Master

Technical Note 3471A

Basic manual: Workshop Repair Manual 323

Special features of the Master fitted with G9T and G9U engines

77 11 301 402 **JUNE 2001** **EDITION ANGLAISE**

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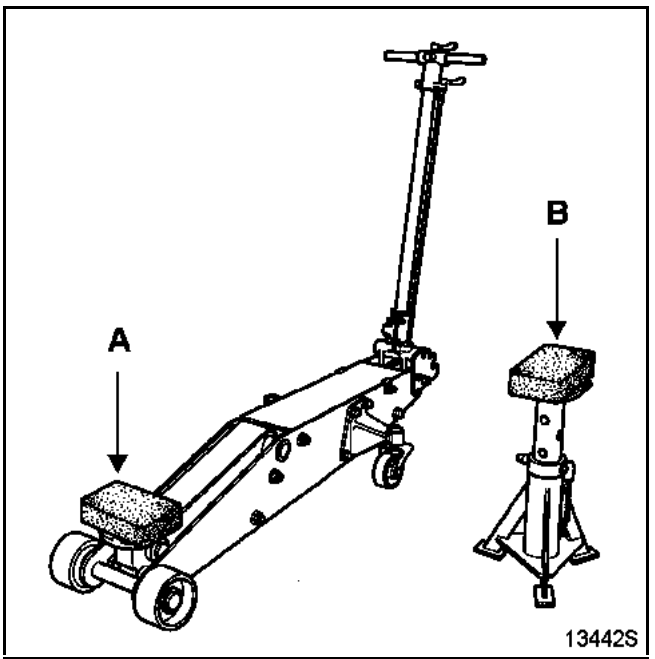
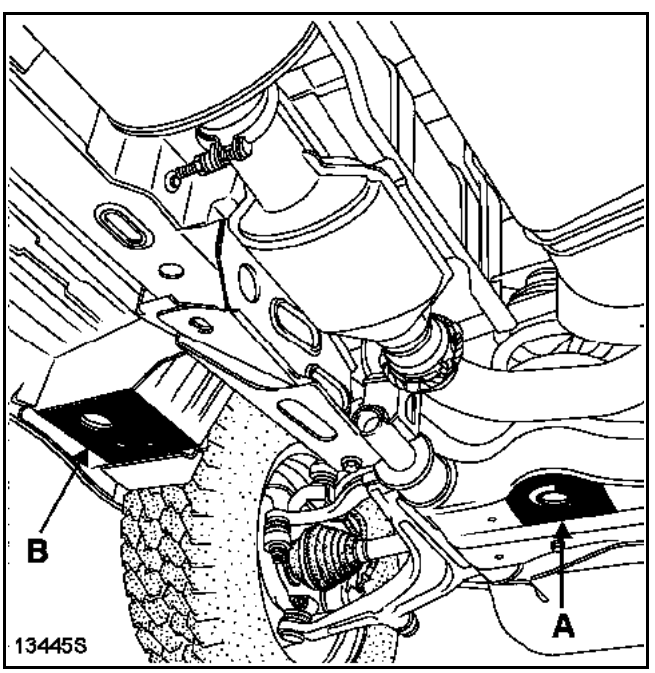
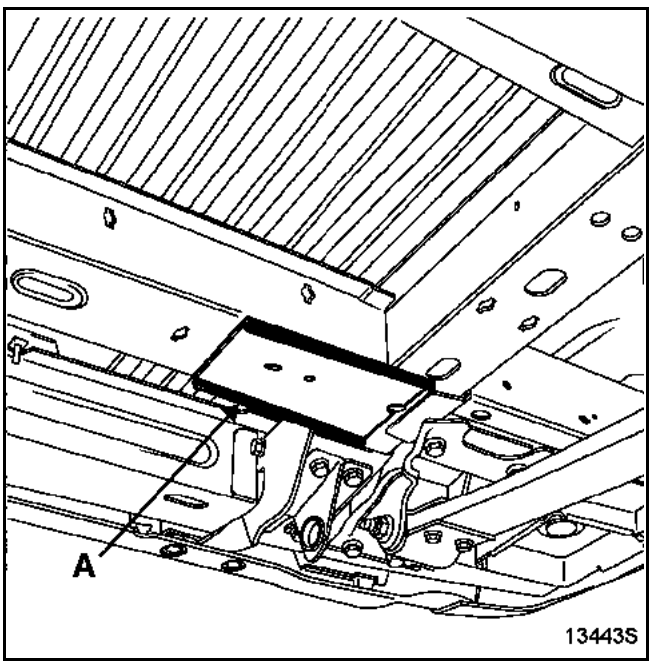
TROLLEY JACK AND AXLE STAND LOCATIONS



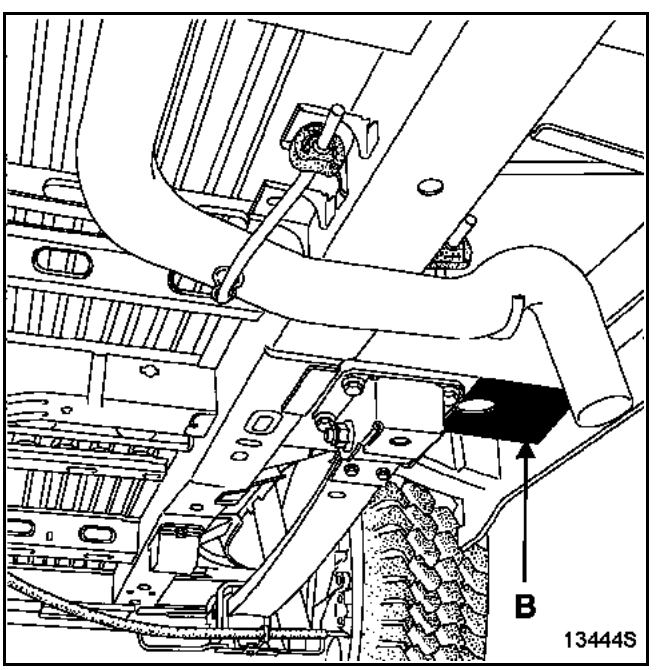
FRONT



REAR



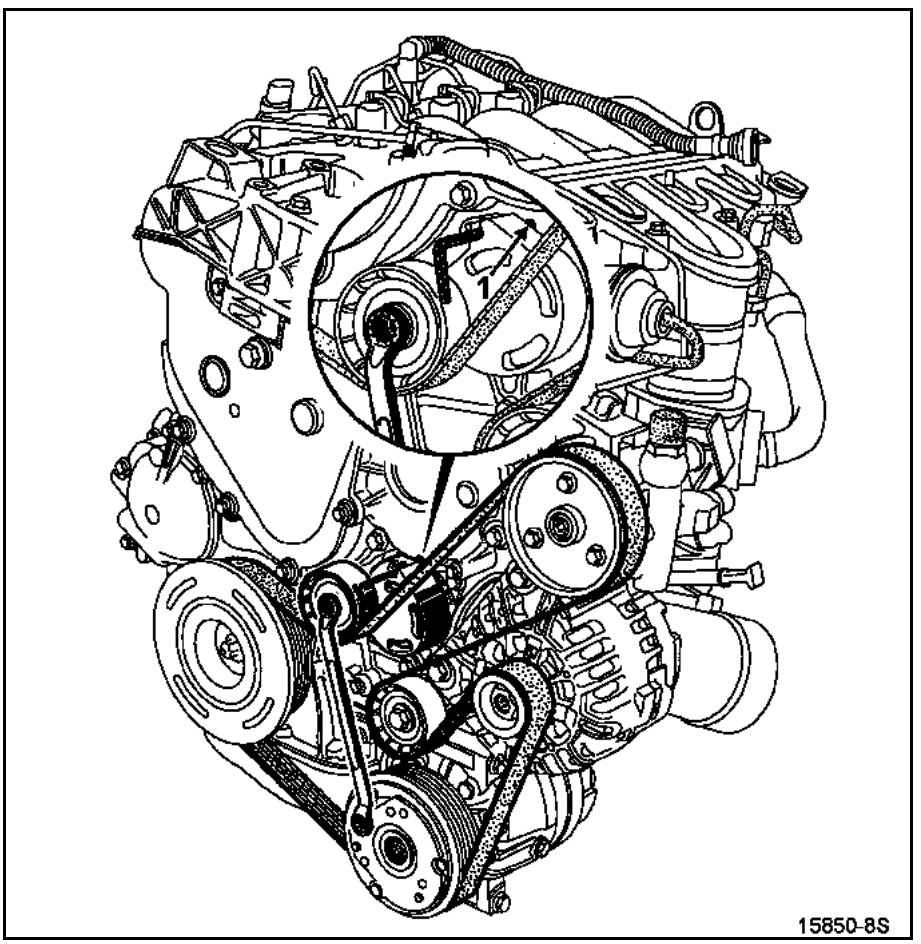
REAR



REMOVAL

Special features for removing the accessories belt

Swivel the auto tensioner **to the left** using a spanner to loosen the belt. Block the tension wheel by putting a **4 mm** Allen key in the hole (1).



REFITTING

NOTE: never refit a belt once it has been removed, but replace it.

Refitting is the reverse of removal.

CYLINDER HEAD

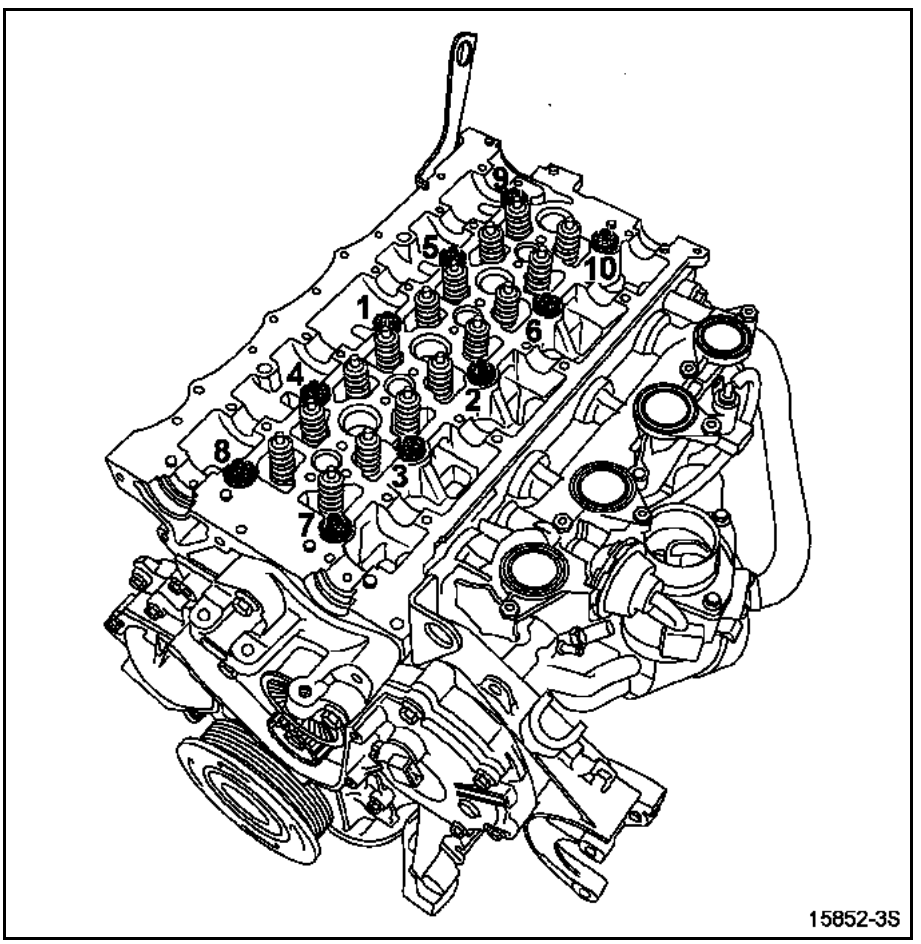
The bolts must be replaced systematically.

Cylinder head tightening procedure

REMINDER: Use a syringe to remove any oil which may have entered the cylinder head mounting bolt holes to achieve correct tightening of the bolts.

Do not oil the new bolts. However, bolts that are to be reused must be lubricated with engine oil.

Tighten all the bolts to **3 daNm** in the order given below.



Check that all the bolts are tightened to **3 daNm**, then angle tighten (bolt by bolt) to **300** ± **6**°.

Do not retighten the cylinder head bolts after performing this procedure.

Components	Average capacity* in litres	
	Capacity without oil filter	After replacing the oil filter
Diesel engine (oil)		
G9T/G9U	**7.6**	**8.3**
Manual gearbox		
PF1	**2.6**	
PK5	**2.4**	

* Check with dipstick

NOTE: never exceed the maximum mark on the dipstick.

Components	Capacity in litres	Grade
Brake circuit	Standard: 0.7 ABS: 1	SAE J 1703 and DOT 4

Brake fluids must be approved by the Technical Department.

Components	Capacity in litres	Grade
Fuel tank	70 or 100	Diesel
Power assisted steering	Separate reservoir 1.1	ELF RENAULT MATIC D2 or MOBIL ATF 220
Coolant circuit	11	GLACEOL RX (Type D) add coolant only

Vehicle type	Engine	Gearbox	Cubic capacity (cc)	Bore (mm)	Stroke (mm)	Compression ratio
XDXG XDXN	G9T 720 G9T 722	PF1	2188	87	92	18.3/1
XDXM	G9U 720	PK5	2499	89	99	18.3/1

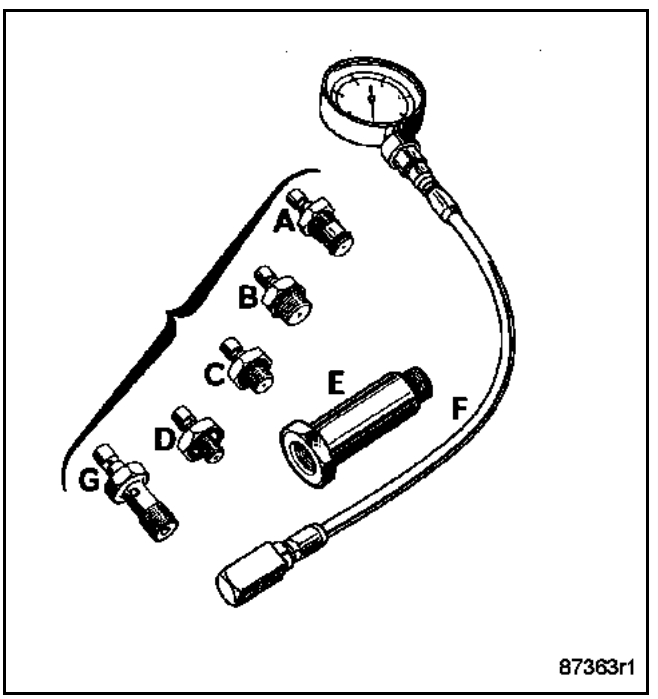
Workshop Repair Manual to be consulted: **Mot. GT9**.

SPECIAL TOOLING REQUIRED
Mot. 836-05 Kit for measuring oil pressure
EQUIPMENT REQUIRED
22 mm long socket

CHECKING

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

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



USE

F + E + C

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

Oil pressure
1000 rpm 1.6 bar min.
3000 rpm 4 bar min.

EQUIPMENT REQUIRED
Suspension spring compressor **Load positioner**

TIGHTENING TORQUES (in daNm)	
Tensioner nut	**2.5**
Caliper mounting bolt on the hub	**11**
Driveshaft gaiter bolt	**2.5**
Steering ball joint nut	**8**
Upper ball joint nut	**9**
Mounting bolt for suspended engine mounting:	
– on the body	**8.5**
– on the engine	**4.4**
Nut for suspended gearbox mounting	**14**
Engine tie bar bolt	**10.5**
Wheel nut	**15.5**

IMPORTANT: before carrying out any work, connect the After-Sales diagnostic tool, set up communication with the injection computer and check that the injection rail is not under pressure.

Make a note of the fuel temperature.

Order the special high pressure injection circuit plug kit.

FOLLOW THE CLEANLINESS INSTRUCTIONS CAREFULLY AS GIVEN IN SECTION 13 SPECIAL FEATURES AND CLEANLINESS

REMOVAL

Loosen the front wheel mounting bolts.

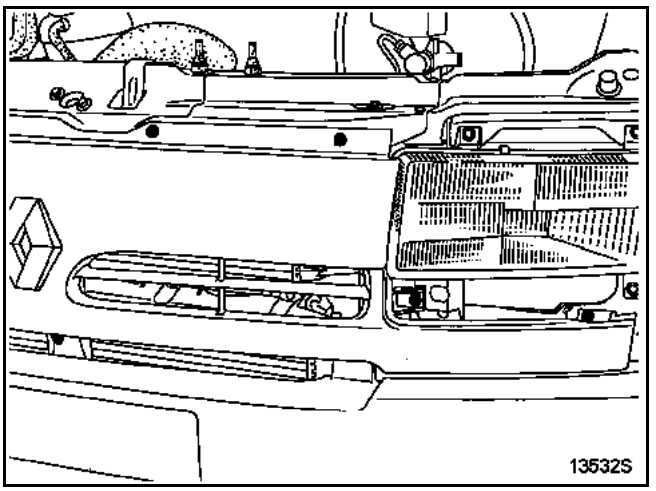
Put the vehicle on four axle stands (see **section 02 Lifting equipment** for the correct positions of the lifting jack and axle stands) or on a lift. (**5 tonnes minimum**).

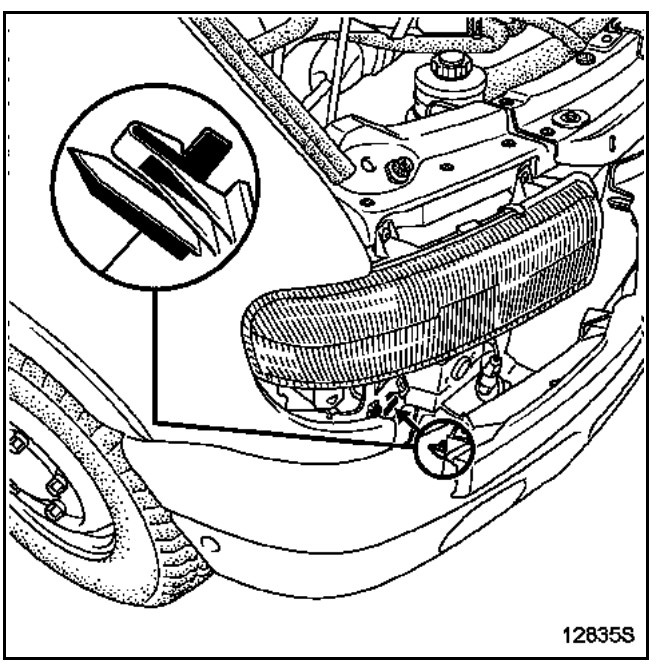
Remove:
– the engine undertray,
– the battery and battery tray.

Drain the cooling circuit through the lower radiator hose.

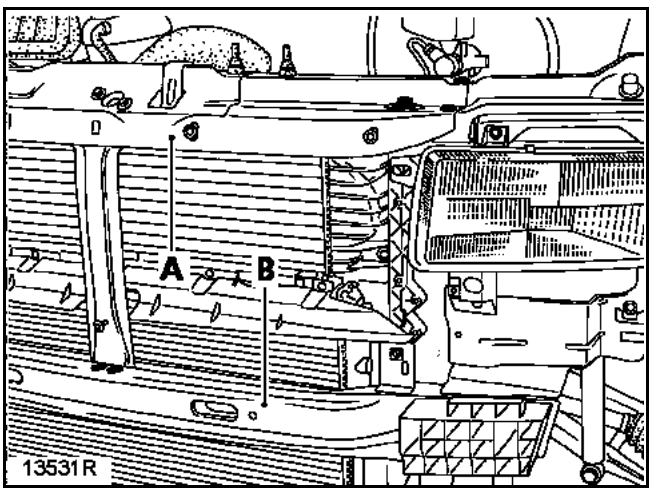
Remove:
– the bonnet
– the front wheels,
– the air filter unit - air intake tube assembly,
– the direction indicators,

– the radiator grille,



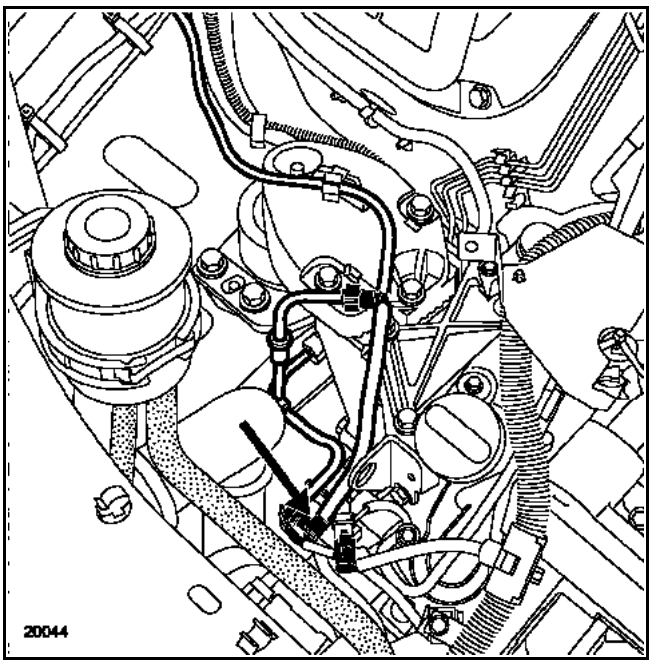


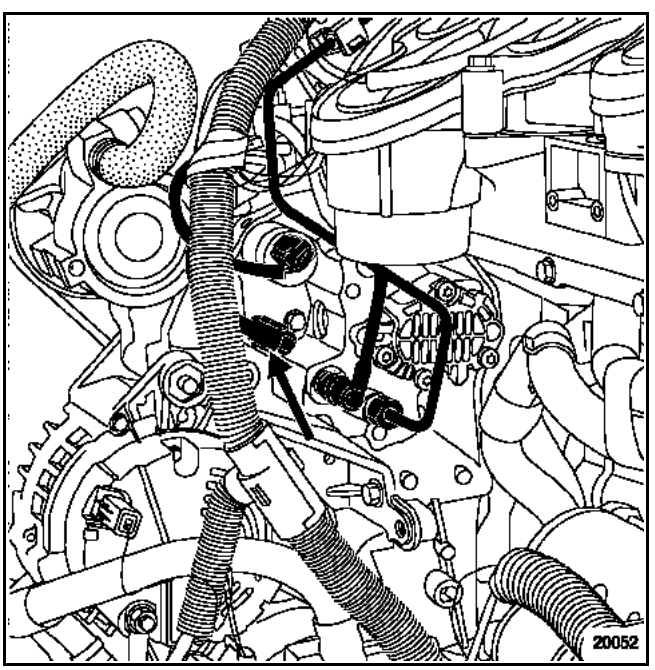
– the bumper,
– the upper crossmember (A),
– the front crossmember (B).



Disconnect:
– the turbocharger pipes on the exchanger,
– the upper radiator hose,

– the fuel return pipes (**fit the cleaning plugs**),



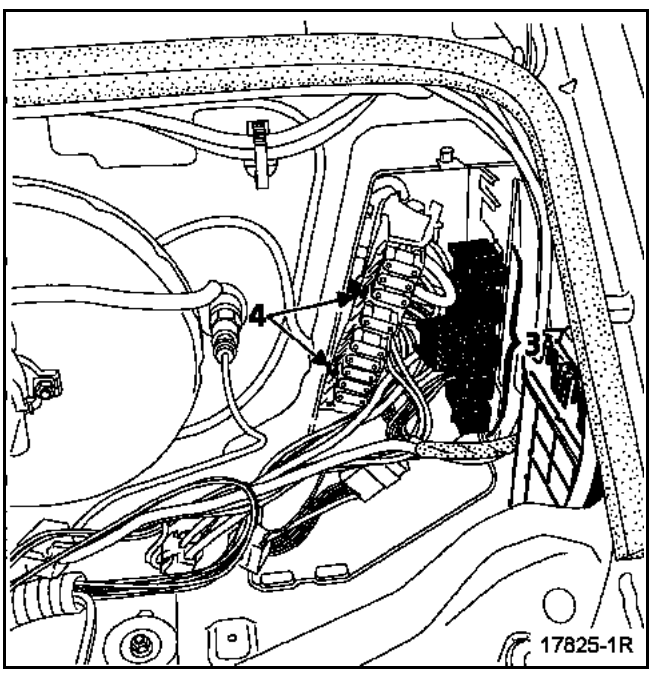


– the air conditioning pipes from the condenser and the pressure relief valve.

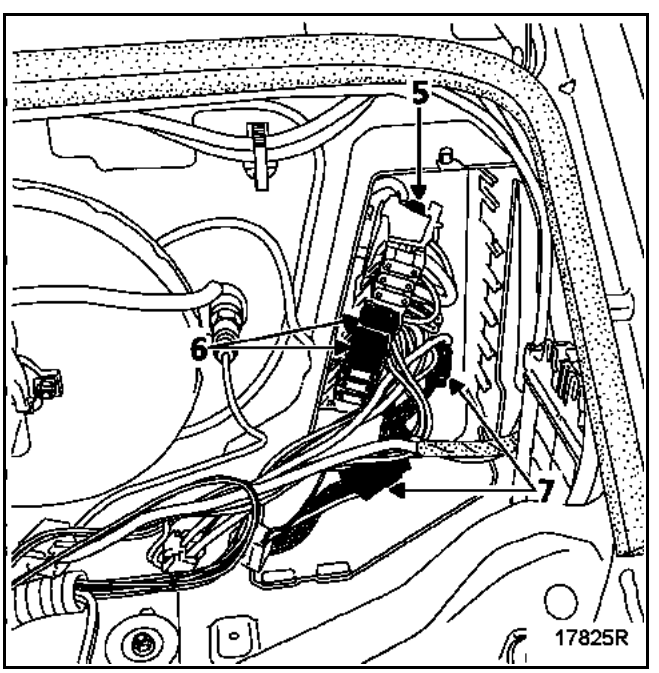
NOTE: plugs must be fitted onto the pipes, the condenser and the pressure relief valve to prevent moisture from entering the circuit.

Disconnect the wiring of the fan assembly.

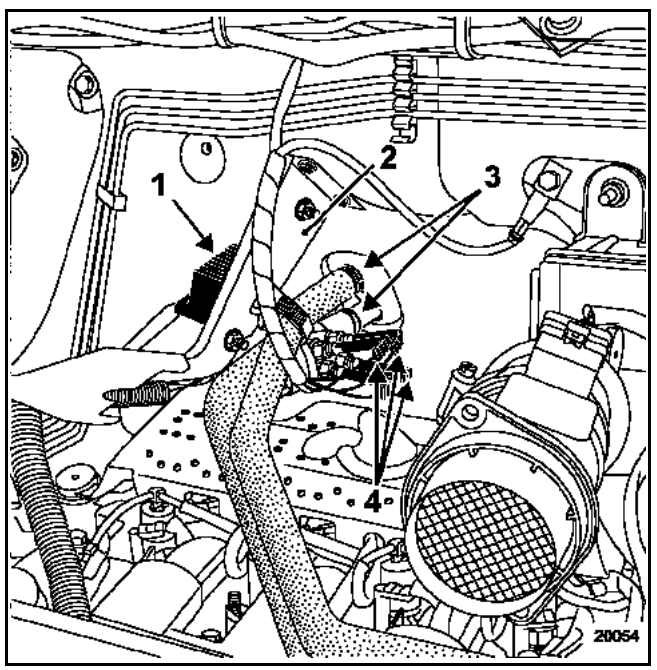
Remove:
– the two lower radiator mountings,
– one of the two mounting bolts from the radiator lower supports, then take out the cooling system by swivelling the supports, take out the earth strap on the left side member,
– the relay holders (3) from their supports and the fuse holder plates in (4),



– the supply (5) and disconnect the fuse holders (6) and the connectors (7),



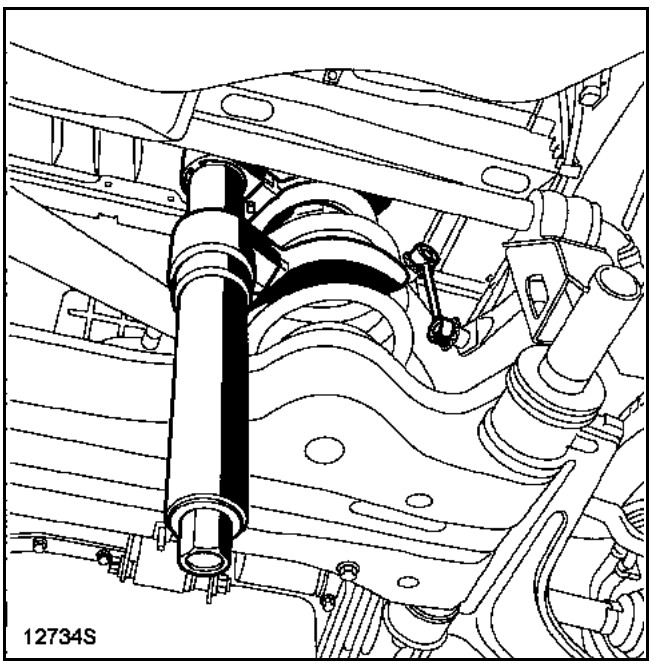
– the computer mountings, remove the computer and place it on the engine,
– the expansion bottle mountings and the expansion bottle,
– the preheater unit mounting (1),
– the expansion bottle support mountings (2),
– the heating pipes (3),
– the thermoplunger connectors (4) and the supply strap from the unit then remove the assembly,



– the clutch slave cylinder pipe by removing the clips.

Disconnect:
– the vacuum pipe on the vacuum pump,
– the gearbox control cables,
– the exhaust downpipe mountings.

Remove the suspension springs using a spring compressor.



NOTE: before decompressing the springs, mark their position.

Remove:
– the left-hand half axle by removing the ball joint nuts for the upper arm and steering arm, the stud for the lower arm ball joint, the **ABS** sensor, the brake calliper (secure it to the body), the drive shaft bellows screws and then separate the upper and lower arms to release the half axle,
– the right-hand half axle (same operation as for the left-hand half axle), except for the drive shaft; the retaining flange for the intermediate bearing anti-friction bearing must be taken out.

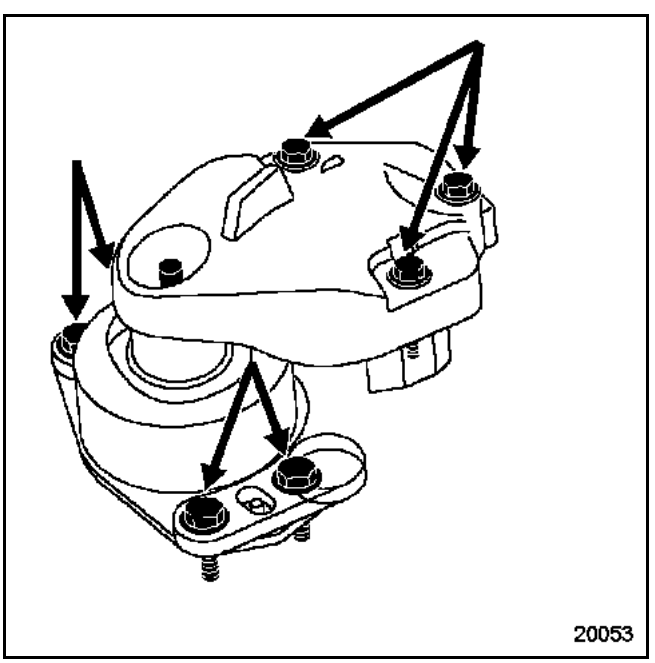
NOTE: use cloths to protect the drive shafts.

Remove:
– the power steering reservoir from its support and change the oil,
– the power assisted steering pipes on the steering box,
– the engine tie-bar.

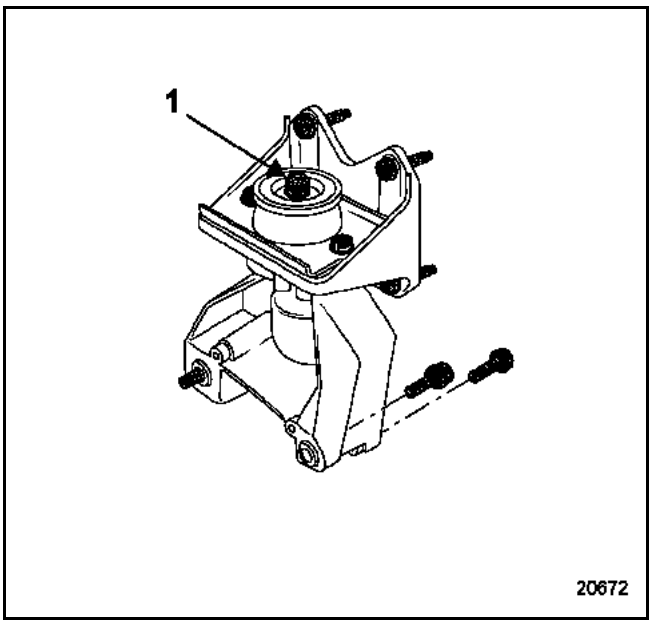
Attach the workshop hoist.

Support the engine and gearbox assembly using a chain.

Remove the suspended engine mounting - engine pad assembly.



Loosen the nut (1) on the left suspended engine mounting rubber pad (without taking it off), then tap it with a copper hammer, to release the suspended engine mounting stud.



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

REFITTING

Place the engine/gearbox assembly following the same method as for removal.

Refit:
– the left-hand suspended engine mounting,
– the right-hand suspended engine mounting,
– the engine tie-bar.
See section **19 Suspended engine mounting** for the tightening torques.

Refitting is the reverse of removal.

Torque tighten the studs and nuts.

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

Bleed the clutch system.

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

Fill up the gearbox and engine with oil (if necessary) then fill and bleed the cooling circuit (see section **19 Filling/bleeding**).

TIGHTENING TORQUES (in daNm)	
Sump bolts:	
– Pretightening	**0.5**
– Tightening	**0.9**

REMOVAL

Put the vehicle on four axle stands (see section **02 Lifting equipment** for the correct positions of the lifting jack and axle stands) or on a lift. (**5 tonnes minimum**).

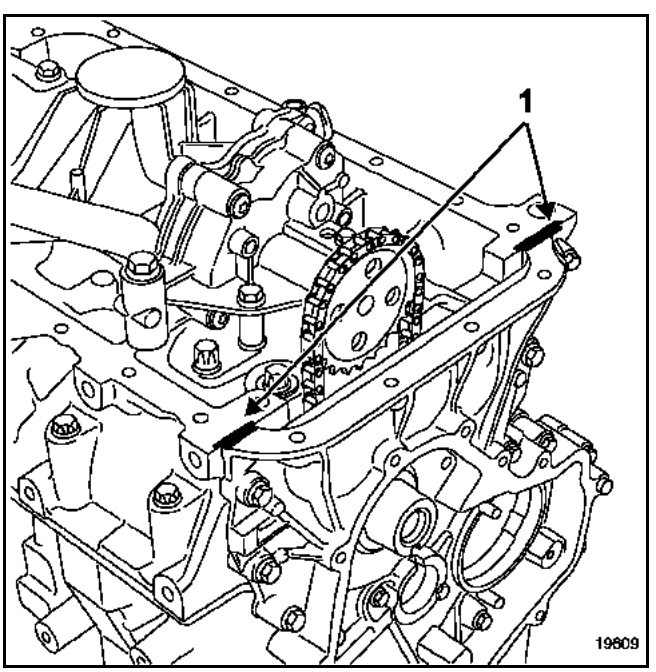
Disconnect the battery and the TDC sensor connector.

Change the engine oil.

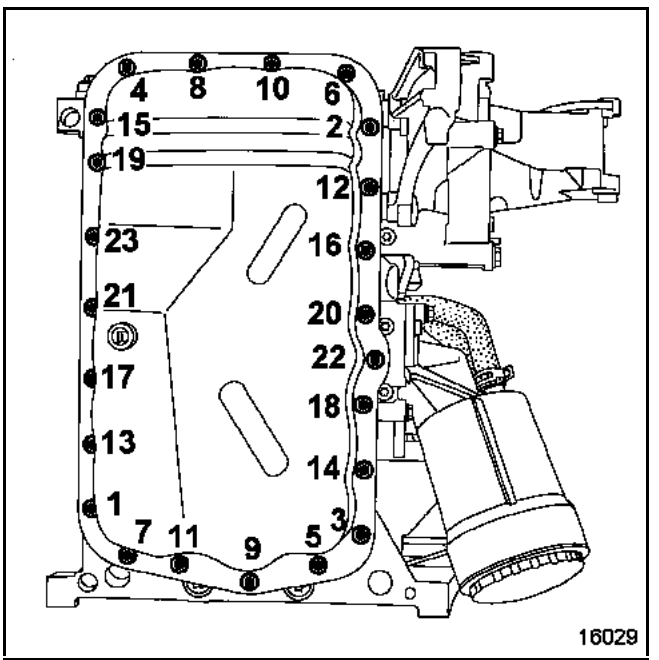
Remove:
– the engine undertray,
– the power-assisted steering pipe mountings on the cylinder block and the air conditioning compressor support,
– the sump mountings.

REFITTING

Apply **Rhodorseal 5661** at (1).



Put back the oil sump fitted with a new seal: pretighten the bolts to a torque of **0.5 daNm** then finally tighten them to **0.9 daNm** in the recommended order.



Top up the engine oil.

SPECIAL TOOLING REQUIRED	
Mot. 1390	**Support for engine/gearbox assembly remove/refit operations**
Mot. 1534	**Inlet camshaft timing tool**
Mot. 1536	**TDC setting rod**
Mot. 1537	**Exhaust camshaft timing tool**

TIGHTENING TORQUE (in daNm and/or °)	
Tension wheel nut	**2.5**
TDC pin hole bolt	**2.2**
Suspended mounting cover bolt	**4.4**
Suspended mounting limiter bolt	**8.5**
Cylinder head suspended mounting bolt	**2.5**
Wheel bolt	**15.5**

REMOVAL

Put the vehicle on four axle stands (see section **02 Lifting equipment** for the correct positions of the lifting jack and axle stands) or on a lift. (**5 tonnes minimum**).

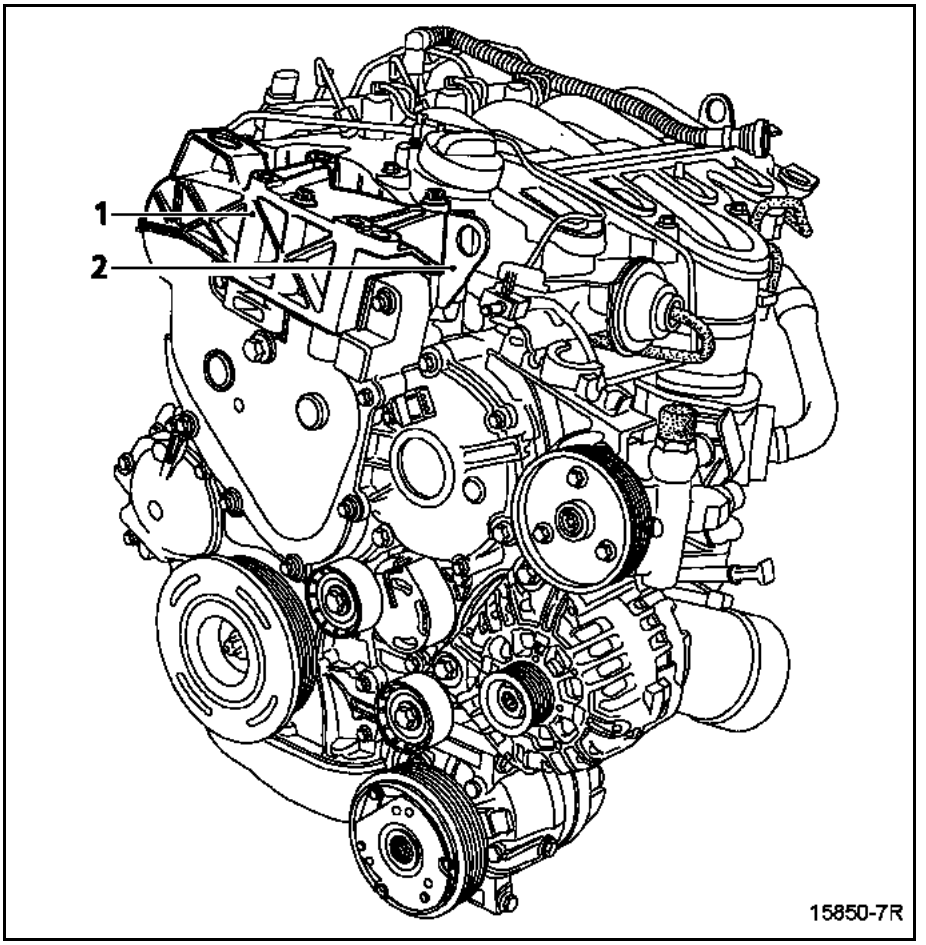
Disconnect the battery.

Remove the engine undertray and the front right wheel.

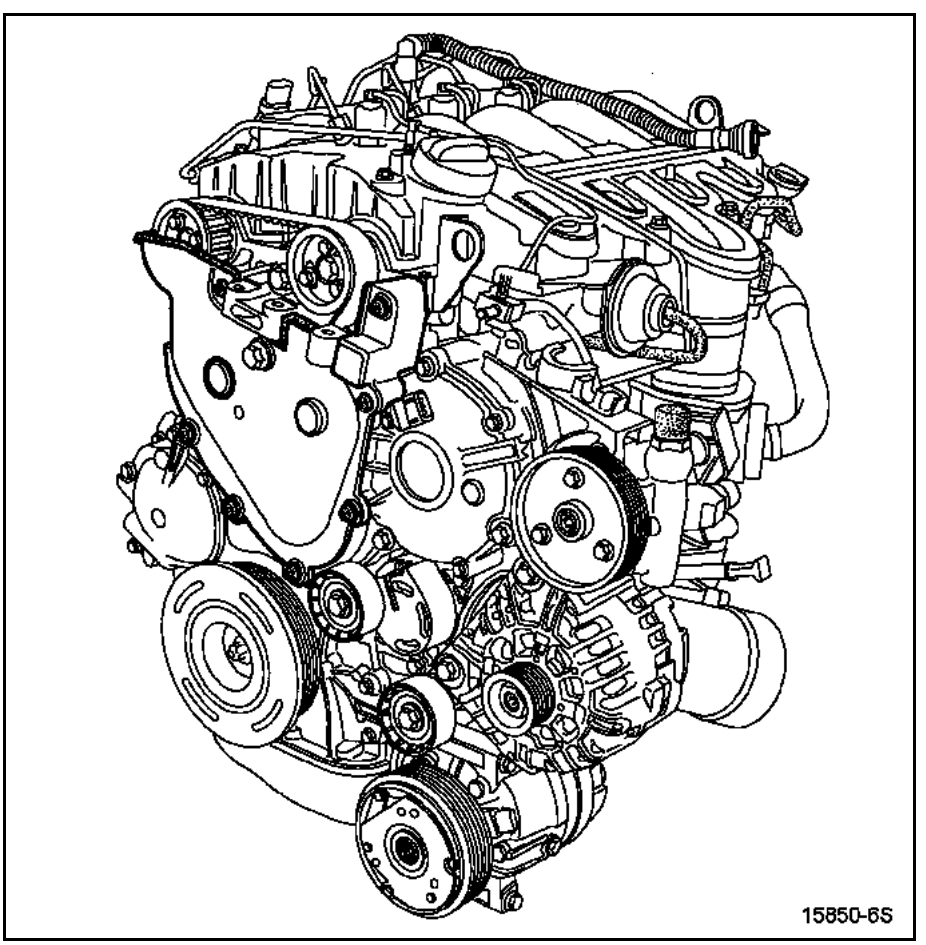
Fit engine support tool **Mot. 1390**.

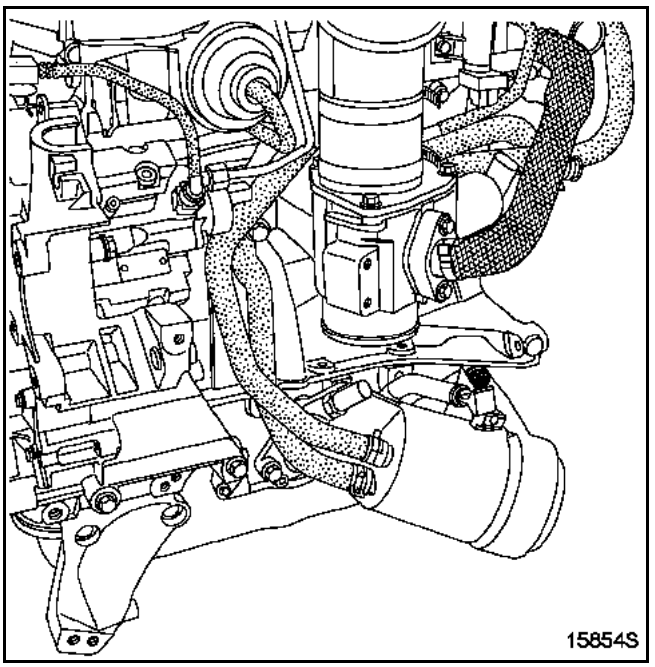
Remove the suspended engine mounting/travel limiter assembly.

Remove:
– the upper timing housing (1),
– the lifting ring (2),



– the valve timing cover,
– the cylinder head suspended mounting.

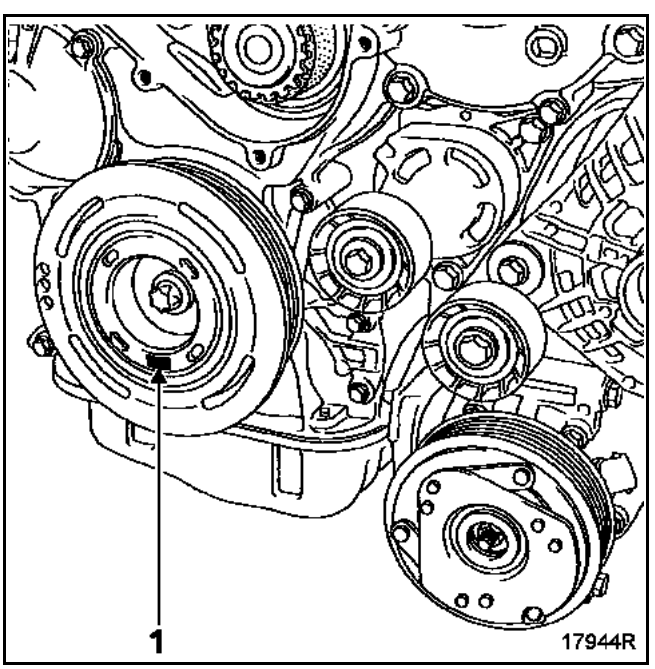




Remove the Top Dead Centre pin plug.

METHOD FOR ADJUSTING TIMING AT THE SETTING POINT

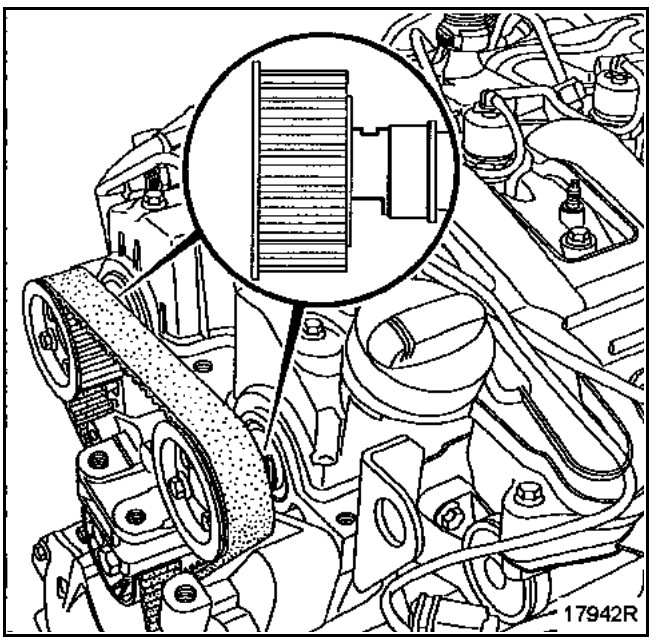
Place the **TDC** mark (1) of the crankshaft accessories pulley almost on the vertical axis of the engine as shown on the following diagram.



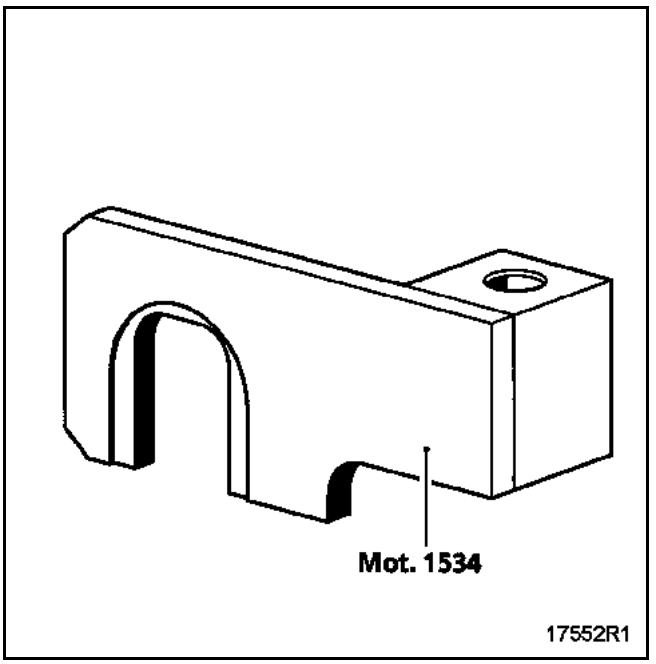
Position TDC pin **Mot. 1536**.

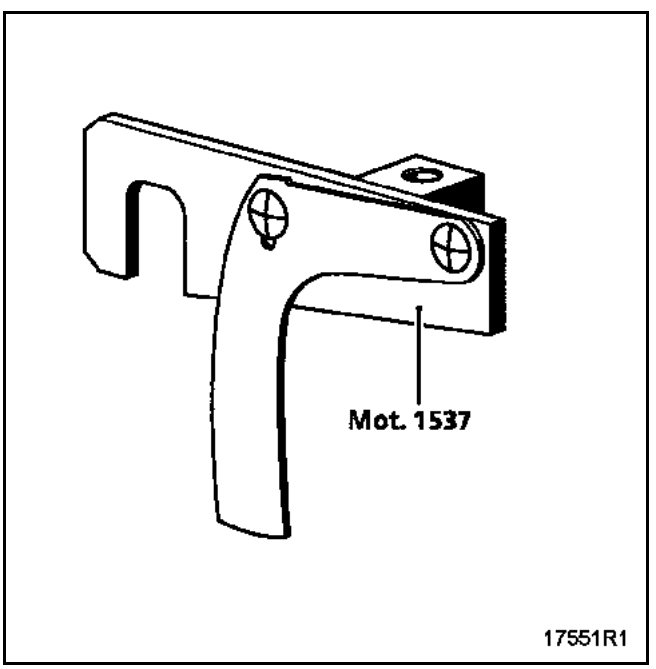
Turn the engine clockwise (timing side), pressing down on TDC pin **Mot. 1536** until it reaches the timing setting point.

The camshaft grooves should be vertical as shown on the following diagram.



The inlet and outlet camshaft timing is set using **Mot. 1534** and **Mot. 1537.**





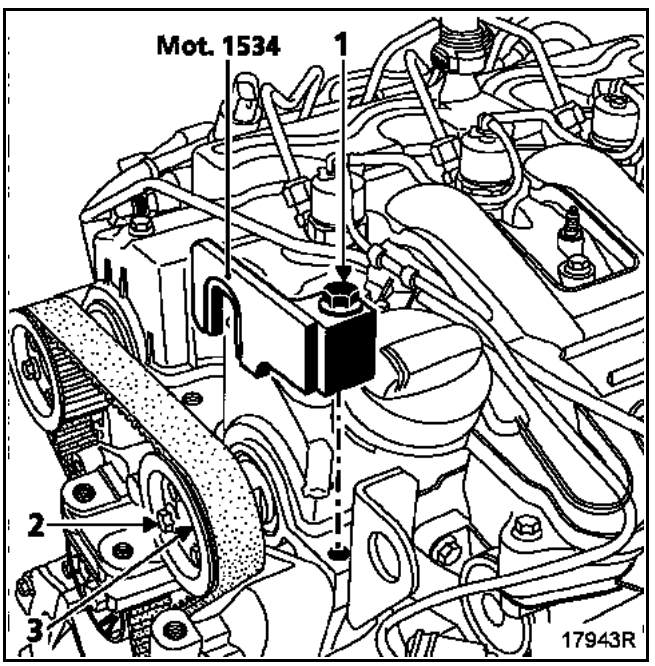
Place **Mot. 1453 and Mot. 1537** in the camshaft grooves as recommended.

For the inlet camshaft:

Set **Mot. 1534** and finger-tighten the bolt (1).

Loosen the three camshaft sprocket bolts by a maximum of one turn.

Turn the inlet camshaft clockwise with the hub mounting bolt (3) (using a **16 mm** tubular hexagon box spanner) in order to pin **Mot. 1534** to the cylinder head and lock the **Mot. 1534** bolt (1).

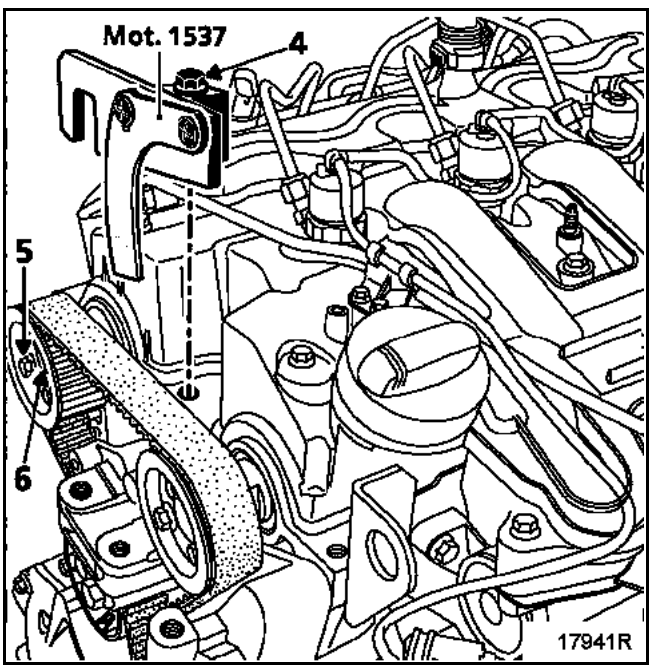


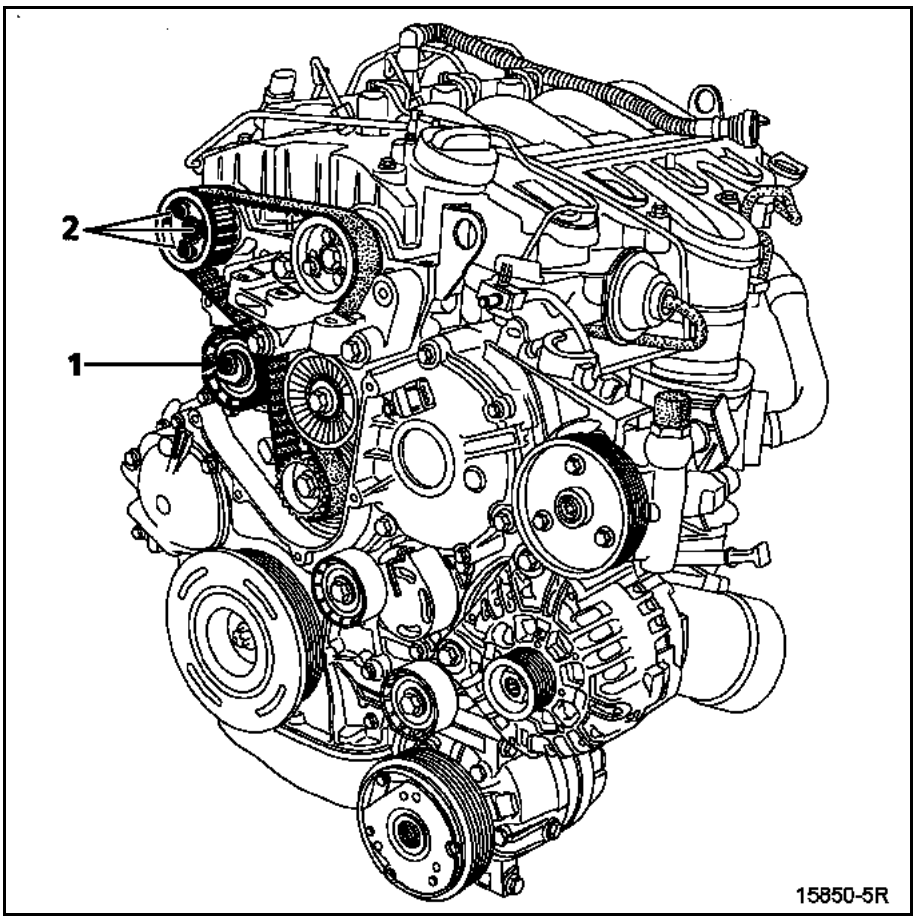
For the outlet camshaft:

Set **Mot. 1537** by finger-tightening the bolt (4).

Loosen the three camshaft sprocket bolts (5) by a maximum of one turn.

Turn the inlet camshaft clockwise with the hub mounting bolt (6) (using a **16 mm** tubular hexagon box spanner) to pin **Mot. 1537** to the cylinder head and lock the **Mot. 1537** bolt (4).





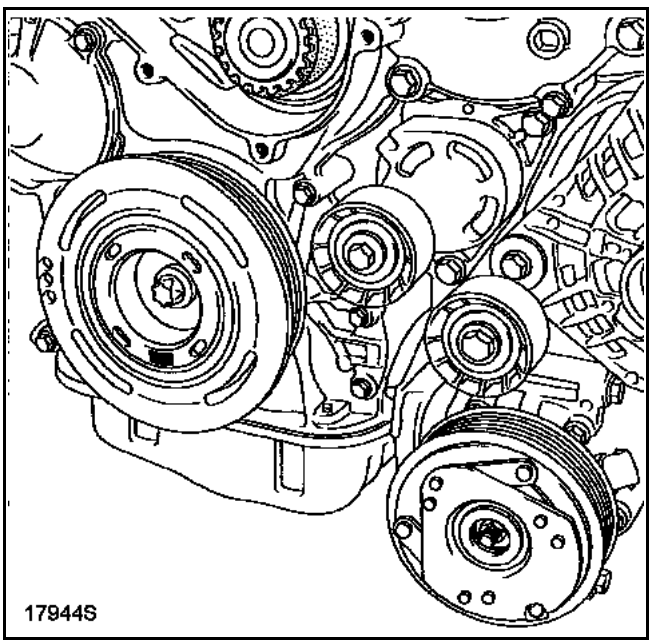
Slacken the timing belt by loosening the tensioning roller bolt (1).

Remove:
– the three bolts (2), then take out the sprocket from the outlet camshaft,
– the timing belt.

REFITTING

TIMING ADJUSTMENT METHOD

Pin the crankshaft to top dead centre (the top dead centre mark on the crankshaft accessories pulley must be on the vertical shaft of the engine).

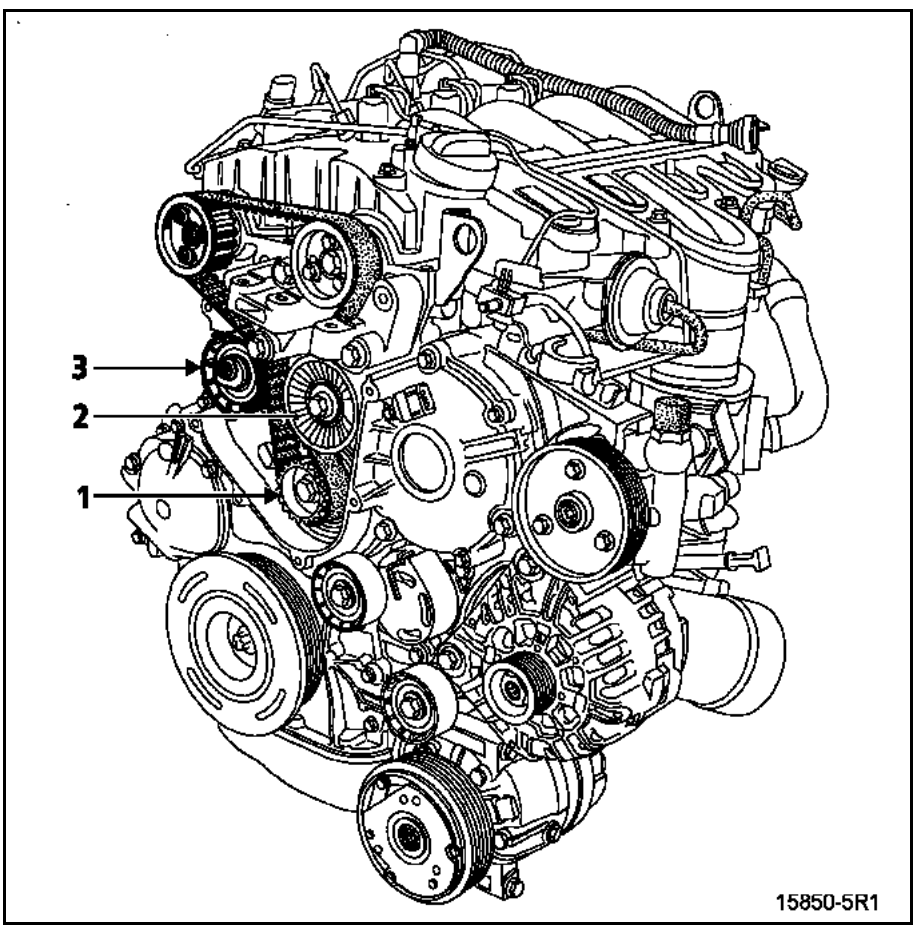


Loosen the three camshaft timing sprocket bolts by a maximum of one turn.

Set the timing belt, starting with the intermediate sprocket (1), the pulley (2), the outlet camshaft sprocket (try to keep the bolts in the middle of the sprocket lights) and the tension wheel (3).

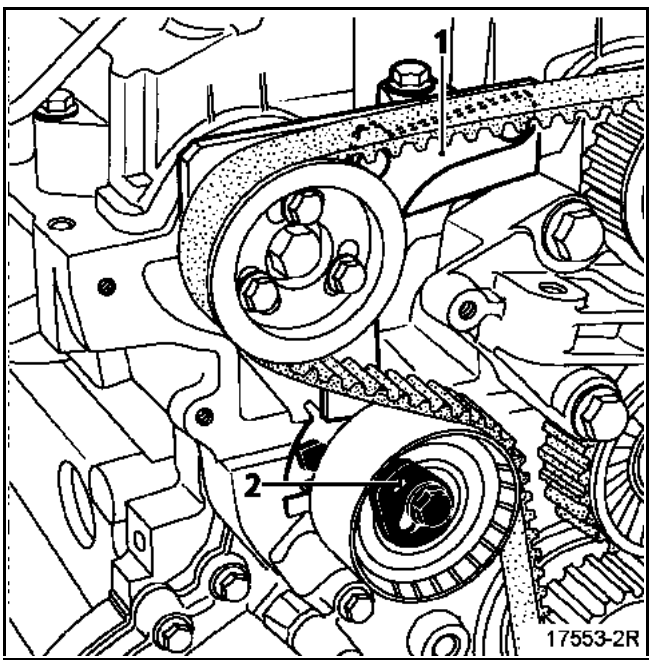
Put the outlet camshaft sprocket on the belt, then place it on the camshaft hub, while trying to keep the bolts in the middle of the sprocket lights.

Replace the three sprocket mounting bolts without tightening them.



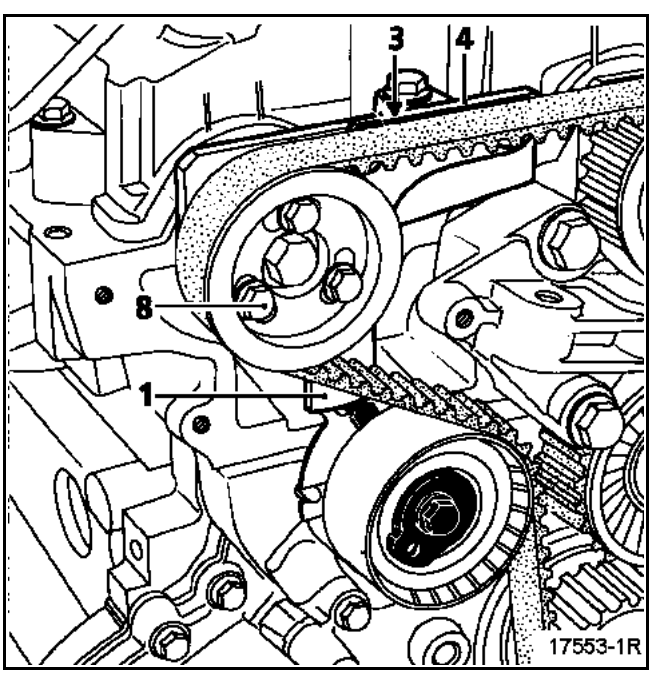
TIMING BELT TENSION

Check that the tab (1) of **Mot. 1537** moves vertically without constraint.

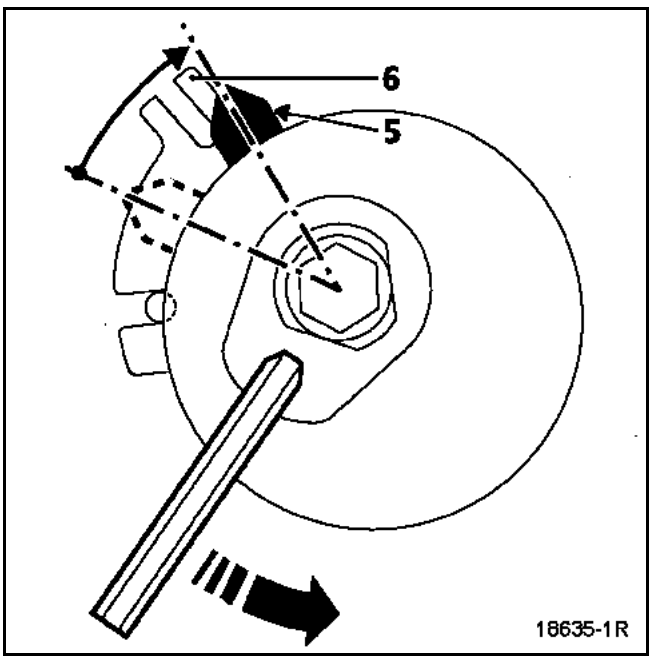


Insert a **6 mm** Allen key in the gear tensioner eccentric opening (2) on the tension wheel.

Pivot the tension wheel eccentric anti-clockwise, until the surface (3) of the tab (1) is aligned with the upper surface (4) of **Mot. 1537**.

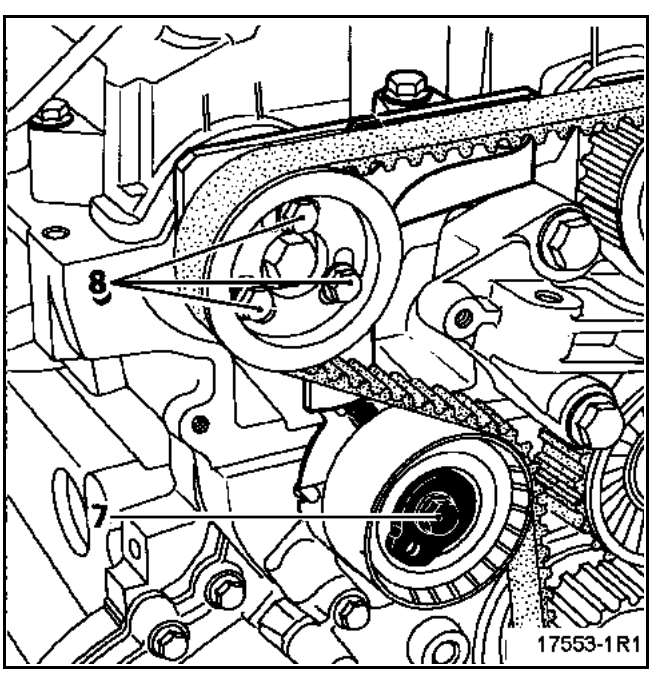


The tension wheel slider (5) should be aligned with the edge (6).



Check that the bolts (8) are not at the stop at the bottom of the camshaft timing pin lights.

Tighten:
– the tension wheel bolts (7),
– the camshaft timing sprocket bolts (8) to a torque of **1 daNm.**



Remove timing tools **Mot. 1534** and **Mot. 1537**, and the TDC pin **Mot. 1536** from the camshafts.

Rotate the crankshaft through two revolutions in a clockwise direction on the timing side.

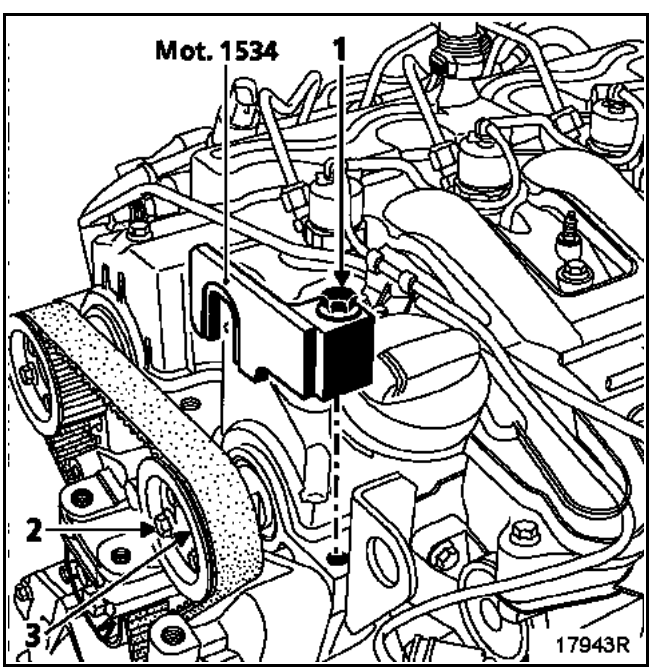
Pin the crankshaft to top dead centre (the top dead centre mark on the crankshaft accessories pulley must be on the vertical axis of the engine).

For the inlet camshaft:

Position **Mot. 1534** and finger-tighten the bolt (1).

Loosen the three camshaft sprocket bolts by a maximum of one turn.

Turn the inlet camshaft clockwise with the hub mounting bolt (3) (using a **16 mm** tubular hexagon box spanner) in order to pin **Mot. 1534** to the cylinder head and lock the **Mot. 1534** bolt (1).

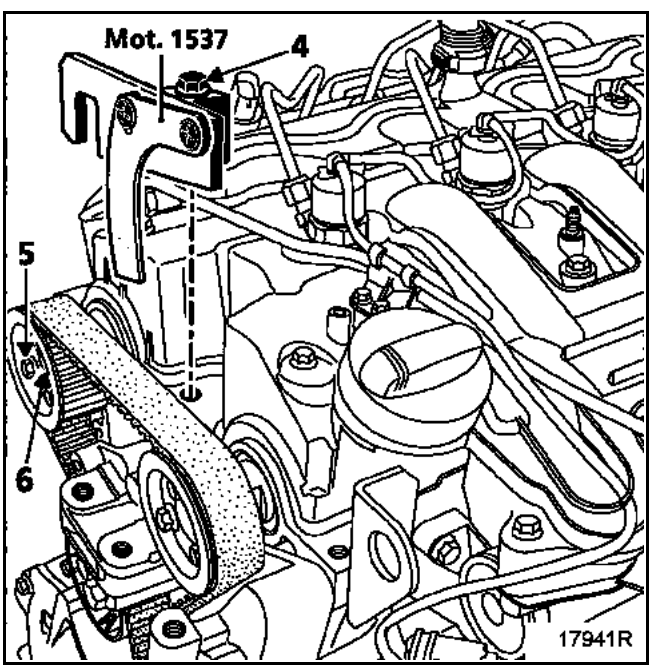


For the outlet camshaft:

Set **Mot. 1537** by finger-tightening the bolt (4).

Loosen the three camshaft sprocket bolts (5) by a maximum of one turn.

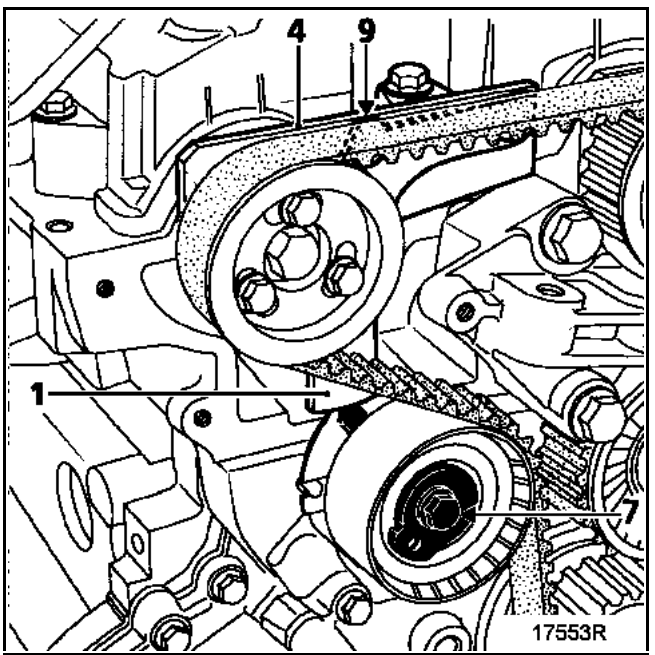
Turn the outlet camshaft clockwise with the hub mounting bolt (6) (using a **16 mm** tubular hexagon box spanner) to pin **Mot. 1537** to the cylinder head and lock the **Mot. 1537** bolt (4).



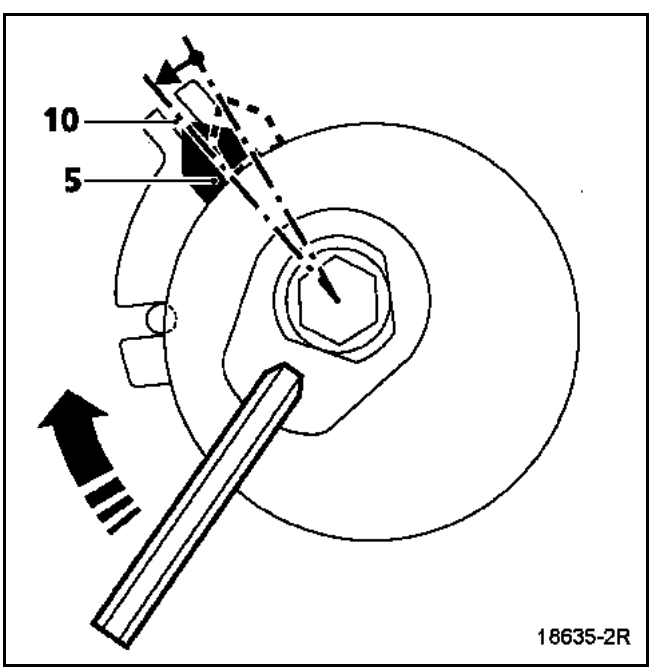
Checking the timing and the tension

Loosen the tension wheel bolt (7) while holding the eccentric with a **6 mm** Allen key.

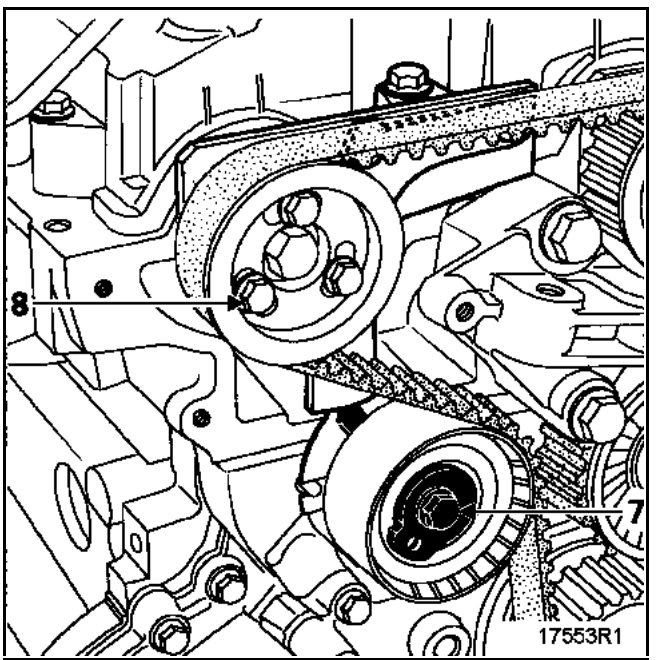
Pivot the tension wheel eccentric clockwise, until the surface (9) of the tab (1) is aligned with the upper surface (4) of **Mot. 1037**.



The tension wheel slider (5) should be positioned in the middle of the groove (10).

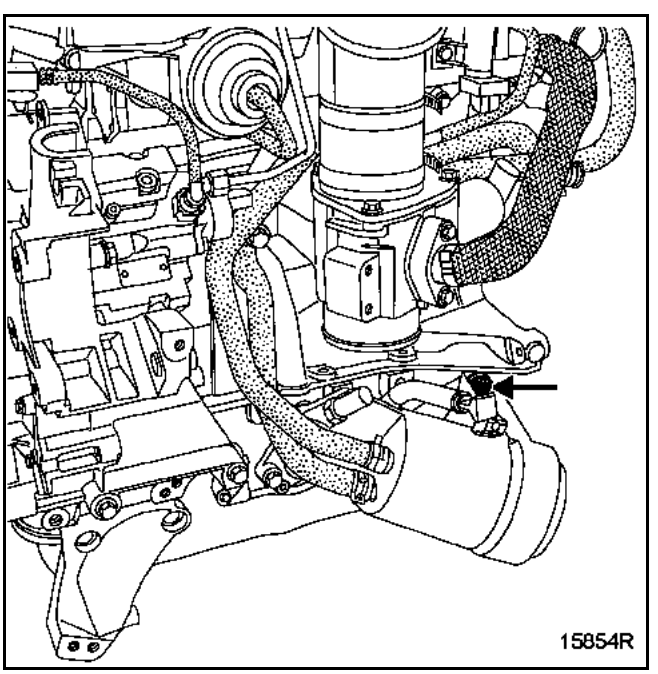


Tighten:
- the tension wheel bolt (7) to a torque of **2.5 daNm**,
- the camshaft timing sprocket bolts (8) to a torque of **1 daNm**.

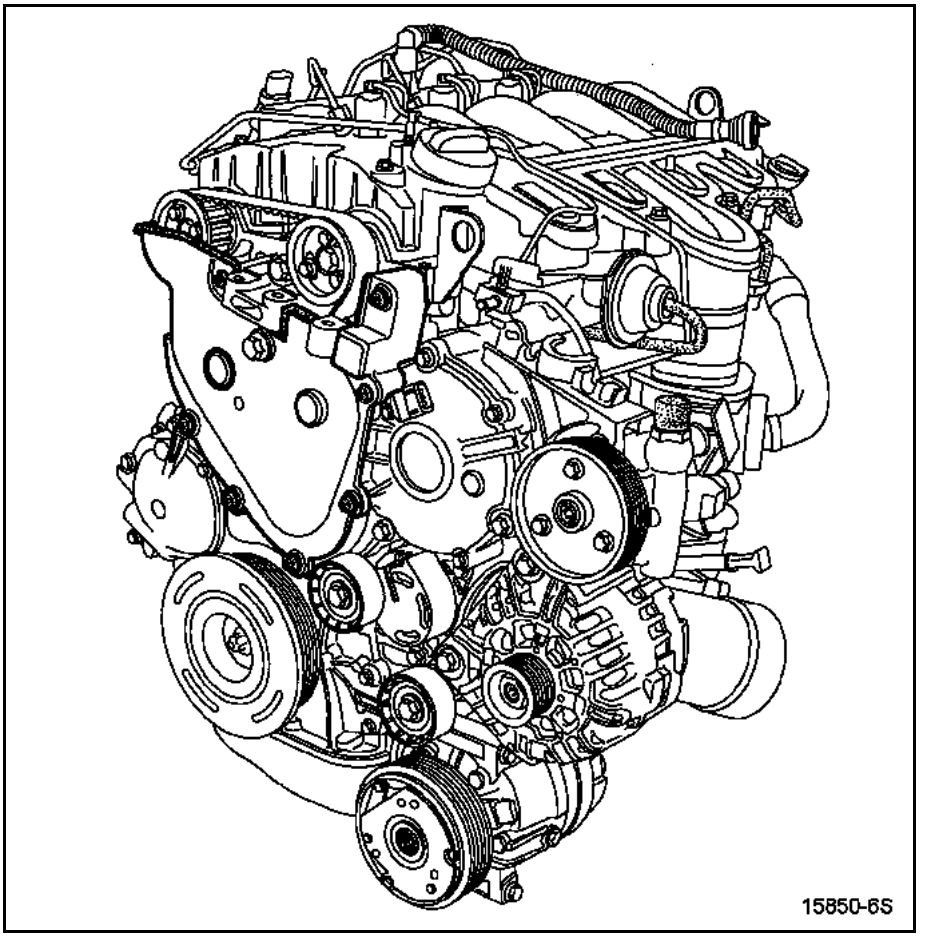


Remove timing tools **Mot. 1534** and **Mot. 1537**, and the TDC pin **Mot. 1505** from the camshafts.

Refit the cap in the TDC pin opening applying **RHODORSEAL 5661** to the thread and by tightening to a torque of **2.2 daNm.**

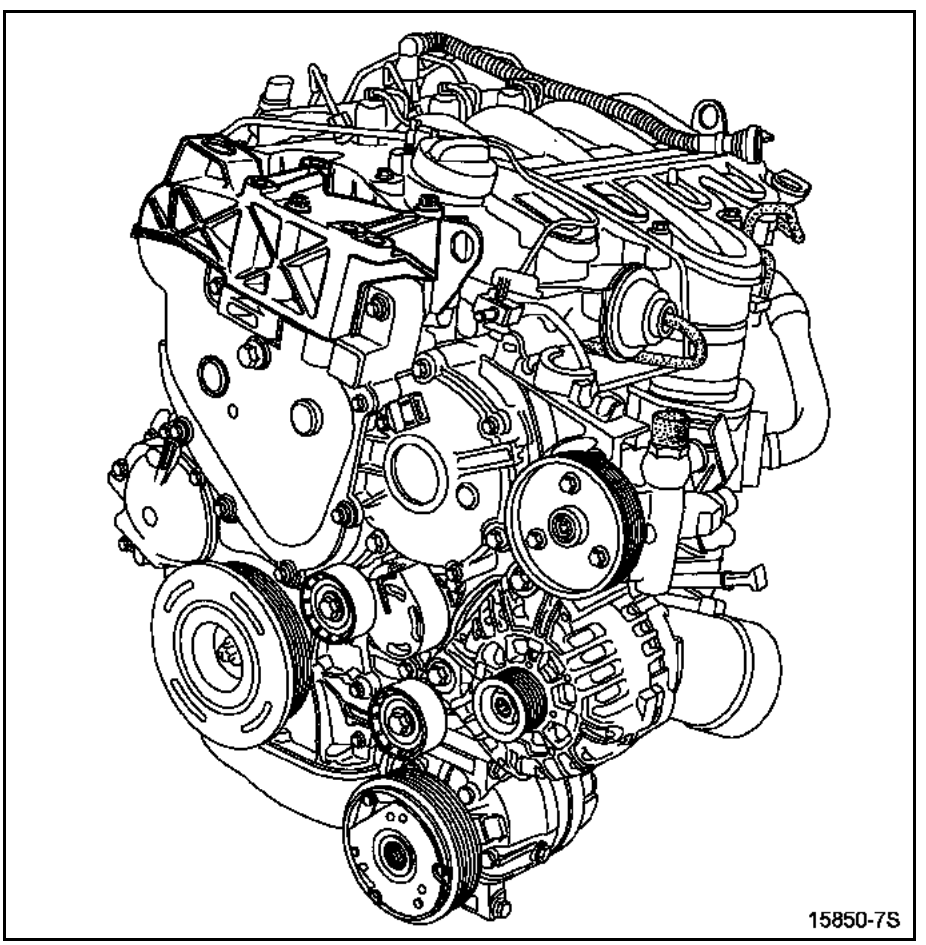


Refit:
– the timing housing, tightening the bolts to a torque of **1 daNm**,



– the cylinder head suspended mounting by tightening the bolts to a torque of **2.5 daNm**.

Refitting is the reverse of removal.



SPECIAL TOOLING REQUIRED	
Mot. 1202-01	Pliers for large hose clips
Mot. 1202-02	
Mot. 1534	Inlet camshaft timing tool
Mot. 1536	TDC setting pin
Mot. 1537	Exhaust camshaft timing tool
Mot. 1448	Remote operation clip pliers for cooling system hose clips
Mot. 1505	Belt tension setting tool Hz measurement
Mot. 1549	Injector extractor
Mot. 1566	Tool for removing and refitting high pressure pipes

EQUIPMENT REQUIRED

18 Torx socket
High pressure pipe wrench (e.g. Facom DM19 wrench)
Angular torque wrench
Cylinder head testing tool

TIGHTENING TORQUE (in daNm and/or °)	
Tension wheel nut	2.5
Front right support mounting bolt on the engine	4.4
Front right support mounting bolt on the side member	8.5
High pressure pipes	2.5
Pretightening injector bracket nut	0.6
Injector bracket nut on the flywheel side	360±30°
High pressure pipe mounting nut	2.5
Injection rail mounting bolt	2.3
Pump/rail pipe bracket bolt	2.5
Camshaft mounting bolt	1.3
Cylinder head cover mounting bolt	1.2
Turbocharger mounting nut	2.6
EGR pipe mounting bolt	2.5
TDC pin hole bolt	2.2
Wheel bolt	15.5

IMPORTANT: before carrying out any work, connect the After-Sales diagnostic tool, set up communication with the injection computer and check that the injection rail is not under pressure.

Make a note of the fuel temperature.

Order the special high pressure injection circuit plug kit.

REMOVAL

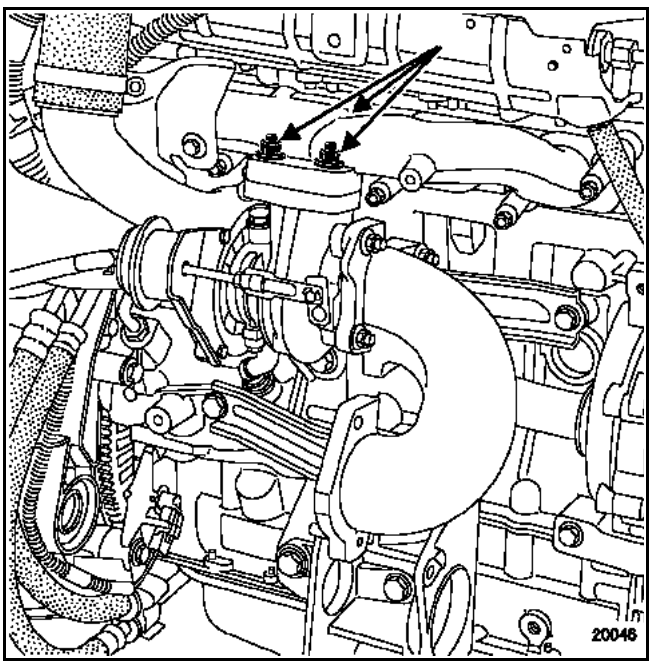
FOLLOW THE CLEANLINESS INSTRUCTIONS CAREFULLY AS GIVEN IN SECTION 13 SPECIAL FEATURES AND CLEANLINESS

Put the vehicle on four axle stands (see **section 02 Lifting equipment** for the correct positions of the lifting jack and axle stands) or on a lift. (**5 tonnes minimum**).

Disconnect the battery.

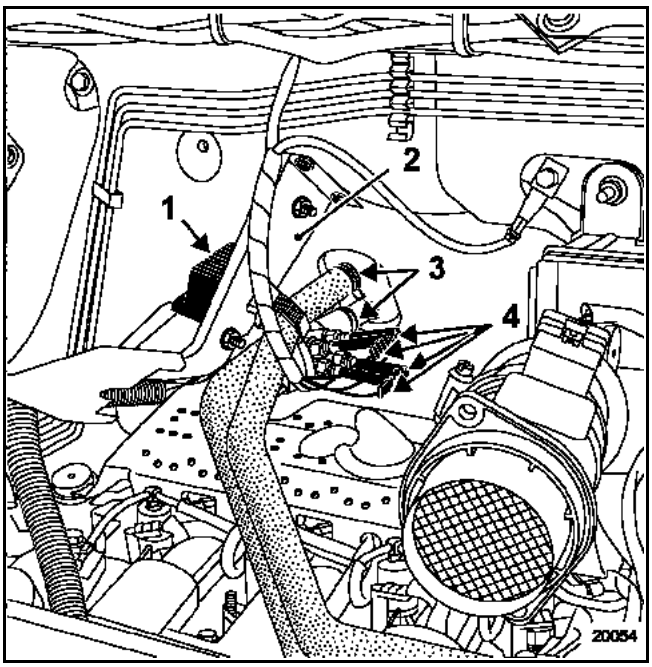
Remove:
– the engine undertray,
– the air filter unit and the air intake tube,
– the air filter mounting,
– the exhaust downpipe mountings,
– the two turbocharging air ducts on the turbocharger and the exchanger inlet,

– the mountings from the turbocharger on the exhaust manifold.



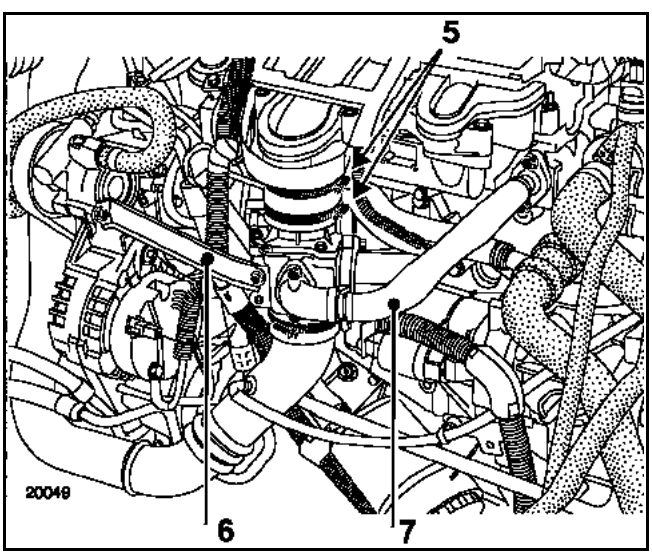
Drain the cooling circuit through the lower radiator hose.

Remove:
– the timing belt (see **the method described in section 11**, Timing belt).
– the tension wheel,
– the expansion bottle mountings and the expansion bottle,
– the preheater unit mounting (1),
– the expansion bottle support mountings (2),
– the heating pipes (3),
– the thermoplunger connectors (4) and the supply strap from the unit then remove the assembly,



Loosen the clamps (5).

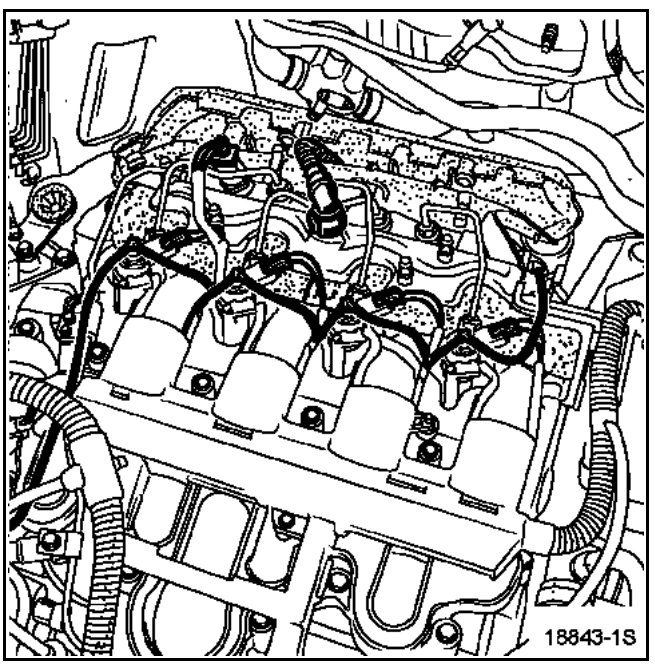
Remove:
– the retaining bracket (6),
– the exhaust gas recirculation pipe (7) and the seals. Replace the pipe and the seals when refitting.



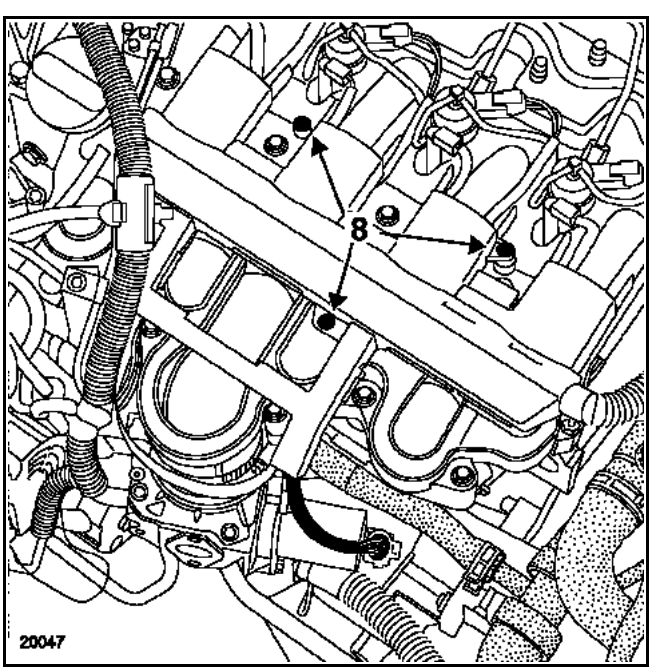
Unclip the rubber flap side partitions.

Unclip the rubber flap from the engine mounting, then the cylinder head cover and push as far as possible to the rear.

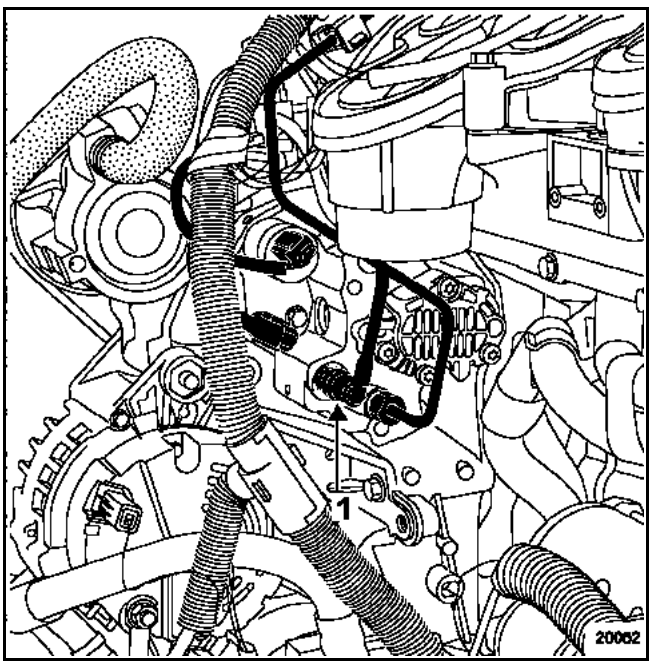
Remove:
– the sealing cover attached by two nuts to the cylinder head cover, holding the stud (on some versions),
– the absorbent soundproofing,



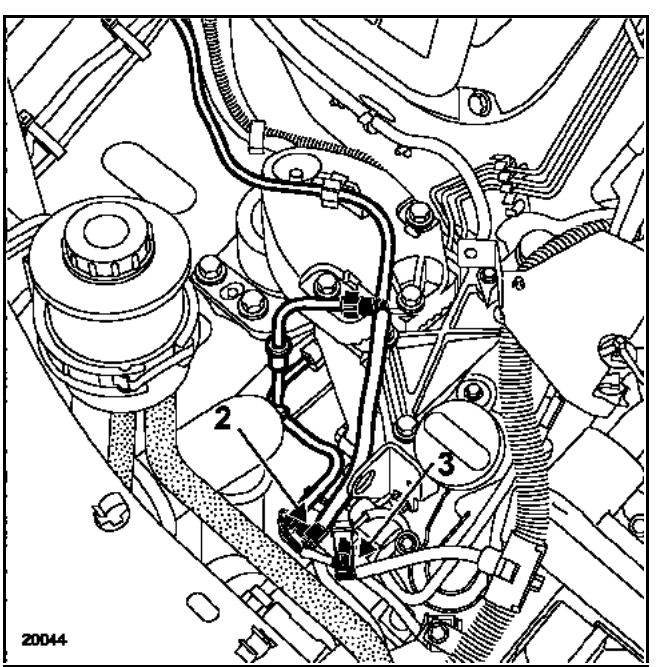
– the electrical harness protector in (8).



Disconnect:
– the vacuum pipe on the vacuum pump,
– the fuel return pipe (1),



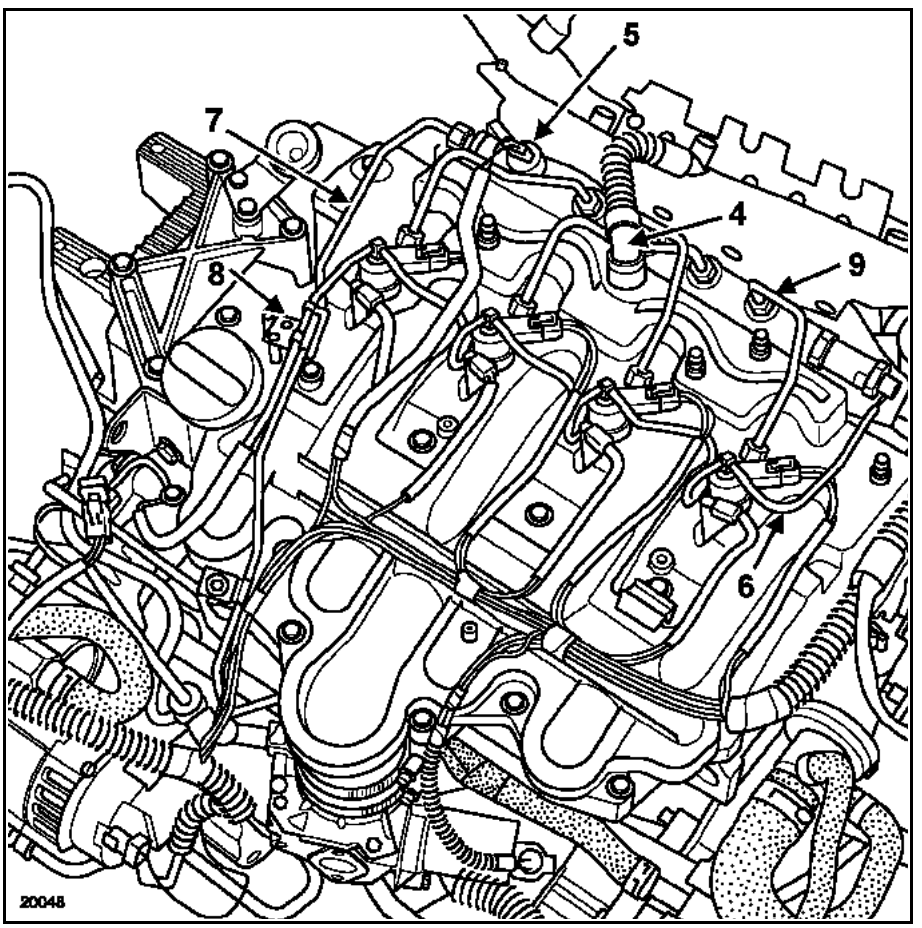
– the pipe (2) and the connector (3),



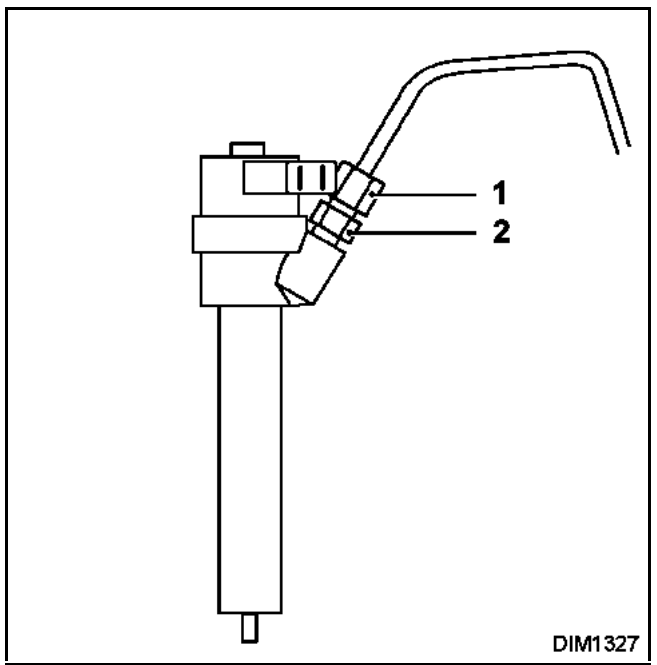
– the oil vapour rebreathing pipe (4),
– the injector connectors, the heater plugs and the pressure sensor (5),
– the diesel fuel return pipe (6) on the injectors and the injector rail then remove it (allow for its replacement when removing it.

Remove:
– the injection pipe (7) between the high pressure pump and the rail, taking care not to damage the bracket (8),
– the injector pipes (9).

Fit plugs to maintain cleanness.

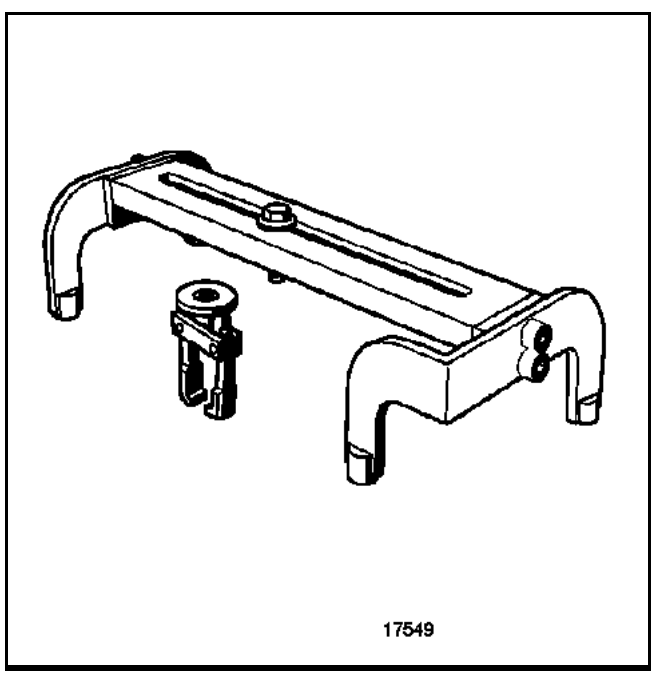


WARNING: when loosening the injection pipe unions (1) on the injector holders, you must hold the filter-rod supporting nuts (2) with a lockwrench.



Loosen the injection rail bolts.

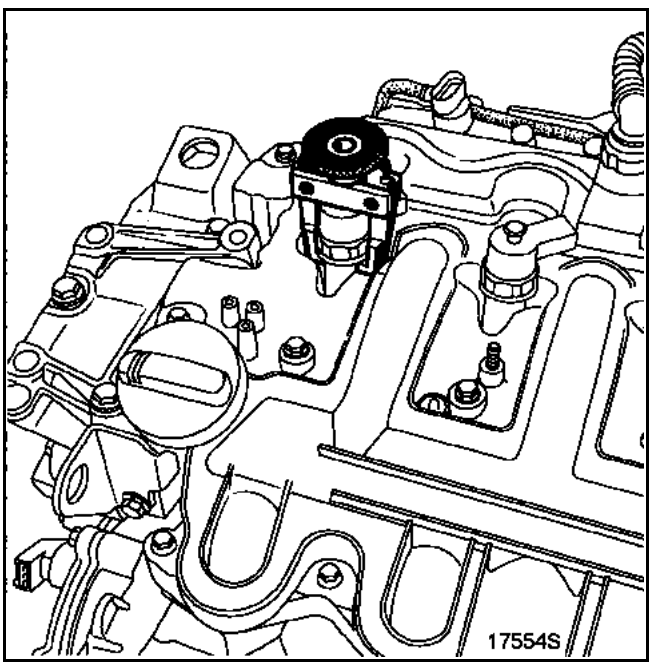
The injectors are removed using tool **Mot. 1549**.



Apply releasing agent around the injector.

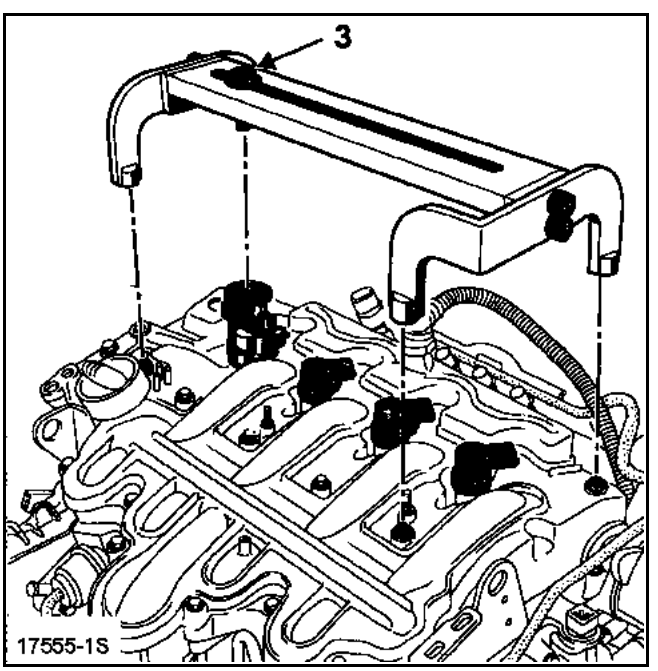
Loosen the injector bracket bolts completely, then place the **Mot. 1549** clamp as shown in the following diagram.

Tighten the knurled ring to bring the two jaws together on the flat surfaces without overtightening.

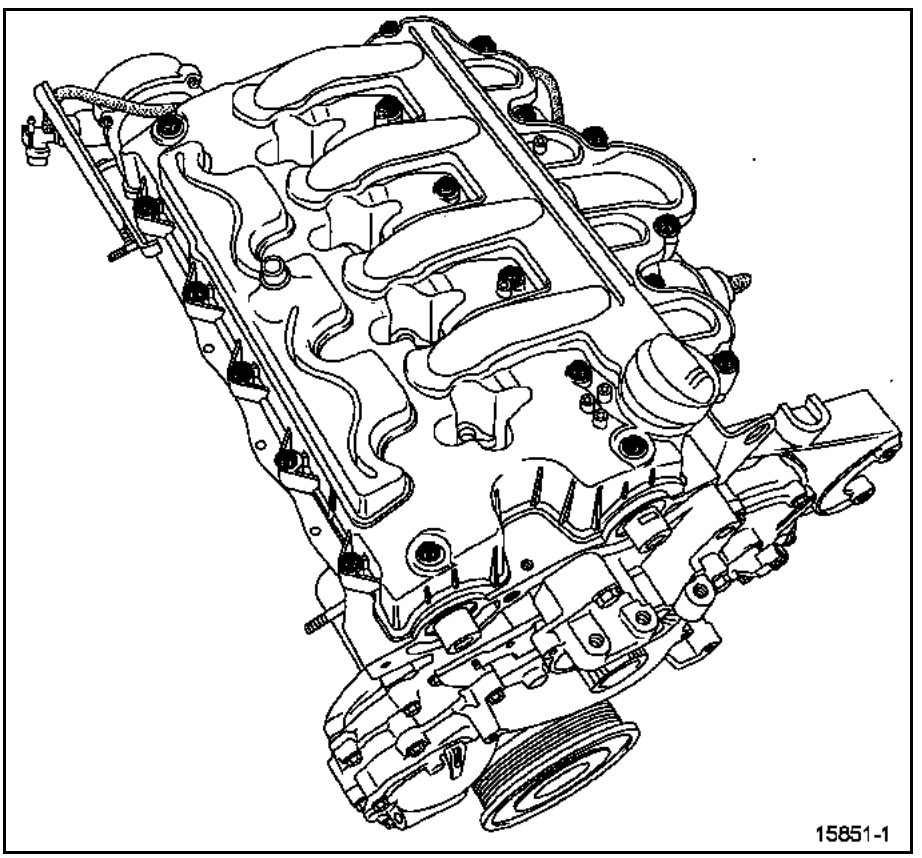


Put the **Mot. 1549** member on the cylinder head cover bolts (as shown in the following diagram).

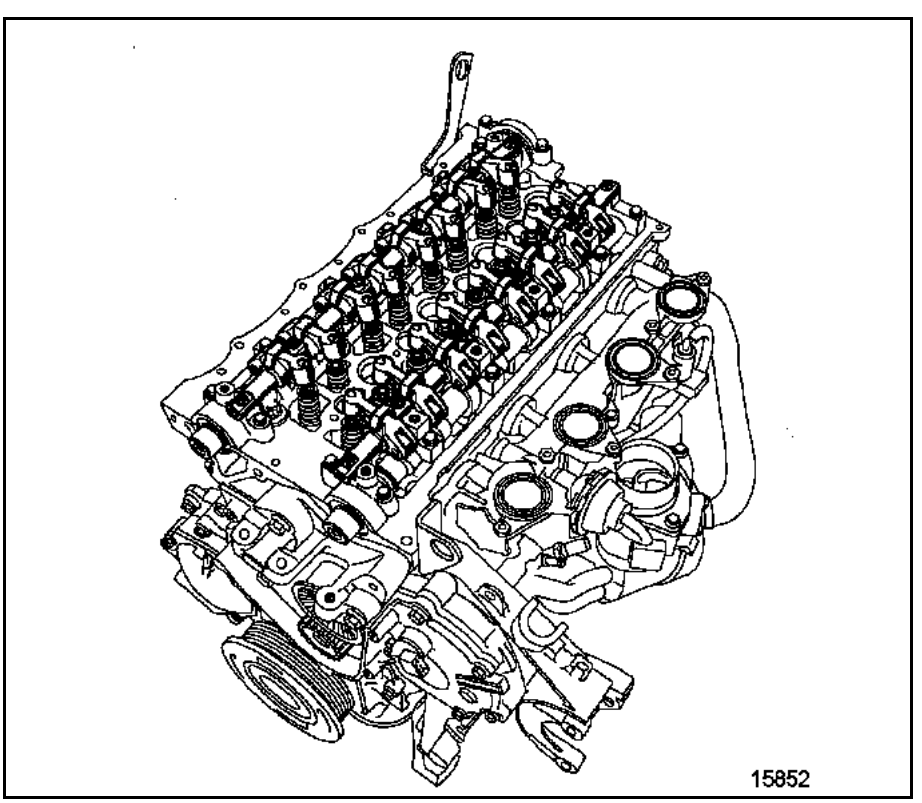
Tighten the bolt in the clamp (3) until the injector is detached. Perform the same operation on the other injectors.



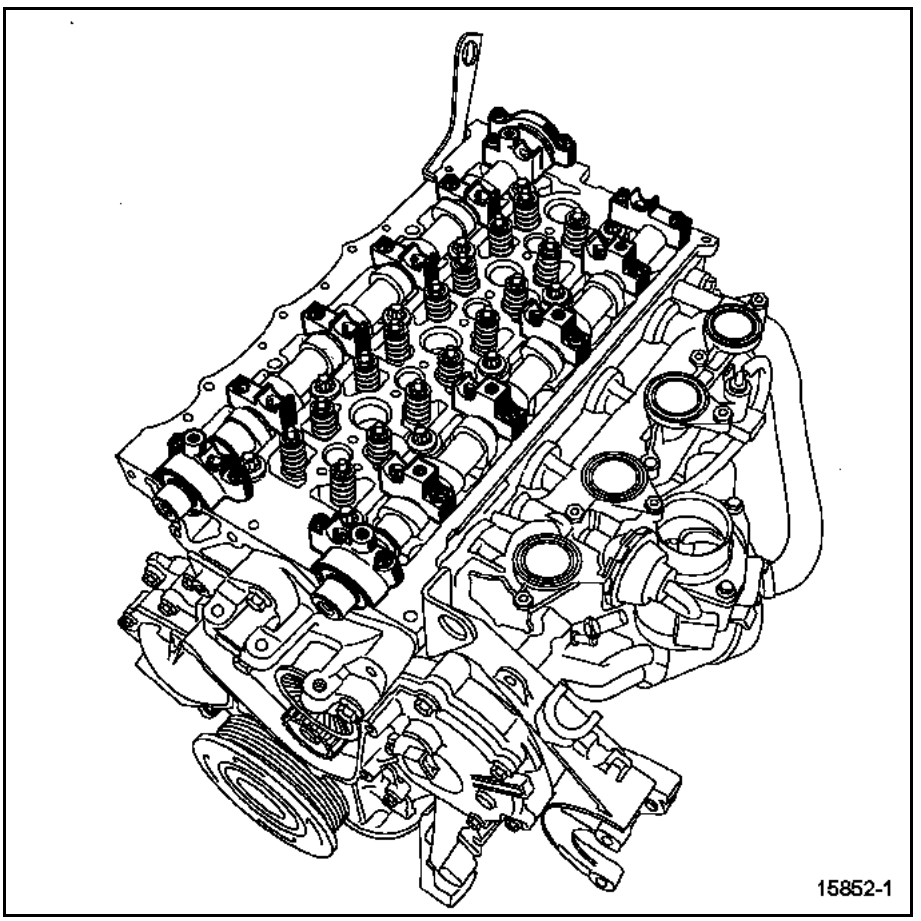
Remove:
– the cylinder head cover,



– the camshafts,



– the mounting bolts from the cylinder head coolant unit,
– the cylinder head.

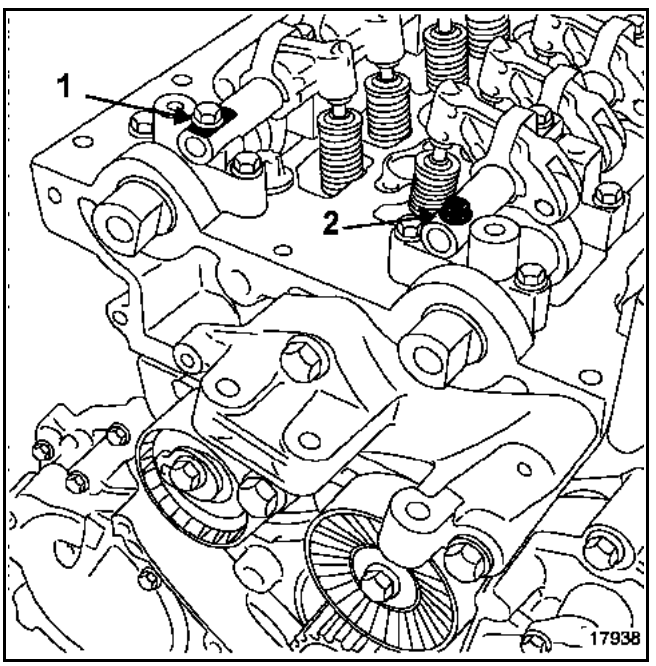


REFITTING

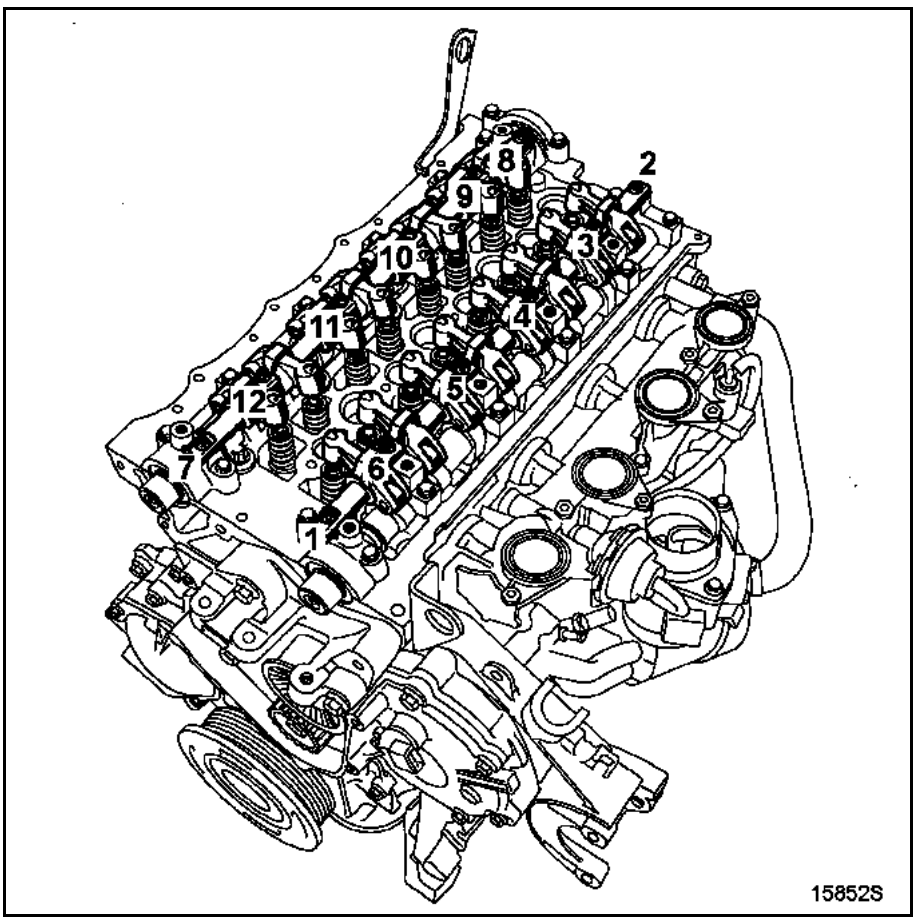
Fit the cylinder head gasket (with the markings on the seal facing upwards), then the cylinder head.

Test the bolts then the cylinder head tightening using an angular wrench (see section 07: Tightening the cylinder head).

Refit the camshafts and position them as follows:
– for the outlet camshaft, put **the end of the camshaft with the flat surface (1) on the timing side**,
– for the inlet camshaft, put **the end of the camshaft without the flat surface (2) on the timing side**,

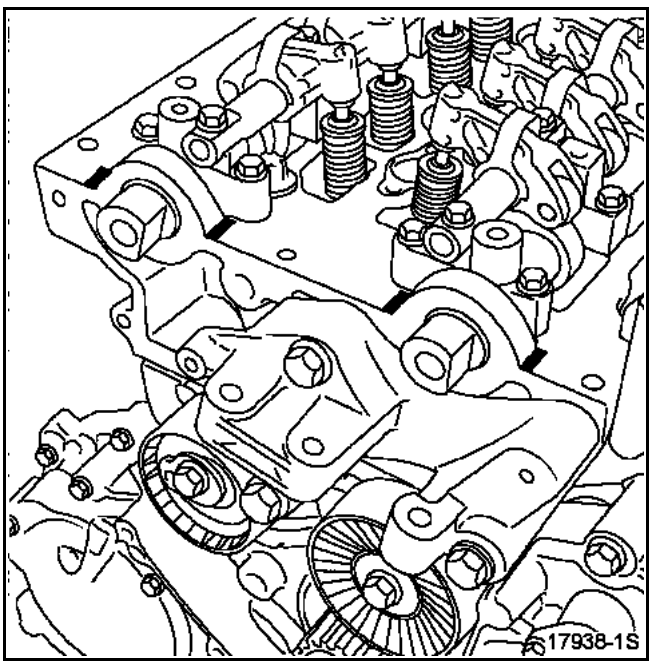


Tighten the camshaft bolts to a torque of **1.3 daNm** in the recommended order.

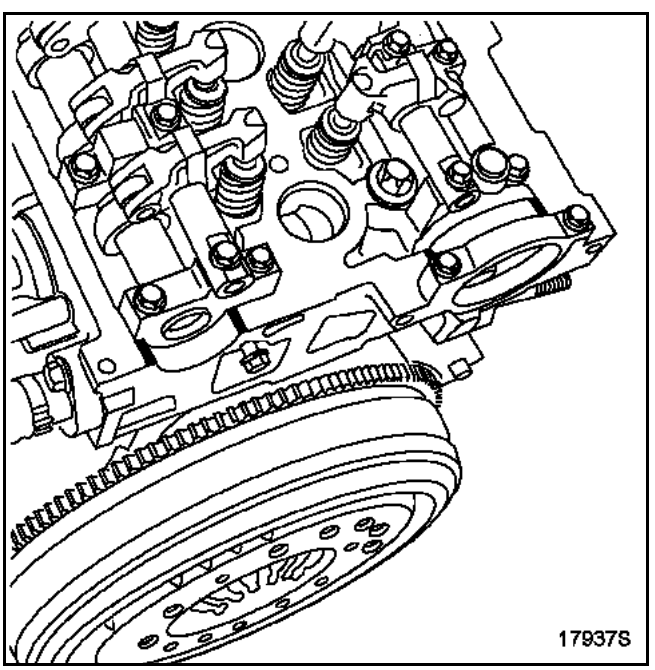


Put **Rhodorseal 5661** in the corners of the camshaft bearing caps and in the valve fastening.

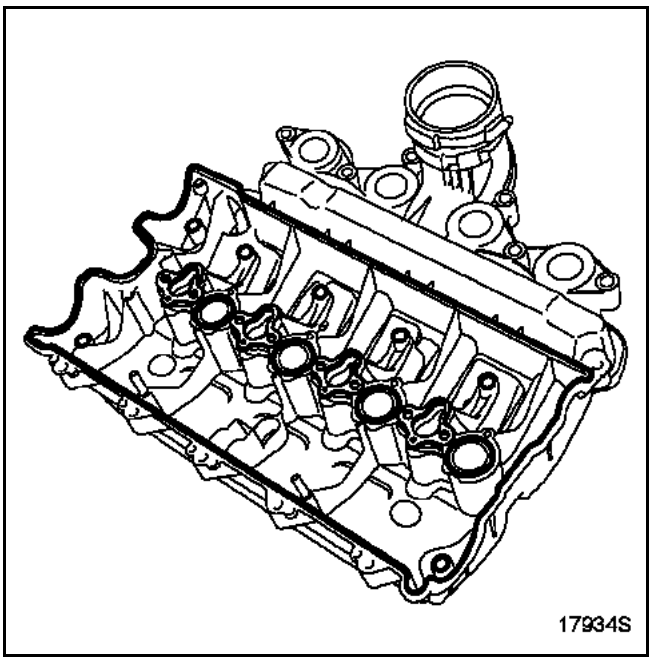
Timing side



Flywheel side

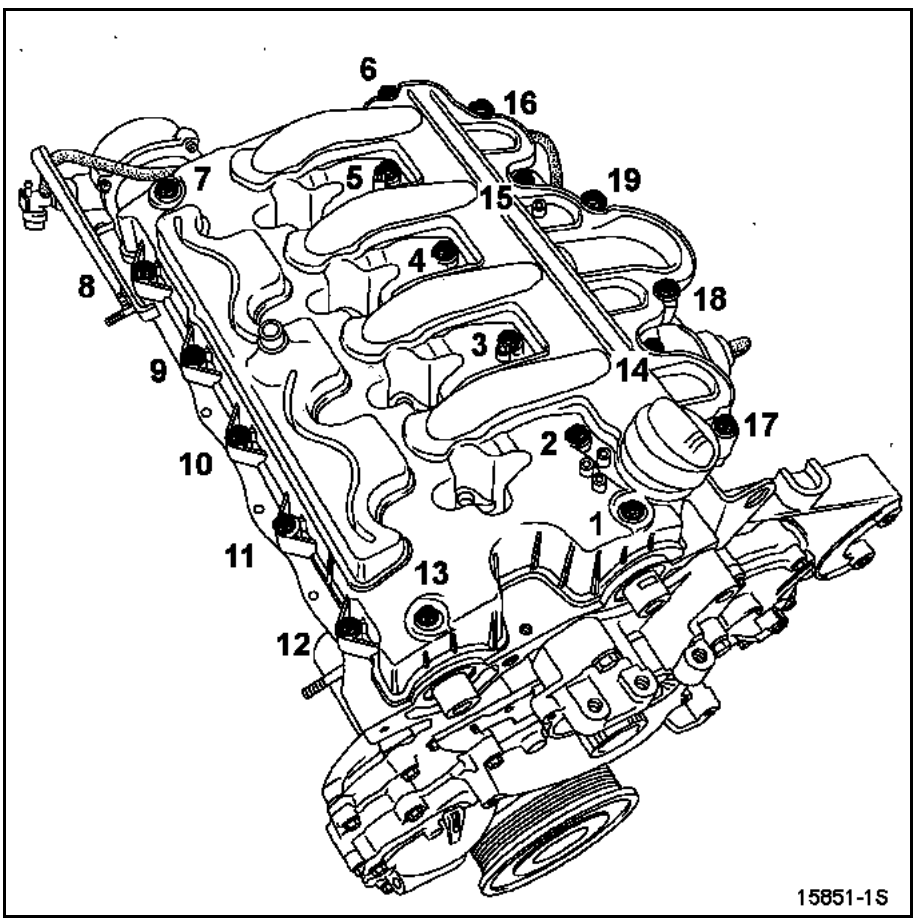


Fit all the seals on the cylinder head cover.



Refit:
– the cylinder head cover/inlet manifold,
– the cylinder head cover mounting bolts so that they touch, by applying a drop of **Loctite Frenbloc** on the bolts (1-2-4-6-8-10-12-13).

Tighten the bolts to a torque of **1.2 daNm** in the recommended order.



Injector removal procedure

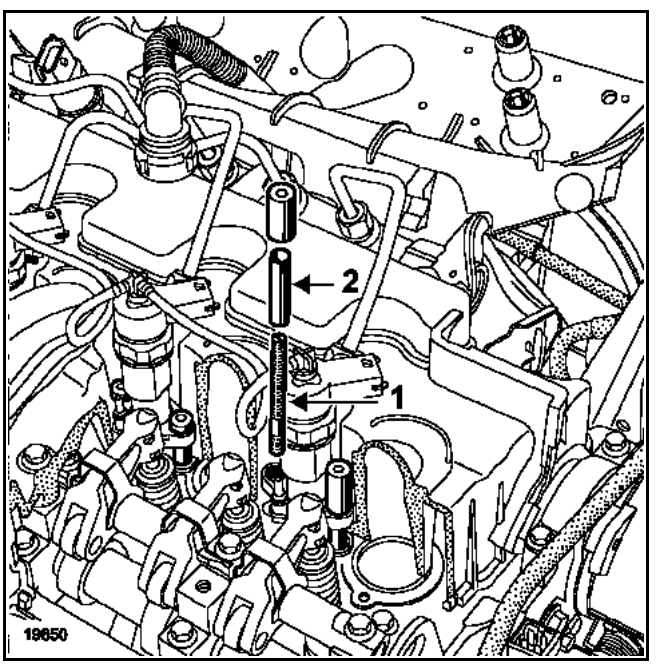
Leave removal of the protection plugs from any component until last.

Clean the injector sockets and the injector bodies, as well as their brackets using a lint-free cloth (use the wipes recommended for this purpose, part no. **77 11 211 707**) dipped in clean solvent.

Dry off using a different new wipe.

Clean one of the old injector mounting bolts and tighten it to the end of the mounting hole thread to clean the tappings.

Fit new studs (1) and injector mounting spacers (2) after coating them with oil on the thread and tighten them as tightly as possible by hand **(0.2 daNm). The studs and nuts must be replaced every time they are removed.**



Fit a new injector head washer on every injector.

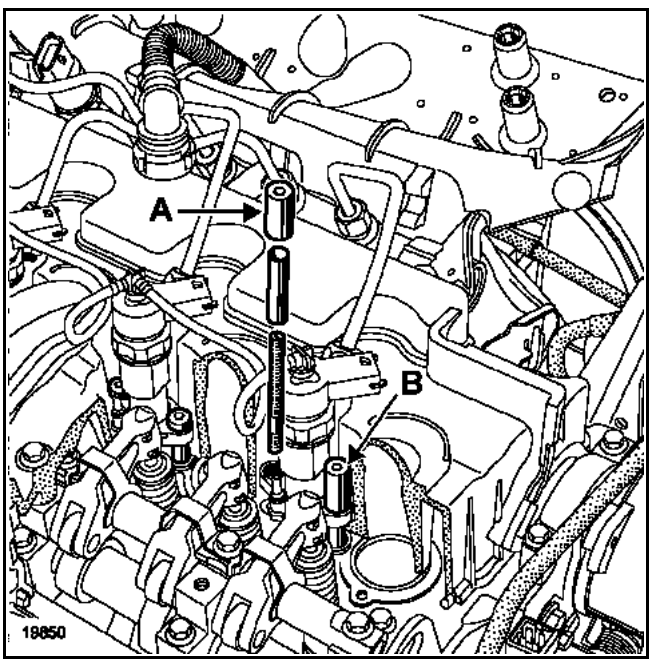
Fit the injector equipped with its bracket and locking spring ring.

Oil the threads of the nuts.

WARNING: tighten the nut (A) on the timing side first, then the bolt (B) on the flywheel side.

Tighten nut A to **0.6 daNm,** then nut B to **0.6 daNm.**

On the timing side first, then on the flywheel side.



Tighten nut B only to **360° ± 30° (nut on the flywheel side).**

Loosen the three rail mounting bolts in order to release it.

Remove the rail plugs, the injector holders and the injection pipes.

Fit the injection pipes between the rail and the injectors and finger-tighten until they touch.

Tighten the three rail mounting bolts to a torque setting of **2.3 daNm**.

Tighten the injector pipe connections on the injectors and the high pressure pump to a torque setting of **2.5 daNm**.

Tighten the injection pipe connections on the rail to **2.5 daNm**.

Clip the pump/rail pipes mounting clip and tighten the two mounting bolts.

Refit the sealing partition, attached to the cylinder head cover by two nuts.

Refix the side partitions of the rail shield correctly.

Fold the rubber flap of the rail protector to the front and clip it .

During any operations on the rail protector, you must ensure that the system components are fitted properly after refitting (see the Rail protector section).

Non-observance of this advice may have serious consequences.

Carry out the rest of the refitting operation in the reverse order to removal.

Throw away the bag of plugs used during the operation.

Refit:
– the timing belt (see the procedure described in section **11** Timing belt).
– the suspended engine mounting, tightening it to torque (see section **19: Suspended engine mounting**).

Refitting is the reverse of removal.

Use the diagnostic tool to erase any faults which may be stored by the injection computer before restarting the engine.

Re-prime the system by switching on the ignition several times, or turn the low pressure pump over with the diagnostic tool using the **Actuator Commands** menu.

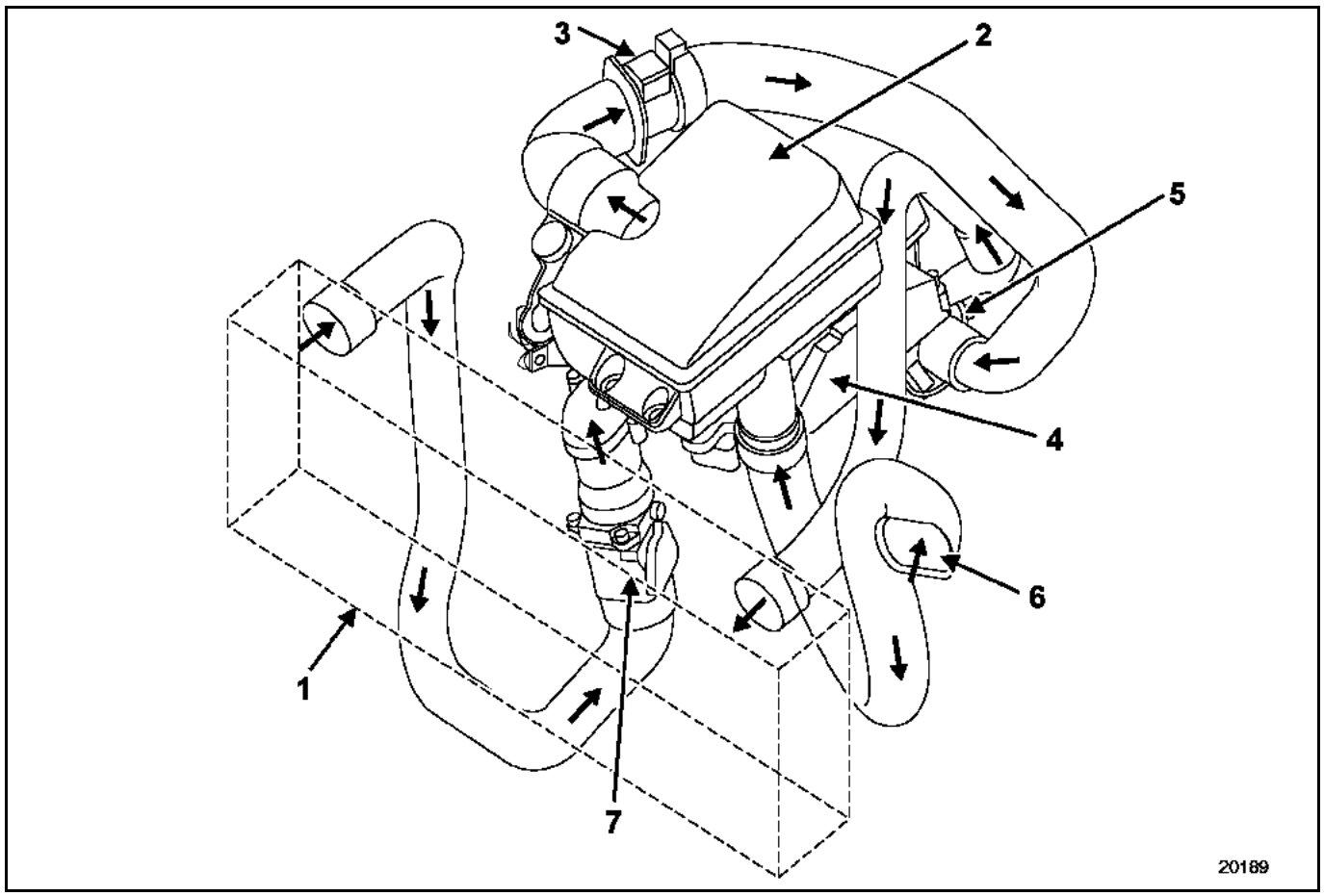
After any operation, check that there are no leaks in the diesel circuit.

Proceed as follows:
– run the engine at idle speed until the fan starts up,
– accelerate several times under no load,
– carry out a road test,
– switch the ignition off and check that there is no leakage of diesel,
– check that the absorbent soundproofing material is not saturated with diesel fuel.

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

Refer to **manual G9T** for the features of camshaft removal and refitting as well as for the procedure for replacing camshaft seals.

AIR INTAKE CIRCUIT DIAGRAM

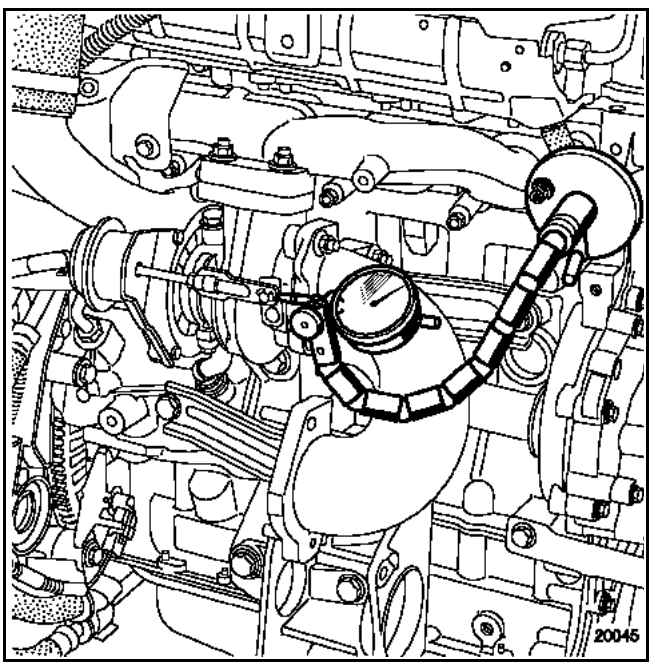


1 Air/air heat exchanger
2 Air filter
3 Flow sensor
4 Inlet manifold
5 Turbocharger
6 Air inlet
7 Damper unit

TURBOCHARGING PRESSURE CONTROL VALVE (WASTEGATE)

Calibration pressure check

Operation on the vehicle.



Use a magnetic base fitted with a gauge which should be positioned at the end of the **wastegate rod** (inserted as close as possible to the centre line of the **wastegate**).

A vacuum is applied progressively to the **wastegate** using pressure gauge **Mot. 1014.**

Calibration value

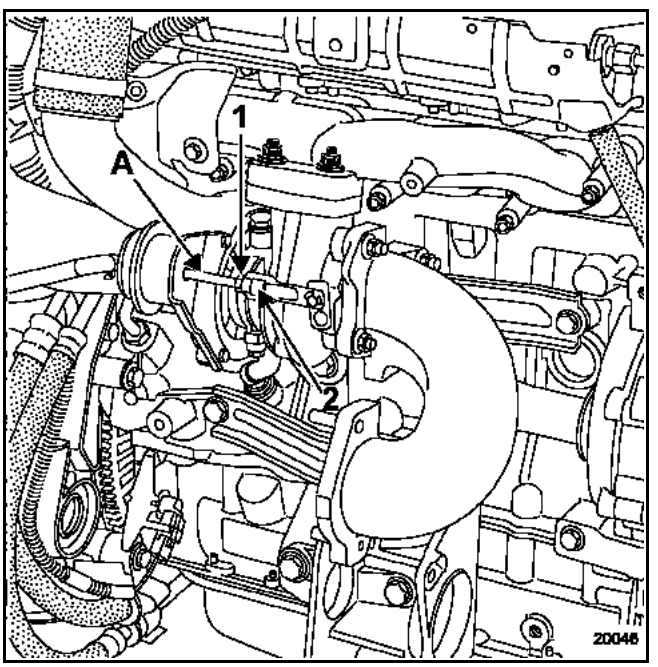
Vacuum value (mbar)	Rod movement (mm)
950 to 1050	1
1350 to 1410	4

On the vehicle itself

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 made with the turbocharger in place.

Loosen the lock nut (1).



Carry out the adjustment by tightening or loosening the adjusting wheel (2) half a turn at a time until the correct calibration pressure is obtained.

Tighten the wheel to increase the calibration pressure.

Loosen the wheel to decrease the calibration pressure.

NOTE: check the calibration pressure after retightening the lock-nut (1).

TIGHTENING TORQUES (in daNm)	
Turbocharger mounting nut	2.6
Oil inlet union	2
Oil return union bolt	0.9
The mounting nuts on the intermediate exhaust downpipe turbocharger	2.6

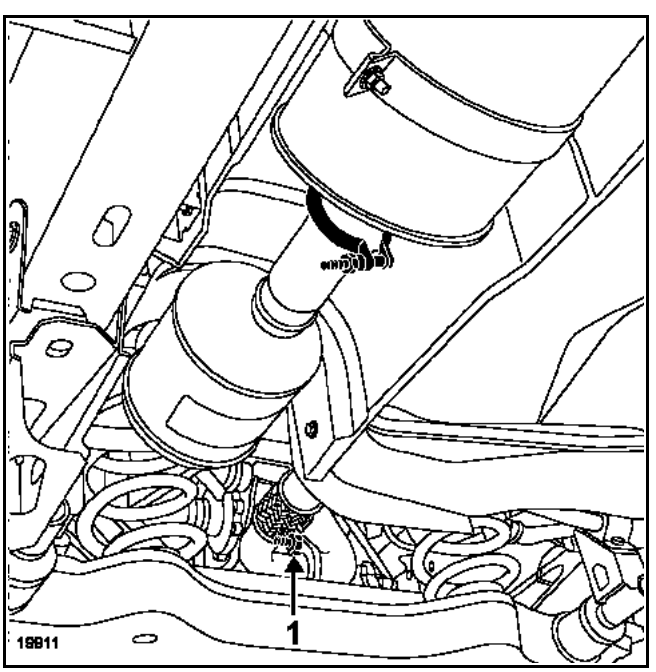
REMOVAL

NOTE: it is recommended that the turbocharger mounting nuts on the exhaust manifold are sprayed with a releasing agent while they are still hot; it will then be easier to remove them.

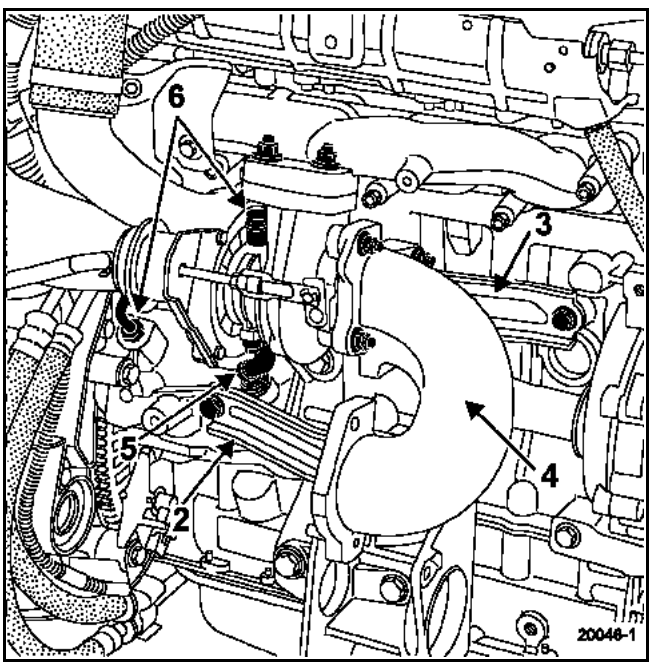
Disconnect the battery.

Put the vehicle on four axle stands (see **section 02 Lifting equipment Trolley jack-axle stands**) or on a lift (**5 tonnes minimum**).

Remove:
– the engine undertray,
– the two catalytic converter mounting nuts (1) on the exhaust downpipe,
– move the exhaust system aside.

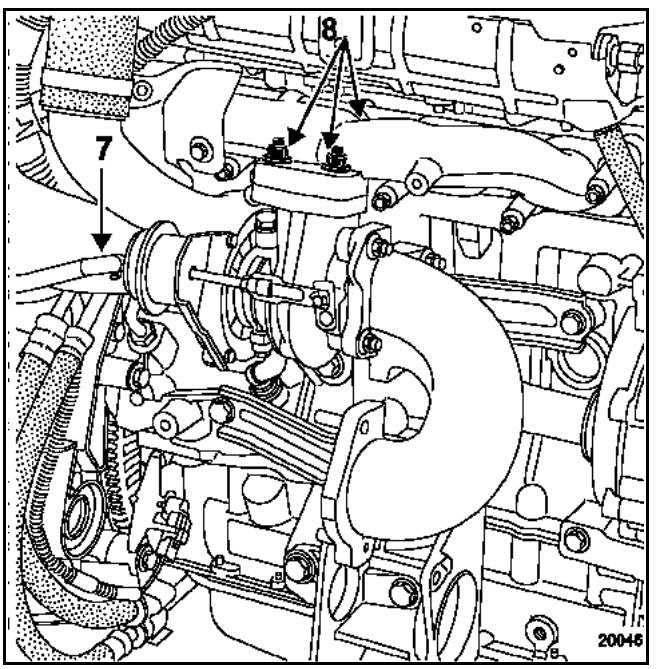


– the air intake and outlet ducts connected to the turbocharger,
– the exhaust downpipe stay (2),
– the turbocharger stay (3),
– the exhaust downpipe (4),
– the engine oil return pipe (5),
– the turbocharger oil supply pipe (6),



Disconnect:
– the turbocharging pressure intake pipe (7) on the **wastegate** valve of the control diaphragm.

Remove:
– the three turbocharger mounting nuts (8) on the exhaust manifold,



– the turbocharger.

REFITTING

For refitting operations, use the reverse procedure to removal.

WARNING: it is imperative that the copper seal in the turbo oil supply union as well as the oil return pipe seal be changed.

IMPORTANT:
Before starting the engine, leave the pressure regulator connector on the high pressure pump disconnected. Then activate the starter motor until the oil pressure warning light extinguishes (persist for a few seconds). Reconnect the regulator, preheat and start the engine. Run the engine at idle speed and check that there are no leaks at the oil connections.
Clear the fault.

Special precautions

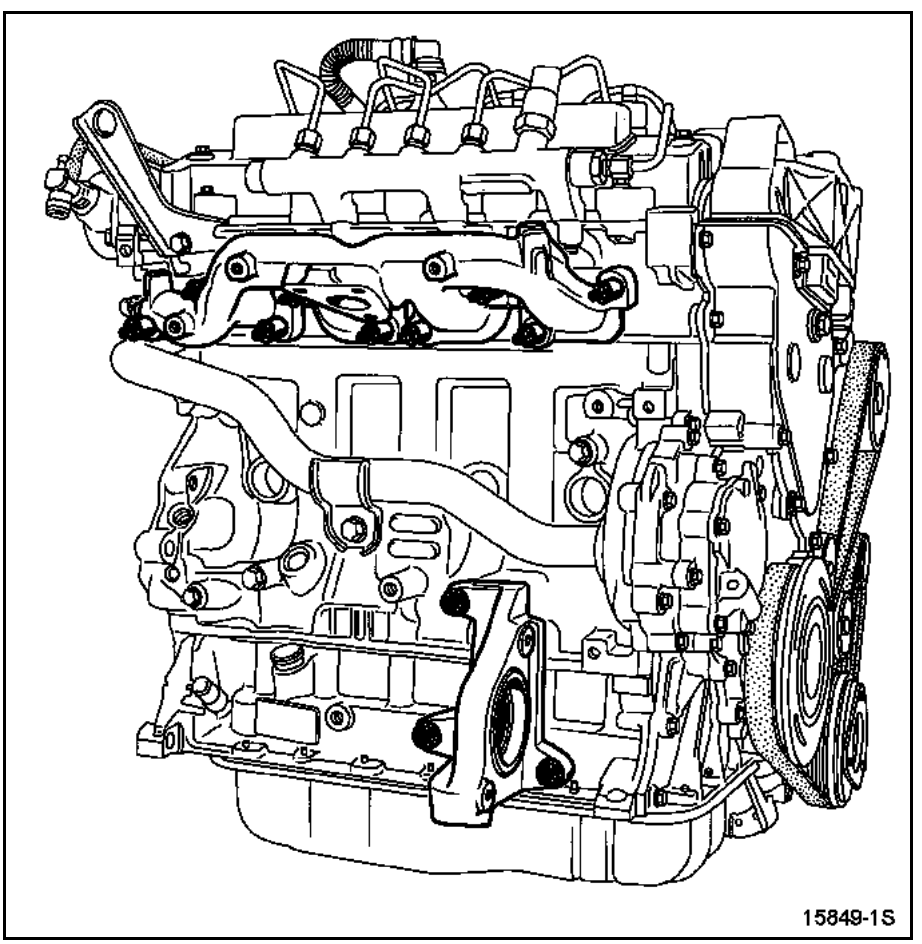
- Before refitting, make sure that the lubrication of the turbocharger bearings is correct. To do this, activate the starter motor having first disconnected the high pressure regulator connector (to inhibit the engine from starting) (erase the computer memory). Sufficient oil should arrive via the oil pressure pipes (place a container underneath). If this is not the case, change the lubrication pipe.
- 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 heat exchanger is not full of oil. If the air/air heat 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 sealed. If not, replace it.

TIGHTENING TORQUES (in daNm)	▽
Manifold mounting stud	**0.8 ± 0.2**
Manifold mounting nut	**2.7 ± 0.4**
the mounting bolts on the heat shield	**1 ± 0.2**

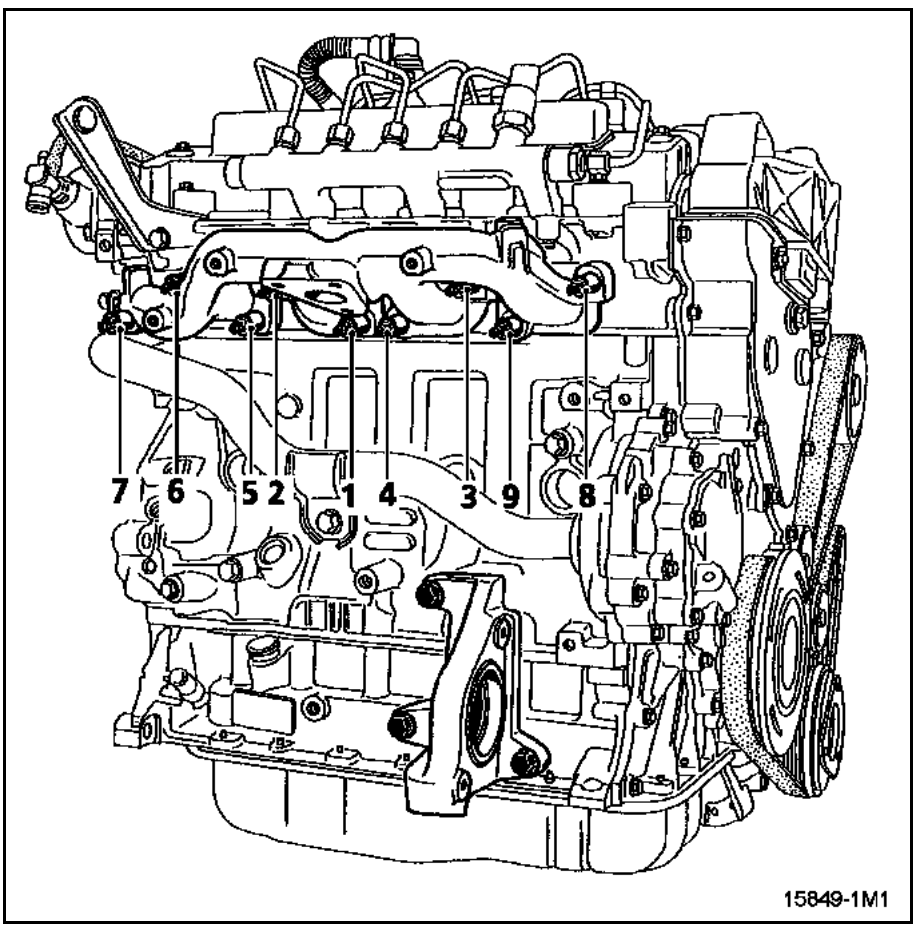
REMOVAL

NOTE: Removal of the exhaust manifold requires removal of the turbocharger (see section **12: Turbocharging, Turbocharger**).

Remove:
– the exhaust manifold heat shield,
– the mounting nuts for the exhaust manifold.
– the exhaust manifold from underneath.



REFITTING



Proceed in the reverse order to removal.

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

Change the exhaust manifold gasket.

TIGHTENING TORQUES (in daNm)	
Clip nuts	5.5 ± 1
EGR pipe mounting bolt	2.5 ± 0.5
Air vent unit mounting bolt	2.2 ± 0.4

AIR VENT UNIT

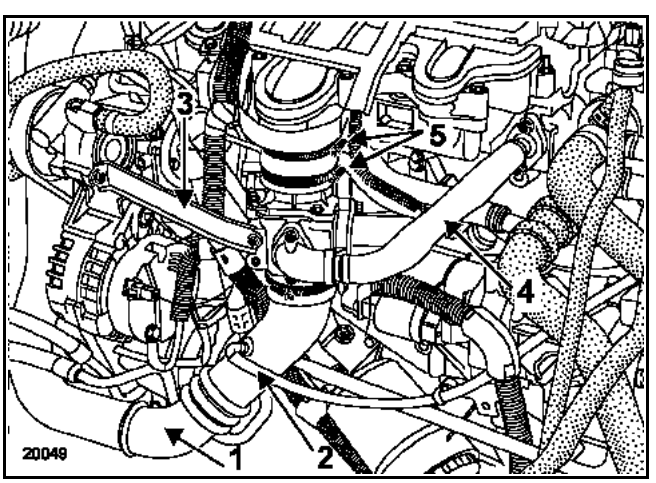
This unit is located between the air/air heat exchanger and the inlet manifold. It incorporates the exhaust gas recirculation electric valve.

REMOVAL

Disconnect the battery.

Put the vehicle on four axle stands (see section **02: Lifting equipment, Trolley jack-axle stands**) or on a lift **(5 tonnes minimum**).

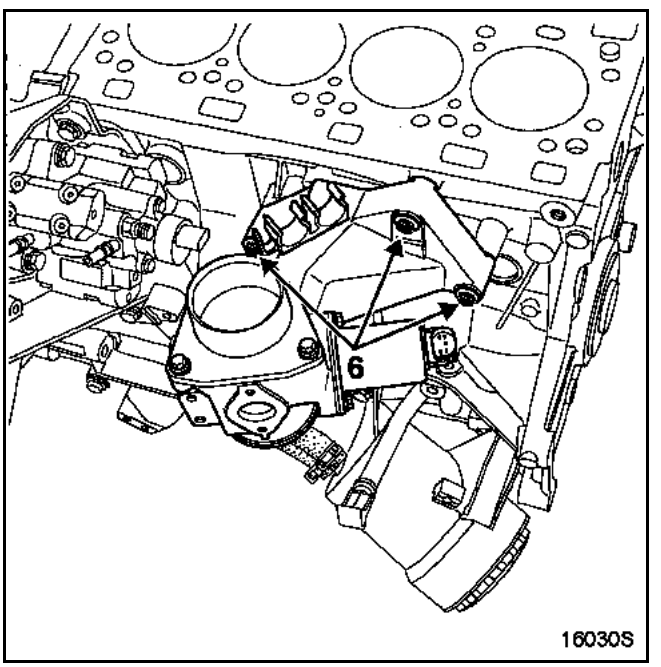
Remove:
– the engine undertray,
– the air exchanger pipe/air vent unit (1) by disconnecting the wastegate pipe (2),
– the stiffening bracket (3) between the air vent unit and the power assisted steering pump,
– the exhaust gas recirculation pipe (4) and the seals. Plan to replace the pipe and the seals when refitting.



Disconnect the exhaust gas recirculation control solenoid valve connector.

Loosen the clips from the connection pipe (5) with the inlet manifold.

Remove:
– the mounting bolts from the air vent unit (6),
– the air vent unit with the exhaust gas recirculation electric valve from underneath.



REFITTING

Proceed in the reverse order to removal observing the tightening torques.

TIGHTENING TORQUES (in daNm)	
Cylinder head cover mounting bolt	1.2
Injection rail mounting bolt	2.3
High pressure pipe nuts	2.5

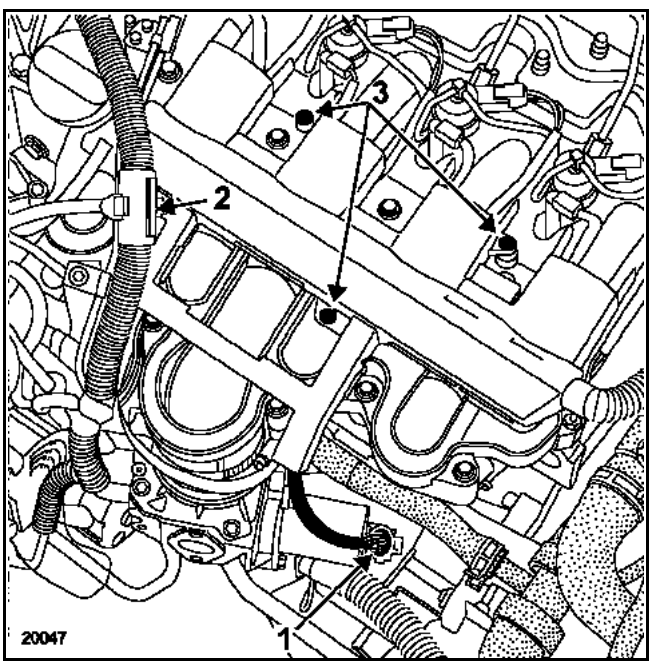
REMOVAL

NOTE: when removing the inlet manifold, the injectors and the pump/rail high pressure pipe must also be removed (see section **13: Diesel equipment, Injector**).

Disconnect:
– the heater plug connectors,
– the connector from the EGR valve (1).

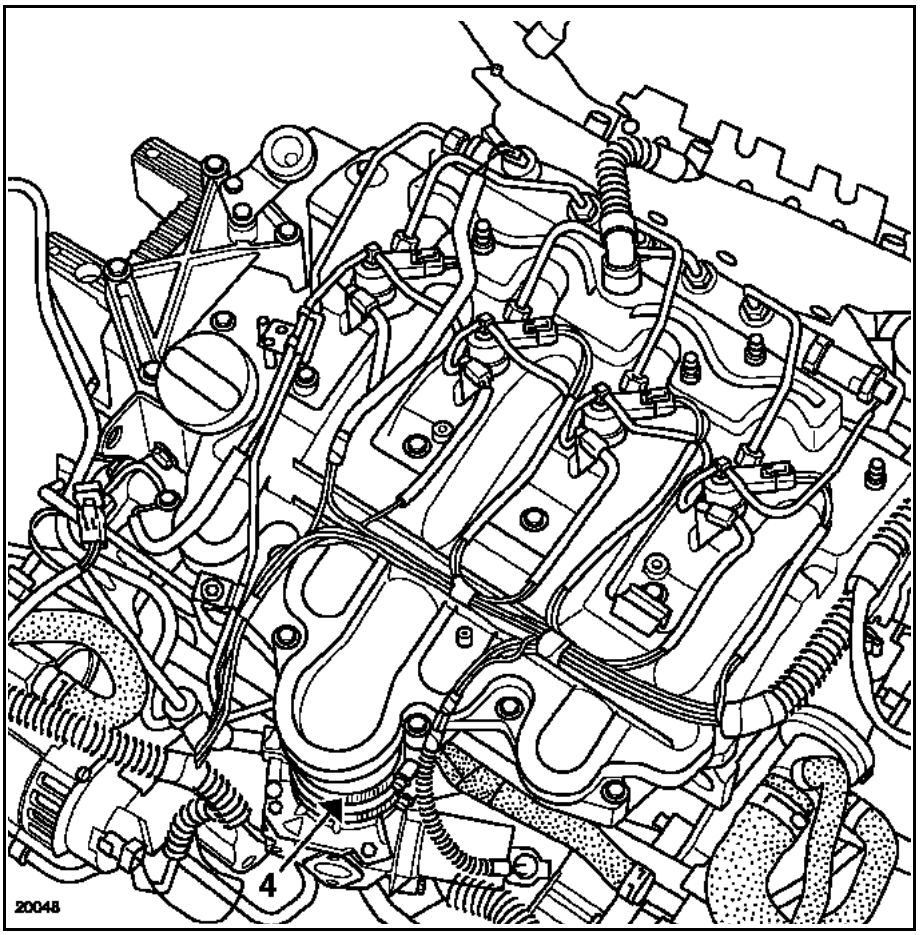
Unclip the electrical harness (2) from the plastic protector.

Remove the protector (3) from the electrical harness.

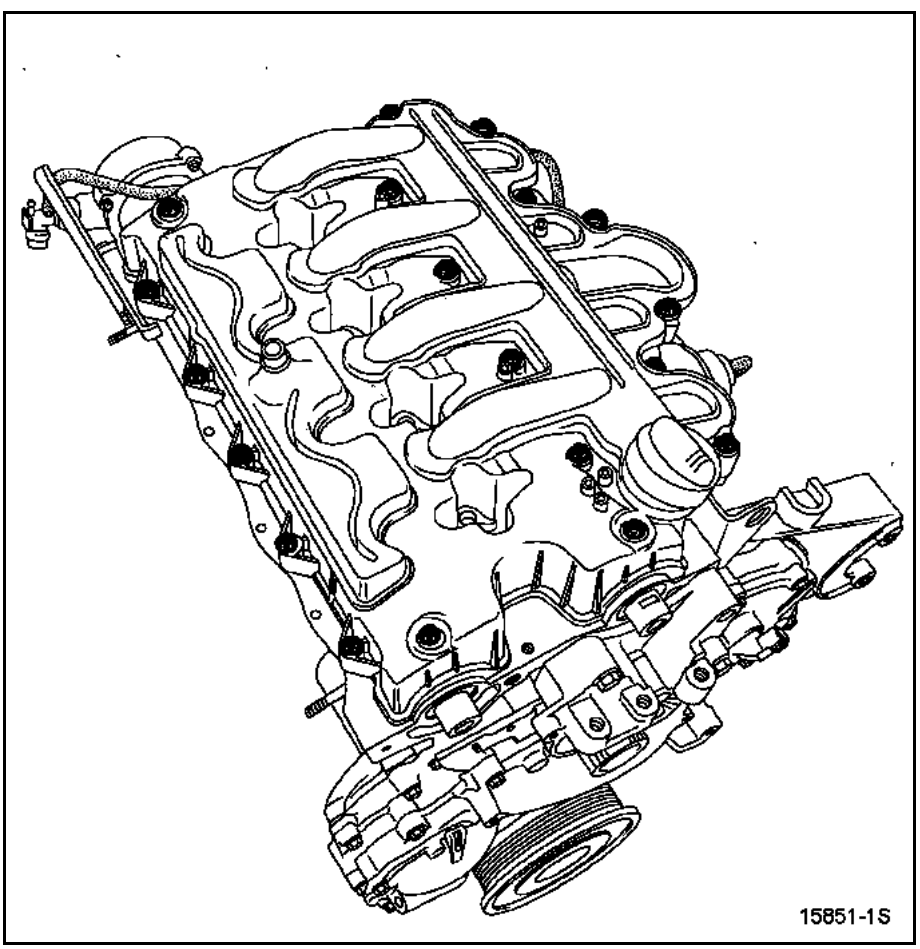


Move aside the electrical harnesses by releasing the top of the inlet manifold.

Loosen the clip from the air vent unit/inlet manifold connection pipe (4).



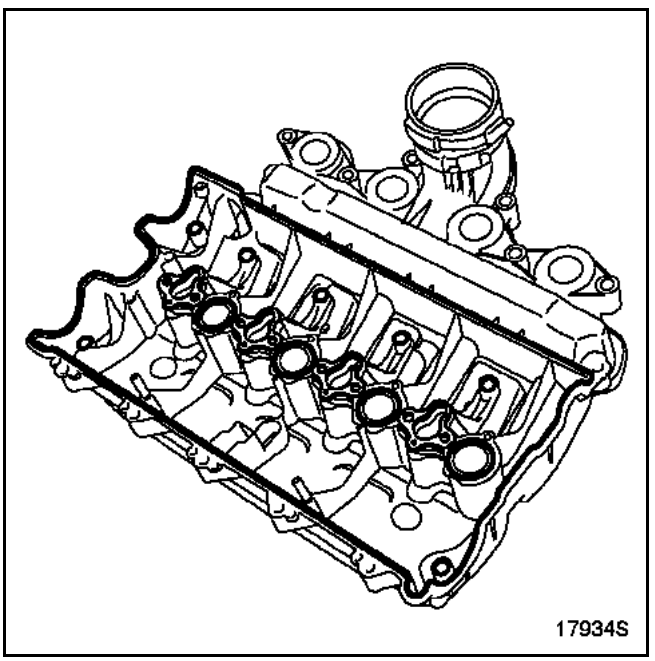
Remove the manifold mounting bolts and then remove the manifold.



REFITTING

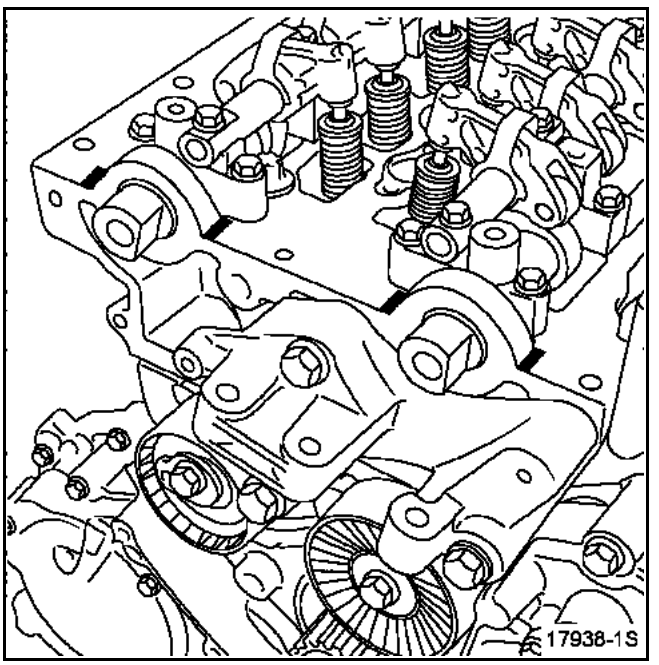
Replace the gaskets with new ones.

Fit all the seals on the cylinder head cover/inlet manifold.

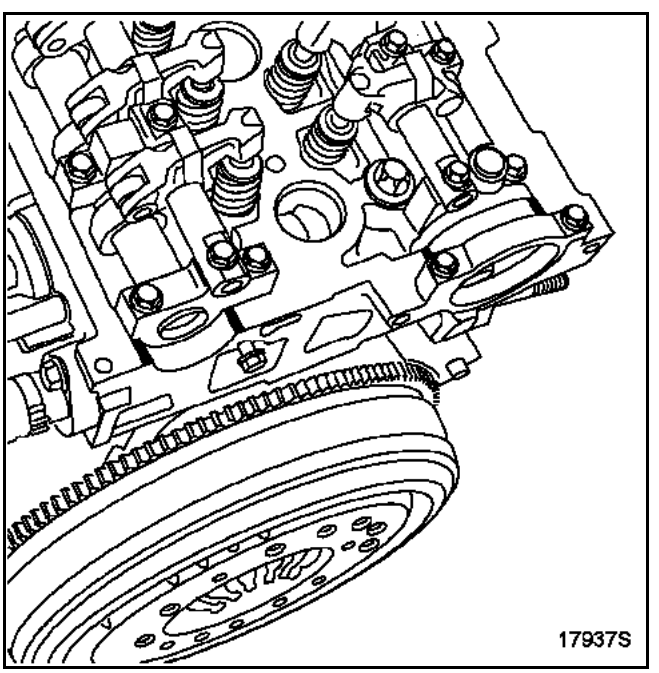


Put **Rhodorseal 5661** in the corners of the camshaft bearing caps and in the valve fastening.

Timing side

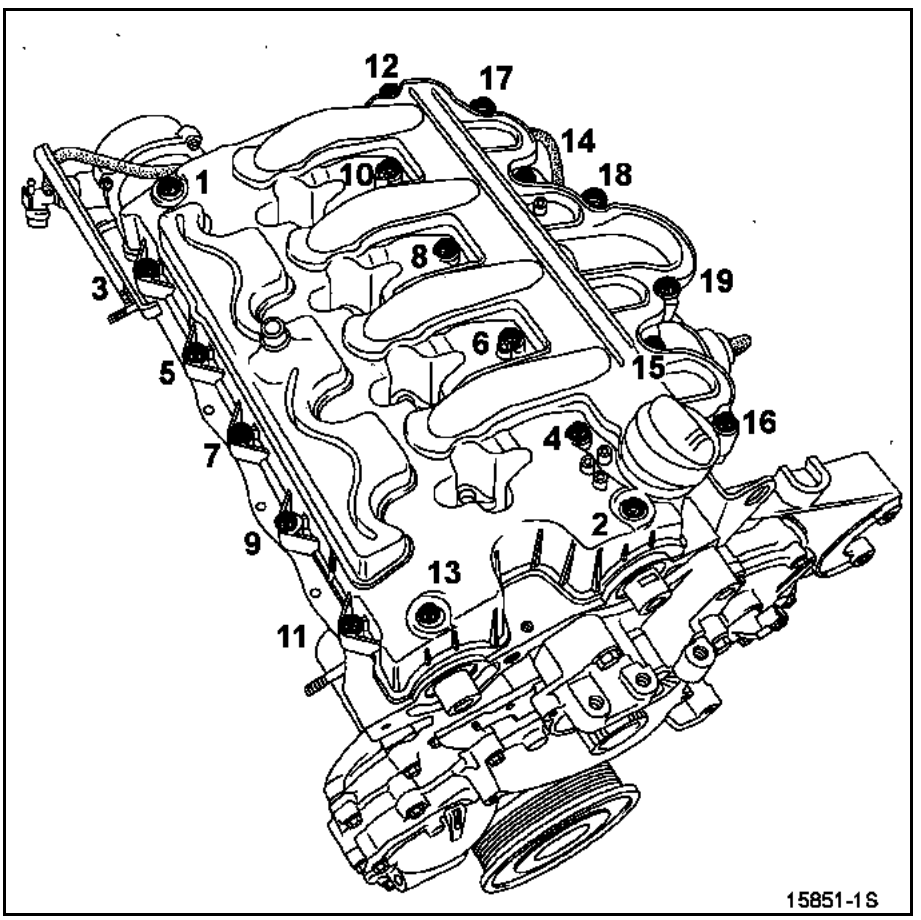


Flywheel side



Refit:
– the cylinder head cover/inlet manifold,
– the cylinder head cover mounting bolts so that they touch, by applying a drop of **Loctite Frenbloc** on the bolts (1-2-4-6-8-10-12-13).

Tighten the bolts to a torque of **1.2 daNm** in the recommended order.



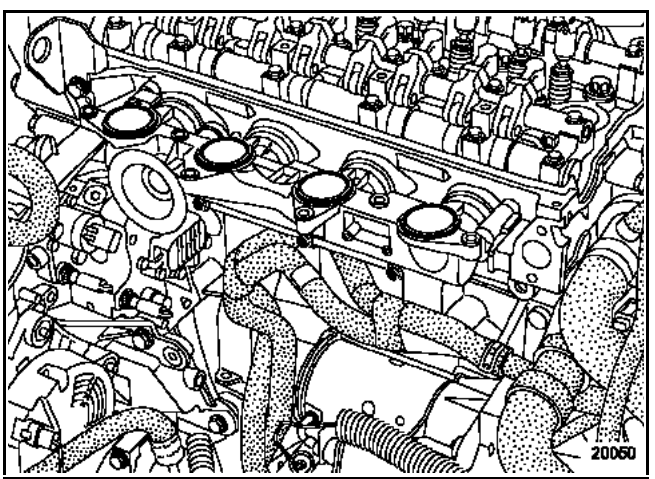
IMPORTANT: when performing the other refitting operations, proceed in the reverse order to removal making **sure** to maintain the order of fitting and recommended tightening torques for refitting the high pressure injector part (see section **13: Diesel equipment, Injector**).

TIGHTENING TORQUES (in daNm)	
Inlet distributor mounting bolts	1.2

REMOVAL

NOTE: when removing the inlet distributor, the inlet manifold and the air vent unit must also be removed (see section **12: Fuel Mixture, Inlet manifold and Air vent unit**).

Remove:
– the mounting bolts for the inlet distributor,
– the inlet distributor.



REFITTING

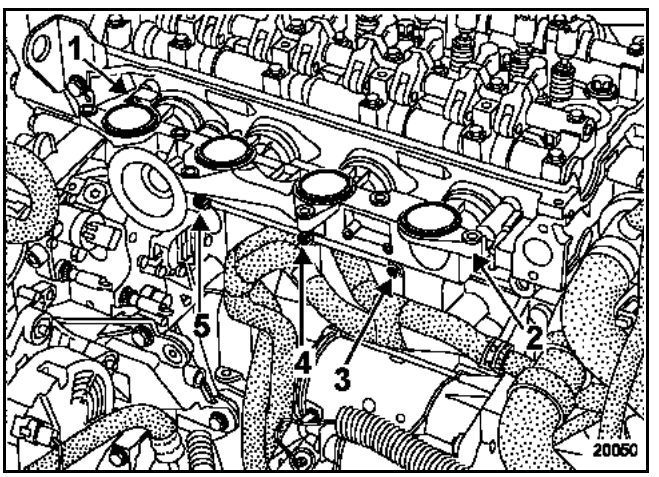
Replace the seals on the inlet distributor and the inlet manifold with new ones.

Replace the inlet distributor.

Put the mounting bolts in the inlet distributor **without locking them**.

Refit the inlet manifold/cylinder head cover observing the torques and the recommended order of tightening (see chapter **12: Fuel mixture, Inlet manifold**).

Tighten the mounting bolts on the inlet distributor to a torque of **1.2 daNm** in the recommended order.



Replace the air vent unit (see section **12: Fuel mixture, Air vent unit**).

IMPORTANT: when performing the other refitting operations, proceed in the reverse order to removal making **sure** to maintain the order of fitting and recommended tightening torques for refitting the high pressure injector part (see section **13: Diesel equipment, Injector**).

Vehicle	Gearbox	Engine							
		Type	Index	Bore (mm)	Stroke (mm)	Capacity (cc)	Compression ratio	Catalytic converter	Anti-pollution number
XDXG	PF1	G9T	720	87	92	2188	18/1	C123	EU 97

ENGINE SPEED (rpm)			SMOKE OPACITY	
IDLE SPEED	Max. - no load	Max. - under load	Homologation value	Max. - legal
800 ± 50	3900 ± 100	3700 ± 100	1 m^{-1} (35%)	3 m^{-1} (73%)

DESCRIPTION	MARQUE/TYPE	SPECIAL NOTES
High pressure pump	**BOSCH CP3**	Pressure from **300** to **1350 bar**
Booster pump (low pressure)	**BOSCH EKP3**	Pressure from **2.5 to 4 bar**
Diesel pressure sensor	**BOSCH**	Incorporated into the rail Resistance: **tracks 1/2 and 1/3 to 4.3 MΩ** **tracks 2/3 to 1050 Ω**
Injectors	**BOSCH**	Solenoid injector Resistance: < **2 Ω** Operating pressure **1350 bar** Maximum pressure **1525 bar**
Pressure regulator	**BOSCH**	Incorporated into the high pressure pump Resistance: ≈ **5 Ω** at **20°C**
Injection computer	**BOSCH EDC15**	**128-track** computer
Pre/postheating unit	**NAGARES BED/7-12**	With pre/postheating function (controlled by the computer)
Pre-heater plugs	**BERU** or **CHAMPION**	Resistance: **0.6 Ω** connector removed
Accelerator potentiometer	**HELLA**	Double track potentiometer
Air intake temperature sensor	**SIEMENS**	Incorporated in the flow sensor Resistance = between **100 Ω and 40 KΩ**

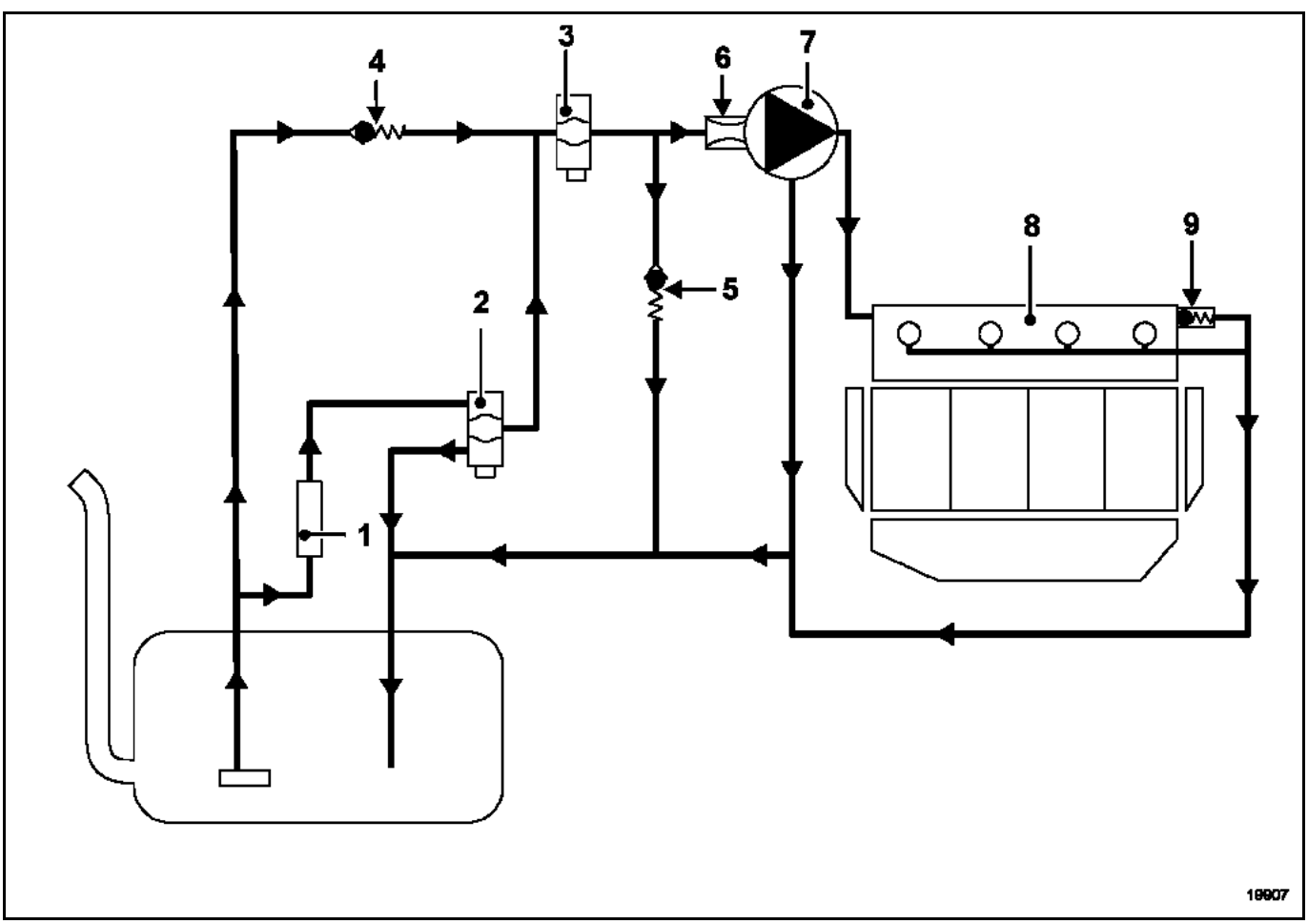
DESCRIPTION	MARQUE/TYPE	SPECIAL NOTES
Diesel fuel temperature sensor	**ELTH**	Resistance: **2050** Ω to **25°C**
Coolant temperature sensor	**ELTH**	Resistance: **2252** ± **112** Ω **to 25°C**
Engine speed sensor	**MGI**	Resistance: **200 to 270** Ω **to 23°C**
Atmospheric pressure sensor		Incorporated into the computer
Camshaft sensor	**ELECTRIFIL**	Hall effect sensor
Airflow sensor	**SIEMENS**	Air flow meter with integrated air temperature sensor **Track 1**: air temperature **Track 2**: earth **Track 3**: **5V** reference **Track 4**: **+ 12V** injection after relay **Track 5**: airflow signal **Track 6**: earth
EGR solenoid valve	**PIERBURG**	Track resistance: **8** ± **0.5** Ω to **20 ºC** (**tracks 1** and **5**) Sensor resistance: **4 K**Ω to **20°C** (**tracks 2** and **4**)
Turbocharger	**GARRETT**	Wastegate calibration: **1380** ± **33 mbar** for a rod travel of **4 mm** **1000** ± **55 mbar** for a rod travel of **1 mm**
Thermoplungers	**EUROPALU**	Resistance: **0.45 + 0.05** Ω to **20°C**
Diagnostic function	**Diagnostic tools (except XR25)**	

The high pressure direct injection system is intended to deliver a specific quantity of diesel to the engine at a specific time.

DESCRIPTION

The system consists of:
– a low pressure pump (1) (located between the air intake unit and the fuel filter),
– a filter unit, pressure regulator without filter element (2),
– a fuel filter (3),
– an anti-leak check valve (4),
– a primer valve (5),
– a high pressure regulator (6) mounted on the pump (the regulator must not be separated from the pump. If there is a fault in one component, both must be changed),
– a high pressure pump (7),
– an injection rail (8) fitted with a diesel fuel pressure sensor and a pressure limiter (9),
– four solenoid injectors,
– various sensors,
– injection computer.

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



OPERATION

The **Common Rail** high pressure direct injection system is a sequential diesel injection system (based on the multipoint injection system for petrol engines).

This new injection system reduces operating noise, reduces the volume of pollutant gases and particles and produces high engine torque at low engine speeds thanks to a pre-injection procedure.

The low pressure pump (also called the booster pump) supplies the high pressure pump via the pressure regulator filter then the fuel filter **during the starting phase only**, under pressure between **2** and **4 bar**.

The **High Pressure** pump generates the high pressure sent to the injector rail. The pressure regulator located on the pump modulates the high pressure pump supply flow. 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 pressure 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 by:
– the duration of injector control,
– the injector opening and closing speed,
– the needle stroke (determined by the type of injector),
– the normal hydraulic flow of the injector (determined by the type of injector),
– the high pressure rail pressure controlled by the computer.

FOR ANY WORK CARRIED OUT ON THE HIGH PRESSURE INJECTION SYSTEM THE CLEANLINESS AND SAFETY ADVICE SPECIFIED IN THIS DOCUMENT MUST BE FOLLOWED.

POST-REPAIR CHECK

Re-prime the circuit. To do that, turn the low pressure pump over by switching on the ignition several times, or turn the low pressure pump over with the diagnostic tool using the **Actuator Commands** menu.

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

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

The system injects the diesel fuel into the engine at a pressure of up to **1350 bar. Before carrying out any work, check that the injector rail is depressurised.**

It is absolutely vital that you observe the tightening torque:
– of the high pressure pipes,
– of the cylinder head injector,
– of the pressure sensor.

When the high pressure pump, injectors and high pressure supply, output and return unions are removed or repaired, all orifices should be fitted with new blanking plugs of the correct size to prevent contamination entering.

WARNING: all pipes removed must be replaced.

When replacing the high pressure pipe, follow the method below:
– remove the high pressure pipe, holding the filter rod on the injector with a lock-wrench,
– fit anti-contamination plugs,
– loosen the high pressure rail,
– fit the new high pressure pipe,
– offer up the unions by hand until they touch,
– tighten the high pressure rail mountings to torque,
– torque-tighten the union at the injector end,
– tighten the high pressure rail connection to torque.

It is prohibited to dismantle the insides of the pump.

It is vital to replace the fuel return pipe fitted to the injectors when it is removed.

The diesel temperature sensor cannot be removed. It is part of the fuel return rail.

It is forbidden to loosen a High Pressure pipe connection when the engine is running.

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 resulting from contamination are:
– damage to or destruction of the high pressure injection system,
– seizing or leaking of a component.

All After-Sales operations must be performed under very clean conditions. This means that no impurities (particles a few microns in size) get into the system during dismantling or into the circuits via the fuel unions.

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

WHAT ARE THE SOURCES OF CONTAMINATION?

Contamination is caused by:
– metal or plastic chips,
– paint,
– fibres,
  ● boxes,
  ● brushes,
  ● paper,
  ● clothing,
  ● cloths.
– foreign bodies such as hairs,
– ambient air,
– etc.

IMPORTANT: it is not possible to clean the engine using a high pressure washer because of the risk of damaging connections. Also the moisture may collect in the connectors and cause electrical connection problems.

INSTRUCTIONS TO BE FOLLOWED BEFORE ANY WORK IS CARRIED OUT 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. After use, they must be thrown away (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 exposed to contamination. The bags must be used only once, and after use they must be thrown away.

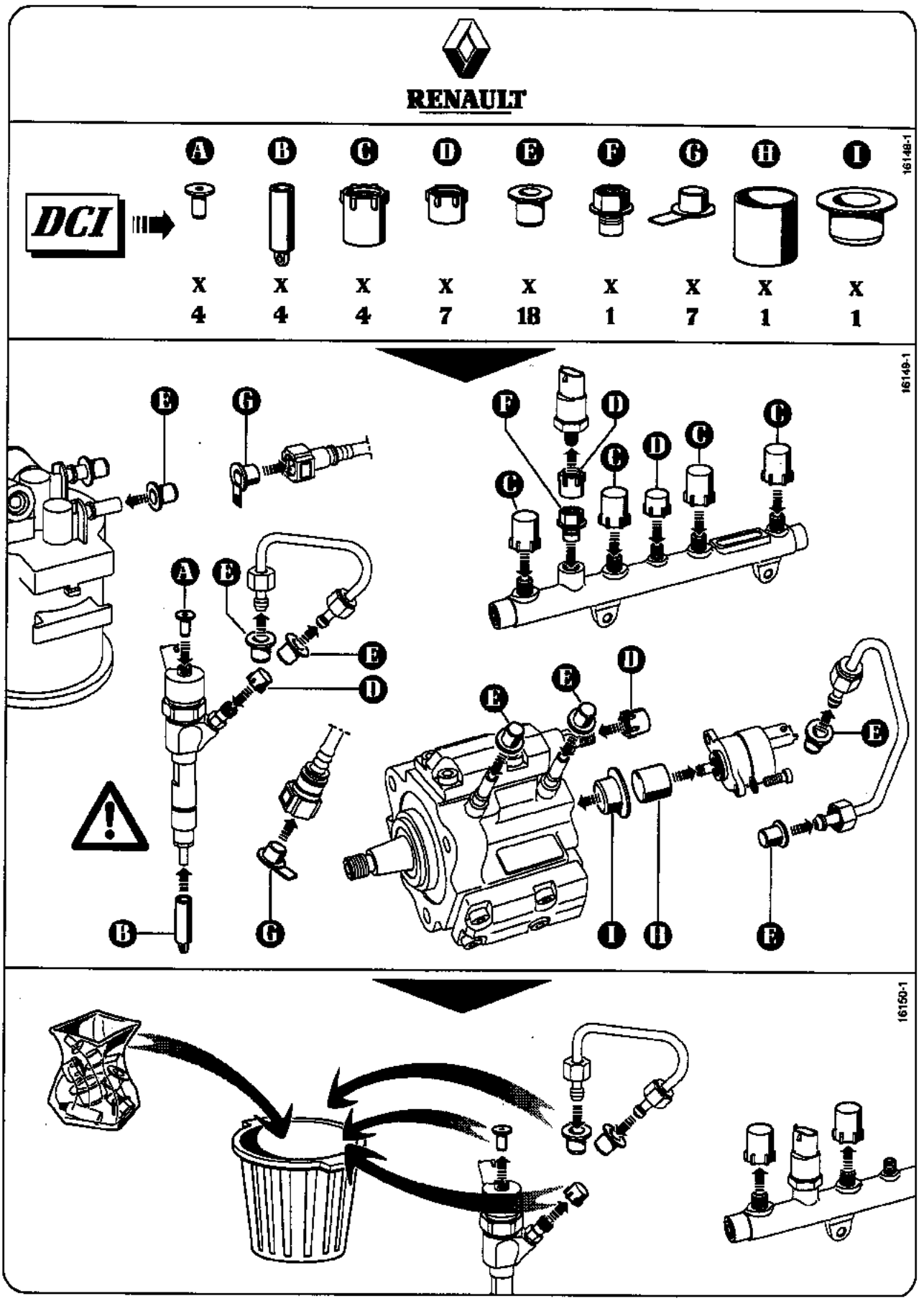
● Make sure that lint-free towelettes are to hand. Towelette part number: **77 11 211 707**. The use of conventional cloth or paper wipes is prohibited. These are not lint-free and may contaminate the fuel circuit of the system. Each lint-free cloth should only be used once.

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 thinners 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 remain adhered.
- Wash your hands before and during the operation if necessary.
- When wearing leather protective gloves, cover these with latex gloves.

INSTRUCTIONS TO BE FOLLOWED DURING THE OPERATION

- As soon as the circuit is open, all openings must be plugged to prevent impurities from entering the system. The plugs to be used are available from the Parts Stores. They must not, under any circumstances, be reused .
- Close the hermetically sealed bag, even if it has to be reopened shortly afterwards. Ambient air carries contamination.
- All components of the injection system that are removed must be stored in a hermetically sealed plastic 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.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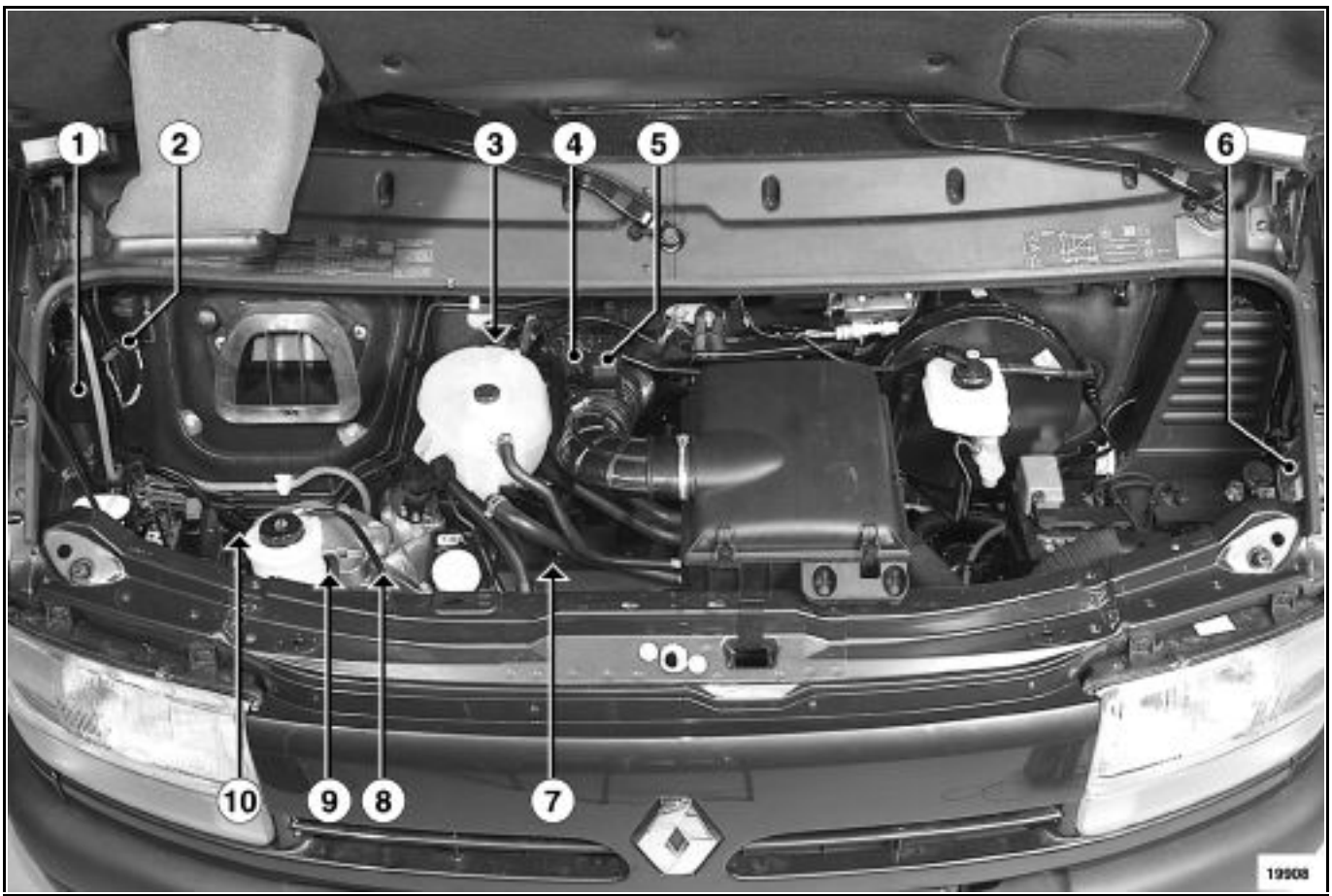
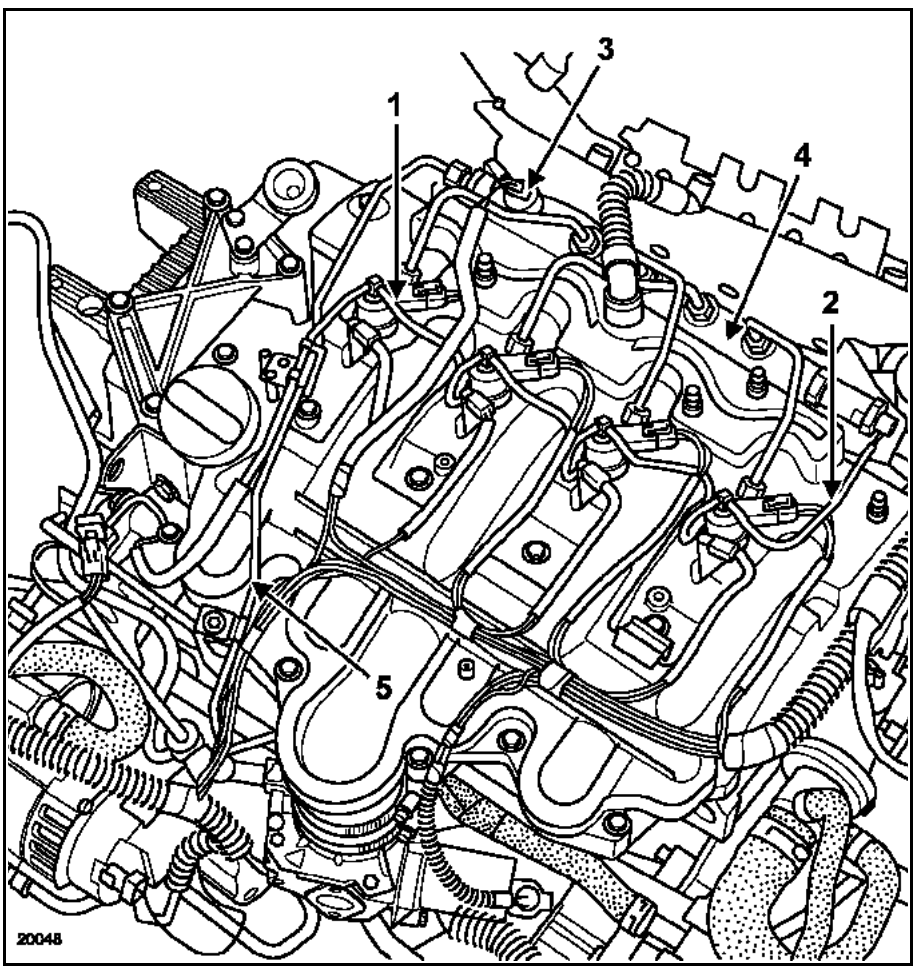
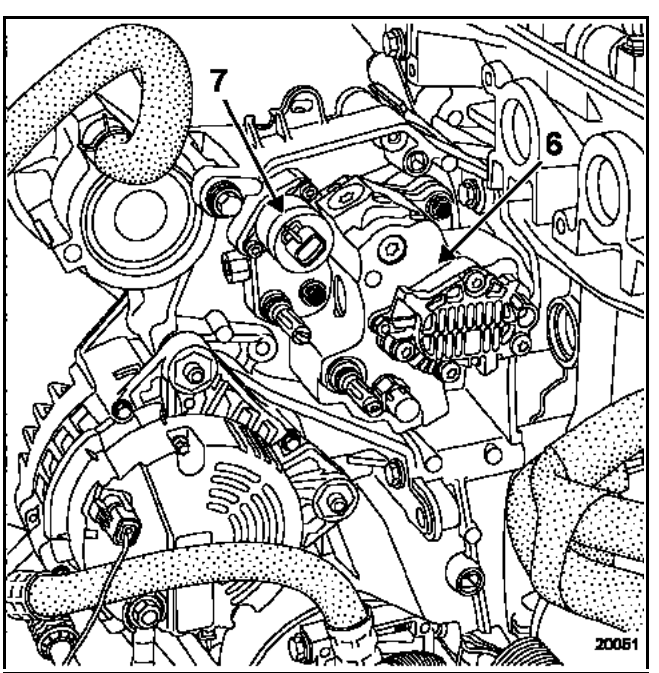


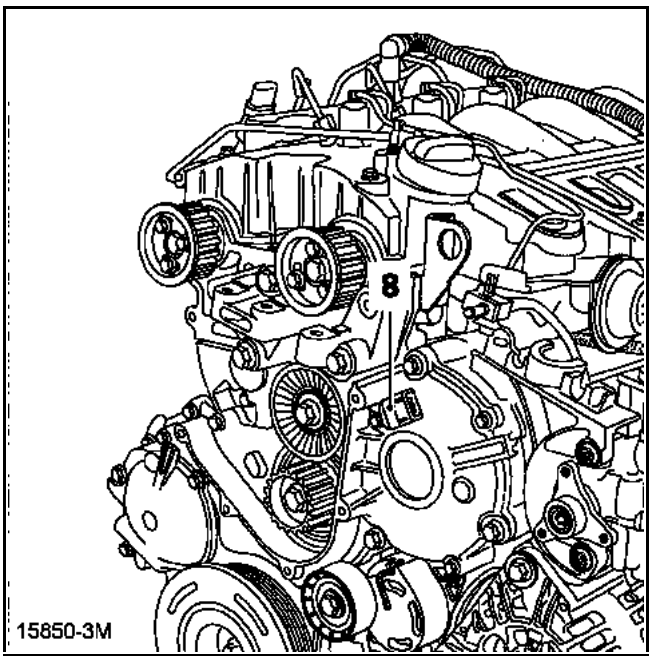
1 Diesel fuel filter with heater
2 Impact sensor
3 Preheating unit
4 Thermoplunger unit
5 Airflow sensor with air temperature sensor
6 Injection computer
7 Damper unit with exhaust gas recirculation valve
8 High pressure pump
9 Diesel fuel temperature sensor
10 Camshaft sensor

1 Injector
2 Injector diesel return pipe
3 Pressure sensor
4 Common injection rail
5 High pressure pump/rail fuel supply pipe

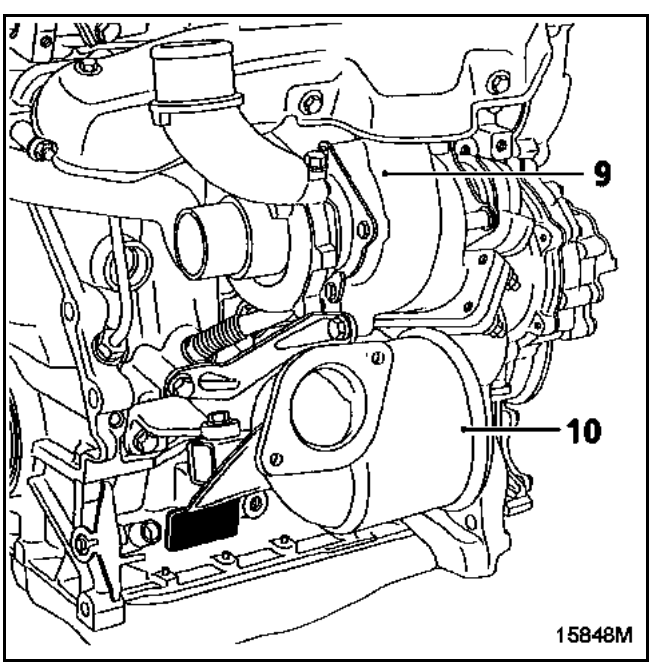


6 High pressure pump
7 Pressure regulator

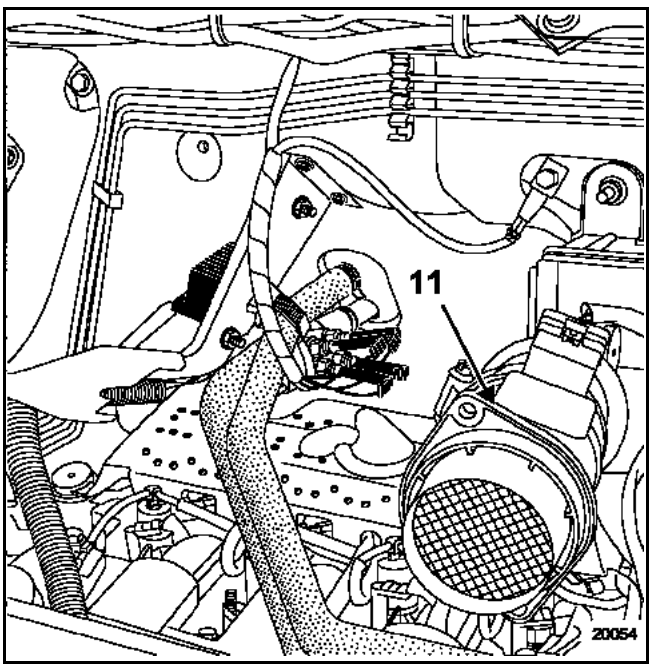


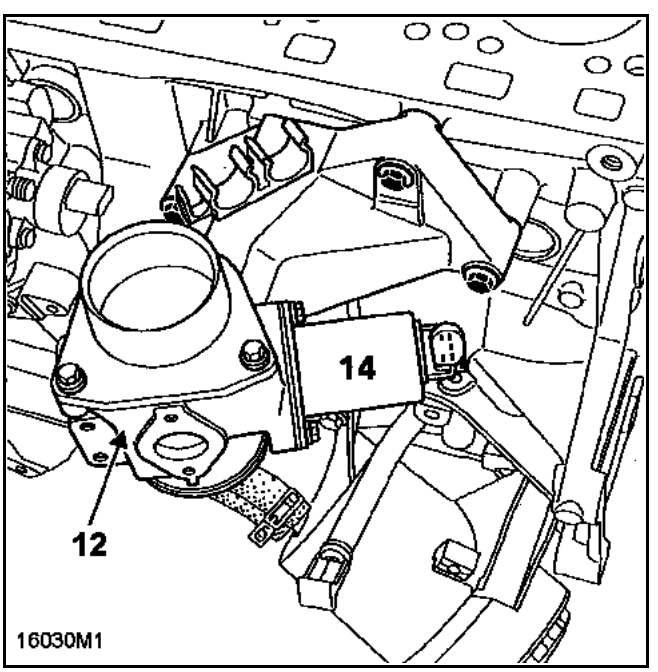


8 Camshaft sensor
9 Turbocharger
10 Priming catalytic converter

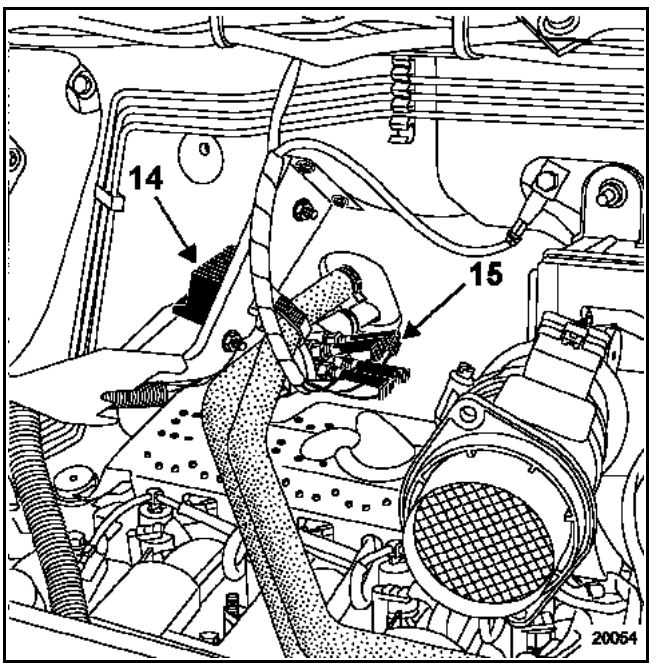


11 Airflow sensor with air temperature sensor
12 Air vent unit
13 Exhaust gas recirculation valve

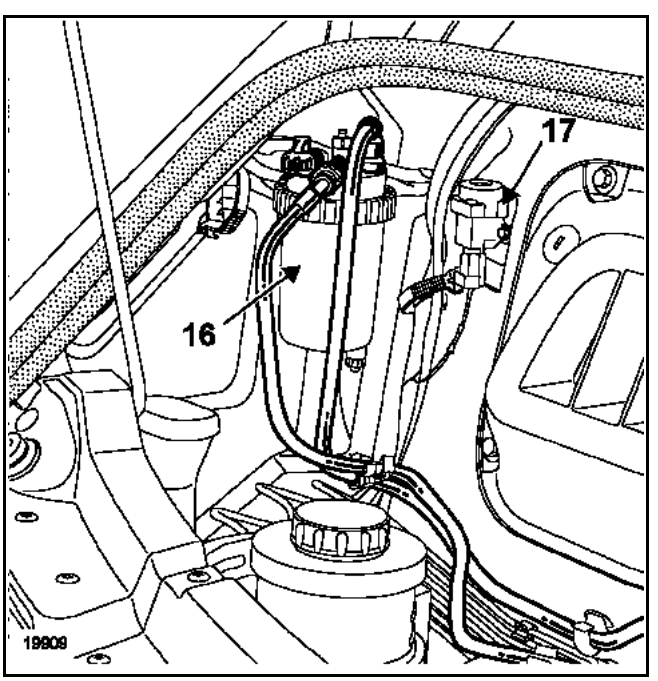




14 Preheating unit
15 Thermoplunger unit



16 Diesel filter
17 Impact sensor



Vehicles using the high pressure diesel fuel system are fitted with an injection warning light. This warning light is used during the preheating phase and when there is an injection fault.

PRINCIPLE FOR LIGHTING UP OF THE WARNING LIGHTS

- The preheating warning light comes on when the ignition is switched on, remains lit during the preheating phase and then goes out (see section **13 Pre/postheating control**).

- When there is an injection fault, the fault warning light (which is also the preheating warning light) comes on permanently, indicating the need to consult a Renault Dealer. These faults are:
  - internal computer fault,
  - engine immobiliser fault,
  - accelerator potentiometer fault,
  - exhaust gas recirculation valve fault,
  - injector fault,
  - computer supply fault
  - booster pump supply fault,
  - camshaft sensor fault,
  - rail pressure sensor fault,
  - rail pressure regulator fault,
  - Top Dead Centre sensor and camshaft sensor synchronisation fault.

- If the engine overheats, the warning light with the engine symbol and the word STOP remains lit.

This vehicle is fitted with an engine immobiliser controlled by a key recognition system.

REPLACING AN INJECTION COMPUTER

Injection computers are supplied without a code, but they can all be programmed with one.

If a computer is replaced, it must be programmed with the code of the vehicle and the correct operation of the engine immobiliser function must be checked.

To do this, switch on the ignition for a few seconds without starting the engine, then switch it off. With the ignition off, the engine immobiliser function comes into operation after approximately **10 seconds** (the red engine immobiliser warning light flashes).

SPECIAL POINTS FOR TESTING THE INJECTION COMPUTER

WARNING:

These vehicles have a special injection computer which does not function unless it is coded.

Consequently, it is strongly recommended not to carry out tests using computers borrowed from the stores or from another vehicle, to prevent coding and uncoding problems which could render the computers useless.

THIS VEHICLE IS FITTED WITH A VARIABLE OUTPUT COMPRESSOR

There is no air conditioning computer on this type of engine. The injection computer controls the compressor clutch according to the request for the compressor to operate (AC function requested by the driver), which can be interrupted at any moment by the tri-function pressure switch.

The tracks used for the air conditioning function are:
– one wire on track **A F4** of the computer which controls the air conditioning compressor clutch,
– one wire on track **A G4** of the injection computer. This wire carries the request for the compressor to start operating.

When the air conditioning function is selected, the idle speed does not change; it is **850 rpm**.

COMPRESSOR OPERATION PROGRAMMING

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

Engine starting program

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

Recovery of performance

When the position of the accelerator pedal is changed significantly and if the engine speed is less than **3000 rpm** And if the vehicle speed is less than **70 mph (110 km/h)**, the compressor cannot be operated for **5 seconds.**

Recovery of output when the vehicle starts moving

If the potentiometer position is greater than **60 %**, if the engine speed is less than **2250 rpm** and if the vehicle speed is below **12 mph (20 km/h)**, the compressor is cut for **5 seconds**.

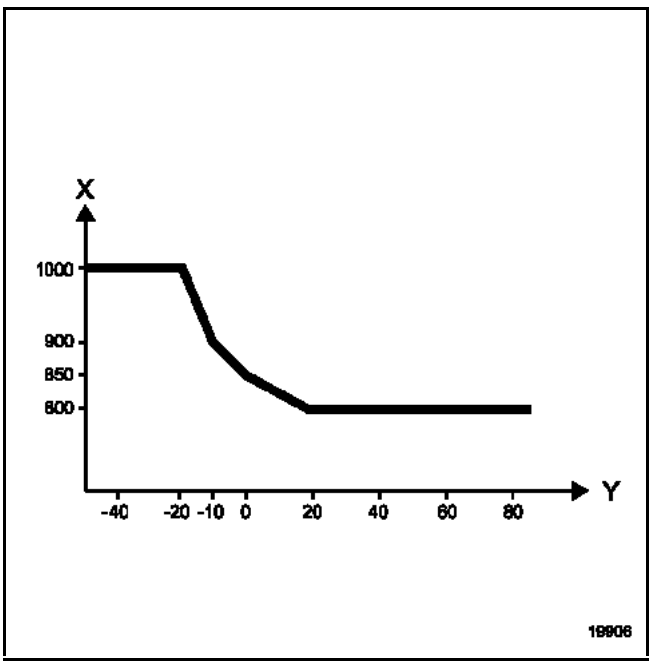
Anti-stall protection

If the foot is lifted from the accelerator pedal and the engine speed is below **675 rpm**, the compressor clutch is disengaged. It is engaged again after **5 seconds** if the engine speed is increased.

Thermal protection program

The compressor does not come into operation when the coolant temperature is greater than **+ 105 °C**.

IDLE SPEED CORRECTION ACCORDING TO COOLANT TEMPERATURE



X: Engine speed in **rpm.**
Y: Coolant temperature in °**C**

CORRECTION ACCORDING TO ELECTRICAL LOAD

The aim of this correction is to compensate for the drop in voltage due to operation of a power consuming component when the battery is at low charge. To achieve this, the idle speed is increased, which increases the speed of rotation of the alternator, and this increases the battery voltage.

The lower the voltage, the more significant the correction. Correction of the engine speed is therefore variable. It begins when the voltage drops to below approximately **12 volts**. Idle speed may reach a maximum speed of **900 rpm.**

CORRECTION OF IDLE SPEED WHEN THE POTENTIOMETER IS FAULTY

Idle speed is held at **1250 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**.

IDLE SPEED CORRECTION WHEN DRIVING

The idle speed when driving is **900 rpm**, with the vehicle moving at more than **1.5 mph (2.5 km/h).**

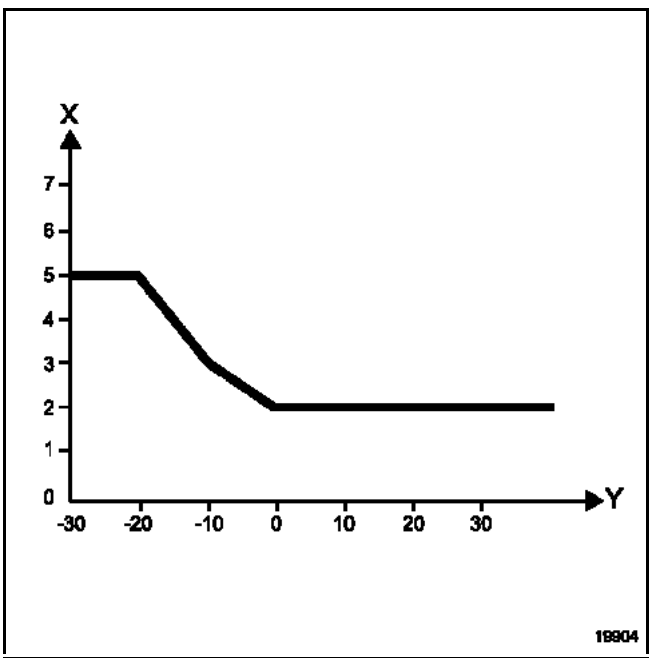
The pre/postheating function is controlled by the preheating unit.

PRE/POSTHEATING OPERATING PRINCIPLE

1) Preheating ignition on

a) Variable preheating

The time period for the warning light to light up and the feed to heater plugs depends on the coolant temperature and the battery voltage.



X Time in **seconds**
Y Coolant temperature in °**C**

In all cases the the lentgth of time the preheating warning light is on cannot exceed **15 seconds.**

b) Fixed preheating

After the warning light goes out the plugs remain supplied for a fixed period of **5 seconds**.

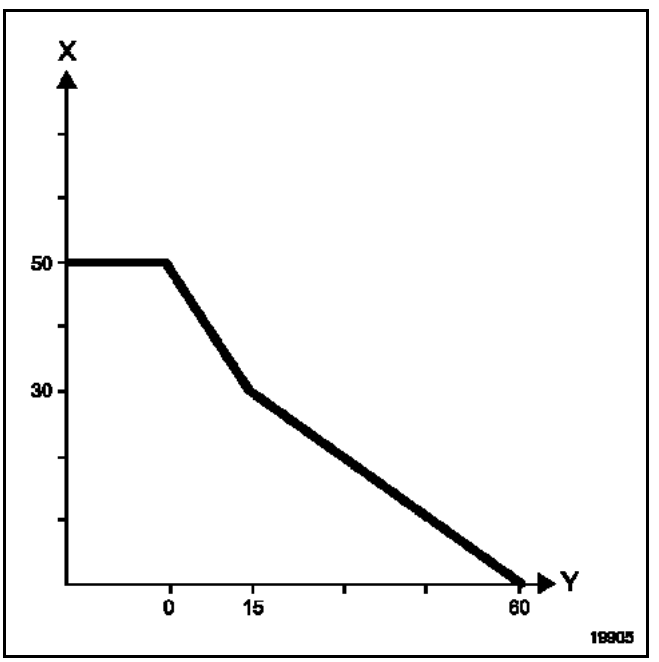
2) Starting the engine

The plugs remain supplied while the starter is being activated.

3) Postheating with the engine running

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

For idle speed without pressing the accelerator pedal.



X Time in **seconds**
Y Coolant temperature in °**C**

The preheating plug resistance is **0.6** Ω (connector disconnected).

TIGHTENING TORQUES (in daNm)	
Pre-heater plugs	**1.1**

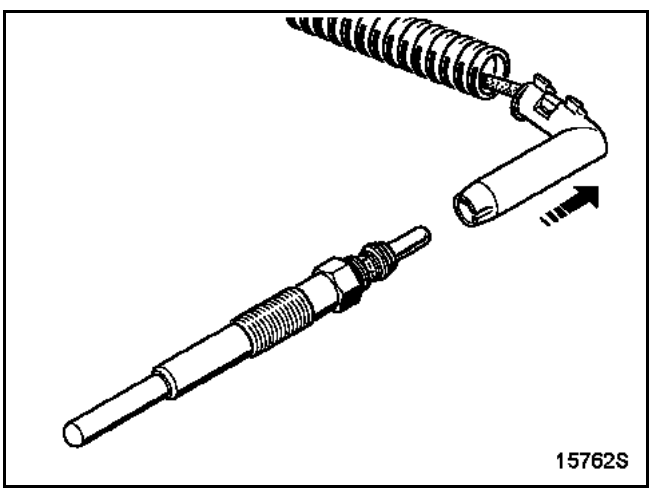
Plugs may be removed without having to open the high pressure circuit.

REMOVAL

Unclip the plug connector.

Clean the outside of the plug to avoid any dirt entering the cylinder.

Loosen and remove the plugs.



REFITTING

Proceed in the reverse order to removal.

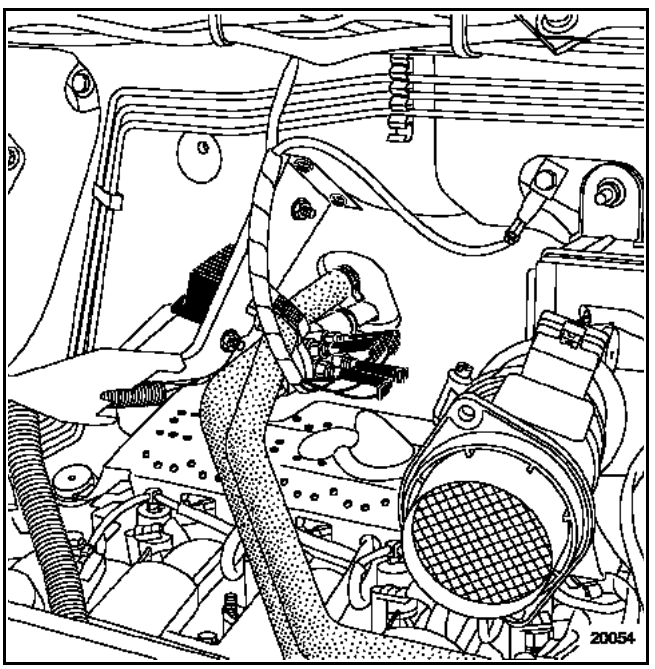
Ensure that no contamination enters the cylinder during this operation.

The four thermoplungers are located under a coolant unit attached to the expansion bottle support.

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 resistance of the thermoplungers is:
0.45 + 0.05 Ω to **20 °C**.

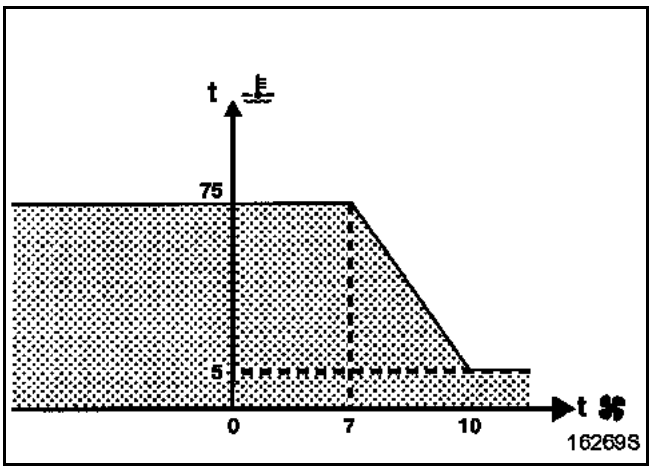


Control strategy

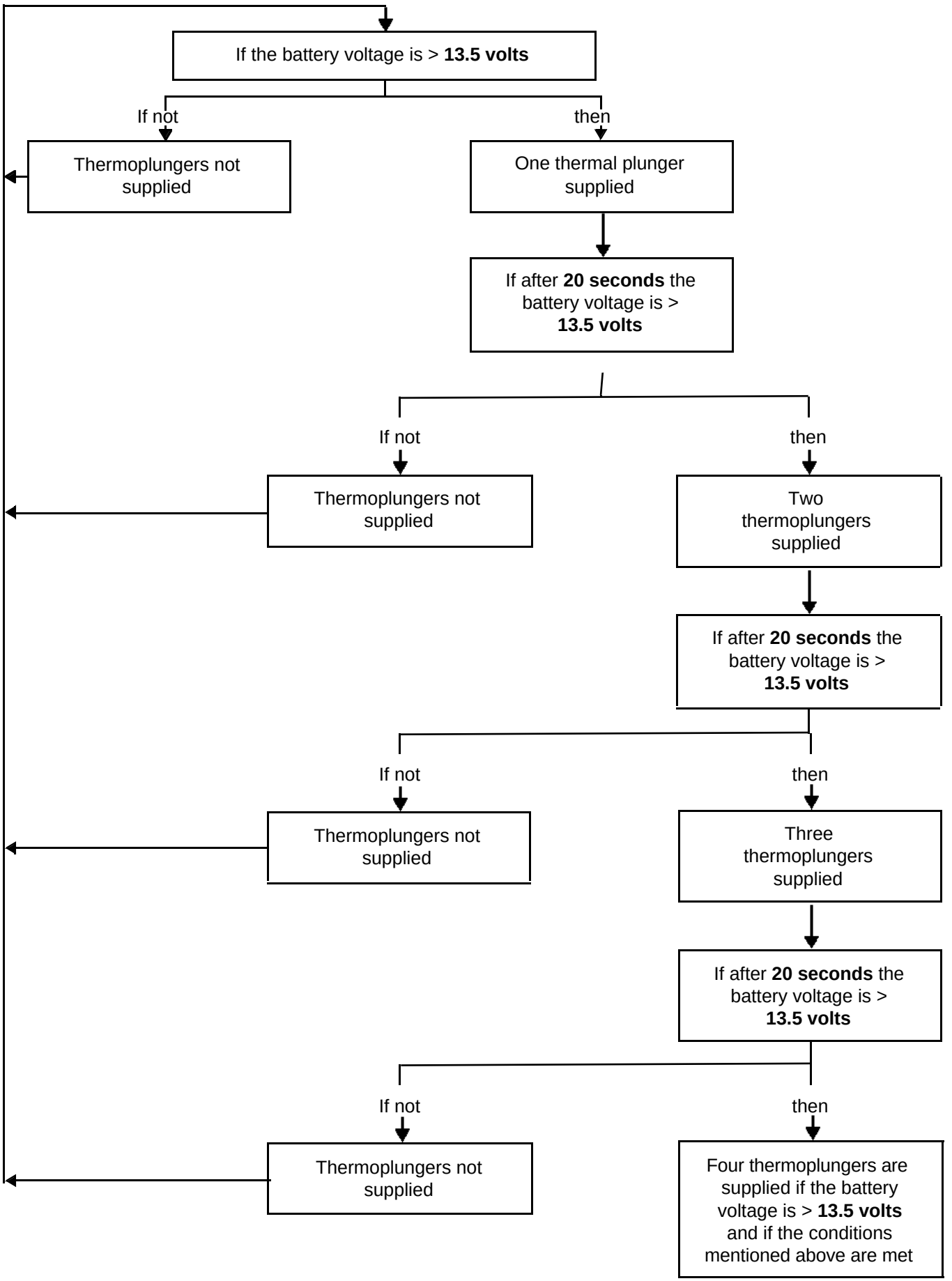
When the thermoplungers are operating the idle speed is brought to **900 rpm**.

Thermoplungers cannot operate in the case of:
– preheating,
– engine speed below **700 rpm.**

If the conditions mentioned above apply, the thermoplungers are controlled according to a mapping related to the air and coolant temperature.



Unhatched area: thermoplunger not supplied
Shaded zone: thermoplunger supplied


If the battery voltage is > **13.5 volts**
If not
then
Thermoplungers not supplied
One thermal plunger supplied
If after **20 seconds** the battery voltage is > **13.5 volts**
If not
then
Thermoplungers not supplied
Two thermoplungers supplied
If after **20 seconds** the battery voltage is > **13.5 volts**
If not
then
Thermoplungers not supplied
Three thermoplungers supplied
If after **20 seconds** the battery voltage is > **13.5 volts**
If not
then
Thermoplungers not supplied
Four thermoplungers are supplied if the battery voltage is > **13.5 volts** and if the conditions mentioned above are met

The booster pump is an electric pump placed under the vehicle in front of the fuel tank.

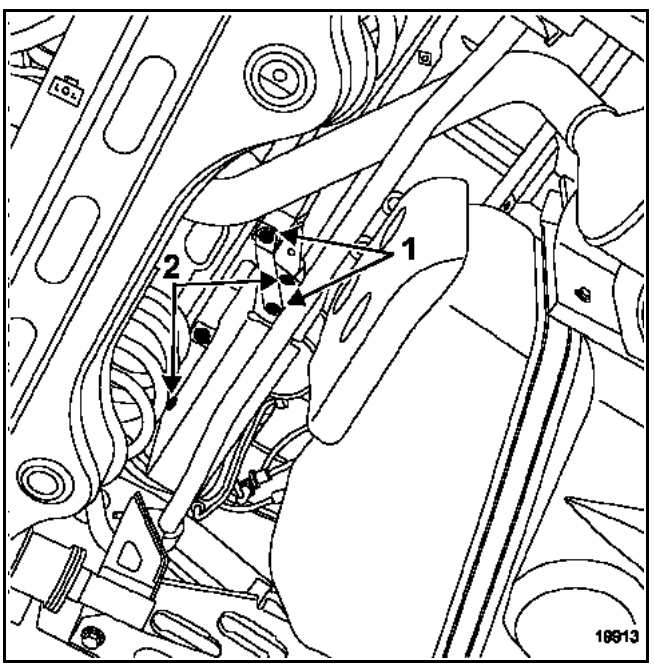
REMOVAL

FOLLOW THE CLEANNESS INSTRUCTIONS CLOSELY

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

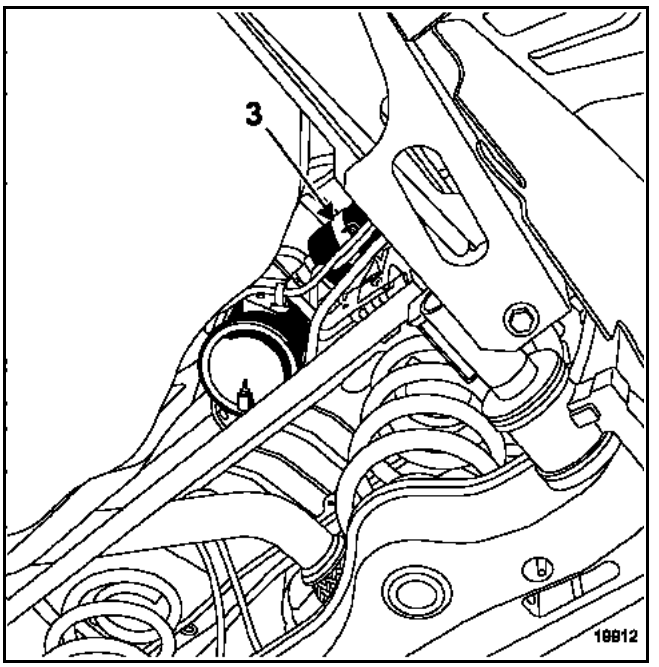
Disconnect the battery.

Remove:
– the two protector mounting bracket bolts (1),
– the two protector mounting bolts (2),
– the protector.



Disconnect:
– the pump electrical connectors,
– the diesel fuel pipes.

Remove the booster pump (3) by taking off its mounting strap.



REFITTING

Proceed with refitting in the reverse order to removal

Re-prime the system by switching on the ignition several times, or turn the low pressure pump over with the diagnostic tool using the **Actuator Command** menu.

The supply pressure regulator is located under the vehicle in front of the fuel tank.

It is a pressure regulator filter unit but has no filter element.

In this way, it is not necessary to replace the element in the course of the vehicle's routine maintenance.

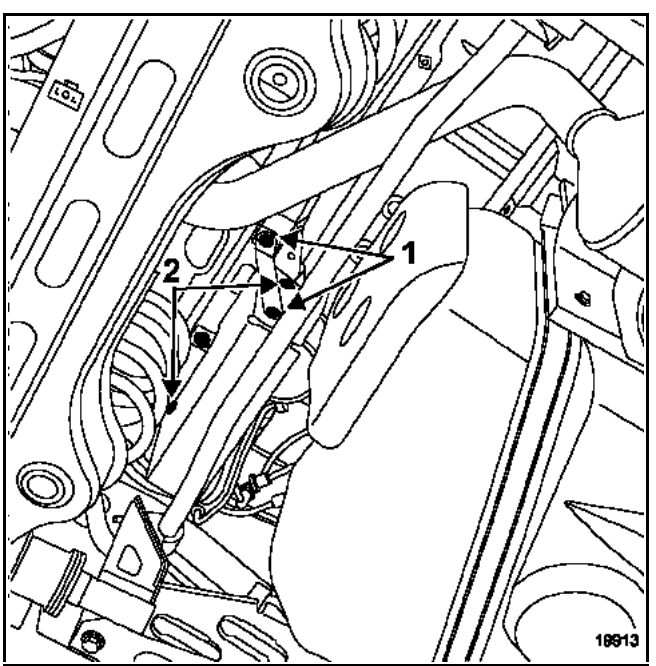
REMOVAL

FOLLOW THE CLEANNESS INSTRUCTIONS CLOSELY

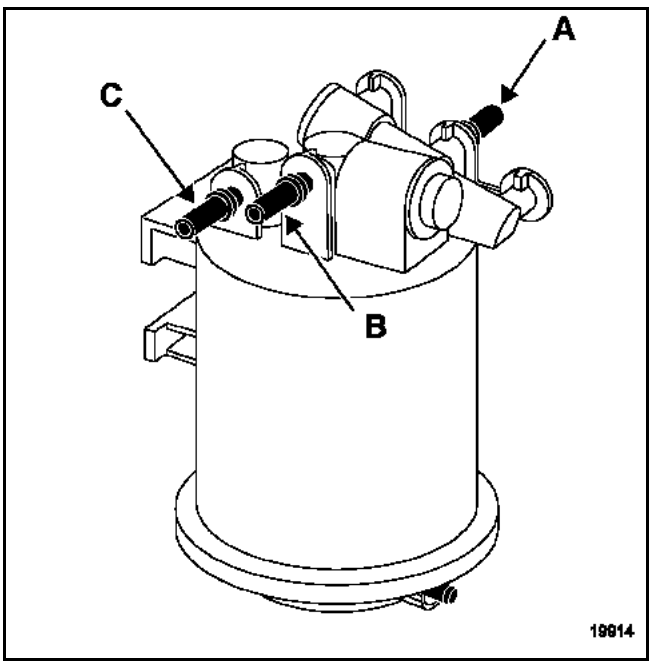
IMPORTANT: take note of the quantity of diesel and the residual pressure in the pipes.

Disconnect the battery.

Remove:
– the two protector mounting bracket bolts (1),
– the two protector mounting bolts (2),
– the protector.



Disconnect:
– the fuel tank return pipes (A),
– the diesel filter supply pipes (B),
– The pipes from the low pressure pump (C).



Remove the pressure regulator by releasing it upwards.

REFITTING

Proceed with refitting in the reverse order to removal

Re-prime the system by switching on the ignition several times, or turn the low pressure pump over with the diagnostic tool using the **Actuator Commands** menu.

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

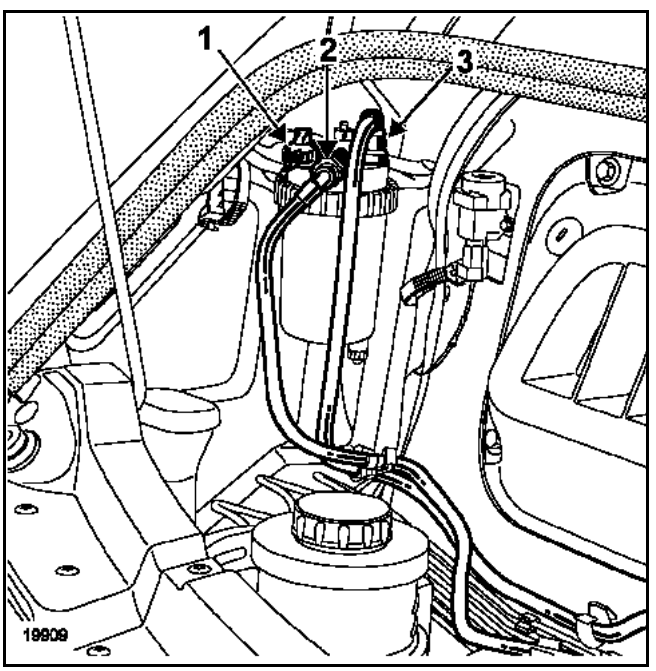
FOLLOW THE CLEANNESS INSTRUCTIONS CLOSELY

WARNING: watch out for the residual pressure and the quantity of diesel fuel remaining in the pipes.

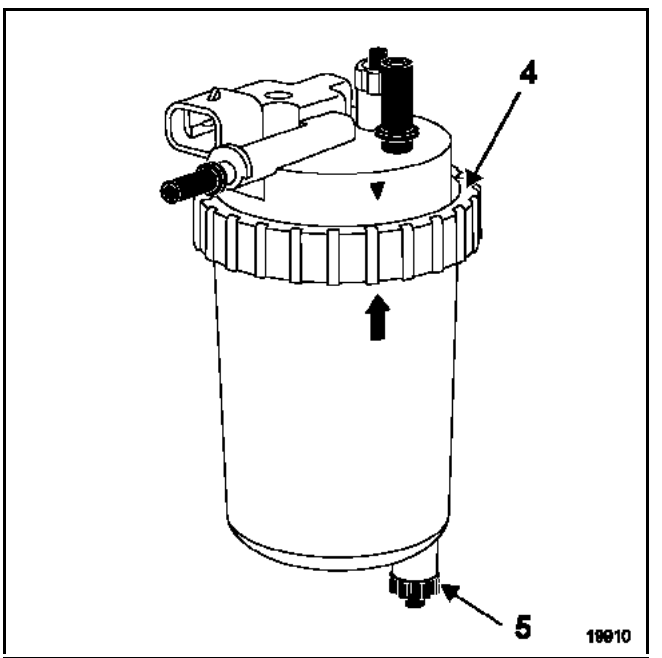
Disconnect the battery.

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.



Unscrew the filter cover (4) and remove the filter cartridge.



REFITTING

Take care to line up the mark on the cover and the mark on the bowl correctly.

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

Be careful not to squeeze or damage the pipes.

IMPORTANT: re-prime the system by switching on the ignition several times, or turn the low pressure pump over with the diagnostic tool using the **Actuator Commands** menu.

From time to time it is necessary to bleed the water trapped in the diesel fuel 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 provided by the booster pump (electric pump fitted under the vehicle in front of the fuel tank which feeds the high pressure pump during starting phases).

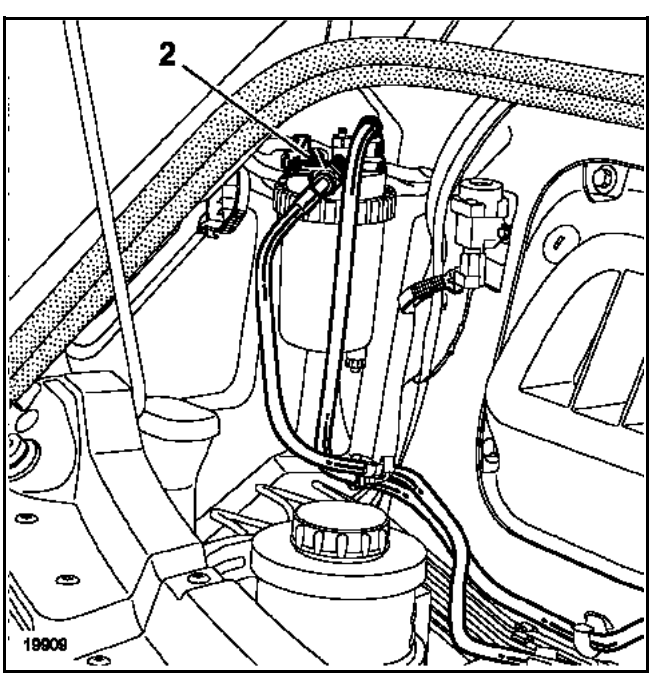
SPECIAL TOOLING REQUIRED	
Mot. 1311-01 or Mot. 1328	Fuel pressure test kit
Mot. 1311-03	I adapter for fuel pressure test kit
EQUIPMENT REQUIRED	
2000 ml graduated cylinder	

LOW PRESSURE CHECK (BOOSTER PUMP)

Fit an **I adapter, Mot. 1311-03**, to be able to connect the fuel pressure test kit **Mot. 1311-01** to the outlet (2) of the fuel filter.

Turn over the fuel pump with the diagnostic tool or by direct feed to the pump or by switching on the ignition.

Raise the pressure which should be at a maximum of **2.5** and **4 bar**.



FLOW TEST (BOOSTER PUMP)

Make the pump flow into a **2000 ml** graduated cylinder. Turn on the ignition to run the pump. The pump is supplied for **15 seconds** if the engine is not started.

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

WARNING: it is forbidden to measure the pressure and flow of the low pressure pump.

DISMANTLING THE PUMP INTERNALS IS PROHIBITED

SPECIAL TOOLING REQUIRED	
Mot. 1536	TDC setting pin
Mot. 1566	Tool for removing and refitting high pressure pipes
Mot. 1548	G9T high pressure pump tool
Mot. 1503	Tool for fitting the rubber pads

EQUIPMENT REQUIRED
High pressure pipe wrench (for example, Facom DM19 wrench).
Socket for tightening the rail high pressure pipe (for example, Facom Crowfoot 18-17 wrench).
Low torque wrench

TIGHTENING TORQUES (in daNm)	
High Pressure pipe	2.5 ± 0.2
High pressure pump mounting	3.2 ± 0.3
High pressure pump pulley nut	9 ± 1.5
Injection rail mounting bolt	2.3 ± 0.3

IMPORTANT: before carrying out any work, connect the After-Sales diagnostic tool, set up communication with the injection computer and check that the injection rail is not under pressure.

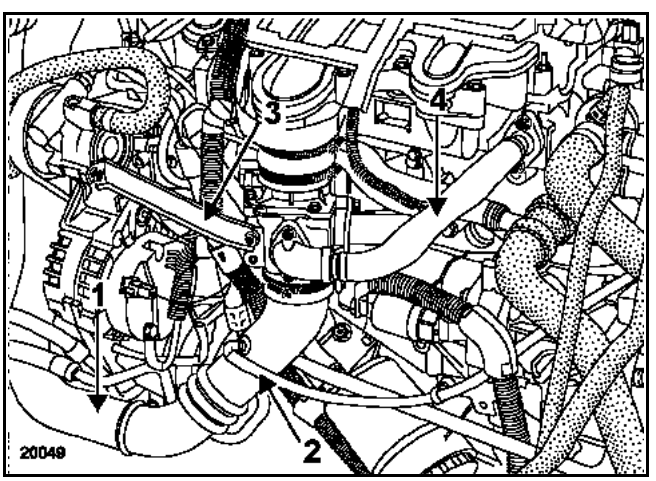
Take note of the fuel temperature.

YOU MUST OBSERVE THE CLEANLINESS ADVICE GIVEN IN THIS SECTION

REMOVAL

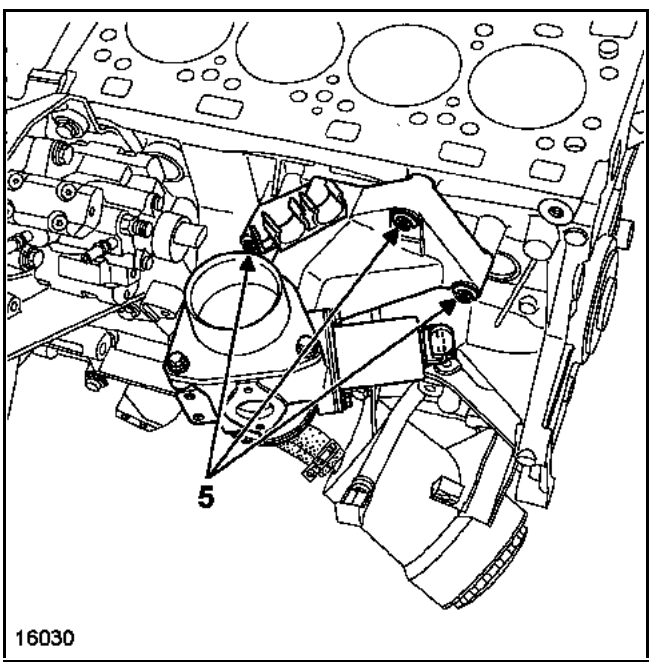
Disconnect:
– the battery,
– the airflow sensor.

Remove:
– the air filter unit,
– the expansion bottle and release it,
– The air exchanger pipe/air vent unit (1) by disconnecting the wastegate pipe (2),
– the stiffening bracket (3) between the air vent unit and the power assisted steering pump,
– the exhaust gas recirculation pipe (4) and the seals. Plan for the replacement of the pipe and the seals when refitting.

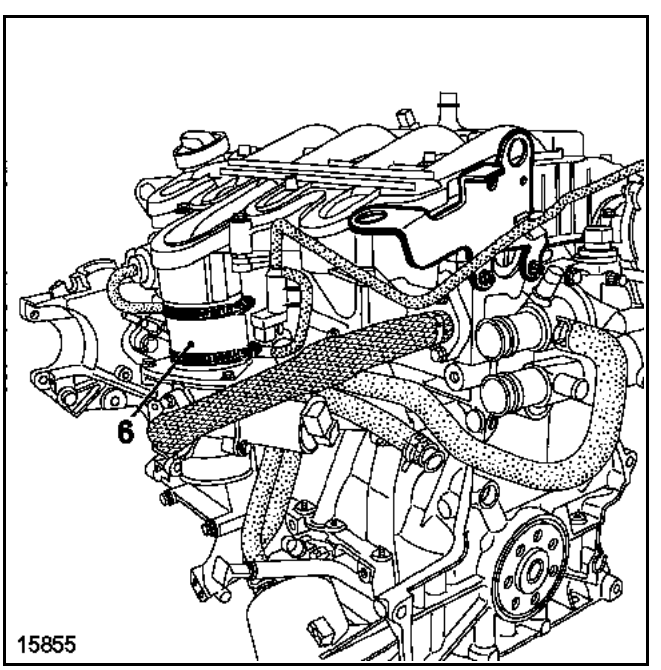


Disconnect the exhaust gas recirculation control solenoid valve connector.

Remove:
– the mounting bolt from the air vent unit (5),

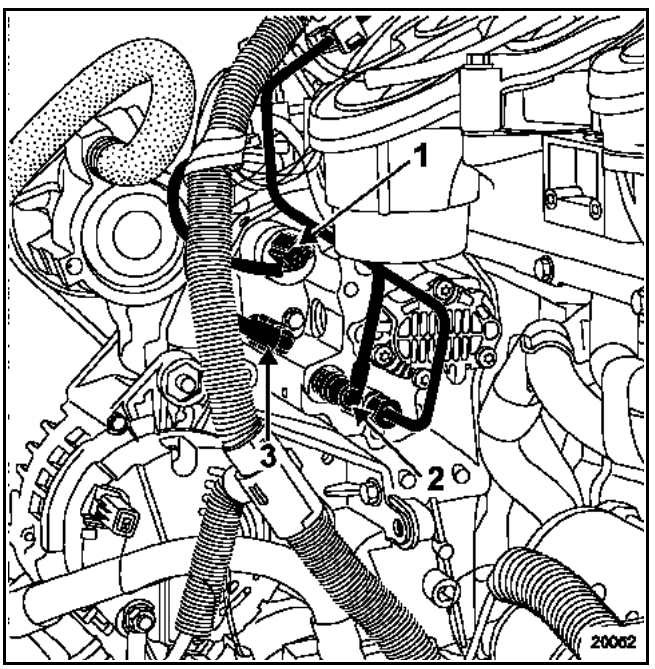


– the connection pipe (6) with the inlet manifold,
– the air vent unit from underneath.



Set the engine to top dead centre using pin **Mot. 1536**.

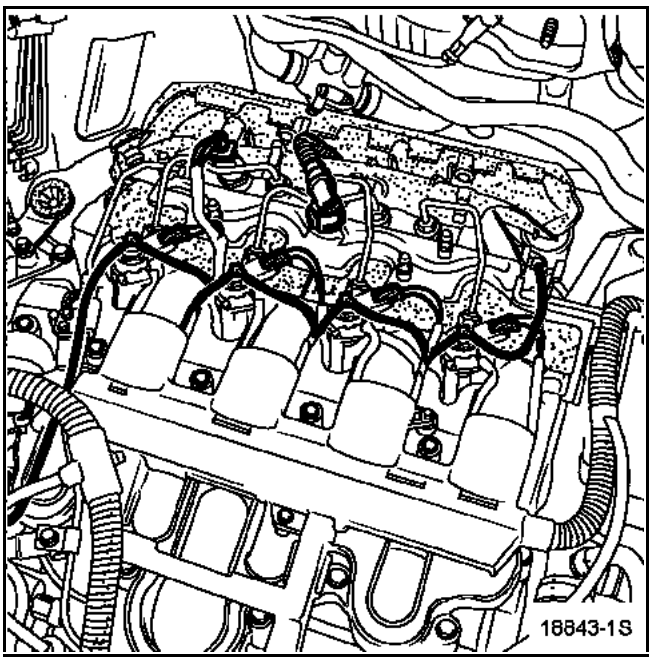
Disconnect:
– the high pressure regulator (1),
– the diesel temperature sensor,
– the fuel return pipe (2) and the fuel supply pipe (3) on the pump, then put in the cleanliness plugs.



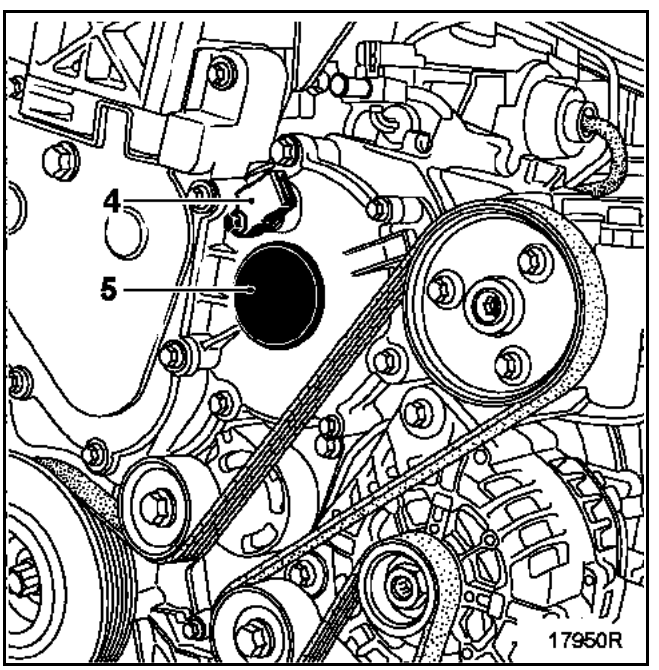
Remove the expansion bottle mounting.

Unclip the rail protector and put it completely aside.

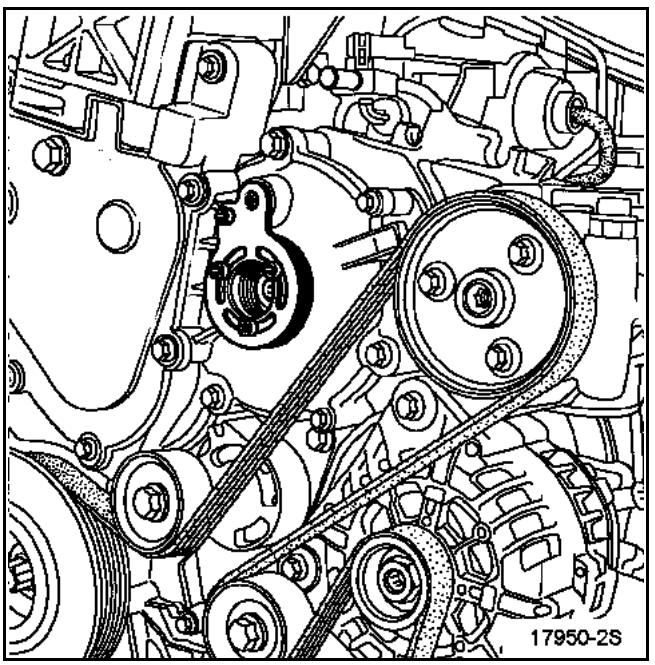
Remove:
– the pump outlet/rail inlet high pressure pipe and fit the sealing plugs.



– the position sensor (4) taking care not to drop the O-ring into the sprockets,
– the pump hub plug (5).



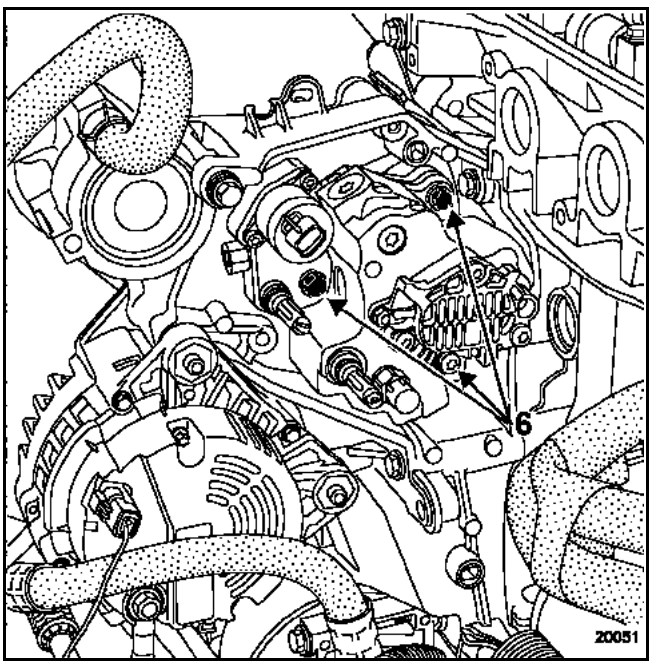
Fit tool **Mot. 1548**, using the central dowel, then remove the central dowel once the tool is in place.



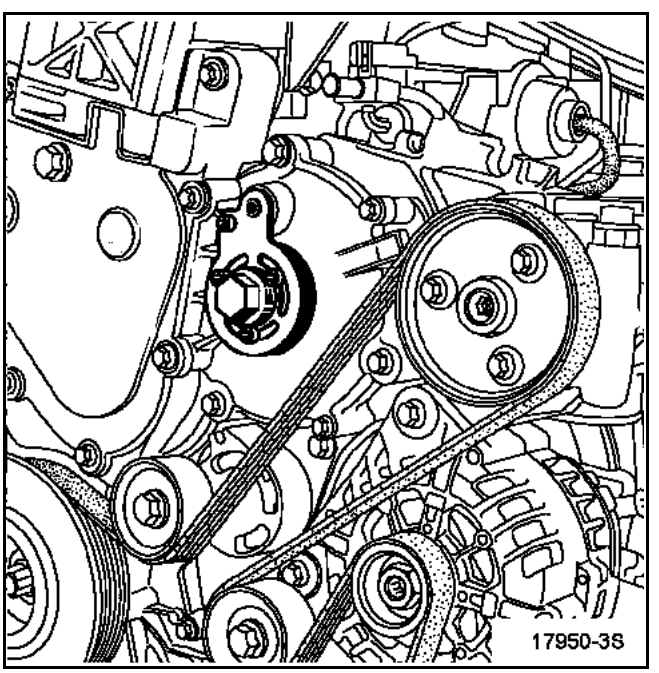
Remove the TDC setting pin **Mot. 1536**.

Remove the pump hub central mounting nut, locking the engine flywheel using a large screwdriver.

Loosen the three mounting bolts on the multifunction support pump by a few turns (6).



Drive out the pump by tightening the dowel on tool **Mot. 1548**.



Remove the pump mounting bolts, then the high pressure pump.

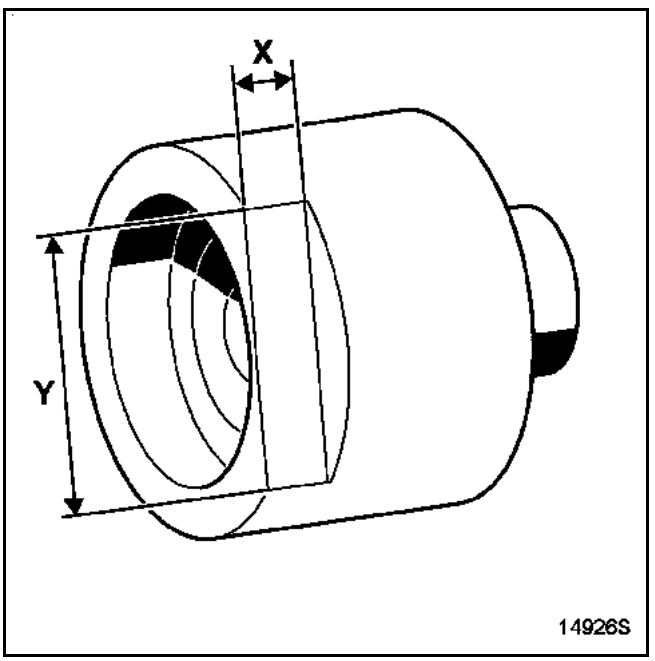
REFITTING

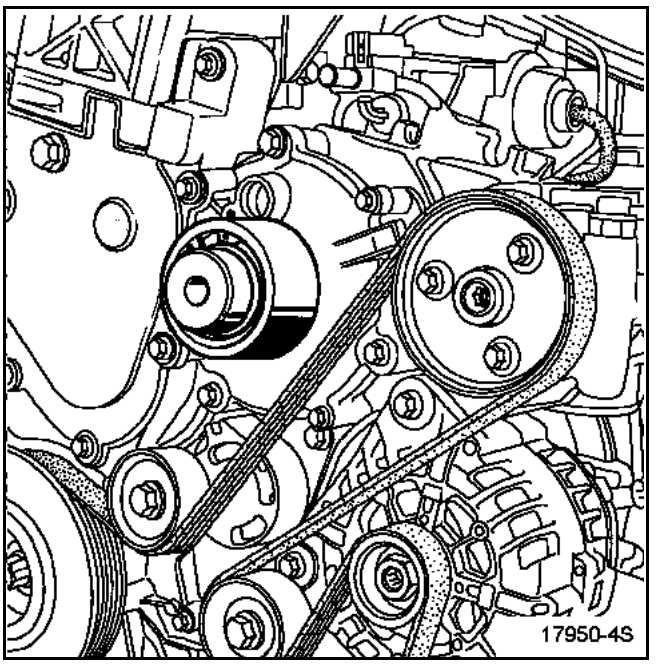
Proceed in the reverse order to removal using the central nut to engage the new pump.

Check that the rear pump mounting holes are in the correct position.

Refit a new pump hub cover plug using tool **Mot. 1503** having first adjusted it.

Mot. 1503 tool adjustment:
Make a flat surface **X = 17 mm** by **Y = 40 mm**.





NOTE: be careful not to put the High Pressure pipes or the rear pump support under any strain. To do this:
- loosen the High Pressure rail.
- finger-tighten the high pressure pipe nuts to the pump and rail before tightening them to torque.
- tighten the rail to the correct torque,
- tighten to the correct torque on the pump side,
- tighten to the correct torque on the rail side,

You must replace the fuel return pipe if it has been removed.

Before starting the engine, reprime the fuel circuit.

Start the low pressure pump by switching on the ignition several times.

Start the engine.

After any operation, check that there are no leaks in the diesel circuit. Run the engine at idle speed until the fan starts up, then accelerate several times with no load.

Check that there are no stored faults using the diagnostic tool. Erase them if necessary.

SPECIAL TOOLING REQUIRED	
Mot. 1549	Injector extractor
Mot. 1566	Tool for removing and refitting the high pressure pipes
EQUIPMENT REQUIRED	
Low torque wrench	
High pressure pipe wrench (e.g. Facom DM19 wrench)	

TIGHTENING TORQUES (in daNm)	
Injector bracket nut pretightening	0.6 ± 0.1
Injector bracket nut on the flywheel side	360 ± 30°
Injector bracket studs	0.2 ± 0.05
High pressure pipe nut	2.5 ± 0.2
Injection rail mounting bolt	2.3 ± 0.3
Pump/rail pipe bracket bolt	2.5 ± 0.2

IMPORTANT: before carrying out any work, connect the After-Sales diagnostic tool, set up communication with the injection computer and check that the injection rail is not under pressure.

Take note of the fuel temperature.

Order the special high pressure injection circuit plug kit.

REMOVAL

FOLLOW THE CLEANNESS INSTRUCTIONS CLOSELY

Disconnect:
– the battery,
– the airflow sensor.

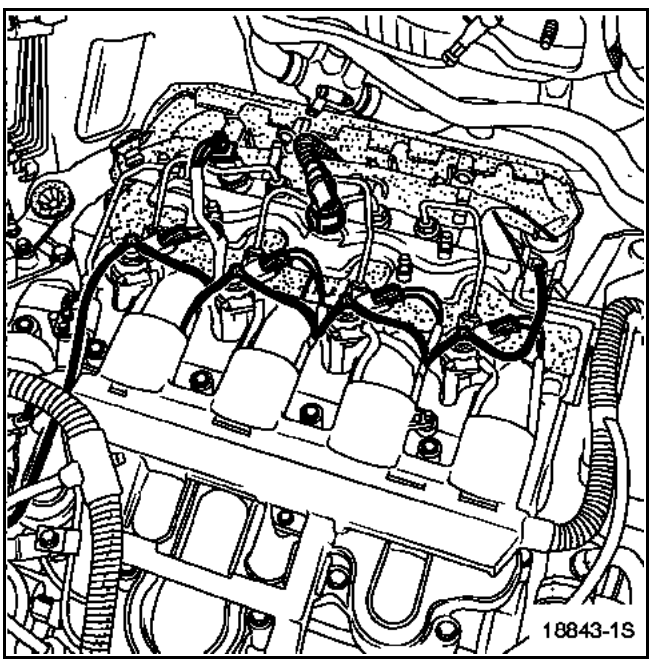
Remove:
– the air filter unit,
– the expansion bottle and move it out of the way,
– the expansion bottle mounting by disconnecting the pre-postheating unit,
– the pipe at the turbocharger inlet, disconnecting the oil vapour rebreathing pipe.

Move aside the heater matrix water pipes with the thermoplunger unit.

Unclip the rubber flap side partitions.

Unclip the rubber flap from the engine mounting, then the cylinder head cover and push as far as possible to the rear.

Remove the sealing cover attached by two nuts to the cylinder head cover, holding the stud (on some versions), and remove the absorbent soundproofing material.



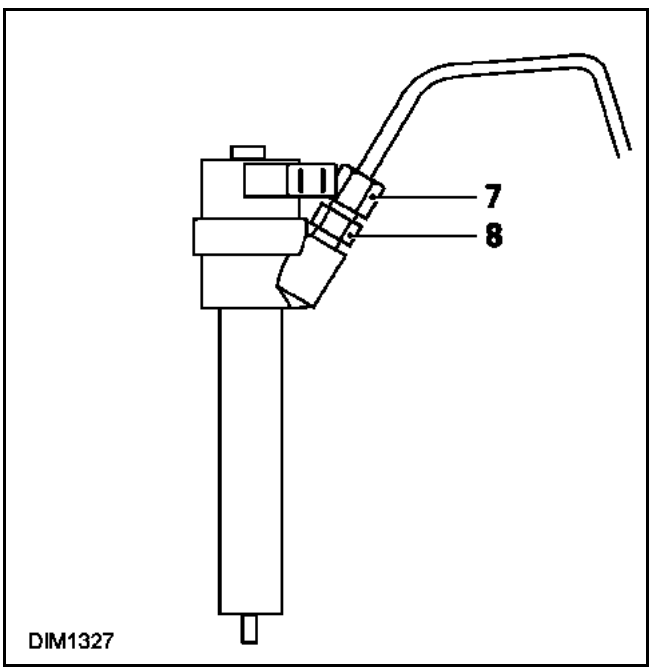
Disconnect the pressure sensor (1) and the injectors electrically.

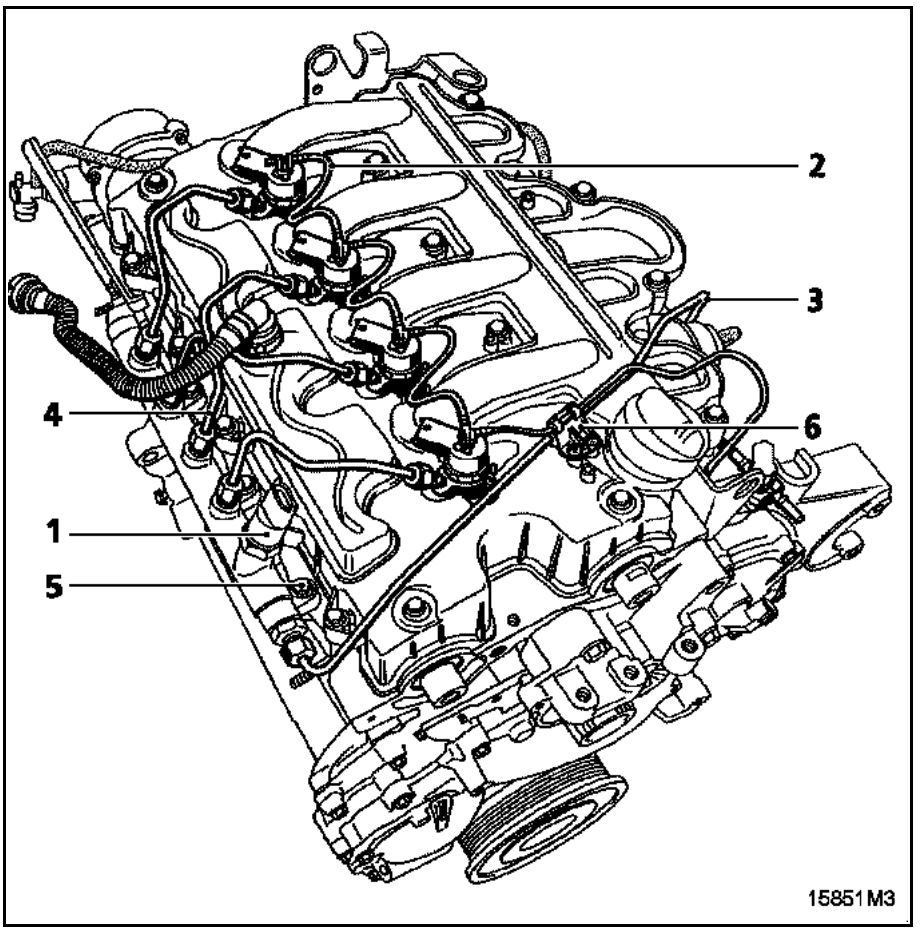
Remove:
– the injector diesel return pipe (2) (to be replaced),
– the injection pipe (3) between the high pressure pump and the rail, NOTE that the cylinder mounting bolt (6) is very fragile,
– the injector pipes (4).

Fit plugs to maintain cleanness.

WARNING: when loosening the injection pipe unions (7) on the injector holders, you must hold the filter-rod supporting nuts (8) with a lockwrench.

Loosen the injection rail bolts (5) without removing it.

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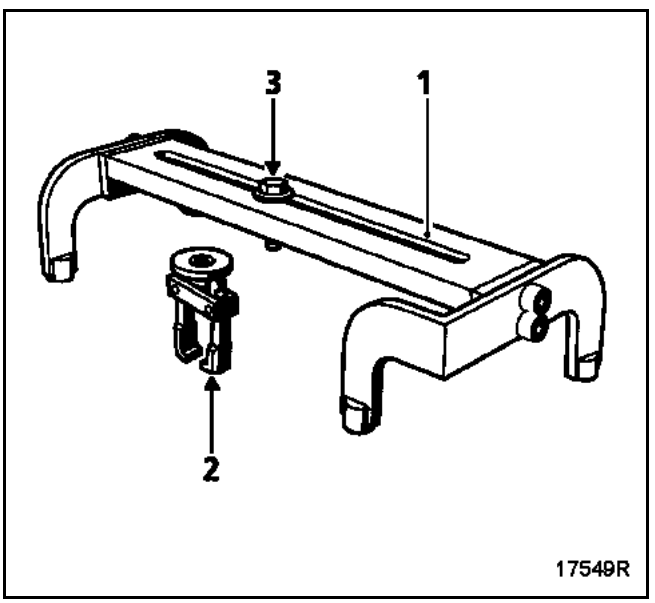
REMOVE THE INJECTOR HOLDER (pipes removed)

Loosen the mounting bolts for each injector holder.

A special extractor must be used to remove the injectors. Never attempt to remove an injector holder locked in its cylinder socket unless using the tool described below.

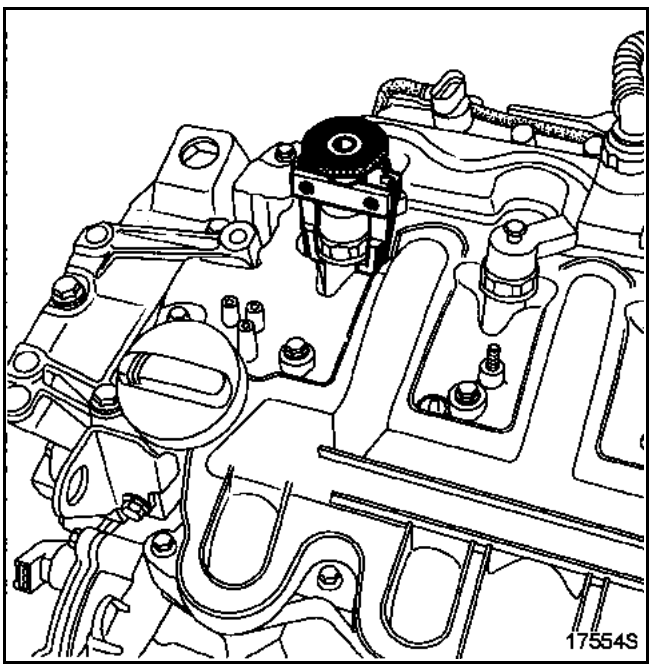
Description of tool **Mot. 1549**:

1 Extractor support chassis; this is fitted on the cylinder head cover mounting bolts. Check that it is fitted correctly before use.
2 Extractor
3 Extraction bolt

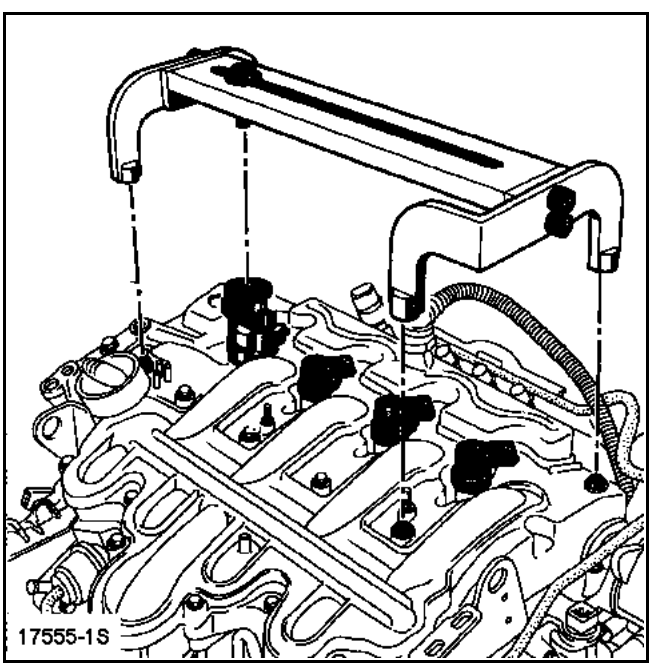


Apply releasing agent around the injector.

Fit the extractor on an injector holder. Tighten the knurled ring to bring the two jaws together on the flat surfaces without overtightening.



Fit the chassis of tool **Mot. 1549** on the cylinder head mounting bolts. Tighten the extraction bolt until the injector is released from the cylinder head.



Remove the washer from the bottom of each injector socket.

REFITTING

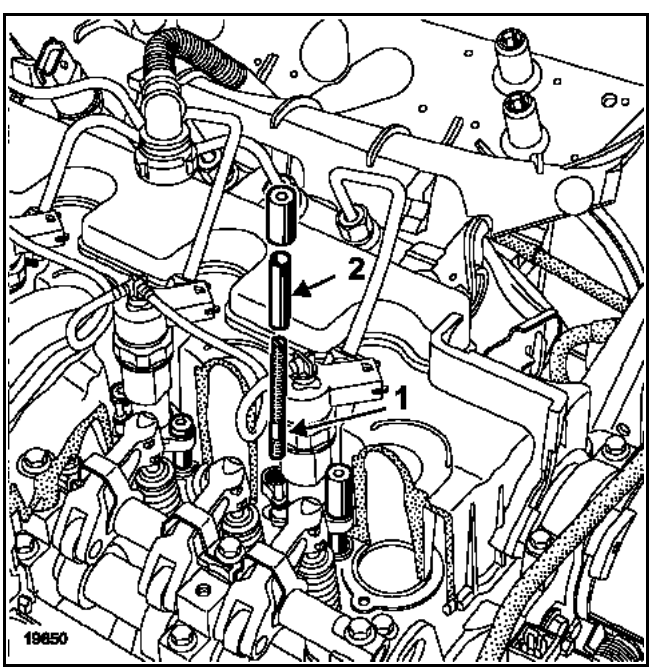
Leave removal of the protection plugs from any component until last.

Clean the injector sockets and the injector bodies, as well as their brackets using a lint-free cloth (use the wipes recommended for this purpose, part no. **77 11 211 707**) dipped in clean solvent.

Dry off using a different new wipe.

Clean one of the old injector mounting bolts and tighten it to the end of the mounting hole thread to clean the tappings.

Fit new studs (1) and injector mounting spacers (2) after coating them with oil on the thread and tighten them as tightly as possible by hand **(0.2 daNm). The studs and nuts must be replaced every time they are removed.**



Fit a new injector head washer on every injector.

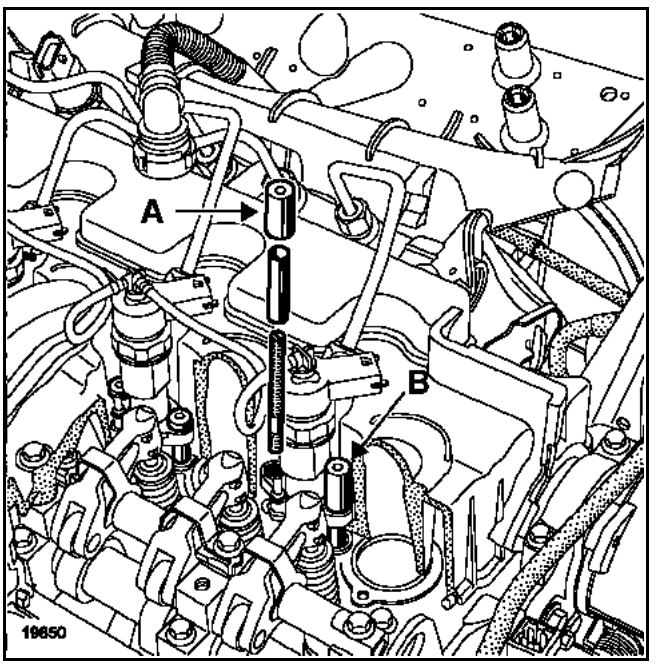
Fit the injector equipped with its bracket and locking spring ring.

Oil the threads of the nuts.

WARNING: tighten the nut (A) on the timing side first, then the bolt (B) on the flywheel side.

Tighten nut A to **0.6 daNm,** then nut B to **0.6 daNm.**

On the timing side first, then on the flywheel side.



Retighten nut B only to **360° ± 30° (nut on the flywheel side).**

Loosen the three rail mounting bolts in order to release it.

Remove the rail plugs, the injector holders and the injection pipes.

Fit the injection pipes between the rail and the injectors and pretighten by hand until they touch.

Tighten the three rail mounting bolts to a torque setting of **2.3 daNm**).

Tighten the injector pipe connections on the injectors and the high pressure pump to a torque setting of **2.5 daNm**

Tighten the injection pipe connections on the rail to **2.5 daNm**.

Clip the pump/rail pipes mounting clip and tighten the two mounting bolts.

Refit the sealing partition, attached to the cylinder head cover by two nuts.

Refix the side partitions of the rail shield correctly.

Fold to the front and clip the rubber flap of the rail protector.

During any operations on the rail protector, you must ensure that the system components are fitted properly after refitting (see the Rail protector section).

Non-observance of this advice may have serious consequences.

Continue the refitting procedure in the reverse order to removal.

Throw away the bag of plugs used during the operation.

Use the diagnostic tool to erase any faults which may be stored by the injection computer before restarting the engine.

Re-prime the system by switching on the ignition several times, or turn the low pressure pump over with the diagnostic tool using the **Actuator Commands** menu.

After any operation, check that there are no leaks in the diesel circuit.
Proceed as follows:
– Run the engine at idle speed until the fan starts up.
– accelerate several times under no load,
– carry out a road test.
– switch the ignition off and check that there is no leakage of diesel,
– check that the absorbent sound-proofing material is not saturated with diesel fuel.

SPECIAL TOOLING REQUIRED	
Mot. 1566	Tool for removing and refitting high pressure pipes
EQUIPMENT REQUIRED	
Low torque wrench	
High pressure pipe wrench (e.g. Facom DM19 wrench)	

TIGHTENING TORQUES (in daNm)	
High pressure pipe nuts	2.5 ± 0.2
Injection rail mounting bolt	2.3 ± 0.3

IMPORTANT: before carrying out any work, connect the After-Sales diagnostic tool, set up communication with the injection computer and check that the injection rail is not under pressure.

Take note of the fuel temperature.

Order the special high pressure injection circuit plug kit.

REMOVAL

FOLLOW THE CLEANNESS INSTRUCTIONS CLOSELY

Disconnect:
– the battery,
– the airflow sensor.

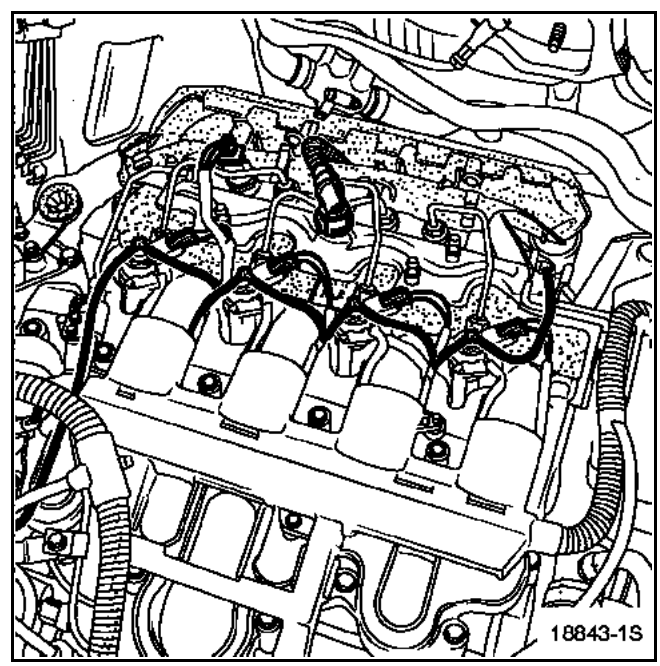
Remove:
– the air filter unit,
– the expansion bottle and release it,
– the expansion bottle mounting by disconnecting the pre-postheating unit,
– the pipe at the turbocharger inlet, disconnecting the oil vapour rebreathing pipe.

Move aside the heater matrix coolant pipes with the thermoplunger unit.

Unclip the side partitions of the rubber flap.

Unclip the rubber flap from the engine mounting, then the cylinder head cover and push as far as possible to the rear.

Remove the sealing cover attached by two nuts to the cylinder head cover, holding the stud (on some versions), and remove the absorbent soundproofing material.



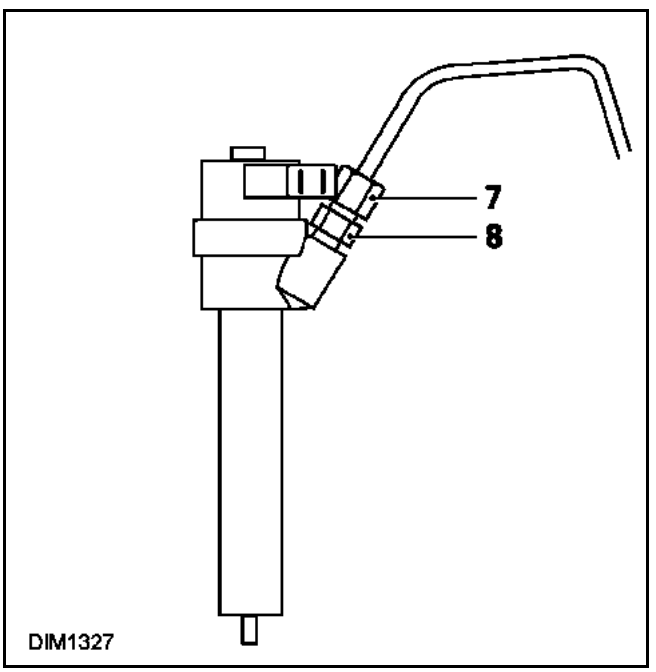
Disconnect the pressure sensor electrically (1).

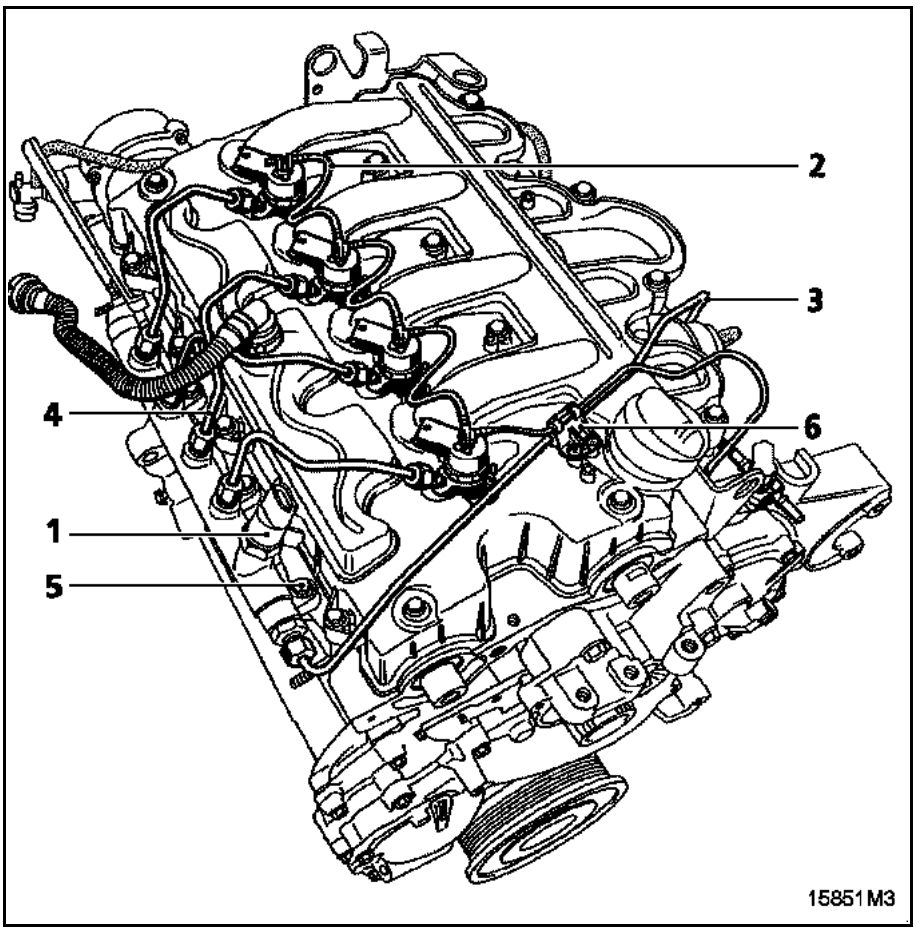
Remove:
– the injector diesel return pipe (2) (to be replaced),
– the injection pipe (3) between the high pressure pump and the rail, NOTE that the cylinder mounting bolt (6) is very fragile,
– the injector pipes (4).

Fit plugs to maintain cleanness.

WARNING: when loosening the injection pipe unions (7) on the injector holders, you must hold the filter-rod supporting nuts (8) with a lockwrench.

Remove:
– the three injection rail bolts (5) and the mounting clamp bolt for the rail on the lower metal protector,
– the rail with its side partition.

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REFITTING

Leave removal of the protection plugs from any component until last.

Refit:
– the injector rail and finger-tighten the mounting bolts **without** fully tightening them,
– the rail mounting clamp bolt on the metal lower protector.

Remove the rail plugs, the injector holders and the injection pipes.

Fit the injection pipes between the rail and the injectors and between the pump and the rail, then pretighten the nuts by hand until they touch.

Tighten the three rail mounting bolts to a torque setting of **2.3 daNm**).

Tighten the injector pipe connections on the injectors and the high pressure pump to a torque setting of **2.5 daNm**

Tighten the injection pipe connections on the rail to **2.5 daNm**.

Continue to refit the rail protector with reference to the removal - refitting method for the rail protector (see section **13: Diesel equipment, Rail protector**).

During any operations on the rail protector, you must ensure that the system components are fitted properly after refitting (see the Rail protector section).
Non-observance of this advice may have serious consequences.

Continue the refitting procedure in the reverse order to removal.

Throw away the bag of plugs used during the operation.

Re-prime the system by switching on the ignition several times, or turn the low pressure pump over with the diagnostic tool using the **Actuator Commands** menu.

Use the diagnostic tool to erase any faults which may be stored by the injection computer before restarting the engine.

After any operation, check that there are no leaks in the diesel circuit.
Proceed as follows:
– run the engine at idle speed until the fan starts up.
– accelerate several times under no load,
– carry out a road test,
– switch the ignition off and check that there is no leakage of diesel,
– check that the absorbent soundproofing material is not saturated with diesel fuel.

GENERAL

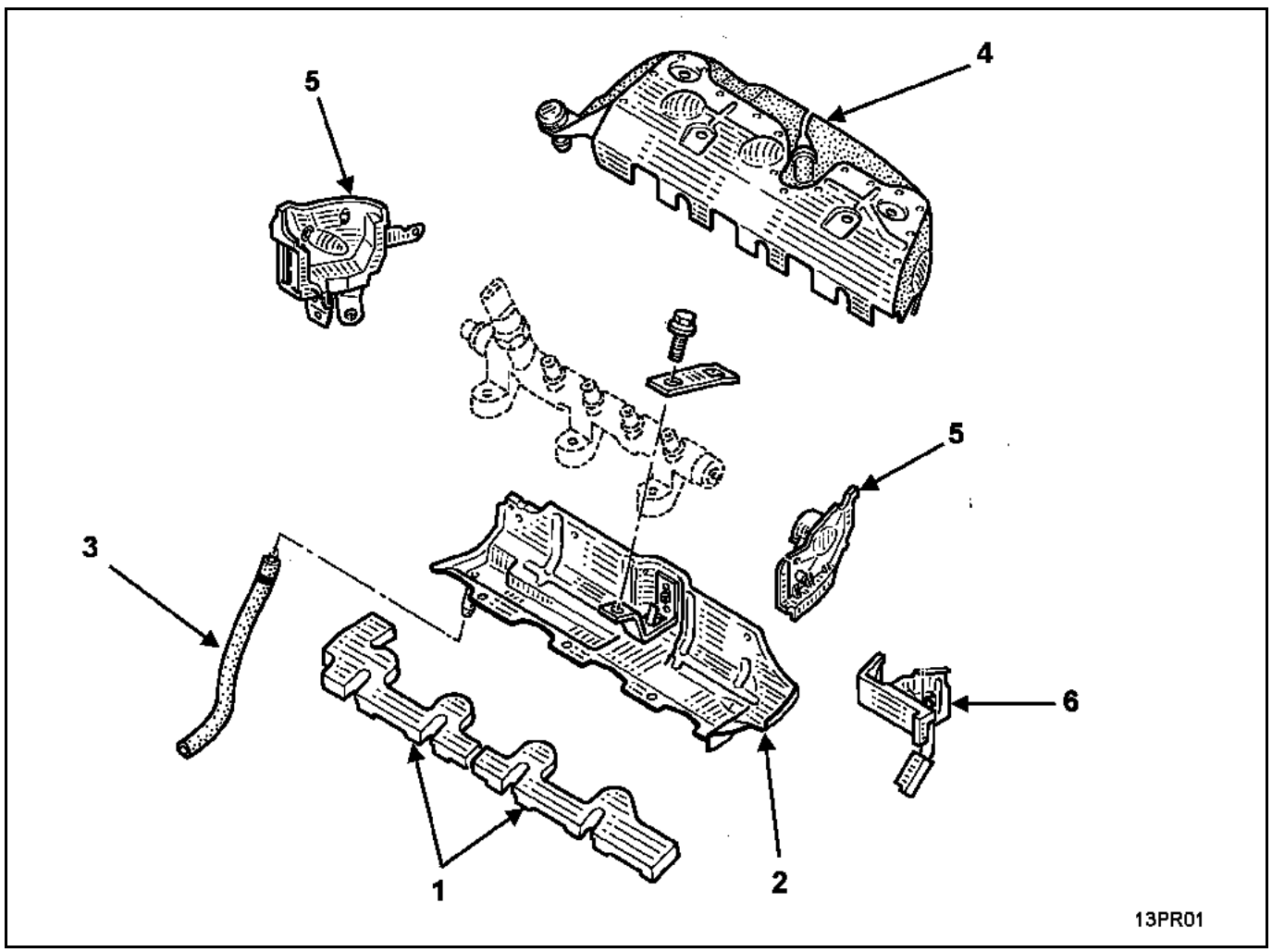
The rail protector, comprising ten parts, ensures insulation of the high pressure injection system from the engine compartment.

THIS RAIL PROTECTOR ENSURES SAFE OPERATION AND REQUIRES SPECIAL ATTENTION WHEN BEING FITTED.

To ensure its safety function, the rail protector must consist of:
– two absorbent soundproofing materials (1) to be replaced if they have deteriorated or are saturated with diesel fuel,
– a lower metal protector (2) fixed between the rail and the cylinder head,
– a diesel drain pipe (3),
– a rubber protector fixed to the metal protector and to the cylinder head cover (4),
– two side partitions (5),
– a partition (6) attached to the cylinder head cover (on some versions),
– two side partition mounting clips on the rubber flap.

During any operations on the rail protector, you must ensure that the system components are fitted properly after refitting.

NON-OBSERVANCE OF THIS ADVICE MAY HAVE SERIOUS CONSEQUENCES FOR SAFETY



SPECIAL TOOLING REQUIRED	
Mot. 1566	Tool for removing and refitting high pressure pipes
EQUIPMENT REQUIRED	
Low torque wrench	

TIGHTENING TORQUES (in daNm)	
High pressure pipe nuts	2.5 ± 0.2
Injection rail mounting bolt	2.3 ± 0.3
Pump/rail pipe bracket bolt	2.5 ± 0.2

IMPORTANT: before carrying out any work, connect the After-Sales diagnostic tool, set up communication with the injection computer and check that the injection rail is not under pressure.

Take note of the fuel temperature.

Order the special high pressure injection circuit plug kit.

REMOVAL

FOLLOW THE CLEANNESS INSTRUCTIONS CLOSELY

Disconnect:
– the battery,
– the airflow sensor.

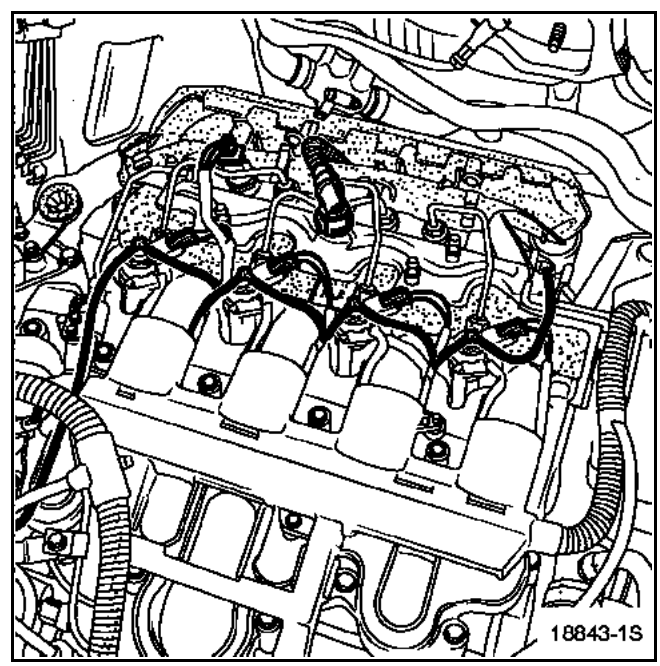
Remove:
– the air filter unit,
– the expansion bottle and move it out of the way,
– the expansion bottle mounting by disconnecting the pre-postheating unit,
– the pipe at the turbocharger inlet, disconnecting the oil vapour rebreathing pipe.

Move aside the heater matrix coolant pipes with the thermoplunger unit.

Unclip the side partitions of the top rubber protector.

Unclip the top rubber protector from the engine mounting, then the cylinder head cover and push as far as possible to the rear.

Remove the sealing cover attached by two nuts to the cylinder head cover, holding the stud (on some versions), and remove the absorbent soundproofing material.



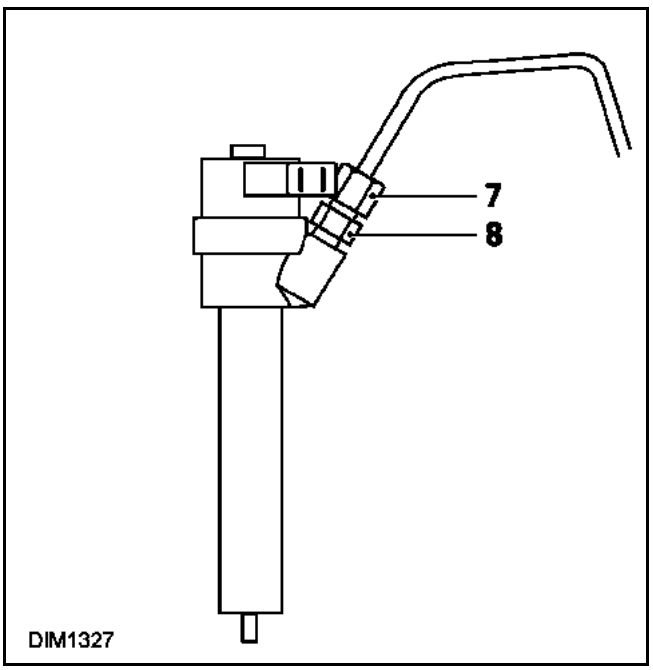
Disconnect the pressure sensor (1) and the injectors electrically.

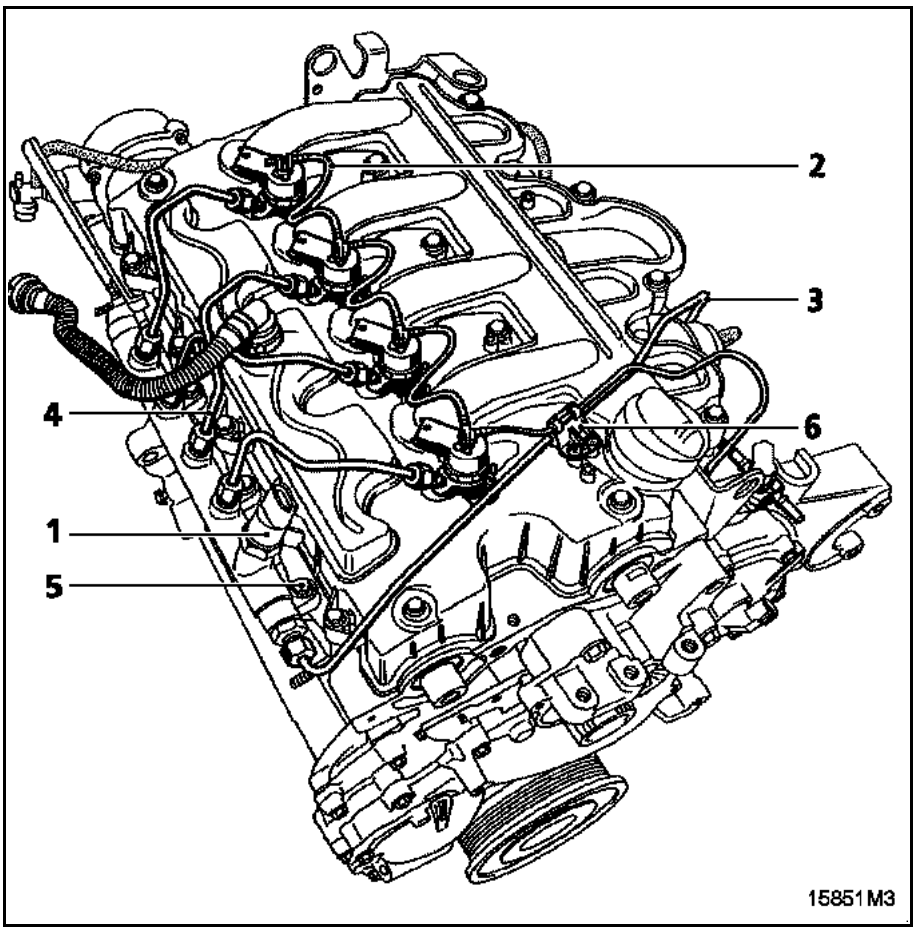
Remove:
– the injector diesel return pipe (2) (to be replaced),
– the injection pipe (3) between the high pressure pump and the rail, NOTE that the cylinder mounting bolt (6) is very fragile,
– the injector pipes (4).

Fit plugs to maintain cleanness.

WARNING: when loosening the injection pipe unions (7) on the injector holders, you must hold the filter-rod supporting nuts (8) with a lockwrench.

Remove the three injection rail bolts (5) and the mounting clamp bolt for the rail on the lower metal protector, then remove the rail with its side partition.

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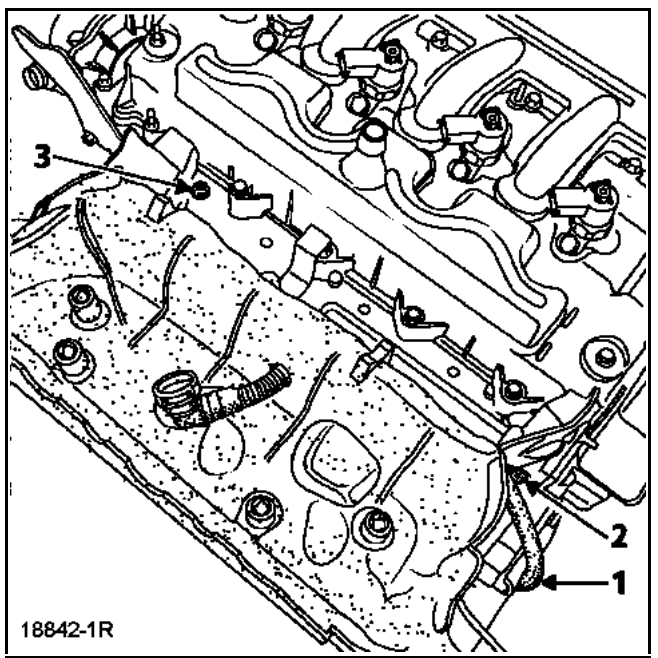
Disconnect the diesel drain pipe (1).

Remove:
– the side partition mounting bolt (2),
– the lower metal protector mounting bolt (3),

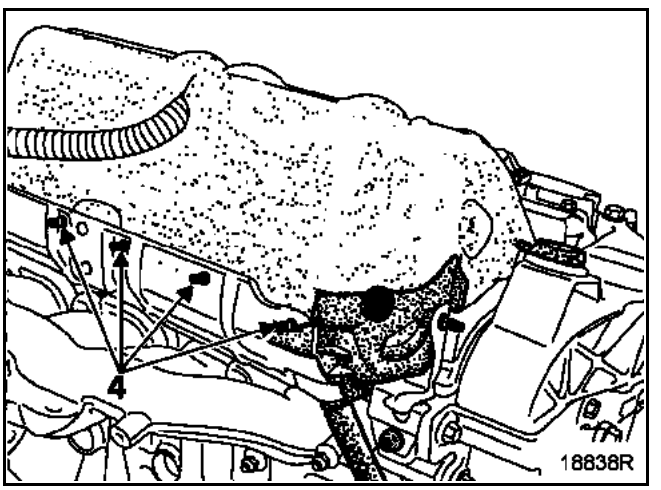


– the rail protector with the side partition, then remove the partition of the central section.

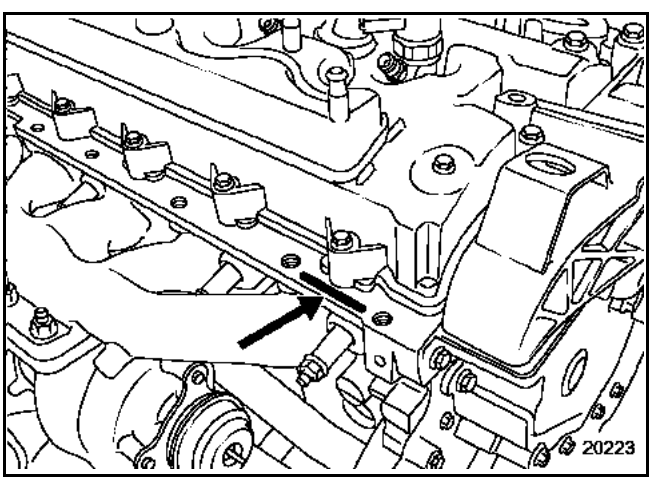
Separate the rubber protector from the lower metal protector.

REFITTING

Refit the upper rubber protector to the lower metal protector by pulling on the five rubber wall sockets (4). **Check that they are properly clipped.**



Put **Rhodorseal 5661** on the cylinder head in the area marked by a black line on the diagram.



Refit the upper rubber/lower metal protector assembly to the engine by refitting the lower metal protector mounting bolt (3).

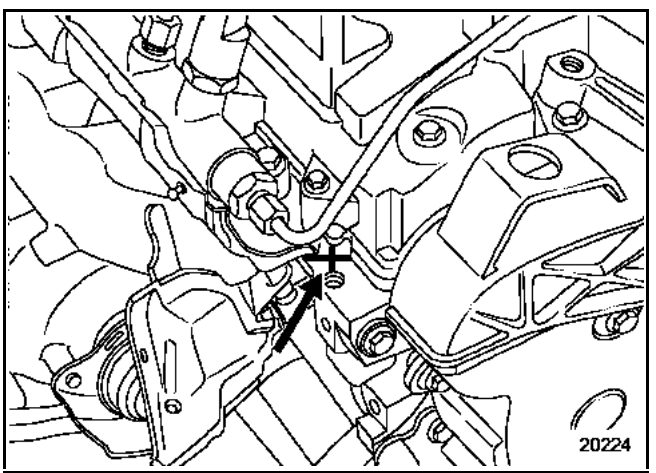
Refit the injection rail with its partition without tightening the rail mounting bolts.

Remove the plugs from the rail, the injector holders, the pump and the injection pipes.

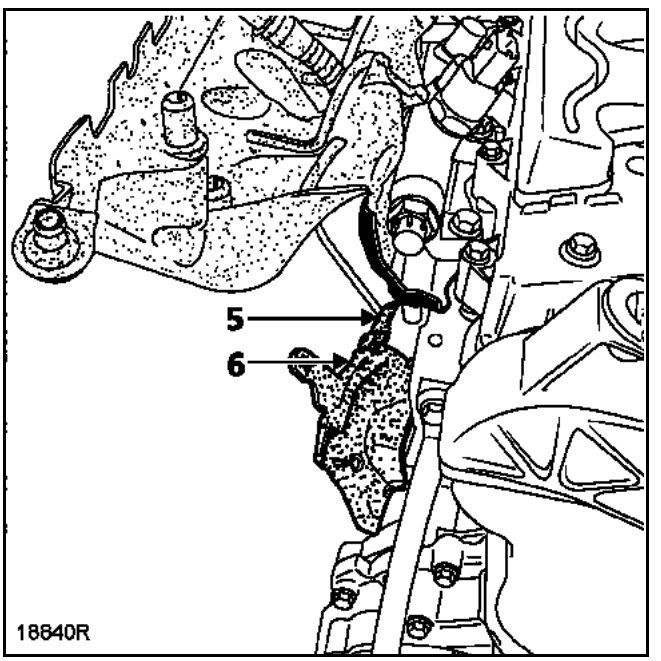
Fit the injection pipes between the rail and the injectors and between the pump and the rail, then pretighten by hand until they touch.

Torque tighten the:
– three rail mounting bolts to **2.3 daNm**,
– the injection pipe connections on the injectors and the high pressure pump to **2.5 daNm**,
– the injection pipe connections on the rail to **2.5 daNm**.

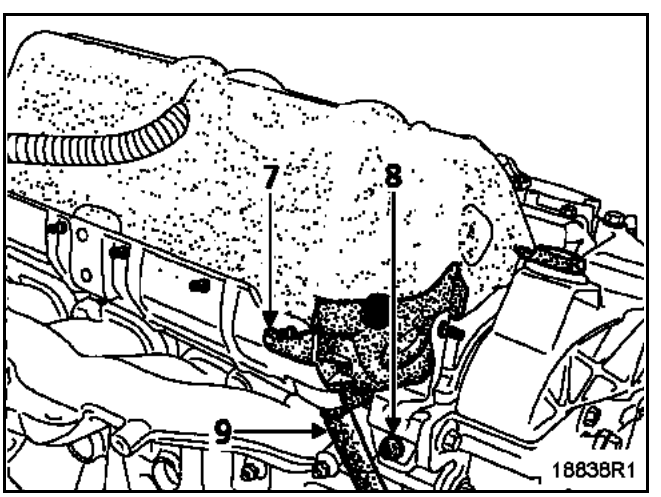
Put **Rhodorseal 5661** on the cylinder head in the area marked by a black cross on the diagram.



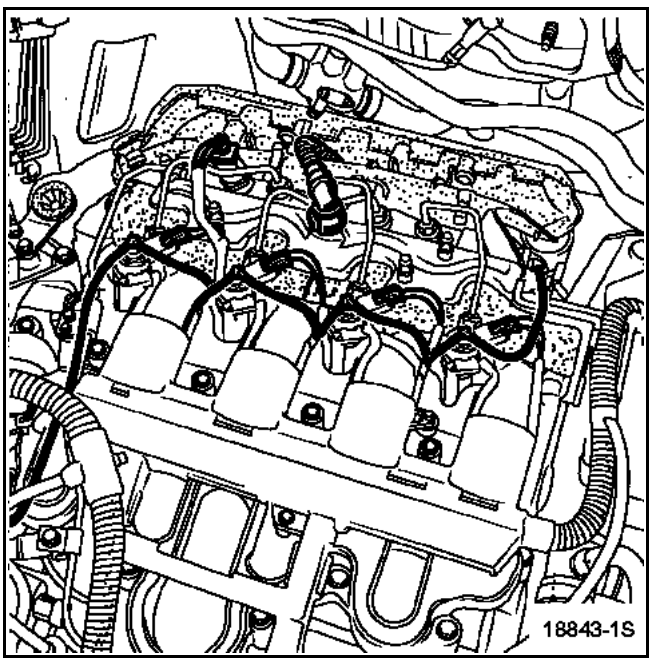
To refit the side partition on the lower metal protector it is **essential** that you use the following method:
– position the lower tab (5),
– fit the rubber ring (6) of the partition onto the lower metal protector,
– then fit the upper section of the partition to the metal protector,



– position the upper tab (7),
– refit the partition mounting bolts (8),
– reconnect the diesel drain pipe (9), checking that it is not plugged.

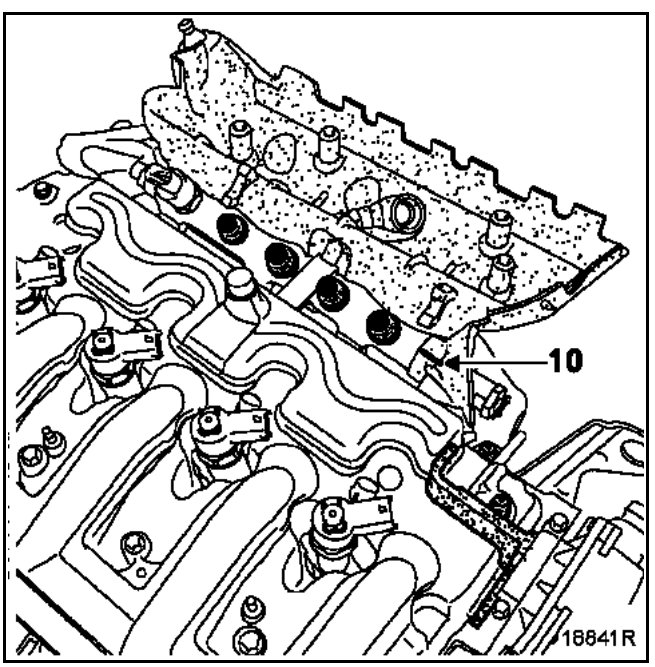


Refit the absorbent soundproofing materials, replacing them if they have deteriorated or are saturated with diesel fuel.



Refit the sealing partition, attached to the cylinder head cover by two nuts.

Check that the mark (10) on the rail partition is positioned correctly (in the axis of the high pressure rail outlets).



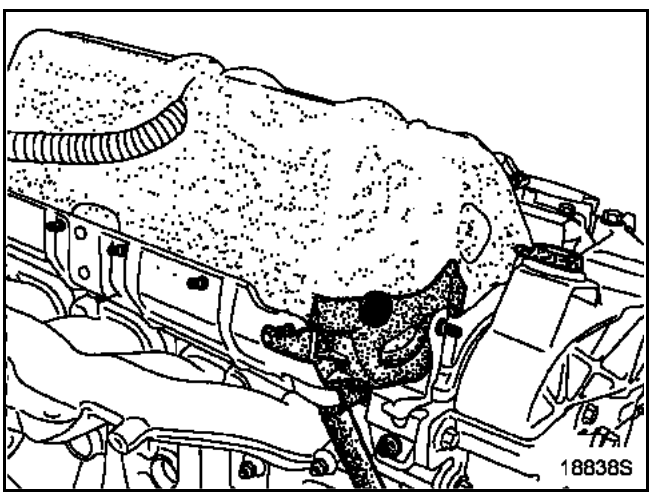
Reconnect the injectors and the rail pressure sensor.

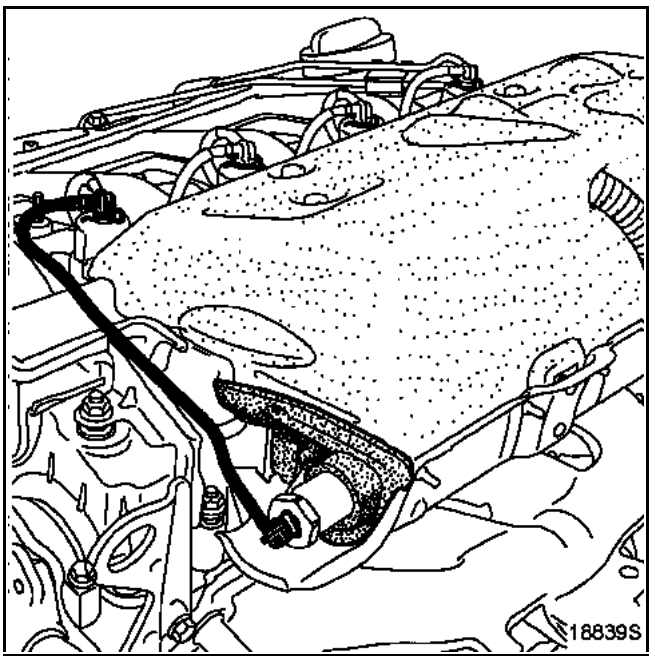
Refit a new diesel return pipe ensuring that the mounting clips are properly fitted at the injectors and at the end of the rail at the overpressure valve.

Fold the rubber protector to the front and clip the side sealing partitions to it.

Check that the clip buttons are correctly welded to the partitions and that the rubber protector is correctly fitted.

IMPORTANT: check that the diesel drain pipe is correctly reconnected.





Reclip the rubber protector to the cylinder head cover and the engine mountings.

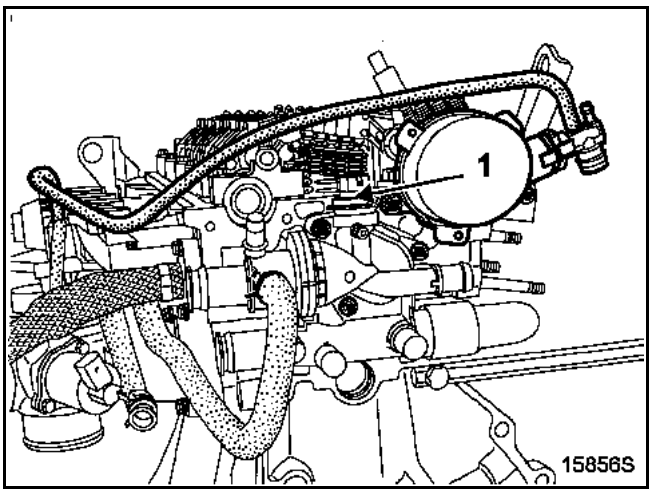
Check that the rubber protector is correctly clipped to the cylinder head cover and engine mountings studs.

Re-prime the system by switching on the ignition several times, or turn the low pressure pump over with the diagnostic tool using the **Actuator Commands** menu.

Use the diagnostic tool to erase any faults which may be stored by the injection computer before restarting the engine.

After any intervention, check that there are no leaks in the diesel circuit.

Proceed as follows:
– run the engine at idle speed until the fan starts up,
– accelerate several times under no load,
– carry out a road test,
– switch the ignition off and check that there is no leakage of diesel,
– check that the absorbent soundproofing material is not saturated with diesel fuel.



The coolant temperature sensor (1) (injection and coolant temperature indicator on the instrument panel) is a sensor with three tracks.
Two tracks for sending coolant temperature information to the computer (tracks **B E1** and **B K3**) and one track to inform the instrument panel.

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

OPERATION

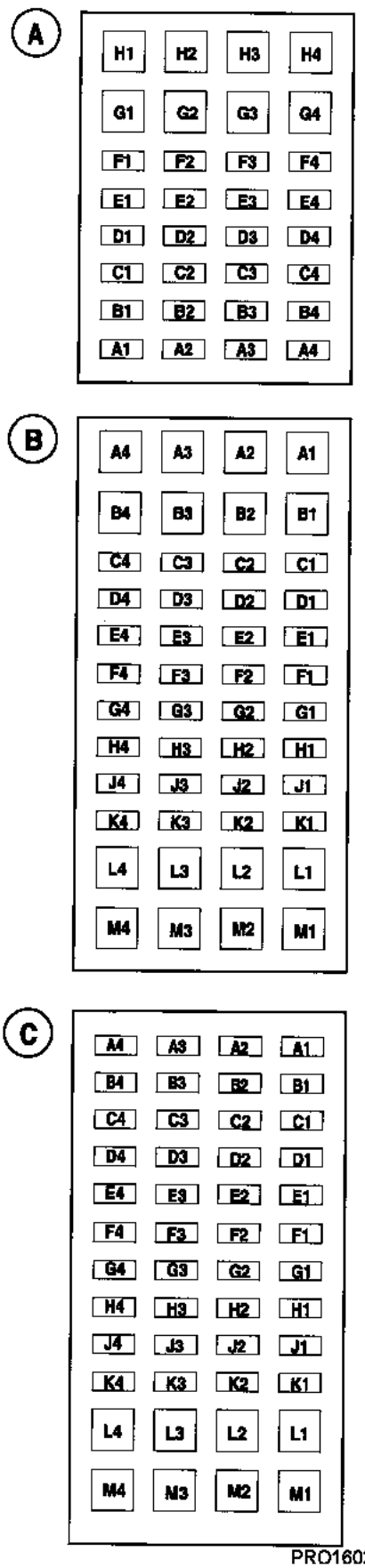
The injection computer uses the coolant temperature to control:
– the injection system,
– the fan relay:
  ● the fan unit is switched on if the coolant temperature exceeds **95 ºC** and is switched off when the temperature falls below **85 ºC**.
  ● the fan assembly can be controlled (at slow speed) for the air conditioning.

COOLANT TEMPERATURE WARNING LIGHT

The warning light is controlled by the computer (track **A H4**).

It lights up when the coolant temperature exceeds **110** °**C** and extinguishes when the temperature falls below **105** °**C**.

ALLOCATION OF TRACKS

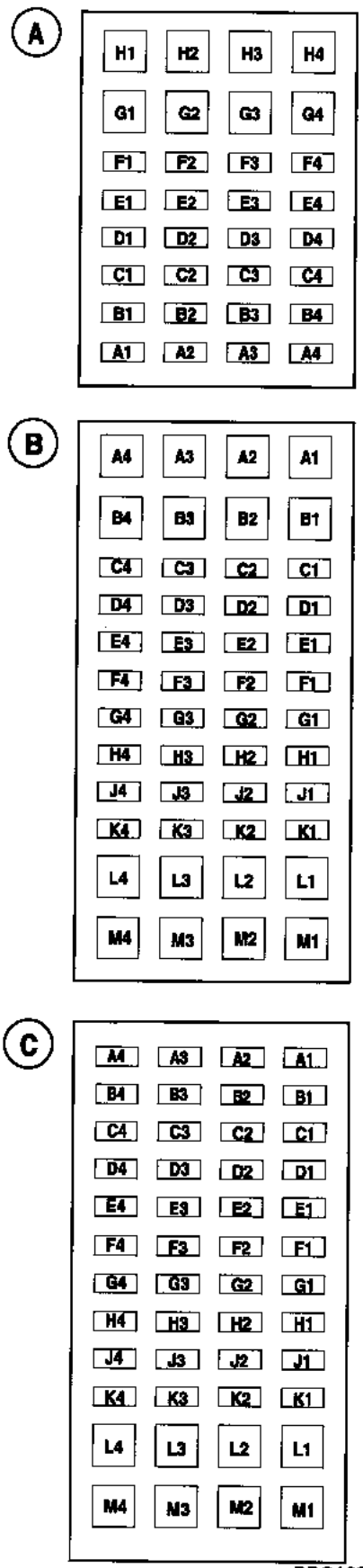


CONNECTOR A

A3	---	Load potentiometer earth (track 2)
B1	←	Heated windscreen input
B3	---	Load potentiometer earth (track 1)
C1	←	Load potentiometer input signal (track 1)
C3	→←	FAULT FINDING
D4	→	Engine speed information output to the instrument panel
E1	---	Load potentiometer feed (track 1)
E2	←	Clutch switch input
E4	←	Vehicle speed input
F1	←	Load potentiometer input signal (track 2)
F3	←	Stop switch input
F4	→	Air conditioning compressor control output
G1	→	Preheating warning light output
G2	←	Immobiliser input
G4	←	Air conditioning request input
H2	---	Load potentiometer feed (track 2)
H4	→	Coolant temperature warning light output

CONNECTOR B

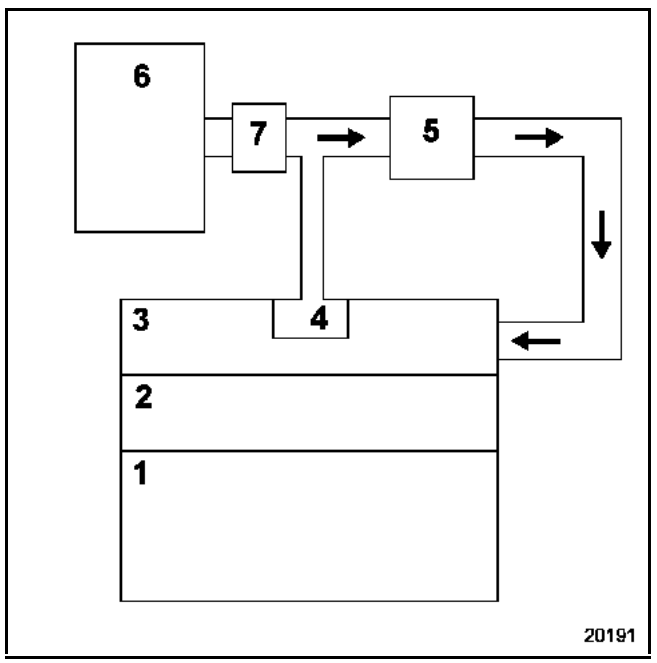
B2	---	EGR position potentiometer earth
B3	←	Plugs diagnostics input
C2	←	EGR position potentiometer signal input
C3	→	Preheating control relay
D1	←	Diesel fuel pressure sensor input
D3	←	Air temperature sensor input
D4	→	Feed control relay output
E1	---	Coolant temperature sensor earth
E3	---	+ after ignition
F2	---	EGR position potentiometer feed
F3	→	Thermoplunger control relay 2 output (2 thermoplungers)
G1	---	Fuel temperature sensor earth
G2	---	Airflow sensor feed
G3	←	Engine speed sensor signal
H2	---	Diesel fuel pressure sensor feed
H3	←	Engine speed sensor signal
H4	←	Airflow sensor signal input
J3	←	Fuel temperature input
K3	←	Coolant temperature sensor input
L1	→	High Pressure regulation valve output
L3	---	Power earth
L4	---	Power earth
M1	→	EGR solenoid valve output
M2	---	+ After relay
M3	---	+ After relay
M4	---	Power earth



CONNECTOR C

A1	→	Booster pump control output
A2	→	Low speed fan unit relay control outlet
A3	---	Airflow sensor earth
B3	---	Diesel fuel pressure sensor earth
B4	→	High speed fan unit relay control outlet
C1	---	Camshaft sensor earth
E4	→	Thermoplunger control relay 3 output (1 thermoplunger)
J4	→	Thermoplunger control relay 1 output (1 thermoplunger)
K4	←	Camshaft position sensor signal
L1	→	Injector command 4
L2	---	Injector 3 feed
L3	---	Injector 2 feed
L4	→	Injector command 2
M1	→	Injector command 1
M2	→	Injector command 3
M3	---	Injector 1 feed
M4	---	Injector 4 feed

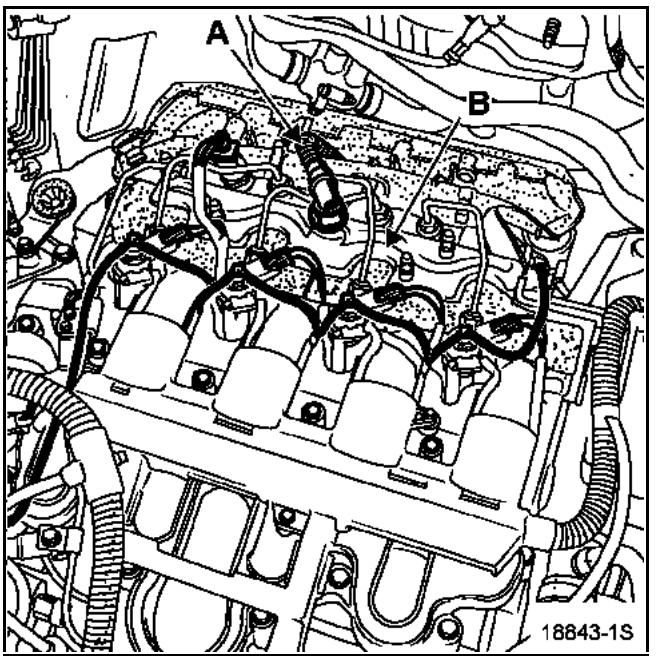
CIRCUIT DIAGRAM



1 Engine
2 Cylinder head
3 Cylinder head cover/inlet distributor
4 Oil decanter (incorporated into the cylinder head cover)
5 Turbocharger
6 Air filter
7 Airflow sensor

CHECKING

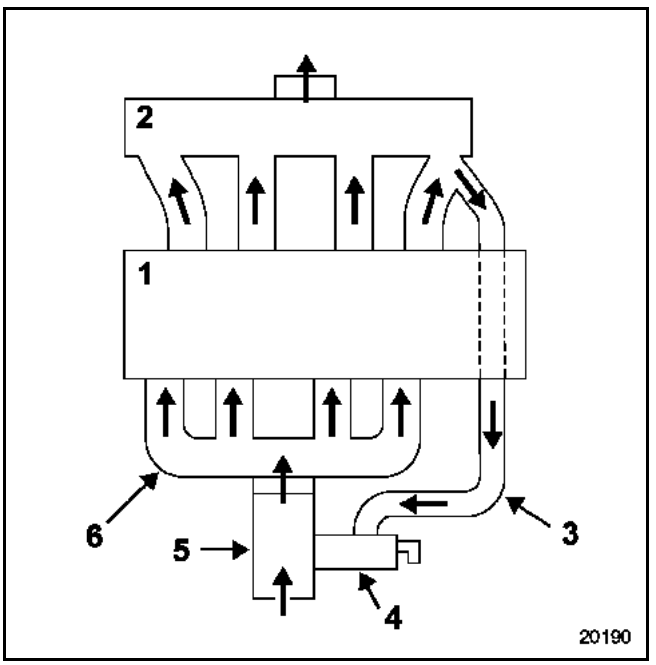
To ensure the correct operation of the anti-pollution system, the oil vapour rebreathing circuit must be kept clean and in good condition.



A Oil vapour rebreathing pipe linked to the intake pipes.

B Oil decanter incorporated into the cylinder head cover/inlet manifold.

CIRCUIT DIAGRAM



1 Cylinder head
2 Exhaust manifold
3 EGR pipe
4 EGR solenoid valve
5 Air vent unit
6 Inlet manifold/cylinder head cover

OPERATING PRINCIPLE

The valve is controlled by an **RCO** signal issued by the injection computer. The **RCO** signal modulates the opening of the valve and consequently the quantity of exhaust gas directed back to the inlet manifold.

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

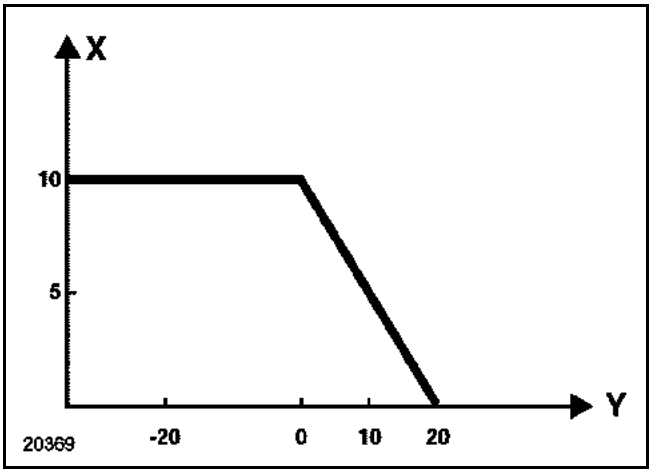
OPERATING CONDITIONS

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

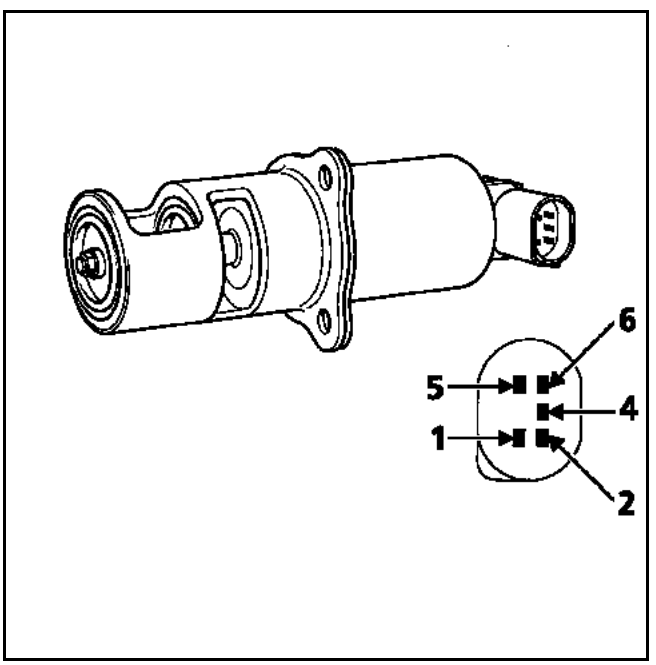
TheEGRfunction is cut off if:
– the battery voltage is less than **8 volts**,
– engine speed is below **650 rpm.**
– engine speed is greater than **4500 rpm.**
– mapping (engine speed/load) exceeds a given threshold,
– the vehicle speed is less than **5 mph (12 km/h)**, the engine speed is less than **900 rpm**and if the coolant temperature is greater than **0 ºC** for **7 seconds.**

The **EGR** valve is not controlled after engine start-up depending on coolant temperature mapping.

X Time (seconds)
Y Coolant temperature (°**C**)



If there is a fault in:
– the coolant temperature sensor,
– the air temperature sensor,
– the atmospheric pressure sensor.
The **EGR** solenoid valve is fed for **40 seconds** on each return to idle speed if the air temperature is greater than **15ºC**.



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

IDENTIFICATION

Vehicle type	Engine	Alternator	Current
XDXG XDXN	G9T 720 G9T 722	Valéo SG 10B	120 A

CHECKING

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

Rpm	120 amps
1800	26
4000	94
6000	105

Removing and refitting the alternator is quite simple.

Refer to section **07: Accessories belt tension** for the refitting procedure.

IDENTIFICATION

Vehicle type	Engine	Starter
XDXG XDXN	G9T 720 G9T 722	Valéo D7 R40

Removing and refitting the starter is quite simple.

Check for the presence of the centring dowel when refitting.

FILLING

It is essential to open the bleed screws on the cylinder head coolant pipe housing outlet.

Fill the circuit through the expansion bottle opening.

Close the bleed screw as soon as the fluid runs out in a continuous jet.

Start the engine **(2 500 rpm)**.

Adjust the level by overflow for a period of about **4 minutes**.

Close the bottle.

BLEEDING

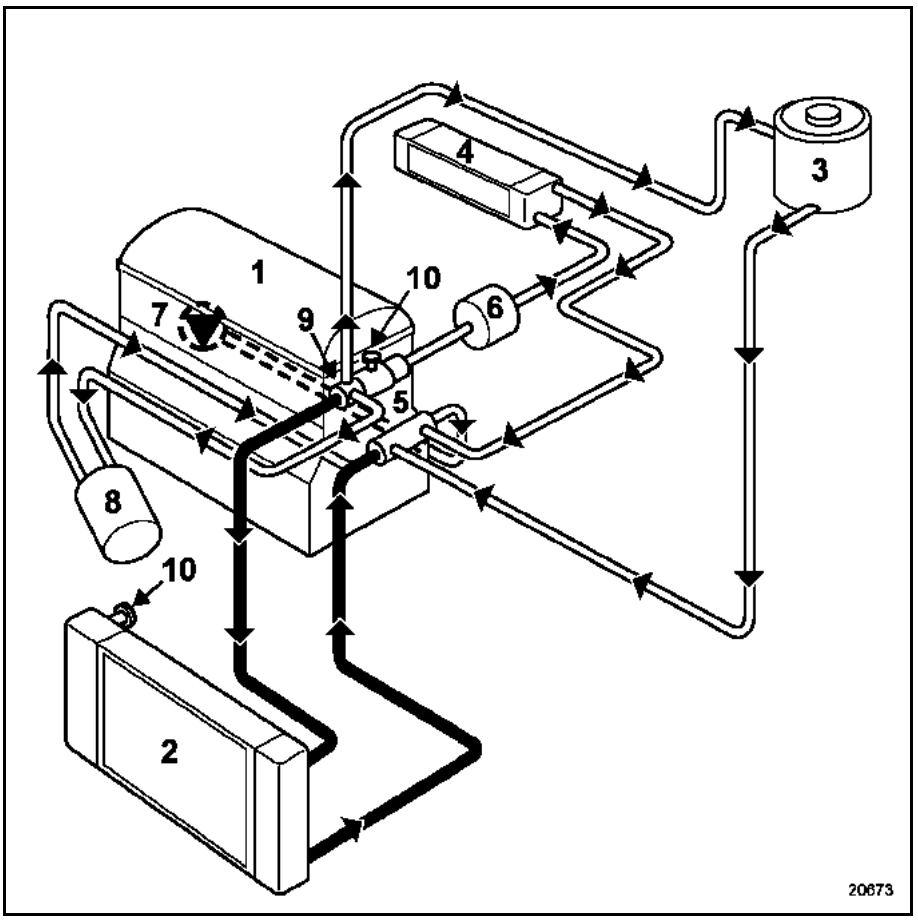
Allow the engine to run for about **20 minutes** at **2500 rpm**, until the engine cooling fan starts up (time necessary for automatic degassing).

Verify that the liquid level is at or near the **Maximum** marker.

NEVER OPEN THE BLEED SCREW WHEN THE ENGINE IS RUNNING.

RE-TIGHTEN THE EXPANSION BOTTLE CAP WHILE THE ENGINE IS WARM.

SPECIFIC COOLANT CIRCUIT



1 Engine
2 Radiator
3 Hot bottle with degassing after thermostat
4 Heater matrices
5 Thermostat mounting
6 Thermoplunger support
7 Coolant pump
8 Coolant/oil heat exchanger
9 Thermostat
10 Bleed screw

The expansion bottle valve rating is **1.2 bar** (colour brown).

SPECIAL TOOLING REQUIRED	
Mot. 1202-01 Mot. 1202-02	Pliers for large clips
Mot. 1448	Remote operation clip pliers for cooling system hose clips

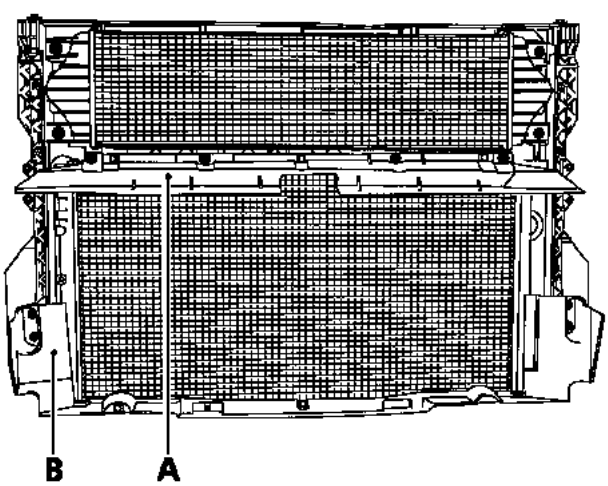
REMOVAL

Disconnect the battery.

Remove the engine undertray.

Drain the cooling circuit through the lower radiator hose.

Remove:
– the front bumper,
– the plastic deflectors (A) and (B) from the radiator,
– the upper radiator hose,
– the radiator mounting bolts on the fan assembly support.



Take out the radiator from underneath.

REFITTING

Refitting is the reverse of removal.

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

SPECIAL TOOLING REQUIRED	
Mot. 1202-01 Mot. 1202-02	Pliers for large clips
Mot. 1448	Remote operation clip pliers for cooling system hose clips
EQUIPMENT REQUIRED	
Sprocket-wrench (e.g. FACOM U 14L)	

TIGHTENING TORQUES (in daNm)	
The coolant pump hub nut	5
The coolant pump mounting bolt	1
The coolant pump cover mounting bolt	1

REMOVAL

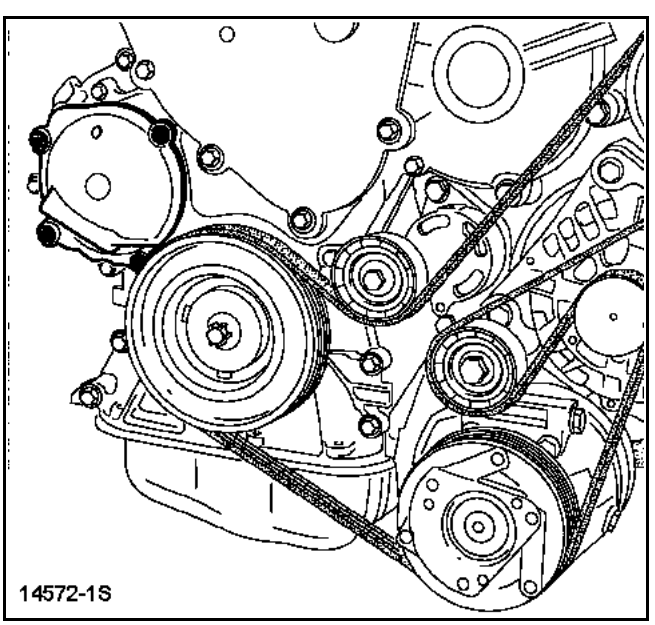
Put the vehicle on four axle stands (see section **02: Lifting equipment** for the correct positions of the lifting jack and axle stands) or on a lift. (**5 tonnes minimum**).

Disconnect the battery.

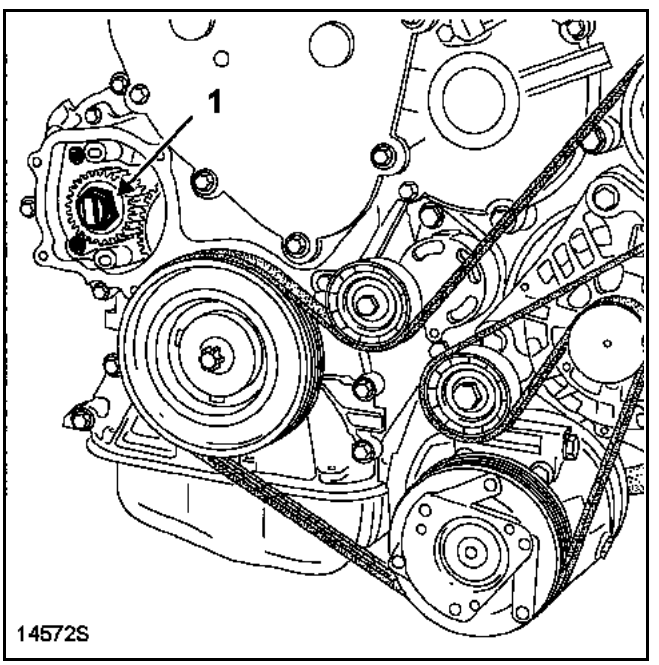
Remove the engine undertray.

Drain:
– the cooling circuit through the bottom hose of the radiator,
– the engine oil (do not refit the oil drain plug).

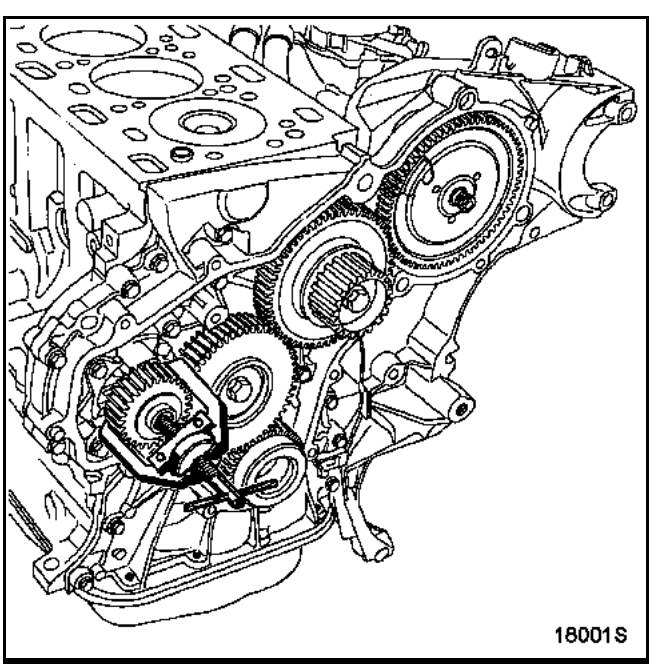
Remove:
– the front right wheel,
– the coolant pump cover,



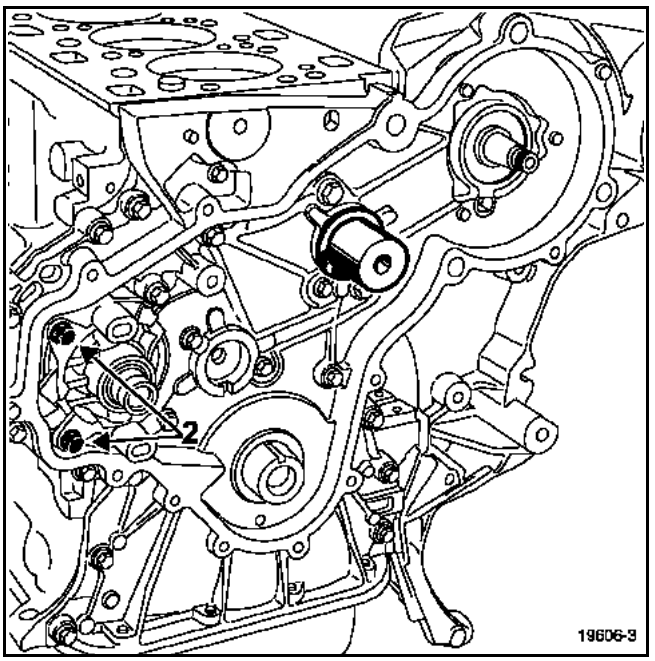
– the coolant pump hub nut (1),



– the sprocket from the coolant pump using the extractor,



– the coolant pump mountings (2),



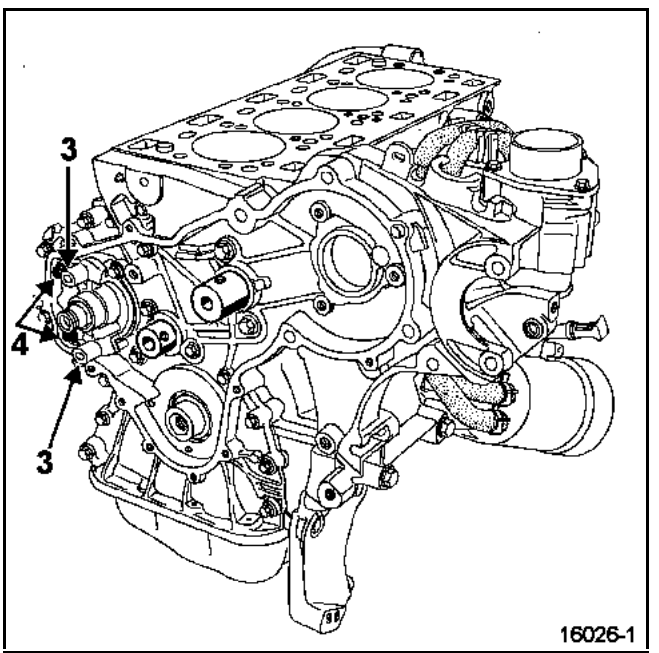
– the coolant pump.

WARNING: some coolant will flow into the oil sump. Make sure the sealing surface of the coolant pump is clean and that the coolant is drained from the sump.

REFITTING

Refit the coolant pump (fitted with a new seal) by pressing down on the bosses (3) to fit the pump properly to the lower timing cover.

Tighten the bolts (4) to a torque of **1 daNm**.



Refit:
– the coolant pump sprocket by tightening the nut to a torque of **5 daNm**,
– the coolant pump cover by tightening the bolts to a torque of **1 daNm**,

Top up the engine oil.

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

TIGHTENING TORQUES (daNm).

A	8.5
B	4.4
C	8.5
D	10.5
E	6.2
F	14
G	4.4

H	6.2
I	4.4
J	4.4