LAGUNA

1 Engine and peripherals

BG0A - BG0B - BG0D - BG0G - KG0A - KG0B - KG0D - KG04

77 11 297 342 **NOVEMBER 2000** **EDITION ANGLAISE**

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

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

Engine and peripherals

Contents

Contents

Vehicle type	Engine	Gearbox	Automatic gearbox	Capacity (cm ^{3})	Bore (mm)	Stroke (mm)	Compression ratio
XG0A	K4M710	JH3	DP0	1598	79.5	80.5	10/1
XG0B	F4P770 F4P771	JR5	DP0	1783	82.7	83	9.8/1
XG0G	F9Q750	PK6	-	1870	80	93	19/1
XG0D	L7X731	-	SU1	2946	87	82.6	10.9/1

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

Engine / Document	K4M	F4P	F9Q	L7X
Mot. K4M	X			
Mot. F4		X		
Mot. F9Q (Common rail high pressure)			X	
Mot. L7X				X

OIL CONSUMPTION MEASUREMENT PROCEDURE

a) Filling to the maximum level

The operation must be carried out with the engine hot (one rotation of the **cooling fan assembly**) 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 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 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 (one rotation of the **cooling fan assembly**) and after settling for **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

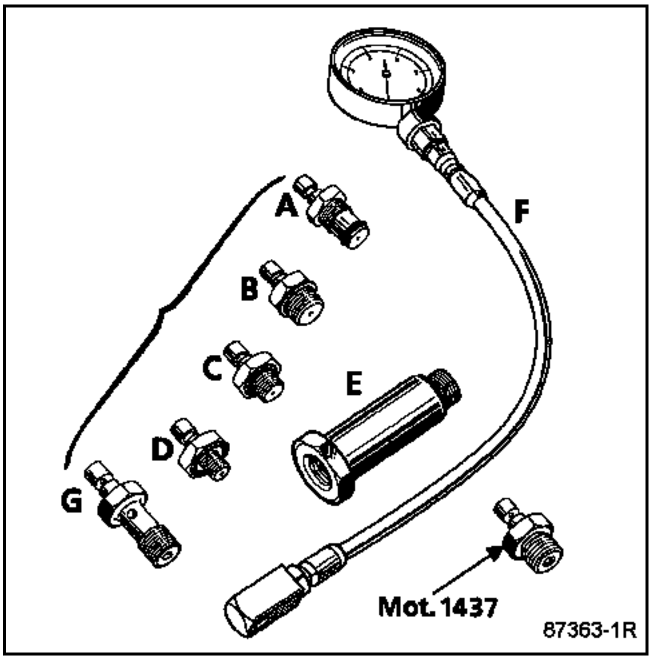
$$\text{OIL CONSUMPTION} = \frac{\text{Quantity of topping up oil (in litres)}}{\text{km (in thousands)}}$$

ESSENTIAL SPECIAL TOOLS	
Mot. 836-05	Boxed kit for measuring oil pressure
Mot. 1437	Pressure measuring connector
ESSENTIAL SPECIAL TOOLING	
Long 22 mm socket	

CHECKING

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

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



USE

K4M and F4P engines	F9Q engine	L7X engine
B + F	B + F	F+Mot. 1437

Connect the pressure gauge in place of the oil pressure switch.

CHECKING THE ENGINE

K4M et F4P engines

Idling	**1 bar**
3000 rpm	**3 bar**

L7X engine

Idling	**2 bar**
3000 rpm	**5 bar**

F9Q engine

1000 rpm	**1.2 bar**
3000 rpm	**3.5 bar**

SPECIAL TOOLING REQUIRED	
Mot. 1202-01 Mot. 1202-02	Hose clip pliers
Mot. 1372	Set for removing tamperproof screws
Mot. 1448	Long nose pliers for hose clips
T. Av. 476	Ball joint extractor
Load positioner	

TIGHTENING TORQUES (in daNm)	
Brake caliper column bolt	0.7
Shock absorber base bolts	18
Lower ball joint nut	11
Driveshaft gaiter mounting bolt	3
Stabiliser bar tie rod nut	4.4
Track rod end nut	3.7
Acoustic mass mounting bolt	2.1
Suspended engine mounting upper linkage mounting bolt	10.5
Body mounting bolt for the suspended engine mounting movement limiter	2.1
Engine mounting bolt for the engine suspension mounting cover	6.2
Engine tie-bar fixing bolt:	
– on the sub-frame	10.5
– on the engine:	
● K4M-F4P	10.5
● F9Q-L7X	18
the bolts mounting the aluminium side members to the lower cross member	4.4
the bolts mounting the aluminium side member tie rods	4.4
Wheel bolts	10.5

REMOVAL

Put the vehicle on a 2 post lift.

During this operation, the vehicle must be secured to the lift with a strap to prevent it from becoming unbalanced.

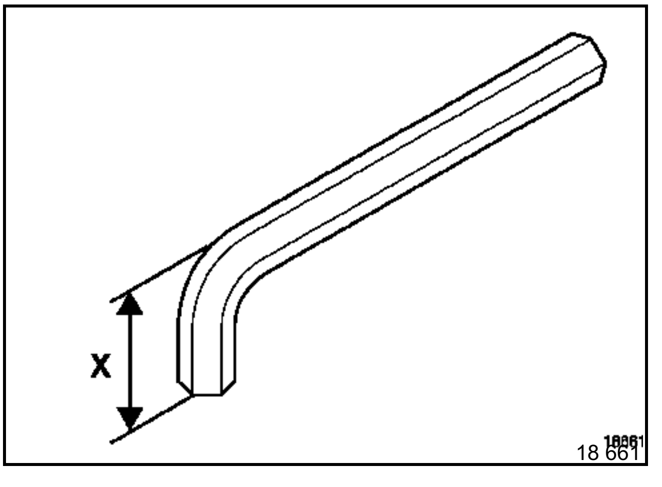
Refer to Section 02 "Underbody lift" for positioning the belt.

Remove:
– the battery,
– the front wheels,
– the engine undertray,
– the right and left wheel arch liners and side protectors

Drain:
– the refrigerant circuit using filling equipment.
– the cooling circuit through the lower radiator hose
– the gearbox and the engine if necessary.

Right-hand side of the vehicle

Remove:
– the brake caliper (having removed its retaining spring) and attach it to the suspension spring,
– the ABS sensor,
– the lower ball joint nut (use an Allen key cut down to **X = 22 mm** to lock the ball joint if necessary),



– the upper mounting of the stabiliser bar tie-rod and slacken the lower mounting,
– the two bolts securing the driveshaft mounting clamp to the relay bearing support (F9Q and L7X engines),
– the track rod end using tool **T.Av. 476**,
– the shock absorber base mounting bolts.

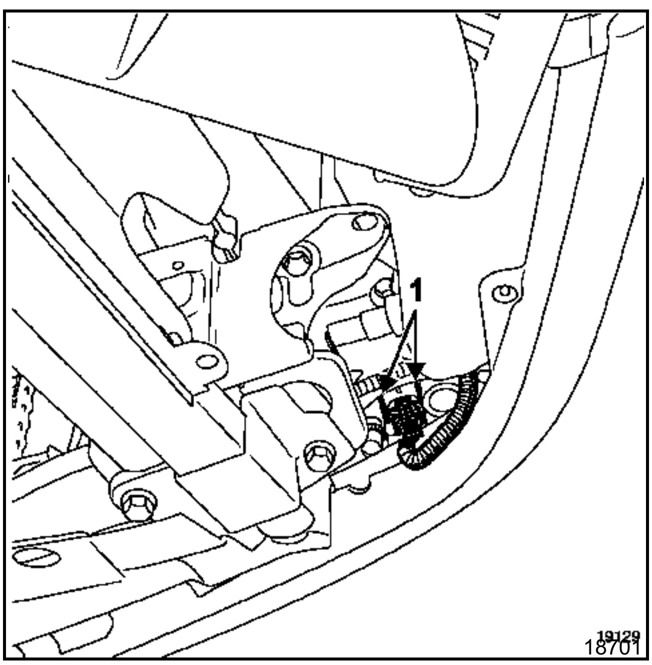
Detach the driveshaft and then remove the hub unit assembled with the driveshaft.

Left-hand side of the vehicle

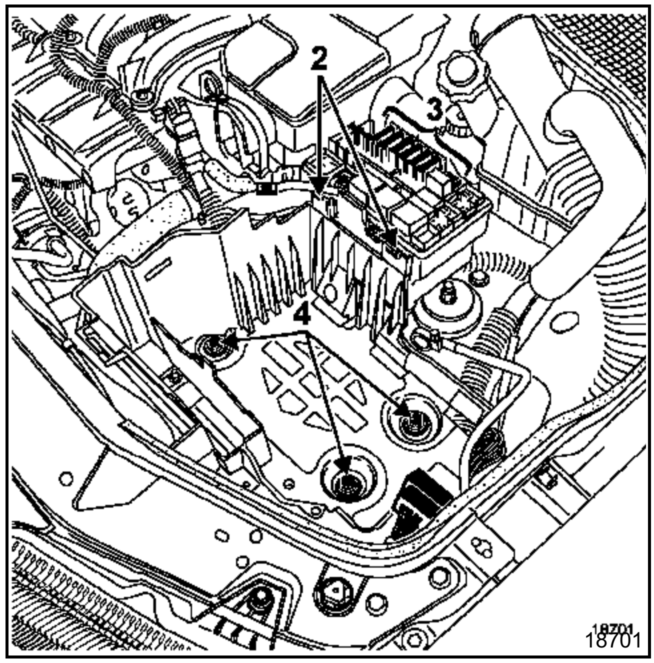
Remove:
– the brake caliper and attach it to the suspension spring,
– the ABS sensor,
– the lower ball joint nut (use an Allen key cut down to **X = 22 mm** to lock the ball joint if necessary),
– the upper mounting of the stabiliser bar tie-rod and slacken the lower mounting,
– the track rod end using tool **T.Av. 476**,
– the driveshaft gaiter mountings (if the car is equipped with a manual gearbox),
– the shock absorber base mounting bolts.

Detach the driveshaft and then remove the hub unit assembled with the driveshaft.

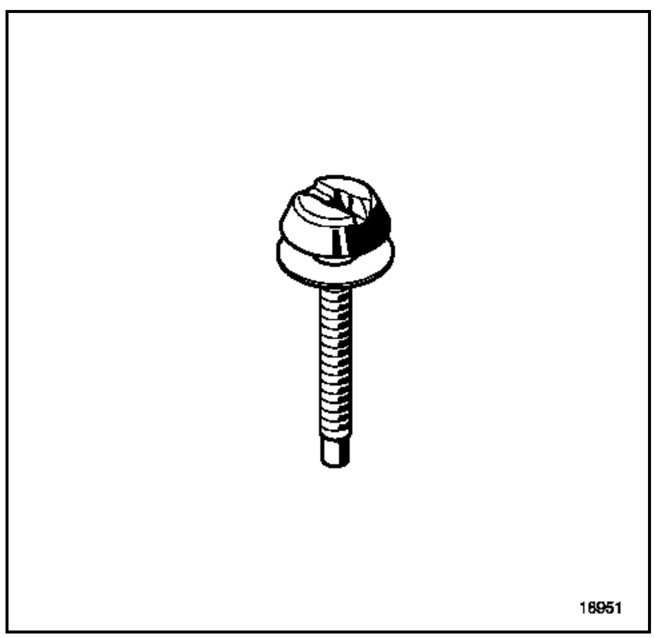
Disconnect the fog lights at (1).



Remove:
– the radiator grille and the bumper,
– the relay plate at (2) and unclip the fuse holder (3),
– the battery tray at (4),



To do this, drill out the three tamperproof bolts using a Ø 5 mm drill bit in the axis of the bolt. Then remove the bolts using a stud extractor Mot. 1372.

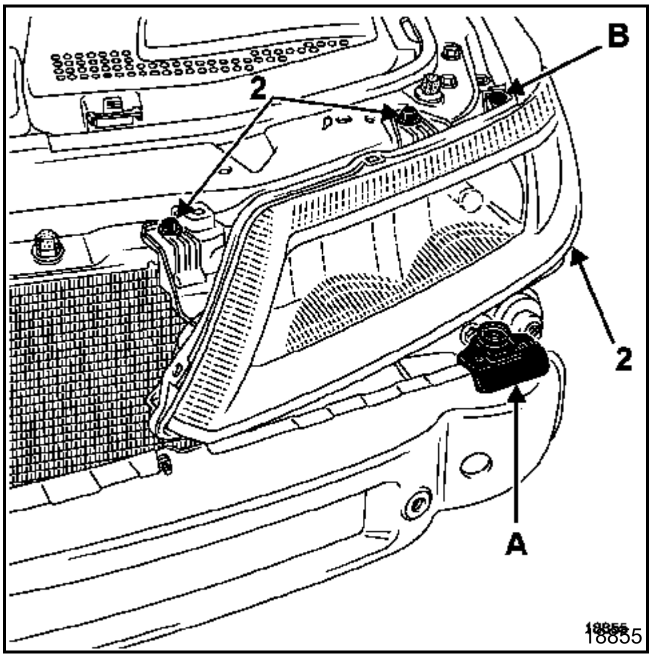


Remove the windscreen washer reservoir filler neck.

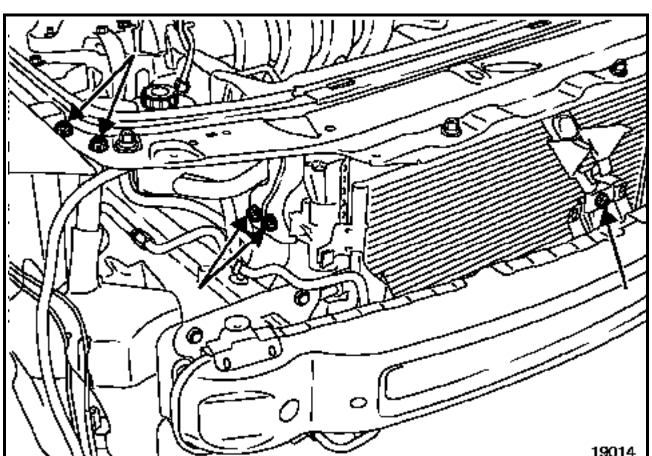
Unclip:
- the power steering reservoir and remove its support,
- the wiring harness from the upper cross member.

Disconnect:
- the lens unit connectors,
- the bonnet contact connector (if fitted).

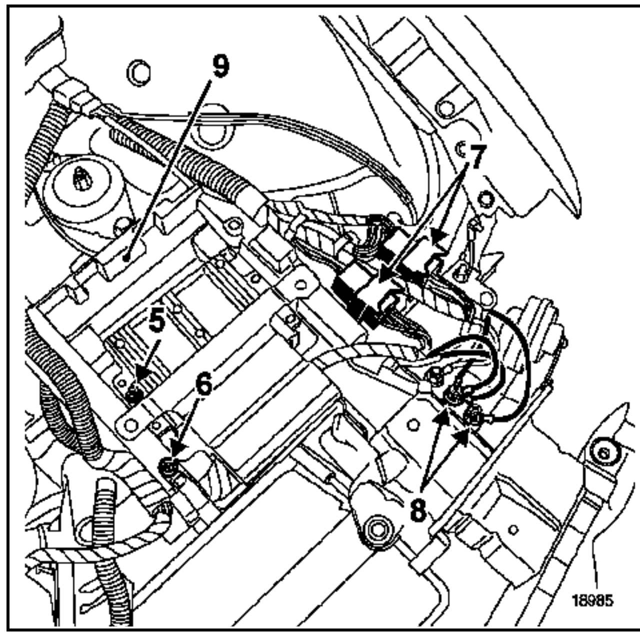
Remove:
- the two upper bumper guides (A), then release the clip (B) on each lens unit,
- the three mounting bolts (2) on each lens unit,
- the two lens units,



- the upper cross member, removing the bonnet opening cable,



- the injection computer mounting (5) and mounting (6),
- the connectors (7),
- the earth strap fixing bolts (8) and then remove the computer bracket (9),



- the resonator unit assembly (K4M-F4P engines) or the air filter unit (F9Q-L7X engines) and the air intake sleeve,
- the lower radiator mountings as well as the upper hose,
- the connectors on the fan assembly and the condenser,
- the mountings of the air conditioning hoses (if fitted) on the compressor and the dehydration canister.

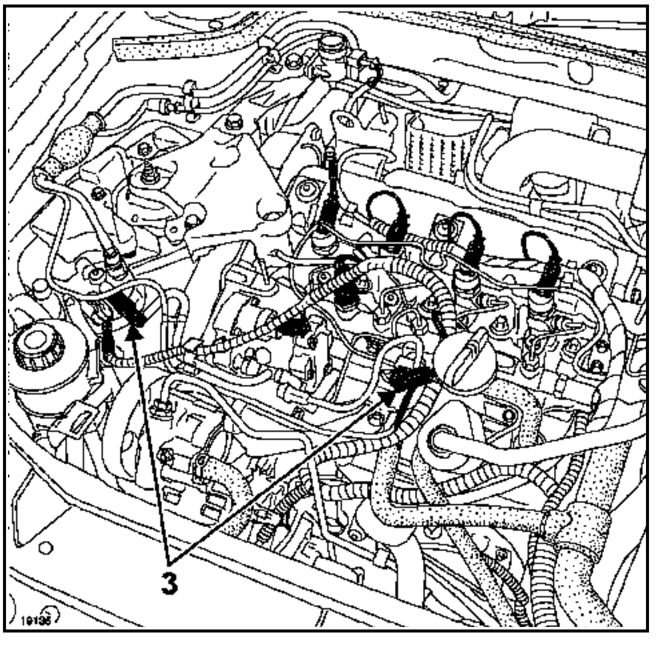
NOTE: plugs must be fitted onto the hoses and pressure relief valve to prevent moisture from entering the circuit.

Remove the cooling assembly.

Disconnect:

F4P-K4M-L7X engines
– the connector and the pipe on the canister bleed solenoid valve,
– the fuel pipe at the upper engine mountings tie rod.

F9Q engine
– the fuel supply pipes at (3) and the diesel filter connector, unclip and remove,

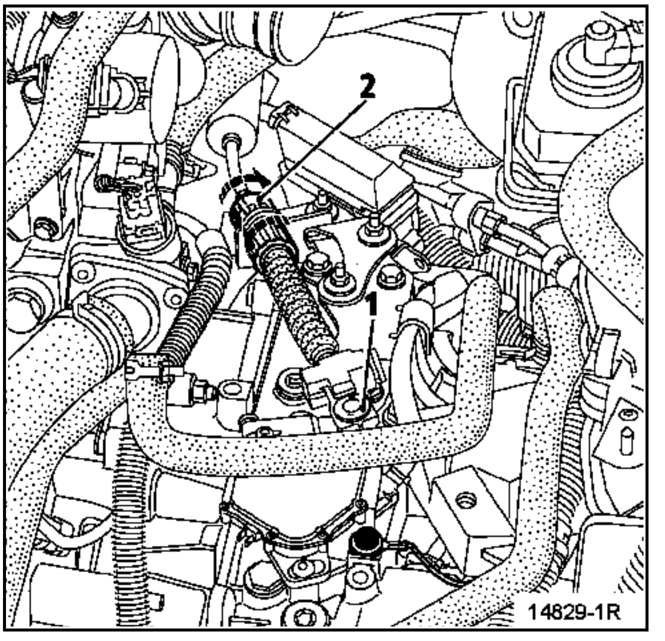


All types
– the brake servo vacuum pipe,
– the hoses on the expansion bottle,
– heater hoses on the cylinder head coolant pipe housing outlet.

<u>Special notes on cars equipped with automatic transmission</u>

Disconnect:
– the ball joint (1) from the multifunction switch cable,
– the cable (2) of the multifunction switch by releasing the sleeve stop.

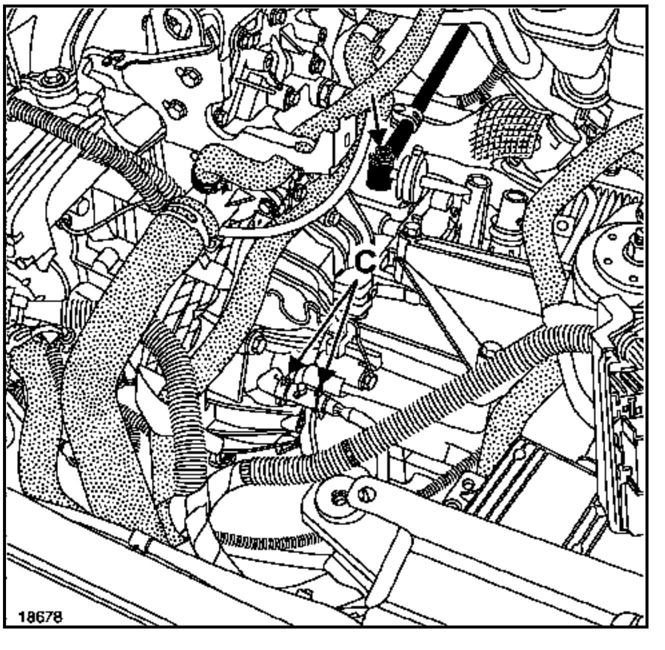
NOTE: do not move the orange ring during this operation. This could break during removal or refitting. Where necessary, do not replace the control cable as the absence of this part does not affect the operation of the system.



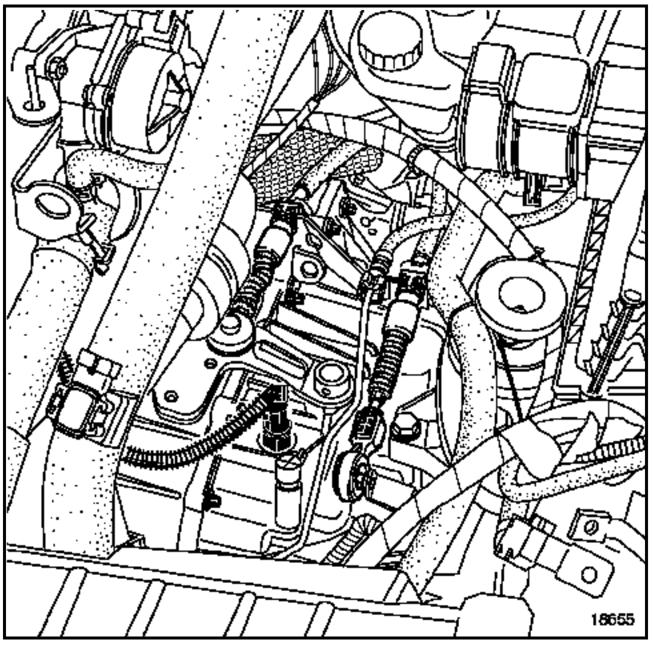
<u>Special notes on cars equipped with manual transmission</u>

Remove:
– the clutch slave cylinder by removing the clips (C),
– the gearbox control(s).

JH3-JR5 gearbox

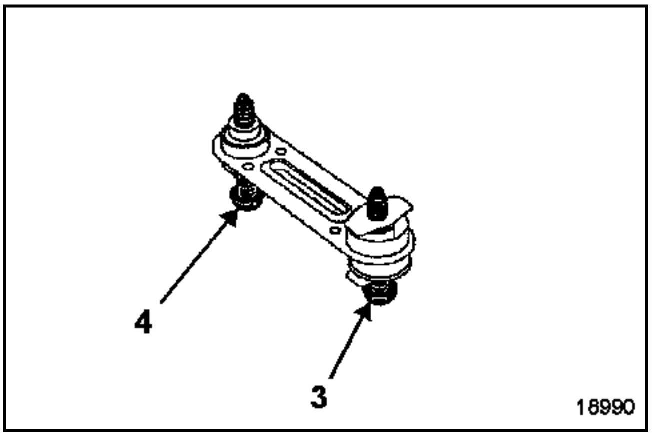


PK6 gearbox

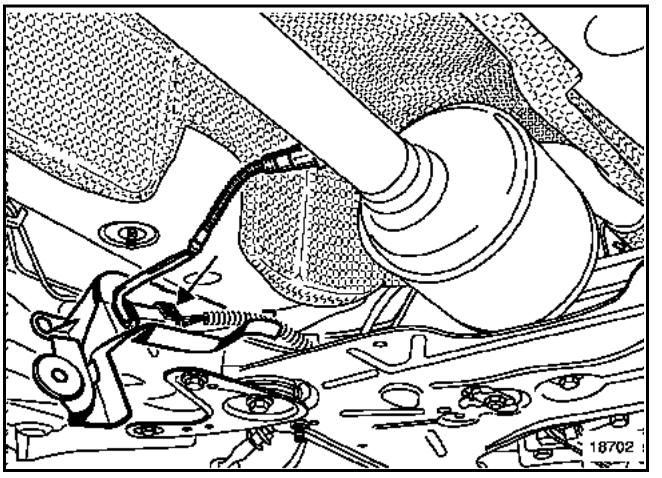


All types

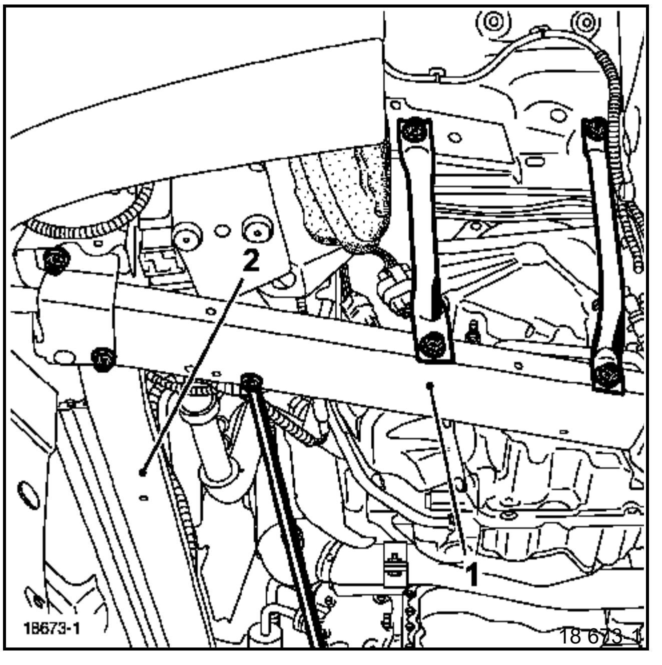
Remove:
– the mounting bolts (3) and undo bolt (4),



– the return pipe on the power steering reservoir having drained this,
– the power assisted steering pipes on the steering box,
– the oxygen sensor connector, then unclip the wiring harness (K4M - F4P engines),

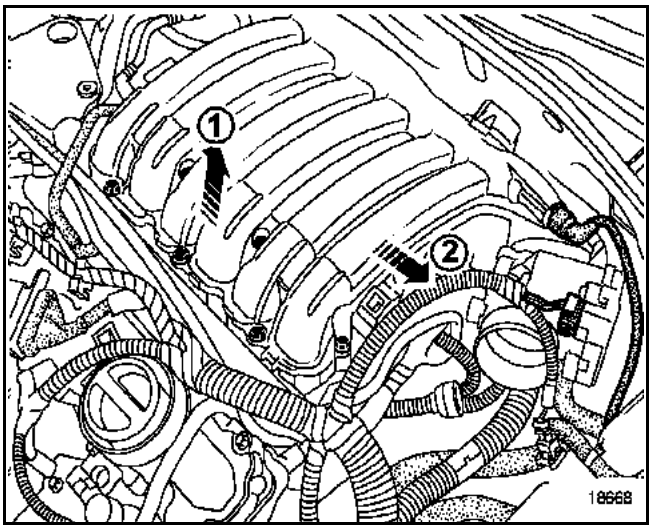


– the exhaust downpipe mountings (K4M, F4P, F9Q engines),
– the power assisted steering radiator mountings on the lower cross member,
– the side members (1) and the cross member (2).

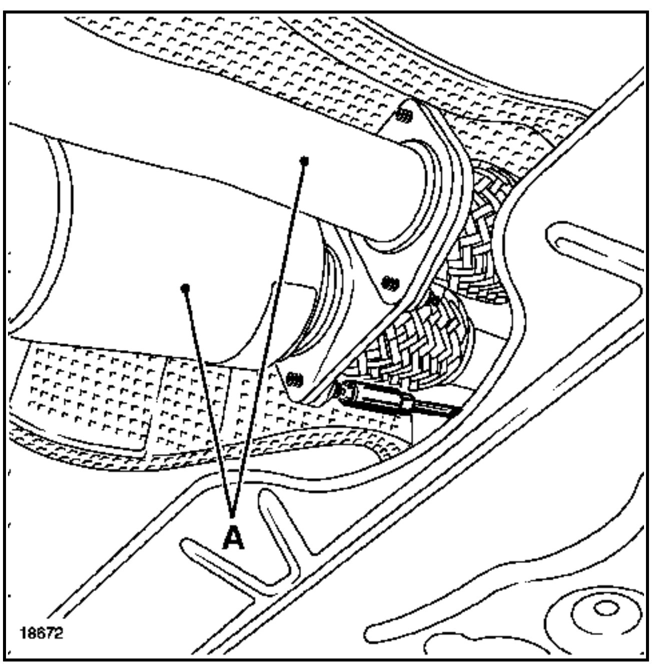


L7X engine

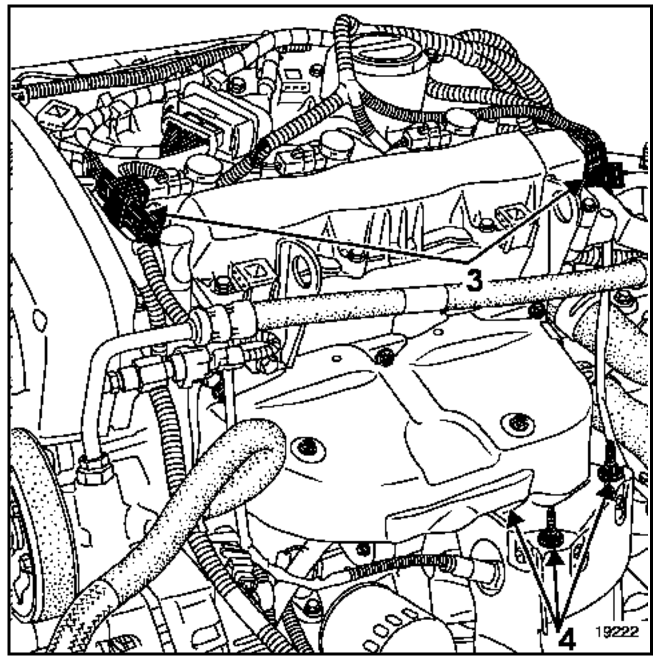
Remove:
- the manifold mountings,
- the manifold by moving it towards the battery,



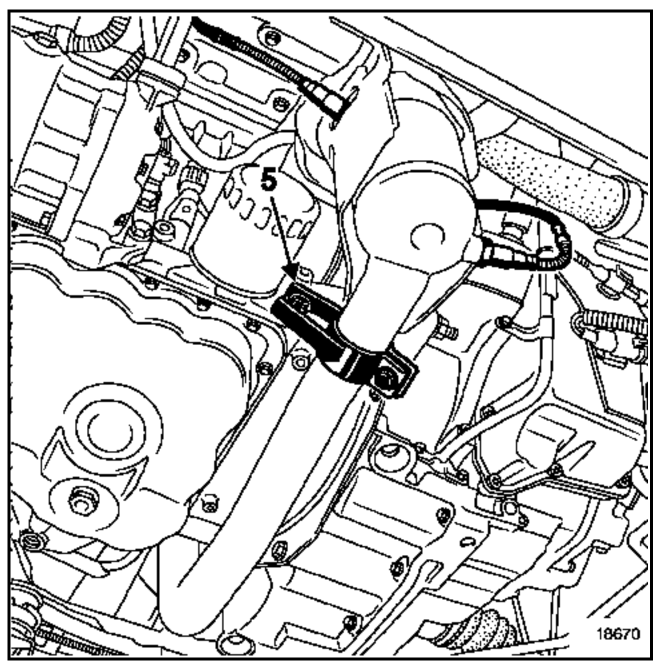
- the catalytic converter/pre-converter clamp nuts passing through the sub-frame (use a long socket) then attach the catalytic converters (A) to the body.



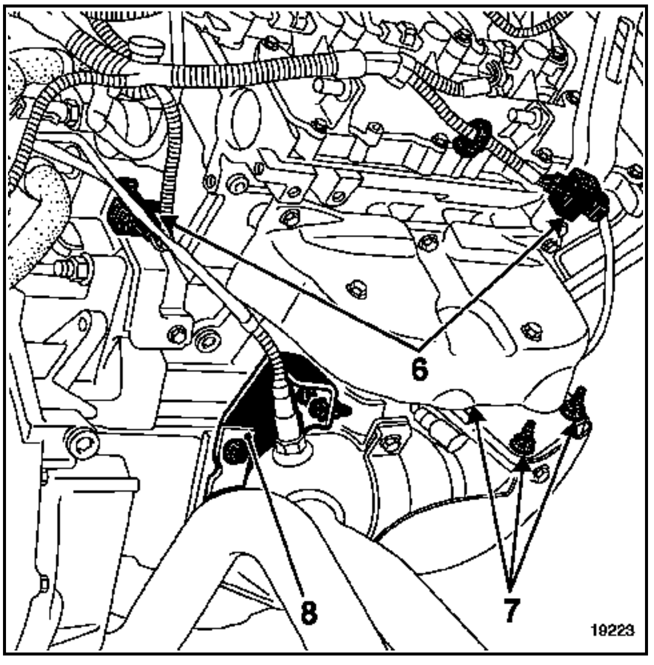
- the oxygen sensor connectors (3),
- the pre-converter mountings (4),



- the mounting (5) then remove the catalytic converter,



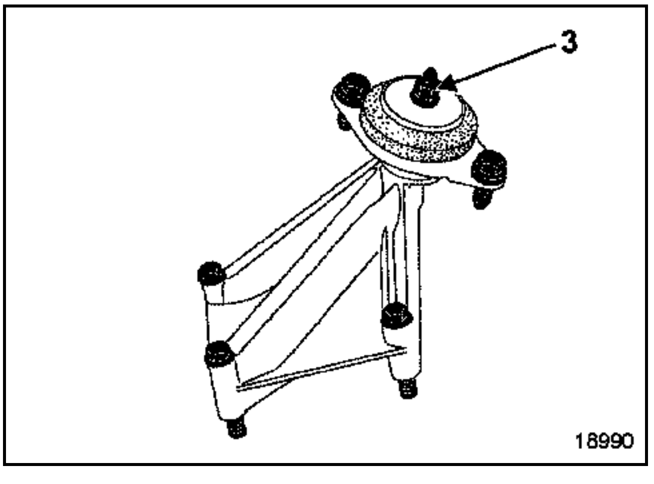
– the oxygen sensor connectors (6),
– the pre-converter mountings (7),
– the stay (8)



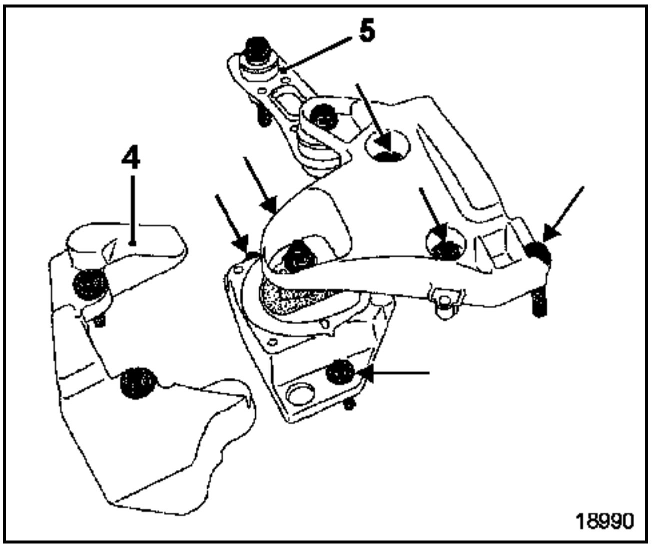
Attach the workshop crane.

Support the engine-gearbox assembly using a load positioner.

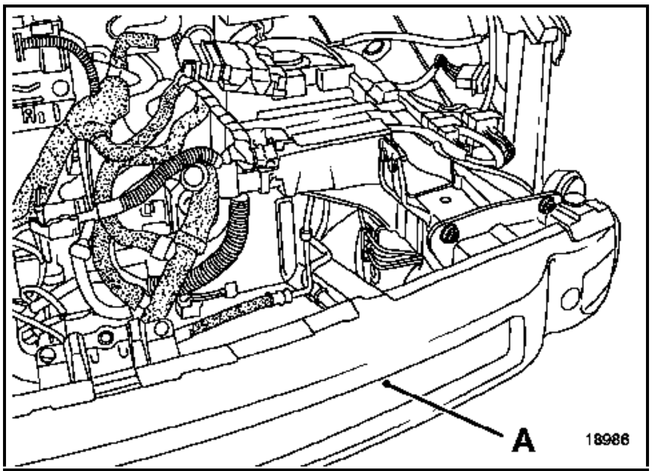
Remove:
– the nut (3), and strike it with a copper hammer to detach the stud,



– the acoustic mass (4),
– the tie-rod mounting bolts (5), then remove the suspension-movement limiter assembly,



– the lower cross member (A).



NOTE: this cross member contributes to the rigidity of the engine compartment structure. It is therefore vital that you support the engine at the pressure points before any intervention on it.

Using a workshop crane, remove the engine-gearbox assembly.

IMPORTANT: refit the lower cross member after removing the engine and gearbox assembly.

REFITTING

Refit the engine-gearbox assembly following the same method as for removal.

Refit:
– the left suspended mounting,
– the right suspended mounting,
– the engine tie-bar.

Refer to section **19** "**Suspended mounting**" for tightening torques.

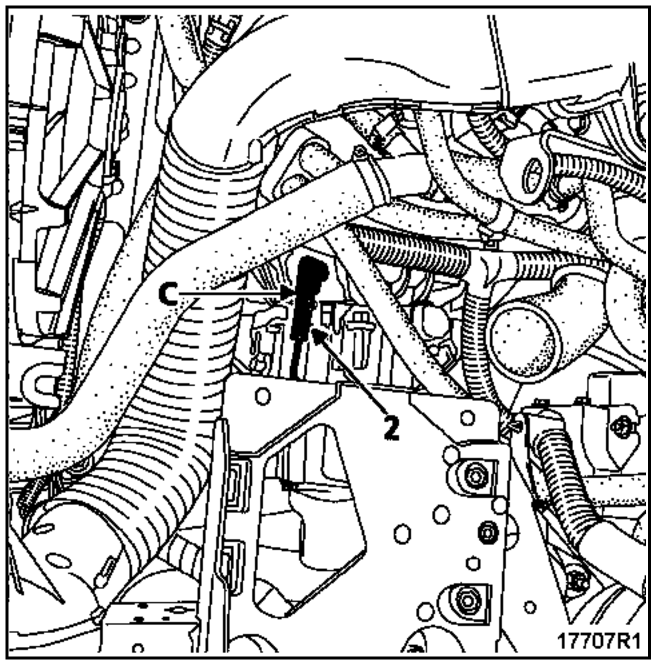
Features of the clutch slave cylinder when separating the engine and gearbox

NB: to avoid damaging the slave cylinder, do not coat the gearbox output shaft with grease.

NB: to avoid leaks, replace the slave cylinder after replacing the clutch mechanism.

Add brake fluid to the reservoir.

Bleed the hydraulic circuit:
– connect a pipe leading from a container of brake fluid to opening (C),
– remove the clip (2),
– unclip the pipe at the first notch which corresponds to the first O-ring,
– fit the Arc 50 bleeding device,
– operate the bleeding device,
– wait until all the air is evacuated from the hydraulic circuit,
– clip the pipe back onto the clutch slave cylinder.



Refill the brake fluid.

Check that the clutch system is operating correctly.

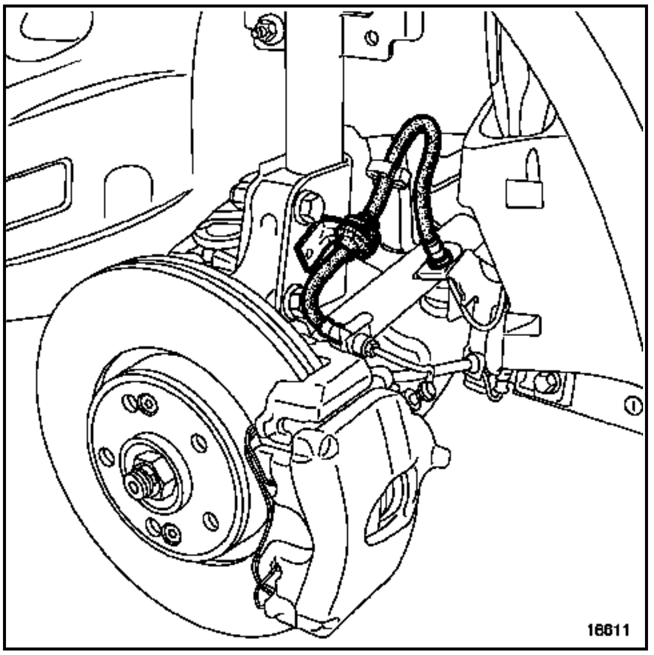
Refit using the same procedure as for removal in reverse.

Replace the tamperproof screws with new ones.

Perform the following operations:
- fill the gearbox with oil,
- fill the engine with oil, if necessary,
- fill and bleed the cooling circuit (see section **19 "Filling - bleeding"**),
- filling and bleeding of the power assisted steering circuit,
- fill the refrigerant circuit using the filling equipment.

Apply **Loctite FRENBLOC** to the brake calliper mounting bolts before fitting and tighten them to the correct torque.

IMPORTANT: ensure that the brake pipe and the ABS sensor wiring are properly fixed.



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

IMPORTANT:
The lens units must be adjusted once they have been fitted:
- park the vehicle on a level surface,
- set the adjustment control to 0,
- carry out the adjustment.

If the vehicle is fitted with Xenon headlights, you will have to initialise the system first, then adjust the beams (refer to the section headed "**Xenon headlights, initialisation of the system**").

IMPORTANT: it is forbidden to turn the bulb with Xenon headlights on unless it is mounted in the lens unit (**this would be hazardous to the eyesight**).

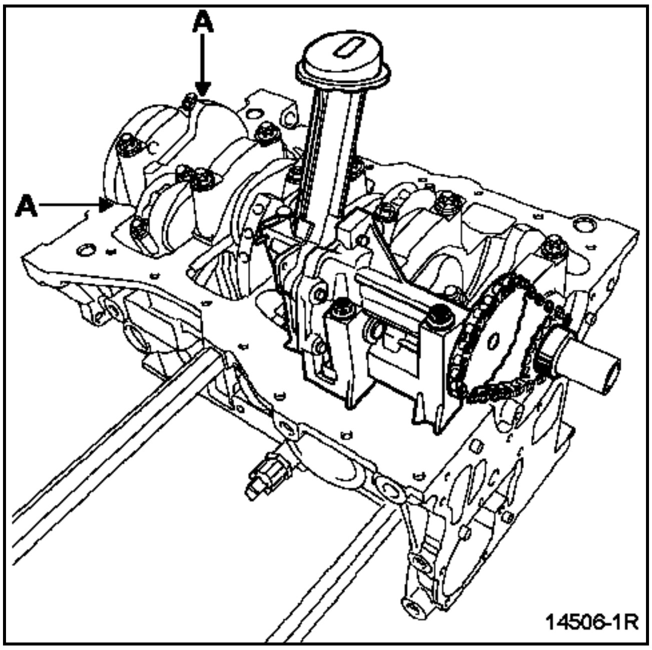
TIGHTENING TORQUE (in daNm)	
Sump bolts	1.4

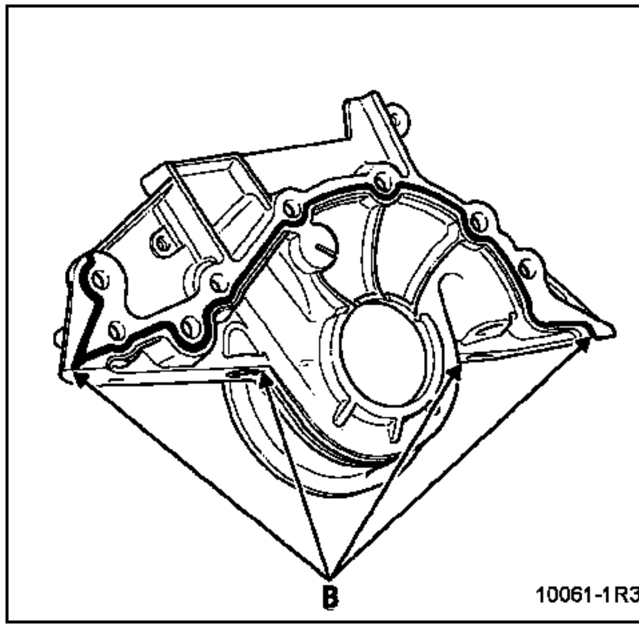
REMOVAL

There are no special difficulties in removing the sump.

REFITTING

Apply **RHODORSEAL 5661** at (A) (on either side of bearing No. 1), and at (B) on the crankshaft closure panel.





Refit the sump with a new gasket, pre-tightening it to a torque of **0.8 daNm**, then finally tightening it to a torque of **1.5 daNm** in a spiral pattern.

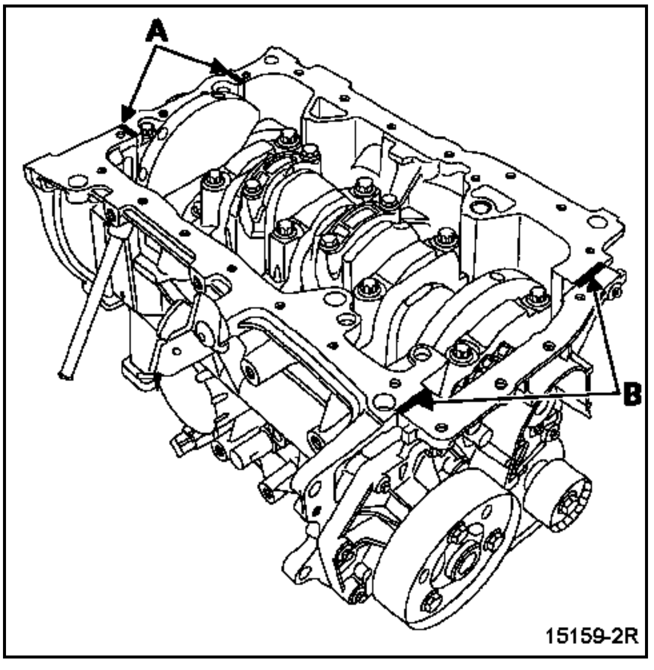
TIGHTENING TORQUE (in daNm)	
Sump bolts	1.4

REMOVAL

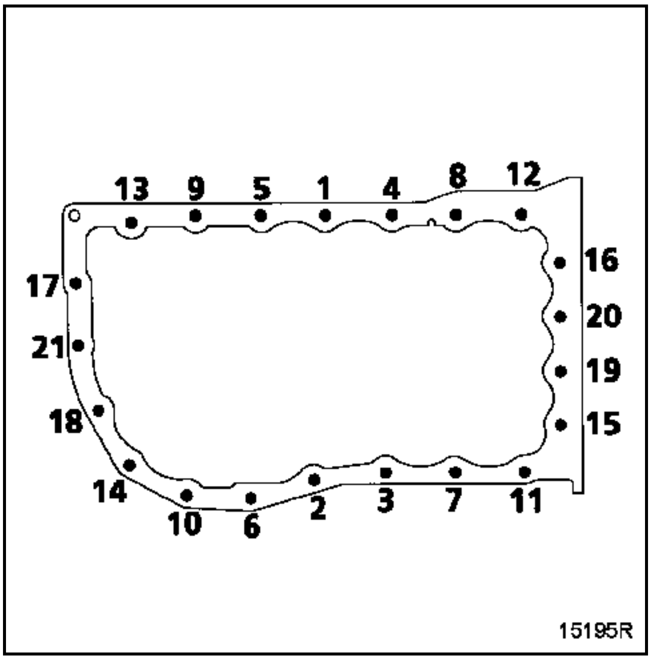
There are no special difficulties in removing the sump.

REFITTING

Put a drop of **RHODORSEAL 5661** at (A) (on either side of bearing No 1), and at (B) (where the crankshaft closure panel and the cylinder block meet).



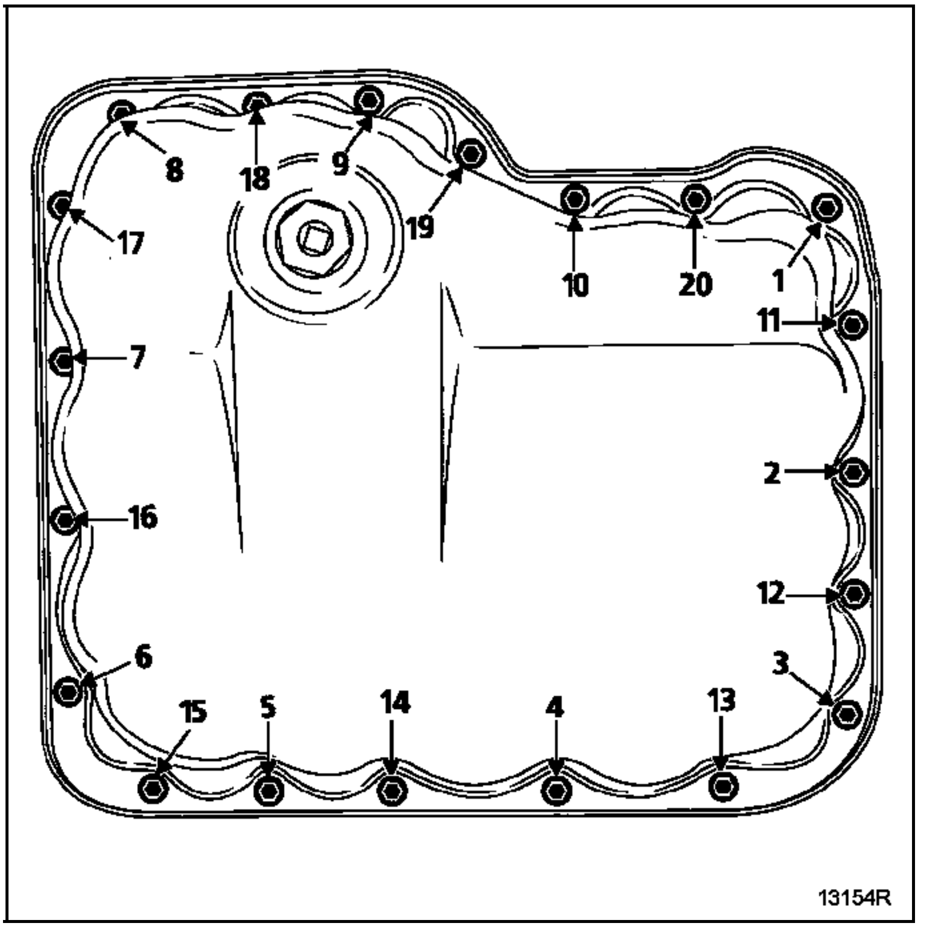
Refit the sump with a new seal, pre-tightening it to a torque of **0.8 daNm,** then tighten it finally to a torque of **1.4 daNm** in the order recommended below.



TIGHTENING TORQUE (in daNm)	
Sump bolts	0.8

There are no special difficulties in removing and refitting the sump.

Tighten the bolts to a torque of **0.8 daNm** in the following order:



NOTE: the sump is sealed by a composite gasket which can be removed and refitted a number of times. If the seal is damaged, it can be partially repaired using the AUTOJOINT OR sealing product.

TIGHTENING TORQUES (in daNm)	
Multifunction support mounting bolt	4.4
Lower mounting bolt for the multifunction support (only on K4M)	2.1

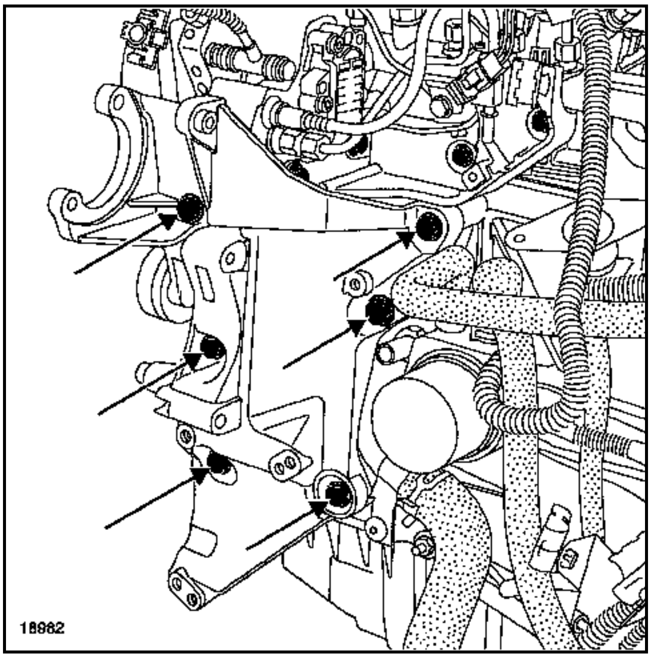
REMOVAL

Put the vehicle on a 2 post lift.

Disconnect the battery.

Remove:
– the alternator (see section **16 "Alternator"),**
– the power steering pump mountings and remove it,
– the air conditioning compressor mountings and attach it to the upper cross member.

F9Q engine



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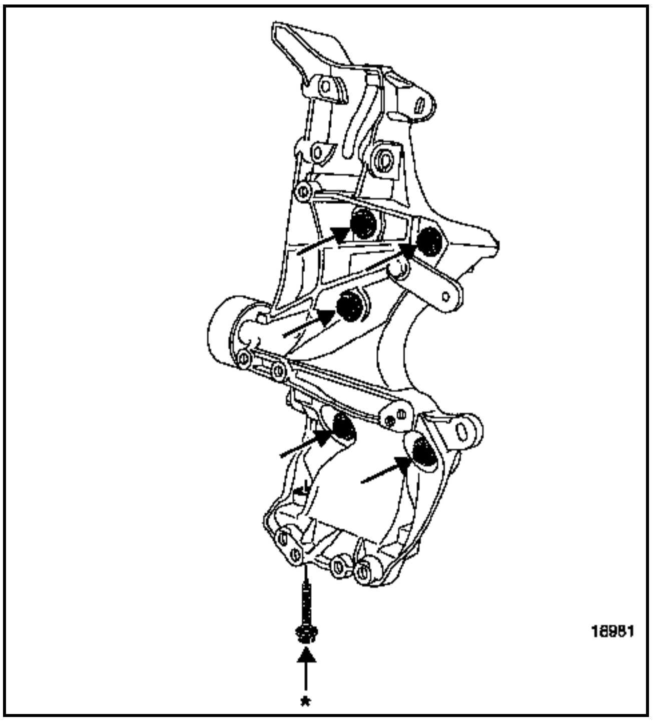
K4M and F4P engines



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* K4M engine only.

REFITTING

Refit the mounting cover tightening the bolts to the correct torque.

See section **07 "Accessories belt tension"** for the tensioning procedure.

Refitting is the reverse of removal.

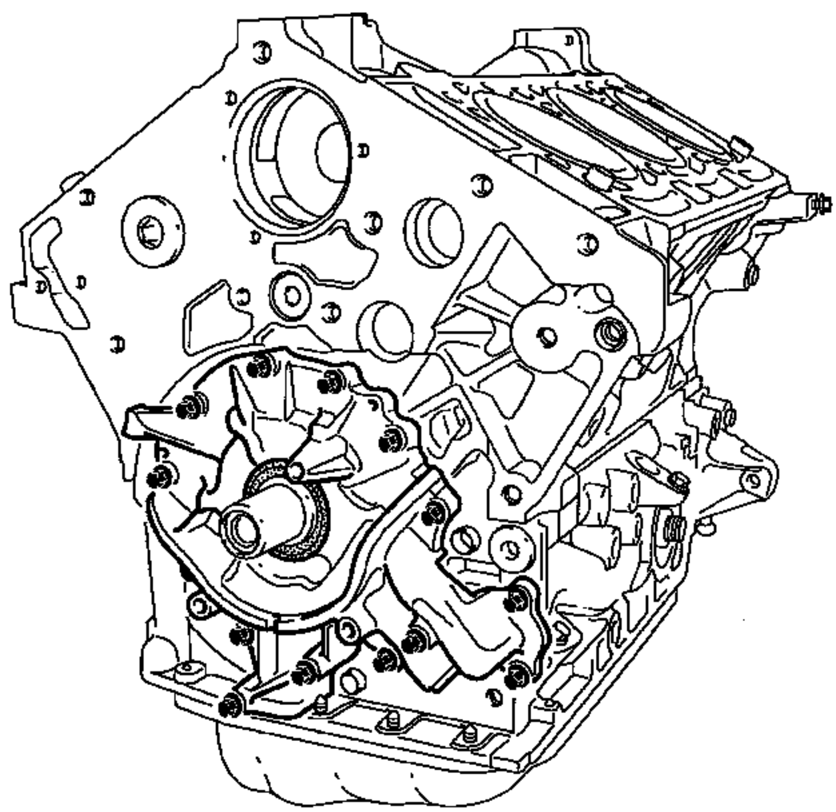
TIGHTENING TORQUE (in daNm)	
Oil pump bolts	**0.8**

REMOVAL

Put the vehicle on a 2 post lift.

Disconnect the battery.

Remove:
- the timing belt (see method described in **section 11 "Timing belt"**).
- the crankshaft pin,
- the lower timing pulley,
- the crankshaft sprocket,
- the compressor mounting bolts,
- the oil pump.



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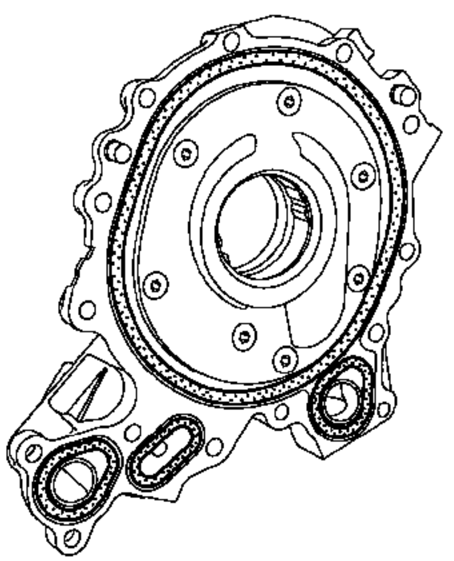
NOTE: the oil pump is sealed by a composite gasket which can be removed and refitted a number of times. If the seal is damaged, it can be partially repaired using the **AUTOJOINT OR** sealing product.



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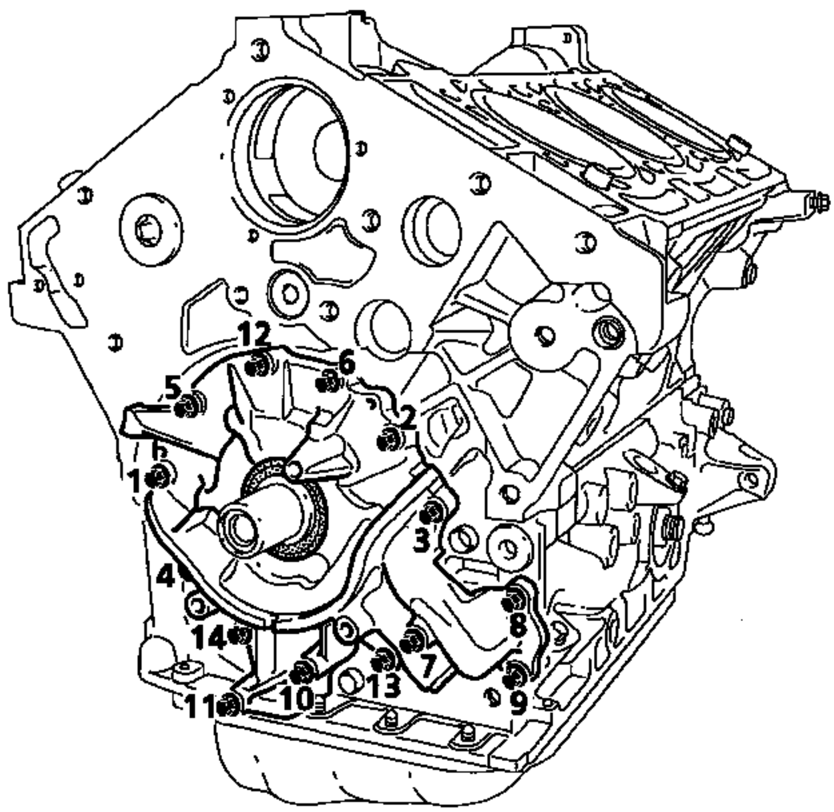
REFITTING

Fit the oil pump.

Tighten the bolts to a torque of **0.8 daNm** in the following order:



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

NOTE: the body of the oil pump must be replaced when the oil pump is replaced.

SPECIAL TOOLING REQUIRED	
Mot. 1054	**TDC setting pin**
Mot. 1453	**Engine support tool**
Mot. 1505	**Tool for checking belt tension**
Mot. 1543	**Tool for pretensioning the belt**

EQUIPMENT REQUIRED
Angular tightening wrench

TIGHTENING TORQUES (in daNm and/or °)	
Tension wheel nut	**5**
Tension wheel plate bolt	**1**
Crankshaft pulley bolt	**2+115°±15°**
Suspended engine mounting upper linkage mounting bolt	**10.5**
Acoustic mass mounting bolt	**2.1**
Body mounting bolt for the suspended engine mounting movement limiter	**2.1**
Engine mounting bolt for the suspended engine mounting cover	**6.2**
Wheel bolts	**10.5**

REMOVAL

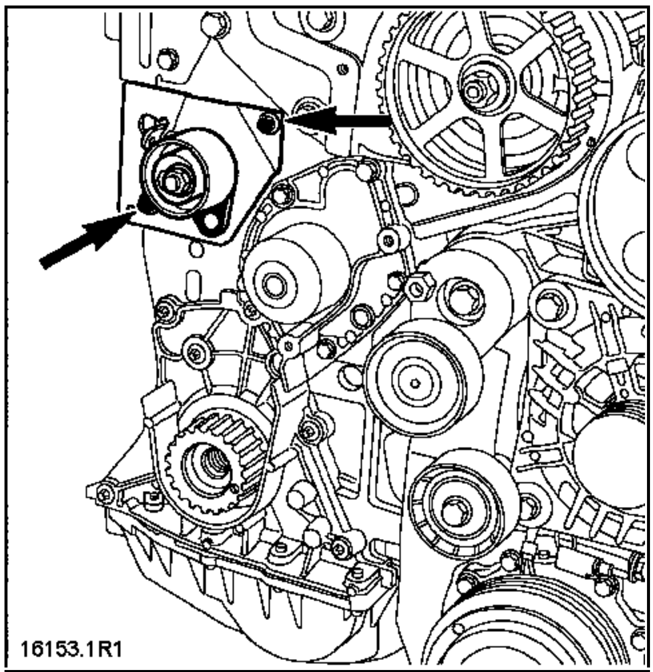
Put the car on a 2 post lift.

Disconnect the battery.

Remove:
– the timing belt (see section **11 "Timing belt"**).
– the two tension wheel plate bolts.

REFITTING

Refit:
– the tension wheel plate by tightening the bolts to a torque of **1 daNm**,
– the timing belt (see section **11 "Timing belt"**).



SPECIAL TOOLING REQUIRED	
Mot. 1054	**TDC setting pin**
Mot. 1453	**Engine support tool**
Mot. 1505	**Tool for measuring belt tension**
Mot. 1543	**Tool for pretensioning the belt**

EQUIPMENT REQUIRED
Angular tightening wrench

TIGHTENING TORQUES (in daNm and/or °)	
Tension wheel nut	**5**
Crankshaft pulley bolt	**2 + 115° ± 15°**
Suspended engine mounting upper linkage mounting bolt	**10.5**
Acoustic mass mounting bolt	**2.1**
Body mounting bolt for the suspended engine mounting movement limiter	**2.1**
Engine mounting bolt for the suspended engine mounting cover	**6.2**
Wheel bolts	**10.5**

REMOVAL

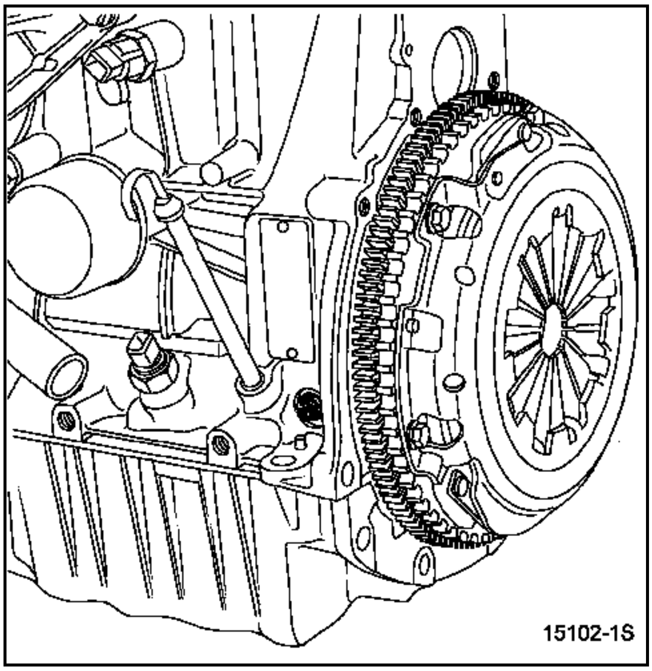
Put the car on a 2 post lift.

Disconnect the battery.

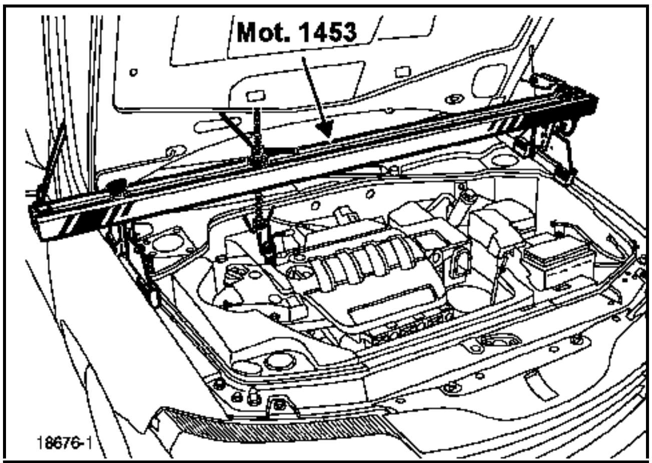
Remove:
- the engine cover,
- the front right wheel,
- the right wheel arch liner and side protector
- the engine undertray,
- the accessories belt (see Section **07 "Accessories belt tension"**),
- the aluminium side member and the side member body tie-rod on the right-hand side of the car.

Unclip the diesel fuel filter from its mounting, unclip the fuel pipes and move the assembly to one side.

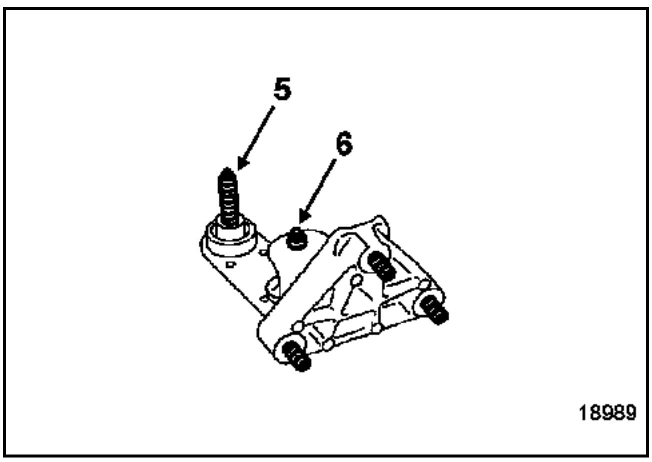
Remove the Top Dead Centre pin plug.



Position the engine support tool **Mot. 1453 with the retaining straps**.

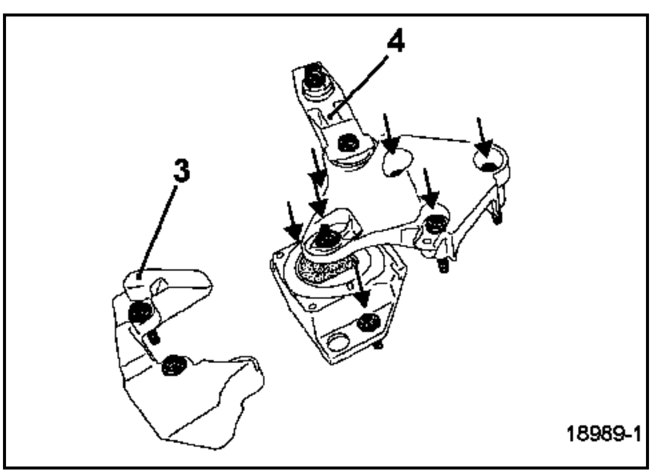


Loosen bolt (5) then remove bolt (6) of the engine tie-bar.



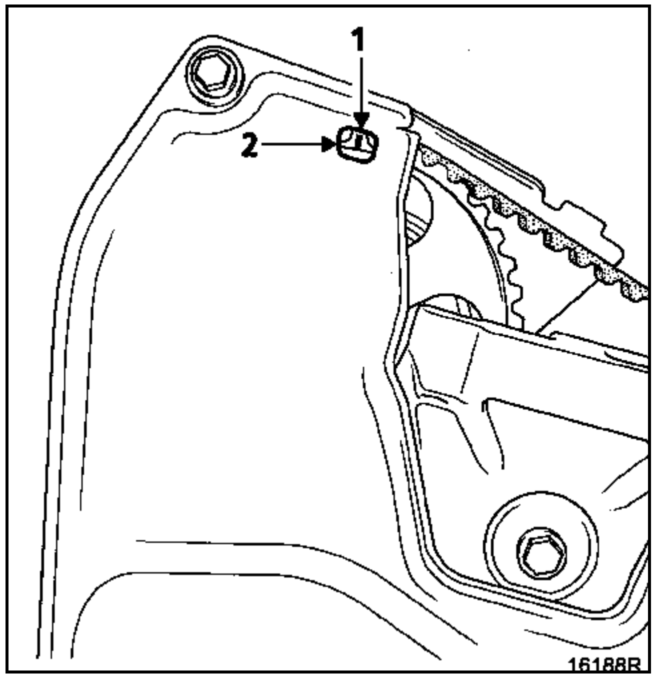
Remove:
– the acoustic mass (3),
– the tie-rod mounting bolt (4),

then remove the suspension-movement limiter assembly.



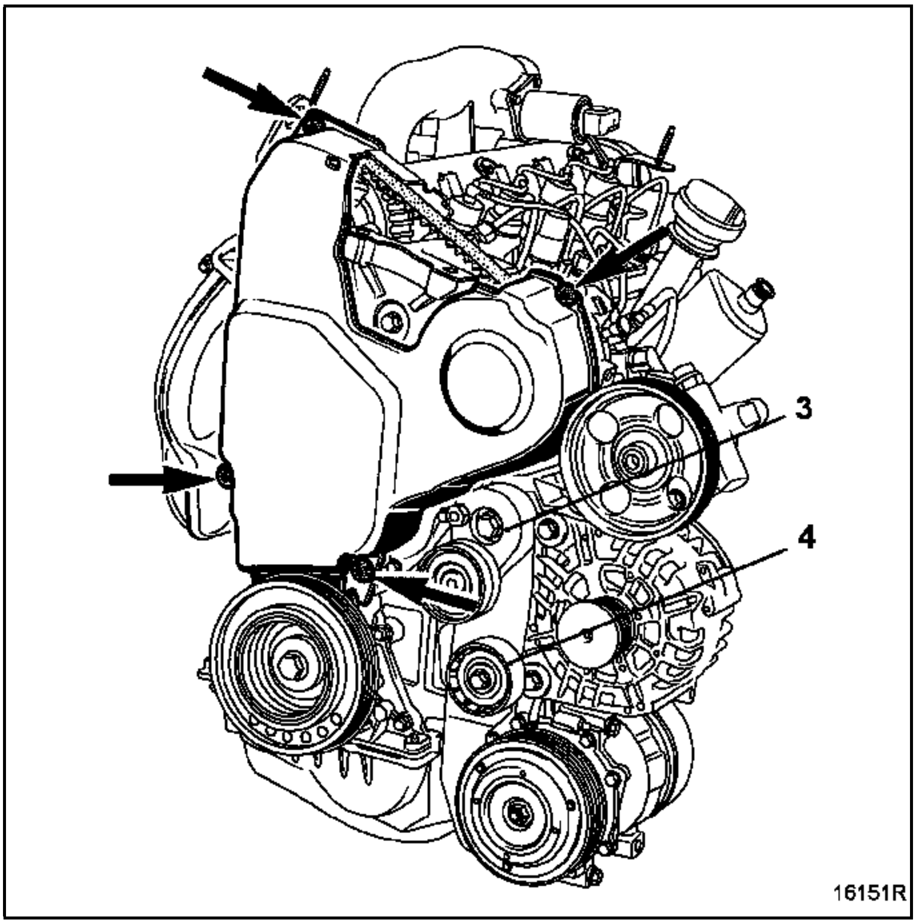
Adjusting the timing

Turn the crankshaft in a clockwise direction (timing side), when the mark (1) on the camshaft pulley appears in the window (2) of the valve timing cover, push the Top Dead Centre pin **Mot. 1054** to pin the crankshaft (the mark on the camshaft pulley must be located approximately in the centre of the window).

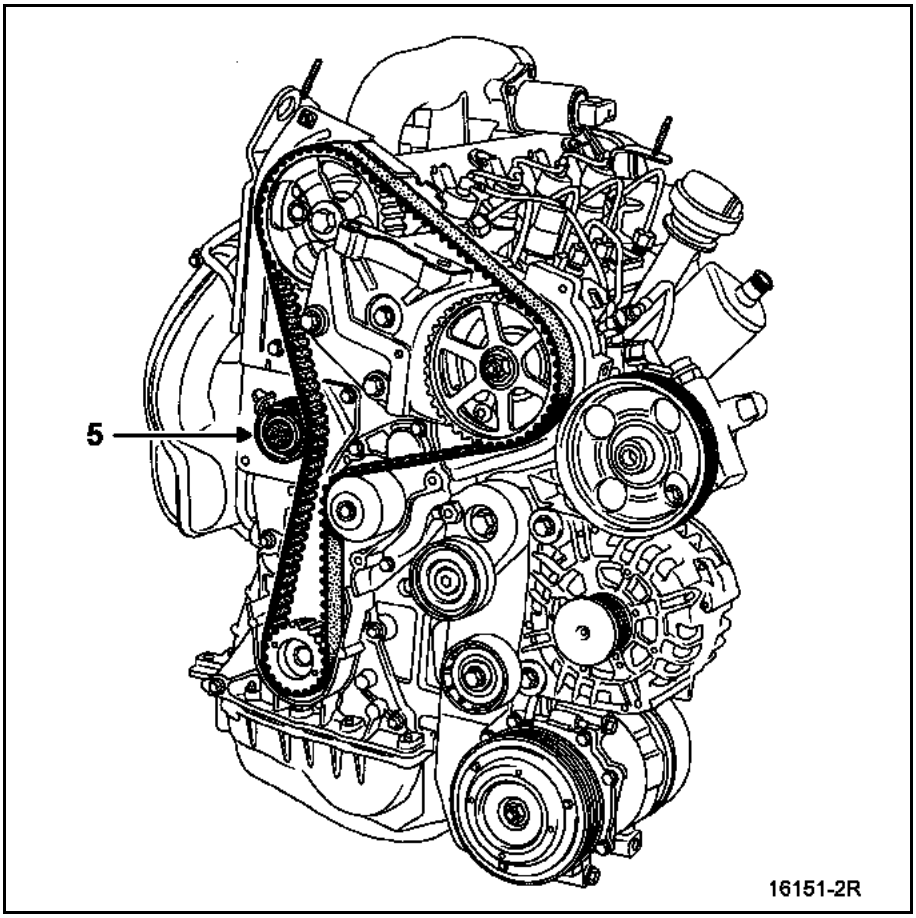


Remove:
– the accessories belt tensioner (3) and the pulley (4),
– the crankshaft accessories pulley by blocking the flywheel,
– the timing cover from underneath the car (lower the engine using the engine support tool **Mot. 1453**).

NOTE: using a pencil, mark the inner timing cover opposite the mark on the camshaft pulley.



Loosen the tensioner by loosening the nut (5), then remove the timing belt.



Refit the timing belt (using the method described in Section **07 "Tensioning the timing belt"**),

Never refit a belt once removed, always replace it.

IMPORTANT: Remove washer **4** included in the kit **Mot. 1543** before fitting the pulley.

It is vital that the crankshaft accessories pulley bolt be tightened to a torque of **2 daNm** plus an angle of **115**° ± **15**°.

NOTE: it is vital that you tighten the tensioner nut to torque to avoid any loosening which may cause damage to the engine.

Refitting is the reverse of removal.

Refit the right side engine suspension mounting and the engine tie-bar (see Section **19 "Suspended engine mounting"** for the tightening torques).

SPECIAL TOOLING REQUIRED	
Mot. 799-01	Tool for locking pinions for toothed timing belt
Mot. 1054	TDC setting pin
Mot. 1368	Timing pulley tightening tool
Mot. 1453	Engine support tool
Mot. 1487	Tool for fitting inlet camshaft sealing plug
Mot. 1488	Tool for fitting exhaust camshaft sealing plug
Mot. 1496	Tool for setting the camshaft
Mot. 1509 Mot. 1509-01	Tool for locking the camshaft pulleys

EQUIPMENT REQUIRED
Angular tightening wrench

TIGHTENING TORQUES (in daNm and/or °)	
Fixed roller bolt	4.5
Crankshaft pulley bolt	2 +135°±15°
Tension wheel nut	2.8
Suspended engine mounting upper linkage mounting bolt	10.5
Engine mounting bolt for the suspended engine mounting cover	6.2
Body mounting bolt for the suspended engine mounting movement limiter	2.1
Acoustic mass mounting bolt	2.1
Wheel bolts	10.5

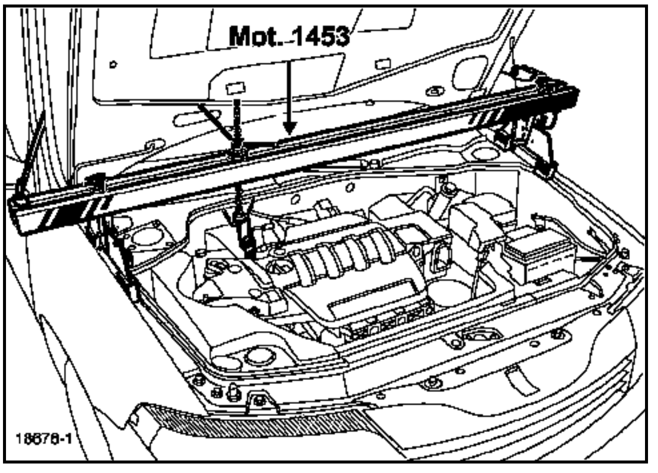
REMOVAL

Put the car on a 2 post lift.

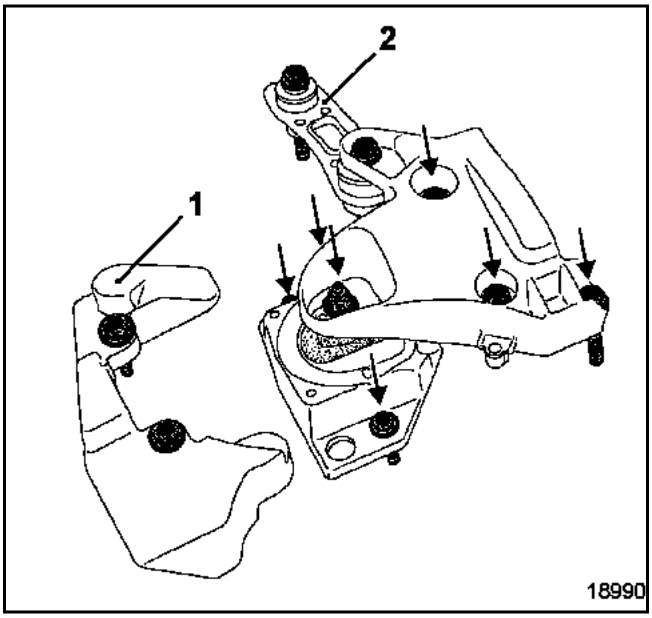
Disconnect the battery.

Remove:
– the front right wheel,
– the front right hand wheel arch liner,
– the engine undertray.

Position the engine support tool **Mot. 1453** with the retaining straps.



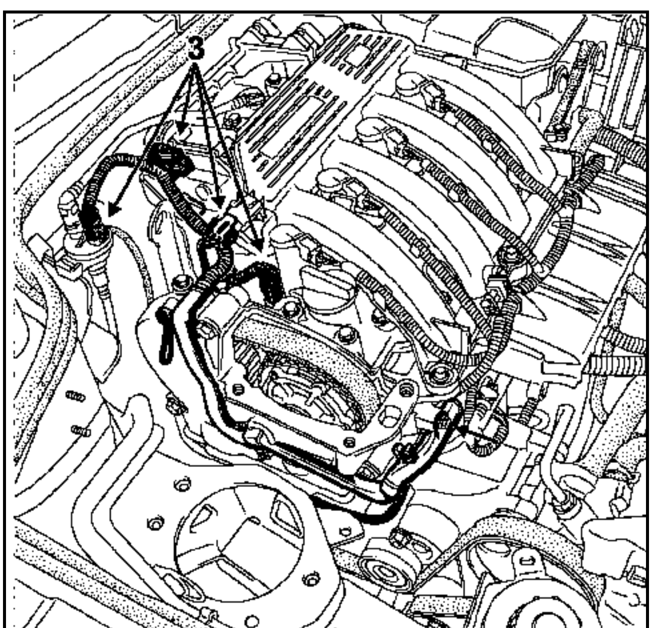
Remove:
– the acoustic mass (1),
– the tie-rod mounting bolt (2), then remove the suspension-movement limiter assembly,



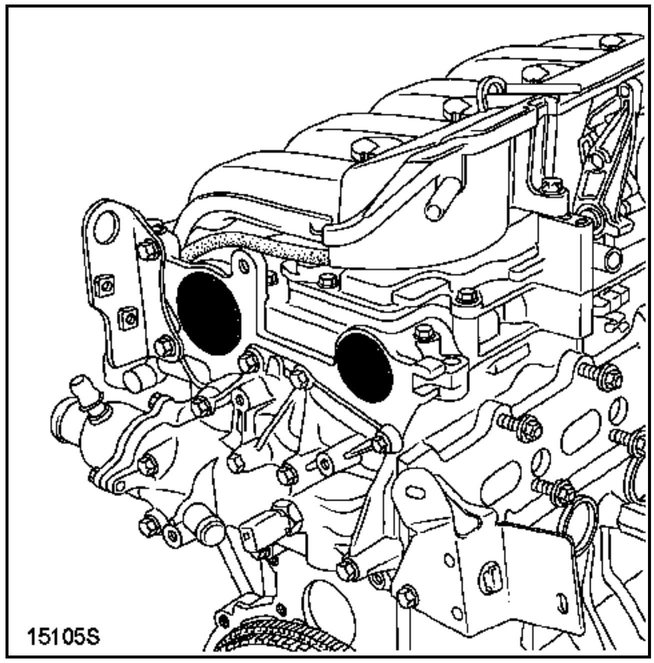
– the accessories belt (see section **07 "Accessories belt tension"**),

Disconnect the connectors (3)

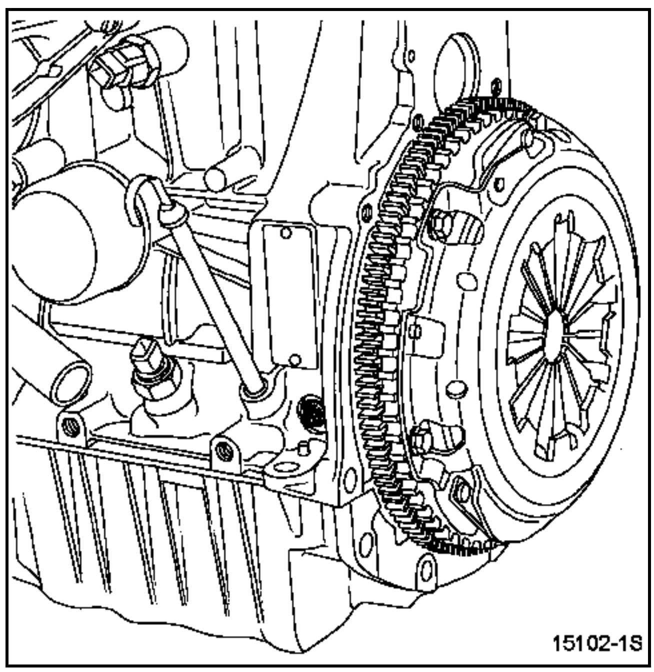
Unclip:
– the wiring harness on the upper timing cover and separate the assembly,
– the petrol pipe on the intermediate timing cover.



Remove:
– the camshaft sealing plugs,

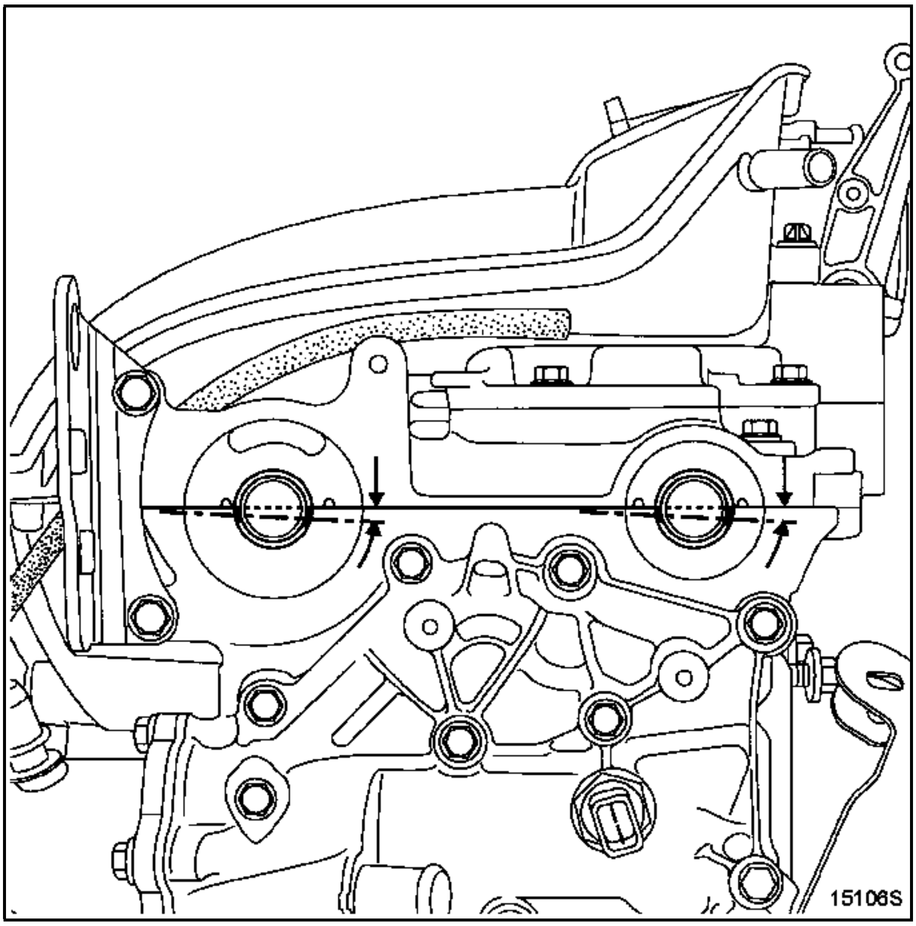


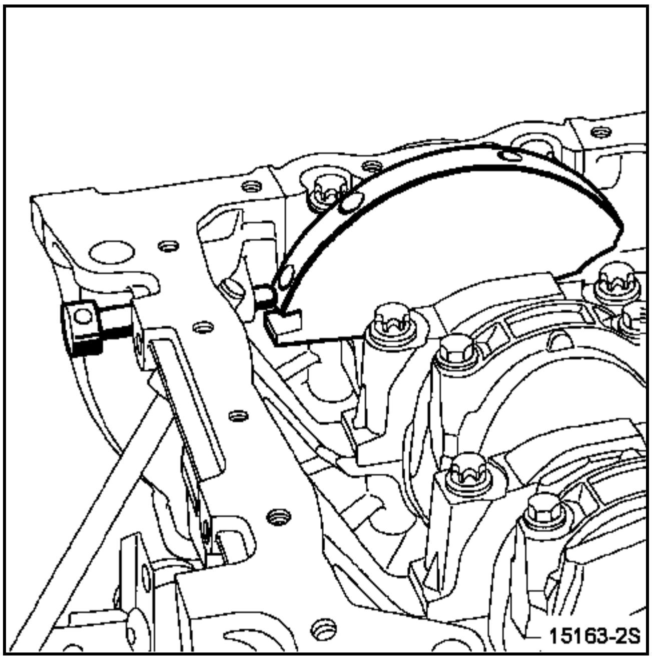
– the Top Dead Centre pin plug



Adjusting the timing

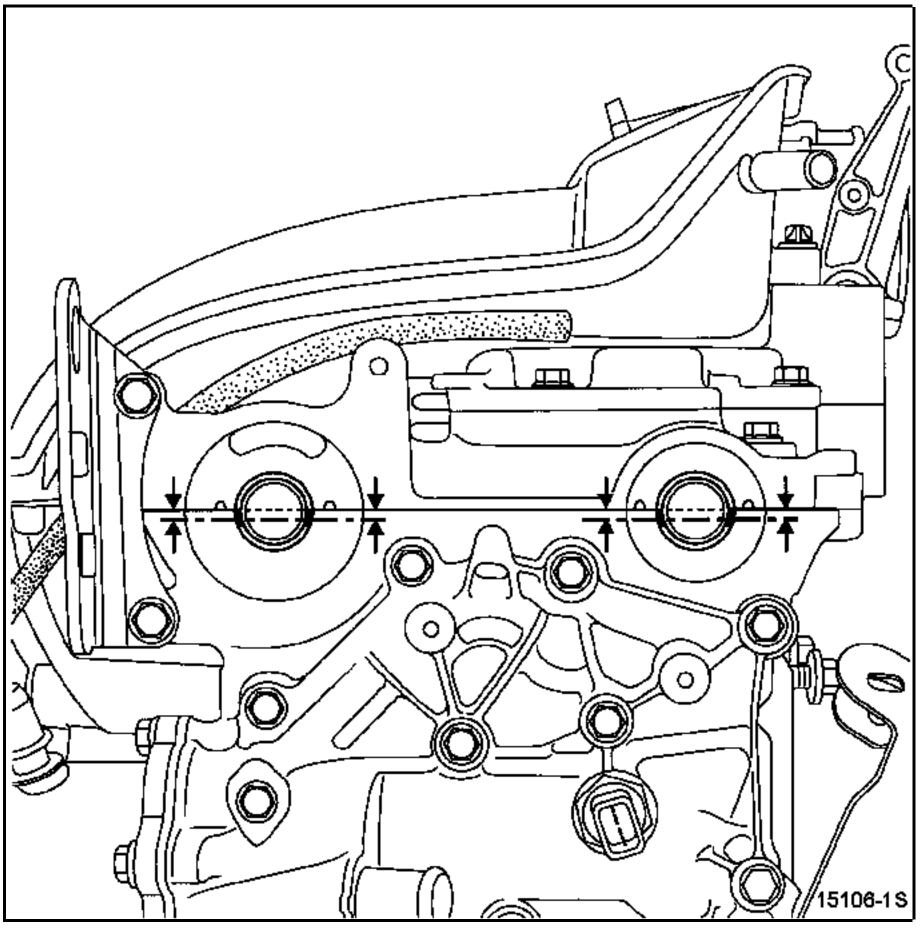
Turn the engine over clockwise (timing side) so as to position the camshaft grooves towards the bottom in an almost horizontal position as shown on the diagram below. Then insert the Top Dead Centre pin **Mot. 1054** so that it is between the balancing hole and the crankshaft setting groove.



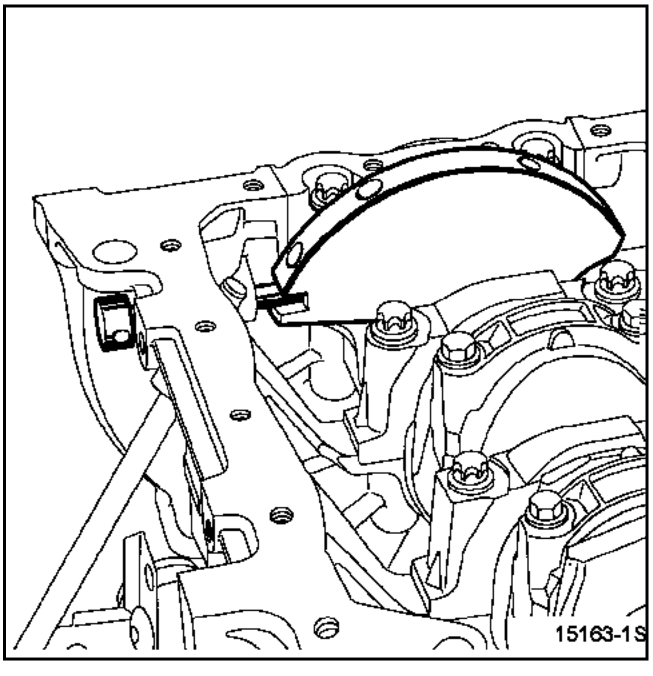


Rotate the engine slightly in the same direction, inserting the pin **Mot. 1054** to the setting point.

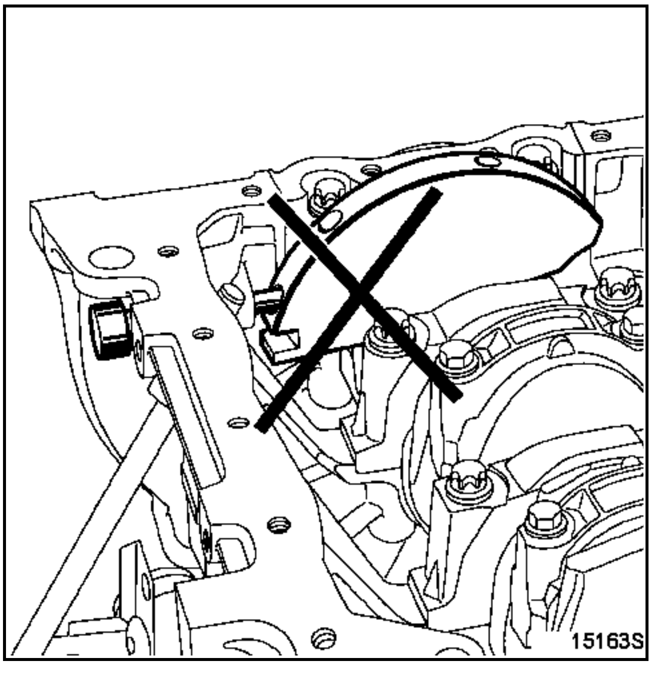
The grooves of the camshafts must, at the setting point, be horizontal and offset towards the bottom as shown on the diagram below.



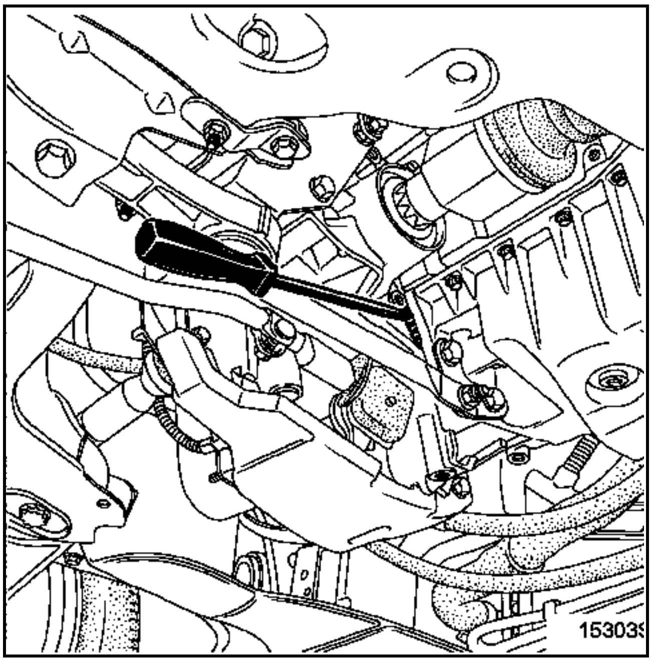
Correct position



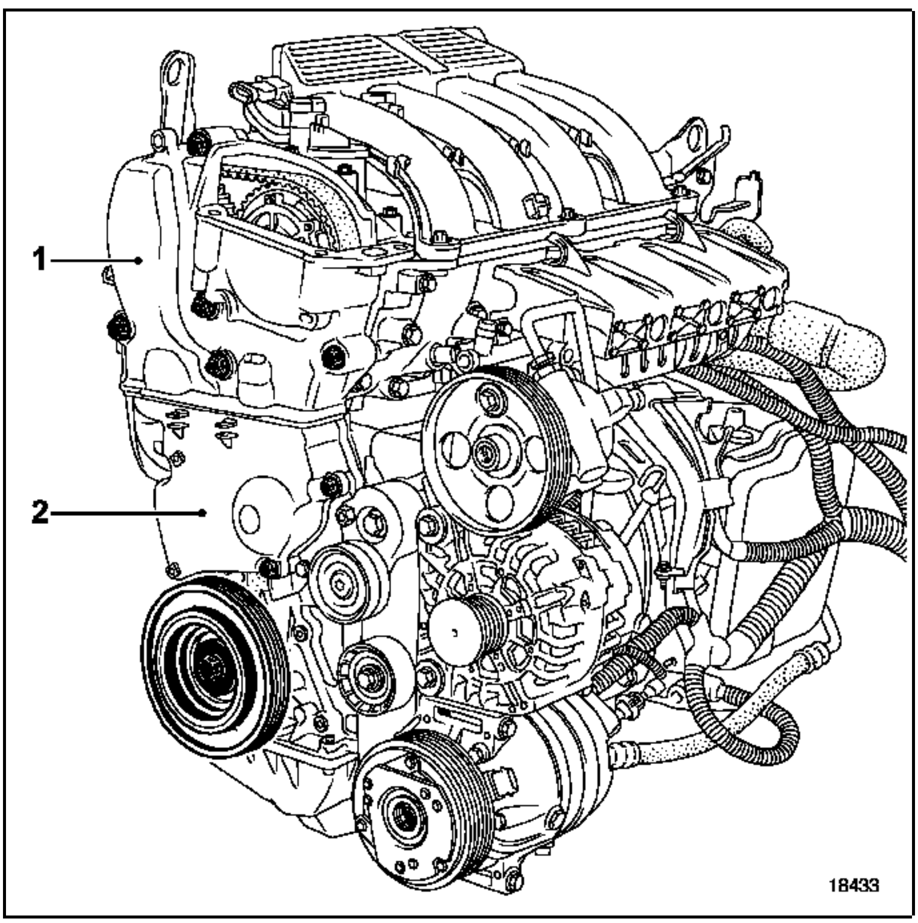
Incorrect position (the pin is in the balancing hole).



Remove:
– the crankshaft pulley, locking the flywheel using a screwdriver,



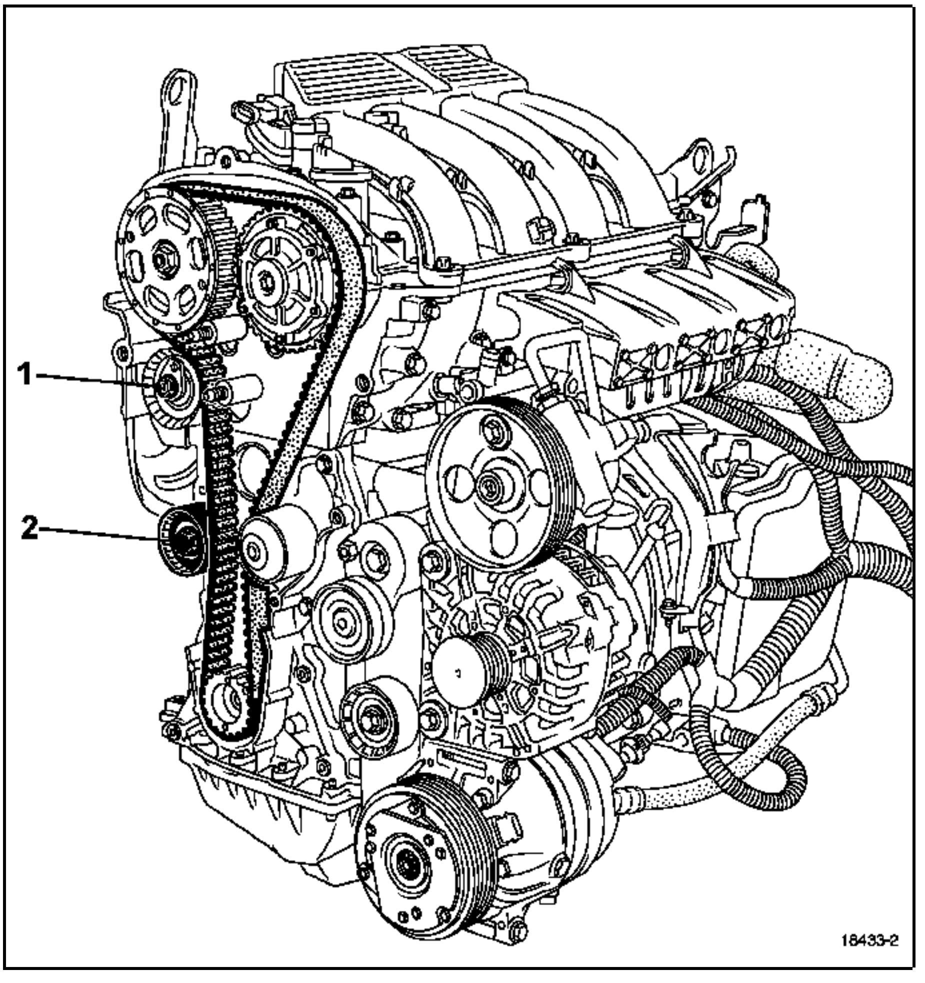
– the upper housing (1).
– the intermediate timing cover (2).



Slacken the timing belt by undoing the nut (1) of the tensioning roller.

To remove the timing belt, remove the fixed roller (2) **taking care not to drop the crankshaft pinion (as this does not have a key).**

Remove the crankshaft timing pinion.

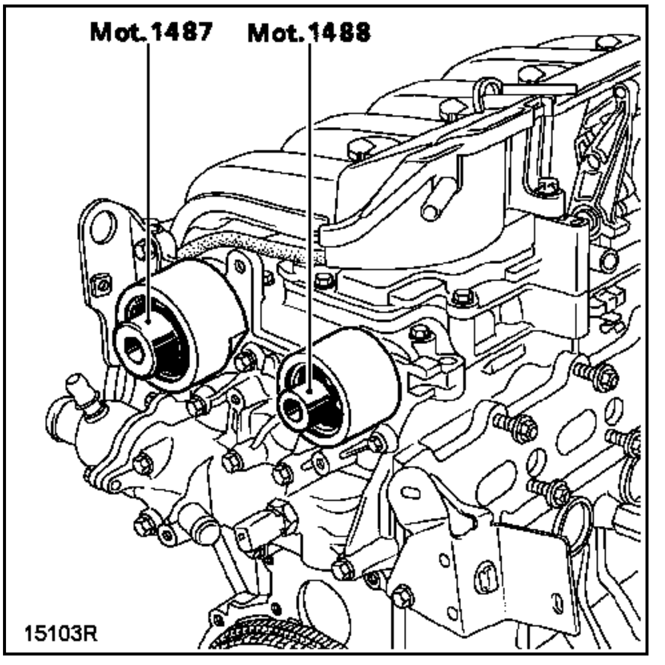


IMPORTANT: it is essential to degrease the end of the crankshaft, the bore of the crankshaft pinion and the bearing faces of the crankshaft pulley to prevent timing slippage, which could damage the engine.

REFITTING

The tensioner and the fixed roller must be replaced when the timing belt is replaced.

Refit:
– the timing belt (following exactly the method described in Section **07 "Timing belt tensioning procedure"**),
– the accessories belt (see section **07 "Accessories belt tension"**),
– the plug of the Top Dead Centre pin, applying a drop of **RHODORSEAL 5661** to the thread,
– the new sealing plugs:
  - of the inlet camshaft **(Mot. 1487)**,
  - of the exhaust camshaft **(Mot. 1488)**



– the right hand suspended engine mounting by tightening it to the correct torque (see Section **19 "Suspended engine mounting"**).

SPECIAL TOOLING REQUIRED	
Mot. 799-01	**Tool for locking pinions for toothed timing belt**
Mot. 1368	**Timing pulley tightening tool**
Mot. 1453	**Engine support tool**
Mot. 1487	**Tool for fitting inlet camshaft sealing plug**
Mot. 1488	**Tool for fitting exhaust camshaft sealing plug**
Mot. 1489	**TDC setting pin**
Mot. 1490	**Tool for locking the camshaft pulleys**
Mot. 1496	**Tool for setting the camshaft**

EQUIPMENT REQUIRED
Angular tightening wrench

TIGHTENING TORQUES (in daNm and/or °)	
Suspended engine mounting upper linkage mounting bolt	**10.5**
Fixed roller bolt	**4.5**
Crankshaft pulley bolt	**2 + 135° ± 15°**
Tension wheel nut	**2.8**
Acoustic mass mounting bolt	**2.1**
Engine mounting bolt for the engine suspension mounting cover	**6.2**
Body mounting bolt for the suspended engine mounting movement limiter	**2.1**
Wheel bolts	**10.5**

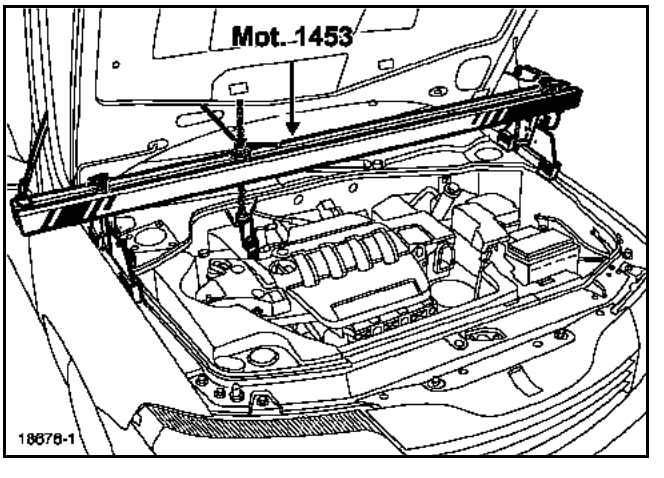
REMOVAL

Put the car on a 2 post lift.

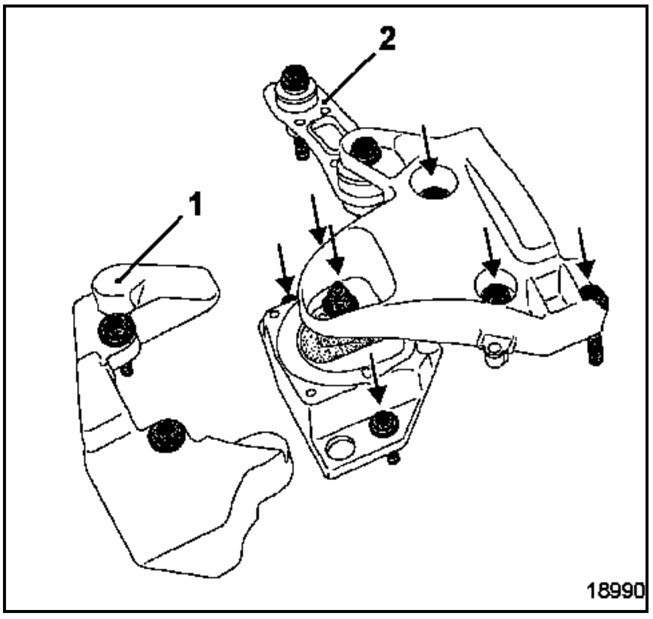
Disconnect the battery.

Remove:
- the front right wheel,
- the front right wheel arch,
- the engine undertray.

Position the engine support tool **Mot. 1453** with the retaining straps.



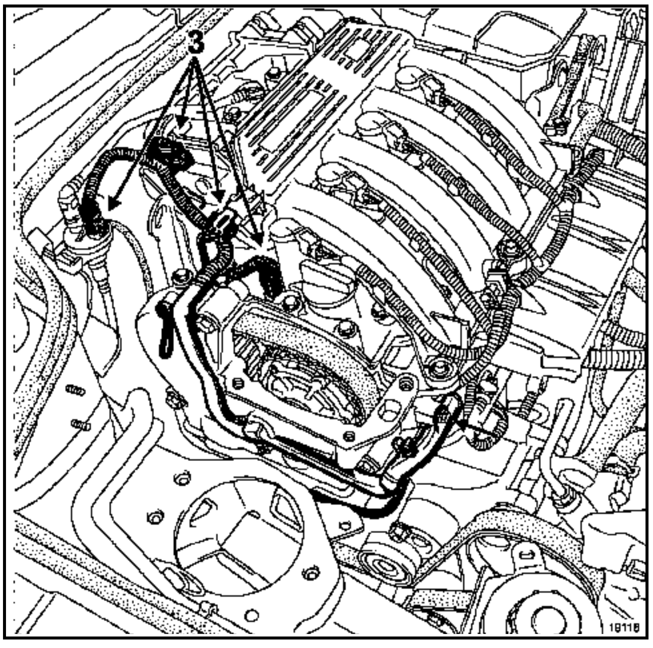
Remove:
- the acoustic mass (1),
- the tie-rod mounting bolts (2), then remove the suspension-movement limiter assembly,



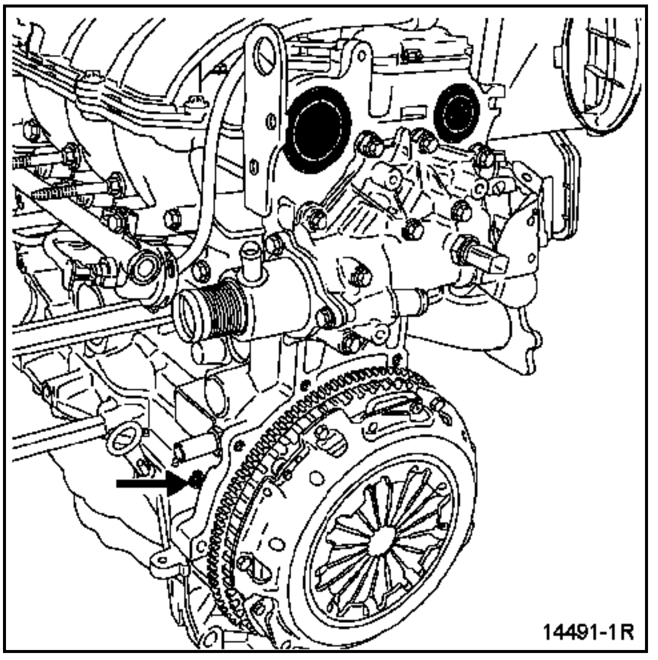
- the accessories belt (see section **07 "Accessories belt tension"**),

Disconnect the connectors (3)

Unclip:
- the wiring harness on the upper timing cover and separate the assembly,
- the petrol pipe on the intermediate timing housing.

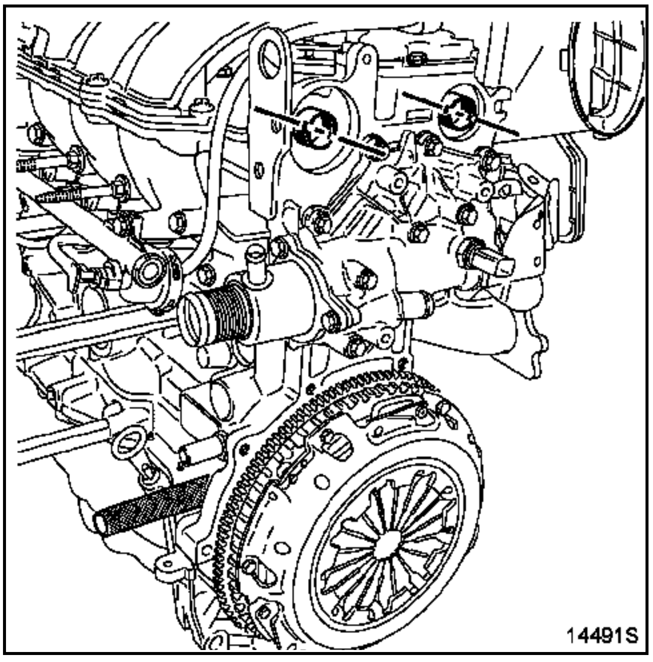


Remove:
- the camshaft sealing plugs,
- the **Top Dead Centre** pin plug.

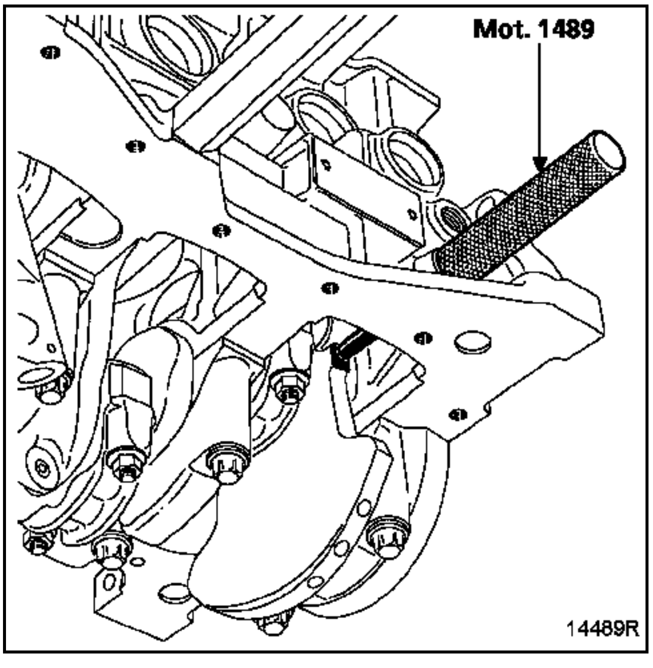


Adjusting the timing

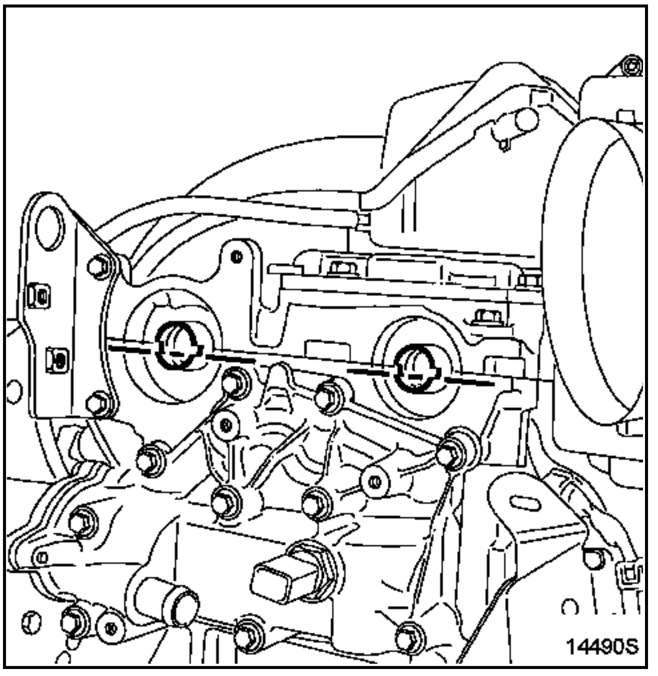
Position the grooves of the camshafts on the under side underneath as shown in the illustration below.



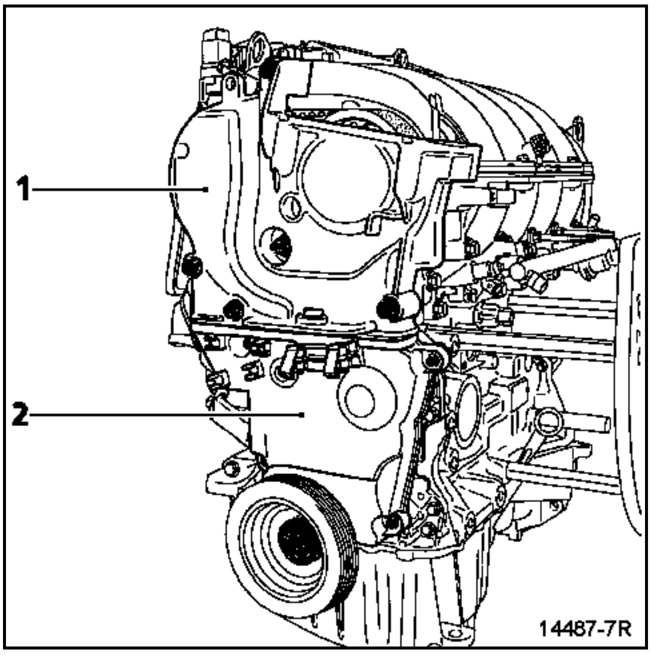
Screw in the TDC pin **Mot. 1489** then turn the engine clockwise (timing end) to bring the crankshaft slowly and smoothly to rest on the pin.



Check that the position of the camshaft grooves is identical to that shown diagram below.

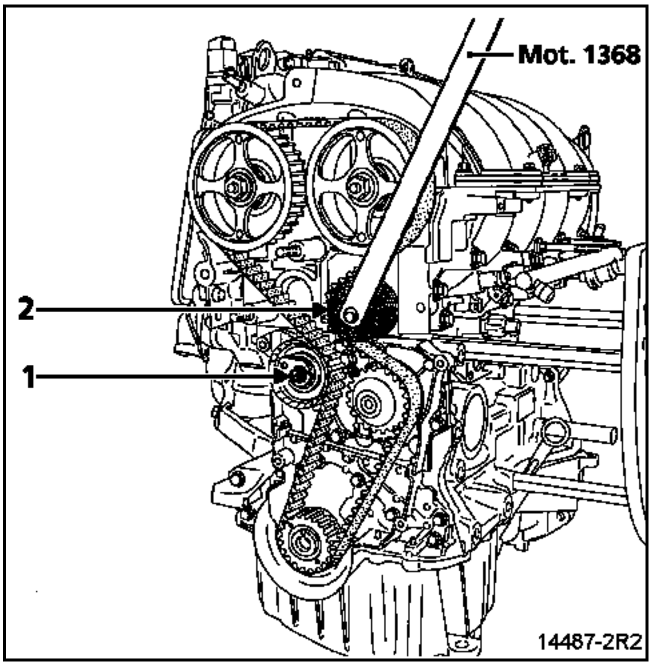


Remove:
– the crankshaft pulley, locking the flywheel using a screwdriver,
– the upper housing (1).
– the intermediate timing cover (2).



Slacken the timing belt by undoing the nut (1) of the tensioning roller.

To remove the timing belt, remove the pulley (2) using tool **Mot. 1368**.



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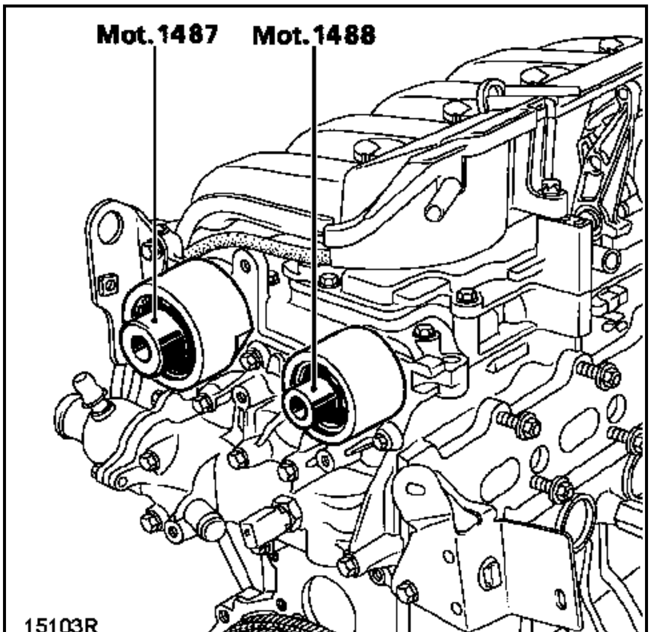
IMPORTANT: it is essential to degrease the end of the crankshaft, the bore of the crankshaft pinion and the bearing faces of the crankshaft pulley to prevent any slip between the timing and the crankshaft which would risk destroying the engine.

REFITTING

The tensioner and fixed roller must be replaced when the timing belt is replaced.

Refit:
– the timing belt (following exactly the method described in Section **07 "Timing belt tensioning procedure"**),
– the accessories belt (see section **07 "Accessories belt tension"**),
– the new sealing plugs:
  ● of the inlet camshaft **(Mot. 1487)**,
  ● of the exhaust camshaft **(Mot. 1488)**.



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– the right hand suspended engine mounting by tightening it to the correct torque (see Section **19 "Suspended engine mounting"**).

SPECIAL TOOLING REQUIRED	
Mot. 1428	Exhaust camshaft hub locking tool
Mot. 1430	Crankshaft and camshaft sprocket timing pin
Mot. 1430-01	Crankshaft and camshaft sprocket timing check pin
Mot. 1436	Timing belt retaining clip
Mot. 1453	Engine support
Mot. 1505	Tool for measuring belt tension
Mot. 1555	Inlet camshaft hub locking tool

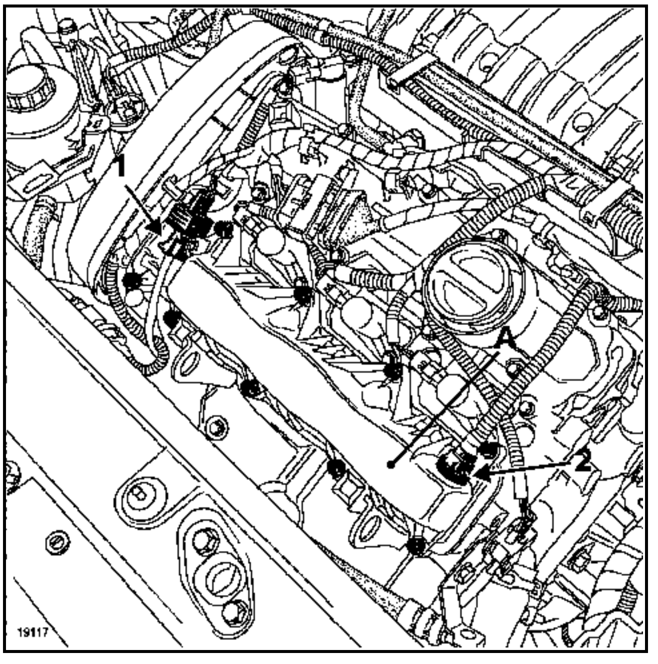
TIGHTENING TORQUES (in daNm)	
Timing tensioner nut	2.5
Camshaft sprocket bolt	1
Tensioner mounting plate securing bolt	2.5
Suspended engine mounting upper linkage mounting bolt	10.5
Engine mounting bolt for the engine suspension mounting cover	6.2
Body mounting bolt for the suspended engine mounting movement limiter	2.1
Acoustic mass mounting bolt	2.1
Crankshaft pulley bolt	2.5
Camshaft cover bolt	1
Wheel bolts	10.5

REMOVAL

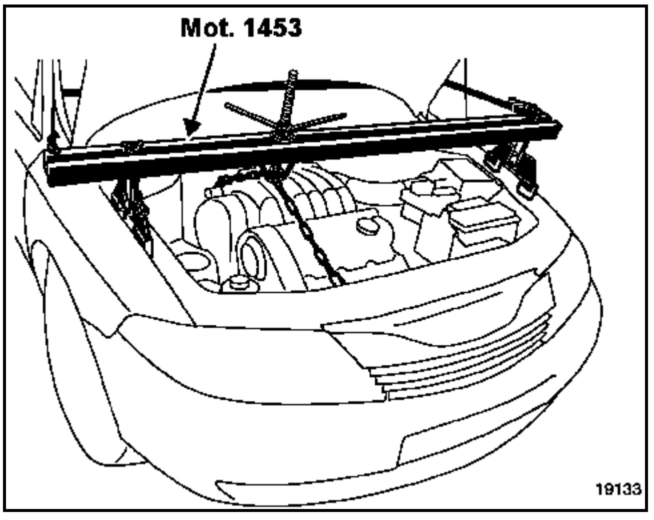
Put the car on a 2 post lift.

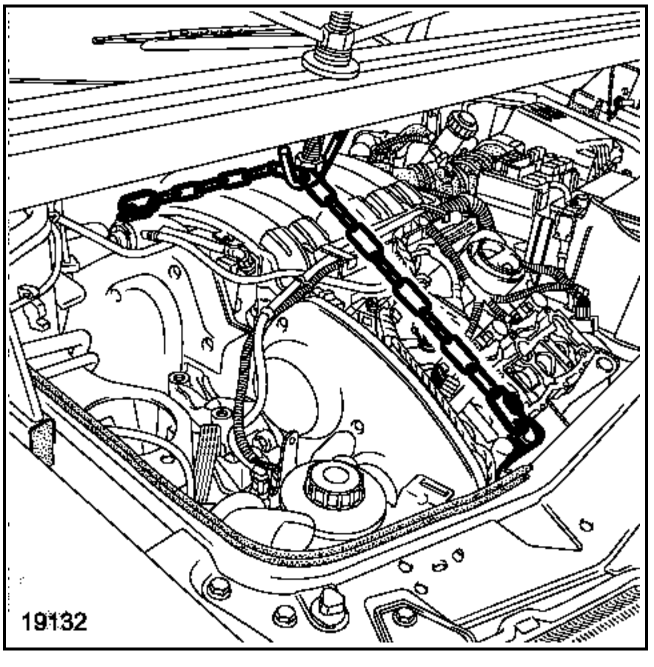
Disconnect the battery.

Remove:
- the front right wheel,
- the right front wheel arch liner and side protector
- the power steering reservoir mounting,
- the style cover,
- the accessories belt (refer to the method in Section **07 "Accessories belt tension")**.
- the camshaft cover (A) by disconnecting the connector (1) then unclip it from the camshaft cover and the hose (2).

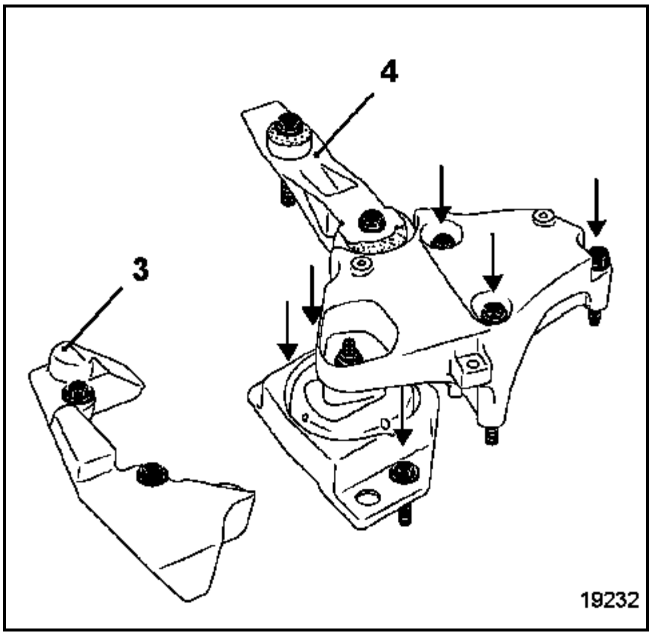


Position the engine support.

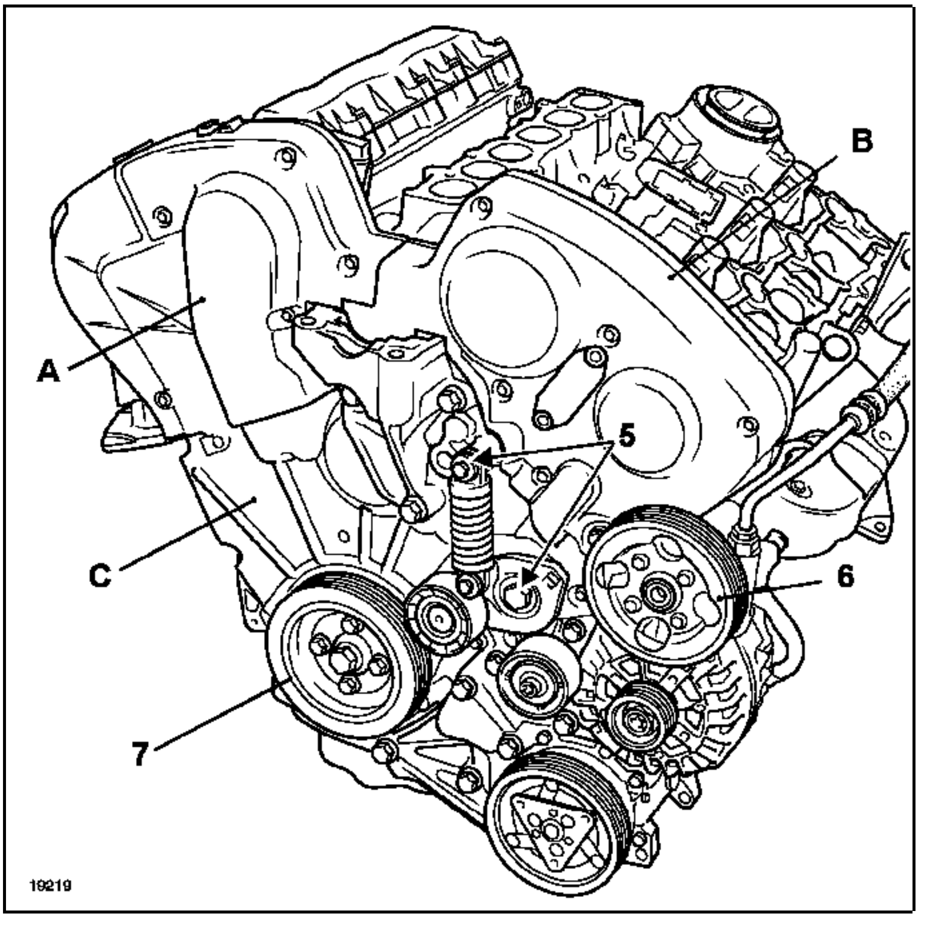




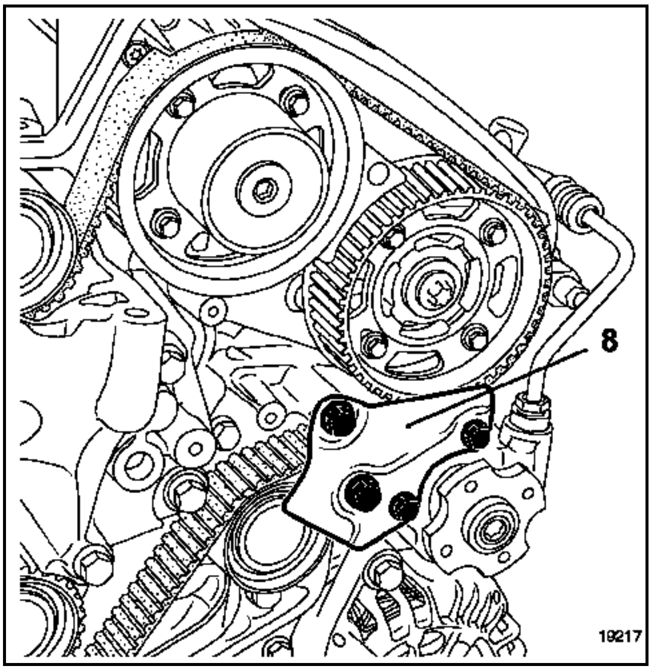
Remove:
- the acoustic mass (3),
- the tie-rod mounting bolt (2), then remove the suspension-movement limiter assembly,



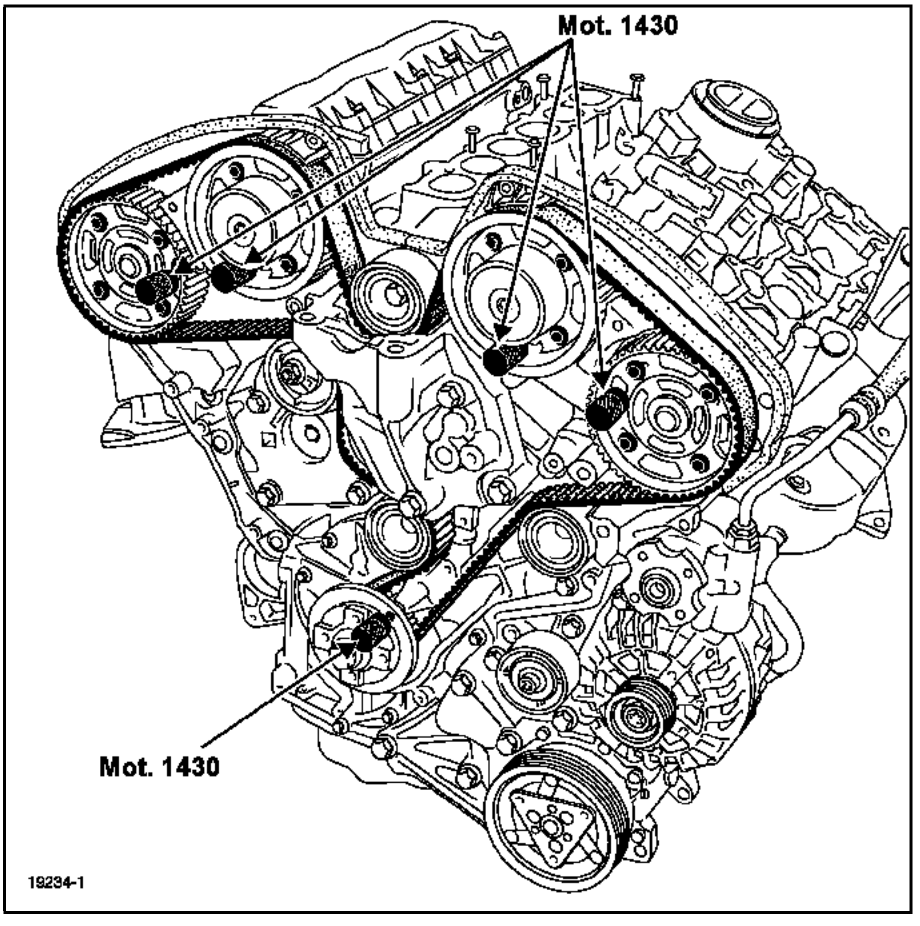
Remove:
- the accessories belt tensioner at (5),
- the power steering pump pulley (6),
- the timing covers (A) and (B),
- the crankshaft pulley (7),
- the lower timing cover (C).



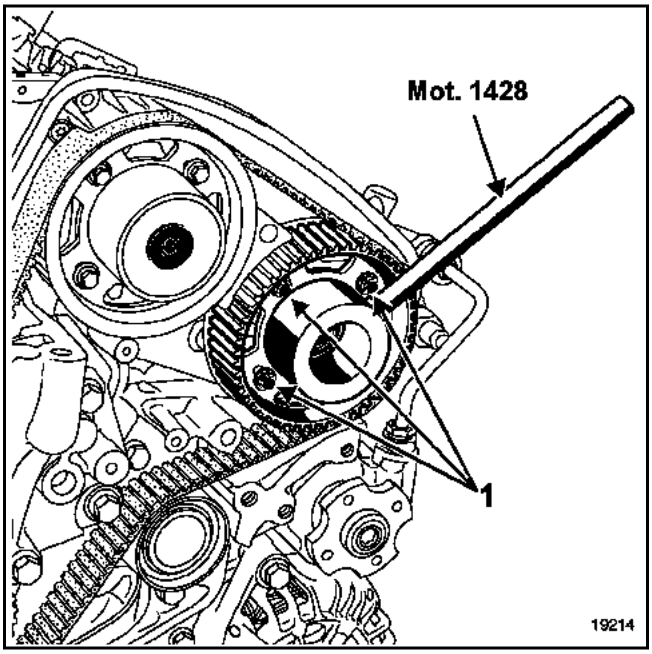
– the cover plate (8).

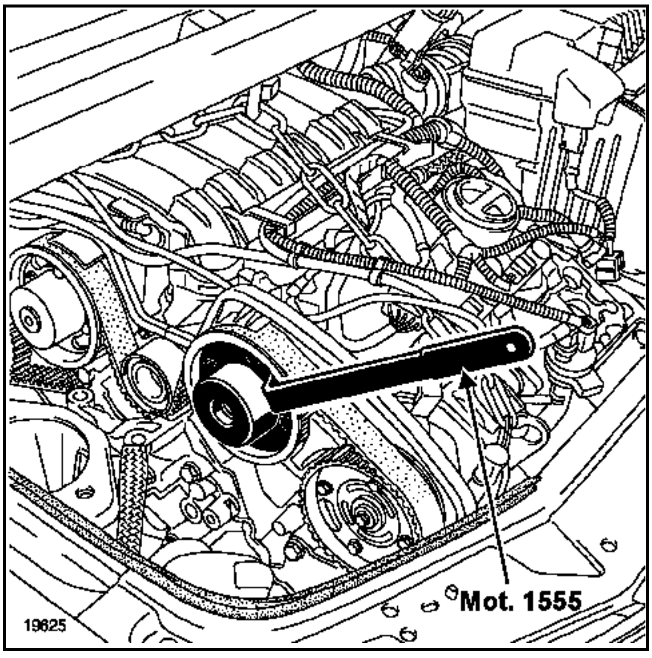


Turn the engine in its operating direction in order to position the crankshaft sprocket and the camshafts using the pins **Mot. 1430**.



First slacken camshaft pulley bolts (1) and turn the camshaft hubs using the **Mot. 1428** tool (exhaust camshaft hub) and the **Mot. 1555** tool (inlet camshaft hub) to facilitate the insertion of the pins.

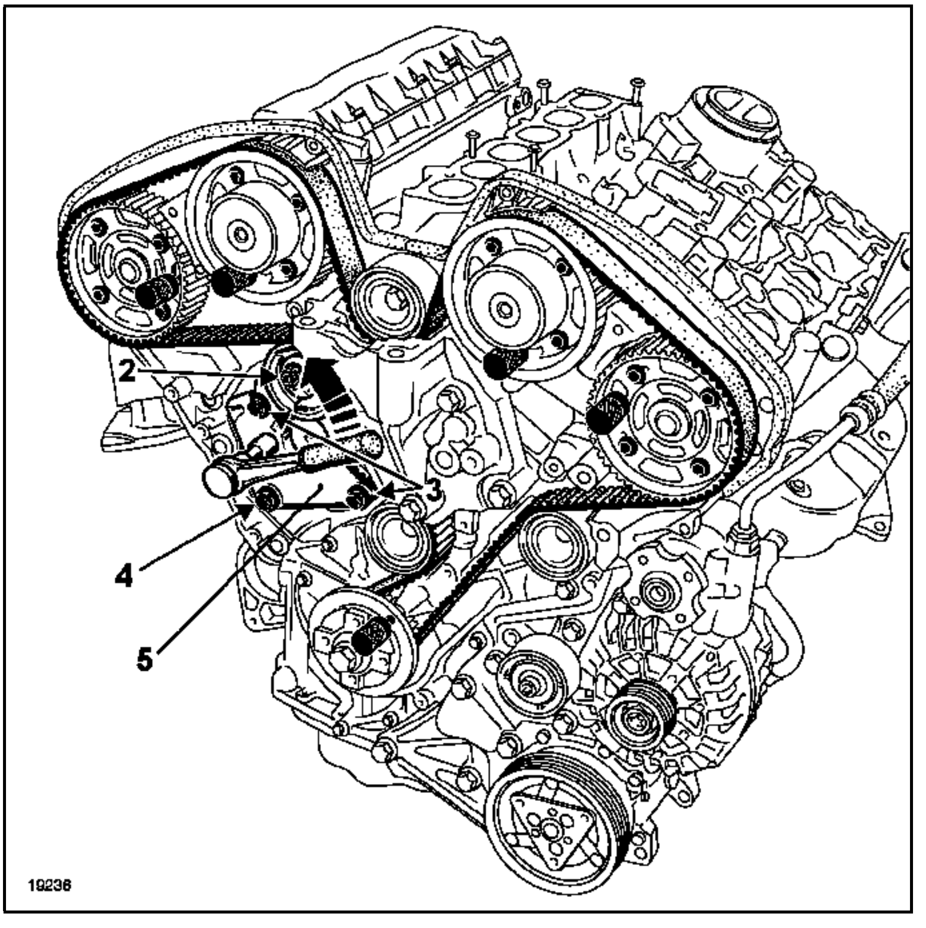




Slacken the tensioner by loosening the nut (2).

Slacken the bolt (3) of the tensioner mounting plate, then remove the bolt (4).

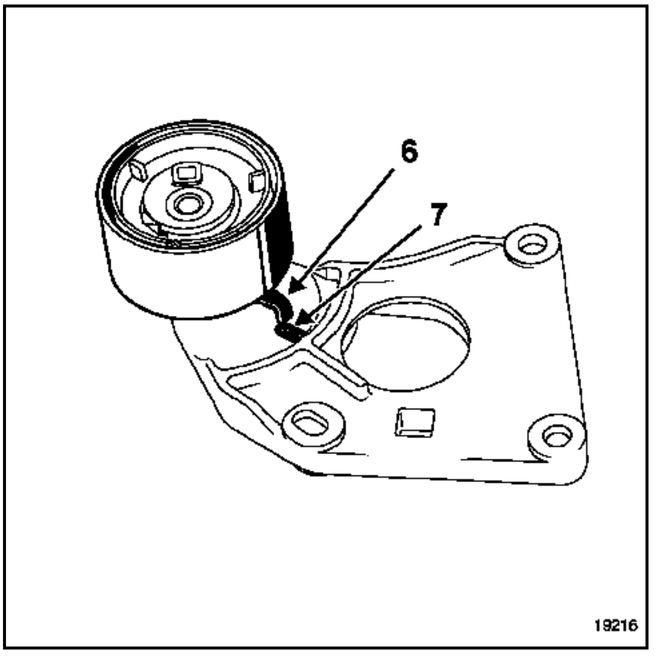
Pivot the plate (5) using a **9.53 mm** square in order to remove the timing belt.



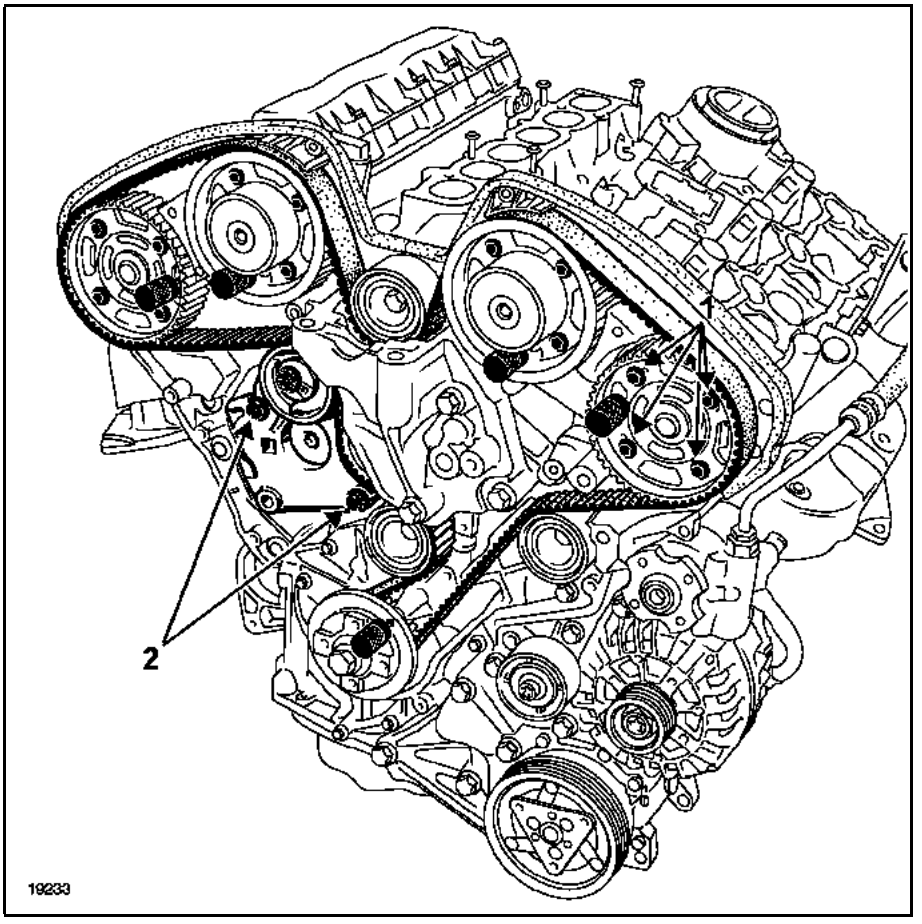
REFITTING

Ensure that the camshafts and crankshaft are correctly positioned.

Ensure that the lug (6) of the tension wheel is correctly positioned in the groove (7).



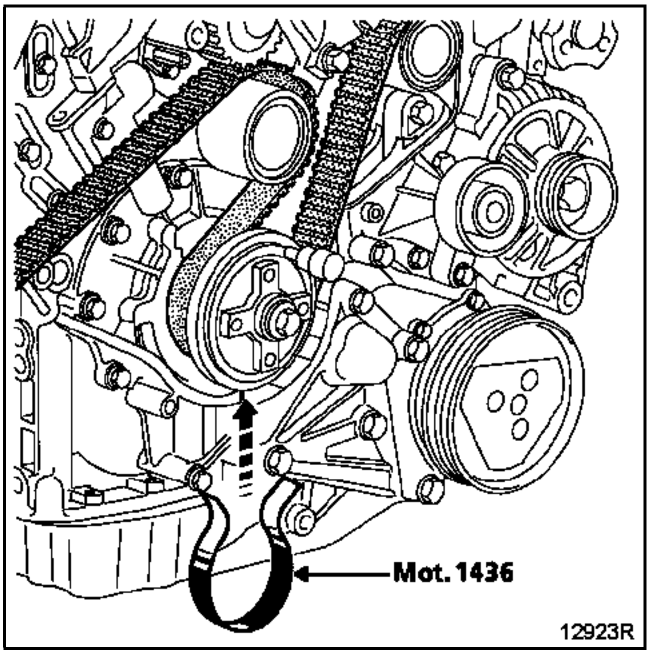
Tighten the bolts (2) to **1 daNm** then slacken them off by 45°.



Turn the camshaft sprockets clockwise until they are up against the slots.

Tighten the bolts (1) to **0.5 daNm** then slacken them off by 45°.

Engage the timing belt on the crankshaft sprocket and lock it in position using the **Mot. 1436** tool.



Position the belt on the tensioner wheel (3), ensuring that the span (D) of the belt is taut.

Turn the camshaft sprocket (4) slightly clockwise, to engage the belt on the sprocket.

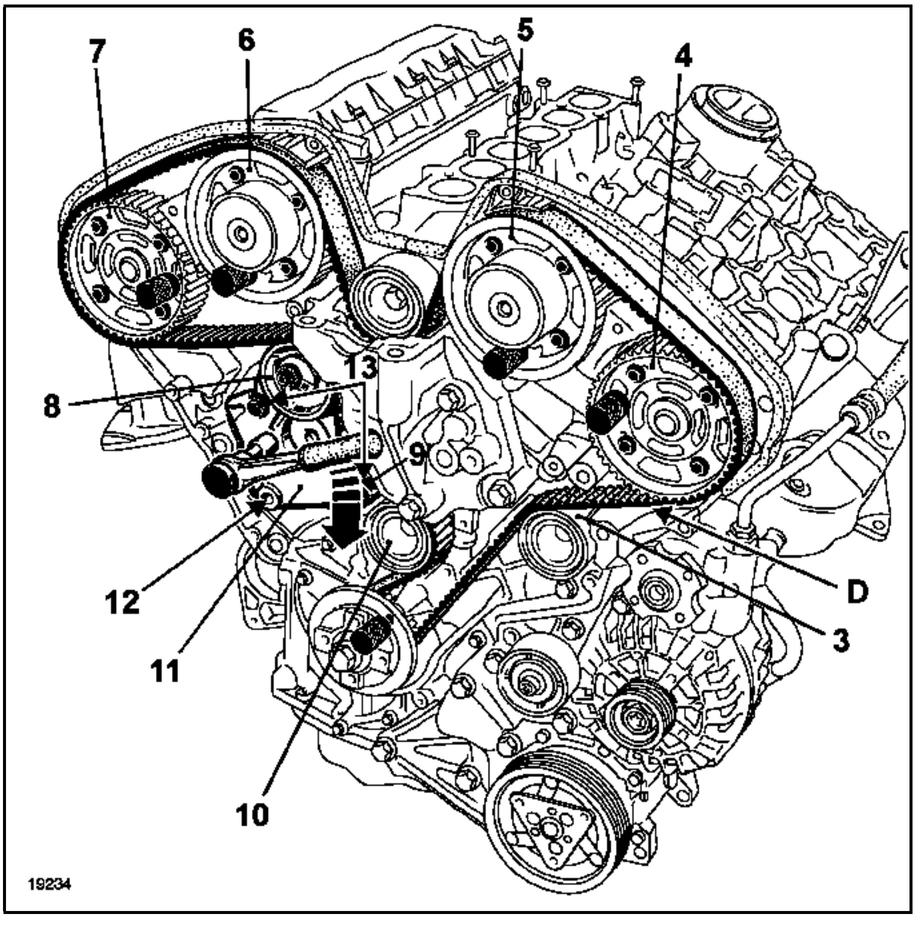
Carry out the same operation for sprockets (5), (6) and (7).

IMPORTANT:
- **The angular displacement of the sprocket with respect to the timing belt must not be more than one tooth.**
- **Verify that the camshaft sprockets are not at the end of the slot; if they are, repeat the timing belt fitting procedure.**

Simultaneously engage the belt on the pulleys (8) and (9) and the sprocket (10).

Pivot the plate (11) using a **9.53 mm** square in order to fit the timing belt, then refit the bolt at (12).

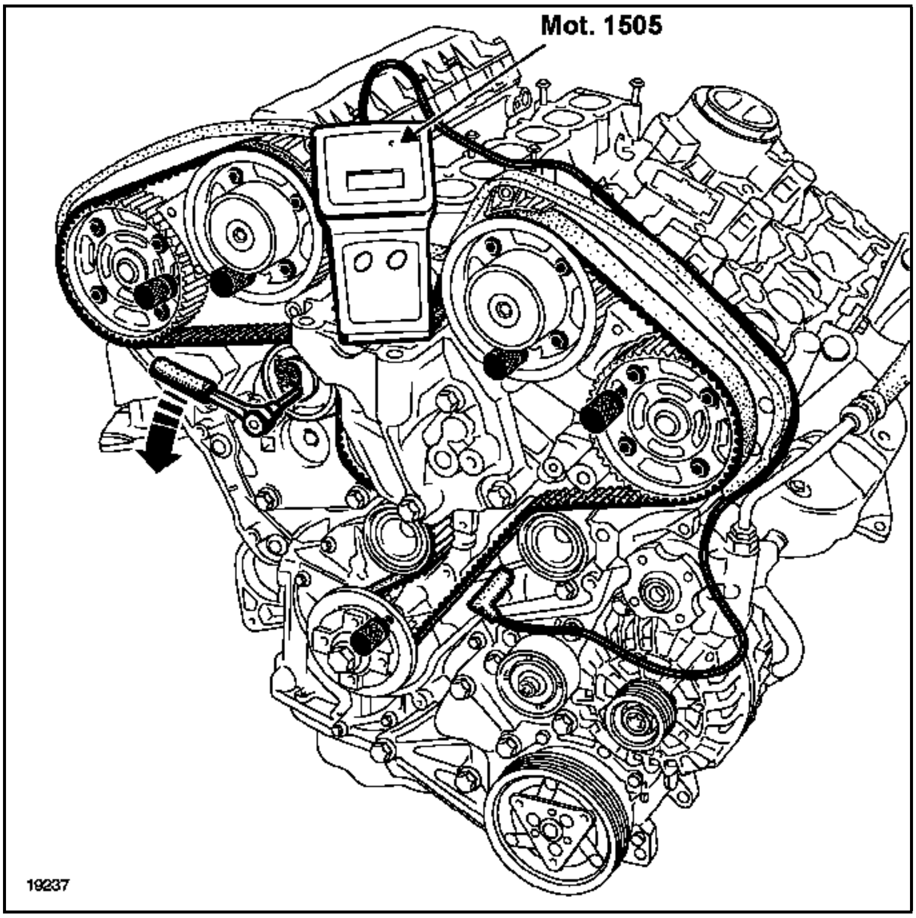
Tighten the bolts (12) and (13) to **2.5 daNm**.



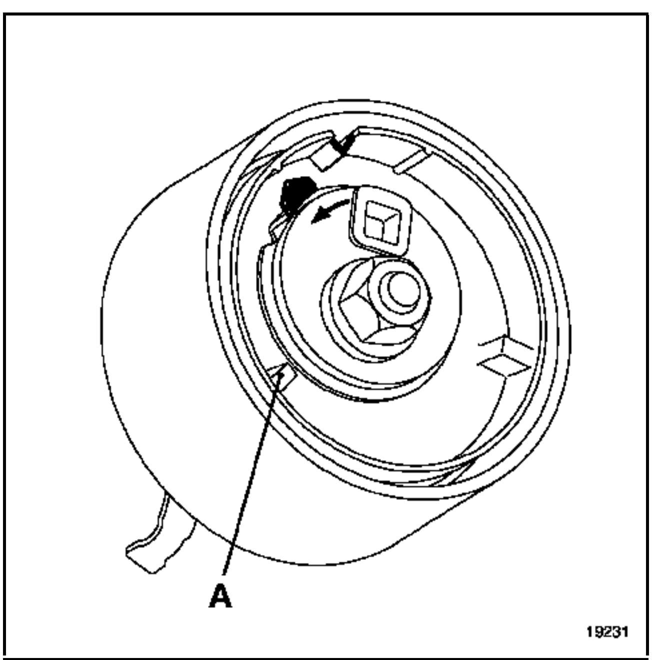
Remove the **Mot. 1436** tool.

Tension the belt with the **Mot. 1505** tool, while turning the tension wheel in the direction of the arrow using a **6.35 mm** square until the recommended fitting value is reached: **106 ± 4 Hz**.

Tighten the tensioner nut to a torque of **1 daNm**.



NOTE: never go past the tensioner stop (A) when turning the tension wheel.



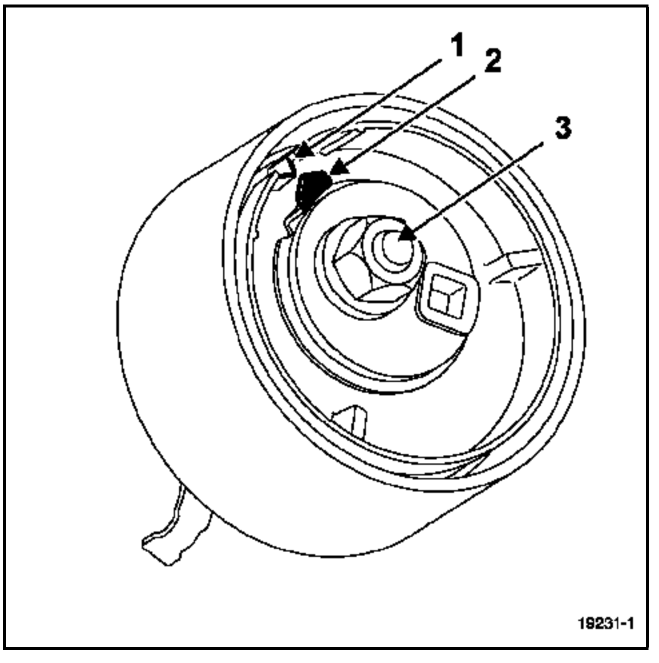
Tighten the camshaft sprocket bolts to **1 daNm** starting with the camshaft (4).

Remove the camshaft and crankshaft timing pins.

Turn the engine over twice.

Position the crankshaft only using a **Mot. 1430** timing pin.

Slacken the tension wheel nut 1/4 of a turn and align the marks (1) and (2), then tighten the nut (3) to **2.5 daNm**.



Remove the crankshaft timing pin.

Turn the engine over twice in the direction of operation.

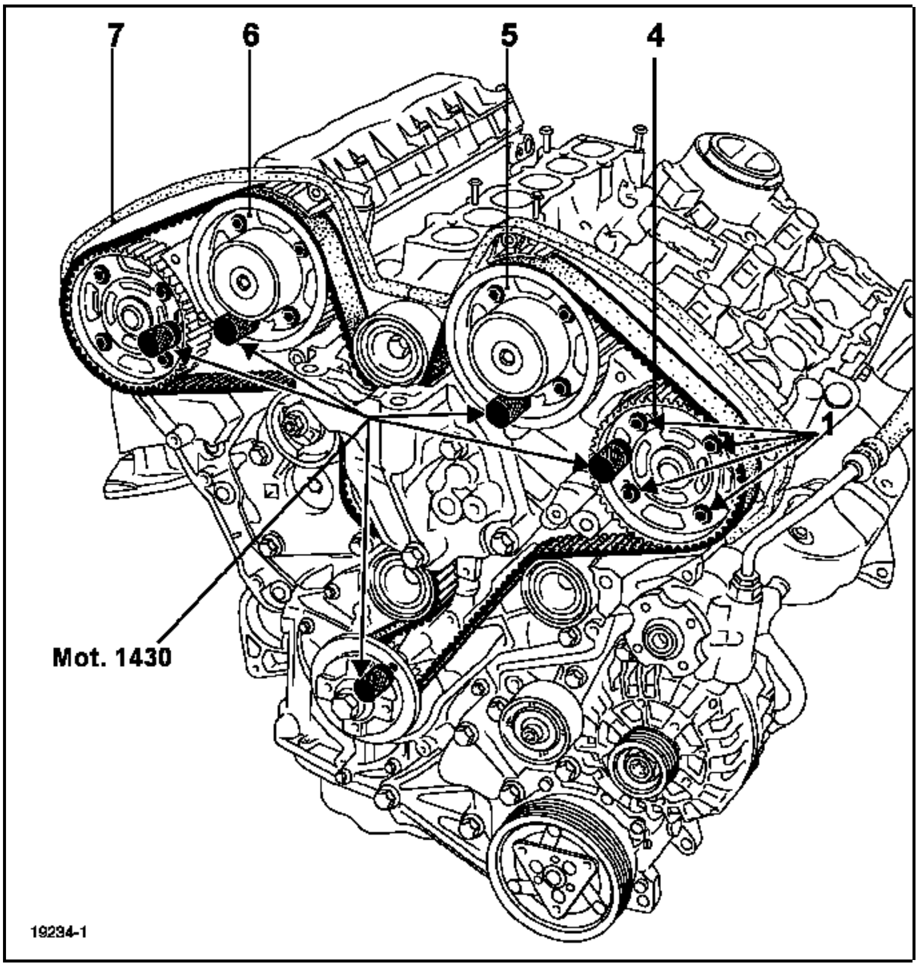
Verify that the tension wheel marks (1) and (2) on the tension wheel are correctly aligned, otherwise repeat the tensioning procedure. To do this, slacken the tension wheel nut by 1/4 of a turn and align the roller marks using a **6.35 mm** square.

Using **Mot. 1430** timing pins, position in order:
– the crankshaft,
– the camshafts (4), (5), (6) and (7).

IMPORTANT:

- if the **Mot. 1430** timing pin will not go into its housing, slacken the camshaft sprocket (1) bolts by 45°.

- if the **Mot. 1430** timing pin will not go into its housing, the camshaft timing operation will be assisted by slackening the bolts (1) by 45° and turning the camshaft hubs using the **Mot. 1428 or Mot. 1555** tools.



Tighten the bolts (1) to **1 daNm** starting with sprocket (4), then (5), (6) and (7).

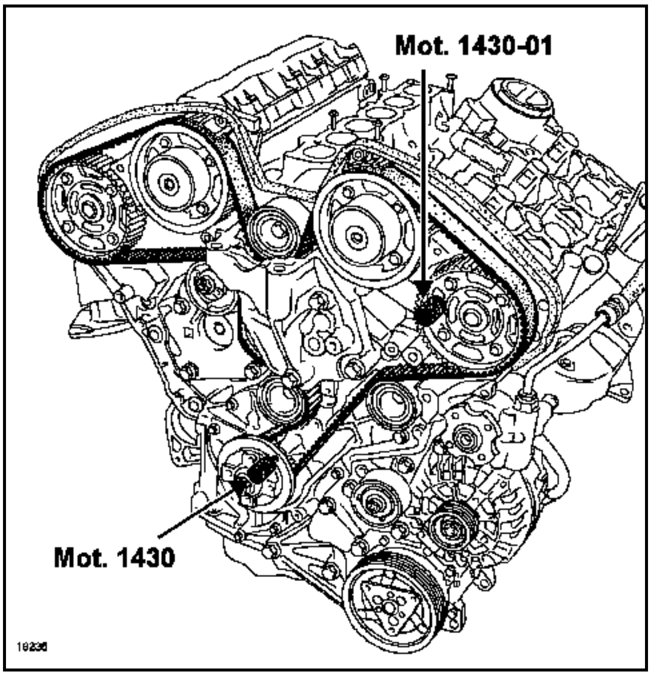
Remove the **Mot. 1430** camshaft and crankshaft timing pins.

CHECKING THE TIMING ADJUSTMENT

Turn the engine over twice.

Insert the **Mot. 1430** crankshaft timing pin.

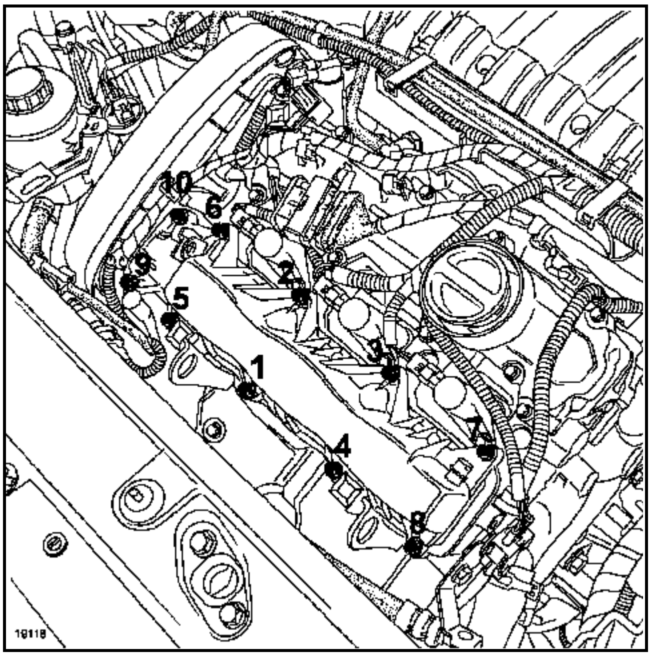
Check that the **Mot. 1430-01** timing check pin fits easily into the cylinder head timing pin holes and butts up against the camshaft sprockets.



If it does not, repeat the timing belt fitting operation.

Remove the crankshaft timing pin.

Finger tighten, then progressively tighten the camshaft cover mounting bolts in the following recommended order:



Tighten the bolts to **1 daNm**.

Refitting is the reverse of removal.

Refit the accessories belt (refer to the method in Section **07 "Accessories belt tension"**).

SPECIAL TOOLING REQUIRED	
Mot. 799-01	Tool for locking pinions for toothed timing belt
Mot. 1202-01 Mot. 1202-02	Pliers for hose clips
Mot. 1367-02	Engine support tool
Mot. 1448	Long nose pliers for hose clips
Mot. 1453	Engine support tool
Mot. 1487	Tool for fitting inlet camshaft sealing plug
Mot. 1488	Tool for fitting exhaust camshaft sealing plug
Mot. 1496	Tool for setting the camshaft
K4M engine:	
Mot. 1489	TDC setting pin
Mot. 1490	Tool for locking the camshaft pulleys
Mot. 1491	Tool for fitting camshaft seals.
F4P engine:	
Mot. 1054	TDC setting pin
Mot. 1509 Mot. 1509-01	Tool for locking the camshaft pulleys
Mot. 1512	Tool for fitting exhaust camshaft seal
Mot. 1513	Tool for fitting the camshaft dephaser solenoid valve seal
Mot. 1517	Tool for fitting inlet camshaft seals

EQUIPMENT REQUIRED
Tool for testing cylinder head Angular tightening wrench

TIGHTENING TORQUES (in daNm and/or °)	
Fixed roller bolt	**4.5**
Crankshaft pulley bolt	**2 + 135°±15°**
Tension wheel nut	**2.8**
Cylinder head bolts	**1.2**
Oil decanter bolts	**1.3**
Engine mounting bolt for the suspended engine mounting cover	**6.2**
Body mounting bolt for the suspended engine mounting movement limiter	**2.1**
Suspended engine mounting upper linkage mounting bolt	**10.5**
Acoustic mass mounting bolt	**2.1**
Lower inlet manifold bolts	**2.1**
Coil bolts	**1.3**
Inlet manifold bolts	**0.9**
Throttle body bolts	**1.5**
Air filter unit bolt	**0.9**
Wheel bolts	**10.5**
F4P engine:	
Exhaust camshaft pulley nut	**3+90°**
Camshaft dephaser bolts	**10**
K4M engine:	
Camshaft pulley nut	**3+84°**

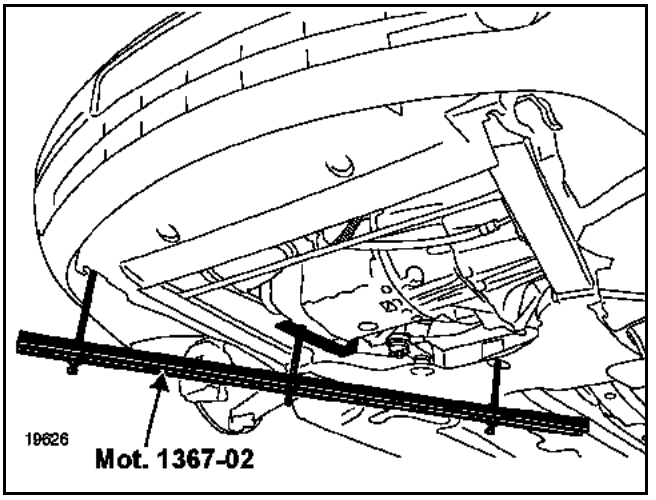
REMOVAL

Put the car on a 2 post lift.

Remove:
- the timing belt (see method described in section **11 "Timing belt"**).
- the engine undertray.

Fit the engine support tool **Mot. 1367-02** between the lower cross member and the right half bracket.

Drain the cooling circuit (through the lower radiator hose).

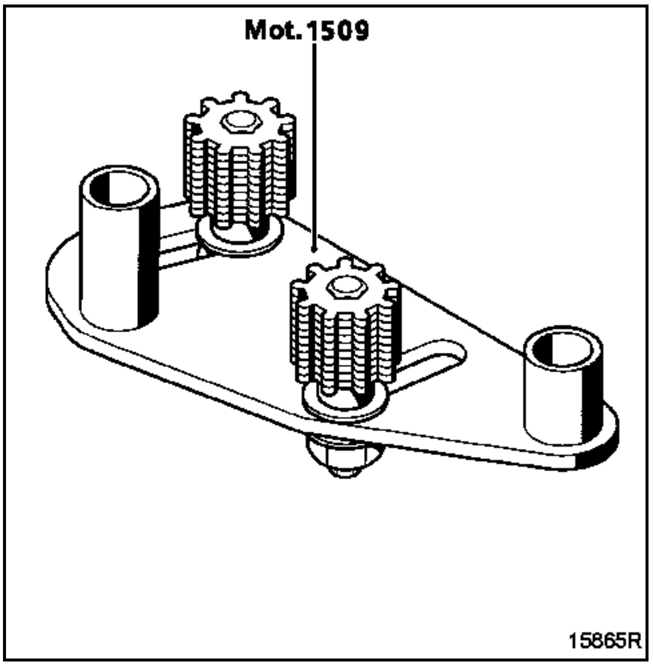


Remove the camshaft pulleys.

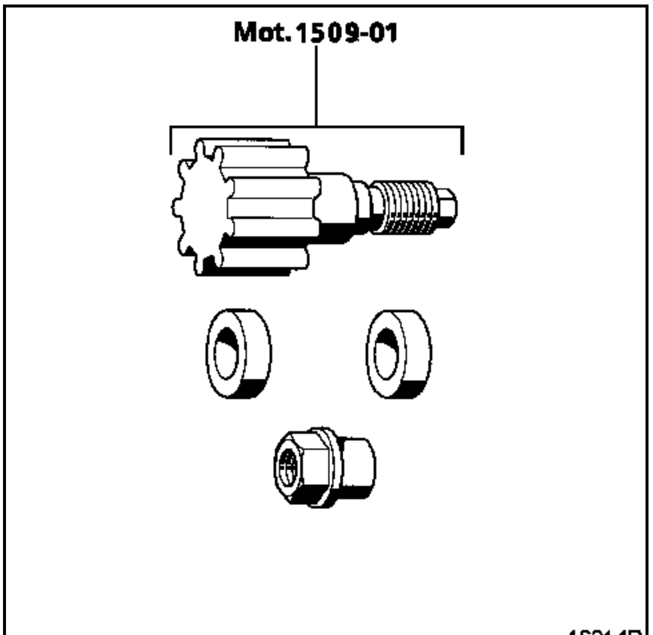
F4P engine

Method for undoing the exhaust camshaft pulley and the inlet camshaft dephaser.

The operation is performed using the **Mot. 1509** and **Mot. 1509-01** tools.



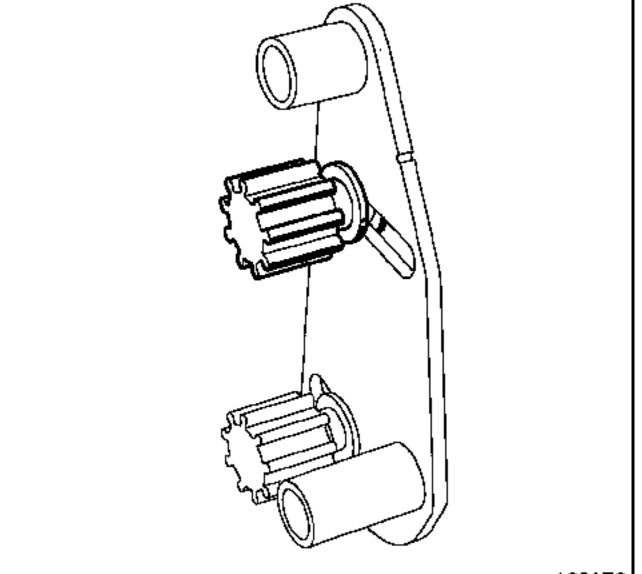
15865R



16014R

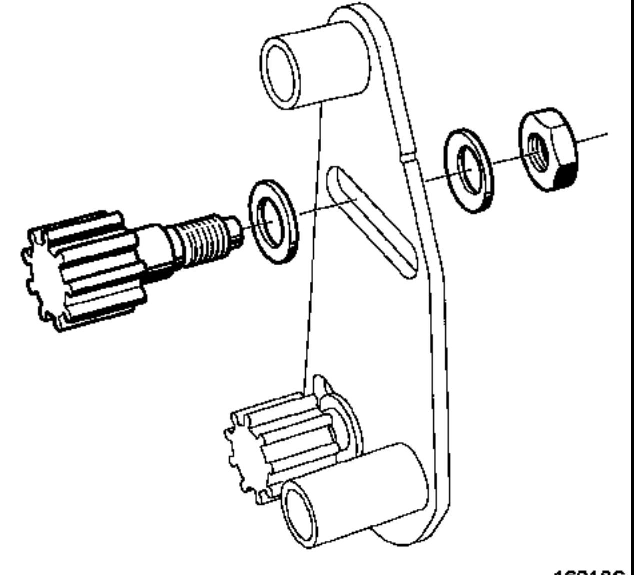
Preparation of the Mot. 1509 tool

Remove the upper toothed pinion from the bracket.



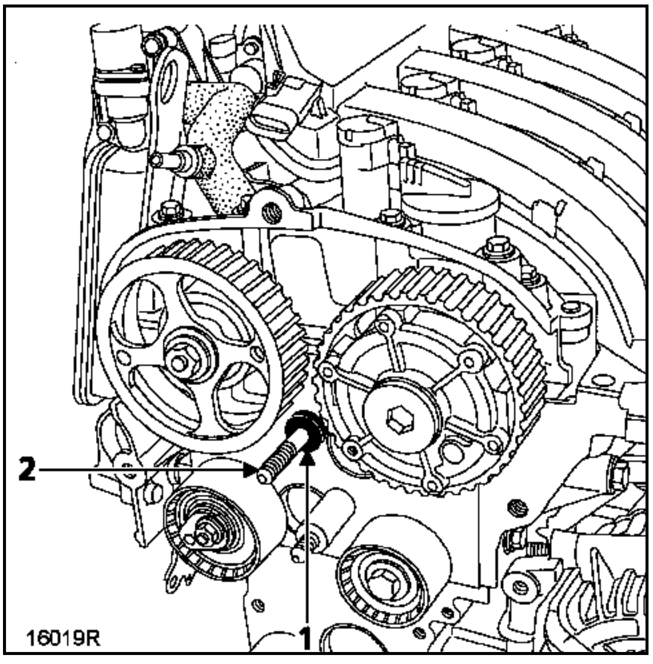
16017S

Replace it with the toothed pinion of the **Mot. 1509-01** tool (reusing the two washers and the nut of the **Mot. 1509**) tool.

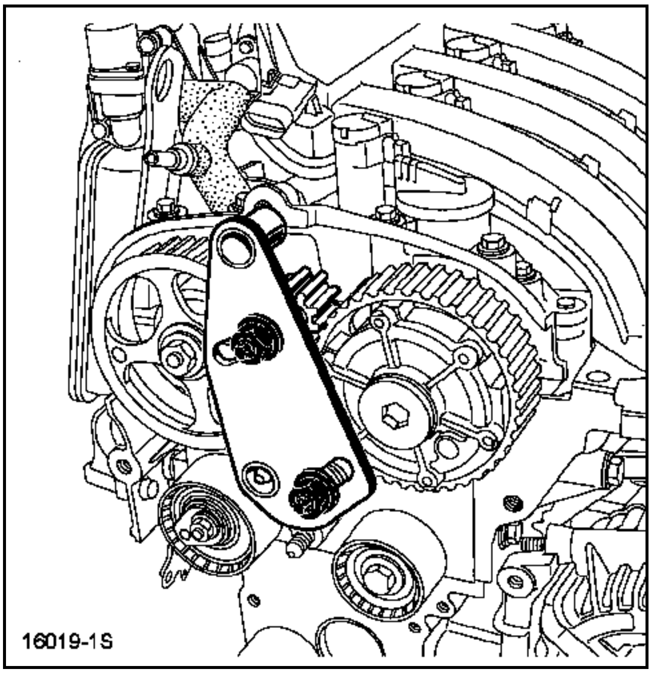


16018S

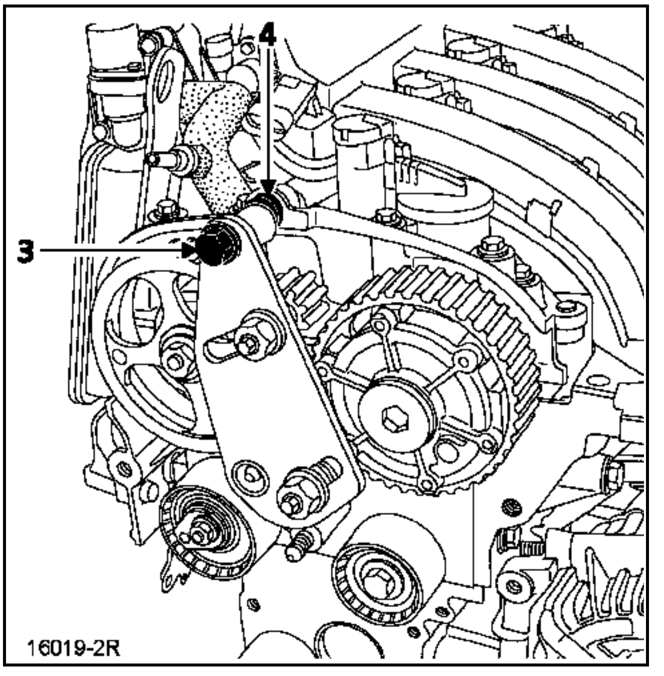
Fit:
– the spacer (1) of tool **Mot. 1509-01** on the stud (2),



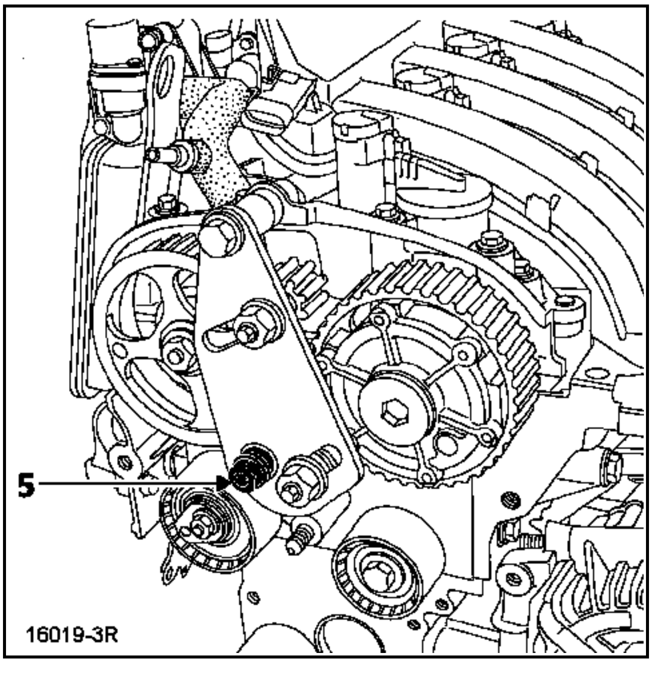
– tool **Mot. 1509** as shown in the diagram below,



– the upper bolt (3) whilst positioning the spacer (4) of tool **Mot. 1509-01** between the tool and the camshaft bearing cap housing **(do not lock the bolt)**.

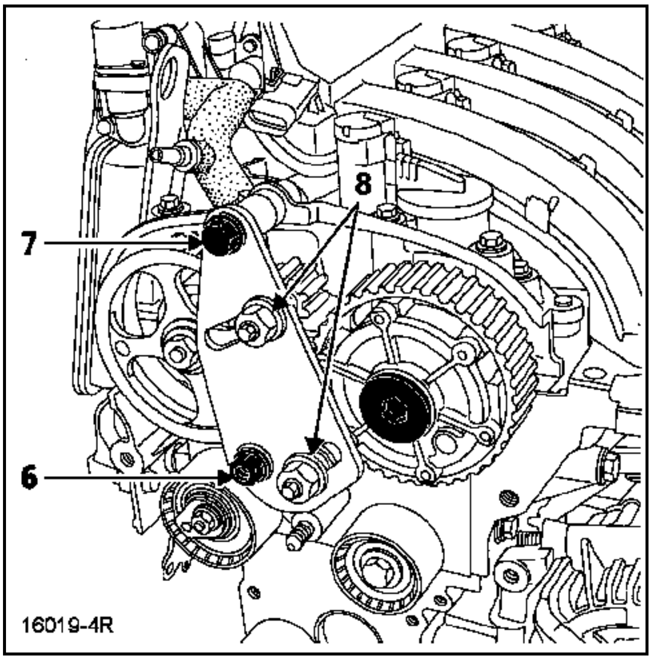


– the shouldered nut (5) of tool **Mot. 1509-01**.

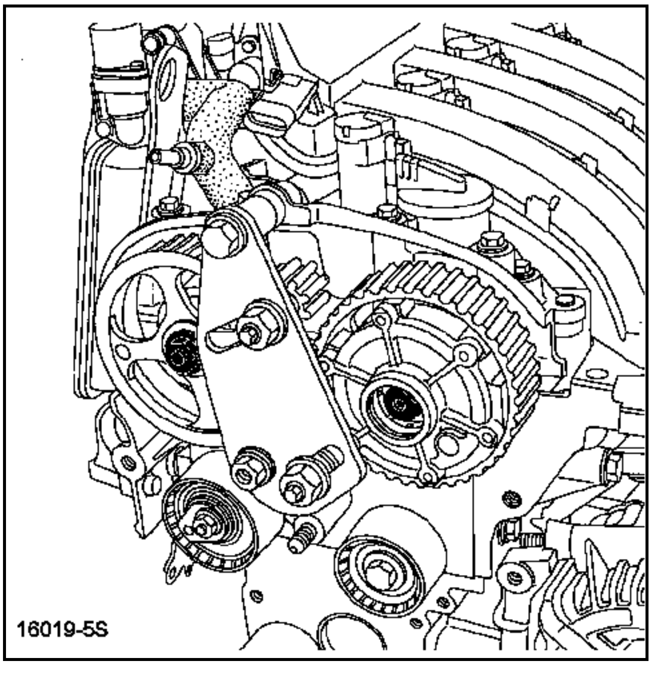


Tighten the shouldered nut (6) and the bolt (7), then bring the pinions of tool **Mot. 1509** into contact with the camshaft pulleys while tightening the nuts (8) to a torque of **8 daNm.**

Remove:
– the blanking plate of the inlet camshaft dephaser using a **14 mm** Allen key,

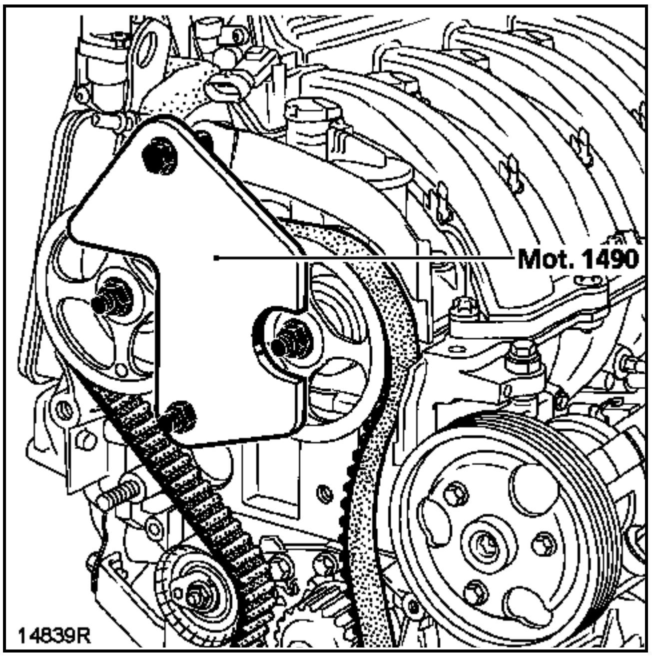


– the nut of the exhaust camshaft pulley,
– the bolt of the inlet camshaft dephaser.

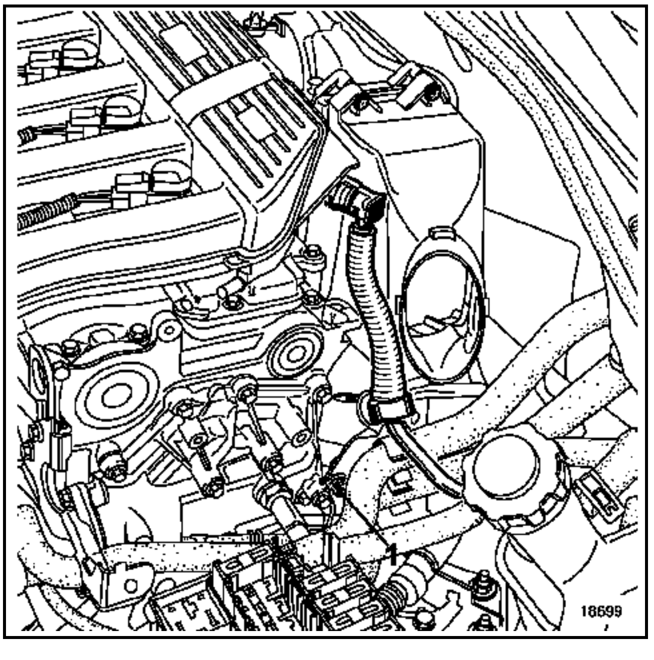


K4M engine

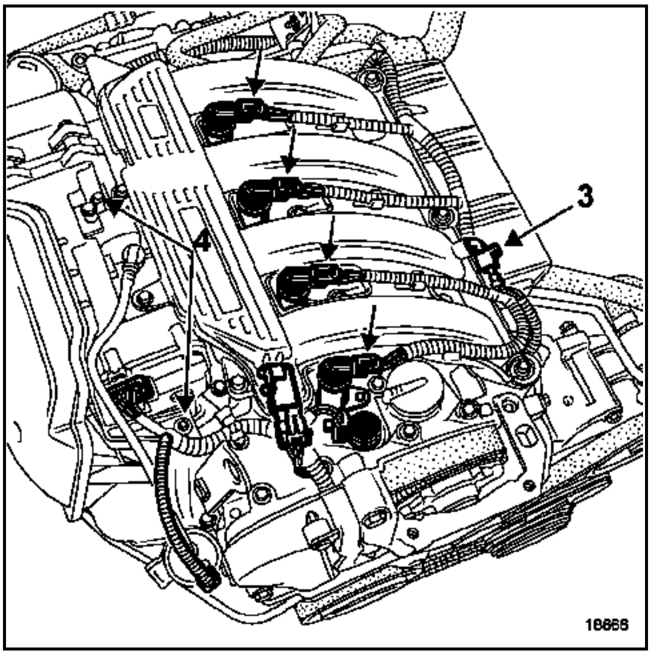
Remove the camshaft pulleys using tool **Mot. 1490** (use the timing cover bolts to attach tool **Mot. 1490**).

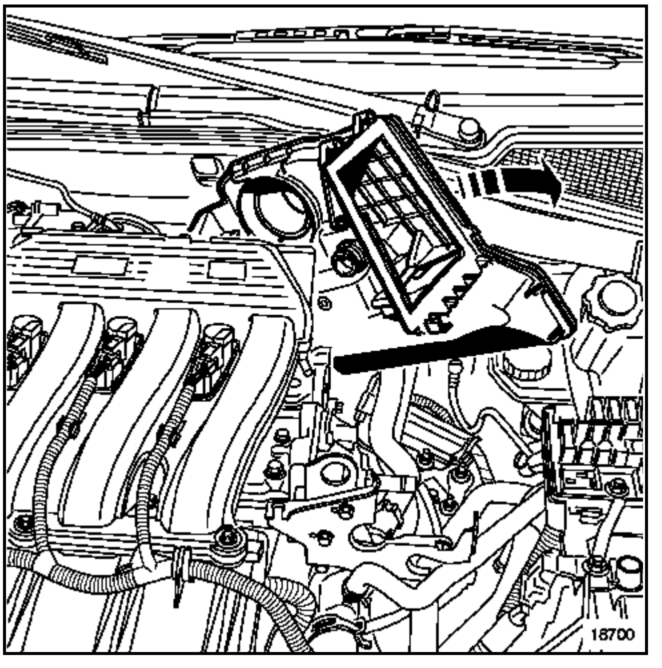


Remove:
– the accelerator cable,
– the injection rail protector,
– the fuel supply pipe to the injector rail and move it to one side,
– the lug mounting (1) and move it to one side.



Disconnect:
– the connector (3) and the ignition coil connectors,
– the vacuum pipe from the brake servo to the inlet manifold,
– the air housing at (4).

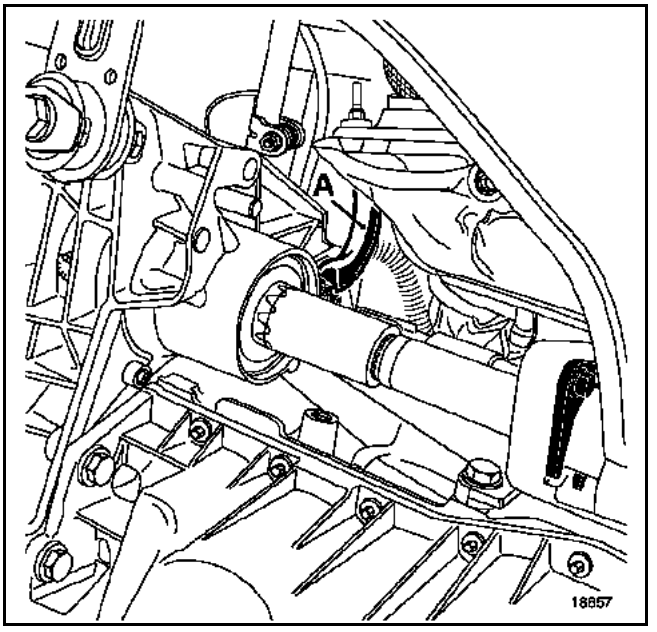




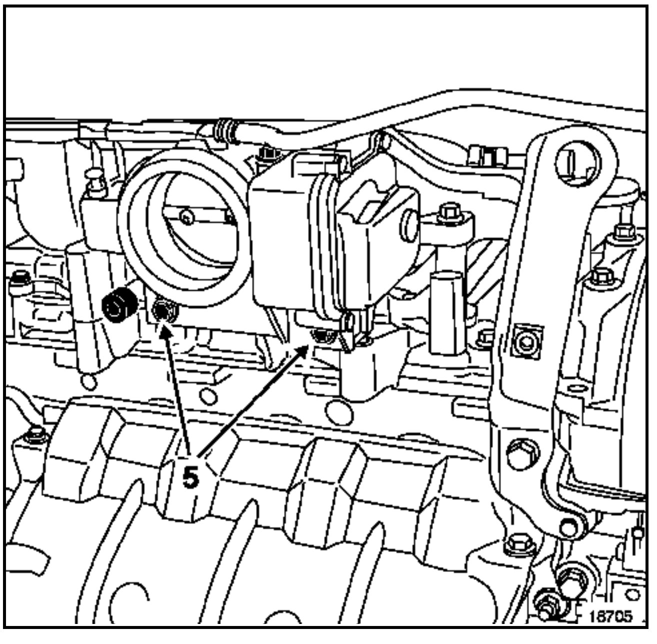
NOTE: inspect the vacuum outlet going from the inlet manifold to the brake servo. The manifold must be replaced if this outlet is broken.

Move the air filter unit to the right in order to remove it. The air filter unit can pass between the windscreen aperture, the engine and the brake servo.

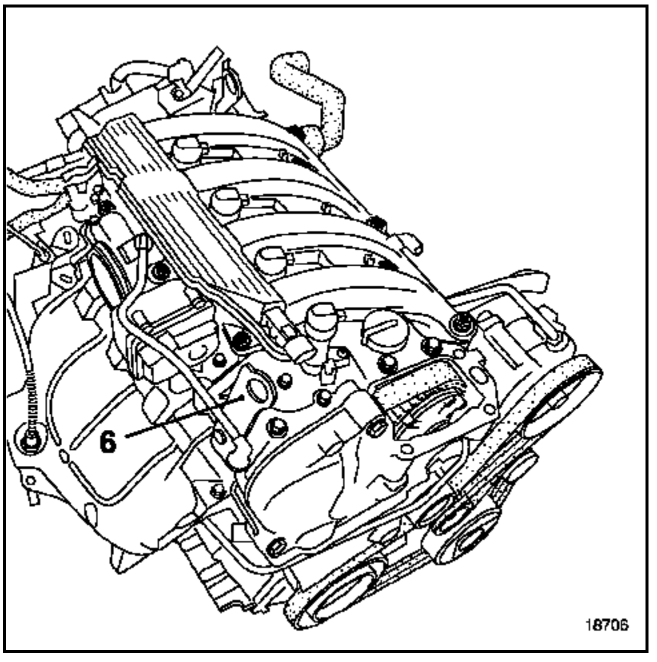
Remove:
– the stay (A),



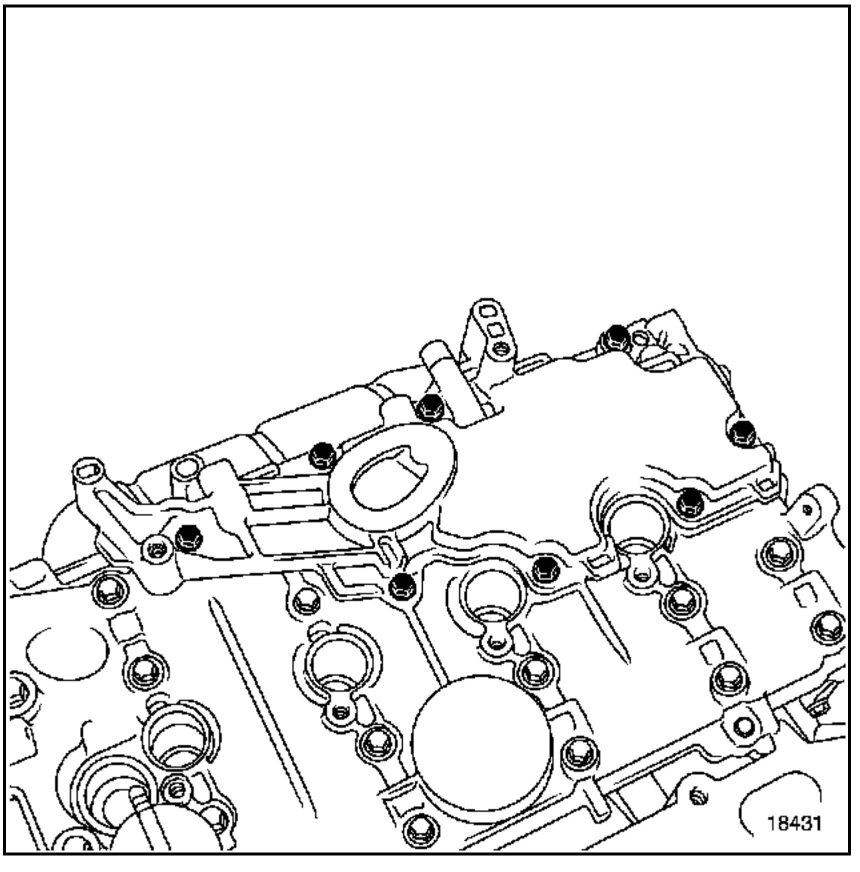
– the exhaust downpipe,
– the throttle body at (5),



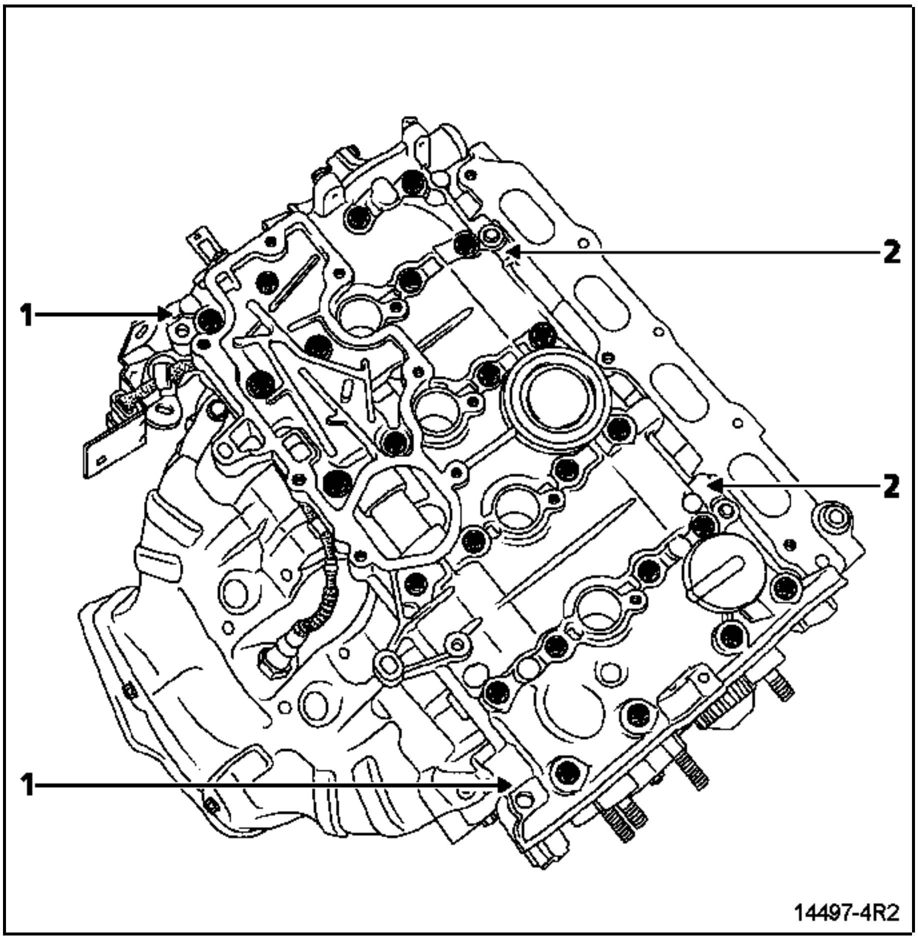
– the oxygen sensor connector of the catalytic converter,
– the lifting bracket (6),
– the inlet manifold,



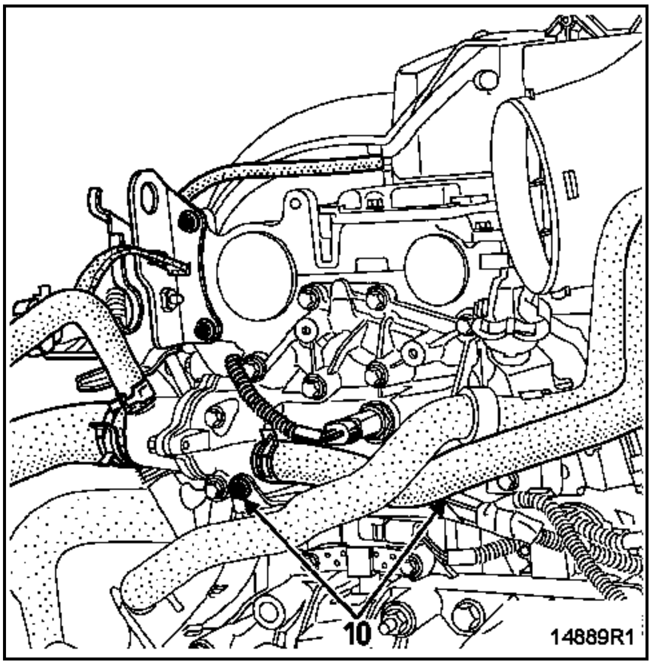
– the ignition coils,
– the oil decanter,



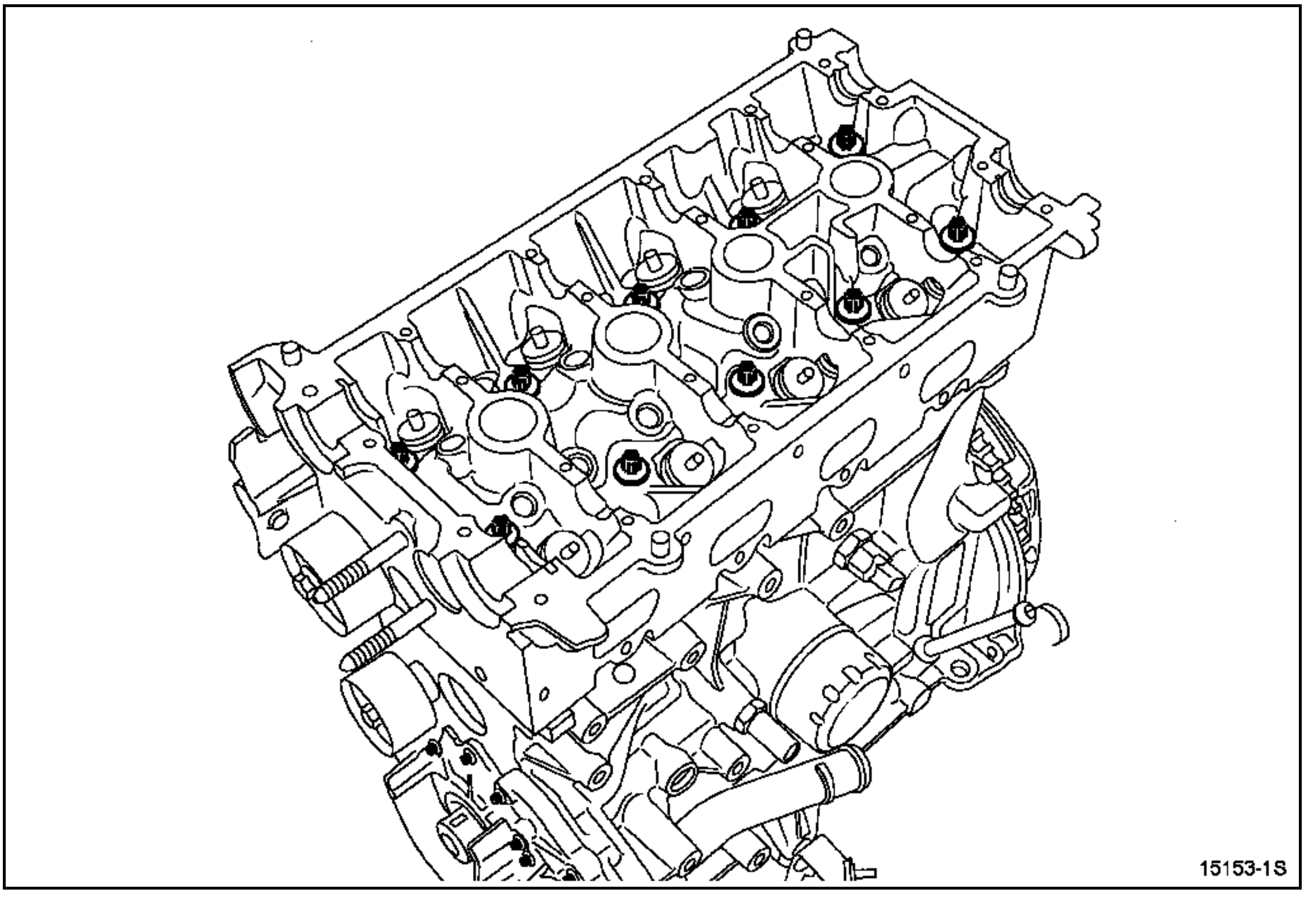
- the lifting bracket on the flywheel side,
- the bolts of the cylinder head cover, then release it vertically by tapping on the "**lugs**" at (1) using a copper hammer and lever it using a screwdriver at (2) (protect the screwdriver to avoid damaging the aluminium surfaces).



– the camshafts and the valve rockers,
– the cylinder head coolant outlet housing hoses and the coolant temperature sensor connector,
– the mountings of the wiring harness bracket at (10),



– the cylinder head.



CLEANING

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

Use the **Décapjoint** product to dissolve any remains of the gasket still adhering.

Wear gloves whilst carrying out the following operation:
Apply the product to the parts to be cleaned; wait about ten minutes, then remove it using a wooden spatula.

Please take the greatest care during this operation to prevent the entry of foreign bodies into the oil galleries (channels located in the cylinder block and in the cylinder head).

CHECKING THE GASKET FACE

Check that there is no gasket face bow.

Maximum bow: **0.05 mm**.

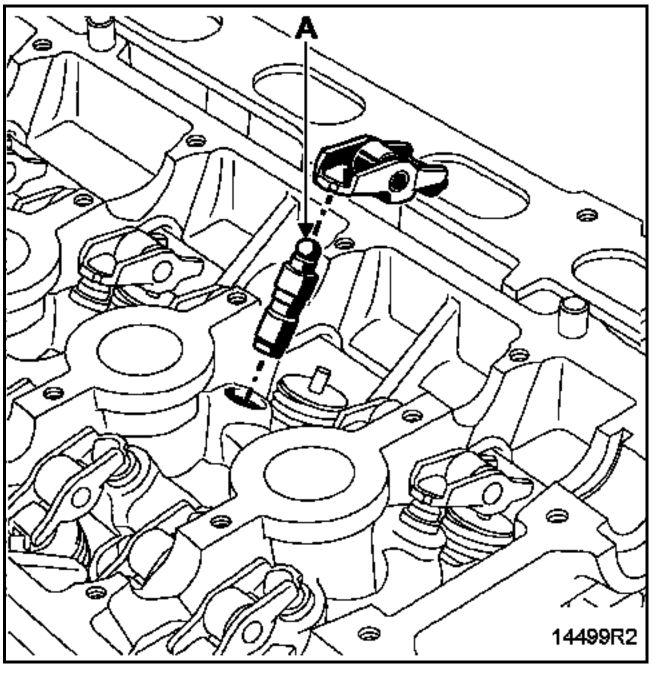
No regrinding of the cylinder head is permitted.

Test the cylinder head to detect possible cracks using the cylinder head test tools (a container and a kit for the particular cylinder head, plug, sealing plate, blanking plate).: The approval number of the cylinder head test container is **664000.**

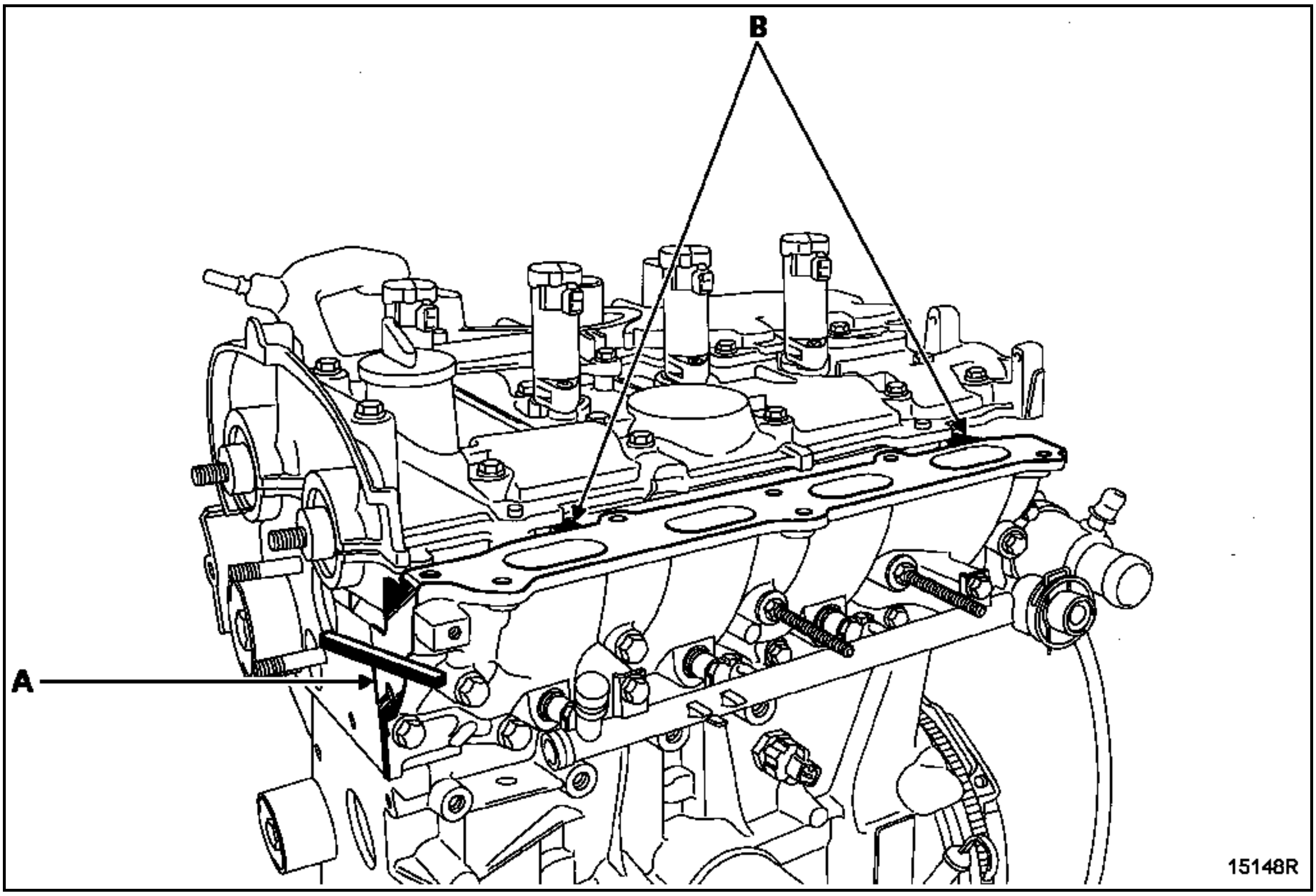
REFITTING

Observe the following points when dismantling and refitting the cylinder head:

- **It is essential to re-prime the hydraulic tappets as these may become drained if left for too long. To check whether a tappet needs repriming, press the top of the tappet at (A) with your thumb and if the tappet piston can be pressed down, immerse the tappet in a container filled with diesel then refit it.**



– Check:
- **that the exhaust heat shield is correctly positioned between the oxygen sensor and the manifold (to prevent a chimney effect which could damage the wiring of the upstream sensor),**
- **the alignment (A) between the lower inlet manifold and the cylinder head (timing side), ensuring that the tabs (B) are making proper contact with those of the cylinder head cover.**

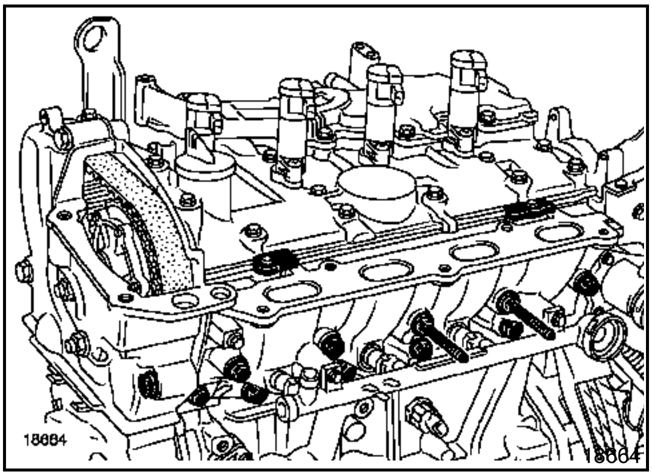


The lower inlet manifold must be tightened to a torque of **2.1 daNm**.

Position the pistons at mid-stroke to prevent any contact with the valves when the camshafts are being refitted.

Position the cylinder head gasket then the cylinder head.

Check the bolts then tighten the cylinder head (see Section 07 "Tightening the cylinder head").



Refit:
– the valve rockers,
– the camshafts, oiling the bearings.

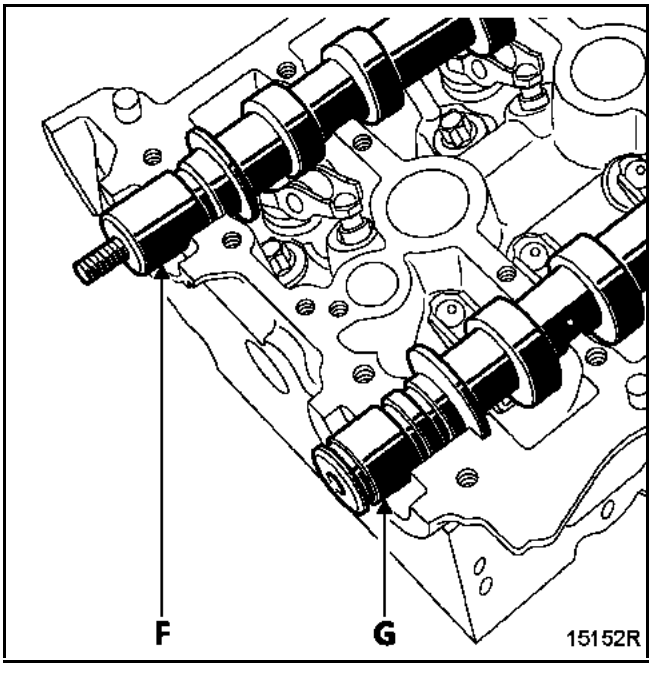
IMPORTANT: do not put oil on the gasket face of the cylinder head cover.

F4P engine

The camshafts are identified by the pulley mountings.

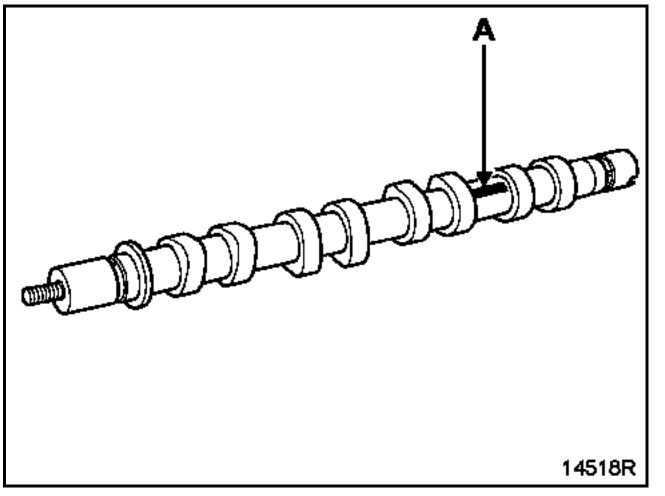
Detail of the pulley mountings:

F exhaust camshaft
G inlet camshaft

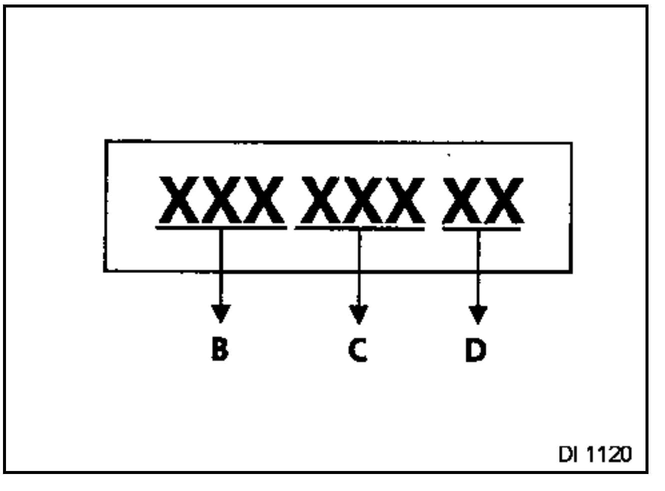


K4M engine

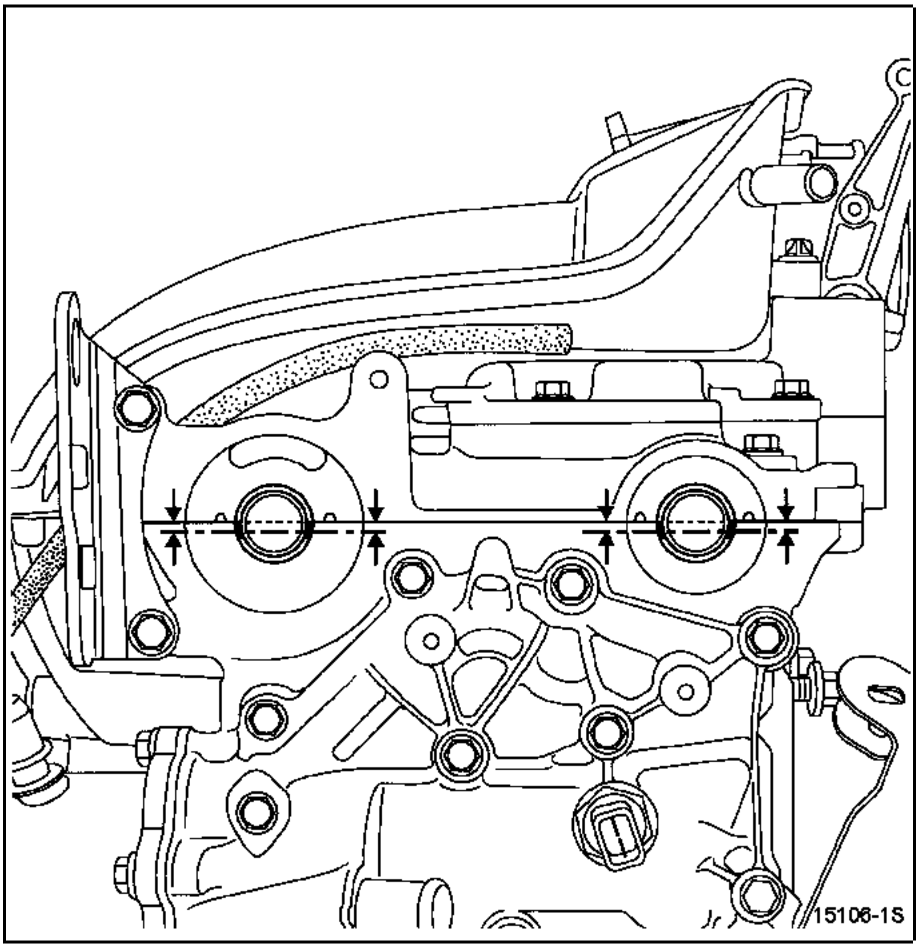
The camshafts are identified by a marking (A).



Detail of the marking:
– the marks (B) and (C) are intended for the supplier only,
– the mark (D) is used for identifying the camshafts:
AM = Inlet
EM = Exhaust

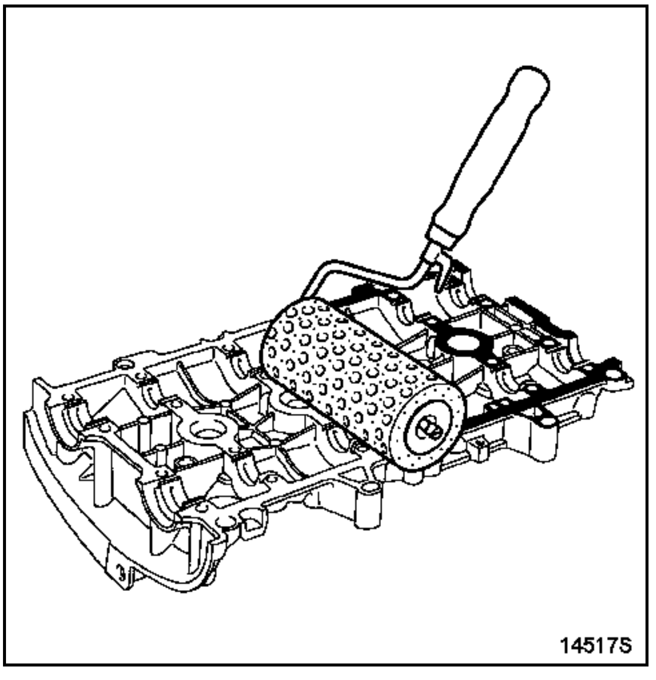


Position the grooves of the camshafts as shown in the diagram below:



NOTE: the gasket faces must be clean, dry and free from grease (avoid finger marks).

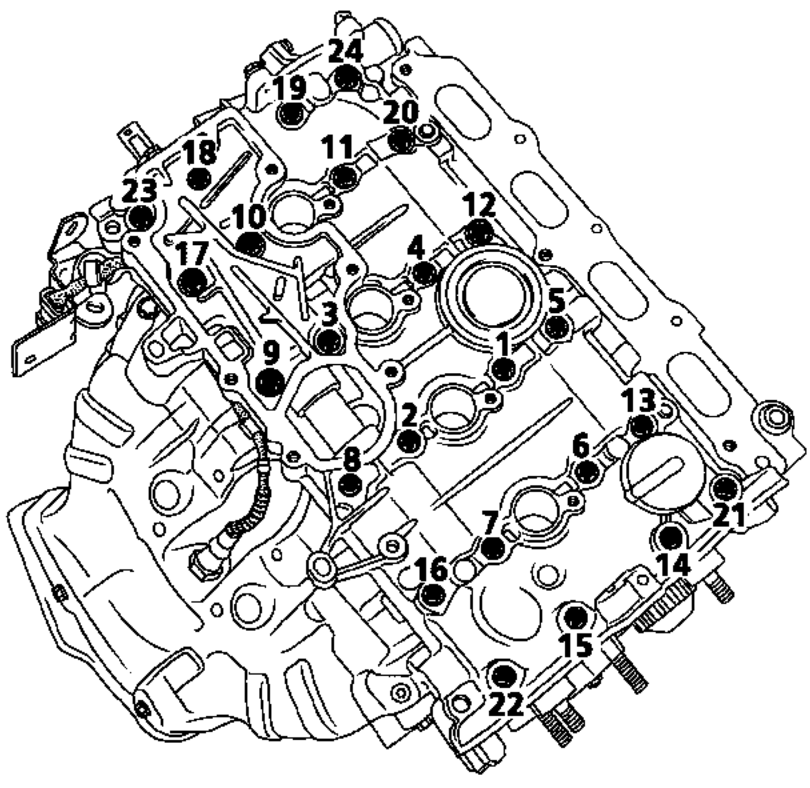
Using a stipple roller, apply **Loctite 518** to the gasket face of the cylinder head cover until it turns **reddish in colour**.



Fit the cylinder head cover tightening it to the correct torque.

Tightening procedure

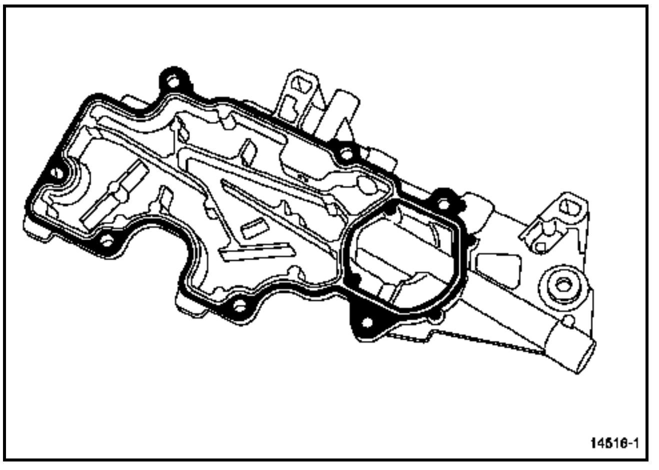
Assembly	Bolt tightening order	Bolt slackening order	Tightening torques (in daNm)
Operation no. 1	22-23-20-13	-	0.8
Operation no. 2	1 to 12 14 to 19 21 and 24	-	1.2
Operation no. 3	-	22-23-20-13	-
Operation no. 4	22-23-20-13	-	1.2



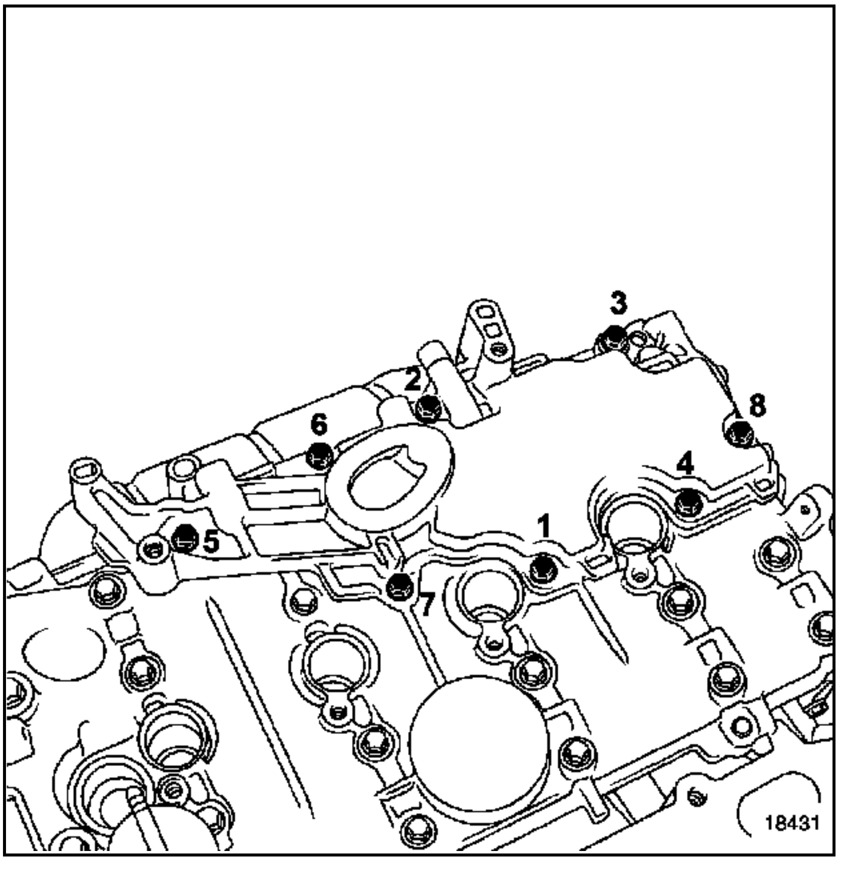
14497-4R1

NOTE: the gasket faces must be clean, dry and free from grease (avoid finger marks).

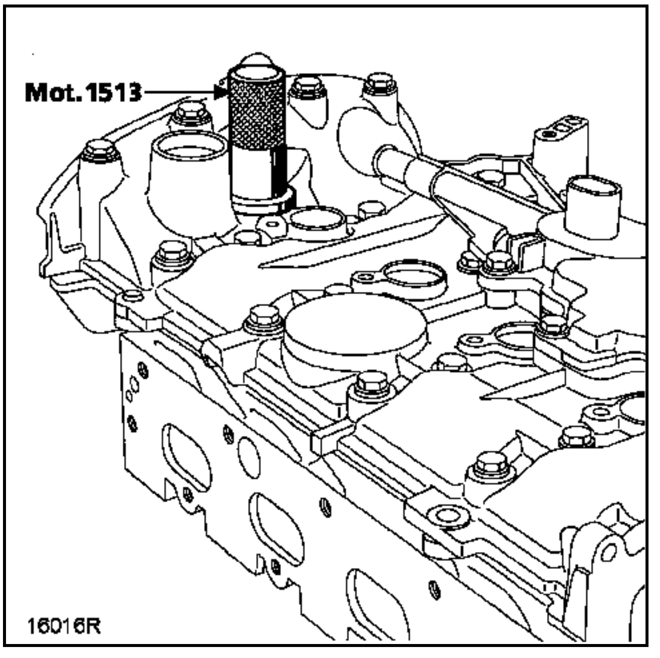
Using a stipple roller, apply **Loctite 518** to the gasket face of the oil decanter until it turns **reddish in colour**.



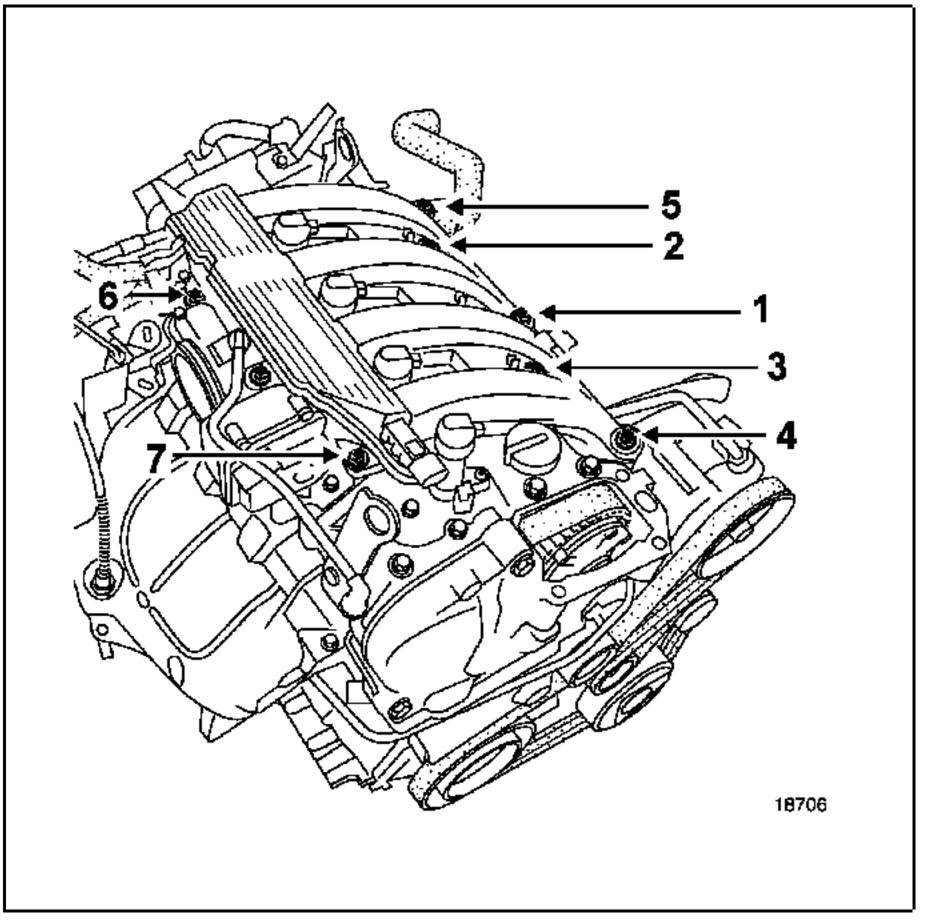
Fit the oil decanter and tighten it to a torque of **1.3 daNm** in the recommended order.



The control valve seal ***(F4P engine)*** is replaced using the **Mot. 1513** tool torque.



Refit:
- the coils, tightening them to **1.3 daNm**,
- the inlet manifold (fitted with new seals), tightening it to **0.9 daNm** in the recommended order,

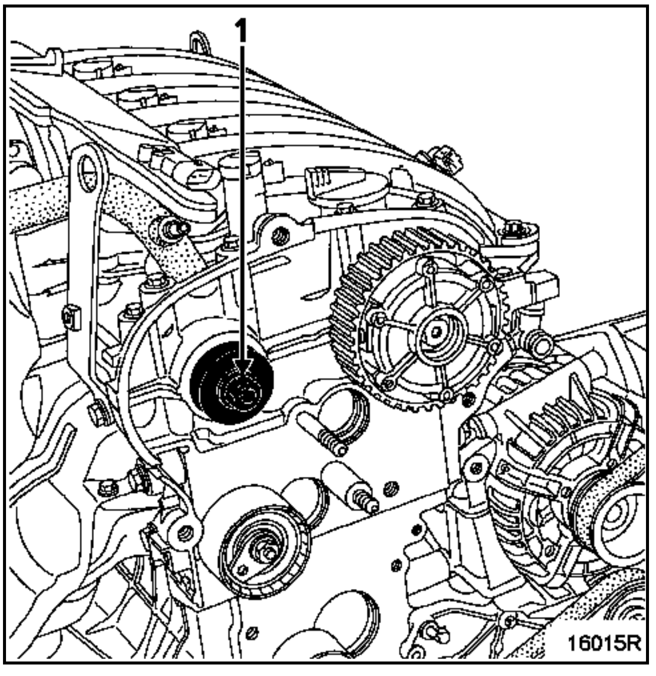


- the throttle body, tightening the bolts to **1.5 daNm**,
- the air filter unit, tightening the bolts to **0.9 daNm,**

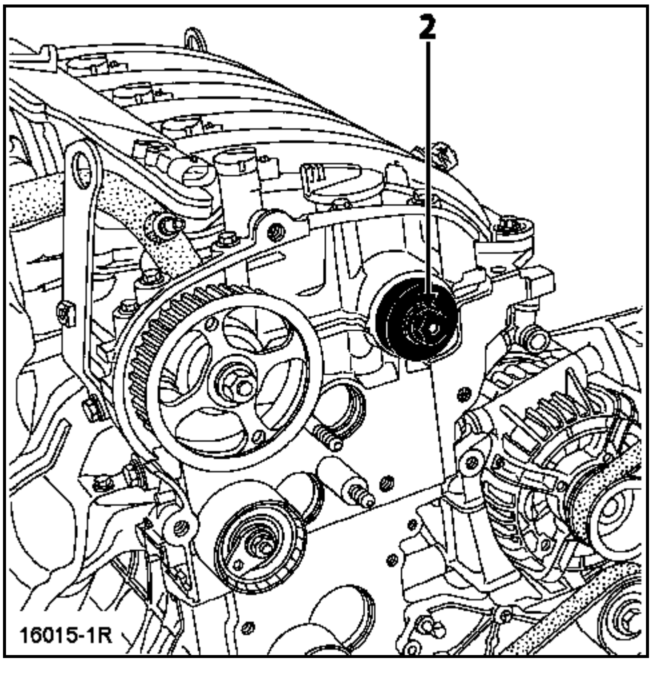
Replacing the camshaft seals

F4P engine

Fitting the **exhaust camshaft** seal, using tool **Mot. 1512** and using the old nut (1).



Fitting the seal of the **inlet camshaft dephaser** using tool **Mot. 1517** and the old bolt (2).

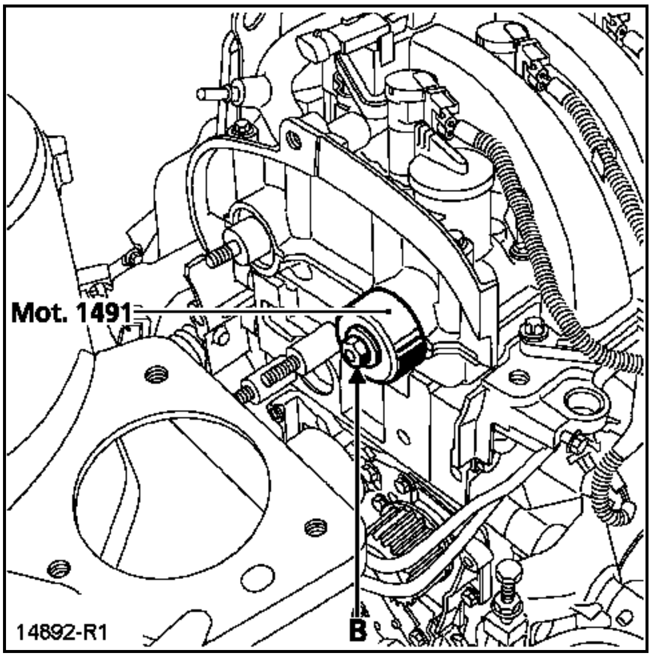


NOTE: to use tool **Mot. 1517**, the hole must be modified to a diameter of **13 mm**.

K4M engine

Fitting the camshaft seals using tool **Mot. 1491**.

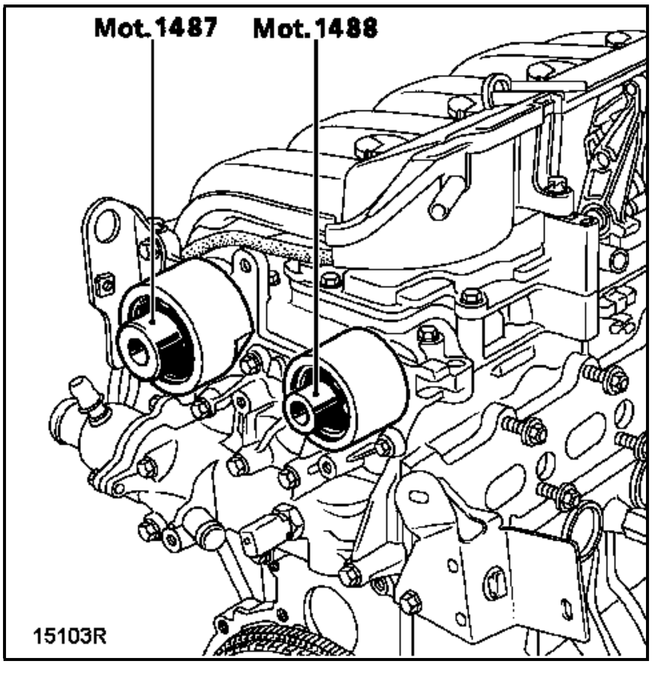
Use the old nuts (3).



Adjusting the timing

IMPORTANT: it is essential to degrease the tip of the crankshaft, the bore of the timing pinion, the bearing faces of the pulley, the ends of the camshafts (timing side) and the bores of the camshaft pinions to prevent the timing from slipping, which could damage the engine.

Refit:
– the timing belt (following exactly the method described in Section **07 "Timing belt tensioning procedure"**),
– the accessories belt (see section **07 "Accessories belt tension"**),
– the new sealing plugs:
  ● of the inlet camshaft **(Mot. 1487)**,
  ● of the exhaust camshaft **(Mot. 1488)**.



– the right hand suspended engine mounting, tightening it to the correct torque (see Section **19 "Suspended engine mounting"**).

Refitting is the reverse of removal.

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

SPECIAL TOOLING REQUIRED		
Mot.	1054	TDC setting pin
Mot.	1202 -01	Hose clip pliers
Mot.	1202-02	
Mot.	1367-02	Engine support tool
Mot.	1448	Long nose pliers for hose clips
Mot.	1453	Engine support tool
Mot.	1505	Tool for measuring belt tension

EQUIPMENT REQUIRED
Tool for testing cylinder head
14 Torx socket
Angular tightening wrench
55 Torx socket

TIGHTENING TORQUES (in daNm and/or°)	
Tension wheel nut	5
Crankshaft pulley bolt	2+115° ±15°
Suspended engine mounting upper linkage mounting bolt	10.5
Engine mounting bolt for the engine suspension mounting cover	6.2
Body mounting bolt for the suspended engine mounting movement limiter	2.1
Acoustic mass mounting bolt	2.1
Engine tie-bar mounting bolt:	
* on engine:	10.5
*on sub-frame:	12
Wheel bolts	10.5

REMOVAL

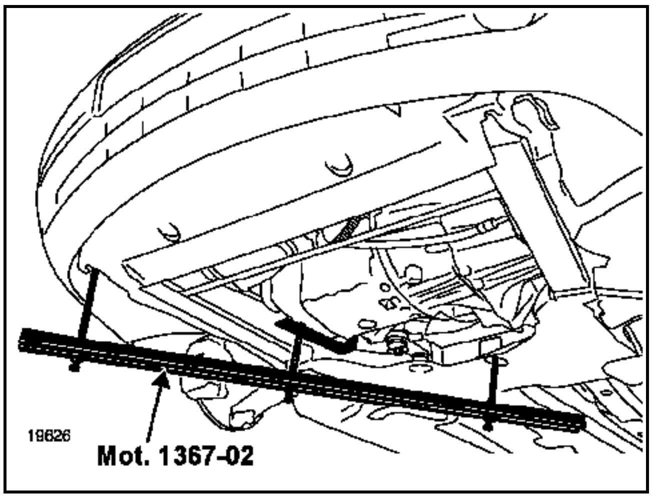
Put the car on a 2 post lift.

Disconnect the battery.

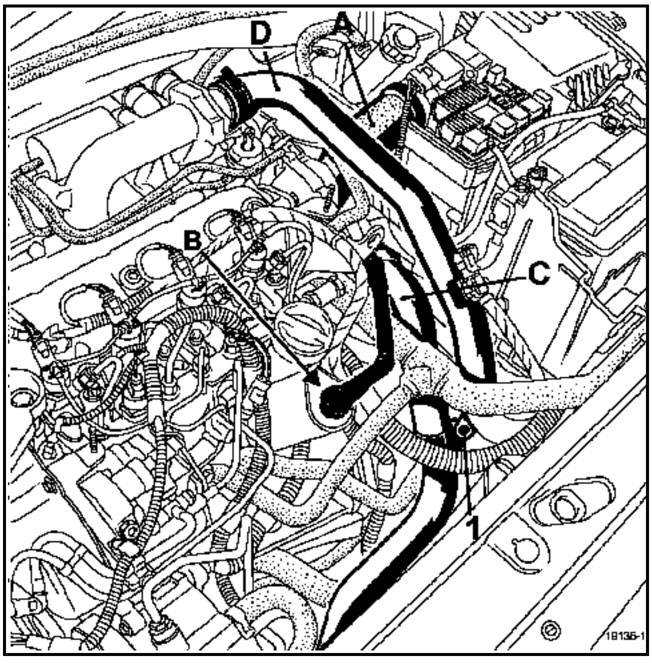
Drain the cooling circuit through the lower radiator hose.

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

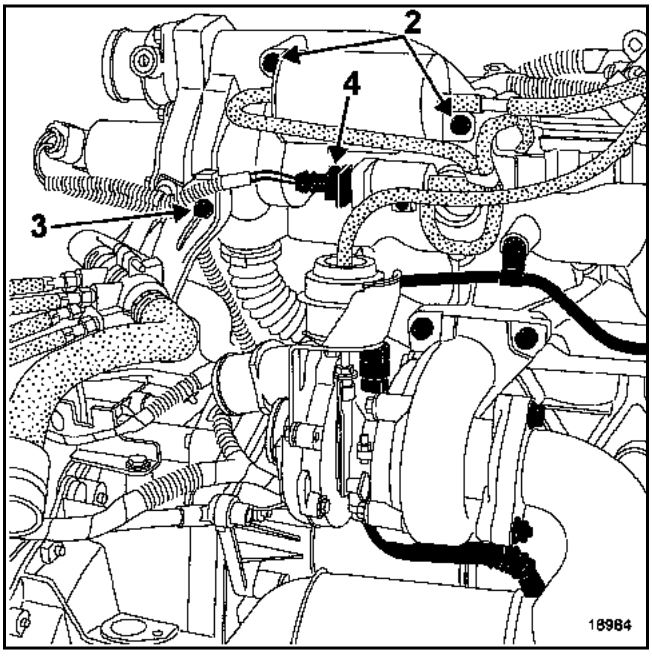
Fit the engine support tool **Mot. 1367-02** between the lower cross member and the left side half bracket.



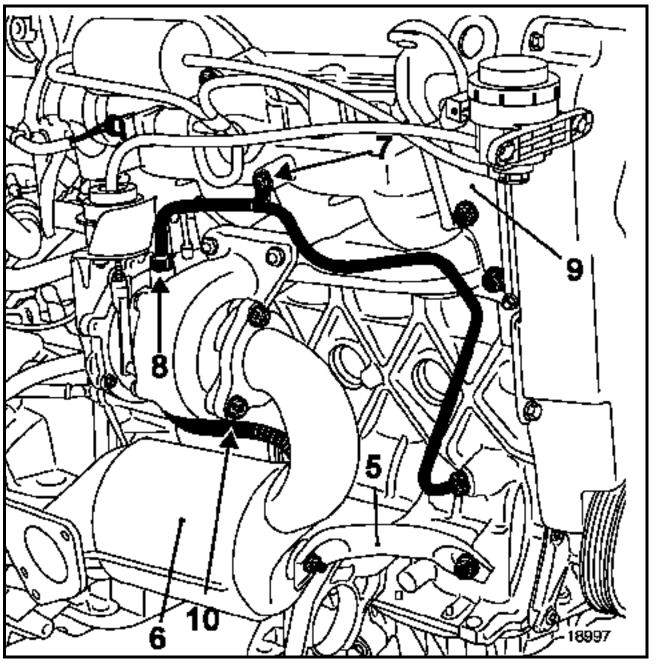
Remove:
- the engine support tool **Mot. 1453**.
- the brake servo vacuum pipe,
- the air hose (A), disconnecting the hose (B) to the oil vapour rebreathing tank.
- the air filter unit,
- the mounting (1),
- the air ducts (C) and (D) to the turbocharger and the inlet manifold respectively, moving them to one side,



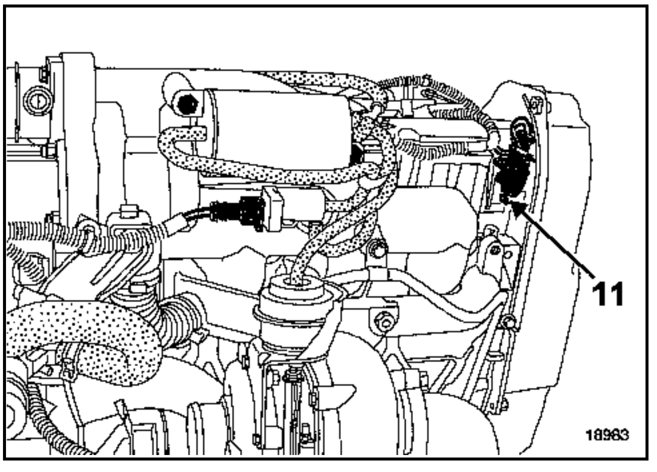
- the vacuum tank mountings (2),
- the mounting (3) and connector (4),



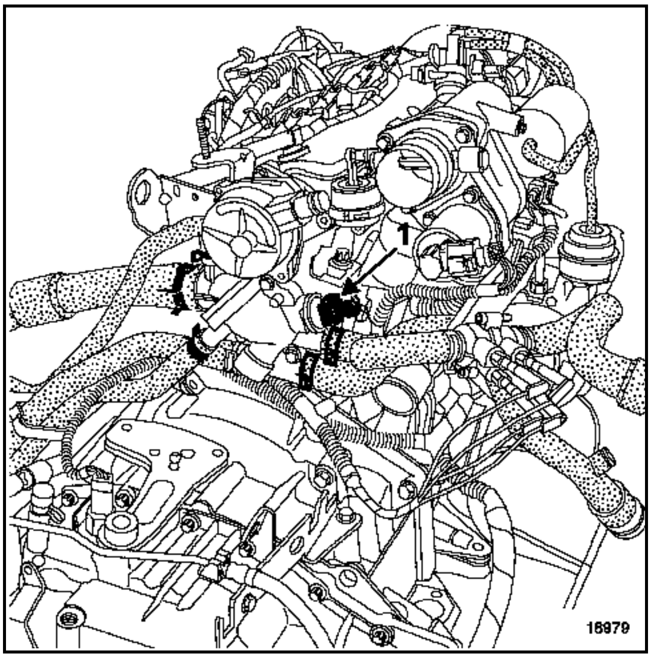
- the stay (5) then the catalytic converter (6),
- the mounting (7) then the oil supply pipe at (8), moving it towards the scuttle panel,
- the lifting bracket (9),
- the oil return pipe (10),



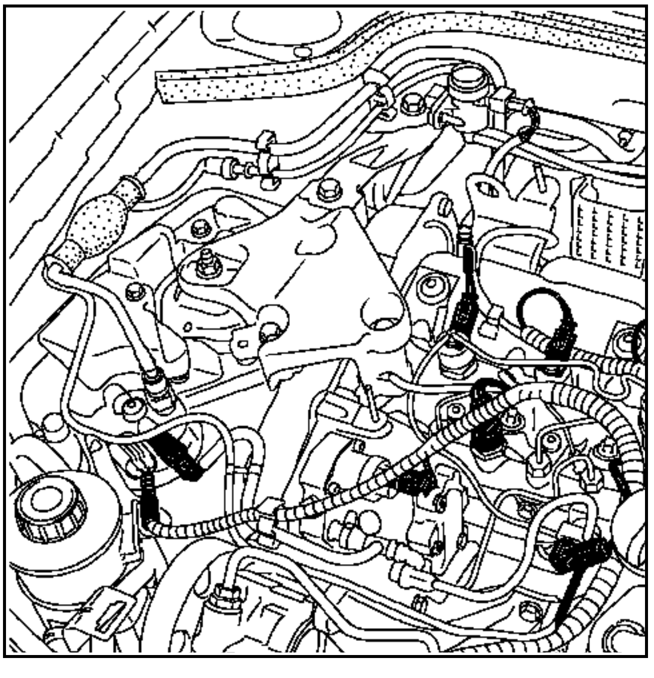
- the TDC sensor (11).



– the hoses to the cylinder head water outlet unit and the connector (1),



– the oil vapour rebreathing tank,
– the fuel return pipe and the supply pipe. Fit blanking pieces to maintain cleanness
– the connectors for the glow plug injectors, the high pressure injection pump, the sensor and the pressure regulator,
– diesel filter connector and unclip the harness,



– the cylinder head bolts,
– the cylinder head.

CLEANING

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

Use the **Décapjoint** product to dissolve any remains of the gasket still adhering.

Wear gloves whilst carrying out the following operation.

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

Please use great care during this operation, to prevent any foreign bodies from being introduced into the oil galleries (ducts located in the cylinder block and in the cylinder head).

CHECKING THE GASKET FACE

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

Maximum bow: **0.05 mm**.

No regrinding of the cylinder head is permitted.

Test the cylinder head to detect possible cracks using the cylinder head test tools (a container and a kit for the particular cylinder head, plug, sealing plate, blanking plate).: The approval number of the cylinder head test container is **664000.**

REFITTING (special notes)

Fit the cylinder head gasket. This is centred by two dowels.

Bring the pistons to mid-stroke position to prevent them from coming into contact with the valves as the cylinder head is tightened.

Centre the cylinder head on the dowels.

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

Tighten the cylinder head using an angular tightening wrench (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 **19 "Filling and bleeding"**).

Consult section **13, "Fuel filter"** for information on how to reprime the diesel circuit.

SPECIAL TOOLING REQUIRED		
Mot.	1428	Exhaust camshaft hub locking tool
Mot.	1430	Crankshaft and camshaft sprocket timing pin
Mot.	1430 -01	Crankshaft and camshaft sprocket timing check pin
Mot.	1436	Timing belt retaining clip
Mot.	1453	Engine support tool
Mot.	1505	Tool for measuring belt tension
Mot.	1555	Inlet camshaft hub locking tool
ESSENTIAL SPECIAL TOOLING		
Tool for testing cylinder head		

TIGHTENING TORQUES (in daNm)	
Timing tensioner bolt	2.5
Camshaft hub bolt	8
Camshaft sprocket bolt	1
Tensioner mounting plate securing bolt	2.5
Inlet manifold bolts	0.8
Suspended engine mounting upper linkage mounting bolt	10.5
Engine mounting bolt for the engine suspension mounting cover	6.2
Body mounting bolt for the suspended engine mounting movement limiter	2.1
Acoustic mass mounting bolt	2.1
Crankshaft pulley bolt	2.5
Inlet manifold bolts	1
Camshaft cover bolt	1
Wheel bolts	10.5

REMOVAL

Put the car on a 2 post lift.

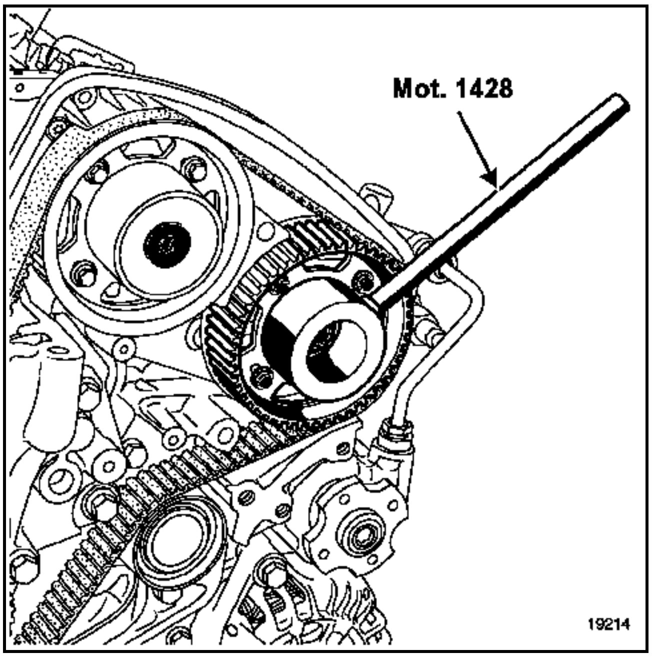
Disconnect the battery.

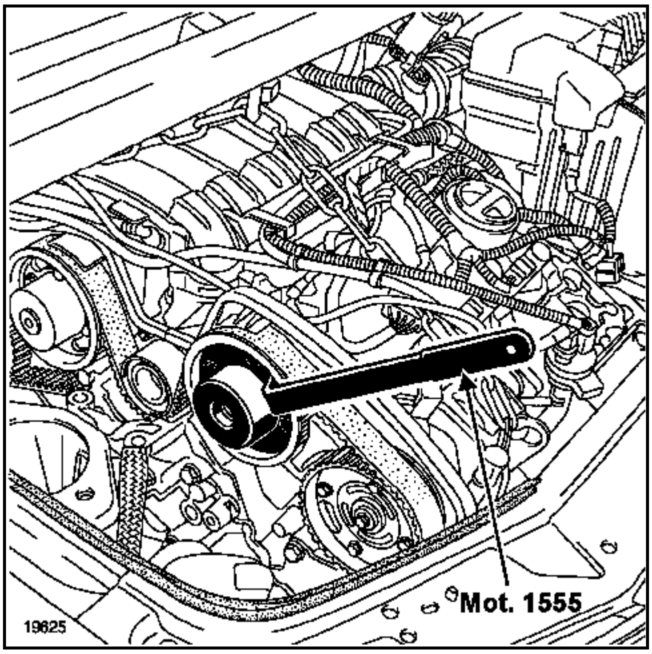
Drain the cooling circuit through the lower radiator hose.

Remove:
– the timing belt (see method described in section **11, "Timing belt"**).
– the timing pins,

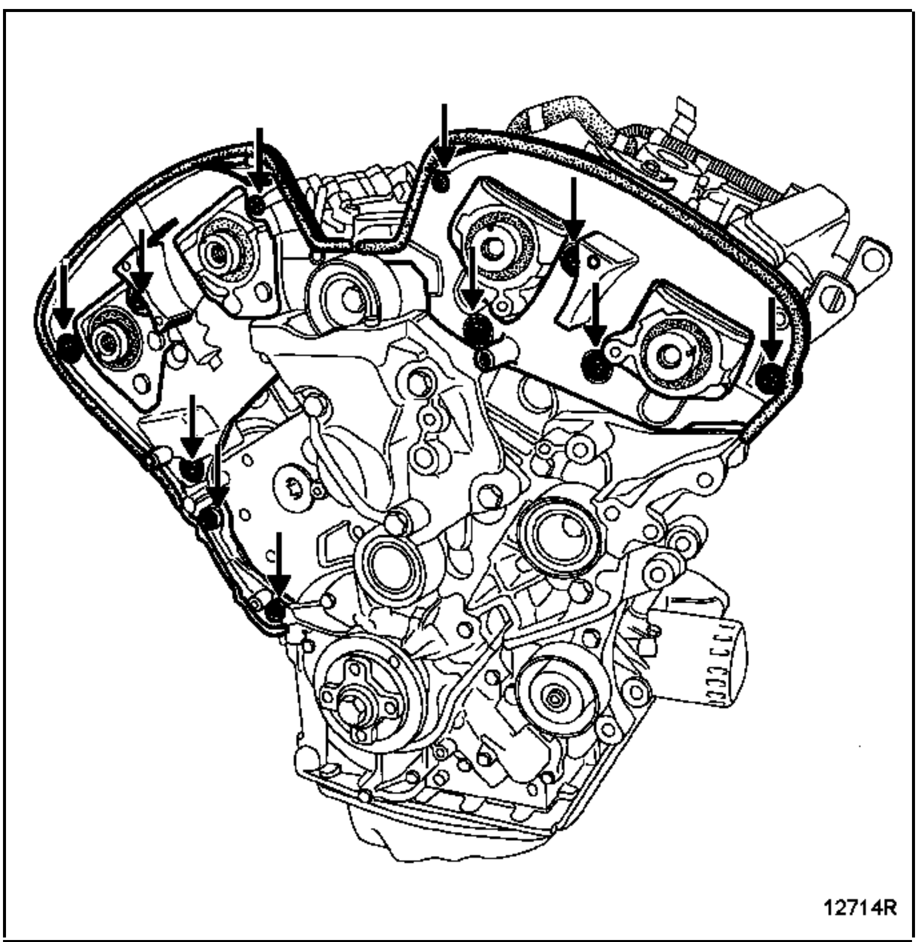
IMPORTANT: The camshaft hub mounting bolts have a left-hand thread; they are slackened clockwise. The arrows on the heads of these bolts indicate the tightening direction.

Remove:
– the camshaft sprocket-hub assembly, locking the hubs using tool **Mot. 1428** (exhaust camshaft hub) and tool **Mot. 1555** (inlet camshaft hub). For the latter, use a 14 junior torx socket.

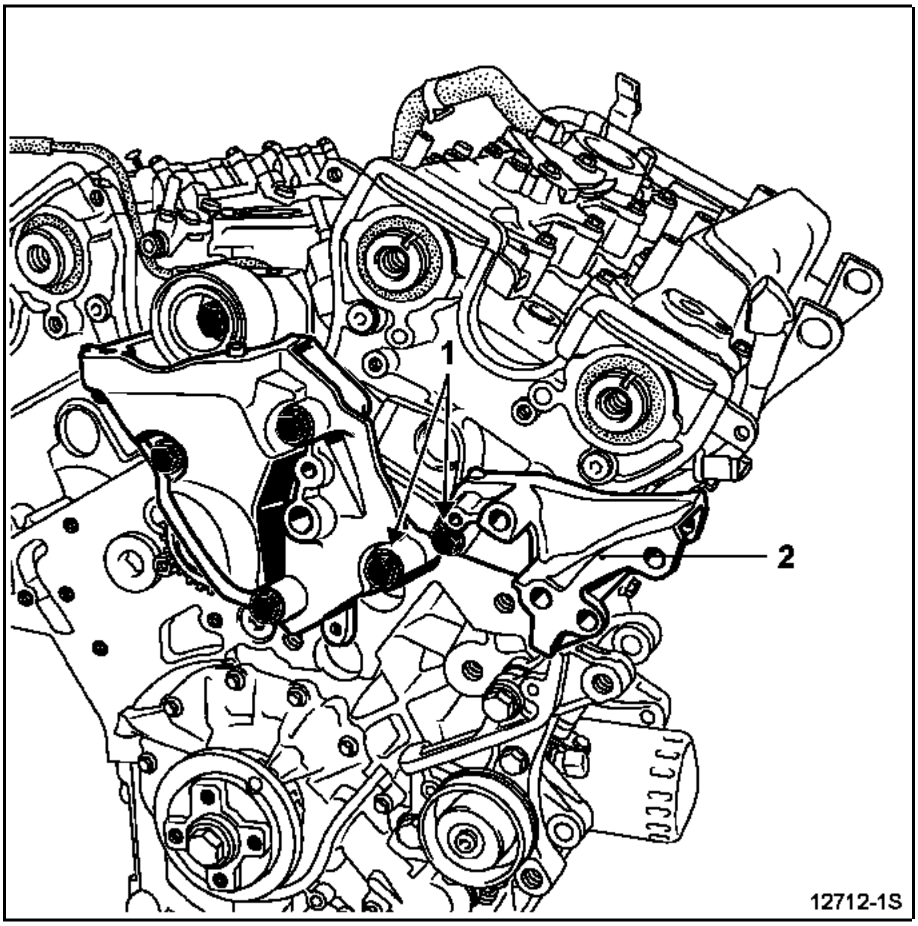




Remove:
- the tension wheel mounting plate
- the inner timing gear cases,



– the bolts (1) and move aside the mounting (2),

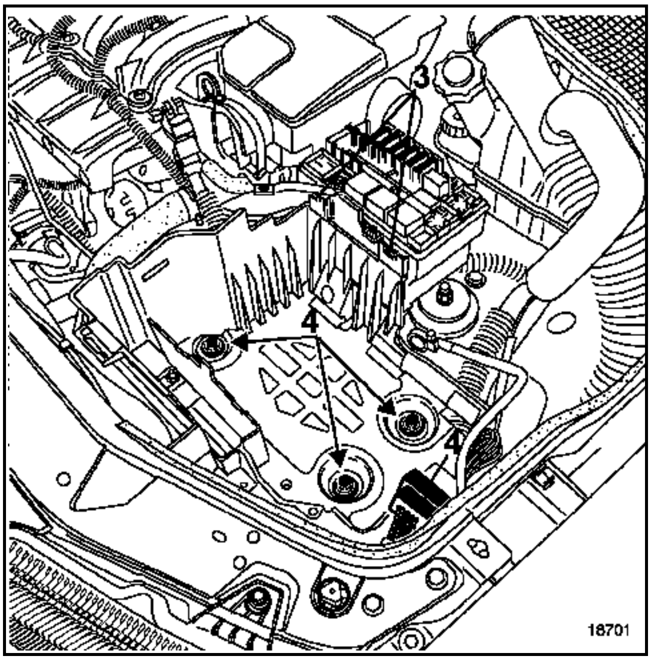


Refit the engine suspension mounting cover and movement limiter assembly.

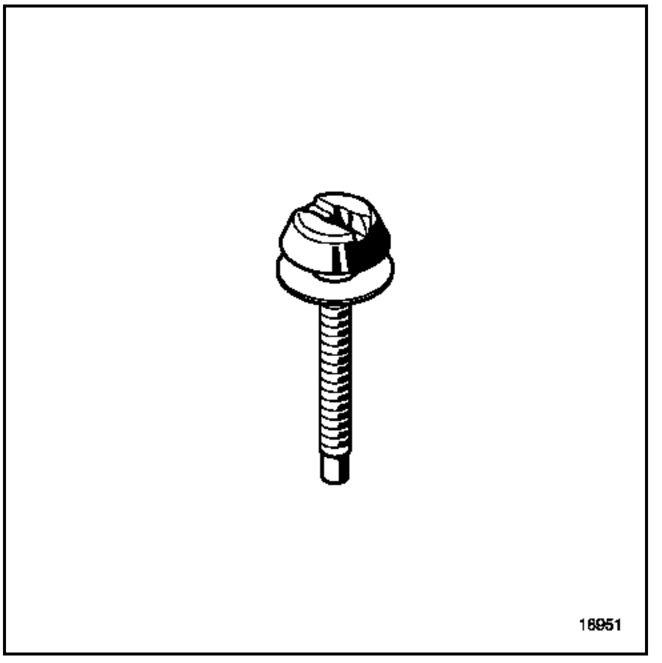
Remove the engine support tool **Mot. 1453**.

Unclip the relay plate at (3).

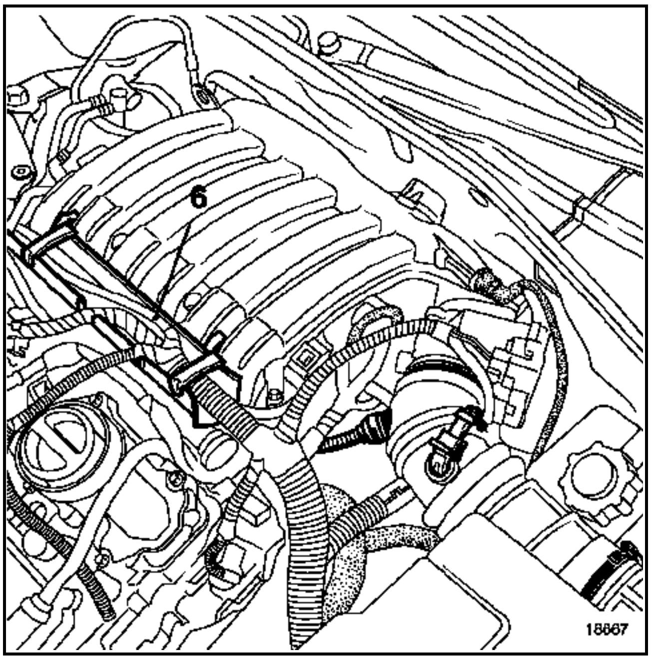
Remove the battery tray at (4).



To do this, drill out the three tamperproof bolts using a Ø 5 mm drill bit, in the axis of the bolt. Then remove the bolts using a stud extractor.

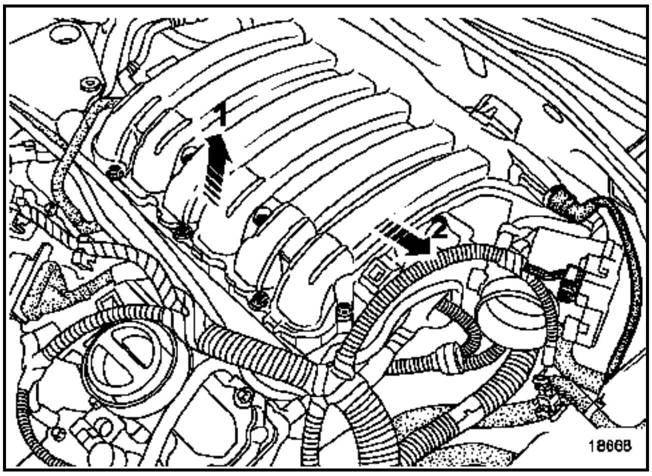


– the air intake pipe (5),
– the electrical harness sheathing (6).

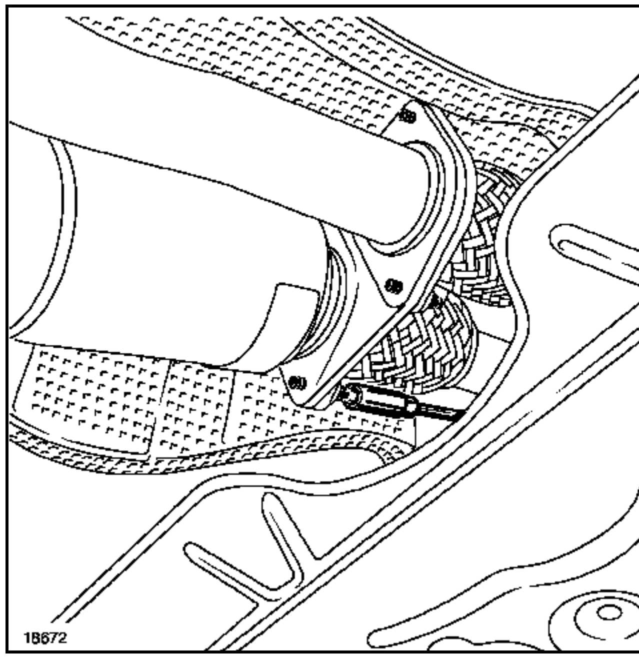


Disconnect:
- the motorised throttle body connector,
- the manifold pressure sensor,
- the brake servo vacuum pipe,
- the two hoses located under the motorised throttle body.

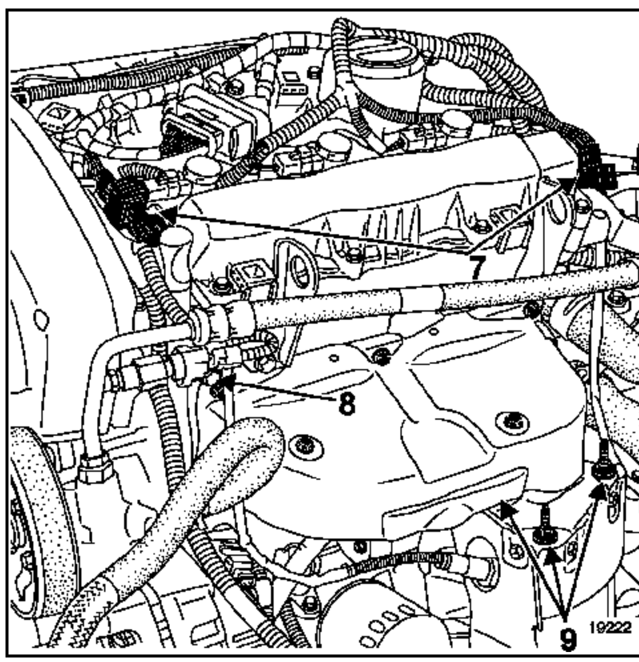
Remove:
- the manifold mountings,
- the manifold by moving it towards the battery.



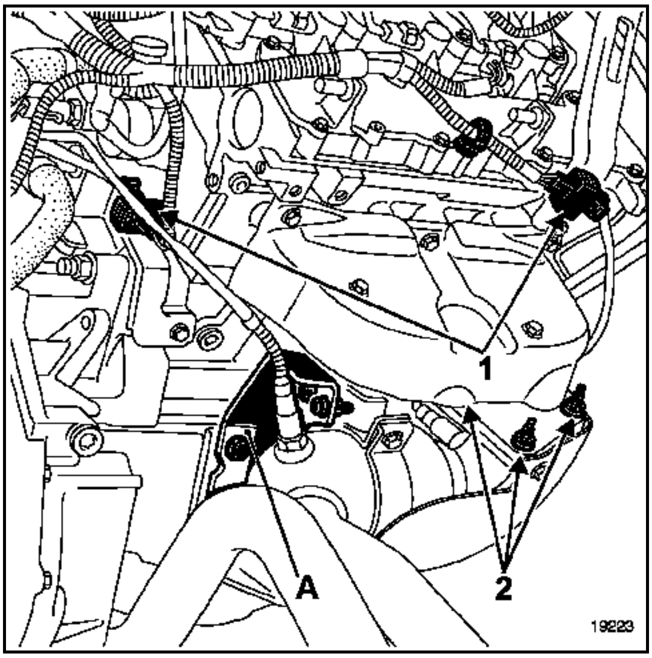
Slacken (to the end of the thread) the catalytic converter/pre-converter clamp bolts passing through the sub-frame (use a long socket).



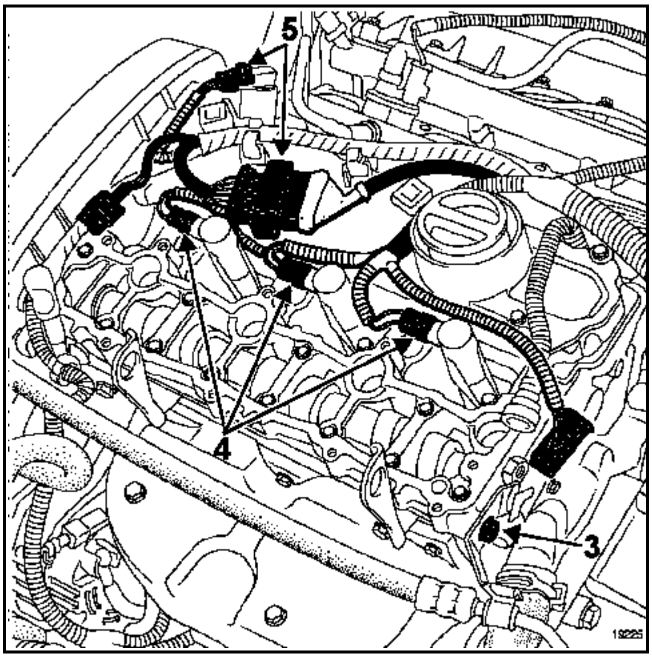
Remove:
- the oxygen sensor connectors (7),
- the dipstick guide tube mounting (8),
- the pre-converter mountings (9).



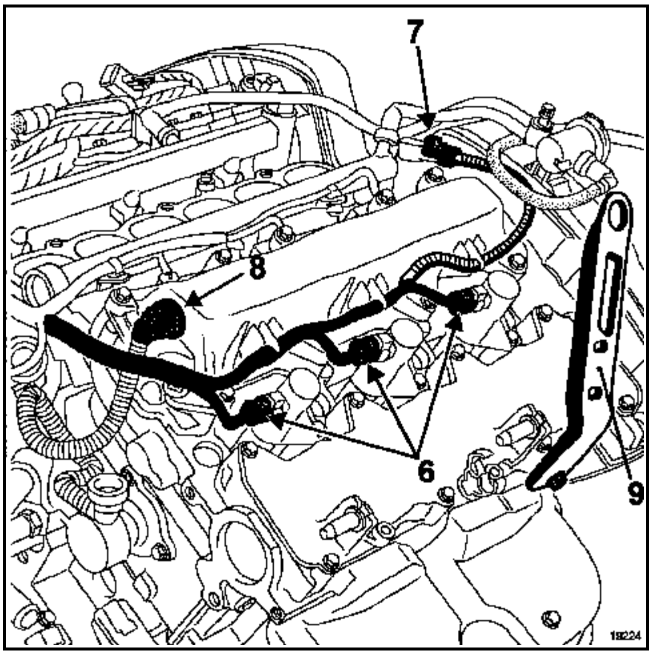
– the oxygen sensor connectors (1),
– the pre-converter mountings (2).
– the stay (A),



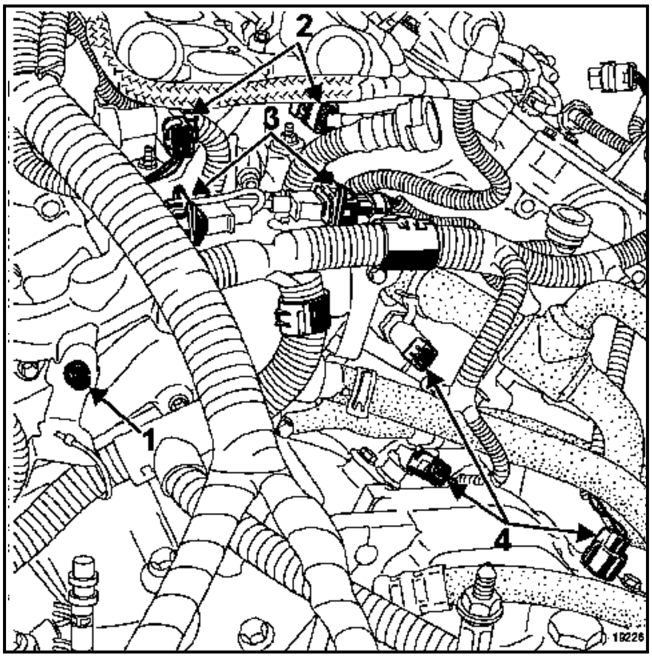
– the mounting (3) and move the pipes to one side,
– the coil connectors (4) and the connectors (5), then unclip the wiring harness and move it to one side.



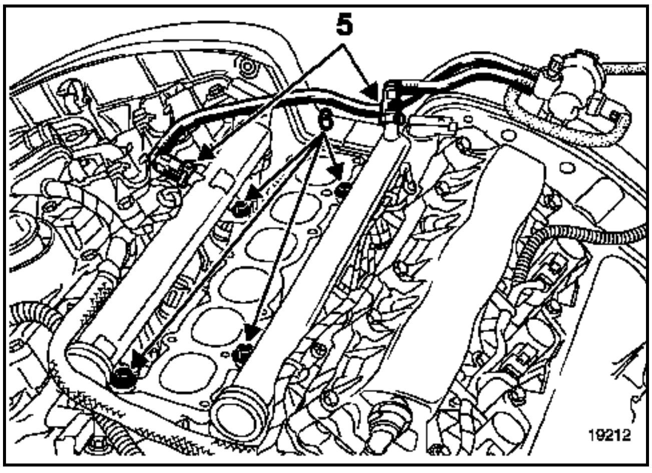
– the coil connectors (6) and the connectors (7), then unclip the wiring harness,
– the pipe (8),
– the lifting bracket (9),



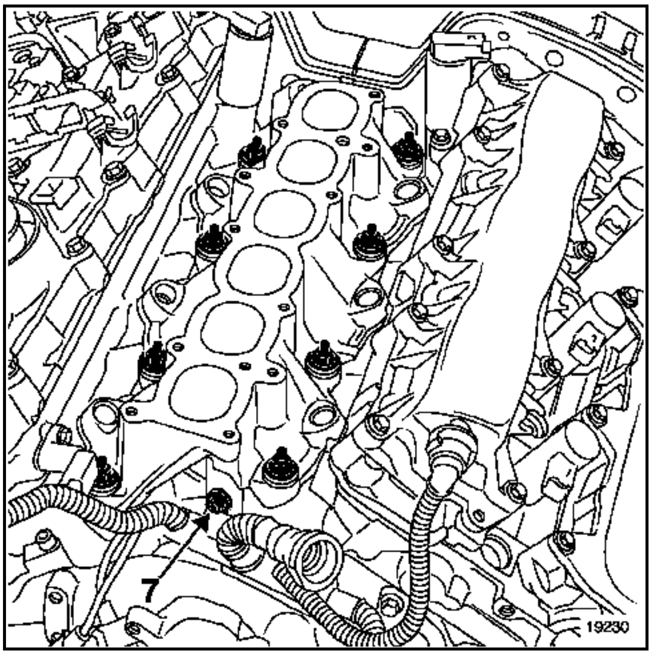
– the mounting (1),
– the connectors (2), (3) and (4) then unclip the wiring harness and move it to one side,



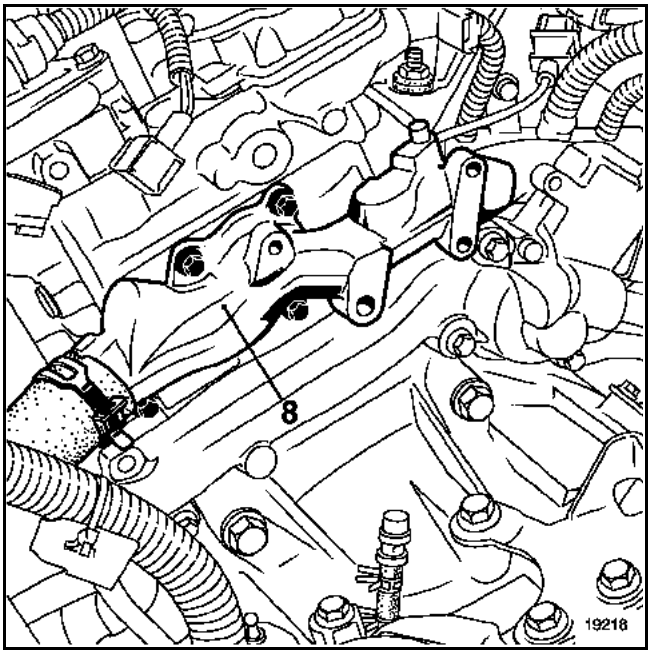
– the fuel supply pipes (5),
– the injector rail mountings (6), then remove the rails,



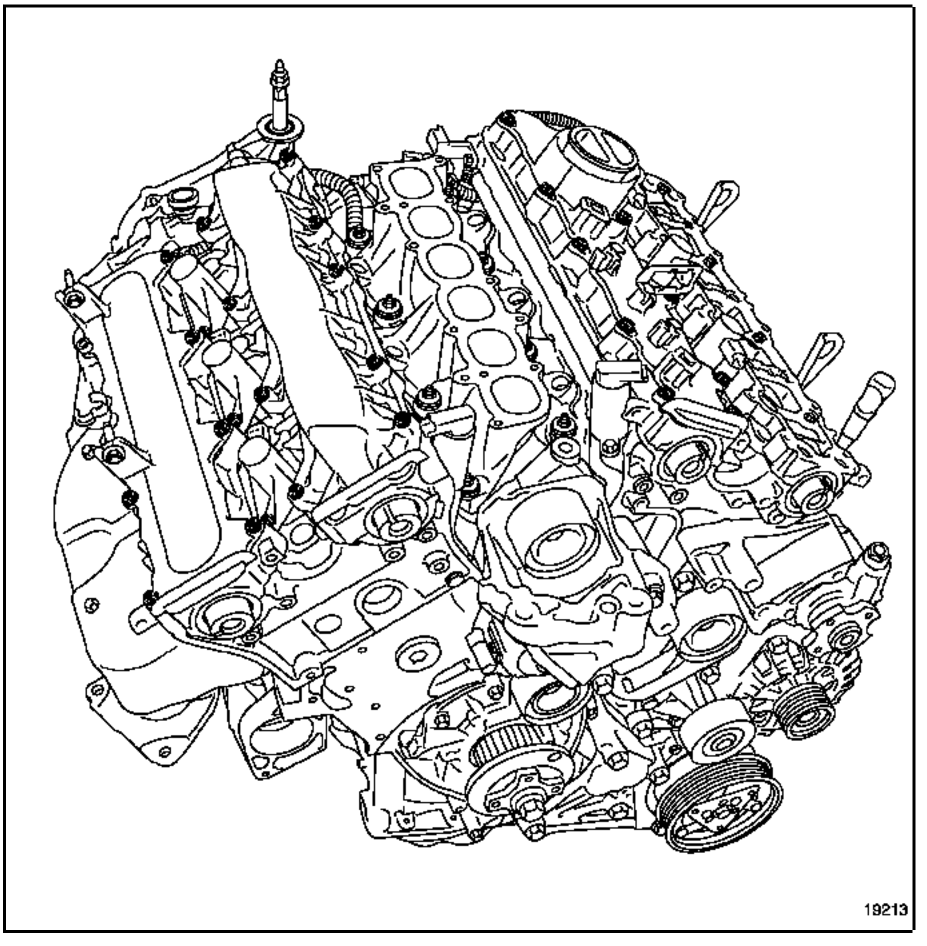
– the mounting (7),
– the air distributor,



– the coolant hose mountings (8) on both cylinder heads,



– the camshaft covers



– the cylinder head bolts,
– the cylinder heads.

CLEANING

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

Use the **Décapjoint** product to dissolve any remains of the gasket still adhering.

Wear gloves whilst carrying out the following operation.

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

Care must be taken whilst carrying out this operation in order to avoid any foreign bodies entering the oil galleries supplying oil under pressure to the camshafts (oil galleries are located both in the cylinder block and the cylinder heads).

CHECKING THE GASKET FACE

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

Maximum bow: **0.05 mm**.

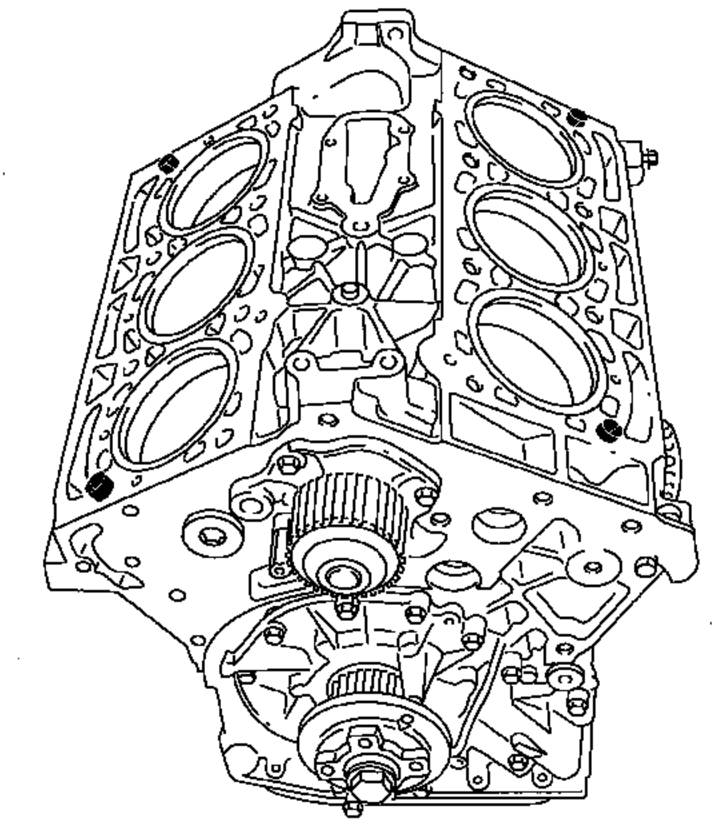
Test the cylinder head to detect possible cracks using the cylinder head test tools (a container and a kit for the particular cylinder head, plug, sealing plate, blanking plate).: The approval number of the cylinder head test container is **664000.**

Cylinder heads undergoing repair may be ground by up to **0.20 mm. The grinding must be carried out on both cylinder heads**.

the ground cylinder heads must be marked with the letter **R** using an electric engraving tool (refer to **L Engine Repair Manual** to locate the areas to be engraved).

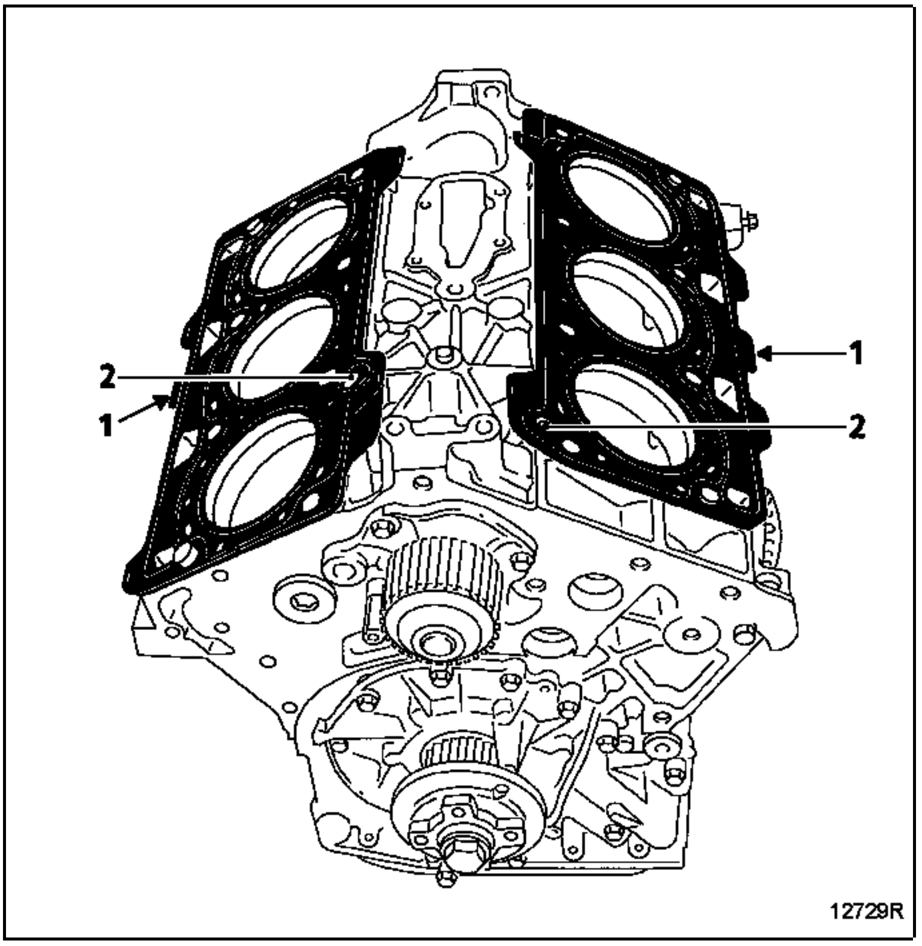
REFITTING - Special points

the cylinder heads are centred using two centring dowels each.



12730S

Fit the new cylinder head gaskets, ensuring that the tabs (1) are facing outward and verify the correct positioning of the oil flow holes (2).



Check the maximum length under head of the bolts: 149.5 mm.

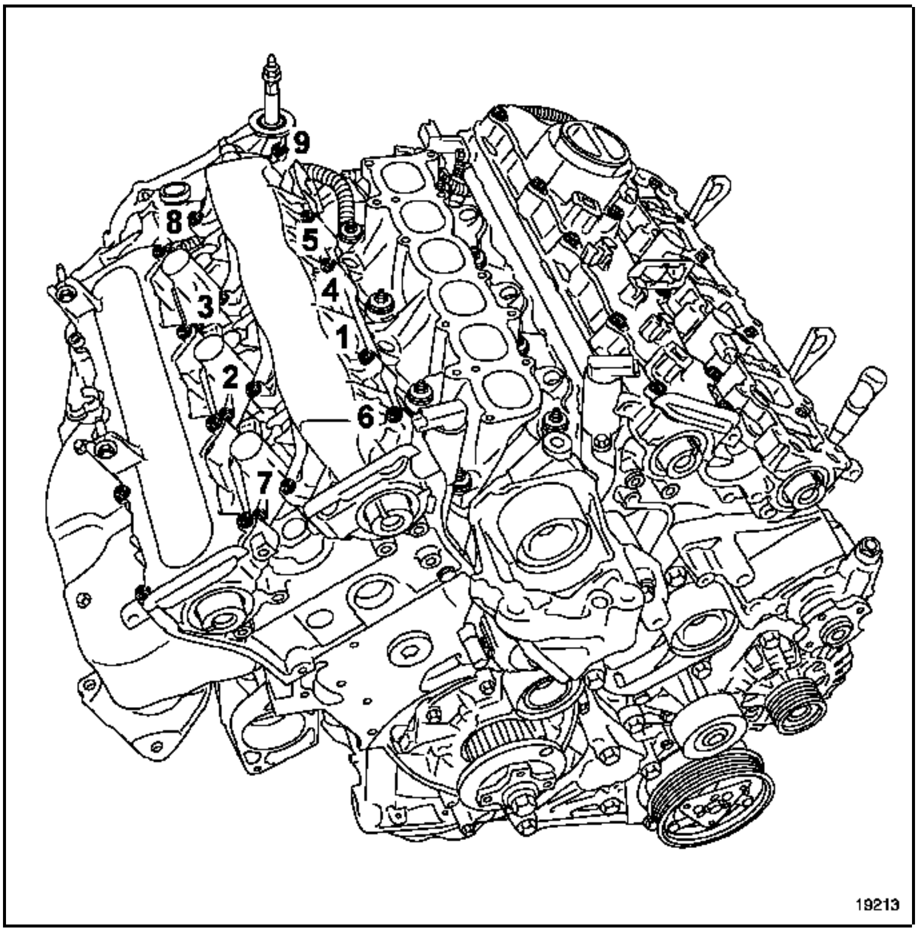
REMINDER

- To ensure the bolts are correctly tightened, use a syringe to remove any oil which may be in the cylinder head mounting holes.

- Coat the bolt threads and under head mating surfaces with engine oil.

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

Finger tighten, then progressively tighten the camshaft cover mounting bolts in the recommended order.

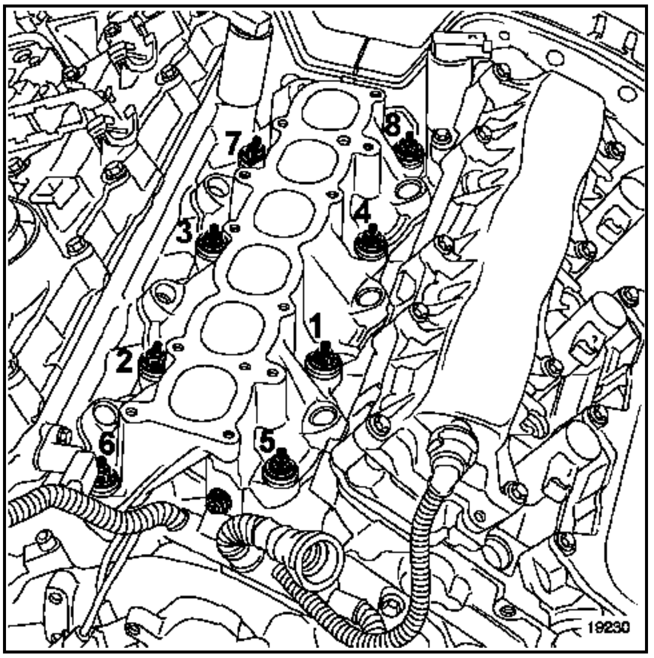


Tighten the bolts to **1 daNm**.

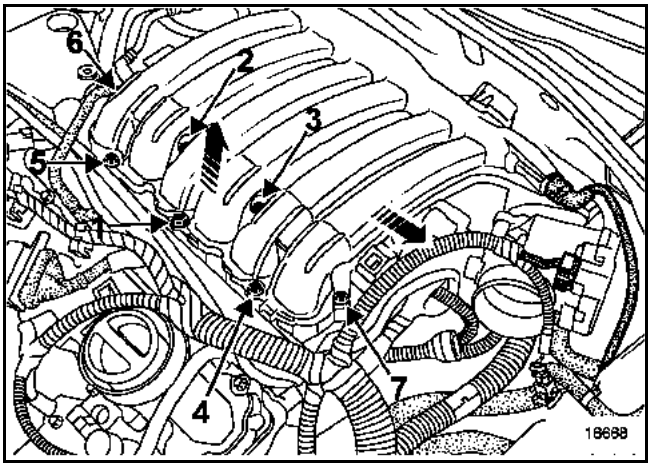
NOTE: the camshaft covers are fitted with a composite seal allowing several removals/refittings. If the seal is damaged, it can be partially repaired using the **AUTOJOINT OR** sealing product.

Replace the inlet manifold seals.

Finger tighten the inlet manifold/injector rail assembly bolts, pre-tighten them to a torque of **0.5 daNm** (in the recommended order), then finally tighten them to a torque of **1 daNm** (in the recommended order).



Refit the inlet manifold, pre-tightening to **05 daNm.** (in the recommended order), then finally tighten to **0.8 daNm.** (in the recommended order).



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 **19 "Filling and Bleeding"**).

SPECIAL TOOLING REQUIRED	
Mot. 1428	**Camshaft hub locking tool**
Mot. 1430	**Crankshaft and camshaft sprocket timing pin**
Mot. 1430 -01	**Crankshaft and camshaft sprocket timing check pin**
Mot. 1432	**Tool for fitting the camshaft seal.**
Mot. 1436	**Timing belt retaining clip**
Mot. 1453	**Engine support tool**
Mot. 1505	**Tool for measuring belt tension**
Mot. 1555	**Inlet camshaft hub locking tool**

TIGHTENING TORQUES (in daNm)	
Timing tensioner bolt	**2.5**
Camshaft hub bolt	**8**
Camshaft sprocket bolt	**1**
Tensioner mounting plate securing bolt	**2.5**
Suspended engine mounting upper linkage mounting bolt	**10.5**
Engine mounting bolt for the engine suspension mounting cover	**6.2**
Body mounting bolt for the suspended engine mounting movement limiter	**2.1**
Acoustic mass mounting bolt	**2.1**
Inlet manifold bolts	**0.8**
Crankshaft pulley bolt	**2.5**
Camshaft cover bolt	**1**
Wheel bolts	**10.5**

REMOVAL

Put the car on a 2 post lift.

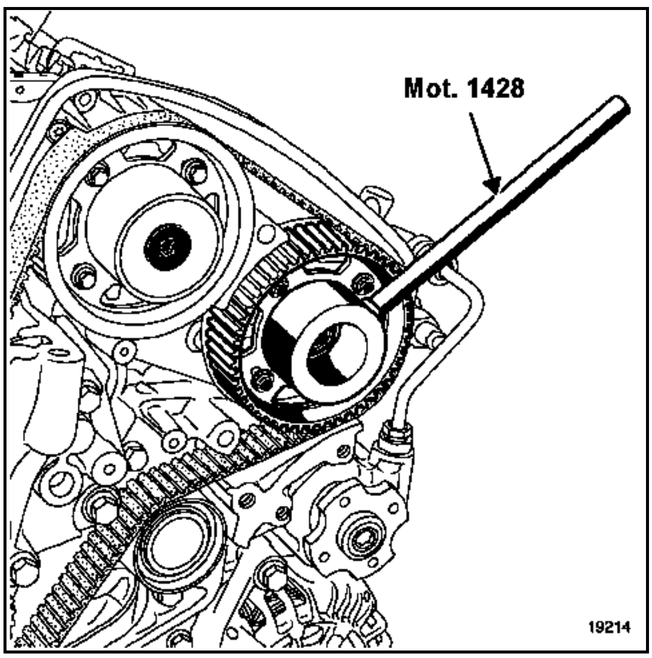
Disconnect the battery.

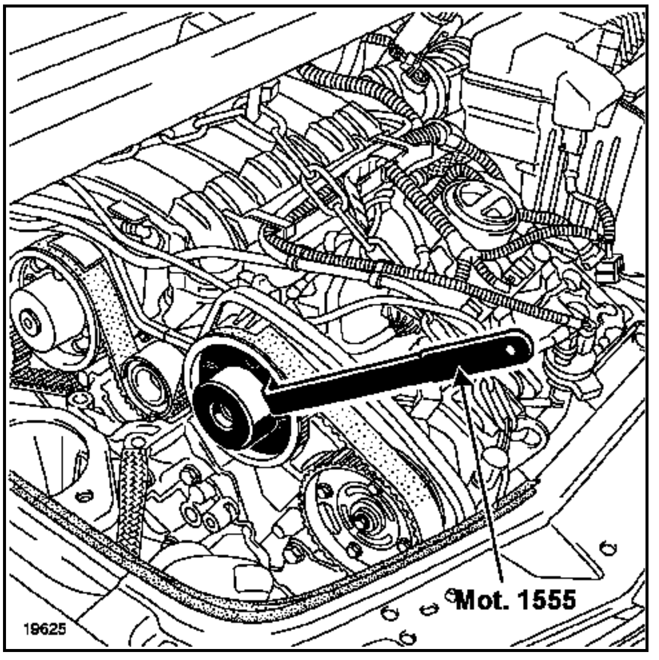
Remove:
– the timing belt (see method described in section **11, "Timing belt"**).
– the timing pins.

IMPORTANT: The camshaft hub mounting bolts have a left-hand thread; they are slackened clockwise. The arrows on the heads of these bolts indicate the tightening direction.

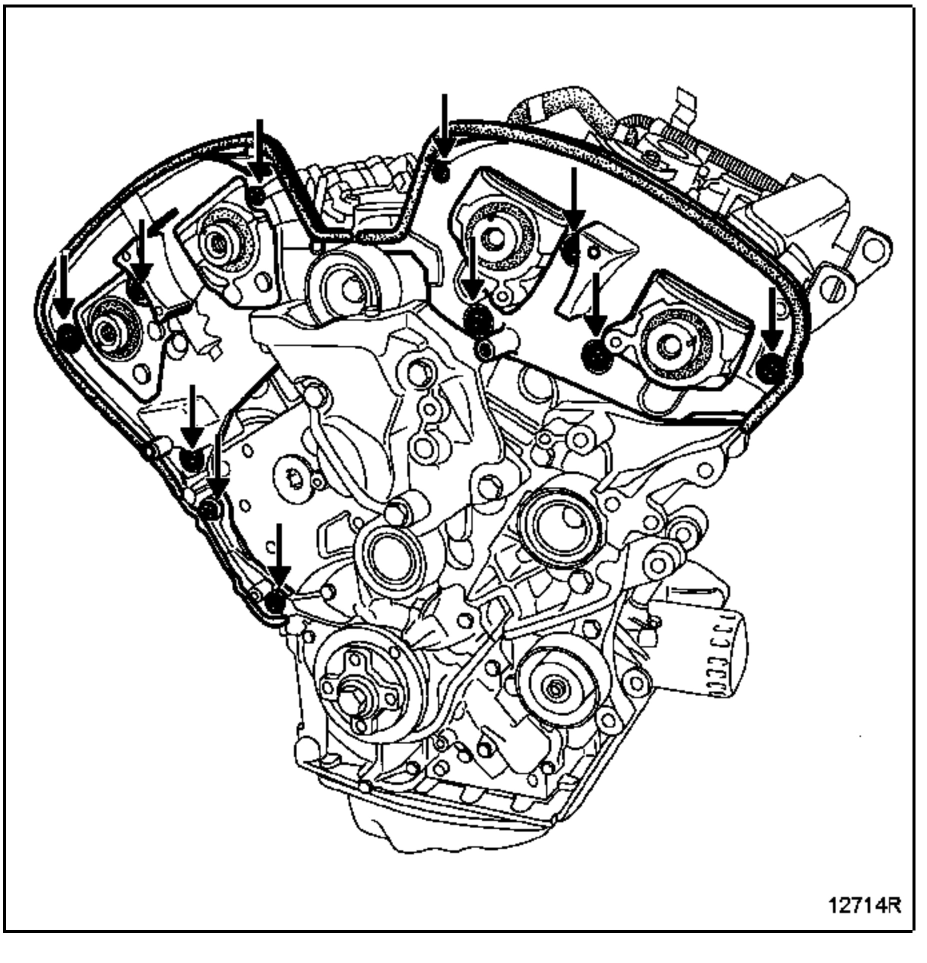
Remove:
– the camshaft sprocket-hub assembly, locking the hubs using tool **Mot. 1428** (exhaust camshaft hub) and tool **Mot. 1555** (inlet camshaft hub).

  For the latter, use a size 14 junior torx socket.



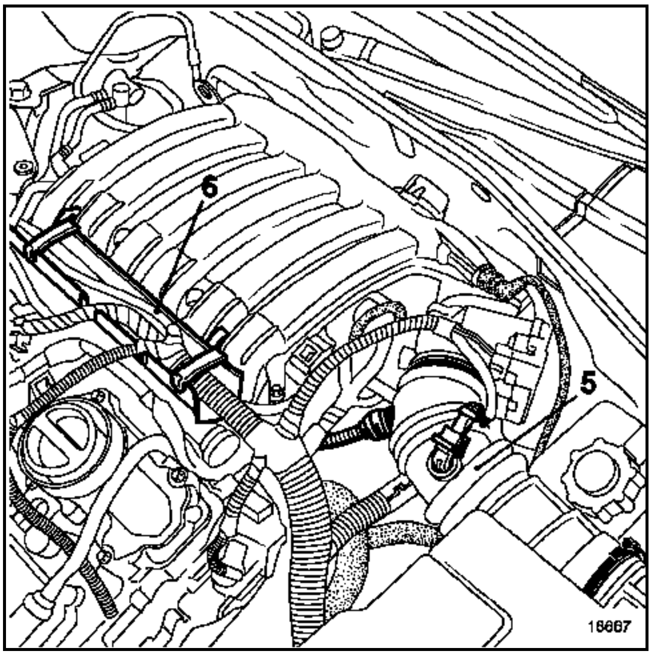


Remove:
– the inner timing covers,



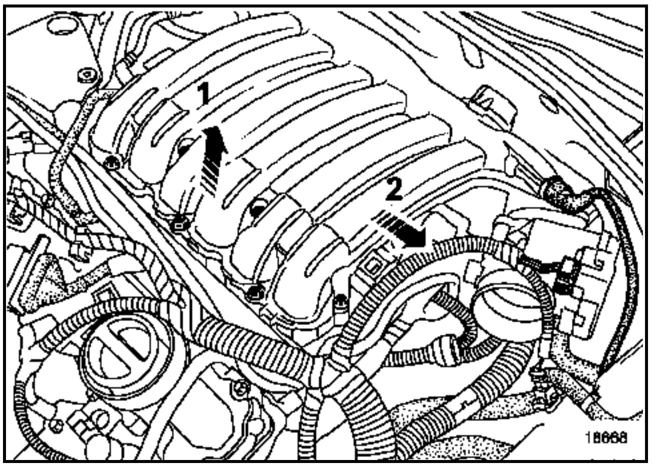
Refit the suspended engine mounting cover/ movement limiter assembly and remove the **Mot. 1453** engine support tool.

Remove:
– the air intake pipe (5)
– the electrical harness sheathing (6).

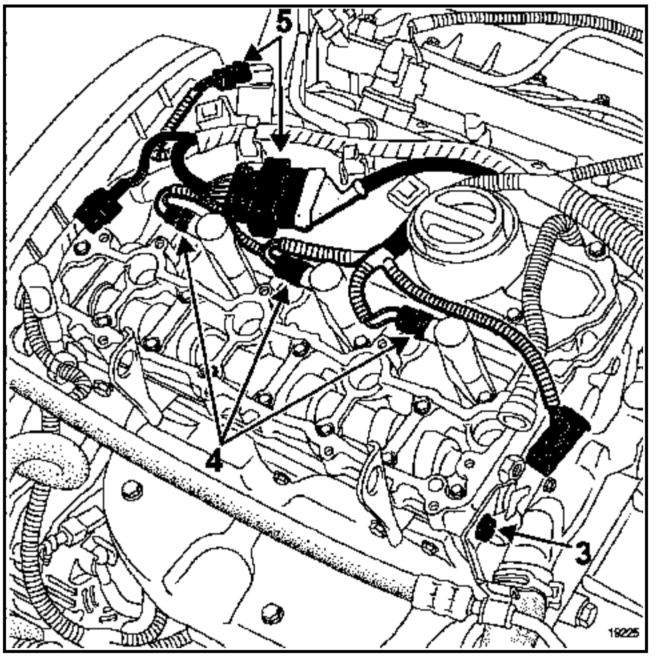


Disconnect:
– the motorised throttle body connector,
– the manifold pressure sensor,
– the brake servo vacuum pipe,
– the two hoses located under the motorised throttle body.

Remove:
– the manifold mountings,
– the manifold by moving it towards the battery,

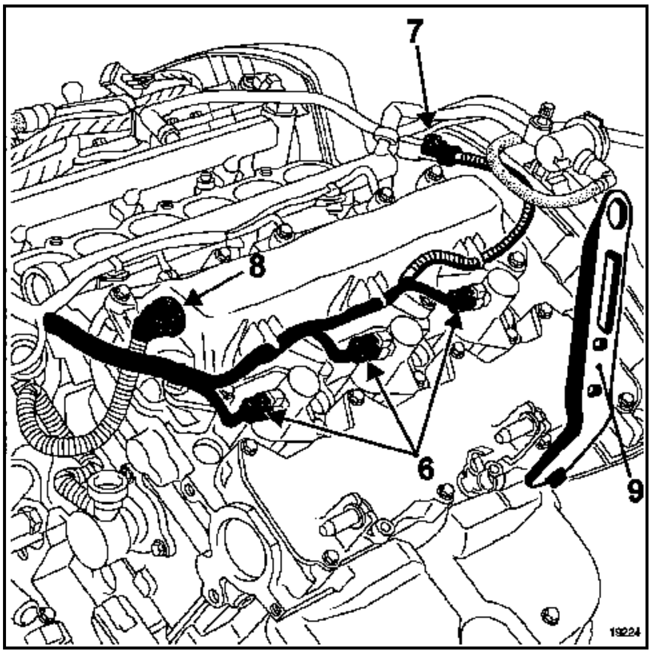


– the mounting (3) and move the pipes to one side,
– the coil connectors (4) and the connectors (5), then unclip the wiring harness and move it to one side,
– the coils,

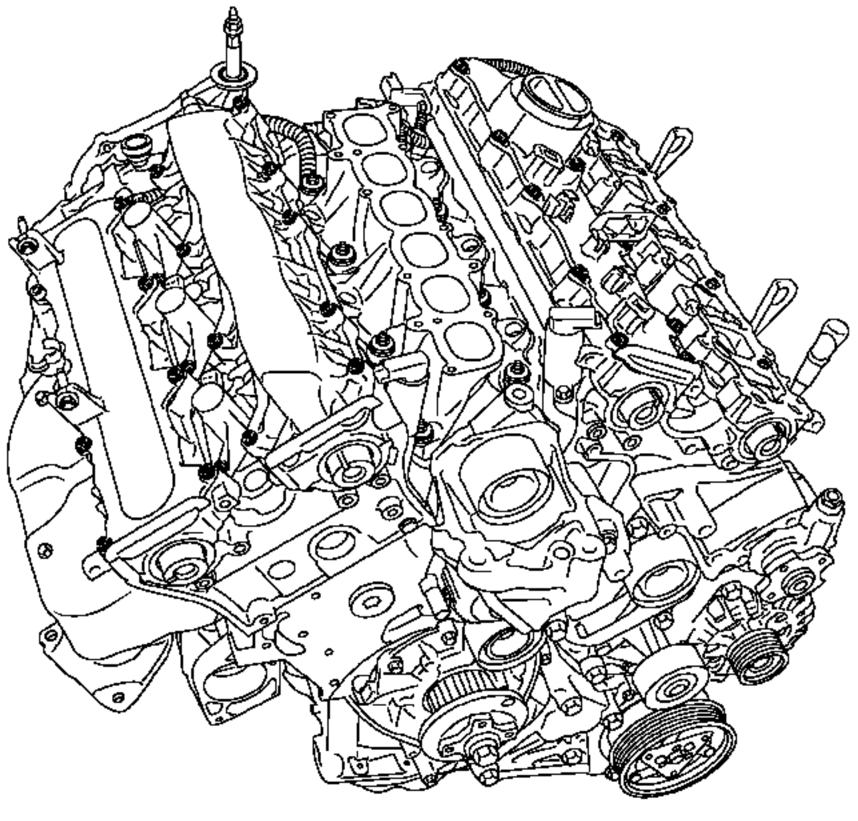


– the fuel supply pipes to the injector rails,

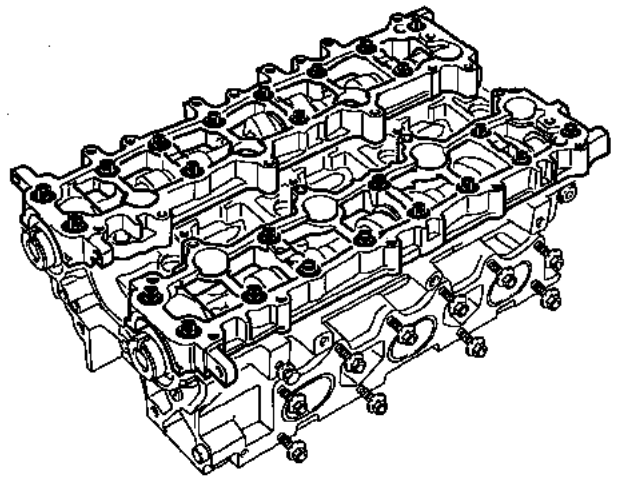
- the coil connectors (6) and the connectors (7), then unclip the wiring harness,
- the coils,
- the pipe (8),
- the lifting bracket (9) after disconnecting the oxygen sensor connector.



Progressively slacken the camshaft cover bolts.


19213

Proceed in the same way for the camshaft bearing cap covers.



12694S

Remove the camshafts.

CLEANING

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

Use the **Décapjoint** product to dissolve any remains of the gasket still adhering.

Wear gloves whilst carrying out the following operation.

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

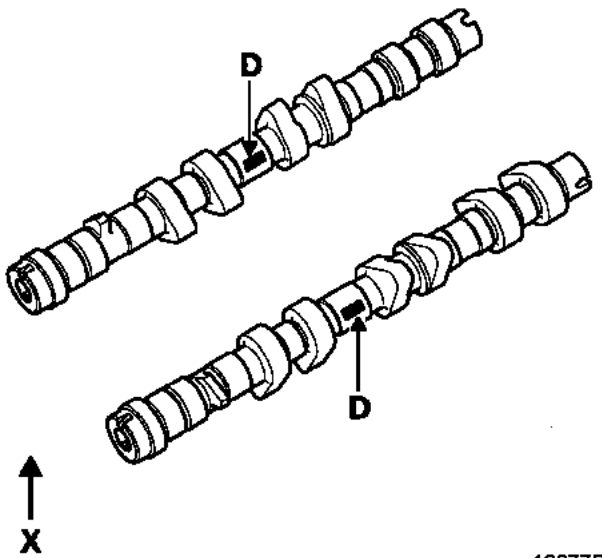
REFITTING

Lubricate the cams and bearings.

Fit the camshafts.

IDENTIFICATION OF THE CAMSHAFTS

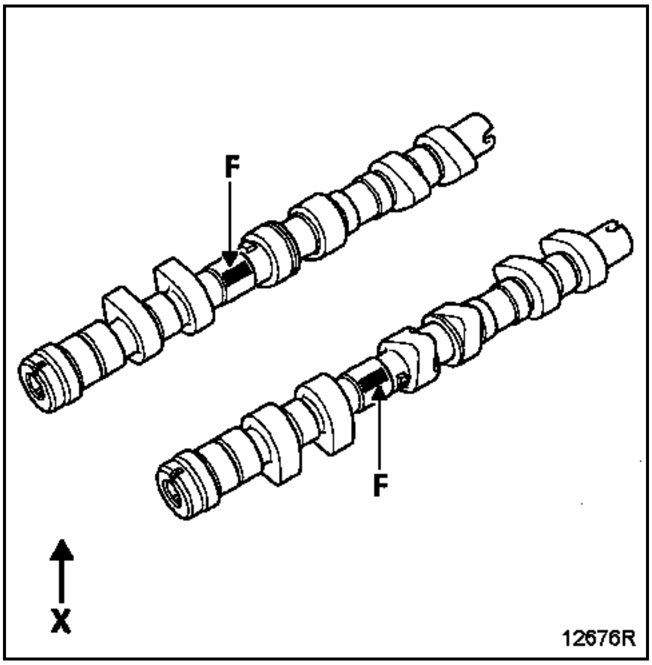
The **long** camshafts are fitted to the **front cylinder head** and are identified by a mark at (D).



12677R

Inlet: D = A423
Exhaust: D = E389
X: timing end.

The **short** camshafts are fitted to the **rear cylinder head** and are identified by a mark at (F).

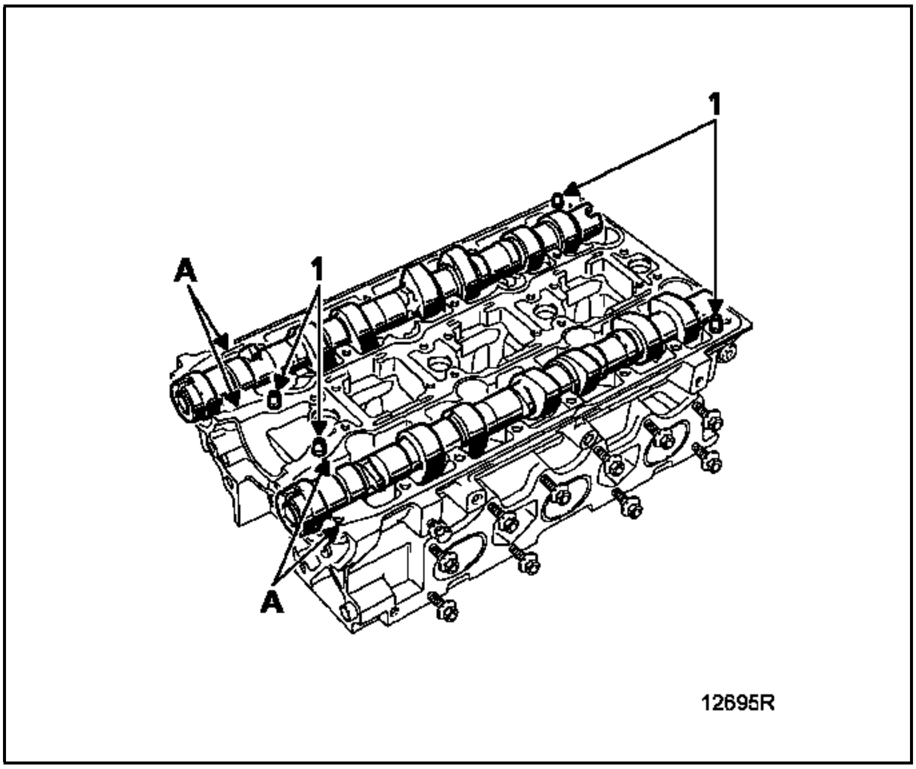


Inlet: .....F = A82
Exhaust: ... ... F = E388
X: timing end.

Verify the presence and correct positioning of the centring dowels (1).

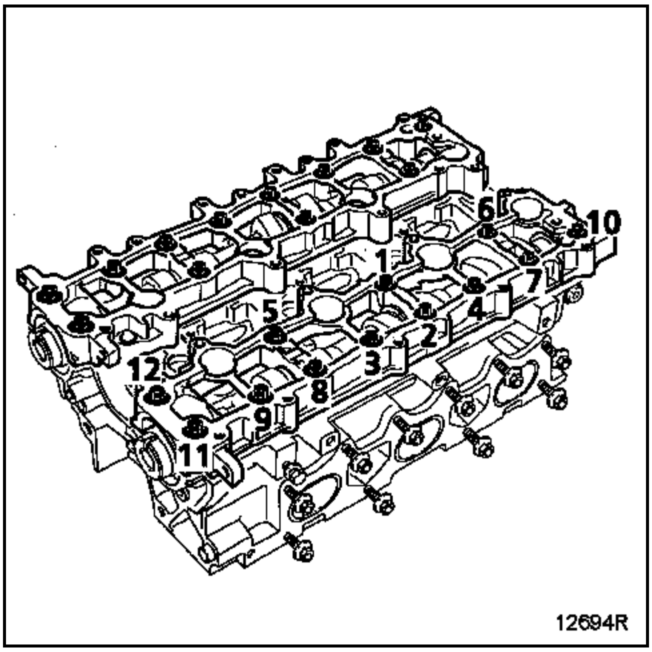
Check the end play of the camshafts (see **L Engine**) manual.

Apply a line (A) of **AUTOJOINT OR** paste to the gasket face.



Position the camshaft bearing cap covers.

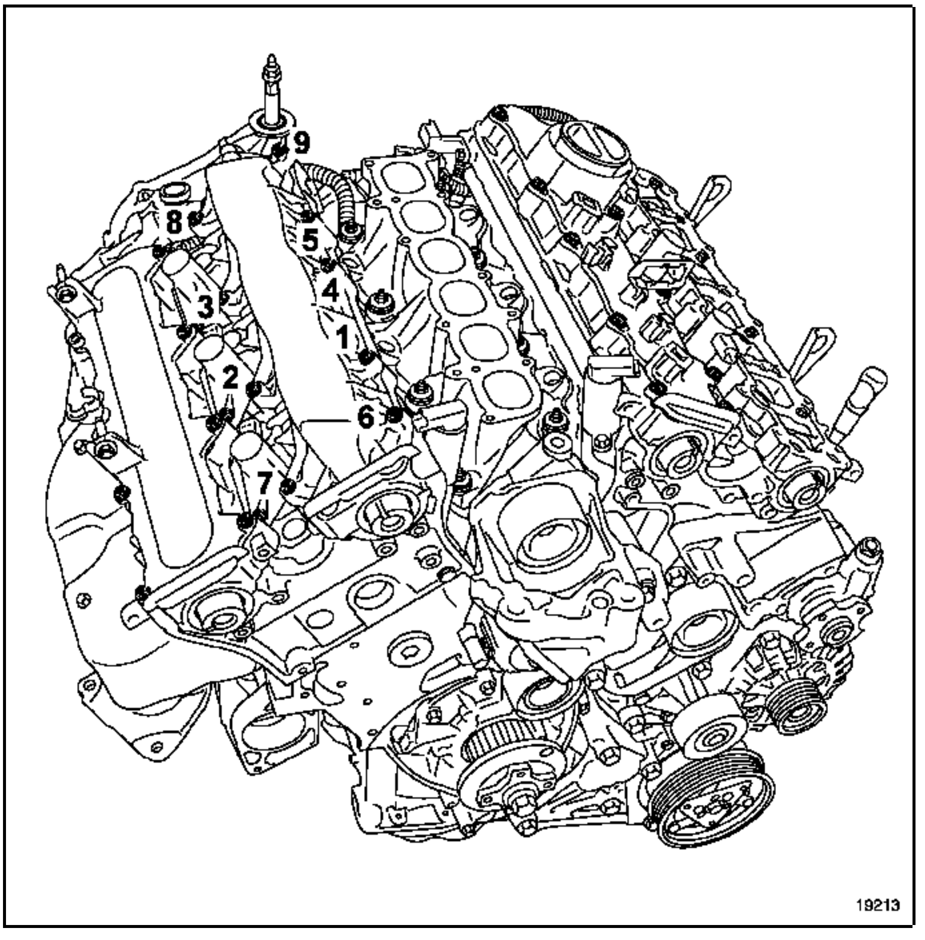
Finger tighten then progressively tighten the mounting bolts in the following order:



Tighten the bolts to a torque of **0.8 daNm**.

Refit the camshaft covers after cleaning the seals and mating surfaces.

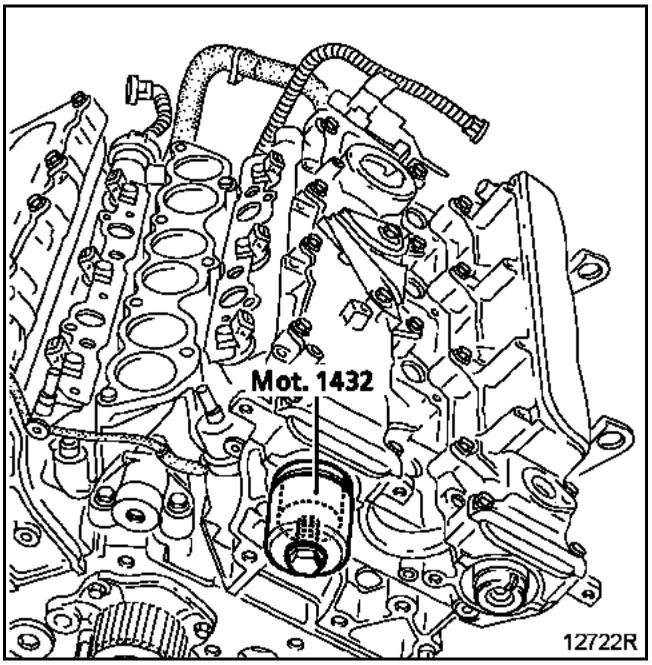
Finger tighten then progressively tighten the mounting bolts in the recommended order.



Tighten the bolts to **1 daNm**.

NOTE: the camshaft covers are fitted with a composite seal allowing several removals/refittings. If the seal is damaged, it can be partially repaired using the **AUTOJOINT OR** sealing product.

Position the camshaft seals using tool **Mot. 1432**.

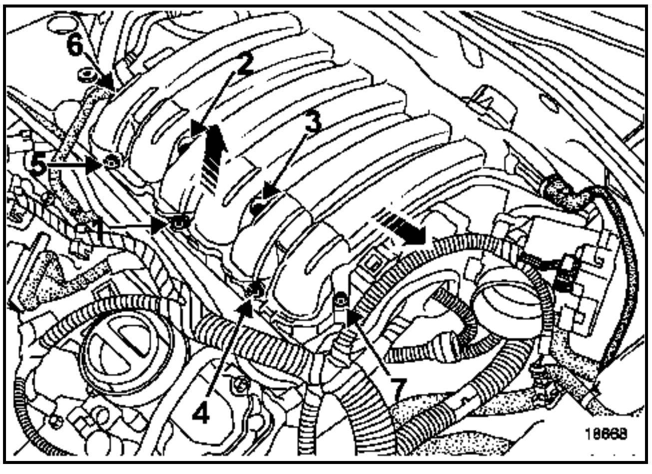


NOTE: before fitting the camshaft seals, verify that seal seatings are clean and contain no traces of jointing compound.

Refitting is the reverse of removal.

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

Refit the inlet manifold, pre-tightening to **0.5 daNm.** (in the recommended order), then finally tighten to **0.8 daNm.** (in the recommended order).



Cars	Gearbox	Engine							
		Type	Index	Bore (mm)	Stroke (mm)	Cubic capacity (cm^3)	Compression ratio	Catalytic converter	Depollution standard
BGOA	JH3 DPO	K4M	710 711	79.5	80.5	1598	10/1	◊ C89	EU 00
BGOB	JR5 DPO	F4P	770 771	82.7	83	1783	9.8/1	◊ C89	EU 00

Tests carried out at idle speed*					Fuel *** (minimum octane rating)
Pollutant emission **					
Engine speed (rpm)	CO (%) (1)	CO_2 (%)	HC (ppm)	Lambda (λ)	
F4P: 750 K4M: 750	0.5 max	14.5 max	100 max	$0.97 < \lambda < 1.03$	Super unleaded (IO 95)

(1) the CO content at 2500 rpm should be no more than 0.3.

* For a coolant temperature greater than 80 ˚C and after the engine speed has stabilised at 2500 rpm for approximately 30 seconds.

** Refer to your country specification for the values required by legislation.

*** IO91 unleaded compatible.

Temperature in ˚C	-10	25	50	80	110
Air sensor NTC type resistance in Ohms	10450 to 8625	2065 to 2040	815 to 805	-	-
Coolant sensor NTC type resistance in Ohms	-	2360 to 2140	850 to 770	290 to 275	117 to 112

DESCRIPTION	BRAND/TYPE	SPECIAL NOTES
Injection and ignition computer	SAGEM S 2000	112 tracks Sequential multipoint injection Static ignition
Motorised throttle body ∅ 60 mm (double track integrated potentiometer)	MGI/VDO	Engine resistance = 1.6 ± 0.3 Ω Potentiometer resistance = 1200 ± 240 Ω
Accelerator pedal sensor	HELLA	Double track potentiometer Track 1 resistance = 1200 ± 480 Ω Track 2 resistance = 1700 ± 680 Ω
Ignition coils	NIPPONDENSO (on F4P) NIPPONDENSO or SAGEM (on K4M)	Four V4 pencil coils SAGEM: Primary resistance ≈ 0.5 Ω Secondary resistance: 11 ± 1 KΩ NIPPONDENSO: Primary resistance ≈ 0.5 Ω Secondary resistance: 6.8 ± 1 KΩ
Spark plugs	CHAMPION RC 87 YCL (on F4P) EYQUEM RFC 50 LZ 2E (on K4M)	Tightening torque: 2.5 to 3 daNm
Manifold pressure sensor	DELCO	Resistance ≈ 50 KΩ Replace the seal each time it is removed.
Pinking sensor	SAGEM	Piezoelectric type. Tightening torque: 2 daNm
Magnetic sensor (TDC and engine speed)	SIEMENS	Variable reluctance type Resistance = 200 to 270 Ω
Oxygen sensors (upstream and downstream)	BOSCH	Heater resistance = 3.4 ± 0.7 Ω at 20 ˚C Internal resistance = 1 kΩ maximum Rich mixture > 800 mV Lean mixture < 50 mV
Injectors	MAGNETI-MARELLI PICO (on F4P) SIEMENS DEKA (on K4M)	Resistance: 14.5±0.7 Ω at 20˚C

DESCRIPTION	BRAND/TYPE	SPECIAL NOTES
Air sensor	JEAGER	CTN (see table) Resistance: 2500 Ω at 20°C
Coolant sensor	JEAGER	CTN (see table) Resistance: 3500 Ω at 20°C
Canister solenoid valve	SAGEM	Resistance: 26 ± 4 Ω at 23°C
Camshaft dephaser solenoid valve (**F4P only**)	AISIN	"All or nothing" solenoid valve Resistance: 7.1 ± 0.5 Ω
Submerged fuel pump incorporating the petrol filter and the pressure regulator	BOSCH	Pressure: 3.5 bar ± 0.06 Minimum flow: 80 to 120 l/h
F4P idle speed manifold pressure		280 ±50 mbars
K4M idle speed manifold pressure		350 ±50 mbars
F4P exhaust counter-pressure		Upstream of the catalytic converter (mbars) 1500 rpm 20 3000 rpm 94 4500 rpm 208 5500 rpm 290
K4M exhaust counter-pressure		Upstream of the catalytic converter (mbars) 1500 rpm 15 3000 rpm 56 4500 rpm 180 5500 rpm 242

Cars	Gearbox	Engine							
		Type	Index	Bore (mm)	Stroke (mm)	Cubic capacity (cm^3)	Compression ratio	Catalytic converter	Depollution standard
BGOD	SU1	L7X	731	87	82.6	2946	10.9 / 1	C141 (2) C142 (2)	EU 00

Tests carried out at idle speed*					Fuel *** (minimum octane rating)
Pollutant emission **					
Engine speed (rpm)	CO (%) (1)	CO_2 (%)	HC (ppm)	Lambda (λ)	
650	0.5 max	14.5 max	100 max	$0.97 < \lambda < 1.03$	Super unleaded (IO 95)

(1) the CO content at 2500 rpm should be no more than 0.3.

* For a coolant temperature greater than 80 °C and after the engine speed has stabilised at 2500 rpm for approximately 30 seconds.

** Refer to your country specification for the values required by legislation.

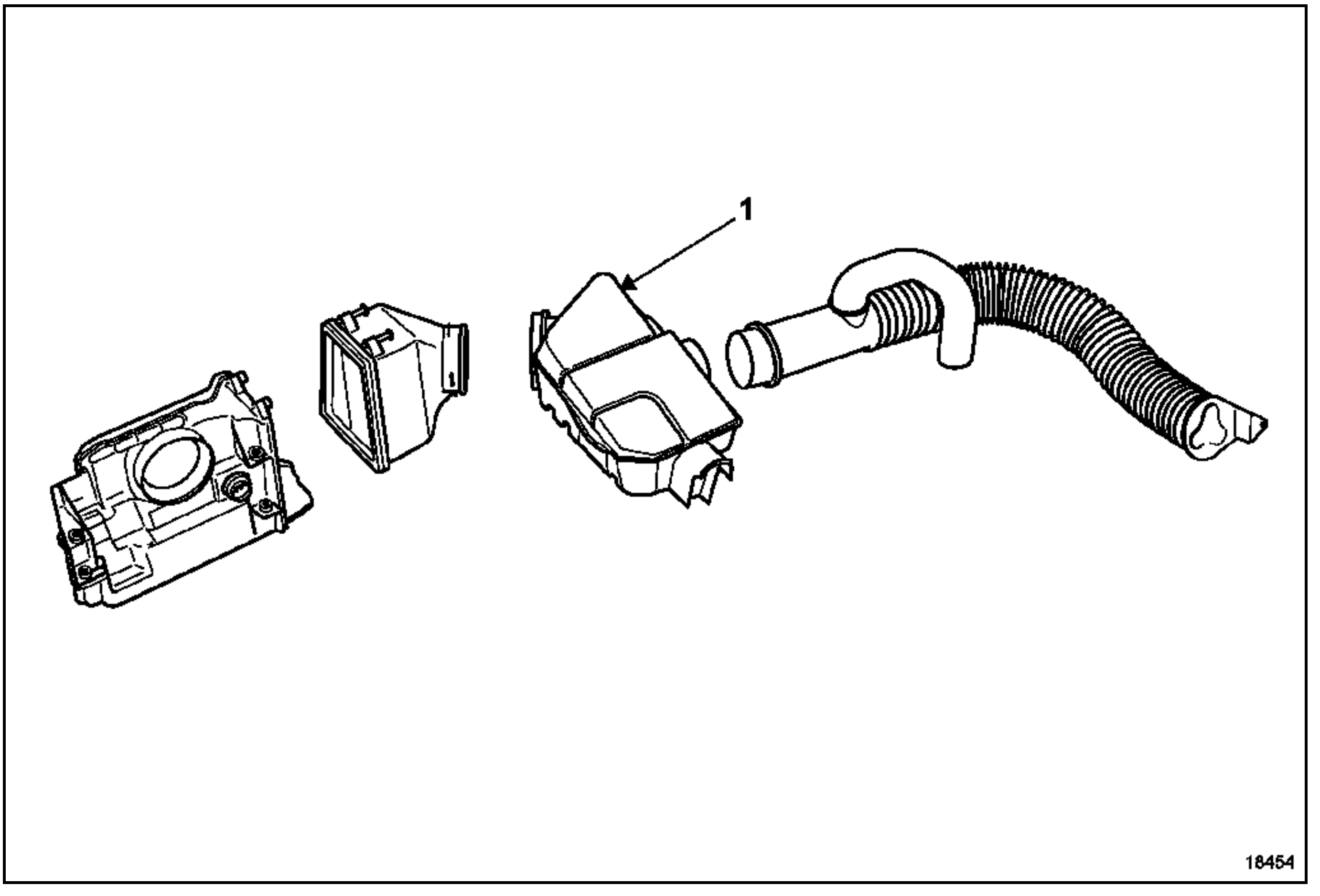
*** IO91 unleaded compatible.

Temperature in °C	-10	25	50	80	110
Air sensor NTC type resistance in Ohms	10450 to 8625	2065 to 2040	815 to 805	-	-
Coolant sensor NTC type resistance in Ohms	-	2360 to 2140	850 to 770	290 to 275	117 to 112

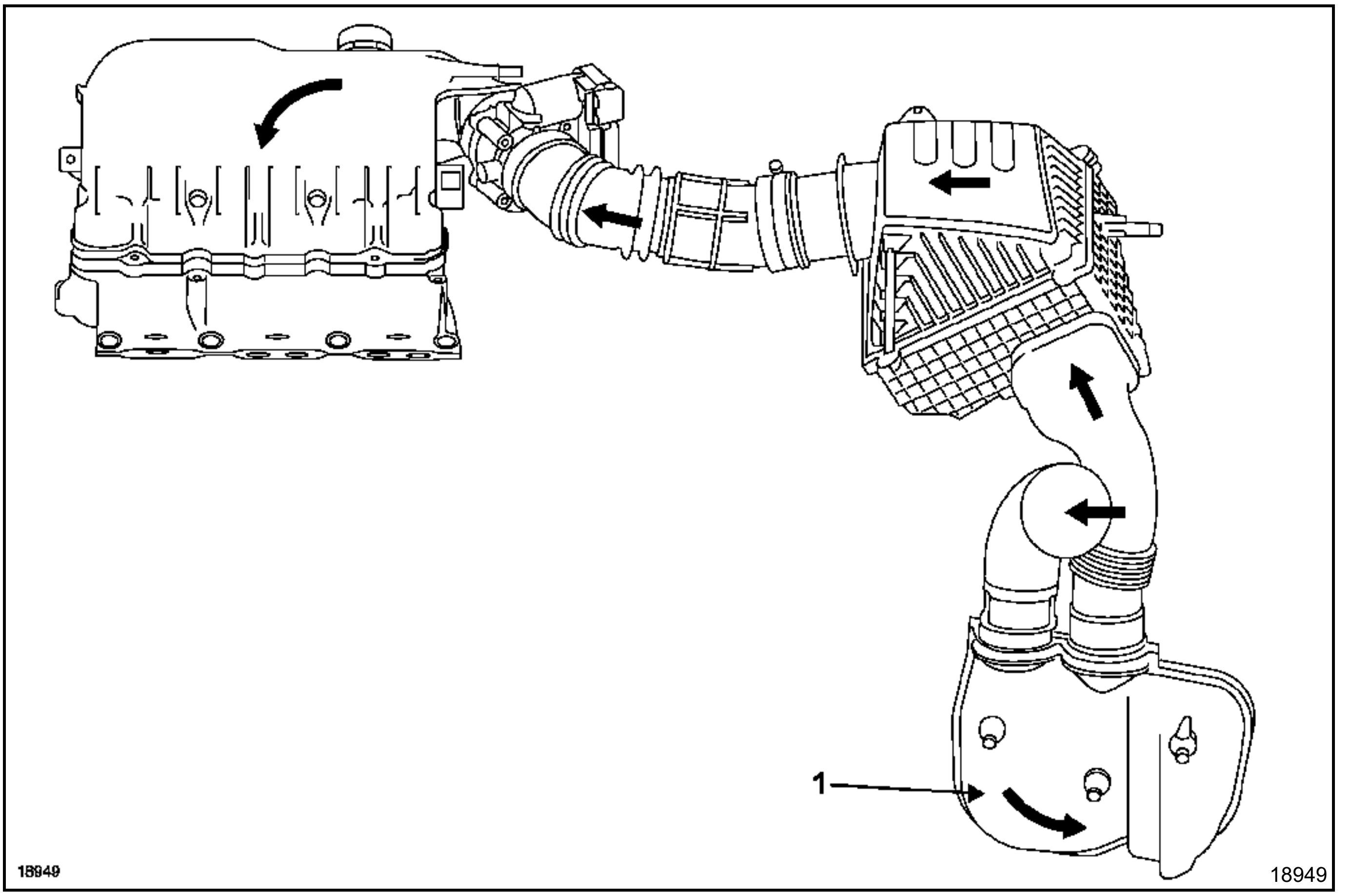
DESCRIPTION	BRAND/TYPE	SPECIAL NOTES
Injection and ignition computer	SAGEM ME 7.4.6	128 tracks Sequential multipoint injection Static ignition
Motorised throttle body ∅ 60 mm (double track integrated potentiometer)	BOSCH	Engine resistance = 1.6 ± 0.3 Ω Potentiometer resistance = 1200 ± 240 Ω
Accelerator pedal sensor	HELLA	Double track potentiometer Track 1 resistance = 1200 ± 480 Ω Track 2 resistance = 1700 ± 680 Ω
Ignition coils	SAGEM	Six pencil coils Primary resistance: 0.5 Ω Secondary resistance: 11 ± 1 KΩ
Spark plugs	BOSCH FGR 8M QPE	Tightening torque: 2.5 to 3 daNm
Manifold pressure sensor	BOSCH	Resistance ≈ 50 KΩ
Pinking sensor	SAGEM	Piezoelectric type.
Magnetic sensor (TDC and engine speed)	-	Tracks 1-2 resistance: 375 Ω
Oxygen sensors (upstream and downstream)	NTK	Heater resistance= 6 ± 1 Ω at 23°C Internal resistance = 5 kΩ maximum Rich mixture > 750 mV ± 70 Lean mixture < 150 mV ± 50
Injectors	BOSCH	Resistance: 14.5±0.7 Ω at 20˚C
Canister solenoid valve	SAGEM	Resistance: 26 ± 4 Ω at 23°C
Coolant pressure sensor.	TEXAS INSTRUMENTS	For the use of air conditioning without a cold loop (omission of air conditioning computer)
Camshaft dephaser solenoid valve		"All or nothing" solenoid valve Resistance: 7.1 ± 0.5 Ω
Cylinder marking sensor		Hall effect sensor

DESCRIPTION	BRAND/TYPE	SPECIAL NOTES
Air sensor	JEAGER	CTN (see table) Resistance: 2500 Ω at 20°C
Coolant sensor	JEAGER	CTN (see table) Resistance: 3500 Ω at 20°C
Submerged fuel pump incorporating the petrol filter and the pressure regulator	BOSCH	Pressure: 3.5 bar ± 0.06 Minimum flow: 80 to 120 l/h
Idle speed manifold pressure		340 ±40 mbars
Exhaust counter-pressure		Upstream of the preconverter (mbars) 1500 rpm 70 3000 rpm 160 4500 rpm 375 5500 rpm 480 6000 rpm 630

The air intake circuit includes an air resonator (1) capable of absorbing certain pressure waves and reducing intake noise.



The air intake circuit includes an air resonator (1) capable of absorbing certain pressure waves and reducing intake noise.



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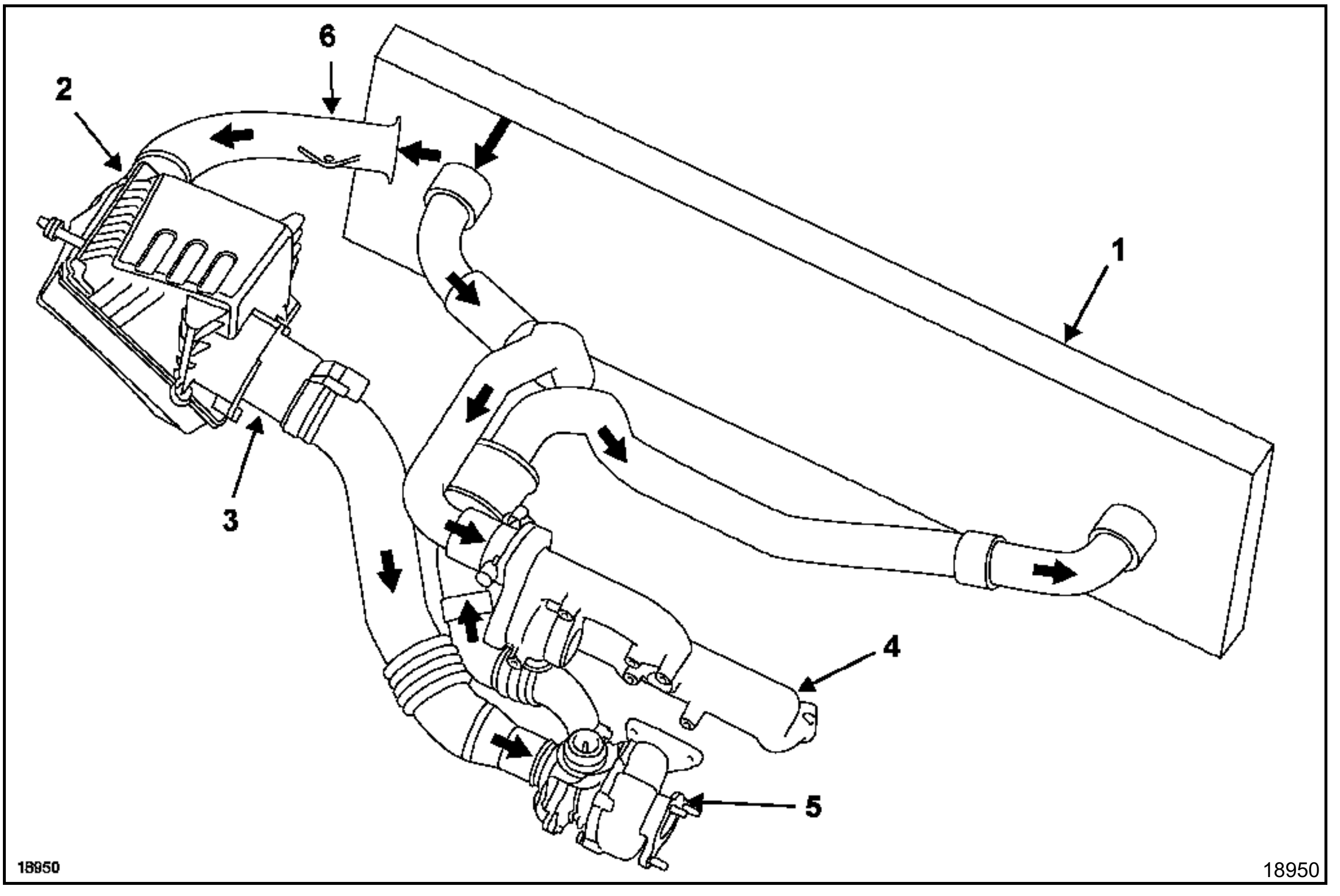
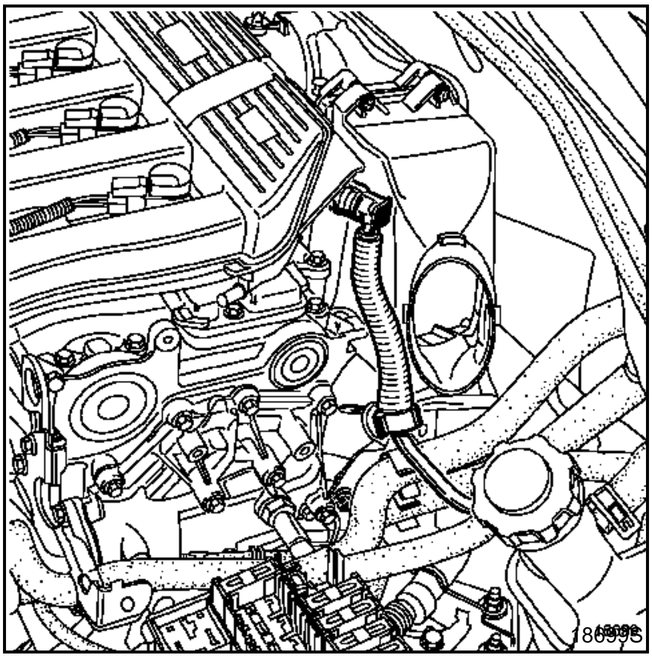
AIR INTAKE CIRCUIT DIAGRAM



1. Air-air exchanger
2. Air filter
3. Flowmeter
4. Inlet manifold
5. Turbocharger
6. Air inlet

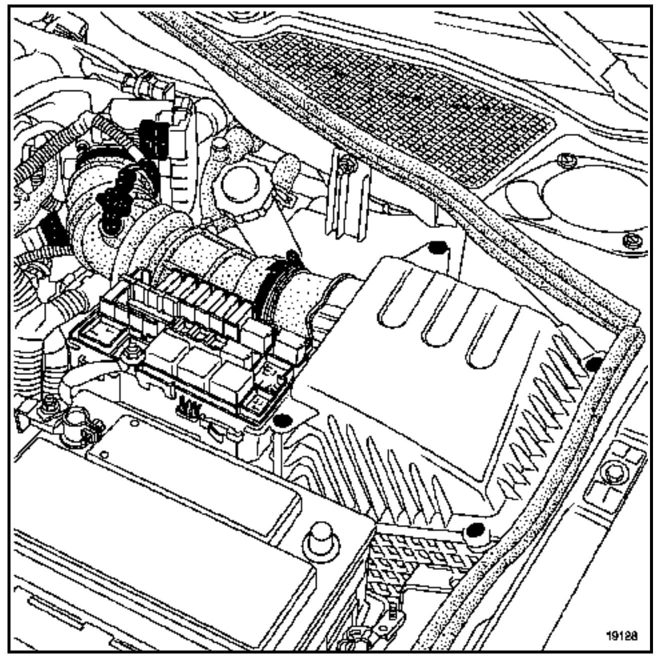
REPLACING THE FILTER ELEMENT

F4P AND K4M ENGINES



Remove:
- the air resonator and disconnect the vacuum pipe from the brake servo (manifold end),
- the two screws on the air filter cover to gain access to the filter element.

L7X AND F9Q ENGINES



Remove the four screws on the air filter cover to gain access to the filter element.

TIGHTENING TORQUE (in daNm)	
Air filter unit bolt	0.9

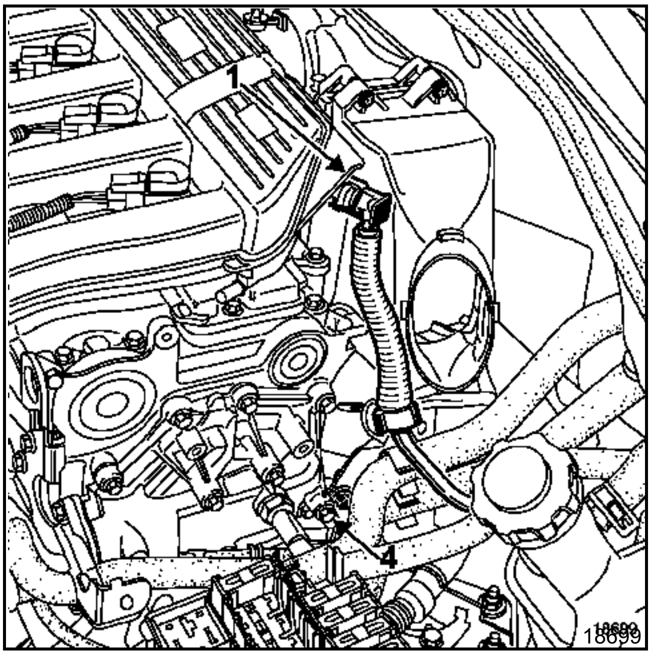
REMOVAL

Disconnect the battery.

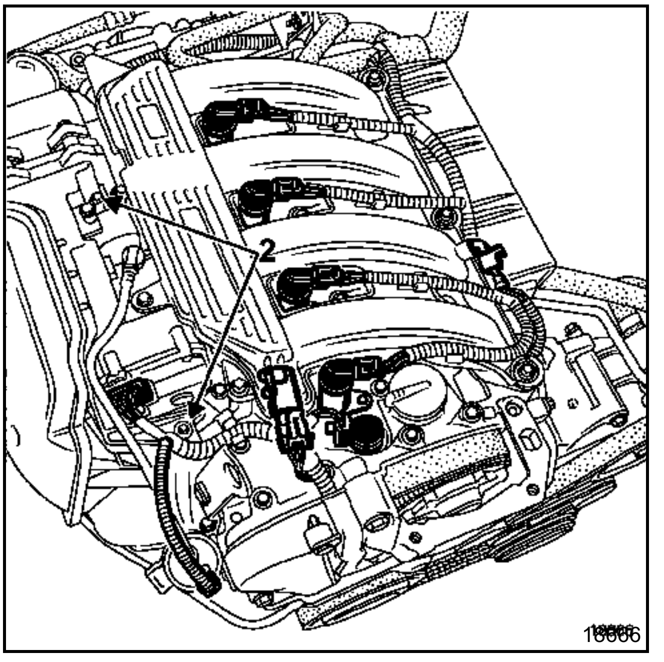
Remove the air resonator.

Disconnect the vacuum pipe from the brake servo (1) (manifold end).

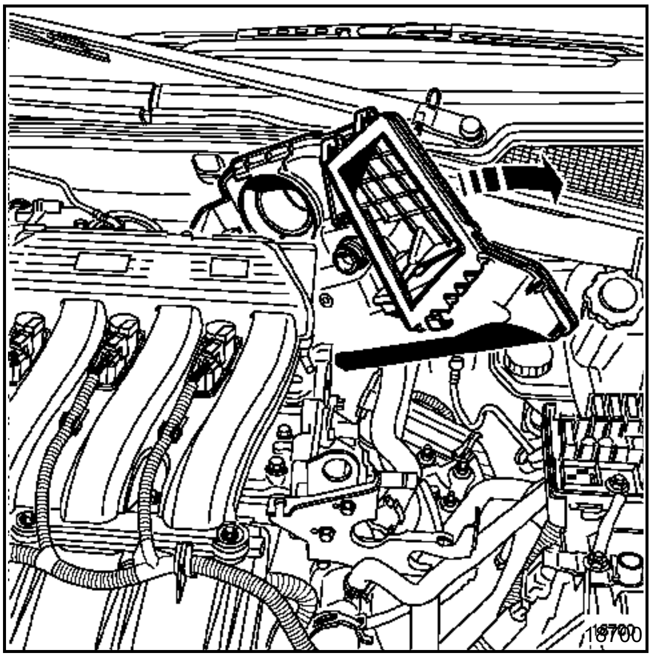
Remove:
- the mounting bracket (4) for the oxygen sensor connector to make it easier to pass the air filter through.



- the air filter,
- the mounting bolts (2) of the air filter unit.



Move the air filter unit to the right in order to remove it. The air filter unit can pass between the windscreen aperture, the engine and the brake servo.



REFITTING

Refitting is the reverse of removal.

Tighten the mounting bolts to the correct tightening torque.

Note: inspect the vacuum outlet going from the inlet manifold to the brake servo. The manifold will have to be replaced if this outlet is broken.

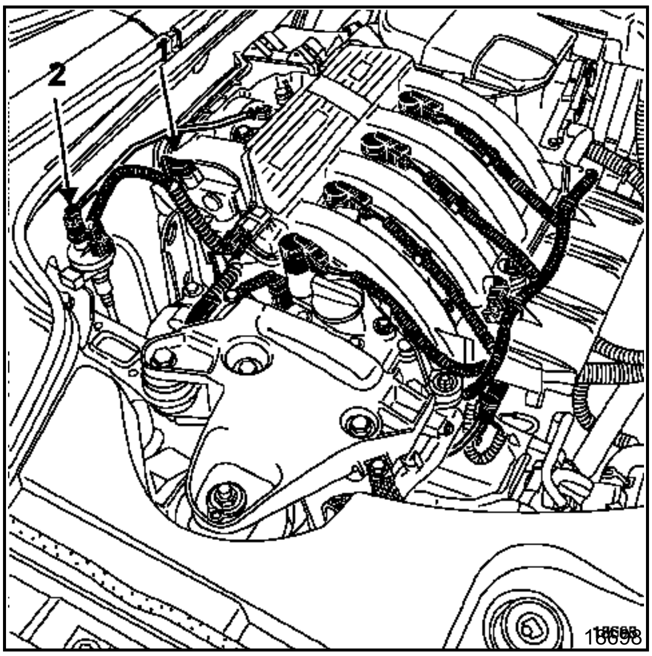
TIGHTENING TORQUES (in daNm)	
Throttle body bolt	**1.3**
Air filter unit bolt	**0.9**

REMOVING THE THROTTLE BODY

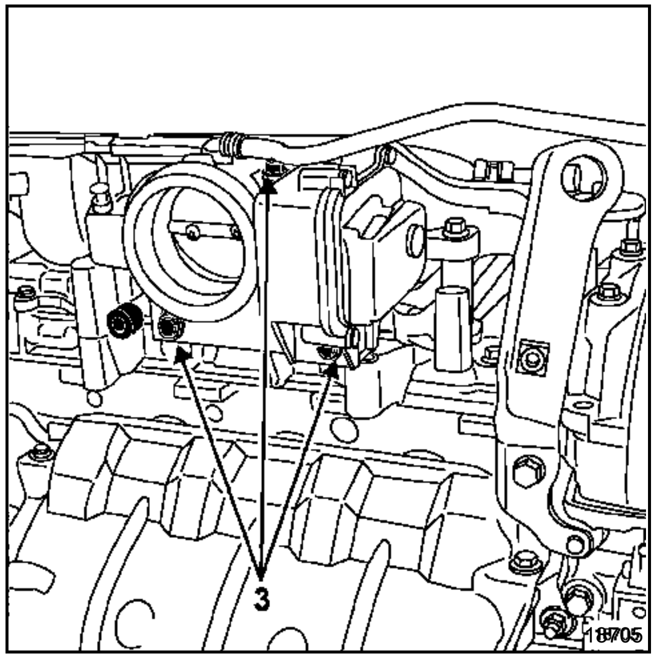
Disconnect the battery.

Remove the air filter unit (see section **12 Fuel mixture "Air intake"**).

Disconnect:
- the motorised throttle body connector (1),
- the petrol vapour rebreathing pipe (2) on the canister solenoid valve.



Remove the throttle body's three mounting bolts (3).



REFITTING

Refitting is the reverse of removal.

Replace the gasket every time the throttle body is removed. Use grease to assist in locating it if necessary.

When the ignition is switched on, the throttle unit should go through a cycle of programming for its minimum and maximum positions.

Use the diagnostic tool to check that the programming has been carried out correctly.

TIGHTENING TORQUE (in daNm)	
Throttle body bolt	**1.3**

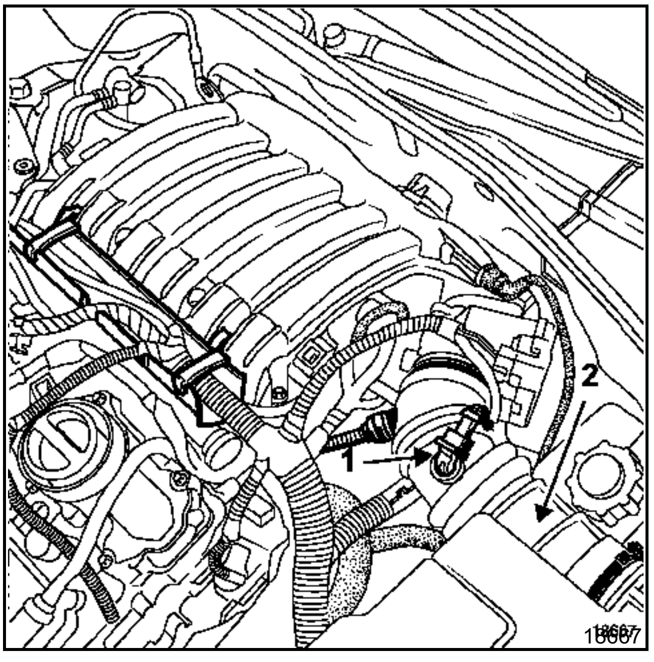
REMOVAL

Disconnect the battery.

Remove the engine cover.

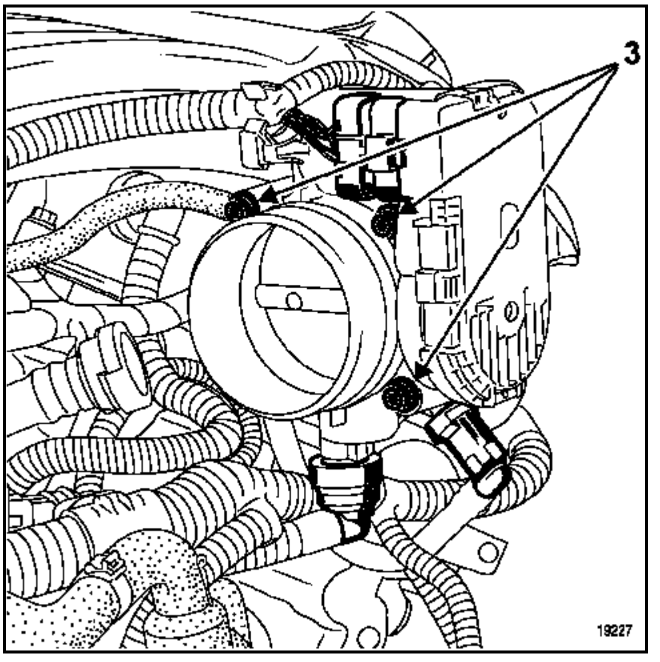
Disconnect the air temperature sensor (1).

Remove the air duct (2).



Disconnect:
- the motorised throttle body,
- the two hoses located under the motorised throttle body.

Remove:
- the four bolts (3) for the motorised throttle body,
- the motorised throttle body.



REFITTING

Refitting is the reverse of removal.

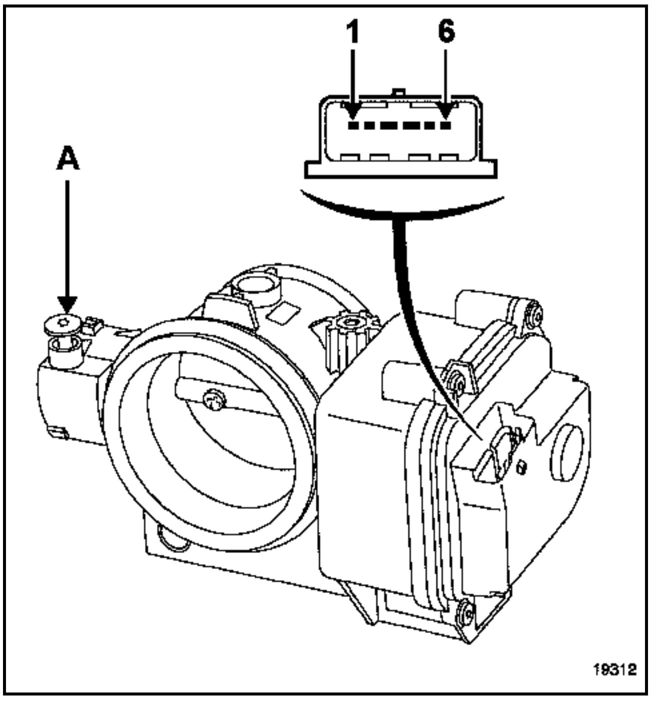
Replace the gasket every time the throttle body is removed.

When the ignition is switched on, the throttle unit should go through a cycle of programming for its minimum and maximum positions.

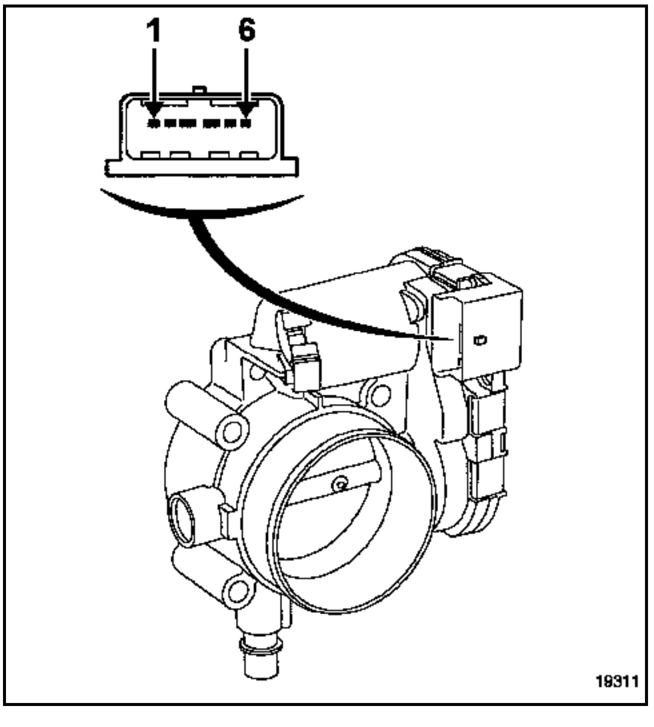
Use the diagnostic tool to check that the programming has been carried out correctly.

IMPORTANT
- **the motorised throttle body cannot be removed.**
- **Modification of the position of the stop screw (A) is forbidden.**

K4M and F4P engines



L7X ENGINE



ALLOCATION OF TRACKS

Motorised throttle body connector:
1: Potentiometer earth
2: Potentiometer no.1 signal
3: - engine
4: + engine
5: Potentiometer + 5V supply
6: Potentiometer no.2 signal

Engine resistance:	**1.6** Ω ± **0.08** Ω
Potentiometer resistance:	**1200** Ω ± **240** Ω

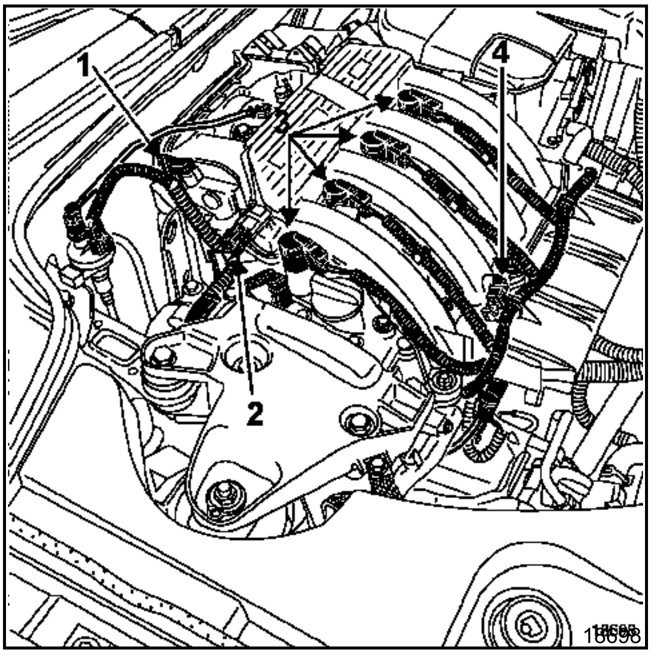
TIGHTENING TORQUES (In daNm or /and°)	
Manifold bolts	**0.9**
Air unit bolt	**0.9**
Throttle body bolt	**1.3**

REMOVAL

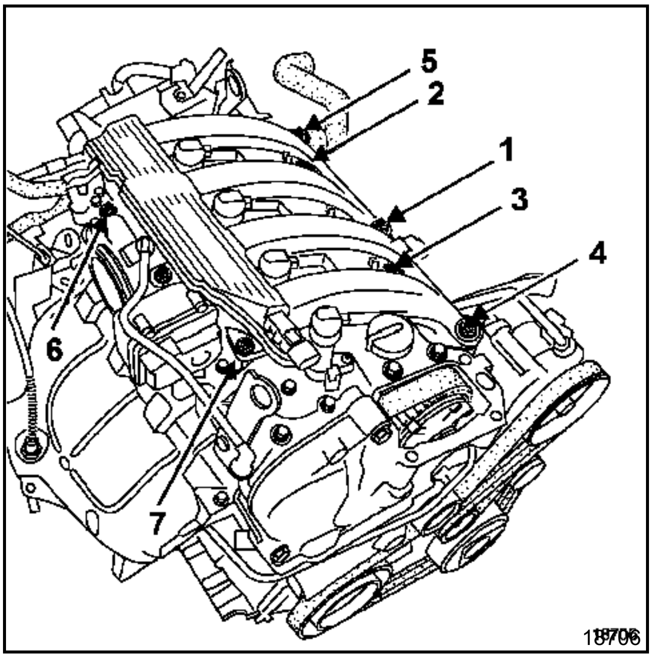
Disconnect the battery.

Remove the air filter unit (see section **12 Fuel mixture "Air intake"**).

Disconnect:
- the motorised throttle body connector (1),
- the absolute air pressure sensor (2),
- the coils (3),
- the air temperature sensor (4).



Remove:
- the three mounting bolts on the throttle body,
- the throttle body,
- the seven bolts on the inlet manifold,
- the inlet manifold.



REFITTING

Refitting is the reverse of removal.

Note: observe the tightening torques for the bolts on the inlet manifold, the throttle body and observe the recommended tightening sequence.

Replace the O-rings in the manifold and the throttle body.

TIGHTENING TORQUES (in daNm)		
Throttle body bolts		**1.3**
Inlet manifold bolt	**pre-tightening**	**0.5**
	tightening	**0.8**

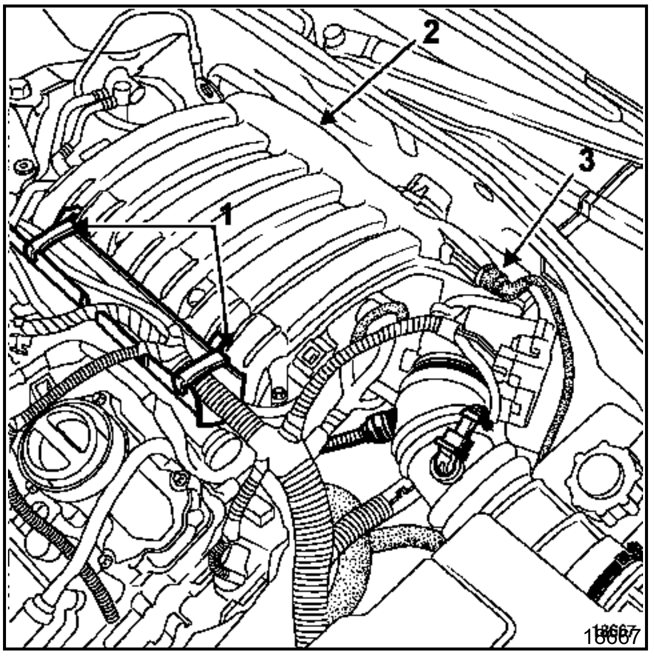
REMOVAL

Disconnect the battery.

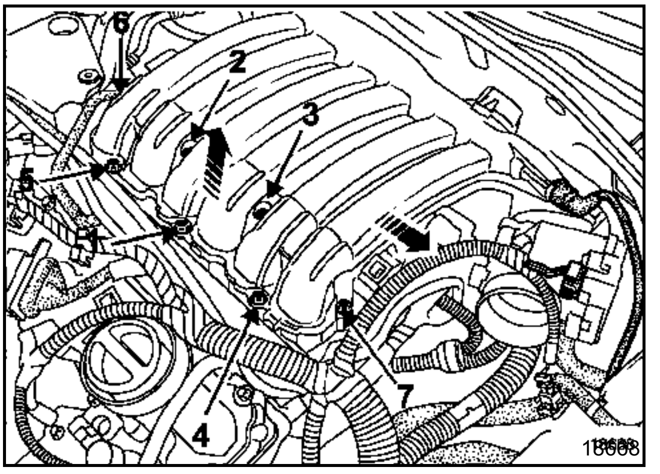
It is necessary to remove the motorised throttle body in order to remove the inlet manifold (see section **12 Fuel mixture "motorised throttle body"**).

Remove the electrical harness channel (1).

Disconnect:
– the manifold pressure sensor (2),
– the vacuum pipe (3) for the brake servo



Remove:
– the mounting bolts for the inlet manifold,
– the manifold by lifting it and displacing it towards the battery.



REFITTING

Replace the gaskets with new ones.

Refitting is the reverse of removal.

Note: observe the tightening torques and sequence for the bolts on the inlet manifold and the throttle body.

TIGHTENING TORQUE (in daNm)	
Injector holder shim bolt	**2.1**

REMOVAL

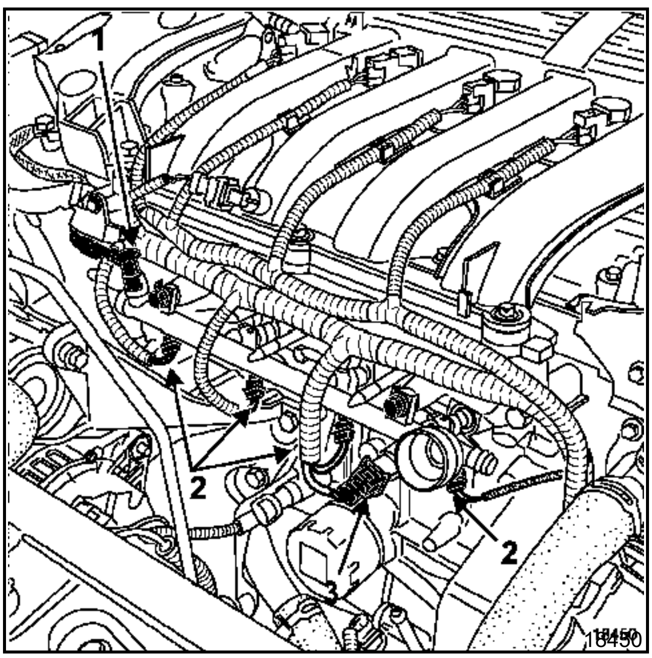
Disconnect the battery.

Remove the inlet manifold (see section **12 Fuel mixture "Motorised throttle body"**).

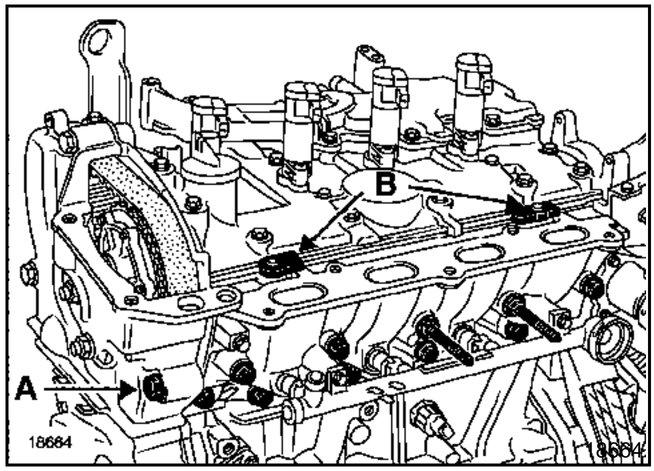
IMPORTANT: be aware that there will be a quantity of fuel in the rail and in the union when you remove the pipes for the rail. Protect the alternator.

Remove the injection rail protection.

Disconnect:
– the fuel delivery pipe (1),
– the injectors (2),
– the pinking sensor (3).



Remove the bolts from the injector holder shim.



REFITTING

Replace the seal.

Tighten bolt (A) by hand so that the injector holder shim is against the suspended mounting, then raise the injector holder shim so that it is resting (at B) on the cylinder head cover.

Tighten the shim mounting bolts and nuts observing the tightening torque.

Continue the refitting procedure in the reverse order to removal.

TIGHTENING TORQUE (in daNm)		
Inlet manifold bolt	**pre-tightening**	**0.5**
	tightening	**1**

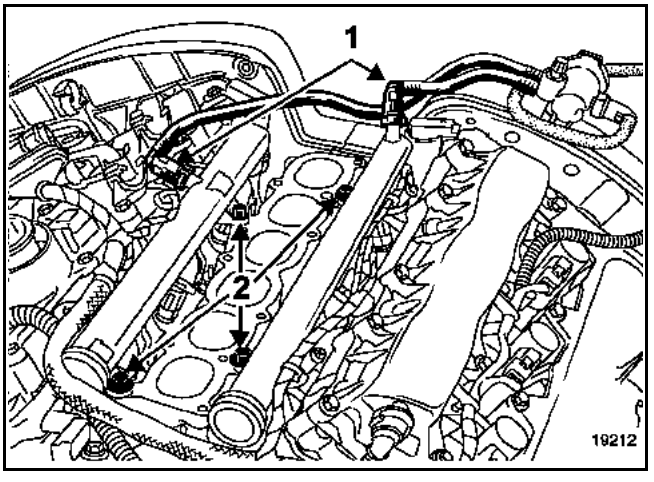
REMOVAL

Disconnect the battery.

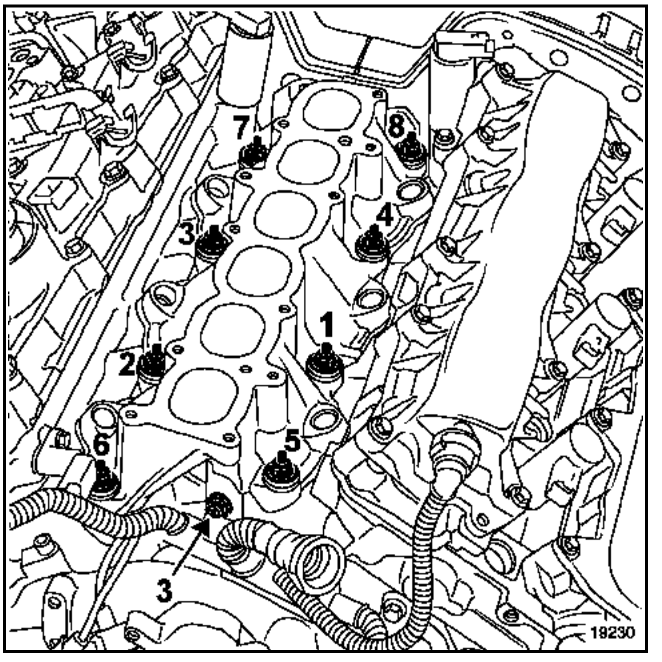
Remove the inlet manifold (see section **12 Fuel mixture "Inlet manifold"**).

Disconnect the fuel inlet unions (1) on the two injection rails; be aware that there will be a quantity of fuel in these.

Remove:
– the injection rail mounting bolts (2),
– the two injection rails.



– the oil vapour rebreather pipes mounting bolts (3),
– the mounting nuts for the inlet manifold,
– the inlet manifold.



REFITTING

Replace the seal.

Proceed with refitting in the reverse order to removal respecting the torques and sequence of tightening of the inlet manifold bolts.

SPECIAL TOOLING REQUIRED	
Mot. 1495	**Tool for removing and refitting the oxygen sensor**

TIGHTENING TORQUES (in daNm)	
Oxygen sensors	**4.5**
Manifold bolts	**1**
Heat shield bolts,	**1**
Three point flange nut	**2**

REMOVAL

Put the vehicle on a 2 post lift.

Disconnect the battery.

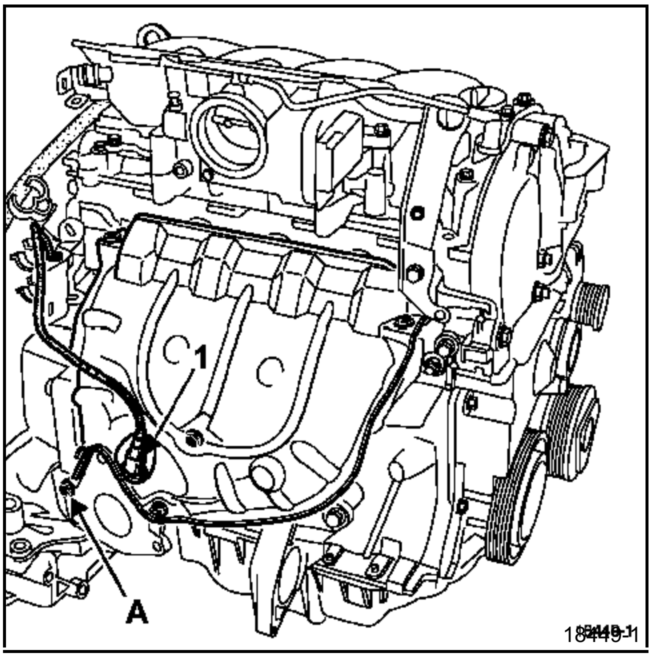
Remove the air filter unit (see section **12 Fuel mixture "Air intake"**).

Disconnect and remove the oxygen sensor (1) using tool **Mot. 1495**.

Remove the upper heat shield of the exhaust manifold.

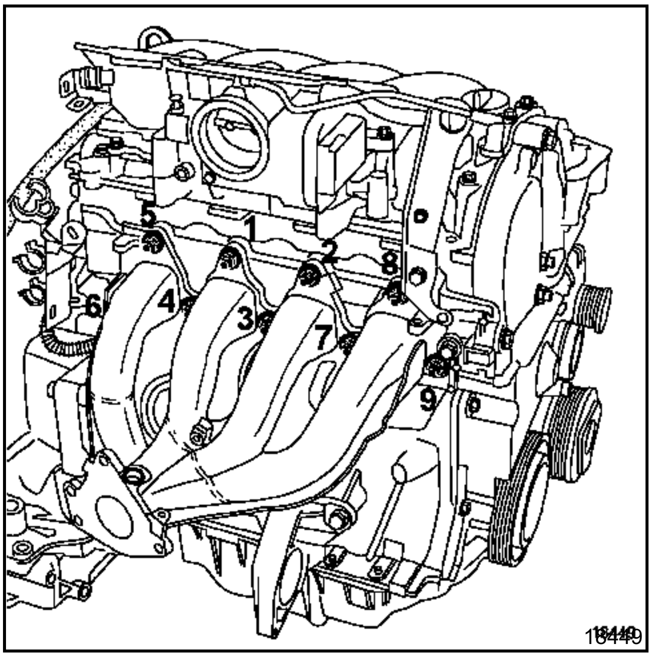
Remove the stay (A) between the exhaust manifold and the gearbox housing.

Disconnect the exhaust downpipe.



Pull the catalytic converter back.

Position a block on the sub-frame to support the exhaust downpipe and avoid damaging the hose which would require the catalytic converter to be replaced.



Remove the mounting nuts for the exhaust manifold.

Release the manifold by pivoting it through **45**°, then remove it by the right.

Remove the lower heat shield.

REFITTING

Refitting is the reverse of removal.

Use the correct order and tightening torque for the mountings nuts of the manifold.

Replace the gaskets for the manifold and the three-point mounting and the manifold nuts.

TIGHTENING TORQUES (in daNm)		
Front exhaust flange nuts		**2.1**
Pre-converter stay bolt		**2.1**
Catalytic converter/pre-converter flange nuts		**2.1**
Manifold nuts	**pre-tightening** **tightening**	**1** **3**

REMOVAL

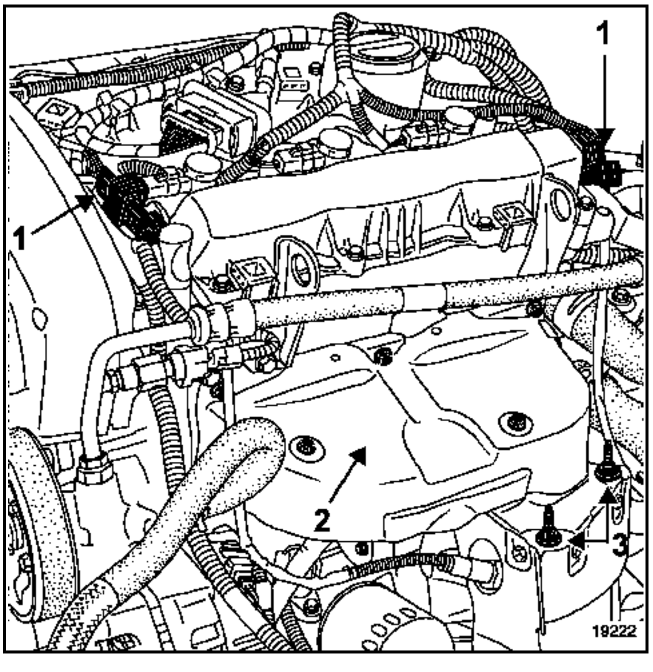
Put the vehicle on a two post lift.

Disconnect the battery.

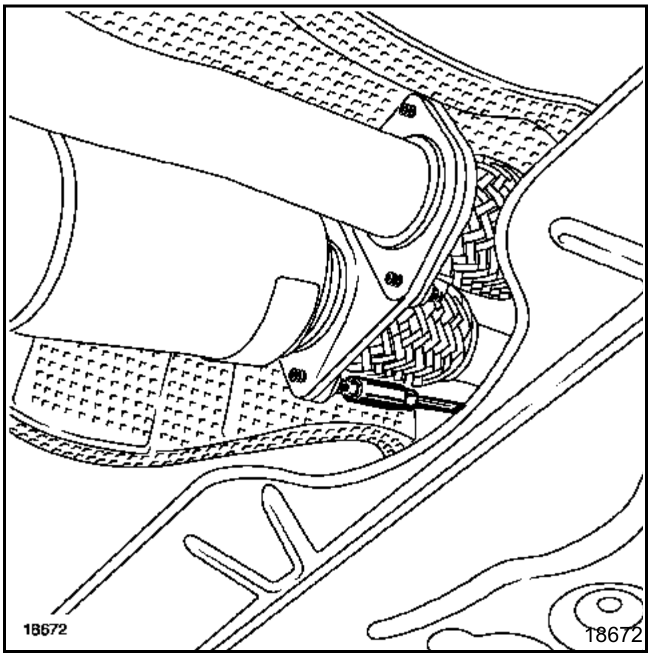
Remove:
- the under-engine fairing,
- the engine cover.

Disconnect and unclip the oxygen sensor connectors (1)

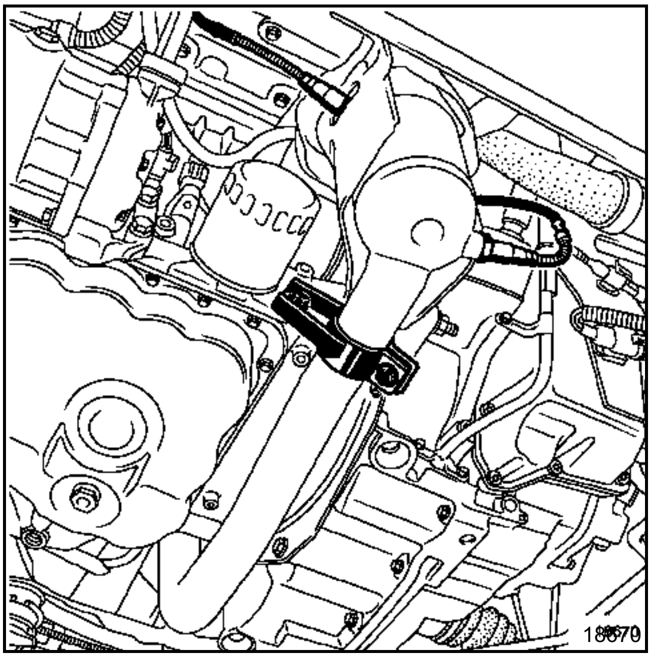
Remove:
- the manifold heat shield (2),
- the nuts (3) securing the exhaust flange to the manifold.



Undo the four catalytic converter/pre-converter flange bolts as far as possible, passing through the sub-frame using one or more extensions.

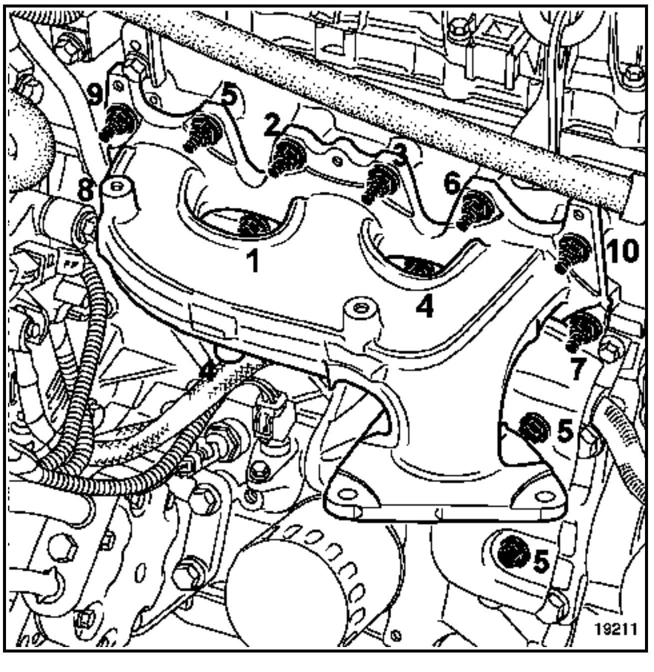


Remove the preconverter stay bolt.



Remove the preconverter in order to provide access to the manifold.

Remove:
– the lower manifold heat shield (4),
– the starter heat shield (5),
– the manifold.



REFITTING

Replace the gaskets with new ones.

Proceed with refitting in the reverse order to removal respecting the torques and sequence of tightening of the manifold bolts.

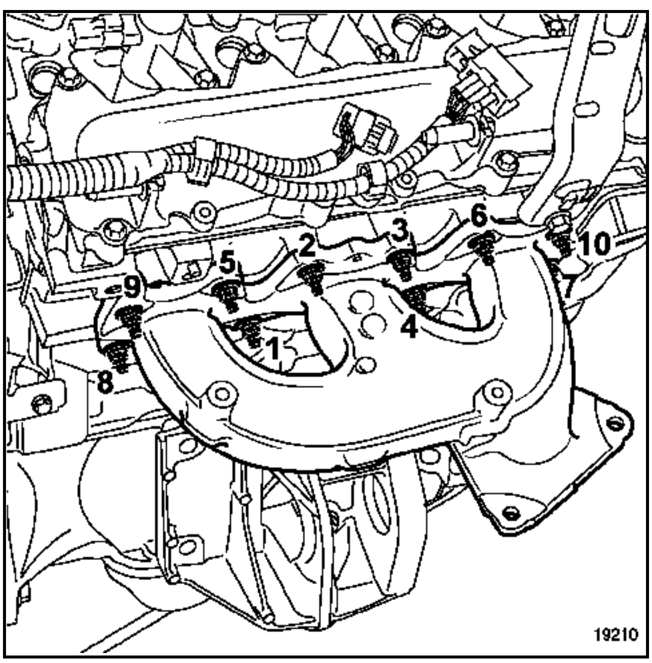
SPECIAL TOOLING REQUIRED	
Mot. 1495	**Tool for removing and refitting the oxygen sensor**

TIGHTENING TORQUES (in daNm)		
Front exhaust flange nuts		**2.1**
Rear exhaust flange nuts		**2.1**
Pre-converter stay nuts		**2.1**
Pre-converter stay bolt		**2.1**
Manifold nuts	**pre-tightening**	**1**
	tightening	**3**

REMOVAL

The removal of the rear bank exhaust manifold requires the removal of the rear bank preconverter (see section **19 Exhaust "Rear bank preconverter"**).

Remove:
- the mounting nuts for the manifold,
- the manifold.



REFITTING

Replace the gaskets with new ones.

Proceed with refitting in the reverse order to removal respecting the torques and sequence of tightening of the manifold bolts.

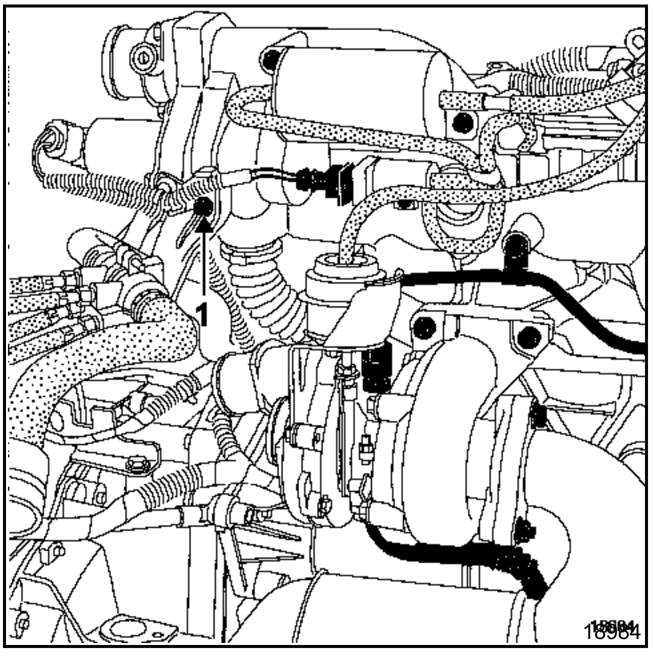
TIGHTENING TORQUES (in daNm)	
Manifold mounting nut	**0.8**
Manifold mounting nut	**2.8**
EGR valve mounting bolt	**0.8**
Damper unit mounting bolts	**0.8**

REMOVAL

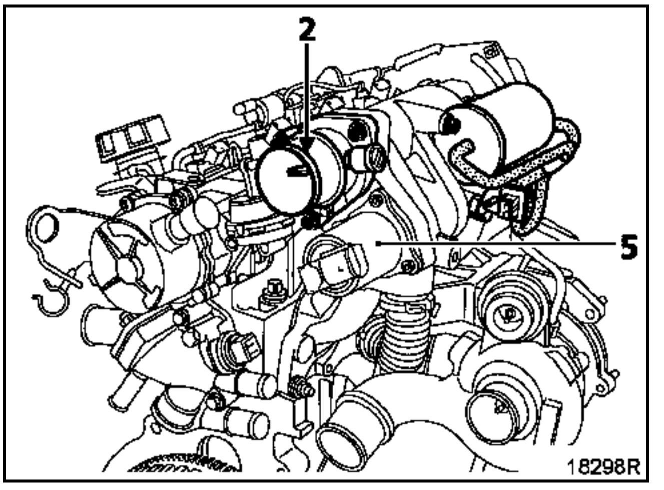
NOTE: Removal of the manifolds requires that you remove the turbocharger (see section **12** "**Turbocharging**"). The two manifolds cannot be removed separately.

Disconnect:
– - the battery,
– the air inlet pipe from the damper,
– the **EGR** solenoid valve.

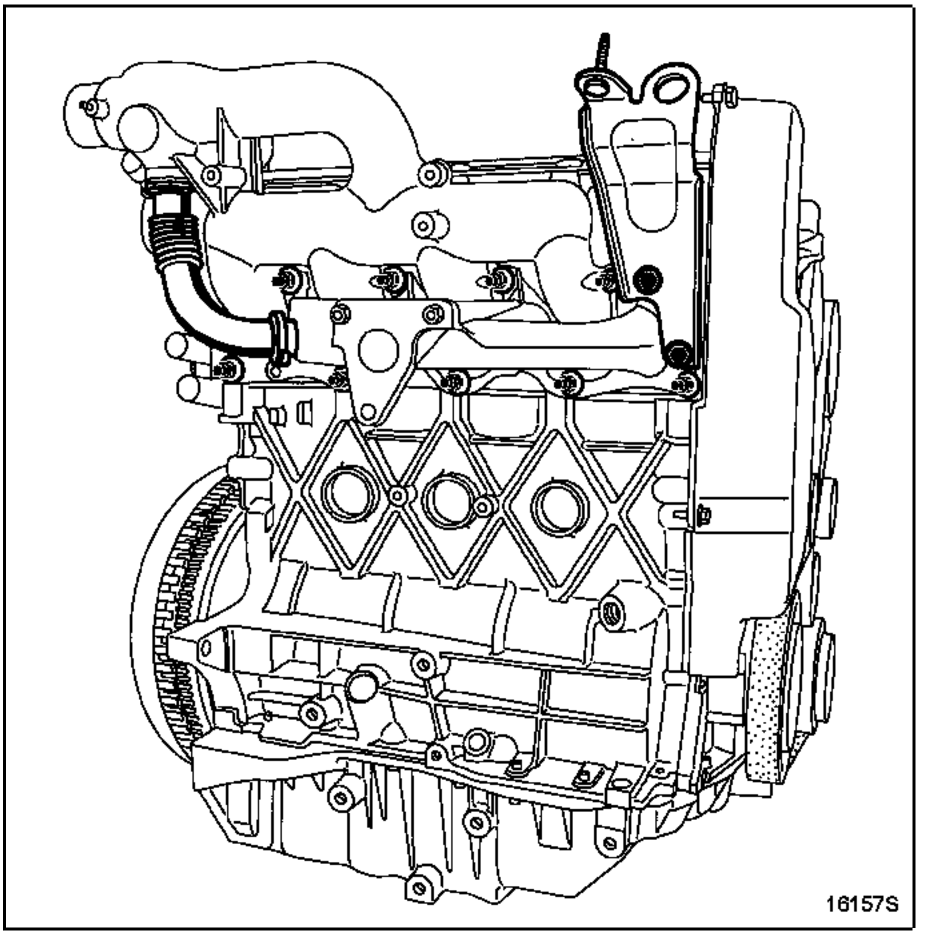
Remove:
– the mounting bolts (1) for the thermoplunger unit, and remove this.



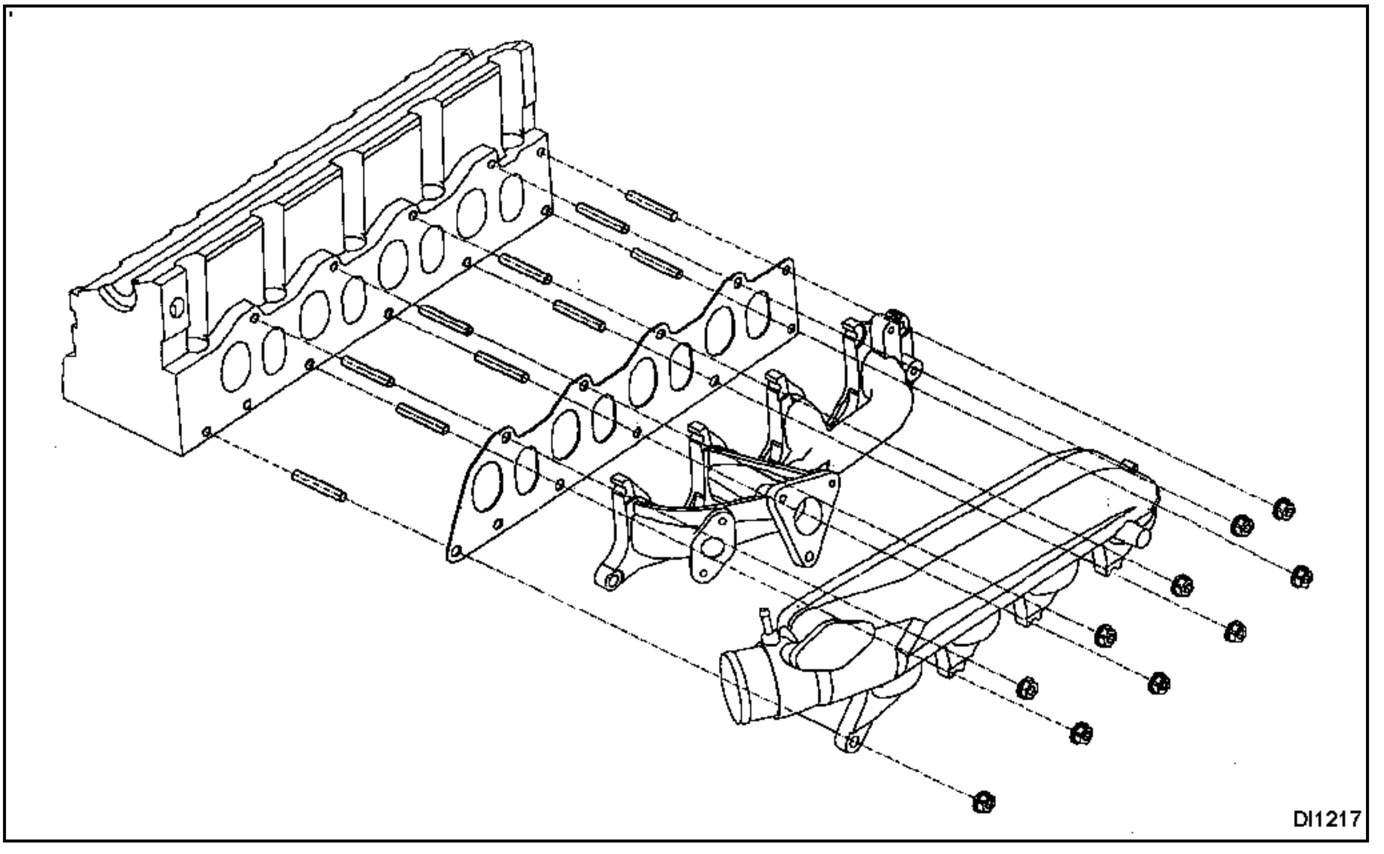
– the damper unit (2),
– the **EGR** solenoid valve (5).



Remove the **EGR** pipe and the lifting bracket.



Remove the nuts securing the manifolds.



REFITTING

Proceed in the reverse order to removal.

Replace the manifold gaskets and ensure that the **EGR** valve and damper unit gaskets are properly fitted.

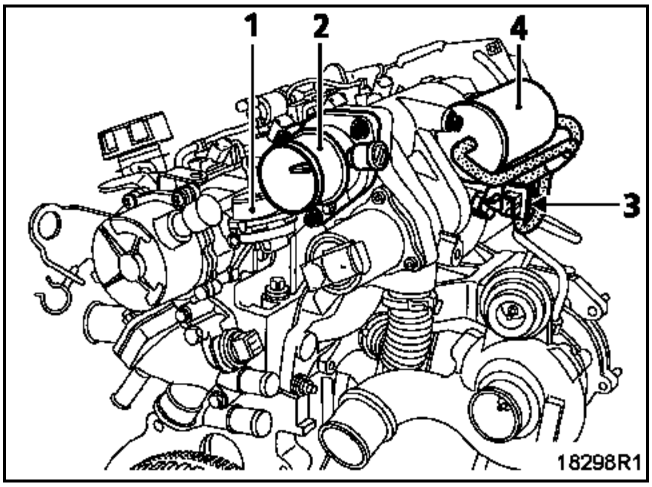
TIGHTENING TORQUES (in daNm)	
Damper bolt	0.8 ± 0.05

OBJECTIVE

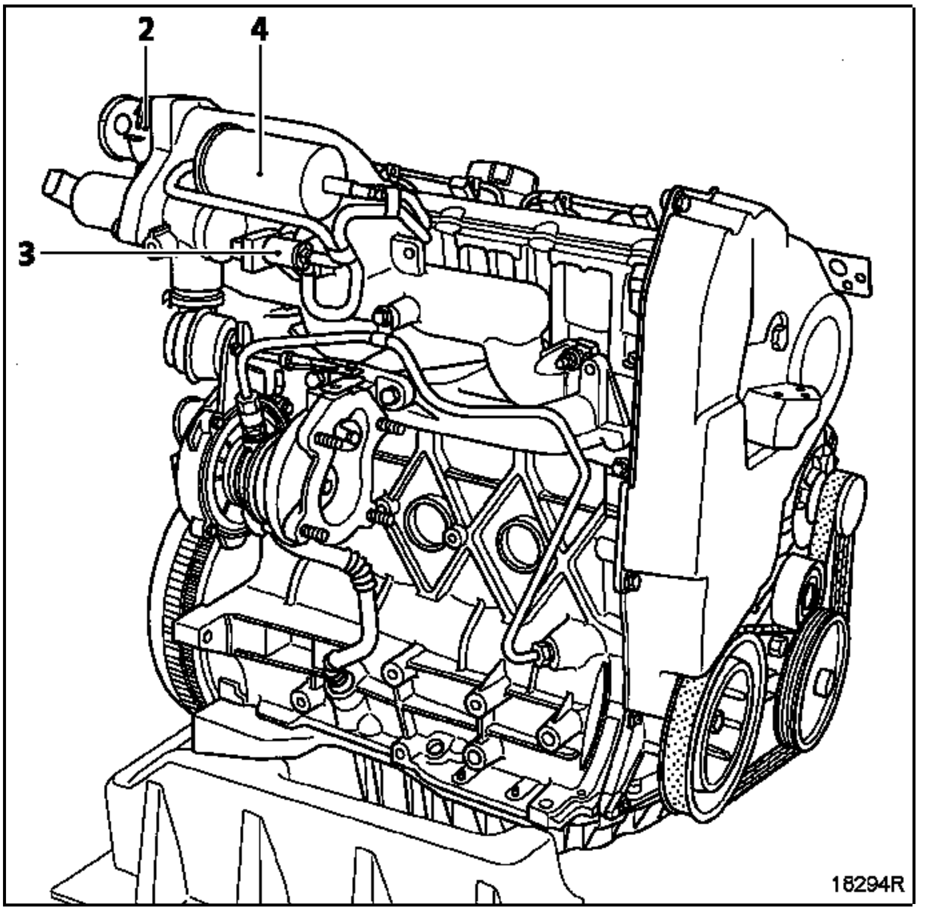
The aim of the system is to stop the engine quickly after the ignition is switched off.

DESCRIPTION

The system consists of:
– a diaphragm (1) acting on the throttle,
– a throttle valve (2),



– a solenoid valve (3),
– a vacuum (4).



OPERATION

When the ignition is switched off, the solenoid valve connects the vacuum with the diaphragm.

The latter is subject to the vacuum which results in the air intake valve being closed.

The engine can no longer breathe air and halts immediately.

REMOVING THE THROTTLE

Disconnect the vacuum hose from the diaphragm.

Remove the three mounting bolts.

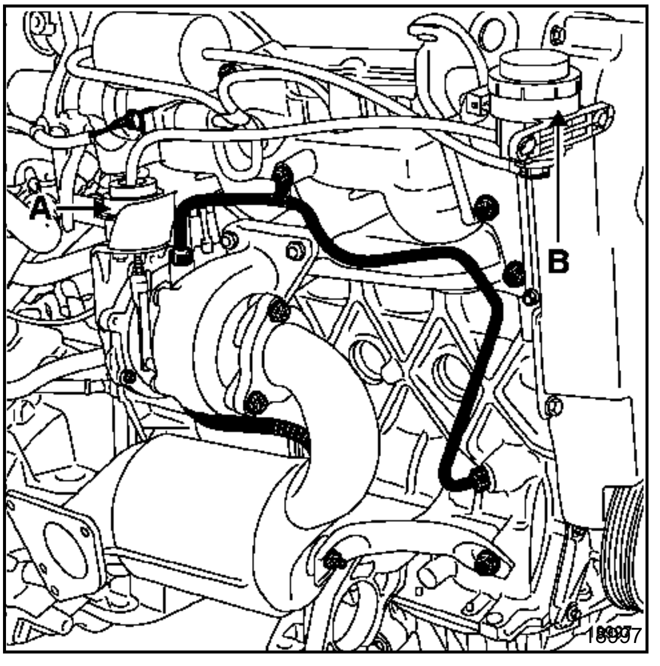
Withdraw the throttle/diaphragm assembly.

REFITTING THE THROTTLE

Replace the seal.

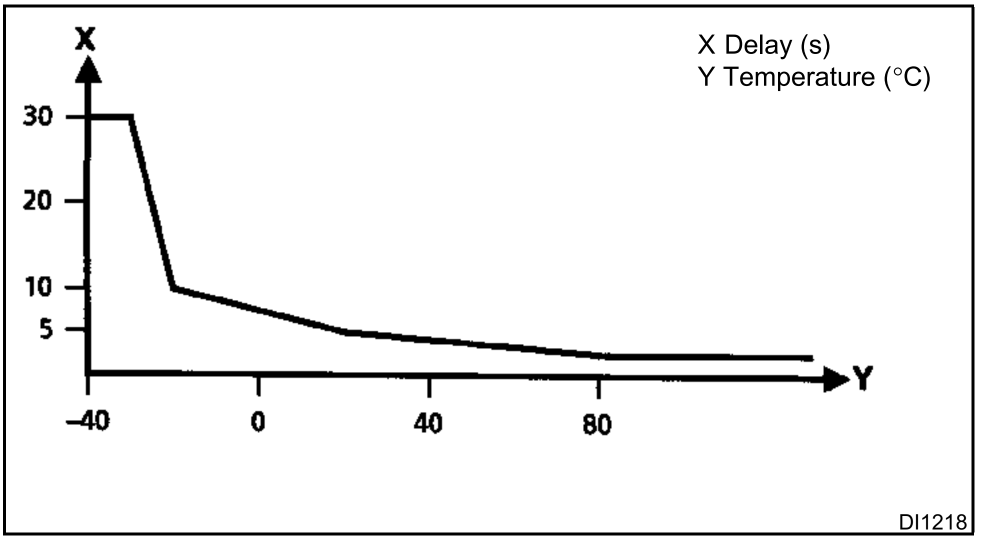
For the other operations, refitting is the reverse of removal.

The LDA (A) of the pressure regulation valve is controlled by a solenoid valve (B) which is controlled by the injection computer. This solenoid valve varies the underpressure as a function of the engine operating ranges, which allows the turbocharging pressure to be regulated.



The pressure regulation valve is open in rest position. The engine operates as normally aspirated.

The solenoid valve, closed in the rest position, is energized after the engine is started following a delay dependent on the coolant temperature.



TURBOCHARGING PRESSURE LIMITATION VALVE (WASTEGATE)

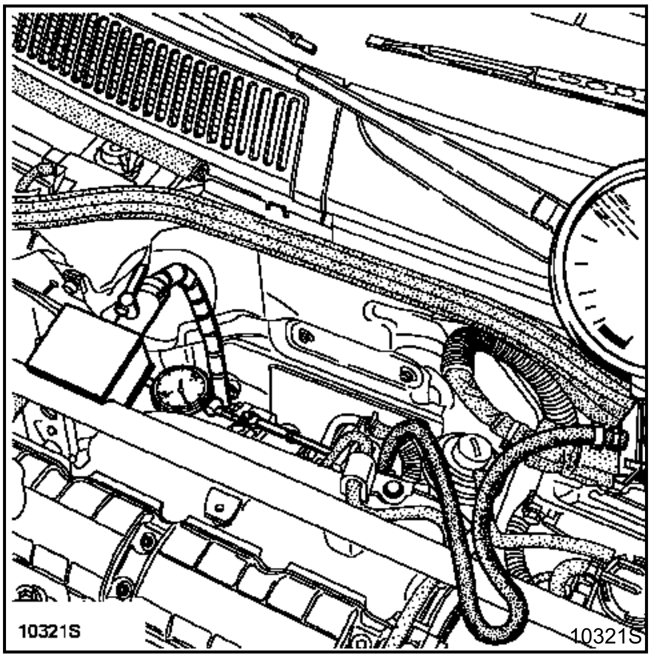
NB: the limitation valve operates in the opposite way to the usual fittings.

The absence of control pressure causes a turbocharging pressure limitation.

Check that there are no leaks between the vacuum pump and the limitation valve.

Checking calibration pressure

Set up on car equipped with **F9Q 754** engine.



Use a magnetic holder fitted with a gauge which should be positioned at the end of the **wastegate rod** (inserted as far as possible in the **wastegate** shaft).

An underpressure is progressively applied to the wastegate using a pressure gauge **Mot. 1014**

IMPORTANT: the turbocharger must be removed to allow the calibration pressure to be checked on the F9Q 750 engine (see section **12 Turbocharging "Turbocharger"**

Calibration value

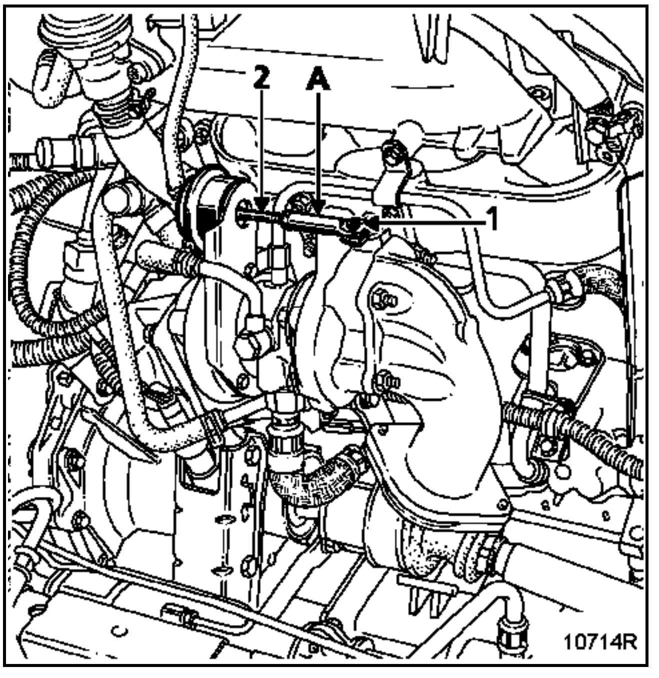
Engine	Underpressure values	Rod movement (mm)
F9Q 754	120 mbars	Between 1 and 4 mm
F9Q 754	400 mbars	Between 10 and 12 mm
F9Q 754	> 450 mbars	Rod at stop
F9Q 750	200 mbars	Between 0.5 and 3.5 mm
F9Q 750	> 600 mbars	Rod at stop

Positioning on the car (F9Q 754)

It may be necessary to adjust the **wastegate** rod length (A) (if the pressure is not within tolerance) when checking the calibration pressure.

This adjustment is carried out with the turbocharger in position on the **F9Q 754** and with the turbocharger removed on the **F9Q 750**.

Unclip the rod (1) and detach the regulator arm (A).



Hold the rod at the limiter valve side (2) with a vice.

Undo the lock nut and then slacken off or tighten the threaded end.

Validate the repair in a road test, checking the "Wastegate opening cyclic ratio" and the "turbocharging pressure" parameters on the diagnostic tools.

TIGHTENING TORQUES (in daNm)	
Turbocharger mounting nuts	**2.4 ± 1**
Oil inlet union	**2.4 ± 4**
Oil inlet union	**2.6 ± 0.2**
Bolts for oil return pipe	**1.2 ± 0.1**
Nuts mounting the catalytic converter on the turbocharger	**2.6 ± 0.2**

REMOVAL

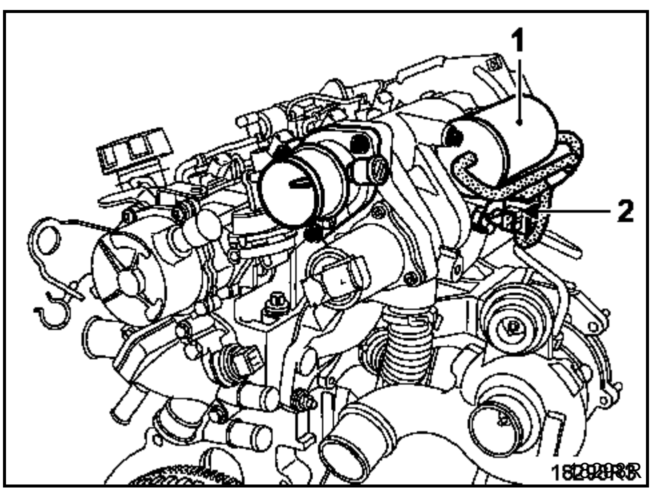
NOTE: to slacken the turbocharger mounting nuts more easily on the exhaust manifold, it is useful to spray a releasing agent on the nuts when they are still hot, just before removal.

Disconnect the battery.

Remove the engine cover.

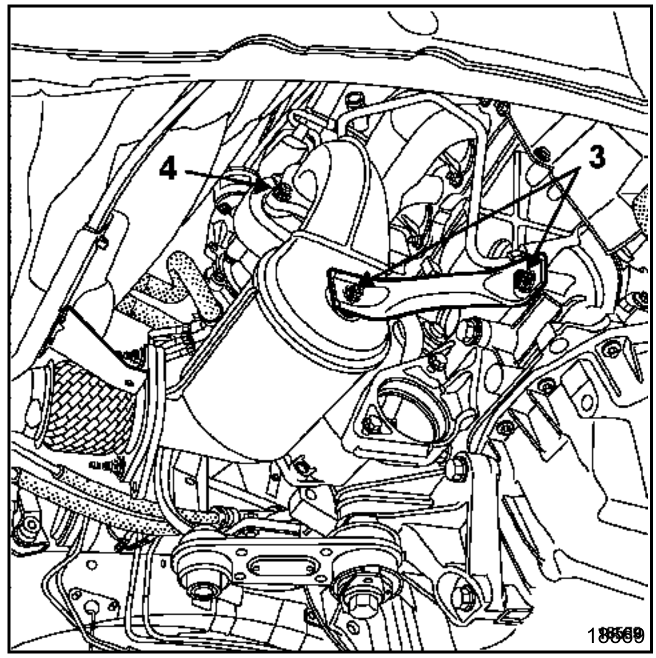
From above:

Remove:
– the vacuum canister (1),
– the engine stop system solenoid valve (2).



From below:

Remove:
– the engine undertray,
– the mounting stay (3),
– the nuts (4) mounting the catalytic converter on the turbocharger and remove the exhaust pipe.

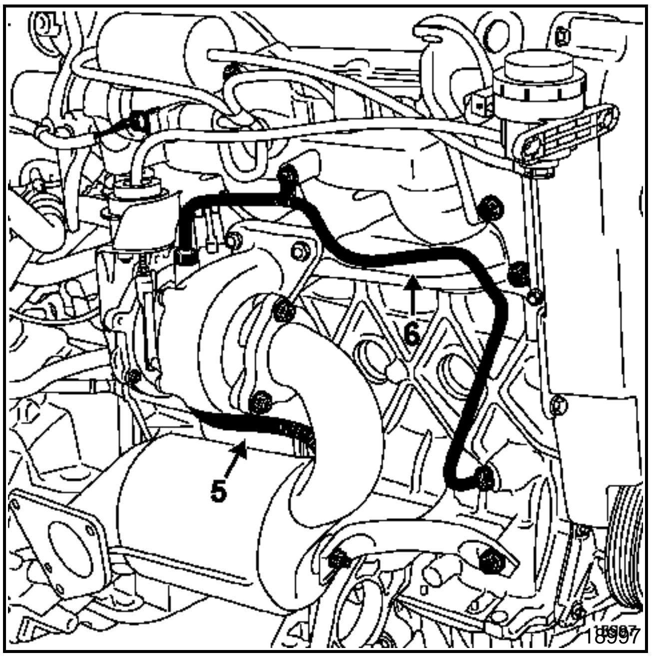


REMOVAL

Remove:
- the two bolts fixing the turbocharger oil return pipe (5) to the engine,
- the lower turbocharger mounting nut on the exhaust manifold.

Disconnect the rubber pipe connected to the **wastegate**.

Remove:
- the unions and the mounting bolts for the pipe (6) supplying oil to the turbocharger,
- the two air intake and outlet ducts connected to the turbocharger,
- the two upper turbocharger mounting nuts on the exhaust manifold,



- the turbocharger from above.

REFITTING

For refitting operations, use the same procedure as for removal in reverse.

IMPORTANT: you must change the copper gasket at the turbocharger oil inlet connection.

IMPORTANT:

Before starting the engine disconnect the pressure regulator manifold on the high pressure pump.
Then run the starter motor until the oil pressure warning light goes out (persist for a few seconds).
Reconnect the regulator, preheat and start the engine.
Run the engine at idling speed and check that there are no leaks at the oil connections.
Erase the fault and check the turbocharging pressure solenoid valve sensor.

Special precautions

- Ensure that no foreign bodies enter the turbine or compressor during the refitting operation.
- If there has been a fault in the turbocharger, check that the air-air exchanger is not full of oil. If the air-air exchanger is full of oil, it must be removed, flushed with a cleaning agent and then left to drain properly.
- Check that the turbocharger oil return pipe is not partially or completely blocked by scale. Also check that it is perfectly tight. If not, replace it.

REMOVAL

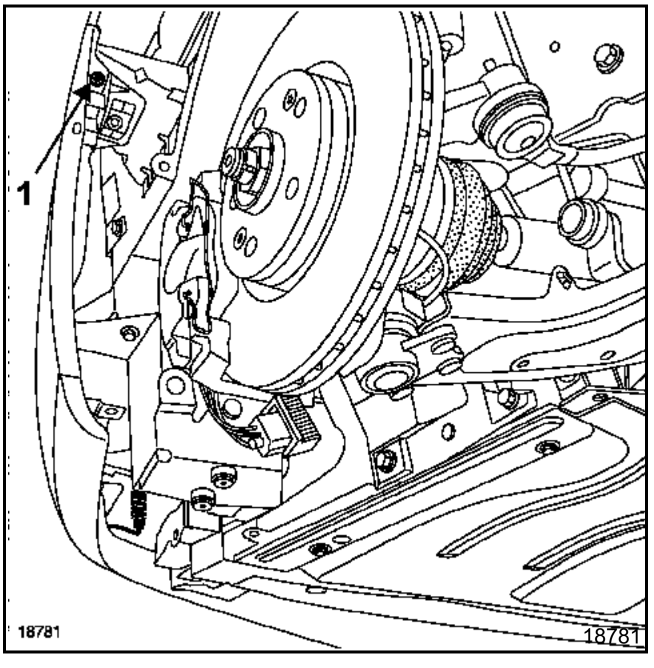
Put the vehicle on a two post lift.

Disconnect the battery.

Remove:
- the front wheels and the under-engine fairing,
- the radiator grille,
- the front section wheel arch liners.

Disconnect the fog lights.

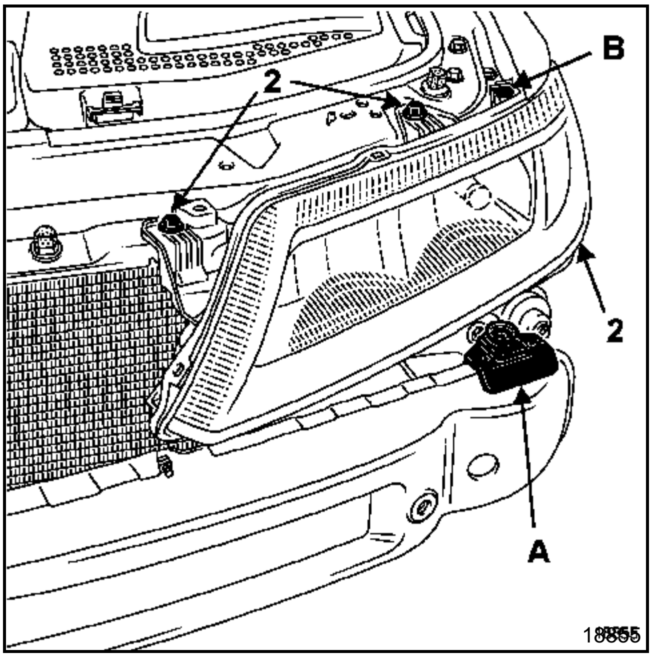
Remove:
- the two mounting bolts (1) for the bumper,



- the bumper by pulling it to the front while disconnecting the headlight washer hose if the car is so equipped.
- The two upper guides (A) for the bumper.

Disengage the clip (B) on each light unit.

Remove:
- the three mounting bolts (2) on each lens unit,
- the two lens units by disconnecting them.



IMPORTANT:

The two lens units must be adjusted once they have been fitted:
- park the vehicle on a level surface,
- set the adjustment control to 0,
- carry out the adjustment.

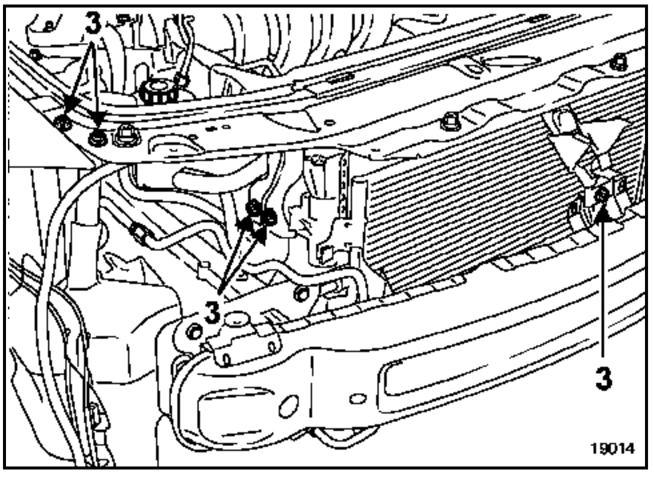
If the vehicle is fitted with Xenon headlights, you will have to initialise the system first, then adjust the beams (refer to the section headed "**Xenon headlights, initialisation of the system**").

IMPORTANT:
it is forbidden to turn the bulb with Xenon headlights on unless it is mounted in the lens unit (**this would be hazardous to the eyesight**).

REMOVAL

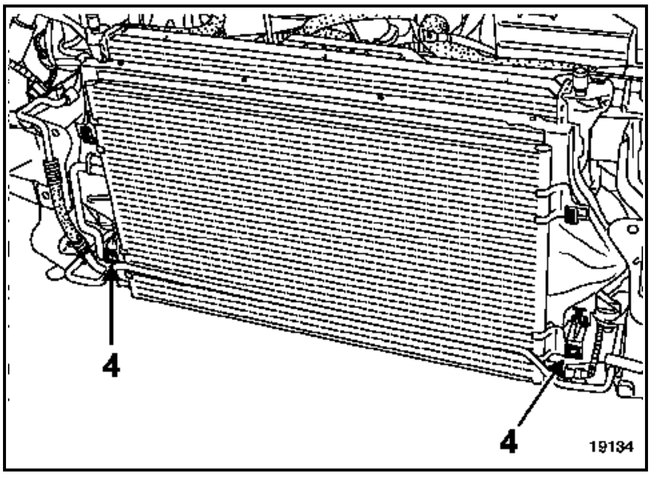
Remove the nine mounting bolts (3) from the upper cross member.

Unclip the bonnet opening cable and remove the upper cross member.



Disconnect the air inlets and outlets from the exchanger.

Remove:
– the clips (4) fixing the condenser and remove the latter if fitted,
– the air-air exchanger by unclipping it at the lower section.



REFITTING

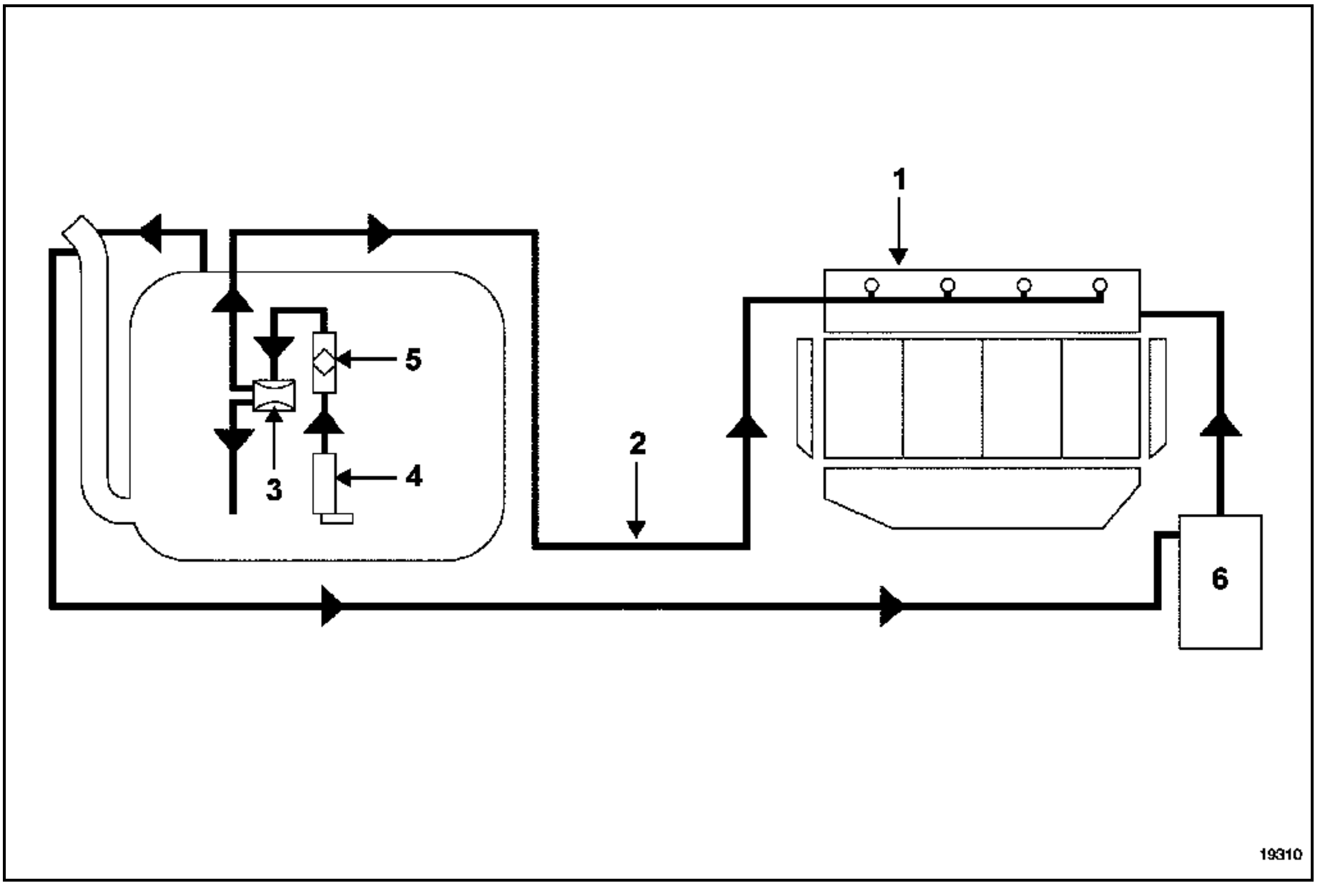
Refitting is the reverse of removal.
Proceed with the adjustment of the lens units.

The petrol fuel supply system for the engine is a no-return circuit.

The petrol fuel pressure no longer varies as a function of the engine load.

The circuit comprises:
– a rail (1) without a union to return piping and without a supply pressure regulator,
– pipes (2) coming from the tank only,
– a fuel supply pump/gauge sender unit/petrol filter assembly fitted with a pressure regulator (3), the pump (4) and the petrol filter (5) (all located in the tank),
– a fuel vapour rebreathing tank (6).

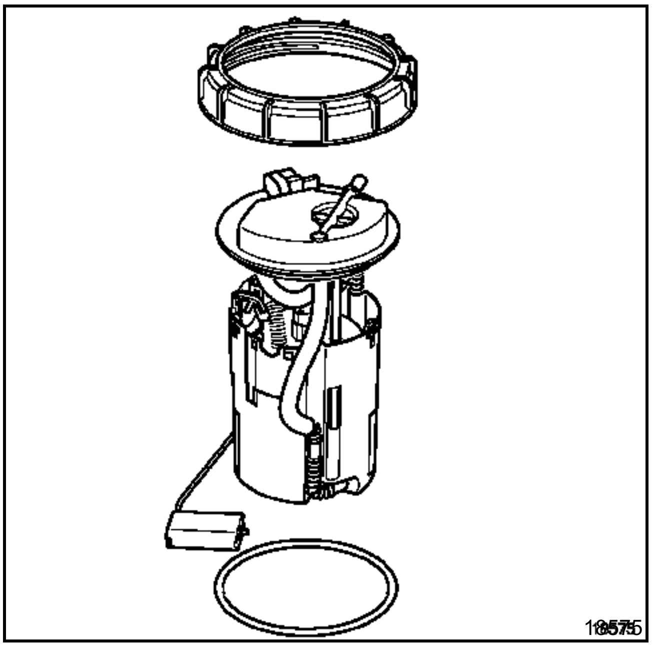
OPERATING DIAGRAM OF THE PETROL CIRCUIT



GENERAL

The fuel filter is located inside the tank; it forms part of the pump/sender assembly and cannot be removed separately.
If it needs to be replaced, then the whole pump/sender assembly must be replaced.

Nevertheless, checking the fuel supply pressure and the pump delivery will provide a diagnostic check of the pump/fuel gauge assembly performance.



TIGHTENING TORQUE (in daNm)	
Injection rail bolt	**0.9**

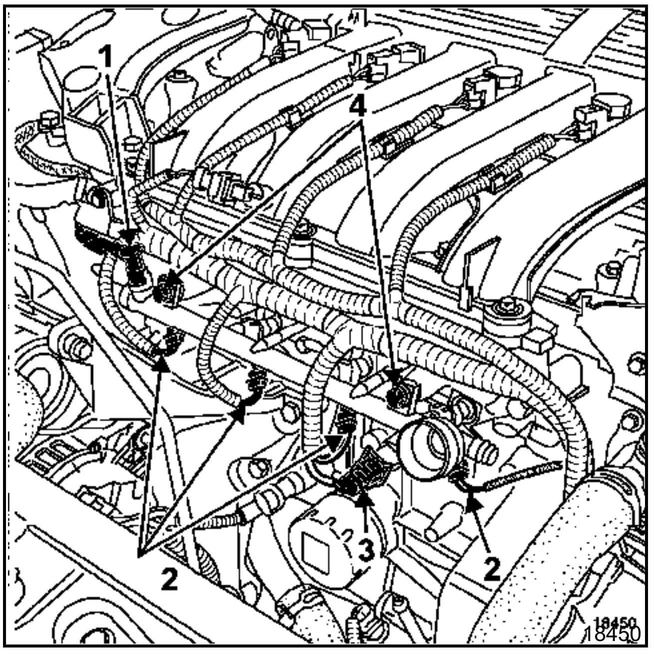
The injectors on the ***F4P engine*** **are the MAGNETI MARELLI PICO** model and the **SIEMENS DEKA** model is fitted on the ***K4M engine***.

They are attached to the injection gallery by retaining clips.

The fuel circulates constantly around the circumference of the injector body. This sweeping by the fuel prevents the formation of petrol vapour bubbles and helps cold starting.

REMOVAL

NOTE: be aware that there will be a quantity of fuel in the rail and in the union when you remove the injectors or the injector rail. Protect the alternator.

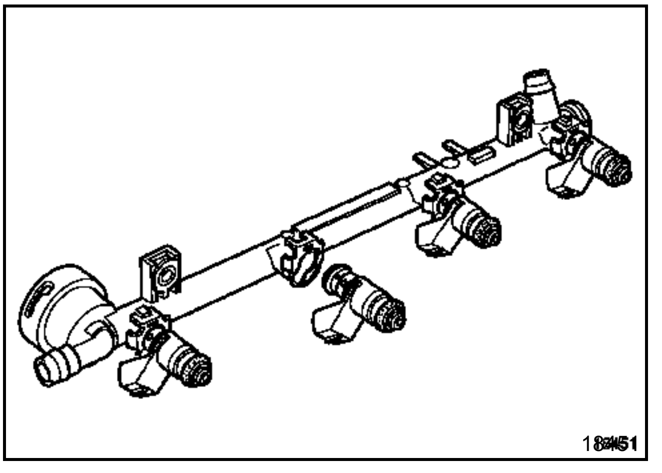


Disconnect the battery.

Remove:
– the rail protector.
– the fuel injection inlet union (1) from the injection rail without squeezing the pipe,
– the injector connectors (2),
– the pinking sensor connector (3),
– the rail mounting bolts (4),
– the injection rail,
– the injector clips,
– the injectors.

REFITTING

You must replace the O-rings and the injector mounting clips.



Observe the correct tightening torque for the rail bolts.

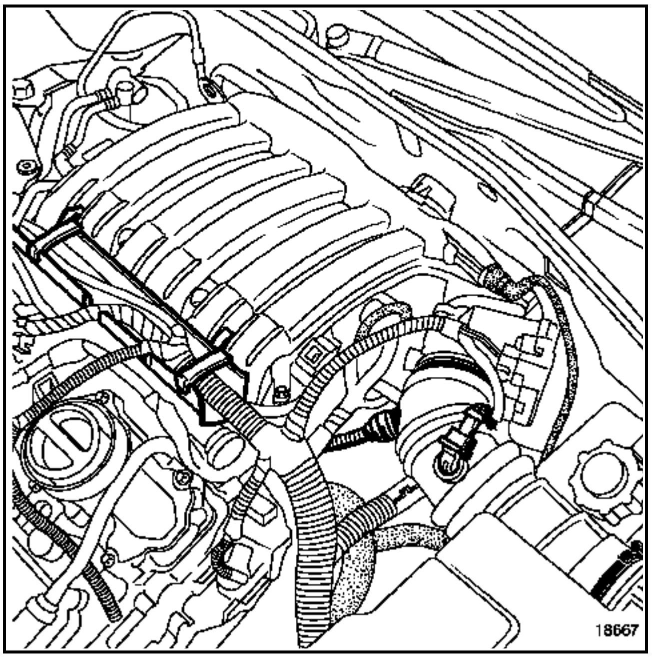
REMOVING THE FRONT BANK RAIL

Disconnect the battery.

Remove the engine cover.

NOTE: be aware that there will be a quantity of fuel in the rail and in the union when you remove the injectors or the injector rail.

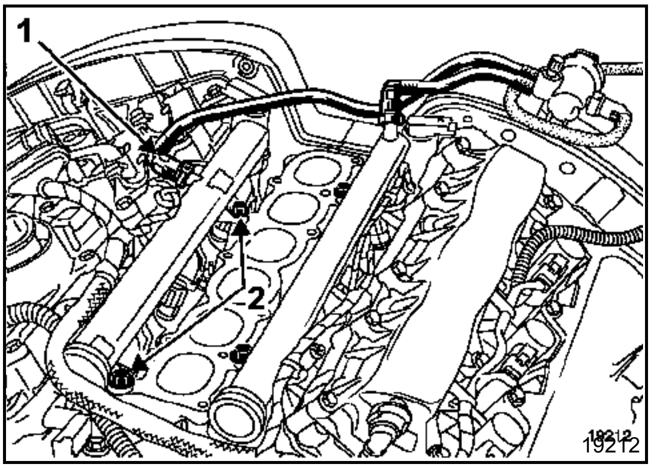
Remove the electrical harness channel.



Disconnect:
- the fuel inlet union (1) from the injection rail,
- the injector connectors.

Unclip the injector rail wiring harness.

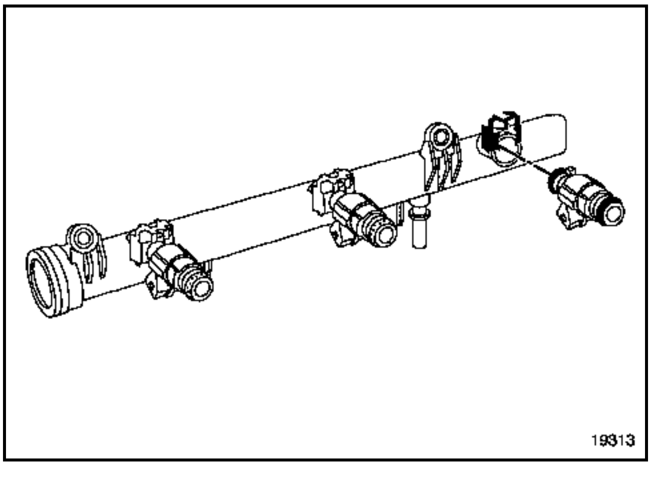
Remove the two bolts (2) securing the injector rail.
Remove the injector rail.



Remove:
- the injector clips,
- the injectors.

REFITTING

You must replace the O-rings and the injector mounting clips.



REMOVING THE REAR BANK RAIL

Disconnect the battery.

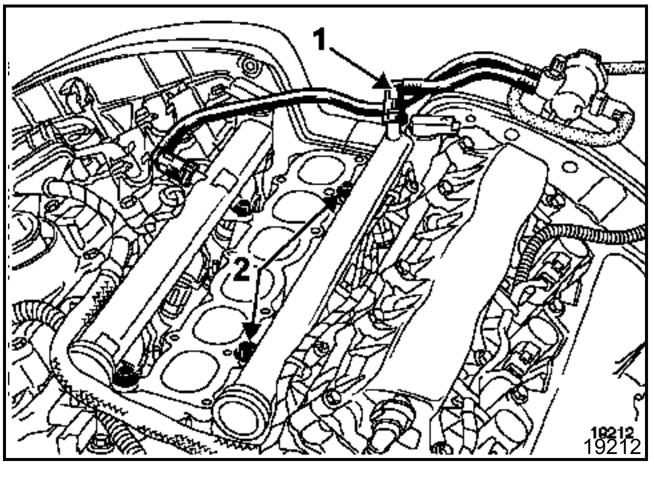
Remove the engine cover.

NOTE: be aware that there will be a quantity of fuel in the rail and in the union when you remove the injectors or the injector rail.

It is necessary to remove the inlet manifold in order to remove the rear bank injector rail (see **section 12 Fuel mixture "Inlet manifold"**).

Disconnect:
– the fuel inlet union (1) from the injection rail,
– the injector connectors.

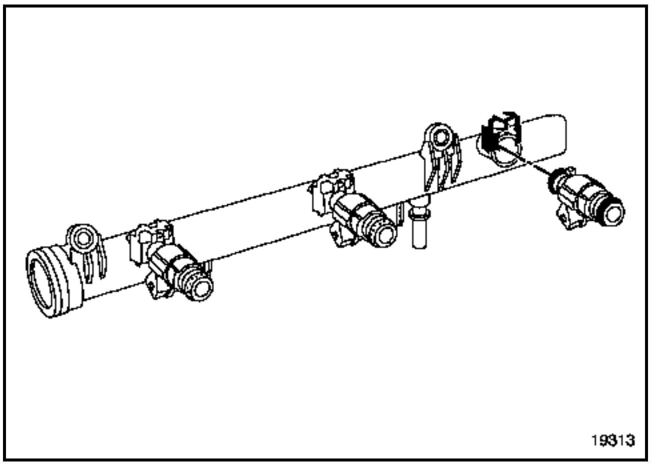
Remove the two bolts (2) securing the injector rail.
Remove the injector rail.



Remove:
– the injector clips,
– the injectors.

REFITTING

You must replace the O-rings and the injector mounting clips.



SPECIAL TOOLING REQUIRED	
Mot. 1311-01	
Mot. 1311-02	
Mot. 1311-03	**Fuel pressure testing unit with pressure gauge and sockets**
Mot. 1311-04	
Mot. 1311-05	
Mot. 1311-06	
Mot. 1311-07	

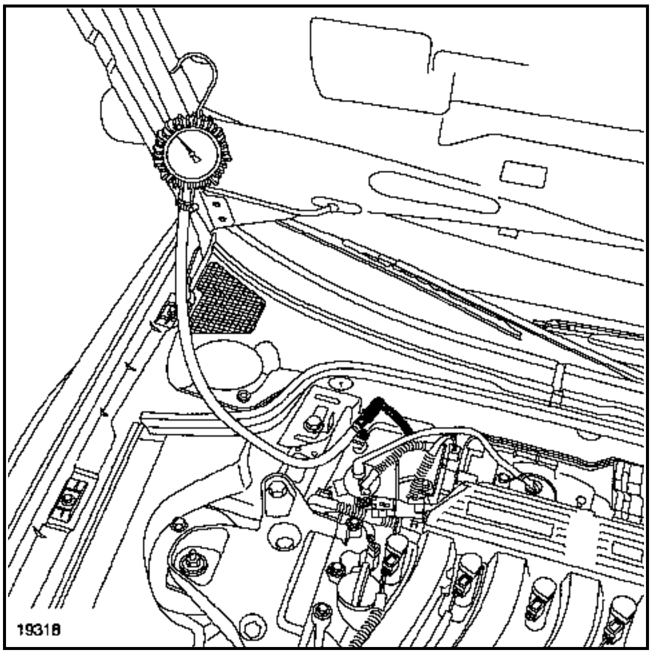
Disconnect the fuel inlet pipe (F), connect a "T" union fitted with a test pressure gauge.

NOTE: be aware that there will be a quantity of fuel in the rail and in the union. Protect sensitive components.

Start the car in order to start the fuel pump running.

Read the pressure, which should be constant.

Pressure read:
3.5 bar ± 0.6



NOTE: it may take a few seconds to read the correct pressure in the injector rail.

SPECIAL TOOLING REQUIRED	
Mot. 1311-01	
Mot. 1311-02	
Mot. 1311-03	**Fuel pressure testing unit with pressure gauge and sockets**
Mot. 1311-04	
Mot. 1311-05	
Mot. 1311-06	
Mot. 1311-07	

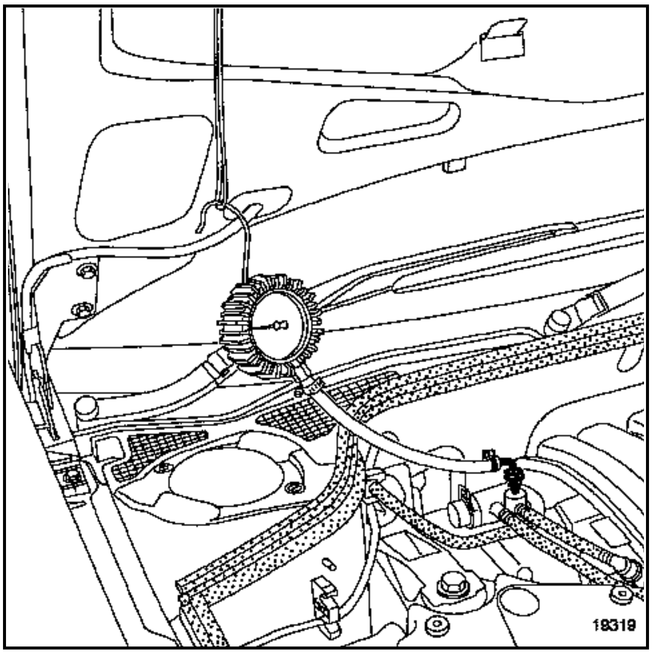
Remove the pressure tapping plug, fit the **Mot. 1311-03** union equipped with the testing pressure gauge.

NOTE: be aware that there will be a quantity of fuel in the rail and in the union. Protect sensitive components.

Start the car in order to start the fuel pump running.

Read the pressure, which should be constant.

Pressure read:
3.5 bar ± 0.6



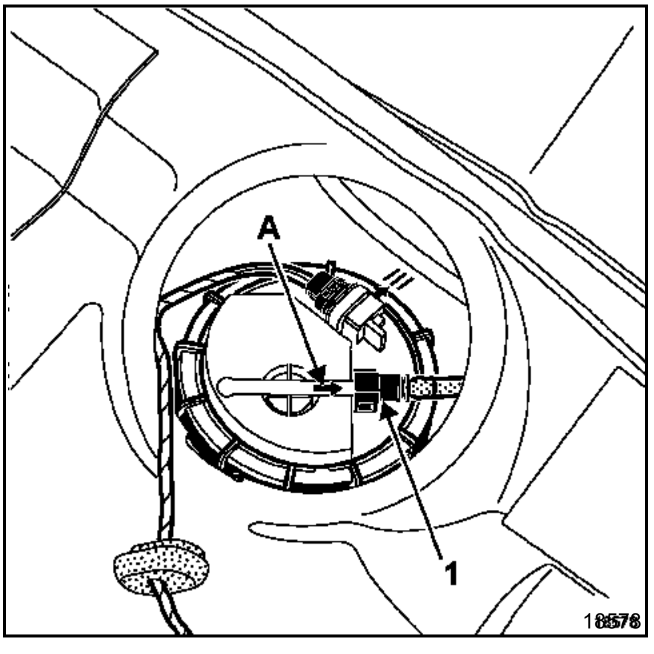
NOTE: it may take a few seconds to read the correct pressure in the injector rail.

SPECIAL TOOLING REQUIRED	
Mot. 1311-01	
Mot. 1311-02	
Mot. 1311-03	**Fuel pressure testing unit with pressure gauge and sockets**
Mot. 1311-04	
Mot. 1311-05	
Mot. 1311-06	
Mot. 1311-07	
EQUIPMENT REQUIRED	
Graduated 2000 ml test tube	

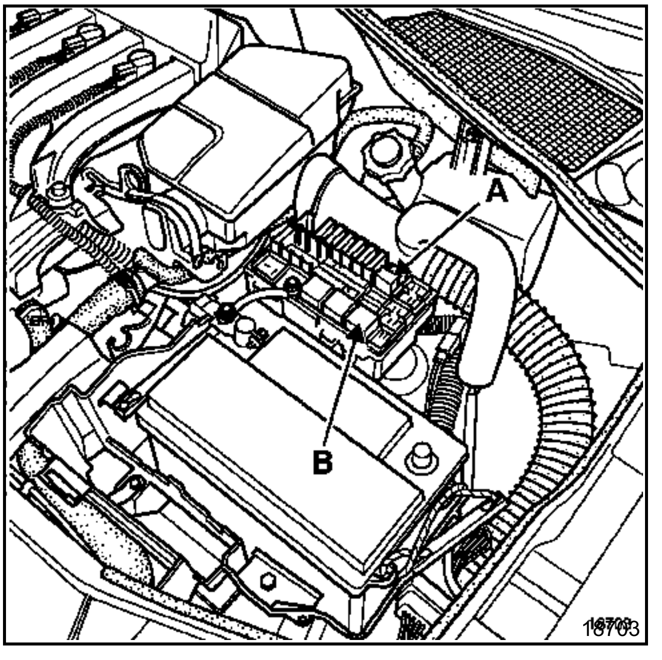
NOTE: be aware that there will be a quantity of fuel in the rail and in the union. Protect sensitive components.

Disconnect the quick-release union (1).

Fit a pipe to the outlet (A) of sufficient length to allow the pump to pump into the graduated measuring cylinder.



Start the pump running by bridging tracks 3 and 5 of the fuel pump relay.
(Relay A for ***K4M and F4P engines*** and relay B for the ***L7X engine***).



Read the pump delivery rate.

Flow read: **80 to 120 litres/hour**.

OPERATING PRINCIPLE

The antipercolation system is controlled directly by the injection computer.

The coolant temperature signal is repeated on the coolant temperature sensor for the injection (see **section 17 "Centralised coolant temperature management"**).

The injection calculator passes into monitoring mode after the ignition is switched off.

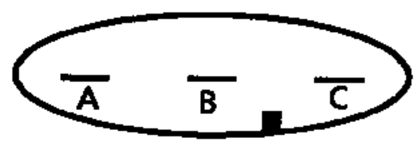
If the coolant temperature exceeds the **112.5°C** threshold for the **F4P** or **102˚C** for the **L7X** and the **K4M** in the two minutes after the engine is stopped, the fan unit low speed is switched on.

If the coolant temperature falls back below **100°C** for the **K4M** or the **F4P** and **95˚C** for the **L7X** the fan unit low speed is switched off (the fan assembly can only operate for a period no longer than 10 minutes).

Type	Gearbox	Engine						Depollution standard
		Type	Index	Bore (mm)	Stroke (mm)	Capacity (cm^3)	Compression ratio	
BG0E	PK6	F9Q	750 754	80	93	1870	19/1	EU 00

ENGINE SPEED (rpm)			SMOKE DENSITY	
IDLING SPEED	**Max. - no load**	**Max. - under load**	**Homologation value**	**Max. - Max**
F9Q 750: 775 rpm ±50 F9Q 754: 800 rpm ± 50	4700 ± 150	4500 ±100	1.2 m^{-1} (39%)	3m^{-1} (70%)

DESCRIPTION	BRAND/TYPE	SPECIAL NOTES
F9Q 750 high pressure pump	BOSCH CR/CP3	Pressure from **250 to 1350 bar**
F9Q 754 high pressure pump	BOSCH CR/CP1	Pressure from **250 to 1350 bar**
Booster pump (low pressure) (only in the F9Q 754)	BOSCH (not in 750)	Pressure from **2.5 to 4 bar** Flow: **80 to 100 litres/hour minimum**
Diesel pressure sensor	BOSCH	Fitted to the injection rail Resistance: **tracks 1,2 and 1,3 = 4.3 MΩ** **tracks 2,3 = 1050 Ω**
Injectors	BOSCH	Solenoid injectors Resistance: < **2 Ω** Maximum pressure **1600 bar**
Pressure regulator	-	Integrated into the high pressure pump (not removable on the CP3) Resistance ≈ **5 Ω at 20°C**
Injection computer	BOSCH	128 track computer
Accelerator pedal sensor	HELLA	Double track potentiometer Track 1 resistance = **1200** ± **480 Ω** Track 2 resistance = **1700** ± **680 Ω**

DESCRIPTION	BRAND/TYPE	SPECIAL NOTES
Pre-post heating unit (located behind the wheel arch liner for the front left wheel)	NAGARES BED/7	With pre-postheating function controlled by the injection computer
Heater plug	BERU or CHAMPION	Resistance: **0.6** Ω connector removed
Air intake temperature sensor	SIEMENS	Integrated in the flow meter Resistance: ≈ **2170** Ω **at 20˚C**
Diesel temperature sensor (only on the F9Q 750)	MAGNETTI MARELLI or ELTH	Resistance ≈ **2050** Ω **at 25**°**C**
Engine speed sensor	MGI	Resistance = **800** ± **80** Ω
Atmospheric pressure sensor	-	Integrated in the computer
Camshaft sensor	ELECTRICIFIL	Hall effect sensor
Turbocharging pressure sensor	DELCO	Resistance: **4 K**Ω across tracks **A** and **C** Resistance: **5 K**Ω across tracks **A** and **C** Resistance: **9 K**Ω across tracks **A** and **B**  DI1330
Turbocharger operating solenoid	BITRON	Resistance: **16.5** ± **1 at 25**°**C**
Air flow meter	SIEMENS	Flow meter with integrated air temperature sensor **Track 1**: air temperature **Track 2**: earth **Track 3**: 5 V reference **Track 4**: + battery **Track 5**: air flow signal **Track 6**: earth
EGR solenoid valve	PIERBURG	Track resistance: **8** ± **0.5**Ω **at 20**°**C** (tracks 1 et 5) Sensor resistance: **4K**Ω ± **1.6K**Ω **at 20**°**C** (tracks 2 et 4)

DESCRIPTION	BRAND/TYPE	SPECIAL NOTES
Turbocharger	ALLIED SIGNAL	Calibration: F9Q 750 (variable geometry turbocharger) **200 mbars** for a rod stroke between **0.5 and 3.5 mm** **> 600 mbars** rod at stop F9Q 754 (fixed geometry turbocharger) **200 mbars** for a rod stroke between **0.5 and 3.5 mm** **400 mbars** for a rod stroke between **10 and 12 mm**
Thermal plungers	-	Resistance: **0.45 ± 0.05Ω at 20°C**
Engine coolant temperature sensor	ELTH	Resistance: **2252 ± 112Ω at 25°C**

The objective of the **common rail** is to deliver a certain quantity of diesel to the engine at a specific time.

DESCRIPTION

The system consists of:
- a low pressure pump, located between the intake assembly and the fuel filter for the **F9Q 754** equipped with the **CP1** high pressure pump,
- a priming bulb, located between the intake assembly and the fuel filter for the **F9Q 750** equipped with the **CP3** high pressure pump,
- a fuel filter,
- a high pressure pump,
- a high pressure pump incorporating the aspiration pump (**CP3**),
- a high pressure regulator mounted on the pump, (**cannot be removed on the CP3**),
- an injection rail fitted with a diesel pressure sensor and a pressure limiter,
- four solenoid injectors,
- various sensors,
- an injection computer.

Removal of the interior of the high pressure pump and the injectors is prohibited.

OPERATION

The **common rail** direct high pressure injection system is a sequential diesel injection system (based on the operation of multipoint injection for petrol engines).

This new injection system reduces operating noise, lowers the quantity of polluting gas and particles and produces significant engine torque at low engine speeds thanks to a pre-injection procedure.

The high pressure pump generates the high pressure sent to the injection rail. The high pressure regulator located on the pump modulates the value of the high pressure via the computer. The rail supplies each injector through a steel pipe.

The computer:
- determines the value of injection pressure necessary for the engine to operate well and then controls the regulator. It checks that the pressure value is correct by analysing the value transmitted by the pressure sensor located on the rail,
- determines the injection time necessary to deliver the right quantity of diesel and the moment when injection should be started,
- controls each injector electrically and individually after determining these two values.

The injected flow to the engine is determined depending on:
- the duration of injector control,
- the injector opening and closing speed,
- the needle stroke (determined by the type of injector),
- the nominal injector hydraulic flow (determined by the type of injector),
- the high pressure rail pressure controlled by the computer.

FOR ANY INTERVENTION IN THE HIGH PRESSURE INJECTION SYSTEM YOU MUST RESPECT THE CLEANING AND SAFETY ADVICE SPECIFIED IN THIS DOCUMENT.

POST-REPAIR CHECK

F9Q 750 engine:
Reprime the circuit using the priming bulb on the engine.

F9Q 754 engine:
A fuel cock is fitted to the fuel filter at the level of the diesel return pipe leading to the tank.
It must be at the open position to be operating normally.
However, to carry out a circuit reignition after an intervention, a filter change or a fuel fault, you should:
– close the fuel cock,
– start the low pressure pump by switching on the ignition several times,
– start the engine,
– OPEN THE FUEL COCK (the valve is open when the two coloured marks are aligned).

NOTE: certain vehicles are not fitted with a fuel cock. In this case, ignore this operation.

After any operation, check that there are no diesel leaks. Start the engine at idling speed until the fan starts up, then accelerate several times under no load.

IMPORTANT: the engine must not run with diesel containing more than 10% diester.

The system can inject the diesel into the engine up to a pressure of **1350 bars. Check that the injector rail is depressurised before any intervention**.

It is absolutely vital that you observe the tightening torque:
– of the high pressure pipes,
– of the injector on the cylinder head,
– of the pressure regulator (cannot be removed on the **F9Q 750** fitted with the **CP3** pump),
– of the pressure sensor.

When the high pressure pump, injectors, supply, return and high pressure output unions are repaired or removed, the bores should be fitted with new and appropriate core seals to avoid impurities.

When replacing the high pressure pipe, follow the method below:
- remove the high pressure pipe,
- fit the cleanliness plugs,
- loosen the high pressure rail,
- fit the high pressure pipe,
- tighten the injector side union to torque,
- tighten the high pressure rail connection to torque,
- tighten the high pressure rail mountings to torque,
- tighten the pump/rail pipe to torque (pump side first).

IMPORTANT:

It is prohibited to remove the interior of the pump.

It is vital that you replace the fuel return pipe placed on the injectors during removal.

The diesel temperature sensor is not removable. It is part of the fuel return rail.

It is forbidden to loosen a high pressure pipe connection when the engine is running.

Removal of the pressure regulator on the F9Q 750 engine equipped with the CP3 pump is prohibited.

CLEANLINESS INSTRUCTIONS WHICH MUST BE FOLLOWED WHEN WORKING ON the HIGH PRESSURE DIRECT INJECTION SYSTEM

Risks relating to contamination

The system is very sensitive to contamination. The risks caused by the introduction of contamination are:
– damage to or destruction of the high pressure injection system,
– seizing of a component or a component which is not sealed.

All after-sales operations must be performed under very good cleanliness conditions. This means that no impurities (particles a few microns in size) have penetrated into the system during removal or into the circuits via the fuel unions.

The cleanliness principle must be applied from the filter to the injectors.

WHAT ARE THE POLLUTING ELEMENTS?

The elements which contaminate are:
– metal or plastic chips,
– paint,
– fibres:
  ● from boxes,
  ● of brushes,
  ● of paper,
  ● of clothing,
  ● of cloths.
– foreign bodies such as hair,
– ambient air,
– etc.

WARNING: it is prohibited to clean the engine using a high pressure washer at the risk of damaging connections. Also the moisture may collect in the connectors and cause electrical connection problems.

INSTRUCTIONS TO BE FOLLOWED BEFORE ANY REPAIRS ON THE INJECTION SYSTEM

● Ensure that you have the plugs for the unions to be opened (bag of plugs sold by the Parts Stores). Plugs are to be used once only. They must be thrown away after use (once used they are soiled and cleaning is not sufficient to make them reusable). Unused plugs must be thrown away.

● Ensure that you have the resealable plastic bags for storing removed parts. There is less risk of parts stored in this way being subjected to impurities. The bags can be used only once, and once used they must be thrown away.

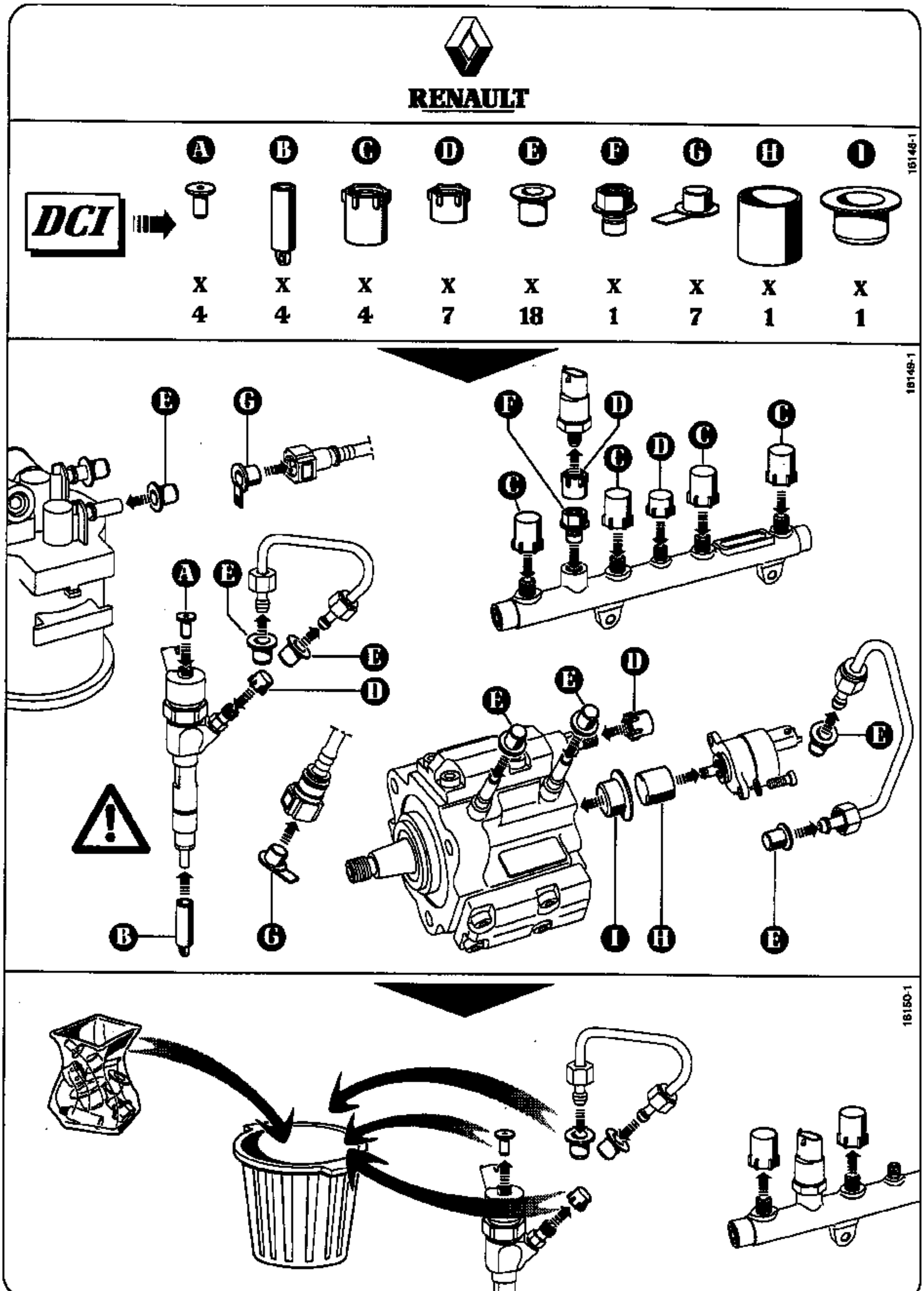
● Ensure that you have lint free cleaning cloths (supplied by **SODICAM**). The use of a normal cloth or paper for cleaning purposes is forbidden. These are not lint free and may contaminate the fuel circuit of the system. Each lint free cloth should only be used once.

INSTRUCTIONS TO BE FOLLOWED BEFORE OPENING THE FUEL CIRCUIT

- For each operation, use new thinner (used thinner contains impurities). Pour it into a clean receptacle.
- For each operation, use a clean brush which is in good condition (the brush must not shed its bristles).
- Use a brush and thinner to clean the connections to be opened.
- Blow compressed air over the cleaned parts (tools, cleaned the same way as the parts, connections and injection system zone). Check that no bristles are left.
- Wash your hands before and during the operation if necessary.
- When wearing protective gloves, cover leather gloves with latex gloves (available from **SODICAM**).

INSTRUCTIONS TO BE FOLLOWED DURING THE OPERATION

- As soon as the circuit is open, all openings must be blanked to prevent pollution from penetrating the circuit. The plugs to be used are available from the Parts Stores. They must not be reused under any circumstances.
- Close the hermetically sealed bag, even if it has to be reopened shortly afterwards. Ambient air carries contamination.
- All components of the injection system must be stored in a hermetically sealed bag once the plugs have been inserted.
- The use of a brush, thinner, bellows, sponge or normal cloth is strictly forbidden once the circuit has been opened. In fact, these elements are liable to cause the entry of impurities into the system.
- A new component replacing an old one must not be removed from its packaging until it is to be fitted to the vehicle.


RENAULT
DCI
A B C D E F G H I
X 4
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X 7
X 18
X 1
X 7
X 1
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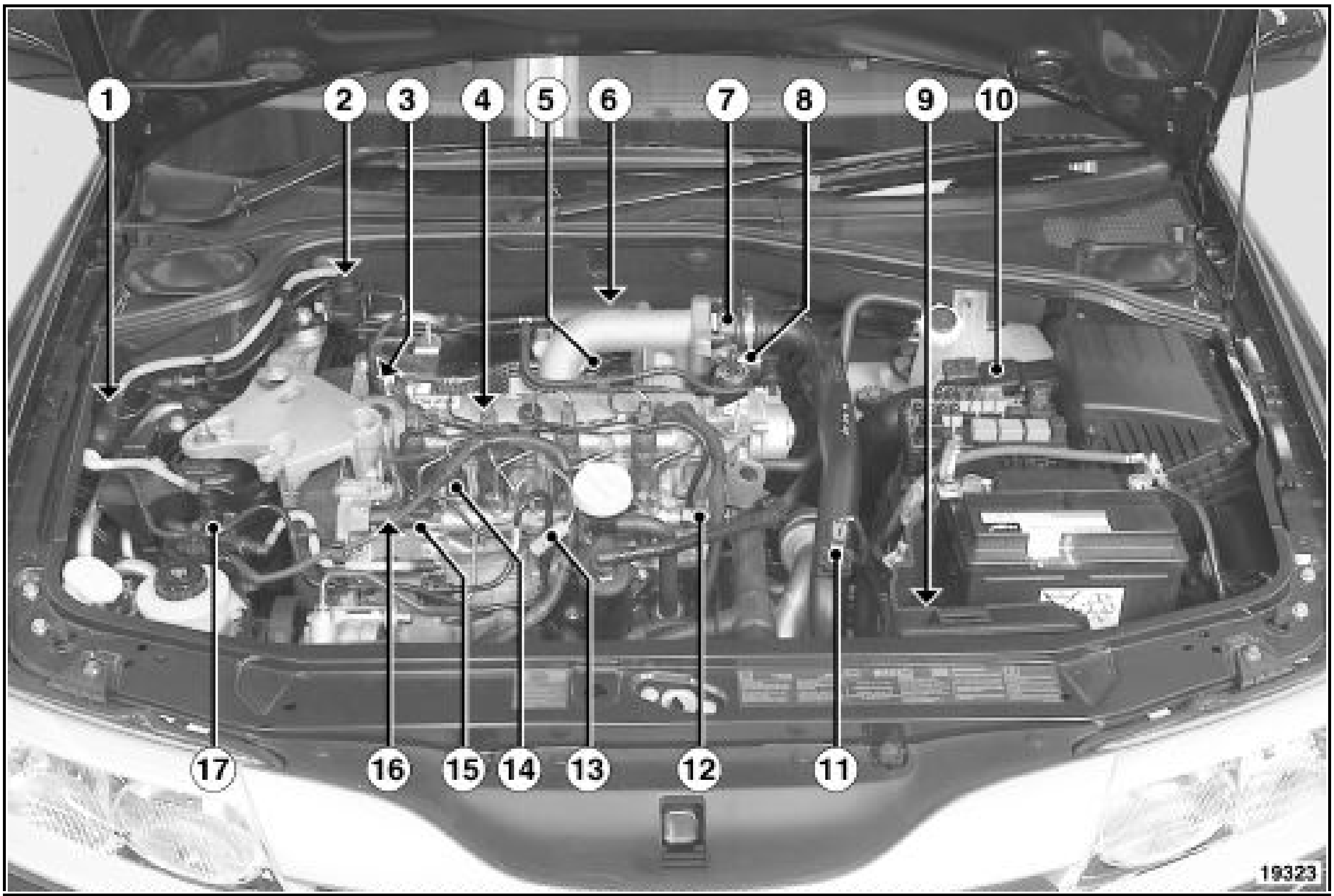
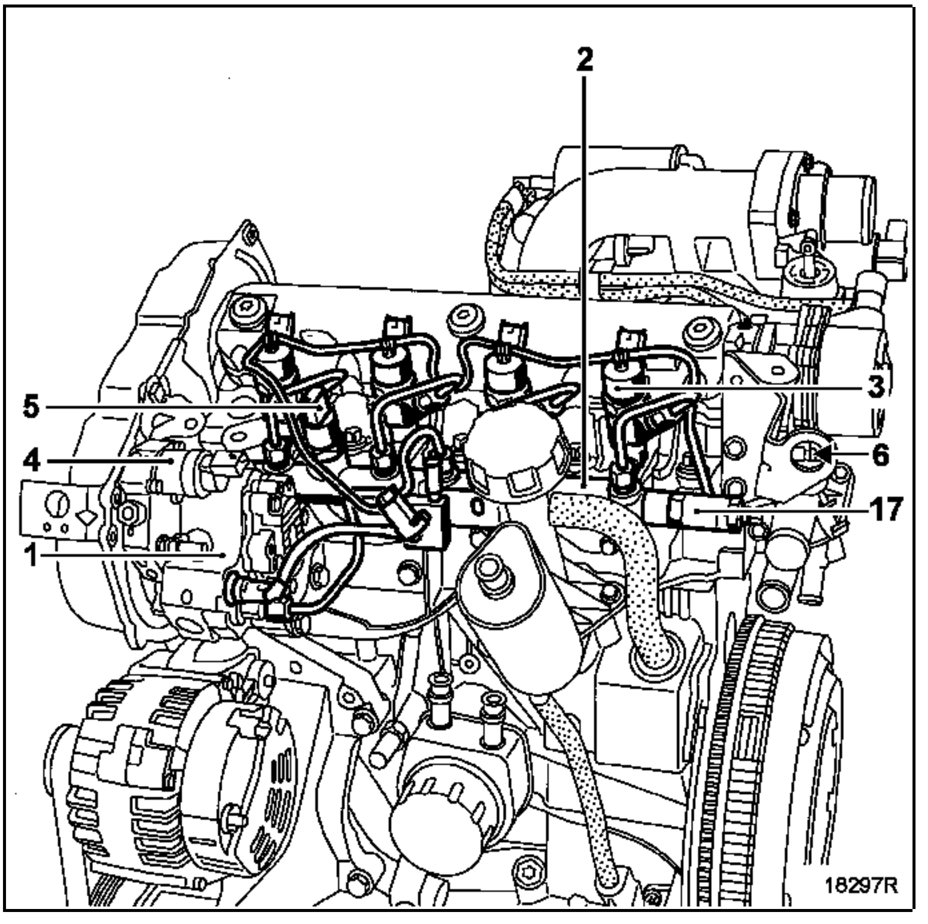
16150-1

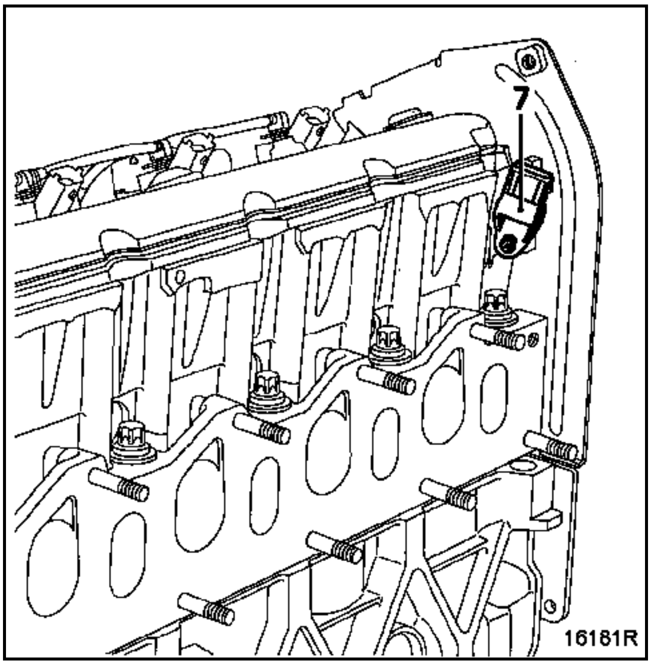
16148-1G



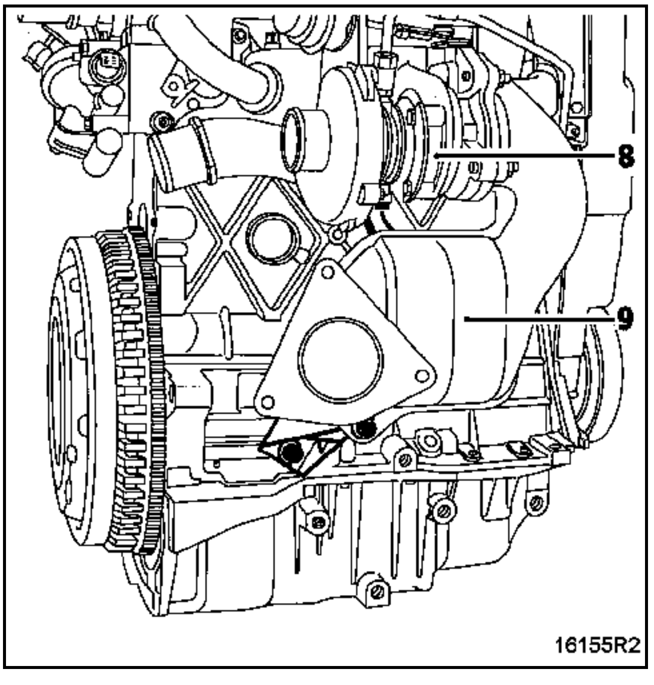
1 Priming bulb (only on the F9Q 750).
2 Turbocharger regulation solenoid
3 Cylinder marking sensor.
4 Solenoid injector.
5 Engine stop system solenoid valve.
6 Engine stop system vacuum.
7 Damper.
8 Damper diaphragm.
9 Injection computer.
10 Flow meter with air temperature sensor.
11 turbocharging pressure sensor.
12 Pressure regulator.
13 Fuel temperature sensor (only on the F9Q 750).
14 Rail pressure sensor.
15 Fuel pressure regulator.
16 High pressure pump.
17 Diesel filter.



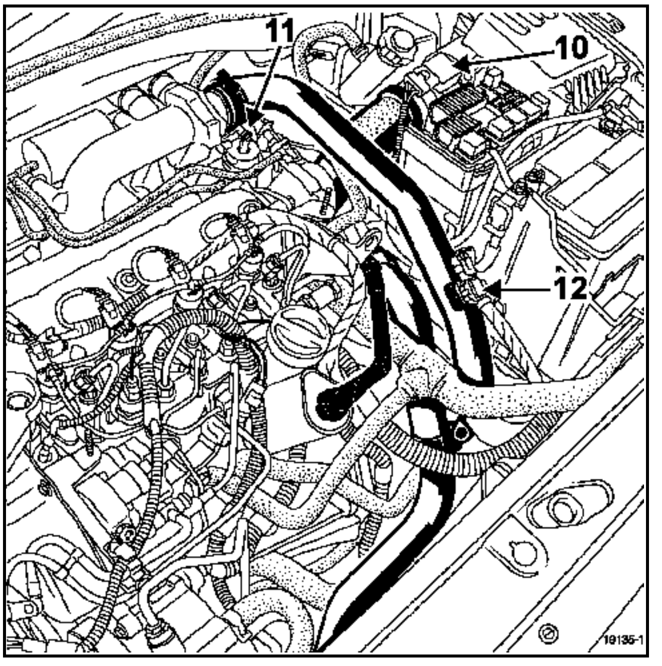
1	High pressure pump
2	Common injection rail
3	Injector
4	Pressure regulator
5	Pressure sensor
6	Water temperature sensor
17	Pressure regulator



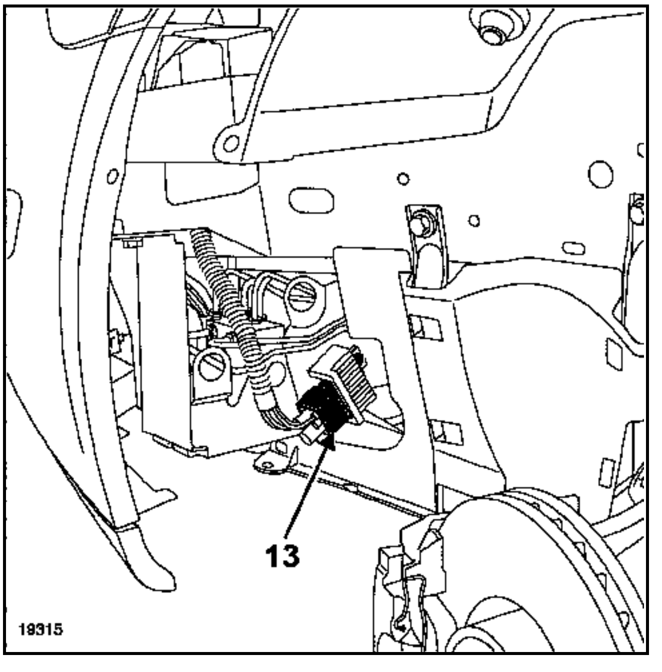
7 Cylinder marking sensor
8 Turbocharger
9 Priming catalytic converter



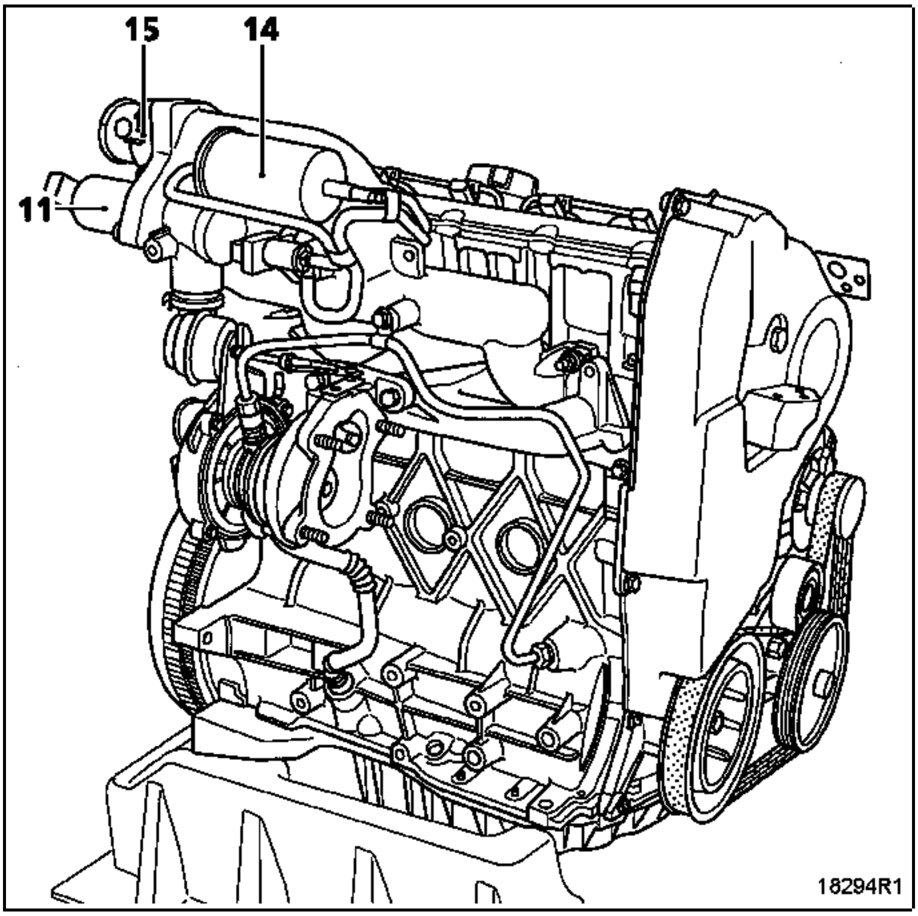
10 Air flow meter with air temperature sensor
11 EGR solenoid valve
12 Turbocharging pressure sensor



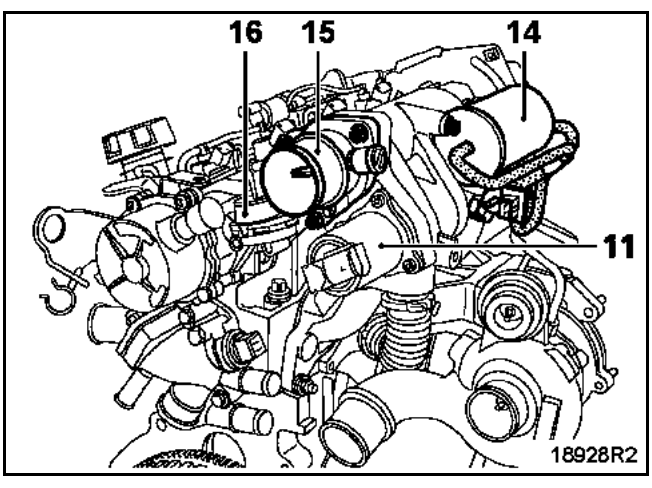
13 Preheating unit



14 Vacuum reservoir



15 Damper
16 Damper diaphragm



Vehicles using the high pressure diesel system are fitted with two injection warning lights in the case of a basic instrument panel or four injection warning lights in the case of an instrument panel with matrix display. These warning lights are used during the preheating phase and in case of an injection fault (or engine overheating).
The warning lights on the instrument panel with matrix display are clearly identified.

WARNING LIGHT PRINCIPLE

- The preheating light lights up when the ignition is switched on, remains illuminated during the preheating phase and then goes out (see section **13** "**Pre-postheating control**").

-

  These faults are:
  - internal computer fault,
  - Immobiliser fault
  - engine speed fault (the vehicle doesn't start),
  - accelerator potentiometer fault,
  - air flow meter fault,
  - vehicle speed sensor fault (see ABS),
  - exhaust gas recirculation valve fault,
  - turbocharging pressure regulator solenoid valve fault,
  - TDC sensor and camshaft sensor coherence fault,

- These faults are:
  - internal computer fault,
  - injector fault,
  - computer supply voltage fault,
  - rail pressure sensor fault (CP3),
  - rail pressure regulator fault,
  - TDC sensor and camshaft sensor coherence fault,

- In the event of the engine overheating, the fault warning light showing an engine with the word "STOP" will light up in the case of a basic instrument panel and is clearly identified in the case of an instrument panel with matrix display.

NOTE: the **OBD (On Board Diagnostic)** indicator light (symbolised by an engine), displayed when ignition is switched on, is never displayed when the engine is running.

This car is fitted with a 3rd generation immobiliser system, which requires a special method for replacing the computer.

REPLACING AN INJECTION COMPUTER’

See section 17 injection "**Computer**" for the method of removing and refitting the computer.

See section 82 "**Immobiliser**" for the method of programming the immobiliser code.

IMPORTANT: **With this engine immobiliser system, the computer keeps its immobiliser code for life.** **In addition, this system does not have a security code.** **Consequently, it is forbidden to perform tests with computers borrowed from the stores or from another vehicle which must then be returned.** **It will no longer be possible to decode them.**

INJECTION COMPUTER / AIR CONDITIONING COMPUTER CONNECTION

The compressor is of the variable capacity type.

The injection computer and the air conditioning computer are connected by the multiplexing network.

Selection of the air conditioning function has no effect on the idling speed.

COMPRESSOR OPERATION PROGRAMMING

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

Engine start programming

The compressor is prevented from operating for **5 seconds** after the engine has started.

Recovery of performance

In the event of a rapid change in the accelerator pedal position and if the engine speed is less than **3000 rpm**, operation of the compressor is prohibited for **5 seconds.**

Recovery of output when the vehicle starts moving

If the position of the potentiometer is more than **50%** the engine speed is less than **2250 rpm** and the vehicle speed is below **12 mph (20 km/h)**, the compressor is cut for **5 seconds.**

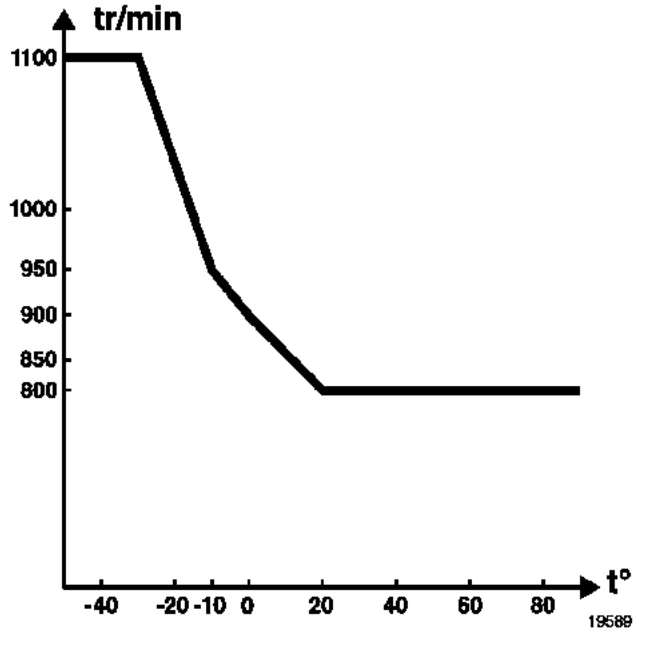
Anti-stall protection

If the no load position is not detected and if the engine speed is less than **675 rpm**, the compressor is inhibited. It is engaged again after **5 seconds** if the engine speed is increased.

Thermal protection programming

The compressor does not engage in cases where the coolant temperature is greater than **+ 112°C**.

IDLING SPEED CORRECTION ACCORDING TO COOLANT TEMPERATURE



CORRECTION OF THE IDLING SPEED WHEN THE POTENTIOMETER IS FAULTY

Idling speed is held at **1200 rpm.** if the accelerator pedal potentiometer is faulty.

If the information from the accelerator pedal position potentiometer and the brake switch information does not correspond, the speed is changed to **1250 rpm**.

CORRECTION OF THE IDLING SPEED ACCORDING TO THE GEAR RATIOS

The idling speed is modified according to the gear engaged in the gearbox:
– in 1st, 2nd and 3rd gears the speed is **840 rpm.**
– for other gears the speed is **870 rpm.**

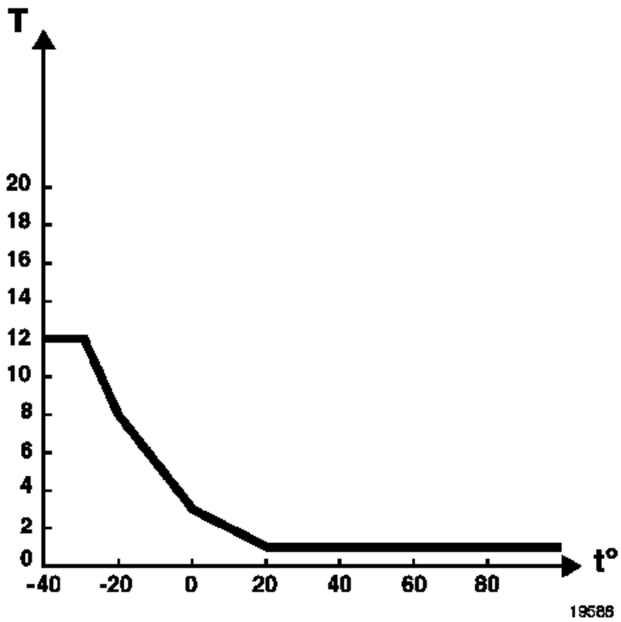
The pre-postheating function is controlled by the preheating unit.

PRE-POSTHEATING OPERATING PRINCIPLE

1) **"Preheating" on ignition**

a) **Variable preheating**

The warning light lighting time and the supply to heater plugs time depends on the coolant temperature and the battery voltage.



In all cases the injection warning light lighting time cannot exceed **15 seconds**.

b) **Fixed preheating**

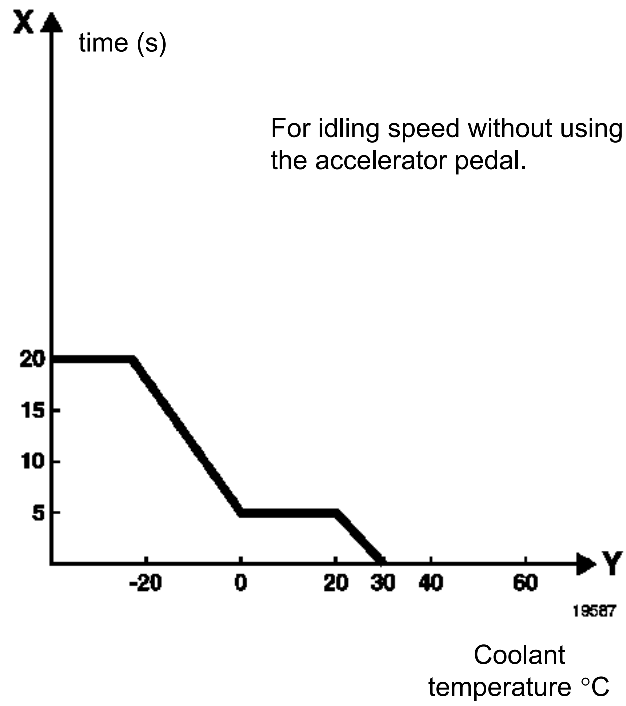
After the warning light goes out the plugs remain supplied for a fixed period of **10 seconds.**

2) **Starting**

The plugs remain supplied while the starter is being activated.

3) **"Postheating" while the engine is running**

During this phase the plugs are supplied continuously according to coolant temperature.



GENERAL

Speed limiter: allows the driver maintain a speed he has selected. This function can be deactivated at any moment by pressing the brake pedal or the clutch pedal, or by using one of the system buttons.

Speed limiter: allows the driver to set a speed limit. The accelerator pedal becomes inactive above this speed. The speed limit selected can be exceeded at any moment by pressing the accelerator pedal beyond its point of resistance.

A warning light on the instrument panel informs the driver of the status of the cruise control/speed limiter:
- Green light: cruise control in operation
- Amber light: speed limiter in operation
- Indicator light flashing: the set speed cannot be maintained (e.g. going downhill).

To control these functions, the injection computer receives the following signals on the following tracks:
- AF2: Speed limiter On/Off
- AD2: Cruise control On/Off
- AB2: Steering wheel switch signal
- AA2: Steering wheel switch earth
- AF3: Stop switch open input
- AE2: Clutch switch input (depending on version)
- AE1: Pedal potentiometer 1 feed
- AH2: Pedal potentiometer 2 feed
- AB3: Pedal potentiometer 1 earth
- AA3: Pedal potentiometer 2 earth
- AC1: Pedal potentiometer 1 signal
- AF1: Pedal potentiometer 2 signal
- AA4: Multiplexing CAN L1 (passenger compartment)
- AB4: Multiplexing CAN H1 (passenger compartment)

The following signals are received by the injection computer via the multiplex network:
- car speed (ABS)
- stop switch closed signal (ABS)
- which gear is engaged

The injection computer sends the following signals over the multiplex network:
- cruise control or speed limit setting to the instrument panel
- warning light illumination (amber, green or flashing)
- gear change signals from the gearbox (depending on version).

The injection computer receives:
- signals from the accelerator pedal
- brake switch signal
- clutch switch signal
- signals from the Start/Stop switch,
- signals from the steering wheel switches
- signals from the ABS computer
- signals from the automatic transmission computer

Using these signals, the injection computer controls the solenoid injectors so as to maintain the set speed in the case of cruise control and not to exceed the set speed in the case of speed limitation.

CRUISE CONTROL OPERATION

Input conditions:
- switch on "cruise control"
- gearbox ratio > 2nd gear,
- car speed > **20 mph (30 kph)**
- cruise control warning light illuminated (green)
- press on "+", "-" or "recall" button

Output conditions:
- brief sharp depression of the accelerator pedal (does not deactivate the function)
- pressing the brake or clutch pedal
- pressing the "O" button
- switch to "Stop"
- no gear engaged
- electronic stability programme system operation
- injection computer operation.

SPEED LIMITER OPERATION

Input conditions:
- switch on "speed limiter"
- gearbox ratio > 2nd gear,
- car speed > **20 mph (30 kph)**
- limiter warning light illuminated (amber)
- press on "+", "-" or "recall" button

Output conditions:
- brief sharp pressure on the accelerator pedal past the point of resistance (does not deactivate the function)
- switch to "Stop"
- pressing the "O" button
- electronic stability programme system operation
- injection computer operation.

NOTE: a flashing speed setting informs the driver that the set speed cannot be maintained.

Defect mode
If one of the components is faulty, the cruise control/speed limiter system cannot be activated.

The resistance of a heater plug is **0.6**Ω

TIGHTENING TORQUE (in daNm)	
Heater plug	**1.5**

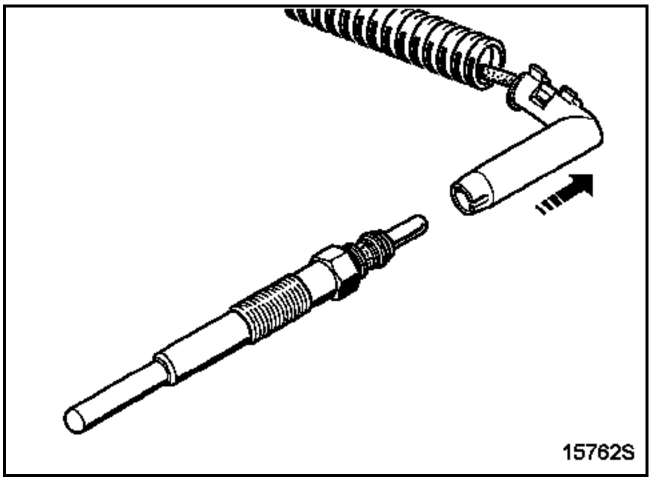
Plugs may be removed without having to open the high pressure circuit.

REMOVAL

Unclip the plug connector.

Clean the plug exterior to avoid any dirt entering the cylinder.

Undo and then remove the plugs.



To undo the plug on cylinder 4 use a size **10 mm** long radio socket attached to a universal joint. Once the plug is loosened use a hose to unscrew it completely.

REFITTING

Proceed in the reverse order to removal.

The four thermoplungers are located on a water unit fixed under the manifold at the engine - gearbox joint.

The objective of the system is to reheat the coolant.

The thermoplungers are supplied with **12 volts** by three relays. One relay controls two thermoplungers, the two other relays control one thermoplunger each. This enables control of one, two, three or four thermoplungers as required.

The thermoplunger resistance is:

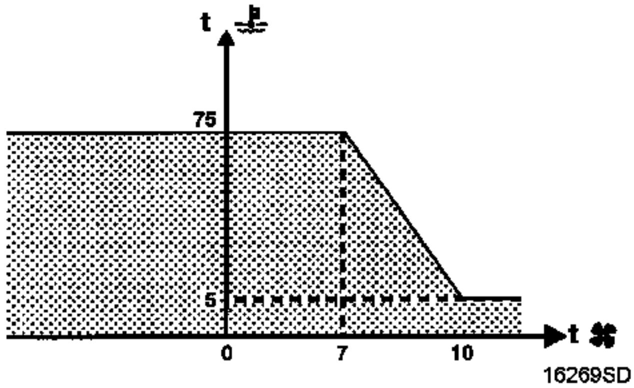
0.45 ± 0.05 Ω at 20°C.

Control strategy

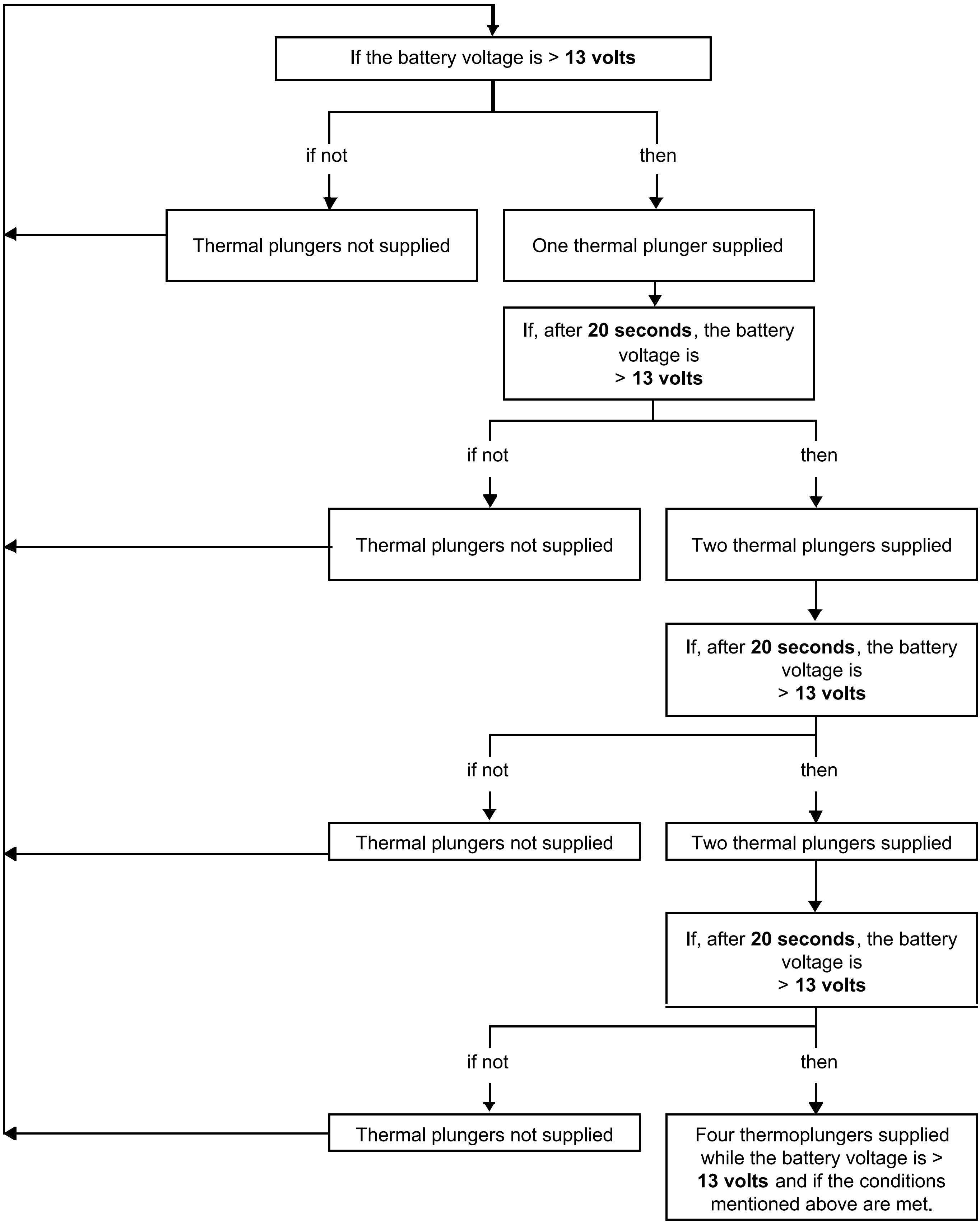
When the thermal plungers are operating the idling speed is brought to **935 rpm**.

Thermal plungers cannot operate in the case of:
– preheating,
– post heating,
– heated windscreen selected,
– engine speed below **600 rpm.**

If the conditions mentioned above apply, the thermal plungers are controlled according to a characteristics map linked to the air and coolant temperature.



Unhatched area: Thermoplunger not supplied
Hatched area: Thermoplunger supplied

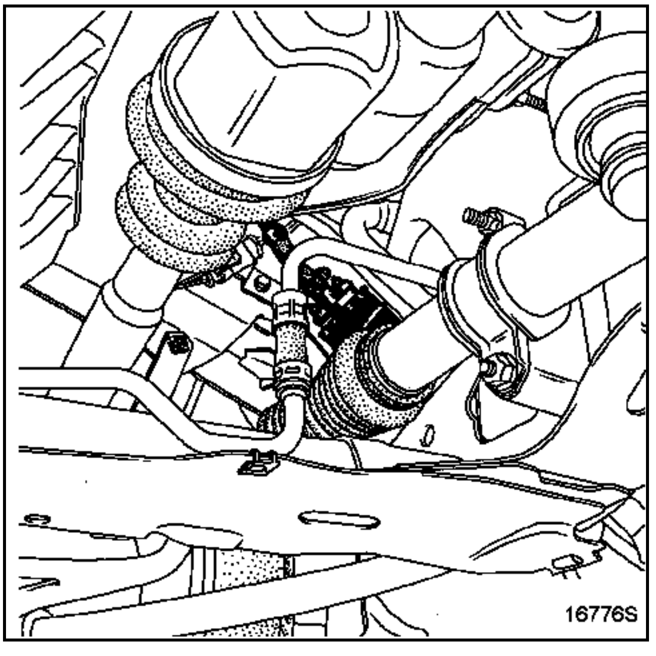

If the battery voltage is > **13 volts**
if not
then
Thermal plungers not supplied
One thermal plunger supplied
If, after **20 seconds**, the battery voltage is > **13 volts**
if not
then
Thermal plungers not supplied
Two thermal plungers supplied
If, after **20 seconds**, the battery voltage is > **13 volts**
if not
then
Thermal plungers not supplied
Two thermal plungers supplied
If, after **20 seconds**, the battery voltage is > **13 volts**
if not
then
Thermal plungers not supplied
Four thermoplungers supplied while the battery voltage is > **13 volts** and if the conditions mentioned above are met.

The booster pump is an electric pump located in the engine compartment.

REMOVAL

YOU SHOULD FOLLOW THE CLEANNESS INSTRUCTIONS CLOSELY

IMPORTANT: take note of the quantity of diesel and the residual pressure in the pipes.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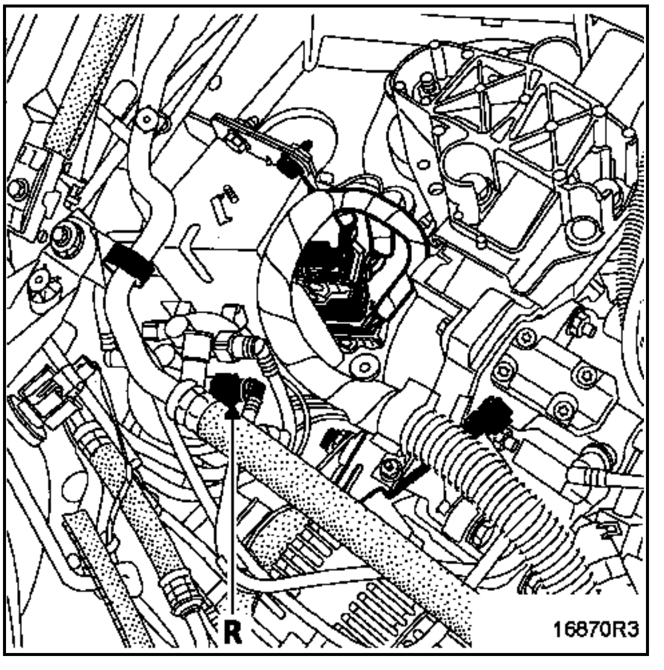
IMPORTANT: a fuel cock (R) is fitted to the fuel filter at the level of the diesel return pipe to the tank.

It must be at the open position to be operating normally.

To reprime the circuit after an intervention, a filter change or a fuel fault you should:
– close the fuel cock (R),
– start the low pressure pump by switching on the ignition several times,
– start the engine,
– OPEN THE FUEL COCK (the valve is open when the two coloured marks are aligned).



16870R3

NOTE: certain vehicles are not fitted with a fuel cock. In this case, ignore this operation.

The fuel filter is located in the engine compartment. It is contained in a cartridge which cannot be removed. This cartridge contains a regulating valve which limits the flow of diesel circulating to the engine.

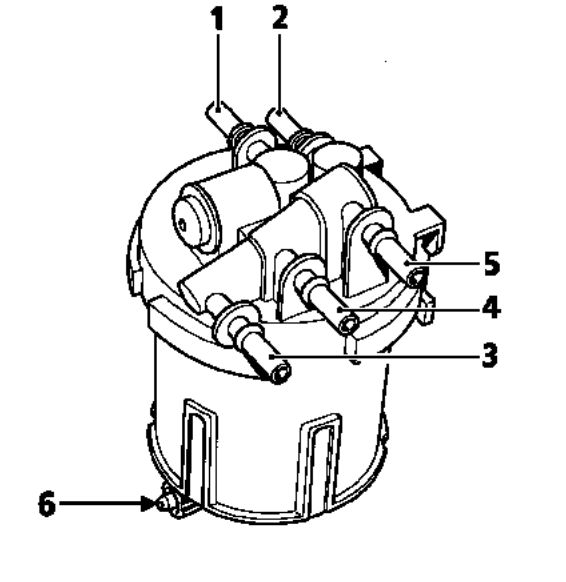
To replace the filter it is therefore necessary to replace the whole unit.

REMOVAL

YOU SHOULD FOLLOW THE CLEANNESS INSTRUCTIONS CLOSELY

IMPORTANT: take note of the quantity of diesel and the residual pressure in the pipes.

Disconnect the pipes on the filter which:
– feed the engine (1),
– come from the fuel tank (2) (low pressure pump),
– return to the tank (3) via the fuel cock (depending on version),
– return from the engine (4),
– which return to the tank via the temperature exchanger (5).



15773R

NOTE: certain vehicles are not fitted with a fuel cock. In this case, ignore the repriming procedure.

REFITTING

It is vital that you respect the position of the connections to the filter.

Be careful not to squeeze or damage the pipes.

IMPORTANT: a fuel cock (R) is fitted to the fuel filter at the level of the diesel return pipe to the tank.

It must be at the open position to be operating normally.

To reprime the circuit after an intervention, a filter change or a fuel fault you should:
– close the fuel cock (R),
– start the low pressure pump by switching on the ignition several times,
– start the engine,
– OPEN THE FUEL COCK (the valve is open when the two coloured marks are aligned).

It is necessary to periodically bleed the water trapped in the diesel filter via the bleed plug (6).

The fuel filter is located in the engine compartment. It is contained in a removable cartridge.
This cartridge contains a diesel fuel heater.

To replace the filter it is therefore necessary to remove the whole unit.

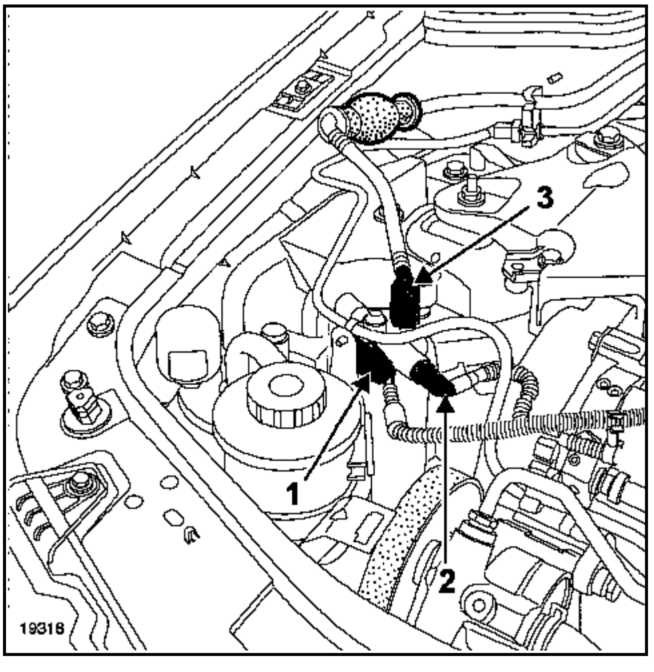
REMOVAL

YOU SHOULD FOLLOW THE CLEANNESS INSTRUCTIONS CLOSELY

IMPORTANT: take note of the quantity of diesel and the residual pressure in the pipes.

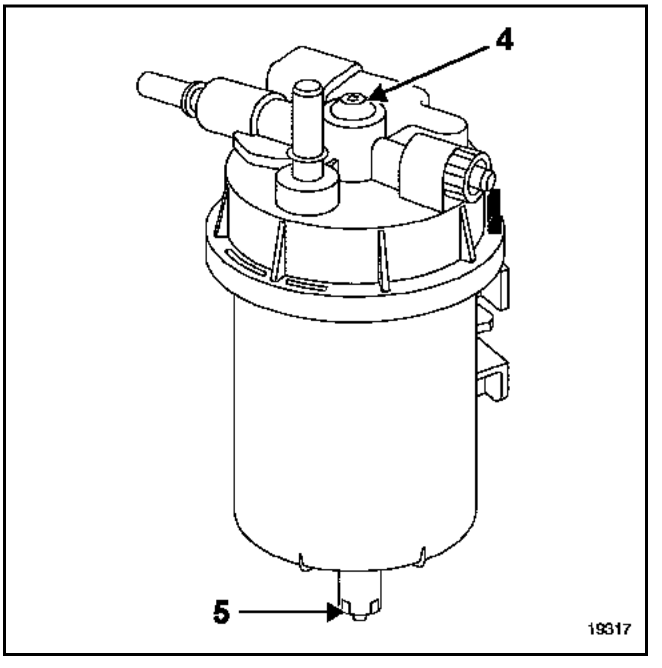
Disconnect, from the filter:
– the diesel fuel heater connector (1),
– the fuel supply pipe to the engine (2),
– the pipes (3) coming from the tank,

Remove the filter by unclipping it from its support.



Mark the position of the cartridge cover in relation to the cartridge container.

Undo the bolt (4) and remove the filter element.



REFITTING

It is vital that you respect the position of the connections to the filter.

Be careful not to squeeze or damage the pipes.

IMPORTANT: Reprime the fuel circuit using the priming bulb.

It is necessary to periodically bleed the water trapped in the diesel filter via the bleed plug (5).

It is possible to check the pressure and flow in the low pressure fuel circuit.

The low pressure is delivered by the booster pump (electric pump located under the diesel filter designed to feed the high pressure pump).

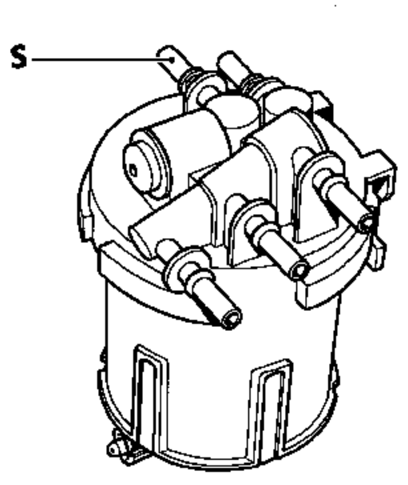
SPECIAL TOOLING REQUIRED	
Mot. 1311-01 or **Mot. 1328**	**Pressure gauge**
Mot. 1311-08	**Pressure measuring connector**
EQUIPMENT REQUIRED	
Graduated 2000 ml test tube	

TESTING LOW PRESSURE (BOOSTER PUMP)

Fit a "**T**" connection **Mot. 1311-08**, to position the pressure gauge **Mot. 1311-01** or Mot. **1328** at outlet (S) of the fuel filter or at the inlet of the high pressure pump.

Turn the fuel pump using the diagnostic tool or by directly feeding the pump (each time the ignition is switched on, the low pressure pump is supplied for **30 seconds**).

Measure the pressure which should be between **2.5 and 4 bar**.



15773R1

TESTING THE FLOW (BOOSTER PUMP)

Make the pump flow into a **2000 ml** graduated test tube. Turn on the ignition to run the pump. The pump is supplied for **30 seconds** if the engine is not started.

The flow read should be at least **80 to 100 litres/hour**.

IMPORTANT: it is forbidden to measure the pressure and the flow of the high pressure pump.

IT IS PROHIBITED TO REMOVE THE INTERIOR OF THE PUMP.

SPECIAL TOOLING REQUIRED		
Mot. 1054		**TDC setting pin**
Mot. 1200-01		**Pump-pulley retaining tool**
Mot. 1383		**Tool for removing the high pressure pipes**
Mot. 1453		**Engine support tool**
Mot. 1525		**Pulley extractor**
Mot. 1525-01		**Extractor adaptor for F9Q**
EQUIPMENT REQUIRED		
"Low torque" torque wrench		

For injection pump CP3

TIGHTENING TORQUES (in daNm and/or °)	
High pressure pipe	**2.5 ± 0.2**
High pressure pump mounting	**3 ± 0.3**
High pressure pump pulley nut	**1.5 plus an angle of $60 \pm 10°$**
Rear pump support mounting bolt	**3 ± 0.3**
Injection rail mounting bolt	**2.2 ± 0.2**

For injection pump CP1

TIGHTENING TORQUES (in daNm)	
High pressure pipe	**2.5 ± 0.2**
High pressure pump mounting	**3.2 ± 0.3**
High pressure pump pulley nut	**5 ± 0.5**
Suspended mounting cover bolt	**6.2 ± 1**
Torque reaction arm bolt	**15**

IMPORTANT: before any intervention, connect the after-sales diagnostic tool, query the injection computer and check that the injection rail is not under pressure.

Take note of the fuel temperature.

REMOVAL

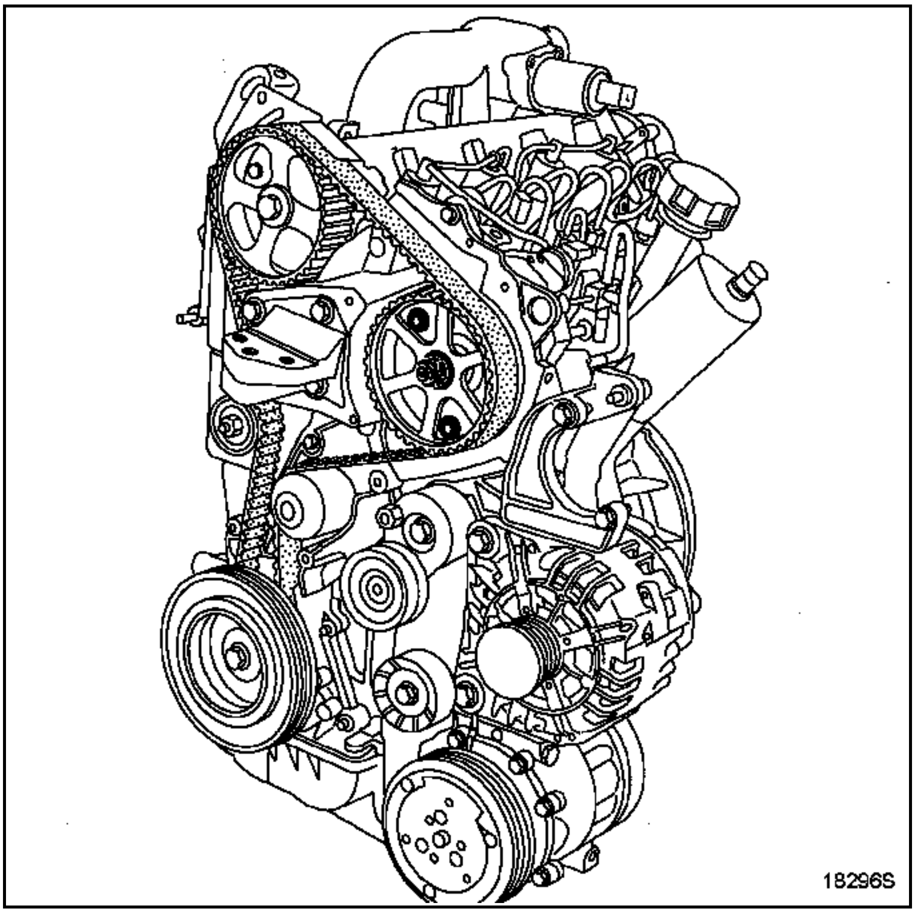
YOU SHOULD FOLLOW THE CLEANNESS INSTRUCTIONS CLOSELY

Disconnect the battery.

Fit tool **Mot. 1453** engine support on the engine.

Set the engine to top dead centre using pin **Mot. 1054**.

Remove:
– the wheel and the front right mudguard,
– the suspended mounting,
– the valve timing cover,



– fit the high pressure pipe using tool **Mot. 1383**,
– the rail.

Insert the blanking plugs.

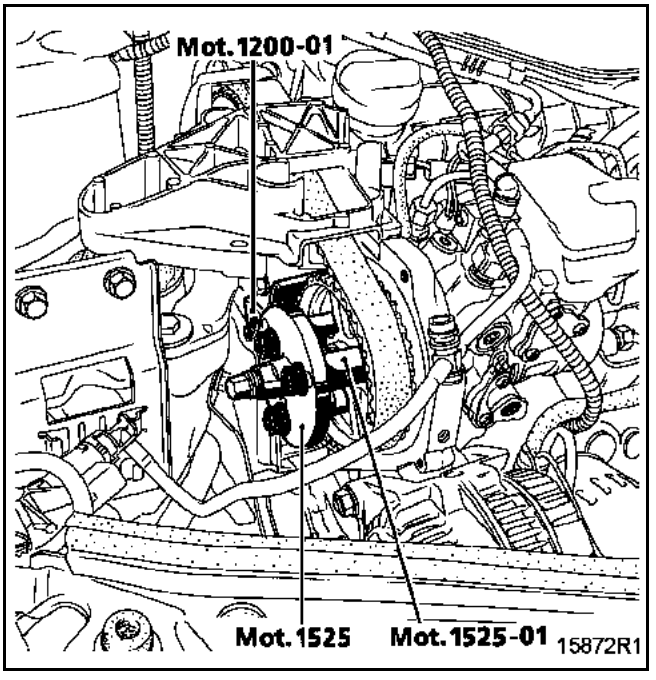
Disconnect the fuel return pipe from the pump and insert the plugs to maintain cleanness.

Remove the rear pump support.

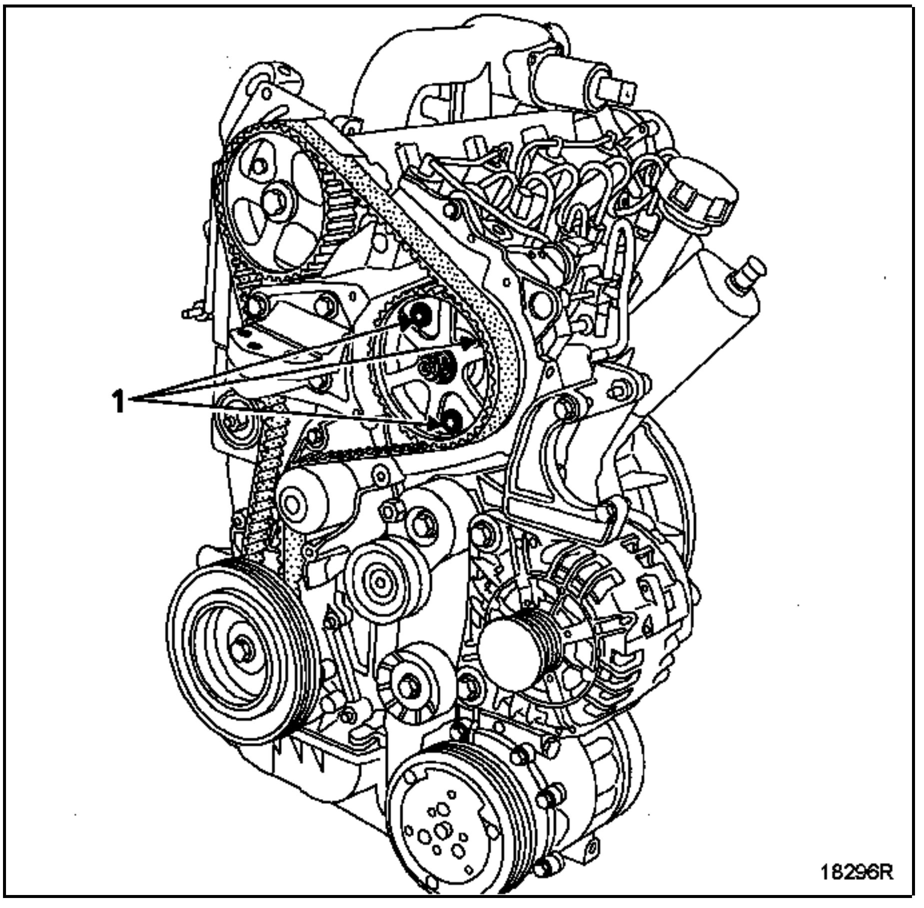
Fit tool **Mot. 1200-01** on the pulley.

Undo the high pressure pump sprocket nut.

Fit the extractor **Mot. 1525** fitted with the adaptor **Mot. 1525-01** on the pulley pump then disassemble the unit.



Remove the mounting nuts by holding the bolts (1).



REFITTING

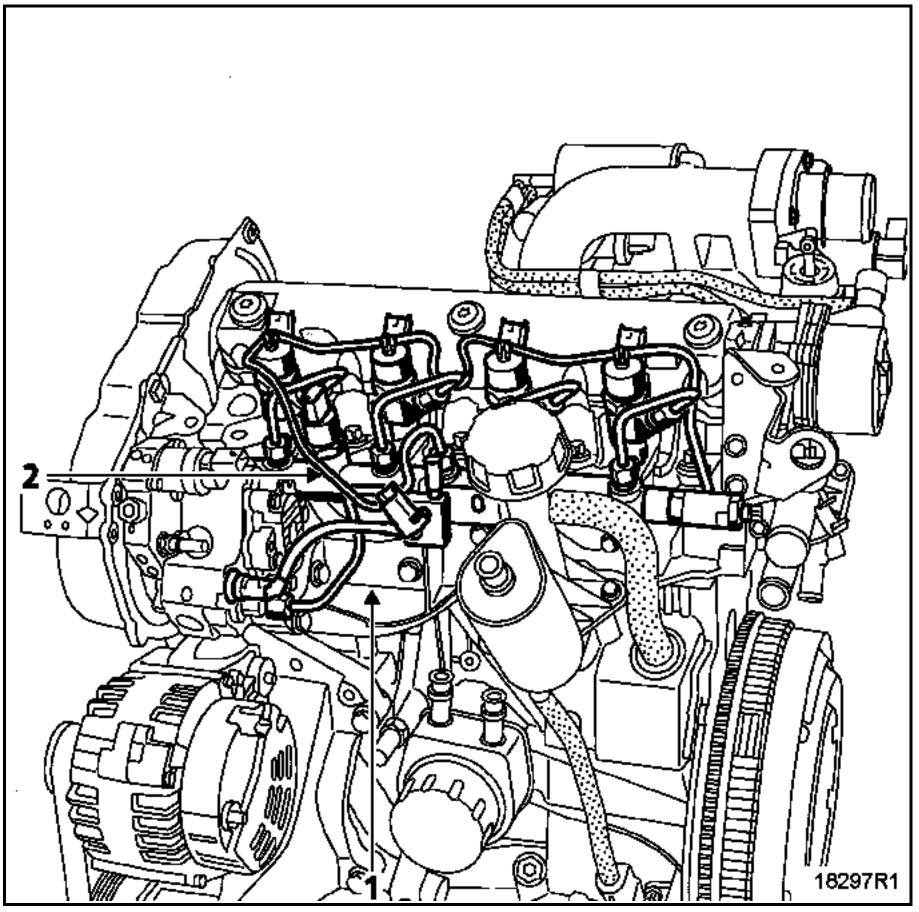
Refitting is the reverse of removal.

NOTE: be careful not to place the high pressure pipe under stress.

Finger-tighten the high pressure pipe nuts at the pump and injector end and then at the rail end. Tighten them to torque in the same order as for pre-tightening.

Tighten the high pressure rail.

You must replace the diesel return pipe (2) every time it is removed.



Refit:
– the suspended mounting (**refer to the procedure in "section 19").**
– the rear pump support (1).

First tighten the bolts to the cylinder head and then those on the rail.

For injection pump CP3:

Reprime the circuit using the priming bulb.

After any intervention, check that there are no leaks in the diesel circuit. Start the engine at idling speed until the fan starts up, then accelerate several times under no load.

For injection pump CP1:

Reprime the circuit:
- close the fuel cock (R),
- start the low pressure pump by switching on the ignition several times,
- start the engine,
- **OPEN THE FUEL COCK** (R) (the valve is open when the two coloured marks are aligned).

NOTE: certain vehicles are not fitted with a fuel cock. In this case, ignore the repriming procedure.

After any intervention, check that there are no leaks in the diesel circuit. Start the engine at idling speed until the fan starts up, then accelerate several times under no load.

SPECIAL TOOLING REQUIRED	
Mot. 1383	**Tool for removing the high pressure pipes**
EQUIPMENT REQUIRED	
"Low torque" torque wrench	

TIGHTENING TORQUES (in daNm)	
High pressure pipe nuts	**2.5 ± 0.2**
Injection rail mounting bolt	**2.2 ± 0.2**
Pressure sensor	**3.5 ± 0.2**

IMPORTANT: before any intervention, connect the after-sales diagnostic tool, query the injection computer and check that the injection rail is not under pressure.

Take note of the fuel temperature.

REMOVAL

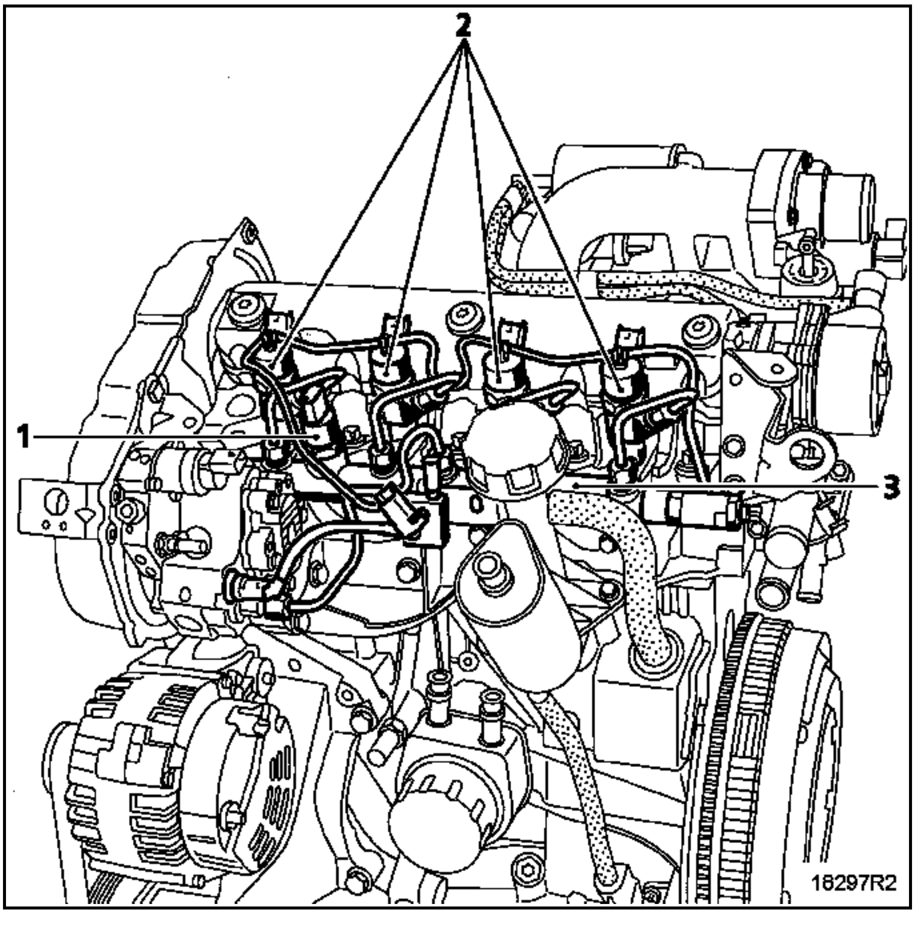
YOU SHOULD FOLLOW THE CLEANNESS INSTRUCTIONS CLOSELY

Disconnect:
- the battery,
- the pressure sensor (1),
- the injectors (2),
- the cylinder marking sensor.

Loosen and remove the high-pressure diesel pipes.

Insert the plugs to maintain cleanness.

Gently remove the injection rail (3).



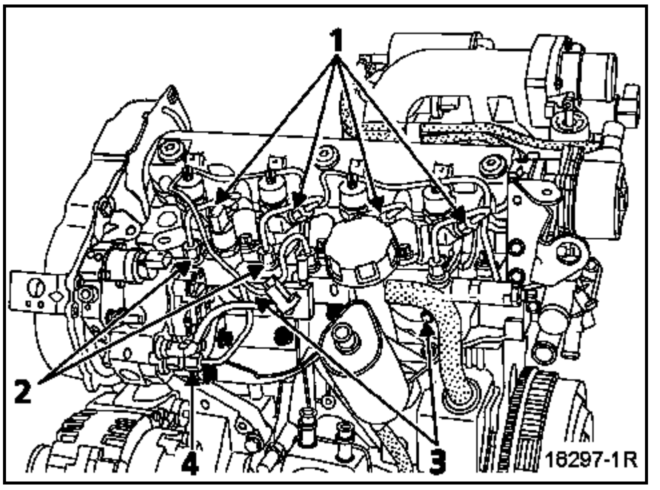
REFITTING

Position the injection rail and finger-tighten the mounting bolts (the rail should be floating).

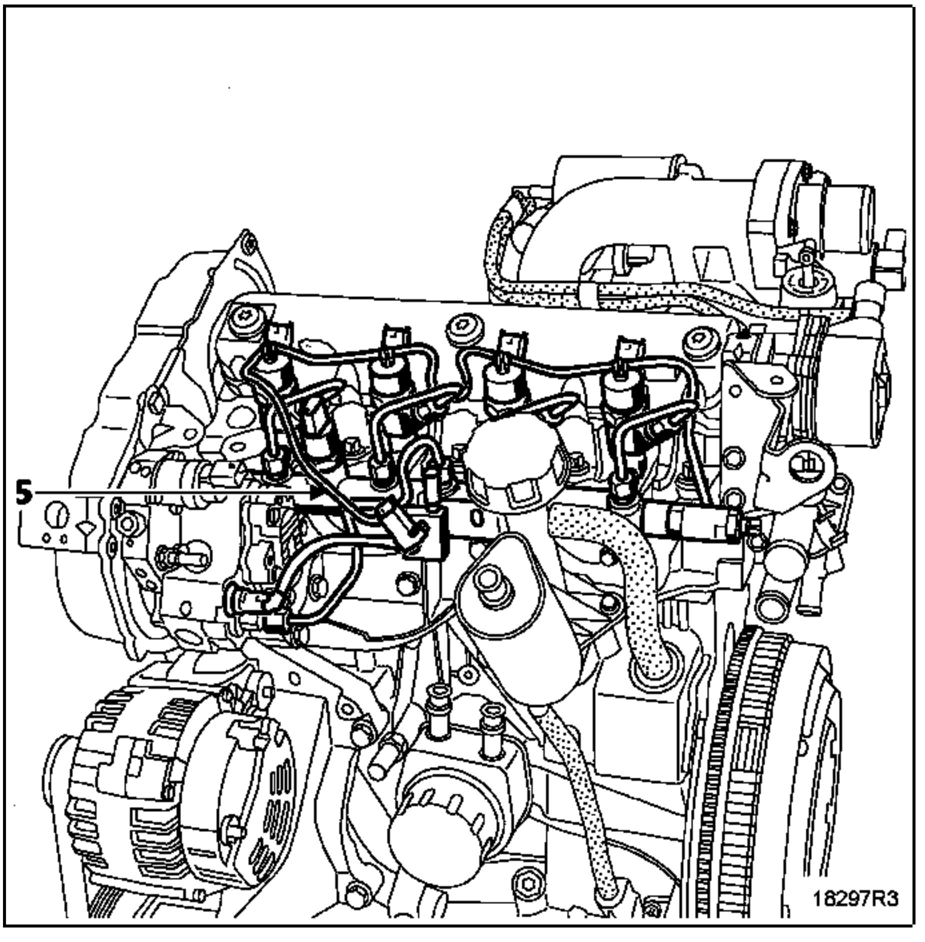
Finger tighten all the high pressure pipes by hand (injector end, pump end, then rail end).

Tighten all the unions on the high pressure injection pipes (injector end (1), pump end (4) then injector rail end (2).

Tighten the rail bolts (3).



NOTE: it is imperative that you replace the fuel return pipe (5) placed on the injectors during removal.



Reprime the circuit using the priming bulb.

After any intervention, check that there are no leaks in the diesel circuit. Start the engine at idling speed until the fan starts up, then accelerate several times under no load.

For injection pump CP1:

Reprime the circuit:
- close the fuel cock (R),
- start the low pressure pump by switching on the ignition several times,
- start the engine,
- **OPEN THE FUEL COCK** (R) (the valve is open when the two coloured marks are aligned).

NOTE: certain vehicles are not fitted with a fuel cock. In this case, ignore the repriming procedure.

After any intervention, check that there are no leaks in the diesel circuit. Start the engine at idling speed until the fan starts up, then accelerate several times under no load.

IT IS FORBIDDEN TO DISMANTLE THE INTERIOR OF AN INJECTOR OR TO SEPARATE THE INJECTOR HOLDER FROM THE PIPE.

SPECIAL TOOLING REQUIRED	
Mot. 1383	**Tool for removing the high pressure pipes**

TIGHTENING TORQUES (in daNm)	
Injector clamp mounting bolt	**2.5 ± 0.2**
High pressure pipe nuts	**2.5 ± 0.5**

IMPORTANT: before any intervention, connect the after-sales diagnostic tool, query the injection computer and check that the injection rail is not under pressure.

Take note of the fuel temperature.

REMOVAL

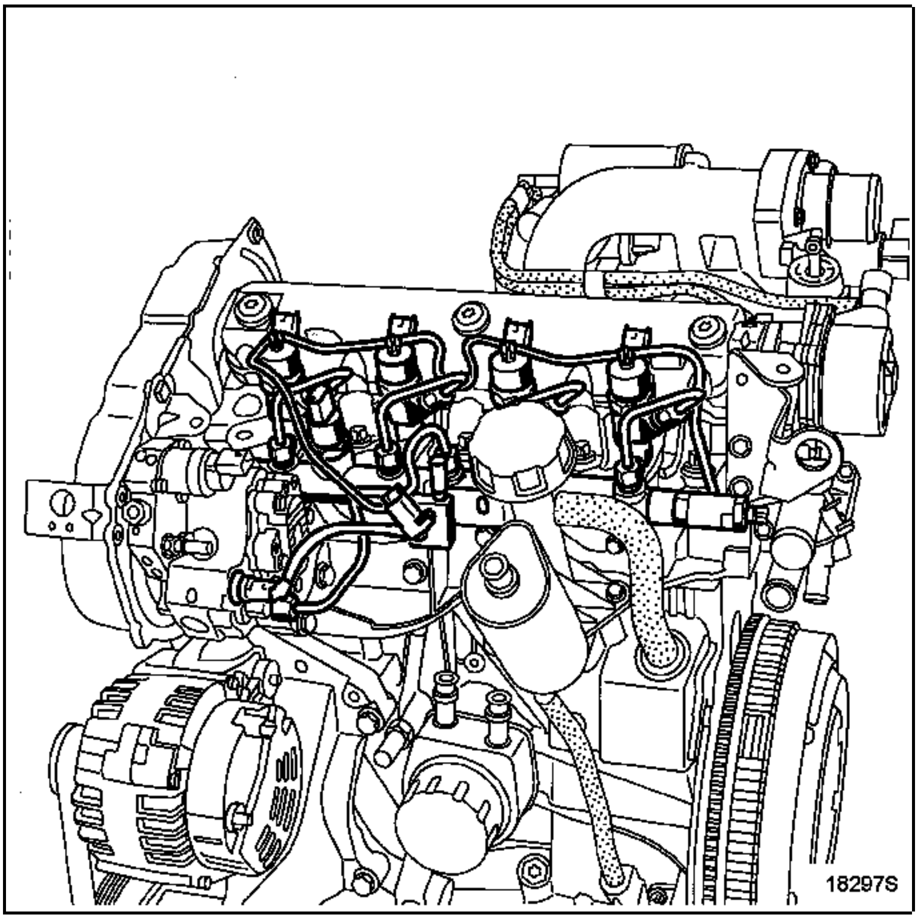
YOU SHOULD FOLLOW THE CLEANNESS INSTRUCTIONS CLOSELY

NOTE: the injectors may be replaced individually.

Remove the high pressure pipe using tool **Mot. 1383**.

Insert the plugs to maintain cleanness.

Remove:
- the injector mounting clamp,
- the injector,
- the flame shield washer.



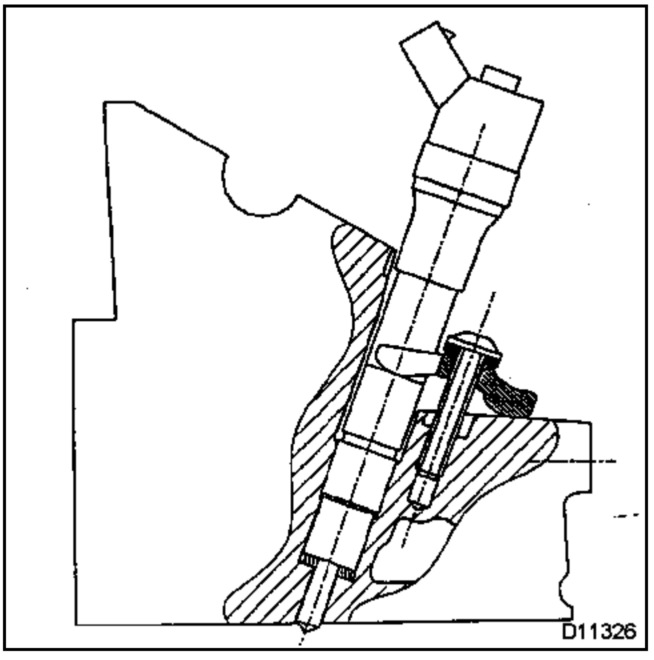
CLEANING

It is absolutely forbidden to use the following when cleaning the injector:
- a metal brush
- an emery cloth,
- an ultrasound cleaner.

To clean the nose of the injector, let it soak in degreaser, then wipe is with a lint-free cloth.

REFITTING

Change the washer beneath the injector.

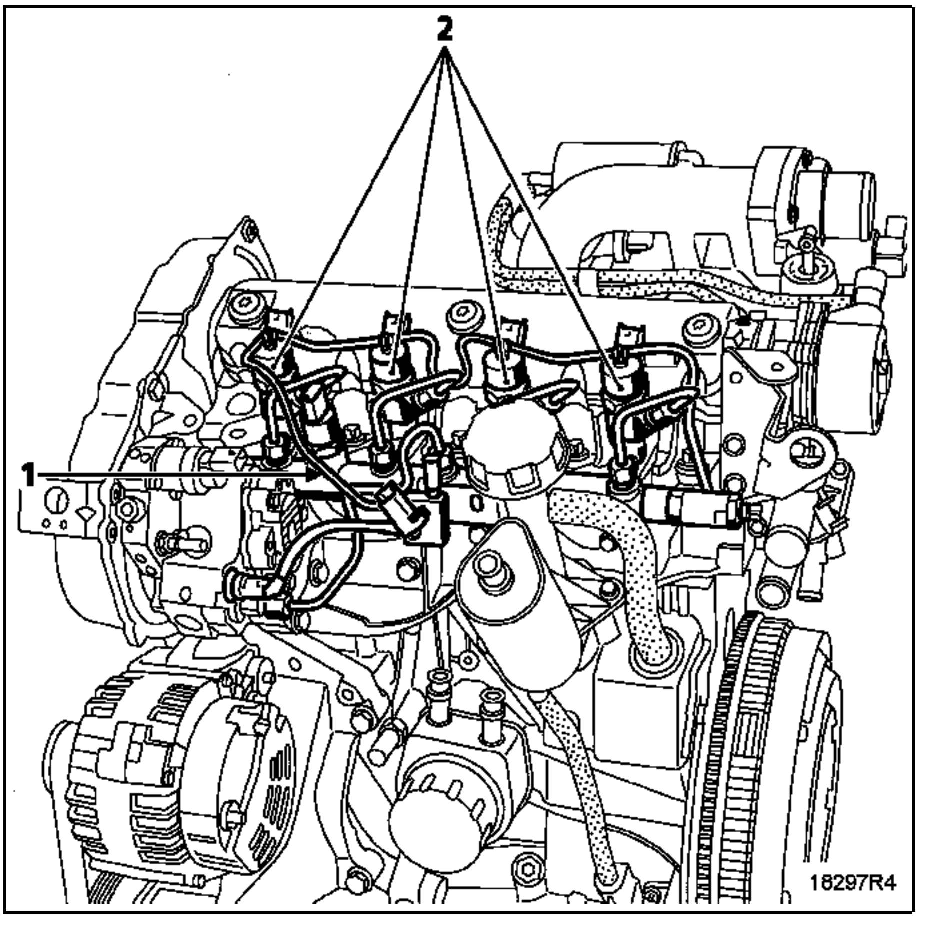


NOTE: be careful when refitting that you do not stress the high pressure pipe. Remove the injection rail.

Fit:

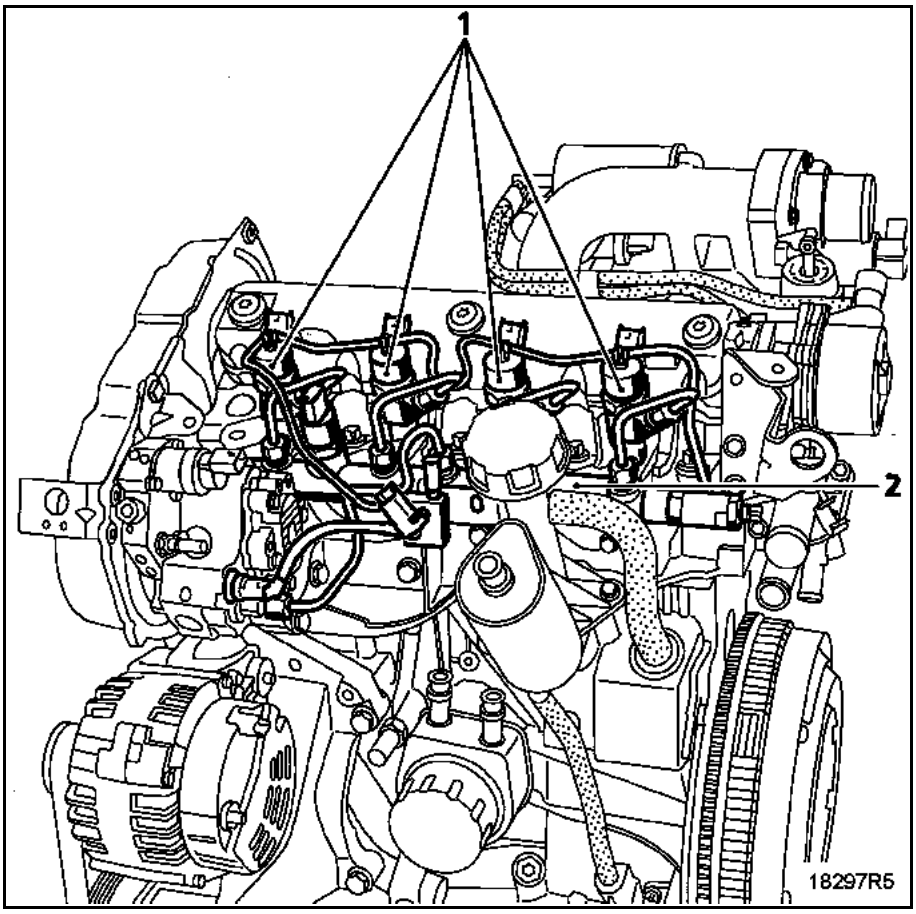
the injector,

the diesel return pipe (1)



Fit the high pressure pipe.

Tighten to torque:
– the injector (1),
– the injector side connections, then the injection rail connections,
– the rail (2).



NOTE: it is essential that you replace the fuel return pipe on the injectors during removal.

After any intervention, check that there are no leaks in the diesel circuit. Start the engine at idling speed until the fan starts up, then accelerate several times under no load.

TIGHTENING TORQUES (in daNm)	
Pressure sensor	3.5 ± 0.5

IMPORTANT: before any intervention, connect the after-sales diagnostic tool, query the injection computer and check that the injection rail is not under pressure. Take note of the fuel temperature.

PRESSURE SENSOR (1)

YOU SHOULD FOLLOW THE CLEANNESS INSTRUCTIONS CLOSELY

REMOVAL

Disconnect the battery.

Disconnect the pressure sensor.

Unscrew the pressure sensor.

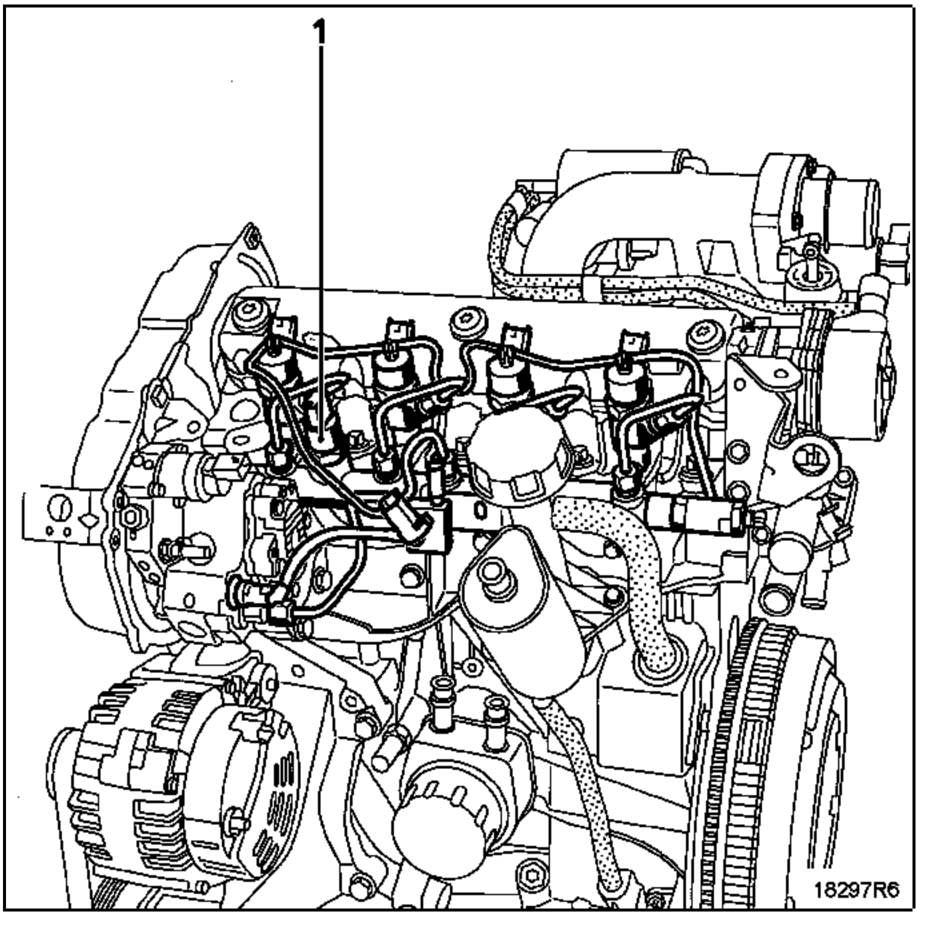
REFITTING

Replace the seal.

Screw in the sensor then tighten it to torque.

Connect the connector.

After any intervention, check that there are no leaks in the diesel circuit. Start the engine at idling speed until the fan starts up, then accelerate several times under no load.



IMPORTANT:
REMOVAL OF THE PRESSURE REGULATOR ON THE CP3 INJECTION PUMP IS PROHIBITED.

TIGHTENING TORQUE (in daNm)	
Regulator bolt	**0.9 ± 0.1**

IMPORTANT: before any intervention, connect the after-sales diagnostic tool, query the injection computer and check that the injection rail is not under pressure. Take note of the fuel temperature.

PRESSURE REGULATOR

YOU SHOULD FOLLOW THE CLEANNESS INSTRUCTIONS CLOSELY

REMOVAL

Disconnect the battery.

Remove the regulator connector.

Remove the retaining bracket for the diesel temperature sensor.

Unscrew the regulator mounting bolts.

Remove the regulator by turning in an anticlockwise direction (do not use any tools as a lever when removing the pump regulator).

REFITTING

Change the seals.

Dampen the seals with clean diesel.

Replace the regulator in the pump by turning it in an anticlockwise direction (do not use any tools as a lever when replacing the pump regulator).

Fit the mounting bolts then tighten to torque.

Connect the connector.

After any intervention, check that there are no leaks in the diesel circuit. Start the engine at idling speed until the fan starts up, then accelerate several times under no load.

GENERAL

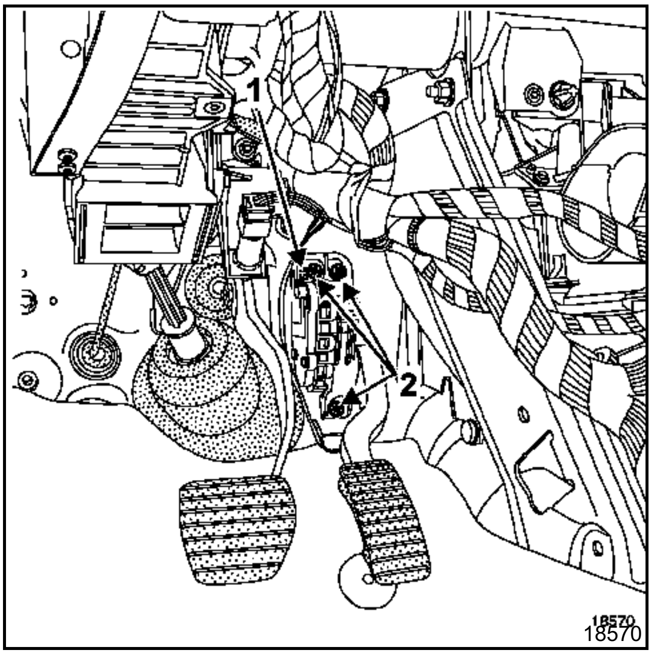
The accelerator pedal potentiometers are incorporated in the accelerator pedal. Its replacement therefore requires replacement of the accelerator pedal.
There are two types of pedal: **with or without point of resistance.**
Cars equipped with cruise control/speed limiter have an accelerator pedal with a point of resistance at the end of their travel (kickdown)
This point of resistance makes it possible to quit the speed limiter function if the driver has to increase his speed.

IMPORTANT: it is permitted to fit a pedal with a point of resistance in place of a pedal without a point of resistance. But fitting a pedal without a point of resistance in place of a pedal with a point of resistance is forbidden.

REMOVAL

Disconnect the battery.

Disconnect the accelerator pedal connector (1).
Remove:
– the three pedal mounting screws (2),
– the pedal.



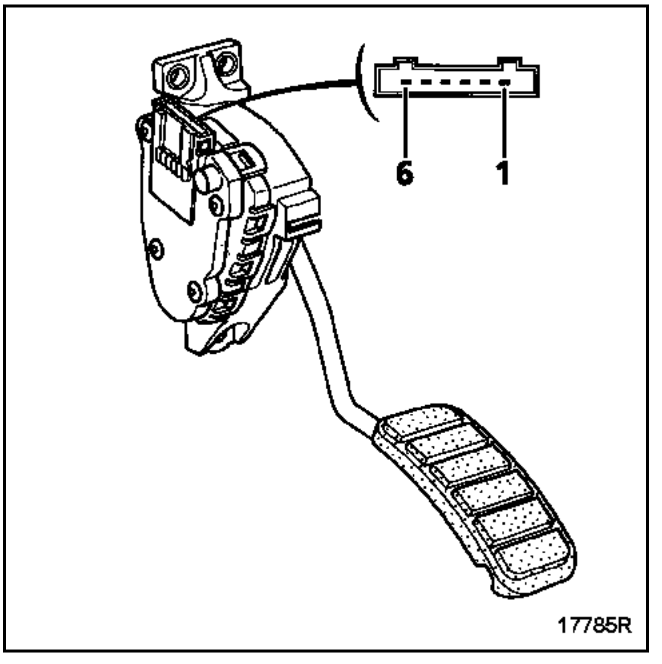
18570

REFITTING

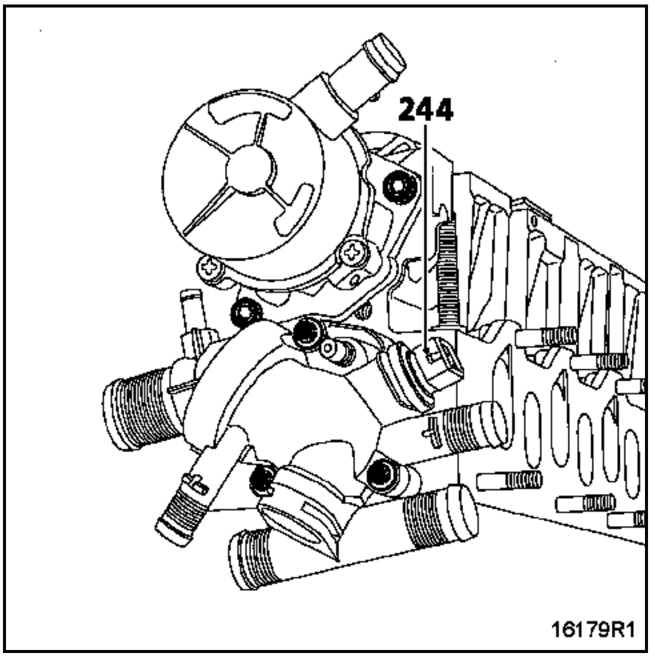
Refitting is the reverse of removal.

Allocation of tracks:

1: Track 2 earth
2: Track 1 earth
3: Track 1 signal
4: Track 1 feed
5: Track 2 feed
6: Track signal 2



NOTE: a fault on the accelerator position potentiometer causes changes in the idle speed or engine operation (see **section 13 "Idle speed correction"**).



244 Coolant temperature sensor (injection and coolant temperature indication on the instrument panel).
Three track sensor, two tracks for coolant temperature information and one track for indication on the instrument panel.

This system allows the engine cooling fan to be controlled by the injection computer. It consists of a single coolant temperature sensor serving injection, the engine cooling fan, the temperature indicator and the instrument panel temperature warning light.

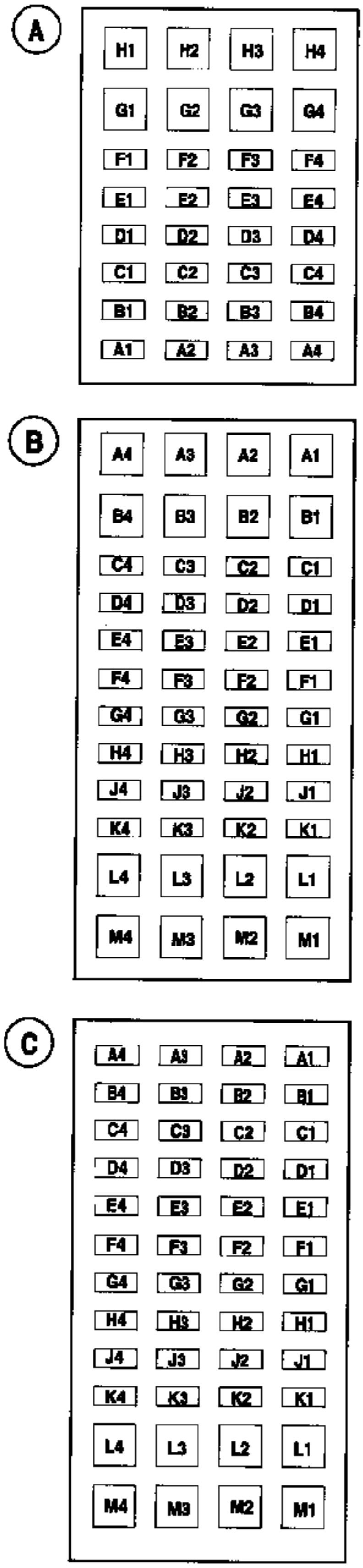
OPERATION

The injection computer controls, as a function of the coolant temperature:
- the injection system,
- the engine cooling fan relays:
  - the fan unit is switched on at slow speed if the coolant temperature exceeds **99˚C** and is switched off when the temperature falls below **96˚C**,
  - the fan unit is switched on at high speed if the coolant temperature exceeds **102 ˚C** and is switched off when the temperature falls below **99˚C**,
  - the fan unit can be controlled for the air conditioning.

COOLANT TEMPERATURE WARNING LIGHT (shared with the injection fault warning light)

The warning light is controlled by the computer.

It is operated when the temperature exceeds **120°C.**



PRO16020

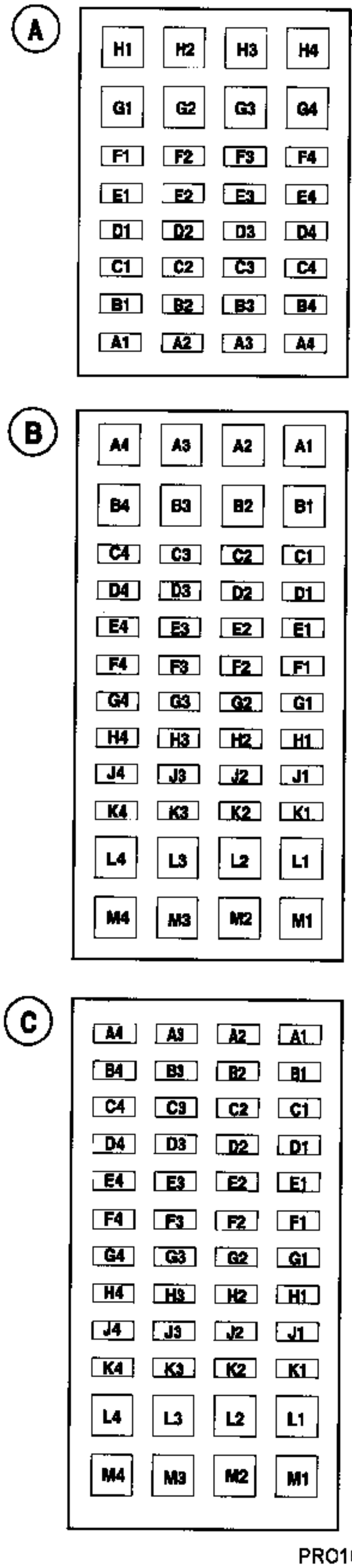
TRACK ASSIGNMENTS

Connector A

H2	——	LOAD POTENTIOMETER FEED (TRACK 2)
F1	←	LOAD POTENTIOMETER INPUT (TRACK 2)
F3	←	BRAKE SWITCH INPUT
E1	---	LOAD POTENTIOMETER SUPPLY (TRACK 1)
E2	←	CLUTCH SWITCH INPUT
C1	←	LOAD POTENTIOMETER INPUT (TRACK 1)
C3	→←	FAULT FINDING
B3	---	LOAD POTENTIOMETER EARTH (TRACK 1)
A3	---	LOAD POTENTIOMETER EARTH (TRACK 2)
A4	→←	MULTIPLEXED LINK CAN L (PASSENGER COMPARTMENT)
B4	→←	MULTIPLEXED LINK CAN H (PASSENGER COMPARTMENT)
A2	---	CRUISE CONTROL/SPEED LIMITER STALK EARTH
B2	←	CRUISE CONTROL/SPEED LIMITER STALK SIGNAL
D2	←	CRUISE CONTROL ON/OFF
F2	←	SPEED LIMITER ON/OFF

CONNECTOR B

B3	←	PLUGS DIAGNOSTICS INPUT (1)
B2	---	EGR VALVE POSITION POTENTIOMETER EARTH
C3	→	PREHEATING RELAY CONTROL
C2	←	EGR POTENTIOMETER POSITION SIGNAL INPUT
C1	←	TURBOCHARGING PRESSURE SENSOR INPUT
D4	→	SUPPLY RELAY CONTROL OUTPUT
D3	←	AIR TEMPERATURE SENSOR INPUT
D1	←	DIESEL FUEL PRESSURE SENSOR
E3	---	+ AFTER IGNITION FEED
E1	---	COOLANT TEMPERATURE SENSOR EARTH
F2	---	EGR POTENTIOMETER POSITION SUPPLY
G3	←	ENGINE SPEED SIGNAL SENSOR
G2	---	AIR FLOW METER SUPPLY
G1	---	FUEL TEMPERATURE SENSOR EARTH (F9Q 750)
H4	←	AIR FLOW METER SIGNAL INPUT
H3	←	ENGINE SPEED SIGNAL SENSOR
H2	---	DIESEL PRESSURE SUPPLY SENSOR
J3	←	FUEL TEMPERATURE INPUT (F9Q 750)
J2	---	TURBOCHARGER PRESSURE SUPPLY SENSOR
K3	←	COOLANT TEMPERATURE SENSOR INPUT
L4	---	POWER EARTH
L3	---	POWER EARTH
L2	→	TURBOCHARGER PRESSURE REGULATOR SOLENOID CONTROL
L1	→	OUTPUT
		PRESSURE REGULATOR SOLENOID CONTROL OUTPUT
M4	---	POWER EARTH
M3	---	+ AFTER RELAY
M2	---	+ AFTER RELAY
M1	→	EGR SOLENOID CONTROL OUTPUT
F3	→	ADDITIONAL HEATING CONTROL



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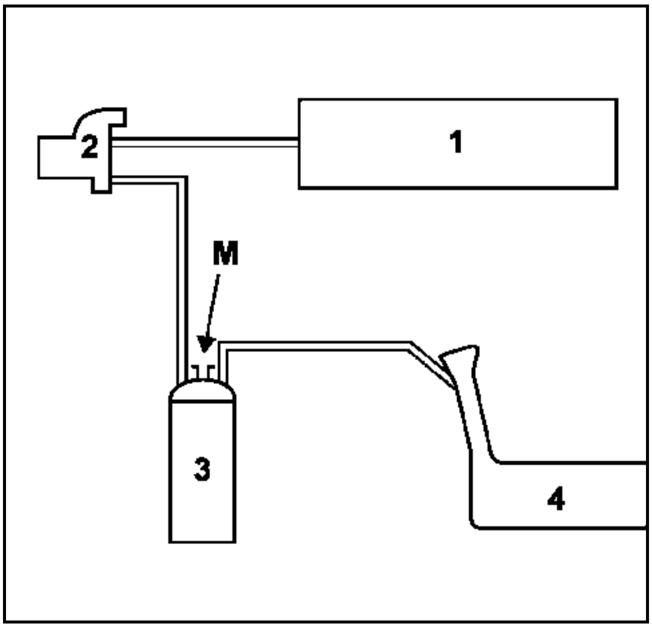
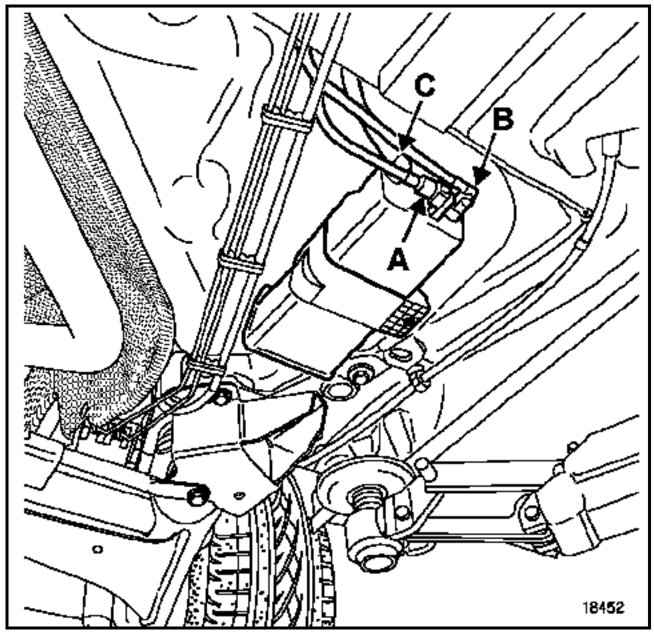
Connector C

A4	---	TURBOCHARGER PRESSURE SENSOR EARTH
A3	---	FLOW METER EARTH
A2	→	LOW SPEED FAN UNIT RELAY CONTROL OUTLET
A1	→	ELECTRIC FUEL PUMP CONTROL OUTPUT (F9Q 754)
B4	→	HIGH SPEED FAN UNIT RELAY CONTROL OUTLET
B3	---	DIESEL PRESSURE SENSOR EARTH
C1	---	CAMSHAFT POSITION SENSOR EARTH
E4	→	ADDITIONAL HEATING CONTROL OUTPUT
J4	→	ADDITIONAL HEATING CONTROL OUTPUT
K4	←	CAMSHAFT POSITION SIGNAL SENSOR
L4	→	INJECTOR 2 CONTROL
L3	---	INJECTOR 2 SUPPLY
L2	---	INJECTOR 3 SUPPLY
L1	→	INJECTOR 4 CONTROL
M4	---	INJECTOR 4 SUPPLY
M3	---	INJECTOR 1 SUPPLY
M2	→	INJECTOR 3 CONTROL
M1	→	INJECTOR 1 CONTROL
F4	→	DAMPER CONTROL (ENGINE STOP SYSTEM)

OPERATING DIAGRAM OF THE CIRCUIT



1 Inlet manifold.
2 Canister bleed solenoid valve.
3 Canister.
4 Tank.
M Venting valve.



A Rebreathing of the fuel vapours coming from the tank.
B Rebreathing of the fuel vapours going to the engine.
C Venting to the air from the tank.

IMPORTANT: the vent to the free air must not be plugged in normal operation.

OPERATING PRINCIPLE

Venting to the air from the tank is through the fuel vapour absorber (canister).

The fuel vapours are retained on their passage by the active charcoal contained in the absorber (canister).

The fuel vapours trapped in the canister are eliminated and combusted by the engine.

This is done by connecting through piping and a solenoid valve, the canister and the inlet manifold. This solenoid valve is located on the front right shock absorber cage in the case of the F4P, K4M, F5R engines and beside the power assisted steering fluid reservoir for the L7X engine.

The principle behind the solenoid valve is to open a passage of variable size (as a function of the RCO signal sent by the injection computer).

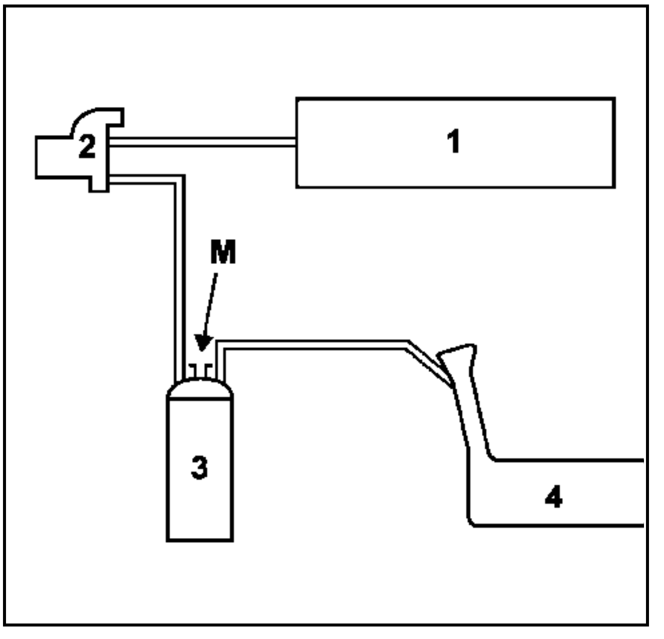
The variation in the passage made available to the fuel vapours in the solenoid valve is a consequence of the balance between the magnetic field created by the electrical supply to the coil and the return spring force attempting to close the solenoid valve.

CHECKING CANISTER BLEED OPERATION

A system malfunction may result in an unstable idle or stalling of the engine.

Check the conformity of the circuit (see operational diagrams)

Check the condition of the pipes to the fuel tank.



1 Inlet manifold.
2 Canister bleed solenoid valve.
3 Canister.
4 Tank.
M Venting valve.

CANISTER PURGE CONDITIONS

The canister bleed solenoid valve is controlled by computer **track C-E1 on the K4M and the F4P and by track C-F4 on the L7X** when:

F4P and K4M engines:
– the coolant temperature is greater than **55˚C**,
– the air temperature is greater than **10˚C**,
– the engine is not idling,
– a given load threshold is reached,
– the throttle potentiometer is not at the No Load position.

L7X engine:
– the coolant temperature is greater than **35˚C**,
– after a period of **20 seconds** after starting.

Canister bleed is not authorised during an EOBD (On Board Diagnostic) procedure.

The opening cyclic ratio of the canister bleed solenoid valve can be displayed on the diagnostic tool by consulting the **"Canister bleed solenoid valve RCO signal"** parameter.

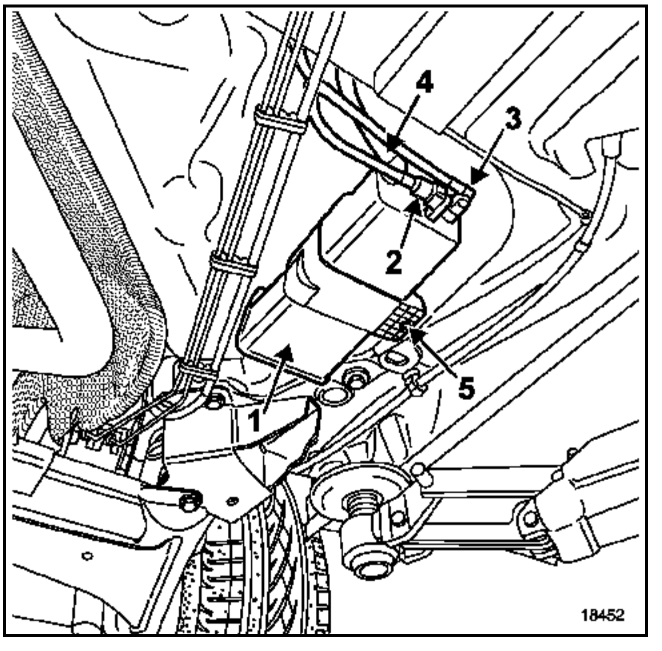
The solenoid valve is closed for a value less than **1.5%**.

REMOVING THE ABSORBER

The absorber (1) is located on the left of the tank.

Disconnect:
– the pipe (2) bringing the fuel vapour from the tank,
– the pipe (3) taking the fuel vapours to the solenoid valve,
– the vent pipe (4).

Remove:
– the canister mounting bolt (5),
– the canister.



REFITTING

Refitting is the reverse of removal.

Check:
– at idle speed,
– by blocking the circuit coming from the tank at the canister,
– by connecting a pressure gauge **(-3 / +3 bar) (Mot. 1311-01)** on the vent outlet from the canister (M),

that there is no vacuum (in the same way, the control value read by the diagnostic tool in the **"Canister bleed solenoid valve RCO signal"** parameter remains minimal **X≤1.5%**).

Is there a vacuum ?

YES: with the ignition off, use a vacuum pump to apply a vacuum of **500 mbars** to the solenoid valve at its output. The vacuum should not vary by more than **10 mbars** in **30 seconds.**

Does the pressure vary?

YES: The solenoid valve is faulty, replace the solenoid valve.

NO: There is an electrical problem, check the circuit.

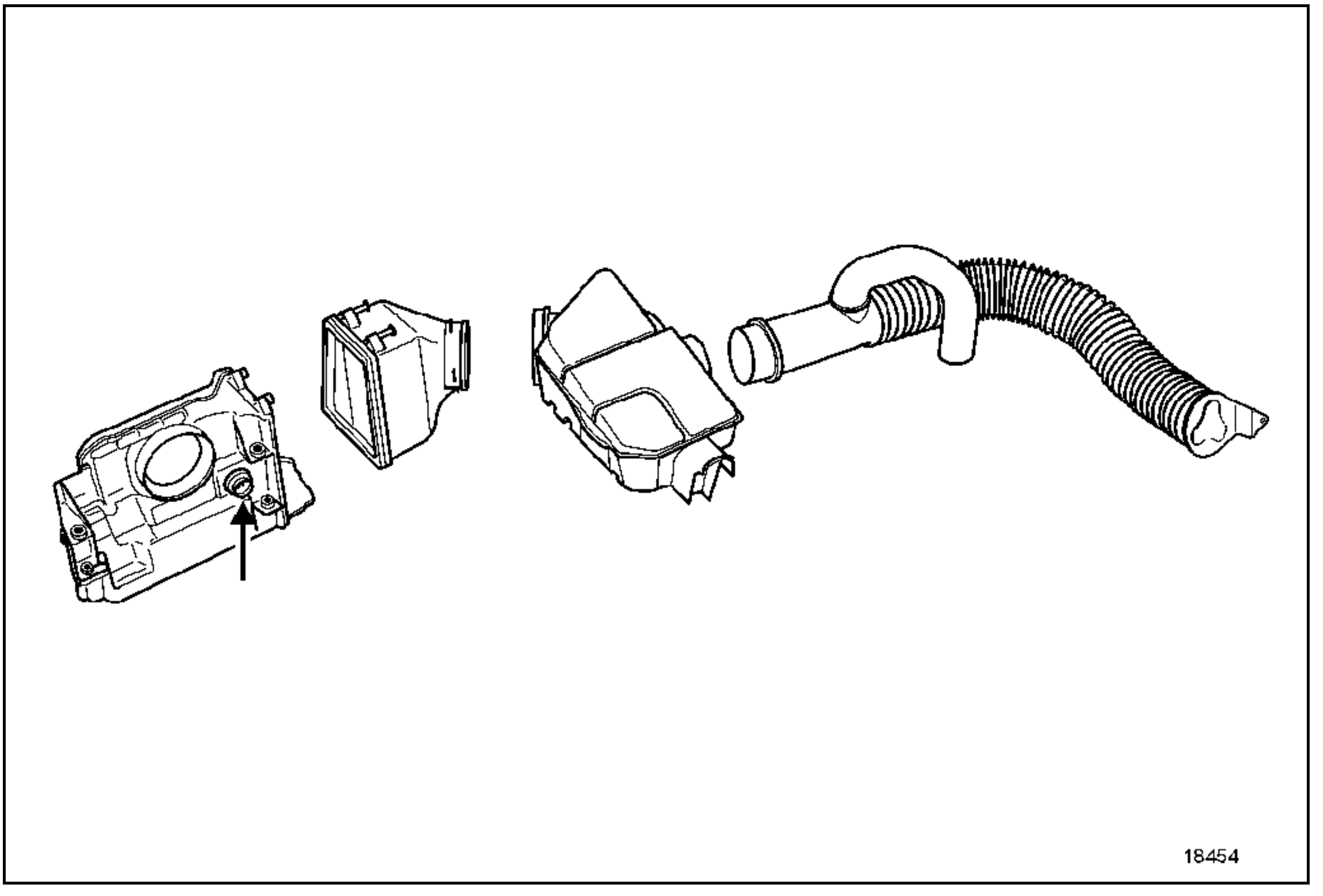
NO: In the bleed conditions (see bleed conditions) an increase in the vacuum should be detected (at the same time, the value of the parameter should increase on the diagnostic tool).

CHECKING THE CONNECTION BETWEEN CANISTER AND TANK

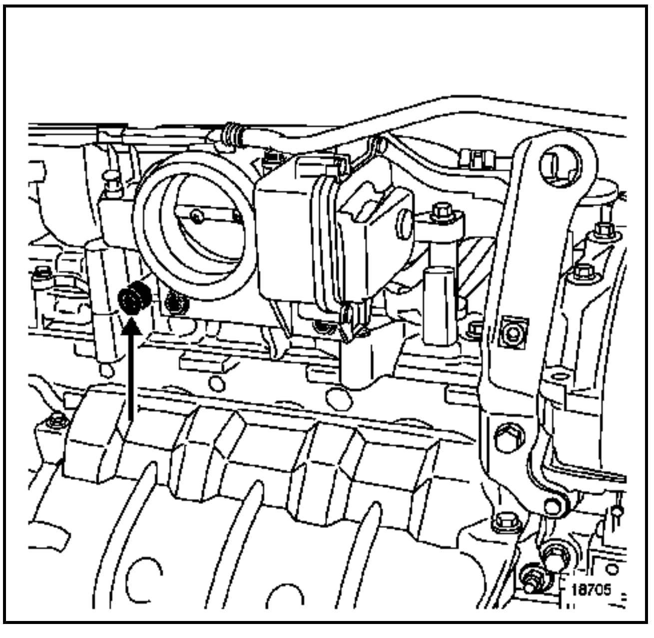
This connection can be checked by connecting a vacuum pump onto the tube going to the canister.

DESCRIPTION OF THE COMPONENTS

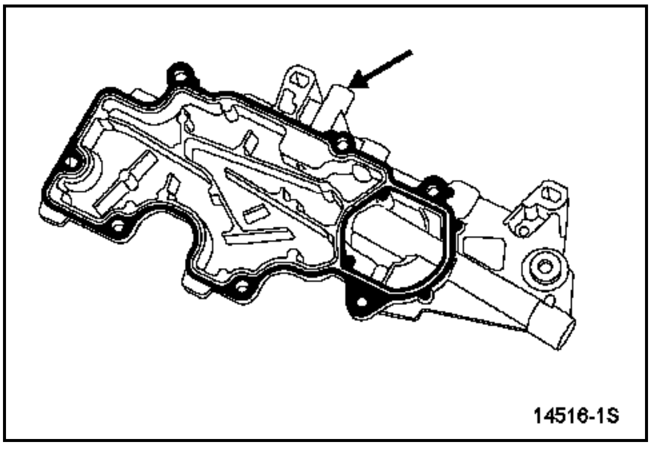
Oil vapour rebreathing hole



Oil vapour outlet hole

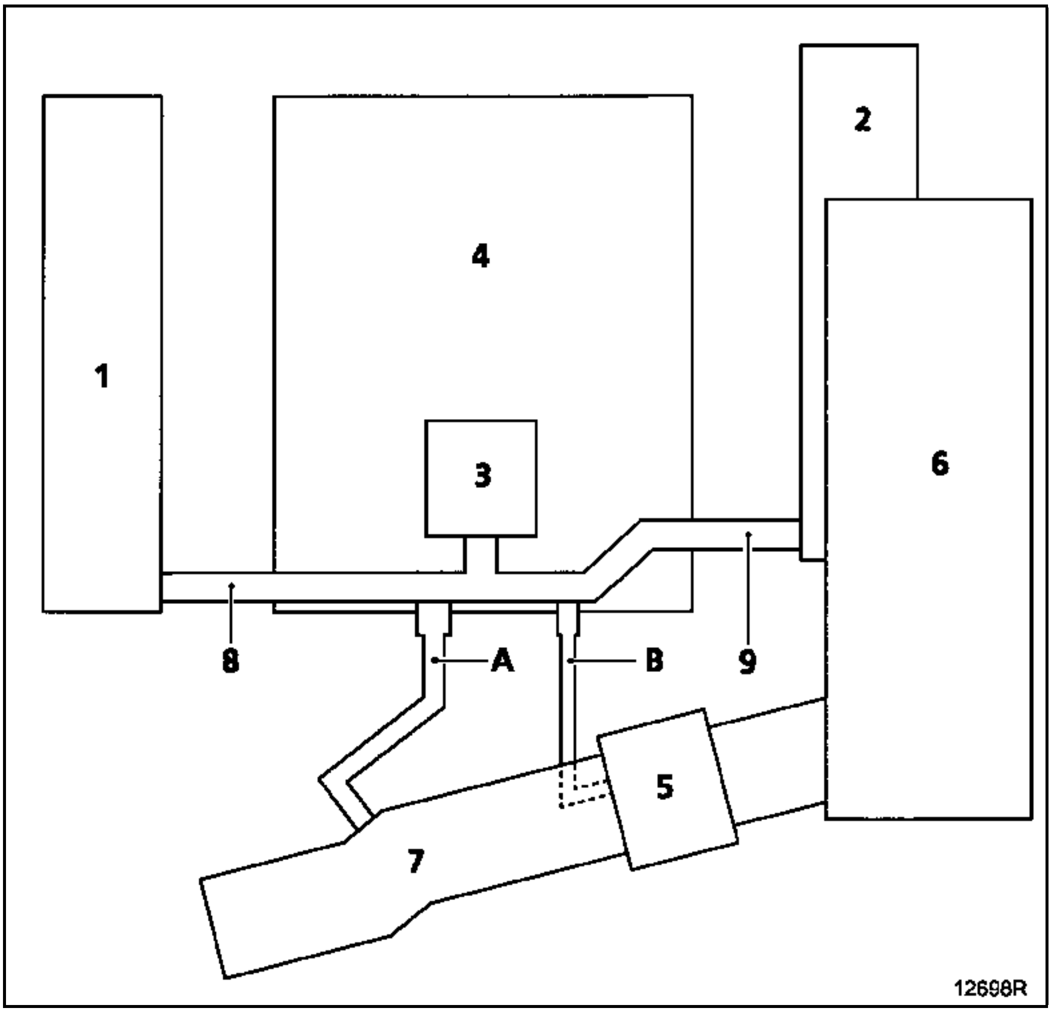


Oil vapour recovery plate located on the cylinder head cover.



Refer to **section 11 "Top and front of engine"** for instructions on removal.

CIRCUIT DIAGRAM

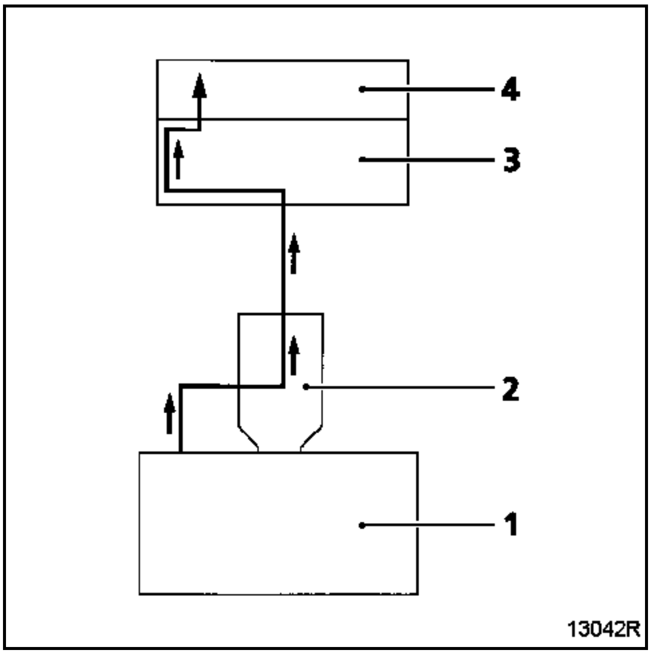


1 Front cylinder head
2 Rear cylinder head
3 Oil separator
4 Engine
5 Throttle housing
6 Inlet manifold
7 Air duct
8 Front cylinder head cover / oil separator pipe
9 Rear cylinder head cover / oil separator pipe

A Circuit upstream of the throttle body.
This circuit is used for medium and heavy loads. The vapours are rebreathed by the vacuum set up in the air duct (7).

B Circuit downstream of the throttle body.
This circuit is used for low loads. The vapours are rebreathed by the vacuum between the throttle and the engine.

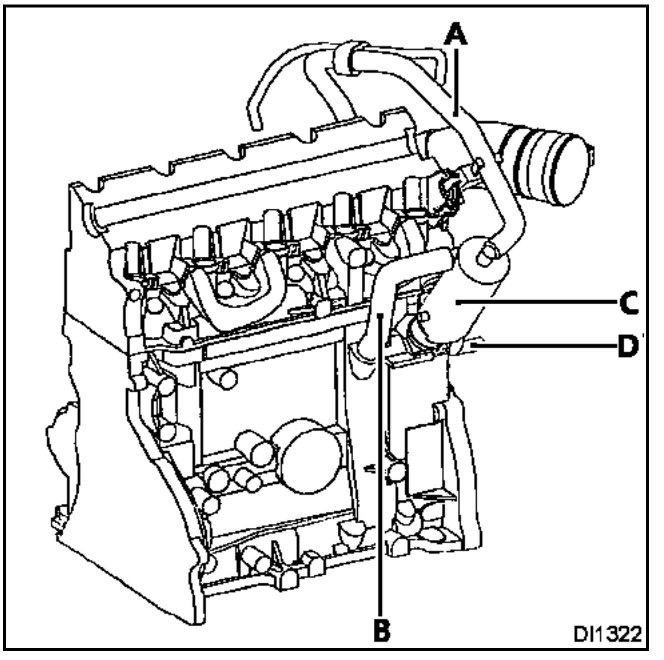
CIRCUIT DIAGRAM



1 Engine
2 Oil separator
3 Air filter unit
4 Inlet manifold

CHECKING

To ensure the correct operation of the anti-pollution system, the oil vapour rebreathing circuit must be kept clean and in good condition.



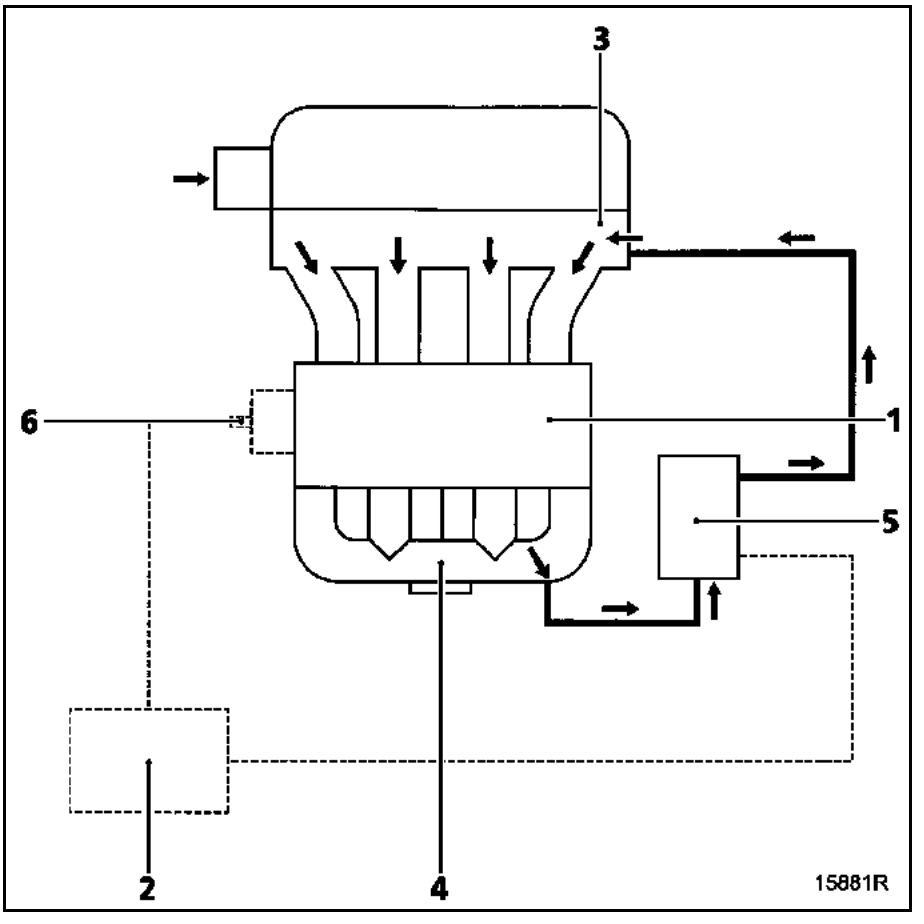
A Oil vapour rebreathing pipe for the bottom of engine

B Oil vapour rebreathing pipe for the top of engine.

C Oil separator.

D Oil vapour rebreathing pipe linked to the intake pipes.

CIRCUIT DIAGRAM



1 Engine
2 Injection computer
3 Inlet manifold
4 Exhaust manifold
5 EGR solenoid valve
6 Water temperature sensor

REMOVING THE VALVE

The EGR valve is an interference fit in the intake manifold.

To facilitate its replacement it is preferable to remove the manifolds.

PURPOSE OF THE EGR SYSTEM

Exhaust gas recirculation is used to reduce the nitrogen oxide (NOx) content of the exhaust gases.

The passage of gas is authorised by the control of an electromagnetic valve by the injection computer.

OPERATING PRINCIPLE

The valve is controlled by Opening Cyclic Ratio (RCO) signal issued by the injection computer. The **RCO signal** permits modulation of the opening of the valve, and consequently, the quantity of exhaust gas directed back towards the inlet manifold.

The computer continuously carries out a test to detect the position of the **EGR** valve flap.

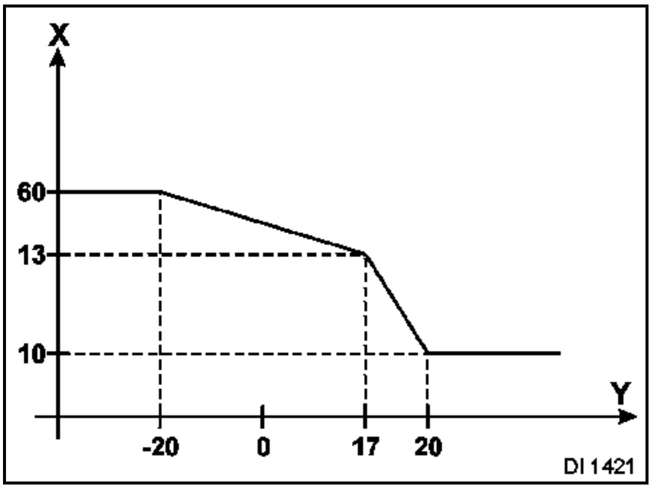
OPERATING CONDITIONS

The parameters which determine the activation of the **EGR** solenoid valve are as follows:
– the coolant temperature,
– the air temperature,
– the atmospheric pressure,
– the accelerator pedal position,
– the engine speed.

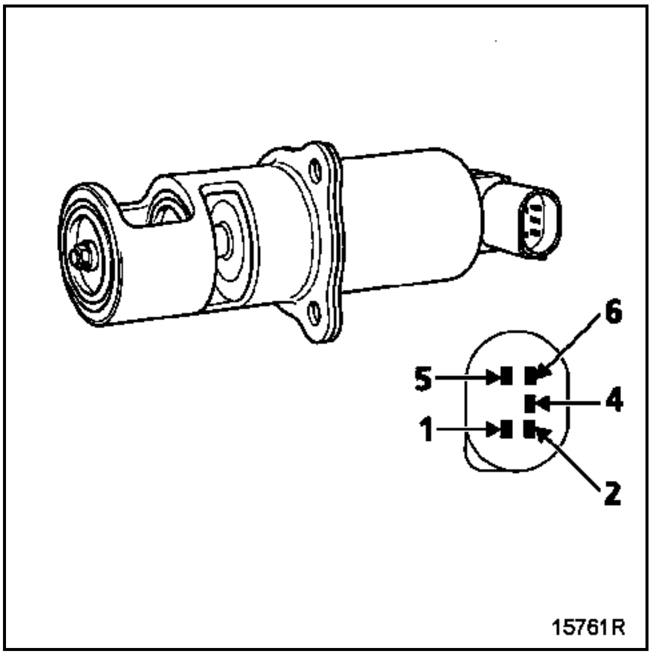
EGR function is disabled if:
– the battery voltage is less than **9 volts**,
– the engine speed is below **700 rpm,**
– a characteristics map (engine speed/load) exceeds a given threshold,
– the vehicle speed is less than **7 mph (12 km/h)**, the engine speed is less than **1000 rpm**and if the coolant temperature is greater than **60 ˚C** for **40 seconds.**

The **EGR** valve is not supplied after engine start according to a coolant temperature characteristics map.

X Time
Y Coolant temperature (˚C)



In case of faults in:
– the air flow meter
– the EGR valve,
– the turbocharging pressure sensor,
– the turbocharger control solenoid valve,
the supply to the EGR solenoid is cut.



1 Solenoid supply
2 Sensor supply
4 Sensor earth
5 Solenoid earth
6 Sensor output

OPERATION - FAULT FINDING

These vehicles are equipped with alternators with internal ventilation and integral regulator. There is also a warning light on the instrument panel which has the following functions:
– the warning light illuminates when the ignition is switched on,
– the light extinguishes when the engine starts,
– if the warning light illuminates while the engine is running it shows there is a "**charging**" fault.

LOOKING FOR FAULTS

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

Check:
– that all electrical connections are good;
– whether the bulb is blown (to find out, connect the circuit to earth; 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,
– damage inside the alternator (rotor, stator, diodes or brushes),
– a regulator fault,
– an overvoltage.

The customer complains of a charging fault but 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 wire which has been cut,
– charred 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 power consumers as possible; the regulated voltage should be between **13.5 V** and **14.8 V.**

IMPORTANT: the battery and regulator must be disconnected when arc welding work is carried out on the vehicle.

IDENTIFICATION

ENGINE	ALTERNATOR	CURRENT
K4M/F4P	Valéo SG 10 B015 Valéo SG 10 B016	120 A
	Valéo SG 12 B050 Valéo SG 12 B053 Valéo SG 12 B055	125 A
F9Q	Valéo SG 12 B017	125 A
L7X	Valéo SG 12 B019	120 A

CHECKING

After **15 minutes** warming up with a voltage of **13.5 volts**.

Engine rpm	120 amps	125 amps
800	**17**	**64**
2000	**50**	**81**
4000	**109**	**118**
6000	**121**	**123**

FAULT FINDING

Diagnostic tools make it possible to check the alternator by measuring the voltage and the output current, with or without electrical power consumers.

NOTE: the workstation's ampermetric clamp is of the inductive type (measurement range: **0** to **1,000 A**). It is placed in position without disconnecting the battery, which allows **computer memories and adjustment programs to be saved.**

Fit the ampermetric clamp directly to the alternator output, with the arrow on the clamp pointing towards the alternator (the station will detect an incorrect position).

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

On completion of the test, the values found will lead to the following diagnostic messages, where appropriate:
- battery voltage, no load < **12.3 V** = battery discharged.

Without consumers:
- regulated voltage > **14.8 V** ⇒ regulator faulty,
- (regulated voltage, no load < **13.2 V**) or (charging current < **2A**) ⇒ charging fault.

With consumers:
- regulated voltage > **14.8 V** ⇒ regulator faulty,
- regulated voltage < **12.7 V** ⇒ it is necessary to check the alternator output against its specification:

Engine / **Current (amps)**	**K4M/F4P**	**F9Q**	**L7X**
Minimum current the alternator must supply with all power consumers switched on (3000 rpm)	80	80	80

Fault finding (continued)

If the measured output is too low, check:
- alternator wear (brushes, etc.),
- battery connections,
- engine earth strap,
- conformity of the alternator,
- belt tension.

If the measured output is correct but the regulated voltage is too low, the alternator is not faulty.

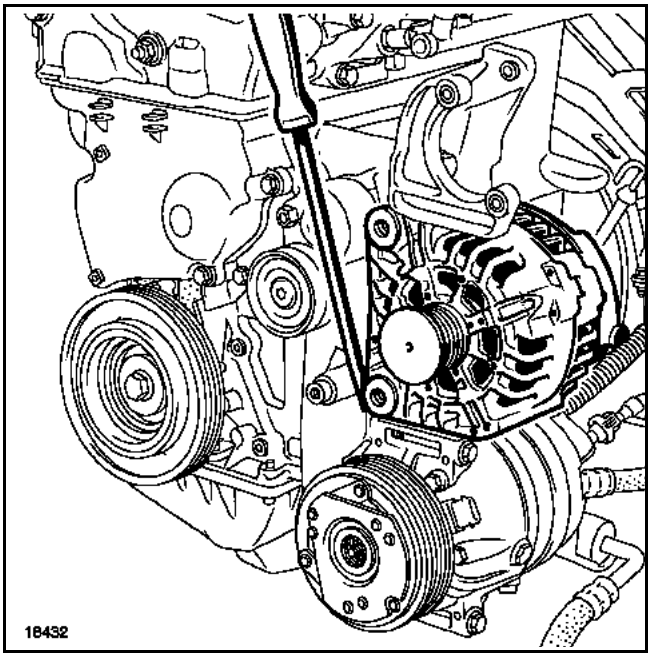
The cause of the problem is to be attributed to one of the following sources:
- the vehicle has too many electrical power consumers,
- the battery is discharged.

REMOVAL

Put the vehicle on a 2 post lift.

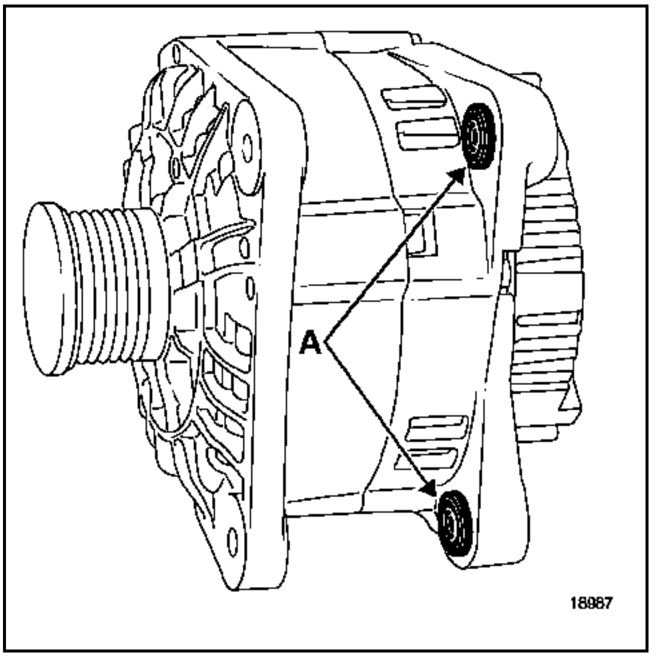
Disconnect the battery as well as all electrical connections on the alternator.

Remove:
– the right-hand front wheel arch liner and side protector
– the accessories belt (see section **07 "Accessories belt tension"**),
– the pulley,
– the alternator mounting bolts, then remove it using a screwdriver.



REFITTING

To facilitate fitting the alternator, compress the rings (A) using a pair of pliers or a vice.



See section **07 "Accessories belt tension"** for the tensioning procedure.

REMOVAL

Put the vehicle on a 2 post lift.

Disconnect the battery.

Remove the engine undertray.

Disconnect the electrical connections to the alternator.

Remove:
- the accessories belt (see section **07 "Accessories belt tension"**),
- the power steering pump pulley,
- the compressor bolts and move it out of the way,
- the alternator.

REFITTING

Proceed in the reverse order from removal.

See section **07 "Accessories belt tension"** for the tensioning procedure.

IDENTIFICATION

ENGINE	STARTER
K4M/F4P	Bosch. 000106017 Bosch. 000106022
F9Q	Valéo D7R44 Valéo D7R47 Valéo D7R49
L7X	Valéo D6RA107

Removal and refitting of the starter does not pose any special problems. It is carried out with the air resonator unit removed.

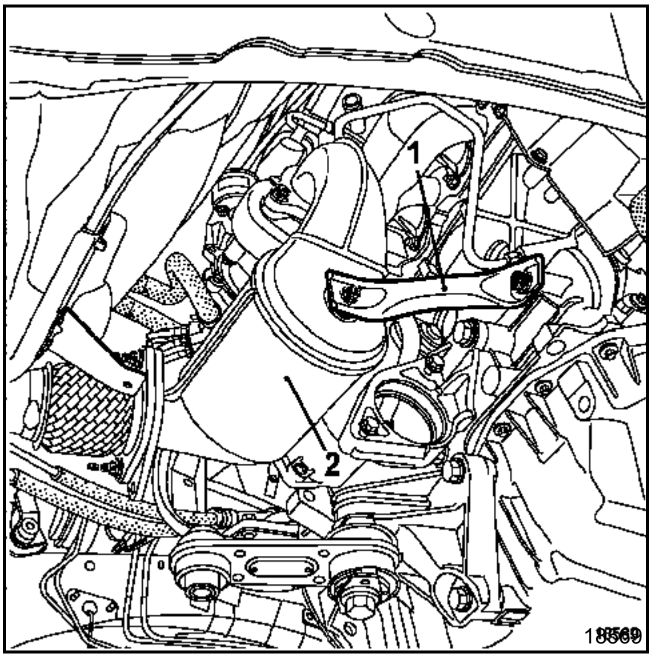
Check for the presence of the centring dowel when refitting.

REMOVAL

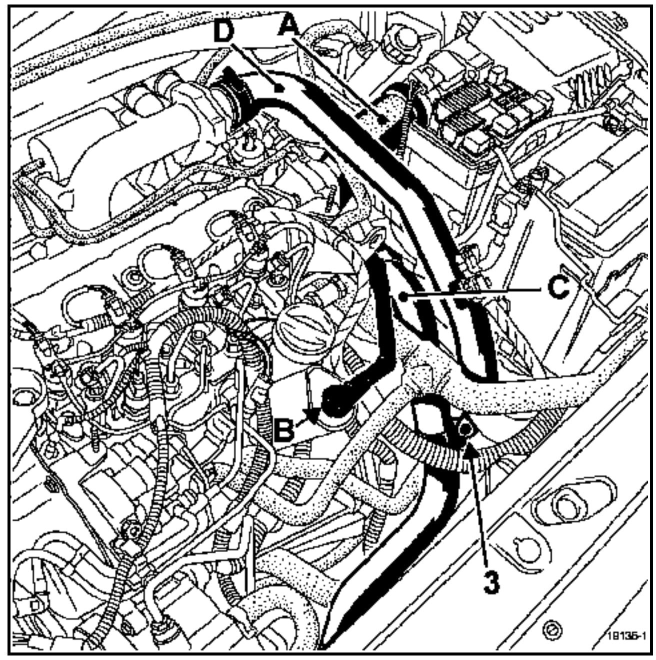
Put the vehicle on a 2 post lift.

Disconnect the battery.

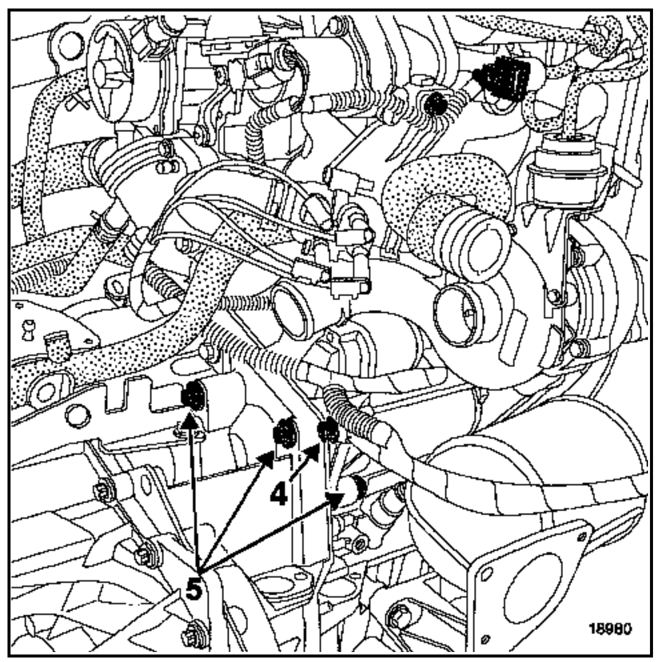
Remove:
– the engine cover,
– the engine undertray,
– the catalytic converter stay (1), then the catalytic converter (2),



– the starter electrical connections,
– the air pipe (A) by disconnecting the hose (B) on the oil vapour rebreathing pipe canister,
– the mounting (3),
– the air hoses (C) and (D) on the turbocharger and the inlet manifold respectively, then move them out of the way,



– the earth strap (4),
– the starter mountings (5),
– the starter motor,



REFITTING

Proceed in the reverse order from removal.

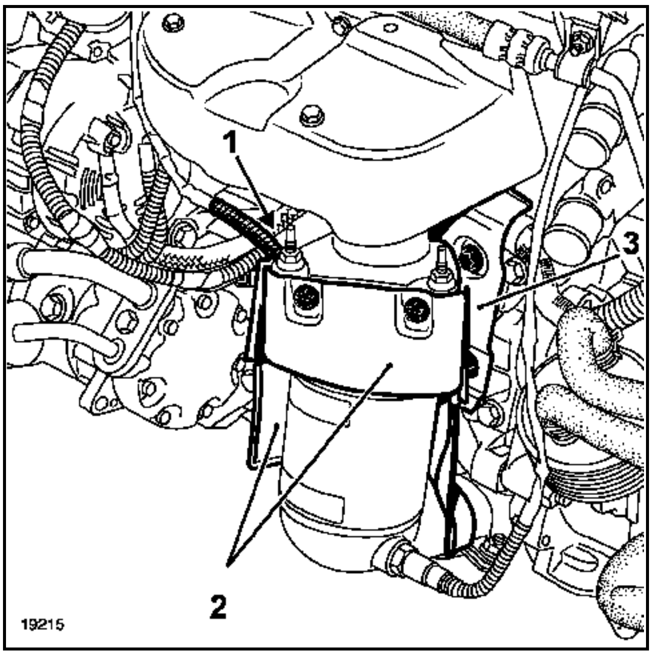
Check for the presence of the centring dowel when refitting.

REMOVAL

Put the vehicle on a 2 post lift.

Disconnect the battery.

Remove:
– the engine cover,
– the engine undertray,
– the oxygen sensor connector (1), then remove it using tool **Mot. 1495**,
– the heat shields (2) then (3),



– the oil filter,
– the starter motor.

REFITTING

Check for the presence of the two centring dowels.

Proceed in the reverse order from removal.

Check the oil level.

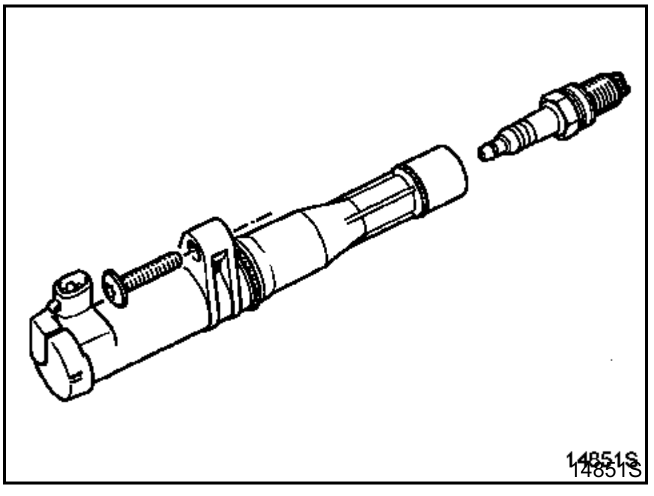
TIGHTENING TORQUES (in daNm)	
Ignition coil screws	**1.5**
Spark plugs	**2.5 to 3**

DESCRIPTION

Static ignition is a system which increases the amount of power available to the spark plugs by eliminating all intermediaries between the spark plug and the coil.

The system also makes it possible to eliminate all moving components from the ignition.

The power module is incorporated in the injection computer. The ignition therefore uses the same sensors as the injection.



There are four ignition coils and each is mounted directly on the plug by means of a screw on the cylinder head cover.

The coils are fed in series in pairs (twin static ignition) via the C H2 and C H3 tracks of the injection computer:
– track C H2 for cylinders 1 and 4,
– track C H3 for cylinders 2 and 3.

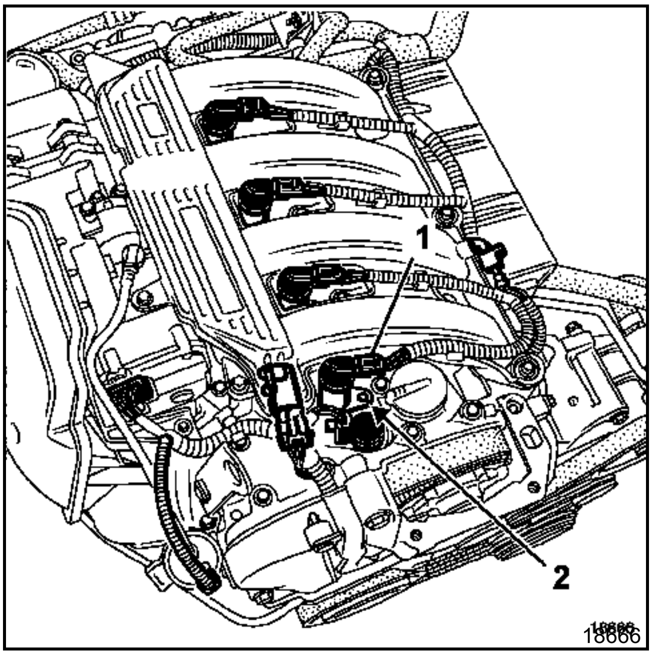
REMOVING A COIL

Disconnect the battery.

Disconnect the ignition coils.

IMPORTANT: be careful not to damage the connectors (1); if they are damaged, be sure to replace them.

Remove the coil mounting screws (2).



REFITTING

Refitting is the reverse of removal. If necessary, replace the coil O-rings.

TIGHTENING TORQUES (in daNm)	
Ignition coil screws	**1.5**
Spark plugs	**2.5 to 3**

DESCRIPTION

Static ignition is a system which increases the amount of power available to the spark plugs by eliminating all intermediaries between the spark plug and the coil.

The system also makes it possible to eliminate all moving components from the ignition.

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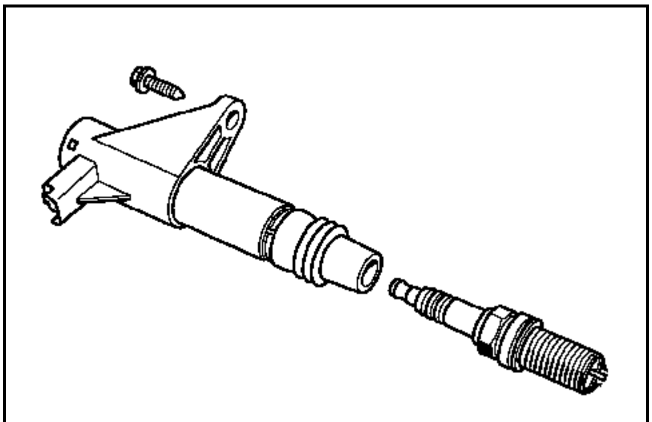


19321

There are six ignition coils and each is mounted directly on the plug by means of a screw on the cylinder head cover.

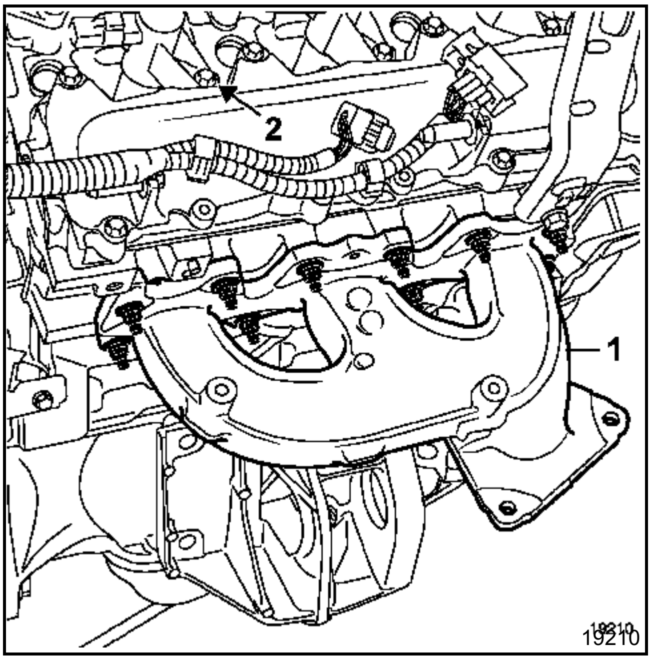
The firing order is: 1-6-3-5-2-4
The coils are fed in series one at a time by tracks A H2, A H3, A H4, A G2, A G3 and A G4 of the injection computer:
– track A H2 for cylinder 1,
– track A H3 for cylinder 3,
– track A H4 for cylinder 2,
– track A G2 for cylinder 6,
– track A G3 for cylinder 5,
– track A G4 for cylinder 4,

REMOVING A COIL

Disconnect the battery.

To remove the coils from the rear cylinders, it is necessary to remove the inlet manifold (see **section 12 FUEL MIXTURE "Inlet manifold"**).

Disconnect the ignition coils and remove the coil mounting screws (2).



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REFITTING

Refitting is the reverse of removal. If necessary, replace the coil O-rings.

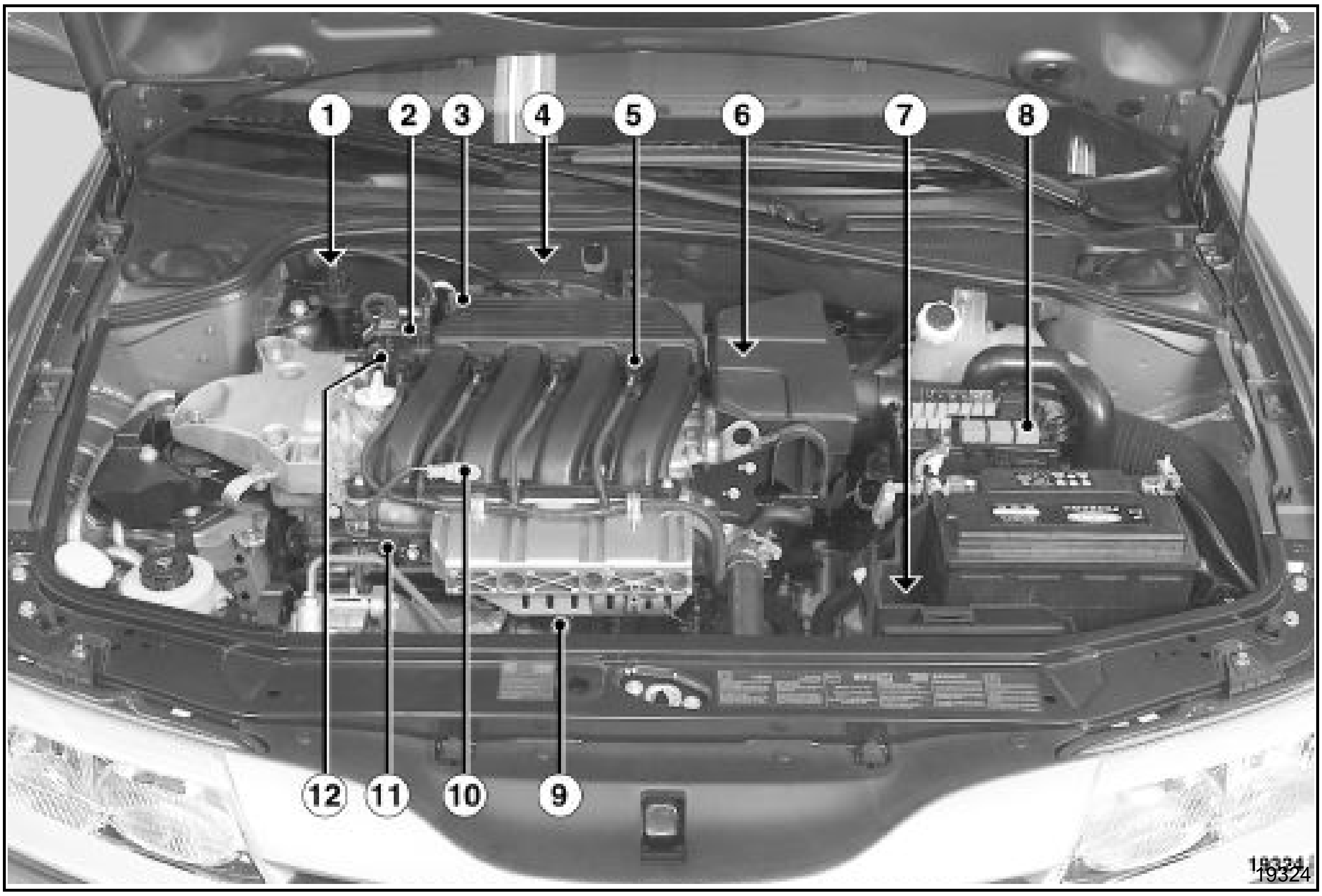
To remove the spark plugs, it is necessary to remove the ignition coils (see **section 17 Ignition "Static ignition"**).

To remove the spark plugs, use the plug spanner: **Elé. 1382**.

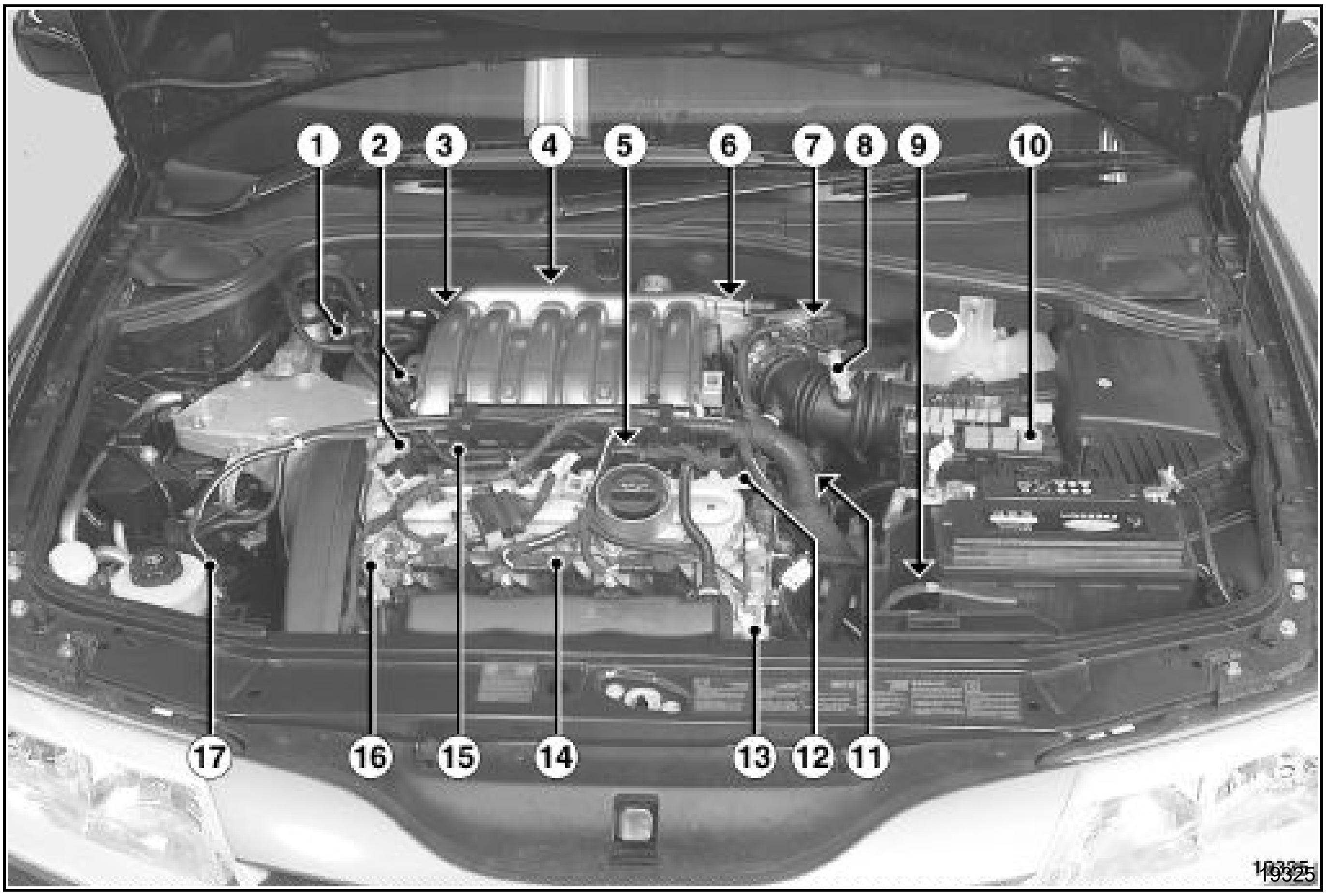
Engine	Make	Type
K4M	EYQUEM	RFC 50 LZ 2E
Flat skirt with seal		
Gap: **0.9 mm**		
Tightening torque: **2.5 to 3 daNm**		

Engine	Make	Type
F4P	CHAMPION	RFC 87 YCL
Flat skirt with seal		
Gap: **0.9 mm**		
Tightening torque: **2.5 to 3 daNm**		

Engine	Make	Type
L7X	BOSCH	FGR 8M QPE
Flat skirt with seal		
Gap: **1 mm**		
Tightening torque: **2.5 to 3 daNm**		

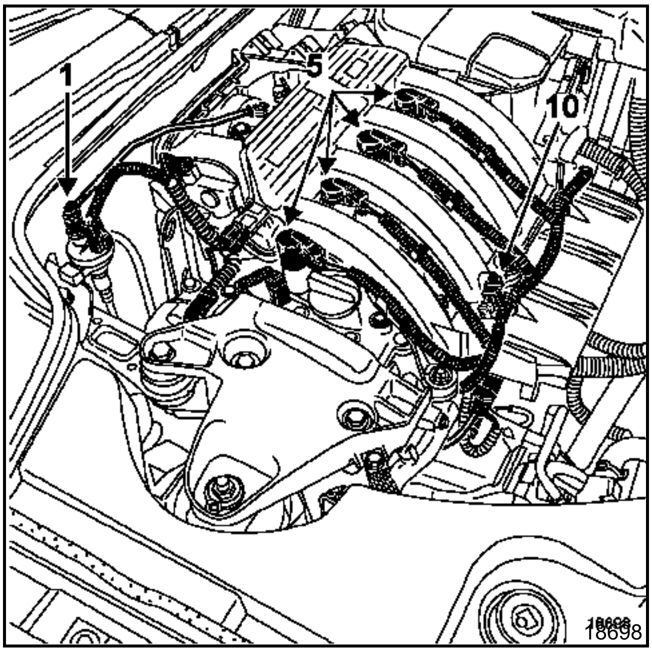


1 Fuel vapour recycling solenoid valve
2 Manifold pressure sensor
3 Motorised throttle body
4 Upstream oxygen sensor
5 Ignition coils
6 Coolant temperature sensor and TDC sensor
7 Injection computer
8 Injection relay
9 Pinking sensor
10 Air temperature sensor
11 Injector rail
12 Camshaft dephaser solenoid valve (F4P only)

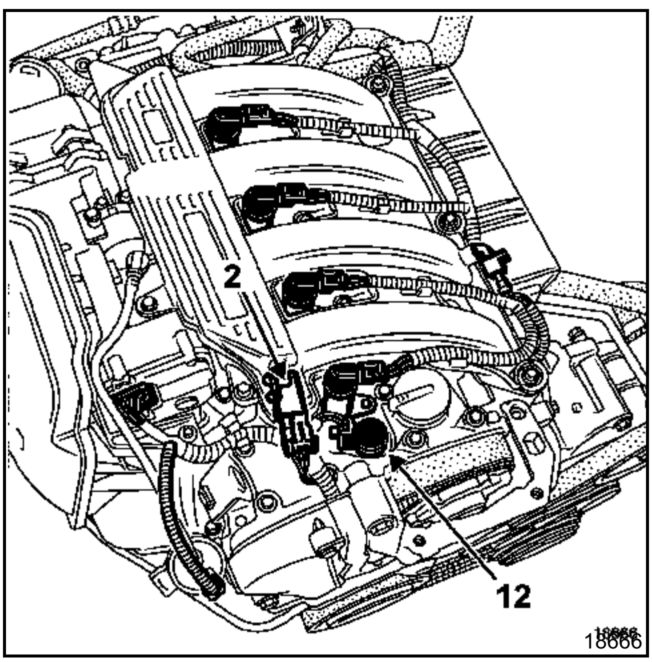


1 Pulse damper
2 Camshaft dephaser solenoid valve (x2)
3 Upstream oxygen sensor (rear cylinders)
4 Manifold pressure sensor
5 Pinking sensor (x2)
6 Downstream oxygen sensor (rear cylinders)
7 Motorised throttle body
8 Air temperature sensor
9 Injection computer
10 Injection relay
11 Coolant temperature sensor and TDC sensor
12 Camshaft sensor (x2)
13 Downstream oxygen sensor (front cylinders)
14 Ignition coils
15 Injector rail
16 Upstream oxygen sensor (rear cylinders)
17 Fuel vapour recycling solenoid valve

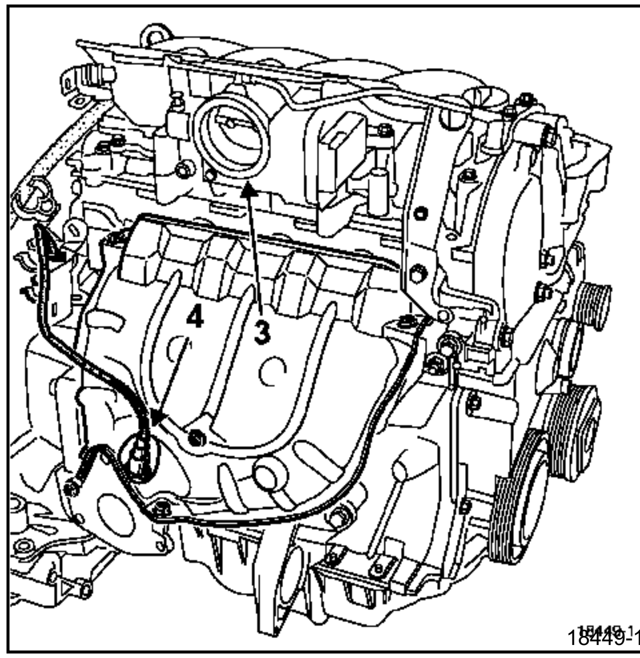
1 Fuel vapour recycling solenoid valve
5 Ignition coils
10 Air temperature sensor



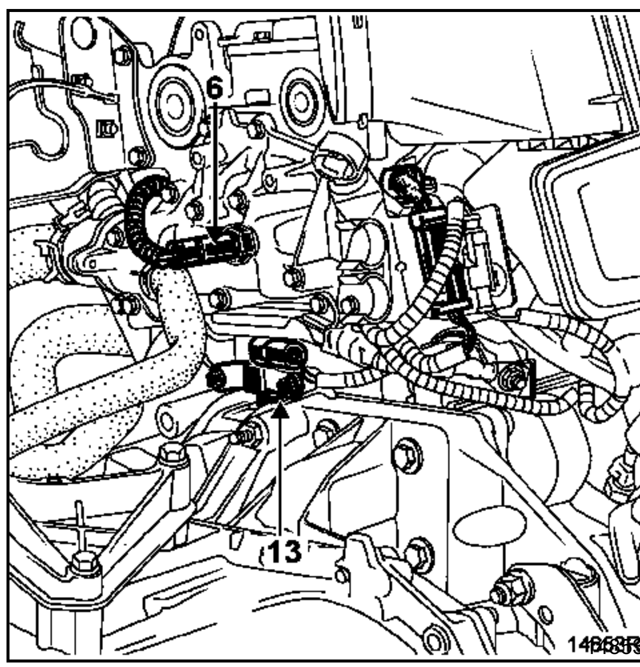
2 Manifold pressure sensor
12 Camshaft dephaser solenoid valve (F4P only)



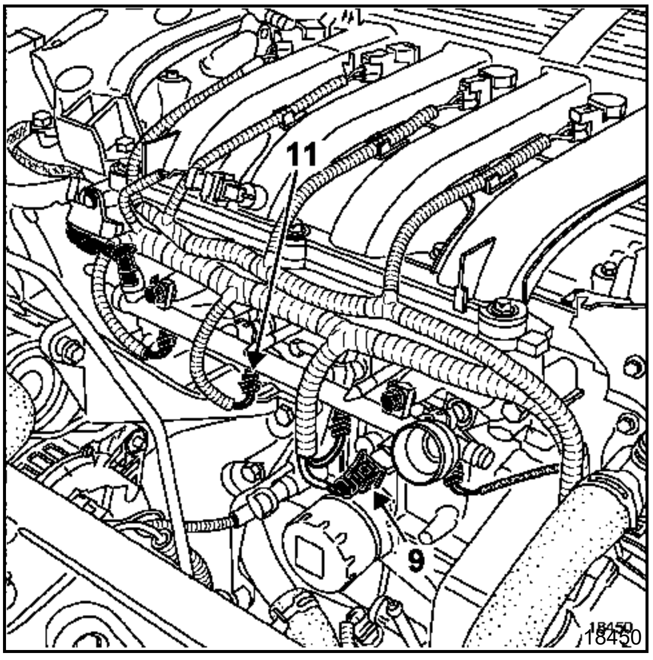
3 Motorised throttle body
4 Upstream oxygen sensor



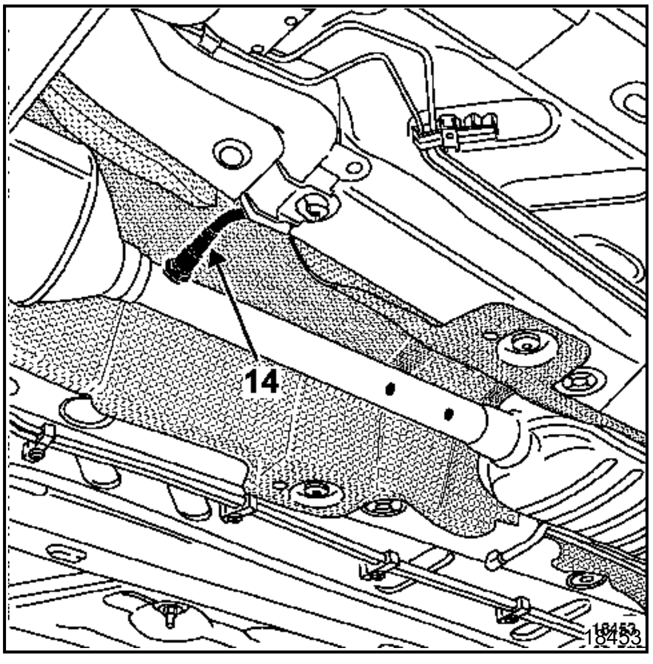
6 Coolant temperature sensor
13 TDC sensor



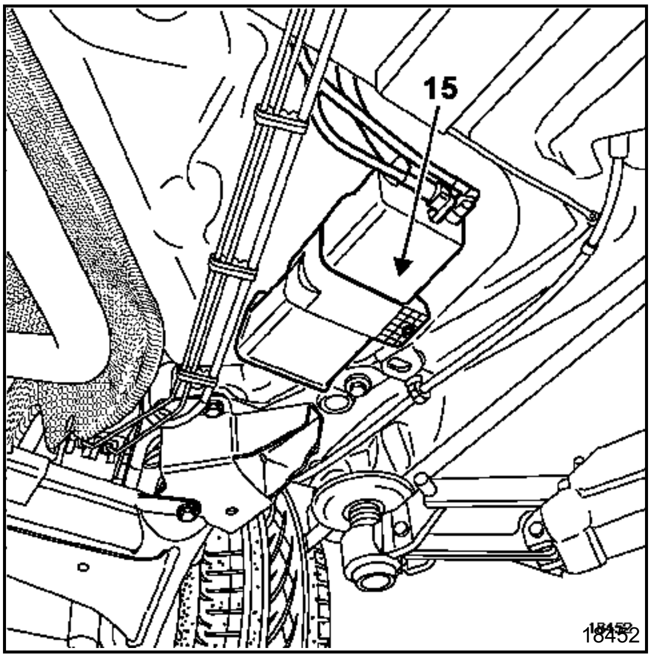
9 Pinking sensor
11 Injector rail



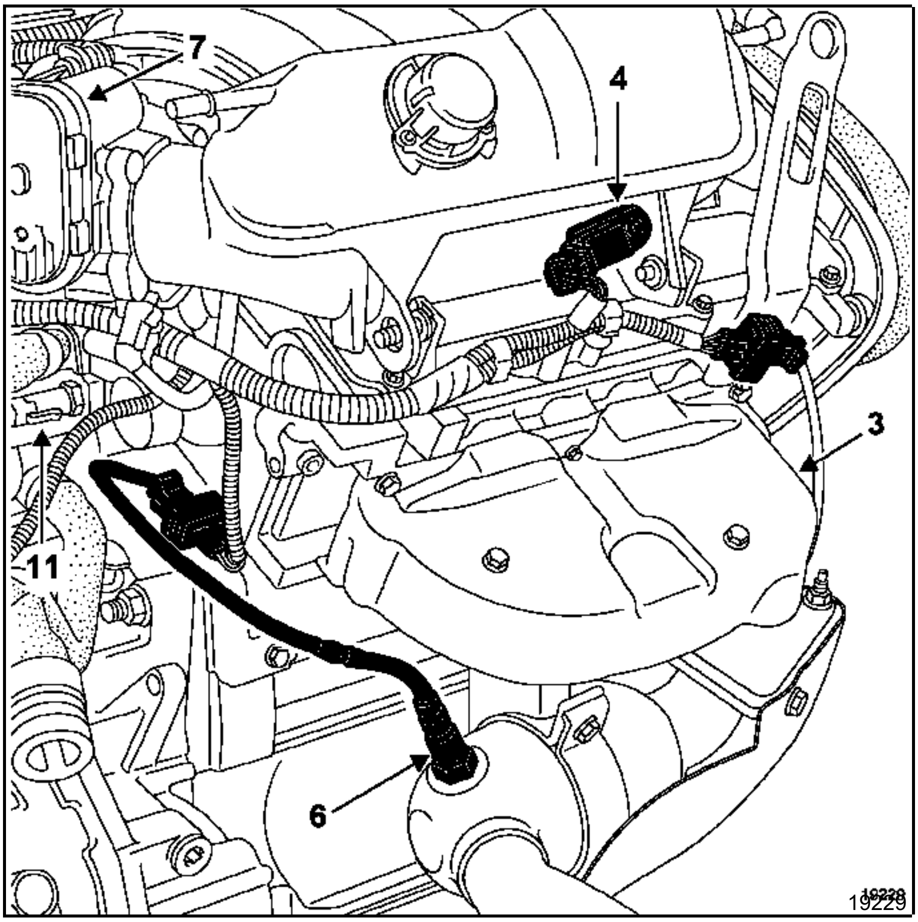
14 Downstream oxygen sensor



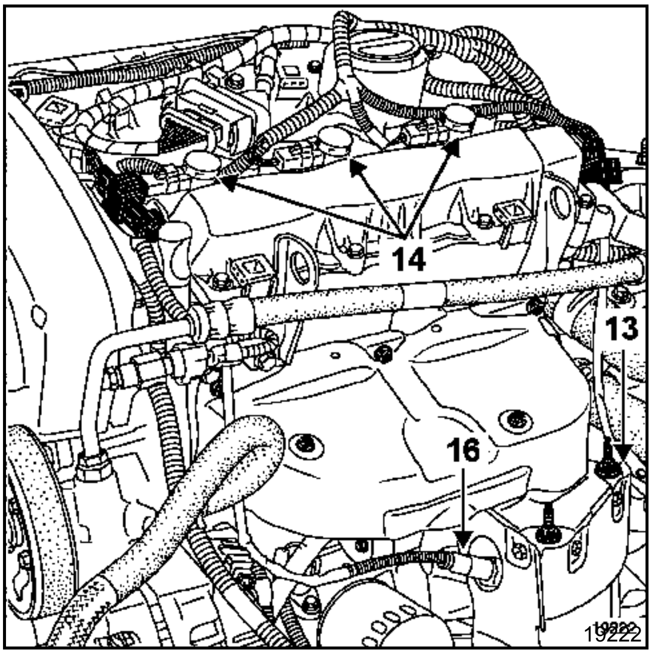
15 Canister



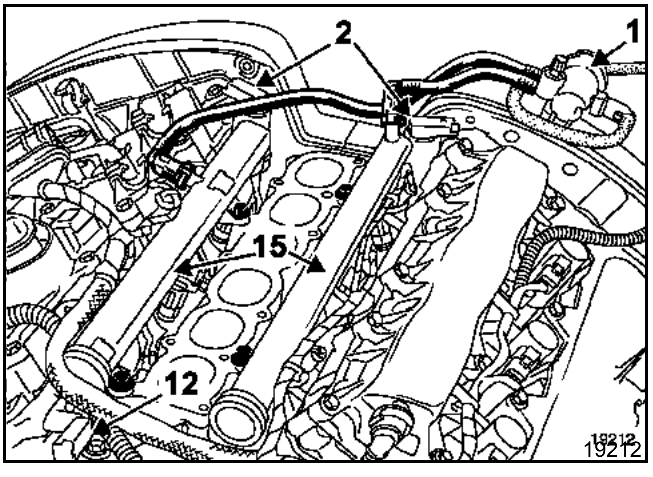
3 Upstream oxygen sensor (rear cylinders)
4 Manifold pressure sensor
6 Downstream oxygen sensor (rear cylinders)
7 Motorised throttle body
11 Coolant temperature sensor



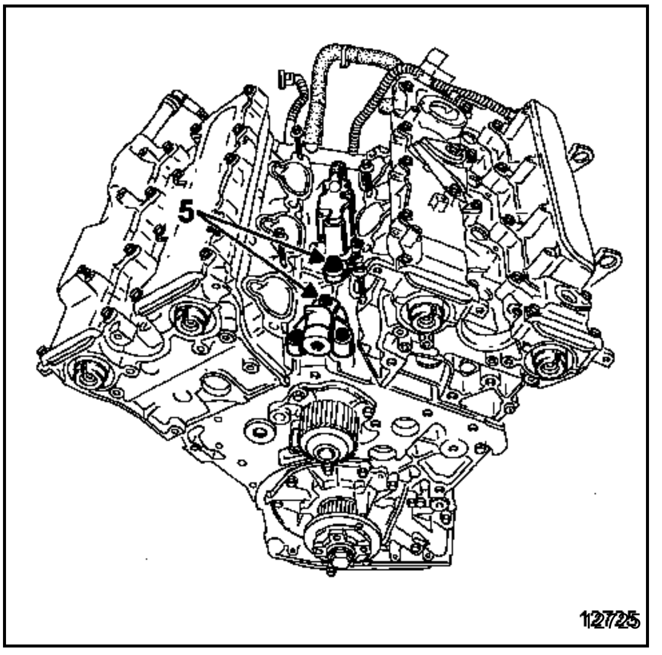
13 Downstream oxygen sensor (front cylinders)
14 Ignition coils
16 Upstream oxygen sensor (front cylinders)



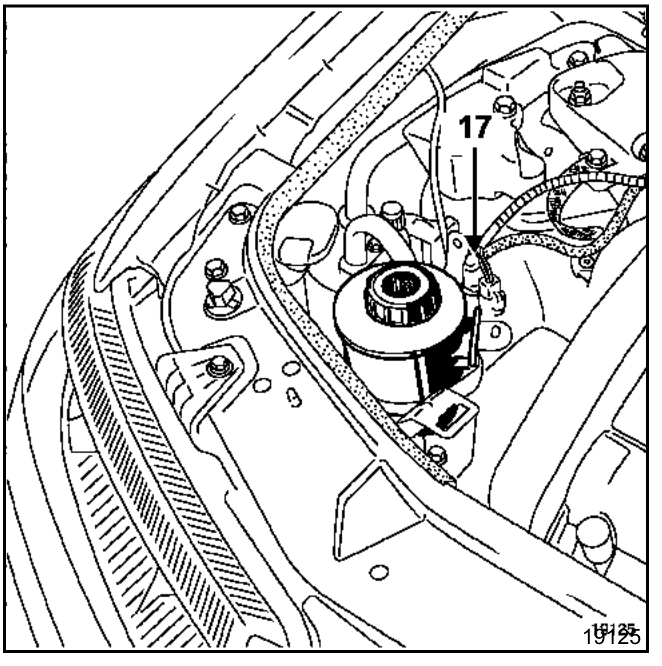
2 Camshaft dephaser solenoid valve (x2)
12 Camshaft sensor (x2)
15 Injector rail
1 Pulse damper



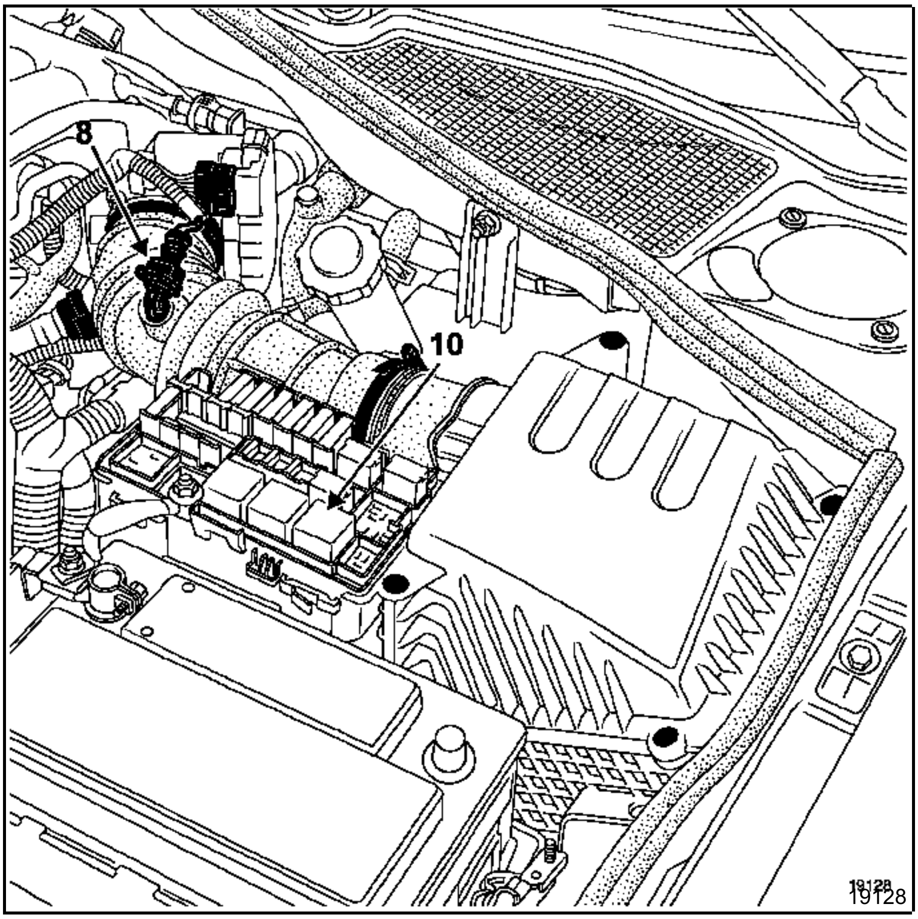
5 Pinking sensor



17 Fuel vapour recycling solenoid valve



8 Air temperature sensor
10 Injection relay



GENERAL INFORMATION

The accelerator pedal potentiometer is incorporated in the accelerator pedal. Its replacement therefore requires replacement of the accelerator pedal.

There are two types of pedal: **with or without point of resistance.**

Cars equipped with cruise control/speed limiter have an accelerator pedal with a point of resistance at the end of their travel (kickdown)

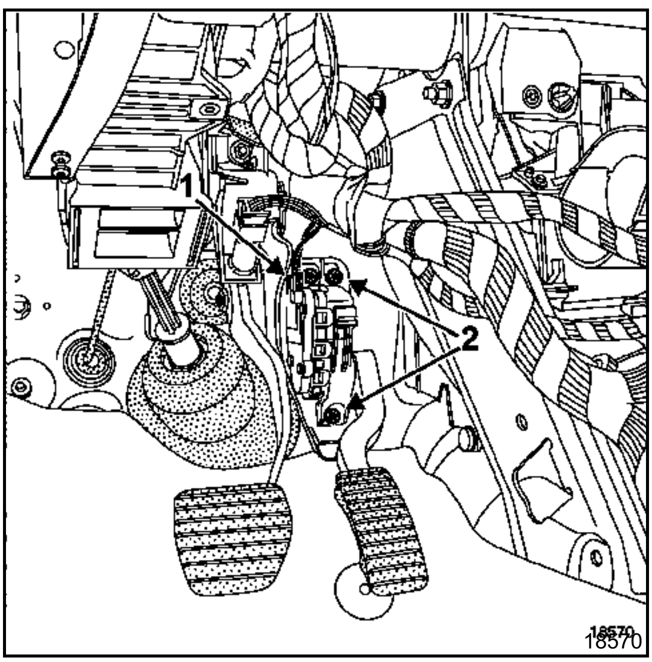
This point of resistance makes it possible to quit the speed limiter function if the driver has to increase his speed.

IMPORTANT: it is possible to fit a pedal with a point of resistance in place of a pedal without a point of resistance. But fitting a pedal without a point of resistance in place of a pedal with a point of resistance is forbidden.

REMOVAL

Disconnect:
– the battery,
– the accelerator pedal connector (1).

Remove:
– the three pedal mounting screws (2),
– the pedal.

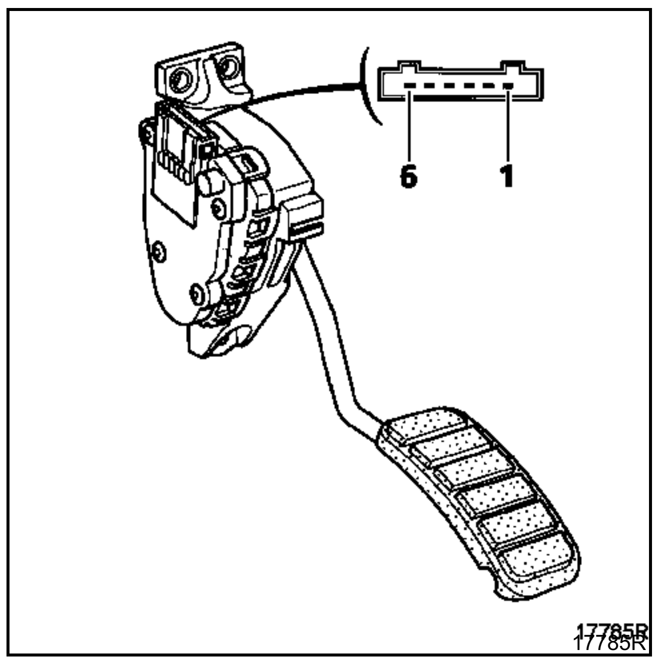


REFITTING

Refitting is the reverse of removal.

Allocation of tracks:

1 Track 2 earth
2 Track 1 earth
3 Track 1 signal
4 Track 1 feed
5 Track 2 feed
6 Track 2 signal



NOTE: a fault on the accelerator position potentiometer causes changes in the idle speed or engine operation (see **section 17 "Idle speed correction"**).

ESSENTIAL SPECIAL TOOLS	
Mot. 1372	**Tamperproof screw extractor**

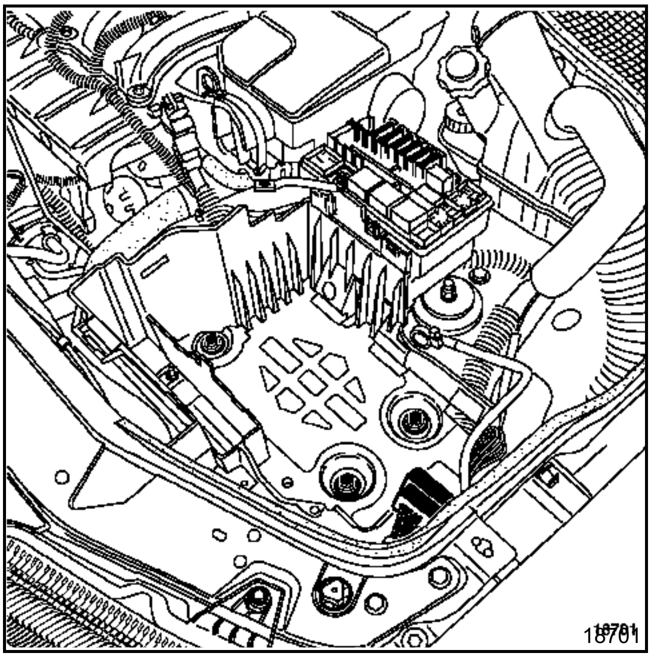
GENERAL

The injection computer is located under the battery tray. To remove it, it is necessary to remove the battery tray, which is held in place by three tamperproof screws.

REMOVAL

Disconnect and remove the battery.

Unclip the relay unit from the battery tray and move it out of the way.



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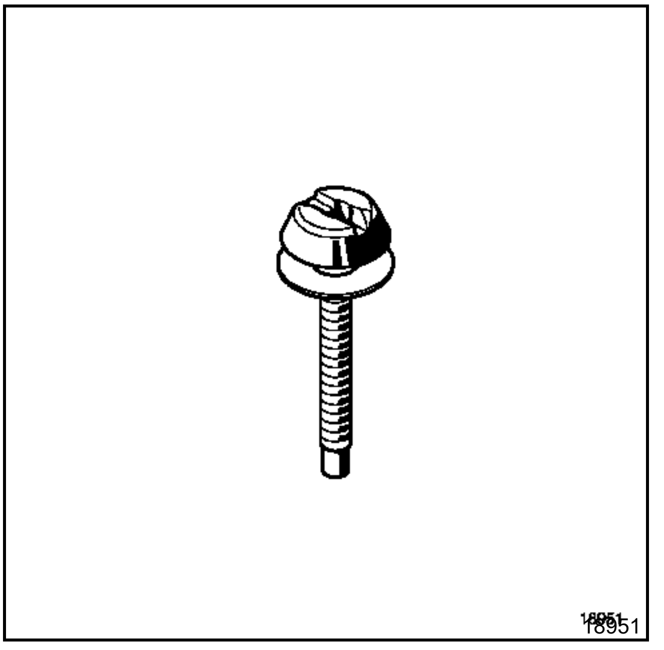
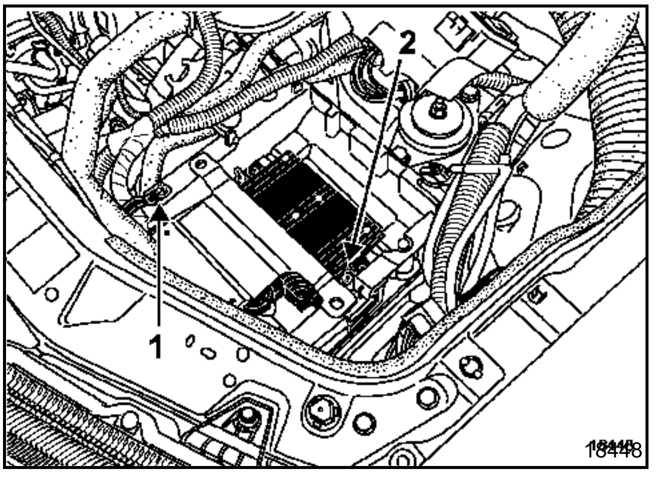
Drill a ∅ **5 mm** hole in the centre of each of the three tamperproof screws.



18951

Remove:
– the three battery tray mounting screws, using tool **Mot. 1372**,
– the battery tray.

Remove:
– the electric wiring retaining strap (1),
– the computer mounting nuts (2),
– the computer and disconnect it.



REFITTING

Refitting is the reverse of removal.

Replace the tamperproof screws with new ones.

Program the immobiliser code following the procedure described in **section 82 "Immobiliser"**.

When the ignition is switched on, the throttle unit should go through a cycle of programming for its minimum and maximum positions.

Use the diagnostic tool to check that the programming has been carried out correctly.

If the programming has not been carried out, refer to **section 17 "Throttle body" fault finding.**

SPECIAL FEATURES OF THE SAGEM "S2000" MULTIPOINT INJECTION

- SAGEM "S2000" type 112-track computer controlling the injection and the ignition.

- Multipoint injection operating in sequential mode without camshaft position sensor. This means that phasing is carried out by software using the TDC sensor.

- Injection warning light on the instrument panel. Installation of a special injection warning light (**OBD** "**O**n **B**oard **D**iagnostic" warning light). Its presence is due to the fact that the **OBD** "**O**n **B**oard **D**iagnostic" fault finding system is fitted.

- Special precautions relating to the engine immobiliser:
  Installation of a 3rd generation type immobiliser which requires a special method for replacing the computer.

- Fuel circuit without return to the tank (the pressure regulator is located on the pump/sender unit).

- Idle speed:
  – nominal idle speed, **750 rpm**
  – idle speed with automatic transmission operation **750 rpm**
  Idle speed adjusted according to:
  – air conditioning,
  – power steering pressostat,
  – battery voltage,
  – electric heated windscreen.
- Maximum engine speeds:
  When the coolant temperature is lower than **75°C** for the F4P or **60°C** for the K4M or for not more than **10 seconds**, the engine cutoff speed is **5800 rpm**, which is the cutoff speed to protect a "cold" engine.

  Once the engine is warm, the cutoff returns to its normal value:
  – in 1st and 2nd gears (depending on SRBCI) **6500 rpm for K4M and 6300 rpm for F4P**
  – in 3rd, 4th and 5th gears **6500 rpm for K4M and 6300 rpm for F4P**

- Canister drain solenoid valve controlled by **O**pening **C**yclic **R**atio (**RCO signal**) depending on engine speed and manifold pressure.

- The fan unit and the coolant temperature warning light on the instrument panel are controlled by the injection computer (GCTE = Central Coolant Temperature Management).

- Automatic configuration for the operation of the cruise control/speed limiter and for air conditioning operation.

- Air conditioning compressor clutch controlled by the injection computer.

- Use of two oxygen sensors located upstream and downstream of the catalytic converter.

- Camshaft dephaser controlled by a solenoid valve controlled by the computer (F4P only).

- Motorised throttle body to regulate the airflow and the idle speed.

SPECIAL FEATURES OF THE BOSCH MULTIPOINT INJECTION

- BOSCH ME7.4.6 128-track computer.

- Sequential multipoint injection controls the injectors one at a time in firing order (1-6-3-5-2-4).

- Static ignition with six pencil coils.

- Injection warning light on the instrument panel.

- Installation of a specific injection warning light (**OBD light**"**O**n **B**oard **D**iagnostic") which is illuminated for three seconds after the engine is started. Its presence is due to the fact that the **OBD** "**O**n **B**oard **D**iagnostic" fault finding system is fitted.

- Special precautions relating to the engine immobiliser:
  Installation of a 3rd generation type immobiliser which requires a special method for replacing the computer.

- Fuel circuit without return to the tank (the pressure regulator is located on the pump/sender unit).

- Idle speed:
  – nominal idle speed **650 rpm**

- Idle speed adjusted in line with:
  – air conditioning,
  – power steering pressostat,
  – battery voltage,

- Maximum engine speed: **6500 rpm**

- Canister drain solenoid valve controlled by **O**pening **C**yclic **R**atio (**RCO signal**) depending on engine operation.

- The fan unit and the coolant temperature warning light on the instrument panel are controlled by the injection computer (GCTE = Central Coolant Temperature Management).

- Automatic configuration for the operation of the cruise control/speed limiter and for air conditioning operation.

- Air conditioning compressor clutch controlled by the injection computer.

- Use of four oxygen sensors located upstream and downstream of the pre-catalytic converter.

- Inlet camshaft dephasers controlled by two solenoid valves managed by the computer according to engine speed and engine load.

This car is fitted with a 3rd generation immobiliser system, which requires a special method for replacing the computer.

REPLACING AN INJECTION COMPUTER'

See **section 17 injection "Computer"** for the method of removing and refitting the computer.

See **section 82 "Immobiliser"** for the method of programming the immobiliser code.

IMPORTANT:

With this engine immobiliser system, the computer keeps its immobiliser code for life.

In addition, this system does not have a security code.

Consequently, it is forbidden to perform tests with computers borrowed from the stores or from another car which must then be returned.

It will no longer be possible to decode them.

THE COMPRESSOR IS OF VARIABLE DISPLACEMENT TYPE

AIR CONDITIONING / INJECTION COMPUTER LINK

The injection computer controls the compressor clutch, taking into account the power absorbed by the compressor and the pressure of the refrigerant fluid in the system.

The data used for the air conditioning function is exchanged via the multiplex network:
- track A A3 multiplex link CAN L (passenger compartment),
- track A A4 multiplex link CAN H (passenger compartment),

When the air conditioning is switched on, the air conditioning control panel requests authorization to engage the compressor clutch. The injection computer either authorizes or blocks engagement of the compressor clutch, controls the fan unit and orders fast idle speed. This engine speed is **896 rpm** for the F4P and **848 rpm** for the K4M.

IMPORTANT: the refrigerant fluid pressure and power consumption values are never 0, whether the compressor is engaged or not.

COMPRESSOR OPERATION PROGRAMMING

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

Engine start programming

The compressor is prevented from functioning for **10 seconds** after the engine is started.

Performance return programming for a period of **5 seconds**

Input conditions
- Throttle fully open
- And engine speed less than **3800 rpm.**
- In **2nd gear or higher**.

Output conditions
- Throttle not fully open
- Or timed period of **5 seconds** expired
- Or engine speed greater than or equal to **3800**

Maximum engine speed protection programming
The compressor clutch is disengaged if the engine speed is above **6016 rpm** for the F4P or **6500 rpm** for the K4M.

Thermal protection programming
The compressor clutch is not engaged if the coolant temperature is above **115°C** for the F4P or **119°C** for the K4M at high engine speed and heavy load.

THE COMPRESSOR IS OF VARIABLE DISPLACEMENT TYPE

AIR CONDITIONING / INJECTION COMPUTER LINK

The injection computer controls the compressor clutch, taking into account the power absorbed by the compressor and the pressure of the refrigerant fluid in the system.

The data used for the air conditioning function is exchanged via the multiplex network:
- track B H3 multiplex link CAN H (passenger compartment),
- track B H4 multiplex link CAN L (passenger compartment).

When the air conditioning is switched on, the air conditioning control panel requests authorization to engage the compressor clutch. The injection computer either authorizes or blocks engagement of the compressor clutch, controls the fan unit and orders fast idle speed. This engine speed is **700 rpm**.

IMPORTANT: the refrigerant fluid pressure and power consumption values are never 0, whether the compressor is engaged or not.

COMPRESSOR OPERATION PROGRAMMING

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

Engine start programming
The compressor is prevented from operating for **20 seconds** after the engine has started.

Thermal protection programming
The compressor does not engage if the coolant temperature is above **+ 115°C**.

MOTORISED THROTTLE BODY

The motorised throttle body carries out idle speed regulation and engine air intake modulation functions. It is composed of an electric motor and two throttle position potentiometers.

When the engine is idling, the throttle position is adjusted according to the idle speed setting. This setting takes into account the major power consumers (air conditioning) and operating conditions (air temperature and coolant temperature).

When the driver presses the accelerator pedal, his request is translated as the angle of the throttle opening. However, to improve driving pleasure, the throttle opening is not directly proportional to the driver's request.

To eliminate misfires, facilitate gear changes and safety functions, the throttle body modulates the engine torque.

MOTORISED THROTTLE BODY DEFECT MODES

The motorised throttle body has three types of defect mode.

- **Reduced Performance Mode:** this mode covers electrical faults for which there is a viable backup solution for the injection system (loss of one of the two tracks on the pedal or the throttle body).
  This mode results in reduced acceleration and limits the maximum opening of the throttle.

- **Driver Override Mode:** this mode is also called "**Electrical Limp-Home**". This mode is applied when the accelerator pedal signal disappears completely, but the injection computer still controls the intake of air to the engine (automatic throttle control is still operational).
  In this mode, the injection computer imposes a set engine speed for each gear ratio and imposes the idle speed when the brake pedal is pressed.

- **Mechanical Limp-home Mode:** this mode covers breakdowns which result in loss of the automatic throttle control (the throttle can no longer be controlled).
  In this case the throttle is in the mechanical rest position and the injection computer limits the engine speed by cutting off the injection.

NOTE: Each of these modes results in illumination of the injection fault warning light on the instrument panel.

MOTORISED THROTTLE BODY

The motorised throttle body carries out idle speed regulation and engine air intake modulation functions. It is composed of an electric motor and two throttle position potentiometers.

When the engine is idling, the throttle position is adjusted according to the idle speed setting. This setting takes into account the major power consumers (air conditioning) and the operating conditions (air temperature and coolant temperature).

When the driver moves the accelerator pedal, his request is translated as a call for torque which causes the throttle to open and the ignition to advance.

To eliminate misfires, facilitate gear changes and safety functions, the throttle body modulates the engine torque.

MOTORISED THROTTLE BODY DEFECT MODES

The motorised throttle body has three types of defect mode.

- **Reduced Performance Mode:** this mode covers electrical breakdowns for which there is a viable backup solution for the injection system (loss of one of the two tracks on the pedal or the throttle body).
  This mode results in reduced acceleration and limits the maximum throttle opening.

- **Driver Override Mode:** this mode is also called "**Electrical Limp-Home**". This mode is applied when the accelerator pedal signal disappears completely, but the injection computer still controls the intake of air to the engine (automatic throttle control is still operational).
  In this mode, the injection computer imposes a set engine speed for each gear ratio and imposes idle speed when the brake pedal is pressed.

- **Mechanical Limp-home Mode:** this mode covers breakdowns which result in loss of the automatic throttle control (the throttle can no longer be controlled).
  In this case the throttle is in the mechanical rest position and the injection computer limits the engine speed by cutting off the injection.

NOTE: Each of these modes results in illumination of the injection fault warning light on the instrument panel.

IDLE SPEED CORRECTION AS A FUNCTION OF COOLANT TEMPERATURE

Coolant Temperature in °C	-20°	20°	40°	80°	100°	120°
Engine speed in rpm (F4P)	1070	980	900	750	750	850
Engine speed in rpm (K4M)	1120	900	820	750	750	900

ELECTRICAL ADJUSTMENT AS A FUNCTION OF BATTERY VOLTAGE AND ELECTRIC POWER BALANCE

The purpose of this adjustment is to compensate for the drop in voltage due to a power consumer switching on when the battery is not well charged. It starts when the voltage falls below **13 V** and the engine speed may reach a maximum of **990 rpm** for the F4P and **910 rpm** for the K4M.

POWER STEERING PRESSOSTAT / INJECTION COMPUTER LINK

The injection computer receives a signal from the power steering pressostat and may increase the idle speed to compensate for this power consumption.
The engine idle speed changes to **770 rpm** for the F4P and **750 rpm** for the K4M.

IDLE SPEED ADJUSTMENT ACCORDING TO THE HEATED WINDSCREEN SIGNAL

If the windscreen is switched on and if the coolant temperature is below **60°C**, the idle speed is fixed at **990 rpm** for the F4P and **910 rpm** for the K4M.

IDLE SPEED ADJUSTMENT WHEN THERE IS AN ACCELERATOR PEDAL POTENTIOMETER FAULT

If there is a fault on the two accelerator pedal position potentiometers, then the engine speed rises to about **2000 rpm** and returns to idle speed when the brake pedal is pressed.

ADJUSTMENT OF THE IDLE SPEED WHEN THERE IS A MOTORISED THROTTLE BODY FAULT

If there is a fault on the two throttle position potentiometers, the throttle body goes into "limp-home" mode (throttle body mechanical stop)
The engine speeds are then **1900 and 2200 rpm.**

NOTE: after a cold start and a long time running at idle speed, a sharp drop in engine speed of about **80 rpm** for the F4P and **160 rpm** for the K4M may be observed. This drop in engine speed is due to the presence of the automatic starter.

IDLE SPEED ADJUSTMENT AS A FUNCTION OF COOLANT TEMPERATURE

T° in °C	-30°	20°	35°	75°	100°	120°
rpm	900	830	780	650	650	800

ELECTRICAL ADJUSTMENT AS A FUNCTION OF BATTERY VOLTAGE AND ELECTRICAL POWER BALANCE

The purpose of this adjustment is to compensate for the drop in voltage due to a power consumer switching on when the battery is not well charged. It starts when the voltage falls below **12 V** and the engine speed may reach a maximum of **1500 rpm**.

POWER STEERING PRESSOSTAT / INJECTION COMPUTER LINK

The injection computer receives a signal from the power steering pressostat and may increase the idle speed to compensate for this power consumption.
The idle speed changes to **720 rpm** if the car speed is below **5 kph**.

IDLE SPEED ADJUSTMENT WHEN THERE IS AN ACCELERATOR PEDAL POTENTIOMETER FAULT

If there is a fault on the two accelerator pedal position potentiometers, then the engine speed rises to **1200 rpm.**

ADJUSTMENT OF THE IDLE SPEED WHEN THERE IS A MOTORISED THROTTLE BODY FAULT

If there is a fault on the two throttle position potentiometers, the throttle body goes into "limp-home" mode (throttle body mechanical stop)
The engine speed is then between **900 rpm** and **1400 rpm**.

ADAPTIVE IDLE SPEED ADJUSTMENT

There is adaptive adjustment of the idle speed but the diagnostic tool cannot interpret this function.

ADAPTIVE IDLE SPEED ADJUSTMENT

PRINCIPLE

Under normal hot engine operating conditions, the idle speed RCO (Opening Cyclic Ratio) signal value varies between a high value and a low value, so that the nominal idle speed is obtained.

It is possible that, due to variations in the operation of the car (running in, engine fouling, etc.), the RCO value could be close to the highest or lowest values.

Adaptive adjustment of the idle speed RCO signal makes it possible to follow the slow variation in the engine's air requirements, so as to reset the RCO signal to a normal average value.

This adjustment only takes effect if the coolant temperature is above **75 °C and 60 seconds** after starting the engine and during the idle speed regulation phase.

IDLE SPEED RCO SIGNAL VALUE AND ADAPTIVE ADJUSTMENT

	F4P	K4M
Nominal idle speed	**X = 750 rpm**	**X = 750 rpm**
Idle speed manifold pressure	**X = 280 mbars**	**X = 350 mbars**
Idle speed RCO signal (PR022)	**3% ≤ X ≤ 26%**	**6% ≤ X ≤ 22%**
Idle speed adaptive RCO signal (PR021)	Min. end stop: -**7.8**% Max. end stop: +**7.8**%	Min. end stop: -**7.8**% Max. end stop: +**7.8**%

INTERPRETATION OF THE GATE VALUES

If there is an excess of air (air intake or throttle stop incorrectly adjusted, etc.), the engine idling speed increases and the idle speed RCO signal value reduces in order to return to nominal idle speed; the adaptive adjustment value of the idle speed RCO signal reduces in order to reset the idle speed RCO signal

If there is insufficient air (due to clogging, etc.), the logic is inverse: the idle speed RCO signal increases and the adaptive adjustment also increases in order to reset the idle speed regulation operation.

IMPORTANT: After the computer memories have been wiped, it is imperative to start, stop, then leave the engine running at idle speed so that the adaptive adjustment can recalibrate itself correctly.

MIXTURE CONTROL

An engine using the "SAGEM S 2000" computer is equipped with two oxygen sensors, called the upstream sensor and the downstream sensor.

HEATING OF THE SENSORS

Heating of the oxygen sensors is controlled by the computer:
– the inlet manifold pressure is below a threshold which depends on a table as a function of the engine speed,
– the road speed is below **135 kph**,
– after a certain mapped engine operating time which depends on the engine's top dead centre (excluding No Load operation) and the coolant temperature.

Heating of the oxygen sensors stops:
– if the car speed is above **140 kph** (value given for information only),
– when the engine is under heavy load.

UPSTREAM SENSOR VOLTAGE

Read the "upstream sensor voltage" parameter on the diagnostic tool: the value read represents the voltage supplied to the computer by the oxygen sensor located upstream of the catalytic converter. It is expressed in millivolts. When the engine is operating in a closed loop, the voltage must oscillate rapidly between two values:
– **100 mV** ± **100** for a lean mixture,
– **800 mV** ± **100** for a rich mixture.

The smaller the difference between the minimum and maximum values, the poorer the signal from the sensor (the difference is usually at least **500 mV**).

NOTE: if the difference is small, check the sensor heater.

DOWNSTREAM SENSOR VOLTAGE

Read the "downstream oxygen sensor voltage" parameter on the diagnostic tool: the value read represents the voltage supplied to the computer by the oxygen sensor downstream of the catalytic converter. It is expressed in millivolts.

The function of this sensor is to locate faults on the catalytic converter and to perform a second more precise check on the richness (slow regulation loop). This function is activated only after the engine has been operating for a certain time.

When the engine is operating in a closed loop, the voltage should vary within the range **600 mV** ± **100**. When the engine is decelerating, the voltage should be less than **200 mV**.

The voltage read on the diagnostic tool at idling speed should be ignored.

MIXTURE ADJUSTMENT

The value read on the diagnostic tool for the "mixture adjustment" parameter represents the average of the richness adjustments made by the computer according to the richness of the fuel mixture detected by the oxygen sensor located upstream of the catalytic converter (in fact, the oxygen sensor analyses the concentration of oxygen in the exhaust gases).

The adjustment value has a midpoint of **128** and limits of **0** and **225**:
- 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

Entry into richness regulation takes place after a maximum initial time from start of **0 seconds** and if the coolant temperature is above **0°C** for the F4P and **10°C** for the K4M.

Unlooping phase

In mixture regulation mode, the phases of operation during which the computer ignores the value of the voltage from the sensor are:
- at full load,
- during heavy acceleration,
- during deceleration with a no load signal,
- when the oxygen sensor is faulty.

DEFECT MODE WHEN THE OXYGEN SENSOR IS FAULTY

When the voltage from the oxygen sensor is incorrect (varying only slightly or not at all) during mixture regulation, the computer will only enter defect mode if the fault has been recognized as present for **3 minutes**. Only in that case will the fault will be stored. In that case the "mixture adjustment" parameter is **128**.

If an oxygen sensor fault is present and recognized and if the fault has already been stored in memory, the system enters the open loop mode directly.

An engine operating with the "BOSCH ME7.4.6" computer is equipped with two oxygen sensors called the upstream sensor and the downstream sensor for each bank of cylinders.

HEATING OF THE SENSORS

Heating of the oxygen sensors is controlled by the computer:
– if battery voltage is lower than **15 V**,
– after a starting period of **4 seconds.**

Heating of the oxygen sensors stops if:
– controlled by the temperature, so as to maintain the temperature at **750°C**.

UPSTREAM SENSOR VOLTAGE

Read the "upstream sensor voltage" parameter on the diagnostic tool: the value read represents the voltage supplied to the computer by the oxygen sensor located upstream of the catalytic converter. It is expressed in millivolts. When the engine is operating in a closed loop, the voltage must oscillate rapidly between two values:
– **100 mV** ± **100** for a lean mixture,
– **800 mV** ± **100** for a rich mixture.

The smaller the difference between the minimum and maximum values, the poorer the signal from the sensor (the difference is usually at least **500 mV**).

NOTE: if the difference is small, check the sensor heater.

DOWNSTREAM SENSOR VOLTAGE

Read the "downstream oxygen sensor voltage" parameter on the diagnostic tool: the value read represents the voltage supplied to the computer by the oxygen sensor downstream of the catalytic converter. It is expressed in millivolts.

The function of this sensor is to locate faults on the catalytic converter and to perform a second more precise check on the richness (slow regulation loop). This function is activated only after the engine has been operating for a certain time.

When the engine is operating in a closed loop, the voltage should vary within the range **600 mV** ± **100**. When the engine is decelerating, the voltage should be less than **200 mV**.

The voltage read on the diagnostic tool at idling speed should be ignored.

MIXTURE ADJUSTMENT

The value read on the diagnostic tool for the "mixture adjustment" parameter represents the average of the richness adjustments made by the computer according to the richness of the fuel mixture detected by the oxygen sensor located upstream of the catalytic converter (in fact, the oxygen sensor analyses the concentration of oxygen in the exhaust gases).

The adjustment value has a midpoint of **1**:
- value less than **1** = request for mixture to be made leaner.
- value greater than **1** = request for mixture to be made richer.

ENTRY INTO RICHNESS REGULATION MODE

Entry into richness regulation mode takes place after an initial timed period irrespective of the coolant temperature.

The initial timed period can vary from **0** to **70 seconds**.

Unlooping phase

In mixture regulation mode, the phases of operation during which the computer ignores the value of the voltage from the sensor are:
- at full load,
- during heavy acceleration,
- during deceleration with injection cutoff,
- when the oxygen sensor is faulty.

DEFECT MODE WHEN THE OXYGEN SENSOR IS FAULTY

If the voltage from the oxygen sensor is incorrect (varying only slightly or not at all) during richness regulation, the computer will only enter defect mode if the fault has been recognized as present for **3 minutes**. The fault will be stored in this case only. In that case the "mixture adjustment" parameter is **1**.

If an oxygen sensor fault is present and recognized and if the fault has already been stored in memory, the system enters the open loop mode directly.

PRINCIPLE

In the closed loop phase, richness regulation adjusts the injection timing so as to obtain a mixture as close as possible to richness 1. The adjustment value is close to 128, with limits of 0 and 255.
Adaptive mixture adjustment makes it possible to offset the injection mapping to reset the richness regulation to 128.
Adaptive adjustments take 128 as the average value after initialization (erasing the memory) and have the following limit values:

	F4P	K4M
Mixture adjustment (PR035)	**60PR** ≤ 035 ≤ **190**	**80PR** ≤ 035 ≤ **250**
Adaptive operating mixture (PR030)	**82 PR**≤ 030 ≤ **224**	**64PR** ≤ 030 ≤ **160**
Adaptive idle speed mixture (PR031)	**32 PR**≤ 031 ≤ **224**	**64PR** ≤ 031 ≤ **160**

Conditions:
– hot engine: coolant temperature above **70°C** for the F4P and **80°C** for the K4M,
– do not exceed an engine speed of **4000 rpm** for the F4P and **4640 rpm** for the K4M,
– disconnect the canister using the solenoid valve or block the inlet pipe on the engine.

Pressure zones which must be passed through during the test

There are five pressure zones to cover during road testing. These zones are defined by the following calibrations:

	Range No. 1 (mbars)	Range No. 2 (mbars)	Range No. 3 (mbars)	Range No. 4 (mbars)	Range No. 5 (mbars)
F4P	**250 ---------------- 400**	**400 ------------------- 517**	**517 ------------------- 635**	**635 -------------------- 753**	**753 --------------- 873**
	Average 325	**Average 458**	**Average 576**	**Average 694**	**Average 813**
K4M	**259 ---------------- 459**	**459 ------------------- 537**	**537 ------------------- 615**	**615 -------------------- 692**	**692 --------------- 815**
	Average 359	**Average 498**	**Average 576**	**Average 654**	**Average 753**

Deactivation of the adaptive programs in the case of prolonged idle speed regulation with a hot engine
If the coolant temperature is above **80 °C** at idle speed for more than **62 seconds**, the adaptive programs are frozen until idling ends.

Following this test the adjustments will be operational. The test must be continued with normal smooth and varied driving for a distance of **5** to **10 kilometres**.
After the test, record the values of the adaptive programs. Initially 128, they should have changed. If not, repeat the readings taking care to observe the test conditions strictly.

INTERPRETATION OF VALUES OBTAINED FROM A ROAD TEST'

In the case of a lack of fuel (injectors clogged, fuel pressure and flow too low, etc.), the richness regulation increases to obtain a richness as close as possible to 1 and the adaptive mixture adjustment increases until the mixture adjustment again fluctuates around 128. In the case of excess fuel, the program works in reverse.

PRINCIPLE

In closed loop phase, richness regulation (PR 35) adjusts the injection timing so as to obtain a mixture as close as possible to richness 1. The adjustment value is close to 1, with limits of 0.75 and 1.25.
The adaptive mixture adjustment makes it possible to offset the injection mapping to reset the richness regulation to 1. The adjustment value is close to 0 with limits of -11% and +11%.
Adaptive adjustments take 1 and 0 as average values after initialization (erasing the memory) and have the following limit values:

Mixture adjustment	**0.75** ≤ PR 35 ≤ **1.25**
Operating adaptive richness	**0.75** ≤ PR 185 et 186 ≤ **1.25**
Idle adaptive richness	**-11%** ≤ PR 125 ≤ **11%**

Conditions:
– hot engine (coolant temperature above **70°C** and air temperature below **55°C**),
– disconnect the canister using the solenoid valve or block the inlet pipe on the engine.
– do not exceed the throttle opening angle for the particular engine speed (see table).

Pressure zones which must be passed through during the test

Engine speed in **rpm**	**Less than 800 rpm**	**More than 1200 rpm**
Throttle opening angle value which must not be exceeded	**60%**	**70%**

Following this test the adjustments will be operational.
The test must be continued by normal smooth and varied driving for a distance of **5** to **10 kilometres**.
After the test, record the values of the adaptive programs. Initially 1 and 0, they should have changed. If not, repeat the readings taking care to observe the test conditions strictly.

INTERPRETATION OF VALUES OBTAINED FROM A ROAD TEST'

If there is a lack of fuel, richness regulation (in PR 35) increases to obtain a richness as close as possible to 1 and the adaptive mixture adjustment increases until the mixture adjustment again fluctuates around 1. If there is excess fuel, the program works in reverse.

The fan unit is controlled by the injection computer.

ANTIPERCOLATION FUNCTION

The antipercolation system is controlled by the injection computer.

The coolant temperature signal used is the one from the injection system.

After the engine is switched off the system enters monitoring mode. If the coolant temperature exceeds the **112.5°C** threshold for the F4P or **103.5˚C** for the K4M during the **3 minutes** after the engine stops, the fan unit low speed is switched on.

If the coolant temperature falls below **100°C**, the fan unit relay is cut off. The fan unit cannot be switched on for more than **10 minutes**.

OPERATION OF THE FAN UNITS

– The fan unit is switched on at slow speed if the coolant temperature exceeds **98˚C** and is switched off when the temperature falls below **95˚C**.
– the fan unit is switched on at high speed if the coolant temperature exceeds **102˚C** and is switched off when the temperature falls below **99˚C**.

OPERATION OF THE TEMPERATURE WARNING LIGHT

The temperature warning light illuminates if the coolant temperature exceeds **118°C** and extinguishes when the temperature falls below **115°C**.

The fan unit is controlled by the injection computer.

ANTIPERCOLATION FUNCTION

The antipercolation system is controlled by the injection computer.

The coolant temperature signal used is the one from the injection system.

After the engine is switched off the system enters monitoring mode. If the coolant temperature exceeds the limit of **102˚C** during the **10 minutes** after the engine is switched off, the fan unit is switched on at slow speed.

If the coolant temperature falls back below **95°C**, the fan unit relay is switched off. The fan unit cannot be switched on for more than **10 minutes**.

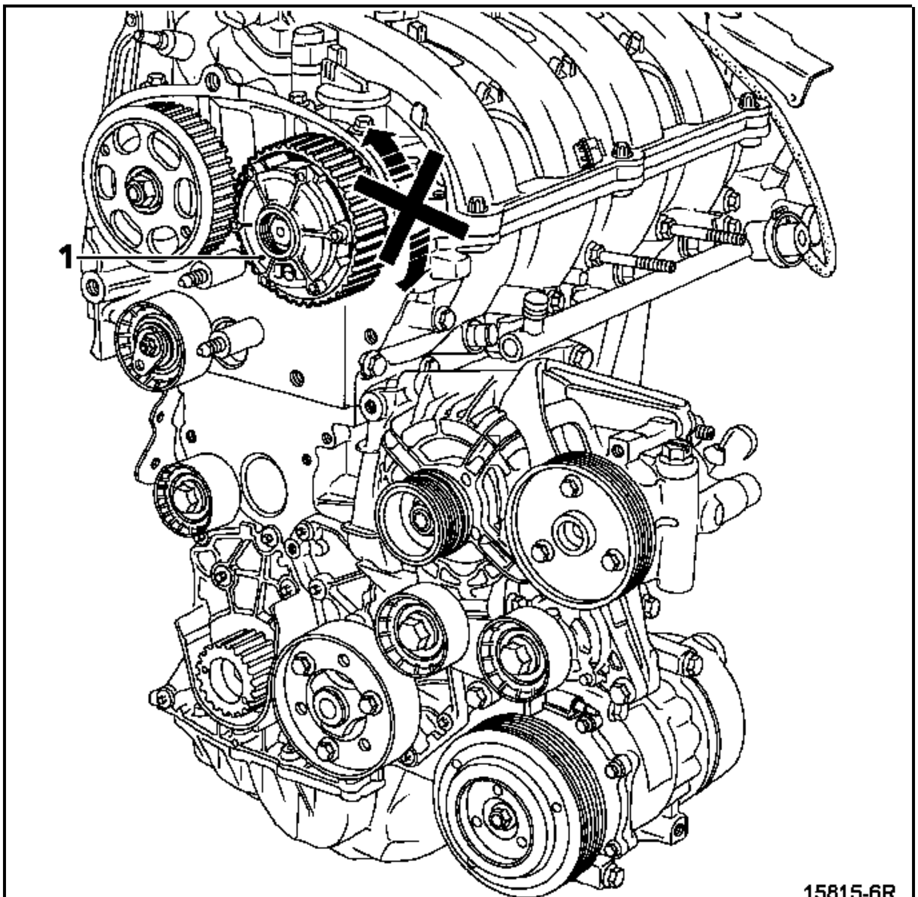
OPERATION OF THE FAN UNITS

– The fan unit is switched on at slow speed if the coolant temperature exceeds **99˚C** and is switched off when the temperature falls below **96˚C**.
– the fan unit is switched on at high speed if the coolant temperature exceeds **102˚C** and is switched off when the temperature falls below **99˚C**.

OPERATION OF THE TEMPERATURE WARNING LIGHT

The temperature warning light illuminates if the coolant temperature exceeds **118°C** and extinguishes when the temperature falls below **115°C**.

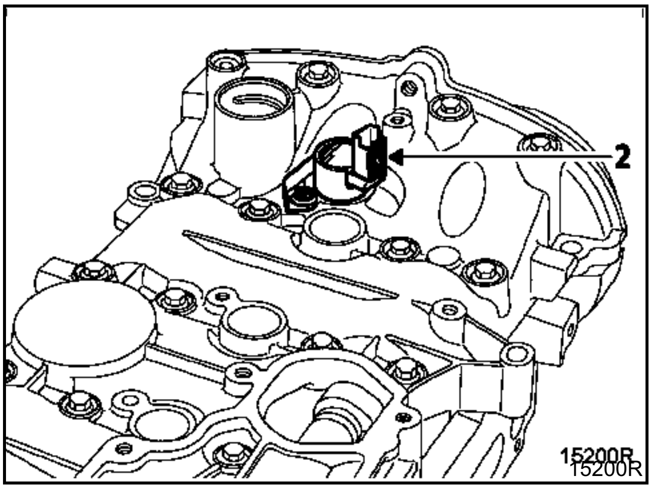
The camshaft dephaser (1) is located on the inlet camshaft. Its role is to modify the valve timing. It is controlled (on or off) by the injection computer via a solenoid valve (2) located on the cylinder head cover.



15815-6R

At rest, the solenoid valve is in the closed position. It allows oil to flow through to control the dephaser depending on engine operation:
– if the engine speed is between **1500** and about **4250 rpm**,
– when the coolant temperature is above **30˚ C,**

IMPORTANT: a solenoid valve which is jammed open causes an unstable idle speed and pressure in the manifold which is too high at idle speed.



15200R

The camshaft dephasers are located on the inlet camshaft. Their function is to modify the timing adjustment. They are controlled (all-or-nothing) by the injection computer via two solenoid valves located on the cylinder head cover.

These allow oil to flow through to control the dephasers as a function of engine operation:
- if the coolant temperature is above **- 40°C**,
- if the air temperature is above **- 30°C**,
- after a period of **2 seconds** after the engine has been started,
- engine speed between **1500** and **4500 rpm.**
- if there is no injection fault.

GENERAL INFORMATION

Cruise control: makes it possible to maintain a speed selected by the driver. This function can be deactivated at any moment by pressing the brake pedal or the clutch pedal, or by using one of the system buttons.

Speed limiter: allows the driver to set a speed limit. The accelerator pedal becomes inactive above this speed. The speed limit selected can be exceeded at any moment by pressing the accelerator pedal beyond its point of resistance.

A warning light on the instrument panel informs the driver of the status of the cruise control/speed limiter:
– Green light: cruise control in operation,
– Amber light: speed limiter in operation,
– Speed setting flashing: the set speed cannot be maintained (e.g. going downhill).

To control these functions, the injection computer receives the following signals on the following tracks:
– A C3: Speed limiter On/Off
– A A2: Cruise control On/Off
– A D2: Steering wheel switch earth
– A D3: Steering wheel switch signal
– A E4: Stop switch open input
– A C4: Clutch switch input (depending on version)
– A G2: Pedal potentiometer 1 feed
– A F2: Pedal potentiometer 2 feed
– A H3: Pedal potentiometer 1 earth
– A F4: Pedal potentiometer 2 earth
– A H2: Pedal potentiometer 1 signal
– A F3: Pedal potentiometer 2 signal
– A A4: Multiplex link CAN H (passenger compartment)
– A A3: Multiplex link CAN L (passenger compartment)
– B K3: Multiplex link CAN L (engine)
– B K4: Multiplex link CAN H (engine)

The following signals are received by the injection computer via the multiplex network:
– car speed (ABS)
– stop switch closed signal (ABS)
– which gear is engaged (automatic transmission)

The injection computer sends the following signals over the multiplex network:
– cruise control or speed limit setting to the instrument panel,
– warning light illumination (amber, green or flashing),
– gear change signals from the gearbox (depending on version).

The injection computer receives:
- signals from the accelerator pedal,
- brake switch signal,
- clutch switch signal,
- signals from the Start/Stop switch,
- signals from the steering wheel switches,
- signals from the ABS computer,
- signals from the automatic transmission computer.

Using these signals, the injection computer controls the motor-driven throttle unit so as to maintain the set speed in the case of cruise control and not to exceed the set speed in the case of speed limitation.

CRUISE CONTROL OPERATION

Entry conditions:
- switch on "cruise control",
- gearbox ratio > 2nd gear,
- car speed > **20 mph (30 kph)**,
- cruise control warning light illuminated (green),
- press on "+", "-" or "recall" button.

Exit conditions:
- brief sharp depression of the accelerator pedal (does not deactivate the function),
- pressing the brake or clutch pedal,
- pressing the "0" button,
- switch to "off",
- no gear engaged,
- electronic stability programme system operation
- injection computer operation.

SPEED LIMITER OPERATION

Entry conditions:
- switch on "speed limiter",
- gearbox > 2nd gear,
- car speed > **20 mph (30 kph)**,
- limiter warning light illuminated (amber),
- press "+", "-" or "recall" button.

Exit conditions:
- brief sharp pressure on the accelerator pedal past the point of resistance (does not deactivate the function),
- pressing the "0" button,
- switch to "off",
- no gear engaged, electronic stability programme system operation,

NOTE: a flashing speed setting informs the driver that the set speed cannot be maintained.

Defect mode
If one of the components is faulty, the cruise control/speed limiter system cannot be activated.

GENERAL INFORMATION

Cruise control: makes it possible to maintain a speed selected by the driver. This function can be disengaged at any moment by pressing the brake pedal (or the clutch pedal with a manual gearbox), or by using one of the system buttons.

Speed limiter: allows the driver to set a speed limit. The accelerator pedal becomes inactive above that speed. The selected speed limit can be exceeded at any moment by depressing the accelerator pedal beyond its point of resistance.

A warning light on the instrument panel informs the driver about the state of the cruise control/speed limiter:
– Green light: cruise control in operation,
– Amber light: speed limiter in operation,
– Speed setting flashing: the set speed cannot be maintained (e.g. going downhill).

To control these functions, the injection computer receives the following signals on the following tracks:
– B C1: Speed limiter On/Off
– B L1: Cruise control On/Off
– A B2: Steering wheel switch earth
– A G1: Steering wheel switch signal
– B B2: Stop switch open input
– B B1: Pedal potentiometer 1 feed
– B H1: Pedal potentiometer 2 feed
– B K1: Pedal potentiometer 1 earth
– B A3: Pedal potentiometer 2 earth
– B A1: Pedal potentiometer 1 signal
– B A2: Pedal potentiometer 2 signal
– B H3: Multiplex link CAN H (passenger compartment)
– B H4: Multiplex link CAN L (passenger compartment)
– A A2: Multiplex link CAN L (engine)
– A C2: Multiplex link CAN H (engine)

The following signals are received by the injection computer via the multiplex network:
– car speed (ABS)
– stop switch closed signal (ABS)
– which gear is engaged (automatic transmission)

The injection computer sends the following signals over the multiplex network:
– cruise control or speed limit setting to the instrument panel,
– warning light illumination (amber, green or flashing),
– gear change signals from the gearbox (depending on version).

The injection computer receives:
● signals from the accelerator pedal,
● brake switch signal,
● clutch switch signal,
● signals from the Start/Stop switch,
● signals from the steering wheel switches,
● signals from the ABS computer,
● signals from the automatic transmission computer.

Using these signals, the injection computer controls the motorised throttle body so as to maintain the set speed in the case of cruise control and not to exceed the set speed in the case of speed limitation.

CRUISE CONTROL OPERATION

Entry conditions:
– switch on "cruise control",
– gearbox > 2nd gear,
– car speed > **20 mph (30 kph)**,
– cruise control warning light illuminated (green),
– press "+", "-" or "recall" button.

Exit conditions:
- brief sharp pressure on the accelerator pedal (does not deactivate the function),
- pressing the brake or clutch pedal,
- pressing the "0" button,
- switch to "off",
- no gear engaged,
- electronic stability programme system operation,
- injection computer operation.

SPEED LIMITER OPERATION

Entry conditions:
– switch on "speed limiter",
– gearbox > 2nd gear,
– car speed > 20 mph (30 kph),
– limiter warning light illuminated (amber),
– press "+", "-" or "recall" button.

Exit conditions:
- brief sharp pressure on the accelerator pedal past the point of resistance (does not deactivate the function),
- pressing the "0" button,
- switch to "off",
- no gear engaged,
- electronic stability programme system operation,
- injection computer operation.

NOTE: a flashing speed setting informs the driver that the set speed cannot be maintained.

Defect mode
If one of the components is faulty, the cruise control/speed limiter system cannot be activated.

This car is equipped with the OBD (On Board Diagnostic) system which has the following features:
When a fault causing excessive pollution is detected, a warning light illuminates on the instrument panel ("OBD" warning light). This warning light informs the driver that he must have his car repaired,

This new computer diagnostic strategy operates as follows:

Only engine misfires are the subject of continuous diagnostics. The other emission control components are tested once while driving (diagnostics is not continuous). However, these test sequences are not always performed. The car must be driven under certain conditions for the test sequences to be executed:
– temperature condition,
– speed condition (threshold, stability, etc.),
– timed starting period,
– engine conditions (manifold pressure, engine speed, throttle angle, etc.).

The OBD management program supplements the management of conventional electrical breakdowns. To meet this standard the requirements are:
– illumination of the OBD warning light (or, for some faults, causing to it flash),
– storing OBD faults.

CONSEQUENCES FOR FAULT FINDING AND REPAIRS

Special care is required when working on the car to prevent the OBD warning light from illuminating after the car has been returned to the customer.
Some faults only appear when the car is being driven, when the adaptive programs have been programmed: **it is therefore essential to validate the repair.**
In addition, the complexity of the system means that the customer has to be asked about the conditions which led to the illumination of the warning light. This information will enable faults to be found more quickly. The circumstances in which the fault occurred are recorded the computer's memory.

NOTE: all electrical faults which result in exceeding the pollution limit cause the OBD warning light to illuminate.

The operational diagnoses used for OBD are:
– diagnostics of combustion misfires which destroy the catalytic converter,
– diagnostics of polluting combustion misfires,
– diagnostics from the upstream and downstream oxygen sensors,
– catalytic converter diagnostics.

NOTE: misfire diagnostics take precedence over all other diagnostics. They are performed practically continuously as soon as the driving conditions are reached.

IMPORTANT: it is essential that the ignition is not switched off before the result is read on the diagnostic tool at the end of each test. Switching off the ignition causes incorrect interpretation of the results and loss of the information that the "diagnostics have been performed".

CONDITIONS WHICH CAUSE ILLUMINATION OF "ON BOARD DIAGNOSTIC" WARNING LIGHT

- **ELECTRICAL FAULT**

  Permanent illumination of the light after several consecutive detections of a fault (depending on the component).

- **LEVEL OF MISFIRES WHICH WILL DESTROY THE CATALYTIC CONVERTER**

  Immediate illumination and flashing of the warning light.

- **CATALYTIC CONVERTER, OXYGEN SENSOR, POLLUTING MISFIRES**

  Illumination of the light after a fault is detected three times consecutively.

IMPORTANT: the catalytic converter and the upstream oxygen sensor diagnostics are sequential and take place:
- once when driving (they last several seconds per test),
- only under certain specific driving conditions.

During a road test, it may be the case that diagnostics for certain functions are not run (e.g. when in a traffic jam).

⇒**The warning light illuminates**
If the same "**On Board Diagnostic**" fault is detected during three consecutive journeys or if the fault is electrical.

⇒**The warning light flashes**
If combustion misfires which could destroy the catalytic converter are detected.

⇒**The warning light extinguishes**
If the "**On Board Diagnostic**" fault does not recur during three consecutive journeys, the warning light extinguishes (but the fault remains stored in the injection computer's memory).
The fault must not be detected during **40 consecutive tests** for the fault to be erased from the computer memory without the use of a diagnostic tool.

NOTE: the fault may not be detected:
- if the fault is temporary,
- due to the way the customer drives, which does not include all of the fault detection conditions.

DIAGNOSTIC CONDITIONS

If, when the ignition is switched on and when the car is being driven, the air temperature read by the temperature sensor is not between **- 7.5˚C and 119˚C**, or if the coolant temperature read by the sensor is not between **- 7.5°C** and **119°C**, or if the difference between **1046 mbars** and the manifold pressure is more than **273 mbars** (altitude of about **2500 m**), then "On Board Diagnostic" procedures are not authorized until the next time the ignition is switched on.

In order for the "**On Board Diagnostic**" system to function correctly, there must be no electrical faults in the injection system, even if the "**On Board Diagnostic**" warning light is not illuminated.

Fault finding of the oxygen sensor and the catalytic converter can never be performed at the same time.

When fault finding of the catalytic converter and oxygen sensor is in progress, the canister bleed is closed and the adaptive programs are set to their most recent value.

TEST PROCEDURE

– repair all electrical faults.
– erase all faults.
– program the injection.
– check the **"On Board Diagnostic"** system

FULL OBD INITIALIZATION

– erasure of faults stored in memory.
– erasure of **OBD** "**On Board Diagnostic**" faults.
– erasure of programming.

PROGRAMMING REQUIRED FOR "ON BOARD DIAGNOSTIC" FAULT FINDING

Torque/gas programming (Status: "Cylinder 1 recognition"):
This is programmed by:
– one deceleration with injection cutoff in **2nd gear** between **2000 rpm** and **2400 rpm** for at least **3 seconds**,
– a second deceleration with injection cutoff in **2nd gear** between **3000 rpm** and **3500 rpm** for the F4P and between **2000 rpm** and **2400 rpm** for the K4M for at least 2 seconds.

Richness adjustment programming
To carry out this programming, the car must be driven while complying with the pressure ranges specified in the **"Injection: Adaptive mixture adjustment"** section.

Engine target programming
To carry out this programming, the car must be driven for **25 minutes**. Confirmation of the programming can be displayed on the diagnostic tool: "Target programming ... ACTIVE".

DIAGNOSTIC CONDITIONS

In order for the OBD (On Board Diagnostic) system to function correctly, there must be no electrical faults in the injection system, even if the OBD warning light is not illuminated.

When fault finding of the catalytic converter and oxygen sensor is in progress, the canister bleed is closed and the adaptive programs are set to their most recent value.

TEST PROCEDURE

- repair all electrical faults,
- erase all faults,
- program the injection,
- check the OBD diagnostic system.

FULL OBD INITIALIZATION

- erasure of faults stored in memory,
- erasure of OBD faults,
- erasure of programming.

PROGRAMMING REQUIRED FOR OBD FAULT FINDING

Engine target programming:

Engine target programming takes place automatically and cannot be carried out with the diagnostic tool.

Richness adjustment programming

To carry out this programming, the car must be driven while complying with the throttle opening angle and engine speed ranges specified in the **"Injection: Adaptive mixture adjustment" section**.

The aim of detecting combustion misfires is to detect a malfunction which would cause pollutant emissions to exceed the **"On Board Diagnostic"** limit, which would damage the catalytic converter.

The diagnostic can detect:
- fouling or flooding of a spark plug,
- clogging of the injectors or an anomaly in their output,
- a fault in the supply system (pressure regulator, fuel pump, etc.),
- a bad connection in the petrol or injection circuits (coil secondary, etc.).

Fault finding is carried out by measuring instantaneous variations in engine rotation speed.
Observation of a drop in torque detects combustion misfires.
This fault finding is practically continuous while the car is being driven. If it is in operation, or if a fault is detected, other "**On Board Diagnostic**" diagnostics will be inhibited (catalytic converter and upstream oxygen sensor).

This diagnostic strategy makes it possible to diagnose two types of fault:
- destructive misfires resulting in destruction of the catalytic converter. These cause the injection warning light to illuminate immediately and flash.
- Polluting misfires which cause the "**On Board Diagnostic**" pollution limit to be exceeded. These cause the injection warning light to illuminate if they are detected during three consecutive journeys.

DETECTION CONDITIONS

Before beginning, it is necessary to check that programming has been carried out correctly and that current conditions as well as those prior to switching on the ignition are as required.
Detection is carried out as soon as the coolant temperature is above **-7.5°C**, in three operating ranges between idle speed and **4500 rpm.**
The polluting combustion misfire test can also be carried out by maintaining the engine at idle speed with all the power consumers on **for 10 minutes** and **40 seconds**.

IMPORTANT: it is essential that the ignition is not switched off before the result is read on the diagnostic tool at the end of this test. Switching off the ignition will lead to the results being misinterpreted.

CONFIRMATION OF THE REPAIR

– Combustion misfires being diagnosed	ACTIVE
– Polluting combustion misfires	No fault detected
– Destructive combustion misfires	No fault detected

If diagnostics have found combustion misfires at the end of the test, refer to the fault finding method associated with this symptom.

The aim of detecting combustion misfires is to detect a malfunction which would cause the OBD (On Board Diagnostic) limit for pollutant emissions to be exceeded, which would damage the catalytic converter.

The diagnostic strategy can detect:
- fouling or flooding of a spark plug,
- clogging of the injectors or an anomaly in their output,
- a fault in the supply system (pressure regulator, fuel pump, etc.),
- a bad connection in the petrol or injection circuits,
- a malfunction of the ignition coils.

Fault finding is carried out by measuring instantaneous variations in engine rotation speed.
Observation of a drop in torque detects combustion misfires.
This fault finding is practically continuous while the car is being driven.

This diagnostic strategy makes it possible to diagnose two types of fault:
- combustion misfires resulting in destruction of the catalytic converter. These cause the OBD warning light to illuminate immediately and flash,
- polluting misfires which cause the "On Board Diagnostic" pollution limit to be exceeded. These cause the OBD warning light to illuminate if they are detected during three consecutive journeys.

IMPORTANT: it is essential that the ignition is not switched off before the result is read on the diagnostic tool at the end of this test. Switching off the ignition will lead to the results being misinterpreted.

CONFIRMATION OF THE REPAIR

– Polluting combustion misfires	No fault detected
– Destructive combustion misfires	No fault detected

If diagnostics have found combustion misfires at the end of the test, refer to the fault finding method associated with this symptom.

The aim of catalytic converter fault finding is to detect a malfunction which would cause pollutant emissions to exceed the **"On Board Diagnostic"** limit.

The ability of the catalytic converter to store oxygen indicates its condition. As the catalytic converter ages, its ability to store oxygen reduces along with its ability to treat pollutant gases.

CONDITIONS FOR STARTING FAULT FINDING

Fault finding of the catalytic converter can only take place after the engine has been running for **17 minutes**, if the conditions required prior to switching on the ignition are met and maintained.
– no electrical faults,
– cylinder recognition done,
– no combustion misfires detected,
– no catalytic converter fault finding performed since the ignition was switched on,
– programming done,
– main loop and double loops active,
– coolant temperature greater than **75˚C**,
– car speed between **40 mph (63 kph)** and **81 mph (130 kph)**,
– pressure between **430** and **650 mbars**,
– engine speed read on the diagnostic tool between **1824** and **3712 rpm** for the F4P and between **1824** and **4000 rpm** for the K4M.

FAULT DETECTION

Fault finding is performed over a stabilized range in **5^{th} gear at 44 mph (70 kph).** When the conditions for starting fault finding are satisfied, richness excitation peaks are applied, which has the effect of sending bursts of oxygen into the catalytic converter. If the catalytic converter is in good condition, it will absorb the oxygen and the downstream oxygen sensor value will remain at its average value. If it is ageing, it will reject the oxygen and the oxygen sensor will start to vibrate. The voltage of the oxygen sensor will oscillate. The "**On Board Diagnostic**" warning light will illuminate after three journeys.
The test cannot exceed **52 seconds** without exiting from the cycle again.

IMPORTANT: it is essential that the ignition is not switched off before the result is read on the diagnostic tool at the end of this test. Switching off the ignition will lead to the results being misinterpreted.

CONFIRMATION OF THE REPAIR

– "On Board Diagnostic catalytic converter fault finding in progress" message	ACTIVE
– "On Board Diagnostic catalytic converter fault finding: done"	ACTIVE
– "Catalytic converter operating fault"	INACTI VE
– "Validation of catalytic converter repair"	OK

If the diagnostic tool shows "On Board Diagnostic: done ... ACTIVE" or "Validation of catalytic converter repair ... 1DEF", the control cycle has not been performed correctly. In this case, repeat the cycle ensuring that the detection conditions are complied with.

If after the test, the diagnostic fault shows "Catalytic converter functional fault ... ACTIVE" or "Validation of catalytic converter repair ... 2DEF", refer to the fault finding method associated with this symptom.

The aim of catalytic converter fault finding is to detect a malfunction which would cause pollutant emissions to exceed the **"On Board Diagnostic"** limit.

The ability of the catalytic converter to store oxygen indicates its condition. As the catalytic converter ages, its ability to store oxygen reduces along with its ability to treat pollutant gases.

CONDITIONS FOR STARTING FAULT FINDING

Catalytic converter fault finding can only be carried out if the conditions required prior to switching on the ignition are met and maintained.
– no electrical faults,
– no combustion misfires detected,
– programming done,
– main loop and double loops active,
– engine speed read on the diagnostic tool is between **1120** and **1840 rpm**.

FAULT DETECTION

Fault finding is carried out at a steady speed at between **20%** and **30%** load and an engine speed between **1120** and **1840 rpm**. When the conditions for starting fault finding are satisfied, richness excitation peaks are applied, which has the effect of sending bursts of oxygen into the catalytic converter. If the catalytic converter is in good condition, it will absorb the oxygen and the downstream oxygen sensor value will remain at its average value. If it is aged, it will reject the oxygen and the oxygen sensor will start to vibrate. The voltage of the oxygen sensor will oscillate. The "On Board Diagnostic" warning light will illuminate after three consecutive journeys.
Catalytic converter fault finding takes **60 seconds**.

IMPORTANT: it is essential that the ignition is not switched off before the result is read on the diagnostic tool at the end of this test. Switching off the ignition will lead to the results being misinterpreted.

CONFIRMATION OF THE REPAIR

– "On Board Diagnostic catalytic converter fault finding: done"	ACTIVE
– "Catalytic converter operating fault"	INACTIVE

If the diagnostic tool shows "Catalytic converter On Board Diagnostic fault finding: not done ... ACTIVE", then the control cycle has not been carried out correctly. In this case, repeat the cycle ensuring that the detection conditions are complied with.

If after the test, the diagnostic fault shows "Catalytic converter functional fault ... ACTIVE" or "Validation of catalytic converter repair ... 2DEF", refer to the fault finding method associated with this symptom.

The aim of catalytic converter fault finding is to detect a malfunction which would cause pollutant emissions to exceed the **"On Board Diagnostic"** limit.

It is performed by measuring and comparing oxygen sensor vibration periods.

Possible breakdowns of the oxygen sensor are of two kinds:
– mechanical damage to an electrical component (breakage, cut in wire) which leads to an electrical fault,
– chemical damage to the component which causes the response time of the sensor to slow down, thus increasing its switching period.

When the required test conditions are met, the average of the sensor periods read is taken, subtracting the effects of interference, then compared with an average period of the **"On Board Diagnostic"** threshold.

TEST CONDITIONS

Fault finding of the upstream oxygen sensor can only take place after the engine has been running for **15 minutes** if all the conditions prior to switching on the ignition are satisfied and maintained.
– no electrical faults detected,
– programming and cylinder recognition done,
– no oxygen sensor fault finding performed since the ignition was switched on,
– no combustion misfires detected,
– coolant temperature greater than **75˚C**,
– average engine speed between **1824** and **4000 rpm** for the F4P and between **1632** and **4000 rpm** for the K4M.
– pressure between **328** and **750 mbars**,
– car speed between **40 mph (63 kph)** and **81 mph (130 kph)**.

FAULT DETECTION

Fault finding takes place during use by the customer, according to conditions previously described, with the canister bleed inhibited. This test is performed over a minimum duration of **40 seconds**. The computer shows "**oxygen sensor fault finding: in progress**".

The test cannot exceed **52 seconds** without exiting from the cycle again.

IMPORTANT: it is essential that the ignition is not switched off before the result is read on the diagnostic tool at the end of this test. Switching off the ignition will lead to the results being misinterpreted.

CONFIRMATION OF THE REPAIR

– "On Board Diagnostic oxygen sensor fault finding in progress" instruction	ACTIVE
– "On Board Diagnostic" oxygen sensor fault finding: done"	ACTIVE
– "Oxygen sensor operating fault"	INACTIVE
– "Validation of oxygen sensor repair"	OK

If the diagnostic tool shows "Oxygen sensor On Board Diagnostic: done ... ACTIVE" or "Validation of the oxygen sensor repair ...1DEF", the control cycle has not been carried out correctly. In this case, repeat the cycle ensuring that the detection conditions are complied with.

If after the test, the diagnostic tool shows "Catalytic converter operating fault ... ACTIVE" or "Validation of catalytic converter repair ... 2DEF", refer to the fault finding method associated with this symptom.

The aim of catalytic converter diagnosis is to detect a malfunction which would cause the **"On Board Diagnostic"** limit for hydrocarbon, carbon monoxide or nitrogen oxide pollutant emissions to be exceeded. It is carried out by measuring and comparing periods of upstream oxygen sensor vibration.

There are two types of possible faults on the upstream oxygen sensor:
– mechanical damage to an electrical component (breakage, cut in wire) which leads to an electrical fault,
– chemical damage to the component which causes the response time of the sensor to slow down, thus increasing its switching period.

When the required test conditions are met, the average of the sensor periods read is taken, subtracting the effects of interference, then compared with an average period of the "On Board Diagnostic" limit.

TEST CONDITIONS

Upstream oxygen sensor fault finding can only be carried out if the conditions required prior to switching on the ignition are met and maintained.
– no electrical faults detected,
– programming done,
– no combustion misfires detected,
– coolant temperature greater than **40˚C**,
– average engine speed between **650** and **6200 rpm.**
– any engine load,
– all speeds.

FAULT DETECTION

Fault finding takes place during use by the customer, according to conditions previously described. The computer shows "**oxygen sensor fault finding: done**".

IMPORTANT: it is essential that the ignition is not switched off before the result is read on the diagnostic tool at the end of this test. Switching off the ignition will lead to the results being misinterpreted.

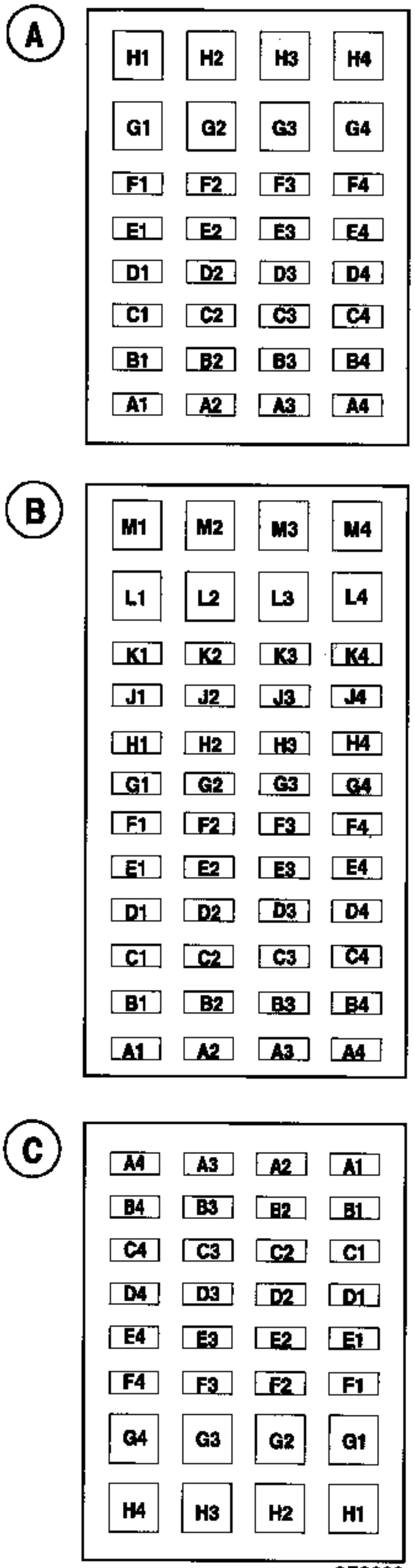
CONFIRMATION OF THE REPAIR

– "On Board Diagnostic" oxygen sensor fault finding:"	done: ACTIVE
– "Oxygen sensor operating fault"	INACTIVE
– "Validation of oxygen sensor repair"	OK

If the diagnostic tool shows "Oxygen sensor On Board Diagnostic: done ... ACTIVE" or "Validation of the oxygen sensor repair ...1DEF", the control cycle has not been carried out correctly. In this case, repeat the cycle ensuring that the detection conditions are complied with.

If after the test, the diagnostic tool shows "Catalytic converter operating fault ... ACTIVE" or "Validation of catalytic converter repair ... 2DEF", refer to the fault finding method associated with this symptom.

INJECTION COMPUTER TRACK ASSIGNMENTS



SE2009

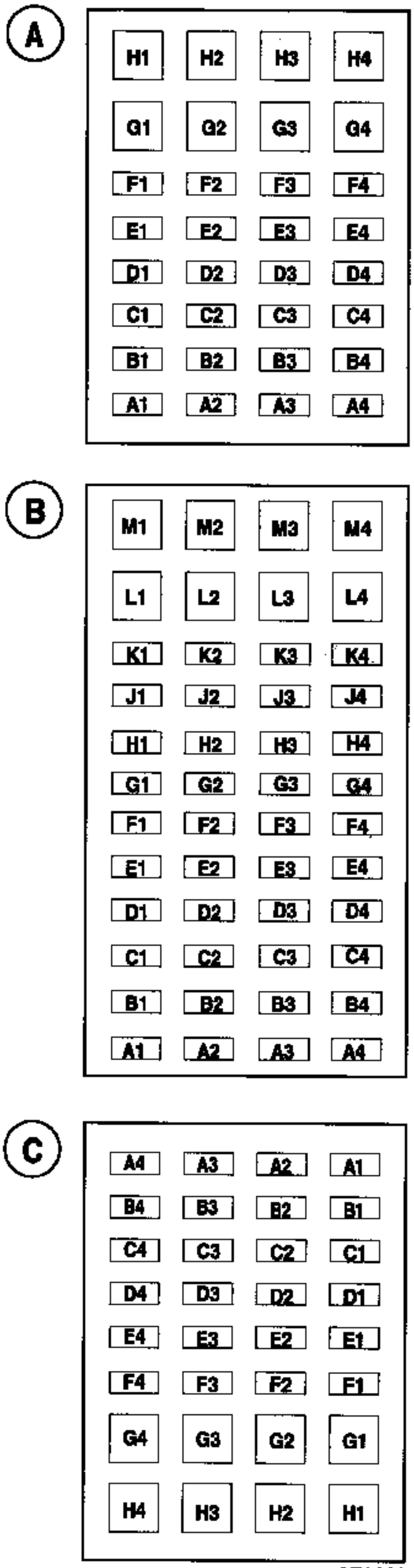
CONNECTOR A

H2	←	PEDAL POTENTIOMETER SIGNAL (TRACK 1)
H3	---	PEDAL POTENTIOMETER EARTH (TRACK 1)
H4	---	POWER EARTH
G2	---	PEDAL POTENTIOMETER FEED (TRACK 2)
G4	---	POWER EARTH
F2	---	PEDAL POTENTIOMETER FEED (TRACK 2)
F3	←	PEDAL POTENTIOMETER SIGNAL (TRACK 2)
F4	---	PEDAL POTENTIOMETER EARTH (TRACK 2)
E4	←	BRAKE SIGNAL
B4	→←	FAULT FINDING
C4	←	CLUTCH SIGNAL
A2	←	CRUISE CONTROL ON/OFF SWITCH
A3	→←	CAN L MULTIPLEX LINK WITH PASSENGER COMPARTMENT CONTROL UNIT
A4	→←	CAN H MULTIPLEX LINK WITH PASSENGER COMPARTMENT CONTROL UNIT
C3	←	SPEED LIMITER ON/OFF SWITCH
D2	---	CRUISE CONTROL/SPEED LIMITER SWITCHES FEED
D3	←	CRUISE CONTROL/SPEED LIMITER SWITCHES SIGNAL

CONNECTOR B

M2	→	INJECTOR 4 CONTROL
M3	→	(-) MOTORISED THROTTLE CONTROL
M4	→	(+) MOTORISED THROTTLE CONTROL
L2	→	INJECTOR 3 CONTROL
L3	→	INJECTOR 2 CONTROL
L4	→	INJECTOR 1 CONTROL
K3	→←	CAN L MULTIPLEX LINK (if AUTOMATIC TRANSMISSION)
K4	→←	CAN L MULTIPLEX LINK (if AUTOMATIC TRANSMISSION)
H2	---	MANIFOLD PRESSURE SENSOR FEED
H3	←	MANIFOLD PRESSURE SENSOR SIGNAL
H4	---	MANIFOLD PRESSURE SENSOR FEED
G2	---	MOTORISED THROTTLE BODY POTENTIOMETER FEED
G3	←	MOTORISED THROTTLE BODY POTENTIOMETER SIGNAL (TRACK 1)
G4	---	MOTORISED THROTTLE BODY POTENTIOMETERS EARTH
F2	←	COOLANT TEMPERATURE SIGNAL
F3	←	ENGINE SPEED SENSOR SIGNAL
F4	---	COOLANT TEMPERATURE SENSOR EARTH
E2	←	AIR TEMPERATURE SIGNAL
E3	---	AIR TEMPERATURE SENSOR EARTH
E4	←	ENGINE SPEED SENSOR SIGNAL
D3	←	MOTORISED THROTTLE POTENTIOMETER SIGNAL (TRACK 2)
D4	→	ACTUATOR CONTROL RELAY
C2	---	PINKING SENSOR SCREENING
B2	---	PINKING SENSOR EARTH
A2	←	PINKING SENSOR SIGNAL
A4	---	+ AFTER IGNITION
C4	←	POWER STEERING PRESSOSTAT SIGNAL

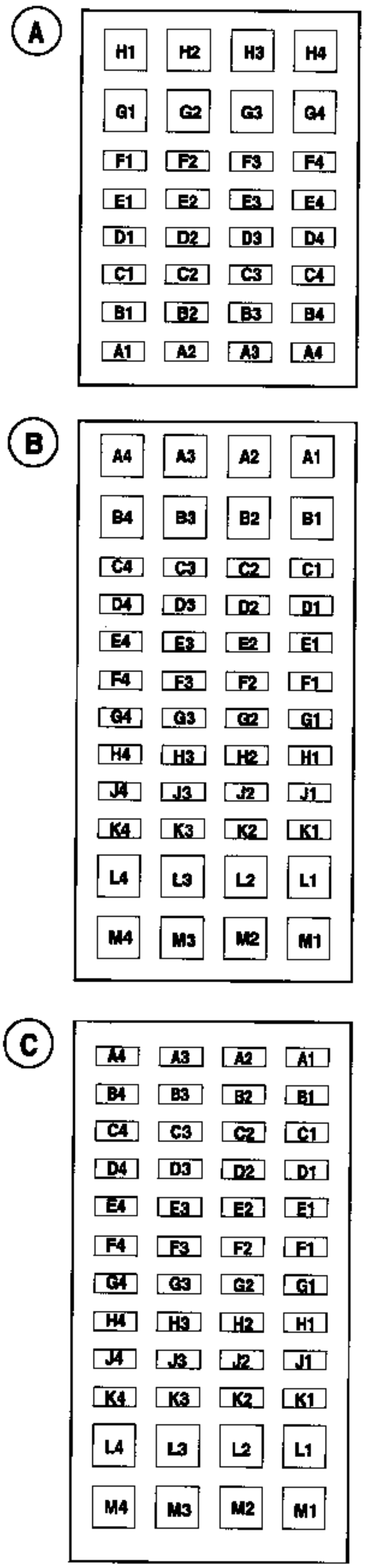
INJECTION COMPUTER TRACK ASSIGNMENTS



SE2009

CONNECTOR C

A2	←	DOWNSTREAM OXYGEN SENSOR SIGNAL
B2	---	DOWNSTREAM OXYGEN SENSOR SIGNAL EARTH
B1	←	UPSTREAM OXYGEN SENSOR SIGNAL
C1	---	UPSTREAM OXYGEN SENSOR SIGNAL EARTH
D1	→	FUEL PUMP CONTROL RELAY
E1	→	CANISTER BLEED SOLENOID VALVE
F2	→	HIGH SPEED FAN UNIT CONTROL RELAY
F1	→	LOW SPEED FAN UNIT CONTROL RELAY
G3	→	DOWNSTREAM OXYGEN SENSOR HEATER CONTROL
G2	---	+ AFTER RELAY FEED
G1	→	UPSTREAM OXYGEN SENSOR HEATER CONTROL
H3	→	CYLINDERS 2 AND 3 IGNITION COIL CONTROL
H2	→	CYLINDERS 1 AND 4 IGNITION COIL CONTROL
H1	---	POWER EARTH
E 2	→	CAMSHAFT DEPHASER SOLENOID VALVE (F4P only)



PRO16020

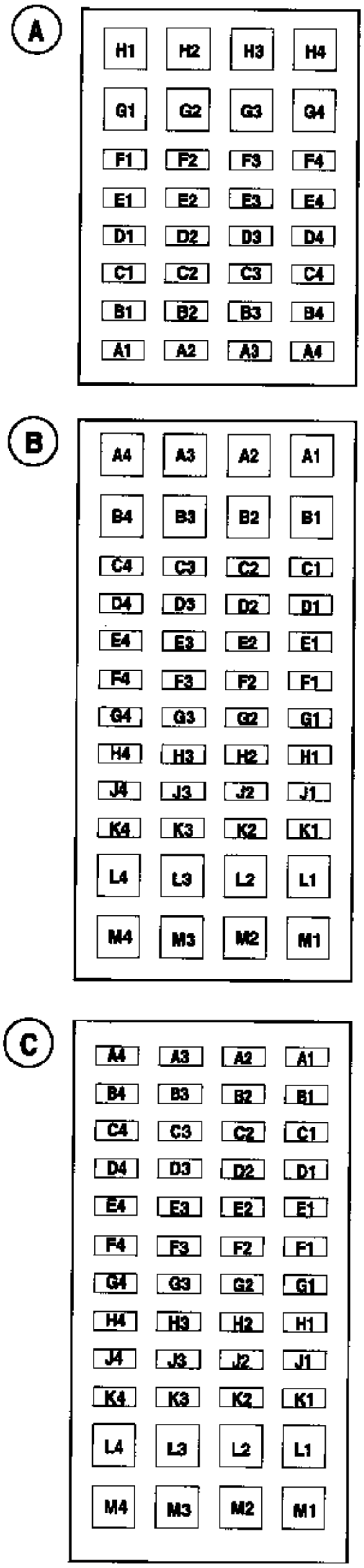
TRACK ASSIGNMENTS

CONNECTOR A

A3	---	MANIFOLD PRESSURE SENSOR FEED
B2	---	CRUISE CONTROL/SPEED LIMITER SWITCHES FEED
B3	←	MANIFOLD PRESSURE SENSOR SIGNAL
C3	---	MANIFOLD PRESSURE SENSOR EARTH
C4	---	AIR TEMPERATURE SENSOR FEED
D1	←	OIL TEMPERATURE SENSOR SIGNAL
D2	---	COOLANT TEMPERATURE SENSOR FEED
D3	←	COOLANT TEMPERATURE SENSOR SIGNAL
D4	←	AIR OIL TEMPERATURE SENSOR SIGNAL
E1	←	REAR CYLINDERS DOWNSTREAM OXYGEN SENSOR SIGNAL
E2	←	REAR CYLINDERS UPSTREAM OXYGEN SENSOR SIGNAL
E3	←	FRONT CYLINDERS DOWNSTREAM OXYGEN SENSOR SIGNAL
E4	←	FRONT CYLINDERS UPSTREAM OXYGEN SENSOR SIGNAL
F1	---	REAR CYLINDERS UPSTREAM OXYGEN SENSOR SIGNAL EARTH
F2	---	REAR CYLINDERS DOWNSTREAM OXYGEN SENSOR SIGNAL EARTH
F3	---	FRONT CYLINDERS DOWNSTREAM OXYGEN SENSOR SIGNAL EARTH
F4	---	FRONT CYLINDERS UPSTREAM OXYGEN SENSOR SIGNAL EARTH
G1	←	CRUISE CONTROL/SPEED LIMITER SWITCHES SIGNAL
G2	→	CYLINDER 6 IGNITION COIL CONTROL
G3	→	CYLINDER 5 IGNITION COIL CONTROL
G4	→	CYLINDER 4 IGNITION COIL CONTROL
H1	---	POWER EARTH
H2	→	CYLINDER 1 IGNITION COIL CONTROL
H3	→	CYLINDER 3 IGNITION COIL CONTROL
H4	→	CYLINDER 2 IGNITION COIL CONTROL
A2	→←	CAN L MULTIPLEX LINK (ENGINE)
C2	→←	CAN H MULTIPLEX LINK (ENGINE)

CONNECTOR B

A1	←	PEDAL POTENTIOMETER SIGNAL (TRACK 1)
A2	←	PEDAL POTENTIOMETER SIGNAL (TRACK 2)
A3	---	PEDAL POTENTIOMETER EARTH (TRACK 2)
B1	---	PEDAL POTENTIOMETER FEED (TRACK 1)
B2	←	STOP SWITCH SIGNAL
B4	---	+ AFTER IGNITION
C1	←	SPEED LIMITER ON/OFF SWITCH
E3	←	POWER STEERING PRESSOSTAT SIGNAL
H1	---	PEDAL POTENTIOMETER FEED (TRACK 2)
H2	→←	FAULT FINDING
J4	→	LOW SPEED FAN UNIT CONTROL RELAY
K1	---	PEDAL POTENTIOMETER EARTH (TRACK 1)
K4	→	HIGH SPEED FAN UNIT CONTROL RELAY
L1	←	CRUISE CONTROL ON/OFF SWITCH
L4	---	POWER EARTH
M4	---	POWER EARTH
H3	→←	CAN H MULTIPLEX LINK WITH PASSENGER COMPARTMENT CONTROL UNIT
H4	→←	CAN H MULTIPLEX LINK WITH PASSENGER COMPARTMENT CONTROL UNIT



PRO16020

CONNECTOR C

A1	←	FRONT CYLINDERS PINKING SENSOR SIGNAL
A2	---	FRONT CYLINDERS PINKING SENSOR EARTH
A3	←	REAR CYLINDERS PINKING SENSOR SIGNAL
A4	---	REAR CYLINDERS PINKING SENSOR EARTH
B1	---	FRONT AND REAR CYLINDERS CAMSHAFT SENSOR EARTH
B2	---	FRONT AND REAR CYLINDERS CAMSHAFT SENSOR FEED
B3	←	MOTORISED THROTTLE BODY POTENTIOMETER SIGNAL (TRACK 1)
B4	←	MOTORISED THROTTLE POTENTIOMETER SIGNAL (TRACK 2)
C1	←	FRONT CYLINDERS CAMSHAFT SENSOR SIGNAL
C2	←	REAR CYLINDERS CAMSHAFT SENSOR SIGNAL
C3	---	MOTORISED THROTTLE BODY POTENTIOMETERS EARTH (TRACK 1 AND 2)
C4	---	+5 V MOTORISED THROTTLE BODY POTENTIOMETERS FEED (TRACK 1 AND 2)
E1	→	ACTUATOR CONTROL RELAY
E2	←	ENGINE SPEED SENSOR SIGNAL
E3	←	ENGINE SPEED SENSOR SIGNAL
F1	→	REAR CYLINDERS CAMSHAFT DEPHASER CONTROL
F4	→	CANISTER BLEED SOLENOID VALVE
G1	→	FRONT CYLINDERS CAMSHAFT DEPHASER CONTROL
H4	---	INJECTORS FEED
J3	→	INJECTOR 2 CONTROL
J4	→	INJECTOR 4 CONTROL
K1	→	INJECTOR 1 CONTROL
K2	→	INJECTOR 6 CONTROL
K3	→	INJECTOR 3 CONTROL
K4	→	INJECTOR 5 CONTROL
L1	→	FRONT CYLINDERS UPSTREAM OXYGEN SENSOR HEATER CONTROL
L2	→	FRONT CYLINDERS DOWNSTREAM OXYGEN SENSOR HEATER CONTROL
L3	---	+ AFTER RELAY FEED
L4	→	(-) MOTORISED THROTTLE CONTROL
M1	→	REAR CYLINDERS UPSTREAM OXYGEN SENSOR HEATER CONTROL
M2	→	REAR CYLINDERS DOWNSTREAM OXYGEN SENSOR HEATER CONTROL
M3	→	(+) MOTORISED THROTTLE CONTROL
M4	---	POWER EARTH

TYPE AND QUANTITY OF COOLANT

Engine	Volume (in litres)	Grade	Special notes
K4M-F4P	6.5	**GLACEOL RX (type D)** only use coolant liquid	Protection down to - 20 ± 2°C for temperate and cold countries Protection down to - 37 ± 2°C for very cold countries
F9Q	7		
L7X	7.2		

THERMOSTAT

Engine type	Starts to open at (°C)	Fully open at (°C)	Travel (mm)
K4M-F4P-F9Q	89	101	7.5
L7X	83	95	7.9

Coolant flow is continuous in the heater matrix, which contributes to the cooling of the engine.

FILLING

It is imperative that you open the bleed screws.

Fill the circuit through the expansion bottle opening.

Close the bleed screws as soon as the liquid starts to flow in a continuous stream.

Start the engine (**2500 rpm**).

Adjust the level by overflow and allow it to continue for about **4 minutes**.

Close the bottle.

BLEEDING

Allow the engine to run for about **20 minutes** at **2500 rpm**, until the engine cooling fan starts up (time necessary for automatic degassing).

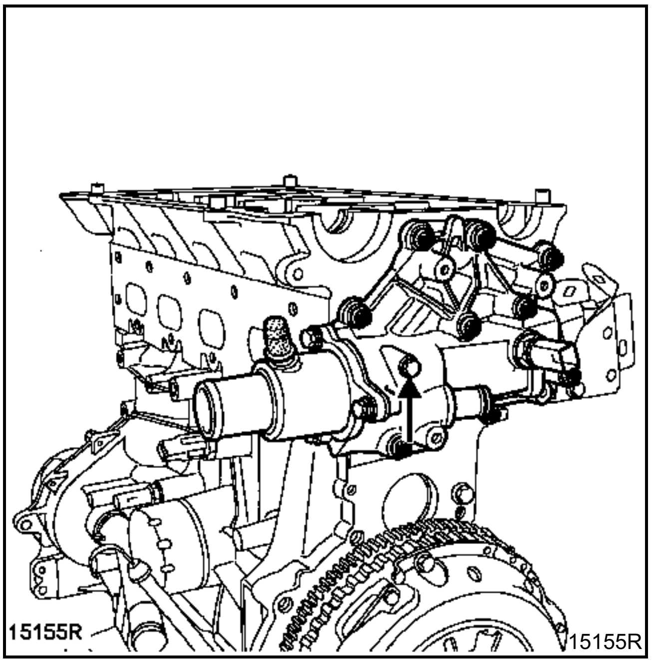
Verify that the liquid level is at or near the "**Maximum**" marker.

DO NOT OPEN THE BLEED SCREW(S) WHILE THE ENGINE IS RUNNING.

RE-TIGHTEN THE EXPANSION BOTTLE CAP WHILE THE ENGINE IS WARM.

K4M and F4P engines

Location of the bleed screw on the coolant housing.



ESSENTIAL SPECIAL TOOLS	
M.S. 554-01	**Adaptor for M.S. 554-07**
M.S. 554-06	**Adaptor for M.S. 554-07**
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 tool **M.S. 554-07** to the adapter.

Warm up the engine then switch it off.

Pump to put the circuit under pressure.

Stop pumping at **0.1 bar** below the valve rating.

The pressure should not drop; if it does, look for the leak.

Gradually unscrew the connector of tool **M.S. 554-07** to depressurise the cooling circuit, then remove tool **M.S. 554-01** and refit the expansion bottle valve fitted with a new seal.

2 - Checking the valve rating.

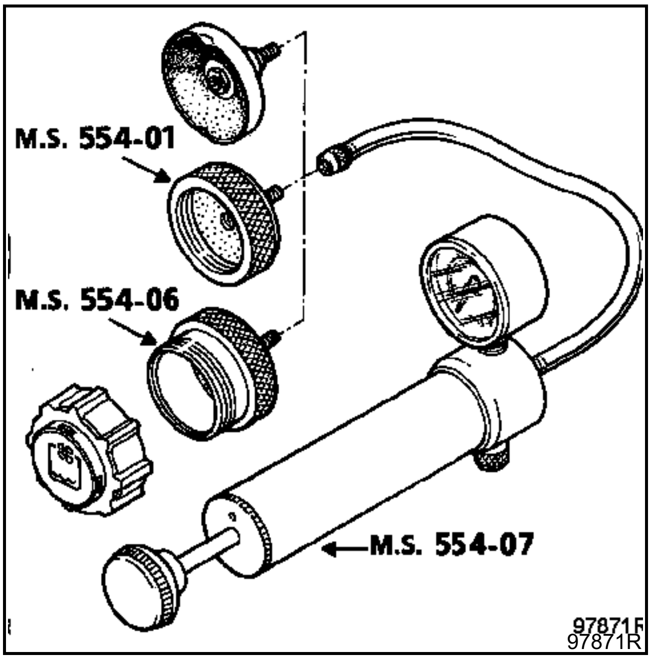
If liquid passes through the expansion bottle valve, the valve must be replaced.

Fit tool **M.S. 554-06** to pump **M.S. 554-07** and fit the valve to be checked to the tool.

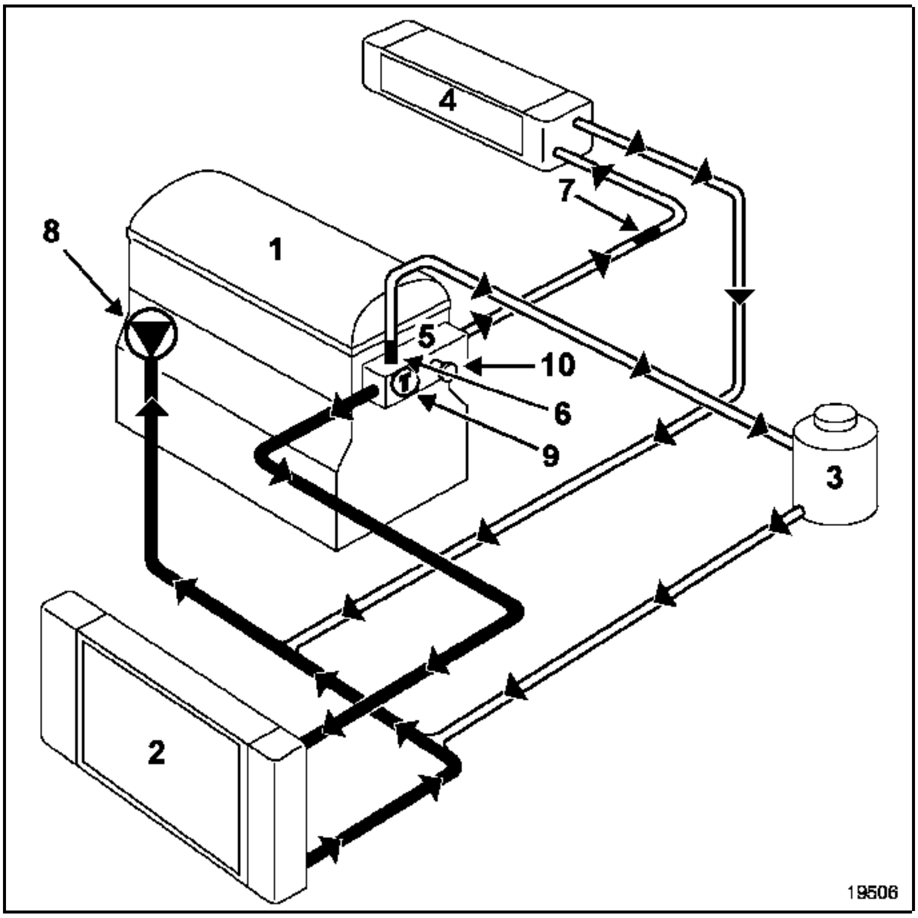
Increase the pressure, which should stabilise at the valve rating pressure with a test tolerance of ± **0.1 bar**.

Valve rating value:

Engines	Colour of valve	Valve rating (in bar)
All types	Brown	1.2



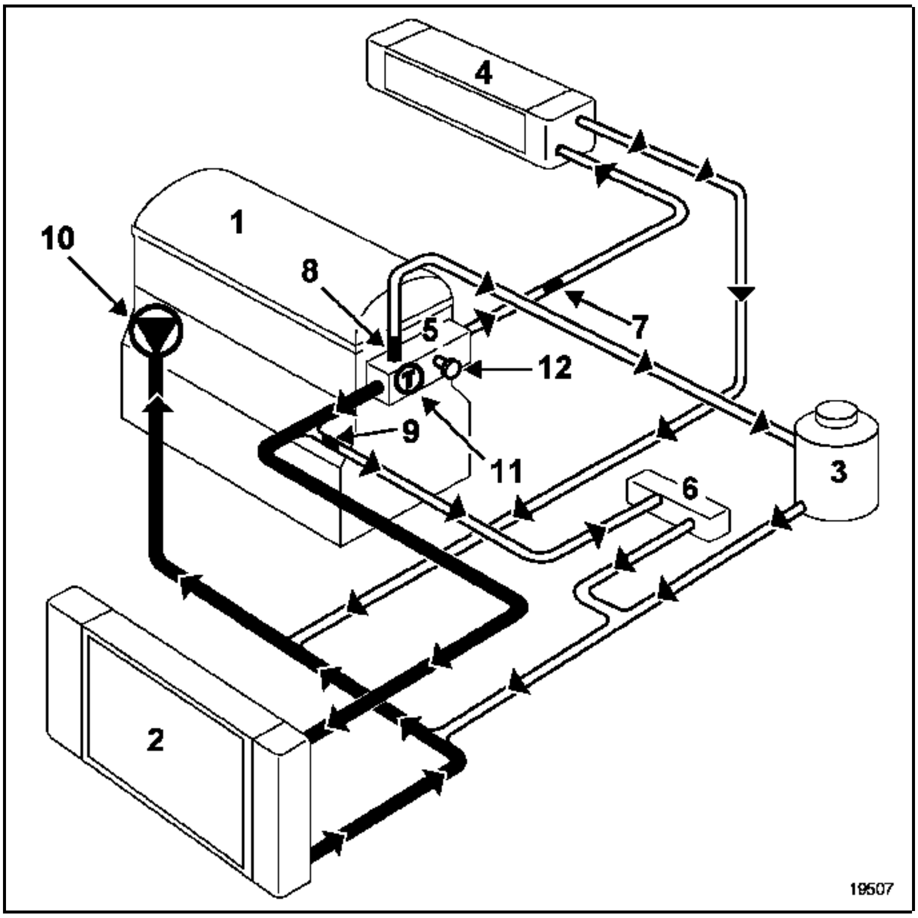
MANUAL GEARBOX



1 Engine
2 Radiator
3 "Hot" bottle with degassing after thermostat
4 Heater matrix
5 Thermostat mounting
6 ∅ **3 mm** restriction
7 ∅ **8.5 mm** restriction
8 Coolant pump
9 Thermostat
10 Bleed screw

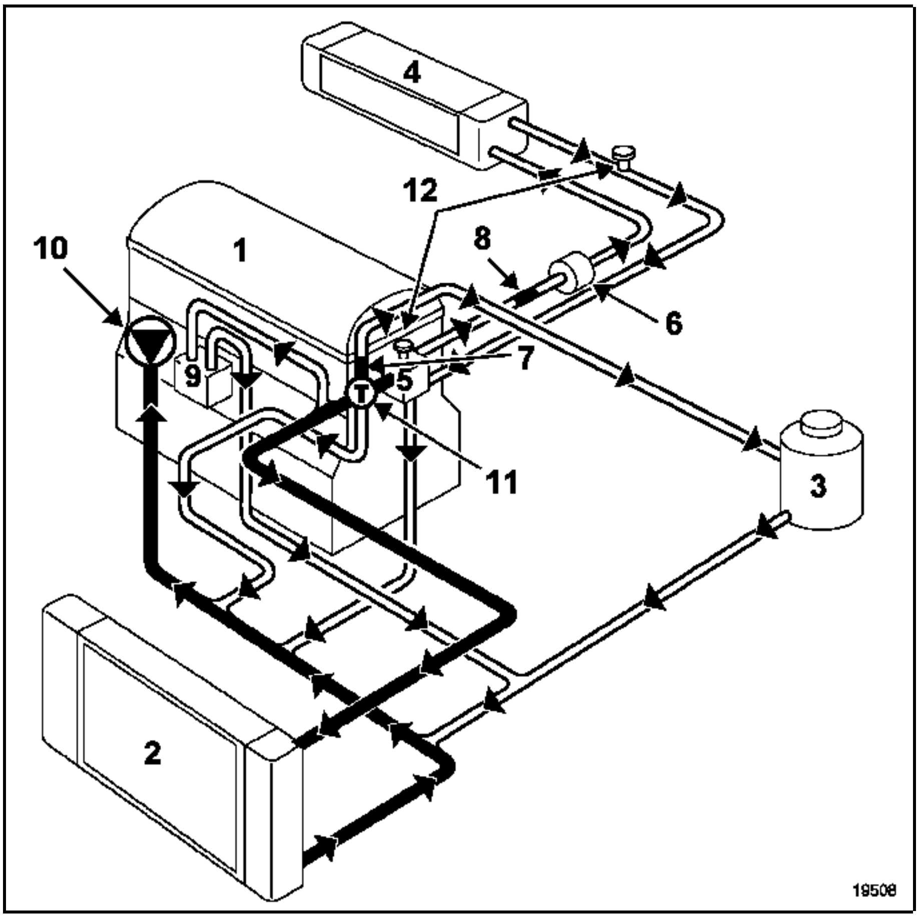
The rating value of the expansion bottle valve is **1.2 bar** (brown).

AUTOMATIC TRANSMISSION



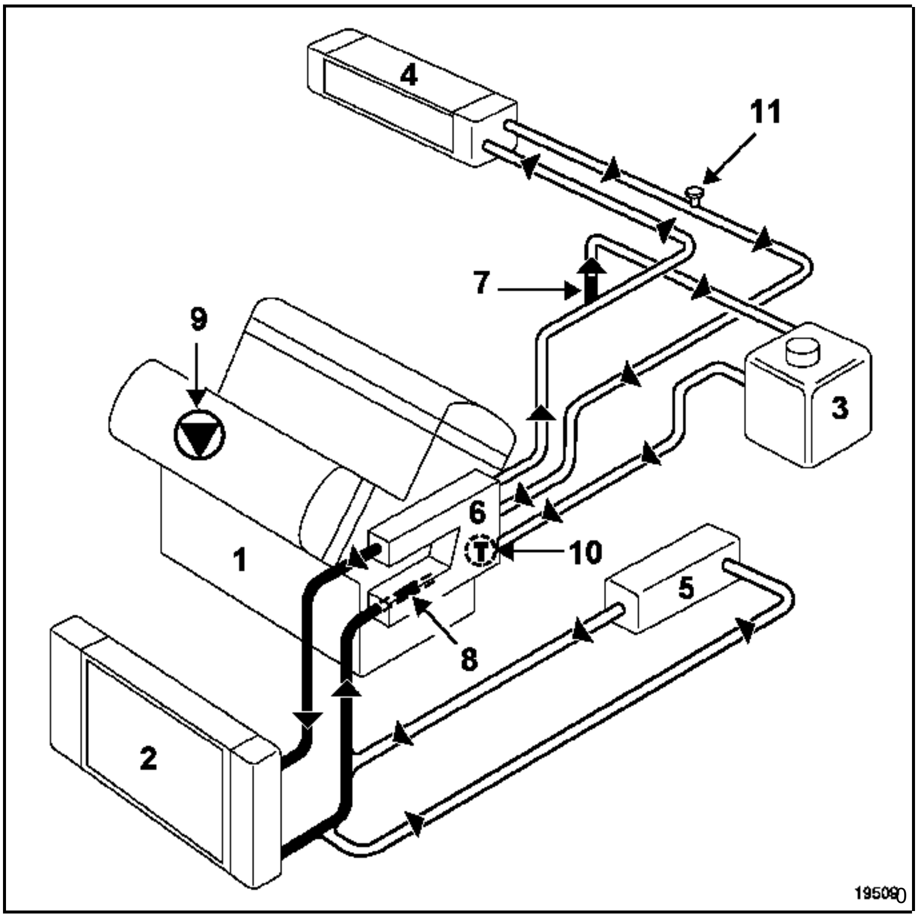
1 Engine
2 Radiator
3 "Hot" bottle with degassing after thermostat
4 Heater matrix
5 Thermostat mounting
6 Automatic transmission oil heat exchanger
7 ∅ **3 mm** restriction
8 ∅ **8.5 mm** restriction
9 ∅**10 mm** restriction
10 Coolant pump
11 Thermostat
12 Bleed screw

The expansion bottle valve rating is **1.2 bar** (colour brown).



1 Engine
2 Radiator
3 "Hot" bottle with degassing after thermostat
4 Heater matrix
5 Thermostat mounting
6 Thermoplunger mounting (if fitted)
7 ∅ **3 mm** restriction
8 ∅ **8.5 mm** restriction
9 Coolant/oil heat exchanger
10 Coolant pump
11 Thermostat
12 Bleed screw

The rating value of the expansion bottle valve is **1.2 bar** (brown).



1 Engine
2 Radiator
3 "Hot" bottle with permanent degassing
4 Heater matrix
5 Automatic transmission oil heat exchanger
6 Coolant outlet housing
7 ∅ **3 mm** restriction
8 ∅**16 mm** restriction
9 Coolant pump
10 Double effect thermostat
11 Bleed screws

The rating value of the expansion bottle valve is **1.2 bar** (brown).

REMOVAL

Put the vehicle on a 2 post lift.

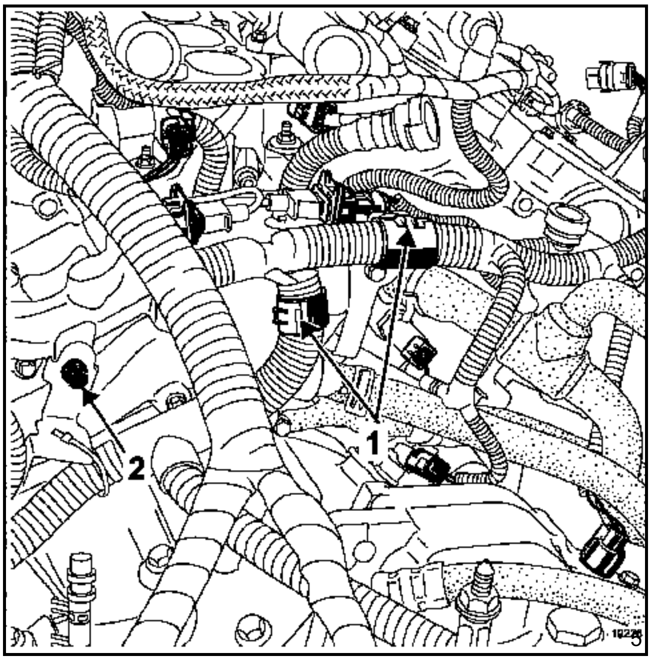
Disconnect the battery.

Remove the engine undertray.

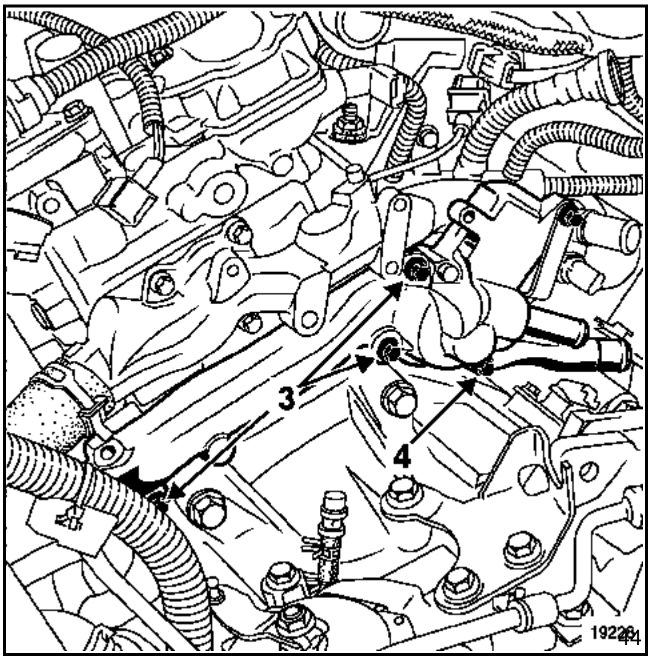
Drain the cooling circuit through the lower radiator hose.

Remove the air filter unit air intake tube.

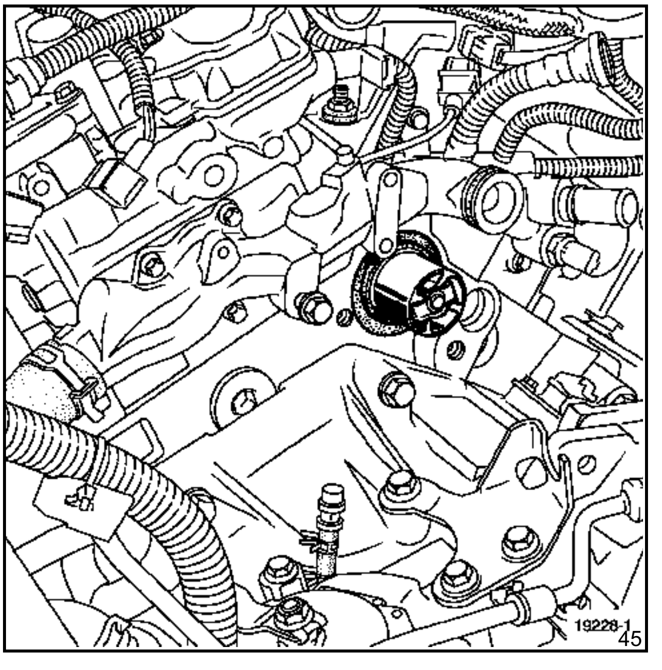
Unclip the harness at (1), remove the attachment at (2) then move the harness to one side.



Remove:
– the coolant hose attachments (3) and (4),



– the thermostat.



REFITTING

Proceed in the reverse order of removal.

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

ESSENTIAL SPECIAL TOOLS	
Mot. 1202-01 **Mot. 1202-02**	**Hose clip pliers**
Mot. 1448	**Long nose pliers for hose clips**

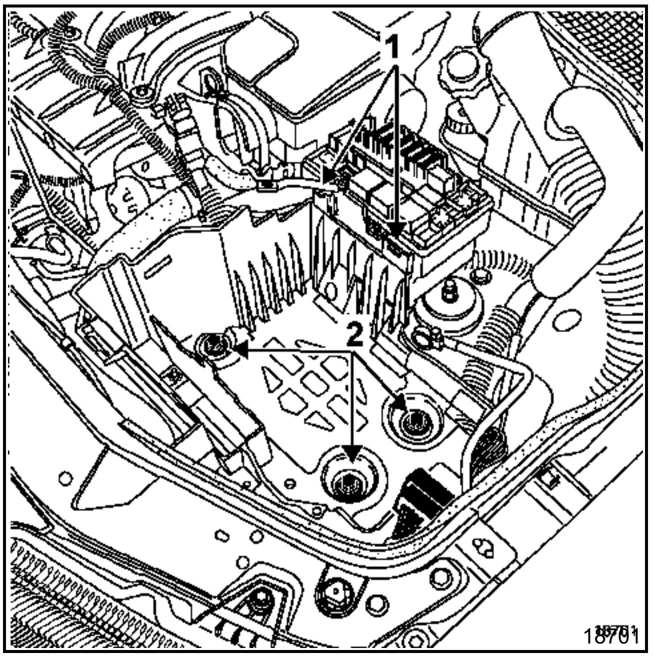
REMOVAL

Put the vehicle on a 2 post lift.

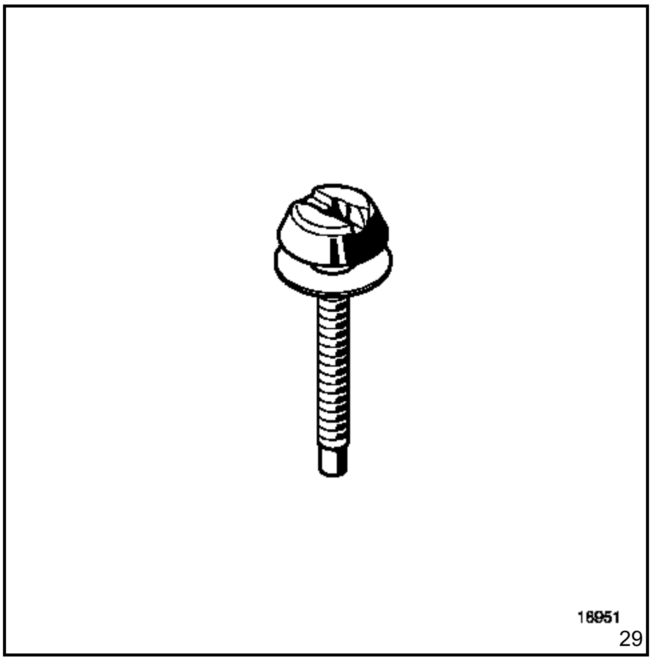
Remove the battery and the engine undertray.

Drain the cooling circuit through the lower radiator hose.

Remove:
– the relay plate at (1),
– the battery tray at (2).

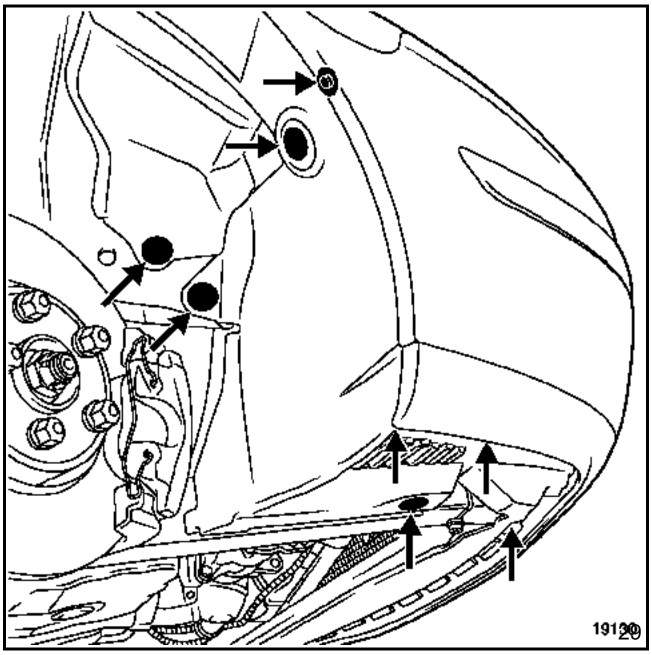


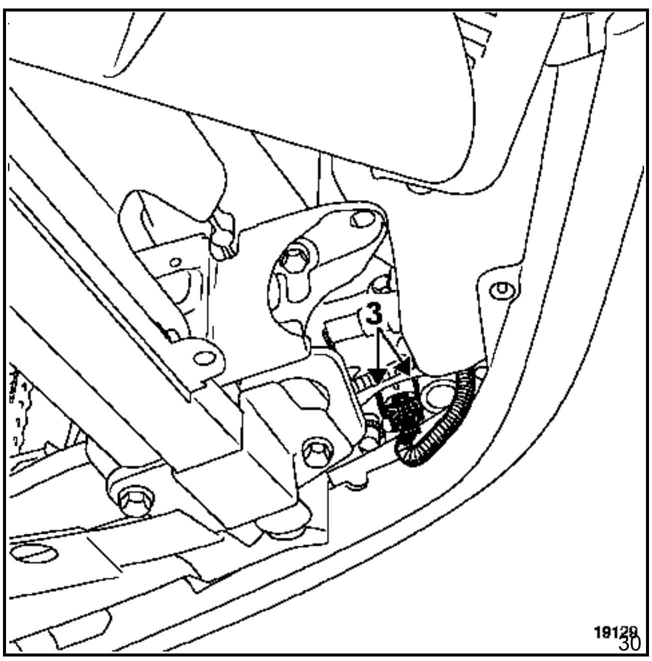
To do this, drill out the three tamperproof bolts using a ∅ 5 mm drill bit in the axis of the bolt. Then remove the bolts using a stud extractor.



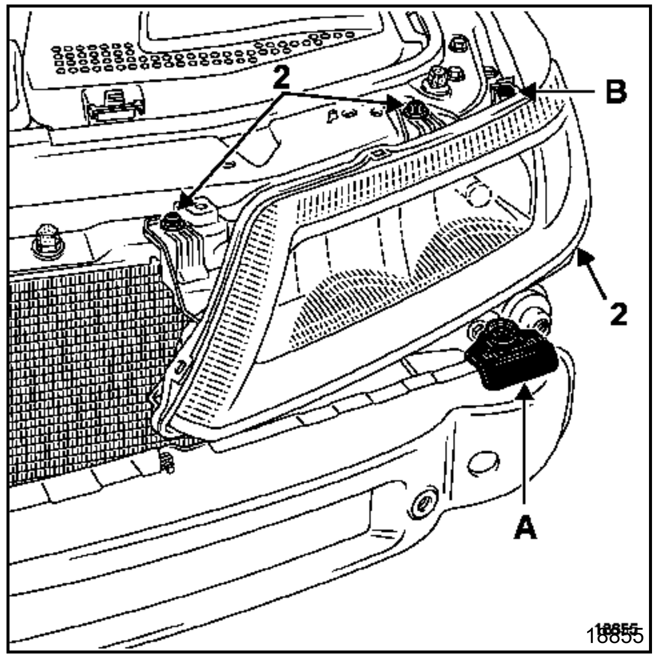
Unclip the power steering reservoir from its mounting and move it to one side.

Disconnect:
- the connectors of the fan unit,
- the radiator upper hose,
- the fog light connectors at (3), by partially removing the left and right wheel arch liners,





- the bumper,
- the two upper bumper guides (A), then release the clip (B) on each lens unit,
- the three attachment bolts (2) on each lens unit,
- the two lens units by disconnecting them.

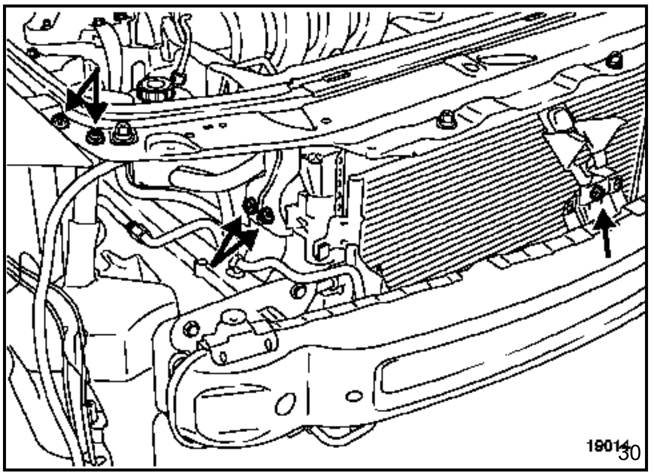


IMPORTANT:
The lens units must be adjusted once they have been fitted:
- park the vehicle on a level surface,
- set the adjustment control to 0,
- carry out the adjustment.

If the vehicle is fitted with Xenon headlights, you will have to initialise the system first, then adjust the beams (refer to the section "**Xenon headlights, initialisation of the system**").

IMPORTANT:
It is forbidden to turn the bulb with Xenon headlights on unless it is mounted in the lens unit (**this would be hazardous to the eyesight**).

Remove:
– the radiator grille,
– the upper cross member mountings, then move the member to one side and place it on the engine,



– the two lower radiator mountings.
– the air ducts to the heat exchanger (F9Q engine) and move them to one side,
– the condenser mounting clips on the radiator or heat exchanger (F9Q engine).

Attach the condenser to the cross member and remove the cooling assembly.

REFITTING

Refitting is the reverse of removal.

Ensure that the fins of the radiator or of the condenser are not damaged during removal and refitting; protect them if necessary.

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

ESSENTIAL SPECIAL TOOLS	
Mot. 1202-01 **Mot. 1202-02**	**Hose clip pliers**
Mot. 1448	**Long nose pliers for hose clips**

TIGHTENING TORQUES (in daNm)		
K4M engine		
water pump bolts	**M6**	**1**
	M8	**2.2**
F4P engine		
Water pump bolts		**0.9**

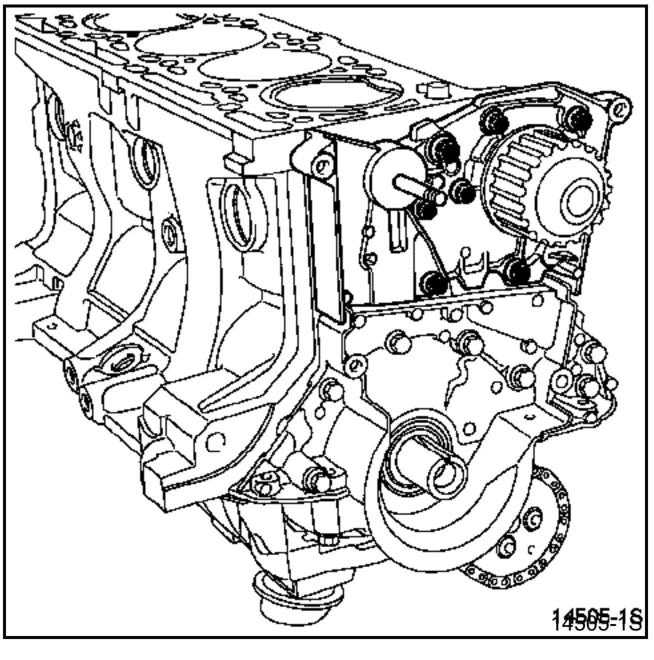
REMOVAL

Put the vehicle on a 2 post lift.

Disconnect the battery.

Drain the cooling circuit through the lower radiator hose.

Remove:
- the timing belt (see section **11 "Timing belt"**).
- the timing tensioner (K4M engine),
- the water pump.



Cleaning

It is very important not to scratch the gasket faces.

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

Wear gloves whilst carrying out the following operation.

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

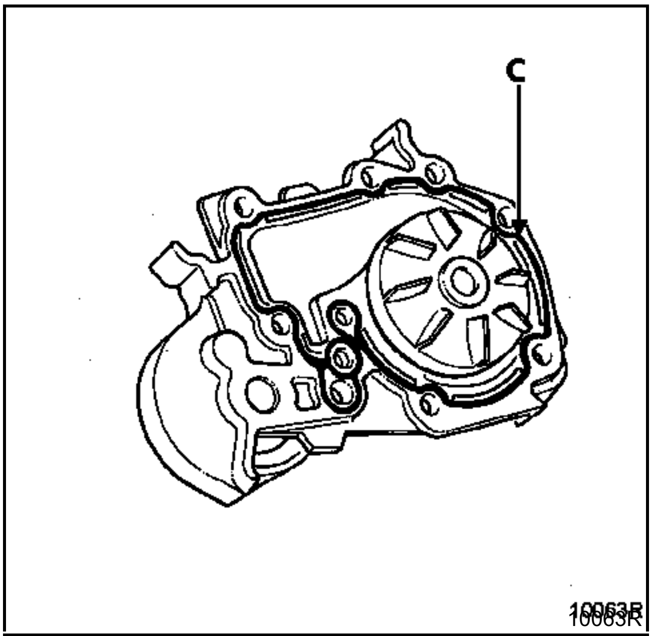
Do not allow this agent to drip on to the paintwork.

REFITTING

Refit the water pump.

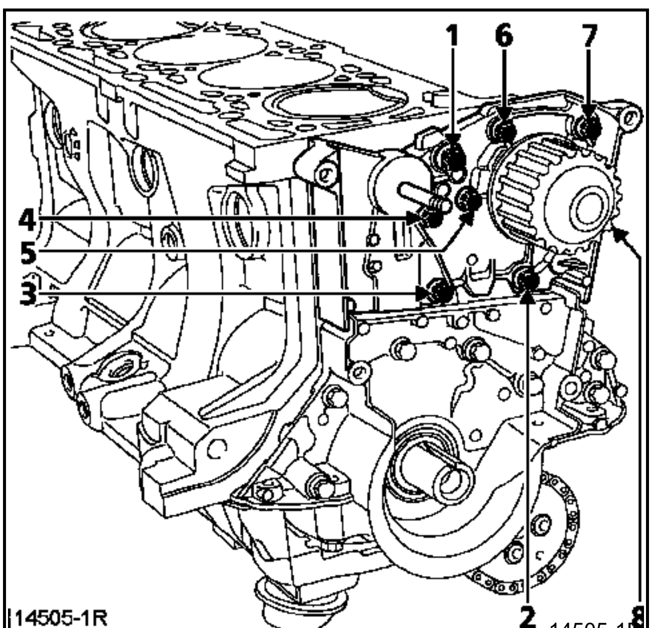
K4M engine

The pump is sealed using **Loctite 518**, the bead (C) must have a width of between **0.6** and **1 mm** and be applied as shown in the diagram below.

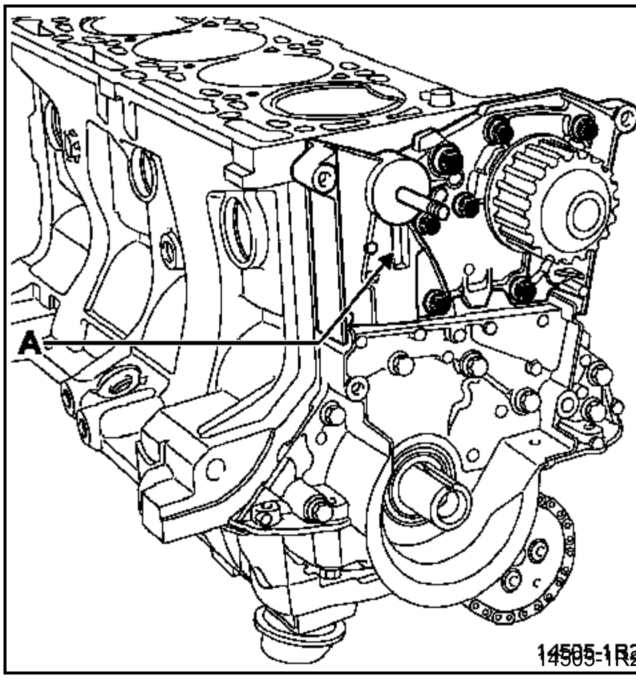


Pre-tighten the **M6** and **M8 bolts** to **0.8 daNm**, then tighten the **M6** bolts to **1.1 daNm** and the **M8** bolt to **2.2 daNm** in the recommended order.

NOTE: apply 1 or 2 drops of **Loctite FRENETANCH** to bolts **1** and **4** of the water pump.



Refit the timing tensioner, making sure to correctly locate the lug in the slot (A).

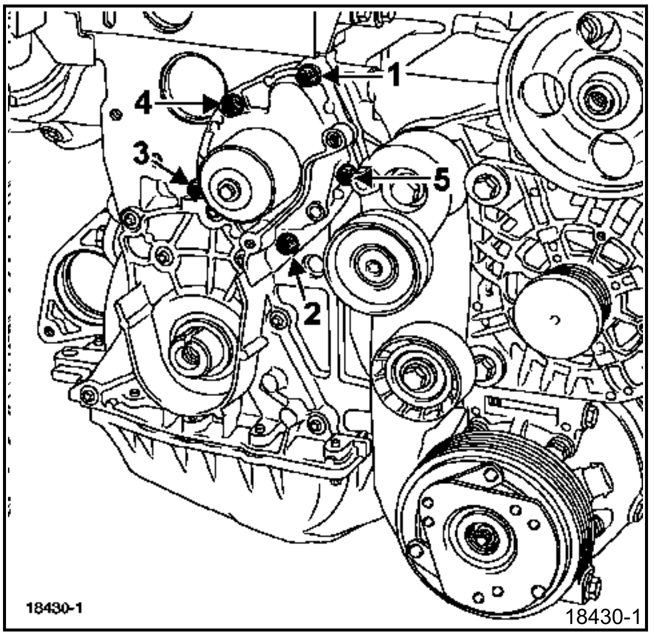


F4P engine

NOTE: put a drop of Loctite FRENETANCH on bolts (3) and (4).

Fit the new seal.

Finger tighten the water pump mounting bolts in the recommended order shown below, then tighten them to a torque of **0.9 daNm** in the same tightening order.



18430-1

Refit the timing belt (it is essential to follow the method described in Section **11 "Timing belt"**),

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

ESSENTIAL SPECIAL TOOLS	
Mot. 1202-01 Mot. 1202-02	Hose clip pliers
Mot. 1448	Long nose pliers for hose clips

TIGHTENING TORQUES (in daNm)	
Water pump bolts	0.9

REMOVAL

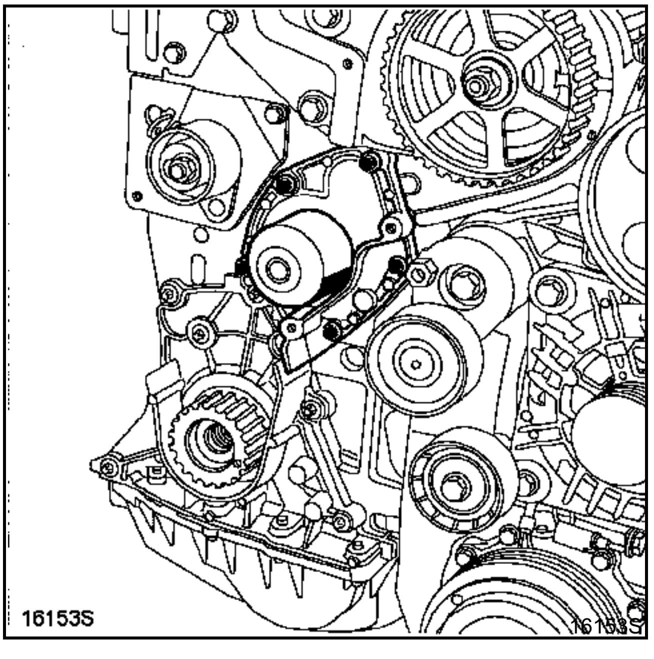
Put the vehicle on a 2 post lift.

Disconnect the battery.

Remove the engine undertray.

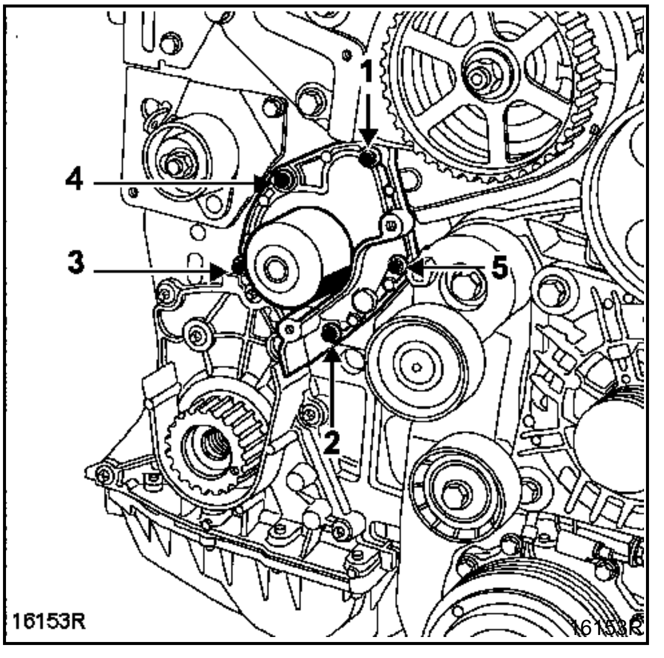
Drain the cooling circuit through the lower radiator hose.

Remove:
– the timing belt (see section **11 "Timing belt"**).
– the water pump.



REFITTING

NOTE: put a drop of Loctite FRENETANCH on bolts (3) and (4).



Refit:
– the water pump fitted with a new seal, tightening the bolts to a torque of **0.9 daNm**,
– the timing belt (see method described in section **11 "Timing belt")**.

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

ESSENTIAL SPECIAL TOOLS	
Mot. 1202-01 Mot. 1202-02	Hose clip pliers
Mot. 1448	Long nose pliers for hose clips
Mot. 1428	Exhaust camshaft hub locking tool
Mot. 1555	Inlet camshaft hub locking tool

TIGHTENING TORQUES (in daNm)	
Water pump bolts	0.8
Camshaft hub bolt	8

REMOVAL

Put the vehicle on a 2 post lift.

Disconnect the battery.

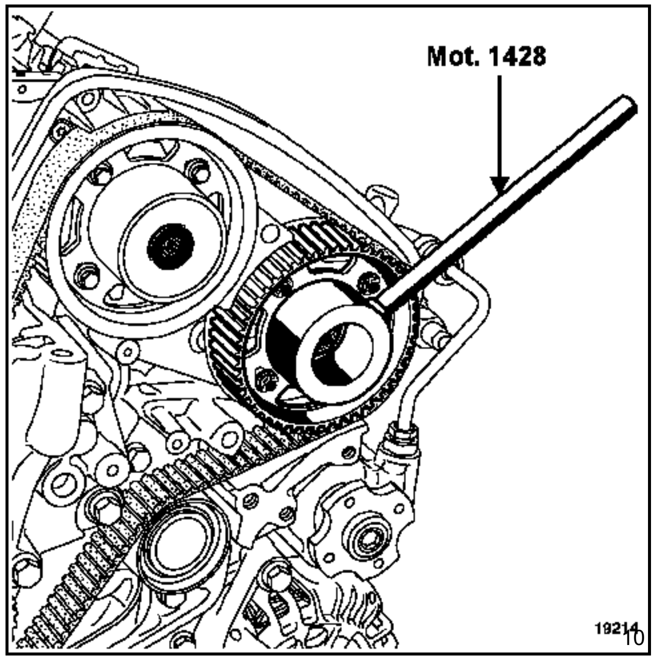
Drain the cooling circuit through the lower radiator hose.

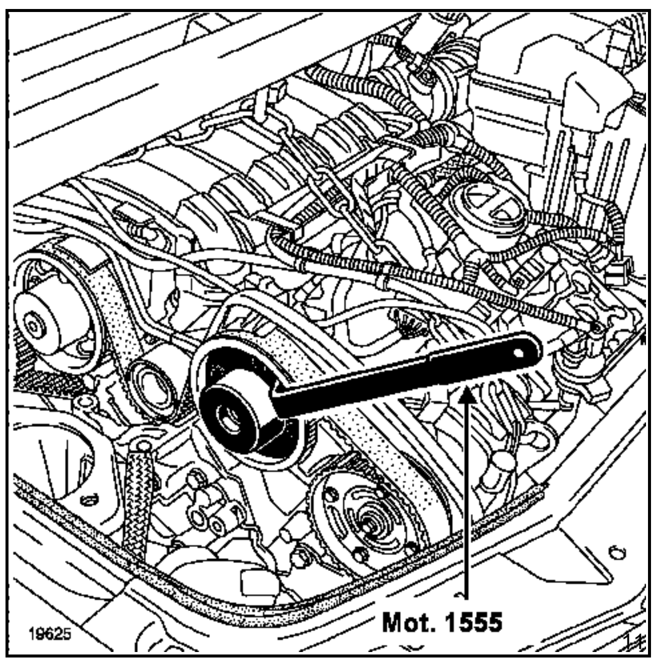
Remove:
- the timing belt (see method described in section **11,** "**Timing belt**").
- the **Mot. 1430** front cylinder head timing pins,

IMPORTANT

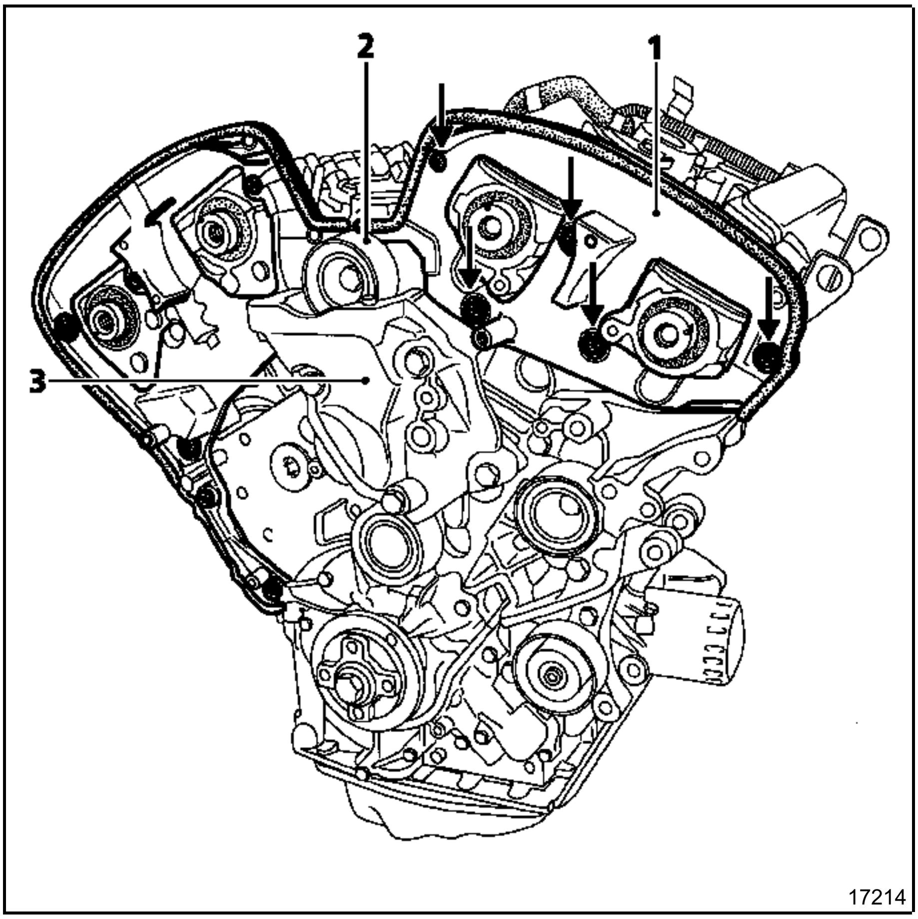
The camshaft hub mounting bolts have a left-hand thread; they are slackened clockwise. The arrows on the heads of these bolts indicate the tightening direction.

Remove:
- the front cylinder head camshaft sprocket-hub assembly, locking the hubs using tool **Mot. 1428** (exhaust camshaft hub) and tool **Mot. 1555** (inlet camshaft hub). For the latter, use a size 14 junior torx socket.

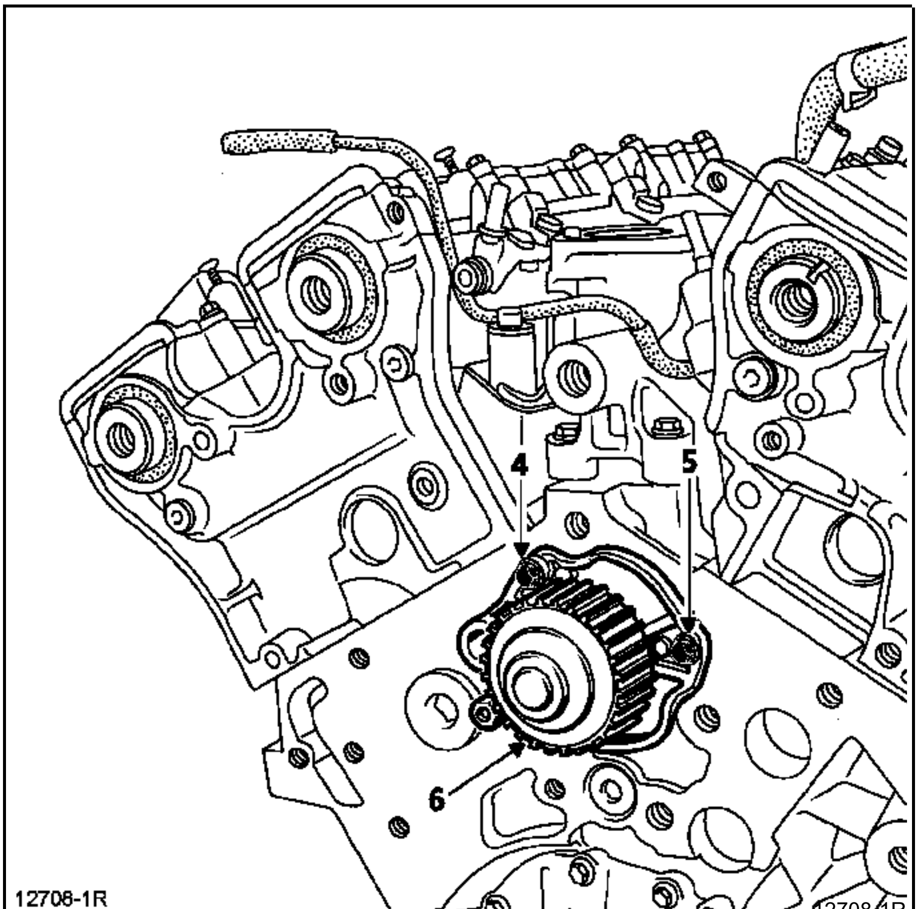




– the inner timing housing (1),
– the pulleys (2),
– the mounting (3) and take it out from above. If necessary, raise the engine using the **Mot. 1453** engine support tool.



Remove the water pump in the following order: bolts (4) and (5) then bolt (6).



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REFITTING

Refit the water pump, after fitting a new seal.

Observe the order of tightening (4), (5), (6), tightening to a torque of **0.8 daNm**.

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

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

The whole exhaust system is made of stainless steel.

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 be ignited.

All damaged heat shields must be replaced.

IMPORTANT:
– the seal between the exhaust manifold gasket face and the catalytic converter (inclusive) must be perfect,
– any damaged seal MUST BE REPLACED,
– when removing/refitting, the catalytic converter must not be subjected to mechanical shock, as this could damage it.

CUTTING THE EXHAUST PIPE

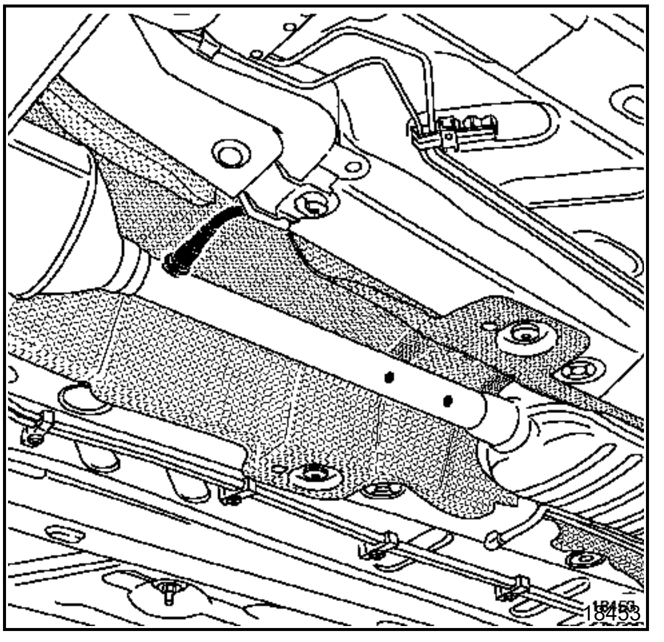
The exhaust pipes are of the one-piece type. This means there is no break between the catalytic converter inlet and the rear silencer inlet, except for vehicles fitted with the **L7X** engine.

It will therefore be necessary, when replacing one of the components in After Sales, to cut the exhaust pipe.

When doing this, it is absolutely essential to:
– carefully identify the area to be cut,
– use the **Mot. 1199-01**cutting tool,
– accurately position the after sales sleeve.

MARKING THE AREA TO BE CUT

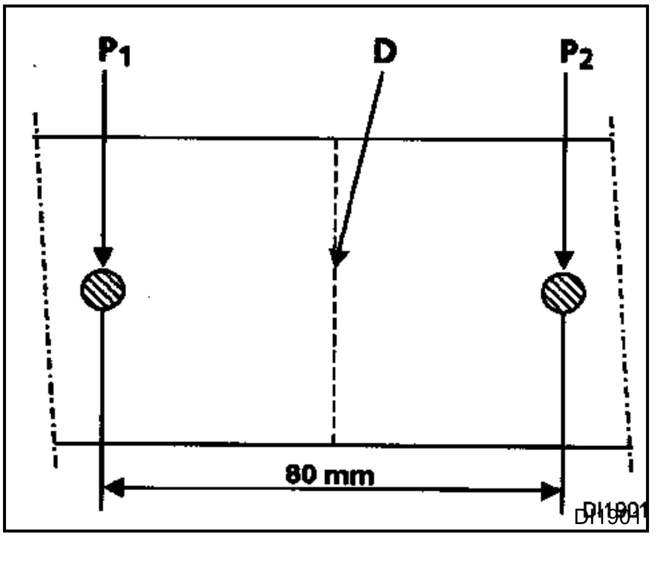
The area to be cut is defined by two punch holes made on the exhaust pipe between the catalytic converter and the expansion box (on K4, F4 and F5 engines).



The cutting area does not need to be marked on the **F9Q** system as the pipe is removed and refitted in one piece.

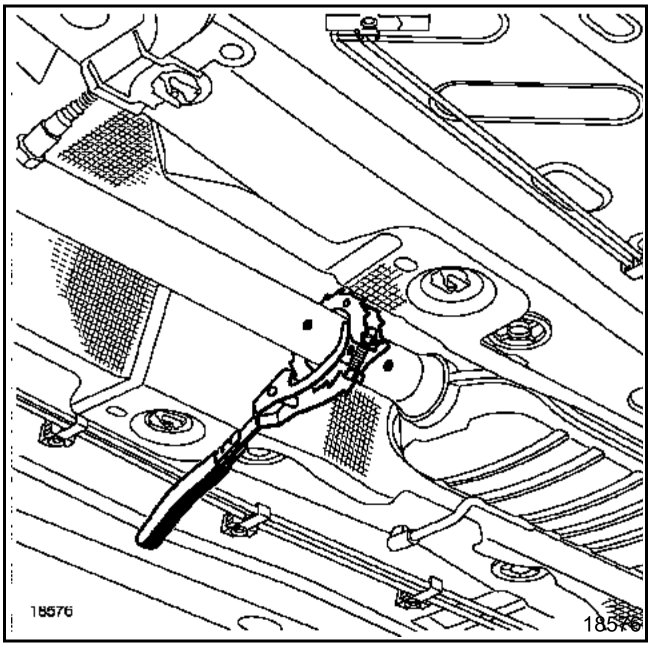
The distance between the two marks is **80 mm**.

To cut the pipe, mark the centre line (D) between the two punch holes (P1 and P2).



USING THE MOT. 1199-01 TOOL

Position the tool against the exhaust pipe.



Tighten the two bolts on the tool so that it grips the exhaust pipe.

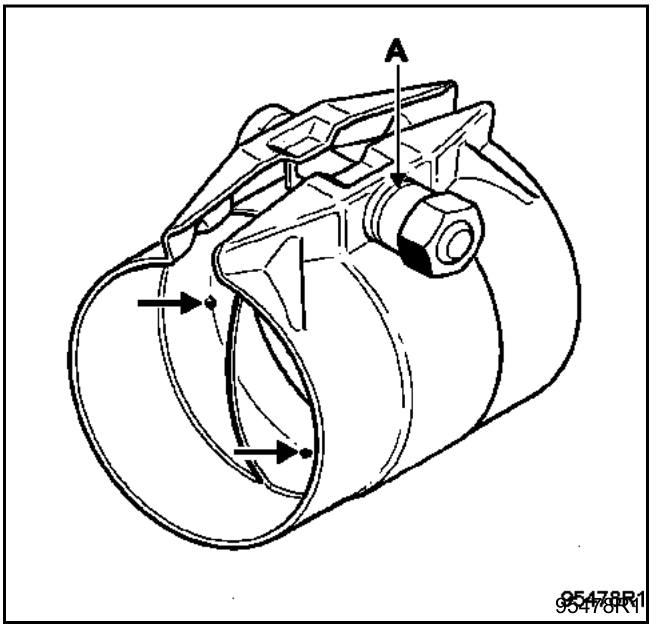
Turn the cutting tool using the handle while supporting the exhaust pipe.

As the cut is made, continue to tighten the two bolts of the tool (do not overtighten the tool against the pipe, to prevent distortion during the cutting operation).

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. This means that the pipe must be in contact with the lugs 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 to the pipe, apply a little mastic to the inner sleeve ring to prevent leaks (exhaust pipe mastic).

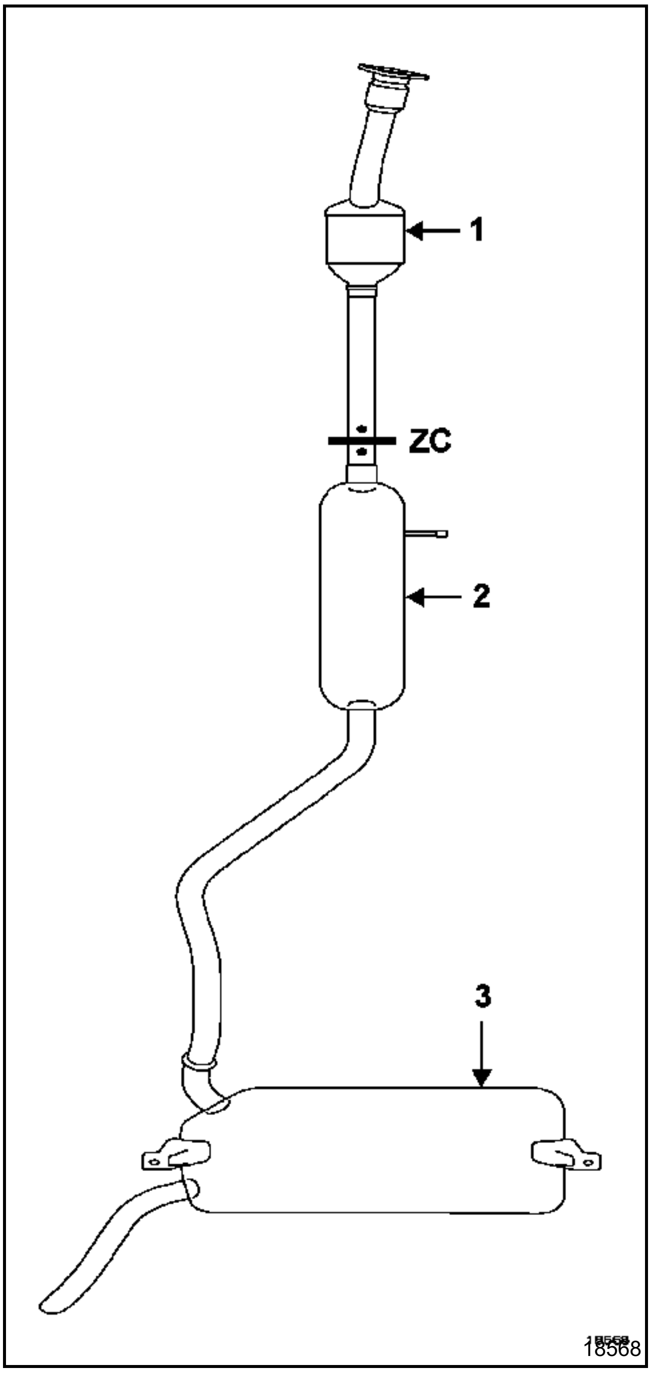
The nut on the collar has a groove (A) to ensure it is tightened to the correct torque.

When the nut is tightened and the groove disappears, it causes a characteristic clicking sound and the nut is then tightened to the correct torque (**2.5 daNm**).

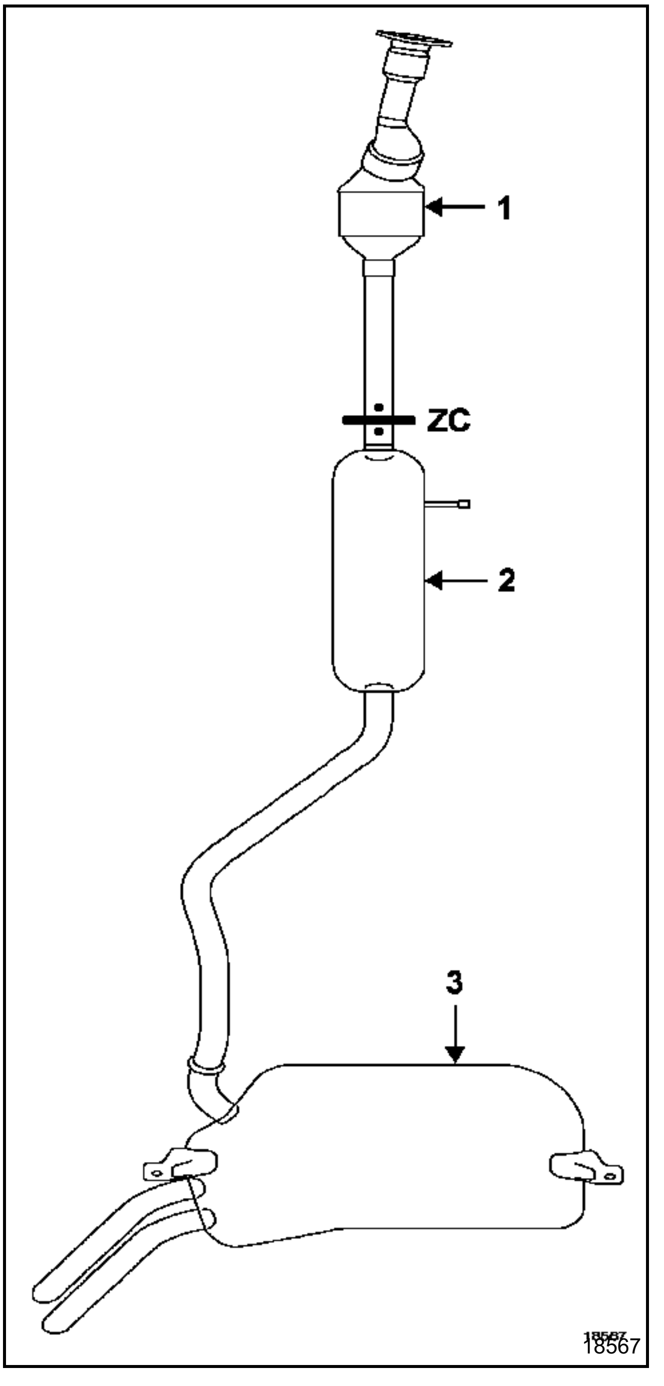
NOTES:
- **There are several sizes of sleeve.**
- **A collar that has been used once must be replaced.**

DIAGRAM OF EXHAUST PIPES AND LOCATION OF CUTTING AREAS

F4P and K4M engines



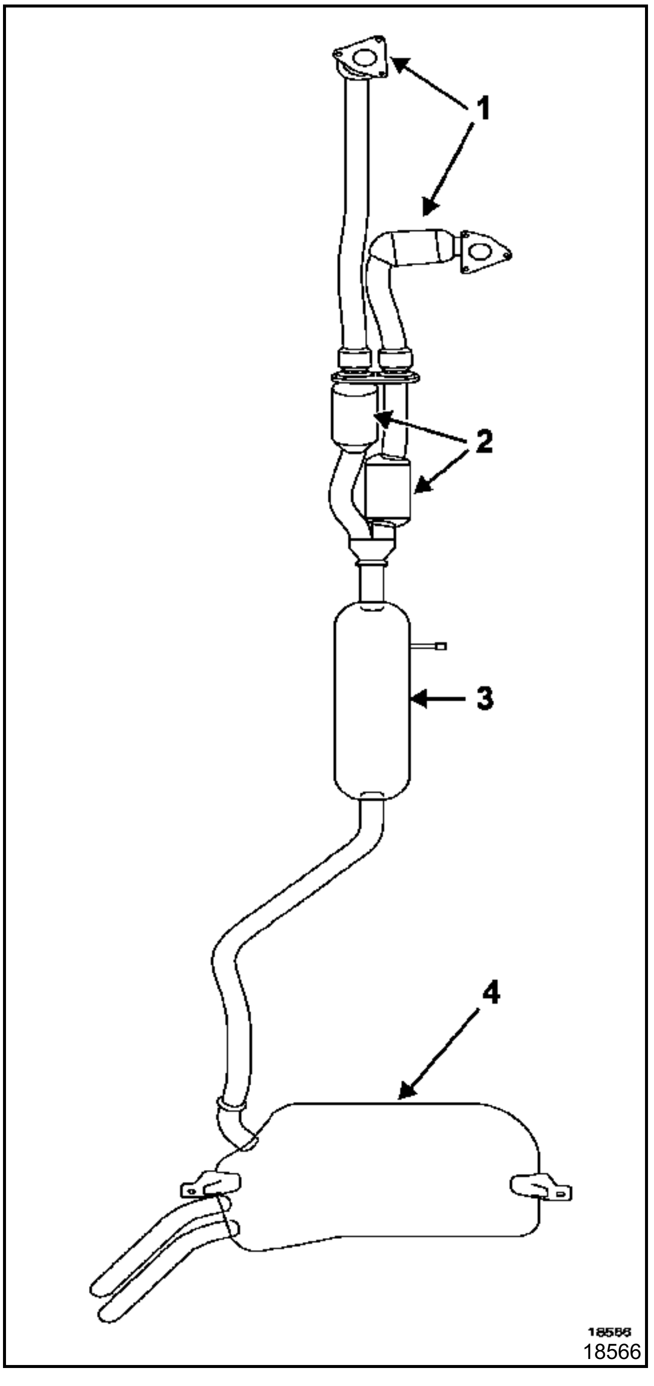
F5R engine



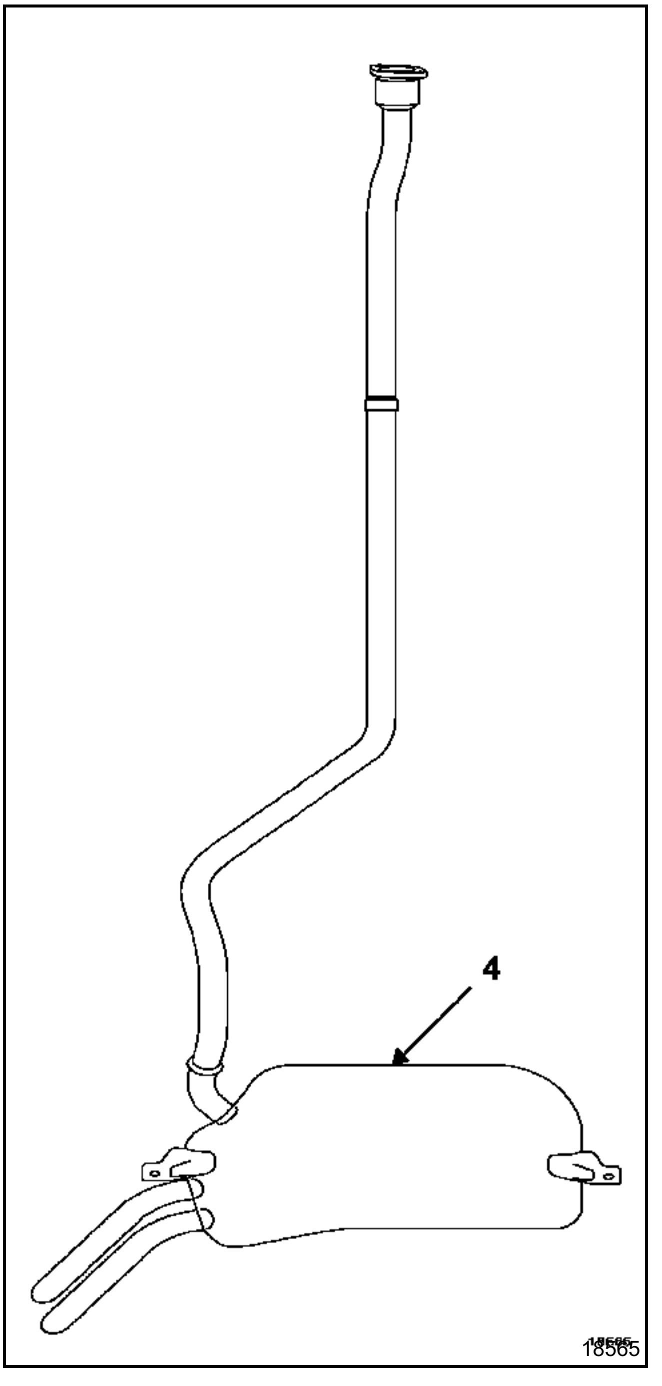
1	Catalytic converter
2	Expansion chamber
3	Silencer
ZC	Exhaust pipe cutting area

DIAGRAM OF EXHAUST PIPES AND LOCATION OF CUTTING AREAS

L7X engine



F9Q engine



1 Precatalytic converter
2 Catalytic converter
3 Expansion chamber
4 Silencer

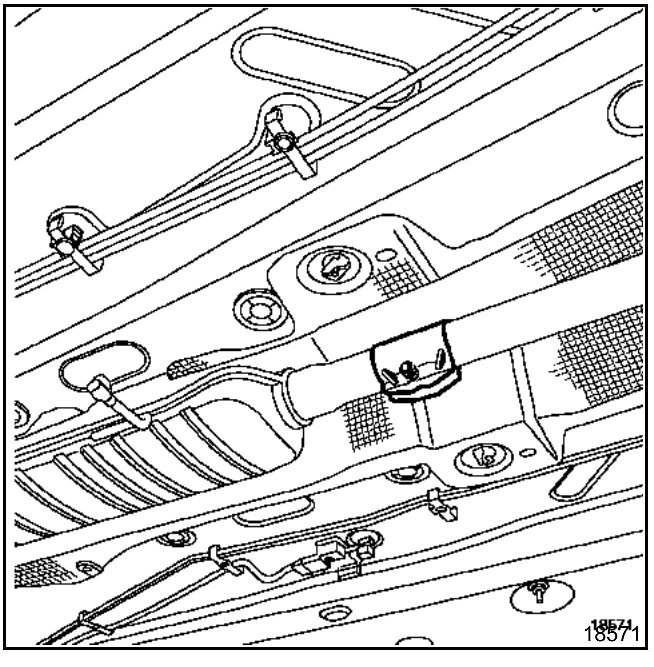
TIGHTENING TORQUES (in daNm)	
Downstream oxygen sensor	**4.5**
After sales sleeve nut	**2.5**
Silencer clamp	**2.5**
Three point flange nuts	**2**

To replace the expansion box or the catalytic converter, you must:
- disconnect the battery,
- remove the downstream oxygen sensor,
- cut the exhaust pipe as described in the General Information.

Before refitting a component, verify that no impurity or metal particle has lodged in the exhaust pipe.

Replace the catalytic converter inlet gasket if the converter is being replaced.

Once fitted, the clamp must not be re-used.



IMPORTANT:
- The sleeve bolt and tightening nut must be positioned so that they cannot come into contact with the underbody.
- Tighten the sleeve while manipulating the exhaust pipe so that it is correctly aligned.
- Check for the presence and correct positioning of all the exhaust pipe heat shields.
- After everything has been refitted, verify that no part of the exhaust pipe is in contact with the underbody.

IMPORTANT: all damaged heat shields must be replaced.

The other components of the exhaust do not pose any specific problems.

TIGHTENING TORQUES (in daNm)	
Catalytic converter/pre-converter flange nuts	2.1
Exhaust clamp	2.5

REMOVAL

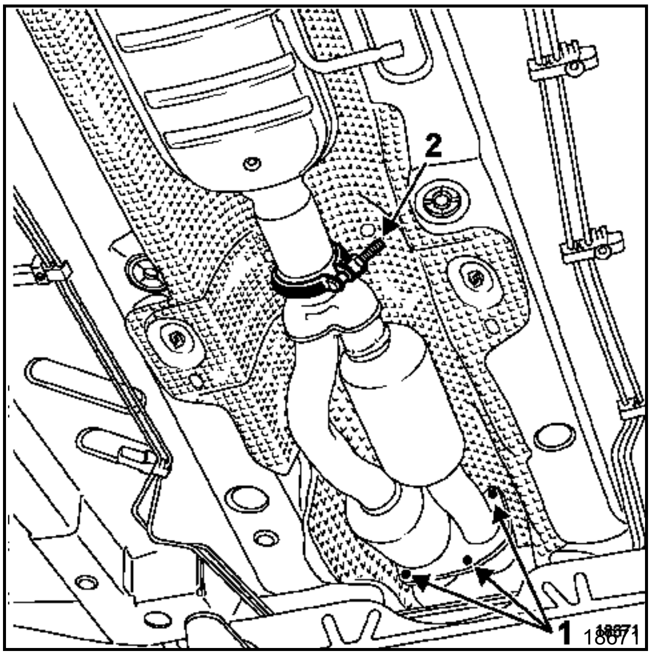
Put the vehicle on a 2 post lift.

Disconnect the battery.

Remove the under-engine fairing.

Place a component jack under the exhaust pipe to support it.

Remove the catalytic converter/pre-converter flange bolts, passing through the sub-frame using one or more extensions.



Remove the exhaust clamp (2) and the catalytic converter.

REFITTING

Refitting is the reverse of removal.

Replace the gaskets with new ones.

Fit a new clamp.

Observe the tightening torques.

The other components of the exhaust do not pose any specific problems.

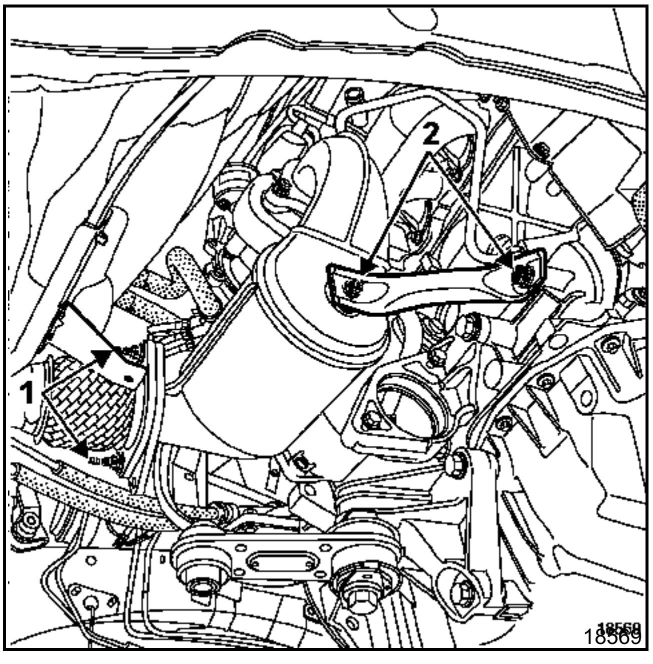
TIGHTENING TORQUES (in daNm)	
Exhaust flange nuts	**2.1**
Catalytic converter strut nut	**2.6**
Catalytic converter strut bolt	**2.1**
Nuts securing catalytic converter to the turbocharger	**2.6**

REMOVAL

Put the vehicle on a 2 post lift.

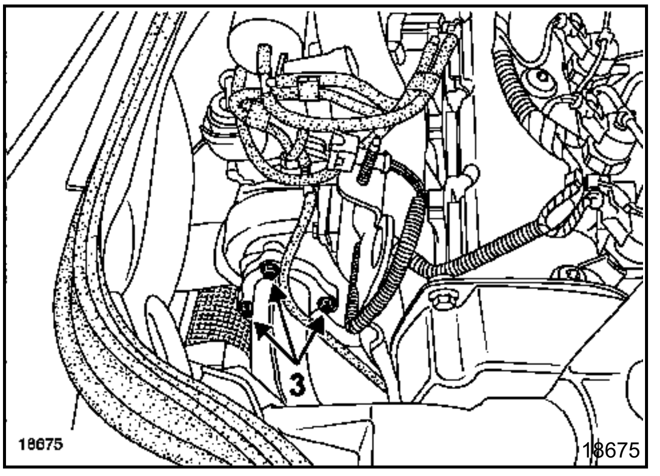
Disconnect the battery.

Remove:
– the front right wheel and the under-motor fairing,
– the two exhaust flange nuts (1),
– the catalytic converter strut, nut and bolt (2).



Disconnect the wastegate solenoid valve and move it to one side.

Remove:
– the three nuts (3) securing the catalytic converter to the turbocharger,
– the catalytic converter from above.



REFITTING

Refitting is the reverse of removal.
Replace the gaskets.

The other components of the exhaust do not pose any specific problems.

TOOLING REQUIRED	
Mot. 1495	Tool for removing and refitting the oxygen sensor

TIGHTENING TORQUES (in daNm)	
Front exhaust flange nuts	2.1
Catalytic converter/pre-converter flange nuts	2.1
Oxygen sensors (upstream and downstream)	4.5
Pre-converter stay bolt	2.1
The engine/engine tie bar bolt	18
Sub-frame tie-rod securing bolt	4.4
Steering shaft yoke bolts	2.1
Sub-frame rear securing bolt	10.5
Aluminium side member securing bolt	4.4
Tie-rod bolt	4.4

REMOVAL

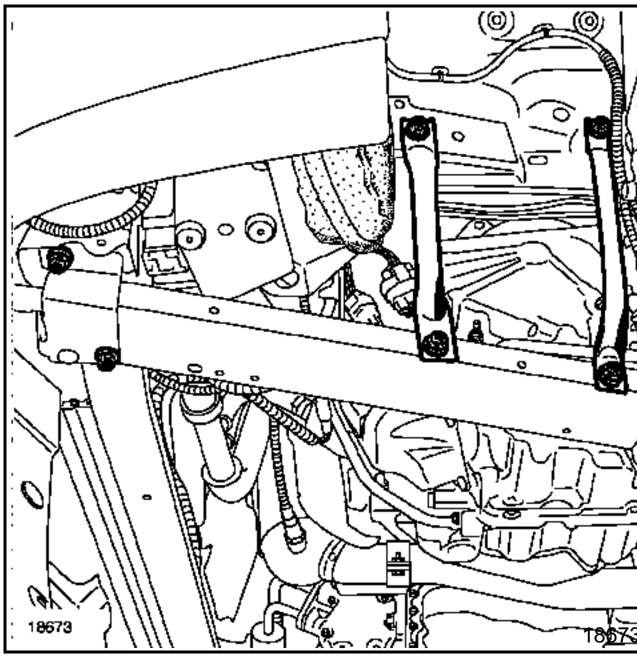
Put the vehicle on a 2 post lift.

Disconnect the battery after verifying that the steering column is locked.

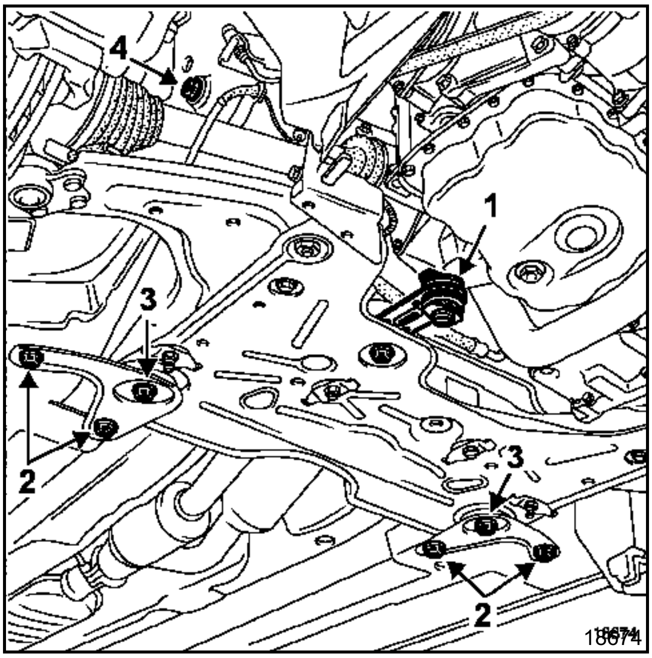
Remove:
- the front wheels and the under-engine fairing,
- the engine cover,
- the manifold heat shield,
- the nuts securing the exhaust flange to the manifold.

Disconnect and unclip the oxygen sensor connectors.

Remove the front tie-rods of the left and right sub-frames.

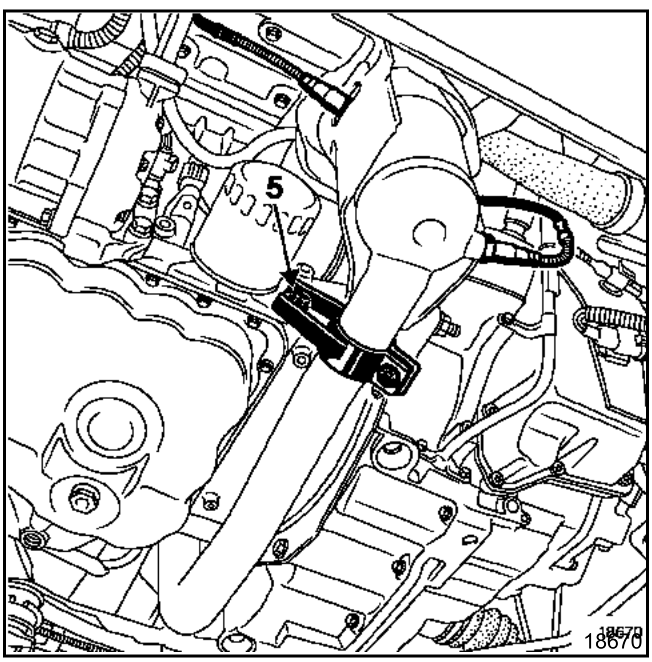


Lower the sub-frame a few centimetres:
- remove the engine tie-bar bolt (1),
- slacken the steering column universal joint bolt a few turns and release the nut by tapping the bolt,
- remove the sub-frame rear mounting triangle bolts (2),
- slacken the sub-frame rear mounting bolts (3) **a maximum of five turns**,



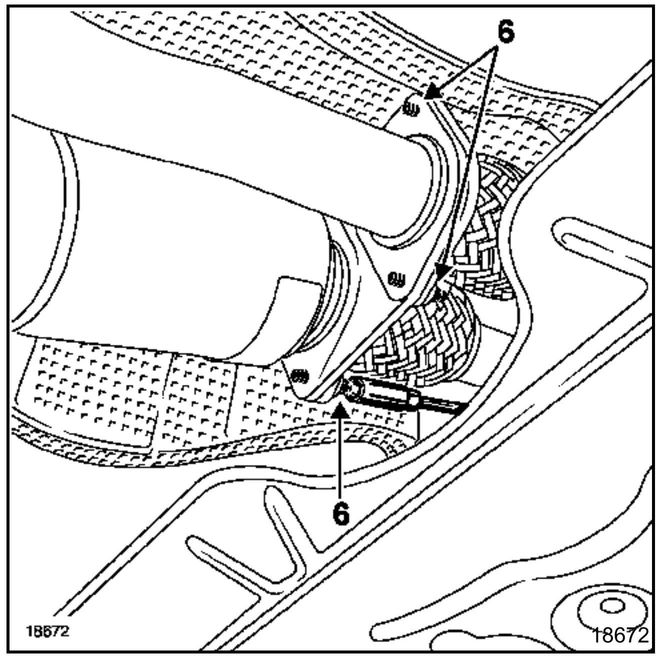
– position a component jack on the front of the sub-frame and remove the sub-frame tie-rod securing bolts (4),
– drop the sub-frame then remove the jack.

Remove:
– the oxygen sensors,
– the stay bolt (5).



Place a component jack under the exhaust pipe to support it.

Remove the four catalytic converter/pre-converter flange bolts, passing through the sub-frame using one or more extensions.



Remove:
– the pre-converter,
– the pre-converter heat shields if the converter is being replaced.

REFITTING

Refitting is the reverse of removal.

Refit the studs on the pre-converter flange.

Replace the gaskets with new ones.

IMPORTANT:
Before tightening the sub-frame front tie-rod securing bolts, ensure that they are in contact with the two rods welded to the bodywork.

Observe the tightening torques.

Ensure that the steering column is completely immobilised by the steering lock.

If it is not, you must adjust the steering column height, as described in section **36 "Steering column assembly"**.

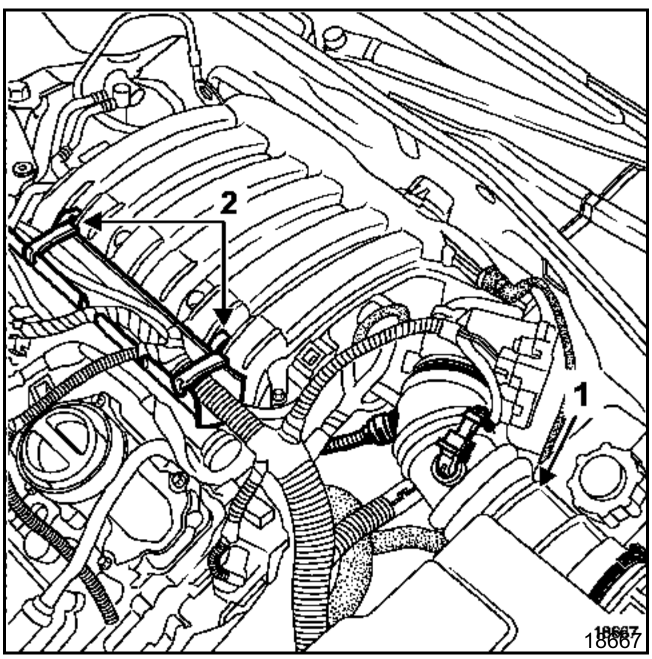
TOOLING REQUIRED	
Mot. 1495	**Tool for removing and refitting the oxygen sensor.**

TIGHTENING TORQUES (in daNm)	
Rear exhaust flange nuts	**2.1**
Catalytic converter/pre-converter flange nut	**2.1**
Oxygen sensors (upstream and downstream)	**4.5**
Pre-converter stay bolt	**2.1**
Inlet manifold bolts, pretightening	**0.5**
Inlet manifold bolts, final tightening	**0.8**

REMOVAL

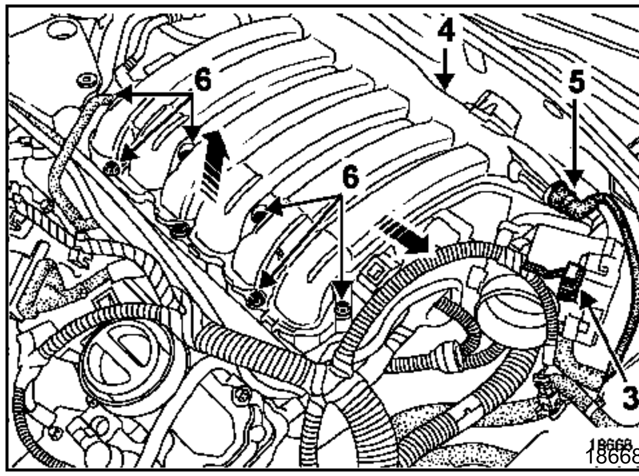
Removal of the rear pre-converter requires removal of the front bank pre-converter.

Remove:
- the air duct (1),
- the electrical harness channel (2).



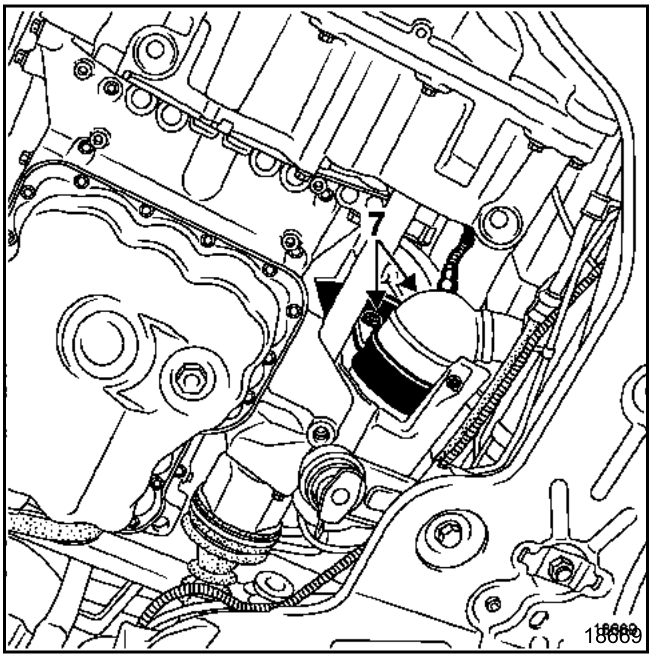
Disconnect:
- the motorised throttle body (3),
- the manifold pressure sensor (4)
- the brake servo vacuum take-off (5),
- the two hoses located under the motorised throttle body.

Remove:
- the inlet manifold bolts,6
- the manifold by moving it towards the battery,



Disconnect and unclip the oxygen sensor connectors.

Remove:
– the manifold heat shield,
– the nuts securing the exhaust flange to the manifold.
– the oxygen sensors,
– the two securing bolts (7) of the rear bank pre-converter stay,



– the pre-converter.

REFITTING

Refitting is the reverse of removal.

Refit the studs on the pre-converter flange.

Replace the gaskets with new ones.

IMPORTANT:
Before tightening the sub-frame front tie-rod securing bolts, ensure that they are in contact with the two rods welded to the bodywork.

Observe the tightening torques.

Ensure that the steering column is completely immobilised by the steering lock.

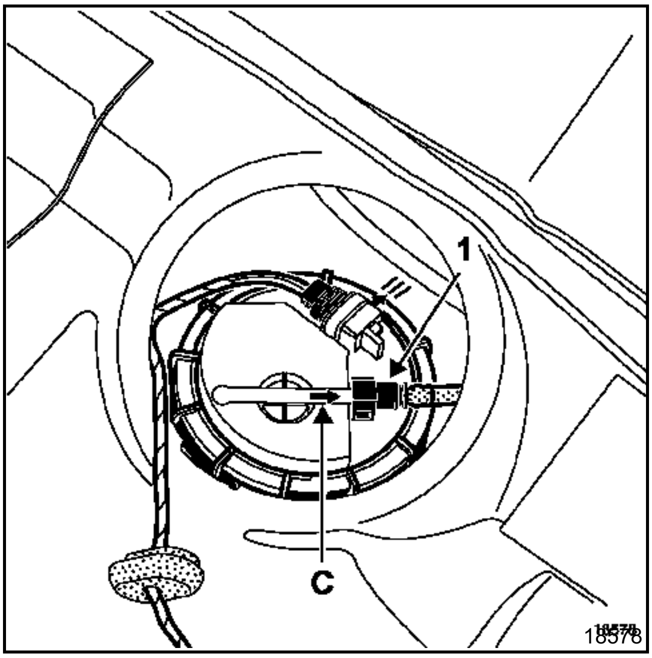
If it is not, you must adjust the steering column height, as described in section **36 "Steering column assembly"**.

TOOLING REQUIRED
INTERCO pneumatic decanting pump, draining the petrol or diesel fuel tank (see EQUIPMENT section)

IMPORTANT: during all the fuel tank removal and refitting operations, refrain from smoking and do not bring incandescent objects anywhere near the working area.

DRAINING THE FUEL TANK (petrol version)

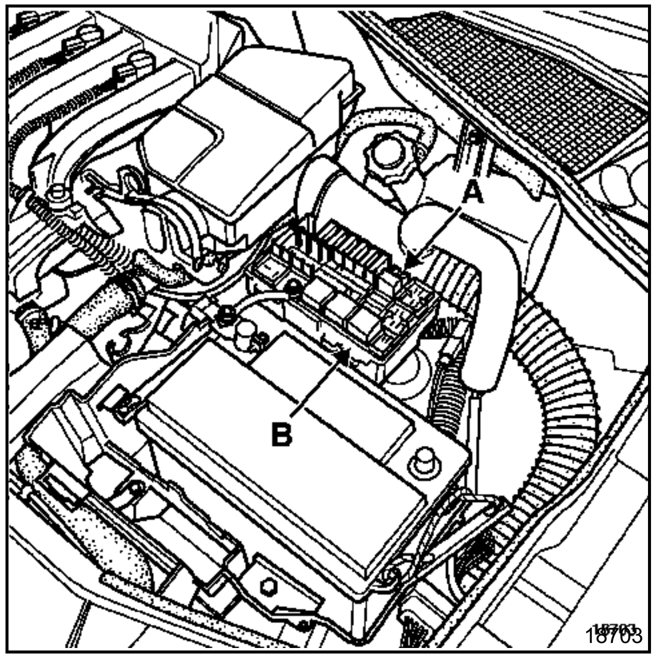
Raise the rear seat cushion and remove the plastic blanking cover giving access to the fuel-pump/sender unit assembly.



Disconnect the quick-release union (1), and fit to the outlet (C) a piece of tubing which is long enough to reach a container outside the vehicle.

NOTE: it is also possible to use an **INTERCO** pneumatic decanting pump (see **EQUIPMENT** catalogue).

In the engine compartment, disconnect the fuel pump relay located in the engine compartment connection unit (Relay A for K4, F4 and F5 engines, Relay B for L7 engine).



Shunt tracks 3 and 5 and let the fuel flow until it runs out in intermittent jets.

Disconnect the shunt.

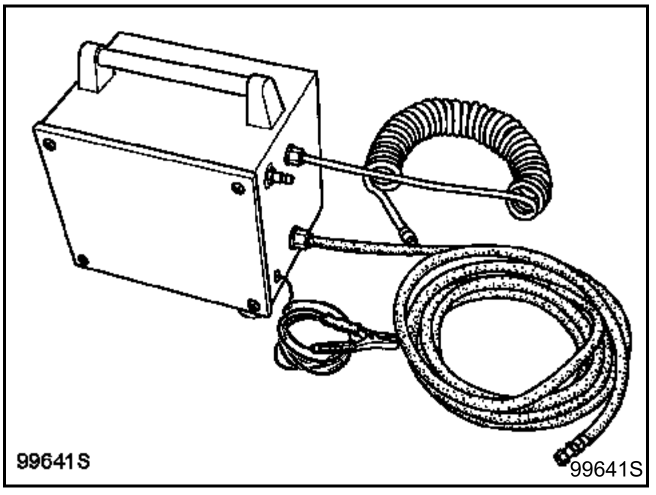
Reconnect the relay.

Disconnect the battery.

DRAINING THE FUEL TANK (diesel version)

Since diesel versions are not fitted with an electric fuel pump, a manual pump must be used to drain the tank.

For example, you can use the **INTERCO** pneumatic pump (see **EQUIPMENT** catalogue).



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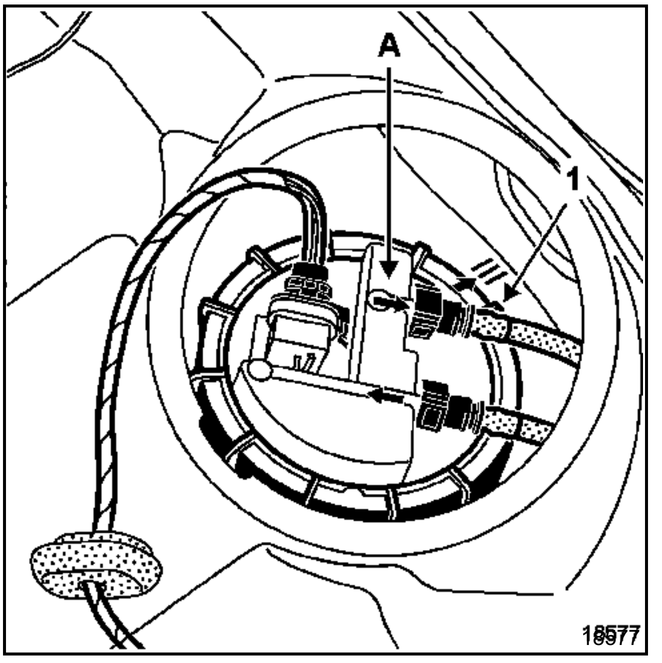
Raise the rear seat cushion and remove the plastic blanking cover giving access to the fuel-pump/sender unit assembly.



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Disconnect the quick-release union (1), and connect the rubber tubing of the pneumatic pump to outlet (A).

Drain the tank.

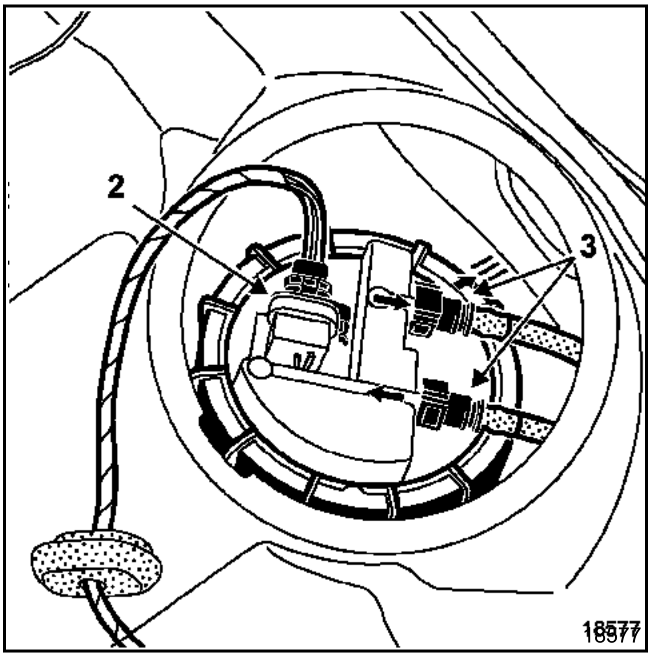
REMOVING THE FUEL TANK (petrol or diesel versions)

Disconnect the battery.

Put the vehicle on a 2 post lift.

Raise the rear seat cushion and remove the plastic blanking cover giving access to the fuel-pump/sender unit assembly.

Disconnect the electrical connector (2) and the quick-release union(s) (3).



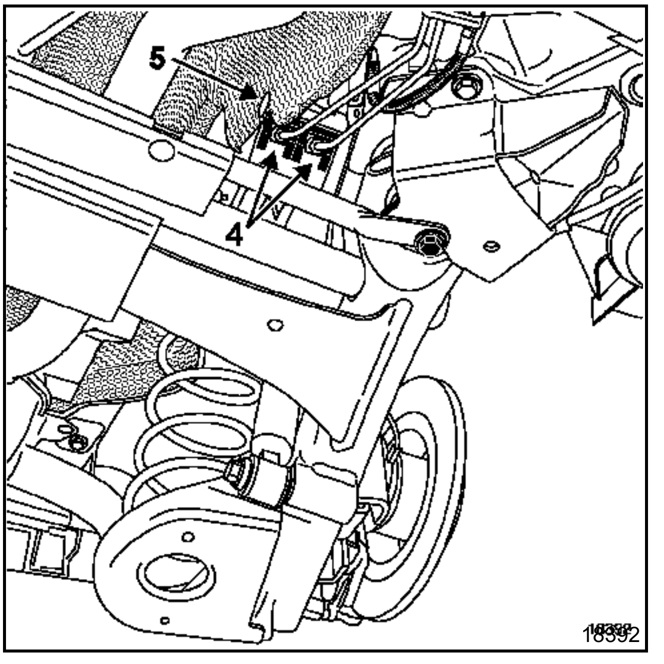
Raise the vehicle.

If required:
– remove the canister,
– disconnect the body height sensor,
– unclip the height sensor linkage,
– unclip the tyre pressure monitoring system harness from the acoustic bar.

Remove the brake pipe clips (4) and release the brake pipes from the acoustic bar.

Remove the heat shield retaining clip (5).

Remove the acoustic bar linking the two rear axle mounting points **by removing then refitting the bolts one after the other**.

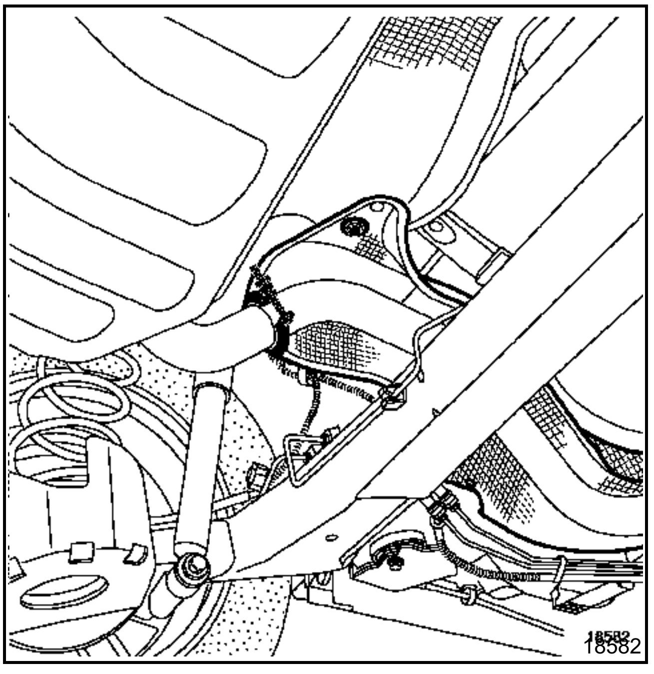


Remove the downstream oxygen sensor (located after the catalytic converter).

Disconnect the exhaust down pipe, have a replacement gasket ready.

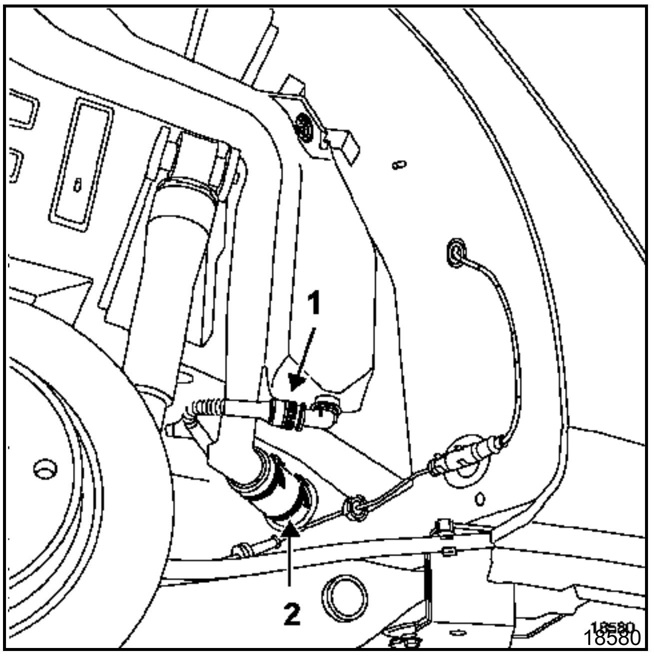
On the L7X engine, remove the expansion chamber.

Remove:
– the silencer clamp, leave the exhaust pipe lying on the rear axle and sub-frame,
– the heat shield.



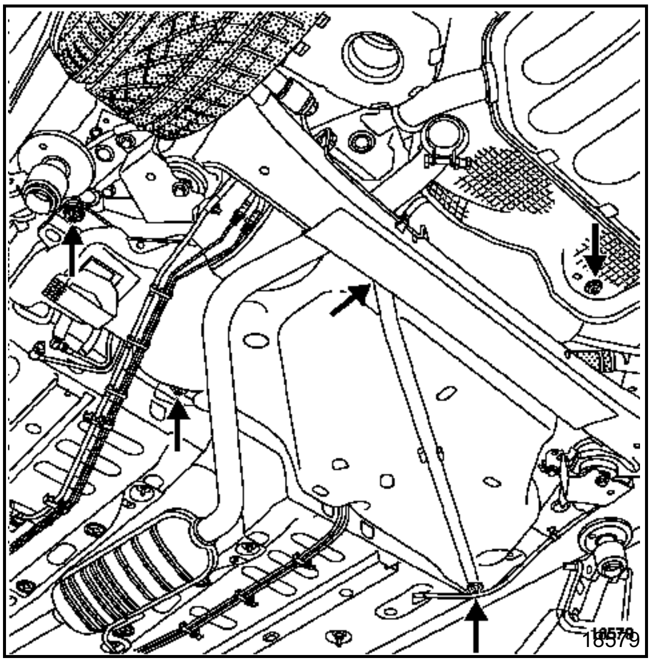
Disconnect the anti-blowback pipe (1).

Remove the filler neck collar (2), have a replacement collar ready.



Remove the tank mounting bolts.

With the help of another person, remove the tank by tilting it towards the front of the vehicle, then pivoting it around the axis of the exhaust pipe.



REFITTING

Refitting is the reverse of removal.

Take care not to pinch or kink any pipes (risk of leaks).

Fit the quick release unions by hand and ensure they are correctly connected.

Ensure the heat shield is refitted correctly.

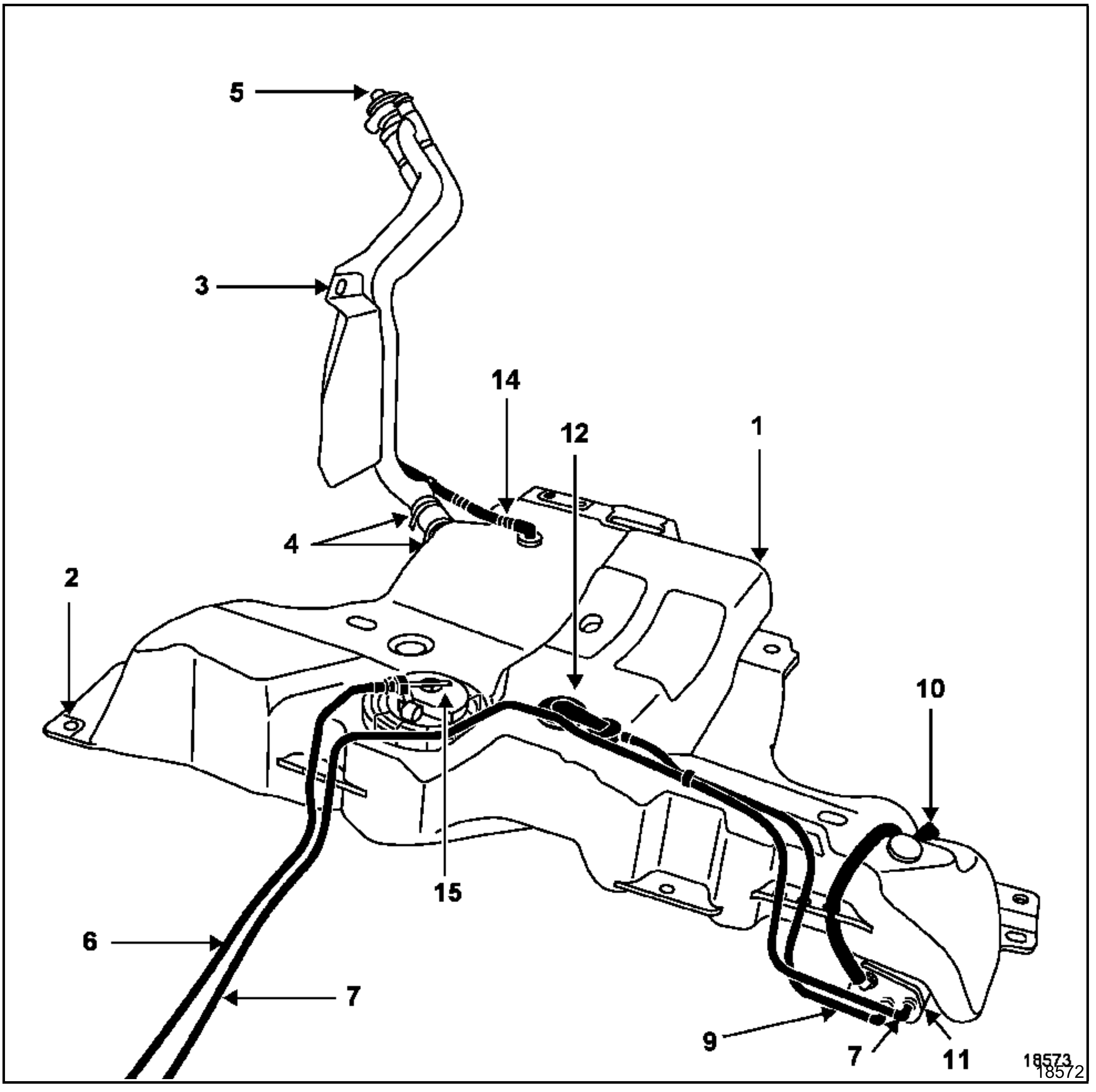
Replace the exhaust downpipe gasket and the filler neck collar.

Tighten the tank mounting bolt to **2.1 daNm**.

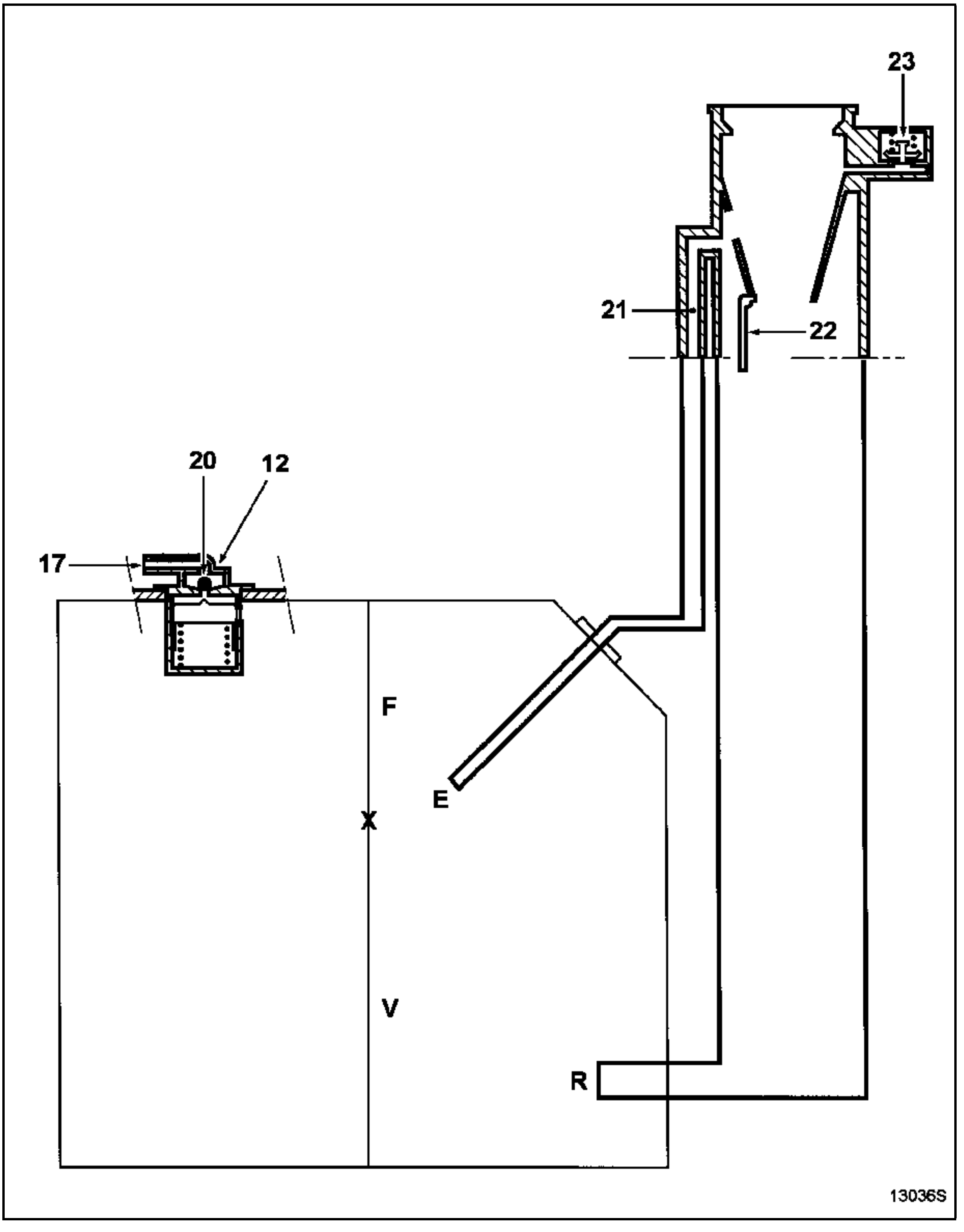
Tighten the oxygen sensor to **4.5 daNm.**

Tighten the rear axle bolts to **8 daNm**.

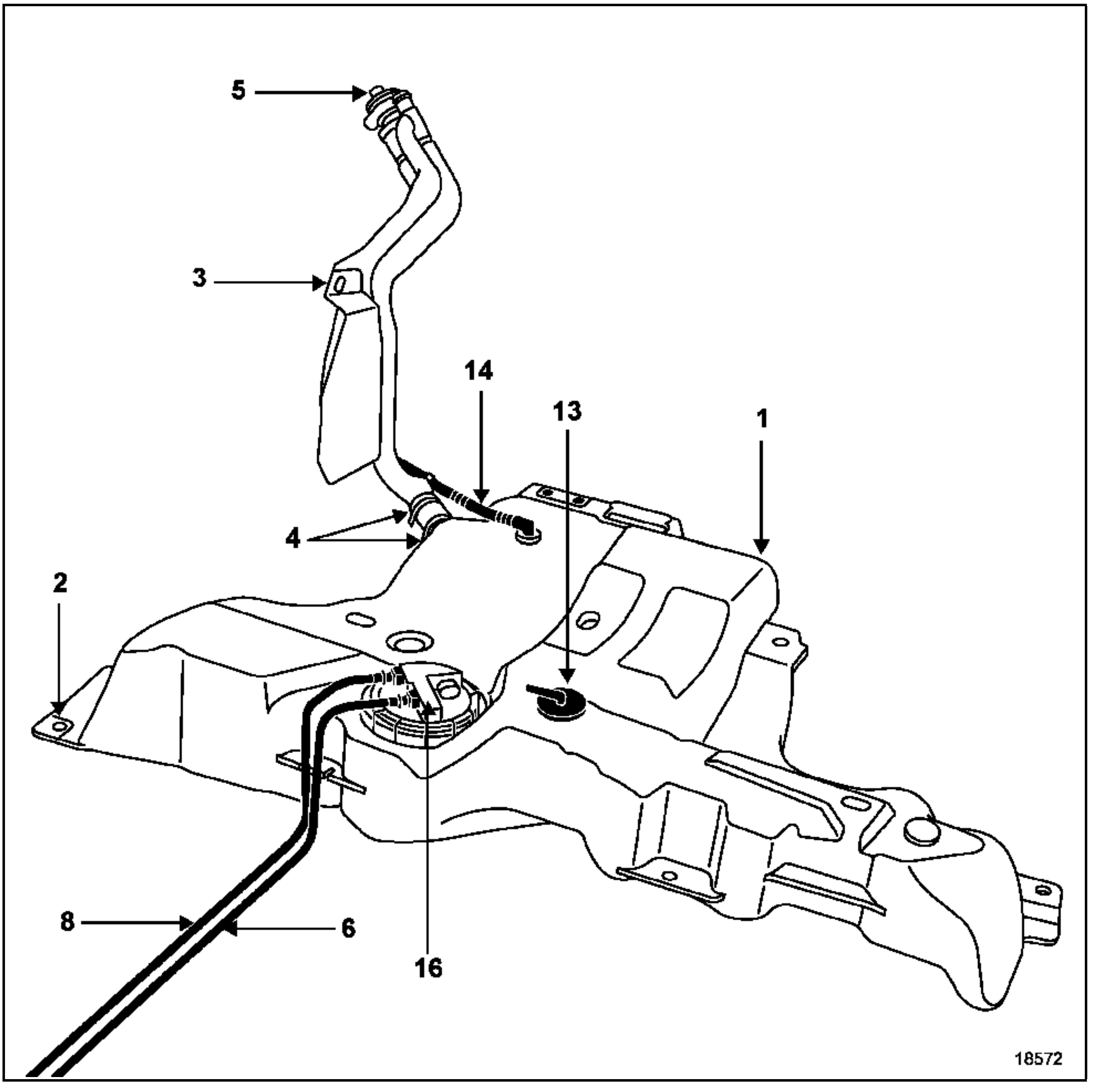
PETROL VERSION



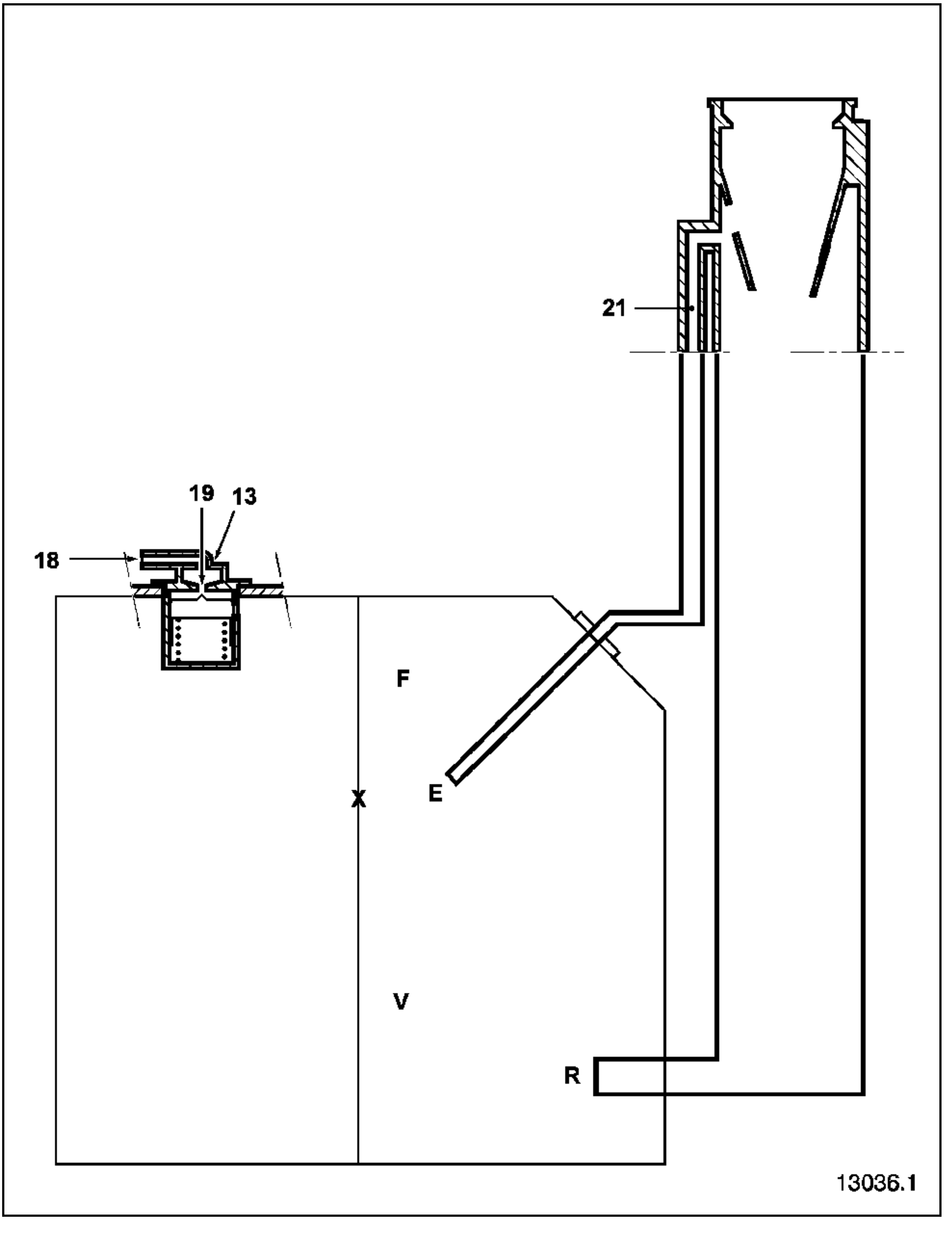
PETROL VERSION



DIESEL VERSION



DIESEL VERSION



Components

1. Fuel tank
2. Mounting bolts (x5)
3. Filler neck
4. Filler neck mounting collars
5. Fuel cap
6. Fuel supply pipe
7. Petrol vapour supply pipe
8. Fuel return pipe
9. Petrol vapour pipe to the canister (from the tank)
10. Breather
11. Fuel vapour absorber
12. Overfill prevention valve and leak prevention valve in case the vehicle turns over
13. Tank venting valve and leak prevention valve in case the vehicle turns over (diesel version)
14. Anti-blowback pipe (degassing - filling)
15. Petrol suction assembly
16. Diesel suction assembly
17. Link to petrol vapour absorber
18. Diesel venting valve
19. Calibrated vent orifice
20. Overfill prevention ball
21. Filling anti-blowback pipe
22. Restriction valve
23. Overpressure/underpressure safety valve

E Orifice allowing air evacuation during filling.

F Air space allowing fuel to expand

R Fuel filler inlet.

V Usable fuel volume.

FUNCTION OF THE VALVES

23 Overpressure/underpressure safety valve (petrol versions only)

If the fuel vapour recirculation circuit is blocked, this valve prevents the fuel tank being subjected to overpressure (the tank expands) or underpressure (as fuel is used, the tank collapses inwards).

22 Restriction valve

This valve prevents leaded petrol or diesel fuel getting into the tank.

12 and 13 Overfill prevention valve and leak prevention valve in case the vehicle turns over

The overfill prevention valve (12) operates using the ball (20).

When the vehicle is stationary, during filling, the ball rests in its seating, retaining a certain amount of air in the tank.

When the vehicle is in motion, the ball (20) leaves its seating, allowing a link between the tank and the petrol vapour absorber.

When the tank is full, it is vital that a sufficient volume of air remains inside the tank to allow the fuel it contains to expand, but not such as to cause it to burst.

The vehicle roll-over leak prevention valve prevents the tank from emptying via the pipe to the petrol vapour absorber or via the venting pipe (diesel).

The tank has a sealed cap.

The filler neck for unleaded petrol has the following special features:
- a smaller filling opening which cannot accept a conventional filling nozzle. (The lead would have the effect of polluting the depollution system: oxygen sensor and catalytic converter.),
- a valve blocking the filler opening (to prevent the escape of petrol vapour or reverse petrol flow).

SPECIAL TOOLING
Clip-removing pliers.

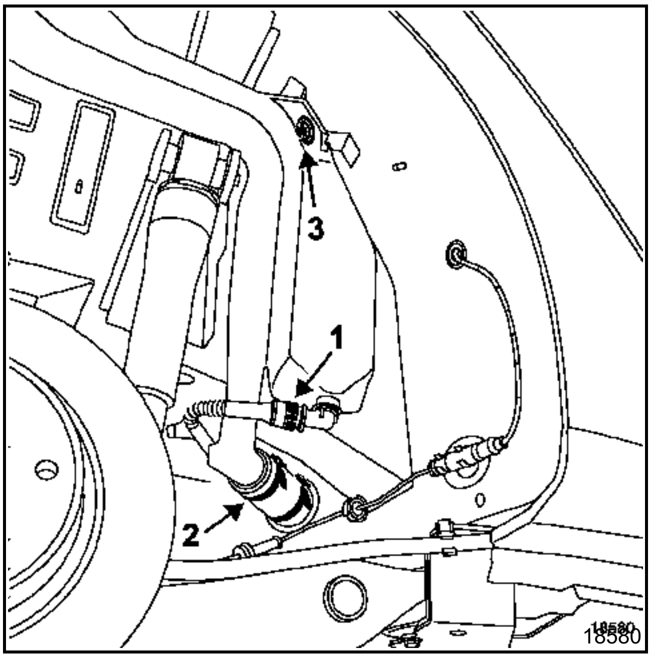
REMOVAL

Disconnect the battery.

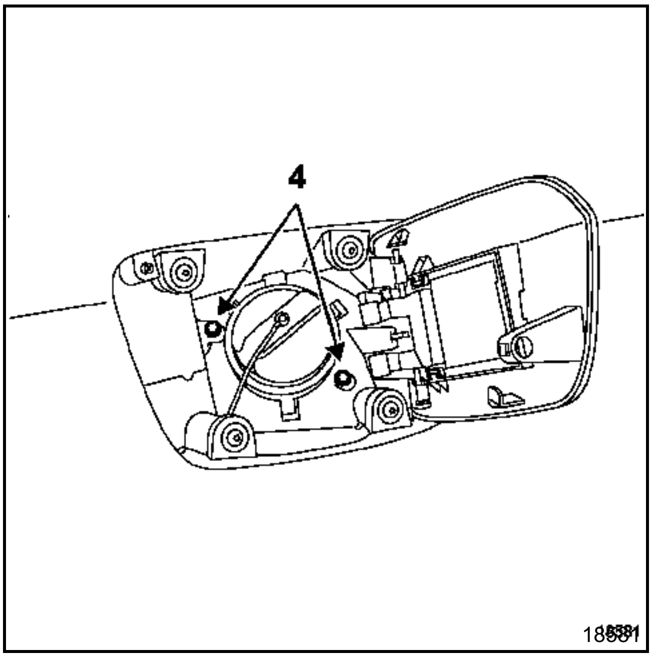
Remove:
- the rear right wheel
- the rear right wheel arch liner.

Disconnect the anti-blowback pipe (1).

Remove:
- the filler pipe collar (2),
- the filler neck mounting bolt (3),



- the filler neck mounting bolts (4),
- the filler neck.



REFITTING

Replace the filler pipe collar with a new one.

Refit in reverse order of removal.

In the petrol version, the pump, the fuel filter and the pump and sender unit form an inseparable assembly.

In diesel versions, there is no submerged pump in the tank, only a sender unit.

To remove the sender unit, refer to the sub-section **"Fuel tank, pump, sender unit, fuel filter".**

Checking the sender unit

Value between terminals A1 and B1 (Ω)	**Height H (mm)**
7 Ω maximum	180
55 ± 7	146
98 ± 10	114
155 ± 16	75
33 ± 20	33

Ensure there is resistance variation by moving the float.

Measuring height H

Place the removed sender unit on a flat surface.
H is the height measured between the sender unit float pin and the gasket face.

NOTE: all the above values are indicative only.

ESSENTIAL SPECIAL TOOLS
Mot. 1397 Fuel pump securing nut

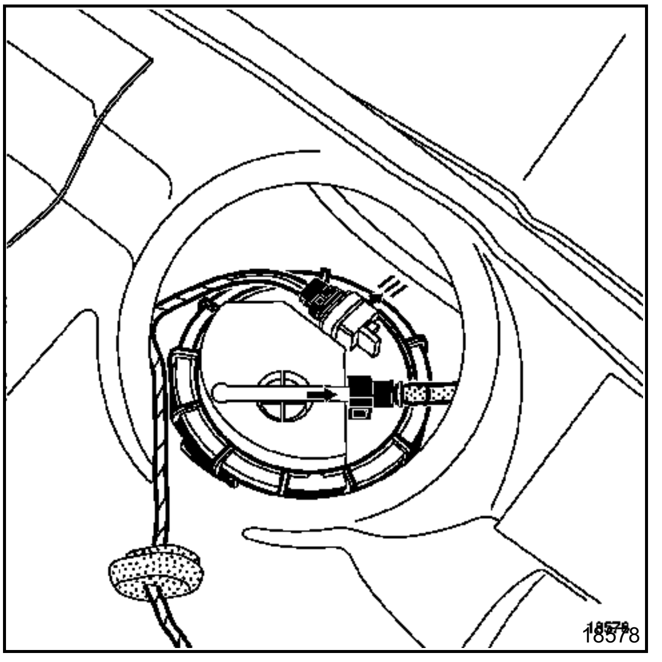
IMPORTANT:
During all operations on the fuel tank or fuel supply circuit, it is vital to:
– refrain from smoking or bringing incandescent objects close to the working area,
– protect yourself against fuel splashes when the pipes are removed (due to residual pressure).

REMOVAL

IMPORTANT: before removing any components, take precautions to trap fuel running out of the pipes (do not clamp piping, this could cause damage).

Removal of the pump/sender assembly does not require removal of the tank. It is accessible from the rear seat. To do this:
– disconnect the battery,
– remove the rear seat cushion and the plastic blanking cover.

Disconnect:
– the quick-release union(s) of the pump/sender assembly,
– the electrical connector.



Remove the sender unit mounting nut using the **Mot. 1397** tool.

Allow any fuel in the sender unit to flow out, then remove the pump/sender assembly, taking care not to damage the float.

NOTE: if several hours will elapse between removing and refitting the pump and sender assembly, refit the nut to the fuel tank to prevent it from distorting.

REFITTING

Replace the O-ring seal.

Replace the pump/sender assembly, positioning the mark on the sender opposite the three raised lines on the tank.

Position the nut and tighten it until the mark on it corresponds with the mark on the tank and the mark on the pump/sender assembly.

Reconnect the quick-release union(s).

Reconnect the electrical connector.

Refit:
– the plastic blanking cover,
– the rear seat cushion.

ASSIGNMENT OF CONNECTOR TRACKS

TRACK	DESCRIPTION
A1	Sender + signal
A2	Not used
B1	Sender - signal
B2	Not used
C1	+ Pump
C2	- Pump

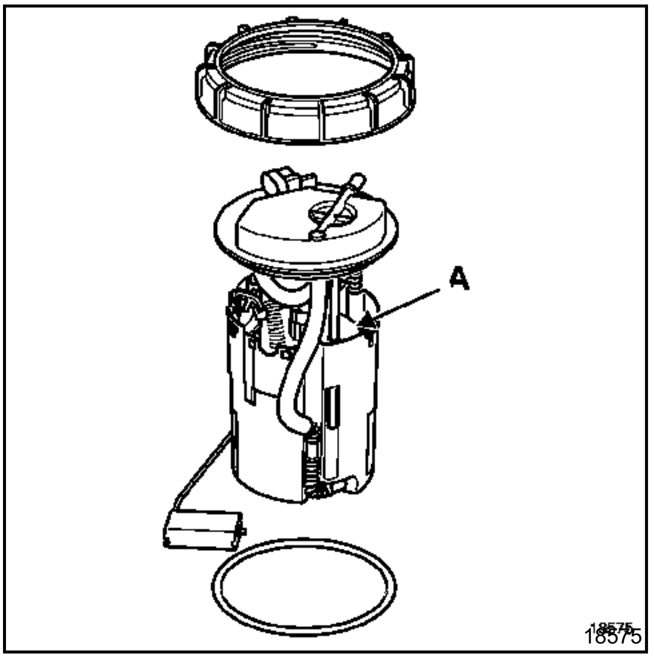
GENERAL

The fuel filter is located inside the tank; it forms part of the pump/sender assembly and cannot be removed separately.

If it needs to be replaced, then the whole pump/sender assembly must be replaced.

It is designed to provide efficient filtration for the whole life of the vehicle.

Nevertheless, checking the fuel supply pressure and the pump delivery will provide a diagnostic check of the pump/sender assembly performance.

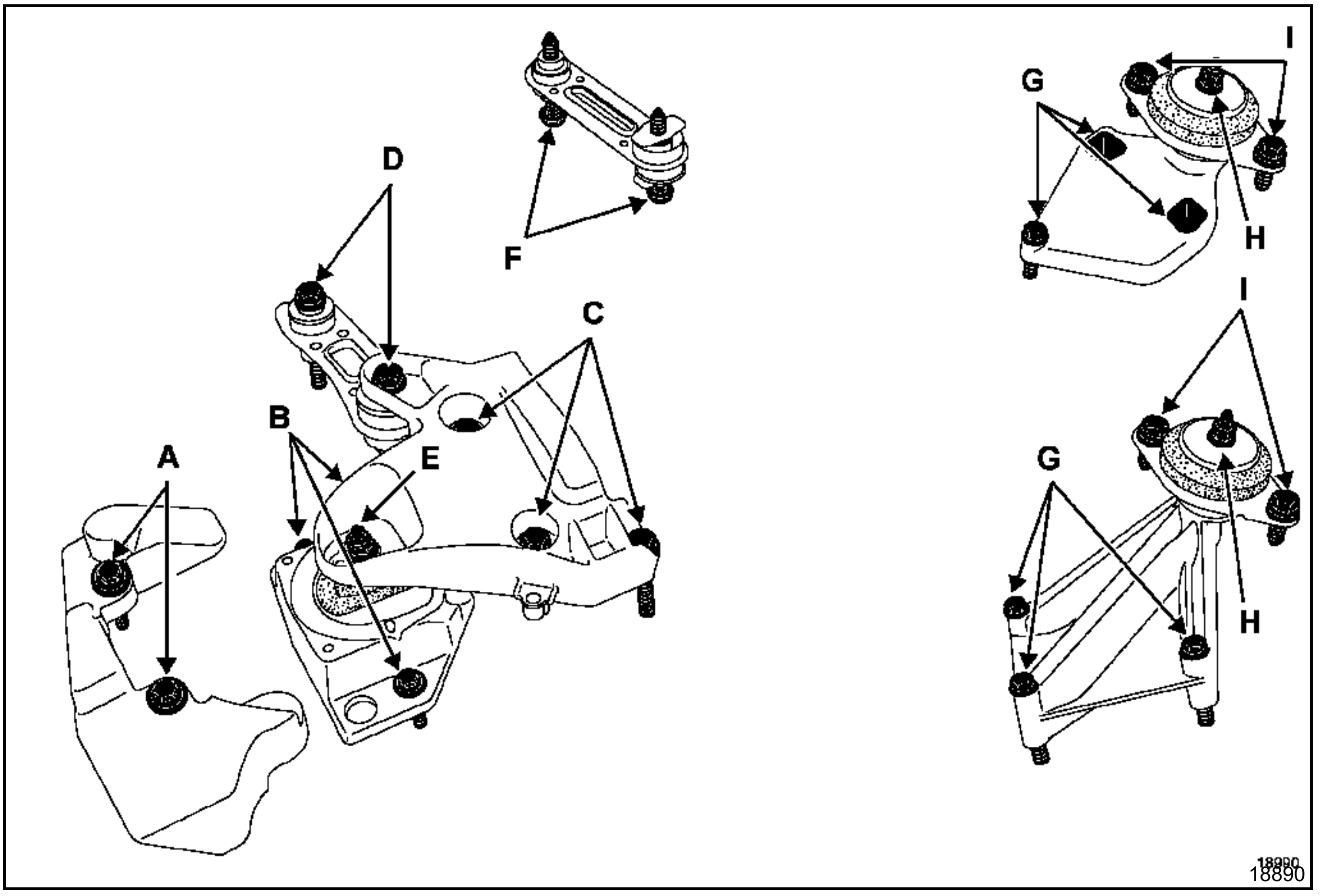


A Filter.

TIGHTENING TORQUES (daNm)

A	2.1
B	2.1
C	6.2
D	10.5
E	4.4
F	10.5

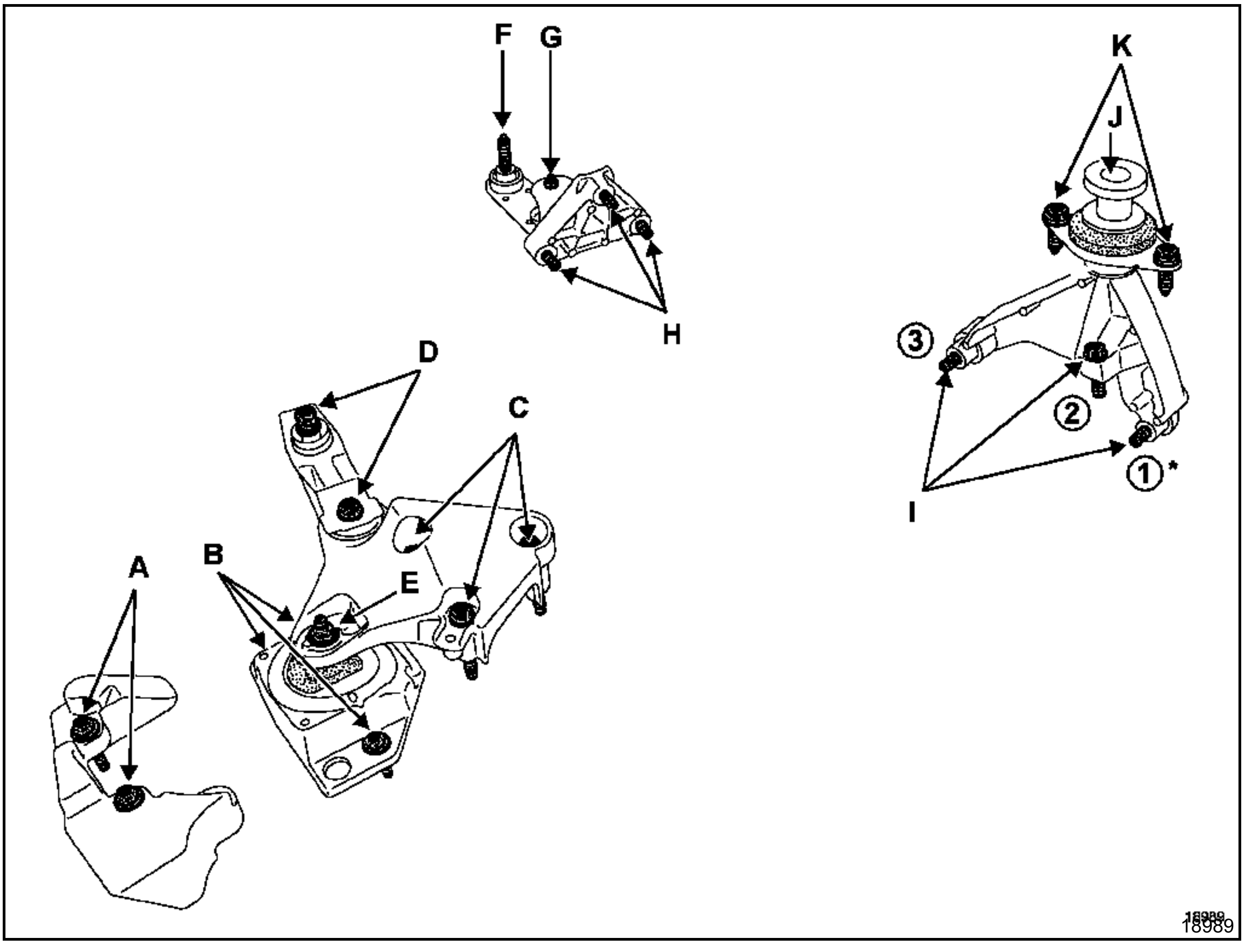
G	6.2
H	4.4
I	6.2



TIGHTENING TORQUES (daNm)

A	2.1
B	2.1
C	6.2
D	10.5
E	4.4
F	10.5

G	18
H	6.2
I	10.5
J	4.4
K	6.2



* Tightening sequence: tighten bolt (1) then (2) and (3)

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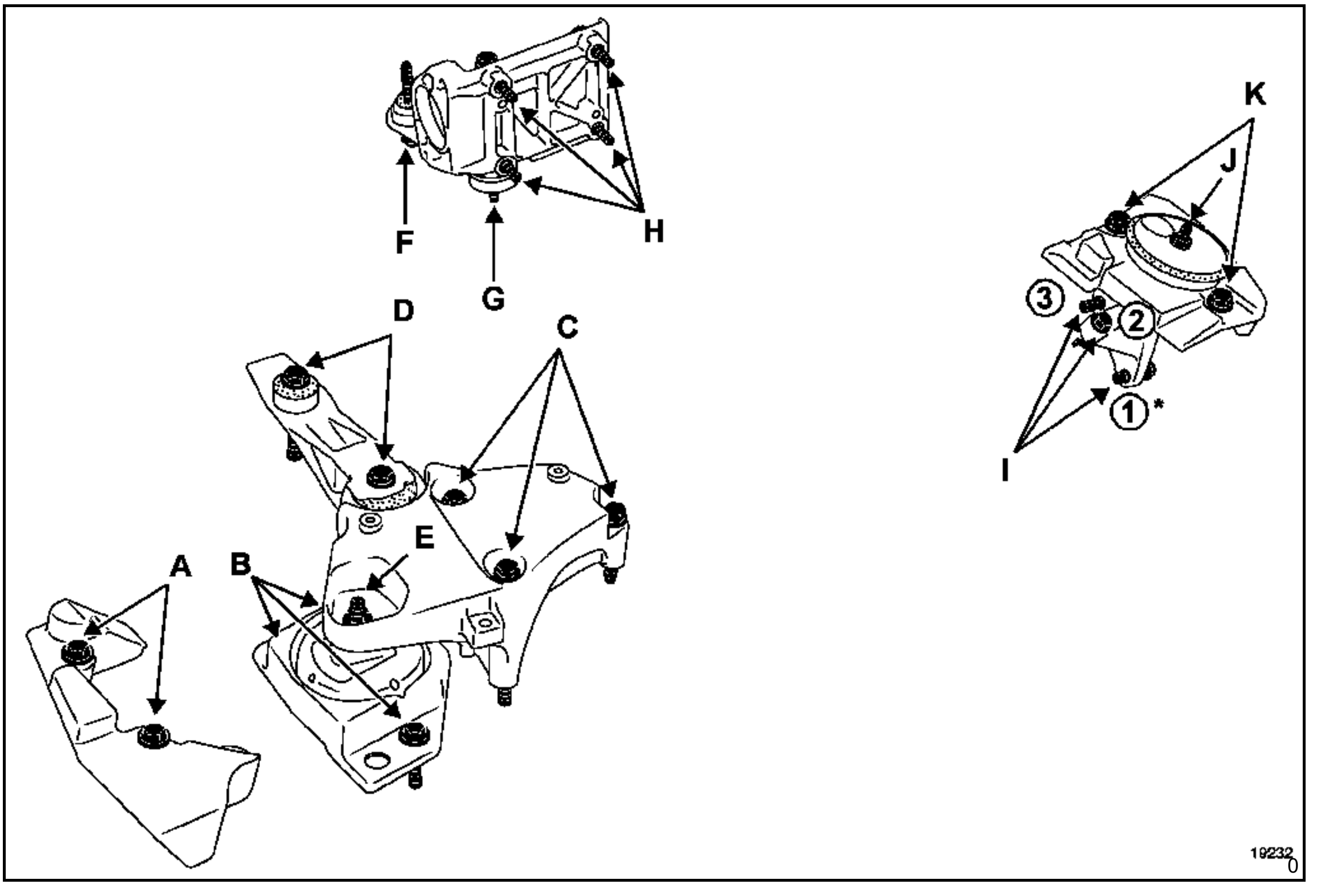

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