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# **1 Engine and Peripherals**

**10 ENGINE AND PERIPHERALS**

**11 TOP AND FRONT OF ENGINE**

**12 FUEL MIXTURE**

**13 FUEL SUPPLY -  
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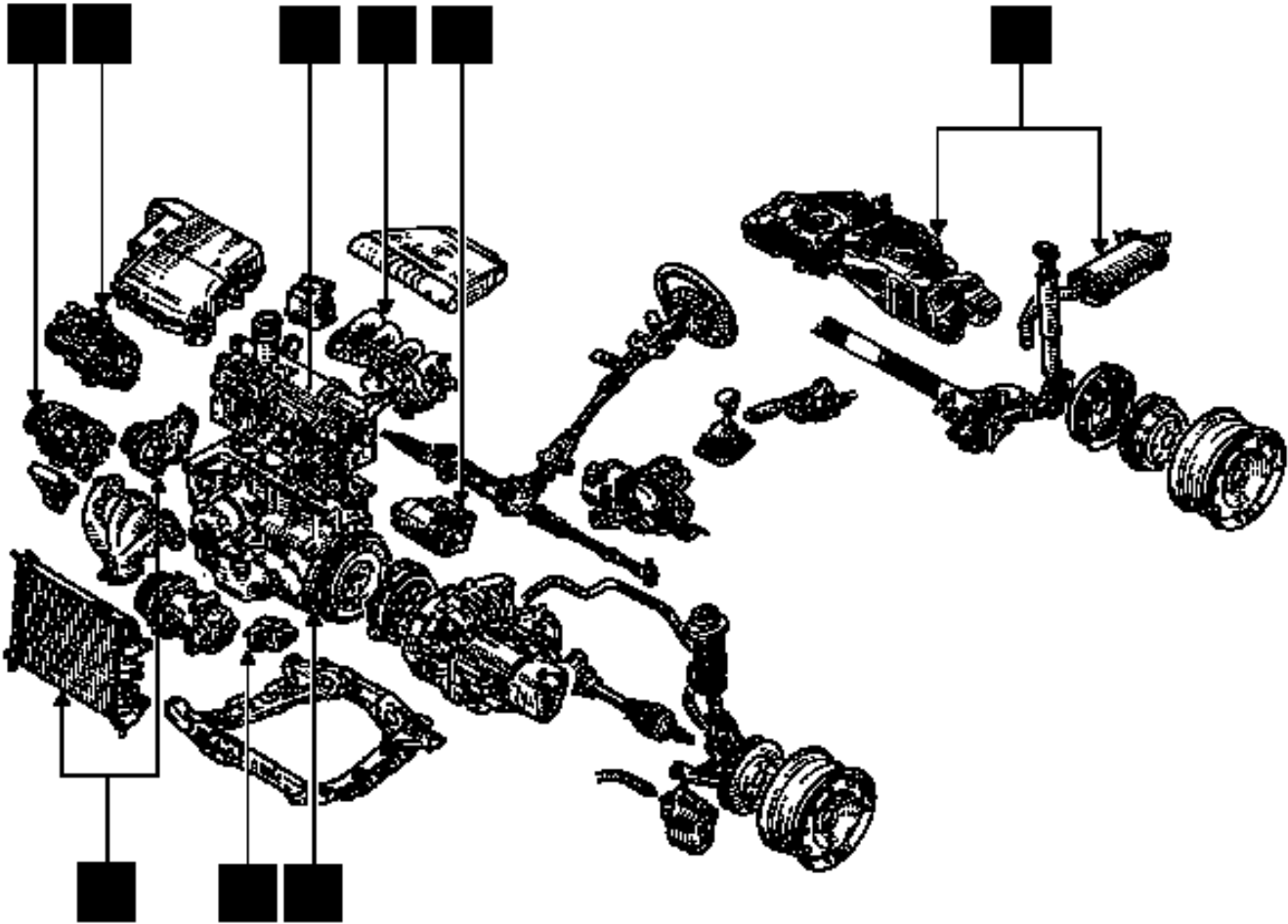
**19 COOLING - EXHAUST - FUEL TANK -  
SUSPENDED ENGINE MOUNTINGS**

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***BB0A - BB0C - BB0D - BB0E - CB0A - CB0C - CB0D - CB0E***

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EXPLODED VIEW



# Engine and peripherals

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Type	Quantity	Components
RHODORSEAL 5661	Coat	Driveshaft roll pin holes
Loctite FRENBLOC Locking and sealing resin	Coat	Brake caliper mounting bolts
Loctite FRENETANCH Locking and sealing resin	Coat	Crankshaft pulley mounting bolts
Exhaust pipe paste	Coat	For sealing the exhaust

Identification

Vehicle type	Engine	Manual gearbox	Capacity (cm <sup>3</sup> )	Bore (mm)	Stroke (mm)	Ratio
B/C B0A	D7F 720	JB1	1 149	69	76.8	9.65/1
B/C B0C	E7J 780	JB1	1 390	75.8	77	9.5 /1
B/C B0D	K7M 744	JB1	1 598	79.5	80.5	9.5 /1
B/C B0E	F8Q 630	JB1	1 870	80	93	21.5 /1

Engine Workshop Repair Manuals to be consulted depending on the type of engine:

Engine Document	D7F	E7J	K7M	F8Q
Mot. D	X			
Mot. E		X		
Mot. K			X	
Mot. F (D)				X

OIL CONSUMPTION MEASUREMENT PROCEDURE

a) Filling to the maximum level

The operation must be carried out with the engine hot (cooling fan cutting in once) and after settling for **15 minutes** to allow all the oil to drain into the sump.

Check visually using the dipstick.

Top up to the maximum level.

Seal the drain plug (with a paint mark on both the filler plug and the sump's drain plug) in order to be able to check later that it has not been removed.

b) Customer driving

Ask the customer to drive the vehicle for a period corresponding to about **1250 miles** (2,000 km) or before the minimum level is reached.

c) Refilling to the maximum level

The operation must be carried out with the engine hot (cooling fan cutting in once) and after a settling time of **15 minutes**.

Check visually using the dipstick.

Top up to the maximum level.

Note the quantity of oil and the mileage covered since the last filling to the maximum level.

d) Measurement of the oil consumption

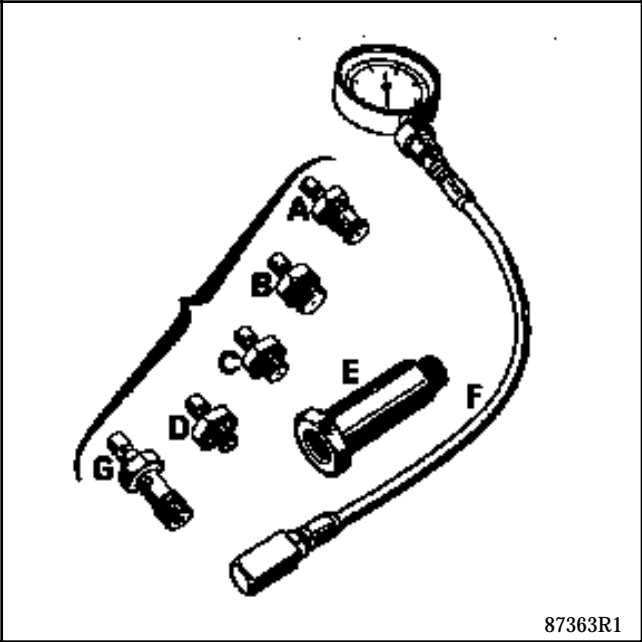
OIL CONSUMPTION = 
$$\frac{\text{Quantity of topping up oil (in litres)}}{\text{km (in thousands)}}$$

SPECIAL TOOLING REQUIRED
Mot. 836-05 Oil pressure measuring kit
EQUIPMENT REQUIRED
22 mm long socket

CHECKING

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

Contents of kit Mot. 836-05.



USE

D engine	E engine	F engine
C + F	C + E + F	B + F

ENGINE CHECKING

D7F engine

Idling	0.8 bar
4 000 rpm.	3.5 bars


E7J / K7M engines

Idling	1 bar
3 000 rpm.	3 bars

F8Q engine

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

SPECIAL TOOLING REQUIRED		
B. Vi.	31-01	Set of three punches for roll pins
Mot.	1202	Hose clip pliers
Mot.	1448	Hose clip pliers extension
Mot.	1273	Tool for checking belt tension
Mot.	1311-06	Tool for removal of fuel pipe
Mot.	1379	Tool for retaining engine on sub-frame
T. Av.	476	Ball joint extractor
EQUIPMENT REQUIRED		
Load positioner		

TIGHTENING TORQUES (in daN.m)		
Brake caliper guide bolt	4	
Shock absorber base bolts	18	
Driveshaft gaiter mounting bolt	2.5	
Left-hand suspended engine mounting bolt on gearbox	6.2	
Left hand suspended engine mounting bolt on body	2.1	
Right hand suspended engine mounting bolt on engine	6.2	
Right hand suspended engine mounting bolt on body	6.2	
Wheel bolt	9	

REMOVAL

- Put the vehicle on a two post lift.
- Remove the battery and the engine undertray.
- Drain:
- the cooling circuit (bottom hose of the radiator),
  - the gearbox and engine oil (if necessary),
  - the air conditioning circuit (if fitted) using a filling station.
- Remove:
- the wheels,
  - the air intake pipe,
  - the expansion bottle and fix it to the engine.



### Left-hand side of the vehicle

Remove:

- the brake caliper mounting bolt then fix it to the shock absorber spring,
- the three driveshaft gaiter mounting bolts,
- the track rod end using tool **T. Av. 476**,
- the shock absorber base bolts.

Tilt the hub to disconnect the driveshaft from the gearbox.

### Right-hand side of the vehicle

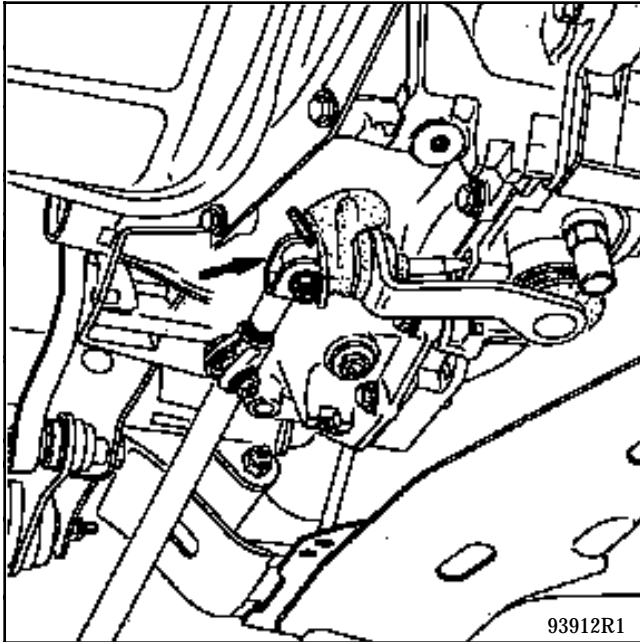
Remove:

- the driveshaft roll pins with the punches **B. Vi. 31-01**,
- the brake caliper mounting bolt then fix it to the shock absorber spring,
- the track rod end using tool **T. Av. 476**,
- the shock absorber base bolts.

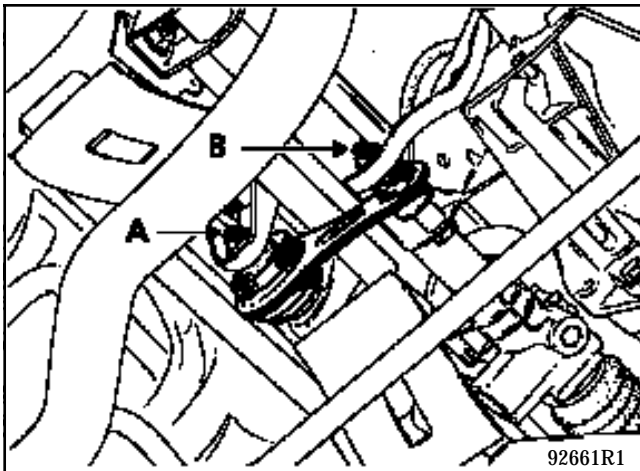
Tilt the hub to disconnect the driveshaft from the gearbox.

Remove the earth strap mounting bolt (gearbox side).

Disconnect the gear selector rod at the gearbox, after releasing the gaiter.



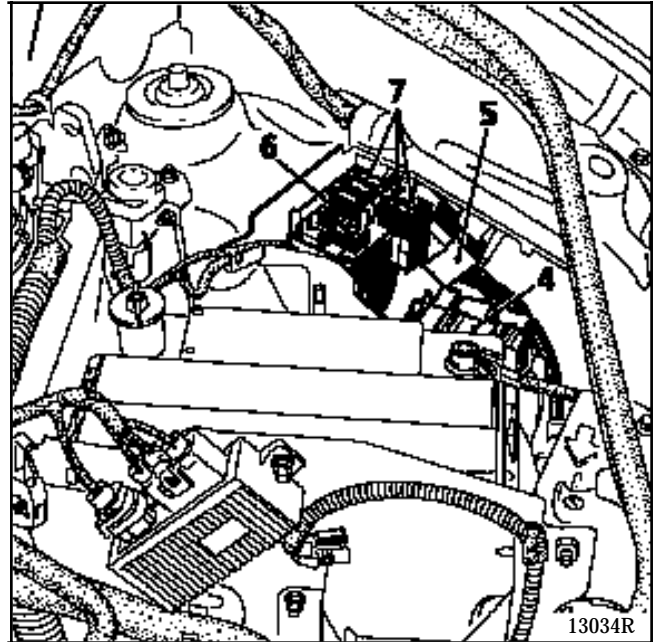
Slacken bolt (A) without removing it and remove bolt (B) from the engine tie-bar.



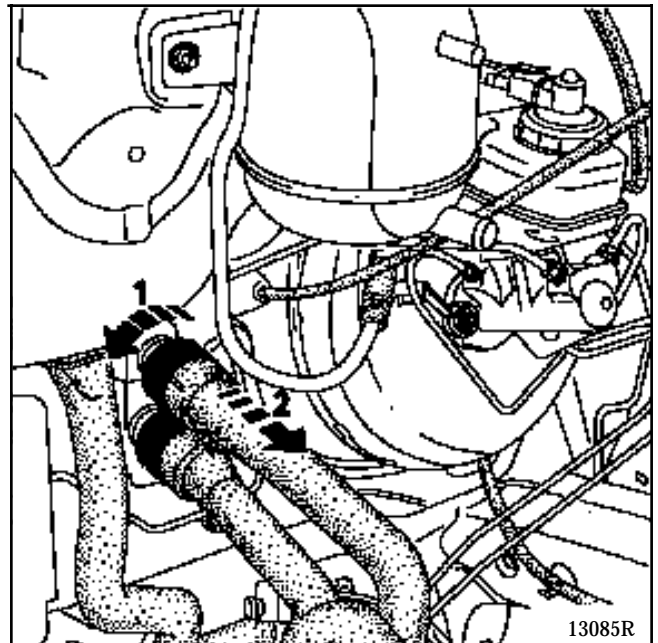
Disconnect:

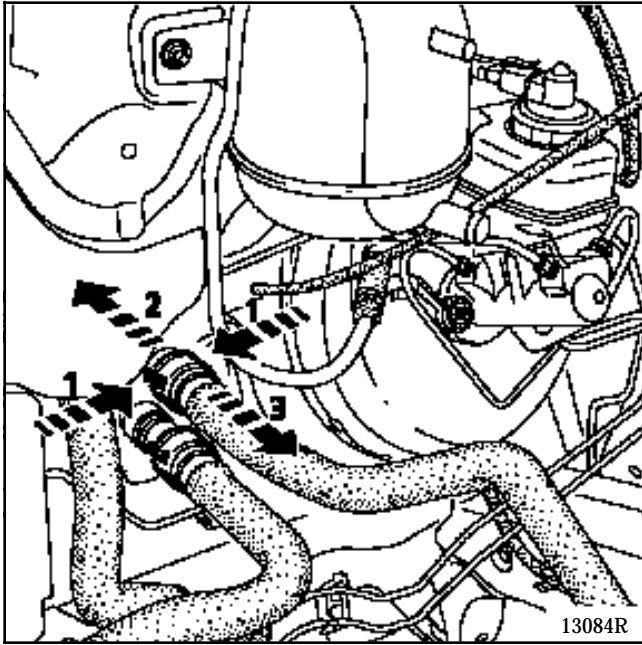
- the accelerator cable,
- the canister pipe,
- the brake servo vacuum pipe,
- the upper hose on the radiator,

- the relay board (4), the connector (5) and the fuse mounting (6) by removing the fuse holders (7),



- the heater hose (there are two types of assembly to be disconnected as shown in the diagrams below),

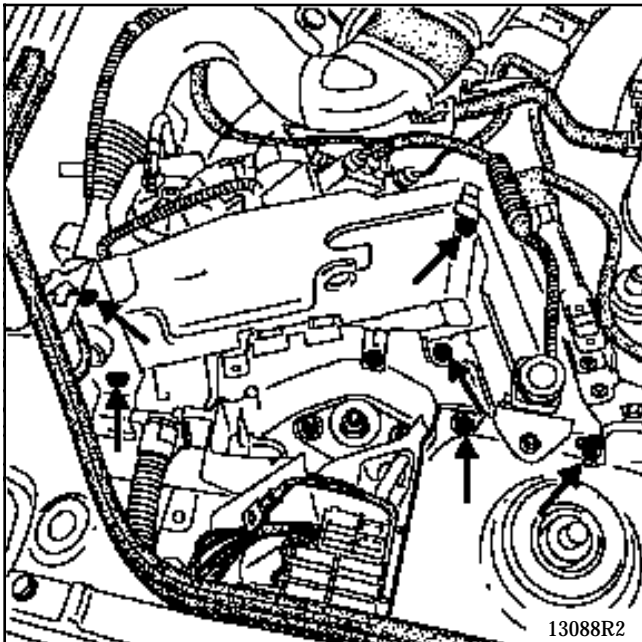




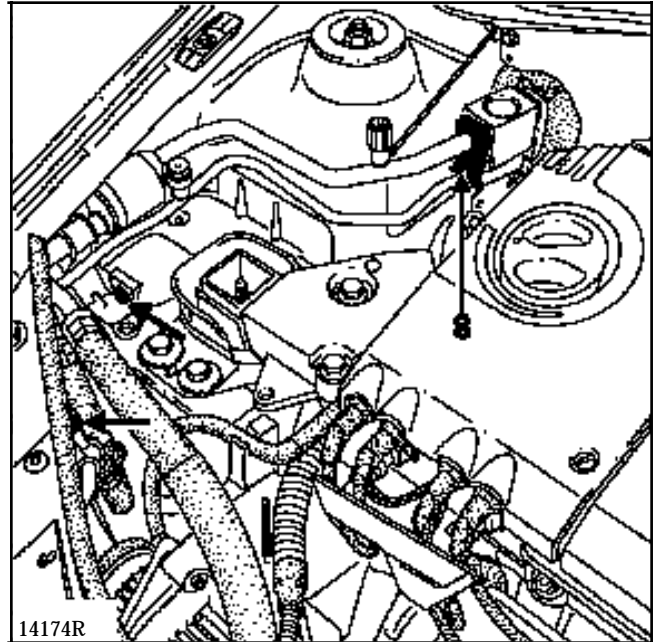
- the connectors of the oxygen sensor and fan,
- the fuel pipes.

Remove:

- the injection computer support plate having disconnected the 55 track connector and the impact switch connector,



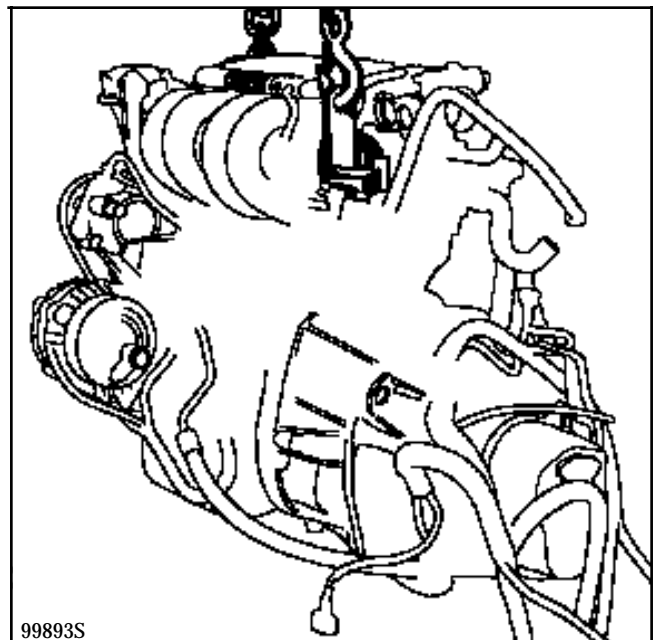
- the AC pipe mountings (if fitted), and the flange (8) and rest the assembly on the engine,



- the power assisted steering pipe mountings on the engine,
- the power assisted steering pump belt,
- the power assisted steering pulley,
- the power assisted steering pump bolts.

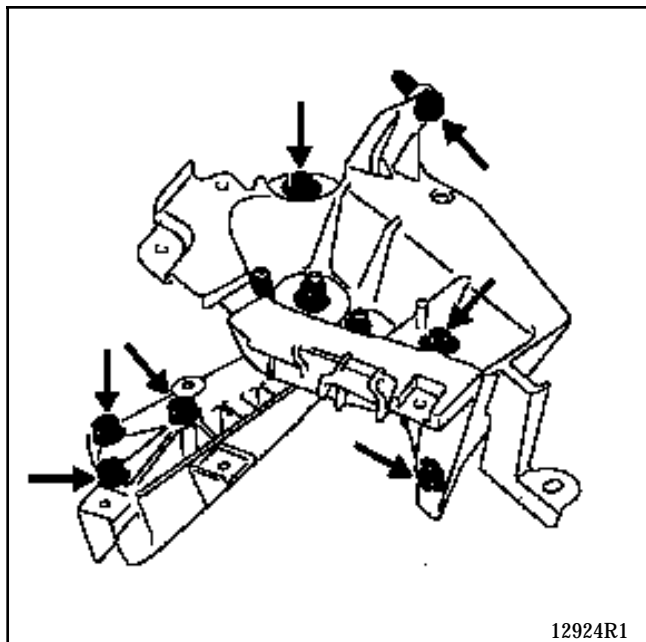
Release the power assisted steering pump unit.

Attach the load positioner to the engine lifting rings.



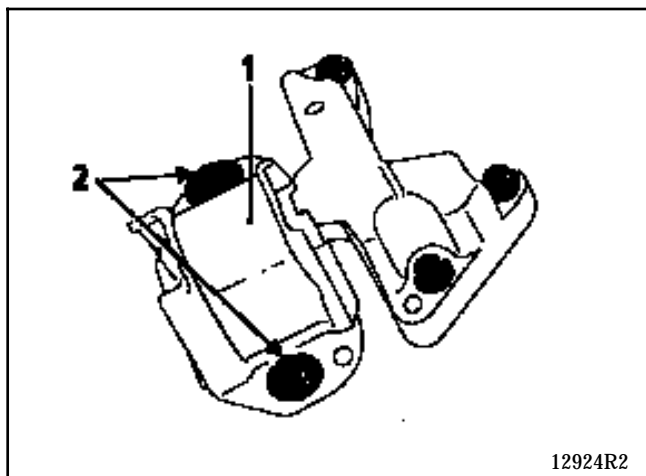
Remove:

- the gearbox side support,



- the mounting bolts (2) of the engine rubber mounting pad (1).

Note the position of the engine mounting pad(1) in relation to the body.



Remove the engine and transmission assembly after taking the power assisted steering unit out of the engine compartment and protecting the radiator.

### REFITTING (Special notes)

Refitting is the reverse of removal.

Tighten the suspended engine mounting bolts to the recommended torque (see section **19 "Suspended engine mounting"**).

Put **RHODORSEAL 5661** on the driveshaft roll pin hole.


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

Refit the power assisted steering pump belt (see section **07 "Accessories belt tension"**).

Carry out the following operations:

- fill the gearbox with oil,
- top up the engine oil level (if necessary),
- fill and bleed the coolant circuit (see section **19 "Filling and bleeding"**).

SPECIAL TOOLING REQUIRED		
B. Vi.	31-01	Set of punches for roll pins
Mot.	1040-01	Dummy sub-frame for removing and refitting engine and transmission assembly
Mot.	1202	Hose clip pliers
Mot.	1448	Hose clip pliers extension
Mot.	1311-06	Tool for removing the fuel pipe
Mot.	1379	Tool for retaining engine on sub-frame
T. Av.	476	Ball joint extractor
T. Av.	1233-01	Tool for sub-frame and axle assembly

TIGHTENING TORQUES (in daN.m)		
Shock absorber base bolts	18	
Track rod end	3.7	
Front sub-frame mounting bolt	6.2	
Rear sub-frame mounting bolt	10.5	
Driveshaft gaiter mounting bolt	2.5	
Mounting nut for rubber engine mounting pad on left suspended engine mounting	6.2	
Mounting bolt for front right suspended engine mounting on the engine	6.2	
Mounting bolt for front right suspended engine mounting on the body	6.2	
Steering shaft yoke bolt	2.5	
Wheel bolt	9	

REMOVAL

- Put the vehicle on a two post lift.
- Remove the battery and the engine undertray.

Drain:

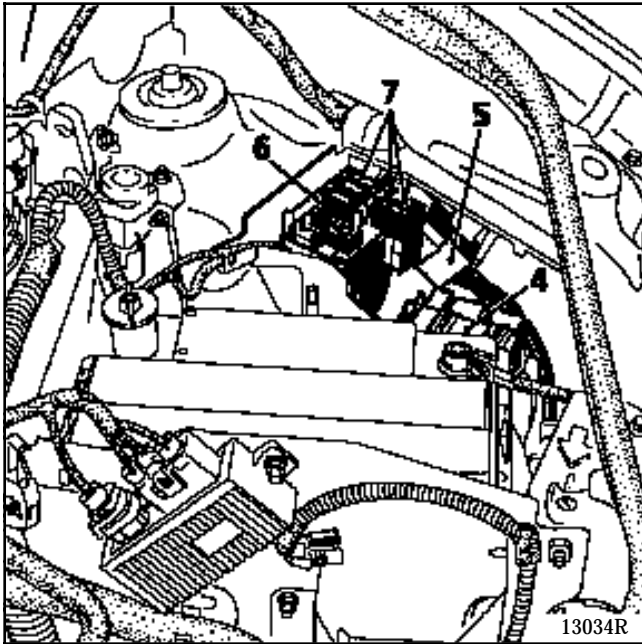
- the coolant circuit (disconnect the lower radiator hose ),
- the gearbox oil (if necessary),
- the engine oil (if necessary).

Remove:

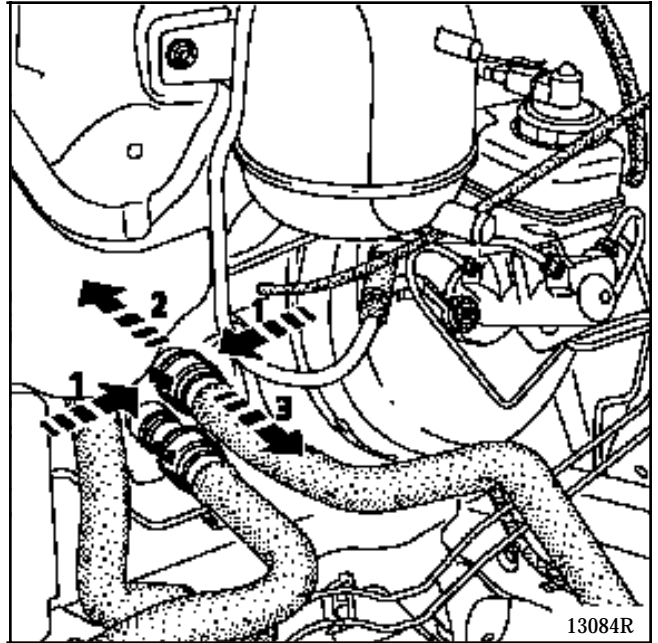
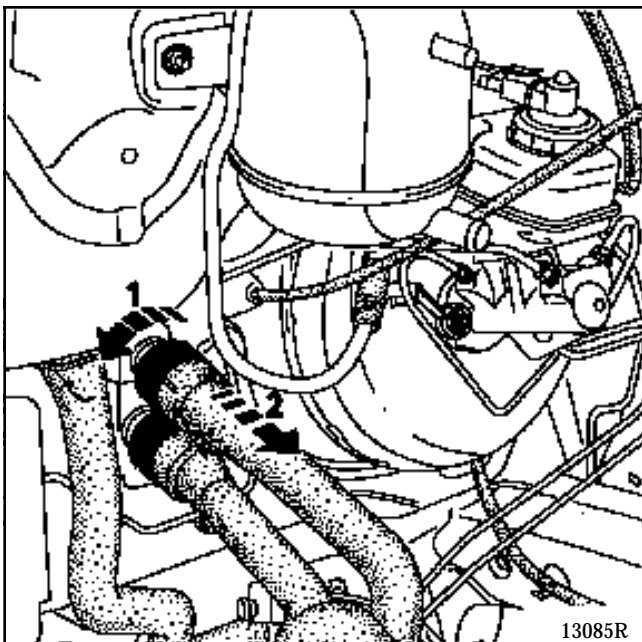
- the wheels,
- the air intake pipe,
- the upper radiator mountings,
- the expansion bottle and fix it to the engine,
- the power assisted steering fluid reservoir, and secure it onto the engine.

Disconnect:

- the accelerator,
- the canister pipe,
- the brake servo pipe,
- the oxygen sensor connector,
- the fuel pipes,
- the relay board (4), the connector (5) and the fuse mounting (6) by removing the fuse holders (7),



- the heater hoses (there are two types of assembly which must be disconnected as shown in the diagrams below),



Remove:

- the shock absorber base bolts ,
- the steering shaft yoke bolt.

### SPECIAL NOTES FOR VEHICLES FITTED WITH DRIVER'S AIR BAG

#### WARNING

In order to avoid any risk of damage to the rotary switch beneath the steering wheel, the following instructions should be followed:

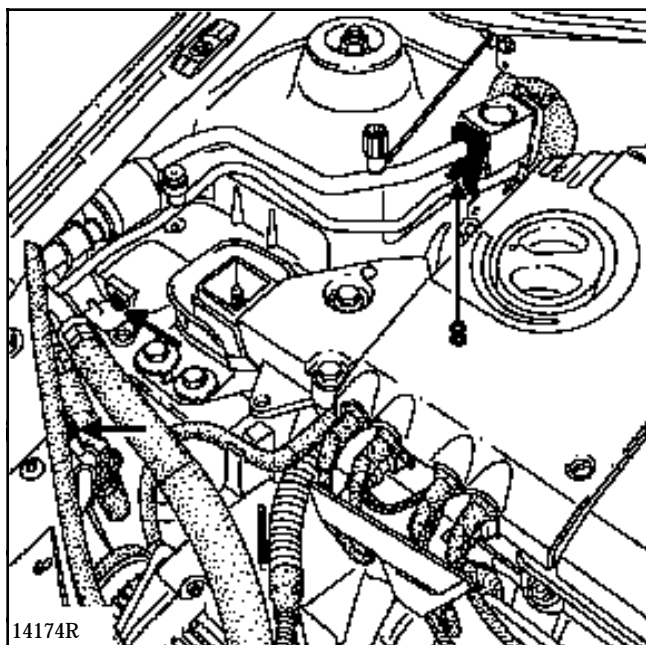
- Before disconnecting the steering column from the rack, the steering wheel **MUST** be immobilised with the wheels straight with the aid of a "steering wheel lock" throughout the operation.
- If there is any doubt about the rotary switch being properly centred, the steering wheel must be removed in order to apply the centring method described in the Technical Note covering the 2nd generation air bag.

**REMINDER:** this kind of work must only be carried out by properly trained and qualified staff.

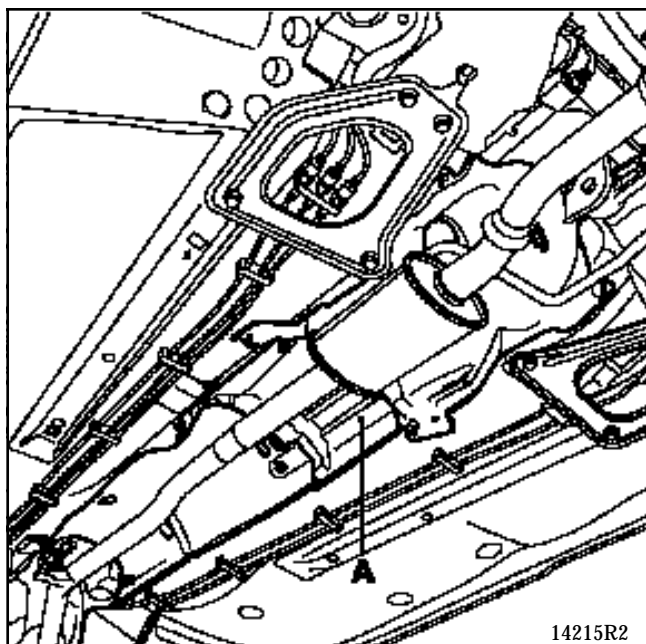
Remove:

- the tie-rods between sub-frame and body,
- the earth strap mounting bolt on the body side,
- the exhaust downpipe mountings.

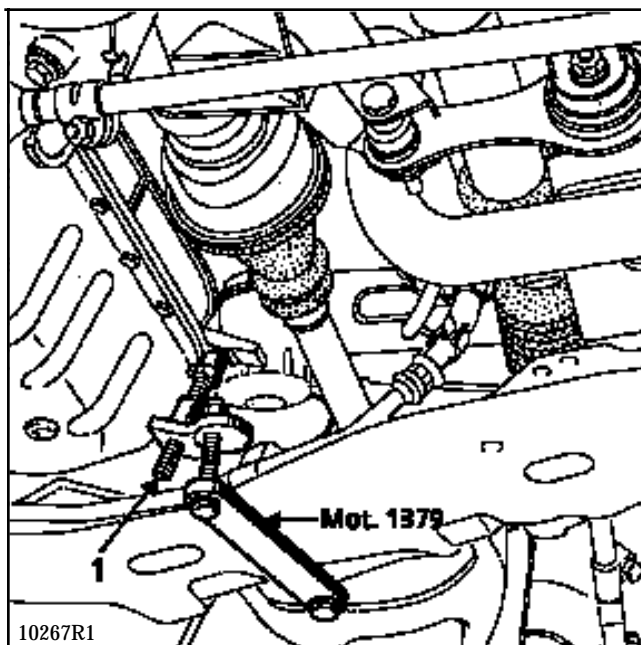
- the AC pipe mountings (if fitted) and the flange (8) and rest the assembly on the engine,



- the heat shield (A) and the gearbox selector rod.



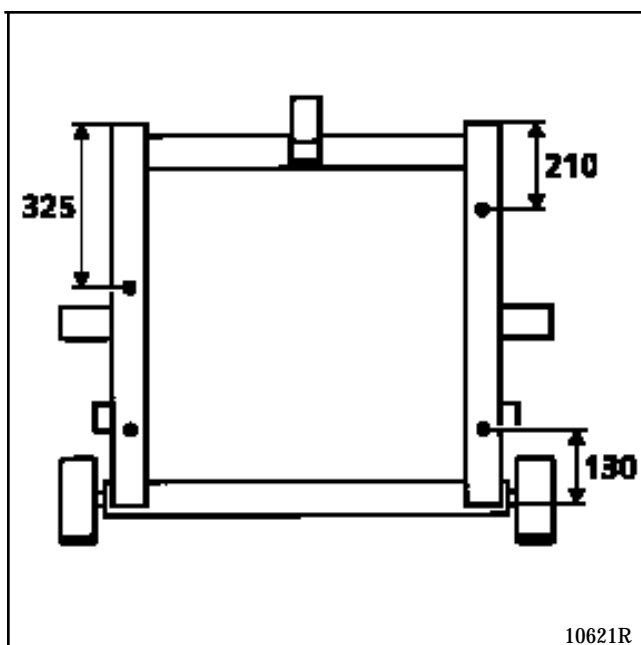
Fit tool **Mot. 1379** onto the sub-frame and take the weight off the right-hand engine mounting, using the threaded rod (1).

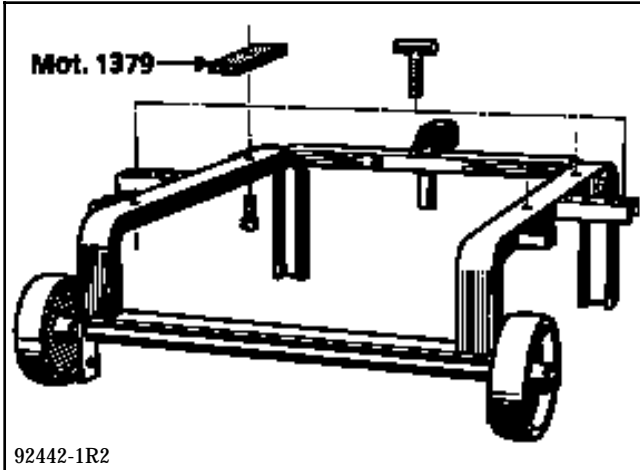


Fit tool **Mot. 1040-01** under the sub-frame having already fitted the shims **Mot. 1379** onto this tool.

Insert a wooden block between the gearbox and the sub-frame.

Diagram showing the holes drilled in tool **Mot. 1040-01** (dimensions in mm).

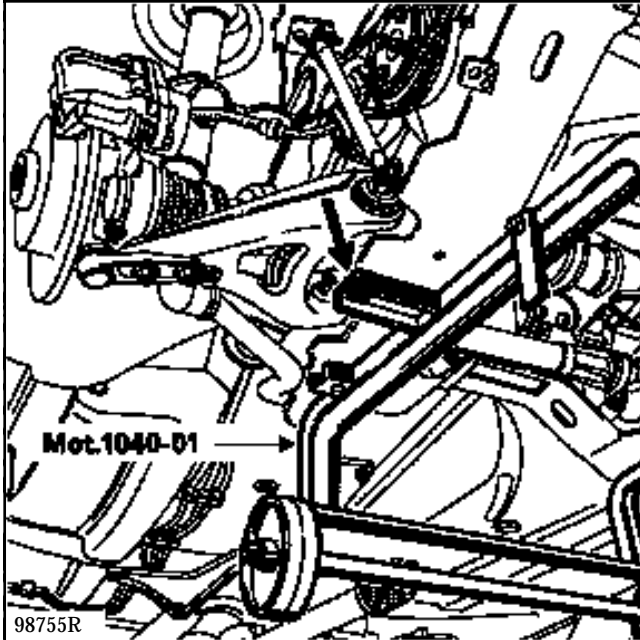




Remove:

- the gearbox suspended engine mounting nut, then tap it with a copper hammer to release the suspended engine mounting stud,
- the suspended engine mounting bolts on the engine.

Lower the lift until the tool touches the ground.



Remove the four mounting bolts of the sub-frame.

Take out the engine and transmission assembly by lifting the body.

### REFITTING (Special notes)

Use tool T. Av. 1233-01 to position the engine and transmission assembly in relation to the body.

Refitting is the reverse of removal.

Correctly refit the heat shields.

Tighten the suspended engine mounting nuts and bolts to the correct torque (see section 19 "Suspended engine mounting").

Apply **Rhodorseal 5661** to the driveshaft roll pin hole.

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

Fill:

- the gearbox with oil (if necessary),
- the engine with oil (if necessary),
- the cooling circuit and bleed it (see section 19 "Filling and bleeding").



## SPECIAL TOOLING REQUIRED

Mot. 1040-01	Dummy sub-frame for removing and refitting engine and transmission assembly
Mot. 1159	Tool for retaining engine on sub-frame
Mot. 1202	Hose clip pliers

## TIGHTENING TORQUES (in daN.m)



Front sub-frame mounting bolt	6.2
Rear sub-frame mounting bolt	10.5
Mounting bolt for front right suspended engine mounting cover on engine	6.2
Mounting nut for front right suspended engine mounting cover	4.4
Mounting nut for rubber engine mounting pad on front left-hand side member support	6.2
Shock absorber base bolts	18
Brake caliper guide bolt	4
Steering shaft yoke bolt	3
Wheel bolt	9

## REMOVAL

Put the vehicle on a two post lift.

Remove the battery and the engine undertray.

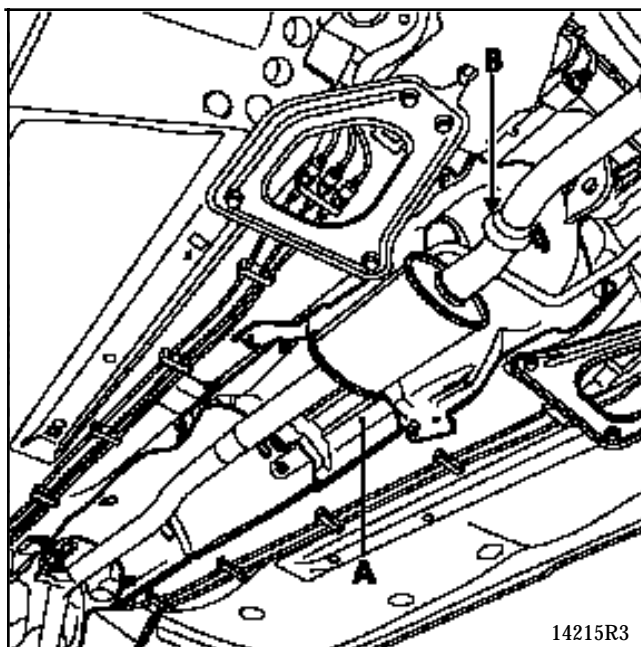
## Drain:

- the cooling circuit through the lower hose on the radiator,
- the gearbox and the engine (if necessary),
- the air conditioning circuit (if fitted) using a filling station.

## Remove:

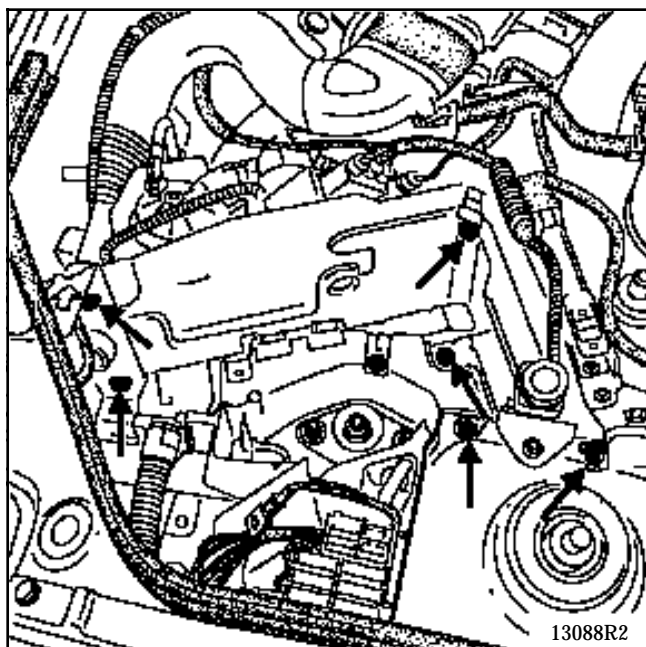
- the front wheels and the wheel arch protectors,
- the radiator grille,
- the front bumper,
- the tie-rods between sub-frame and body,
- the brake calipers (and the **ABS** sensors if fitted) and attach them to the suspension springs,
- the shock absorber base bolts,

- the heat shield (A) and the gearbox selector rod,



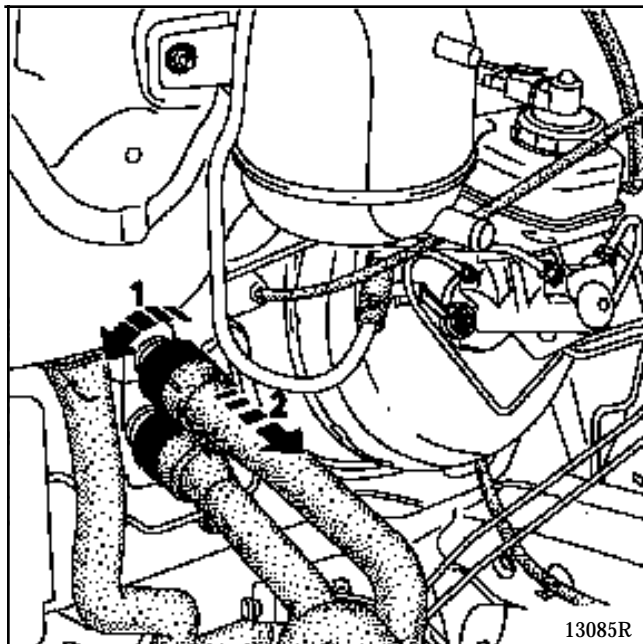
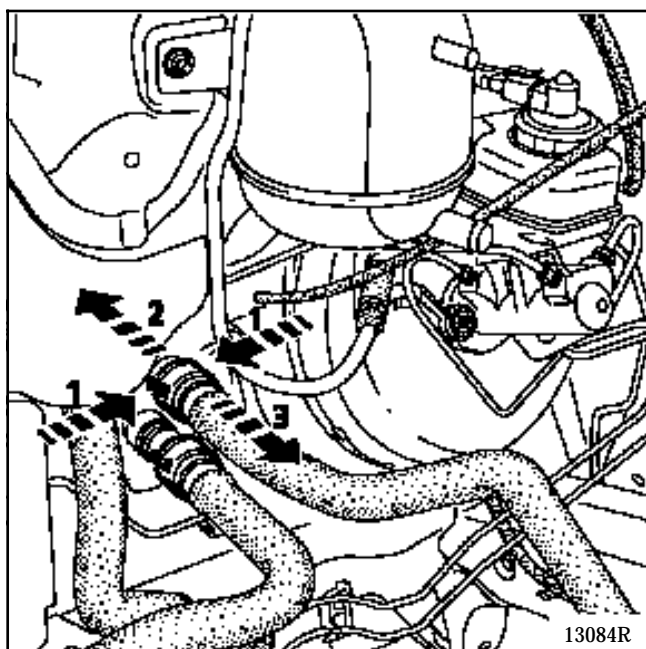
- the exhaust pipe clamp (B) between the catalytic converter and the expansion chamber,
- the earth strap on the gearbox,
- the front bumper,
- the air intake pipe from the air filter,

- the injection computer support after disconnecting the **55 track** connector and that of the impact switch.

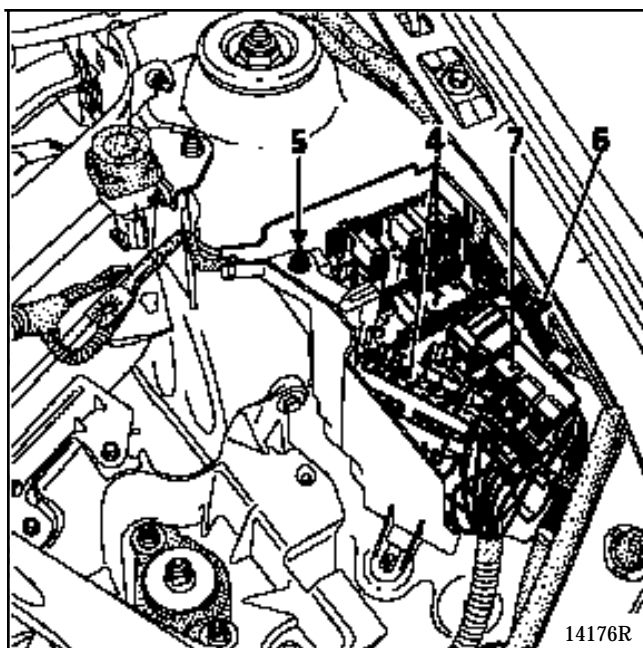


#### Disconnect:

- the hoses on the expansion bottle,
- the brake servo pipe,
- the heater hoses (there are two types of assembly which must be disconnected as shown in the diagrams below),



- the fuse mounting (4) by removing the mounting (5) and the relay board (6) and the connector (7),

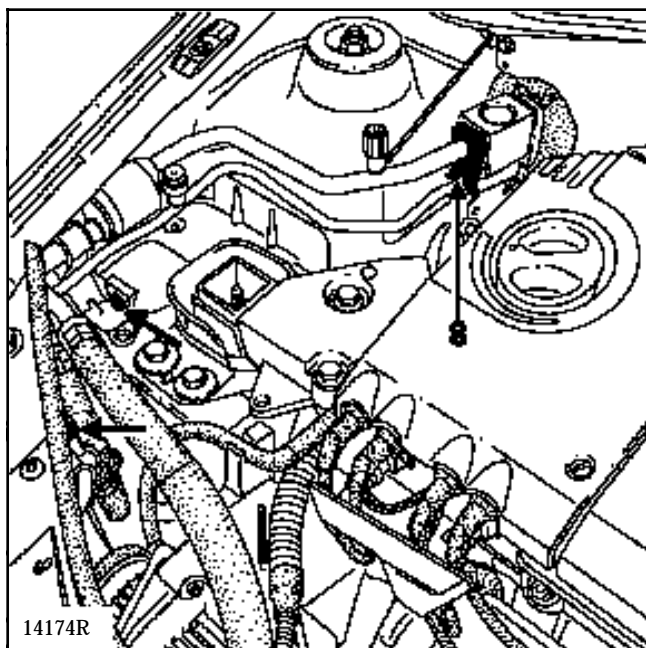


- the canister pipe on the solenoid valve,
- the accelerator and clutch cables.

Unclip the power assisted steering reservoir and place it on the engine.

Remove:

- the air filter assembly and disconnect fuel injection pipes on the gallery ,
- the accelerator and clutch cables,
- the upper mountings of the radiator and attach it to the engine,
- the AC pipe mountings (if fitted) and the flange (8) and rest the assembly on the engine,



- the nut and the eccentric bolt of the steering shaft yoke, after pushing back the guard.

**SPECIAL NOTES FOR VEHICLES FITTED WITH DRIVER'S AIR BAG**

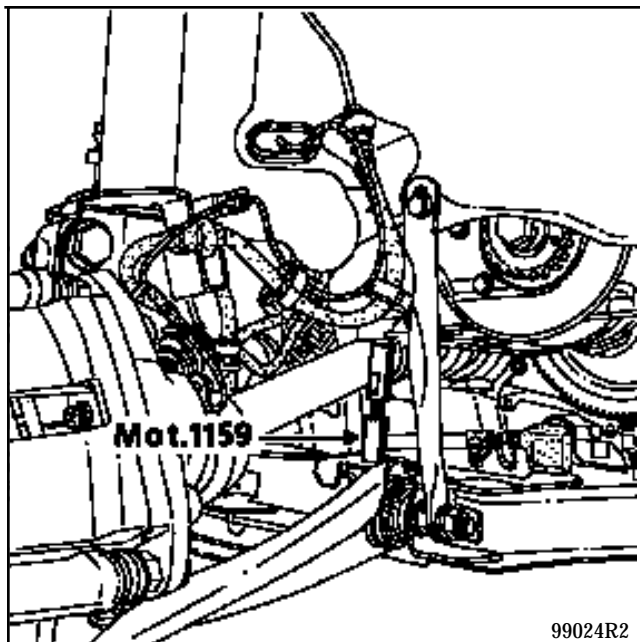
**WARNING**

In order to prevent any risk of damage to the rotary switch beneath the steering wheel, the following instructions should be observed:

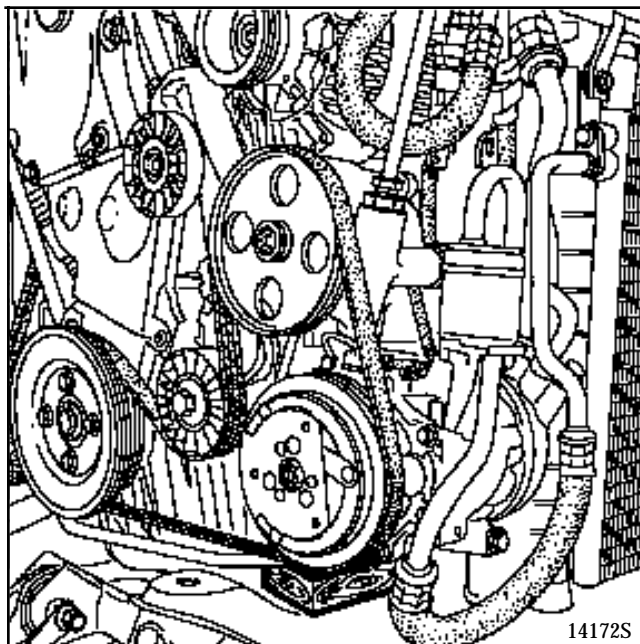
- Before disconnecting the steering column and the rack, the steering wheel **MUST** be immobilised with the wheels straight, using a "steering wheel lock", throughout the operation.
- If there is any doubt that the rotary switch is properly centred, the steering wheel must be removed in order to apply the centring method described in section 88 "Air bag".

**REMINDER:** this kind of work must only be carried out by properly trained and qualified staff.

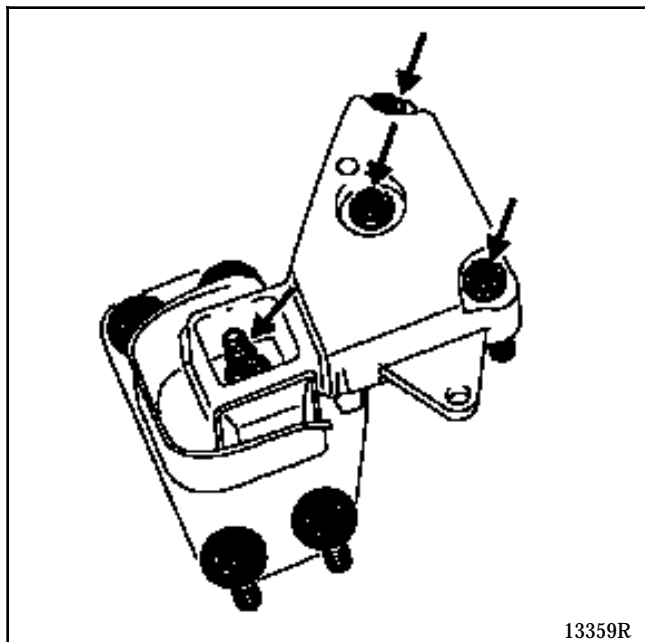
Fit tool Mot. 1159 between the sub-frame and the cylinder block.



Insert a shim between the multi-function support and the sub-frame.



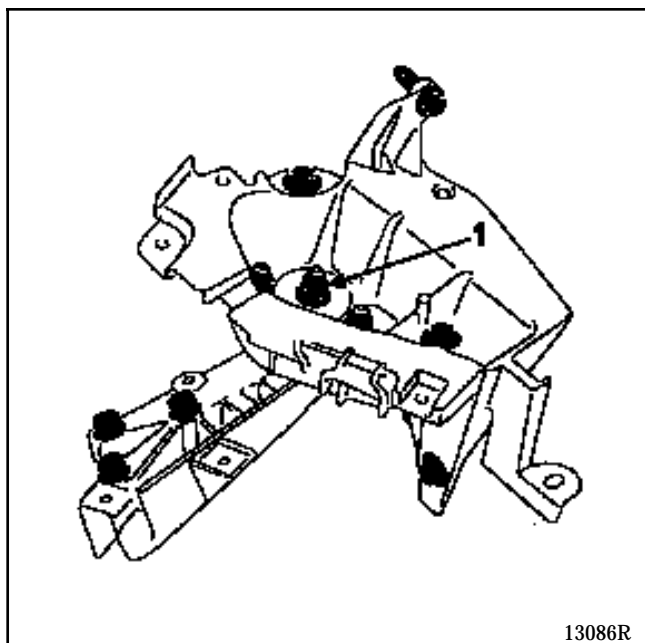
Remove the suspended engine mounting cover.



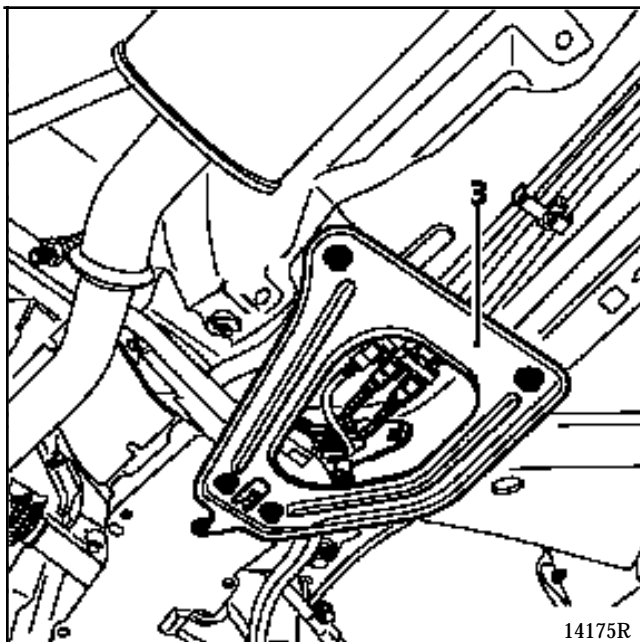
Insert a shim between the gearbox and the sub-frame.

Remove:

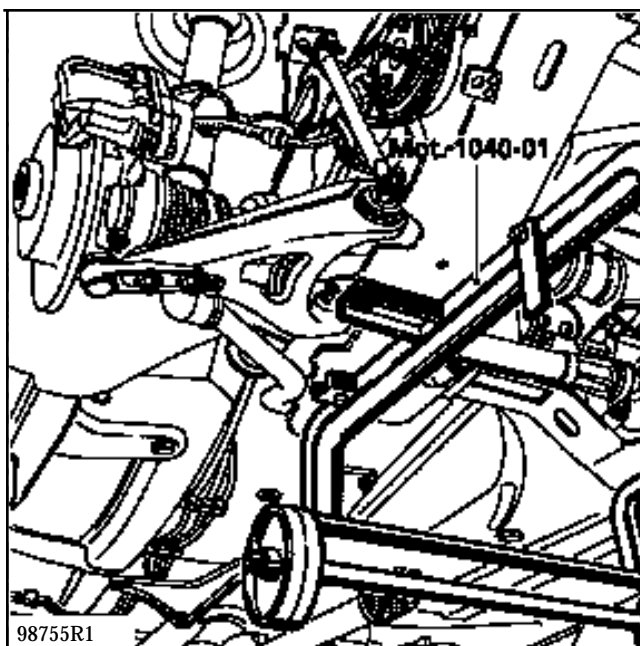
- the nut (1), then tap it with a copper hammer to release the suspended engine mounting stud,



- the tie rods (3).



Fix tool **Mot. 1040-01** underneath the sub-frame.



Lower the lift until the tool touches the ground.

Remove the sub-frame mounting bolts and take out the engine and transmission assembly by lifting the body.

**NOTE :** for any operation requiring separation of the engine, gearbox and sub-frame assembly, take care to mark the position of **Mot. 1159** on the sub-frame.

### REFITTING

The alignment of the sub-frame with the body will be made easier by positioning two threaded rods **Mot. 1233-01** in the two front mountings of the sub-frame on the body.

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

- **6.2 daN.m** at the front,
- **10.5 daN.m** at the rear.

Refitting is the reverse of removal.

Fit the heat shields correctly.

Apply **Loctite FRENBLOC** to the caliper mounting bolts and tighten them to the recommended torque.

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

Fill:

- the engine and gearbox with oil, if necessary,
- the cooling circuit and bleed it (see section **19** "**Filling and bleeding**").

### SPECIAL TOOLING REQUIRED

Mot. 1040-01	Dummy sub-frame for removing and refitting engine and transmission assembly
Mot. 1159	Tool for retaining engine on sub-frame
Mot. 1202	Hose clip pliers
Mot. 1448	Hose clip pliers extension
Mot. 1311-06	Tool for removing fuel pipe

### TIGHTENING TORQUES (in daN.m)



Front sub-frame mounting bolt	6.2
Rear sub-frame mounting bolt	10.5
Mounting bolt for front right suspended engine mounting cover on engine	6.2
Mounting nut for front right suspended engine mounting cover	4.4
Mounting nut for rubber engine mounting pad on front left-hand side member support	6.2
Shock absorber base bolt	18
Brake caliper guide bolt	4
Steering shaft yoke bolt	3
Wheel bolt	9

### REMOVAL

Put the vehicle on a two post lift.

Remove the battery and the engine undertray.

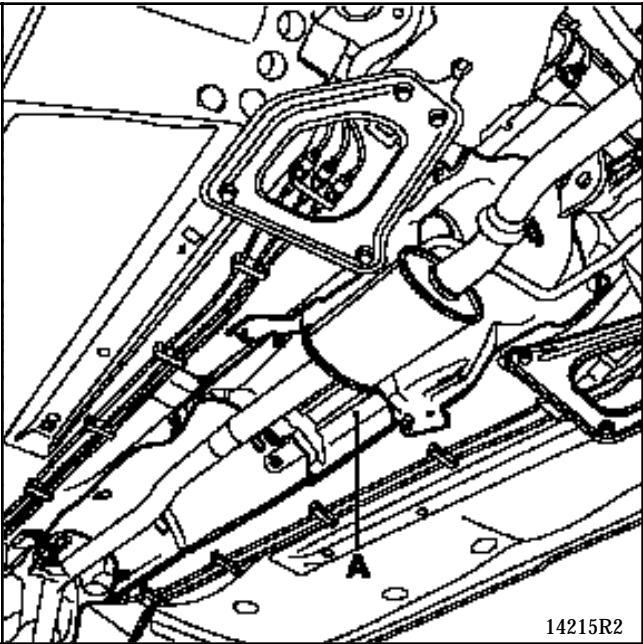
Drain:

- the cooling circuit through the lower hose on the radiator,
- the gearbox and the engine (if necessary),
- the air conditioning circuit (if fitted) using a filling station.

Remove:

- the front wheels,
- the tie-rods between sub-frame and body,
- the brake calipers (and the **ABS** sensors if fitted) and attach them to the suspension springs,
- the shock absorber base bolts,

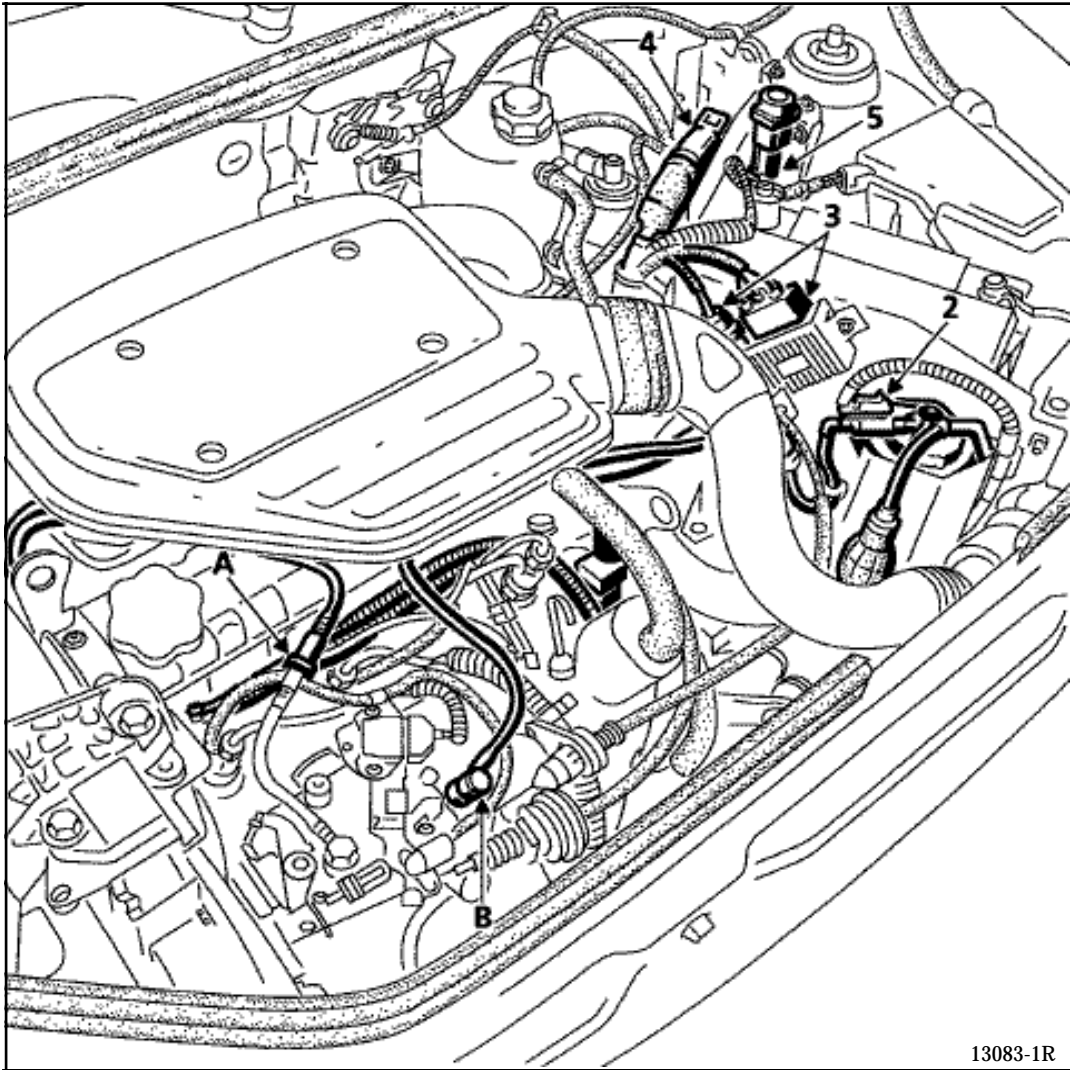
- the heat shield (A) and the gearbox selector rod,



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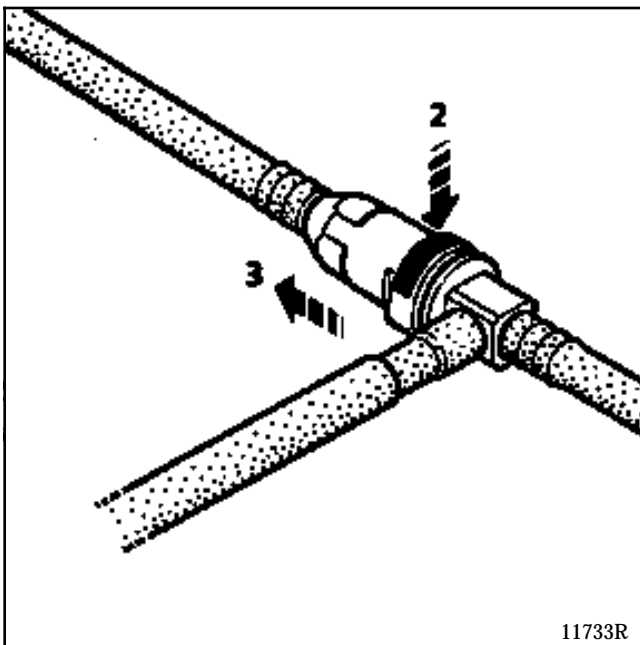
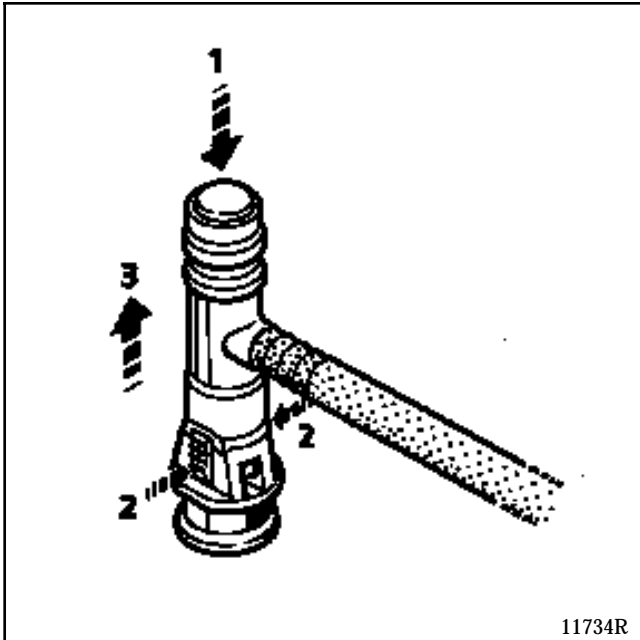
- the exhaust downpipe,
- the earth strap on the gearbox,
- the front bumper,
- the air intake pipe from the air filter,
- the fuel supply and return unions (A) and (B),
- the connectors (2), (3), (4) and (5).

Unclip the fuel pipes from the air filter unit and the timing cover and unclip the diesel filter from its support and move the assembly to one side.

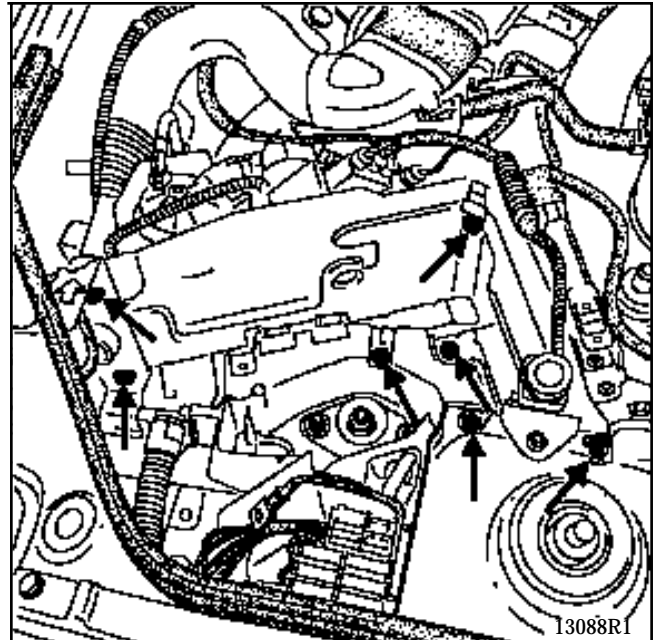


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For the locking of the quick release unions, refer to the diagrams below:

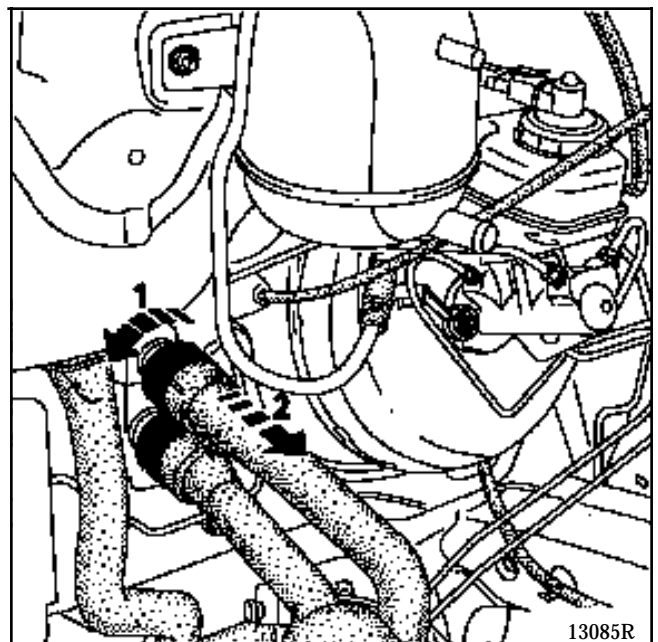


Remove the computer support.

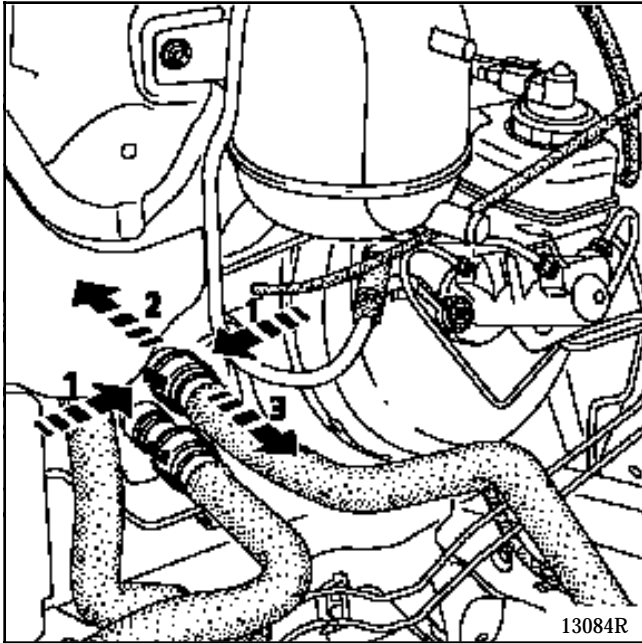


Disconnect:

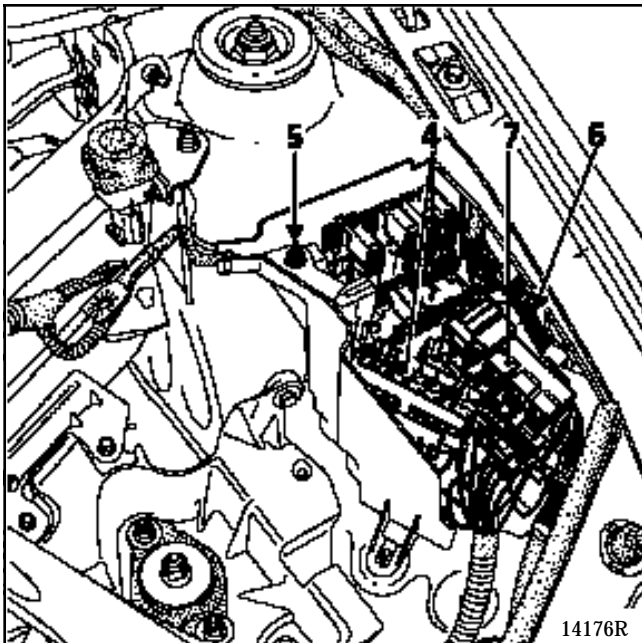
- the hoses on the expansion bottle,
- the brake servo pipe,
- the heater hoses (there are two types of assembly to be disconnected, as shown in the diagrams below),







- the fuse mounting (4) by removing the nut (5) and the relay board (6) and the connector (7),

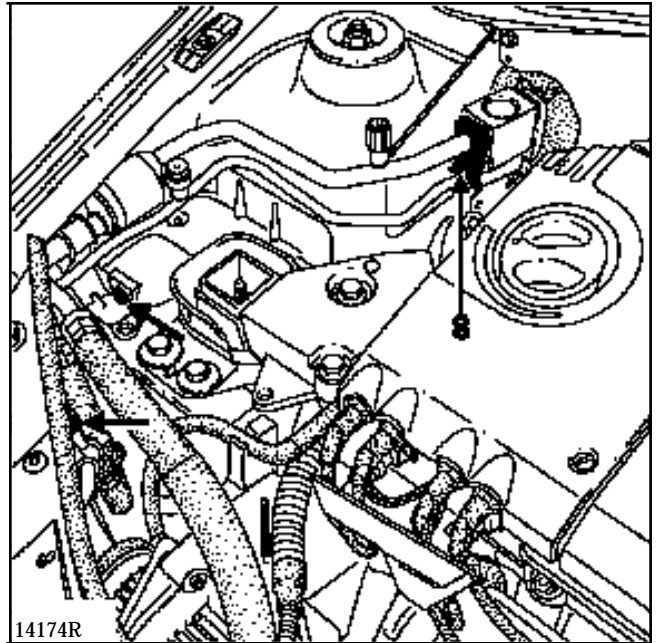


- the accelerator and clutch cables.

Unclip the power assisted steering reservoir and place it on the engine.

Remove:

- the upper mountings of the radiator and attach it to the engine,
- the nut and the eccentric bolt of the steering shaft yoke, after pushing back the guard,
- the AC pipe mountings (if fitted) and the flange (8) and rest the assembly on the engine.



### SPECIAL NOTES FOR VEHICLES FITTED WITH DRIVER'S AIR BAG

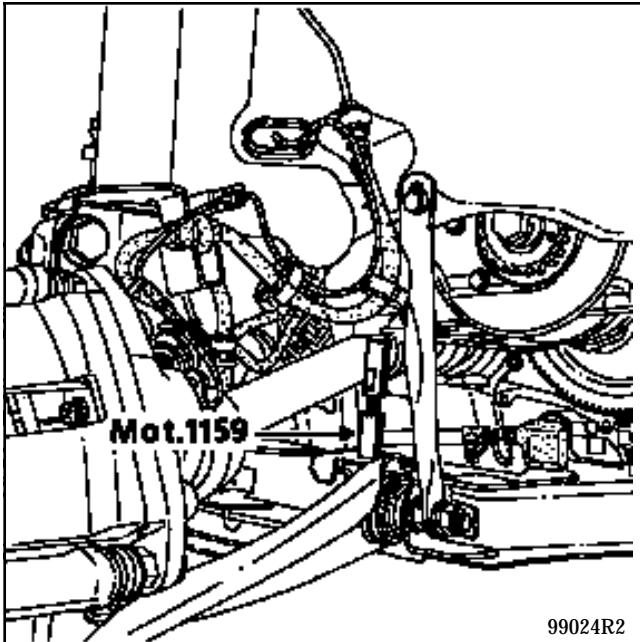
#### WARNING

In order to prevent any risk of damage to the rotary switch beneath the steering wheel, the following instructions should be observed:

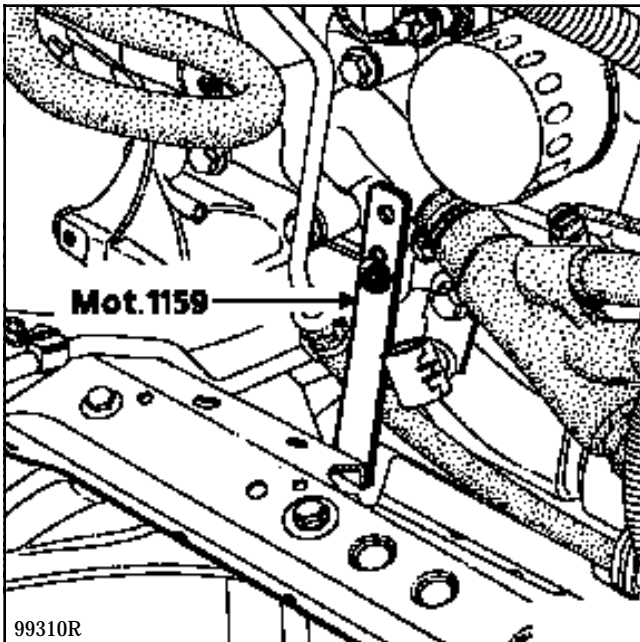
- Before disconnecting the steering column and the rack, the steering wheel **MUST** be immobilised with the wheels straight, using a "steering wheel lock", throughout the operation.
- If there is any doubt that the rotary switch is properly centred, the steering wheel must be removed in order to apply the centring method described in section 88 "Air bag".

**REMINDER:** this kind of work must only be carried out by properly trained and qualified staff.

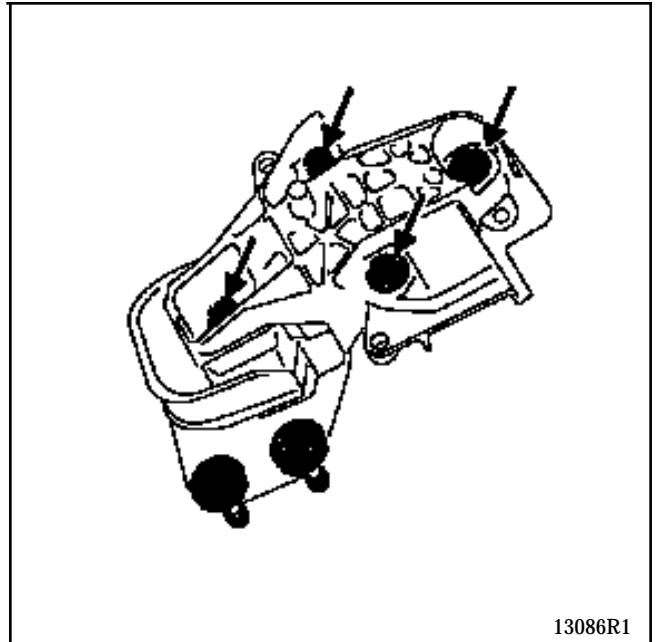
Fit tool **Mot. 1159** between the sub-frame and the cylinder block.



Fit tool **Mot. 1159** in place of the coolant pipe mounting on the cylinder block.

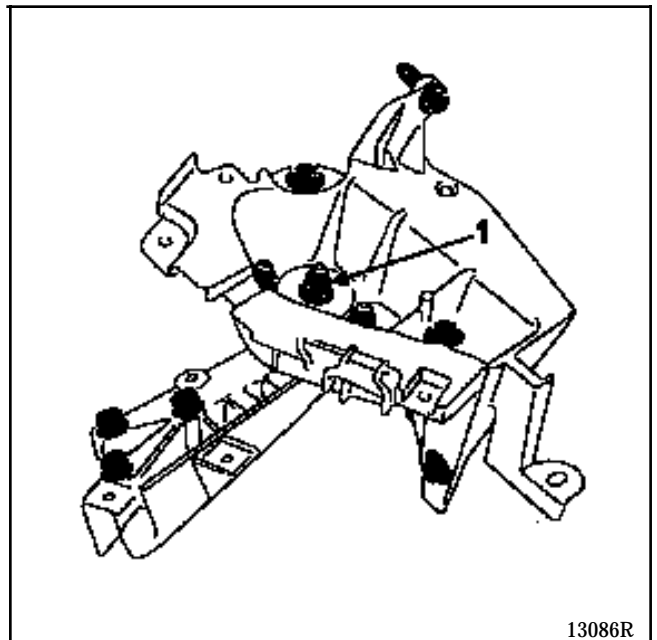


Remove the suspended engine mounting cover.

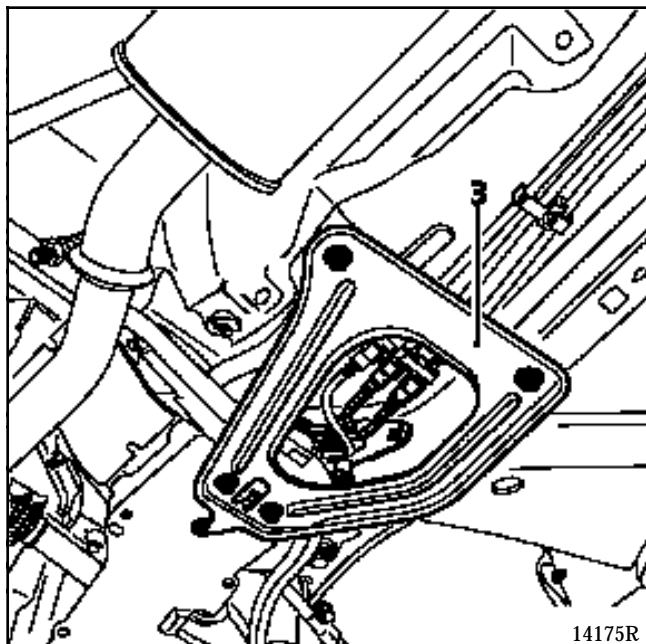


Insert a shim between the gearbox and the sub-frame.

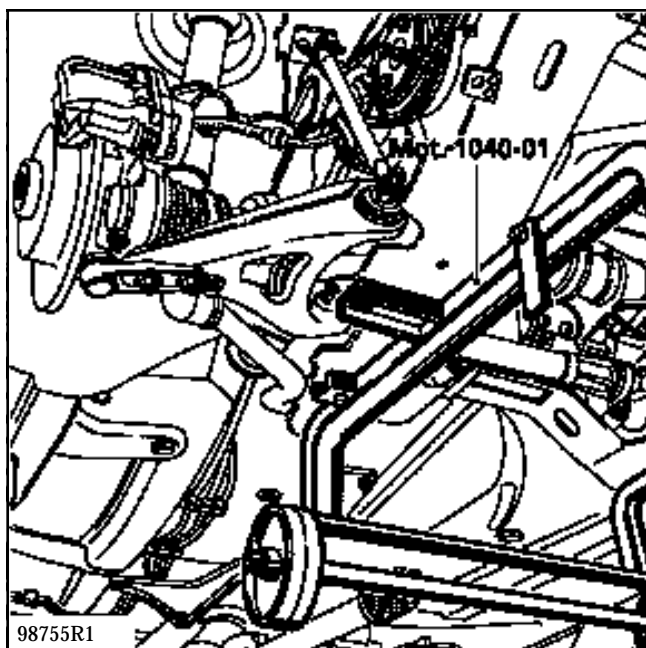
Remove the nut (1), then tap it with a copper hammer, to release the suspended engine mounting stud.



Remove the tie rods (3).



Fit tool **Mot. 1040-01** under the sub-frame.



Lower the lift until the tool touches the ground.

Remove the sub-frame mounting bolts and take out the engine and transmission assembly by lifting the body.

**NOTE :** for any operation requiring separation of the engine, gearbox and sub-frame assembly, take care to mark the position of Mot. 1159 on the sub-frame.

### REFITTING

The alignment of the sub-frame with the body will be made easier by positioning two threaded rods **Mot. 1233-01** in the two front mountings of the sub-frame on the body.

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

- **6.2 daN.m** at the front,
- **10.5 daN.m** at the rear.

Refitting is the reverse of removal.

Fit the heat shields correctly.

Apply **Loctite FRENBLOC** to the caliper mounting bolts and tighten them to the recommended torque.

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

Fill :

- the air conditioning circuit (if fitted),
- the engine and gearbox (if necessary),
- the cooling circuit and bleed it (see section 19 "Filling and bleeding"),
- the power assisted steering circuit (if fitted).

TIGHTENING TORQUES (in daN.m)	
Sump bolt	1

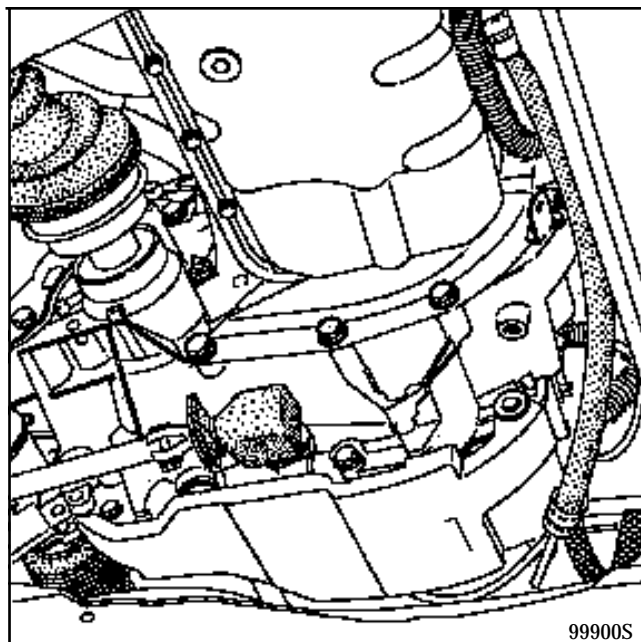
Put the vehicle on a 2 post lift.

Disconnect the battery and remove the engine undertray.

Drain the engine.

Remove:

- the oil level sensor using a 19 mm half-moon wrench,
- the gearbox - engine guard,



- the sump bolts.

Rotate the sump towards the rear of the vehicle in order to release the oil pump strainer from the sump partitioning.

Clean the sealing surfaces without scratching the aluminium.

### REFITTING

Proceed in the reverse order of removal and fit a new gasket.

SPECIAL TOOLING REQUIRED	
Mot. 1233-01	Threaded rods for lowering the sub-frame

TIGHTENING TORQUES (in daN.m)	
Front sub-frame mounting bolt	6.2
Rear sub-frame mounting bolt	10.5
E7J and K7M sump bolt	1
F8Q sump bolt	1.5
Steering shaft yoke bolt	3
Engine tie-bar bolt	6.2
Wheel bolt	9



REMOVAL

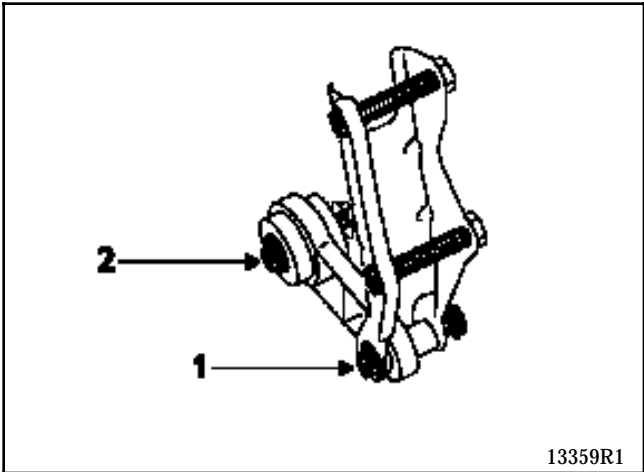
Put the vehicle on a two post lift.

Disconnect the battery and remove the engine undertray.

Drain the engine.

Remove:

- the front right hand wheel and the wheel arch protector,
- the nut and the eccentric bolt of the steering shaft yoke, after pushing back the guard,
- the lower ball joint mountings and the track rod ends for the **E7J** and **K7M** engines,
- the tie-rods between sub-frame and body,
- the gear control on the gearbox side,
- bolt (1), and slacken engine tie-bar bolt (2), without removing it,



- the bumper lower mountings,
- the exhaust downpipe for the F8Q engine.

Special notes for the E7J and K7M engines

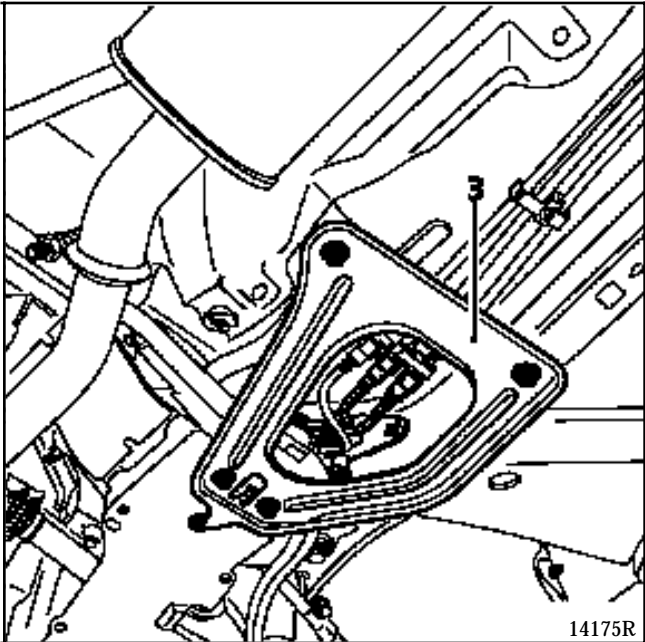
Remove:

- the exhaust manifold heat shield,
- the catalytic converter,
- the power assisted steering pipe mountings on the cylinder block and the multifunction mounting.

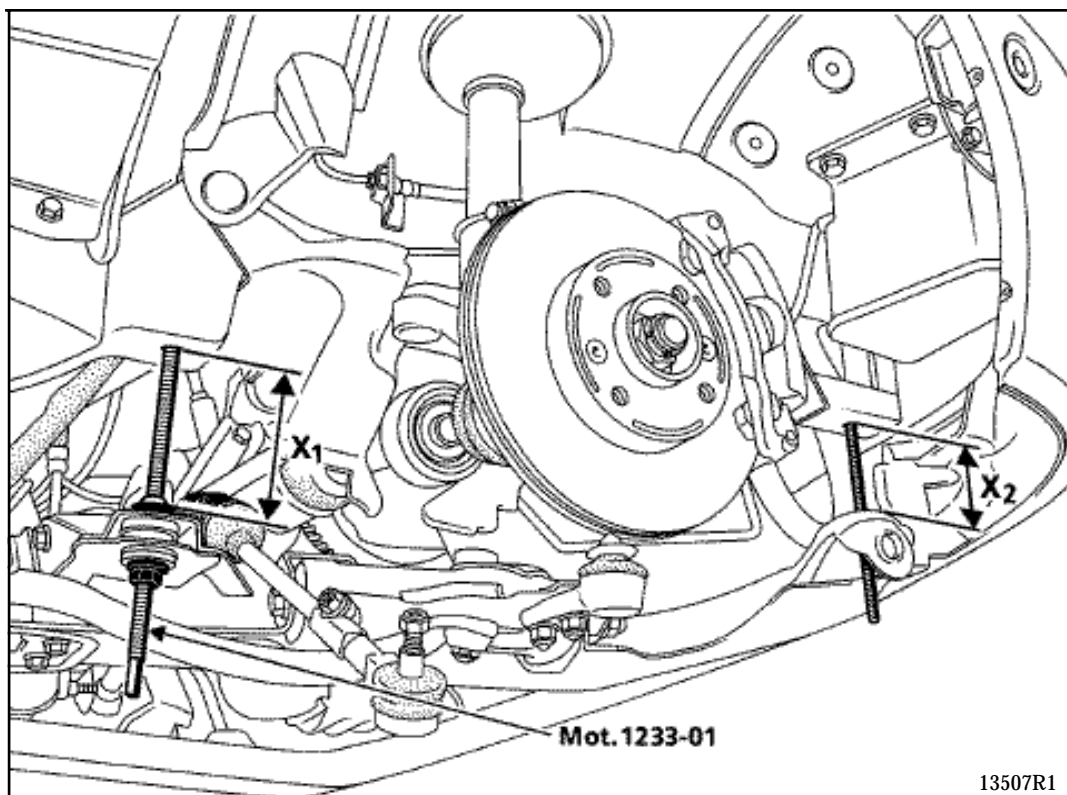
All engine types

Remove:

- the tie rods (3),
- the sub-frame mounting bolts, inserting the threaded rods **Mot. 1233-01** as you go.



Gradually lower the sub-frame with the aid of the threaded rods **Mot. 1233-01** until dimensions **X<sub>1</sub>** and **X<sub>2</sub>** are reached approximately.



**E7J and K7M engines**

**X<sub>1</sub> = 9 cm      X<sub>2</sub> = 13 cm**

**F8Q engine**

**X<sub>1</sub> = 7 cm      X<sub>2</sub> = 9 cm**

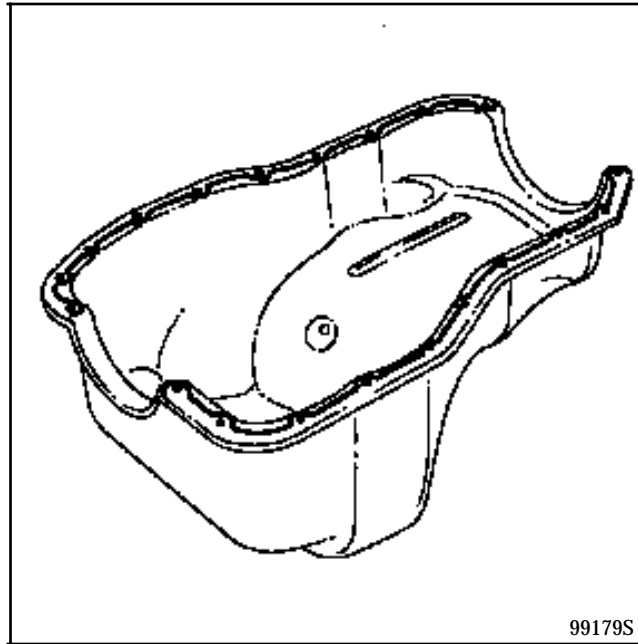
Remove the sump.

### REFITTING

Clean the sump.

#### E7J and K7M engines

Apply an approximately 3 mm wide bead of **RHODORSEAL 5661** as shown in the diagram below.



**Do not forget to replace the two half-moon gaskets on each side of the sump.**

#### F8Q engine

Fit a new after-sales gasket.

Refitting is the reverse of removal.

SPECIAL TOOLING REQUIRED		
Mot. 1054	TDC pin	
Mot. 1273	Tool for checking belt tension	
Mot. 1355	Tool for fitting pump seal	
Mot. 1374	Pump seal extractor	
Mot. 1379	Tool for retaining engine on sub-frame	

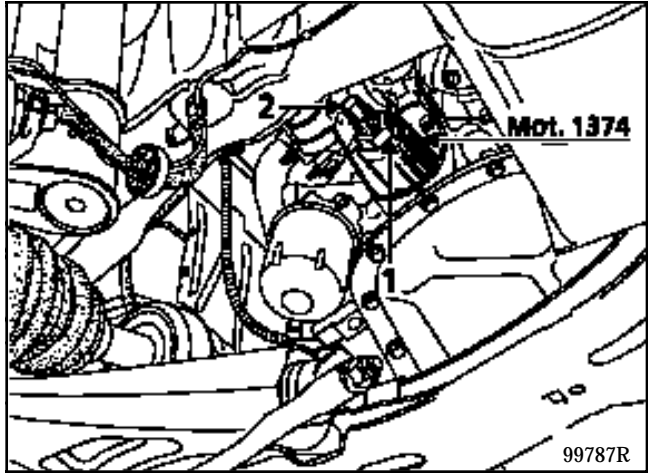
TIGHTENING TORQUES (in daN.m and/or °)		
Crankshaft output mounting bolt	2 + 90°	
Mounting bolt for front right suspended engine mounting on the engine	6.2	
Mounting bolt for front right suspended engine mounting on the body	6.2	
Timing belt tension wheel nut	5	



### REPLACEMENT

#### REMOVAL

Remove the timing belt (see section 11 "Timing belt").  
Use tool **Mot. 1374** to remove the crankshaft seal.

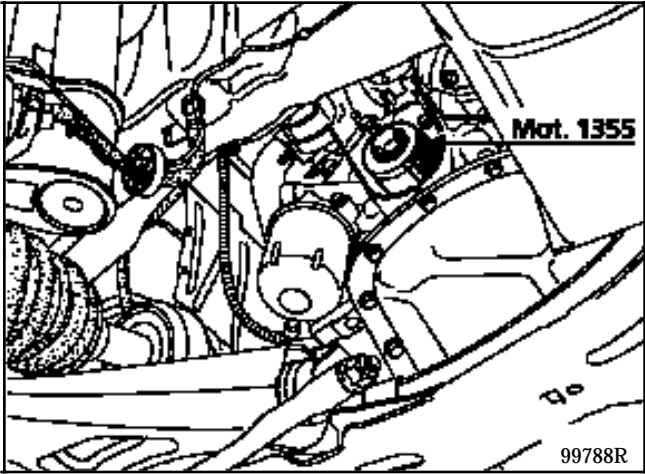


Screw the body of the tool into the seal using nut (1), then use bolt (2) to extract the seal.

#### REFITTING

Refit the new seal onto the crankshaft output without damaging it when passing the timing sprocket drive groove.


Position it using tool **Mot. 1355**.



Refit the new timing belt (see the method described in section 11 "Timing belt").



SPECIAL TOOLING REQUIRED		
Mot. 1054	TDC pin	
Mot. 1273	Tool for checking belt tension	
Mot. 1355	Tool for fitting oil pump	
Mot. 1379	Tool for retaining engine on sub-frame	

TIGHTENING TORQUES (in daN.m and/or °)		
Crankshaft output mounting bolt	2 + 90°	
Mounting bolt for front right suspended engine mounting on the engine	6.2	
Mounting bolt for front right suspended engine mounting on the body	6.2	
Timing belt tension wheel nut	5	

REMOVAL

- Remove:
- the timing belt (see method described in section 11 "Timing belt"),
  - the oil level sensor using a 19 mm half-moon wrench,
  - the oil dipstick,
  - the crankshaft pulley and sprocket,
  - the engine flywheel guard.

Lift the engine and gearbox assembly with the aid of tool **Mot. 1379**.

Remove the sump bolts.

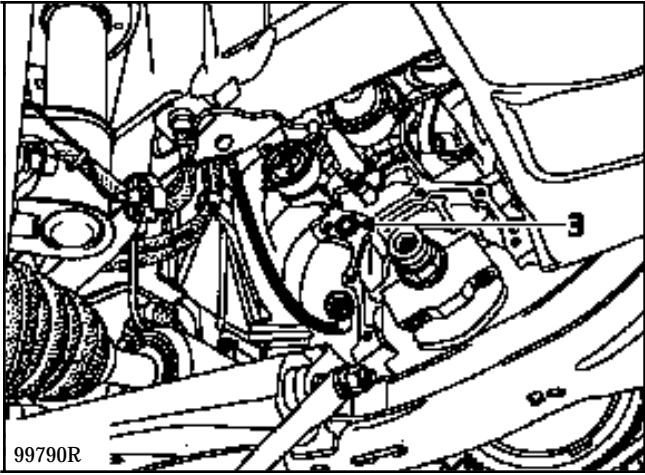
Rotate the sump towards the rear of the vehicle in order to release the oil pump strainer from the sump partitioning.

- Remove:
- the oil pump strainer,
  - the oil pump.

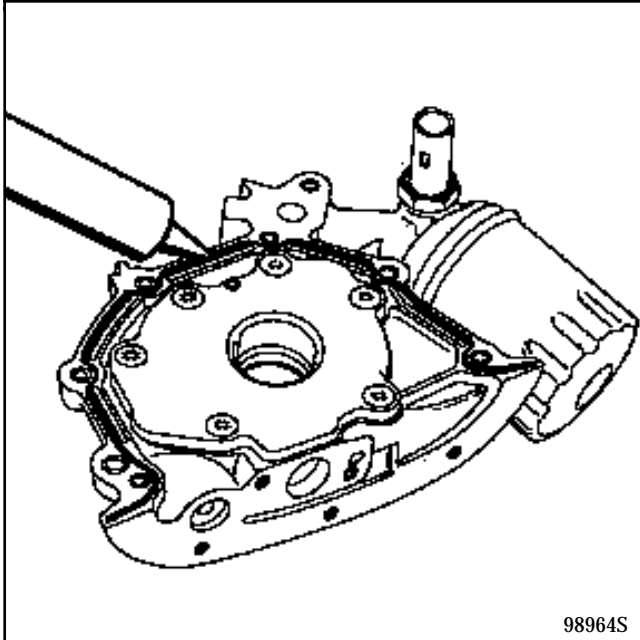
Clean the sealing surfaces without scratching the aluminium.

REFITTING

Replace the oil pressure seal (3).



Apply a bead of **RHODORSEAL 5661** to the sealing surface.

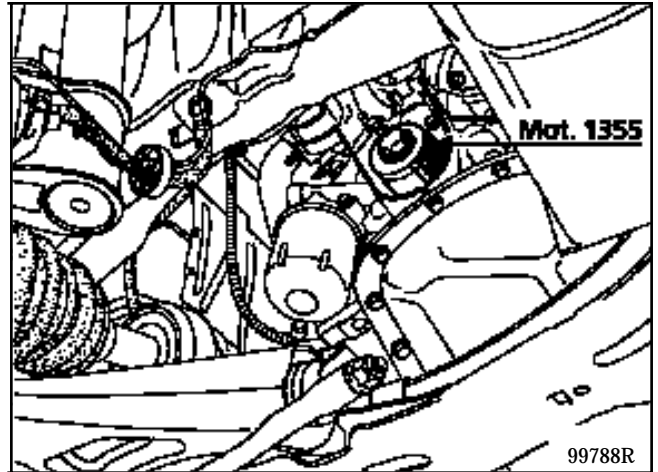


**IMPORTANT:** the oil pump is driven by two studs located on the crankshaft.

Refit:

- the oil pump onto the engine and tighten it to a torque of **0.9 daN.m**,
- the new seal onto the crankshaft output without damaging it when passing the timing sprocket drive groove.

Position it with the aid of tool **Mot. 1355**.



Refit the strainer with a **new** O-ring.

Clean the sealing surfaces (cylinder block, sump).

Refit the sump.

Tighten the bolts to a torque of **1 daN.m**.

Refit:

- the timing belt (see method described in section **11 "Timing belt"**),
- the new alternator and power assisted steering pump belts (see tension values in section **07 "Accessories belt tension"**).

### SPECIAL TOOLING REQUIRED

Mot. 1054	TDC pin
Mot. 1135-01	Tool for tensioning timing belt
Mot. 1273	Tool for checking belt tension
Mot. 1379	Tool for securing engine to sub-frame
Mot. 1386	Tool for pre-tensioning the timing belt

### TIGHTENING TORQUES (in daN.m and/or °)



Crankshaft accessories pulley mounting bolt	2 + 90°
Mounting bolt for front right suspended engine mounting on engine	6.2
Mounting bolt for the right hand suspended engine mounting on the body	6.2
Timing belt tension wheel nut	5

### REMOVAL

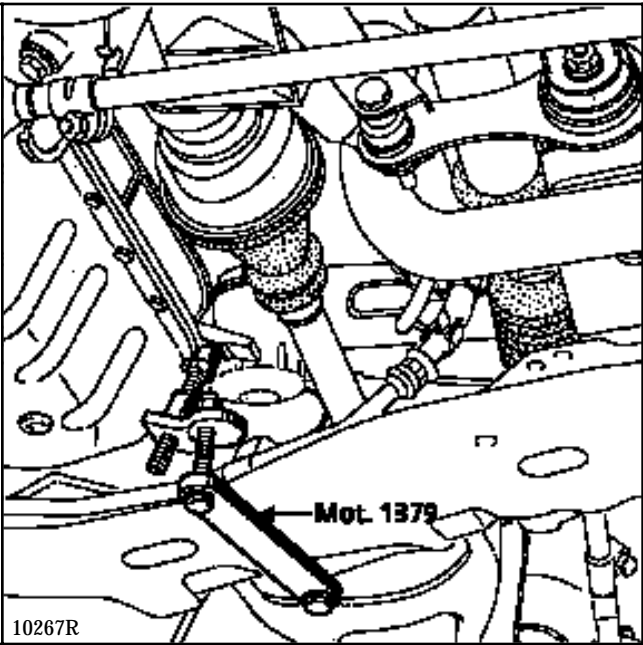
Put the vehicle on a two post lift.

Disconnect the battery.

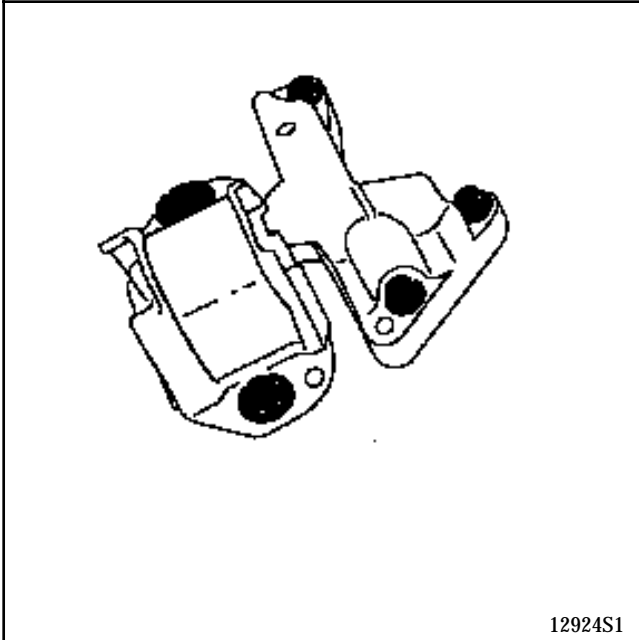
Remove :

- the front right hand wheel,
- the accessories belts,
- the crankshaft pulley.

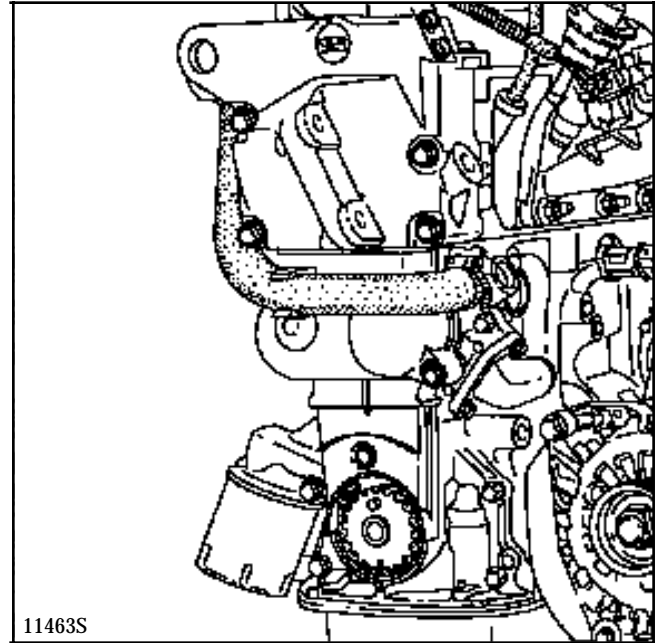
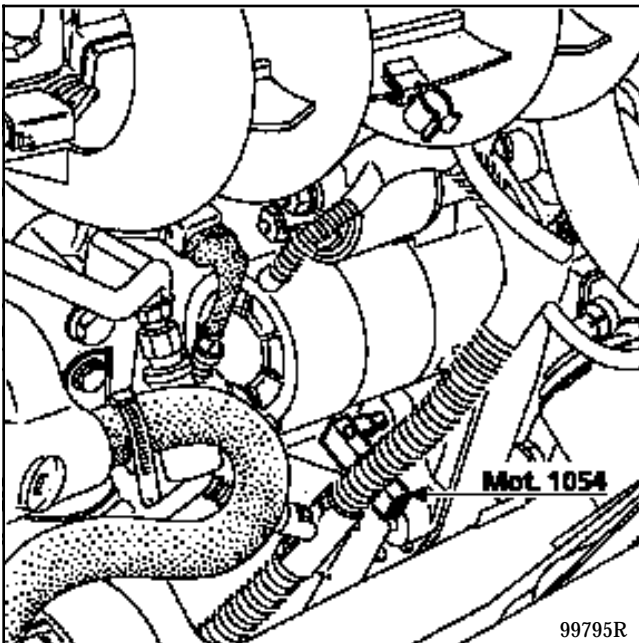
Fit tool Mot. 1379.



Remove the suspended engine mounting.

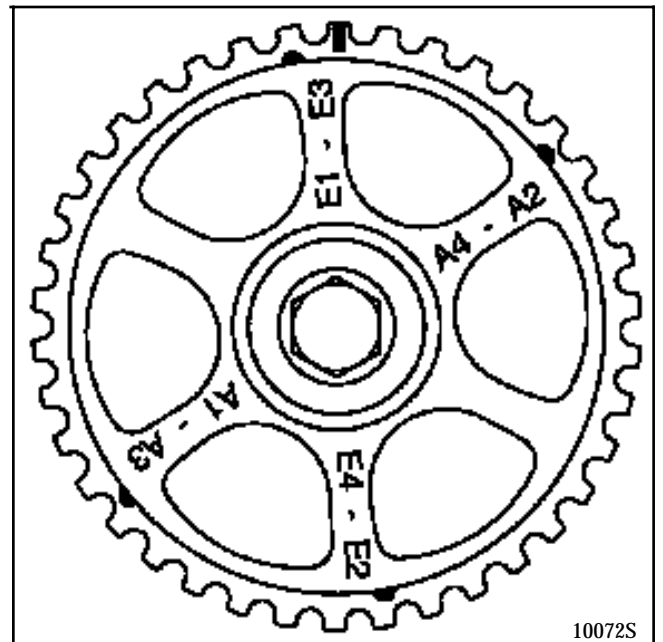


Use tool **Mot. 1054** to pin the engine at TDC by aligning the crankshaft and camshaft sprocket markings with the fixed markings.



Remove the timing cover and the timing belt.

**IMPORTANT:** The camshaft sprocket bears five markings, of which only the rectangular one on the surface of one of the teeth represents TDC; the other markings are intended as an aid for adjusting the valve rockers.



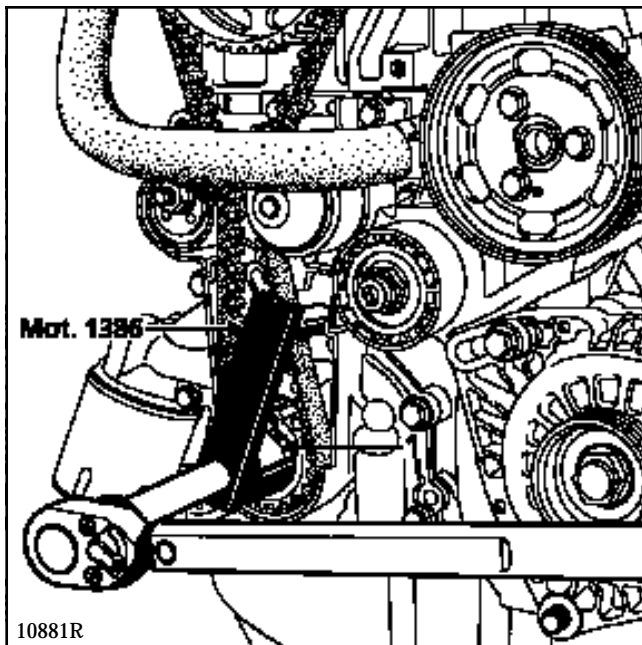
### REFITTING

Line up the markings of the timing belt with those of the camshaft and crankshaft sprockets.

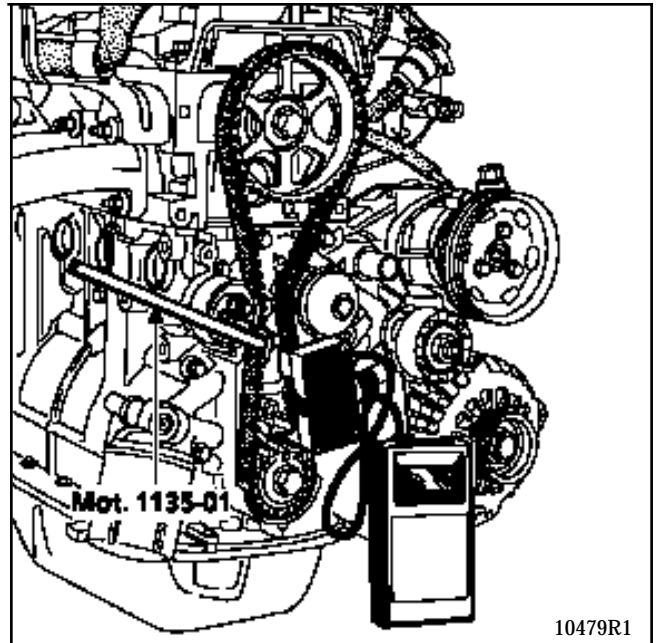
### PROCEDURE FOR TENSIONING TIMING BELT

Remove pin **Mot. 1054**.

Fit the spacer (1) of tool **Mot. 1386** and tighten the crankshaft sprocket bolt.



- a) Fit tool **Mot. 1273** and, using tool **Mot. 1135-01**, turn the tension wheel anti-clockwise until the value of **20 US** is obtained (turn the sensor wheel until it is released, as indicated by three clicks).



Tighten the tension wheel nut.

Turn the engine at least twice (never in the opposite direction to normal operation).

Pin the engine at **TDC**, then remove the pin.

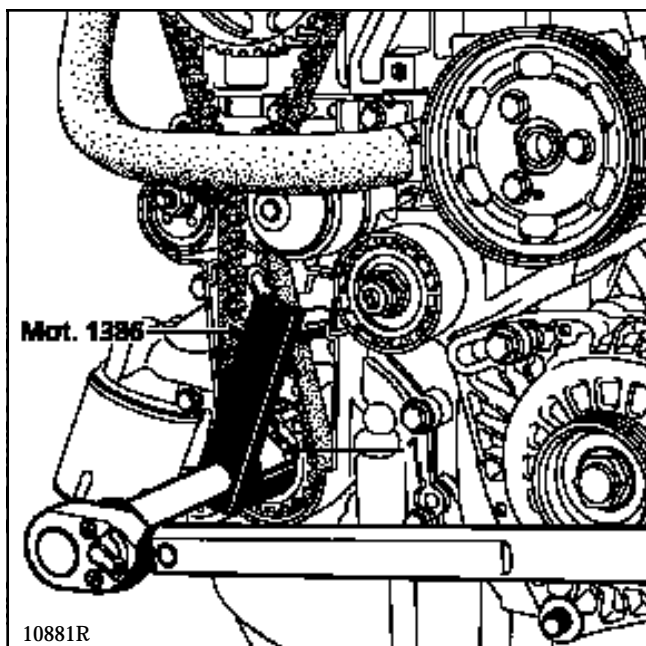
Check that the timing is correctly adjusted on the crankshaft and camshaft side.

Slacken the tension wheel nut and turn it slightly clockwise using tool **Mot. 1135-01** until the two holes of the tension wheel are lined up horizontally.

Retighten the tension wheel nut.

- b) Turn the engine at least twice (never in the opposite direction to normal operation).

Pin the engine at TDC, then remove the pin .  
Using tool **Mot. 1386** and a **torque wrench**, apply a pretensioning torque of **1 daN.m** between the crankshaft sprocket and the water pump.



Fit tool **Mot. 1273** and note the tension value, which should be **20±3 US** (fitting tension), or simply adjust by varying the position of the tension wheel using **Mot. 1135-01** and repeat the tensioning process in (b).

Tighten the tension wheel nut to a torque of **5 daN.m**.

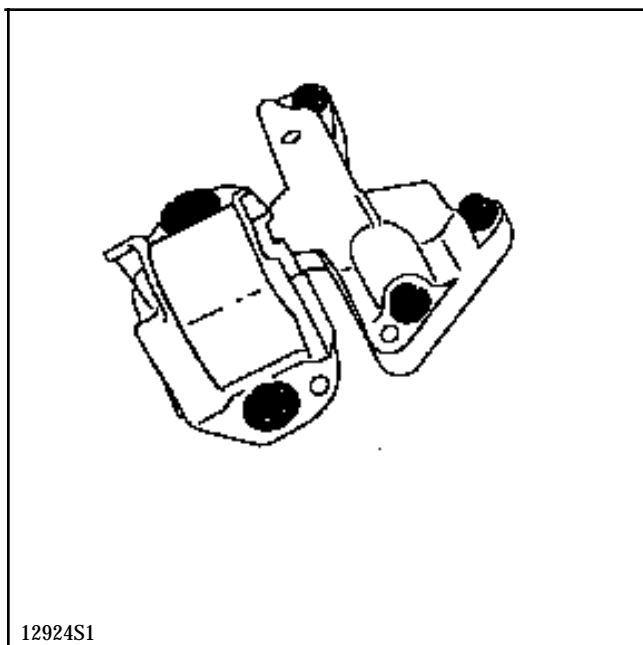
### IMPORTANT

Following each variation of the tension wheel position, turn the engine at least twice before proceeding to measure the tension .

Apply the pretensioning of **1 daN.m** which allows all belt play to be eliminated.

Refitting is the reverse of removal.

Fit the suspended engine mounting .



Refit the accessories belts (see section **07** "Accessories belt tension").

SPECIAL TOOLING REQUIRED		
Mot.	591-02	Index
Mot.	591-04	Angle tightening wrench
Mot.	1135-01	Tool for tensioning timing belt
Mot.	1273	Tool for checking belt tension

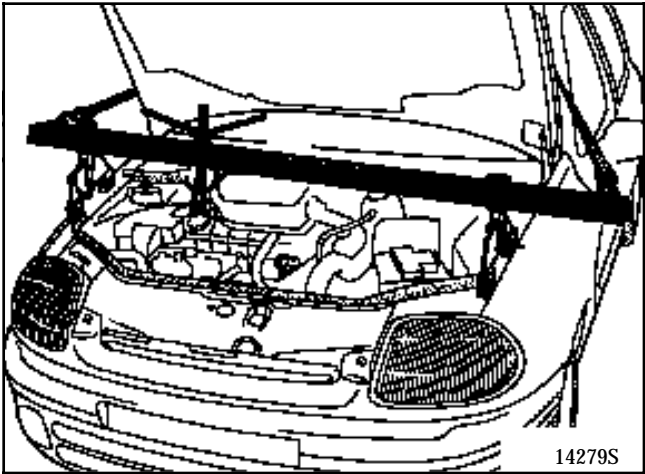
EQUIPMENT REQUIRED	
Engine support tool	
Angular tightening wrench	

TIGHTENING TORQUES (in daN.m and/or °)		
Wheel bolts	9	
Crankshaft pulley bolt	2 + 68° ± 6°	
Tension wheel nut	5	
Bolt for suspended engine mounting cover	6.2	
Nut for suspended engine mounting cover	4.4	



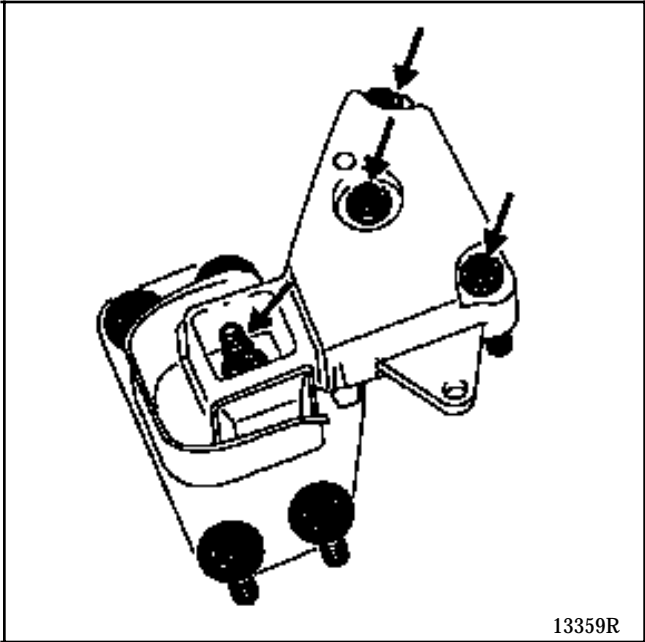
REMOVAL

- Put the vehicle on a two post lift.
- Disconnect the battery.
- Fit the engine support tool.



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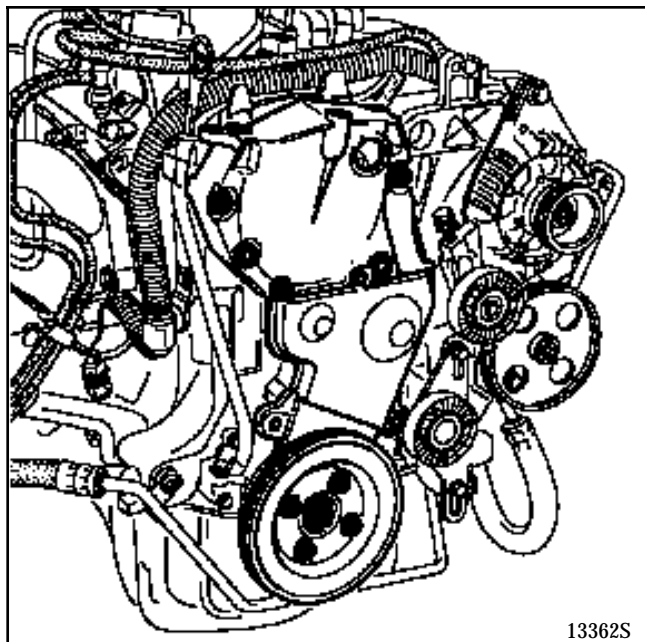
- Remove :
- the front right hand wheel and the wheel arch protector,
  - the suspended engine mounting cover,



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- the alternator and power assisted steering pump belts,

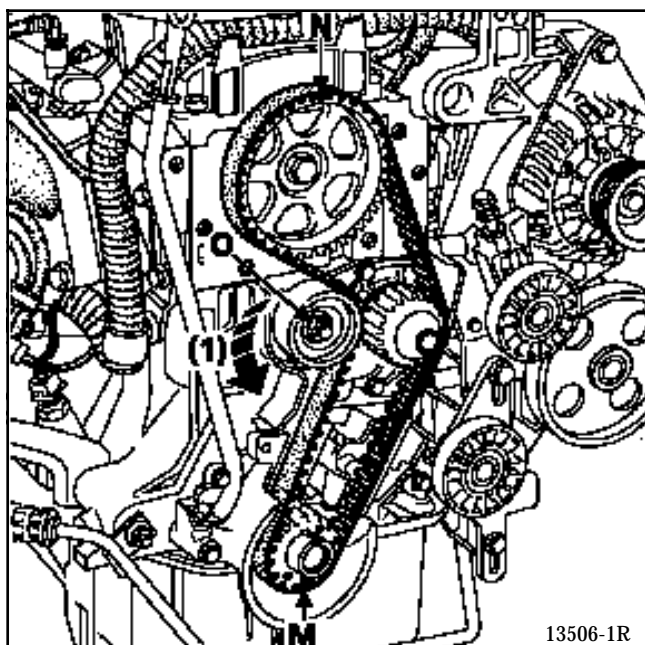
- the crankshaft pulleys and hub,
- the timing covers.



Bring the engine to the setting point.

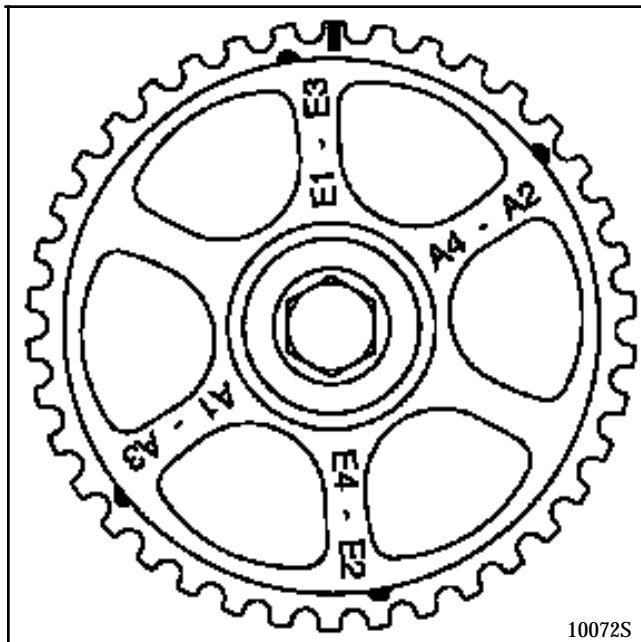
The markings (N) and (M) on the camshaft and crankshaft sprockets must be vertical, as shown below.

Slacken the nut (O) and release the tension wheel, then remove the belt.



(1) Tensioner direction of rotation.

**IMPORTANT:** The camshaft sprocket has five markings, of which only the rectangular one on the surface of one of the teeth represents TDC; the other markings are intended as an aid for adjusting the valve rockers.





### REFITTING

An arrow indicating the direction of rotation and two dashes for setting are marked on the surface of the belt.

Check that the engine is at the setting point.

Bring the belt markings in line with the sprocket markings .

Observe the mounting direction for the belt and begin to position it on the crankshaft sprocket.

Carry out the tensioning of the belt using tool **Mot. 1135-01**, until the fitting value is obtained (see section **07 "Timing belt tension"**).

Tighten the nut (O) of the tension wheel to a torque of **5 daN.m**.

**It is essential to tighten the nut of the tension wheel to a torque of 5 daN. to avoid any slackening which may damage the engine .**

Refitting is the reverse of removal.


Refit the crankshaft pulley, being sure to tighten the bolt to a torque of **2 daN.m** then apply an angle of **68° ± 6°**.

Refit and tension the accessories belts (see section **07 "Accessories belt tension"**).

Never refit a belt once it has been removed.  
Replace it.

SPECIAL TOOLING REQUIRED	
Mot. 1054	TDC pin
Mot. 1273	Tool for checking belt tension

EQUIPMENT REQUIRED
Engine support tool 14mm torx socket

TIGHTENING TORQUES (in daN.m and/or °)		
Wheel bolts	9	
Crankshaft pulley bolts	2 + 115° ± 15°	
Tension wheel nut	5	
Bolt for suspended engine mounting cover	6.2	
Nut for suspended engine mounting cover	4.4	

REMOVAL

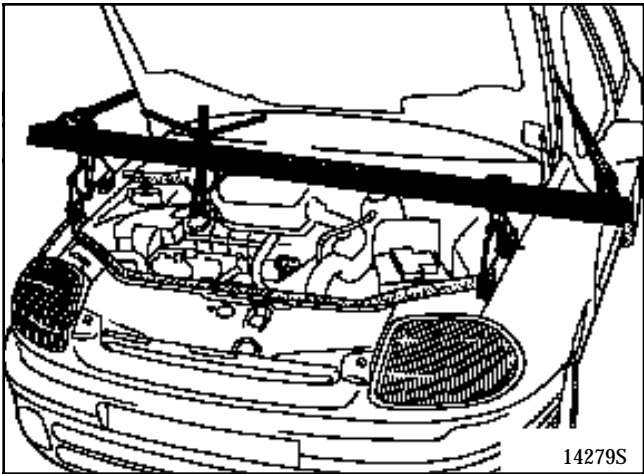
Put the vehicle on a two post lift.

Disconnect the battery.

Remove :

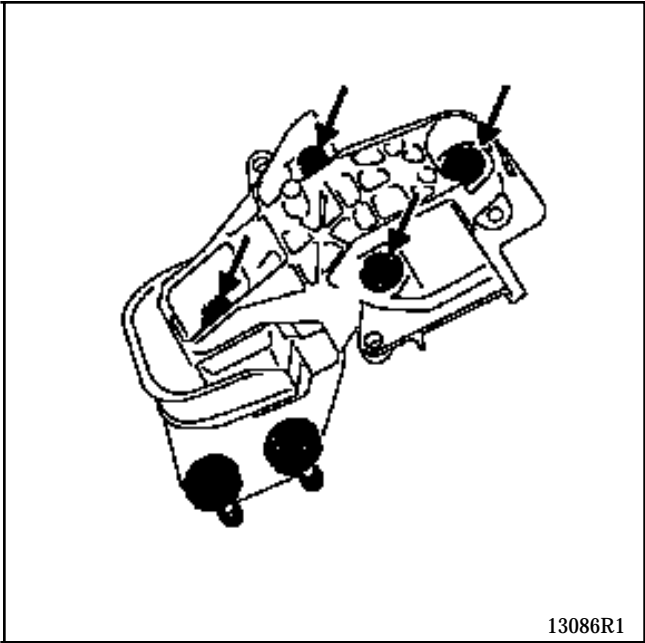
- the front right hand wheel and the wheel arch protector,
- the protective plastic covering over the suspended engine mounting cover.

Fit the engine support tool.



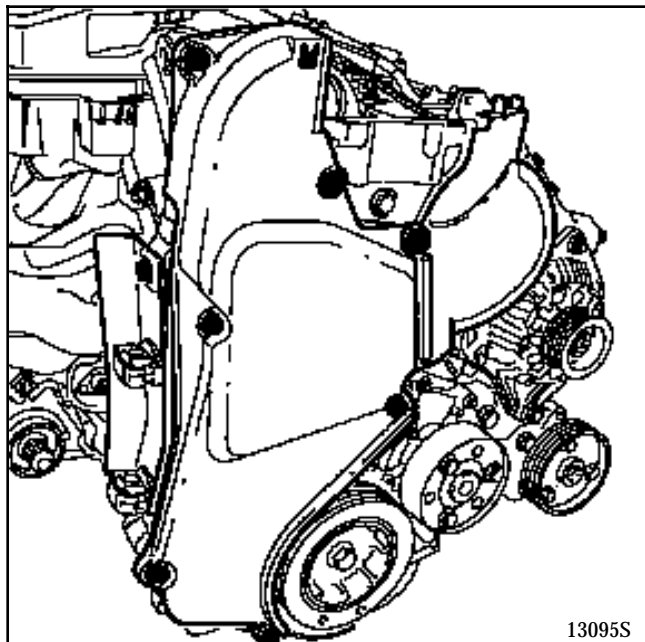
Remove :

- the accessories belt,
- the suspended engine mounting cover.



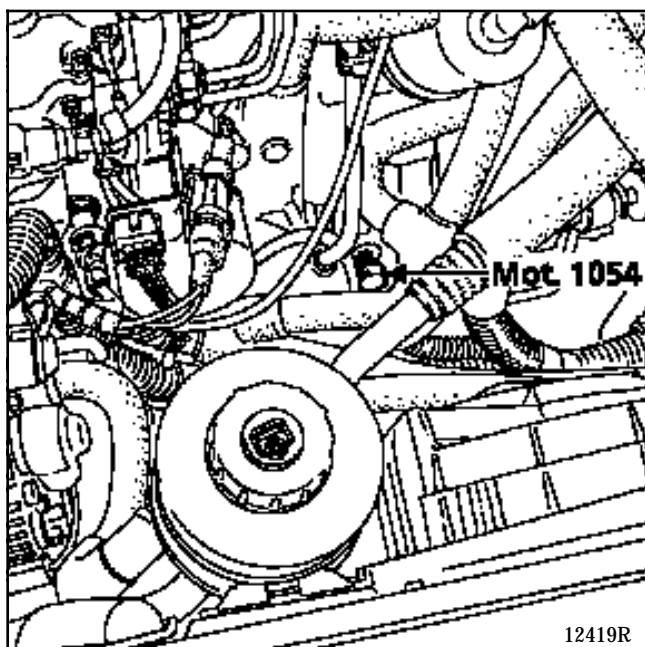
### Adjusting the timing

Turn the crankshaft so that the camshaft timing reference mark is visible through the timing window .



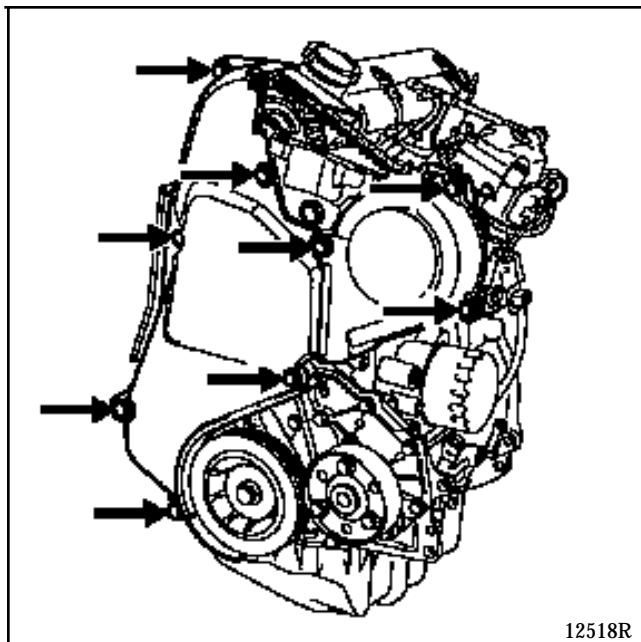
Remove the **TDC** pin plug.

Fit the **TDC** pin, tool **Mot. 1054**.



Remove :

- the timing covers,



- the crankshaft pulley.

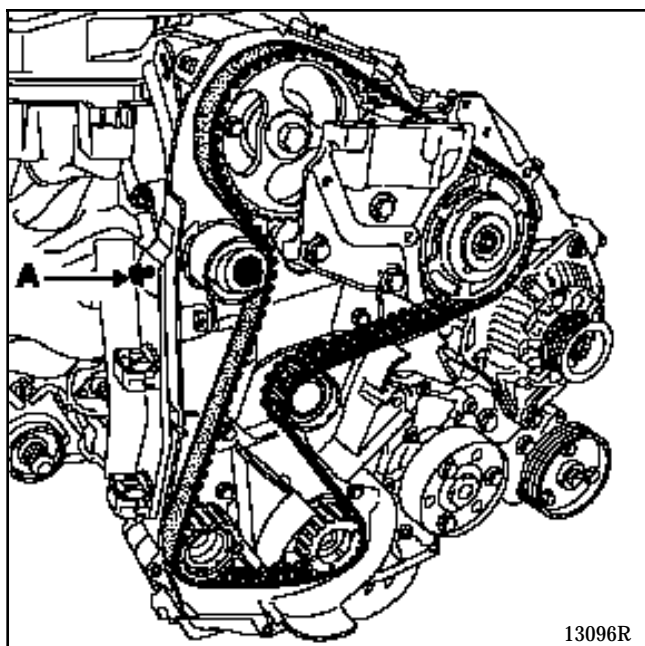
Slacken the tension wheel and remove the belt.

**NOTE :** Slackening the tension wheel nut by more than one turn may cause the tensioner to become disengaged.

### REFITTING

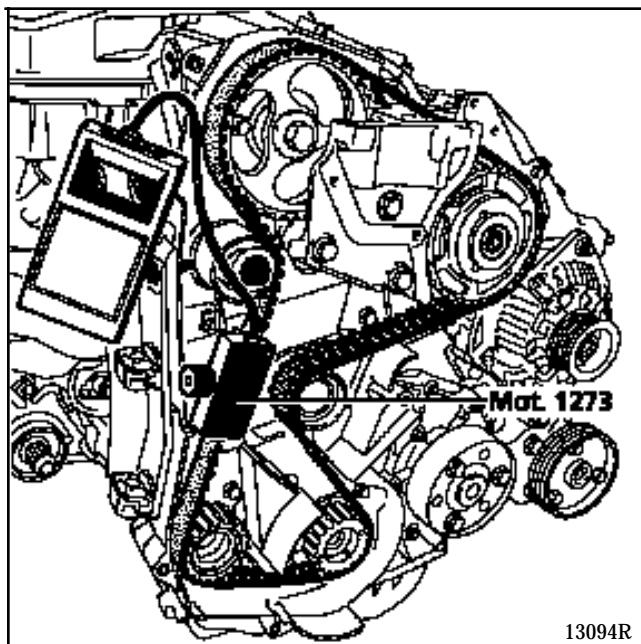
Check that the pin **Mot. 1054** is in place.

Fit the timing belt by aligning the belt markings with those of the camshaft, injection pump and crankshaft sprockets.



Tension the timing belt by tightening a bolt (A) on the inner timing housing.

Fit tool **Mot. 1273** and tension the belt until the fitting value is reached (see section 07 "Timing belt tension").



Tighten the tension wheel nut to **5 daN.m**.

**NOTE :** It is essential to tighten the tension wheel nut to a torque of **5 daN.m** to avoid any slackening which may damage the engine.

Check the injection pump timing (see section 13 "Pump- Checking the timing").

### Replace the crankshaft pulley bolts.

Refit the crankshaft pulley, being sure to tighten the bolt to a torque of **2 daN.m** then apply an angle of  $115^\circ \pm 15^\circ$ .

Refitting is the reverse of removal.

Refit the accessories belt (see section 07 "Accessories belt tension").

**NOTE :** Never refit a belt once removed, but replace it.

### SPECIAL TOOLING REQUIRED

Mot. 591-02	Index
Mot. 591-04	Angle wrench for tightening cylinder head and index
Mot. 1054	TDC pin
Mot. 1202	Hose clip pliers
Mot. 1448	Hose clip pliers extension
Mot. 1273	Tool for checking belt tension
Mot. 1379	Tool for securing engine to sub-frame

### EQUIPMENT REQUIRED

12mm torx socket  
Angular tightening wrench

### TIGHTENING TORQUES (in daN.m and/or °)



Crankshaft output mounting bolt	2 + 90°
Mounting bolt for front right suspended engine mounting on engine	6.2
Mounting bolt for the right hand suspended engine mounting on the body	6.2
Timing belt tension wheel nut	5
Wheel bolts	9

### REMOVAL

Put the vehicle on a two post lift.

Disconnect the battery and remove the engine undertray.

Drain the cooling circuit.

Fit the engine support tool **Mot. 1379**.

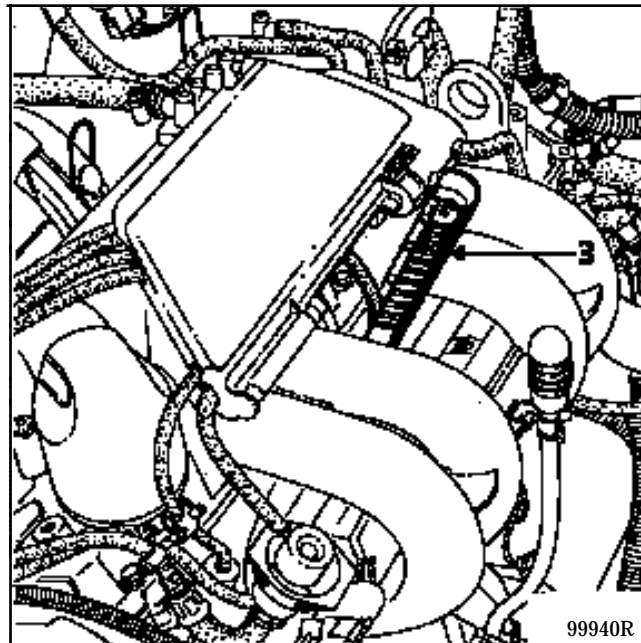
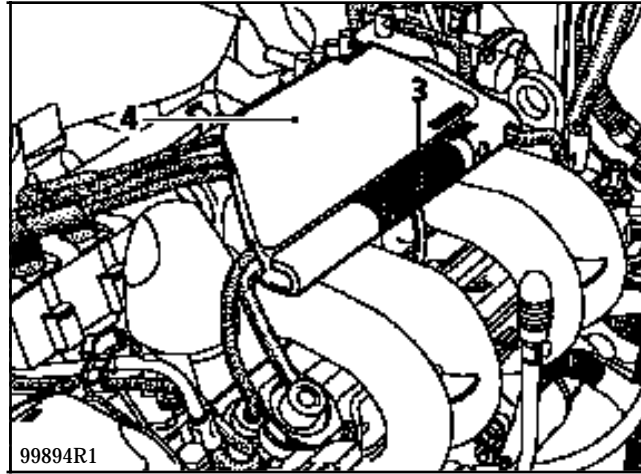
Remove :

- the timing belt (see method described in section **11 "Timing belt"**),
- the dipstick,
- the brake servo pipe,
- the air filter,
- the accelerator cable,
- the fuel supply and return pipes level with the timing belt cover on the cylinder head.

Slacken the compressor mounting bolts for vehicles fitted with AC.

Disconnect:

- the spark plug leads using tool (3) which is integrated to the plastic cover (4),

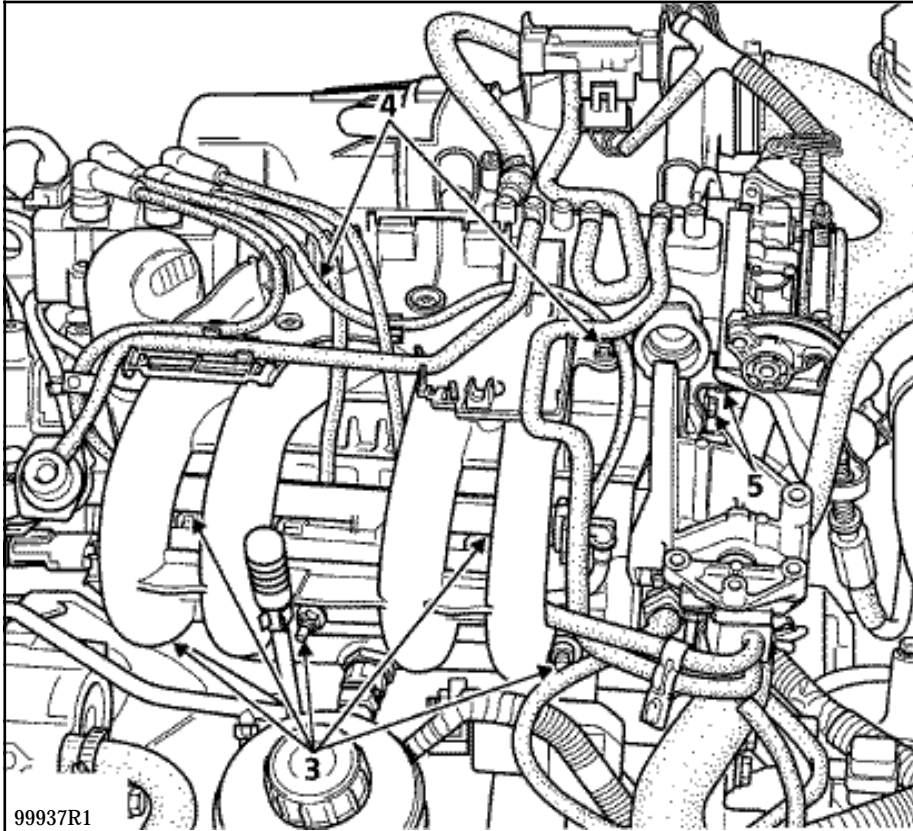


- the canister pipe along with the fuel vapour rebreathing hoses on the solenoid valve,
- the connectors :
  - of the ignition module,
  - of the injectors,
  - of the idle speed regulation stepping motor,
  - of the throttle position potentiometer,
  - of the air temperature sensor.

Extract the hose connecting the water pump to the heater matrix, and the electrical wiring loom from the heat shield on the rocker cover.

Remove :

- the mounting bolts (5) for the throttle body retaining bracket on the cylinder head,
- the mounting nuts (3) for the manifold on the cylinder head
- the mounting bolts (4) of the manifold on the valve rocker cover
- the inlet manifold, throttle body and fuel gallery assembly.



- the thermostat hoses,
- the valve rocker covers,
- the cylinder head mounting bolts,
- the cylinder head.

Use a syringe to remove any oil which may have entered the cylinder head mounting bolt holes.

This is necessary, in order to obtain the correct tightening of the bolts.

Care must be taken whilst carrying out this operation in order to avoid any foreign bodies entering the oil supply pipes in the cylinder head.

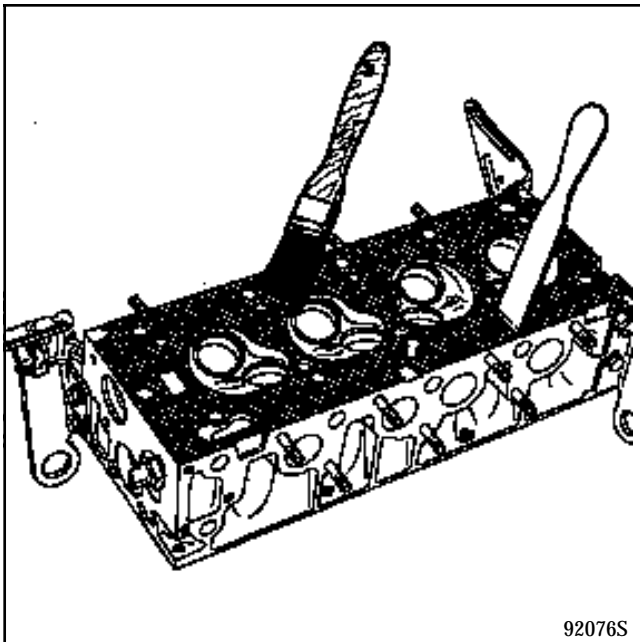
**Failure to follow to this advice could lead to the blocking of the jets and thus cause damage to the camshaft.**

### CLEANING

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

Use the **Décapjoint** product to dissolve any part of the gasket which remains attached.

Apply the product to the parts to be cleaned; wait about ten minutes, then remove it using a wooden spatula.



Gloves should be worn during this operation.

### CHECKING THE GASKET FACE

Check for gasket face bow using a straight edge and a set of feeler gauges.

Maximum deformation : **0.05 mm.**

**Regrinding of the cylinder head is not permitted.**

Check the cylinder head for any possible cracks.

### REFITTING

The cylinder head is centred by two dowels at the rear of the engine.

**REMINDER:** in order to obtain the correct tightening of the bolts, use a syringe to remove any oil which may have entered the cylinder head mounting bolt holes .

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

**Adjustment of the valve rockers and tightening of the cylinder head should be carried out when the engine is cold.**



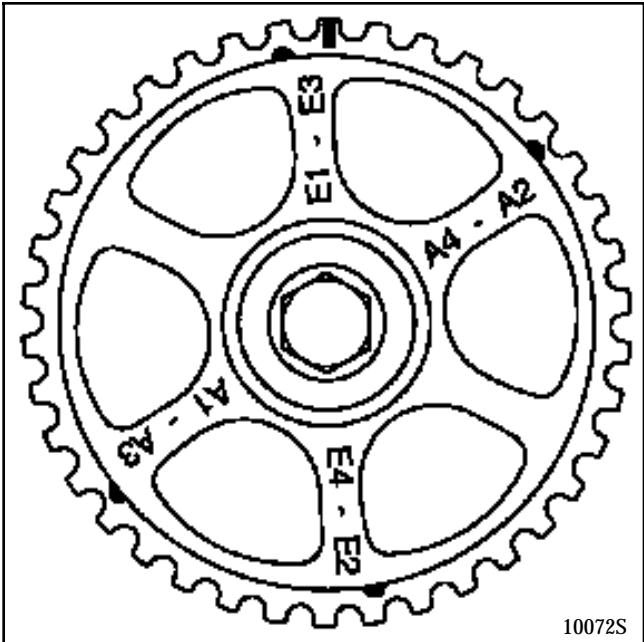
Tighten the cylinder head using an angular tightening wrench (see section 07 "Tightening the cylinder head").

Remove the TDC pin (Mot. 1054).

Refit:

- the timing belt (see method described in section 11 "Timing belt"),
- the accessories belt (see section 07 "Accessories belt tension").

**IMPORTANT:** The camshaft sprocket has five markings, of which only the rectangular one on the surface of one of the teeth represents TDC; the other markings are intended as an aid for adjusting the valve rockers.



ADJUSTING THE VALVE ROCKERS IF NECESSARY

Adjustment values (cold engine) (in mm) :

- Inlet 0.10
- Exhaust 0.20


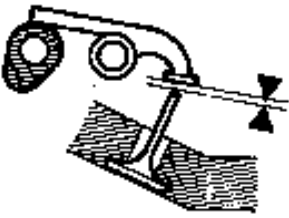
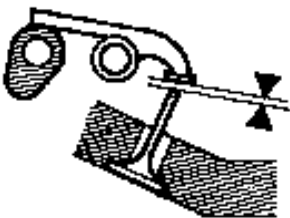
"Tilt" method

Place the valves for the cylinder concerned in the "end of exhaust-beginning of inlet"position	Adjust the valve rocker clearance for the cylinder concerned
1	4
3	2
4	1
2	3

### Open exhaust valve method

Bring the exhaust valve of cylinder n° 1 to the fully open position, then adjust the inlet valve clearance for cylinder n° 3 and the exhaust valve clearance for cylinder n° 4.

Follow the same method for the other cylinders, in the order shown by the table below.

Exhaust valve to be opened.	Inlet valve to be adjusted	Exhaust valve to be adjusted.
		
1	3	4
3	4	2
4	2	1
2	1	3

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Proceed with re-assembly in the reverse order to removal.

Remove the tool for securing the engine to the sub-frame **Mot. 1379**.

**NOTE :** tightening the inlet manifold :

- progressively hand tighten the six nuts until the inlet manifold comes into contact with the cylinder head, then tighten them to a torque of **1.5 daN.m**,
- fit the upper bolts and tighten them to a torque of **0.9 daN.m**.

Fill and bleed the cooling circuit (see section **19 "Filling and bleeding"**).

Adjust the accelerator cable.

## SPECIAL TOOLING REQUIRED

Mot. 588	Retaining bracket
Mot. 591-02	Index
Mot. 591-04	Angle wrench for tightening cylinder head and index
Mot. 1159	Tool for securing engine to sub-frame
Mot. 1202	Hose clip pliers
Mot. 1273	Tool for checking belt tension

Engine support tool  
55mm torx socket  
Angular tightening wrench

## TIGHTENING TORQUES (in daN.m and/or °)



Tension wheel nut	5
Crankshaft pulley bolt	2 + 68° ± 15°
Bolt for suspended engine mounting cover	6.2
Nut for suspended engine mounting cover	4.4
Wheel bolts	9

## REMOVAL

Put the vehicle on a two post lift.

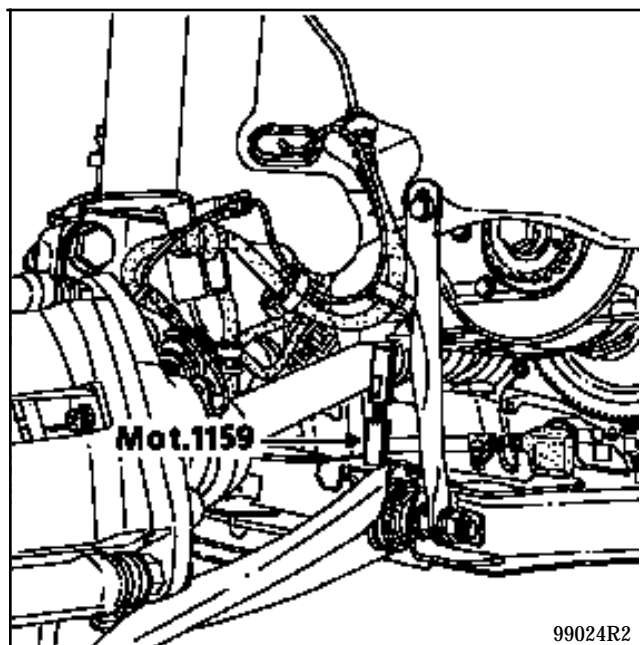
Disconnect the battery.

Remove :

- the bonnet,
- the timing belt (see method described in section 11, "Timing belt").

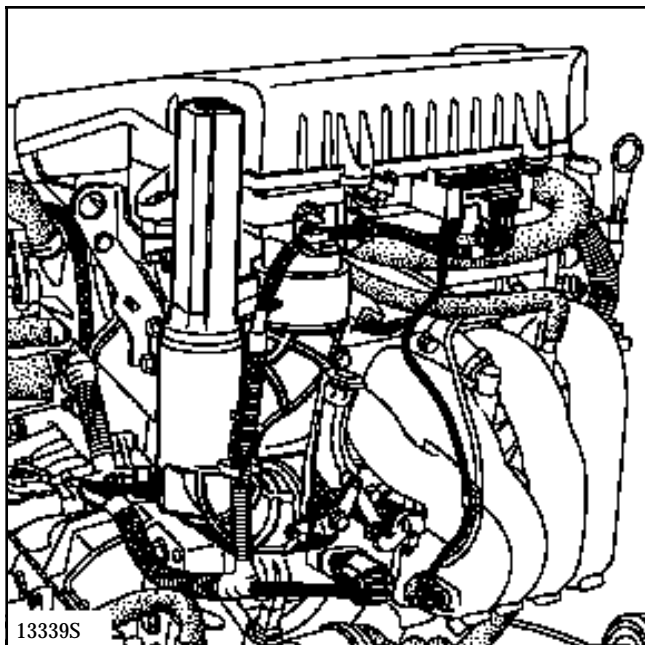
Drain the cooling circuit through the lower radiator hose.

Fit tool **Mot. 1159** between the sub-frame and the cylinder block then remove the engine support tool.

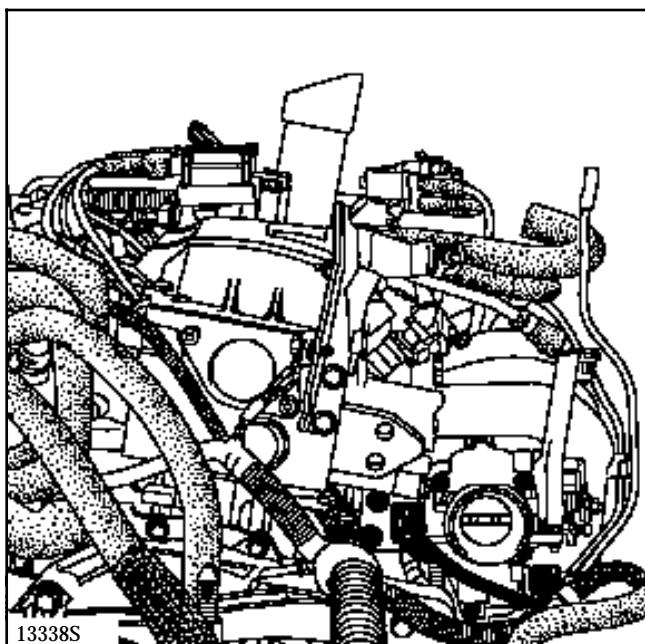


Remove :

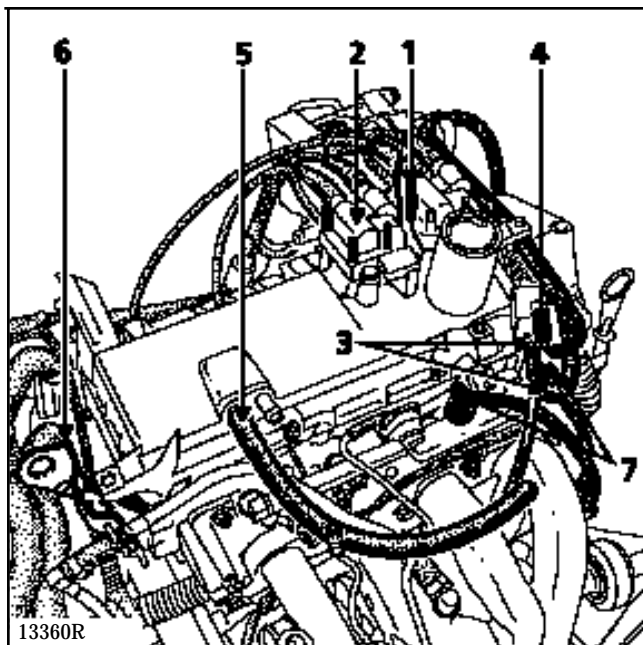
- the connector and the pipe on the absolute pressure sensor,
- the stepping motor connector,



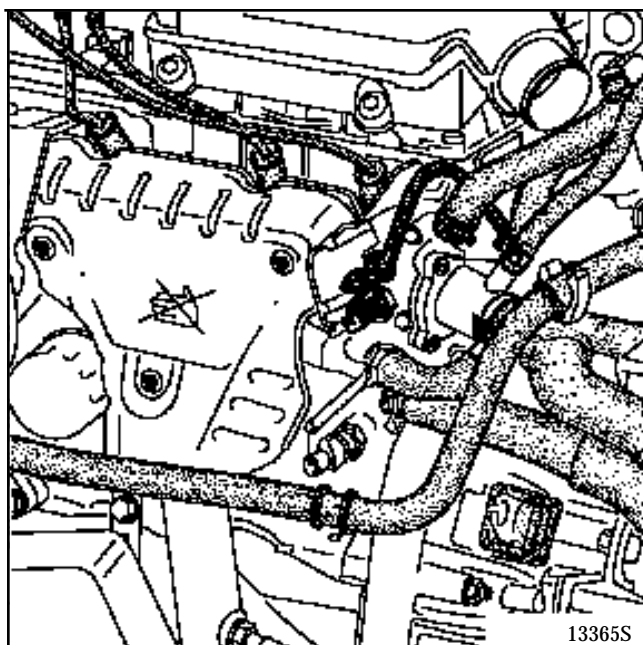
- the cover on the air filter assembly,
- the air filter assembly,
- the throttle position potentiometer connector,
- the accelerator cable,
- the air intake pipe, having disconnected the air temperature sensor connector,



- the connectors of the ignition coils, along with the connector at (1),
- the coil (2),
- the pipes (3) and the connector (4),
- the pipe (5),
- the lifting bracket(6),
- the fuel supply and return pipes (7),
- the injector connectors,
- the cylinder head cover,



- the connectors and the hoses on the thermostat support,

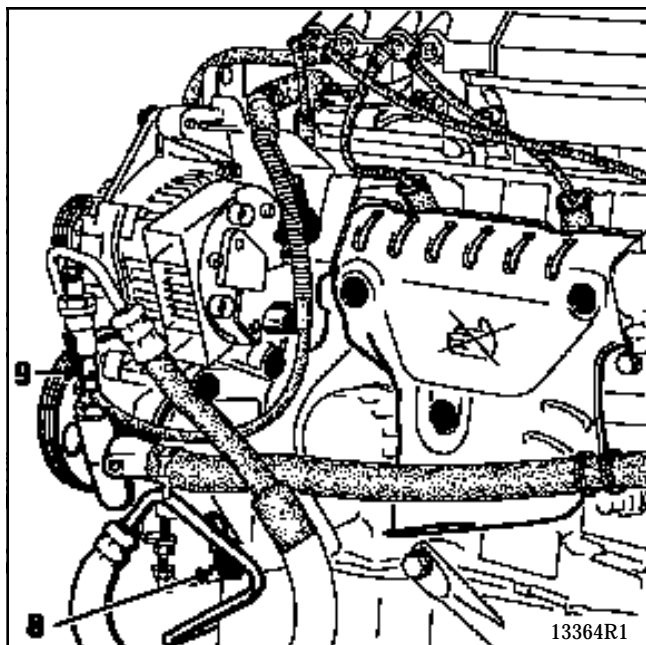


- the heat shield and the exhaust downpipe mountings,

### Vehicles without air conditioning

Remove :

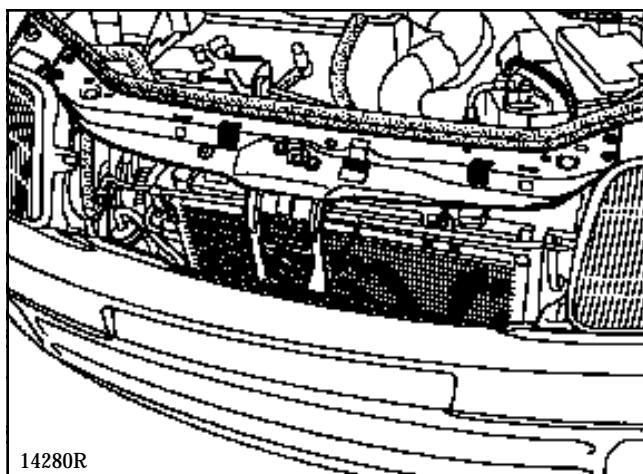
- the alternator ,
- the pressostat mounting (8) and connector (9),
- the power assisted steering mounting bolts and move it to one side,
- the multi-function support mounting bolts and move it to one side,



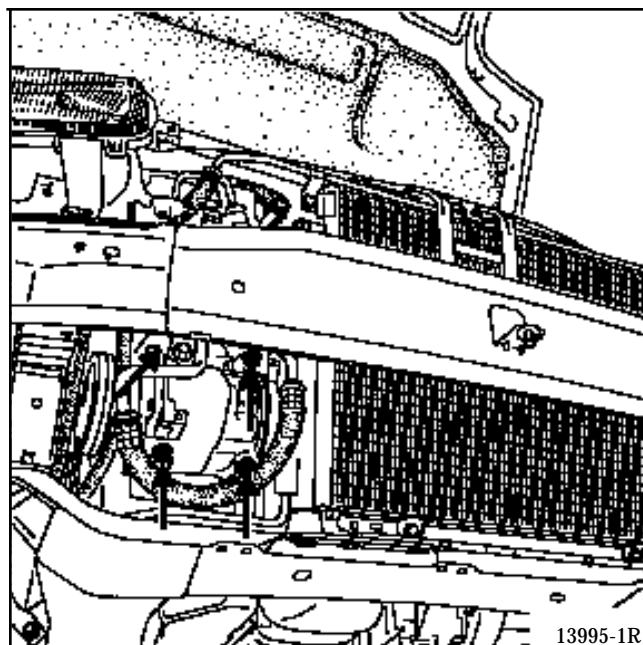
### Vehicles fitted with air conditioning

Remove :

- the radiator grille,
- the left hand wheel arch protector,
- the front bumper,
- the upper cross member (by slackening the two lower mounting bolts) and put it on the engine,

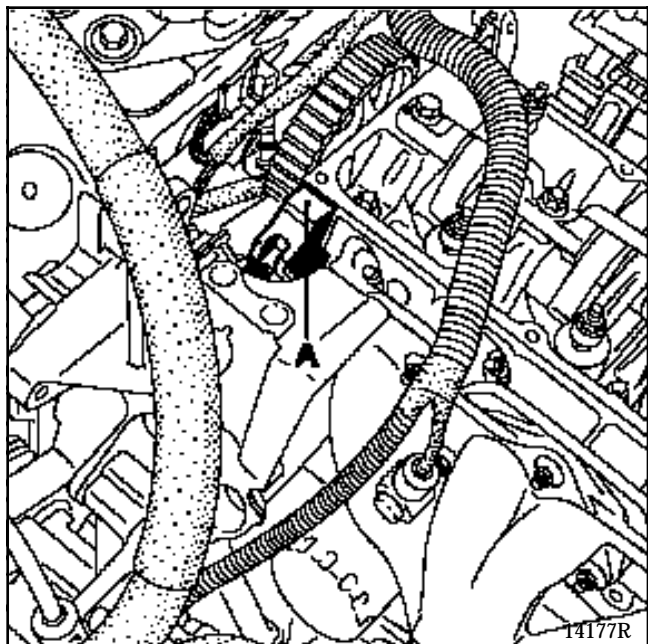


- the power assisted steering pump mounting bolts and move it to one side,
- the compressor mounting bolts and move it to one side,



- the multi-function support mounting bolts and move it to one side,

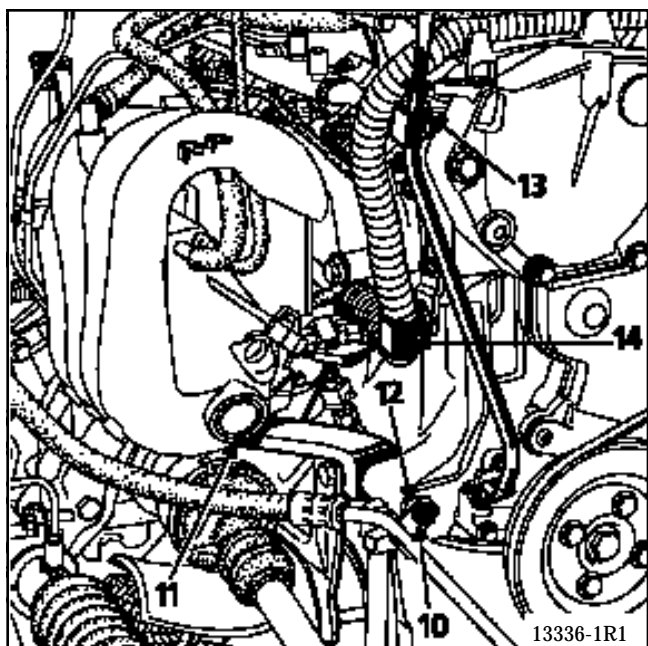
- the intermediary support(A),



### All vehicle types

Remove :

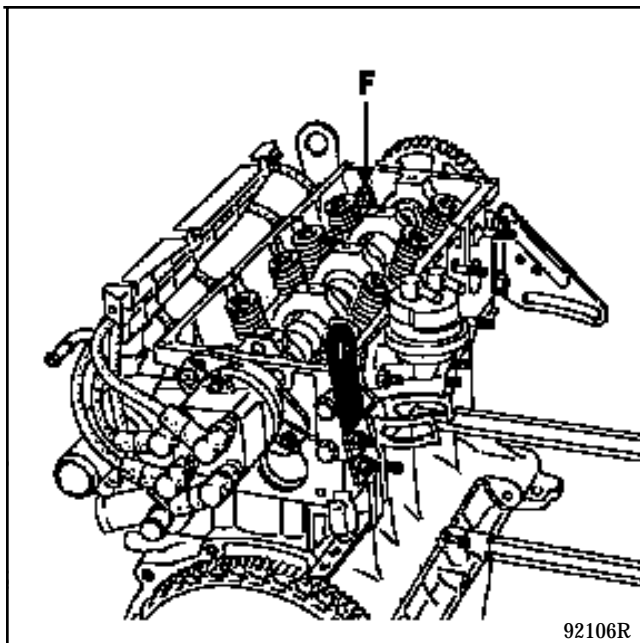
- the mounting (10),
- the bolt of the strut (11) and slacken the nut (12),
- the mounting nut (13) of the dipstick guide tube.



Unhook the wiring loom at (14).

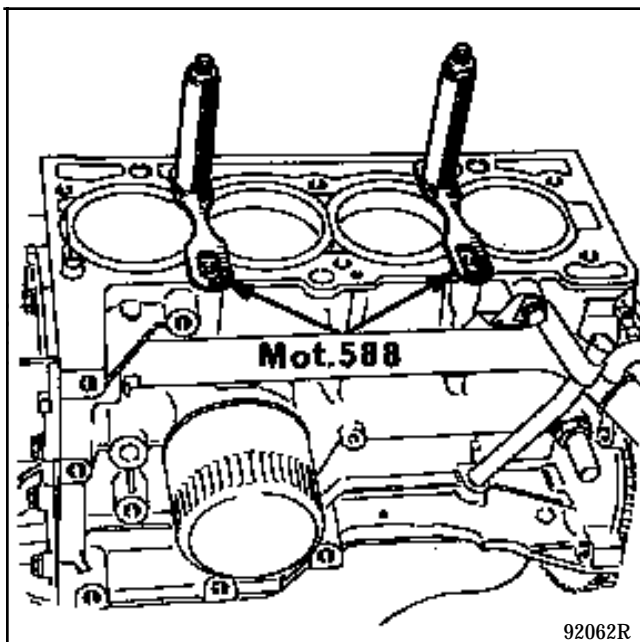
Remove :

- the cylinder head bolts, except for bolt (F) which must simply be released, then pivot the cylinder head around the bolt,



- the cylinder head.

Fit the cylinder liner retaining brackets, tool **Mot. 588** (E7J engine).



Use a syringe to remove any oil which may be in the cylinder head mounting holes.

This is necessary, in order to obtain the correct tightening of the bolts.

Care must be taken whilst carrying out this operation in order to avoid any foreign bodies entering the oil supply pipes in the cylinder head.

**Failure to follow to this advice could lead to the blocking of the jets and thus cause rapid deterioration of the camshaft.**

#### CLEANING

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

Use the **Décapjoint** product to dissolve any part of the gasket which remains attached.

Apply the product to the parts to be cleaned; wait about ten minutes, then remove it using a wooden spatula.

Gloves should be worn during this operation.

#### CHECKING THE GASKET FACE

Check for gasket face bow using a straight edge and a set of feeler gauges.

Maximum deformation: **0.05 mm.**

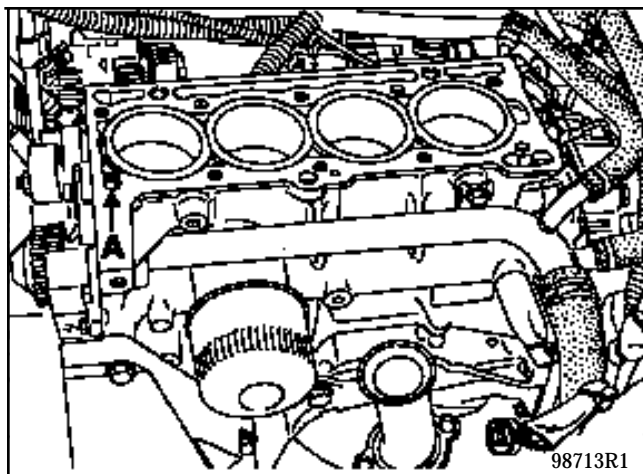
**Regrounding of the cylinder head is not permitted.**

Check the cylinder head for any possible cracks.

#### REFITTING (Special notes)

Remove the cylinder liner brackets **Mot. 588 (E7J engine)**.

Check for the presence of the centring dowel(G).



Position the cylinder head gasket.

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

Refit the cylinder head (**shortest bolts on the inlet side**).

Tighten the cylinder head (see section 07 "**Tightening the cylinder head**").

Refitting is the reverse of removal.

Correctly refit the heat shields.

Refit the timing belt, (see section 11 "**Timing belt**").

Fill and bleed the cooling circuit, (see section 19 "**Filling and Bleeding**").

ADJUSTING THE VALVE ROCKERS IF NECESSARY

Adjustment values (cold engine) (in mm) :

- Inlet

0.10
- Exhaust

0.25

"Tilt" method


Place the valves of the cylinder concerned in the "end of exhaust-beginning of inlet"position	Adjust the valve rocker clearance for the cylinder concerned
1	4
3	2
4	1
2	3

Open exhaust valve method

Bring the exhaust valve of cylinder n° 1 to the fully open position, then adjust the inlet valve clearance for cylinder n° 3 and the exhaust valve clearance for cylinder n° 4.

Follow the same method for the other cylinders, in the order shown by the table below.

Exhaust valve to be opened.



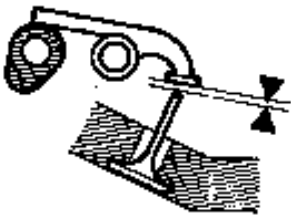
1

3

4

2

Inlet valve to be adjusted.



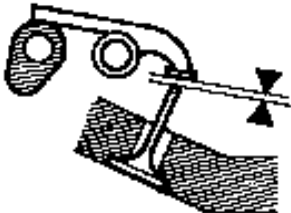
3

4

2

1

Exhaust valve to be adjusted.



4

2

1

3

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SPECIAL TOOLING REQUIRED		
Mot. 251-01	Dial gauge support tool	
Mot. 252-01	Plate for measuring piston protrusion	
Mot. 591-02	Index	
Mot. 591-04	Angle wrench for tightening cylinder head and index	
Mot. 1054	TDC pin	
Mot. 1159	Tool for securing engine to sub-frame	
Mot. 1202	Hose clip pliers	
Mot. 1273	Tool for checking belt tension	
Mot. 1311-06	Tool for removing fuel pipe	
Engine support tool 55mm torx socket Angular tightening wrench		

TIGHTENING TORQUES (in daN.m and/or °)		
Tension wheel nut		5
Crankshaft pulley bolt	$2 + 115^{\circ} \pm 15^{\circ}$	
Bolt for suspended engine mounting cover		6.2
Nut for suspended engine mounting cover		4.4
Wheel bolts		9

REMOVAL

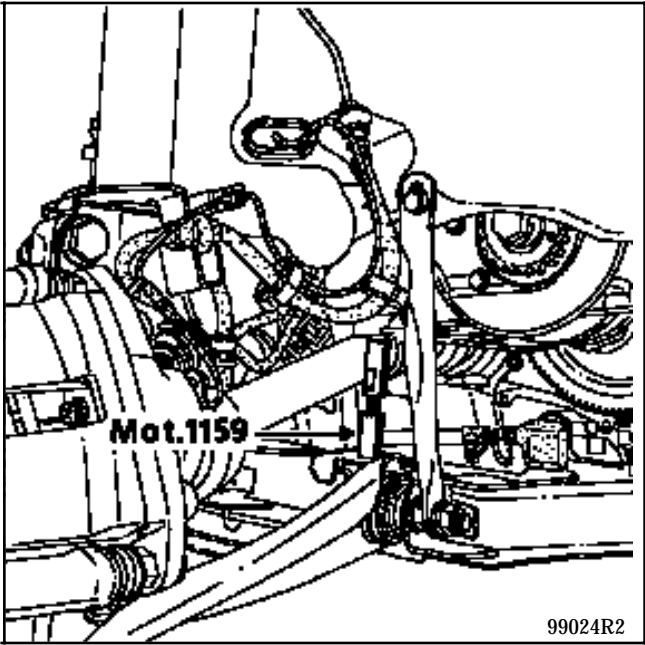
Put the vehicle on a two post lift.

Disconnect the battery and remove the engine undertray.

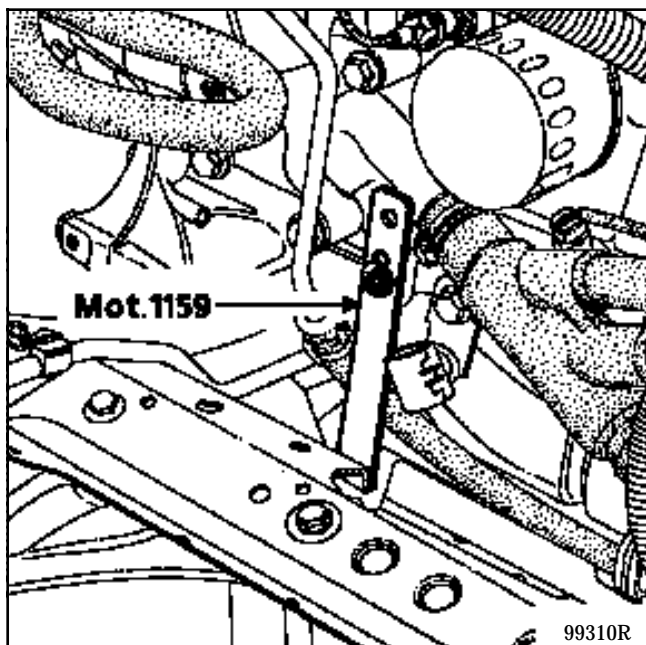
Remove the timing belt (see method described in section 11 "Timing belt").

Drain the cooling circuit through the lower radiator hose.

Fit tool **Mot. 1159** between the sub-frame and the cylinder block.

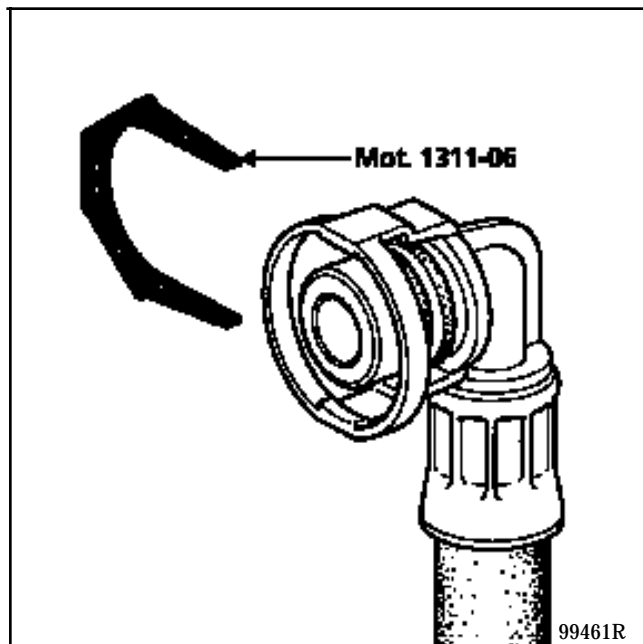
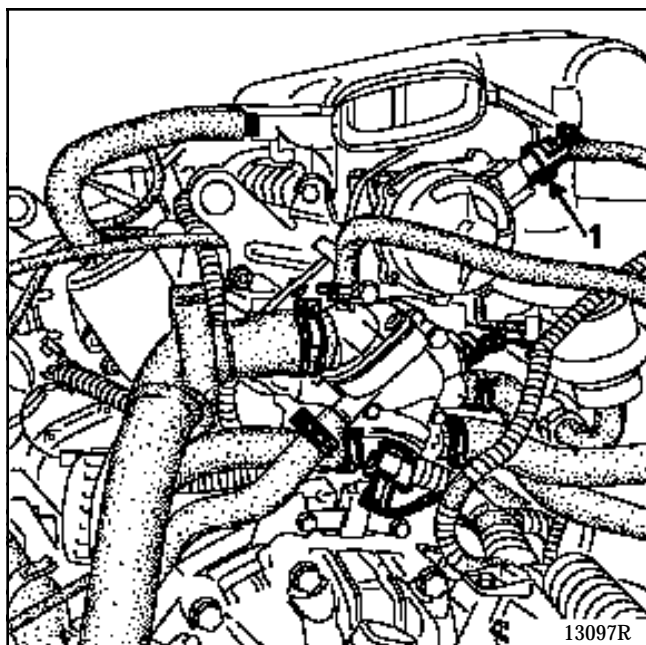


Place bracket **Mot. 1159** at the mounting of the coolant pipe on the cylinder block, then remove the engine support tool.



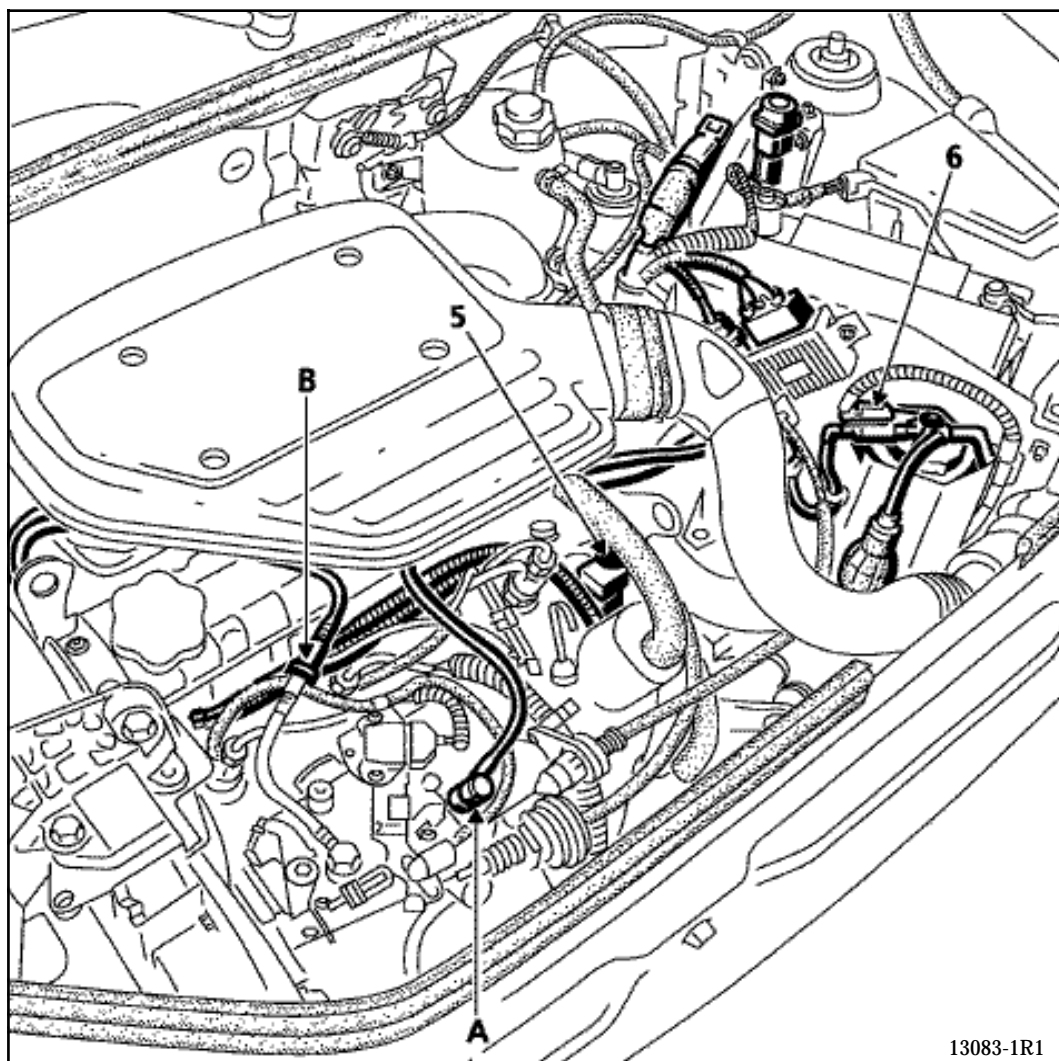
Remove :

- the exhaust downpipe,
- the hoses and connectors of the cylinder head coolant pipe housing outlet,
- the connection at (1) using tool **Mot. 1311-06**,

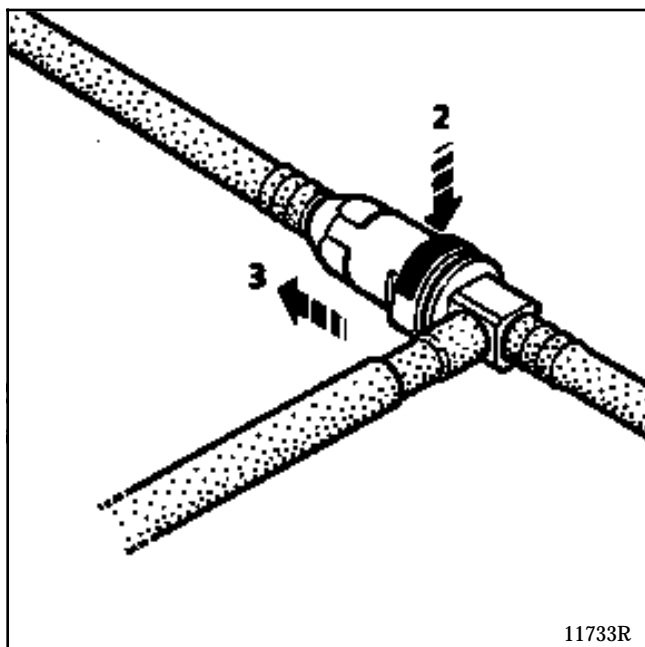
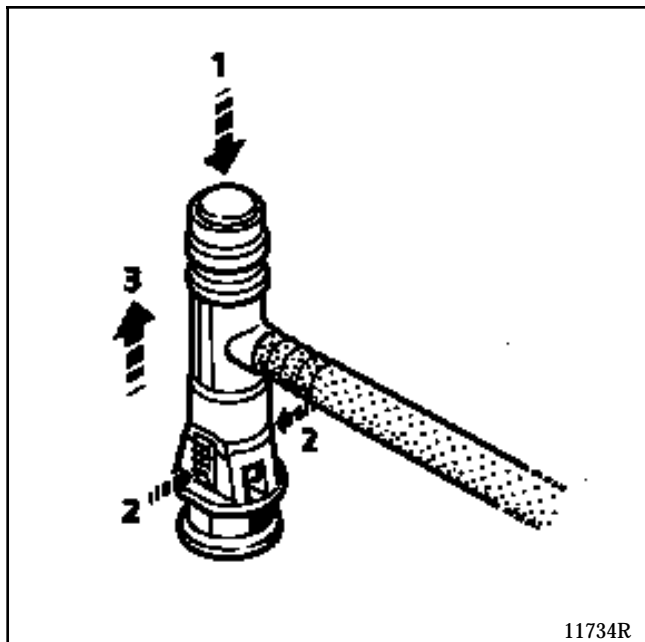


- the air filter assembly by disconnecting the **EGR** solenoid valve and the air temperature sensor connectors (unclip the fuel supply pipes from the air filter housing),
- the air inlet pipe,
- the accelerator cable,
- the feeds for the heater plugs,
- the connector of the injector with sensor, along with the fast idle solenoid valve connector (5),
- the fuel supply and return unions at (A) and (B).

Disconnect connector (6) from the diesel fuel filter, remove it from its support and move the diesel fuel filter pipe assembly to one side.

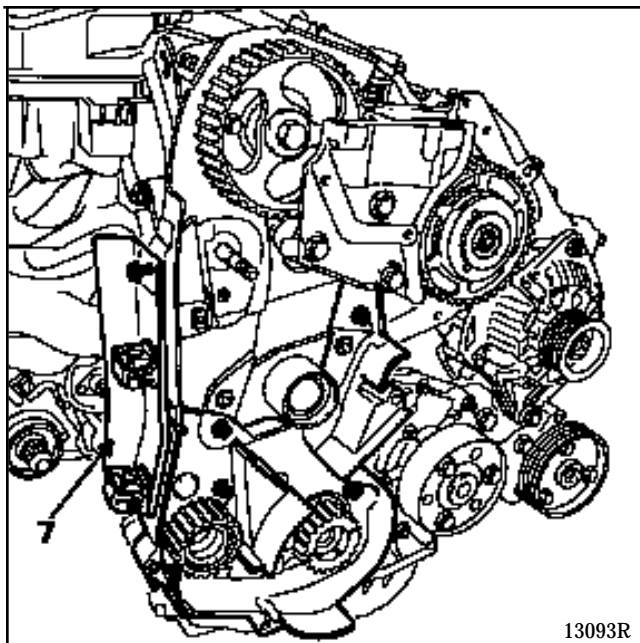


To release the quick release unions, refer to the following diagrams.



Remove the fuel pipe support (7).

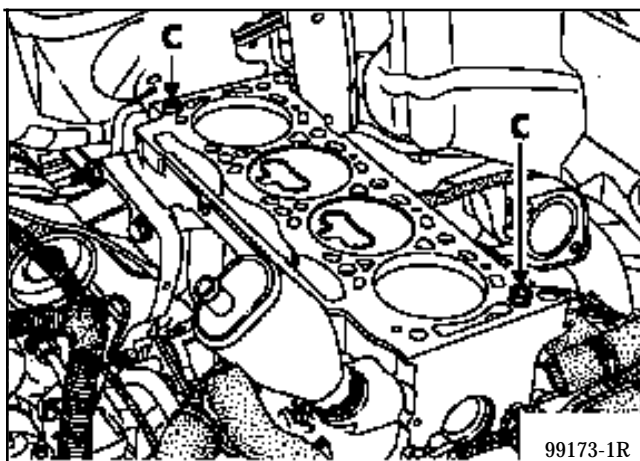
Slacken, but do not remove, the lower timing cover mounting bolts.



Remove :

- the accessories belt tensioning system,
- the cylinder head bolts.

Release the cylinder head by separating the lower part of the inner camshaft housing. Do this without pivoting the cylinder head, as this is centred by the two dowels at (C).



Using a syringe, extract any oil which may have entered the cylinder head mounting holes .

This is necessary, in order to obtain the correct tightening of the bolts.

Care must be taken whilst carrying out this operation in order to avoid any foreign bodies entering the oil supply pipes in the cylinder head.

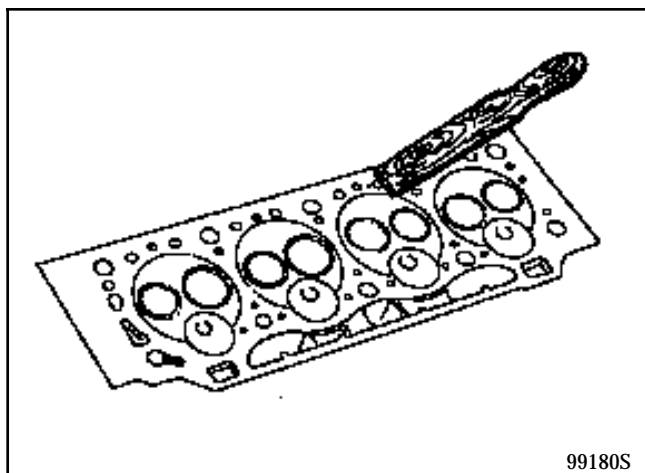
**Failure to take this advice could lead to the blocking of the oilways, resulting in damage to the camshaft.**

### CLEANING

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

Use the **Décapjoint** product to dissolve any part of the gasket which remains attached.

Apply the product to the parts to be cleaned; wait about ten minutes, then remove it using a wooden spatula.



Gloves should be worn during this operation.

### CHECKING THE GASKET FACE

Check for gasket face bow using a straight edge and a set of feeler gauges.

Maximum deformation: **0.05 mm.**

**Regrinding of the cylinder head is not permitted.**

Check the cylinder head for any possible cracks.

### DETERMINING THE THICKNESS OF THE CYLINDER HEAD GASKET

#### Checking piston protrusion

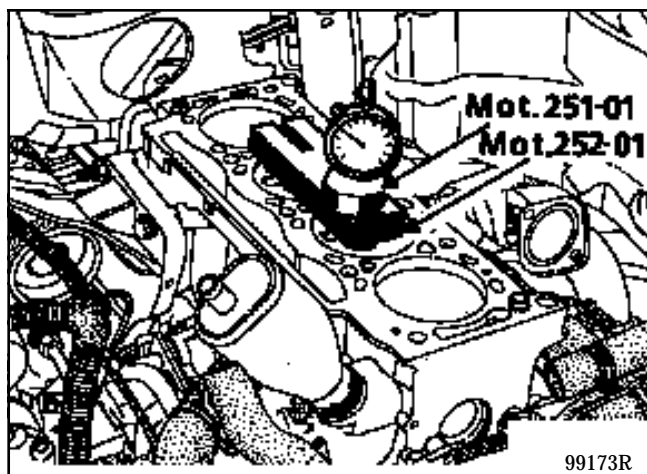
Clean the piston crowns in order to eliminate any traces of deposits.

Turn the crankshaft in its direction of rotation once, to bring piston **n° 1** close to TDC.

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

Fit tool **Mot. 251-01**, complete with dial gauge **Mot. 252-01**, on the plate. Ensure that the dial gauge measuring pin is in contact with the cylinder block; then locate the piston TDC.

**NOTE :** All measurements are to be carried out in the longitudinal axis of the engine, in order to eliminate any errors due to tilting of the piston.



Measure the piston protrusion.

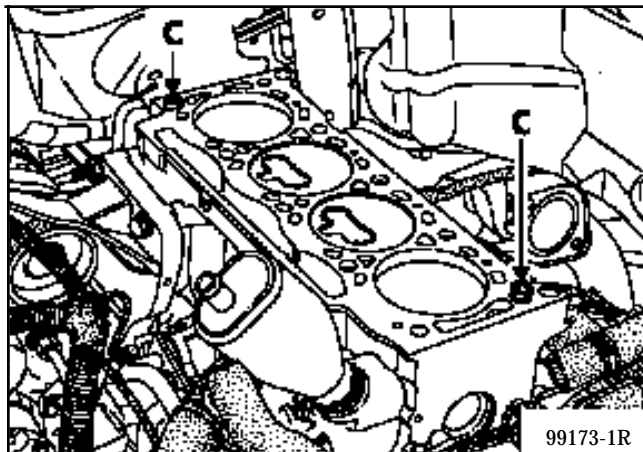
**ONLY TAKE INTO CONSIDERATION THE DIMENSIONS OF THE PISTON WITH THE GREATEST PROTRUSION.**

For a maximum piston protrusion:

- lower than **0.868 mm**, use a gasket marked by a tab with two holes ,
- included between **0.868 mm** and **1mm**, use a gasket marked by a tab with one hole,
- greater than **1mm**, use a gasket marked by a tab with three holes.

### REFITTING (special notes)

Refit the cylinder head gasket selected previously. This is centred by two dowels at (C).



Bring the pistons to mid-stroke position to prevent them from coming into contact with the valves during the tightening of the cylinder head .

Centre the cylinder head on the dowels.

Lubricate the threads and under the heads 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, (see method described in section **11** "Timing belt").

Fill and bleed the cooling circuit , (see section **9** "Filling and bleeding").

SPECIAL TOOLING REQUIRED	
Mot. 1366-01	Tool for removing valve adjusters (additional item to Mot. 1366)

TIGHTENING TORQUES (in daN.m) 	
Studs for mounting manifolds on cylinder head	1
Nut for mounting manifolds on cylinder head	2.7
Mounting bolt for strut on inlet manifold	2.5
Mounting bolt for strut on cylinder block	2.5

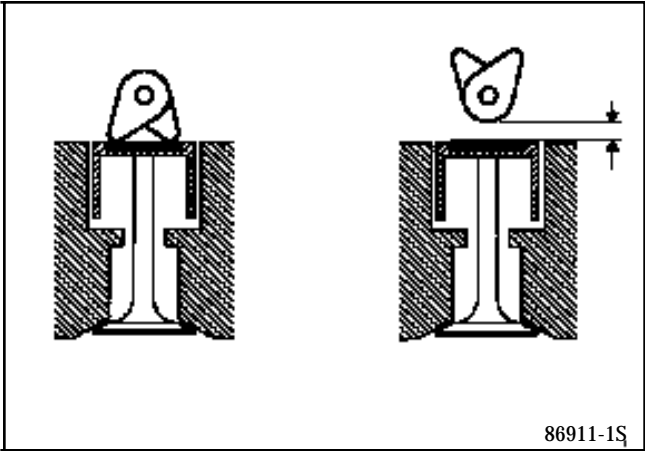
Put the vehicle on a two post lift.

Disconnect the battery.

CHECKING THE VALVE CLEARANCE

Remove the air filter housing along with the cylinder head cover.

Placer the valves of the cylinder concerned at the "end of exhaust - beginning of inlet" position and check the clearance .



1	4
3	2
4	1
2	3

Compare the two dimensions noted to the recommended dimensions, and replace the shims concerned.

Clearance ( in mm ), when the engine is cold :

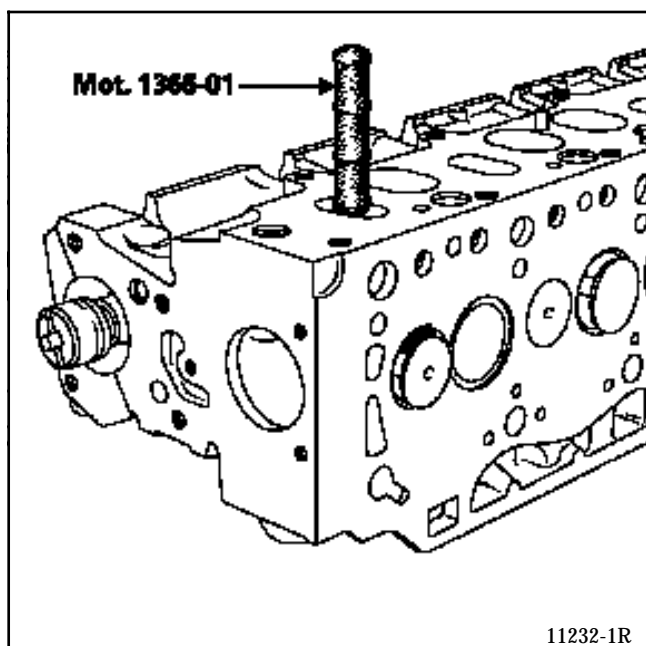
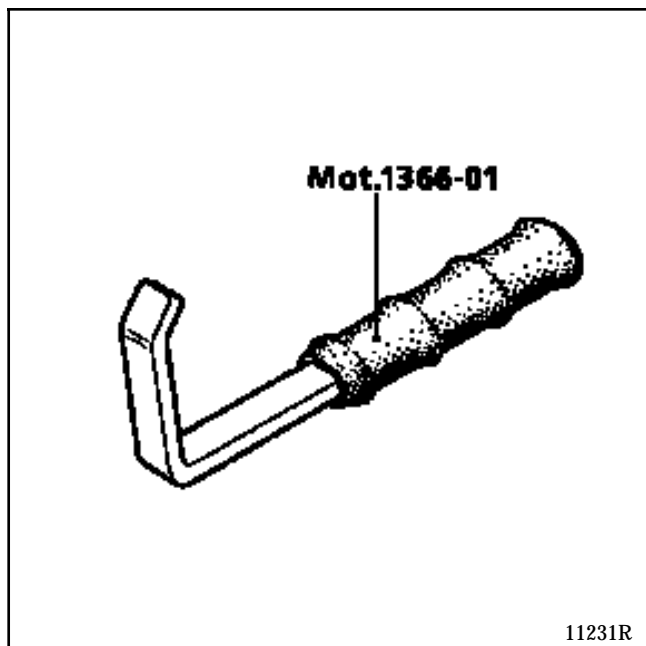
- Inlet: 0.10
- Exhaust : 0.25

### REPLACING THE TAPPET SHIMS

In order to carry out this operation it is necessary to remove the inlet and exhaust manifolds (see section 12 Inlet/Exhaust Manifolds) .

Fully open the valve concerned (by turning the engine in its operating direction).

Insert tool **Mot. 1366-01** into the port concerned .



### For inlet valves

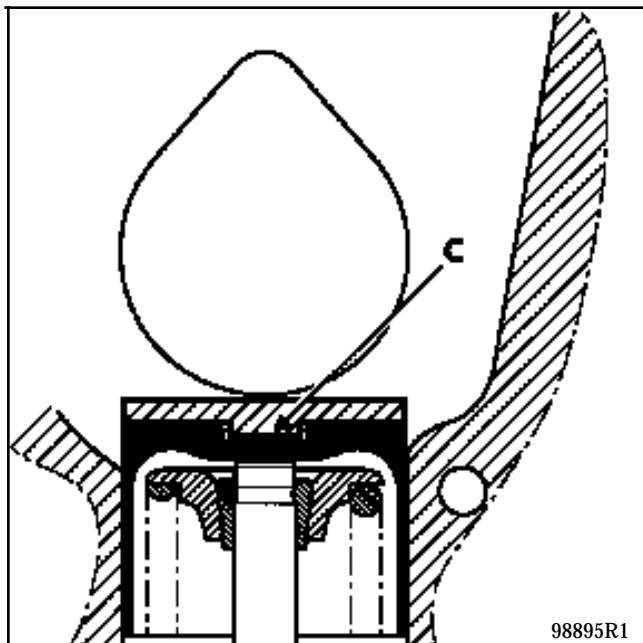
Turn the engine in the operating direction, in order to bring the valve into contact with tool **Mot. 1366-01** (rotate the camshaft by  $90^\circ$  in relation to the fully open position).

### For the exhaust valves

**It is vital to turn the engine in the opposite direction to normal operation** (in order to avoid the locking of the engine), until the valve comes into contact with tool **Mot. 1366-01** (rotate camshaft by  $90^\circ$  in the relation to the fully open position).

Extract the tappet shim using a screwdriver and a magnetic tool.

**NOTE :** during the refitting of the tappet shim, extract any oil which may be in the bottom of the pushrod bore ( C ) .



### REFITTING

Refitting is the reverse of removal.



Vehicle	Gearbox	Engine							Depollution standard
		Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cm³)	Ratio	Catalytic converter	
XB0A	JB1	D7F	720	69	76.8	1 149	9.65/1	◇ C53	EU 96

Engine		Tests at idle speed*					Fuel*** [minimum octane rating]
		Engine speed [rpm]	Pollutant emission **				
Type	Suffix			CO (%) (1)	CO <sub>2</sub> (%)	HC (ppm)	
D7F	720	740 ± 50	0.5 max	14.5 min	100 max	0.97<λ<1.03	Unleaded (OR95)

(1) at 2500 rpm, CO must be a maximum of 0.3

\*

For a coolant temperature above 80°C and after stable speed of 2500 rpm, for about 30 seconds. Test to be carried out after return to idle speed.

\*\*

For legal values refer to your country specification.

\*\*\*

OR 91 unleaded compatible.

Temperature in °C (± 1°)	0	20	40	80	90
Air temperature sensor CTN type Resistance in Ohms	5000 to 7000	1 700 to 3300	800 to 1550	-	-
Coolant temperature sensor CTN type Resistance in Ohms	6700 to 8000	2 600 to 3 000	1 100 to 1 300	270 to 300	200 to 215

DESCRIPTION	MAKE/TYPE	SPECIAL NOTES		
Computer	SAGEM or MAGNETI MARELLI	35 tracks on manual gearbox vehicles without option 55 tracks on air conditioning vehicles		
Injection	-	Multipoint with semi-sequential regulation		
Ignition	-	Static with 2 dual output monobloc coils Power module integral in computer One pinking sensor tightening torque : <b>2.5 daN.m</b>	Tracks	Resistance
			1 - 2	1.5 Ω
			1 - 4   1 - 3 2 - 3   2 - 4	1 Ω
			3 - 4	0.6 Ω
			HT - HT	8 KΩ
TDC sensor	-	Resistance <b>220 Ω</b>		
Plugs	EYQUEM RFC50LZ2E	Gap: <b>0.9 mm</b> Tightening torque: <b>2.5 to 3 daN.m</b>		
Fuel filter	-	Mounted under vehicle in front of fuel tank Replaced during major service		
Fuel pump	-	Submerged in fuel tank Flow: at least <b>80 litres/hour</b> at a regulated pressure of <b>3 bars</b> and a voltage of <b>12 V</b>		
Pressure regulator	-	Regulated pressure Zero vacuum: <b>3 ± 0.2 bars</b> Vacuum of 500 mbars : <b>2.5 ± 0.2 bars</b>		
Solenoid injectors	SIEMENS or BOSCH	Voltage: <b>12 Volts</b> Resistance : <b>14.5 ± 1 Ω</b>		

DESCRIPTION	MAKE/TYPE	SPECIAL NOTES			
Throttle body	MAGNETI MARELLI 873 633	Ø 36 mm diameter			
Idle speed regulation stepping motor	AIR PAX	Voltage: <b>12 V</b> (at high frequency) Resistance : Tracks A-D <b>100 ± 10 Ω</b> Tracks B-C <b>100 ± 10 Ω</b>			
Throttle potentiometer	-	Voltage: <b>5 V</b> Resistance :	Track	No load	Full load
			AB	1 300 Ω	1 300 Ω
			AC	1 360 Ω	2 350 Ω
			BC	2 300 Ω	1 260 Ω
Fuel vapour rebreathing canister Solenoid valve	-	Voltage: <b>12 Volts</b> Resistance : <b>35 ± 5 Ω</b>			
Heated oxygen sensor	BOSCH or DELPHI	Voltage at <b>850 °C</b> Rich mixture > <b>625 mvolts</b> Lean mixture : <b>0 to 80 mvolts</b> Heating resistance, tracks A-B : <b>3 to 15 Ω</b> Tightening torque : <b>5 daN.m</b>			
Diagnostic function	FICHE n° 27 CODE <b>D13</b> SELECTOR S8	Throttle potentiometer : Regulated idle speed : <b>10 ≤ # 17 ≤ 50</b> Full load : <b>185 ≤ # 17 ≤ 240</b> Idle speed R.C.O. : <b>4 % ≤ # 12 ≤ 14 %</b>  Adaptive idle speed R.C.O. :- <b>4.3 % ≤ # 21 ≤+3.9 %</b> Adaptive richness operation : <b>106 ≤ # 30 ≤150</b> Adaptive idle speed richness : <b>106 ≤ # 31 ≤ 150</b>			

Vehicle	Gearbox	Engine							Depollution standard
		Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cm <sup>3</sup> )	Ratio	Catalytic converter	
XB0C	BVM	E7J	780	75.8	77	1 390	9.5/1	◇ C63	EU 96

Engine		Tests at idle speed*					Fuel*** [minimum octane rating]
		Engine speed [rpm]	Pollutant emission **				
Type	Suffix		CO (%) (1)	CO <sub>2</sub> (%)	HC (ppm)	Lambda (λ)	
E7J	780	750 ± 50	0.5 max	14.5 min	100 max	0.97<λ<1.03	Unleaded (OR 95)

(1) at 2500 rpm, CO must be a maximum of 0.3

\* For a coolant temperature above 80°C and after stable speed of 2500 rpm, for about 30 seconds. Test to be carried out after return to idle speed.

\*\* For legal values refer to your country specification.

\*\*\* OR 91 unleaded compatible.

Temperature in °C (± 1°)	0	20	40	80	90
Air temperature sensor CTN type Resistance in Ohms	7470 to 11970	3060 to 4045	1315 to 1600	-	-
Coolant temperature sensor CTN type Resistance in Ohms	6700 to 8000	2600 to 3000	1100 to 1300	270 to 300	200 to 215

DESCRIPTION	MAKE/TYPE	SPECIAL NOTES		
Computer	SIEMENS FENIX 5	55 Tracks		
Injection	-	Multipoint with semi-sequential regulation		
Ignition	-	Static with two coils Power module integral in computer One pinking sensor tightening torque : <b>2.5 daN.m</b>	Tracks	Resistance
			1 - 2	0.5 Ω
			1 - 3 2 - 3	1 Ω
			HT - HT	10 KΩ
TDC sensor	-	Resistance <b>220 Ω</b>		
Plugs	<b>CHAMPION</b> : RC10PYC RC10YCL	Gap: <b>0.9 mm</b> Tightening torque: <b>2.5 to 3 daN.m</b>		
Fuel filter	-	Mounted under vehicle in front of fuel tank Replaced during major service		
Fuel pump	-	Submerged in fuel tank Flow: at least <b>80 litres/hour</b> at a regulated pressure of <b>3 bars</b> and a voltage of <b>12 V</b>		
Pressure regulator	-	Regulated pressure Zero vacuum: <b>3 ± 0.2 bars</b> Vacuum of 500 mbars : <b>2.5 ± 0.2 bars</b>		
Solenoid injectors	SIEMENS	Voltage: <b>12 Volts</b> Resistance : <b>14.5 ± 1 Ω</b>		

DESCRIPTION	MAKE/TYPE	SPECIAL NOTES												
Throttle body	PIERBURG 714 227	diameter 41 mm												
Idle speed regulation stepping motor	-	Voltage: <b>12 V</b> (at high frequency) Resistance : Tracks A-D <b>52 ± 5 Ω</b> Tracks B-C <b>52 ± 5 Ω</b>												
Throttle potentiometer	-	Voltage: <b>5 V</b> Resistance : <table><tr><th>Track</th><th>no load</th><th>full load</th></tr><tr><td>1 - 2</td><td>5 440 Ω</td><td>2 200 Ω</td></tr><tr><td>1 - 3</td><td>4 500 Ω</td><td>4 460 Ω</td></tr><tr><td>2 - 3</td><td>2 160 Ω</td><td>5 340 Ω</td></tr></table>	Track	no load	full load	1 - 2	5 440 Ω	2 200 Ω	1 - 3	4 500 Ω	4 460 Ω	2 - 3	2 160 Ω	5 340 Ω
Track	no load	full load												
1 - 2	5 440 Ω	2 200 Ω												
1 - 3	4 500 Ω	4 460 Ω												
2 - 3	2 160 Ω	5 340 Ω												
Fuel vapour rebreathing canister Solenoid valve	DELCO REMY	Voltage: <b>12 Volts</b> Resistance : <b>35 ± 5 Ω</b>												
Heated oxygen sensor	NGK	Voltage at <b>850 °C</b> Rich mixture > <b>625 mVolts</b> Lean mixture : <b>0 to 80 mVolts</b> Heating resistance, tracks A-B : <b>3 to 15 Ω</b> Tightening torque : <b>4.5 daN.m</b>												
Diagnostic function	FICHE n° 27 CODE <b>D13</b> SELECTOR S8	Throttle potentiometer : Regulated idle speed : <b>16 ≤ # 17 ≤ 50</b> Full load : <b>185 ≤ # 17 ≤ 243</b> Idle speed R.C.O. : <b>2 % ≤ # 12 ≤ 15 %</b>  Adaptive idle speed R.C.O.: - <b>2.4 % ≤ # 21 ≤ +6.2 %</b> Adaptive richness operation : <b>64 ≤ # 30 ≤ 192</b> Adaptive idle speed richness : <b>64 ≤ # 31 ≤ 192</b>												

Vehicle	Gearbox	Engine							Depollution standard
		Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cm <sup>3</sup> )	Ratio	Catalytic converter	
XB0D	BVM	K7M	744	79.5	80.5	1 598	9.7/1	◇ C64	EU 96

Engine		Tests at idle speed*					Fuel*** [minimum octane rating]
		Engine speed [rpm]	Pollutant emission **				
Type	Suffix		CO (%) (1)	CO <sub>2</sub> (%)	HC (ppm)	Lambda (λ)	
K7M	744	750 ± 50	0.5 max	14.5 min	100 max	0.97<λ<1.03	Unleaded (OR 95)

(1) at 2500 rpm, CO must be a maximum of 0.3

\*

For a coolant temperature above 80°C and after stable speed of 2500 rpm, for about 30 seconds. Test to be carried out after return to idle speed.

\*\*

For legal values refer to your country specification.

\*\*\*


OR 91 unleaded compatible.

Temperature in °C (± 1°)	0	20	40	80	90
Air temperature sensor CTN type Resistance in Ohms	7470 to 11970	3060 to 4045	1315 to 1600	-	-
Coolant temperature sensor CTN type Resistance in Ohms	6700 to 8000	2600 to 3000	1100 to 1300	270 to 300	200 to 215

DESCRIPTION	MAKE/TYPE	SPECIAL NOTES		
Computer	SIEMENS FENIX 5	55 Tracks		
Injection	-	Multipoint with semi-sequential regulation		
Ignition	-	Static with two coils Power module integral in computer One pinking sensor tightening torque : <b>2.5 daN.m</b>	Tracks	Resistance
			1 - 2	0.5 Ω
			1 - 3 2 - 3	1 Ω
			HT - HT	10 KΩ
TDC sensor	-	Resistance <b>220 Ω</b>		
Plugs	EYQUEM RFC50 LZ2E	Gap: <b>0.9 mm</b> Tightening torque: <b>2.5 to 3 daN.m</b>		
Fuel filter	-	Mounted under vehicle in front of fuel tank Replaced during major service		
Fuel pump	-	Submerged in fuel tank Flow: at least <b>80 litres/hour</b> at a regulated pressure of <b>3 bars</b> and a voltage of <b>12 V</b>		
Pressure regulator	-	Regulated pressure Zero vacuum: <b>3 ± 0.2 bars</b> Vacuum of 500 mbars : <b>2.5 ± 0.2 bars</b>		
Solenoid injectors	SIEMENS	Voltage: <b>12 Volts</b> Resistance : <b>14.5 ± 1 Ω</b>		



DESCRIPTION	MAKE/TYPE	SPECIAL NOTES		
Throttle body	PIERBURG 714 227			
Idle speed regulation stepping motor	-	Voltage: <b>12 V</b> (at high frequency) Resistance : Tracks A-D <b>52 ± 5 Ω</b> Tracks B-C <b>52 ± 5 Ω</b>		
Throttle potentiometer	-	Voltage: <b>5 V</b> Resistance :	Track	no load
			1 - 2	5 440 Ω
			1 - 3	4 500 Ω
			2 - 3	2 160 Ω
Fuel vapour rebreathing canister Solenoid valve	DELCO REMY	Voltage: <b>12 Volts</b> Resistance : <b>35 ± 5 Ω</b>		
Heated oxygen sensor	-	Voltage at <b>850 °C</b> Rich mixture > <b>625 mVolts</b> Lean mixture : <b>0 to 80 mVolts</b> Heating resistance, tracks A-B : <b>3 to 15 Ω</b> Tightening torque : <b>4.5 daN.m</b>		
Diagnostic function	FICHE n° 27 CODE <b>D13</b> SELECTOR S8	Throttle potentiometer : Regulated idle speed : <b>19 ≤ # 17 ≤ 51</b> Full load : <b>190 ≤ # 17 ≤ 243</b> Idle speed R.C.O. : <b>6 % ≤ # 12 ≤ 15 %</b>  Adaptive idle speed R.C.O.: <b>- 2.4% ≤ # 21 ≤ +6.2 %</b> Adaptive richness operation : <b>60 ≤ # 30 ≤ 195</b> Adaptive idle speed richness : <b>60 ≤ # 31 ≤ 195</b>		

TIGHTENING TORQUES (in daN.m)		
Throttle body mounting bolt on inlet manifold	1	
Throttle body support bracket mounting bolt on cylinder head	1	

There are no special notes for removal - refitting.

## TIGHTENING TORQUE (in daN.m)



Throttle body mounting bolt

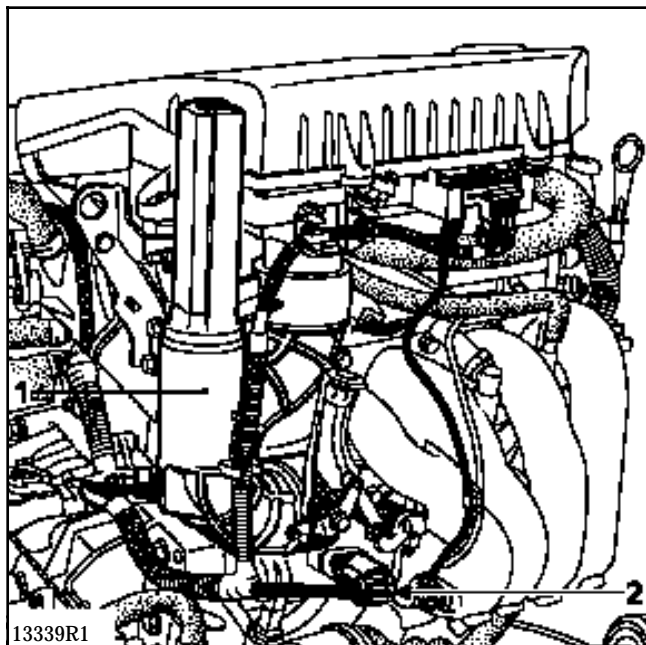
1

## REMOVAL

Disconnect the battery.

Remove the air filter.

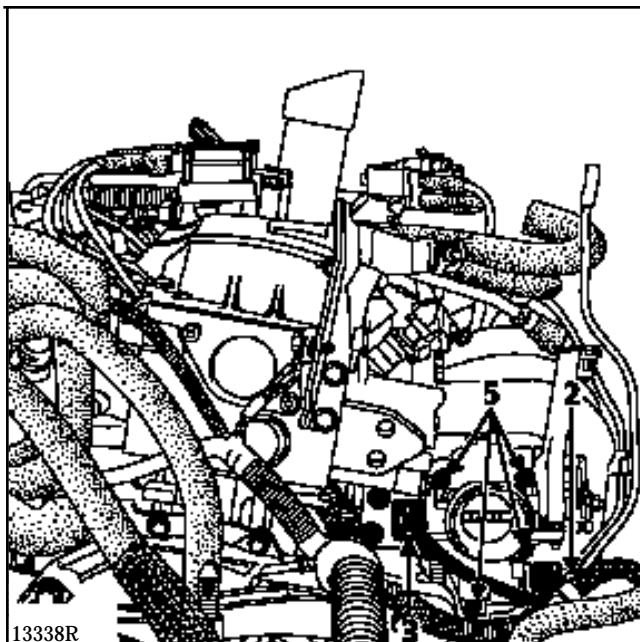
Remove the air intake pipe (1).



Disconnect:

- the accelerator cable,
- the connectors :
  - of the stepping motor (2),
  - of the throttle potentiometer (3).


Remove the four throttle body mounting bolts (5) and remove the throttle body.



## REFITTING

Replace the throttle body seal.

Refitting is the reverse of removal.

TIGHTENING TORQUES (in daN.m)		
Fuel gallery mounting bolt on manifold	1	
Manifold mounting nut on cylinder head	1.7	
Manifold mounting stud on cylinder head	1	

There are no special notes for removal - refitting.

Tightening torque (in daN.m)



Inlet manifold bolt and nut

2

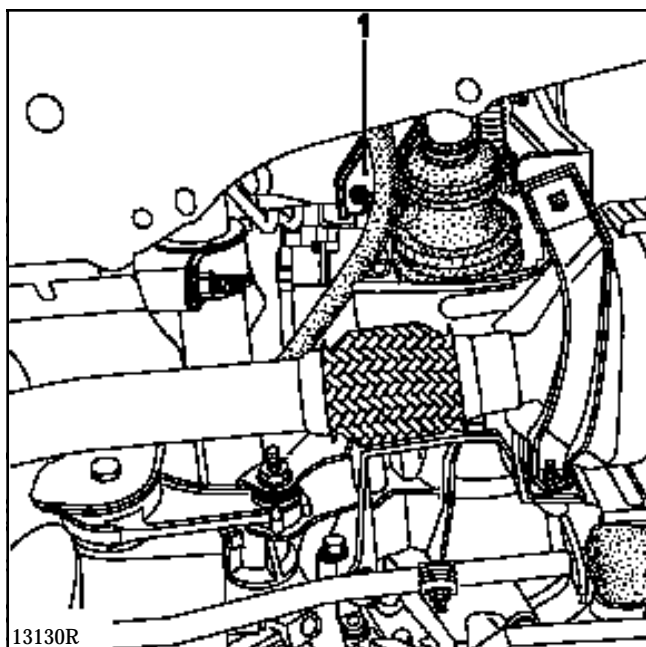
## REMOVAL

Remove:

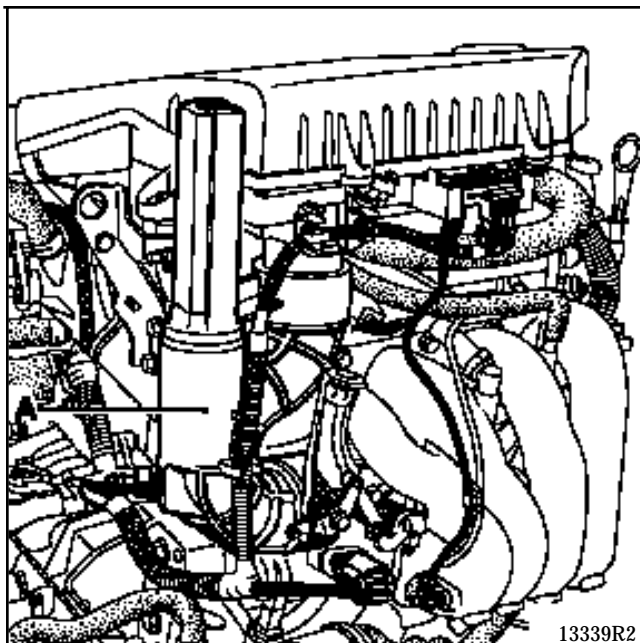
- the air filter,
- the fuel gallery (see section 13).

*Lift the vehicle.*

Remove the strut (1) (to gain access to the bolt fixing the strut on the right-hand side of the vehicle, remove the wheel arch protector and the right-hand wheel).

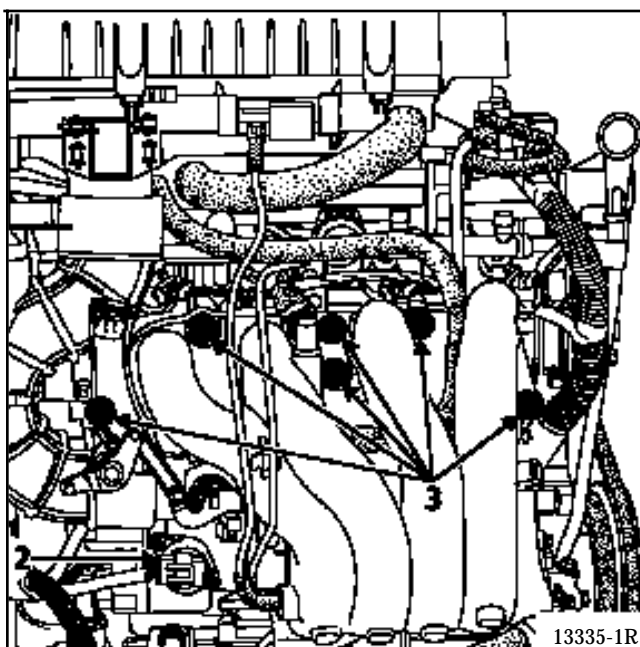
*Lower the vehicle.*

Remove the air intake pipe (A) connecting the throttle body to the air filter.

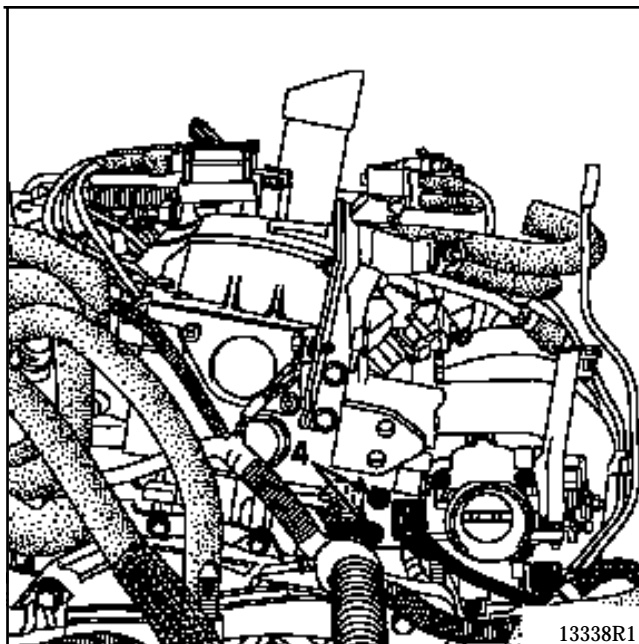


Disconnect the accelerator cable and the electrical connectors (2) connected to the throttle body.

Remove the bolts and nuts (3) securing the manifold.



Remove the two bolts (4) mounting the retaining bracket on the cylinder block.




Remove the manifold.


### REFITTING

Replace the inlet manifold gaskets.

Refitting is the reverse of removal.

TIGHTENING TORQUES (in daN.m)		
Manifold mounting nut	2.5	
Manifold mounting stud	1	
Exhaust downpipe mounting bolt	2.2	

There are no special notes for removal - refitting.

TIGHTENING TORQUE (in daN.m)	
Manifold mounting bolt	2

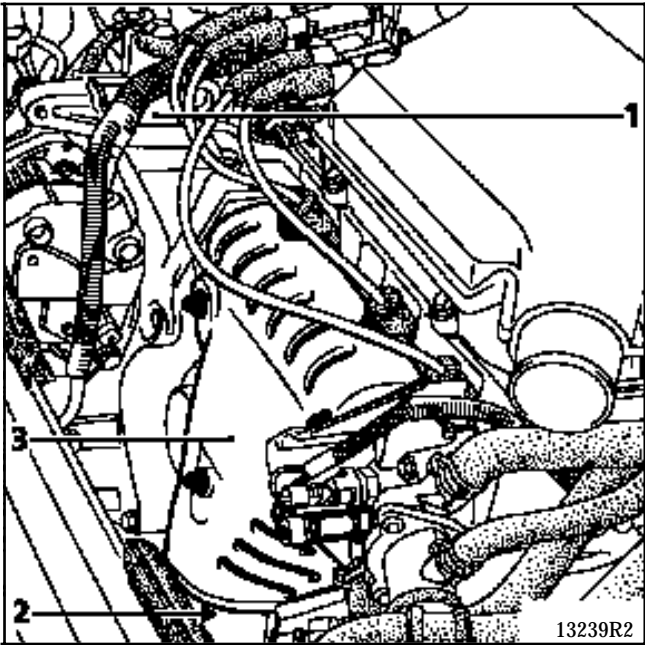
REMOVAL

Remove the multifunction support (1) (see section 10).

Disconnect the exhaust manifold / exhaust front pipe (2).

Remove the heat shield (3).

Remove the exhaust manifold.



REFITTING

Replace the manifold gasket.

Refitting is the reverse of removal.



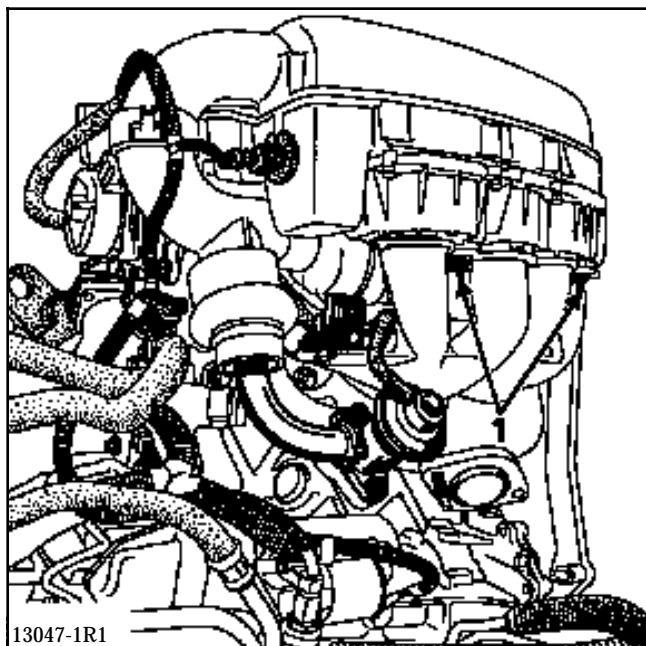
## TIGHTENING TORQUES (in daN.m)



Manifold mounting studs on cylinder head	1
Manifold mounting nuts on cylinder head	2.7
Inlet manifold strut mounting bolt	2.5
Cylinder block strut mounting bolt	2.5

## REMOVAL

Remove the air filter (two upper mounting bolts , two lower mounting nuts (1)).



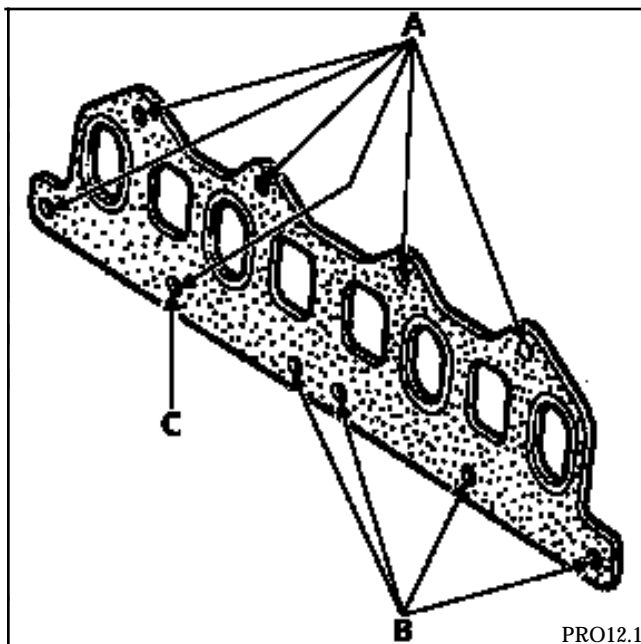
Remove, from above, the two nuts fixing the exhaust downpipe to the manifold.

Slacken, without removing it, the nut on the clamp connecting the downpipe to the exhaust pipe.

Tilt the exhaust downpipe towards the gearbox.

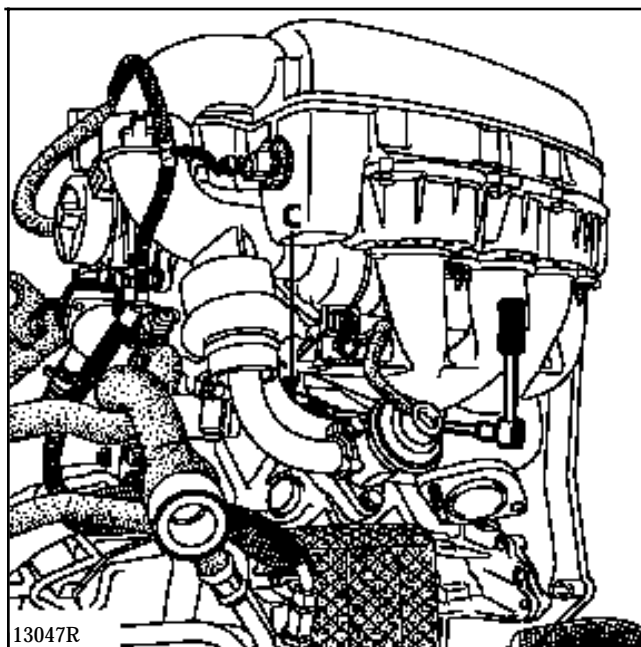
Remove the nuts securing the manifolds:

- nuts (A) from above,
- nuts (B) from below.



## Special note

To remove nut (C) located above the starter motor, use a small ratchet (6.35 mm square) and a universal joint.



**REFITTING**

Replace the manifold gaskets (metal part of the gasket on the manifold side).

Replace the gaskets between the inlet manifold and the air filter.

Replace the steel gasket between the exhaust manifold and the exhaust downpipe.

For the other operations, refitting is the reverse of removal.

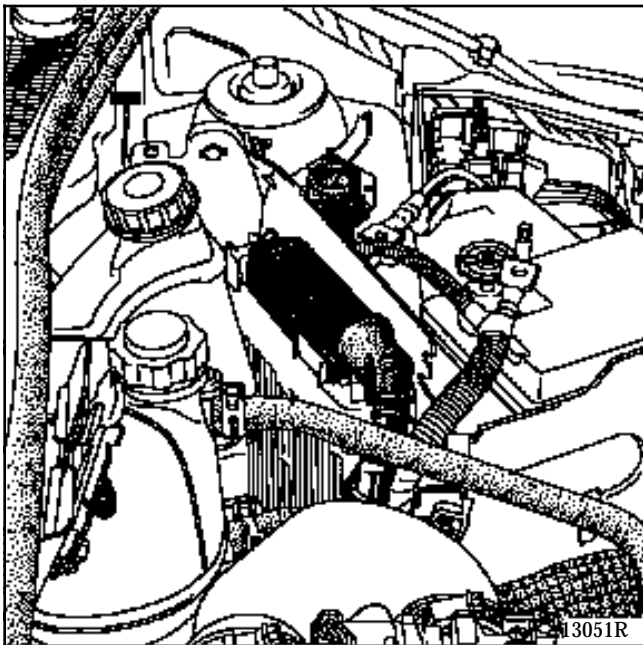
### OBJECTIVE

The main function of this feature is to avoid any fires that may result from the leakage of fuel during an accident. In order to achieve this, all components pumping fuel from the fuel tank will automatically stop functioning during and immediately after the impact. They can then only be made to operate again by a mechanical action carried out by the driver or the repairer.

### DESCRIPTION

The system consists simply of an inertia switch (1), which:

- detects the impact,
- and thus cuts off the electrical circuit.



This is fitted:

- in **petrol engines**, between track 1 of the pump relay (236) and the + supply,
- in **diesel engines**, between the + supply and the electrical solenoid (or the coded solenoid valve if the vehicle is fitted with an engine immobiliser).

### OPERATION

During the impact, the ball of the inertia switch moves up and interrupts the electrical connection.

In **petrol engines**, the + supply of the pump relay control circuit (236) is cut. Neither the pump or the injectors will receive any further electrical supply.

The fuel contained in the tank is actually isolated.

In **diesel engines**, the electrical supply to the electrical solenoid or the coded solenoid is cut off.

The pump can no longer take in fuel, as there is no more high pressure. All risk of fire due to the outlet of diesel fuel at high pressure onto the engine is removed.

### RESETTING AND OPERATING THE SWITCH

In order to reset the inertia switch, it is sufficient to press it down in order to replace the ball bearing in its original position.

**IMPORTANT:** for **petrol engines**, , having reset the switch, the memory of the computer **MUST** be erased, using the **XR25**. The injection computer will memorise a pump relay fault once the system has gone into operation.

**SPECIAL TOOLING REQUIRED**

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

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

Bolt mounting fuel gallery on manifold

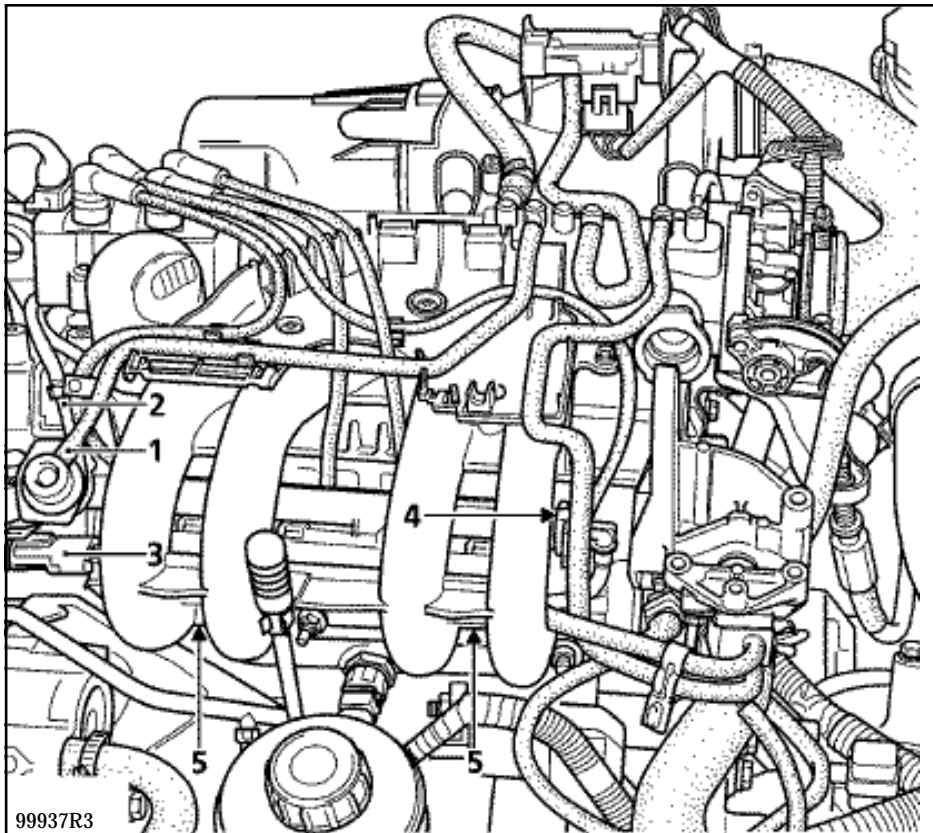
1

**IMPORTANT:** during the disconnection of the fuel circuit, be sure to use a cloth to avoid fuel leakage due to the residual pressure.

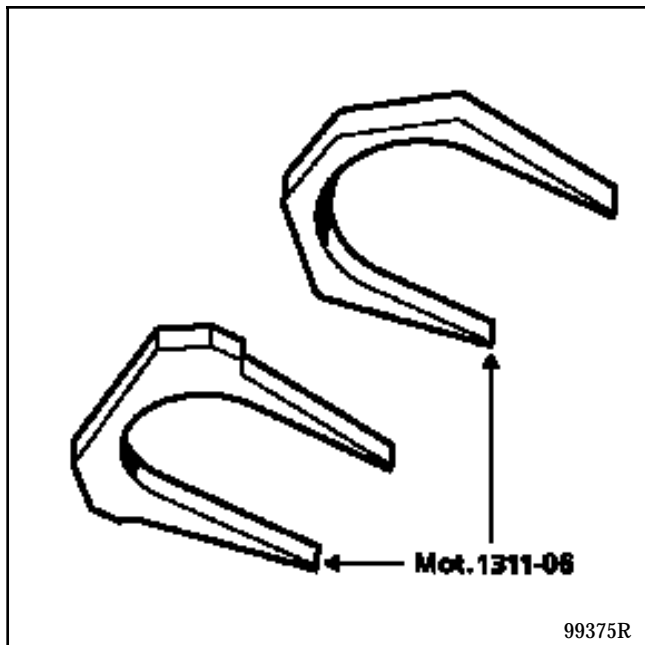
**REMOVAL**

Disconnect :

- the battery,
- the pressure/vacuum pipe (1) of the pressure regulator,
- the fuel return pipe (2),
- the electrical connector of the injectors (3).

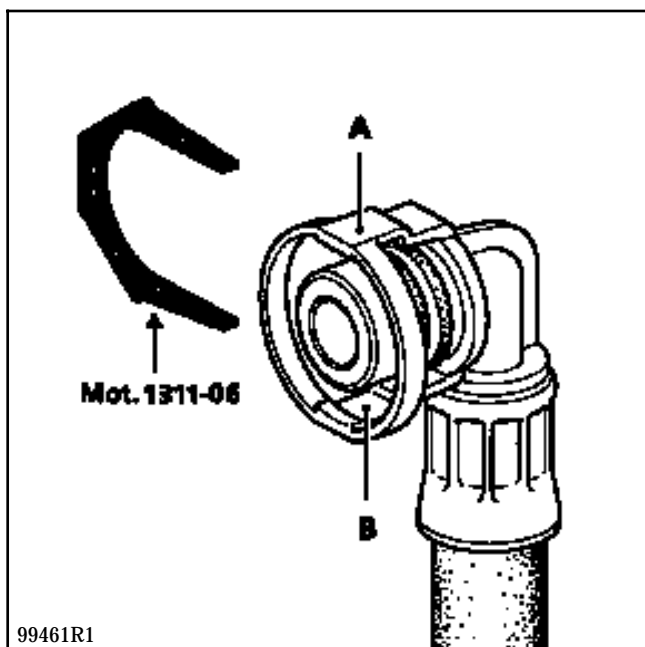


Disconnect the fuel supply pipe (4) using the tool **Mot. 1311-06** with the largest section (the fuel pipe is equipped with a removal tool which is attached to the connection incorporated in the vehicle ).



To disconnect the unions, slip tool **Mot. 1311-06** between the two stems (A) and (B).

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



Remove the two bolts (5) mounting the fuel gallery on the manifold.

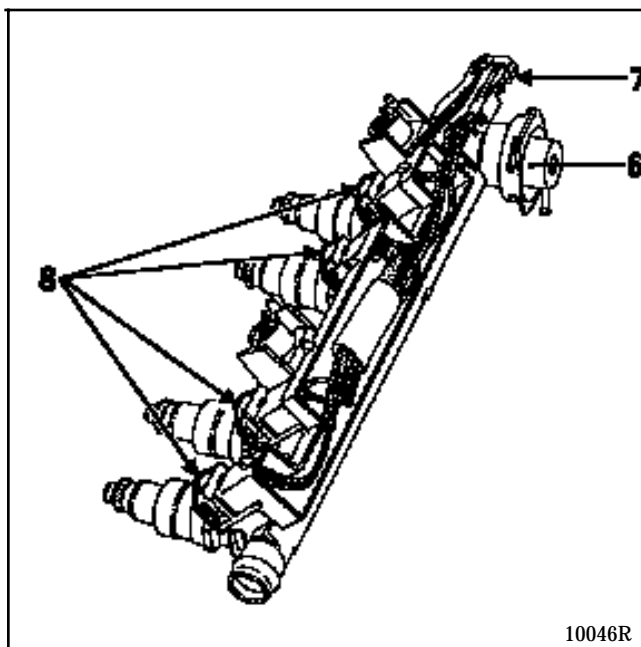
Slide the fuel gallery, along with the injectors, between the manifold and the cylinder head.

Extract the fuel gallery from the right hand side of the vehicle.

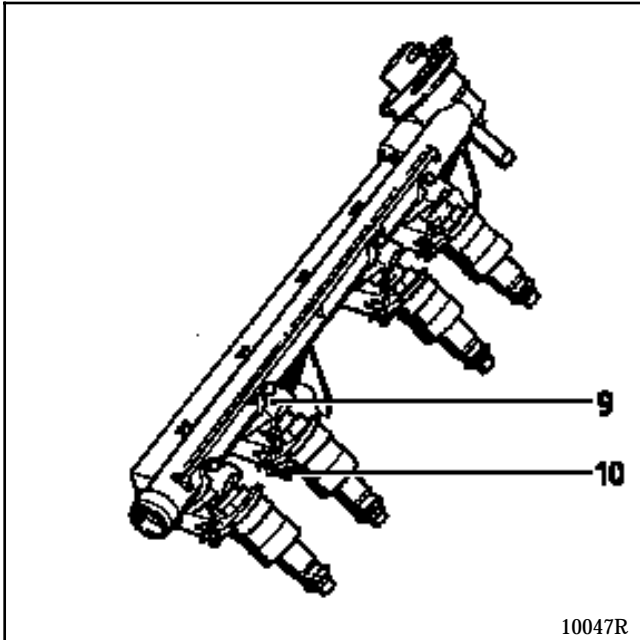
### NOTES

The fuel pressure regulator (6) is clipped to the fuel gallery .

There is an intermediate connector (7) between the injector connector (8) and the computer.



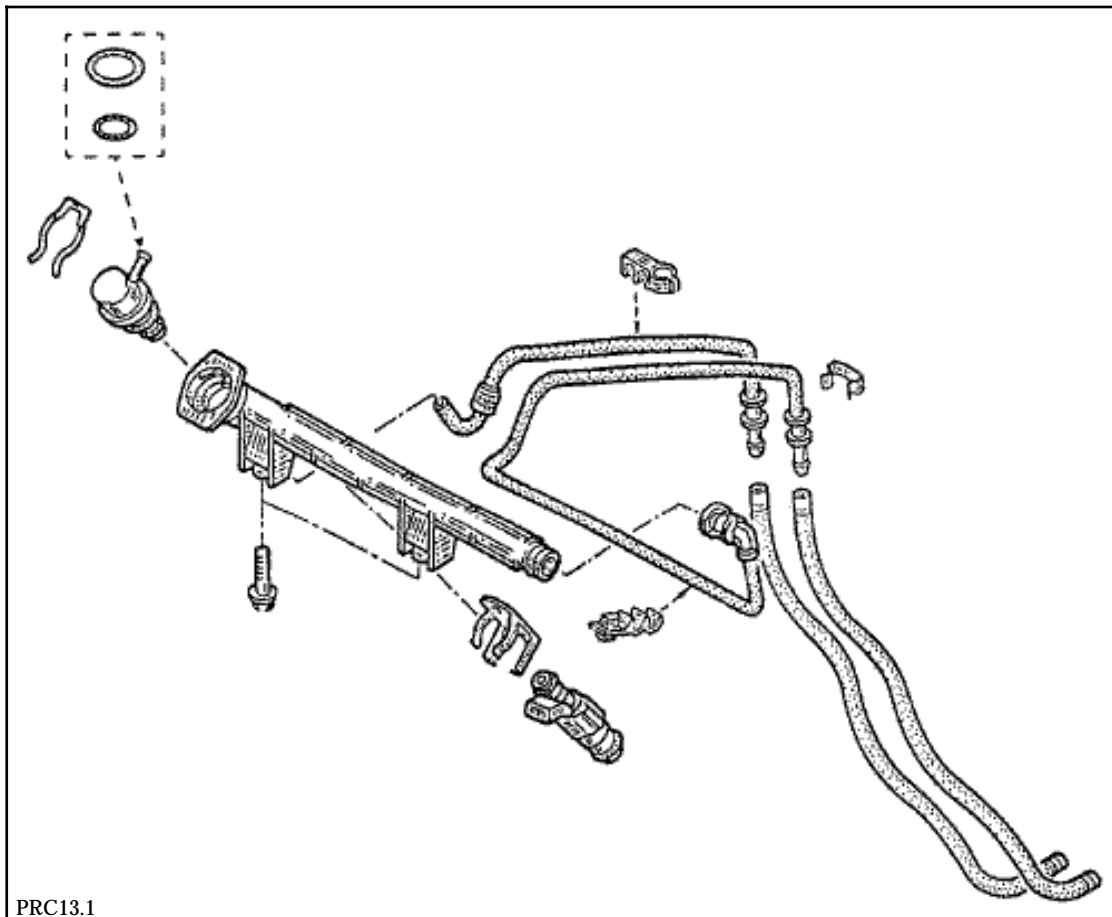
To remove an injector, remove the clip (9), then press on the fastener (10) before pulling on the injector.

**REFITTING**

Replace the O rings at the base of the injector (if the injector has been removed, also replace the seal which is level with the injector head).

To ensure that the fuel pipe unions are correctly fastened, it is necessary to hear a "click" whilst fastening.

For all other operations, refitting is the reverse of removal.



**IMPORTANT:** during the disconnection of the fuel circuit, be sure to use a cloth to avoid fuel leakage due to the residual pressure.

### REMOVAL

Disconnect the battery.

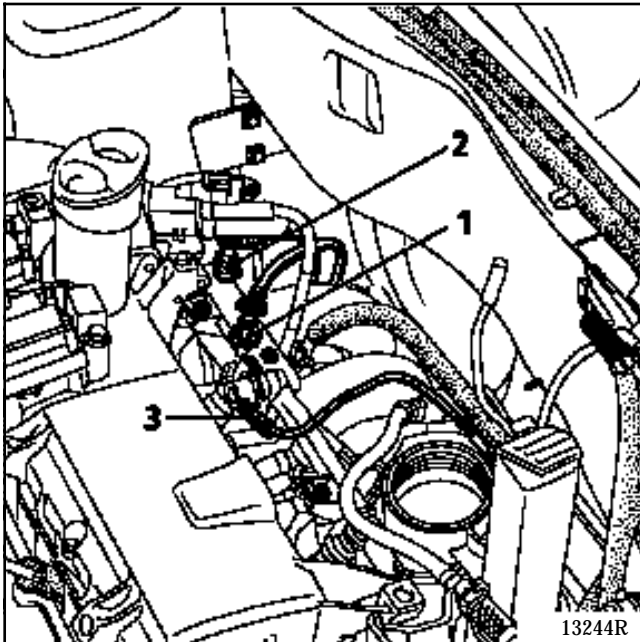
Remove the air filter.

Disconnect :

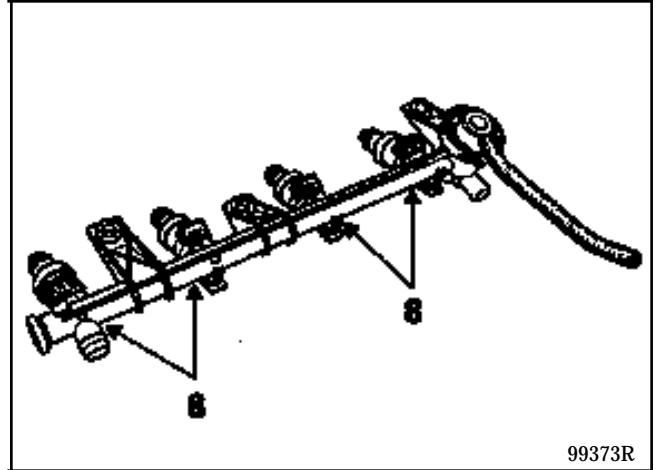
- the fuel supply pipe (1),
- the fuel return pipe (2),
- the fuel pressure regulator pipe (3).

Remove the three bolts (4) mounting the fuel gallery (5).

Remove the fuel gallery.



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



### REFITTING

Replace the O rings at the base of the injector (if the injector has been removed, also replace the seal which is level with the injector head).

To ensure that the fuel pipe unions are correctly fastened, it is necessary to hear a "click" sound whilst fastening.

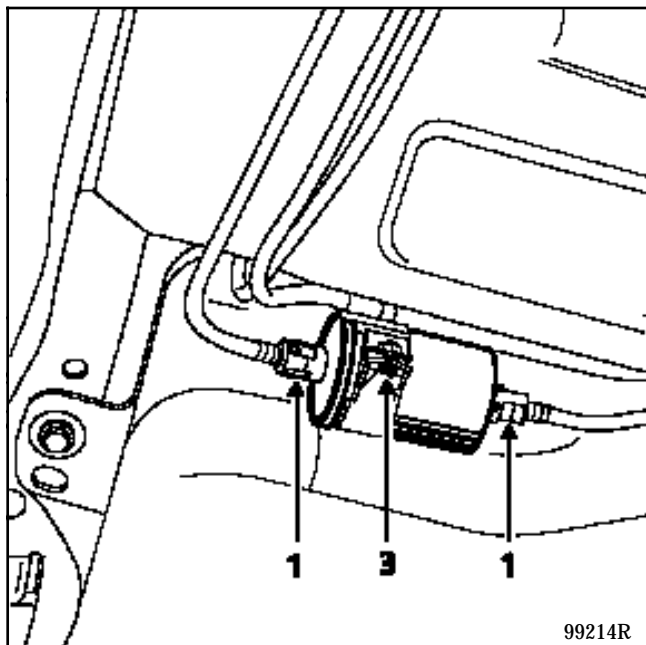
For all other operations, refitting is the reverse of removal.

### SPECIAL TOOLING REQUIRED

<b>Mot. 1265</b>	<b>Pliers for removing quick release unions</b>
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### LOCATION

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



### REPLACEMENT

It is recommended to replace the fuel filter at each vehicle major service.

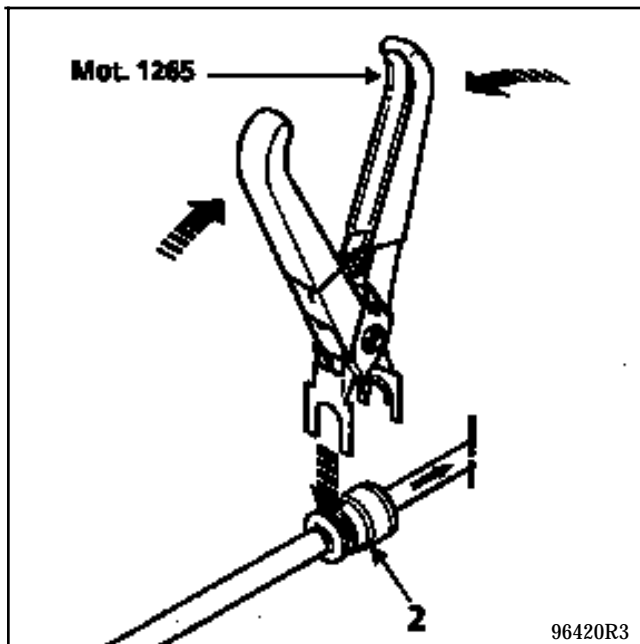
**IMPORTANT:** during the disconnection of the fuel circuit, be sure to use a cloth to avoid fuel leakage due to the residual pressure.

### REMOVAL

Before removing the filter take precautions to catch fuel that will run out of the pipes (the pipes should not be clamped as they would be damaged).

Remove the clips (1).

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



Remove bolt (3) and remove the fuel filter.

### REFITTING

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

Reconnect the pipes by hand (tool **Mot. 1265** is not required).

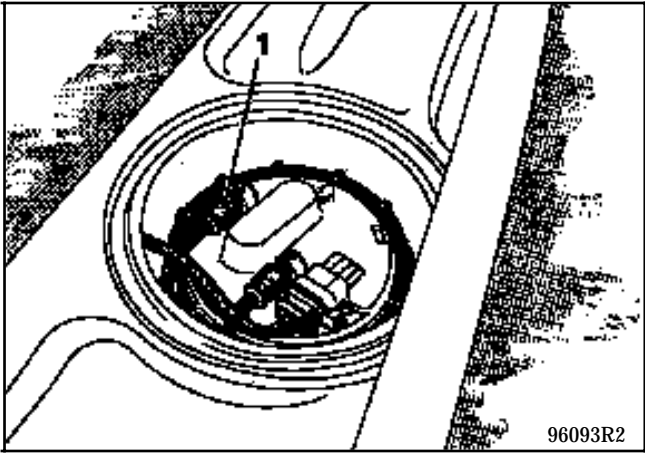
Ensure that the quick release unions are correctly fastened.

Refit the safety clips (1).



SPECIAL TOOLING REQUIRED	
Mot. 1265	Pliers for removing quick release unions
EQUIPMENT REQUIRED	
2 000 ml measuring cylinder	

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



IMPORTANT

- During this operation, it is essential :
- to refrain from smoking and handling incandescent objects close to the working area,
  - to take precautions against possible fuel leakage which may occur due to the residual pressure in the supply pipes when they are removed.

CHECKING THE PUMP FLOW

Disconnect the fuel return pipe (1) (**Mot. 1265**).

Connect a piece of pipe to the hose and place this into a **0-2 000 ml** graduated measuring cylinder.

Shunt terminals (3) and (5) on the fuel pump relay (it is located in the engine fuse box). In one minute, the pump flow must be a minimum of **1.3 litres** for a voltage of **12 volts**.

If the fuel flow is low, check the pump feed voltage (approximately **10 %** reduction in flow for a voltage drop of **1 Volt**)

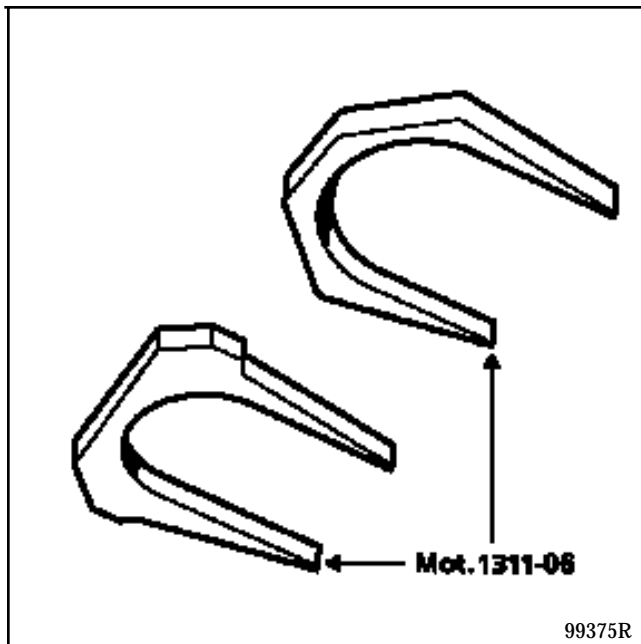
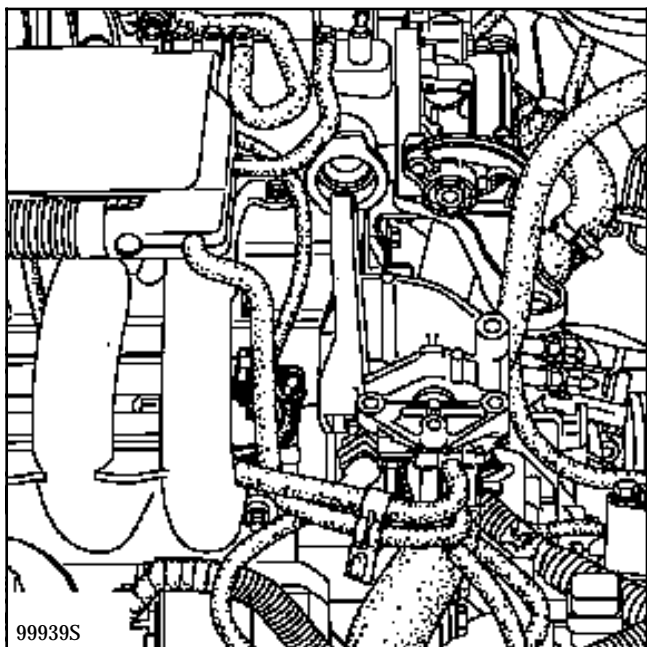
### CHECKING THE FUEL PRESSURE

#### SPECIAL TOOLING REQUIRED

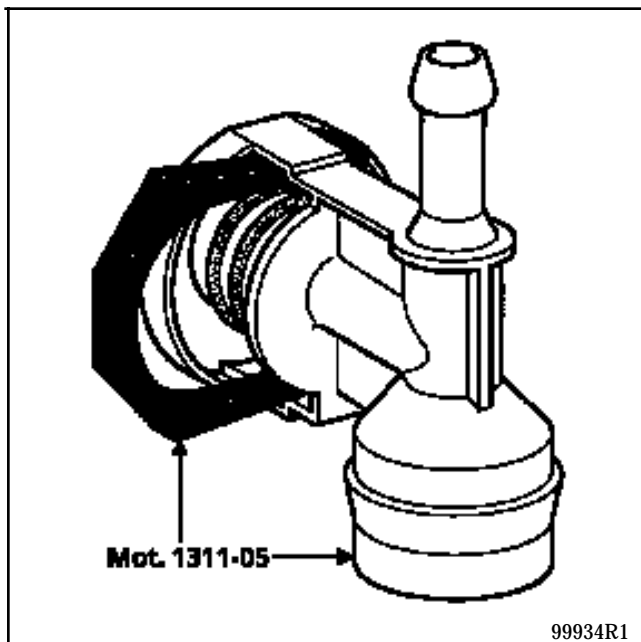
Mot. 1311-01	Fuel pressure test kit (with a pressure gauge (0 - 10 bar )
Mot. 1311-05	Junction tool (for union K)
Mot. 1311-06	Tool for removing the fuel pipe unions

**IMPORTANT:** during the disconnection of the fuel circuit, be sure to use a cloth to avoid fuel leakage due to the residual pressure.

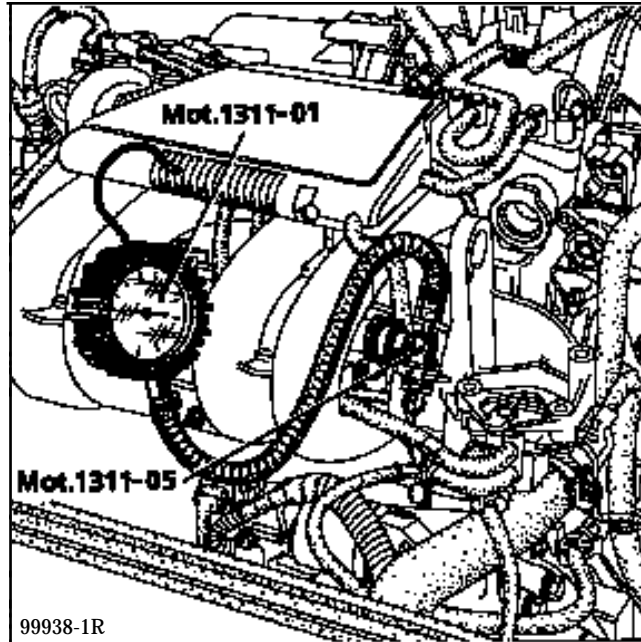
Disconnect the fuel supply pipe using the tool **Mot. 1311-06** with the largest section (see method described in section 13 "Fuel gallery").



Connect tool **Mot. 1311-05** to the fuel gallery , then reconnect the fuel supply pipe to the tool itself.



Connect pressure gauge **0 - 10 bars** along with the flexible hose, **Mot. 1311-01**.



Shunt terminals (3) and (5) on the pump relay, which is situated in the engine fuse box.

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

By applying a vacuum of **500 mbars** to the pressure regulator, a fuel pressure of **2.5 bars  $\pm$  0.2** should be obtained.

## CHECKING THE FUEL PRESSURE

## SPECIAL TOOLING REQUIRED

**Mot. 1311-01** Fuel pressure test kit (with a pressure gauge (0 - 10 bar)

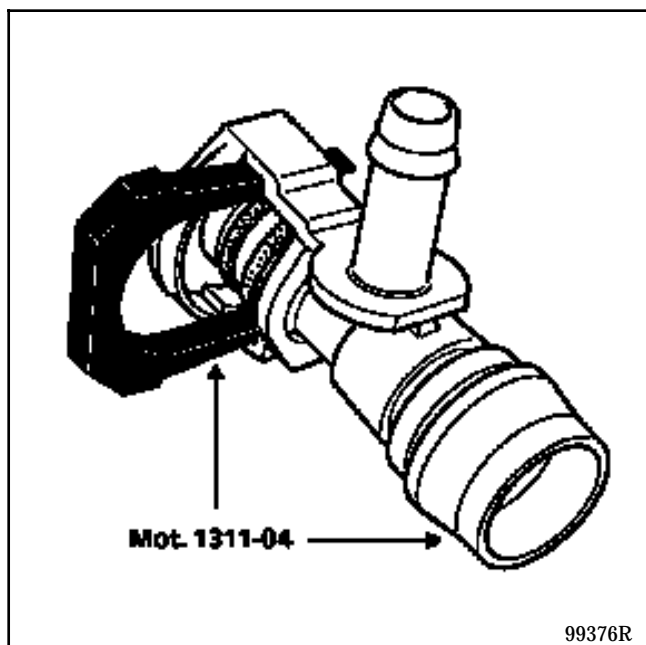
**Mot. 1311-04** Junction tool (for union J)

**IMPORTANT:** during the disconnection of the fuel circuit, be sure to use a cloth to avoid fuel leakage due to the residual pressure.

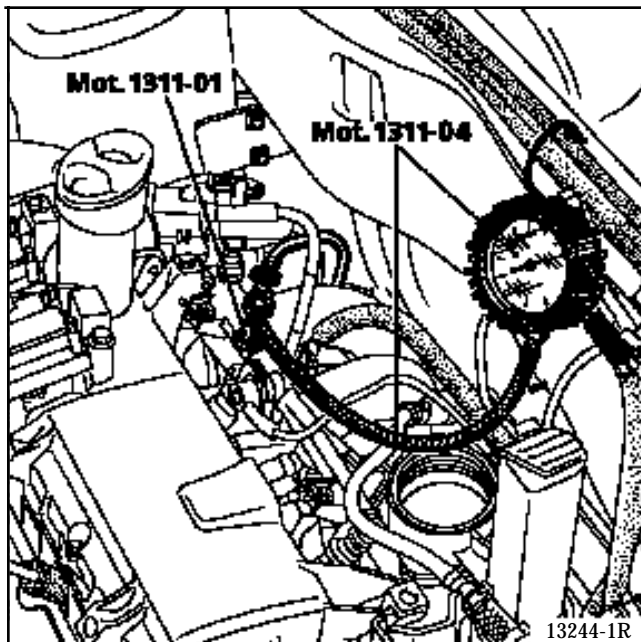
Remove the air filter.

Disconnect the fuel supply pipe.

Connect the junction tool **Mot. 1311-04** to the fuel gallery, then reconnect the fuel supply pipe to the tool itself.



Connect pressure gauge **0 ; 10 bars** along with the flexible hose, **Mot. 1311-01**.

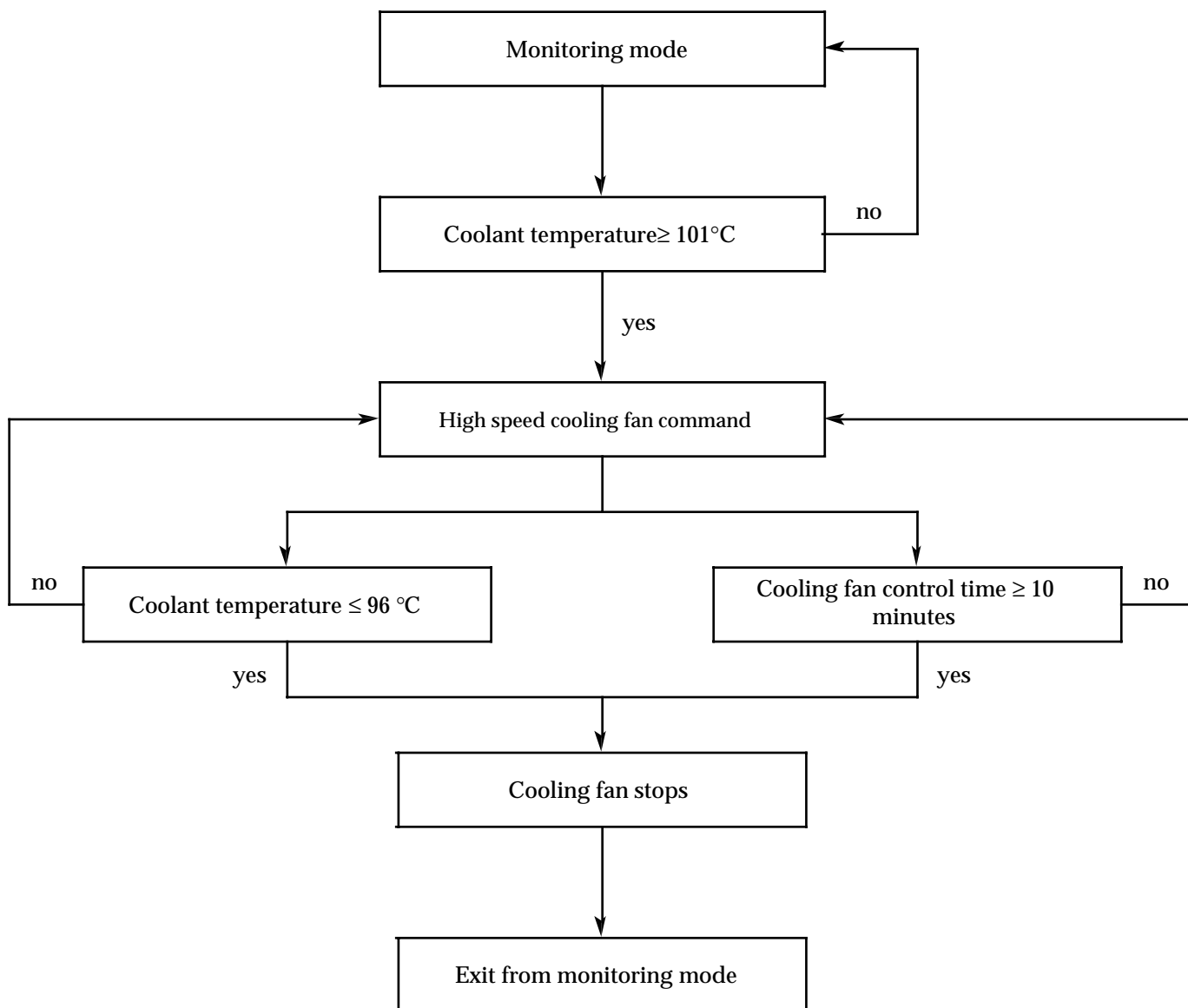


Shunt terminals (3) and (5) on the fuel pump relay located in the engine fuse box.

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

By applying a vacuum of **500 mbars** to the pressure regulator, a fuel pressure of **2.5 bars  $\pm$  0.2** should be obtained.

When the ignition is switched off, the coolant temperature monitoring mode begins.



Monitoring mode ends **2 minutes (E7J), 3 minutes (K7M)** after switching off the engine in cases where the coolant temperature is not greater than or equal to **101 °C** or once the coolant temperature falls below **92 °C (E7J), 89 °C (K7M)**.

The use of electronic injection in Diesel engines has allowed the operational power of these engines to be optimised, thus reducing the emission rate of pollutant gases.

The system consists of a computer, which receives information from:

- the coolant temperature sensor,
- the air temperature sensor,
- the engine speed sensor,
- the vehicle speed sensor,
- the load potentiometer,
- the injection lift sensor, which forms part of the injector of cylinder n° 3 (injector with sensor),
- air conditioning mode

It controls:

- the injection pump :
  - the altimetric corrector via a relay,
  - the advance solenoid valve,
- the cold start system (plugs and pre-postheating unit),
- the exhaust gas recycling system (**EGR**),
- the injection fault warning light,
- the preheating warning light,
- the solenoid valve controlling the fast idle speed LDA,
- the relay controlling the power assisted steering electric pump assembly (for vehicles with **air conditioning**), the pump assembly is supplied once the engine speed exceeds **650 rpm**.
- the suppression or operation of the air conditioning.

It carries out a self diagnosis procedure which may be visualised using the **XR25**.

### SPECIAL FEATURES

On the injection pump it is possible to replace:

- the load potentiometer,
- the advance solenoid valve,
- the altimetric corrector,
- the electrical solenoid.

**DIESEL EQUIPMENT**  
**Specifications**

**13**

Vehicles	Gearbox	Engine							Depollution standard
		Type	Suffix	Bore (mm)	Stroke (mm)	Capacity (cm <sup>3</sup> )	Ratio	Catalytic converter	
XB0E	JB	F8Q	630	80	93	1 870	21.5/1	◇ C55	EU96

Vehicles	ENGINE SPEED (rpm)			SMOKE OPACITY	
	Idle speed	no load maximum	full load maximum	Homologation value	Legal maximum
XB0E	850 ± 25	5 100 ± 100	4 600 ± 100	1.11 m <sup>-1</sup> (36 %)	2.5 m <sup>-1</sup> (64 %)

Temperature in °C (± 1°)	0	20	40	80	90
<b>Air temperature sensor</b> CTN type Resistance in Ohms	7470 to 11970	3060 to 4045	1315 to 1600	-	-
<b>Coolant temperature sensor</b> CTN type Resistance in Ohms	-	3060 to 4045	1315 to 1600	300 to 370	210 to 270

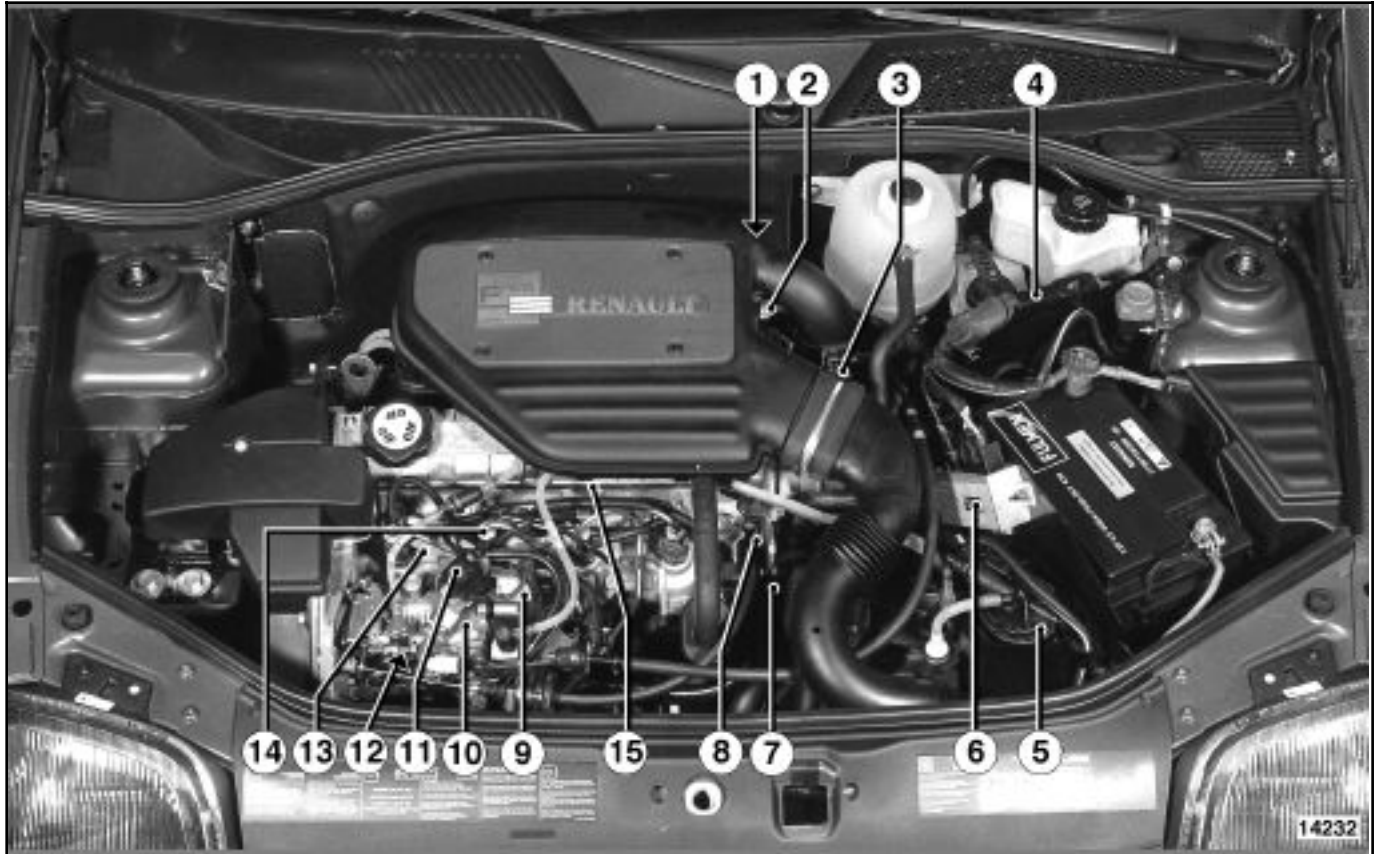
# DIESEL EQUIPMENT

## Specifications

13

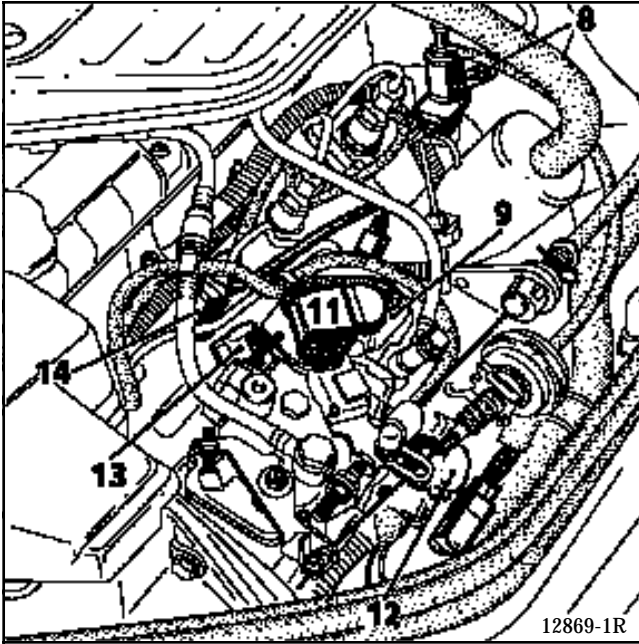
DESCRIPTION	MAKE/TYPE	SPECIAL NOTES		
Computer	LUCAS	25 track (in case of computer replacement, programme the new computer to memorise the full load position of the load potentiometer)		
Injection	-	Indirect		
Injection pump	LUCAS DIESEL 8448B171 A/231A (F8Q 630)	Rotary pump fitted with : - an advance solenoid valve, - an altimetric corrector (F8Q 630).		
Pump setting (obtain TDC point using Ø 8 mm pin)	-	Dimension ( X ) on pump		
Injector holders	LUCAS DIESEL LCR 6735 405	Tightening torque: 7 daN.m (injector on injector holder and injector holder in cylinder head )		
Holder for injector with sensor (needle lift)	LUCAS DIESEL LDCR020011AB1	Tightening torque : 7 daN.m Resistance ≈ 105 Ω		
Injectors	LUCAS DIESEL RDN OSDC 6902	Command: 130 $\pm$ 5 bars Maximum difference: 8 bars		
EGR solenoid valve	-	Voltage: 12 volts Resistance : 46 ± 5 Ω		
Return pipes	-	Ø interior : 2.5 mm Length: 330 ± 5 mm		
Preheating relay housing	NAGARES	With pre-postheating function (command controlled by the computer)		
Heater plugs	BERU Pencil type plug	Resistance : 0.8 Ω Tightening torque : 2 daN.m		
TDC sensor	-	Resistance : 220 Ω		
Fast idle solenoid valve	-	Voltage: 12 V Resistance : 46 Ω		
Advance corrector	-	Voltage: 12 V Resistance : 11.5 Ω		
Load potentiometer	-	Voltage: 5 V Resistance : (in K Ω approximately)		
		<b>Track</b> (10 track connector)	<b>no load</b>	<b>full load</b>
		5 - 4	4.5	4.5
		3 - 4	5.6	2.8
		3 - 5	2.8	5.6
Altimetric corrector	-	Voltage: 12 V Resistance : 15.5 Ω		
Fault finding	Fiche n° 43 Code D34 Selector S8	-		



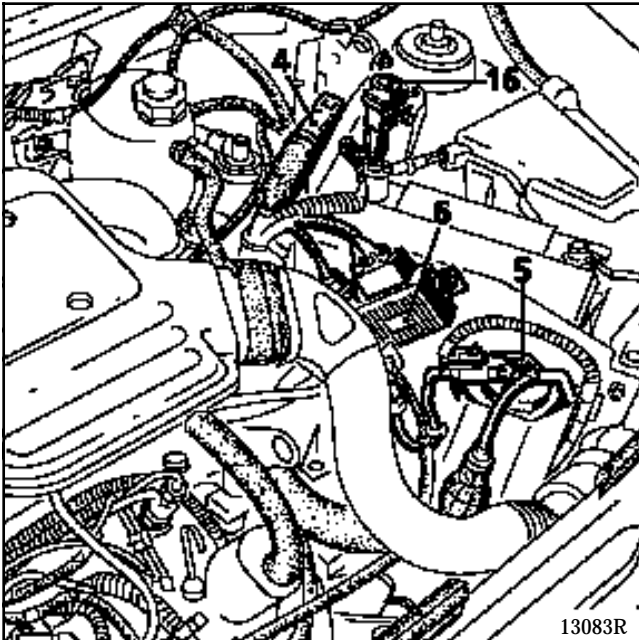


- 1 EGR valve and solenoid valve
- 2 Air temperature sensor (white connector)
- 3 Coolant temperature sensor (white connector)
- 4 Diesel injection computer
- 5 Fuel filter
- 6 Pre-postheating plug relay housing
- 7 TDC sensor
- 8 Fast idle solenoid valve
- 9 Electrical solenoid / coded solenoid / secure housing
- 10 Digital DPC injection pump
- 11 Load potentiometer
- 12 Advance solenoid valve
- 13 Altimetric corrector
- 14 Injector with sensor (needle lift)

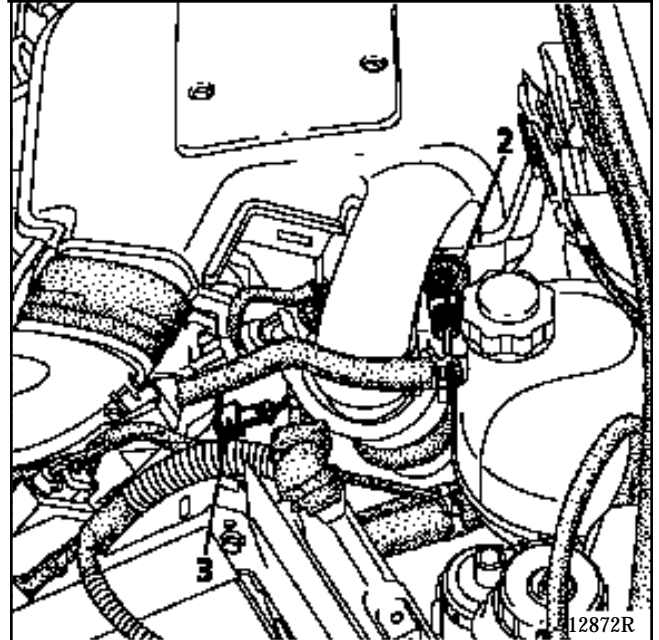
- 8 Idle speed solenoid valve
- 9 Electrical solenoid / coded solenoid valve
- 11 Load potentiometer
- 12 Advance solenoid valve
- 13 Altimetric corrector
- 14 Injector with sensor



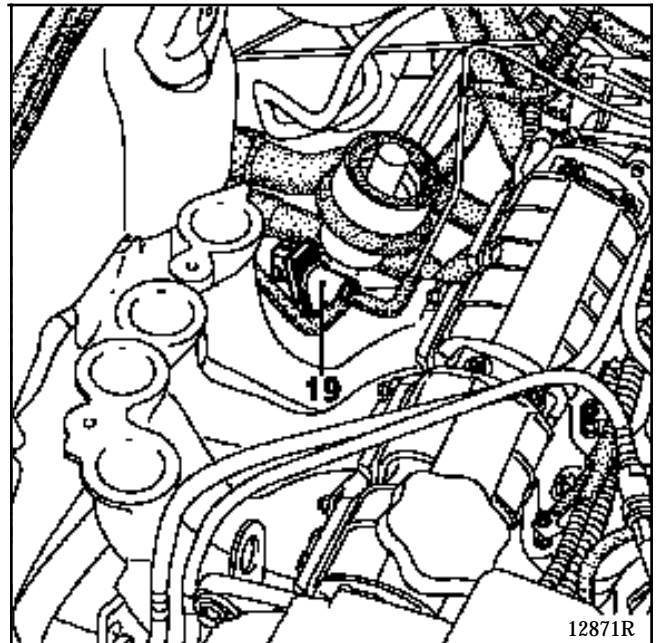
- 4 Injection computer
- 5 Fuel filter
- 6 Pre-postheating plug relay housing
- 16 Inertia switch



- 2 Air temperature sensor
- 3 Coolant temperature sensor



- 19 EGR solenoid valve

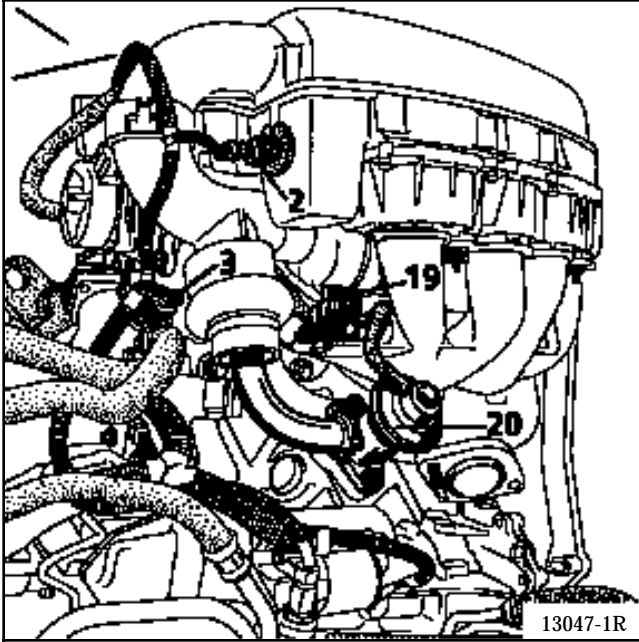


# DIESEL EQUIPMENT

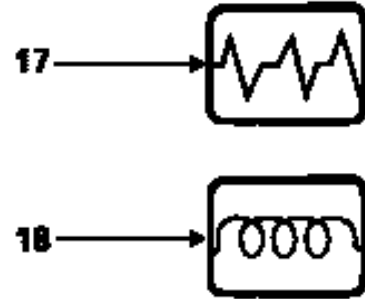
## Location of components

13

- 2 Air temperature sensor
- 3 Coolant temperature sensor
- 19 EGR solenoid valve
- 20 EGR valve

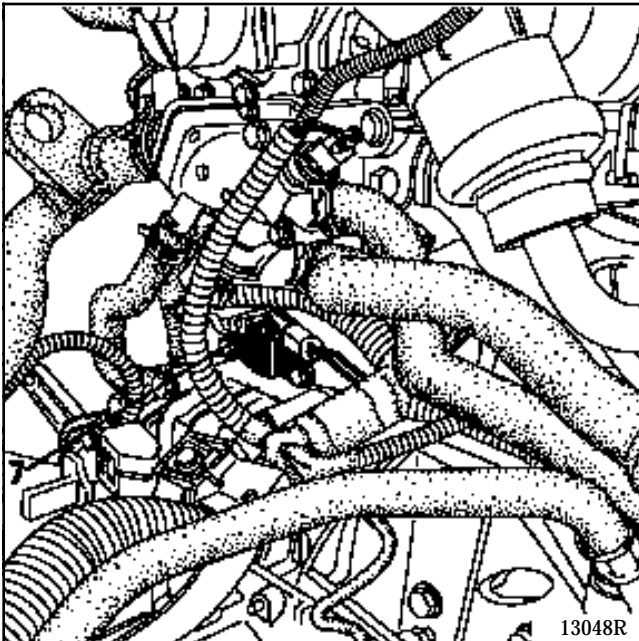


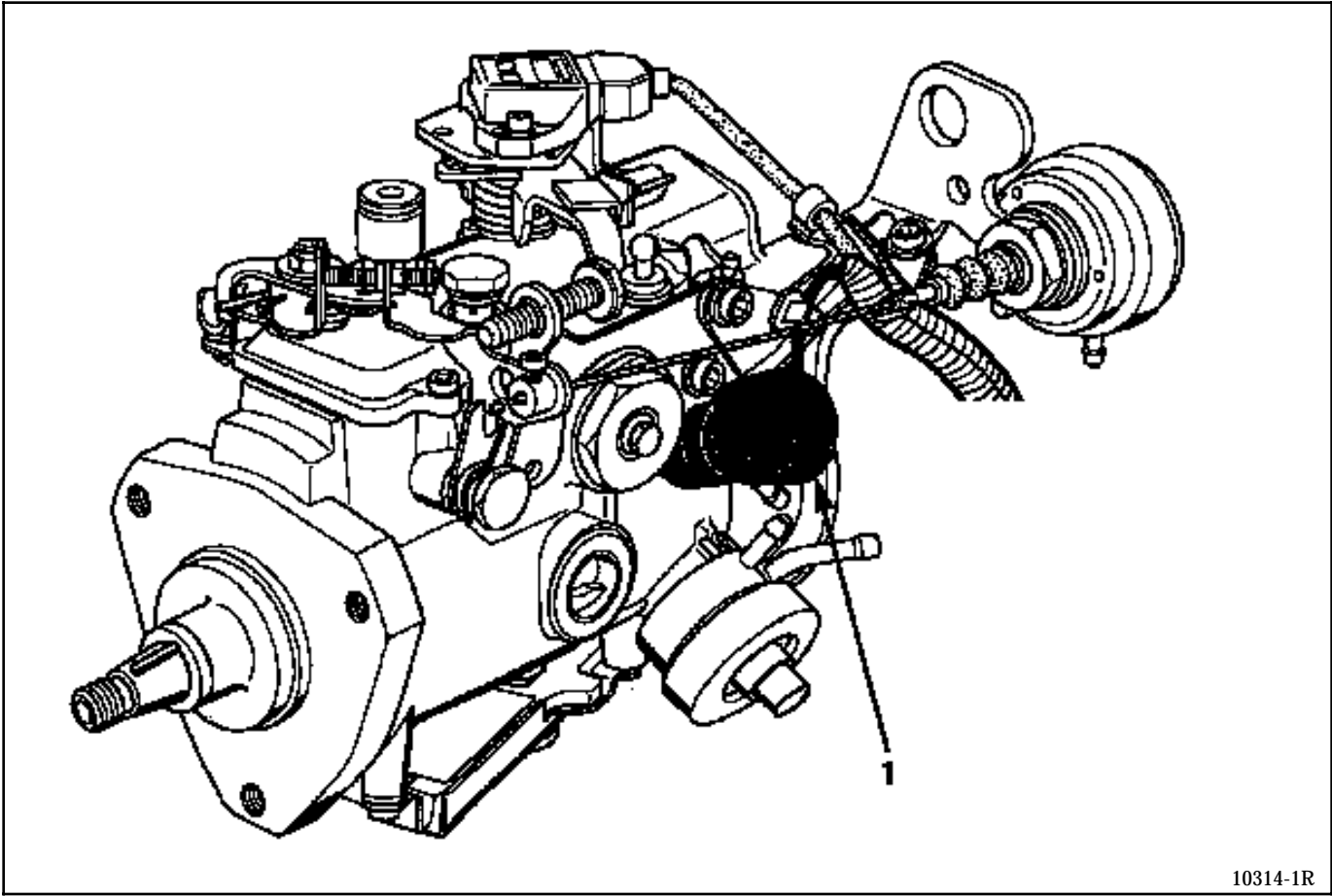
- 17 Diesel injection fault warning light
- 18 Preheating warning light  
Warning light illuminates when ignition is switched on during preheating phase.



87970R

- 7 Engine speed sensor





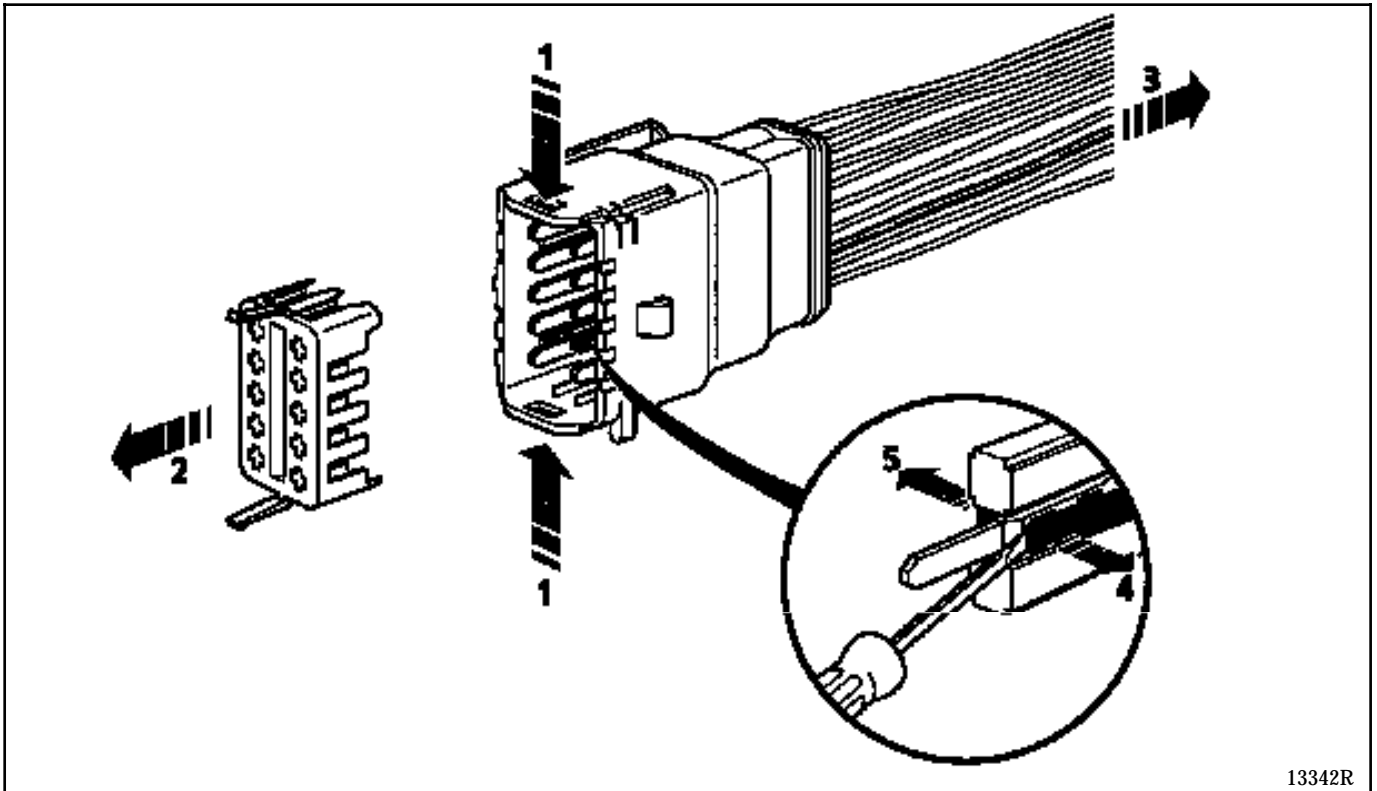
10314-1R

SPECIAL TOOLING REQUIRED	
Mot. 997-01	Tool for removing injector and advance solenoid valve
TIGHTENING TORQUES (in daN.m)	
Advance solenoid valve	3

**REMOVAL**

Disconnect the electrical connector from the pump.

Remove the two terminal connectors for the advance solenoid from the **10 track** pump connector.



To remove the terminals from the pump connector :

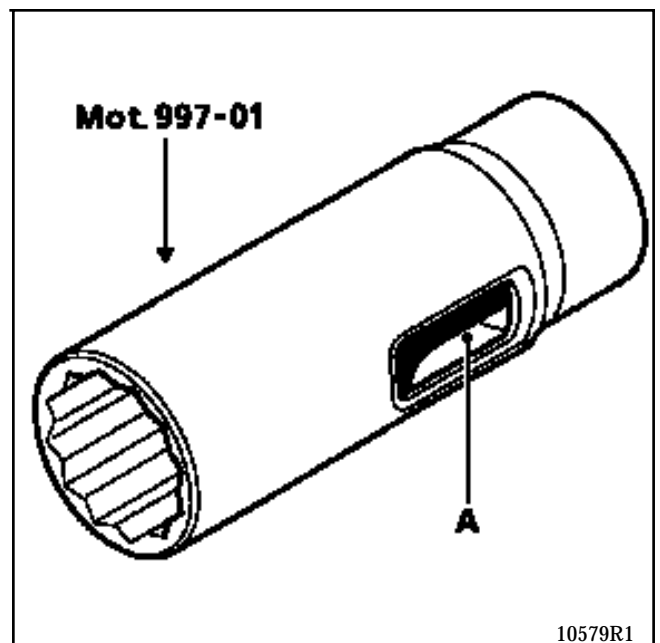
- 1) Pull the yellow guide to release the terminal connectors, then press on the two tabs on each side of the connector.
- 2) Extract the yellow guide.
- 3) Pull the wire to be removed.
- 4) The terminal connector is secured by two tabs, one on each side ; using a screwdriver, move one of these to one side (the action of pulling on the wire prevents the tab from going back into place).
- 5) Using a screwdriver, move the other tab to one side.

The terminal connector can now be removed from the connector.

Remove the protective sheath grouping the pump actuators.

Remove the protective cover on the solenoid valve.

Remove the solenoid valve using tool **Mot. 997-01**.



A Connector passage

### REFITTING

The small filter (3) situated at the bottom of the system, **MUST** be removed, using a pair of needle-nose pliers, and replaced with a new filter.

The outer part serves as a seal and locks on to a recommended torque, tightening the actuator.

Replace, in the following order : the seal at (4) of the "banjo" return connection (5) ; the new actuator (1) fitted with an external filter, along with the the two seals at (6) and (7).

Tighten the actuator to a torque of **3 daN.m** using socket **Mot. 997-01**.

Place the new protective cover (2) on the actuator.

Reconnect the two terminals to the connector.

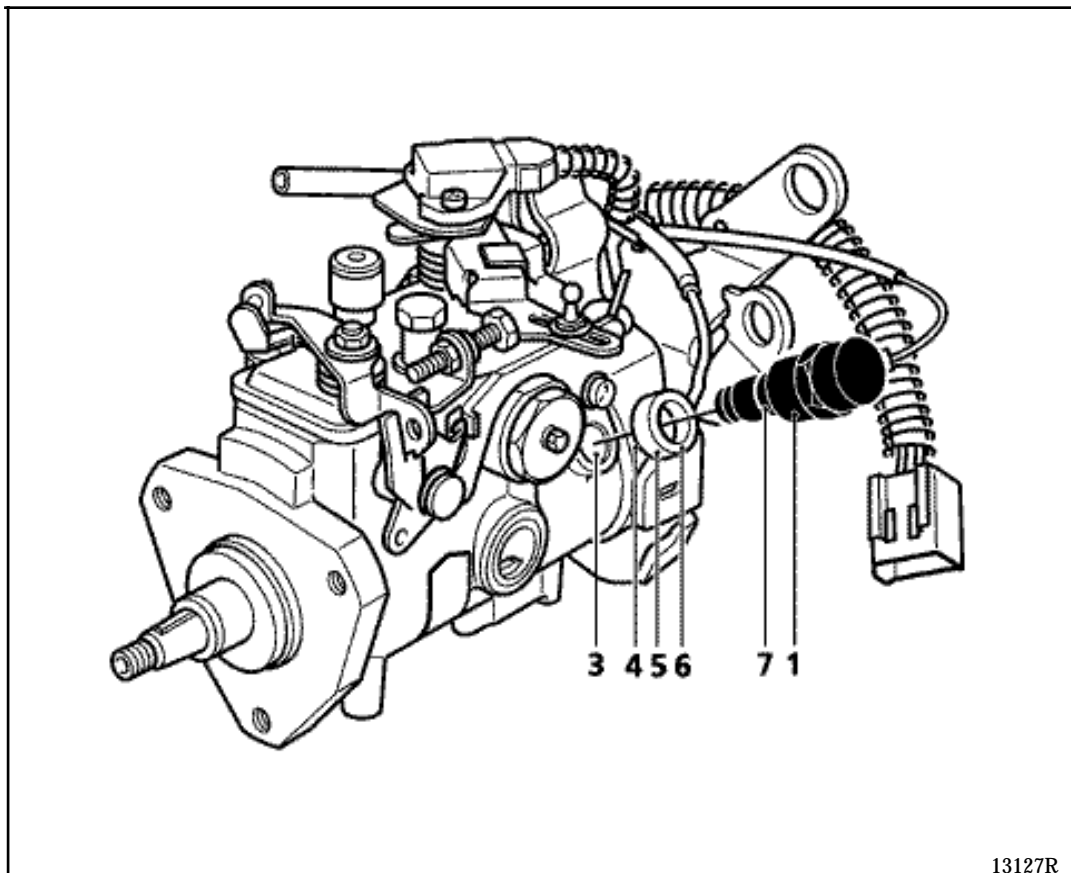
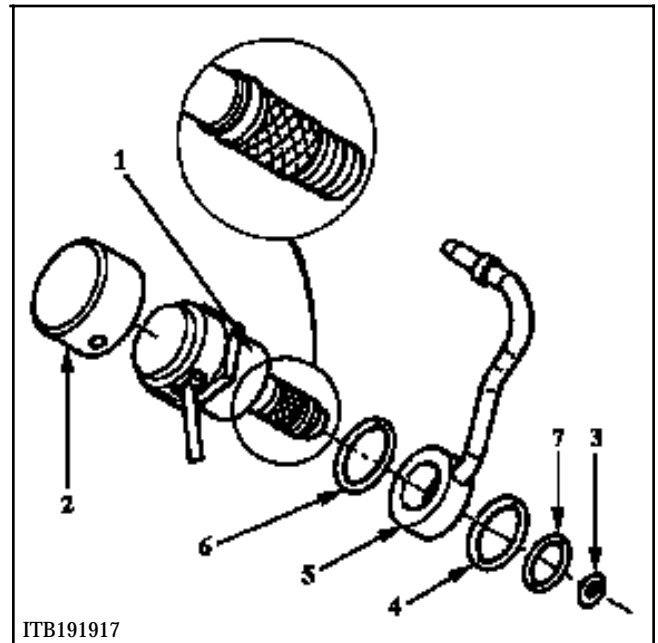
Reconnect the connector itself.

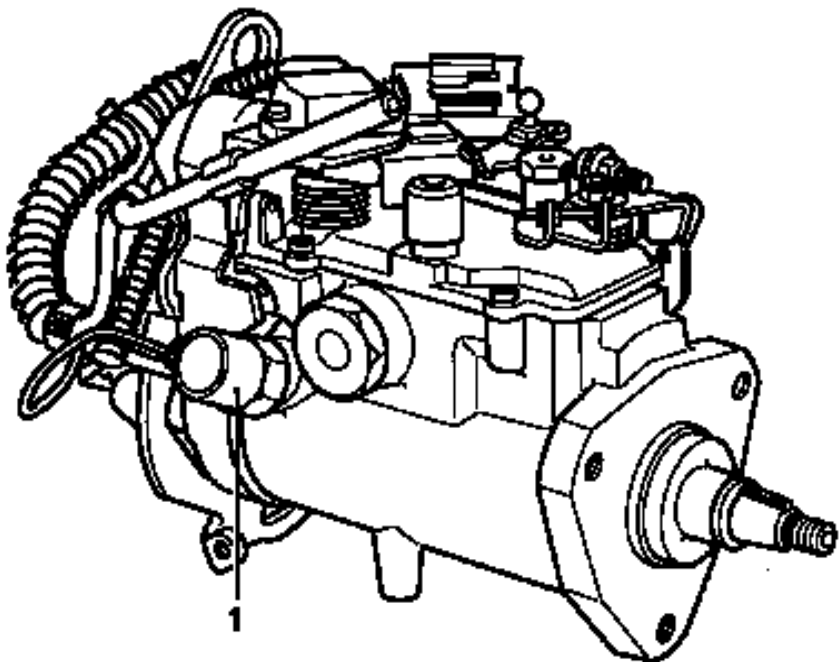
Replace the protective sheath on the wiring, along with the retaining clip.

Bleed the diesel circuit using the priming pump before starting the engine.

**The computer memory MUST be erased by pressing G0\*\*.**


The vehicle must be tested after the operation.





13129R

SPECIAL TOOLING REQUIRED	
Mot. 997-01	Tool for removing injector
Mot. 1140	Tool for removing altimetric corrector

TIGHTENING TORQUES (in daN.m)	
Altimetric corrector	3

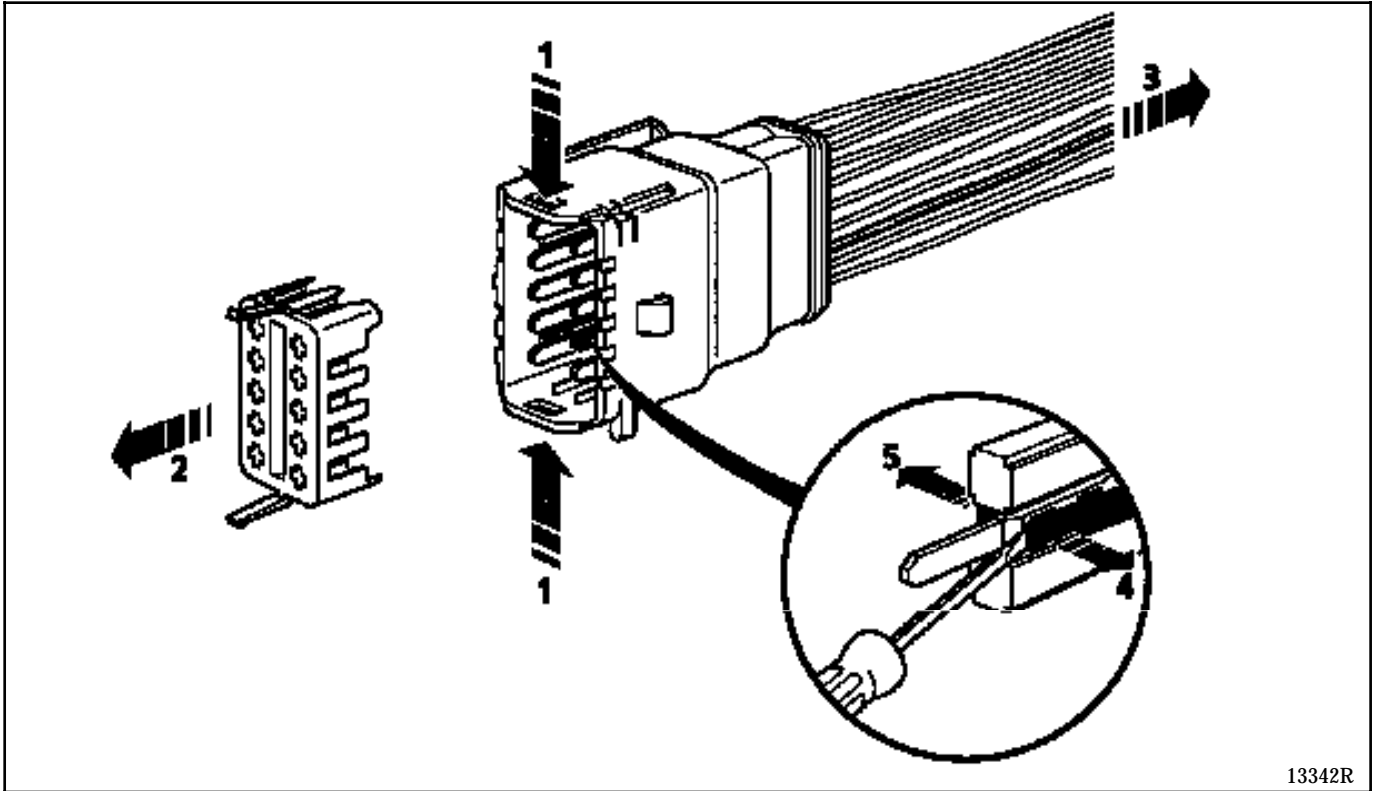
REMOVAL

Remove the high pressure pipes.

Remove the injector with sensor, using tool **Mot. 997-01**.

Disconnect the electrical connector from the pump.

Remove the two terminals for the altimetric corrector from the **10 track** pump connector.



13342R

To remove the terminals for the pump connector:

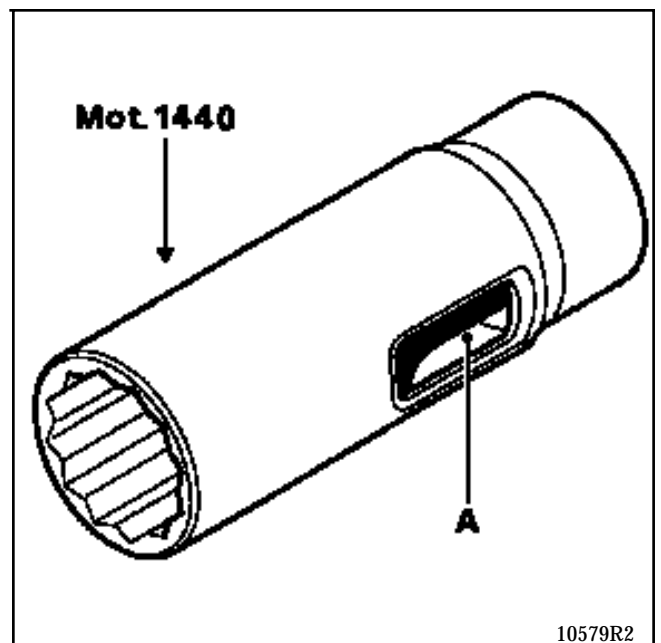
- 1) Pull the yellow guide to release it from the terminals, then press the two tabs on either side of the connector.
- 2) Extract the yellow guide.
- 3) Pull the wire to be removed.
- 4) The terminal is held in place by two small tabs, one on each side; using a screwdriver, move one of the tabs to one side (the action of pulling on the wire prevents the tab from going back into place).
- 5) Using a screwdriver move the other tab to one side.

The terminal may now be removed from the connector.

Remove the protective sheath grouping the pump actuators.

Remove the protective cover from the solenoid valve.

Remove the altimetric corrector (1) using tool **Mot. 1440**.



10579R2

A Connector passage



### REFITTING

The small filter (2) located at the bottom of the system, **MUST** be removed, using a pair of needle-nosed pliers, and replaced with a new filter.

Tighten the actuator (1) to a torque of **3 daN.m** using the socket **Mot. 1440**.

Place a new protective cover on the actuator.

Reconnect the two terminals to the connector.

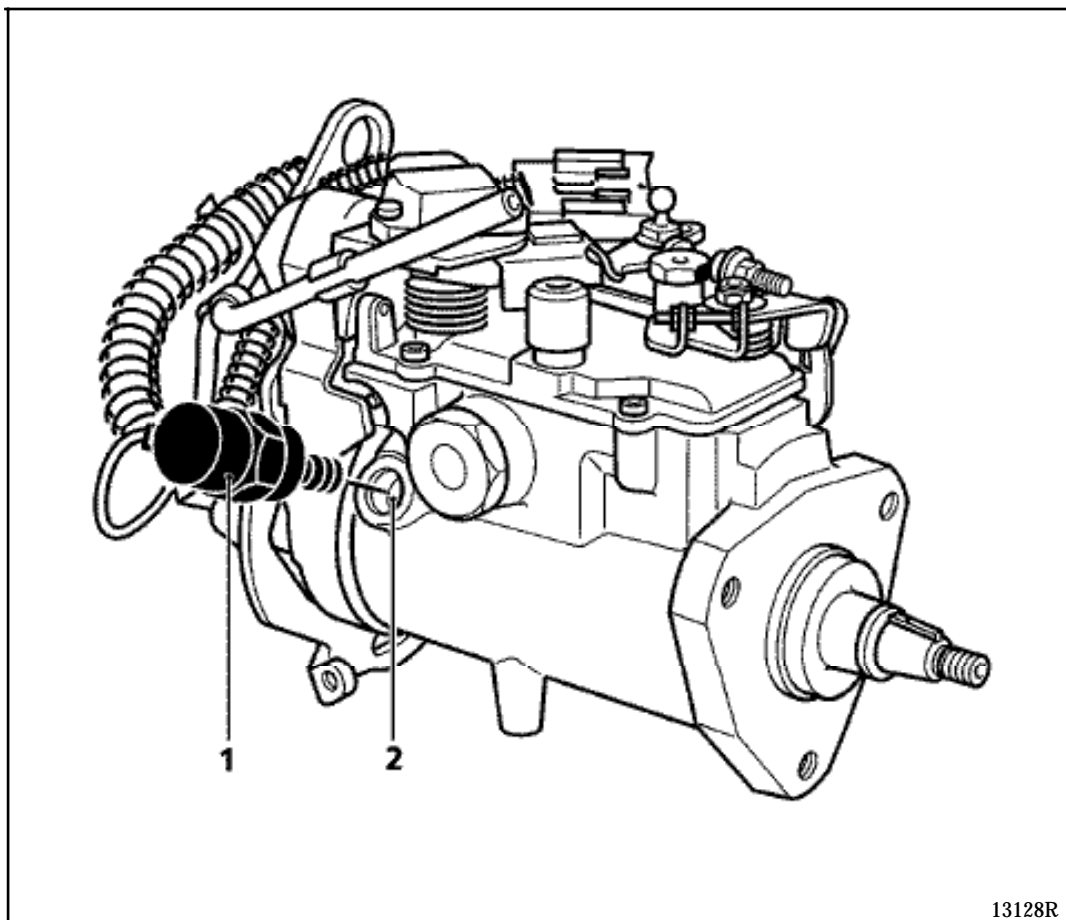
Reconnect the connector.

Replace the protective sheath on the wiring, along with the retaining clip.

Bleed the diesel circuit using the priming pump before starting the engine.

**The computer memory MUST be erased, by pressing GO\*\*.**

The vehicle **MUST** be tested after the operation.

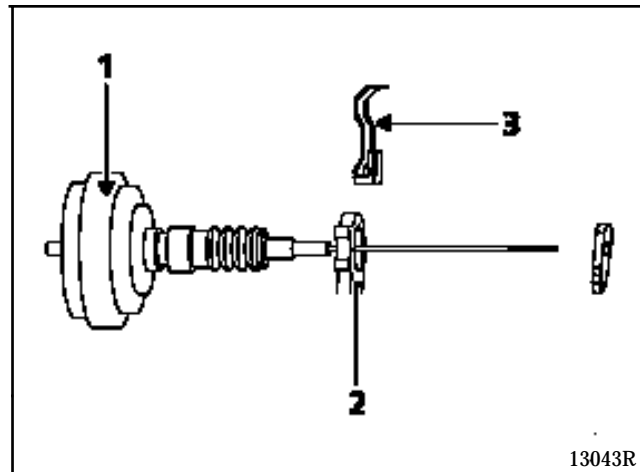


**ROLE :** it acts on the flow in proportion to altitude ; if the vehicle is running at an altitude greater than or equal to **1 000 metres**, the computer reduces the flow by **3 mm<sup>3</sup>/ stroke**. The conventional flow is reestablished if the vehicle runs at an altitude lower than **900 metres**.

### REFITTING AND ADJUSTING THE LDA

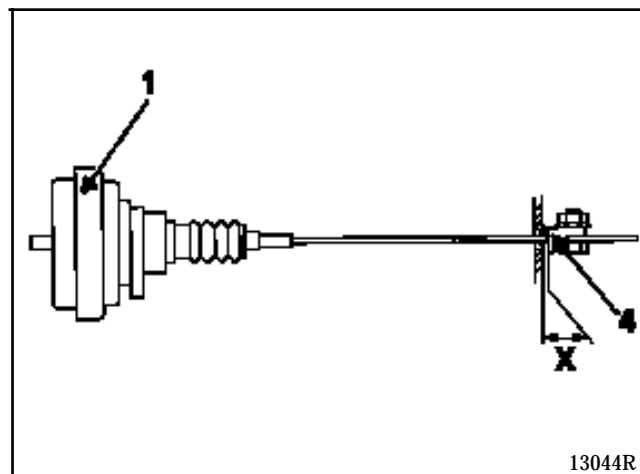
Fit the LDA (1) on the rear fitting of the injection pump (2).

Fit the retaining clip (3) onto the LDA.



Fit the cable stop (4) on the cable.

Position the cable grip on the cable; the dimension **X** must be **2 mm ± 1**. Tighten the cable grip nut.



SPECIAL TOOLING REQUIRED	
Mot. 1372	Kit for extracting the self-shear bolts from the electronic unit
Mot. 1372-02	Drilling guide tube for self-shear bolts
Mot. 1441	Socket for removing the coded solenoid valve

EQUIPMENT REQUIRED
Ø 3.3 mm HSS drill Ø 4 mm tap Ratchet tap holder

TIGHTENING TORQUES (in daN.m)	
Coded solenoid valve	1.75 ± 0.25
Self-shear bolt	1.2 ± 0.1



The operation to remove the cover giving access to the coded solenoid valve is to be carried out with the pump removed.

**IMPORTANT:** the roll pin thread is very delicate; use oil during the operation.

REMOVAL

- Block the high pressure outlets of the pump.
- Drill the roll pin using a Ø 3.3 mm HSS drill bit.
- Tap the roll pin with a set of 4 mm screw taps (**IMPORTANT** : take great care when carrying out this operation, use oil when tapping).
- Screw a Ø 4 mm , 30 cm long threaded rod into the roll pin .

Making an extractor locally:

- Drill a 4 mm hole in a metal block. Insert the threaded rod into the metal block.
- Fit a washer, a nut and a counter nut.
- Remove the roll pin using the locally made tool.
- Drill the five self-shear bolts to a length of 4 mm using the drilling guide tube **Mot. 1372-02** and the Ø 4 mm drill bit contained in the **Mot. 1372** kit.
- Use the extractor and its handle **Mot. 1372** to remove the bolts (or any other type of extractor).
- The bolts may also be removed using a hammer and a small chisel.
- NOTE** : before removing the diesel fuel inlet raised mounting, ensure that the pump is clean because metal particles from the self-shear bolts or from the roll pin may be found around it.
- Remove the diesel fuel inlet raised mounting.
- Remove the protective fitting and the rear mounting fitting.
- Remove the coded solenoid valve terminals from the pump connector.
- Use socket **Mot. 1441** to slacken the advance solenoid valve.

### REFITTING

All seals which are removed must be replaced.

Fit the coded solenoid valve, then tighten it to the correct torque.

Fit the pump cover.

Check that the coded solenoid valve wire is not-pinchd.

Fit the diesel fuel inlet raised mounting.

Reposition the five shear bolts, then tighten them to **1.2 daN.m** then remove the bolt heads by bending them using a tube inserted over the bolt head.

Fit a new roll pin.

Refit the coded solenoid valve terminals

### REMOVAL / REFITTING / ADJUSTING THE LOAD POTENTIOMETER

**IMPORTANT:** removing the load potentiometer is a delicate operation. The following procedure **MUST** be observed.

#### REMOVAL

Disconnect the injection pump connector.

Remove the three load potentiometer terminals from the connector.

Remove the wires from the plastic sheath.

Remove the two bolts (1) holding the potentiometer.

The potentiometer slide contact is held in the full load lever (2) by a plastic insert (3).

Use a screwdriver to remove the plastic insert from its position in the load lever (Figure 1).

Turn the plastic insert 90° (Figure 2).

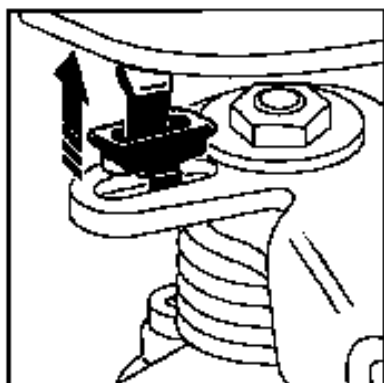
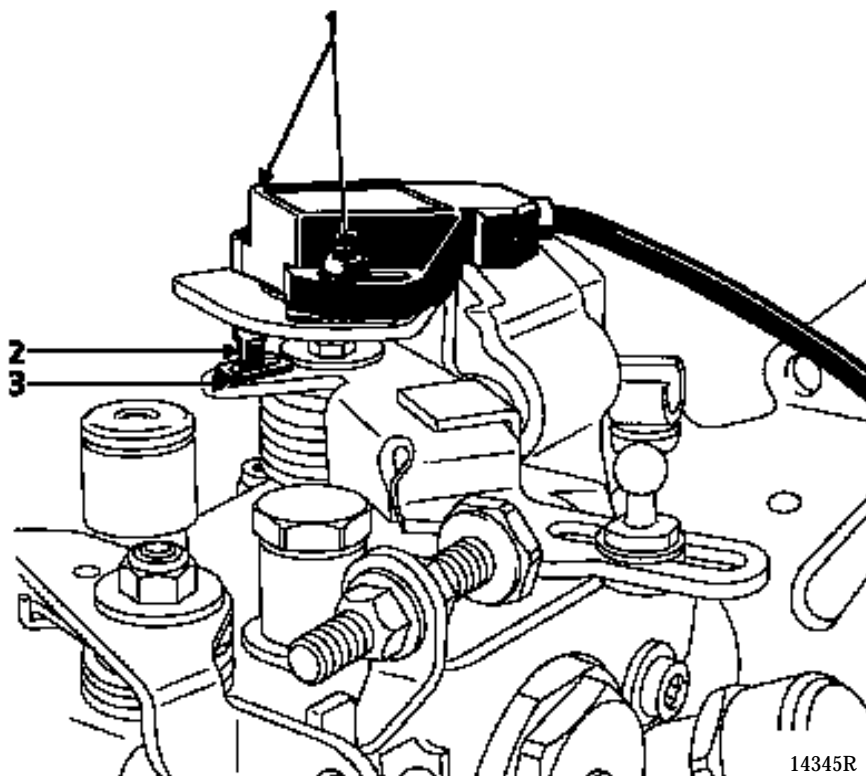


FIGURE 2

FIGURE 1

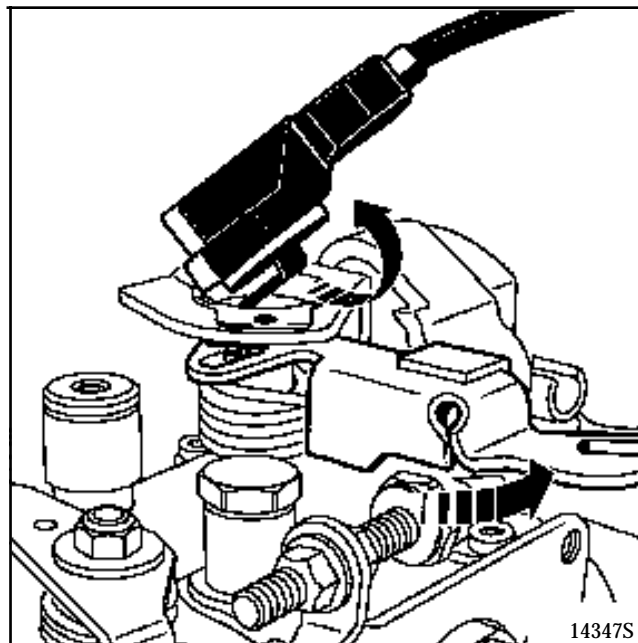
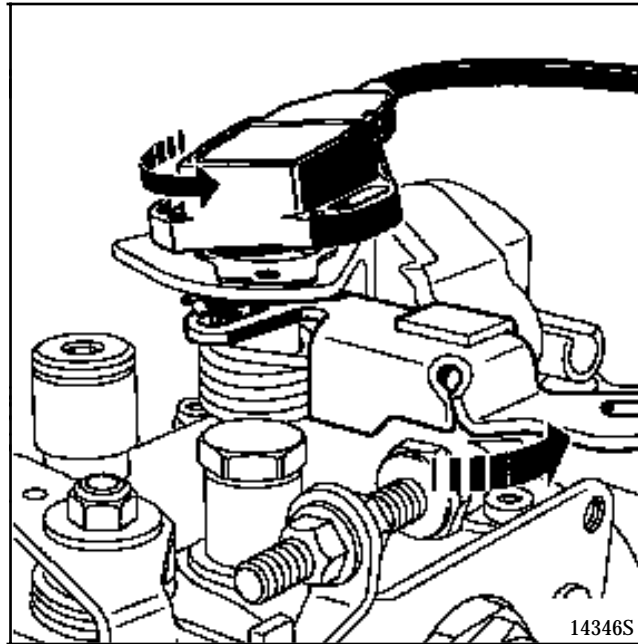


14345R

Put the load lever in the full load position.

Turn the potentiometer 90° anti-clockwise.

Lift the potentiometer from the cable side.



**REFITTING**

Turn the plastic insert 90° in relation to its initial position (**Figure 3**), bring it as close as possible to the rotation axis of the load lever .

Put the load lever in the full load position.

Insert the load potentiometer slide contact into the plastic insert.

Fit the load potentiometer.

Release the load lever, set it to no load position.

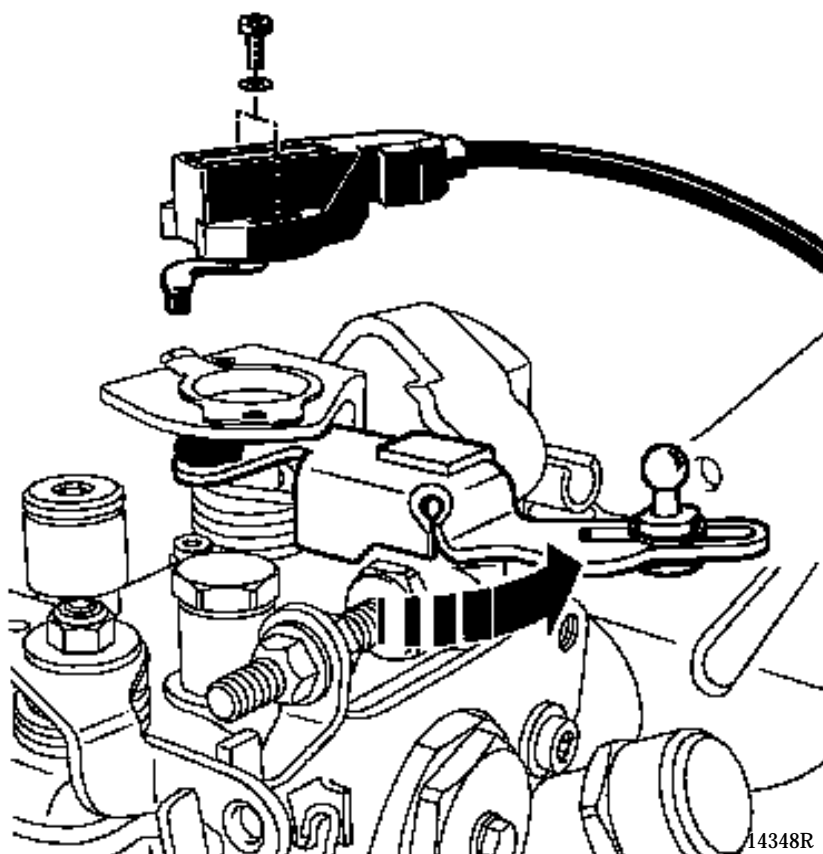
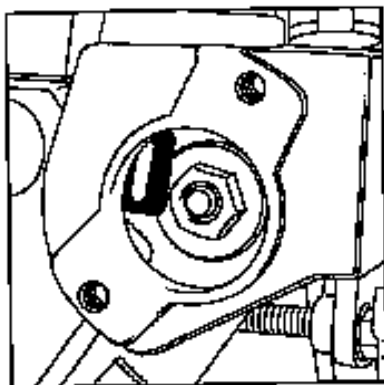
Turn the plastic insert 90°.

Using a small screwdriver, refit the plastic insert in the load lever.

Retighten the bolts holding the potentiometer without locking them.

Adjust the potentiometer (see below).

**FIGURE 3**



### ADJUSTMENT

**NOTE :** In the factory, vehicles are programmed with the full load position. (memorising the voltage delivered by the potentiometer in the full load position). This value is used to adjust the load potentiometer after it has been replaced. It is therefore essential, if the injection computer has to be replaced during the vehicle's lifetime, to carry out this programming (**G31\***).

If it is necessary to replace the load potentiometer, in order to adjust it we compare the voltage delivered by the potentiometer in full load position, with the value memorised. The new potentiometer is said to be correctly adjusted when the two voltages are equal. This is displayed on the **XR25**. **G32\*** indicates the difference in voltage between the value memorised and the one from the potentiometer. The adjustment is correct if this value is between **0.000** and **0.040** in the full load position.

The potentiometer and the computer cannot be replaced at the same time (if necessary, replace the potentiometer first and then the computer).

**IMPORTANT:** the load potentiometer can only be replaced if the position "full load" has been memorised in the injection computer. It is possible that the "full load" programming has not been carried out. As a result, the potentiometer can only be replaced when bargraph 12 RH side is extinguished (programming carried out). If bargraph 12 RH side is illuminated (programming not carried out), check that the full load value for # 17 is between 75.66 and 87.36 :

- if this is the case, carry out the full load position programming (see "computer configuration"), then replace the potentiometer,
- if the value is not between these two figures, the pump must be removed so that it can be adjusted on a repair bench or replaced.

Remove the two bolts mounting the faulty potentiometer, remove it, and fit the new potentiometer. Tighten the two bolts mounting the potentiometer but do not lock them - (it should be possible to turn the potentiometer body).

Connect the **XR25**, and switch on the ignition.

Set the selector to **S8**.

Enter code

**D 3 4**

Press down on the accelerator pedal (full load position). Do not act directly on the load lever.

Enter code

**G 3 2 \***

Holding the full load position, turn the potentiometer body until the XR25 shows a value between **0.000** and **0.040** (if you are too far from the **0** value, the screen will display **HL** which means "Hors Limite = "Off limits"). Just turn the potentiometer body to obtain the display of a decimal value.

Tighten the two bolts holding the potentiometer in the full load position when the value read is between **0.000** and **0.040**.



### PROGRAMMING THE FULL LOAD POSITION

Switch off the ignition.

Replace the computer.

Carry out the programming of the full load position; in order to do this :

Switch on the ignition.

Connect the **XR25**.

Set the selector to **S8**.

Enter code 

D	3	4
---	---	---

Enter code 

G	3	1	*
---	---	---	---

When the display flashes "**PF**", press the accelerator pedal down as far as it will go.

The programming is complete when the screen displays the following wording:

	b	o	n
--	---	---	---

	F	i	n
--	---	---	---

then

G	d	I	E
---	---	---	---

Bargraph 12 on the right hand side should be extinguished.

Switch off the ignition.

**DPCN LUCAS** injection computers are configured before sale "**with air conditioning**". If the vehicle does not have air conditioning, use command **G50\*4\*** on the **XR25** to carry out the "**without air conditioning**" programming.

**DPCN LUCAS** are configured before sale "**with power assisted steering**" (**power assisted steering with pump assembly**). If the vehicle is not fitted with a power assisted steering pump assembly, use command **G50\*9\*** on the **XR25** to carry out the "**no power assisted steering with pump assembly**" programming.

**COMPUTER CONFIGURATION IN RELATION TO AIR CONDITIONING.**

For vehicles with air conditioning, enter **G50\*3\*** on the **XR25**.

For vehicles without air conditioning, enter **G50\*4\*** on the **XR25**.

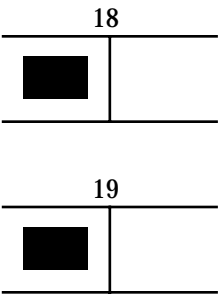
**COMPUTER CONFIGURATION IN RELATION TO THE PAS (POWER ASSISTED STEERING PUMP ASSEMBLY)**

The vehicle may have two types of PAS assembly :

- a **PAS** assembly including a high pressure pump driven by a belt. In this case, the computer must be configured without **PAS** : enter **G50\*9\*** with the **XR25**,
- a **PAS** assembly with a pump assembly which is driven electrically and controlled by the injection computer ( this type of **PAS** is fitted in all vehicles which are also equipped with **AC**). In this case, the computer must be configured with **PAS** : enter **G50\*8\*** with the **XR25**.

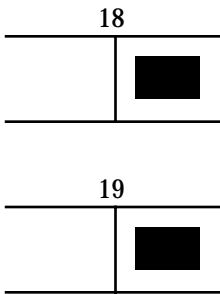
**IMPORTANT** : according to the above explanations, only two types of combination are possible for the illumination of bargraphs **18** and **19**.

**Vehicle with AC  
and PAS pump assembly**



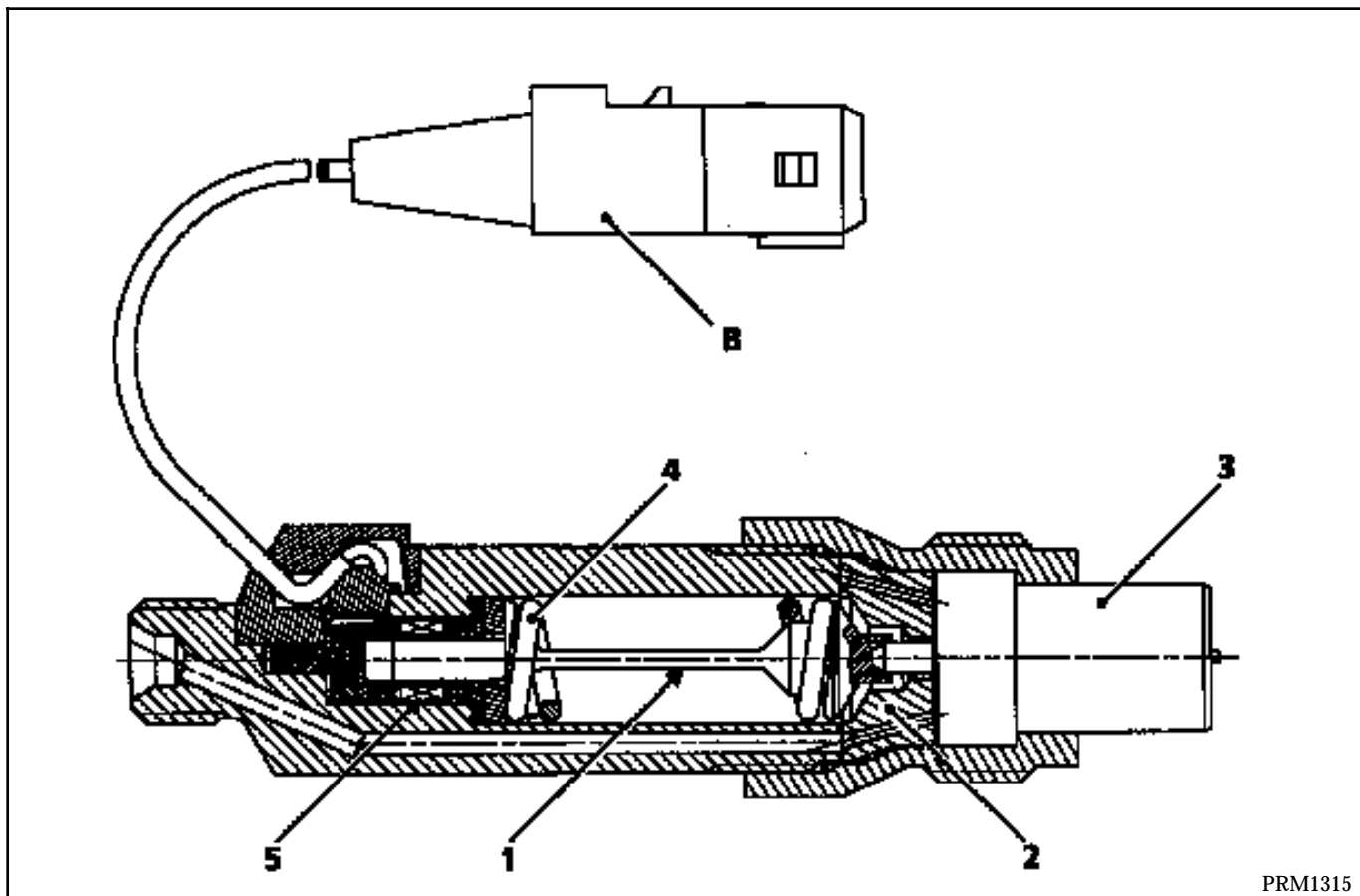
**AC**

**Vehicle without AC and PAS pump assembly  
(with conventional PAS)**



**PAS**

**NOTE** : if the computer has been replaced, remember to carry out the programming of the load potentiometer full load position (see "**Load potentiometer**" section ).



PRM1315

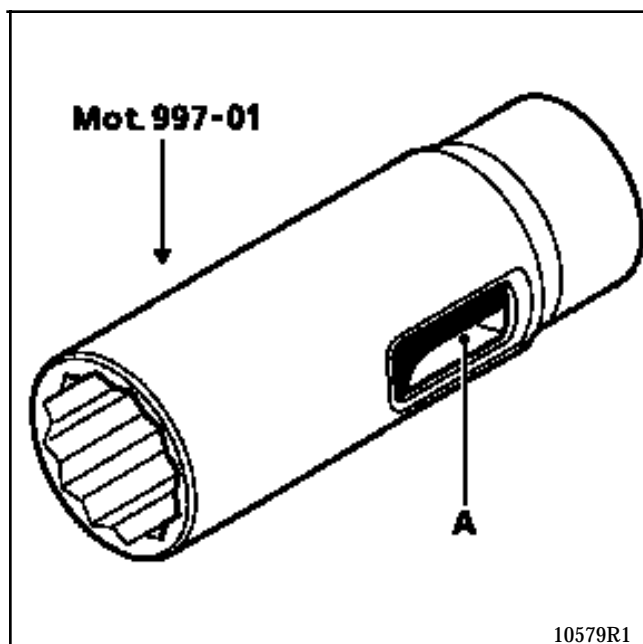
- 1 Pushrod
- 2 Spacer
- 3 Injector
- 4 Spring
- 5 Winding

The needle lift sensor is integrated in the injector holder. It transmits the movements of the injector needle to the computer. This allows the start of injection to be deduced. The computer processes this information and uses it to compare the advance requested to the advance corrector on the pump to the advance actually applied. In this way, the system works as a closed loop.

Tooling required to remove the injector : **Mot. 997-01.**

Tightening torque : **7 daN.m.**

**NOTE :** it is possible to modify tool **Mot. 997** by milling the socket at (A), (through which the connector of the injector with sensor passes (B)).



10579R1

### OPERATING PRINCIPLE OF THE INJECTION WARNING LIGHT ON THE INSTRUMENT PANEL

When the ignition is switched on, the injection fault warning light illuminates. It extinguishes as the engine begins to run.

- **Fault in a component of the injection assembly**

Faults in the following components may cause illumination of the fault warning light:

- injector with sensor,
- advance solenoid valve,
- engine speed sensor,
- load lever potentiometer,
- pre-postheating (depending on version).

The pre-postheating function is controlled by the computer.

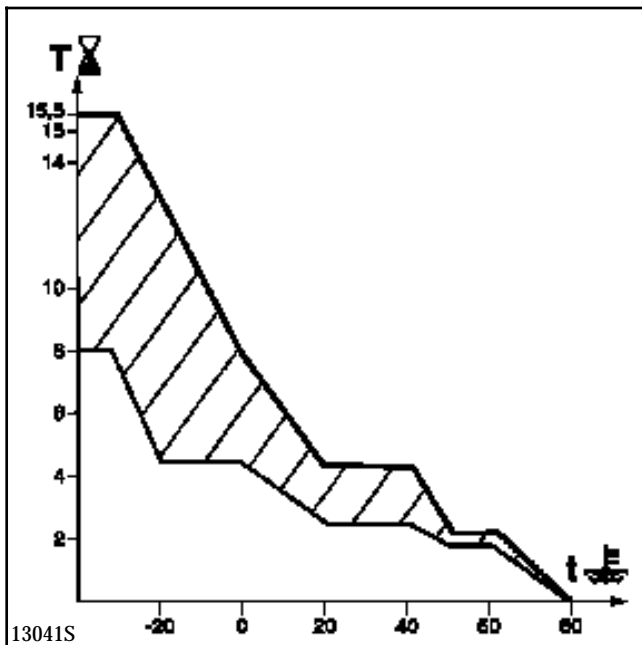
This computer controls the preheating plug relay unit.

### 1) Ignition - Preheating

The preheating process is divided in two phases :

#### a) Variable preheating

This is dependent on the coolant temperature, on the battery voltage and on altitude (internal computer sensor) when the ignition is switched on (the preheating warning light illuminates).



— Maximum preheating limit (battery voltage lower than **9.3 volts** and altitude higher than **2 000 m**).

- - - Minimum preheating limit (battery voltage greater than **10.5 volts** altitude lower than **350 m**).

#### b) Fixed preheating

After the preheating warning light has extinguished (variable preheating), the plugs remain fed for **8 seconds** before the engine is started.

### 2) Starting the engine

During the action of the starter motor, the four plugs are fed continuously.

### 3) Engine running - Postheating

The postheating also may be divided in to two phases:

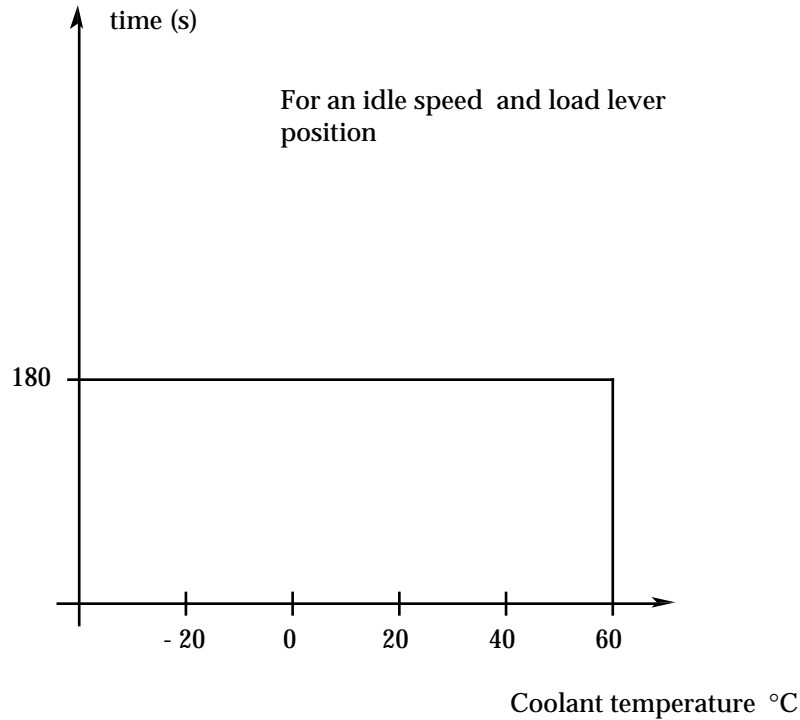
#### a) Fixed postheating

After starting the engine, the plugs are supplied simultaneously for a period of **10 seconds**.

#### b) Variable postheating

Variable postheating begins when fixed postheating ends. The time during which the plugs are fed (continuously) depends upon :

- the coolant temperature
- the engine speed ,
- the load (load potentiometer on pump lever ).



Variable postheating may be interrupted :

- permanently, if the coolant temperature is  $> 60^{\circ}\text{C}$ ,
- temporarily, if the unit receives full load information for more than **3 seconds**; the function is established once again if the engine returns to idle speed or low load,
- temporarily again if the battery voltage is  $> 16\text{ V}$ ; the function is restored if **battery voltage**  $< 15\text{ V}$ .

In all cases, the total duration of the postheating function will never exceed **3 minutes**.

The fast idle speed function is controlled by the computer via a solenoid valve controlling the LDA (versions with or without air conditioning).

- The fast idle speed control is active :
- if the coolant temperature is lower than **10 °C**, when the ignition is switched on.

	F8Q 630
Coolant temperature when the ignition is switched on (°C)	Fast idle speed cut off temperature (°C)
15	20
5	20
0	25
- 10	25
- 20	35

- if the engine speed falls to **650 rpm** and the vehicle speed is lower than **15 mph** (25 km/h) (starting improvement programming). The fast idle speed is cut off once the speed becomes **> 850 rpm**

**NOTE :**

- Fast idle speed operational :
  - solenoid valve not operated,
  - cable loose, and not tensioned.
- Nominal idle speed :
  - solenoid valve controlled,
  - cable tensioned.

**SPECIAL FEATURES:** once the **AC** has been selected on the instrument panel, the fast idle speed function is activated.

### CONNECTION BETWEEN AIR CONDITIONING AND INJECTION COMPUTER

Electrical connection :

- from the air conditioning computer to the injection computer consists of one wire. This track only carries the information that the AC is operating. From this, the injection computer deduces the **AC selection information** : track **11**,
- from the injection computer to the air conditioning computer consists of one wire. This track carries all information regarding authorising and preventing operation of the compressor : track **19**.

### COMPRESSOR OPERATION PROGRAMMING

During certain stages of operation, the injection computer stops the compressor from functioning.

#### Engine start programming

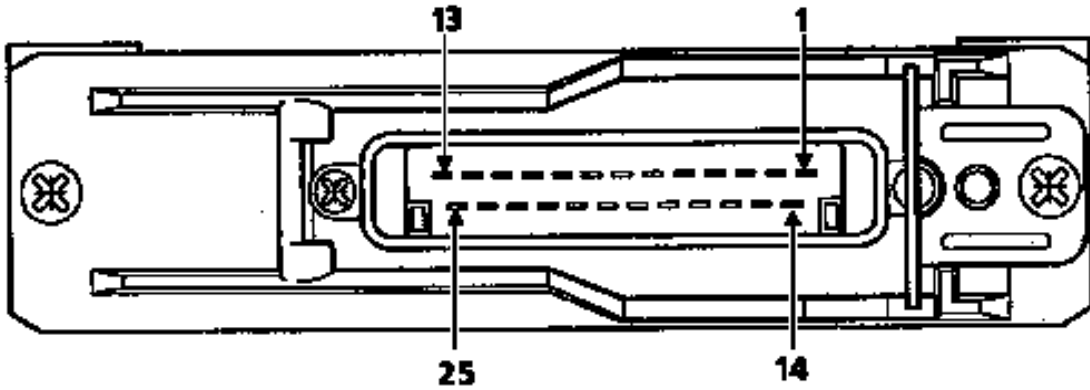
After the engine has started running, the compressor is prevented from functioning for **3 seconds**.

#### Stalling prevention programming

If the engine speed is lower than **700 rpm.**, the compressor is automatically cut off. It will only be allowed to function again if the engine speed exceeds **775 rpm**.



## CONNECTION



PRM1316

1 -<-	Computer supply	14 -->	Plug relay control
2 ----	Computer earth	15 -->	Altimetric corrector relay control
3 ----	Sensor earth	16 -->	Fast idle speed control
4 -->	Potentiometer lever supply	17 -->	Load lever position information
5 -->	EGR solenoid control	18 -->	Fault finding warning light control
6 -->	Advance corrector control	19 -->	AC prevention control
7 -<-	Needle lift signal	20 -->	Power assisted steering pump assembly relay control
8 -<-	Engine speed signal	21 -->	Engine speed information
9 -->	Preheating warning light control	22	Not used
10 -<-	Fault finding information line L	23 -<-	Load lever signal
11 -<-	AC status	24 -<-	Air temperature signal
12 -<-	Vehicle speed signal	25 -<-	Coolant temperature signal
13 -><-	Fault finding information line K		

# DIESEL EQUIPMENT

## Defect modes

13

If there is a fault in one of the components listed below, the computer enters "**defect mode**" which means that it uses replacement values to ensure engine operation.

Faulty component	Set values (for replacement)				
	Advance corrector	Pre-postheating time	EGR function	Fast idle speed	AC function
Coolant sensor	Running time function	Preheating : - 30°C Postheating : 80°C	Cut	Running time function	-
Air sensor	Temperature = 22 °C	-	Cut	-	-
Load potentiometer	100 % load lever position	Postheating: 30 % load lever position	Cut	-	20 % load lever position
Altitude sensor	Altitude = 900 m	Altitude = 900 m	Cut	-	-
Battery 16 V < U < 6 V	Battery Voltage= 13.5V	Not controlled	-	-	-
TDC sensor	Minimum advance Solenoid valve fully open position	Postheating : Not controlled until ignition is switched off then on again	Cut	Speed = 2 000 rpm	Speed = 2 000 rpm
Needle lift sensor	Defect mode advance	-	-	-	-
Vehicle speed sensor	-	-	Position : S = 175 km/h (108 mph)	Position : S = 175 km/h (108 mph)	Position : S = 175 km/h (108 mph)
Preheating plugs relay unit	-	Cut	-	-	-

### OPERATION OF THE RAM PULLEY (micrometrically adjusted pulley)

#### List of components

**1 Aluminium pulley bolt.**

It joins the adaptor hub (8) to the pulley rim (4). Pre-tighten the bolt to **2 daNm**, then tighten to  **$9 \pm 0.5$  daNm**.

**2 Pulley flange.**

**3 Collar nut.**

It secures the pump shaft to the pulley. Its tightening torque is  **$4.5 \pm 0.5$  daNm**.

**4 Pulley rim.**

When making adjustments, this is fixed. Its internal section consists of :

- a thread on which the part is screwed (5),
- three guide vanes (b) into which the part (6) lines up.

**5 Micrometric advance ring.**

It consists of three grooves (c) into which the three arms of the tool **Mot. 1358-01** fit.

Its external section consists of a thread (a) which screws into the pulley (4). It is joined laterally.

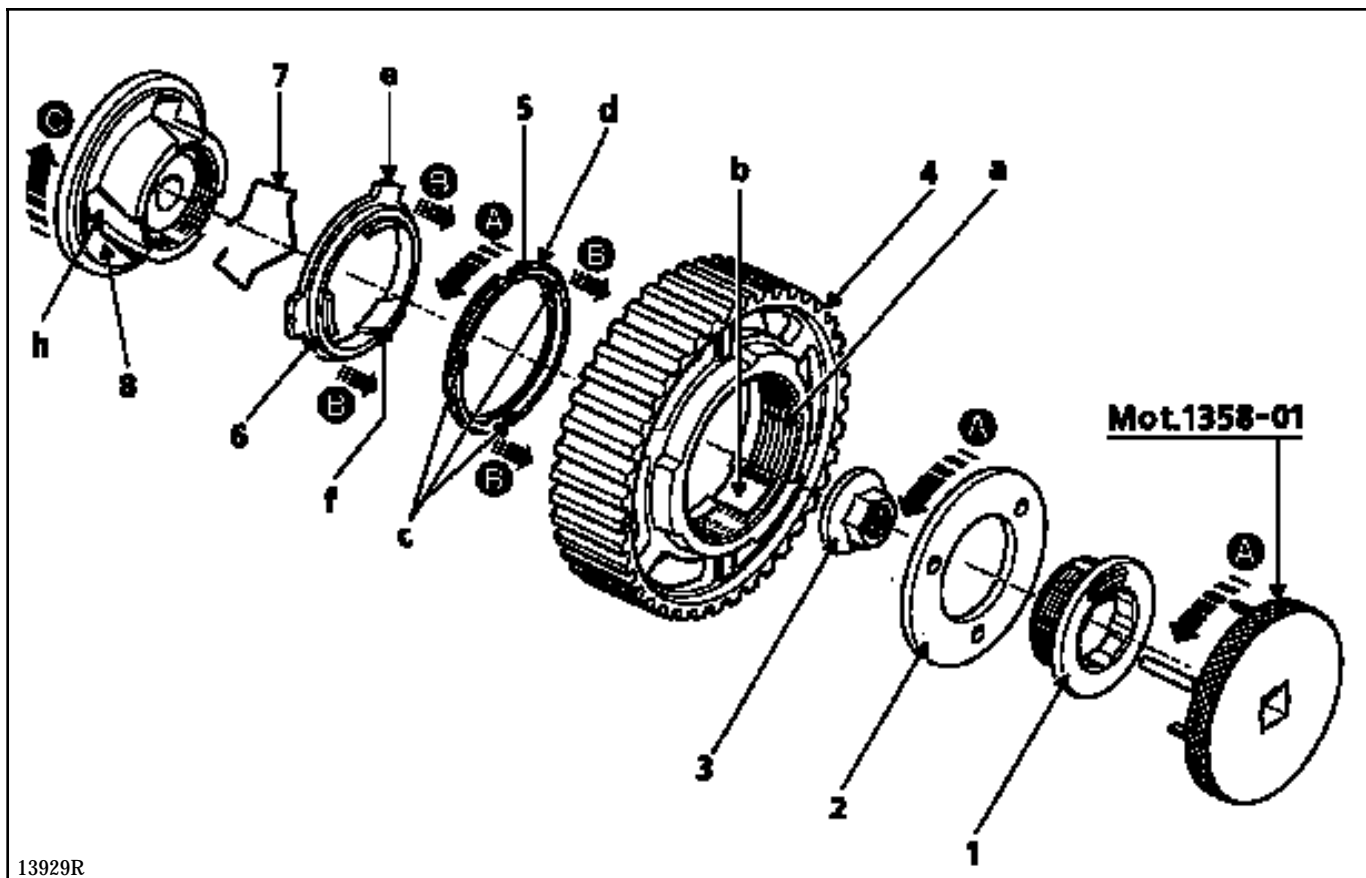
**6 Angular adjustment ring.**

It is locked in rotation. On its external part there are three lugs (e) which slide on the pulley rim (4). On its internal part there are three helical guide vanes (f) which slide on the adaptor hub (8).

**7 Screw locking device.**

**8 Adaptor hub.**

It drives the pump while adjustments are being made. This turns the pump shaft. It consists of three helical vanes (h).



### Operating principle

Before adjusting, slacken the bolt at (1).

Fit tool **Mot. 1358-01** into the three holes on the pulley flange (2). The three rods of the tool fit into the three grooves on the micrometric advance ring (5).

The rotation (A) of tool **Mot. 1358-01** rotates the micrometric advance ring (5).

When this turns, it screws into the pulley rim (4). As it screws in, the part (5) has a rotary, but also a lateral movement (B). It becomes closer to the nut (1).

Part (6) is connected to part (5) for lateral movements. On the other hand, it is locked for rotary motion. In effect, these three lugs slide into the three vanes on the pulley rim (4). As a result, part (6) moves towards the bolt (1).

Part (6) has three helical guide vanes. These fit into the helical vanes of part (8). Following the transverse movement of part (6), and as part (8) cannot move transversely, part (6), by moving, turns part (8) via the helical vanes.

- A Rotary movement made by the operator acting on the tool.
- B Transverse movement of the rings.
- C Rotary movement applied to the pump shaft, divided by **180** in relation to the movement of A.

SPECIAL TOOLING REQUIRED	
Mot. 1054	TDC pin
Mot. 1200	} Pump-pulley retaining tool
Mot. 1317	

### Special notes regarding removal of the pump

Never unscrew the aluminium nut of the RAM Pulley, to remove the pump, just unscrew the gold-coloured nut holding the pump shaft.

The central gold-coloured nut is used as an extractor .

The pump can be removed without removing the **RAM** pulley.

The three bolts holding the pump on the accessories assembly remain on the accessories surface after the pump has been removed.

Check the pump settings after it has been refitted.

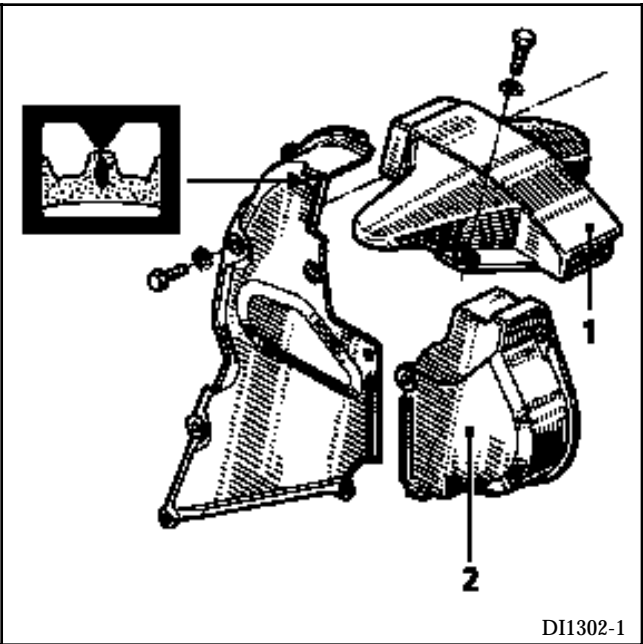
TIGHTENING TORQUES (in daN.m)	
Nut mounting the pump shaft to the <b>RAM</b> pulley	4.5
Pump mounting bolt	2.2



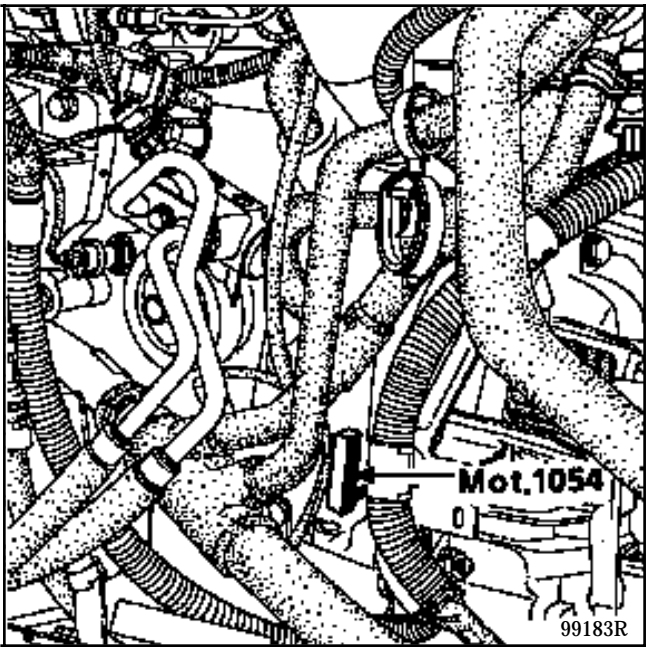
### REMOVAL

With the battery disconnected, remove:

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

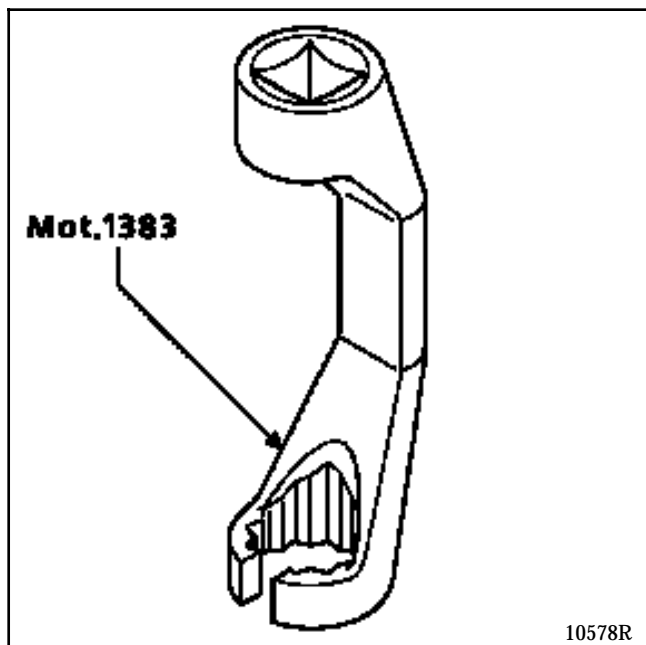


Pin the engine using tool **Mot. 1054**. For this operation, turn the engine so that the index of the camshaft sprocket is in line with the marking on the timing cover (use a mirror).

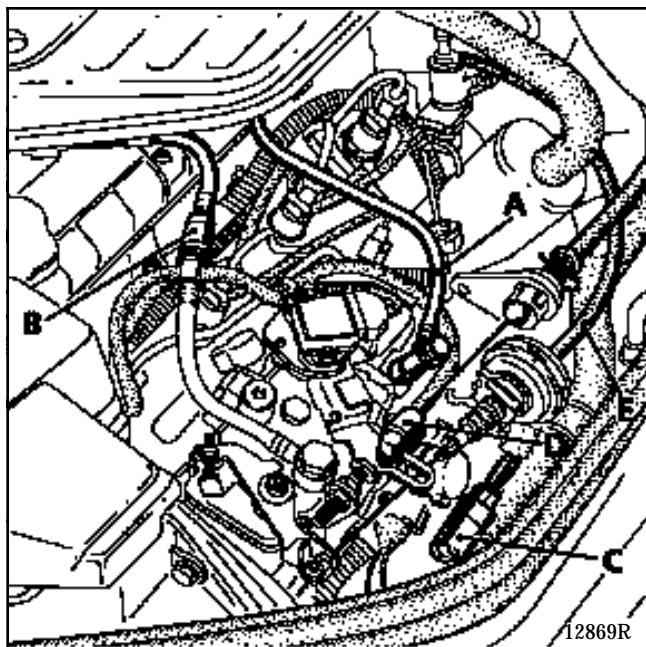


Remove :

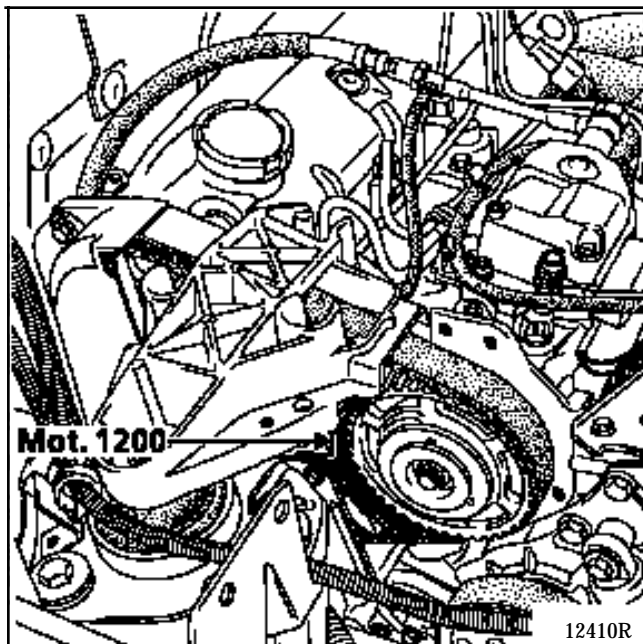
- the fuel supply pipe (A),
- the fuel return pipe (B),
- the pump connector (C),
- the accelerator cable (D),
- the vacuum pipe(E) connected to the fast idle speed LDA,
- the high pressure pipe using tool **Mot. 1383**,



- the rear support mounting bolt.



Fit tool **Mot. 1200** or **Mot. 1317** , for retaining the pump pulley.



Insert a torx screwdriver in the gaps of the **RAM** pulley and slacken:

- the three bolts mounting the pump
- the central nut securing the pump shaft to the **RAM** pulley.

Alternately, slacken the central nut and all three of the bolts mounting the pump until they are completely free.

Extract the pump.

### REFITTING

Clean the pump shaft very thoroughly, using solvent to remove any grease.

Refit the pump.

Tighten the three bolts mounting the pump to the correct torque.

Pretighten the central nut of the pump to 2 **daN.m**.

**IMPORTANT** : a pretightening operation **MUST** be carried out before the final tightening; tighten the central pump nut to a torque of **4.5 daN.m**.

Carry out the timing operations (see "**Pump - Timing**").

For all other operations, refitting is the reverse of removal.

SPECIAL TOOLING REQUIRED	
Mot. 856	Dial gauge mounting (BOSCH mechanical pump)
Mot. 1054	TDC pin
Mot. 1079	LUCAS pump timing kit
Mot. 1311-06	Tool for removing diesel fuel pipe
Mot. 1200-01	Pump pulley retaining tool
Mot. 1358-01	} Set of tools for operations on a RAM pulley
Mot. 1359	

### IMPORTANT:

- tool **Mot. 1358-01** **MUST** be used (tool **Mot. 1358** does not work on **HTD2** pulleys),
- the engine must only be rotated by turning a wheel, in 5th gear, (turn gently without sharp movements to avoid the engine moving back due to compression).
- the engine should only be turned in its operating direction. if it is turned in the opposite direction, repeat the operations for checking and adjusting the timing.

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



**RAM pulley nut (adjustment locking)**

**9**

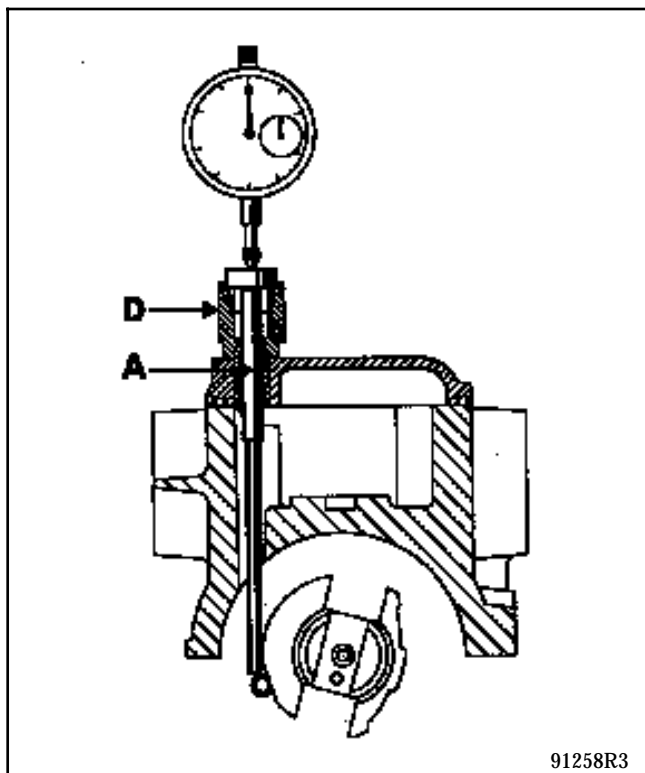
### CHECKING THE SETTING OF INJECTION PUMPS FITTED WITH RAM PULLEYS

Remove the plug (D) located on the pump cover.

Fit tool **Mot. 1079** and zero the dial gauge on the pump cam BDC (this operation will be made easier by turning the engine in its operating direction).

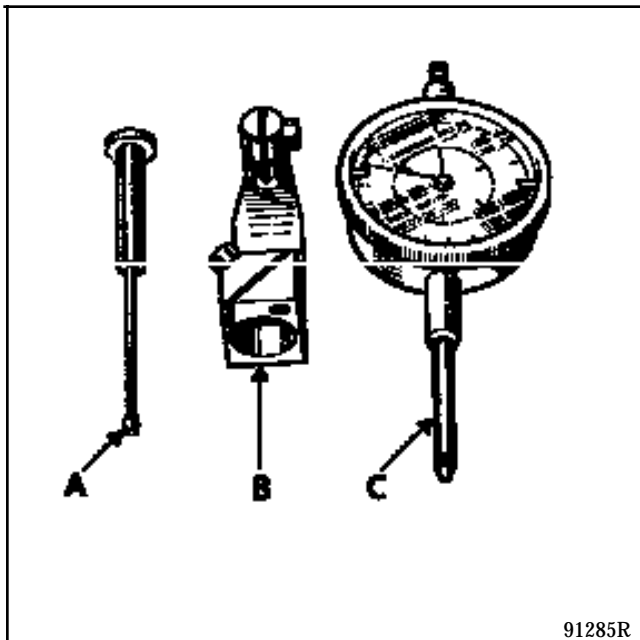
**NOTE :** in order to obtain a precise adjustment, and to avoid bringing the dial gauge to its limit, it is advisable to adjust it to **1 mm**.

Check that the pump piston stroke is less than the dial gauge stroke.



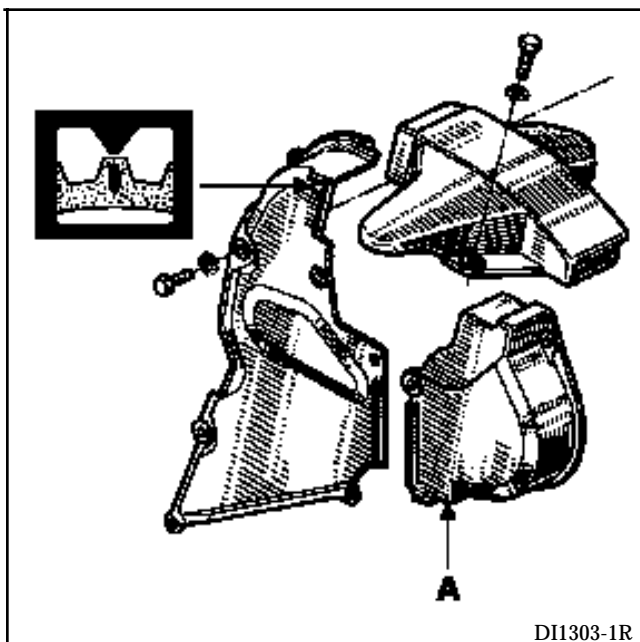
### Components of tool **Mot. 1079**

- A Timing pin
- B Dial gauge support
- C 30 mm dial gauge



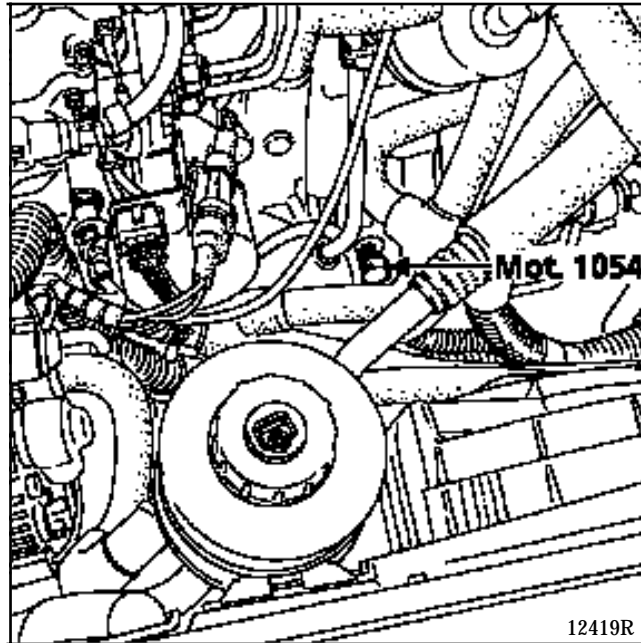
Pin the engine using tool **Mot. 1054** (two people), according to the following procedure :

- turn the engine in its operating direction (clockwise from timing end),
- locate the spot on the camshaft pulley where the reference mark will appear,
- **Stop the engine from turning half a tooth before the two reference marks align**





Fit the pin, tool **Mot. 1054**.



Maintain pressure on the pin.

Turn the engine slowly until the pin locates into the slot in the crankshaft.

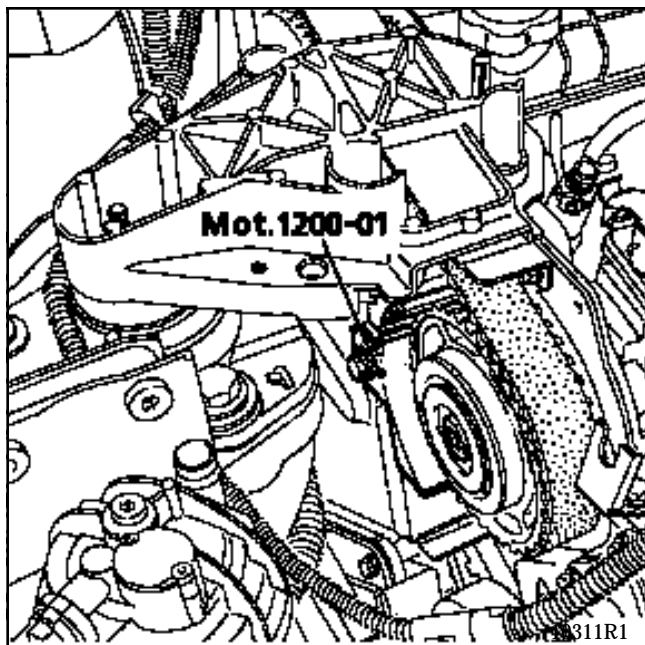
Check the pump piston lift, which may be read on the dial gauge.

**ADJUSTING THE TIMING OF INJECTION PUMPS FITTED WITH RAM PULLEYS** (to be carried out after the setting has been checked, see above).

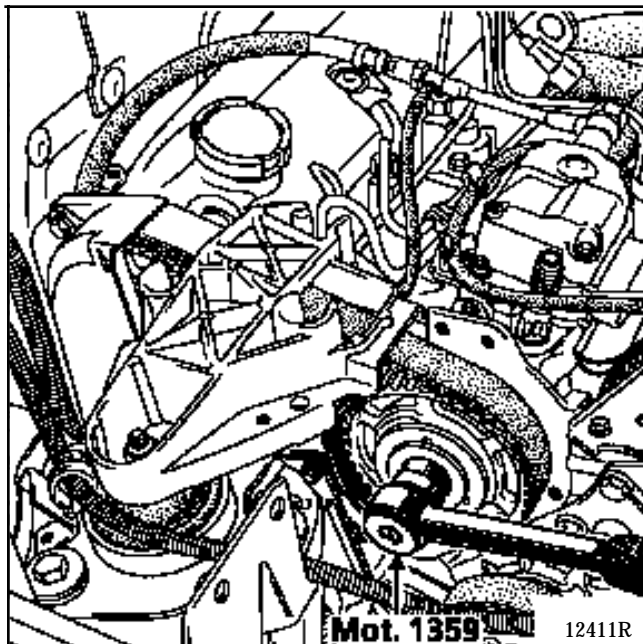
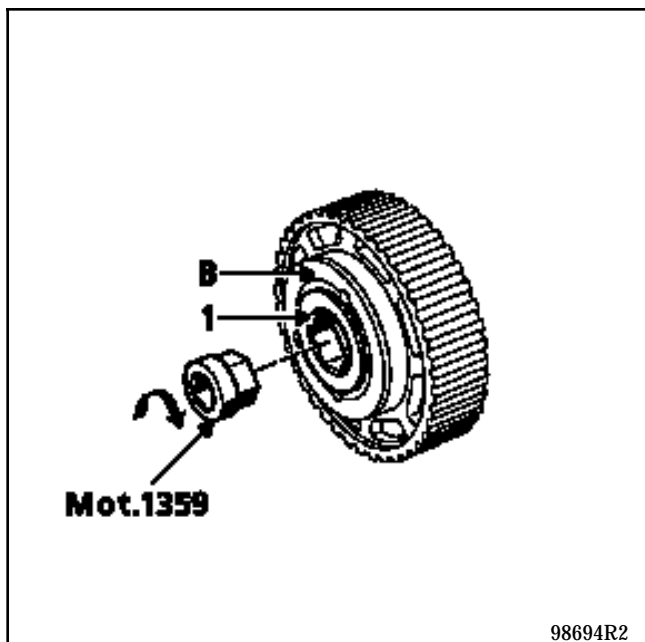
Remove :

- the pin, tool **Mot. 1054**,
- the RAM pulley's protective cover.

Fit tool **Mot. 1200-01** to immobilise the pulley.

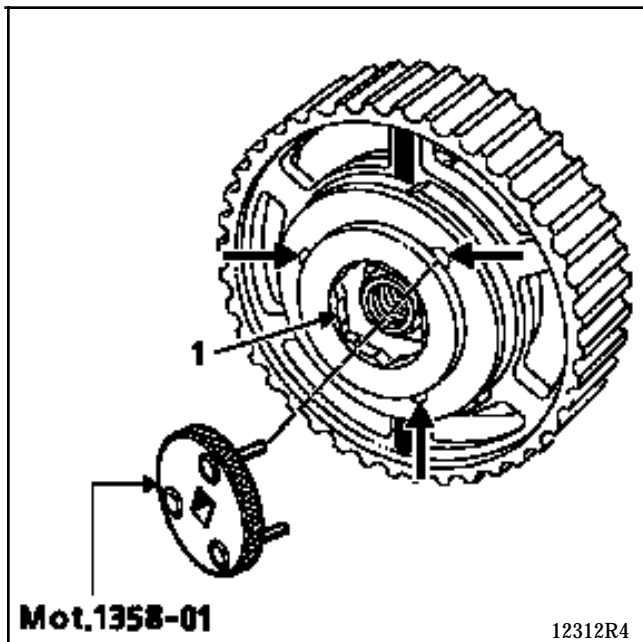


**IMPORTANT:** slightly loosen the bolt at (1) using tool **Mot. 1359** (**IMPORTANT: left hand thread**) so that the flange (B) can rotate freely.



Fit tool **Mot. 1358-01** into the three openings of flange (B).

Turn the tool - flange assembly so that the three brackets of the tool fit into the three slots in the adjusting ring bolt.



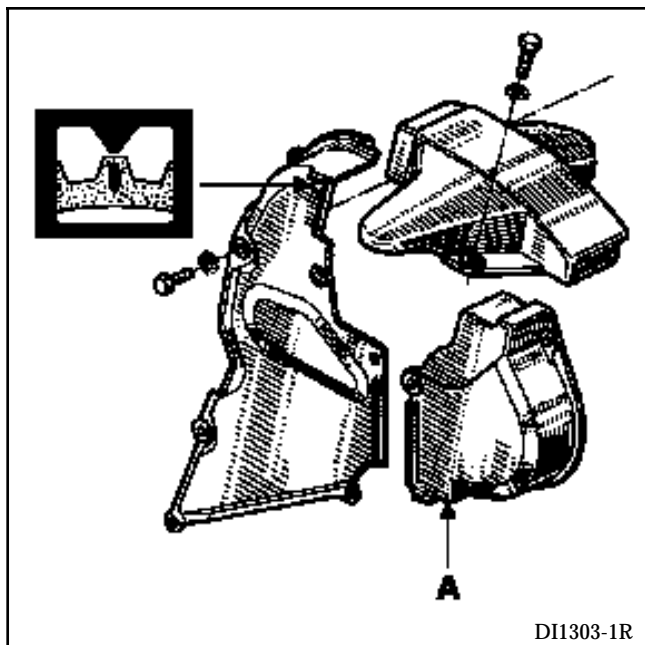
Turn the flange - tool **Mot. 1358-01** assembly clockwise until the pulley stops, which allows the pulley to be put to the start of timing position.

Remove the immobilising tool **Mot. 1200-01**.

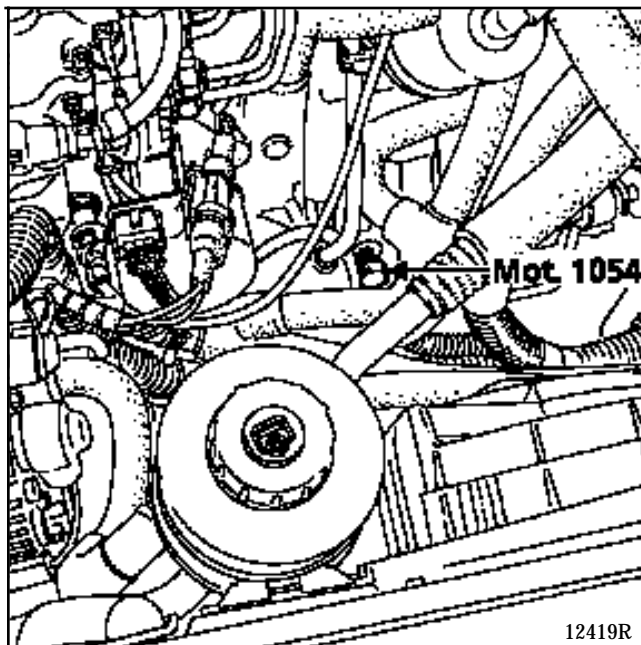
Turn the engine twice in the direction of rotation.

Pin the engine using tool **Mot. 1054** (two people) :

- Turn the engine in its operating direction (clockwise from timing end),
- locate the spot on the camshaft pulley where the reference mark will appear,
- **Stop the engine from turning half a tooth before the two reference marks align.**



Fit pin **Mot. 1054**.



Maintain pressure on the pin.

Turn the engine slowly until the pin locates into the slot in the crankshaft .

Using tool **Mot. 1358-01**, adjust the setting by turning the tool anti-clockwise until the correct setting value is reached on the dial gauge.

The value is noted on the load lever.

If the value is not correct, adjust the timing (see below).

**NOTE : if the timing value is exceeded, turn the engine back two revolutions to regain the clearance using tool Mot. 1358-01 then restart the preceding adjustment operation.**

Leave the pin **Mot. 1054** in place.

Slightly pretighten bolt (1) using tool **Mot. 1359** to a torque of not more than **2 daN.m** (left hand thread, the dial gauge needle should not move).

**IMPORTANT: the torque wrench used for this operation must operate to the left .**

Remove pin **Mot. 1054**.

Fit tool **Mot. 1200-01** to immobilise the pulley.

Turn the engine by hand anti-clockwise to bring the locking tool into contact with the pulley.

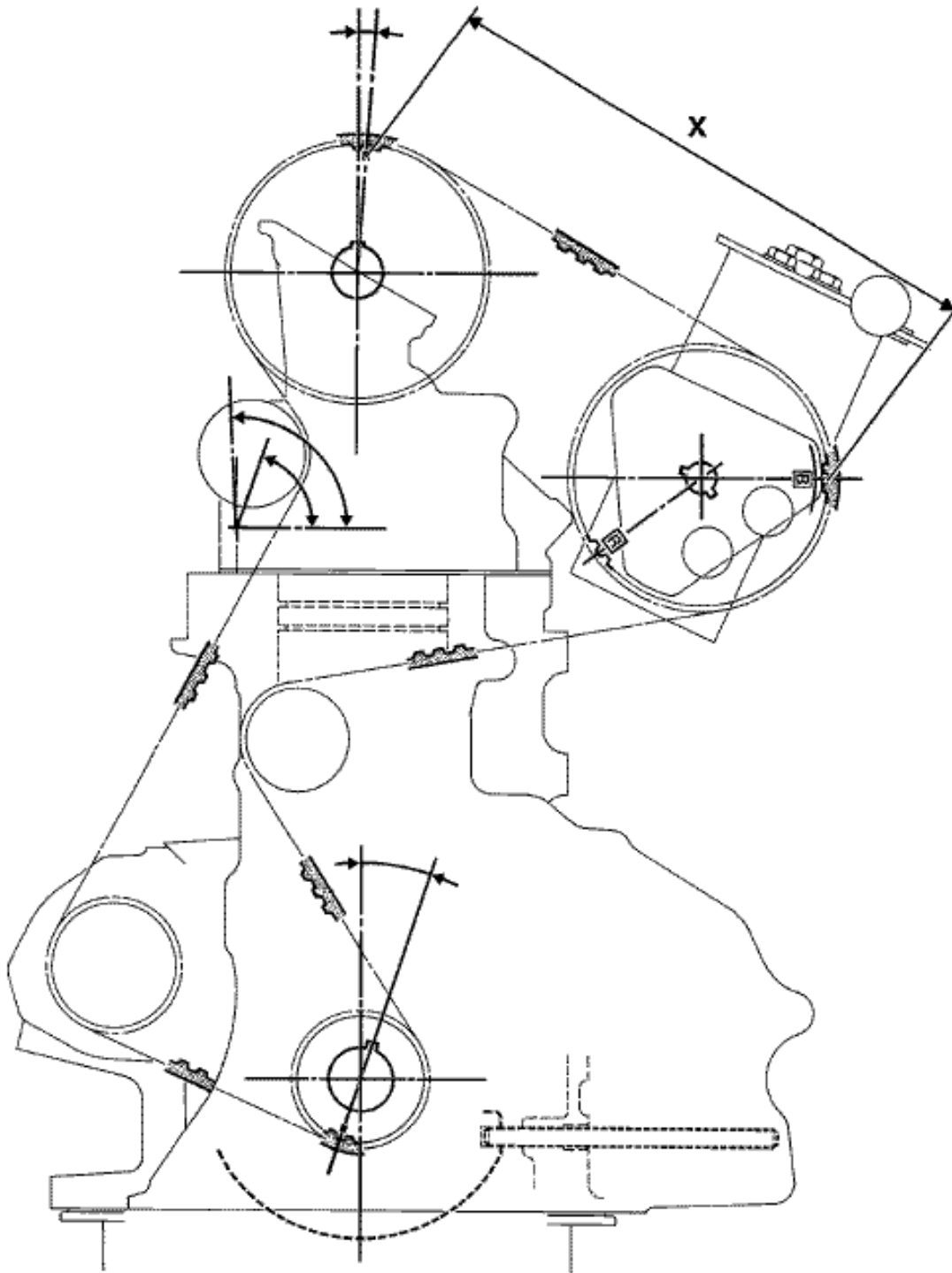
Tighten bolt (1) to **9 daN.m**, using tool **Mot. 1359**.

Turn the engine over twice and check the pump timing once again.

If you are unable to set the injection pump, check the setting of the timing.

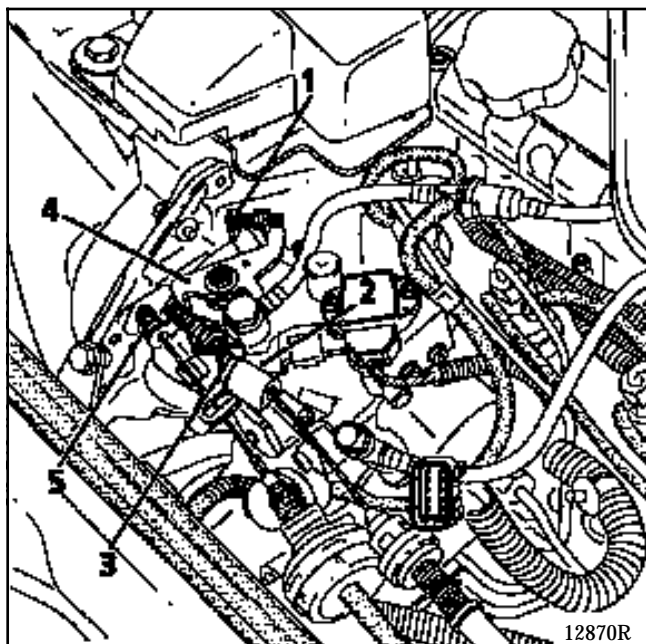
Put the camshaft marking opposite that on the belt cover. The timing is set correctly if **X = 30** teeth on the belt between the camshaft marking and that of the pump pulley.

When the camshaft marking is opposite the belt cover marking, the pulley pump marking is not necessarily horizontal.



92600R3

These adjustments **MUST** be made when the engine is warm, and after the engine cooling fan has operated at least twice.



- 1 Idle speed adjustment screw
- 2 Load lever
- 3 Residual flow adjustment screw (anti-stall function)
- 4 Fast idle lever
- 5 Idle speed cable grip

### IDLE SPEED AND RESIDUAL FLOW ADJUSTMENT (anti-stall)

- a) Ensure that the fast idle speed function is not operational .
- b) Adjust the idle speed to **825 ± 25 rpm.** using screw (1).
- c) Place a **4 mm** shim between the load lever (2) and the residual flow screw (3).
- d) Adjust the engine speed to **1 250 ± 50 rpm.** using the residual flow screw (3).
- e) Remove the **4 mm** shim then accelerate sharply twice.
- f) Check the conformity of the idle speed; if necessary, repeat the idle speed adjustment and check the residual flow once more.

**The idle speed adjustment and anti-stall function adjustment must be carried out correctly, since these operations directly influence the behaviour of the engine at idle speed and in the deceleration phase (hesitation idle speed lasts too long, etc.).**

### FAST IDLE SPEED

Without applying a vacuum to the LDA, position the cable grip (5) at **2 ± 1 mm** from the fast idle speed lever (4).

**NOTE :** the fast idle speed value is not directly adjustable; it is adjusted on the injection bench.

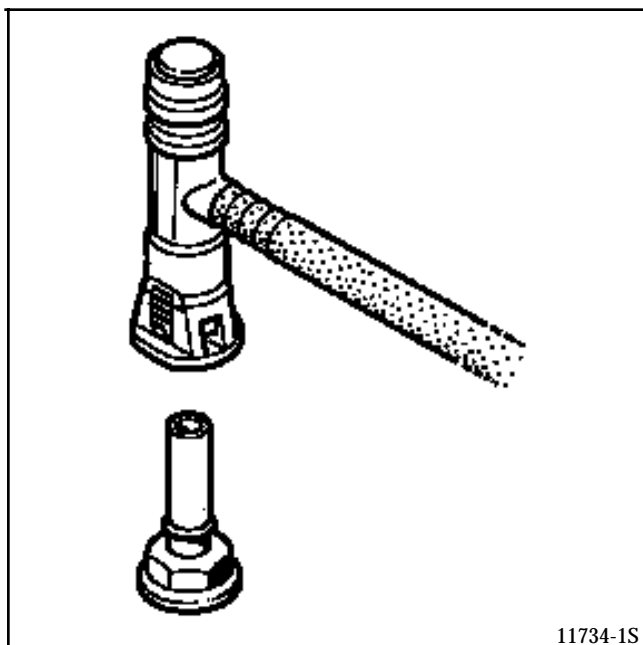
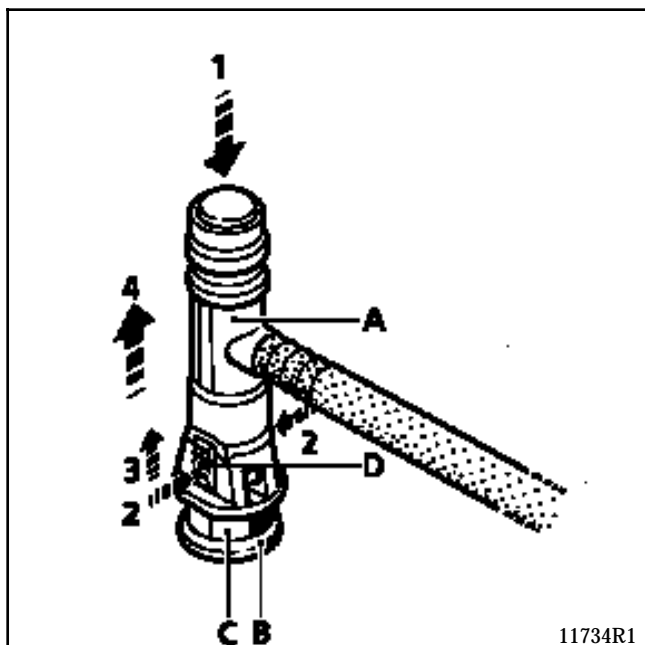
### CHECKING THE MAXIMUM SPEED

Whilst the engine is warm, accelerate to full load ; the engine speed must be between **4 500** and **4 700 rpm** (this adjustment can only be carried out in a **Renault Injection Centre** workshop).

To unlock the pump quick-release union, see below.

The removal - refitting of the diesel fuel supply quick release union from the injection pump does not require a tool (DO NOT USE CLAMPS).

**IMPORTANT:** the union does not require force to be removed (following the method below, it simply needs to be pulled gently).



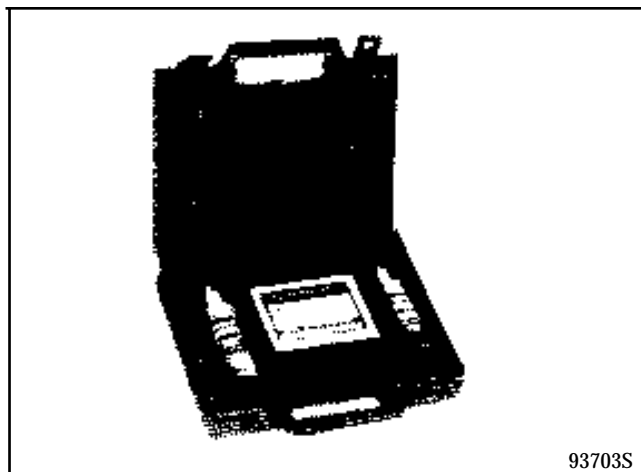
- 1 Push the plastic union (A) on its metal end (B) in the direction the arrow is pointing (1), to bring it into contact with the six-sides (C) of end piece (B).
- 2 Simply hold the notched parts (D), without pushing, whilst maintaining the contact between the plastic union (A) and the six-sides (C) of end piece (B) in the direction of the arrow (1).
- 3 Still keeping the plastic union (A) in contact with the metal end (B), in the direction of the arrow (1), lift the notched parts in the direction of the arrow (3). (A small screwdriver may be used to hold the notched section upright).
- 4 Remove the union (A) by gently pulling upwards.

**NOTE :** it can only be unclipped if the notched section is upright.

This test can only be carried out using a lead testing kit supplied by NAUDER.

To obtain a testing kit, contact your local After Sales Head Office.

Part numbers :     - Complete kit : **T900**  
                      - 40 test papers : **T900/1**



## METHOD

### DETECTING LEAD IN THE EXHAUST

**a - Test conditions :**

- Engine stopped.
- Exhaust pipes hot but not burning.
- Do not test when the temperature is below 0 °C.

**b** - If necessary, use a soft cloth to clean the inside of the exhaust pipe so any soot deposits are removed.

**c** - Wearing the gloves, take a test paper and moisten it slightly with distilled water (the paper is not effective if it is too wet).

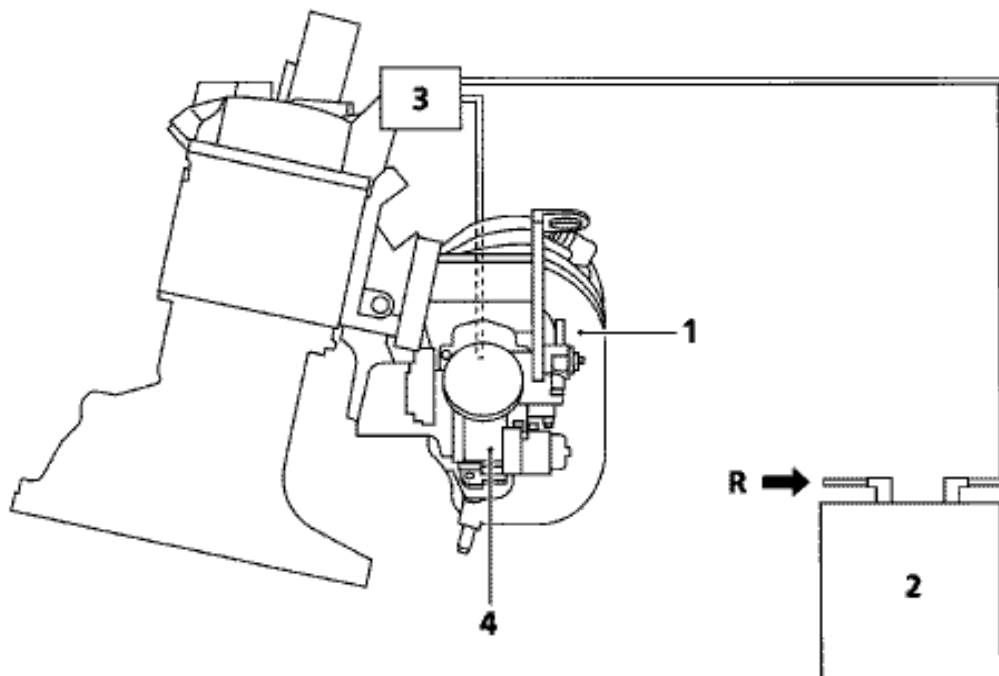
**d** - Press the damp paper onto the cleaned exhaust pipe immediately and hold it there firmly for about a minute.

**e** - Remove the test paper and allow to dry. The test paper will turn red or pink if lead is present.

**IMPORTANT** : The test for lead should only be carried out on the exhaust pipe, never on the oxygen sensor.



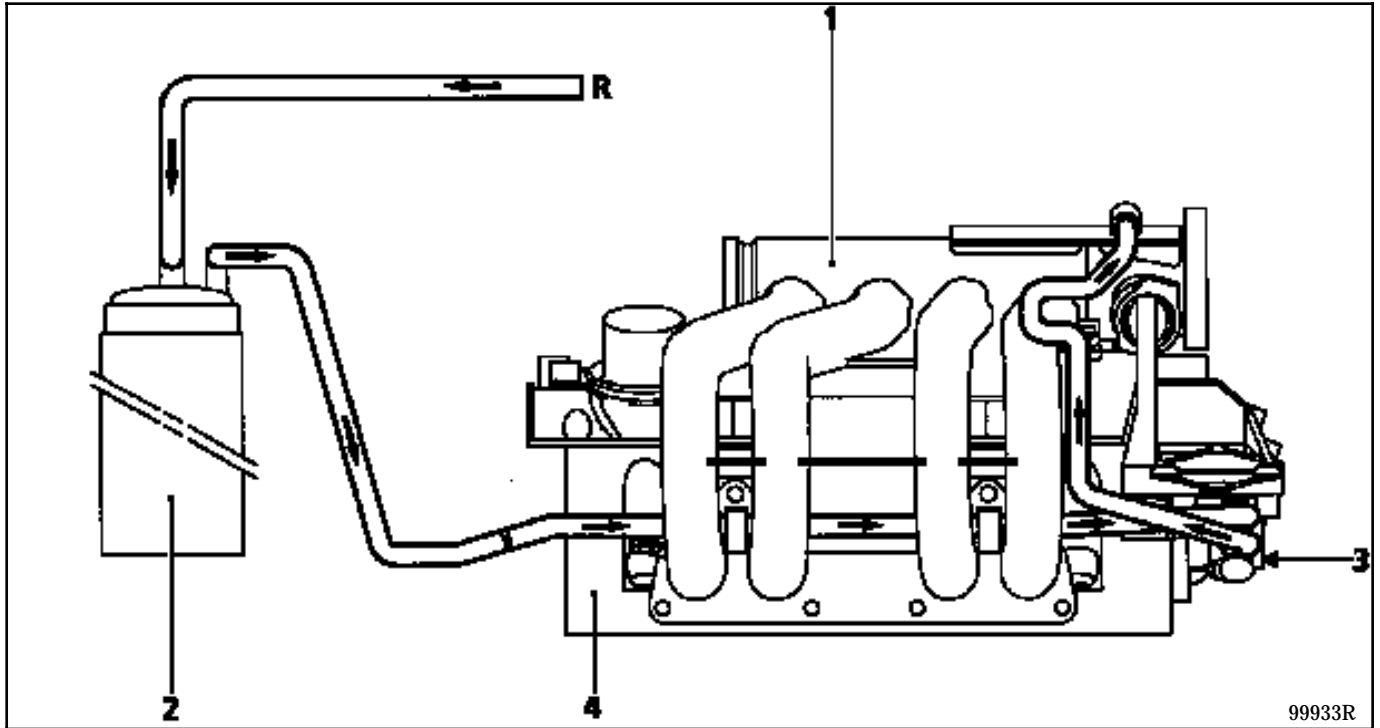
### OPERATING DIAGRAM OF THE CIRCUIT



13123R

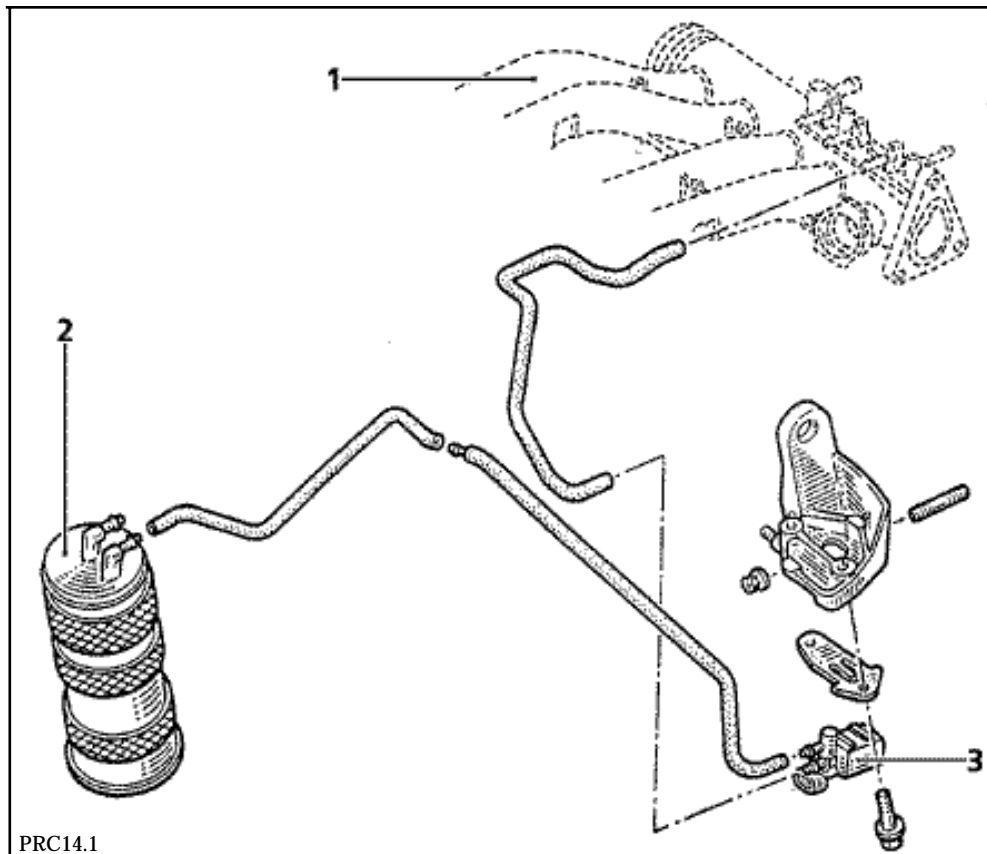
- 1 Inlet manifold
- 2 Fuel vapour canister
- 3 RCO control solenoid valve
- 4 Throttle body
- R Pipe from fuel tank

## OPERATING DIAGRAM OF THE CIRCUIT



99933R

- 1 Inlet manifold
- 2 Fuel vapour canister
- 3 RCO control solenoid valve
- 4 Cylinder head
- R Pipe from fuel tank



PRC14.1

### CONDITION FOR BLEEDING THE CANISTER (E7J and K7M engines)

#### During richness regulation

- Coolant temperature greater than **50°C** (E7J engine), **20 °C** (K7M engine).
- Air temperature greater than **15 °C** (E7J engine), **10 °C** (K7M engine).
- No load position not recognised (if there is a fault in the throttle position sensor, the condition of no load position not recognised is replaced by an engine speed condition **R > 1500 rpm.**).

#### Outside richness regulation

- Coolant temperature greater than **50 °C** (E7J engine), **15 °C** (K7M engine).
- Air temperature greater than **15 °C** (E7J engine), **10 °C** (K7M engine).
- Full load position recognised (function of engine speed and manifold pressure).

**If there is a fault in the oxygen sensor, bleeding is permitted outside of no load conditions.**

It is possible to read the cyclical opening ratio for the canister bleed solenoid using the **XR25, #23**. The solenoid is closed for **#23 = 0.7 %** (minimal value).

### CONDITION FOR BLEEDING THE CANISTER ( D7F engine)

- Coolant temperature greater than **+ 15 °C**
- Air temperature greater than **+ 10 °C**.
- No load position not recognised (if there is a fault in the throttle position sensor, the condition of no load position not recognised is replaced by an engine speed condition **R > 1500 rpm.**).

It is possible to read the cyclical opening ratio for the canister bleed solenoid using the **XR25 #23**. The solenoid is closed for **#23 = 0.7 %**

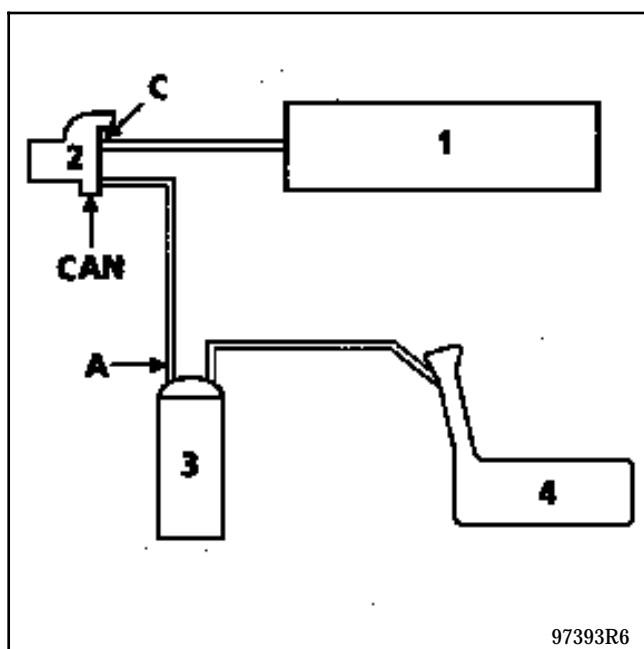
### CHECKING CANISTER BLEED OPERATION

Incorrect operation of the system may cause the idle speed to be unstable or the engine to stall.

Check the conformity of the circuit (see operational diagrams)

**Be sure to check that the pipe marked "CAN" on the solenoid valve is correctly connected to the canister.**

Check the condition of the pipes to the fuel tank.



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

At idle speed connect a pressure gauge (- 3 ; +3 bars) (Mot. 1311-01) to the "CAN" outlet on the solenoid valve, to check there is no vacuum (the command value read by the XR25 for #23 remains minimal X = 0.7 % ). **Is there a vacuum ?**

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

**Does the pressure vary?**

**YES** The solenoid valve is faulty, replace it. Air must be blown into the pipe (A) connecting the solenoid valve to the canister to remove any particles of active carbon.

**NO** There is an electrical fault. Check the circuit.

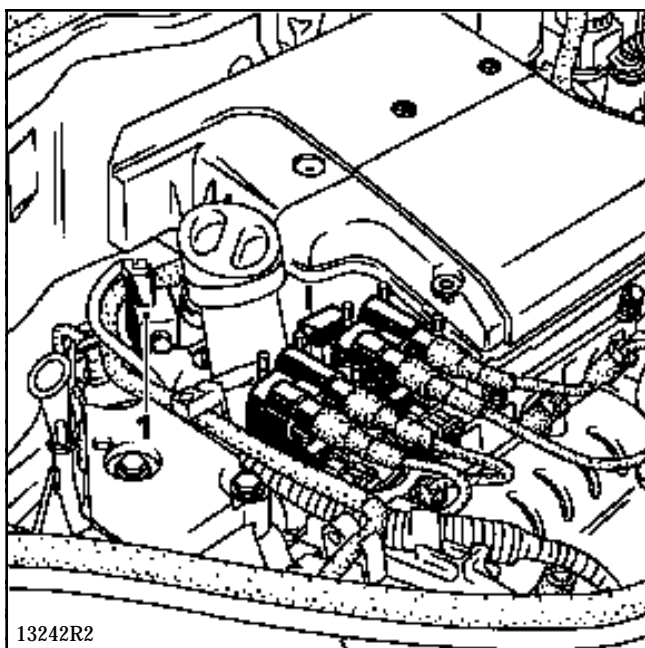
**NO** Under bleeding conditions (not at idle speed, engine warm), the vacuum should increase (the value for #23 on the XR25 should also be seen to increase).

### LOCATION - REMOVAL

#### CANISTER BLEED SOLENOID VALVE (1)

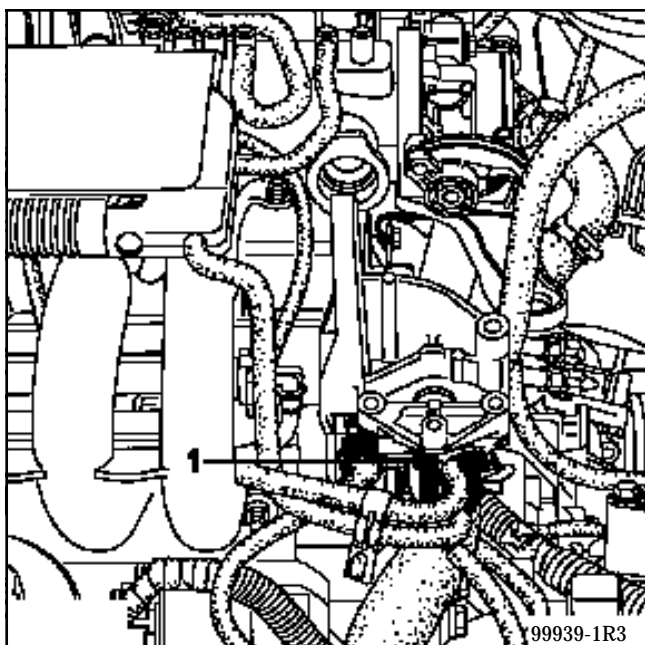
##### E7J and K7M engines

It is mounted above the inlet manifold, underneath the cover.



##### D7F engine

It is mounted at the front, on the lifting bracket.



### REMOVAL OF THE FUEL VAPOUR CANISTER (1)

This is located in the front right hand wheel arch.

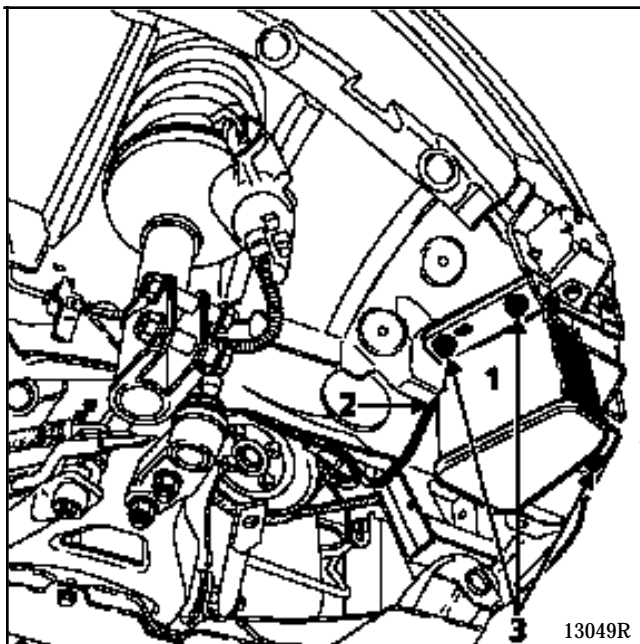
#### REMOVAL

Disconnect the pipe connecting the canister to the inlet manifold, from the top of the vehicle.

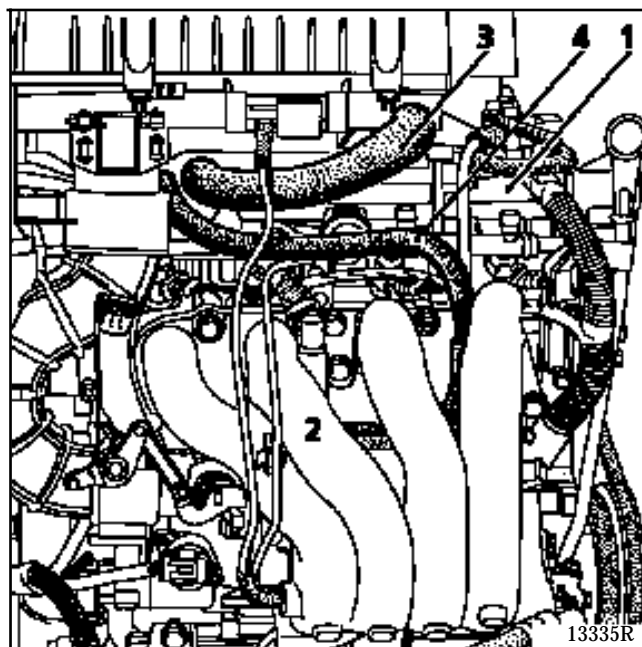
From the bottom, remove the wheel arch protector.

Disconnect the pipe at (2) connecting the canister to the fuel tank.

Remove the three bolts at (3) mounting the canister (1) then extract it.



### DIAGRAM

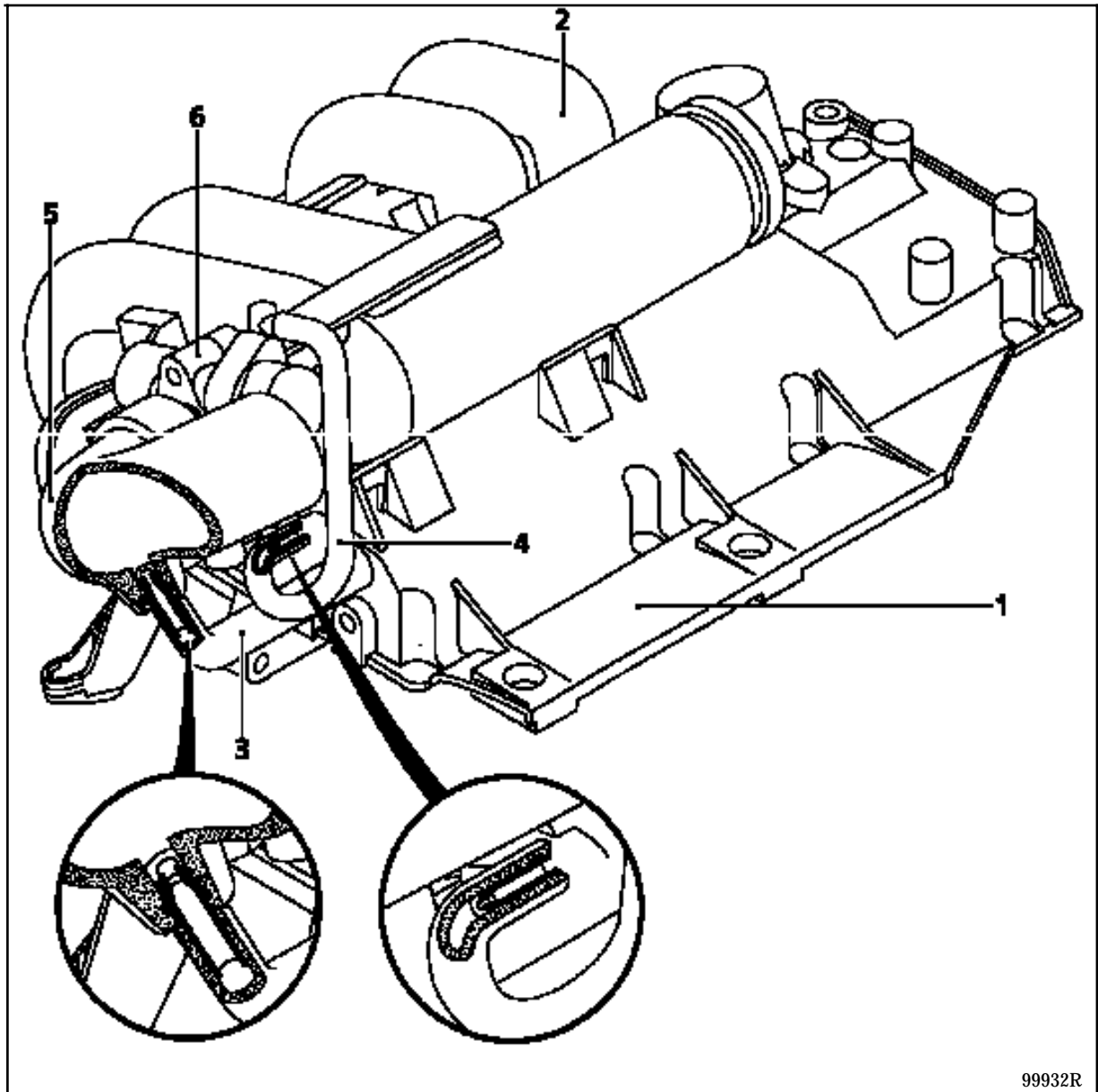


- 1 Cylinder head
- 2 Manifold
- 3 Oil vapour rebreathing pipe connected upstream from the throttle body (the circuit is used for medium and high loads).
- 4 Oil vapour rebreathing pipe connected downstream from the throttle body .

### CHECKING

To ensure the correct operation of the antipollution system, it is important to keep the oil vapour rebreathing system clean and in good working condition.

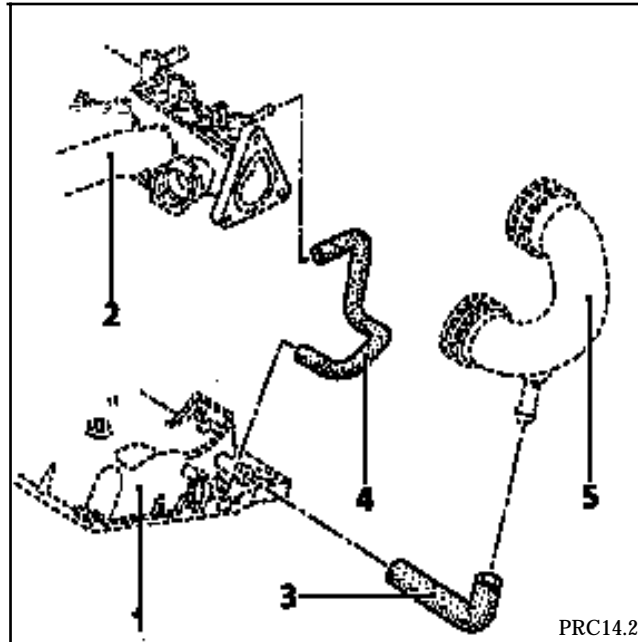
DIAGRAM



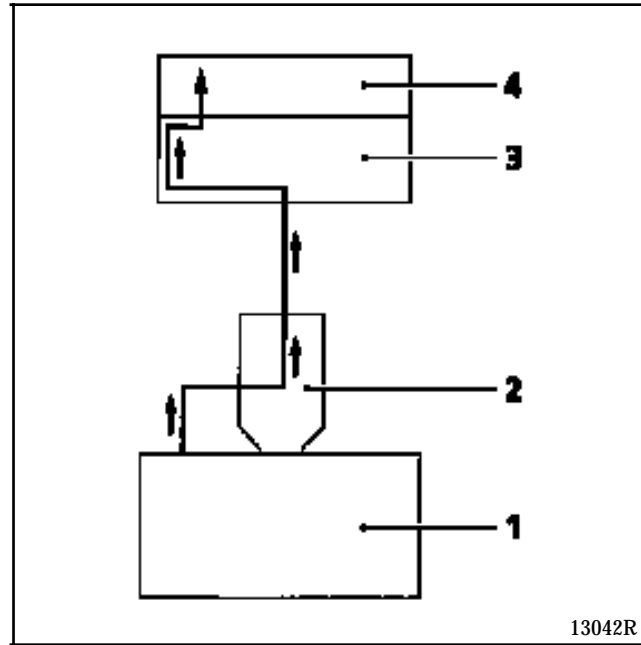
- 1 Cylinder head cover
- 2 Manifold
- 3 Oil vapour rebreathing pipe connected upstream from the throttle body (the circuit is used for medium and high loads)
- 4 Oil vapour rebreathing pipe connected downstream from the throttle body
- 5 Air pipe
- 6 Throttle body

**CHECKING**

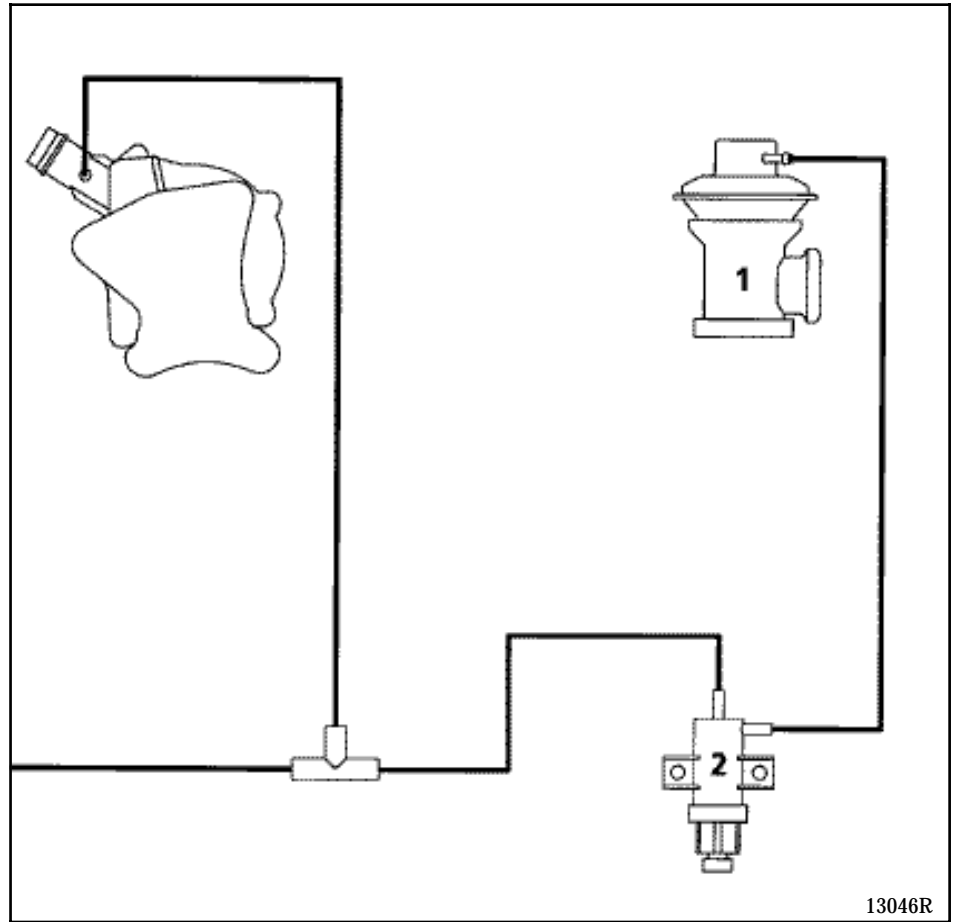
To ensure the correct operation of the antipollution system, it is important to keep the oil vapour rebreathing system clean and in good working condition.



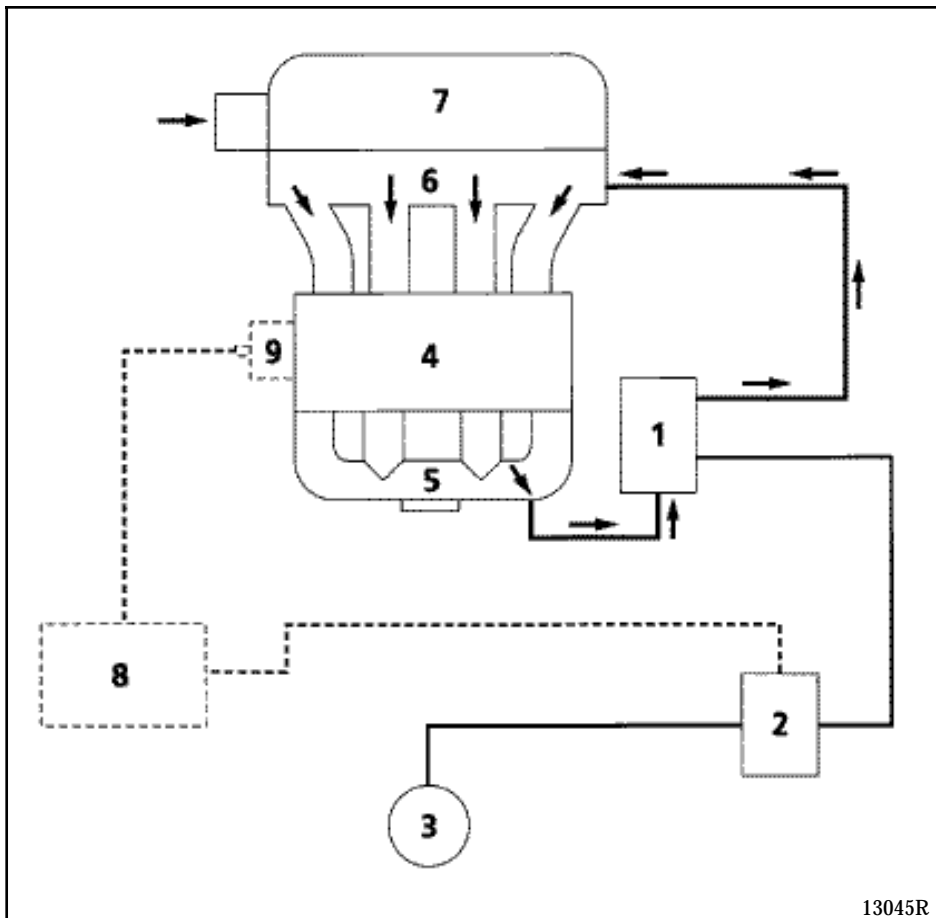




- 1 Engine
- 2 Oil decanter
- 3 Air filter
- 4 Inlet manifold



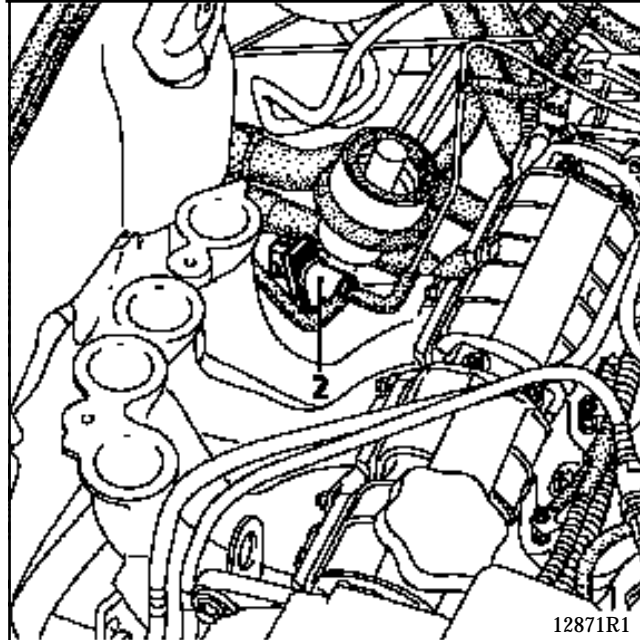
13046R



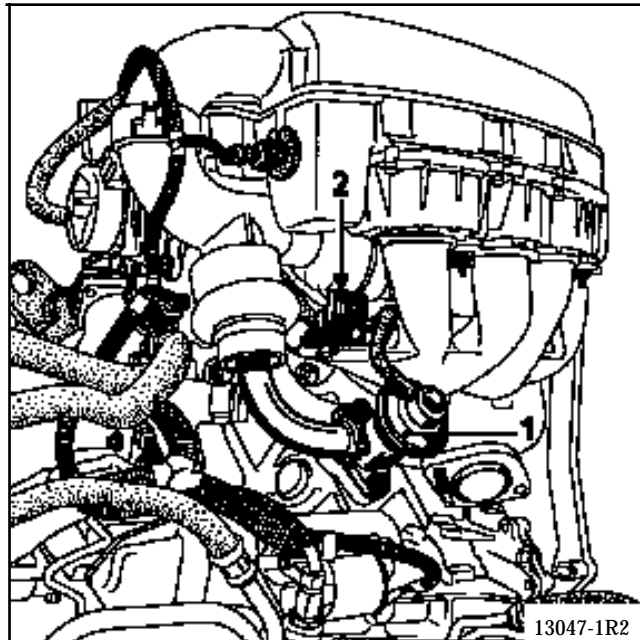
- 1 EGR valve
- 2 EGR solenoid (ON/OFF)
- 3 Vacuum pump
- 4 Engine
- 5 Exhaust manifold
- 6 Inlet manifold
- 7 Air filter
- 8 Injection computer
- 9 Coolant temperature sensor

13045R

To remove the **EGR** solenoid (2), remove the air filter .



To remove the **EGR** valve (1), remove the air filter first, and replace the seal between the solenoid valve and the manifold after each removal operation.



### SPECIAL NOTES

In order to remove the steel pipe connecting the **EGR** valve to the air filter, it is necessary to remove the **EGR** valve .

The **EGR** is controlled by the computer via an ON/OFF solenoid valve.

The operation of the **EGR** solenoid valve is dependent upon the following parameters:

- the air temperature,
- the coolant temperature,
- the altitude,
- the position of the load lever,
- the vehicle speed,
- the engine speed.

The **EGR** function is cut if :

- the air temperature < **17°C** or
- the coolant temperature < **45°C** or
- the engine speed/ load potentiometer pair is greater than a certain threshold .

The **EGR** is cut at idle speed.

Once the vehicle speed reaches > **28 km/h**, (17 mph), it becomes operational again.

Bargraph **14 RH** is illuminated if the **EGR** function is permitted. In order to determine if the **EGR** is actually controlled, use #**24**. If the value is different from **0**, the **EGR** is activated .

### OPERATION - FAULT FINDING

These vehicles are fitted with alternators with internal ventilation and integral regulator, also with a warning light on the instrument panel which has the following functions :

- when the ignition is switched on, the light illuminates
- when the engine is started the light extinguishes,
- if the light illuminates whilst the engine is running there is a "**charging**" fault.

### LOOKING FOR FAULTS

**The warning light does not illuminate when the ignition is switched on.**

Check:

- all electrical connections are good.
- the bulb has not blown. (Earth the circuit and the bulb should illuminate).

**The warning light illuminates when the engine is running.**

This indicates a charging fault which could be caused by :

- the alternator drive belt being broken or the charging wiring being cut,
- internal alternator damage (rotor, stator, diodes or brush),
- a regulator fault,
- excess voltage.

**The customer complains of a lack of charge and the warning light is operating correctly.**

If the regulated voltage is less than **13.5 V**, check the alternator. The fault could be caused by :

- a diode which has been damaged,
- a phase which is cut,
- contaminated or worn tracks.

### 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 registers a stable regulated voltage.

This voltage should be between **13.5 V** and **14.8 V**.

Switch on as many consumers as possible, the regulated voltage should be between **13.5 V** and **14.8 V**.

**IMPORTANT: if arc welding work is to be carried out on the vehicle, the battery and regulator must be disconnected.**

IDENTIFICATION

ENGINE	ALTERNATOR	CURRENT
D7F	AC Delco	80 A
E7J / K7M	Valéo A 11 VI 87	75 A
E7J AC and K7M AC	Valéo A 13 VI 188	110 A
F8Q	Valéo A 11 VI 88	75 A
F8Q AC	Valéo A 13 VI 195	110 A

CHECKING

After 15 minutes warming up at a voltage of 13.5 volts.

Engine rpm	75 amps	80 amps	110 amps
1000	46	54	57
2000	68	75	94
3000	71	80	105
4000	72	82	108

FAULT FINDING

SPECIAL TOOLING REQUIRED
OPTIMA 5800 Diagnostic station

CHECKING THE CHARGING CIRCUIT USING THE DIAGNOSTIC STATION

The **OPTIMA 5800 diagnostic station** allows the alternator to be checked by measuring the voltage and current delivered, with or without electrical consumers.

**NOTE :** the clamp used for this station is of the inductive type (measurement range: **0** to **1000 A**). It is fitted without disconnecting the battery, which allows the **the computer memory and adaptive information to be saved**.

Fit the clamp directly at the alternator output, with the arrow pointing towards the alternator (any incorrect positioning is detected by the station).

- The measurement is carried out in three stages :
- measurement of the battery voltage, ignition off,
  - measurement of the regulated voltage and of the current supplied, without consumers,
  - measurement of the regulated voltage and current supplied, with a maximum number of consumers.

On completion of the test, the values noted will lead to the following fault finding messages :

- Battery voltage, no load < **12.3 V** = battery uncharged.

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** = > it is necessary to check the alternator supply in relation to its specifications :

Engine  Current (amps)	D7F	E7J and K7M		F8Q	
		without AC	with AC	without AC	with AC
Nominal current	80	70	105	70	105
Minimum current which the alternator must supply, all consumers on	60	60		75	

### FAULT FINDING (continued)

If the electrical supply measured is too low, check:

- the wear of the alternator (brush...),
- the battery connections,
- the engine earth strap,
- the conformity of the alternator,
- the belt tension.

If the electrical supply measured is correct and the regulated voltage is too low, the alternator is not faulty.

The cause of the problem is to be attributed to one of the following sources:

- the vehicle has too many electrical consumers,
- the battery is discharged.



**SPECIAL TOOLING REQUIRED****Mot. 1273****Tool for checking belt tension****REMOVAL**

Place the vehicle on a two post lift .

Disconnect the battery as well as all electrical connections leading to the alternator.

Remove :

- the power assisted steering pump belt and / or the air conditioning compressor (if fitted),
- the alternator belt.

**Engine fitted with air conditioning**

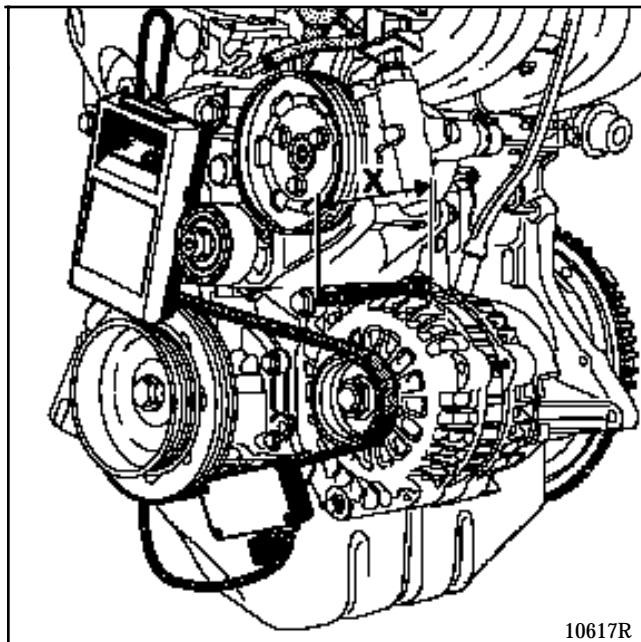
Remove :

- the radiator grille,
- the upper radiator mountings,
- the fan assembly by slackening the lower mounting bolts (lift the radiator),
- the alternator.

**REFITTING**

Refitting is the reverse of removal.

Tensioning of the alternator belt is carried out using the locally manufactured tool shown below (threaded rod **100 mm** in length (X) and three **M6** nuts).



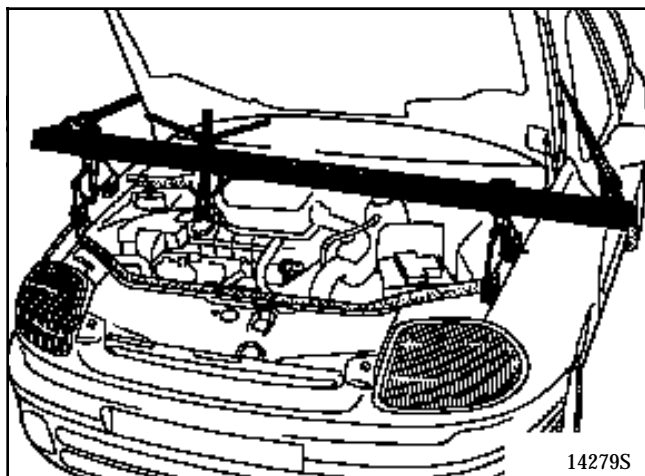
See section 07 "Accessories belt tension" for the tension values.

**SPECIAL TOOLING REQUIRED****Mot. 1273****Tool for checking belt tension****REMOVAL**

Place the vehicle on a two post lift .

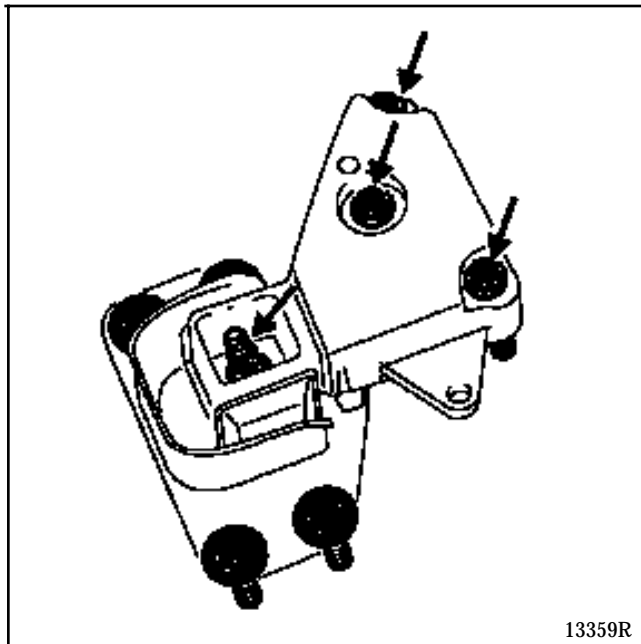
Disconnect the battery as well as all electrical connections leading to the alternator.

Fit the engine support tool.

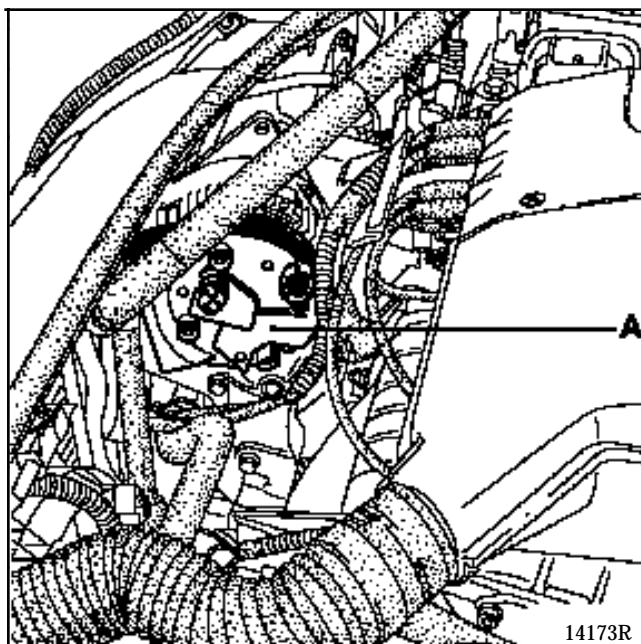


Remove :

- the suspended engine mounting cover (to allow the tension of the alternator belt to be adjusted when it is refitted),



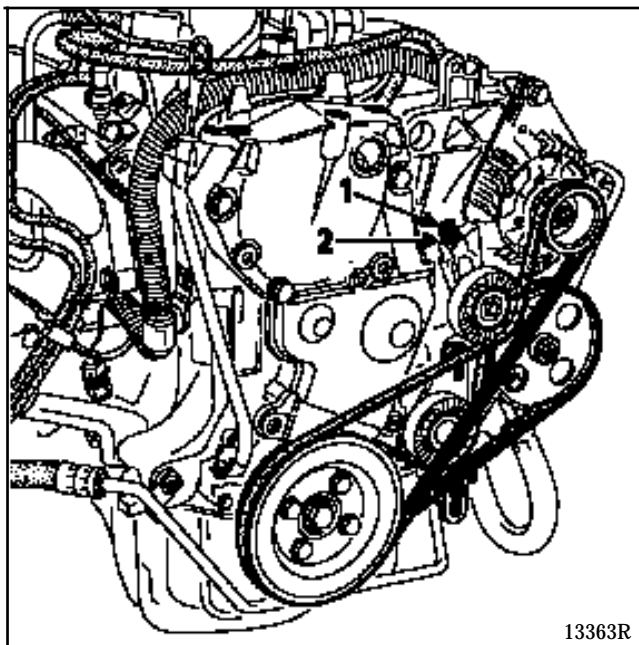
- the alternator belt,
- the alternator by removing the housing (A) for a vehicle fitted with air conditioning.



### REFITTING

Refitting is the reverse of removal.

Tension the belt using the bolt at (1) and tighten the nut at (2), having measured the tension.



See section 07 "Accessories belt tension" for the tension values.

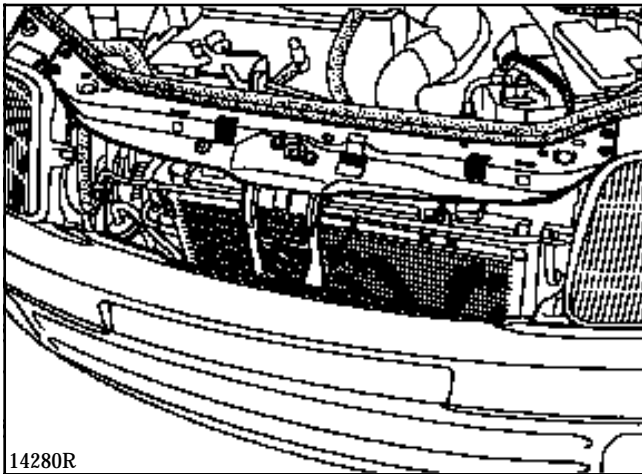
**SPECIAL TOOLING REQUIRED****Mot. 1273****Tool for checking belt tension****REMOVAL**

Place the vehicle on a two post lift .

Disconnect the battery as well as all electrical connections leading to the alternator.

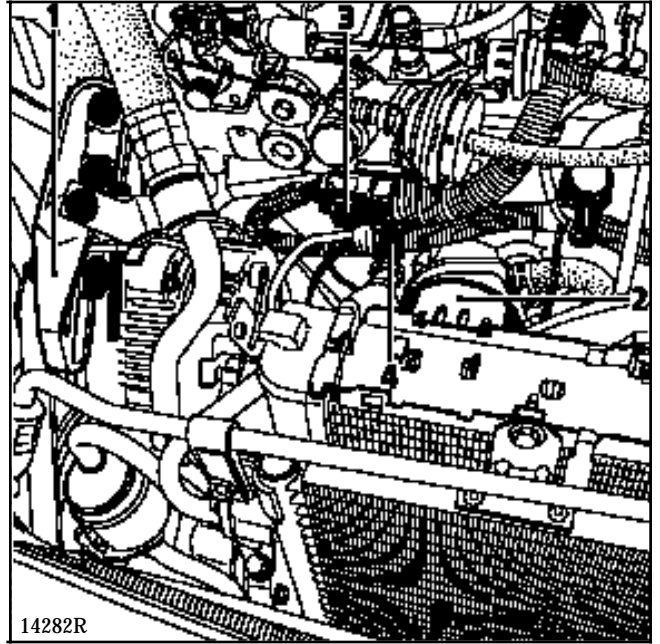
Remove :

- the engine undertray and the right hand-wheel arch protector,
- the radiator grille,
- the upper cross member (by slackening the lower mountings),



- the alternator belt,

- the belt tensioning system(1),
- the oil filter (2),
- the connector (3) and the flange (4) and move the wiring loom to one side,



- the fan assembly (by slackening the lower mountings),
- the alternator.

**REFITTING**

Refitting is the reverse of removal.

See section 07 "Accessories belt tension" for the tension values.

IDENTIFICATION

ENGINE	STARTER MOTOR
D7F	Valéo D7 E1 Bosch 0001116001
E7J and K7M	D6 RA 73
F8Q	Bosch 0001108180

### FAULT FINDING

SPECIAL TOOLING REQUIRED
OPTIMA 5800 Diagnostic station

### CHECKING THE STARTER MOTOR USING THE DIAGNOSTIC STATION

Checking of the starter motor is carried out using the **OPTIMA 5800**, by measuring the battery voltage and the current absorbed in the engine starting phase. The following operation faults may be highlighted :

- a fault in the battery ( the voltage falls during the starting phase),
- locking of the starter motor (the current absorbed is too high),
- a fault in the engine starter gear (the current absorbed is too low).

In order to carry out the measurement, it is necessary to prevent the engine from starting:

- **D7F / E7J and K7M** engines: disconnect the engine speed sensor (located on the clutch housing),
- **F8Q** engine: disconnect the pump electrical solenoid and isolate the terminal.

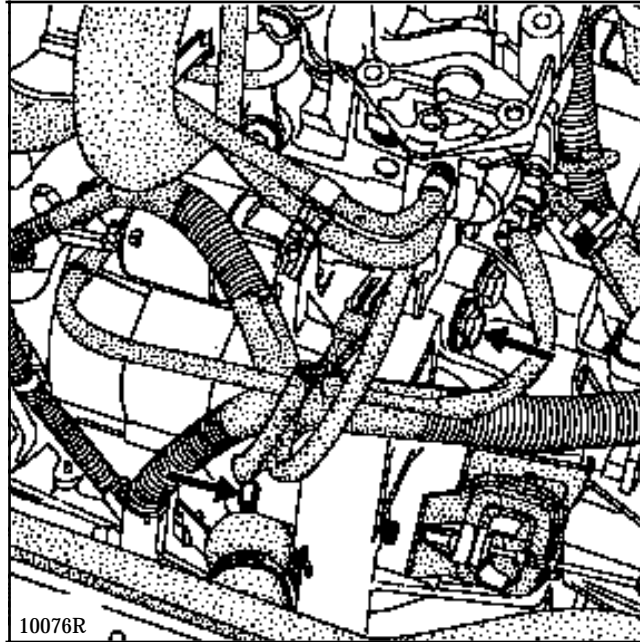
#### NOTE :

- an open circuit on the engine speed sensor or the ignition creates a fault memorised by the injection computer, this fault must then be erased from the memory using the **XR25** (see "**Injection**" section),
- if the engine is fitted with an immobiliser, it is sufficient to lock the doors using the remote control.

**REMOVAL**

Place the vehicle on a 2 post lift, and disconnect the battery.

Disconnect the starter electrical connections.



Remove the two mounting bolts on the starter motor.

**REFITTING**

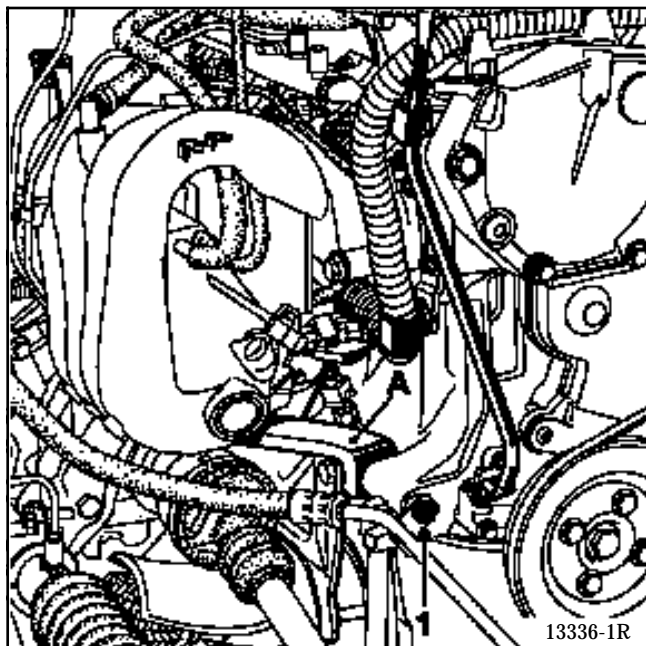
Refitting is the reverse of removal.

### REMOVAL

Place the vehicle on a two post lift .

Remove :

- the engine undertray ,
- the mounting (1) for the power assisted steering pipe and the strut at (A),



- the front right hand wheel,
- the driveshaft roll pin using punches **B. Vi. 31-01**,
- the upper shock absorber base bolt and slacken the lower bolt.

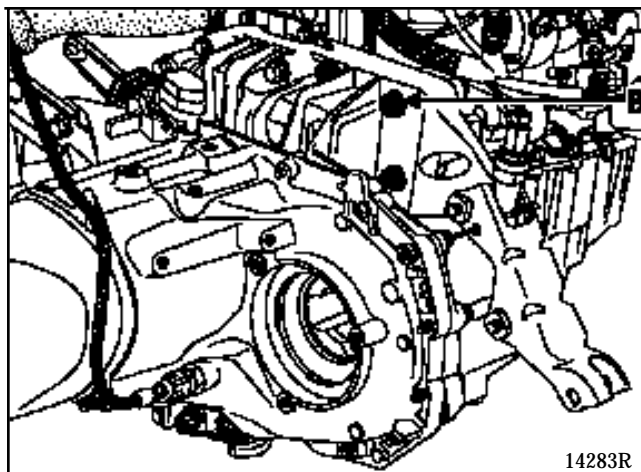
Tilt the hub and release the driveshaft assembly from the gearbox.

Remove the starter motor connections and the mounting bolts and remove it from below the vehicle.

### REFITTING

Refitting is the reverse of removal.

Check for the presence of the centring dowel which should be located at (B).



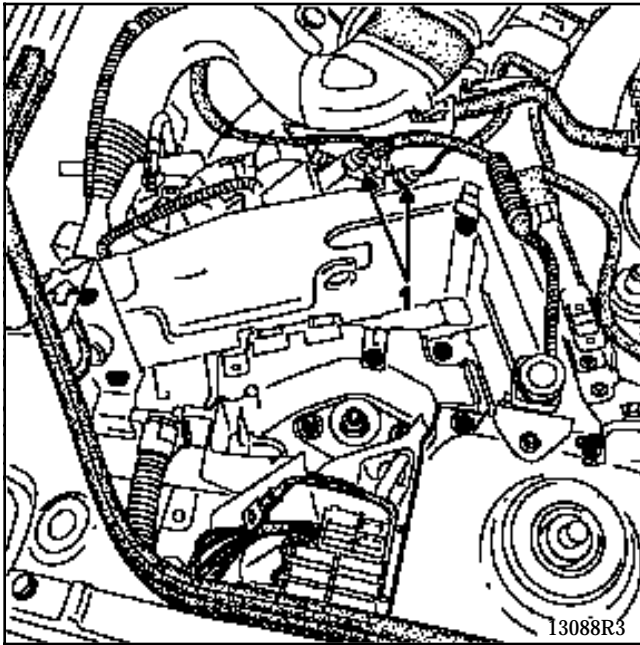


**REMOVAL**

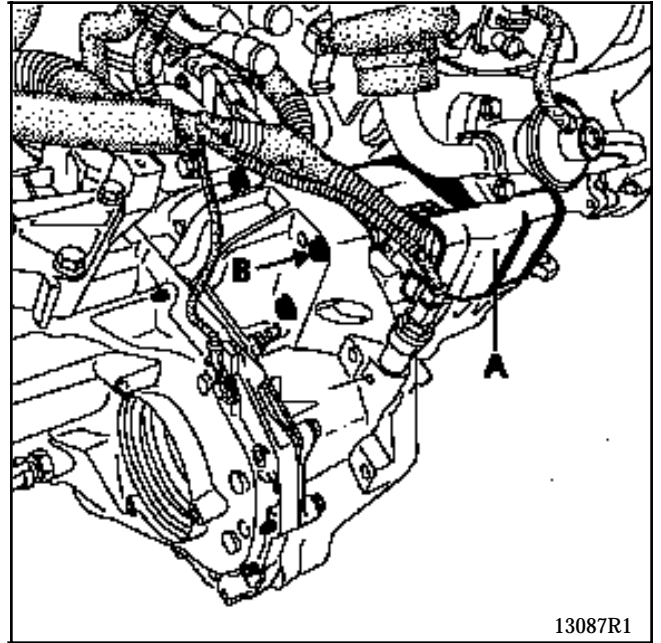
Place the vehicle on a two post lift .

Remove :

- the air filter inlet pipe,
- the battery,
- the computer support mounting bolts and the connectors (1) then move the computer support/ diesel filter assembly to one side,



- the engine undertray ,
- the starter motor mounting bolts and the heat shield (A),



- the starter motor connections ,
- the starter motor .

**REFITTING**

Refitting is the reverse of removal.

Correctly refit the heat shields.

Check for the presence of the centring dowel, which should be located at (B).

The differences between a static ignition with two coils and ignition using a distributor are:

- there is no high voltage distributor,
- there are two dual output coils in one unit.

### PRESENTATION

The system comprises :

- the injection computer (the ignition power stage is integrated into the computer),
- two dual output coils, (for the **D7F** engine, these are moulded into one unit),
- four spark plugs,
- an anti-interference condenser (4).

### 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 (1)

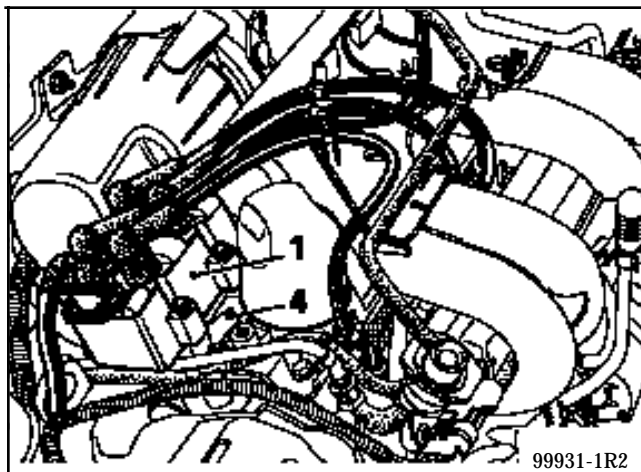
There are two coils. They are of the dual output type (they cannot be separated in the **D7F** engine).

They are controlled separately by the computer.

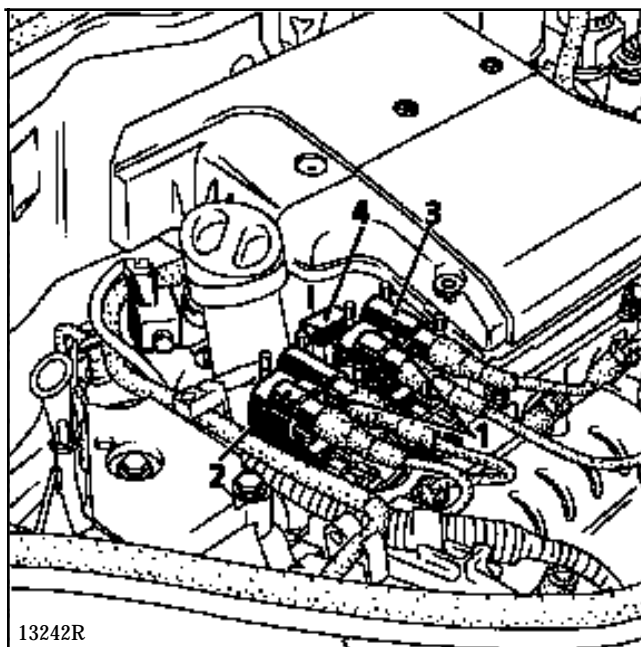
They create two sparks simultaneously.

Both coils are connected to an anti-interference condenser.

**D7F Engine**



**E7J and K7M engines**



#### Special features of the E7J engine

The coil at (2) has a black electrical connector. It creates a spark simultaneously at cylinders **1** and **4**. It is controlled by track **28** of the injection computer.

The coil at (3) has a grey electrical connector. It creates a spark simultaneously at cylinders **2** and **3**. It is controlled by track **29** of the injection computer.

**D7F Engine**

**Electrical connector**

Track	Allocation
1	coil control for cylinders 1 - 4
2	coil control for cylinders 3 - 2
3	+ after ignition
4	+ anti-interference condenser

Test to be made between tracks	Resistance
1 - 2	1.5 $\Omega$
1 - 3	1 $\Omega$
1 - 4	1 $\Omega$
2 - 3	1 $\Omega$
2 - 4	1 $\Omega$
3 - 4	0.6 $\Omega$
HV - HV	8 K $\Omega$

**E7J and K7M engines**

**Electrical connector**

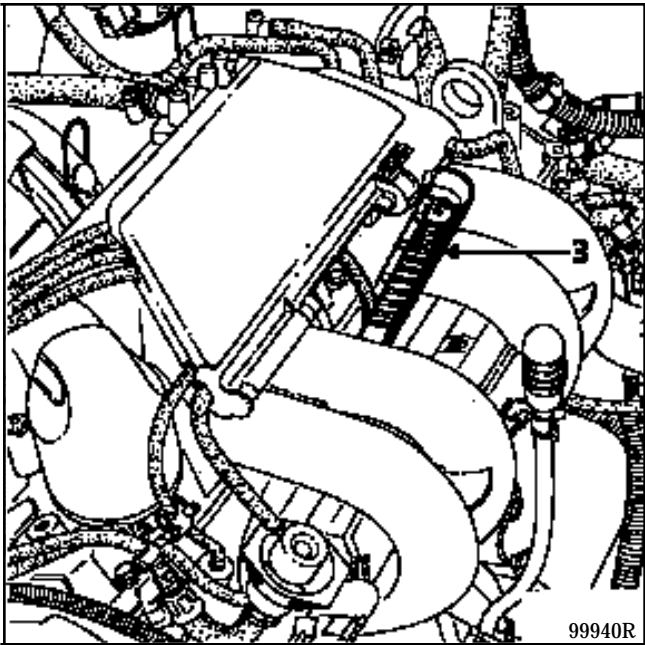
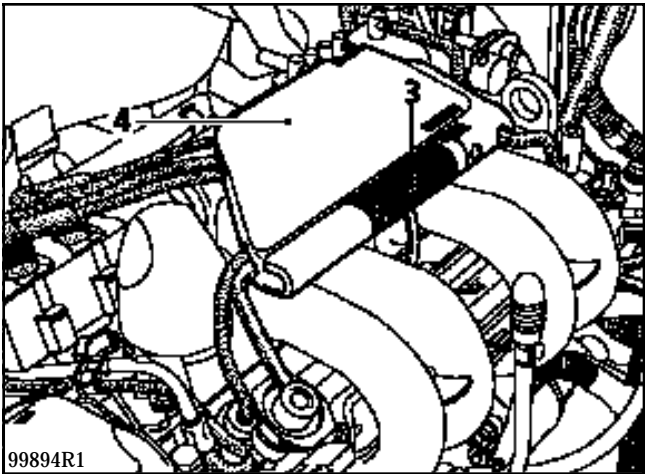
Track	Allocation
1	+ anti-interference condenser
2	+ after ignition
3	coil control by computer

Test to be made between tracks	Resistance
1 - 2	0.5 $\Omega$
1 - 3	1 $\Omega$
2 - 3	1 $\Omega$
HV - HV	10 K $\Omega$

Engine	Make	Type
D7F K7M	EYQUEM	RFC 50 LZ 2E
E7J	CHAMPION	RC 10 PYC RC 10 YCL
Flat base with seal		
Gap: 0.9 mm		
Tightening torque : 2.5 to 3 daN.m		

D7F Engine

To disconnect the spark plug leads, use the tool (3), which is integrated in the plastic cover (4) on the cylinder head.



NOTE : to remove the plugs, use the tool kit, Ele. 1382.

**SPECIAL NOTES FOR MULTIPOINT INJECTION**

- **35 track SAGEM** or **MAGNETI MARELLI** computer for vehicles without options.
- **55 track SAGEM** computer, **SAFIR** or **MAGNETI MARELLI type** for versions with air conditioning.
- Semi-sequential multipoint injection. Injectors controlled two by two (injectors for cylinders **1** and **4** followed by injectors for cylinders **2** and **3**).
- Static ignition with dual single unit coils.
- Canister bleed solenoid valve controlled by RCO signal.
- Computer configuration depending on gearbox type (manual gearbox or automatic transmission).
- The maximum engine speed permitted is **6 200 rpm**.
- Idle speed correction depending on :
  - battery voltage,
  - air conditioning,
  - power assisted steering pressostat.
- Injection warning light on instrument panel not operational.
- Use fault finding fiche n° **27**.

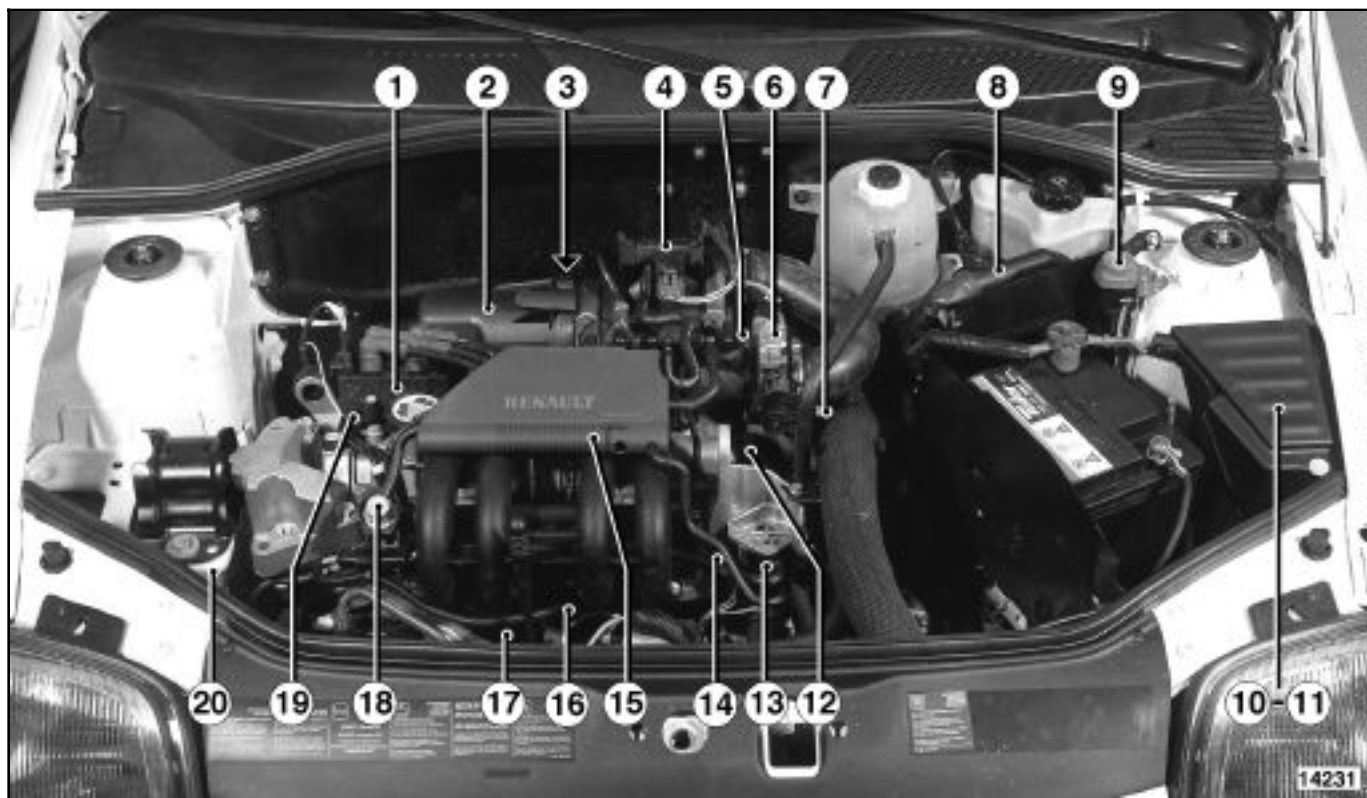
**FITTING A 2ND GENERATION ENGINE IMMOBILISER REQUIRES A SPECIAL PROCEDURE FOR REPLACING THE COMPUTER.**

## SPECIAL NOTES FOR MULTIPOINT INJECTION

- 55 track SIEMENS FENIX 5 computer.
- Semi-sequential multipoint injection. Injectors are controlled two by two (injectors for cylinders 1 and 4 followed by cylinders 2 and 3).
- Static ignition with dual coils.
- Canister bleed solenoid controlled by RCO signal.
- Computer configuration depending on gearbox type (manual gearbox or automatic transmission)
- Idle speed correction depending on :
  - air conditioning,
  - power assisted steering pressostat,
  - battery voltage.
- Injection warning light on instrument panel operational.
- Use fault finding fiche n° 27.
- Maximum speed:
  - **6 200 rpm** if 1st , 2nd or 3rd gears (**E7J**),
  - **6 000 rpm** if 4th,or 5th gears (**E7J**),
  - **6 000 rpm** . (**K7M**).

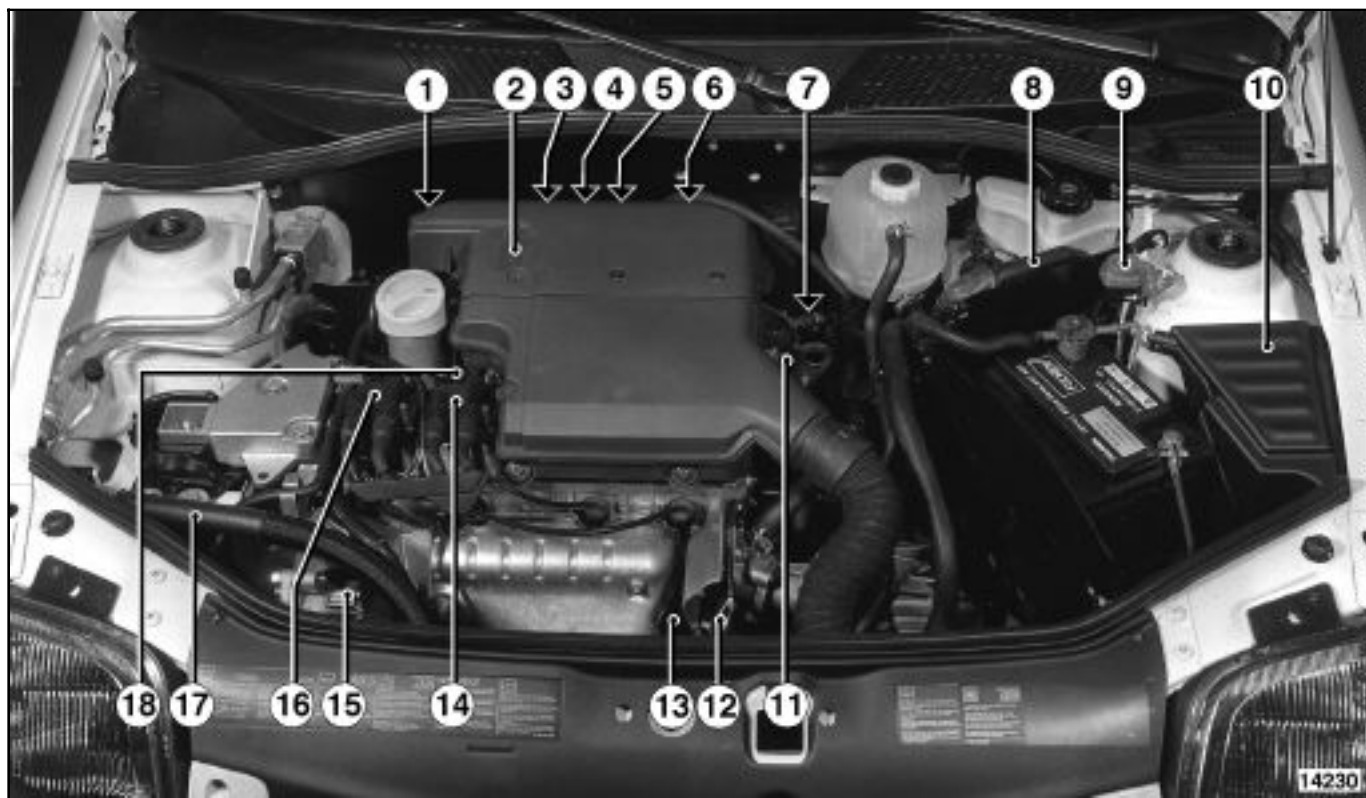
**FITTING A 2ND GENERATION ENGINE IMMOBILISER REQUIRES A SPECIAL PROCEDURE FOR REPLACING THE COMPUTER.**

## LOCATION OF COMPONENTS



- 1 Coil
- 2 Air filter
- 3 Oxygen sensor
- 4 Absolute pressure sensor
- 5 Throttle position potentiometer
- 6 Idle regulation stepping motor
- 7 Air temperature sensor
- 8 Injection computer
- 9 Inertia switch
- 10 Locking relay
- 11 Fuel pump relay
- 12 TDC sensor
- 13 Fuel vapour recycling solenoid valve
- 14 Coolant temperature sensor
- 15 Tool for removing spark plug leads
- 16 Pinking sensor
- 17 PAS pressostat
- 18 Pressure regulator
- 19 Anti-interference condenser
- 20 Fuel vapour absorber canister

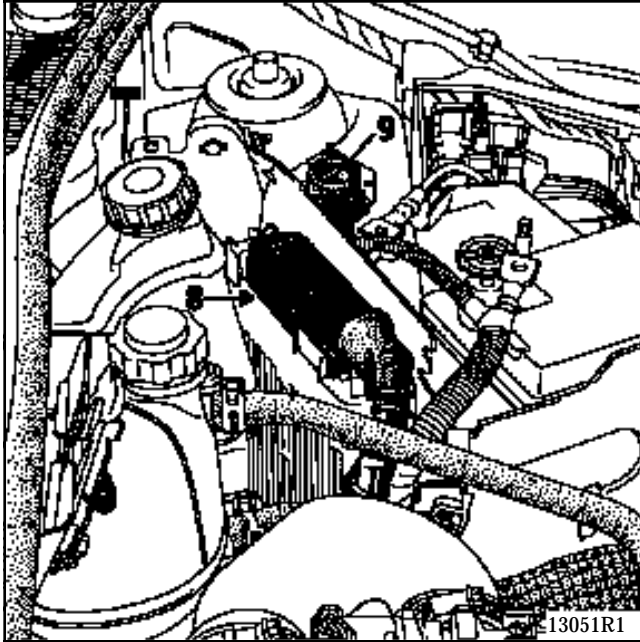
## LOCATION OF COMPONENTS



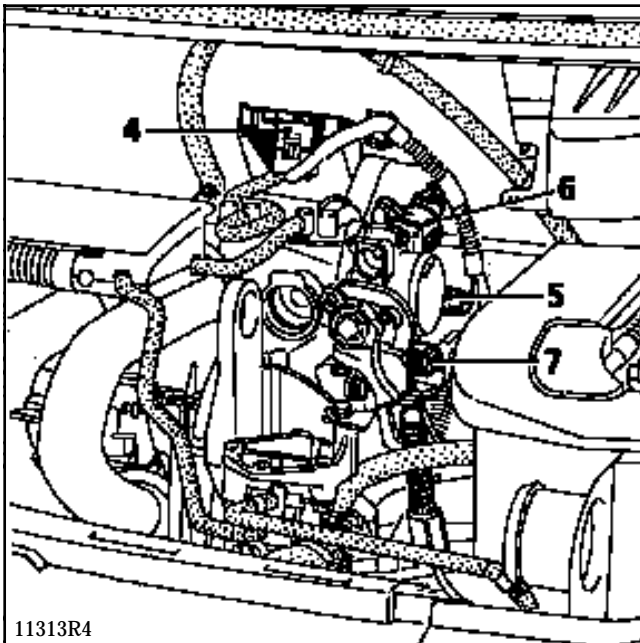
- 1 Fuel vapour recycling solenoid valve
- 2 Air filter
- 3 Pinking sensor
- 4 Absolute pressure sensor
- 5 Idle regulation stepping motor
- 6 Throttle position potentiometer
- 7 Air temperature sensor
- 8 Injection computer
- 9 Inertia switch
- 10 Fuel pump relay
- 11 TDC sensor
- 12 Coolant temperature sensor
- 13 Oxygen sensor
- 14 Coil for cylinders 2 - 3
- 15 PAS pressostat
- 16 Coil for cylinders 1 - 4
- 17 Fuel vapour canister
- 18 Anti-interference condenser



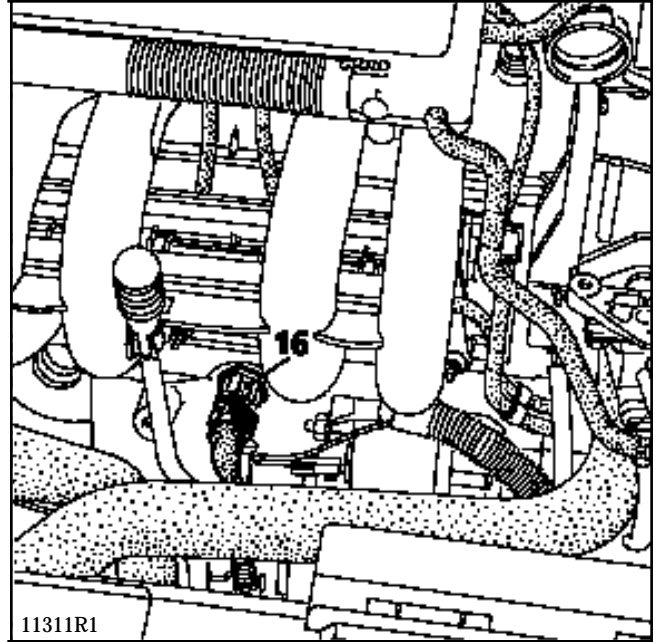
- 8 Injection computer
- 9 Inertia switch



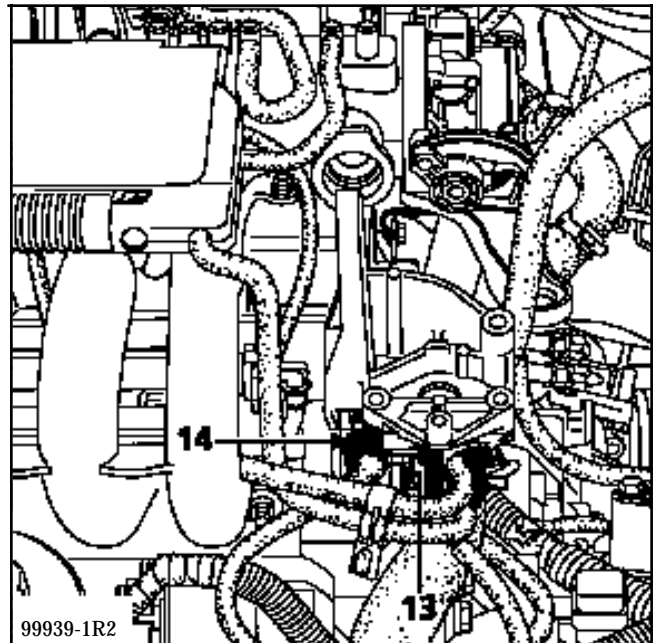
- 4 Absolute pressure sensor
- 5 Throttle position potentiometer
- 6 Idle regulation stepping motor
- 7 Air temperature sensor



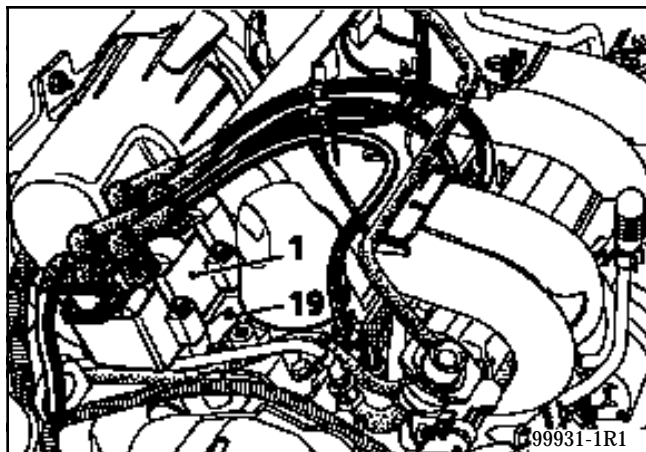
- 16 Pinking sensor  
(tightening torque : 2.5 daN.m)



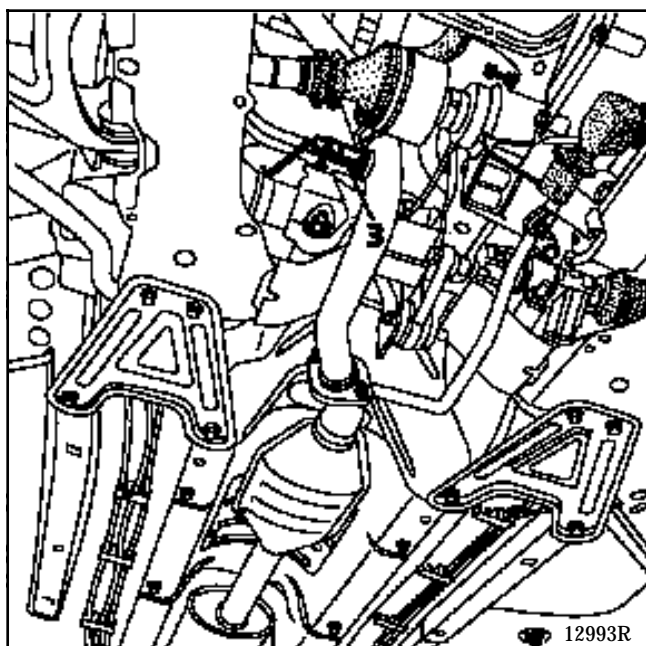
- 13 Fuel vapour recycling solenoid valve
- 14 Coolant temperature sensor



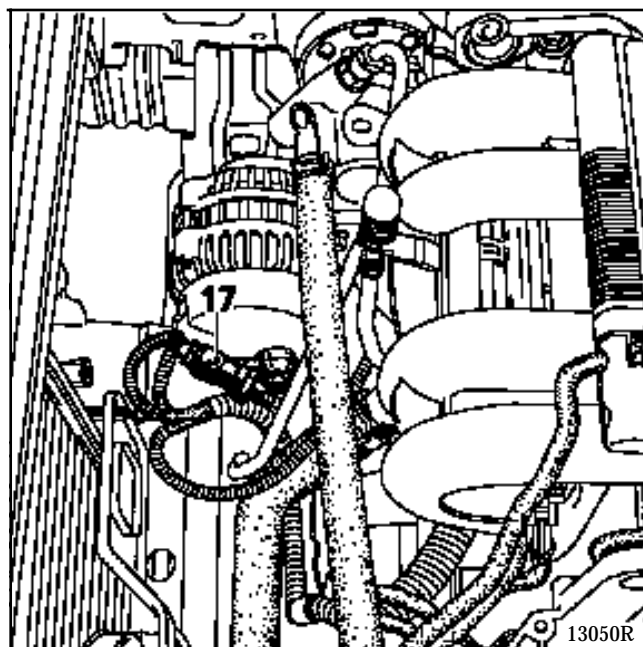
- 1 Coil
- 19 Anti-interference condenser



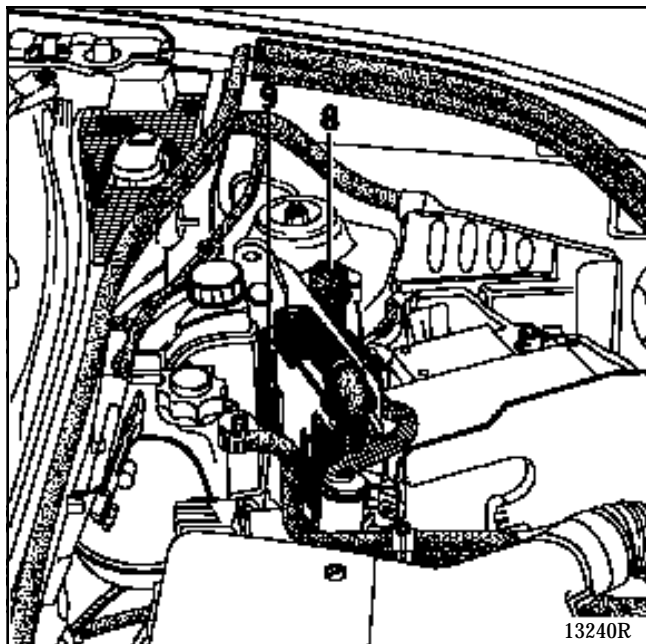
- 3 Oxygen sensor  
(tightening torque : 5 daN.m)



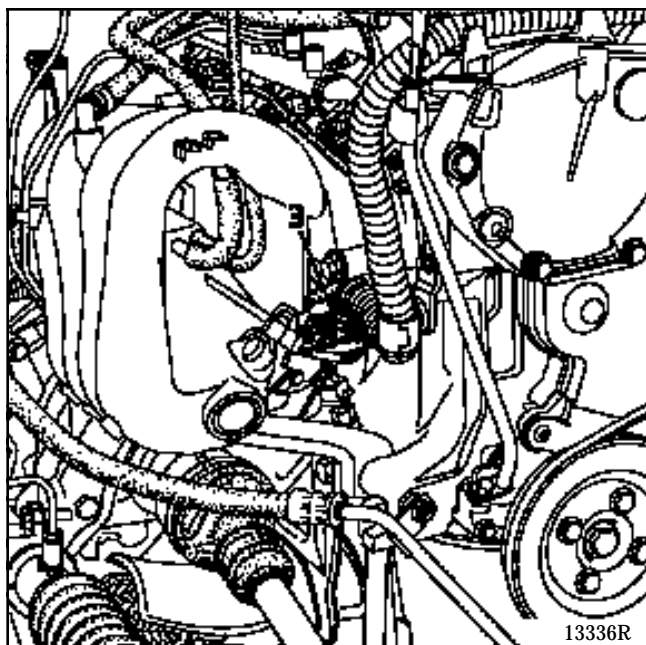
- 17 PAS pressostat



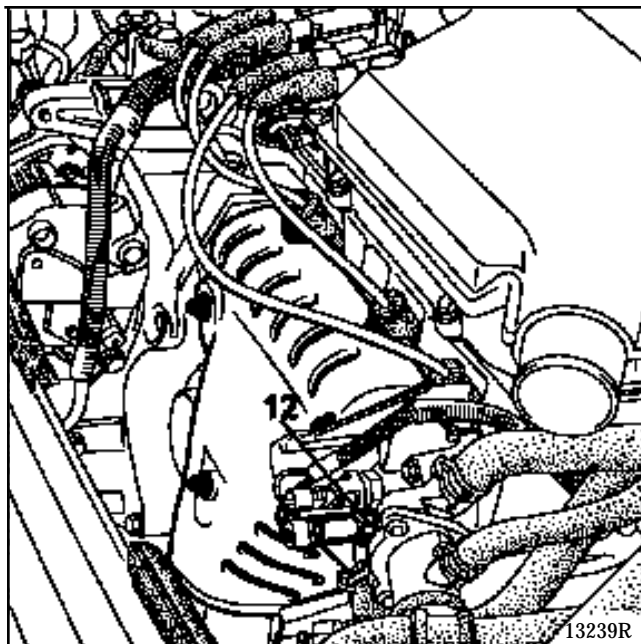
- 8 Injection computer
- 9 Inertia switch



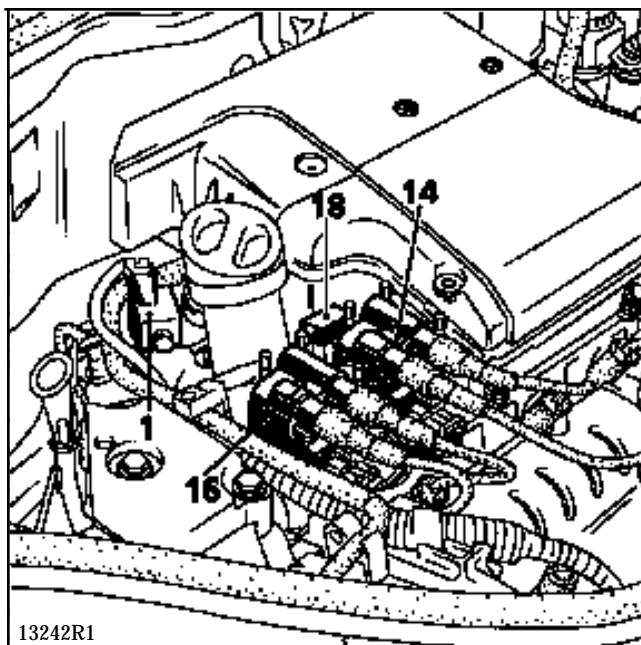
- 3 Pinking sensor  
(tightening torque : 2.5 daN.m)



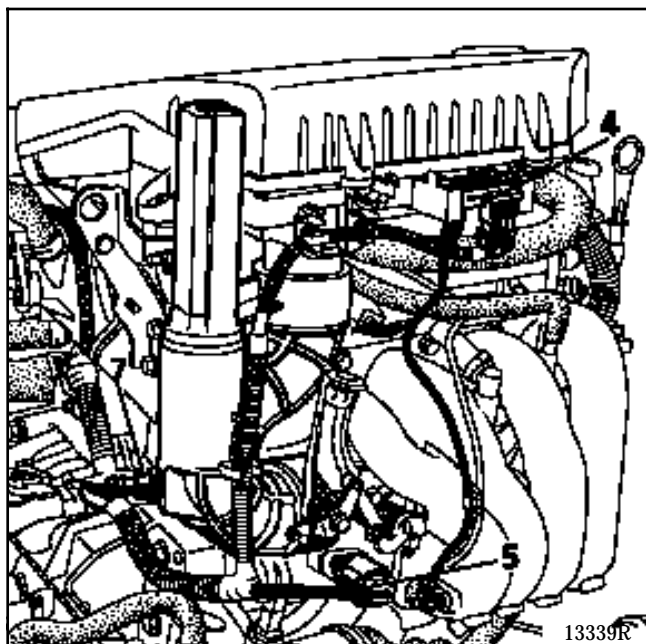
- 12 Coolant temperature sensor



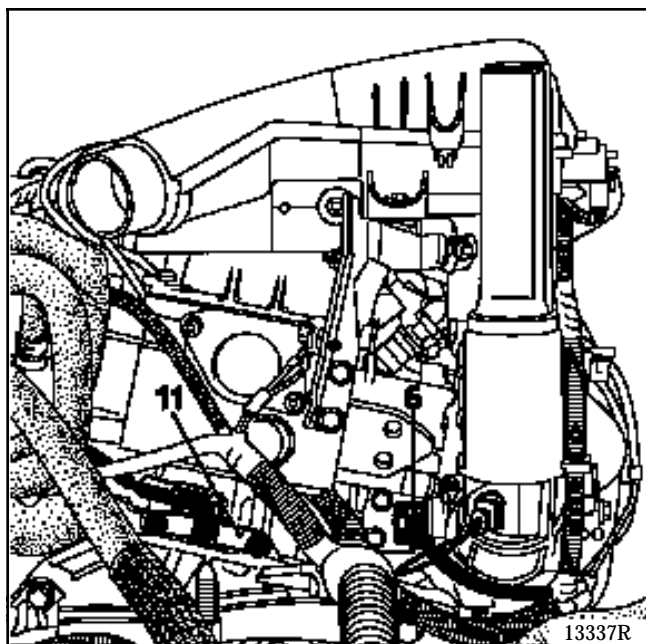
- 1 Fuel vapour recycling solenoid valve
- 14 Coil for cylinder 2 - 3
- 16 Coil for cylinder 1 - 4
- 18 Anti-interference condenser



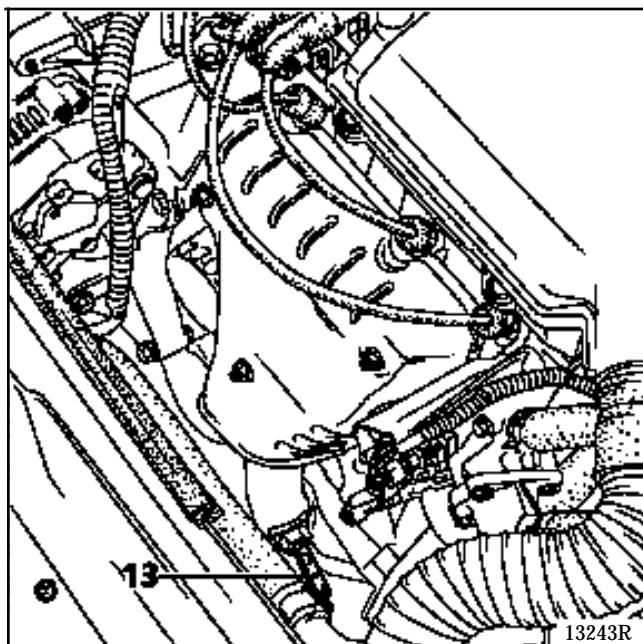
- 4 Absolute pressure sensor
- 5 Idle regulation stepping motor
- 7 Air temperature sensor



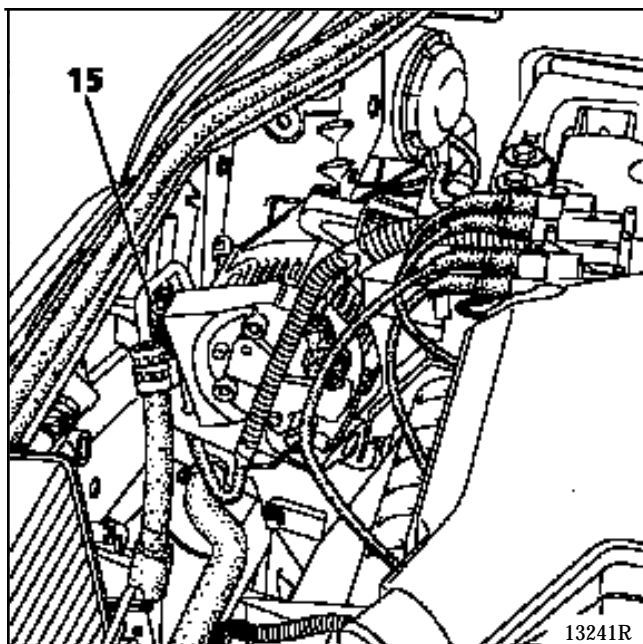
- 6 Throttle position potentiometer
- 11 TDC sensor



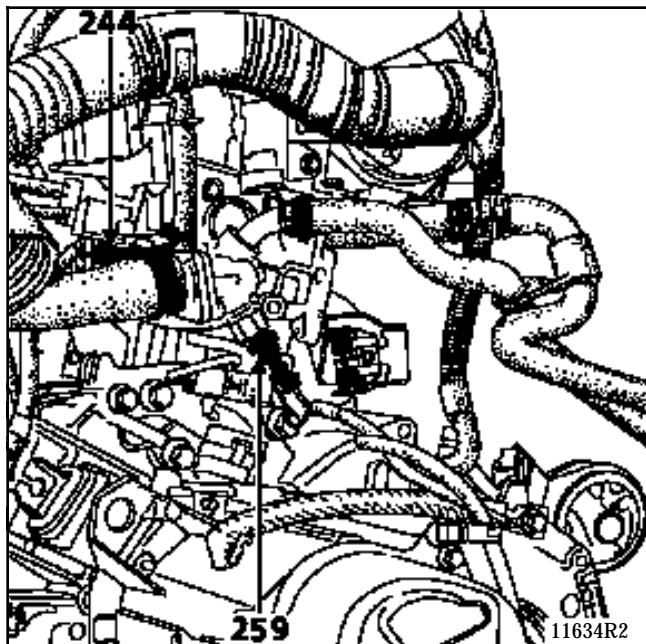
- 13 Oxygen sensor  
(tightening torque : 4.5 daN.m)



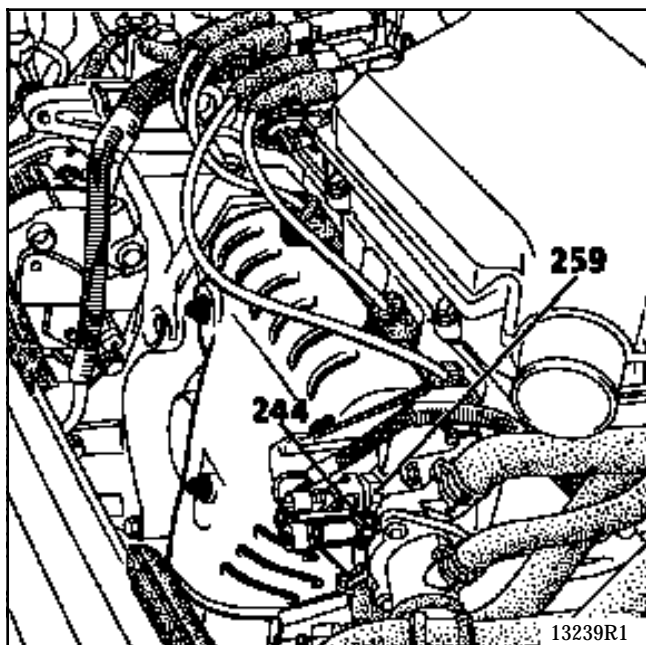
- 15 PAS pressostat



### D7F Engine



### E7J and K7M engines



**244** Injection coolant temperature sensor and coolant temperature indication on instrument panel.

**3 track sensor**, of which two tracks are allocated to the injection coolant temperature information, and one to the indication of the coolant temperature on the instrument panel.

**259** Warning coolant temperature switch for instrument panel.

### Operating principle

Sensor **244** allows:

- the coolant temperature to be shown on the instrument panel,
- the injection computer to receive constant information on the engine coolant temperature .

The injection computer, depending on the coolant temperature, controls :

- the injection system,
- the cooling fan assembly.

The **engine cooling fan assembly** is controlled at fast speed (both slow and fast speeds are controlled by the air conditioning system) if the temperature is greater than **99°C**. If the temperature falls below **96°C**, it cuts off automatically ( if a check has to be carried out, ensure that the air conditioning is not operational).

### PRINCIPLE FOR ILLUMINATION OF INJECTION FAULT WARNING LIGHT ON INSTRUMENT PANEL

- **Vehicles not equipped with the immobiliser function**

When the ignition is switched on, the warning light illuminates constantly for **3 seconds** , then extinguishes.

- **Vehicles with immobiliser function deactivated:**

When the ignition is switched on, the injection warning light illuminates constantly for **3 seconds** and then extinguishes.

When the doors are unlocked, the red immobiliser light, which was previously flashing, extinguishes. When ignition is switched on, it illuminates for **3 seconds** , then extinguishes.

- **Vehicles with immobiliser function activated:**

When the ignition is switched on, the computer does not recognise the code, and prevents the engine from starting. The injection warning light remains illuminated for **3 seconds** and then extinguishes.

Before the ignition is switched on, the red immobiliser light flashes. On switching the ignition on, it flashes more rapidly.

If a fault is detected in the immobiliser system whilst the engine is running, the injection warning light flashes in the engine speed range between idle speed and **1 500 rpm** approximately .

- **Fault in a component of the injection system**

The warning light is illuminated if a fault has been detected in:

- the pressure sensor,
- the vehicle speed
- the throttle potentiometer,
- the idle regulation stepping motor,
- the automatic transmission connection,
- the injector.

This vehicle is fitted with a 2nd generation immobiliser system.

### REPLACING THE INJECTION COMPUTER

All computers are supplied uncoded, but can be programmed with a code.

When replacing the computer, the vehicle code must be programmed in and then a check must be made to ensure that the immobiliser system is operational.

To do this, it is sufficient to carry out the following operations:

- turn the ignition on for a few seconds and turn it off again,
- remove the key to operate the immobiliser function.

### CHECKING THE IMMOBILISER FUNCTION

Remove the key from the ignition switch. After **10 seconds** the red immobiliser warning light will flash.

For special notes on testing an injection computer (test part), refer to section 82: "Immobiliser".
---

## Computer configuration depending on gearbox type

### COMPUTER CONFIGURATION DEPENDING ON GEARBOX TYPE (MANUAL GEARBOX OR AUTOMATIC TRANSMISSION)

Each time the injection computer is replaced, it must be programmed with the type of gearbox (manual or automatic) which is fitted in the vehicle. The computers are designed to function with either type of gearbox.

#### Method for configuring the computer

Connect the **XR25**

Select **S8**

Switch on the ignition

Enter **D13** then

**For vehicles fitted with manual gearbox :**

Enter **G50\* 2\***

**For vehicles fitted with automatic transmission :**

Enter **G50\* 1\***

The screen will display :

d	E	F
---	---	---

if the configuration has not been made

b	a	n
---	---	---

F	i	n
---	---	---

then

1	0	n	J
---	---	---	---

if the configuration is complete.

To ensure that the computer has memorised the data correctly, switch the ignition back on , using fault finding fiche n° 27; the fault bargraph **20 LH** should be extinguished, whilst the **19 LH** or **RH** status bargraph should be illuminated.



### THIS VEHICLE IS FITTED WITH A VARIABLE COMPRESSOR

### AIR CONDITIONING/INJECTION COMPUTER CONNECTION

The electrical connection:

- between the air conditioning computer and the injection computer consists of a single wire (**track 5**). This track carries two types of information :
    - **the fast idle speed request information** . For this information to be transmitted to the injection computer , two conditions must be fulfilled :
      - the air conditioning function must have been selected on the instrument panel,
      - the pressure in the air conditioning circuit must be greater than a certain threshold.If this information is transmitted, the fast idle speed is obtained (it is therefore normal that sometimes, when the air conditioning is switched on, engine idling, there is no fast idle speed ).
    - **the Absorbed Power information**. This information has no influence on the idle speed. It simply informs the injection computer of the torque value taken up by the compressor; the computer, in turn, acts on the idle speed regulation solenoid to anticipate this torque requirement. The absorbed power may be read using the **XR25**. When the air conditioning is switched on , **#44** should be between **300 and 5 000 watts**.
- IMPORTANT:** the value at **#44** at idle speed is never equal to **0**, whatever the status of the compressor, off or on . The minimum value which may be read using **#44** is approximately **250 watts**.
- the link between the the injection computer and the air conditioning computer consists of a single wire (**track 51**). This track carries the information regarding the authorisation or prevention of compressor operation.

### COMPRESSOR OPERATION PROGRAMMING

During certain operating phases, the injection computer prevents the compressor from operating.

#### Programming when starting engine

The compressor is prevented from functioning for **10 seconds** after starting the engine .

#### Recovery of performance ( D7F engine)

Depending on the torque required by the driver and on the power absorbed by the air conditioning compressor, the injection computer stops or allows the operation of the compressor .

#### Anti-stalling function (D7F and K7M engines)

If the no load position is not recognised, if the engine speed is lower than **550 rpm** . (D7F) and **480 rpm** . (K7M) and the power absorbed by the compressor is greater than **300 watts** (D7F) and **1 000 watts** (K7M), then the compressor disengages.

It engages again if (D7F) :

- if the no load position is recognised,
- if the no load position is not recognised when the engine speed reaches **1 800 rpm**.

It is reengaged (K7M) if the no load position is recognised when the engine speed reaches **640 rpm**.

#### Thermal protection programming ( E7J engine )

The compressor does not engage in cases where the coolant temperature is greater than or equal to **+ 115°C**.

### CONNECTION BETWEEN THE POWER ASSISTED STEERING PRESSOSTAT AND THE INJECTION COMPUTER

The injection computer receives information from the power assisted steering pressostat . This varies depending on the pressure present in the hydraulic circuit. The higher the pressure, , the more energy is absorbed by the power assisted steering pump.

To compensate for this energy absorption, the injection computer increases the opening ratio of the idle speed regulation stepping motor.

The information is received on track 13 of the injection computer. If the pressostat is closed, the computer receives an earth. The idle speed is adjusted to:

- **800 rpm** for the **D7F** and **E7J** engines,
- **850 rpm** for the **K7M** engine.

### IDLE SPEED CORRECTION DEPENDING ON THE BATTERY VOLTAGE

The objective of this correction is to compensate for the drop in voltage, due to consumer operation when the battery is poorly charged. To correct this, the idle speed is increased, allowing the alternator to speed up and 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:

- **880 rpm** for the **D7F** engine,
- **930 rpm** for the **E7J** engine,
- **910 rpm** for the **K7M** engine.

### IDLE SPEED CORRECTION DEPENDING ON AIR CONDITIONING OPERATION

The injection computer increases the idle speed to **850 rpm** for the **D7F / K7M** engines and to **850 rpm** for the **E7J** engine, provided it receives the fast idle speed information from the air conditioning computer.

PRINCIPLE

Under normal warm engine operating conditions, the **R.C.O.** idle speed value at **#12** varies between a high value and a low value, until the nominal idle speed is obtained .

It is possible that during variations in the operation of the vehicle (running in, engine contamination..), that the **R.C.O.** idle speed value could become close to the highest or lowest values.

The adaptive correction (**#21**) of the **R.C.O.** idle speed (**#12**) allows the slow variations in the engine air requirement to be corrected, so that the **R.C.O.** (**#12**) is recentred to an average nominal value.

This correction only becomes effective if the coolant temperature is higher than **75°C**, **20 seconds** after starting the engine and if the nominal idle speed regulation phase has been reached.

VALUES FOR THE R.C.O. IDLE SPEED AND ITS ADAPTIVE CORRECTION

	D7F 710 engine	E7J 780 engine	K7M 744 engine
Nominal idle speed (#06)	X = 740 rpm.	X = 750 rpm.	X = 750 rpm.
R.C.O. idle speed (#12)	$4 \% \leq X \leq 14 \%$	$2 \% \leq X \leq 15 \%$	$6 \% \leq X \leq 15 \%$
Adaptive idle speed (#21)	Limit value: - minimum : - 4.3 % - maximum :+3.9 %	Limit value: - minimum : - 2.4 % - maximum :+6.2 %	Limit value: - minimum : - 2.4 % - maximum :+6.2 %

INTERPRETATION OF THE GATE VALUES

In the case of excess air (air leak or throttle stop incorrectly adjusted ..) the idle speed increases, and the **R.C.O.** idle speed value at **#12** decreases, in order to return to the nominal idle speed; the value of the **R.C.O.** idle speed adaptive correction at **#21** decreases to re-center the **R.C.O.** idle speed at **#12**.

In the case of a lack of air (contamination, etc.), the process is inverted : the **R.C.O.** idle speed at **#12** increases and the adaptive correction at **#21** also increases, in order to re-center the **#12** to an average nominal value.

**IMPORTANT :** It is vital, after erasing the memory from the computer (disconnecting the battery), to let the engine run at idle speed before returning the vehicle to the customer, so that the adaptive correction can be correctly reset.

### 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 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 :
  - **46 °C** for the **E7J** engine,
  - **30 °C** for the **D7F** engine,
  - **45 °C** for the **K7M** engine,
- outside no load conditions, if the coolant temperature is greater than:
  - **+ 20 °C** for the **E7J** engine,
  - **+ 20 °C** for the **D7F** engine,
  - **+ 20 °C** for the **K7M** engine,

The timed starting period is dependent on the coolant temperature:

- at **20 °C** it is a maximum of:
  - **3 minutes** for the **E7J** engine,
  - **1 minute 20 seconds** for the **D7F** engine,
  - **4 minutes** for the **K7M** engine,
- at **80 °C** it is a maximum of:
  - **1 minute 30 seconds** for the **E7J** engine,
  - **35 seconds** for the **D7F** engine,
  - **1 minute** for the **K7M** engine,

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**,
- 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 re-centre 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:

D7F Engine	E7J Engine	K7M Engine
$106 \leq \#30 \leq 150$	$64 \leq \#30 \leq 192$	$60 \leq \#30 \leq 195$
$106 \leq \#31 \leq 150$	$64 \leq \#31 \leq 192$	$60 \leq \#31 \leq 195$

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.



### INTERPRETATION OF INFORMATION GATHERED DURING 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 re-centre 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. In order for these to be put to good use during fault finding, no conclusion may be drawn from their value unless they are at the minimum or maximum correction limit, and if both gate values were offset 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).



**VOLUME AND GRADE OF COOLANT**

Engine	Volume (in litres)	Grade	Special notes
D7F	5	<b>GLACEOL RX (type D)</b> recommended coolant only	Protection down to $-20 \pm 2^{\circ}\text{C}$ , warm, temperate and cold countries
E7J and K7M	6		
F8Q	7.5		Protection down to $-37 \pm 2^{\circ}\text{C}$ for extreme cold countries

**THERMOSTAT**

Engine type	Starts opening (in °C)	Fully open (in °C)	Travel (in mm)
D7F / E7J / K7M / F8Q	89	101	7.5

There is no heater matrix coolant control valve.

Coolant flow is continuous in the heater matrix, which contributes to the cooling of the engine.

### FILLING

Check the tightening of the drain plug(s).

Open the bleed screw(s).

Fill the circuit through the opening in the expansion bottle.

Tighten the bleed screws as soon as the liquid flows in a continuous jet.

Start the engine (**2 500 rpm**).

Adjust the level by overflow for a period of about **4 minutes** .

Close the bottle.

### BLEEDING

Allow the engine to run for about **10 minutes** at **2 500 rpm**, until the fan(s) operate (time necessary for automatic degassing ).

Check the liquid level is at the "**Maximum**" marker.

**DO NOT OPEN THE BLEED SCREW(S) WHILST THE ENGINE IS RUNNING.**

**RE-TIGHTEN THE EXPANSION BOTTLE CAP WHILST THE ENGINE IS WARM.**

SPECIAL TOOLING REQUIRED		
M.S. 554-01	Adapter for M.S. 554-05	
M.S. 554-06	Adapter for M.S. 554-05	
M.S. 554-07	Kit for testing cooling circuit sealing	

1 - Testing the sealing of the circuit

Replace the expansion bottle valve with adapter **M.S. 554-01**.

Connect this to tool **M.S. 554-07**.

Let the engine warm up then turn it off.

Pump to put the circuit under pressure.

Stop pumping at **0.1 bar** less than the valve is rated.

The pressure should not drop, otherwise 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 valve with a new seal.

2 - Checking the rating of the valve.

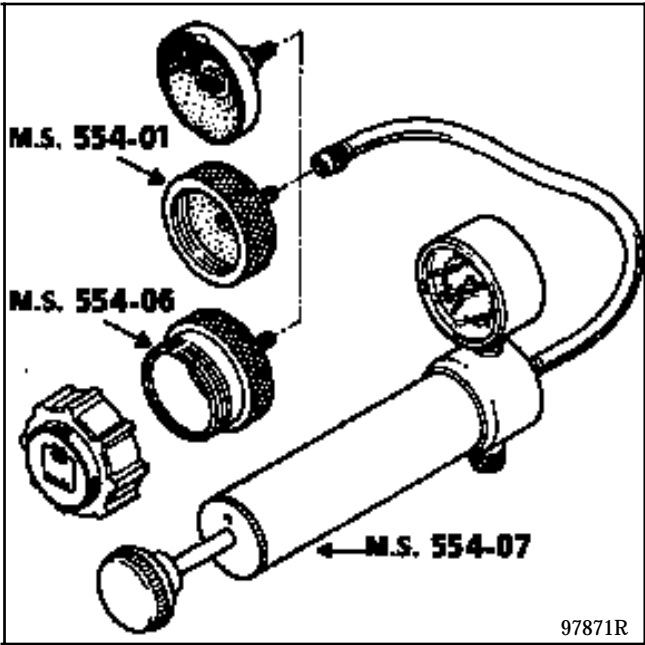
If liquid passes through the expansion bottle valve, the valve must be replaced.

On pump **M.S. 554-07** fit tool **M.S. 554-06** and fit the assembly on the valve to be checked.


Increase the pressure which should stabilise at the valve rating pressure with a test tolerance of  $\pm 0.1$  bar.

Valve rating :

Engines	Colour of valve	Valve rating (in bars)
D7F / E7J / K7M / F8Q	Brown	1.2



SPECIAL TOOLING REQUIRED	
Mot. 591-02	Index
Mot. 591-04	Angle tightening wrench
Mot. 1135-01	Tool for tensioning the timing belt
Mot. 1202	Hose clip pliers
Mot. 1273	Tool for checking belt tension
EQUIPMENT REQUIRED	
Engine support tool	

TIGHTENING TORQUES (in daN.m and / or °)		
Tension wheel nut	5	
Crankshaft pulley bolt	2 + 68° + 6°	
Bolt for suspended engine mounting cover	6.2	
Nut for suspended engine mounting cover	4.4	
Water pump bolt	2.2	
Water pump nut	1	
Wheel bolts	9	

REMOVAL

Place the vehicle on a two post lift.

Disconnect the battery.

Drain the cooling circuit from the lower radiator hose.

Remove:

- the timing belt (see method described in section 11 "Timing belt"),
- the timing tension wheel,
- the water pump, and extract this from above.

CLEANING

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

Use the product **Décapjoint** to dissolve the part of the gasket which remains attached.

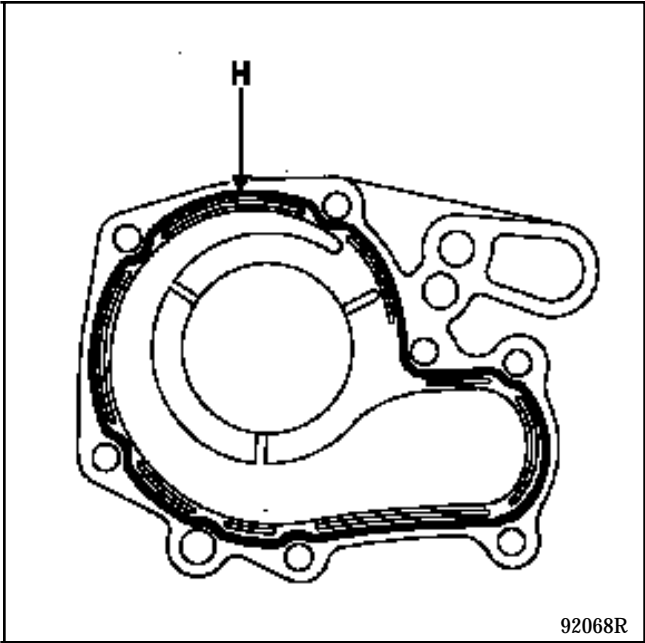
Apply the product to the part to be cleaned, wait approximately 10 minutes, then remove it using a wooden spatula.

Gloves should be worn during the operation.

REFITTING

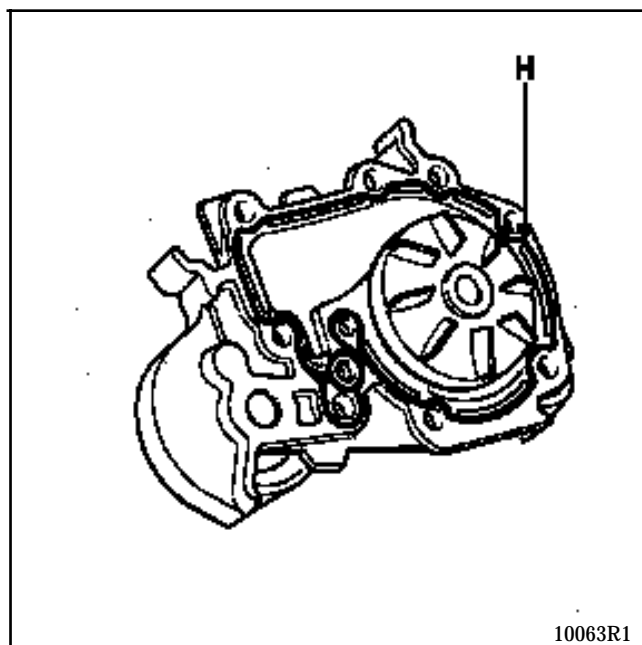
The sealing of the water pump is carried out using the product **LOCTITE 518**; the bead (H) must be applied following the diagram below.

E7J engine



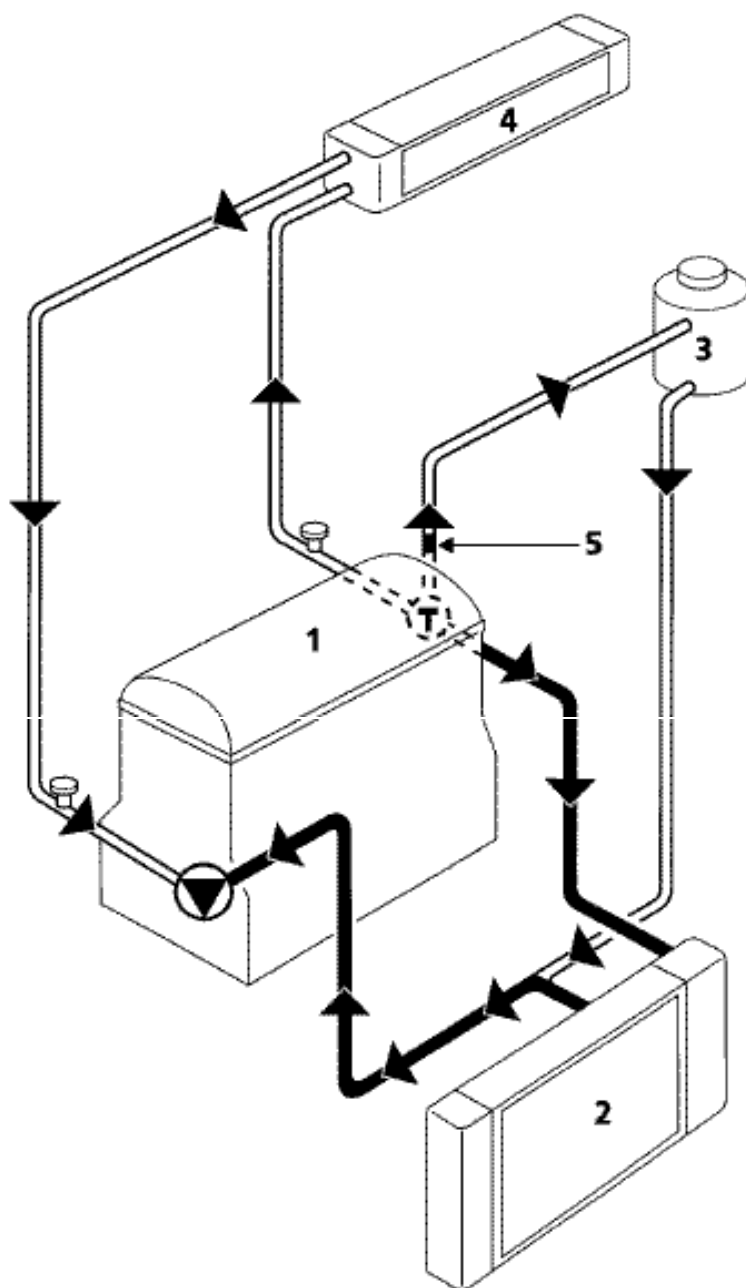
92068R

K7M engine



Refit the timing belt (see method described in section 11 "**Timing belt**").

Fill and bleed the cooling circuit (see section 19 "**Filling and bleeding**").



10070-2R

- 1 Engine
- 2 Radiator
- 3 "Hot" bottle with permanent degassing
- 4 Heater matrix
- 5 3 mm diameter restriction

The fan is controlled at high speed by the injection computer if the coolant temperature is greater than **99°C**.

If the coolant temperature is lower than **96°C**, the fan stops operating.



Water pump

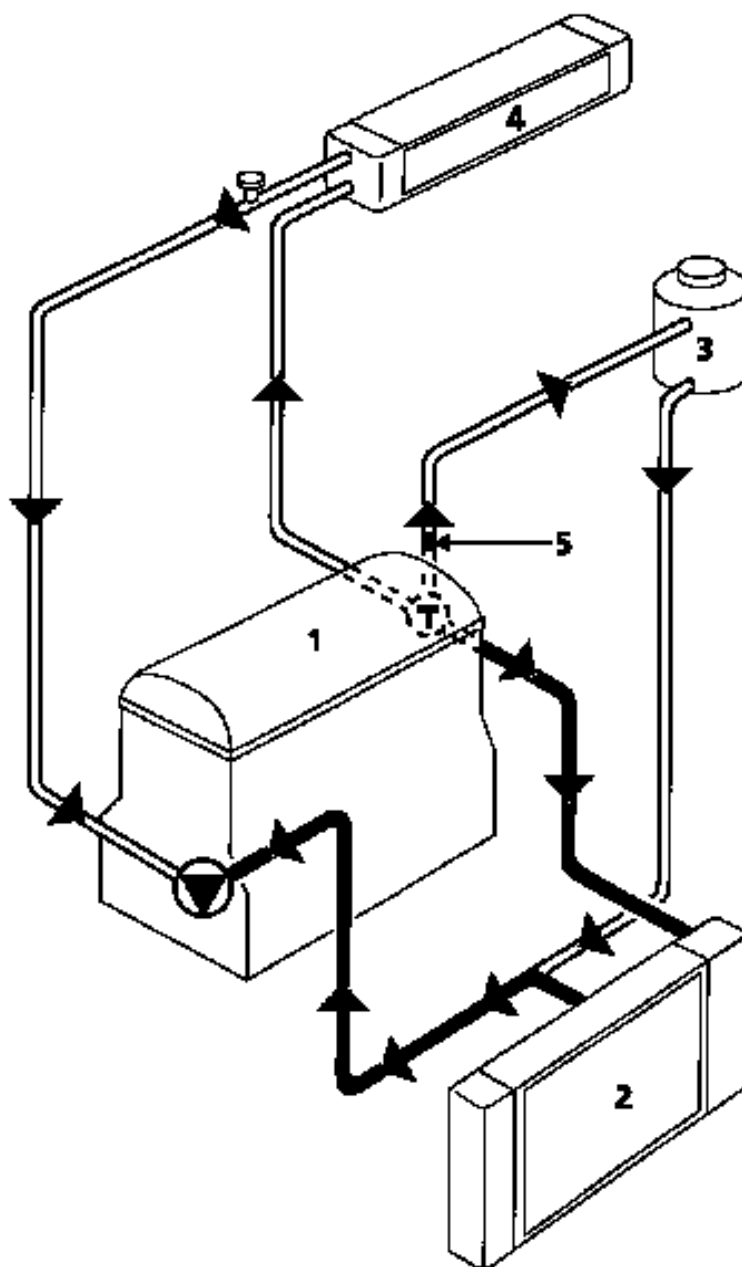


Thermostat



Bleed screw

The expansion bottle valve is brown, and its rating is **1.2 bar**.



10070-3R

- 1 Engine
- 2 Radiator
- 3 "Hot" bottle with permanent degassing
- 4 Heater matrix
- 5 3 mm diameter restriction

The fan is controlled at high speed by the injection computer if the coolant temperature is greater than **99°C**.

If the coolant temperature is lower than **96°C**, the fan stops operating.



Water pump

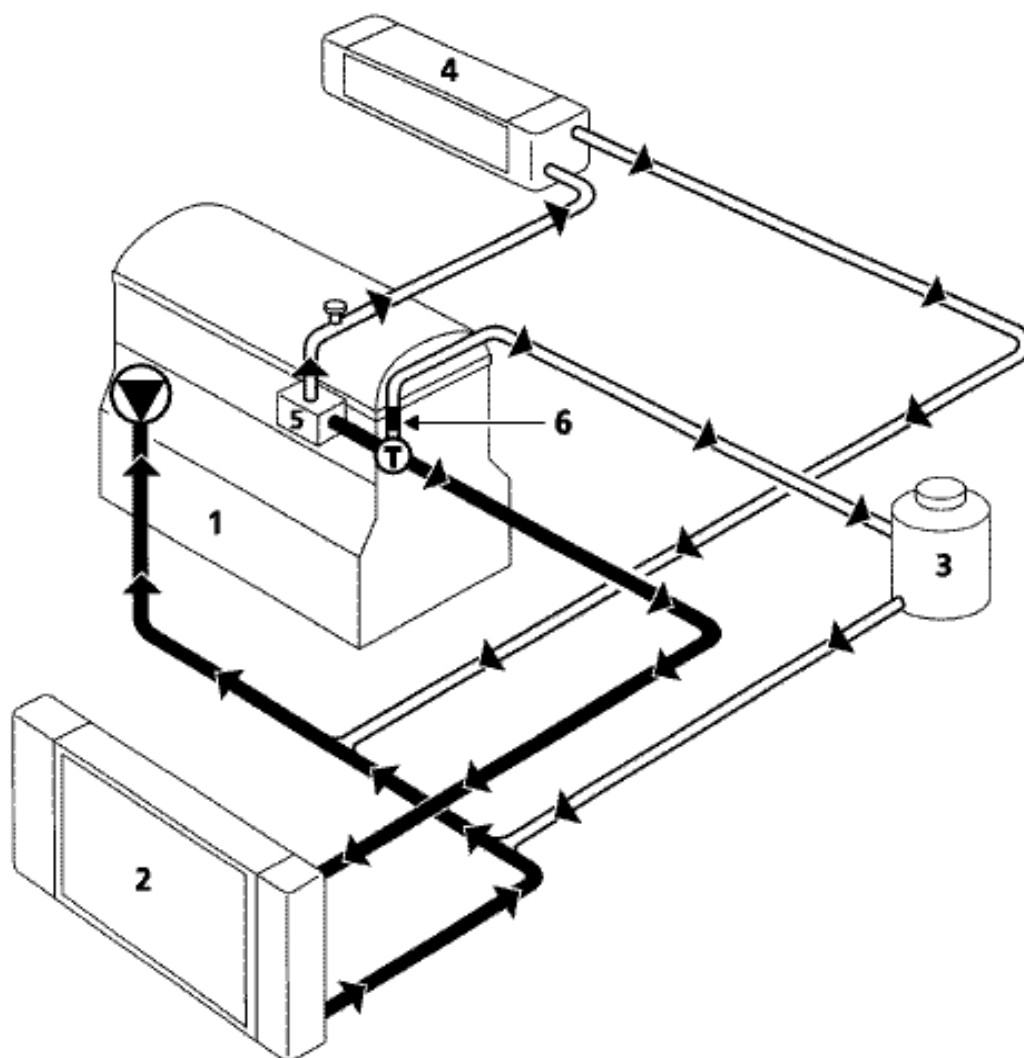


Thermostat



Bleed screw

The expansion bottle valve is brown, and its rating is **1.2 bar**.



13508R

- 1 Engine
- 2 Radiator
- 3 "Hot" bottle with permanent degassing
- 4 Heater matrix
- 5 Thermostat mounting
- 6 3 mm diameter restriction

The fan is controlled at high speed by the injection computer if the coolant temperature is greater than **99°C**.

If the coolant temperature is lower than **96°C**, the fan stops operating.



Water pump



Thermostat



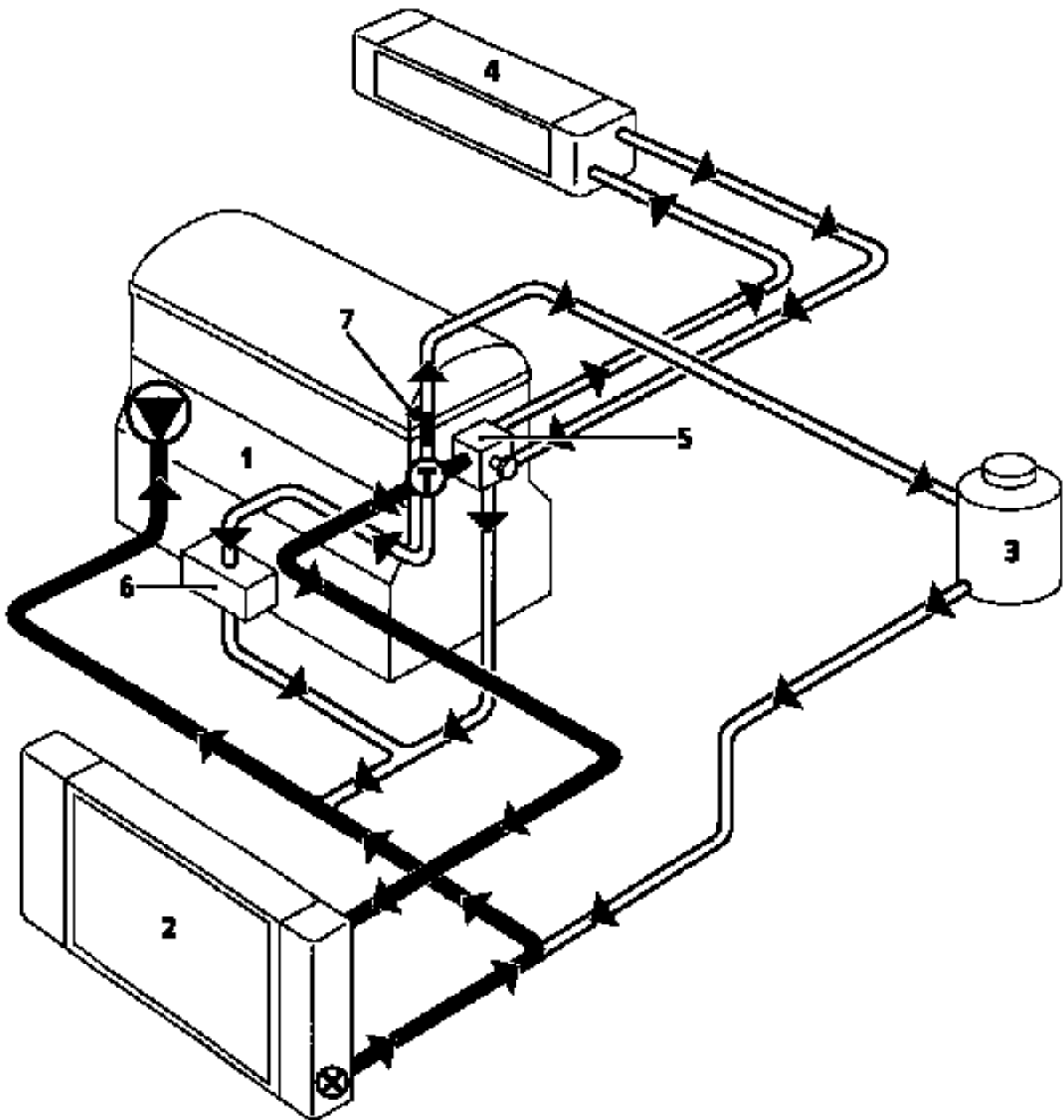
Bleed screw



Temperature switch

The expansion bottle valve rating is **1.2 bar** (colour; brown).





13504-1R

- 1 Engine
- 2 Radiator
- 3 "Hot" bottle with permanent degassing
- 4 Heater matrix
- 5 Thermostat mounting
- 6 Oil heat exchanger
- 7 3 mm diameter restriction



Water pump



Thermostat



Bleed screw



Temperature switch

The expansion bottle valve rating is **1.2 bar**  
(colour:brown).

During operation, the catalytic converter reaches high temperatures, and consequently, it is vital not to park the vehicle in a place where combustible materials could come into contact with it, and, as a result, ignite.

### IMPORTANT:

- the seal, between the exhaust manifold gasket face and the catalytic converter (inclusive), must be in perfect condition,
- it is imperative that every gasket which is removed should be **REPLACED**,
- during removal and refitting, the catalytic converter must not undergo repeated mechanical shocks, as it will be damaged.

### CUTTING THE EXHAUST PIPE

The exhaust pipes are of the monobloc type. There is no join from the beginning of the catalytic converter or the expansion box, to the end of the silencer.

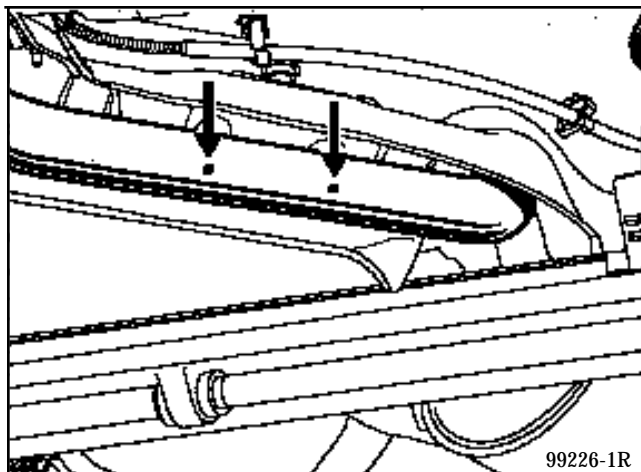
It will therefore be necessary, when replacing one of the components in After Sales, to cut the exhaust pipe.

For this, it is absolutely essential to accurately :

- mark the area to be cut,
- use the cutting tool **Mot. 1199-01**,
- fit the after sales sleeve .

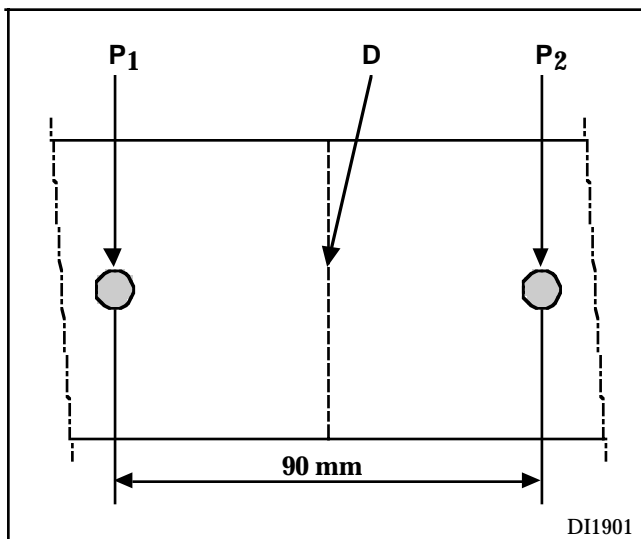
### MARKING THE AREA TO BE CUT

The area to be cut is defined by two punch marks on the exhaust pipe.



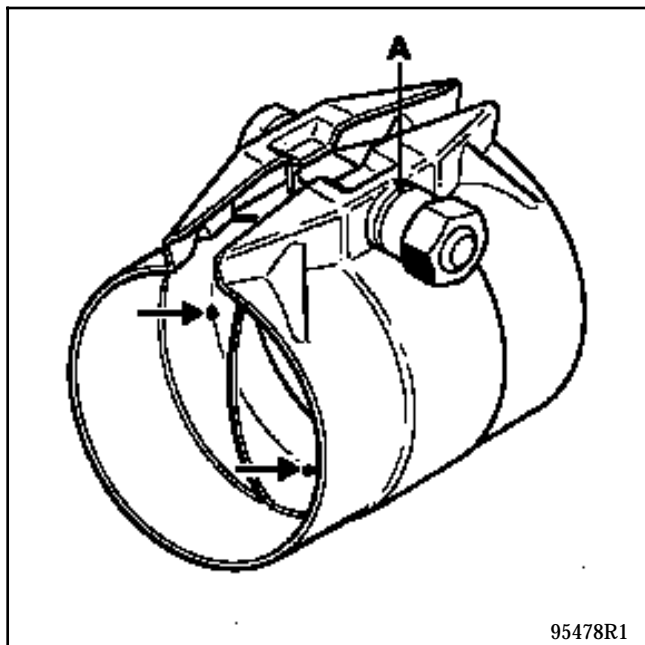
There are a maximum (depending on engine) of two cutting areas on the exhaust pipe, situated between the catalytic converter and the expansion box and between the expansion box and the silencer.

The distance between the two markings is **90 mm**. To cut the pipe, mark the central point (D) between the two markings (P<sub>1</sub> and P<sub>2</sub>).



**IMPORTANT:** to cut the exhaust pipe, it is essential to use tool **Mot. 1199-01**; this tool allows 2mm thick pipes to be cut.

## FITTING THE AFTER SALES SLEEVE



To avoid any leaks in the exhaust pipe, the sleeve must be correctly positioned over the two exhaust pipe sections. The pipe must be against the stops inside the sleeve.

Begin by positioning the sleeve over the used section of the pipe, adjust the collar by tightening gently.

Check the position of the pipe in relation to the stops.

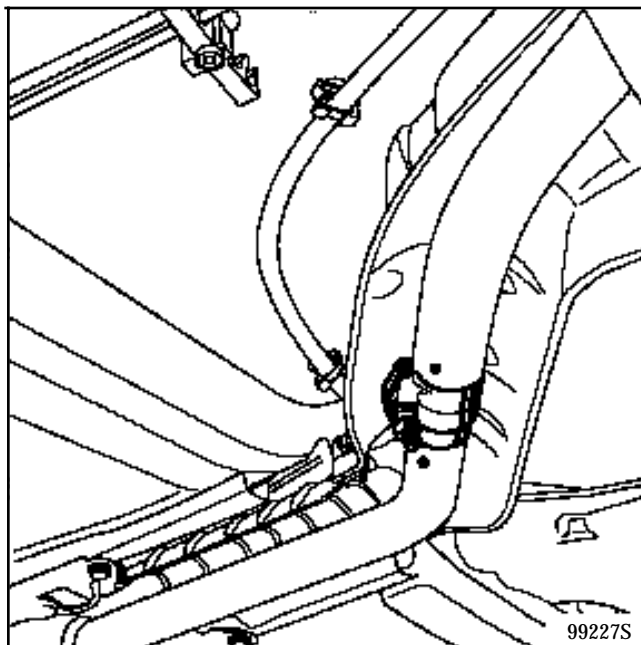
Fit the new section of the pipe.

Before fitting the sleeve on the pipe, apply a little paste to the inner ring on the sleeve to prevent leaks.

(Exhaust paste, Part Number. **77 01 421 161** SODICAM).

**IMPORTANT :** the bolt and nut used for tightening the sleeve must be **aligned vertically** to avoid any risks of touching the underside of the body.

Do not reuse an old clip.



The nut on the collar has a groove (A) to ensure it is tightened to the correct torque. When the nut is tightened and the groove disappears, it causes a distinct clicking sound and the nut is then tightened to the correct torque (**2.5 daN.m**).

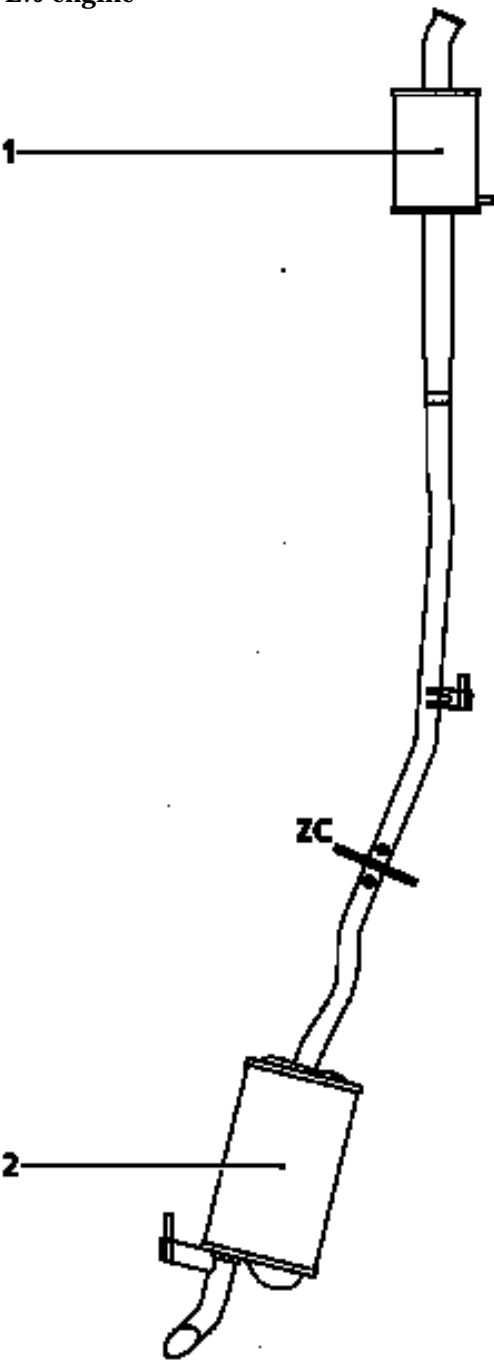
**NOTE:** there are different sleeve diameters available.

### IMPORTANT:

- check that there is no point of contact between the exhaust pipe and the vehicle body,
- check for the presence and correct positioning of all heat shields for the exhaust pipe,
- check that the two cutting marks are correctly aligned.

DIAGRAM OF EXHAUST PIPES AND LOCATION OF CUTTING AREAS

E7J engine

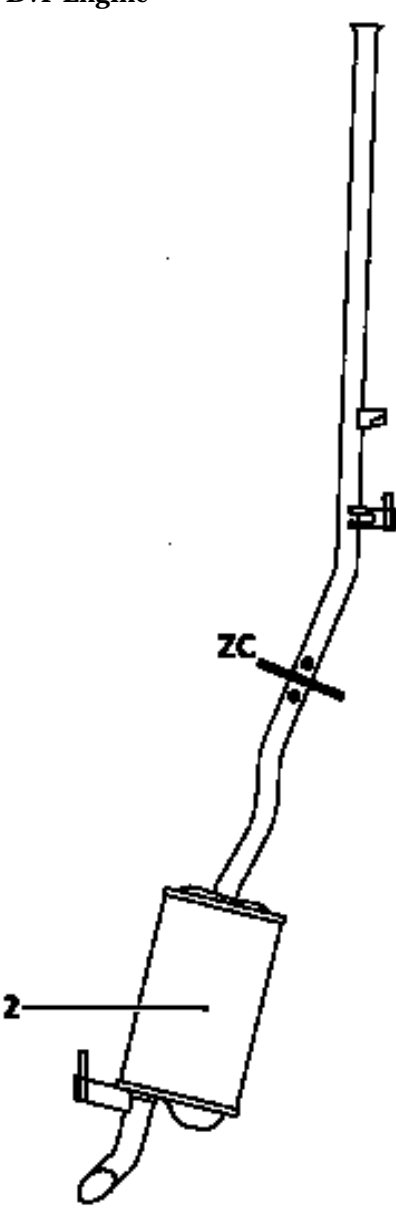


2

ZC

13823R

D7F Engine



2

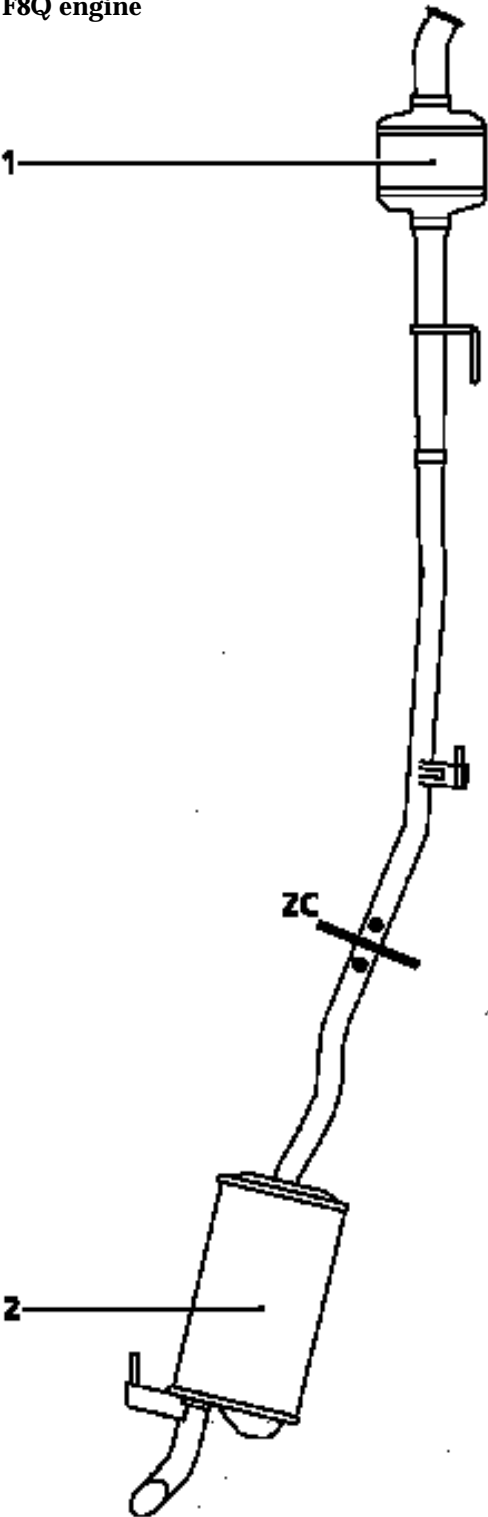
ZC

13824R

- 1 Expansion box
- 2 Silencer
- ZC Pipe cutting area

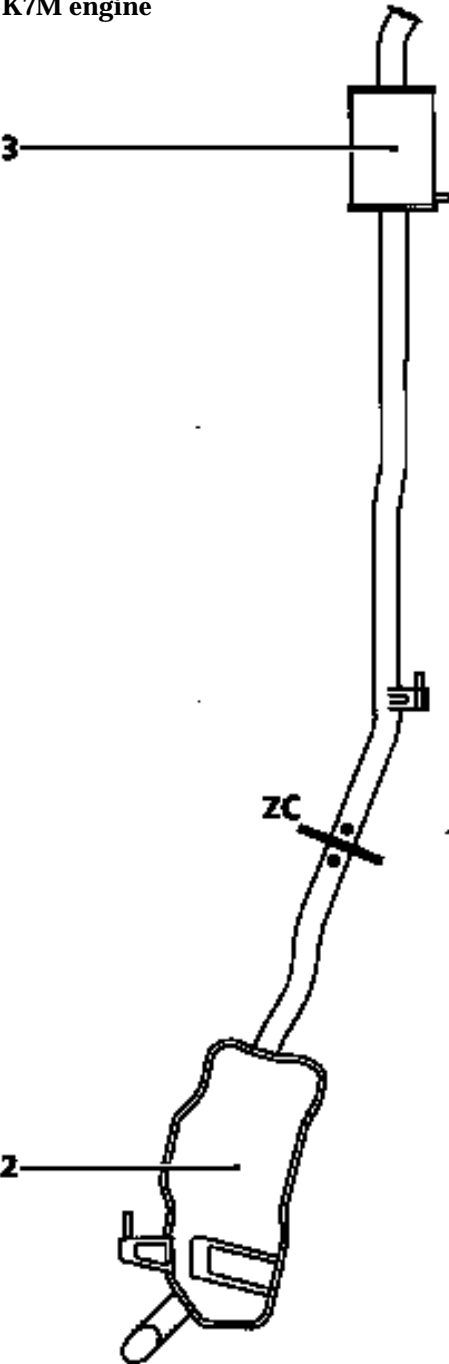
DIAGRAM OF EXHAUST PIPES AND LOCATION OF CUTTING AREAS

F8Q engine



13821R

K7M engine



13822R

- 1 Catalytic converter
- 2 Silencer
- 3 Expansion box
- ZC Pipe cutting area

### EQUIPMENT REQUIRED

INTAIRCO pneumatic siphoning pump, for petrol or diesel tank draining system (see EQUIPMENT catalogue).

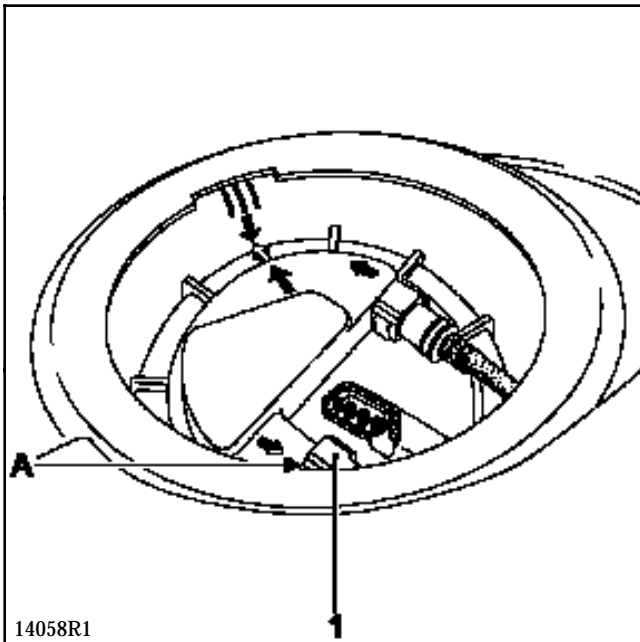
**IMPORTANT :** during all the fuel tank removal and refitting operations, refrain from smoking and be sure not to handle incandescent objects in the vicinity of the working area.

#### DRAINING THE FUEL TANK (Petrol version)

Remove the pump - sender unit assembly access cover.

Remove the clip which shows if the assembly has been pushed in (if fitted).

Disconnect the quick release union at (1).



Attach to the outlet at (A), a pipe long enough to be placed into a container outside the vehicle .

**NOTE :** Alternatively, an INTAIRCO pneumatic siphoning pump may be used (see EQUIPMENT catalogue).

Put the battery on a charger so that it does not lose its charge.

In the engine compartment, disconnect the fuel pump relay, which is located in the engine connection unit.

Shunt **tracks 3** and **5** and let the fuel flow until it runs out in intermittent jets.

Disconnect the shunt.

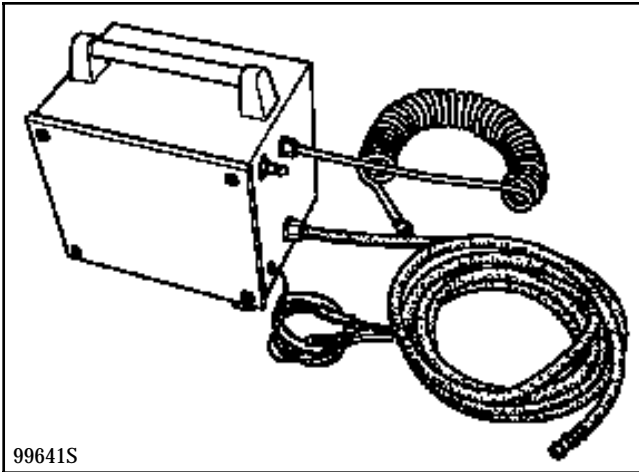
Reconnect the relay.

Disconnect the battery.

### DRAINING THE FUEL TANK (Diesel version)

Since diesel versions are not fitted with an electrical fuel pump, an external pump must be used to drain the tank.

For example, the **INTAIRCO** pneumatic siphoning pump can be used (see **EQUIPMENT** catalogue).

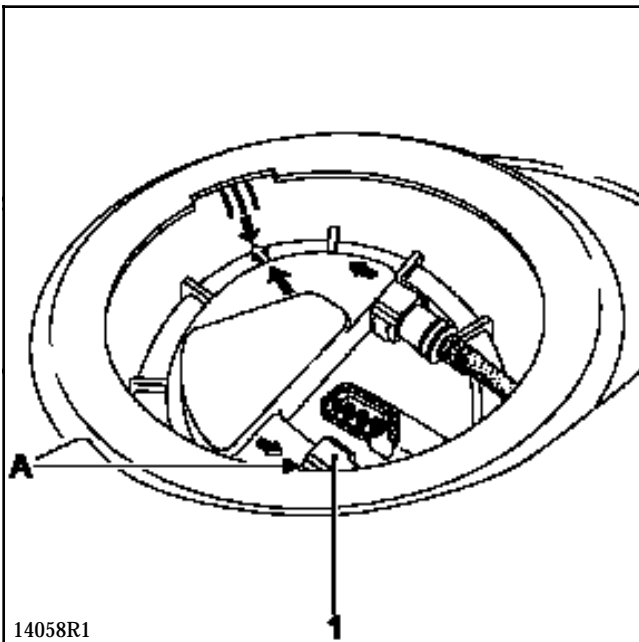


99641S

Remove the pump - sender unit access cover.

Remove the clip which shows if the assembly has been pushed in (if fitted).

Disconnect the quick release union.



14058R1

Connect the rubber hose from the pneumatic pump to the outlet union (A).

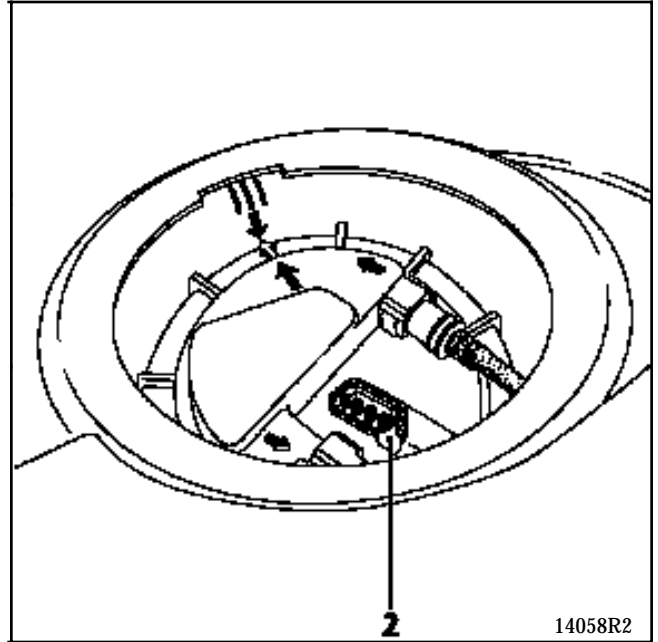
Drain the fuel tank.

### REMOVING THE FUEL TANK (Petrol or diesel version)

Disconnect the battery.

Place the vehicle on a two post lift.

Disconnect the electrical connector (2) and the quick release unions.



14058R2

Lift the vehicle.

Separate the exhaust pipe from the exhaust down pipe.

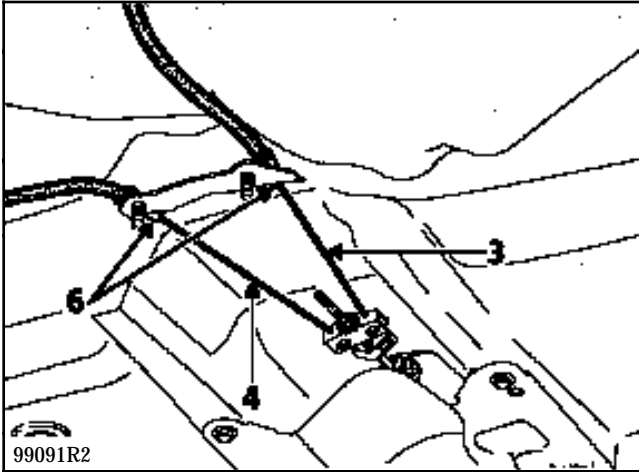
Remove the exhaust mounting bracket from the middle of the vehicle.

Tilt the exhaust pipe.

Disconnect the petrol filter and the union with the fuel gallery.

Remove the heat shield located below the fuel tank and below the handbrake cables.

Disconnect cables (3) and (4) from the handbrake lever. The system which allows the handbrake cables to be released is located within the passenger compartment. The method is described in section 37. Carefully release the plastic cable stops (6).



Disengage the adjuster to release the cables.

Disconnect the pipes going from the fuel tank to the fuel gallery.

Disconnect the overflow pipe from the fuel tank.

Separate the tank from the filler neck.

Unclip the handbrake cables from under the tank.

Position a component jack under the fuel tank.

Remove the four bolts mounting the tank.

Tilt the tank to the right hand side, then remove it.

### REFITTING

The fuel tank has three oblong positioning holes :

- two next to the fuel tank lateral mounting bolts
- one next to the rear fuel tank mounting bolt.

To ensure that the fuel tank is correctly positioned, the three positioning holes must be aligned with the three holes in the body sub-frame.

Refitting is the reverse of removal.

Take care not to pinch any pipes (risk of leaks).

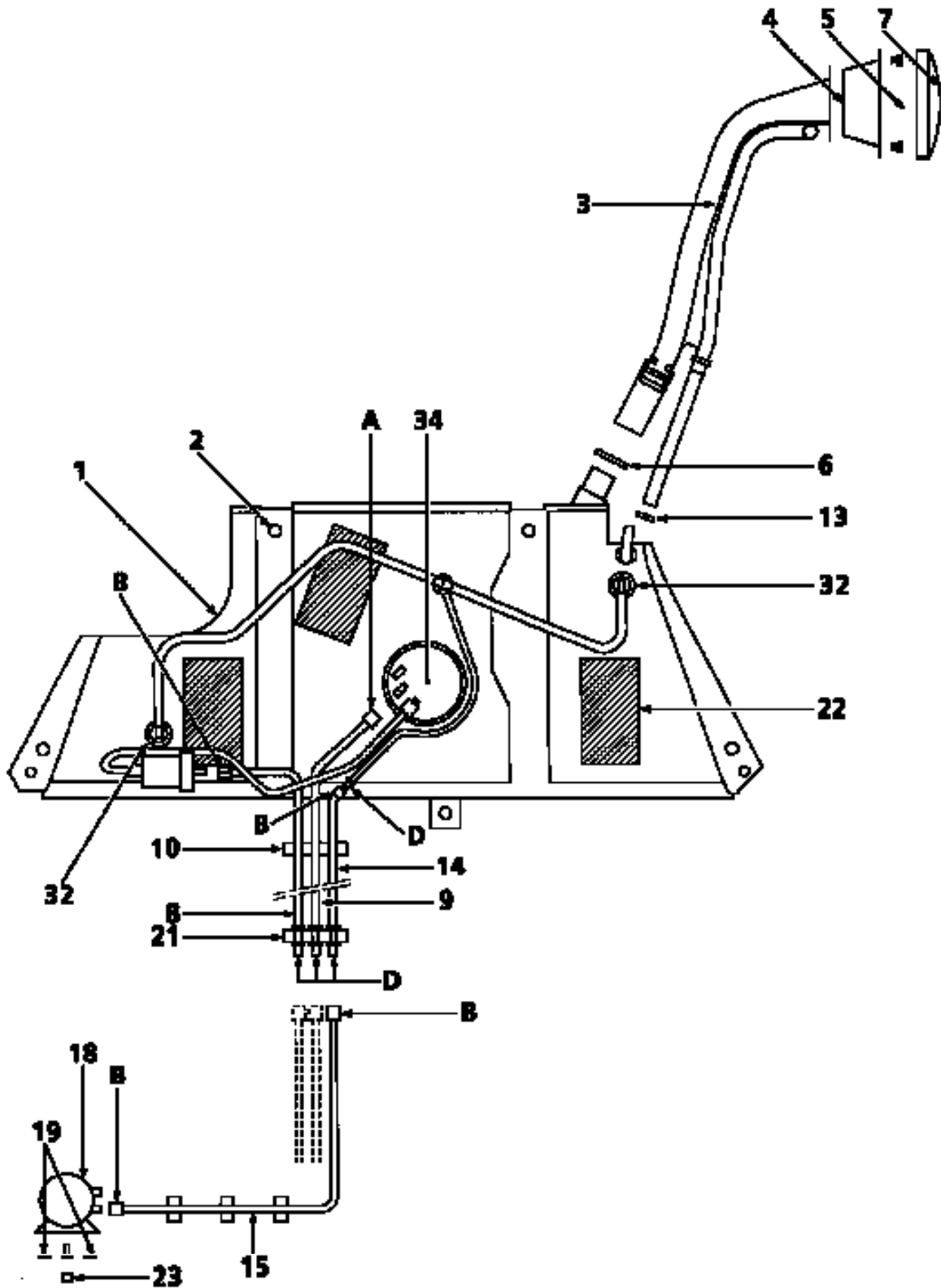
Fit the quick release unions by hand and ensure they connect correctly.

Take care to ensure the heat shields are correctly refitted.

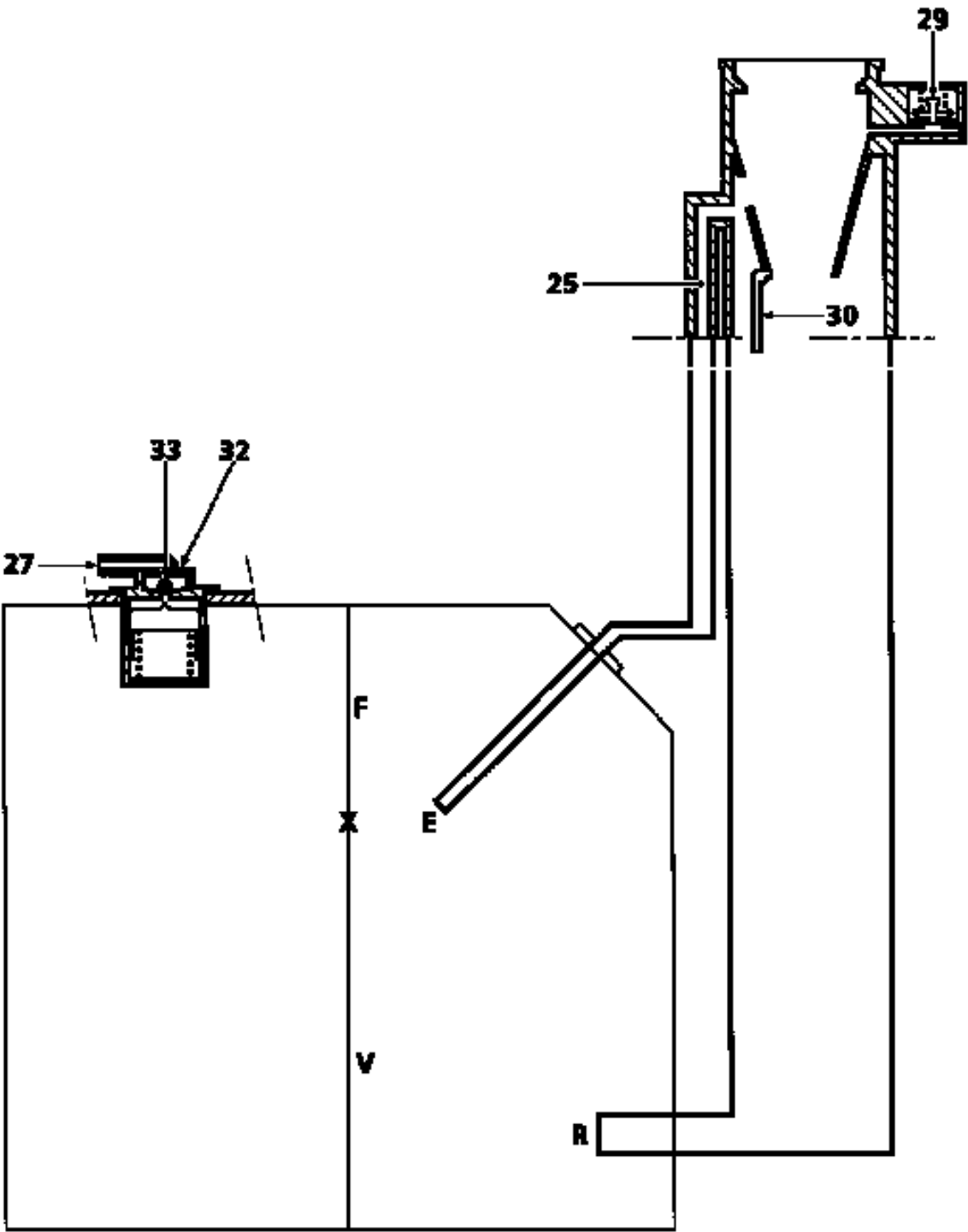
Tighten the fuel tank mounting bolts to a torque of **2.1 daN.m**.



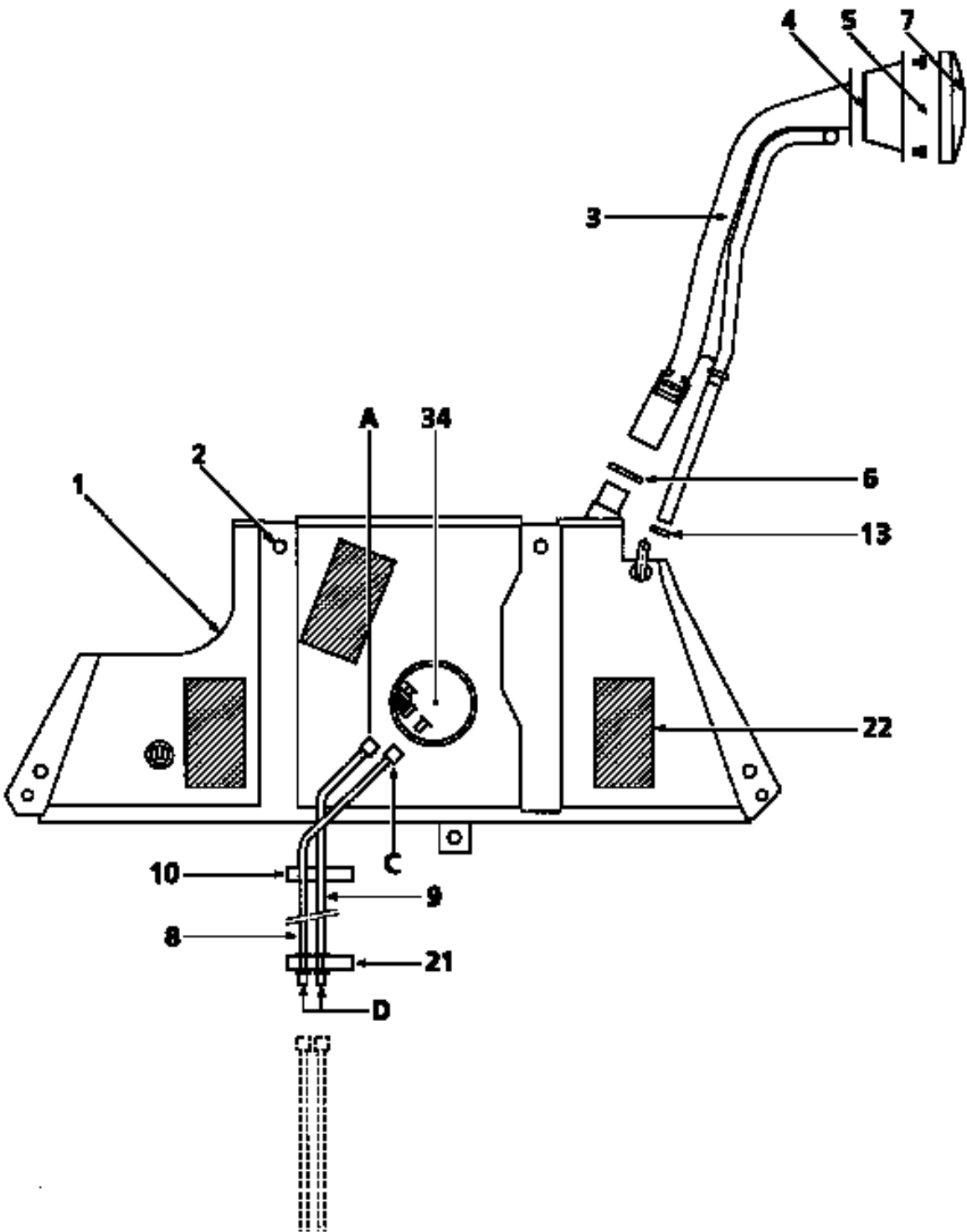
## Petrol version



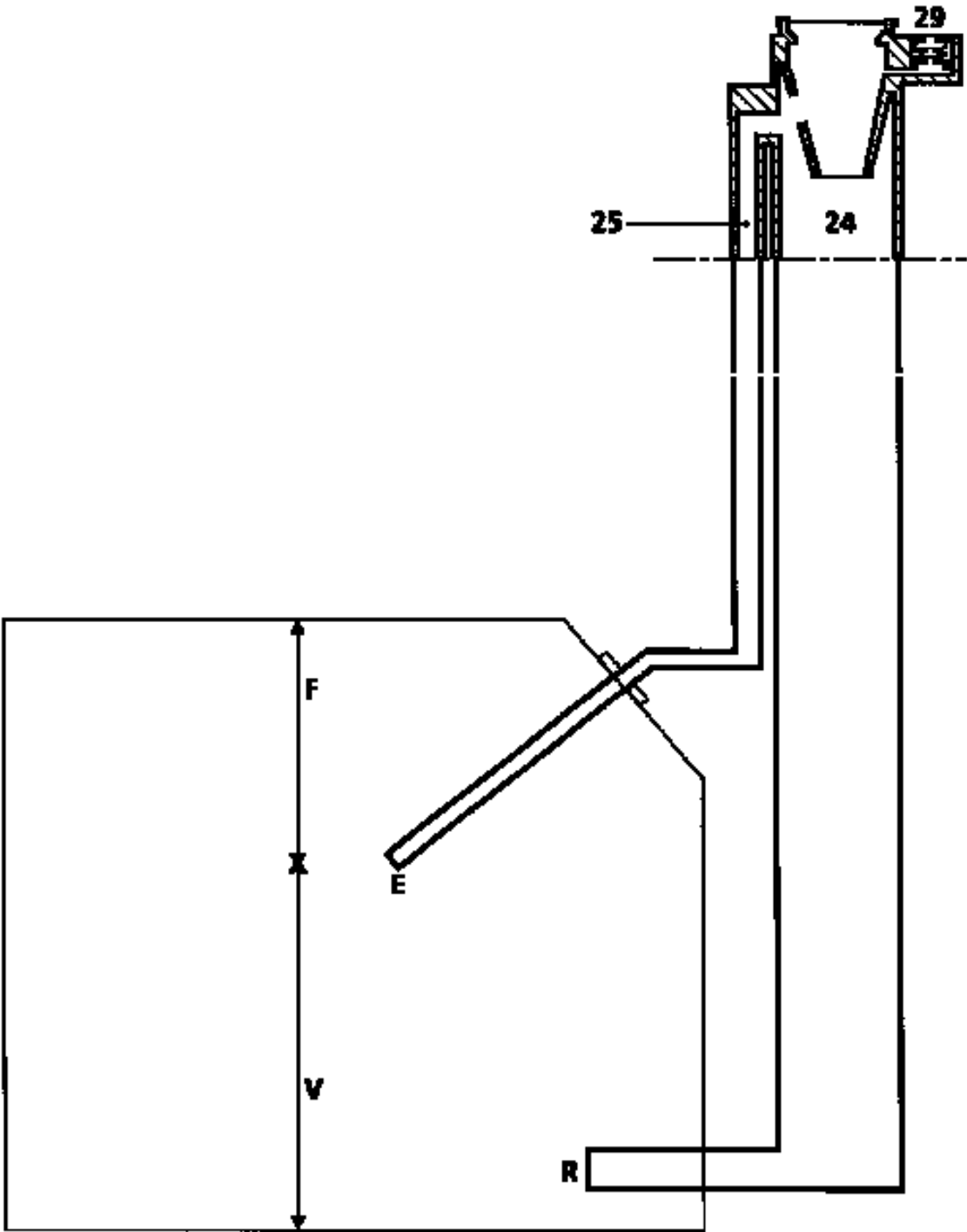
Petrol version



Diesel version



Diesel version



13035R

The tank breathes through the top opening of the fuel breather/sender unit assembly.

### Components

- 1 Tank
- 2 Bolts (x 4)
- 3 Filler neck
- 4 Filler neck bowl
- 5 Rivet (x 3)
- 6 Sleeve mounting clip
- 7 Fuel cap
- 8 Fuel supply pipe
- 9 Fuel return pipe
- 10 Clip
- 13 Clip
- 14 Canister pipe
- 15 Canister pipe
- 18 Canister
- 19 Bolt
- 21 Clip
- 22 Damper pad
- 23 Captive nut
- 24 Connection between filler neck outlet and fuel passage pipe
- 25 Degassing - filling
- 27 Canister connection (fuel vapours)
- 29 Over-pressure - under - pressure safety valve
- 30 Restriction valve
- 32 Over - filling prevention valve and leak prevention valve in case vehicle turns over
- 34 Breathing assembly
  
- A Quick-release union
- B Quick-release union
- C Quick-release union
- D End piece (not quick-release)
- E Opening for air outlet during filling
- F Air volume allowing the fuel to expand
- R Fuel inlet for filling (with anti-overflow valve)
- V Maximum fuel volume allowed

### PURPOSE OF THE VALVES

#### 29 Over-pressure-under-pressure safety valve

If the fuel vapour recirculation circuit is blocked, this valve prevents the fuel tank being subject to excess pressure (the tank would inflate) or lack of pressure (as fuel is used, the tank would be crushed).

#### 30 Restriction valve

This valve prevents leaded or diesel fuel being put into the tank.

#### 32 Overfill and leak prevention valve in case vehicle turns over

The overfill prevention valve operates using the ball at (33).

When the vehicle is stationary, during filling, the ball rests in its seat, retaining a certain volume of air in the reservoir .

When the vehicle is moving, the ball (33) moves out of its seat, thus allowing the tank to be connected to the canister.

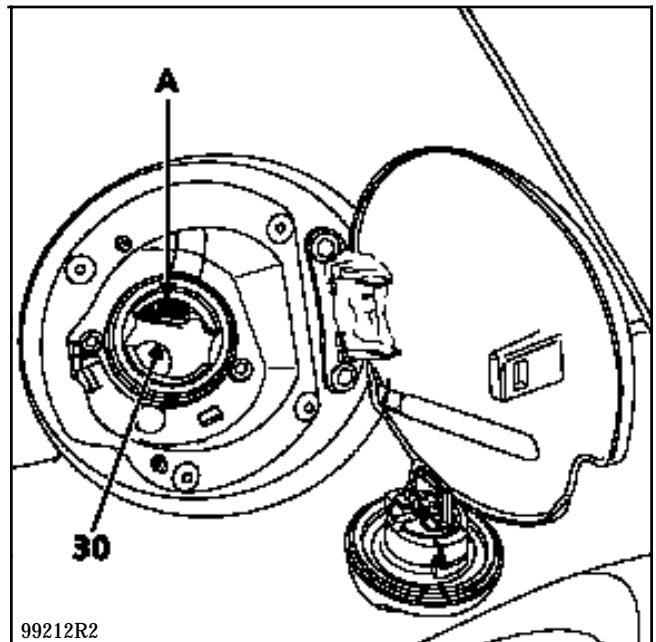
When the tank is full, it is vital that a sufficient volume of air to allow the fuel contained within it to expand is retained inside the tank, but not too much, otherwise there is a risk of the tank exploding .

If the vehicle turns over, this valve prevents the tank from emptying, either through the pipe leading to the canister, or through the breather pipe (in Diesel versions).

The tank has a sealed cap.

The filler neck for unleaded petrol has the following special features :

- a filling opening with a smaller diameter and not compatible with a conventional filling nozzle (the lead would have the effect of polluting the depollution system: oxygen sensor and catalytic converter),
- a valve blocking the filling opening (30) (to avoid fuel evaporating or the reverse passage of fuel).



In petrol versions, the pump and sender unit cannot be separated.

In diesel versions, there is no pump immersed in the tank, and there is only a sender unit.

For the removal of the sender unit, please refer to subsections "**Tank**", "**Pump-sender unit**".

### Checking the sender unit

Value between terminals A1 and B1 (in $\Omega$ )	Height H (in mm)
$3.5 \pm 3.5$	164
$61 \pm 7$	143
$110 \pm 10$	110
$190 \pm 16$	81
$280 \pm 20$	52
$310 \pm 10$	47

Check for a variation in resistance by moving the float.

### Measuring the height

Remove the sender unit and place it on a flat surface. **H** is the height measured between the float pin and the work plane.

**NOTE** : all the above values are given merely as an indication.

SPECIAL TOOLING REQUIRED

Mot. 1397      Wrench for removing  
pump-sender unit assembly nut

**IMPORTANT :**

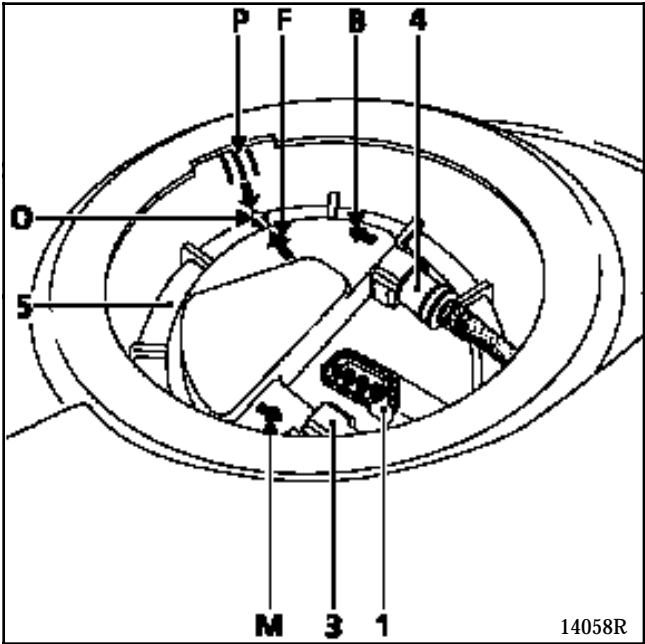
During all operations on the fuel tank or on the fuel supply circuit , it is vital :

- to refrain from smoking and handling incandescent objects in the vicinity of the working area,
- to avoid fuel leakage, due to the residual pressure present in the pipes during removal .

**REMOVAL**

To remove the pump-sender unit assembly, it is not necessary to remove the tank, as it is accessible through the inside of the vehicle. To do this :

- disconnect the battery,
- lift the rear bench seat ,
- remove the steel access cover,
- disconnect the electrical connection at (1),



- the fuel supply pipe (3) (which is marked by a green quick release union and an arrow (M)),
- the fuel return pipe (4) (marked by a red quick release union and by an arrow (B)).

Remove mounting nut (5) using tool **Mot. 1397** (unlock the nut, remove the tool, slacken the nut by hand then remove it).

Extract the pump - sender unit assembly.

**NOTE :** if several hours have to pass between the removal and refitting of the fuel pump-sender unit assembly, refit the nut on the tank, to avoid deforming it.



**REFITTING**

Replace the seal.

Position the pump - sender unit assembly (the arrow (F) must be facing the three lines and the arrow (P) moulded on the fuel tank).

Position the nut and tighten it (the nut is correctly tightened when the marking (O) on it is in line with the three lines on the fuel tank).

Connect the fuel pipes.

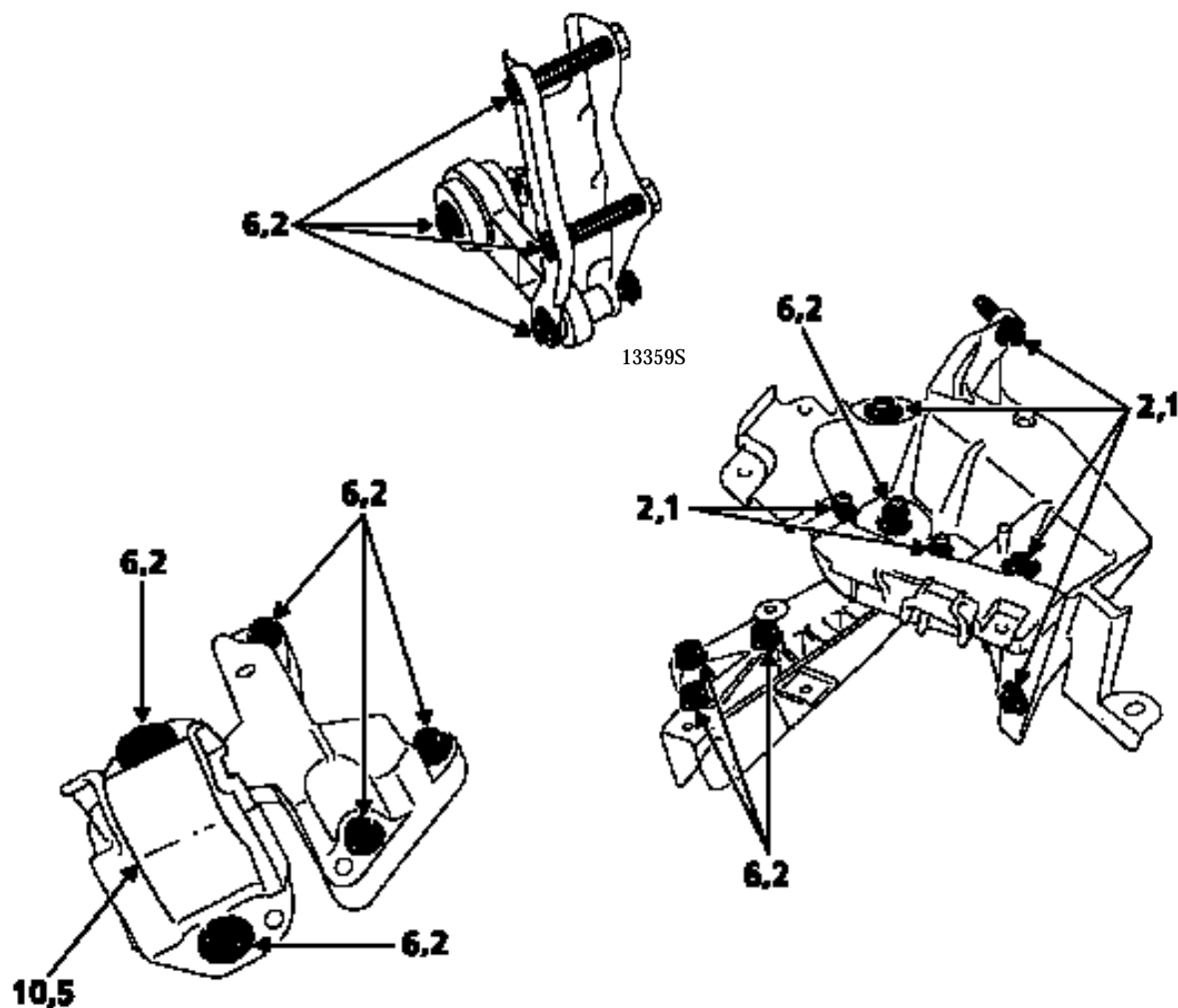
Reconnect the electrical connection.

Refit the steel cover.

**ALLOCATION OF CONNECTOR TRACKS**

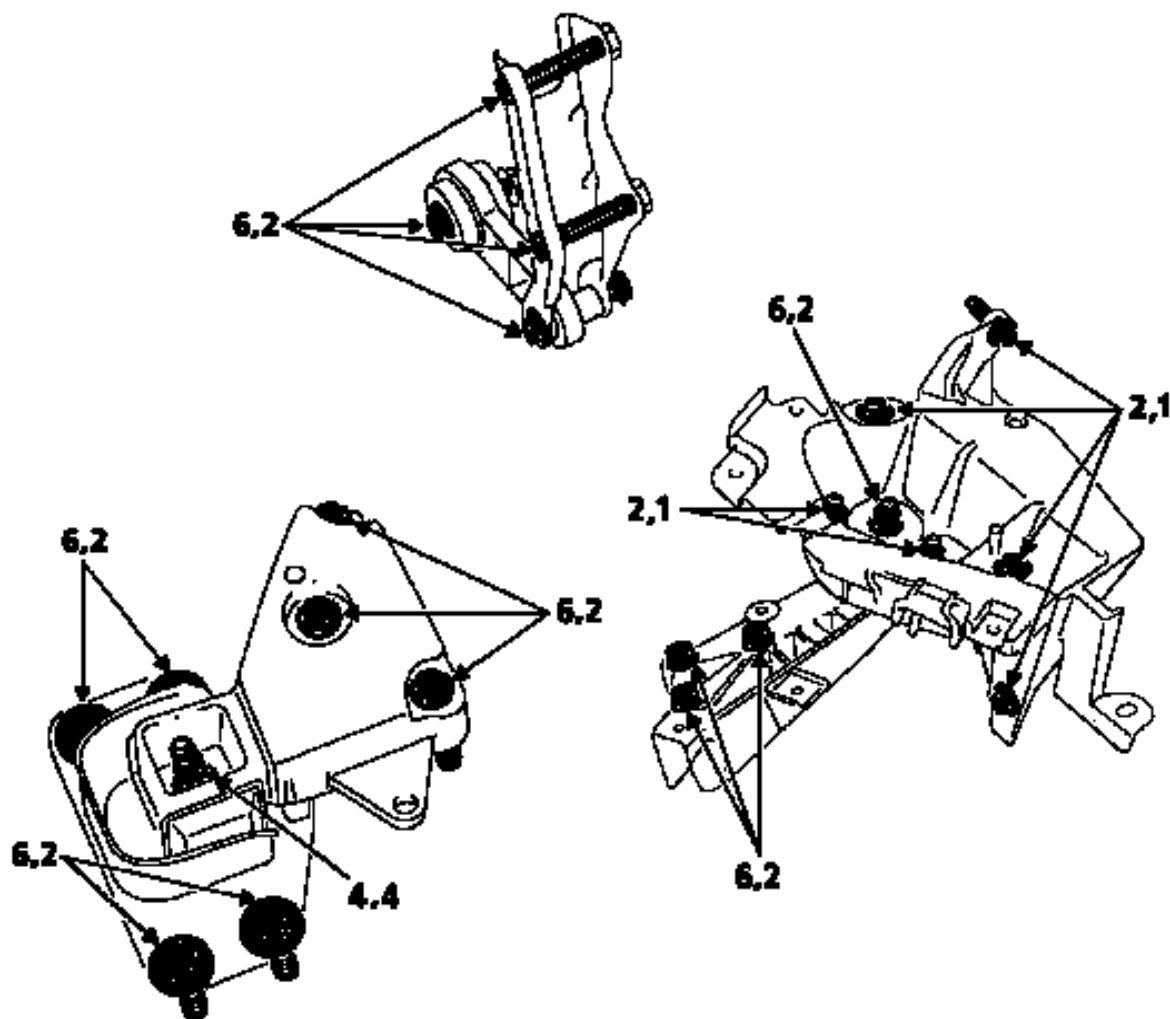
TRACK	ALLOCATION
A1	Earth
A2	Not used
B1	Sender unit information to instrument panel
B2	Not used
C1	Pump
C2	Pump

TIGHTENING TORQUES (in daN.m)



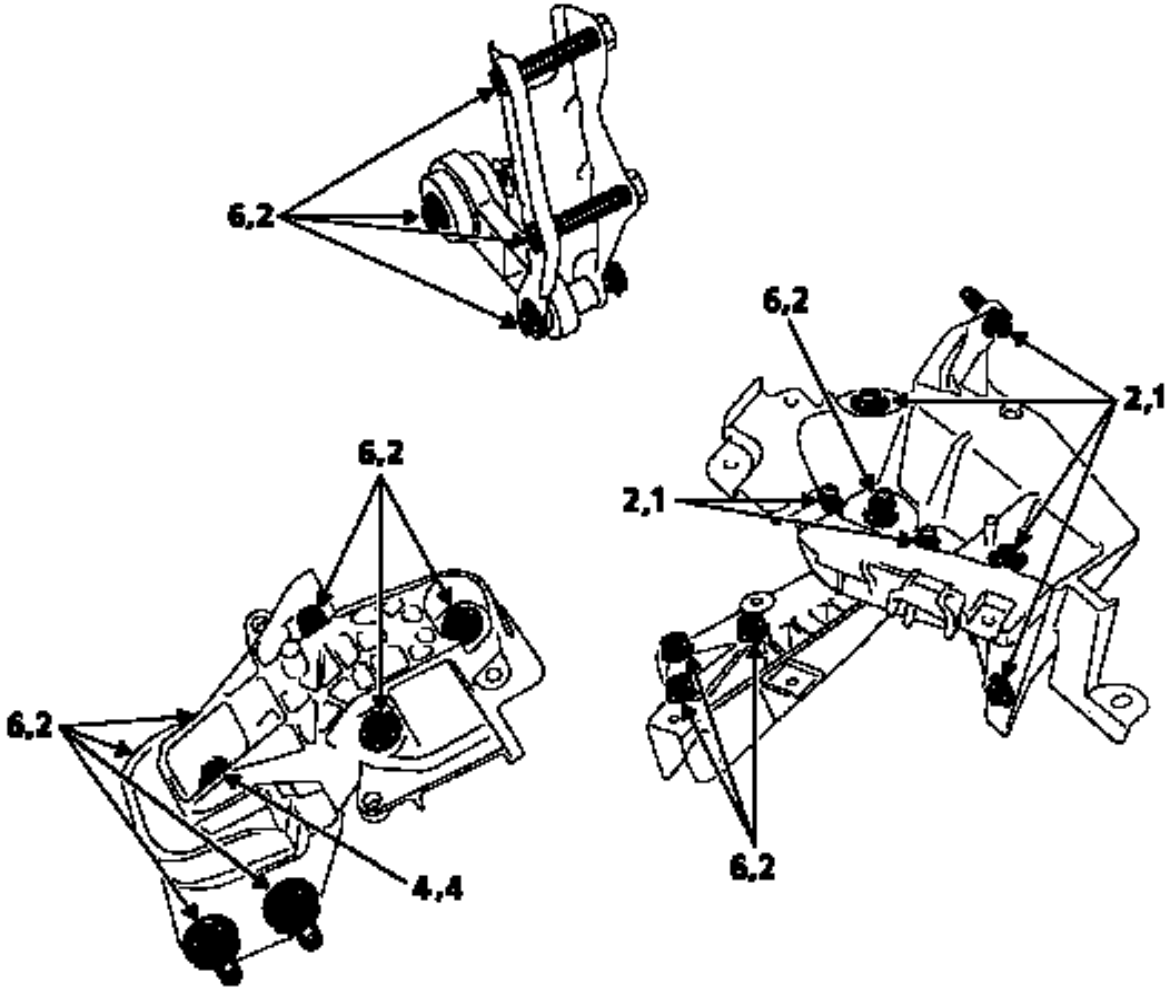
12924G

TIGHTENING TORQUES (in daN.m)



13359R3

TIGHTENING TORQUES (in daN.m)



13086R2