



# **1 Engine and peripherals**

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**CB1A**

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**AUGUST 2001**

**EDITION ANGLAISE**

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

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

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# Engine and peripherals

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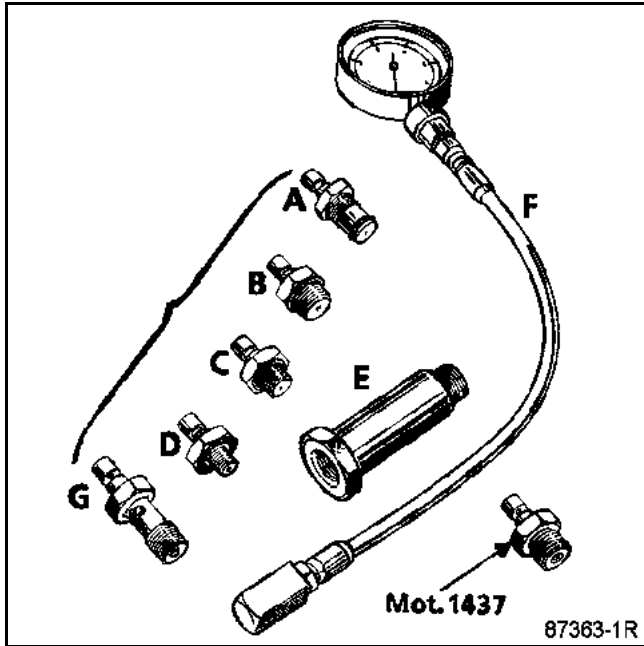
Vehicle type	Engine	Manual gearbox	Capacity (cm <sup>3</sup> )	Bore (mm)	Stroke (mm)	Compression
CB1A	L7X 760	PK6	2 946	87	82.6	11.4 / 1

### CHECKING

SPECIAL TOOLING REQUIRED	
Mot. 836-05	Oil pressure measuring kit
Mot. 1437	Pressure measuring connector

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

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



#### Use:

Engine L: F + **Mot. 1437**

#### Oil pressure

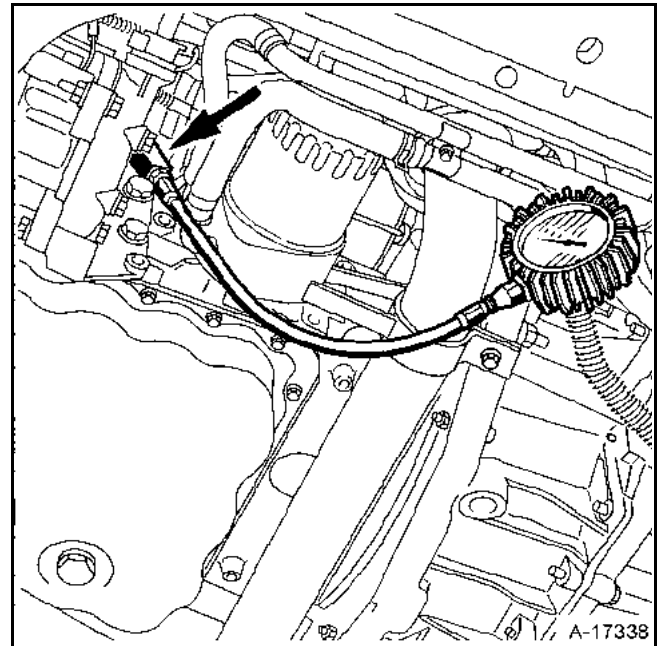
Idle speed	<b>2 bar</b>
3000 rpm	<b>5 bar</b>

Place the vehicle on a lift.


Remove the engine undertray.

Remove the oil pressure contractor.

Fit the **Mot. 1437 adapter**, and the oil pressure gauge.



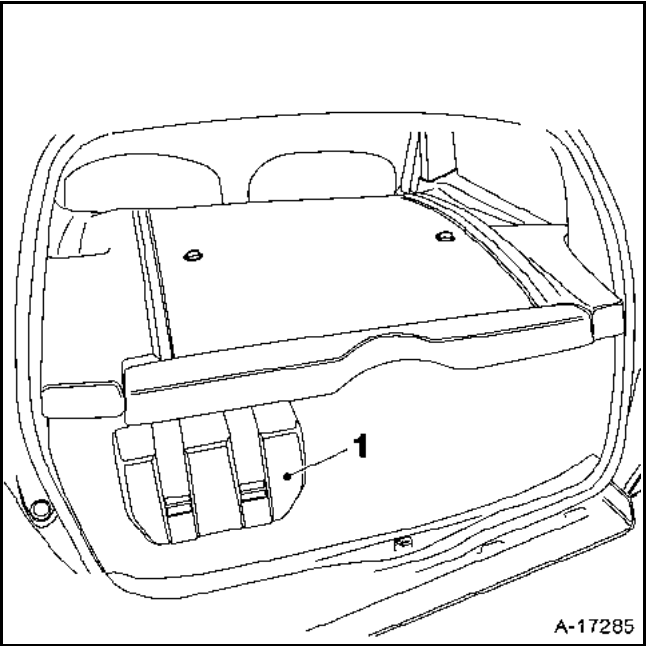
SPECIAL TOOLS REQUIRED	
Mot. 453-01	Set of 2 hose clamps for general use
Mot. 1202	Hose clip pliers
Mot. 1390	Support for removing and refitting the engine and gearbox assembly
T. Av. 476	Ball joint extractor

TIGHTENING TORQUES (in daNm)	
Wheel bolts	9
Lower ball joint nut	5.5
Driveshaft nuts	28
Steering ball joint nuts	3.7
Torsion bar bolt	8
Lower chassis bolt	9
Primary catalytic converter bolt	4.5
Right side engine mounting nut and bolt	6.2
Left side engine mounting nut and bolt	8

REMOVAL

- Place the vehicle on a two post lift.
- Remove the tray under the bonnet.
- Disconnect the battery.
- Drain the air conditioning circuit.
- Remove the engine undertray.

- Remove:
- the rear lining,
  - the linings from the right and left 'C' pillars,
  - the lid of the tool box and the tool box (1),
  - the rear carpet.

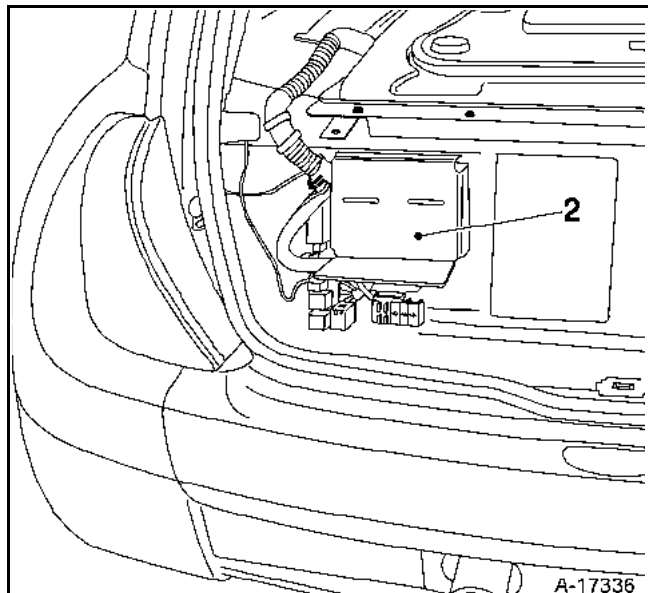


Remove the coolant expansion bottle from the flame shield and place it on top of the engine.

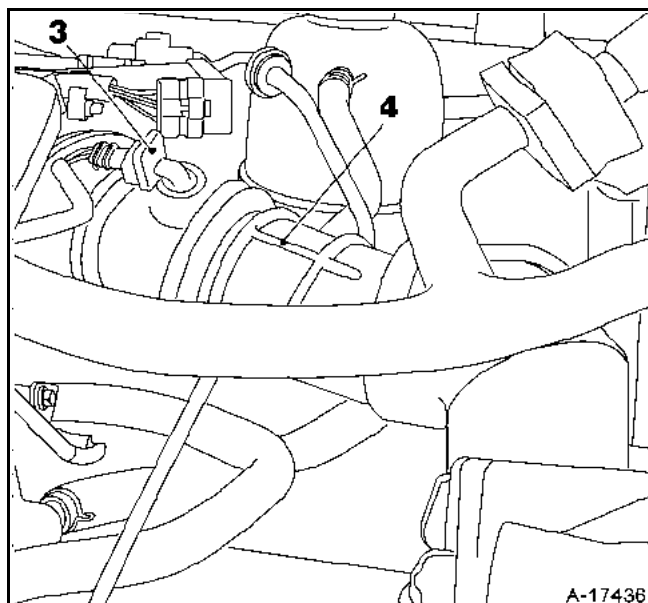
Take off the supporting frame cover (2).

Disconnect:

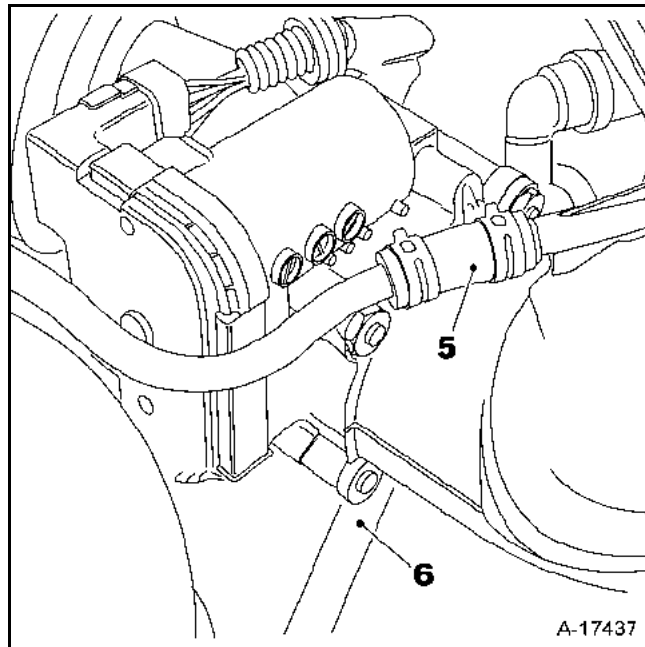
- the relays and fuses from the supporting frame,
- the earth point from the flame shield,
- the engine wiring from the vehicle wiring,
- the engine wiring from the engine cooling fans,



- the air temperature sensor (3) from the air intake pipe,
- the air intake pipe (4) from the throttle body,
- the oil vapour rebreather pipe from the air intake pipe,

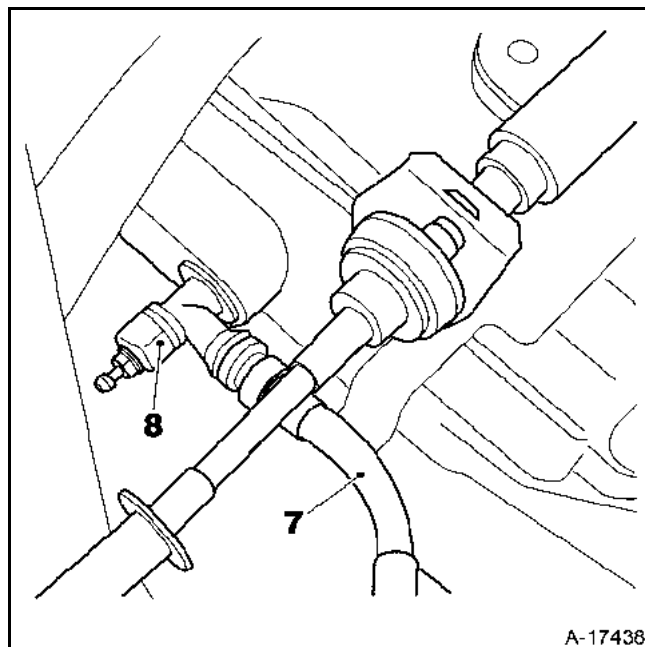


- the brake servo vacuum pipe (5) and the bleed hose (6) from the inlet manifold,
- the connector from the wiring harness for the solenoid valve for recycling vapour from the petrol tank,



- the gear selection cables from the gearbox.

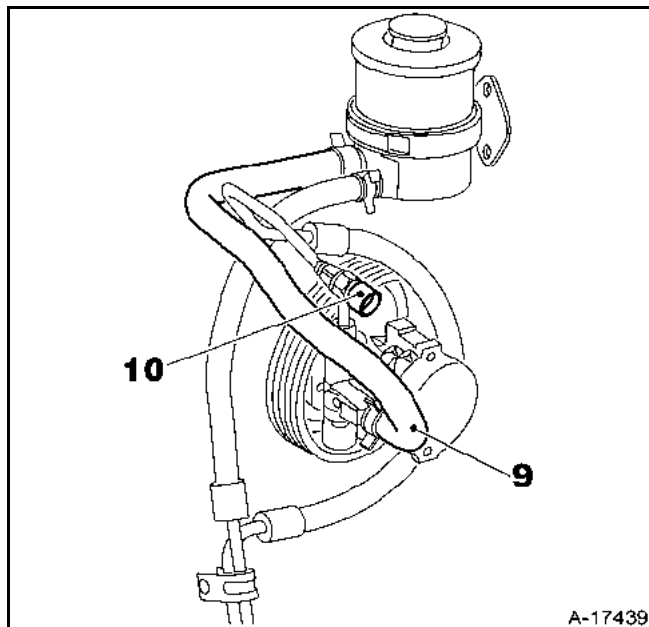
Clamp the clutch hose (7) with tool **Mot. 453-01** and remove the clutch hose from the slave cylinder (8).



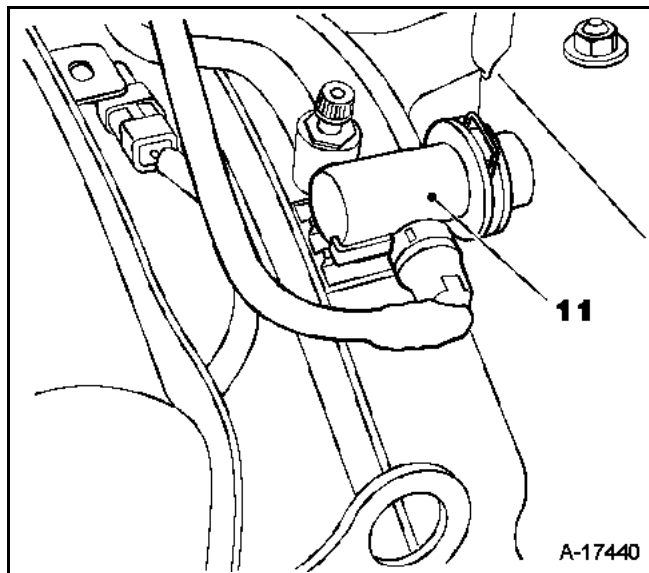
Clamp the power steering pump low pressure pipe (9) with tool **Mot. 453-01** and remove the pipe from the pump.

Disconnect:

- the wiring harness connector from the pressure switch (10),



- the fuel pipe from the pulse damper (11).



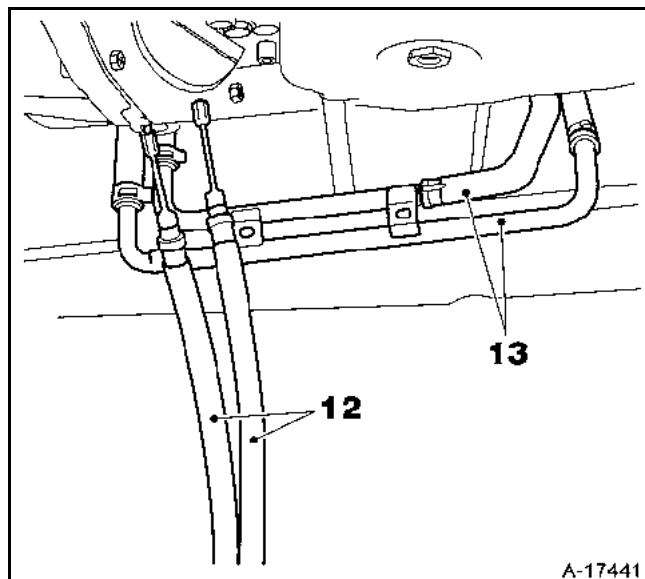
Raise the vehicle and remove the boot.

Remove the rear wheels.

Drain the coolant circuit by the bottom hose and the drain plug on the cylinder block.

Disconnect:

- the radiator and coolant pipes from their connections,
- the handbrake cables (12) and rear calipers,
- the cooling pipes (13) from the sub-frame,
- the ABS wiring harness from the sub-frame.

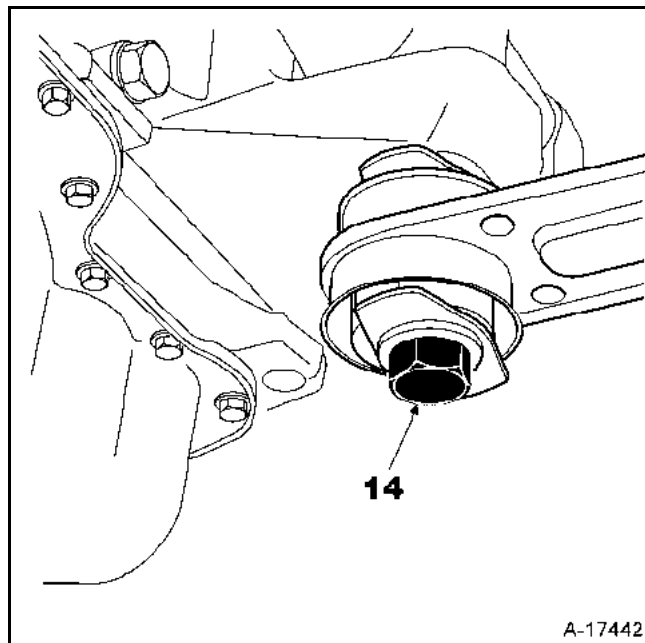


Remove:

- the driveshafts,
- the travel limiter bolt (14) on the end of the engine.

Disconnect:

- the track control arms,
- the lower ball joints.



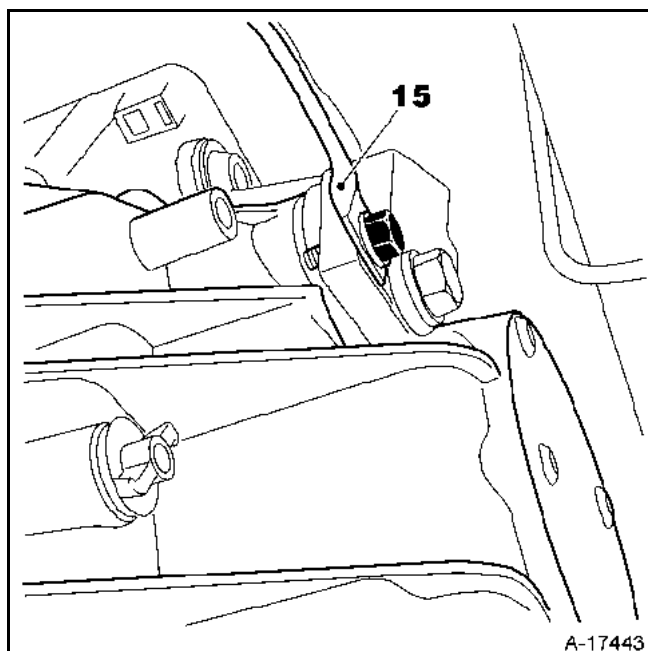
Lower the vehicle and position the **Mot. 1390** support under the sub-frame, making sure that you have access to its bolts.

Remove the four sub-frame bolts and raise the vehicle.

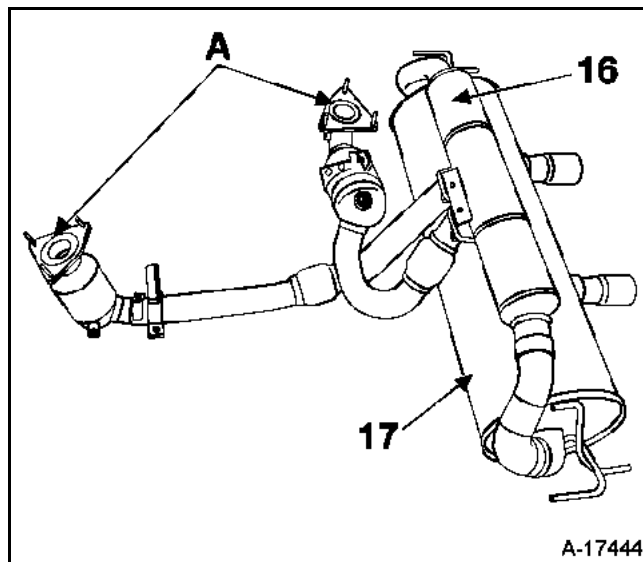
Take off the sub-frame from below the vehicle.

Disconnect:

- the engine earth strap (15),
- the starter motor wiring harness.



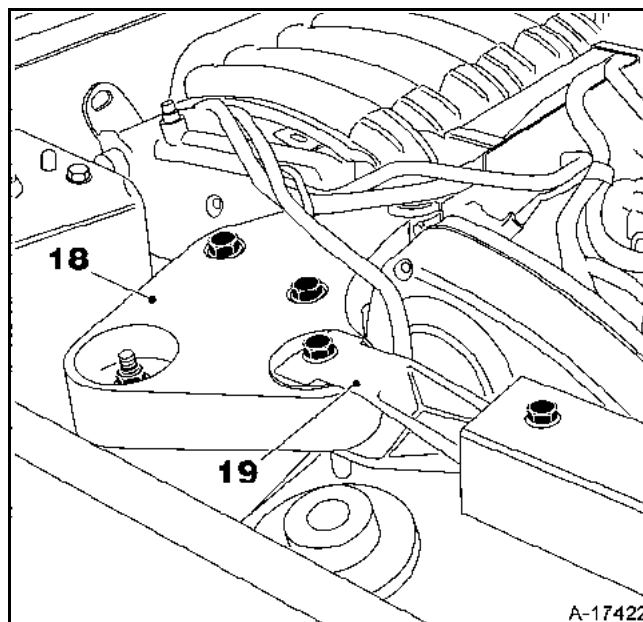
Separate the secondary catalytic converter (16) from the silencer (17) and remove the silencer. The brackets marked A remain fixed to the exhaust manifolds.



Position the **Mot. 1390** support under the engine/transmission assembly, ensuring that the engine mountings are accessible from the inside of the vehicle.

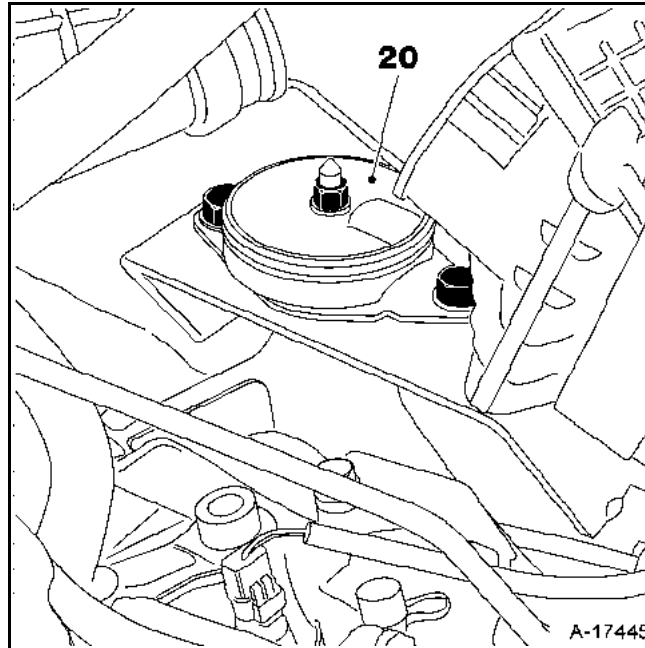
Remove:

- the engine retaining bracket (18) and the travel limiter (19),





- the left-hand engine mounting (20).



Raise the vehicle.

Remove the engine/gearbox assembly from under the vehicle.

### REFITTING

Refit in the reverse order to removal.

Fill:

- the engine and the gearbox with oil, and if necessary, fill the coolant circuit, and bleed it (see **section 19 - Topping up and changing the engine oil**),
- the power-assisted steering circuit, and bleed it,
- the air conditioning circuit with new R134a refrigerant fluid,
- the hydraulic clutch/brake reservoir and bleed it.

### REMOVAL

Put the car on a two-post lift.

Remove the tray under the bonnet.

Disconnect the battery.

Remove:

- the engine protectors,
- the engine undertray.

Drain the oil from the engine.

Undo the sump bolts and remove the sump taking care not to damage the gasket.

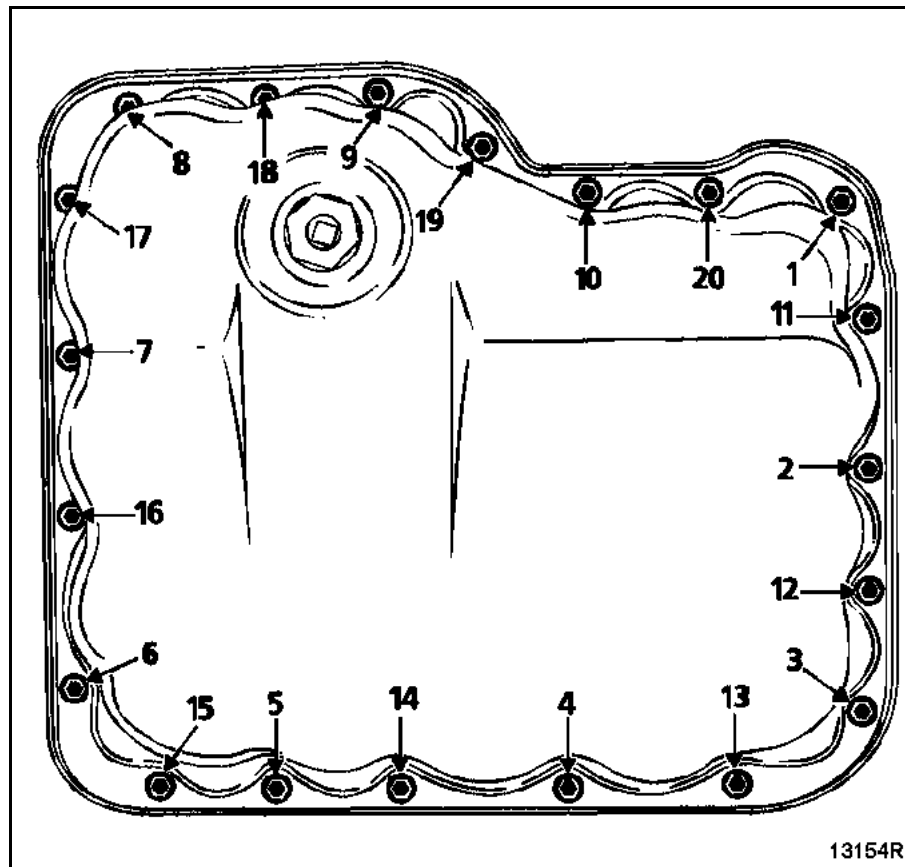
### REFITTING

Refit in reverse order to removal.


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

Tighten the bolts on the cover to a torque of **0.8 daNm** in the recommended order:

Fill the engine with oil.



SPECIAL TOOLING REQUIRED	
Mot. 1505	Tool for checking the tension of the timing belt
Mot. 1428	Exhaust camshaft pulley locking tool
Mot. 1555	Inlet camshaft pulley locking tool
Mot. 1430	Crankshaft and camshaft sprocket timing pins
Mot. 1430-01	Crankshaft and camshaft pulley setting checking pin
Mot. 1436	Timing belt locking pin

TIGHTENING TORQUES (in daNm)	
Timing belt tensioner pulley nut	2.5
Timing belt tensioner bolt	2.5
Camshaft pulley bolt	1
Crankshaft pulley bolt	2.5
Wheel bolts	9
Right-hand engine mounting bracket nut and bolt	6.2
Travel limiter bolt	8

REMOVAL

Put the car on a two-post lift.

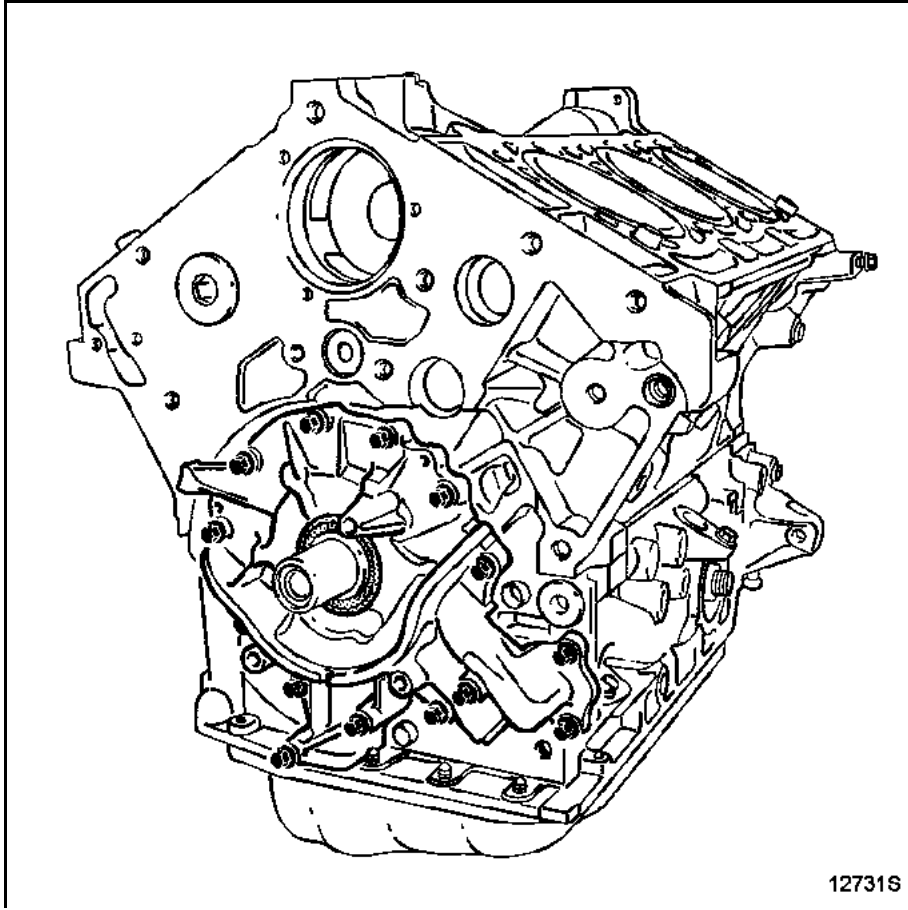
Remove the tray under the bonnet.

Disconnect the battery.

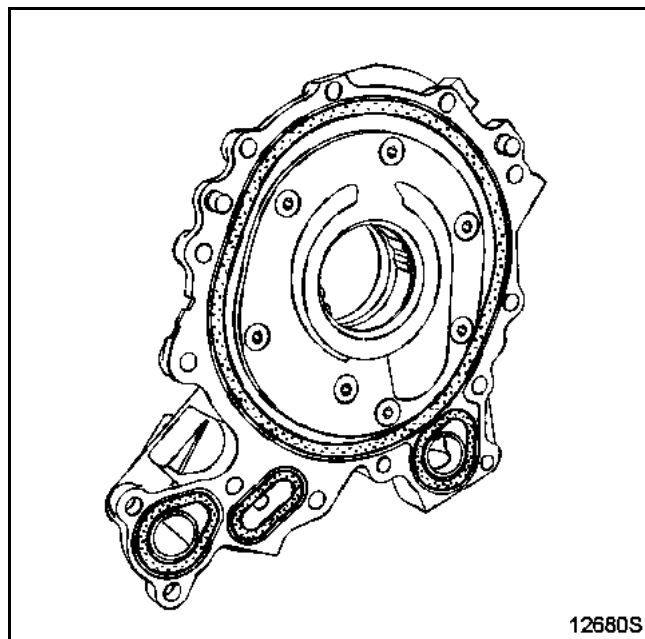
Remove the timing belt (see method described in **section 11 Timing belt**).

Drain the oil from the engine.

- Remove:
- the lower timing pulley,
  - the crankshaft pulley,
  - the compressor bracket,
  - the oil pump, taking care not to damage the gasket.



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

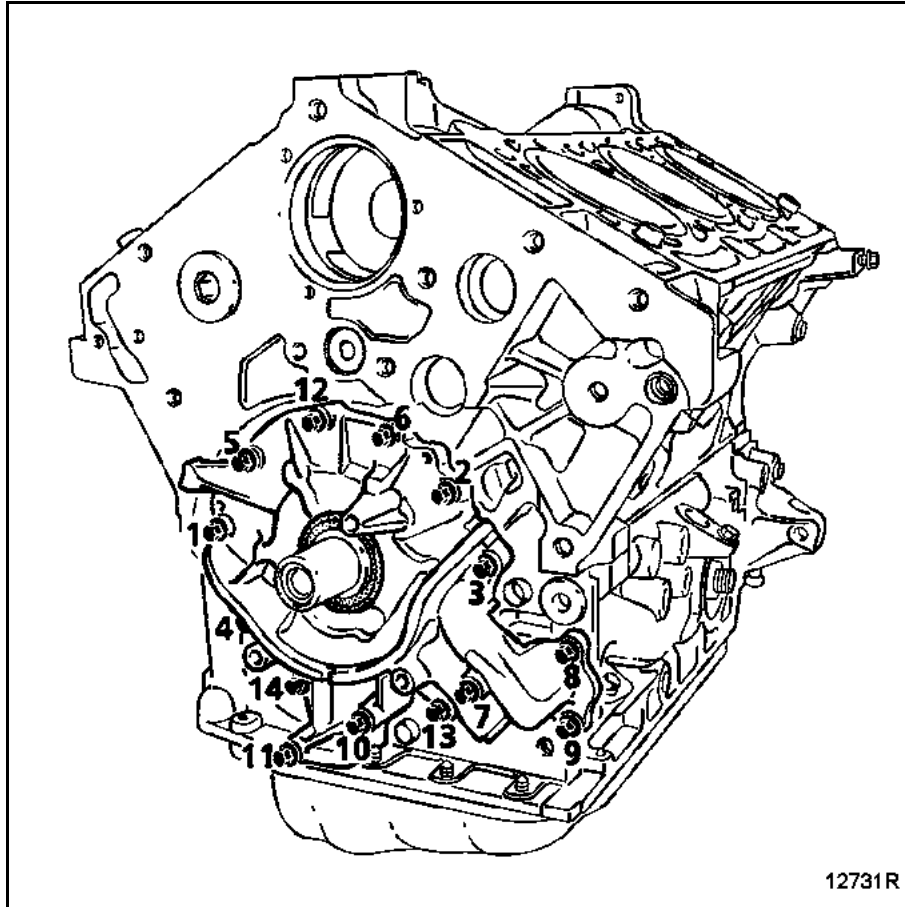


### REFITTING

**NOTE:** when the the oil pump is replaced, the body of the oil pump must be filled - the pump is not self-priming.

Fit the oil pump.

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



Refit:

- the compressor bracket,
- the crankshaft pulley,
- the lower timing pulley.
- the timing belt (see method described in **section 11** Timing belt).

Fill the engine with oil.

# TOP AND FRONT OF ENGINE

## Timing belt

11

### SPECIAL TOOLING REQUIRED

Mot. 1505	Tool for checking timing belt tension
Mot. 1428	Exhaust camshaft pulley locking tool
Mot. 1555	Inlet camshaft pulley locking tool
Mot. 1430	Crankshaft and camshaft pulley timing pins
Mot. 1430-01	Crankshaft and camshaft pulley setting checking pin
Mot. 1436	Timing belt locking pin

### EQUIPMENT REQUIRED

Ball joint setter  
Hydraulic platform

### TIGHTENING TORQUES (in daNm)



Timing belt tensioner pulley nut	2.5
Timing belt tensioner bolt	2.5
Camshaft pulley bolt	1
Crankshaft pulley bolt	2.5
Wheel bolts	9
Right-hand engine mounting bracket nut and bolt	6.2
Travel limiter bolt	8

### TO REMOVE

Put the car on a two-post lift.

Remove the tray under the bonnet.

Disconnect the battery.

Remove the engine covers.

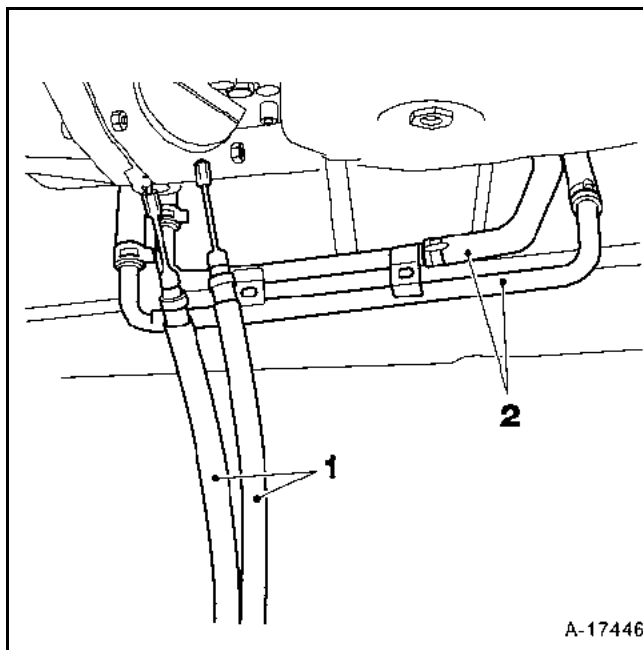
Raise the vehicle.

Remove:

- the rear wheels,
- the engine undertray.

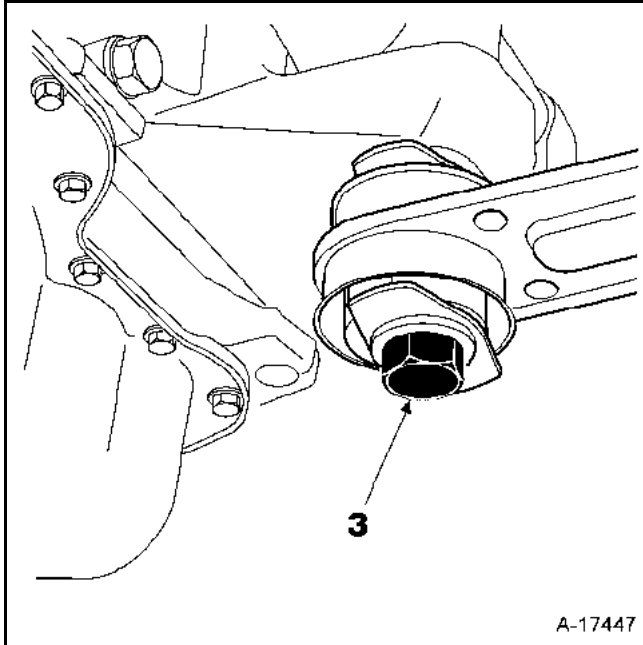
Disconnect:

- the handbrake cables (1) from the rear calipers and detach them from the sub-frame,
- the water pipes (2) from the sub-frame,
- the ABS wiring from the sub-frame,



- the rear lower ball joints from the sub-frame,
- the ball joints from the rear hub track control arms.

Remove the travel limiter bolt (3) on the outside of the engine.



Unscrew the four bolts from the sub-frame.

Position the hydraulic platform under the sub-frame, making sure that you have access to the sub-frame bolts.

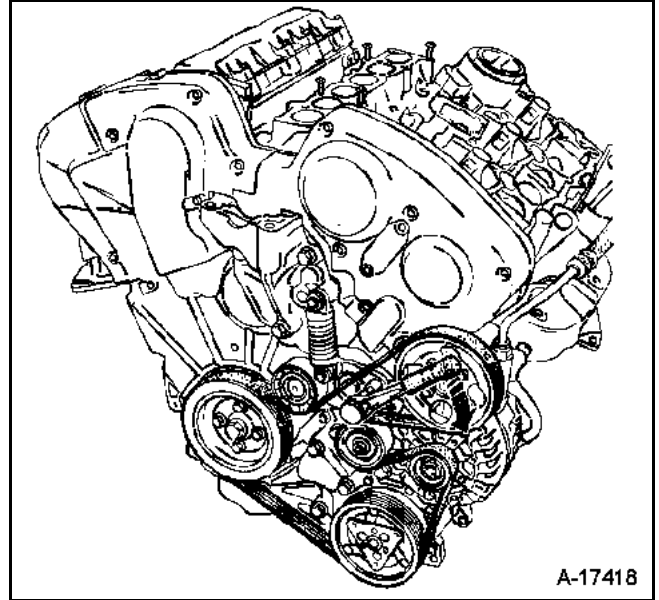
Raise the hydraulic platform to support the sub-frame.

Remove the four bolts from the sub-frame and lower it slowly, separating the ball joints from the rear hubs.

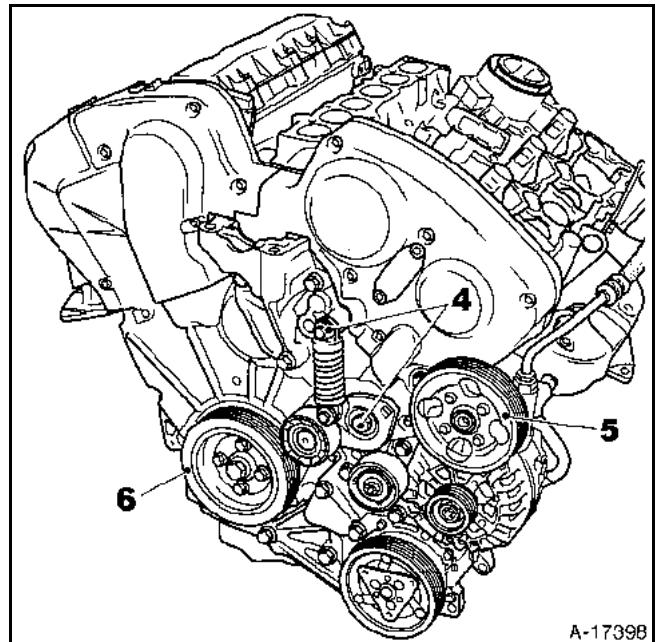
Remove:

- the hydraulic platform and the sub-frame from under the vehicle,
- the sub-frame from the hydraulic platform, using a workshop crane,

- the accessories belt (see method described in **section 07 - Accessories belt tension**),



- the accessories belt tensioner at (4),
- the power steering pump pulley (5),
- the crankshaft pulley (6).



Lower the vehicle.

Remove the engine tripm.

Position the hydraulic platform under the engine.

Raise the hydraulic platform to support the engine.

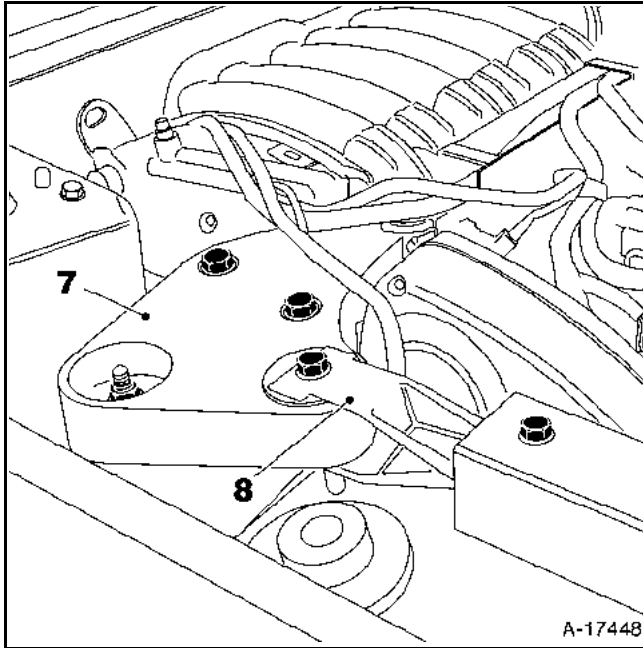
# TOP AND FRONT OF ENGINE

## Timing belt

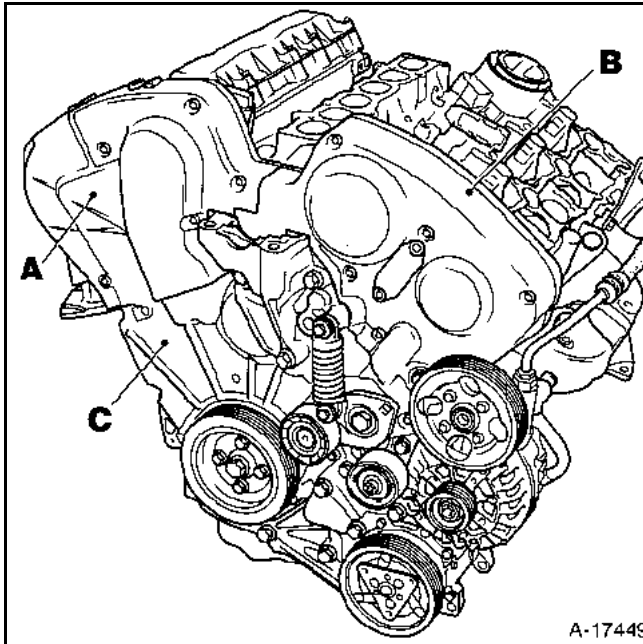
11

Remove:

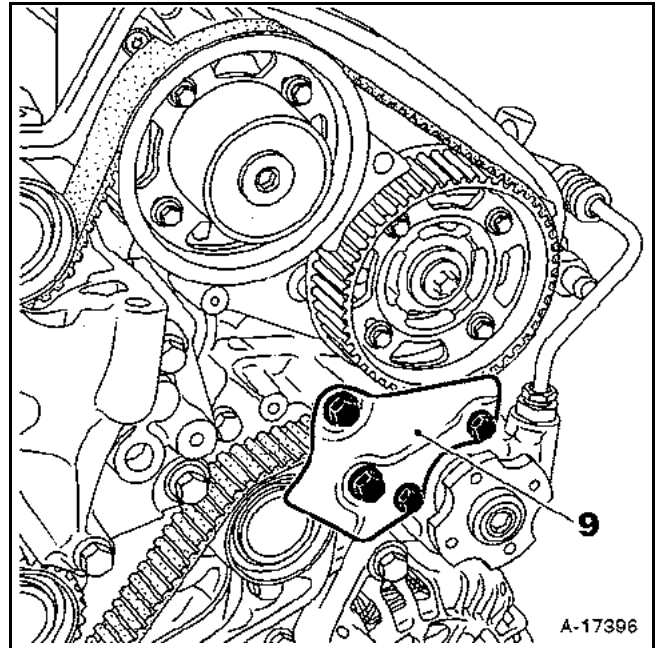
- the engine retaining bracket (7) and the travel limiter (8),



- the timing belt covers (A) and (B), whilst at the same time disconnecting the pulse damper from the top of the timing belt cover (A),
- the timing belt sump (C),



- the cover plate (9).



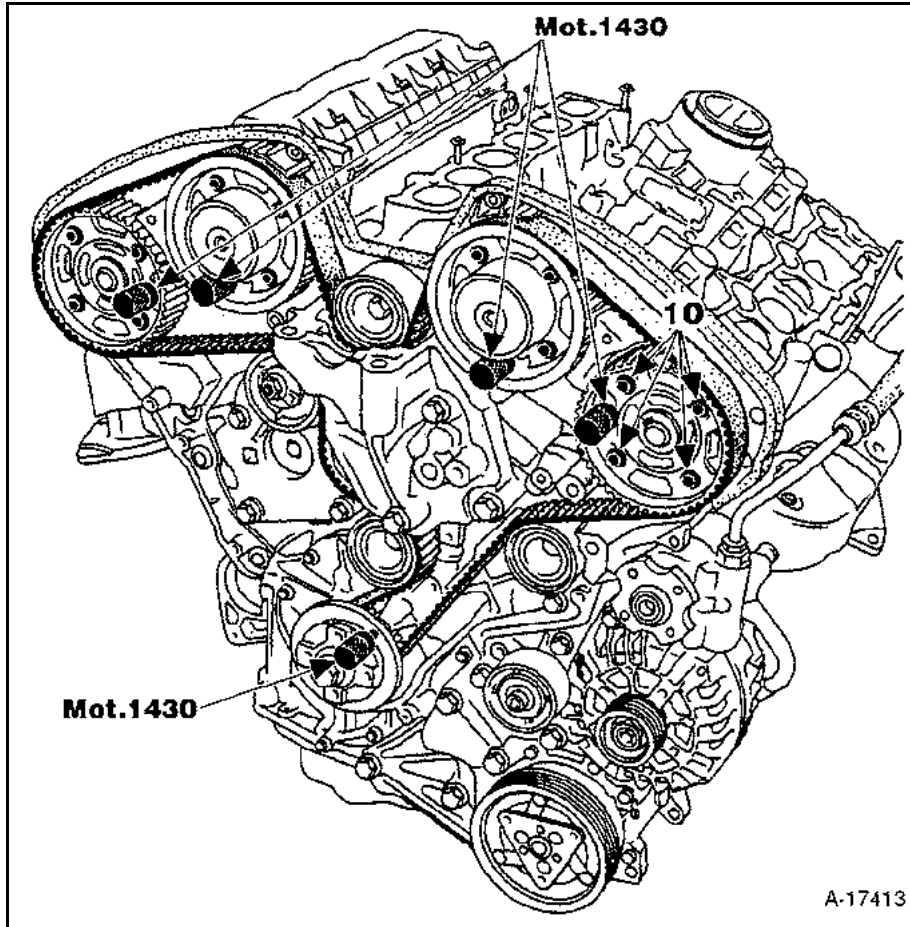


# TOP AND FRONT OF ENGINE

## Timing belt

11

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

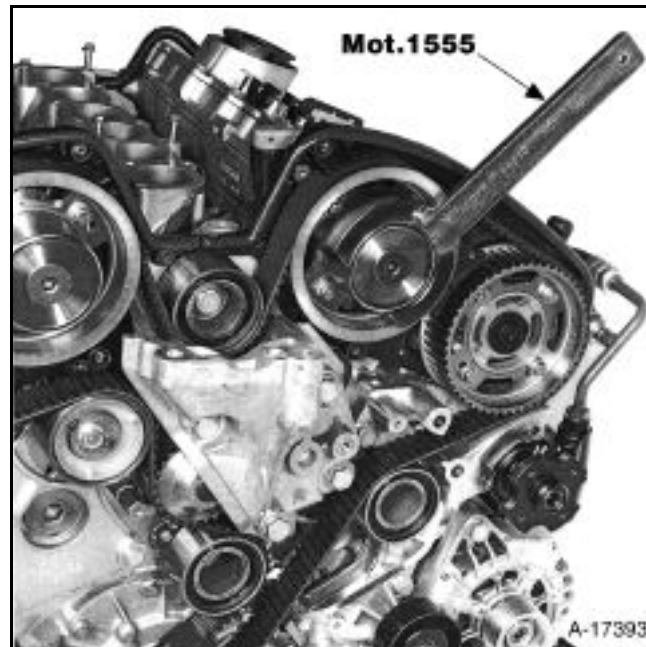
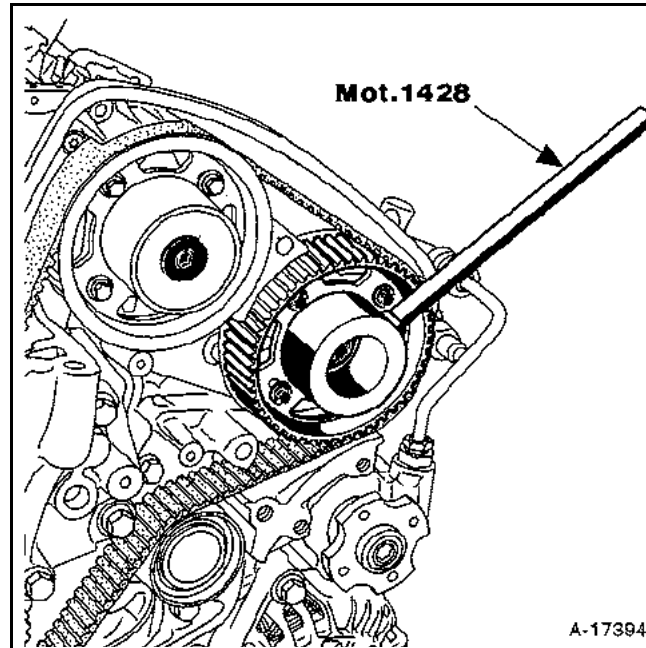


# TOP AND FRONT OF ENGINE

## Timing belt

11

To do this, slacken the camshaft pulleys (10) and turn the camshaft hubs using the tools **Mot. 1428** and **Mot. 1555**, to fit the pins.



# TOP AND FRONT OF ENGINE

## Timing belt

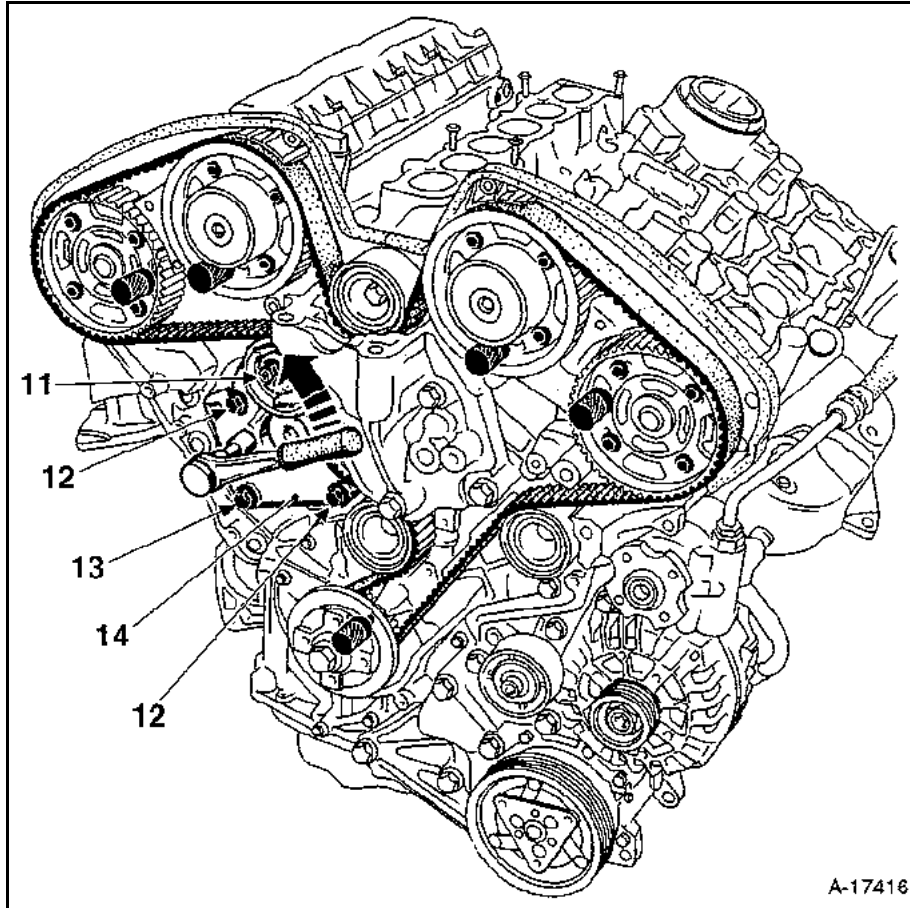
11

Slacken the nut (11) to free the tensioner pulley.

Slacken the bolts (12), then remove bolt (13) from the tensioner pulley bracket (14).

Using a **12.7 mm** square drive, turn the tensioner pulley bracket to release the timing belt.

Remove the timing belt.

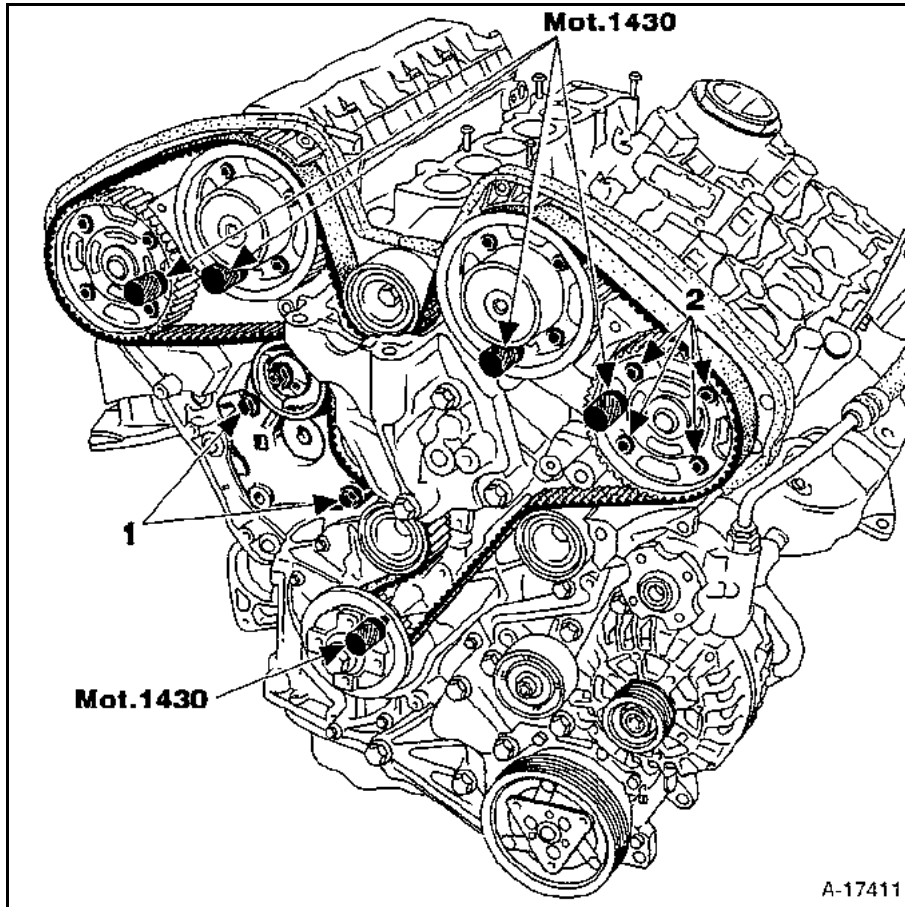


### REFITTING

Check that the locking is correct for the camshafts and the crankshaft  
**Mot. 1430.**

Check that the lug at the back of the tensioner pulley is correctly placed in the groove of the tensioner pulley bracket.

Tighten the bolts (1) to **1 daN.m** then slacken them by **45°**.



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

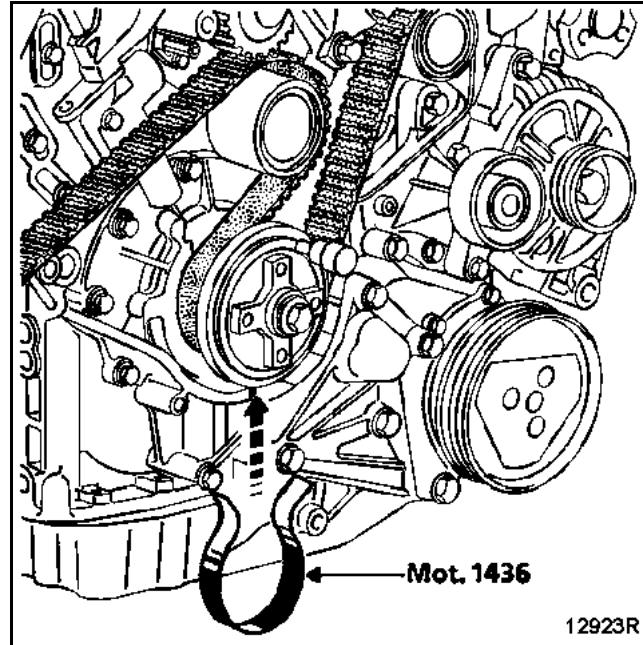
Tighten the bolts (2) to **0.5 daN.m** then unscrew them by **45°**.

## TOP AND FRONT OF ENGINE

### Timing belt

11

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



# TOP AND FRONT OF ENGINE

## Timing belt

11

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

Turn the camshaft pulley (4) slightly anticlockwise, to lock the belt on the pulley.

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

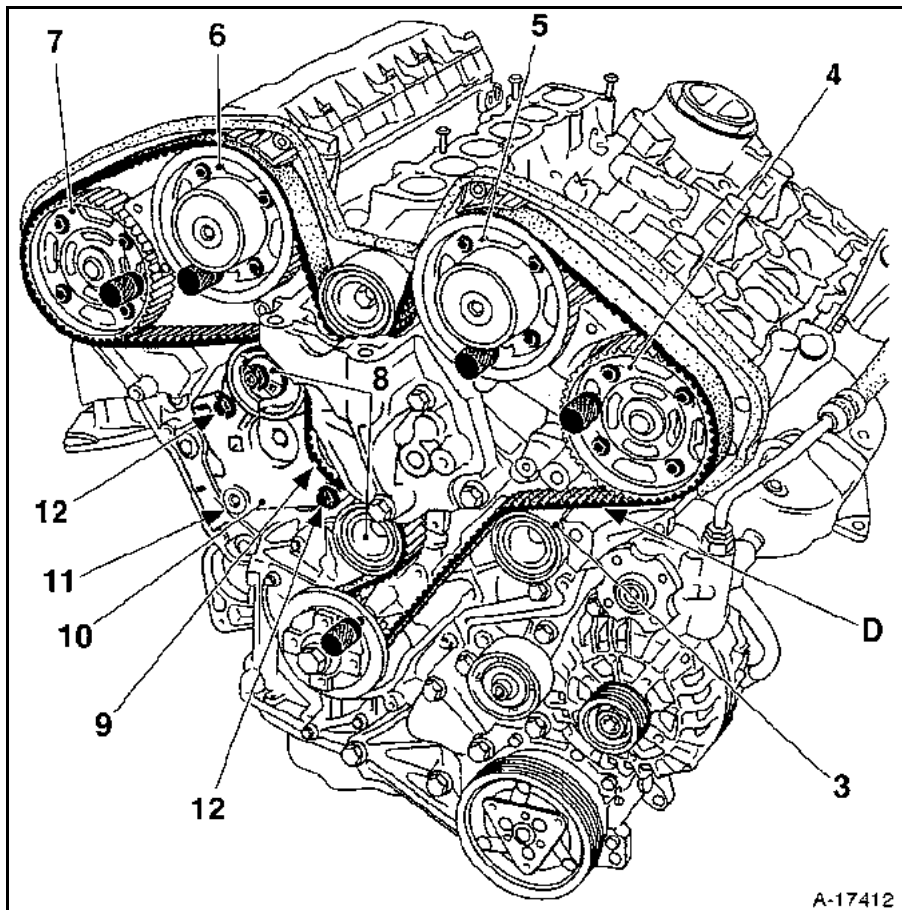
### IMPORTANT:

- The angular displacement of the pulley with respect to the timing belt must not be more than one tooth's worth.
- Check Verify that the camshaft pulleys are not at the end of the slot; if they are, repeat the timing belt fitting procedure.

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

Using a **12.7 mm** square drive, turn the pulley bracket (10) to tighten the timing belt, then replace the bolt in (11).

Tighten the bolts (11) and (12) to **2.5 da N.m.**

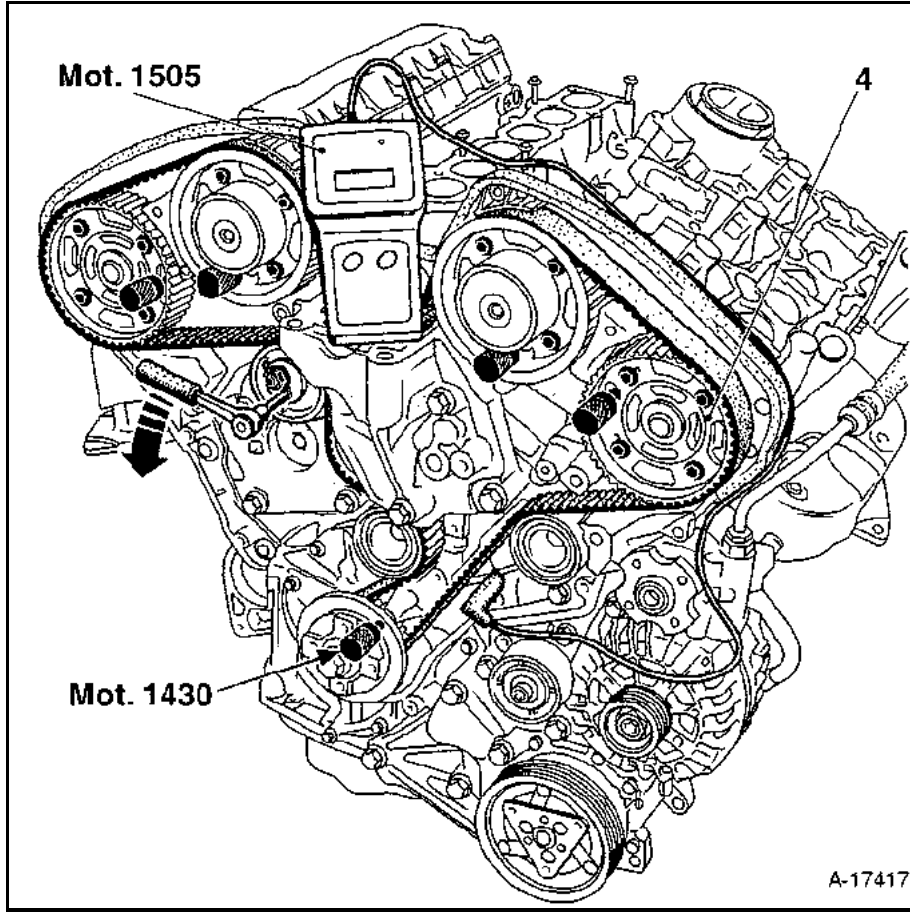


# TOP AND FRONT OF ENGINE

## Timing belt

11

Remove the **Mot. 1436** tool and fit the tension checking tool, **Mot. 1505** (see method described in **section 07 - Timing belt tension**).



Tighten the belt using a **6 mm** square drive to turn the tensioner pulley to a value of **106 + 4 Hz**.

Tighten the tension pulley nut to a torque of **1 daN.m**.

**NOTE:** don't let the tension pulley rotate past the pulley stop.

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

Remove the timing pins from the camshaft and crankshaft using the **Mot. 1430** tool.

Turn the engine over twice.

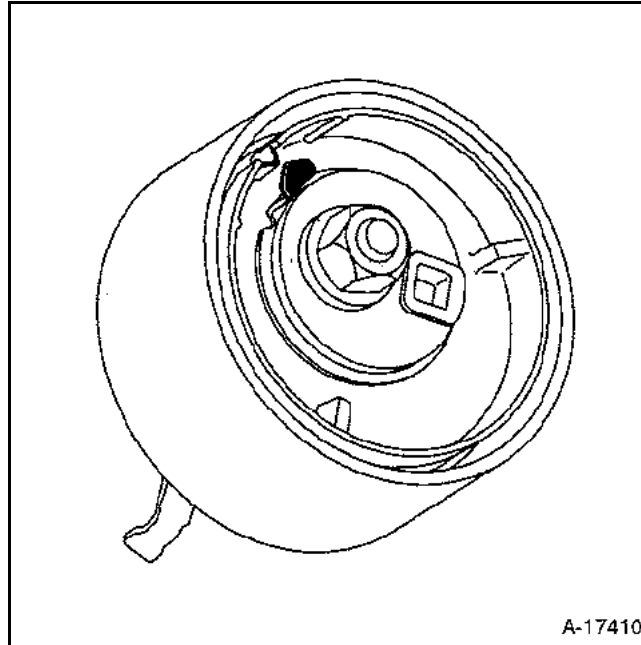
Lock the crankshaft only using a **Mot. 1430** timing pin.

# TOP AND FRONT OF ENGINE

## Timing belt

11

Slacken the pulley nut by **90°** and align the marks, then tighten the nut to **2.5 daN.m.**



Remove the crankshaft pin.



Turn the engine over twice.

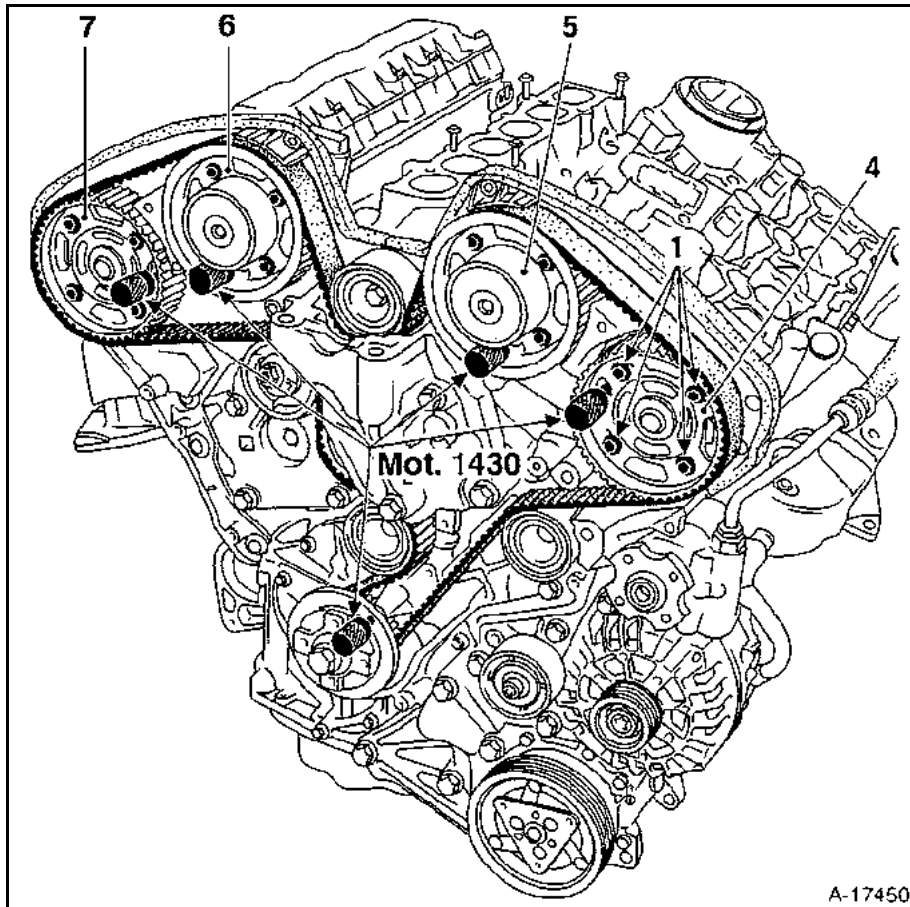
Check that the marks on the tension pulley are aligned; if not, repeat the tensioning process. To do this, slacken the pulley nut by  $90^\circ$  and align the marks on the pulley using a **6 mm** square drive.

Using the **Mot. 1430** timing pins, position in order:

- the crankshaft,
- the camshafts (4), (5), (6) and (7).

### IMPORTANT:

- If the **Mot. 1430** pin will not go into its housing, unscrew the camshaft pulley bolts (1) by  $45^\circ$ .
- If the **Mot. 1430** timing pin will not go into its slot, the camshaft timing operation will be assisted by slackening the bolts (1) by  $45^\circ$  and turning the camshaft hubs using the **Mot. 1428** and **Mot. 1555** tools.



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

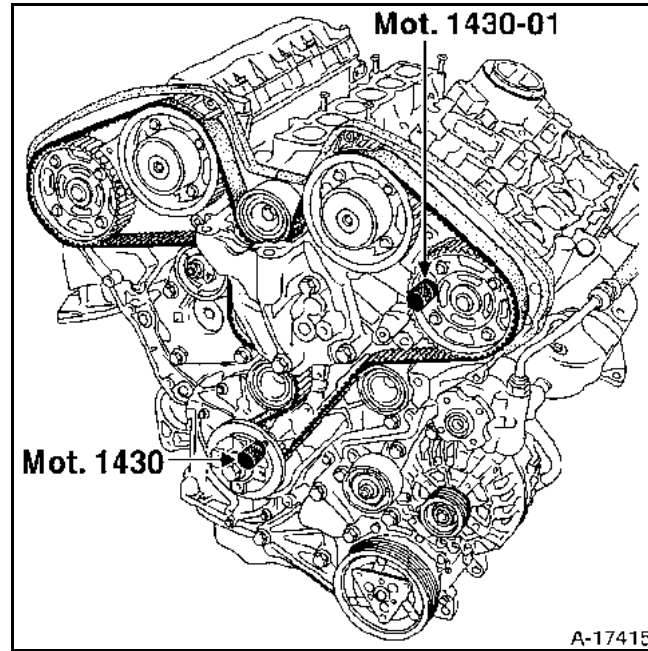
Remove the **Mot. 1430** camshaft and crankshaft timing pins.

### CHECKING TIMING

Turn the engine over twice.

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

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



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

Remove the crankshaft timing pin.

Refit in reverse order to removal.


Refit the accessories belt (see method described in **section 07 - Accessories belt tension**).

# TOP AND FRONT OF ENGINE

## Cylinder head gasket

11

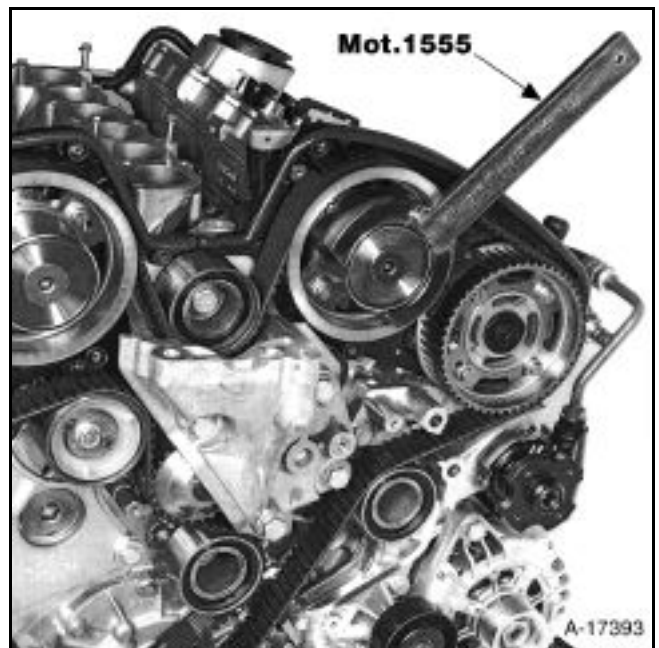
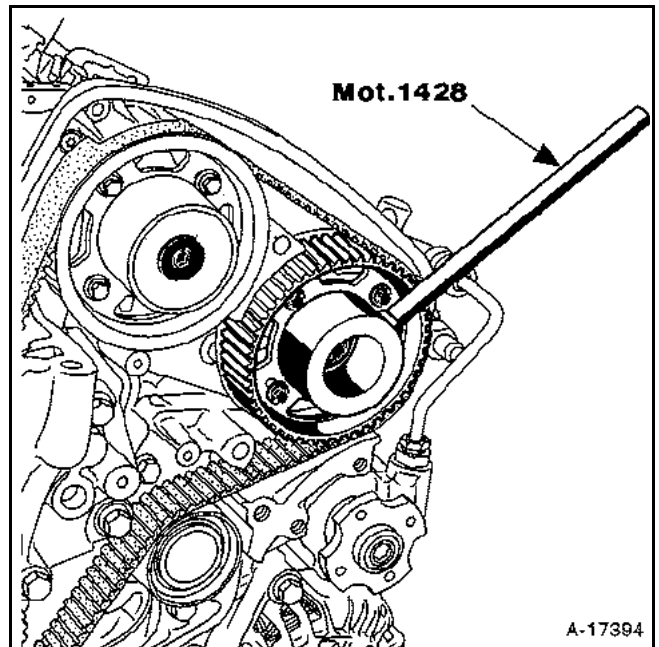
SPECIAL TOOLING REQUIRED	
Mot. 1505	Tool for checking timing belt tension
Mot. 1428	Exhaust camshaft pulley locking tool
Mot. 1555	Inlet camshaft pulley locking tool
Mot. 1430	Crankshaft and camshaft pulley setting pins
Mot. 1430-01	Crankshaft and camshaft pulley setting checking pin
Mot. 1436	Timing belt locking pin

TIGHTENING TORQUES (in daNm)	
Timing belt tensioner pulley nut	2.5
Camshaft hub bolt	8
Timing belt tensioner bolt	2.5
Camshaft pulley bolt	1
Crankshaft pulley bolt	2.5
Wheel bolts	9
Right-hand engine mounting bracket nut and bolt	6.2
Travel limiter bolt	8

### REMOVAL

Remove:

- the engine (see method described in **section 10 - Engine-gearbox**),
- the timing belt, (see procedure described in **section 11 -Timing Belt**),
- the timing pins,
- the camshaft sprocket-hub assembly, locking the hubs using the **Mot. 1428** and **Mot. 1555** tools.

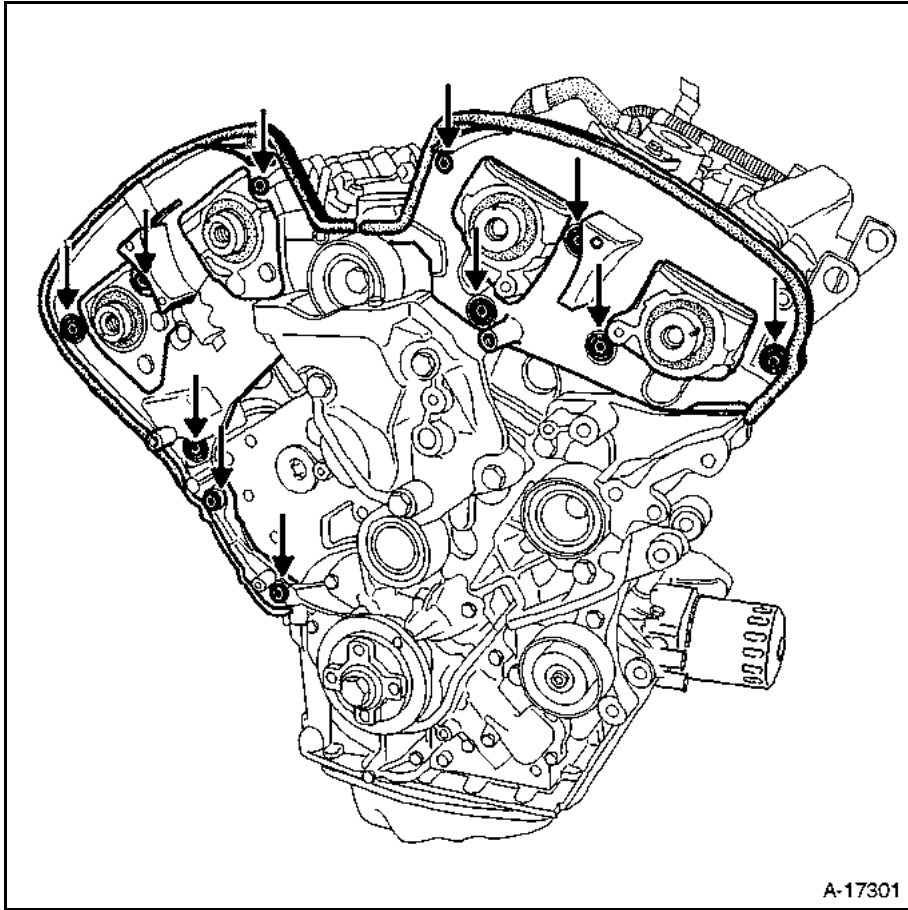


# TOP AND FRONT OF ENGINE

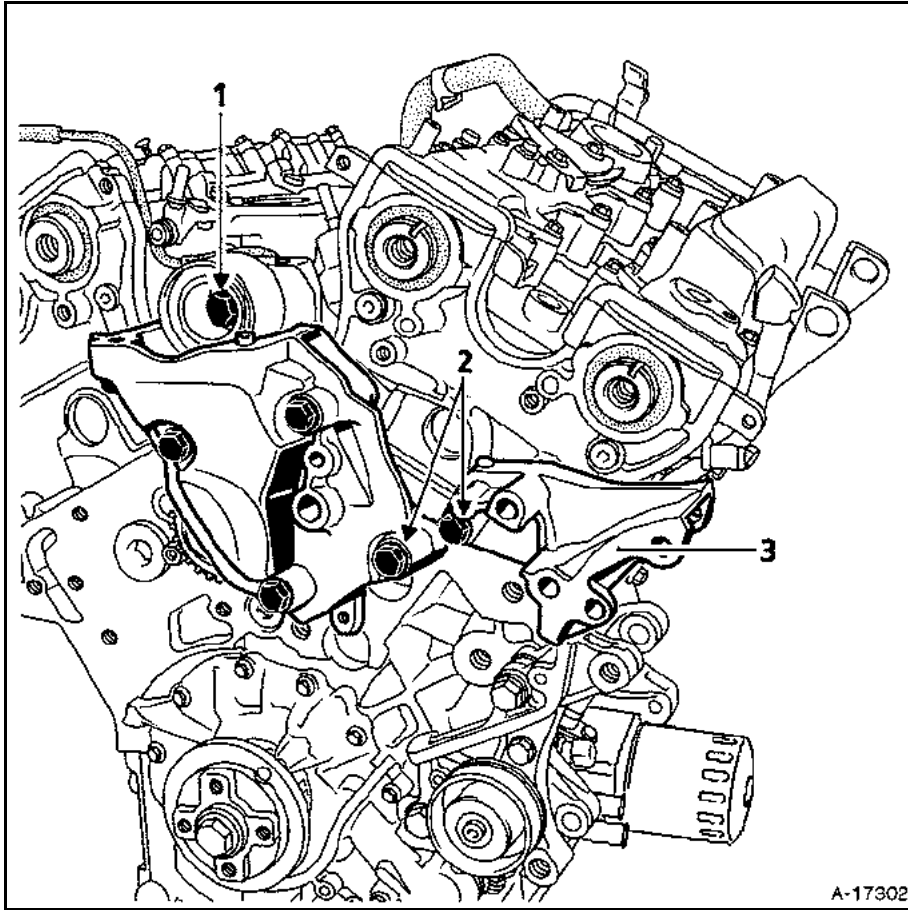
## Cylinder head gasket

11

- the inner timing gear cases,



- the pulley (1),
- the bolts (2) and remove the mounting (3) with the power-assisted steering pump which is attached to it,

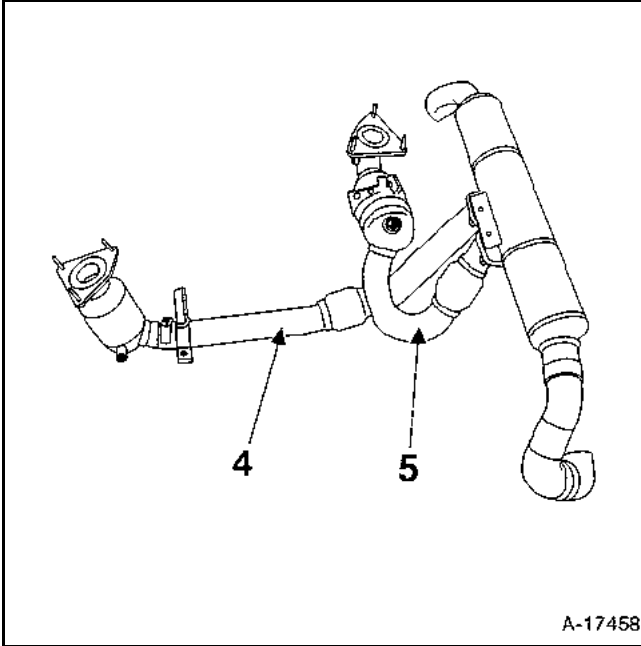


# TOP AND FRONT OF ENGINE

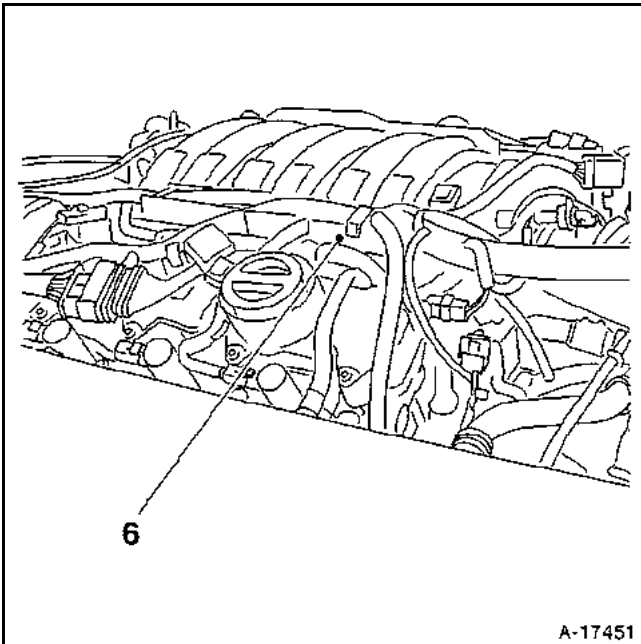
## Cylinder head gasket

11

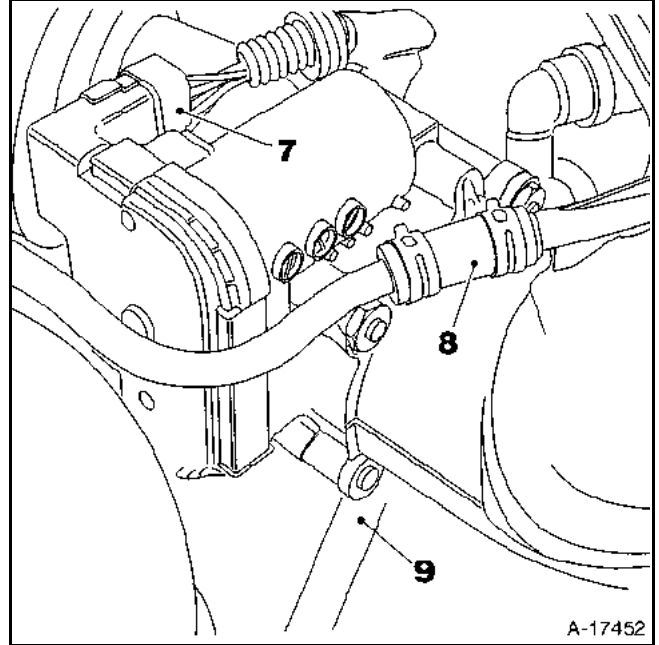
- the primary catalytic converters (4) and (5) and the exhaust manifolds,



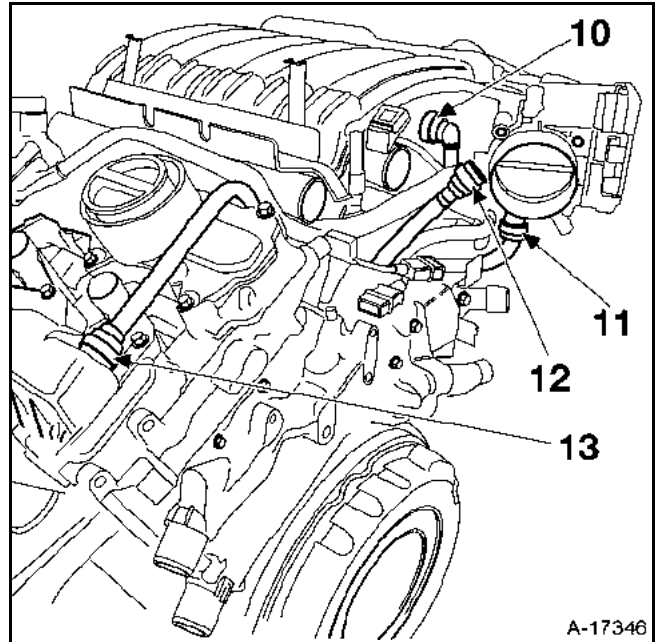
- the engine wiring harness from the mounting wiring harness (6) and remove it to one side,



- the motorised throttle body connector (7)
- the brake servo vacuum pipe (8) and the bleeding hose for vapour from the petrol tank (9) from the inlet manifold,



- the oil vapour rebreather pipes (10), (11), (12) and (13) from the valve rocker covers, the throttle body and the air intake pipe,

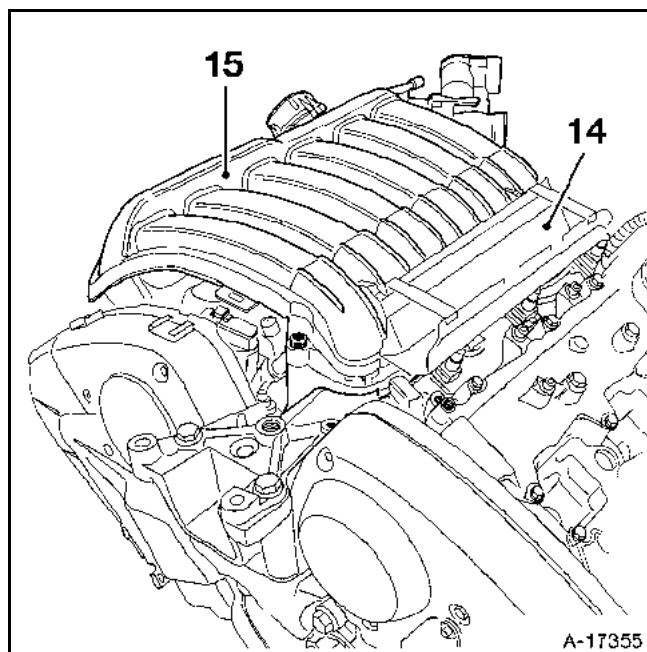


# TOP AND FRONT OF ENGINE

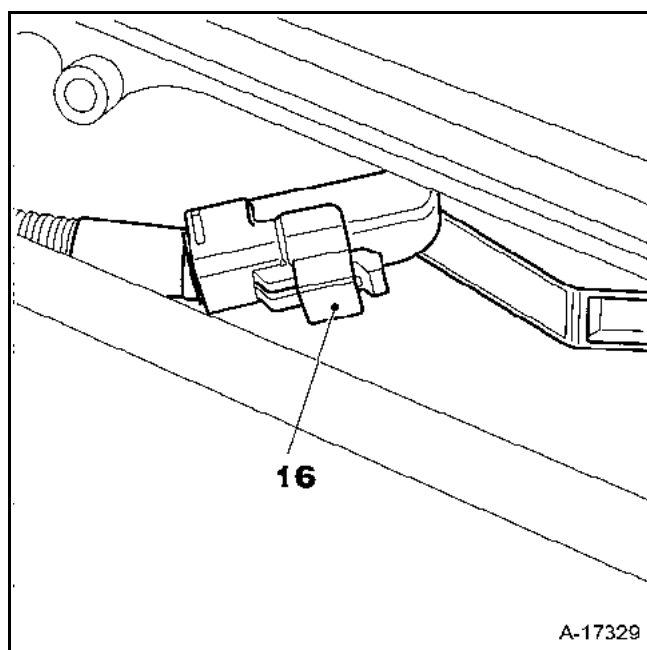
## Cylinder head gasket

11

- the wiring harness bracket (14),
- the inlet manifold mounting bolts (15), disconnect it and lift it up to reach the pressure sensor.



Disconnect the pressure sensor connector (16) and remove the inlet manifold.



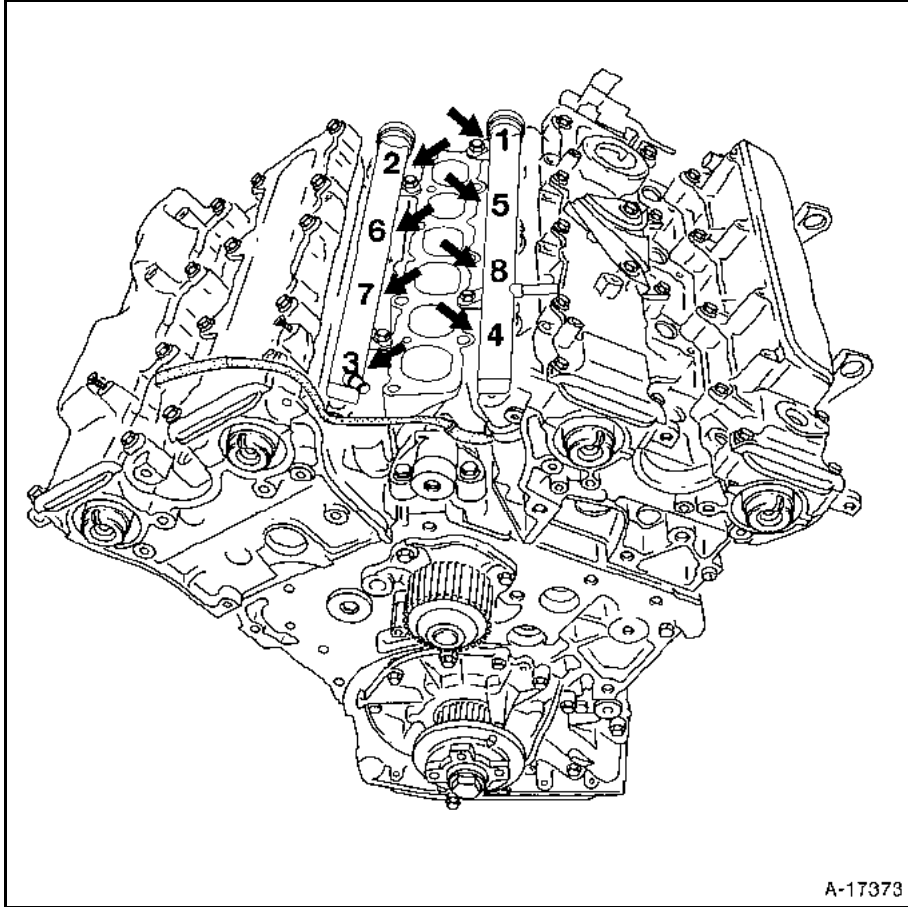
# TOP AND FRONT OF ENGINE

## Cylinder head gasket

11

Slacken and remove the bolts one by one from the air inlet distributor in the recommended order.

Carefully remove the air inlet distribution/injector rail assembly to avoid damaging the rubber seals.





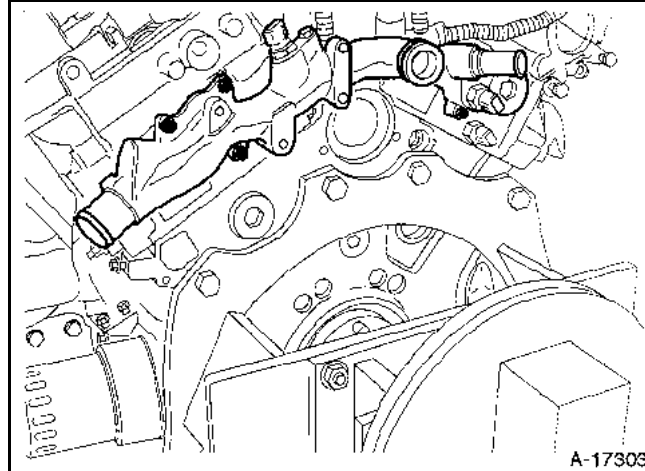
# TOP AND FRONT OF ENGINE

## Cylinder head gasket

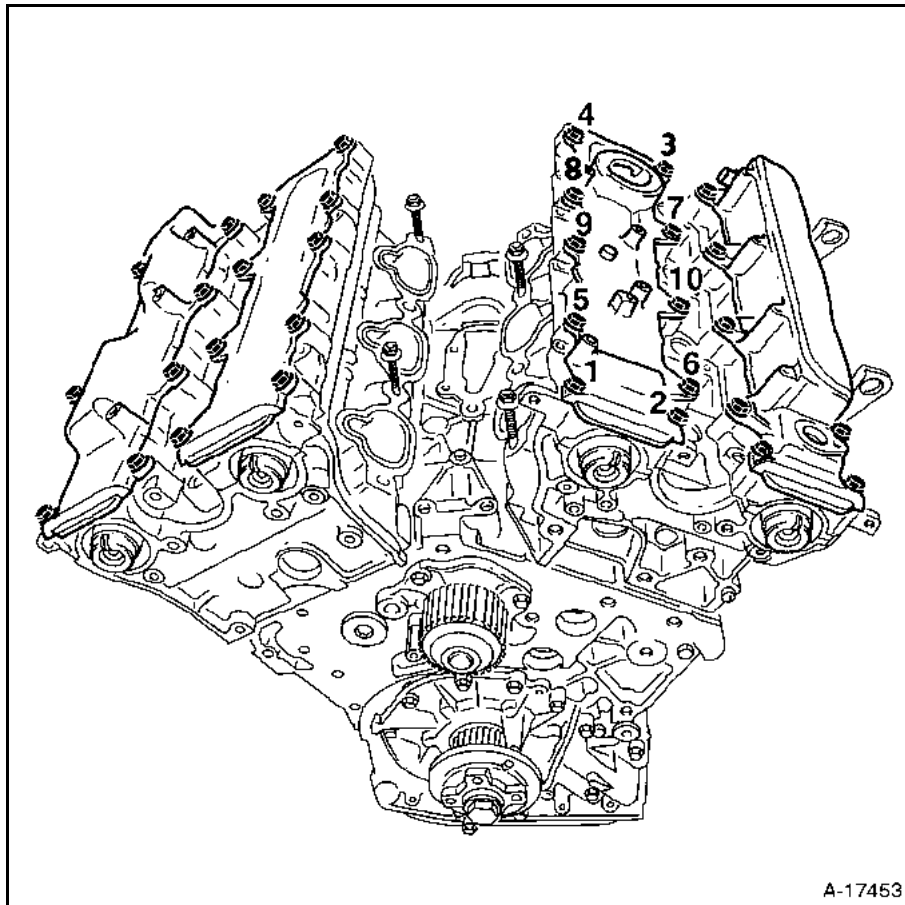
11

Remove:

- the front lifting bracket and the mounting bolt from the gauge guide tube,
- the mountings from the coolant manifold on the two cylinder heads.



Slacken and remove the camshaft cover bolts one by one following the recommended method, then remove the camshaft covers.



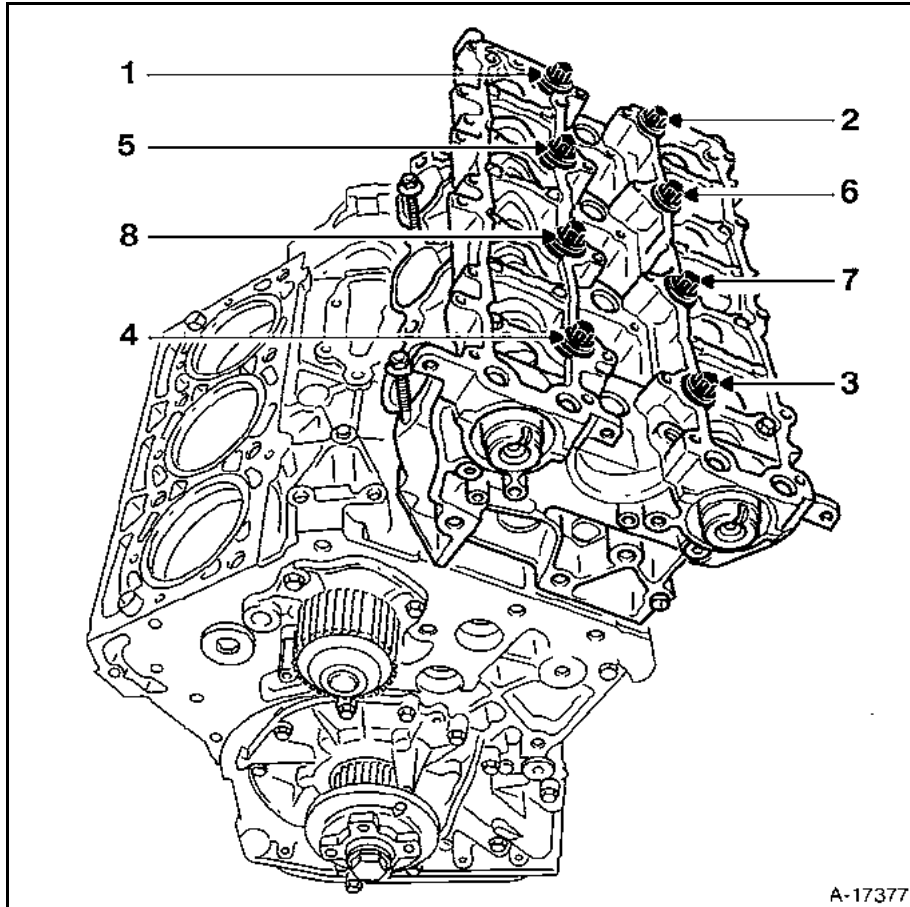
## TOP AND FRONT OF ENGINE

### Cylinder head gasket

11

Slacken and remove the cylinder head bolts one by one in the recommended order.

Remove the cylinder head carefully to prevent damage to the sealing surfaces.



### CLEANING

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

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

Apply the product to the part to be cleaned, wait approximately 10 minutes, then remove it using a wooden spatula.

Wear gloves whilst carrying out this operation.

**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 heads).**

### CHECKING THE GASKET FACE

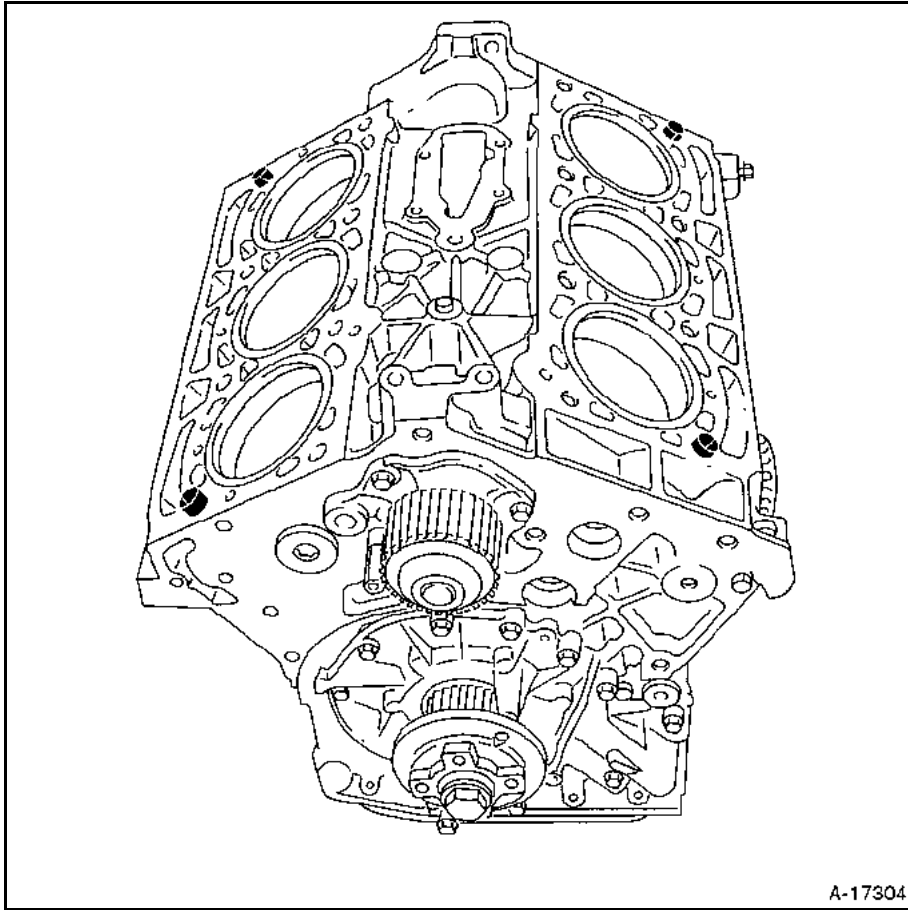
Check for gasket face bow using a straight edge and a set of shims.

Maximum deformation: **0.05 mm.**

**Replace the cylinder head if the deformation exceeds this limit. Regrinding of cylinder heads is not permitted.**

### REFITTING - Special Notes

the cylinder heads are centred using two centring dowels each.

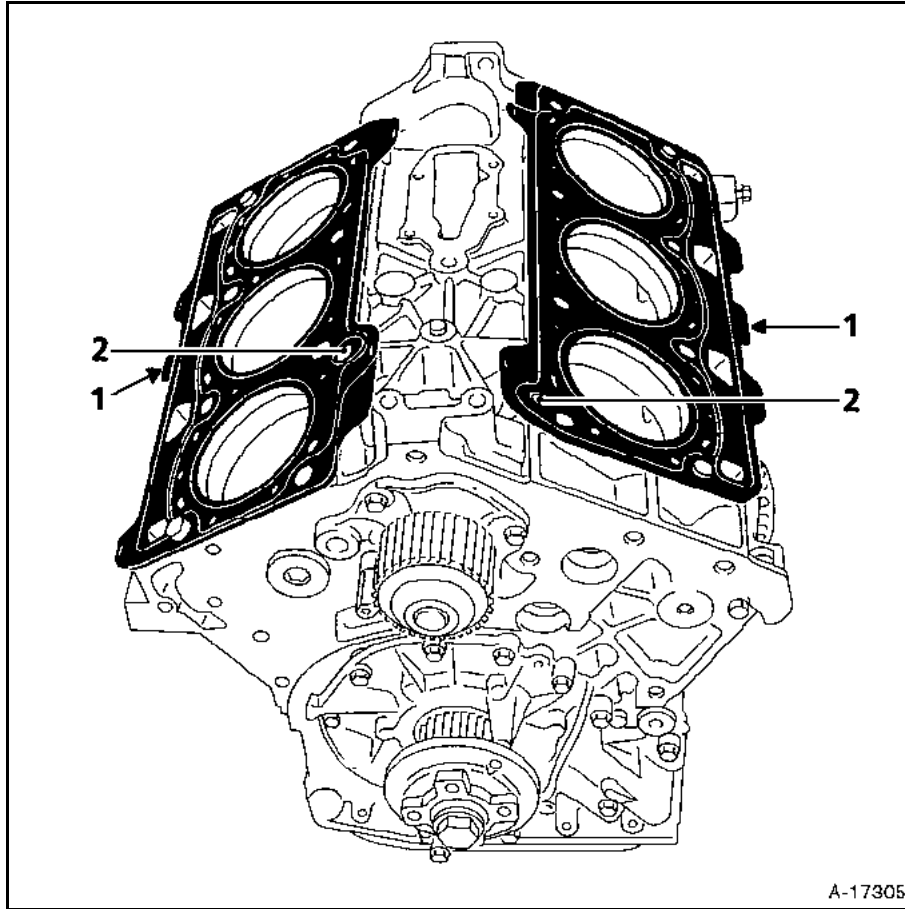


# TOP AND FRONT OF ENGINE

## Cylinder head gasket

11

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



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

### REMINDER:

- In order to ensure that the bolts are correctly tightened, use a syringe to remove any oil which may be in the cylinder head securing holes.
- Coat the bolt threads and head mating surfaces with engine oil.

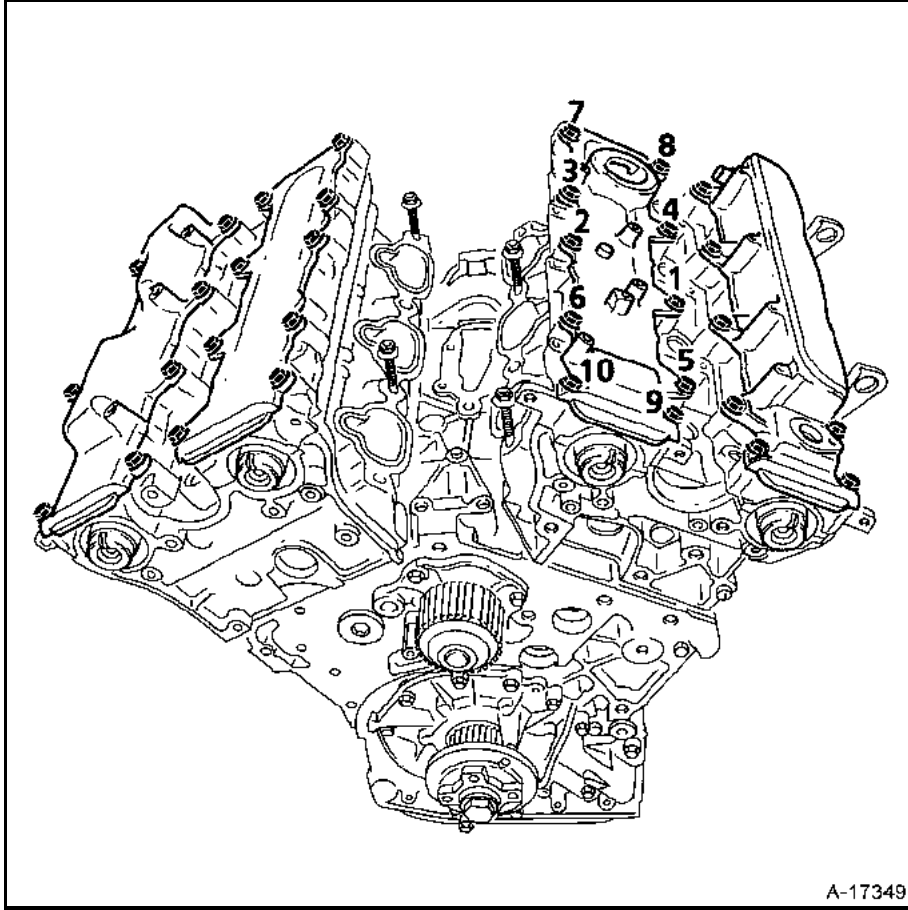
Tighten the cylinder heads using a cylinder head angular tightening wrench (see **section 07 - Tightening cylinder heads**).

## TOP AND FRONT OF ENGINE

### Cylinder head gasket

11

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



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

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

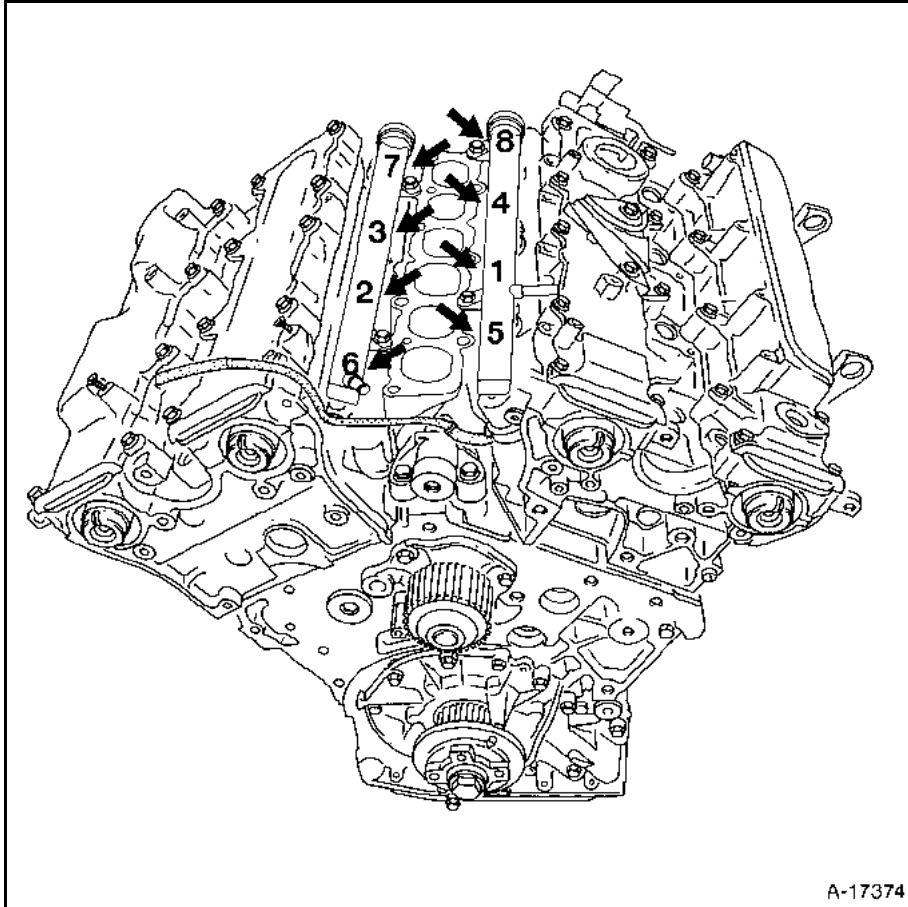
# TOP AND FRONT OF ENGINE

## Cylinder head gasket

11

Replace the seal on the air intake manifold.

Finger tighten the air inlet manifold/injector rail assembly bolts, pre-tighten to **1 daN.m** (in the recommended order), then tighten to a torque of **2.5 daN.m** (in the recommended order).



Refit in reverse order to removal.

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

Refit the engine (see method described in **section 10 - Engine - Gearbox**).

Fill with engine oil, if required.

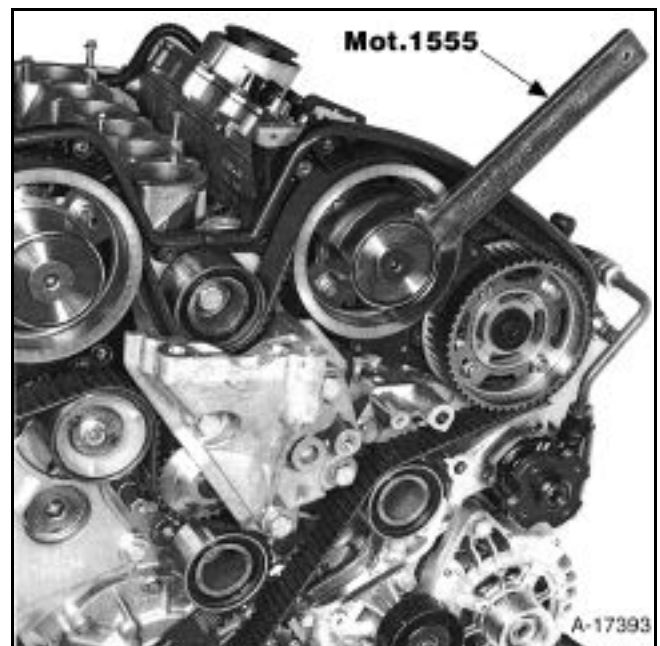
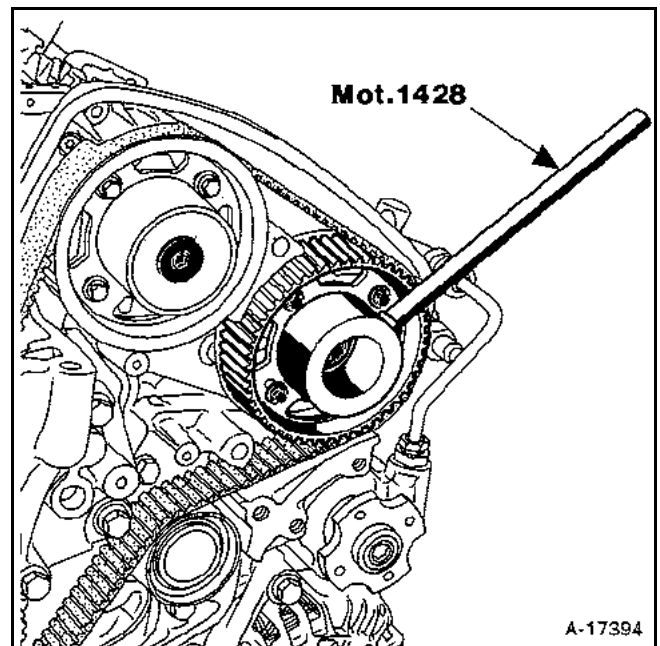
SPECIAL TOOLING REQUIRED	
Mot. 1505	Tool for checking timing belt tension
Mot. 1428	Exhaust camshaft hub locking tool
Mot. 1555	Inlet camshaft pulley locking tool
Mot. 1430	Crankshaft and camshaft pulley setting checking pins
Mot. 1430-01	Crankshaft and camshaft pulley setting checking pin
Mot. 1432	Camshaft seal fitting tool
Mot. 1436	Timing belt locking pin

TIGHTENING TORQUES (in daNm)	
Timing belt tensioner pulley nut	2.5
Camshaft hub bolt	8
Timing belt tensioner bolt	2.5
Camshaft sprocket bolt	1
Crankshaft pulley bolt	2.5
Wheel bolts	9
Right-hand engine mounting bracket nut and bolt	6.2
Travel limiter bolt	8

### REMOVAL

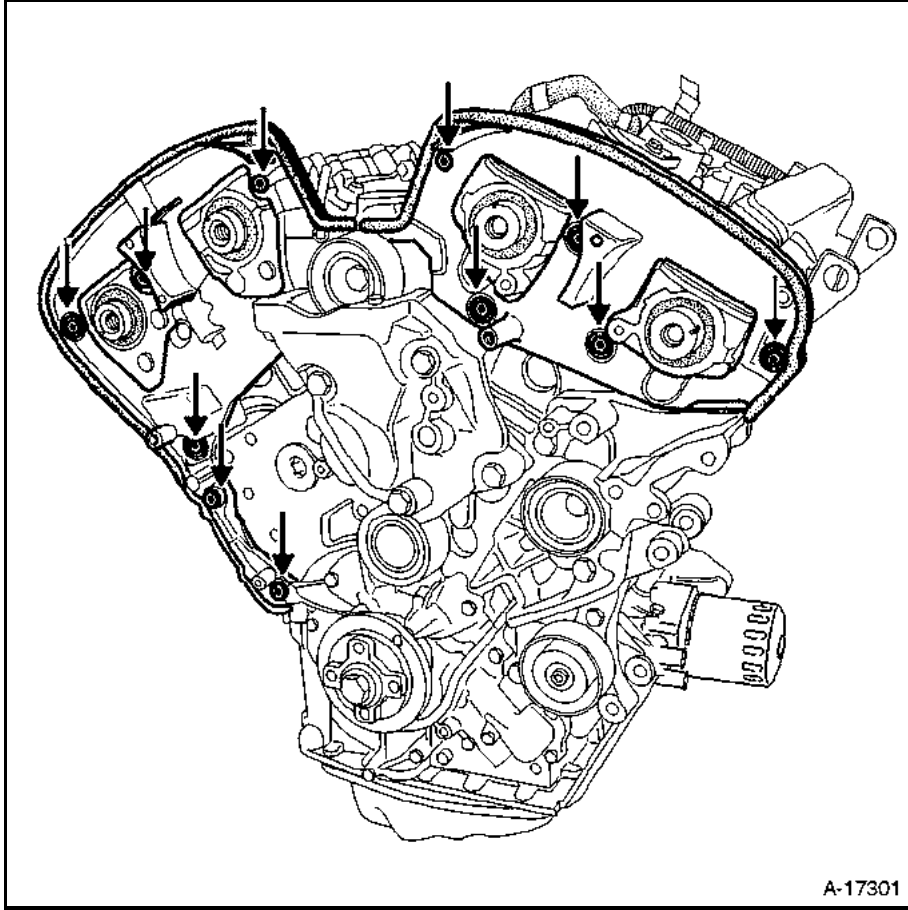
Remove:

- the engine(see method described in **section 10 - Engine-gearbox**),
- the timing belt, (see procedure described in **section 11 - Timing Belt**),
- the camshaft timing pins only,
- the camshaft sprocket-hub assembly, locking the hubs using the **Mot. 1428** and **Mot. 1555** tools.





Remove:  
– the inner timing gear cases,

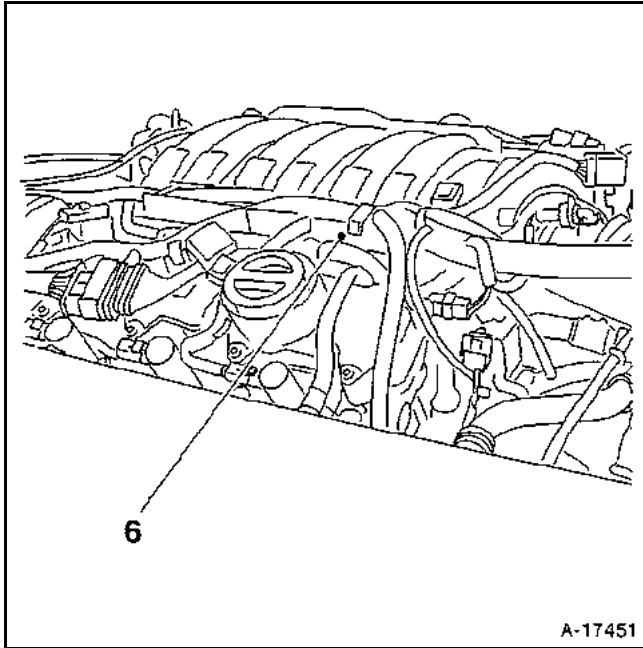


# TOP AND FRONT OF ENGINE

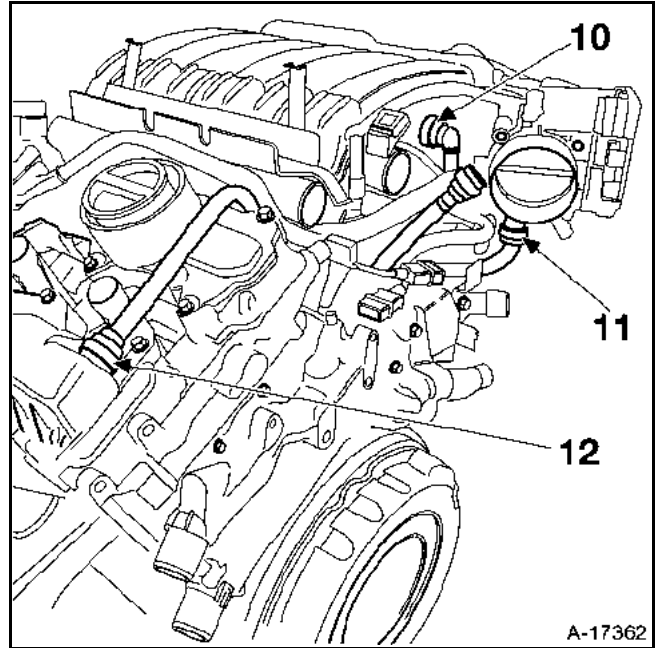
## Camshaft

11

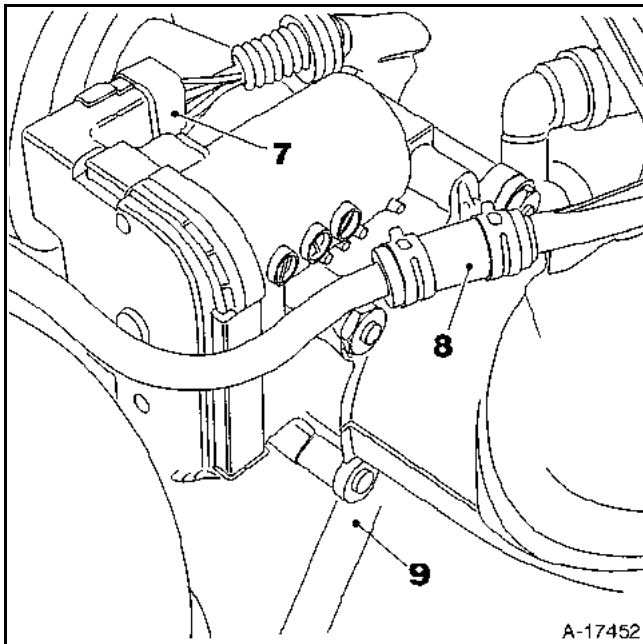
- the air intake pipe from the throttle body,
- the engine wiring harness from the mounting wiring harness (6) and remove it to one side,



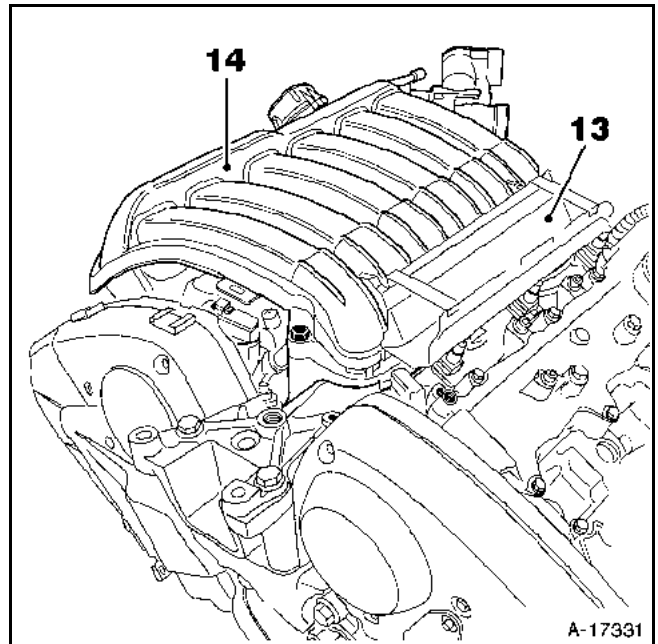
- the oil vapour rebreather pipes (10), (11), and (12), from the valve rocker covers and the throttle body,



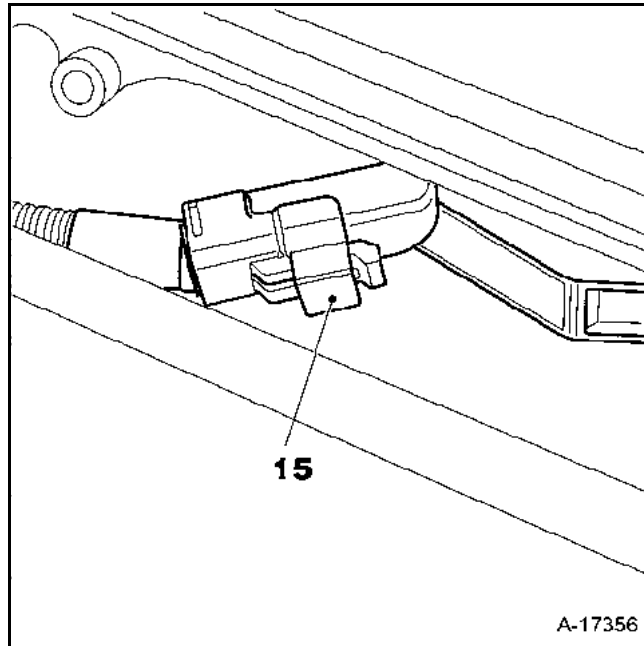
- the motorised throttle body connector (7)
- the brake servo vacuum pipe (8) and the bleeding hose for vapour from the petrol tank (9) from the inlet manifold,



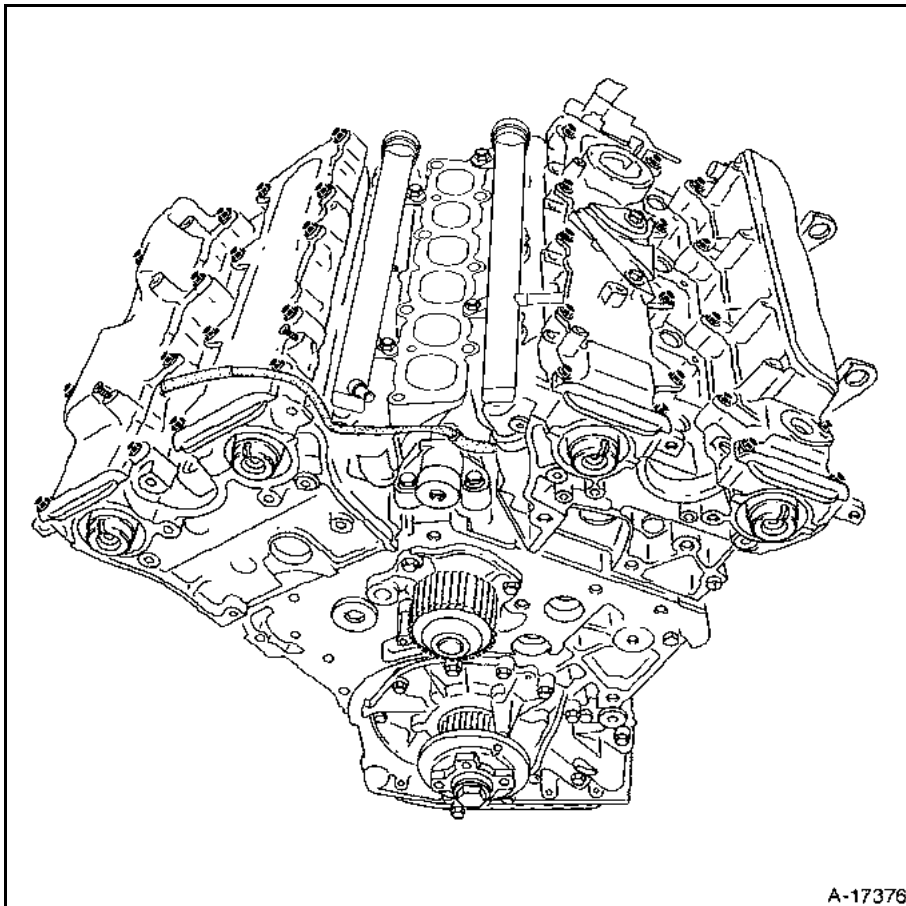
- the wiring harness bracket (13),
- the inlet manifold mounting bolts (14), disconnect it and lift it up to reach the pressure sensor.



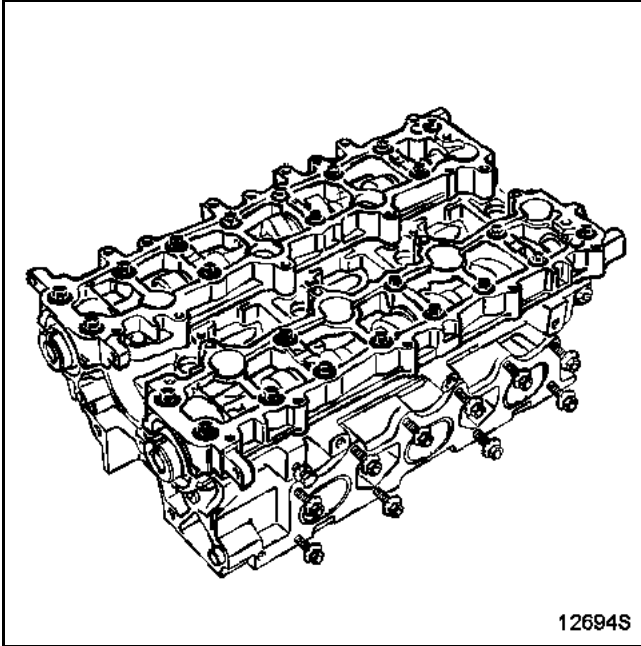
Disconnect the pressure sensor connector (15) and remove the inlet manifold.



Slacken and remove the camshaft cover bolts one by one in the recommended way, then remove the camshaft covers.



Proceed in the same way for the camshaft supporting bolts.



Remove the camshaft bearings to avoid damaging the sealing surfaces.

Remove the camshafts and camshaft sealing rings.

### CLEANING

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

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

Apply the product to the part to be cleaned, wait approximately 10 minutes, then remove it using a wooden spatula.

Wear gloves whilst carrying out this operation.

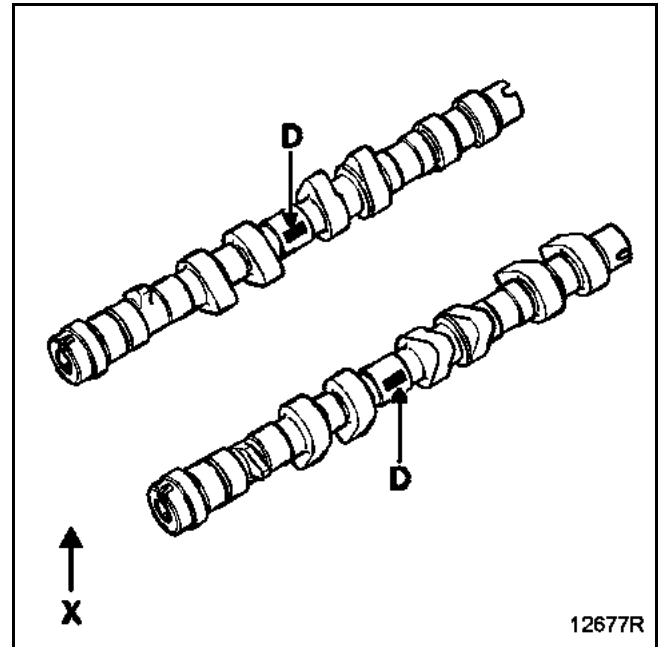
### REFITTING

Lubricate the cams and bearings.

Fit the camshafts.

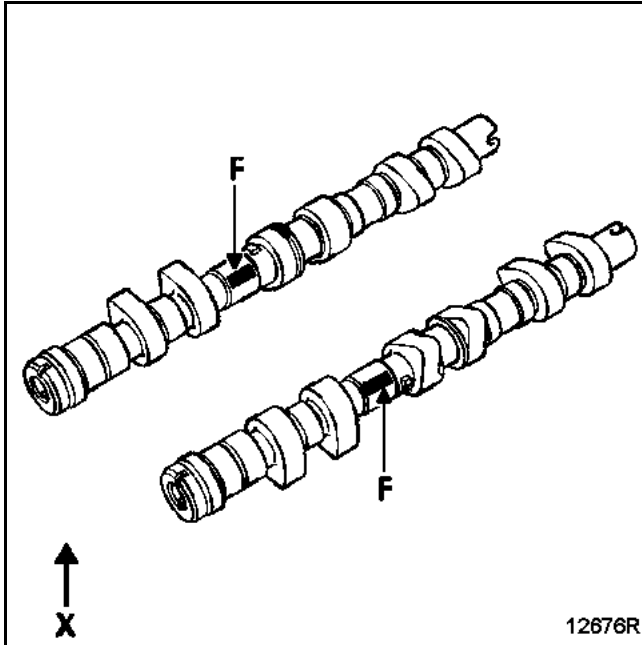
### IDENTIFICATION OF THE CAMSHAFTS

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



Inlet: D = A718  
Exhaust: D = E720  
X: timing end

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

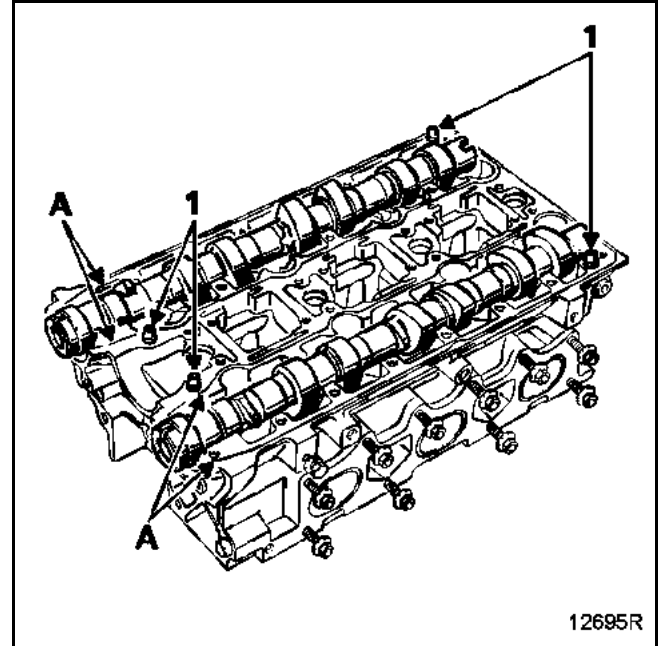


Inlet: F = A717  
 Exhaust: F = E719  
 X: timing end

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

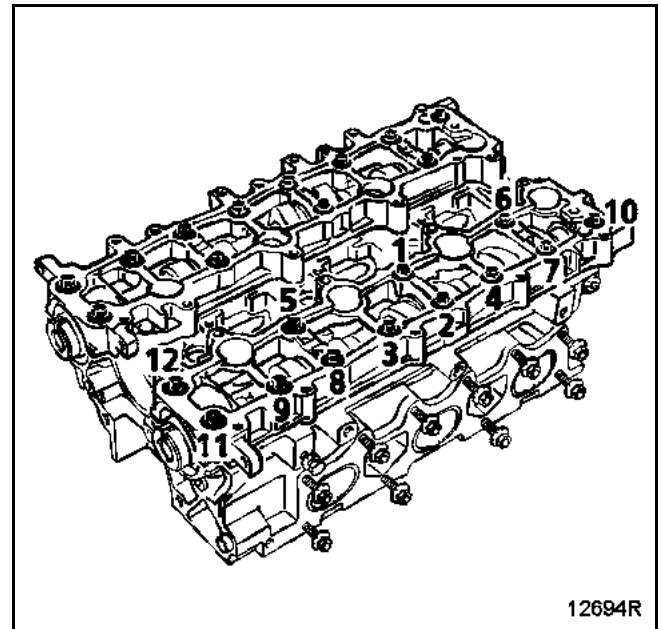
Check the end play of the camshafts (see **L Engine** manual).

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



Position the camshaft bearing cap covers.

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



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

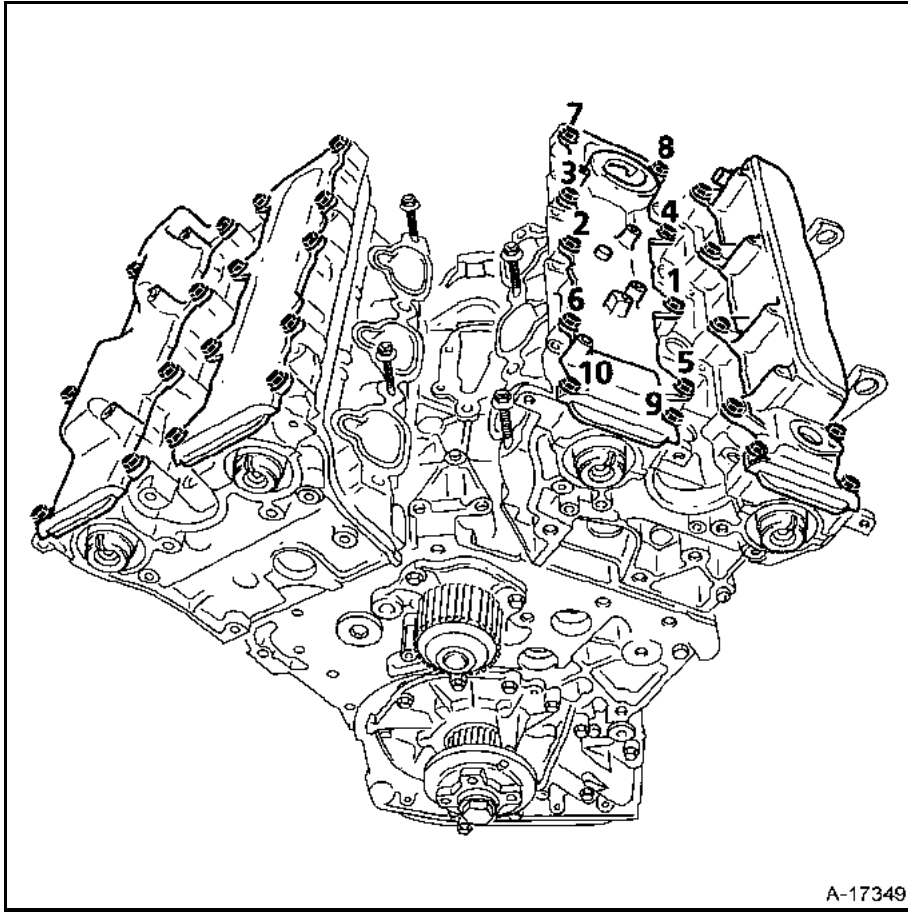
Refit the camshaft covers after cleaning the seals and mating surfaces.

# TOP AND FRONT OF ENGINE

## Camshaft

11

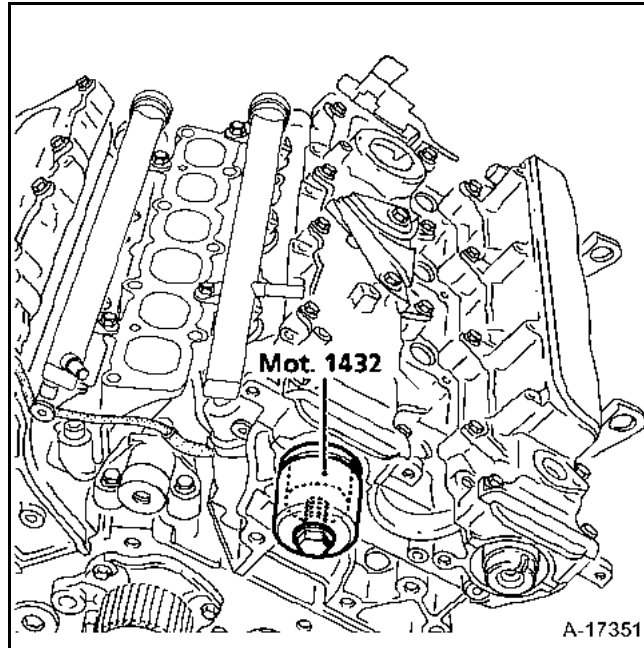
Finger tighten then progressively tighten the mounting bolts in the recommended order.



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

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

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



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

Refit in reverse order to removal.

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

# FUEL MIXTURE Specifications

12

Vehicle	Gearbox	Engine							Anti-pollution standard
		Type	Index	Bore (mm)	Stroke (mm)	Capacity (cm <sup>3</sup> )	Compression ratio	Catalytic converter	
CB1A	PK6	L7X	760	87	82.6	2 946	11.4 / 1	♦ C65 ♦ C80	EU 96

Engine		Tests at idle speed*					Fuel*** (minimum octane rating)
Type	Index	Engine speed (rpm)	Emission of pollutants **				
			CO (%) (1)	CO2 (%)	HC (ppm)	Lambda (λ)	
L7X	760	650 ± 50	0.5 max	14.5 min	100 max	0.97<λ> 1.03	Unleaded (95 RON)

(1) at **2 500 rpm** the CO content should be 0.3 maximum.

- \* For a coolant temperature greater than **80 °C** and after the speed has stabilised at **2 500 rpm** for approximately **30 seconds**.  
Test to be carried out after return to idle speed.
- \*\* For legal values refer to your country specification.
- \*\*\* Super unleaded 97 RON recommended.

Temperature in °C (± 1°)	0	20	40	80	90
<b>Air temperature sensor</b> NTC type resistance in Ohms	5000 to 7000	2000 to 3000	1000 to 1500	-	-
<b>Temperature sensor</b> Type (green 2 track connector) NTC type resistance in Ohms	-	2000 to 3000	1000 to 1500	250 to 350	200 to 240



# FUEL MIXTURE

## Specifications

12

DESCRIPTION	MARQUE/TYPE	SPECIAL NOTES
Computer	BOSCH/ME7.0	55 tracks
Injection		Multipoint with sequential regulation
Ignition		Static with 6 higher spark plug coils Power module integral in computer A pinking sensor Tightening torque: <b>2 daNm</b> Firing order: 1 - 6 - 3 -5 - 2 - 4 Resistance (coil) =
TDC sensor		Track resistance <b>1-2: 375 Ω</b>
Spark plugs	BOSCH FGR 7 HQPE	Gap: (non adjustable) Tightening: <b>2.5 to 3 daN.m</b>
Fuel filter		Fitted to the upper right-hand side of the fuel tank Replaced during major service
Fuel pump	BITRON	Immersed in the tank Flow: <b>80 l/h</b> minimum under a regulated pressure of <b>4 bar</b> and at a voltage of <b>12 volts</b>
Pressure regulator	PIERBURG	Regulated pressure <b>4 ± 0.2 bars</b>
Pulse damper	BOSCH	
Solenoid injector	BOSCH	Voltage: <b>12 volts</b> Resistance: <b>13 ± 1Ω</b>
Throttle body	BOSCH	“Fly by wire”

FUEL MIXTURE  
Specifications

DESCRIPTION	MARQUE/TYPE	SPECIAL NOTES
Idle speed regulation solenoid valve	BOSCH	Voltage: <b>12 volts</b> Track resistance <b>1-3: 24 Ω</b> <b>1-2: 12 Ω 2</b> <b>2-3 12 Ω</b>
Fuel vapour rebreathing canister Solenoid valve	-	Voltage: <b>12 volts</b> (RCO control) Resistance <b>30 ± 5 Ω</b>
Heated oxygen sensor	-	Voltage at <b>850°C</b> Rich mixture > <b>625 mV</b> Lean mixture: <b>0 to 80 mV</b> Heating resistance, track <b>1-2: 2 to 15 Ω</b> Tightening torque: <b>4 to 5 daN.m</b>

### TIGHTENING TORQUES (in daNm)



Throttle body mounting bolt on the inlet manifold

2

### REMOVAL

Remove the tray under the bonnet.

Disconnect the battery.

Remove:

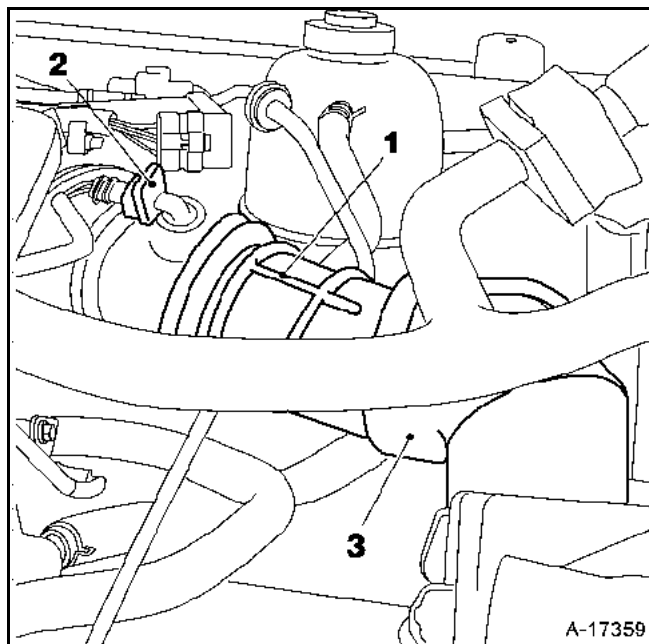
- the two clamps holding the air filter unit,
- the oil vapour rebreather pipe from the air intake pipe (1).

Disconnect the air temperature sensor (2).

Unscrew the clamp holding the air intake pipe and disconnect it from the throttle body.

Remove the coolant expansion bottle from the flame shield and place it to one side.

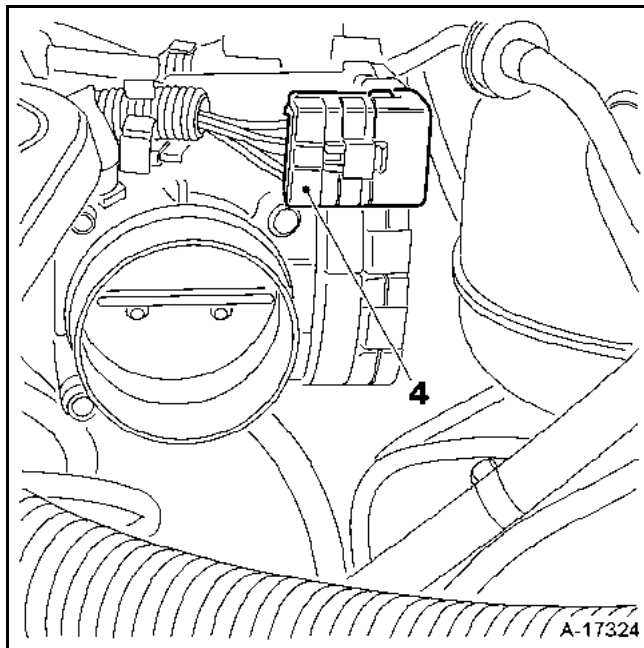
Remove the air intake pipe from the elbow (3).



A-17359

Disconnect:

- the wiring harness connector from the throttle body (4),
- the oil vapour rebreathing pipe from the throttle body.



A-17324

Remove the throttle body mounting bolts then remove the throttle body.

**NOTE:** the throttle body is a sealed unit that does not contain any user-serviceable components.

### REFITTING

Replace the rubber seal.

Refitting is then the reverse of removal.

### TIGHTENING TORQUES (in daNm)



Manifold mounting bolt	2
Manifold mounting	2.5

### REMOVING THE INLET MANIFOLD

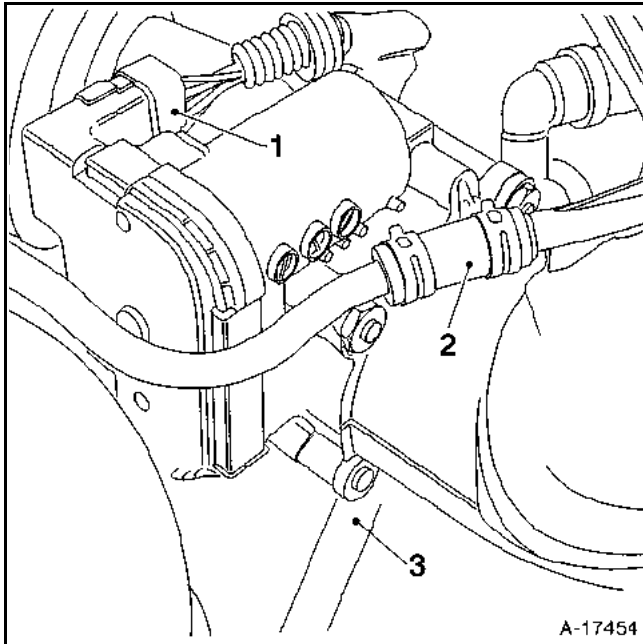
Remove the tray under the bonnet.

Disconnect the battery.

Remove the engine cover.

Disconnect:

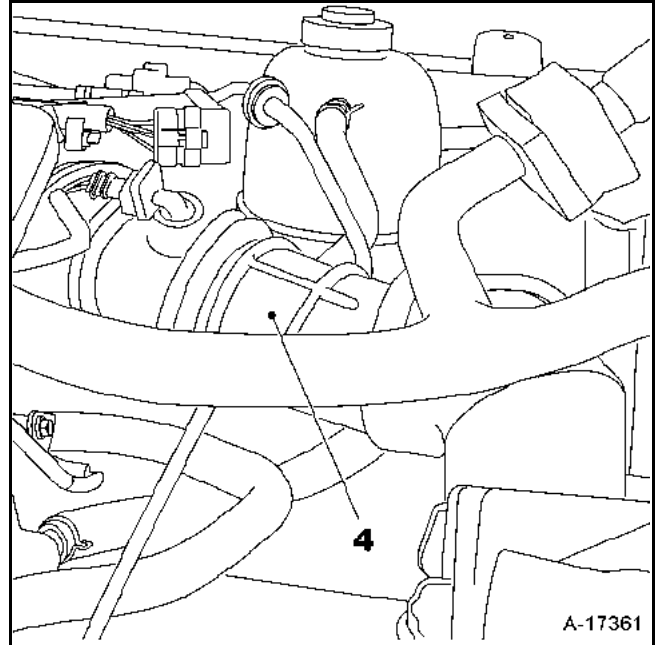
- the throttle body connector (1),
- the brake servo vacuum pipe (2) and the bleed hose (3) from the inlet manifold,
- the oil vapour rebreathing pipe from the throttle body.



A-17454

Unscrew the clamp holding the air intake pipe (4) on the throttle body.

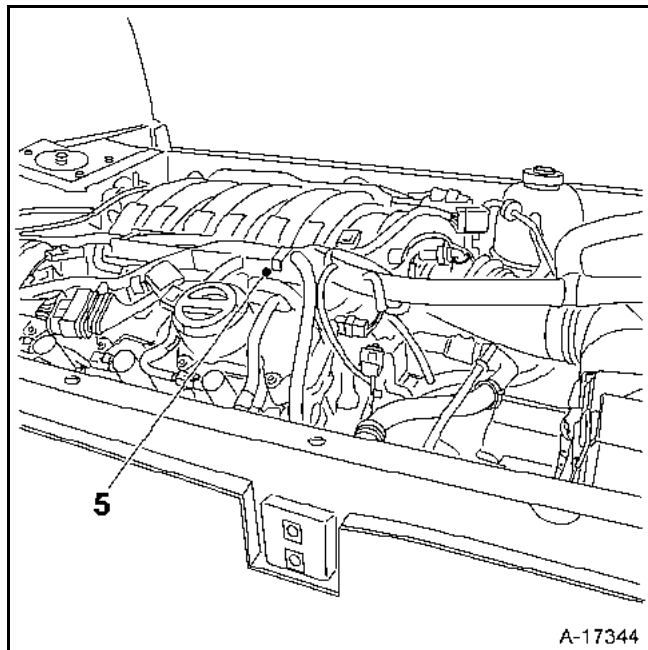
Remove the coolant expansion bottle from the flame shield and place it to one side.



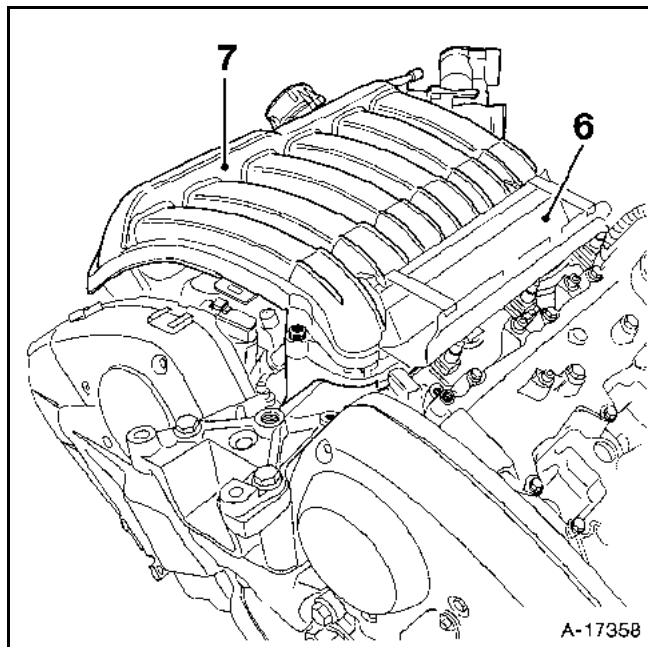
A-17361

Remove:

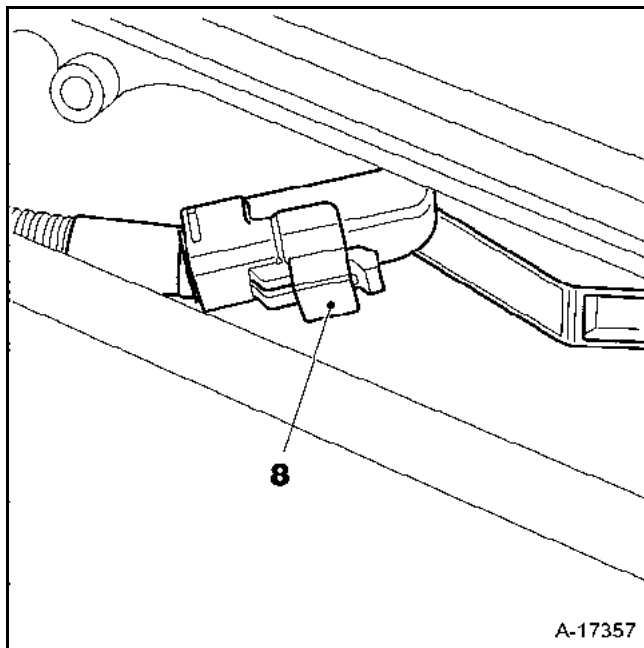
- the engine wiring harness from the bracket (5) and remove it to one side,



- the wiring harness bracket (6),
- the inlet manifold mounting bolts (7), then disconnect it and lift it up to reach the manifold absolute pressure sensor.



Disconnect the absolute pressure sensor connector (8) and remove the inlet manifold.



### REMOVAL OF THE AIR INLET MANIFOLD/INJECTOR RAIL ASSEMBLY

Remove the fuel lines from the injector rails.

**IMPORTANT:** check that the fuel inlets on the injector rails are covered for safety.

Disconnect the wiring connectors from the injector rails.

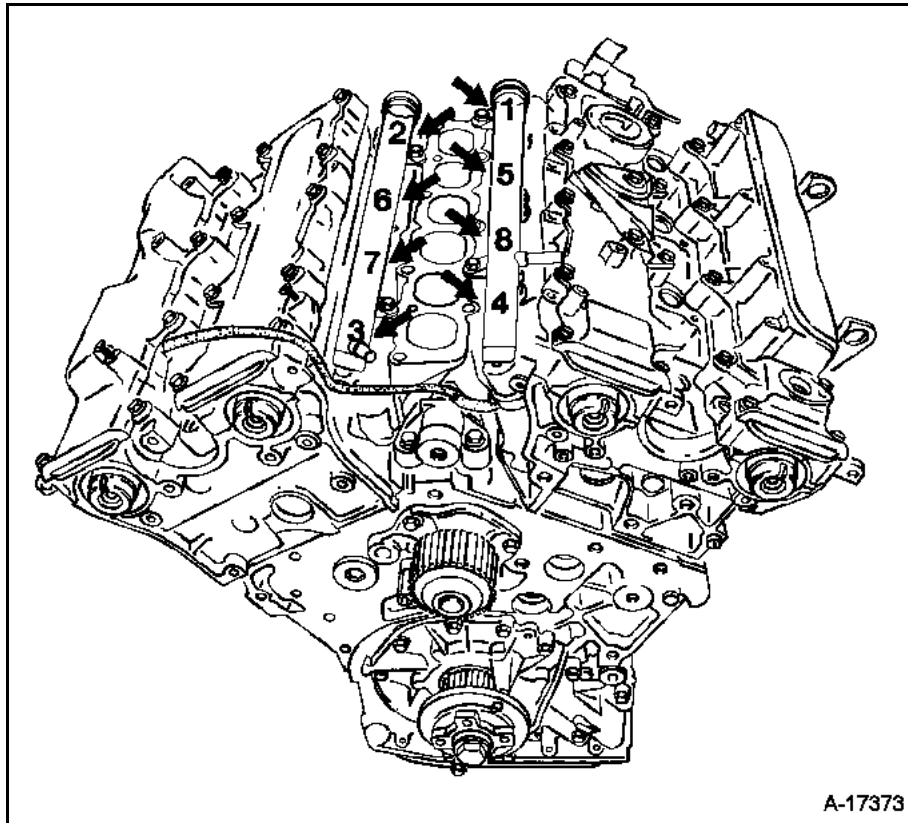
Disconnect the bracket from the oil vapour rebreather pipe on the inlet manifold.

Disconnect the wiring from the brackets on the injector rails.

Slacken and remove the bolts one by one from the air inlet manifold in the recommended order.

Carefully remove the air inlet manifold/injector rail assembly to avoid damaging the rubber seals.

Remove the injector rails from the inlet manifold.



### REFITTING

Change the seals.

Refit in reverse order to removal.

**NOTE:** To remove the air inlet manifold/injector rail, see the method described in **section 11 - Cylinder head gasket**.

### TIGHTENING TORQUES (in daNm)



Manifold nut	3
Primary catalytic converter mounting bolt	3

### REMOVAL

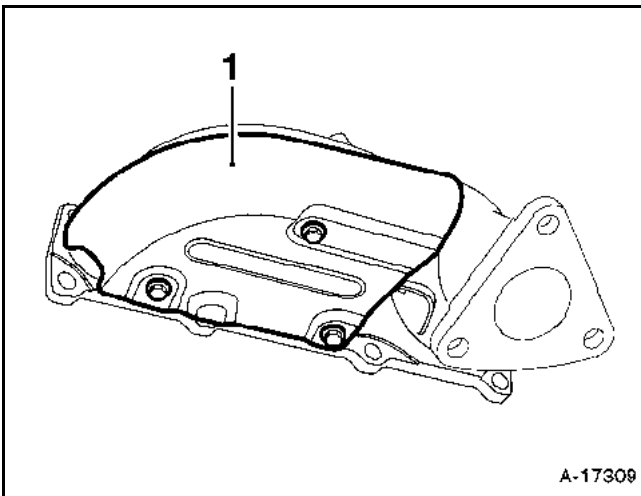
Remove:

- the engine from the vehicle (see method described in **section 10 - Engine - Gearbox**).

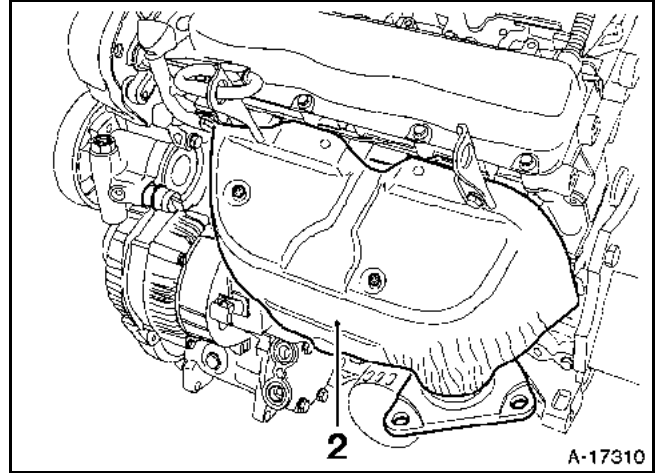
Slacken the bolts on the primary catalytic converter heat screens.

Remove:

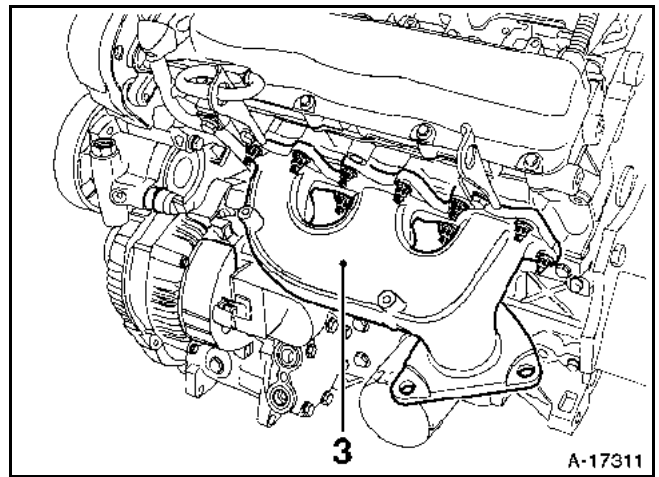
- the primary catalytic converter from the exhaust manifold,
- the heat screen (1) under the exhaust manifold,



- the heat screen (2) from the exhaust manifold,




- the mounting nuts from the exhaust manifold (3), then take it out.



### REFITTING

Replace the seal.

Refit in reverse order to removal.

TIGHTENING TORQUES (in daNm)		
Manifold nut	3	
Primary catalytic converter mounting bolt	3	

### REMOVAL

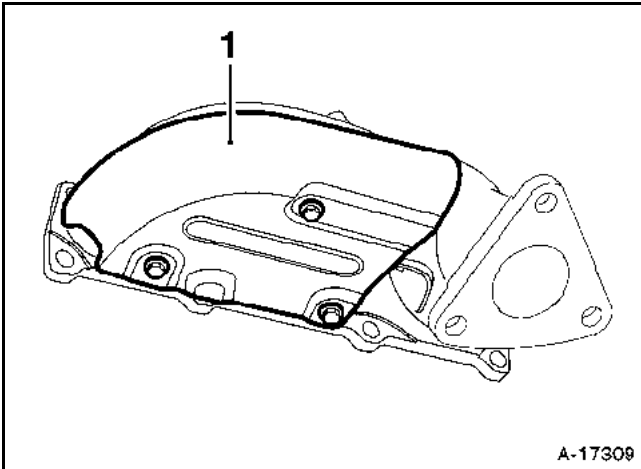
Remove:

- the engine from the vehicle (see method described in **section 10 - Engine - gearbox**).

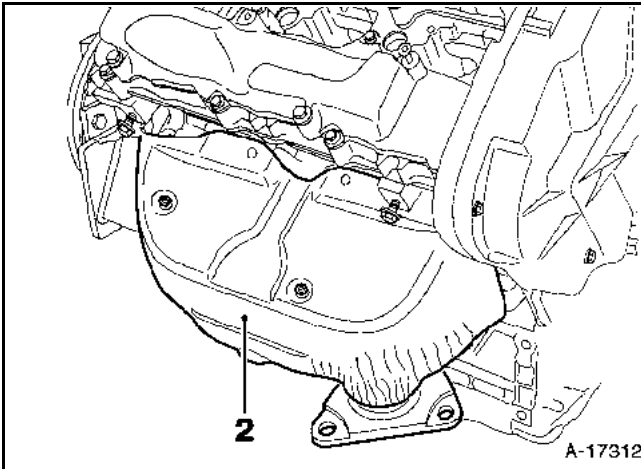
Slacken the bolts on the primary catalytic converter heat screens.

Remove:

- the primary catalytic converter from the exhaust manifold,
- the heat screen (1) under the exhaust manifold,



- the heat screen (2) from the exhaust manifold,



- the mounting nuts from the exhaust manifold, then take it out.

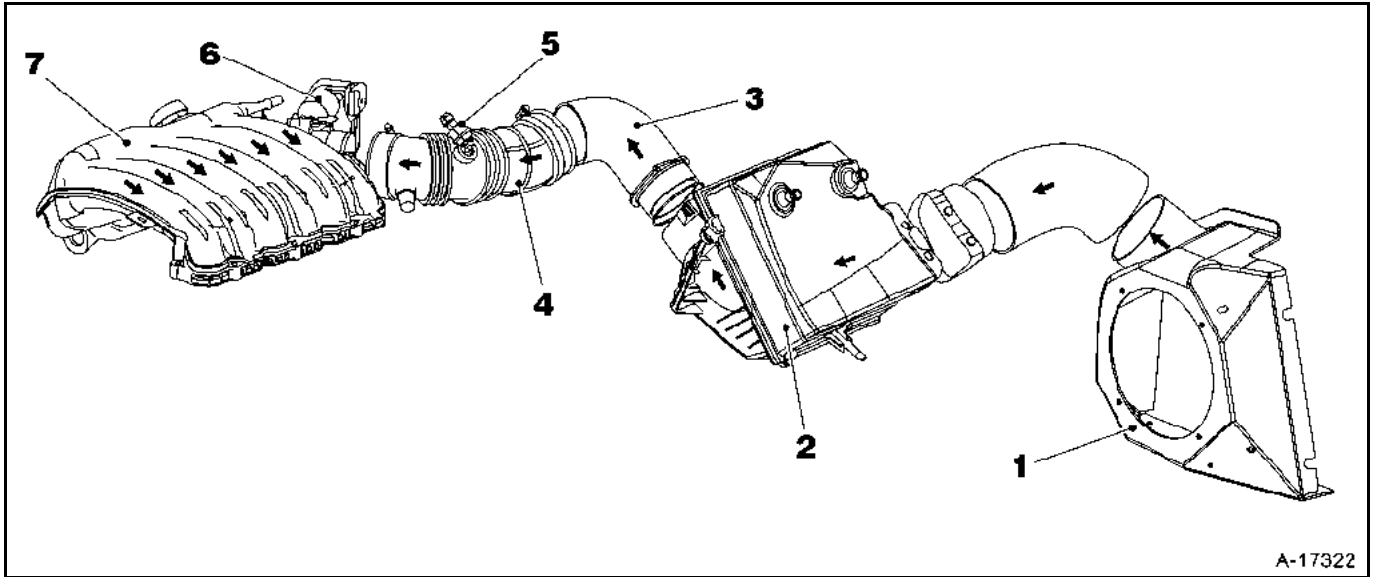
### REFITTING

Replace the seal.

Refit in reverse order to removal.



**INLET CIRCUIT**



- 1 Vehicle side moulding
- 2 Air filter
- 3 Air filter exhaust bend
- 4 Air pipe
- 5 Air temperature sensor
- 6 Throttle housing
- 7 Inlet manifold

### CHECKING THE FUEL PRESSURE AND PUMP FLOW

SPECIAL TOOLING REQUIRED	
Mot. 1311-01	Fuel pressure test kit
Mot. 1311-03	Pressure measuring connector

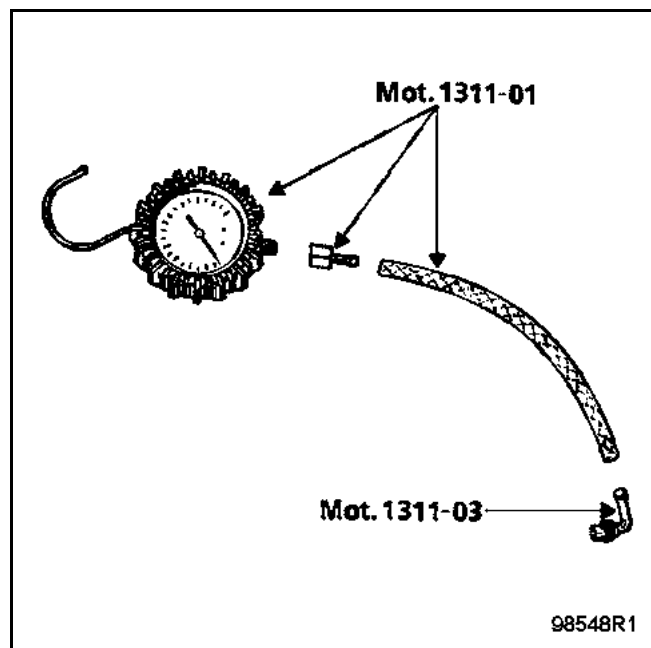
### CHECKING THE PRESSURE

Remove the protective plastic cover from the cylinder head cover.

A quick-release union specially designed for pressure measurements is fitted at the end of the injector rail.

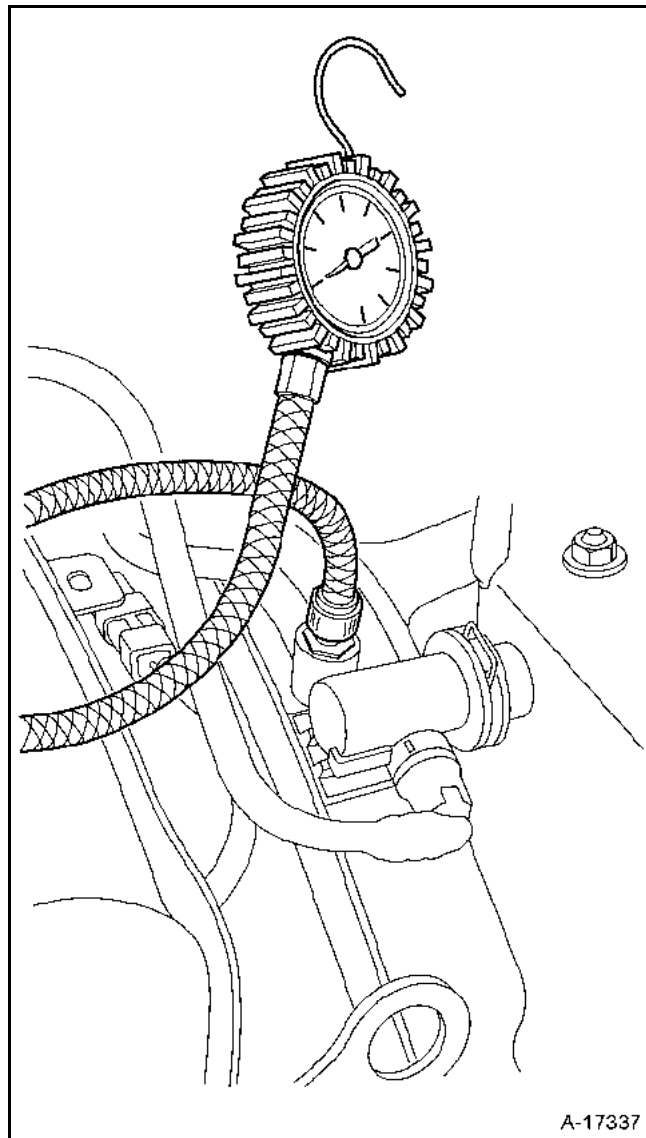
Use the **Mot. 1311-03** tool to connect to this union. The **Mot. 1311-03** tool is part of the **Mot. 1311-01** kit.

Fit **Mot. 1311-03** to the pressure gauge 0; + 10 bars using the kit (**Mot. 1311-01**).



Turn the ignition key to **ON** to start the fuel pump.

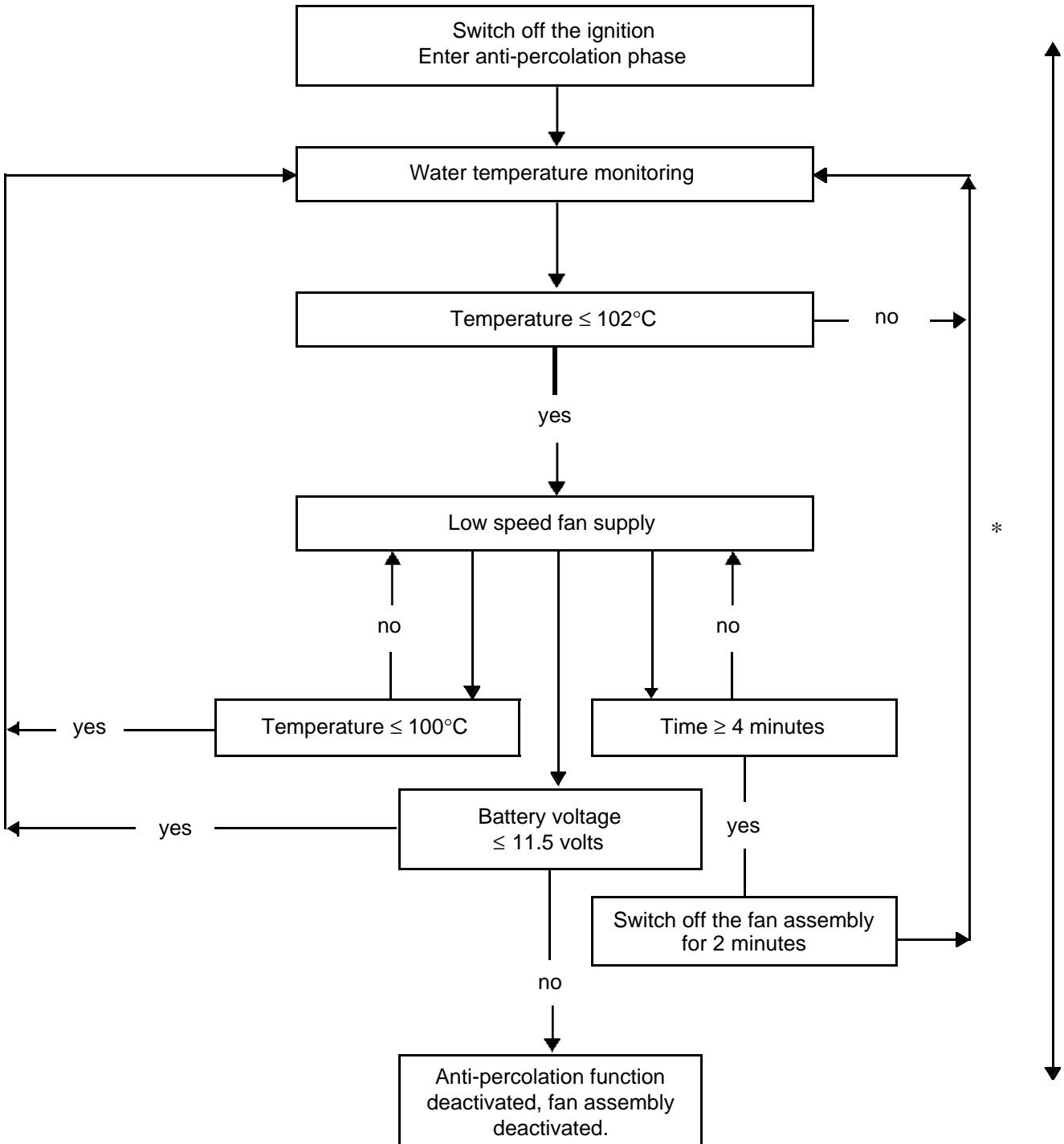
Check the pressure, which should be  $4 \pm 0.2$  bars.



### OPERATING PRINCIPLE

The anti-percolation relay control (279) is addressed directly by the injection computer (track 36).


The coolant temperature information is picked up by the injection coolant temperature sensor.



\* Anti-percolation function maximum operating time of 30 minutes.

**POWER STEERING PUMP**

SPECIAL TOOLING REQUIRED	
Mot. 453-01	Set of 2 hose clamps for general use

TIGHTENING TORQUES (in daNm)	
Cylinder head cover pump bracket bolt	4
Pump mounting bolt on the bracket	2
Pump pulley bolt	1

**REMOVAL**

Place the vehicle on a two post lift.

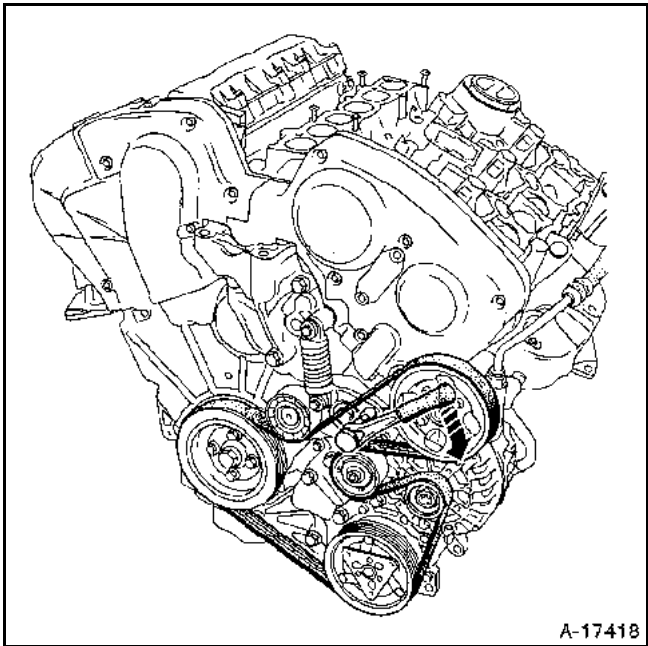
Remove the tray under the bonnet.

Disconnect the battery.

Remove:

- the engine covers,
- the engine undertray,
- the accessories belt, (refer to the method in **section 07 - Accessories belt tension** ).

Drain the power steering circuit.



Remove the power steering pump pulley (4 bolts).

Put a **Mot. 453-01** clamp on the low pressure pipe (1) at the pump inlet.

Remove:

- the pressure switch (2) from the high pressure pipe,
- the clip from the low pressure pipe and slacken the high pressure pipe with a pipe wrench,
- the assisted steering pump by taking the three retaining bolts off its bracket.

**NOTE:** Expect power steering fluid to drain during this operation; protect the alternator.

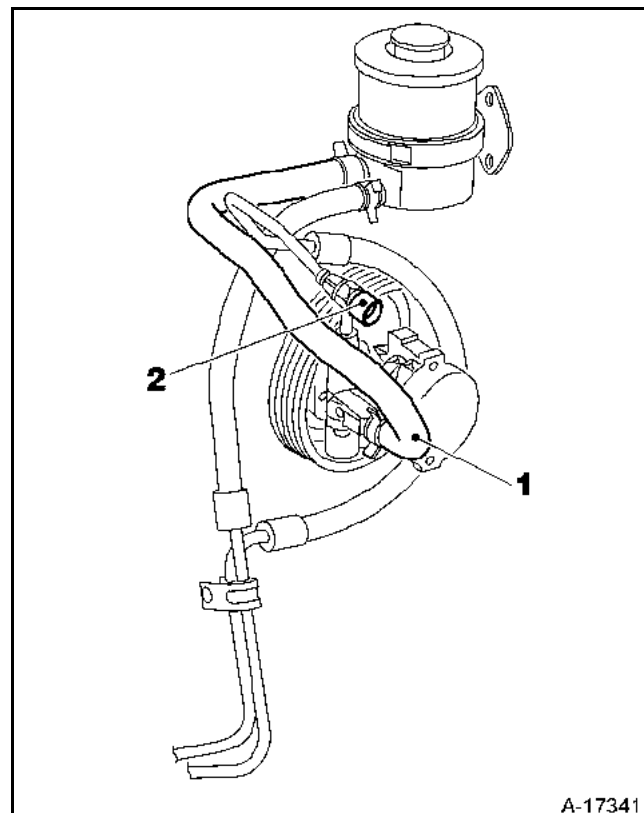
### REFITTING

Proceed in the reverse order to removal, respecting the tightening torques.

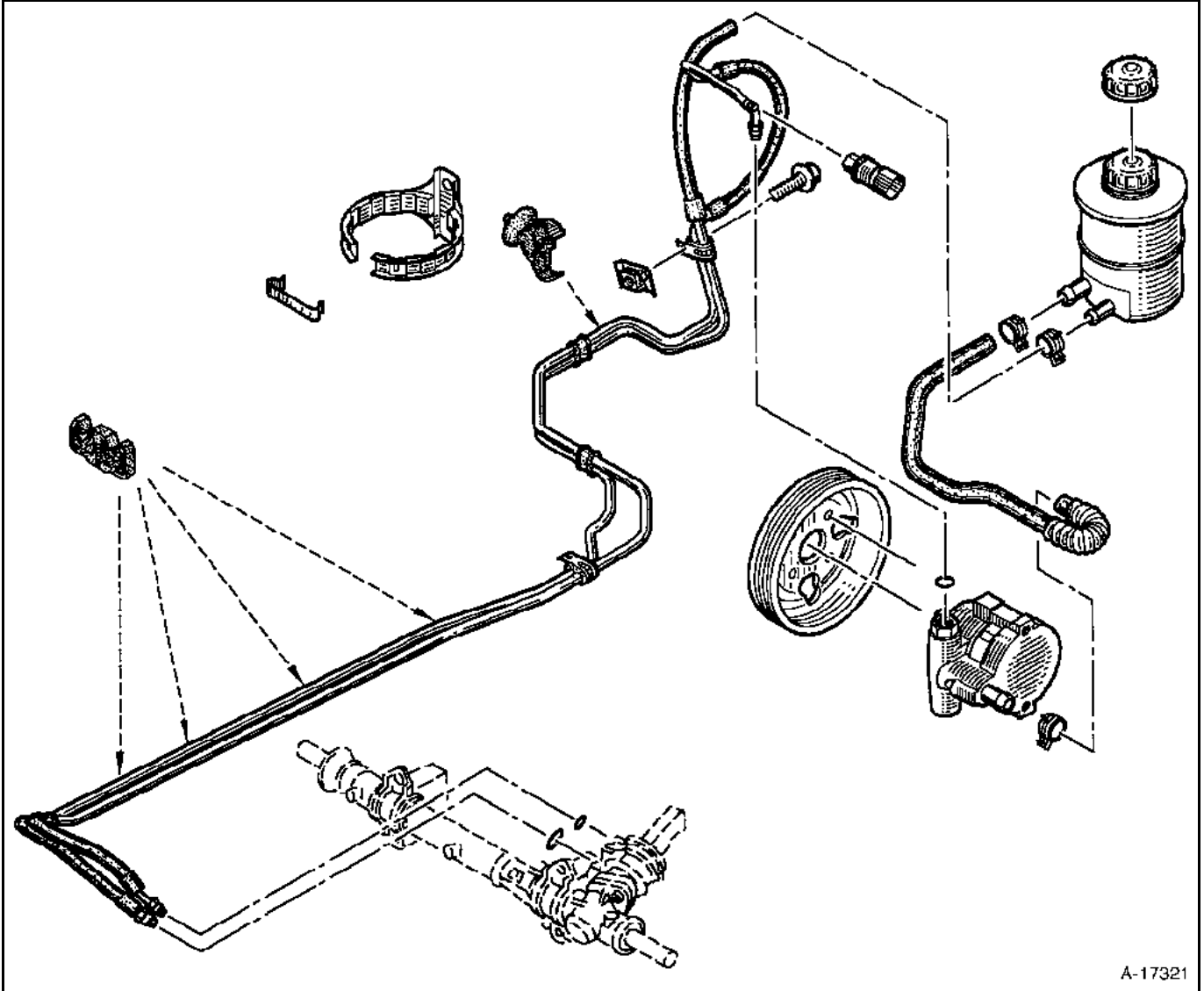
Refit the accessories belt (see method described in **Section 07 - Accessories belt tension**).

**NOTE:** the accessories belt tension is automatically controlled by a tensioner.

Fill and bleed the circuit.



**POWER STEERING PIPE LAYOUT**



A-17321

POWER STEERING PIPES

SPECIAL TOOLING REQUIRED
Mot. 453-01    Set of 2 hose clamps for general use

Put the car on a two-post lift.

Remove the tray under the bonnet.

Disconnect the battery.

Remove:

- the engine covers,
- the engine undertray.

Drain the power steering circuit.

TANK/POWER STEERING PIPE

REMOVAL

Place a **Mot. 453-01** clamp on the hoses to be removed.

Remove:

- the hoses from the tank and drain it completely,
- the hoses from the pump.

REFITTING

Proceed in the reverse order to removal.

TANK LOW PRESSURE FUEL RETURN PIPE

REMOVAL

Place a **Mot. 453-01** clamp on the hoses to be removed.

Remove:

- the hoses from the tank and drain it completely,
- the engine undertray,
- the pipe on a level with the union under the cooling assembly,
- the pipe marking its layout.

REFITTING

Proceed in the reverse order to removal.

HIGH PRESSURE PIPE PUMP/VALVE

REMOVAL

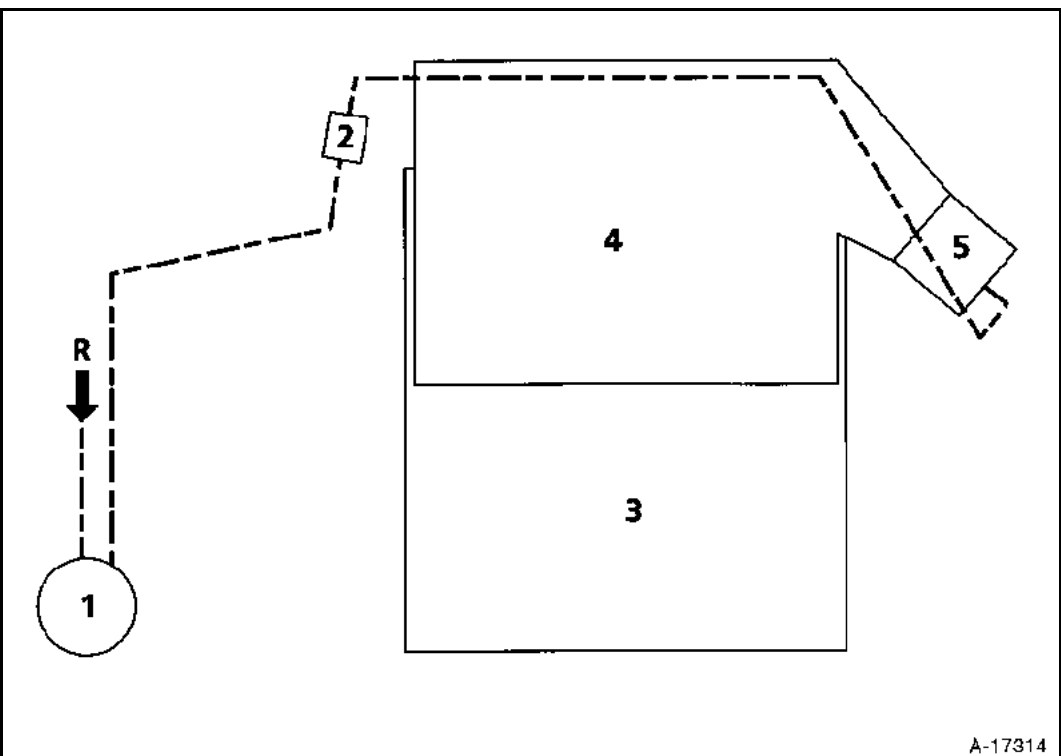
Remove:

- the air filter unit,
- the connector of the pressure switch,
- the pipe on a level with the pump,
- the mountings on the gearbox and the cylinder head,
- the pipe on a level with the valve,
- the pipe marking its layout.

REFITTING

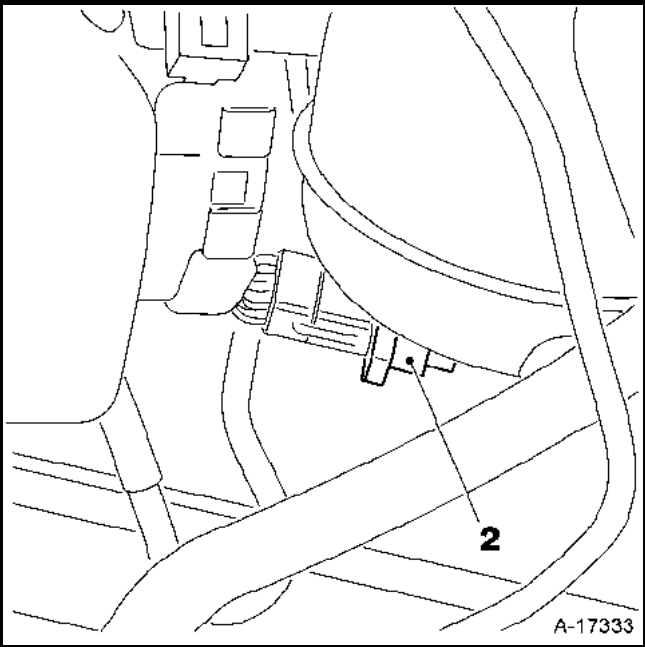
Proceed in the reverse order to removal.

**OPERATING DIAGRAM OF THE CIRCUIT**



A-17314

- 1 Canister
- 2 Solenoid valve
- 3 Engine
- 4 Inlet manifold
- 5 Throttle housing
- R Pipe from fuel tank



A-17333



### OPERATING PRINCIPLE

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

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

When the tank is opened, a valve isolates the canister from the tank when the cap is removed so that the vapour from the petrol tank contained in the canister does not react with the atmosphere.

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

This is done by connecting the canister and the inlet manifold with piping. A solenoid valve is incorporated into the pipework and is responsible for bleeding the canister.

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

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

### CANISTER BLEED CONDITIONS

**For richness regulation**, if the coolant temperature is higher than **60°C**, bleeding is initiated for 1 minute, then suspended for 1 minute. This happens several times, then the bleed time is increased to **5 minutes** and **30 seconds** with the bleeding suspension still at 1 minute.

**Outside richness regulation**, bleeding is initiated if the full load position is registered.

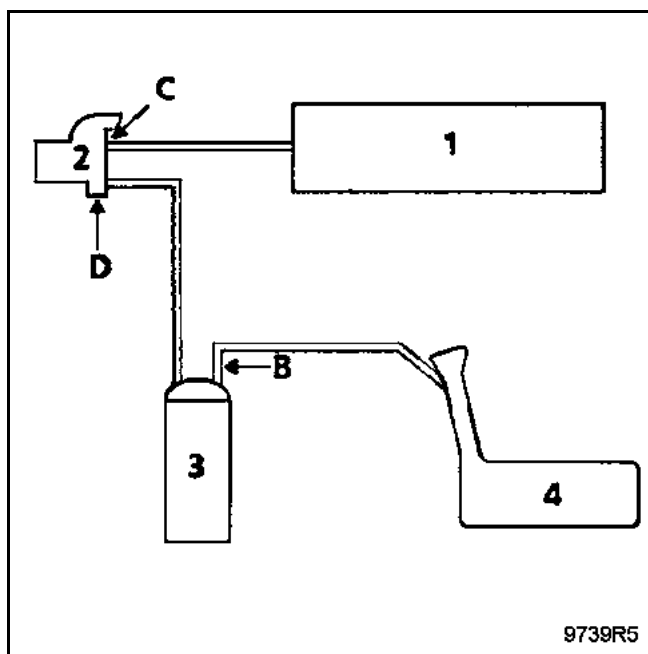
It is possible to display the canister bleed solenoid valve's RCO signal with the XR25 at # 23. The solenoid valve is closed for #23 = **0 %**.

### CHECKING CANISTER BLEED OPERATION

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

Check the correctness 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 Reservoir

Check the idle speed, by connecting a pressure gauge **(-3; +3 bars) (Mot. 1311-01)** to the outlet (D) on the solenoid valve, to check there is no vacuum (the command value read by the **XR25** for #23 remains minimal X =0 %). **Is there a vacuum?**

**YES** With the ignition off, use a vacuum pump to generate a vacuum of **500 mbars** in the solenoid valve at (C). This should not vary by more than **10 mbars** in **30 seconds**. **Does the pressure vary?**

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

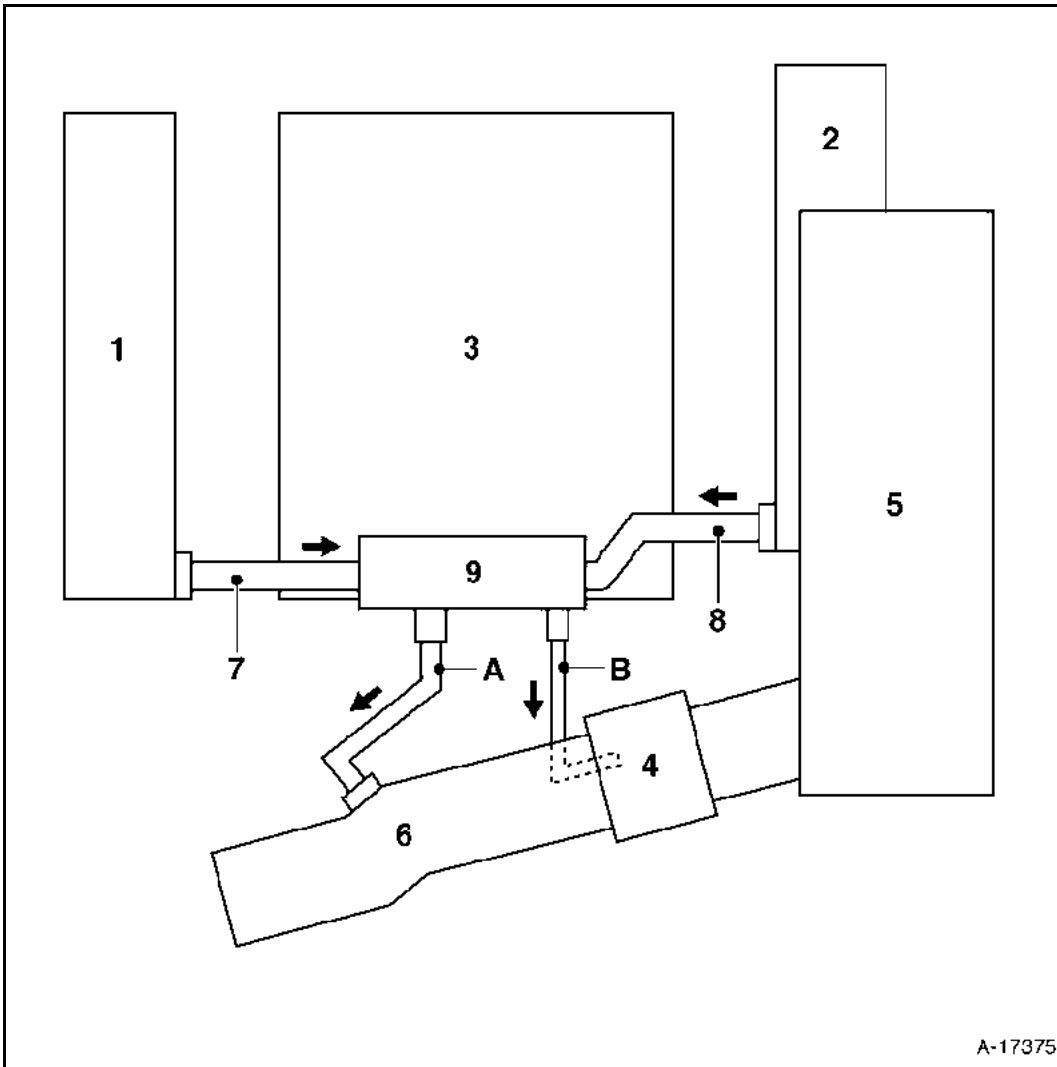
**NO** There is an electrical problem, check the circuit.

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

The pipes for venting to the air from the tank may also be checked. After removing the cap from the tank, use a vacuum pump to apply a vacuum to the pipes at (B). The fact that a vacuum can be created in these pipes shows that the overfill prevention valve is properly sealed.

Conversely, when the cap is replaced, the vacuum should quickly disappear showing that the pipes are not blocked and that there is communication with the internal degassing volumes in the tank.

### CIRCUIT DIAGRAM



- 1 Front cylinder head
  - 2 Rear cylinder head
  - 3 Engine
  - 4 Throttle housing
  - 5 Inlet manifold
  - 6 Air filter to the throttle body air duct
  - 7 Front cylinder head cover/oil separator pipe
  - 8 Rear cylinder head cover/oil separator pipe
  - 9 Oil separator
- A Circuit upstream of the throttle body  
This circuit is used for average and high loads. The vapours are rebreathed by the vacuum in the air duct (6).
- B Circuit downstream of the throttle body  
This circuit is used for low loads. The vapours are rebreathed by the vacuum between the throttle and the engine.

IDENTIFICATION

VEHICLE	ENGINE	ALTERNATOR	CURRENT
CB1A	L7X 760	VALEO A 13 VI 201	120 A

CHECKING

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

rpm	amps
1500	26
4000	94
6000	105

**NOTE:** Do not start the engine when the alternator is disconnected from the wiring harness. This could damage the alternator.

### REMOVAL

Put the car on a two-post lift.

Remove the tray under the bonnet.

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

Remove:

- the engine undertray,
- the accessories belt (see method described in **section 07 - Accessories belt tension**),
- the power steering pump pulley,
- the compressor bolts and move it out of the way,
- the alternator.

### REFITTING

Proceed in the reverse order to removal.

IDENTIFICATION

VEHICLE	ENGINE	STARTER
CB1A	L7X 760	VALÉO D7R17

### REMOVAL

Place the vehicle onto a two post lift.

Remove the tray under the bonnet.

Disconnect the battery.

Remove the engine covers and engine undertray.

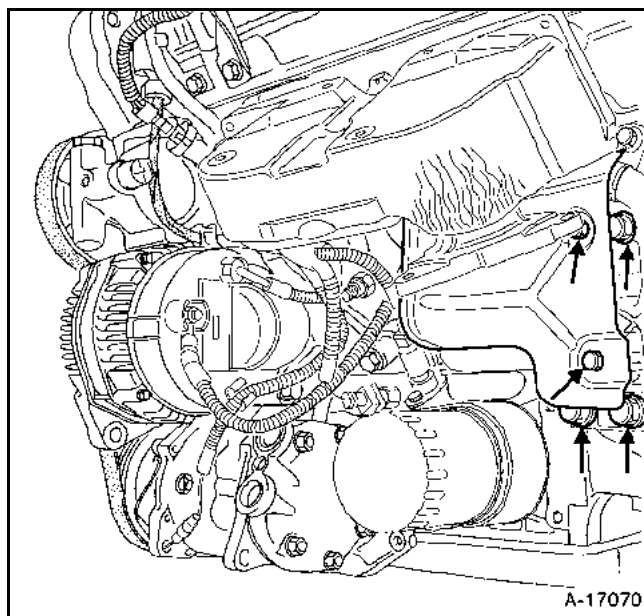
Drain the oil from the engine.

Remove the oil filter and Modine oil cooler.

**NOTE:** It is not necessary to disconnect the Modine cooler from the cooling circuit. Remove the coolant supply pipes from the sub-frame, remove the Modine cooler from the engine block and put the assembly to one side. Store the Modine cooler in a clean plastic bag to protect it from dirt.

Remove:

- the rear sub-frame,
- the front primary catalytic converter assembly and the heat shield,
- the starter motor electric connectors,
- the starter motor mounting bolts and remove the starter motor from the clutch cover.



### REFITTING

Proceed in the reverse order to removal.

**NOTE:** The front primary catalytic converter seals need to be changed.

Fill the engine with oil.

Ignition is controlled by the injection/ignition computer.

The firing order is 1 - 6 - 3 - 5 - 2 - 4.

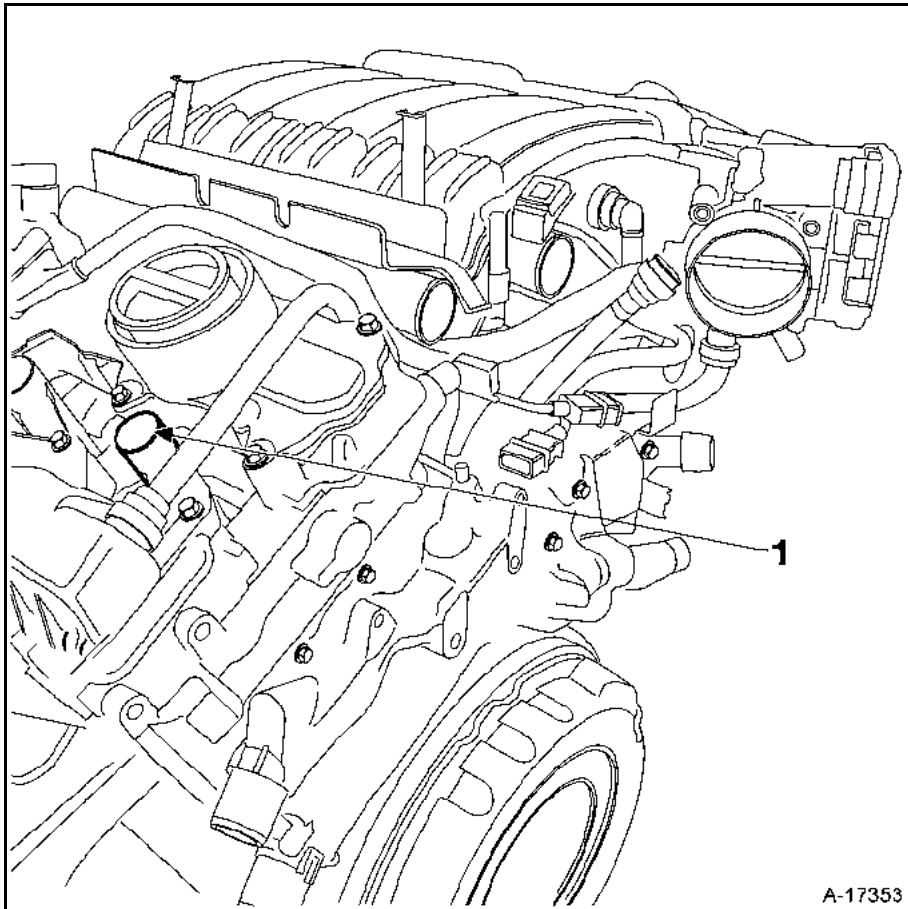
### PRESENTATION

The system is comprised of:

- the injection computer (the ignition power stage is integrated into the computer),
- six spark plug protection coils (1),
- six spark plugs,
- a pinking sensor.

### COILS (1)

These are mounted onto six spark plugs and attached to the cylinder head by a bolt.



A-17353



### SPARK PLUGS

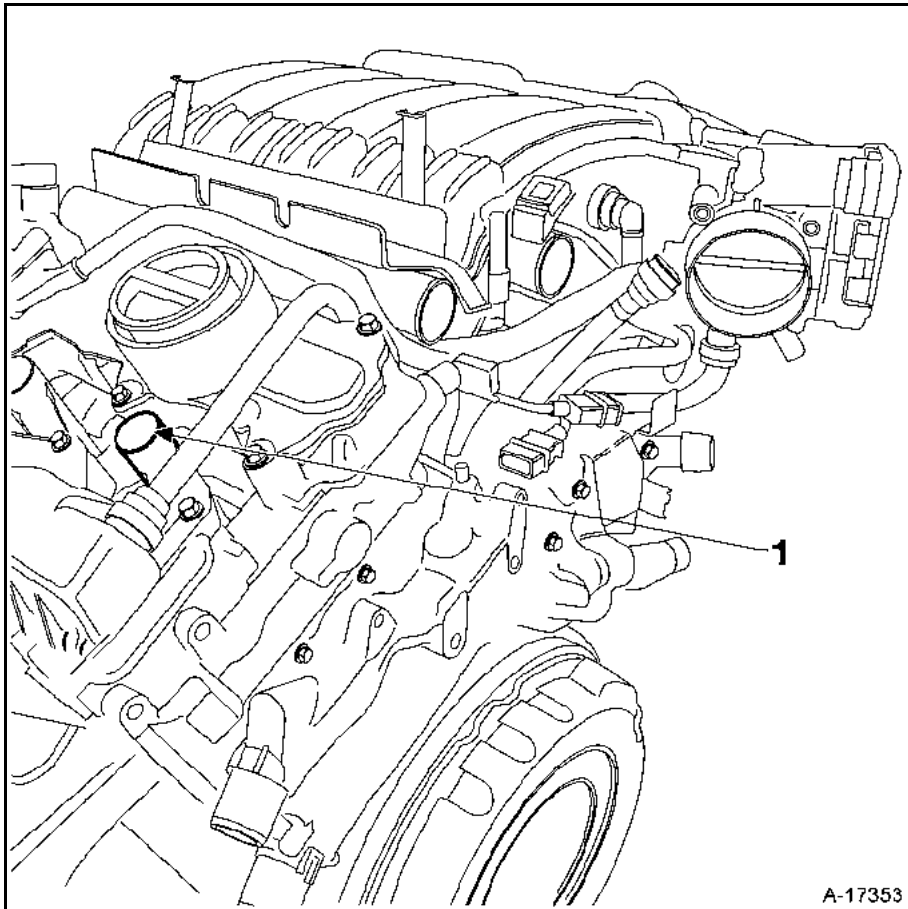
**Bosch FGR 7 HQPE**

Gap: **(non adjustable)**

Tightening torque: **2.5 to 3 daNm**

### FRONT CYLINDERS

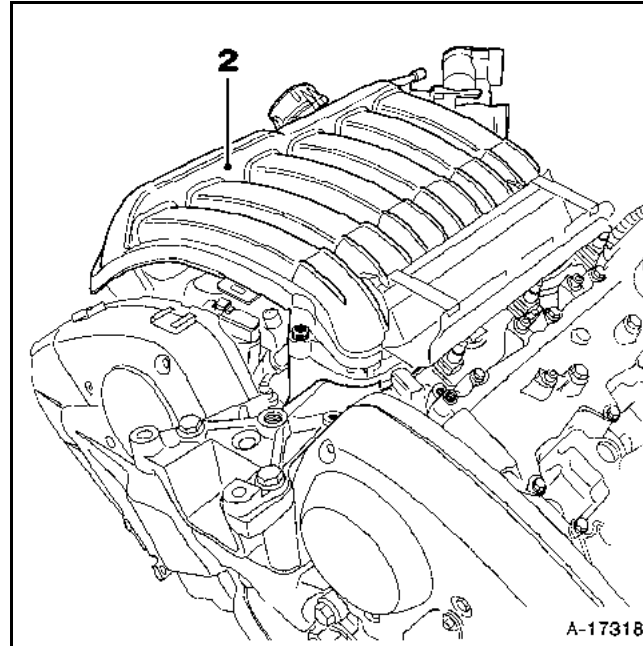
These can be removed once the engine cover and coils have been removed (1).



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### REAR CYLINDERS

These can be removed once the inlet manifold has been removed (2).



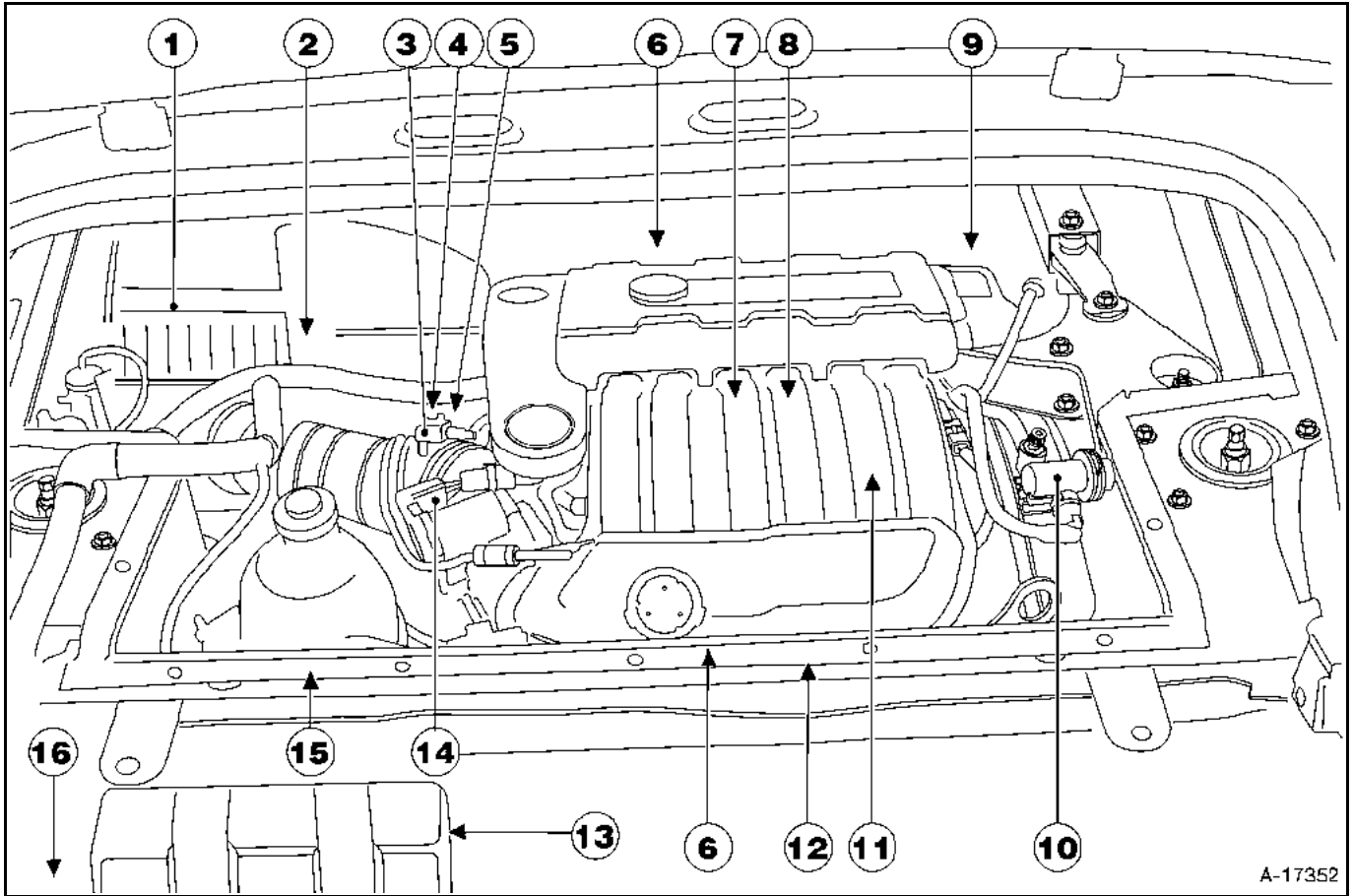
### SPECIAL NOTES FOR MULTIPOINT INJECTION

- 55 track computer **BOSCH ME7.6**
- Semi-sequential multipoint injection, paired injector control (cylinder injectors 1 and 5 / 3 and 4 / 2 and 6).
- Semi-static ignition with six spark plug protection coils.
- Canister bleed solenoid valve controlled by RCO signal.
- Anti-percolation function (control of low speed fan assembly).
- Idling speed correction depending on:
  - air conditioning,
  - electric heated windscreen,
  - power steering pressostat,
  - battery voltage.
- Injection warning light on instrument panel operational.
- The maximum engine speed is **7 200 rpm**.
- Use fault finding fiche no. 47.
- If the coolant temperature sensor has a fault, the XR25 shows the defect mode at #02 (**69°C** engine running).
- If the air temperature sensor has a fault, the XR25 shows the defect mode at #03 (**39°C** engine running).
- 2<sup>nd</sup> generation engine immobiliser system.

# INJECTION

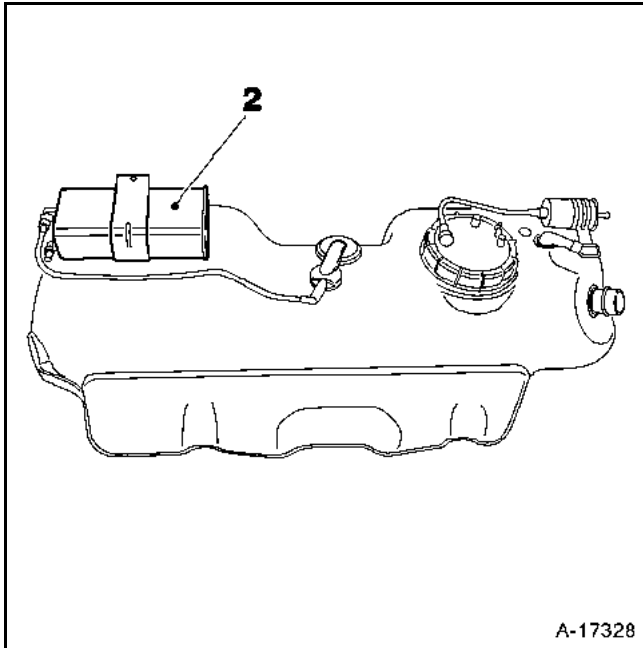
## Location of components

17

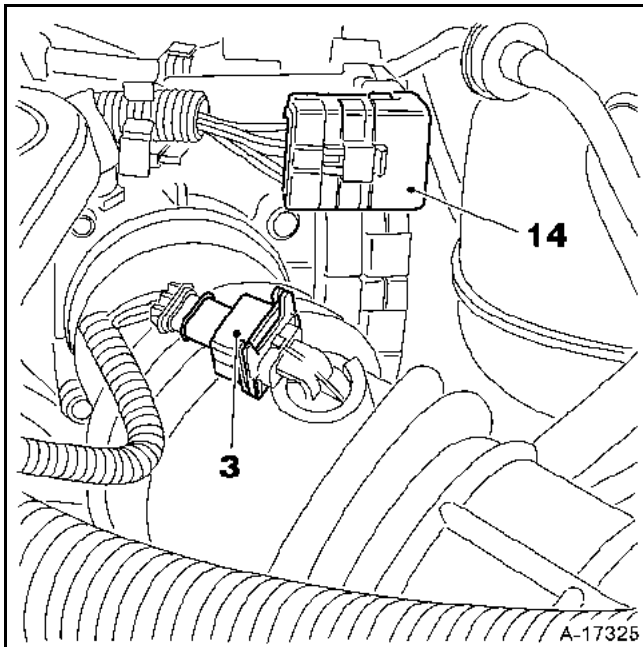


- |    |                                 |    |                                      |
|----|---------------------------------|----|--------------------------------------|
| 1  | Air filter                      | 11 | Injector rail                        |
| 2  | Fuel vapour absorber (canister) | 12 | Pressure sensor                      |
| 3  | Air temperature sensor          | 13 | Injection computer,                  |
| 4  | Coolant temperature sensor      | 14 | Mechanical throttle control          |
| 5  | TDC sensor                      | 15 | Fuel vapour recycling solenoid valve |
| 6  | Oxygen sensor                   | 16 | Relay                                |
| 7  | Pinking detector                |    |                                      |
| 8  | Coils                           |    |                                      |
| 9  | Power steering pressostat       |    |                                      |
| 10 | Pulse damper                    |    |                                      |

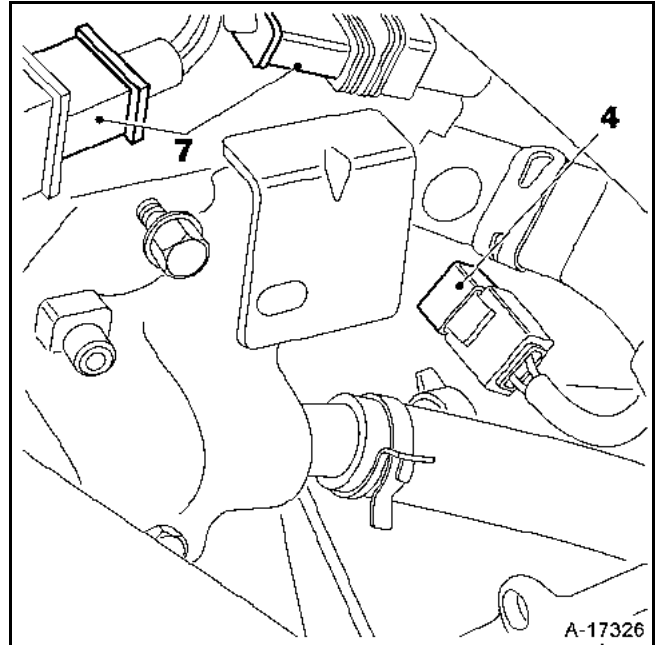
- 2 Fuel vapour absorber (canister)



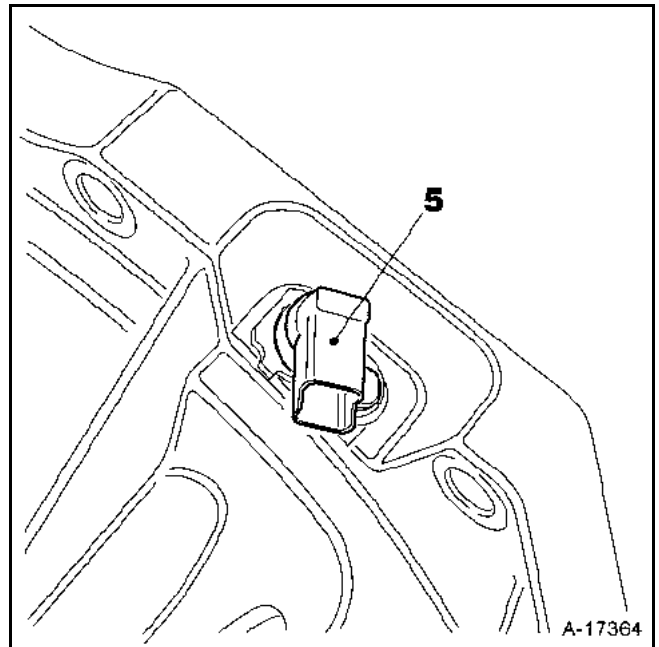
- 3 Air temperature sensor  
14 Mechanical throttle control



- 4 Coolant temperature sensor  
7 Pinking sensor connector



- 5 TDC sensor

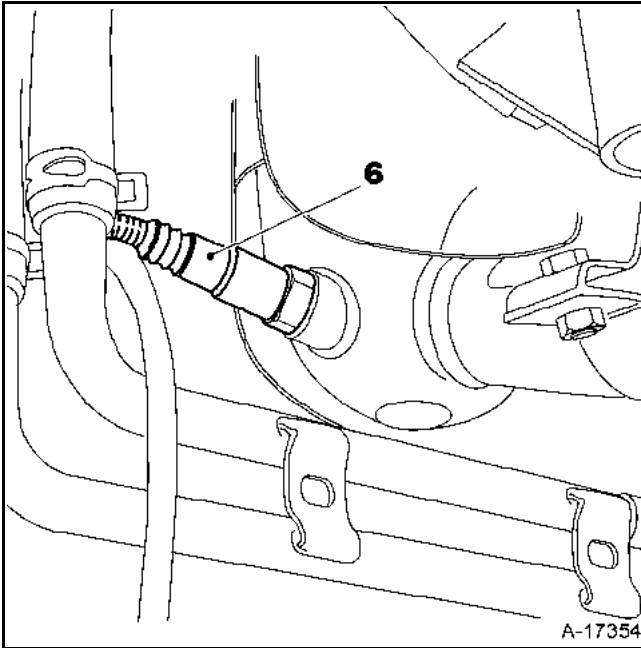


# INJECTION

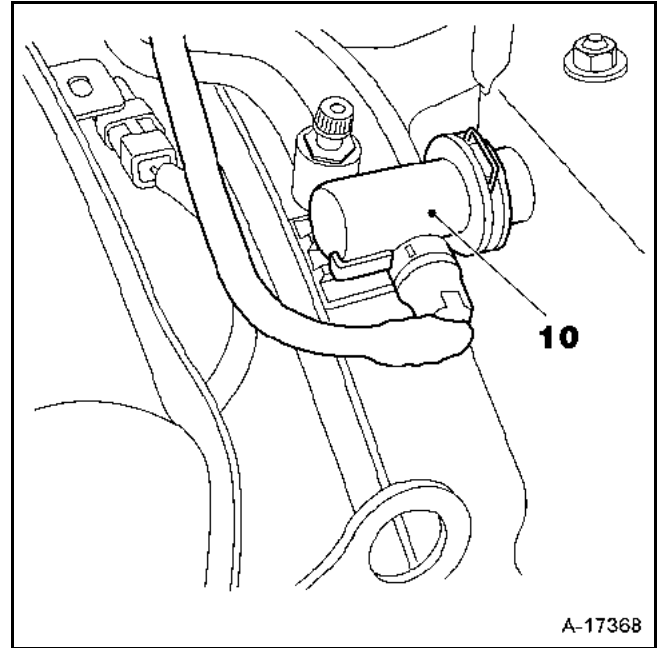
## Location of components

17

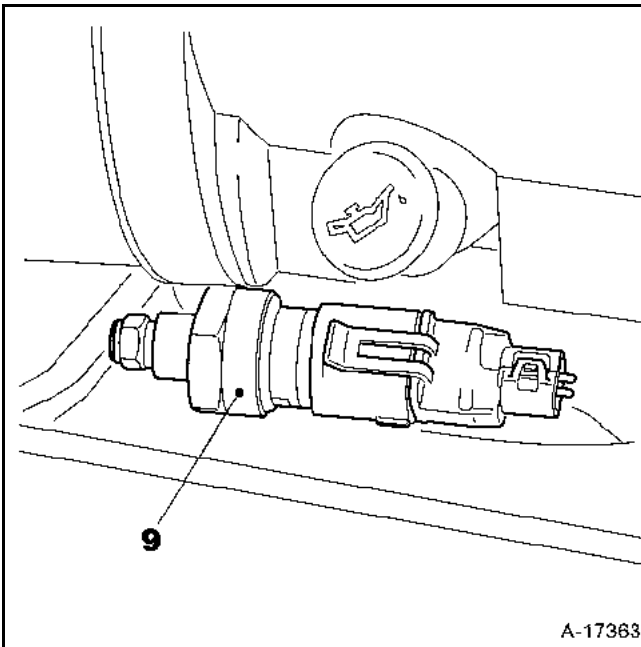
- 6 Oxygen sensor (1 of 4); one at each end of both primary catalytic converters



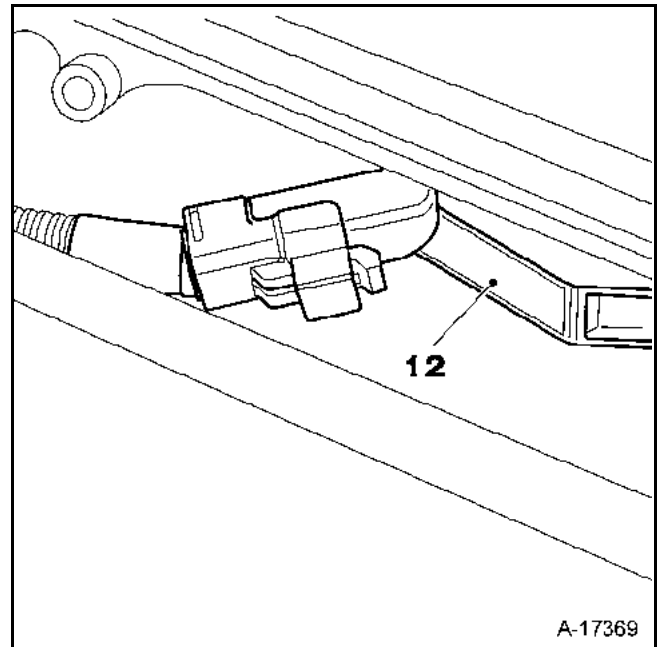
- 10 Pulse damper



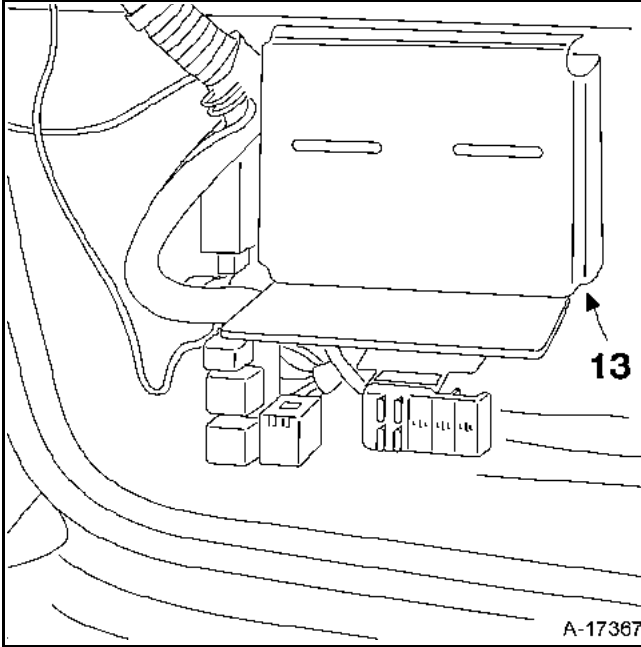
- 9 Power steering pressostat



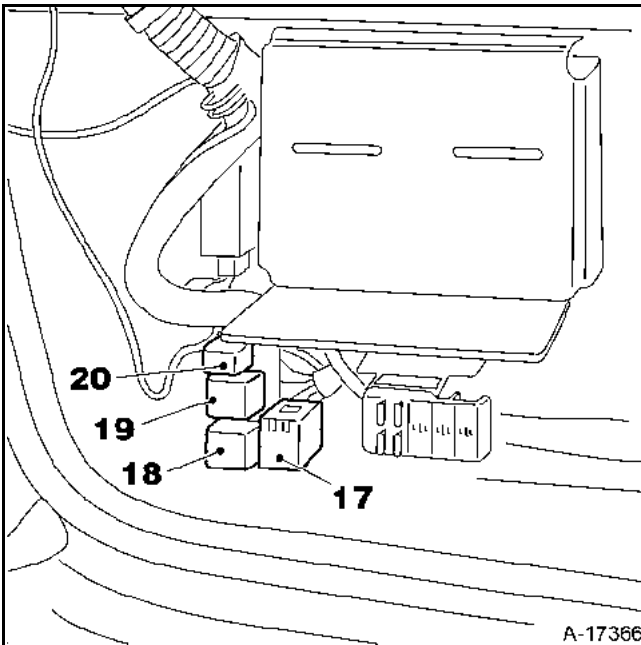
- 12 Pressure sensor



### 13 Injection computer

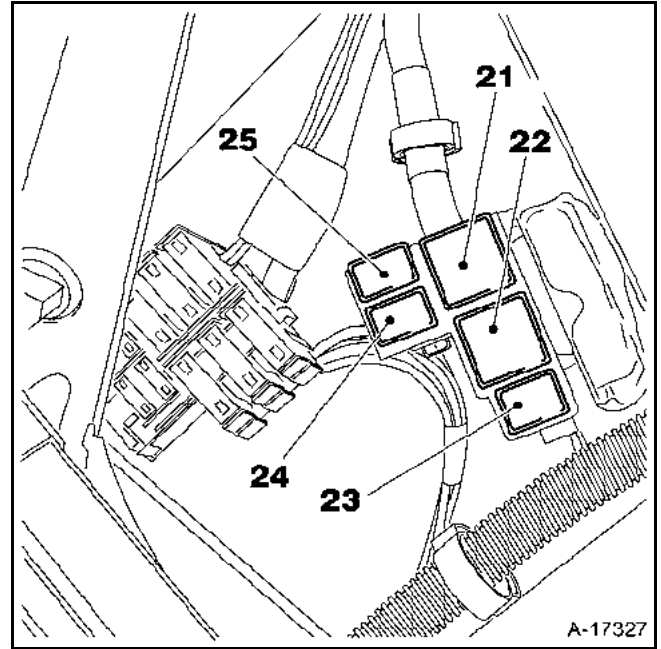


- 17 Side admission ventilation fan relay
- 18 Oxygen sensor heater relay and ignition coil relay
- 19 Locking relay
- 20 Air conditioning relay

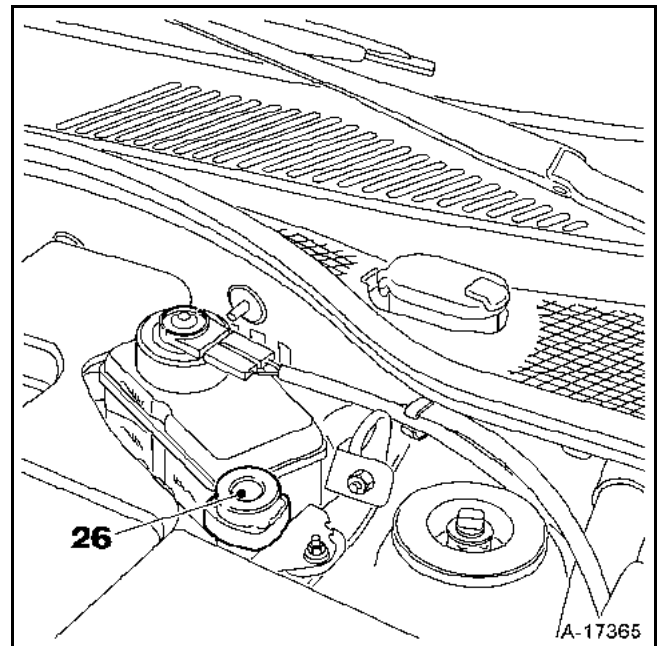


The following relays are located in the front compartment:

- 21 Operation in series and in parallel for the front ventilation fan relay
- 22 Fuel pump relay
- 23 ABS warning light relay
- 24 Ventilation fan relay 1
- 25 Ventilation fan relay 2



### 26 Inertia switch (located in the front compartment)



This vehicle is fitted with a 2<sup>nd</sup> generation engine immobiliser system. The injection computer **MUST** have been programmed with the immobiliser code for it to work.

### REPLACING THE INJECTION COMPUTER'

The computers are not coded on delivery. When a computer is replaced it must be programmed with the vehicle code, then checked to ensure that the immobiliser function is working properly.

To do this, simply switch on the ignition for a few seconds without starting the engine and then switch it off.

### CHECKING THE IMMOBILISER FUNCTION

Take the ignition key out of the ignition switch. After **10 seconds** the red warning immobiliser light should flash (to check that it is impossible to start the engine, see Technical Note 2725A).

**TESTING AN UNCODED INJECTION COMPUTER ON LOAN FROM A PARTS STORE** (This procedure is strongly discouraged)

**WARNING:** before an injection computer can be tested, it must have been programmed with the vehicle immobiliser code for it to work. After the test, the computer **must be decoded** before being returned to the parts store. if this is not done, the computer will be **unusable**. This procedure must be carried out by staff that have undergone the necessary training. To decode the computer, see Technical Note 2725A.

**A COMPUTER CANNOT BE FROM A VEHICLE FITTED WITH AN IMMOBILISER TO PERFORM A TEST ON ANOTHER VEHICLE WHETHER OR NOT IT IS FITTED WITH AN IMMOBILISER.**



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

#### ● Vehicles with immobiliser function deactivated

When the ignition is switched on, the injection warning light comes on for **3 seconds** and then goes out.

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

#### ● Vehicles with immobiliser function activated

When the ignition is switched on, the computer does not recognise the code, and stops the engine from starting. The injection warning light remains lit for **3 seconds** and then goes out.

Before the ignition is switched on, the red immobiliser light flashes. When the ignition is switched on, this light flashes twice as fast.

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

#### ● Fault in a component in the injection system

Faults in the following components may cause the warning light to come on:

- absolute pressure sensor
- throttle position potentiometer,
- injectors,
- pinking sensor,
- idle speed regulation valve.

### AIR CONDITIONING / INJECTION COMPUTER LINK

The electrical connection:

- from the air conditioning computer to the injection computer consists of one wire. This track only carries the information that the AC is operating. From this, the diesel injection computer deduces the AC selection information: track 40
- from the injection computer to the air conditioning computer consists of one wire. This track carries all information regarding authorisation and inhibition of operation of the compressor: track 23.

### COMPRESSOR OPERATION PROGRAMMING

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

#### Engine start programming

The compressor is prevented from operating for **2 seconds** after the engine has started.

#### Thermal protection programming

The compressor clutch is not engaged if the coolant temperature is above or equivalent to: **+ 115°C** or if the temperature is lower than or equivalent to **0°C**.

### CONNECTION BETWEEN THE POWER STEERING PRESSOSTAT AND THE INJECTION COMPUTER

The injection computer receives information from the power steering pressostat. This is dependent on the pressure in the hydraulic circuit. The higher the pressure, the more energy is absorbed by the power steering pump.

To compensate for the energy being absorbed, the injection computer increases the opening ratio of the idle speed regulation solenoid valve.

The signal is received on track 54 of the injection computer. If the pressostat is closed, the computer receives an earth. The idle speed is corrected to **720 rpm**.

### IDLE SPEED CORRECTION DEPENDING ON THE BATTERY VOLTAGE

The purpose of this adjustment is to compensate for the drop in voltage due to a power consumer switching on when the battery is not well charged. To do this, the idle speed is increased, thus causing the alternator to rotate faster, consequently leading to an increase in charging voltage.

The lower the voltage, the more significant the correction. Correction of the engine speed is therefore variable. It begins when the voltage drops below **12.4 volts**. Correction begins at the nominal engine speed and may reach a maximum of **800 rpm**

### IDLE SPEED ADJUSTMENT DUE TO THE HEATED WINDSCREEN SIGNAL

If the electric windscreen is selected, the computer receives a **+12 V** signal. The idle speed remains at **650 rpm**. The idle solenoid valve is opened further to compensate for the absorption of energy by the alternator.

### IDLING SPEED CORRECTION WHEN AIR CONDITIONING IS SELECTED

If air conditioning is selected, the idling speed is fixed at **700 rpm**.

### PRINCIPLE

Under normal operating conditions when the engine is warm, the idle speed R.C.O. **#12** varies between high and low values to reach the nominal idling speed.

In the case of variations in the operation of the vehicle (such as running in, engine wear etc.) the idle speed R.C.O. may be close to high or low values.

The adaptive correction (**#21**) on the idle speed R.C.O. (**#12**) enables the engine's air requirement to be slowly varied, by bringing the R.C.O. (**#12**) back to a nominal average value.

This correction is only effective if the coolant temperature is higher than **80°C**, and if the nominal idle speed regulation phase is set.

### VALUES FOR THE R.C.O. IDLE SPEED AND ITS ADAPTIVE CORRECTION

Nominal idle speed ( <b>#06</b> )	X = 650 rpm
Idle speed R.C.O. ( <b>#12</b> )	$20 \leq X \leq 40$
Adaptive idle speed ( <b>#21</b> )	Stop: – minimum: - 12.5 – maximum: + 12.5

### INTERPRETATION OF THESE PARAMETERS

In the event of excess air (faulty air intake, throttle stop etc.) the idle speed increases, the idle speed R.C.O. value **#12** decreases to the nominal idle speed; the adaptive correction value of the idle speed R.C.O. **#21** decreases in order to bring the idle speed R.C.O. back to **#12**.

When there is a lack of air (clogging, etc.), the reverse occurs:

The idle speed R.C.O. **#12** increases and the adaptive correction **#21** increases in the same way in order to bring it **#12** back to an average nominal value.

**IMPORTANT:** after the computer memory has been erased (battery disconnected), it is vital that the engine is run for 10 minutes at idle speed before the vehicle is returned to the customer so that the adaptive correction can run its course properly.

### OXYGEN SENSOR VOLTAGE (#05)

Reading **#05** on the **XR25**: the value read refers to the voltage communicated to the computer by the oxygen sensor; it is expressed in volts (in fact, the value varies between **0** and **1 000** millivolts).

When the engine is in the loop phase, the voltage value should oscillate rapidly and should be between **50 ± 50 mV** (lean mixture) and **850 ± 50 mV** (rich mixture) and vice versa.

The smaller the variance between the maximum and minimum values, the less effective the information sensor (this variance is generally at least **500 mV**).

### RICHNESS CORRECTION (#35)

The value given under **#35** on the **XR25** refers to the average richness correction supplied by the computer according to the richness of the fuel mixture determined by the oxygen sensor (the oxygen sensor analyses the oxygen content of the exhaust directly from the richness of the fuel mixture).

The correction value uses 1 as its middle point (experience has shown that under normal operating conditions, **#35** is close to 1 with only a small amount of variation).

- Value lower than 1: needs to be leaner
- Value higher than 1: needs to be richer

### ENTRY INTO RICHNESS REGULATION MODE

#### Loop phase

The start of richness regulation is effective after a starting delay if the coolant temperature has reached **9°C**.

The starting delay depends on the coolant temperature:

- at **20°C**, it is at a maximum of **25 seconds**
  - at **80°C**, it is at a maximum of **8 seconds**
- when richness regulation has not yet started, **#35 = 1**

#### Unlooping phase

When in richness regulation, the operating phases in which the computer ignores the voltage signal provided by the sensor are:

- at full load: **#35 = 1**
- fast accelerations: **#35 = 1**
- decelerations with no load signal (injection cut-out): **#35 = 1**
- when the oxygen sensor is faulty: **#35 = 1**

### DEFECT MODE IN THE EVENT OF AN OXYGEN SENSOR FAULT

When a fault is detected in the oxygen sensor and if the fault has already been stored, the system enters the open loop mode directly (**#35 = 1**).

### PRINCIPLE

In closed loop phase (see **section 17 Richness regulation**), the richness regulation (**#35**), corrects the injection timing so as to obtain a mixture as close as possible to richness 1. The correction value is close to 1.

However, variations can affect the components of the injection system, and cause the correction to shift to ensure richness 1 is obtained.

Adaptive correction allows the injection mapping to be adjusted to recentre the richness regulation to 1 and to ensure a constant authority of correction to make the mixture leaner or richer.

The richness regulation adaptive correction is divided into two parts:

- adaptive correction focusing on average and heavy engine loads (reading **#30**),
- adaptive correction focusing on idle speed and low engine loads (reading **#31**).

$0.75 \leq \#30 \leq 1.25$
$-1 \leq \#31 \leq +1$

These values must only be used if they are read at idle speed.

The adaptive corrections only work when the engine is warm and in loop phase (**#35 variable**).

When the computer is reinitialised, it is therefore necessary to carry out a road test.

### ROAD TEST

#### Conditions:

- active richness regulation for more than **20 seconds**,
- engine warm (coolant temperature > **80°C**).

Perform a road test encompassing all the engine operating phases, from idle speed to full load (a **15 minute** road test will suffice).

Following this test, the adjustments will be operational.

**#31** varies more markedly on the idle speed and low loads, and the **#30** on the average and high loads, but both work on the whole range of manifold pressures.

The test should be followed by normal, smooth and varied driving over **5 to 10 kilometres**.

After the test, record the values from **#30** and **#31**. Initially 1 and 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

When there is a lack of fuel (injectors dirty, pressure and fuel flow too low etc.), the richness regulation **#35** increases to obtain richness as close as possible to 1 and the adaptive correction **#30** and **#31** increases until the richness correction returns to oscillating around 1.

When there is too much fuel, the reverse is true:

The richness regulation **#35** decreases and the adaptive correction **#30** and **#31** decreases by the same amount in order to bring the richness correction (**#35**) back to around 1.

**NOTE:** the analysis that can be made by using **#31** should be approached with caution as this correction mainly takes place at idle speed and on low loads and moreover is very sensitive.

Conclusions should not be drawn too hastily from this parameter but rather the position of **#30** should be analysed.

the information provided by these two parameter values gives an idea of the engine's operating richness and so enables fault finding. In order for these to be put to good use during fault finding, no conclusion may be drawn from their value unless they are at the minimum or maximum correction limit, and if both parameter values were shifted in the same direction

<b>IMPORTANT: # 30 and #31 should only be used and analysed following a customer complaint, an operating fault and if they are at a limit with an offset from #35.</b>
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REFER TO TECHNICAL NOTE 3467A.



COOLANT QUANTITY AND QUALITY

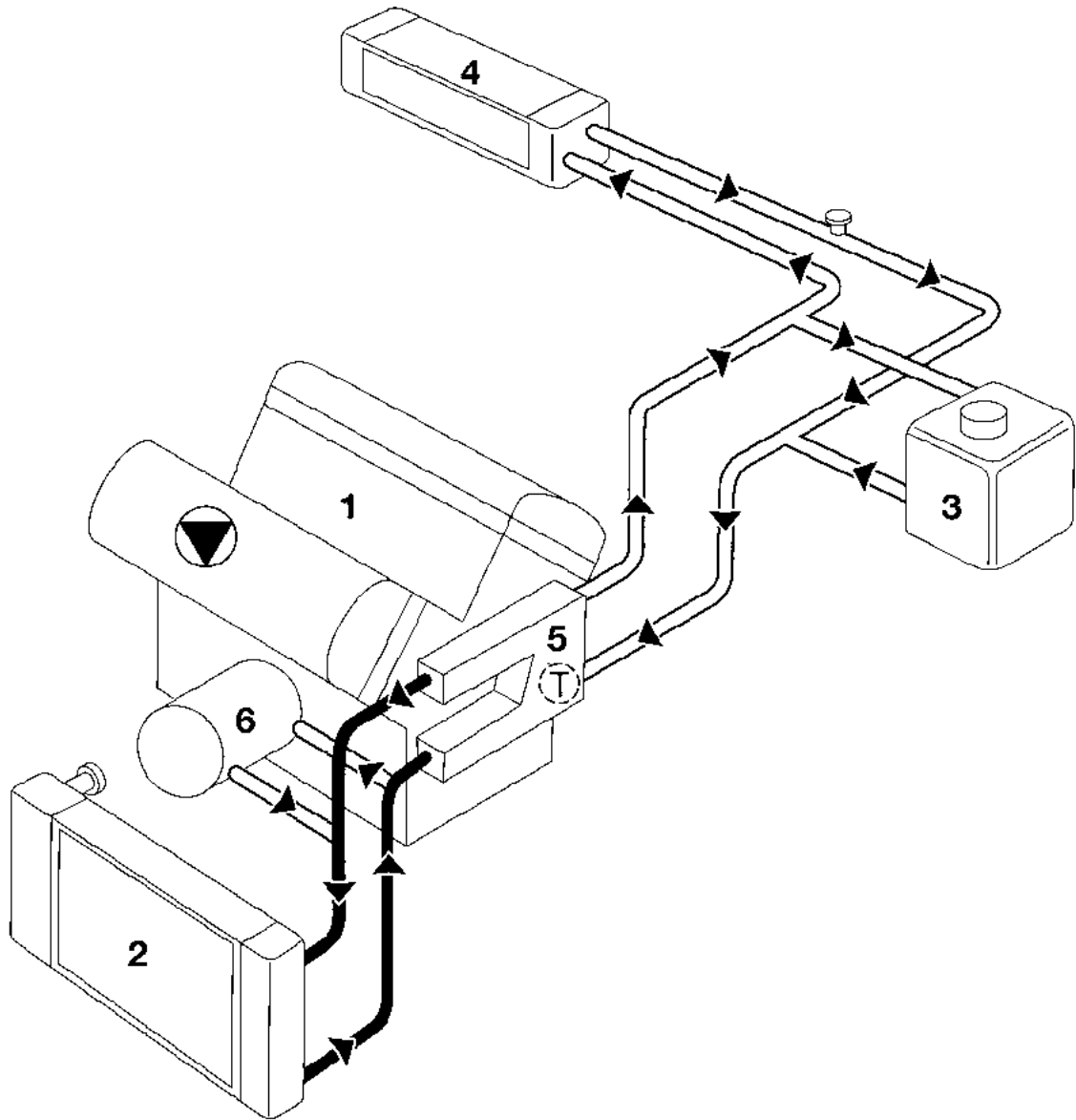
Engine	Volume (in litres)	Grade	Special notes
L7X 760	15	<b>GLACEOL RX (type D)</b> add only coolant	Protection down to - 20°C ± 2°C for hot, temperate and cold countries. Protection down to - 37 ± 2°C for extreme cold countries

THERMOSTAT

Engine type	Starts to open at (°C)	Fully open at (°C)	Travel (mm)
L7X 760	83	95	7.5

# COOLING SYSTEM Diagram

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A-17334

- 1 Engine
- 2 Radiator:
- 3 "Warm" tank with expansion bottle
- 4 Heater matrix
- 5 Coolant outlet housing
- 6 Modine cooler



Coolant pump



Double effect thermostat



Bleed screws

The expansion bottle valve rating of the 415#EDU (brown).

Coolant flow is continuous in the heater matrix, which contributes to the cooling of the engine.

### FILLING

**It is essential to open the following bleed screws:**

- on top of the radiator,
- on the heater hoses.

Fill the circuit through the expansion bottle opening.

Close the bleed screws as soon as the liquid starts to flow in a continuous stream.

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

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

Close the bottle.

### BLEEDING

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

Check the liquid level is at the **Maximum** marker.

**DO NOT OPEN THE BLEED SCREW(S) WHILE THE ENGINE IS RUNNING.**

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

### REMOVAL

Place the vehicle on a two-post lift

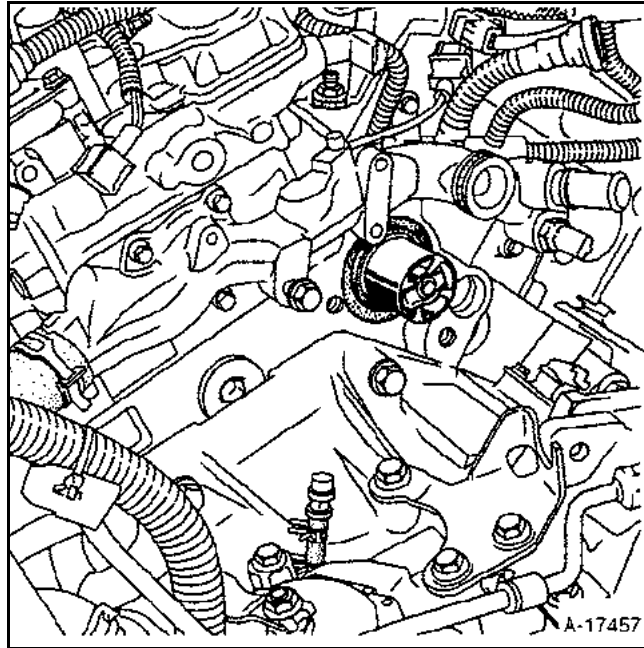
Remove the tray under the bonnet.

Disconnect the battery.

Remove the engine undertray.

Drain the coolant circuit using the bottom hose and the drain plug on the cylinder block.


Remove the thermostat.



### REFITTING

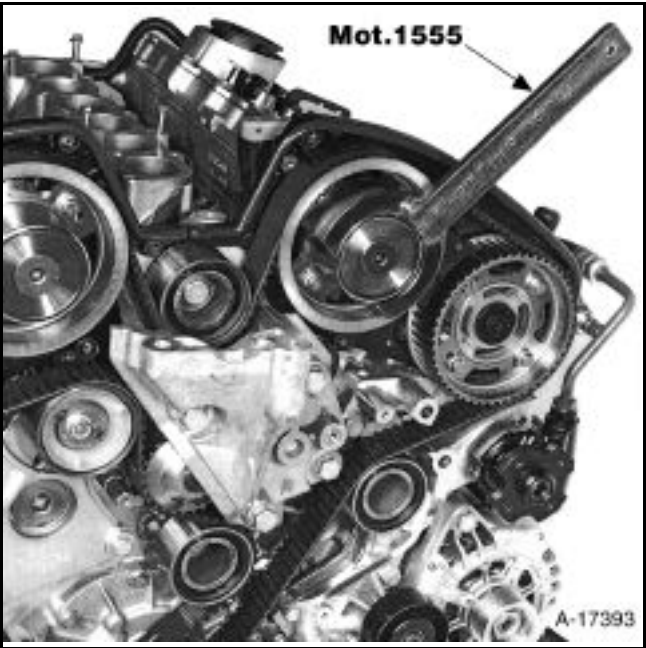
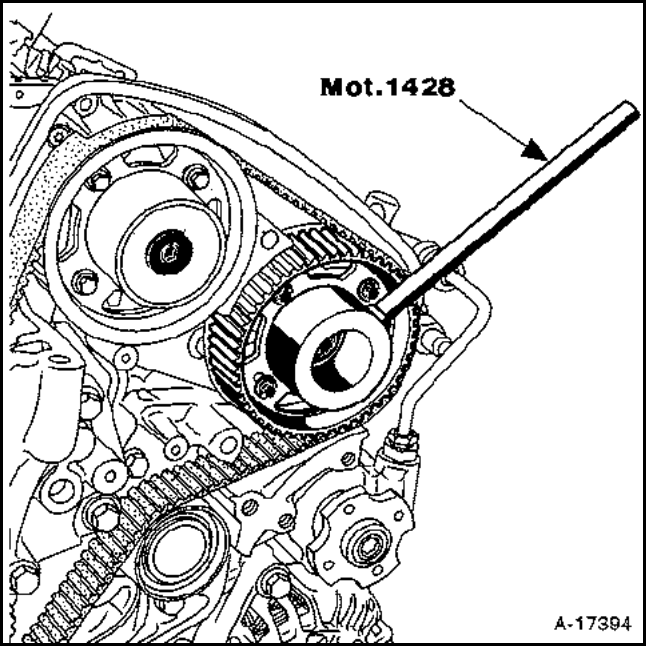
Proceed in the reverse order to removal.

SPECIAL TOOLS REQUIRED	
Mot. 1505	Tool for checking timing belt tension
Mot. 1428	Exhaust camshaft hub locking tool
Mot. 1555	Inlet camshaft hub locking tool
Mot. 1430	Crankshaft and camshaft pulley timing pins
Mot. 1430-01	Crankshaft and camshaft pulley timing check pin
Mot. 1436	Timing belt locking pin

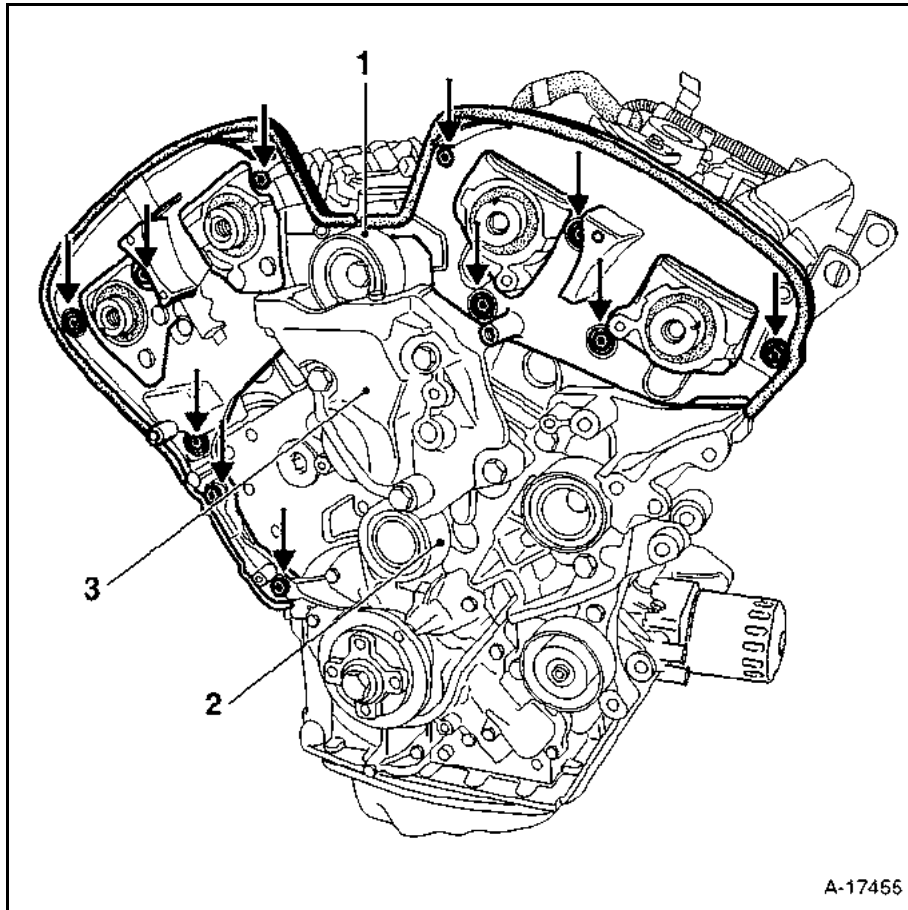
TIGHTENING TORQUES (in daNm)	
Timing belt tensioner pulley nut	2.5
Timing belt tensioner bolt	2.5
Camshaft pulley bolt	1
Crankshaft pulley bolt	2.5
Wheel bolts	9
Right-hand engine mounting bracket nut and bolt	6.2
Travel limiter bolt	8

REMOVAL

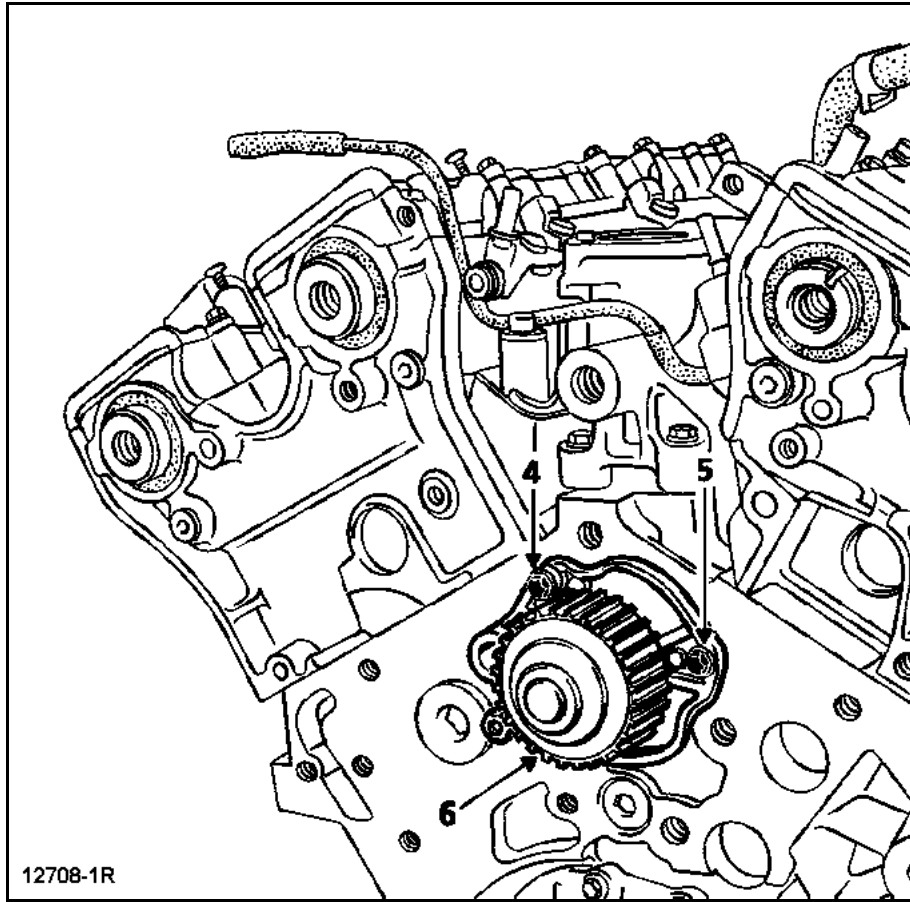
- Remove:
- the engine (see method described in **section 10 - Engine-gearbox**),
  - the timing belt, (see procedure described in **section 11 - Timing Belt**),
  - the timing pins **Mot. 1430**,
  - the camshaft pulley-hub assembly, locking the hubs using the **Mot. 1428** and **Mot. 1555** tools.



- the inner timing gear cases,
- the pulleys (1) and (2),
- the bracket (3),



- the water pump in the following order: bolts (4) and (5) then bolt (6).



### REFITTING

Refit the water pump, after fitting a new seal.

Observe the order of tightening (4), (5), (6), tightening to a torque of **0.8 daNm**.

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

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

TIGHTENING TORQUES (in daNm)

