LAGUNA

Technical Note 3562A

XG0N

Basic manual: Workshop Repair Manual 339 and Technical Note 3218A

Special features of Laguna II models fitted with the F5R700 engine

77 11 306 942 **OCTOBER 2001** **EDITION ANGLAISE**

Contents

Contents

Components	Average capacity* in litres	
	Capacity without oil filter	After replacing the oil filter
Petrol engine (oil)		
F5R	**5**	**4.8**
Manual gearbox		
JR5	**2.5**	

* Check with dipstick

NOTE: never exceed the maximum mark on the dipstick.

Components	Capacity in litres	Grade
Brake circuit	Normal: 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	Approximately 40	Unleaded petrol
Power assisted steering	Separate reservoir: 1.1	ELF RENAULT MATIC D2 or MOBIL ATF 220
Coolant circuit	5	GLACEOL RX (type D) Add only coolant

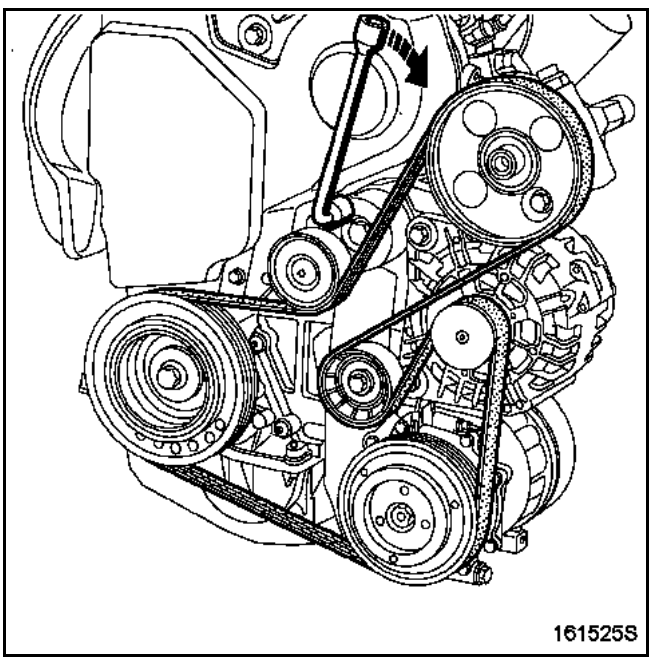
REMOVAL

Put the vehicle on a two-post lift.

Disconnect the battery.

Turn the belt's self-tensioner in the direction indicated below using a **16 mm** spanner.

Remove the accessories belt.



REFITTING

NOTE: always change a belt after it has been removed.

Refitting is the reverse of removal.

SPECIAL TOOLING REQUIRED	
Mot. 799-01	Tool for immobilising pinions for toothed timing belt
Mot. 1054	Top Dead Centre setting pin
Mot. 1368	Tool for tightening the camshaft pulleys
Mot. 1383	Pipe wrench for removal of HP pipes
Mot. 1448	Long nose pliers for hose clips
Mot. 1453	Engine support tool
Mot. 1488	Tool for removing the camshaft covers
Mot. 1512	Tool for fitting camshaft oil seal
Mot. 1526	Tool for setting the camshaft
Mot. 1535	Tool for locking the camshaft pulleys
EQUIPMENT REQUIRED	
Angular torque wrench	

There are two distinct procedures for setting the timing.

1st PROCEDURE

The first procedure is used when replacing all timing components not requiring one or more of the camshaft pulleys to be undone.

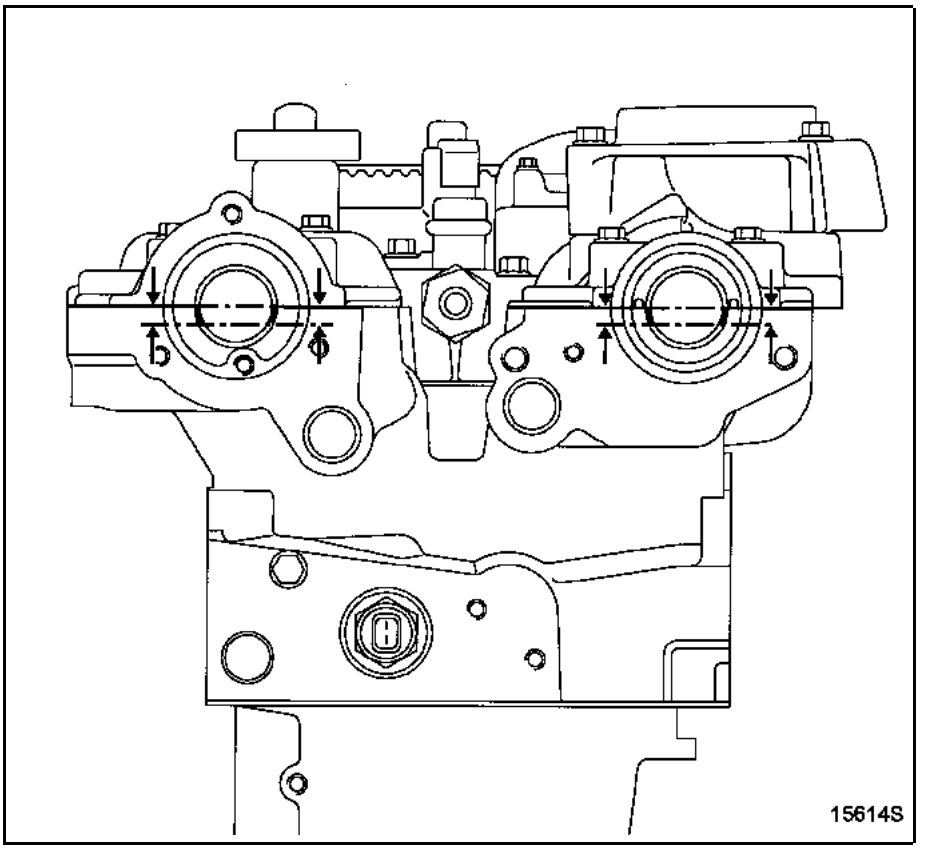
The cleanliness and safety rules must be complied with for any operations on the fuel circuit.

Timing adjustment

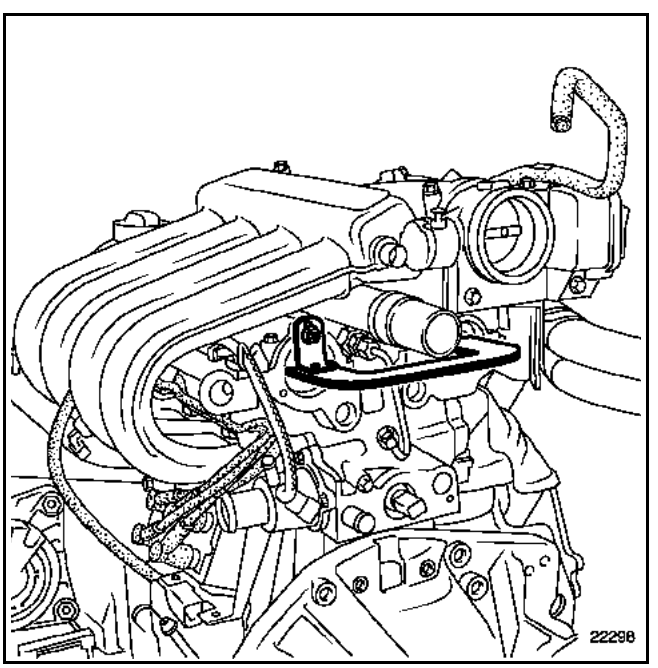
WARNING: it is essential to degrease the end of the crankshaft, the bore of the crankshaft pinion and the bearing faces of the crankshaft pulley to prevent any slip between the timing system and the crankshaft which would risk destroying the engine.

Position the grooves of the camshafts using tool **Mot. 799-01** as shown in the diagram opposite.

The grooves must be horizontal and offset towards the bottom.

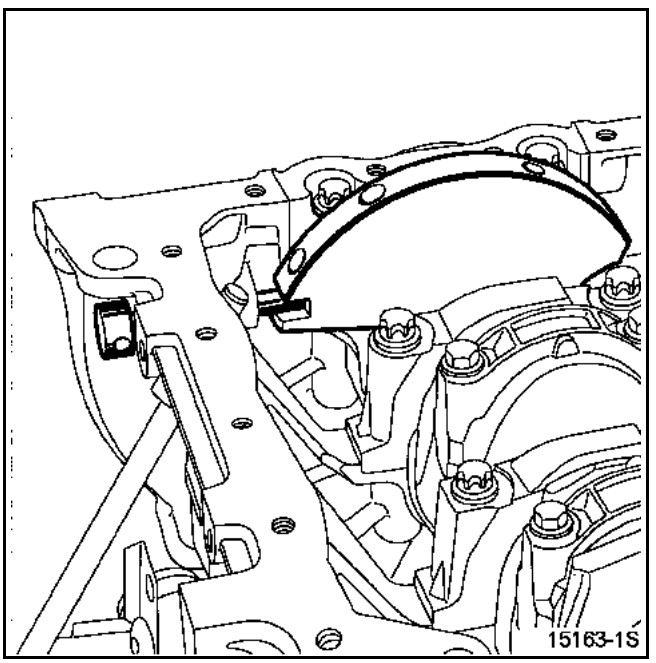


Mount tool **Mot. 1526** on the end of the camshafts.

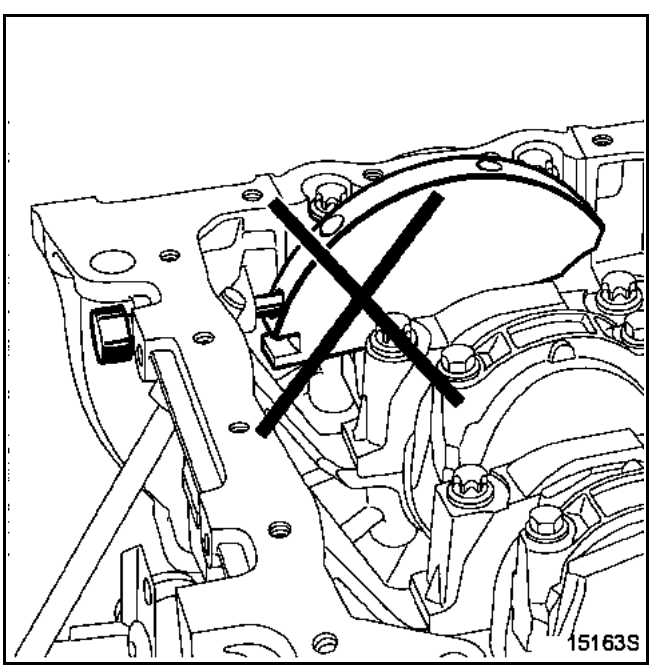


Ensure that the crankshaft is at Top Dead Centre and not in the balancing hole.

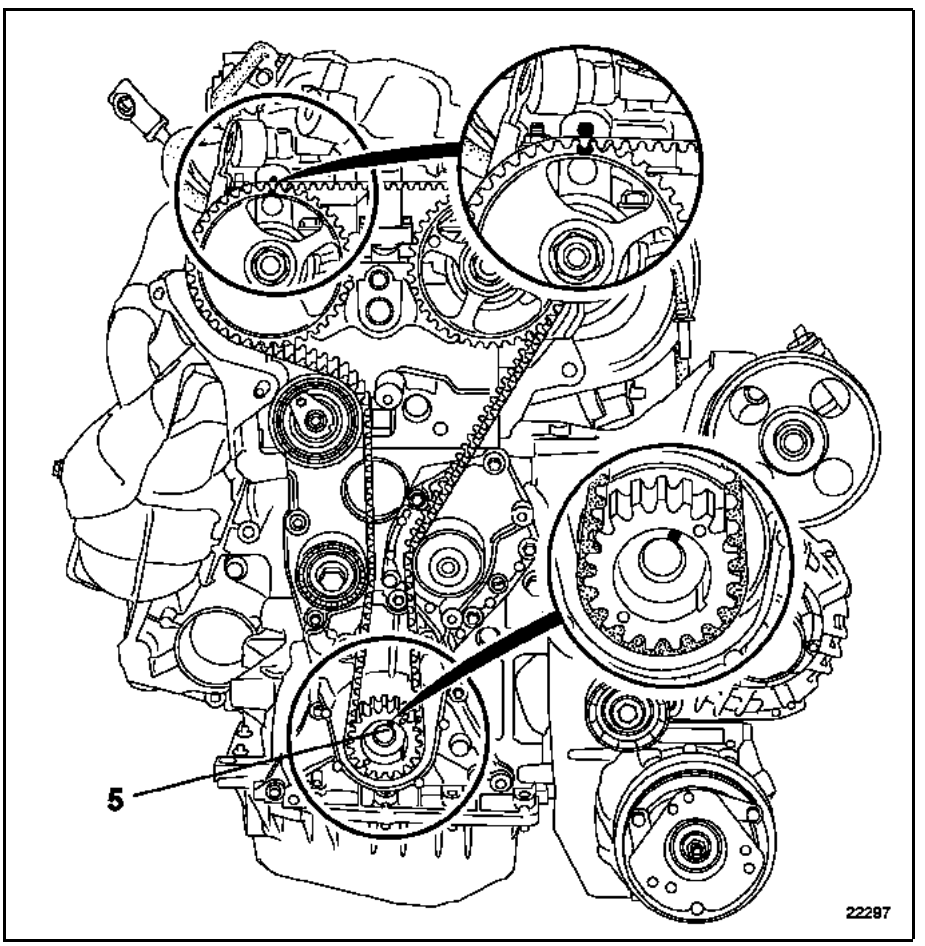
Correct position



Incorrect position



The groove (5) of the camshaft must be between the two reference marks on the engine block.

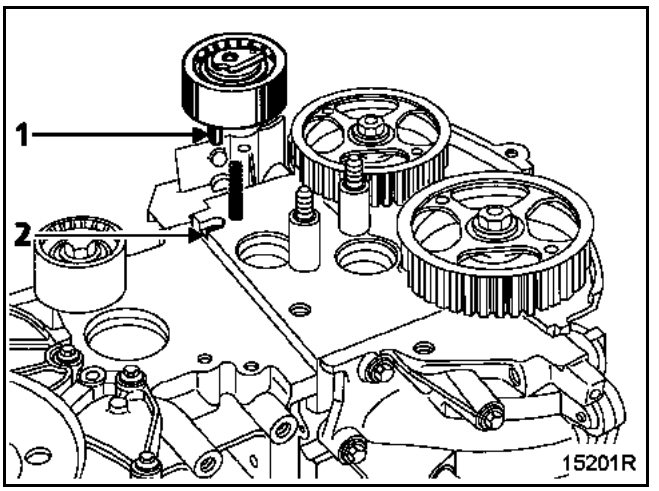


The exhaust camshaft pinion mark must be opposite the cylinder reference sensor mounting hole.

Fitting the belt

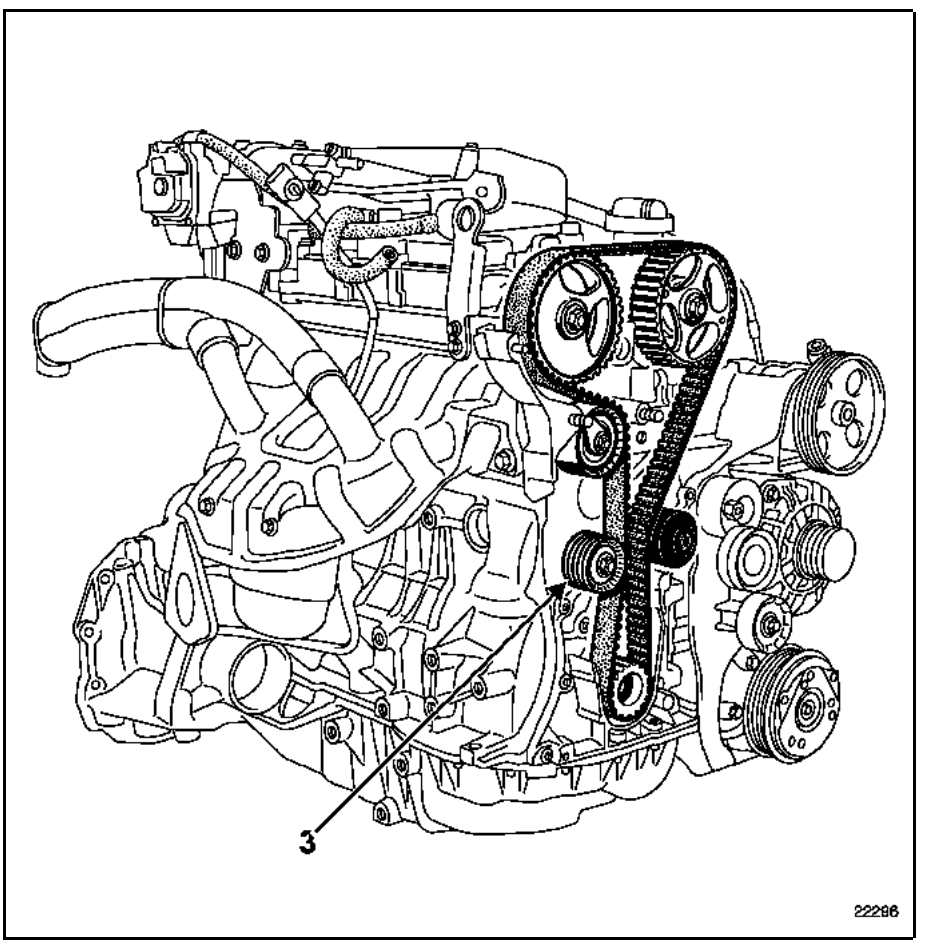
The tensioners and fixed rollers must be replaced when the timing belt is replaced.

Ensure that the lug (1) of the tension wheel is correctly positioned in the groove (2).

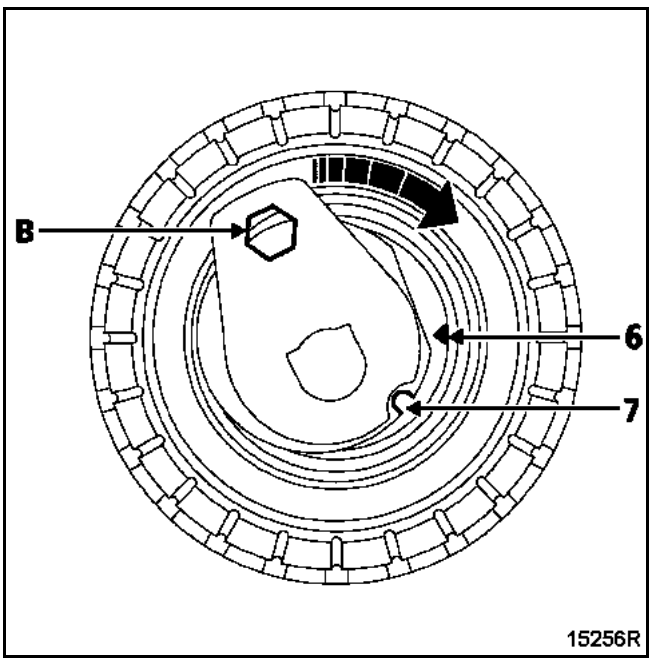


Refit:
- the timing belt,
- the tensioner wheel (3) tightening the bolts to a torque of:
  - **5 daNm** for the M10 bolts,
  - **2.8 daNm** for the M8 bolts.
- the crankshaft accessories pulley by moving the bolt away from the pulley (**2** to **3 mm** clearance between the bolt and the pulley).

NOTE:
- the crankshaft accessories pulley bolt can be reused if the length under its head does not exceed **49.1 mm** (otherwise replace it),
- do not oil the new bolt. However, bolts must be oiled if they are being reused.



Align the references (6) and (7) of the tension wheel using a **6 mm** Allen key at (B).

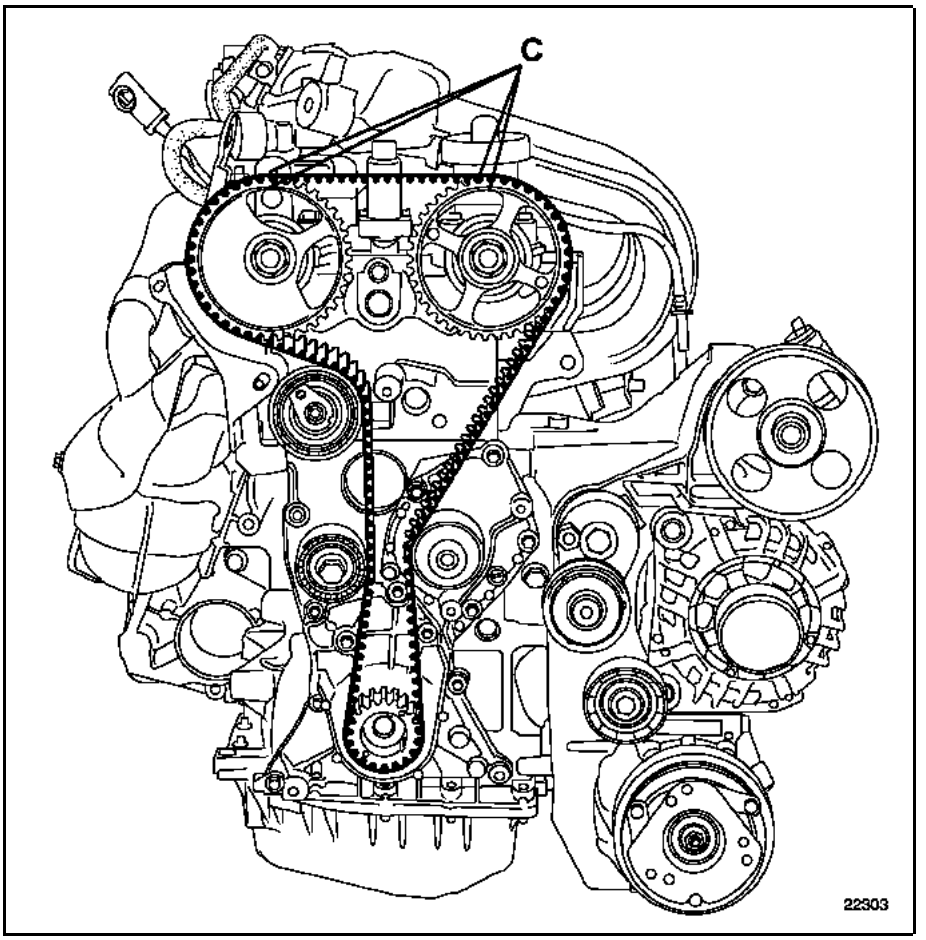


Pretighten the tension wheel nut to a torque of **1 daNm**.

Tighten the crankshaft pulley bolt to a torque of **2 daNm (Top Dead Centre setting pin Mot. 1054 still in place)**.

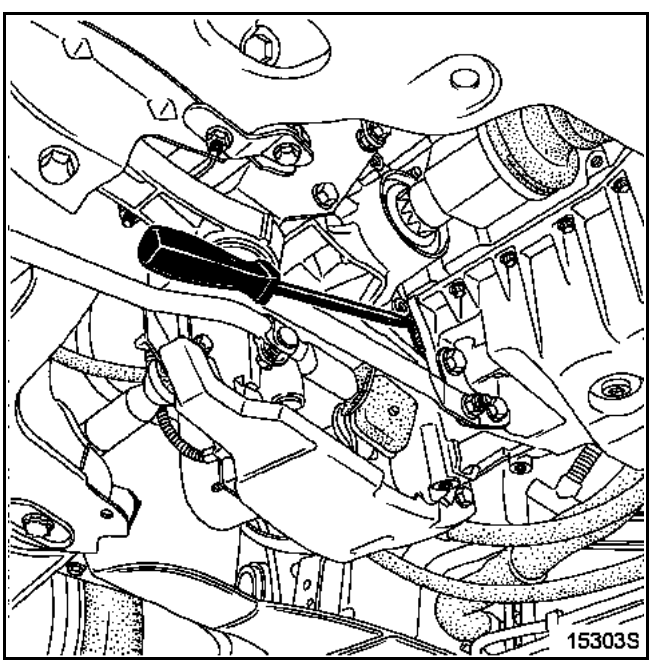
NOTE: do not turn the tension wheel in an anti-clockwise direction.

Mark the position (C) of the camshaft pulleys in relation to the camshaft bearing cap housings.

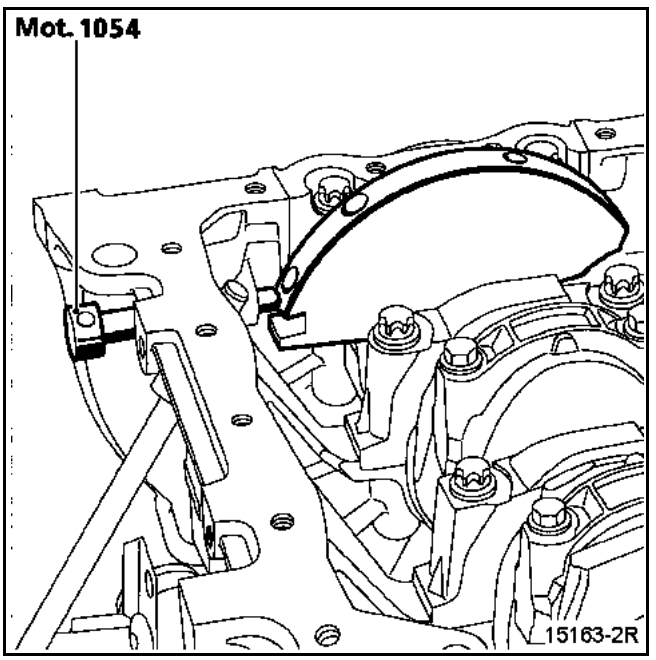


Remove the camshaft setting tool **Mot. 1526** as well as the Top Dead Centre setting pin **Mot. 1054**.

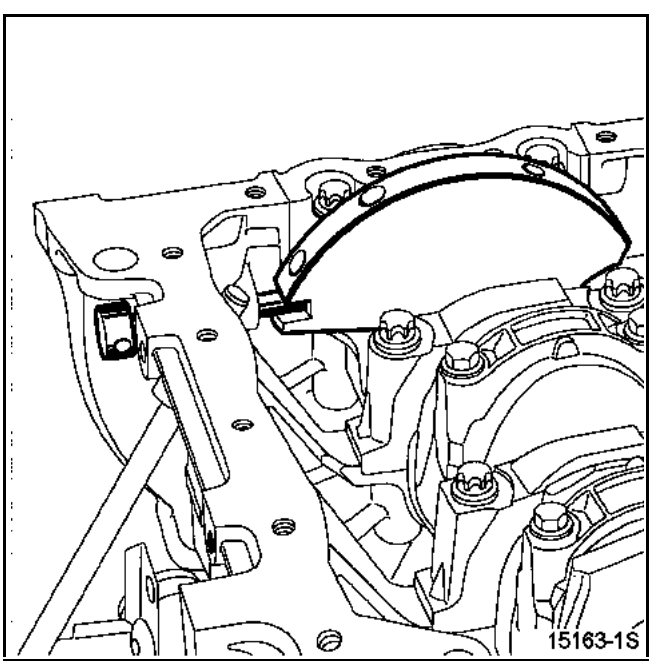
Tighten the crankshaft pulley bolt to an angle of **115° ± 15°**, locking the flywheel using a screwdriver.



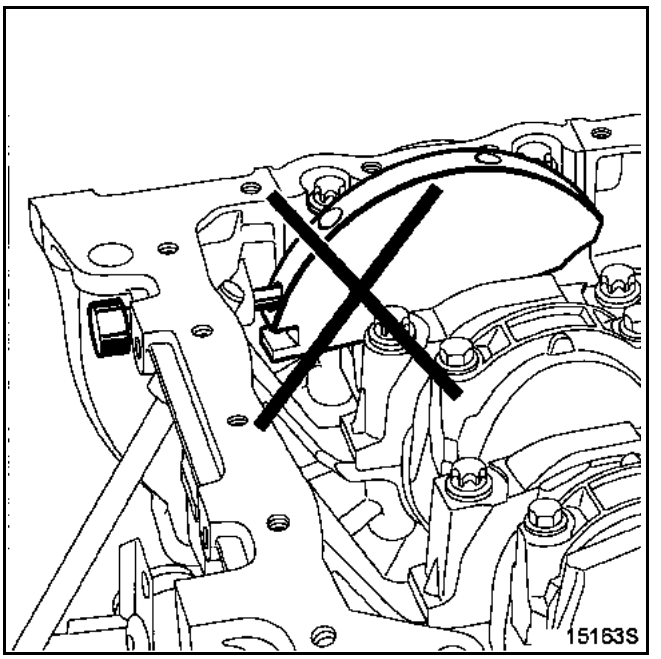
Rotate the crankshaft through two revolutions in a clockwise direction (timing side). Before the two revolutions are completed (one half-tooth before alignment of the marks on the camshaft pulleys and camshaft bearing cap housings), insert the Top Dead Centre setting pin **Mot. 1054** so that it is between the balancing hole and pinning hole, then bring the timing to its setting point.



Correct position



Incorrect position



Remove the TDC setting pin **Mot. 1054**.

Ensure that the tension wheel marks are aligned, then continue with the tensioning process and tighten the nut to the torque of **2.8 daNm**.

Checking the timing and tension

Checking the tension

Rotate the crankshaft through two revolutions in a clockwise direction (timing side), then pin the crankshaft just before the second complete revolution, aligning the marks previously made on the camshaft pulleys and camshaft bearing cap housings.

Remove the TDC setting pin **Mot. 1054**.

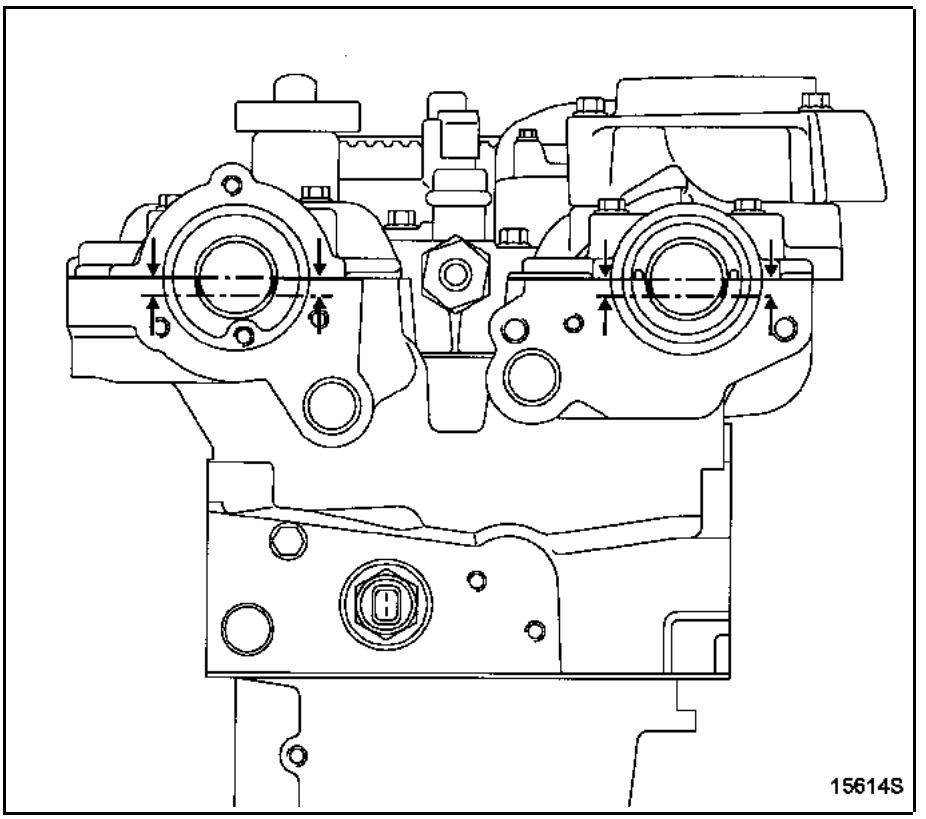
Check the alignment of the tension wheel, then continue with the tensioning process.

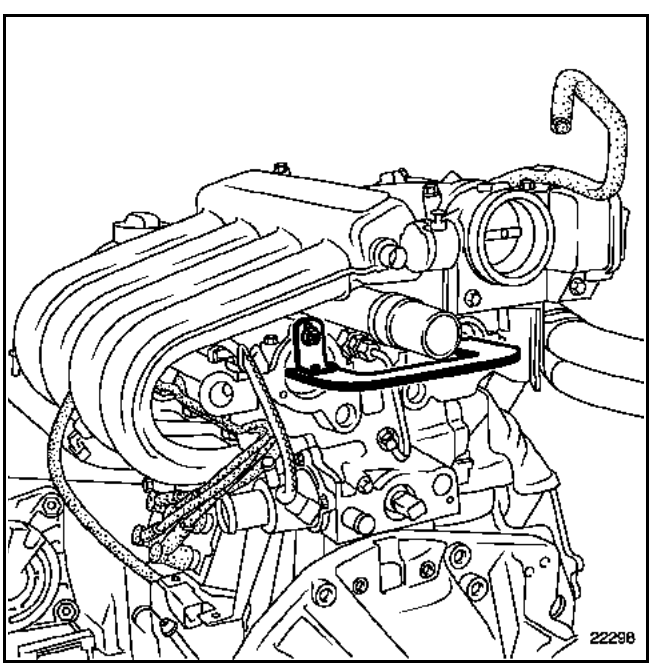
Checking the timing

Ensure that the tension wheel marks are in the correct position before checking the timing.

Fit the Top Dead Centre pin **Mot. 1054** ensuring that the marks previously made are aligned.

Fit (without forcing) tool **Mot. 1526** for setting the camshafts (the camshaft grooves must be horizontal and offset towards the bottom). If the tool cannot be inserted, the timing setting and tensioning procedure must be repeated.



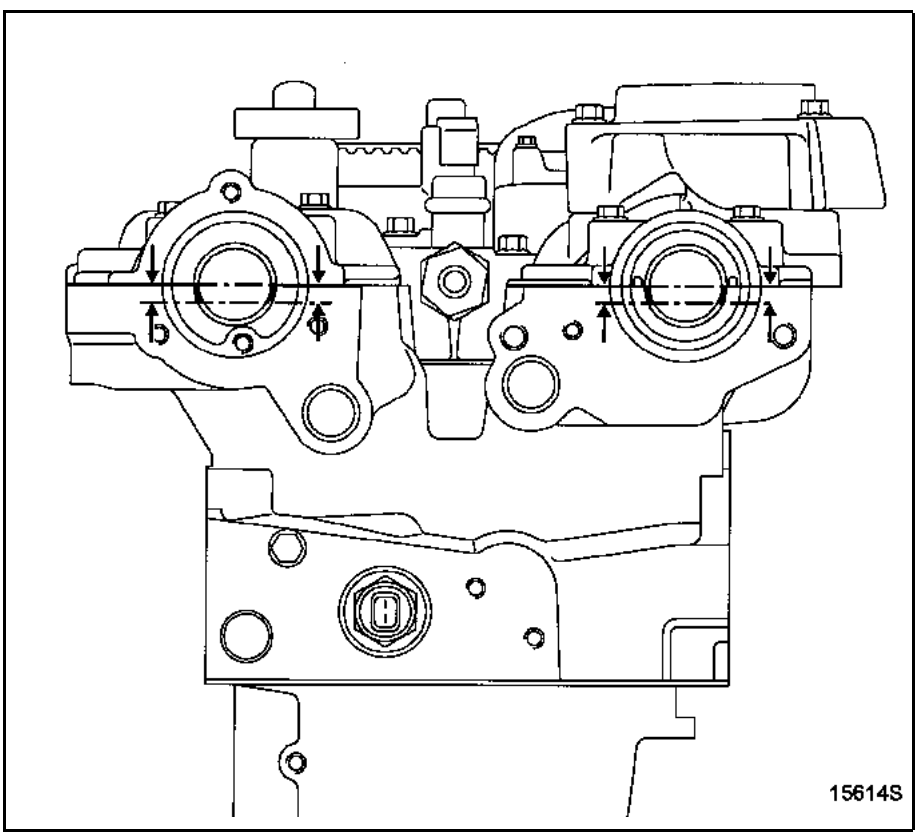


2nd PROCEDURE

The second procedure is used for the replacement of all components requiring the slackening of one or more of the camshaft timing pulleys.

Timing adjustment

WARNING: it is essential to degrease the end of the crankshaft, the bore of the crankshaft pinion, the bearing faces of the crankshaft pulley as well as the ends of the camshafts (timing side) and the bores of the camshaft pulleys, to prevent there being any slip between the timing system, the crankshaft and the camshaft pulleys which may damage the engine.

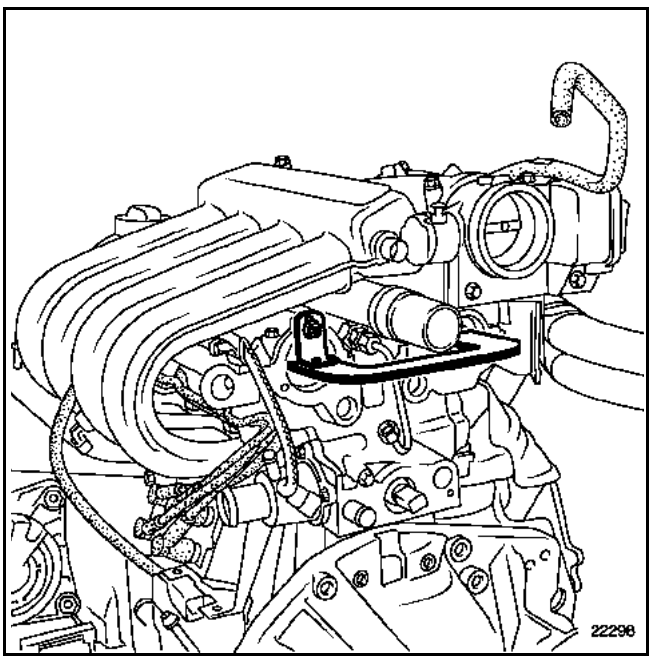


Position the grooves of the camshafts horizontally, using tool **Mot. 799-01** as shown in the diagram above.

The grooves must be facing downwards.

This will be made possible by mounting the camshaft pulleys with the old nuts, tightening them to a maximum torque of **1.5 daNm**.

Mount tool **Mot. 1526** on the end of the camshafts.

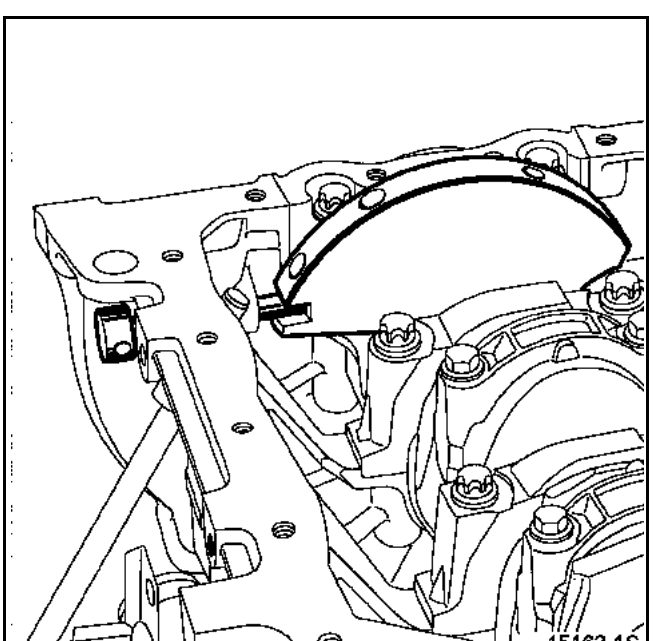


The old pulley nuts must be removed and replaced with new ones.

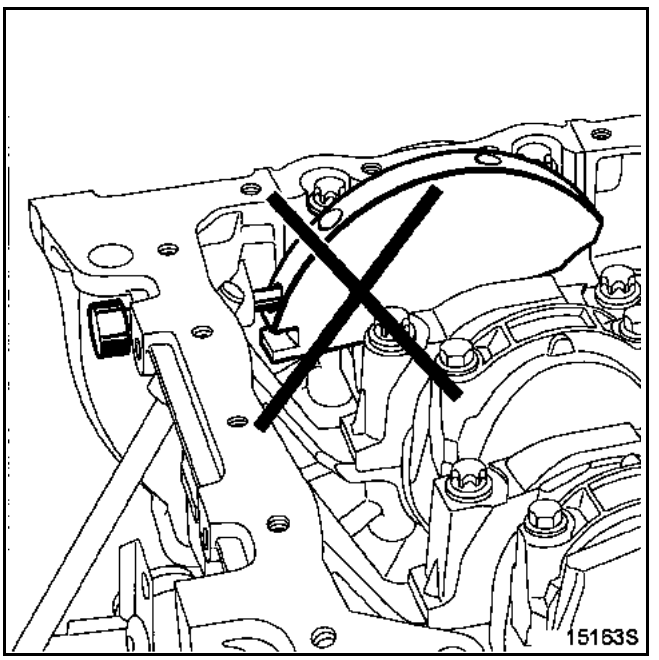
Tighten the nuts, without locking them, to a clearance of **0.5** to **1 mm** between the nuts and the pulleys.

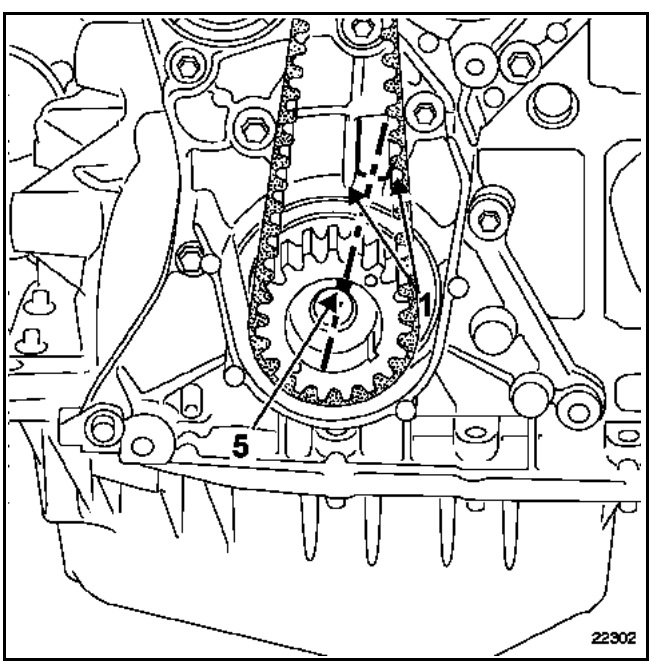
Ensure that the crankshaft is correctly pinned at Top Dead Centre and not in the balancing hole (the groove (5) of the crankshaft must be positioned between the two reference marks (1) on the engine block).

Correct position



Incorrect position



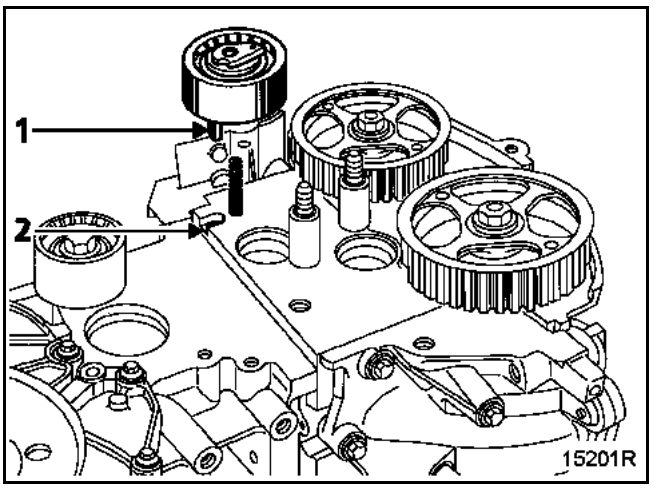


The tensioners and fixed rollers must be replaced when the timing belt is replaced.

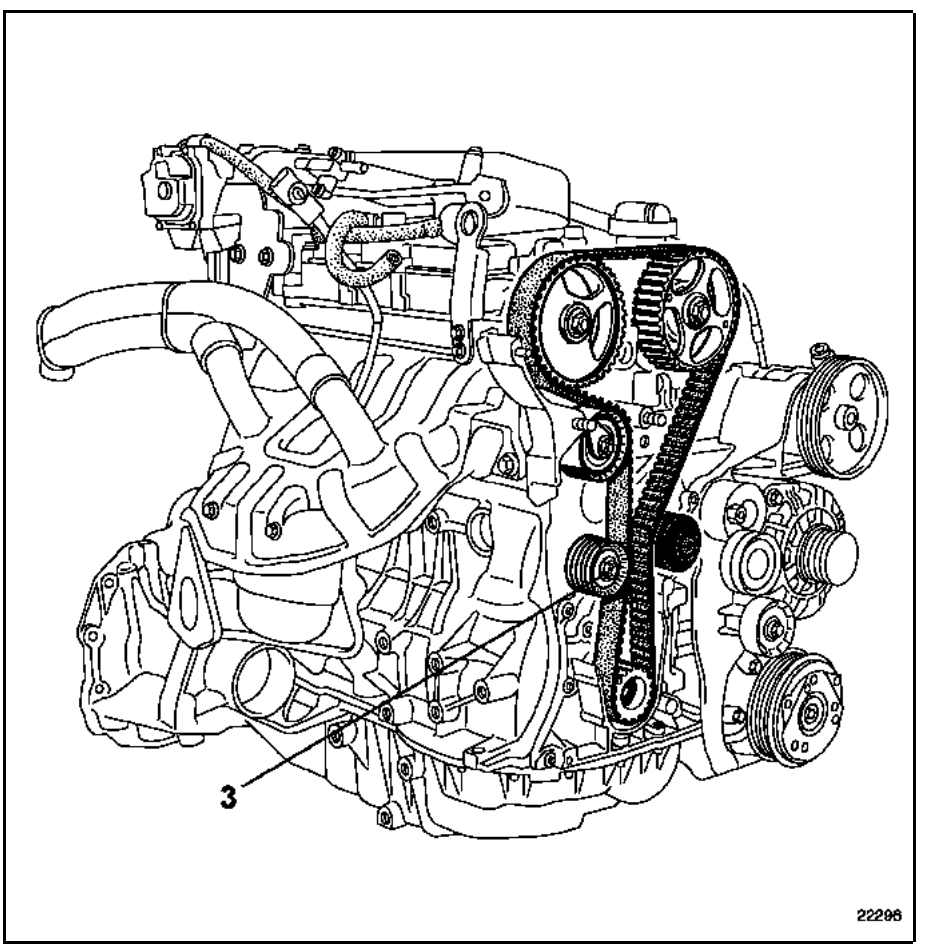
Position the exhaust camshaft pulley reference mark opposite the position sensor thread.

NOTE: an incorrectly positioned exhaust camshaft pulley will prevent the engine from starting.

Ensure that the lug (1) of the tension wheel is correctly positioned in the groove (2).



Refit:
- the timing belt,
- the tensioner wheel (3) tightening the mounting bolts to a torque of **5 daNm** for the ∅ **10** and **2.8 daNm** for the ∅ **8 mm**.

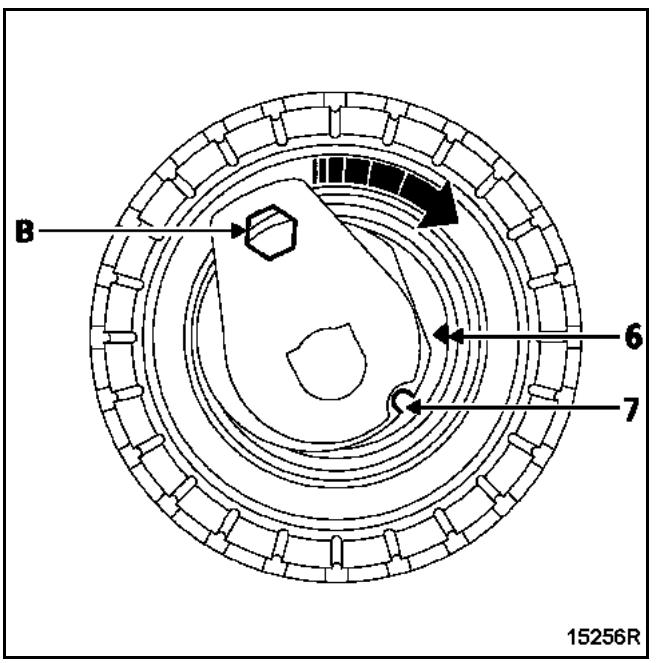


Fit the crankshaft accessories pulley by pretightening the bolt (without locking the bolt, clearance of **2 to 3 mm** between the bolt and the pulley)

NOTE:
- the crankshaft accessories pulley bolt can be reused if the length under its head does not exceed **49.1 mm** (otherwise replace it),
- do not oil the new bolt. However, bolts must be oiled if they are being reused.

Ensure that there is always a clearance of **0.5** to **1 mm** between pulley nuts and camshafts.

Align the references (6) and (7) of the tension wheel using a **6 mm** Allen key at (B).



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

Rotate the timing system through six revolutions (timing side) using the exhaust camshaft pulley and tool **Mot. 799-01**.

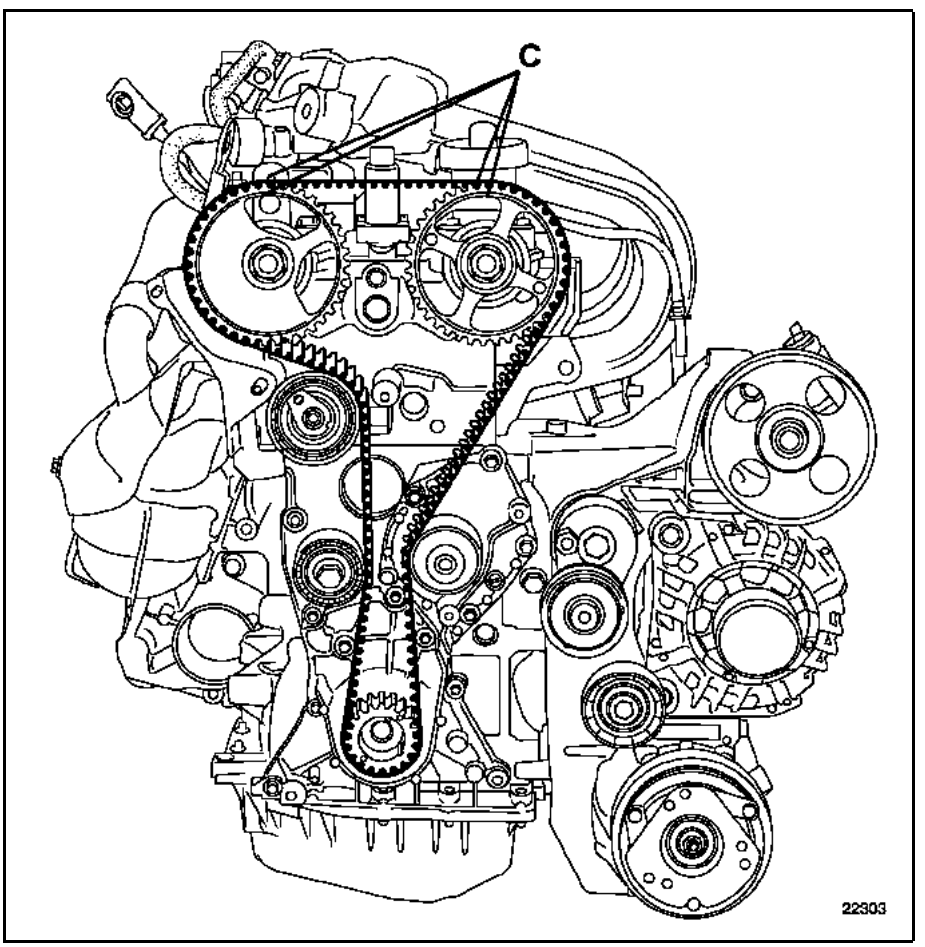
NOTE: check that the pulleys do not touch the bolts, otherwise realign them as and when required.

Ensure that the tension wheel marks are aligned, then continue with the tensioning process and tighten the nut to the torque of **2.8 daNm**.

Rotate the exhaust camshaft pulley until the reference mark is opposite the phasing sensor.

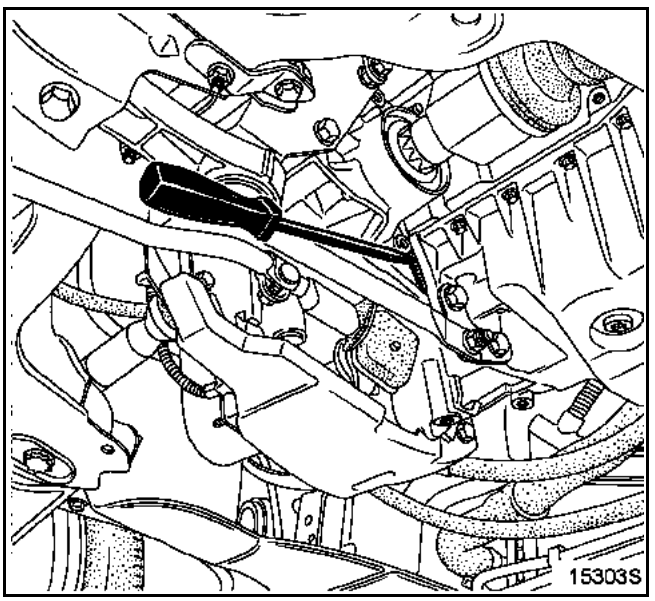
Tighten the crankshaft pulley bolt to a torque of **2 daNm** (**Top Dead Centre pin still positioned in the crankshaft**).

Mark the position (C) of the camshaft pulleys in relation to the camshaft bearing cap housings.



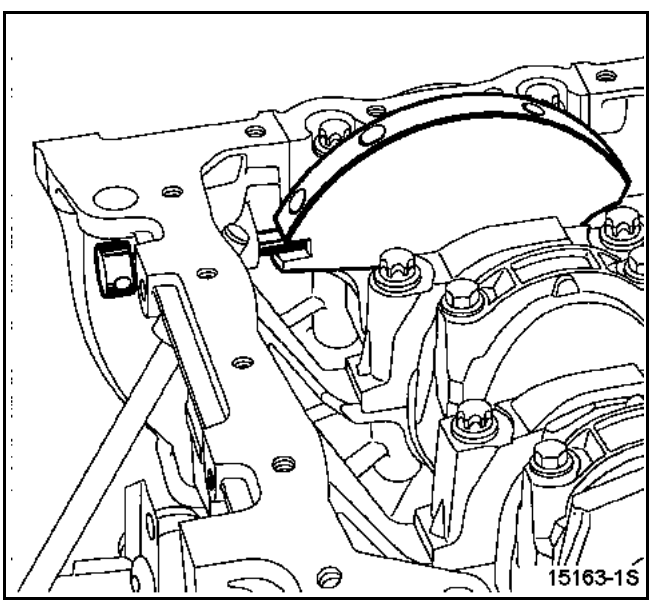
Remove the TDC pin .

Tighten the crankshaft pulley bolt to an angle of **115° ± 10°**, locking the flywheel using a screwdriver.

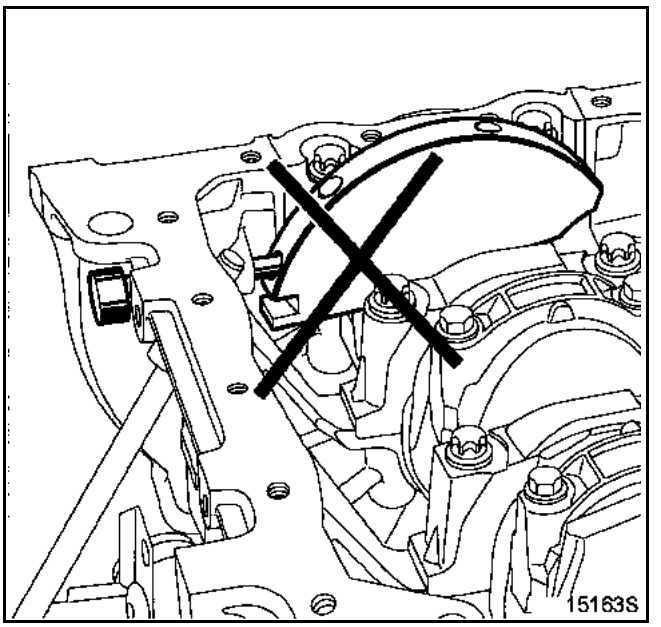


Pin the crankshaft aligning the marks previously made on the camshaft pulleys and camshaft bearing cap housings, to ensure that the pin is positioned in the pinning hole and not in the crankshaft balancing hole.

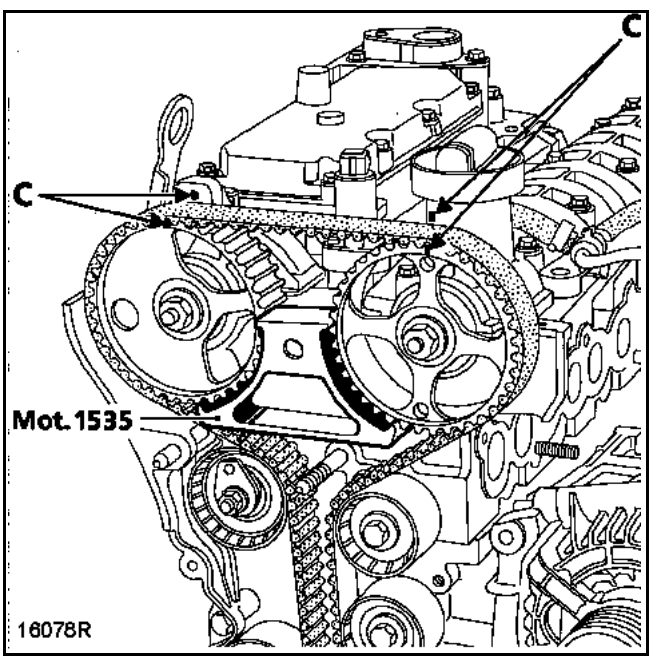
Correct position



Incorrect position

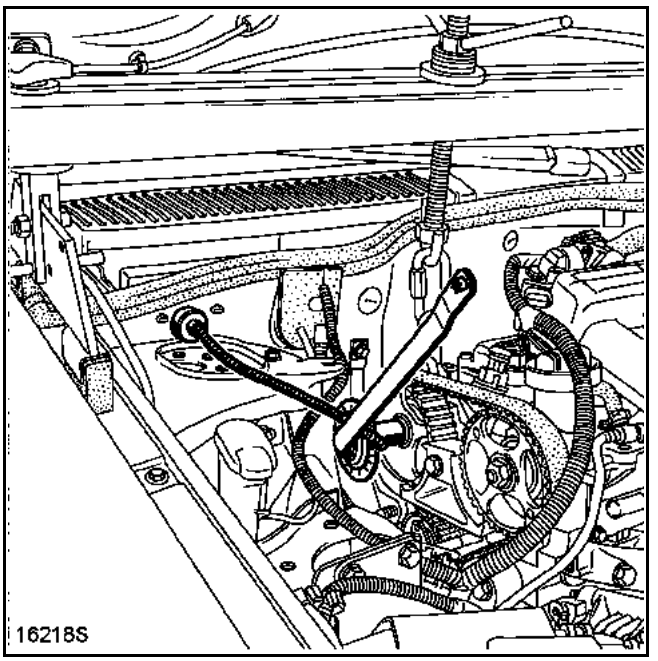


Fit the camshaft pulley locking tool **Mot. 1535** and attach with a casing bolt.



Tighten the nut of the inlet camshaft pulley to a torque of **3 daNm**, then turn through **90°**.

Tighten the nut of the exhaust camshaft pulley to a torque of **3 daNm**, then turn through **45°** and a second **45°** using tool **Mot. 1368**.



Remove tool **Mot. 1526** for setting the camshaft, tool **Mot. 1535** for locking the camshaft pulleys and Top Dead Centre pin **Mot. 1054**.

Checking the timing and tension

Checking the tension

Rotate the crankshaft through two revolutions in a clockwise direction (timing side), then pin the crankshaft just before the second complete revolution, aligning the marks on the camshaft pulleys and camshaft bearing cap housings.

Remove the TDC setting pin **Mot. 1054**.

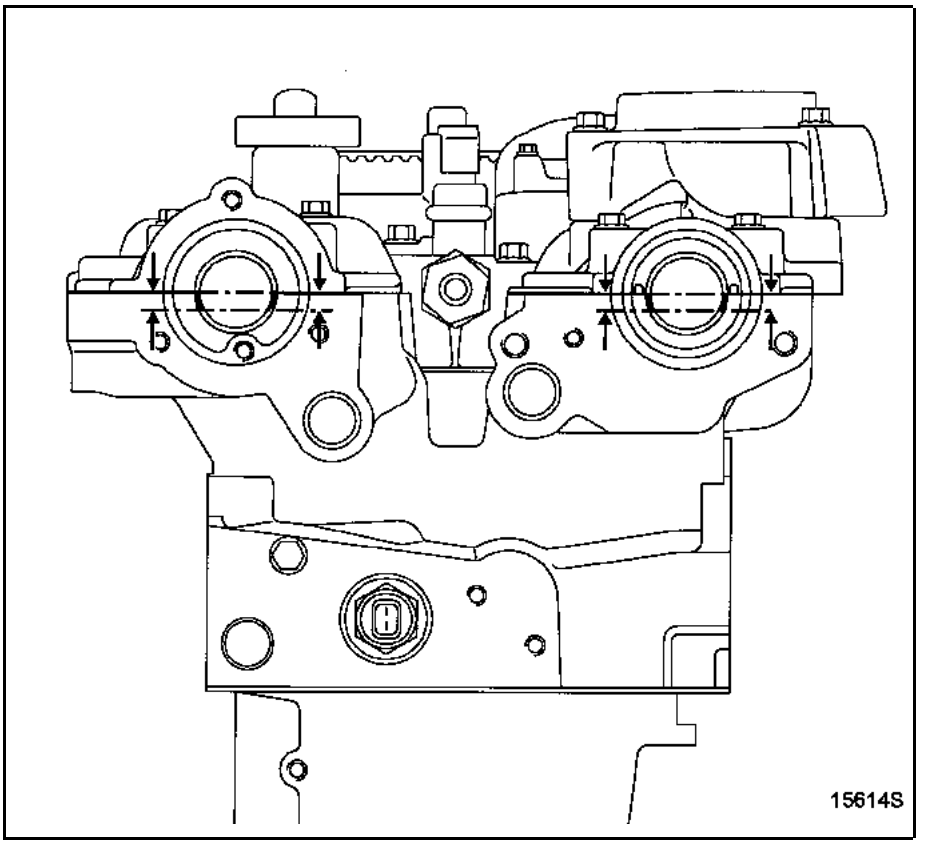
Check the alignment of the tension wheel, then continue with the tensioning process.

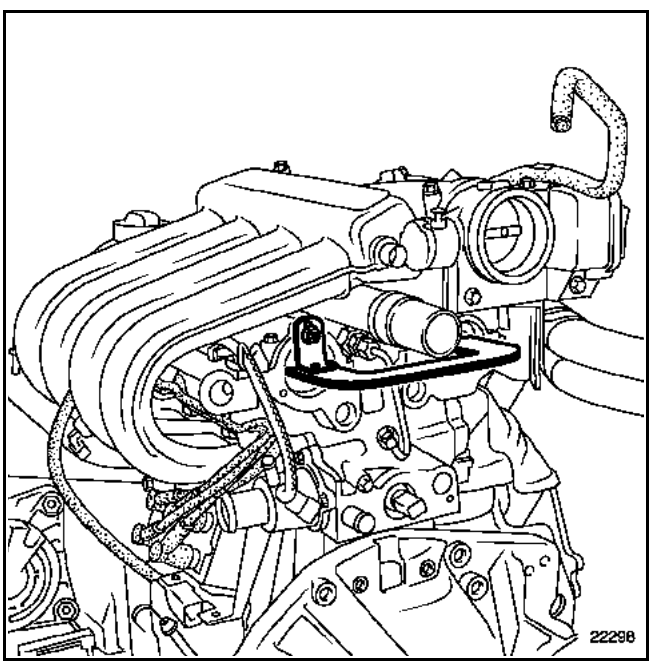
Checking the timing

Ensure that the tension wheel marks are in the correct position before checking the timing.

Fit the Top Dead Centre pin **Mot. 1054** ensuring that the marks previously made are aligned.

Fit (without forcing) tool **Mot. 1526** for setting the camshafts (the camshaft grooves must be horizontal and offset towards the bottom). If the tool cannot be inserted, the timing setting and tensioning procedure must be repeated.





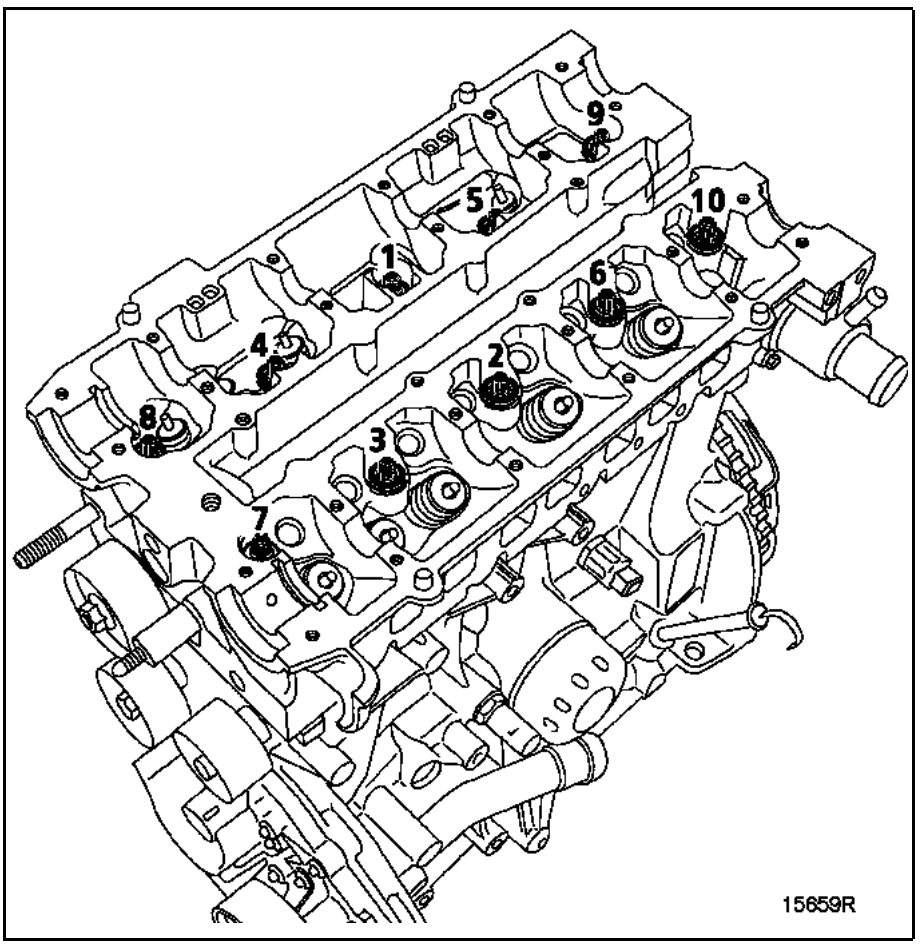
METHOD FOR TIGHTENING THE CYLINDER HEAD

The bolts can be reused if the length under the head does not exceed 137.7 mm (otherwise replace all the bolts).

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, the bolts must be oiled if they are being reused.

Tighten all the bolts to **2 daNm** in the order recommended below.



Check that all bolts are tightened to **2 daNm** then angle tighten (bolt by bolt) by **200° ± 6°** in tightening order.

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

Rim	Tyres	Tyre pressure when cold (in bar) (1)	
		Front	Rear
6.5 J 16	205/55R16	2.3	2.2
7 J 17	225/45R17V	2.3	2.2

(1) The tyre pressures are values for motorway use

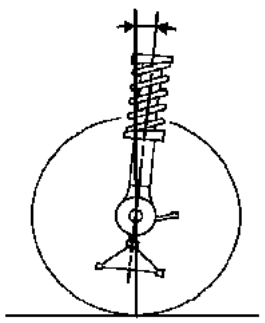
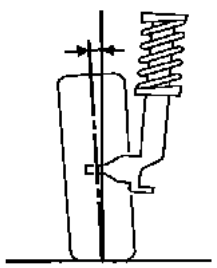
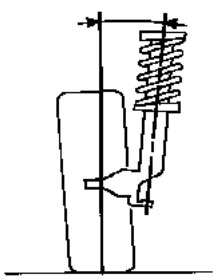
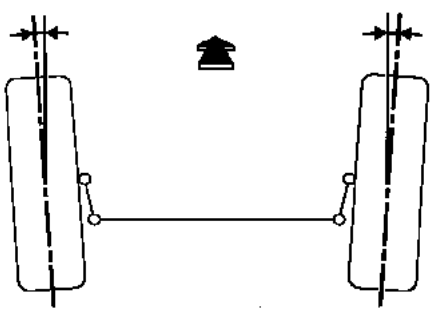
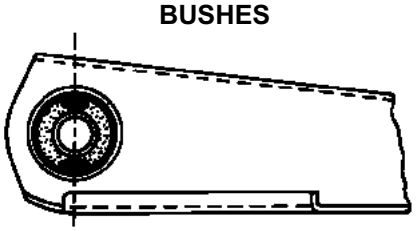
Tightening torque of the wheel nuts: **10.5 daNm**

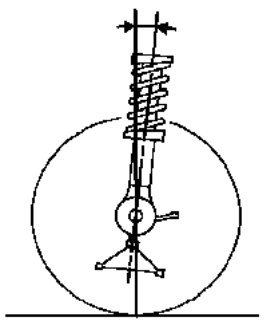
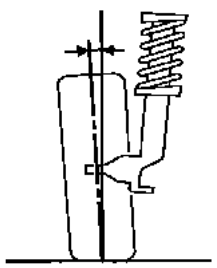
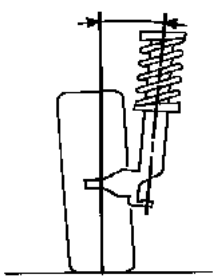
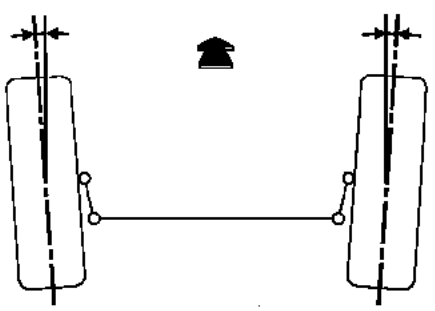
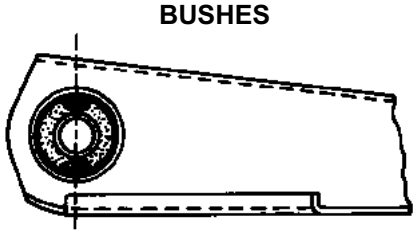
Rim run-out: **0.3 mm**

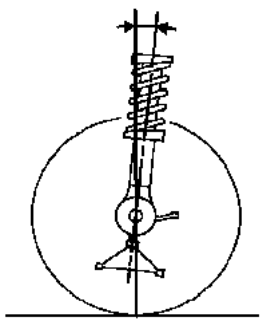
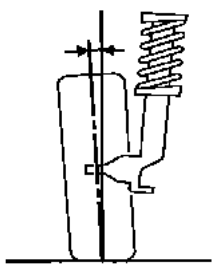
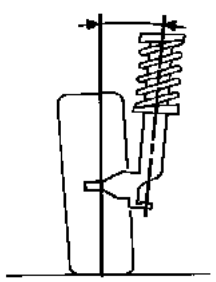
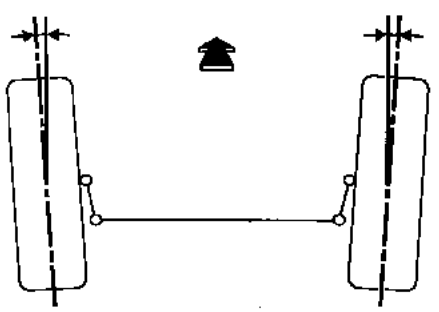
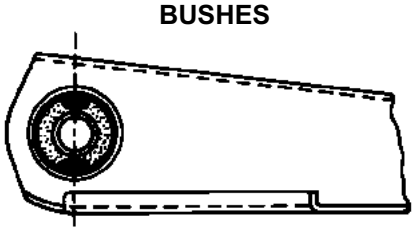
Vehicle type	Disc thickness (in mm)		Disc thickness (in mm)		Maximum disc run-out (in mm)
	Front		Rear		
	Normal	Min.	Normal	Max.	
XG0N	26	23.5	11	8.5	0.2

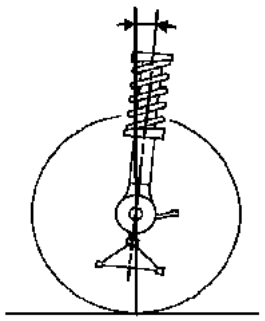
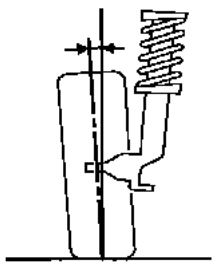
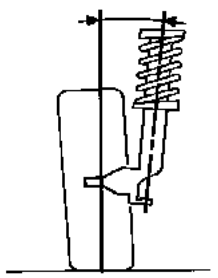
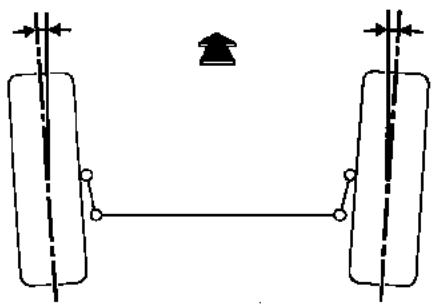
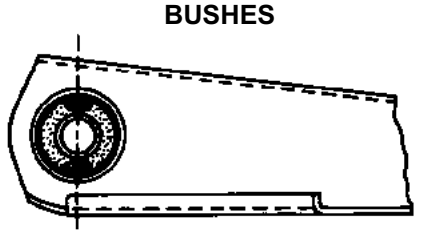
(1) Tyre fitted

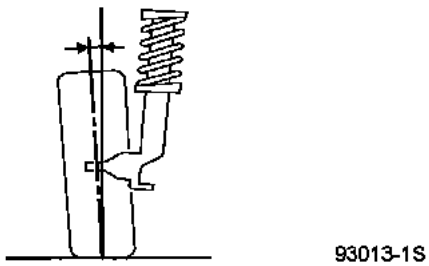
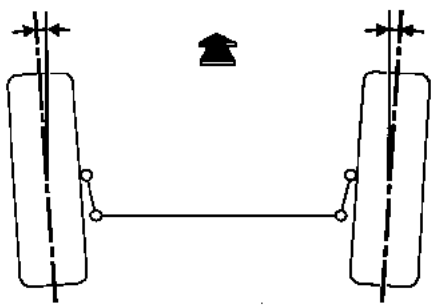
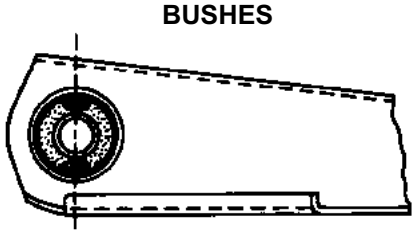
Vehicle type	Lining thicknesses (in mm) (including backing)				Brake fluid
	Front		Rear		
	New	Min.	New	Min.	
XG0N	17	7.5	16	7	SAE J 1703 DOT 4

ANGLES	VALUES	POSITION OF FRONT AXLE	ADJUSTMENT
CASTOR  93012-1S	3˚49' 4˚19' ±30' 4˚49' Max. right/left difference = 1˚	H5 - H2 = 28 mm H5 - H2 = 8 mm H5 - H2 = -12 mm	NOT ADJUSTABLE
CAMBER  93013-1S	-0˚05' -0˚12' ±30' -0˚20' Max. right/left difference = 1˚	H1 - H2 = 123 mm H1 - H2 = 135 mm H1 - H2 = 149 mm	NOT ADJUSTABLE
PIVOT  93014-1S	12˚12' 12˚30' ±30' 12˚52' Max. right/left difference = 1˚	H1 - H2 = 123 mm H1 - H2 = 135 mm H1 - H2 = 149 mm	NOT ADJUSTABLE
PARALLELISM  93011-1S	(for 2 wheels) Toe-out +0˚ ± 10' +0 mm ± 1 mm	UNLADEN	Adjustable by rotating track rod sleeves 1 turn= 30' (3 mm)
POSITION FOR TIGHTENING RUBBER BUSHES  81603S1	–	UNLADEN	–

ANGLES	VALUES	POSITION OF FRONT AXLE	ADJUSTMENT
CASTOR  93012-1S	3˚35' 4˚05' ±30' 4˚35' Max. right/left difference = 1˚	H5 - H2 = 42 mm H5 - H2 = 22 mm H5 - H2 = 2 mm	NOT ADJUSTABLE
CAMBER  93013-1S	-0˚05' -0˚12' ±30' -0˚20' Max. right/left difference = 1˚	H1 - H2 = 141 mm H1 - H2 = 137 mm H1 - H2 = 152 mm	NOT ADJUSTABLE
PIVOT  93014-1S	12˚12' 12˚30' ±30' 12˚52' Max. right/left difference = 1˚	H1 - H2 = 141 mm H1 - H2 = 137 mm H1 - H2 = 152 mm	NOT ADJUSTABLE
PARALLELISM  93011-1S	(for 2 wheels) Toe-out +0˚ ± 10' +0 mm ± 1 mm	UNLADEN	Adjustable by rotating track rod sleeves 1 turn= 30' (3 mm)
POSITION FOR TIGHTENING RUBBER BUSHES  81603S1	–	UNLADEN	–

ANGLES	VALUES	POSITION OF FRONT AXLE	ADJUSTMENT
CASTOR  93012-1S	3˚49' 4˚19' ±30' 4˚49' Max. right/left difference = 1˚	H5 - H2 = 28 mm H5 - H2 = 8 mm H5 - H2 = -12 mm	NOT ADJUSTABLE
CAMBER  93013-1S	-0˚05' -0˚12' ±30' -0˚20' Max. right/left difference = 1˚	H1 - H2 = 123 mm H1 - H2 = 135 mm H1 - H2 = 145 mm	NOT ADJUSTABLE
PIVOT  93014-1S	12˚12' 12˚30' ±30' 12˚52' Max. right/left difference = 1˚	H1 - H2 = 123 mm H1 - H2 = 135 mm H1 - H2 = 145 mm	NOT ADJUSTABLE
PARALLELISM  93011-1S	(for 2 wheels) Toe-out +0˚ ± 10' +0 mm ± 1 mm	UNLADEN	Adjustable by rotating track rod sleeves 1 turn= 30' (3 mm)
POSITION FOR TIGHTENING RUBBER BUSHES  81603S1	–	UNLADEN	–

ANGLES	VALUES	POSITION OF FRONT AXLE	ADJUSTMENT
CASTOR  93012-1S	3˚35' 4˚05' ±30' 4˚35' Max. right/left difference = 1˚	H5 - H2 = 44 mm H5 - H2 = 24 mm H5 - H2 = 4 mm	NOT ADJUSTABLE
CAMBER  93013-1S	-0˚05' -0˚12' ±30' -0˚20' Max. right/left difference = 1˚	H1 - H2 = 140 mm H1 - H2 = 137 mm H1 - H2 = 148 mm	NOT ADJUSTABLE
PIVOT  93014-1S	12˚12' 12˚30' ±30' 12˚52' Max. right/left difference = 1˚	H1 - H2 = 140 mm H1 - H2 = 137 mm H1 - H2 = 148 mm	NOT ADJUSTABLE
PARALLELISM  93011-1S	(for 2 wheels) Toe-out +0˚ ± 10' +0 mm ± 1 mm	UNLADEN	Adjustable by rotating track rod sleeves 1 turn= 30' (3 mm)
POSITION FOR TIGHTENING RUBBER BUSHES  81603S1	–	UNLADEN	–

ANGLES	VALUES	POSITION OF FRONT AXLE	ADJUSTMENT
CAMBER  93013-1S	-0˚40' ± 10'	UNLADEN	NOT ADJUSTABLE
PARALLELISM  93011-1S	(for 2 wheels) Toe-in -32' ± 10' -3.2 mm ± 1 mm	UNLADEN	NOT ADJUSTABLE
POSITION FOR TIGHTENING RUBBER BUSHES  81603S1	–	UNLADEN	–

Vehicle type	Engine	Gearbox	Cubic capacity (cc)	Bore (mm)	Stroke (mm)	Compression ratio
BG0N KG0N	F5R 700	JR5	1998	82.7	93	11.5/1

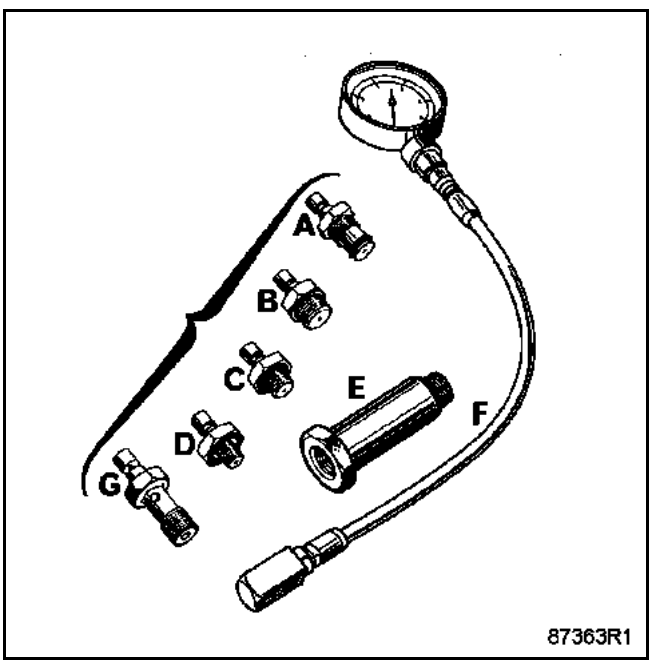
Manual to consult: **Mot. F5R**.

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

CHECKING

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

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



USE

B + F

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

Oil pressure

Idle speed	**1 bar**
3 000 rpm.	**3 bar**

SPECIAL TOOLING REQUIRED	
Mot.1202-01 Mot.1202-02	Pliers for large hose clips
Mot. 1372	Set for removing tamperproof screws
Mot. 1448	Remote operation clip pliers for cooling system hose clips
T. Av. 476	Ball joint extractor
Load positioner	

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

REMOVAL

Put the car on a two-post lift.

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

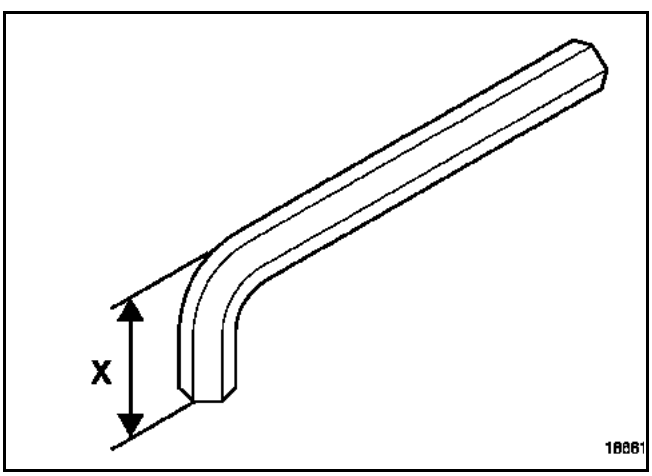
Refer to Section 02 "Underbody lift" for positioning the belt.

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

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

Right-hand side of the vehicle

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



– the upper mounting of the stabiliser bar tie-rod and slacken the lower mounting,
– the track rod end using tool **T.Av. 476**,
– shock absorber base mounting bolts.

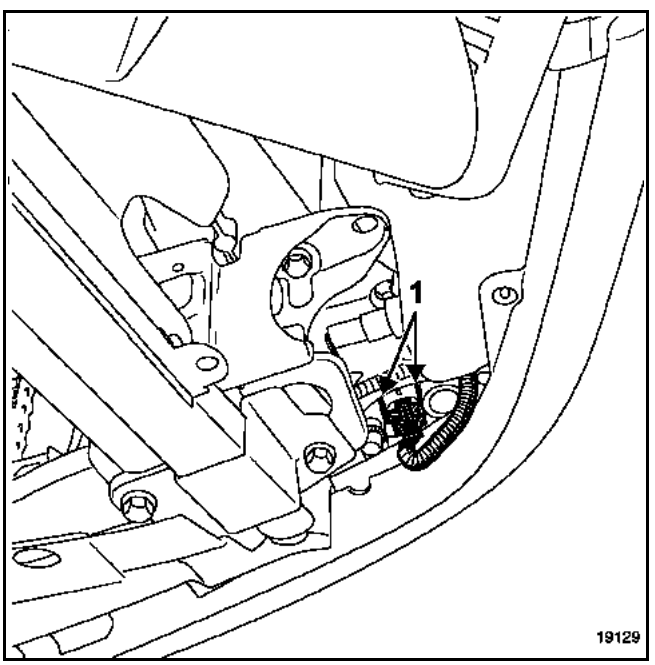
Remove the driveshaft and then remove the hub unit assembled with the driveshaft.

Left-hand side of the vehicle

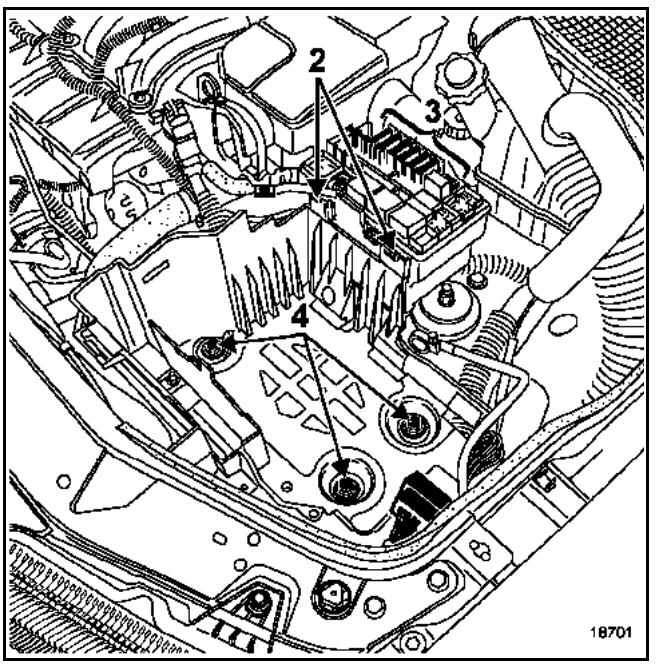
Remove:
– the brake caliper and attach it to the suspension spring,
– the ABS sensor,
– the lower ball joint nut (use an Allen key cut down to **X = 22 mm** to lock the ball joint if necessary),
– the upper mounting of the stabiliser bar tie-rod and slacken the lower mounting,
– track rod end, using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

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

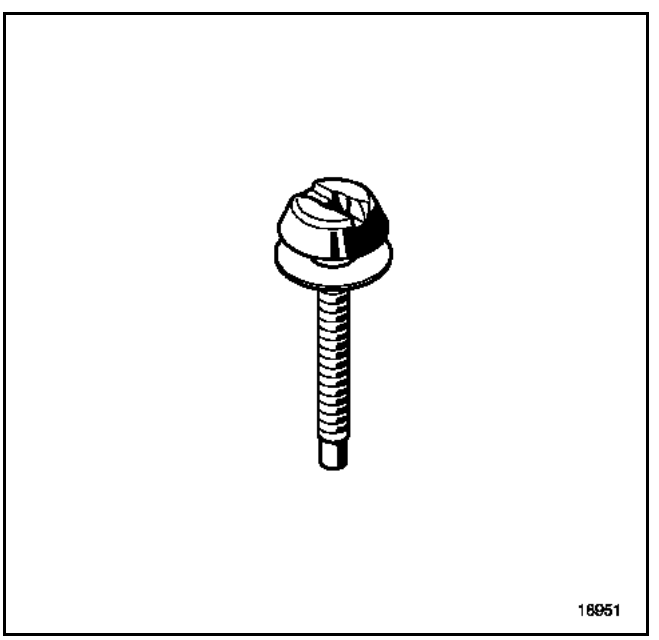
Disconnect the fog lights at (1).



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



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

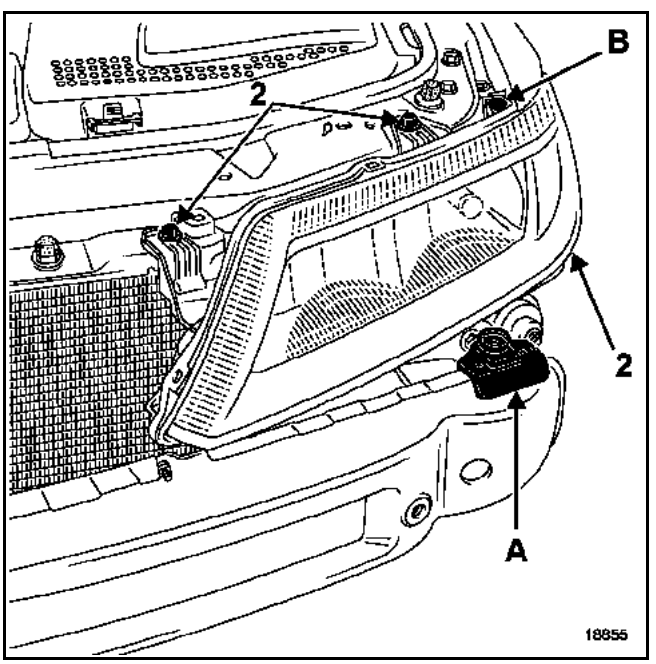


Remove the windscreen washer-tank filler neck.

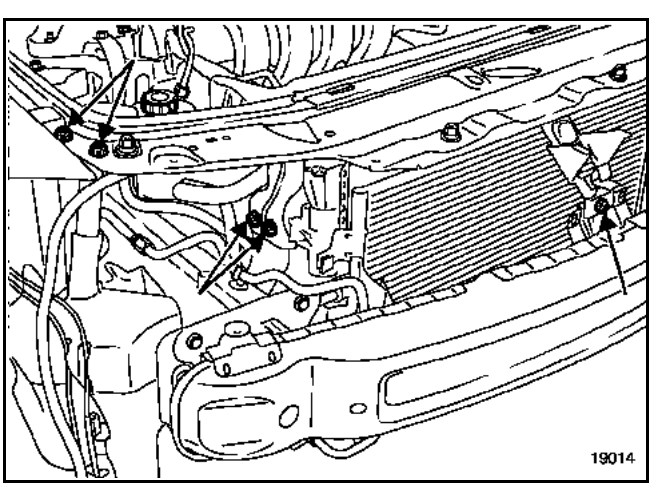
Unclip:
– the power steering reservoir and remove its support,
– the wiring harness from the upper cross member.

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

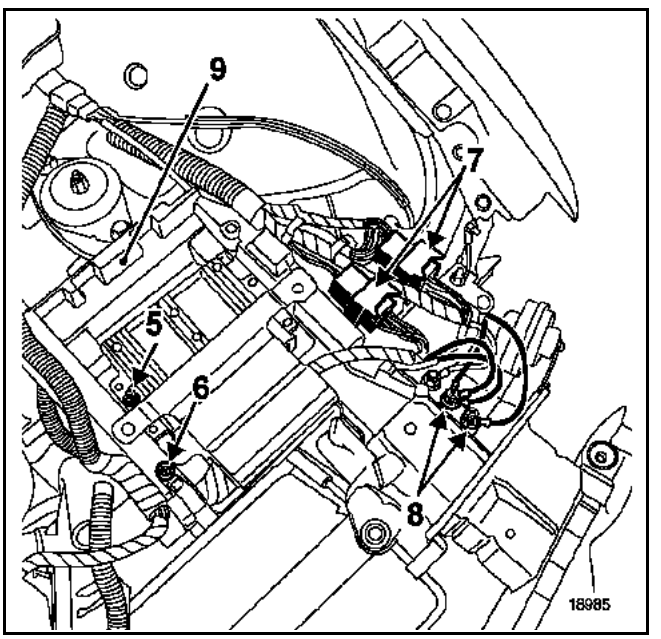
Remove:
– the two upper bumper guides (A), then release the clip (B) on each lens unit,
– the three mounting bolts (2) on each lens unit,
– the two lens units,



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



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



– the resonator unit and air intake assembly,
– lower radiator mountings as well as the top hose,
– connectors on the fan assembly and the condenser,
– the mountings of the air conditioning hoses (if fitted) on the compressor and the dehydration canister.

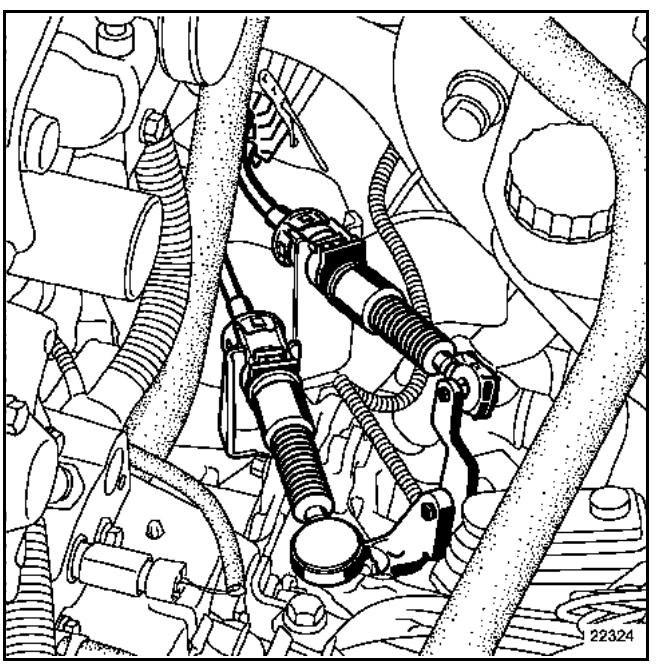
NOTE: plugs must be fitted onto the hoses and pressure relief valve to prevent moisture from entering the circuit.

Remove the cooling assembly.

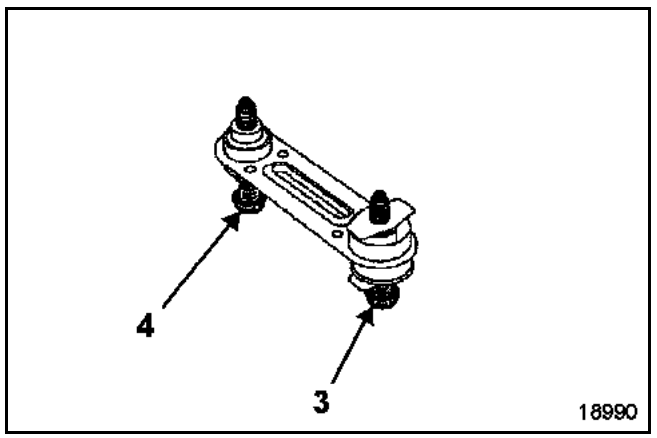
Disconnect:
– the connector and the pipe on the canister bleed solenoid valve,
– the fuel pipe at the upper engine mounting tie rod,
– brake servo vacuum pipe,
– the hoses on the expansion bottle,
– heater hoses on the cylinder head coolant pipe housing outlet.

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

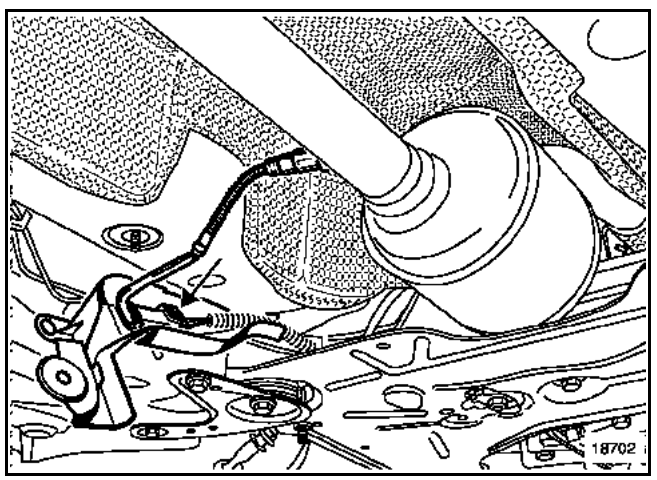
JR5 gearbox



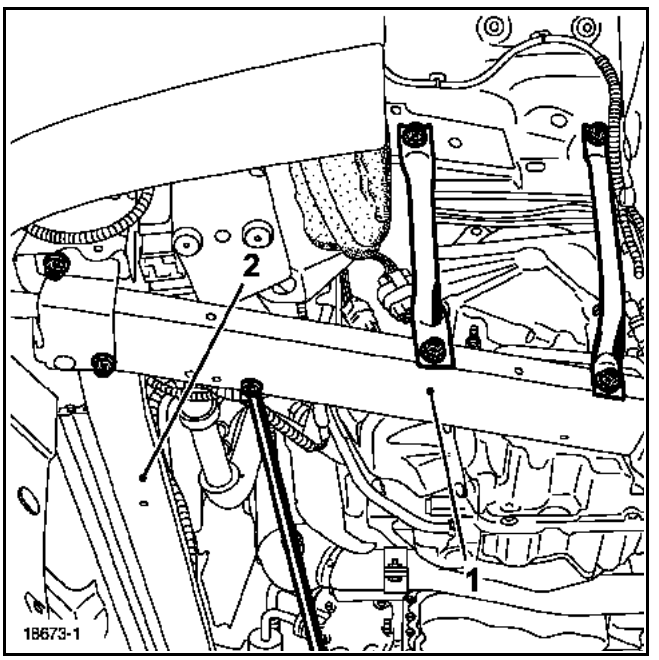
Remove:
– mounting bolts (3) and undo bolt (4),



– the return pipe on the power steering reservoir having drained this,
– the power assisted steering pipes on the steering box,
– the oxygen sensor connector, then unclip the wiring harness,



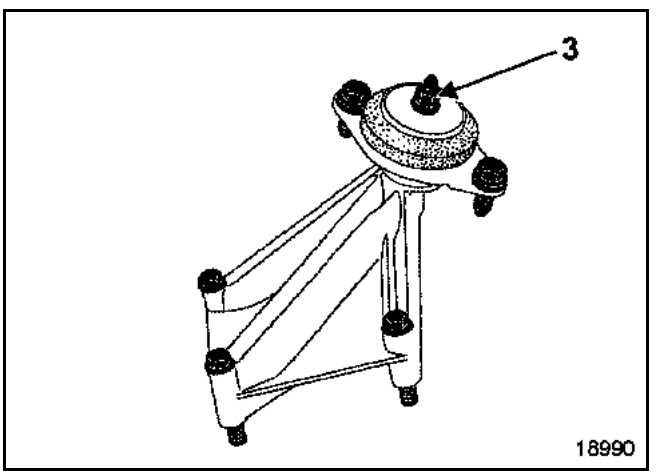
– the exhaust downpipe mountings,
– the power assisted steering radiator mountings on the lower cross member,
– the side members (1) and the cross member (2).



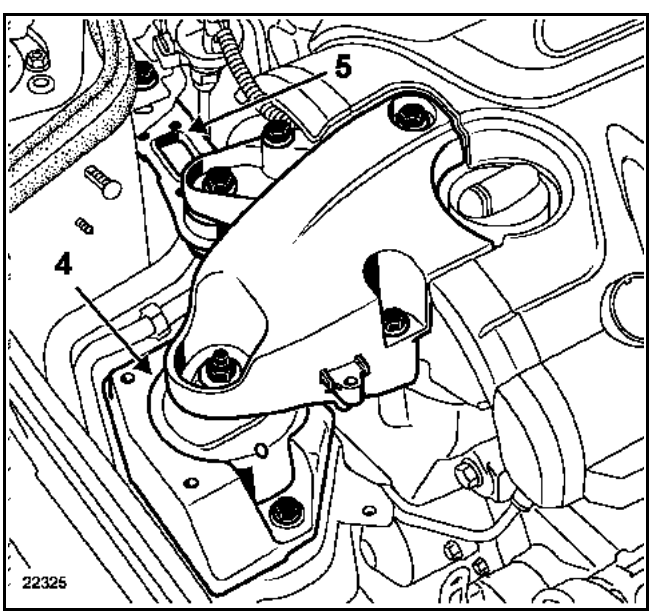
Attach the workshop hoist.

Support the engine-gearbox assembly using a load positioner.

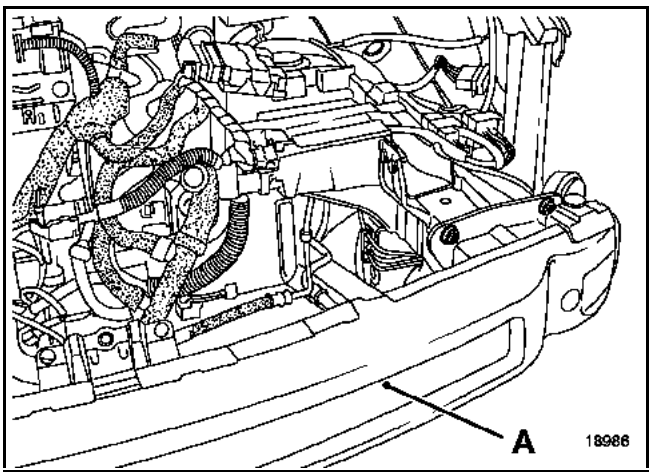
Remove:
– the nut (3), and strike it with a copper hammer to detach the stud,



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



– the lower cross member (A).



NOTE: this cross member contributes to the rigidity of the engine compartment structure. Consequently, before the engine can be repaired it is essential that it be supported at its support points.

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

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

REFITTING

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

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

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

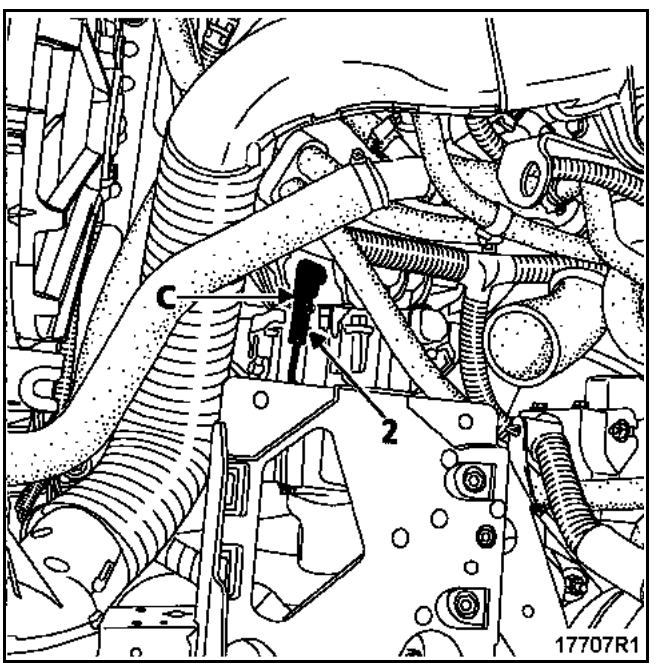
Points to note regarding the clutch slave cylinder when separating the engine and gearbox

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

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

Add brake fluid to the reservoir.

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



Top up the brake fluid.

Check that the clutch system is operating correctly.

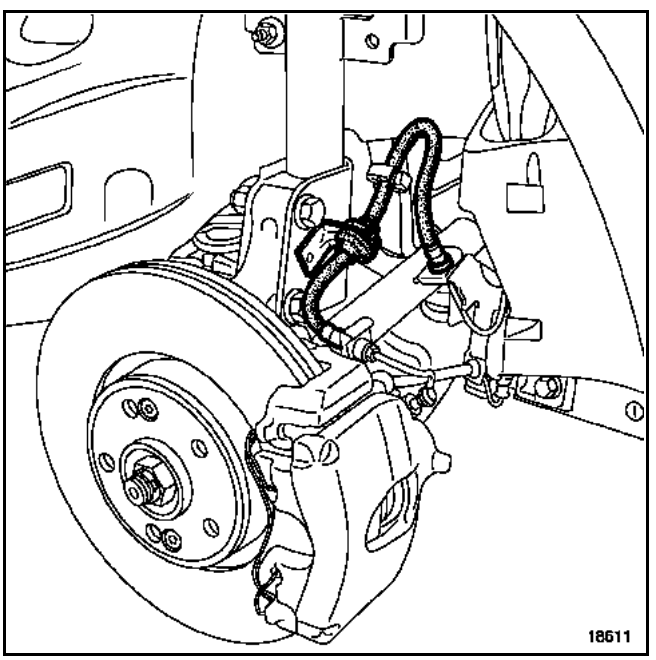
Refit using the same procedure as for removal in reverse.

Replace the tamperproof screws with new ones.

Perform the following operations:
– fill the gearbox with oil,
– fill the engine with oil, if necessary,
– fill and bleed the cooling circuit.
– fill and bleed the power assisted steering circuit,
– fill the refrigerant circuit using the filling equipment.

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

IMPORTANT: ensure that the brake pipe and the ABS sensor wiring are fitted correctly.



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

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

If the vehicle has xenon headlights, the system must be initialised and the headlights adjusted (refer to the **headlights with xenon bulbs, system initialisation** section).

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

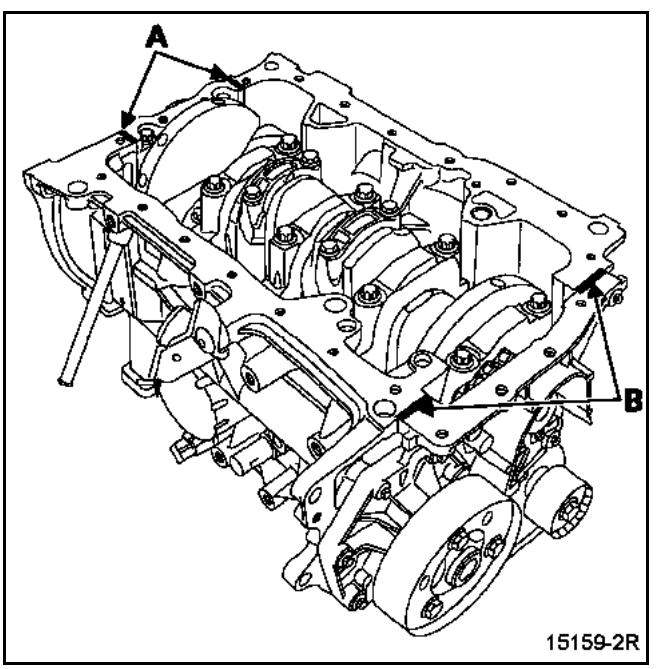
TIGHTENING TORQUE (In daNm)	
Sump bolts	1.4

REMOVAL

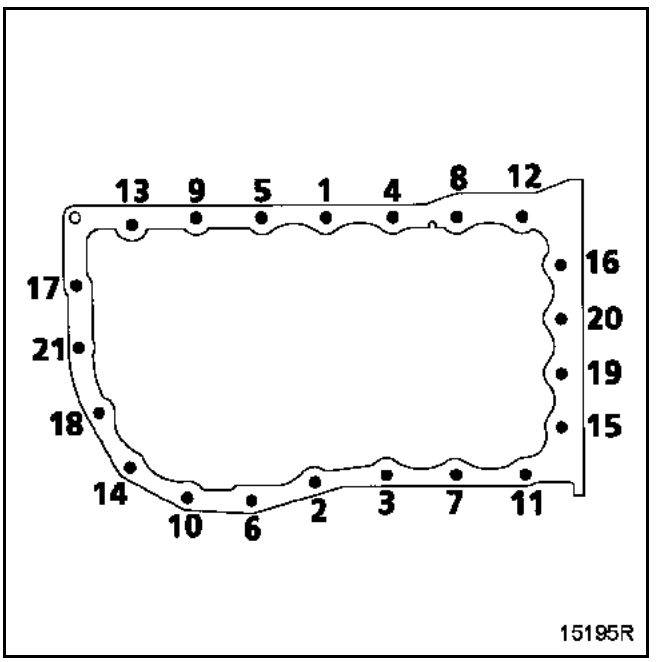
There are no special difficulties in removing the sump.

REFITTING

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



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



SPECIAL TOOLING REQUIRED	
Mot. 799-01	Tool for immobilising pinions for toothed timing belt
Mot. 1054	TDC setting pin
Mot. 1368	Tool for tightening the camshaft pulleys
Mot. 1383	Pipe wrench for removal of HP pipes
Mot. 1453	Engine support
Mot. 1488	Tool for removing the camshaft covers
Mot. 1512	Tool for fitting camshaft oil seal
Mot. 1526	Camshaft setting tool
Mot. 1535	Tool for locking the camshaft pulleys
EQUIPMENT REQUIRED	
Angular torque wrench	

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

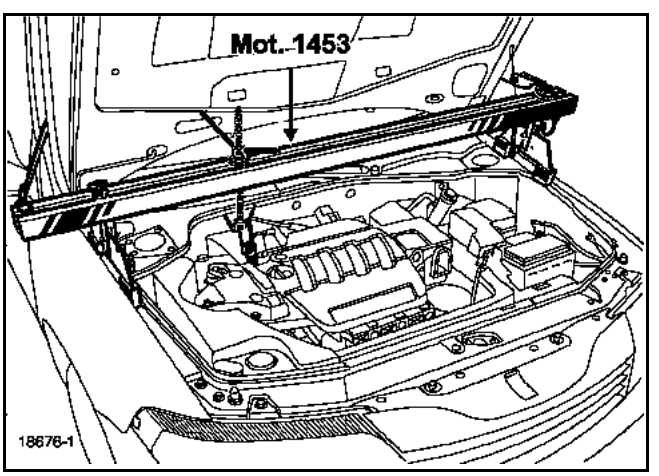
REMOVAL

Put the car on a two-post lift.

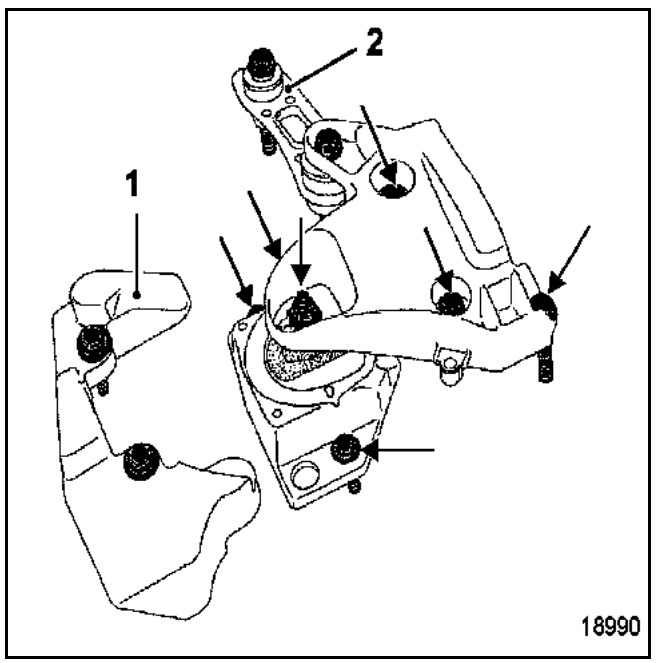
Disconnect the battery.

Remove:
– the front right wheel,
– the front right-hand mudguard,
– the engine undertray.

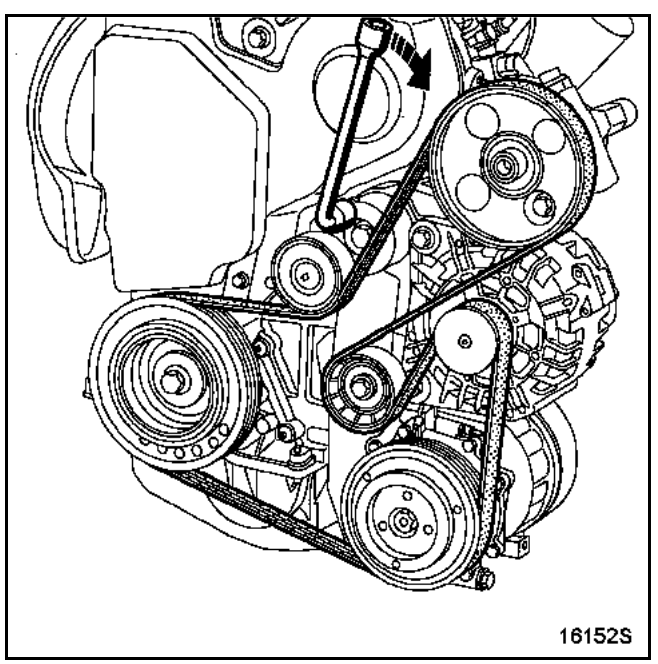
Position the engine support tool **Mot. 1453** with the retaining straps.



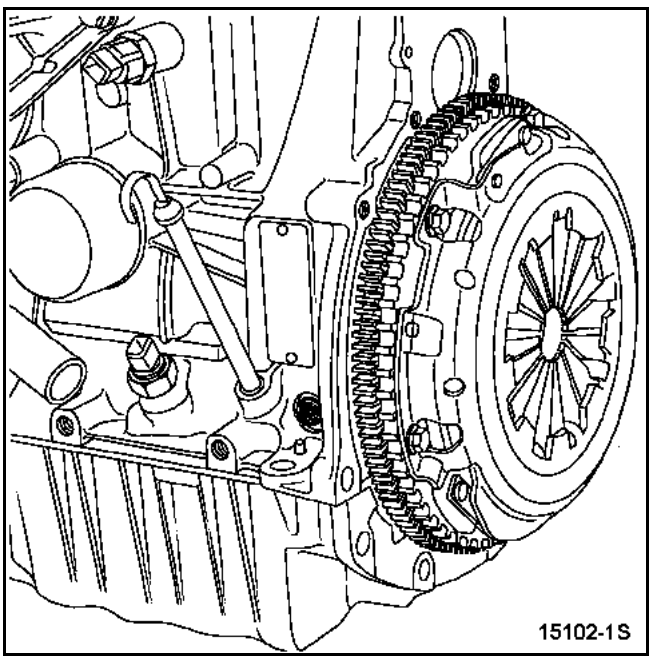
Remove:
– the soundproofing (1),
– the tie-rod (2) mounting bolts, then remove the suspended modular movement-limiter mounting assembly,



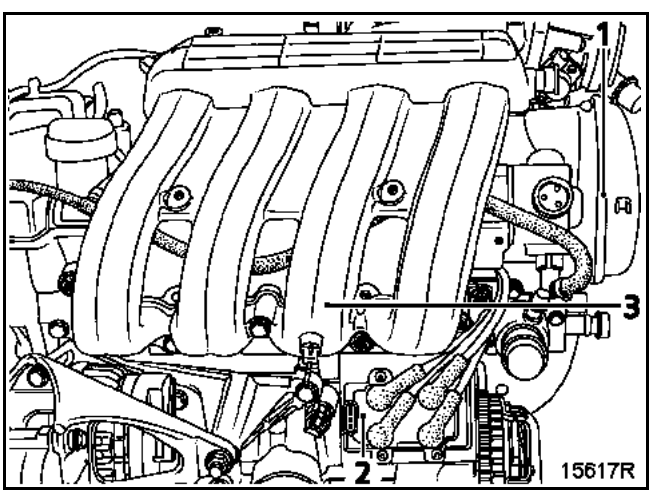
– the accessories belt (see **07 Accessories belt tension** section),



Remove:
– Top Dead Centre pin plug.



– the air resonator (1),
– the ignition coil and wiring loom (2),

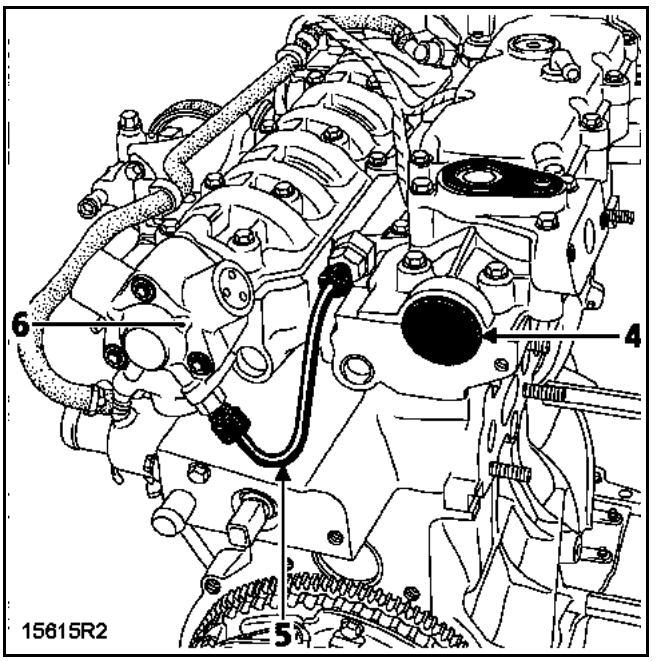


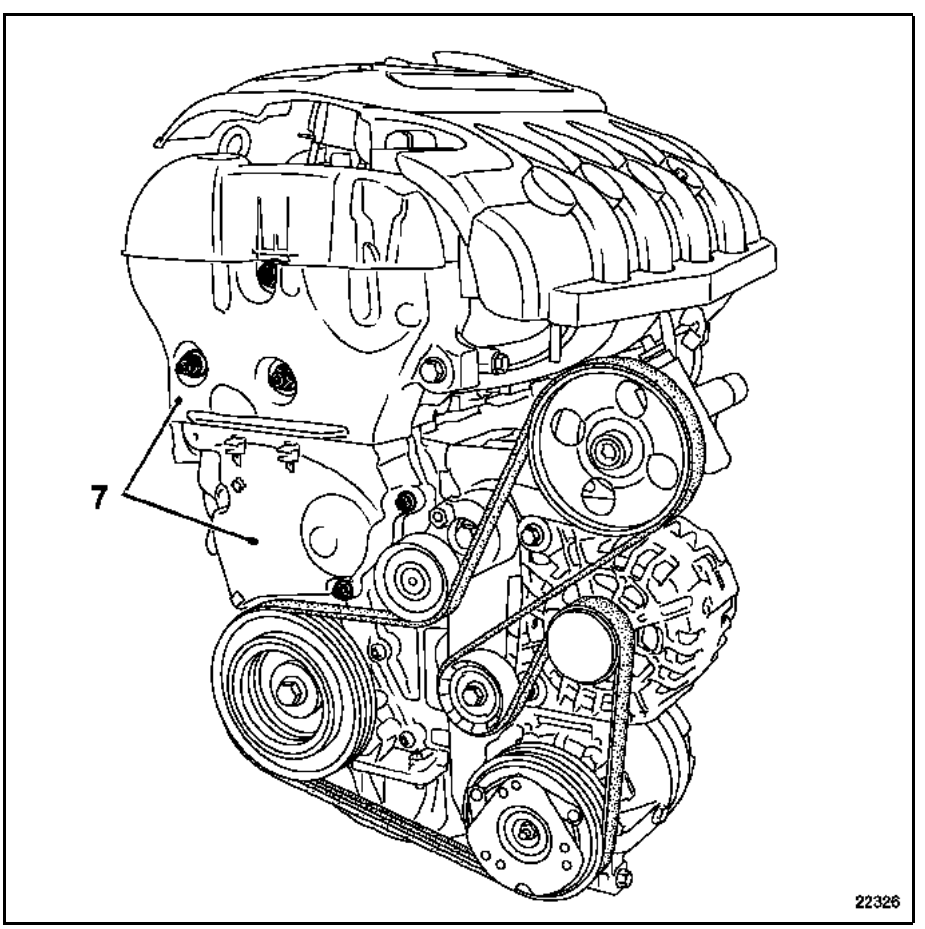
– the inlet manifold (3) (see **12 Inlet manifold** section),

– the exhaust camshaft sealing plug.(4),
– the high pressure petrol pipe, using tool **Mot. 1383** (5). For this operation, hold the unions with a spanner.

Fit plugs to maintain cleanliness

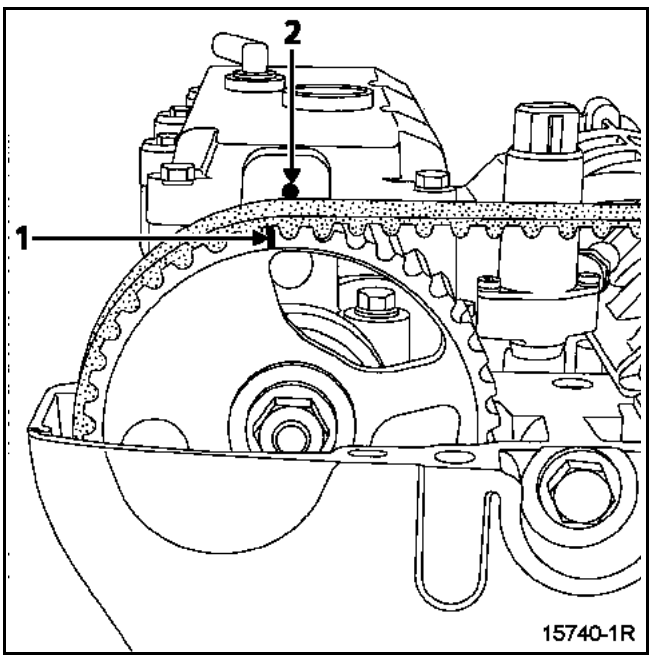
Remove:
– the high pressure fuel pump (6),
– the timing cover mounting bolts and then remove the covers (7).

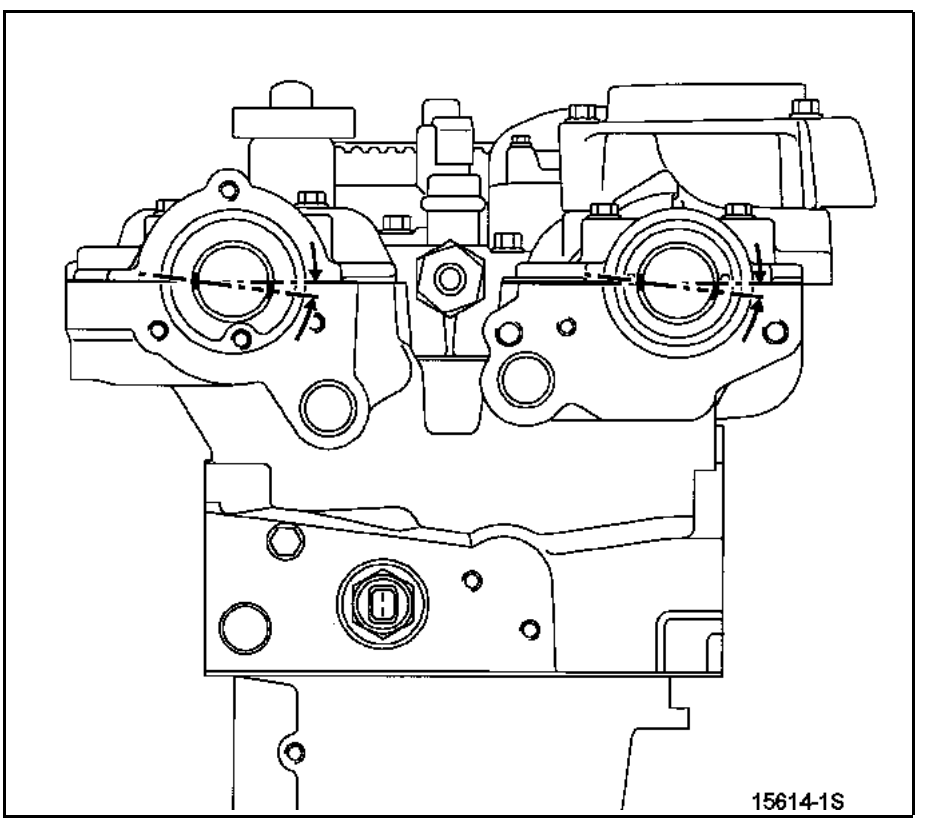




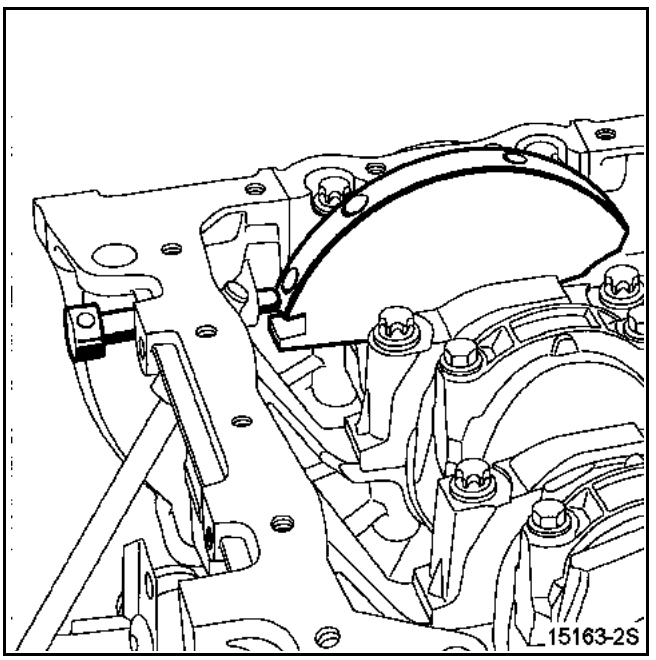
Timing adjustment

Position the exhaust camshaft pulley reference mark (1) one tooth before the phasing sensor (2). The grooves of the camshafts must be offset towards the bottom and practically horizontal as shown below.



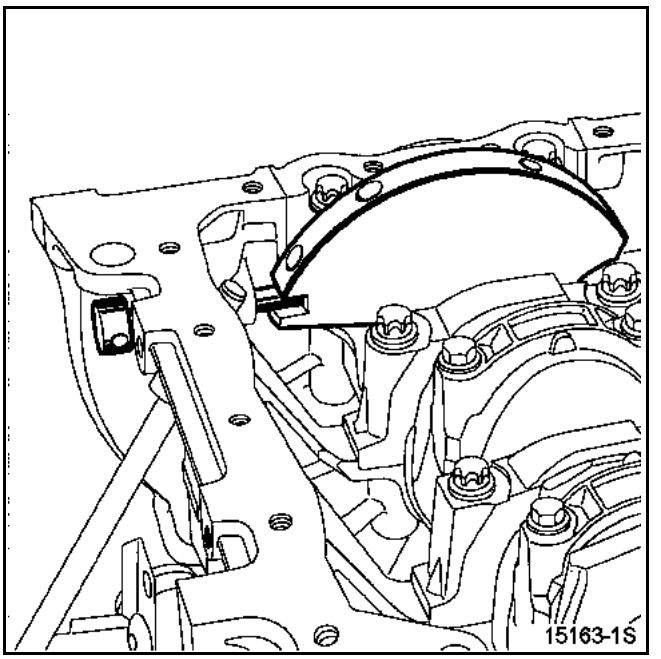


Insert the Top Dead Centre setting pin **Mot. 1054** so that it is between the balancing hole and the crankshaft locking slot.

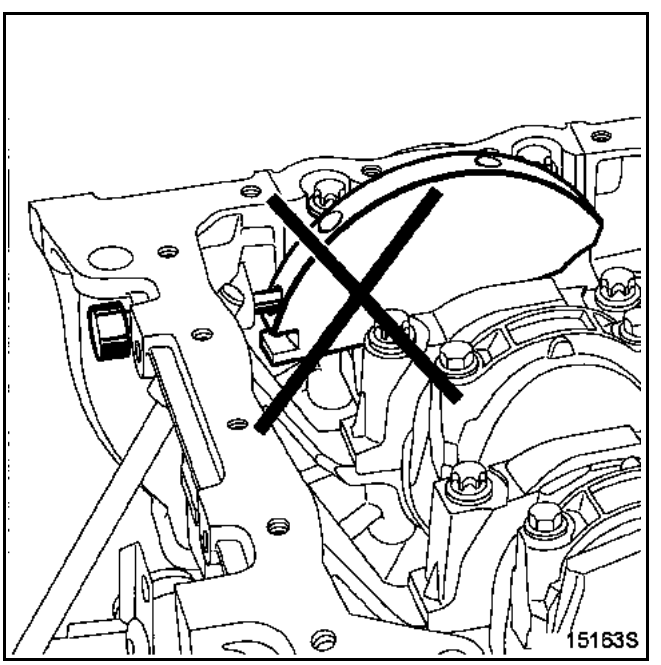


Rotate the engine slightly in the same direction, inserting the pin **Mot. 1054** to the setting point.

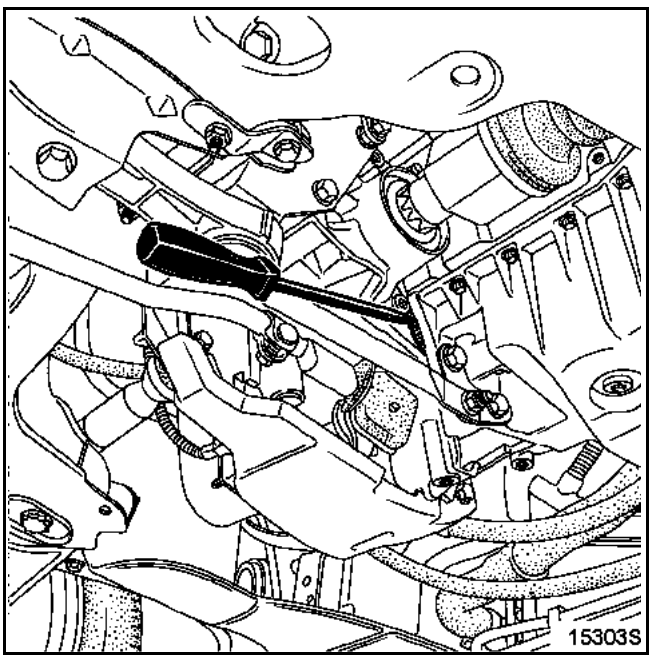
Correct position



Incorrect position



Remove the timing pulley, blocking the flywheel using a screwdriver.

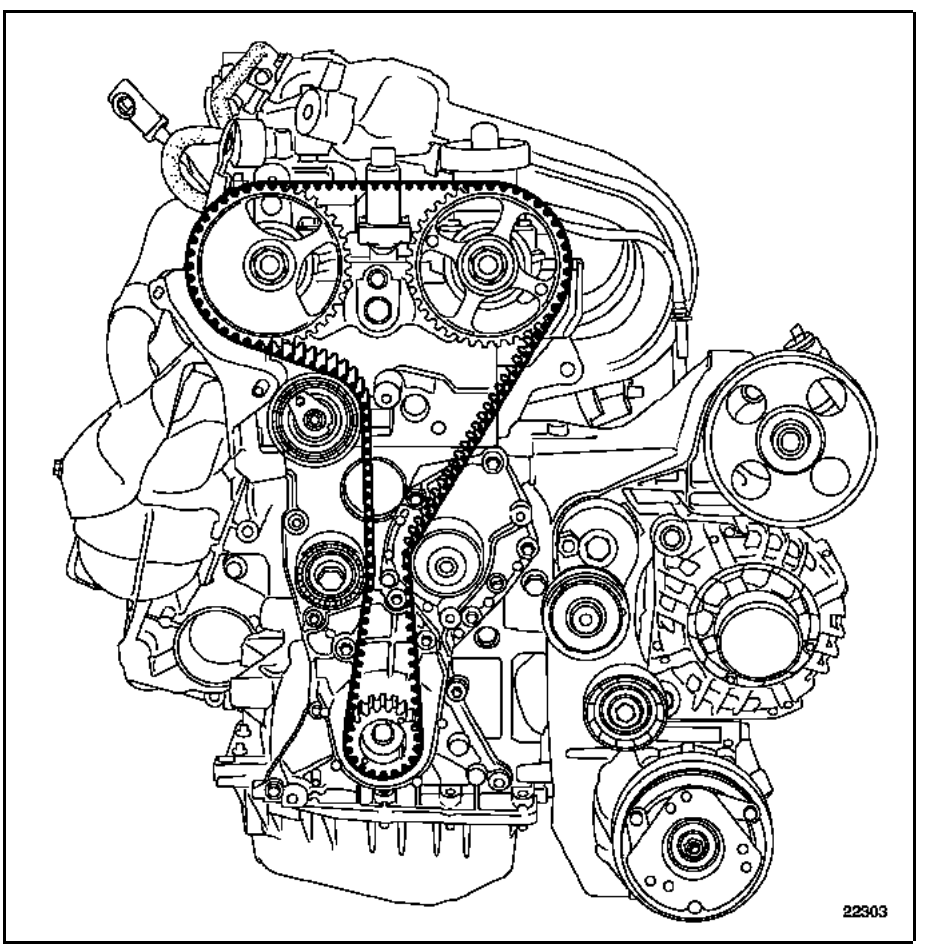


Release the timing belt through the tension wheel.

Remove the belt and tensioner wheel.

Take care not to drop the crankshaft sprocket, as this does not have a key.

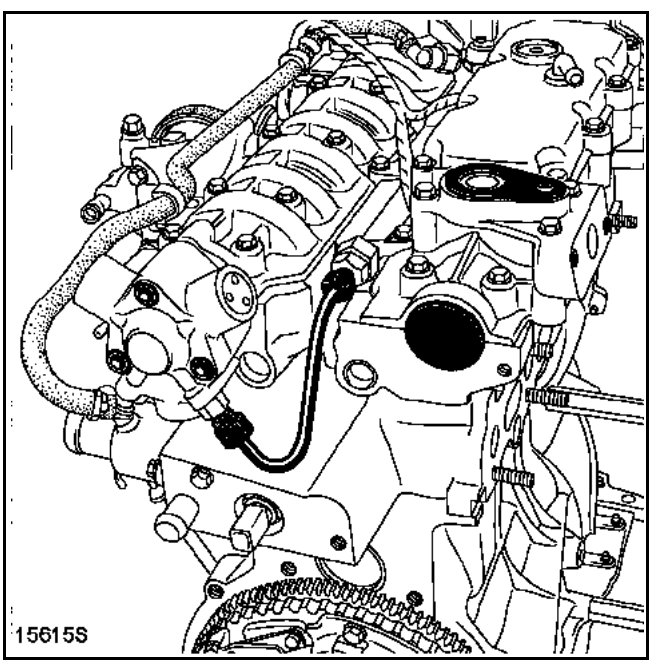
IMPORTANT: it is essential to degrease the end of the crankshaft, the bore of the crankshaft pinion and the bearing faces of the crankshaft pulley to prevent any slip between the timing and the crankshaft which would risk destroying the engine.



REFITTING

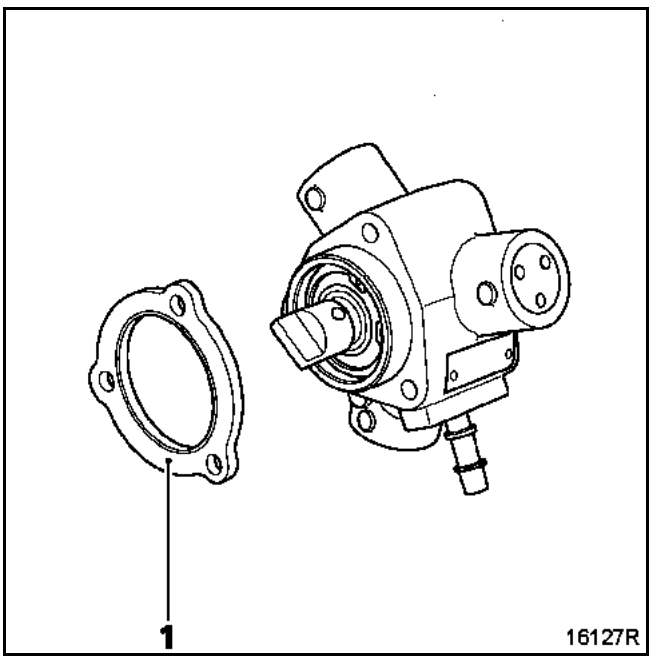
The tensioner and fixed roller must be replaced when the timing belt is replaced.

Refit:
– the timing belt (following exactly the method described in Section **07 Timing belt tensioning procedure**),
– the accessories belt (see section **07 Procedure for tensioning the accessories belt**section),
– the plug of the Top Dead Centre pin, applying a drop of **RHODORSEAL 5661** onto the thread,
– the new plug of the exhaust camshaft using tool **Mot. 1488**,

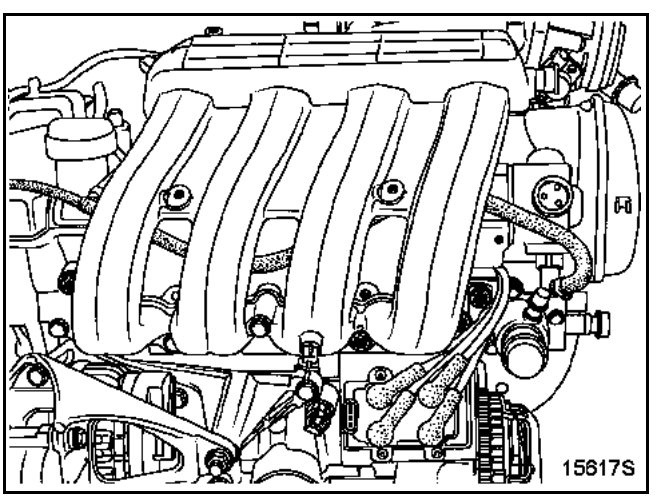


– the high pressure fuel pump and fuel pipe (refer to the method in section **13 High pressure pump**).

Replace the shim (1).



Refit the inlet manifold (refer to the method in section **12 Inlet manifold**),



– the resonator and the air intake pipe,
– the right-hand suspended engine mounting by torque tightening.

SPECIAL TOOLING REQUIRED	
Mot. 1054	TDC setting pin
Mot. 1159	Engine support tool
Mot. 1368	Tool for tightening the camshaft pulleys
Mot. 1383	Pipe wrench for removal of HP pipes
Mot. 1448	Long nose pliers for hose clips
Mot. 1453	Engine support tool
Mot. 1488	Tool for removing the camshaft covers
Mot. 1512	Tool for fitting camshaft oil seals
Mot. 1526	Tool for setting the camshaft
Mot. 1530	Tool for extracting injectors
Mot. 1532	Tool for removing high pressure rail
Mot. 1533	Tool for fitting injector seals
Mot. 1535	Tool for locking the camshaft pulleys
EQUIPMENT REQUIRED	
Tool for testing cylinder head Angular tightening wrench	

TIGHTENING TORQUES (in daNm and/or °)	
Wheel bolts	10.5
Fixed roller bolts:	
– M10:	5
Tension wheel nut	2.8
Crankshaft pulley bolts	115° ± 15°
Mounting bolts to suspended mounting	6.2
Intermediate timing housing bolts	2
Camshaft bearing cap cover bolts	1.2
Oil decanter bolts	1.3
Injector rail mounting bolts	1.5
High pressure pump mounting bolts	1
High pressure pipe union	2.5
Camshaft pulley nuts	3 ± 90°

When working on the fuel circuit, the cleanliness and safety rules must be complied with.

REMOVAL

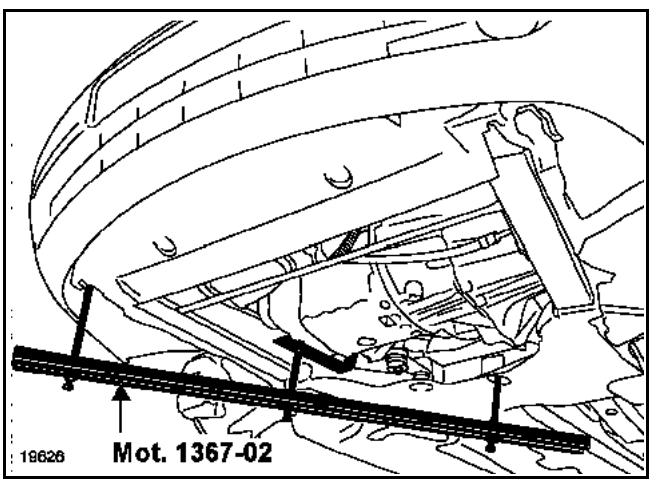
Put the vehicle on a two-post lift.

Disconnect the battery.

Remove:
– the front right wheel,
– the front right wheel arch as well as the engine undertray.

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

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



Remove:
– the air intake pipe and resonator,
– the ignition coil and wiring loom,
– the inlet manifold (see section **12 Inlet manifold**),
– the high pressure petrol pipe using tool **Mot. 1383** retaining the connections with a spanner.

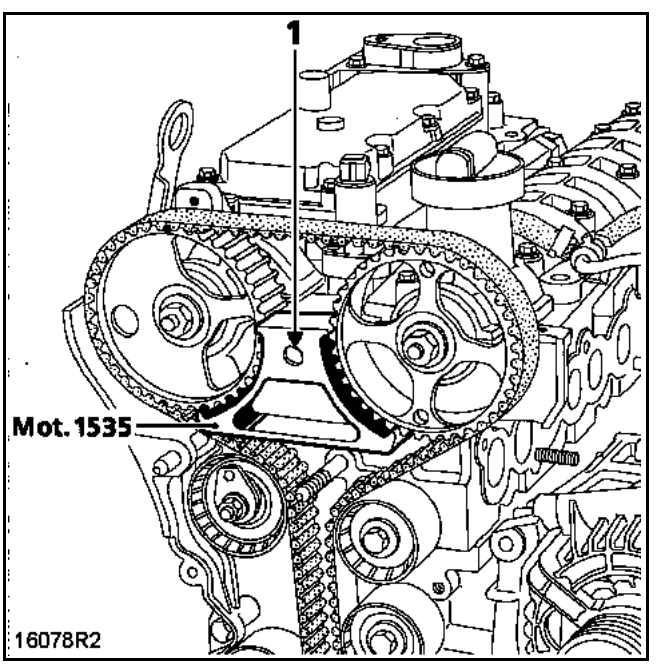
Fit plugs to maintain cleanliness.

Remove:
– the high pressure fuel pump (see section **13 High pressure pump** section),
– the suspended mounting support,
– the exhaust camshaft sealing plug,
– the accessories belt (see section **11 Accessories belt**).

Set the engine to Top Dead Centre using pin **Mot. 1054**.

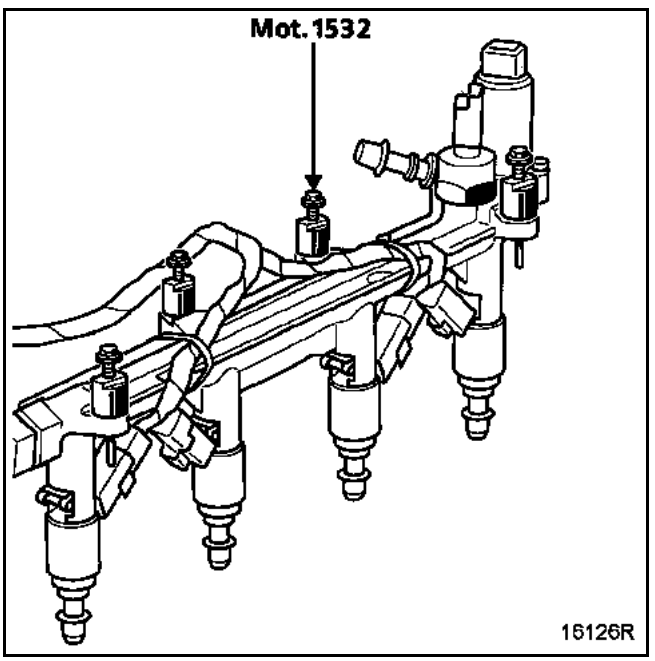
Remove the timing belt (see section **11 Timing belt** section).

Fit the tool **Mot. 1535** positioning the timing cover bolt in the hole (1), and remove the camshaft pulleys.



remove the injector rail mounting bolts (position the sealing plugs).

Fit the injector rail extraction tool **Mot. 1532** (sockets and rods are threaded).

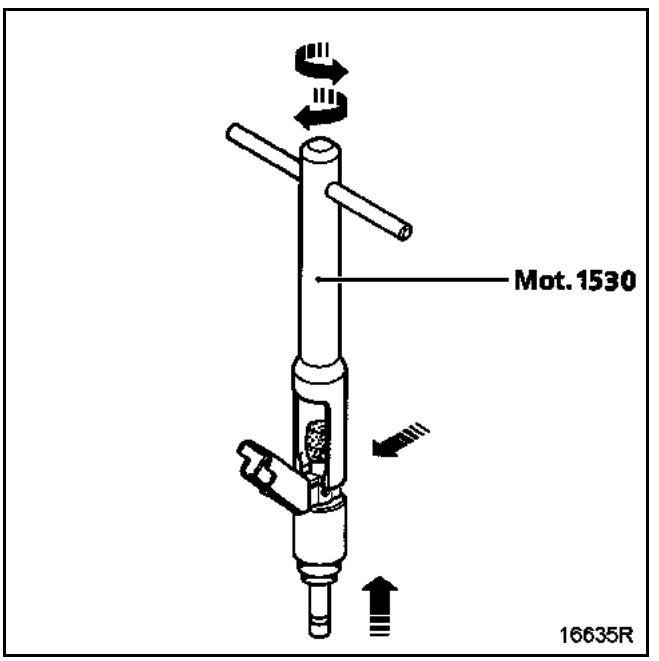


Remove the injector rail. The injector retaining clips remain in place and allow the injector rail to slide out during removal.

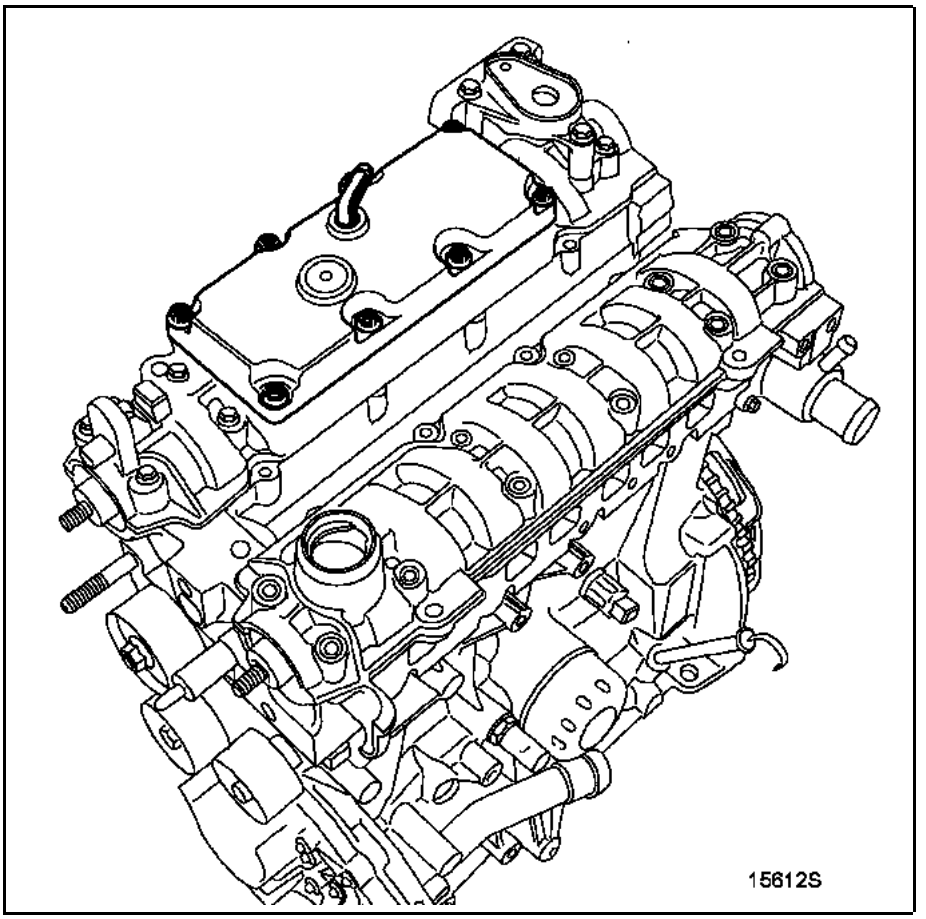
Fit plugs to maintain cleanliness.

Remove:
– the clips located between the injectors and the rail,
– the injectors using tool **Mot. 1530**. This is done by gently turning the injector to break the scale.

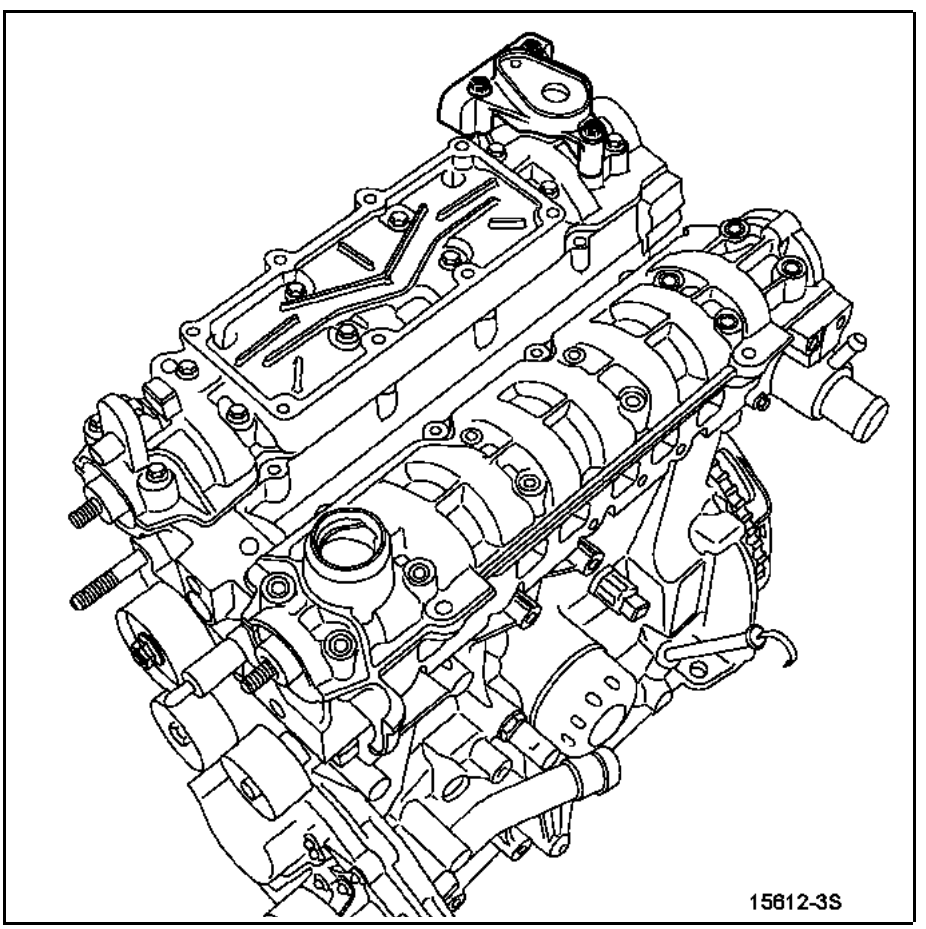
Remove the injector and fit plugs to maintain cleanliness.



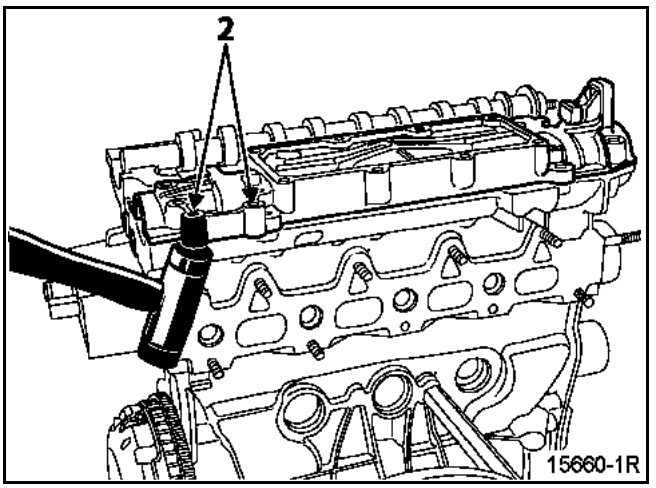
Remove:
– the oil decanter,



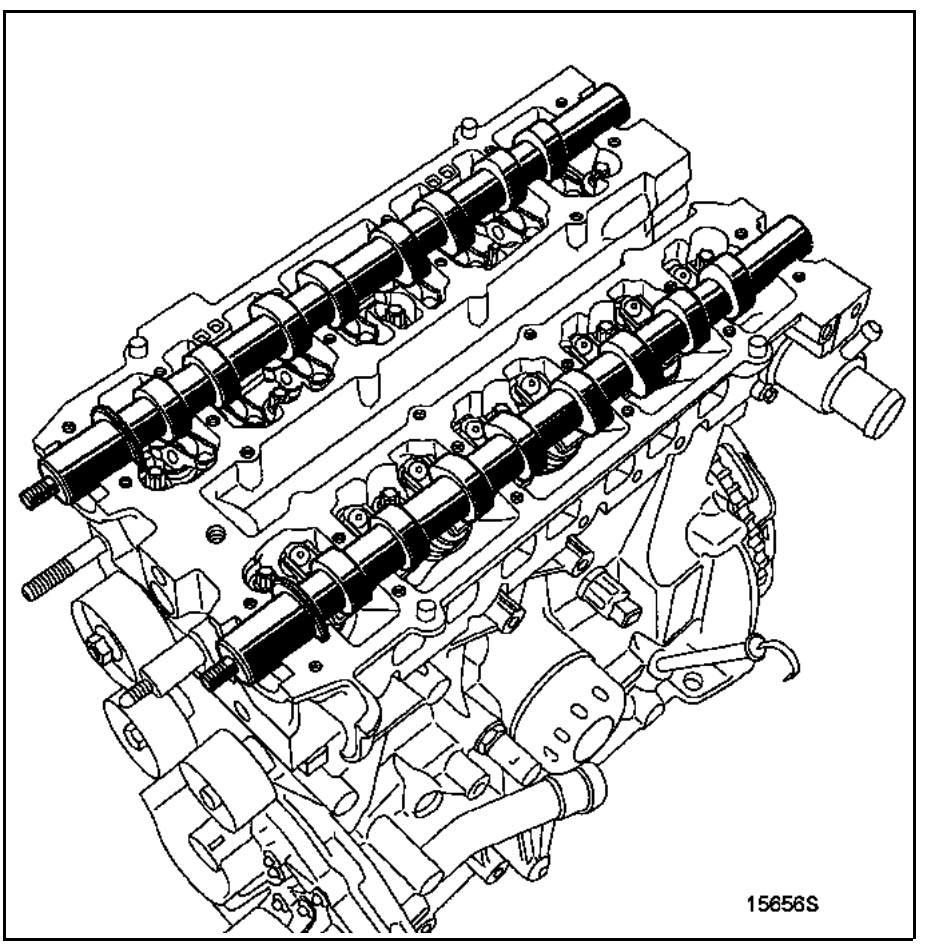
– the EGR valve/manifold connecting pipe,
– the EGR valve mounting,
– the camshaft bearing cap bolts.



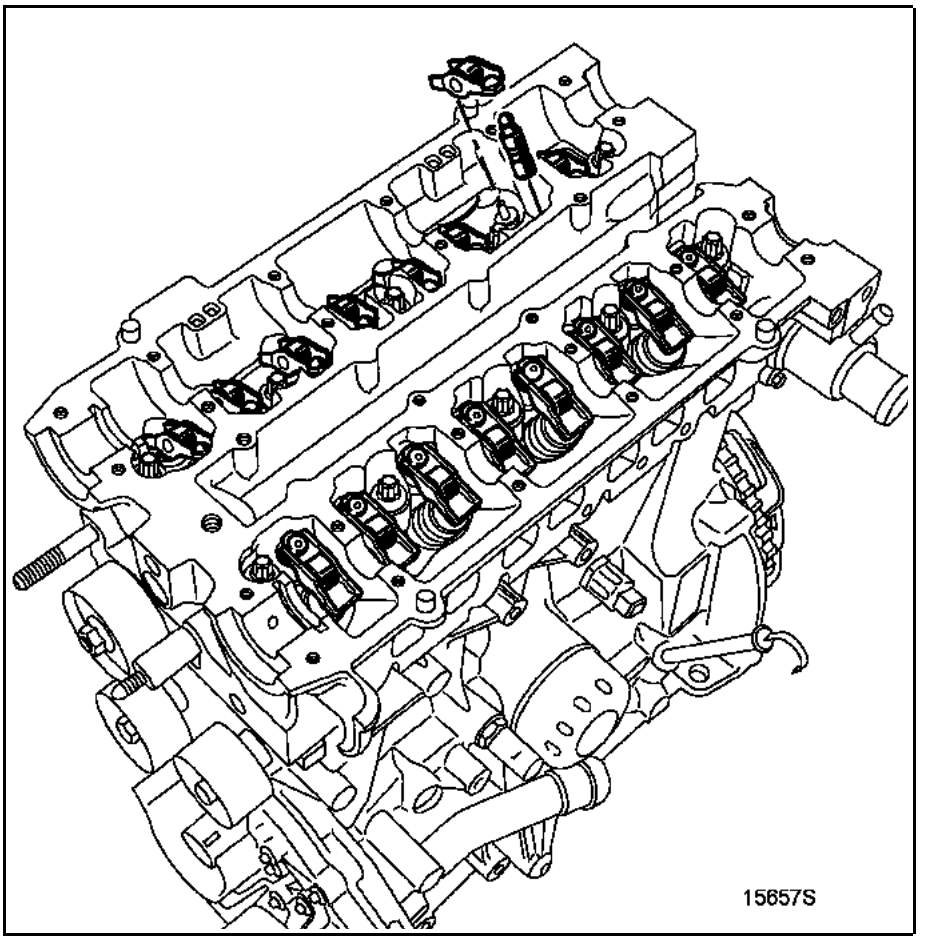
Prise off the camshaft bearing cap cover by tapping the lugs (2) with a mallet and, at the same time, sliding a screwdriver under the lug.



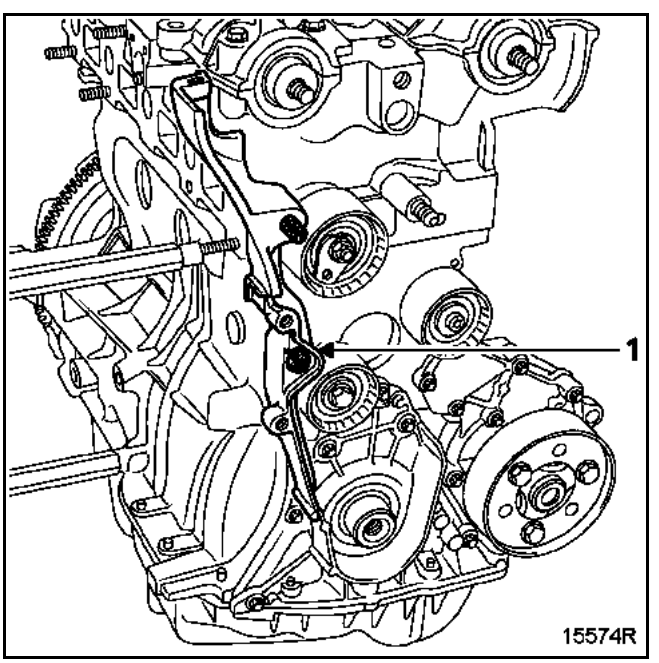
Remove:
– the camshafts,



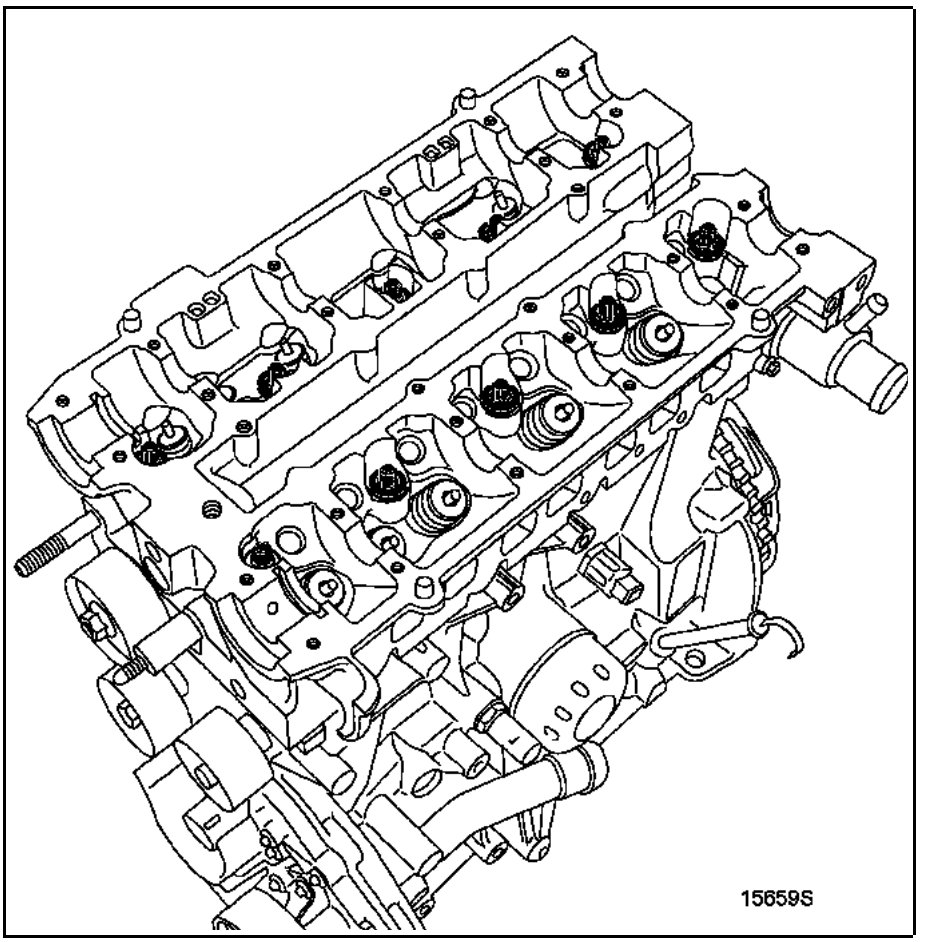
– the earth strap,
– the catalytic converter/manifold connecting bolts,
– the exhaust manifold stay,
– the wiring harness brackets,
– the coolant pipes on the radiator tank,
– the hydraulic valve rockers and stops,



– the aluminium timing cover (1).



Remove the cylinder head.



Cleaning

It is very important not to scratch the mating surfaces of any aluminium components.

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

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

Wear gloves whilst carrying out this operation.

Do not allow this product to drip on to the paintwork.

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

CHECKING THE GASKET FACE

Check for mating surface bow using a ruler and a set of shims.

Maximum bow **0.05 mm**

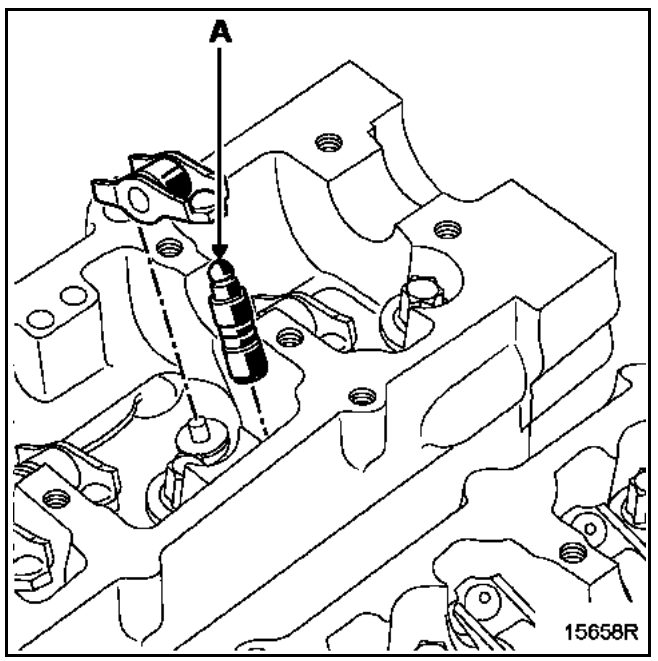
No regrinding of the cylinder head is permitted.

Check the cylinder head for cracks.

REFITTING

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

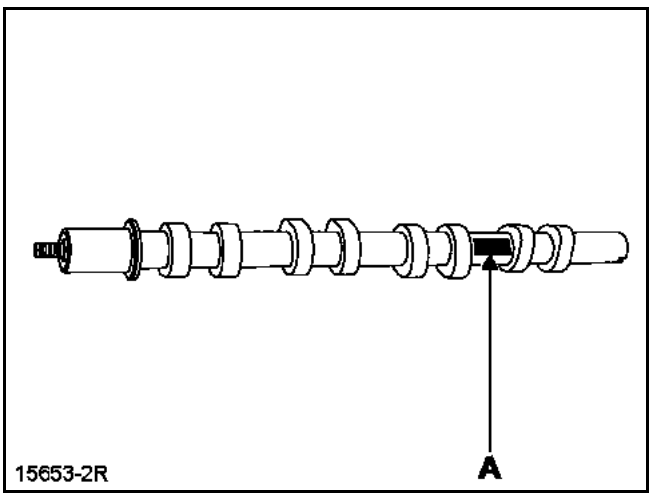
– **It is important to re-prime the hydraulic tappets as these may become drained after a long time. To check whether they need repriming, press the top of each tappet at (A) with your thumb. If the piston can be pressed into the tappet, immerse it in a container filled with diesel.**



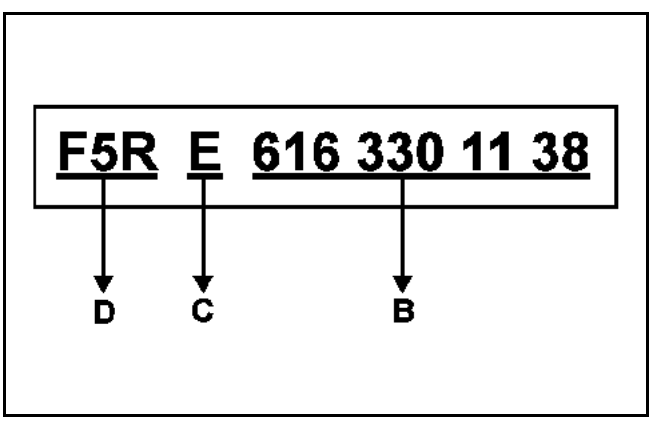
Refit:
– the valve rockers,
– the camshafts, oiling the bearings.

IMPORTANT: do not spill oil onto the gasket face of the camshaft bearing cap housings.

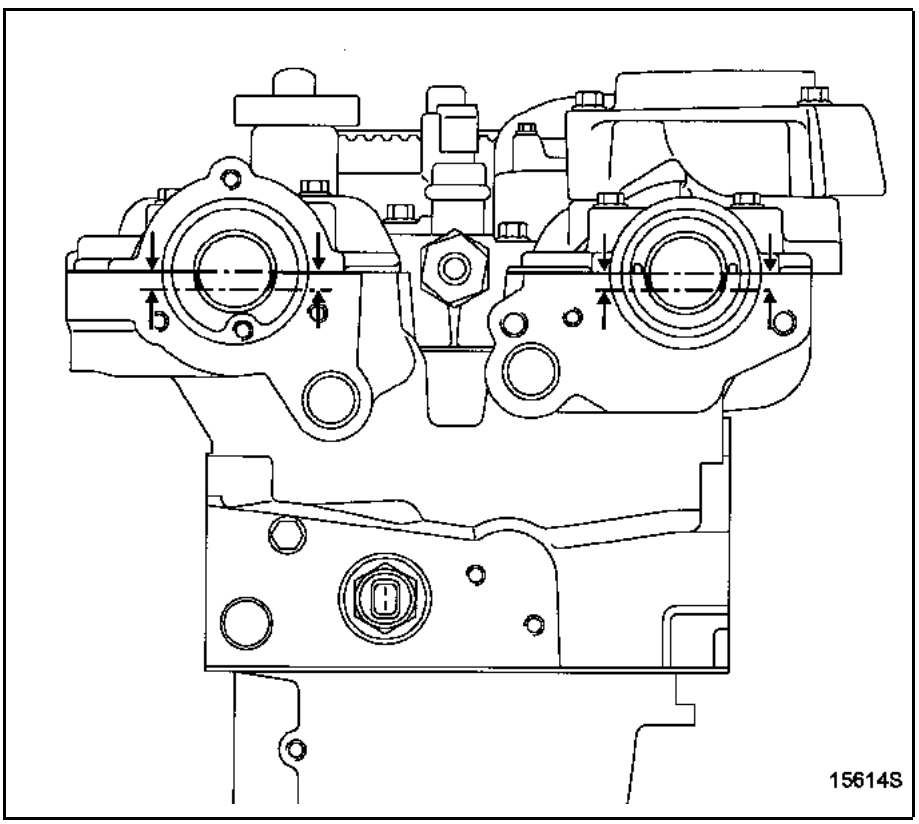
NOTE: the camshafts are identified by a marking (A).



Detail of the marking (A):
– the reference B is used by the supplier only,
– marking C is used to identify the camshafts:
  A = Inlet,
  E = Exhaust,
– the reference D gives the engine type
  Example:

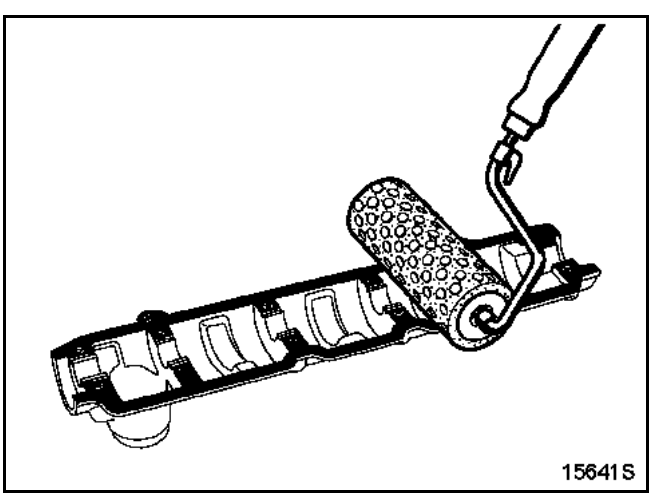


position the grooves of the camshaft as shown in the diagram below (the grooves must be horizontal and offset towards the bottom).

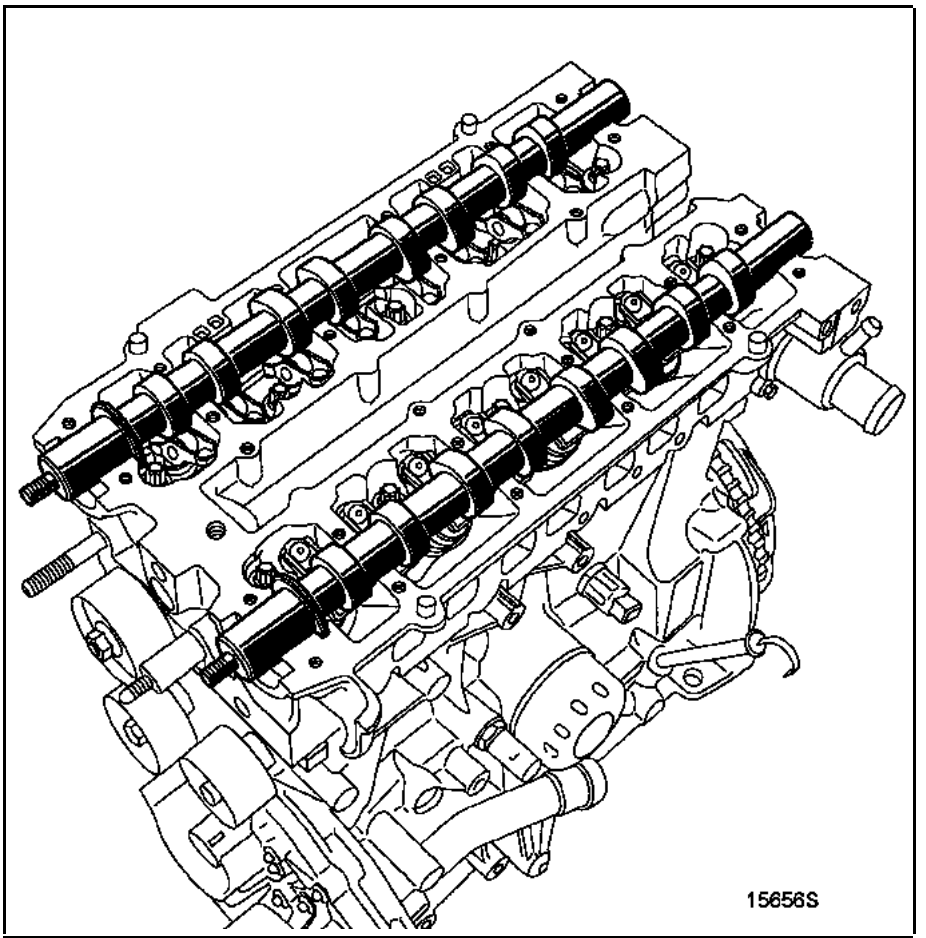


NOTE: the gasket faces must be clean, dry and free from grease (avoid finger marks).

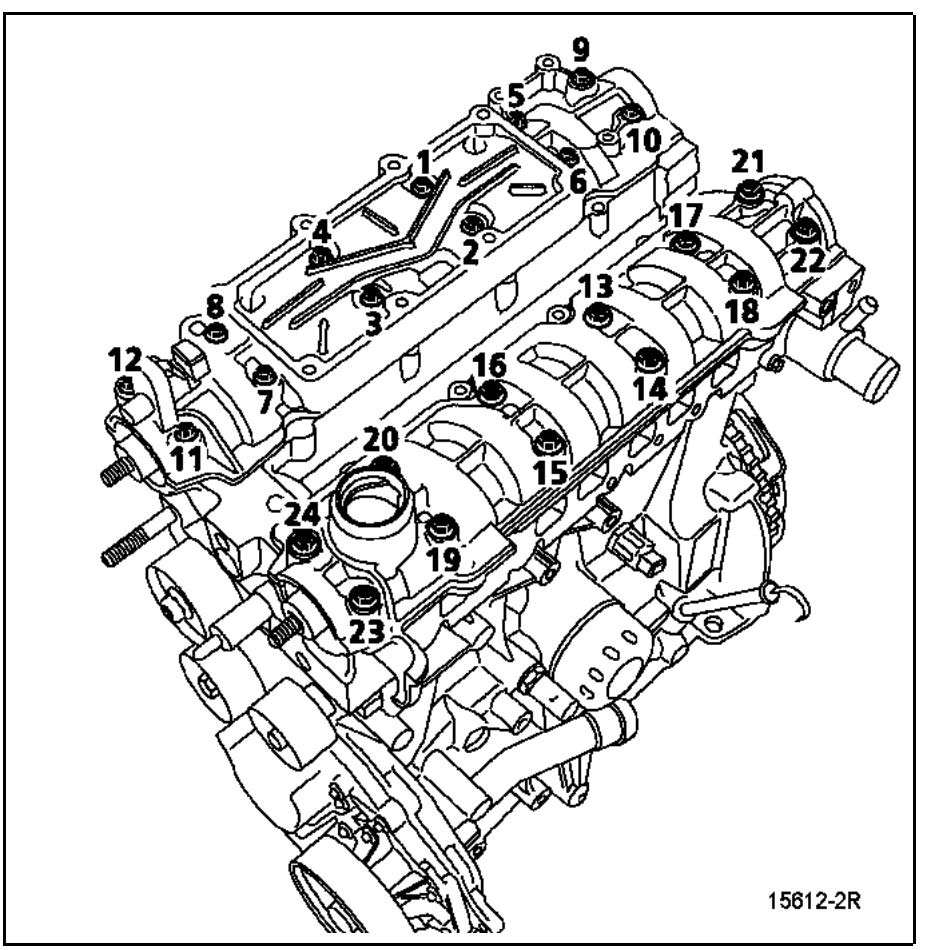
Using a stipple roller, apply **Loctite 518** to the gasket face of the camshaft bearing cap housings until it turns **reddish in colour**.



Refit:
– the camshafts.

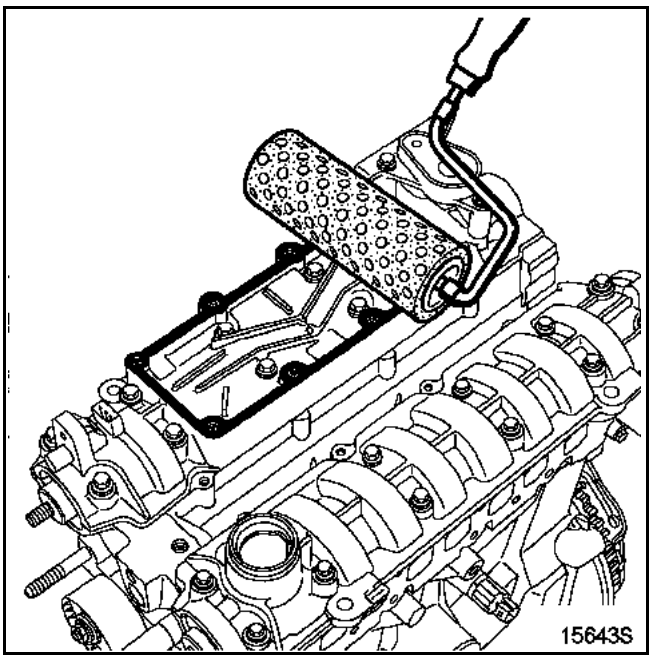


– the camshaft bearing cap housings. Tighten them to a torque of **1.2 daNm** following the recommended order and method,

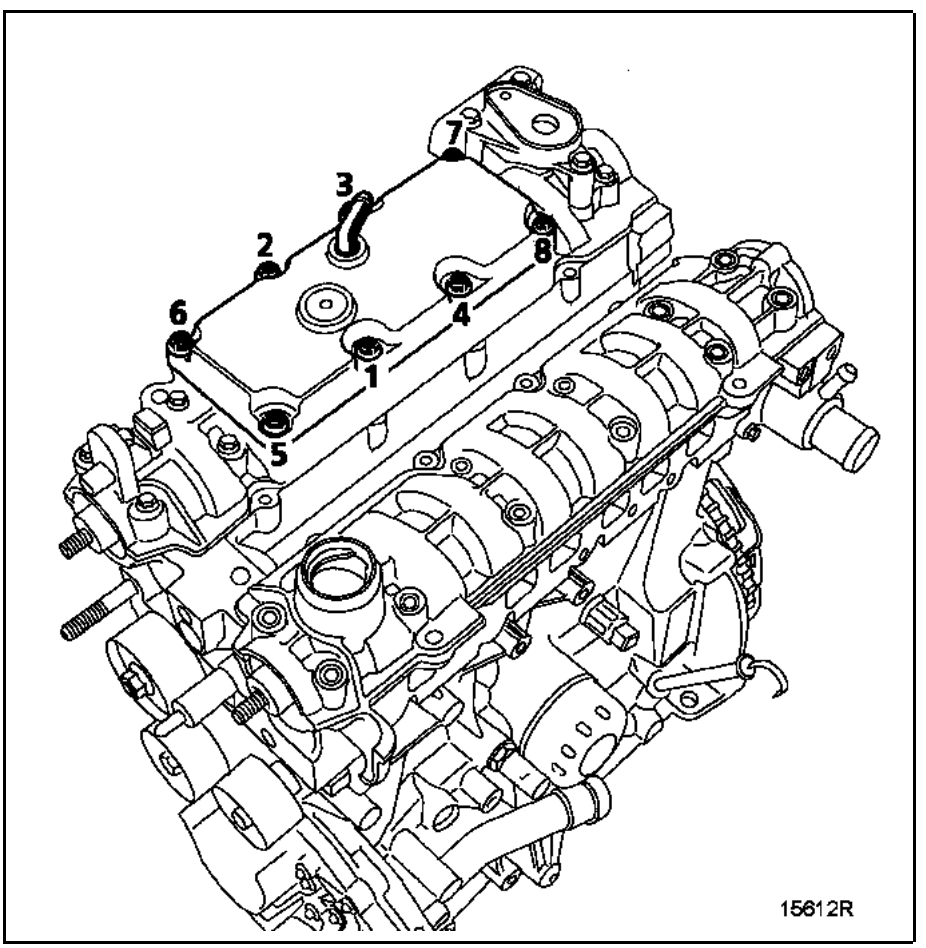


– the EGR valve mounting,
– the oil decanter.

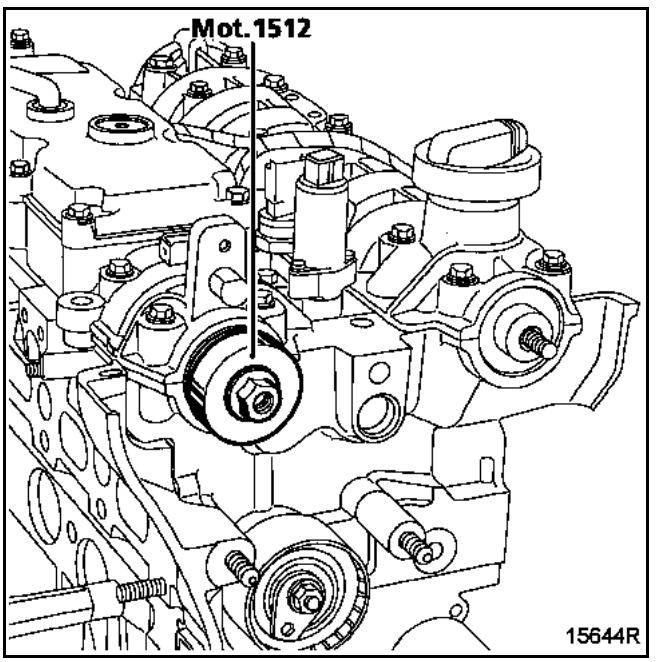
Apply **Loctite 518** using a stipple roller to the gasket faces until they turn reddish in colour.



Tighten the oil decanter to a torque of **1.3 daNm** in the recommended order.



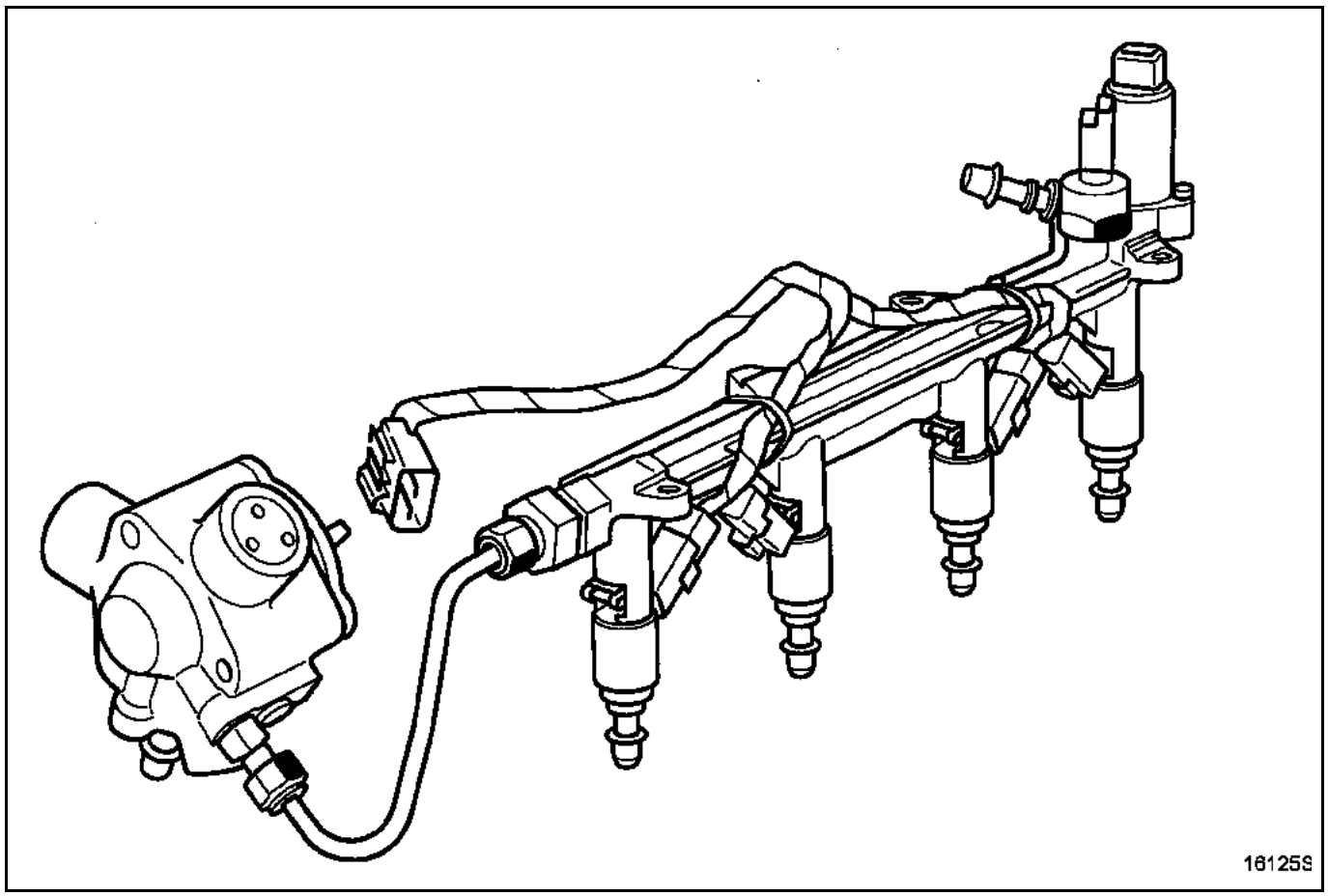
Refit:
– the camshaft seals using tool **Mot. 1512**.



– the coolant pipes on the radiator tank,
– the wiring harness brackets,
– the earth strap,
– the catalytic converter/manifold connecting bolts,
– the exhaust manifold stay,
– the EGR valve/manifold connecting pipe,
– the EGR valve bracket.

Replace the injector seals using tool **Mot. 1533** (refer to the method in section **13 Injector rail/injector gallery**).

Replace the injectors and the clips on the rail paying attention to their positioning.

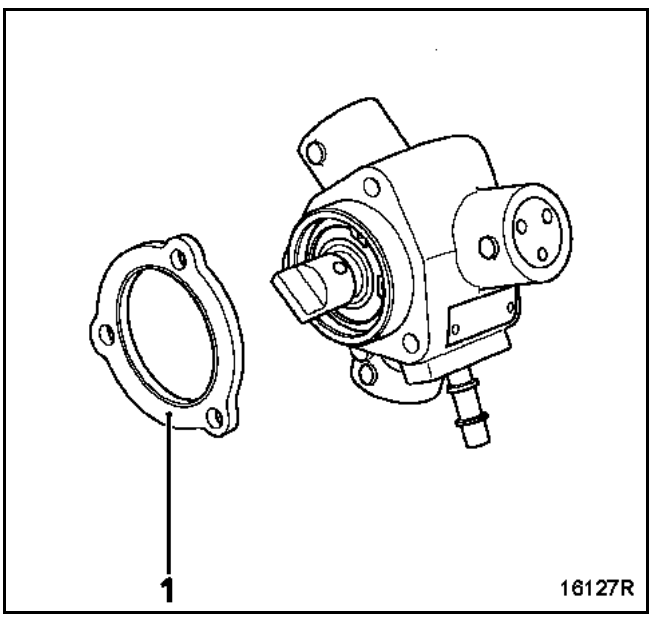


Refit the injector rail (see section **13 Injector rail/injection gallery** section).

Timing adjustment

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

Refit:
– the timing belt (following exactly the method described in section **07 Timing belt tensioning procedure**
– the high pressure pump, replacing the shim (1) (see section **13 High pressure pump**),



– the plug of the exhaust camshaft using tool **Mot. 1488**,
– the inlet manifold (see section **12 Inlet manifold**),
– the accessories belt (refer to the method in section **07 Accessories belt)**.
– the right suspended engine mounting as well as the engine tie-bar.

Switch the ignition on and off several times before starting the vehicle in order to prime the fuel pump and fuel circuit.

IMPORTANT: when exhaust manifold mounting studs are removed, they must be replaced and sealed using, "LOCTITE FRENBLOC BLEUE".

FUEL MIXTURE
Specifications

12

Type	Gearbox	Engine							
		Type	Index	Bore (mm)	Stroke (mm)	Cubic capacity (cc)	Compression ratio	Catalytic converter	Depollution standard
B G0 N K G0 N	JR5	F5R	700	82.7	93	1998	11.5/1	◊ C144 ◊ C90	IF 05

Tests carried out at idle speed*					Fuel *** (minimum octane rating)
Pollutant emission **					
Engine speed (rpm)	CO (%) (1)	CO2 (%)	HC (ppm)	Lambda (λ)	
750 rpm.	0.5 max	14.5 max	100 max	0.97<λ<1.03	Super unleaded (95 RON)

(1) at **2500 rpm**. CO should be 0.3 max.

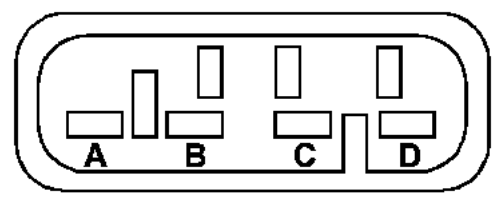
* * For a coolant temperature greater than **80ºC** and after the engine speed has stabilized at **2500 rpm.** for approximately **30 seconds**

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

*** **IO91** unleaded compatible

Temperature in °C ± 1	- 10	25	50	80	110
Throttle valve and manifold air sensor NTC type resistance in Ohms	10.450 to 8 625	2.065 to 2.040	815 to 805	-	-
Coolant sensor NTC type resistance in Ohms	-	2.360 to 2.140	850 to 770	290 to 275	117 to 112

DESCRIPTION	MANUFACTURER/ TYPE	SPECIAL NOTES
Injection and ignition computer	SIEMENS "SIRIUS 35"	**112 tracks** Direct sequential multipoint injection Static ignition with single unit coil
Motorized throttle body ∅ 60 mm (double track integrated potentiometer)	MGI/VDO	Engine resistance **= 1.6 ± 0.3 Ω** Potentiometer resistance **= 1500 ± 300 Ω**
Accelerator pedal sensor	HELLA	Double track potentiometer Track 1 resistance **= 1200 ± 480 Ω** Track 2 resistance **= 1700 ± 680 Ω**
Magnetic sensor (TDC and engine speed)	AUTOMATIC TRANSMISSION	Variable reluctance type Resistance = **200** to **270 Ω**
Camshaft position sensor	SAGEM	Hall effect sensor
Canister solenoid valve	SAGEM	Resistance: **26 ± 4 Ω at 23°C**
Pinking sensor	SAGEM	Piezoelectric type. Torque tighten to **2 daNm**
Injectors	AUTOMATIC TRANSMISSION	Resistance: **1.87 ± 0.1 Ω at 20°C** Operation under high pressure
Manifold pressure sensor	DELCO	Replace the seal each time it is removed
Fuel pressure sensor	AUTOMATIC TRANSMISSION	Resistance between tracks 2 and 3: **2200 Ω ± 220 Ω**
Air sensor	JEAGER	CTN (see table) Resistance **2500 Ω at 20°C**
Coolant sensor	JEAGER	CTN (see table) Resistance **3500 Ω at 20°C**
Fuel pressure regulator	SIEMENS	Resistance: **3.6 Ω at 20°C** Resistance: **5.4 Ω at 120°C**
Fuel pump	BOSCH	Pressure: **4.5 ± 0.06 bar**
Spark plugs	CHAMPION REC 14 PYC	Tightening torque: **2.5 to 3 daNm**
Idle speed manifold pressure	-	**310 ± 40 mbar**

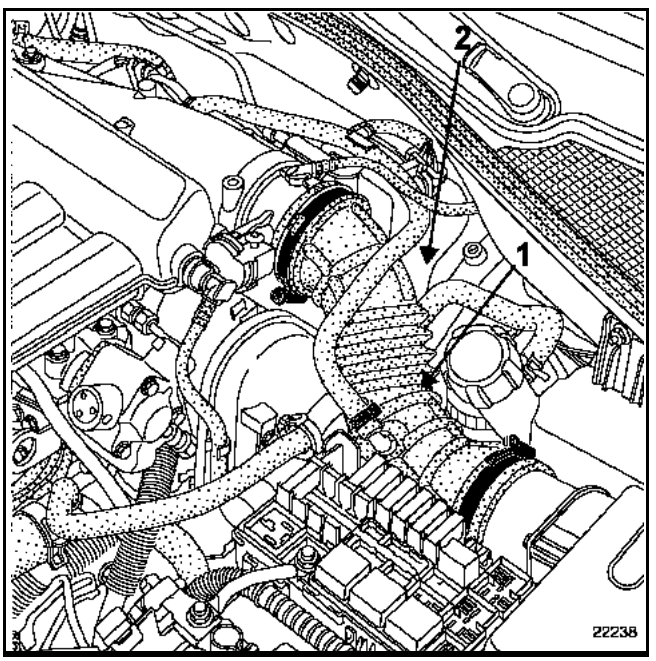
DESCRIPTION	MANUFACTURER/ TYPE	SPECIAL NOTES
Upstream oxygen sensor	BOSCH	Heater resistance: **9 ± 1 Ω at 23 °C** Rich mixture **> 750 ± 240 mV** Lean mixture **< 150 ± 50 mV**
Downstream oxygen sensor	BOSCH	Heater resistance: **3.4 ± 0.7 Ω at 23 °C** Rich mixture **> 750 ± 70 mV** Lean mixture **< 150 ± 50 mV**
Ignition coils	SAGEM	Monobloc coil with four outputs Primary resistance ≈ **0.5** Ω Secondary resistance: **11 ± 1 KΩ** A : coil feed cylinders 1 and 4 B : coil feed cylinders 2 and 3 C : supply D : common wire 

TIGHTENING TORQUE (in daNm)	
Throttle housing	1.3

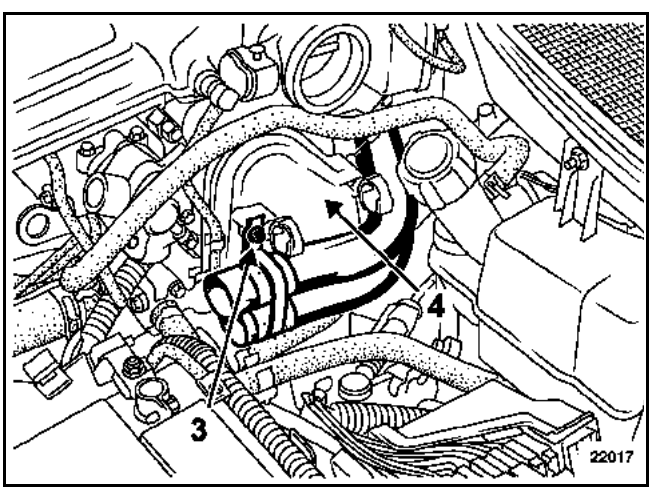
REMOVAL

Disconnect the battery.

Remove:
– the air inlet pipe (1) by disconnecting the oil vapour rebreather pipes and the air temperature connector (2),



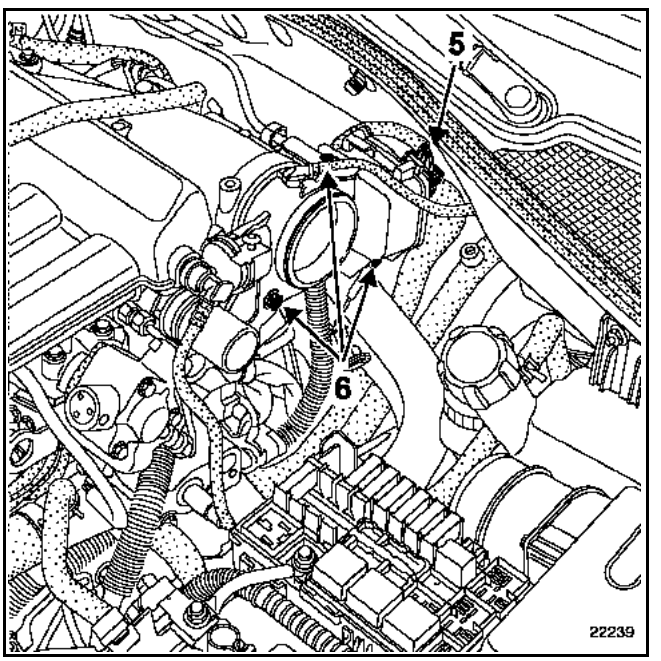
– the bolt (3) for securing the air inlet pipes,
– the air resonator (4).



NOTE: when removing the exhaust manifold cooling air inlet pipes, handle them with care as they are deformable.

Disconnect:
– the motorized throttle body connector (5),
– the petrol vapour rebreathing pipe on the canister solenoid valve.

Remove:
– the three mounting bolts (6) of the throttle body,
– the motorized throttle body.



REFITTING

Refitting is the reverse of removal.

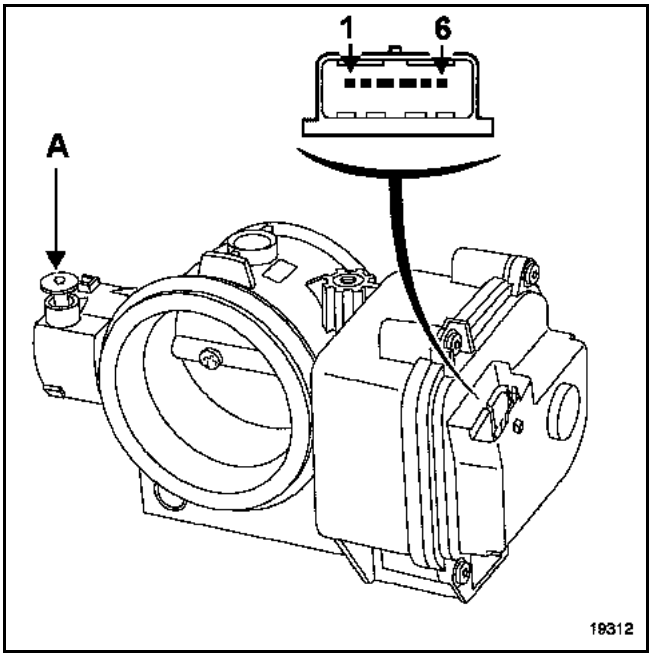
Replace the gasket every time the throttle body is removed. Use grease to assist in locating it if necessary.

IMPORTANT: the exhaust manifold cooling air inlet pipes are deformable. It is essential to handle the air inlet pipes with care and to refit them correctly.

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

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

IMPORTANT
– the motorized throttle body cannot be repaired,
– modification of the position of the stop screw (A) is forbidden.



ALLOCATION OF TRACKS

Motorized throttle body connector

Track	Description
1	Potentiometer earth
2	Potentiometer No. 1 signal
3	- motor
4	+ motor
5	Potentiometer + 5V supply
6	Potentiometer No. 2 signal

Engine resistance: **1.6 Ω ± 0.3 Ω**
Potentiometer resistance: **1500 Ω ± 300 Ω**

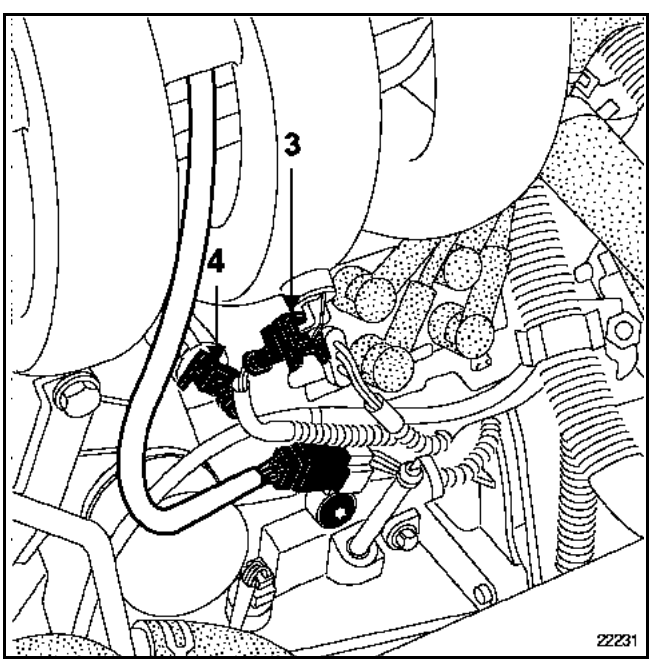
TIGHTENING TORQUES (in daNm)	
Inlet manifold ∅ 8 mounting bolts	**2.5**
Inlet manifold ∅ 6 mounting bolts	**1**
Side mounting bolt	**2.5**
Throttle body bolts	**1**

REMOVAL

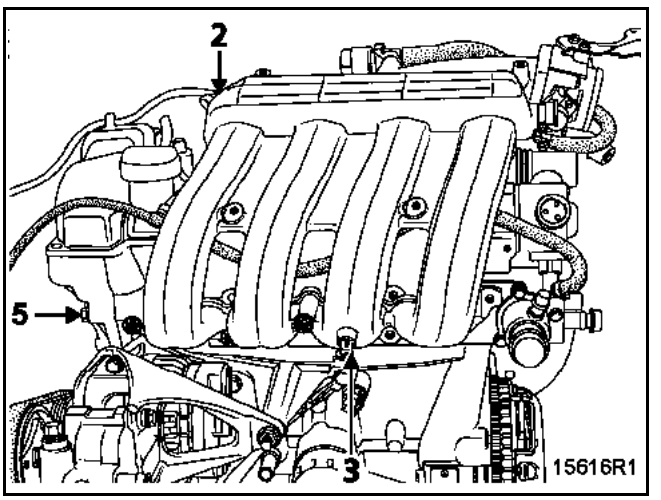
Disconnect the battery.

The removal of the inlet manifold requires the removal of the motorized throttle body. (See **Section 12 Fuel mixture "Motorized throttle body"**),

Disconnect:
– the manifold pressure sensor (2),
– the oil vapour rebreathing pipe,
– the ignition coils
– the air temperature and pinking sensors (3) and (4).



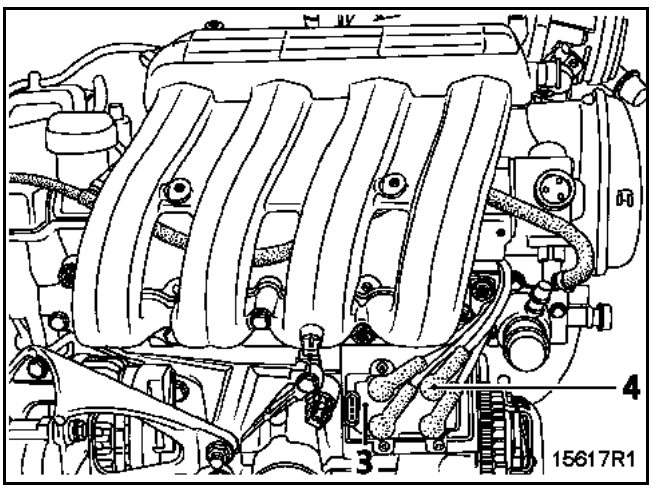
Remove:
– the ignition coils and mounting,
– the ignition rail,
– the inlet manifold side bolt (5),
– the inlet manifold mounting nuts and bolts,
– the inlet manifold.



REFITTING

Replace the inlet manifold gasket.

Refit:
– the inlet manifold by replacing the seals and observing the torques of the ∅ **6 mm** and **8 mm** nuts,



– the manifold lateral bolt,
– the ignition coil (3) and wiring loom (4),
– the resonator and the air intake pipe,
– the connectors for the pressure sensor and motorized throttle body.

IMPORTANT: the exhaust manifold cooling air inlet pipes are deformable. It is essential to handle the air inlet pipes with care and to refit them correctly.

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

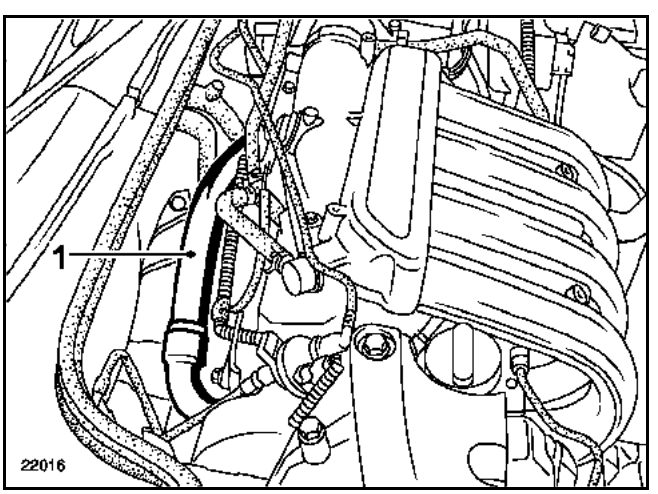
TIGHTENING TORQUES (in daNm)	
Catalytic converter/manifold connecting nuts	**1.2**
Exhaust manifold mounting nuts	**1.8**
Engine tie-bar	**6.2**
Oxygen sensor	**4.5**
Shock absorber lower bolts	**17**
Lower ball joint	**6**

REMOVAL

Put the vehicle on a two-post lift.

Disconnect the battery.

Remove:
– the exhaust manifold cooling air inlet pipes (1) For removal, refer to section **12 Fuel mixture "Inlet manifold"**,



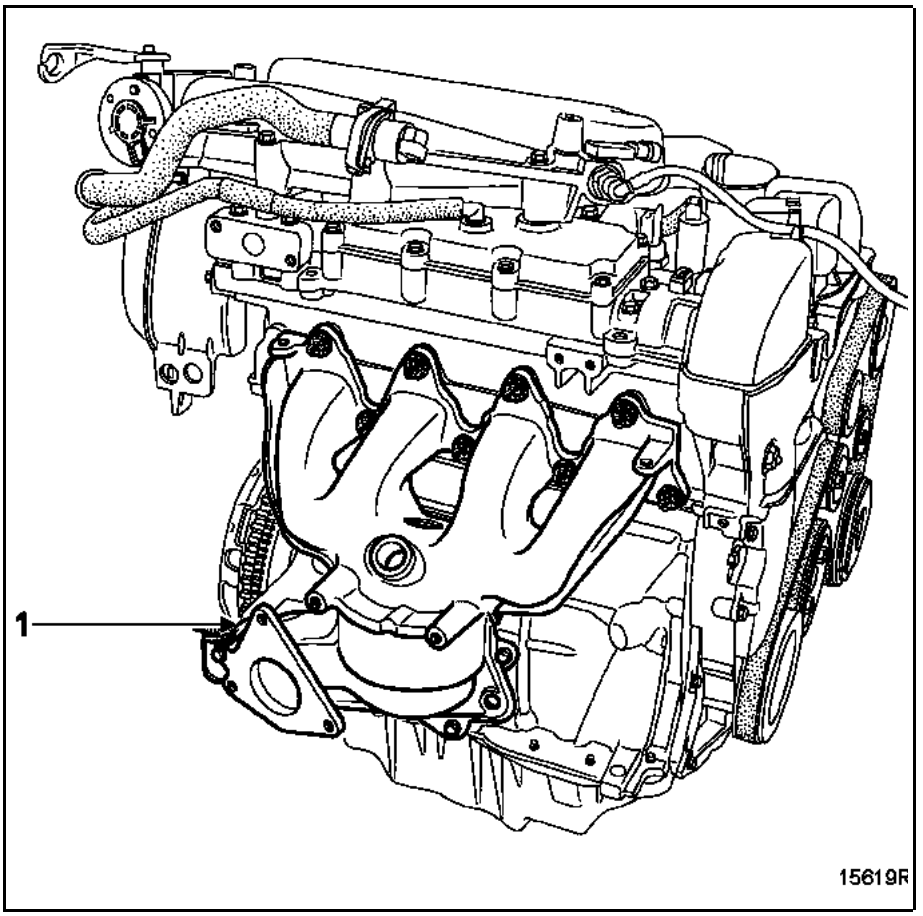
– the front right wheel,
– the front right-hand mudguard,
– the ABS sensor connector,
– the front right brake calliper,
– the lower ball joint mounting bolt,
– the shock absorber base mounting bolts,
– the front right driveshaft,
– the oxygen sensor using tool **Mot. 1495**.

– the exhaust stay (1),
– the manifold heat shields,
– the torque reaction arm,
– the manifold and catalytic converter connection mounting bolts.

Loosen the catalytic converter/ exhaust pipe connection clamp and move the catalytic converter back several centimetres.

Remove the exhaust manifold nuts.

Push the engine and disengage the manifold from the bottom.



REFITTING

Replace all removed seals.

Refit the components in the reverse order to removal.

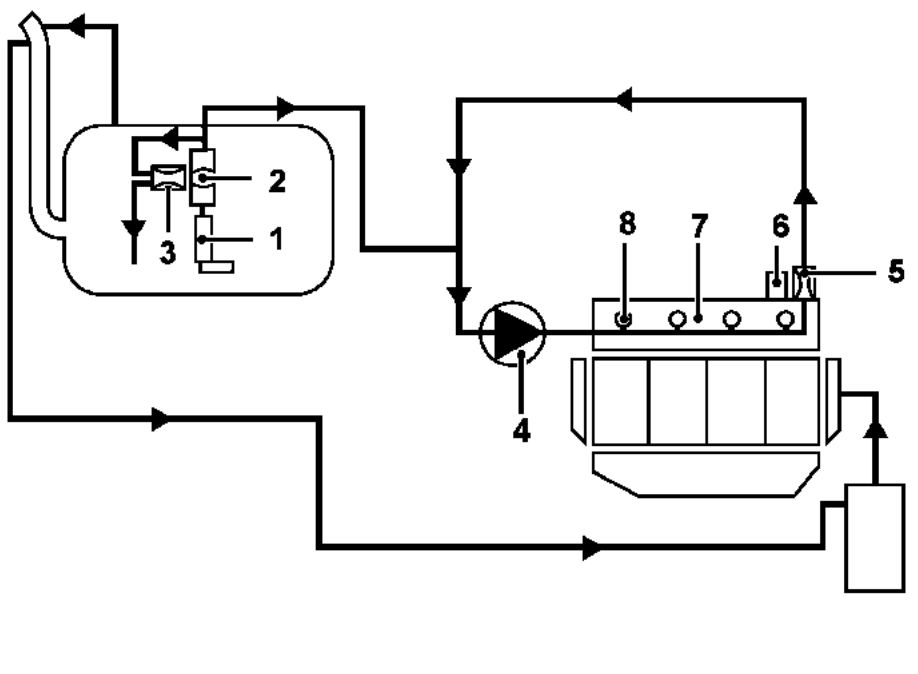
It is essential to torque tighten all bolts.

Refit the heat shield.

IMPORTANT: whenever the exhaust manifold mounting studs are removed, they must be replaced and sealed using **"LOCTITE FRENBLOC BLEUE"**.

IMPORTANT: the exhaust manifold cooling air inlet pipes are deformable. It is essential to handle the air inlet pipes with care and to refit them correctly.

The petrol supply circuit is made up of:
– the low pressure fuel pump (1) (located in the pump and sender unit assembly in the tank),
– a fuel filter (2) that cannot be separated from the pump and sender unit assembly,
– a pressure regulator (3) that cannot be separated from the pump and sender unit assembly,
– a high pressure mechanical pump located at the end of the camshaft (4) ,
– an injector rail (high pressure) (7) fitted with a pressure sensor (6) and rail pressure regulator (5),
– four solenoid injectors (8) leading directly to the combustion chamber.



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

THE CLEANLINESS INSTRUCTIONS DESCRIBED IN THIS DOCUMENT FOR ANY OPERATIONS ON THE FUEL SUPPLY SYSTEM MUST BE STRICTLY COMPLIED WITH (SECTION 17).

The low pressure fuel pump is immersed in the fuel tank.

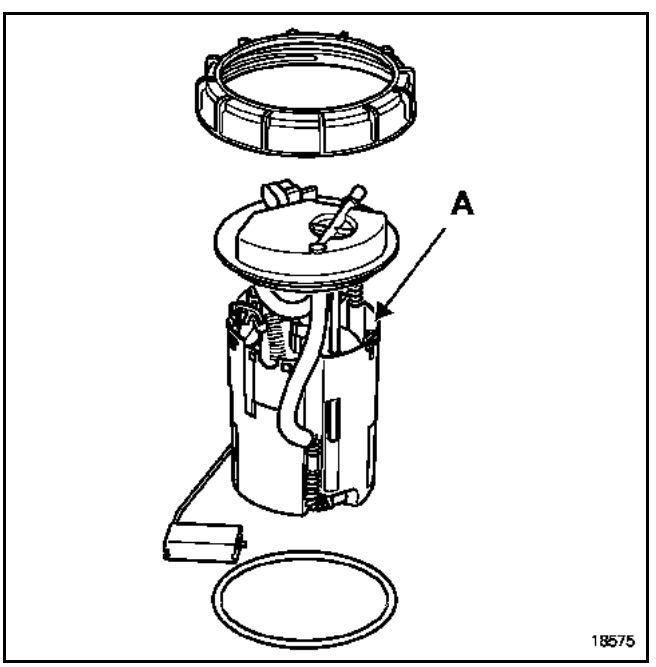
It is installed on the pump and sender unit and holds the low pressure regulator.

The fuel filter is located inside the tank; it forms part of the pump/sender assembly and cannot be separated.

If it needs to be replaced, then the whole pump/sender assembly must be replaced.

It is designed to provide efficient filtration for the whole life of the vehicle.

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



A Filter.

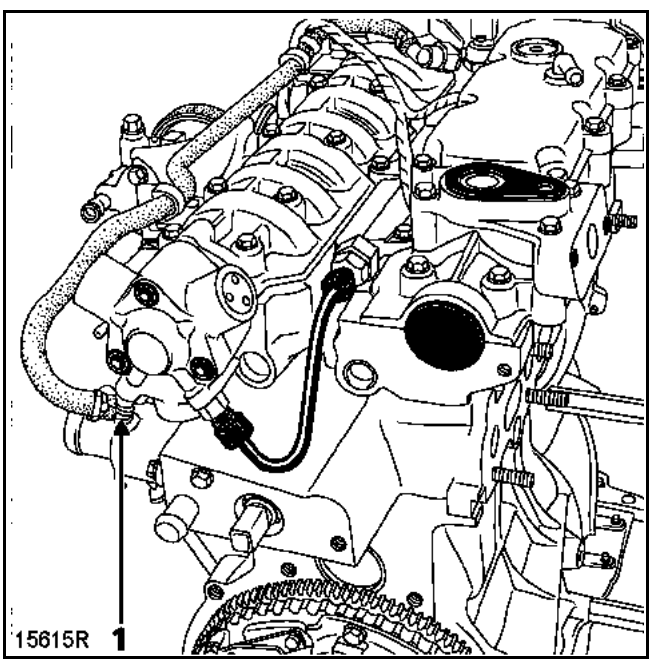
SPECIAL TOOLING REQUIRED	
Mot. 1311	Fuel pressure testing unit with pressure gauge and sockets
EQUIPMENT REQUIRED	
2000 ml graduated cylinder	

CHECKING THE FUEL PRESSURE

Disconnect the fuel supply union (1) and connect "T" union fitted with a pressure gauge **Mot. 1311**.

Start the engine in order to start the low pressure fuel pump running.

Pressure reading: **4.5 ± 0.06 bar**
Maximum pressure: **6 bar**



**IMPORTANT: the pressure reading in the fuel pressure parameter on the diagnostic tool is not measurable with a pressure gauge.
Under no circumstances attempt to read it.**

CHECKING THE FUEL PUMP FLOW

Disconnect the fuel supply pump union (1) located on the high pressure pump and place it in a measuring cylinder.

Prime the fuel pump by shunting the control relays or using the diagnostic tool.

Minimum flow reading: **165 litres/hour**

SPECIAL TOOLING REQUIRED	
Mot. 1383	Tool for removing high pressure unions

TIGHTENING TORQUES (in daNm)	
High pressure pump mounting bolts	1.2
High pressure pipe union	2.5

The high pressure pump is a mechanical pump installed at the end of the camshaft. Dismantling the interior of the high pressure pump is prohibited, as this is sold as a complete unit.

IMPORTANT: when removing the injectors, high and low pressure pumps or rail, be aware that there will be a quantity of fuel in the unions. Protect sensitive components.

REMOVAL

WARNING:
Before carrying out any work, connect the After-Sales diagnostic tool, establish dialogue with the injection computer and check that the injection rail pressure is below **5 bar**. Take note of the fuel temperature.

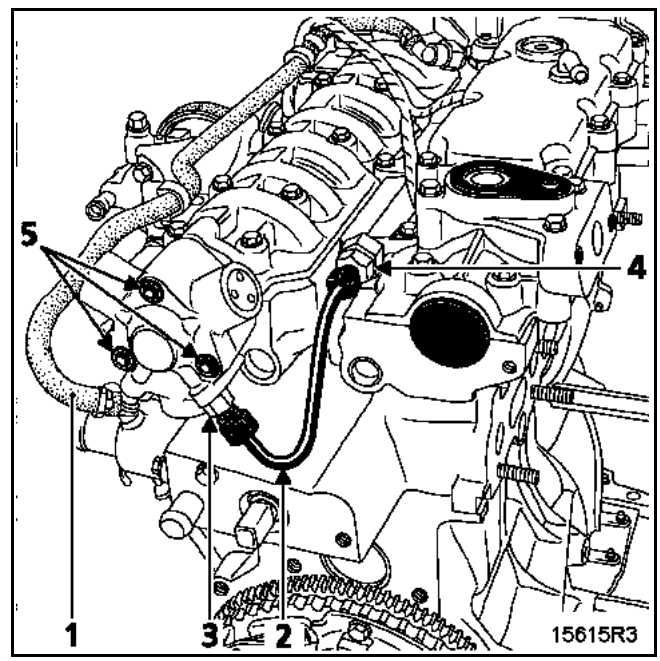
Put the vehicle on a two-post lift.

Disconnect the battery.

FOLLOW THE CLEANLINESS INSTRUCTIONS CLOSELY

Disconnect the low pressure union (1) for fuel feed and return. Fit anti-contamination plugs,

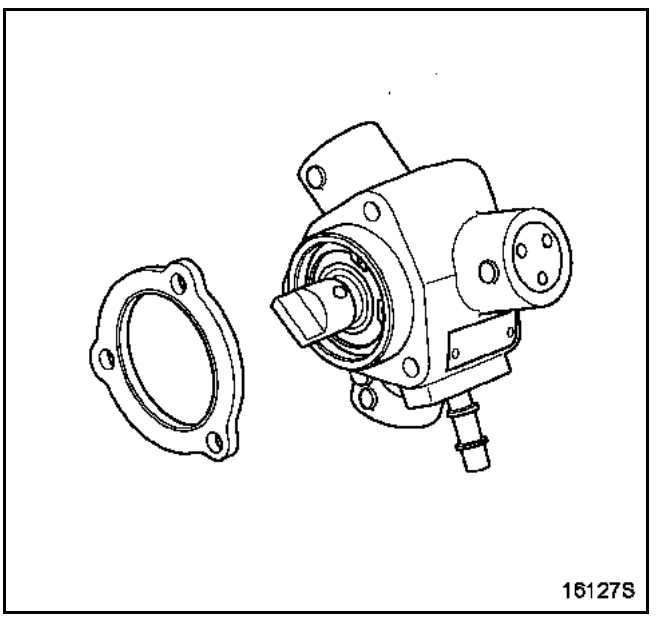
Remove:
– the inlet manifold (see the method in Section **12 "Inlet manifold"**).



– the high pressure pipe (2) using tooll **Mot. 1383**. Hold fast the intermediate steel union for the pump (3) and the rail union (4) as you undo it,
– the pump mounting bolts (5),
– the intermediate shim between the pump and the cylinder head and clean the gasket face.

REFITTING

Replace the intermediate shim between the pump and the cylinder head.



Fit:
– the pump on its mounting and torque tighten the bolts,
– the pipes and torque tighten the unions using tool **Mot. 1383**. As you do this, hold fast the intermediate steel unions for the pump and rail.

WARNING:
After carrying out any work, check that there are no leaks in the fuel circuit. Run the engine at idle speed until the cooling fan assembly starts up, then accelerate several times under no load. Check that there are no leaks.

SPECIAL TOOLING REQUIRED	
Mot. 1383	Tool for removing high pressure unions
Mot. 1530	Injector extraction tool
Mot. 1532	Injector rail removal tool
Mot. 1533	Tool for replacing injector seals
Mot. 1608	Torque screwdriver

TIGHTENING TORQUES (in daNm)	
Rail mounting bolts	1.5 ± 0.2
High pressure pipe union	2.5 ± 0.3
Pressure sensor	1.6 ± 0.05
Pressure regulator mounting bolts	0.23 ± 0.07

NOTE: removal of the intermediate union, located between the high pressure pipe and rail, and the pressure regulator is prohibited. In this instance, replace the injector rail.

The injectors are attached to the injector rail by clips. They protrude directly into the cylinder head injection chamber.

REMOVAL

WARNING:
Before carrying out any work, connect the After-Sales diagnostic tool, establish communication with the injection computer and check that the injection rail pressure is below **5 bar**. Take note of the fuel temperature.

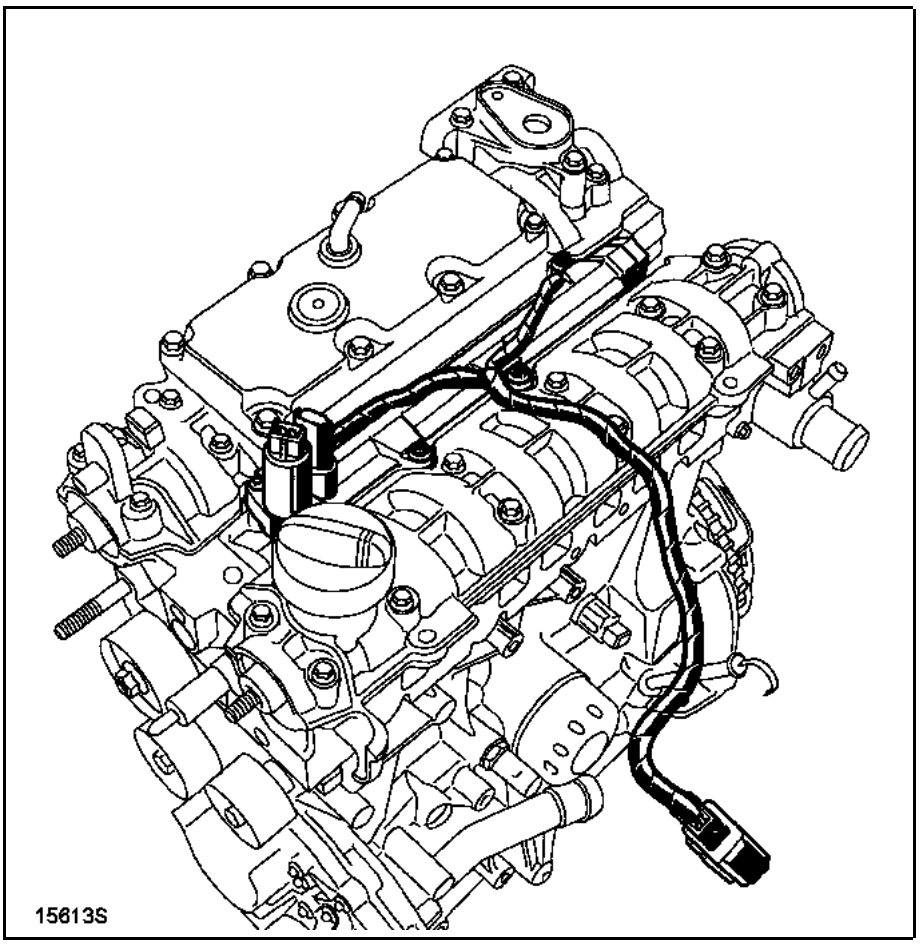
Disconnect the battery.

FOLLOW THE CLEANLINESS INSTRUCTIONS CLOSELY

Disconnect the injector rail connectors and the injectors.

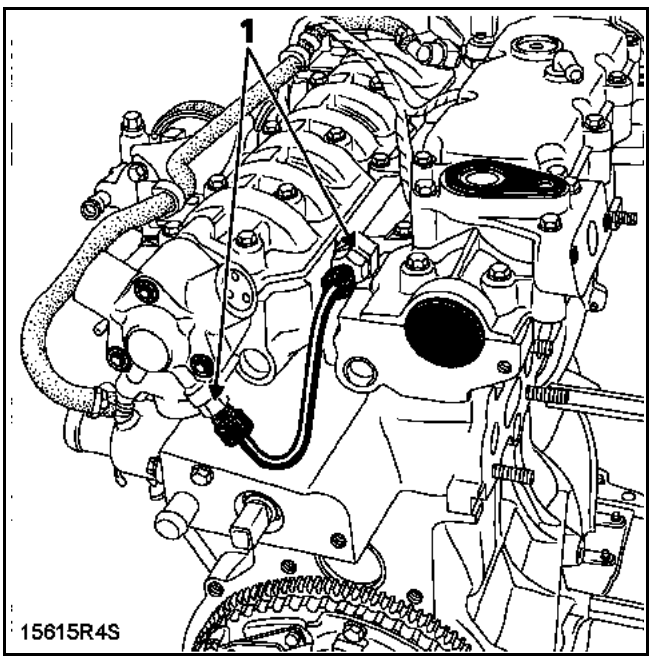
Remove the inlet manifold (see section **12 Inlet manifold**).

IMPORTANT: when removing the injectors, high and low pressure pumps or rail, be aware that there will be a quantity of fuel in the unions.
Protect sensitive components.



Remove the high pressure union using tool **Mot. 1383** maintaining the unions on the rail and pump (1).

Fit plugs to maintain cleanliness.

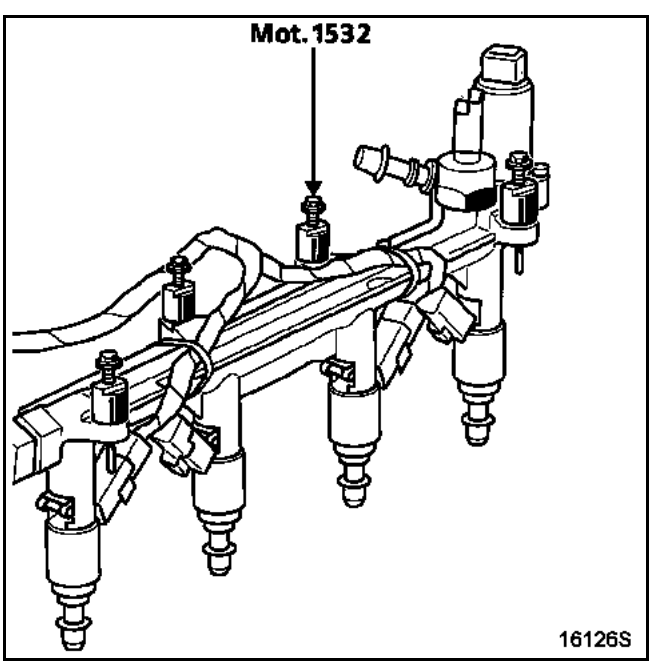


Remove the (low pressure) fuel return pipe.

Fit plugs to maintain cleanliness.

Remove the rail mounting bolts.

Extract the rail using tool **Mot. 1532** tightening each bolt consecutively by one quarter of a turn.



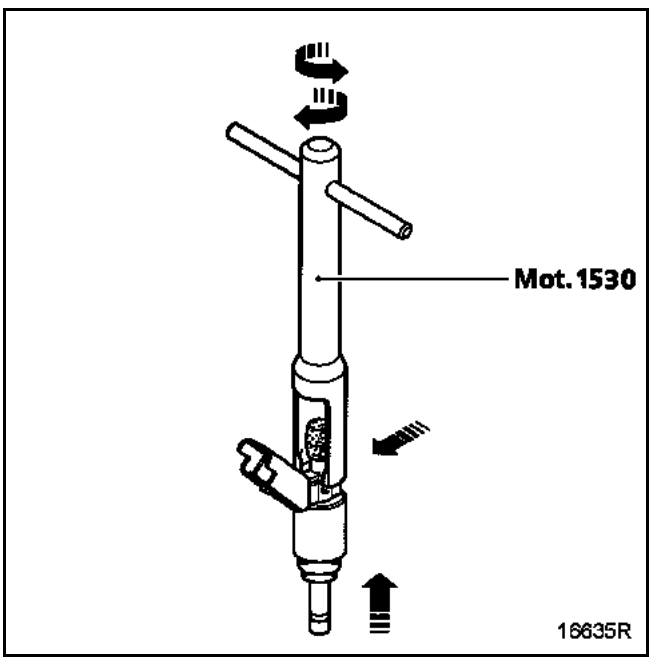
NOTE: the injectors are attached to the injection gallery by retaining clips. It is not necessary to remove them to extract the gallery.

After extracting the rail, remove the injector clips.

Fit plugs to maintain cleanliness.

Fit the extraction tool **Mot. 1530**.

Rotate in order to break the scale on the injector nozzle.



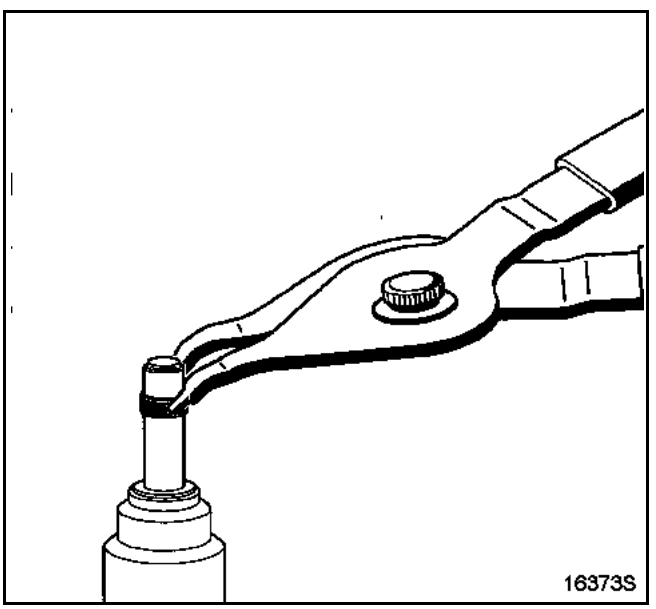
Remove the injectors.

Fit plugs to maintain cleanliness.

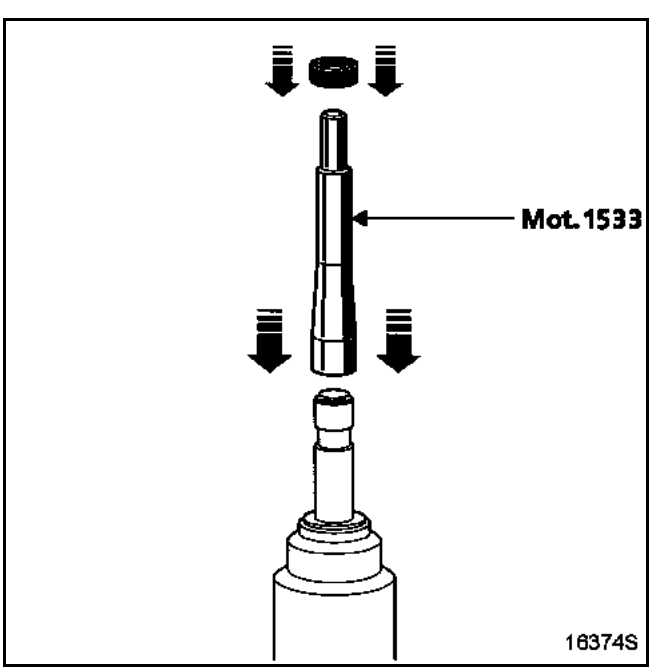
INJECTOR SEAL NOZZLE REPLACEMENT

The Teflon seals of the injectors must be replaced.

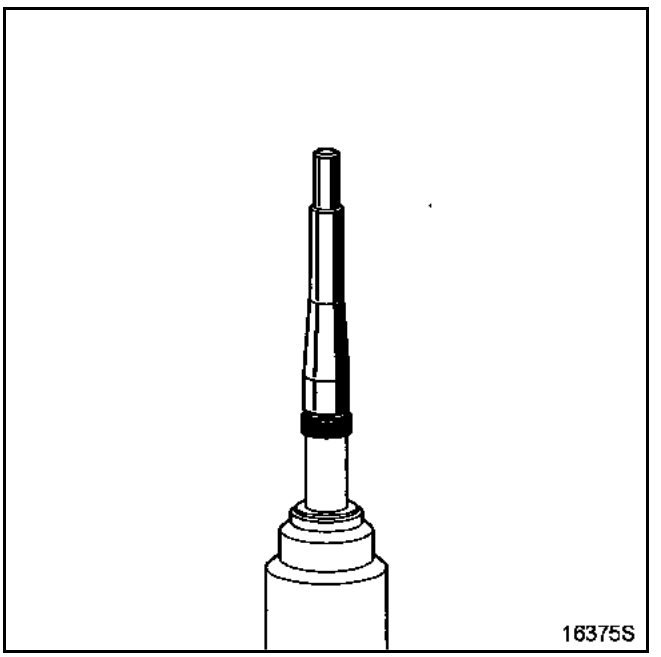
To do this:
– clean the injector by immersing it in suitable clean thinner. The use of a wire brush, sand paper or an ultrasound cleaner is forbidden,
– wipe the injector nozzle using a lint free cloth,
– carefully break the seal with circlip pliers, taking care not to mark the injector, then clean the injector again,



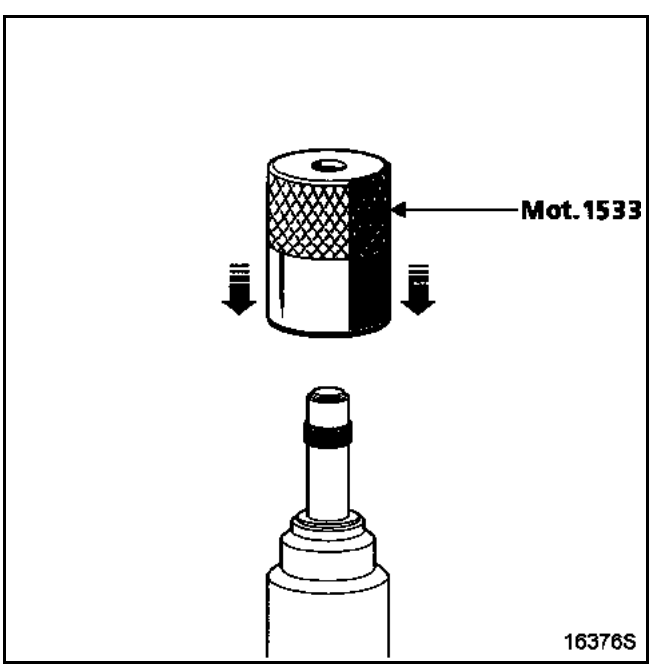
– apply:
● the cone of tool **Mot. 1533** to the injector,



● the seal to the cone, and slowly fit by hand,



– remove the cone and retract the injector seal using the body of tool **Mot. 1533** pushing it to its stop.

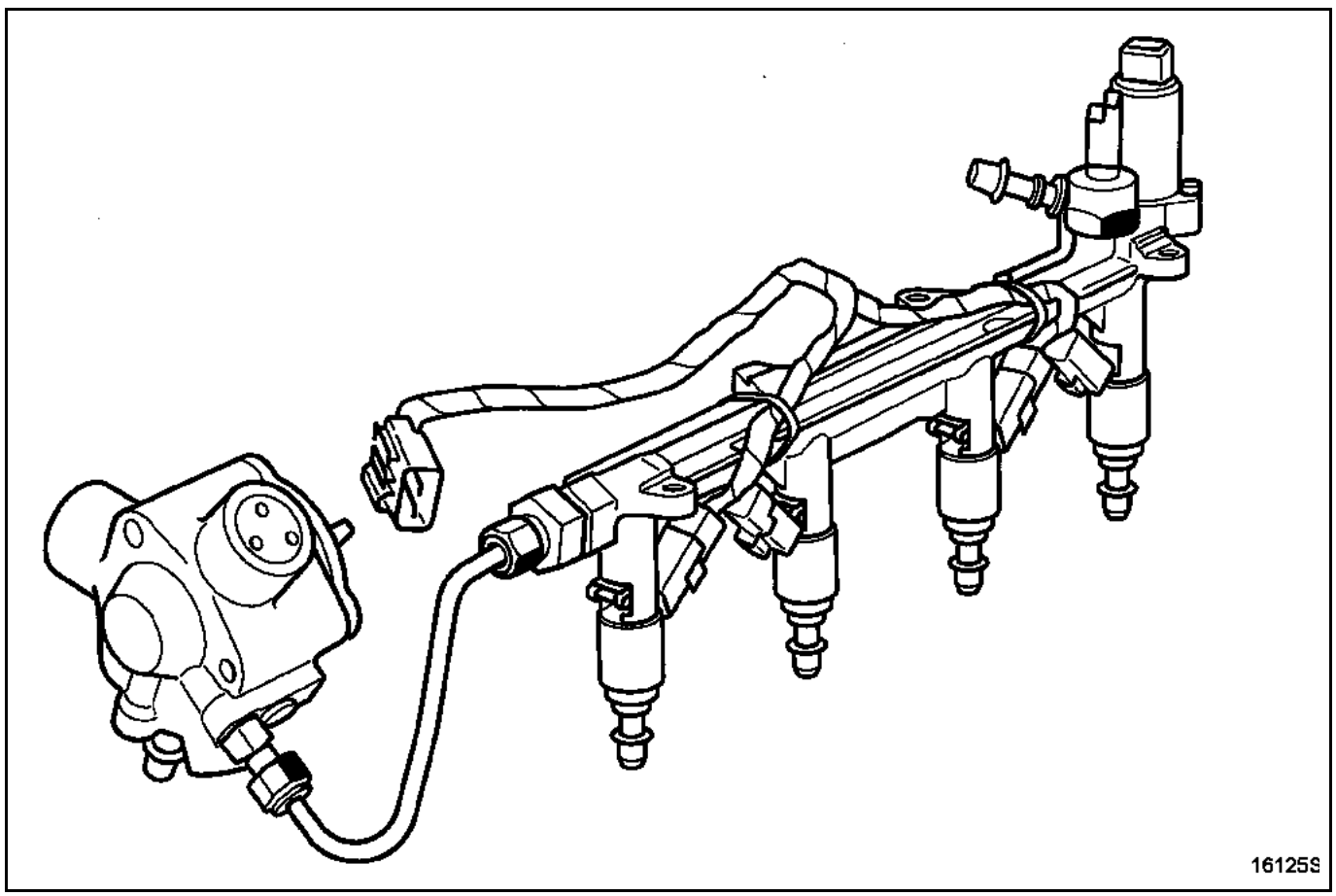


REFITTING

Replace:
– O-rings,
– the plastic clips and steel springs,
– the Teflon rings for the injectors.

position the injectors on the injector rail.

Fit the springs and retainer clips for the injectors, positioning them carefully.



Fit:
– the injection rail,
– the pipe and torque tighten using tool **Mot. 1383** taking care not to put it under pressure.

Refit the connectors.

IMPORTANT: After carrying out any work, check that there are no leaks in the fuel circuit. Run the engine at idle speed until the cooling fan assembly starts up, then accelerate several times under no load. Check that there are no leaks.

SPECIAL TOOLING REQUIRED	
Mot. 997-01	**Pressure sensor removal socket**

TIGHTENING TORQUE (in daNm)	
Injector rail pressure sensor	**1.6 ± 0.05**

REMOVAL

IMPORTANT: before carrying out any work, connect the After-Sales diagnostic tool, establish communication with the injection computer and check that the injection rail pressure is below **5 bar**. Take note of the fuel temperature.

Disconnect the battery.

FOLLOW THE CLEANLINESS INSTRUCTIONS CLOSELY

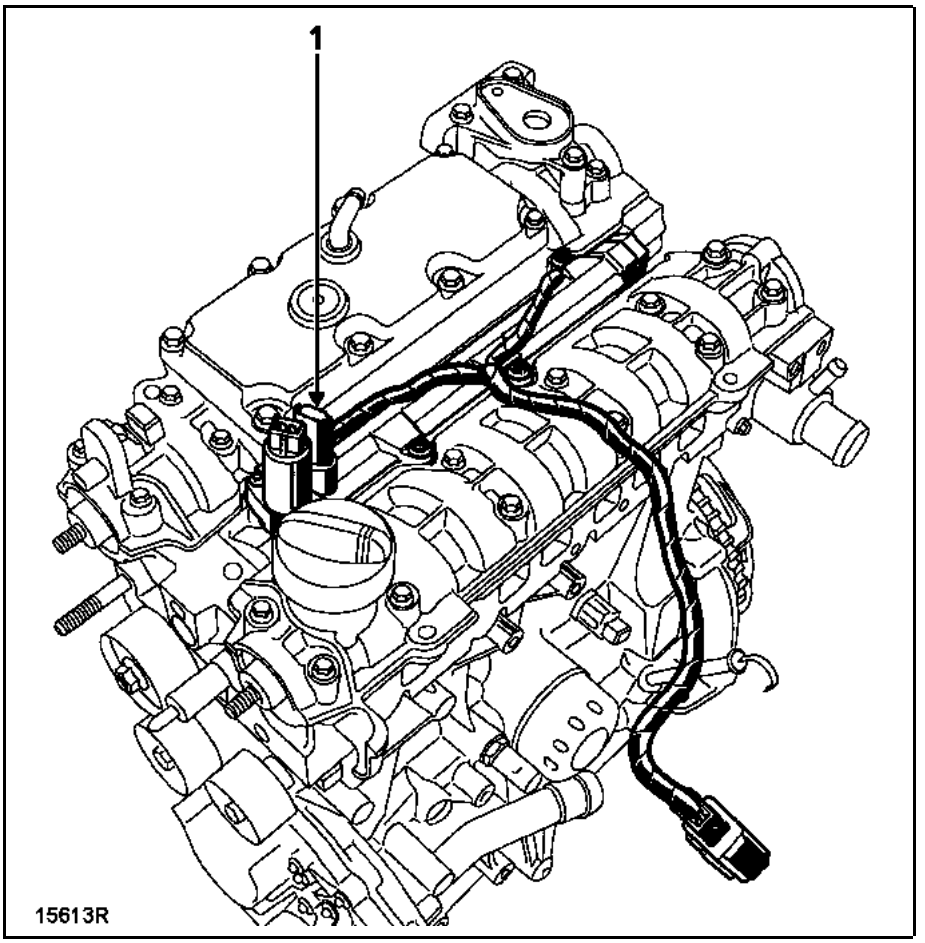
The removal of the pressure sensor requires the removal of the inlet manifold. (See section **12 Fuel mixture inlet manifold**).

IMPORTANT: when removing the injectors, high and low pressure pumps or rail, be aware that there will be a quantity of fuel in the unions. Protect sensitive components.

Disconnect the pressure sensor (1) and unscrew it.

Fit a blanking piece to maintain cleanliness.

If tool **Mot. 997-01** does not fit on the sensor, loosen the injector rail mounting bolts by a few turns to free them.



REFITTING

Replace the sealing gasket.

Position the sensor then torque tighten it.

IMPORTANT: there are two types of sensor: one with gold connections and another with tin connections. The wiring loom connector must be the same type as the sensor connector.
If this is not the case, the connector must be replaced.

IMPORTANT: before carrying out any work, check that there are no leaks in the fuel circuit. Run the engine at idle speed until the cooling fan assembly starts up, then accelerate several times under no load. Check that there are no leaks.

SPECIAL TOOLING REQUIRED	
Mot. 1608	**Torque screwdriver**

TIGHTENING TORQUE (in daNm)	
Fuel pressure regulator	**0.23 ± 0.07**

REMOVAL

IMPORTANT: before carrying out any work, connect the After-Sales diagnostic tool, establish communication with the injection computer and check that the injection rail pressure is below **5 bar**. Take note of the fuel temperature.

Disconnect the battery.

FOLLOW THE CLEANLINESS INSTRUCTIONS CLOSELY

Disconnect the fuel pressure and fuel pressure regulator sensor connector.

Remove the two regulator mounting bolts.

Remove the regulator.

REFITTING

Thinly coat the regulator seals in new engine oil.

Carefully push the regulator in without rotating in order to avoid damaging the seal.

Screw in the two regulator mounting bolts then torque tighten.

Connect the pressure sensor and regulator.

Connect the battery.

IMPORTANT: before carrying out any work, check that there are no leaks in the fuel circuit. Run the engine at idle speed until the cooling fan assembly starts up, then accelerate several times under no load. Check that there are no leaks.

SPECIAL TOOLING REQUIRED	
Mot. 1130	Tamperproof cap removing tool
Mot. 1202-01 Mot.1202-02	Pliers for large hose clips

PUMP FILTER REPLACEMENT

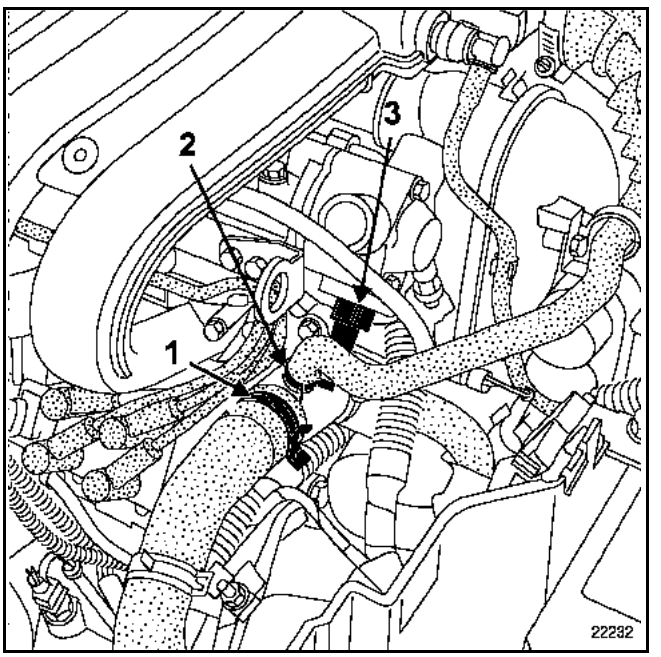
IMPORTANT: before carrying out any work, connect the After-Sales diagnostic tool, establish communication with the injection computer and check that the injection rail pressure is below **5 bar**. Take note of the fuel temperature.

Disconnect the battery.

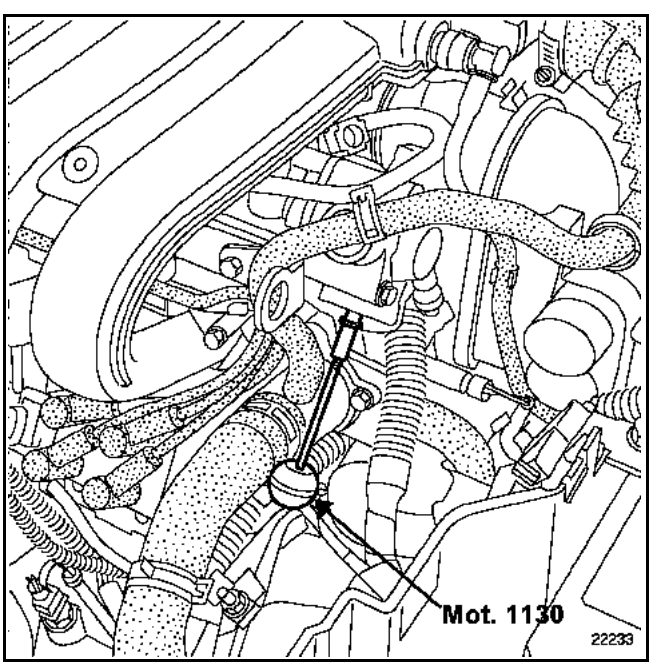
IMPORTANT: when removing the injectors, high and low pressure pumps or rail, be aware that there will be a quantity of fuel in the unions. Protect sensitive components.

Separate clips (1) and (2) from the cooling hoses using hose clip pliers **Mot. 1202-01** and **Mot. 1202-02**.

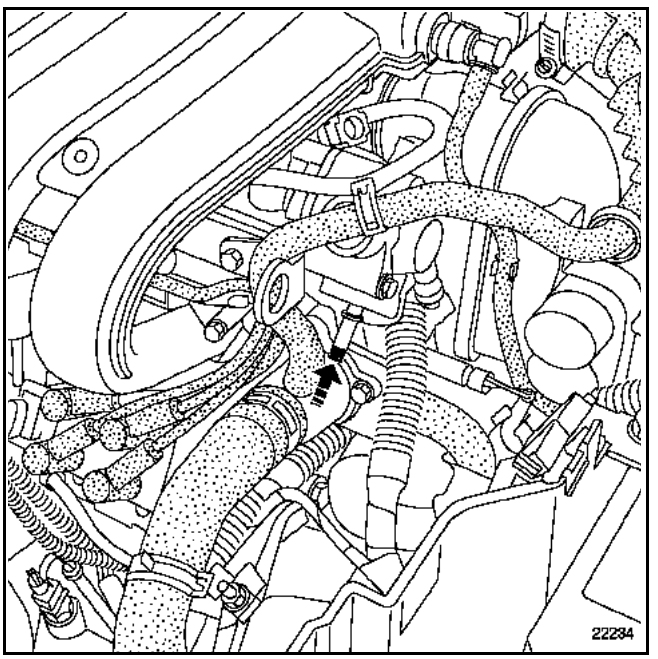
Disconnect petrol feed union (3)from the high pressure pump.



Extract the pump inlet filter using tool **Mot. 1130**.



Fit a new filter, pushing it right to the bottom with the finger.



For other operations, refitting is the reverse of removal.

IMPORTANT: After carrying out any work, check that there are no leaks in the fuel circuit. Run the engine at idle speed until the cooling fan assembly starts up, then accelerate several times with no load. Check that there are no leaks.

OPERATING PRINCIPLE

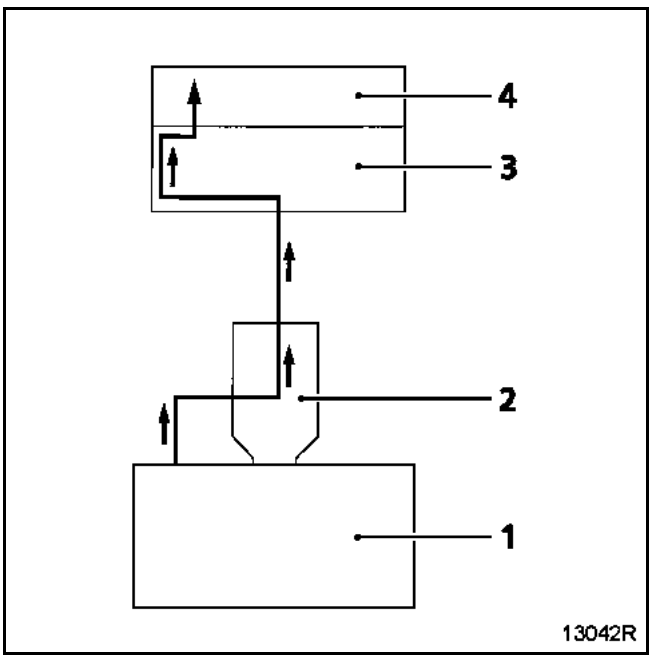
The anti-percolation system is controlled directly by the injection computer.

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

The injection calculator passes into monitoring mode after the ignition is switched off. If the engine coolant temperature passes the threshold of **99 °C** during the two minutes after the engine is switched off, the fan low speed relay is supplied.

If the temperature falls back below **96 °C**, the **fan assembly** relay is cut off (the fan assembly must not operate for more than **10 minutes**).

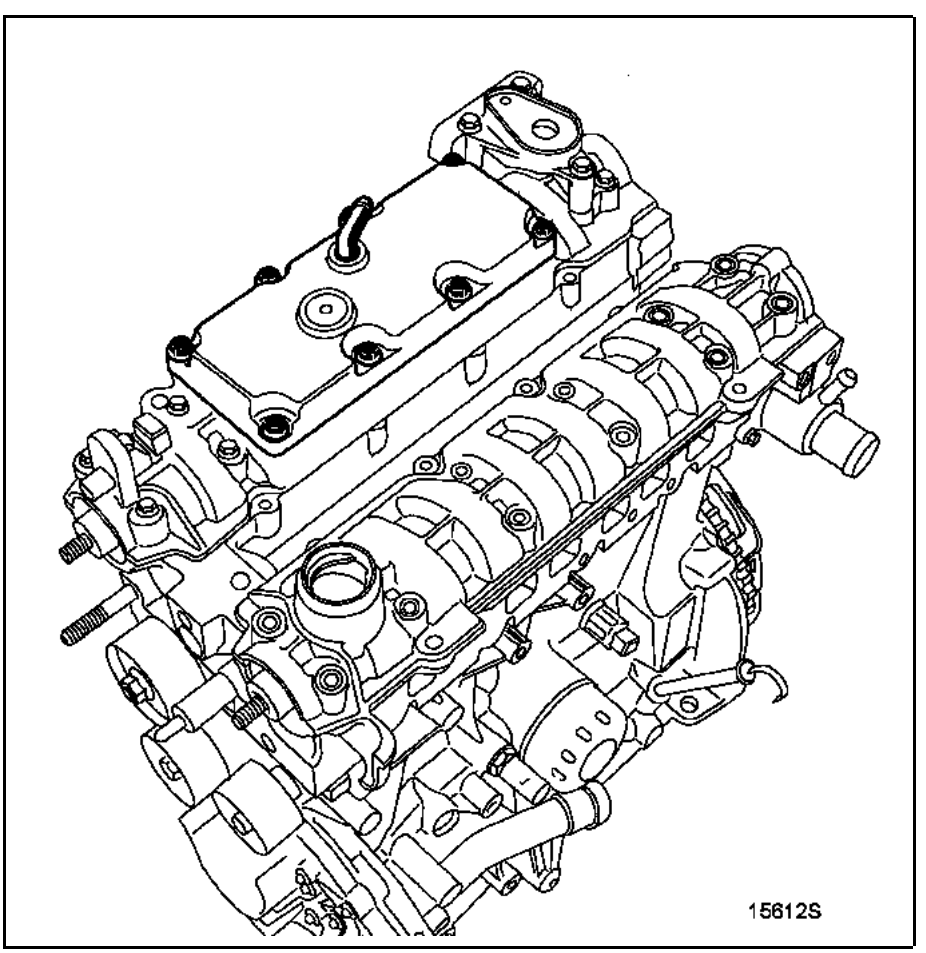
OPERATING DIAGRAM OF THE CIRCUIT



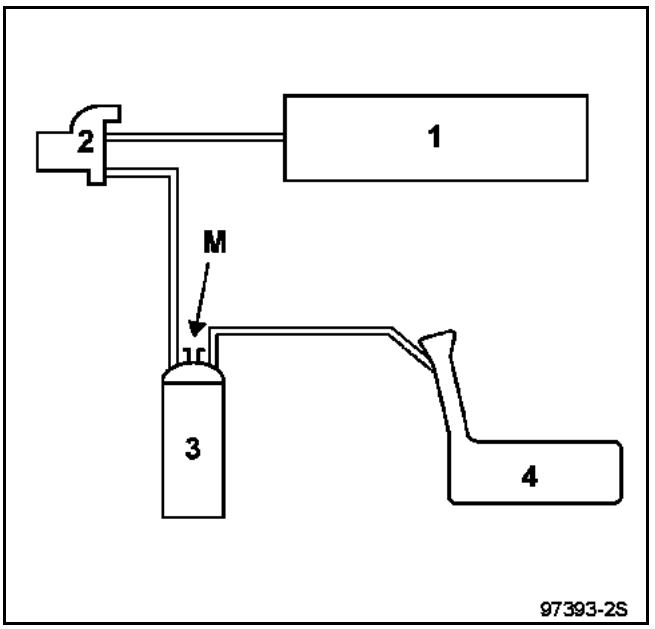
1 Engine
2 Oil decanter
3 Air filter unit
4 Inlet manifold

CHECKING

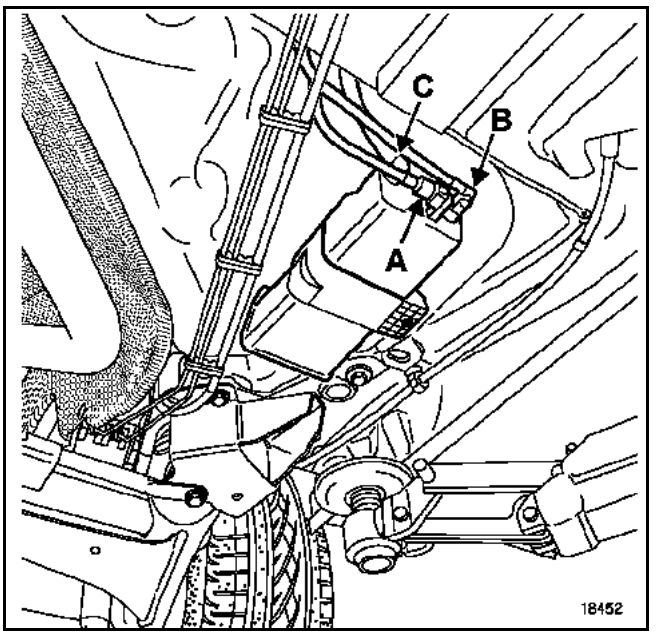
To ensure the correct operation of the anti-pollution system, the oil vapour rebreathing circuit must be kept clean and in good condition.



OPERATING DIAGRAM OF THE CIRCUIT



1 Inlet manifold
2 Canister bleed solenoid valve
3 Canister
4 Fuel tank
M Vent to the atmosphere



A Rebreathing of the fuel vapours coming from the tank
B Rebreathing of the fuel vapours going to the engine
C Tank vent

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

OPERATING PRINCIPLE

The tank vents to the atmosphere through the fuel vapour absorber (canister).

The fuel vapours are trapped by the active charcoal contained in the absorber (canister) as they pass.

The fuel vapours trapped in the canister are flushed out and burnt by the engine.

This is done by connecting the canister and the inlet manifold through piping and a solenoid valve. This solenoid valve is located on the front right shock absorber cage.

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

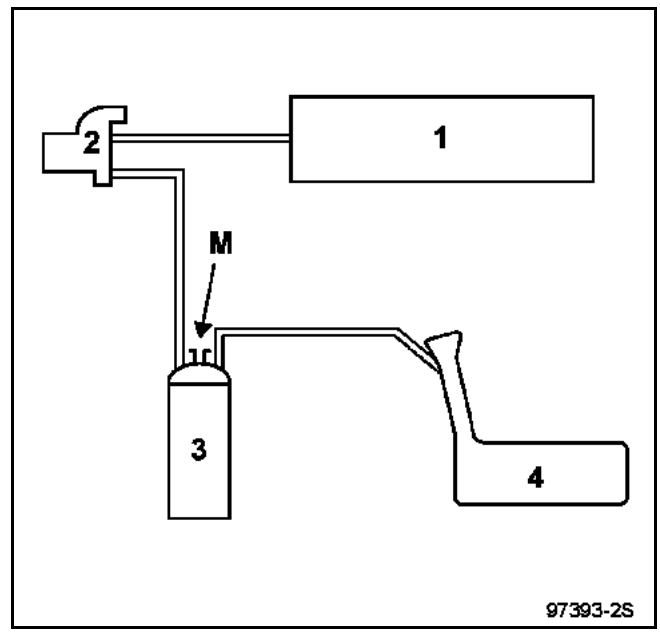
The variation in the passage made available to the fuel vapours in the solenoid valve is a result of the balance between the magnetic field created by the electrical supply to the coil and the return spring force attempting to close the solenoid valve.

CHECKING CANISTER BLEED OPERATION

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

Check the conformity of the circuit (see operational diagrams)

Check the condition of the pipes to the fuel tank.



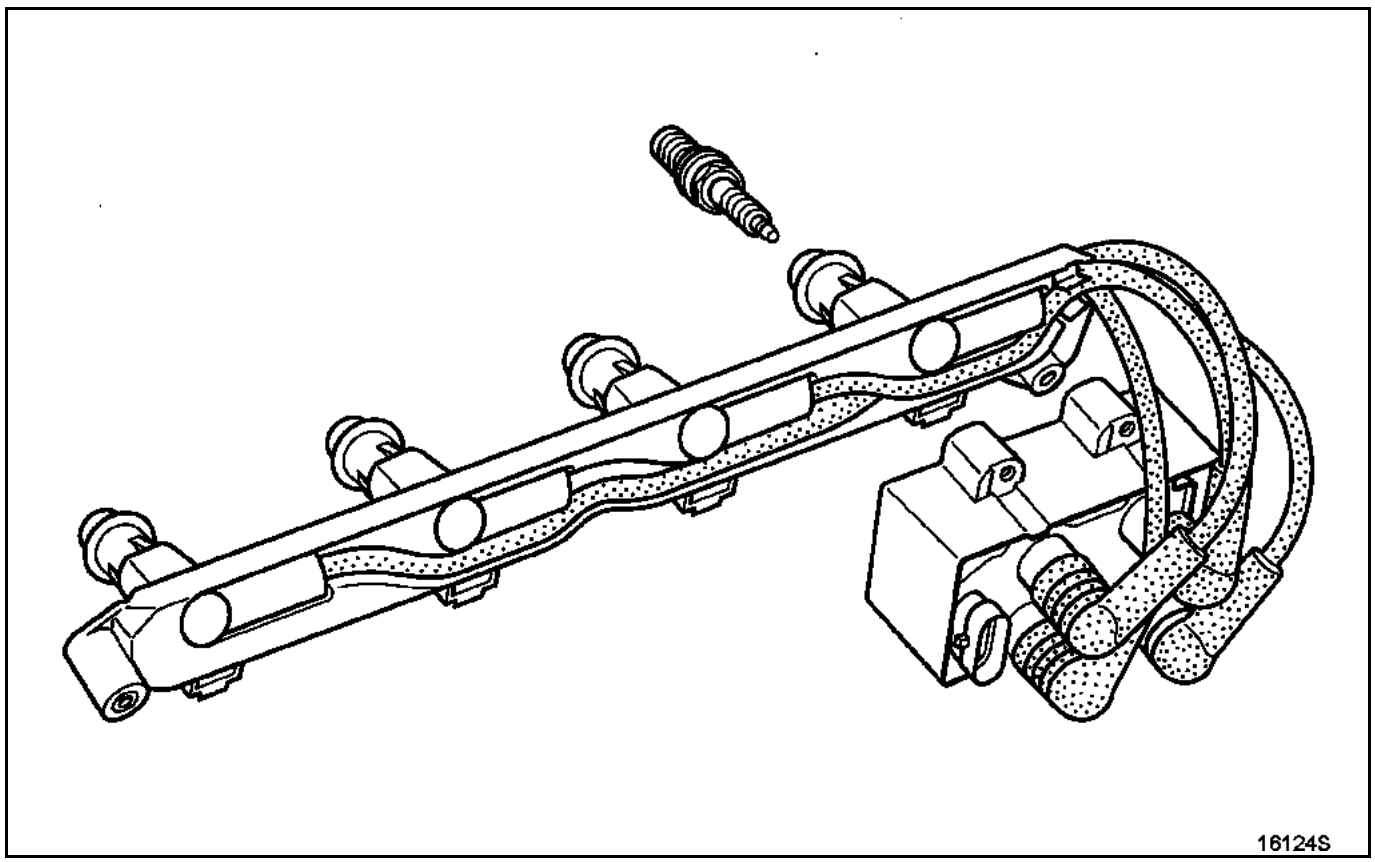
1 Inlet manifold
2 Canister bleed solenoid valve
3 Canister
4 Fuel tank
M Vent to the atmosphere

TIGHTENING TORQUES (in daNm)	
Ignition coil screws	1 to 1.5
Spark plugs	2.5 to 3

DESCRIPTION

The ignition system is static on the basis of signals from the engine speed and exhaust camshaft position sensors.

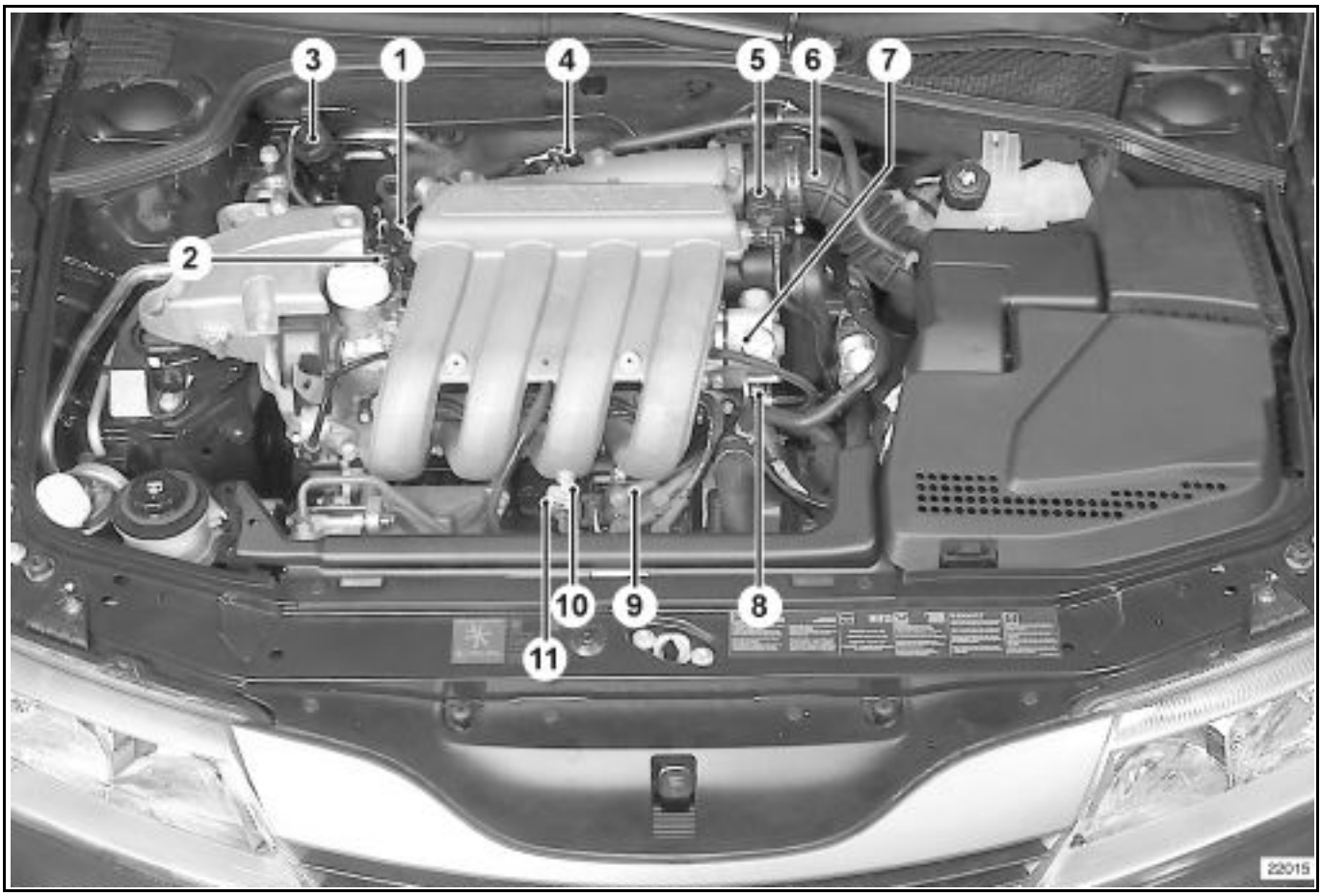
The power module is incorporated in the injection computer.



IMPORTANT: the spark plugs fitted in the F5R are engine-specific and have a long thread.

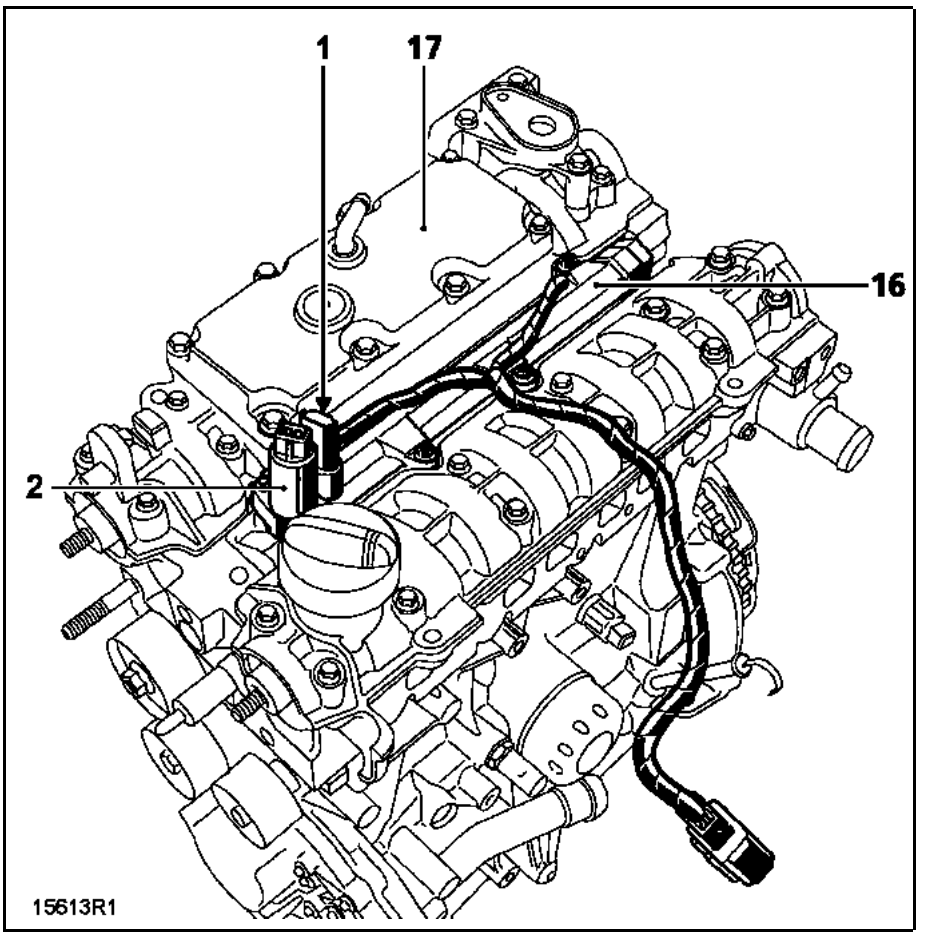
SPECIAL FEATURES OF SIEMENS Sirius 35 MULTIPOINT INJECTION

- A **SIEMENS 112-track Sirius 35** computer controls the injection and ignition.
- Multipoint injection operating in sequential mode with cylinder **n°1** position sensor on the camshaft.
- Injection warning light on the instrument panel. Special injection warning light (OBD "On Board Diagnostic" warning light). Integrated as part of the OBD "On Board Diagnostic" system.
- Special precautions relating to the engine immobiliser:
  Installation of a 3rd generation immobiliser which requires a special method for replacing the computer.
- Fuel circuit without return to the tank (the pressure regulator is located on the pump/sender unit).
- Idle speed
  nominal idle speed **750 rpm.**
- Idle speed corrected as a function of:
  – air conditioning,
  – coolant temperature,
  – battery voltage,
  – electric heated windscreen.
- Maximum engine speeds:
  – when the coolant temperature is less than **75°C** **5900 rpm.**
  – when the coolant temperature is greater than **75ºC** **6450 rpm.**
- Canister bleed solenoid valve controlled by Opening Cyclic Ratio (OCR).
- The fan unit and the coolant temperature warning light on the instrument panel are controlled by the injection computer (GCTE = Central Coolant Temperature Management).
- Automatic configuration for cruise control/speed limiter operation.
- Use of two oxygen sensors located upstream and downstream of the catalytic converter.

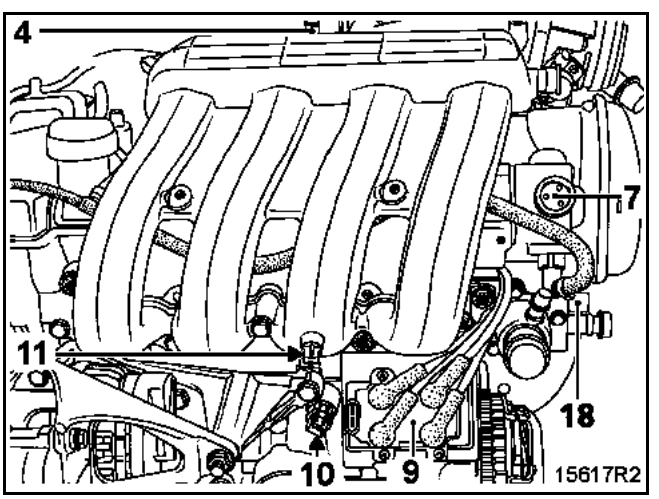


1 Fuel pressure sensor
2 Fuel pressure regulator
3 Canister bleed solenoid valve
4 Manifold pressure sensor
5 Motorized throttle body
6 Throttle air temperature sensor
7 High pressure pump
8 Engine speed sensor
9 Ignition coil
10 Pinking sensor
11 Air temperature sensor

1 Fuel pressure sensor
2 Pressure regulator
16 High pressure injector rail
17 Oil decanter

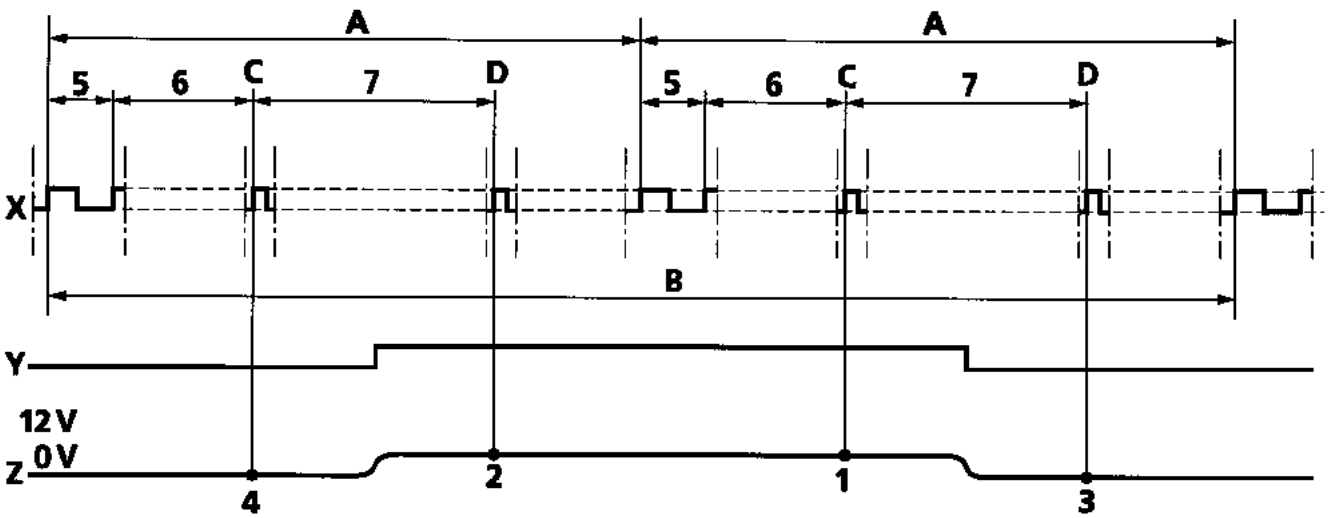


4 Manifold pressure sensor
7 High pressure pump
9 Ignition coil
10 Pinking sensor
11 Air temperature sensor
18 Coolant temperature sensor



The direct multipoint injection operates in sequential mode as soon as the engine is started.

The computer uses a camshaft sensor to detect the engine position and to determine which cylinder to inject and which spark plug to supply.



98406R1

A 1 crankshaft rotation
B 1 camshaft rotation

C Top Dead Centre 1 - 4
D Top Dead Centre 2 - 3

1 Cylinder 1 in inlet stroke
2 Cylinder 2 in inlet stroke
3 Cylinder 3 in inlet stroke
4 Cylinder 4 in inlet stroke

5 Long tooth
6 84° or 14 teeth
7 30 teeth

X Engine flywheel target
Y Camshaft target
Z Voltage released by the cylinder position sensor

NOTE: all values are expressed in degrees from top dead centre.

The injection timing is corrected according to the petrol fuel pressure.

IMPORTANT: IT IS ESSENTIAL TO FOLLOW THE CLEANLINESS AND SAFETY INSTRUCTIONS DESCRIBED OVERLEAF WHEN CARRYING OUT ANY WORK.

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

RISKS LINKED TO POLLUTION

The petrol direct injection system is very sensitive to pollution. The risks caused by the introduction of contamination are:
– damage to or destruction of the high pressure injection system,
– seizing or non-sealing of a component,
– destruction of the engine (by continuously injecting into the cylinder).

All After-Sales operations must be performed under very clean conditions. This means that no impurities (particle of several microns in size) must enter the high pressure injection system while it is being dismantled, or the circuits through the fuel connectors.

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 swarf,
– paint,
– fibres:
  ● of cardboard,
  ● brushes,
  ● paper,
  ● clothing,
  ● cloths,
– foreign bodies such as hair,
– ambient air,
– etc.

WARNING: when cleaning the engine with a high pressure jet take care not to damage the connections. In addition, moisture may collect in the connectors and create electrical connection problems.
Water may also build up in the injector and plug wells which open out directly into the cylinder.

INSTRUCTIONS TO BE FOLLOWED BEFORE ANY WORK IS CARRIED OUT ON THE INJECTION SYSTEM

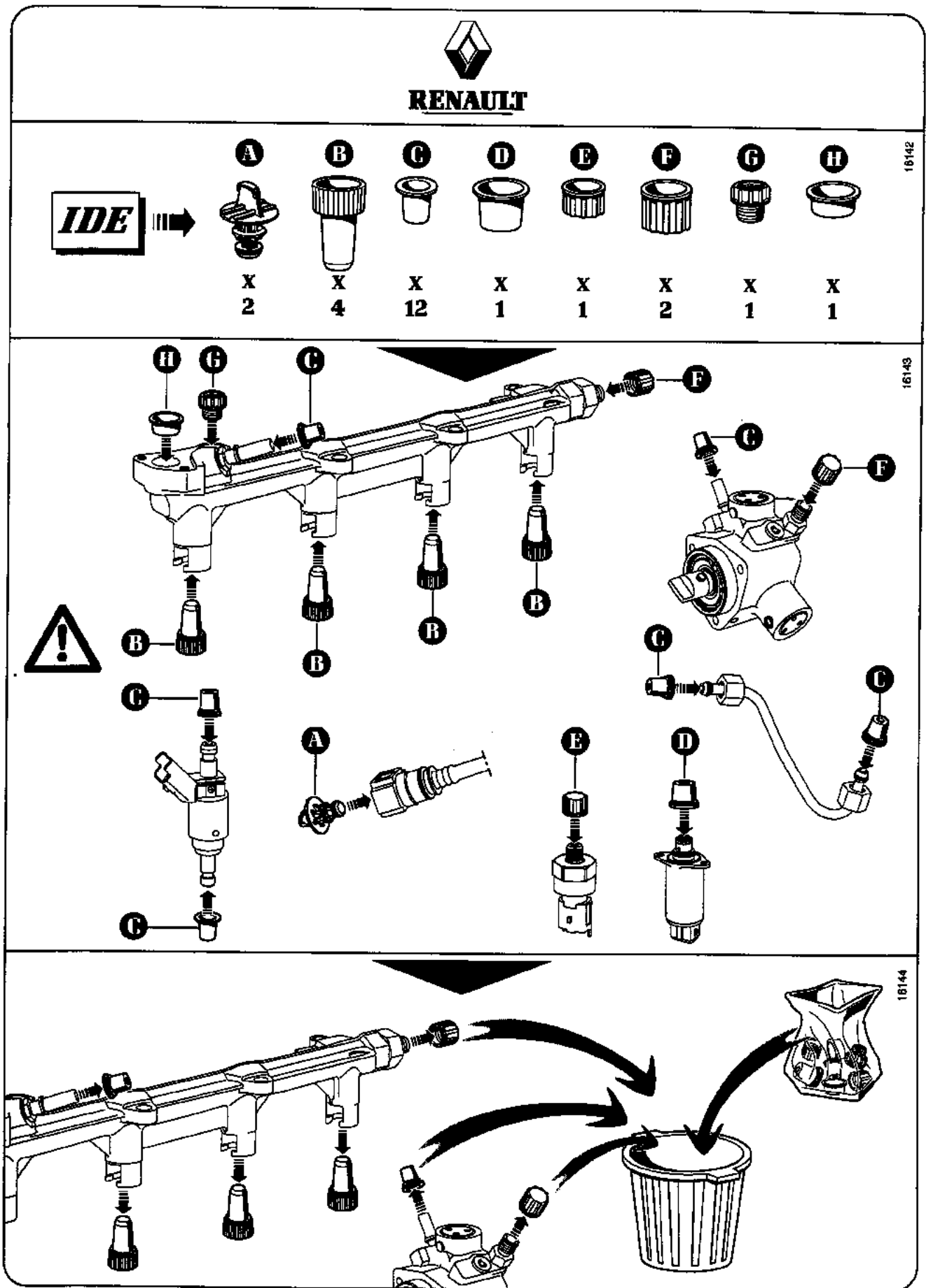
- Ensure that you have the plugs for the unions to be opened (bags of plugs may be obtained from the Parts Stores). Plugs are to be used once only. They must be disposed of after use. It is not sufficient to clean them in order to reuse them.
- Ensure that you have the resealable plastic bags for storing removed parts. Stored parts will therefore be less subject to the risk of impurities. Bags are to be used once only and should be disposed of after use.
- Make sure that lint-free cleaning cloths are available (cleaning cloths part number **77 11 211 707**). **The use of a normal cloth or paper for cleaning purposes is forbidden.** These are not lint free and may contaminate the fuel circuit of the system. Each lint-free cloth should only be used once.

INSTRUCTIONS TO BE FOLLOWED BEFORE OPENING THE FUEL CIRCUIT

- Use new thinner for each operation, (used thinner contains impurities). Pour it into a clean container.
- For each operation, use a clean brush which is in good condition (the brush must not lose its hairs).
- Using a brush and thinner, clean the parts to be dismantled, the tools which are to be used and the part of the bench used.
- Wash your hands before and during the operation if necessary.
- When wearing leather protective gloves, cover these with latex gloves (available from SODICAM).

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. These items are likely to allow impurities to enter 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.
- When cleaning a gasket face, use lint free absorbent paper. Start from the centre of the part and progressively clean towards the outside so as to move the impurities outwards.



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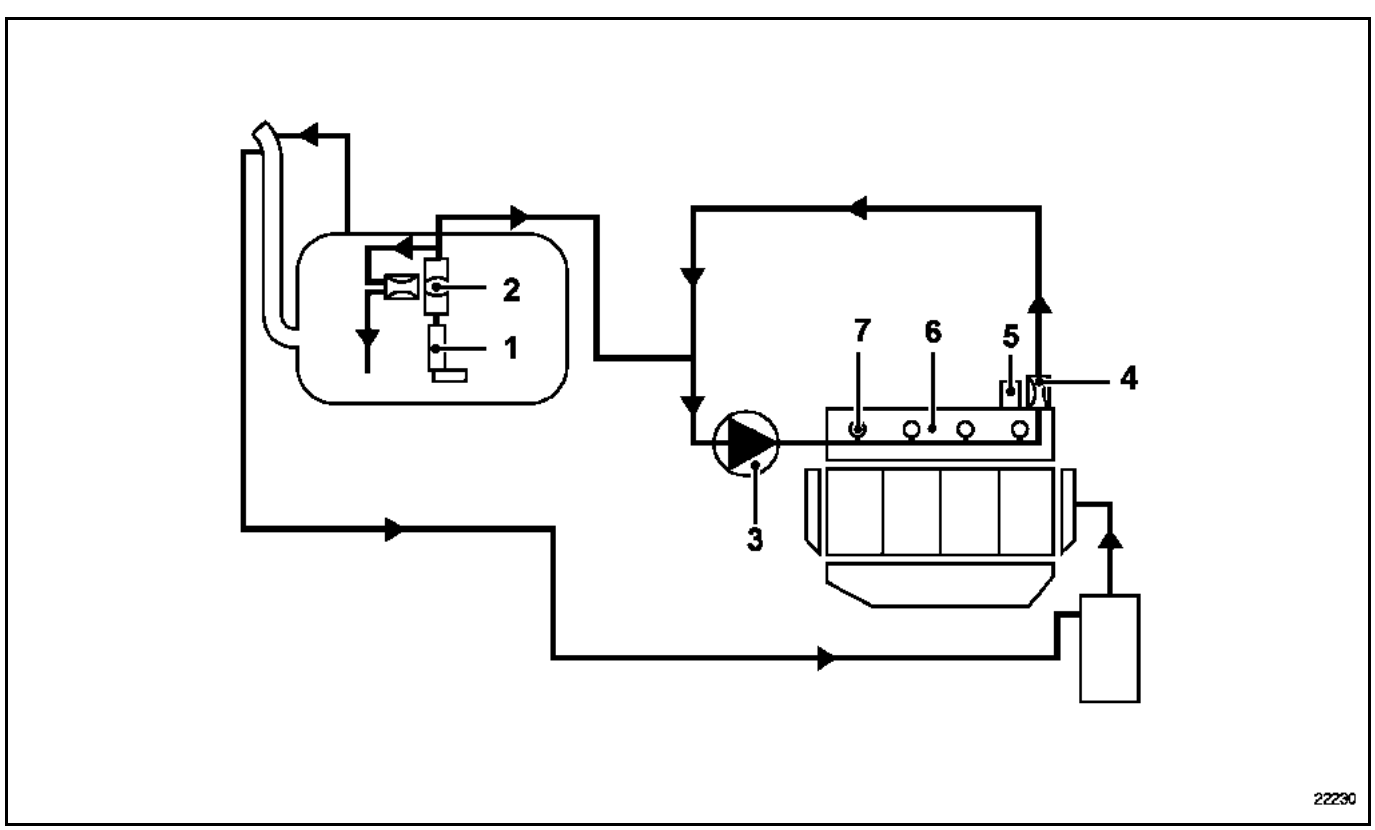
DIRECT INJECTION OPERATION

The low pressure pump (also called the supercharging pump) supplies the high pressure pump, through the filter under pressure of **4.5 bar**.

The high pressure pump has the unique role of supplying the flow that it directs towards the rail. The pressure regulator located on the rail modulates the high pressure value according to the computer commands and the pressure sensor data. The fuel circulates in the rail, feeding each injector.

The computers:
– determine the value of pressure necessary for the engine to operate well and then control the regulator. They check that the pressure value is correct by analysing the value transmitted by the high pressure sensor located on the rail,
– determine the injection time necessary to deliver the right quantity of fuel and the moment when injection should be started. Having determined these two values, they control each injector individually. The system can inject the fuel into the engine at a pressure of between **40 and 100 bar**,
– manage ignition.

The system consists of:
– a low pressure pump (1) located in the inlet assembly,
– a fuel filter (2) located in the inlet assembly,
– a high pressure pump (3) located at the end of the camshaft,
– a regulator (4) and a pressure sensor (5) fitted on the rail,
– an injector rail (6),
– four solenoid injectors (7),
– various sensors (coolant and air temperature sensors, pressure sensor...),
– a **112 track** injection computer controlling injection and ignition.



Vehicles that operate with the direct multipoint injection system use two injection warning lights that light up for several seconds each time the ignition is switched on:
– the injection warning light for minor faults,
– the coolant temperature warning light:
  ● on constantly if the coolant temperature is greater than **118 °C**,
  ● flashing if there is a major injection fault **requiring the engine to be switched off** as quickly as possible.

PRINCIPLE FOR INJECTION MINOR FAULT WARNING LIGHT COMING ON

When there is a minor fault on the high pressure injection system, the fault warning light lights up. These faults are:
– injector fault,
– low pressure operating fault,
– computer link problem,
– fuel pressure sensor fault
– excessive pressure.

If a fault is present when the ignition is switched on, the warning light lights up for a few seconds, goes out and then lights up again according to the fault.

PRINCIPLE FOR COOLANT TEMPERATURE WARNING LIGHT COMING ON

When there is a serious fault in the high pressure injection system, the engine overheating light flashes. If this should happen, it is essential to switch off the engine as quickly as possible. These faults are:
– fuel pressure regulator fault (pressure above **125 bar**),
– pressure sensor fault (pressure above **125 bar**).

In such an instance, the (low pressure) supercharging pump, ignition and injection are cut off after several seconds.

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

REPLACING AN INJECTION COMPUTER

For the removal and refitting of the computer, follow the methods in section **17 Injection computer of Workshop Repair Manual 339**.
For programming the immobiliser code, see section **82 Immobiliser of Workshop Repair Manual 339**.

WARNING:

With this engine immobiliser system, the computer keeps its immobiliser code for life.

Furthermore, this system does not have a security code.

Consequently, it is forbidden to perform tests with computers borrowed from the stores or from another vehicle which must then be returned.

It will no longer be possible to decode them.

THE COMPRESSOR IS OF VARIABLE DISPLACEMENT TYPE

AIR CONDITIONING/INJECTION COMPUTER LINK

The injection computer controls air conditioning compressor clutch authorization.

The data used for the air conditioning function is exchanged via the multiplex network:
– Track A A3 multiplex link CAN L (passenger compartment),
– Track A A4 multiplex link CAN H (passenger compartment),

When the air conditioning is switched on, the air conditioning computer requests authorization to engage the compressor clutch. The injection computer either authorizes or inhibits engagement of the compressor clutch, controls the fan unit and orders fast idle speed. This speed may reach **900 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 **10 seconds** after the engine is started.

Maximum engine speed protection programming
The compressor is disengaged if the engine speed is greater than **6300 rpm.**

Thermal protection program
The compressor does not engage in cases where the coolant temperature is greater than **115°C**, at high speed.

MOTORIZED THROTTLE BODY

The motorized throttle body carries out idle speed regulation and engine air inlet modulation functions. It is composed of an electric motor and two throttle position potentiometers.

When the engine is idling, the throttle position is adjusted according to the idle speed setting. This setting takes into account the major power consumers (air conditioning) and operating conditions (air temperature and coolant temperature).

When the driver depresses the accelerator pedal, his request is translated as the angle of the throttle opening. However, to improve driving comfort, the throttle opening is not directly proportional to the driver's request.

To eliminate misfires, facilitate gear changes and safety functions, the throttle body modulates the engine torque.

MOTORISED THROTTLE BODY DEFECT MODES

The motorized throttle body has three types of defect mode.

- **Reduced Performance Mode:** this mode covers electrical faults for which there is a viable backup solution for the injection system (loss of one of the two tracks on the pedal or the throttle body).
  This mode results in reduced acceleration and limits the maximum opening of the throttle.

- **Loss of Driver Intervention Mode:** this mode is also called the **"Electrical Limp Home Mode"**. This mode is applied when the accelerator pedal signal disappears completely, but the injection computer still controls the aspiration of air by the engine (automatic throttle control is still operational).

- **Mechanical Limp Home Mode:** this mode covers breakdowns which result in loss of the automatic throttle control (the throttle can no longer be controlled).
  In this case the throttle is in the mechanical rest position and the injection computer limits the engine speed by cutting off the injection.

NOTE: Each of these modes results in illumination of the injection fault warning light on the instrument panel.

IDLE SPEED CORRECTION ACCORDING TO COOLANT TEMPERATURE

Coolant temperature in °C ± 1	-20°	0°	20°	40°	60°	80°
Engine idle speed in rpm	1150	1088	1088	900	750	750

ELECTRICAL CORRECTION ACCORDING TO BATTERY VOLTAGE AND ELECTRIC POWER BALANCE

The purpose of this adjustment is to compensate for the drop in voltage due to a power consumer being switched on when the battery is not well charged. It starts when the voltage falls below **13 V** and the engine speed may reach a maximum of **990 rpm.**

POWER STEERING PRESSURE SWITCH/INJECTION COMPUTER LINK

The injection computer receives a signal from the power steering pressostat and may increase the idle speed to compensate for this power consumption.

IDLING SPEED CORRECTION ACCORDING TO HEATED WINDSCREEN INFORMATION

If the windscreen is selected, the idling speed is fixed at **1000 rpm.**

IDLE SPEED ADJUSTMENT WHEN THERE IS AN ACCELERATOR PEDAL POTENTIOMETER FAULT

If there is a fault on the two accelerator pedal position potentiometers, the computer enters performance limiting mode.

If there is a fault on the two accelerator pedal position potentiometers, then the engine speed rises to **1800 rpm**.

ADJUSTMENT OF THE IDLE SPEED WHEN THERE IS A MOTORIZED THROTTLE BODY FAULT

If there is a fault on the two accelerator pedal position potentiometers, the computer enters performance limiting mode.

If there is a fault on the two accelerator pedal position potentiometers, the throttle body enters "Mechanical Limp Home Mode" (throttle body mechanical stop).

The engine speeds are then **800 and 1100 rpm**.

ADAPTIVE IDLE SPEED ADJUSTMENT

PRINCIPLE

Under normal hot engine operating conditions, the throttle angle opening value varies between a high value and a low value, so that the nominal idle speed is obtained.

It is possible that, due to variations in the operation of the vehicle (running in, engine fouling, etc.), the throttle angle opening value could be close to the highest or lowest values.

The adaptive correction of the idle speed throttle angle opening enables the engine's air requirement to be slowly varied, by bringing the throttle angle opening back to a nominal average value.

This adjustment only takes effect if the coolant temperature is above **85°C**, **30 seconds** after the engine is started and during the idle speed regulation phase.

THROTTLE ANGLE OPENING VALUE AND ITS ADAPTIVE CORRECTION

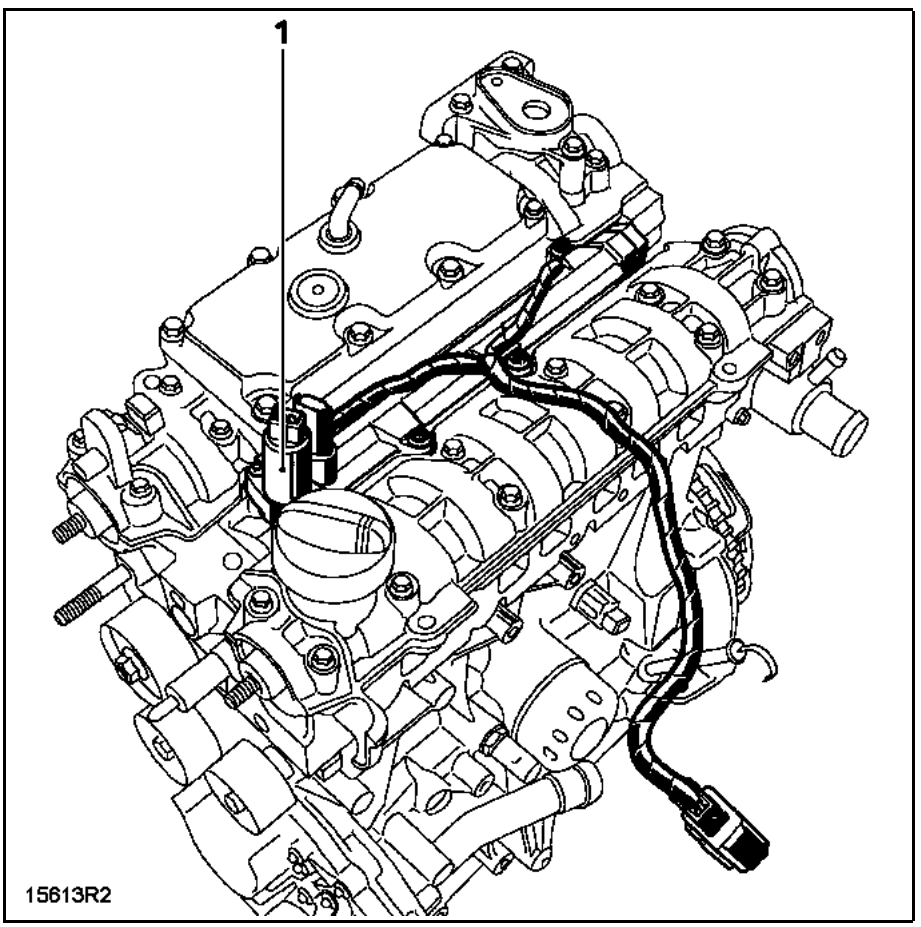
Nominal idle speed	**X = 750 rpm**
Measured throttle position	**0.7° ≤ X ≤ 4°**
Throttle opening adaptive (correction linked to idle speed)	Min. end stop: **- 20 Nm** Max. end stop: **+ 20 Nm**

Whenever the engine is switched off, the computer programs the motorized throttle body position end stops.

IMPORTANT: after erasing the computer memory, it is essential to start the engine then stop it to allow the programming of the throttle end stops. Start the engine again and let it run at idle speed so that the adaptive correction can take place.

Fuel pressure regulation is carried out by the computer supplying a regulator (1) located on the injector rail. The regulator is controlled by an instruction taking into account engine dispersion and ageing. This control instruction is displayed by the diagnostic tools in **parameter**.

Fuel pressure regulation takes into account the following components:
– the pressure sensor in the injector rail,
– the coolant temperature sensor,
– the engine speed sensor,
– the torque requirement,
– the air temperature.



The fuel pressure read in the **fuel pressure** parameter should be between **45 and 100 bars** (with the engine running) when the pressure regulation is active (Status: "**Pressure regulation: CONFORMS**").
The **OCR fuel regulation solenoid valve** parameter should be approximately **36%** at idling speed.

NOTE: a regulation error (Parameter: **Fuel pressure regulation error**) switches on the fault warning light.

HEATING THE OXYGEN SENSORS

The upstream oxygen sensor is heated by the injection computer when the engine is started.

The downstream oxygen sensor is heated after a delay according to the coolant temperature and the engine speed.

Heating of the upstream oxygen sensor is stopped:
– if the vehicle speed is greater than **87 mph (140 km/h)** (value given for information purposes),
– in the case of heavy engine load,
– in the case of high engine speed.

The downstream sensor is constantly reheated.

UPSTREAM SENSOR VOLTAGE

The value displayed on the diagnostic tool in the **upstream sensor voltage** parameter represents the voltage (in millivolts) sent to the computer by the oxygen sensor.
When the engine is operating in a closed loop, the voltage must oscillate rapidly between two values:
– **150 ± 100 mV** for a lean mixture,
– **750 ± 100 mV** for a rich mixture.

The smaller the difference between the minimum and maximum values, the poorer the signal from the sensor (the difference is usually at least **500 mV**).

NOTE: if the difference is small, check the sensor heater.

MIXTURE ADJUSTMENT

The value displayed on the diagnostic tool under the **richness correction** parameter represents the average of the richness corrections brought by the computer in accordance with the richness of the fuel mixture detected by the oxygen sensor.

The correction value has a midpoint of **0%** and limits of **-33% and +33%**.
– value lower than **0%**: requires a leaner mixture,
– value greater than **0%**: requires a richer mixture.

ENTRY INTO RICHNESS REGULATION MODE

Richness regulation will start after a timed starting period if the coolant temperature is greater than **10 °C** and if the upstream oxygen sensor is ready (sufficiently warm).

The timed starting period, depending on coolant temperature, is between **15 and 225 seconds**.

When the mixture regulation is complete the parameter value is **0%**.

Non-loop mode

In the mixture regulation phase, the phases of operation during which the computer does not take into account the value of the voltage supplied by the upstream sensor are:
– under full load if the engine speed is above **1200 rpm.**,
– under heavy acceleration,
– under deceleration with a no load signal,
– when the oxygen sensor is faulty.

DEFECT MODE IN THE EVENT OF AN OXYGEN SENSOR FAULT

The computer enters defect mode when the voltage sent by the oxygen sensor is incorrect in richness regulation for a minimum of **10 seconds**.

When a fault is detected and if the fault has already been stored, the system enters the open loop mode directly (richness correction value **0%**).

PRINCIPLE

In looping phase, the richness regulation corrects the injection time to obtain fuel dosing as close as possible to a richness of **1**. The correction value is close to **0%**, with limits of **-33% and +33%**.

The adaptive correction makes it possible to offset the injection map to realign the mixture regulation around **0%**.

After reinitialising the computer (return to **0%** of the adaptive corrections) a special road test must therefore be carried out.

PARAMETER	F5R 700 engines
Operating adaptive richness	**-20% ≤ X ≤ +20%**

ROAD TEST

Conditions:
– engine warm (coolant temperature **> 80 °C**),
– do not exceed an engine speed of **4500 rpm.**

The test must be followed by normal, smooth and varied driving over **3 to 6 miles (5 to 10 kilometres)** with idle speed phases.

After the test, read the adaptive richness values. Initially **0%**, they should have changed. If not, repeat the test ensuring that the test conditions are observed.

INTERPRETATION OF INFORMATION GATHERED DURING A ROAD TEST

In the case of a lack of fuel (injectors clogged, pressure and flow of fuel too low, etc), the richness regulation increases to obtain a richness as close as possible to 1. The adaptive richness correction increases until the richness correction again fluctuates at around **0%**.

In the event of an excessive amount of fuel, the logic is reversed: the richness regulation decreases and the adaptive richness correction also decreases to realign the richness correction at around **0%**.

GENERAL INFORMATION

Cruise control: allows the driver maintain a selected speed. This function can be switched off at any moment by depressing the brake pedal or the clutch pedal, or by using one of the system buttons.

Speed limiter: allows the driver to set a speed limit. The accelerator pedal will not function above the set speed. The speed limit selected can be exceeded at any time by depressing the accelerator pedal beyond its point of resistance.

A warning light on the instrument panel informs the driver of the status of the cruise control/speed limiter:
– green light: cruise control in operation,
– amber light: speed limiter in operation,
– indicator light flashing: the set speed cannot be maintained (e.g. going downhill).

To control these functions, the injection computer receives the following signals:

Track	Description
A C3	Speed limiter on/off
A A2	Cruise control on/off
A D3	Steering wheel switch earth
A D2	Steering wheel switch signal
A E4	Stop switch open input
A C4	Clutch switch input (depending on version)
A G2	Pedal potentiometer 1 feed
A F2	Pedal potentiometer earth
A F3	Pedal potentiometer signal
A A3	CAN L multiplex (passenger compartment)
A A4	CAN H multiplex (passenger compartment)

The following signals are received by the injection computer via the multiplex network:
– vehicle speed (ABS),
– the stop switch closed signal (ABS),
– which gear is engaged (automatic transmission).

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

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

Using these signals, the injection computer controls the motor-driven throttle unit so as to maintain the set speed in the case of cruise control and not to exceed the set speed in the case of speed limitation.

CRUISE CONTROL OPERATION

Conditions for entering cruise control mode
- switch on cruise control
- gearbox ratio > 2nd gear
- vehicle speed > at **17 mph (28 km/h)**
- cruise control warning light illuminated (green)
- recorded value speed (press CONTINUE)

Conditions for exiting cruise control mode:
- brief sharp pressure on the accelerator pedal (past the point of resistance).
- pressing the brake or clutch pedal
- press SET
- switch to Stop

SPEED LIMITER OPERATION

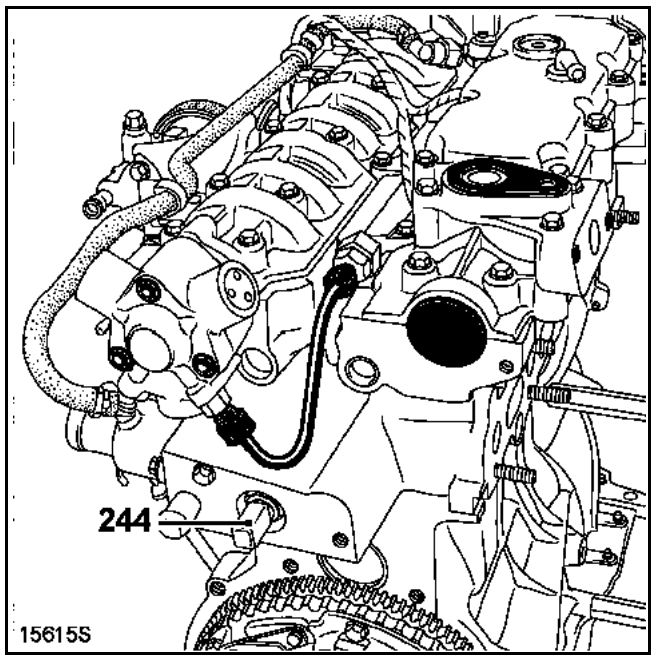
Conditions for entering cruise control mode
- switch on cruise control
- gearbox ratio > 2nd gear
- vehicle speed > at **17 mph (28 km/h)**
- cruise control warning light illuminated (green)
- recorded value speed (press CONTINUE)

Conditions for exiting cruise control mode:
- brief sharp pressure on the accelerator pedal (past the point of resistance).
- pressing the brake or clutch pedal
- press SET
- switch to Stop

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

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

GCTE



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

This system is fitted with a single coolant temperature sensor which is used for the injection, the fan assembly and the temperature warning light on the instrument panel.

Operating principle

Sensor **244** enables:
– - the coolant temperature to be indicated on the instrument panel,
– - the injection computer to be informed of the engine coolant temperature .

The injection computer uses the coolant temperature to control:
– the injection system,
– the fan assembly relays:
  - The **fan assembly** is switched on at slow speed if the coolant temperature exceeds **99 °C** and is switched off when the temperature falls below **96 °C**,
  - The **fan assembly** is switched on at high speed if the coolant temperature exceeds **102 °C** and is switched off when the temperature falls below **99 °C**,
  - the **fan assembly** can be controlled at low speed for the Anti-percolation device and for the air conditioning.
– the coolant temperature warning light.

If the coolant temperature sensor should fail, the fan assembly runs constantly at low speed.

COOLANT TEMPERATURE WARNING LIGHT

The coolant temperature warning light is switched on by the injection computer if the coolant temperature exceeds **118 °C**. The warning light comes on for a few seconds when the ignition is switched on.

When there is a major fault in the high pressure injection system, the engine overheating light flashes.

This vehicle is fitted with the OBD "On Board Diagnostic" system. When a fault causing excessive pollution is detected, a warning light on the instrument panel ("OBD" warning light) lights up. This warning light informs the driver that he must have the car repaired.

This new computer diagnostic strategy operates as follows:

Only engine misfires are the subject of continuous fault finding. The other emission control components are tested once while driving (fault finding is not continuous). However, these test sequences are not always performed. The car must be driven under certain conditions for the test sequences to be executed:
– temperature condition,
– speed condition (threshold, stability, etc.),
– timed starting period,
– engine conditions (manifold pressure, engine speed, throttle angle, etc.).

The OBD management program supplements the management of conventional electrical failures. To meet this standard the requirements are:
– the OBD light coming on (or flashing for some faults),
– storing OBD faults.

RESULT OF FAULT FINDING AND REPAIRS

Special care is required when working on the car to prevent the MIL warning light from coming on after the car has been returned to the customer.

Some faults only appear when the car is being driven, when the adaptive programs have been programmed: **it is therefore essential to validate the repair.**

In addition, the complexity of the system means that the customer has to be asked about the conditions which led to the illumination of the warning light. This information will enable faults to be found more quickly. The circumstances in which the fault occurred are recorded the computer's memory.

NOTE: all electrical faults which result in exceeding the pollution limit cause the OBD warning light to come on.

The operational diagnostics used for OBD are:
– fault finding for combustion misfires which destroy the catalytic converter,
– fault finding for polluting combustion misfires,
– fault finding for the upstream and downstream oxygen sensors,
– fault finding for the catalytic converter.

Note: misfire diagnostics take precedence over all other diagnostics. They are performed practically continuously as soon as the driving conditions are reached.

IMPORTANT: it is essential that the ignition is not switched off before the result is read on the diagnostic tool at the end of each test. Switching off the ignition causes incorrect interpretation of the results and loss of the information that the "diagnostics have been performed".

CONDITIONS FOR THE O.B.D. WARNING LIGHT COMING ON

● **Electrical fault**
Warning light comes on continuously after fault detection on three consecutive running cycles and one running cycle for the coils, manifold pressure sensor, injectors, fuel pressure regulator and motorized throttle body (fault finding conditions satisfied).

● **Catalytic converter or destructive misfires**
Immediate flashing of the warning light.

● **Catalytic converter and oxygen sensor faults, polluting misfires**
Warning light comes on continuously after three consecutive running cycles.

IMPORTANT: fault finding for the catalytic converter and upstream oxygen sensor are sequential, and take place:
– once per running cycle (it lasts for several seconds per test),
– only under certain specific driving conditions.

During a road test, it may be the case that diagnostics for certain functions are not run (e.g. when in a traffic jam).

– warning light comes on
if the same OBD fault is detected during three consecutive running cycles or there is an electrical failure.

– warning light flashes
if misfires leading to destruction of the catalytic converter are detected.

– light goes out
if the OBD fault is not detected again during three running cycles, the light goes out (but the fault is stored in the injection computer).
The fault must not be detected during 40 consecutive tests for the fault to be erased from the computer memory without the use of a diagnostic tool.

NOTE: the fault may not be detected:
– if the fault is temporary,
– if the way the customer drives does not include all of the fault detection conditions.

FAULT FINDING CONDITIONS

If, when the ignition is switched on and when the car is being driven, the air temperature read by the temperature sensor is not between **-7.5 ºC and 119 ºC**, or if the coolant temperature read by the sensor is not between **- 7.5 ºC and 119 ºC**, or if the difference between **1046 mb** and the manifold pressure is more than **273 mb** (altitude of about **2500 m**), then "On Board Diagnostic" procedures are not authorized until the next time the ignition is switched on.

In order for the OBD (On Board Diagnostic) system to function correctly, there must be no electrical faults in the injection system, even if the OBD warning light is not illuminated.

When fault finding of the catalytic converter and oxygen sensor is in progress, the canister bleed is closed and the adaptive programs are set to their most recent value.

TEST PROCEDURE

– Repair all electrical faults.
– Erase all faults.
– Program the injection.
– Check the OBD diagnostic system.

FULL OBD INITIALIZATION

– Erasing of fault memory.
– Erasing OBD faults.
– Erasing of programming.

PROGRAMMING REQUIRED FOR OBD FAULT FINDING

Engine target programming:
This is programmed by:
– one deceleration with injection cut-off in **2nd gear** between **2400 rpm and 2000 rpm** for at least **5 seconds**.
– a second deceleration with injection cut-off in **2nd gear** between **3500 rpm and 3000 rpm** for at least **5 seconds**.

Richness adaptives programming
The car must be driven while complying with the conditions specified in the **Injection: Adaptive mixture adjustment** section, for this programming to be carried out.

The aim of detecting combustion misfires is to detect a malfunction which would cause the OBD limit for hydrocarbon pollutant emissions to be exceeded, and would damage the catalytic converter.

The diagnostic can detect:
– fouling or flooding of a spark plug,
– clogging of the injectors or an anomaly in their output,
– a fault in the supply system (pressure regulator, fuel pump, etc.),
– faulty wiring of the petrol and injection circuits (coil secondary, etc),
– a malfunction of the ignition coils.

Fault finding is performed by measuring the instantaneous variations in engine rotation speed.
Observation of a drop in torque detects combustion misfires.
This fault finding is practically continuous while the car is being driven.

This fault finding strategy makes it possible to distinguish two types of fault:
– destructive misfires resulting in destruction of the catalytic converter. These cause the OBD warning light to light up immediately and flash,
– pollutant combustion misfires causing the OBD pollution limit to be exceeded. These cause the OBD warning light to illuminate if they are detected during three consecutive running cycles.

DETECTION CONDITIONS

Before starting, the programming must be checked. The conditions prior to switching on the ignition and the current conditions must also be satisfied.
Detection is carried out as soon as the coolant temperature is above **- 7.5 °C**, between idling speed and **4500 rpm**.
The polluting combustion misfire test can also be carried out by maintaining the engine at idle speed with all the power consumers on **for 10 minutes and 40 seconds**.

IMPORTANT: it is essential that the ignition is not switched off before the result is read on the diagnostic tool at the end of this test. Switching off the ignition will lead to the results being misinterpreted.

REPAIR CONFIRMATION

– Combustion misfires being diagnosed - ACTIVE
– Polluting combustion misfires - No fault detected
– Destructive combustion misfires - No fault detected

If the diagnostic tool has found combustion misfires after the test, refer to the fault finding method linked with this symptom.

The aim of catalytic converter fault finding is to detect a malfunction which would cause hydrocarbon pollutant emissions to exceed the OBD limit.
The ability of the catalytic converter to store oxygen indicates its condition. As the catalytic converter ages, its ability to store oxygen reduces along with its ability to treat pollutant gases.

CONDITIONS FOR ENTERING FAULT FINDING MODE

Fault finding of the catalytic converter can only take place after the engine has been running for **16 minutes and 40 seconds**, if all the conditions prior to switching on the ignition are satisfied and maintained.
– no electrical faults,
– no combustion misfires detected,
– no catalytic converter fault finding performed since the ignition was switched on,
– programming done,
– main loop and double loop active,
– coolant temperature greater than **75 ºC**,
– car speed between **40 mph (63 kph) and 81 mph (130 kph)**,
– pressure between **430 and 50 mbar**,
– engine speed reading on the diagnostic tool of between **1760 and 3616 rpm**.

FAULT DETECTION

Fault finding is performed over a stabilised range in 5th gear at **43 mph (70 km/h)**. When the conditions for entering fault finding are satisfied, richness excitation peaks are applied, which has the effect of sending gusts of oxygen to the catalytic converter. If the catalytic converter is in good condition it will absorb the oxygen and the downstream oxygen sensor value will remain at its average value. If it is ageing, it will reject the oxygen and the oxygen sensor will start to vibrate. The voltage of the oxygen sensor will fluctuate. (The OBD light will come on after three running cycles).
The test cannot exceed **52 seconds** in duration without exiting from the cycle again.

IMPORTANT: it is essential that the ignition is not switched off before the result is read on the diagnostic tool at the end of this test. Switching off the ignition will lead to the results being misinterpreted.

REPAIR CONFIRMATION

– "On Board Diagnostic catalytic converter fault finding: in progress" message - - - - ACTIVE
– "On Board Diagnostic catalytic converter fault finding: done" - - - - - - - - - - - - - - - ACTIVE
– "Catalytic converter operating fault" - INACTIVE
– "Validation of catalytic converter repair" - OK

If the diagnostic tool shows "Catalytic converter On Board Diagnostic fault finding: not done ... ACTIVE", then the control cycle has not been carried out correctly. If this should happen, repeat the cycle ensuring that the detection conditions are complied with.

If after the test, the diagnostic tool shows "Catalytic converter functional fault ... ACTIVE" or "Validation of catalytic converter repair ... 2DEF", refer to the fault finding method associated with this symptom.

The aim of oxygen sensor fault finding is to detect a problem which would cause the OBD limit to be exceeded by HC, CO or NOx pollutant emissions. It is carried out by measuring and comparing periods of upstream oxygen sensor vibration.

There are two types of possible faults of the upstream oxygen sensor:
– mechanical damage to an electrical component (breakage, cut in wire) which leads to an electrical fault.
– chemical damage to the component which causes the response time of the sensor to slow down, thus increasing its switching period.

When the required test conditions are met, the average of the sensor periods read is taken, subtracting the effects of interference, then compared with an average period of the "OBD" limit.

TEST CONDITIONS

Fault finding of the upstream oxygen sensor can only take place after the engine has been running for **14 minutes and 15 seconds**, if all the conditions prior to switching on the ignition are satisfied and maintained.
– no electrical faults detected,
– programming done,
– no oxygen sensor fault finding performed since the ignition was switched on,
– no combustion misfires detected,
– coolant temperature greater than **75 ºC**,
– average engine speed between **1760 and 3616 rpm.**
– pressure between **300 and 750 mbar**,
– vehicle speed between **40 mph and 81 mph (63 and 130 km/h).**

FAULT DETECTION

Fault finding takes place during use by the customer, according to conditions previously described. The computer shows "**oxygen sensor fault finding: in progress**".

IMPORTANT: it is essential that the ignition is not switched off before the result is read on the diagnostic tool at the end of this test. Switching off the ignition will lead to the results being misinterpreted.

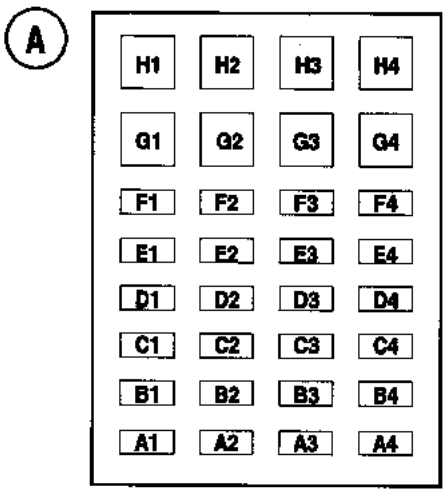
REPAIR CONFIRMATION

– Have the message "On Board Diagnostic oxygen sensor fault finding: in progress" - - - - - - - ACTIVE
– "On Board Diagnostic oxygen sensor fault finding: completed" - ACTIVE
– "Oxygen sensor operating fault" - INACTIVE
– "Validation of oxygen sensor repair" - OK

If the diagnostic tool shows " On Board Diagnostic oxygen sensor fault finding: done ... ACTIVE" or "Validation of oxygen sensor repair ...1DEF", the control cycle has not been carried out correctly. If this should happen, repeat the cycle ensuring that the detection conditions are complied with.

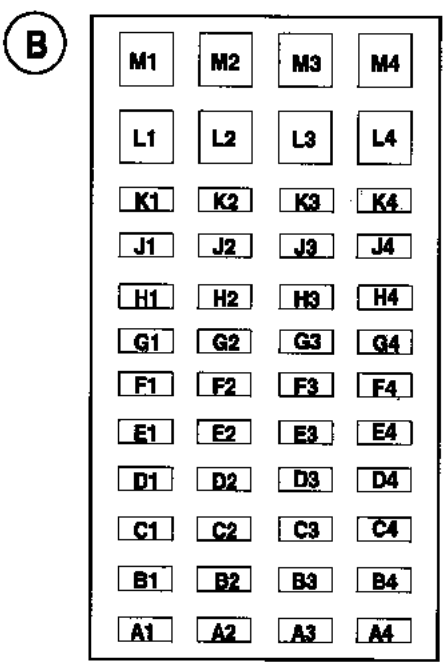
If after the test, the diagnostic tool shows "Catalytic converter functional fault ... ACTIVE" or "Validation of catalytic converter repair ... 2DEF", refer to the fault finding method associated with this symptom.

ALLOCATION OF INJECTION COMPUTER INPUTS AND OUTPUTS



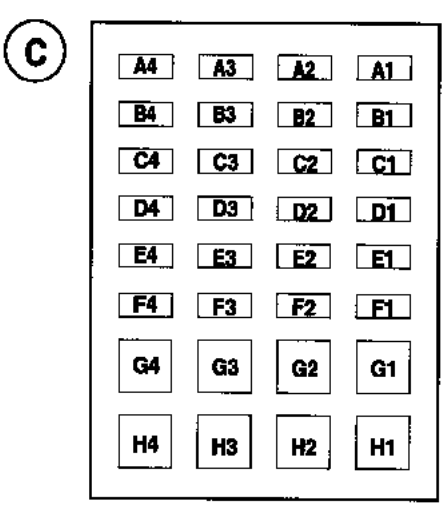
CONNECTOR A

A2	←	Cruise control on/off switch
A3	→←	CAN L MULTIPLEX LINK with UCH
A4	→←	CAN H MULTIPLEX LINK with UCH
B4	→←	FAULT FINDING
C3	←	Speed limiter On/Off switch
C4	←	Clutch signal
D1	---	+ after ignition
D2	---	Cruise control/speed limiter switches feed
D3	←	Cruise control/speed limiter sensor signal
E4	←	Brake signal
F2	---	Pedal potentiometer feed (track 1)
F3	←	Pedal potentiometer signal (track 2)
F4	---	Pedal potentiometer earth (track 2)
G1	---	+ After relay supply
G2	---	Pedal potentiometer feed (track 1)
G4	---	Power earth
H1	---	Power earth
H2	←	Pedal potentiometer feed (track 1)
H3	---	Pedal potentiometer feed (track 1)
H4	---	Power earth

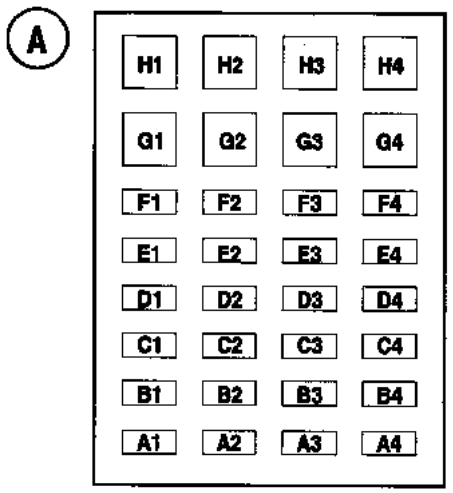


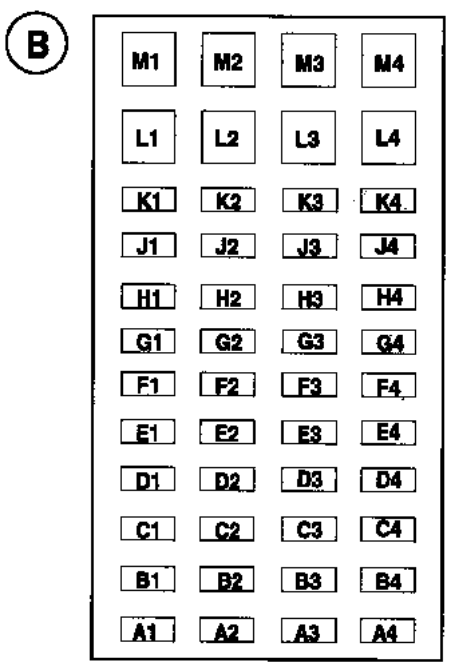
CONNECTOR B

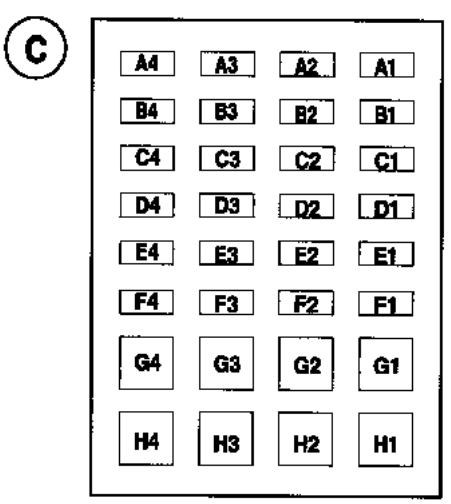
A1	---	Manifold pressure sensor earth
A2	←	Manifold pressure sensor signal
A3	←	DOWNSTREAM oxygen sensor signal
A4	←	Motorized throttle body potentiometer signal (track 2)
B1	---	DOWNSTREAM oxygen sensor earth
B3	←	Fuel pressure sensor signal
B4	---	Throttle air temperature sensor earth
C2	←	Motorized throttle body signal (track 1)
C3	←	Coolant temperature sensor signal
C4	←	Air temperature sensor signal
D2	---	Manifold pressure sensor feed
D3	---	Motorized throttle body potentiometers feed
E1	---	UPSTREAM oxygen sensor earth
E3	---	Fuel pressure sensor feed
F2	---	Motorized throttle body potentiometers earth
G1	→	High speed fan assembly control relay
G2	---	Coolant temperature sensor earth
G3	←	UPSTREAM oxygen sensor signal
G4	---	+ before ignition
H1	→	Fuel pump control relay
H2	→	Additional heating control relay 2
H4	---	Fuel pressure sensor earth
J1	→	Actuator (power latch) control relay
J2	→	Low speed fan assembly control relay
J3	←	Engine speed sensor signal
J4	←	Engine speed sensor signal
K1	→	Additional heating control relay 1
K2	---	Air temperature sensor earth



ALLOCATION OF INJECTION COMPUTER INPUTS AND OUTPUTS







CONNECTOR B

L1	→	Injector command 2
L2	→	Injector command 3
L3	→	Injector command 2
L4	→	Injector command 1
M1	→	Injector command 4
M2	→	Injector command 1
M3	→	Injector command 3
M4	→	Injector command 4

CONNECTOR C

A3	←	Throttle air temperature sensor signal
B1	←	Camshaft sensor signal
B2	←	Pinking sensor signal
B3	←	Power steering pressostat signal
C1	→	Canister bleed solenoid valve control
C2	---	Pinking sensor earth
D1	→	DOWNSTREAM oxygen sensor heater control
D2	→	Fuel pressure regulator control
E1	---	+ After relay supply
E2	---	+ After relay supply
E3	→	UPSTREAM oxygen sensor heater control
F3	---	+ After relay supply
G1	→	Motorized throttle body (-) control
G2	---	Power earth
H1	→	Motorized throttle body (-) control
H2	---	Power earth
H3	→	Cylinders 2 and 3 ignition coil control
H4	→	Cylinders 1 and 4 ignition coil control

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

TIGHTENING TORQUE (in daNm)	
Water pump bolts	0.9

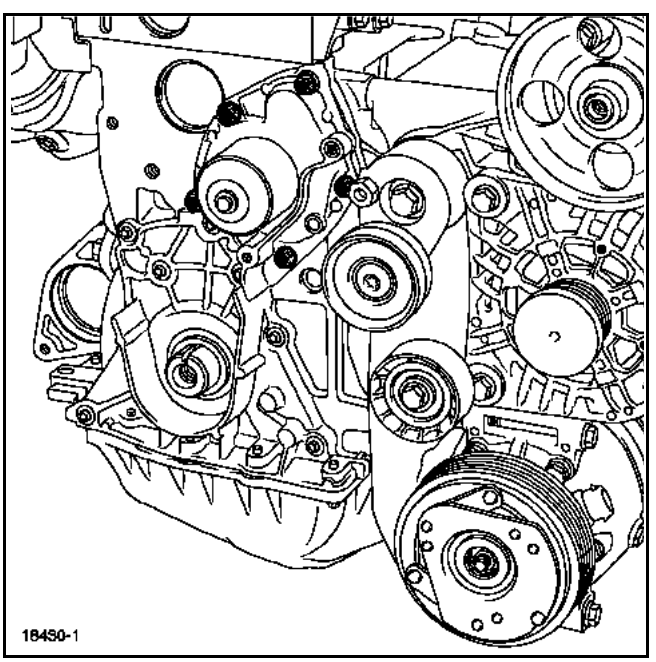
REMOVAL

Put the car on a two-post lift.

Disconnect the battery.

Drain the cooling circuit through the lower radiator hose.

Remove:
– timing belt (see section **11 Timing belt**).
– the coolant pump.



Cleaning

It is very important not to scratch the gasket faces.

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

Wear gloves whilst carrying out the following operation.

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

Do not allow this product to drip on to the paintwork.

REFITTING

NOTE: put a drop of Loctite FRENETANCH on bolts (3) and (4).

Fit the new seal.

Finger tighten the water pump mounting bolts in the recommended order shown below, then tighten them to a torque of **0.9 daNm** in the same tightening order.

Refit the timing belt (it is essential to follow the method described in Section **11 "Timing belt"**),

Fill and bleed the cooling circuit.