USING THIS MANUAL

This manual has four main sections:

- specifications,
- engine removal,
- engine refitting.
- cylinder head gasket

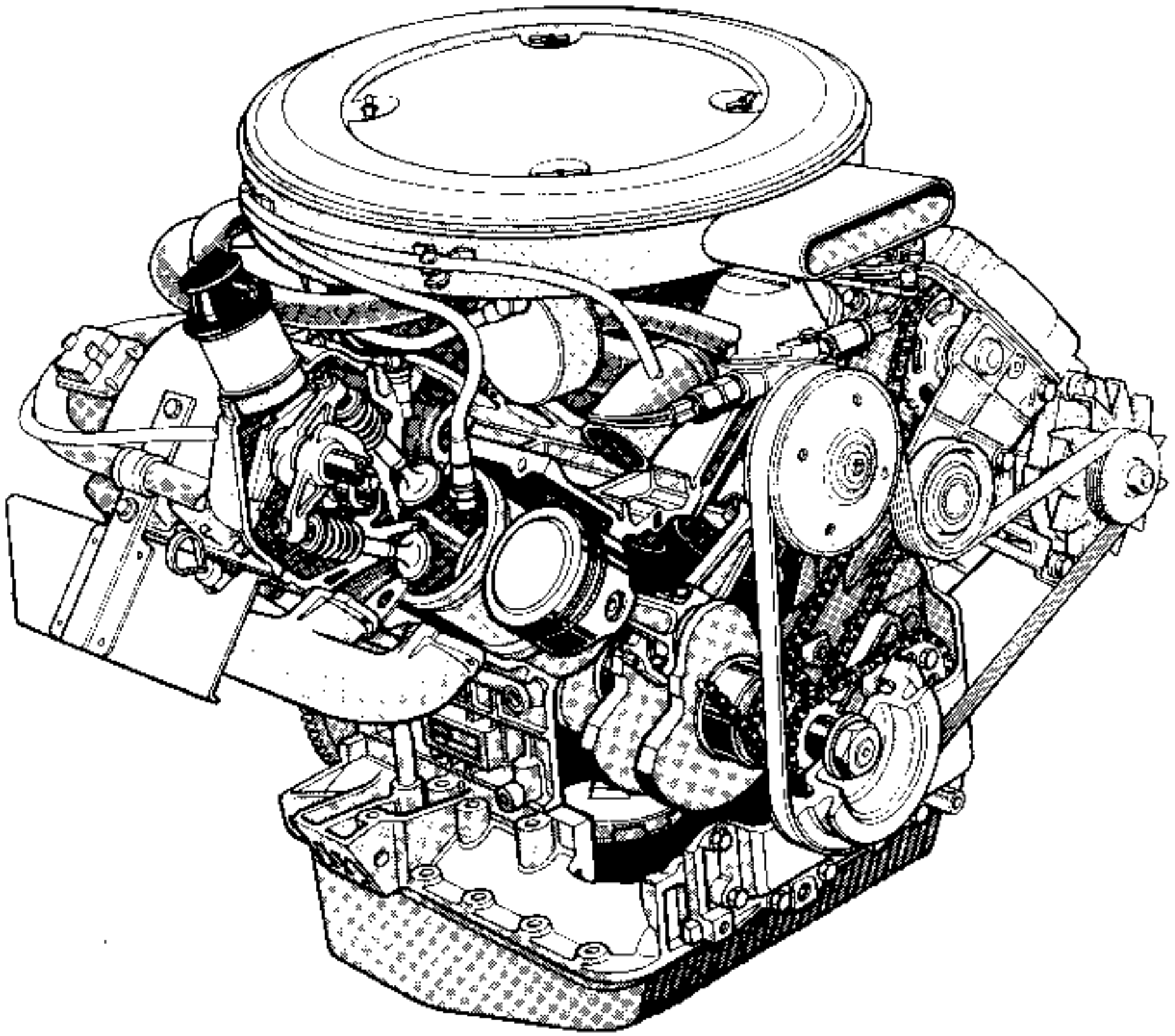
When repairing components on the vehicle refer to the vehicle MR.

UNITS OF MEASUREMENT

- All **dimensions** are given in millimetres: **mm** (except where otherwise indicated).
- Tightening torques are given in decaNewtonmetre : **daN.m.** (remember: **1 daN.m = 1.02 m.kg)**

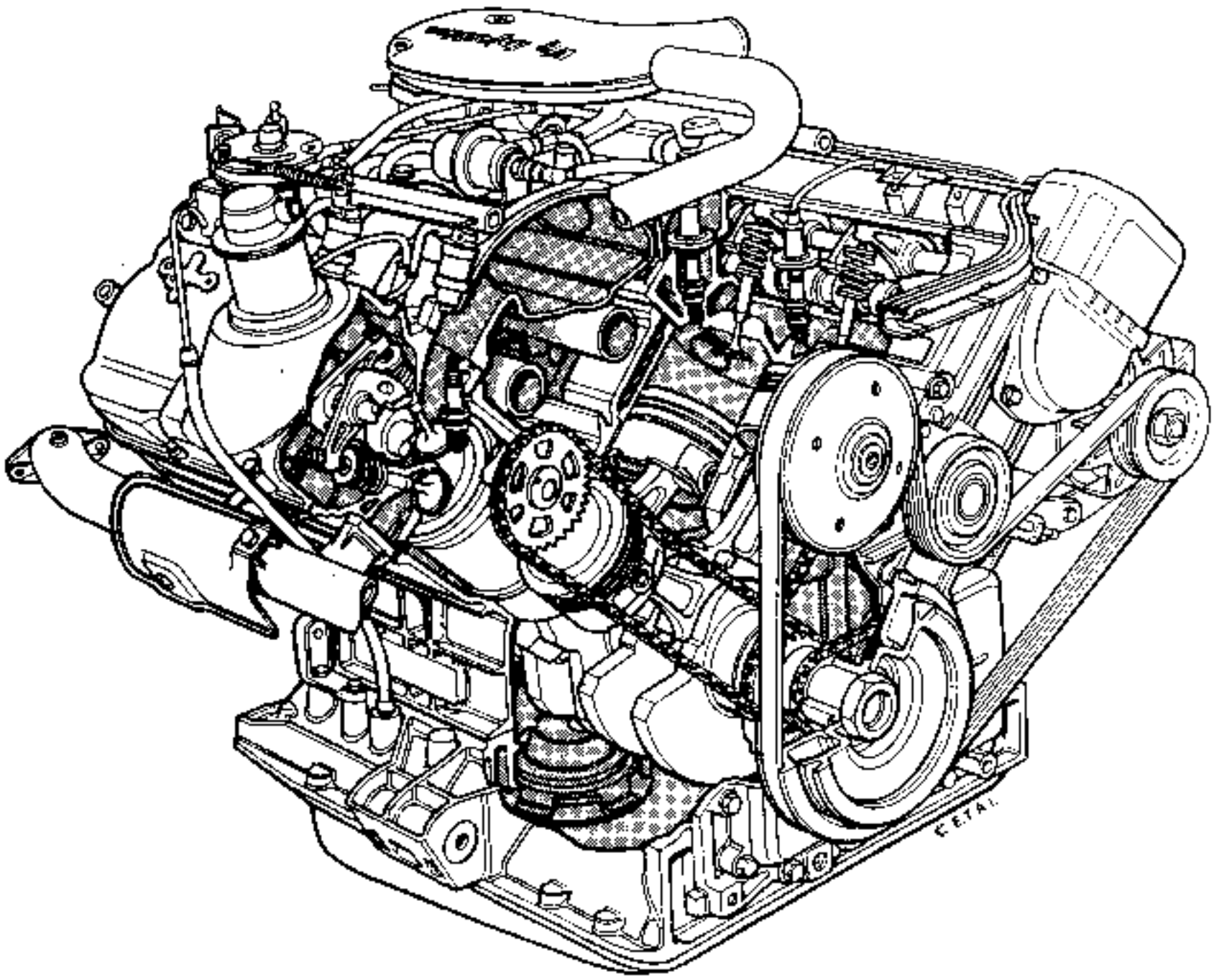
Tightening torques where no tolerance is specified should be to ± **10%**.

Pressures are given in bar.

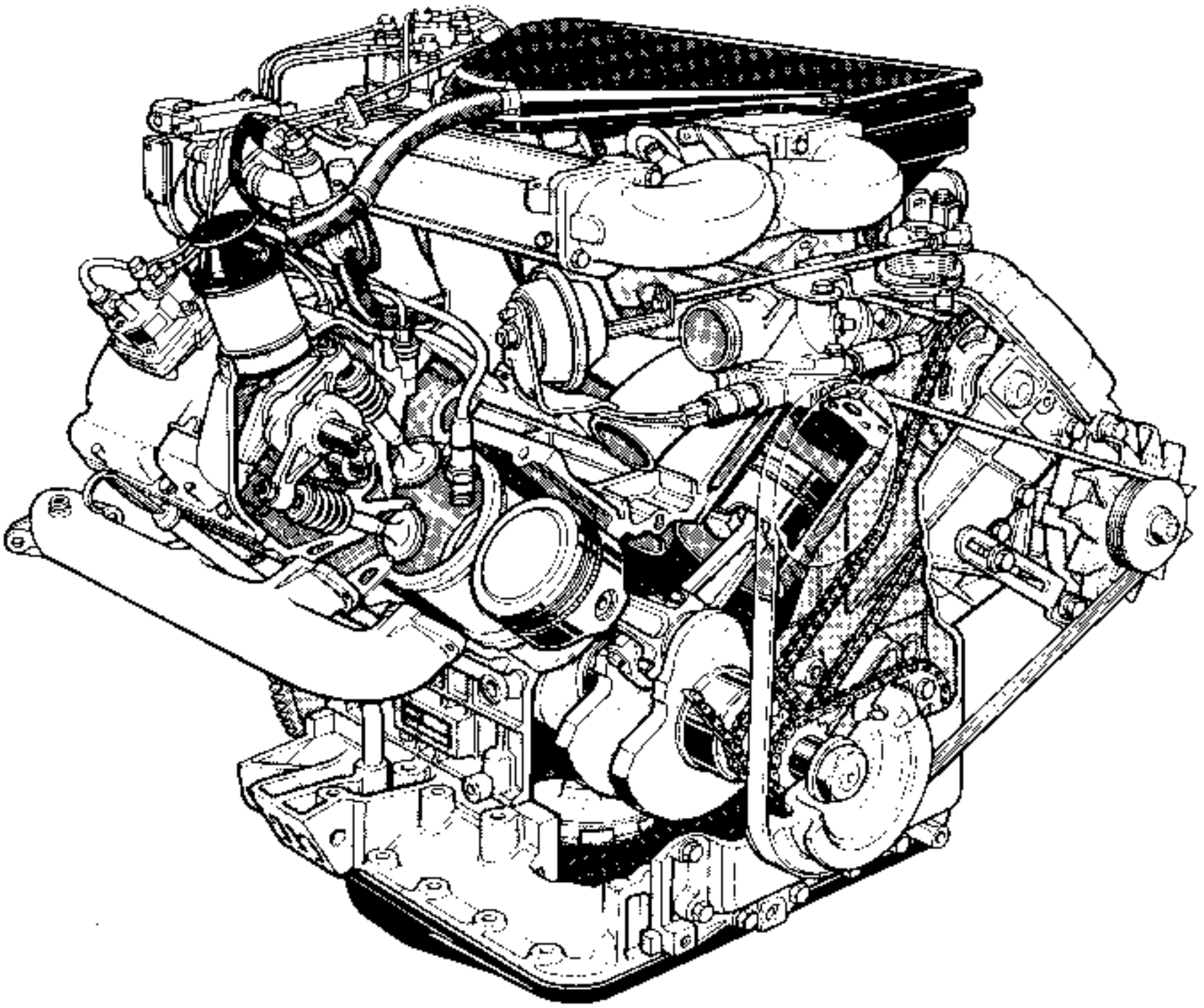


DI1015

ENGINE ASSEMBLY
Section view



DI1016



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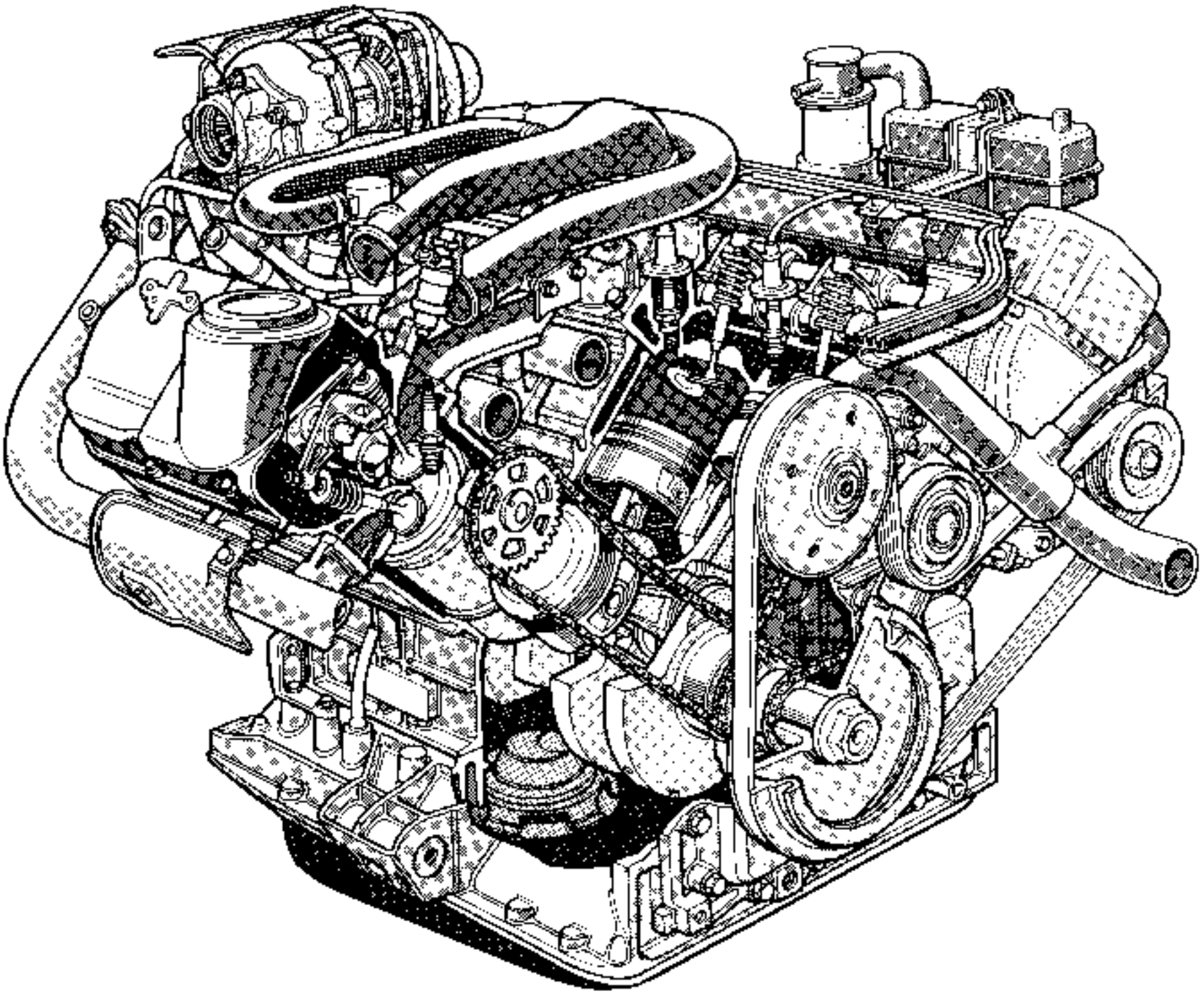
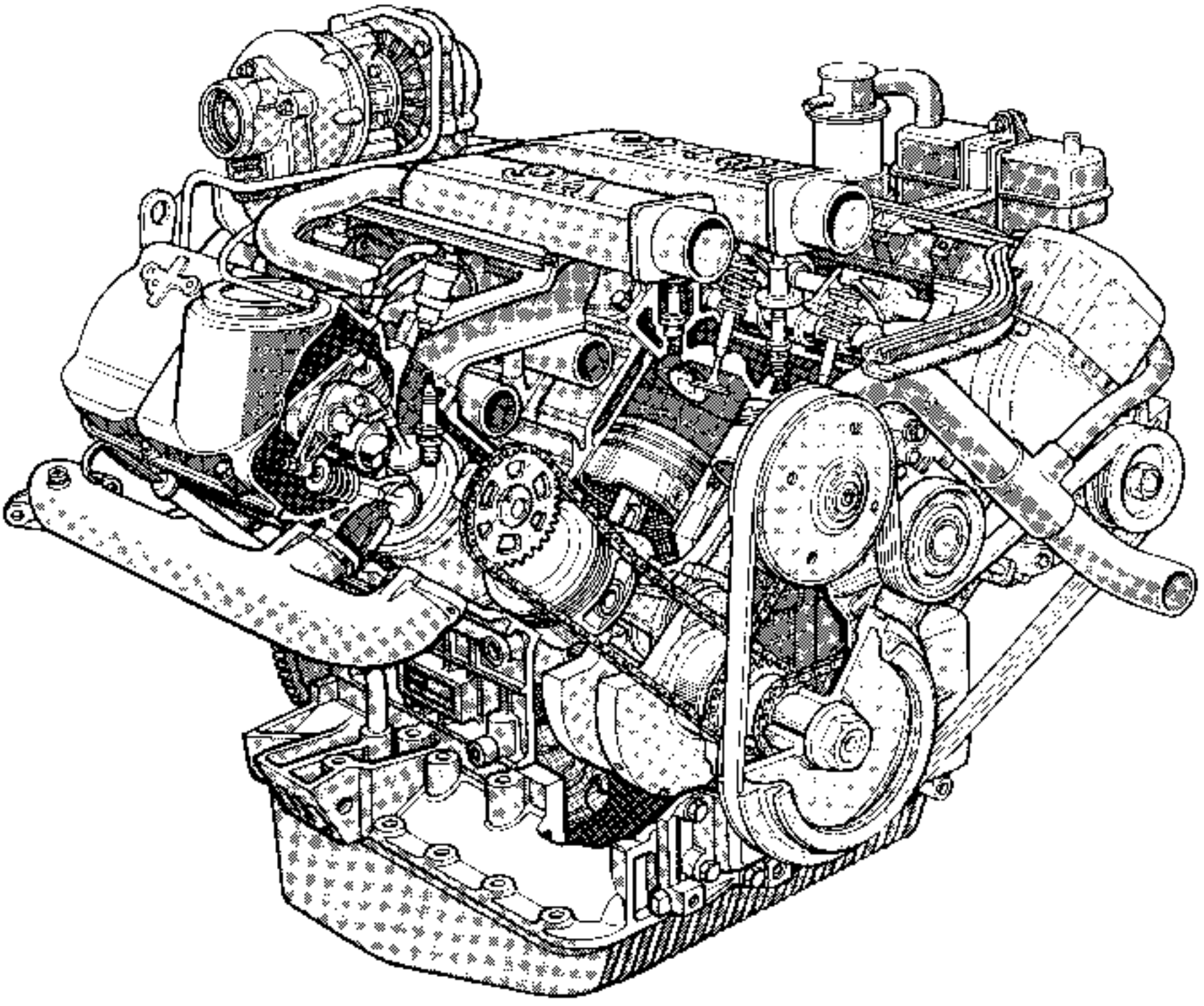


DI1018

ENGINE ASSEMBLY
Section view



DJ1019

The space available determines the shape of the identification plate riveted to the cylinder block or stamped on the inside of the cylinder block V, which is difficult to see. An additional plate is fitted to the cylinder block

The plates show:

at **A** : the engine type

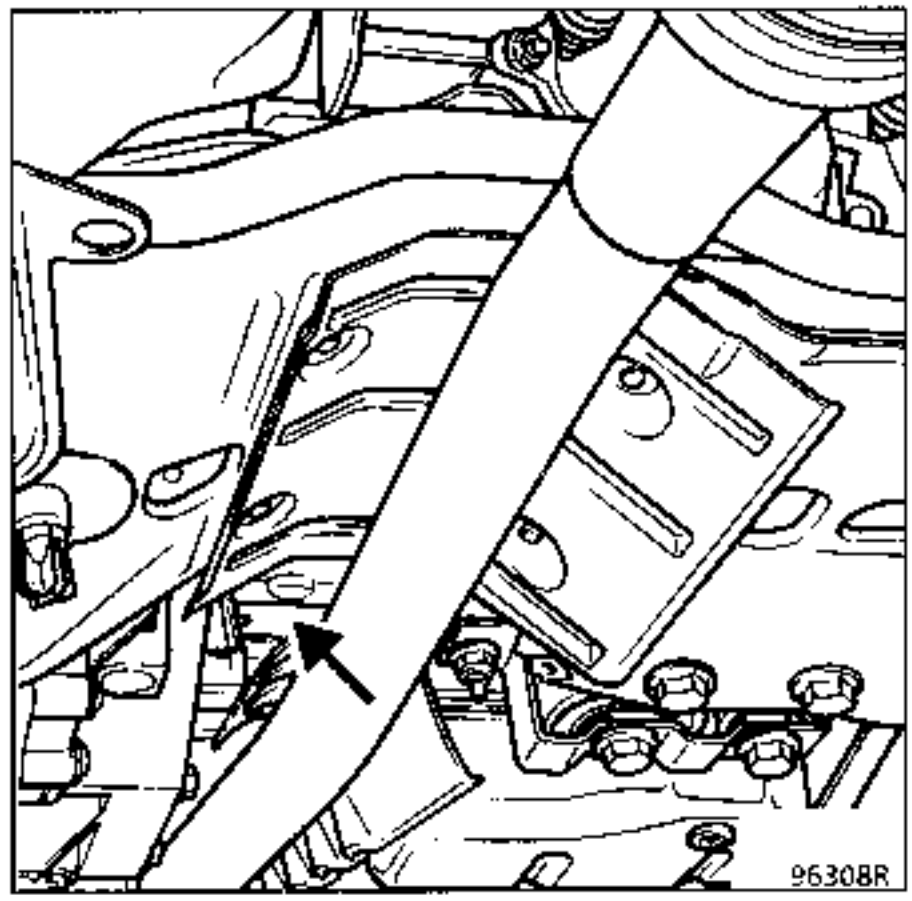
at **B** : the MINES approval letter

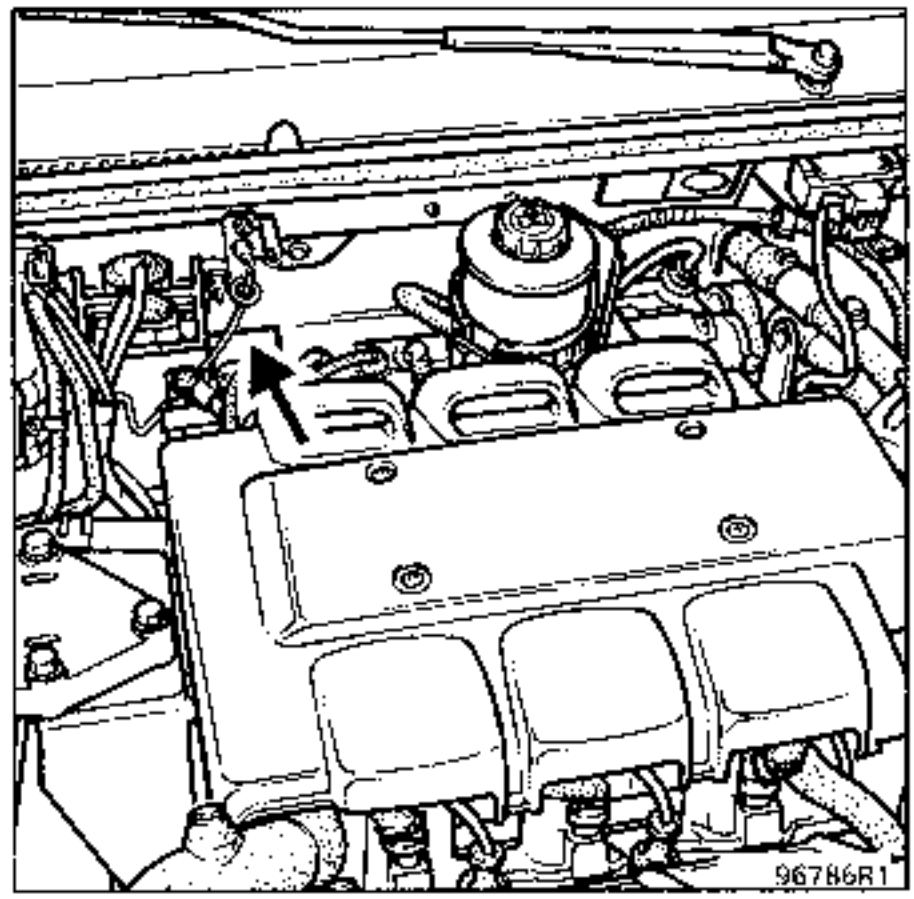
at **C** : RNUR identity

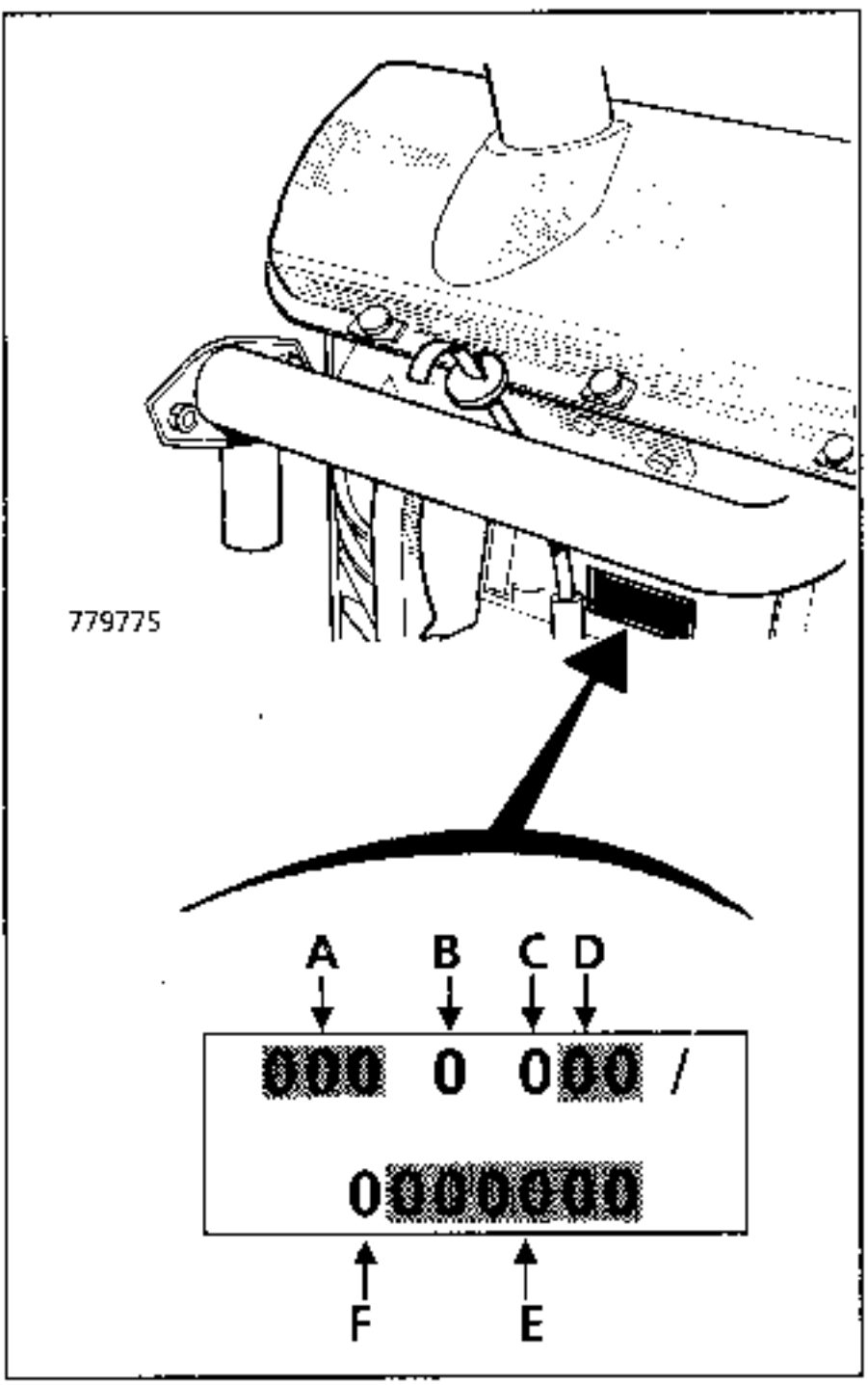
at **D** : the engine suffix

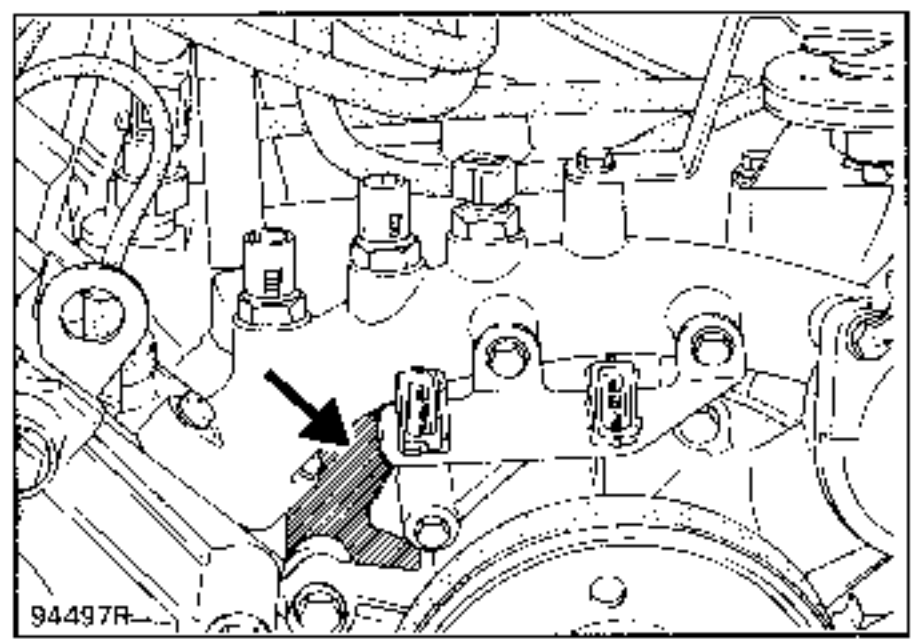
at **E** : the engine fabrication number

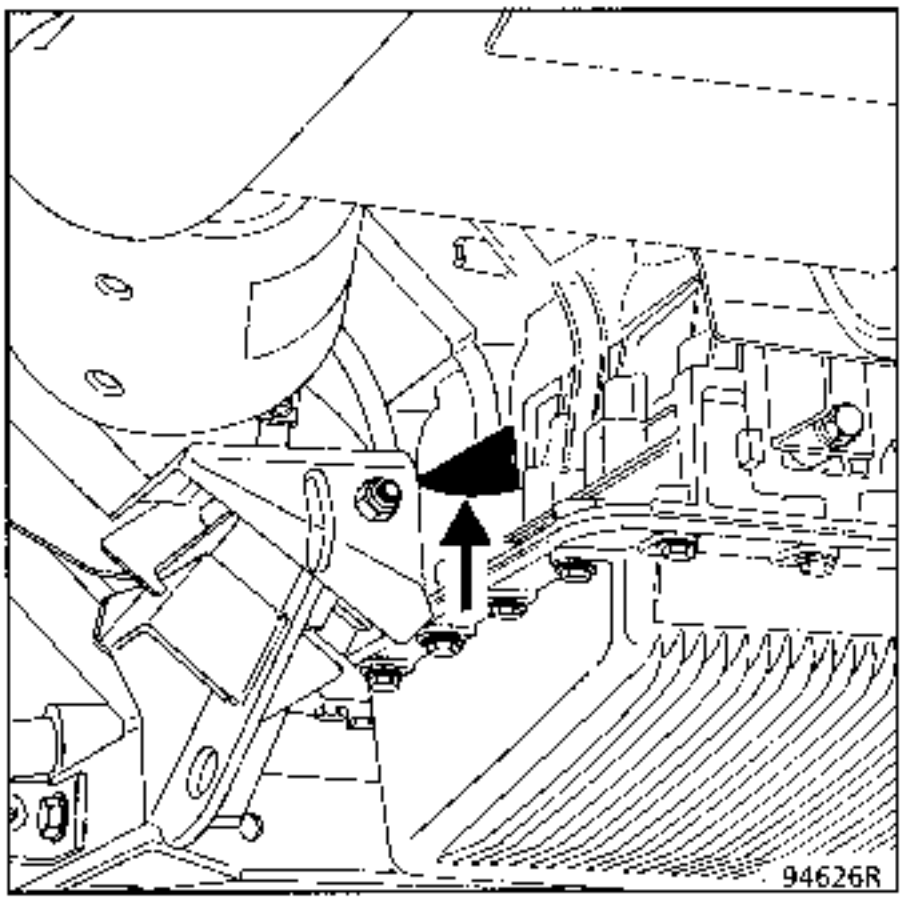
at **F** : the engine identification and factory of assembly letter



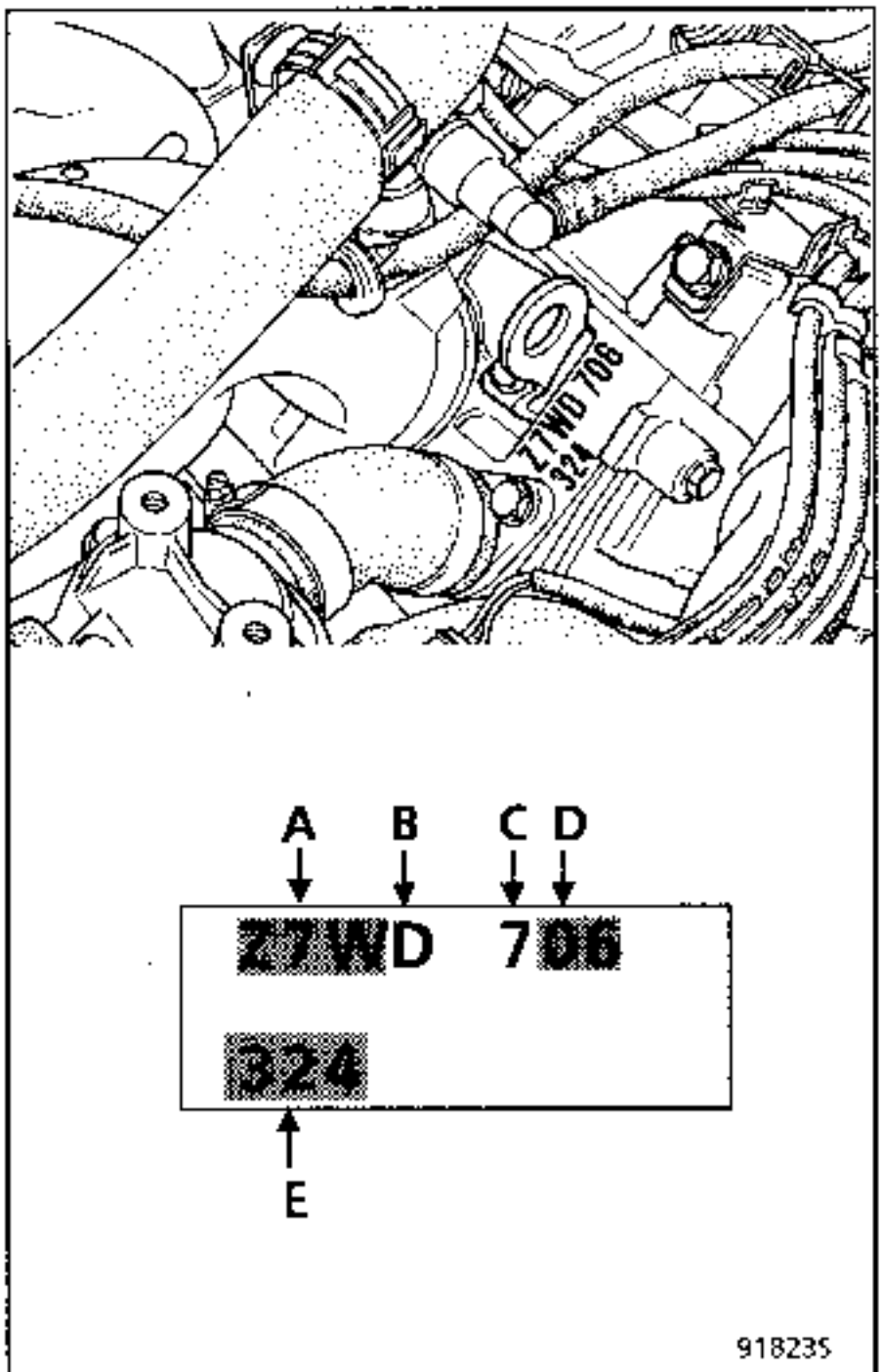








The engine identification may also be stamped on the cylinder head.



At A : the engine type

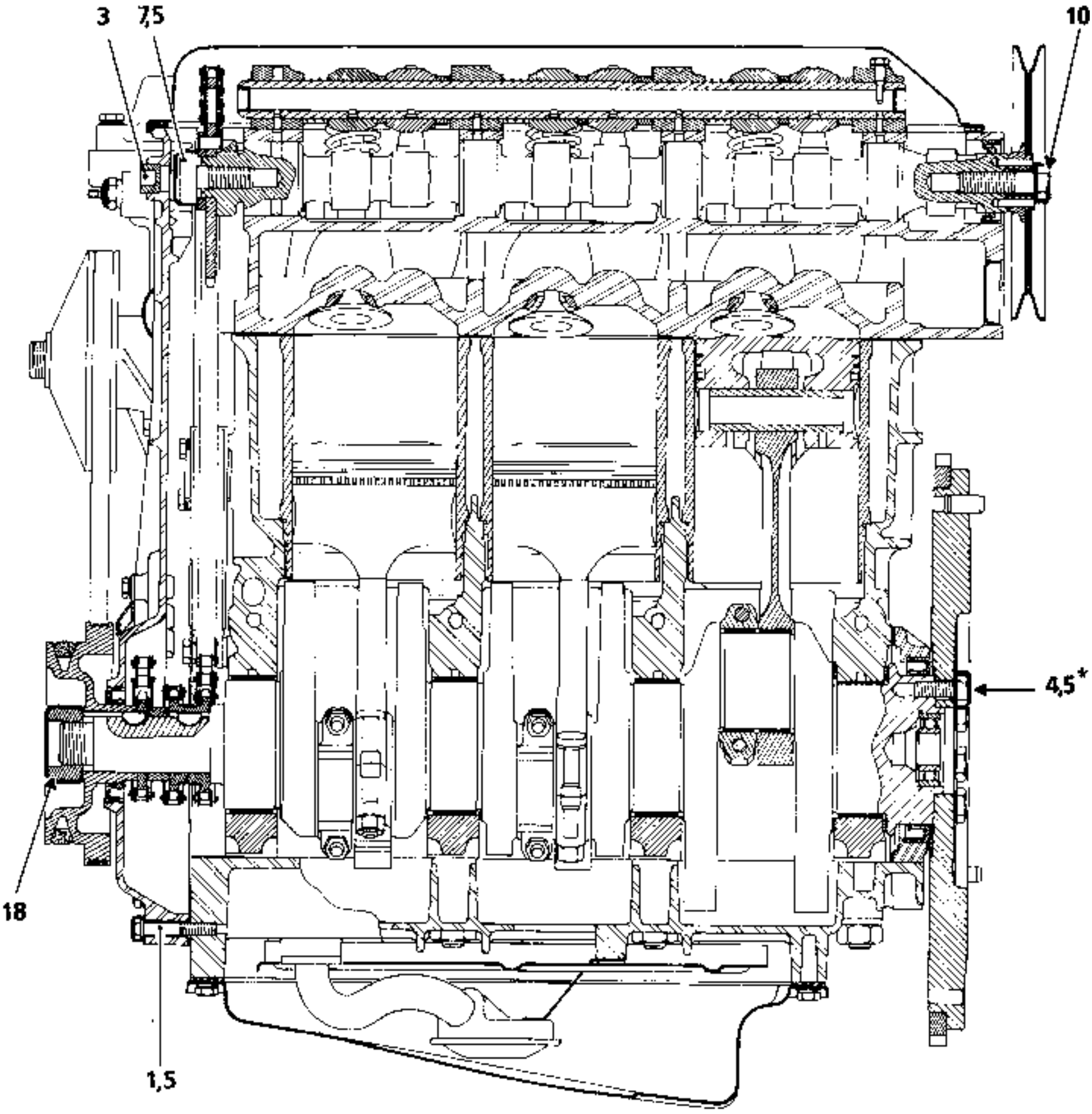
At B : the MINES approval letter

At C : RNUR identity

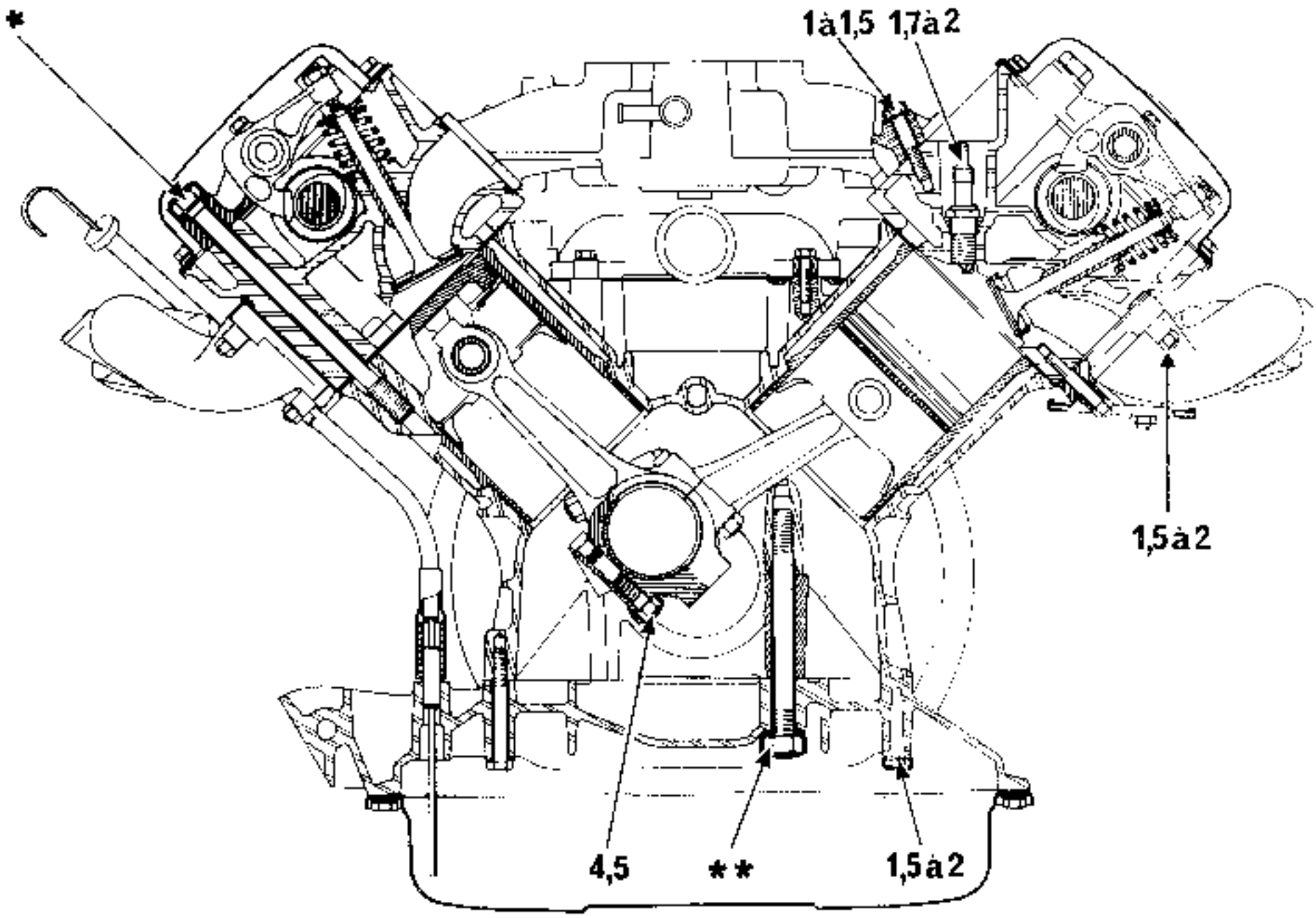
At D : the engine suffix

At E : the engine fabrication number

Engine	Suffix	Vehicle	Compression ratio	Bore (mm)	Stroke (mm)	Capacity (cm^3)
Z7V	A 708 B 709 B 711	B 298	9.2	88	73	2664
Z7U	A 702 A 730	B 295 D 501	8.6	91	63	2458
	A 732	D 50A	8			
	A 734	D 501 D 502				
	700	B 296				
Z6W	A 700 A 702	D 500	9.5	91	73	2849
Z7W	A 700 A 701	B 293				
	A 702	B 29 A	8.8			
	A 706 A 707 709	B 29 F B 293	9.5			
	712 713	J 638 J 638 AT				
Z7X	A 744	D 503	7.6	93	73	2975
	B 722 K 722 C 723	B 544	9.6			
	S 744	D 503	7.6	93	72.7	2963
	L 726	B 545				
	N 722 P 722 R 723	B 544				
	760	B 56 E				
	765	B 56 R				
	721 753	B 54 B B 54 J				



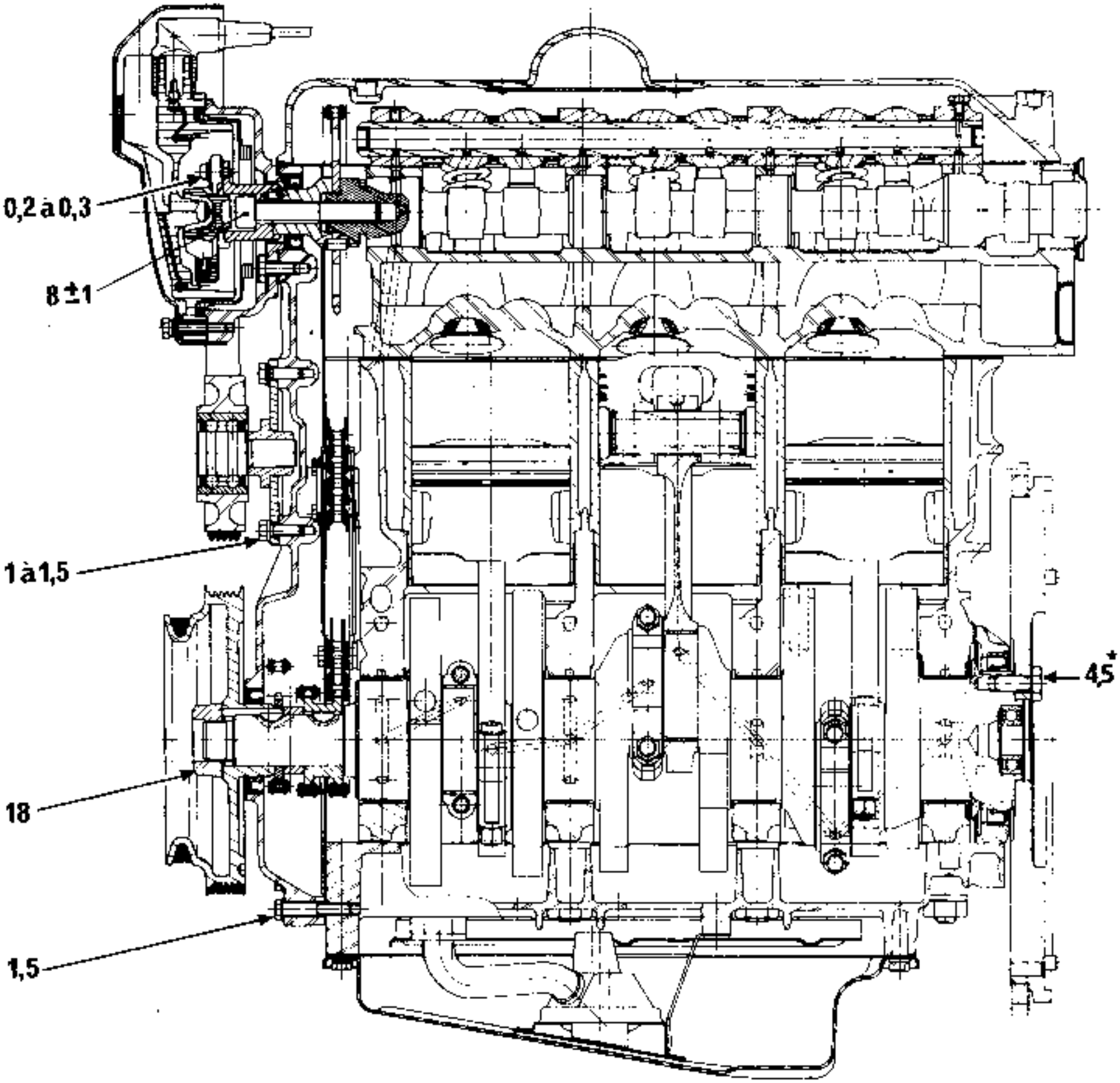
* 6.5 to 7 for automatic transmission



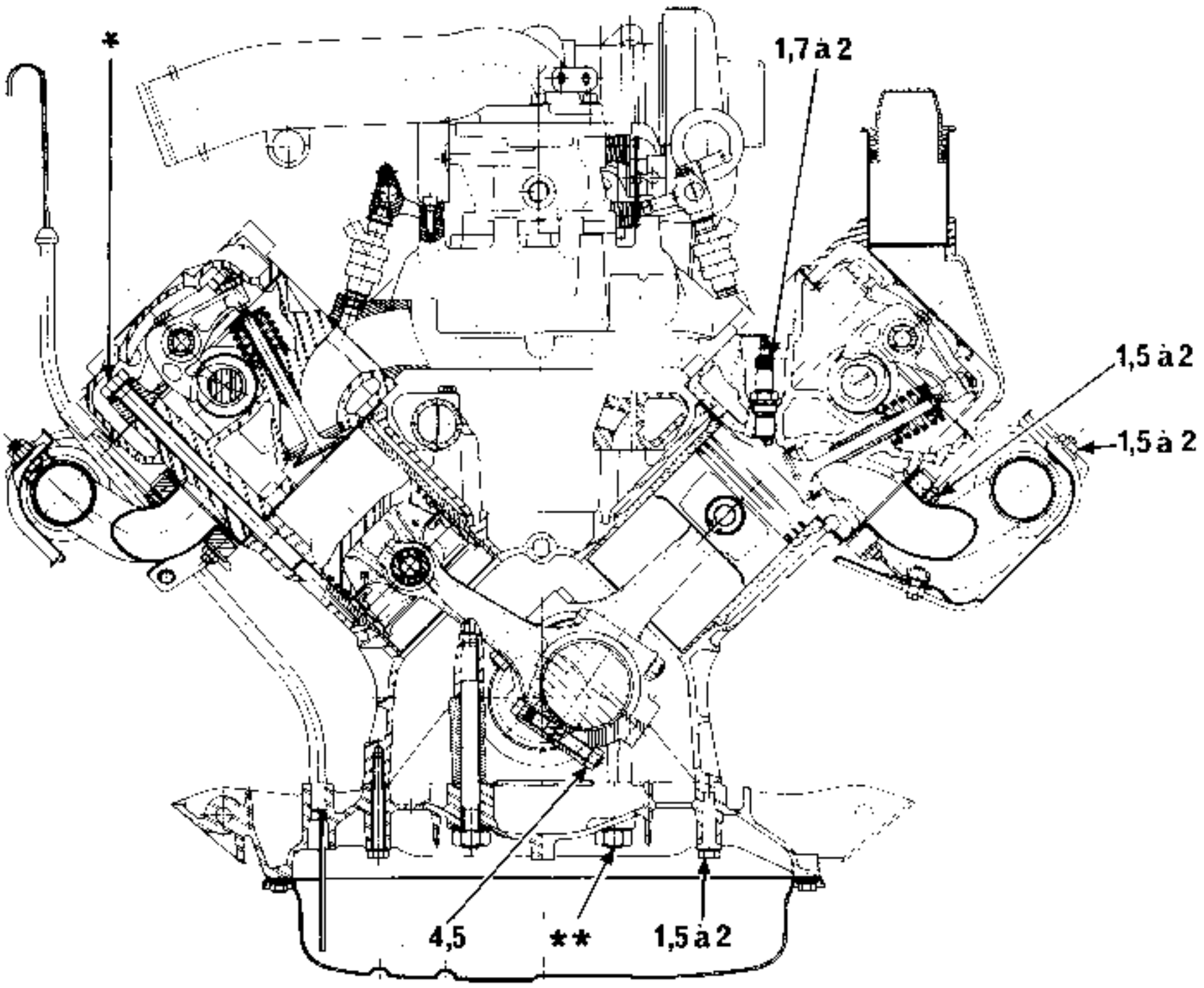
77600-1R1

* See cylinder head tightening

** Pre-tighten to 3, then apply an angle of 75°



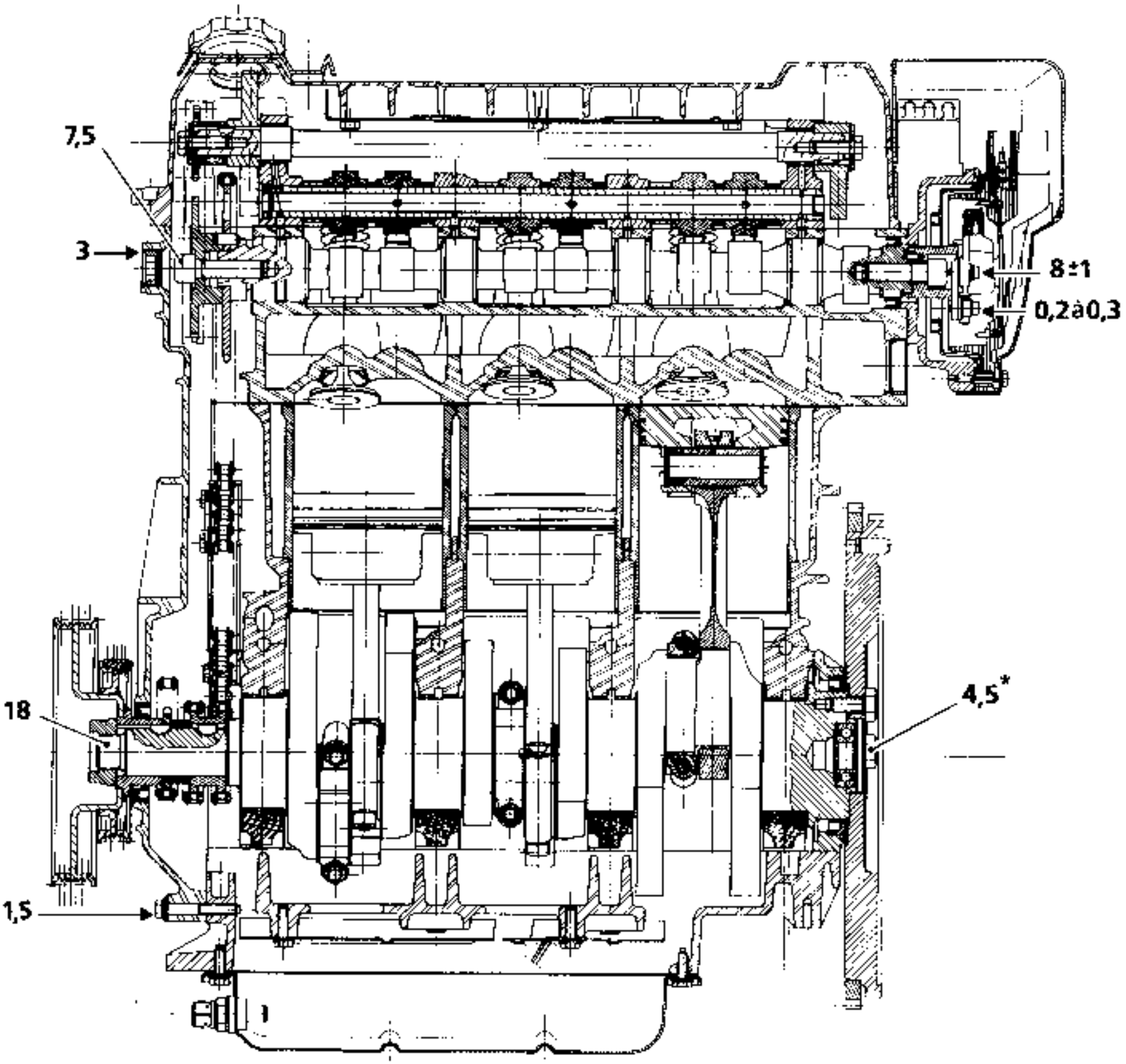
* 6.5 to 7 for automatic transmission



89135R

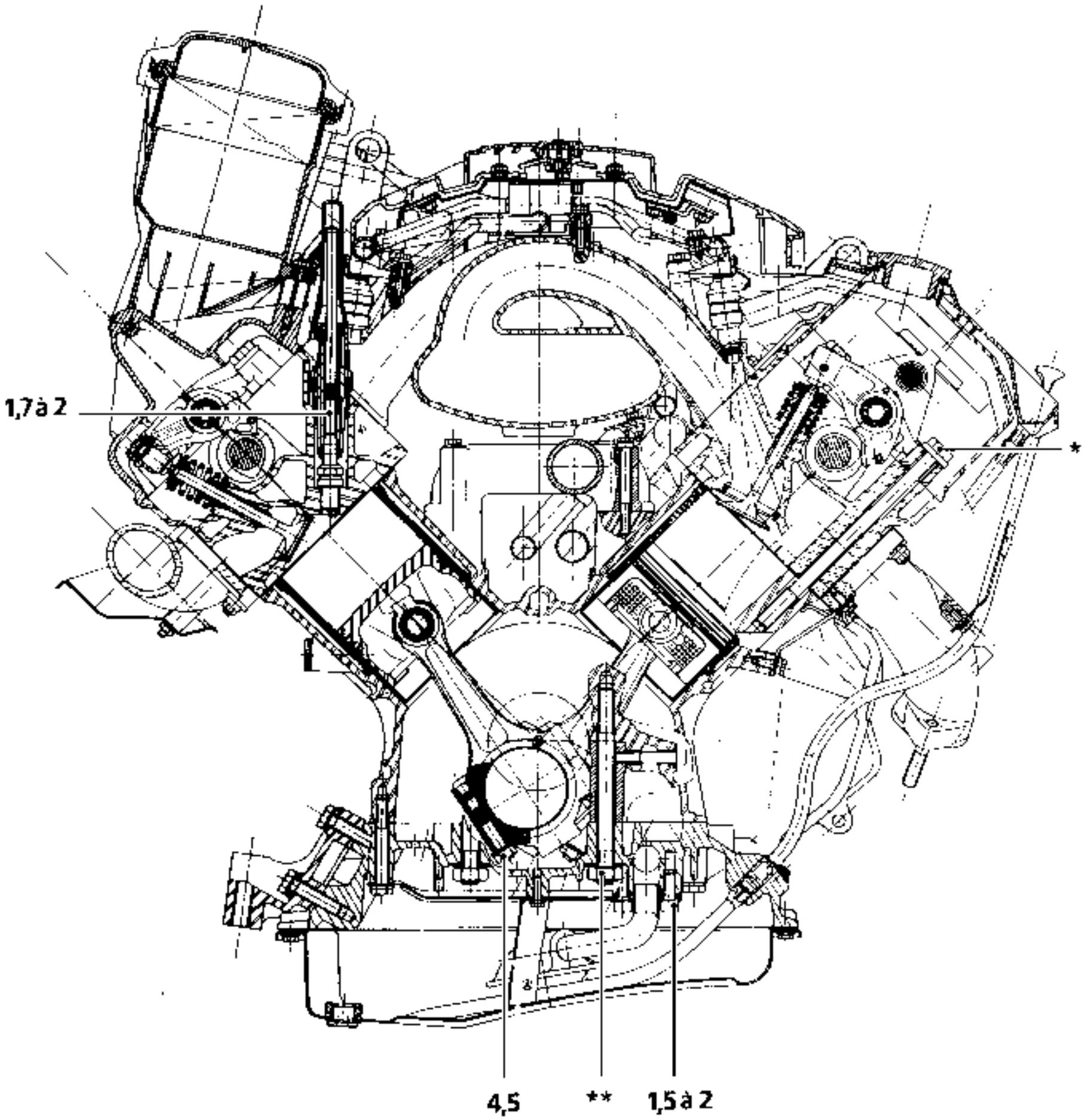
* See cylinder head tightening

** Pre-tighten to 3, then apply an angle of 75°



DI1021

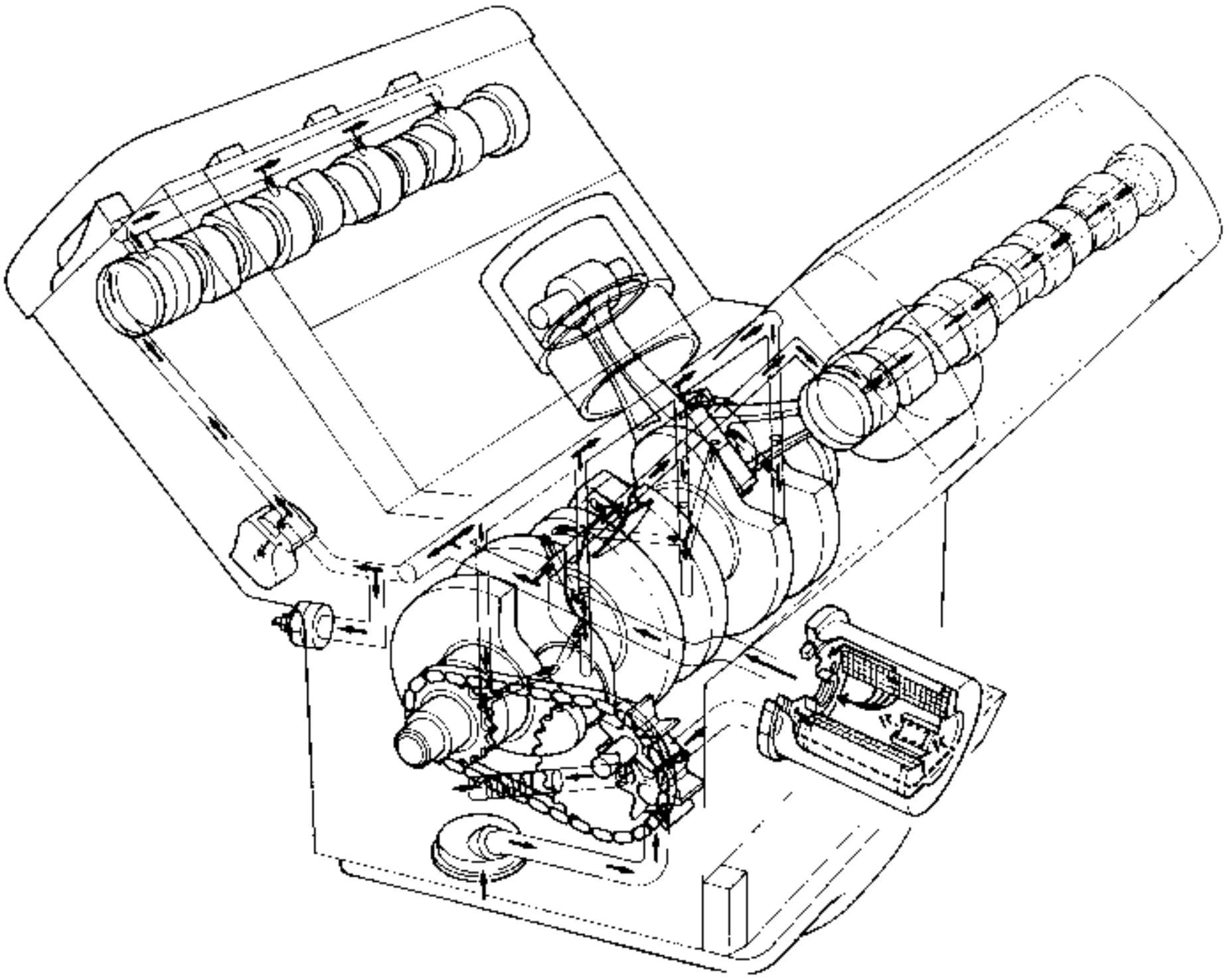
* **6.5 to 7** for automatic transmission



DI1022

* See cylinder head tightening

** **TIGHTENING BEARING NUTS** : Pre-tighten to **3**, then apply an angle of **75°**



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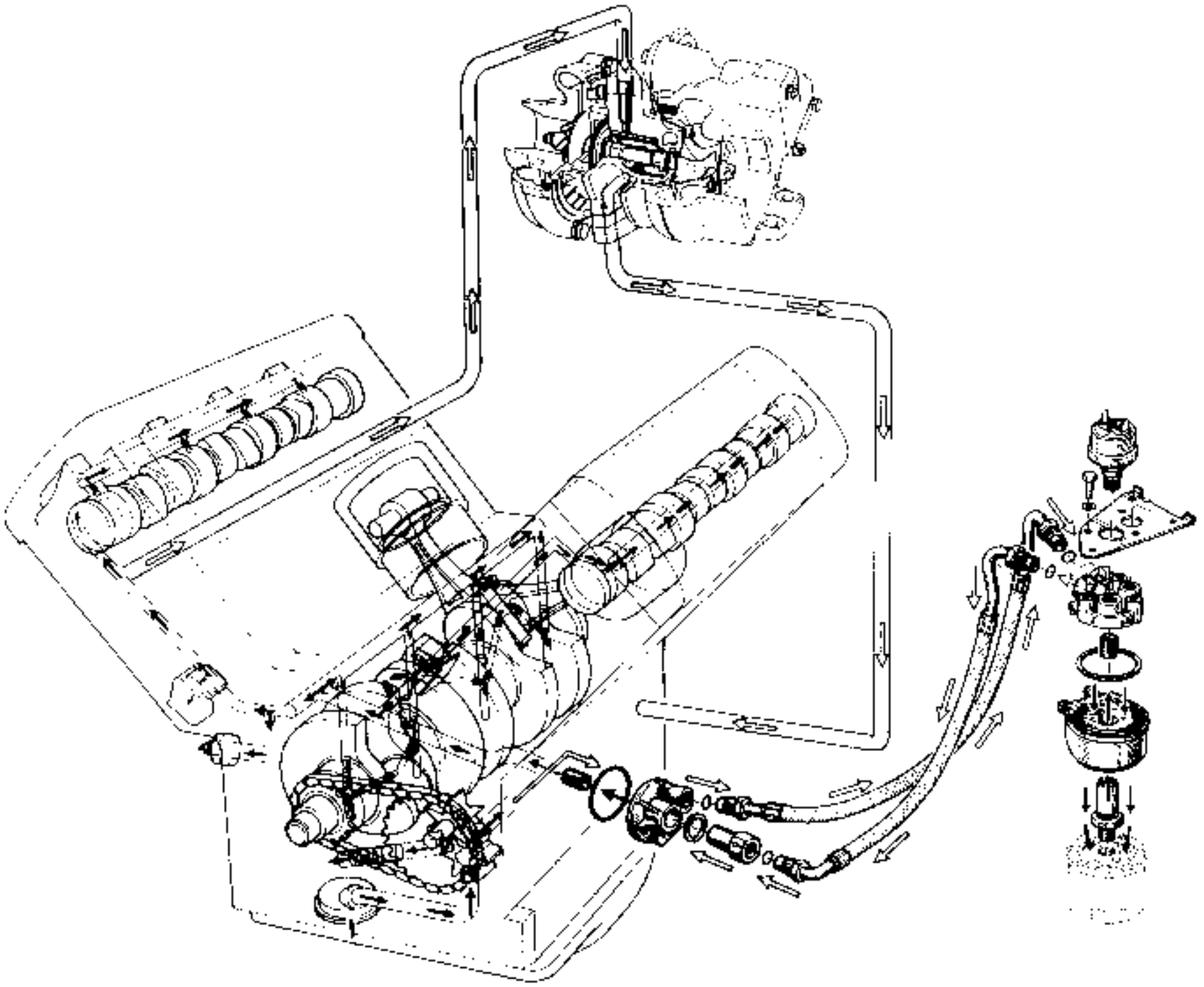
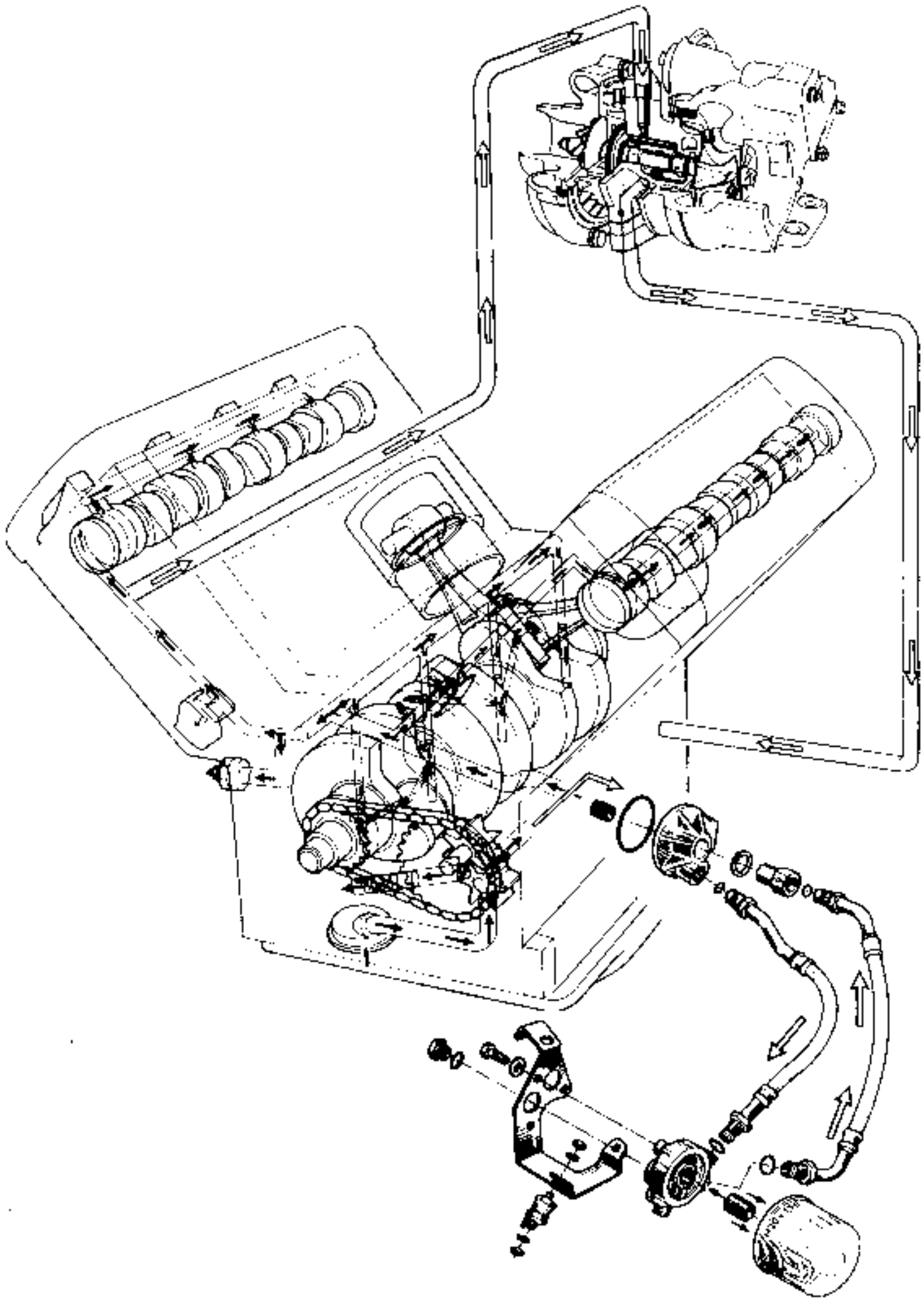
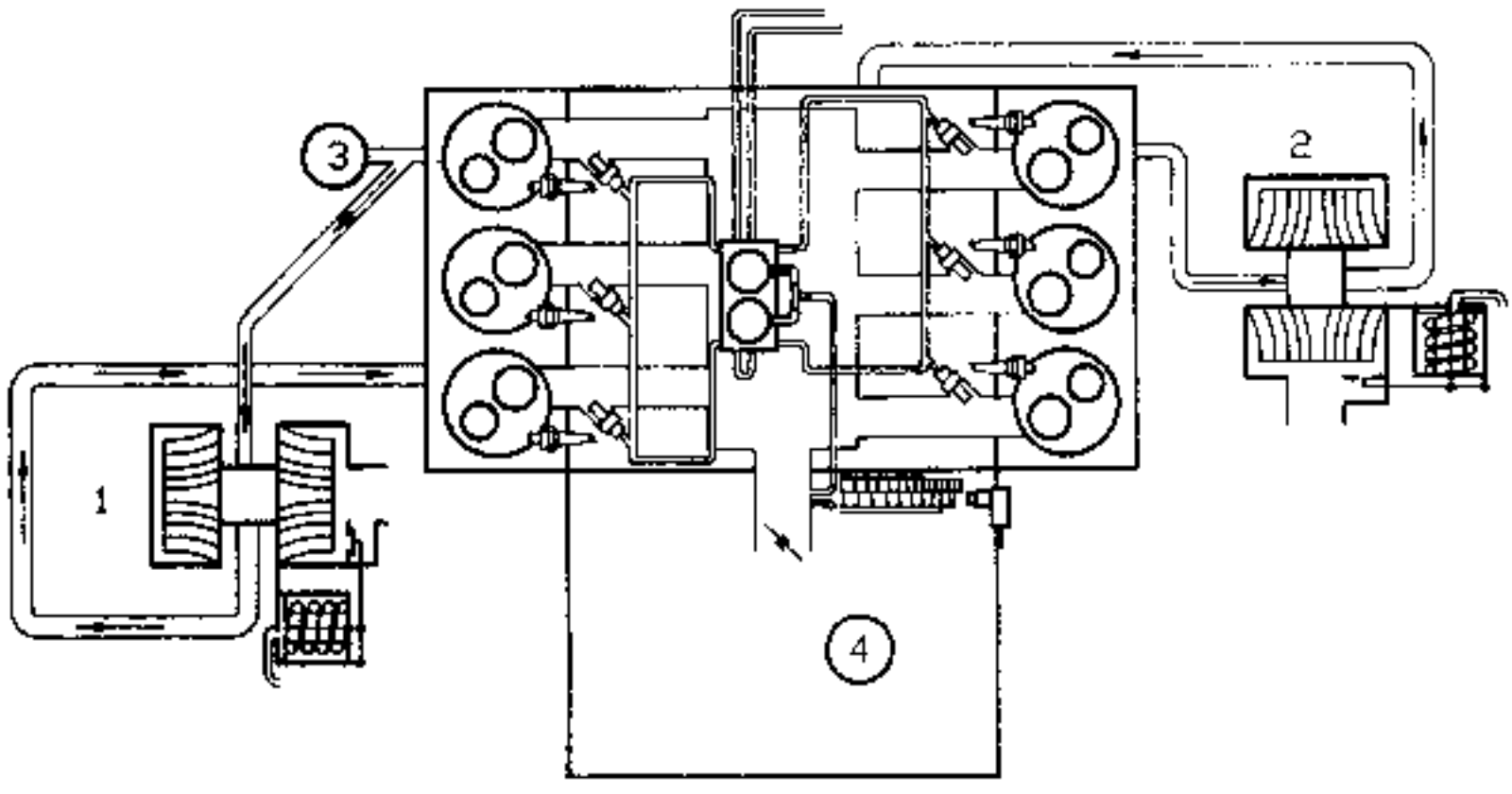


DI1023

ENGINE ASSEMBLY
Lubrication circuit diagram



DI1024



DI1026

1 - Front turbo

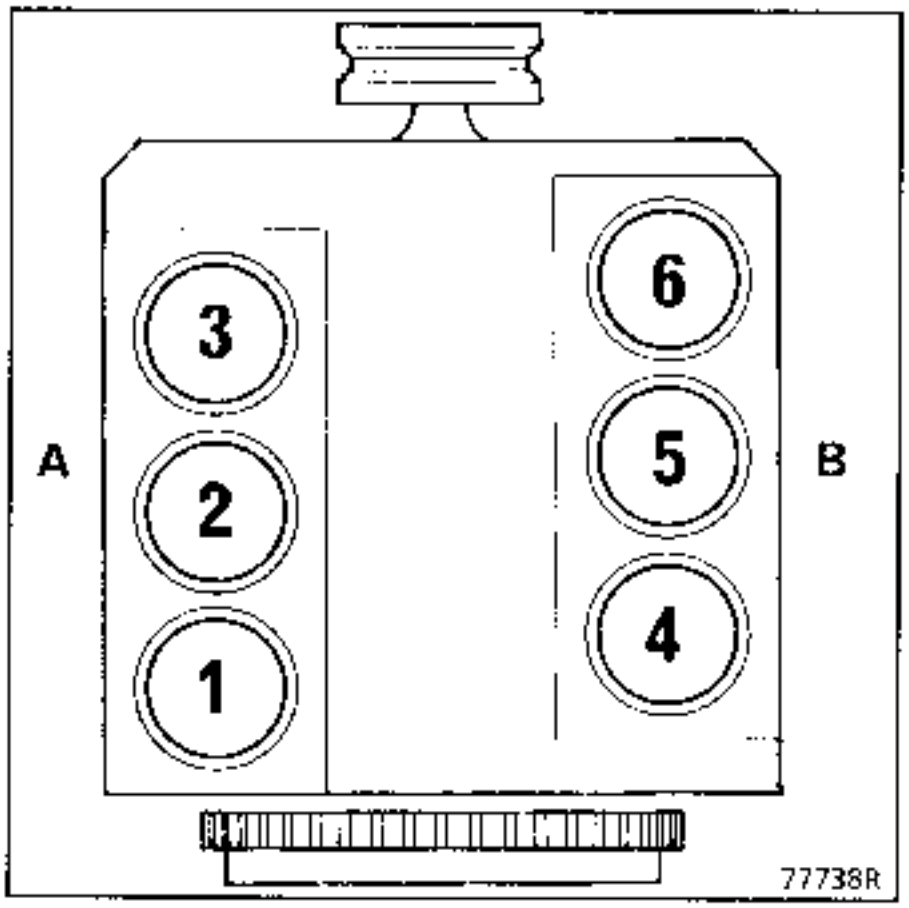
2 - Rear turbo

3 - Engine oil cooler

4 - Gear box oil cooler

CYLINDER BANK MARKINGS

The assembly of cylinders 1 - 2 - 3 is considered to be bank A and the assembly of cylinders 4 - 5 - 6 is considered to be bank B.



CYLINDER HEADS

Gasket face bow (mm) **0.05**

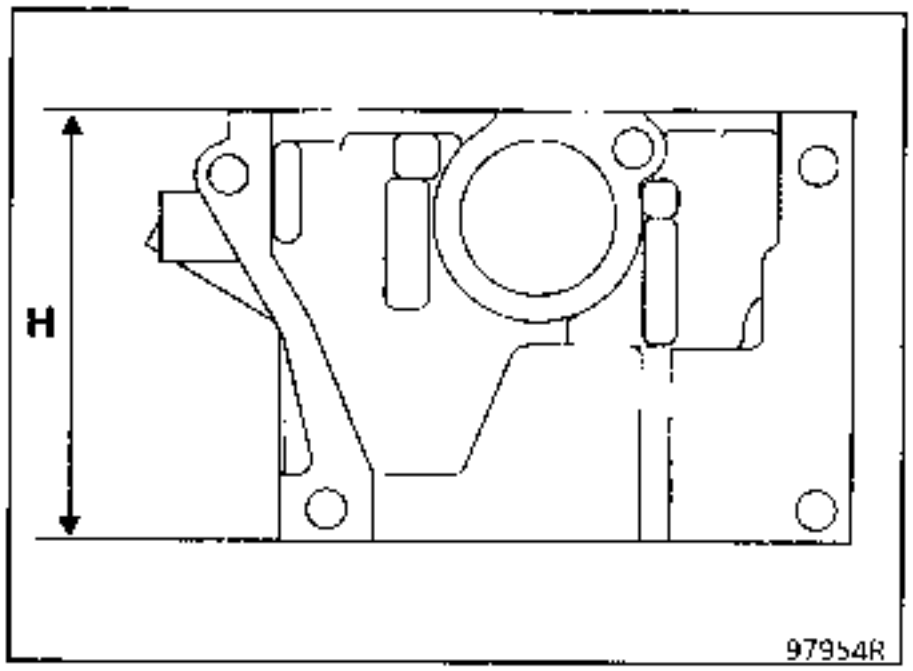
No re-surfacing is permitted

Rocker adjustment for all types of engine (except: Z7X 721, 722, 723, 753, 760, 765 ; hydraulic rockers).

Rocker arm clearance adjustment, when cold (mm) :

- Inlet **0.10**
- Exhaust **0.25**

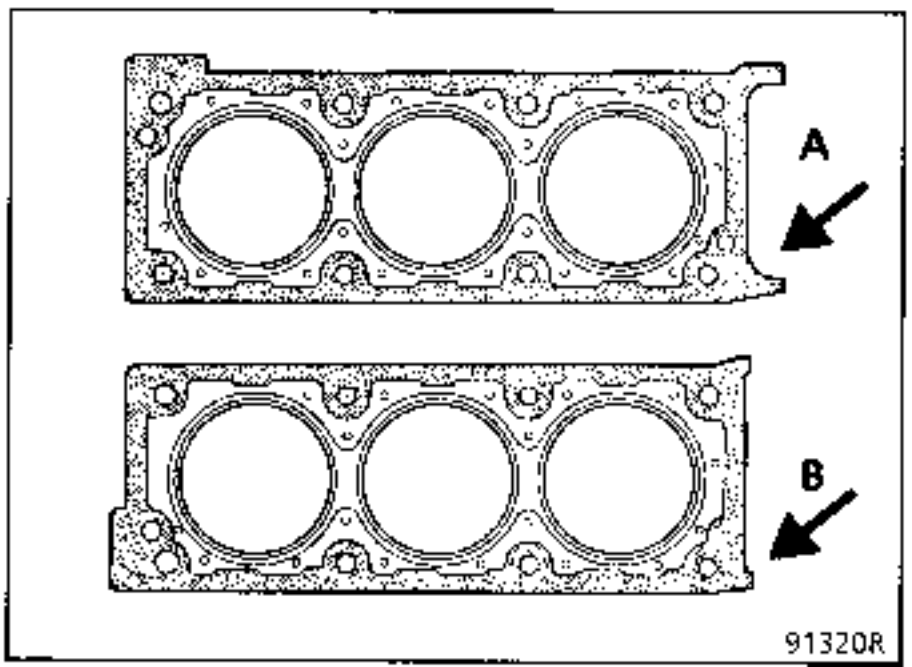
CYLINDER HEAD HEIGHT



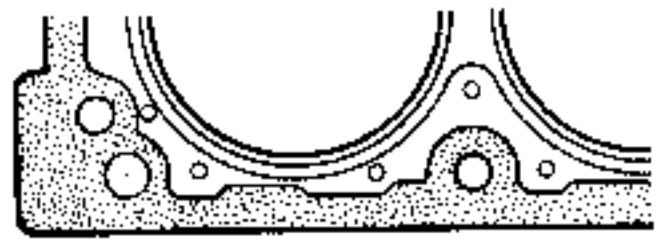
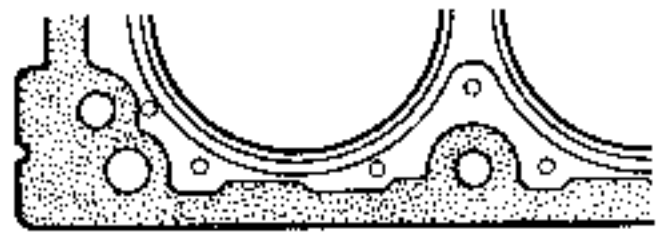
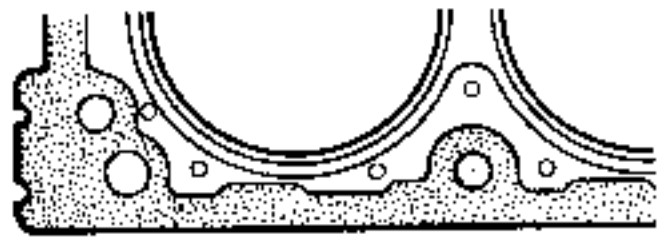
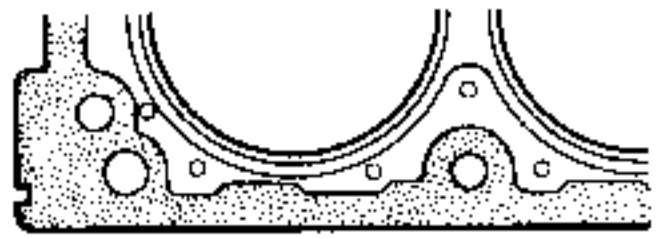
ENGINES	Cylinder head height H (mm)	Chamber volume (cm³)
Z7X	110.83	49.85
Z7U	111.07±0.15	53.3
Z7V		52.2
Z6W		53.3
Z7W 702	110.83	
Z7W except 702		51.59

CYLINDER HEAD GASKETS

The two cylinder head gaskets are different: the gasket for bank A has a larger cut-out than the gasket for bank B.



THE CYLINDER HEAD GASKETS ARE IDENTIFIED ACCORDING TO THE ENGINE TYPE

ENGINE	MARKING	
Z7V	No marking	
Z7U	Marking with 1 hole	
Z7V Z6W	Marking with 2 holes	
Z7X	Marking with a square hole	

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ENGINE	Gasket thickness (mm)
Z7V - Z7X	1.46
Z7U - Z6W - Z7W	1.70

TIGHTENING THE CYLINDER HEAD

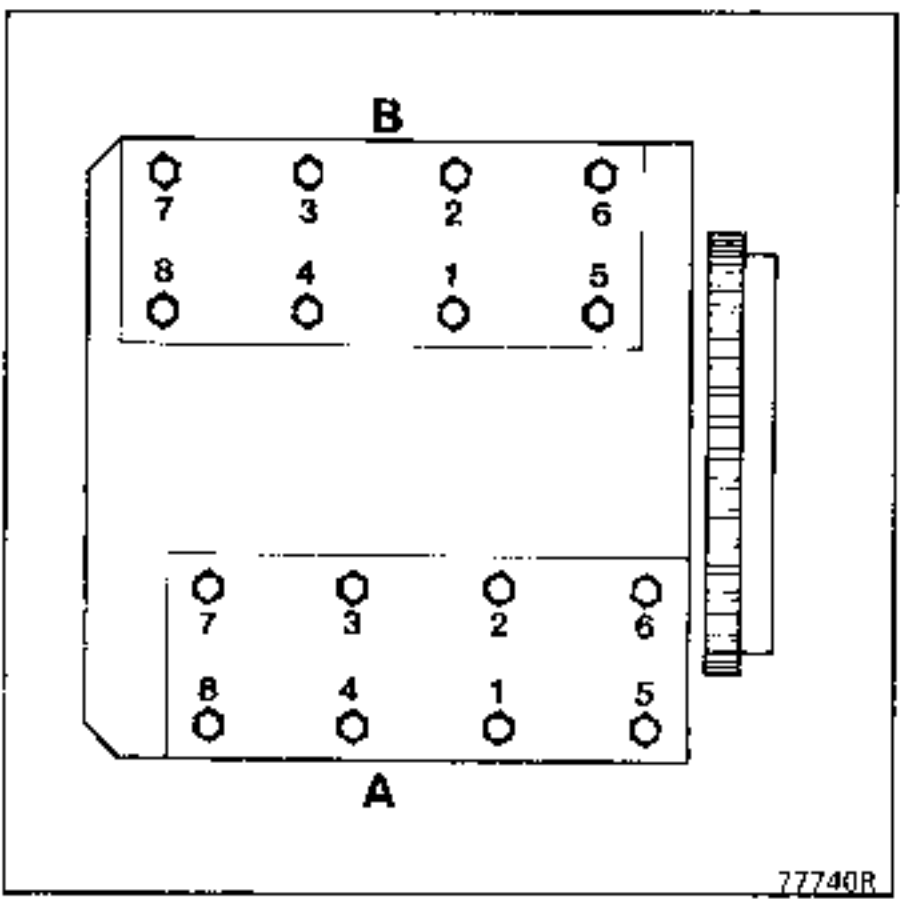
Z7X ENGINES, except Z7X 744

Tightening method:
Use engine oil to lubricate the threads and under the heads of the bolts.

Reminder: In order to tighten the bolts correctly, use a syringe to remove any oil from the cylinder head mounting holes.

Tighten in the following order:

- 1st tightening : **6 daN.m.**



Wait for 3 minutes then slacken bolt by bolt and carry out:

- 1st re-tightening : **4 daN.m.**

- 2nd re-tightening (angle) **180°**

The cylinder head is not tightened for a second time.

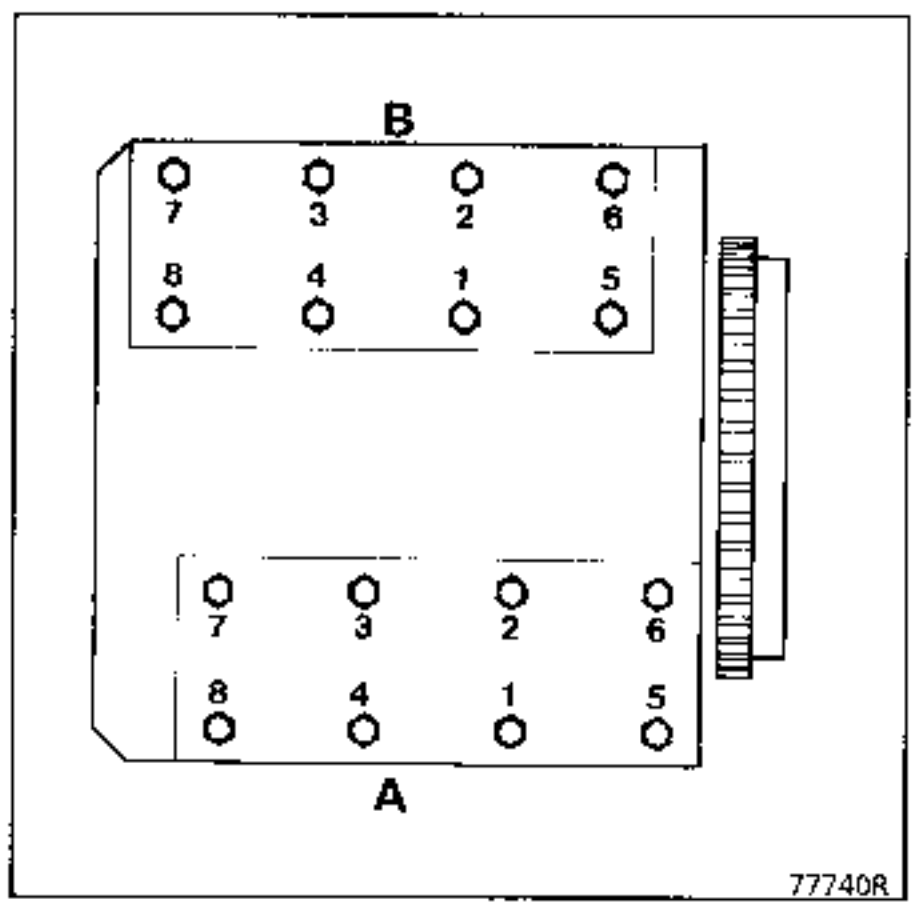
Z7X 74 ENGINE

Use engine oil to lubricate the threads and under the heads of the bolts.

Reminder: In order to tighten the bolts correctly, use a syringe to remove any oil from the cylinder head mounting holes.

Tighten in the following order:

- 1st tightening: **6 daN.m.**



Wait for 3 minutes then slacken bolt by bolt and carry out:
- 1st tightening : **4 daN.m.**

- 2nd tightening (angle) **180°**

Run the engine until the engine cooling fans operate.

Let the engine cool down (minimum of 6 hours).

Retighten (angle) by **50°** (without slackening the bolts beforehand) .

The cylinder head is not tightened for a second time.

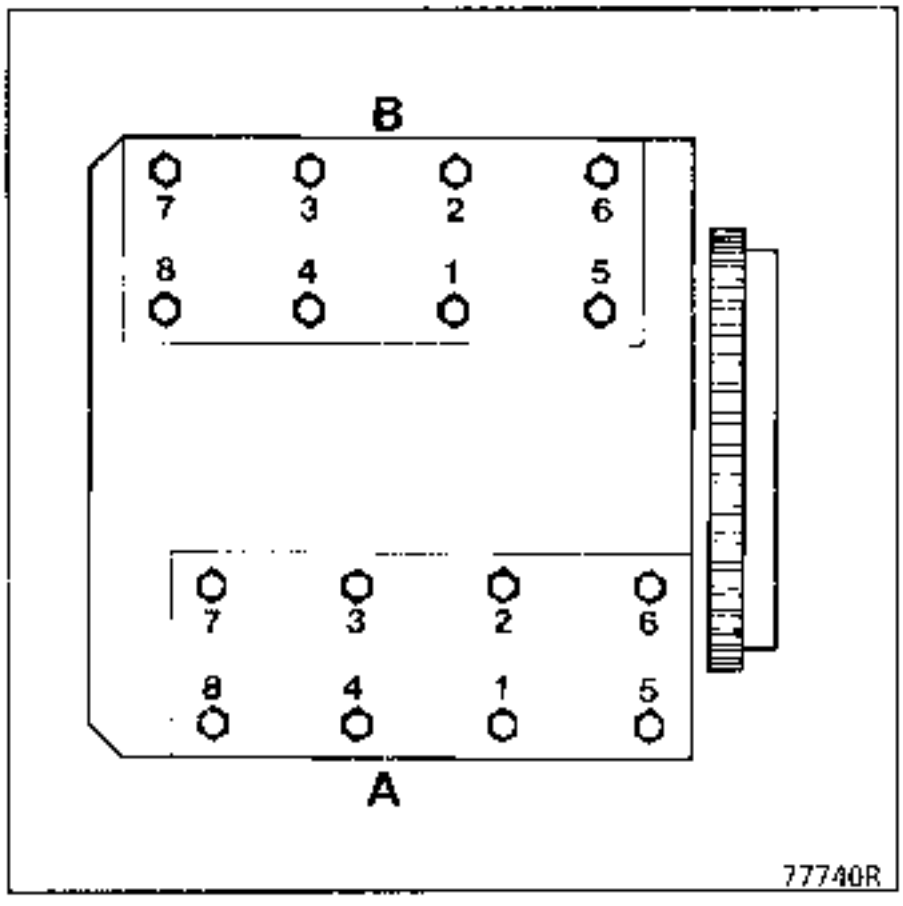
Z7U ENGINES (except 734) - Z7W 702

Use engine oil to lubricate the threads and under the heads of the bolts.

Reminder: In order to tighten the bolts correctly, use a syringe to remove any oil from the cylinder head mounting holes.

Tighten in the following order:

- 1st tightening: **6 daN.m.**



Wait for 3 minutes then slacken bolt by bolt and carry out:

- 1st re-tightening : **2 daN.m.**
- 2nd re-tightening (angle) **127°**

Adjust the valve clearances.

Run the engine until the engine cooling fans operate.

Let the engine cool down (minimum of 6 hours).

Retighten (angle) by **25°** (without slackening the bolts beforehand) .

The cylinder head is not tightened for a second time.

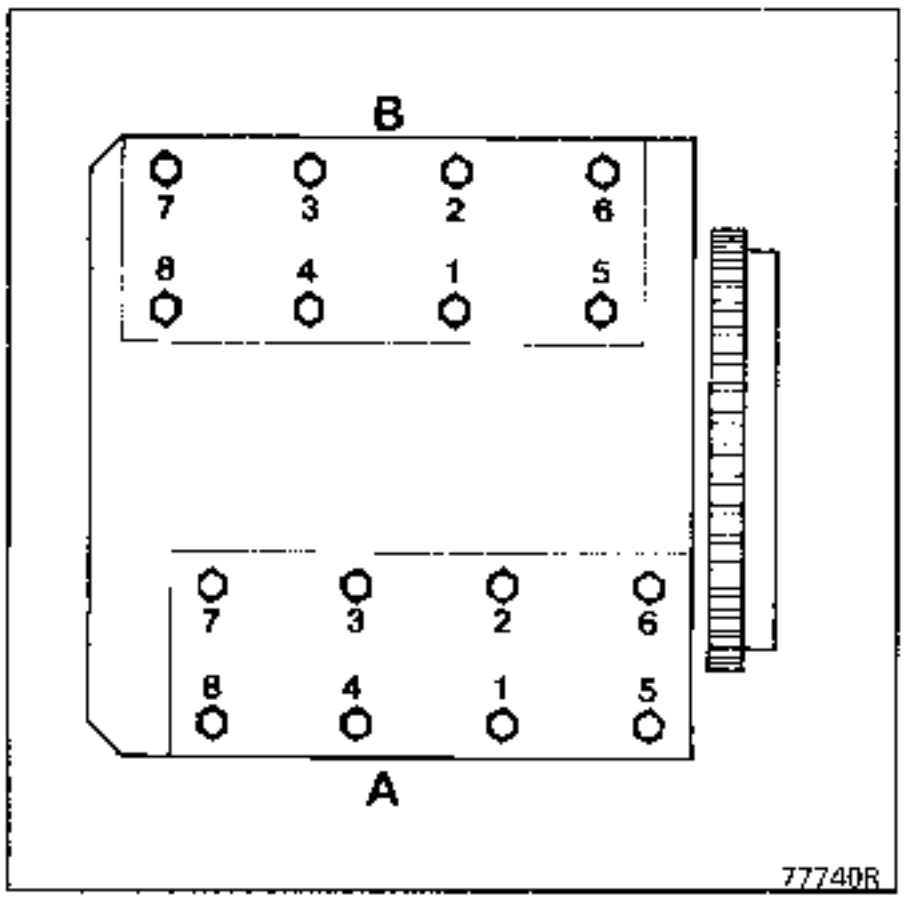
Z7U 734 ENGINES

Use engine oil to lubricate the threads and under the heads of the bolts.

Reminder: In order to tighten the bolts correctly, use a syringe to remove any oil from the cylinder head mounting holes.

Tighten in the following order:

- 1st tightening: **6 daN.m.**



Wait for 3 minutes then slacken bolt by bolt and carry out:

- 1st re-tightening : **2 daN.m.**
- 2nd re-tightening (angle) **106°**

Adjust the valve clearances.

Run the engine until the engine cooling fans operate.

Let the engine cool down (minimum of 6 hours).

Retighten (angle) by **45°** (without slackening the bolts beforehand) .

The cylinder head is not tightened for a second time.

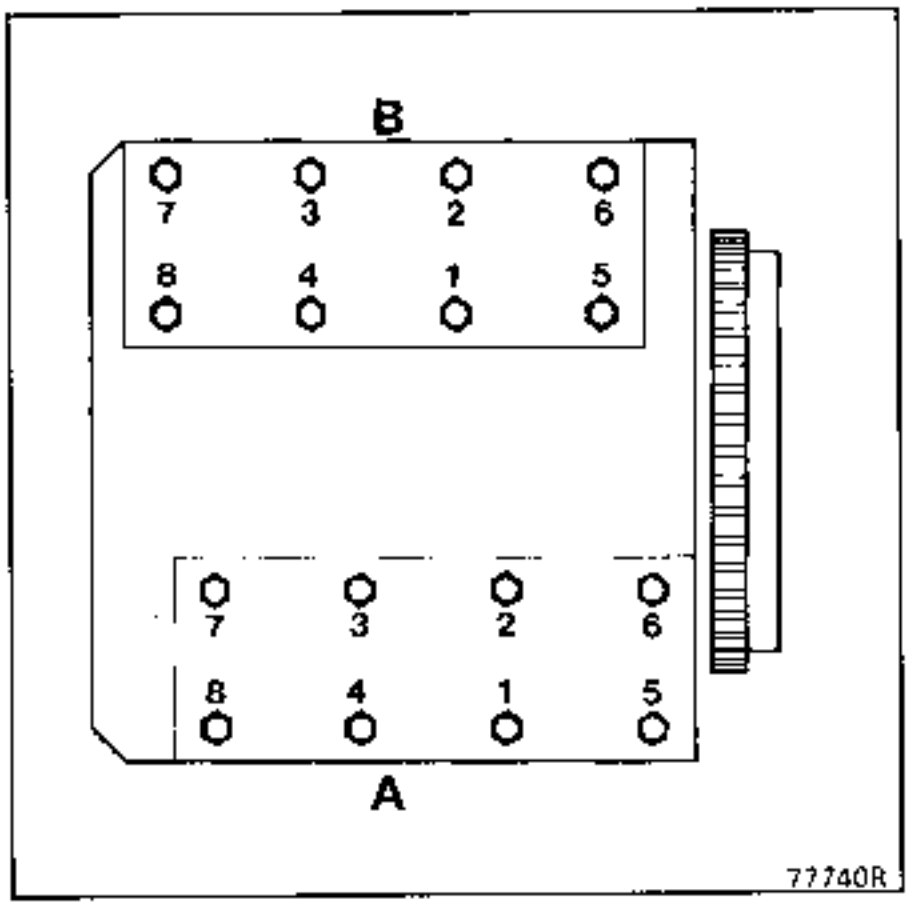
Z7V - Z6W ENGINES

Use engine oil to lubricate the threads and under the heads of the bolts.

Reminder: In order to tighten the bolts correctly, use a syringe to remove any oil from the cylinder head mounting holes.

Tighten in the following order:

- 1st tightening: **6 daN.m.**



Wait for 3 minutes then slacken bolt by bolt and carry out:

- 1st re-tightening : **2 daN.m.**

- 2nd re-tightening (angle) **115°**

Adjust the valve clearances.

Run the engine until the engine cooling fans operate.

Let the engine cool down (minimum of 6 hours).

Slacken all the bolts then:

- 1st re-tightening **2 daN.m.**

- 2nd re-tightening (angle) **115°**

The cylinder head is not tightened for a second time.

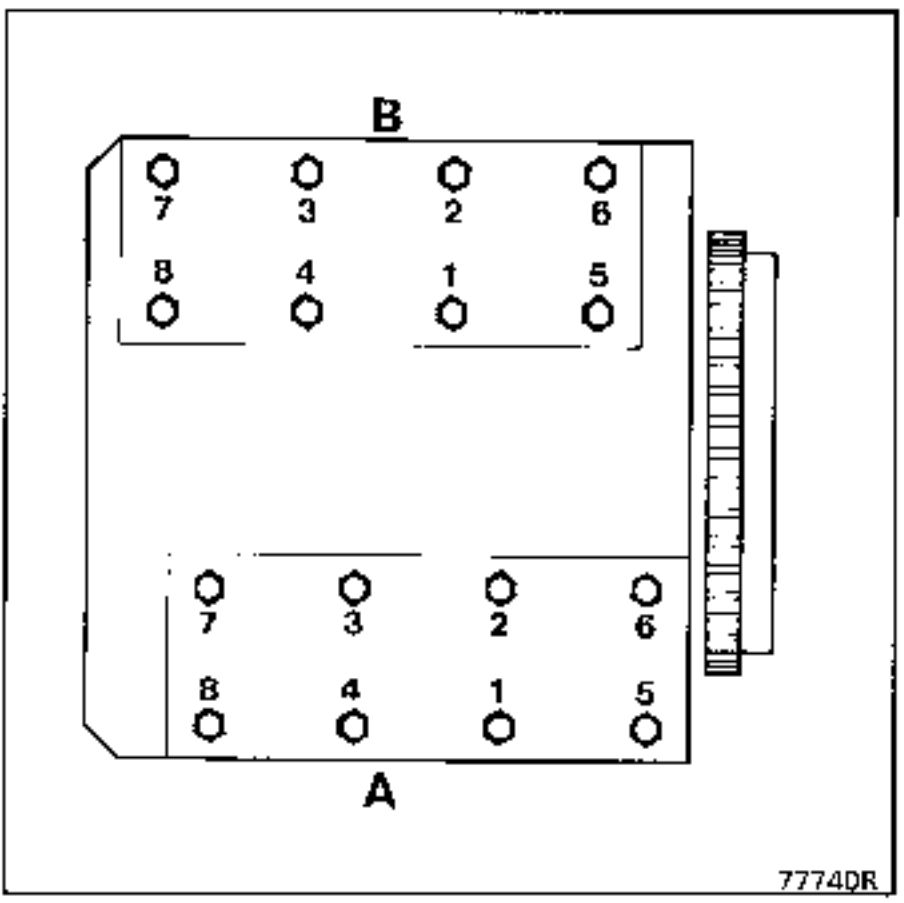
Z7W ENGINES (except 702)

Use engine oil to lubricate the threads and under the heads of the bolts.

Reminder: In order to tighten the bolts correctly, use a syringe to remove any oil from the cylinder head mounting holes.

Tighten in the following order:

- 1st tightening: **6 daN.m.**



Wait for 3 minutes then slacken bolt by bolt and carry out:

- 1st re-tightening : **2 daN.m.**
- 2nd re-tightening (angle) **106°**

Adjust the valve clearances.

Run the engine until the engine cooling fans operate.

Let the engine cool down (minimum of 6 hours).

Retighten (angle) by 45° (without slackening the bolts beforehand) .

The cylinder head is not tightened for a second time.

VALVES

ENGINES	Valve stem diameter (mm)	Valve angle		Head diameter	
		Inlet	Exhaust	Inlet	Exhaust
Z7U	8	120°	90°	43.8	37
Z7V				44	
Z7W 702					
Z7W except 702		90°		45.3	38.5
Z6W		120°		44	37
Z7X		90°		46.5	39.8
Z7X 726 - 744*				46.02	39

* ATTENTION : For Z7X 726 - 744 engines, the exhaust valves contain sodium.

VALVE SPRINGS

	Z7V	Z7U - Z7W - Z6W Z7X 726, 744
Free length (mm)	47.2	47.1
Length under load (mm) :		
24.8 daN	–	40
25.6 daN	40	–
56.4 daN	32.2	–
65.1 daN	–	30
Coils touching (mm)	30	28.3
Wire diameter (mm)	4.2	4.1
Internal diameter (mm)	21.4	21.4

NEUTRALISING SODIUM IN EXHAUST VALVES (For Z7X 726,744 engines)

Before scrapping exhaust valves the sodium present in them must be neutralised.

PROCEDURE

- The valves must be sawn in a dry area, where all contact with water must be avoided (Do not use a wet saw).
- Wear goggles to protect your eyes.
- Saw off the valve stems at the tulip.
- Prepare a container of water and place it outside (approximately 10 litres of water for four valves).
- Drop the cut valves into the water as soon as they have been sawn. Avoid causing splashing.
- The sodium in the valves will react with the water, creating soda and releasing hydrogen. All the sodium has been destroyed when hydrogen is no longer produced (bubbles are no longer formed in the water).
- During the reaction, keep the container well away from heat sources (Do not smoke).
- Once the valves have been treated in this manner, they may be scrapped. Waterproof gloves must be worn to remove the valves from the water.
- Rinse the container out thoroughly with water.
- If the solution contacts skin or eyes, rinse immediately and thoroughly with water for 15 minutes and contact a doctor.

VALVE SEATS

ENGINES	Seat angle		Seat width (mm)	
	Inlet	Exhaust	Inlet	Exhaust
Z7U/Z6W	120°	90°	1.3 to 1.7	2 to 2.4
Z7V			1.7 to 2.1	
Z7W 702				
Z7W except 702	90°		1.3 to 1.7	
Z7X				

VALVE GUIDES

All types

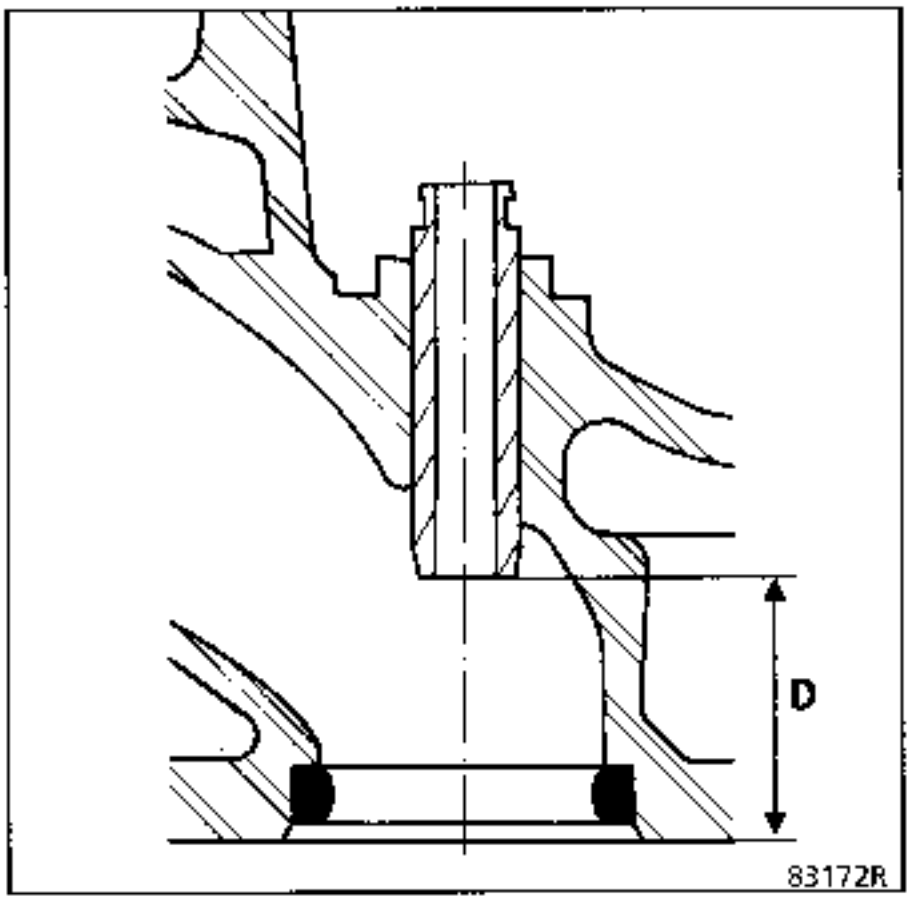
Inner diameter (mm) **8**

Outer diameter (mm) :
- normal **13**
- repair size with 2 grooves **13.35**

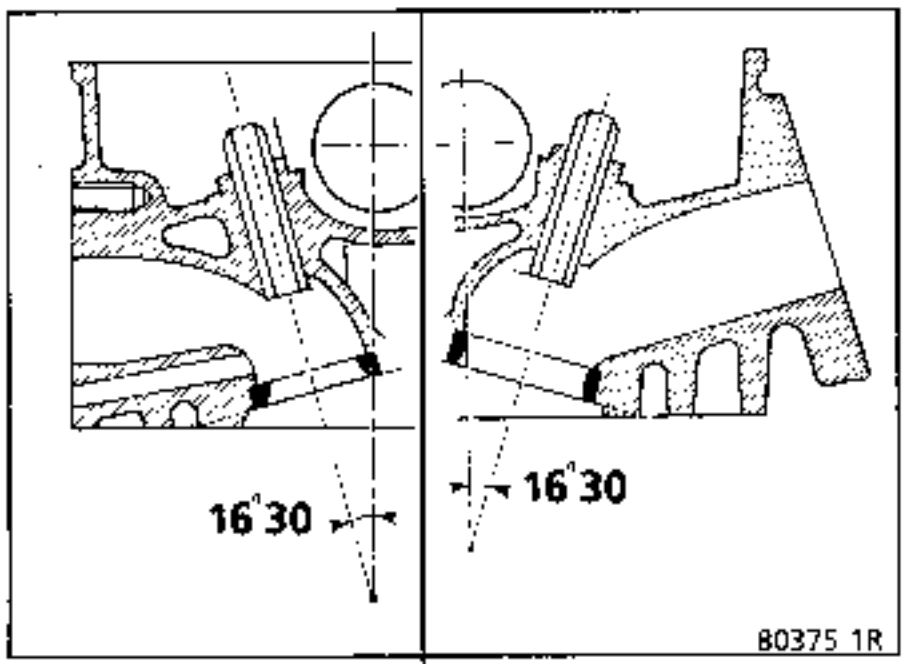
Valve guide positions:

NOTE : after the repaired guide has been fitted, the inner diameter must be bored to **8mm.**

ENGINES	Inlet (D) (mm)	Exhaust (D) (mm)
Z7X	46.5 ± 0.5	39.4 ± 0.5
Z7W, Z7U Z6W	40 ± 0.5	39.4 ± 0.5
Z7V	42 ± 0.5	39.4 ± 0.5



Inlet and exhaust guide position



CAMSHAFTS

All types

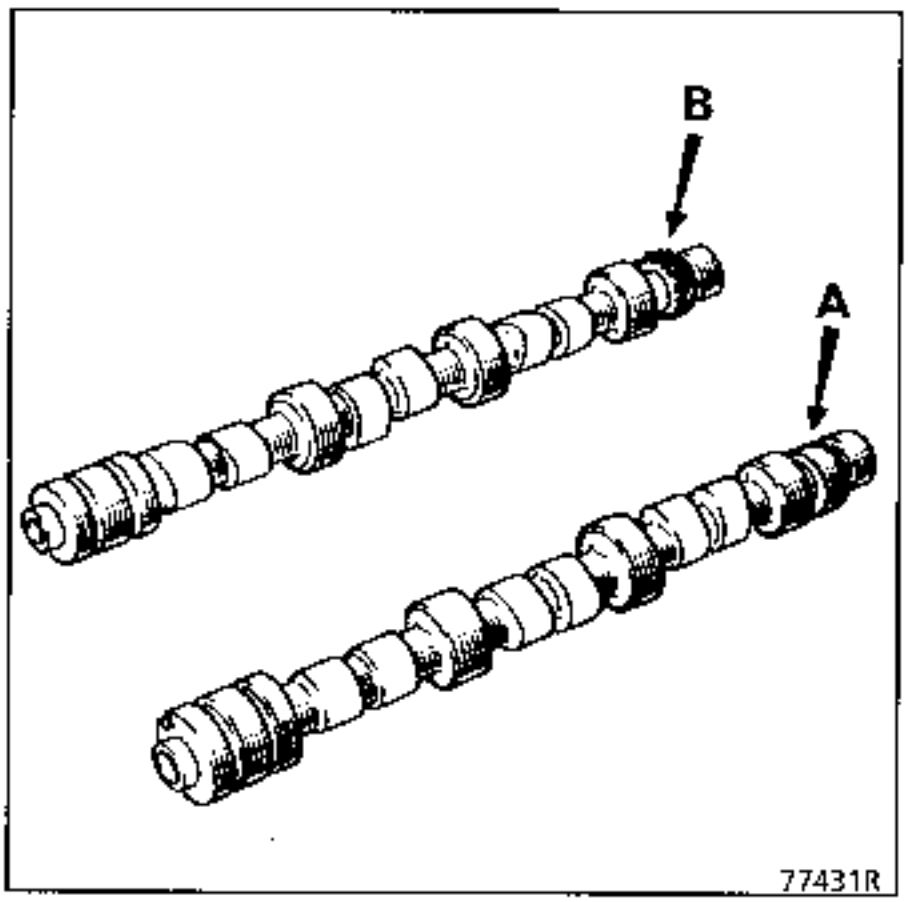
Number of bearings **4**

Endplay (mm) **0.07 to 0.14**

Camshaft with equidistant crankpins

The two camshafts are different:

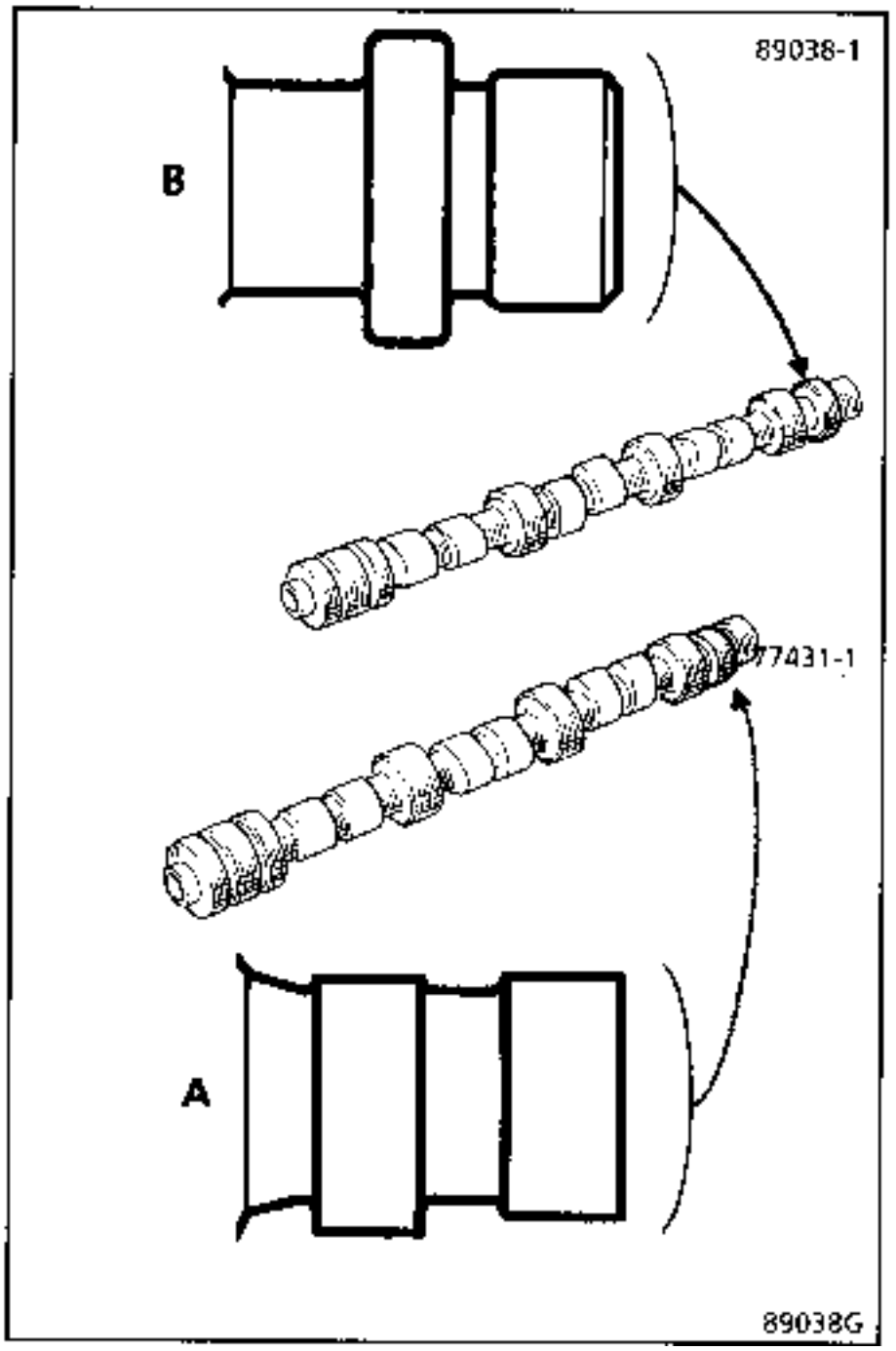
- the bank A camshaft has the fuel pump drive cam (A),
- the bank B camshaft has the distributor drive (B).



Camshaft with offset crankpins

The two camshafts are different:

-the bank A camshaft has the fuel pump drive cam (A),
- the bank B camshaft has the distributor drive (B), which is not machined. However, the distributor curves for the right hand and left hand sides are identical.

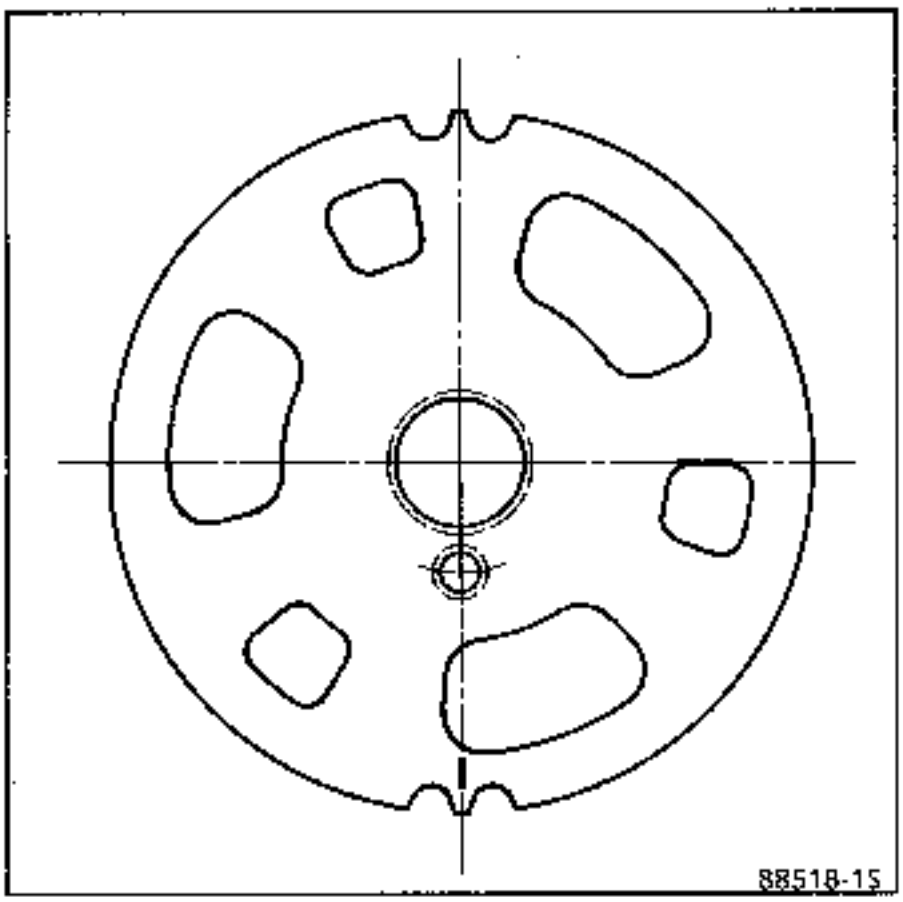


CAMSHAFT SPROCKETS

Engine with offset crankpins

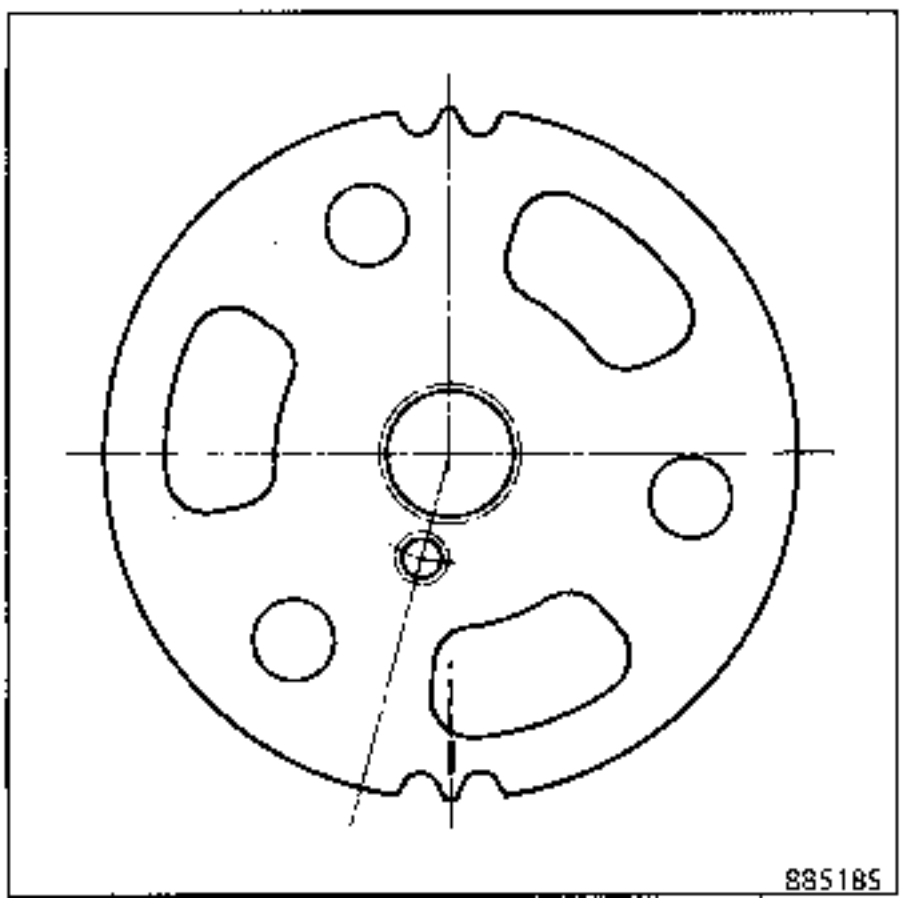
The camshaft sprockets for banks A and B are different.

BANK A SPROCKET

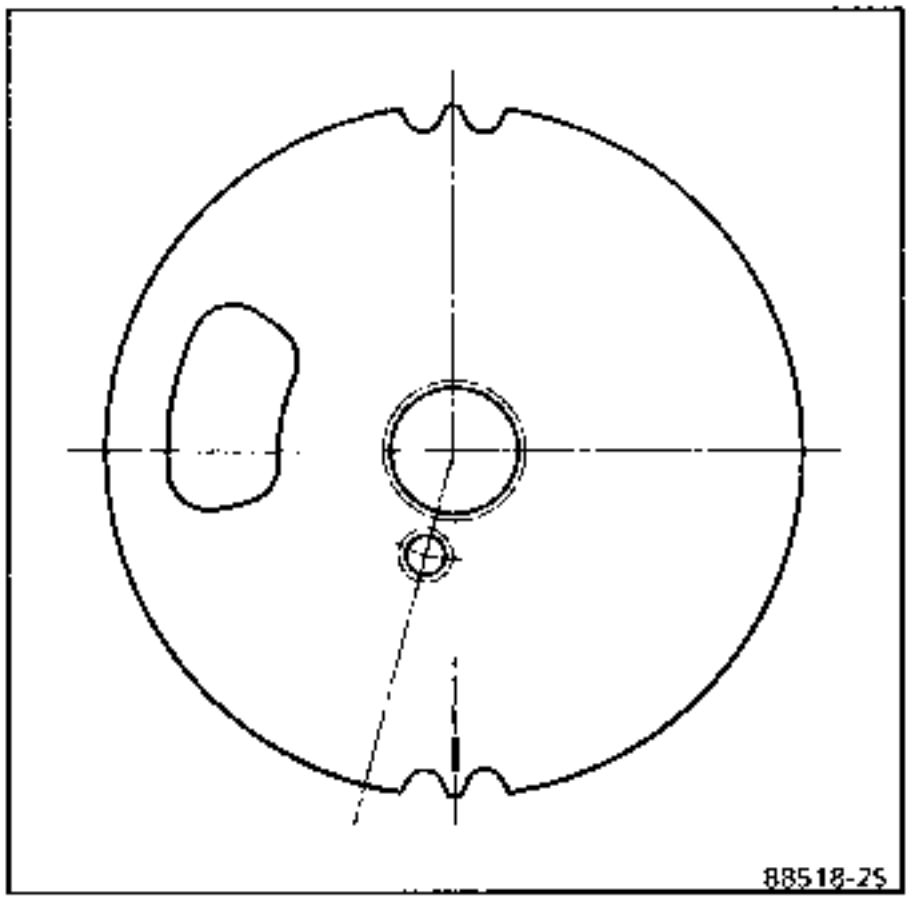


fitted without a spacer.

BANK B SPROCKET (1st fitting)



2nd fitting

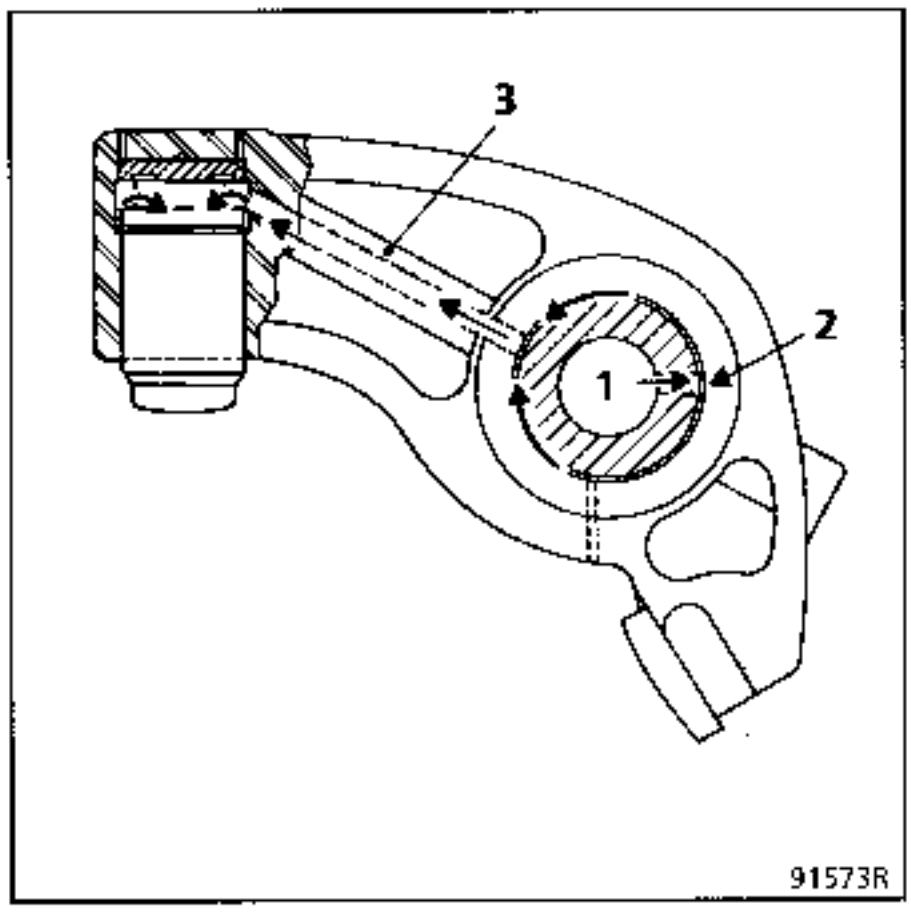


fitted with a spacer.

Engine with equidistant crankpins

The camshaft sprockets for banks A and B are identical.

HYDRAULIC PUSHROD ROCKERS



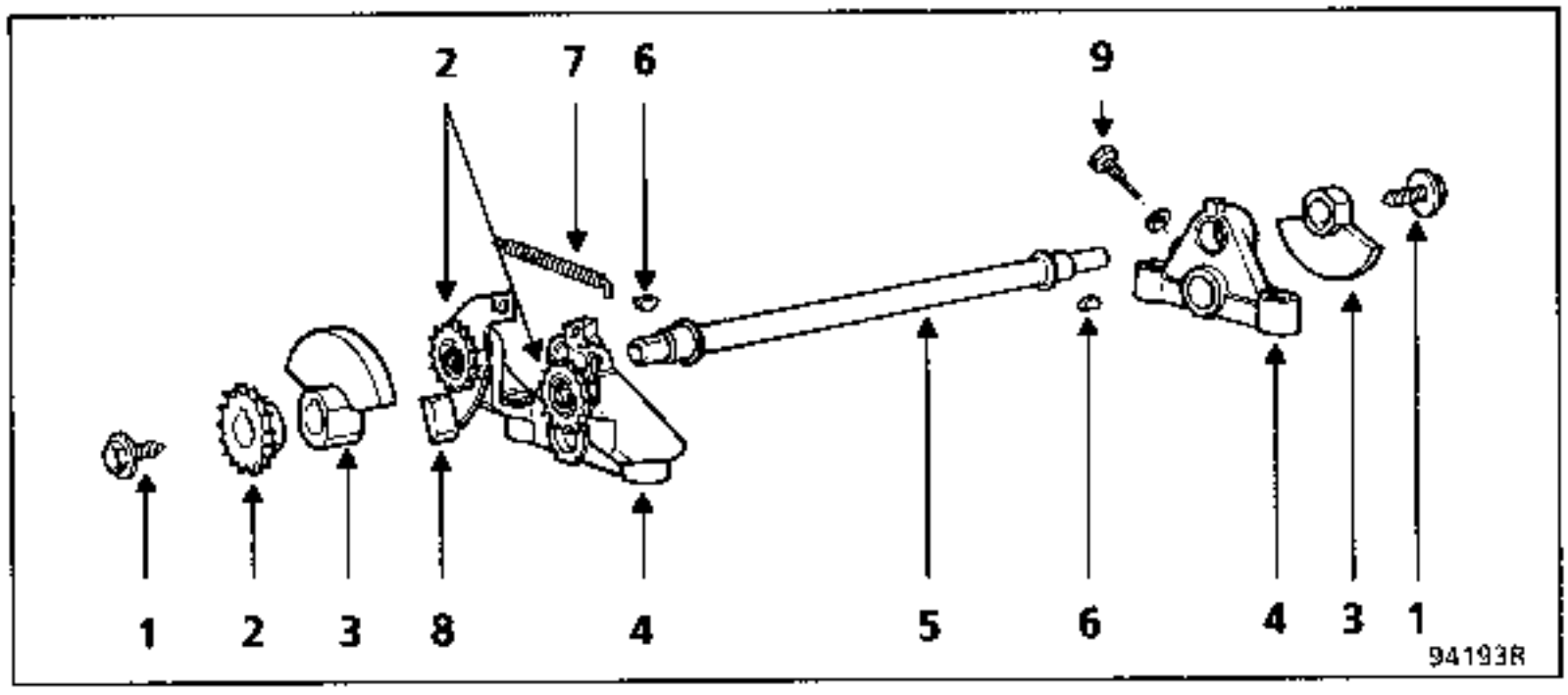
Operating principle
Oil pressure arrives at the centre of the shaft at 1, crosses the shaft at 2, works its way between the rocker and the shaft, enters the rocker channel 3, crosses the thrust washer and returns to the hydraulic pushrod.

ORIENTATION OF THE THRUST WASHER

The cut-outs for passage of the oil should be on the hydraulic pushrod side.

Hydraulic pushrod
The hydraulic pushrod cannot be repaired.

EXPLODED VIEW OF THE CAMSHAFT BALANCING SYSTEM



1 - Mounting bolt

2 - Sprockets

3 - Balance weights

4 - Bearing

5 - Connecting shaft

6 - Keys

7 - Chain tensioning system

8 - Chain tensioner

9 - Rocker shaft mounting bolt

TIMING DIAGRAM

VALVE TIMING	ENGINES					
	Z 7 U*	Z 7 U 700*	Z 6 V*	Z 6 W**	Z 7 W* Z 7 X**	Cylinder bank
Inlet valve opens BTDC	8°	12°	21° 19°	10° 12°	14°	A B
Inlet valve closes ABDC	40°	52°	57° 55°	47° 45°	50°	A B
Exhaust valve opens BBDC	40°	52°	57° 55°	52° 50°	55°	A B
Exhaust valve closes ATDC	8°	12°	21° 19°	5° 6°	21°	A B

* with a theoretical clearance of 0.35 mm at the valve stem
** with a theoretical clearance of 0.7 mm at the valve stem

The theoretical clearance is only valid for a valve timing check and is in no way related to the normal tappet operating clearance.

CRANKSHAFT

All types

Number of main bearings: 4

Main bearing shell material: aluminium - tin

Endplay (mm) : 0.07 to 0.27

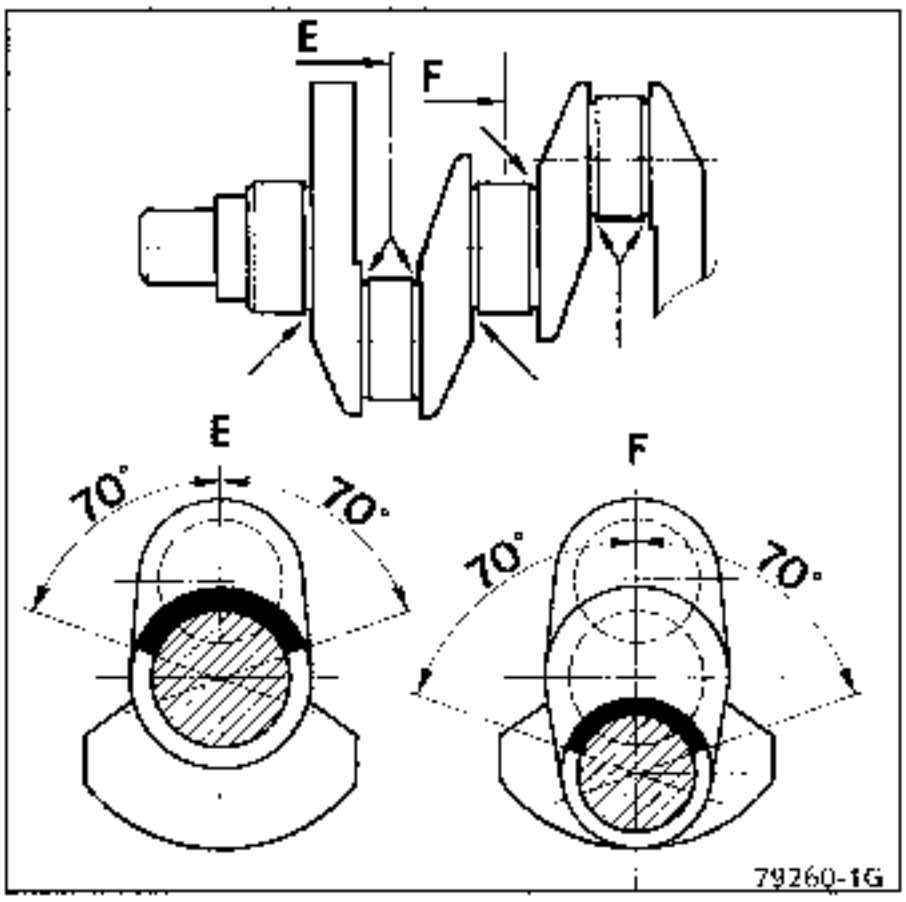
Thrust washer thickness (mm) :
2.30-2.40-2.45-2.50

	Z7W 702* Z7U* Z7X 726* Z7X 744*	Z7W except 702 Z7X except 726, 744	Z6W Z7V Z7W 702
Crankpins			
Nominal diameter (mm)	60	60	52.290
Re-grind diameter (mm)	–	59.746	51.996
Re-grind tolerance (mm)	–	−0.010 −0.029	−0.010 −0.029
Main bearing journals			
Nominal diameter (mm)	70.062	70.062	70.062
Re-grind diameter (mm)	–	69.808	69.762
Re-grind tolerance (mm)	–	0 −0.019	0 −0.019

* Regrinding of the crankshaft for engines with offset crankpins is not permitted.

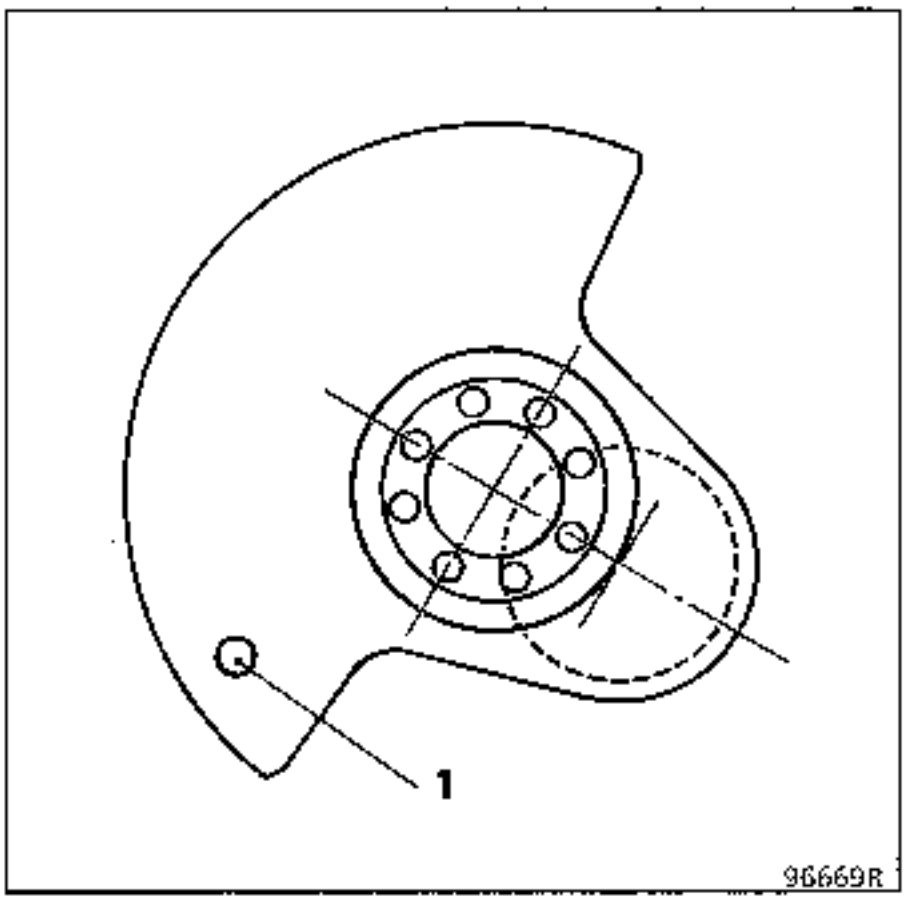
After re-grinding, on crankshafts with equidistant crankpins, the roll-hardened zone should remain intact over the 140° sector shown between the arrows.

These zones are marked (E) and (F) in the example.

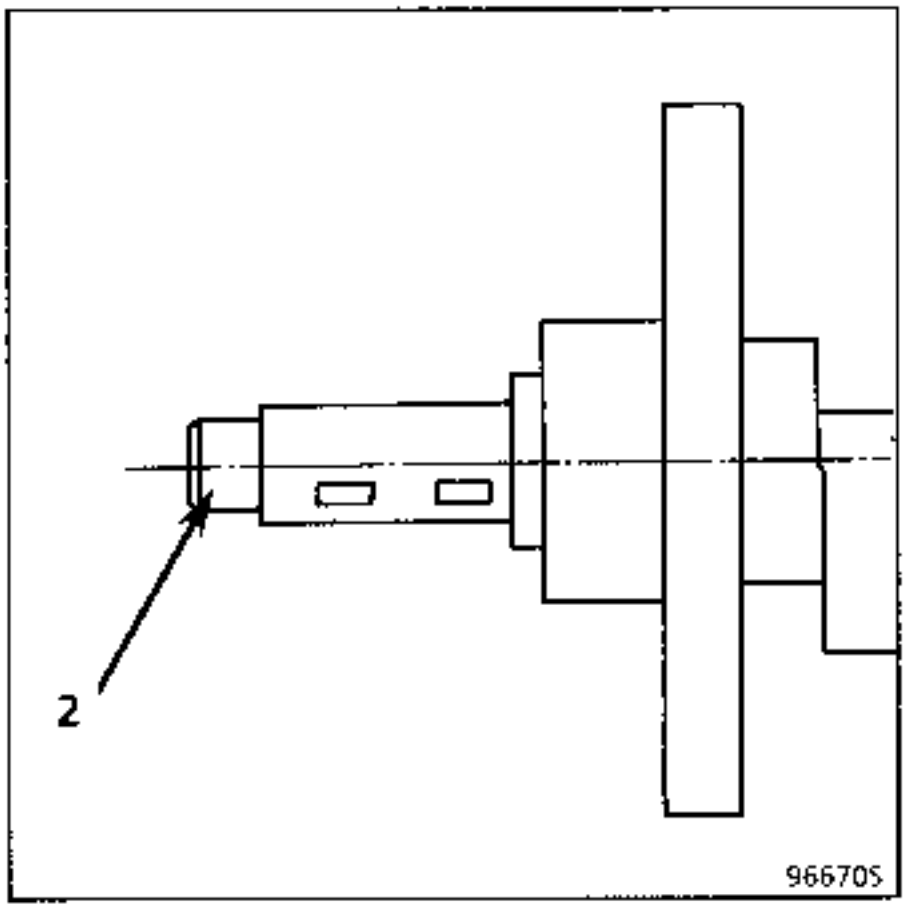


Z7X type engines have **two types of crankshaft,** depending on the stroke :

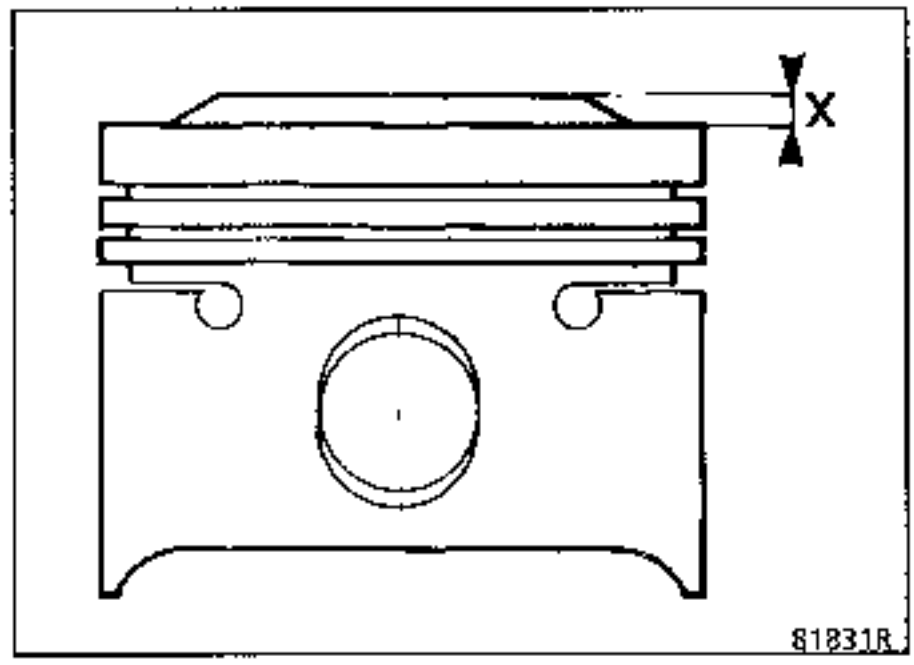
- For a **stroke of 75 mm** - no special mark
- For a **stroke of 72.7 mm,** the crankshaft has two markings:
  - a hole (1) on the counterweight on the flywheel side



● a blue paint mark (2) on the timing side.



Measuring dimension X



CONNECTING RODS

Bearing shell material : aluminium - tin

Big end clearance (mm) : **0.20 to 0.38**

PISTONS

ENGINE	C/R	Dimension X (mm)
Z7W	9.5 8.8	1.6 0.8
Z7V	9.2	1.96
Z7U	8 8.6	1.57 3.6
Z6W	9.5	3.3
Z7X 726 - 765 760 - 721 753 - 744	7.6	Flat head
Z7X 722 - 723	9.6	1

PISTONS

Fitting direction: Arrow facing timing gear end

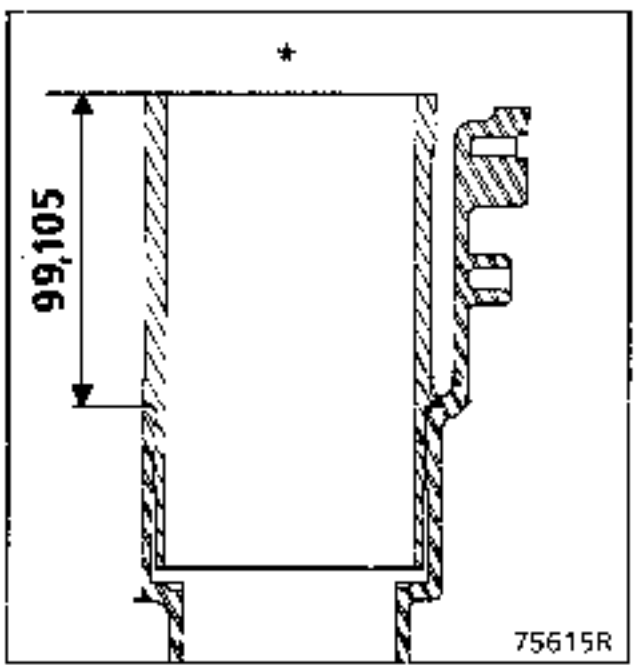
	ENGINES					
	Z7U*	Z7V**	Z7W except 702*	Z7W 702**	Z6W**	Z7X**
Gudgeon pin length (mm)	72	72	60	72	72	65
Gudgeon pin diameter (mm) :						
External	25	23.5	25	23.5	23.5	25
Internal	15	14	15	15	15	13.5
Piston ring (mm)						
Upper ring	1.75	1.5	1.5	1.5	1.5	1.75
Taper compression ring	2	2	2	2	2	2
Oil scraper ring	4	4	4	4	4	3

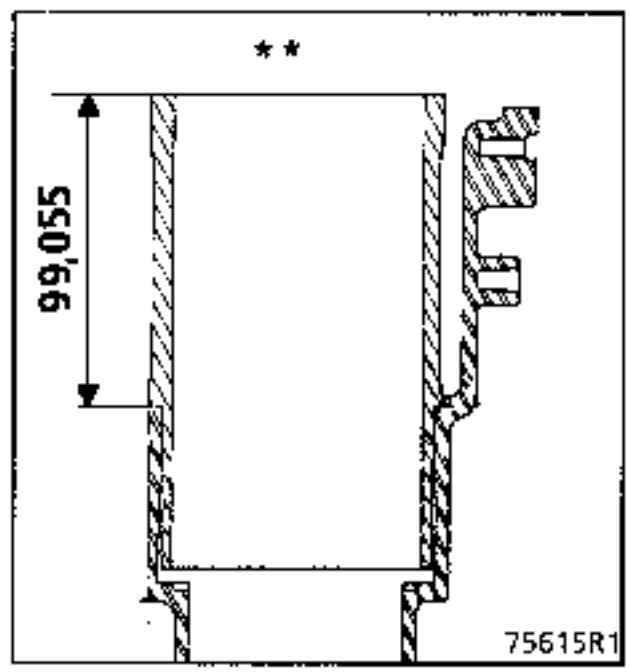
* The gudgeon pin is fully floating and is held laterally by circlips.

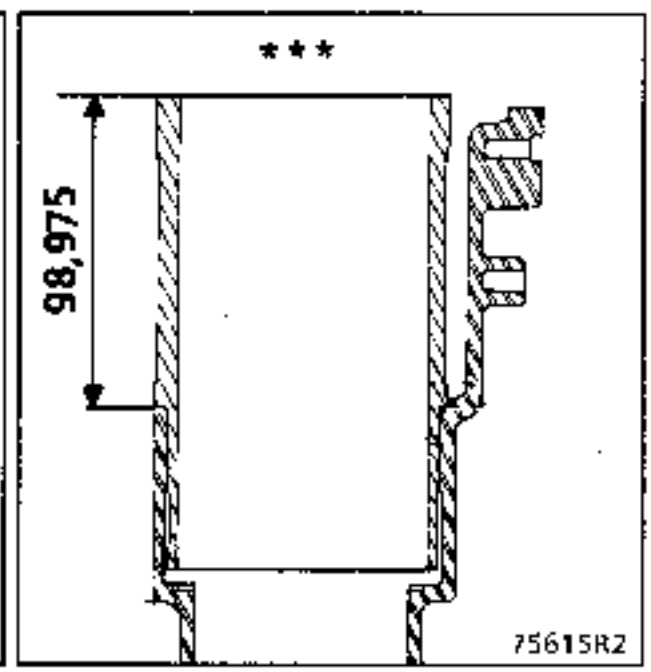
** The gudgeon pin is press fitted in the small end and is floating in the piston (see page 10-67).

LINERS

ENGINES	Internal diameter (mm)	Base locating diameter (mm)
Z7V	88	93.48
Z7W except 702	91	97.68
Z7W 702 - Z6W - Z7U		96.48
Z7X	93	97.68







* Liner base paper seal thickness (mm) :

- blue mark 0.087
- white mark 0.102
- red mark 0.122
- yellow mark 0.147

** Liner base varnished seal thickness (mm) :

- red mark 0.116
- colourless mark 0.136
- blue mark 0.166

*** Liner base varnished seal thickness (mm) :

- yellow mark 0.216
- red mark 0.246
- green mark 0.276

Liner protrusion (mm)	
*	** ***
0.16 to 0.23	0.13 to 0.20

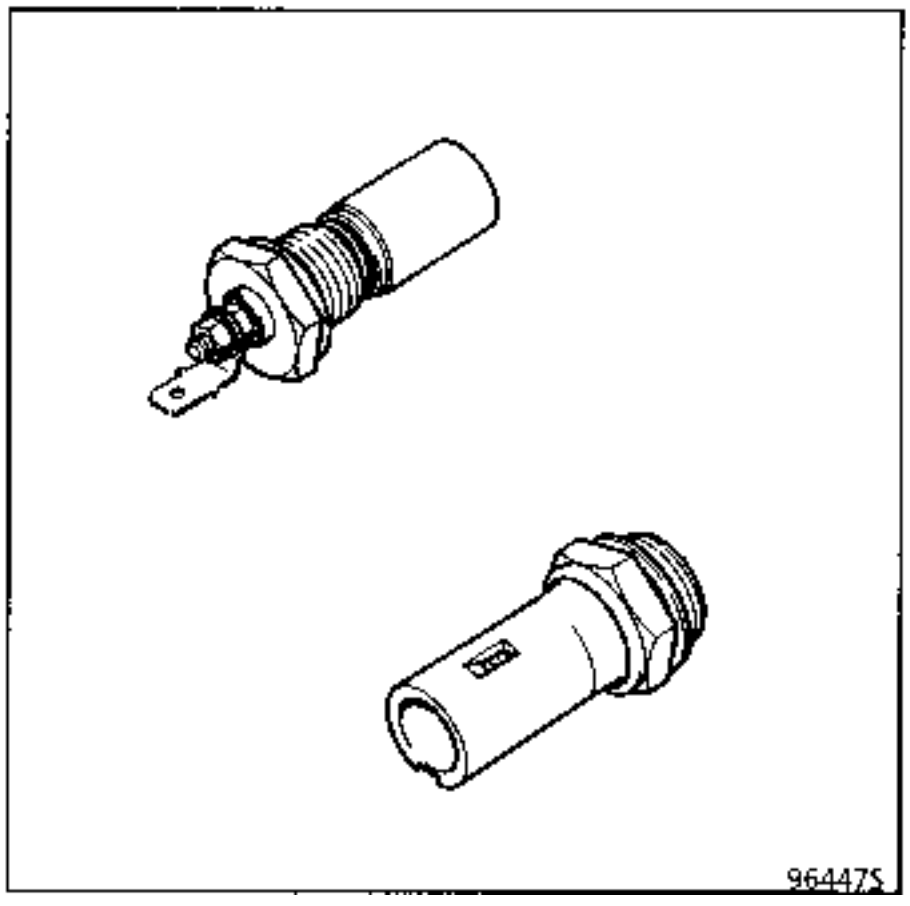
OIL PUMP

ENGINE TYPES	ENGINE SPEED in rpm	MINIMUM PRESSURE At 80° C (bar)	TOOLING MOT. 836-05
Z6W, Z7U, Z7V	900	2,2	B or C + F
	4000	4.4	
Z7W	IDLE SPEED	1	
	5500	4	
Z7X	IDLE SPEED	2.2	
	4000	4.4	

Oil pressure switches

Two versions

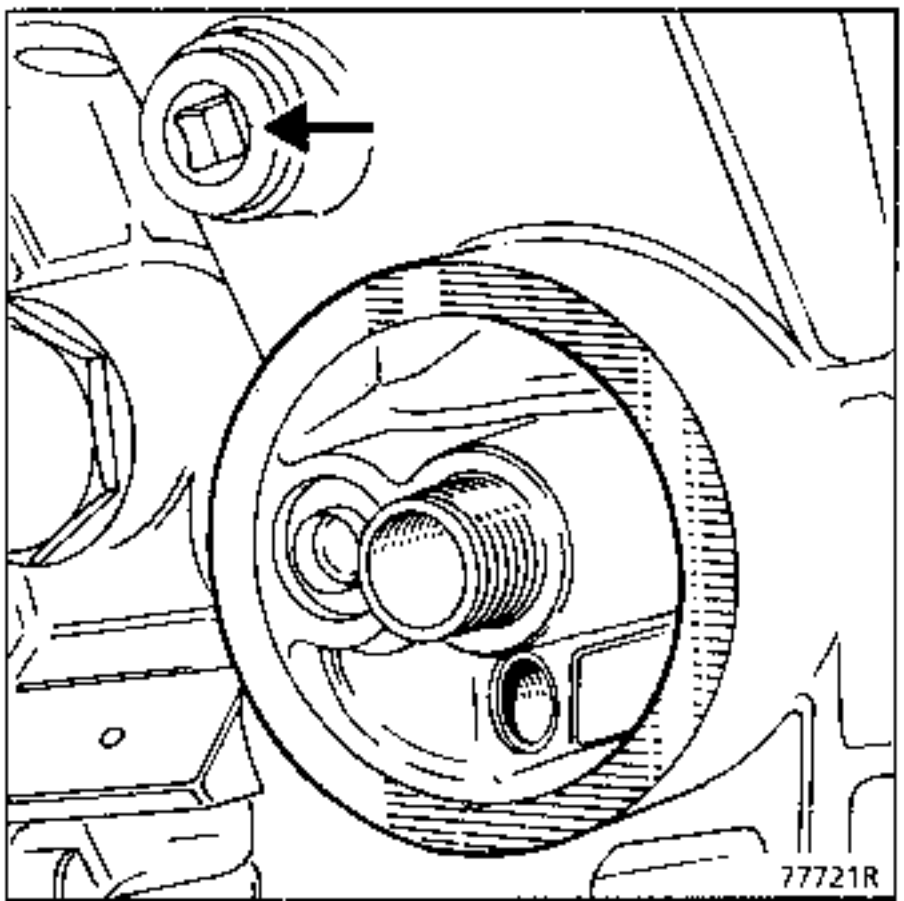
Take care not to interchange the switches (risk of poor internal engine lubrication).

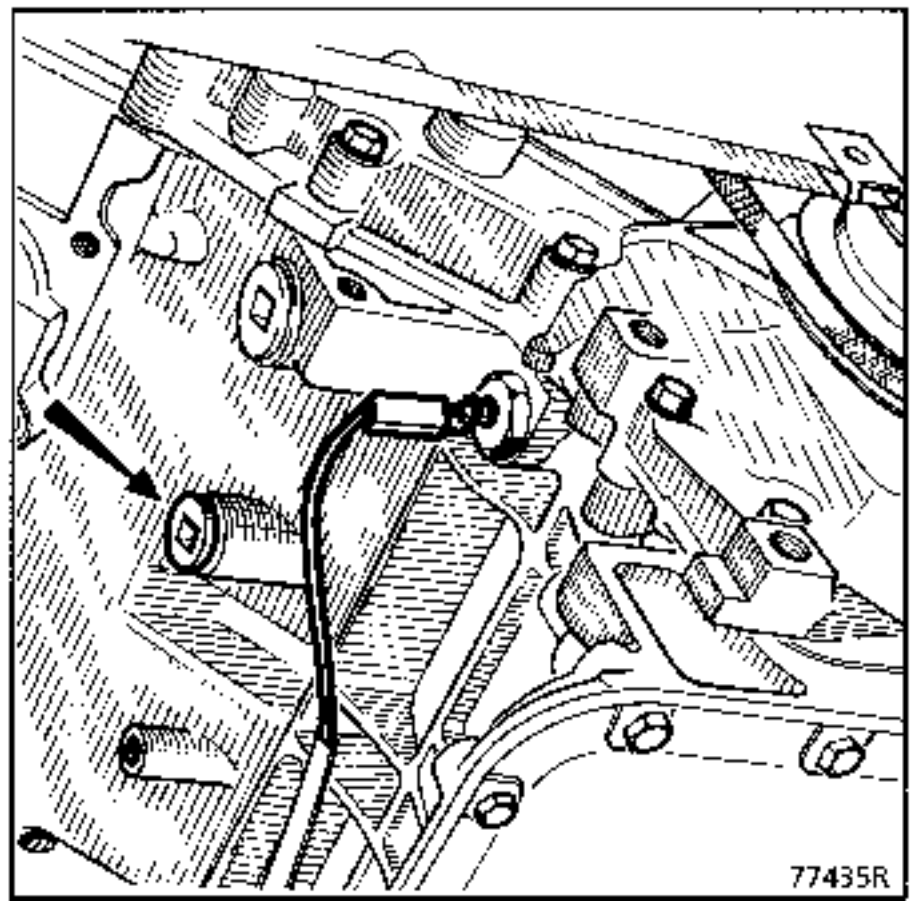


CONSUMABLES

TYPE	QUANTITY	COMPONENT CONCERNED	PART NUMBER
Solvent S56	1 litre	Cleaning parts	77 01 421 513
Décapjoint	Aerosol	Cleaning gasket surfaces	77 01 405 952
Loctite Frenetanch	1 to 2 drops	Mounting bolt: oil decanter	77 01 394 070
Loctite Frenbloc	1 to 2 drops	Chain tensioner shaft - flywheel	77 01 394 071
Loctite Autoform	Coat	Flywheel bolting face on crankshaft	77 01 400 309
Rhodorseal 5661 (CAF 4/60 THIXO)	Coat	Corners between cylinder head gasket and timing cover gasket	77 01 404 452
Autojoint OR AJ66 (Tube 100g)	Coat	Enlarged path timing cover	77 01 422 751

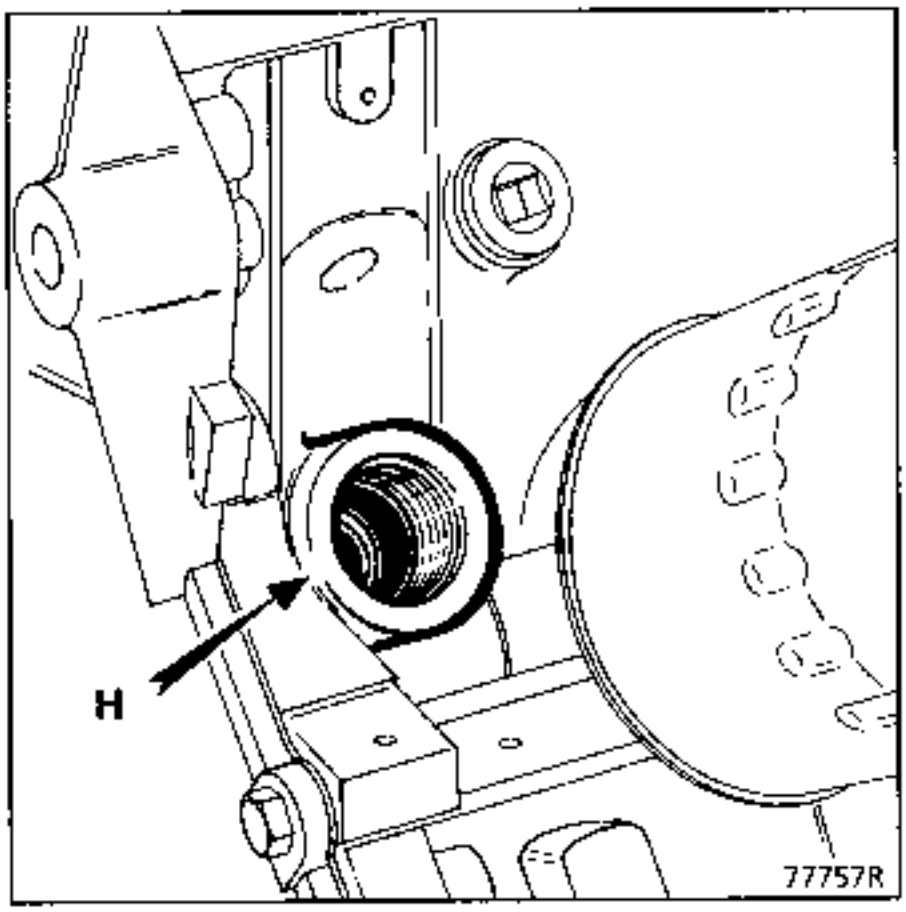
DRAINING THE COOLING SYSTEM IN THE CYLINDER BLOCK





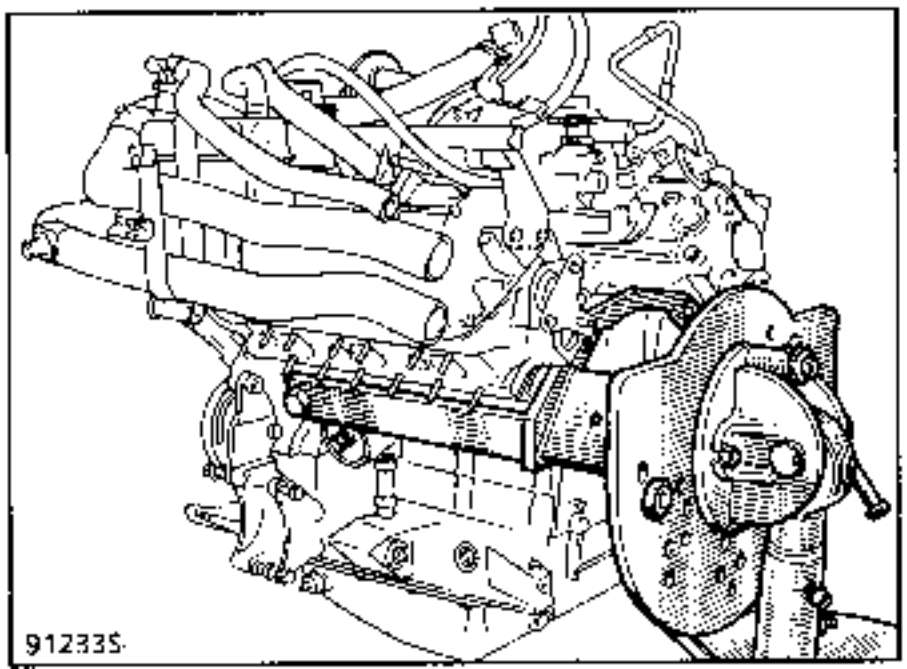
FITTING THREAD INSERTS

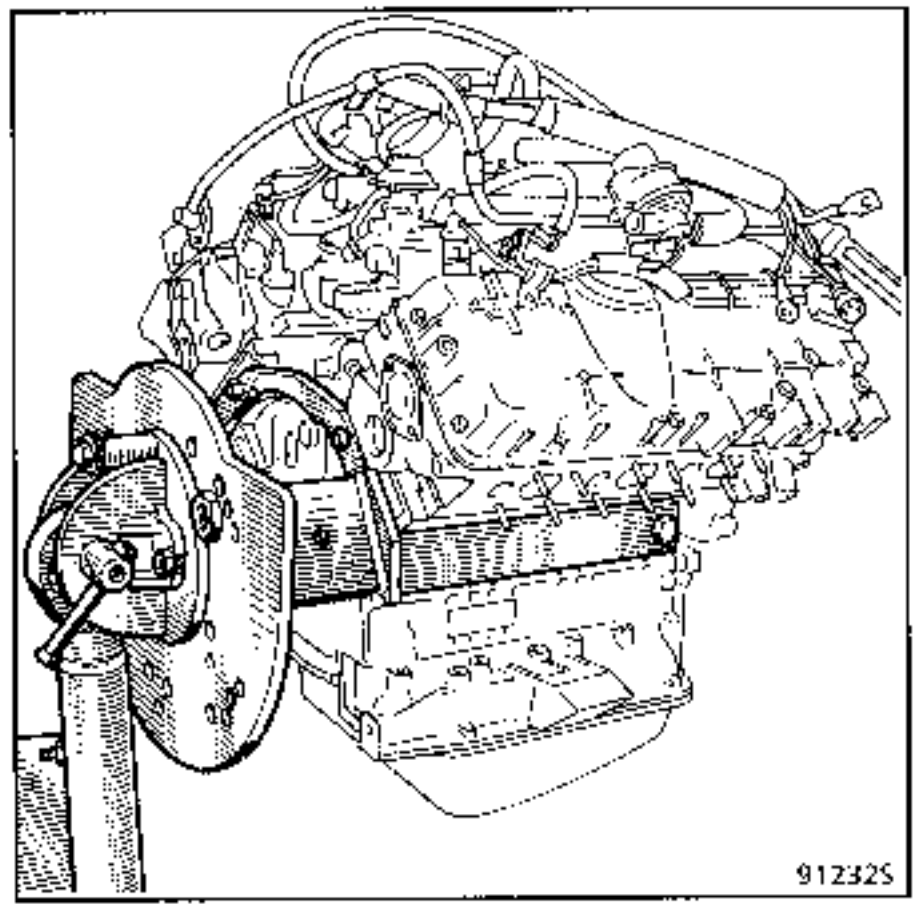
Thread inserts may be used to restore the threaded holes in engine components with the exception of the **M25 x 1.50** threaded hole (H) for the oilway plug in the cylinder block.



FIXING THE ENGINE TO THE DESVIL STAND (Part Number 124, 125 with Mot. 1091)

Fit the tool on the adjustable stand.





PREPARATION OF USED ENGINE FOR RETURN

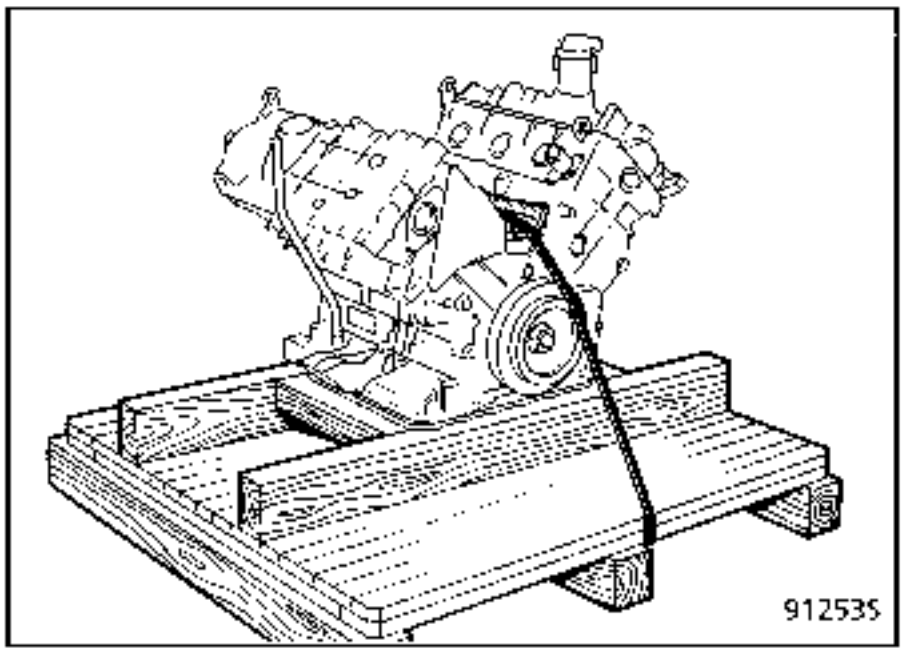
The engine should be cleaned and drained.

Leave on the engine or enclose in the return packaging :

- the dipstick and its tube,
- the flywheel or drive plate,
- the clutch mechanism and plate,
- the fuel pump,
- the water pump and its pulley,
- the crankshaft pulley,
- the rocker box cover,
- the plugs,
- the belt tensioner,
- the pressure switch and temperature switch,
- the timing cover,
- the oil filter,

Remember to remove:

- all the coolant hoses,
- the belt or belts.



NEW EXCHANGE ENGINE

When fitting a new engine, certain checks should be made:

- check the condition of the radiator and the various pipes which were not supplied with the new engine,

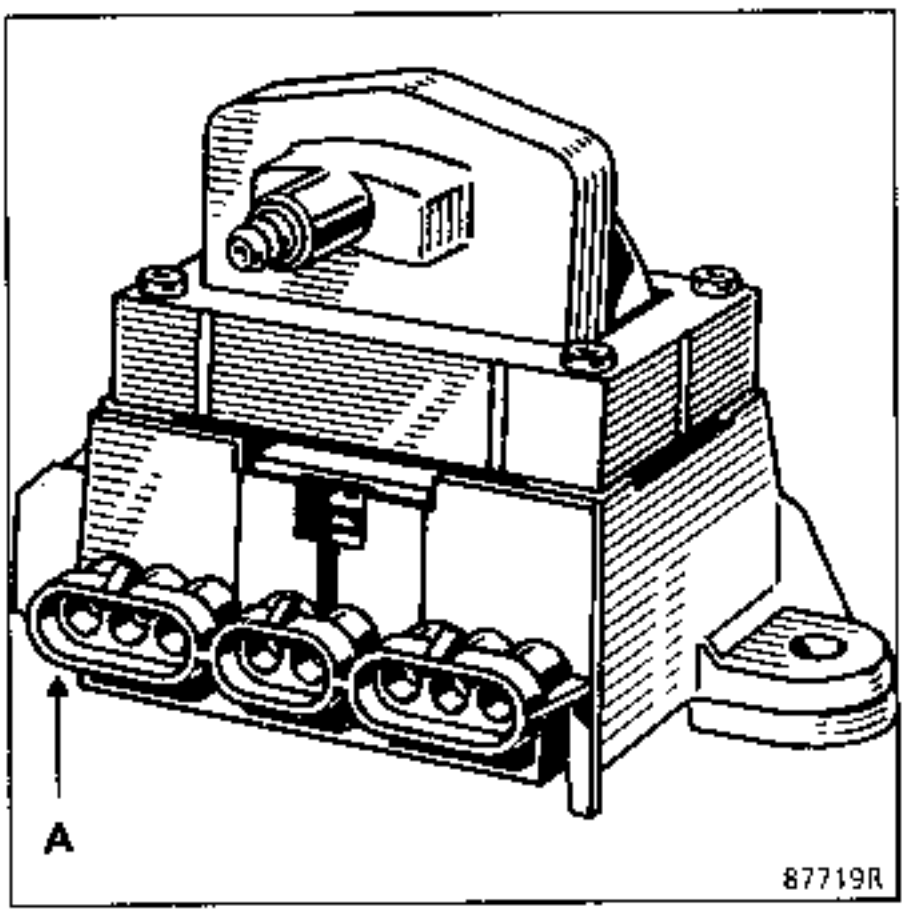
- check that there are no foreign bodies in the manifolds.

The cylinder heads of the new engine are tightened and re-tightened in the factory of manufacture. There is no need to re-tighten the cylinder heads when the engine is delivered.

PRECAUTIONS TO BE TAKEN WHEN STARTING UP THE ENGINE

Z7U - Z7X Bi Turbo engines
After an operation on the engine which made it necessary to disconnect the oil pipes, the oil circuit for the turbocompressor(s) must be reprimed under the following conditions:

- disconnect the junction block (A) on the ignition power module,



- disconnect the turbocharger(s) oil inlet hose and fill the turbocharger with engine oil,

- activate the starter to reprime the turbocharger oil circuit until the oil flows out of the turbocharger(s) oil inlet hose,

- reconnect the oil inlet hose to the turbocharger(s),

- reconnect the junction block (A).

Start the engine and let it run at idle speed until the oil circuit is re-established in the turbocharger(s).

PRECAUTIONS TO BE TAKEN WHEN STOPPING THE ENGINE

Let the engine idle for approximately 30 seconds before turning the ignition off.

Otherwise, if the engine accelerates causing the turbocharger(s) to be activated, and the ignition is switched off, the turbocharger(s) will continue to operate under its / their own inertia but will not be lubricated (as the engine has stopped). There is then a risk of the turbine shaft seizing.

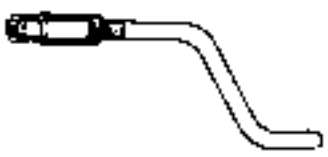
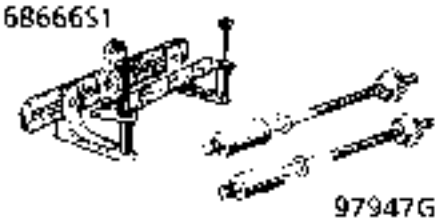
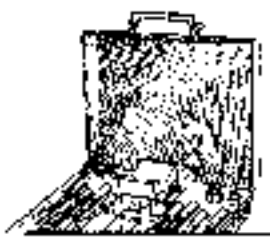
PRECAUTIONS FOR WASHING THE ENGINE

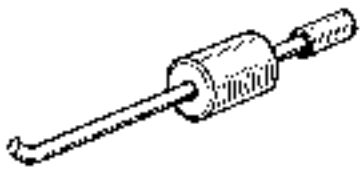
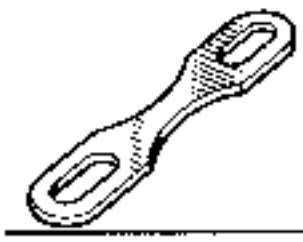
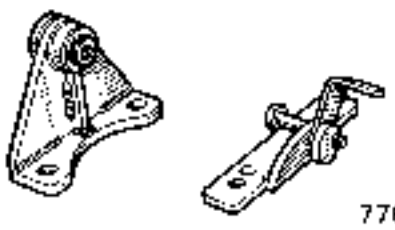
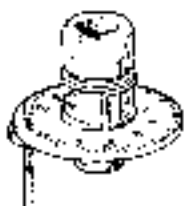
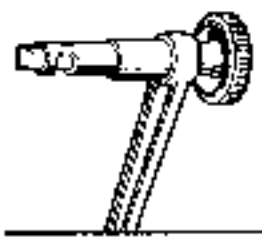
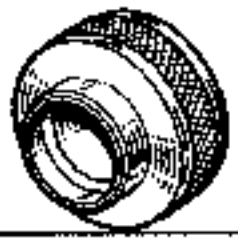
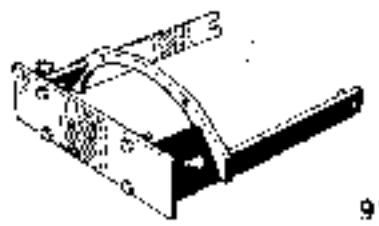
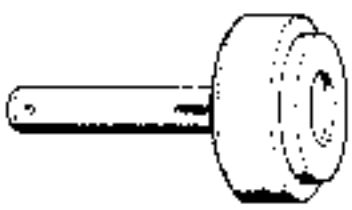
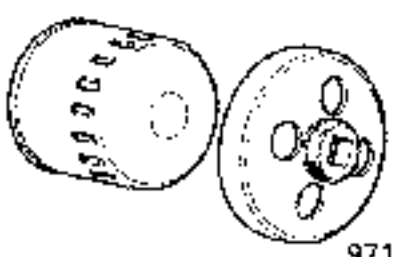
Protect the alternator from splashes of water and cleaning fluids.

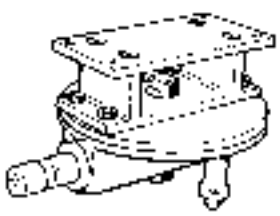
Never allow water to enter the air inlet pipes.

PARTS TO BE RENEWED WHENEVER THEY ARE REMOVED.

- flywheel mounting bolts,
- all seals,
- connecting rod nuts,
- pipe plugs,
- valve guides,
- cylinder head bolts (if using an asbestos-free gasket).

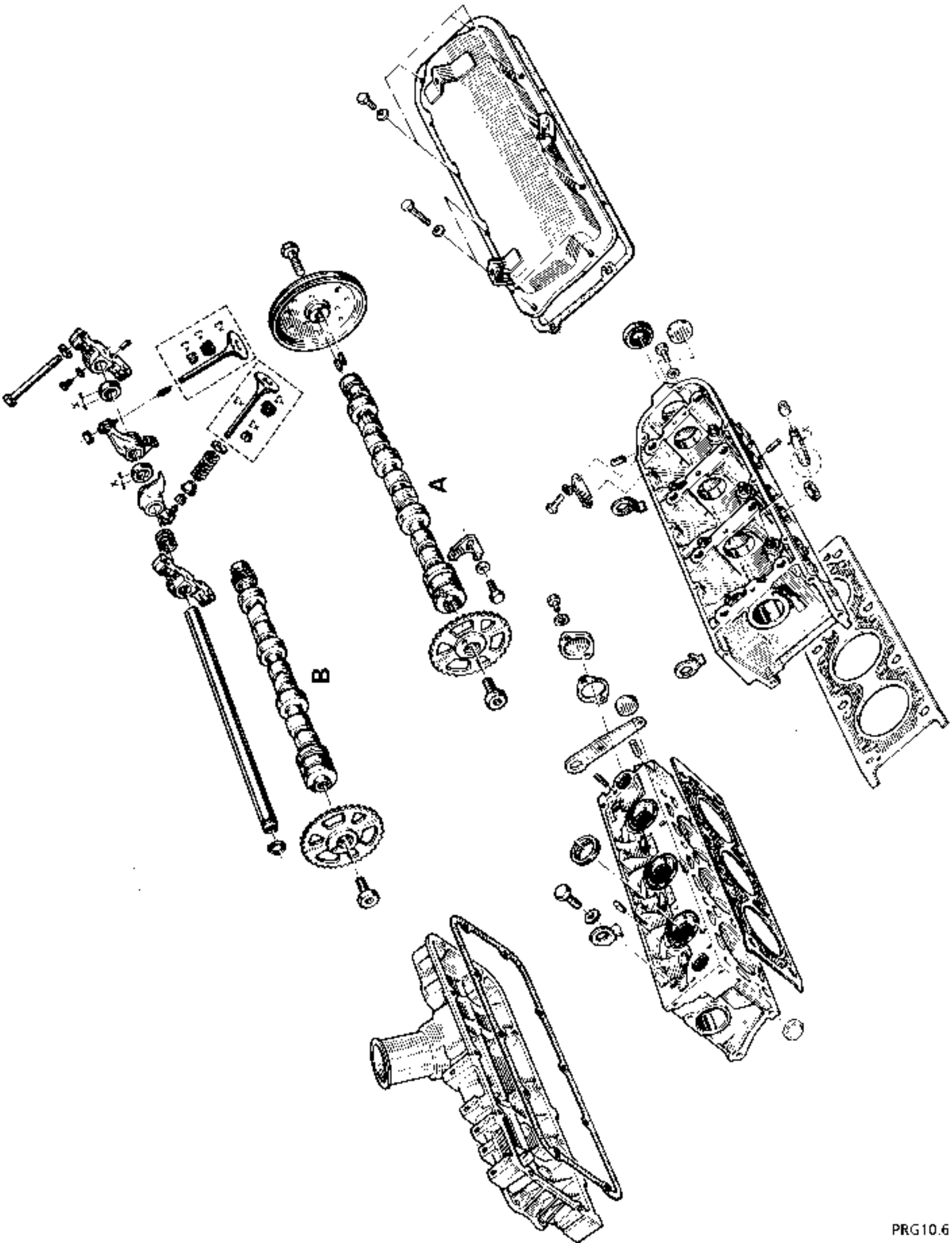
Drawing	Method reference	Part number	Description
 79393S	Elé. 721	00 00 072 100	Plug spanner with limited torque setting
 6881151	Emb. 786-01	00 00 078 601	Mandrel for centring the clutch plate
 6860351	Mot. 11	00 01 072 500	Crankshaft bearing extractor
 838125	Mot. 251-01	00 00 025 101	Dial gauge stand, use with **Mot. 252-01**
 8381251	Mot. 252-01	00 00 025 201	Pressure plate for measuring liner protrusion, use with **Mot. 251-01**
68666S1  97947G	Mot. 330-02 + Mot.330-03	00 00 033 002 00 00 033 003	Cylinder head stand
 6971651	Mot. 445	00 00 044 500	Oil filter wrench
 76641-1S1	Mot. 574-20	00 00 047 420	Tooling for replacing gudgeon pins
 7212151	Mot. 582	00 00 058 200	Flywheel immobilising tool

Drawing	Method reference	Part number	Description
 7766951	**Mot. 587**	00 00 058 700	Cylinder head centring device extractor and gasket extractor
 7766651	**Mot. 588**	00 00 058 800	Liner retaining straps
 7766851	**Mot. 589-01**	00 00 058 901	Camshaft sprocket supports
 781815	**Mot. 591-04**	00 00 059 104	Angular wrench for tightening the cylinder head 1/2" drive
 7774451	**Mot. 647**	00 00 064 700	Rocker adjusting wrench
 7766952	**Mot. 658**	00 00 065 800	Sleeve for fitting the crankshaft pulley seal
 9187951	**Mot. 1091**	00 00 109 100	Engine stand for V6 engine
 968985	**Mot. 1129-01**	00 00 112 901	Mandrel for fitting crankshaft bearing seal of interior seal diameter **80 mm**
 97160-151	**Mot. 1280-01**	00 00 012 801	Oil filter wrench

Drawing	Method reference	Part number	Description
 8799551	M.S. 1008	00 00 100 800	Removable head for DESVIL stand (Sold by DESVIL)

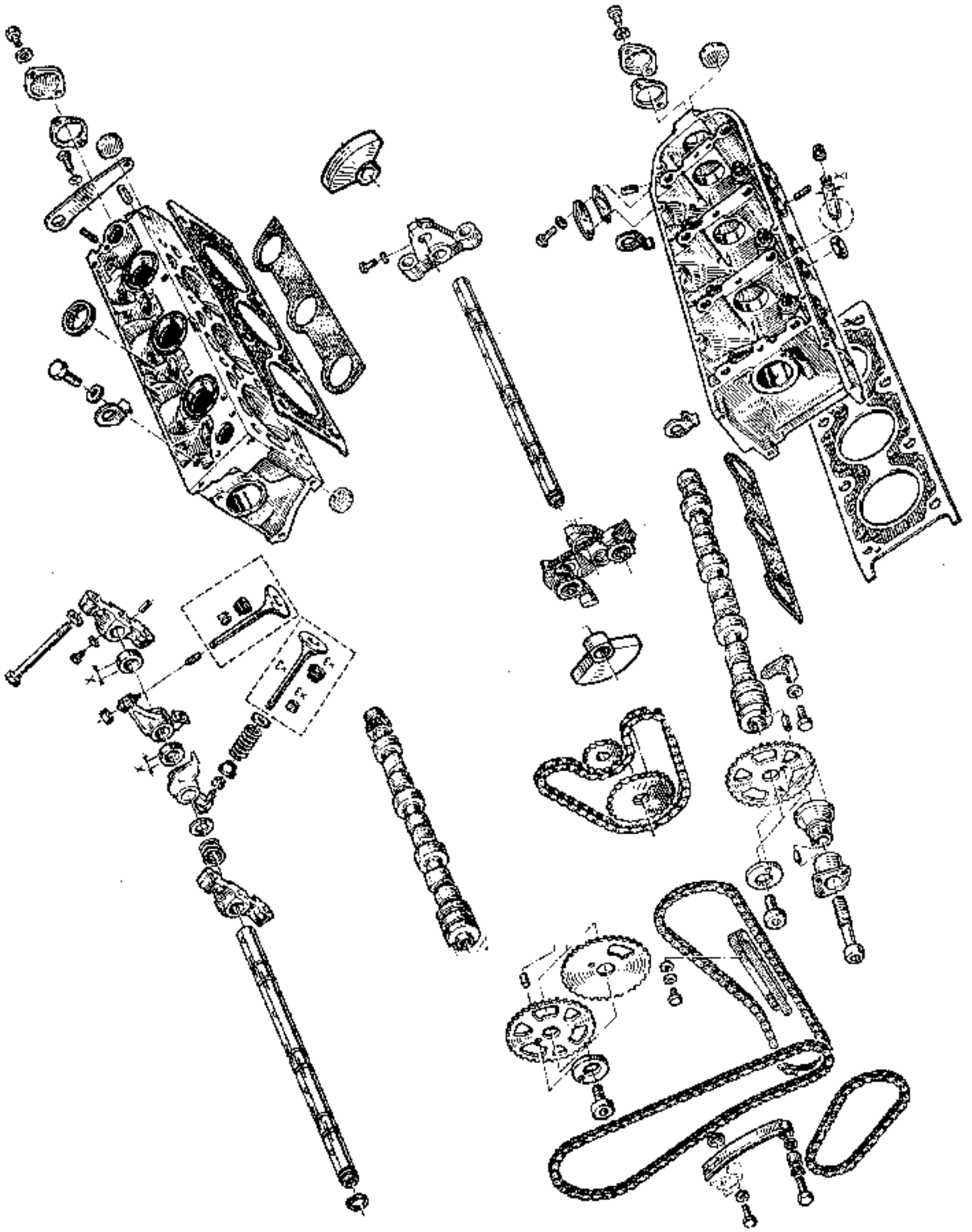
Suppliers reference	Supplier	Description
DESVIL Ref. 124 Ref. 125 Ref. 126	DESVIL Contact your After Sales Head Office for further information	DESVIL stand Without wheels With wheels Head for stand 124 or 125
		C 108 NEWAY : Kit of milling tools for re-grinding valve seats
		Valve removal tool
		Ring for fitting the piston and piston rings in the liner (all types)
		Pliers for removing the valve stem seal

EXPLODED VIEW OF THE CYLINDER HEAD (Engine with equidistant crankpins)



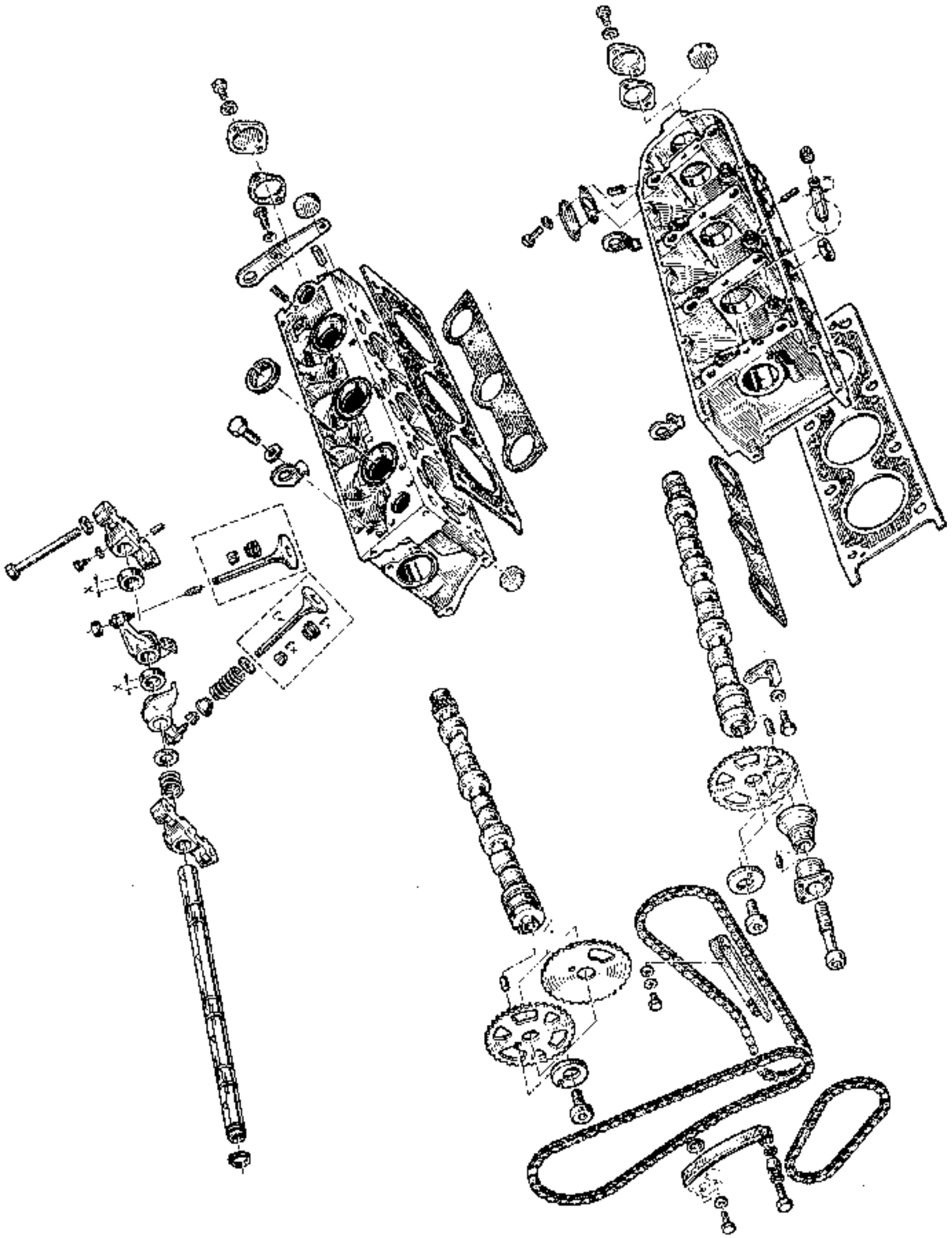
PRG10.6

EXPLODED VIEW OF THE CYLINDER HEAD (Engine with offset crankpins and balancer system)



PRG10.8

EXPLODED VIEW OF THE CYLINDER HEAD (Engine with offset crankpins and without balancer system)



PRG1D.9

REMOVING THE ENGINE

Before fitting the engine to the stand **Mot. 1091,** the engine peripherals must be removed:

- alternator,
- air conditioning compressor,
- turbocharger(s) (depending on version),
- exhaust manifolds,
- flywheel and mechanism plate,
- oil filter mounting,
- oil level sensor,
- oil pressure sensor.

Drain:

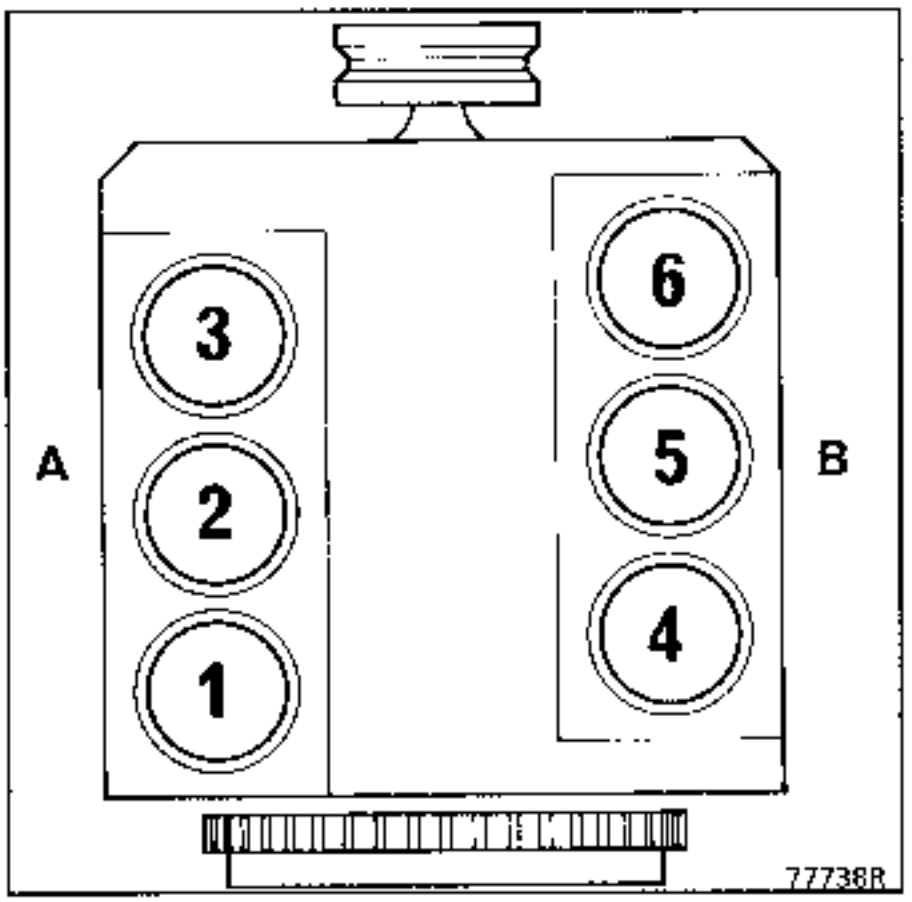
- the engine oil,
- the coolant from the cylinder block

REMINDER

MARKING OF THE CYLINDER BANKS

The assembly of cylinders 1 - 2 - 3 is considered to be bank A.

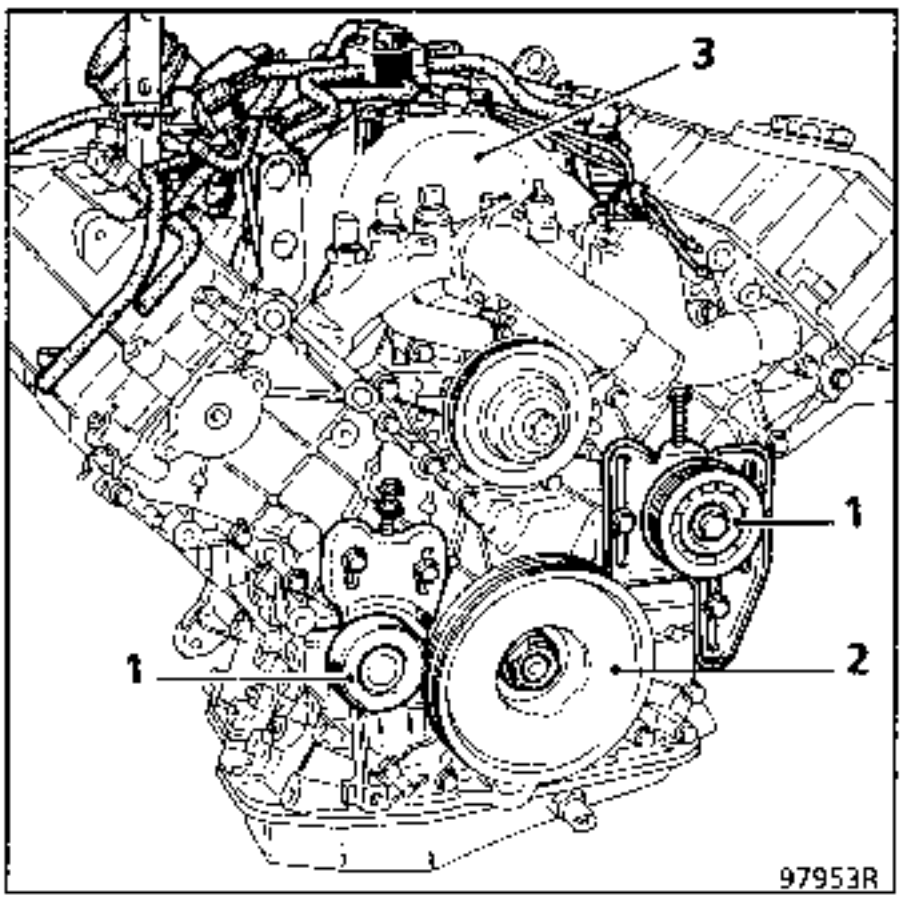
The assembly of cylinders 4 - 5 - 6 is considered to be bank B.



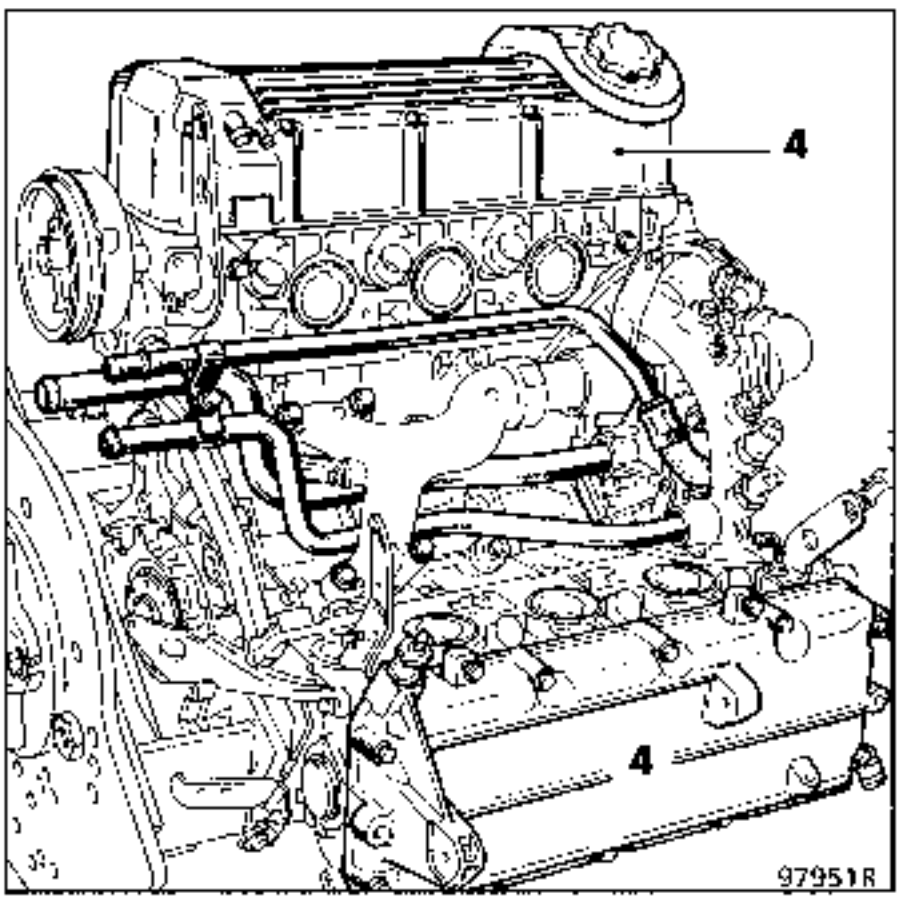
REMOVING THE CYLINDER HEAD

Remove:

- the two tensioners (1),
- the crankshaft pulley (2),
- the inlet manifold (3),



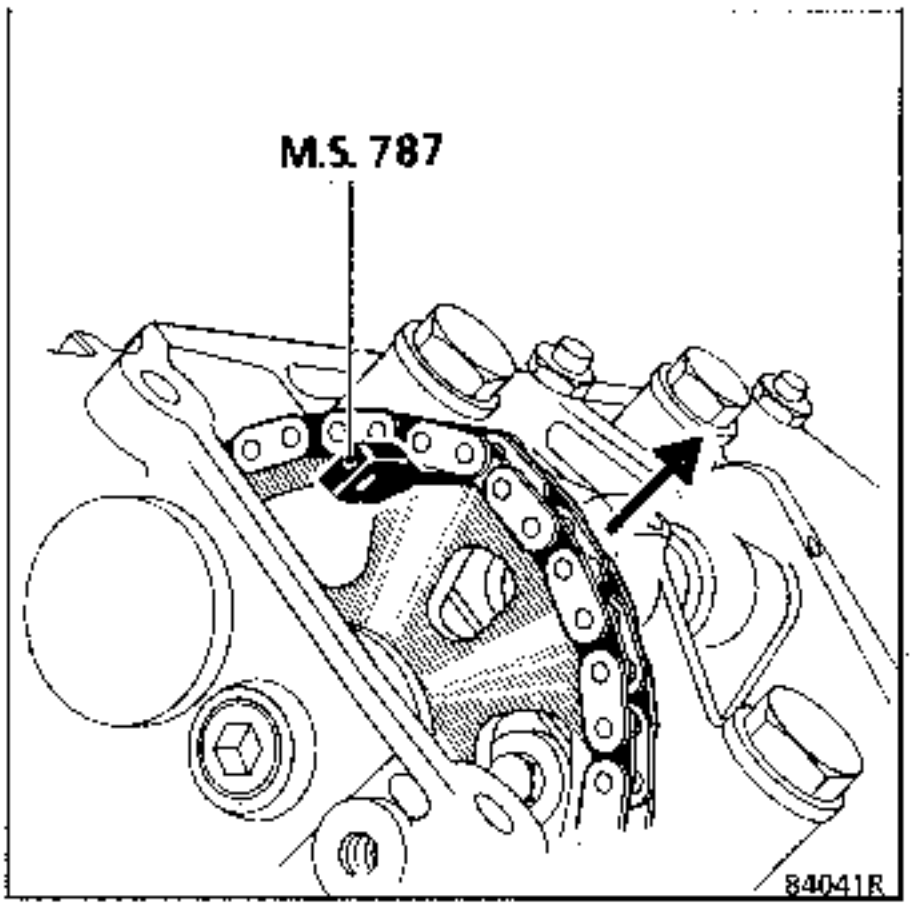
- the rocker box covers (4),
- the water pump

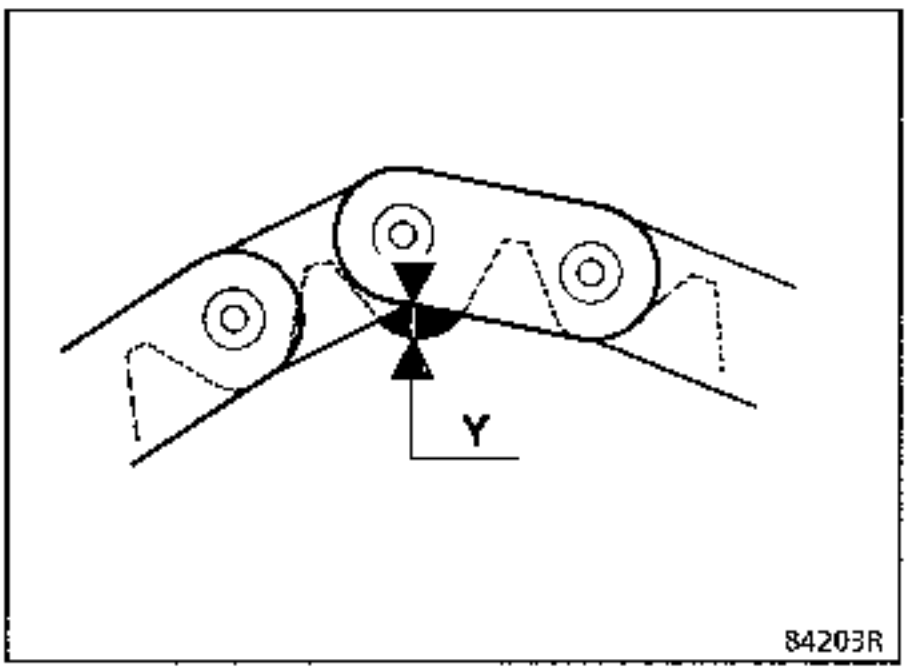


METHOD FOR CHECKING THE TENSION OF THE TIMING CHAIN

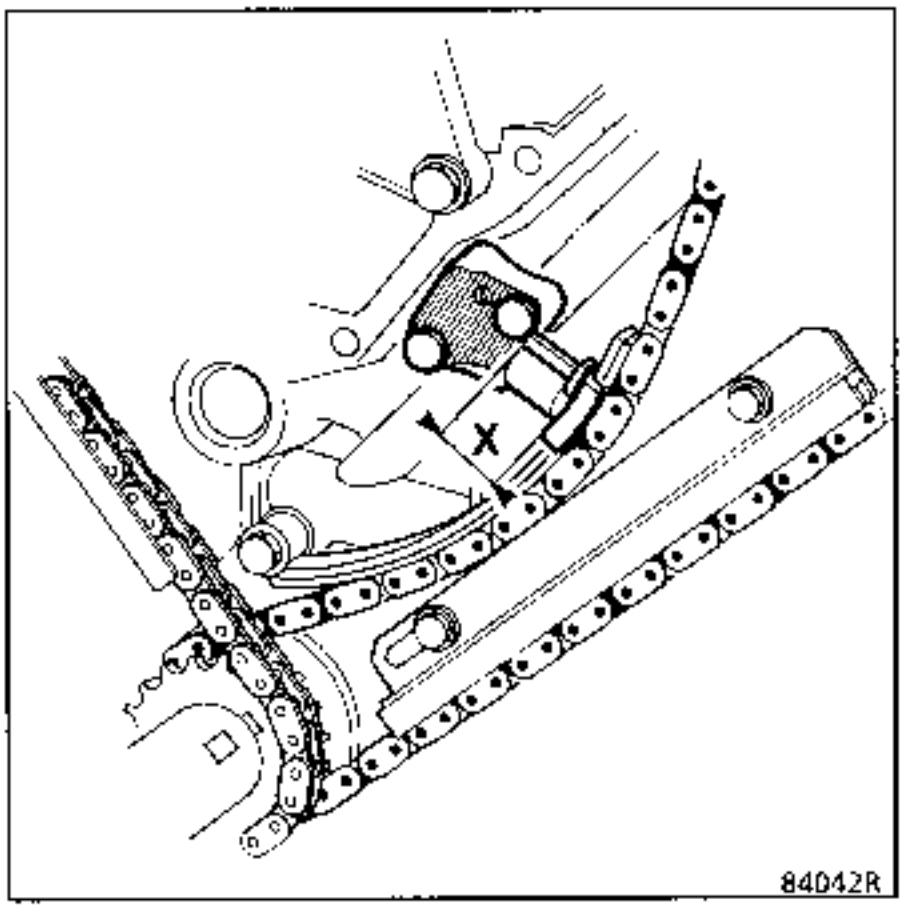
After removal of the left hand rocker cover, pull on the timing chain (arrow) to determine the clearance (Y) between the root of the sprocket tooth and the chain with the help of tool M.S. 787.

A maximum clearance (Y) of 1.7 mm must not be exceeded. This dimension corresponds to a travel X = 22 mm of the timing chain tensioner plunger.



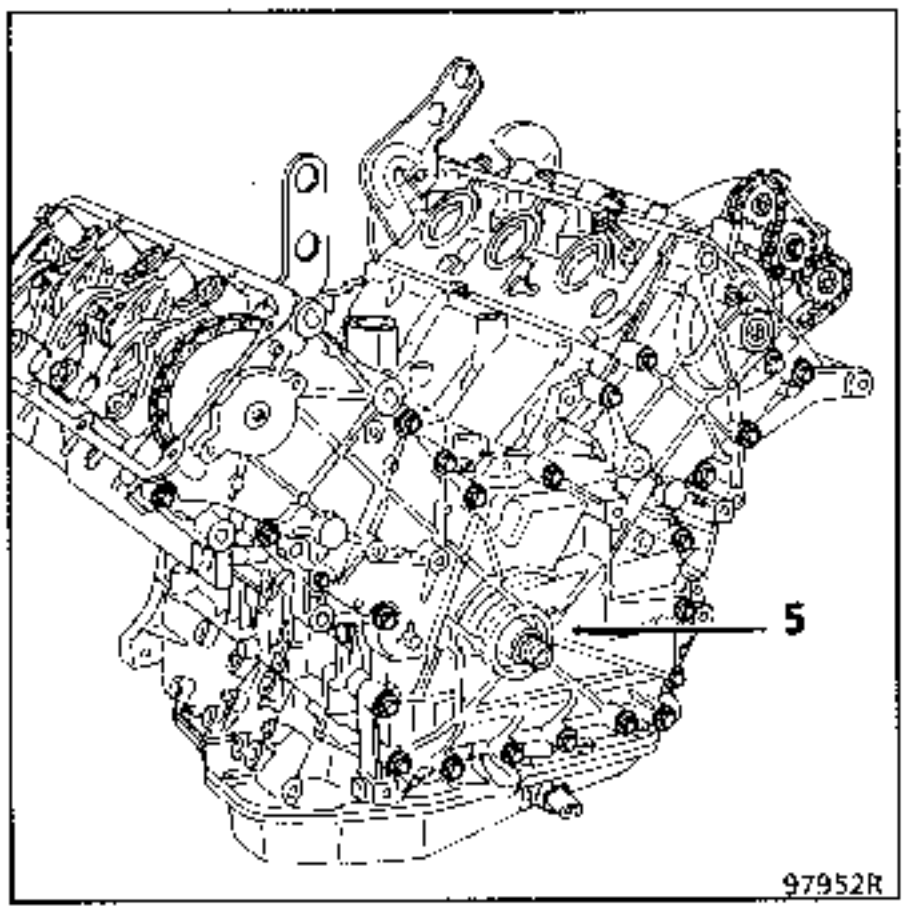


If parts have to be replaced, all the parts belonging to the timing mechanism must be replaced: chains, sprockets, glide shoes and tensioners.

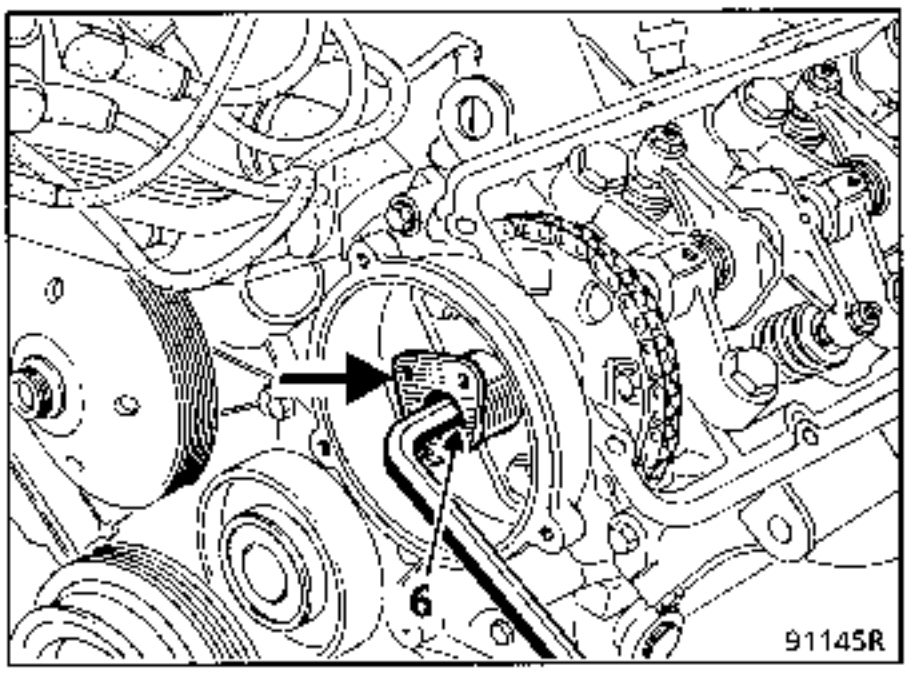


If, on the other hand, the gap is correct, the protruding length (X) of the timing chain tensioner plunger can be measured.

Remove:
- the timing cover (5)



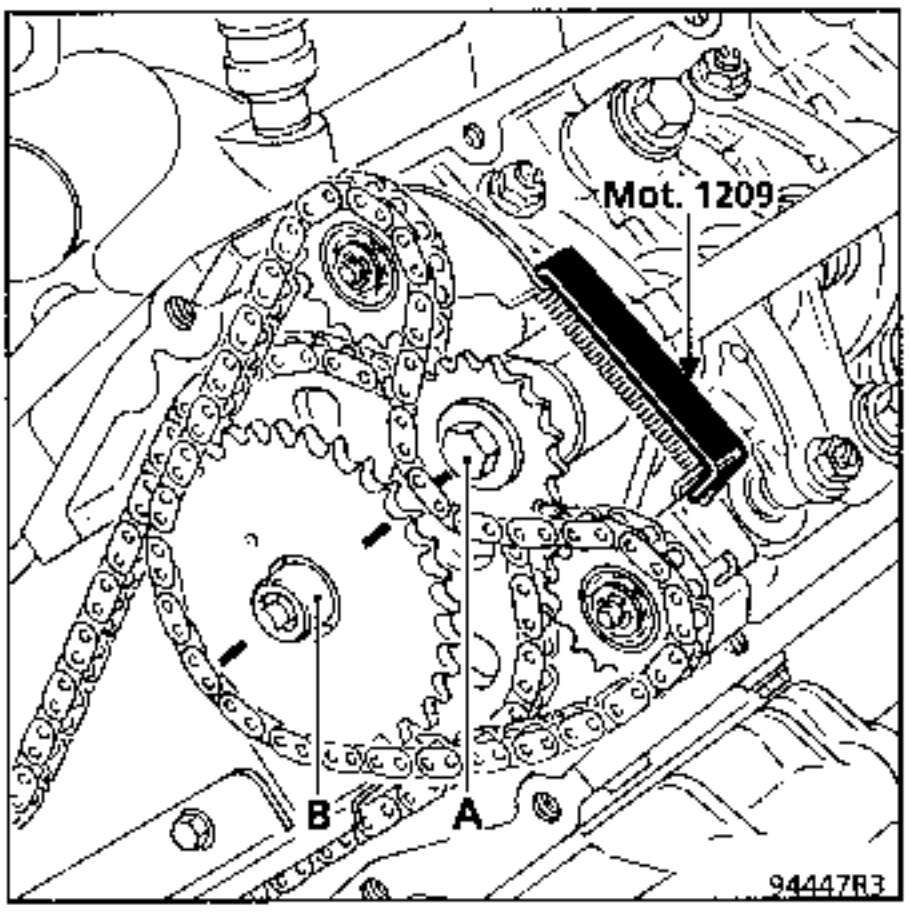
NOTE : For engines with the distributor on the timing cover side, remove the rotor arm, remove bolt (6) then the timing cover (5)



Remove:

- the timing balance system (if fitted).

Fit tool **Mot. 1209** to the balance system chain tensioner.



Remove:

- the bolts (A and B), and extract the balance system chain, together with its flyweight,
- the sprockets with the oil pump drive chain. Retain the key and the spacer.

Slacken the mounting bolt for the camshaft sprocket for bank B.

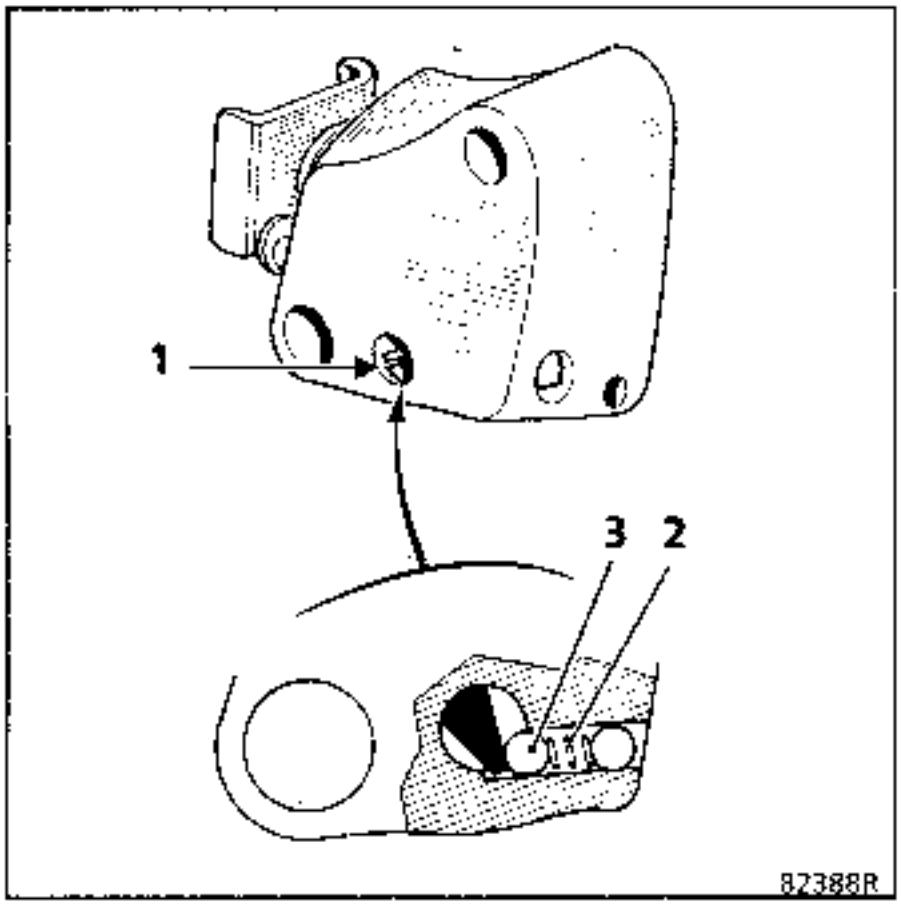
Mark the components of the timing gear according to their side if they are to be re-used.

Remove the timing gear.

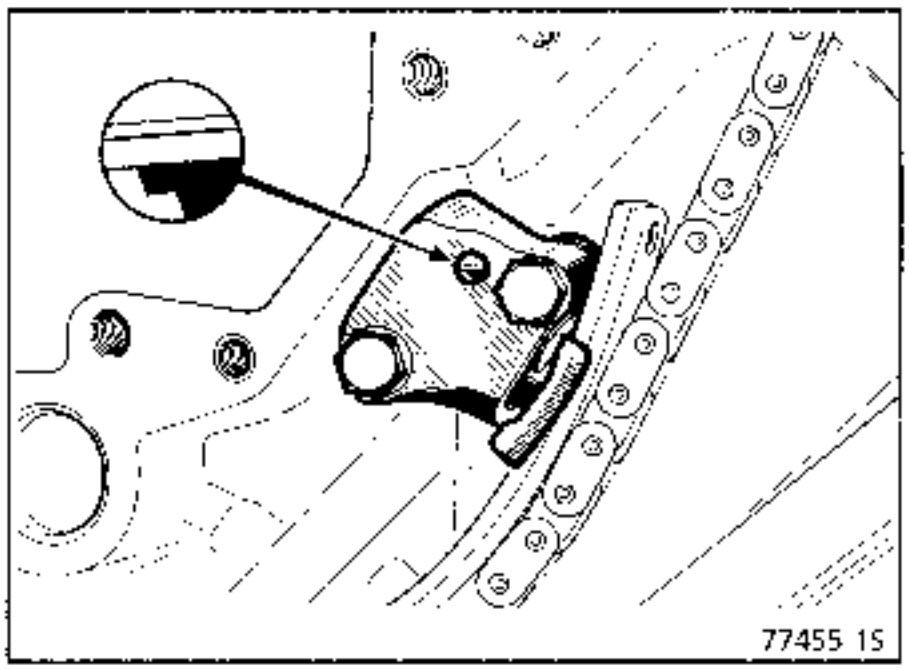
The chain tensioner retaining lock (1) must not be removed.

This is held in position (set or released) by the action of a spring (2) which forces a ball (3) against the locking finger.

If the tensioner retaining lock is accidentally removed replace the chain tensioner, as there is no sure way of checking the position of the locking finger in relation to the thrust ball when refitting (risk of positioning the locking finger in the coils of the spring).

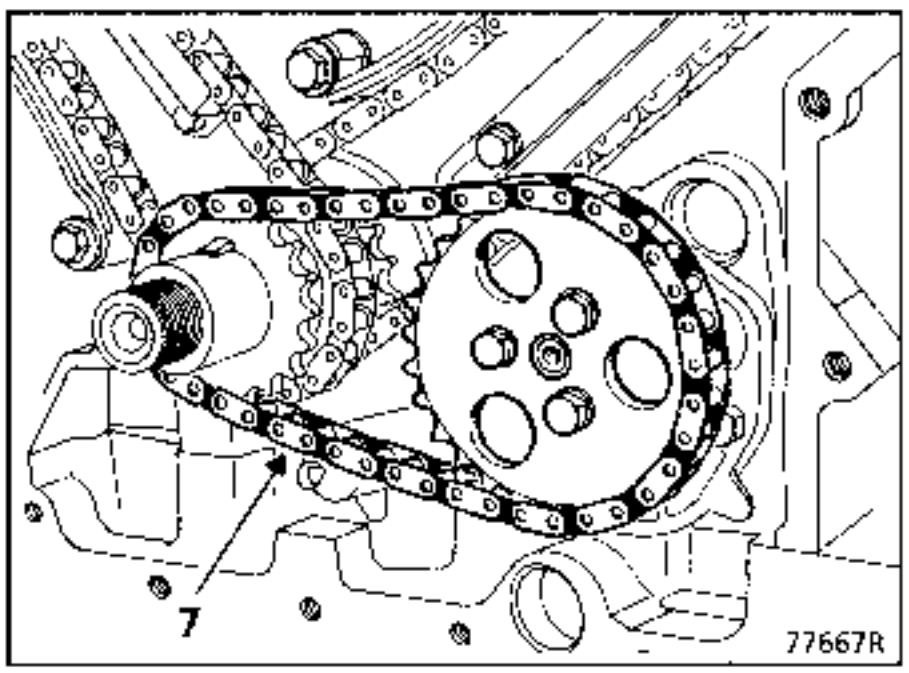


Release both chain tensioners by using a screwdriver to turn the ratchet mechanism **anti-clockwise**.



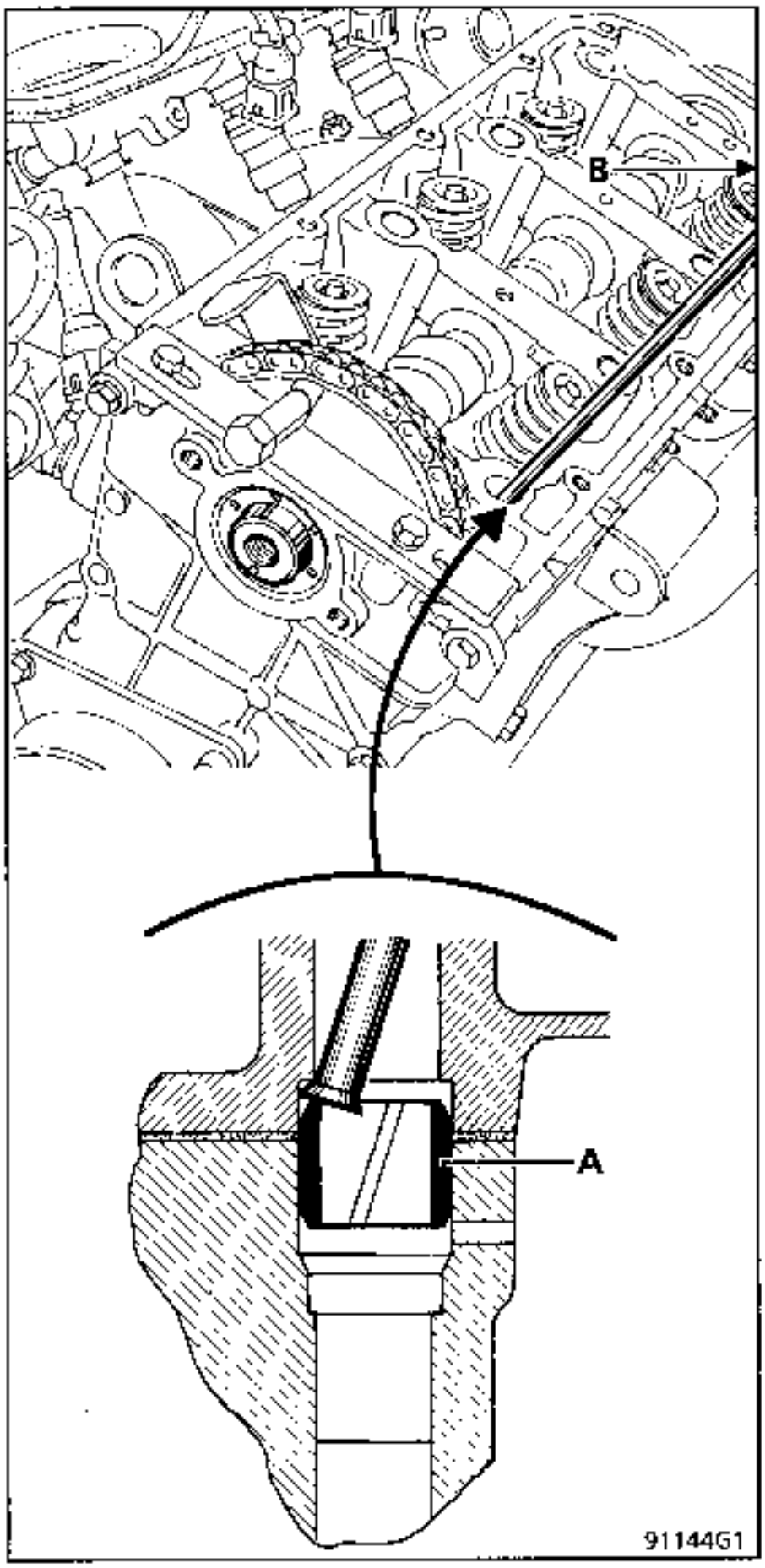
Remove:

- the oil pump sprocket and its drive chain (7),
- the camshaft sprockets with the timing chains,



- the rocker shafts
- the cylinder heads.

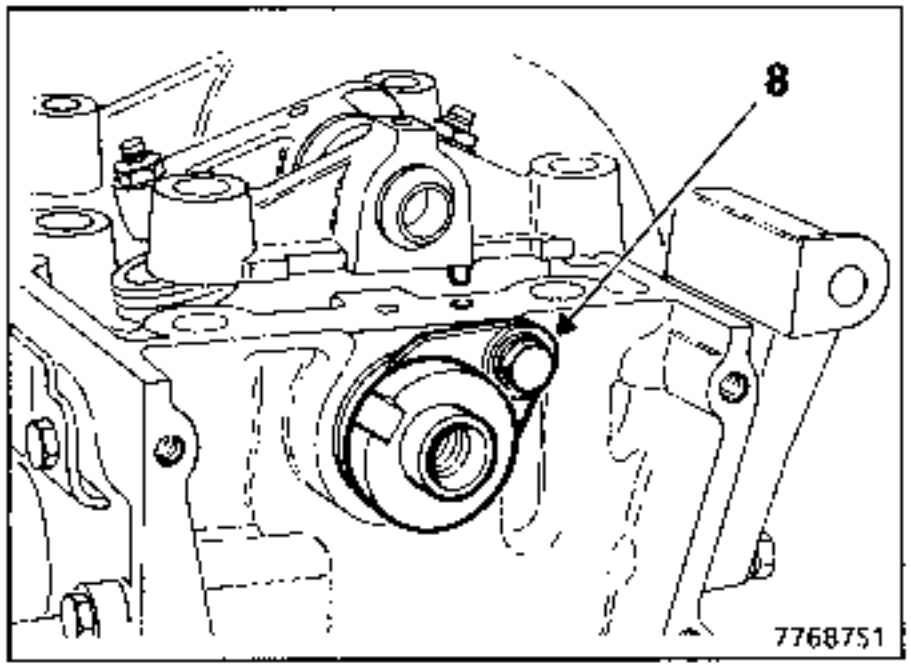
NOTE : If removal of the cylinder heads is difficult, press in the centring pins (A) and (B) using a used push rod shaft for example.



Remember to fit the liner retaining straps.

PREPARATION OF THE CYLINDER HEAD FOR CLEANING

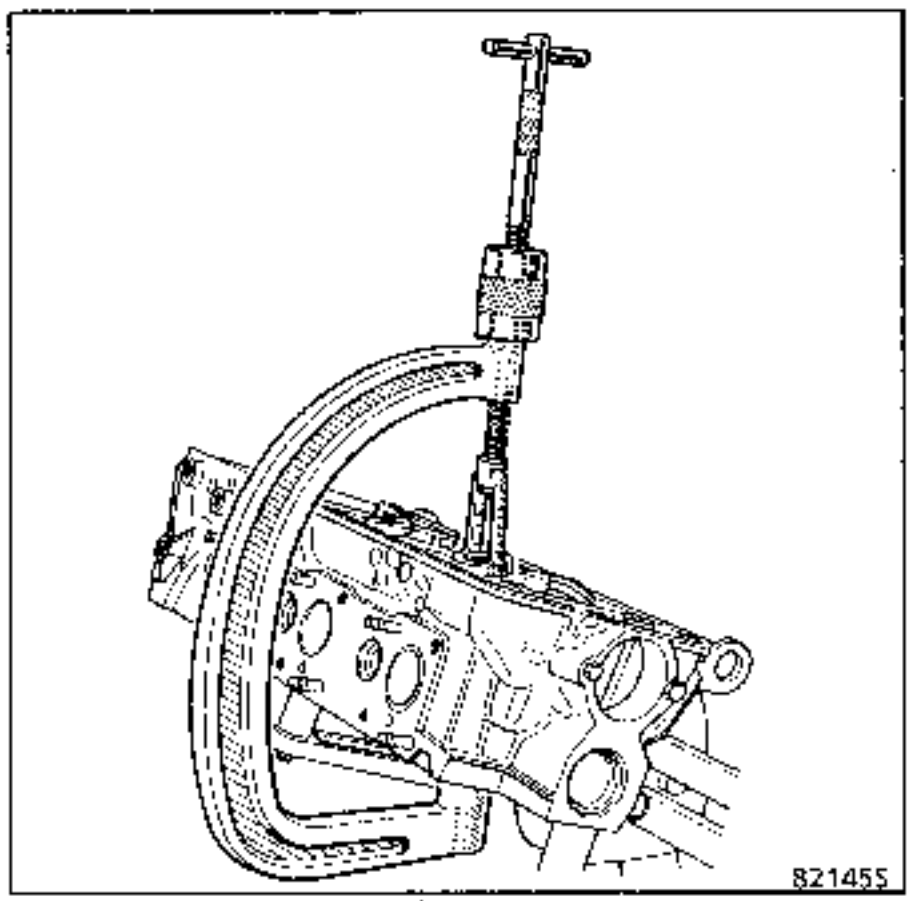
Remove the camshaft stop mounting bolt (8), then extract the camshaft.



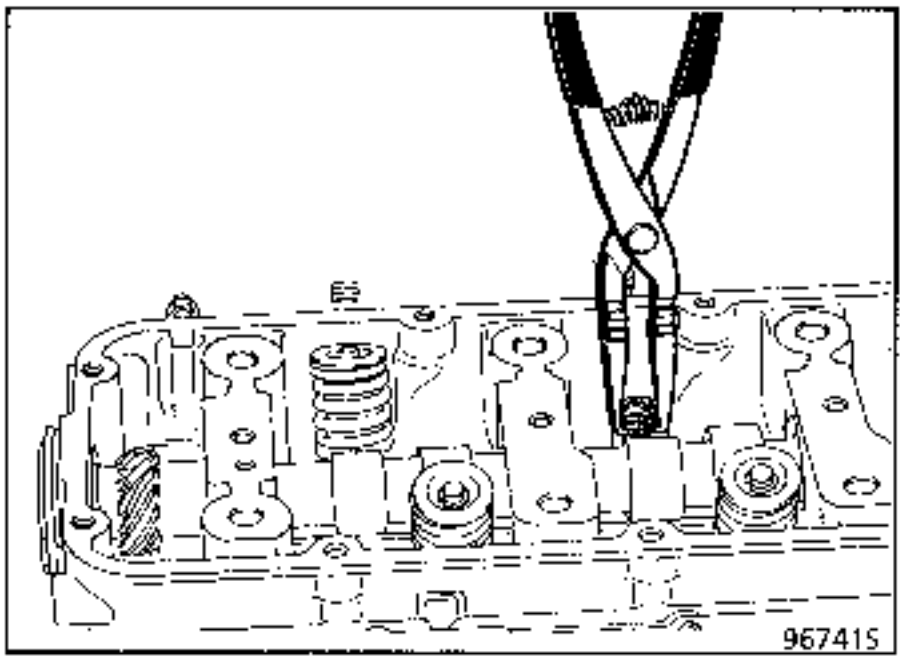
REMOVAL

Compress the valve springs using a compressor (Eg. **FACOM U 43 LA**).

Remove the half rings, the upper cups, the springs and the thrust washers. Put the parts in order.



Remove the valve stem seals using pliers (Eg. **FACOM DM 10 A)**



CLEANING

It is very important not to scratch the surface of components in aluminium.

Use Décapjoint to dissolve any remaining traces of gasket.

Apply the product to the area to be cleaned; wait for about 10 minutes then remove using a wooden spatula.

Gloves should be worn during this operation.

This operation should be carried out with extreme care, so that foreign bodies are not introduced into the oilways bringing oil under pressure to the camshaft (the oilways are located in both the cylinder block and the cylinder head).

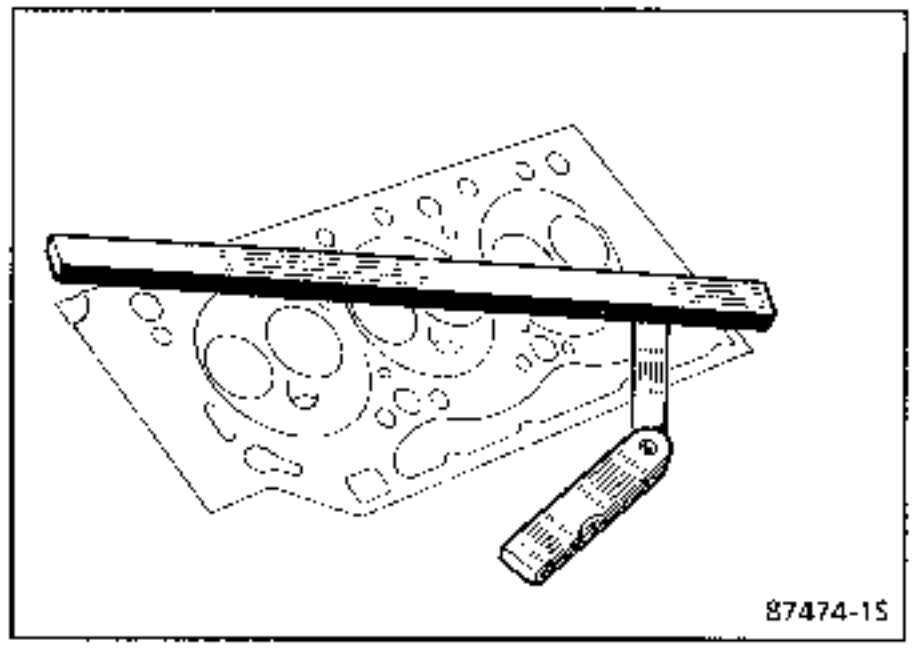
If this precaution is not observed, the jets may be blocked and the cams and pushrods rapidly damaged.

CHECKING CYLINDER HEAD BOW

Use a straight edge and a set of feeler gauges to check for cylinder head bow.

- maximum deformation **0.05mm**

The cylinder head may not be reground.



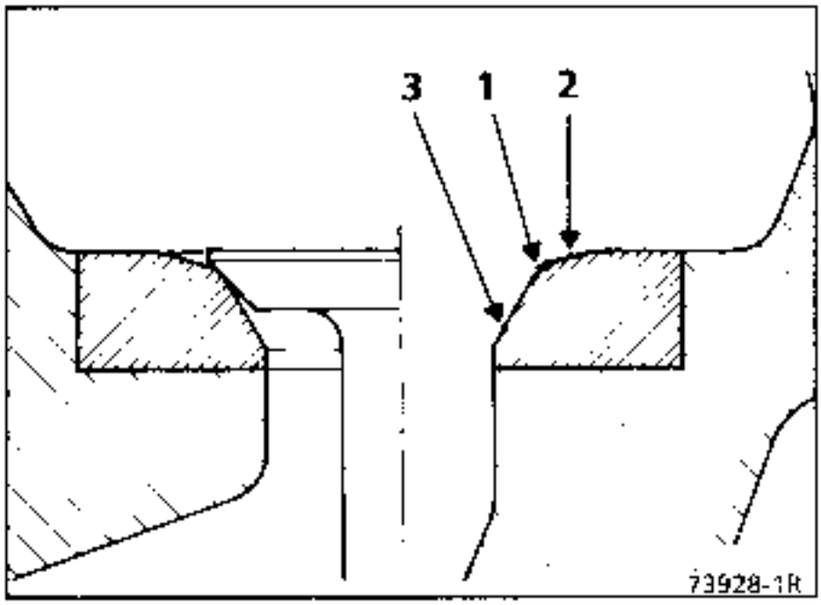
RECTIFICATION OF VALVE SEATS

Valve seats
Seat angles:
- Inlet **120° or 90°**
- Exhaust **90°**

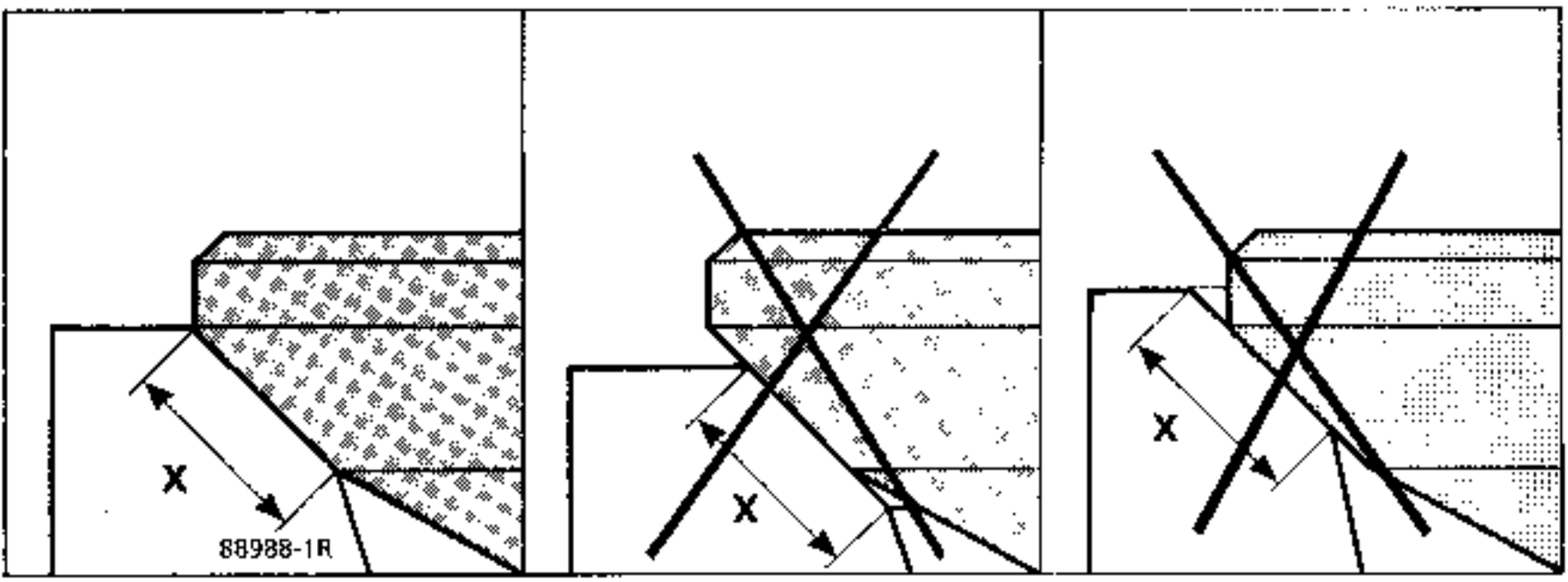
Seat width (mm)

ENGINE	INLET	EXHAUST
Z7U Z6W Z7X Z7W except 702	1.3 to 1.7	2 to 2.4
Z7V Z7W 702	1.7 to 2.1	

The valve seat (1) is obtained by reducing the width at (2) then at (3) using the recommended values.



NOTE : Observe the position of the valve seat in relation to the valve.



Z7X 726 - 744 ENGINES

Before scrapping exhaust valves the sodium present in them must be neutralised.

PROCEDURE

- The valves must be sawn in a dry area, where all contact with water must be avoided (Do not use a wet saw).
- Wear goggles to protect your eyes.
- Saw off the valve stems at the tulip.
- Prepare a container of water and place it outside (approximately 10 litres of water for four valves).
- Drop the cut valves into the water as soon as they have been sawn. Avoid causing splashing.
- The sodium in the valves will react with the water, creating soda and releasing hydrogen. All the sodium has been destroyed when hydrogen is no longer produced (bubbles are no longer formed in the water).
- During the reaction, keep the container well away from heat sources (Do not smoke).
- Once the valves have been treated in this manner, they may be scrapped. Waterproof gloves must be worn to remove the valves from the water.
- Rinse the container out thoroughly with water.
- If the solution contacts skin or eyes, rinse immediately and thoroughly with water for 15 minutes and contact a doctor.

REFITTING THE VALVES

All types

Fit the new valves (if necessary).

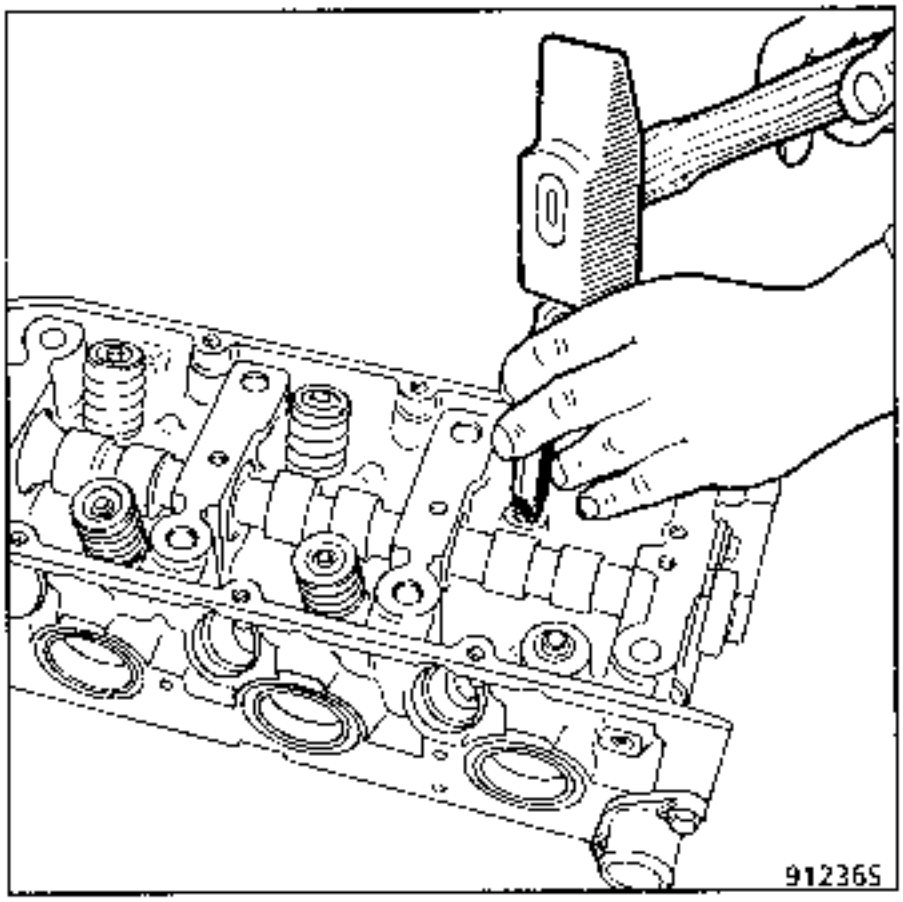
Grind in the valves in their respective seat.

Mark the parts.

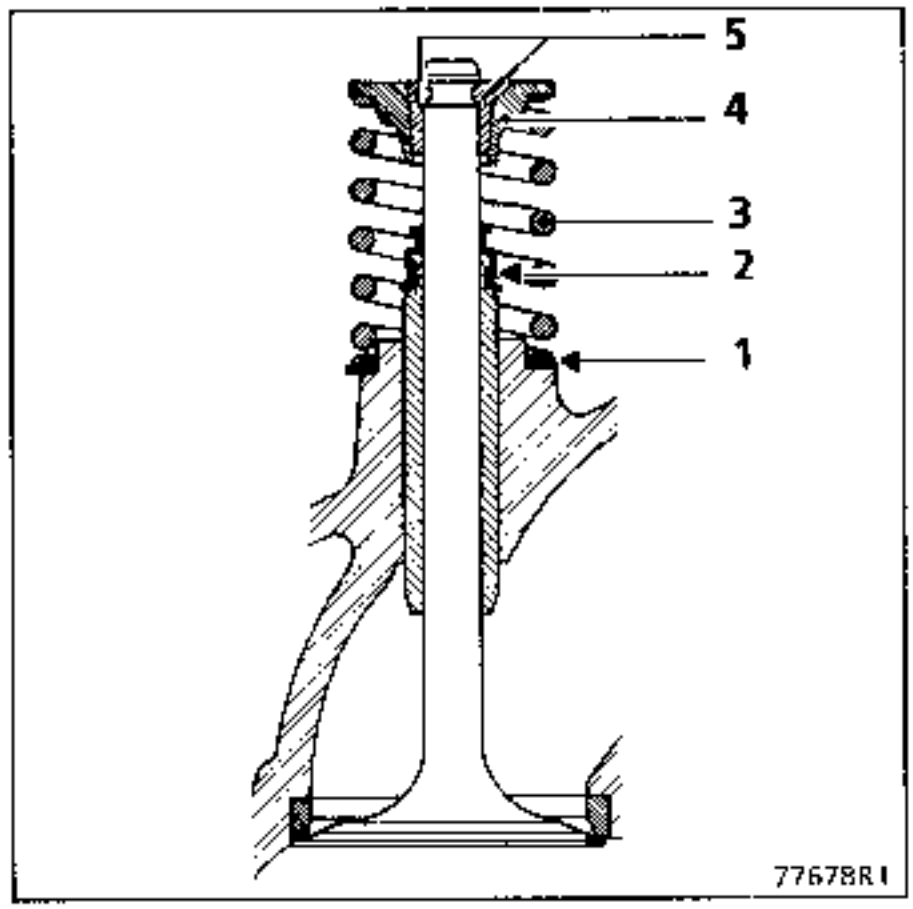
Clean all the parts carefully.

Lubricate the parts with engine oil.

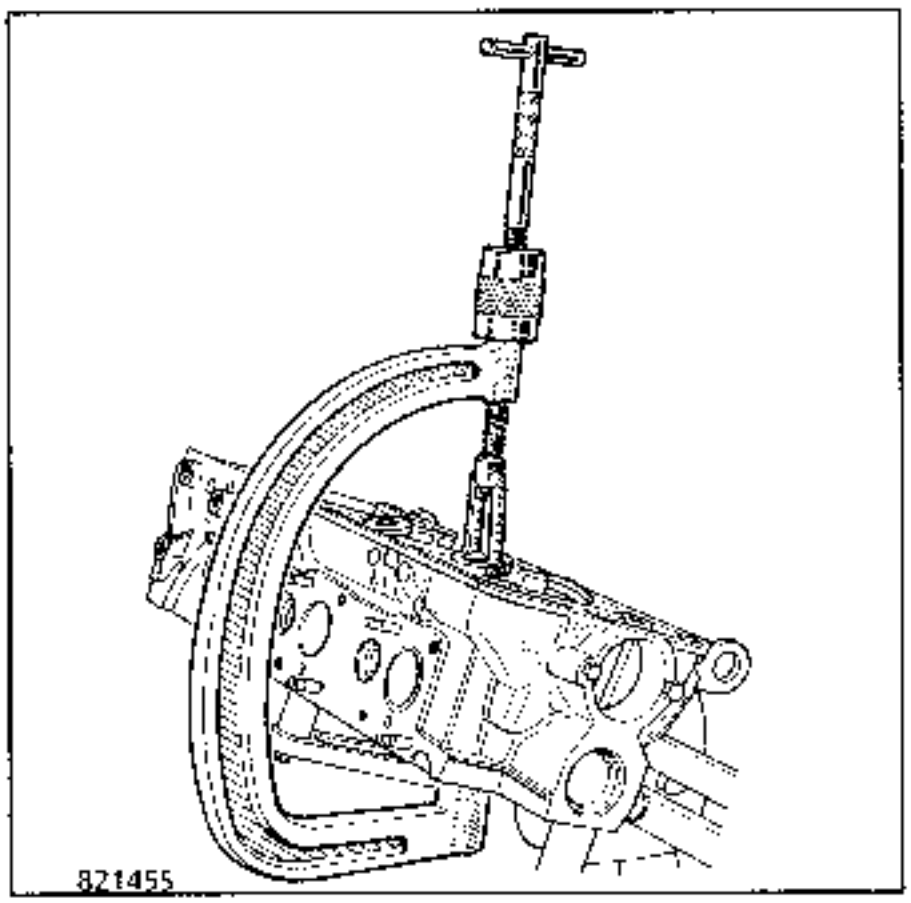
Renew the valve stem seals. For refitting use an 11 mm angled box wrench (Nervus Type).



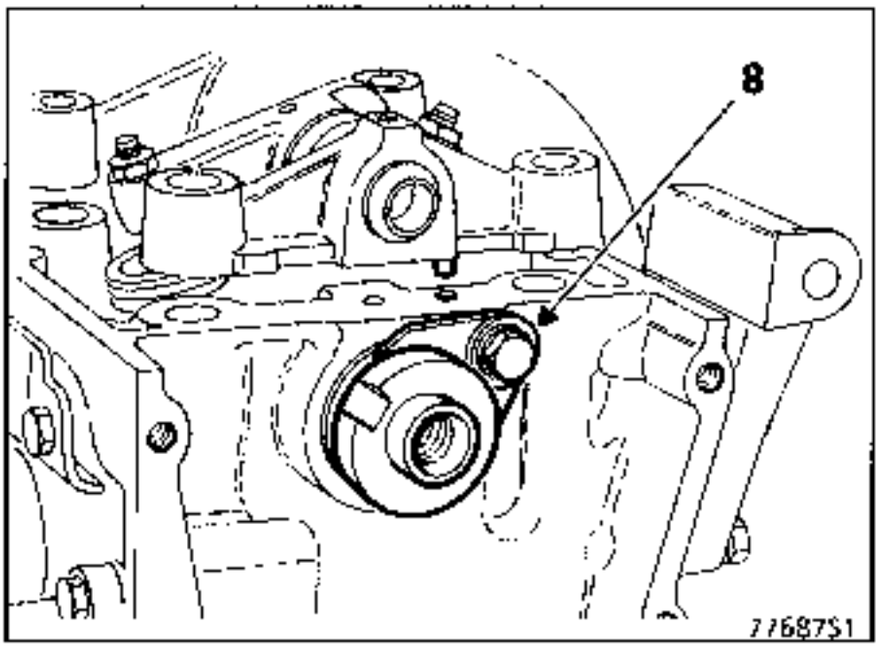
Refit in increasing numerical order.



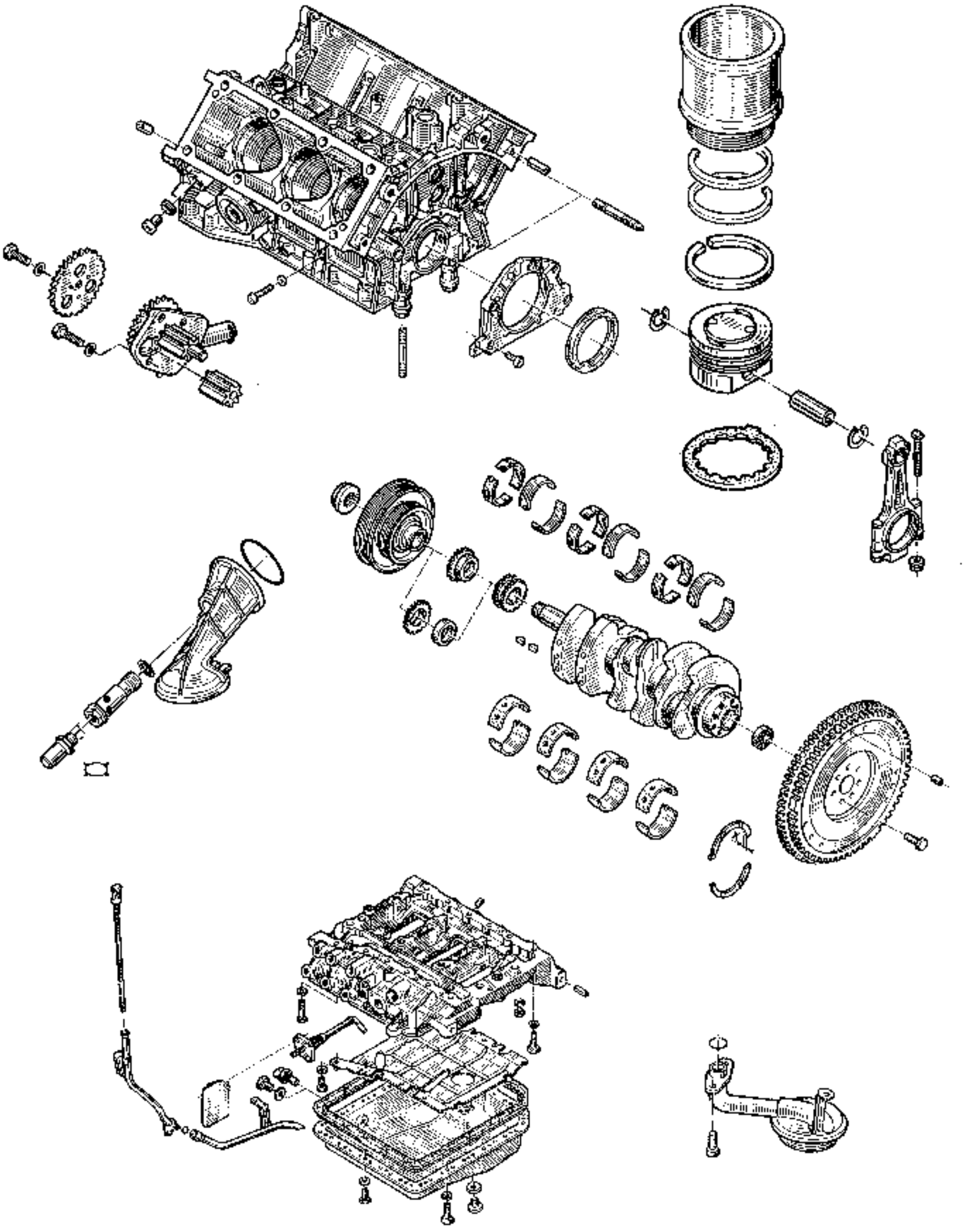
Compress the springs using a compression tool (Eg. **FACOM U 43 LA**) then fit the half rings on the valve stem.



Refit the camshaft in the cylinder head and position the flange (8), dividing the flange play on either side of the camshaft.



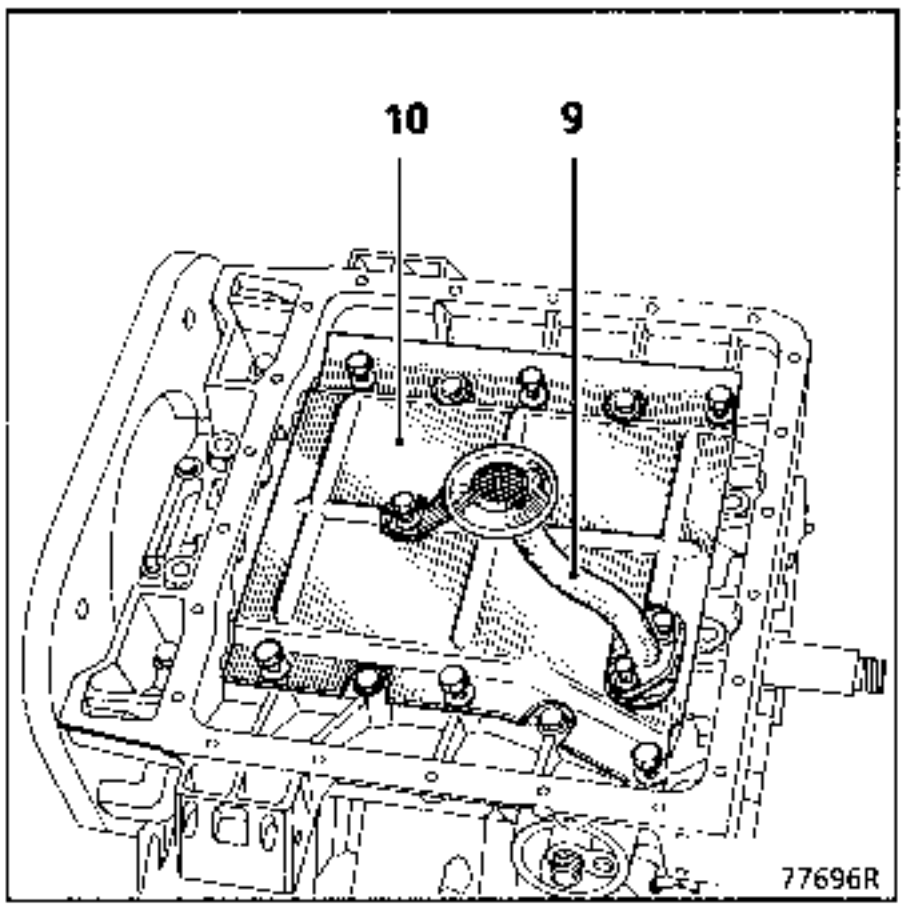
EXPLODED VIEW - CYLINDER BLOCK



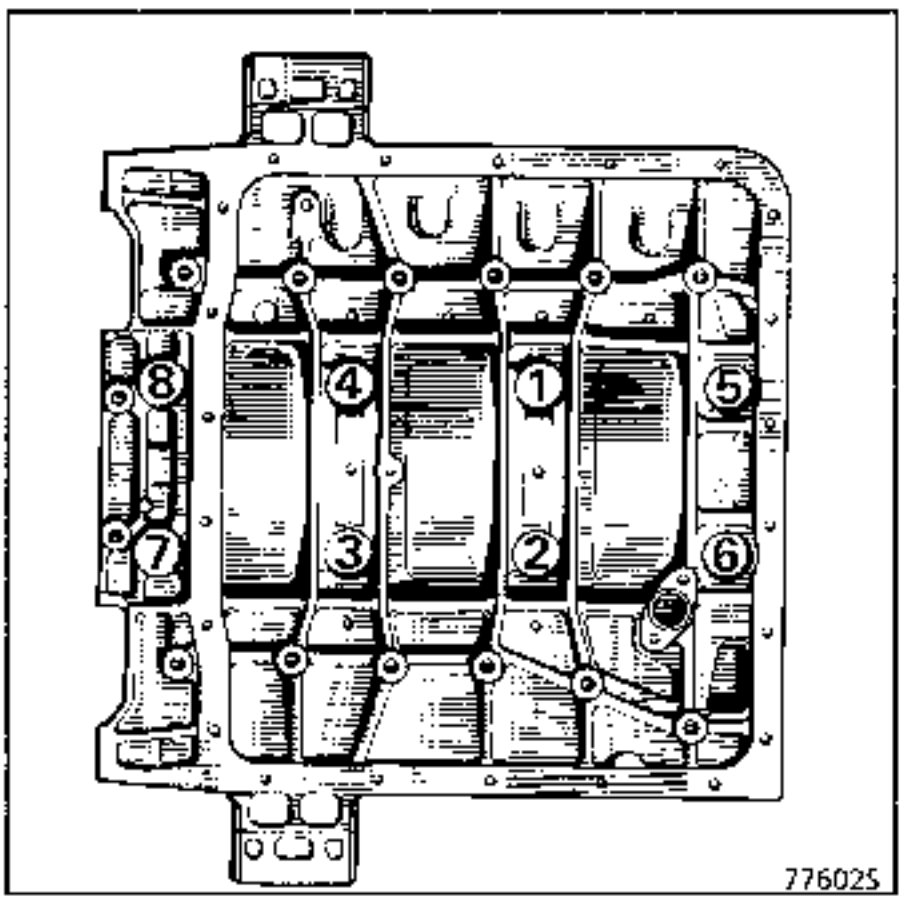
REMOVING THE PISTON LINERS

It is possible to replace one individual "piston - liner" assembly.

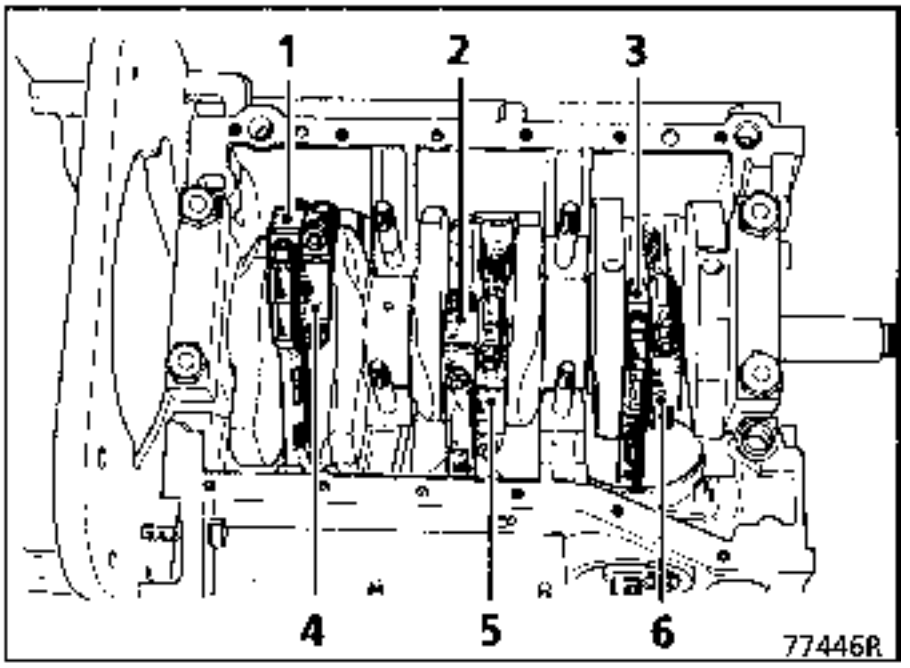
Remove:
- the sump,
- the strainer (9),
- the anti-emulsion plate (10)



Remove the bearing cap housing.

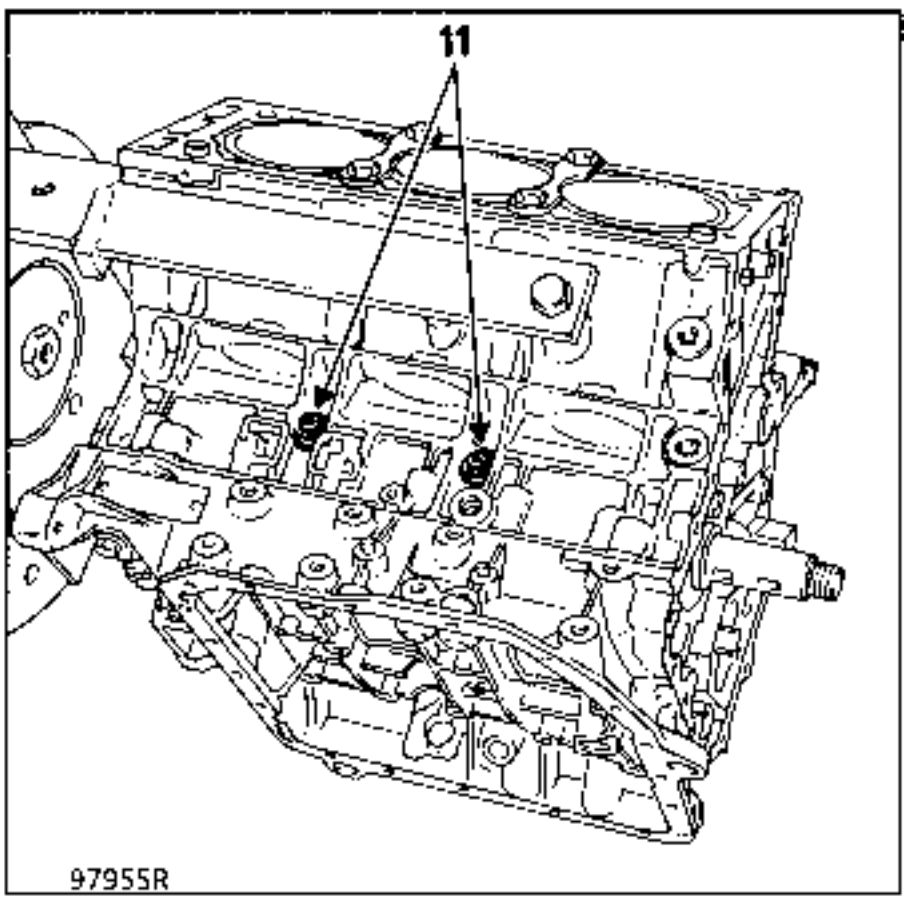


Number the connecting rods starting from the flywheel side so that their numbering corresponds to the numbers for the cylinders.



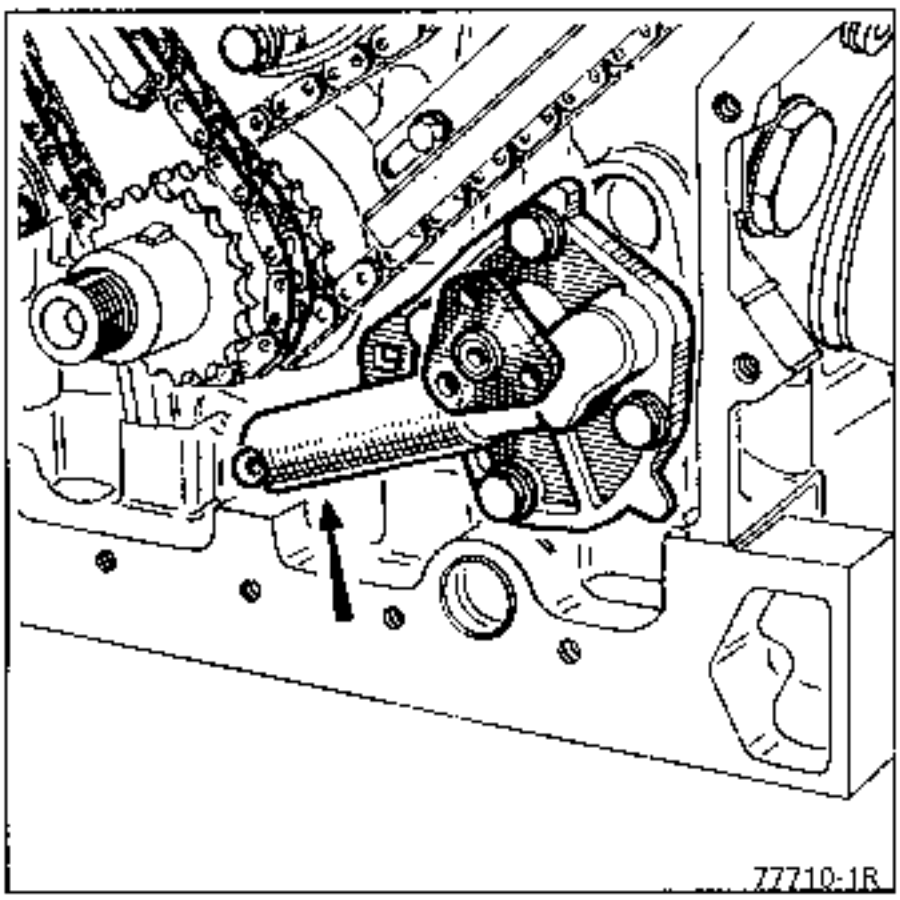
Remove:

- the big ends,
- the liner retaining flanges,
- the connecting rod - piston - liner assemblies (marked),
- the two bolts (11) (if fitted) to extract the bearing caps,
- the half thrust washers,
- the crankshaft.



REMOVAL AND REPAIR OF THE OIL PUMP

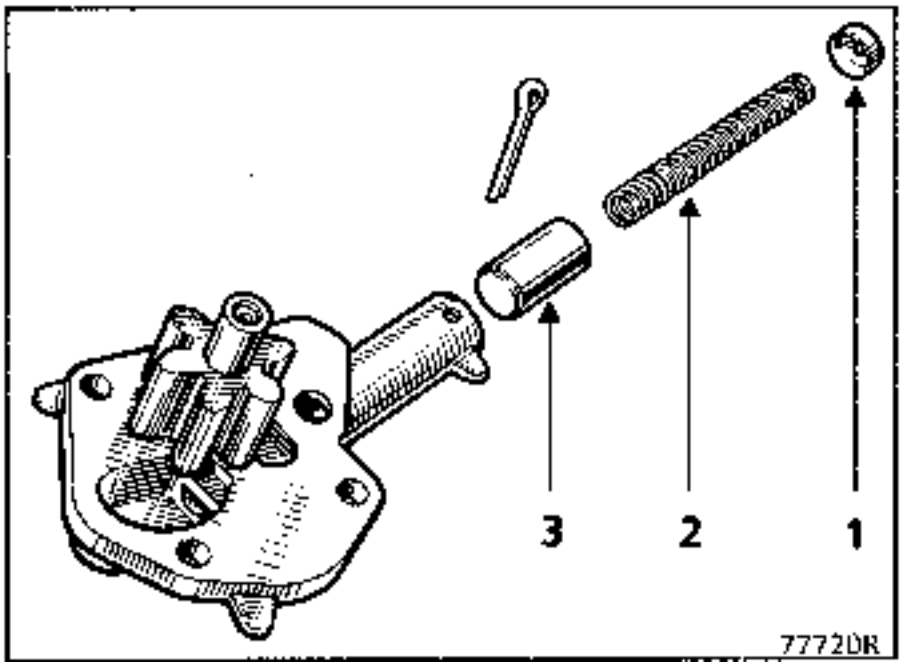
Remove:
- the oil pump cover (never release the cover by tapping on the cylindrical section which houses the pressure release valve).



- the idle gear

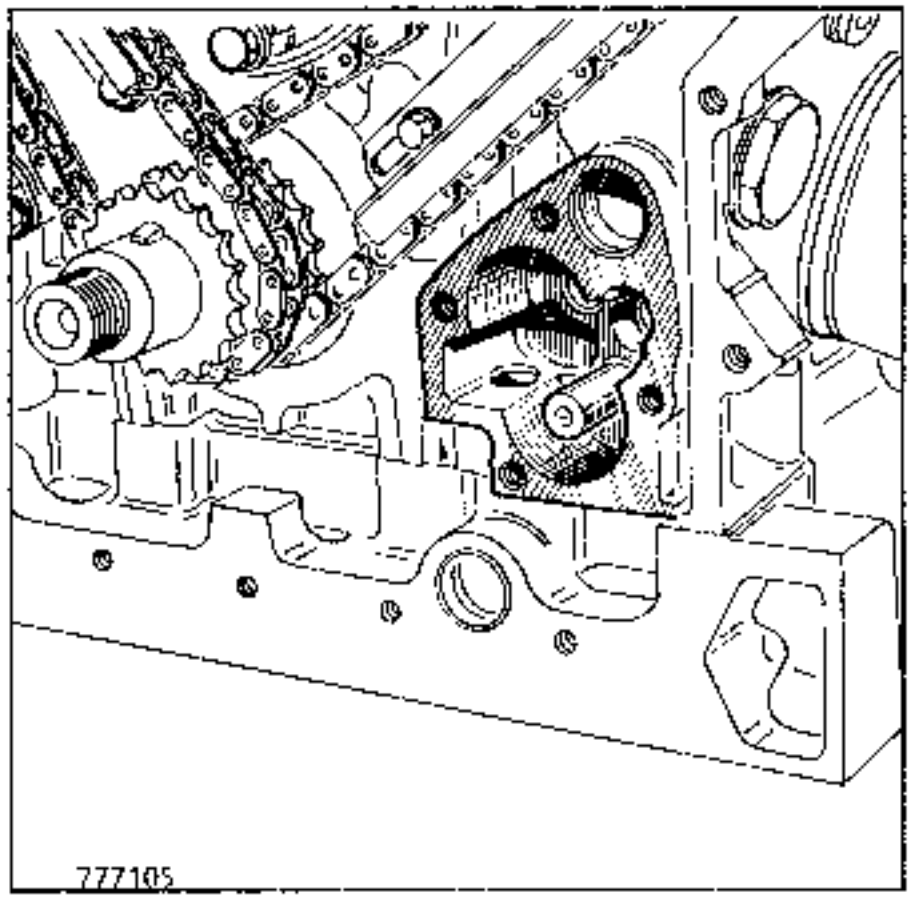
REPAIR

Remove the retaining split pin and remove components 1 to 3.



Check:
- the condition of the parts,
- the location in the cylinder block.

If one of the pump components is worn, the complete pump assembly must be replaced.



Check the operation of the assembly.

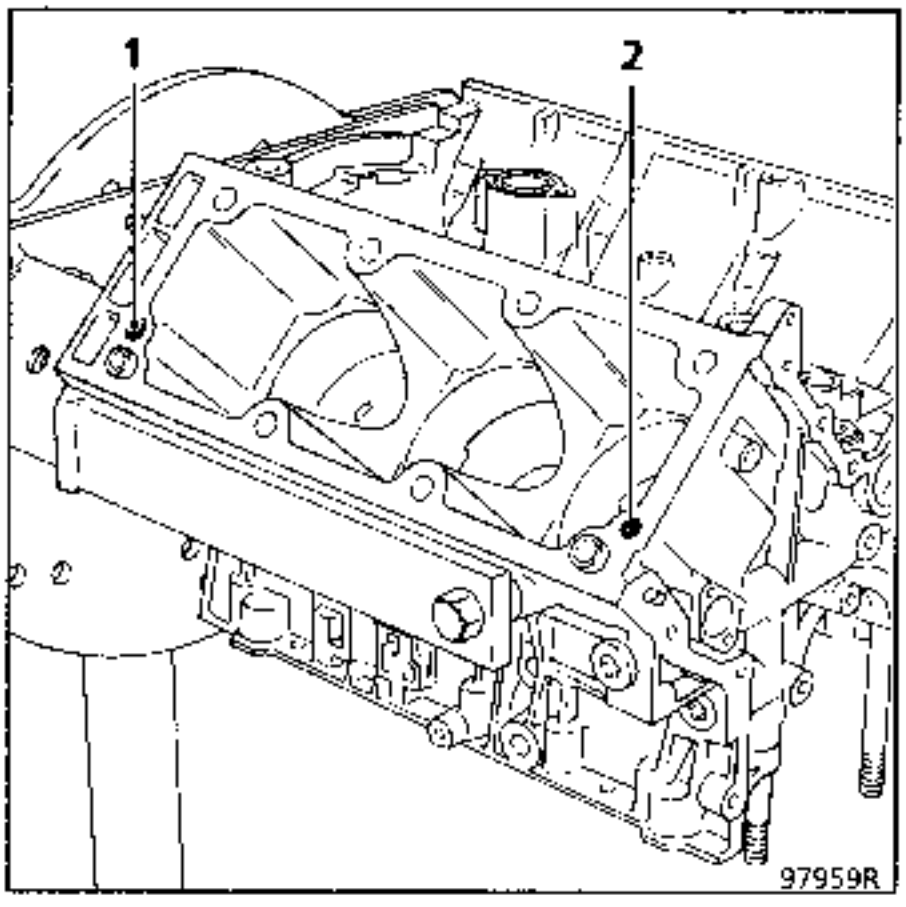
Make sure that you do not invert the direction in which the release piston and the closing cover are fitted.

Now clean:

- the cylinder block using **DECAP-JOINT** taking care to protect openings (1) and (2).

Take care not to allow foreign bodies to enter the oilways, which may block the jets for the rockers, causing rapid cam, camshaft and rocker finger wear.

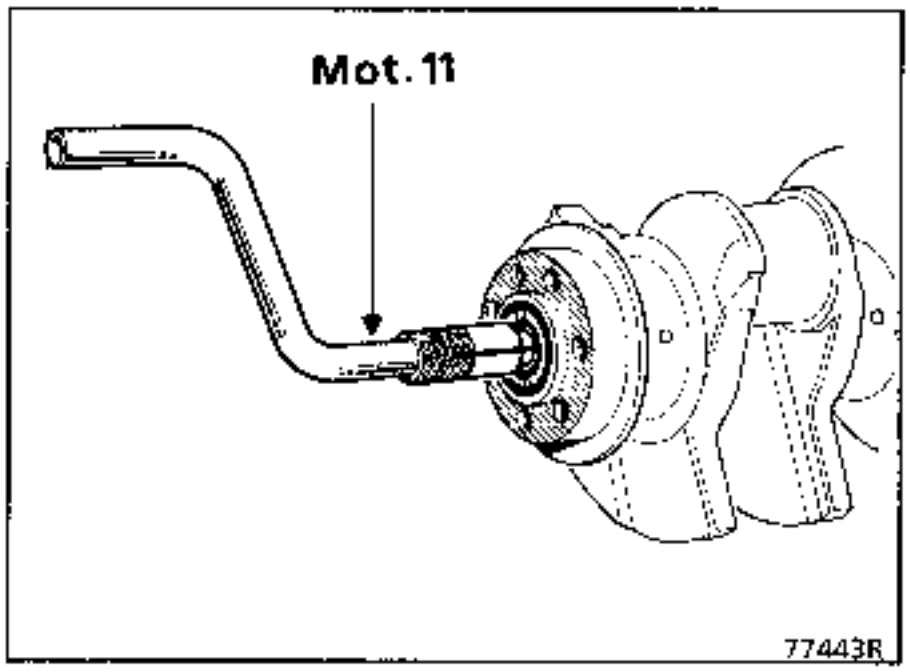
- the inside of the cylinder block especially the liner base seal faces.



Clean the crankshaft, inserting a piece of wire into the lubrication openings.

To extract the centring bearing on the clutch shaft, use extractor tool **Mot. 11.**

Do not re-use the bearing.



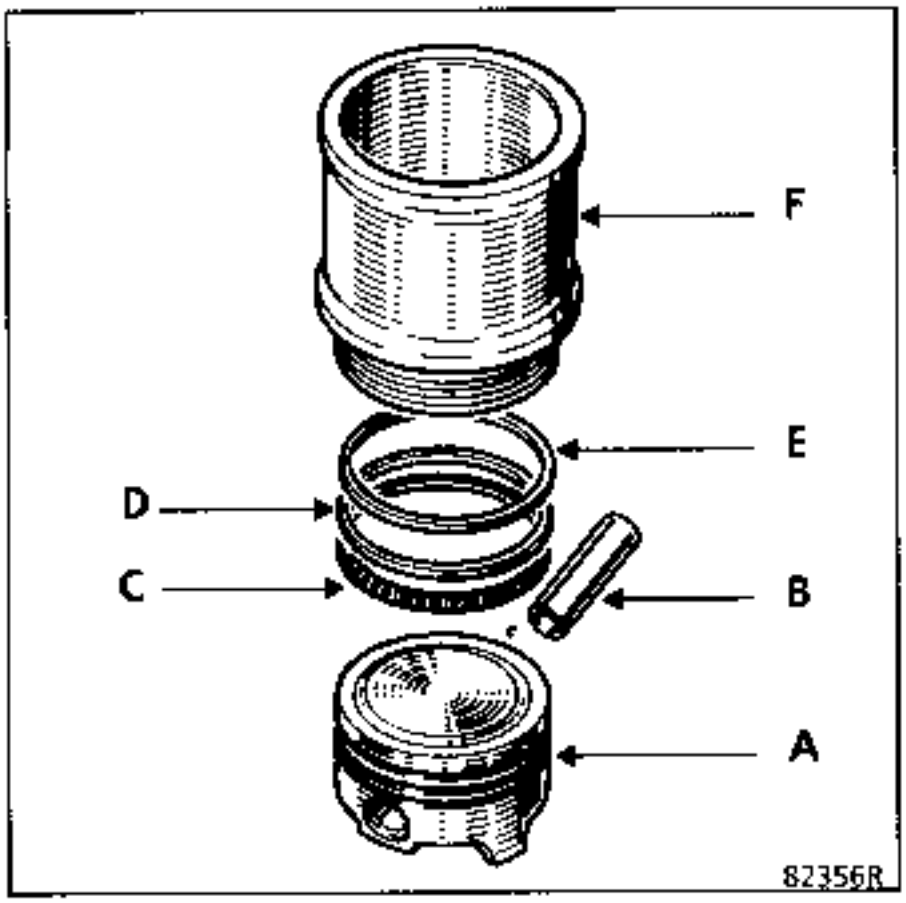
REPLACEMENT OF THE CYLINDER LINERS/PISTONS

The components in the cylinder liner - piston kit are supplied as matched sets.

Mark the parts in each box **A** to **F** to retain the matching of the components.

Dissolve the preservative coating: Solvent S56.

Do not scrape the parts.



CYLINDER LINER PROTRUSION

These engines are fitted with exelnyl cylinder liner base seals.

Seals are available in the following thicknesses:

PAPER SEALS (mm)
- blue : **0.087**
- white : **0.102**
- red : **0.122**
- yellow : **0.147**

VARNISHED SEALS (mm)
- red : **0.116**
- colourless : **0.136**
- blue : **0.166**

VARNISHED SEALS (mm)
- yellow : **0.216**
- red : **0.246**
- green : **0.276**

ATTENTION: CYLINDER LINER HEIGHT
With the cylinder liner base seals in position, the amount of cylinder liner protrusion above the cylinder block face should be:

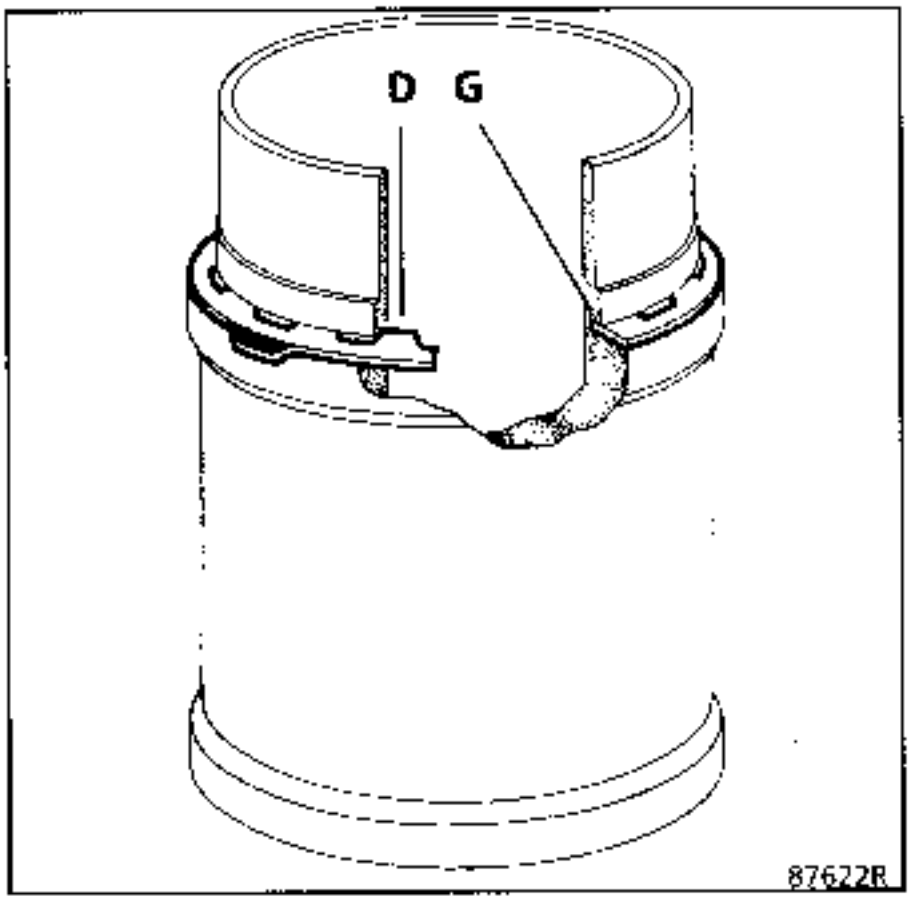
PAPER SEAL
- between **0.16 and 0.23 mm,**
- as close as possible to **0.23 mm.**

VARNISHED SEAL
- between **0.13 and 0.20 mm,**
- as close as possible to **0.20 mm.**

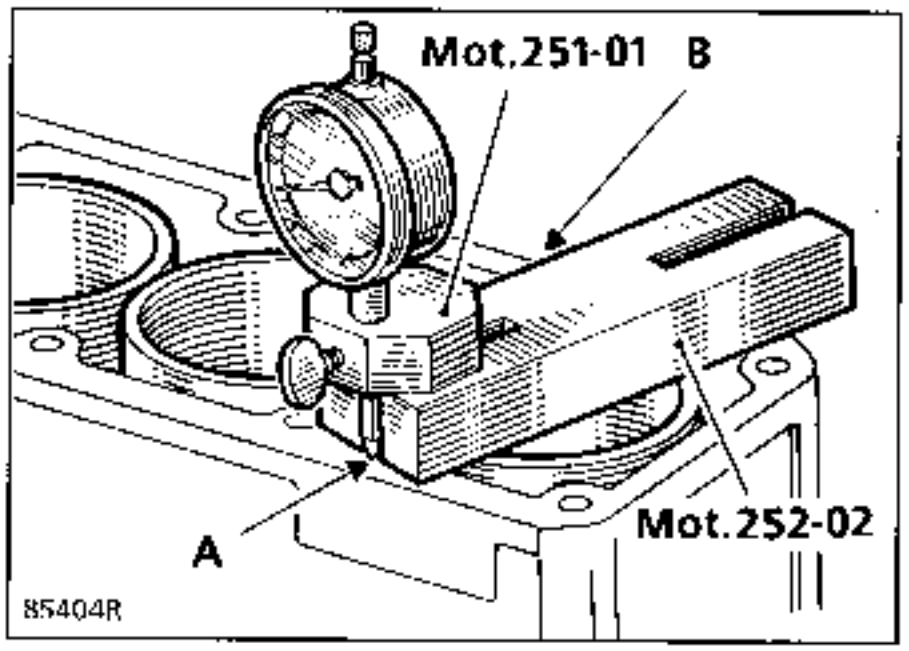
As the cylinder liners are new, there is no need to insert them at any particular angle.

Furthermore, it is possible to compensate in cylinder liner level by inserting the liner in different positions.

Fit to each cylinder liner a seal with a blue tag and bend castellation (**D**) into recess (**G**).



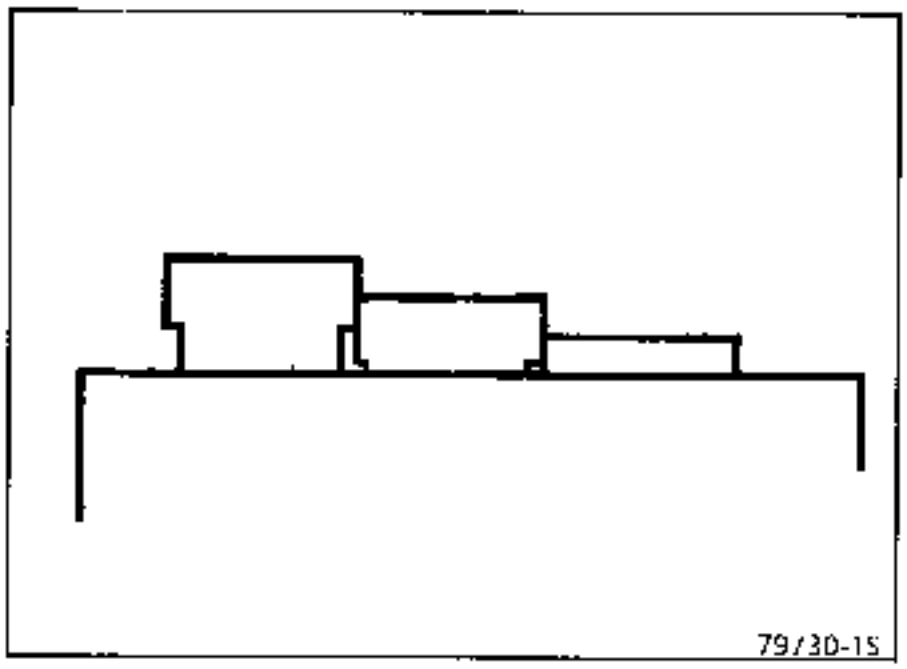
Check the cylinder liner protrusion for each liner at points (A) and (B) using the pressure plate **Mot. 252-01** and the support **Mot. 251-01** fitted with a dial gauge.



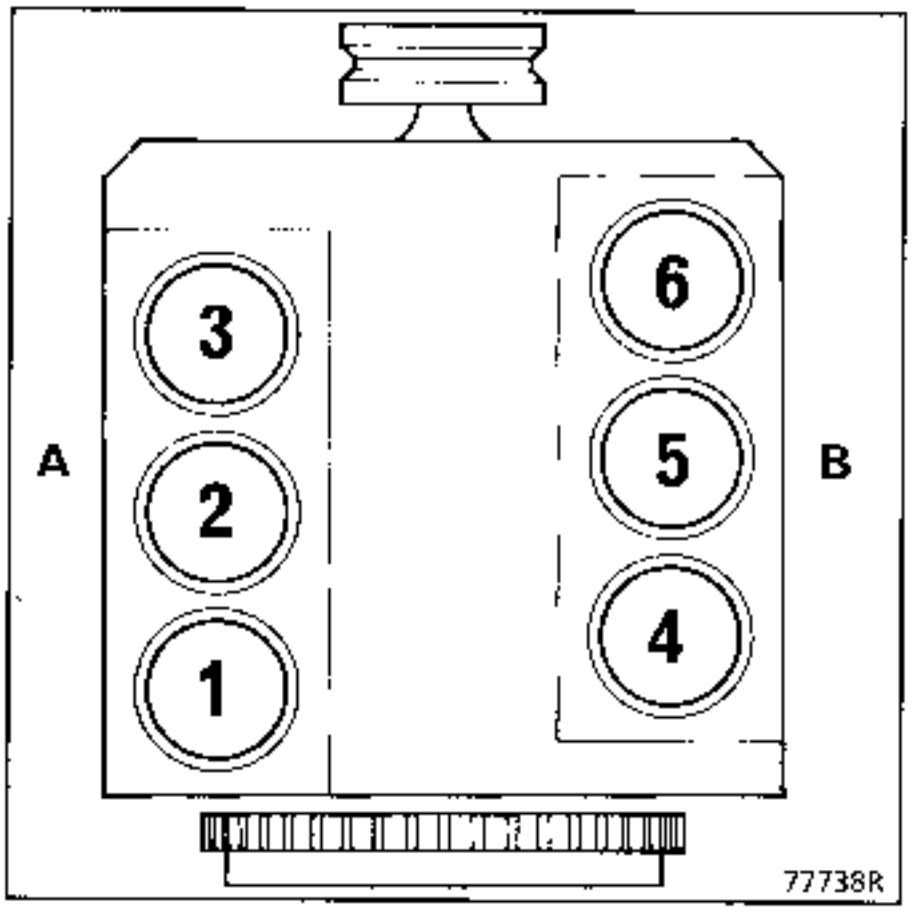
Insert the cylinder liners so that the base seal colour tags are visible.

Change the base seal thickness if necessary in order to position the cylinder liners so that:

- the difference in protrusion between any two adjacent cylinder liners does not exceed **0.04 mm** (within the permitted tolerance),
- any differences in the liner protrusion are stepped down from cylinder n° 1 to cylinder n° 3 (or from 4 to 6) or vice-versa.



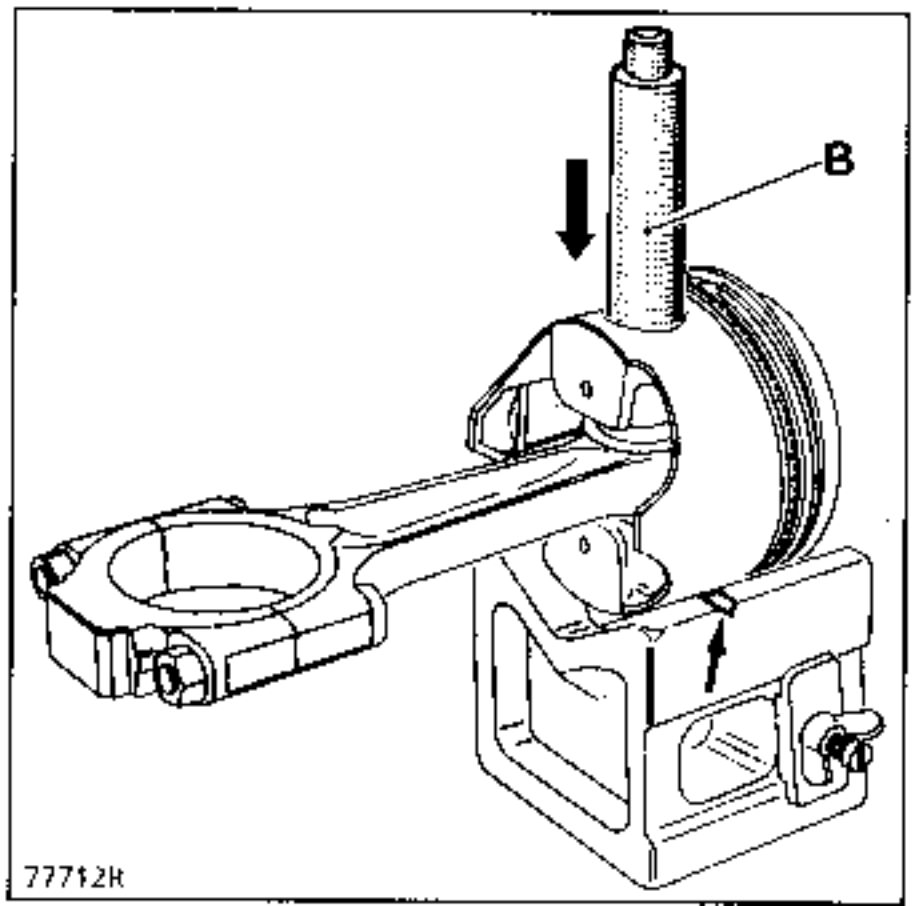
Once the correct positions have been obtained, regroup the assemblies A, B, C, D, E and F, and then number the cylinder liners, the pistons and the gudgeon pins from 1 to 6 (number 1 at the flywheel end) so that they match the corresponding connecting rod.



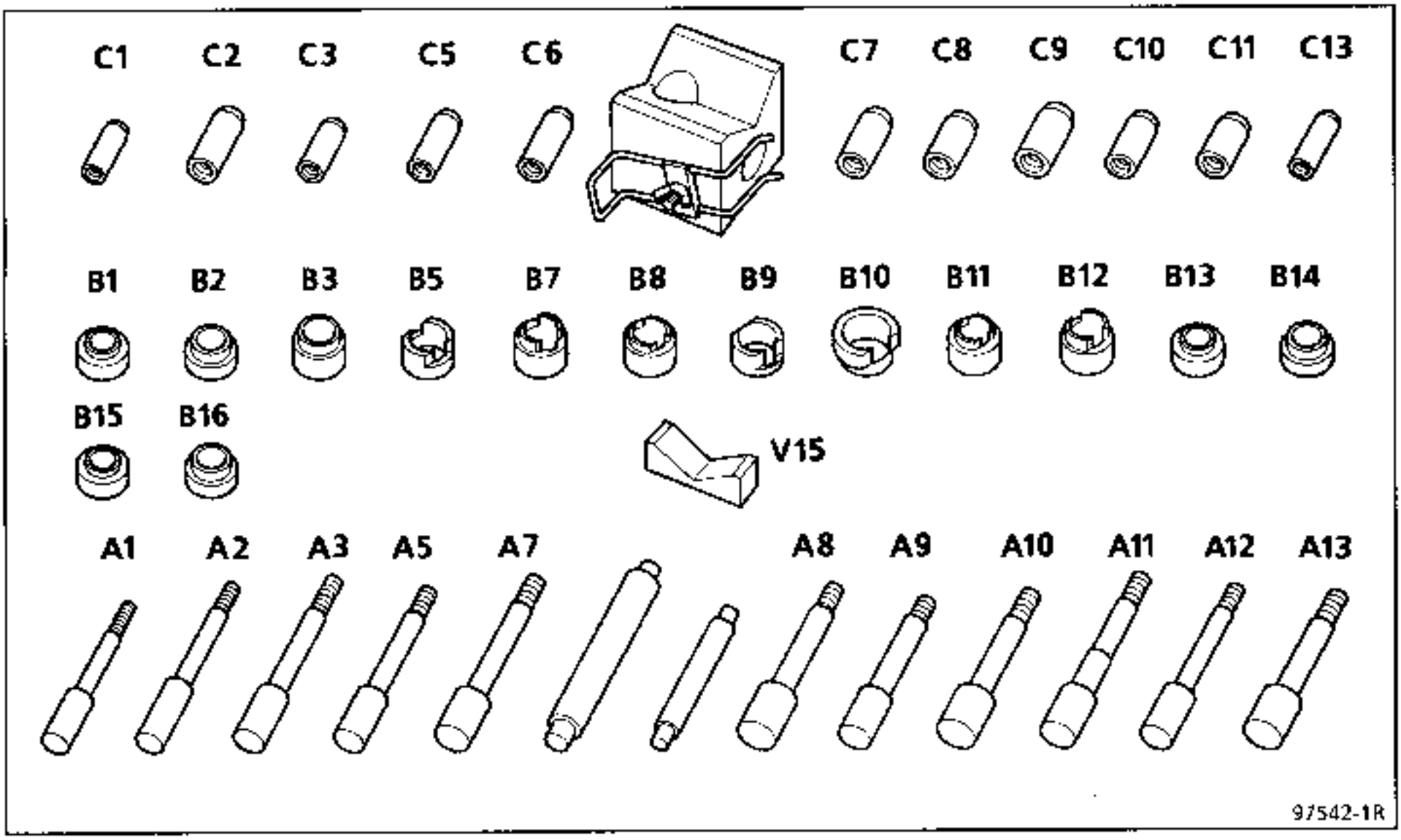
REMOVING THE GUDGEON PINS

The following tools are required:
- the piston support block,
- the gudgeon pin extraction mandrel (large diameter).

Place the piston in the "V" of the support base, with the gudgeon pin aligned with the extraction hole (two lines indicate the centre of the hole to facilitate this alignment).
Remove the gudgeon pin with the extraction mandrel under a press.



USING KIT MOT. 574-20



Engine type	Gudgeon pin outside diameter in mm	Gudgeon pin bore in mm	Tool Mot. 574-20		
			Gudgeon pin	Thrust pad	Centring guide
Z7U	25	15	Mounted fully floating		
Z7V	23,5	14	A7	B7	C8
Z6W	23,5	15	A8	B8	C8
Z7W except 702	25	15	Mounted fully floating		
Z7W 702	23,5	15	A8	B8	C8
Z7X	25	13,5	Mounted fully floating		

PREPARING THE CONNECTING RODS

Check:

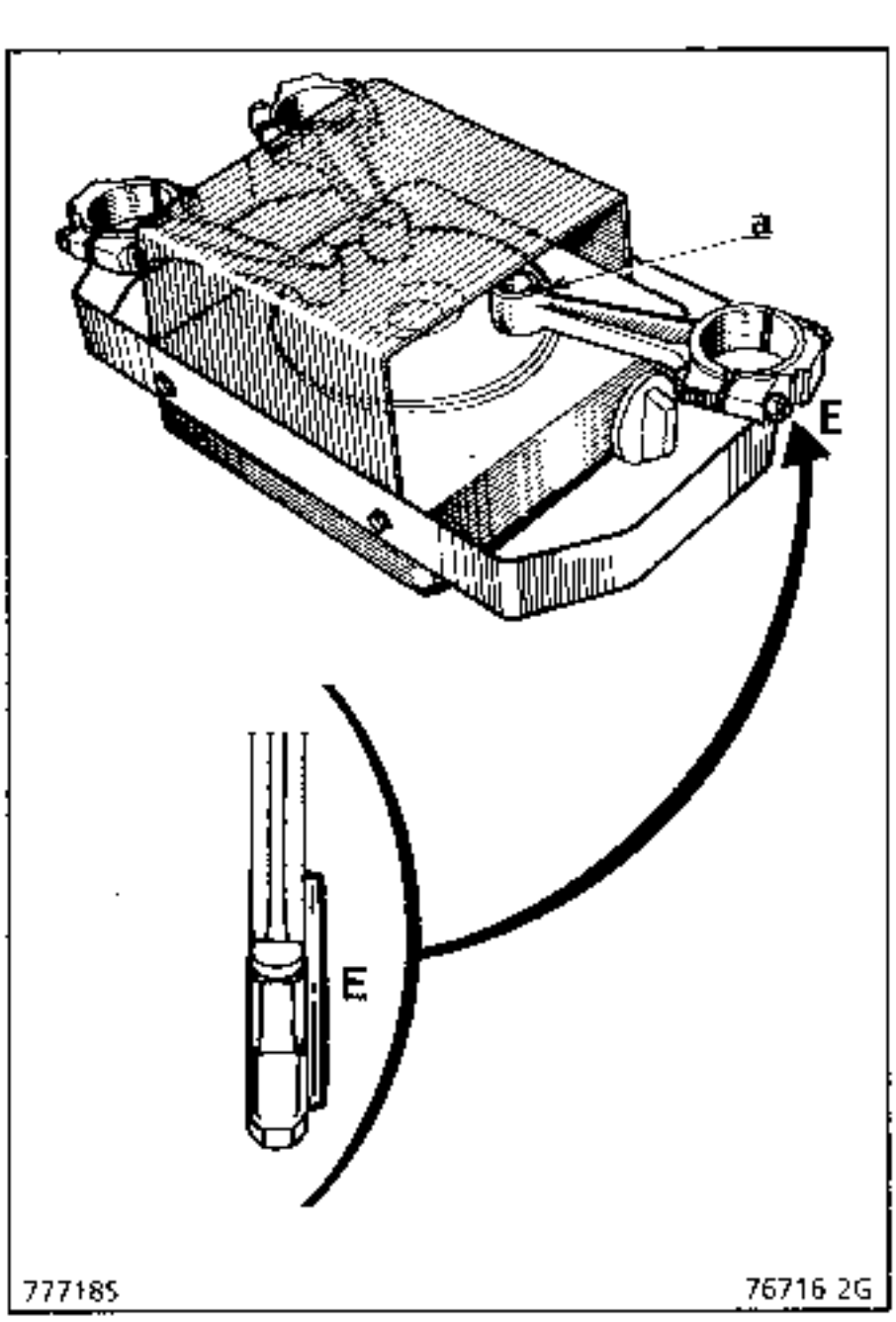
- the condition of the connecting rods (bent or twisted),
- the mounting faces of big end bearing caps and connecting rods (if necessary remove any burrs with an oilstone to obtain smooth faces).

Use a **1500 W** hotplate (see MR 500).

Place the small ends of connecting rods 1, 2 and 3 on the hotplate with raised flange (E) towards the bottom.

Check that each connecting rod small end sits squarely in contact with the hotplate.

As a temperature guide place a small piece of soldering tin wire with a melting point of approximately **250° C** on each small end at (a).



777185 76716 2G

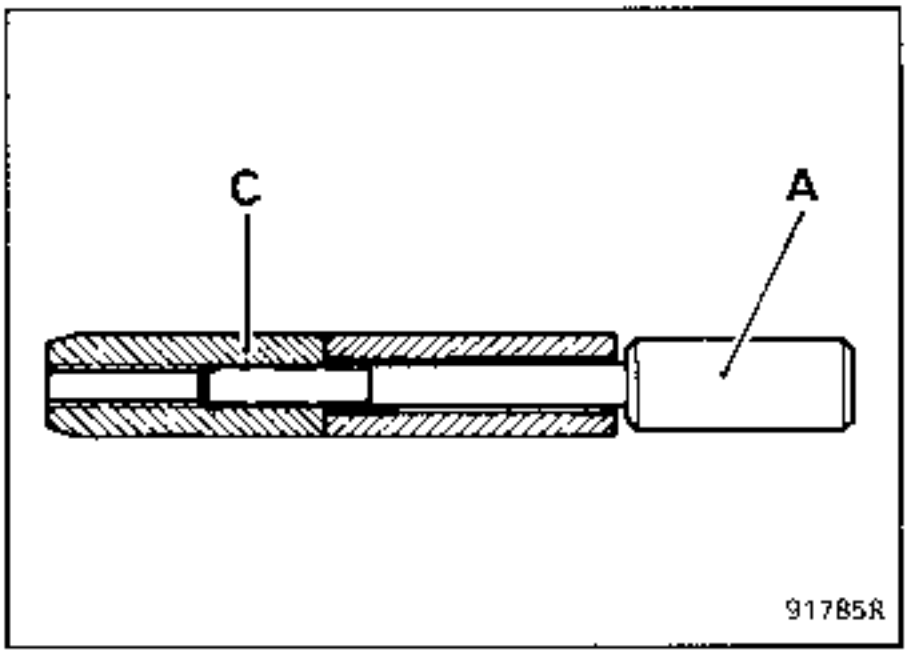
Heat up the connecting rod small ends until the soldering wire begins to melt.

PREPARING THE GUDGEON PINS

Check that each gudgeon pin rotates freely in its corresponding new piston.

Fit the gudgeon pin to the fitting mandrel: do not tighten the mandrel, the gudgeon pin must be able to float freely between the mandrel head (A) and the centring guide (C).

Thoroughly lubricate the assembly with engine oil.



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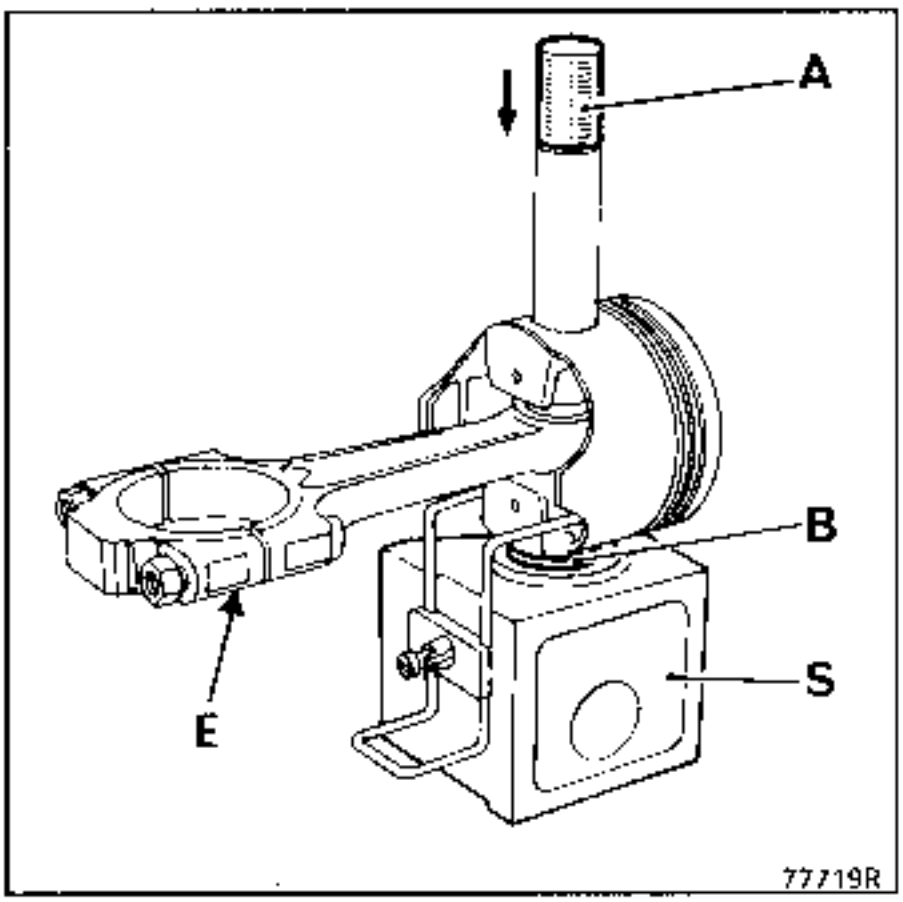
ASSEMBLING CONNECTING RODS AND PISTONS FOR BANK A

Place the thrust pad (B) over support base (S) and clamp the piston to the support base with the retaining clip, with the arrow facing towards the top. **The spotfacing on the piston must rest against the thrust pad**.

The following operations must be carried out as quickly as possible so that the heat loss is reduced to a minimum.

- Wipe off the soldering tin droplets,
- Insert the centring guide (C) into the piston,
- With one hand insert the connecting rod into the piston (raised flange (E) towards the bottom),
- With the other hand, press in the gudgeon pin quickly until the guide touches the support face



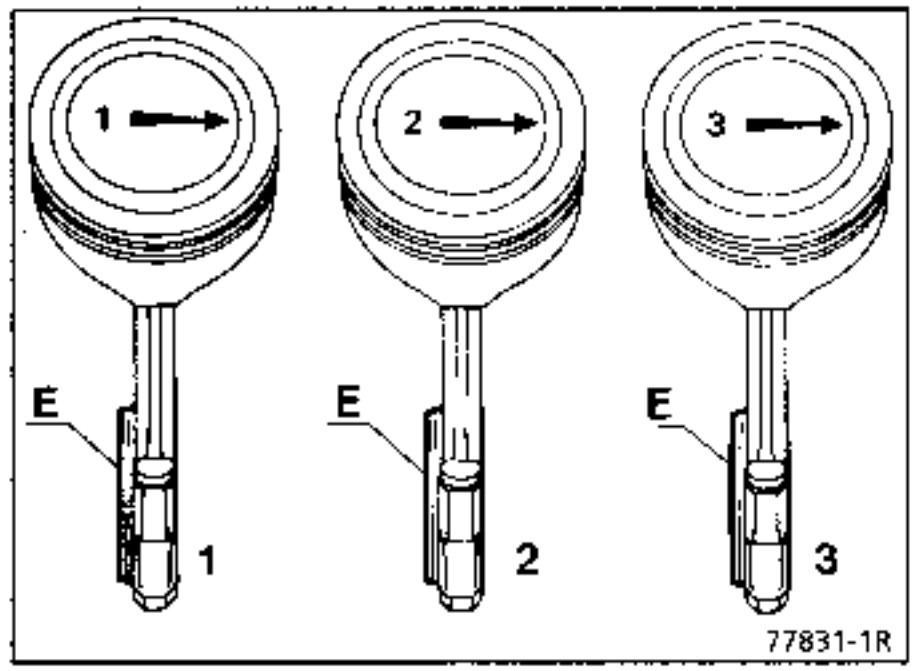
After a few moments, remove the connecting rod - piston assembly from the support base, unscrew the guide and remove the mandrel.

Check that the gudgeon pin ends are below the piston skirt on both sides, in any position of the connecting rod in the piston.

Assemble the two other connecting rods in the same way.

Mark the three assemblies in a convenient manner so that they can be immediately recognised as belonging to cylinder bank A.

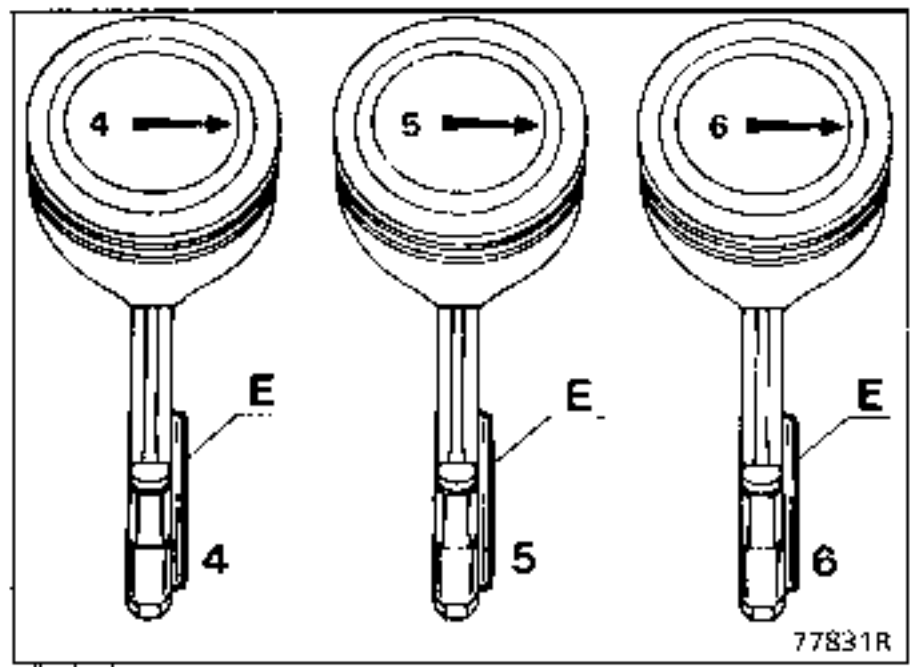
Reminder: the raised flange on the big ends must be opposite the "AV" mark in the piston crown.



ASSEMBLING CONNECTING RODS AND PISTONS FOR BANK B

Place the small ends of connecting rods 4, 5 and 6 onto the hotplate, evenly spread, **WITH THE RAISED FLANGE** on the big end **TOWARDS THE TOP**.
Place the piston over support base (S) with the arrow in the piston crown facing towards the top.
Mark the three assemblies in a convenient manner so that they can be immediately recognised as belonging to cylinder bank B.

Reminder: the raised flange on the big ends must be on the same side as the "AV" mark in the piston crown.



ASSEMBLING PISTONS AND LINERS

Fitting the piston rings

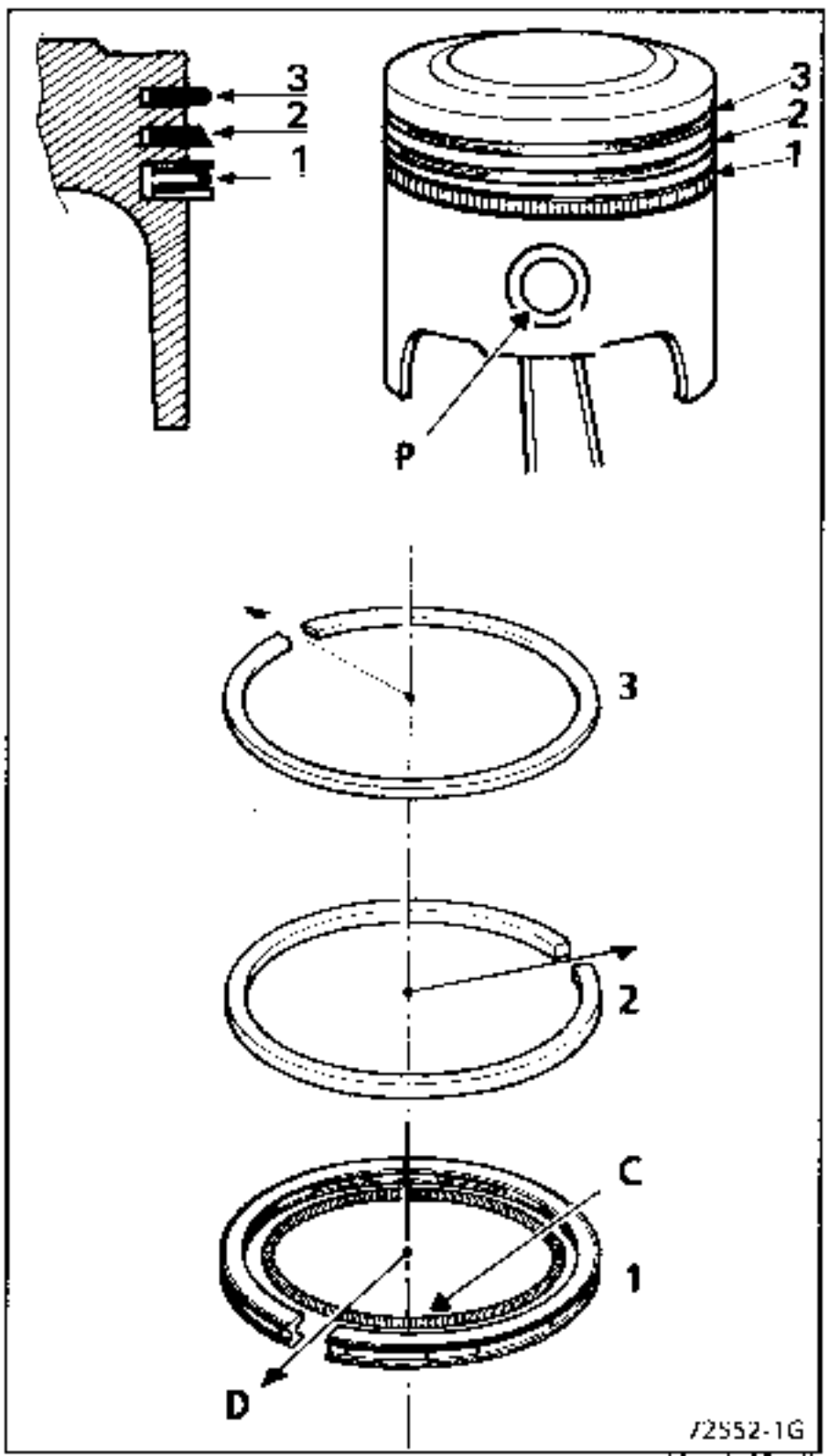
The gaps of the piston rings have been set in the factory - they should move freely in their grooves.

The piston ring faces marked "Haut - Top" must face towards the combustion chambers.

1 Oil scraper ring:
- gap (C) of the expander ring in line with the centre of gudgeon pin (P),
- gaps (D) on the side rails offset about **20 to 50 mm.**

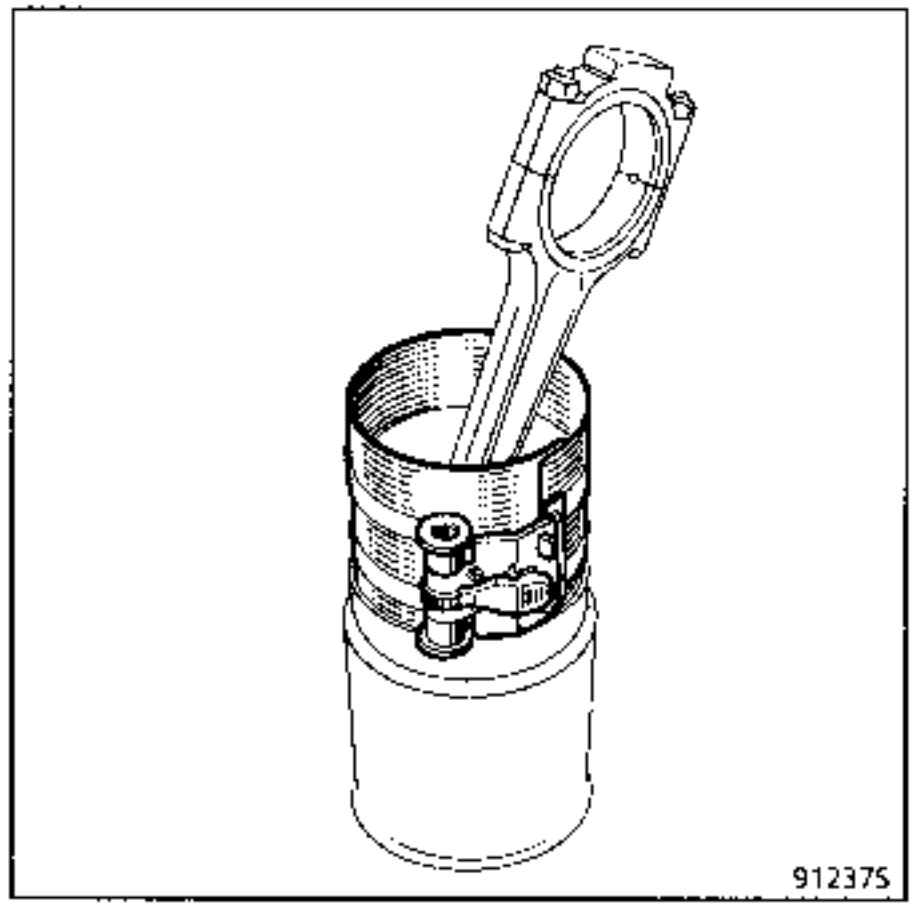
2 Taper compression ring — Spaced evenly at 120° from the expander ring gap

3 Top ring



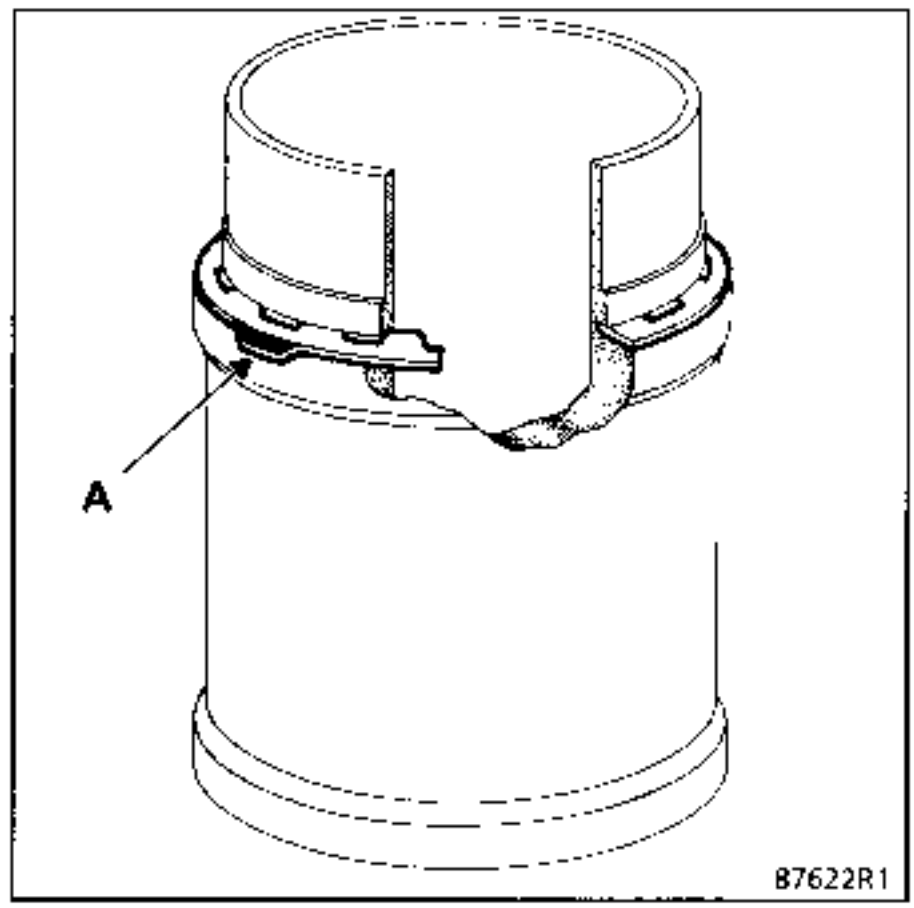
Lubricate the pistons.

Fit the connecting rod - piston assemblies into their respective cylinder liners using the piston ring tool (Type FACOM 750 TB).



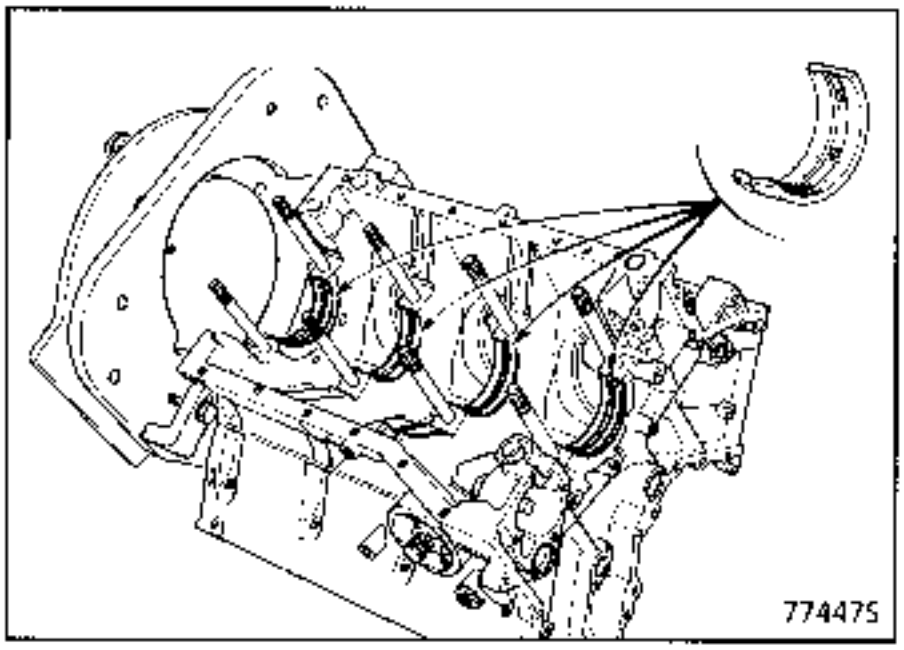
Fit the bearing shells into the big ends.

Carefully cut off the thickness identification tag (A) of the cylinder liner base seal.



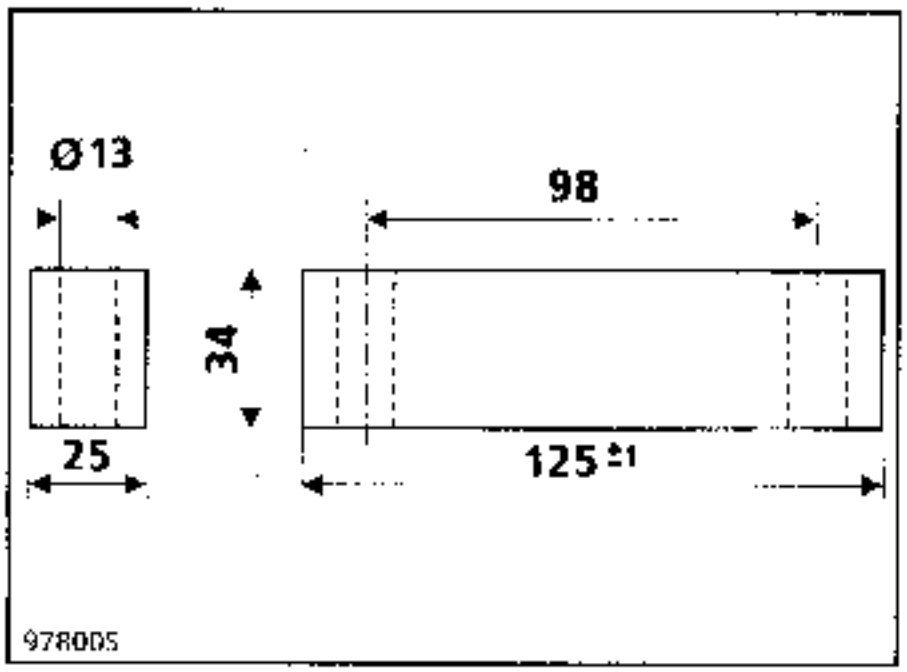
Refitting:

Fit the main bearing shells (locating tabs in their locations):
- shells with oil grooves are fitted in the cylinder block,
- shells without oil grooves are fitted to the main bearing caps.

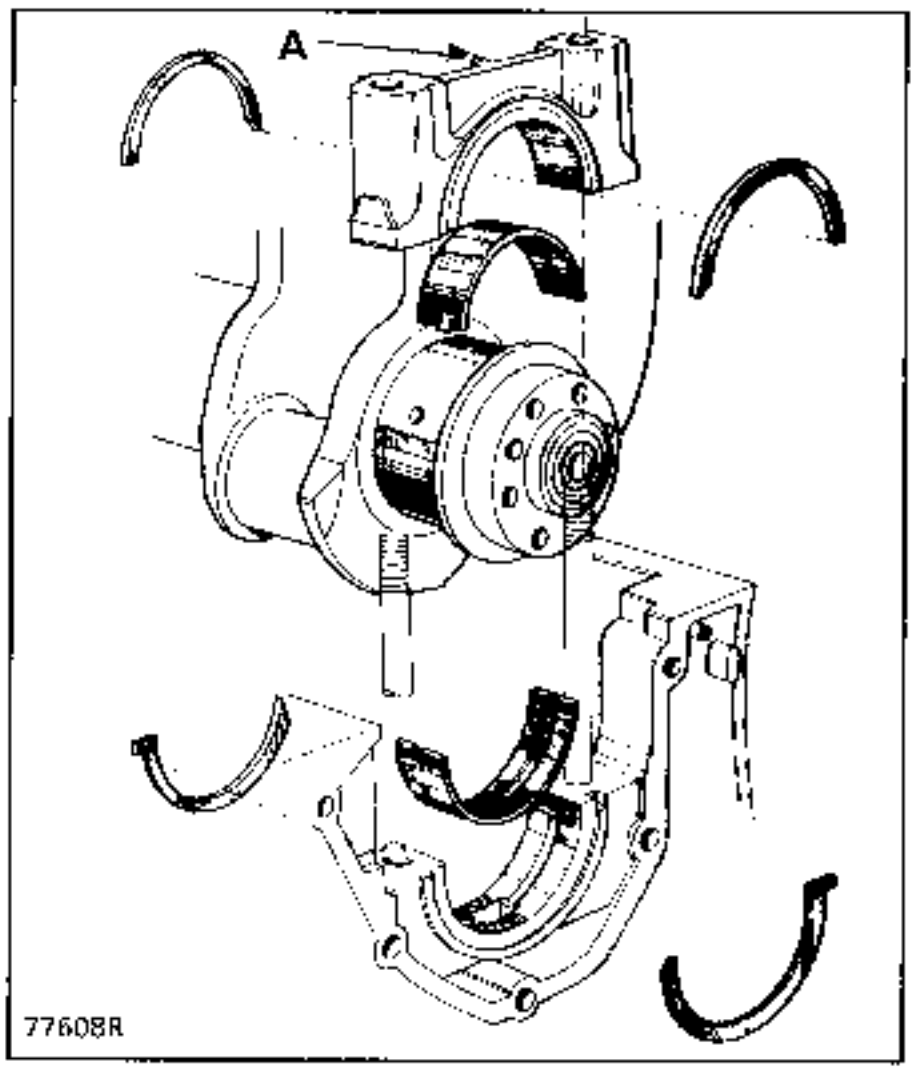


- the crankshaft,
- the nominal size upper thrust half washers **(2.30 mm)**, with the oil grooves facing the crankshaft flange,
- the lower thrust half washers, with the copper coated faces and the oil grooves facing the crankshaft flange,
- the front and rear main bearing caps, with boss (A) facing the timing gear end.

Fit retaining clamps **Mot. 590** astride the main bearing caps (or make a tool locally following the diagram below)



Dimensions in mm.

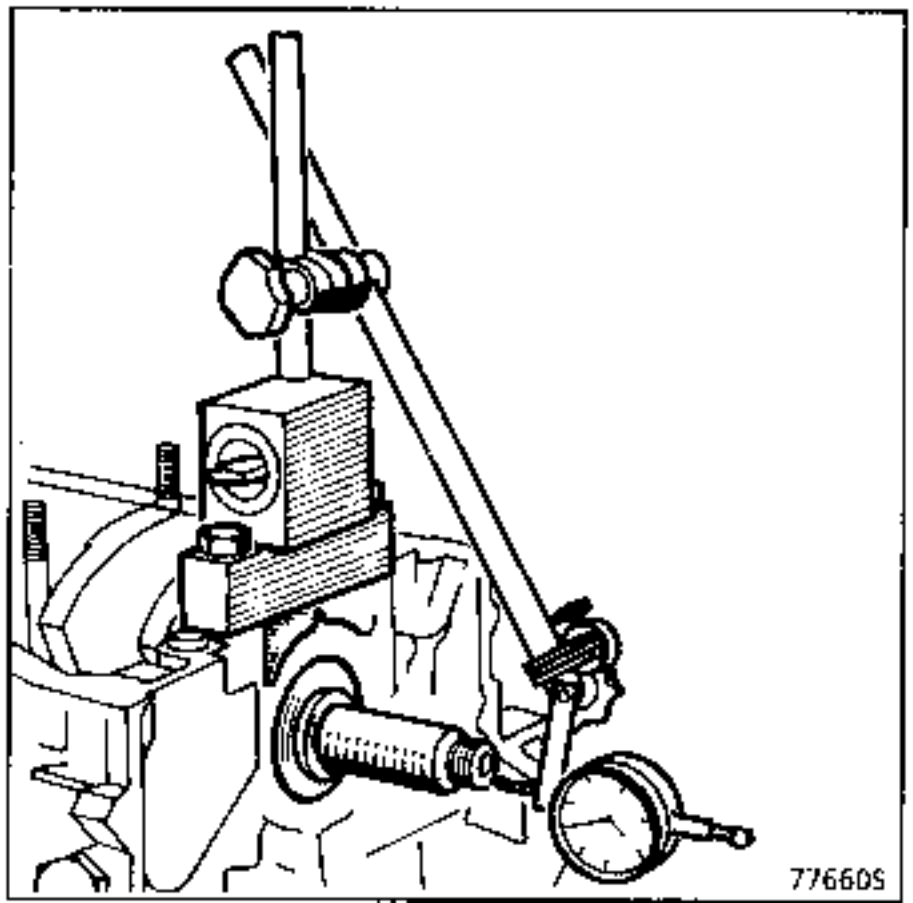


Place a dial gauge on the end face of the crankshaft and zero the gauge, with the crankshaft pushed towards the clutch end.

Fully push the crankshaft towards the timing end.

Read off the endplay, it should be between **0.07 mm and 0.27 mm.**

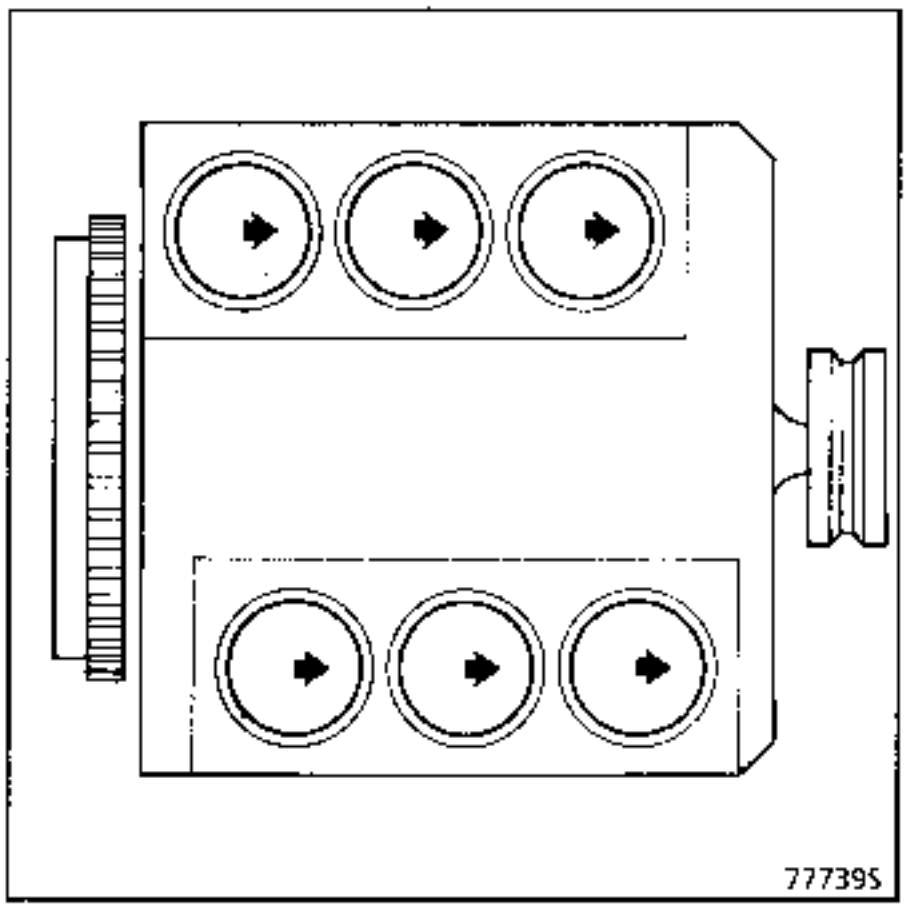
If the endplay is not correct, replace the thrust washers.

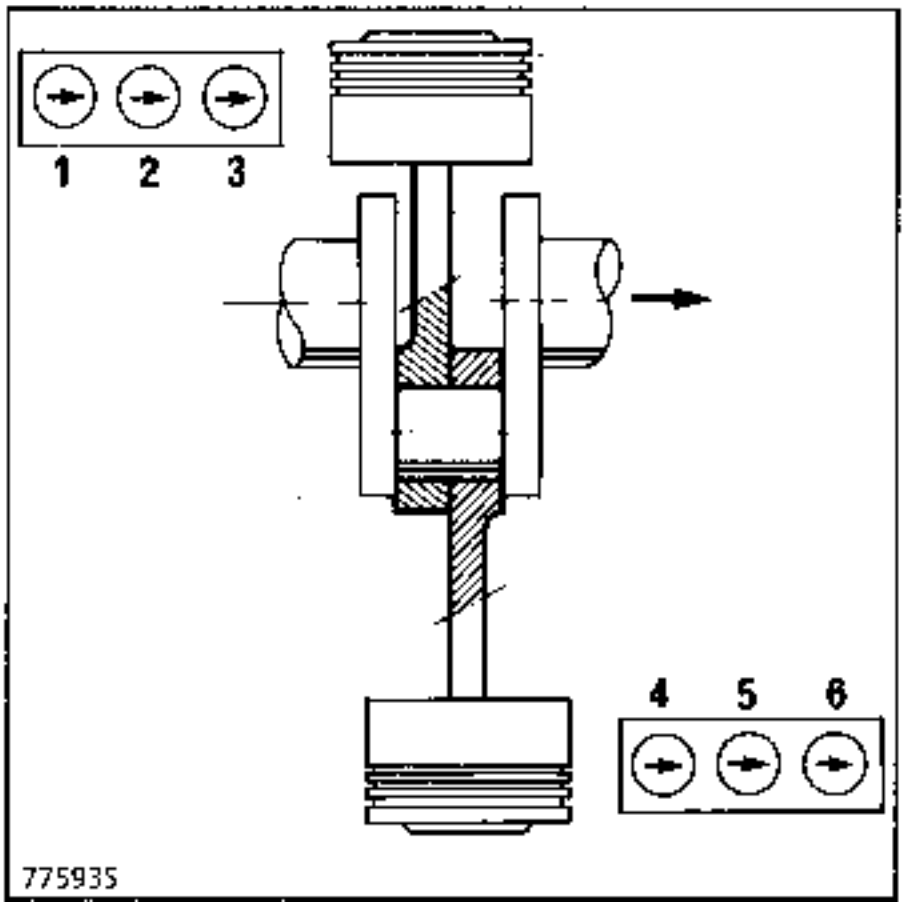


Fit the liner - piston assembly.

REMINDER

Fit assembly N° 1 into the cylinder block (arrow on piston **ON TIMING SIDE**).





Fit the main bearing cap with the bearing shell.

Align the corresponding marks on the bearing cap and the connecting rod .

Hand tighten the two new nuts.

Immobilise the first liner using a retaining strap.

Carry out the same operations for assemblies N° 2 - 3 - 4 - 5 and 6 immobilising each liner as it is fitted.

Torque tighten the connecting rod nuts to **4.5 daN.m.**

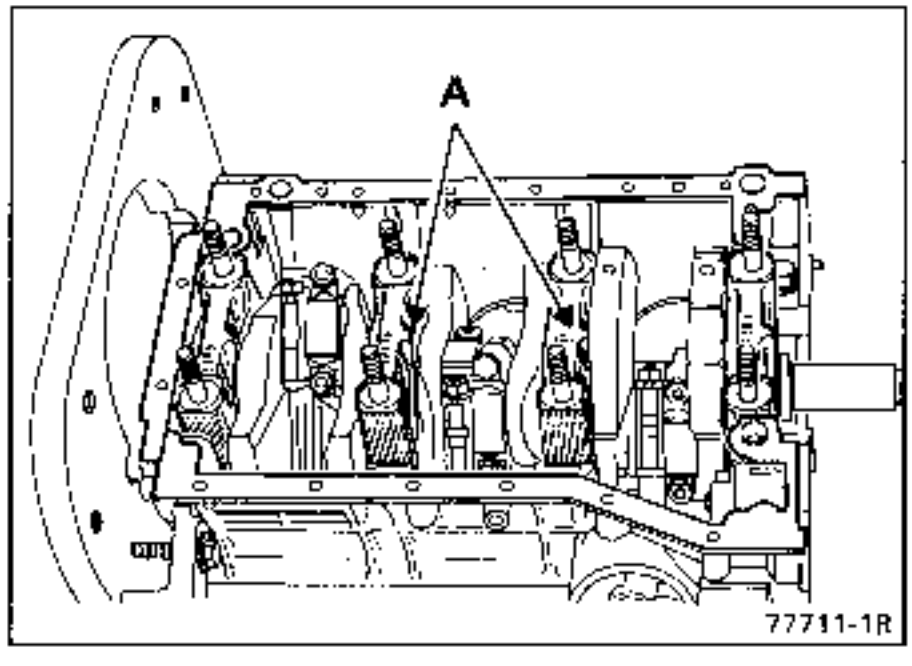
Check the moving assembly moves correctly.

Remove the retaining clamps **Mot. 590** or the locally made tool.

Refit:

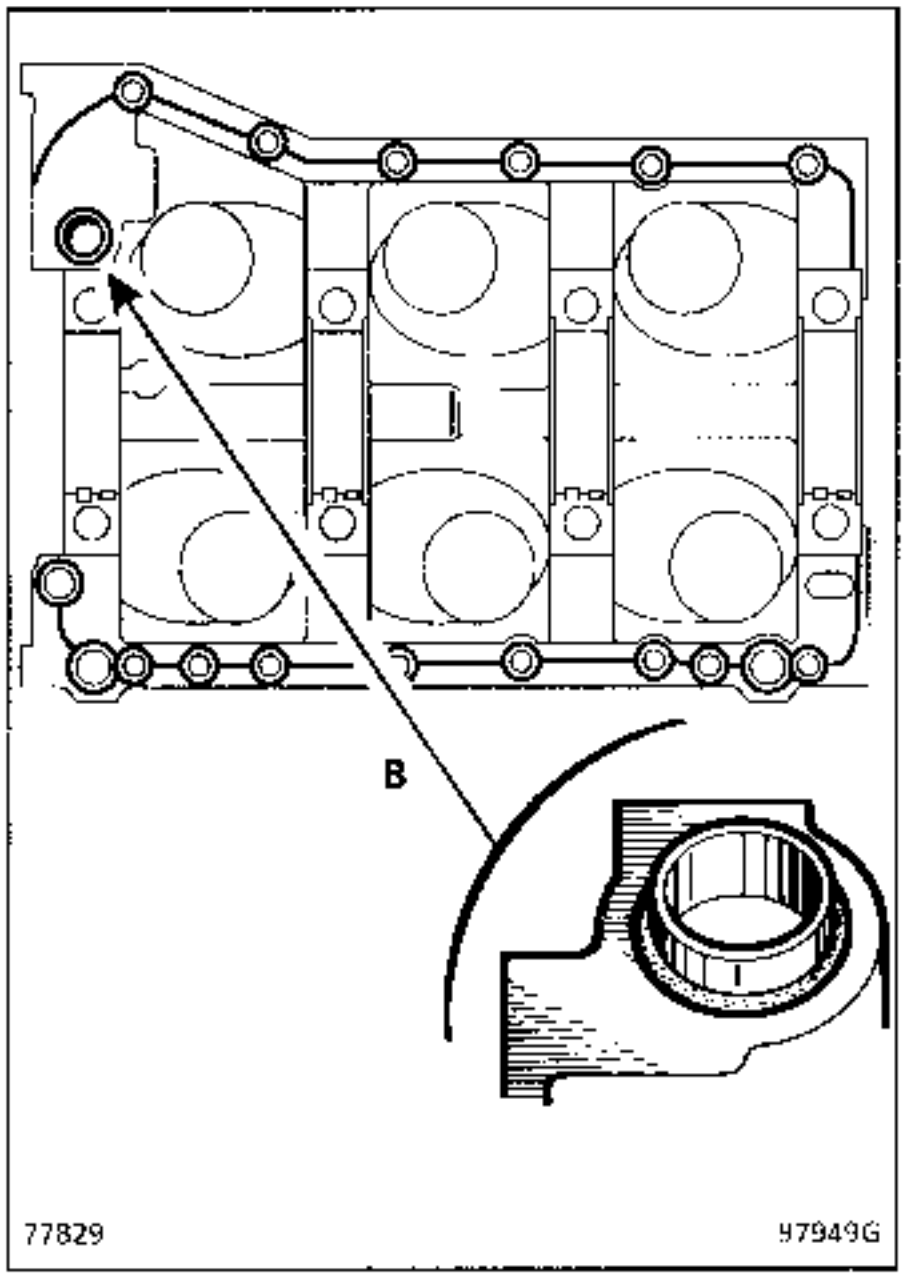
- the intermediate bearing caps with boss (A) facing towards the timing cover,

- the rear oil seal carrier, fitted with its oil seal. If necessary trim the gasket between the carrier and the cylinder block with a knife or apply a bead of **Loctite 518** (depending on version) and hand tighten the bolts.



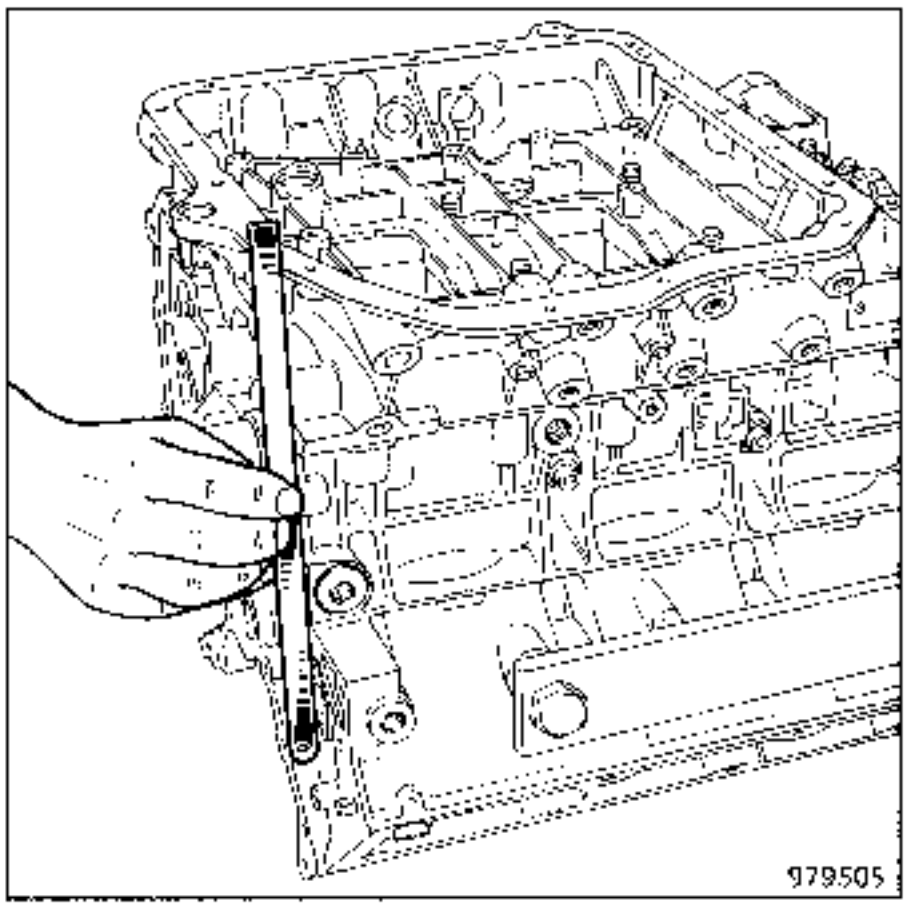
- fit a new O ring to the oil inlet pipe at (B),

- Coat the assembly face with **Rodorseal 5661.**



- refit the bearing casing.

It is essential that the bearing casing and the cylinder block be correctly aligned at the **TIMING END** in order to avoid distortion of the clutch housing when fitting the gear box.



Refit:

- the flat washers (boss under nut) and the main bearing cap nuts without tightening,
- the bolts around the bearing casing, without tightening.

Tighten the 8 nuts to the correct torque in the sequence shown.

Place graduated disc **Mot. 591-04** between the torque wrench and the socket.

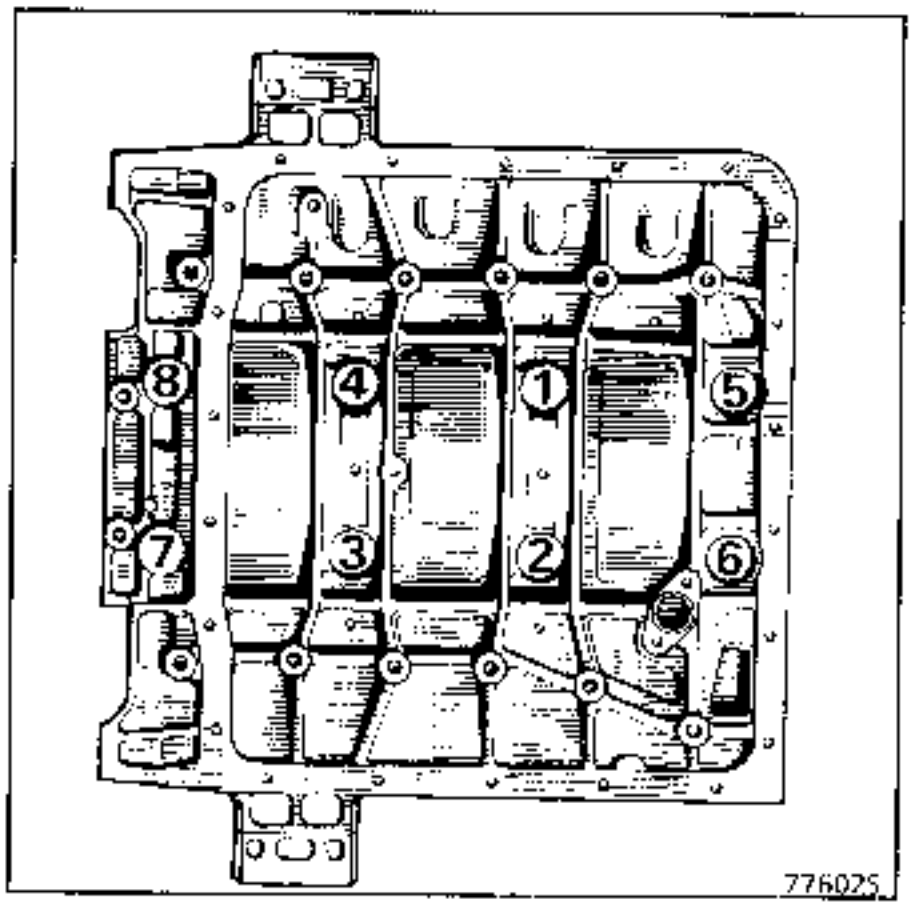
Turn the graduated disc clockwise until the locking stem rests against a solid part of the engine which prevents the disc from turning.

Pre-tighten to **3 daN.m** then:

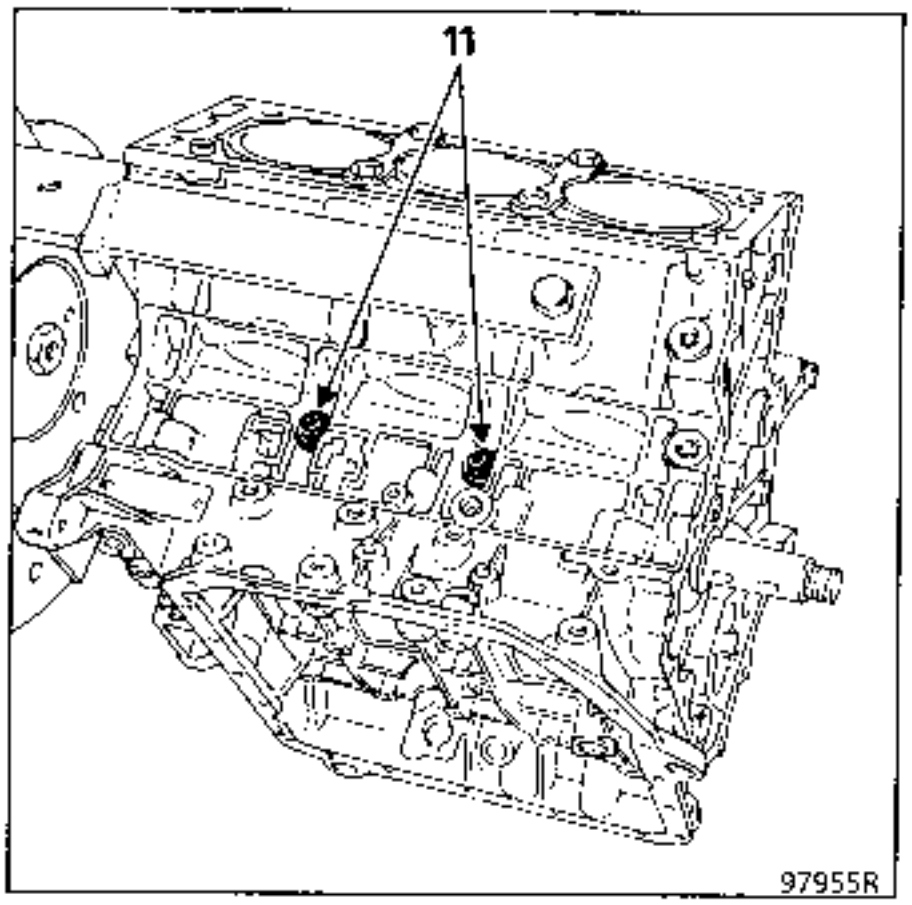
- Adjust the moving pointer to the angular tightening value: **75°** for the main bearing cap nuts,

- Tighten the nuts until the moving pointer reaches the **0 mark.**

Repeat the operation on each main bearing cap in the sequence shown.

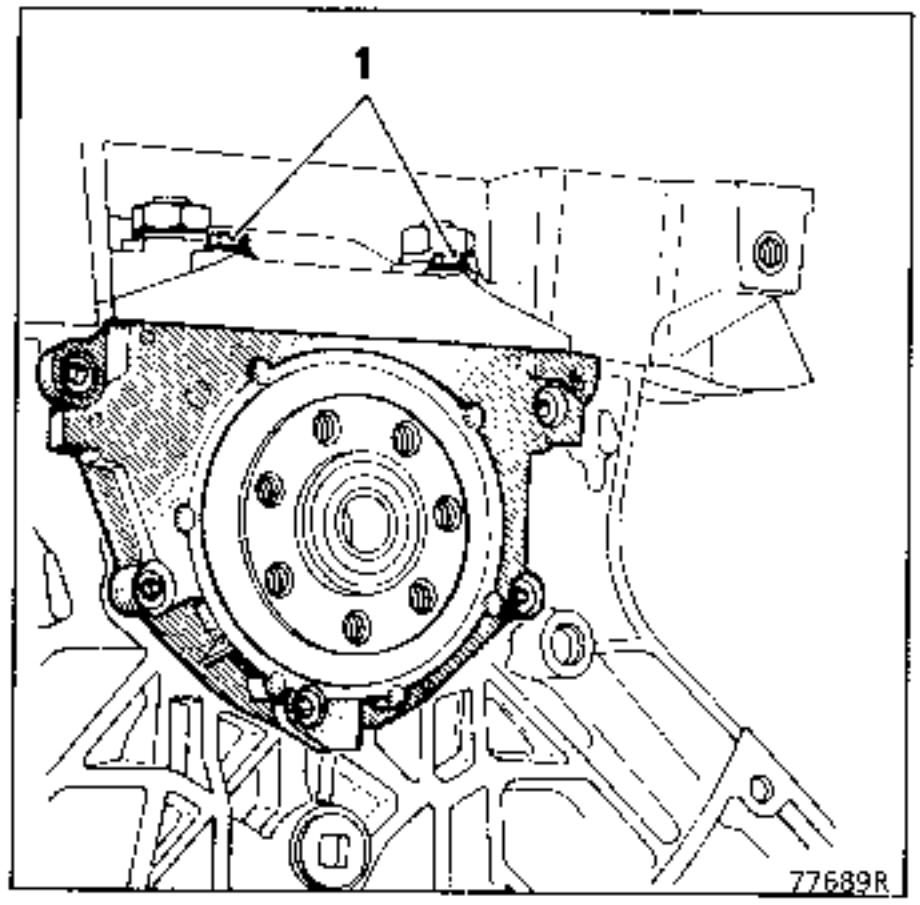


Refit the two bolts (11) (if the engine is fitted with them).



REAR OIL SEAL CARRIER

First tighten the lower mounting bolts (1) then the 5 hexagonal socket head bolts.

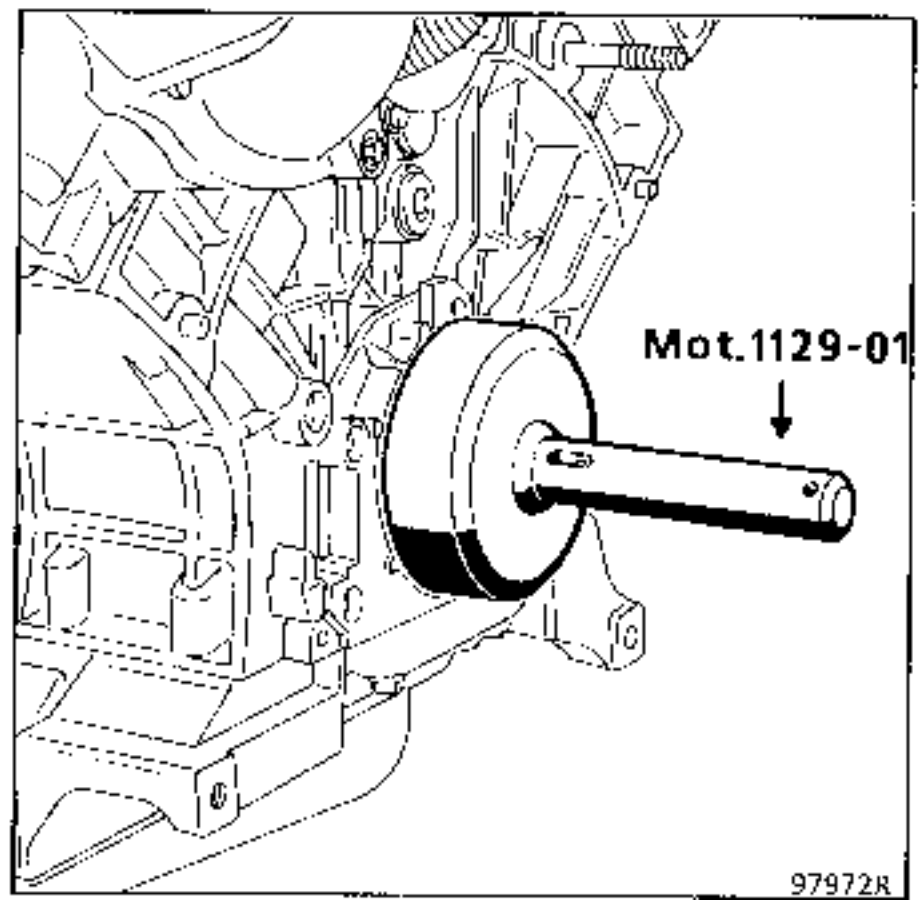


Lubricate a new oil seal and fit it onto tool **Mot. 1129-01.**

Take extreme care when fitting the oil seal as the oil seal lip is delicate.

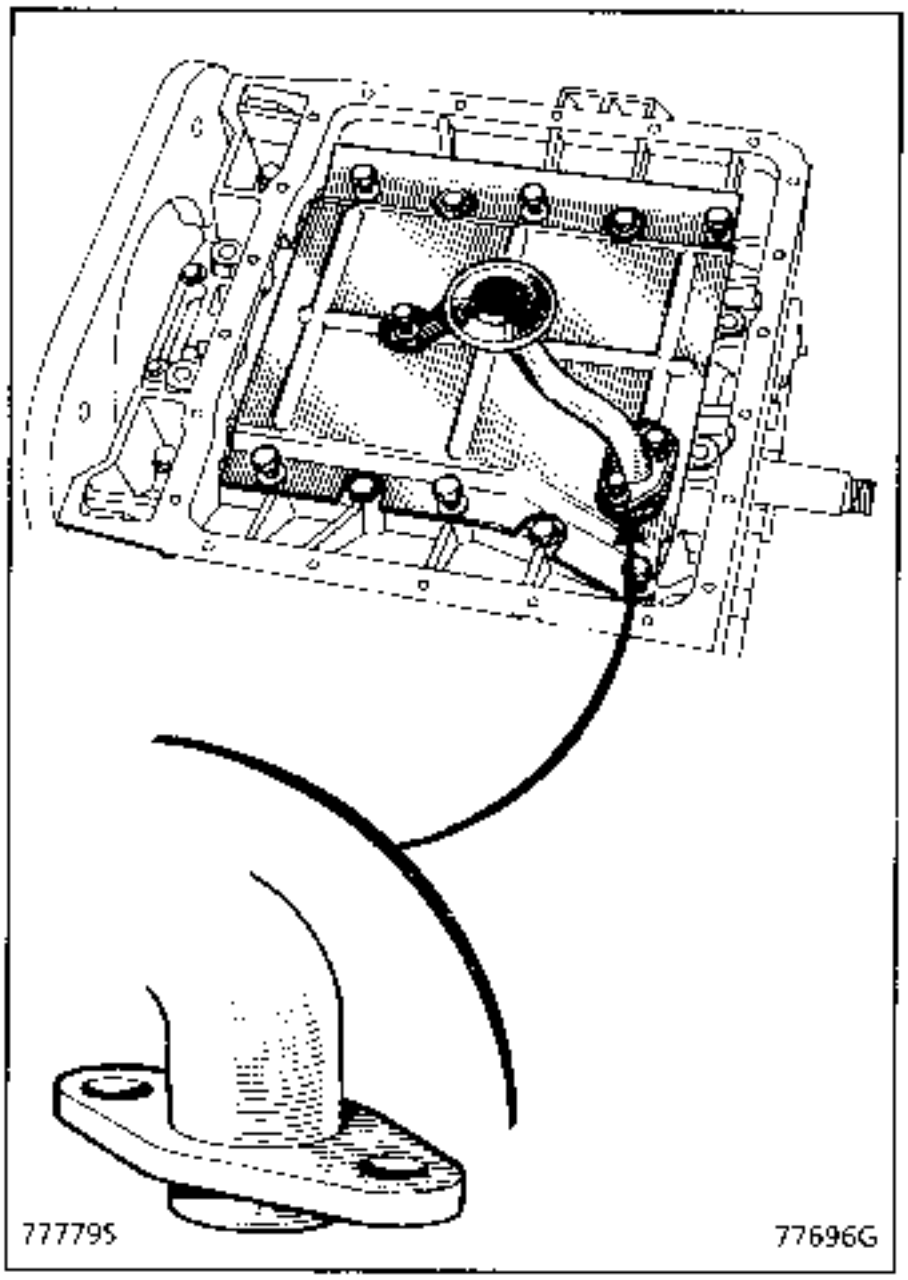
Locate the oil seal by tapping on the end of the tool.

Remove the tool by pulling and turning it at the same time.



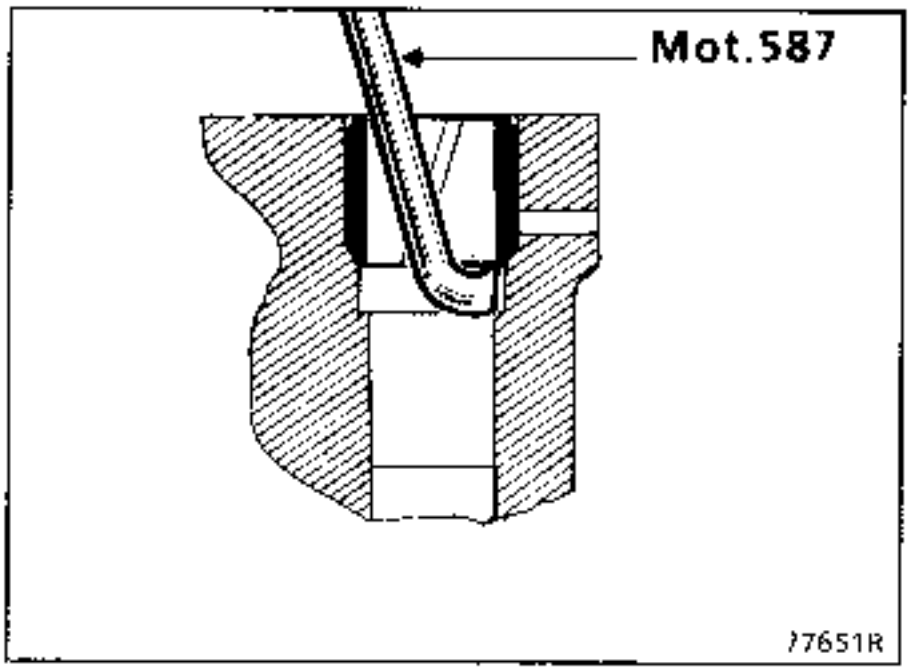
Refit:

- the anti-emulsion plate,
- the strainer fitted with a new O ring,

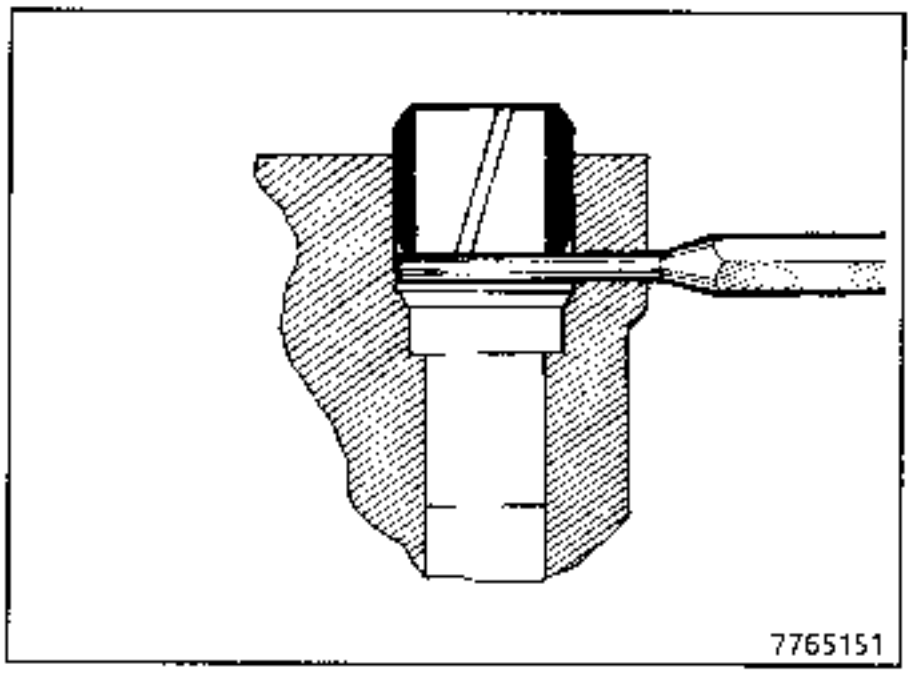


- the sump, fitted with a new gasket or a bead of **Rhodorseal 5661** (depending on version).

Refit the cylinder head centring dowels using extractor **Mot. 587** if necessary.

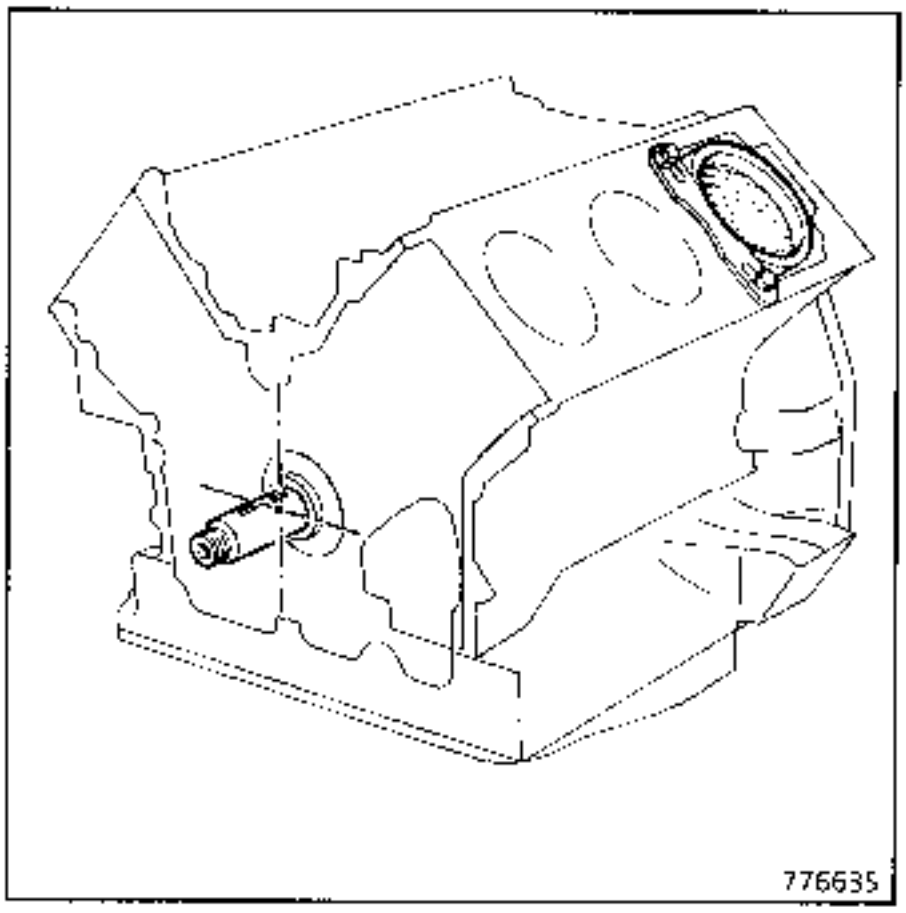


Set the dowels to the correct height using a 3 mm roll pin punch.



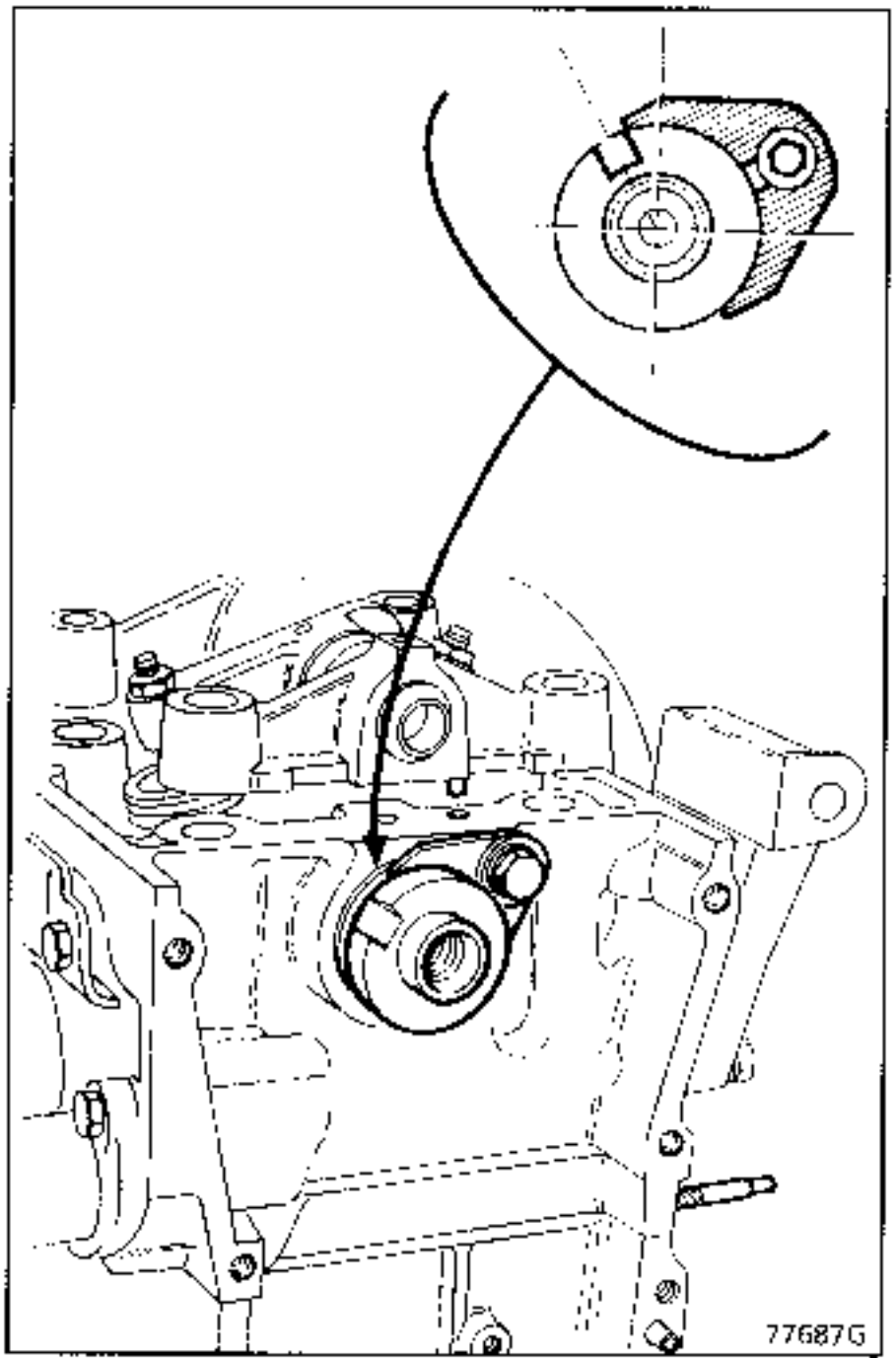
Refit the cylinder heads.

To enable the timing to be set, the crankshaft should be positioned with the keyway uppermost, which corresponds to piston N° 1 , 15 mm before TDC in order to avoid any contact with the valves.



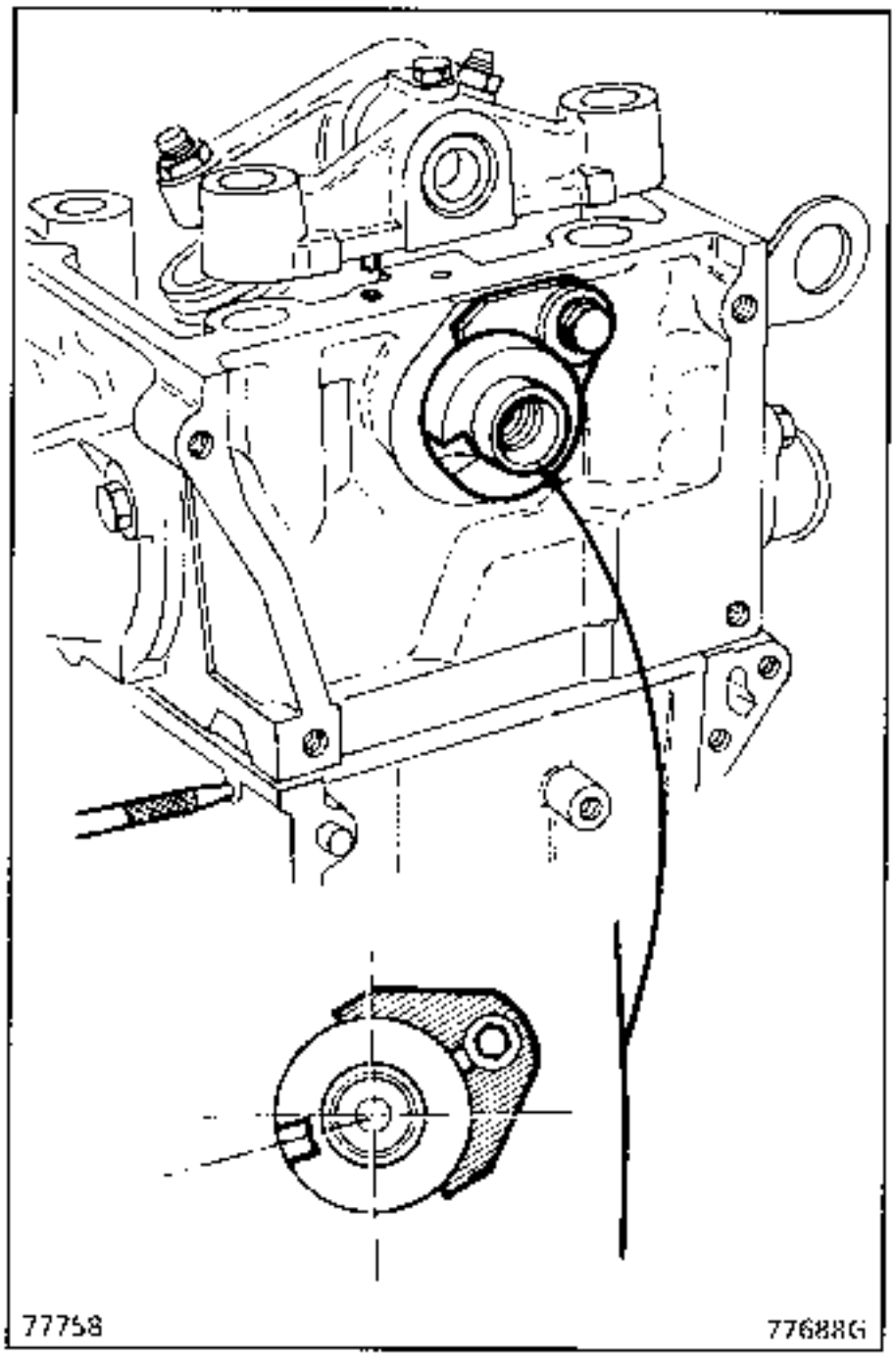
BANK A CYLINDER HEAD

Position the camshaft for bank A so the rocker arms for cylinder N° 1 are in the "rocking" position (shown on diagram below).



BANK B CYLINDER HEAD

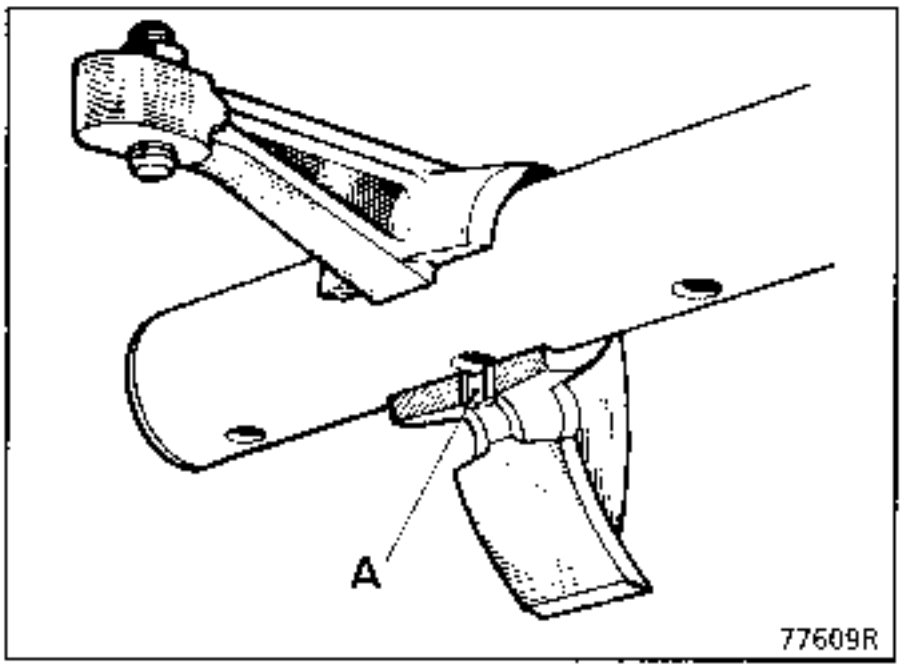
Position the camshaft for bank B so the rocker arms for cylinder N° 6 are in the "rocking" position (shown on diagram below).



ROCKER SHAFTS

The rocker shaft assemblies for cylinder banks A and B are identical; they match their respective cylinder heads by turning the complete assembly round.

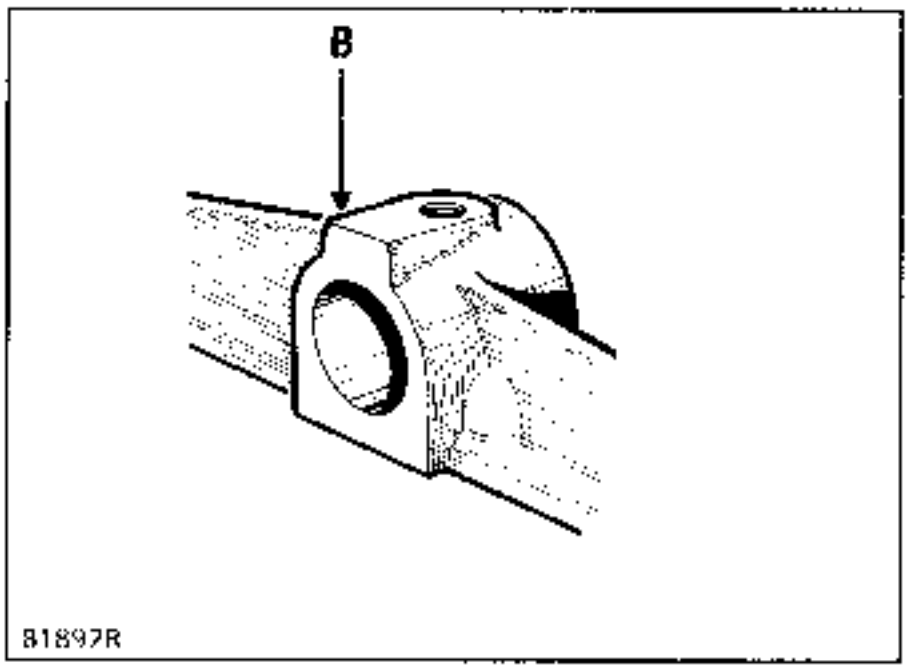
The fitting direction of the rocker shaft must not be reversed as oil feed holes (A) for the rocker arms will be obstructed: always fit the rocker shafts with the holes facing towards the bottom.



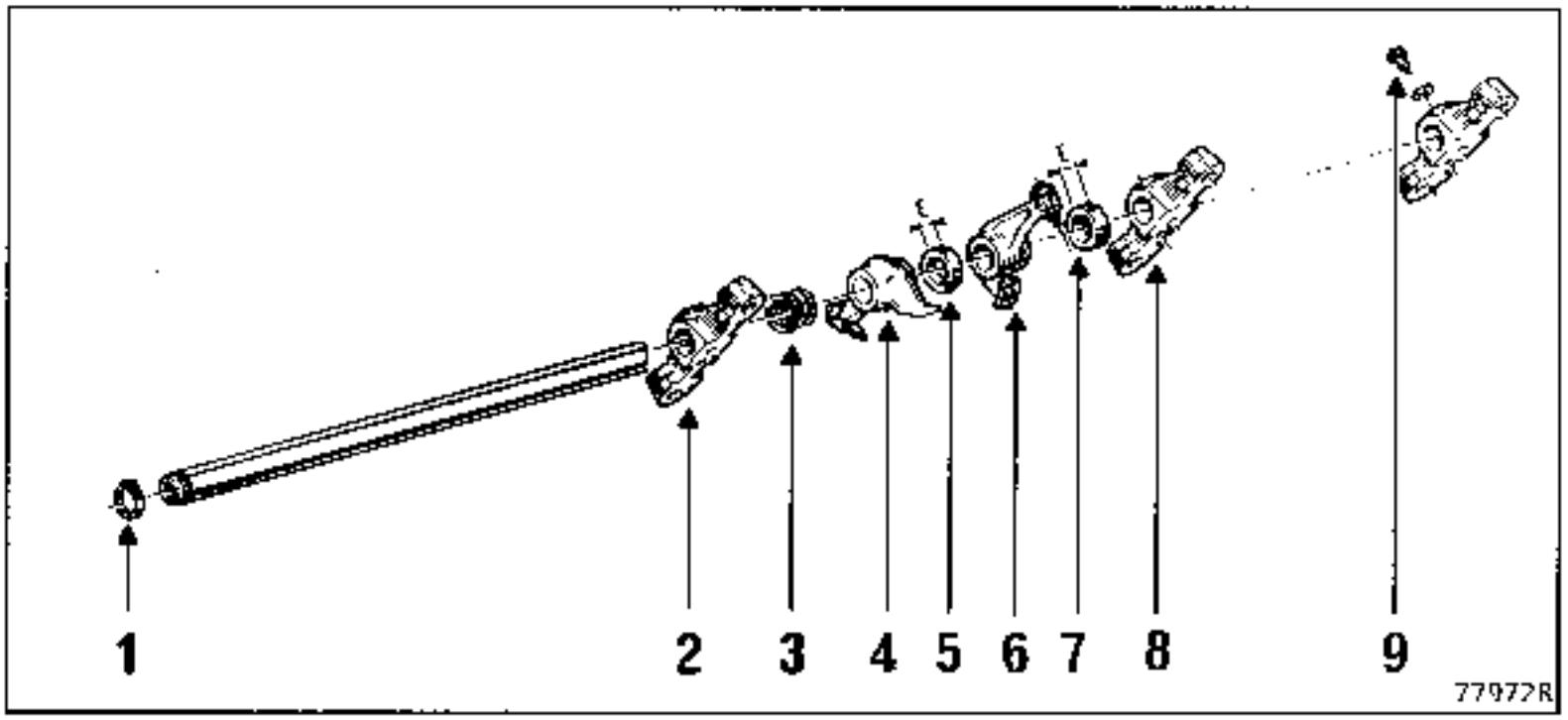
ATTENTION : Oil feed holes (A) in the rocker arms and rocker shaft must be clear of any obstruction and in a clean condition (risk of camshaft wear).

Assemble in the following order (viewed from the circlip)

1 Circlip.
2 Pedestal with flat on boss (B) facing the circlip.



3 Spacer spring.
4 Rocker arm with tappet adjusting screw on left.
5 Spacer E = 5.35 mm
6 Rocker arm with tappet adjusting screw on right.
7 Spacer E = 8.2 mm.
8 Pedestal with flat on boss facing the circlip



Complete the assembly of the rocker shaft observing the correct order.
Insert set bolt (9) into the pedestal to secure the assembly.

TIGHTENING THE CYLINDER HEAD

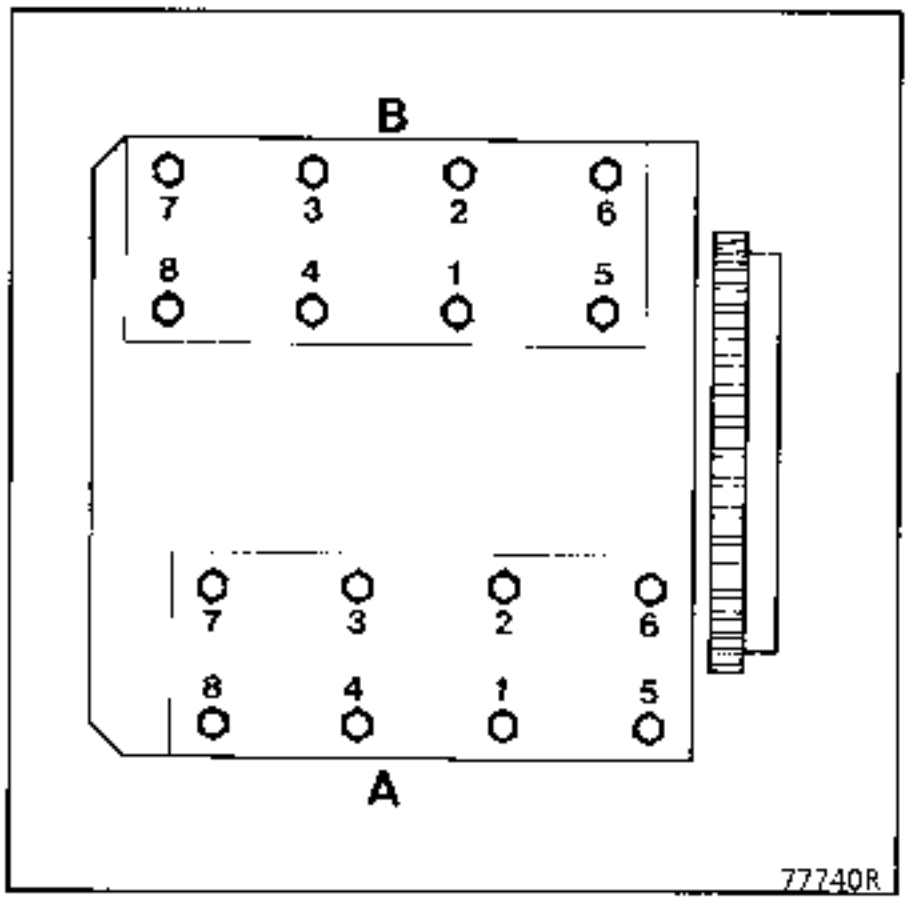
Z7X ENGINES, except Z7X 744

Tightening method:
Use engine oil to lubricate the threads and under the heads of the bolts.

Reminder: In order to tighten the bolts correctly, use a syringe to remove any oil from the cylinder head mounting holes.

Tighten in the following order:

- 1st tightening : **6 daN.m.**



Wait for 3 minutes then slacken bolt by bolt and carry out:

- 1st re-tightening : **4 daN.m.**

- 2nd re-tightening (angle) **180°**

The cylinder head is not tightened for a second time.

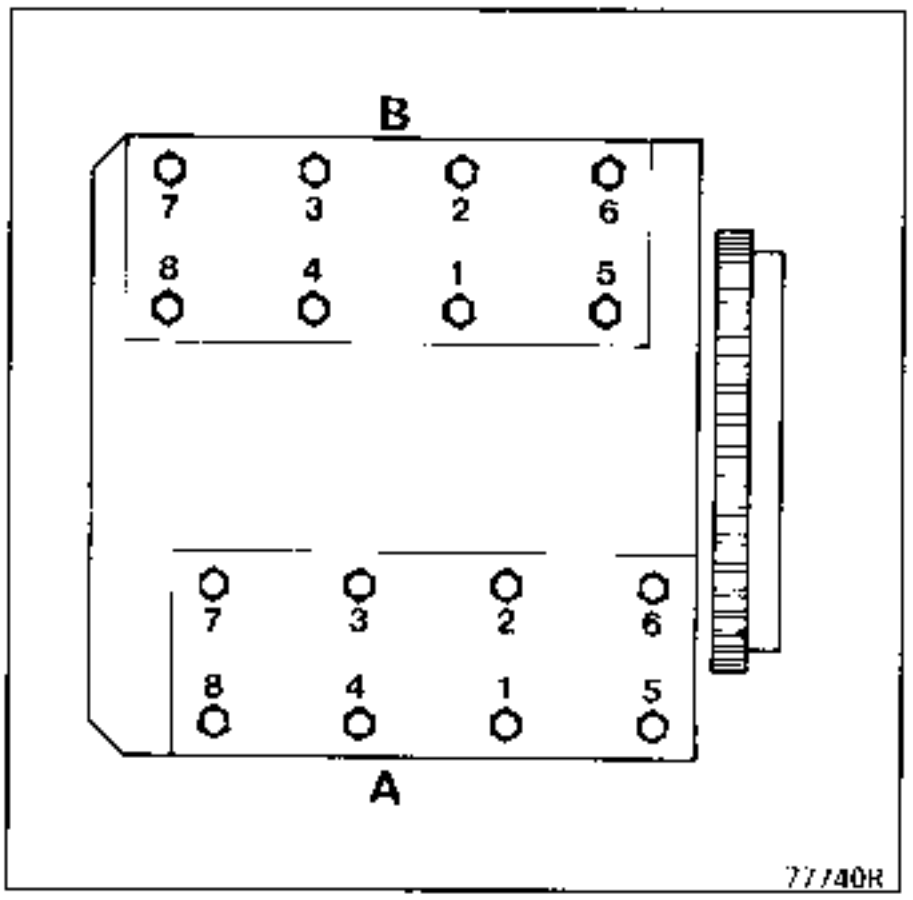
Z7X 74 ENGINE

Use engine oil to lubricate the threads and under the heads of the bolts.

Reminder: In order to tighten the bolts correctly, use a syringe to remove any oil form the cylinder head mounting holes.

Tighten in the following order:

- 1st tightening: **6 daN.m.**



Wait for 3 minutes then slacken bolt by bolt and carry out:
- 1st tightening : **4 daN.m.**

- 2nd tightening (angle) **180°**

After having completely refitted the engine back in the vehicle, run the engine until the engine cooling fans operate.

Let the engine cool down (minimum of 6 hours).

Retighten (angle) by **50°** (without slackening the bolts beforehand) .

The cylinder head is not tightened for a second time.

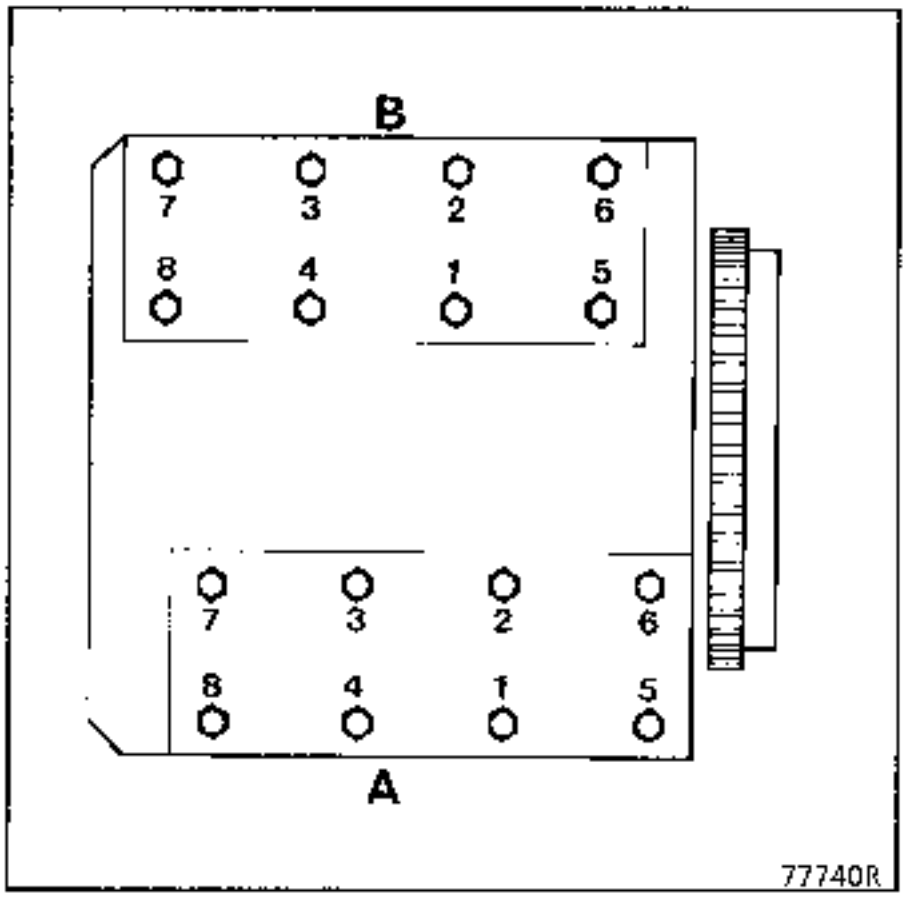
Z7U ENGINES (except 734) - Z7W 702

Use engine oil to lubricate the threads and under the heads of the bolts.

Reminder: In order to tighten the bolts correctly, use a syringe to remove any oil from the cylinder head mounting holes.

Tighten in the following order:

- 1st tightening: **6 daN.m.**



Wait for 3 minutes then slacken bolt by bolt and carry out:

- 1st re-tightening : **2 daN.m.**

- 2nd re-tightening (angle) **127°**

Adjust the valve clearances.

After having completely refitted the engine back in the vehicle, run the engine until the engine cooling fans operate.

Let the engine cool down (minimum of 6 hours).

Retighten (angle) by **25°** (without slackening the bolts beforehand) .

The cylinder head is not tightened for a second time.

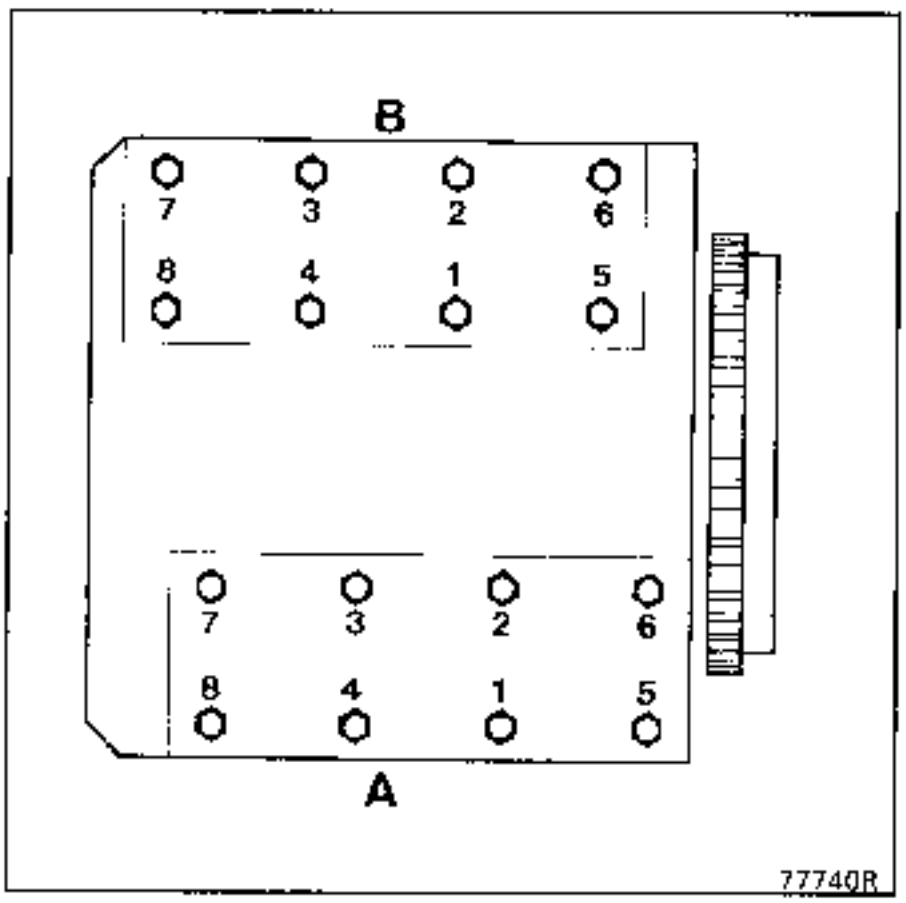
Z7U 734 ENGINES

Use engine oil to lubricate the threads and under the heads of the bolts.

Reminder: In order to tighten the bolts correctly, use a syringe to remove any oil from the cylinder head mounting holes.

Tighten in the following order:

- 1st tightening: **6 daN.m.**



Wait for 3 minutes then slacken bolt by bolt and carry out:

- 1st re-tightening : **2 daN.m.**

- 2nd re-tightening (angle) **106°**

Adjust the valve clearances.

After having completely refitted the engine back in the vehicle, run the engine until the engine cooling fans operate.

Let the engine cool down (minimum of 6 hours).

Retighten (angle) by **45°** (without slackening the bolts beforehand) .

The cylinder head is not tightened for a second time.

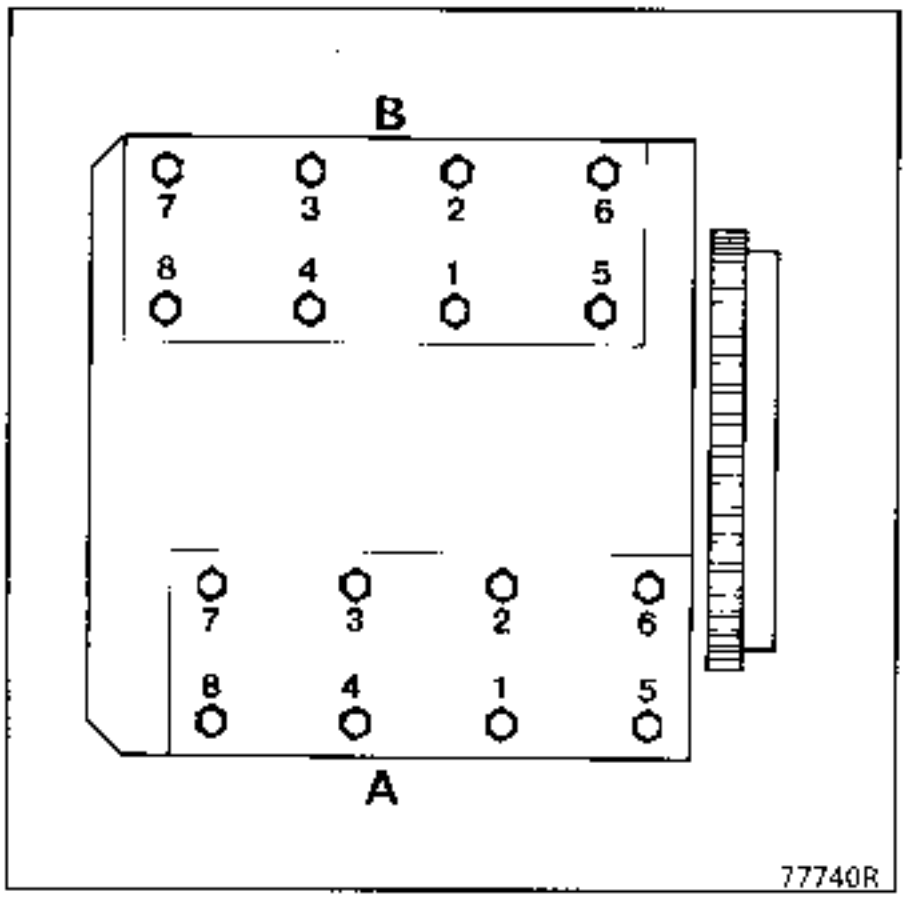
Z7V - Z6W ENGINES

Use engine oil to lubricate the threads and under the heads of the bolts.

Reminder: In order to tighten the bolts correctly, use a syringe to remove any oil from the cylinder head mounting holes.

Tighten in the following order:

- 1st tightening: **6 daN.m.**



Wait for 3 minutes then slacken bolt by bolt and carry out:

- 1st re-tightening : **2 daN.m.**

- 2nd re-tightening (angle) **115°**

Adjust the valve clearances.

After having completely refitted the engine back in the vehicle, run the engine until the engine cooling fans operate.

Let the engine cool down (minimum of 6 hours).

Slacken all the bolts then:

- 1st re-tightening **2 daN.m.**

- 2nd re-tightening (angle) **115°**

The cylinder head is not tightened for a second time.

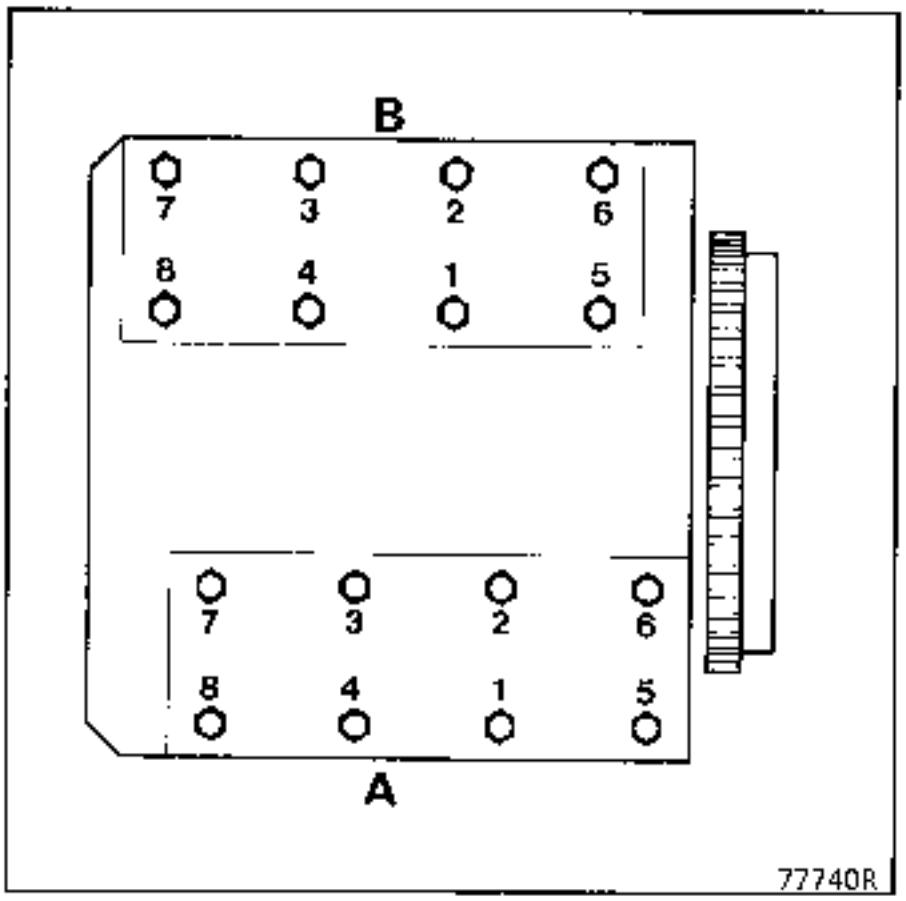
Z7W ENGINES (except 702)

Use engine oil to lubricate the threads and under the heads of the bolts.

Reminder: In order to tighten the bolts correctly, use a syringe to remove any oil from the cylinder head mounting holes.

Tighten in the following order:

- 1st tightening: **6 daN.m.**



Wait for 3 minutes then slacken bolt by bolt and carry out:

- 1st re-tightening : **2 daN.m.**
- 2nd re-tightening (angle) **106°**

Adjust the valve clearances.

After having completely refitted the engine back in the vehicle, run the engine until the engine cooling fans operate.

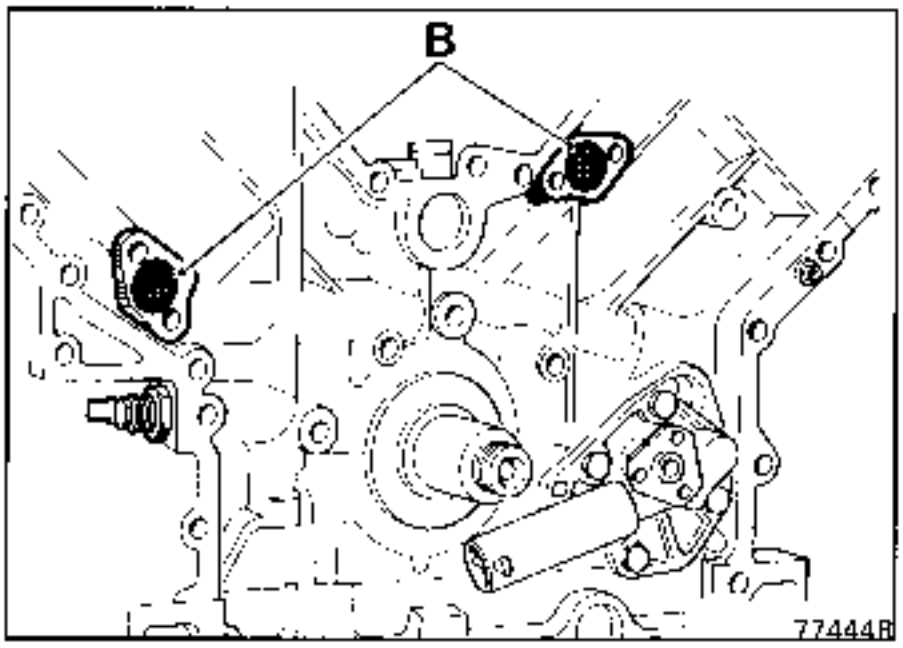
Let the engine cool down (minimum of 6 hours).

Retighten (angle) by **45°** (without slackening the bolts beforehand) .

The cylinder head is not tightened for a second time.

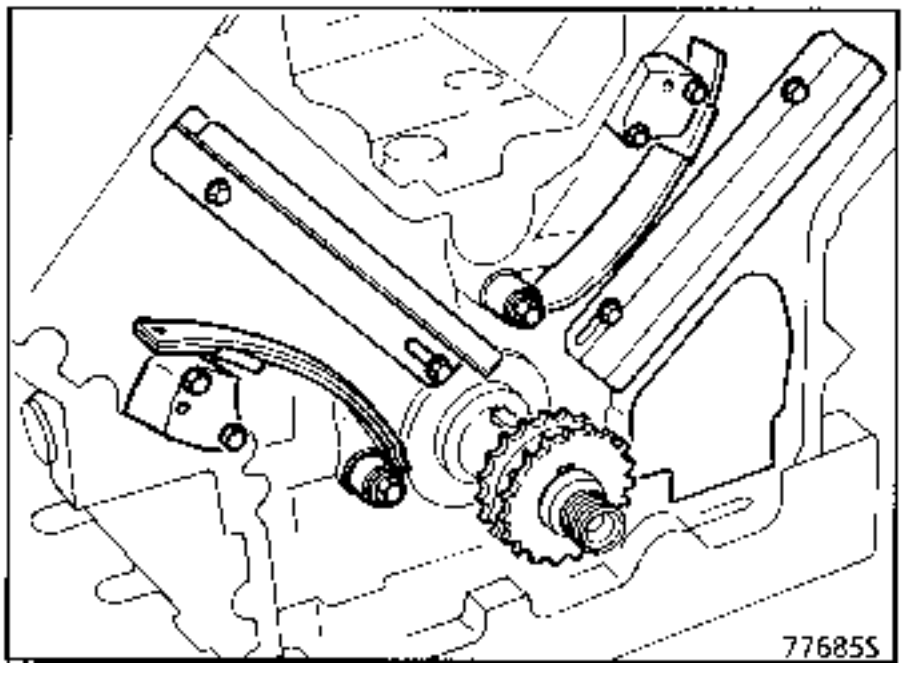
Refitting the timing gear

- refit the oil pump,
- ensure the filters (B) are clean.



Fit:

- the chain tensioners,
- the fixed glide shoes,
- the tensioner blades,
- the timing sprocket key and timing sprocket, with the timing mark facing the outside.

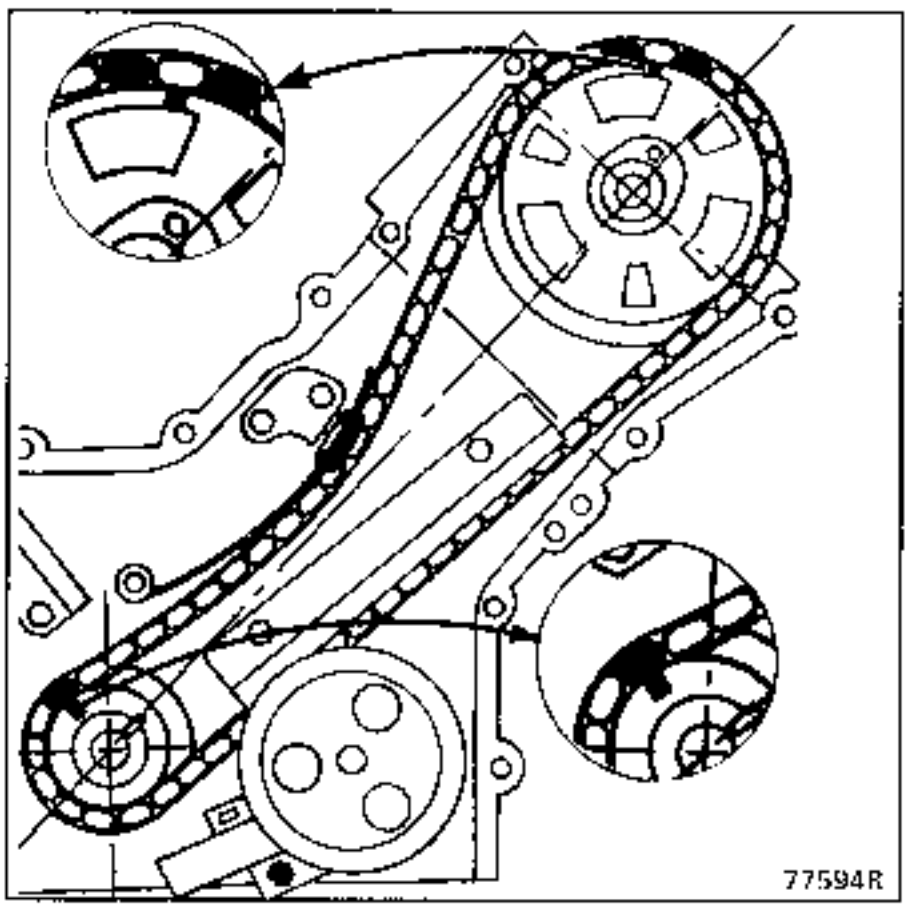


ENGINE WITH OFFSET CRANKPINS AND EQUIDISTANT CRANKPINS.

VALVE TIMING - BANK A

Turn the crankshaft clockwise so that the keyway centreline is in line with the centreline of bank A.

Position the chain and chain sprocket in accordance with the diagram below (rear set of teeth on the double timing sprocket).

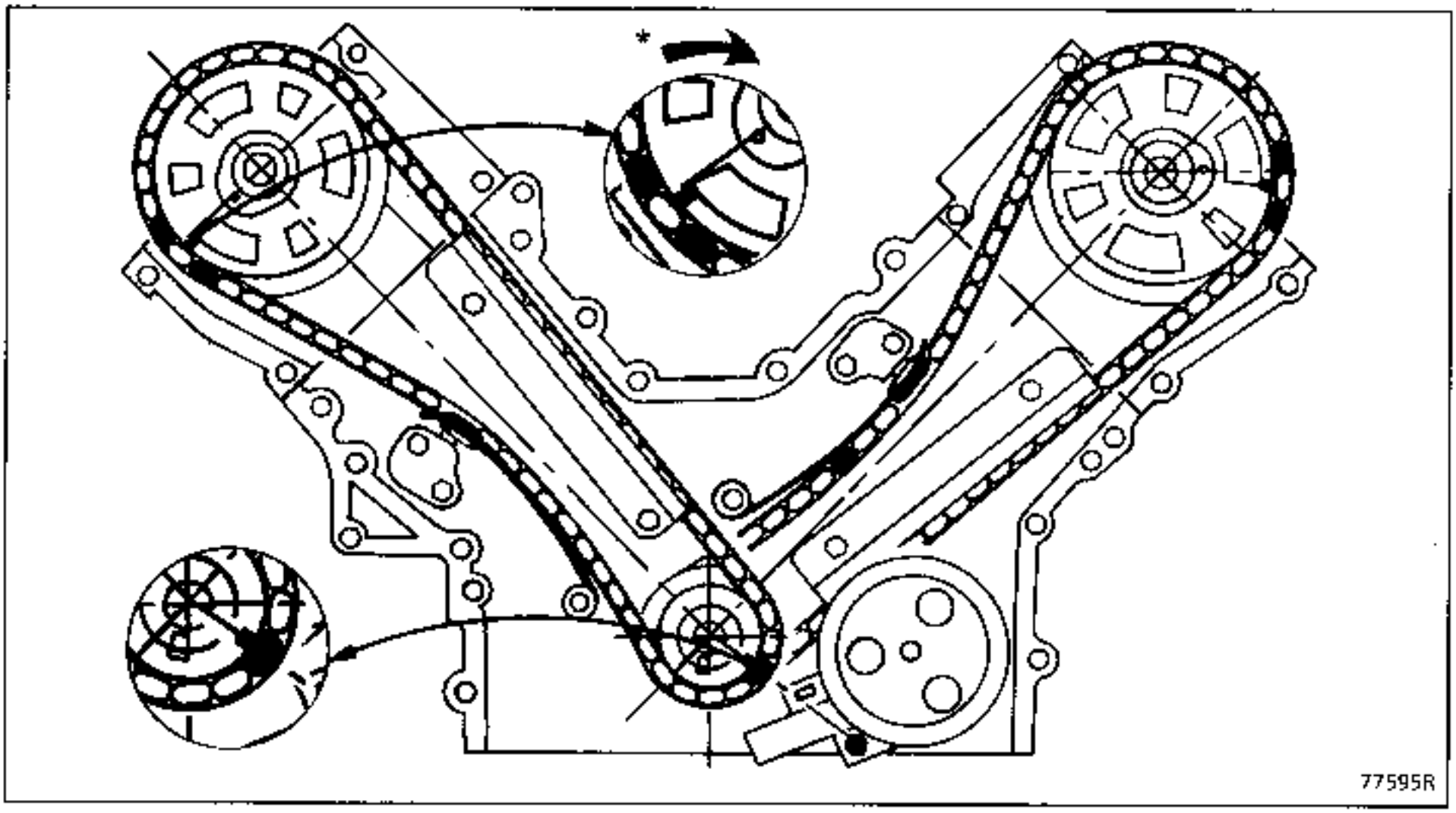


ENGINE WITH EQUIDISTANT CRANKPINS

VALVE TIMING - BANK B

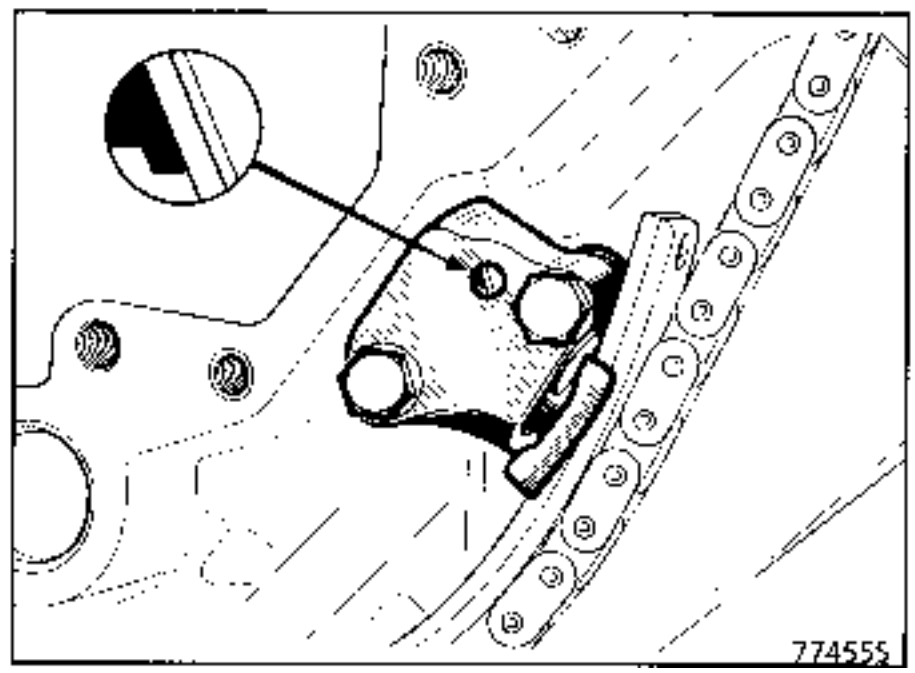
Turn the crankshaft through 150° (clockwise*); the timing mark on the crankshaft sprocket will be aligned with the oil pump cover lower mounting bolt.

Position the chain and sprockets in accordance with the diagram below.



Free both chain tensioners by pushing against the glide shoe.

Do not assist the action of the tensions by other means.

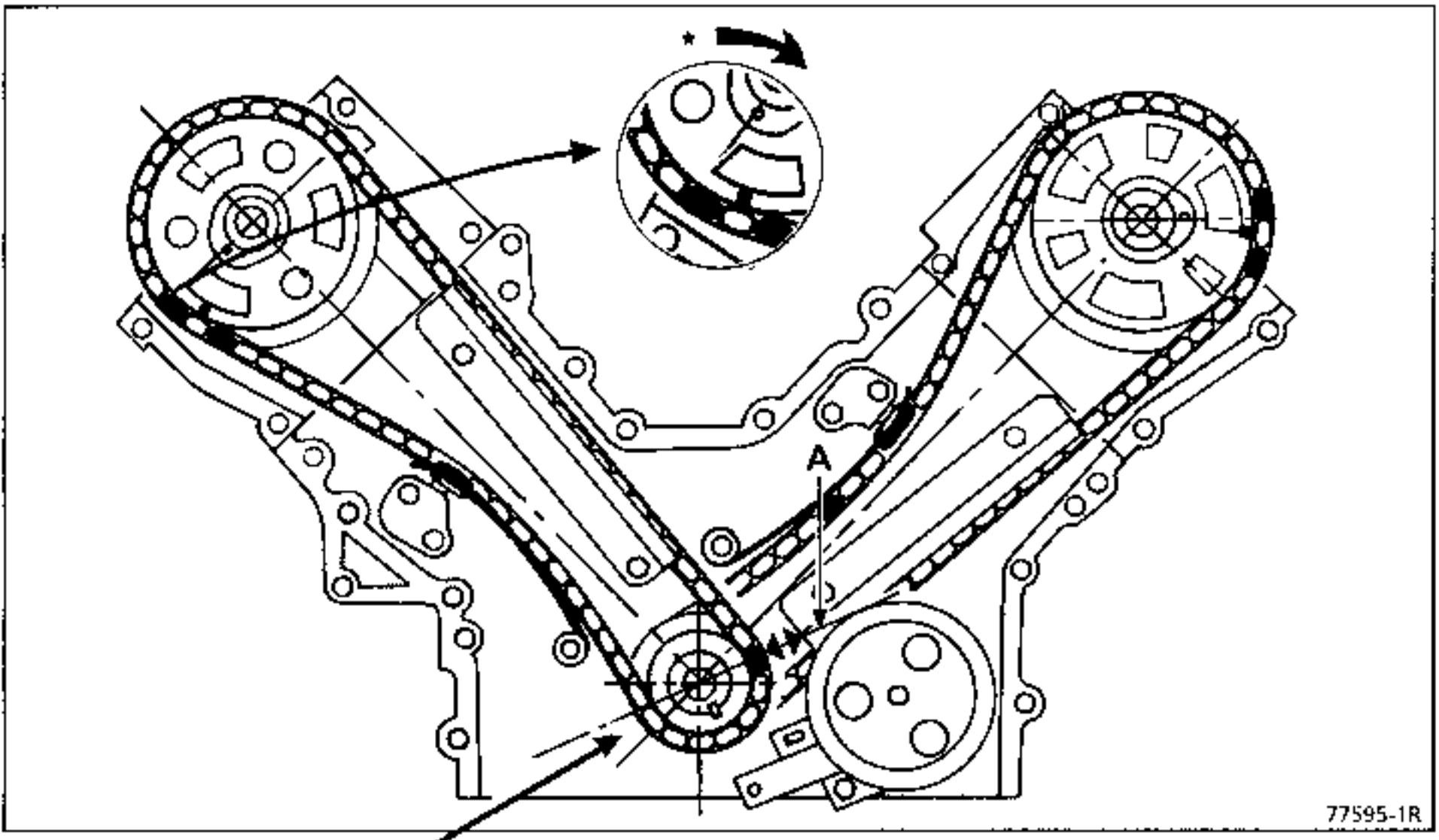


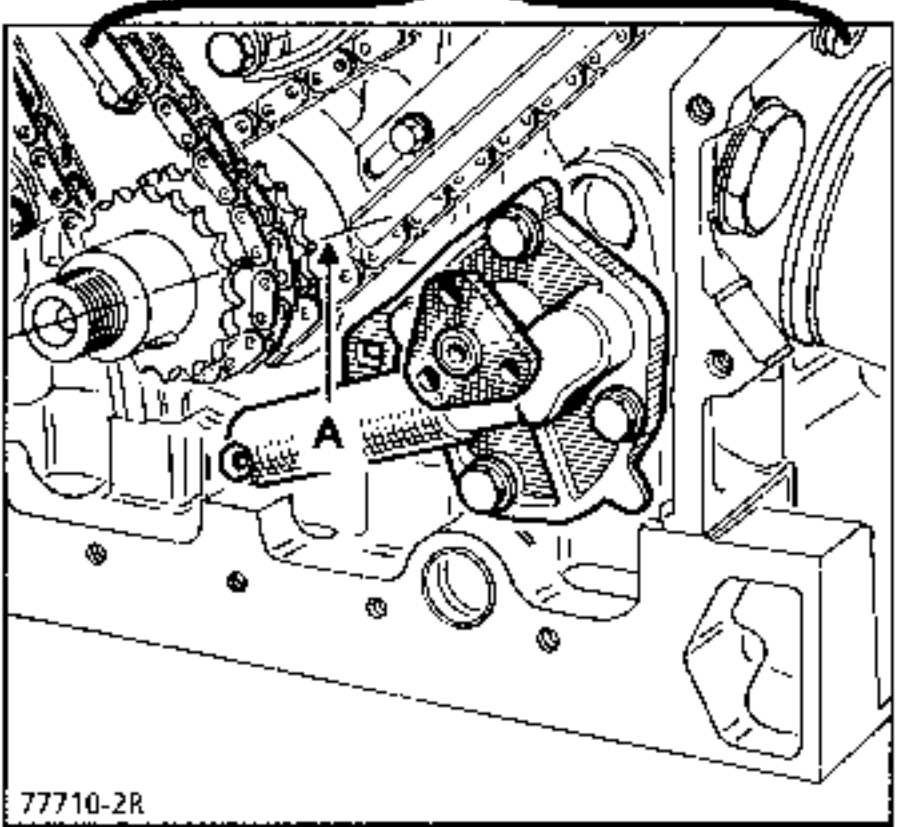
ENGINE WITH OFFSET CRANKPINS

VALVE TIMING - BANK B

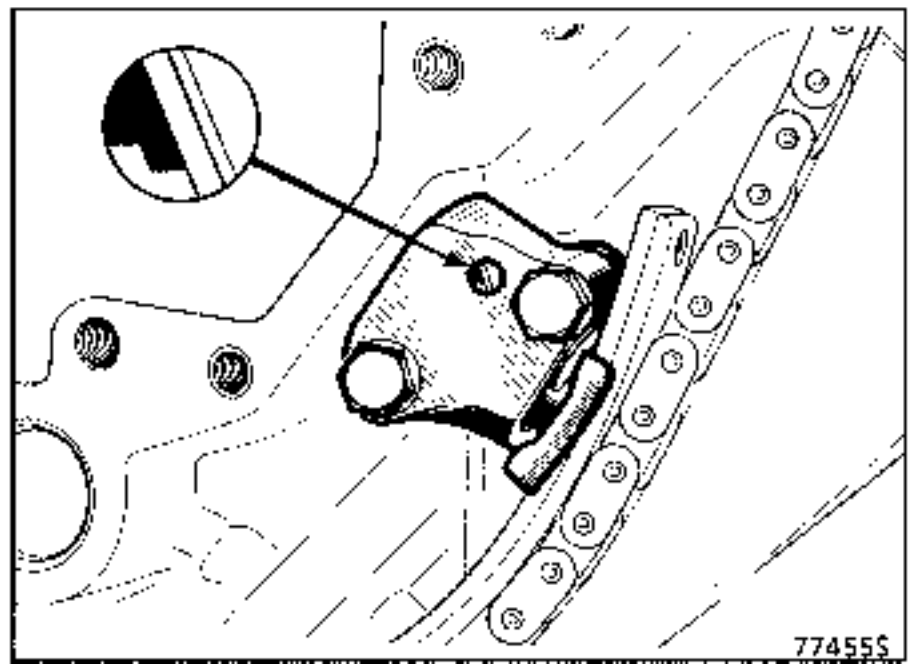
Turn the crankshaft through **120°** (clockwise*); the timing mark on the crankshaft sprocket will be aligned with the edge of the left hand fixed glide shoe for bank A (marked A).

Position the chain and sprockets in accordance with the diagram below.





Free both chain tensioners by pushing against the glide shoe.
Do not assist the action of the tensions by other means.

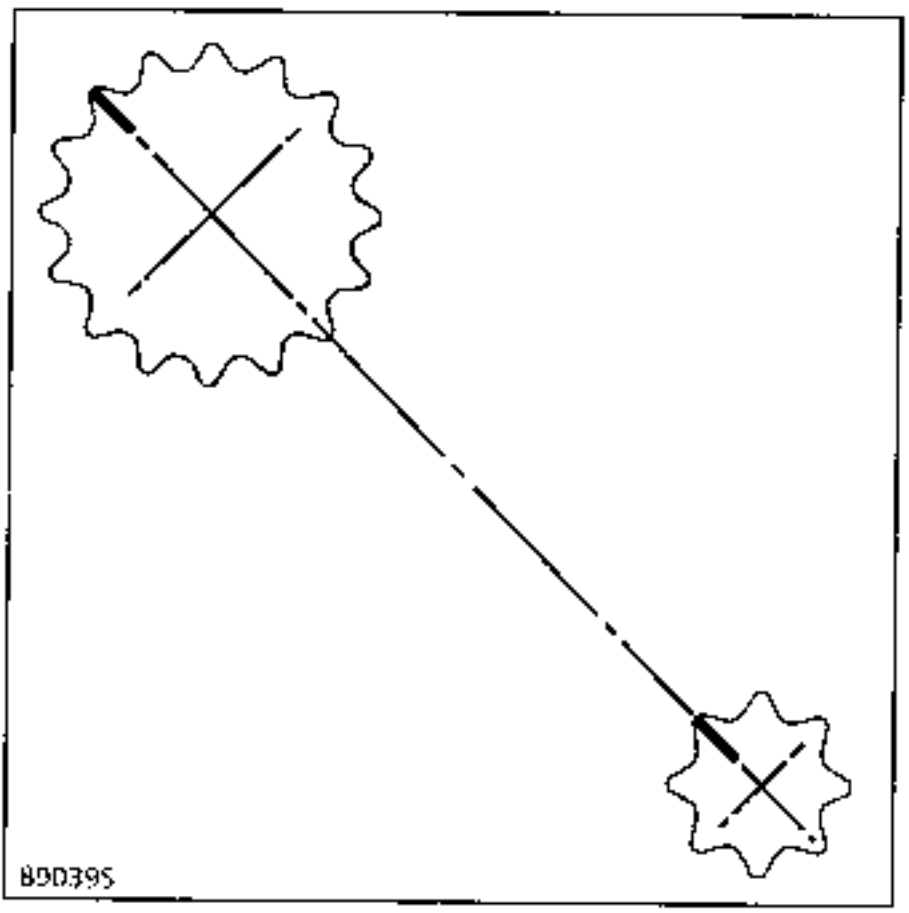


The timing is checked from the mounting position of the chain for bank B.

VALVE TIMING CHECK (BANK B)

Rotate the crankshaft so that the crankshaft sprocket timing mark (clockwise direction) is on the centreline of the bank B camshaft.

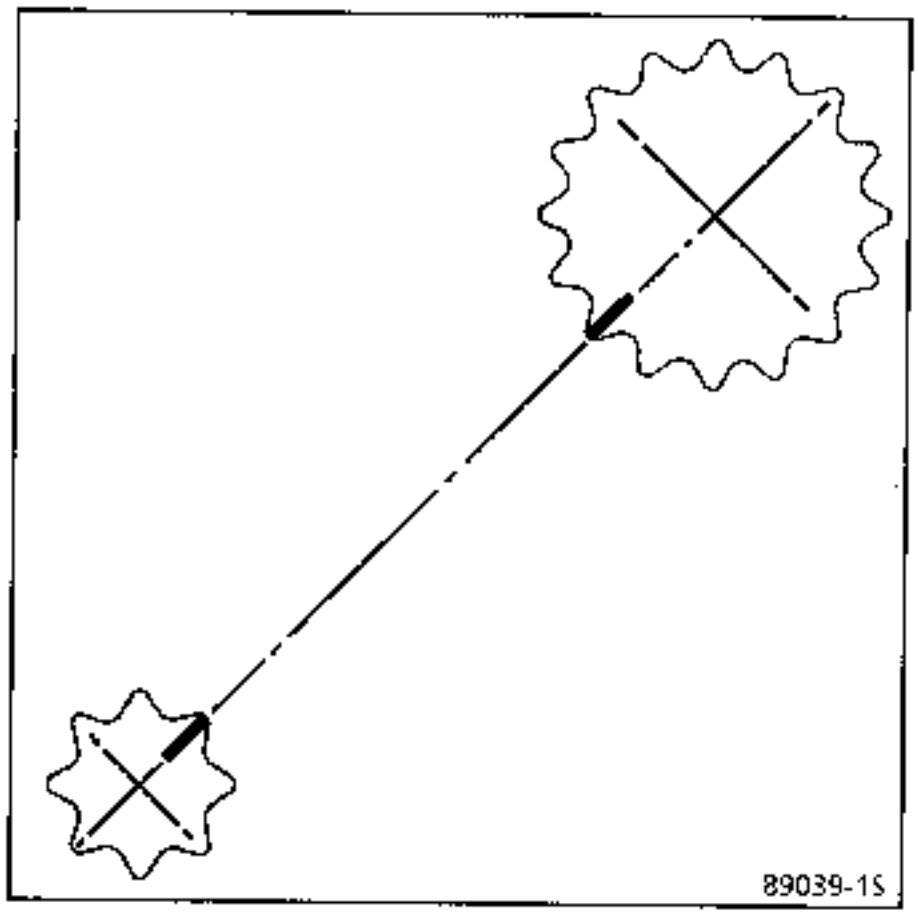
In this position, check that the crankshaft and camshaft timing marks of bank B are aligned.



VALVE TIMING CHECK (BANK A)

Rotate the crankshaft so that the crankshaft sprocket timing mark (clockwise direction) is on the centreline of the bank A camshaft.

In this position, check that the crankshaft and camshaft timing marks of bank A are aligned.

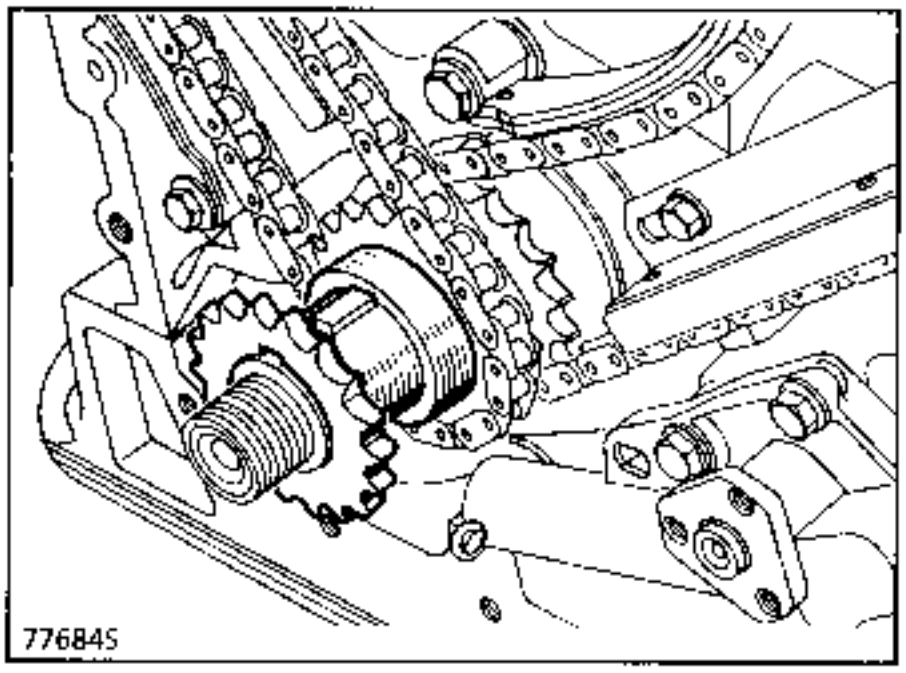


NOTE :
Take no account of the marks on the chains.

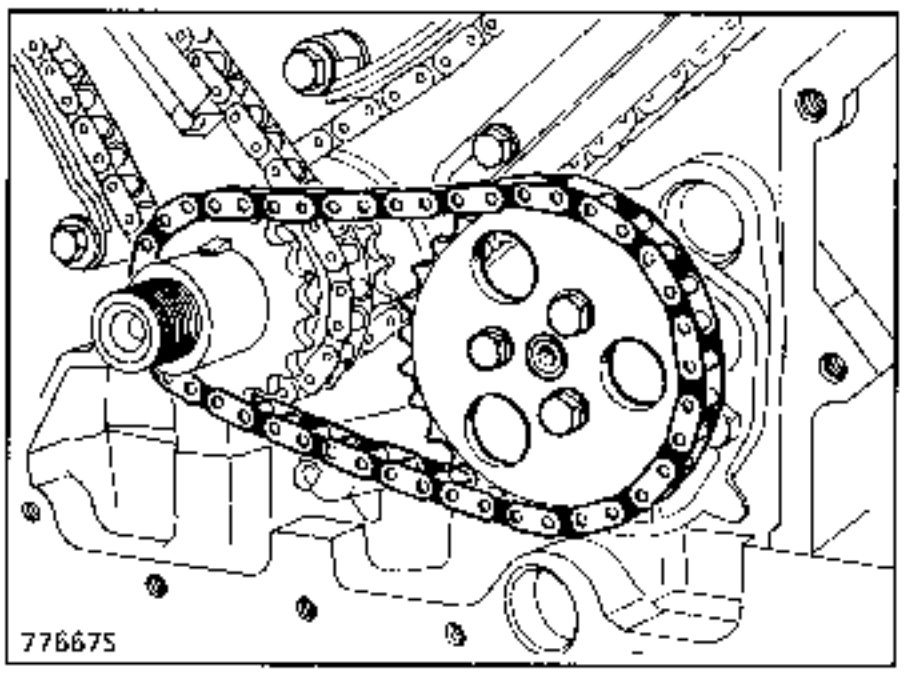
Rotate the crankshaft until the crankshaft keyway is vertically at the top.

Refit:

- the spacer for the oil pump drive sprocket,
- the key,
- the oil pump drive sprocket.

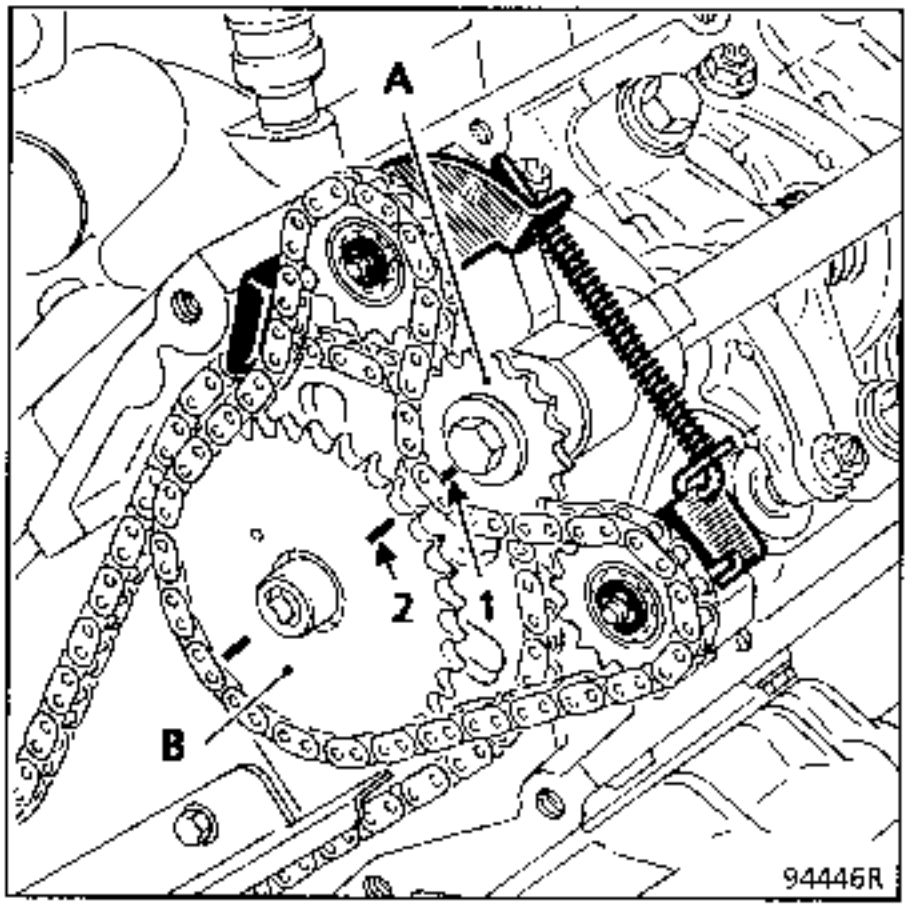


- the oil pump drive chain and sprocket (fit the bolts using **Loctite FRENBLOC** and tighten them to the recommended torque).



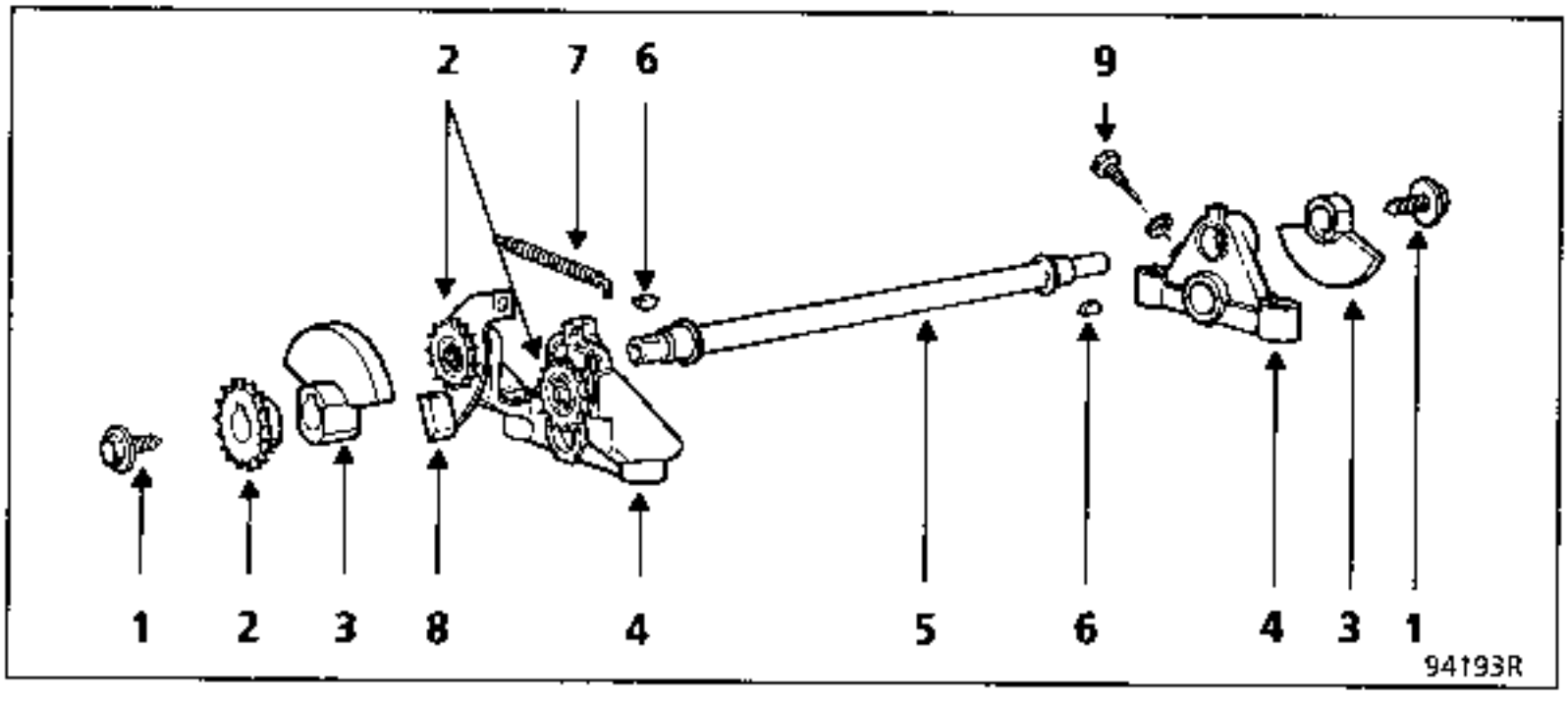
Refitting the timing balancer system (if the engine is fitted with the system)

Refit the flyweight, the sprocket (A) and tighten to the recommended torque.



Fit the chain onto the sprocket (A), fit the sprocket (B) and align marks (1) and (2) opposite each other.

EXPLODED VIEW OF THE CAMSHAFT BALANCING SYSTEM



1 - Mounting bolt

2 - Sprockets

3 - Balance weights

4 - Bearing

5 - Connecting shaft

6 - Keys

7 - Chain tensioning system

8 - Chain tensioner

9 - Rocker shaft mounting bolt

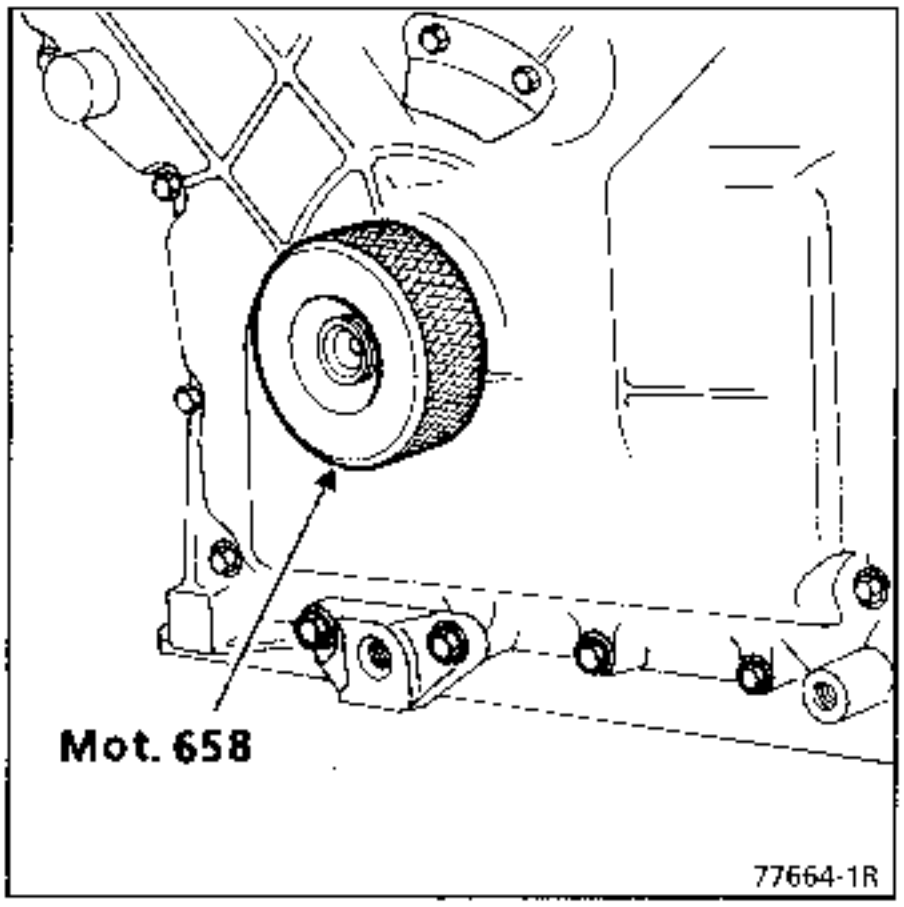
REFITTING THE TIMING COVER
(depending on version)

Refit:
- the timing cover gaskets in dry condition or using a sealing paste:
  Autojoint OR AJ 66 for covers which do not have a paper seal.

- the timing cover (located by two pins),
- the mounting bolts (coat the lower bolts with **Loctite FRENETANCH).**

For paper seals:
- trim off the gasket flush with the top faces of the cylinder heads and apply four spots of **Rhodorseal 5561 .**

Refit:
- the crankshaft pulley oil seal using sleeve **Mot. 658** (push the sleeve into contact with the timing cover).



- the crankshaft pulley (seal face lubricated) and tighten the nut to the recommended torque (thread coated with **Loctite FRENETANCH).**

ADJUSTING ROCKER ARM CLEARANCES

All types

Clearances (mm), engine cold:

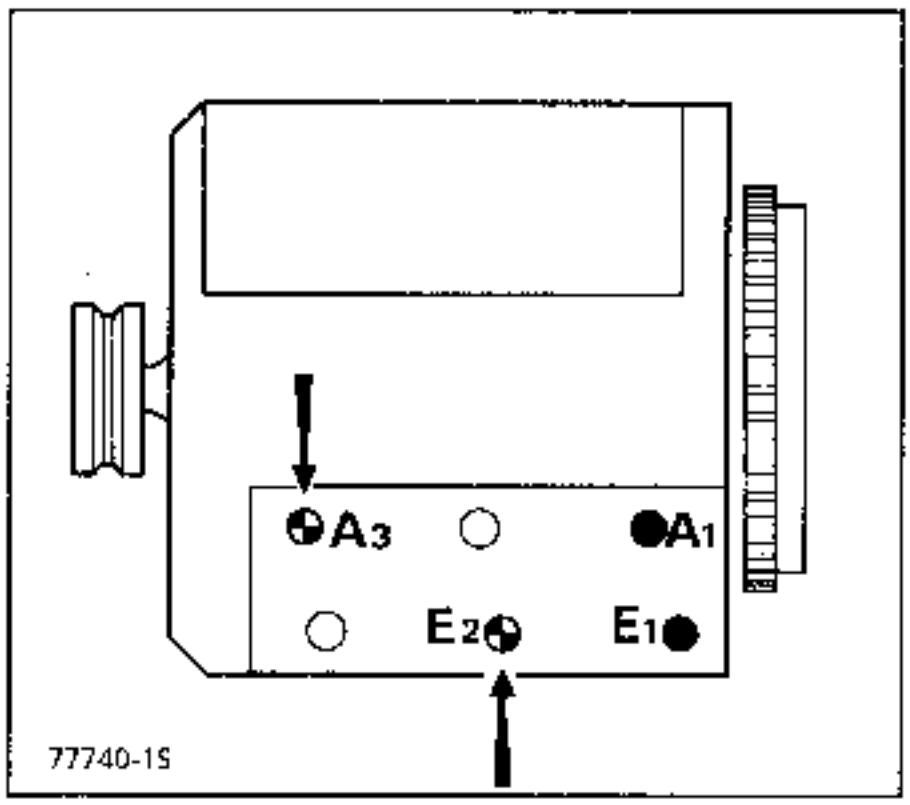
- inlet	0.10
- exhaust	0.25

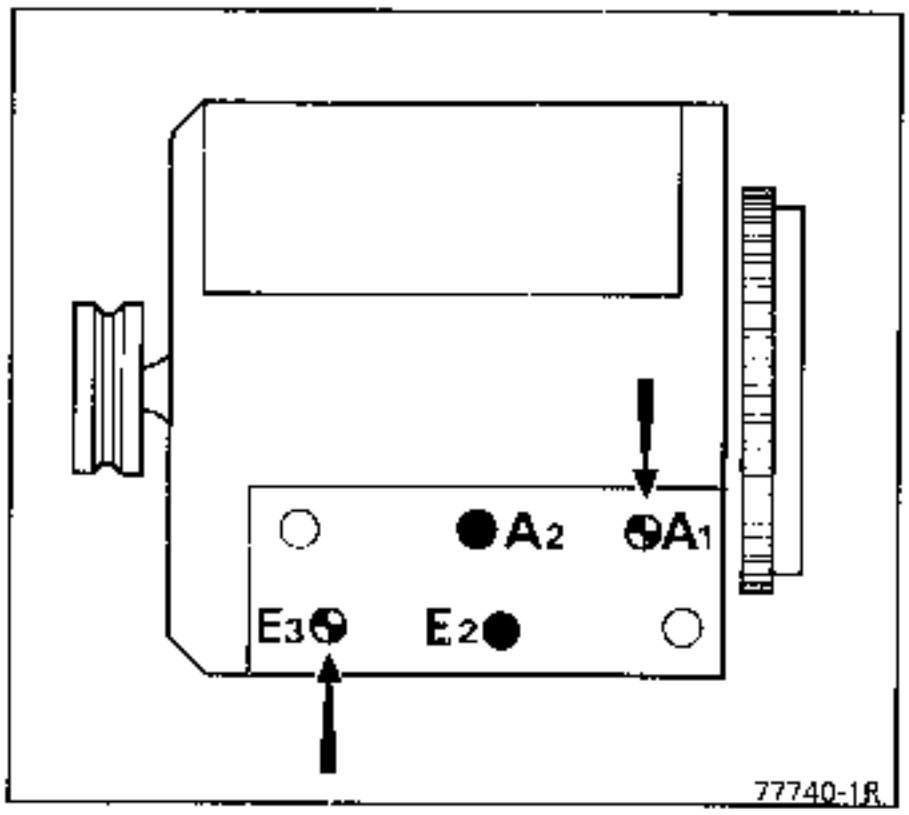
FIRST METHOD

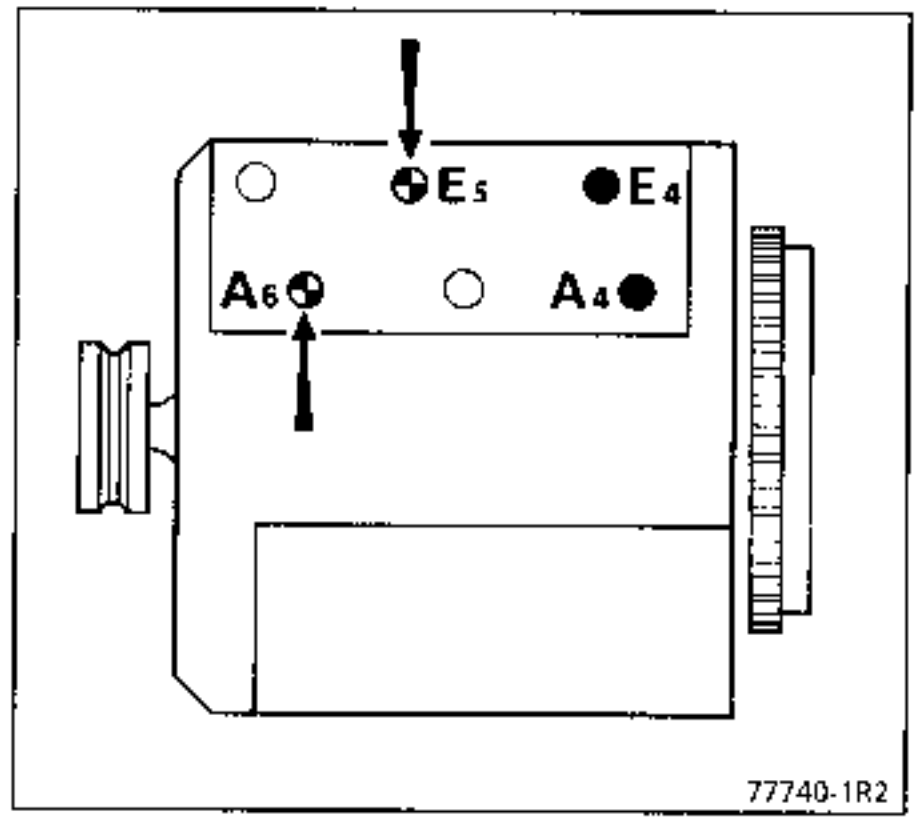
Adjusting the rocker arms on each cylinder head in turn

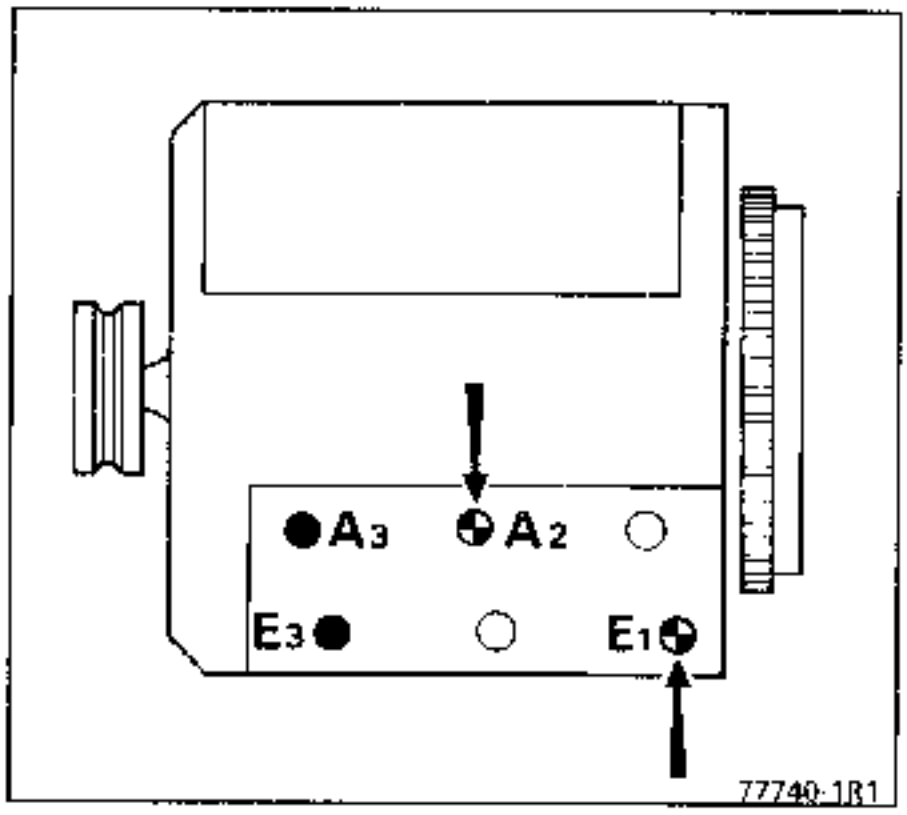
CYLINDER BANK A

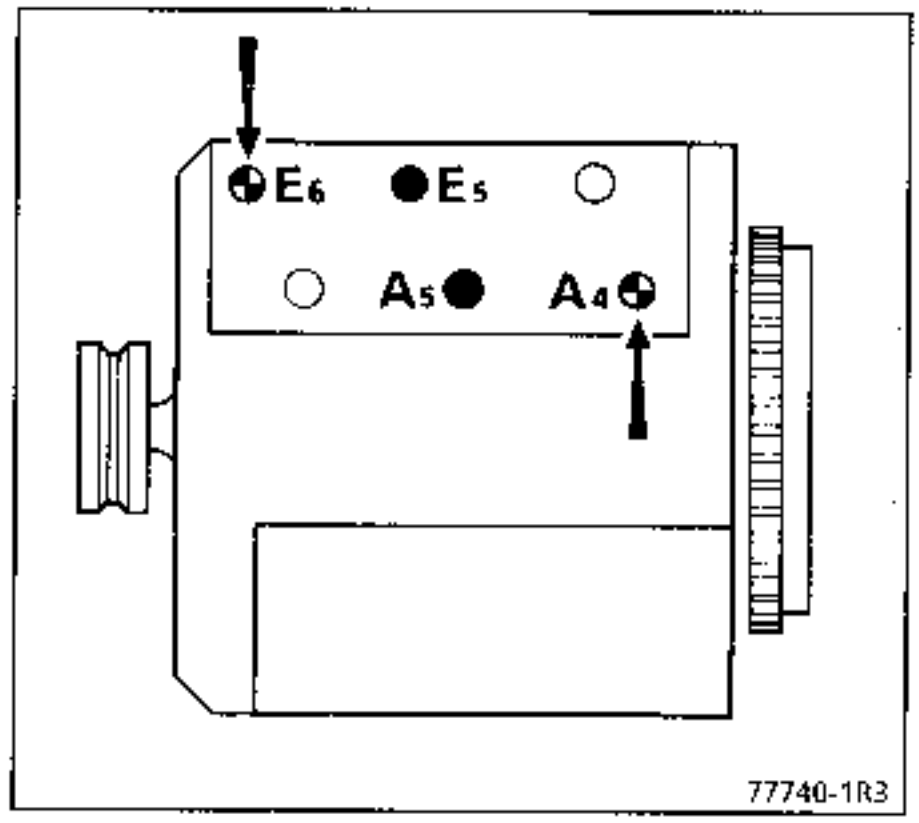
Rocker arms "rocking"	Rocker arms in position for adjustment	
	Inlet	Exhaust
A1 - E1	A3	E2
A2 - E2	A1	E3
A3 - E3	A2	E1





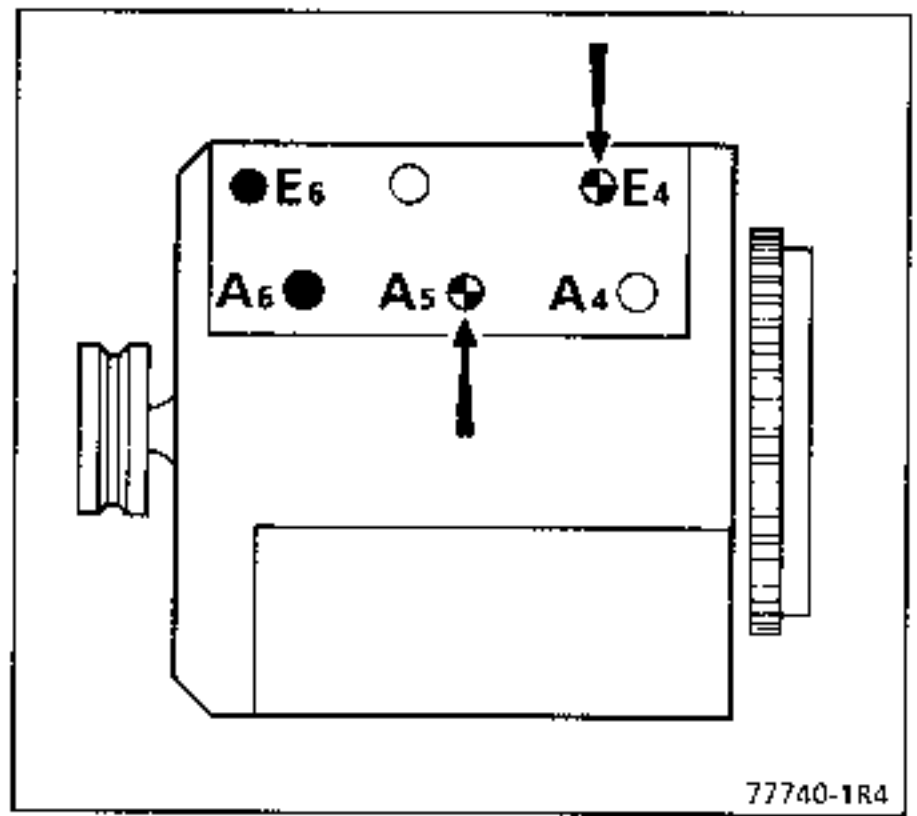






CYLINDER BANK B

Rocker arms "rocking"	Rocker arms in position for adjustment	
	Inlet	Exhaust
A4 - E4	A6	E5
A5 - E5	A4	E6
A6 - E6	A5	E4

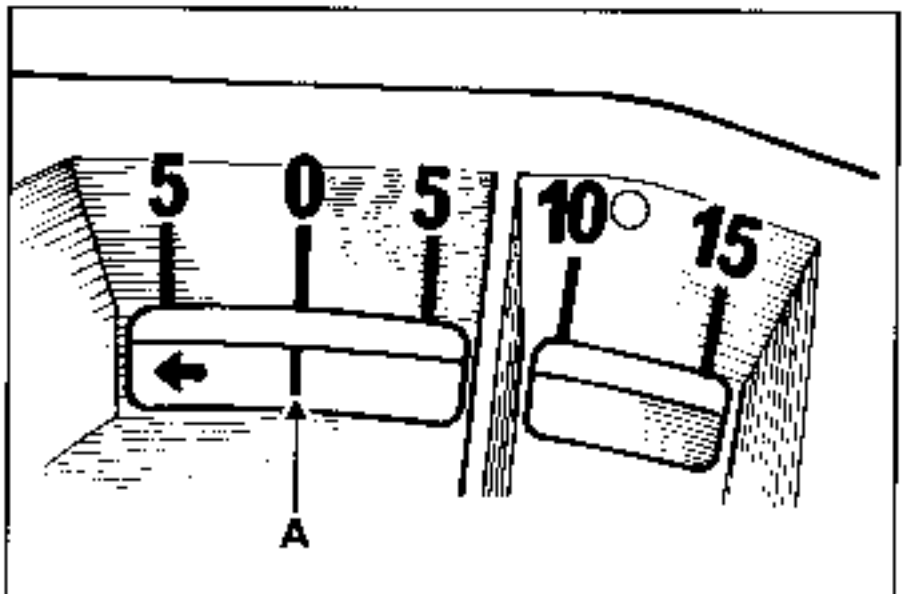


SECOND METHOD

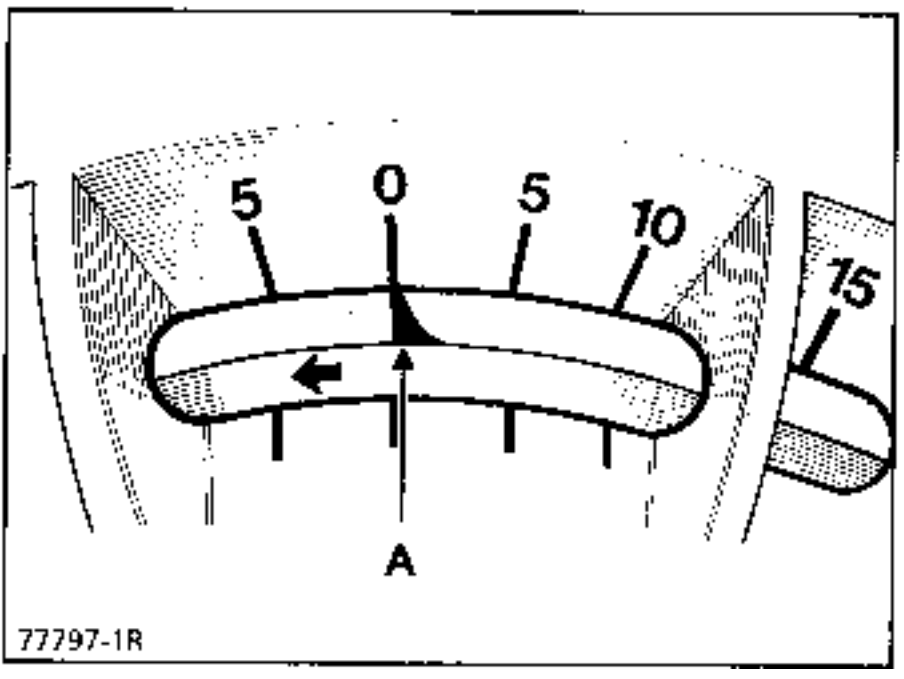
Set the piston of cylinder N° 1 at TDC position in the firing stroke, which corresponds to:

- rocker arms on cylinder N° 5 "rocking",
- timing mark (A) on the flywheel opposite line (0) on the clutch housing.

VEHICLES WITH MANUAL GEAR BOX



VEHICLES WITH AUTOMATIC TRANSMISSION



Cylinder No. 1 on TDC firing stroke	Rocker arms in position for adjustment	
	Inlet	Exhaust
	A1	E1
	A2	E3
	A4	E6

Starting from position (1), turn the crankshaft one complete revolution, which corresponds to:

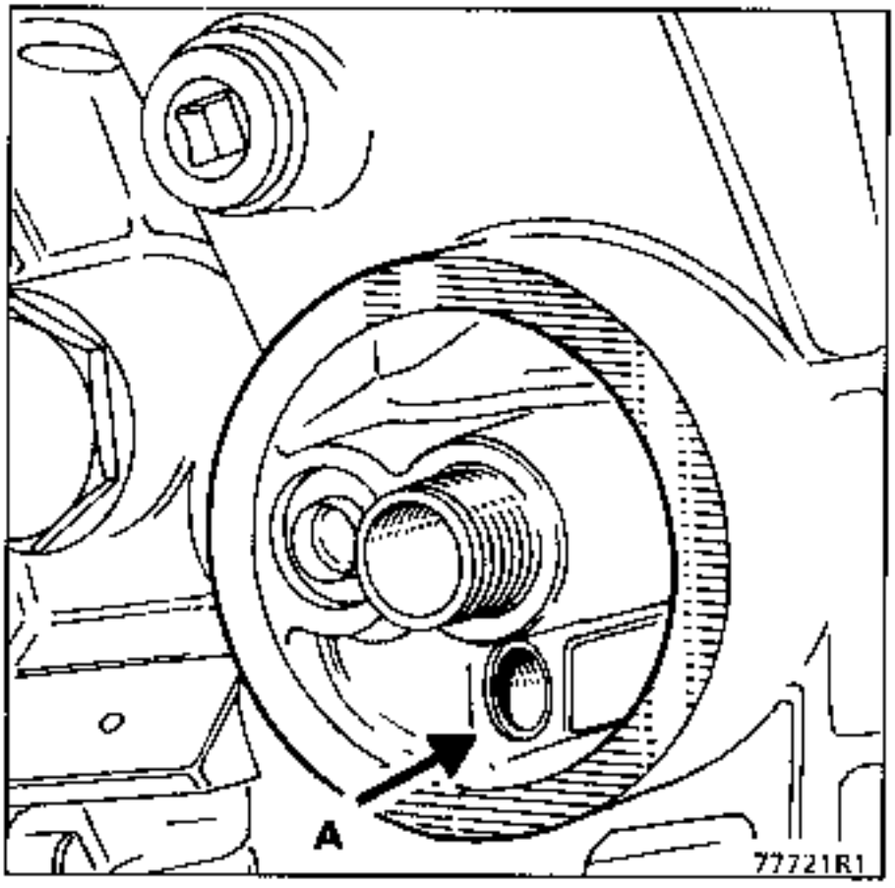
- TDC "end of exhaust - beginning of inlet" on cylinder N° 1,
- rocker arms of cylinder N° 1 "rocking",
- timing mark (A) on the flywheel opposite line (0) on the clutch housing.

Cylinder No. 1 on TDC "end of exhaust - beginning of inlet"	Rocker arms in position for adjustment	
	Inlet	Exhaust
	A3	E2
	A5	E4
	A6	E5

FIRING ORDER

1 - 6 - 3 - 5 - 2 - 4

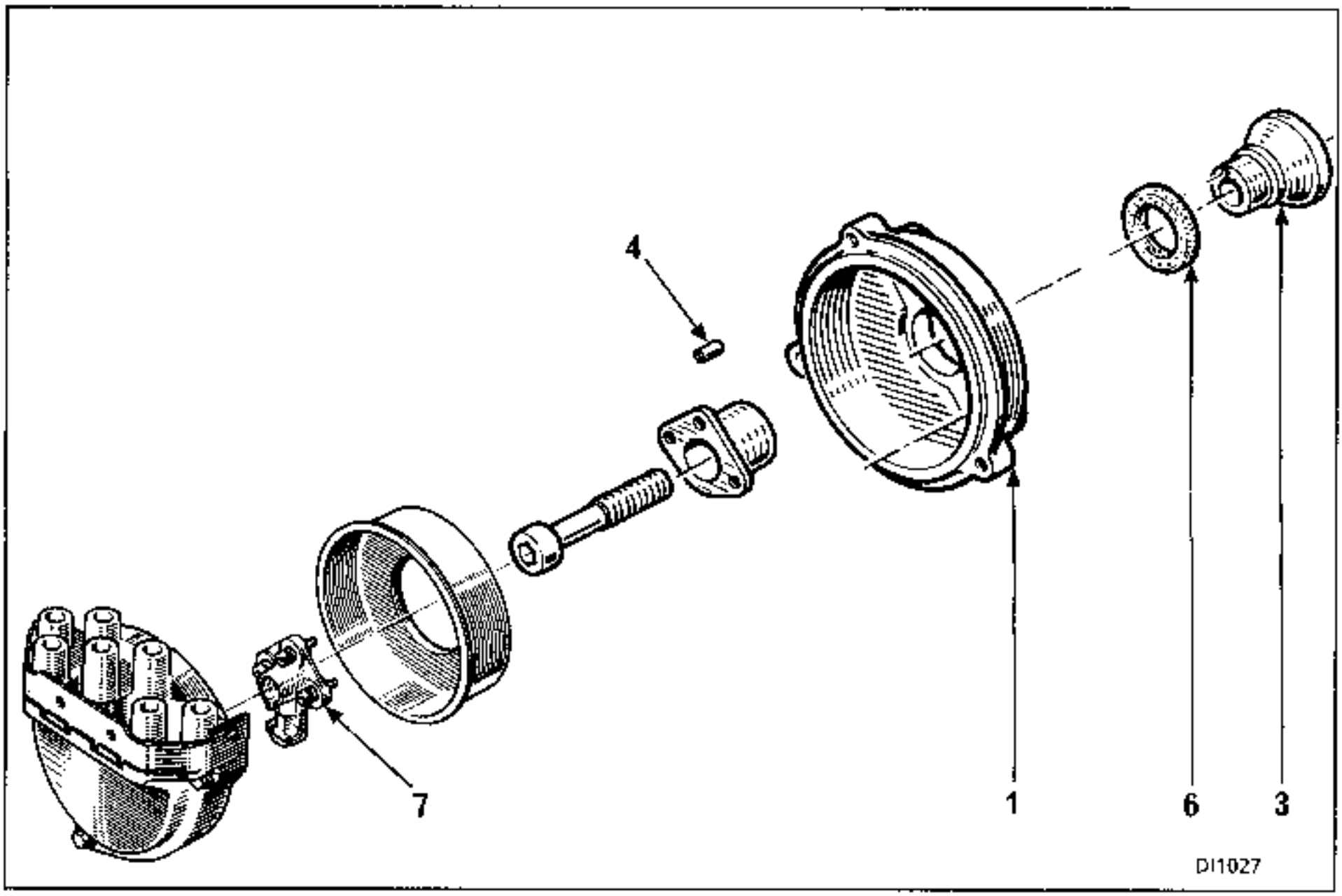
In order to ensure that the oil pump is primed, remove the filter and inject engine oil into hole (A) using a burette (a graduated glass tube with an end tap).



Refit:

- the rocker box covers, replacing the gaskets,
- the water pump mountings,
- the accessories fitted to the engine.

SPECIAL NOTES FOR THE DISTRIBUTOR



If the lip of the seal has marked the drive seat (3), replace it.

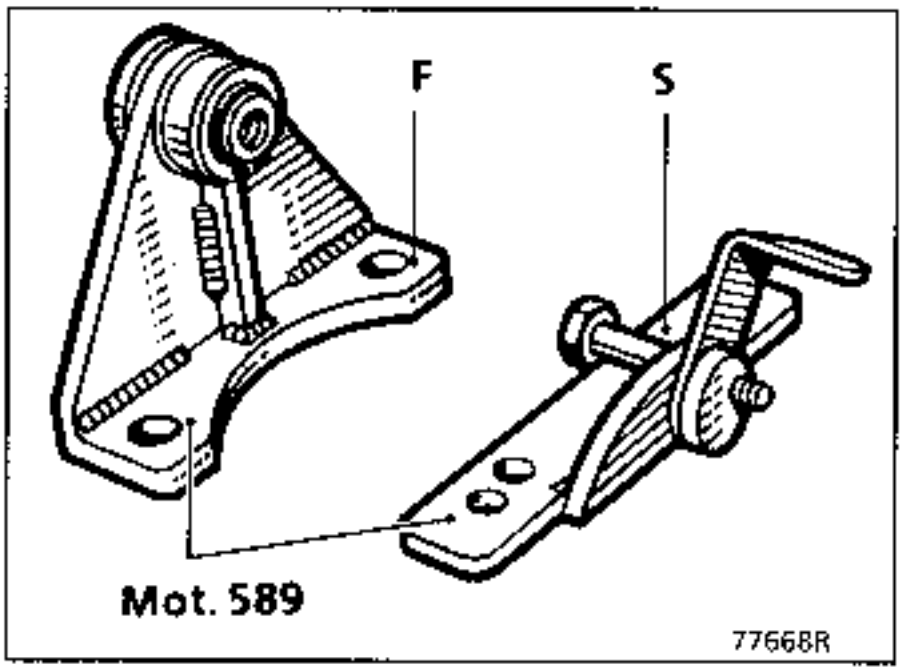
Make sure that the drive (3) is in the correct position in the camshaft sprocket location.

Refit the seal (6) using housing (1).

Make sure that locating dowel (4) is fitted.

Coat bolts (7) with one or two drops of **Loctite FRENETANCH.**

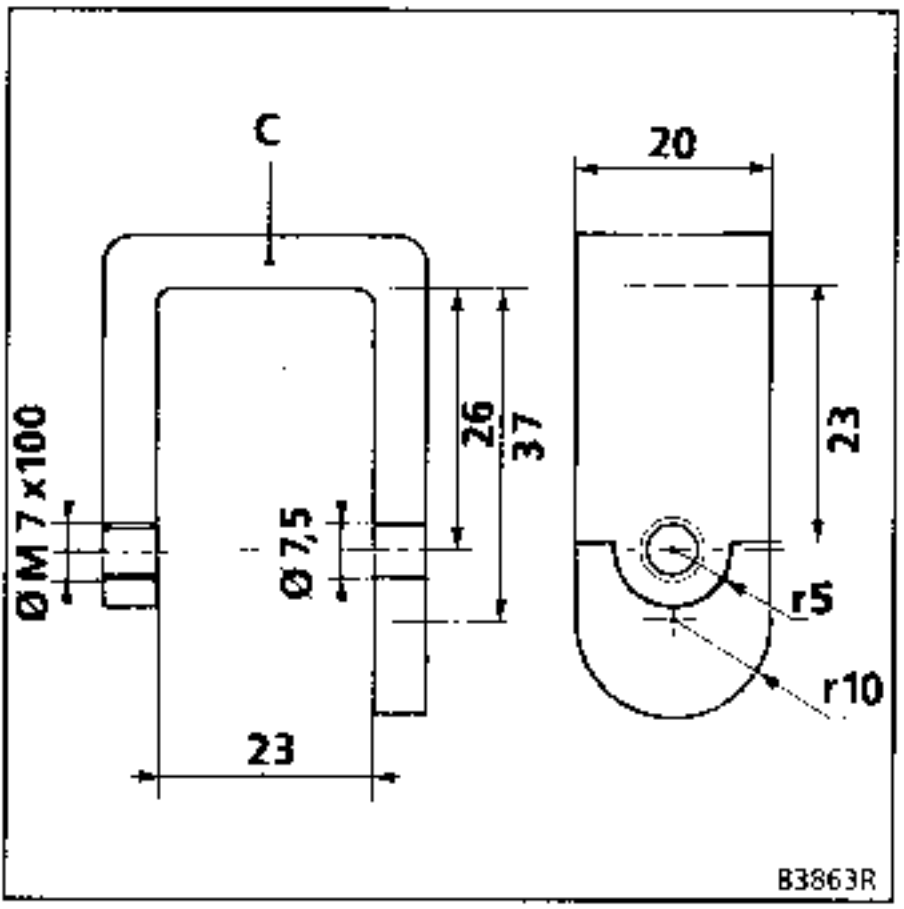
If only one cylinder head is to be removed, the operation may be carried out without removing the timing cover using tool **Mot. 589** consisting of a bracket (S) and a dummy bearing (F).



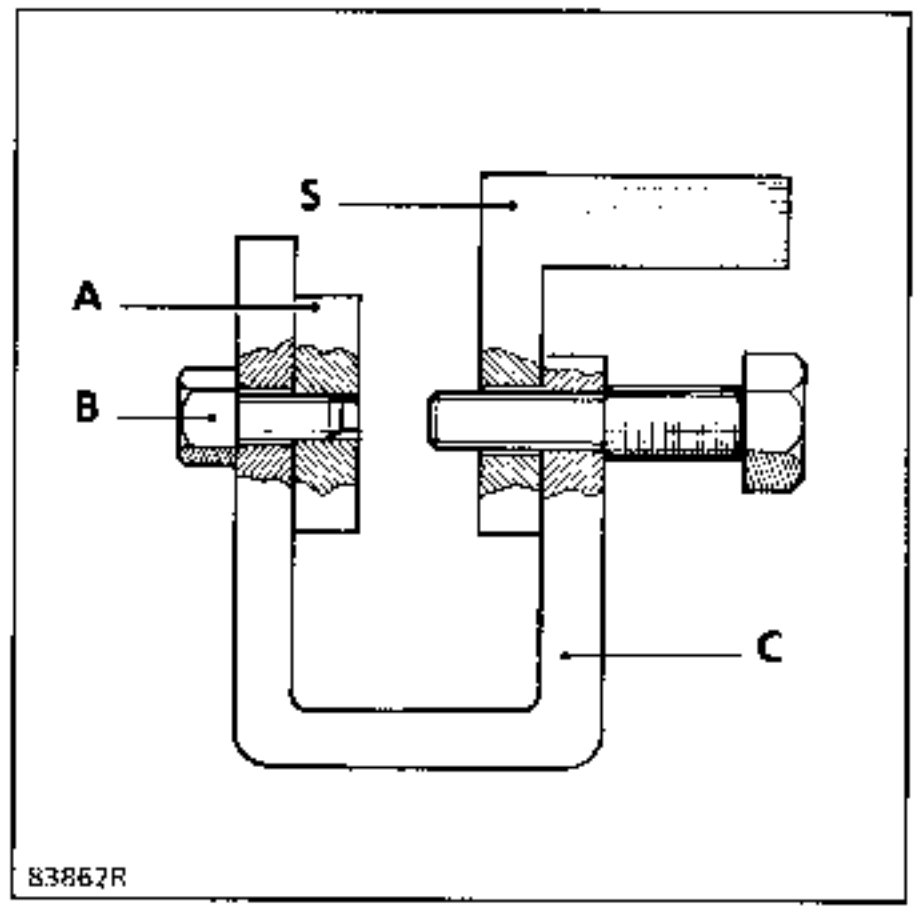
The timing chain must not be allowed to come out of engagement during this operation. The timing cover must be removed to release the timing chain tensioner if the chain slips off the sprocket accidentally.

SPECIAL CASE when the timing sprocket is not removed..

A bracket (C) must be made locally to fit to tool **Mot. 589.**

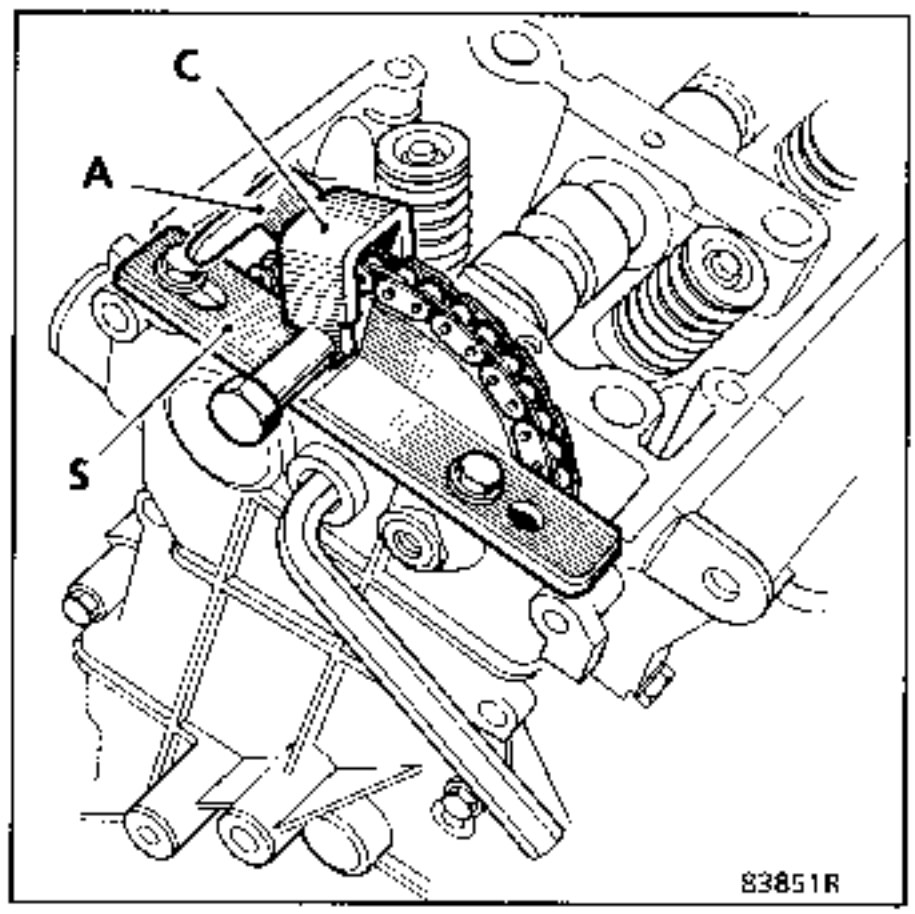


Position of bracket (C) on tool **Mot. 589.**



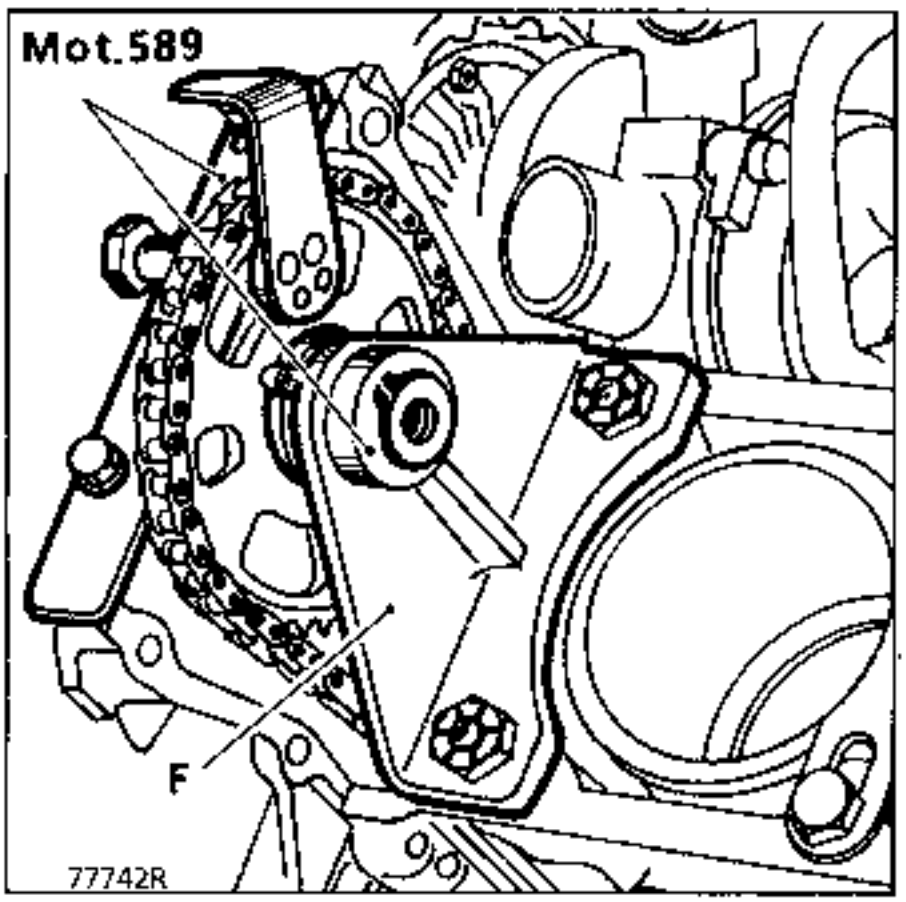
Part (A) is attached to the inside of the bracket (C) by means of bolt (B) **(M7x100 ; length without head: 12 mm).**

Place the modified tool **Mot. 589** in position.



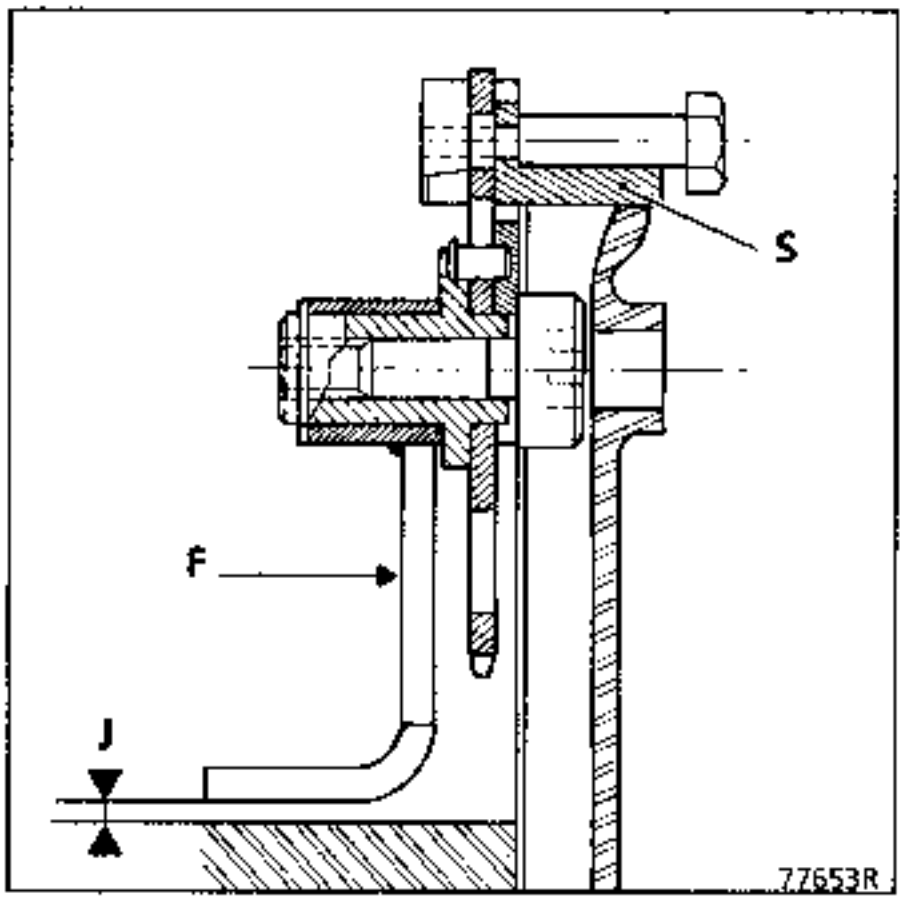
Dimensions in mm.

In order to prevent any alterations of the valve timing, use dummy bearing (F) only if the crankshaft has to be rotated for example, for example : when replacing "liner and piston" assemblies.



FITTING THE DUMMY BEARING

With bracket (5) in place, fit the dummy bearing (F) and slightly tighten the camshaft sprocket mounting bolt.



If there is a slight gap (J) between the lower end of the dummy bearing and the face of the cylinder block, fit shims to prevent the timing chain disengaging and the timing chain tensioner locking in the advanced position.

CYLINDER BANK A

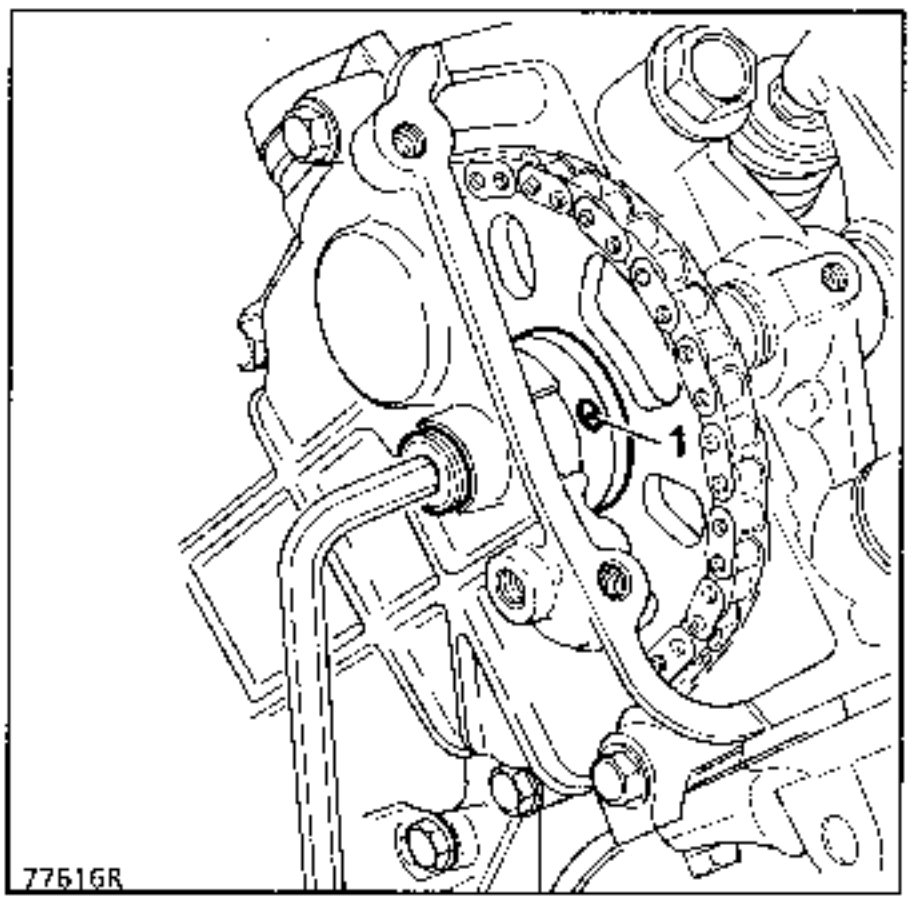
Disconnect the battery.

Drain the cooling system.

Remove:
- the air filter,
- the pipes and hoses,
- the inlet manifold,
- the alternator,
- the exhaust flange,
- the rocker box cover,
- the access plug for the camshaft sprocket bolt or the timing cover (depending on version)

Slacken the power assisted steering pump belt and remove the pulley (depending on version).

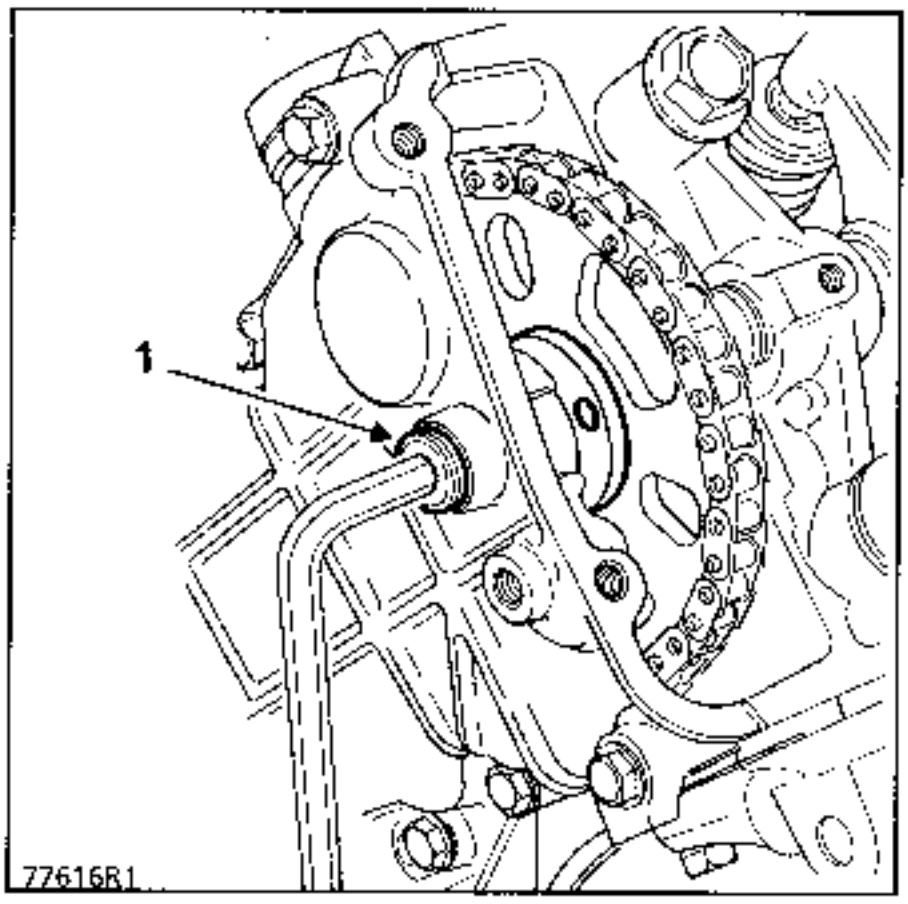
Turn the camshaft sprocket so that drive pin (1) is at the top.



Slacken the camshaft sprocket bolt (allen key).

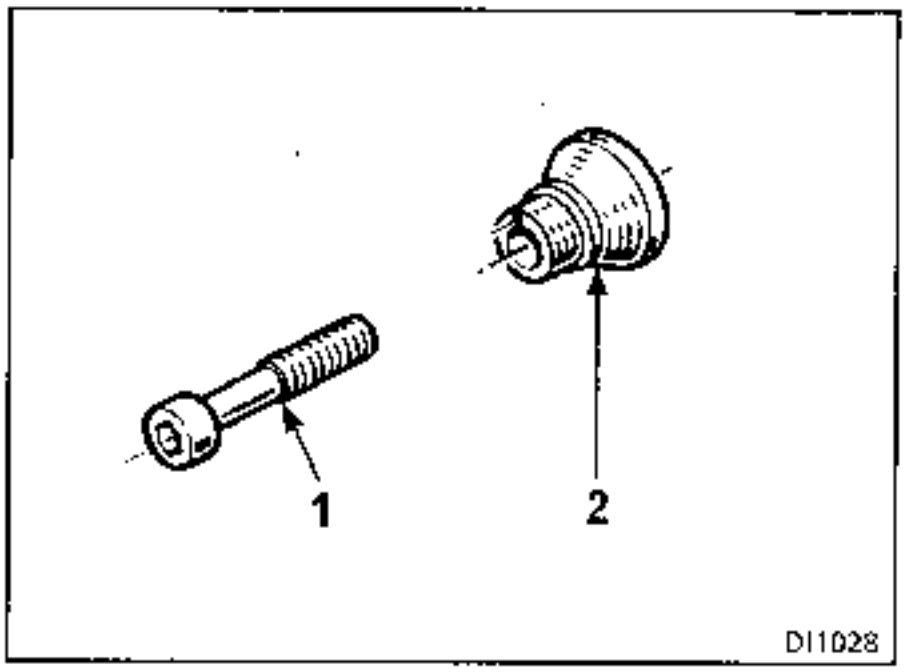
For engines with a distributor on cylinder bank A.

Remove:
- the rotor arm,
- slacken bolt (1) with an allen key.

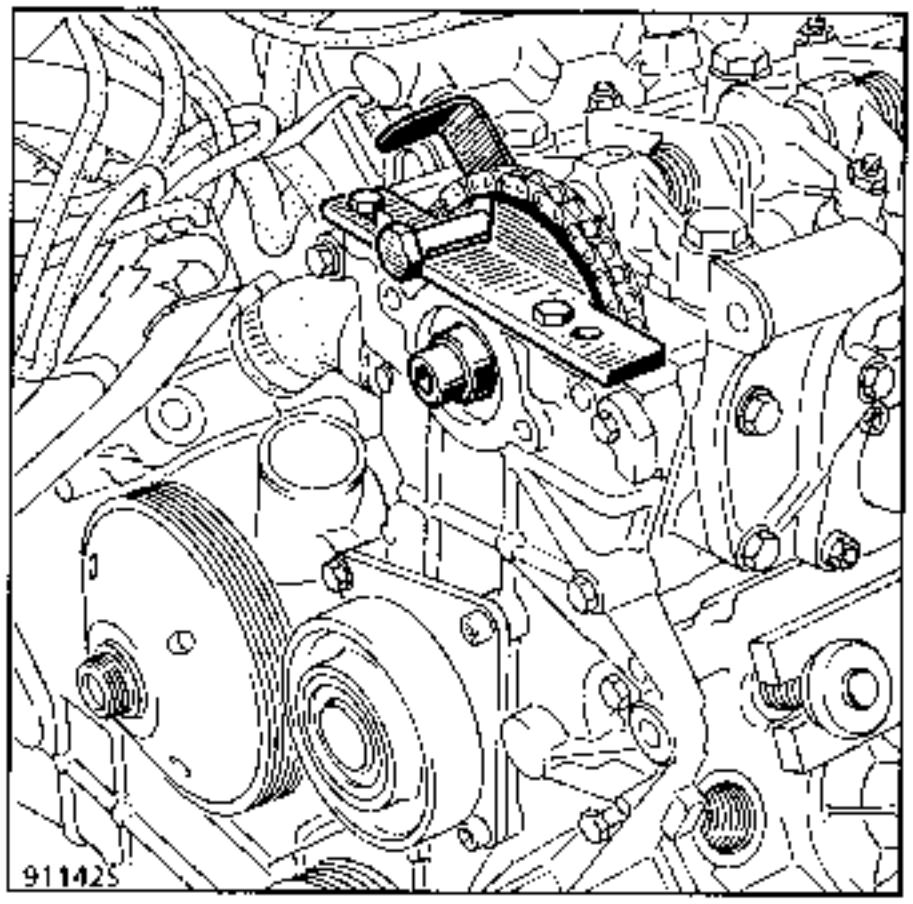


Extract the camshaft bearing oil seal.

Refit bolt (1) and timing finger mounting (2).



Fit the camshaft sprocket support (F) on the timing cover..

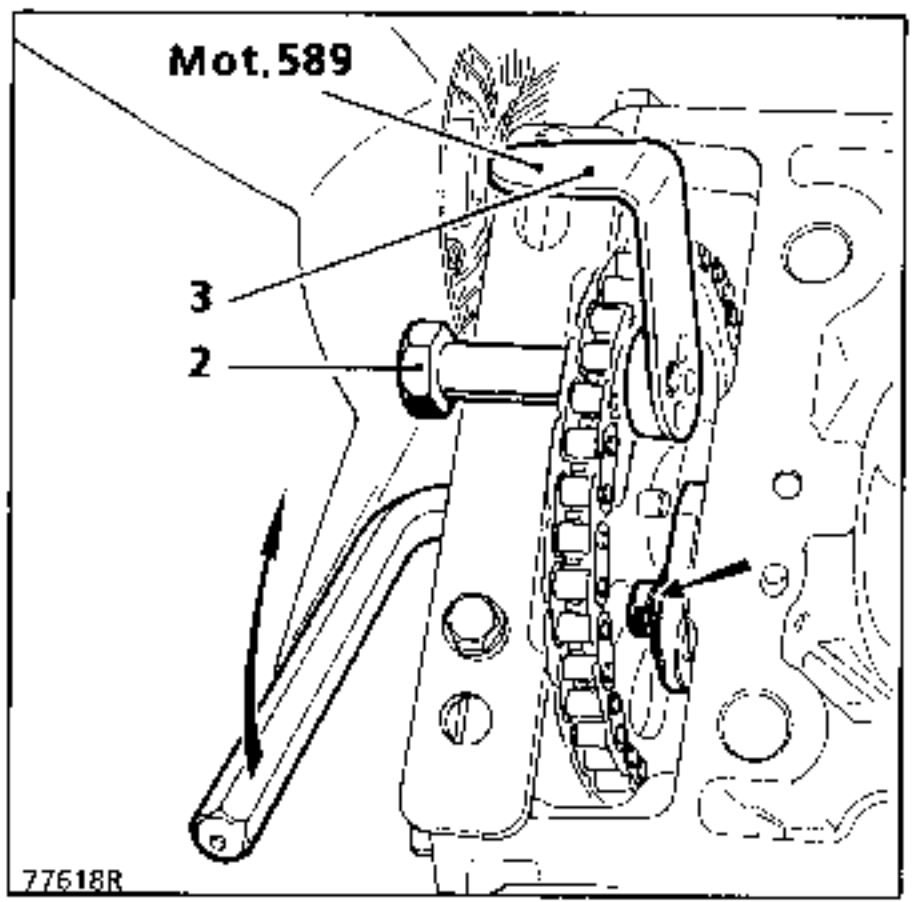


Tighten the two bolts moderately.

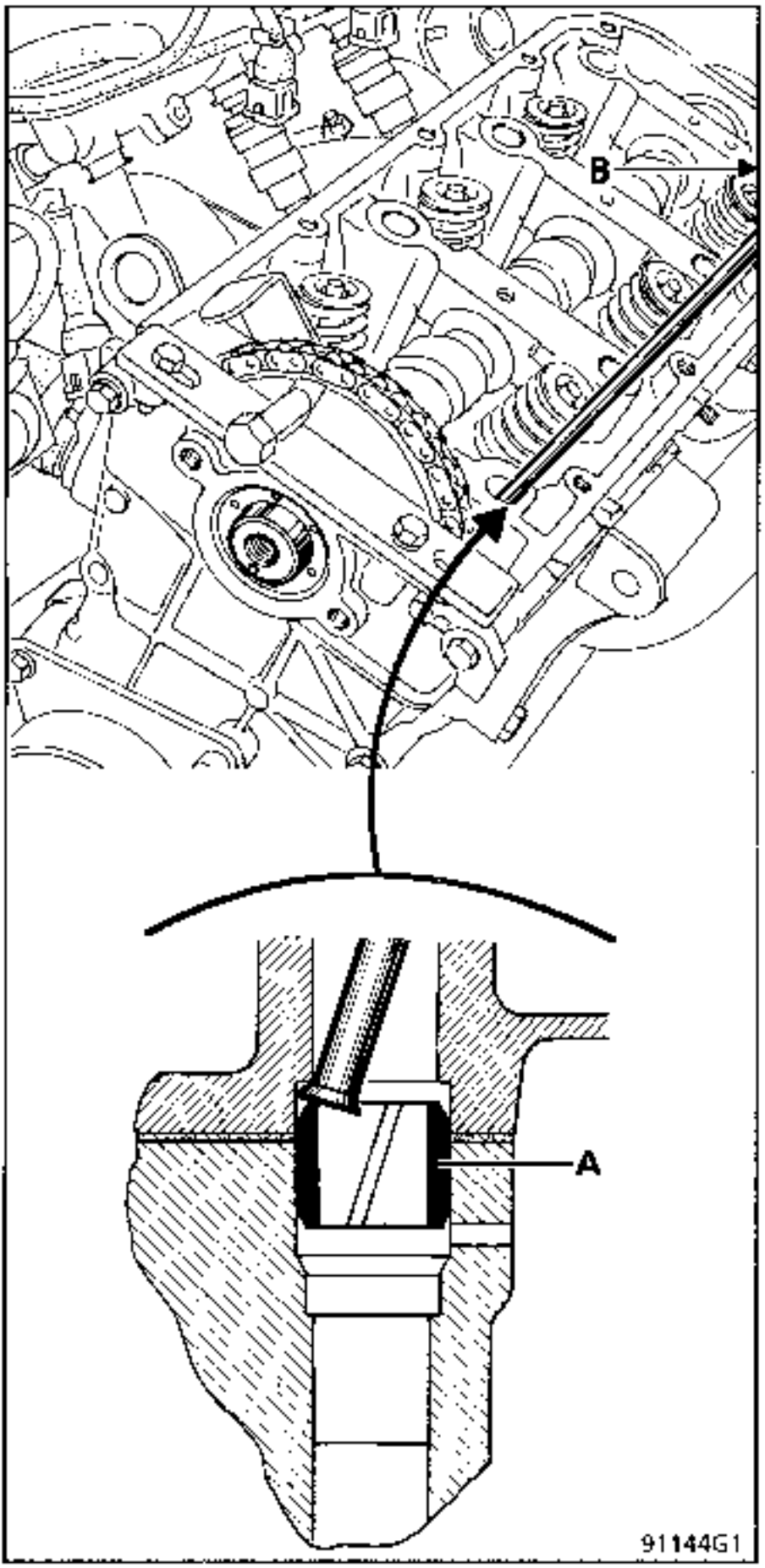
Attach the camshaft sprocket to the support using bolt (2) and nut (3) using a hole in the sprocket.

Remove:
- the cylinder head bolts,
- the rocker shaft assembly.

Unscrew:
- the camshaft flange bolt and free the flange from its recess,
- the camshaft sprocket bolt carefully until the camshaft is disengaged from the bolt.



Press the locating pins down at (A) and (B) using an old pushrod for example.



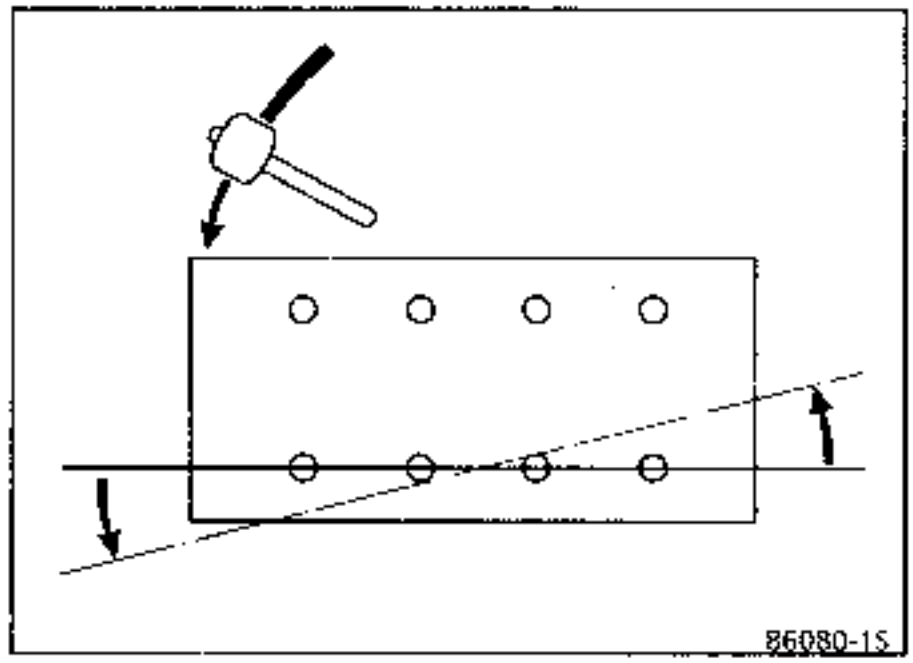
Remove:
- the hose and water outlet union on the cylinder head,
- the four bolts securing the cylinder head to the timing cover.

Release the cylinder head.

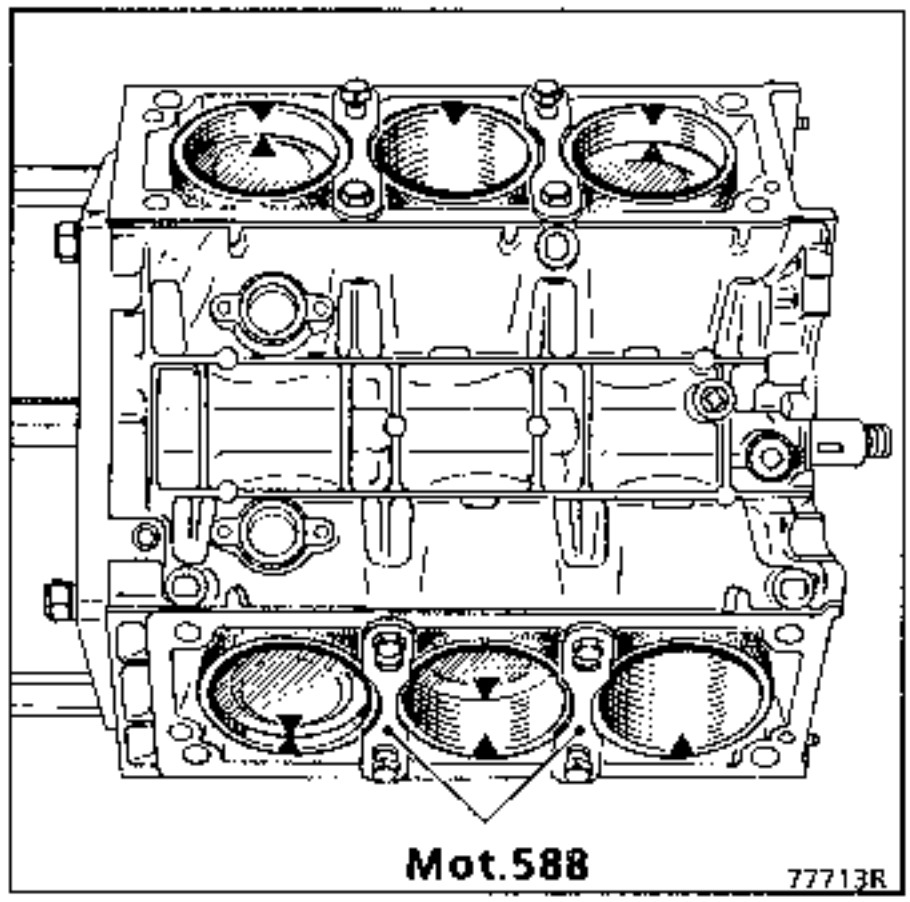
As the cylinder head gasket is bonded to the cylinder head, the cylinder block and the cylinder liners, **it is very important not to lift the cylinder head.** This would unstick the cylinder liners from their bases and cause impurities to enter the assembly.

The cylinder head should be rotated to release it from the cylinder block.

Release the cylinder head by tapping the ends using a plastic mallet, with a horizontal rotational movement.



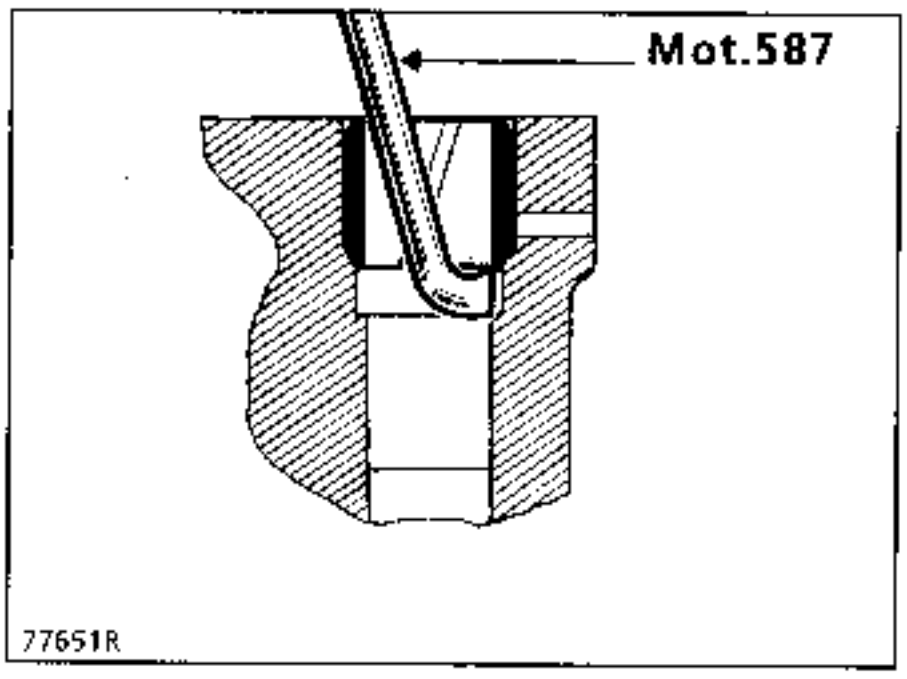
Fit the cylinder liner retaining straps **Mot. 588** to the cylinder block.



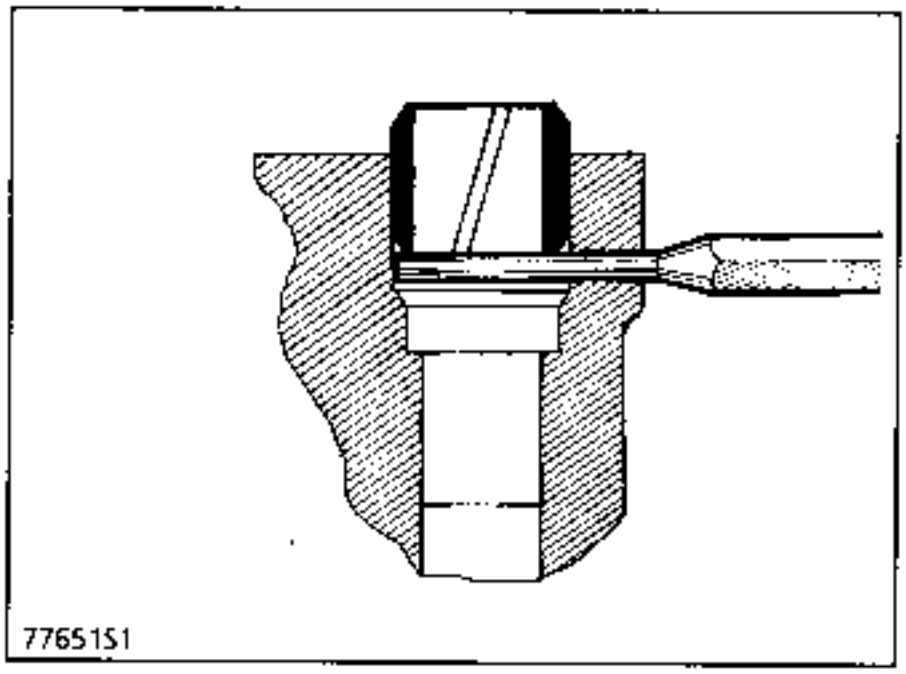
Use a syringe to remove any coolant remaining in the cylinder block.

Remove the locating pins (A) and (B) for the cylinder head using extractor **Mot. 587.**

Remove the cylinder head gasket.

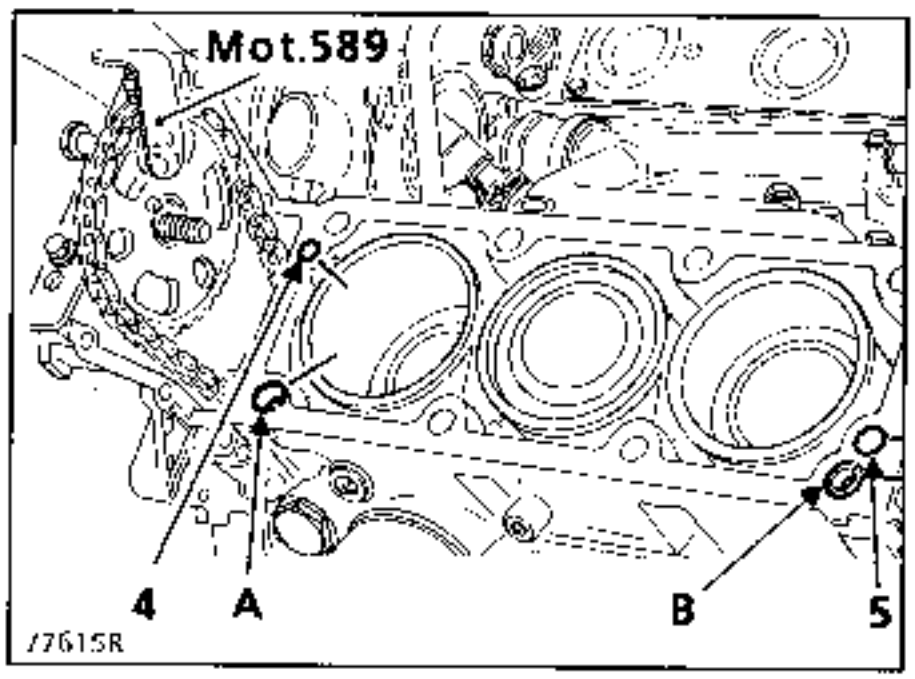


Fit the locating pins to their correct height using a roll pin punch (3mm diameter).



Clean the gasket faces of the cylinder head and the cylinder block using **Décapjoint.**

Take care not to introduce any foreign bodies into the oil feed hole (4) and oil return hole (5), which might block the rocker arm jet holes and lead to excessive wear of cams and rocker fingers.



CHECKING LINER PROTRUSION

With the cylinder liner seals in position, the liner protrusion in relation to the gasket face of the cylinder block should be :

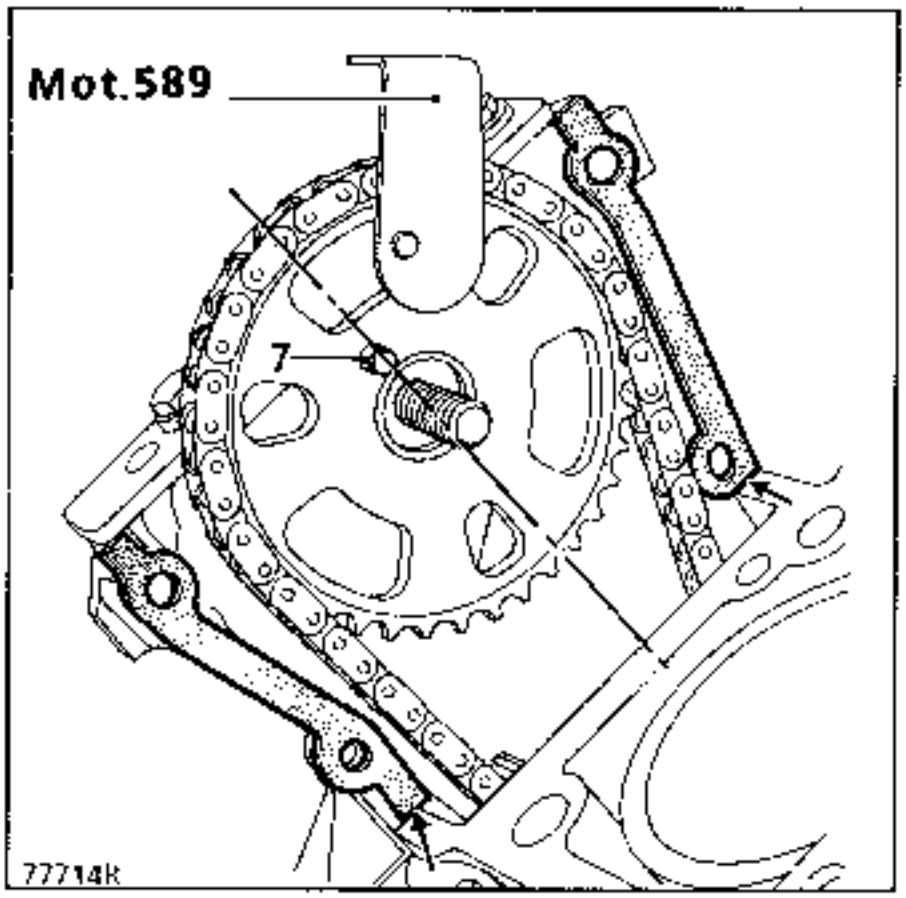
- between **0.16** and **0.23,** for a paper seal
- between **0.13** and **0.20,** for a varnished seal.

If the liner protrusion is not correct, replace the liner base seals.

REFITTING

Check that the camshaft sprocket drive pin (7) is uppermost.

Avoid any slackening of the timing chain. If it becomes slack accidentally, then it is imperative that the timing cover is removed in order to release the chain tensioner.



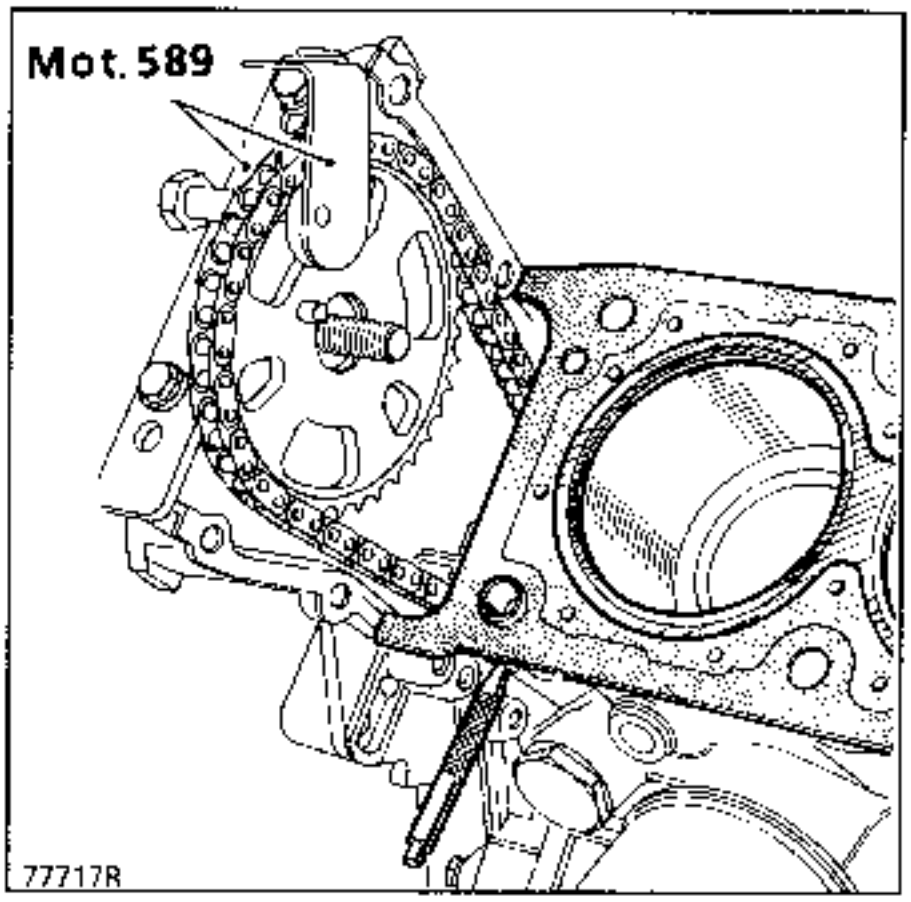
SEALING BETWEEN THE CYLINDER HEAD AND TIMING COVER

Trim the gaskets off level with the cylinder block (>).

Cut sections from the new gaskets to replace these parts.

Run a thin bead of **Rhodorseal 5661** along where the cuts have been made.

Insert a 3 mm diameter pin (roll pin punch) into each locating pin hole and insert each dowel so that it rests on the pin punch and is prevented from being pushed down when the cylinder head is fitted.



Fit:

- a new cylinder head gasket in dry condition,
- the cylinder head, taking care not to dislodge the timing cover gasket.

Insert the timing cover mounting bolts and hand tighten them.

Line up the drive pin and hole on the camshaft and sprocket and insert the camshaft carefully into the camshaft sprocket.

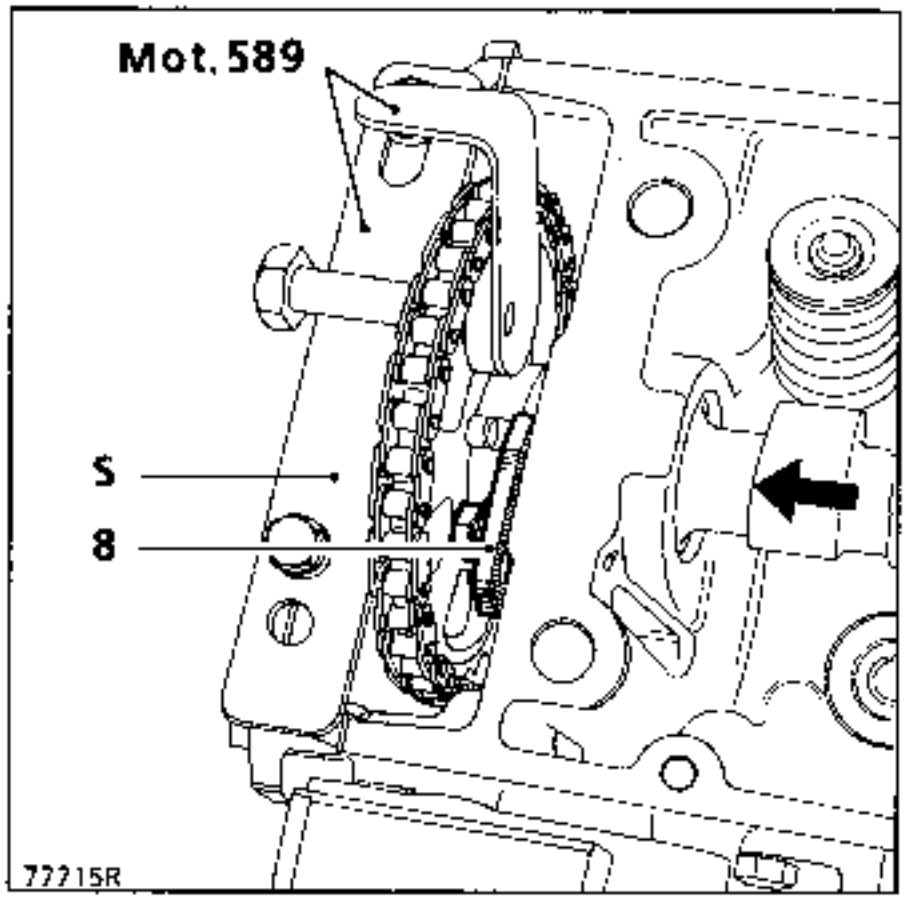
Make sure that the camshaft stop (8) is fully withdrawn to allow the camshaft flange to pass through.

Tighten the sprocket mounting bolt moderately.

Remove support (S)

Push the camshaft stop fully home into its groove and tighten the bolt to the recommended torque.

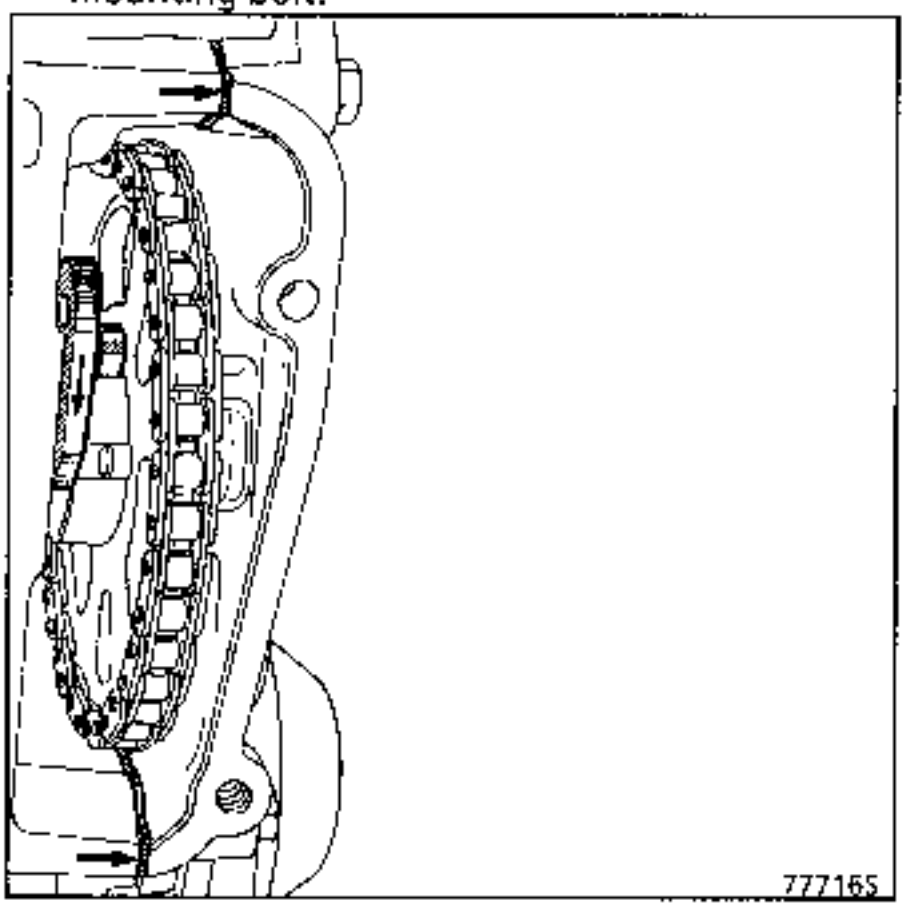
Remove both 3 mm diameter pins.



Fit the rocker shaft assembly and the cylinder head bolts.

Tighten the cylinder head bolts
(see Specifications section)

Tighten to the recommended torque:
- the timing cover bolts and trim the seals,
- the timing sprocket mounting bolt,
- the access plug for the camshaft sprocket mounting bolt.



Fit:

- a new camshaft bearing seal,
- the inlet manifold with new gaskets,
- the pipes and hoses,
- the water outlet union with a new seal.

Adjust the rocker arm clearance.

Fit the rocker box cover.

Run the engine until the cooling fan operates.

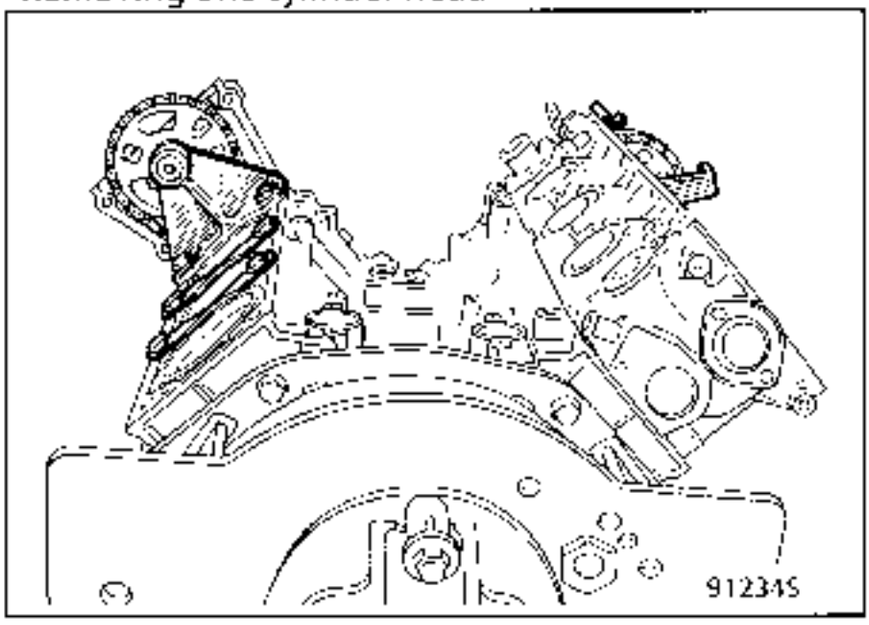
Let the engine cool down for at least 6 hours then retighten the cylinder head (if necessary).

With this method, the vehicle does not need to be returned to the workshop to retighten the cylinder head.

The operations for removing and refitting the cylinder head for bank B are identical to those for bank A.

Both cylinder heads may be removed at the same time as described below:

Example :
Removing one cylinder head



Removing both cylinder heads