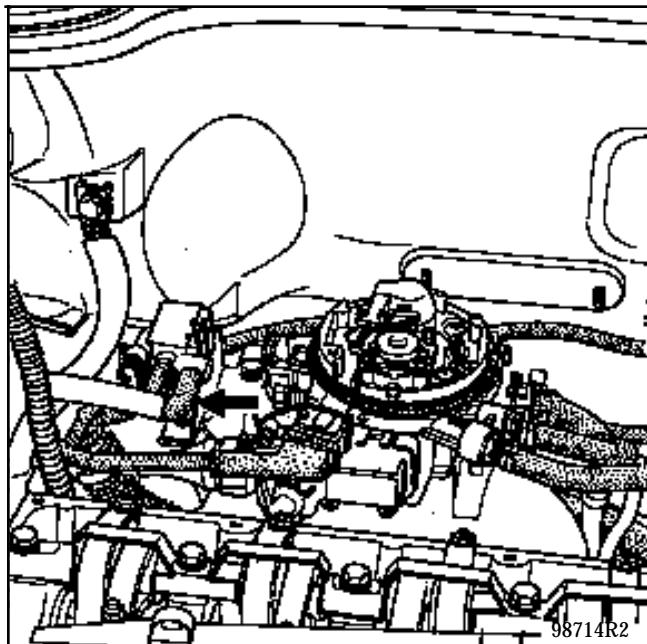
- the air filter.

Fit the engine support tool, for example **DESVIL M300**.



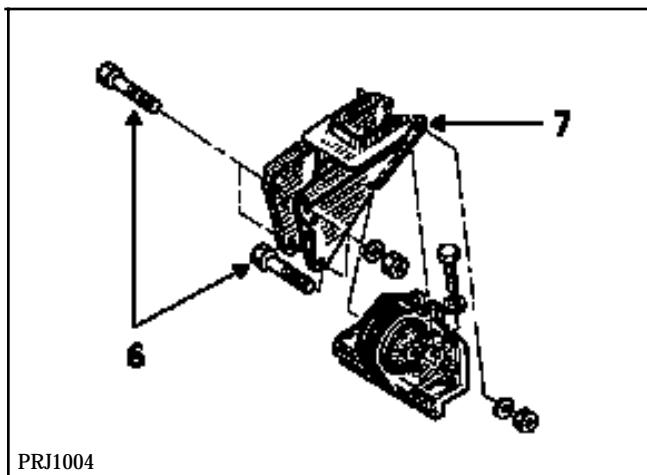
Remove:

- the canister solenoid valve pipe,

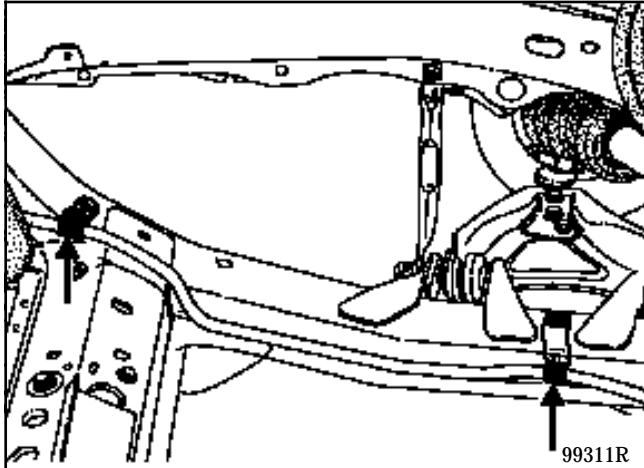


- the fuel pipes and their mounting on the right hand side member and the inlet manifold,
- the power assisted steering reservoir,
- the speedo gear from the gearbox.

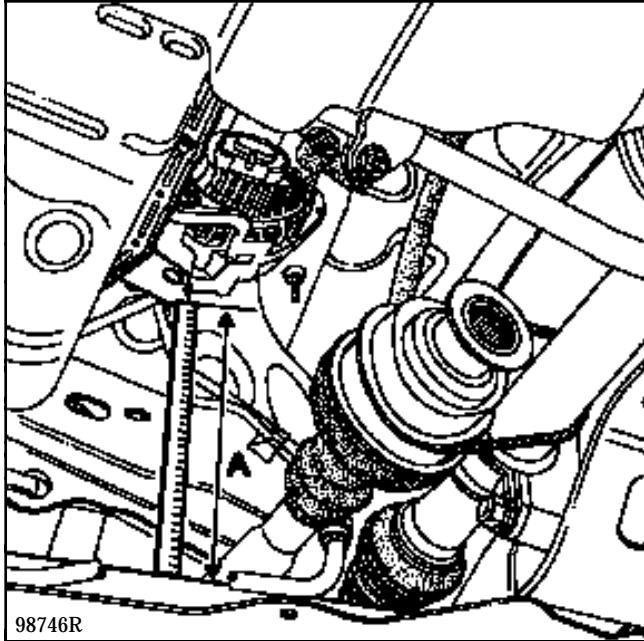
Lift the engine by the two lifting rings (4) and (5) so that the three bolts (6) on mounting (7) may be removed and then remove the engine by lifting it out.



Remove the two power assisted steering pipe bolts on the sub-frame.

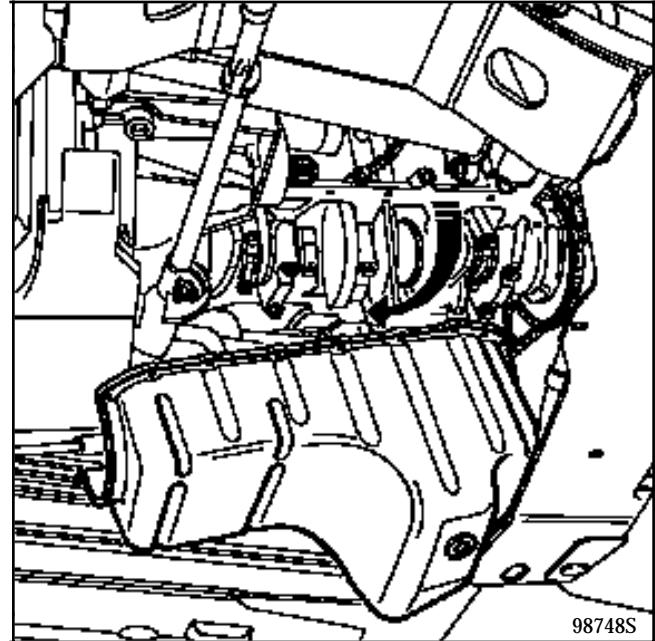


Lift the engine using the lifting ring (5) at the timing end to ensure dimension (A) is 25 cm between the sub-frame and the edge of the cylinder block.

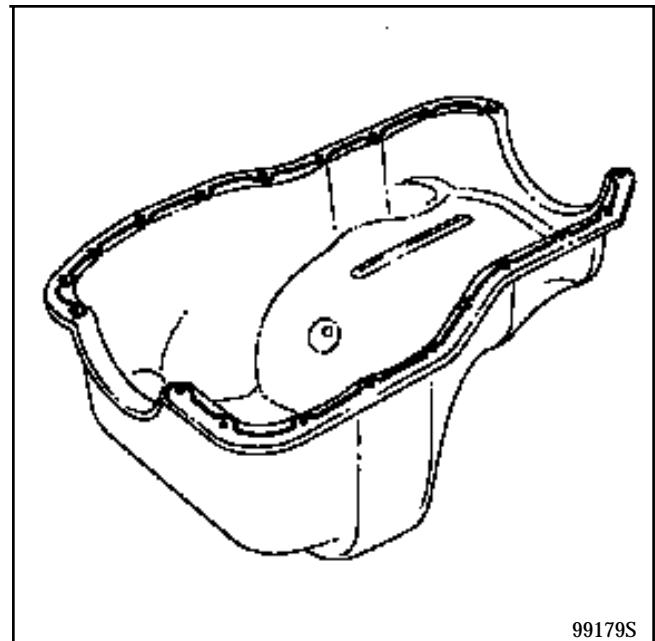


Remove:

- the sump bolts then release the sump,
- the sump, in the direction shown by the arrow.



Clean the sump before applying a bead of RHODORSEAL 5661, width 3 mm.



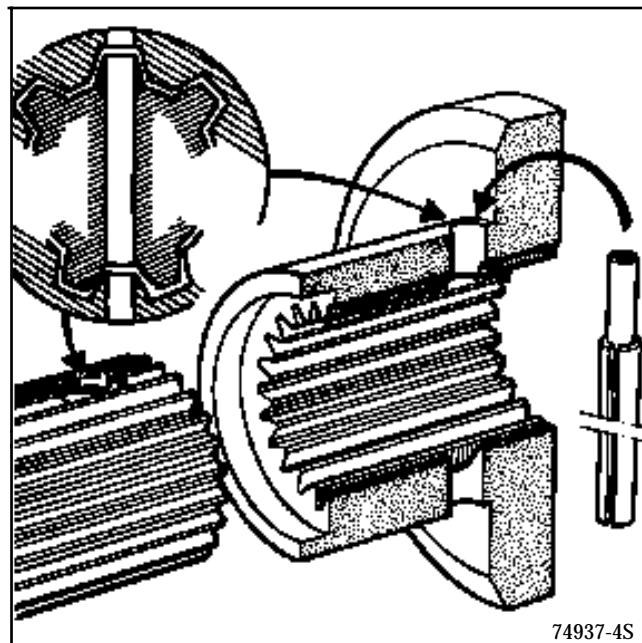
NOTE : remember to renew the two rubber seals at the edge of the sump.

**REFITTING**

Refitting is the reverse of removal.

An input chamfer on the sunwheel facilitates the fitting of new roll pins.

Seal the ends with **RHODORSEAL 5661**.



Fill the engine with oil.

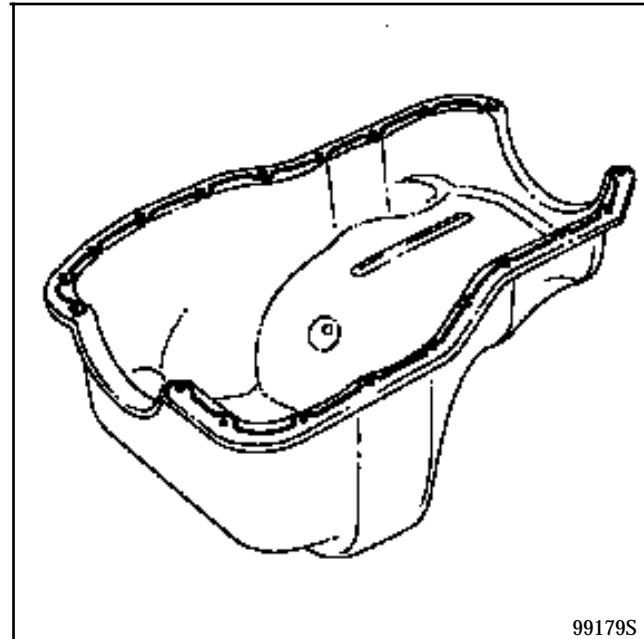
TIGHTENING TORQUES (in daN.m)	
Sump bolt	0.7 to 0.9

#### REMOVAL

To remove the aluminium sump, the engine and transmission assembly must be removed.

#### REFITTING

Clean the sump before applying a bead of RHODORSEAL 5661 (eg- CAF 4/60 TIXO), width 3 mm.



**NOTE : remember to renew the two rubber seals at the edge of the sump.**

## SPECIAL TOOLING REQUIRED

B.Vi. 31-01	Set of punches
Mot. 453-01	Hose clamp pliers
Mot. 1311-06	Tool for removing fuel pipe
T.Av. 476	Ball joint extractor

## EQUIPMENT REQUIRED

Engine support tool  
(example : DESVIL M300)

## TIGHTENING TORQUES (in daN.m)



Wheel bolt	9
Track rod nut	3.5
Shock absorber base bolt	17
Engine tie bar bolt:	
- on gearbox	6.5
- on sub-frame	7.5
Right hand engine mounting nut	4.5
Left hand gearbox mounting nut	4.5
Sump bolt	0.7 to 0.9
Oil pump bolt	2.5
Tie bar bolt on gearbox	2.5
Tie bar bolt on engine	5

## REMOVAL

Put the vehicle on a 2 post lift.

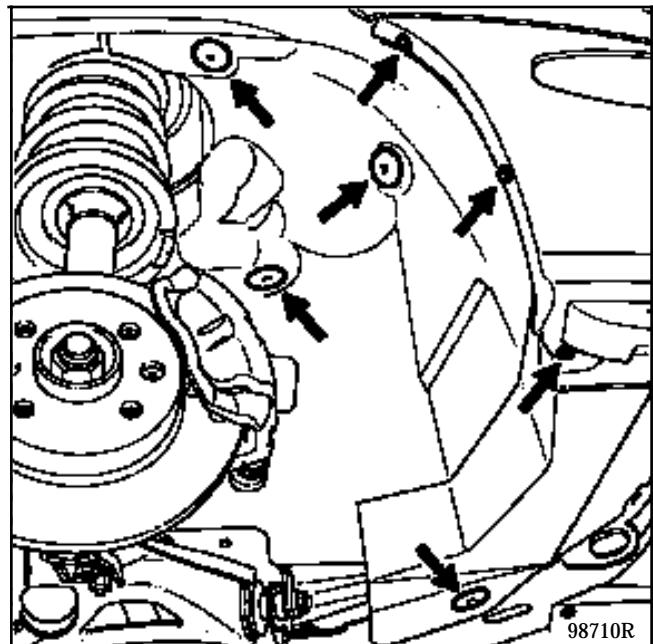
Disconnect the battery.

Remove the expansion bottle and position it below the level of the upper radiator hose on the thermostat.

Disconnect the upper radiator hose on the thermostat and clamp it using tool Mot. 453-01.

Remove:

- the front wheels,
- the right hand mudguard,



- the catalytic converter (disconnect the oxygen sensor connector),
- the gearbox control at the gearbox end.

***On the left hand side of the vehicle***

Remove:

- the track rod end using tool T.Av. 476,
- the three gaiter bolts,
- the shock absorber base bolts.

Release the driveshaft from the gearbox taking care to protect the spider.

Attach the driveshaft to the body.

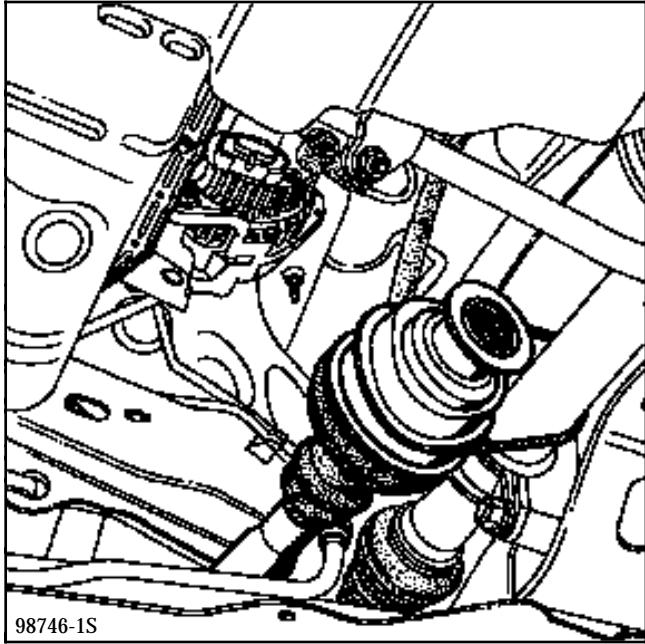
***On the right hand side of the vehicle***

Remove:

- the driveshaft roll pin using punches B.Vi. 31-01,
- the upper shock absorber bolt and slacken the lower bolt.

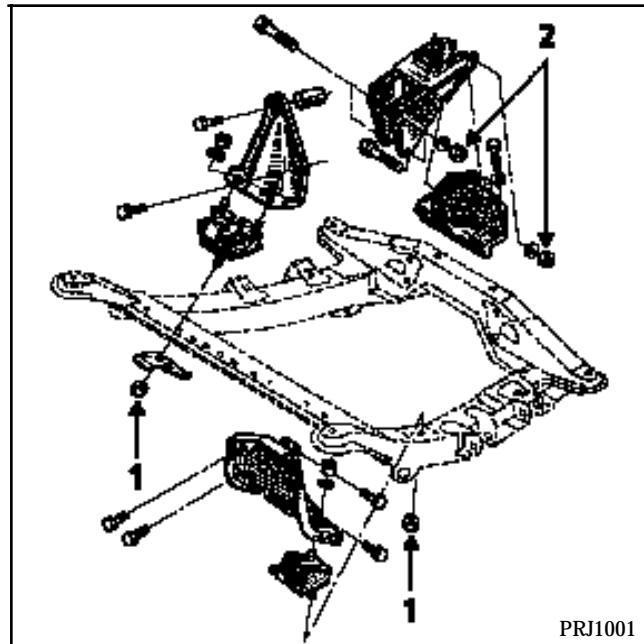
Tilt the hub and release the driveshaft from the gearbox.

Attach the driveshaft to the steering.



Remove:

- the engine - gearbox tie bar,
- nuts (1) for the engine and gearbox mounting pads,
- nuts (2) for the tie bar mounting,

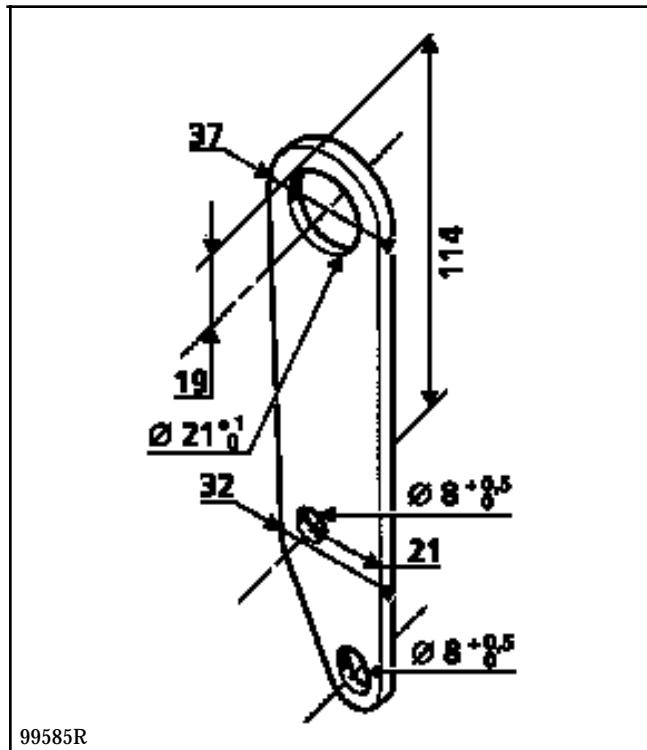
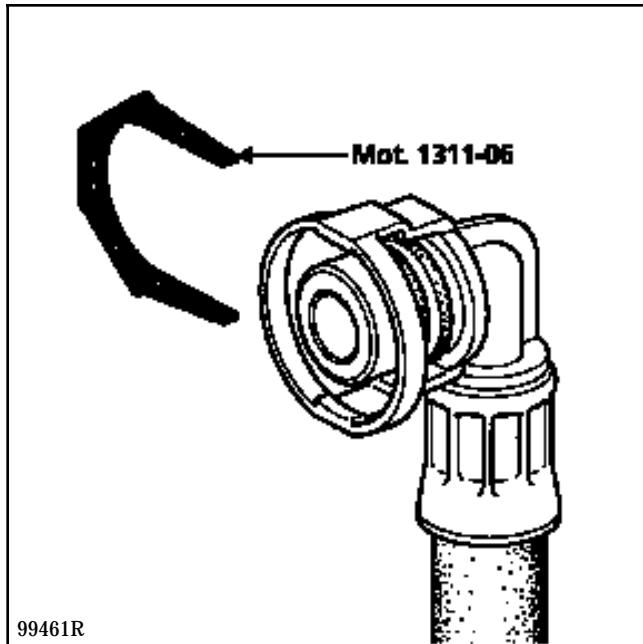


- the tie bar between the shock absorber turrets,
- the earth strap,
- the speedo gear from the gearbox,
- the power assisted steering reservoir.

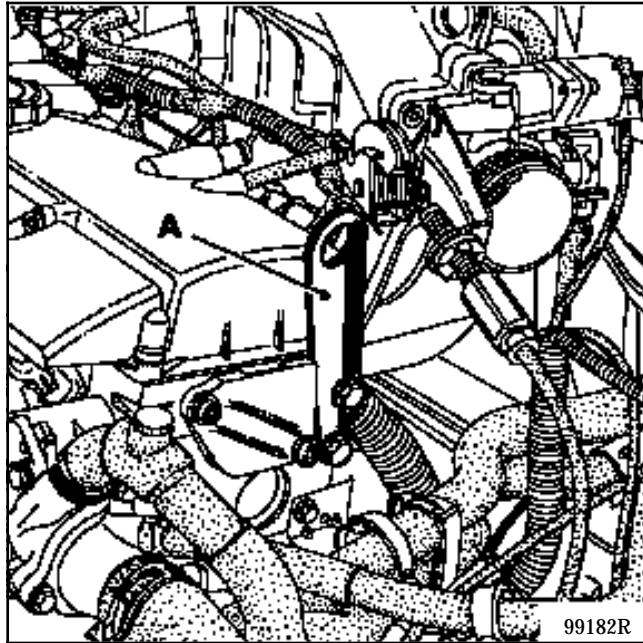
Disconnect:

- the brake servo pipe,
- the canister pipe,
- the oil vapour rebreathing pipe,
- the throttle potentiometer connector,

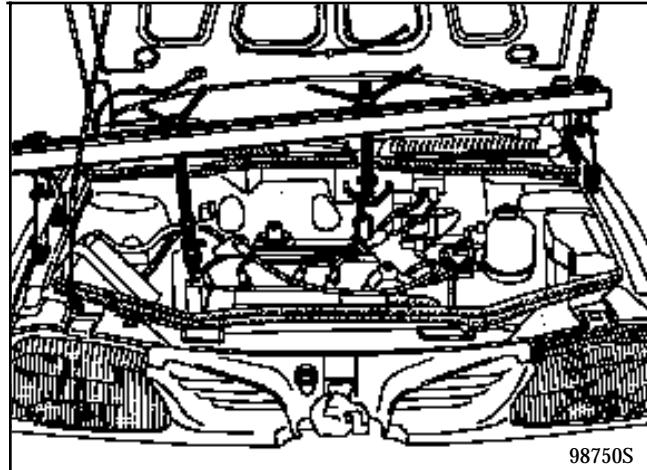
- the fuel supply and return pipes using tool Mot. 1311-06.



Fit the lifting bracket (A) (locally made) to the engine block.

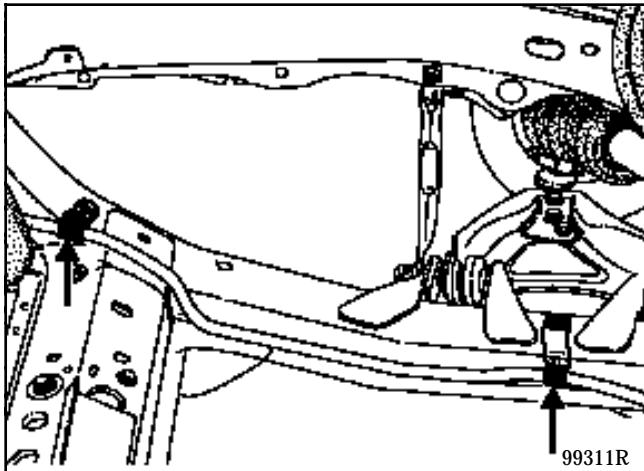


Fit the engine support tool (for example: DESVIL 300).



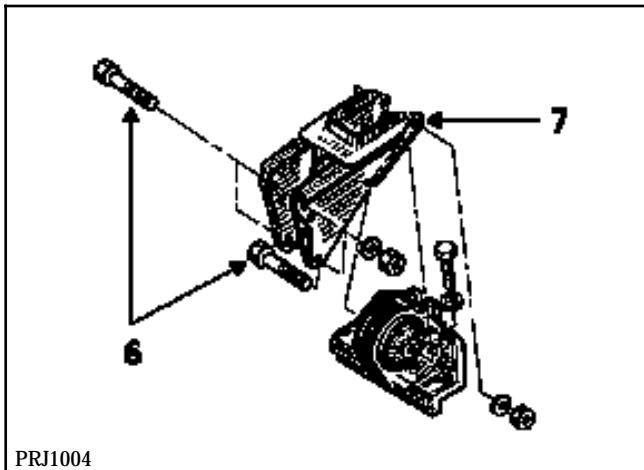
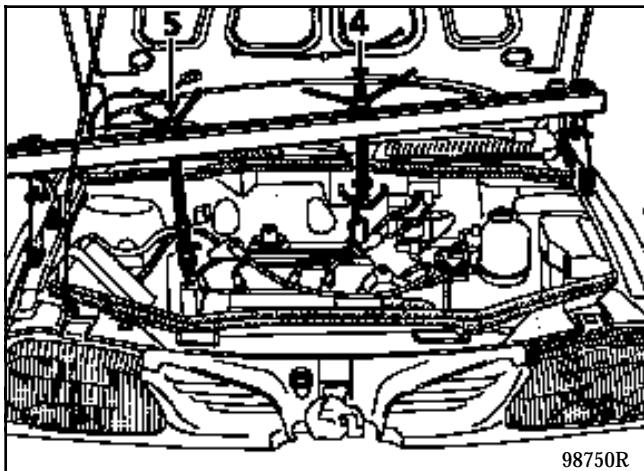
Release the clutch cable from the side member.

Remove the two mounting bolts for the power assisted steering pipe on the sub-frame and move the pipe to one side.



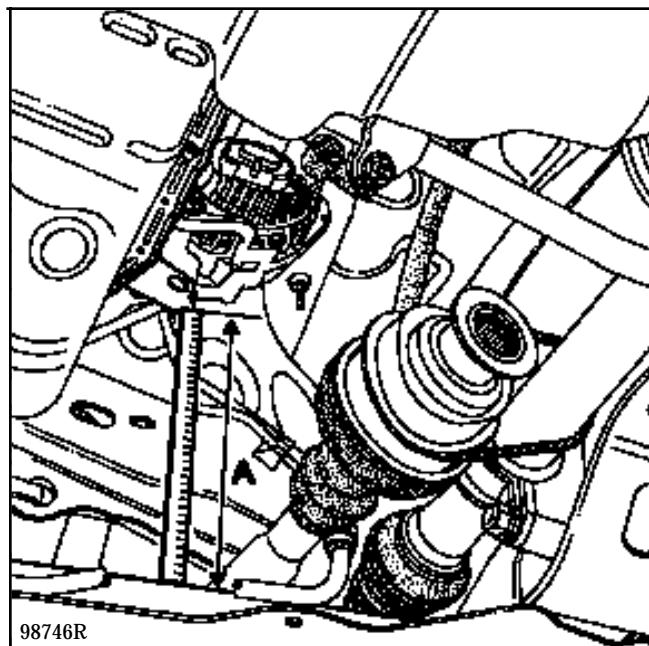
Lift the engine:

- using the two lifting rings (4) and (5) so that the three bolts (6) may be removed and remove the mounting (7) from the bottom,



PRJ1004

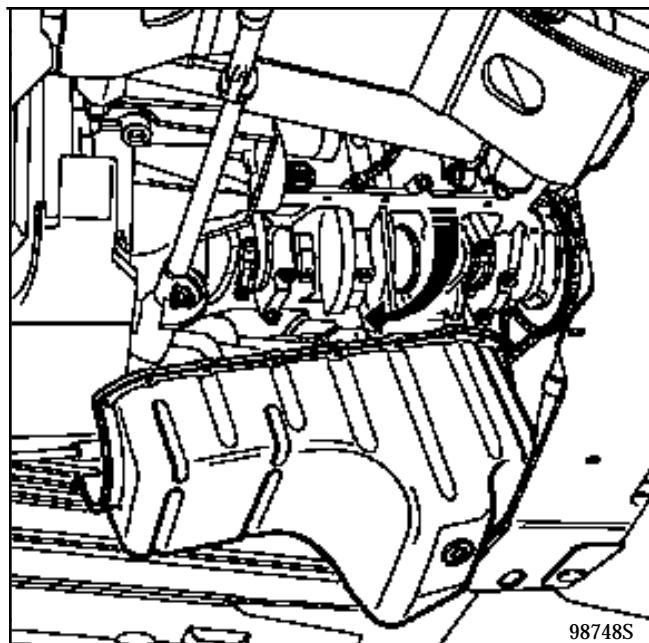
- using lifting ring (5) at the timing end to obtain dimension (A) of **26 cm** approximately between the sub-frame and the edge of the cylinder block.



**NOTE :** check that the main wiring for the engine connection unit does not jam between the 5th gear housing and the side member when the engine is lifted.

Remove:

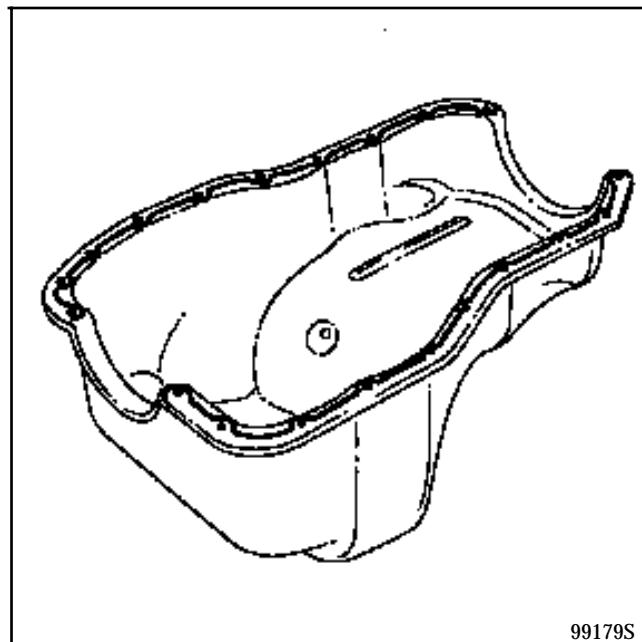
- the sump bolts then release the sump,
- the sump in the direction shown by the arrow.



98748S

**REFITTING**

Clean the sump before applying a bead of RHODORSEAL 5661 (eg- CAF 4/60 TIXO), width 3 mm.



**NOTE : remember to renew the two rubber seals at the edge of the sump.**

Refitting is the reverse of removal.

**EQUIPMENT REQUIRED**

**Engine support tool**  
(example : DESVIL M300)

**TIGHTENING TORQUES (in daN.m)**


<b>Sump bolt</b>	<b>1.2 to 1.5</b>
<b>Suspended engine mounting cover nut</b>	<b>4.5</b>

**REMOVAL**

Put the vehicle on a 2 post lift.

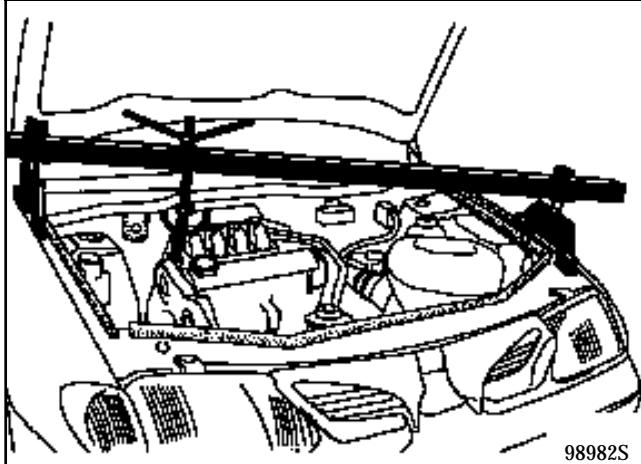
Disconnect the battery.

Drain the engine.

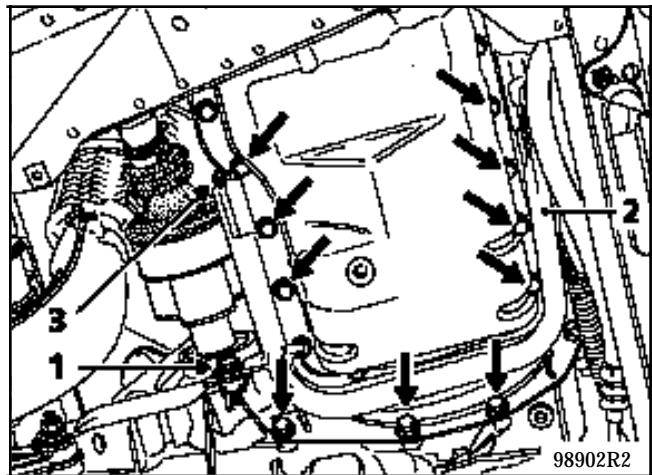
**Remove:**

- the tie bar between the shock absorber turrets,
- the plastic cap for the suspended engine mounting cover.

Fit the engine support tool (for example : **DESVIL M300**).


**Remove:**

- the two exhaust downpipe bolts,
- the engine tie bar bolt (1),
- the engine - gearbox tie bar (2).



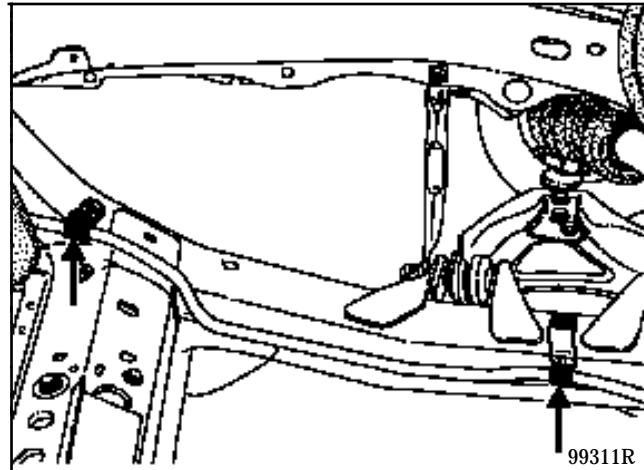
**NOTE :** bolt (3) is removed with a 50 star shaped socket (for example: EX 250 - FACOM, shortened to dimension X = 13 mm) and an 8 combination wrench.



98903S

Remove:

- the two mounting bolts for the power assisted steering pipe on the sub-frame and move it to one side,



- the sump bolts then release the sump,
- the nut from the suspended engine mounting cover.

Lift the engine using the engine support tool then remove the sump.

#### **REFITTING**

Refitting is the reverse of removal.

Fill the engine with oil.

## SPECIAL TOOLING REQUIRED

- Mot. 591-02 Index  
 Mot. 591-04 Angular wrench for angular tightening  
 Mot. 1135-01 Tool for tensioning timing belt  
 Mot. 1273 Tool for checking belt tension

TIGHTENING TORQUES		(in daN.m) or (in degrees)
Wheel bolt		9
Crankshaft pulley	2 daN.m + 68° ± 6°	
Timing belt tensioner nut		5

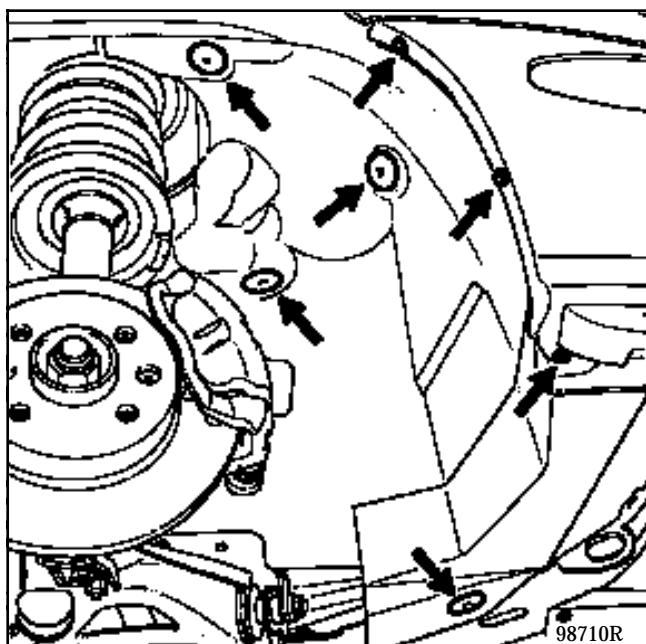
## REMOVAL

Put the vehicle on a 2 post lift.

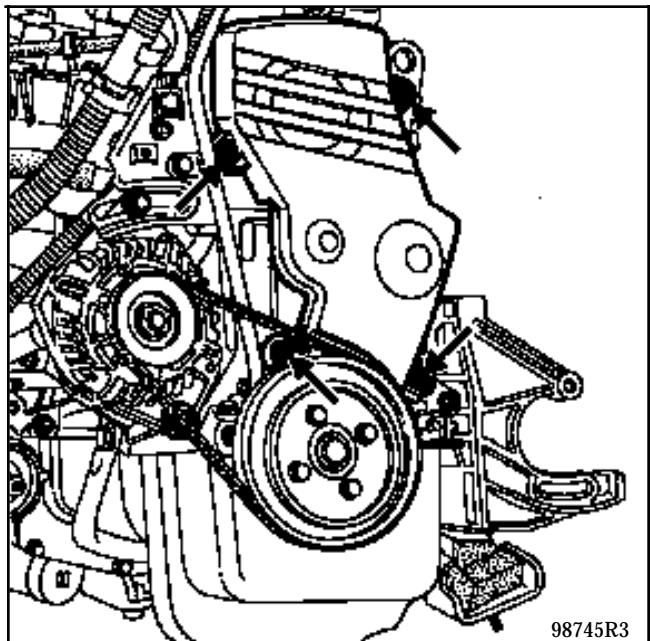
Disconnect the battery.

Remove:

- the power assisted steering belt,
- the alternator drive belt,
- the front right hand wheel,
- the front right protector at the end of the wheel arch,



- the crankshaft sprocket, immobilising the starter gear with a large screwdriver,
- the timing cover.

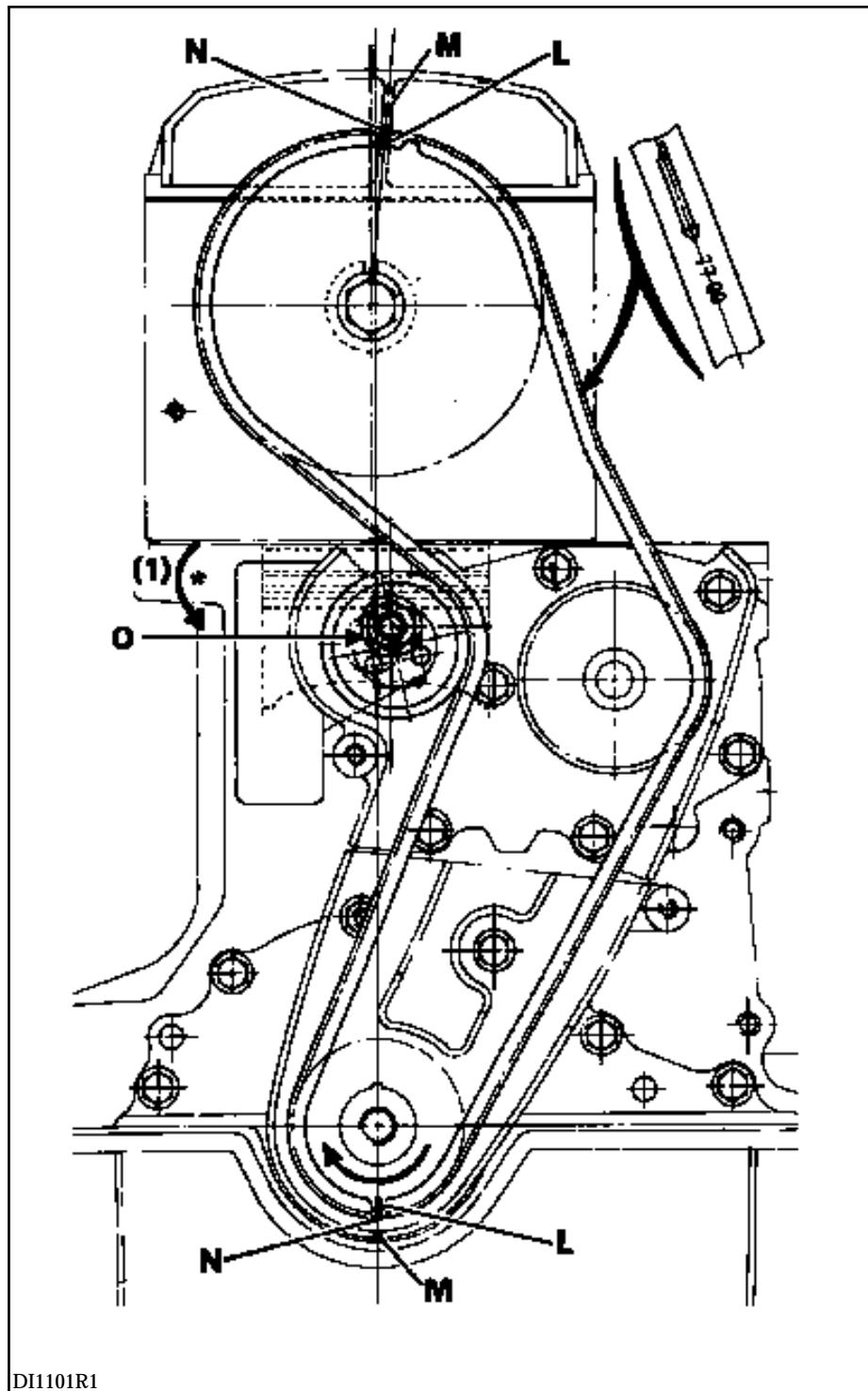


Set the engine to the timing adjustment position.

Align reference marks ( L ) on the sprockets with the fixed reference marks ( M ).

Slacken nut ( O ) then slacken the tensioner before removing the belt.

## ADJUSTING THE TIMING



(1) direction in which tensioner tightens

**REFITTING**

There is an arrow on the back of the belt showing the direction of rotation and two marks for adjustment.

Align the reference marks (marks N) on the belt with those on the sprockets (L) and the casings (M).

Ensure the belt is fitted in the correct direction and begin positioning it on the crankshaft sprocket.

By moving the tensioner using tool Mot. 1135-01, tighten the belt until the fitting tension is obtained (see section 07 Timing belt tension ).

Tighten tensioner nut (O) to 5 daN.m.

***It is vital to tighten the tensioner nut to 5 daN. m to avoid any loosening of the tensioner which could damage the engine.***

Refitting is the reverse of removal.

**NOTE**

- To refit the crankshaft pulley, tighten the crankshaft pulley bolt to 2 daN.m plus an angle of **68° ± 6°**.
- To tension the accessories belt (see section 07 accessories belt tension).

SPECIAL TOOLING REQUIRED		
Mot.	1054	TDC pin
Mot.	1273	Tool for checking belt tension
Mot.	1289-03	Fork for centring suspended mounting limiter
EQUIPMENT REQUIRED		
Star socket ST X 14 FACOM for example		
Engine support tool DESVIL M300 for example		

TIGHTENING TORQUES	(in daN.m)	
Wheel bolt	9	
Crankshaft pulley bolt	12	
Engine suspended mounting bolt	6	
Cylinder head suspended mounting bolt	2	
Engine suspended mounting cover bolt	4	
Timing belt tensioner nut	4	

**REMOVAL**

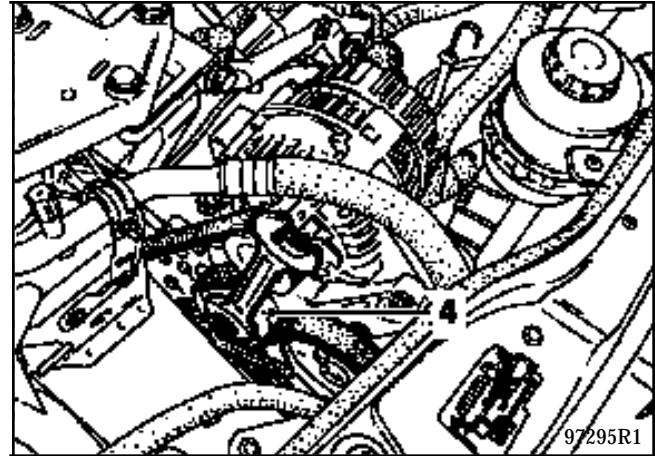
Put the vehicle on a 2 post lift.

Disconnect the battery.

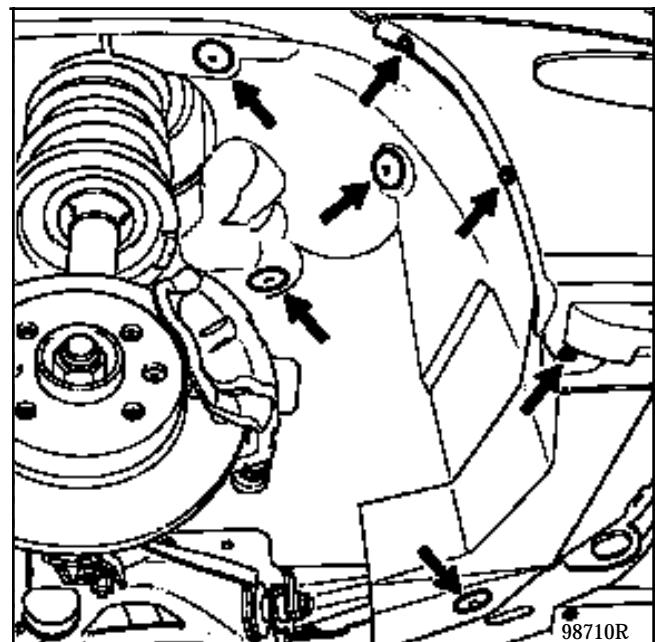
**Remove:**

- the computer and its mounting,
- the accessories belt in the following manner:  
Slacken the tensioner (4) by the central bolt, using a 7 mm allen key, by a quarter turn (cut the end of the tool to approximately 12 mm) while holding the outer nut with a 22 mm open wrench.

Slackening the tensioner using the 22 mm wrench automatically damages the adjustment teeth, destroying the air conditioning and/or power assisted steering mounting.

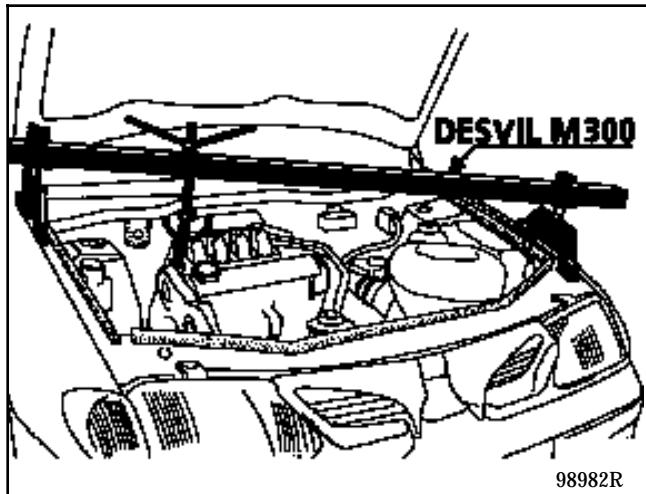
**Remove:**

- the front right hand wheel,
- the front right protector at the end of the wheel arch,



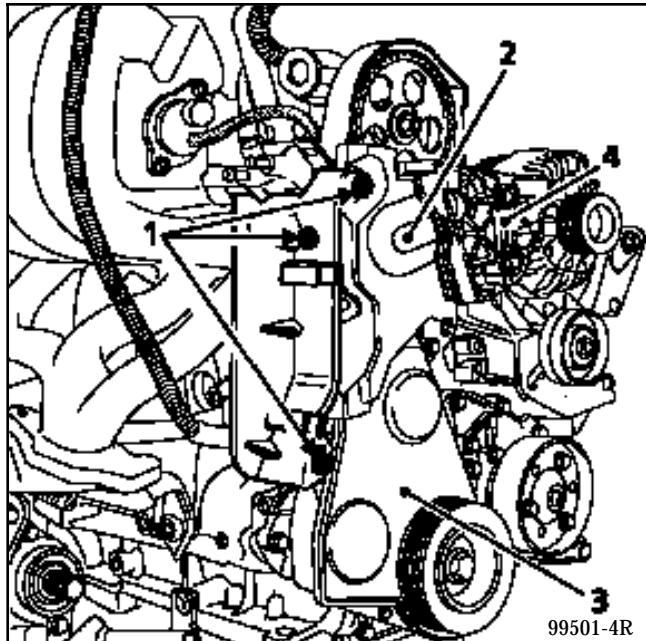
- the crankshaft pulley bolt,
- the tie bar between the shock absorber turrets.

Fit the engine support tool **DESVIL M300** for example.



Remove:

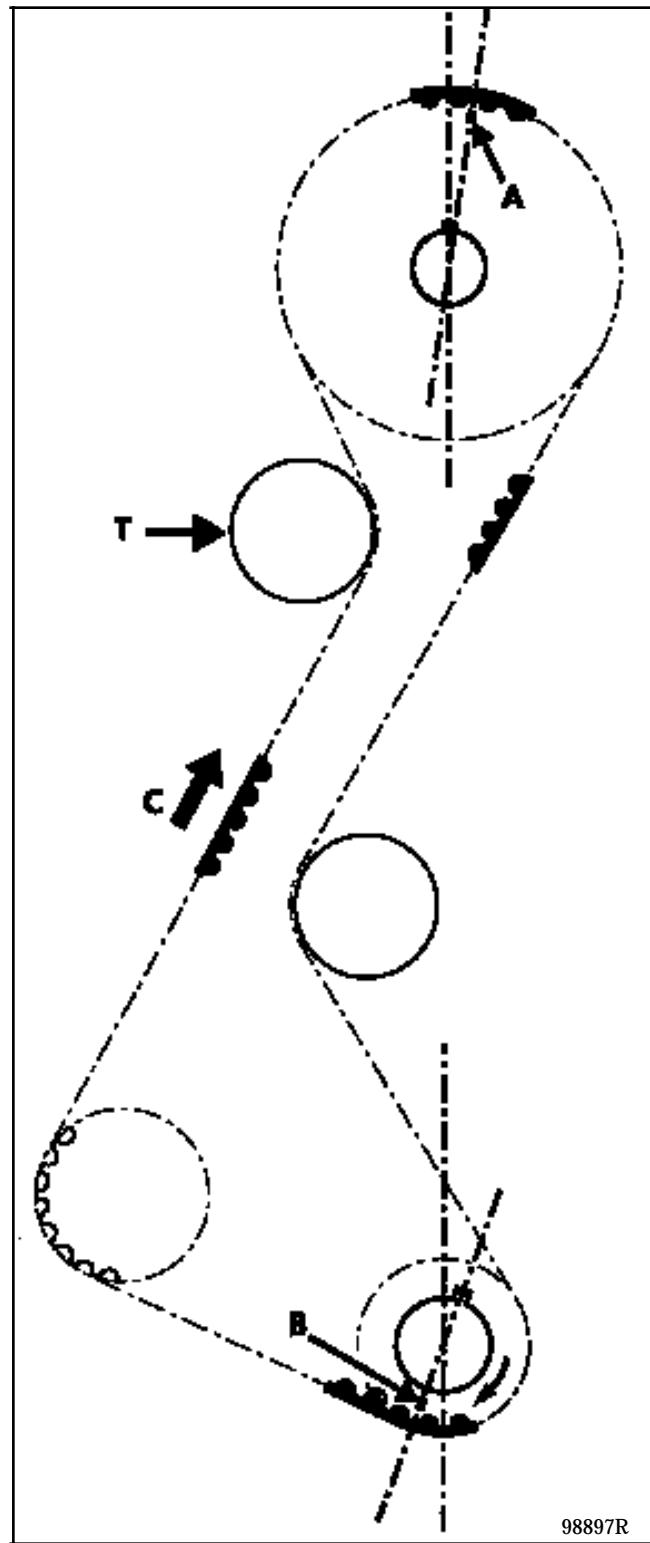
- the plastic protector from the suspended engine mounting cover,
- the suspended mounting and cover,
- bolts (1) from the fuel pipe mounting,
- the two timing covers (2) and (3),

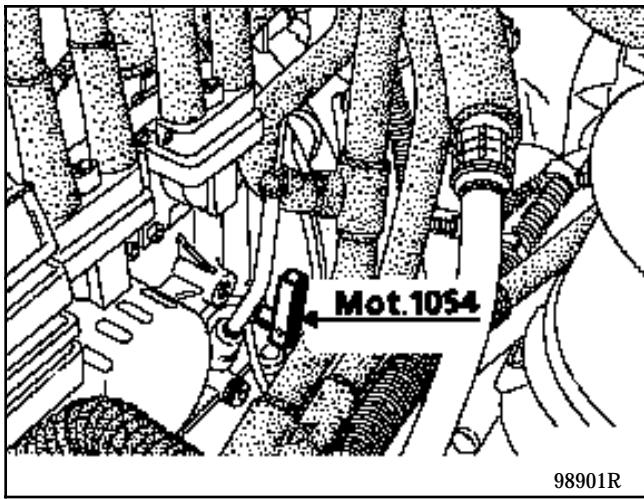


- the suspended mounting support (4) on the cylinder head.

**Note :** the timing belt is **captive** on its mounting.  
Remove the TDC plug.

Turn the crankshaft to the timing adjustment position (see diagram below) and insert the TDC pin **Mot. 1054**.





Slacken the tensioner (T) and remove the belt.

**Note :** if the tensioner nut is slackened by more than one turn, it may disengage.

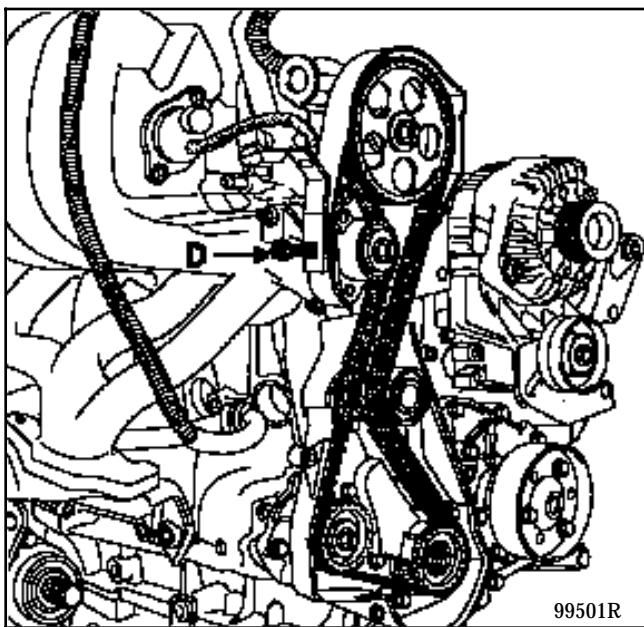
#### REFITTING

Check that pin **Mot. 1054** is in position.

Position the belt, ensuring :

- the fitting direction arrow (C) is located between the intermediate shaft sprocket and the tensioner,
- the reference marks on the belt are aligned with the marks on the sprockets (engine removed or crankshaft output pulley removed) between (A) and (B) 61 teeth.

Pretension the timing belt by tightening one bolt (D) on the inner timing cover.



For the method for tensioning the belt (see section 07 Timing belt).

Lock the tensioner at **4 daN.m**.

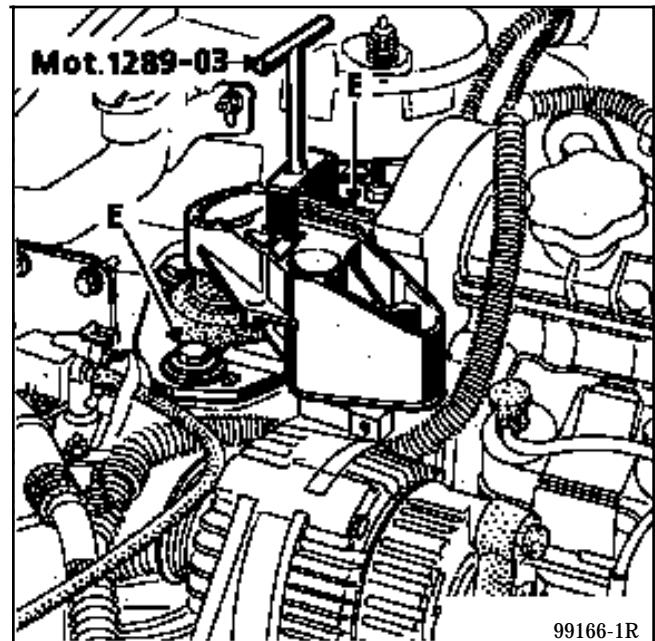
Refitting is then the reverse of removal.

Fit the limiter assembly with the suspended mounting cover.

#### ADJUSTING THE LONGITUDINAL MOVEMENT LIMITER

Slacken limiter bolts (E).

Insert the limiter centring fork **Mot. 1289-03** into the openings in the suspended mounting cover.



Tighten the 2 bolts (E) to a torque of **5 to 6.5 daN.m**.

SPECIAL TOOLING REQUIRED		
Mot.	1054	TDC pin
Mot.	1202	Hose clip pliers
Mot.	1273	Tool for checking belt tension
Mot.	1289-03	Fork for centring suspended mounting limiter
EQUIPMENT REQUIRED		
Star socket ST X 14		FACOM for example
Engine support tool		DESVIL M300 for example

TIGHTENING TORQUES	(en daN.m)	
Wheel bolt	9	
Crankshaft pulley bolt	12	
Suspended mounting limiter bolt	6	
Suspended mounting cover bolt	4	
Tensioner nut	5	

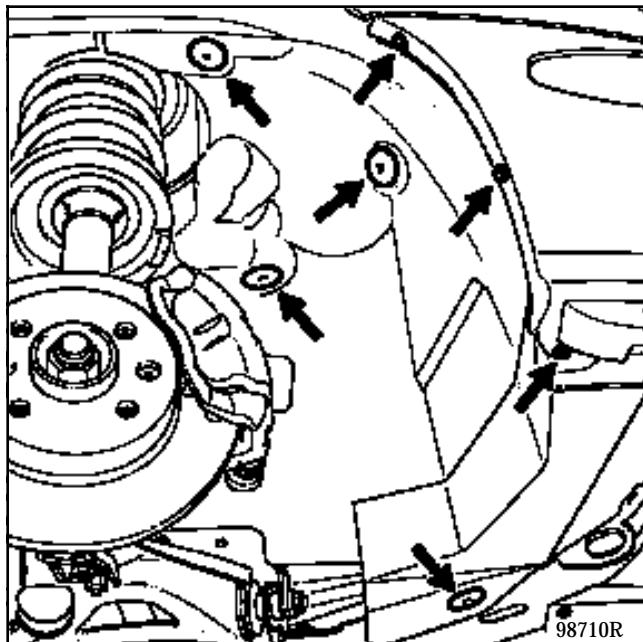
**REMOVAL**

Put the vehicle on a 2 post lift.

Disconnect the battery.

**Remove:**

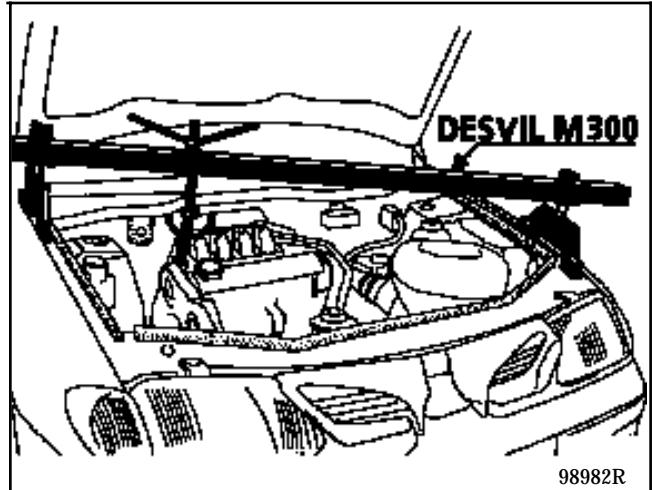
- the front right hand wheel,
- the protection at the end of the wheel arch,



- the acoustic tie bar between the shock absorber turrets,

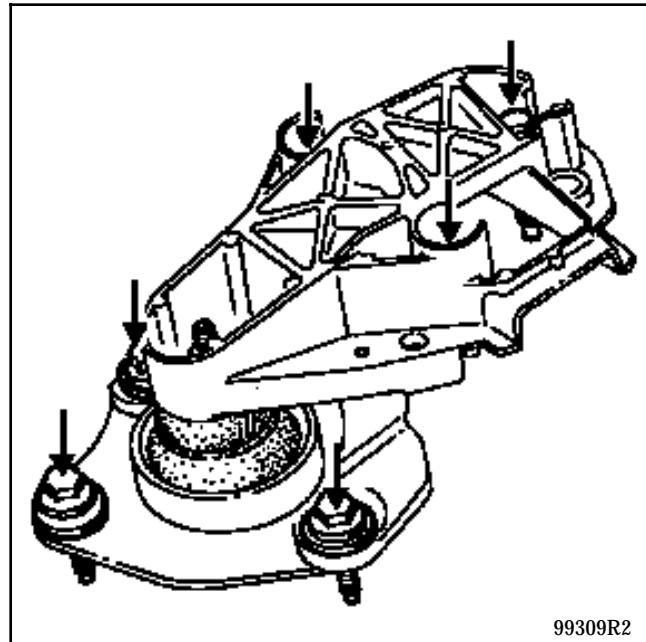
- the right hand suspended mounting cap.

Position the engine support tool **DESVIL M300** for example.



**Remove:**

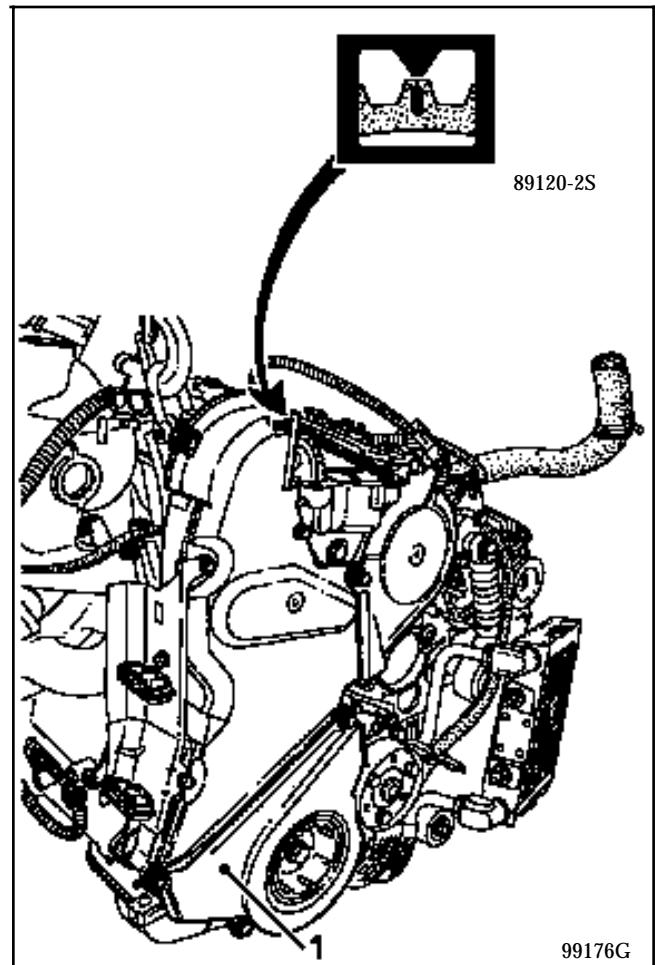
- the suspended mounting cover and the movement limiter,



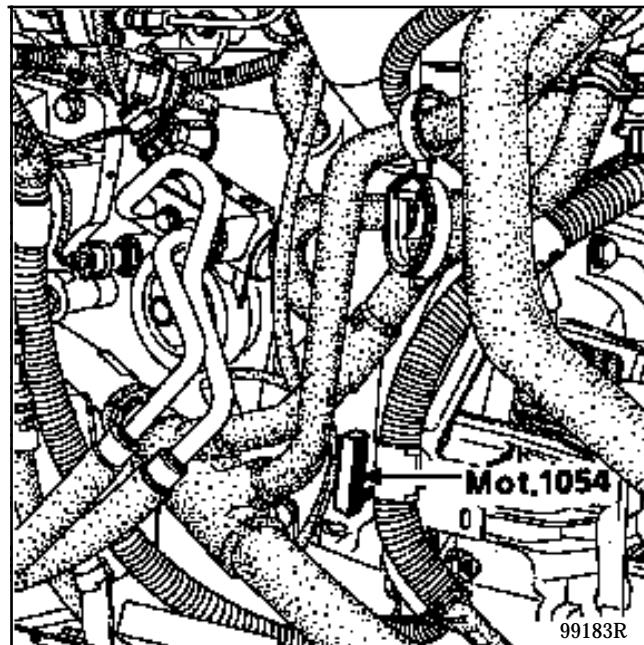
- the lower timing casing (1),

- the alternator drive belt (see section 16 "Removing the alternator"),

Turn the crankshaft to position the camshaft timing reference mark in the timing window.

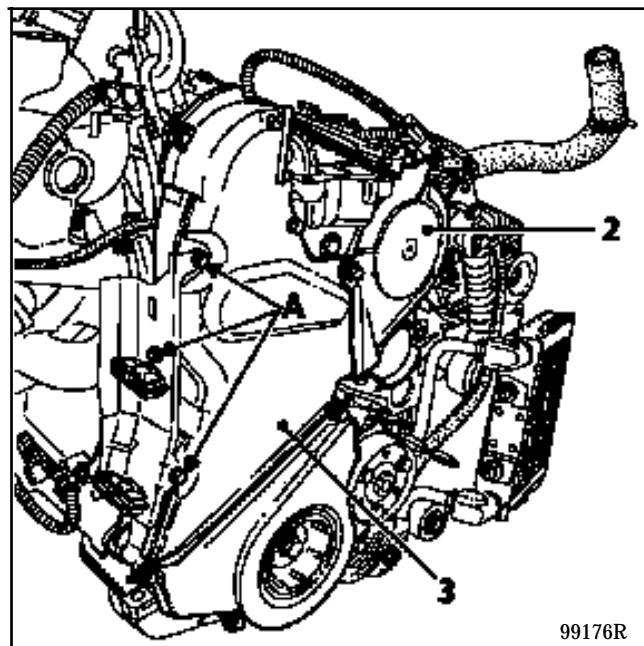


Fit the TDC pin , Mot.1054.



**Remove:**

- the fuel pipe mounting bolts (A),
- the timing covers (2) and (3).



Slacken the tensioner and remove the belt.

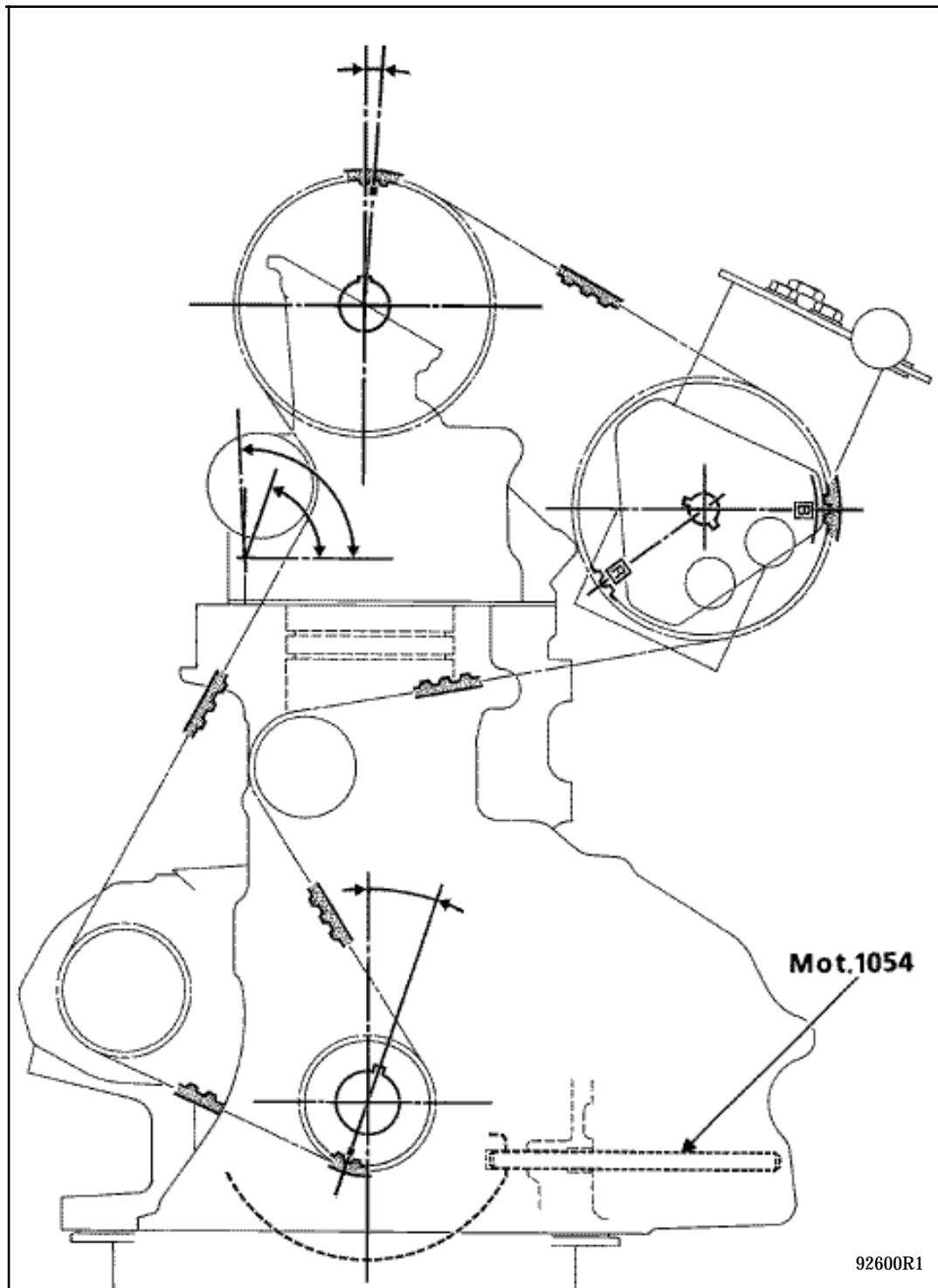
**Note :** if the tensioner nut is slackened by more than one turn, it may disengage.

**REFITTING (special notes)**

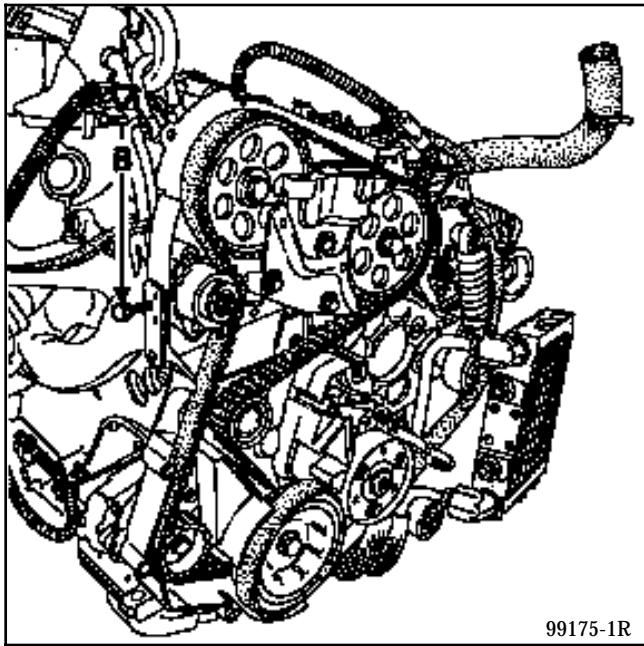
Check that tool **Mot. 1054** is in position.

Fit the belt, aligning the reference marks on the pulleys and belt.

Injection pump reference mark: **B** (BOSCH), **R** (LUCAS DIESEL)



Tighten the timing belt by tightening one bolt (B) on the inner timing cover.



Fit tool Mot. 1273 and tension the belt until the fitting tension is obtained (see section 07, Timing belt tension ).

Tighten the tensioner nut to **5 daN.m**.

It is vital to tighten the tensioner nut to 5 daN. m to avoid any loosening of the tensioner which could damage the engine.

Refit the crankshaft pulley and ensure the bolt is tightened to a torque of **12 daN.m**.

Refitting is then the reverse of removal.

Fit the suspended mounting cover assembly and the movement limiter.

### ADJUSTING THE LONGITUDINAL MOVEMENT LIMITER

Slacken limiter bolts (4).

Insert the limiter centring fork Mot. 1289-03 into the openings in the suspended mounting cover.



Tighten the limiter bolts (4) to a torque of **5.5 daN.m**.

Check the injection pump timing (see section 13, injection pump).

SPECIAL TOOLING REQUIRED		
Mot.	588	Retaining flange
Mot.	591-02	Index
Mot.	591-04	Angular wrench for angular tightening
Mot.	1273	Tool for checking belt tension
EQUIPMENT REQUIRED		
Star socket ST X 12    FACOM for example		

TIGHTENING TORQUES		(in daN.m) or (in degrees)
Wheel bolt		9
Crankshaft pulley		$2 \text{ daN.m} + 68^\circ \pm 6^\circ$
Timing tensioner nut		5

### REMOVAL

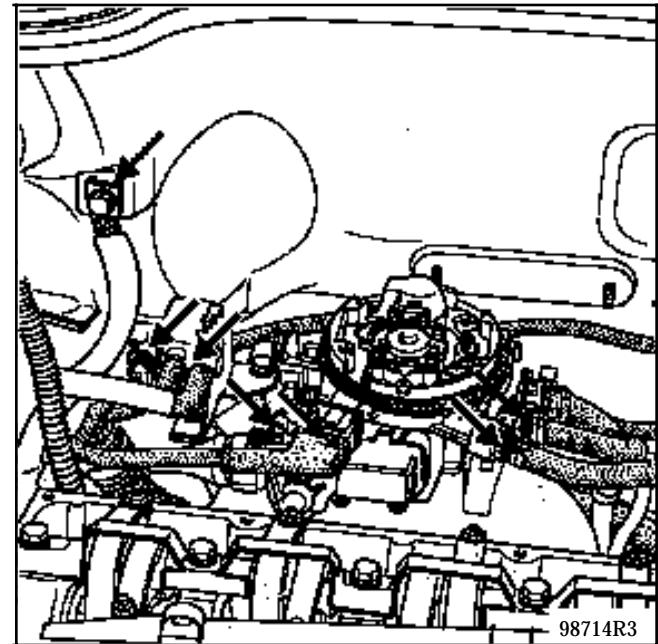
Put the vehicle on a 2 post lift.

Disconnect the battery.

Remove:

- the timing belt (see section 11, timing belt),
- the air filter,
- the rocker box cover,
- the earth strap,
- the fuel pipes,
- the canister solenoid valve pipe.

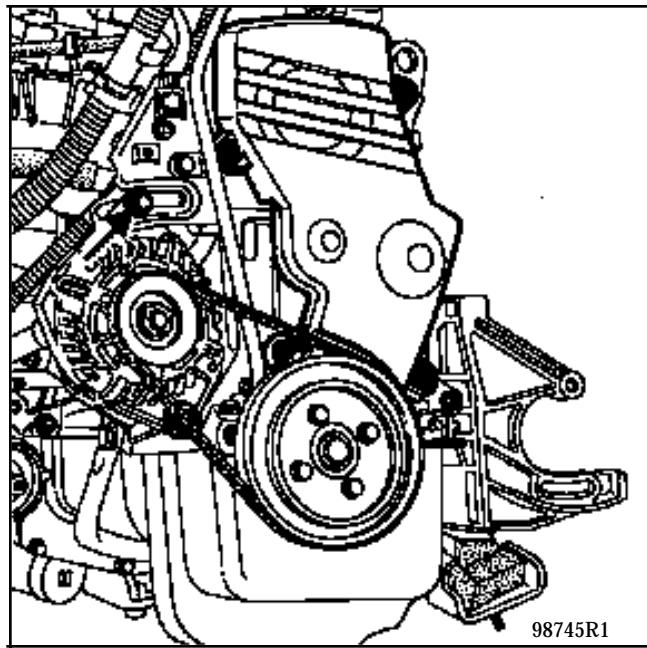
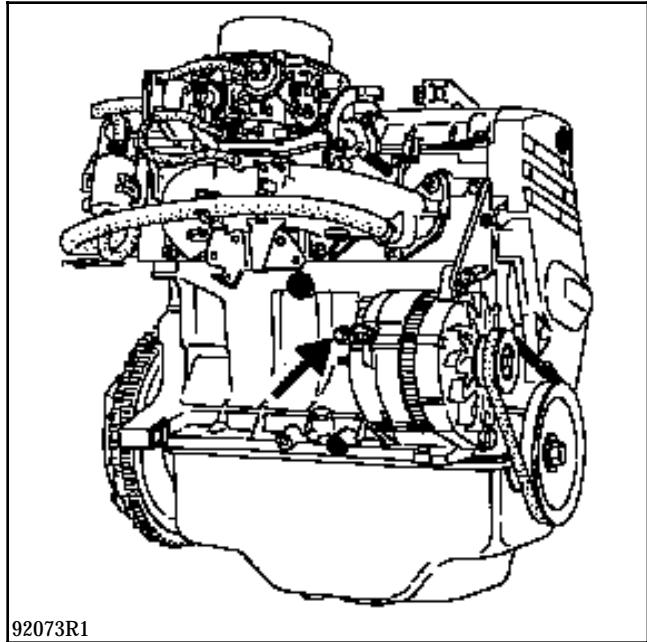
Disconnect the throttle body connections.



Release the wiring from the cylinder head.

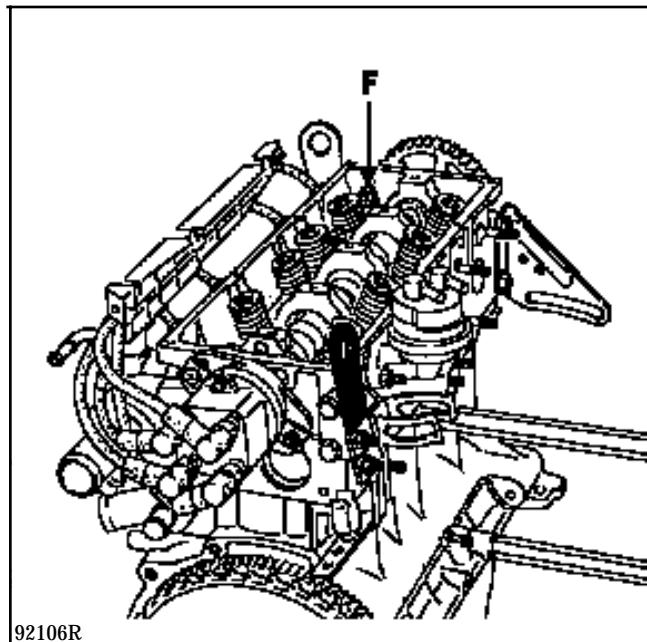
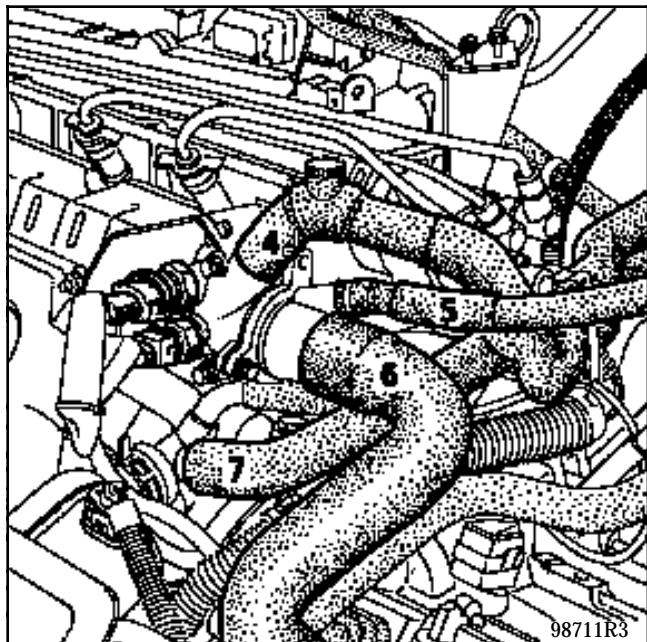
Remove the upper mounting bolt for the dipstick, the brake servo pipes and the absolute pressure sensor, together with the accelerator cable.

Drain the cooling circuit via the lower radiator hose and the cylinder block via the drain bolt.



### Remove:

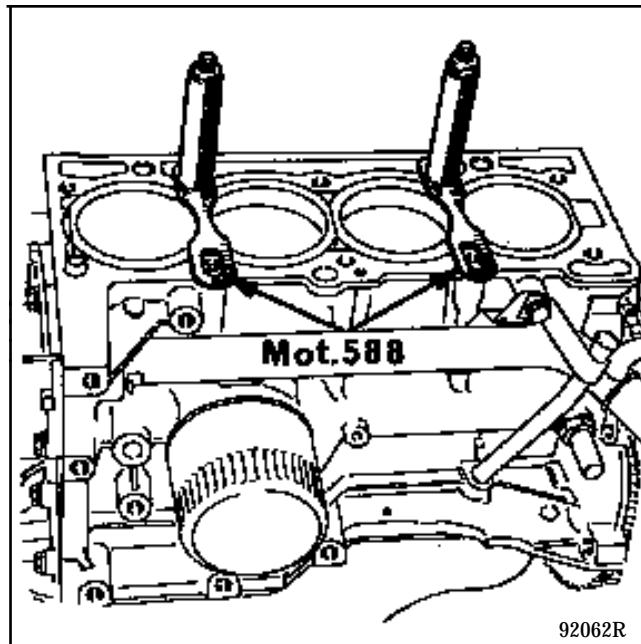
- the thermostat hose,
- the connectors for the sensors,



- hoses 4, 5, 6, and 7,
- the upper alternator mounting,

- the cylinder head, the gasket.

Fit the liner retaining flanges  
**Mot. 588** (except K7M).



#### CLEANING

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

Use **Décapjoint** to dissolve any gasket remaining on the metal.

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

Gloves should be worn during this operation.

Remember that this operation should be carried out with extreme care to avoid the risk of foreign bodies being introduced into the oilways bringing oil under pressure to the rocker shaft (oilways are located in both the cylinder head and the cylinder block).

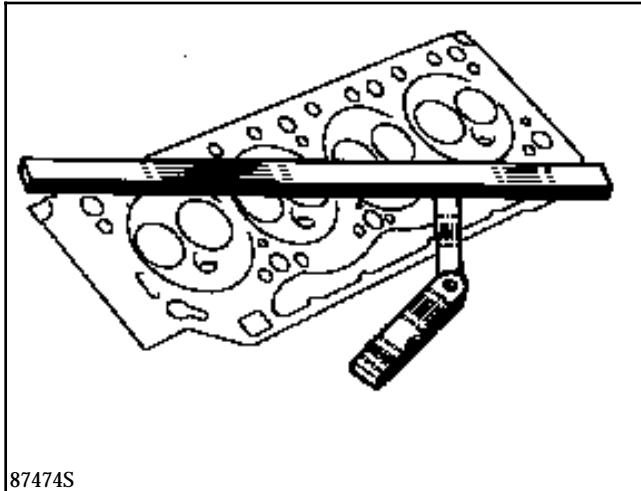
If this recommendation is not observed there is a risk that the rocker jets may become blocked and damage may occur rapidly to the rocker cams and tappets.

**CHECKING THE GASKET FACE**

Use a straight edge and a set of shims to check for gasket face deformation.

Maximum bow **0.05 mm**.

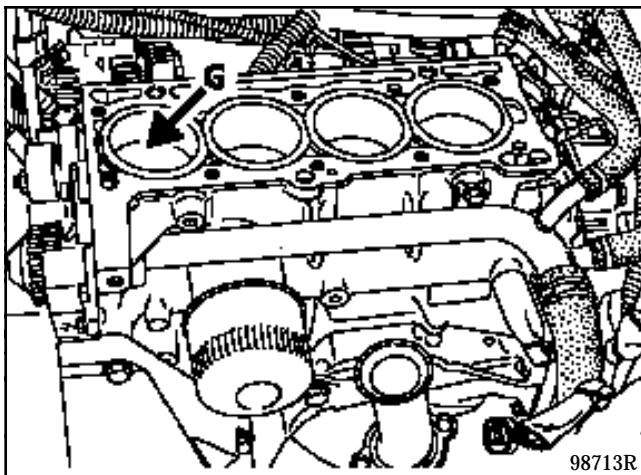
**The cylinder head may not be re-ground.**

**REFITTING (Special notes)**

Remove the liner retaining flanges Mot. 588  
(except K7M).

Wipe the gasket faces of the cylinder block and the cylinder head.

Check the centring dowel is present (G).



Position the cylinder head gasket.

Refit the cylinder head, lubricate the threads and the bearing faces under the heads of the bolts with engine oil.

**Note :** check the length of the bolts for the cylinder head, **the shorter ones are used on the inlet side.**

Cylinder head tightening (see section 07, cylinder head tightening).

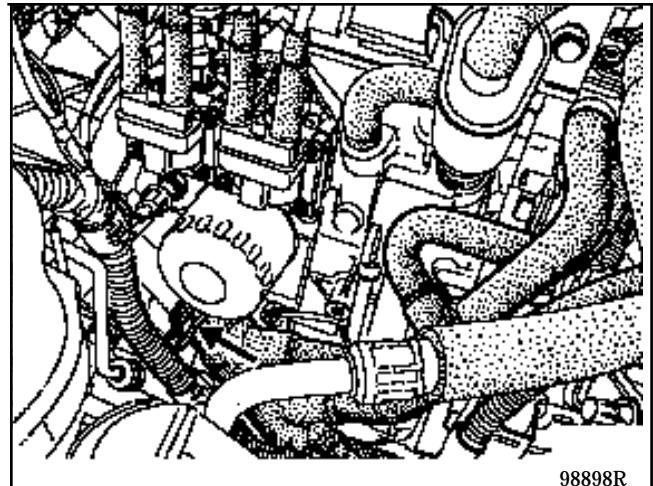
Refitting is the reverse of removal.

For refitting the timing belt, (see section 11-Timing belt).

Fill and bleed the cooling circuit, (see section 19).

SPECIAL TOOLING REQUIRED				
Mot. 591-04	Angular wrench for tightening the cylinder head			
Mot. 591-02	Index			
Mot. 1054	TDC pin			
Mot. 1159	Engine support tool			
Mot. 1273	Tool for checking belt tension			
Mot. 1289-03	Fork for centring the suspended engine mounting limiter			
EQUIPMENT REQUIRED				
Allen key for cylinder head bolts ST 10L FACOM for example				
Engine support tool DESVIL M300 for example				
Star socket ST X 14 FACOM for example				
Star shaped elbowed allen key T50 FACOM for example				

TIGHTENING TORQUES (in daN.m)		
Front right suspended engine mounting cover nut	3 to 4.5	
Wheel bolt	9	
Tensioner nut	4	
Suspended engine mounting cover bolt	4	
Suspended engine mounting limiter bolt	6	
Crankshaft pulley	12	
Bolt mounting suspended engine mounting on cylinder head	2	



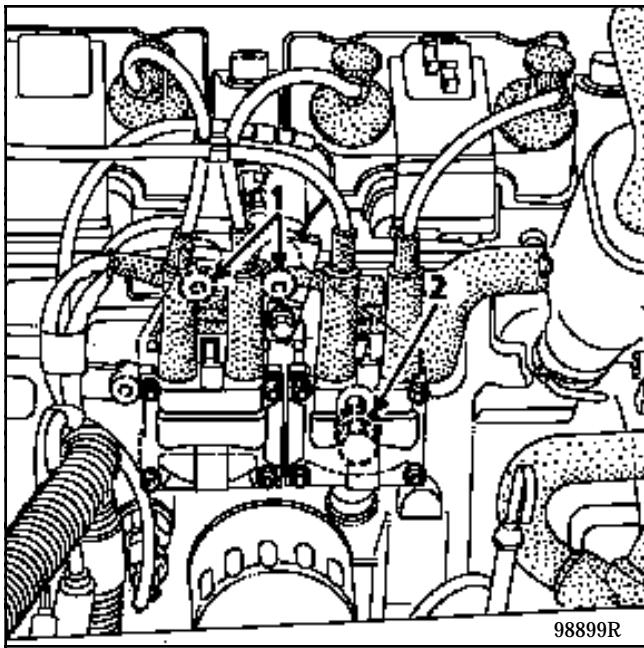
### REMOVAL

Put the vehicle on a 2 post lift.

Disconnect the battery.

Drain the cooling circuit from the lower radiator hose at the water pump end.

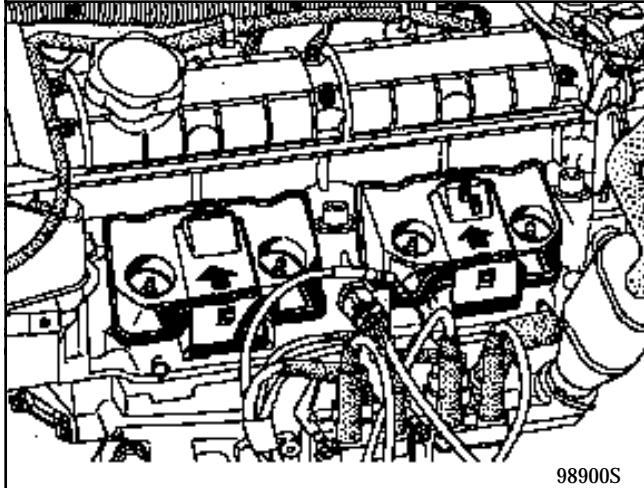
Remove the 2 bolts (1) and slacken bolt (2) of the coil mounting then slide it downwards.

**Remove:**

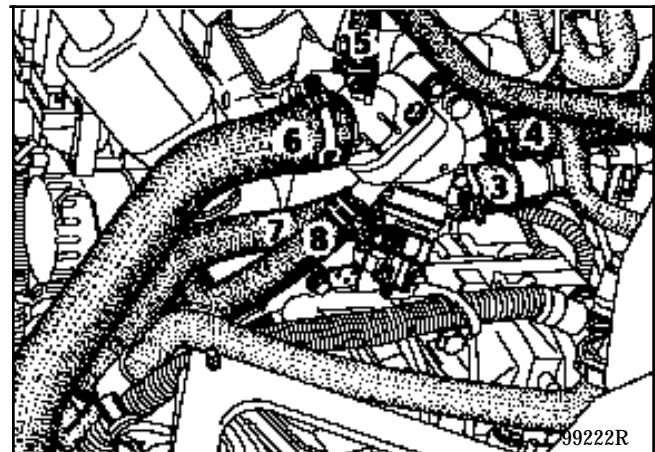
- the timing belt (see section 11-Timing belt),
- the spark plug caps.

**Disconnect:**

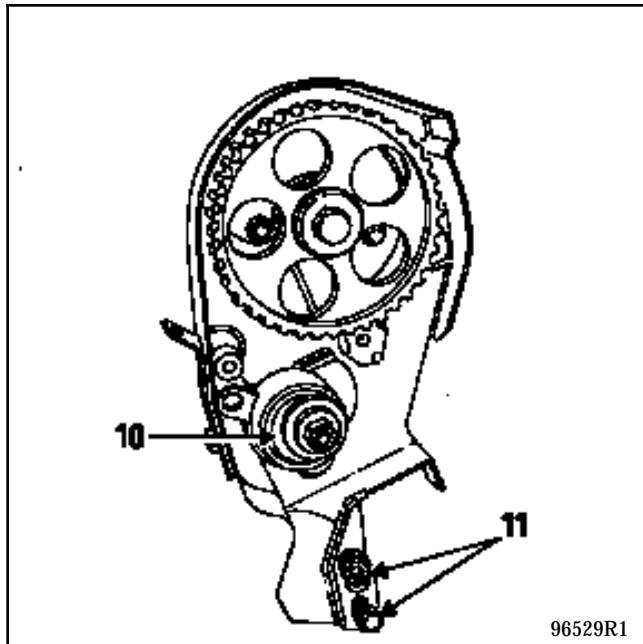
- the pinking sensor,
- the cylinder reference sensor,
- the absolute pressure sensor and its pipe,
- the idle speed valve,
- the air and coolant sensors,
- the throttle potentiometer,
- the injectors,
- the canister solenoid valve pipe,
- the oil vapour rebreathing pipe,
- the brake servo pipe,
- the accelerator cable,
- the fuel supply and return pipes (gallery end),
- the coolant temperature sensor (9).

**Remove:**

- the air filter,
- hoses 3, 4, 5, 6, 7, 8,



- the earth strap,
- the timing belt tensioner (10),
- the two bolts (11) mounting the upper inner timing cover,

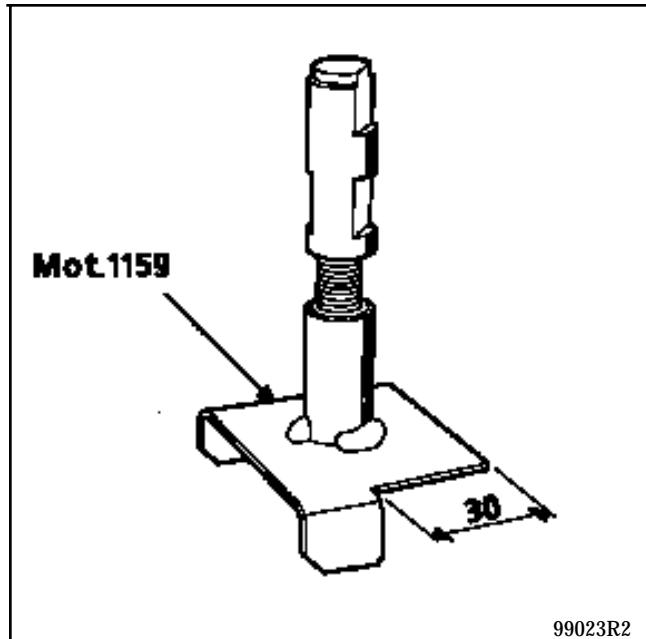


96529R1

Lift the engine slightly.

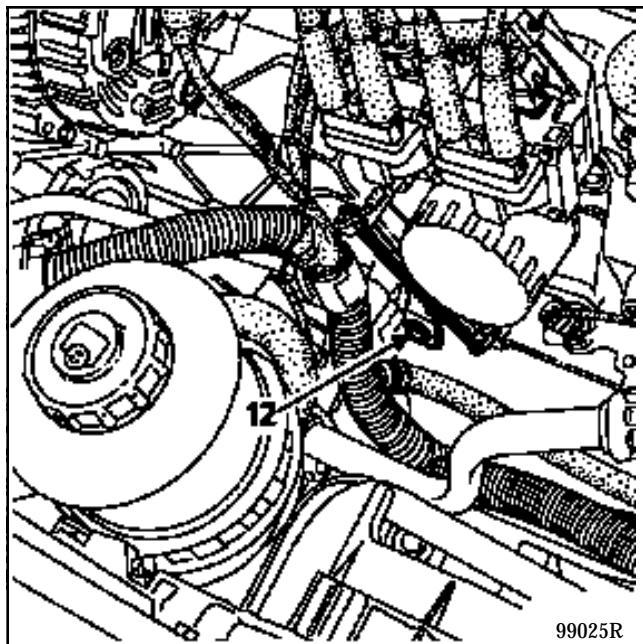
Fit tool Mot. 1159 under the oil pump.

**Note :** cut the base of tool Mot. 1159 to 30 mm.

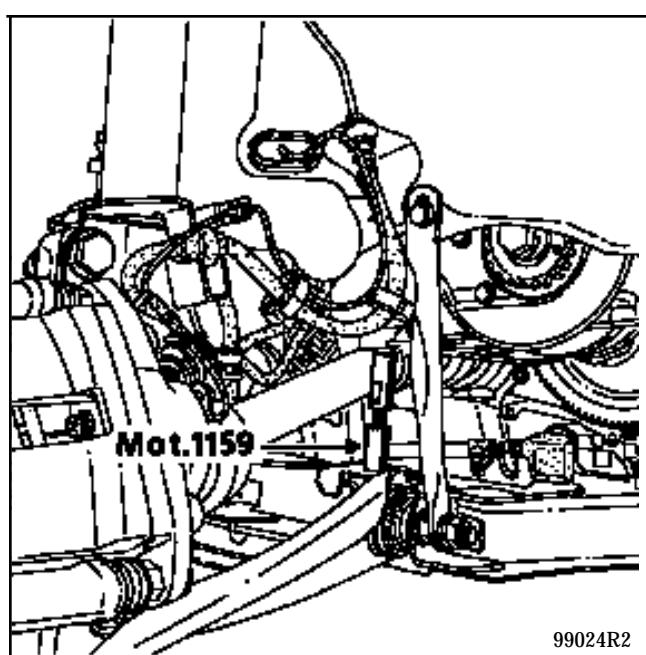


99023R2

- the exhaust downpipe,
- the exhaust strut,
- mounting bolt (12) for the water hose.

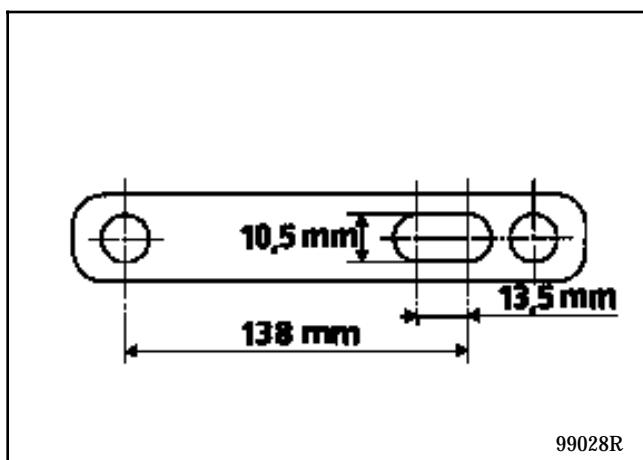


99025R

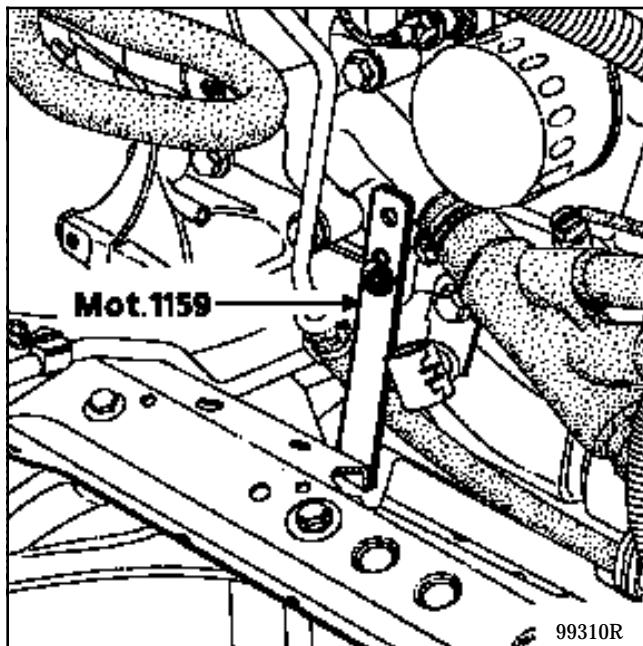


99024R2

Diagram for drilling tool Mot. 1159 for use with BA0X (diameter 10.5 mm).



Fit the bracket of tool Mot. 1159 under the water pump.

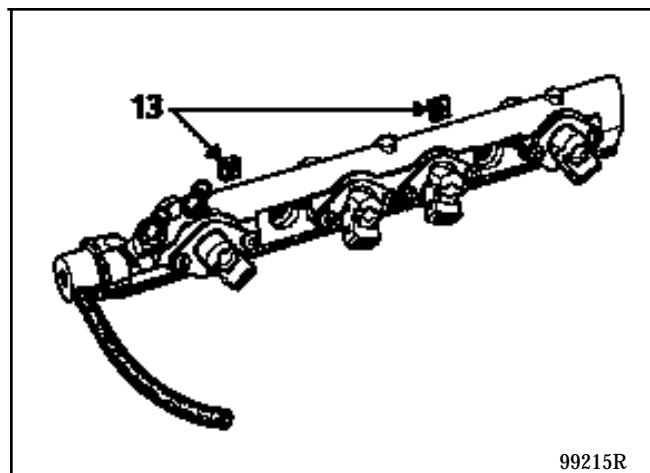


Remove the engine support tool DESVIL M300 for example.

Remove:

- the throttle body,
- the fuel gallery.

**Note :** ensure that seals (13) do not fall off when removing the pump,



- the cylinder head bolts, using a 10 mm, long allen key, FACOM ST10L for example.
- the cylinder head.

**CLEANING**

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

Use **Décapjoint** to dissolve any gasket remaining on the metal.

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

Gloves should be worn during this operation.

Remember that this operation should be carried out with extreme care to avoid the risk of foreign bodies being introduced into the oilways bringing oil under pressure to the camshaft (oilways are located in both the cylinder head and the cylinder block).

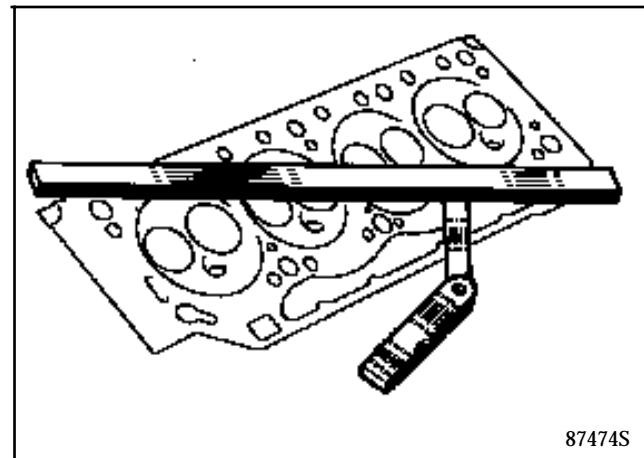
If this recommendation is not observed there is a risk that the rocker jets may become blocked and damage may occur rapidly to the rocker cams and tappets.

**CHECKING THE GASKET FACE**

Use a straight edge and a set of shims to check for gasket face deformation.

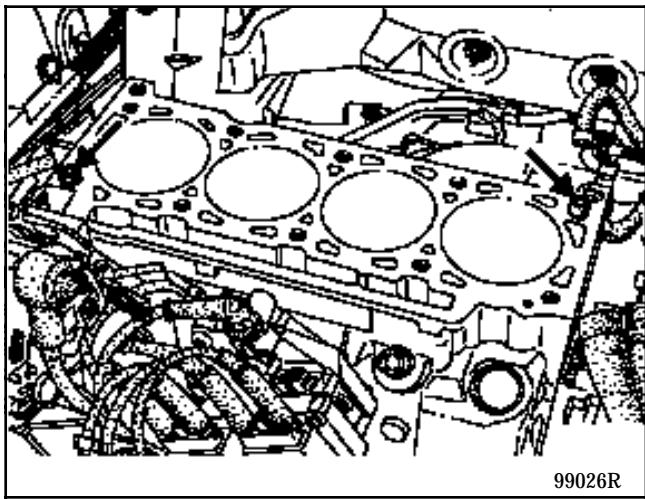
Maximum bow **0.05 mm**.

**The cylinder head may not be re-ground.**



**REFITTING (special notes)**

The cylinder head is centred by two dowels.



Tighten the cylinder head (see section tightening the cylinder head).

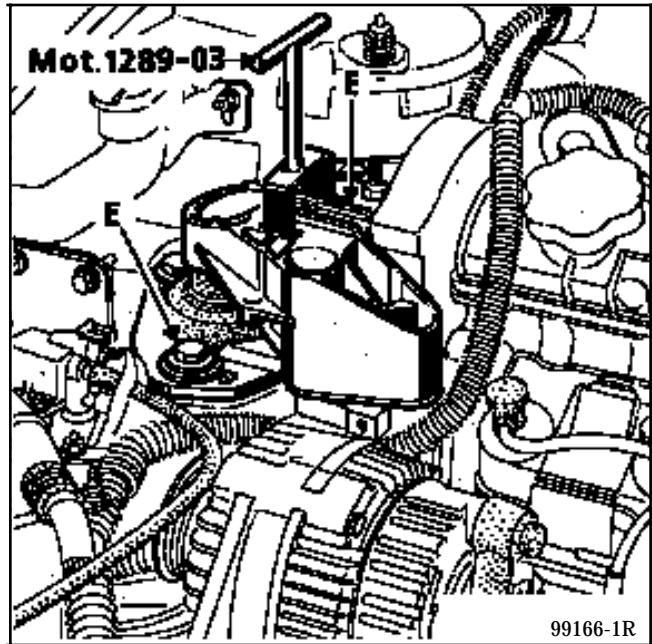
Refitting is the reverse of removal.

Fit the limiter assembly plus the suspended engine mounting cover.

**ADJUSTING THE LONGITUDINAL MOVEMENT LIMITER**

Slacken limiter bolts (E).

Insert the limiter centring fork Mot. 1289-03 into the openings in the suspended mounting cover.



Tighten the 2 bolts (E) to a torque of **5 to 6.5 daN.m.**

Fill and bleed the cooling circuit (see section 19).

Adjust the accelerator cable.

SPECIAL TOOLING REQUIRED		
Mot.	251-01	Dial gauge mounting
Mot.	252-01	Pressure plate for measuring cylinder liner protrusion
Mot.	1311-06	Tool for removing fuel pipe
Mot.	591-02	Index
Mot.	591-04	Angular wrench for tightening the cylinder head
Mot.	1054	TDC pin
Mot.	1159	Tool for retaining the engine on the sub-frame
Mot.	1202	Hose clip pliers
Mot.	1273	Tool for checking belt tension
Mot.	1281-01	Oil filter wrench
Mot.	1289-03	Fork for centring suspended engine mounting limiter
EQUIPMENT REQUIRED		
Star socket ST X 14 FACOM for example		
Star socket EX 255 FACOM for example		
Engine support tool DESVIL M300 for example		

TIGHTENING TORQUES	(in daN.m)	扳手
Wheel bolt	9	
Crankshaft pulley bolt	12	
Suspended engine mounting cover bolt	6	
Suspended engine mounting limiter bolt	4	
Tensioner nut	5	

### REMOVAL

Put the vehicle on a 2 post lift.

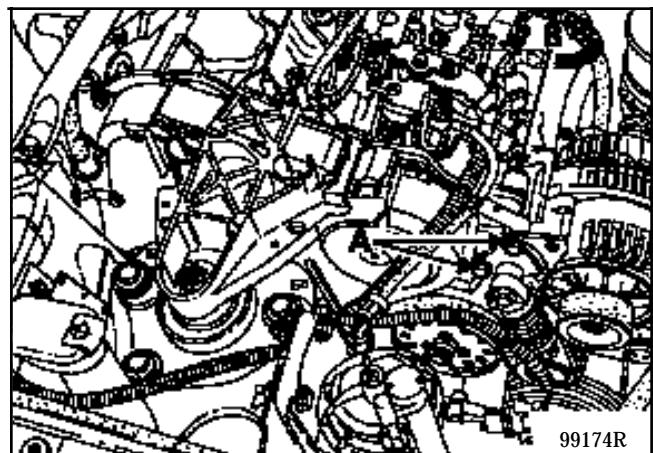
Disconnect the battery.

Remove the engine undertray.

Drain the cooling circuit via the lower radiator hose (radiator end).

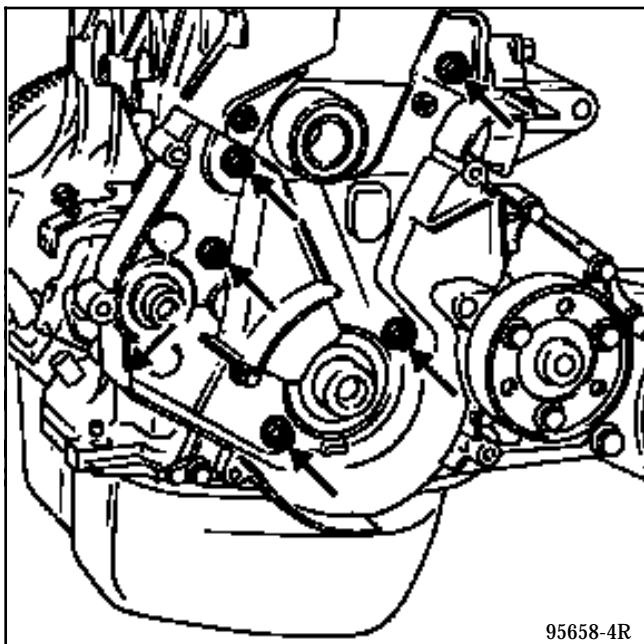
### Remove:

- the timing belt (see section 11 - timing belt),
- bolts (A) mounting the tensioner, together with bolt (B) for the alternator drive belt tension strut mounting,



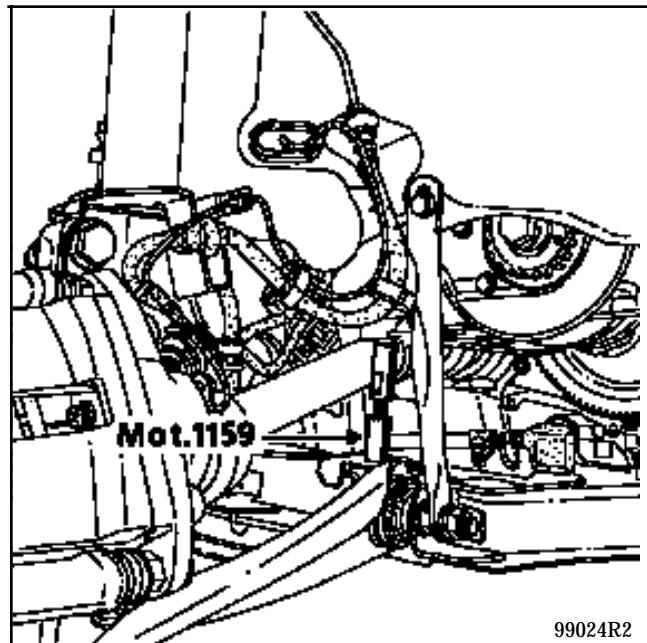
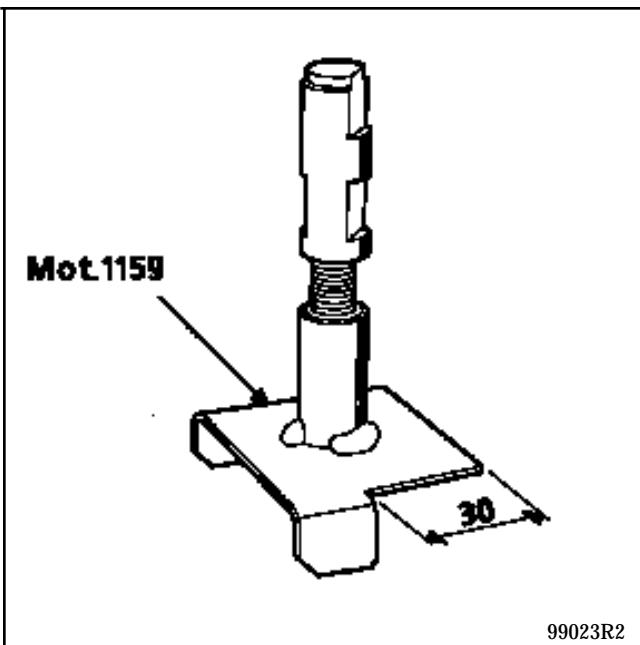
99174R

- the exhaust flange at the manifold outlet,
- the air filter,
- the earth strap,
- the fuel return union on the injection pump, together with the mounting bracket on the manifold,
- the mounting bolts for the inner timing cover on the engine block.



Fit tool Mot. 1159 under the oil pump.

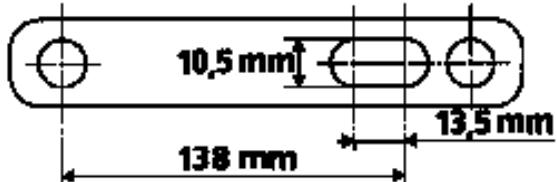
**Note :** cut the base of tool Mot. 1159 to 30 mm.



Remove the oil filter.

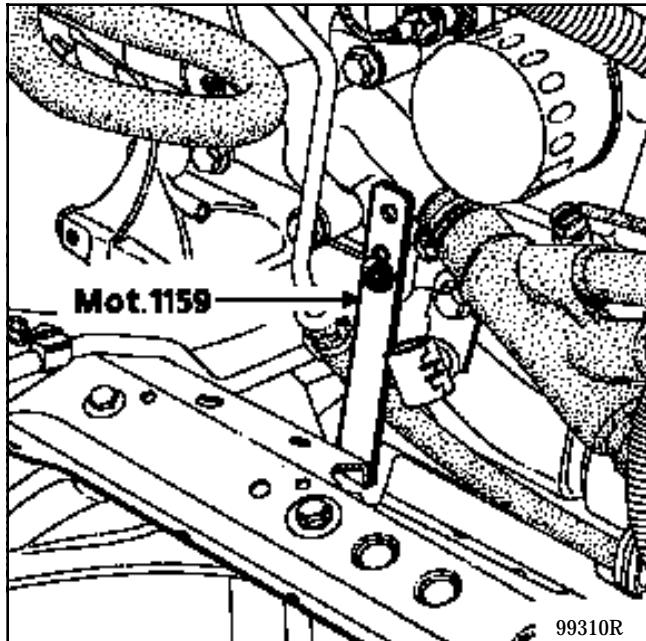
Release the wiring from the alternator and move the wiring to one side.

Diagram for drilling tool Mot. 1159 (diameter 10.5 mm).



99028R

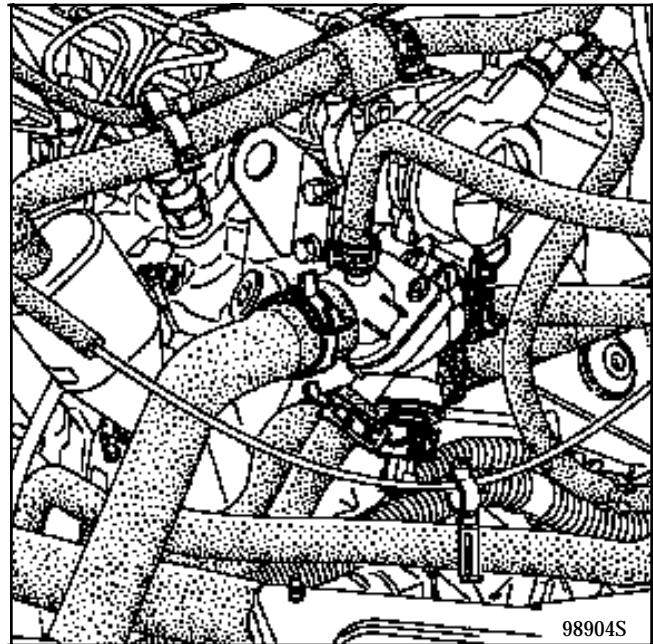
Fit the bracket of tool Mot. 1159 under the water pump.



99310R

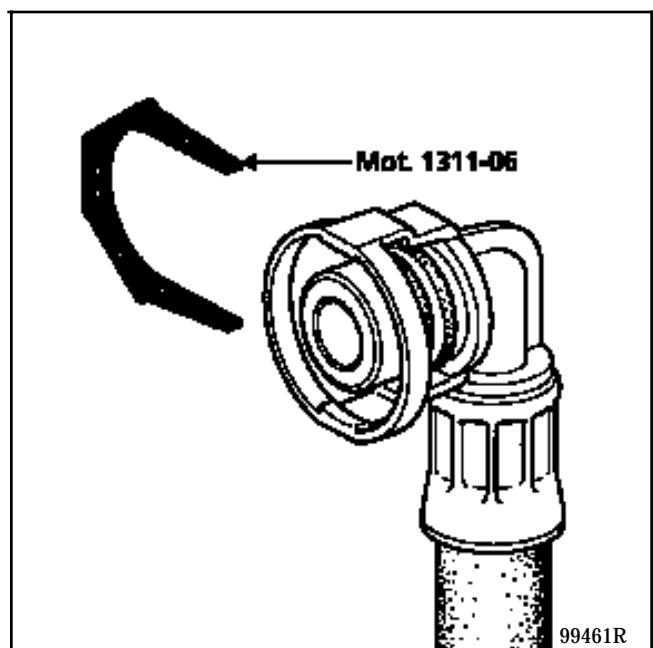
Disconnect:

- the thermostat hoses,
- the connectors for the sensors,



98904S

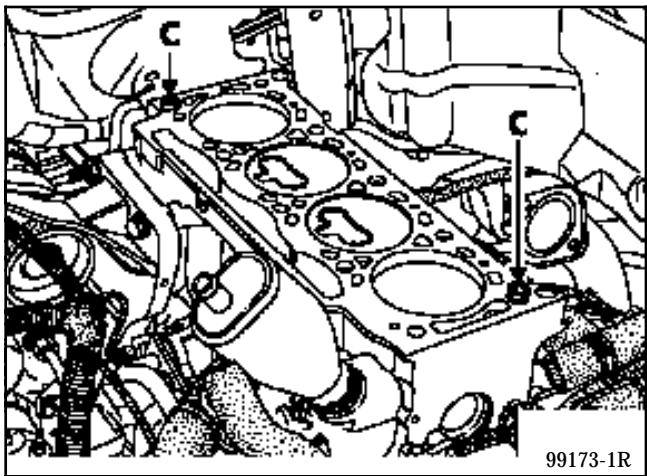
- the brake servo pipe,
- the 2 oil vapour rebreathing hoses on the decanter,
- the accelerator cable,
- the preheater plug connector,
- the injection pump connectors,
- the solenoid valve pipes,
- the fuel supply pipe to the diesel fuel filter using tool Mot. 1311-06



99461R

Remove the cylinder head bolts using the star socket 55 tool EX 255 FACOM for example.

Release the cylinder head by separating the lower part of the inner camshaft housing; do this without pivoting the cylinder head, as it is centred by 2 dowels (C).



Use a syringe to remove any oil in the mounting holes for the cylinder head.

This is necessary to ensure the bolts can be tightened correctly.

Protect the pipe bringing oil up so that foreign bodies are not allowed to enter the oilways bringing oil into the cylinder head.

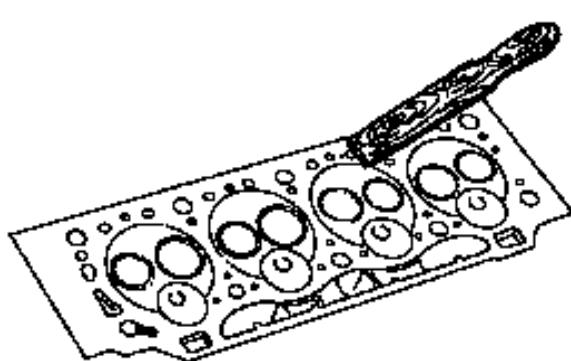
If this recommendation is not observed there is a risk that the oilways may become blocked and damage may occur rapidly to the camshaft.

#### CLEANING

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

Use Décapjoint to dissolve any gasket remaining on the metal.

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



99180S

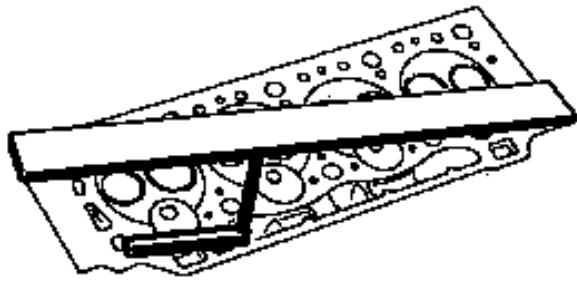
Gloves should be worn during this operation.

### CHECKING THE GASKET FACE

Use a straight edge and a set of shims to check for gasket face deformation.

Maximum bow **0.05 mm**.

**The cylinder head may not be re-ground.**



99181S

### DETERMINING THE THICKNESS OF THE GASKET

#### Checking piston protrusion

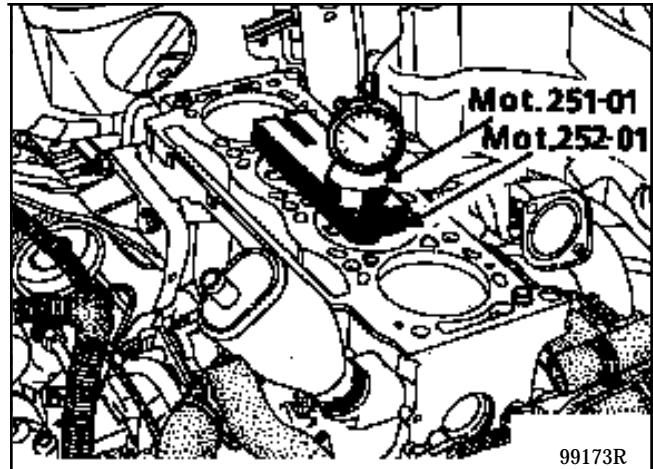
Clean the piston crowns to eliminate any deposits.

Turn the crankshaft in the normal operating direction by one turn to bring piston No. 1 close to TDC.

Place tool **Mot. 252-01** on the piston.

Fit tool **Mot. 251-01** with a dial gauge to the pressure plate **Mot. 252-01**. The pin of the dial gauge should be touching the cylinder block; determine the TDC for the piston.

**NOTE :** all measurements should be made in the longitudinal axis of the engine to eliminate errors due to piston tilt.



Measure the piston protrusion.

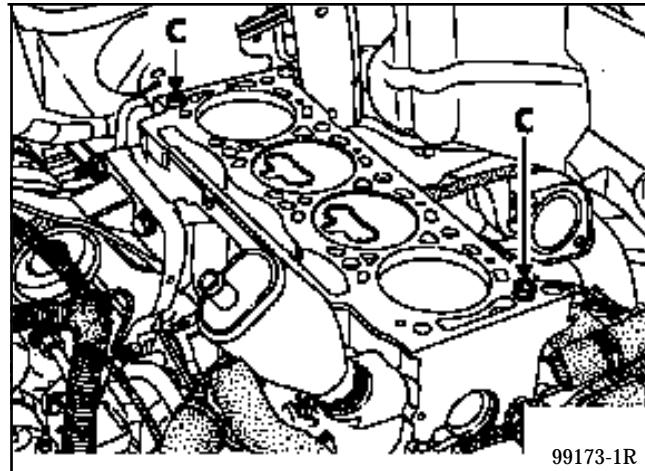
**ONLY TAKE INTO ACCOUNT THE DIMENSION FOR THE PISTON WITH THE MAXIMUM PROTRUSION**

For a maximum piston protrusion :

- less than **0.868**, use a gasket marked by a tab with 2 holes,
- between **0.868** and **1.000**, use a gasket marked by a tab with 1 hole,
- greater than **1.000**, use a gasket marked by a tab with 3 holes.

**REFITTING (special notes)**

Fit the gasket selected previously. It is centred by 2 dowels (C).



Positions the pistons halfway in the barrels to avoid any contact with the valves when the cylinder head is tightened.

Centre the cylinder head on its dowels.

Lubricate under the heads and the threads of the mounting bolts.

Tighten the cylinder head (see section 07- tightening the cylinder head).

Refitting is the reverse of removal.

Refit the timing belt.

Fill and bleed the cooling circuit (see section 19).

# FUEL MIXTURE Specifications

**12**

Vehicle	Gearbox	Engine							Depollution standard
		Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cm <sup>3</sup> )	Ratio	Catalytic converter	
BA0E	JB1	E7J	764	75.8	77	1 390	9.1/1	◊ C44	EU 96

Engine		Tests carried out at idle speed*					Fuel *** (minimum octane rating)
		Engine speed (rpm.)	Emission of pollutants **				
Type	Suffix		CO (%)	CO <sub>2</sub> (%)	HC (ppm)	Lambda ( $\lambda$ )	
E7J	764	750±50	0.3 maximum	14.5 minimum	100 maximum	0.97< $\lambda$ <1.03	Unleaded (OR 95)

Engine		Computer	Supplier's No.	Homologation No.	RENAULT No. (G70*)
Type	Suffix				
E7J	764	SIEMENS 35 tracks (FENIX 3)	S 111 730 108 B	77 00 864 451	77 00 874 461

\* For a coolant temperature greater than 80°C and at stable engine speed of 2 500 rpm for approximately 30 seconds.

\*\* For legislative values, refer to specification for individual country.

\*\*\* Compatible with OR 91 unleaded.

Temperature in °C ( $\pm 1^\circ$ )	0	20	40	80	90
Air temperature sensor Type CTN Resistance in Ohms	7 470 to 11 970	3 060 to 4 045	1 315 to 1 600	-	-
Coolant temperature sensor Type CTN Resistance in Ohms	-	3 060 to 4 045	1 315 to 1 600	300 to 370	210 to 270

# FUEL MIXTURE Specifications

**12**

DESCRIPTION	MAKE/TYPE	SPECIAL NOTES
Computer	SIEMENS FENIX 3	35 tracks
Injection		Regulated monopoint injection
Ignition		Advance laws integral in injection computer Ignition power module Pinking sensor
Plugs	EYQUEM FC 52 LS NGK BCP 5 ES	Gap: 0.9 mm Tightening torque: 2.5 to 3 daN.m
Fuel filter		Mounted in front of the fuel tank under the vehicle
Fuel pump	WALBRO	Submerged in fuel tank Flow: 50 litres/hour minimum Pressure: 1.06 bar
Pressure regulator		Pressure 1.06 bar (non-adjustable)
Solenoid injector		Voltage: 12 V Resistance : $\approx 2 \Omega$
Throttle body	BOSCH	Diameter 36 mm
Idle speed regulation micromotor		Non-adjustable Integral no load switch
Fuel vapour recirculation canister Solenoid valve	CAN 10	Voltage: 12 V Resistance : $\approx 34.5 \Omega$
Heated oxygen sensor	NGK	Voltage at 850°C Rich mixture : > 625 mvolt Lean mixture: 0 to 80 mvolt Tightening torque: 4.5 daN.m
Fault finding		<u>Throttle potentiometer</u> Idle speed regulation: $15 \leq \#17 \leq 30$ Full load: $192 \leq \#17 \leq 210$ Adaptive richness operation: $112 \leq \#30 \leq 160$ Adaptive richness idle speed: $104 \leq \#31 \leq 160$

# FUEL MIXTURE Specifications

**12**

Vehicle	Gearbox	Engine							Depollution standard
		Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cm <sup>3</sup> )	Ratio	Catalytic converter	
BA0F	Manual	K7M	702	79.5	80.5	1598	9.7/1	◊ C45	EU 96
BA0F	Automatic	K7M	703	79.5	80.5	1598	9.7/1	◊ C45	EU 96
BA0L	Manual	K7M	720	79.5	80.5	1598	9/1	◊ C45	EU 96

Engine		Tests carried out at idle speed*					Fuel *** (minimum octane rating)
		Engine speed (rpm.)	Emission of pollutants**				
Type	Suffix		CO (%)	CO <sub>2</sub> (%)	HC (ppm)	Lambda ( $\lambda$ )	
K7M	702 720	720±50	0.3 maximum	14.5 minimum	100 maximum	0.97< $\lambda$ <1.03	Unleaded (OR 95)
K7M	703	750±50	0.3 maximum	14.5 minimum	100 maximum	0.97< $\lambda$ <1.03	Unleaded (OR 95)

Engine		Computer	Supplier's No.	Homologation No.	RENAULT No. (G70*)
Type	Suffix				
K7M	702	SIEMENS 55 tracks (FENIX 5)	S 105 300 101 D	77 00 860 319	77 00 863 499
K7M	703	SIEMENS 55 tracks (FENIX 5)	S 105 300 201 C	77 00 860 337	77 00 869 818
K7M	720	SIEMENS 55 tracks (FENIX 5)	S 105 300 104 B	77 00 864 454	77 00 865 827

\* For a coolant temperature greater than 80°C and at stable engine speed of 2 500 rpm for approximately 30 seconds.

\*\* For legislative values, refer to specification for individual country.

\*\*\* Compatible with OR 91 unleaded.

Temperature in °C ( $\pm 1^\circ$ )	0	20	40	80	90
Air temperature sensor Type CTN Resistance in Ohms	7 470 to 11 970	3 060 to 4 045	1 315 to 1 600	-	-
Coolant temperature sensor Type CTN Resistance in Ohms	-	3 060 to 4 045	1 315 to 1 600	300 to 370	210 to 270

# FUEL MIXTURE Specifications

**12**

DESCRIPTION	MAKE/TYPE	SPECIAL NOTES
Computer	SIEMENS FENIX 5	55 tracks
Injection		Semi-sequential regulated multipoint injection
Ignition		Static with two dual output coils Power module integral in computer One pinking sensor
Plugs	EYQUEM FC 52 LS CHAMPION C10YC	Gap: 0.9 mm Tightening torque: 2.5 to 3 daN.m
Air filter		Replace every other oil change
Fuel filter		Mounted in front of the fuel tank under the vehicle Replace at major service
Fuel pump	WALBRO	Submerged in fuel tank Flow: 80 litres/hour minimum for regulated pressure of 3 bars and voltage of 12 V
Pressure regulator		Regulated pressure Zero vacuum: $3 \pm 0.2$ bars Vacuum of 500 mbar : $2.5 \pm 0.2$ bars
Solenoid injector	SIEMENS	Voltage: 12 V Resistance : $14.5 \pm 1$ Ω
Throttle body	PIERBURG 714 186	Diameter 44 mm
Idle speed regulation stepping motor		
EGR (K7M 703) solenoid valve	PIERBURG 72213000	Voltage: 12 V Resistance : $30 \pm 3$ Ω
Fuel vapour recirculation canister Solenoid valve	CAN 10 DELCO REMY	Voltage: 12 V Resistance : $35 \pm 5$ Ω
Heated oxygen sensor	NGK	Voltage at $850^{\circ}\text{C}$ Rich mixture: > 625 mvolt Lean mixture: 0 to 80 mvolt Tightening torque: 4.5 daN.m
Fault finding	FICHE n° 27 CODE D13 SELECTOR ON S8	<u>Throttle potentiometer</u> Idle speed regulation: $5 \leq \#17 \leq 47$ Full load: $164 \leq \#17 \leq 253$ R.C.O. idle speed: $4 \% \leq \#12 \leq 14 \%$ (K7M 720) $6 \% \leq \#12 \leq 15 \%$ (K7M 702/703 in P and N) $10 \% \leq \#12 \leq 20 \%$ (K7M 703 in D) Adaptive R.C.O. idle speed: $- 2.4 \% \leq \#21 \leq + 6.2\%$ Adaptive richness operation: $0 \leq \#30 \leq 208$ Adaptive richness idle speed: $100 \leq \#31 \leq 255$ (K7M 720) $104 \leq \#31 \leq 255$ (K7M 702/703)

# FUEL MIXTURE Specifications

**12**

Vehicle	Gearbox	Engine							Depollution standard
		Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cm <sup>3</sup> )	Ratio	Catalytic converter	
BA0G	Manual	F3R	750	82.7	93	1998	9.8/1	◊ C47	EU 96

Engine		Tests carried out at idle speed*					Fuel *** (minimum octane rating)
		Emission of pollutants **					
Type	Suffix	Engine speed (rpm.)	CO (%)	CO <sub>2</sub> (%)	HC (ppm)	Lambda ( $\lambda$ )	
F3R	750	770±50	0.3 maximum	14.5 minimum	100 maximum	0.97< $\lambda$ <1.03	Unleaded (OR 95)

Engine		Computer		Supplier's No.	Homologation No.	RENAULT No. (G70*)
Type	Suffix					
F3R	750	SIEMENS 55 tracks (FENIX 5)		S 103 717 101 B	77 00 868 299	77 00 874 462

\* For a coolant temperature greater than 80°C and at stable engine speed of 2 500 rpm for approximately 30 seconds.

\*\* For legislative values, refer to specification for individual country.

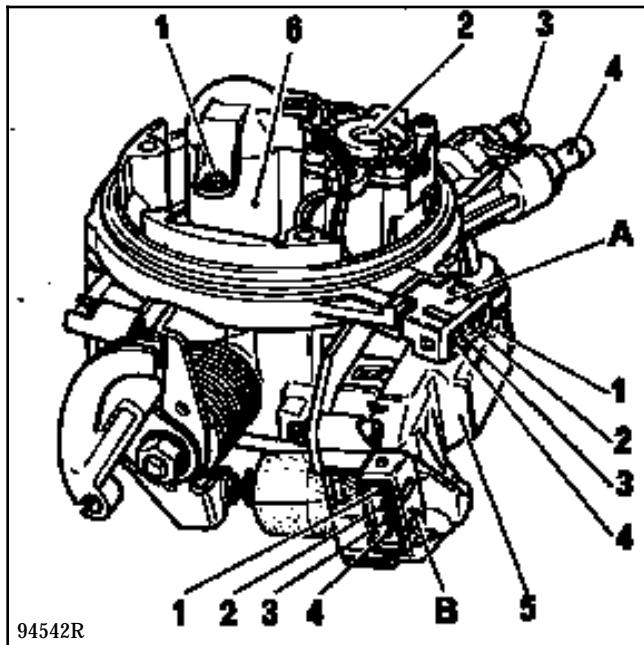
\*\*\* Compatible with OR 91 unleaded.

Temperature in °C ( $\pm 1^\circ$ )	0	20	40	80	90
Air temperature sensor Type CTN Resistance in Ohms	7 470 to 11 970	3 060 to 4 045	1 315 to 1 600	-	-
Coolant temperature sensor Type CTN Resistance in Ohms	-	3 060 to 4 045	1 315 to 1 600	300 to 370	210 to 270

# FUEL MIXTURE Specifications

12

DESCRIPTION	MAKE/TYPE	SPECIAL NOTES
Computer	SIEMENS FENIX 5	55 tracks
Injection		Sequential regulated multipoint injection
Ignition		Static with two dual output coils Power module integral in computer One pinking sensor
Plugs	EYQUEM C 52 LS CHAMPION N7YCX BOSCH W7DCO	Gap: 0.9 mm Tightening torque: 2.5 to 3 daN.m
Air filter		Replace every other oil change
Fuel filter		Mounted in front of the fuel tank under the vehicle Replace at major service
Fuel pump	WALBRO	Submerged in fuel tank Flow: 80 litres/hour minimum for regulated pressure of 3 bars and voltage of 12 V
Pressure regulator	WEBER BOSCH	Regulated pressure Zero vacuum: $3 \pm 0.2$ bars Vacuum of 500 mbar : $2.5 \pm 0.2$ bars
Solenoid injector	SIEMENS	Voltage: 12 V Resistance: $14.5 \pm 1 \Omega$
Throttle body	SOLEX Diameter 60 mm	Reference: 127 F3R 751 without AC - F3R 750 Reference: 132 F3R 751 AC
Idle speed regulation solenoid	HITACHI AESP 207-17	Voltage: 12 V Resistance: $9.5 \pm 1 \Omega$
Fuel vapour recirculation canister Solenoid valve	CAN 10 DELCO REMY	Voltage: 12 V Resistance: $35 \pm 5 \Omega$
Heated oxygen sensor	BOSCH LSH 25	Voltage at 850°C Rich mixture: > 625 mvolt Lean mixture: 0 to 80 mvolt Tightening torque: 4.5 daN.m
Fault finding	FICHE n° 27 CODE D13 SELECTOR ON S8	<u>Throttle potentiometer</u> Idle speed regulation: $8 \leq \#17 \leq 38$ Full load: $188 \leq \#17 \leq 245$ R.C.O. idle speed: $20 \% \leq \#12 \leq 40 \%$ (F3R 750) $18 \% \leq \#12 \leq 38 \%$ (F3R 751) Adaptive R.C.O idle speed: - 6.2 % or - $8.6 \leq \#21 \leq + 6.2 \%$ Adaptive richness operation: $82 \leq \#30 \leq 224$ Adaptive richness idle speed: $32 \leq \#31 \leq 224$

**PRESENTATION**

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

**Connector (A)****Injector and air temperature sensor operations**

- |         |                        |
|---------|------------------------|
| 1 and 4 | Air temperature sensor |
| 2       | +monopoint injector    |
| 3       | - monopoint injector   |

**Connector (B)****Idle speed regulation and low load switch operations**

- |          |                 |
|----------|-----------------|
| 1 + or - | Motor feed      |
| 2 - or + | Motor feed      |
| 3 and 4  | Low load switch |

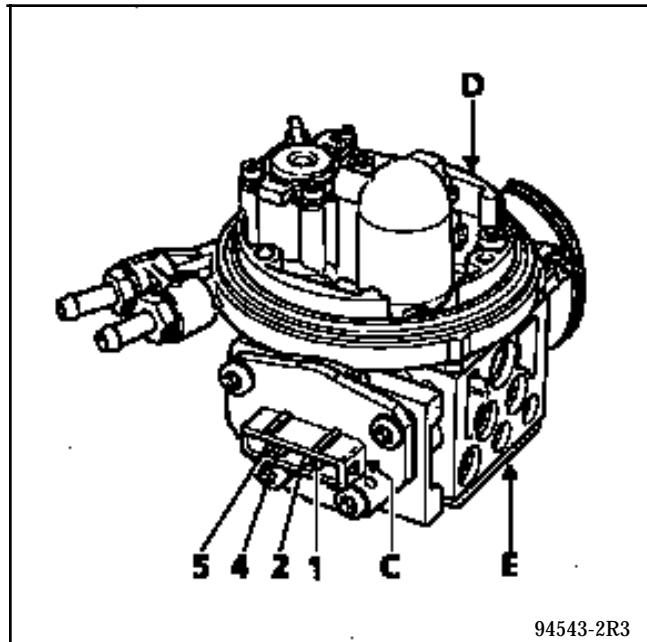
**Connector (C)****Throttle potentiometer operation**

- 1 Earth
- 2 + 5 V feed
- 4 Throttle position information (voltage changes between 0 and 5 V)
- 5 Not used

The throttle body has two sections:

- The upper section is known as the injection section (D).
- The lower section is known as the throttle section (E).

**NOTE :** when the unit is removed, the two sections are joined together by plastic clips. Squeeze the end of the clips to separate the two sections.



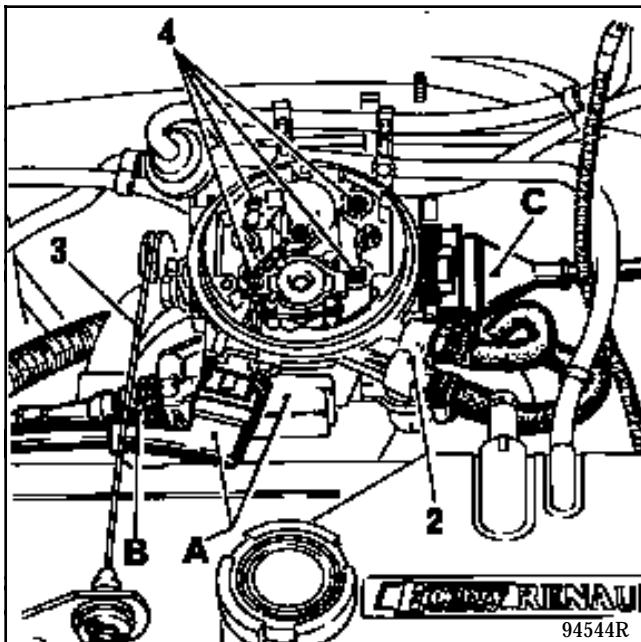
**REMOVAL**

Remove the air filter.

Disconnect:

- connectors (A) (B) and (C),
- the fuel supply pipes (1) and return pipes (2),
- the accelerator control cable (3).

Remove the mounting bolts (4) and remove the throttle body.

**REFITTING**

Replace the seals between the manifold and the throttle body.

Reconnect:

- the fuel supply and return pipes, ensuring the connectors are correctly clipped back together,
- the accelerator control and refit the air filter.

**AIR TEMPERATURE SENSOR****REMOVAL**

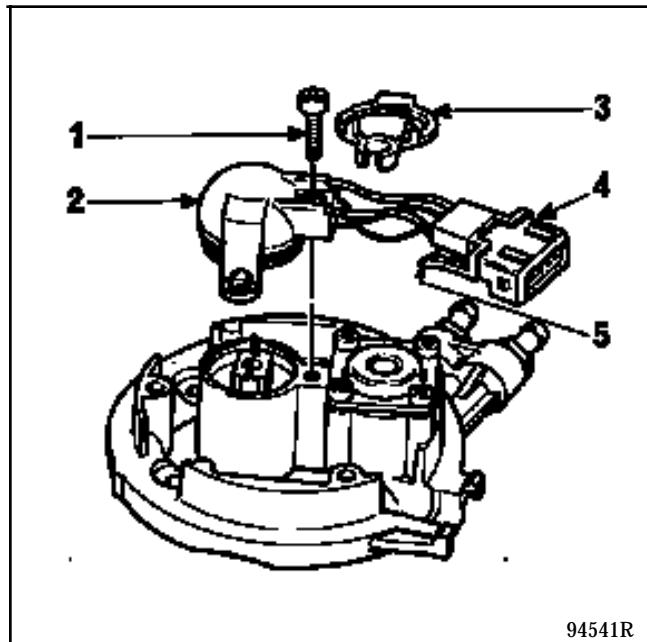
Remove the air filter.

Disconnect the connector.

Remove bolt (1) and lift cover (2).

Release the wires from mounting (3).

Remove the connector (4) after releasing hooks (5).

**REFITTING**

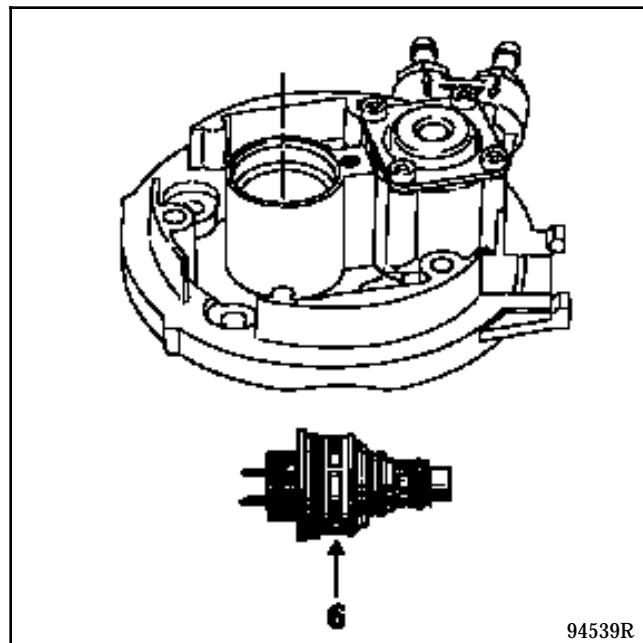
Check the connectors are correctly clipped in.

**INJECTOR****REMOVAL**

Remove the air filter.

Remove the air temperature cover (see previous page).

Remove the injector (6) from its housing.

**REFITTING**

Replace the O rings and lubricate them.

Fit the injector and cover so that they are correctly aligned and mount the assembly.

**REMOVING - REFITTING THE FUEL PRESSURE REGULATOR**

The fuel pressure regulator cannot be adjusted if it is faulty. The upper section of the throttle body must be renewed.

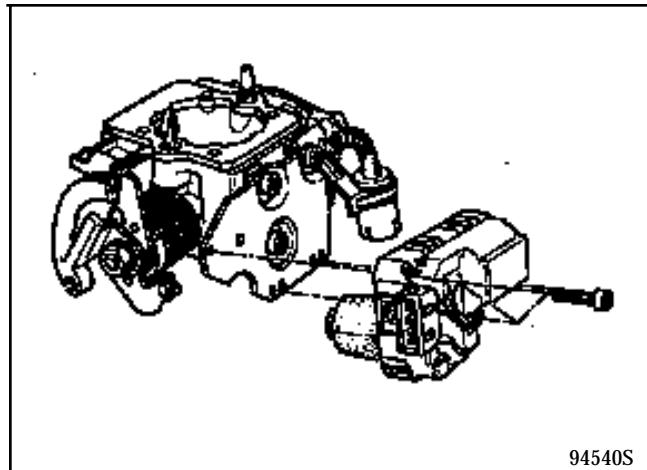
**IDLE SPEED REGULATION MOTOR****REMOVAL**

Remove the air filter.

The motor may be removed without having to remove the throttle body. Access to the bolts is made easier however by removing the mounting bolts for the throttle body and releasing it without disconnecting the fuel pipes.

Disconnect the motor connector.

Remove the mounting bolts and remove the motor.

**REFITTING**

No adjustment may be made. However, ignition on, if the low load switch bargraph on the XR25 is not illuminated, fit a shim between the throttle stop and the micromotor to obtain the no load switch position.

Turn the ignition on then off; the micromotor should position itself in the cold start position.

Repeat the operation without the shim, then check the position of the throttle, ignition on, engine not running, using the XR25 and #17.

**THROTTLE POTENTIOMETER**

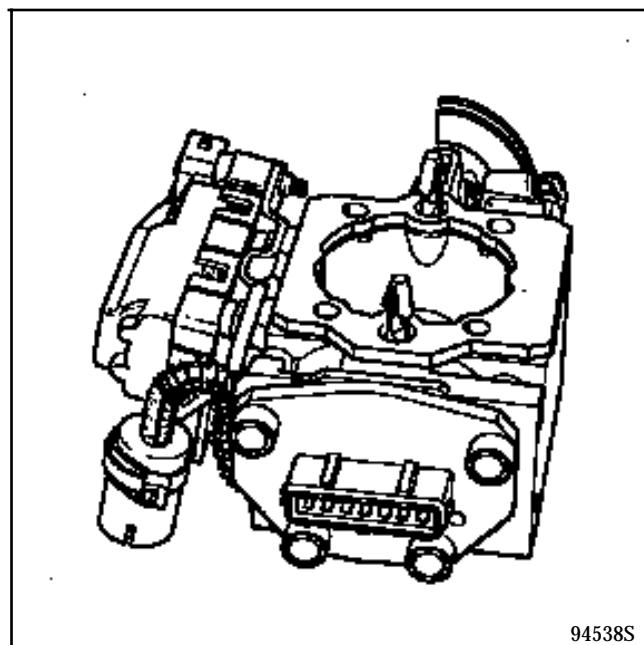
The throttle potentiometer is set in the factory and cannot be repaired.

If there is a fault, renew the throttle body section.

**REMOVAL**

Remove the air filter and the complete monopoint throttle body assembly (see previous pages).

Remove the upper section of the throttle body and the idle speed regulation motor.

**REFITTING**

Renew the seals.

Refit the throttle body peripherals.

Check:

- the connectors are correctly connected,
- on the XR25 :
  - the bargraphs are present for :
    - low load,
    - full load.
  - the throttle position using the XR25 and #17.

Refit the air filter.

## TIGHTENING TORQUES (in daN.m)



**Throttle body mounting bolt  
on inlet manifold**

2

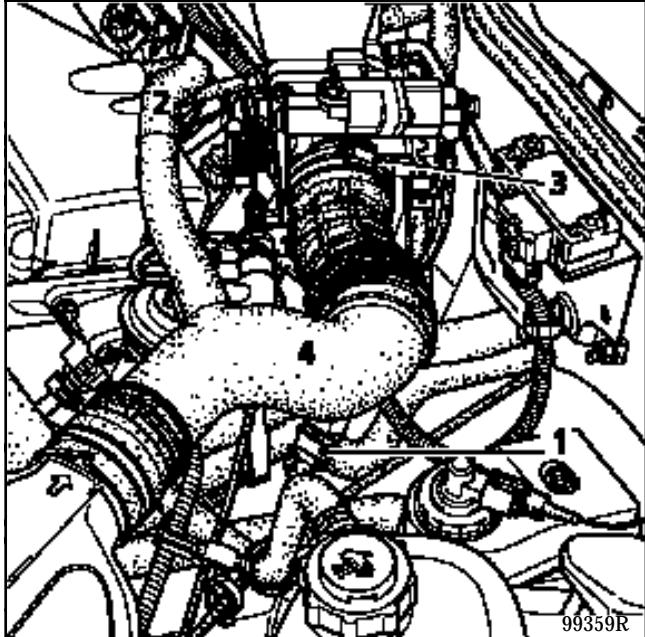
## REMOVAL

Remove the acoustic tie bar.

## Disconnect:

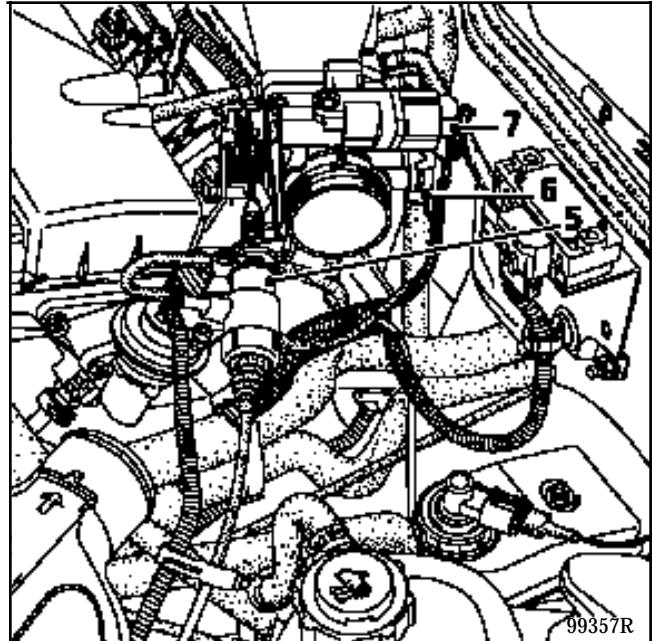
- the air temperature sensor (1),
- the oil vapour rebreathing pipe (2) on the rocker box cover.

Slacken the clips (3) mounting the air sleeve (4) to the air filter and the throttle body, then remove the sleeve.

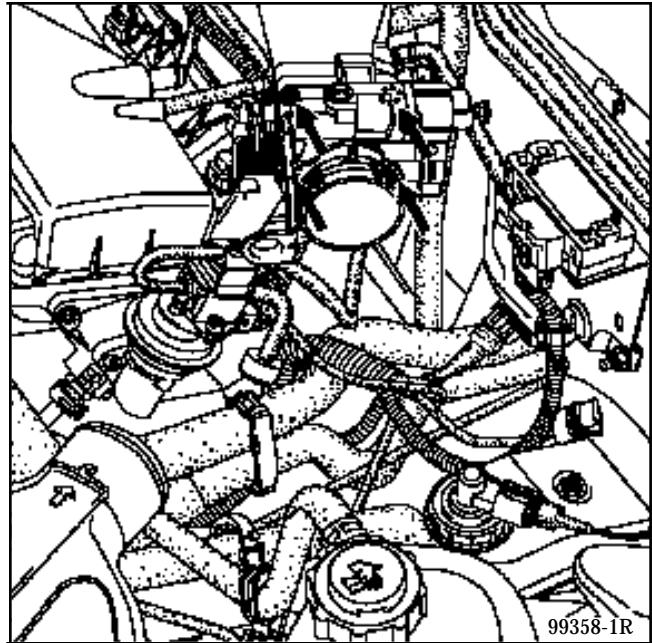


Disconnect :

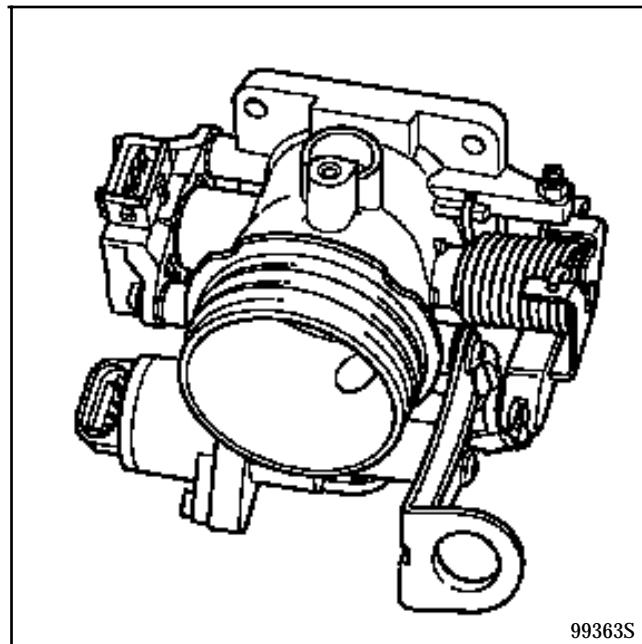
- the accelerator cable (5),
- the throttle position potentiometer connector (6),
- the idle speed regulation stepping motor connector (7).



Remove the four bolts mounting the throttle body and remove the throttle body.



To make the operation easier, remove the throttle body to remove the potentiometer and the idle speed regulation stepping motor.



The throttle position potentiometer is not adjustable.

#### REFITTING

Renew the seal between the throttle body and the manifold.

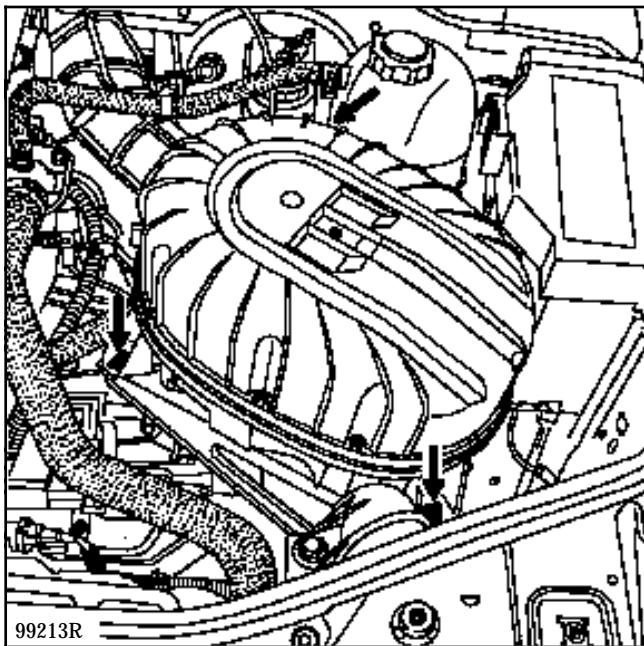
The remaining refitting operations are the reverse of removal.

## TIGHTENING TORQUES (in daN.m)

**Throttle body mounting bolt****on inlet manifold****2****Throttle potentiometer mounting bolt****0.2****REMOVAL**

Disconnect the battery.

Remove the three bolts mounting the unit to the air filter.

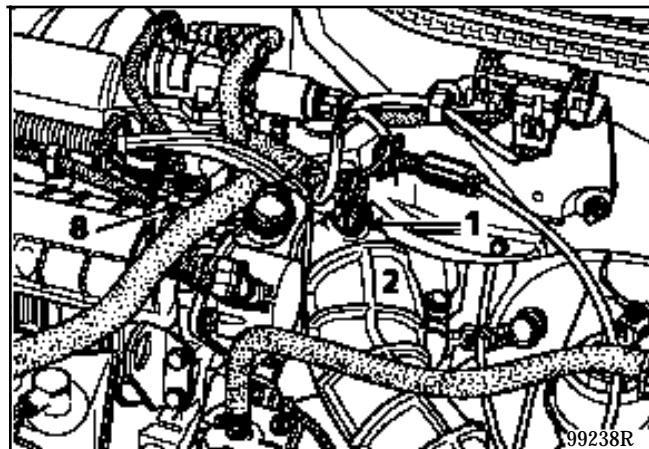


Disconnect:

- the air temperature sensor (1),
- the throttle position potentiometer (8).

Slacken the clip mounting the air sleeve (2) to the throttle body.

Remove the air filter and the air sleeve.

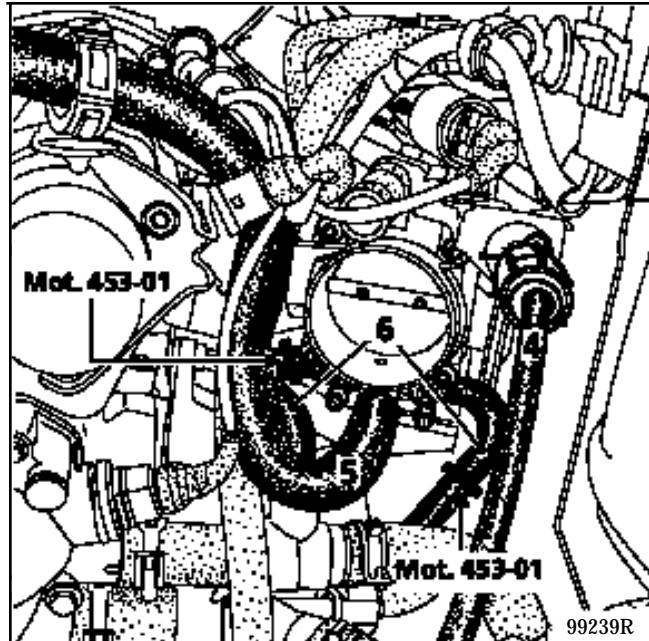


Disconnect :

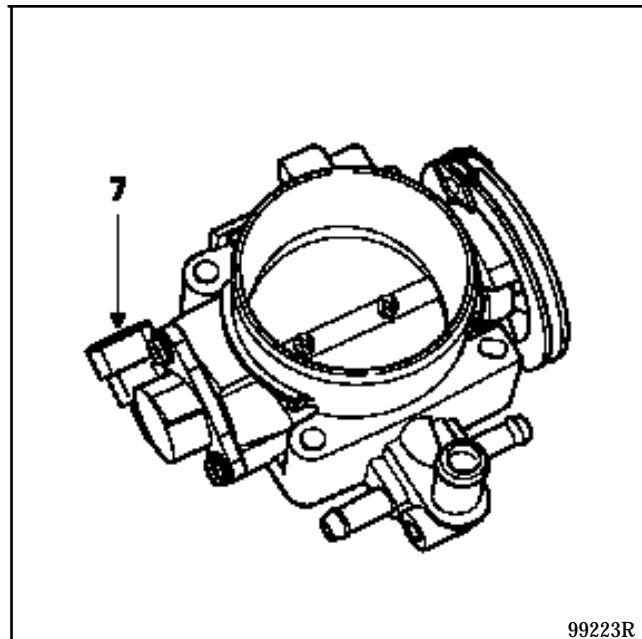
- the accelerator cable (4),
- the oil vapour rebreathing pipe (5),
- the two water hoses (6) which heat the throttle body after clamping them using tool Mot. 453-01.

Remove the four mounting bolts for the throttle body and remove it.

Remove the heat shield between the throttle body and the manifold.



**NOTE :** the throttle position potentiometer (7) may only be removed after removing the throttle body (non-adjustable).



#### REFITTING

Remove the seals bonded on the heat shield for the throttle body and renew them (it is not necessary to bond them into position again).

Refitting is then the reverse of removal.

## TIGHTENING TORQUES (in daN.m)



Manifold nuts	2.5
---------------	-----

## REMOVAL

To remove the manifold, the throttle body must be removed (see previous pages).

There are no special notes for removal.

The inlet manifold is fitted with an electrical heater (2) with a PTC type resistance (positive temperature coefficient).

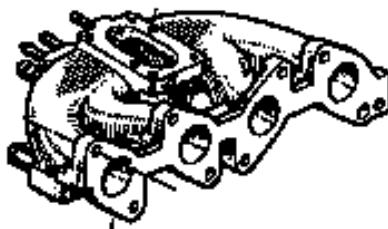
This is mounted in the inlet manifold, opposite the throttle, and is secured by a circlip.

The heater is fed via a relay by the computer up to a coolant temperature of 68°C.

If the coolant temperature sensor is faulty, the heater is permanently fed.

## REFITTING

When refitting, replace the manifold gasket and bleed the cooling circuit.



PRM1202

- 1 Retaining circlip.
- 2 Electrical heater.
- 3 Seal.

**TIGHTENING TORQUES (in daN.m)**

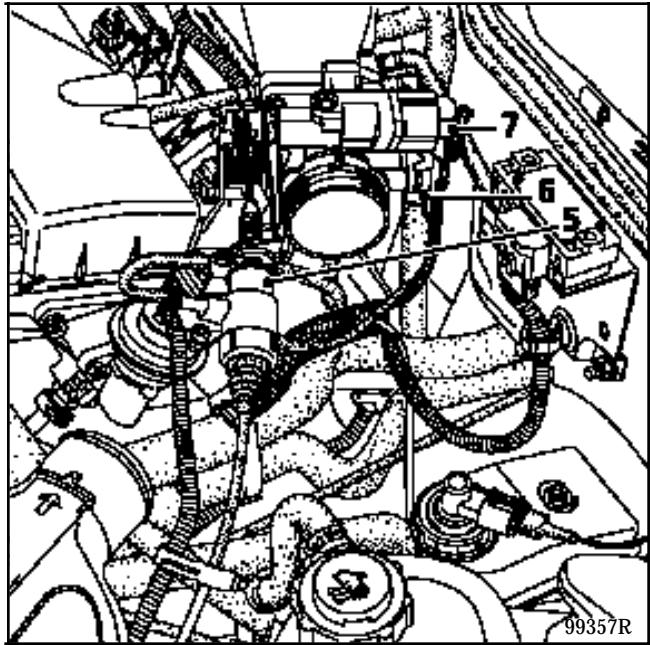
<b>EGR solenoid valve mounting bolt</b>	1
<b>Inlet manifold bolt and nut</b>	2.5
<b>EGR steel pipe bolt</b>	1

**NOTE : the fuel gallery must be removed beforehand** (refer to section 13 "Fuel gallery").

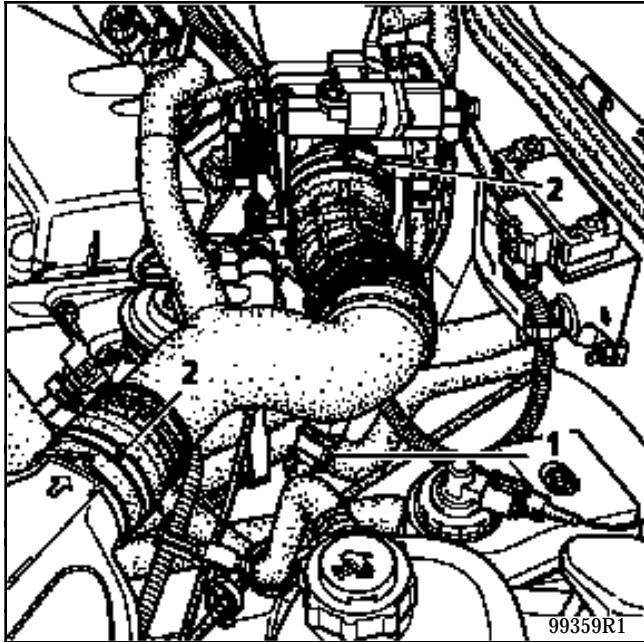
**REMOVAL**

Disconnect the air temperature sensor (1).

Slacken the two clips (2) mounting the air sleeve to the throttle body and the air filter and remove the sleeve.



99357R



99359R1

Disconnect:

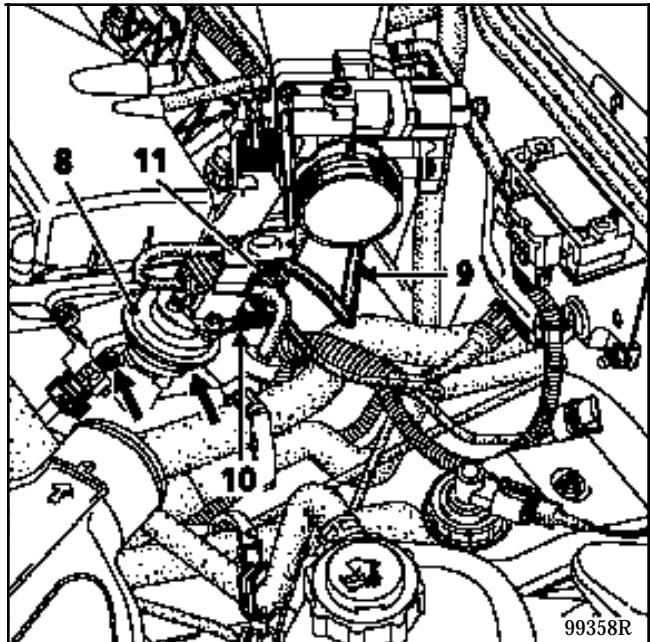
- the accelerator cable (5),
- the throttle position potentiometer connector (6),
- the idle speed regulation stepping motor connector (7).

**K7M 703 engine**

From the EGR solenoid valve, disconnect (8) :

- the hose (9) going to the manifold,
- the electrical connector (10).

Remove the 2 bolts mounting the solenoid valve (8), then remove the valve.

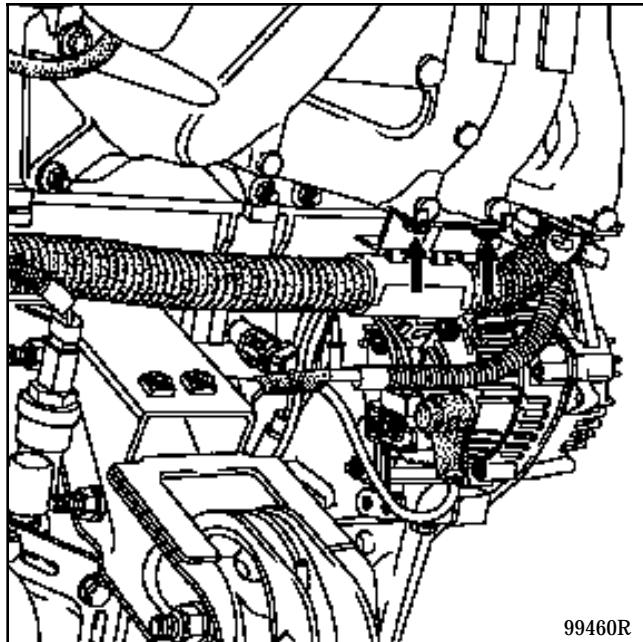


99358R

Unscrew the steel pipe (11) which goes to the manifold from the EGR solenoid valve mounting (release the clip first).

#### All engine types

Remove the two bolts from under the manifold which mount the wiring retaining bracket.



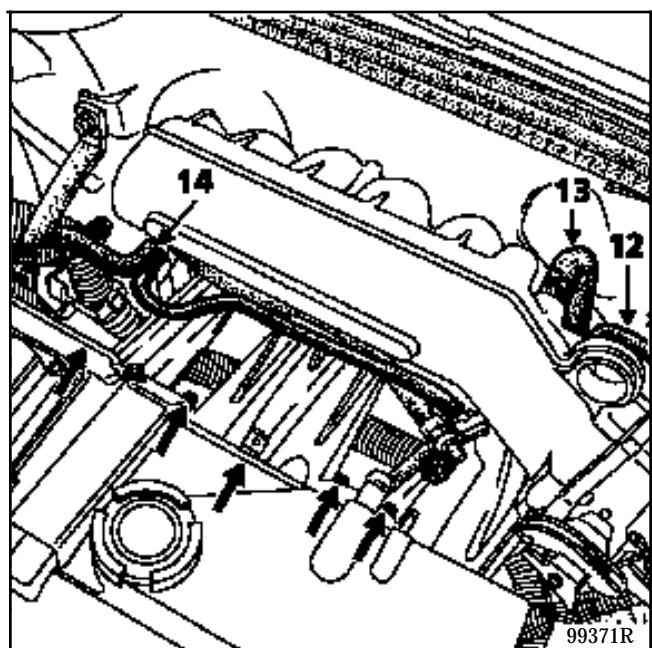
From the manifold, disconnect:

- the pipe (12) connected to the absolute pressure sensor,
- the pipe (13) connected to the brake servo,
- the fuel supply and return pipes.

Disconnect the two hoses from the canister bleed solenoid valve (14).

Remove the four lower mounting nuts then the five upper mounting bolts.

Remove the manifold.



#### REFITTING

Renew all gaskets and seals which have been removed.

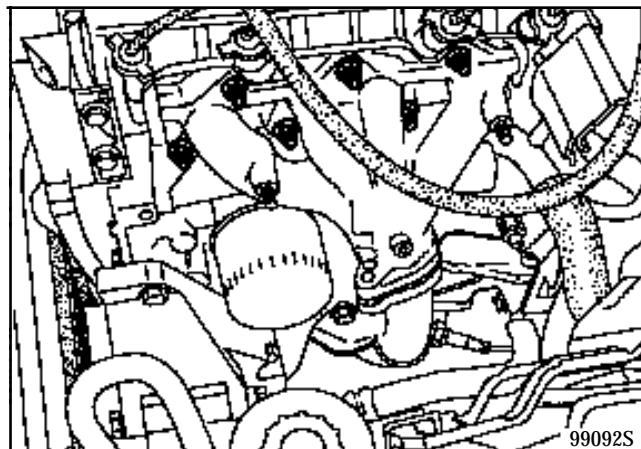
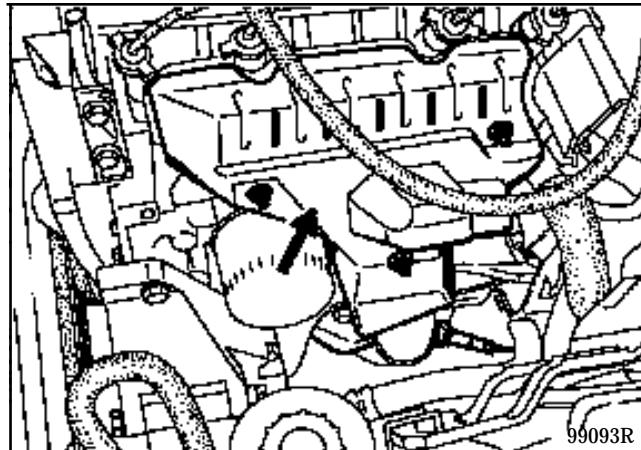
Refitting is the reverse of removal.

Remember to reclip the clip mounting the EGR pipe.

TIGHTENING TORQUES (in daN.m)	
Manifold nuts	2

**REMOVAL**

After removing the heat shield from the manifold, remove the mountings.

**REFITTING**

Renew the gasket systematically.

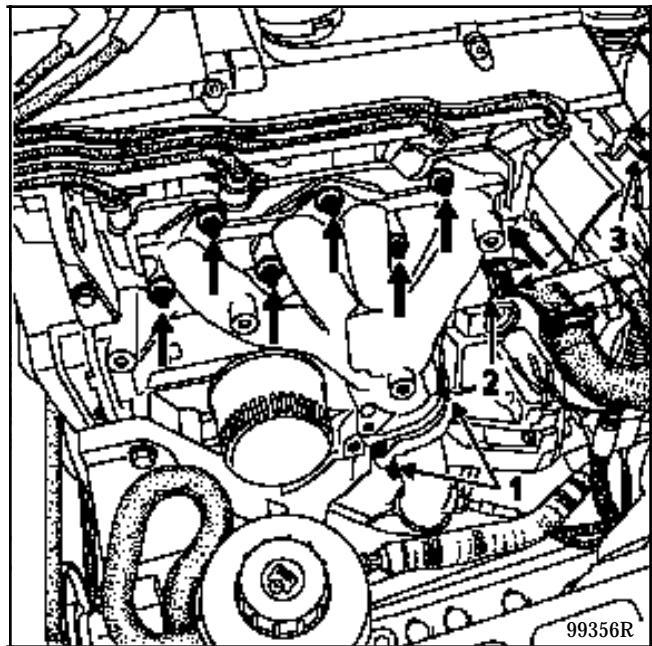
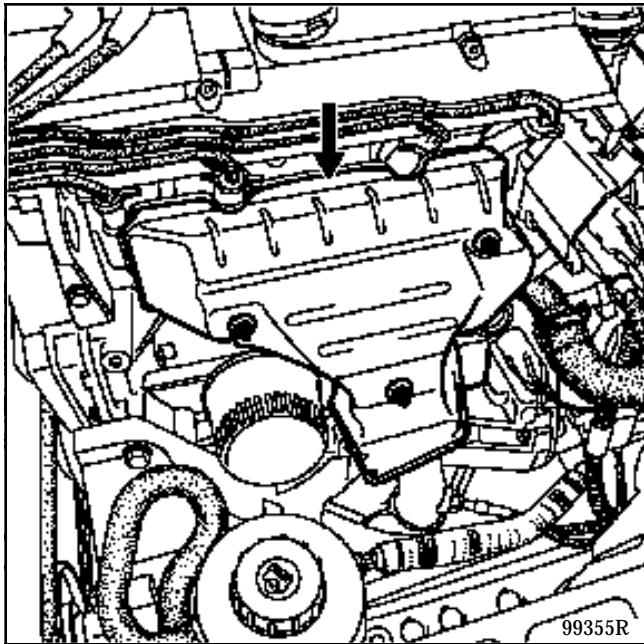
## TIGHTENING TORQUES (in daN.m)



Manifold mounting nut	2
EGR steel pipe bolt	1

## REMOVAL

Remove the heat shield.



Remove the exhaust manifold.

## Remove:

- the two nuts (1) connecting the exhaust manifold to the exhaust downpipe,
- nut (2) for the steel pipe connecting the EGR solenoid valve and the manifold; first remove clips (3) (K7M 703),
- the seven nuts mounting the manifold.

## REFITTING

Renew the manifold gasket.

Refitting is the reverse of removal.

**TIGHTENING TORQUES (in daN.m)**

<b>Throttle body mounting bolt on manifold</b>	<b>2</b>
<b>Manifold mounting nut on cylinder head</b>	<b>2</b>
<b>Manifold mounting stud on cylinder head</b>	<b>1</b>
<b>Strengthening bracket mounting bolt on exhaust manifold</b>	<b>4</b>

**NOTE : the fuel gallery must be removed beforehand (refer to section 13 "Fuel gallery").**

The inlet manifold may be removed by itself, but removing the exhaust manifold requires the inlet manifold to be removed.

If the manifold gasket is renewed, both manifolds must be removed.

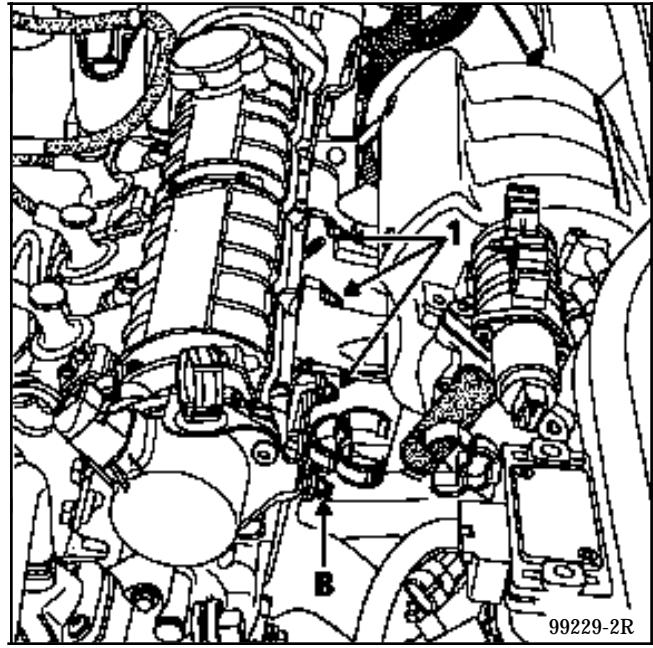
**REMOVAL**

Put the vehicle on a 2 post lift.

**From above the vehicle:**

Remove the upper and lower mounting nuts (1) for the inlet manifold (the 2 nuts (B) at each end only secure the exhaust manifold).

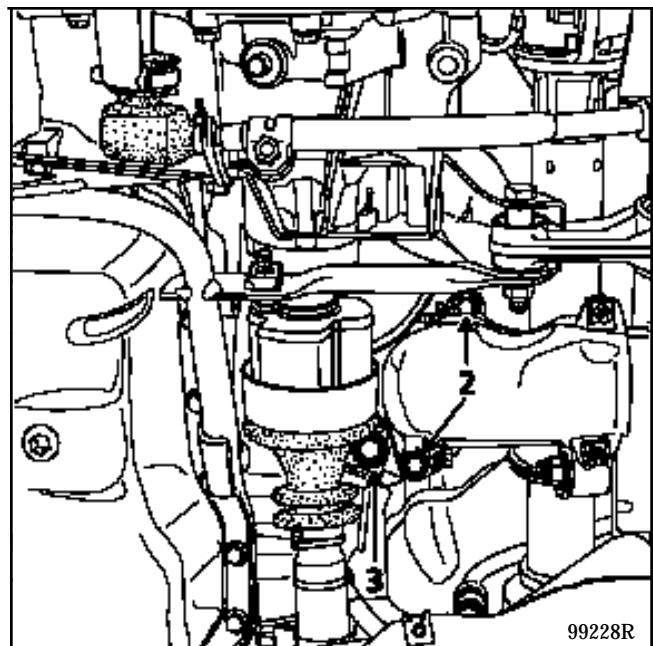
Remove the inlet manifold.

**From below the vehicle:**

Use rope to attach the exhaust chamber to the body.

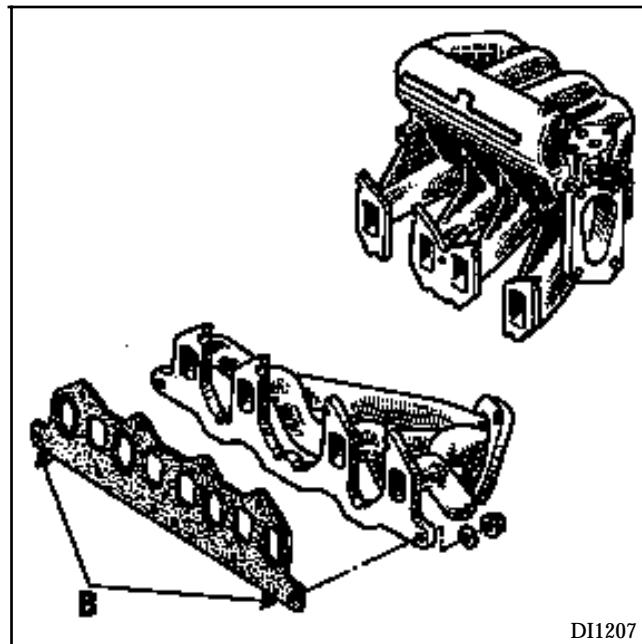
**Remove:**

- the 2 mounting bolts (2) securing the downpipe to the exhaust manifold,
- bolt (3) securing the exhaust manifold to the strengthening bracket.



***From above the vehicle:***

Remove the 2 bolts (B).



Remove the exhaust manifold.

**REFITTING**

The manifold gasket should be fitted with the metal side against the manifold (crimped side against the cylinder head).

Refitting is the reverse of removal.

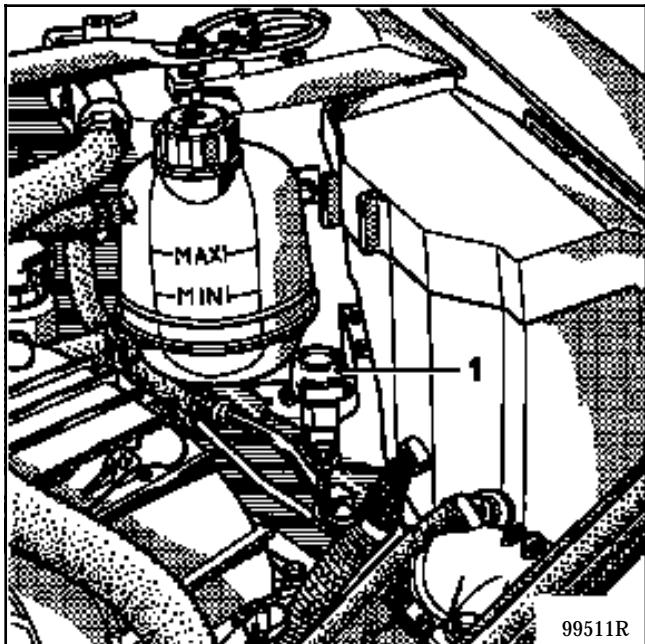
### AIM

The aim of this function is to avoid a fire after an accident due to a fuel leak. To accomplish this, all components which pump fuel from the fuel tank are stopped during and after the impact. They may only be started again by a mechanical action performed by the driver or repair mechanic.

### DESCRIPTION

The system comprises an inertia switch which may be reset, which:

- detects the impact (1),
- cuts the electrical circuit.



It is mounted:

- For **petrol engines**, between track 1 of the pump relay (236) and the + feed.

- For **diesel engines**, between the + feed and the fuel shut off (or the coded solenoid valve if the vehicle is fitted with an engine immobiliser).

### OPERATION

During the impact, the inertia switch ball leaves its seat and breaks the electrical current.

For **petrol engines**, the + feed to the pump relay control circuit (236) is cut. The pump and the injectors are thus no longer fed electrically. The fuel in the fuel tank is therefore isolated.

For **diesel engines**, the + feed to the fuel shut off or the coded solenoid valve is cut.

The pump can no longer take up fuel, there is no high pressure any more. Any risk of fire due to high pressure diesel spray over the engine is removed.

### RESETTING THE SWITCH AND SWITCH OPERATION

To reset the inertia switch, press the top to reposition the ball in its seat.

#### IMPORTANT:

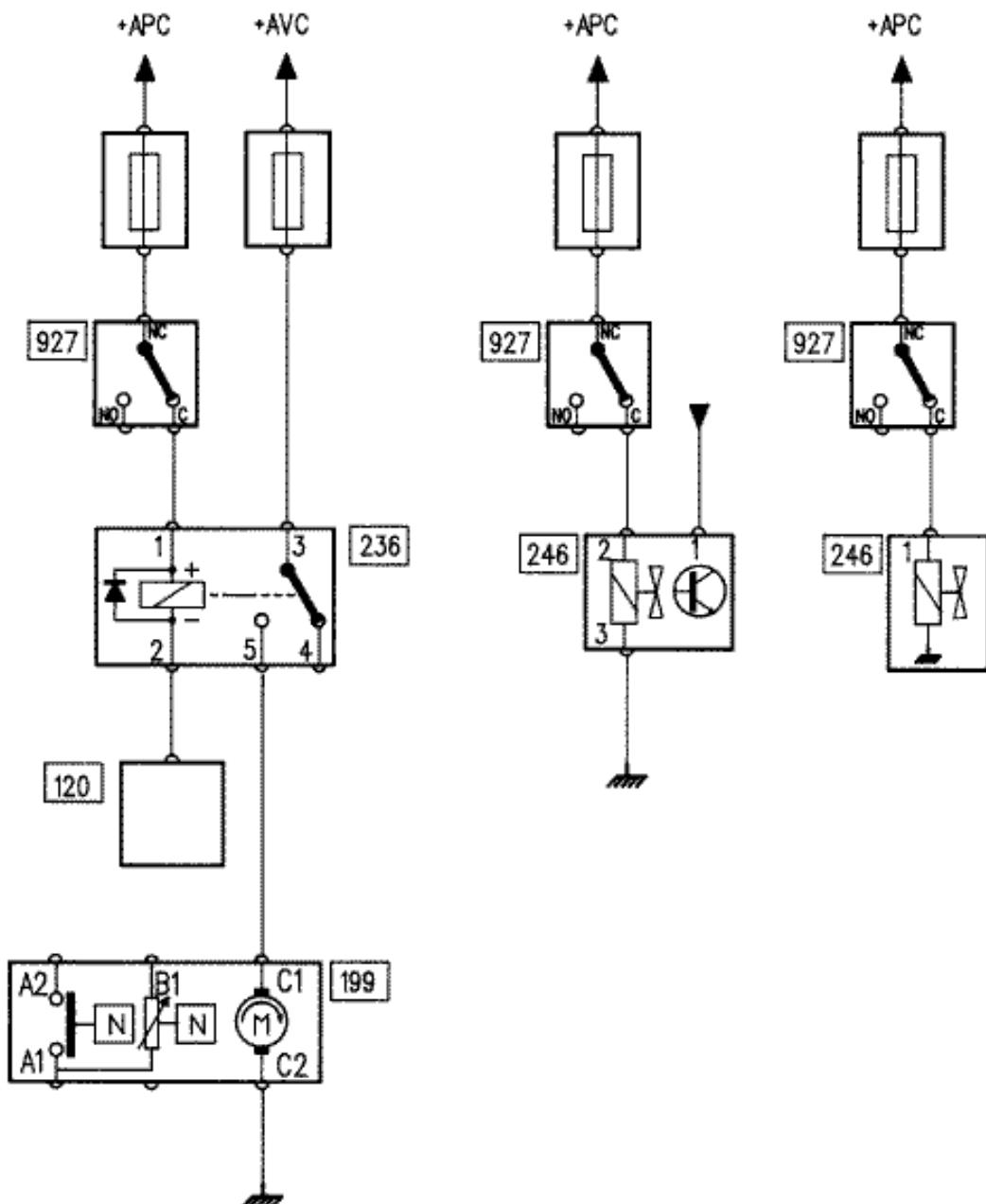
- for **petrol engines**, after resetting the switch, the computer memory **MUST** be erased using the XR25. The injection computer will memorise a pump relay fault when the system is triggered.
- for **diesel engines**, after resetting the switch, the passenger compartment connection unit memory **MUST** be erased using the XR25. This unit will memorise a break in feed to the coded solenoid valve.

# FUEL SUPPLY

## Fuel cut-out on impact

**13**

### WIRING DIAGRAM



PRJ99472

#### Key

- 120** Injection computer
- 199** Fuel pump
- 236** Fuel pump relay
- 246** Fuel shut off
- 927** Inertia switch

## SPECIAL TOOLING REQUIRED

**Mot. 1311-06** Tool for removing fuel pipe unions

## TIGHTENING TORQUES (in daN.m)



Fuel gallery mounting bolt on manifold 0.8

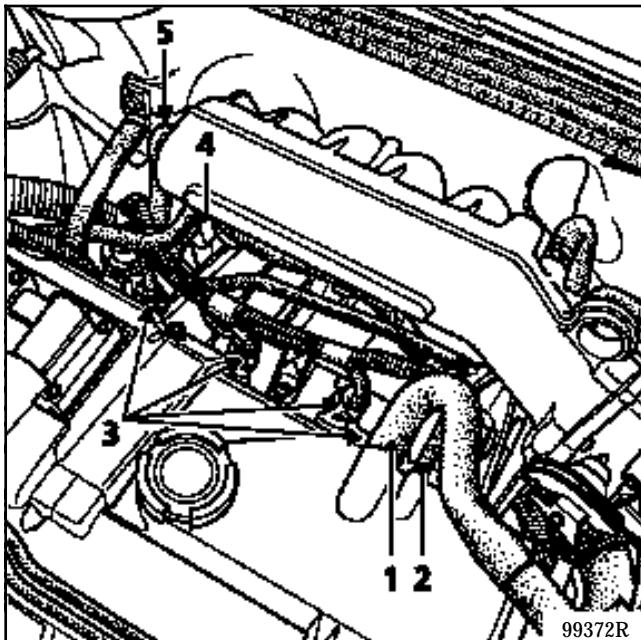
## REMOVAL

Disconnect the battery.

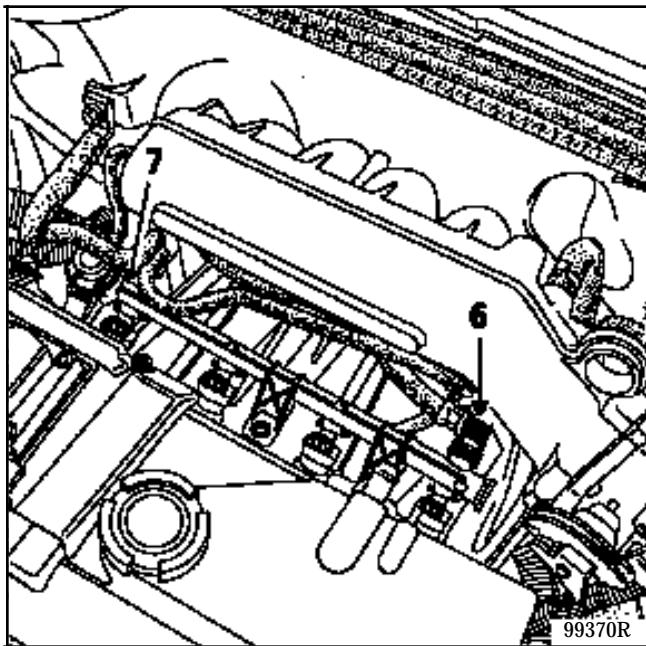
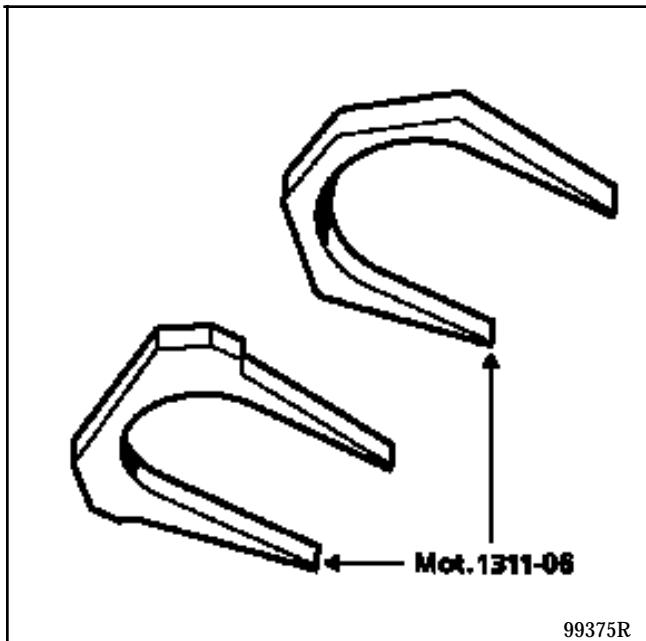
Remove the acoustic tie bar.

Disconnect:

- the oil vapour rebreathing pipes (1) and the fuel vapour recirculation pipes (2),
- the connectors for the injectors (3) and the canister bleed solenoid valve (4),
- on the manifold, the pipe (5) connecting the pressure regulator to the manifold vacuum,

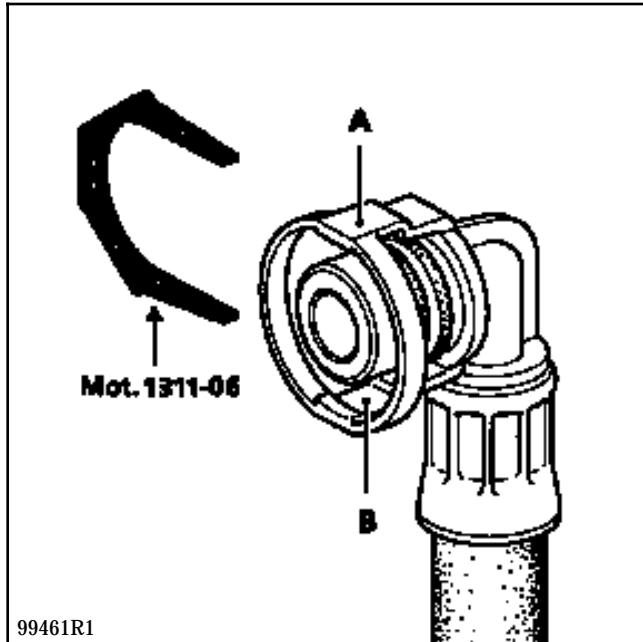


- the fuel supply pipes (6) and return pipes (7) using the small section tool **Mot. 1311-06** (the fuel supply pipe uses a removal tool connected to the union fitted on the vehicle).

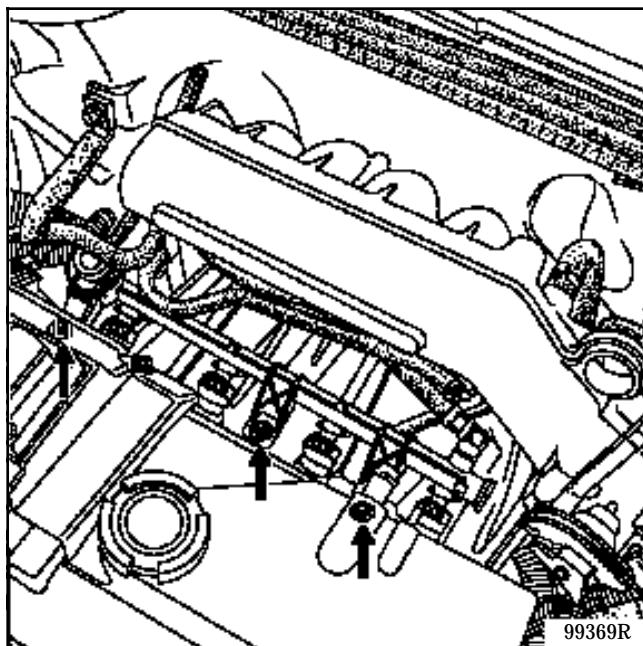


To remove the unions, fit tool Mot. 1311-06 between the two parts (A) and (B).

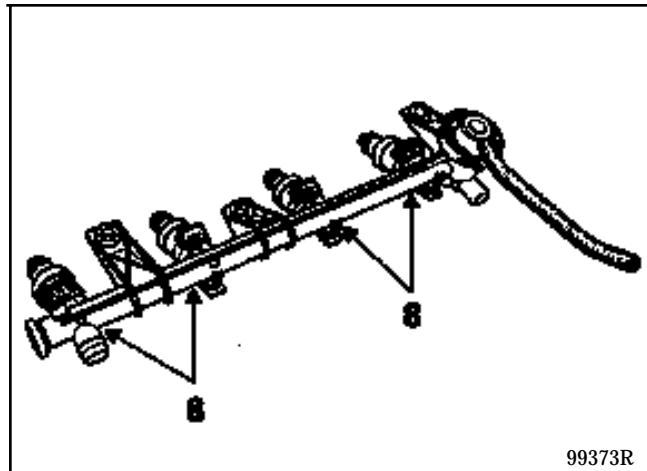
Press on the tool to lift the two retaining claws then pull the union.



Remove the three gallery mounting bolts then remove the gallery.



To remove an injector, remove clips (8) then pull the injectors.



### REFITTING

Renew the O rings at the base of the injectors (if the injector has been removed, also renew the seal at the head of the injector).

The fuel supply and return unions should click when they are correctly connected.

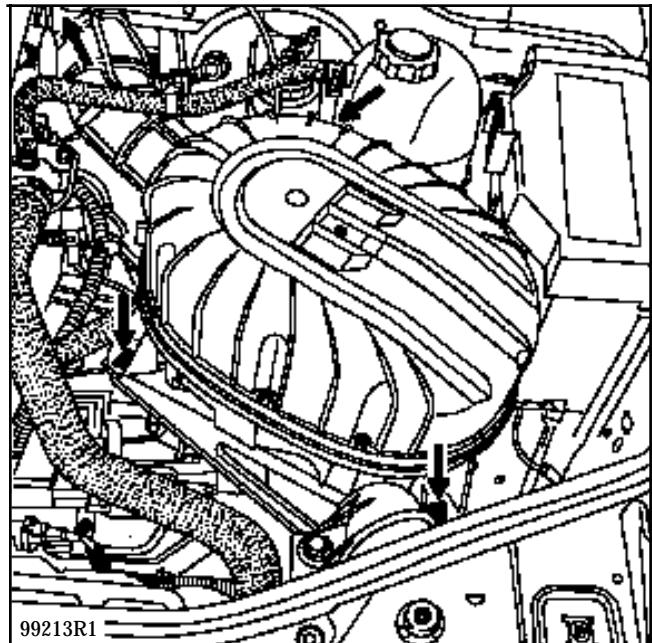
Refitting is then the reverse of removal.

**TIGHTENING TORQUES (in daN.m)**

<b>Throttle body mounting bolt on manifold</b>	2
<b>Fuel gallery mounting nut</b>	1

Slacken the clip mounting the air sleeve to the throttle body.

Remove the three nuts mounting the air filter.

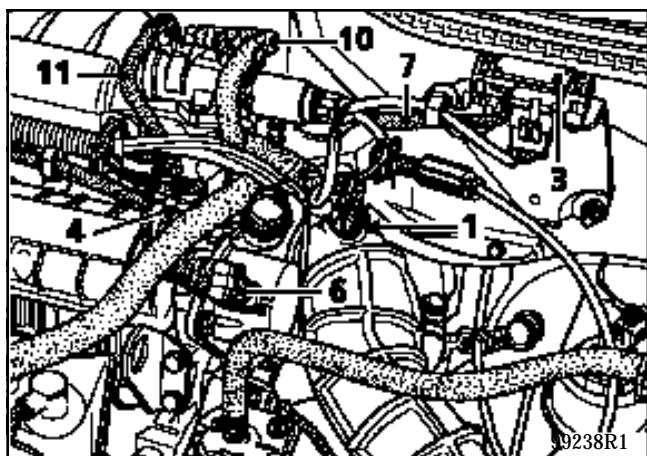
**REMOVAL**

Disconnect the battery.

Remove the acoustic tie bar.

Disconnect:

- the air temperature sensor (1),
- the pressure sensor (3),
- the throttle potentiometer (4),
- the cylinder reference sensor (6),
- the fuel vapour recirculation pipe (11),
- the brake servo vacuum pipe (10),
- from the manifold, the pressure sensor vacuum pipe (7).



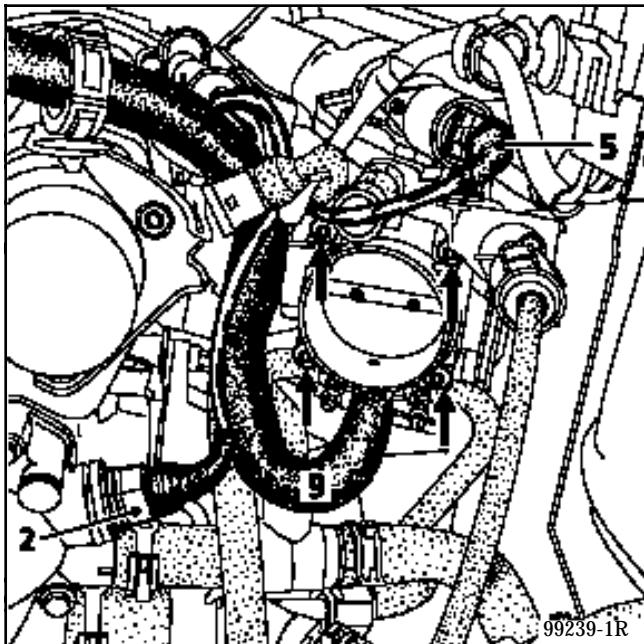
Remove the filter and the air sleeve.

Disconnect:

- the oil vapour rebreathing pipe (9),
- the coolant temperature sensor (2),
- the idle speed regulation solenoid valve (5).

Remove the four bolts mounting the throttle body (do not disconnect the coolant hoses which warm the throttle body).

Remove the heat shield between the throttle body and the manifold.



Unclip the wiring and the pipe mounted on the manifold and tilt the assembly towards the injection computer.

Disconnect the injectors.

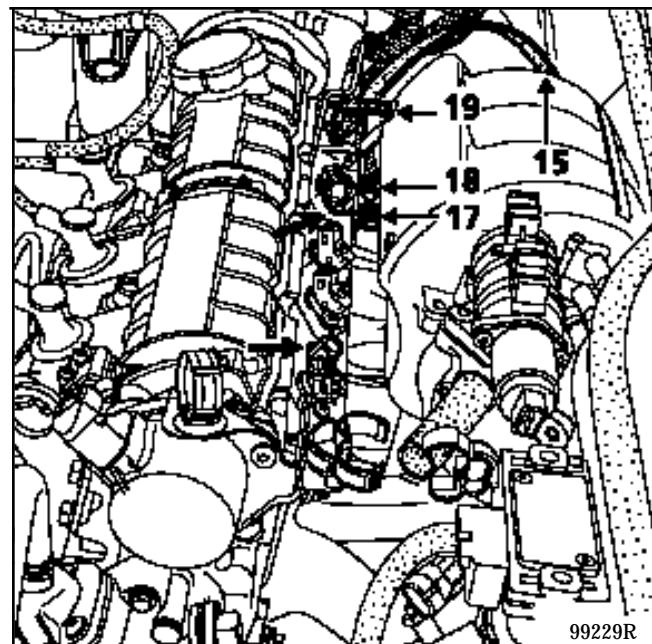
Remove the wiring mounting.

Disconnect:

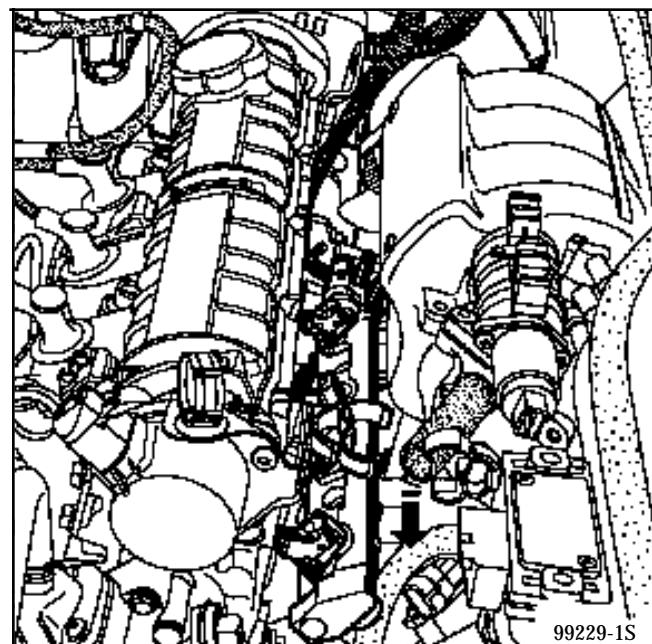
- the fuel supply pipe (17) on the flywheel end, marked by a green ring,
- the return pipe to the fuel tank (18) at the timing end, marked by a red ring,
- the vacuum pipe (19) for the fuel pressure regulator.

Remove:

- the two fuel gallery mounting nuts,
- the earth strap (15).



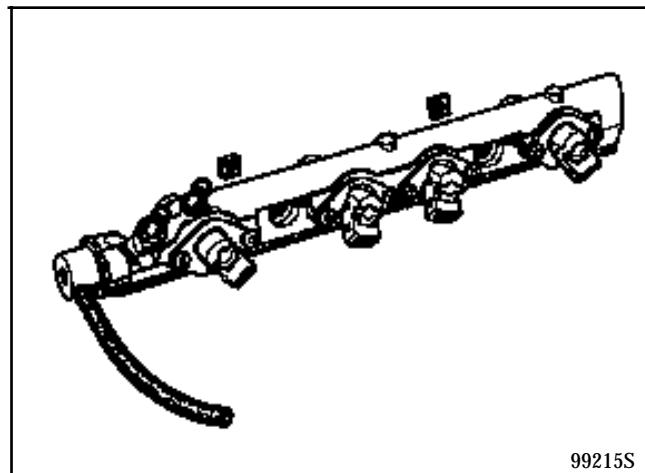
Remove the fuel gallery by sliding it along the inlet manifold.



**REFITTING**

Ensure the two plastic spacers are present. They should be located on the two gallery mounting studs between the studs and the cylinder head.

Remove the seals bonded on the throttle body heat shield, then renew them (they do not need to be bonded when refitting).



Refitting is then the reverse of removal.

The injectors fitted to this type of engine are of the type "SIEMENS DEKA 2".

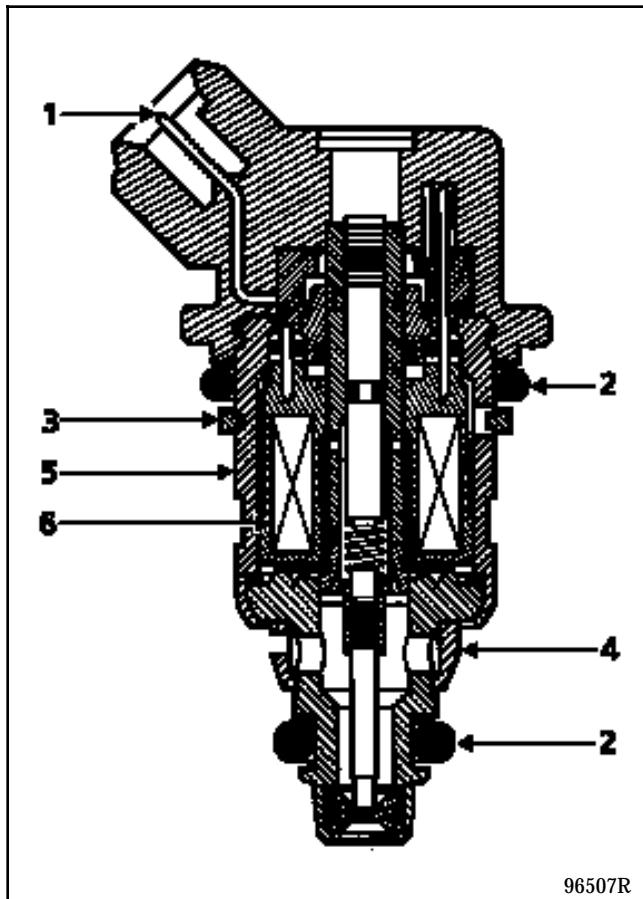
They are mounted on the fuel gallery. Each injector is sealed by two O rings.

Fuel circulates permanently around the circumference of the injector body. This fuel washing prevents bubbles of fuel vapour forming and aids warm starting.

**IMPORTANT :** there are no special notes for removing the injectors. **The fuel gallery must however be removed beforehand** since the fuel in the gallery would enter the cylinder concerned. When any operation involves removal of an injector, **new O rings and flat seals under the gallery must be fitted.**

**NOTE :** when refitting the upper seal, use the tapered ring provided with the kit of seals.

#### INJECTOR DETAIL



- 1 Connector
- 2 O rings
- 3 Upper O ring retaining circlip
- 4 Filter
- 5 Metal body
- 6 Winding

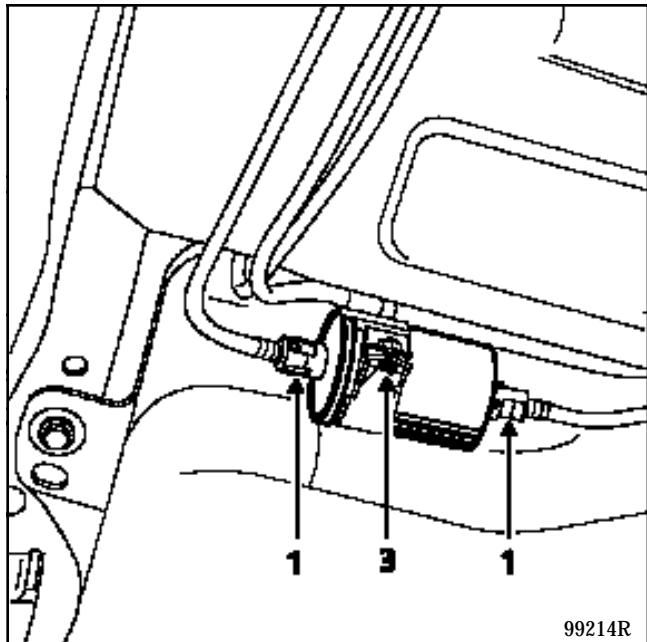
### SPECIAL TOOLING REQUIRED

Mot. 1265

Pliers for removing quick release unions

### LOCATION

The fuel filter is located under the vehicle in front of the fuel tank.



### REPLACEMENT

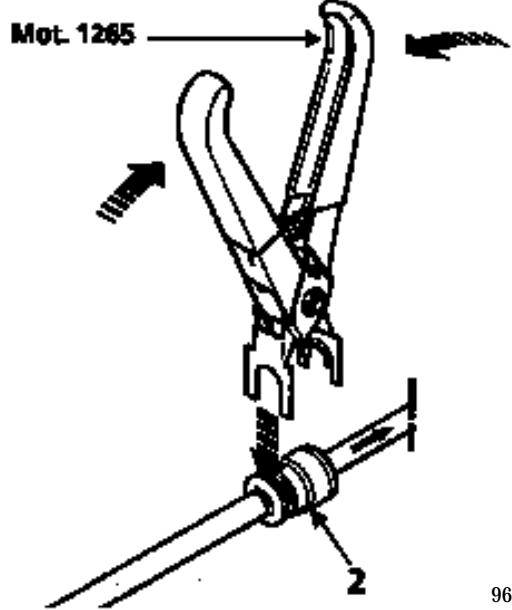
Replace the fuel filter at each major service.

### REMOVAL

Before removing the filter, take precautions to catch the fuel which will run out (do not clamp the pipes as they will be damaged).

Remove the clips (1).

Disconnect the pipes with quick release unions (2) using tool Mot. 1265.



Remove bolt (3) and remove the fuel filter.

### REFITTING

Observe the direction of fuel flow (marked by an arrow on the filter).

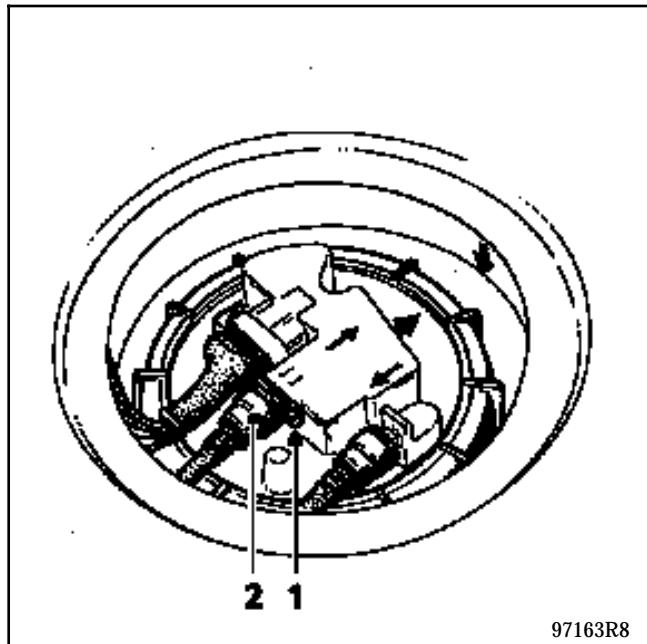
Reconnect the pipes by hand (it is not necessary to use tool Mot. 1265).

Ensure the quick release unions are correctly connected.

Refit the safety clips (1).

SPECIAL TOOLING REQUIRED	
Mot. 1265	Pliers for removing quick release unions
EQUIPMENT REQUIRED	
1 measuring cylinder 2000 ml	

It is recommended to check the fuel pump flow using the fuel return pipe connected to the sender unit assembly.



### IMPORTANT

During this operation the following points must be observed:

- Do not smoke and keep all heat sources away from the working area.
- Take precautions to guard against fuel spray due to the residual pressure in the pipes when they are removed.

### CHECKING THE PUMP FLOW

Lift the rear seat.

Remove the plastic cover.

Remove the clip (1).

Use tool Mot. 1265 to disconnect the fuel return pipe (2) (marked by a red quick release union).

Connect an 8 mm semi-rigid pipe to the quick release union and insert the other end of the pipe into the 0-2000 ml measuring cylinder.

Shunt terminals (3) and (5) of the fuel pump relay (located in the engine fuse box). In a period of one minute the pump flow should be a minimum of :

- 1.3 litres for F3R - K7M engines,
  - 0.83 litres for E7J engines,
- for a voltage of 12 Volts.

**NOTE :** when refitting, ensure the quick release unions are correctly connected.

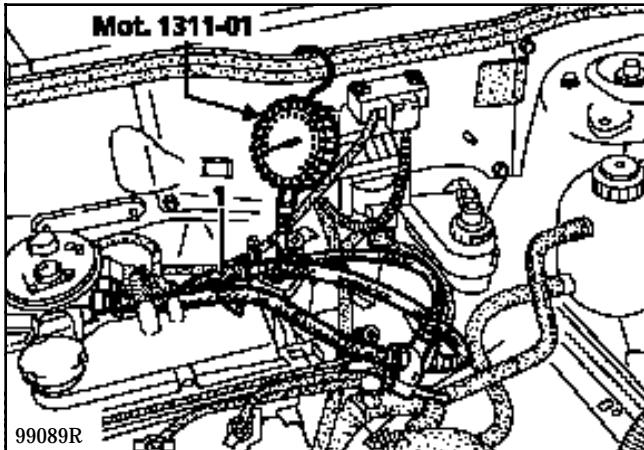
If the flow is low, check the feed voltage to the pump (a drop of approximately 10% is caused for a drop in voltage of 1 Volt).

## CHECKING THE FUEL SUPPLY PRESSURE

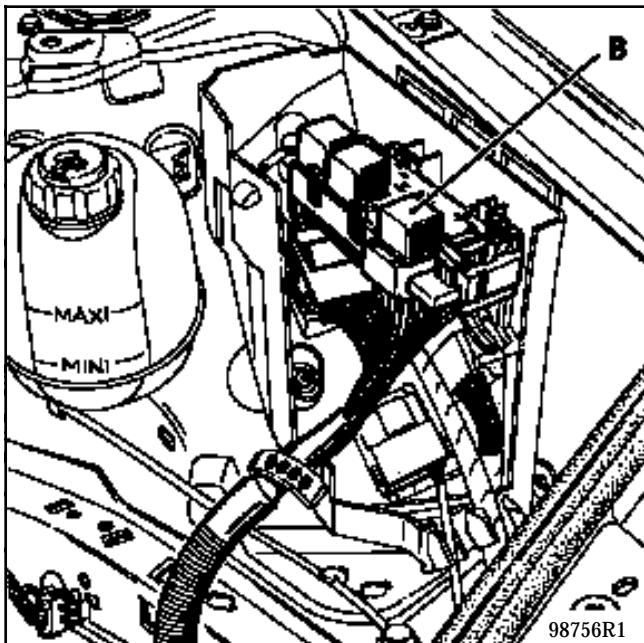
## SPECIAL TOOLING REQUIRED

Mot. 1311-01 Fuel pressure test kit

Disconnect the fuel supply pipe (1) from the throttle body and insert the **0 - 10 bars** pressure gauge and the three way union from the test kit Mot. 1311-01.



Shunt terminals (3) and (5) of the fuel pump relay (B) in the engine connection unit (see diagram on page 13-2).



The pressure should be **1.06 bar**.

## Checking the pump safety valve

If the fuel pressure is correct, feed the fuel pump and clamp the pipe with the two position valve for a brief moment. The pressure should stabilise at approximately 3 bars.

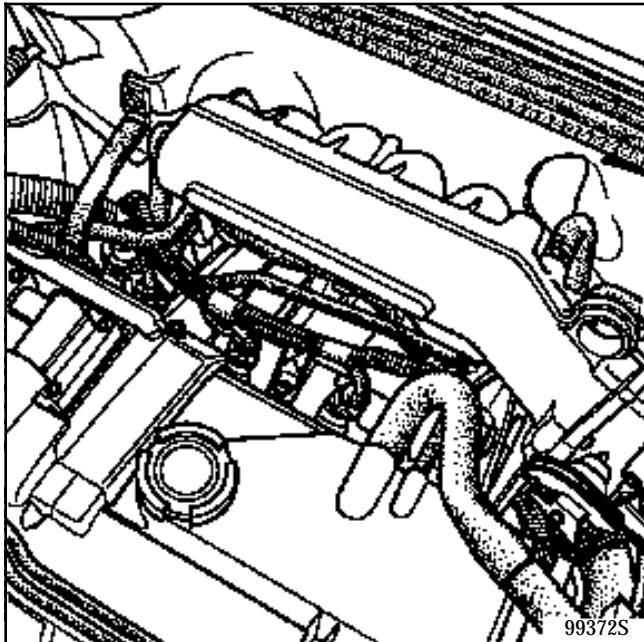
### CHECKING THE FUEL SUPPLY PRESSURE

#### SPECIAL TOOLING REQUIRED

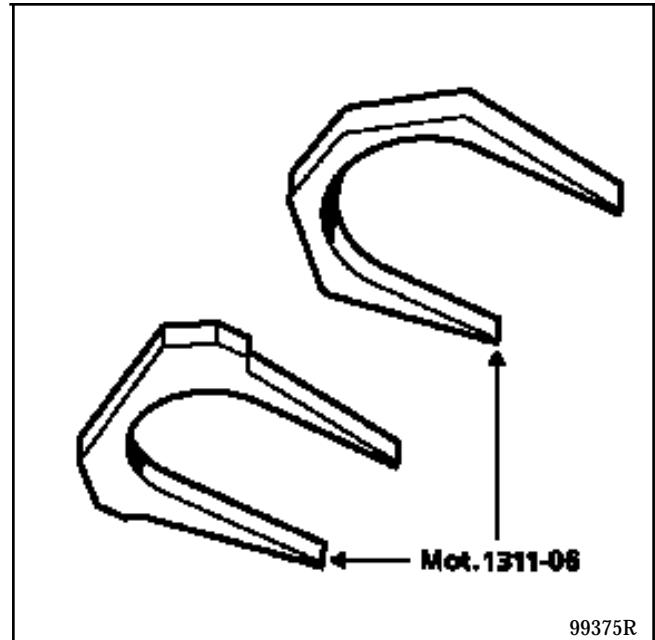
- Mot. 1311-01** Fuel pressure test kit (with 0 ;+ 10 bars pressure gauge included)
- Mot. 1311-04** T piece (J union)
- Mot. 1311-06** Tool for removing fuel pipes

Disconnect:

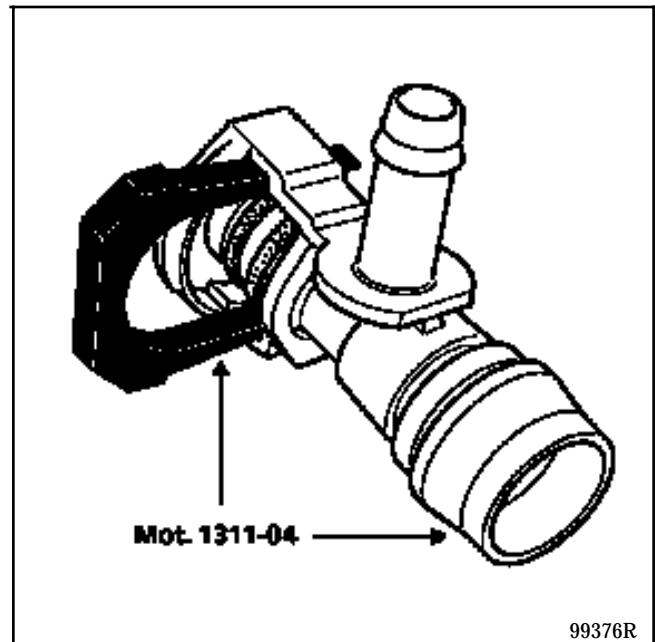
- the oil vapour rebreathing pipes and the fuel vapour recirculation pipes,



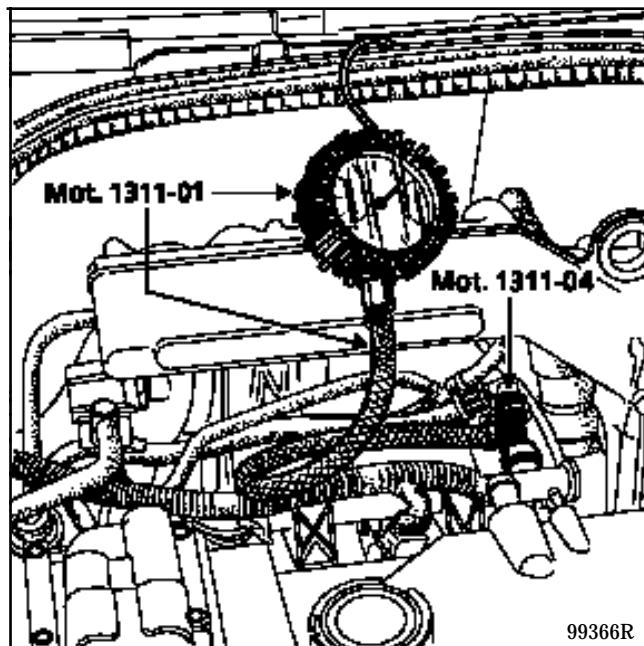
- the fuel supply pipe using small section tool **Mot. 1311-06** (method described in section 13 "Fuel gallery").



Connect the T piece **Mot. 1311-04** to the gallery, then reconnect the fuel supply pipe to the T piece.



Fit the 0 ; 10 bars pressure gauge and the hose  
**Mot. 1311-01.**



Shunt terminals (3) and (5) on the fuel pump relay located in the engine fuse box (see diagram on page 13-2).

The pressure should be **3 bars  $\pm 0.2$ .**

When a vacuum of 500 mbars is applied to the pressure regulator, the fuel pressure should be **2.5 bars  $\pm 0.2$ .**

#### **CHECKING THE PUMP SAFETY VALVE** (under the same conditions as previously)

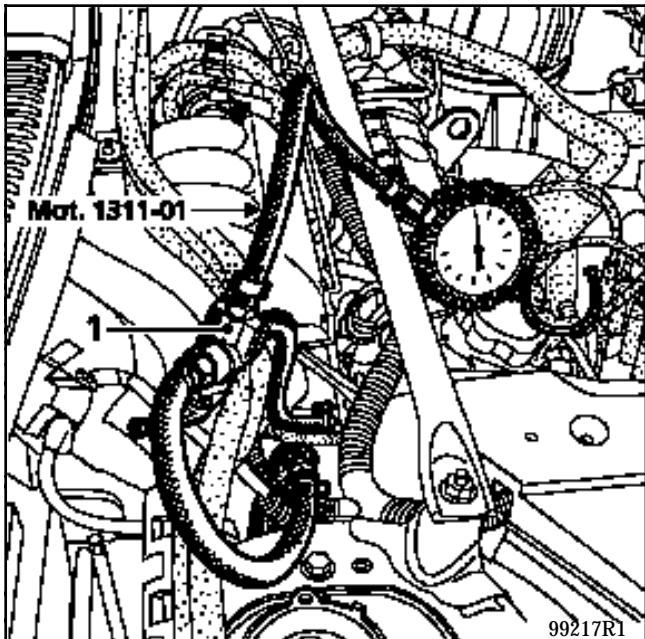
Shunt terminals (3) and (5) of the fuel pump relay (see diagram on page 13-2).

When the fuel return pipe is clamped briefly, the pressure should stabilise between **4.5 and 7.5 bars.**

## CHECKING THE FUEL SUPPLY PRESSURE

## SPECIAL TOOLING REQUIRED

**Mot. 1311-01 Fuel pressure test kit (with 0 ;+  
10 bars pressure gauge included)**



Disconnect the rear fuel pipe.

Fit the three way valve (1) from tool **Mot. 1311-01** and connect the **0 ;+ 10 bars** pressure gauge.

Shunt terminals (3) and (5) of the fuel pump relay located in the engine fuse box.

The pressure should be **3 bars ± 0.2**.

When a vacuum of **500 mbars** is applied to the fuel pressure regulator, the pressure should be **2.5 bars ± 0.2**.

**CHECKING THE PUMP SAFETY VALVE** (under the same conditions as previously)

Shunt terminals (3) and (5) of the fuel pump relay (see diagram on page 13-2).

When the fuel return pipe is clamped briefly by the two position valve, the pressure should stabilise between **4.5 and 7.5 bars**.

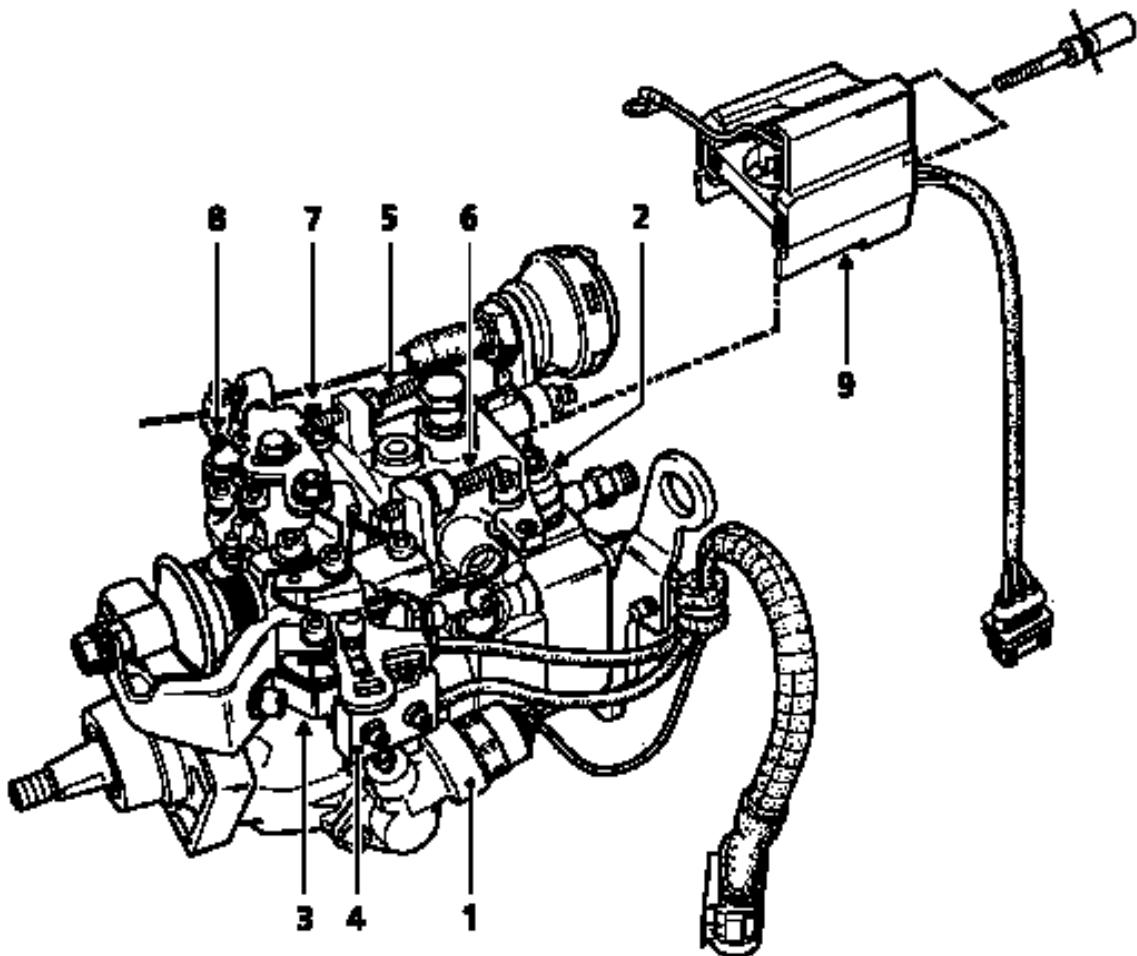
# DIESEL EQUIPMENT Specifications

**13**

Vehicle	Gearbox	Engine							Depollution standard
		Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cm <sup>3</sup> )	Ratio	Catalytic converter	
BA0U	JB3	F8Q	620	80	93	1 870	21.5/1	None	EU93
BA0A	JB3	F8Q	620	80	93	1 870	21.5/1	◆ C25	EU96

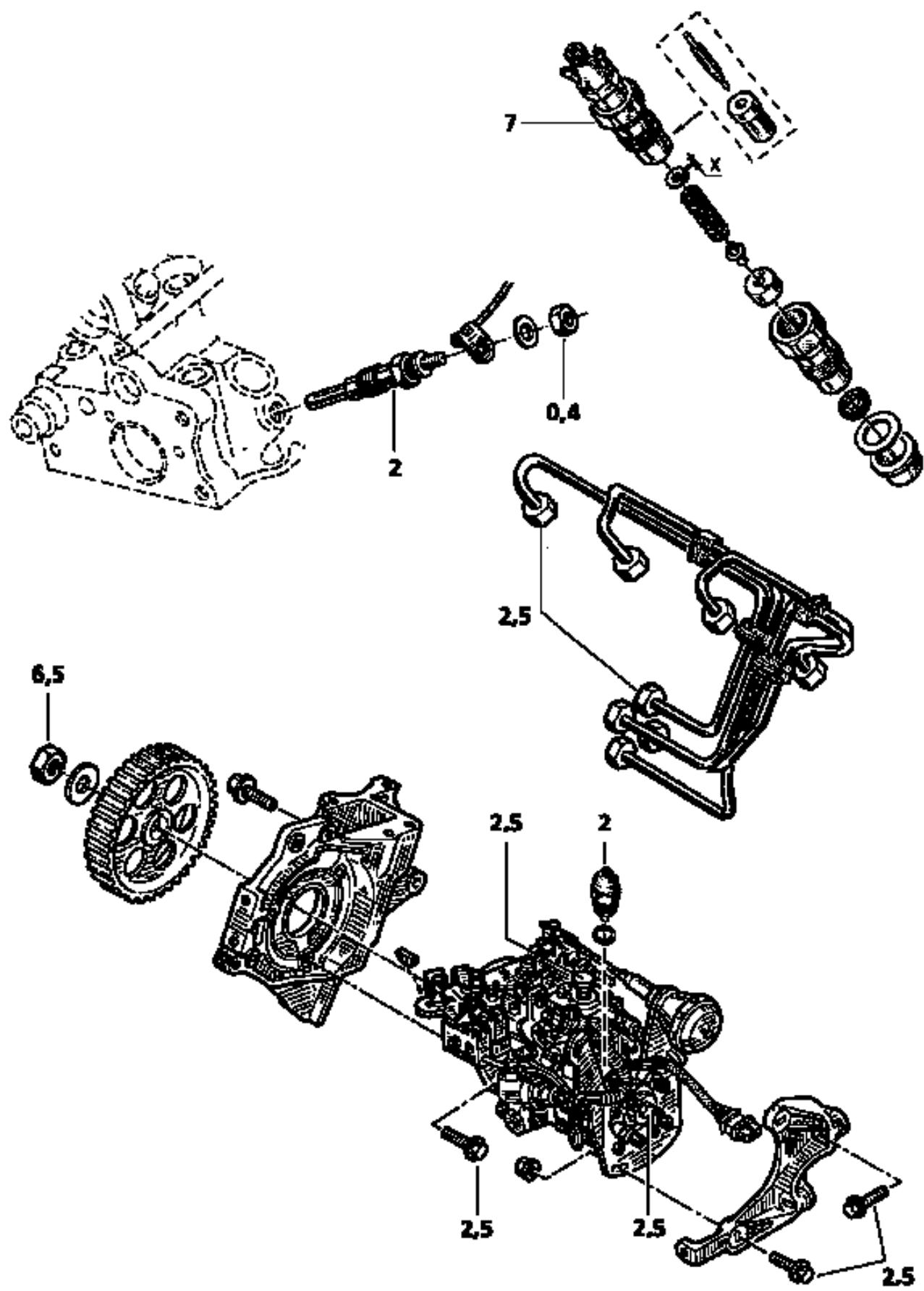
ENGINE SPEED (rpm.)			SMOKE OPACITY	
Idle speed	Maximum no load	Maximum with load	Homologation value	Legal maximum
825 ± 25	5 200 ± 100	4 600 ± 100	1.24 m <sup>-1</sup> (40 %)	2 m <sup>-1</sup> (55 %)

DESCRIPTION	MAKE /TYPE	SPECIAL NOTES
Injection pump Pumps R598-2 and R598-3 differ in that a coded fuel shut off valve has been added	BOSCH VE 4/8F 2300R598 VE 4/8F 2300R 598-1* VE 4/8F 2300R 598-2 VE 4/8F 2300R 598-3*	Rotary pump with: - separate idle lever - solenoid controlled load dependence (ALFB) - post-heating and EGR cut-out microswitch - air conditioning cut-out microswitch*
Pump timing obtained by 8mm diameter TDC pin (Mot. 1079)		Pump piston lift: 0.82 ± 0.04 mm (the setting value is stamped on the load lever)
Injector holders	BOSCH KCA 17 S 42	Tightening torque : 7 daN.m
Injectors	BOSCH DNOSD 302	Test: 130 +8 -5 bars Maximum gap: 8 bars
Fuel filter	PURFLUX	Priming pump The filter is fitted with an electrical fuel heater
EGR solenoid valve		Voltage: 12 volts Resistance : 10 ± 5 Ω
Fuel pipes		External diameter : 6 mm Internal diameter : 2.5 mm Length: 400 mm
Pre-heating unit	NAGARES	With pre-post-heating function and cold start functions and fast idle solenoid
Heater plugs	BOSCH	Current: 15 A approximately after 8 seconds heating Tightening torque : 2 daN.m



99337R2

- 1 Load dependence control solenoid valve (ALFB)
- 2 Fuel shut off solenoid
- 3 Microswitch for cutting post-heating and exhaust gas recirculation (EGR)
- 4 Air conditioning microswitch
- 5 Residual flow stop screw (anti-stall)
- 6 Maximum engine speed stop screw (no adjustment may be made except at a Renault Injection Centre)
- 7 Normal idle speed adjustment stop screw
- 8 Fast idle speed adjustment stop screw
- 9 Coded solenoid valve electronic unit



**ALFB (solenoid controlled load dependence)**

**ROLE**

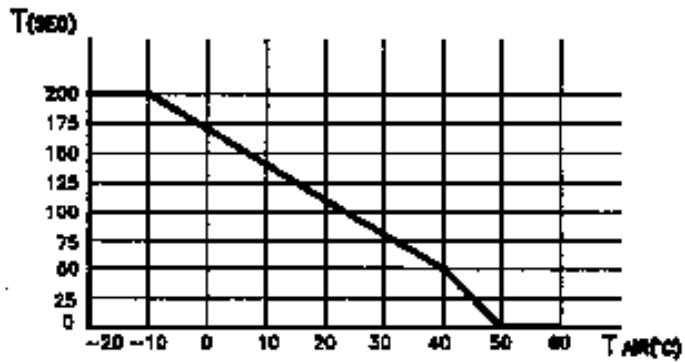
To eliminate the action of LFB load dependence (internal drop in pressure in the pump and therefore advance), depending on the engine temperature and atmospheric pressure.

**OPERATION**

**1. Control by pre-post-heating unit**

- a) As long as the coolant temperature is < 29°C, the solenoid valve is fed when the ignition is turned on.
- b) If the coolant temperature sensor is faulty, the solenoid valve is fed when the ignition is turned on depending on the air temperature (the air temperature sensor is located in the pre-post-heating unit).

**Coolant temperature sensor faulty**

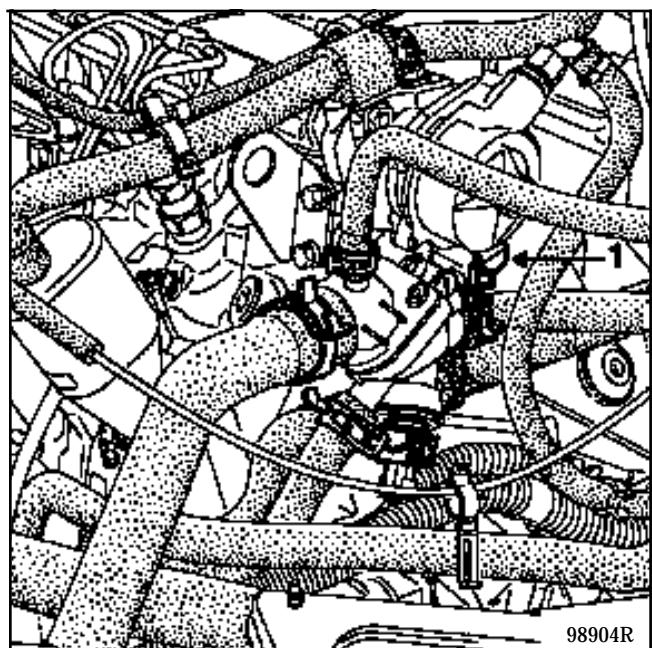


DI1301

- c) If both the coolant and air temperature sensors are faulty, the solenoid valve is fed for 200 seconds when the ignition is turned on.

**LOCATION**

**Coolant temperature sensor (1) (black connector)**



98904R

**SPECIFICATIONS**

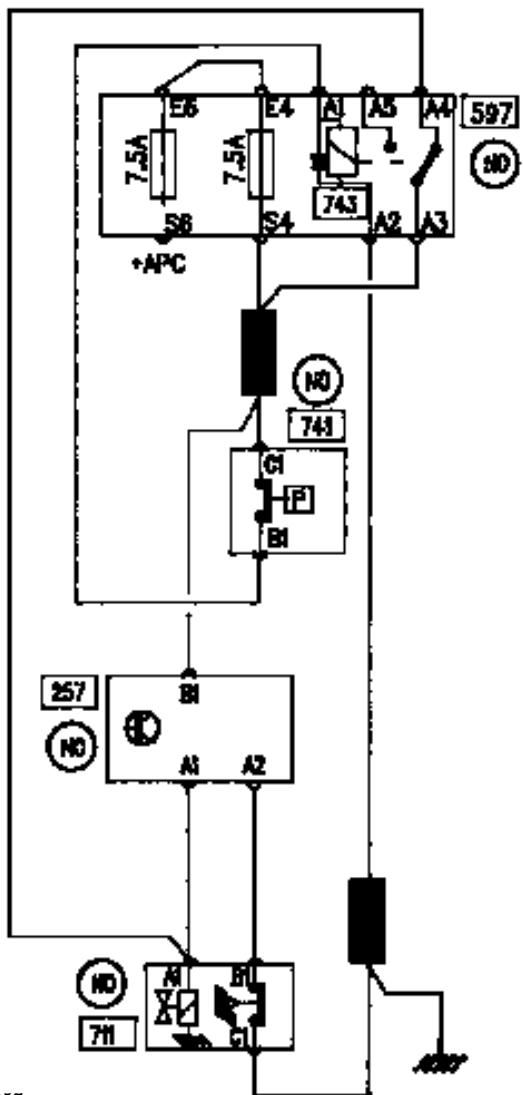
Temperature in °C	Resistance Ω
25	2 610 to 2 990
80	310 to 350

## **2. Control by altimetric capsule**

At altitude, when atmospheric pressure is approximately **925 ± 20 mbars**, the ALFB solenoid valve is fed via a relay and the altimetric capsule.

## KEY

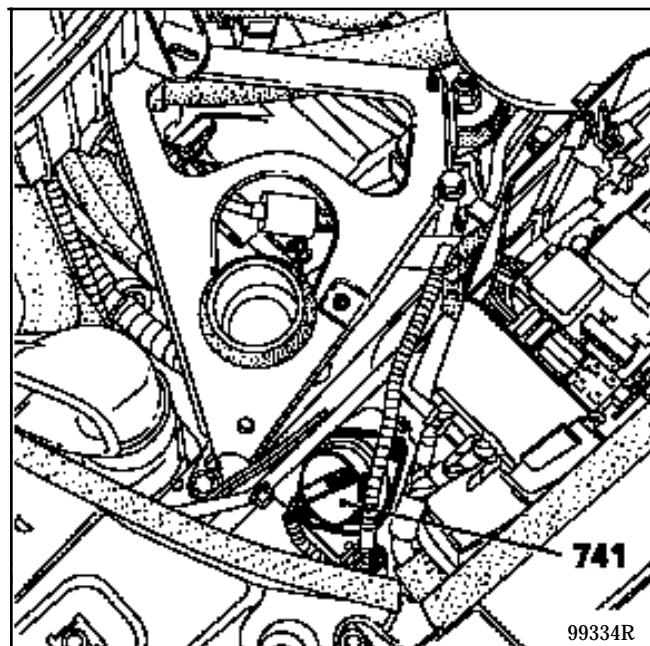
- 257 Pre-heating unit
  - 597 Engine fuse box
  - 711 ALFB solenoid valve mounted on injection pump
  - 741 Altimetric capsule
  - 743 Altimetric relay



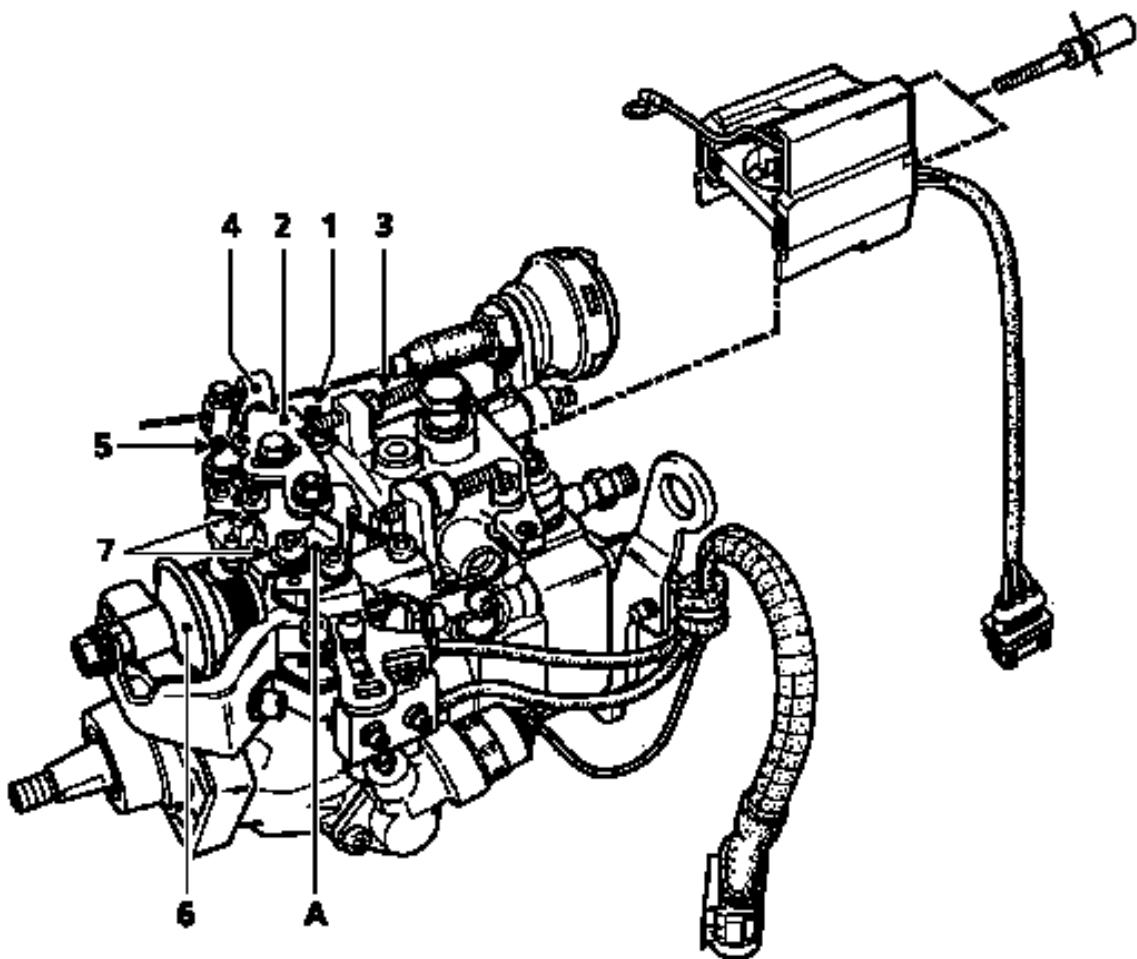
PRJ99257

## **LOCATION**

## Altimetric capsule (741)



These adjustments **must** be made when the engine is warm, after the cooling fan assemblies have operated at least twice.



99337R3

#### **ADJUSTING THE IDLE SPEED AND THE RESIDUAL FLOW (anti-stall)**

Slacken the residual flow screw two turns and check that the load lever is touching the screw.

Adjust the idle speed to **825 ± 25 rpm** using screw (1).

Fit a 4mm shim between the load lever (2) and the residual flow screw (3).

Adjust the engine speed to **1 150 ± 25 rpm** using the residual flow screw (3).

Remove the 4 mm shim then accelerate sharply twice.

Check the idle speed setting is correct; if necessary adjust the idle speed again and recheck the residual flow setting.

The idle speed and anti-stall function must be set correctly since they have a direct effect on engine behaviour at idle speed and during deceleration (hesitation, idle speed remains operative, etc...).

### ADJUSTING THE FAST IDLE SPEED

Set the separate idle speed lever (4) against the fast idle screw (5), then adjust the engine speed to **950 ± 25 rpm** using this screw (5).

### ADJUSTING THE POSITION OF THE FAST IDLE CABLE GRIP (when the idle speed and residual flow settings are correct )

Check that the separate idle speed lever (4) is against the idle speed screw (1).

Hold the cable taut.

Position the cable grip at a distance of :

- **6 mm ± 1** (without air conditioning)  
from lever (4)
- **2 mm ± 1** (with air conditioning)  
from lever (4)

**NOTE** : vehicles fitted with the air conditioning option are fitted with a fast idle control diaphragm operated pneumatically by a solenoid valve. Fast idle is obtained during post-heating or when air conditioning is selected (see operating diagram in the pre-heating section).

### ADJUSTING THE DECELERATION DAMPER (6)

When the adjustments above have been made, the deceleration damper must be adjusted as described below.

Slacken screws (7) to release the lever (A).

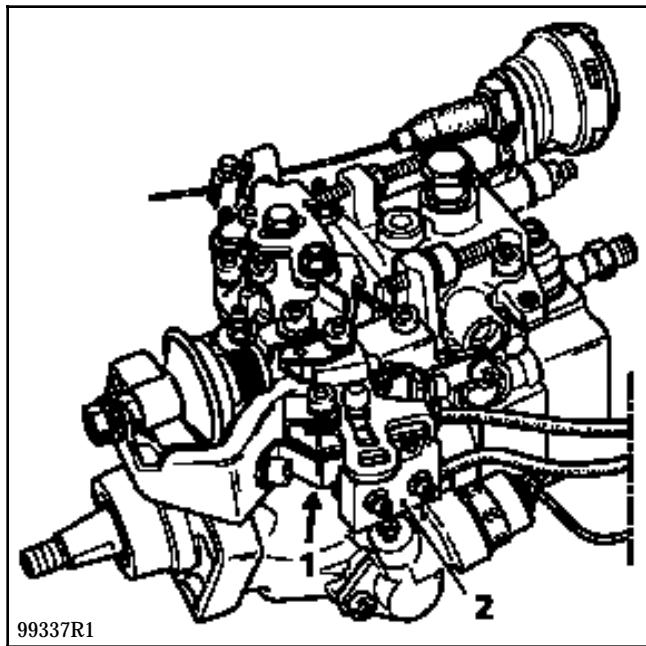
Fit a 1 mm shim between the deceleration damper and the lever (A).

Push lever (A) on the deceleration damper to the stop.

Ensure the load lever (2) remains in contact with the residual flow screw (3).

Tighten the screws (7) in this position.

Remove the adjusting shim and ensure there is contact between the load lever (2) and the residual flow screw (3).



- 1 Microswitch for cutting out post-heating and EGR
- 2 Microswitch for cutting out air conditioning (if operational)

The post-heating cut-out microswitch (1) is also used for cutting EGR .

In order to meet depollution standards this microswitch requires precise adjustment.

Fit a shim between the anti-stall screw (residual flow) and the load lever.

Microswitch	Shim thickness (mm)	Microswitch position	Resistance ( $\Omega$ )
EGR	18.2	closed	0
	19.2	open	infinity (tracks B1 and C1)
CA	17.5	closed	0
	18.5	open	infinity (tracks B2 and C2)

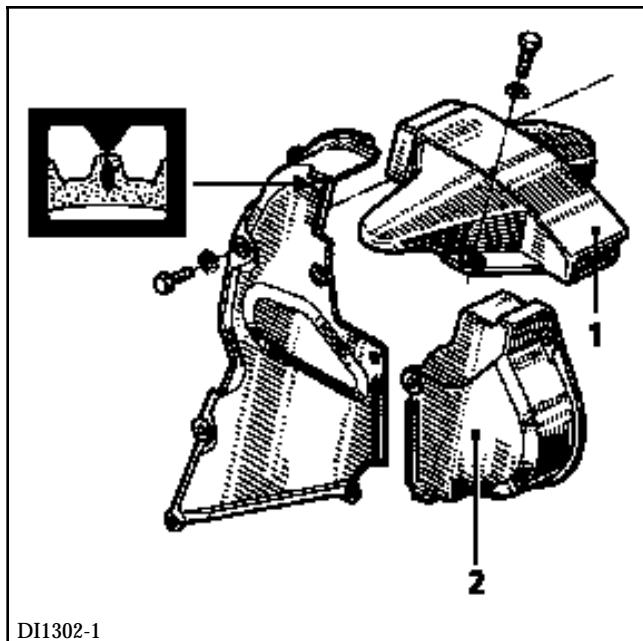
Adjustment is made by moving the microswitch after slackening the two mounting bolts.

SPECIAL TOOLING REQUIRED	
<b>B.Vi. 868</b>	Wrench for removing high pressure pipe
<b>Mot. 909-02</b>	12 sided wrench for removing injection pump mounting
<b>Mot. 997</b>	Socket for removing injector holder
<b>Mot. 1053</b>	Pump pulley extractor
<b>Mot. 1054</b>	TDC pin
<b>Mot. 1200</b>	Pump pulley retaining tool

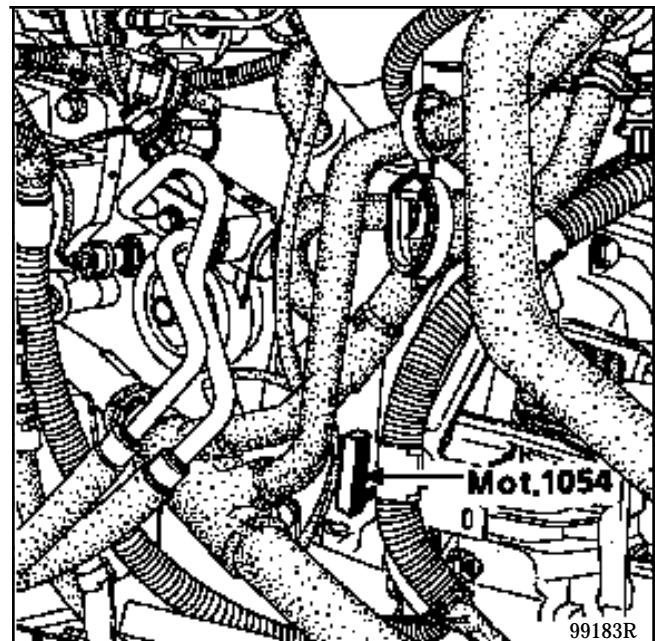
#### REMOVAL

Battery disconnected, remove:

- the suspended engine mounting housing (1),
- the injection pump pulley housing (2).

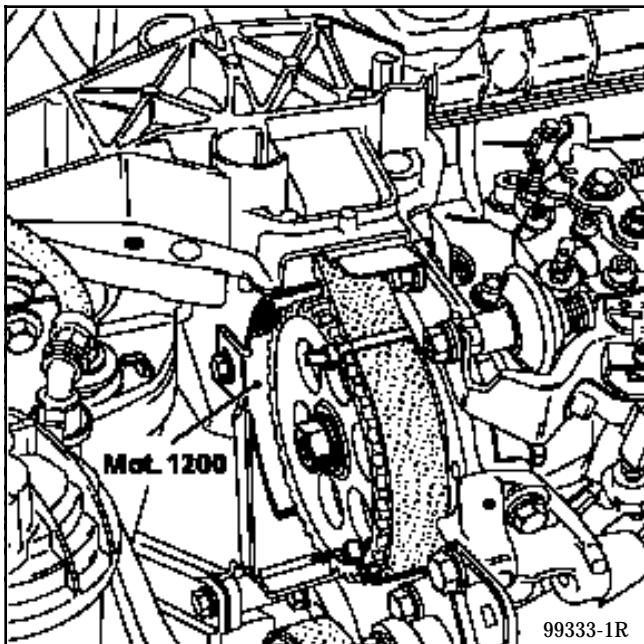


Immobilise the engine using tool **Mot. 1054**. To do this, turn the engine so that the camshaft sprocket index is aligned with the timing cover reference mark.



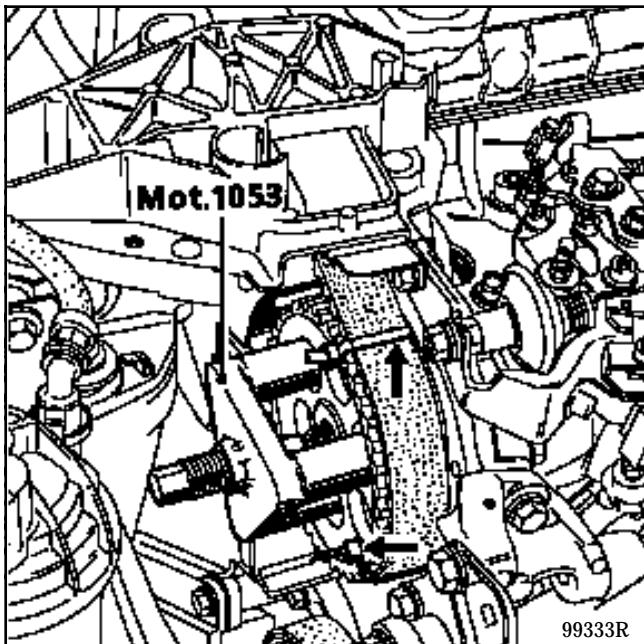
Disconnect the fuel supply pipe at the injection pump end.

Fit the pump pulley retaining tool Mot. 1200.



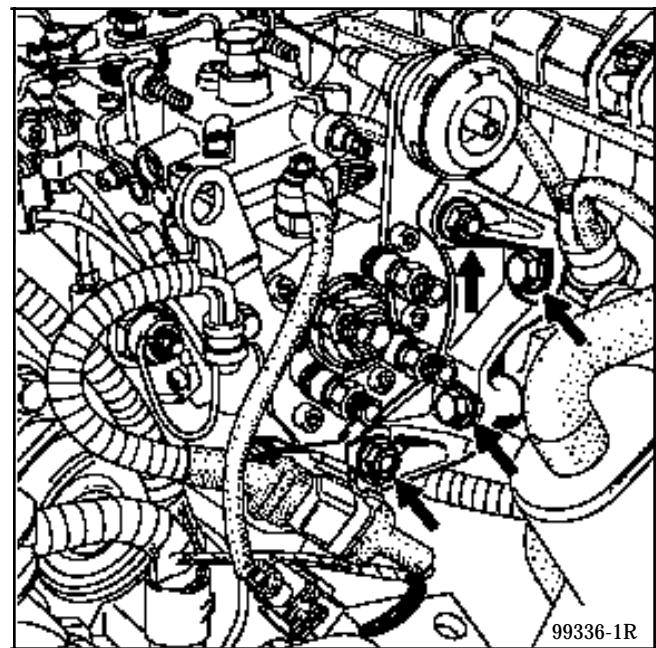
Remove the pump sprocket mounting nut.

Release the sprocket from the cone using tool Mot. 1053 (fit two plastic clips before removing the sprocket).



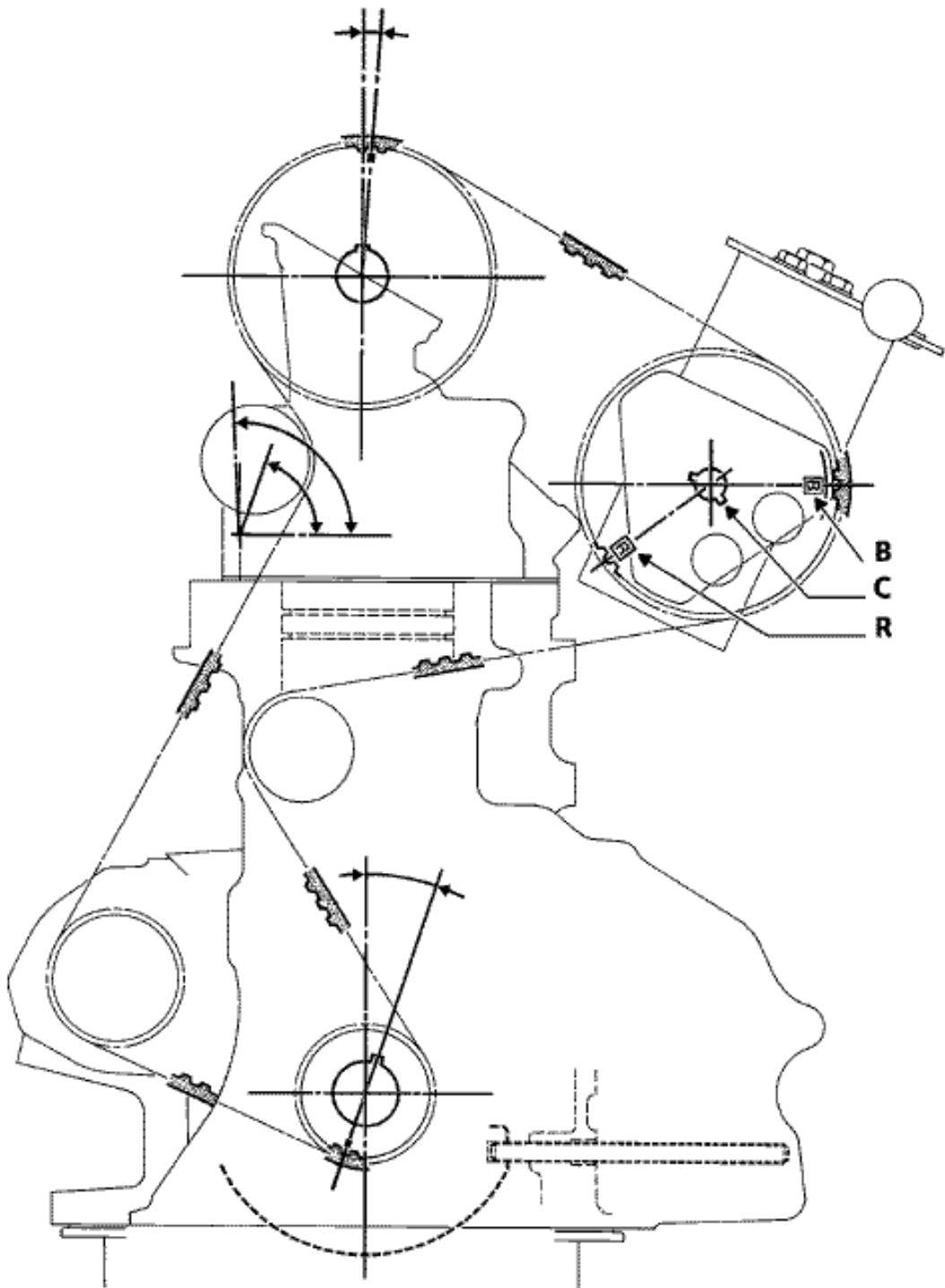
Remove:

- the fuel return pipe,
- the high pressure pipe using tool **B.Vi. 868**,
- the accelerator cable,
- the connections,
- the fast idle control,
- the four rear mounting bolts,



- the three injection pump mounting bolts; to make removing the lower bolt easier, use tool **Mot. 909-02**.

Remove the pump (retain the key from the drive cone).



92600R2

- B BOSCH pump
- R LUCAS DIESEL pump
- C keyway to be used

### REFITTING (Special notes)

To facilitate refitting the lower injection pump mounting bolt, remove the injector holder for cylinder n° 4 (when refitting, the copper seal and the flame arresting washer must be **systematically** renewed).

Refitting is the reverse of removal.

**IMPORTANT :** depending on equipment, the pump drive sprocket has a different position. There are two position markers and two differently aligned keyways.

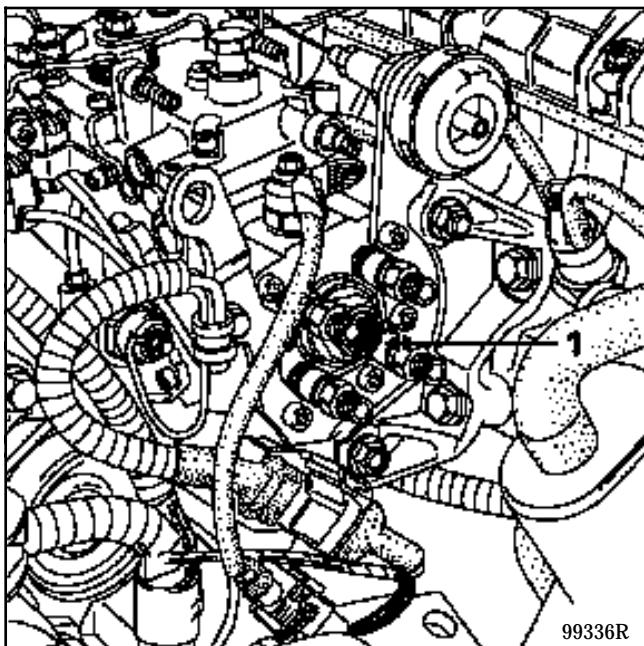
Fit the pump ensuring the key fits into the sprocket (reference C).

Tighten the pump mounting nut to the recommended torque (see previous pages).

**Carry out pump timing (see method below).**

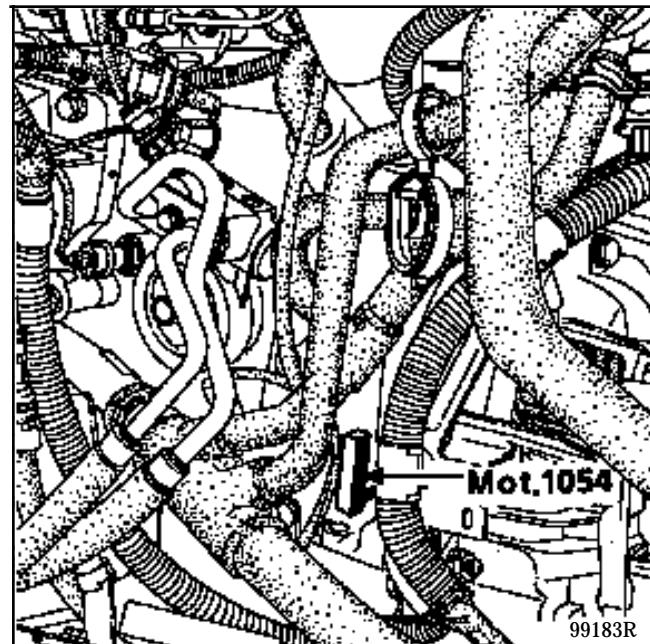
**CHECKING THE PUMP TIMING**

In place of the plug (1) insert the dial gauge mounting **Mot. 856** and attach a dial gauge with socket.



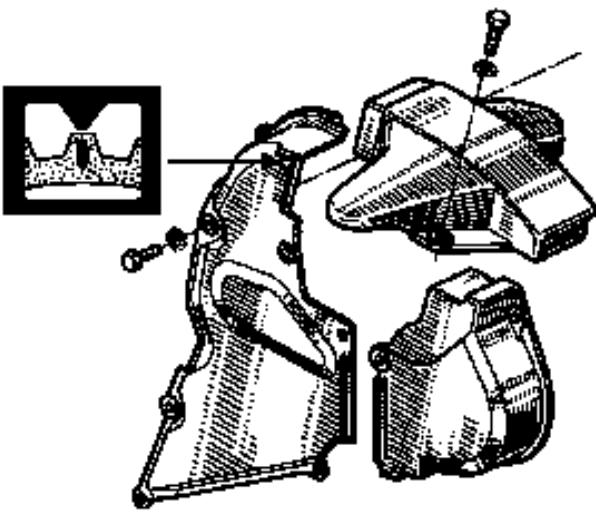
Zero the dial gauge to BDC on the injection pump piston.

Immobilise the engine using tool **Mot. 1054**. To do this, turn the engine so that the camshaft sprocket index is aligned with the timing cover reference mark.



Check the pump piston lift shown on the dial gauge ; it should be  **$0.82 \pm 0.04$  mm**. If it is not, rotate the pump to obtain the required piston lift.

**IMPORTANT :** after tightening the pump mounting bolts, turn the engine over twice. Immobilise the engine once more to check the pump timing.



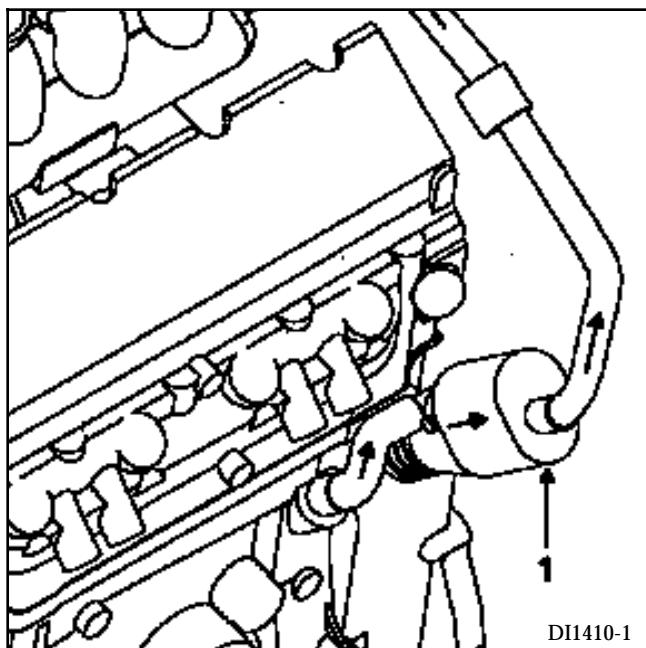
**REPLACEMENT**

SPECIAL TOOLING REQUIRED	
Mot. 1372	Kit for removing self shearing bolts from computers

**REMOVAL**

This operation must be carried out with the ignition turned off.

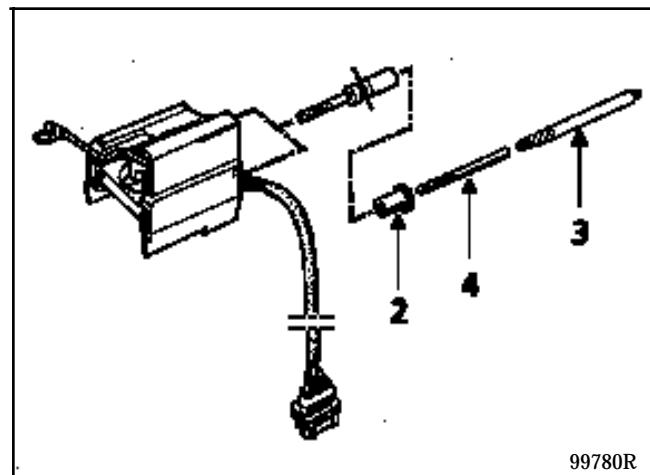
Remove the oil vapour decanter (1).



Fit the drilling tube (2) from kit Mot. 1372 into the computer.

Use:

- the **4 mm** diameter drill from kit Mot. 1372 to drill the two bolts (drilling depth approximately **3 mm**),
- the number 6 extractor from the kit Mot. 1372 to remove the bolts.



Remove the computer.

**REFITTING**

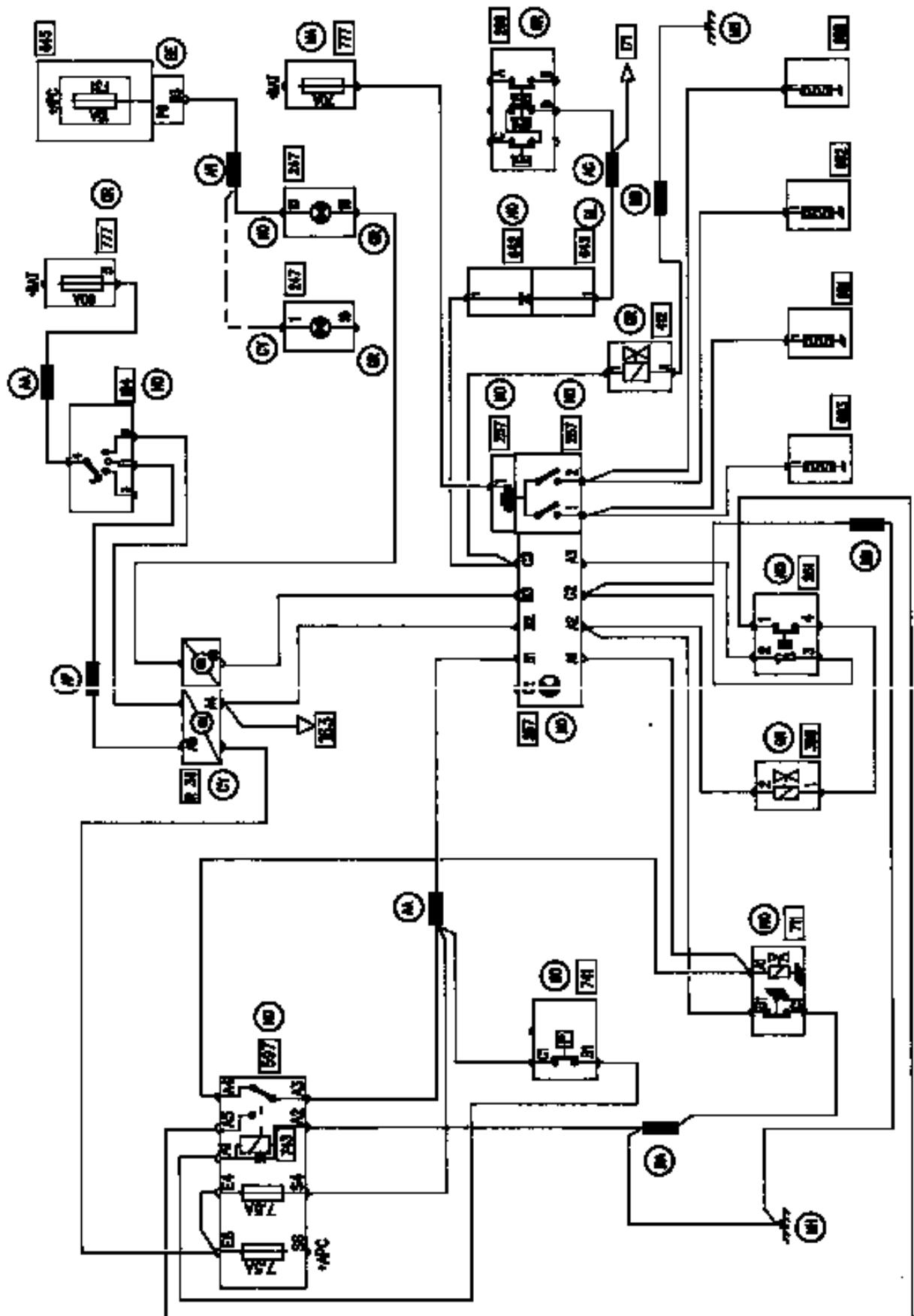
Use the self shearing bolts available from the Parts Department.

**Composition of kit Mot. 1372 :**

- one 4 mm diameter drill (4)
- one number 6 extractor(3)
- one drilling tube (2)

**NOTE :**

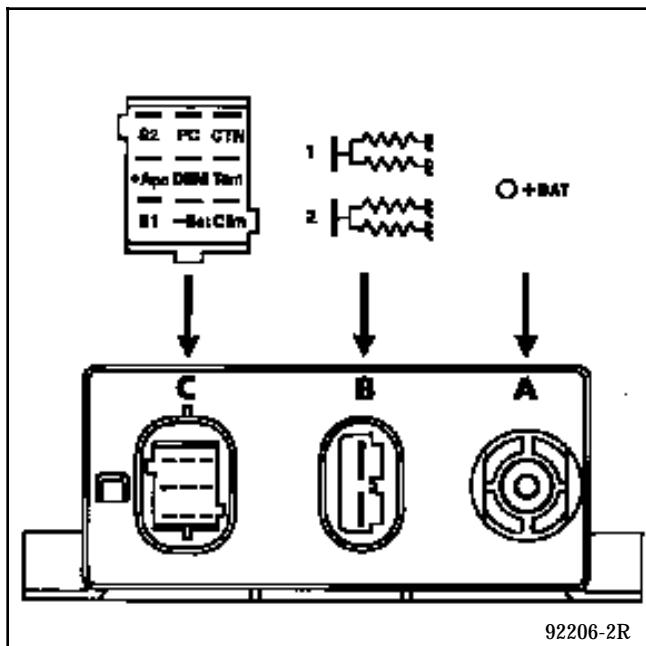
- take care to remember to replace the plastic cover on the solenoid valve nut,
- lightly oil the drill to facilitate drilling.



#### DIAGRAM KEY

- 104 Ignition switch
- 163 Starter
- 171 Air conditioning clutch
- 206 Air conditioning trifunction pressure switch
- 247 Instrument panel
- 251 Bi-function coolant temperature switch
- 257 Pre-heating unit
- 398 EGR solenoid valve
- 412 Fast idle solenoid valve (AC version)
- 597 Engine fuse box
- 642 AC / pre-heating separation diode
- 645 Passenger compartment fuse box
- 680 Pre-heating unit n° 1
- 681 Pre-heating unit n° 2
- 682 Pre-heating unit n° 3
- 683 Pre-heating unit n° 4
- 711 Diesel fuel pump
- 741 Altimetric capsule
- 743 Altimetric relay
- 777 Power feed for fuse box

#### IDENTIFICATION OF CONNECTORS



#### Connector (A)

+ Bat + before ignition feed

#### Connector (B)

- 1 Feed to heater plugs 1 and 3
- 2 Feed to heater plugs 2 and 4

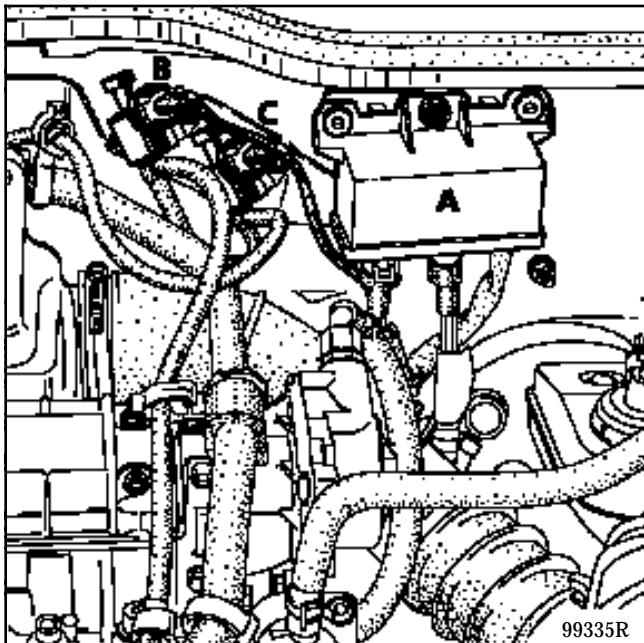
#### Connector (C)

- A1 / S2 Load dependence solenoid valve control
- A2 / PC Load lever microswitch information
- A3 / CTN CTN type sensor coolant temperature information
- B1/+APC + after ignition feed
- B2 / DEM Starter information
- B3 / Tem Pre-heating warning light control (via earth)
- C1 / S1 Not used
- C2 / -Bat Earth
- C3 / Clim Fast idle solenoid valve control during post-heating phase

**LOCATION**

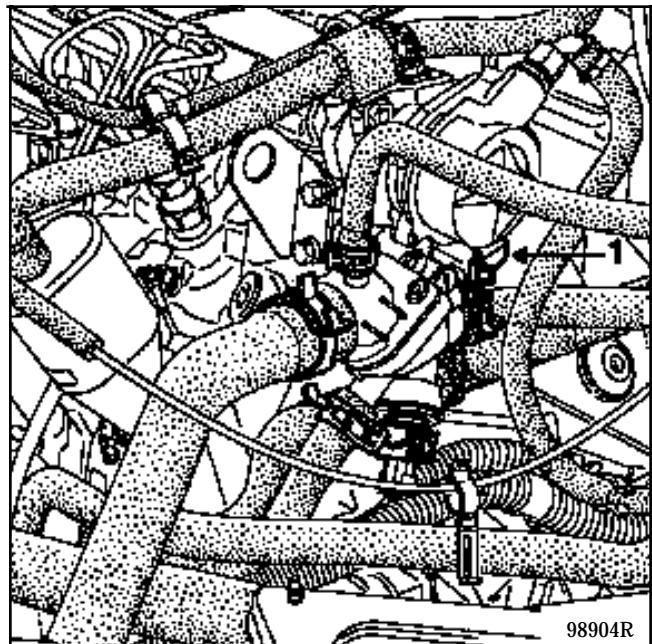
**Pre-post-heating unit (A)**

This unit has two diodes to prevent the feeding of the heater plugs when the air conditioning system is operating and also has a CTN type air temperature sensor.



- B** Air conditioning diaphragm control solenoid valve on injection pump (fast idle)
- C** EGR control solenoid valve

**Coolant temperature sensor (1) (black connector)**



**SPECIFICATIONS**

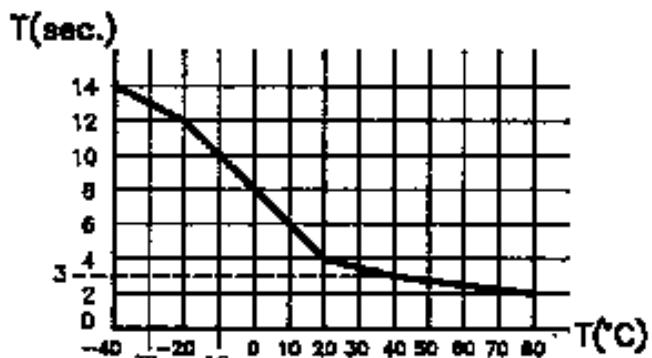
Temperature in °C ± 1	Resistance Ω
25	2 610 to 2 990
80	310 to 350

**PRINCIPLE OF OPERATION FOR GAS PRE-POST-HEATING**

**1. "Pre-heating" when the ignition is turned on**

**a) Variable pre-heating**

The time period during which the warning light is illuminated and the heater plugs are fed is dependent on the coolant temperature.



DI1304

If the coolant temperature sensor is faulty, the heater plugs are fed systematically for 14 seconds.

**b) Fixed pre-heating**

After the pre-heating warning light has extinguished (variable pre-heating), the plugs remain fed for up to 8 seconds before the engine is started.

**2. Starting**

The plugs remain fed while the starter is activated.

**3. "Post-heating" while the engine is running**

Post-heating has two phases:

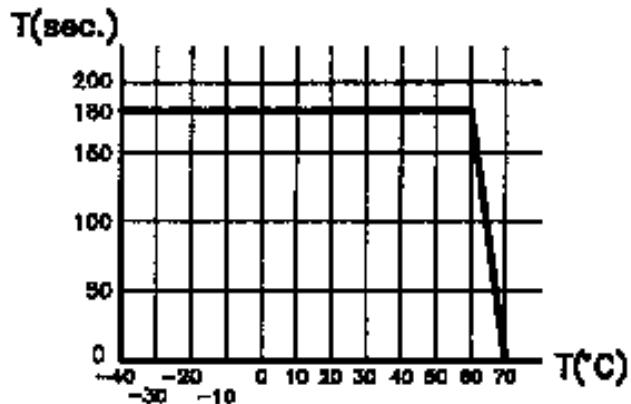
**a) Fixed post-heating**

After the engine has been started, the plugs are fed for 10 seconds.

**b) Variable post-heating**

Variable post-heating begins when fixed post-heating has ended.

During this phase, the plugs are fed alternately 1 - 3 and 2 - 4 depending on the coolant temperature.



DI1305

If the coolant temperature sensor is faulty, the heater plugs are fed systematically for 30 seconds.

Variable post-heating may be interrupted:

- finally when the coolant temperature  $> 65^{\circ}\text{C}$ ,
- momentarily when the unit receives full load information (post-heating microswitch opens) for more than 1 second ; post-heating begins again when the engine returns to idle speed or low load (microswitch closes).

**FAULT FINDING**

**1. The pre-heating warning light does not operate**

<b>TEST</b>	<b>SOLUTION</b>
<p>Earth the warning light output of connector (C) using a 2 A fuse when the ignition is turned on (track B3).</p> <ul style="list-style-type: none"> <li>• The fuse blows.</li> <li>• The warning light does not illuminate.</li> <li>• The warning light does illuminate.</li> </ul>	<p>The warning light wiring in the instrument panel is in short circuit. Repair the wiring.</p> <p>The bulb is blown or the wiring is faulty. Replace the bulb or repair the wiring.</p> <p>Check:</p> <ul style="list-style-type: none"> <li>- + battery on connector (A),</li> <li>- + after ignition on connector (C),</li> <li>- battery earth on connector (C).</li> </ul> <p>If the feed is correct, replace the pre-post-heating unit.</p>

**2. The pre-heating warning light only operates for a fraction of a second when the ignition is turned on.**

<b>TEST</b>	<b>SOLUTION</b>
<p>Disconnect connector (B) and test the pre-heating:</p> <ul style="list-style-type: none"> <li>• The warning light illuminates and there is a voltage at the connector outputs (B).</li> <li>• The warning light illuminates and there is no voltage at the connector outputs (B).</li> <li>• The pre-heating warning light illuminates for a fraction of a second only.</li> </ul>	<p>Check the plugs circuit. If it is correct, check and replace the faulty plug(s).</p> <p>Replace the pre-post-heating unit.</p> <p>Check the before ignition feed to the pre-heating unit.</p>

**FAULT FINDING**

**3. There is no fast idle when engine is cold (with air conditioning option)**

<b>TEST</b>	<b>SOLUTION</b>
<p>Run the air conditioning.</p> <ul style="list-style-type: none"> <li>• The fast idle operates</li> </ul>	<p>Check the connections at the pre-post-heating unit (connector C).</p> <p>Ensure continuity between track C3 of connector (C) and track 1 on the solenoid valve.</p> <p>Replace the pre-post-heating unit (ensure the warning light operates correctly when the ignition is turned on).</p>

<b>TEST</b>	<b>SOLUTION</b>
<ul style="list-style-type: none"> <li>• The fast idle does not operate.</li> </ul>	<p>If the fast idle solenoid valve opens the pneumatic circuit, repair the circuit between the vacuum pump, the solenoid valve and the diaphragm.</p> <p>If the solenoid valve does not open the circuit, measure the voltage between the 2 tracks on the solenoid valve connector.</p> <ul style="list-style-type: none"> <li>• <b>12 volts</b> Replace the solenoid valve after testing the connections.</li> <li>• <b>0 volt</b> Ensure the following continuities :            - between track 2 on the connector and earth,            - between track 1 and track C3 of the pre-post-heating unit.</li> </ul>

#### FAULT FINDING

##### 4. Engine operation fault (difficulty in starting, idle speed unstable, noise...)

Check:

- the feed to the pre-post-heating unit :
  - +before ignition at connector A.
  - +after ignition on track B1 of connector C.
  - earth on track C2 of connector C.
- at the pump connector, the resistance of the ALFB solenoid valve (between earth and track A1) :  $7\Omega \pm 0.5$ ,
- the coherence of the temperature reading given by the coolant temperature sensor,

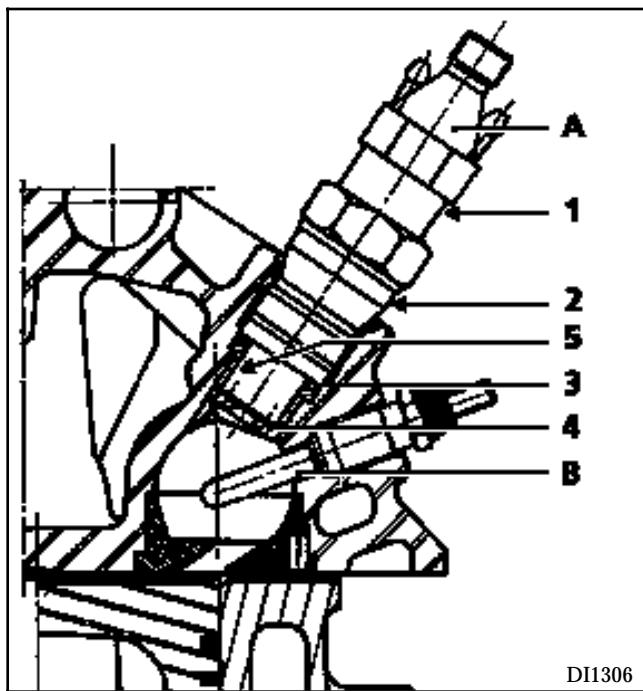
Temperature (°C)	25	80
Resistance ( $\Omega$ )	2 610 to 2 990	310 to 350

- the adjustment and operation of the post-heating microswitch,
- the coherence of the open or closed status of the altimetric capsule switch according to the altimetric pressure of the test site (the switch should be closed for a pressure  $> 925 \pm 20$  mbars).

If the fault persists carry out a complete re-adjustment of the pump.

#### SPECIFICATIONS

##### Injector holder (A)



**1 + 2** Injector holder assembly.

**3** Seal between the injector holder assembly and the cylinder head.

**4** Flame arresting washer.

**5** Injector protector.

The injector holder assembly is screwed into the cylinder head.

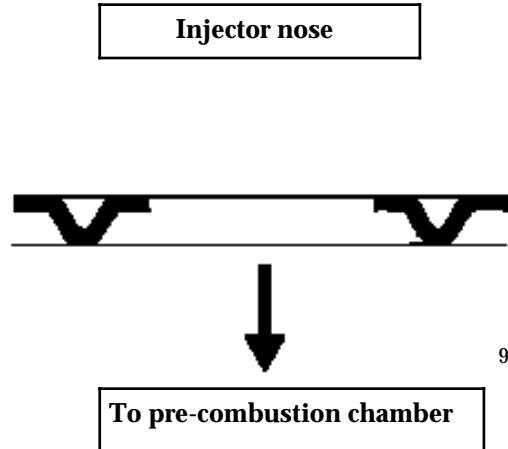
In order to remove the injector high pressure pipes, use wrench **B.Vi. 868**. To remove the injector holder assembly, use the 27 mm long socket **Mot. 997**.

The following tightening torques must be observed:

- lower section (2) on upper section (1) of the injector holder :  $7 \pm 1$  daN.m,
- injector holder on cylinder head:  $7 \pm 1$  daN.m.

Each time an injector holder is removed, the copper seal and the flame arresting washer must be renewed.

##### Position of the flame arresting washer



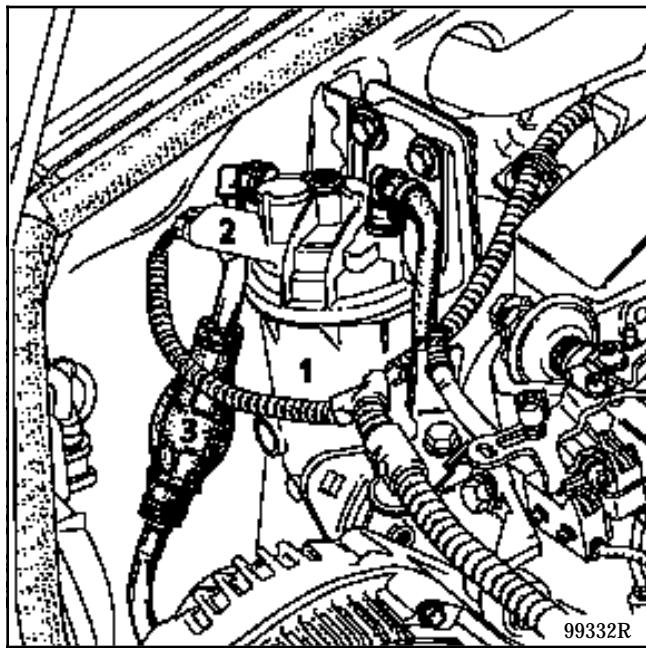
94952R1

##### Heater plug (B)

Current: 15A after 8 seconds heating

Tightening torque : 2 daN.m

**LOCATION**



- 1 Fuel filter
- 2 Electric heater
- 3 Hand priming unit

The electric diesel fuel heater and the thermostat are integral in the head of the filter.

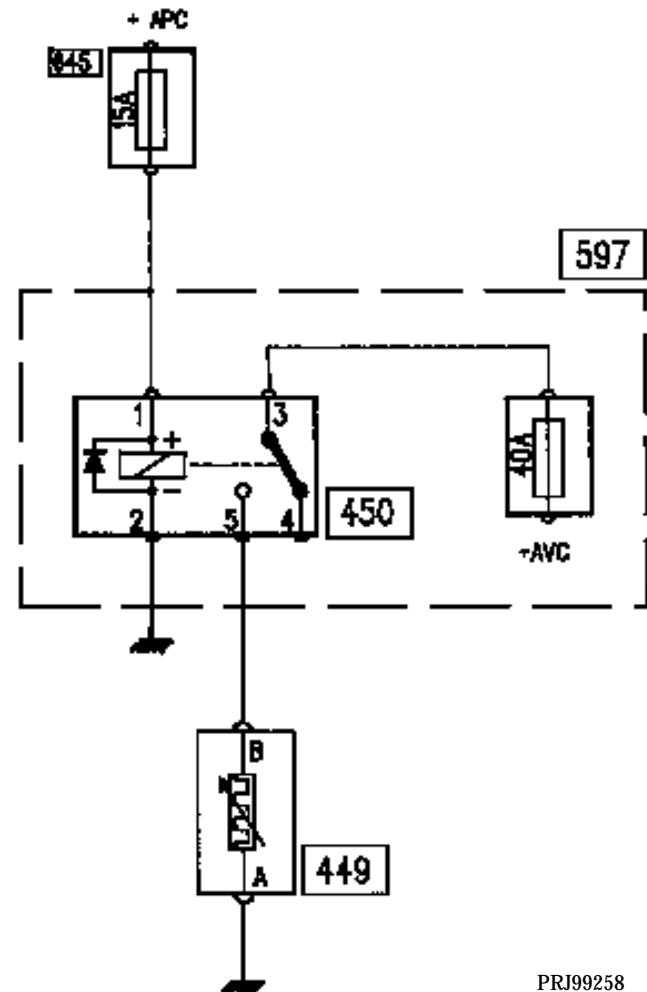
**Operating temperature**

Electrical circuit closes: 0°C

Electrical circuit opens: from 8°C

Heater power: 150 W

**DIAGRAM**



PRJ99258

- |            |                                |
|------------|--------------------------------|
| <b>449</b> | Electric heater                |
| <b>450</b> | Diesel heating relay           |
| <b>597</b> | Engine fuse box                |
| <b>645</b> | Passenger compartment fuse box |

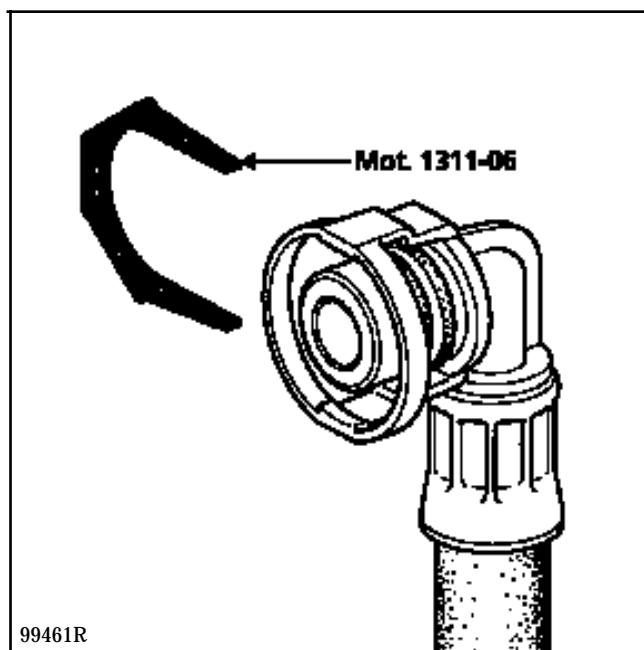
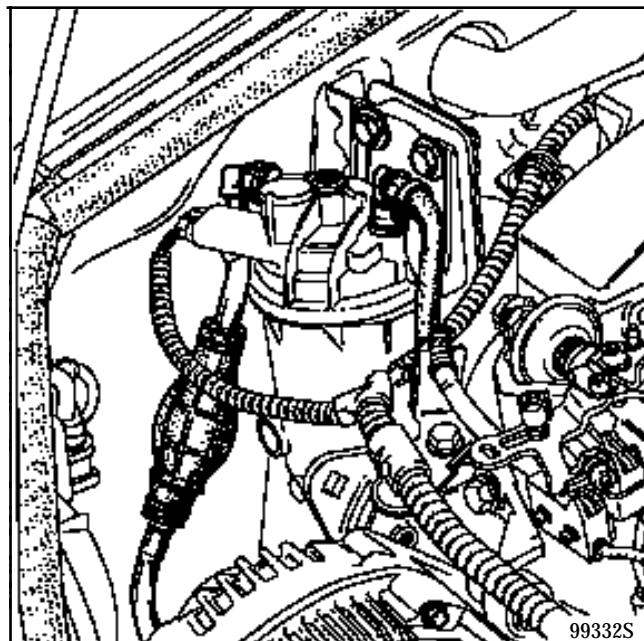
**Principle of the electric heater**

The heater has heated studs. They are ceramic, made from barium titanate which has a positive temperature coefficient, meaning that its resistance increases as its temperature increases.

**REMOVAL - REFITTING (Special notes)**

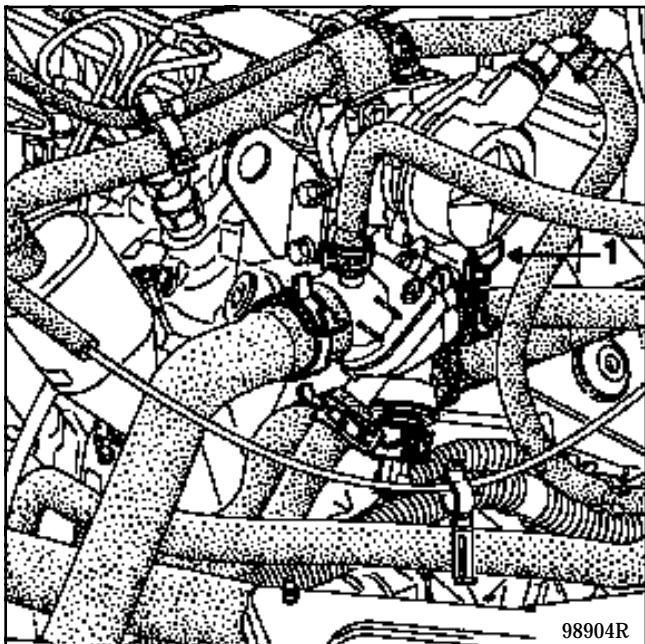
To remove the filter assembly use tool Mot. 1311-06 for the quick release unions.

When refitting, refit the quick release unions by hand and ensure they click back together correctly (two O rings ensure sealing).

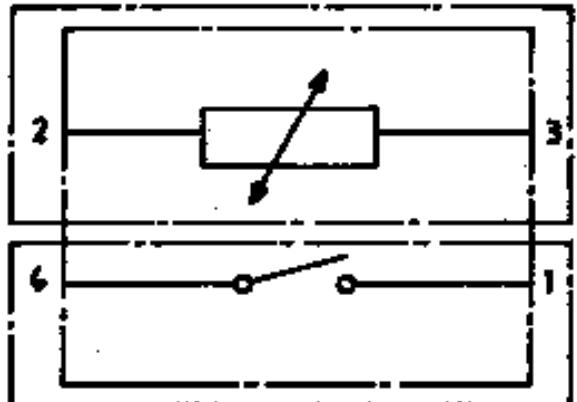


#### LOCATION

Temperature sensor (1) (black connector)



#### DIAGRAM



DI1307

The sensor has two functions

- **Thermistor** (tracks 2 and 3) :  
i.e. a resistance which varies with coolant temperature. The tracks are connected to the pre-post-heating unit.
- **Temperature switch** (tracks 1 and 4) :  
for operating the EGR solenoid valve.

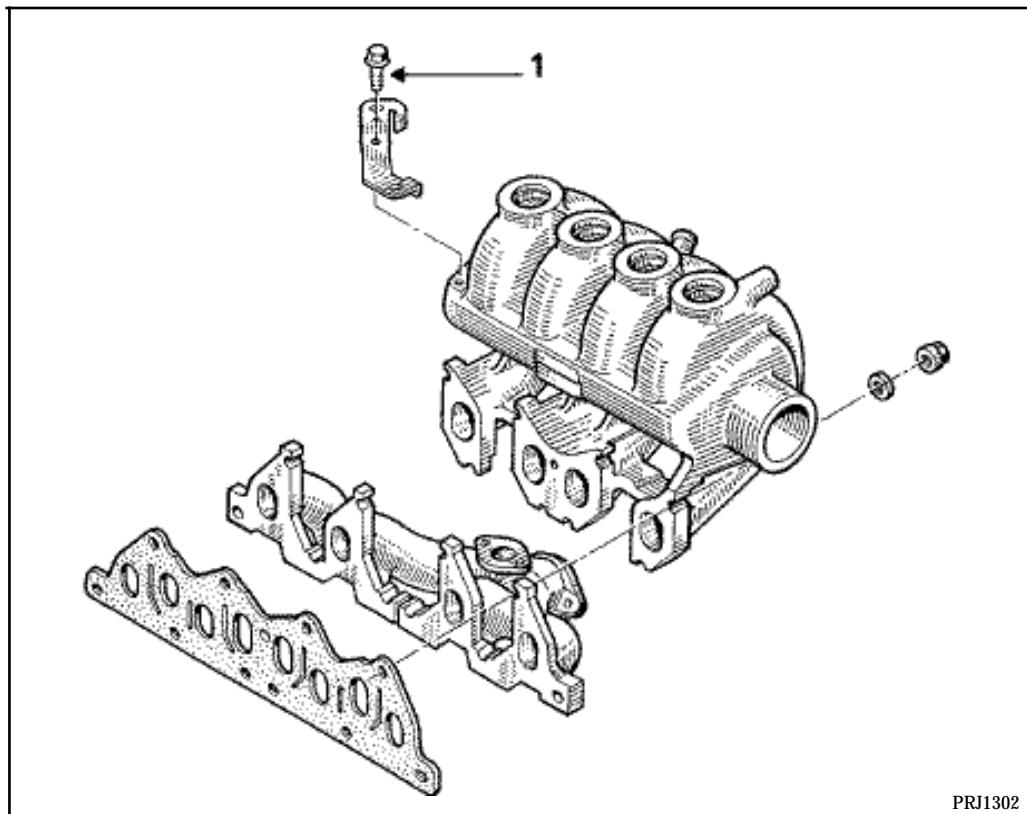
#### SPECIFICATIONS

##### Thermistor

Temperature in °C ± 1	Resistance Ω
25	2 610 to 2 990
80	310 to 350

##### Temperature switch

Temperature in °C ± 1	Switch status
30	closed
20	open



PRJ1302

**Tightening torques (in daN.m)**



<b>Manifold mounting nuts</b>	2.5
-------------------------------	-----

**REMOVAL**

Vehicle on a lift, battery disconnected, remove:

- the bar between the shock absorber turrets,
- . the air inlet pipes,
- . the oil vapour rebreathing pipes,
- . the EGR control pipe (if fitted),
- bolt (1) on the inlet manifold.

**From under the vehicle:**

Remove:

- the engine undertray,
- the exhaust downpipe.

Then remove the ten mounting nuts for the manifolds to release them.

**REFITTING**

Refitting is the reverse of removal.

Renew:

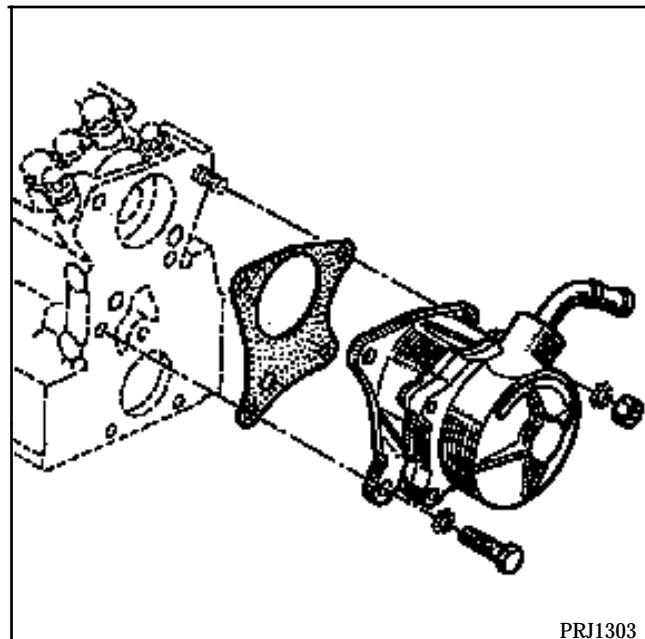
- the manifold gasket,
- the two exhaust downpipe gaskets.

**SPECIAL TOOLING REQUIRED****M.S. 870      Vacuum gauge**

Renew the drive dog systematically when replacing the pump.

**CHECKING**

Engine warm, at **4 000 rpm**, the minimum vacuum should be 700 mbars (525 mmHg) in **3 seconds**.



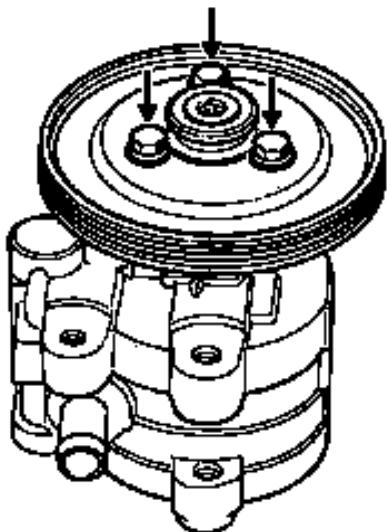
# PUMP

## Mechanical power assisted steering pump

### REPLACING THE PULLEY

#### REMOVAL

Remove the component by removing the three bolts.



98829R

#### REFITTING

Refitting is the reverse of removal.

### FILLING THE CIRCUIT

Oil grade to be used:

ELF RENAULTMATIC D2

or MOBILATF 220

Capacity : 1.1 litres

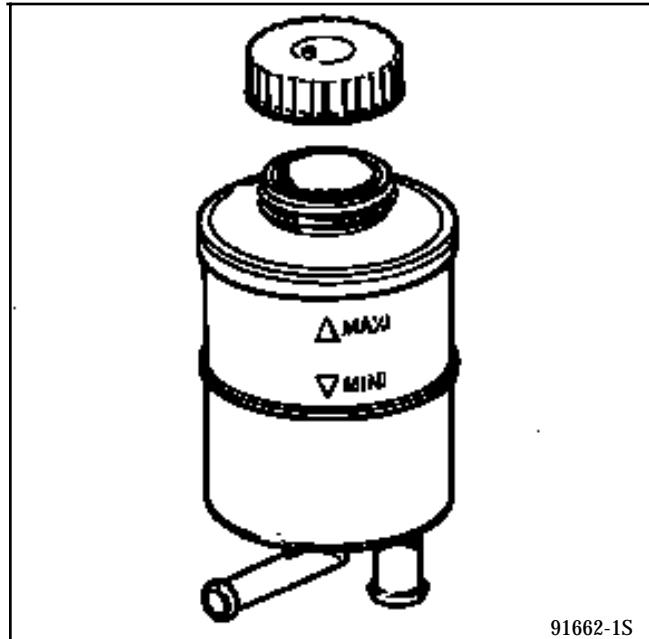
Fill the reservoir to the top.

Move the steering wheel gently in both directions.

Top up the level.

Start the engine and move the steering wheel gently from full lock to full lock.

Top up the level.



91662-1S

The oil should be visible to the level of the **MAXIMUM** line.

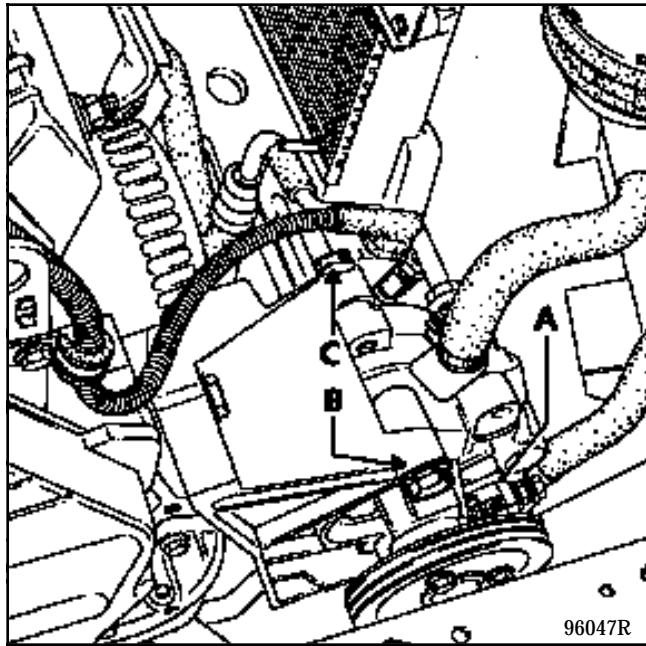
## SPECIAL TOOLING REQUIRED

Mot. 453-01      Hose clamp pliers

## REMOVAL

Slacken the tensioner nut and lock nut assembly (A).

Release the two upper mounting bolts (B) and (C) for the pump.



Remove bolt (D) using a half moon polygon wrench.

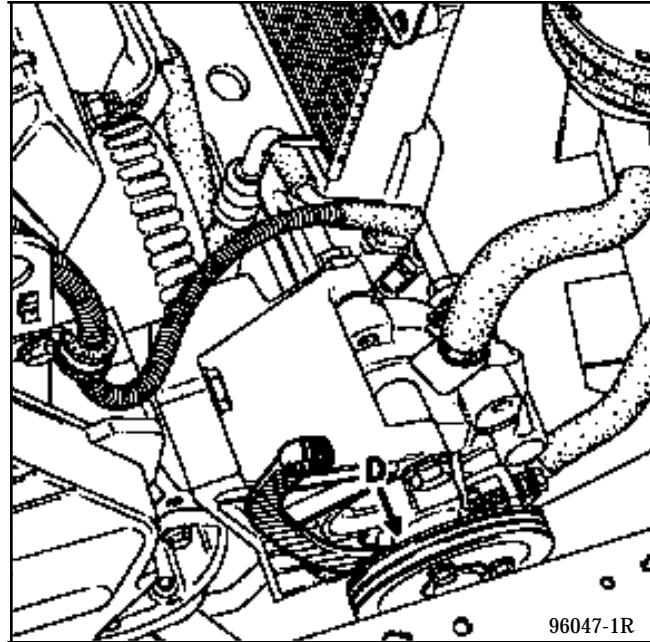
Remove the belt.

Fit clamp Mot. 453-01 to the supply pipe.

Disconnect the supply and high pressure pipes.

Remove the upper pump mounting bolt (C).

Remove the pump.



## REFITTING

Insert bolt (B).

Refit :

- the pump,
- the belt,
- the supply and high pressure pipes.

Remove clamp Mot. 453-01.

Adjust the belt tension (see section "Adjustment values").

Fill and bleed the circuit by moving the steering wheel gently from lock to lock.

## SPECIAL TOOLING REQUIRED

Mot. 453-01      Hose clamp pliers

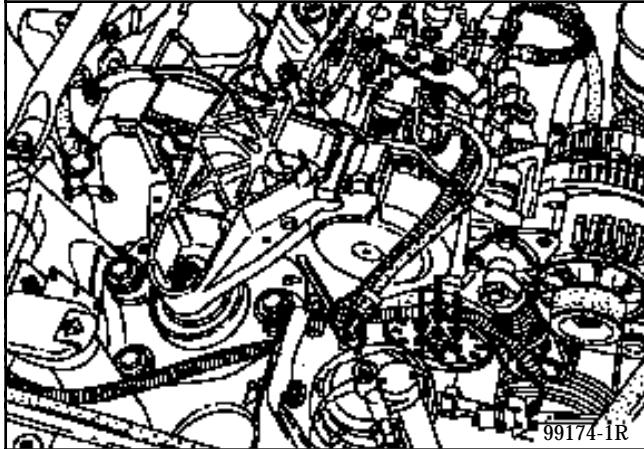
## REMOVAL

Remove the belt (see corresponding section).

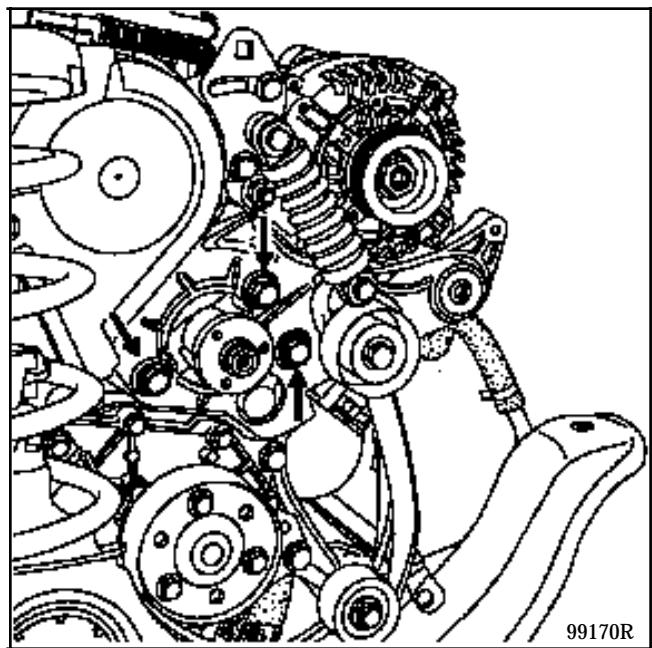
Fit clamp Mot. 453-01 to the supply pipe.

Remove:

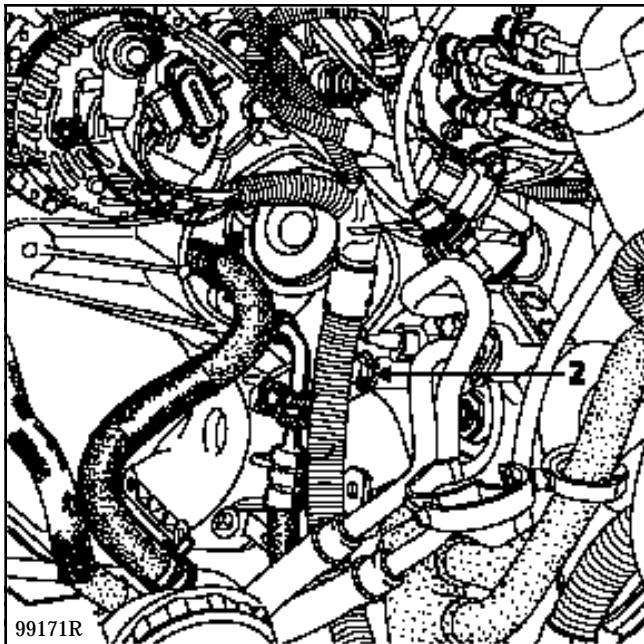
- the pulley (three bolts),



- the supply pipe and the high pressure pipe,
- the three pump mounting bolts.



- the wiring mounting and the high pressure pipe by removing bolt (2),



Remove the pump.

## REFITTING

Refitting is the reverse of removal.

## SPECIAL TOOLING REQUIRED

Mot. 453-01      Hose clamp pliers

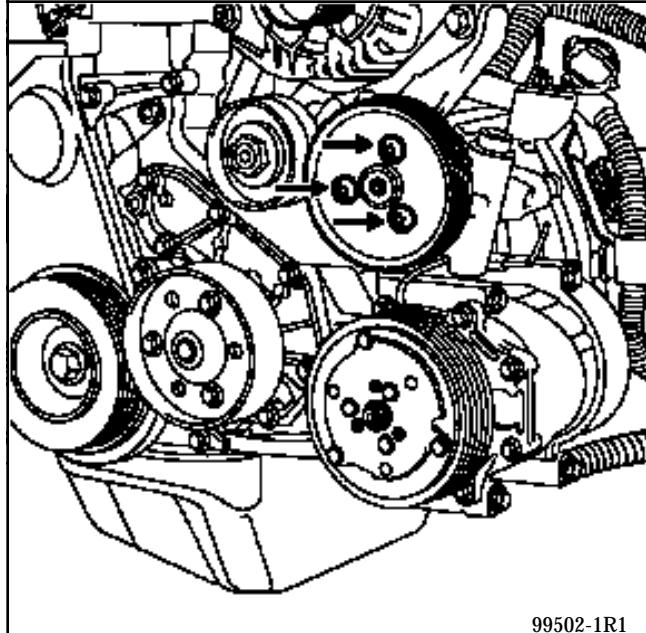
## REMOVAL

Remove the belt (see corresponding section).

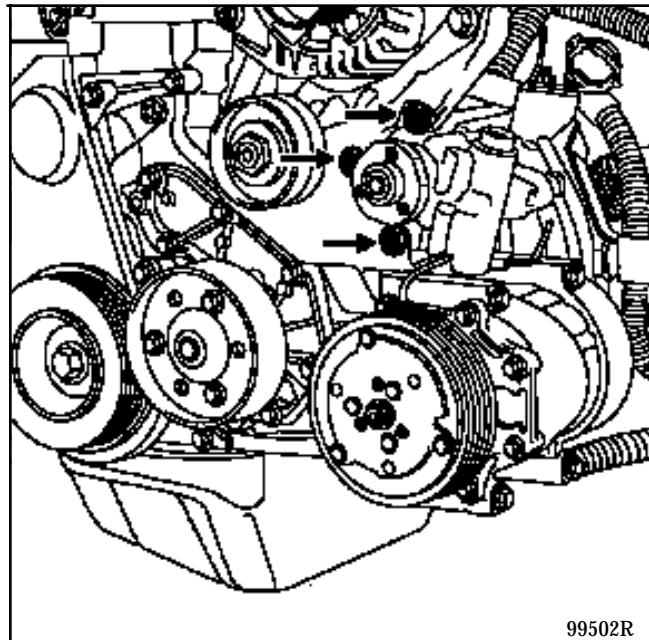
Fit clamp Mot. 453-01 to the supply pipe.

Remove:

- the pulley (three bolts),



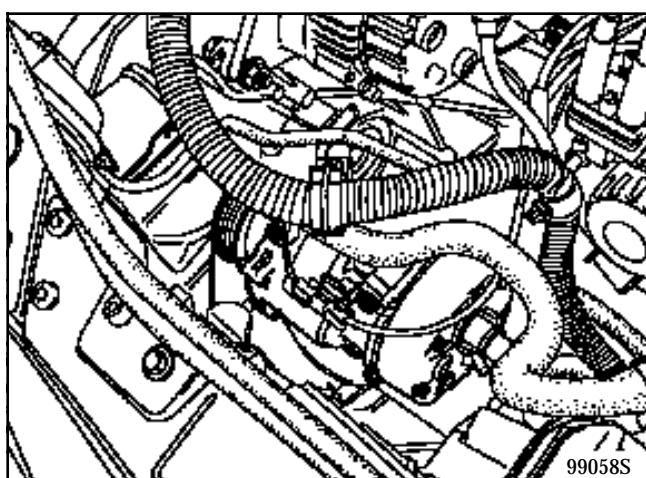
- the three pump mounting bolts.



Remove the pump.

## REFITTING

Refitting is the reverse of removal.



## CHECKING THE OIL PRESSURE

SPECIAL TOOLING REQUIRED	
Mot. 453-01	Hose clamp pliers
Dir. 1204	Pressure test union
Dir. 803	Metric thread union
Fre. 1085 or Fre. 244-03	{ Pressure gauge
Fre. 284-06	Connecting pipe

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

Disconnect the high pressure pipe (take precautions to catch the oil which will run out).

Insert union Dir. 803 (metric thread) between the pipe and the pump.

For engines where it is fitted, remove the pressostat on the rigid pipe (high pressure).

Connect the pressure test union Dir. 1204 and the oil pressure gauge Fre. 1085 (or Fre. 244-03 + Fre. 284-06).

Connect pressure gauge Fre. 1085 (or Fre. 244-03 + Fre. 284-06).

Remove clamp Mot. 453-01.

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

#### Wheels in straight line:

Regardless of engine speed, the pressure should not exceed **5 to 7 bars**.

#### Full lock to one side:

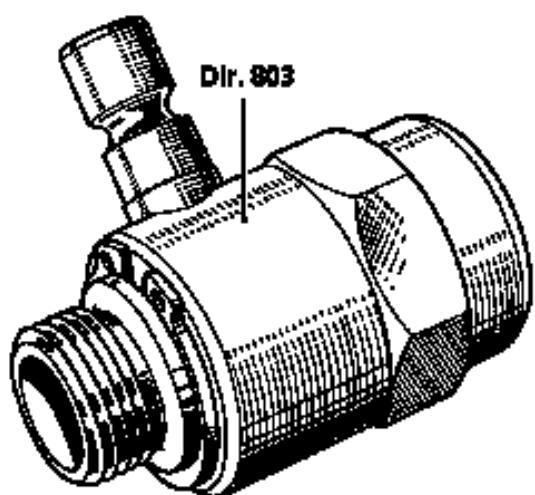
Hold the steering at full lock, the maximum pressure should be **79 to 86 bars**.

This operation should not be prolonged to avoid a high increase in the oil temperature.

Remove union Dir. 803 and pressure gauge Fre. 1085 or Fre. 244-03, cutting the supply to the pump with clamp Mot. 453-01.

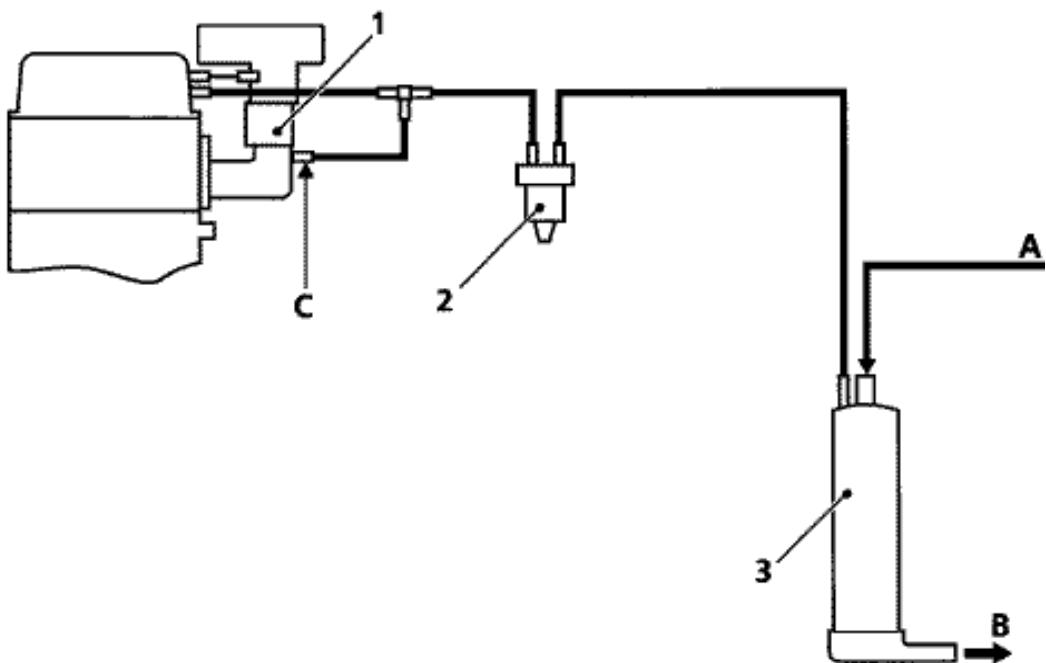
Reconnect the high pressure pipe and remove clamp Mot. 453-01.

Top up the oil in the reservoir.



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## CIRCUIT OPERATIONAL DIAGRAM



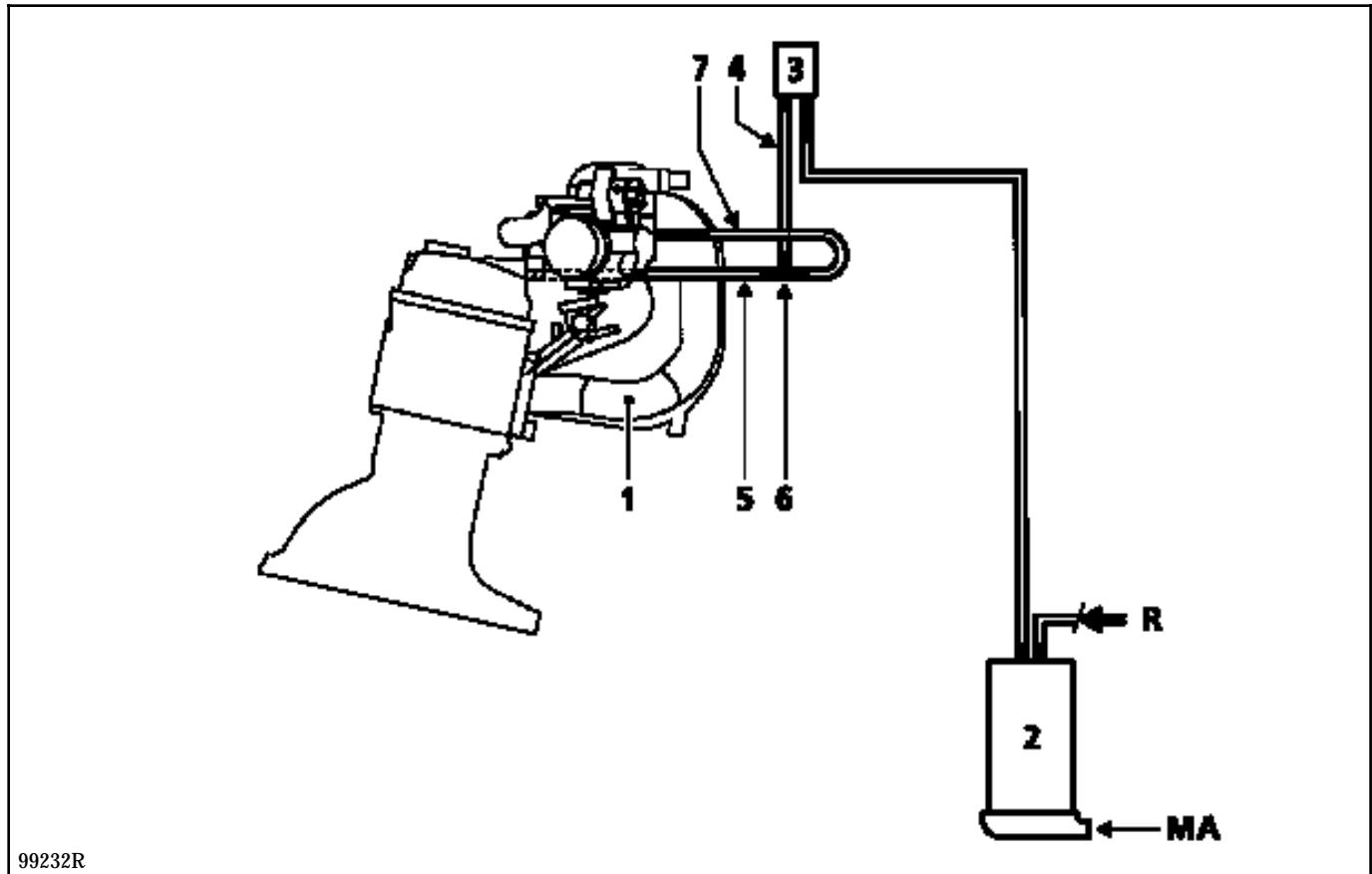
98170R

- 1 Throttle body
- 2 Canister bleed solenoid valve
- 3 Canister

A Pipe from fuel tank for recirculation of fuel vapour

B Breather

C Take-off downstream of throttle

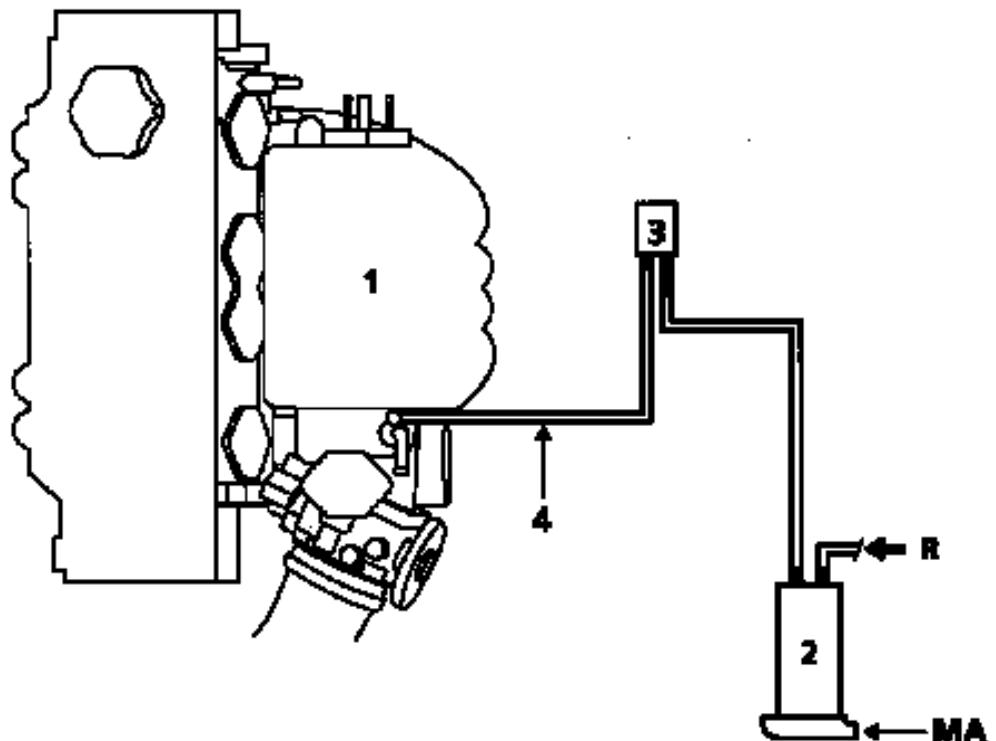
**CIRCUIT OPERATIONAL DIAGRAM**

- 1 Inlet manifold
- 2 Canister
- 3 RCO control solenoid valve
- 4 Fuel vapour recirculation pipe
- 5 Oil vapour rebreathing pipe
- 6 T piece connecting the oil vapour rebreathing pipe (5) and fuel vapour recirculation pipe (4)
- 7 Oil vapour rebreathing and fuel vapour recirculation pipe

R Pipe from fuel tank

MA Breather opening

## CIRCUIT OPERATIONAL DIAGRAM



1 Inlet manifold

2 Canister

3 RCO control solenoid valve

4 Fuel vapour recirculation pipe

R Pipe from fuel tank

MA Breather opening

### **OPERATING PRINCIPLE**

The fuel tank is connected to the outside through the canister.

Fuel vapour is retained by the active carbon in the canister.

So that the fuel vapour contained in the canister does not evaporate into the atmosphere when the fuel tank is opened, a valve isolates the canister from the fuel tank when the fuel filler cap is removed.

The fuel vapour contained in the canister is eliminated and burnt by the engine.

To do this, a pipe connects the canister and the inlet manifold. A solenoid valve is located on this pipe to control bleeding of the canister.

The operating principle for the solenoid valve is to give a variable passage diameter (depending on an RCO signal from the injection computer).

The variation in the selection of passage diameter for the fuel vapour in the solenoid valve results from the balance between a magnetic field created by the feed to the coil and the force of a return spring ensuring the valve remains closed.

### **CONDITIONS FOR CANISTER BLEEDING**

#### **During richness regulation**

Coolant temperature greater than:

- + 55°C (F3R engine),
- + 15°C (K7M engine),
- + 70°C (E7J engine).

Air temperature greater than:

- - 10°C (F3R engine),
- + 10°C (K7M engine),
- + 20°C (E7J engine).

No load position not recognised (if the throttle position sensor is faulty, the non-recognition of the no load condition is replaced by an engine speed condition

engine speed **R > 1500 rpm.**

#### **Outside richness regulation**

No load position not recognised.

Coolant temperature less than +15°C for **F3R** and **K7M engines** (no condition for **E7J engine**).

**If the oxygen sensor is faulty, the canister is bled when there is no no load.**

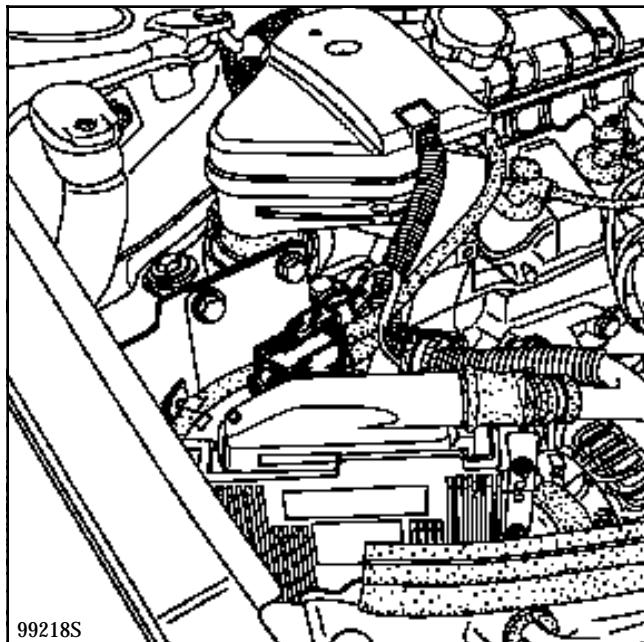
The cyclical opening ratio for the canister bleed solenoid valve may be seen using the XR25 and #23. The solenoid valve is closed for #23 = 0.7 % (minimum value) except for E7J engines (no #23).

**LOCATION - REMOVAL**

**CANISTER BLEED SOLENOID VALVE**

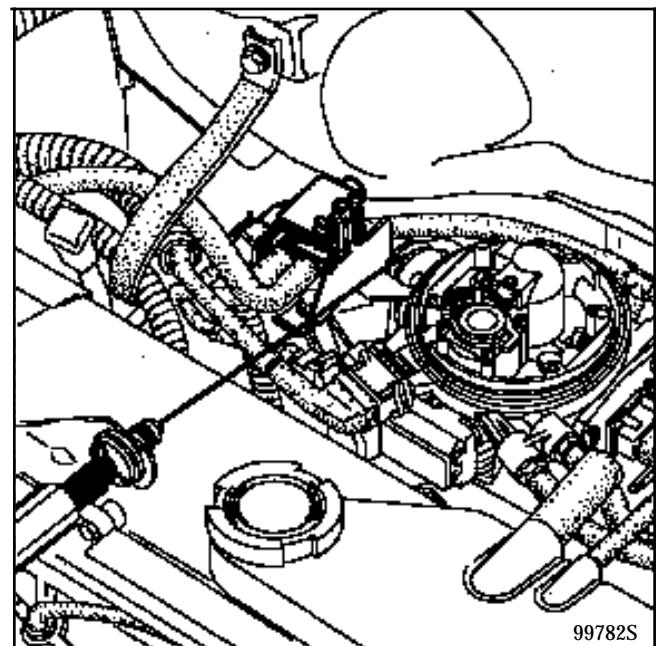
**F3R engine**

The valve is mounted at the front right on the same mounting as the computer.



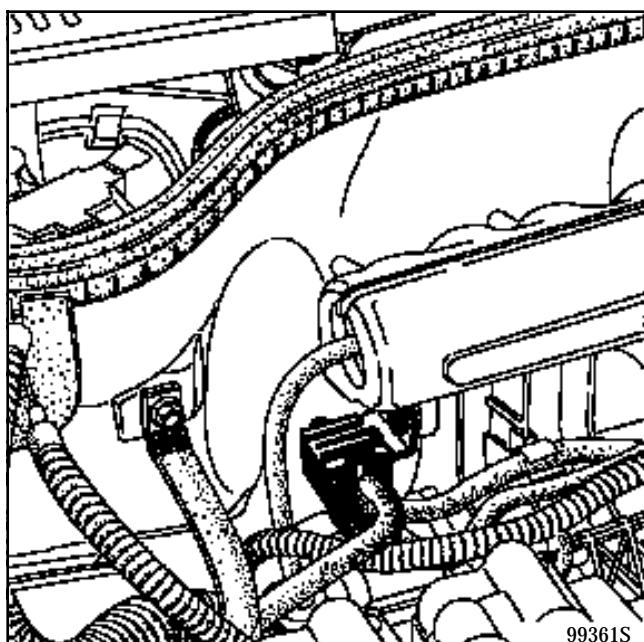
**E7J engine**

The valve is mounted on the inlet manifold.



**K7M engine**

The valve is mounted on the inlet manifold.



**CANISTER**

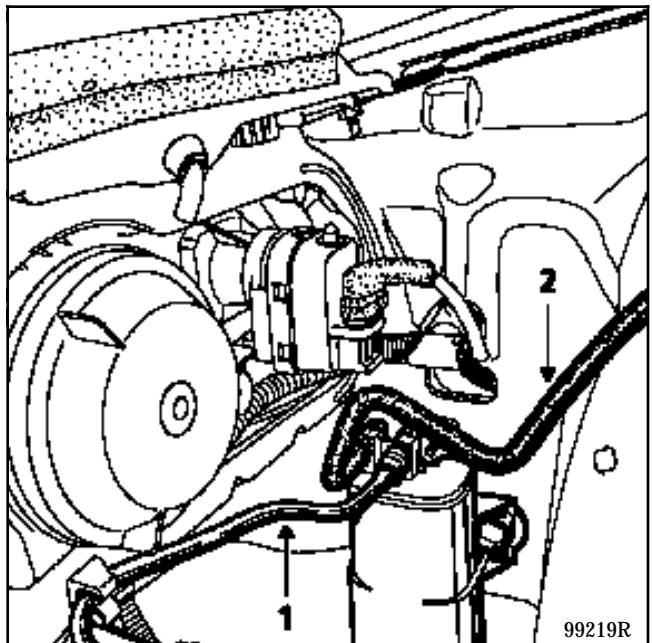
This is located at the front of the vehicle.

**REMOVAL**

Remove the computer mounting.

Disconnect:

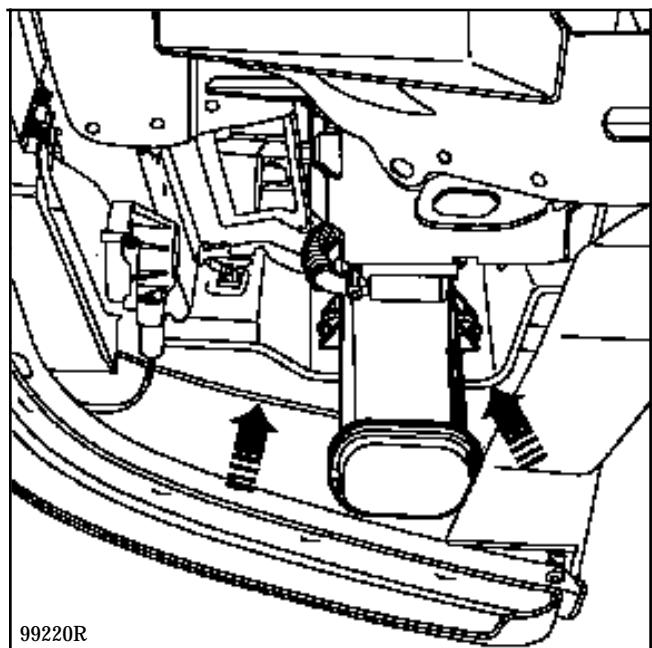
- the pipe (1) connected to the fuel tank (use clamp **Mot. 1265**),
- the pipe (2) connected to the solenoid valve.



**From under the vehicle:**

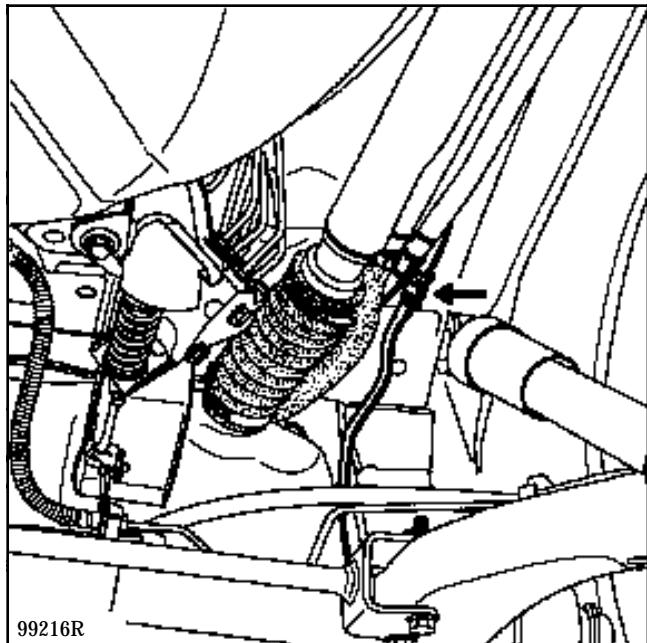
Remove the two mounting bolts for the canister (pass the wrench between the mudguard skirt and the bumper).

Remove the canister.



**CANISTER - FUEL TANK CONNECTION**

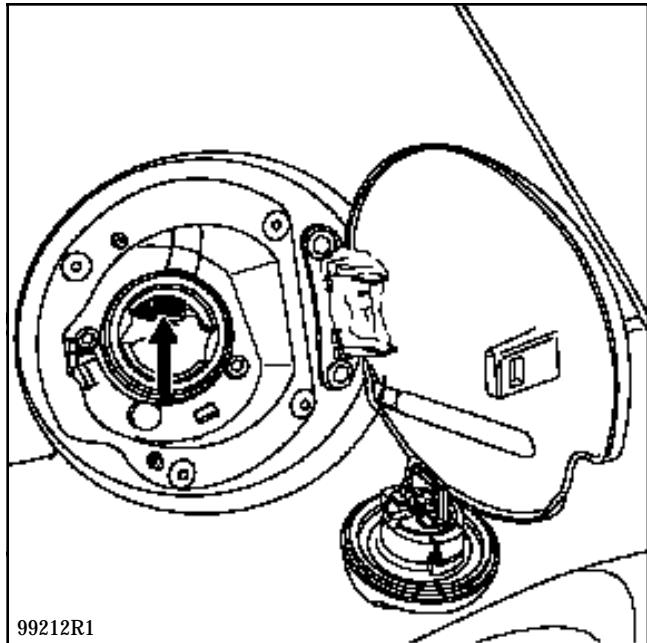
The canister is connected to the fuel tank filler neck by a quick release union.



The sealing valve isolates the canister when the fuel filler cap is removed.

When the fuel filler cap is in position, the valve is open and the fuel vapour may be absorbed by the canister.

In the filler neck, a separate circuit connects the quick release union to the sealing valve.



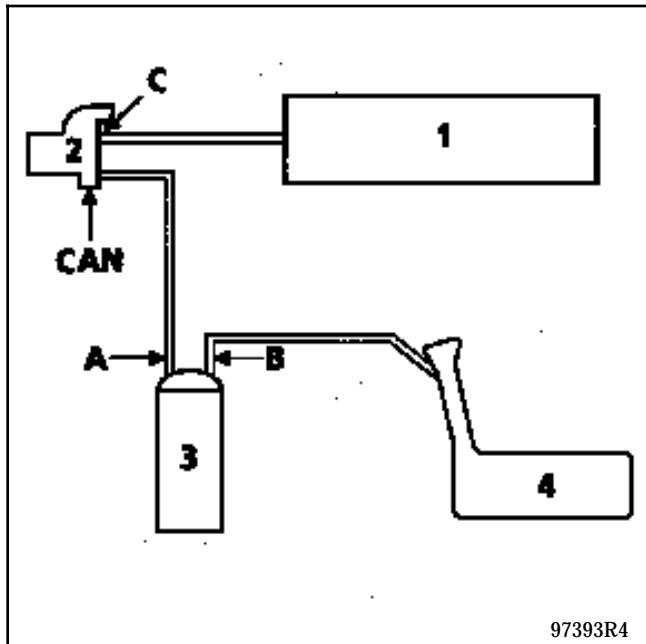
### CHECKING THE OPERATION OF THE CANISTER BLEED VALVE

A malfunction in the system could cause the idle speed to be unstable or the engine to stall.

Check the circuit conforms (see diagrams).

**Take care to check that the pipe marked "CAN" on the solenoid valve is connected to the canister.**

Check the condition of the pipes up to the fuel tank.



- 1 Inlet manifold
- 2 Canister bleed solenoid valve
- 3 Canister
- 4 Fuel tank

At idle speed, check by connecting a pressure gauge (- 3 ; +3 bars) (**Mot. 1311-01**) to the "CAN" outlet on the solenoid valve, that there is no vacuum (in the same manner, check the command value read by the **XR25** using #23 remains at a minimum X = 0.7 % for **F3R** and **K7M engines**). **Is there a vacuum ?**

**YES** Ignition off, use a vacuum pump to apply a vacuum of **500 mbars** to the solenoid valve at (C). The vacuum should not vary by more than **10 mbars in 30 seconds**.

**Does the pressure vary?**

**YES** The solenoid valve is faulty, renew it. Air must also be blown into the pipe connecting the solenoid valve to the canister to eliminate any particles of active carbon.

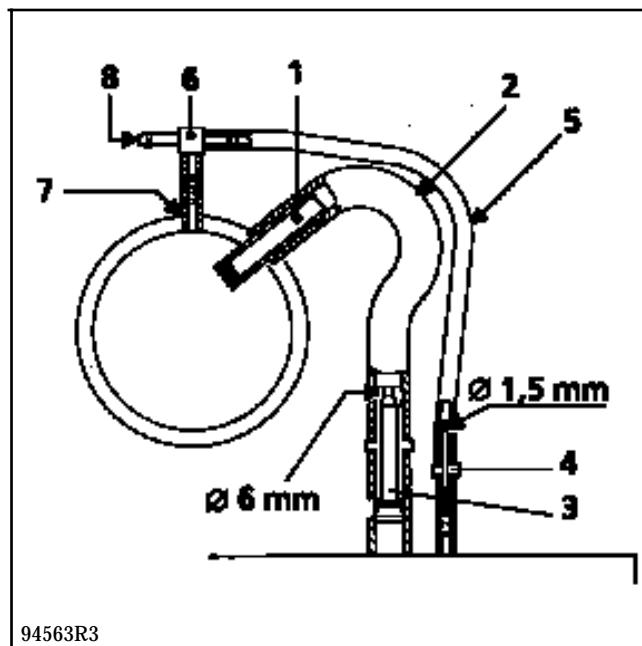
**NO** There is an electrical fault - check the circuit.

**NO** Under bleeding conditions (engine not at idle speed, engine warm), there should be an increase in the vacuum (at the same time, the value for #23 on the **XR25** should increase for **F3R** and **K7M engines**).

The fuel tank breather pipe can also be checked. After removing the filler cap, use a vacuum pump to apply a vacuum to the pipe at (B). If a vacuum can be applied to the pipe this shows that the overfilling valve is correctly sealed.

As soon as the filler cap is replaced, however, the vacuum should disappear quickly as the pipe is no longer blocked and the internal degassing chambers in the fuel tank are connected.

## PRESENTATION OF THE CIRCUIT



## Upstream rebreathing circuit

- 1 Take-off on air filter
- 2 Filter - nozzle connecting pipe
- 3 6 mm diameter nozzle

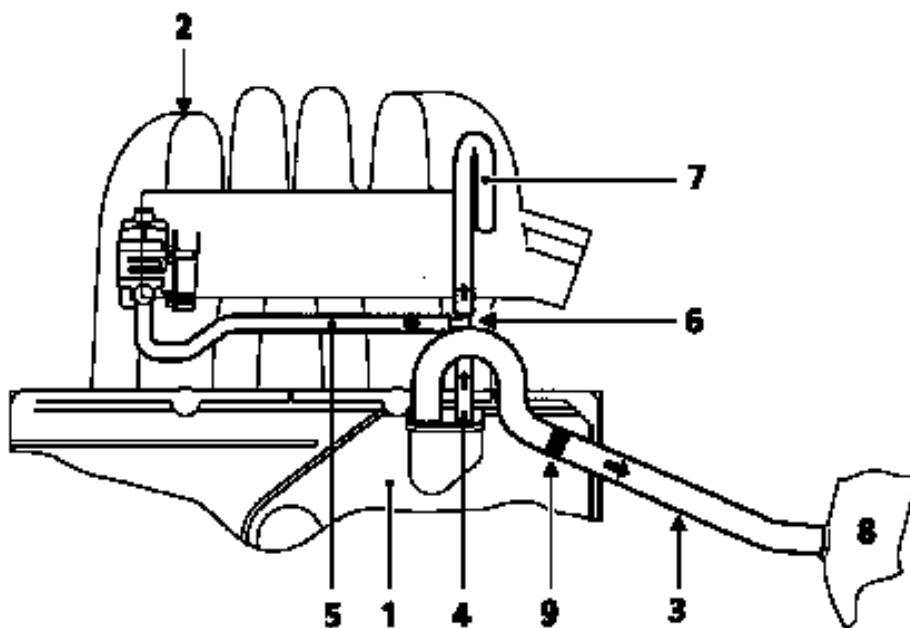
## Downstream rebreathing circuit

- 4 1.5 mm diameter nozzle
- 5 Restriction to T union connecting pipe
- 6 T union
- 7 Take-off on inlet manifold
- 8 To canister bleed

## CHECKING

To guarantee correct operation of the antipollution system, the oil vapour rebreathing circuit should be kept clean and in good condition.

Check the nozzles are present and correct.

**PRESENTATION OF THE CIRCUIT**

99231R

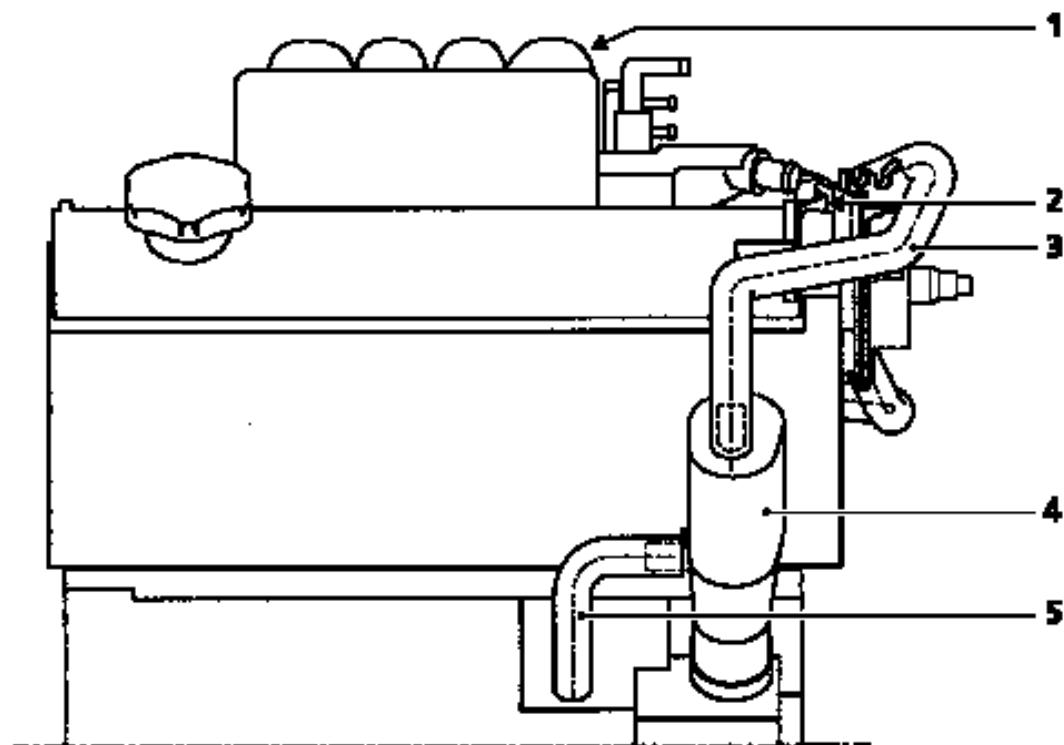
- 1 Cylinder head
- 2 Manifold
- 3 Oil vapour rebreathing pipe connected upstream of the throttle body (the circuit is used for average and high loads)
- 4 Oil vapour rebreathing pipe connected downstream of the throttle body
- 5 Fuel vapour recirculation pipe
- 6 T piece connecting the oil vapour rebreathing pipe (4) and fuel vapour recirculation pipe (5)
- 7 Oil vapour rebreathing pipe and fuel vapour recirculation pipe
- 8 Air duct
- 9 5 mm diameter nozzle

**CHECKING**

To guarantee correct operation of the antipollution system, the oil vapour rebreathing circuit should be kept clean and in good condition.

Check the nozzle is present and correct.

## PRESENTATION OF THE CIRCUIT



DI1407-1

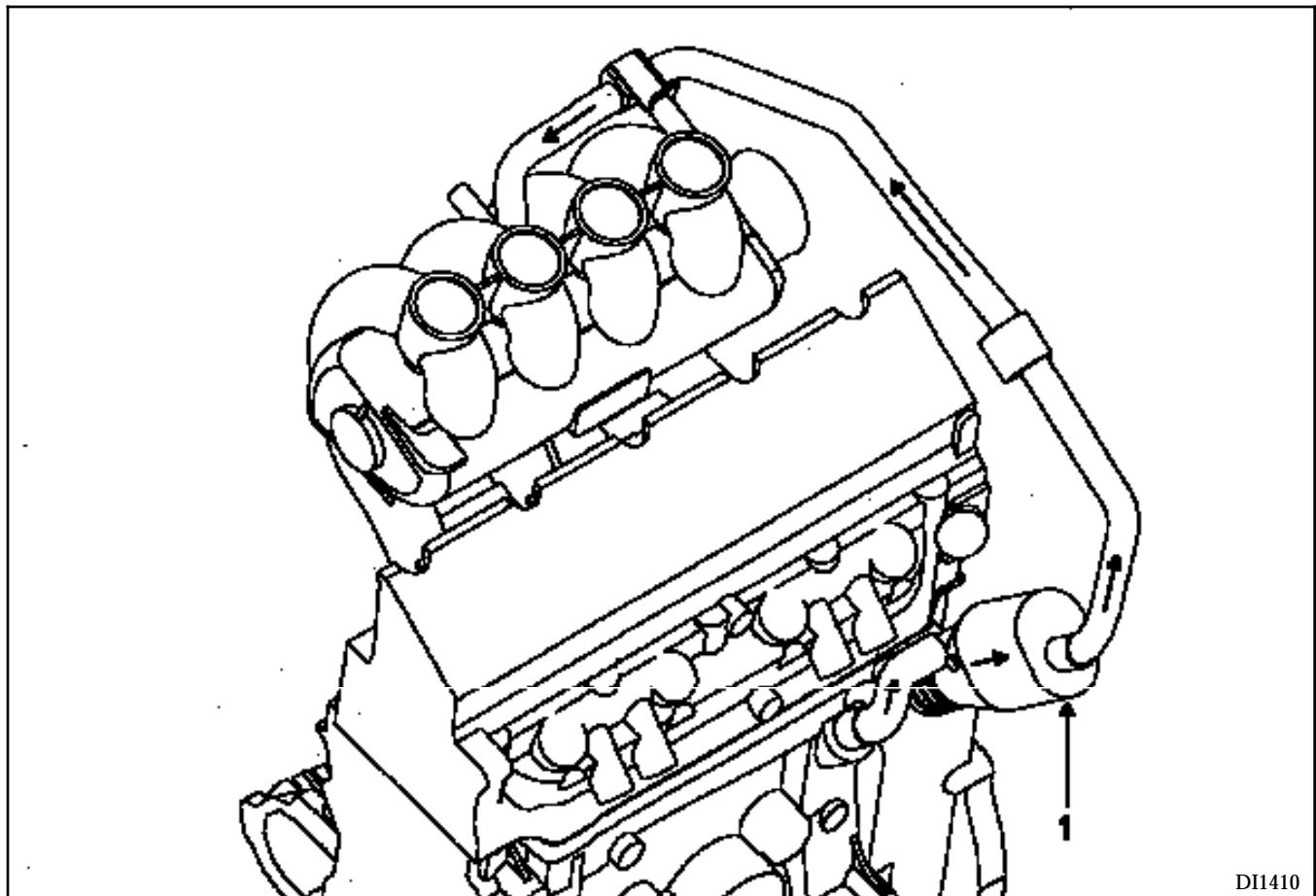
- 1 Inlet manifold
- 2 Throttle body
- 3 Oil vapour rebreathing pipe (connected to throttle body)
- 4 Oil decanter
- 5 Oil vapour rebreathing pipe from the engine to the decanter

The restrictions upstream and downstream of the oil vapour rebreathing system are moulded into the throttle body.

**CHECKING**

To guarantee correct operation of the antipollution system, the oil vapour rebreathing circuit should be kept clean and in good condition.

## PRESENTATION OF THE CIRCUIT



DI1410

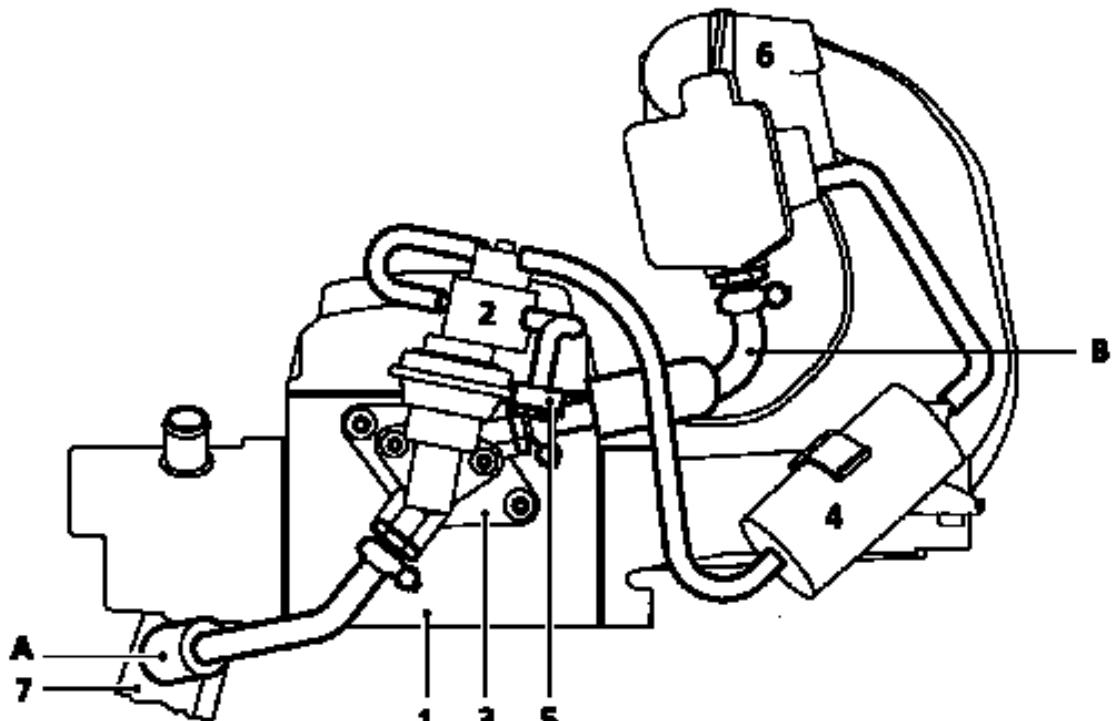
**1 Oil vapour decanter**

To guarantee correct operation of the antipollution system, the oil vapour rebreathing circuit should be kept clean and in good condition.

**The oil vapour rebreathing pipes have no restrictions.**

This system is only fitted to the **K7M 703** engine.

**PRESENTATION OF THE CIRCUIT**



- 1 Cylinder head
- 2 EGR solenoid valve (operated by an RCO signal)
- 3 Mounting for EGR solenoid valve
- 4 Vacuum reservoir
- 5 Filter unit
- 6 Inlet manifold
- 7 Exhaust manifold

- A Exhaust gas to EGR solenoid valve
- B Exhaust gas circulation to inlet manifold

**TIGHTENING TORQUES (in daN.m)**

<b>Mounting bolt for EGR solenoid valve</b>	<b>2.2</b>
<b>EGR solenoid valve bolt</b>	<b>1</b>
<b>Steel pipe bolts for EGR solenoid valve</b>	<b>1</b>

**REMOVING THE EGR SOLENOID VALVE**

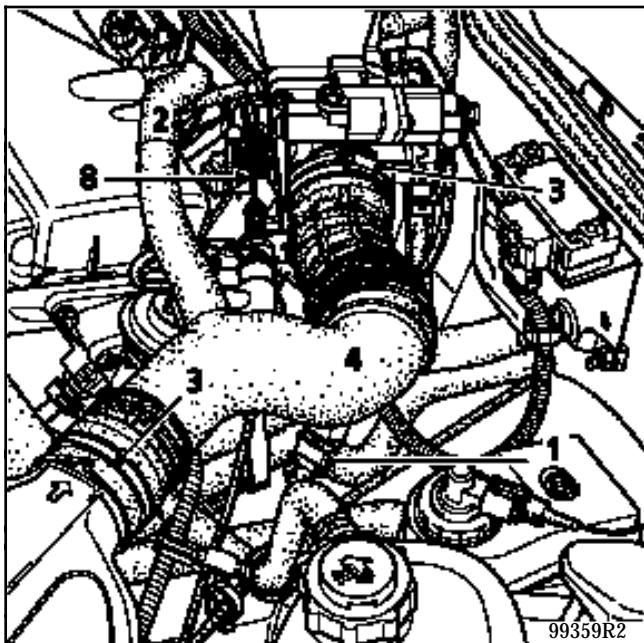
Remove the acoustic tie bar.

Disconnect:

- the air temperature sensor connector (1),
- the oil vapour rebreathing pipe (2).

Slacken the two clips (3) mounting the air duct (4) and remove it.

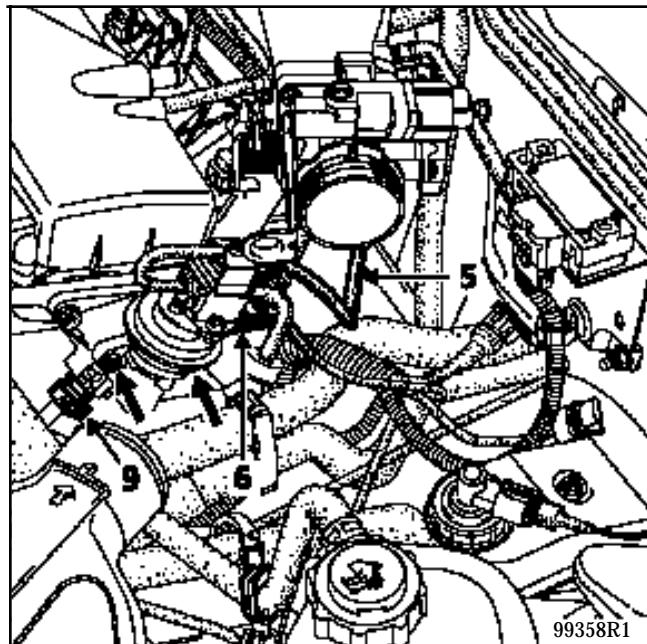
Disconnect the accelerator cable (8).



From the solenoid valve, disconnect:

- the vacuum pipe (5),
- the electrical connector (6).

Remove the two mounting bolts for the EGR solenoid valve, then remove the valve.

**REFITTING THE EGR SOLENOID VALVE**

Renew the seal.

Refitting is then the reverse of removal.

**SPECIAL NOTES**

To remove the two steel pipes connecting the EGR solenoid valve mounting to the exhaust manifold and the inlet manifold, unclip the two clips (9) on either side of each pipe.

**PURPOSE OF THE EGR SYSTEM**

Recirculation of exhaust gas, or EGR, is used to reduce the nitrous oxide (NOx) content of exhaust gas.

The formation of nitrous oxide takes place at very high temperatures in the engine combustion chambers when driving under heavy loads.

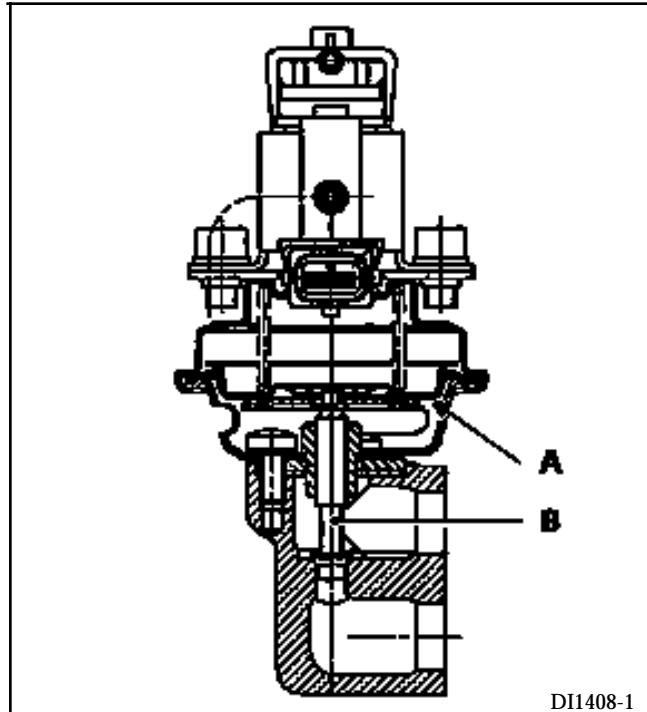
By reducing the temperature of the combustion chambers, the amount of nitrous oxide produced is reduced. The simplest means of reducing the combustion chamber temperature is to introduce inert gas into the chamber.

Exhaust gas is made up of used inert gasses, so it is recirculated into the inlet manifold in the correct amount at the right time.

**SOLENOID VALVE OPERATING PRINCIPLE**

The EGR solenoid valve is operated by an RCO signal from the injection computer. The RCO signal modulates the opening in the solenoid valve and this permits more or less exhaust gas to be channelled to the inlet manifold.

Depending on this signal, the solenoid valve applies to diaphragm (A) a quantified amount of the manifold vacuum. Diaphragm (A) moves and pulls valve (B) which permits the passage of exhaust gas (by vacuum) to the inlet manifold.



### OPERATING CONDITIONS FOR THE EGR SOLENOID VALVE

The EGR system is operational if the following conditions are met:

- coolant temperature greater than 20°C,
- air temperature greater than 5°C,
- no load position not recognised and throttle position less than a set threshold, dependent on engine speed (at 1024 rpm the throttle position must be greater than 59 seen using # 17 ; at 5120 rpm the throttle position must be greater than 103 seen using # 17),
- manifold vacuum greater than a certain threshold.

The EGR solenoid valve is not operated if a fault is detected with the :

- air temperature sensor,
- manifold pressure sensor,
- throttle potentiometer,
- EGR system.

A status bargraph on the XR25 visualises operation of the EGR solenoid valve by the computer.

It is however better to carry out a road test to show this status. A test with the vehicle stationary, engine operating under low loads is not sufficient.

A faulty component in the EGR system will cause an obvious worsening of the exhaust gas values.

### CHECKING THE SEALING AND OPERATION OF THE EGR SOLENOID VALVE

After the cooling fan has operated at least once, stop the engine and turn the ignition off.

Disconnect the electrical connector.

Supply a 12 V feed directly to the solenoid valve.

Disconnect the pipe (D) connected to the vacuum reservoir from the solenoid valve. In its place connect a vacuum pump.

Create a vacuum of **300 mbars**. The pressure should not drop by more than **2 mbars** per second (120 mbars per minute).

Eliminate the vacuum to return the solenoid valve to atmospheric pressure.

Run the engine at idle speed.

Create a vacuum of **300 mbars** again, the engine should run at idle speed, but unsteadily. If this is not the case, replace the solenoid valve assembly.

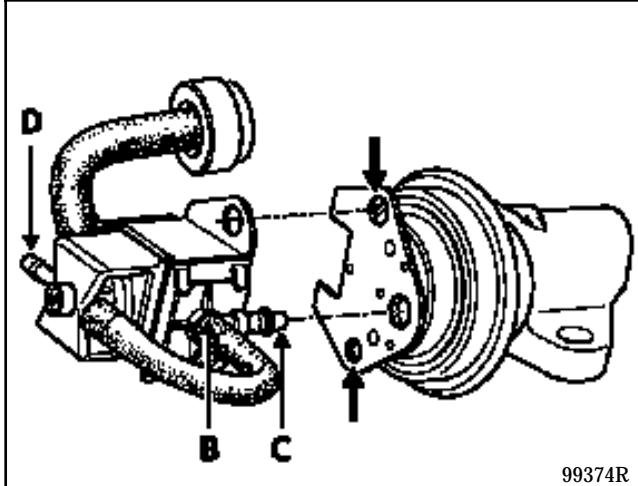
Erase the computer memory after the operation.

### CLEANING THE EGR SOLENOID VALVE (if there is a fault)

In certain cases, a deviation in the nitrous oxide value at the exhaust may be noted due to the fact that the EGR solenoid valve has become contaminated. If this is noted, we recommend that at approximately 50000 miles (80 000 km), the EGR solenoid valve is cleaned to ensure correct depollution.

Remove as much contamination from the EGR solenoid valve as possible then blow out with compressed air.

Remove the two mounting bolts securing the solenoid to the valve. Remove the solenoid (ensure that no impurities enter the EGR valve diaphragm area).



Remove all the pipes from the solenoid.

**With no electrical feed,** blow compressed air in through union (C).

**With 12 V feed,** blow compressed air in through union (B).

This ensures that any possible impurities are removed the way they entered the valve.

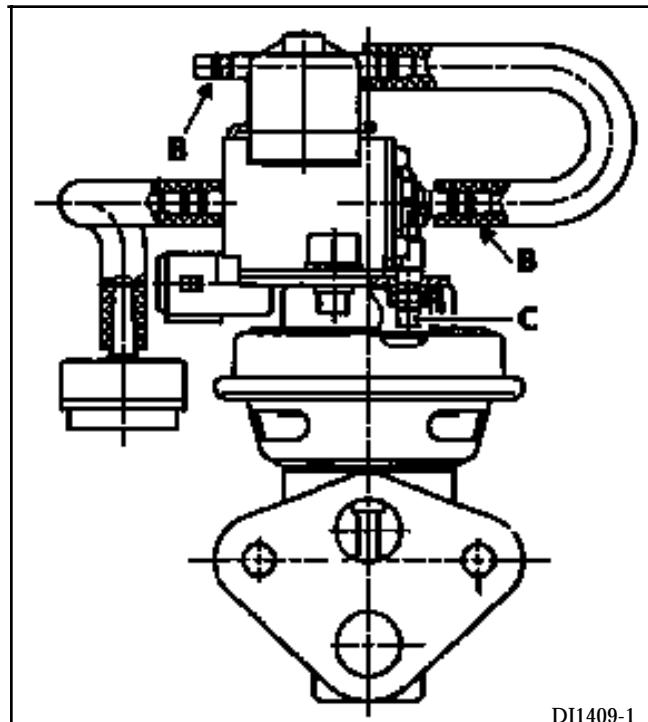
**IMPORTANT:** do not blow compressed air on the EGR solenoid valve diaphragm.

Refit the pipes to the solenoid.

Renew:

- the O ring on union (C),
- the filter unit.

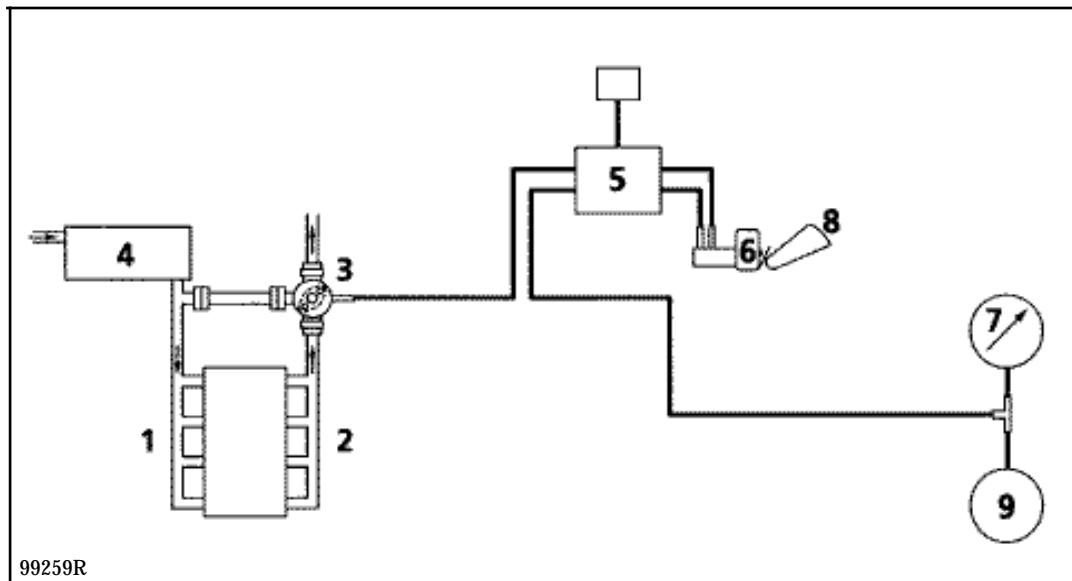
Refit the solenoid to the valve.



Depollution for this engine uses recirculation to the inlet of some of the exhaust gasses.

Recirculation of the exhaust gas reduces the combustion temperatures to reduce the formation of nitrous oxides (NOx).

Recirculation is only permitted under certain load and temperature conditions.



- 1 Inlet manifold
- 2 Exhaust manifold
- 3 EGR valve
- 4 Air filter
- 5 EGR solenoid
- 6 Microswitch (on injection pump)
- 7 Vacuum pump
- 8 Injection pump load lever
- 9 Brake servo

To meet the requirements of the **EURO 96 standard**, this vehicle is fitted with an oxidation catalytic converter.

#### ROLE

The converter deals with the following three pollutants at the same time:

- hydrocarbons (HC),
- carbon monoxide (CO),
- particulates, by a chemical oxidation reaction.

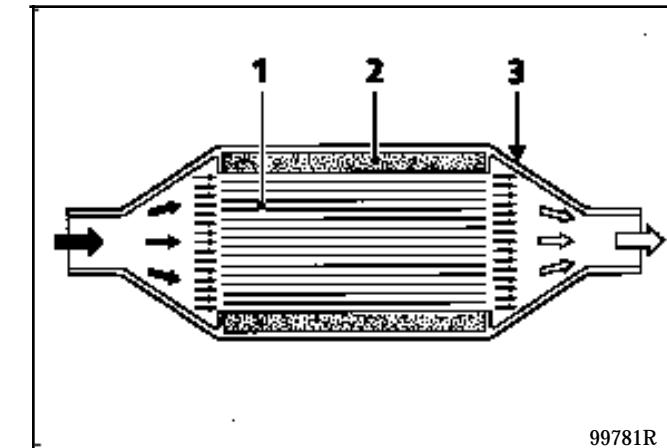
#### FUEL

No specific fuel is required for correct operation.

#### CONSTITUTION

The converter comprises:

- a monolith (1) in a honeycomb ceramic. A substance containing precious metals is deposited on the walls of the honeycomb (mainly platinum),
- a metal jacket (2) retaining the monolith in its shell,
- a shell (3) with inlet and outlet cones, optimising the distribution of exhaust gas flow.



99781R

#### CHECKING THE CATALYTIC CONVERTER

The performance of the catalytic converter on the exhaust gas is difficult to check. The maximum temperature of the exhaust gas from a diesel engine is not sufficient to melt the monolith (in comparison to petrol engines).

**FAULT FINDING**

Faults which may cause a customer complaint due to the catalytic converter.

- 1. Catalytic converter polluted by an accumulation of soot, causing poor efficiency of the converter.**

**Cause :**

- prolonged town driving,
- air filter dirty,
- poor operation of the EGR system
- injection pump fault, etc.

**Customer complaint:**

- lack of power,
- large amount of smoke.

**Solution:**

De-contamination of the exhaust pipe by hard driving on open roads.

- 2. Loss of efficiency due to premature aging of the monolith\***

**Cause :**

- injection incorrectly set,
- oil vapour rebreathing fault, etc.

**Customer complaint:**

Abnormal engine operation.

**Solution:**

Replace the catalytic converter.

- (\*) By prolonged operation at exhaust gas temperatures which are too high (greater than 800°C).

### CHECKS TO BE MADE BEFORE THE ANTI-POLLUTION TEST

**Ensure:**

- the ignition system is operating correctly (correct spark plugs, correctly set plug gap, high voltage leads in good condition and correctly connected).
- the injection system is operating correctly (supply is correct - check using the XR25).
- the exhaust pipe is correct and is sealed.
- the EGR is operating correctly.

Check the vehicle history if possible (run out of fuel, lack of power, use of incorrect fuel).

### CHECKING ANTI-POLLUTION STANDARDS

Run the engine until the engine cooling fan has operated twice.

Connect a correctly calibrated four gas analyser to the exhaust tail pipe.

Keep the engine speed at **2500 rpm** for approximately 30 seconds then let the engine return to idle speed and note the pollutant values.

<b>CO</b>	<b>≤ 0.3 %</b>
<b>CO<sub>2</sub></b>	<b>≥ 14.5 %</b>
<b>HC</b>	<b>≤ 100 ppm</b>
<b>0,97</b>	<b>≤ λ ≤ 1.03</b>

**1**

**NOTE : λ =**  **richness**

$\lambda > 1 \rightarrow$  **lean mixture**  
 $\lambda < 1 \rightarrow$  **rich mixture**

If, after these tests, the values are correct, the antipollution system is correct.

If the values are not correct, additional tests must be carried out:

- Check the condition of the engine (condition of the oil, valve clearances, timing, etc,...),
- Check the correct operation of the oxygen sensor (see section 17) ,
- test for the presence of lead (see following page).

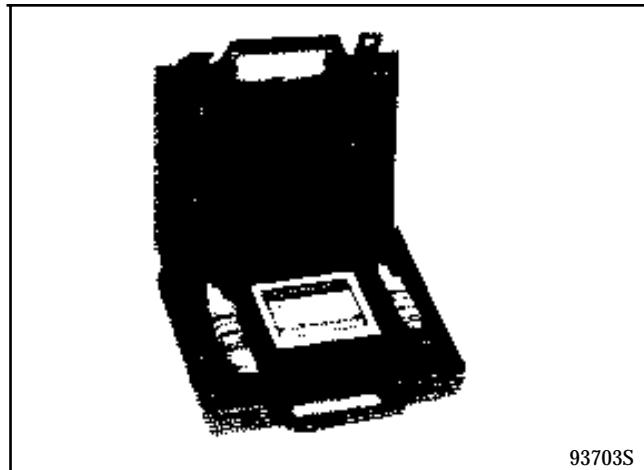
If the test for the presence of lead is positive, ensure the vehicle uses two or three full tanks of unleaded fuel before replacing the oxygen sensor.

If, after all these tests have been carried out, the values still do not conform, the catalytic converter must be replaced.

**This test is only possible using the Nauder lead test kit.**

To obtain a test kit, contact your After Sales Head Office.

- Part numbers:
- For the complete kit: T900
  - For a set of 40 test papers : T 900/1



## METHOD

### Detecting lead at the exhaust

- a - Conditions for the test:
  - Engine not running
  - Exhaust pipe warm but not burning.
  - Do not perform the test if the temperature is below 0 °C.
- b - If necessary, use a dry cloth to clean the inside of the exhaust pipe to remove soot deposits.
- c - Wearing the gloves, moisten a test paper slightly with distilled water (if the paper becomes too wet, it will lose its efficiency).
- d - Apply the moistened test paper to the cleaned section of the exhaust pipe and hold it there with slight pressure for approximately one minute.
- e - Remove the test paper and leave it to dry. If lead is present, the paper will be a red or pinkish colour.

**ATTENTION :** The test for lead should be carried out on the exhaust tail pipe. It should never be carried out on the oxygen sensor.

# STARTING - CHARGING

## Alternator

**16**

### IDENTIFICATION

ENGINE	ALTERNATOR	CURRENT
F3R F8Q }	Valéo A 11 VI - 59 Valéo A 13 VI 45	75 A 110 A
F3R CA F8Q CA }	Valéo A 13 VI - 57	110 A
K7M	Valéo A 11 VI - 61 Valéo A 13 VI 105	75 A 110 A
E7J	Valéo A 13 VI 104 Valéo A 13 VI 105	80 A 110 A

### CHECKING

After 15 minutes warming up with a voltage of 13.5 volts.

engine rpm	75 apms	80 apms	110 apms
1000	46	54	57
2000	68	75	94
3000	71	80	105
4000	72	82	108

**Alternator****OPERATION - FAULT FINDING**

These vehicles are fitted with alternators with internal ventilation, an integral regulator and a warning light on the instrument panel which operates as follows :

- when the ignition is turned on, the warning light illuminates,
- when the engine starts, the warning light extinguishes,
- if the warning light illuminates again when the engine is running, there is a "charging" fault.

**LOOKING FOR FAULTS**

**The warning light does not illuminate when the ignition is turned on.**

Check:

- the electrical connections are correct,
- the bulb is not blown (to do this, earth the circuit; the bulb should illuminate).

**The warning light illuminates when the engine is running**

There is a charging fault which could be due to:

- the alternator drive belt being broken or the charging cable being cut,
- internal damage to the alternator (rotor, stator, diodes or brushes),
- regulator fault,
- an excess voltage.

The customer complains of a charging fault and the warning light operates correctly.

If the regulated voltage is less than **13.5 V**, check the alternator. The fault could be caused by:

- a destroyed diode,
- a cut phase,
- track contamination or wear.

**Checking the voltage**

Connect a voltmeter across the battery terminals and read the battery voltage.

Start the engine and increase the engine speed until the voltmeter needle stabilises at the regulated voltage.

This voltage should be between **13.5 V** and **14.8 V**.

Connect as many consumers as possible, the regulated voltage should remain between **13.5 V** and **14.8 V**.

***IMPORTANT: if arc welding is carried out on the vehicle, the battery and the regulator must be disconnected.***

## SPECIAL TOOLING REQUIRED

Mot. 1273	Tool for testing belt tension
T. Av. 476	Ball joint extractor

## TIGHTENING TORQUES (in daN.m)



Upper shock absorber mounting bolt	3
Track rod end nut	3.5
Wheel bolts	9

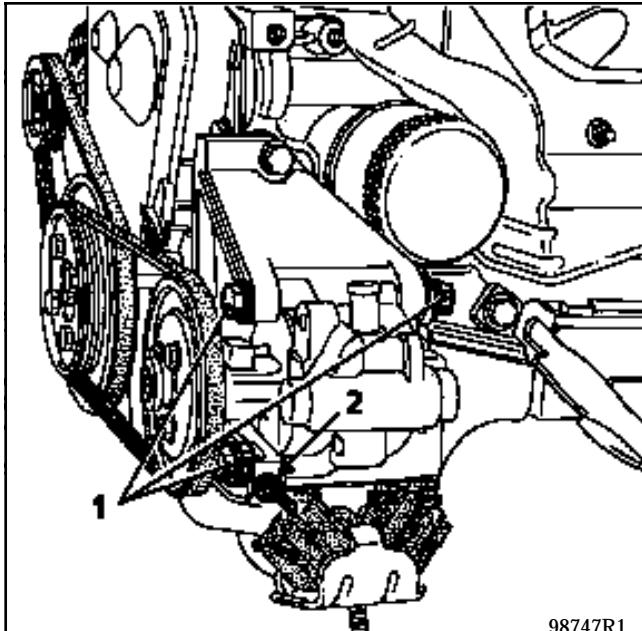
## REMOVAL

With the vehicle on a 2 post lift, disconnect:

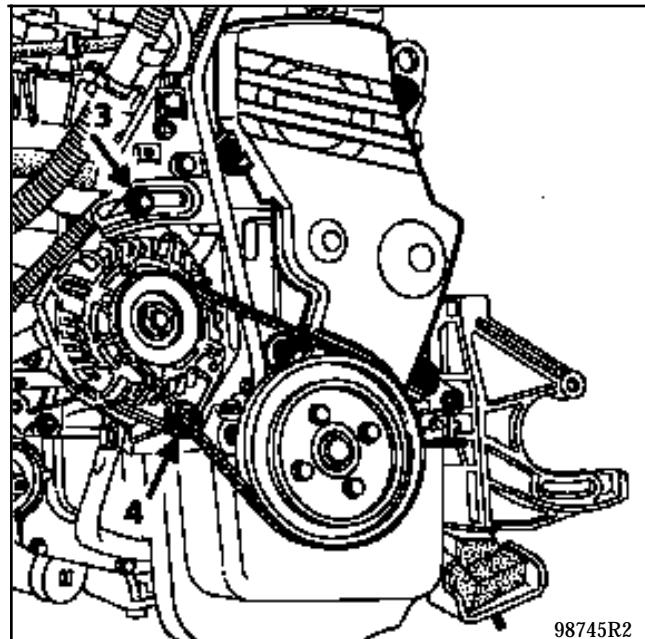
- the battery,
- the alternator electrical connections.

## Remove:

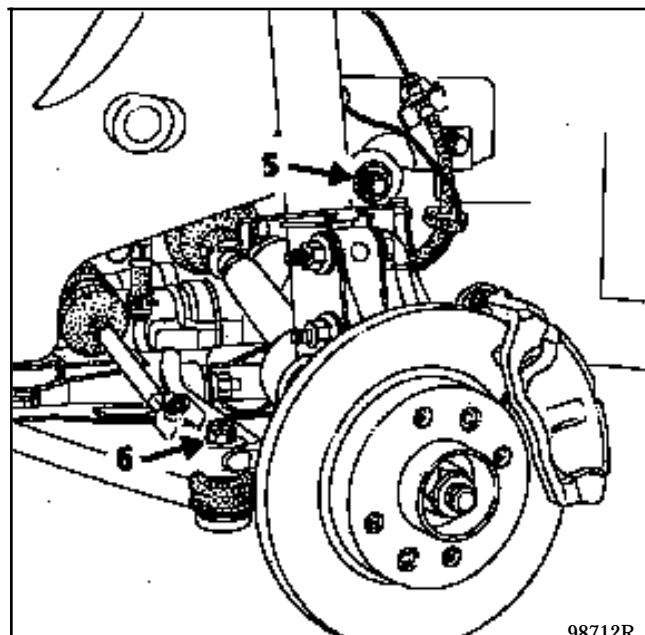
- the power assisted steering belt by slackening the three bolts (1) and the nuts (2) for the tensioner,



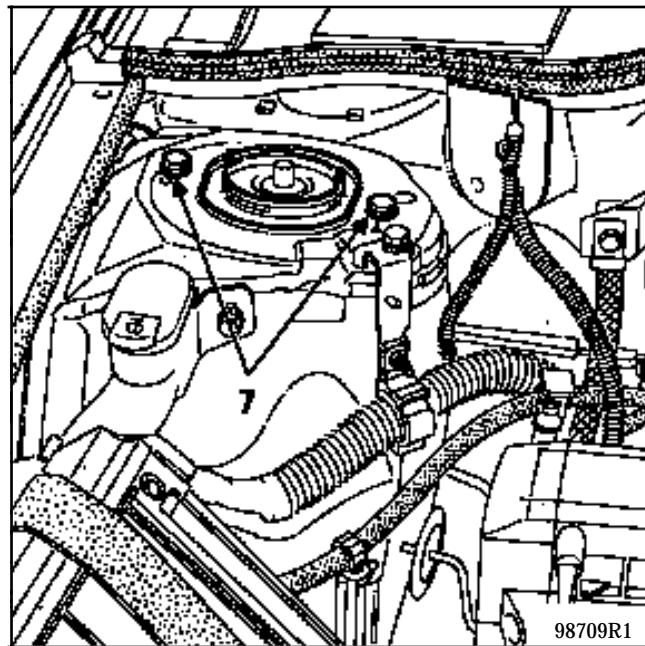
- the alternator drive belt, together with bolt (3) and shaft (4), removing through opening (5),



- the front right hand wheel,
- the track rod end (6) using tool T. Av. 476,



- the two upper shock absorber mounting bolts (7).



Press downwards on the front axle assembly to make removing the alternator easier through the front right hand wheel arch.

#### **REMOVAL**

Refitting is the reverse of removal.

#### **Special notes:**

- do not refit the old drive belt, **renew it**,
- refer to section 07 for tension values.

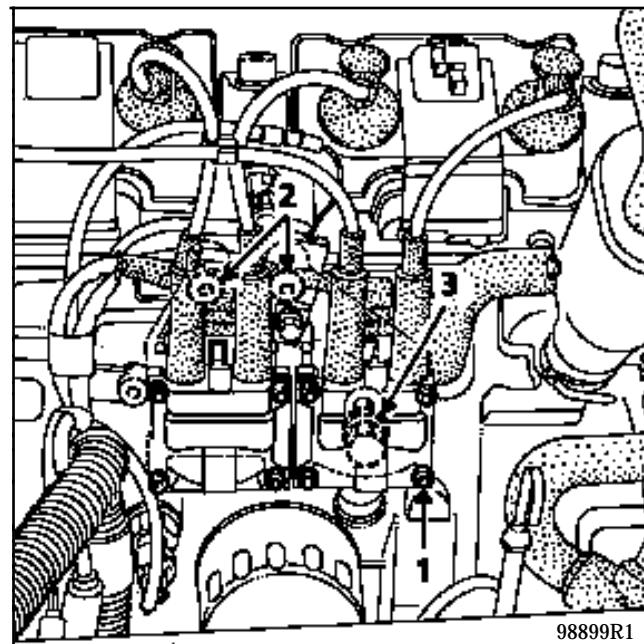
**REMOVAL**

(there are no special notes for engines fitted with power assisted steering)

To release the alternator shaft the following must be removed:

- the mounting bolts (1) for the coils,
- the two bolts (2) from the coil mounting.

Slacken bolt (3) then slide the mounting down.

**REFITTING**

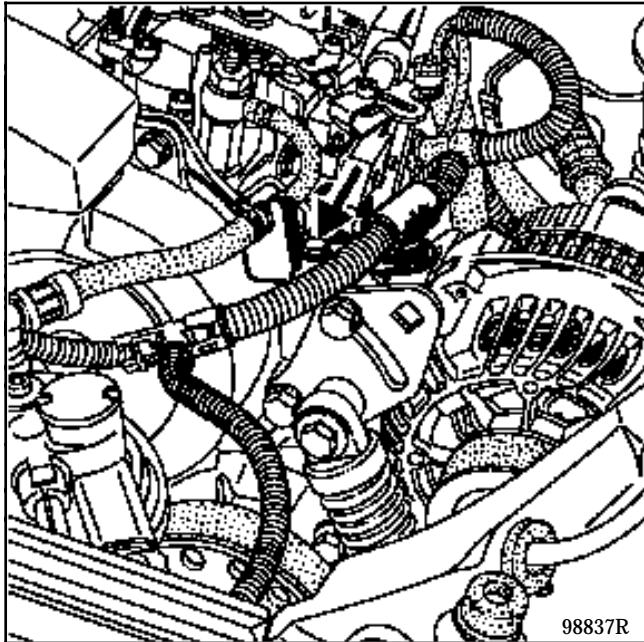
Refitting is the reverse of removal.

**REMOVAL**

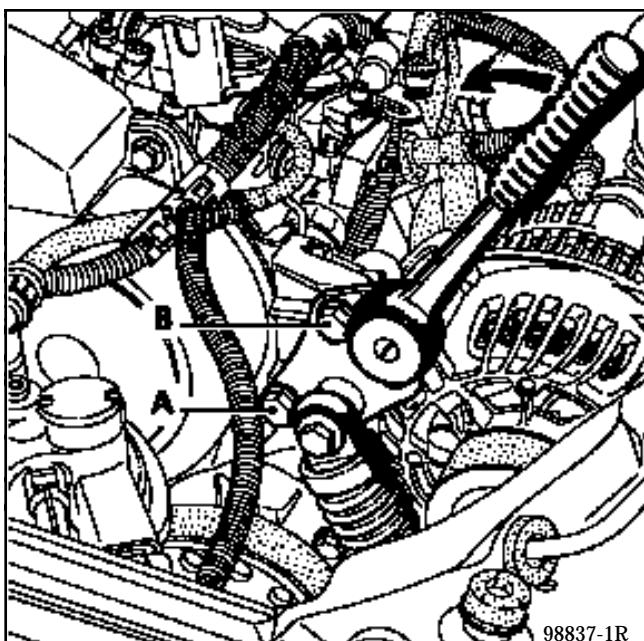
Disconnect:

- the battery,
- the alternator electrical connections.

Remove the mounting bolt for the diesel fuel pipe retaining bracket and move it to one side.



Slacken bolt (A) then bolt (B), to just past the shoulder, while holding the automatic tensioner plate with a 9 mm wrench (Eg. : FACOM J 151 ratchet), then slacken the belt by moving the ratchet in the direction of the arrow.



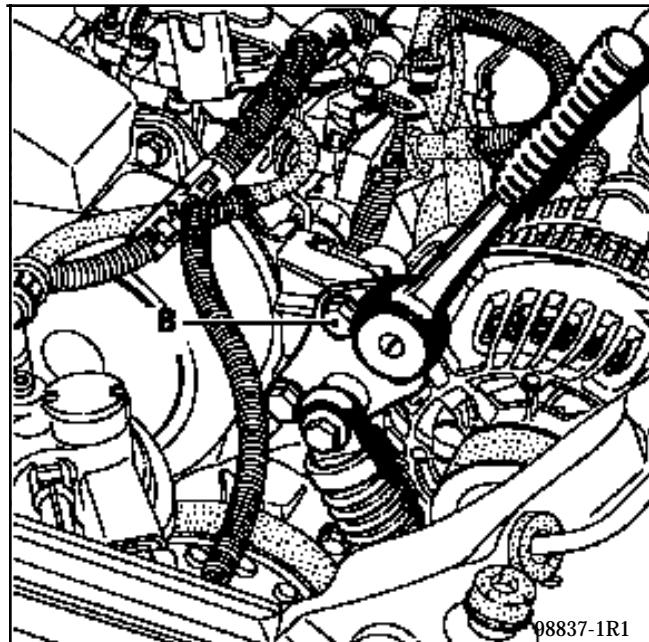
Remove:

- the lower timing cover,
- the belt,
- the alternator mounting bolts,
- the alternator.

**REFITTING (Special note)**

Refitting is the reverse of removal.

The belt is tensioned by moving the automatic tensioner plate against the stop at bolt (B), without forcing it, using a 9 mm wrench (Eg. : FACOM J 151 ratchet ).



**NOTE : do not refit a belt once it has been removed.**

### FAULT FINDING

SPECIAL TOOLING REQUIRED
OPTIMA 5800 diagnostic station

### CHECKING THE CHARGING CIRCUIT USING THE DIAGNOSTIC STATION

The OPTIMA 5800 diagnostic station is used to test the alternator by measuring the voltage and current flow, with and without electrical consumers.

**NOTE :** the ampermetric clamp on the station is of the inductive type (measuring range : 0 to 1000 A). It may be positioned without disconnecting the battery, which **allows computers to retain their memory and settings**.

Depending on the engine, the ampermetric clamp may be positioned in different locations (the diagnostic station will detect incorrect positioning) :

- F3R, F8Q engines : directly at the alternator output, the arrow on the clamp pointing towards the alternator.
- E7J, K7M engines : on the cable connecting the positive battery terminal to the alternator (this cable crosses the battery compartment partition).

Measurements are made in three stages:

- measurement of battery voltage, ignition off,
- measurement with no consumers of the regulated voltage and current flow,
- measurement with the maximum number of consumers of the regulated voltage and current flow.

At the end of the test, the values noted will form the basis of a diagnostic report message:

- Battery voltage no load < 12.3 V = battery discharged.

Without consumers:

- Regulated voltage > 14.8 V => regulator faulty,
- (Regulated voltage no load < 13.2 V) or (charging current < 2 A => charging fault).

With consumers:

- Regulated voltage > 14.8 V => regulator faulty,
- Regulated voltage < 12.7 V => check the alternator flow with reference to its specifications:

Engine	E7J	K7M	F3R	F8Q
Without air conditioning	75 (45)	75 (50)	75 (50)	75 (50)
With air conditioning	/	110 (80)	110 (80)	110 (80)

Notes for the table:

- Current values in Amps.
- The value in brackets corresponds to the minimum flow which should be supplied by the alternator when all consumers are connected.

### FAULT FINDING (cont)

If the measured flow is too low, check:

- if the alternator is worn (brushes....),
- the battery connections,
- the engine earth strap,
- the conformity of the alternator,
- the belt tension.

If the flow measured is correct and the regulated voltage is too low, the alternator is not at fault.

The fault is caused by :

- the vehicle having too many consumers or,
- the battery being discharged.

## Starter motor

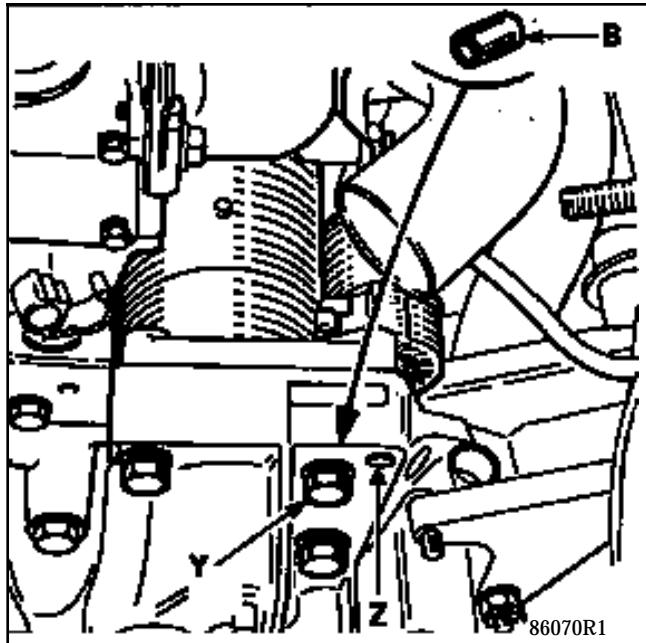
VEHICLE	ENGINE	STARTER
BA0E	E7J	VALÉO D 6 R A 133 MITSUBICHI M 002 T 48381
BA0F - BA0L	K7M	VALÉO D 6 R A 133
BA0G	F3R	VALÉO D 6 R A 133 BOSCH 0001107047
BA0G - BA0A	F8Q	BOSCH 000 1110114 BOSCH B 001115006

## REMOVAL

There are no special notes for removing and refitting the starter.

Check the centring dowel (B) is present, which should be located in the position shown on the table.

Engine	Location of dowel
E 7 J / K 7 M	Y
F 3 R F 8 Q	Z



### FAULT FINDING

SPECIAL TOOLING REQUIRED
OPTIMA 5800 diagnostic station

### CHECKING THE STARTER USING THE DIAGNOSTIC STATION

The starter may be tested using the OPTIMA 5800 diagnostic station, by measuring the battery voltage and the current used during the starting phase. The following operating faults may be detected:

- battery fault (voltage drops when the starter is activated),
- starter jammed (the current used is too high),
- starter fault (the current used is too low).

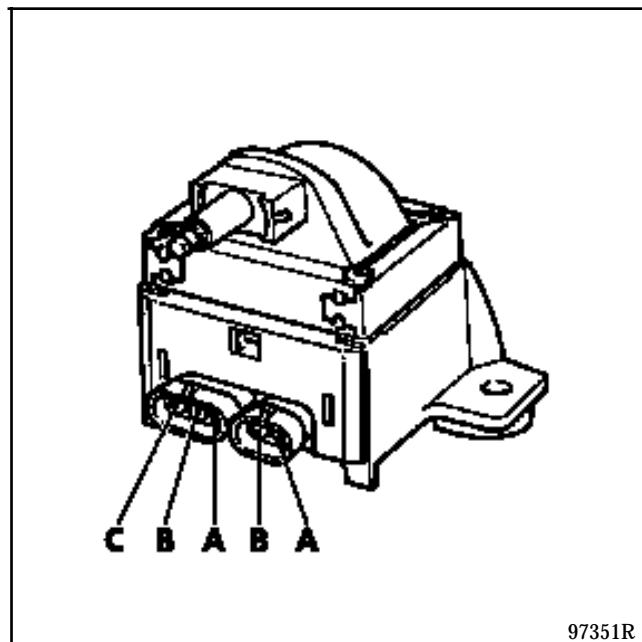
To carry out the test the vehicle must be prevented from starting:

- E7J, K7M engines : disconnect the engine speed sensor (on the clutch bellhousing),
- F3R engines : disconnect the engine speed sensor (on the gearbox),
- F8Q engines : disconnect the fuel shut off on the pump and insulate the terminal.

#### NOTE :

- an open circuit on the engine speed sensor or the ignition creates a fault which is memorised in the injection computer. Erase this fault using the XR25 (see injection section),
- if the vehicle is fitted with an immobiliser, just lock the doors using the PLIP.

The injection computer incorporates the ignition advance calculation function and sends a control signal (5 V) to the ignition power module.



### 3 track connector

- A + after ignition
- B Ignition power module earth
- C Not used

### 2 track connector

- A Not used
- B Control signal

The differences between static ignition with two coils and distributed ignition are:

- the high voltage distributor is no longer used,
- two dual output coils are used.

## PRESENTATION

The system comprises:

- the injection computer (the ignition power stage is integrated into the computer),
- two dual output coils,
- four spark plugs,
- an anti-interference condenser.

## DESCRIPTION - OPERATING PRINCIPLE

### COMPUTER

The injection computer (120), depending on the information received from various sensors, but principally depending on the engine speed and load, determines:

- the number of degrees of advance to be used and consequently the ignition point,
- which cylinders are at TDC and consequently the ignition coil to be operated.

The spark is created at the two cylinders at TDC by cutting the earth to the coil concerned.

### COILS

There are two coils. They are of the dual output type.

They are controlled separately by the computer.

They create two sparks at the same time.

They have a foolproofing device (K7M engine):

- on their base to prevent them being fitted incorrectly to the rocker box cover,
- at the retaining clips for the high voltage leads.

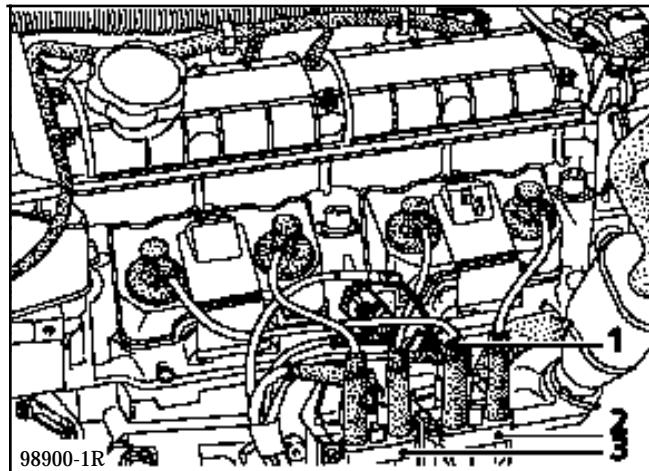
They are colour coded on the 3 track electrical connectors.

Coil (2) has a black electrical connector. This coil provides the sparks for cylinders 1 and 4 at the same time. It is controlled by track 28 on the injection computer.

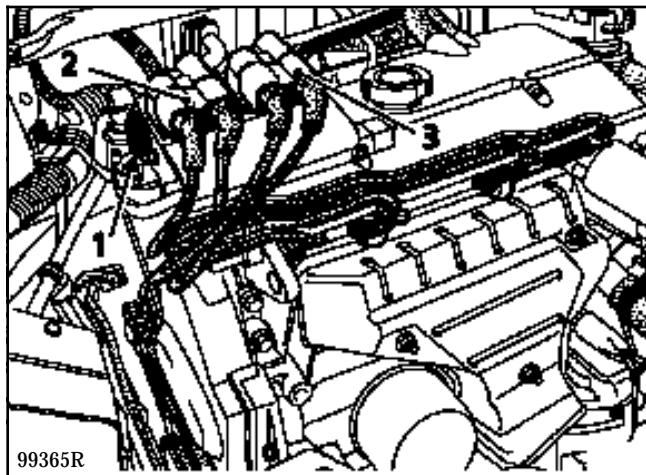
Coil (3) has a grey electrical connector. This coil provides the sparks for cylinders 2 and 3 at the same time. It is controlled by track 29 on the injection computer.

Both coils are connected to an anti-interference condenser (1).

### F3R engine



## K7M engine



## Electrical connector

Track	Allocation
1	+anti-interference condenser
2	+after ignition
3	coil control via computer

## Coil connector track identification

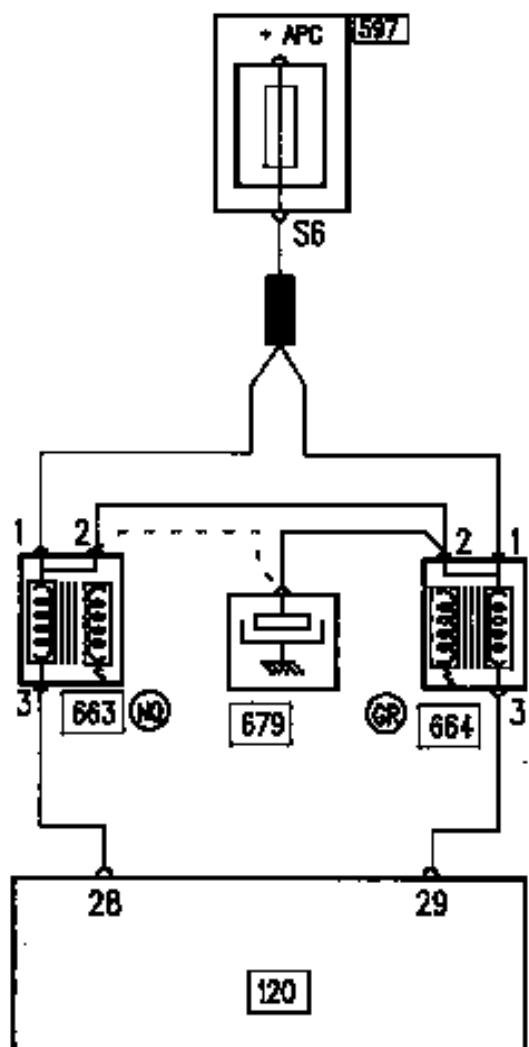
Inscription on connector + -

Connector ---

Track number 1 2 3

Test to be made between tracks	Resistance	
	K7M engine	F3R engine
1 - 2	0.5 Ω	0.2 Ω
1 - 3	1 Ω	1 Ω
2 - 3	1 Ω	1 Ω
HT - HT	10 kΩ	8 kΩ

## DIAGRAM



PRJ99029

## KEY TO COMPONENTS

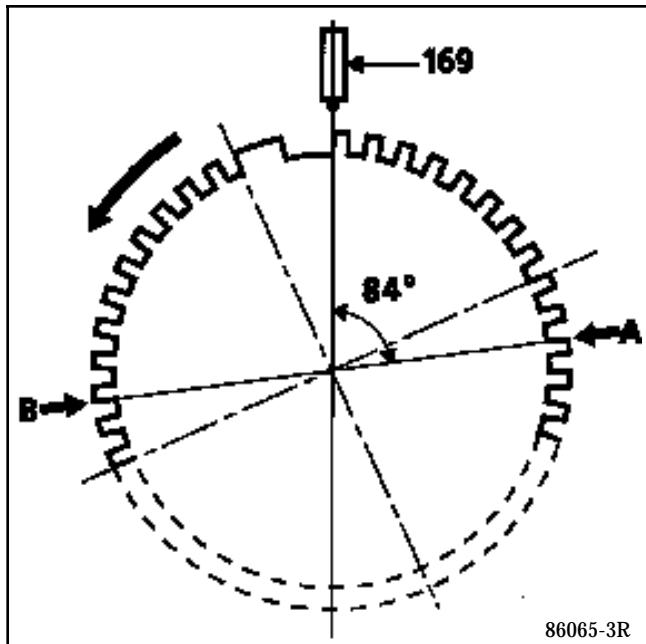
- 120 Injection computer
- 597 Engine fuse box
- 663 Dual output ignition coil for cylinders 1 and 4
- 664 Dual output ignition coil for cylinders 2 and 3
- 679 Anti-interference condenser, connected to coil:
  - 664 for F3R engines
  - 663 for K7M engines (dotted line)

**SPECIAL NOTES FOR THE FLYWHEEL****Description**

The flywheel has 60 regularly spaced teeth. Two teeth have been removed to create a fixed marker gap at  $84^\circ$  or 14 teeth before TDC for cylinders 1 and 4. There are therefore in fact only 58 teeth.

**NOTE :** advance correction depending on the signal from the pinking sensor is dealt with in section 17 Injection.

**Cylinder 1 is at the flywheel end.**



Cylinders 1 and 4 are at TDC when the arrow (A) passes in front of the engine speed sensor (169).

Cylinders 2 and 3 are at TDC when the arrow (B) passes in front of the engine speed sensor (169).

**Operating principle**

The computer knows that TDC for cylinders 1 and 4 is located on the rising edge of the 15th tooth after the fixed gap. Consequently, depending on the amount of advance to be used, the computer knows exactly where to locate the ignition point by counting the number of teeth.

TDC for cylinders 2 and 3 is located on the rising edge of the 45th tooth after the fixed gap.

Engine	Make	Type
<b>E7J</b>	EYQUEM	FC 52 LS
	NGK	BCP 5ES
<b>K7M</b>	EYQUEM	FC 52 LS
	CHAMPION	C10YC
<b>F3R</b>	EYQUEM	C 52 LS
	CHAMPION	N7Y CX
	BOSCH	W7DCO
Flat base with seal		
Gap 0.9 mm		
Tightening torque 2.5 to 3 daN.m		

**SPECIAL NOTES FOR BOSCH MONOPPOINT INJECTION**

- Use the XR25 with the latest cassette and fiche n° 28.  
Read the computer Part Number using code G70\*.  
Erase the memory using code G0\*\*.
- Injection warning light operational (see principle of ignition section).
- Maximum engine speed before ignition cut-out: **6 500 rpm**.
- Corrected idle speed after operation of the air conditioning: **900 rpm**.
- Corrected idle speed with wheels at full lock (power assisted steering pressostat information) : **825 rpm**.
- Canister bleed solenoid valve controlled by RCO signal depending on engine operating conditions (the valve is not operated for no load).
- If there is a fault with the absolute pressure sensor, the manifold pressure is recreated depending on the throttle position and the engine speed.
- Reading of the default values from the air temperature sensor (#03) or coolant temperature sensor (#02), not the values taken in defect mode by the computer when they are recognised as being faulty.
- There is a+after ignition input (track 30) to inform the computer that the ignition has been turned off while it remains fed for a few seconds to reposition the idle speed micromotor.  
(Avoids false detection of a fault in the engine immobiliser system).

**FITTING A 2ND GENERATION ENGINE IMMOBILISER REQUIRES A SPECIAL PROCEDURE FOR REPLACING THE COMPUTER.**

## LOCATION OF COMPONENTS



- 1 Injection computer
- 2 Coolant temperature sensor (white connector)
- 3 TDC sensor
- 4 Fuel vapour recirculation solenoid valve
- 5 Ignition power module
- 6 Idle speed regulation micromotor
- 7 Throttle position potentiometer
- 8 Absolute pressure sensor

## NOTES:

- the injector and the air temperature sensor are integral in the upper section of the throttle body (see section 12),
- the pinking sensor is located under the inlet manifold,
- the diagnostic socket is located in the passenger compartment connection unit.

**SPECIAL NOTES FOR MULTIPONT INJECTION**

- 55 track SIEMENS FENIX 5 computer.
- Semi-sequential multipoint injection. Injectors controlled in pairs (injectors for cylinders 1 and 4 then injectors for cylinders 2 and 3).
- Static ignition with two coils.
- Canister bleed solenoid controlled by RCO signal.
- EGR solenoid valve controlled by RCO signal (K7M 703).
- Idle speed correction depending on:
  - air conditioning,
  - heated windscreens,
  - power assisted steering pressostat.
- Injection warning light on instrument panel operational.
- Use fault finding fiche N° 27.

**FITTING A 2ND GENERATION ENGINE IMMOBILISER REQUIRES A SPECIAL PROCEDURE FOR REPLACING THE COMPUTER.**

## LOCATION OF COMPONENTS



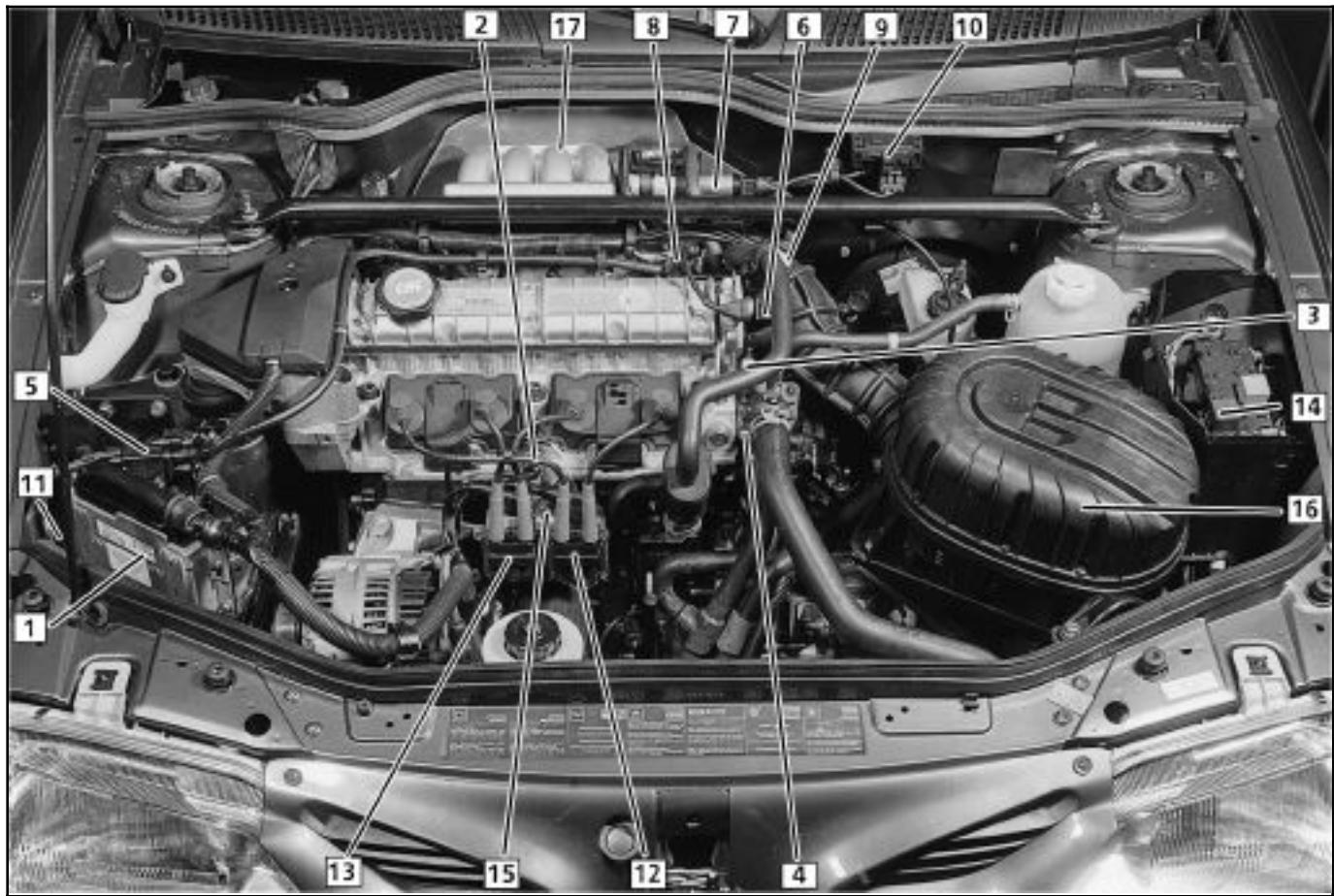
- 1 Injection computer
- 2 Pinking sensor
- 3 Coolant temperature sensor
- 4 TDC sensor
- 5 Fuel vapour recirculation solenoid valve
- 7 Idle speed regulation stepping motor
- 8 Throttle position potentiometer
- 9 Air temperature sensor
- 10 Absolute pressure sensor
- 11 Canister
- 12 Coil for cylinders 1 - 4
- 13 Coil for cylinders 2 - 3
- 14 Fuel pump relay
- 15 Anti-interference condenser
- 16 Air filter
- 17 Oxygen sensor
- 18 Power assisted steering pressostat
- 19 EGR solenoid valve
- 20 Vacuum reservoir
- 21 EGR air filter

**SPECIAL NOTES FOR MULTIPONT INJECTION**

- 55 track SIEMENS FENIX 5 computer.
- Injection cylinder by cylinder (sequential).
- Static ignition with two coils.
- Canister bleed solenoid controlled by RCO signal.
- Idle speed correction depending on:
  - battery voltage,
  - air conditioning,
  - heated windscreen.
- Injection warning light on instrument panel operational.
- Use fault finding fiche N° 27.
- Computer configuration depending on gearbox type (manual gearbox or automatic transmission).

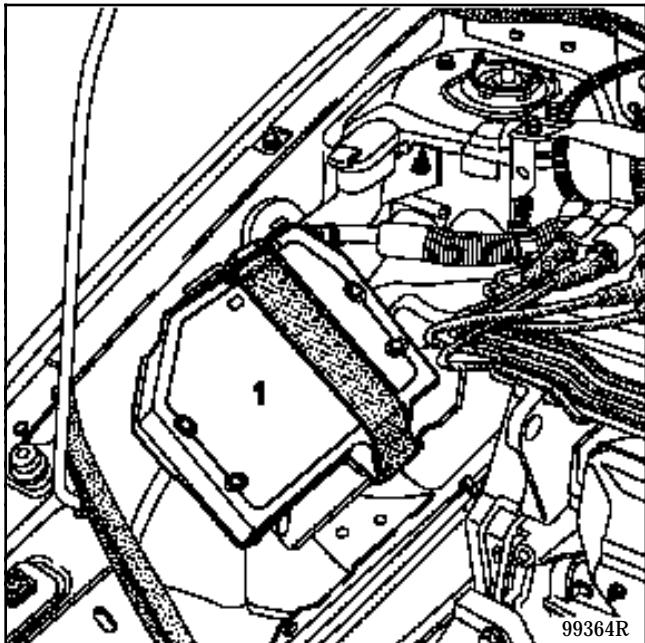
**FITTING A 2ND GENERATION ENGINE IMMOBILISER REQUIRES A SPECIAL PROCEDURE FOR REPLACING THE COMPUTER.**

## LOCATION OF COMPONENTS

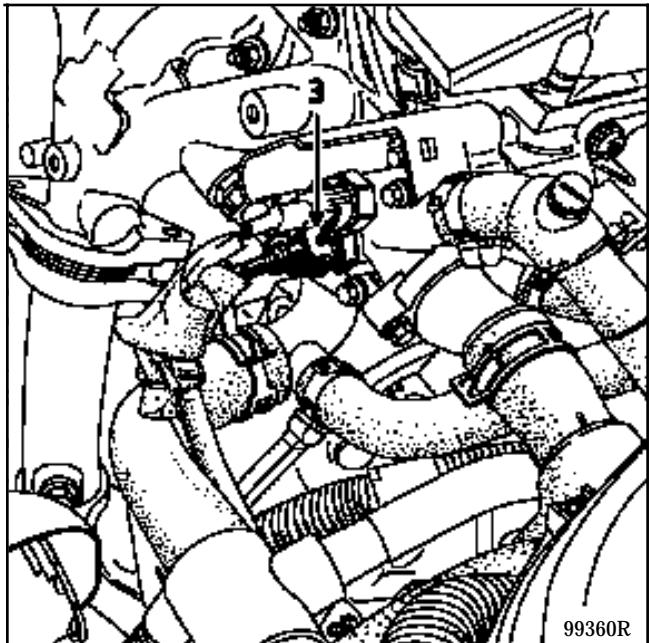
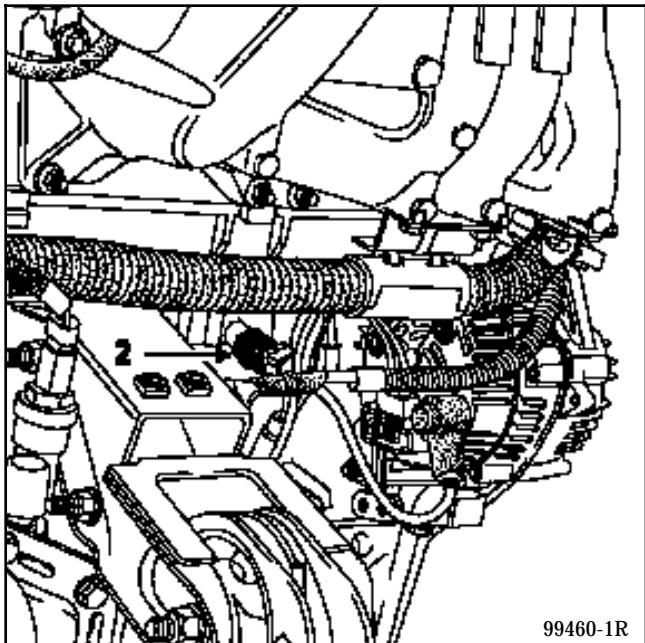


- 1 Injection computer
- 2 Pinking sensor
- 3 Coolant temperature sensor
- 4 TDC sensor
- 5 Fuel vapour recirculation solenoid valve
- 6 Cylinder reference sensor
- 7 Idle speed regulation solenoid valve
- 8 Throttle position potentiometer
- 9 Air temperature sensor
- 10 Absolute pressure sensor
- 11 Canister
- 12 Coil for cylinders 1 - 4
- 13 Coil for cylinders 2 - 3
- 14 Fuel pump relay
- 15 Anti-interference condenser
- 16 Air filter
- 17 Oxygen sensor

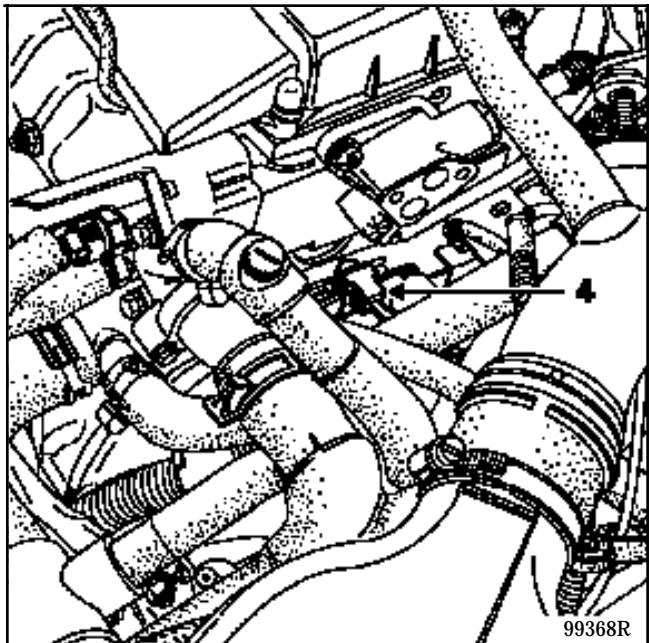
1 Injection computer



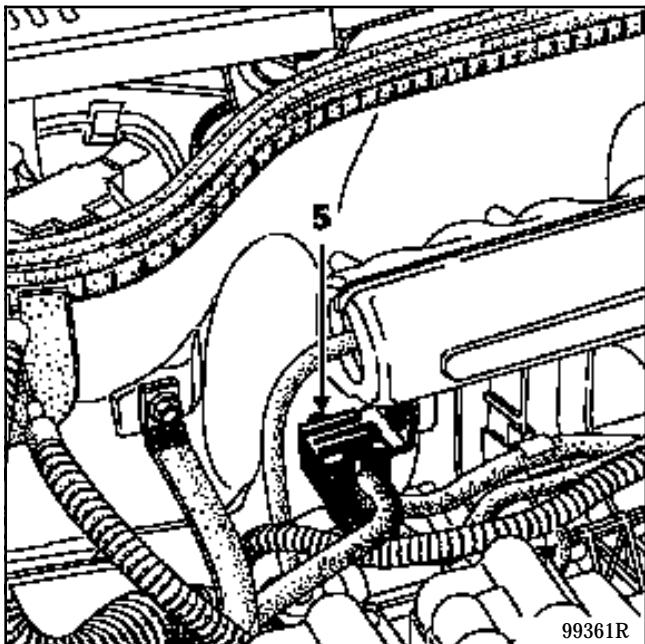
3 Coolant temperature sensor

2 Pinking sensor  
(tightening torque: 2.5 daN.m)

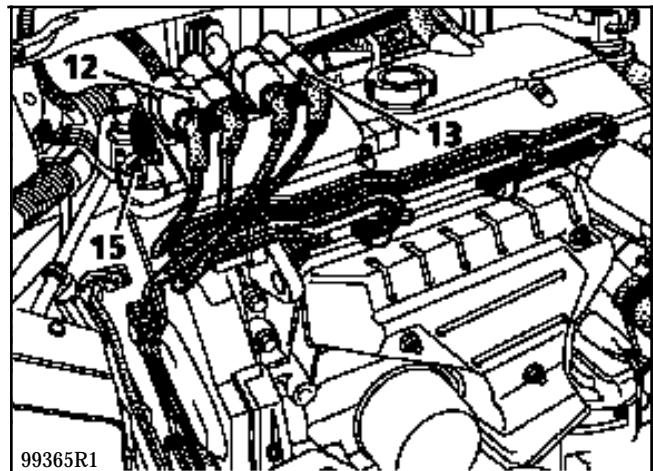
4 TDC sensor



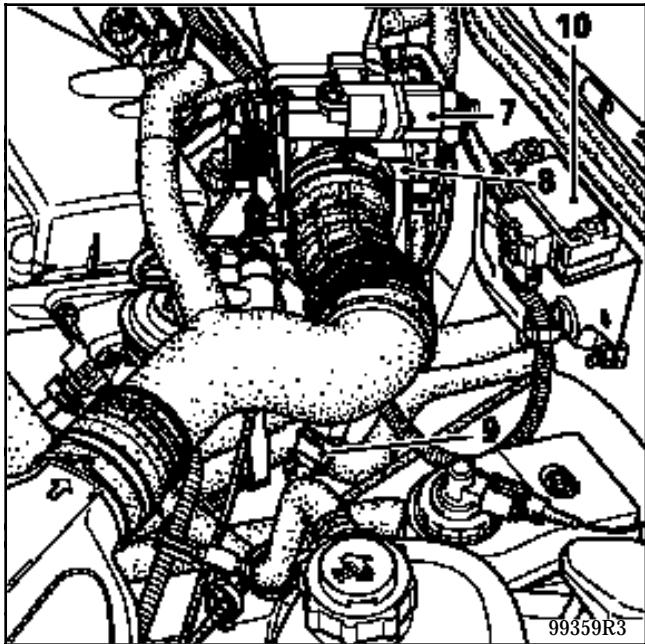
**5** Fuel vapour recirculation solenoid valve



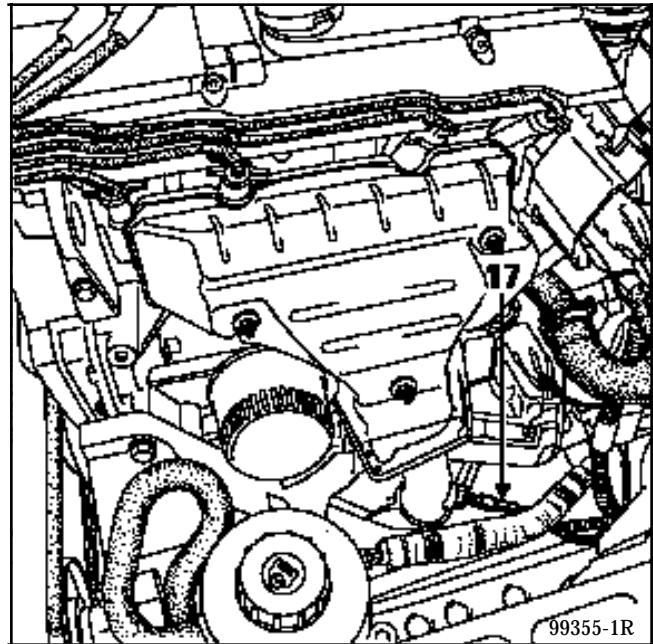
- 12** Coil for cylinders 1-4
- 13** Coil for cylinders 2-3
- 15** Anti-interference condenser

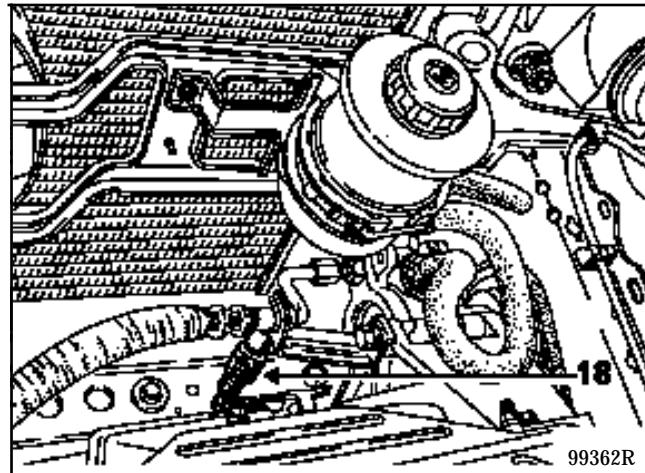
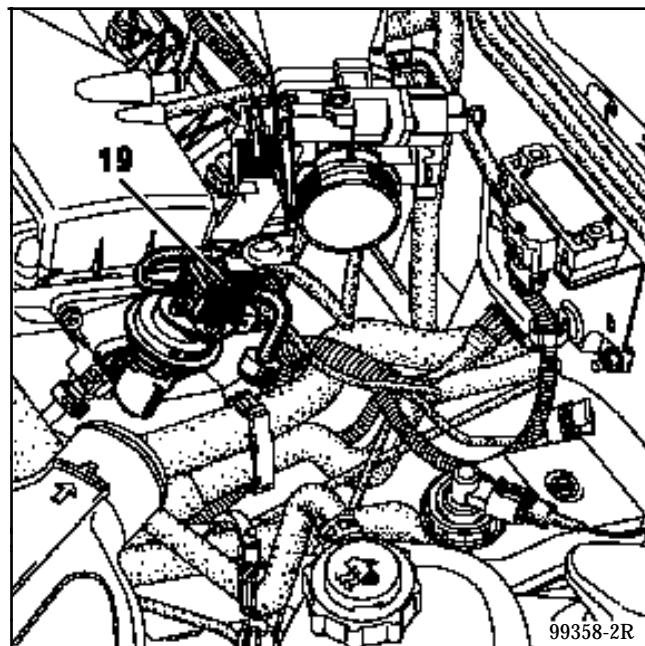


- 7** Idle speed regulation stepping motor
- 8** Throttle position potentiometer
- 9** Air temperature sensor
- 10** Absolute pressure sensor

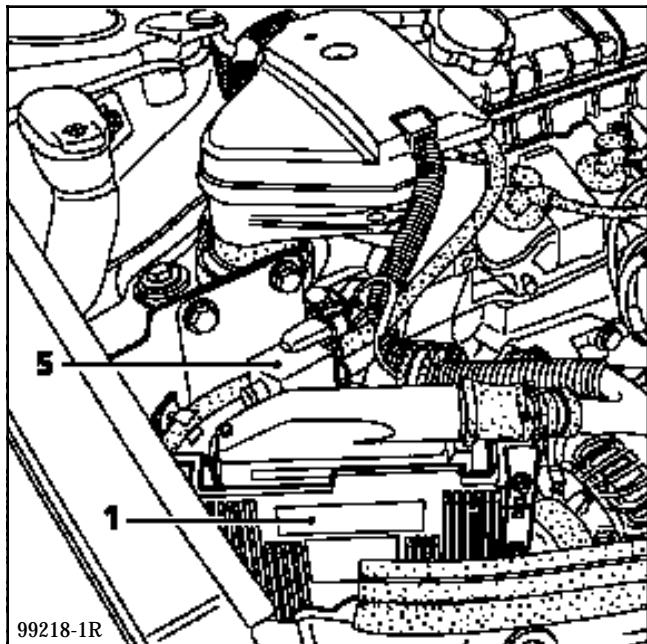


- 17** Oxygen sensor  
(tightening torque: 4.5 daN.m)

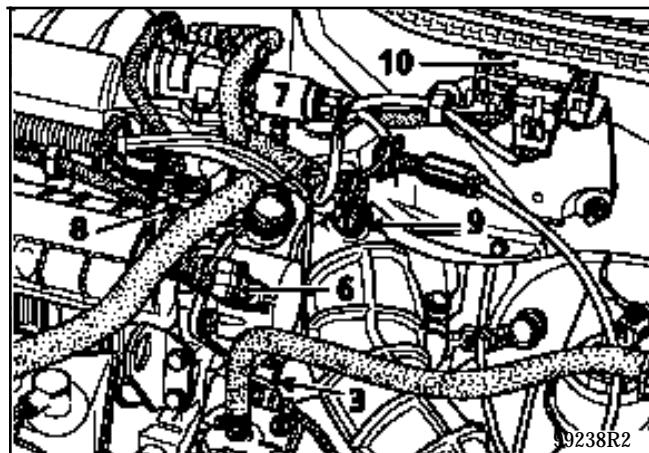


**18** Power assisted steering pressostat**19** EGR solenoid valve

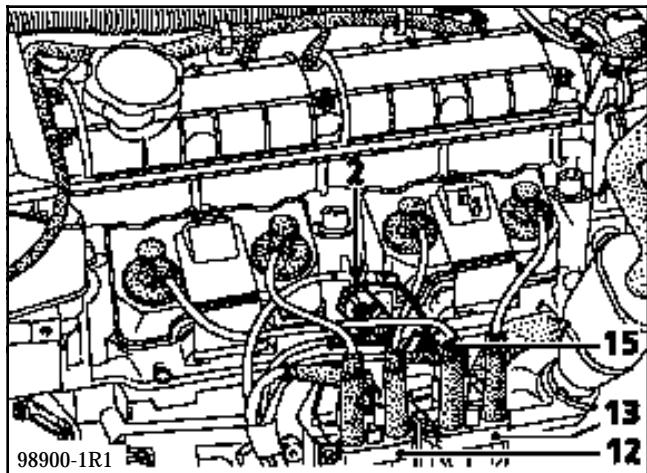
- 1** Injection computer  
**5** Fuel vapour recirculation solenoid valve



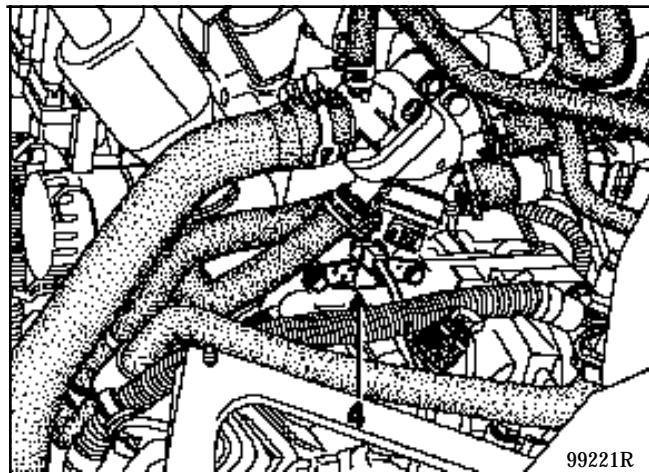
- 3** Coolant temperature sensor (clipped)  
**6** Cylinder reference sensor (see removal in sub-section "Special notes for sequential injection")  
**7** Idle speed regulation solenoid valve  
**8** Throttle position potentiometer (non-adjustable)  
**9** Air temperature sensor (clipped)  
**10** Absolute pressure sensor



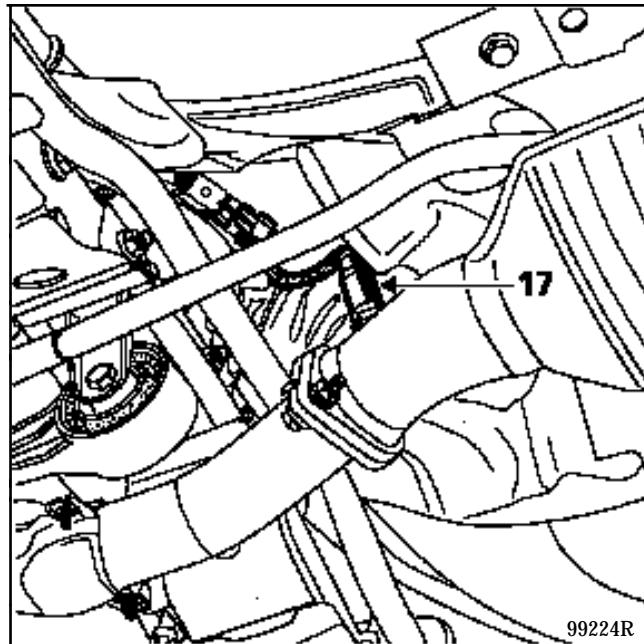
- 2** Pinking sensor  
 (tightening torque : **2.5 daN.m**)  
**12** Coil for cylinders 1 - 4  
**13** Coil for cylinders 2 - 3  
**15** Anti-interference condenser



- 4** TDC sensor



17 Oxygen sensor  
(tightening torque: 4.5 daN.m)



**OPERATING PRINCIPLE**

The K7M engine is fitted with semi-sequential injection.

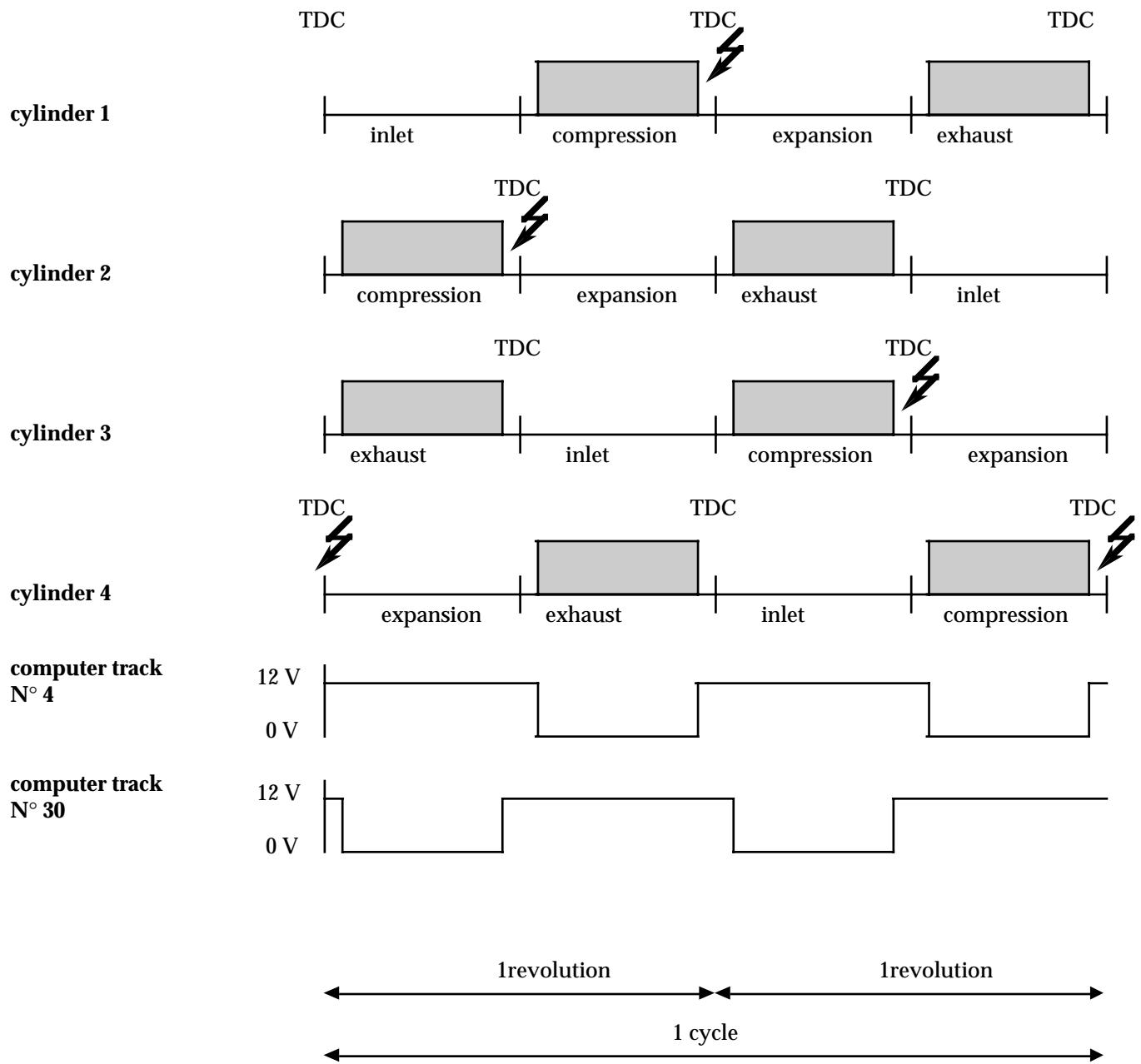
Injection of fuel is carried out simultaneously to cylinders 1 - 4 and cylinders 2 - 3.

To do this, the two pairs of injectors are connected to two injection computer tracks:

- the injectors for cylinders **1** and **4** are connected to computer track **4**,
- the injectors for cylinders **2** and **3** are connected to computer track **30**.

For each cylinder, there is one injection per revolution, i.e. two per cycle. These injections take place during the compression and exhaust phases.

The injection computer uses the same system as that used to control the ignition coils for determining when to control which injector. By analysing the signal from the flywheel, it knows the TDC point for cylinders 1 - 4 and cylinders 2 - 3 (see principle in section 17 "Ignition"). By counting the number of teeth, the engine phases preceding TDC maybe determined.



Ignition



injection of petrol

### PRESENTATION

The F3R engine is fitted with sequential injection.

Injection of fuel is not carried out simultaneously to all four cylinders as with conventional injection, but cylinder after cylinder when they are at the start of the inlet phase.

To do this, it is necessary for:

- each injector to be connected separately to the computer (injector n° 1 is at the flywheel end),
- the computer to know which cylinder is at the inlet phase.

To determine the cylinder at the inlet phase, the computer uses 2 sensors:

- the TDC sensor,
- the cylinder reference sensor.

The TDC sensor allows the computer to determine the engine speed, and to know which cylinders are at TDC:

- cylinders 1 and 4 at TDC,
- cylinders 2 and 3 at TDC.

The cylinder reference sensor allows the computer to know which of the two cylinders at TDC is at the start of the inlet phase.

### DEFECT MODE IN THE CASE OF A FAULT WITH THE CYLINDER REFERENCE SENSOR

The system remains in sequential injection. The cycle 1 - 3 - 4 - 2 is retained.

When fuel is injected for the first time, or at the beginning of the starting phase, the computer decides arbitrarily to inject fuel to cylinder n° 1 when cylinders 1 and 4 are at TDC.

Two possibilities may then arise:

- the system is phased correctly,
- the system is out of phase by one revolution.

Operation of the engine is not greatly affected.

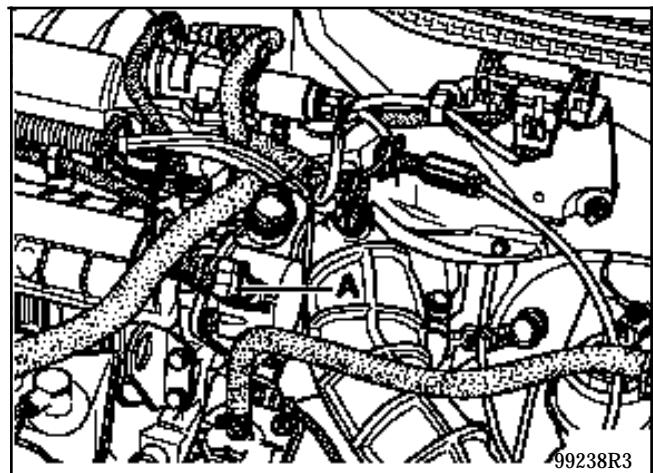
### DESCRIPTION

The cylinder reference sensor (A) is located at the end of the camshaft. It is mounted by three bolts on to the cylinder head.

The sensor is opposite a long target of 180°. This is mounted on the end of the camshaft.

If the target is located within the sensor air gap, 12 V is sent to the computer.

If the target is not in the sensor airgap, 0 V is sent to the computer.



### SENSOR OPERATING PRINCIPLE

The sensor is supplied with 12 Volts. The computer sends it a 5 V feed on track 2.

Depending on the position of the target, the sensor closes the circuit and earths this voltage (the computer receives 0 V), or the sensor leaves the circuit open (the computer receives 12 V).

### PRINCIPLE FOR RECOGNISING THE CYLINDER AT THE INLET PHASE

Depending on the signal from the TDC sensor, the computer knows at what moment cylinders 1 and 4 are at TDC and at what moment cylinders 2 and 3 are at TDC. (For further explanations refer to section 17 "Ignition").

Cylinders 1 and 4 are at TDC,

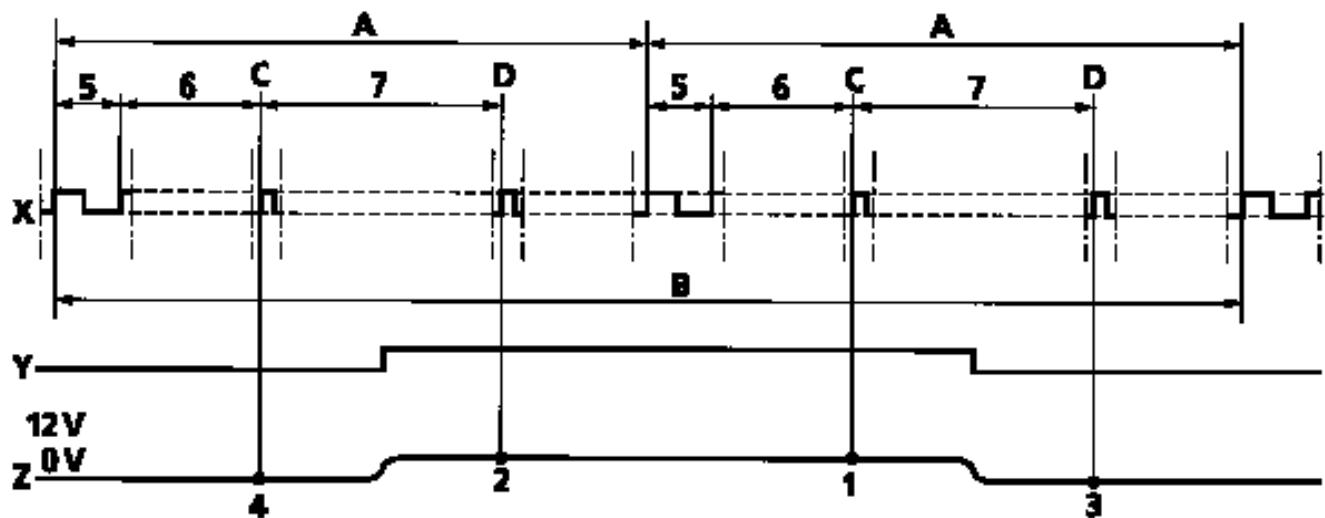
- if the signal from the cylinder reference sensor is 0 Volts, cylinder 4 is at the start of the inlet phase,
- if the signal from the cylinder reference sensor is 12 Volt, cylinder 1 is at the start of the inlet phase.

Cylinders 2 and 3 are at TDC,

- if the signal from the cylinder reference sensor is 0 Volts, cylinder 3 is at the start of the inlet phase,
- if the signal from the cylinder reference sensor is 12 Volt, cylinder 2 is at the start of the inlet phase.

### LOGIC

Cylinder at TDC	Signal from cylinder reference sensor	Cylinder at start of inlet phase
1 - 4	12 Volt	1
	0 Volts	4
2 - 3	12 Volt	2
	0 Volts	3



98406R1

A 1 rotation of the crankshaft  
 B 1 rotation of the camshaft

C TDC 1 - 4  
 D TDC 2 - 3

1 Cylinder 1 at inlet  
 2 Cylinder 2 at inlet  
 3 Cylinder 3 at inlet  
 4 Cylinder 4 at inlet

5 Gap in flywheel  
 6 84° or 14 teeth  
 7 30 teeth

X Flywheel target  
 Y Camshaft target  
 Z Voltage from cylinder reference sensor

**NOTE :** All values are given in TDC degrees.

### 1. REMOVING THE CYLINDER REFERENCE SENSOR

Disconnect the sensor

Remove:

- the cylinder reference sensor (A) (one bolt),
- the cover (B) (three bolts).

Target (C) is secured on the end of the camshaft by a spring ring.

To release the target from the camshaft:

- Rest a copper hammer behind the target.
- Use a mallet to tap the hammer gently.
- Remove the target (C) and the plastic protective cover (D).

### 2. REFITTING THE CYLINDER REFERENCE SENSOR

**IMPORTANT : the order of operations described below MUST be observed. Not following the method could cause incorrect operation and / or damage to the sensor.**

Refit :

- the sensor to the cover, push it upwards and tighten to a torque of **0.15 daN.m**,
- the protective plastic cover,
- the target (this has a foolproofing device. Check its position before fitting to the end of the camshaft),
- the cover with the sensor. Tighten the three cover bolts to a torque of **1 daN.m**.

### 3. ADJUSTING THE SENSOR / TARGET GAP

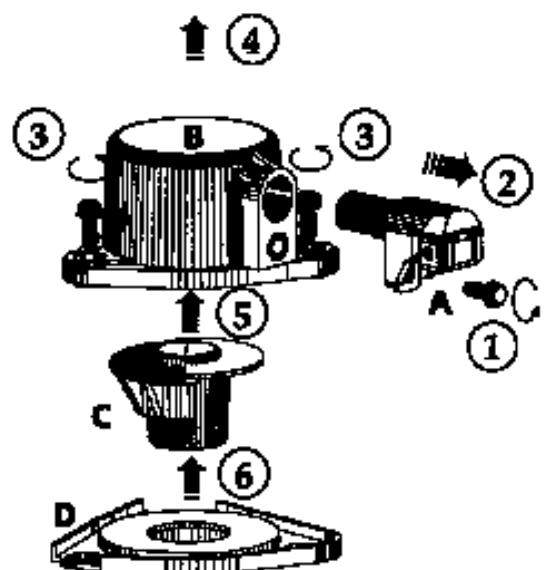
Slacken the bolt mounting the sensor without touching the sensor then retighten it to a torque of **0.8 daN.m**.

By slackening the bolt the sensor is released. A spring in the cover pushes the sensor against the target.

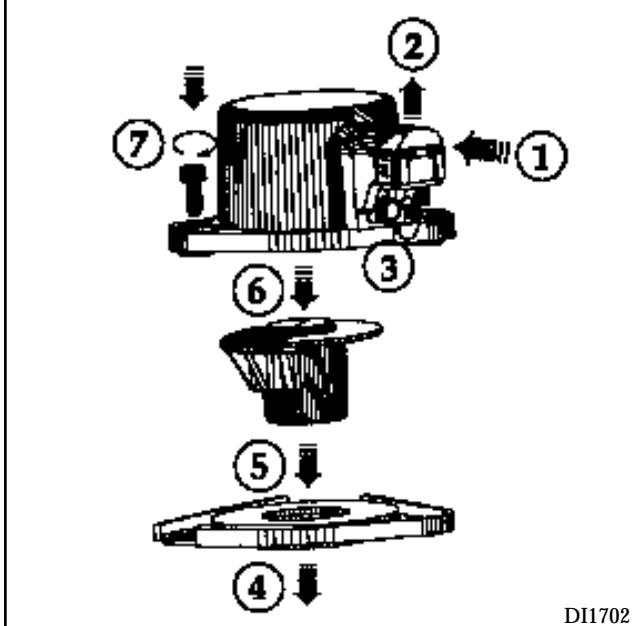
When the bolt is tightened the sensor is secured. It has two small plastic pips which touch the target. These pips wear as the engine turns. There is no longer contact between the two components and the gap is set.

## 1 REMOVAL

## 2 REFITTING

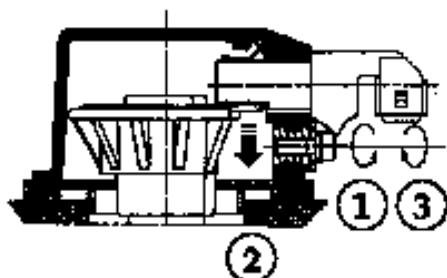


DI1701



DI1702

## 3 ADJUSTMENT



DI1703

## CYLINDER REFERENCE SENSOR CONNECTIONS

TRACK	ALLOCATION
1	Earth
2	Information to injection computer on track 42
3	+after ignition

### PRINCIPLE FOR ILLUMINATION OF THE INJECTION FAULT WARNING LIGHT ON THE INSTRUMENT PANEL

- **Vehicle without engine immobiliser system**

When the ignition is turned on, the warning light illuminates for 3 seconds then extinguishes.

- **Vehicle with engine immobiliser system deactivated**

When the ignition is turned on, the warning light illuminates for 3 seconds then extinguishes.

When the doors are unlocked, the red immobiliser warning light, which was previously flashing, extinguishes. When the ignition is turned on, it illuminates for 3 seconds then extinguishes.

- **Vehicle with engine immobiliser system activated**

When the ignition is turned on, the computer does not identify the code and the vehicle cannot be started. The injection warning light illuminates for 3 seconds then extinguishes.

Before the ignition is turned on, the red immobiliser warning light flashes. When the ignition is turned on, this light flashes twice as fast.

If a fault in the immobiliser system is detected when the engine is running, the injection warning light will flash in the engine speed range from idle speed to **1 500 rpm** approximately.

- **Fault with an injection system component**

Faults in the following components cause the warning light to illuminate:

- absolute pressure sensor,
- throttle position potentiometer,
- injectors,
- idle speed regulation stepping motor (K7M engine),
- idle speed regulation valve (F3R engine),
- no vehicle speed information when the vehicle is moving,
- EGR solenoid valve (K7M 703 engine),
- automatic transmission computer → injection computer (F3R - K7M engines).

This vehicle is fitted with a 2nd generation engine immobiliser system.

### REPLACING THE INJECTION COMPUTER

The computers are supplied uncoded but are capable of being programmed with a code.

When replacing the computer, the vehicle code must be programmed in and then check that the immobiliser system is operational.

To do this, carry out the following operations:

- **Vehicle fitted with a PLIP engine immobiliser system**
  - Lock and unlock the doors using the PLIP.
  - Turn the ignition on for a few seconds.
  - Lock the doors using the PLIP, the immobiliser function is operational.
- **Vehicle fitted with a coded key engine immobiliser system**

Turn the ignition on for a few seconds then turn it off again.

### CHECKING THE IMMOBILISER FUNCTION

- **Vehicle fitted with a PLIP engine immobiliser system**
  - Turn the ignition off, lock the doors from inside the vehicle using the PLIP. The red immobiliser warning light should flash.
  - Turn the ignition on, The red immobiliser warning light should flash twice as fast.
- **Vehicle fitted with a coded key engine immobiliser system**

Remove the key from the ignition switch, after 10 seconds the red immobiliser warning light should flash.

### TESTING AN UNCODED INJECTION COMPUTER FROM STOCK OR FROM A VEHICLE NOT FITTED WITH AN IMMOBILISER SYSTEM

To avoid coding the injection computer before the test, **it is vital to cut the + 12 V before ignition feed to the immobiliser system**. Remove the passenger compartment connection unit fuse (F39) (for more details, refer to section 82).

**NOTE :** if the injection computer has been coded by mistake, a method exists for decoding it (refer to section 82).

### SPECIAL NOTES

Using the XR25 it is possible to see if the injection computer is coded. The computer is uncoded if bargraph 2 right hand side is illuminated and if \*22 = 2 DEF

**A CODED COMPUTER FITTED TO A VEHICLE WITH AN ENGINE IMMOBILISER MAY NOT BE USED FOR TESTING ANOTHER VEHICLE, REGARDLESS OF WHETHER THIS VEHICLE HAS AN ENGINE IMMOBILISER OR NOT.**

**CONFIGURING THE COMPUTER DEPENDING ON GEARBOX TYPE (MANUAL OR AUTOMATIC)**

Each time the injection computer is replaced, the gearbox type for the vehicle must be programmed (manual or automatic). The computer is designed to operate with both these types of gearbox.

Procedure for configuring the computer:

Connect the XR25

ISO selector on S8

Turn the ignition on

Enter **D13** then

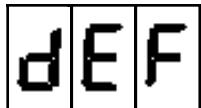
**For a vehicle fitted with a manual gearbox:**

Enter **G60\***

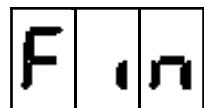
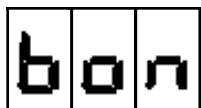
**For a vehicle fitted with an automatic transmission:**

Enter **G50\***

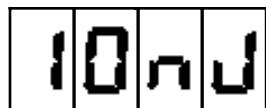
The display shows:



If the configuration has not been programmed



then



once the configuration is complete

After programming the configuration, turn the ignition off to store it in the memory. Memorisation is effective after the ignition has been turned off, once the computer has left the monitoring mode.

The monitoring mode varies from 30 seconds to 13 minutes.

To check that storing has been correctly carried out, turn the ignition on using fault finding fiche n° 27, bargraph 20 LH side should be extinguished, bargraph 19 RH or LH side should be illuminated.

There is a method for configuring the computer which does not require the use of the XR25. To do this:

- turn the ignition on,
- start the engine,
- accelerate the engine to a speed greater than **2500 rpm** for **10 seconds**,
- turn the ignition off,
- turn the ignition on again and start the engine,
- accelerate the engine to a speed greater than **2500 rpm** for **10 seconds**,
- turn the ignition off.

The memorisation procedure is the same as that described previously.

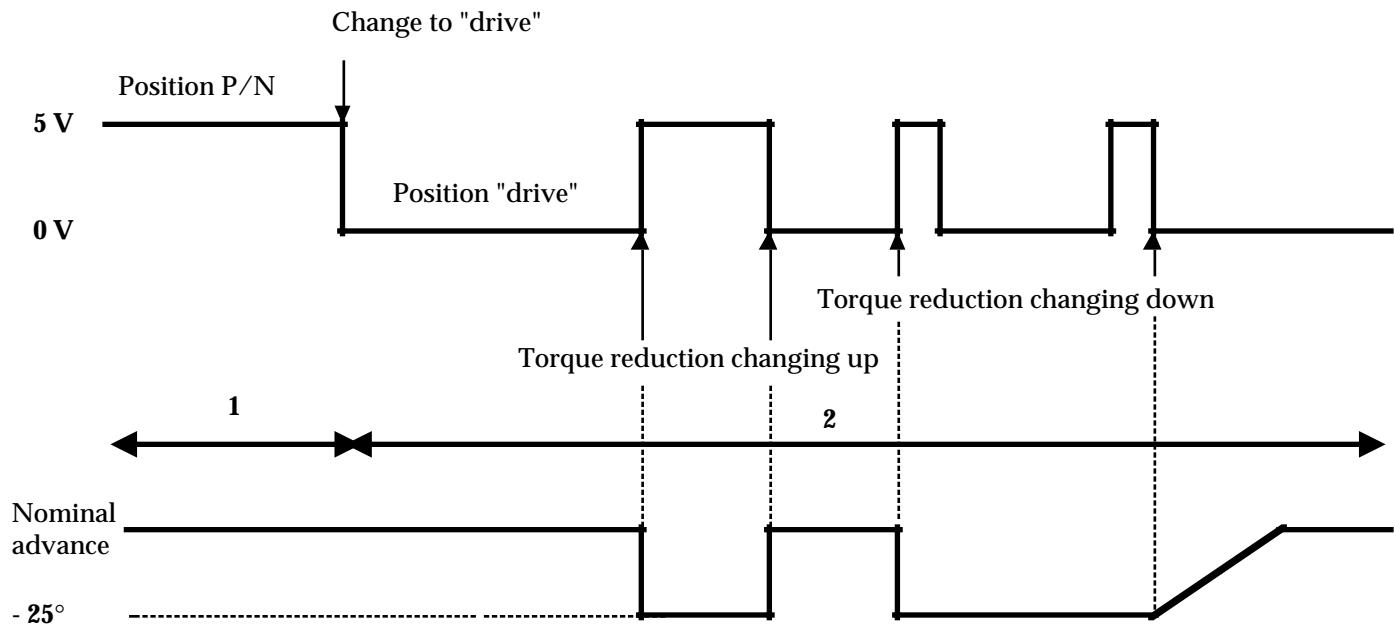
**NOTE :** the configuration procedure using the XR25 may be used to reconfigure an incorrectly configured computer (automatic transmission instead of manual gearbox). The procedure which does not use the XR25 will however only work for an unconfigured blank injection computer from stock.

## AUTOMATIC TRANSMISSION COMPUTER CONNECTION TO INJECTION COMPUTER

"Park"/"Neutral" position and torque reduction information.

These two items of information are sent on one track of the injection computer.

## Signal transmitted



1. In the "Park" or "Neutral" position, you can check whether the voltage, measured using a voltmeter between track 7 and earth is actually approximately 5 V.  
As soon as the "drive" (or "other") position is reached, the voltage drops to approximately 0.
2. From the "drive" position and while driving, the automatic transmission computer sends:
  - a long pulse for changing up a gear,
  - two short pulses for changing down a gear.

The injection computer, in both cases, to smooth the gear change, retards the advance by  $25^\circ$  compared to the initial advance, for the complete period of torque reduction if the vehicle speed is greater than 6 mph (10 km/h).

The advance returns to the initial setting:

- at once for changing up a gear,
- progressively for changing down a gear.

### AIR CONDITIONING / INJECTION COMPUTER CONNECTION

The electrical connection:

- from the air conditioning computer to the injection computer is by one wire. This track only transmits the information that the air conditioning is operating. The injection computer deduces that the air conditioning has been selected:  
track 6 F3R engine  
track 5 K7M engine  
track 34 E7J engine
- from the injection computer to the air conditioning computer is by one wire. This track transmits the compressor operation authorisation and prevention information :  
track 51 F3R - K7M engines  
track 20 E7J engine

### PROGRAMMING FOR OPERATION OF THE COMPRESSOR

During certain operating phases, the injection computer prevents operation of the compressor.

#### Starting the engine

The compressor is prevented from operating for 10 seconds after the engine has been started.

#### Thermal protection

The compressor clutch is prevented from engaging if the coolant temperature is greater than or equal to :

- + 115°C (F3R and E7J engines)
- + 120°C (K7M engine)

#### Over-revving protection

The compressor may not operate if the engine speed is greater than :

- 6 000 rpm (F3R engine),
- 5 600 rpm (K7M engine),
- 5 400 rpm (E7J engine).

### OPERATING PRINCIPLE

1. Idle speed regulation.
2. Air conditioning operation information becomes ON for the first time since the ignition was turned on.  
The driver must select air conditioning from the control panel.

The idle speed is increased to:

F3R engine	900 rpm
K7M engine	850 rpm
E7J engine	900 rpm

The injection computer prevents the compressor from operating to assist the increase in idle speed.

3. 2 to 5 seconds after receiving the information for air conditioning operation ON, the computer authorises operation of the compressor and increases the idle speed regulation solenoid valve percentage opening. The idle speed does not increase.

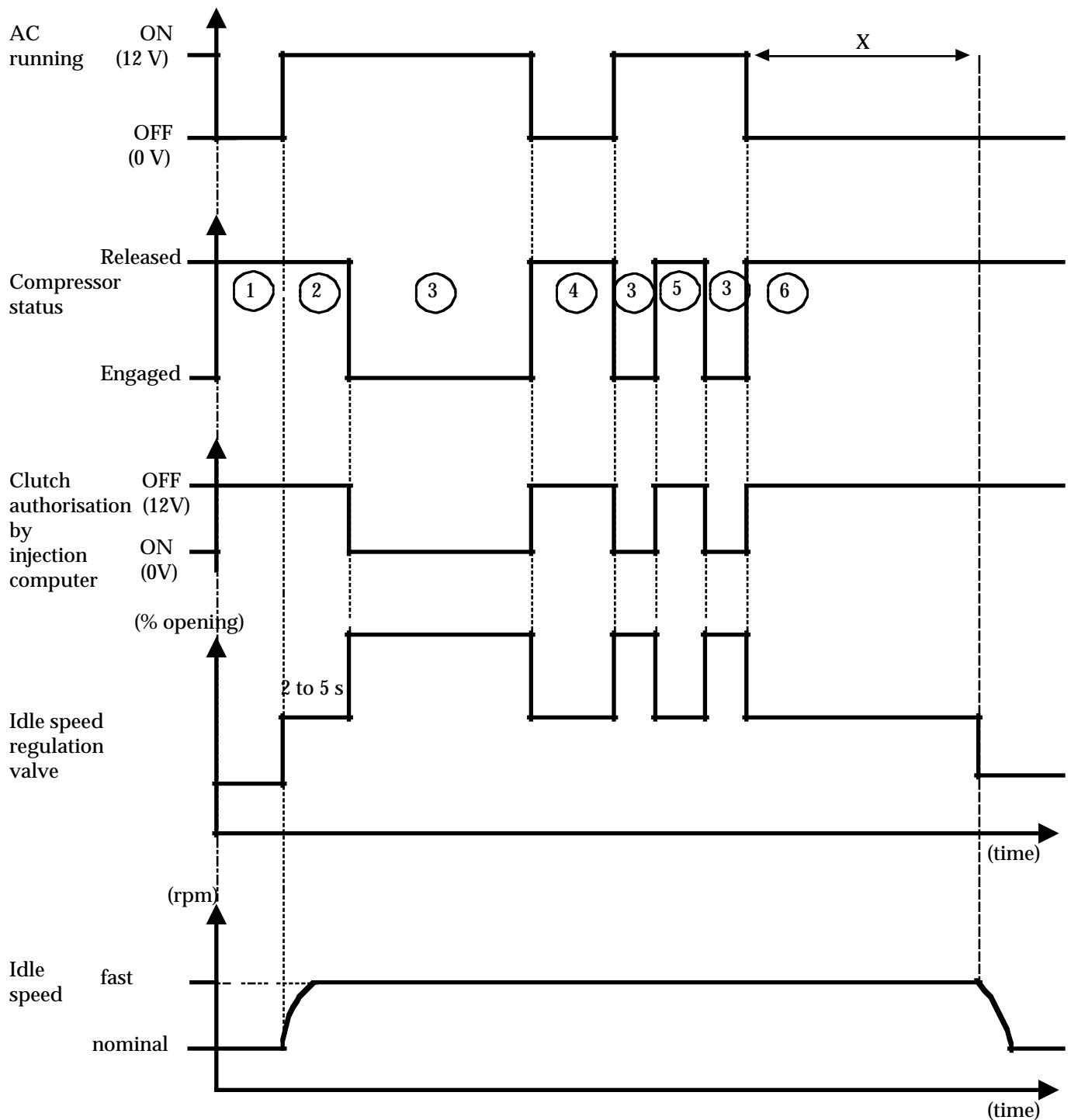
4. Air conditioning operation information becomes OFF, the injection computer, anticipating the drop in load due to the releasing of the compressor clutch, reduces the percentage opening of the idle speed regulation solenoid valve then authorises the release of the compressor clutch and transmits the clutch feed authorisation information OFF. The engine runs at fast idle speed.

(If the air conditioning computer has not received the compressor cut-out authorisation 2 seconds after transmitting the air conditioning operation information OFF, it cuts the compressor itself).

5. Following prevention of compressor operation by the injection computer (clutch feed authorisation OFF), the injection computer anticipates the drop in load due to the release of the clutch and reduces the percentage opening of the idle speed regulation solenoid valve. The compressor clutch is released by the air conditioning computer.
6. Air conditioning operation information becomes OFF, the operation is similar to that described in point 4.

The engine is running at fast idle speed. To return to normal idle speed, the computer must detect that the driver has turned the air conditioning off at the control panel. It deduces this state from the air conditioning operation information if it is OFF for longer than :

- 15 seconds for **K7M** and **E7J** engines,
- 40 seconds for **F3R** engine,  
shown by the letter X on the next page.



### POWER ASSISTED STEERING PRESSOSTAT - INJECTION COMPUTER CONNECTION (K7M and E7J engines)

The injection computer receives information from the power assisted steering pressostat. This depends on the pressure in the hydraulic circuit. The higher the pressure, the more energy is used by the power assisted steering pump.

The injection computer, to compensate for this energy use, increases the percentage opening of the idle speed regulation stepping motor for the K7M engine or adjusts the idle speed micromotor for the E7J engine.

The information is received on track 13 (K7M engine) and track 8 (E7J engine) on the injection computer. Pressostat closed, the computer receives an earth. The idle speed is adjusted to **820 rpm** for the K7M engine and **825 rpm** for the E7J engine.

### IDLE SPEED CORRECTION DEPENDING ON THE BATTERY VOLTAGE (F3R engine)

This correction compensates for the drop in voltage due to operation of consumers when the battery is poorly charged. To do this, the idle speed is increased, allowing the alternator to rotate more and consequently increase the charging voltage.

The lower the voltage, the greater the degree of correction. Correction of the engine speed is therefore variable. It begins when the voltage drops to below **12.7 Volts**. Correction begins at the nominal engine speed and may reach a maximum of **910 rpm**.

### IDLE SPEED CORRECTION DEPENDING ON HEATED WINDSCREEN INFORMATION

The E7J engine has no heated windscreens.

If the heated windscreens function is selected, the computer receives + 12 V information :  
on track 6 for K7M engines  
on track 5 for F3R engines.

If the coolant temperature is less than 60°C, the idle speed is set to :

- 1 000 rpm (F3R engine)
- 850 rpm (K7M engine)

**PRINCIPLE ( K7M and F3R engines)**

The E7J engine has no idle speed adaptive correction and no #12 function.

Under normal warm engine operating conditions, the RCO idle speed value using #12 varies between an upper and a lower value to obtain the nominal idle speed.

If the engine operating conditions are different (running in, engine contaminated...) the RCO idle speed value may be situated close to the upper or lower value.

Adaptive correction (#21) for the RCO idle speed (#12) allows compensation to be made for slow variations in the engine's air requirements, in order to recentre the RCO value (#12) to a nominal average value.

This correction is only operational if the coolant temperature is greater than 80°C, 20 seconds after starting the engine and if the engine is in the nominal idle speed regulation phase.

**RCO IDLE SPEED VALUES AND ADAPTIVE CORRECTION**

	<b>Engine F3R 750</b>	<b>Engine F3R 751</b>	<b>Engine K7M 702</b>	<b>Engine K7M 703</b>	<b>Engine K7M 720</b>
Nominal idle speed (#06)	X = 770 rpm.	X = 770 rpm.	X = 720 rpm.	X = 750 rpm. in P and N	X = 720 rpm.
R.C.O. idle speed (#12)	20 %≤X≤40 %	18 %≤X≤38 %	6 %≤X≤15 %	10 %≤X≤20 % in D 6 %≤X≤15 % in P and N	4 %≤X≤14 %
Adaptive idle speed (#21)	Threshold: - min : - 8.6 % - max : +6.2 %	Threshold: - min : - 8.6 % - max : +6.2 %	Threshold: - min : - 2.4 % - max : +6.2 %	Threshold: - min : - 2.4 % - max : +6.2 %	Threshold: - min : - 2.4 % - max : +6.2 %

Minimum threshold for the F3R engine 750 (- 8.6 %) : this value is taken from the definitive setting. The first versions to be marketed have a threshold of - 6.2 %.

**INTERPRETATION OF THE GATE VALUES**

If there is an excess of air (air leak, throttle stop incorrectly set...) the idle speed increases, the RCO idle speed value for #12 decreases to return to the nominal idle speed; the RCO idle speed adaptive correction value for #21 reduces to recentre the RCO idle speed for #12.

If there is a lack of air (pollution, etc.), the strategy is reversed:

The RCO idle speed for #12 increases and adaptive correction for #21 also increases, in order to recentre #12 to a nominal average value.

**IMPORTANT :** after erasing the computer memory (disconnecting the battery), the engine must be allowed to run at idle speed before returning the vehicle to the customer so that the adaptive correction may correctly reset itself.

### OXYGEN SENSOR VOLTAGE (#05)

Reading **#05** on the **XR25** : the value read is the voltage sent to the computer by the oxygen sensor; it is expressed in Volts (the value actually varies between **0** and **1 000** millivolts).

When the engine is in the loop phase, the voltage value should oscillate rapidly and should be between **50±50 mV** (lean mixture) and **850 ± 50 mV** (rich mixture) and vice versa.

The smaller the gap between the upper and lower oscillating values, the poorer the information from the sensor (the gap is usually at least **500 mV**).

### RICHNESS CORRECTION (#35)

The value given under **# 35** on the **XR25** represents the average value of richness corrections made by the computer depending on the richness of the burnt mixture as seen by the oxygen sensor (the oxygen sensor actually analyses the oxygen content of the exhaust gases directly from the richness of the burnt mixture).

The richness correction has a centre point of 128 with thresholds of 0 and 255 (experience has shown that under normal operating conditions **# 35** is located close to 128 with only a small amount of variation).

- Value less than 128 : request for mixture to be made leaner
- Value greater than 128 : request for mixture to be made richer

### ENTRY INTO RICHNESS REGULATION MODE

#### Loop phase

Richness regulation begins after the timed starting period :

- for no load if the coolant temperature has reached:
  - 25°C for E7J engines,
  - 40°C for K7M engines,
  - 35°C for F3R engines.
- outside no load conditions if the coolant temperature is greater than :
  - + 20°C for K7M engines,
  - + 15°C for F3R engines,
 there is no coolant temperature condition for E7J engines.

The timed starting period is dependent on the coolant temperature:

- at **20°C** it is a maximum of :
  - 45 seconds for E7J engines,
  - 1 minute for K7M engines,
  - 2 minutes for F3R engines,
- at **80°C** it is a maximum of :
  - 9 seconds for E7J engines,
  - 16 seconds for K7M engines,
  - 1 minute for F3R engines.

if richness regulation has not yet started, **#35 = 128**

### **Non-loop mode**

When richness regulation is occurring, the operating phases when the computer ignores the voltage information from the oxygen sensor are:

- Full load: #35 = variable and greater than **128**
- Sharp acceleration: #35 = variable and greater than **128**
- Sharp deceleration with no load information (injection cut) : #35 = **128**
- Oxygen sensor fault: #35 = **128**

### **DEFECT MODE IN THE EVENT OF AN OXYGEN SENSOR FAULT**

If the voltage from the oxygen sensor is incorrect (# 05 varies only slightly or not at all) during richness regulation, the computer will only enter defect mode (# 35 = 128) if the fault has been present for 3 to 5 minutes. The fault will be memorised in this case only.

If an oxygen sensor fault is present and recognised and if the fault has already been stored, the system enters the open loop mode directly (# 35 = 128).

### PRINCIPLE

In the loop mode (see section 17 "Richness regulation"), richness regulation (# 35), corrects the injection timing to give fuel metering which is as close as possible to richness 1. The correction value is close to 128, with limit values of 0 and 255.

Variations may affect the components of the injection system and the correction may drift towards 0 or 255, to ensure richness 1 is obtained.

Adaptive correction allows the injection mapping to be adjusted to recentre the richness regulation to 128 and to ensure a constant authority of correction to make the mixture leaner or richer.

Adaptive correction to richness regulation has two parts:

- Adaptive correction for average and high engine loads (#30)
- Adaptive correction for idle speed and low engine loads (#31).

Adaptive corrections take 128 as the average value after initialisation (erasing the memory) and have the following threshold values:

F3R engine	K7M 702/703 engine	K7M 720 engine	E7J engine
$82 \leq \#30 \leq 224$	$0 \leq \#30 \leq 208$	$0 \leq \#30 \leq 208$	$112 \leq \#30 \leq 160$
$32 \leq \#31 \leq 224$	$104 \leq \#31 \leq 255$	$100 \leq \#31 \leq 255$	$104 \leq \#31 \leq 160$

Adaptive correction only takes place when the engine is warm, in the loop phase (#35 variable) and for a specified manifold pressure range.

The engine must have operated in the loop mode for **several pressure zones** in order that adaptive correction begins to change to compensate for the variations in engine operating richness.

Following reinitialisation of the computer (return to 128 for # 30 and # 31) a special road test must therefore be carried out.

## ROAD TEST

### Conditions :

- Engine warm (coolant temperature > 70° C)
- Do not exceed engine speed                   **4 300 rpm** F3R engine  
    and **4 000 rpm** K7M engine

For this test, start from a fairly low engine speed, in 3rd or 4th gear using progressive acceleration **to stabilise the required pressure for 10 seconds in each zone** (see table).

**NOTE:** For the F3R engine, for example, for zone n° 1, try to maintain the average of 355 mb for at least 10 seconds.

### Pressure zones to cover during the test (# 01)

	Zone n° 1 (mbars)	Zone n° 2 (mbars)	Zone n° 3 (mbars)	Zone n° 4 (mbars)	Zone n° 5 (mbars)	
F3R	300 ----- 410 ----- 500 ----- 590 ----- 680 ----- 870	Average 355	Average 455	Average 545	Average 635	Average 775
K7M	280 ----- 390 ----- 510 ----- 620 ----- 740 ----- 930	Average 335	Average 450	Average 565	Average 680	Average 835

Following this test the corrections will be operational.

# 31 varies more significantly for idle speed and low loads and # 30 for average and high loads, but both are operational over all of the manifold pressure ranges.

The test should be followed by a normal, varied drive, covering 3 to 6 miles (5 to 10 km).

After the test, read the values for # 30 and # 31. Initially 128, they should now have changed. If they have not changed, repeat the test, taking care to ensure the test conditions are correctly observed.

### Special notes for the E7J engine

A road test should be carried out after which the engine should be allowed to idle for a few minutes. The values for #30 and #31 should have changed.

During the road test, stabilise the engine speed for a few moments between 2 000 rpm and 4 400 rpm and the manifold pressure between 400 and 700 mbars.

Condition #31 : if engine speed < 1 000 rpm and if the manifold pressure < 450 mbars, #31 should be modified.

### INTERPRETING VALUES GATHERED AFTER A ROAD TEST

If there is a lack of fuel (injectors dirty, fuel pressure and flow too low...), richness regulation # 35 increases to obtain the richness as close as possible to richness 1 and adaptive correction # 30 and # 31 increases until the richness correction returns to oscillate around 128.

If there is an excess of fuel, the situation is reversed:

Richness regulation # 35 reduces and adaptive correction # 30 and # 31 also reduces to recentre the richness correction (# 35) around 128.

**NOTE:** the analysis which may be made using # 31 remains difficult since this correction mainly operates for idle speed and low loads and is also very sensitive.

Hasty conclusions should not therefore be drawn from this gate value, rather the position of # 30 should be examined.

The information from these two gates gives an idea about the engine operation richness, and may be used as a guide for fault finding. For them to be of use during fault finding, conclusions may only be drawn if the values are at the minimum or maximum correction thresholds, and if both values have drifted in the same direction.

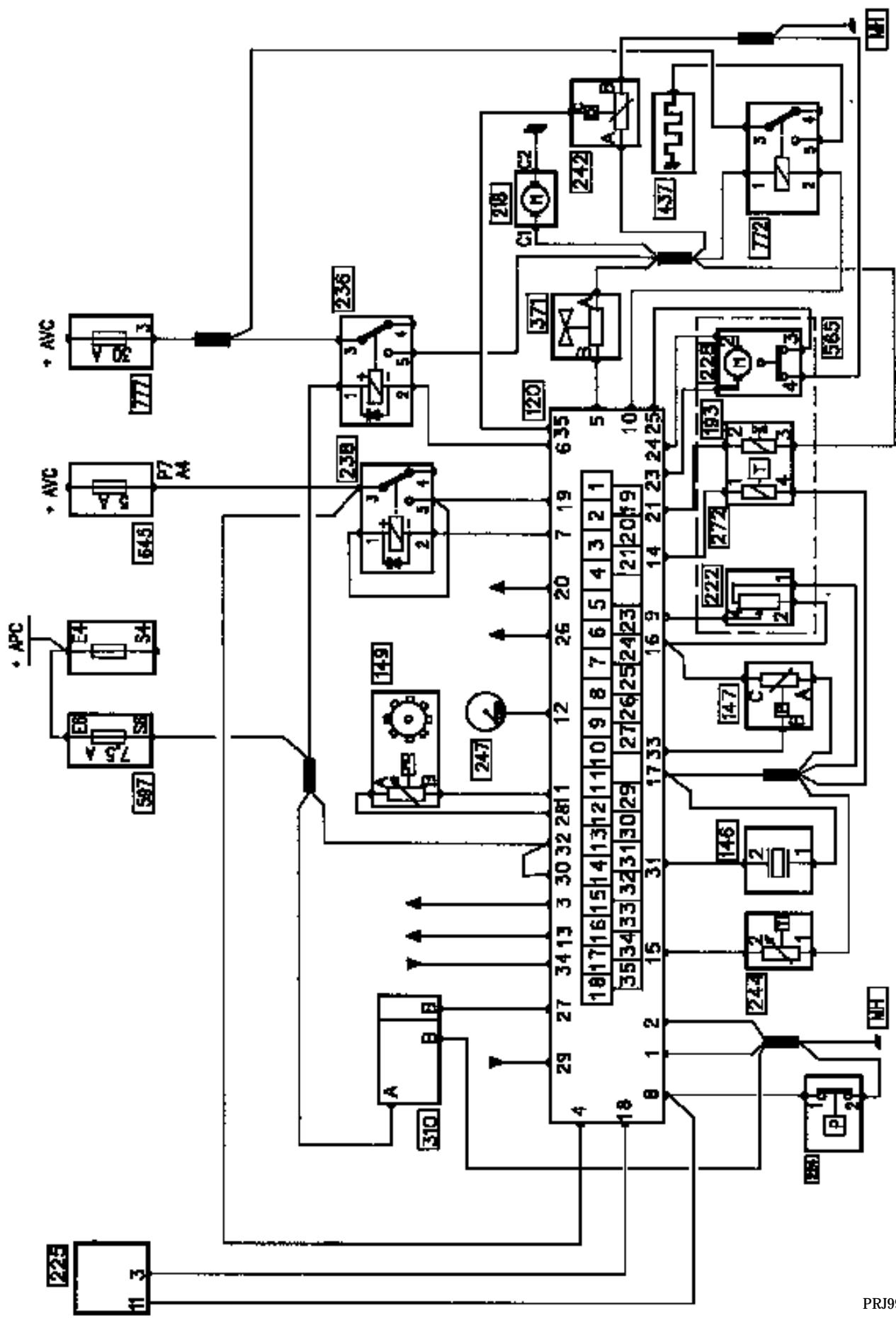
**IMPORTANT :** # 30 and # 31 should only be examined and analysed after a customer complaint, an operating fault and if they are at the threshold with the value for # 35 also offset (# 35 varies above 175 or below 80).

# INJECTION

## Operating wiring diagram

**KEY TO OPERATIONAL WIRING DIAGRAMS (E7J, F3R, K7M)**

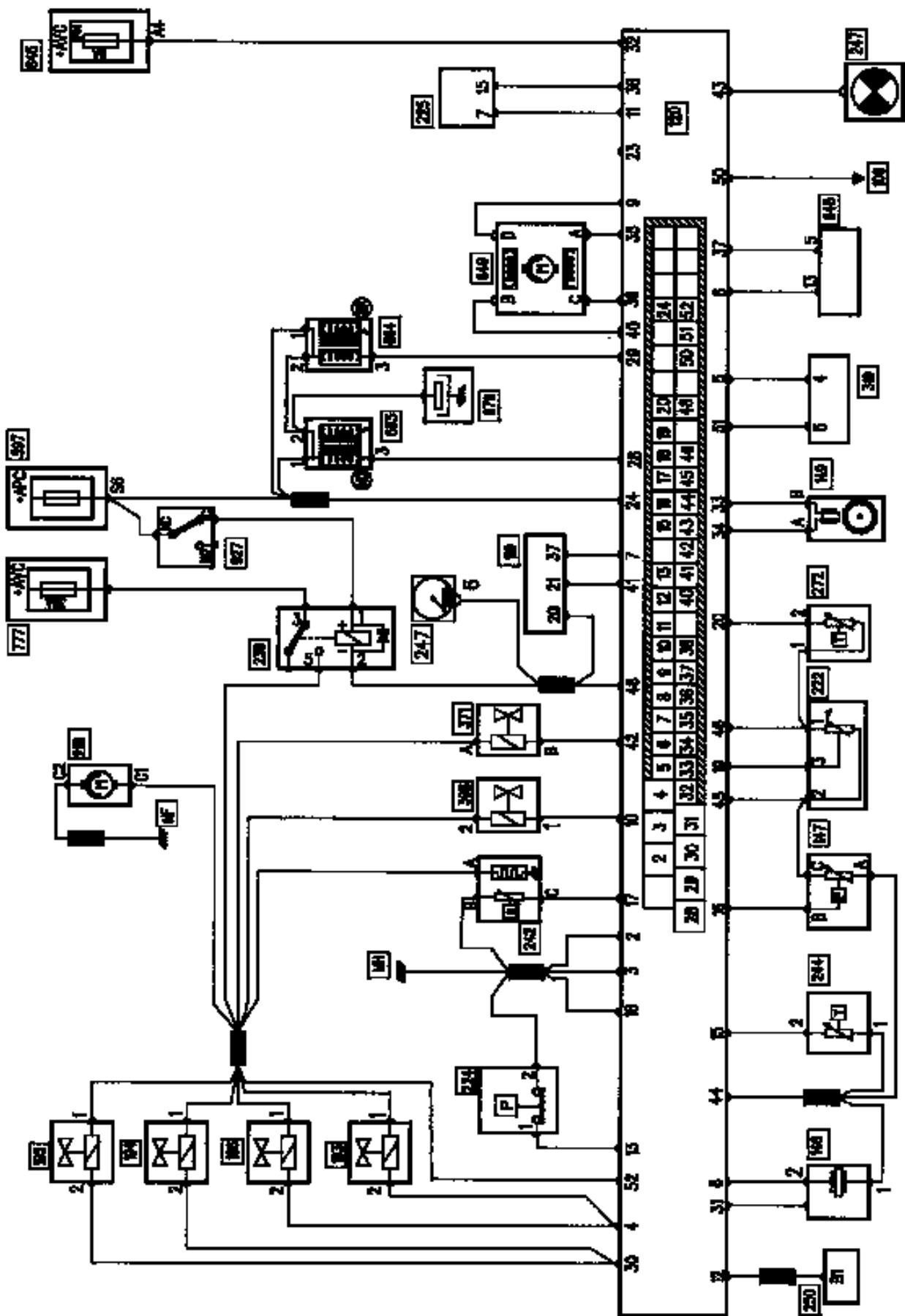
COMPONENT NO	DESCRIPTION
109	On board computer
119	Automatic transmission computer
120	Injection computer
146	Pinking sensor (located under the inlet manifold for E7J engine)
147	Absolute pressure sensor
149	TDC sensor
<b>193 to 196</b>	<b>Injectors</b>
218	Fuel pump
222	Throttle position potentiometer
224	Power assisted steering pressostat
225	Diagnostic socket
228	Idle speed regulation micromotor
236	Fuel pump relay (in engine fuse box)
238	Injection feed locking relay
242	Oxygen sensor
244	Coolant temperature sensor
247	Instrument panel
250	Vehicle speed sensor
272	Air temperature sensor
310	Ignition power module
319	Air conditioning control panel
341	Idle speed regulation solenoid valve
371	Fuel vapour recirculation solenoid valve
398	Exhaust gas recirculation solenoid valve (EGR)
437	Throttle body heater (under throttle body)
565	Throttle body assembly
597	Engine fuse box
645	Passenger compartment connection unit
649	Idle speed regulation stepping motor
663	Dual ignition coil n°1 (cylinders 1 and 4)
664	Dual ignition coil n° 2 (cylinders 2 and 3)
679	Radio anti-interference condenser
746	Cylinder reference sensor
772	Heater relay (in engine fuse box)
777	Power fuse board (near battery)
927	Inertia switch
<b>MF</b>	Rear right hand electrical earth
<b>MH</b>	Engine electrical earth (located on the cylinder block between the starter and the alternator for the E7J engine)



**COMPUTER TRACK ALLOCATION**

Track	ALLOCATION
1	Power earth
2	Electronic earth
3	Vehicle speed information
4	+ before ignition (permanent) computer memory
5	Canister bleed signal (sequential earth period)
6	Pump relay control (via track N° 2)
7	Locking relay control (via track N° 2)
8	Diagnostic line for erasing the memory and power assisted steering pressostat information
9	Throttle position potentiometer information (pin N° 4 on 222)
10	Heater relay command
11	TDC sensor signal (track B)
12	Rev counter information at instrument panel
13	Connection with injection fault warning light on instrument panel
14	Air temperature information
15	Coolant temperature information
16	+ 5 V feed for absolute pressure sensor and throttle potentiometer
17	Common earth for absolute pressure sensor, throttle potentiometer and coolant temperature sensor
18	Emission of diagnostic signal to diagnostic socket
19	Main computer feed via injection locking relay
20	Air conditioning compressor command
21	Injector control via earth
22	Not used
23	+ or - feed to idle speed micromotor (pin N° 1)
24	+ or - feed to idle speed micromotor (pin N° 2)

Track	ALLOCATION
25	No load information input
26	Not used
27	Power module command
28	TDC sensor signal input (track A)
29	Immobiliser coded line input via decoder unit
30	+ 12 V information when ignition turned on
31	Pinking sensor noise signal input
32	+ 12 V after ignition information
33	Voltage information dependent on manifold pressure seen by sensor (on track B)
34	Air conditioning compressor operation request input
35	Voltage from oxygen sensor input



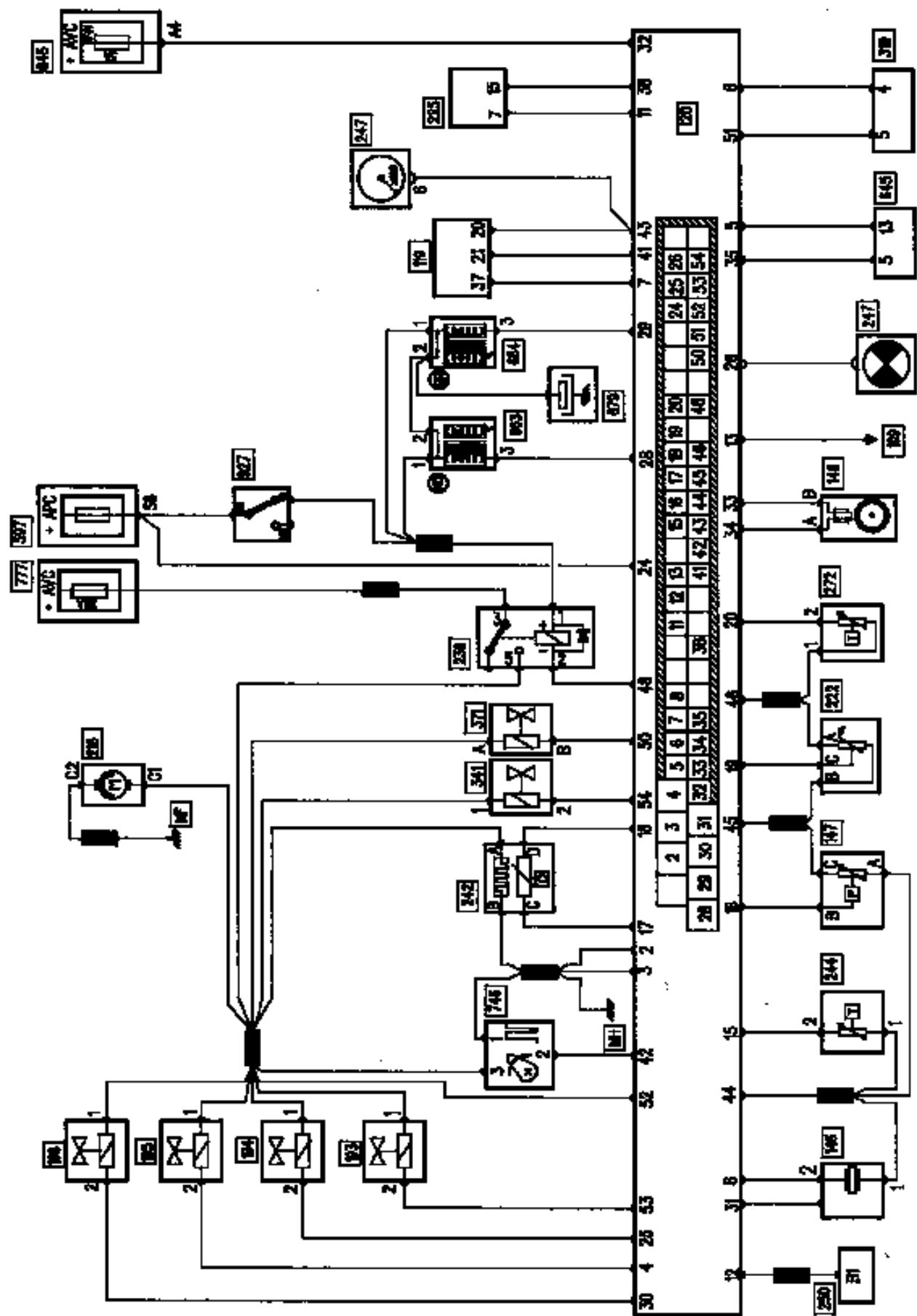
PRJ99475

**COMPUTER TRACK ALLOCATION**

Track	ALLOCATION
1	Not used
2	Power earth n° 1
3	Power earth n° 2
4	Command for injector n° 2 and n° 3 via earth
5	Air conditioning on - off information and request for compressor operation authorisation (0 - 12 V)
6	Heated windscreen information (0 - 12 V)
7	Park / Neutral / torque reduction information (0 - 5 V) (K7M 703)
8	Pinking sensor signal
9	Stepping motor control (0 - 12 V)
10	EGR solenoid valve control (0 - 12 V) (K7M 703)
11	Bi-directional diagnostic line K used for entry into fault finding mode (looking for computer), emission of diagnostic signals from computer, application of command modes (G..*), erasing the memory (G0**) and ending fault finding (G13*)
12	Vehicle speed information
13	Power assisted steering pressostat information
14	Not used
15	Coolant temperature sensor information
16	Manifold pressure information transcribed by absolute pressure sensor
17	Voltage information from oxygen sensor
18	Earth
19	Throttle position potentiometer information
20	Air temperature sensor information
21	Not used
22	Not used
23	Not used
24	+ 12 V after ignition

Track	ALLOCATION
25	Not used
26	Not used
27	Not used
28	Command for coil for cylinders 1 and 4
29	Command for coil for cylinders 2 and 3
30	Command for injector n° 1 and n° 4 via earth (n° 1 flywheel end)
31	Pinking sensor screened cable
32	+12 V before ignition
33	TDC sensor signal (track B)
34	TDC sensor signal (track A)
35	Stepping motor command (0 - 12 V)
36	Stepping motor command (0 - 12 V)
37	Immobiliser coded line input
38	Uni-directional diagnostic line L for entry into diagnostic mode only (looking for computer)
39	Not used
40	Stepping motor command (0 - 12 V)
41	Throttle angle information for automatic transmission computer
42	RCO control (sequential earth period for canister bleed solenoid valve RCO)
43	Command for injection fault warning light on instrument panel
44	Common earth for pinking sensor and coolant temperature sensor and absolute pressure sensor
45	+ 5 V feed for absolute pressure sensor and throttle position potentiometer
46	Common earth for air temperature sensor and throttle position potentiometer
47	Not used
48	Command (via earth) for fuel pump relay and engine speed information
49	Not used

Track	ALLOCATION
50	Fuel flow information for on board computer
51	Air conditioning compressor clutch operation prevention command (0 V → authorisation ; 12 V → prevention)
52	Monitoring of injector feed and fuel pump feed from relay (236)
53	Not used
54	Not used
55	Not used



PRJ99473

**COMPUTER TRACK ALLOCATION**

Track	ALLOCATION
1	Not used
2	Power earth n° 1
3	Power earth n° 2
4	Command for injector n° 3 via earth
5	Heated windscreen information (0 - 12 V)
6	Air conditioning on - off information and request for compressor operation authorisation (0 - 12 V)
7	Park / Neutral / torque reduction information (0 - 5 V) (F3R 751)
8	Pinking sensor signal
9	Not used
10	Not used
11	Bi-directional diagnostic line K used for entry into fault finding mode (looking for computer), emission of diagnostic signals from computer, application of command modes (G..*), erasing the memory (G0**) and ending fault finding (G13*)
12	Vehicle speed information
13	Fuel flow information for on board computer
14	Not used
15	Coolant temperature sensor information
16	Manifold pressure information transcribed by absolute pressure sensor
17	Voltage information from oxygen sensor
18	Oxygen sensor earth
19	Throttle position potentiometer information
20	Air temperature sensor information
21	Not used
22	Not used
23	Not used
24	+ 12 V after ignition

Track	ALLOCATION
25	Command for injector n° 2 via earth
26	Command for injection fault warning light on instrument panel
27	Not used
28	Command for coil for cylinders 1 and 4
29	Command for coil for cylinders 2 and 3
30	Command for injector n° 4 via earth (timing end)
31	Pinking sensor screened cable
32	+12 V before ignition
33	TDC sensor signal (track B)
34	TDC sensor signal (track A)
35	Immobiliser coded line input
36	Not used
37	Not used
38	Uni-directional diagnostic line L for entry into diagnostic mode only (looking for computer)
39	Not used
40	Not used
41	Throttle angle information for automatic transmission computer
42	Cylinder reference sensor information
43	Engine speed information
44	Common earth for pinking sensor and coolant temperature sensor and absolute pressure sensor
45	+ 5 V feed for absolute pressure sensor and throttle position potentiometer
46	Common earth for air temperature sensor and throttle position potentiometer
47	Not used
48	Command (via earth) for fuel pump relay (236)
49	Not used

Track	ALLOCATION
50	R.C.O. command (sequential earth period) for canister bleed solenoid
51	Air conditioning compressor clutch operation prevention command (0 V → authorisation ; 12 V → prevention)
52	Monitoring of injector feed and fuel pump feed from relay (236)
53	Command for injector n° 1 via earth (flywheel end)
54	R.C.O. command (sequential earth period) for idle speed regulation valve
55	Not used

**VOLUME AND GRADE OF COOLANT**

<b>Engine</b>	<b>Volume (in litres)</b>	<b>Grade</b>
F8Q	7.5	<b>GLACEOL RX (type D) use coolant only</b>
F3R	7	
E7J - K7M	6	

**THERMOSTAT**

<b>Engine type</b>	<b>Begins to open (in °C)</b>	<b>Fully open (in °C)</b>	<b>Travel (in mm)</b>
E7J - K7M - F8Q - F3R	89	101	7.5

There is no water control valve.

Coolant circulates continuously in the heater matrix, assisting with engine cooling.

### FILLING

**The following bleed screws must be opened:**

- on the top of the radiator,
- on the heating hose,
- on the thermostat mounting(except E7J- K7M engines ).

Fill the circuit at the expansion bottle opening.

Close the bleed screws as soon as fluid runs out in a continuous jet.

Start the engine (**2 500 rpm**).

Adjust the level by overflow for approximately **4 minutes**.

Close the expansion bottle.

### BLEEDING

Let the engine run for **20 minutes** at **2 500 rpm**,until the engine cooling fan operates (time required for automatic degassing).

Check the fluid level is close to the "**Maximum**" mark.

**NEVER OPEN THE BLEED SCREWS WHEN THE ENGINE IS RUNNING.**

**TIGHTEN THE EXPANSION BOTTLE CAP WHEN THE ENGINE IS WARM.**

SPECIAL TOOLING REQUIRED		
M.S.	554-07	Kit for checking cooling circuit sealing
M.S.	554-01	Adaptor for M.S. 554-05
M.S.	554-06	Adaptor for M.S. 554-05

## 1 - Checking the cooling circuit sealing

Replace the expansion bottle cap with tool **M.S. 554-01**.

To this, connect tool **M.S. 554-07**.

Let the engine warm up then turn the ignition off.

Pump to put the circuit under pressure.

Stop pumping at **0.1 bar** less than the rating value of the expansion bottle cap.

The pressure should not drop. If it does, look for the leak.

Slowly unscrew the union of tool **M.S. 554-07** to decompress the cooling circuit, then remove tool **M.S. 554-01** and refit the expansion bottle cap fitted with a new seal.

## 2 - Checking the rating of the expansion bottle cap

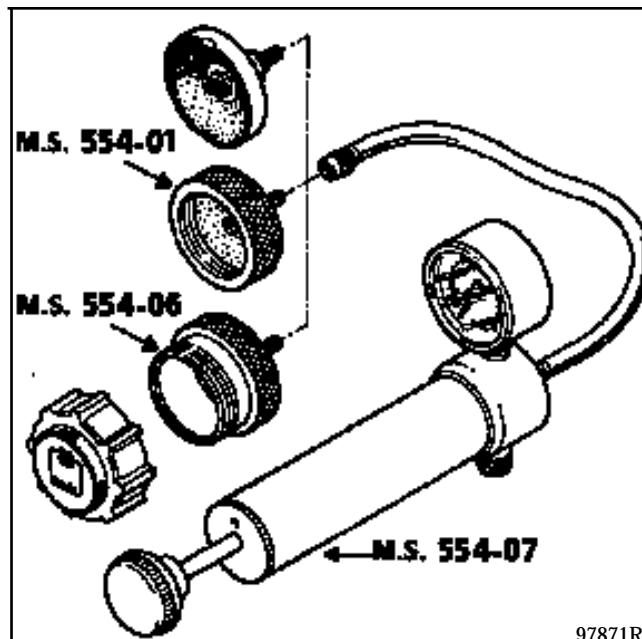
If fluid passes through the expansion bottle cap valve, the cap must be replaced.

On the pump **M.S. 554-07** fit tool **M.S. 554-06** and fit this to the valve to be checked.

Increase the pressure which should stabilise at the calibration value for the cap valve, with a test tolerance of  $\pm 0.1$  bar.

**Valve rating value:**

Engine	Valve colour	Rating (in bar)
F8Q - E7J	Brown	1.2
K7M - F3R	Blue	1.6



97871R

**REMOVAL**

Put the vehicle on a 2 post lift.

Disconnect:

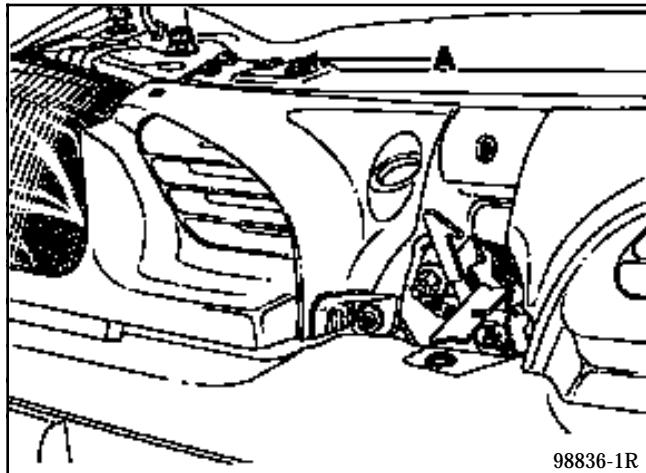
- the battery,
- the connectors for the fan, the relays and the thermistor.

Remove the engine undertray.

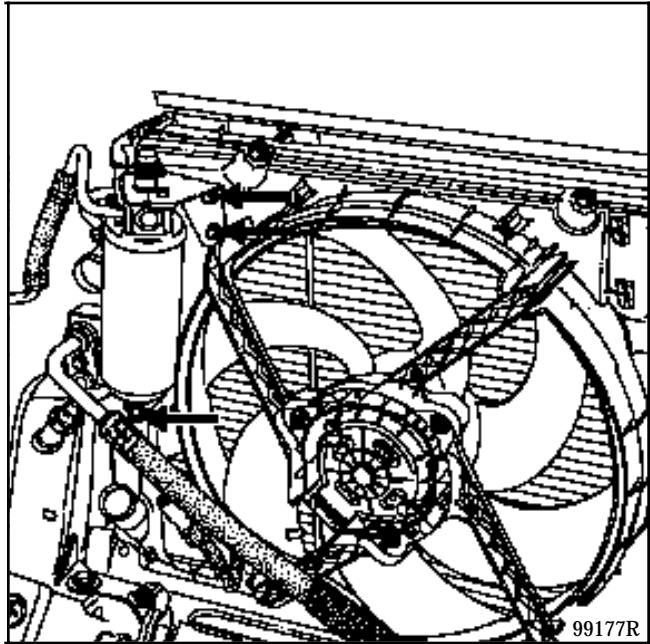
Drain the cooling circuit from the lower radiator hose (radiator end).

Remove:

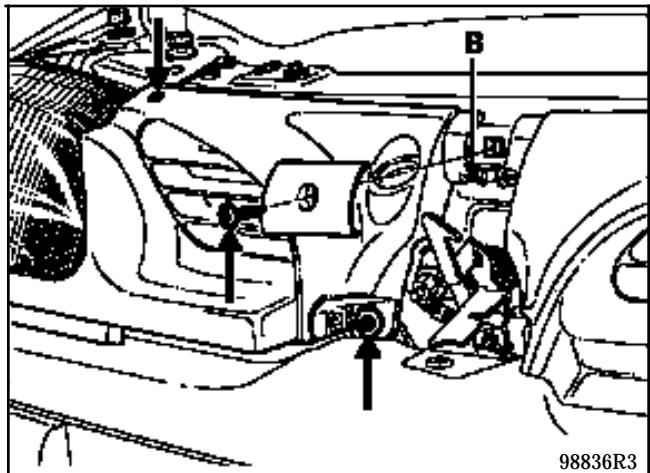
- the two bolts (A) from the radiator mounting brackets on the upper cross member,



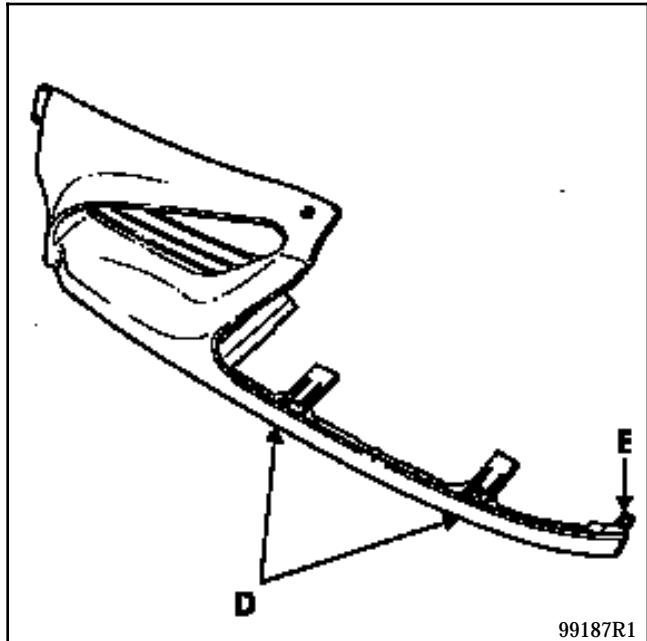
- the bolts and nut from the dehydrating bottle,



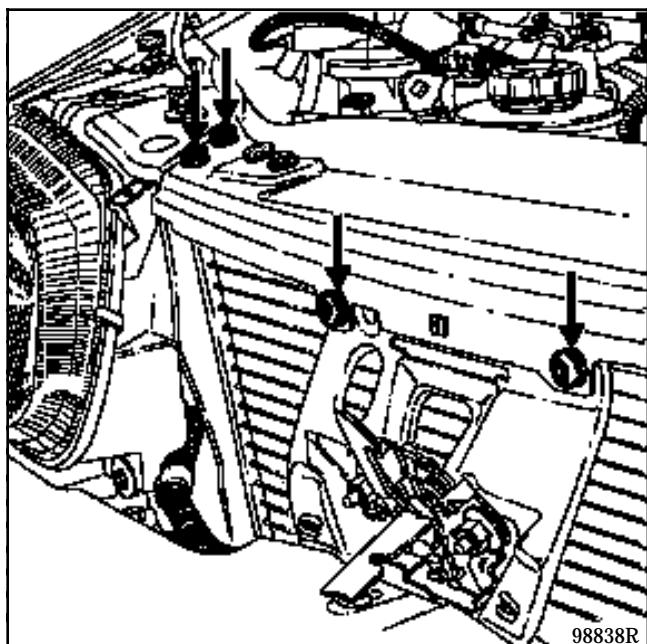
- the two indicators,
- the mounting bolts from the radiator half grilles and unclip them at (B).



Unclip the grille at (D) using a screwdriver and release the sides by lifting the tabs at (E).



Remove the 6 mounting bolts for the upper cross member and remove it.

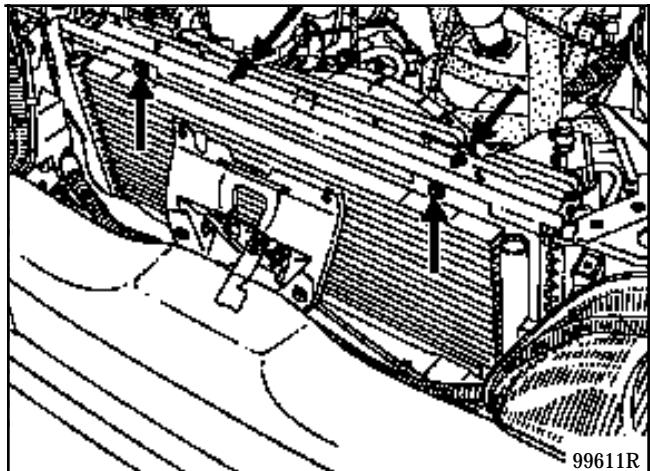


Disconnect the upper radiator hose by removing the air filter inlet sleeve.

Unclip the power assisted steering reservoir.

Remove:

- the 4 mounting bolts from the fan mounting on the radiator and remove it,
- the 4 mounting bolts for the condenser on the radiator,

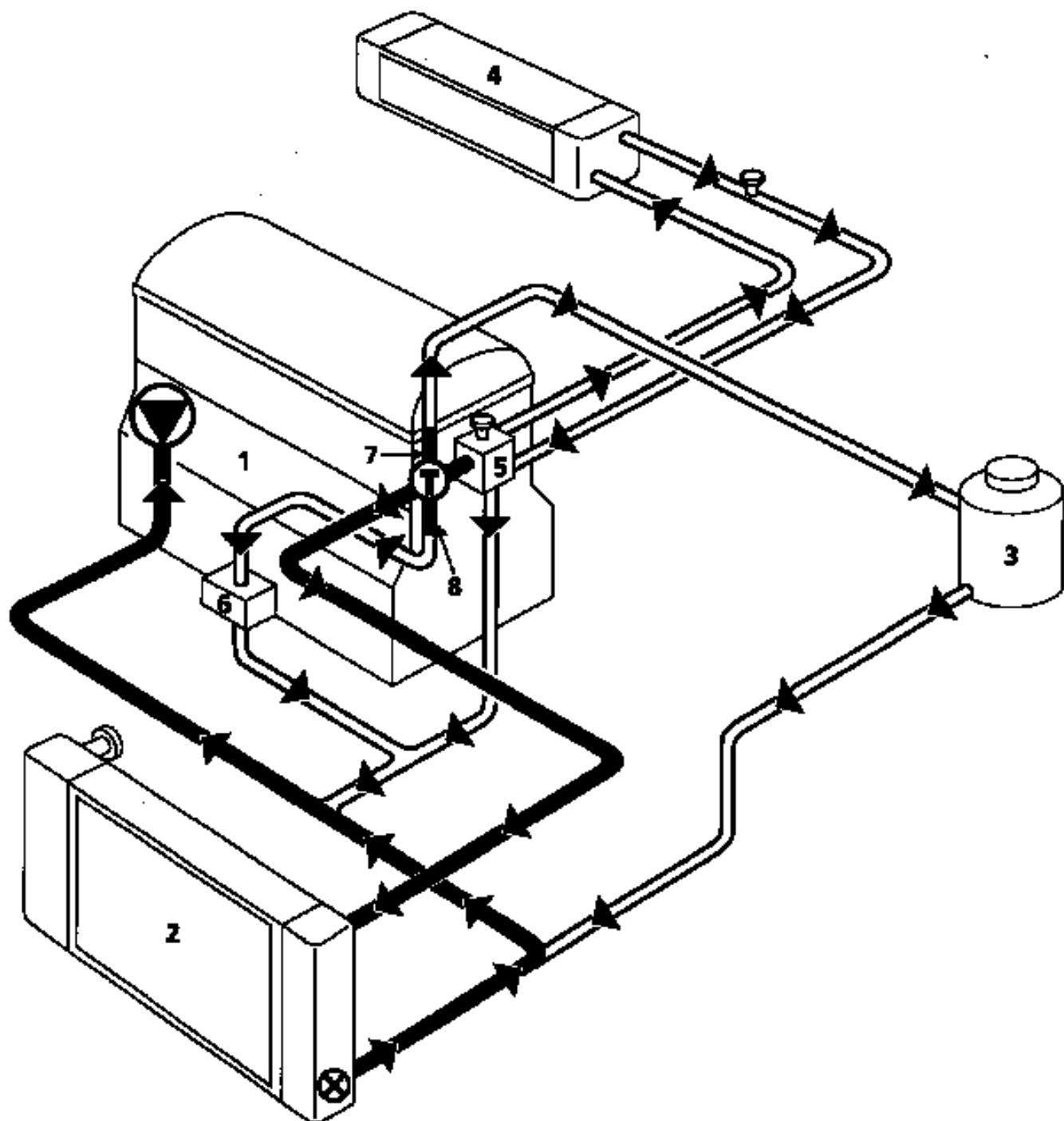


- the radiator.

## REFITTING

Refitting is the reverse of removal.

Fill and bleed the cooling circuit.

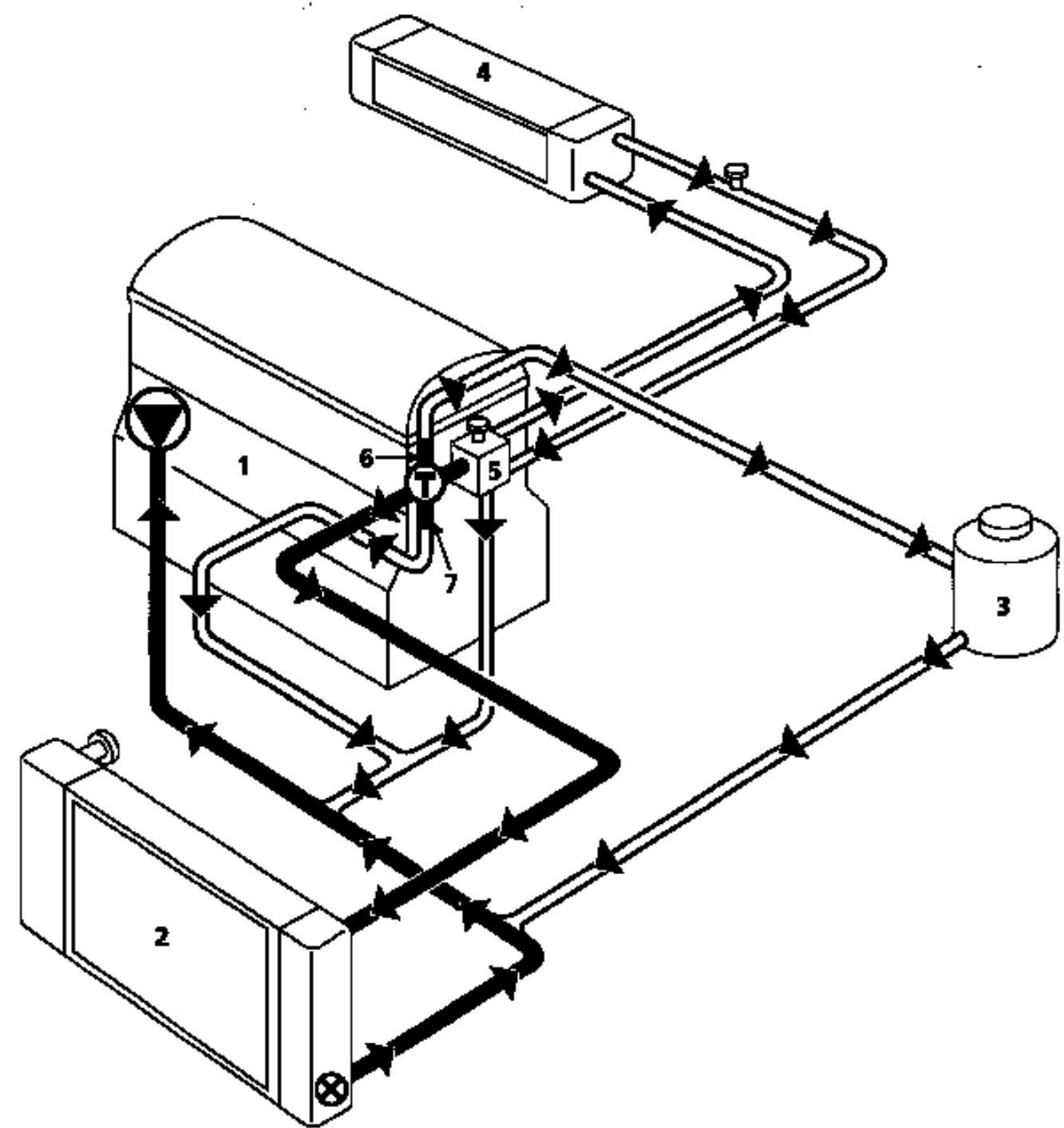


99417R

- 1 Engine
- 2 Radiator
- 3 Expansion bottle with degassing after thermostat
- 4 Heater matrix
- 5 Thermostat mounting
- 6 Oil temperature exchanger
- 7 3 mm diameter restriction
- 8 6 mm diameter restriction

- |  |                    |
|--|--------------------|
|  | Water pump         |
|  | Thermostat         |
|  | Bleed valve        |
|  | Temperature switch |

The rating of the expansion bottle cap is 1.2 bar (brown).

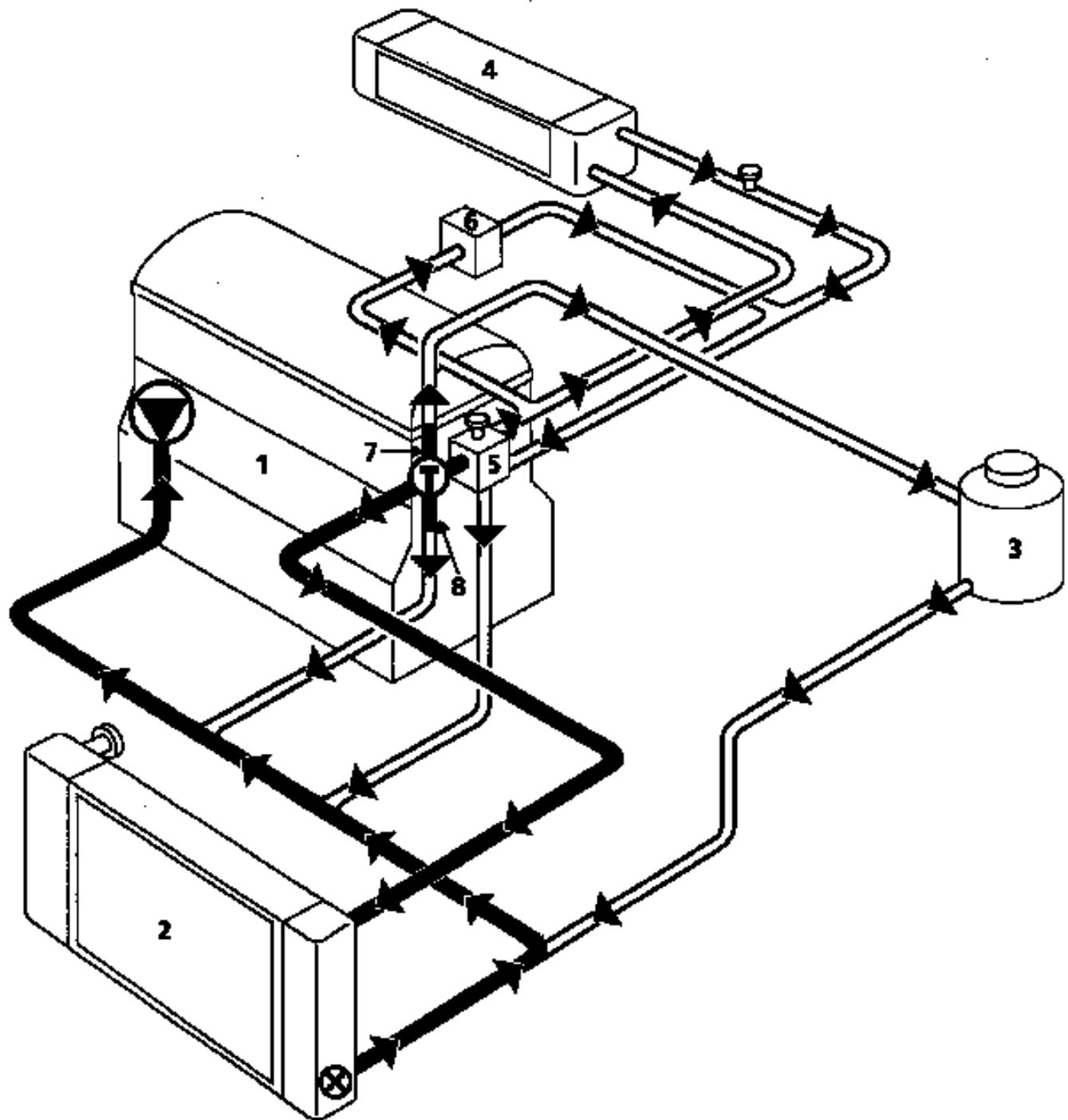


99416R

- 1 Engine
- 2 Radiator
- 3 Expansion bottle with degassing after thermostat
- 4 Heater matrix
- 5 Thermostat mounting
- 6 3 mm diameter restriction
- 7 6 mm diameter restriction

- Water pump
- Thermostat
- Bleed valve
- Temperature switch

The rating of the expansion bottle cap is **1.2 bar** (brown).

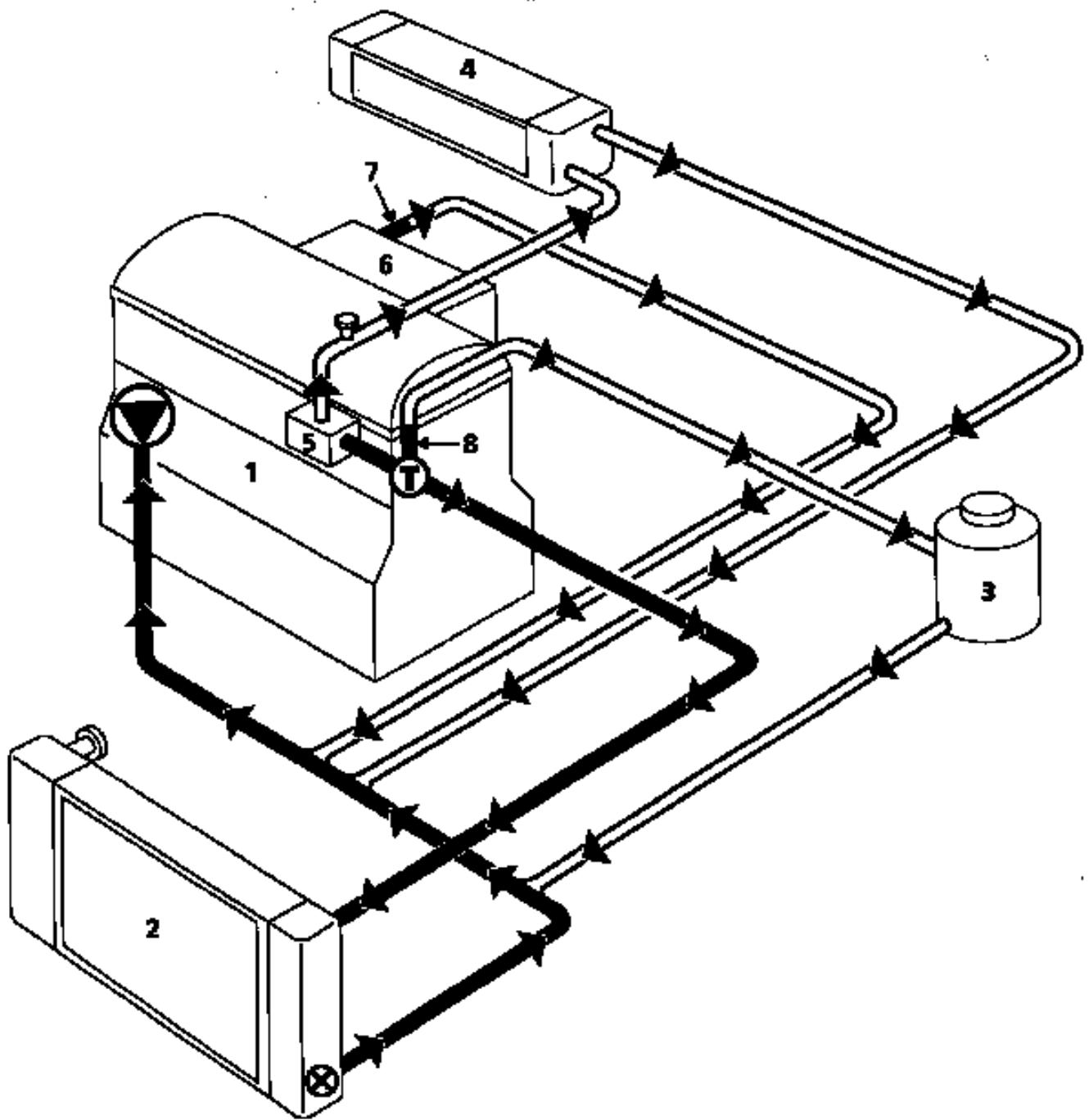


99415R

- 1 Engine
- 2 Radiator
- 3 Expansion bottle with degassing after thermostat
- 4 Heater matrix
- 5 Thermostat mounting
- 6 Throttle body
- 7 3 mm diameter restriction
- 8 8 mm diameter restriction

- Water pump
- Thermostat
- Bleed valve
- Temperature switch

The rating of the expansion bottle cap is **1.6 bar** (blue).

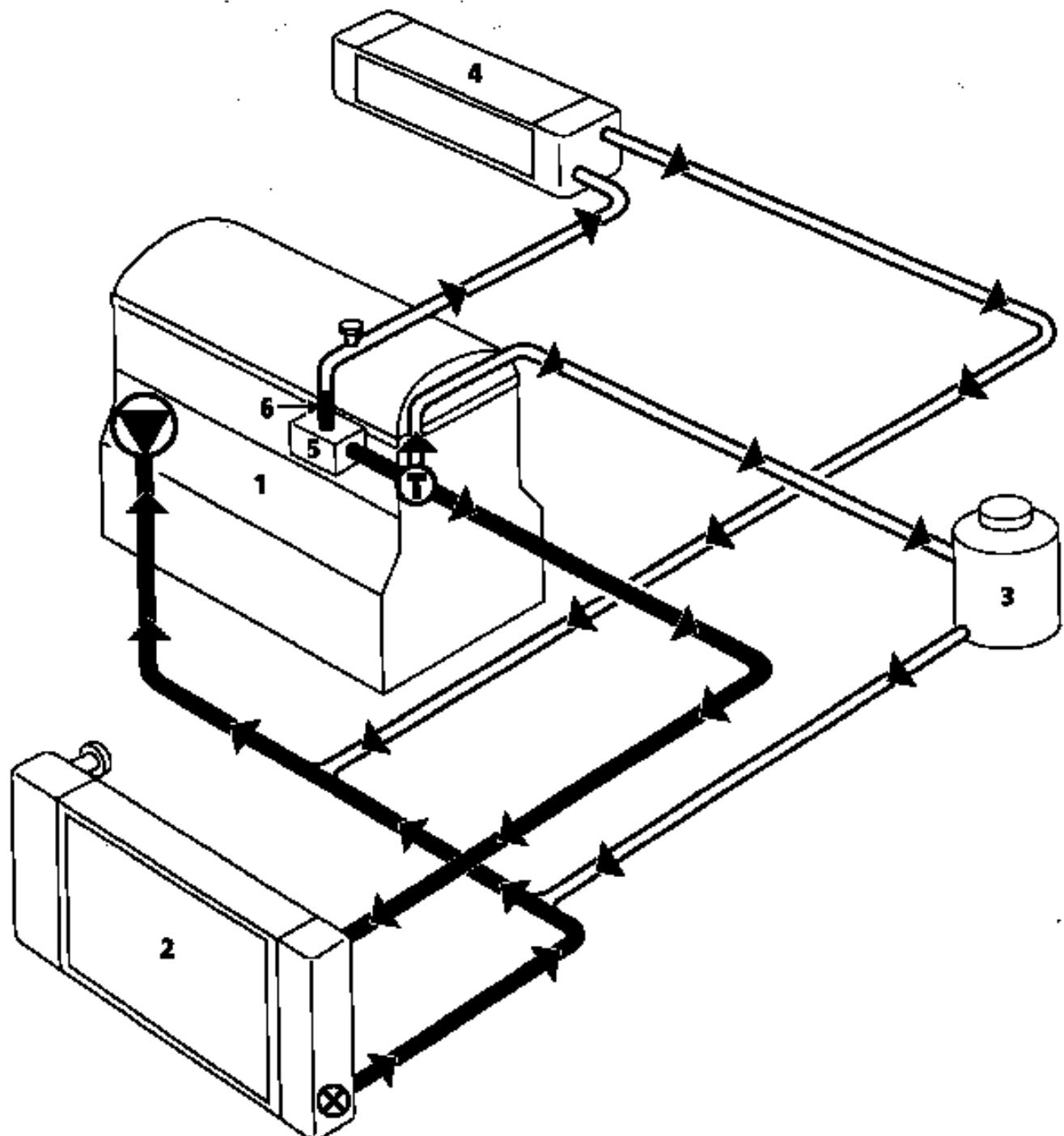


99414R

- 1 Engine
- 2 Radiator
- 3 Expansion bottle with degassing after thermostat
- 4 Heater matrix
- 5 Thermostat mounting
- 6 Inlet manifold
- 7 10 mm diameter restriction
- 8 3 mm diameter restriction

- Water pump
- Thermostat
- Bleed valve
- Temperature switch

The rating of the expansion bottle cap is 1.2 bar (brown).

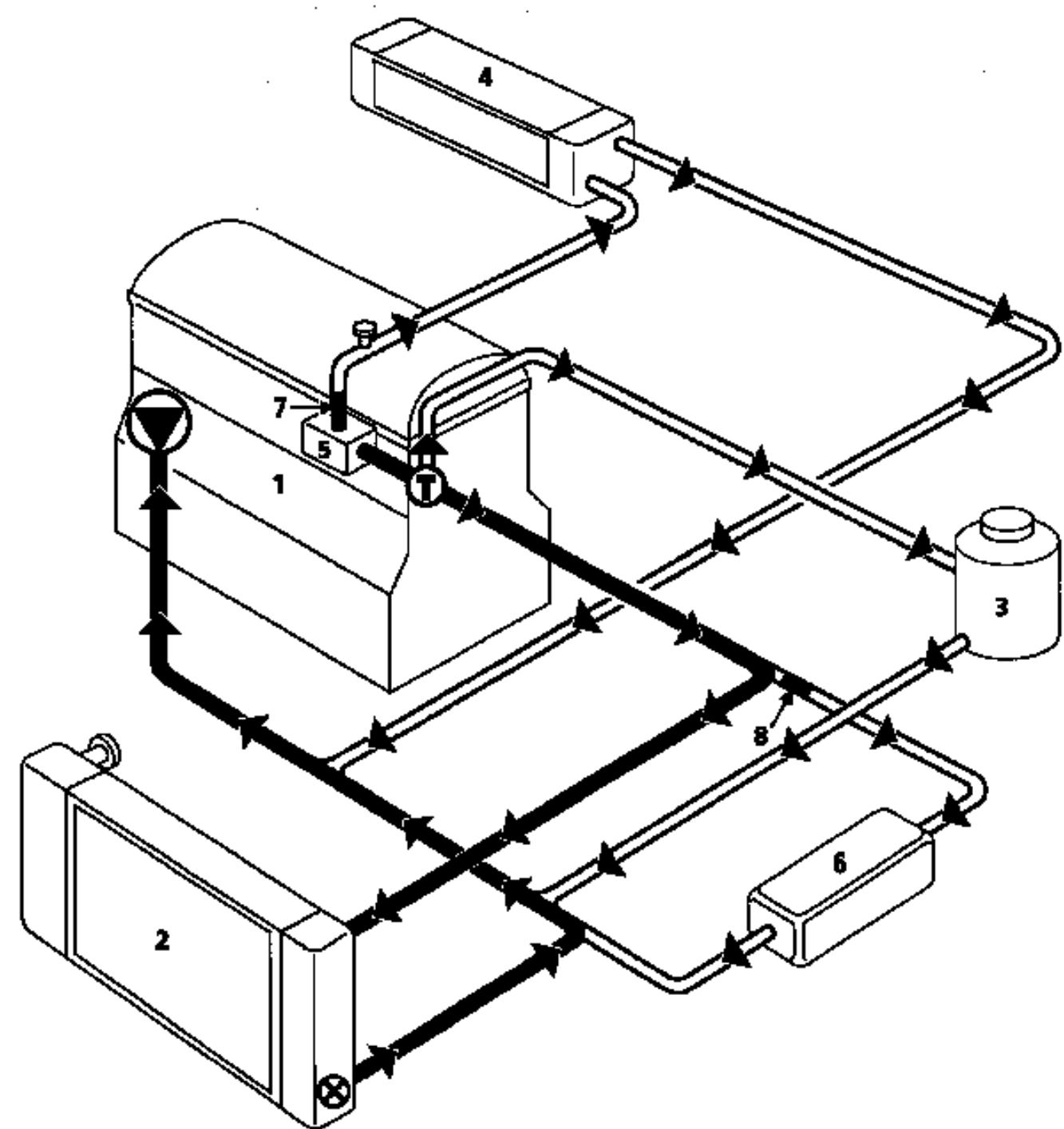


99413R

- 1 Engine
- 2 Radiator
- 3 Expansion bottle with degassing after thermostat
- 4 Heater matrix
- 5 Thermostat mounting
- 6 3 mm diameter restriction

- Water pump
- Thermostat
- Bleed valve
- Temperature switch

The rating of the expansion bottle cap is **1.6 bar** (blue).



99412R

- 1 Engine
- 2 Radiator
- 3 Expansion bottle with degassing after thermostat
- 4 Heater matrix
- 5 Thermostat mounting
- 6 Automatic transmission oil temperature exchanger
- 7 3 mm diameter restriction
- 8 6 mm diameter restriction

- Water pump
- Thermostat
- Bleed valve
- Temperature switch

The rating of the expansion bottle cap is **1.6 bar** (blue).

The catalytic converter reaches high temperatures during operation and consequently the vehicle should never be parked in an area where there is combustible material which could come into contact with the exhaust and pose a fire risk.

Under certain conditions, this type of material could catch fire.

### IMPORTANT:

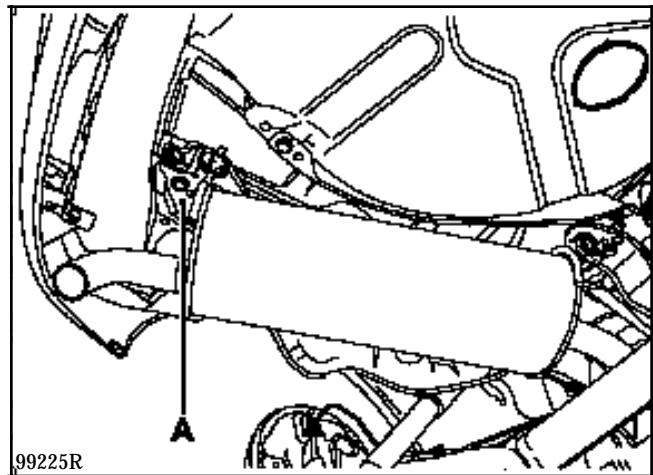
- sealing between the exhaust manifold gasket face and the catalytic converter must be perfect,
- any seals removed **MUST** be renewed (especially at the catalytic converter flange),
- during removal and refitting the catalytic converter should not be subjected to repeated mechanical impacts as it may be damaged.

### EXHAUST PIPE MOUNTINGS UNDER THE BODY

The exhaust pipe is attached under the body using rubber mountings.

These may generally be released by hand by lifting the exhaust pipe.

In certain cases however, the retaining bolts for mounting (A) under the body may have to be slackened to release the rubber mountings more easily.



### CUTTING THE EXHAUST PIPE

The exhaust pipes are of monoblock construction. This means there is no break between the inlet to the catalytic converter or the expansion chamber and the silencer outlet.

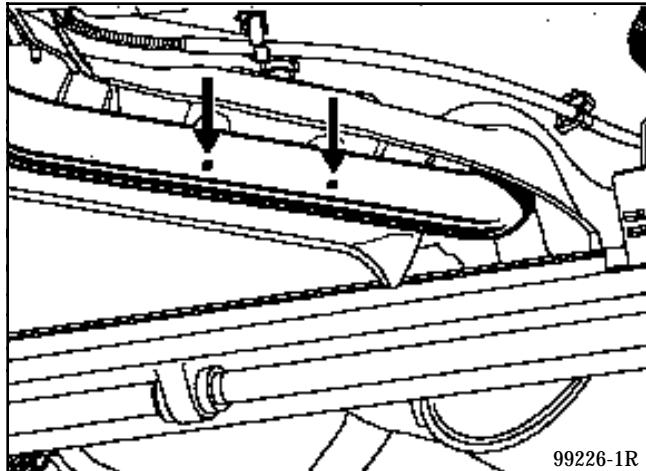
If one of the components requires replacement as an After Sales operation, the exhaust pipe must be cut.

To do this:

- mark up the cutting line correctly,
- use the cutting tool **Mot. 1199**,
- fit the After Sales sleeve.

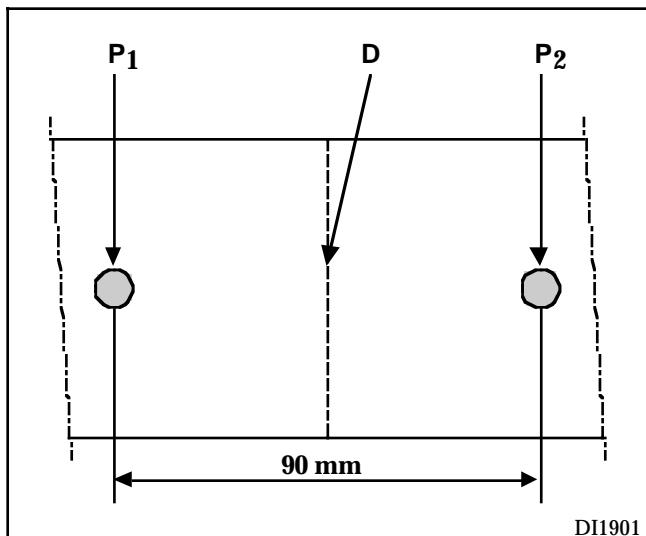
### MARKING UP THE CUTTING LINE

The cutting line is marked by two punched marks in the exhaust pipe.



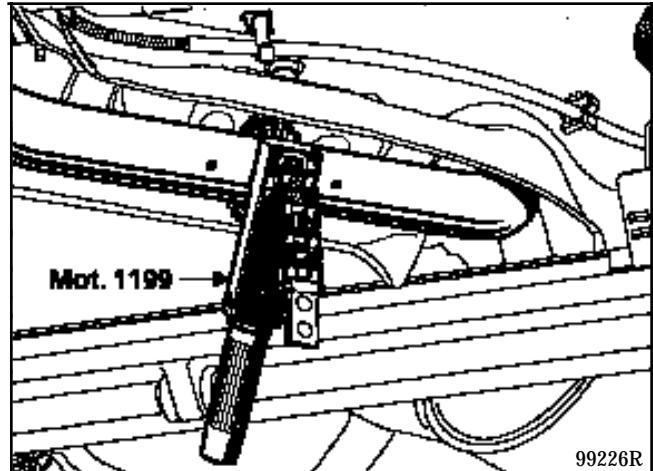
There are a maximum (depending on engine) of two cutting zones on the exhaust pipe, located between the catalytic converter and the expansion chamber and between the expansion chamber and the silencer.

The distance between the two markers is **90 mm**. To cut the pipe, mark the centre point (D) between the two markers (P<sub>1</sub> and P<sub>2</sub>).



### USING TOOL MOT. 1199

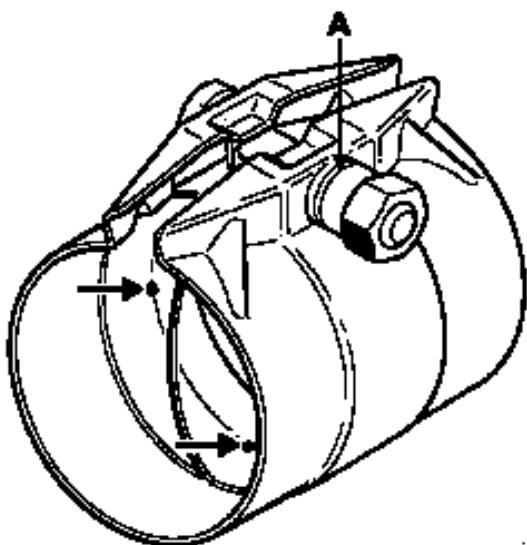
Fit tool Mot. 1199 to the exhaust pipe.



Slacken the chain as far as possible (unscrew) and pass it around the pipe. Attach the chain to the tool.

Tighten and pivot the tool around the pipe, while tightening the chain (screw in) as cutting proceeds (do not tighten the tool on the pipe too much to ensure it cuts without deforming the pipe).

**POSITIONING THE AFTER SALES SLEEVE**



95478R1

To avoid any leaks from the exhaust, it is important to position the sleeve over the two exhaust pipes correctly. This means that the pipe should fit against the lugs inside the sleeve.

Begin by positioning the sleeve on the old section of the exhaust pipe then adjust the diameter of the clip by tightening it gently.

Check the positioning of the pipe on the lugs.

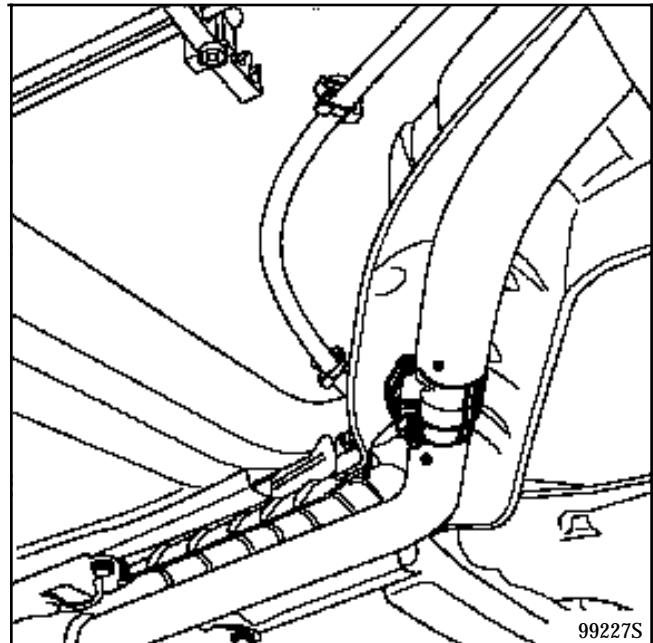
Fit the new replaced part.

Before fitting the sleeve on the pipe, mastic may be applied to the inner ring of the sleeve to prevent a leak.

(Exhaust mastic Part Number : 77 01 421 161  
SODICAM).

**IMPORTANT :** the bolt and nut assembly on the sleeve must be **aligned vertically** to avoid any risk of contact with the body.

Once a clip has been fitted once, do not re-use it.



99227S

The nut on the clip has a groove (A) to ensure the clip is tightened to the correct torque. When tightening, when this groove is no longer visible, it clicks and the nut is then tightened correctly (2.5 daN.m).

**NOTE:**

there are 2 sleeves of different diameters :

- **50 mm diameter** : F3R- K7M - E7J engines
- **45 mm diameter** : F8Q engine

**IMPORTANT:**

- check there is no contact between the exhaust pipe and the body,
- check the exhaust pipe heat shields are in good condition and are all present.

### NOISE FROM THE EXHAUST PIPE

The vehicle should be tested in order to localise the source of the noise (if necessary with the customer present). The fault should then be reproduced when the vehicle is stationary, if possible. To do this, accelerate sharply in order to cover a wide range of engine resonance.

Having reproduced the noise:

- ensure there is no contact between the exhaust pipe and the vehicle body,
- check the alignment, conformity and condition of the exhaust system,
- attempt to eliminate the noise noted by tightening the exhaust pipe or the heat shields at fault.

If the noise is found to be caused by the catalytic converter, remove it and carry out the following checks:

- visual examination of the inside of the shell (melted monolith).
- listen to the catalytic converter after shaking it (split monolith or foreign body present).

If the monolith has melted, the cause must be determined (see chapter 14: checks to be made before the anti-pollution test) and check that catalytic particles have not blocked the exhaust system further down the pipe.

Only if one of the observations specified above is noted should the catalytic converter be replaced.

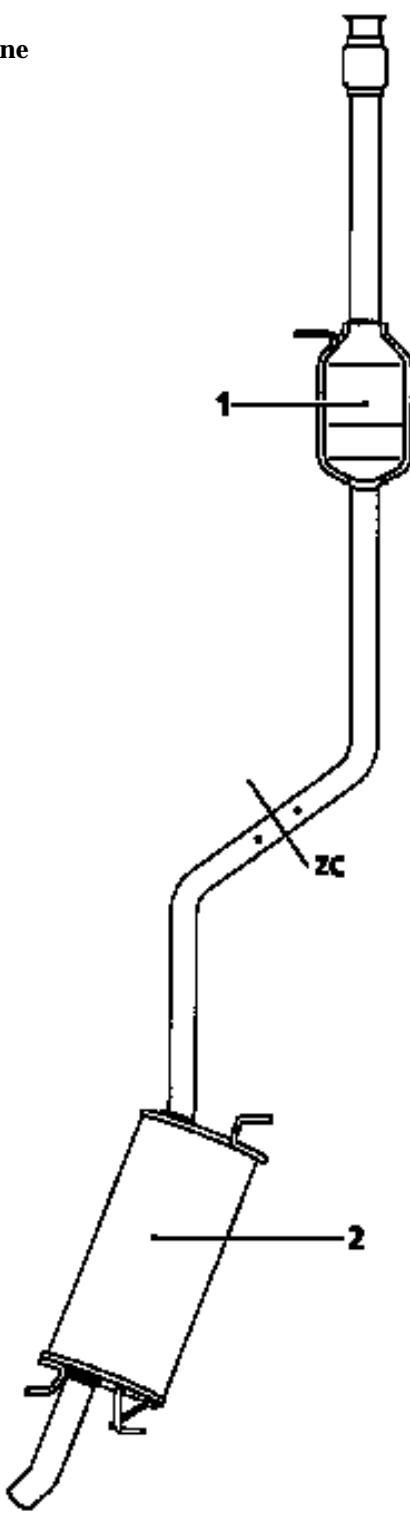
# EXHAUST

## Exhaust pipe assembly

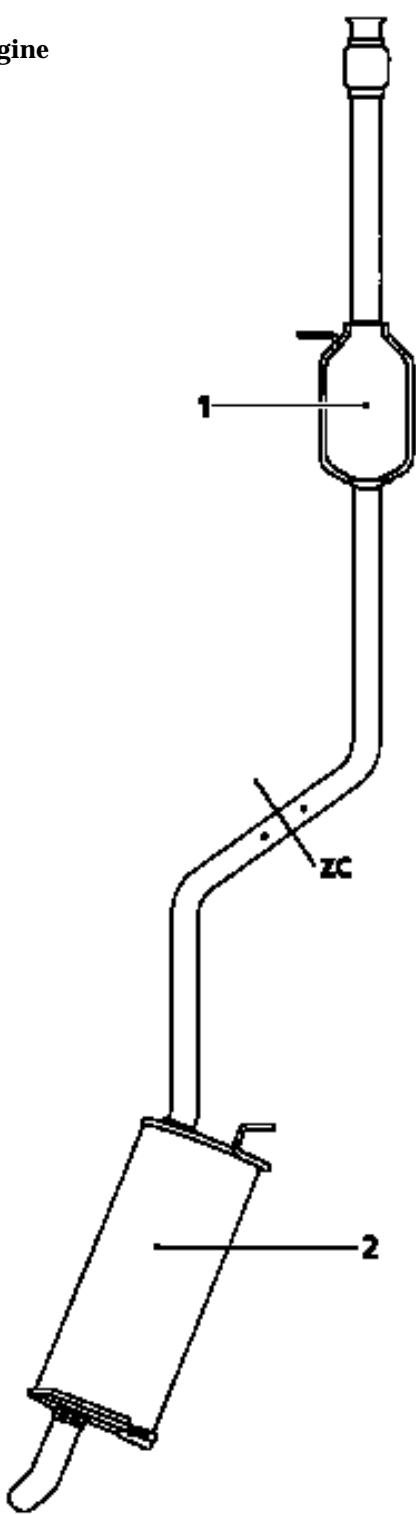
19

### PRESENTATION OF EXHAUST PIPES AND CUTTING ZONES

E7J engine



K7M engine



99233R

99237R

1 Expansion chamber

2 Silencer

ZC Exhaust pipe cutting zone

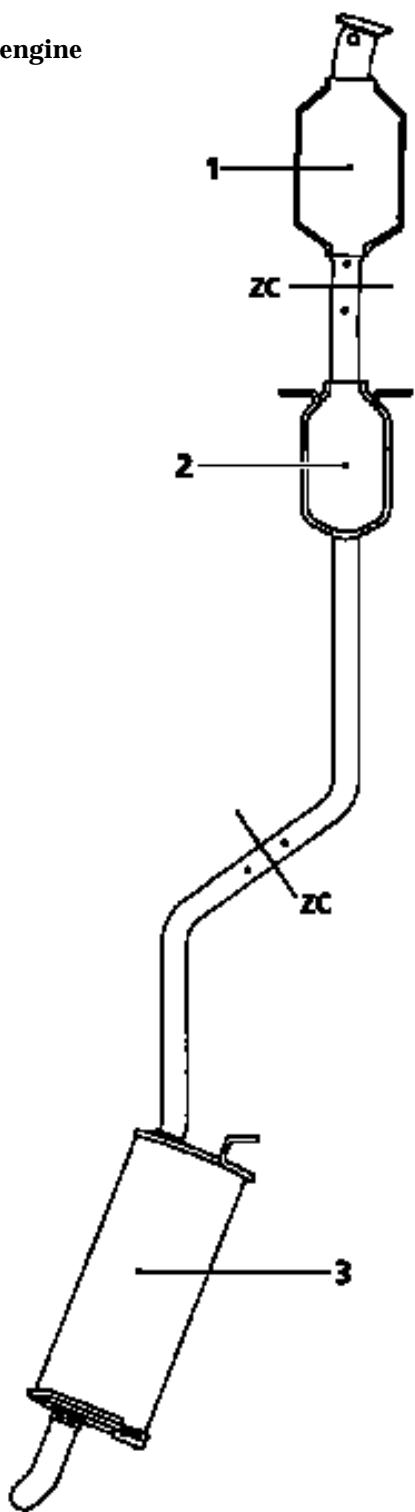
# EXHAUST

## Exhaust pipe assembly

19

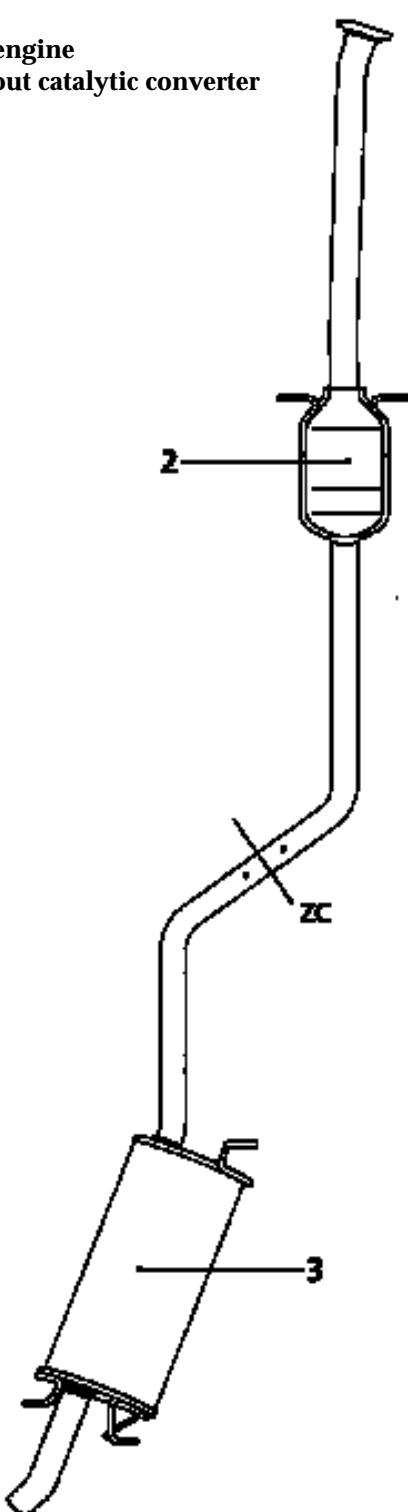
### PRESENTATION OF EXHAUST PIPES AND CUTTING ZONES

F3R engine



99236R

F8Q engine  
without catalytic converter



99235R

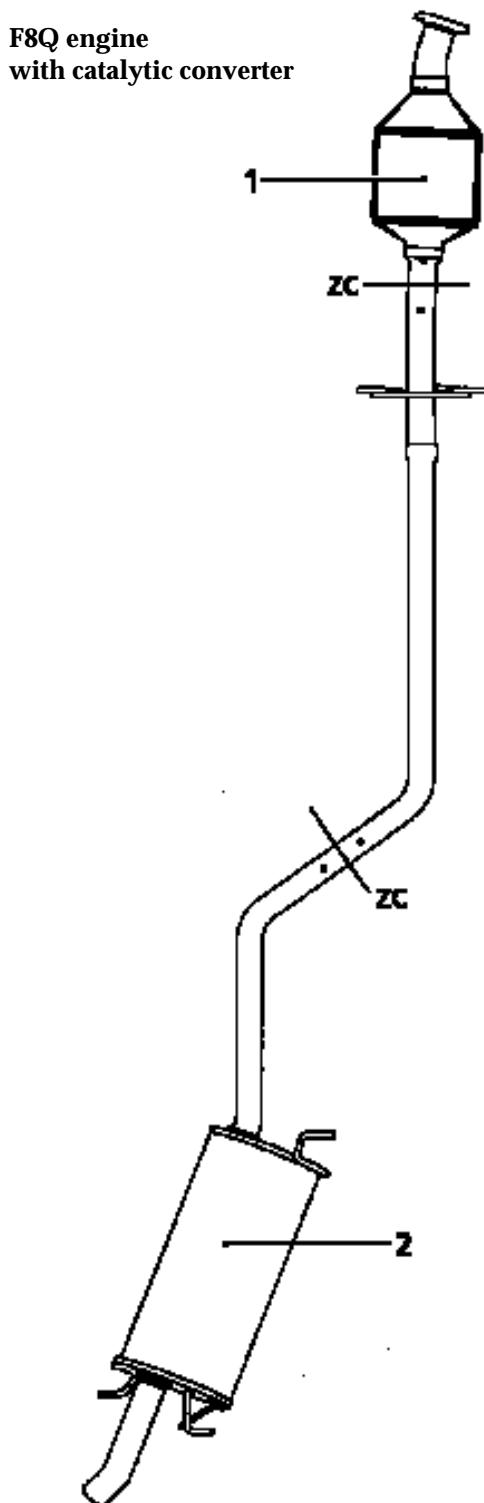
- 1 Catalytic converter
- 2 Expansion chamber
- 3 Silencer
- ZC Exhaust pipe cutting zone

# EXHAUST

## Exhaust pipe assembly

19

### PRESENTATION OF EXHAUST PIPES AND CUTTING ZONES



- 1 Catalytic converter
- 2 Silencer
- ZC Exhaust pipe cutting zone

EQUIPMENT REQUIRED	
INTAIRCO pneumatic pump for draining the fuel tank (petrol or diesel), (see EQUIPMENT 95 catalogue).	
Piston pump 333 (for draining diesel fuel tank).	
SPECIAL TOOLING REQUIRED	
Mot. 1199	Exhaust pipe cutting tool
Mot. 1265	Pliers for removing quick release unions
Mot 1265-01	

**IMPORTANT :**

during the complete removal and refitting operation, do not smoke and keep all heat sources away from the working area.

**DRAINING THE FUEL TANK (petrol version)**

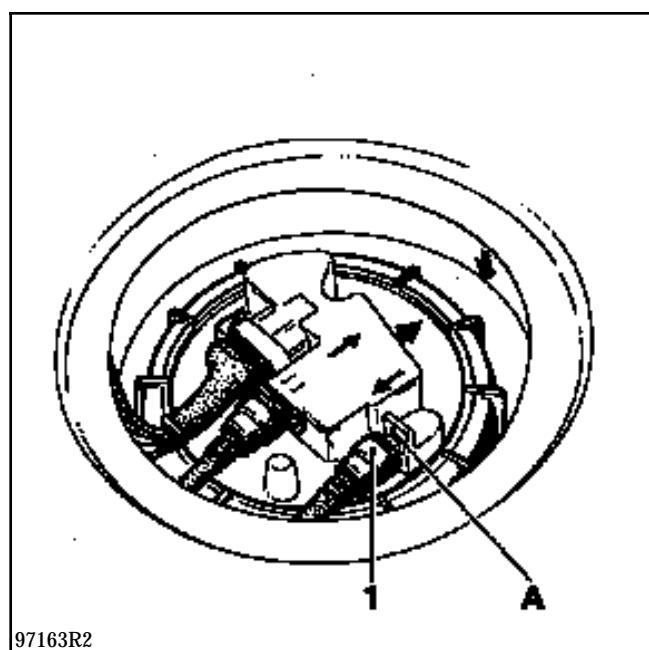
Remove the plastic access cover (under the rear right hand seat).

Remove the clip (if fitted).

Disconnect the quick release union (1), Mot. 1265 (see below for details on fitting the pliers).

Fit a pipe onto outlet (A) long enough to empty into a container outside the vehicle.

**Note :** the INTAIRCO pneumatic pump may also be used (see EQUIPMENT 95 catalogue) or piston pump 333. Refer to your After Sales Head Office for more details.

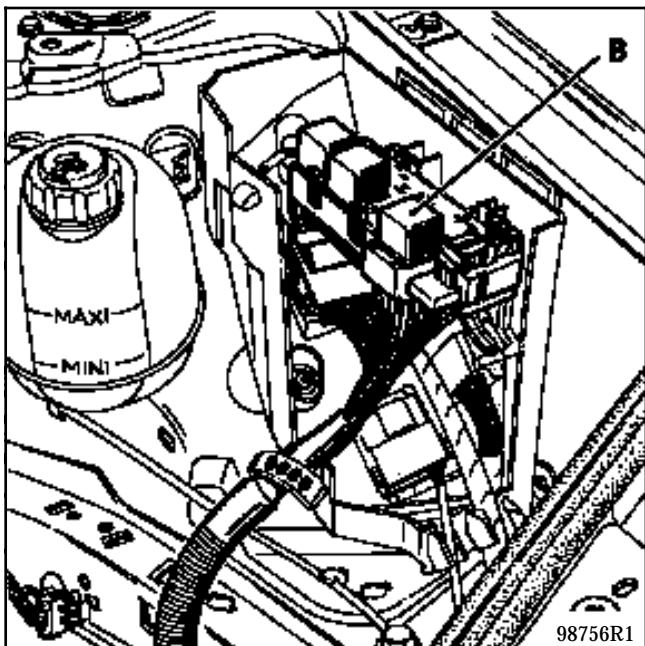


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# FUEL TANK

## Fuel tank

In the engine compartment, disconnect the fuel pump relay (identifiable as it has larger section wires , 5 mm<sup>2</sup> , on tracks 3 and 5) located in the engine connection unit.



B - Fuel relay

Shunt tracks 3 and 5 and allow the fuel to run out until it is only pumped out intermittently.

Disconnect the shunt.

Reconnect the relay.

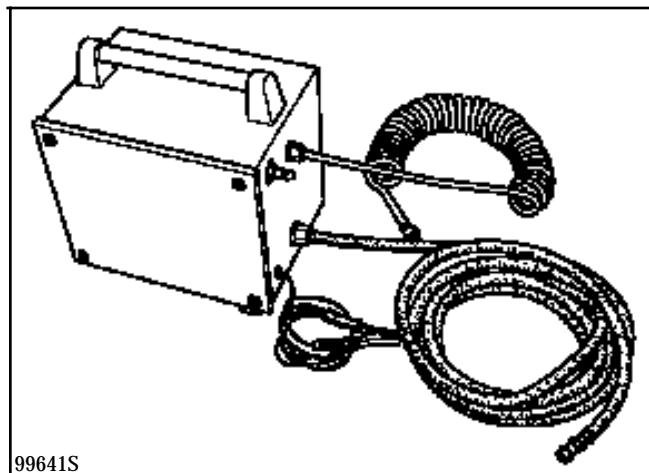
Disconnect the battery.

### DRAINING THE FUEL TANK (diesel version)

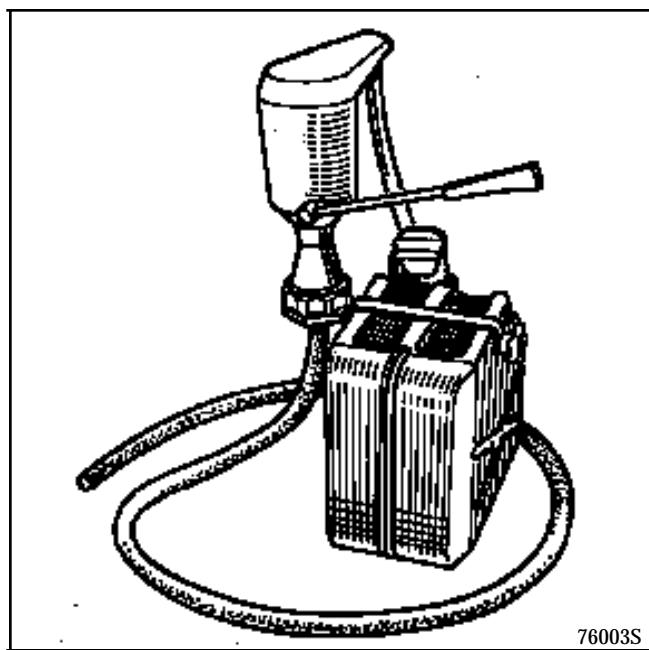
As there is no electric fuel pump, a pump must be used to drain the fuel tank.

Use for example:

- the INTAIRCO pneumatic pump (see EQUIPMENT 95 catalogue),



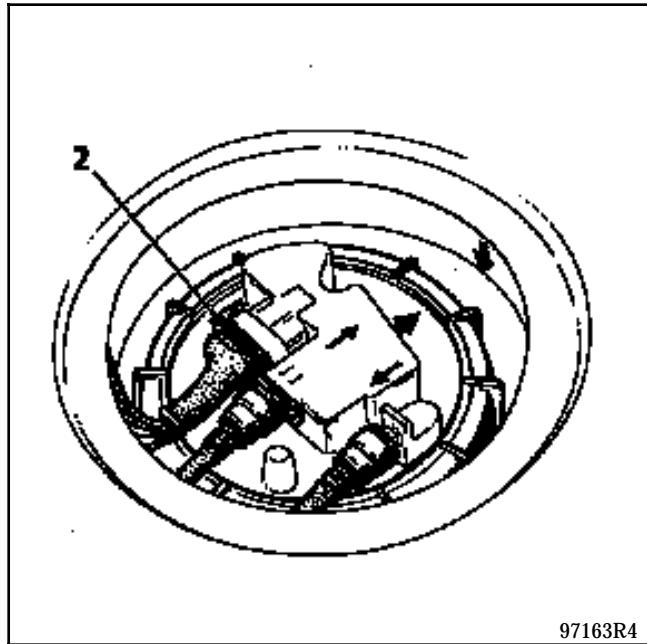
- piston pump 333. Refer to your After Sales Head Office for more details.



**REMOVING THE FUEL TANK (petrol or diesel versions)**

Vehicle on a 2 post lift.

Disconnect the electrical connector (2) and the quick release unions , **Mot. 1265** or **Mot. 1265-01** (see below for positioning the pliers).

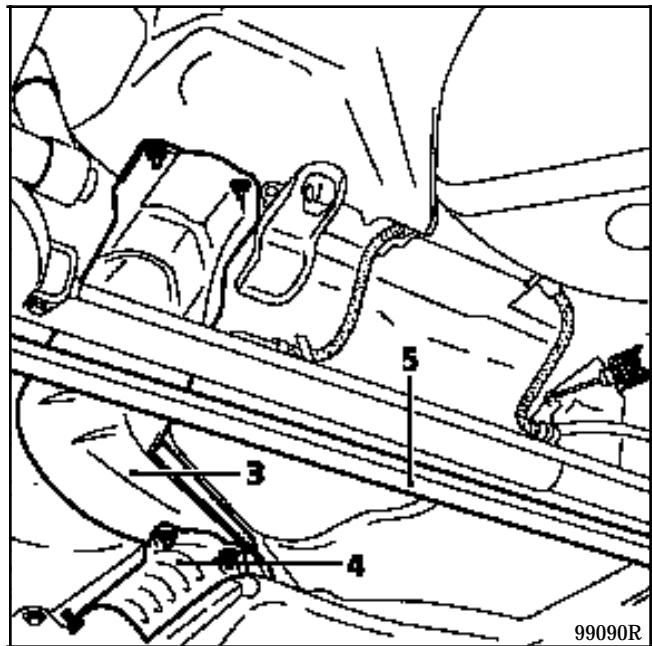


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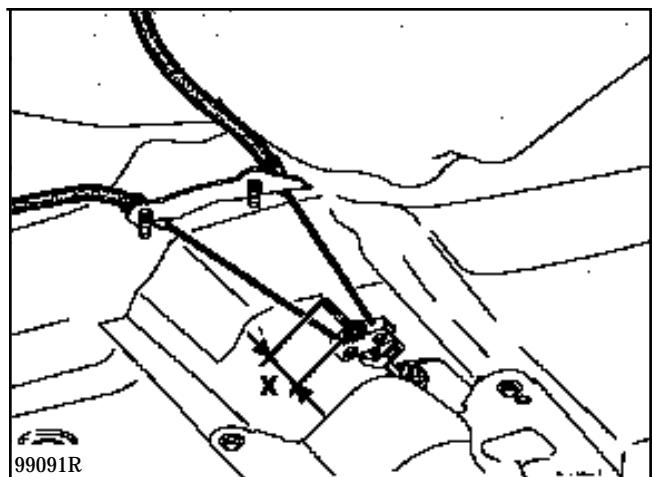
Lift the vehicle.

Remove the silencer, use the pipe cutting tool **Mot. 1199** (see Exhaust section).

Remove the heat shields (3) and (4) and the strut (5).

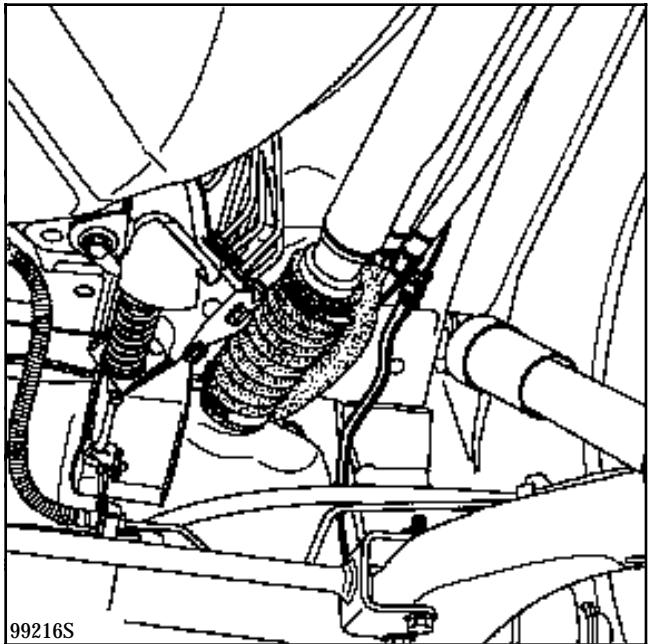


Measure dimension X before releasing the hand-brake adjuster.



Slacken the adjuster to release the left and right hand cables (release the plastic cable stop with care).

Disconnect the pipes from the fuel tank filler neck using tool Mot. 1265.



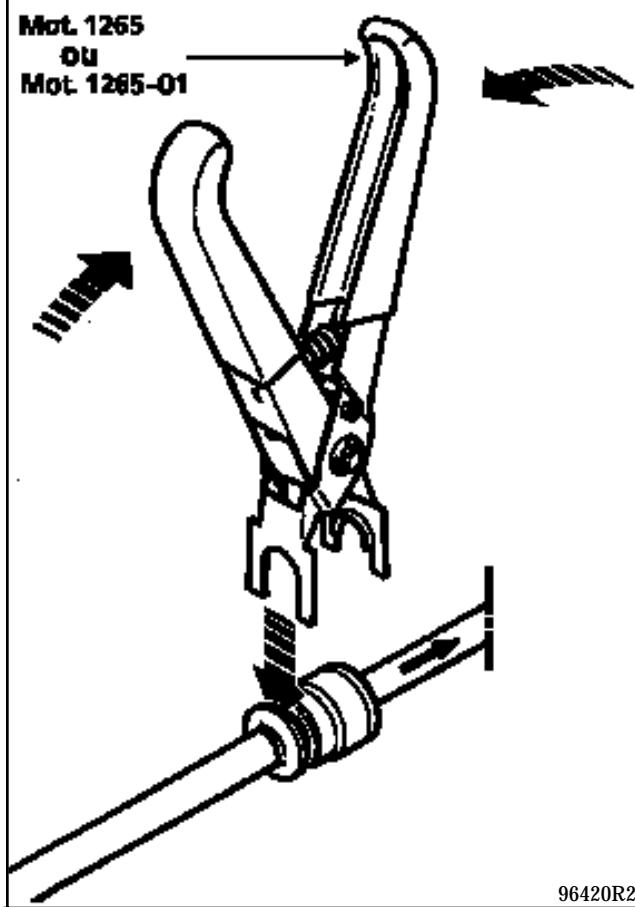
Fit a jack under the fuel tank.

Remove the 3 mounting bolts at the front of the fuel tank.

Slacken the mounting bolts for the rear mounting sufficiently to allow the fuel tank to be released.

**IMPORTANT:**

when removing the fuel tank, release the brake pipes sufficiently to avoid deforming them.



**Mot. 1265 : 8 mm diameter pipe.**

**Mot. 1265-01 : 10 mm diameter pipe (diesel fuel supply circuit).**

**REFITTING**

Refitting is the reverse of removal.

Take care not to compress the pipes (risk of a leak).

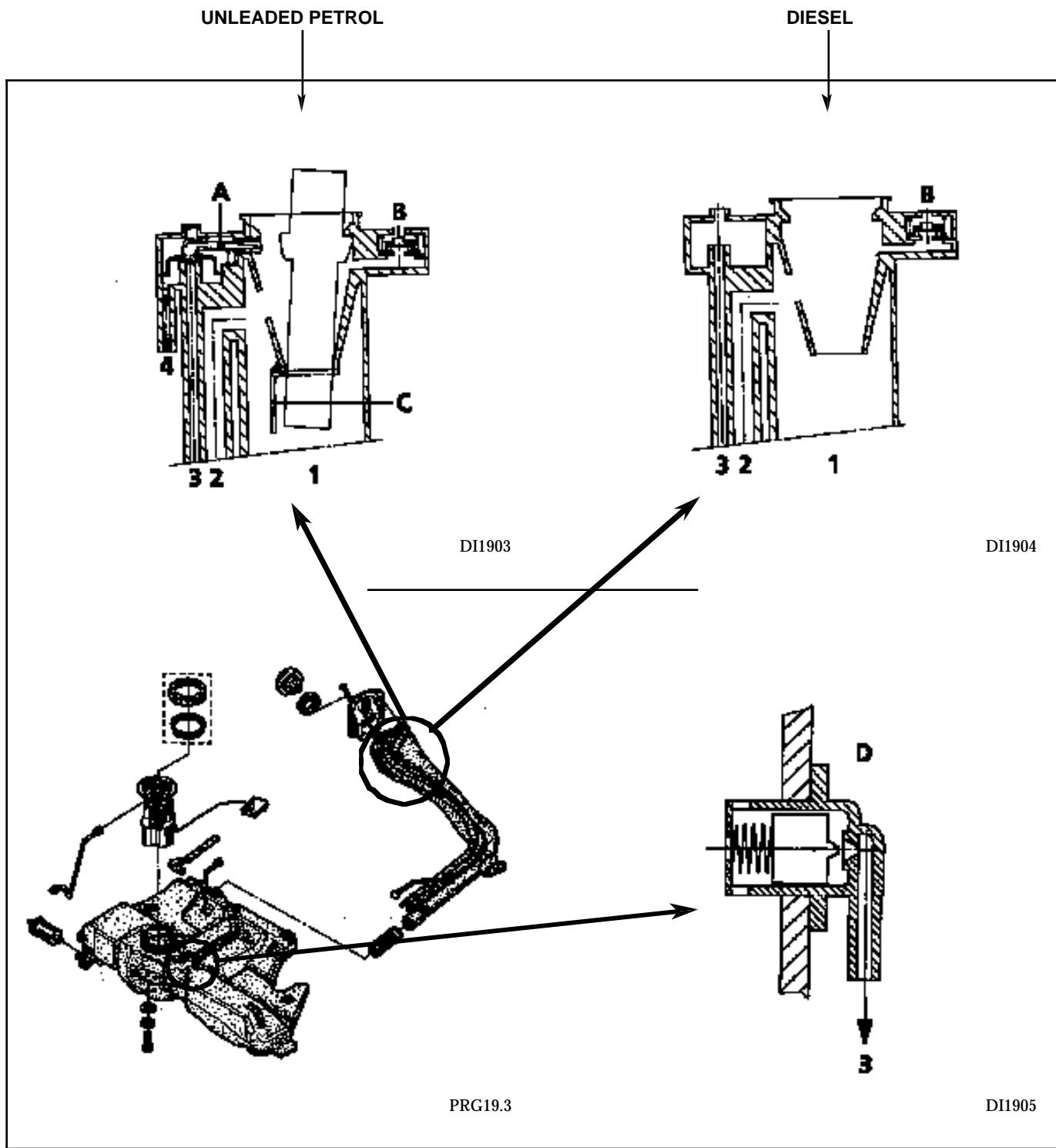
Fit the quick release unions by hand and ensure they click together correctly (two O rings ensure sealing).

Take care to ensure the heat shields are correctly refitted.

# FUEL TANK

## Filler neck

**19**



- 1 - Filler neck outlet - fuel passage
- 2 - Degassing when filling
- 3 - Breather
- 4 - Connection to canister (petrol vapour)

- A - Overfilling valve
- B - Excess - insufficient pressure safety valve
- C - Restriction valve
- D - Valve preventing leaks if the vehicle is turned over

# FUEL TANK

## Filler neck

### ROLE OF THE VALVES

#### A) Over-filling valve

When the fuel filler cap is removed, the valve is closed, locking a volume of air in the breather chamber. This prevents fuel from entering this chamber.

When the filler cap is replaced, the valve opens and the fuel tank breather is again connected to the canister.

#### B) Excess - insufficient pressure safety valve

If the fuel vapour recirculation circuit is blocked, this valve prevents the fuel tank from excess pressure (the fuel tank would otherwise inflate) or insufficient pressure (as fuel is used, the fuel tank would be crushed).

#### C) Restriction valve

This valve prevents leaded fuel from entering the fuel tank.

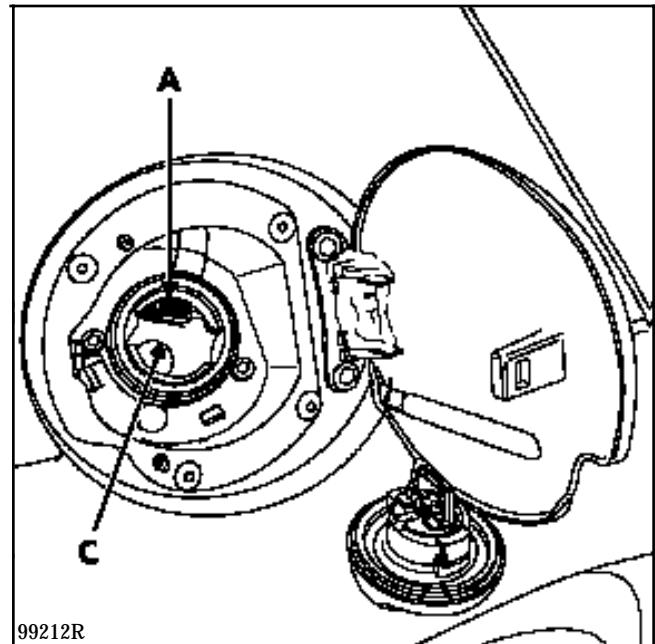
#### D) Valve preventing leaks if the vehicle is turned over

If the vehicle is turned over, this valve prevents the fuel tank from emptying, either through the pipe to the canister or the breather pipe (Diesel).

The fuel tank has a sealed filler cap and a ventilation circuit.

The filler neck for unleaded fuel has:

- an opening which is narrower and incompatible with a leaded fuel pump nozzle (lead would pollute the depollution system: the oxygen sensor and catalytic converter),
- a valve blocking the filling opening (C) (to prevent fuel vapour evaporating or fuel coming out of the tank).



Refitting the fuel filler cap releases the over-filling valve (A), allowing the tank to breathe through the breather.

For petrol engines, the pump and gauge sender unit are an inseparable assembly.

For diesel engines, there is no pump submerged in the fuel tank, there is only a gauge sender unit.

For removing the gauge sender unit refer to the section FUEL TANK "Pump - sender unit".

#### **Checking the gauge sender unit**

<b>Display</b>	<b>Value between terminals A1 and B1 (in <math>\Omega</math>)</b>
4/4	7 maximum
3/4	54.5 $\pm$ 7
1/2	98 $\pm$ 10
1/4	155 $\pm$ 16
Minimum	300 $\pm$ 20

Ensure the resistance varies by moving the float.

<b>Display</b>	<b>Height H (in mm)</b>
4/4	48
3/4	90
1/2	133
1/4	147
Minimum	190

#### **Measuring the height H**

With the gauge sender unit removed, place it on a flat surface.

H is the height measured between the float pin and the working surface.

**NOTE :** these value are given for information only.

SPECIAL TOOLING REQUIRED	
<b>Mot. 1264-01</b>	Wrench for removing the pump - sender unit nut.
<b>Mot. 1265</b>	Pliers for removing quick release unions (petrol engine)
<b>Mot. 1265-01</b>	Pliers for removing quick release unions (diesel engine)

**IMPORTANT :**

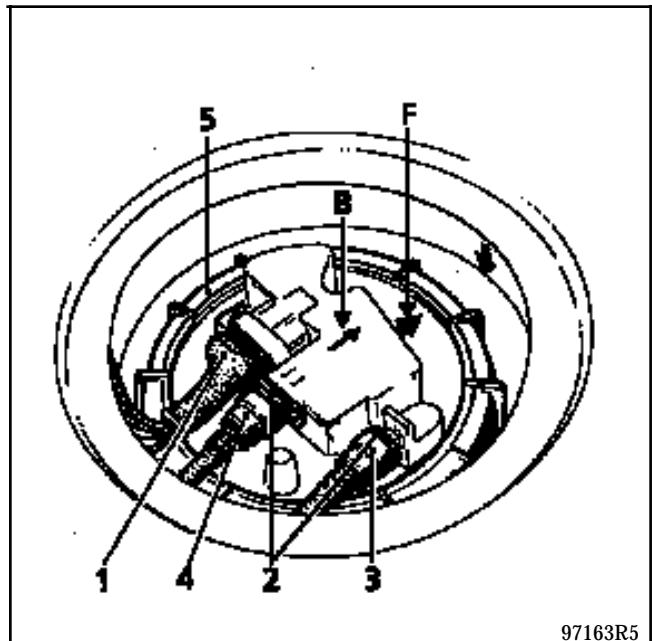
During all operations on the fuel tank or fuel supply circuit, it is vital to:

- avoid smoking and keep all heat sources away from the working area,
- take precautions against fuel splashes due to the residual pressure in the fuel pipes when they are removed.

**REMOVAL**

The fuel tank does not need to be removed to remove the pump and sender unit assembly. It may be reached from inside the vehicle as follows :

- disconnect the battery,
- lift the rear bench seat,
- remove the plastic cover,
- disconnect the electrical connector (1),
- remove the clips (2).



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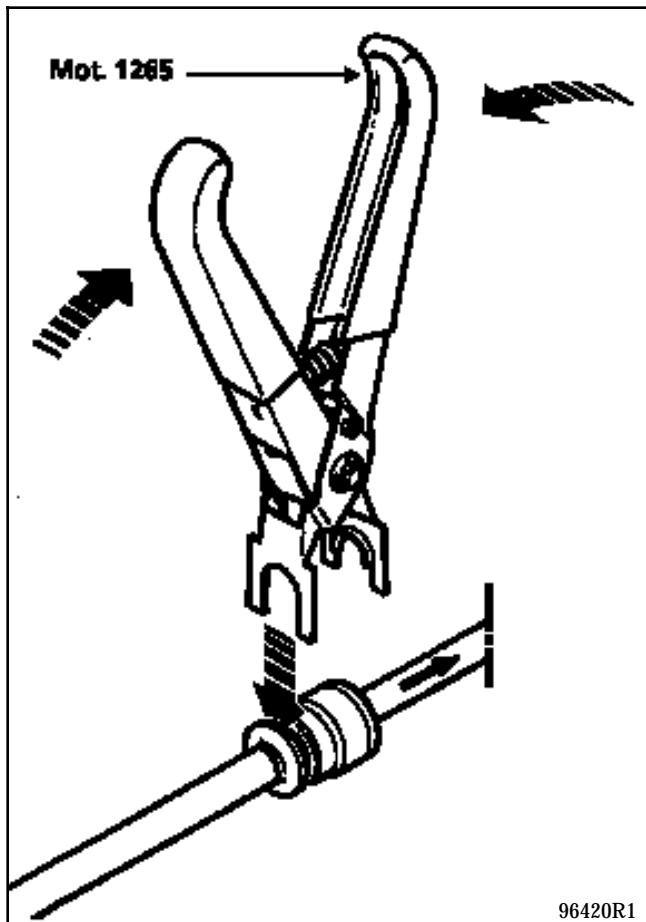
# FUEL TANK

## Pump and sender unit

19

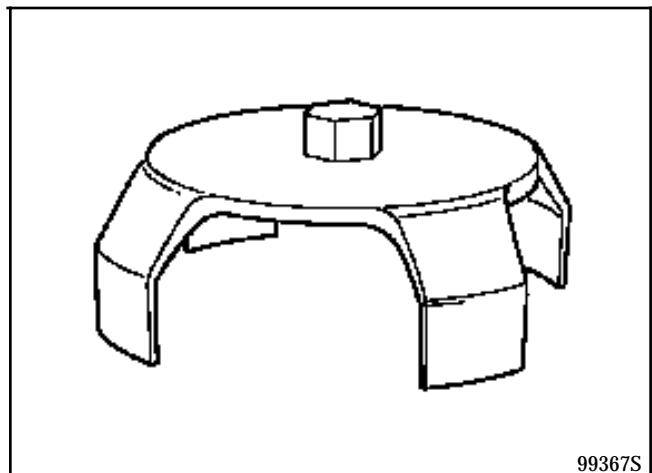
Use pliers Mot. 1265 (petrol engine) or Mot. 1265-01 (diesel engine) to disconnect:

- the fuel supply pipe (3) (marked by a green quick release union),
- the fuel return pipe (4) (marked by a red quick release union and an arrow (B)).



Remove the mounting nut (5) using tool Mot. 1264-01 (release the nut, remove the tool then slacken the nut by hand and remove it).

Remove the pump and sender unit assembly.



**NOTE :** if several hours may elapse between removing and refitting the pump and sender unit assembly, refit the nut to the fuel tank to prevent it from distorting.

**REFITTING**

Check the seal is not damaged and renew it if necessary.

First fit the seal on the fuel tank before refitting the assembly.

Position the pump and sender unit assembly (arrow (F) should be aligned with the longitudinal axis of the vehicle, pointing backwards).

Fit the nut and tighten it to a torque of **3.5 daN.m.**

Clip the fuel pipes back together (tools **Mot. 1265** or **Mot. 1265-01** do not need to be used).

Refit the safety clips (2).

Reconnect the electrical connector .

Refit the plastic cover.

**ALLOCATION OF CONNECTOR TRACKS**

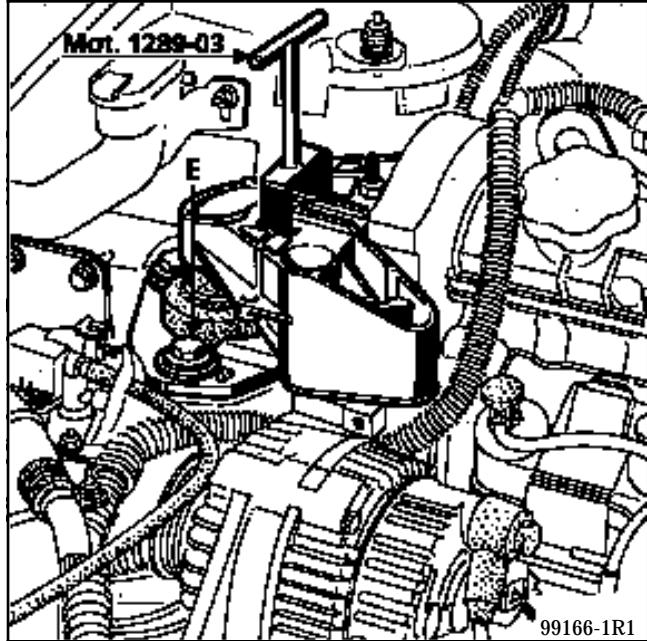
TRACK	ALLOCATION
A1	Earth
A2	Low fuel warning light
B1	Gauge information to instrument panel
B2	Not used
C1	Pump
C2	Pump

### ADJUSTING THE LONGITUDINAL MOVEMENT LIMITER FOR F ENGINES

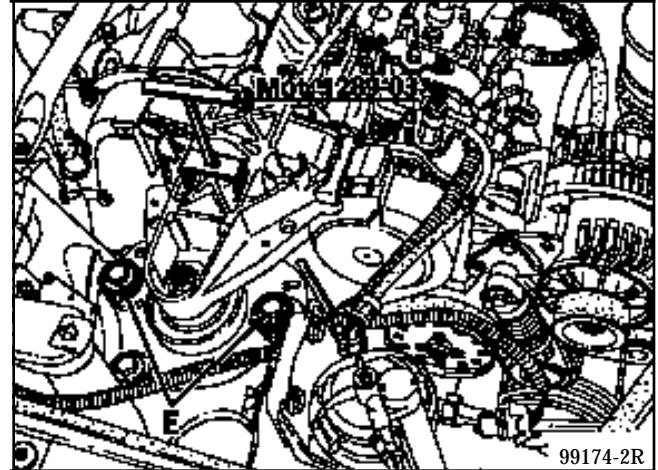
Slacken limiter bolts (E).

Insert the limiter centring fork Mot. 1289-03 into the openings on the suspended engine mounting cover. Tighten the two bolts (E) to a torque of 5 to 6.5 daN.m.

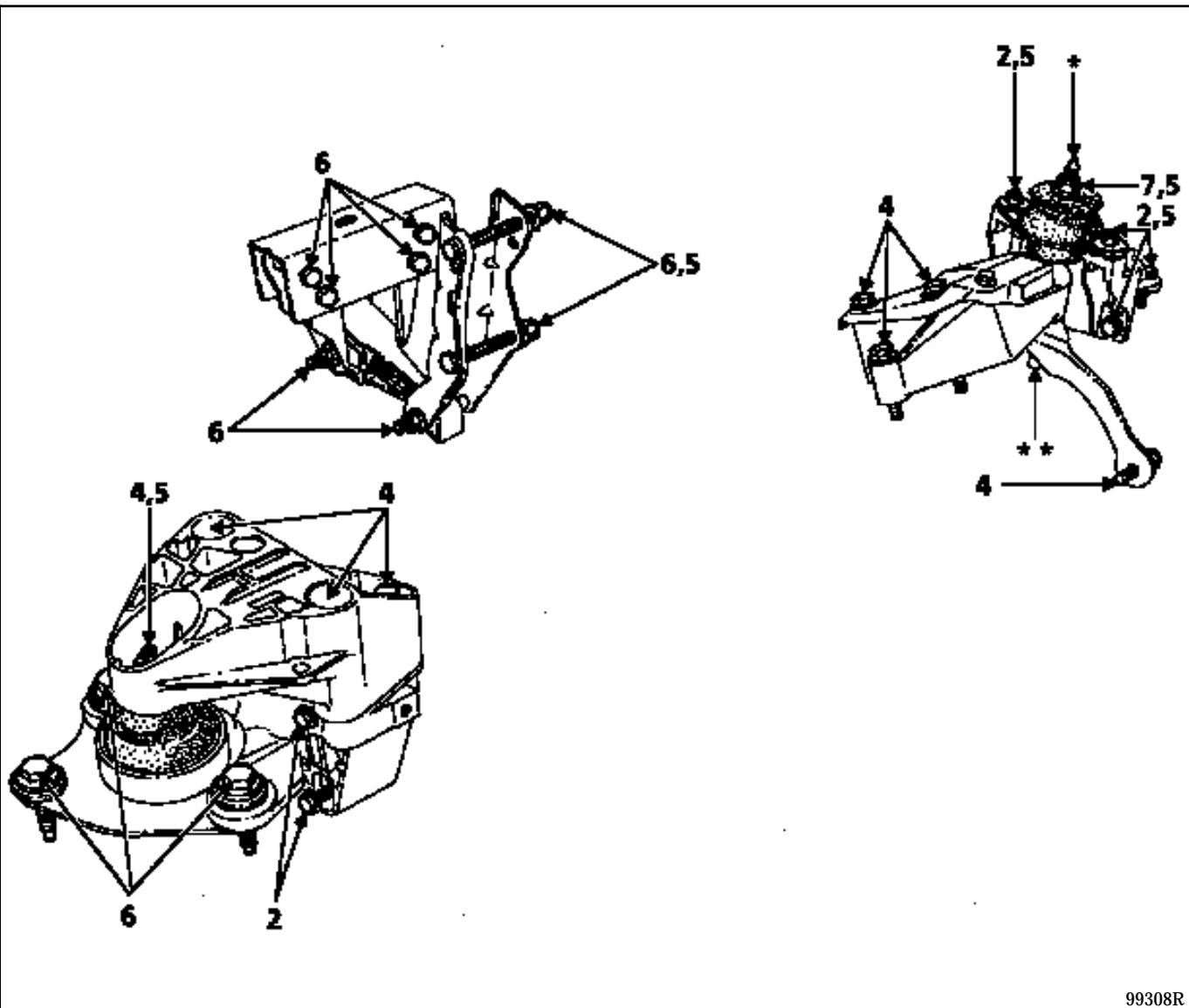
F engine (petrol)



F engine (diesel)



TIGHTENING TORQUES (in daN.m)

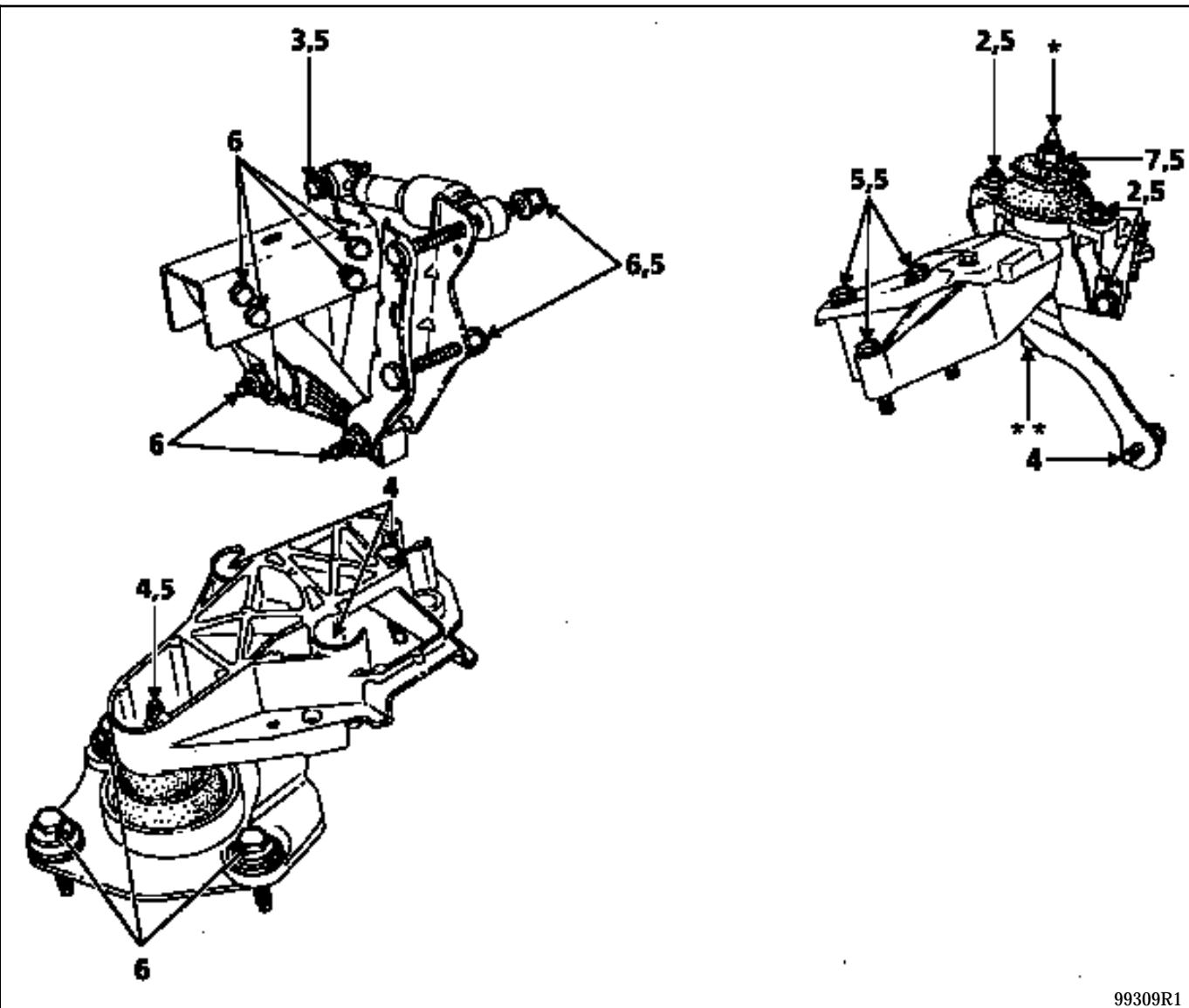


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\* Tighten the stud to 6 daN.m

\*\* Tighten the nut to 4 daN.m

TIGHTENING TORQUES (in daN.m)

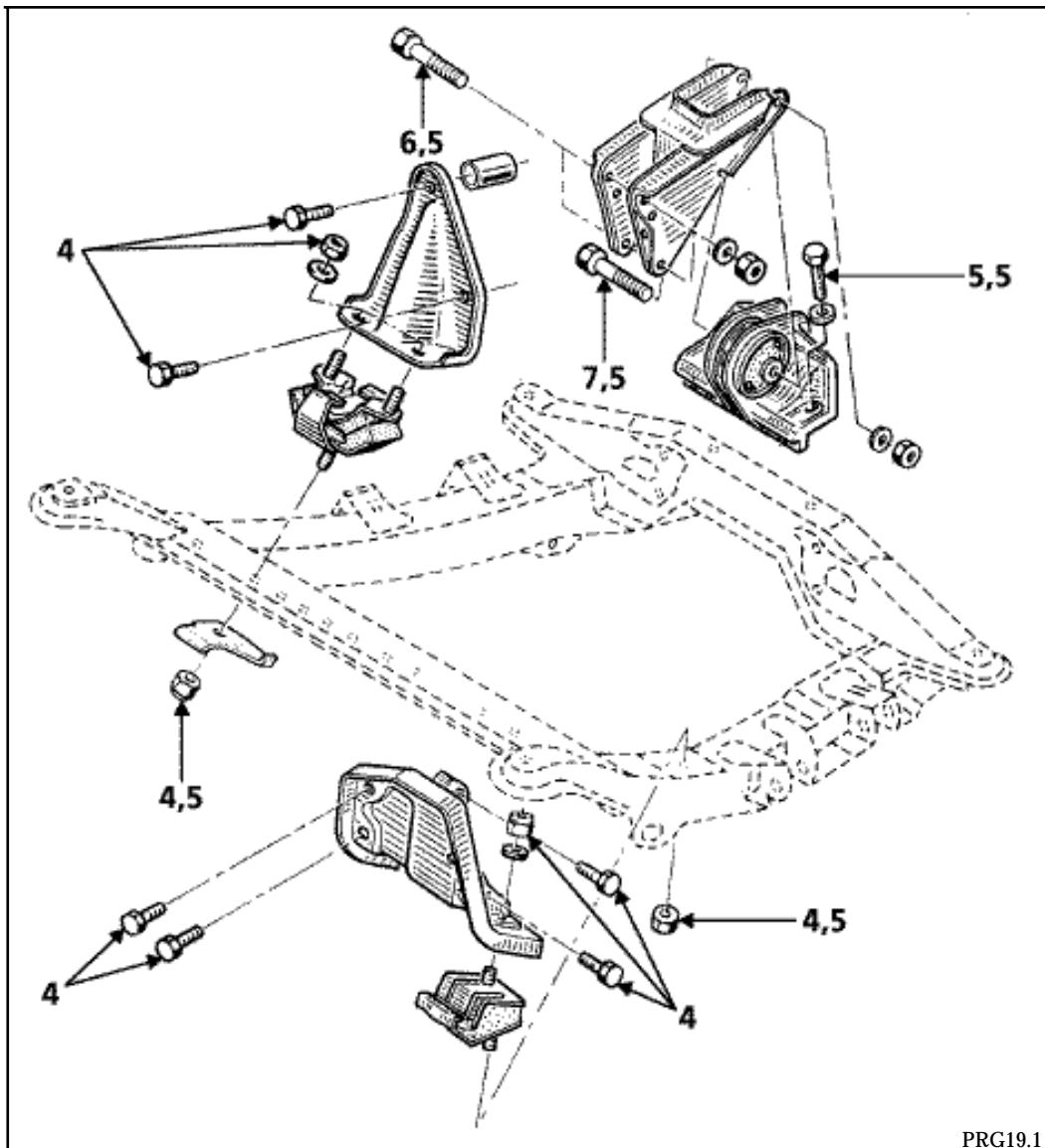


99309R1

\* Tighten the stud to 6 daN.m

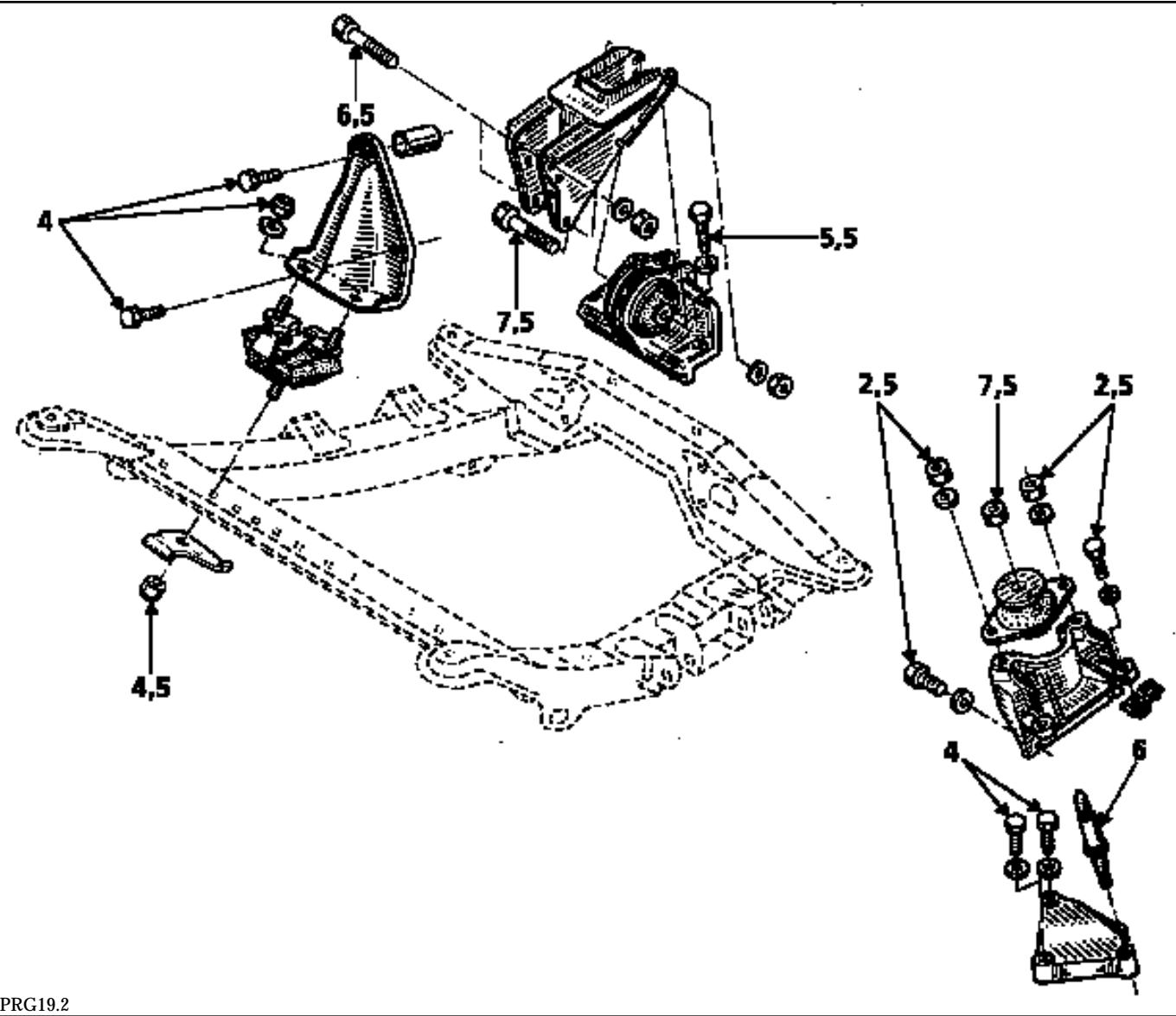
\*\* Tighten the nut to 4 daN.m

TIGHTENING TORQUES (in daN.m)



PRG19.1

TIGHTENING TORQUES (in daN.m)



PRG19.2