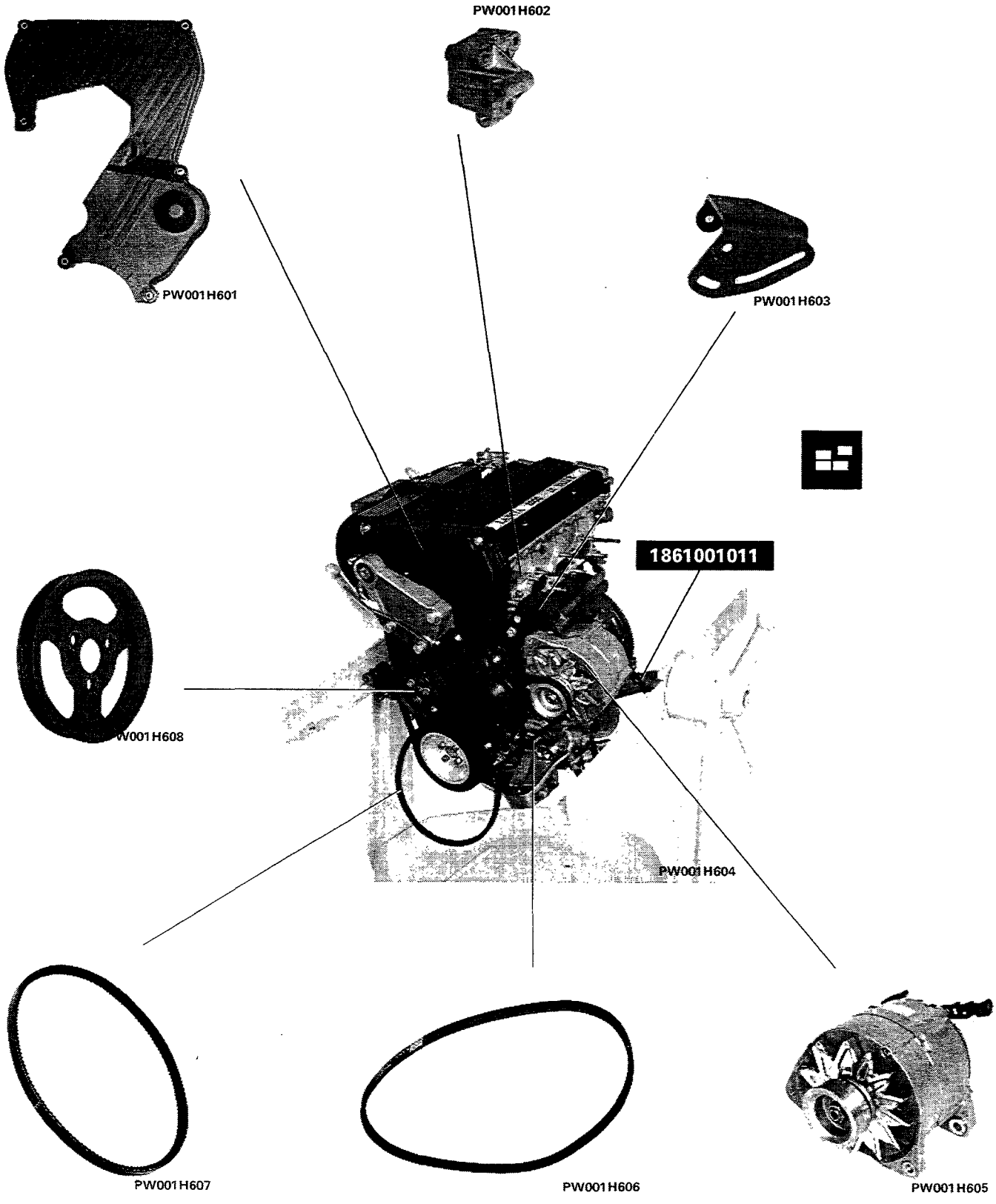
page

For matters not dealt with in this section, refer to the 2000 i.e. - 2000 i.e. turbo Section of the "Lancia petrol engine overhaul" manual.

SEQUENCE OF OPERATIONS

– Drain the engine oil (using spanner 1850113000) while the engine is raised off the ground by the hoist;
– mount the engine on the rotating stand using brackets 1861001011;
– remove the parts illustrated below:



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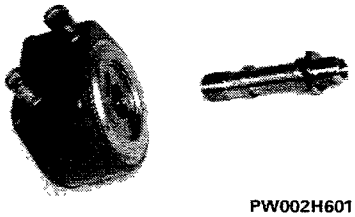
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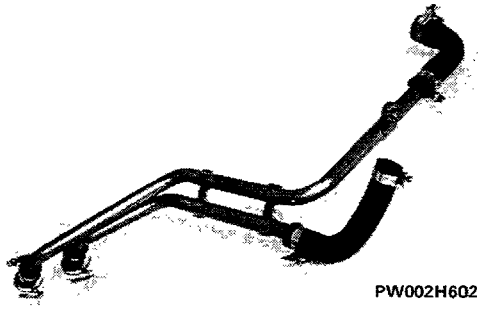
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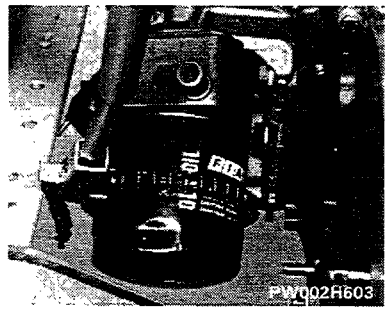
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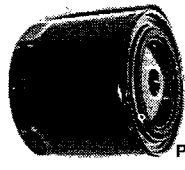
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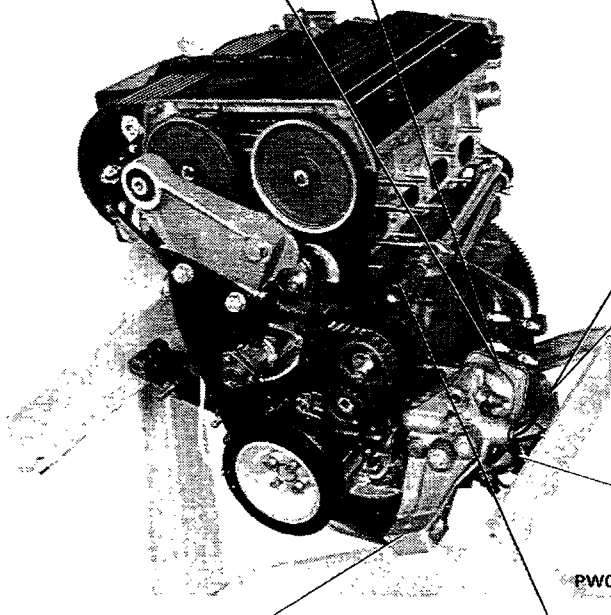
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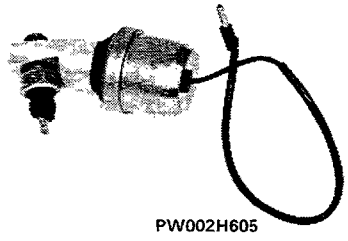
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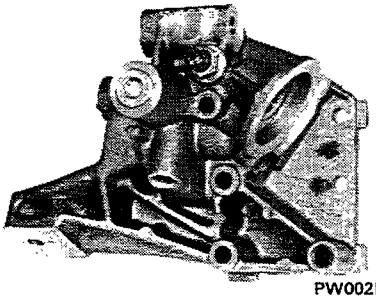
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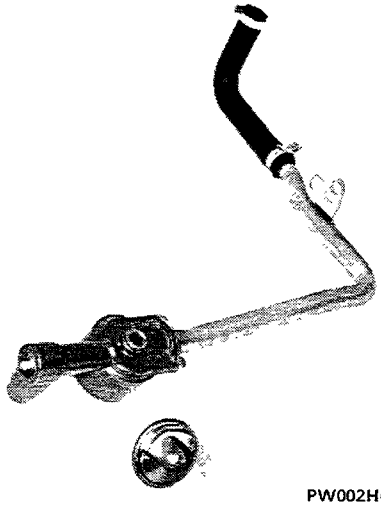
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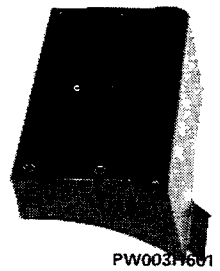
* 2000 i.e. 16V engine only



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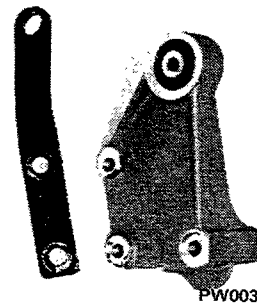

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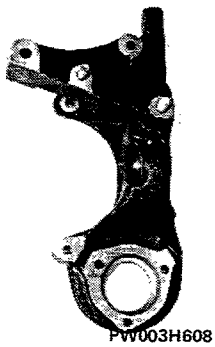

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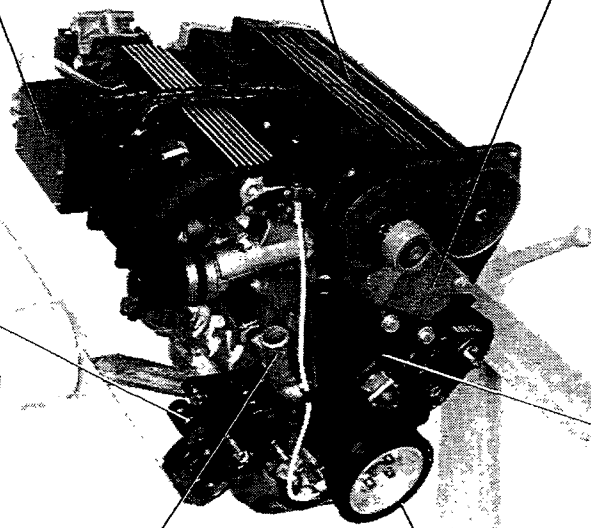

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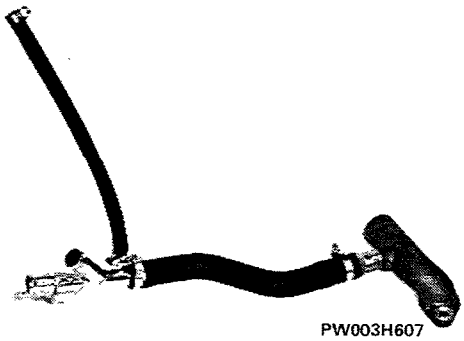

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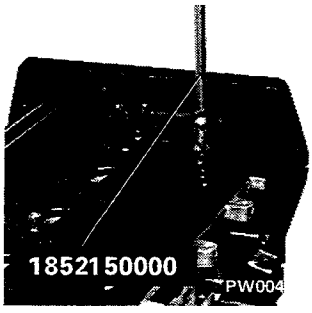

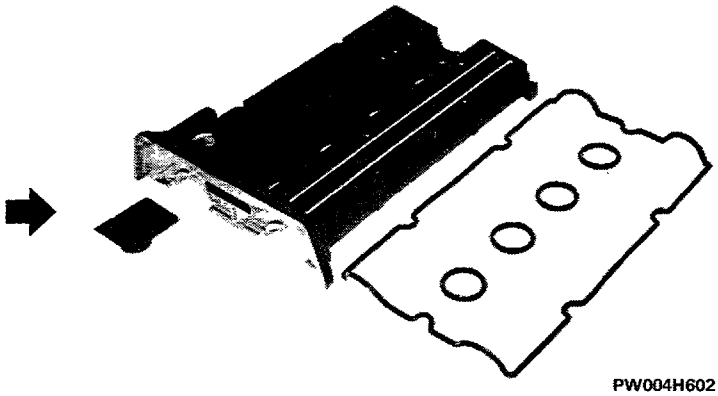

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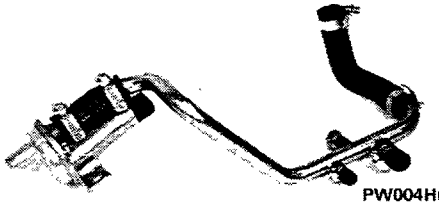

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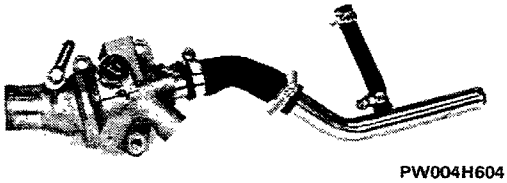

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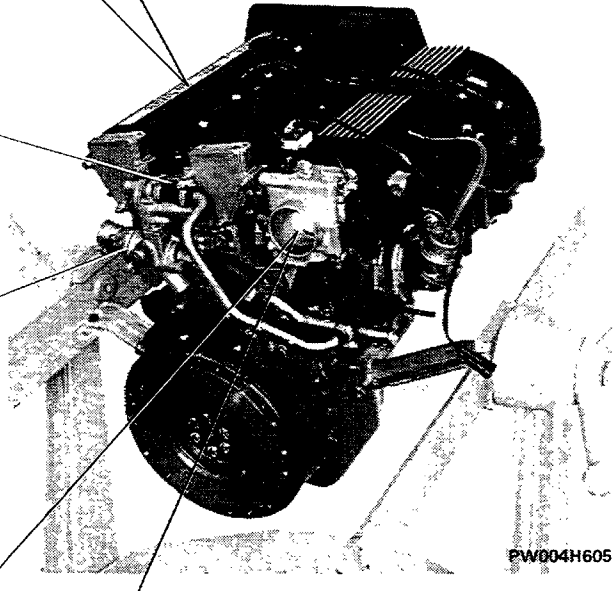

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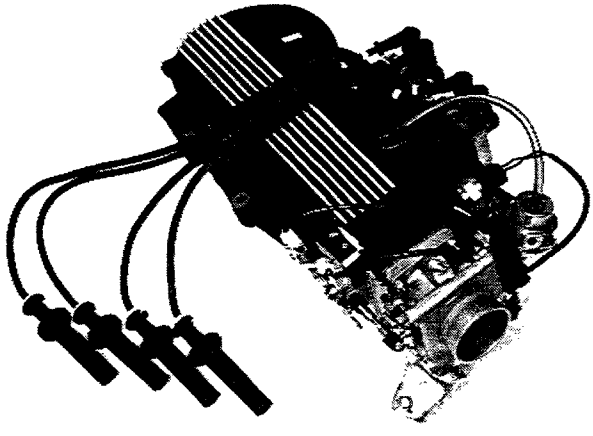

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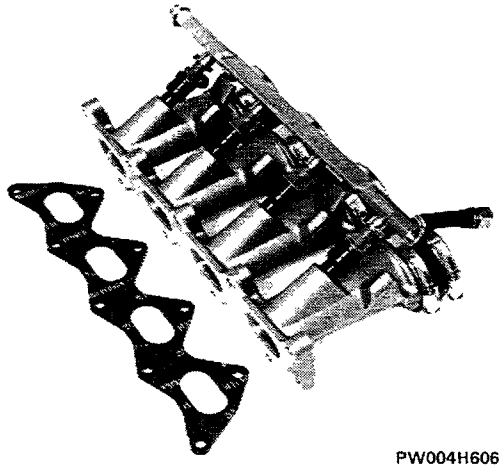

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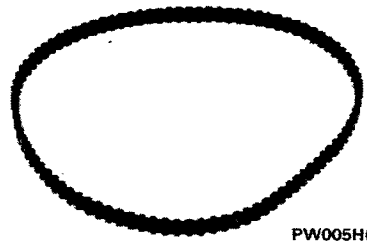
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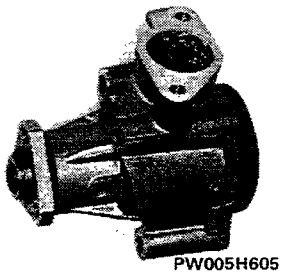
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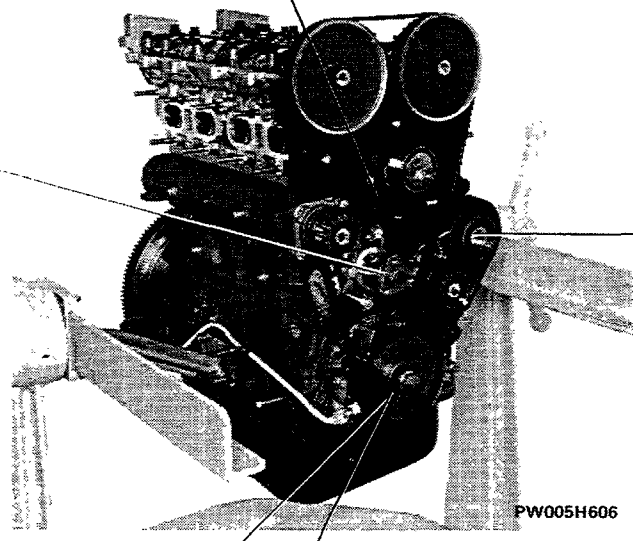
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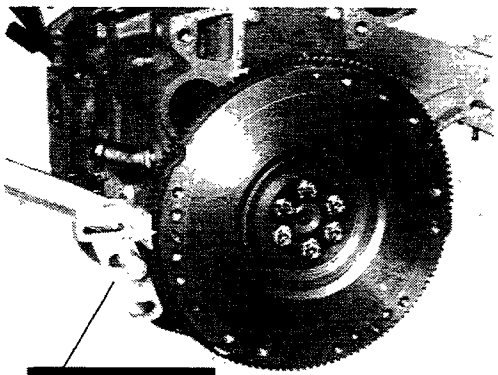

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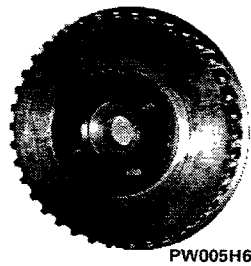
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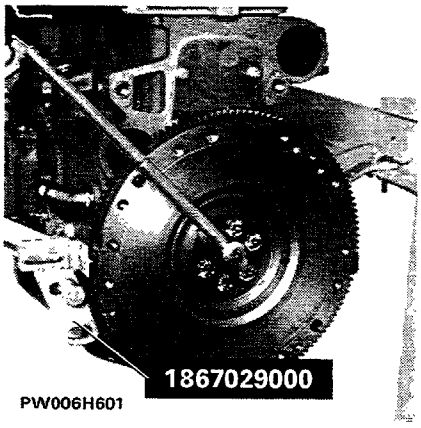
The sprocket bolt has a left-hand thread.

To remove the sprocket bolt, use the flywheel locking tool 1867029000

10.



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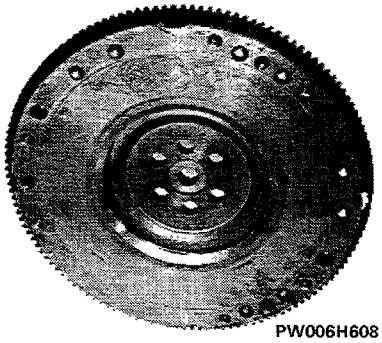

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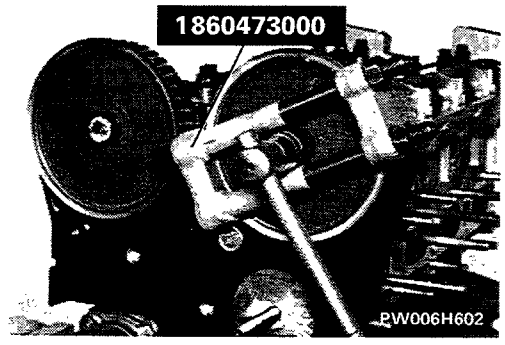

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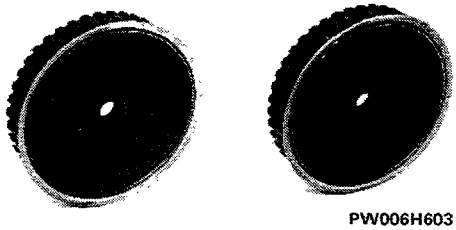

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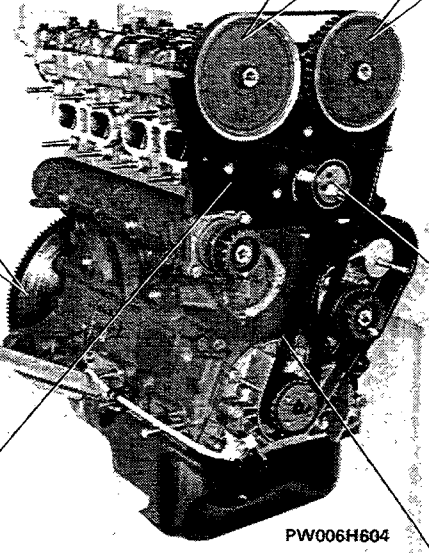

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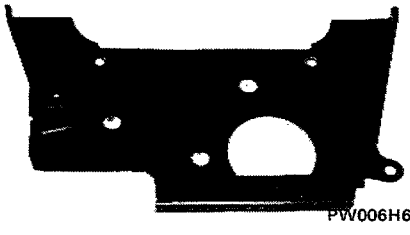

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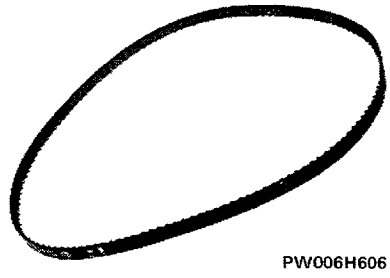

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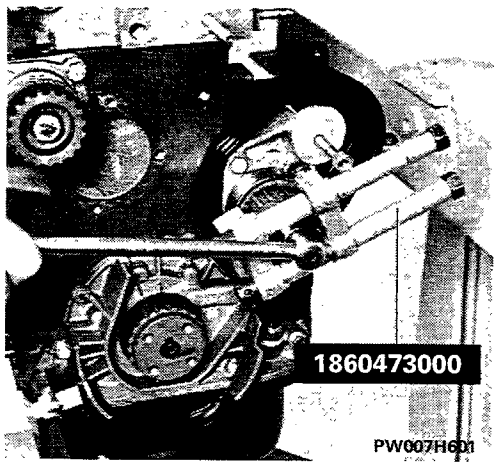


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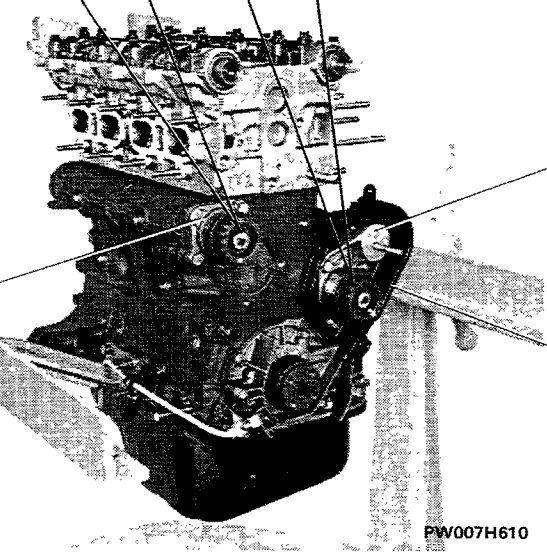
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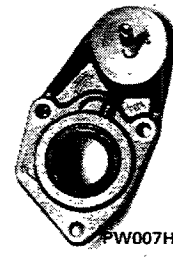
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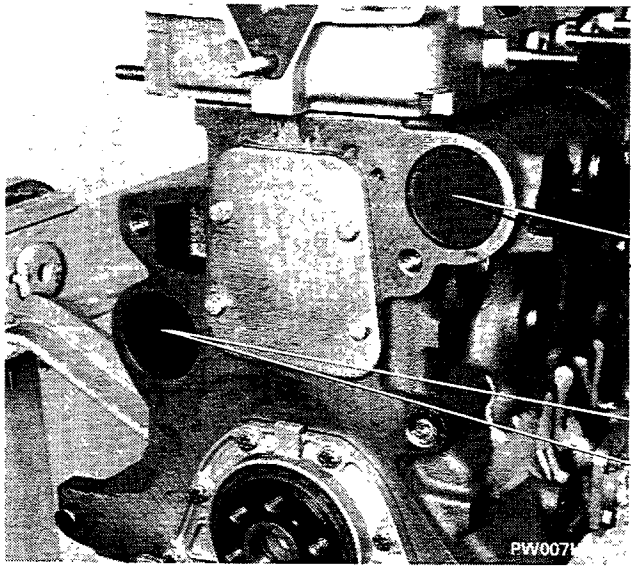
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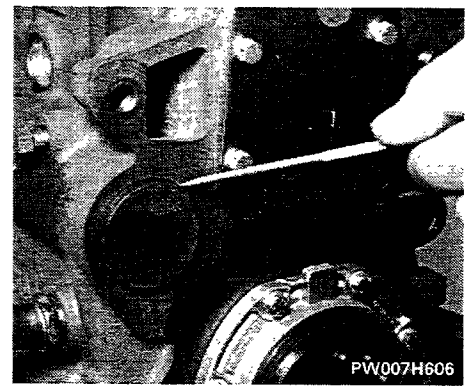
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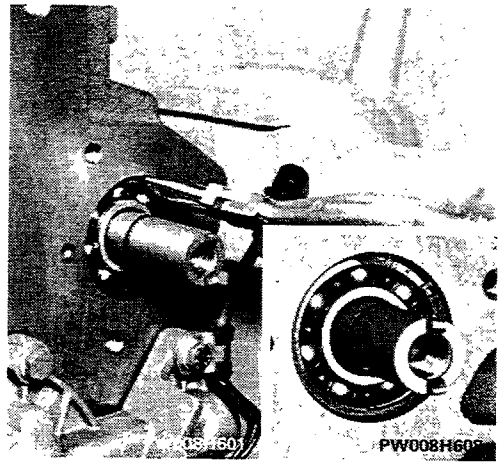
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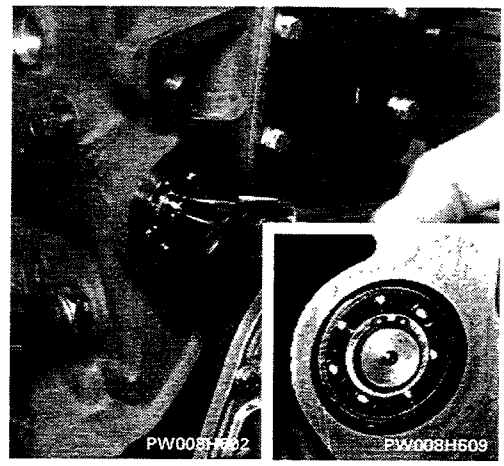
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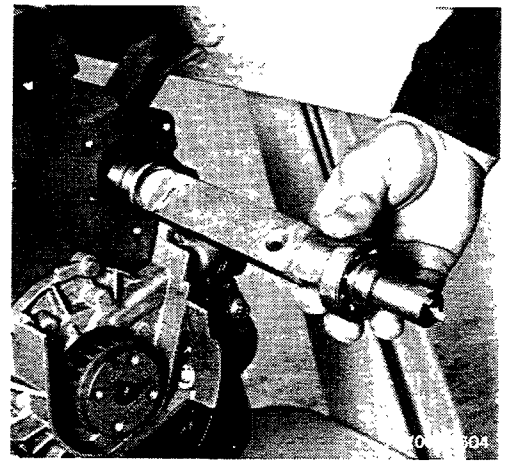

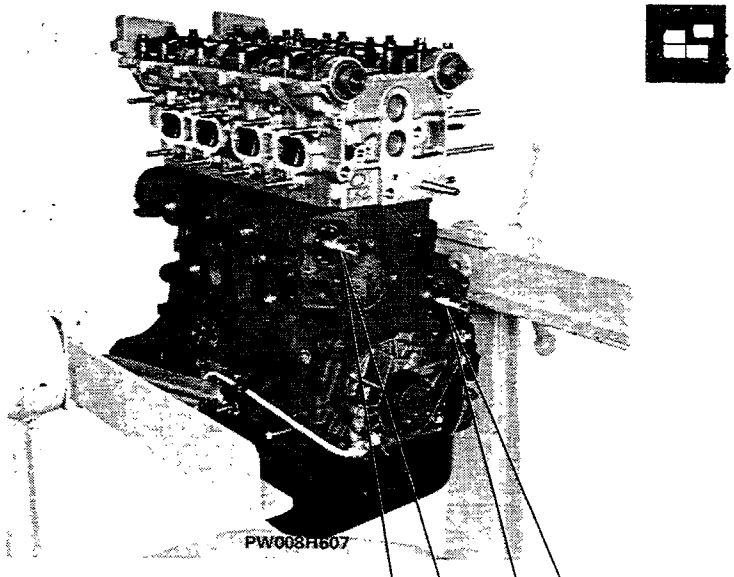
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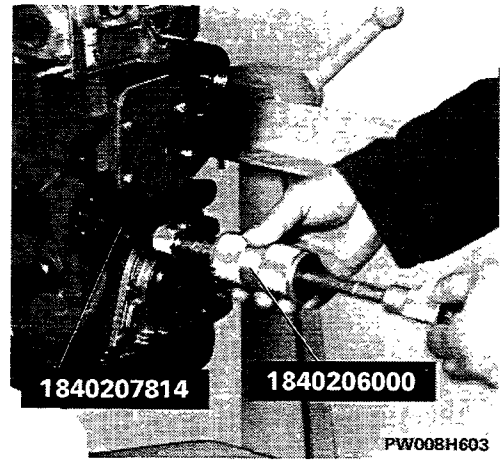
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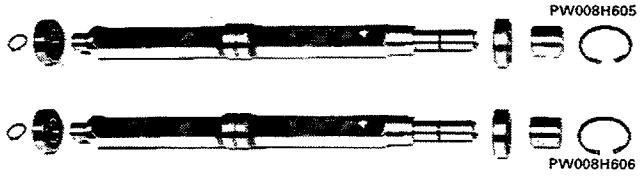
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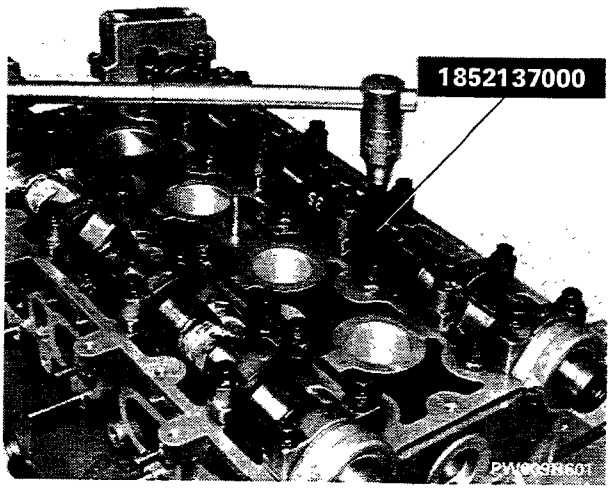
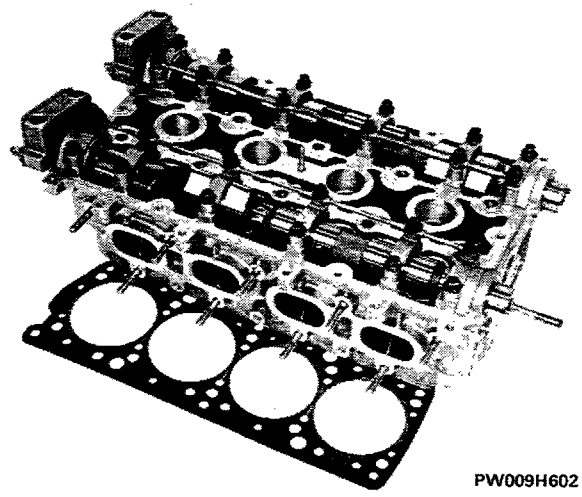
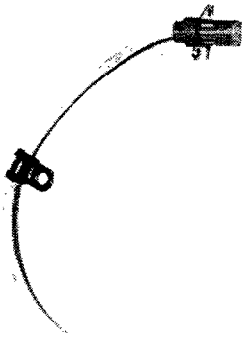
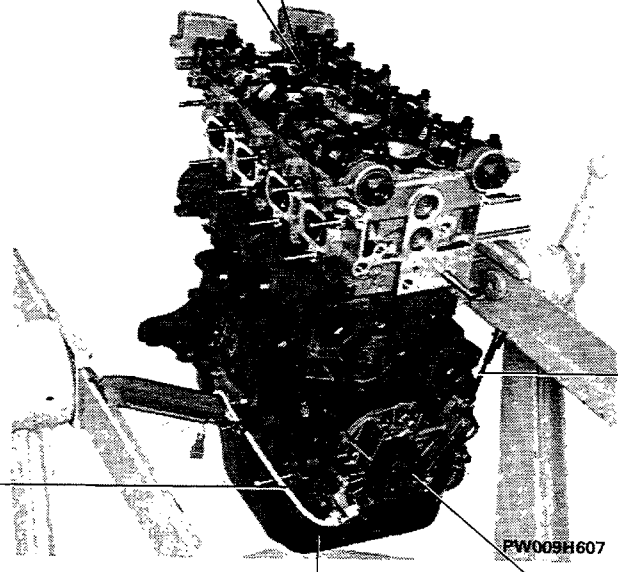
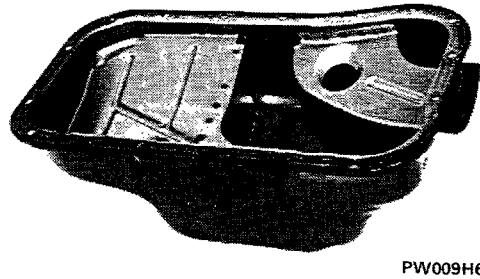








The sensor bracket should never be removed



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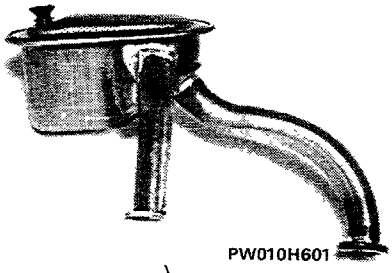
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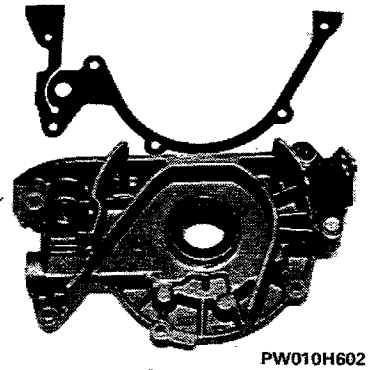
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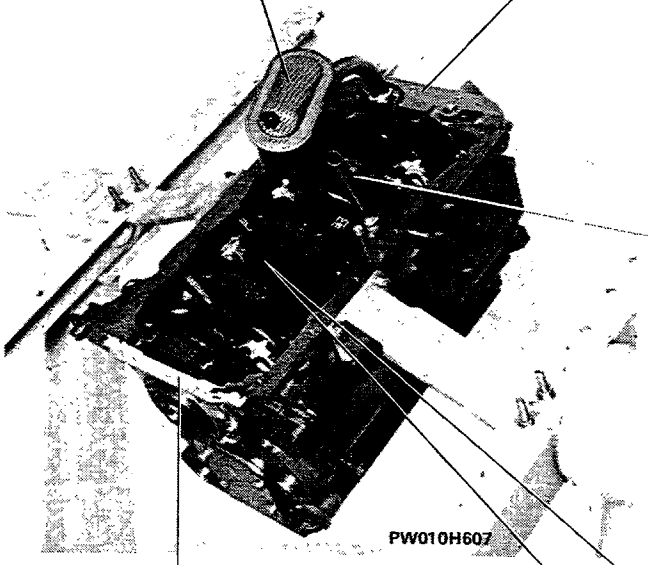
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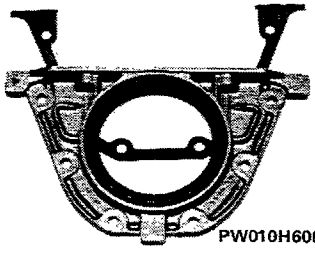
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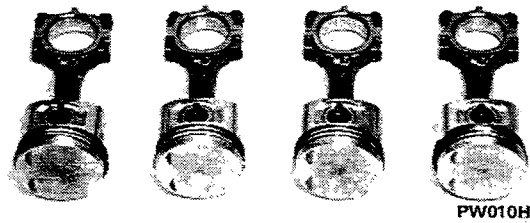
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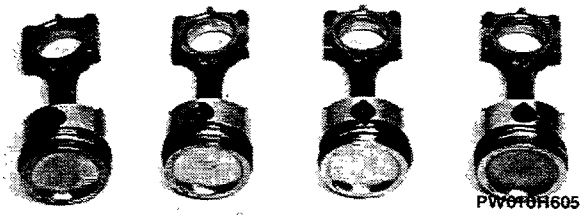
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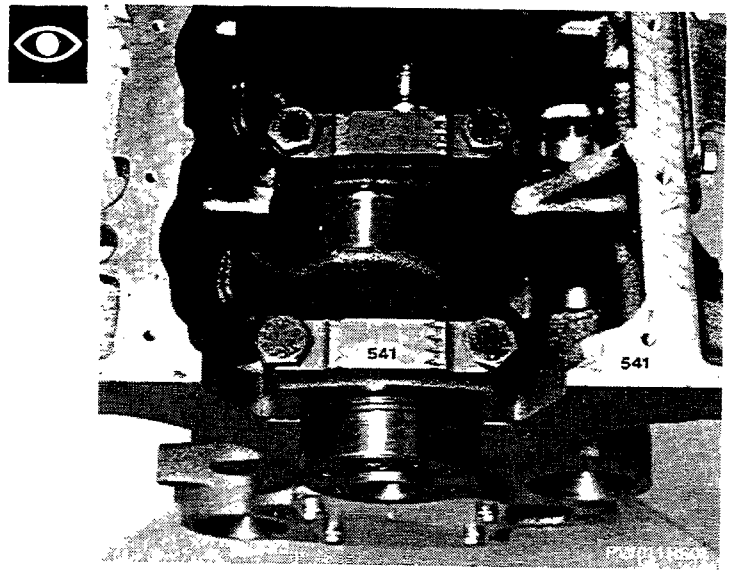
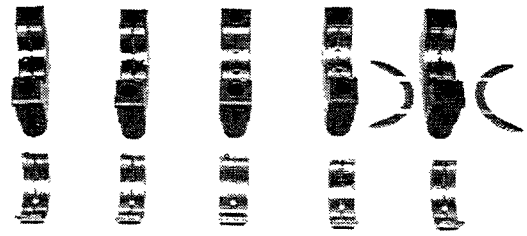
* 2000 i.e. 16V turbo engine



Numbering on cylinder block and bearing caps

The numbers stamped on the cylinder block and bearing caps must be the same and legible from the flywheel side.
The bearing cap positions are indicated by a series of notches starting from the timing gear side.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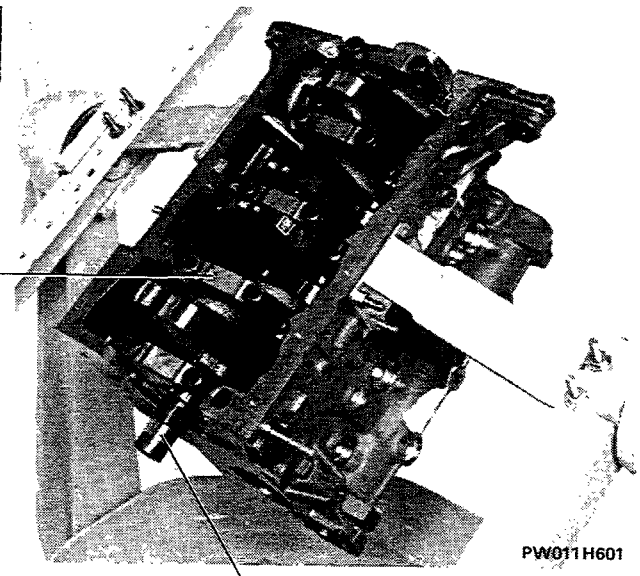
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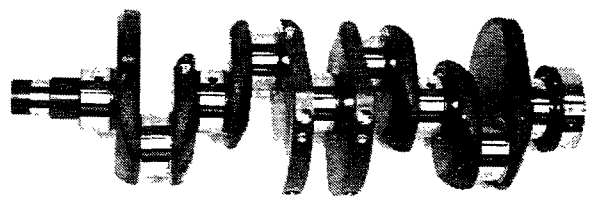
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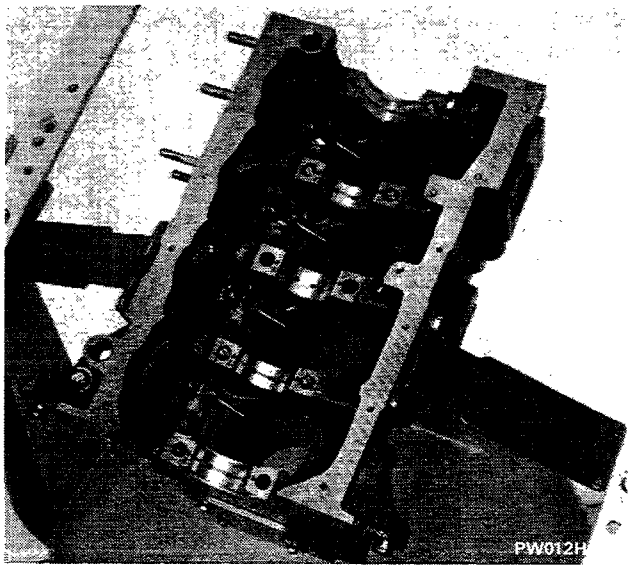
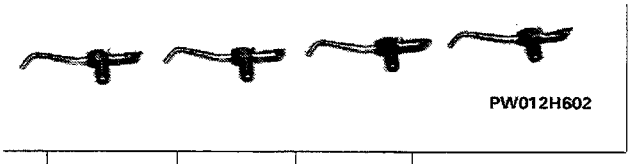
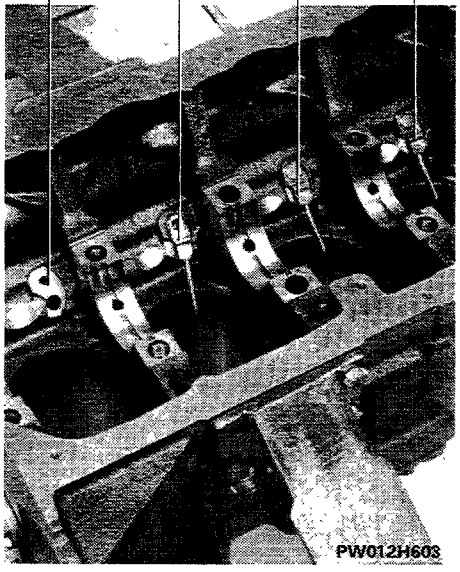
2000 ie 16V 2000 ie 16V turbo

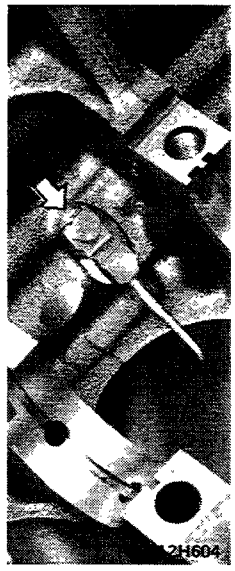
10.



After dismantling the engine, carefully check the various dismantled parts.
The following sections contain instructions for the main checking and measuring operations necessary in order to determine whether the components are suitable for reuse.
The correct refitting sequences are also described, and special tools are indicated to facilitate the engine reassembly procedure.





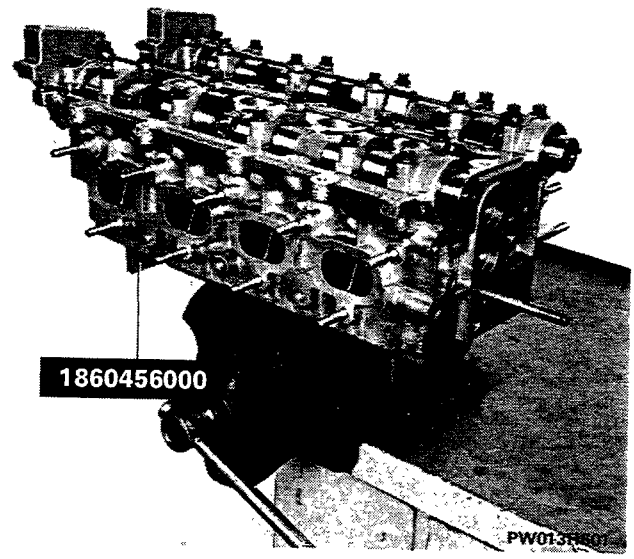


Location of piston lubricating and cooling jets

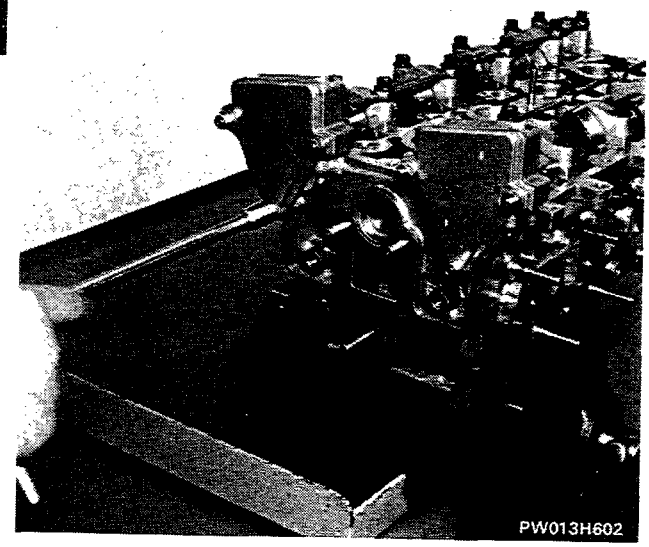
The spray jets are screwed into a special lubricating passage in the cylinder block.

NOTE *The arrow shows the point to be staked.*

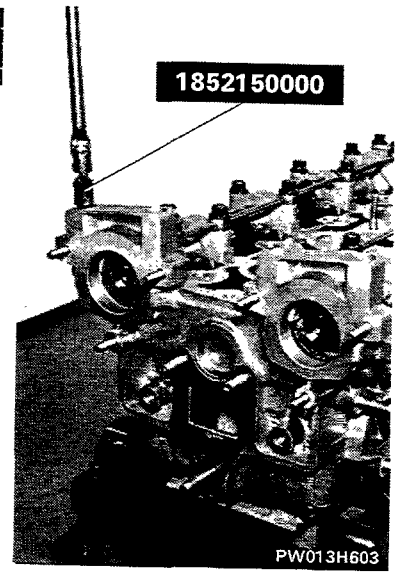
DISMANTLING AND CHECKS

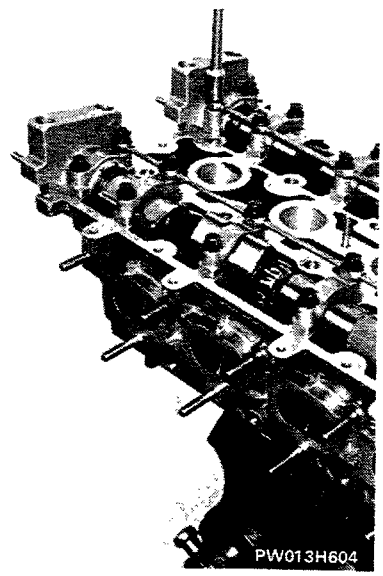


Mounting cylinder head on tool 1860456000

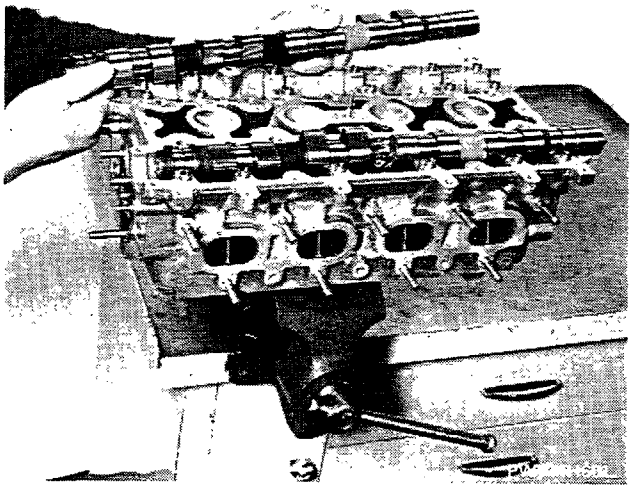


Dismantling side covers from camshaft rear caps

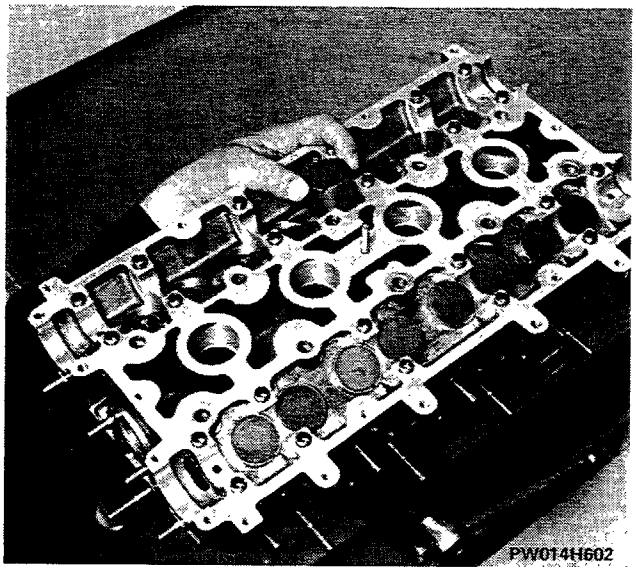




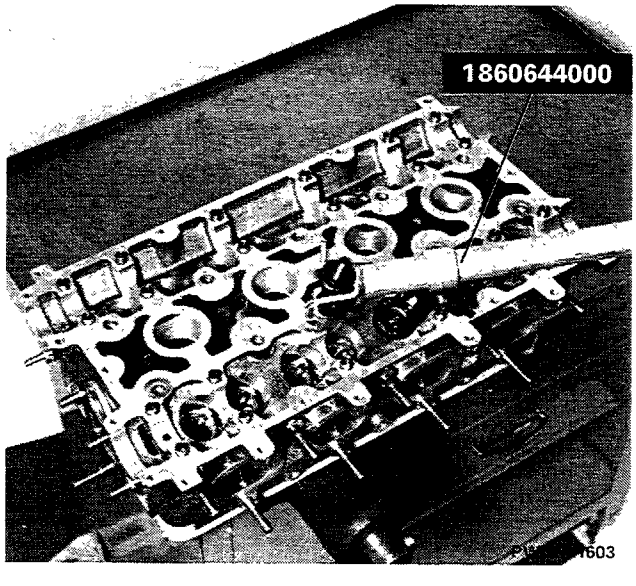
Dismantling camshaft caps and lubrication pipes



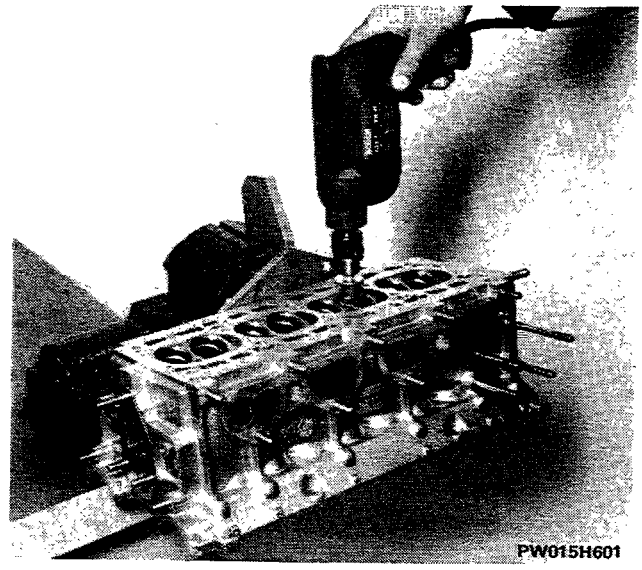
Dismantling camshafts



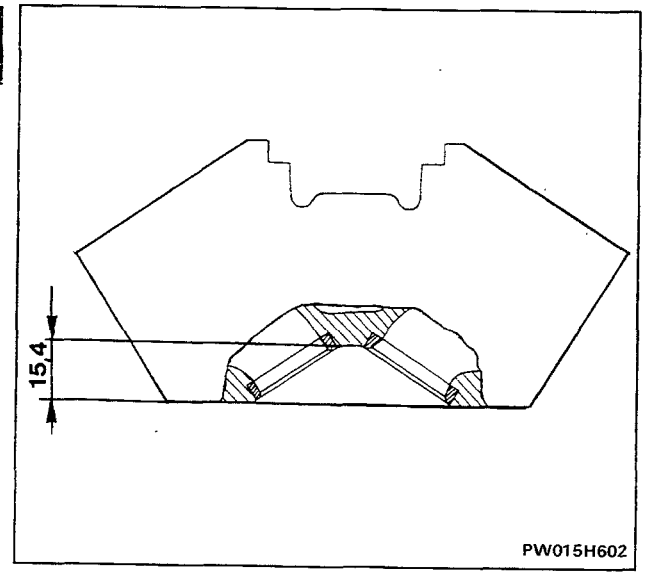
Dismantling tappets



Dismantling half collets, caps, springs, valves

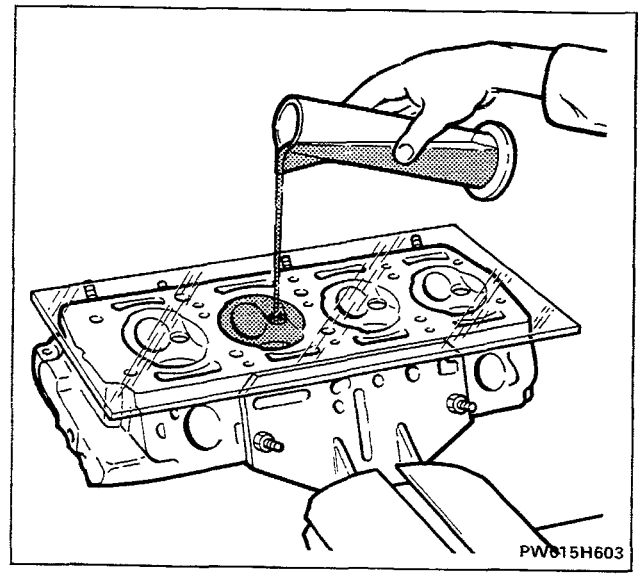


Decarbonizing and cleaning valve seats and passages



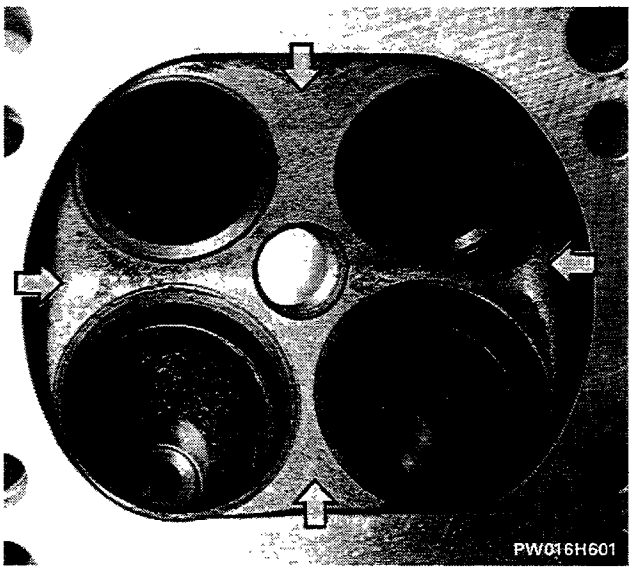
Refacing cylinder head

Slight refacing of the cylinder head is permitted.
However, if the combustion chamber depth then becomes less than 15.4 mm, the cylinder head should be replaced since it could give rise to damage to the valve seats.



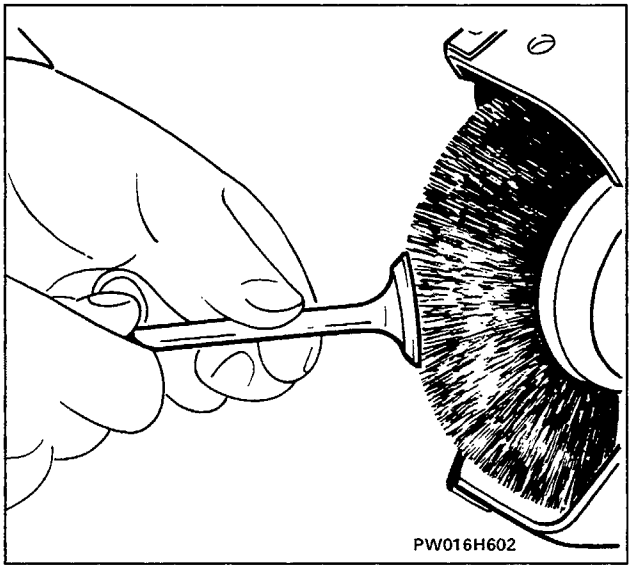
Measuring combustion chamber volume (41.8 cc)

After refacing the cylinder head, check the combustion chamber volume after fitting the valves and spark plugs.
Fill a measuring cylinder with VS 20 or 30 engine oil and note the amount put in, then allow the oil to stand in the cylinder for approx. 10 minutes.
After filling the combustion chamber, allow the oil to stand in the measuring cylinder for approx. 10 minutes.
Measure the remaining oil: the difference in the cylinder contents before and after filling the chamber corresponds to the volume of the chamber.



Areas for removal of material 41.8cc

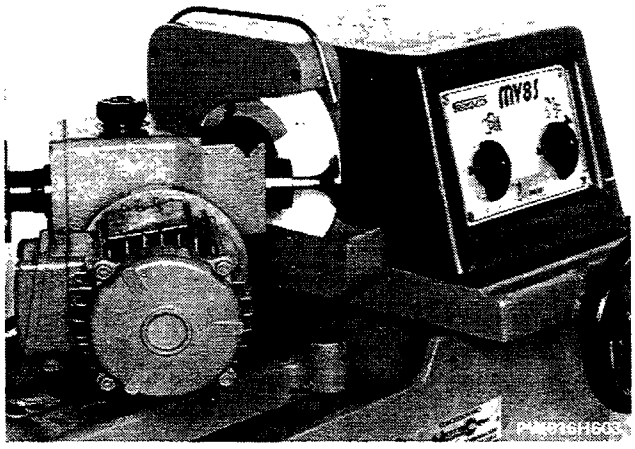
If the measurment is less than 00.0 cc material should be removed from inside the chamber in order to obtain the correct value.
The arrows in the photo show the areas where material should be removed.



VALVES

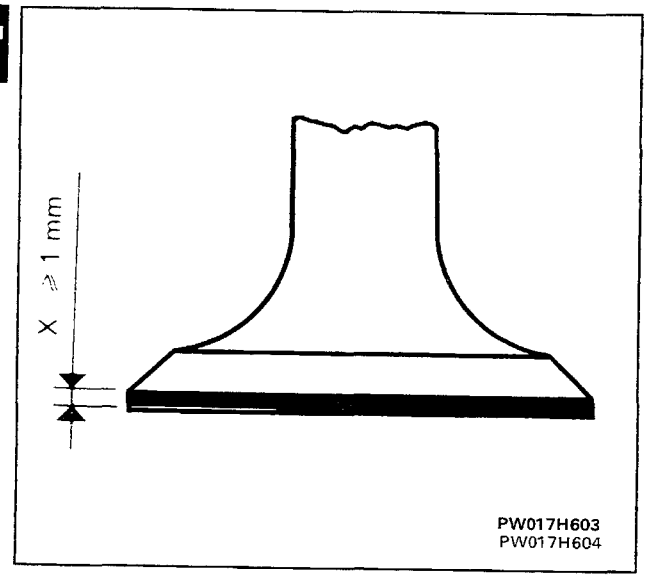
Decarbonizing valves

Check that the valve stem does not show signs of scoring or seizure; also check using a micrometer that the valve stem diameter is within the tolerance limits.



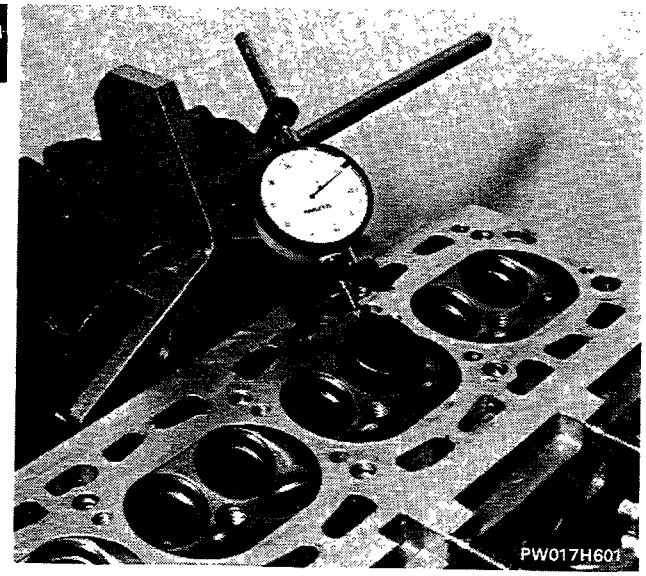
Valve regrinding using a cutter

Set the scale to an angle of 45°30' and regrind the valve, removing as little material as possible. If the top of the valve stem is pitted, regrind it, again removing as little material as possible.



Checking dimension (X)

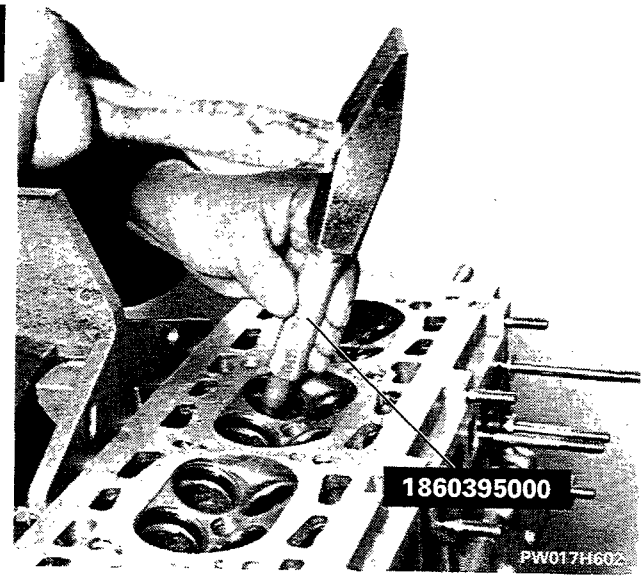
After regrinding check that the thickness (X) of the valve on the head perimeter is at least 1 mm, otherwise the valve will need to be renewed.



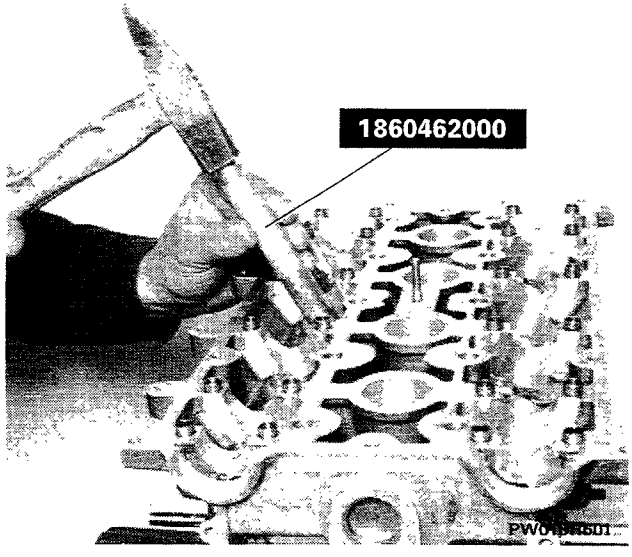
Checking clearance between valve stem and valve guide

NOTE *If the clearance (measured as illustrated) between valve stem and valve guide is over 0.25 mm, the valve guide should also be renewed.*

VALVE GUIDES



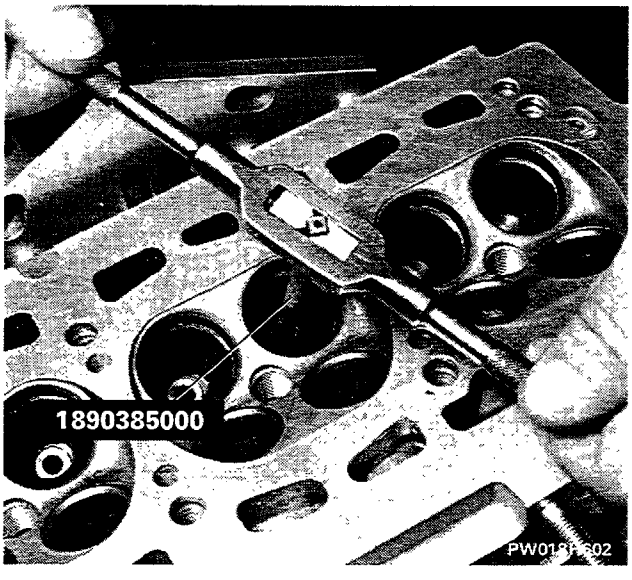
Removing valve guide



Fitting valve guide

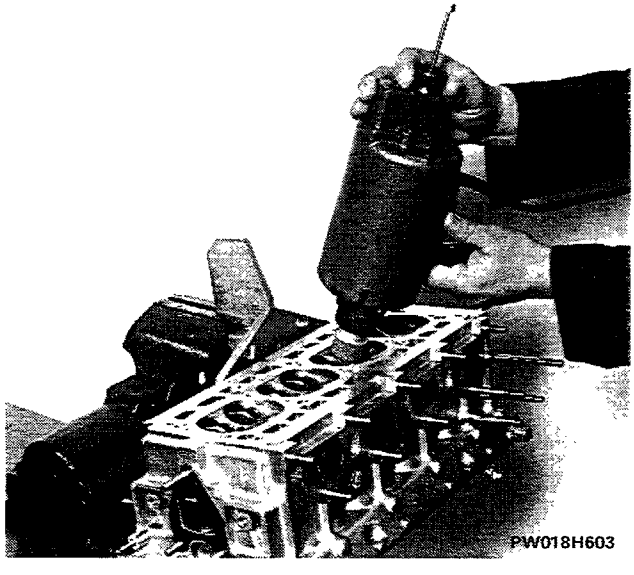
Replacement valve guides are also available with oversized external diameter (0.05, 0.10 and 0.25 mm).

NOTE *Before installing the new valve guides, heat up the cylinder head to 100° - 120°C.*



Reaming valve guide inner surface

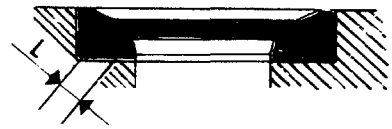
This should be done if slight distortion occurs during installation.

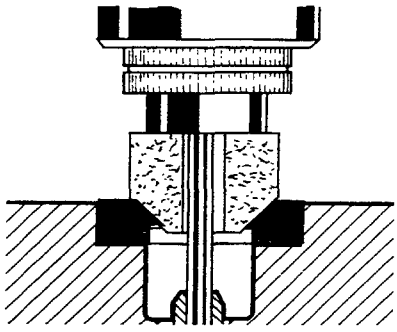


Regrinding valve seats in the cylinder head

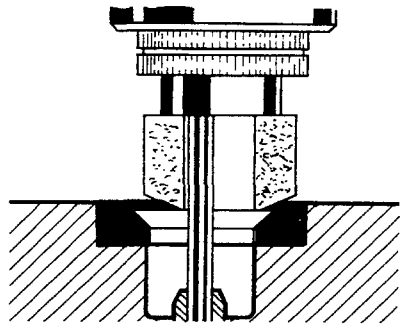
NOTE *The valve seats in the cylinder head should be reground whenever the valves or valve guides are reground or replaced.*

W = Valve seat recut at 45° and reduced to the specified width.

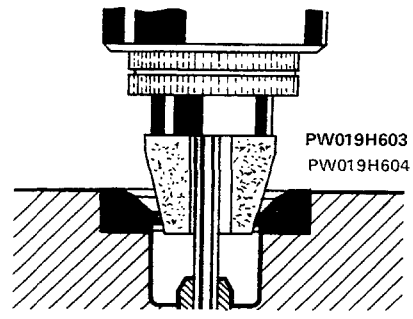




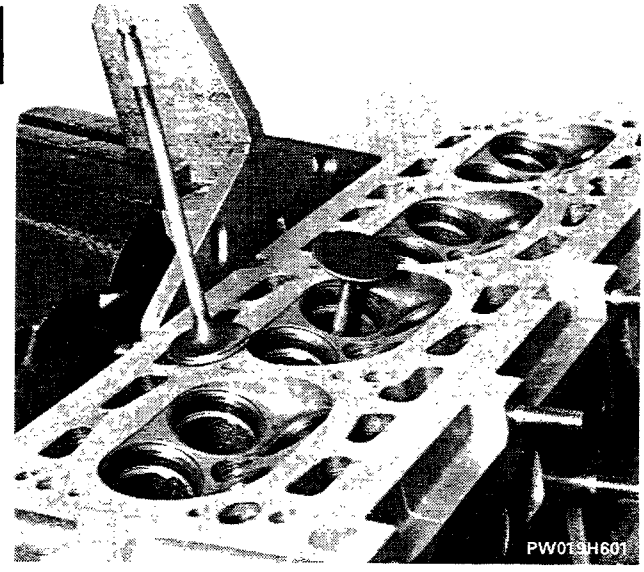
Regrinding valve seat with 44° 30' cutter.



Reducing outer valve seat with 20° cutter.

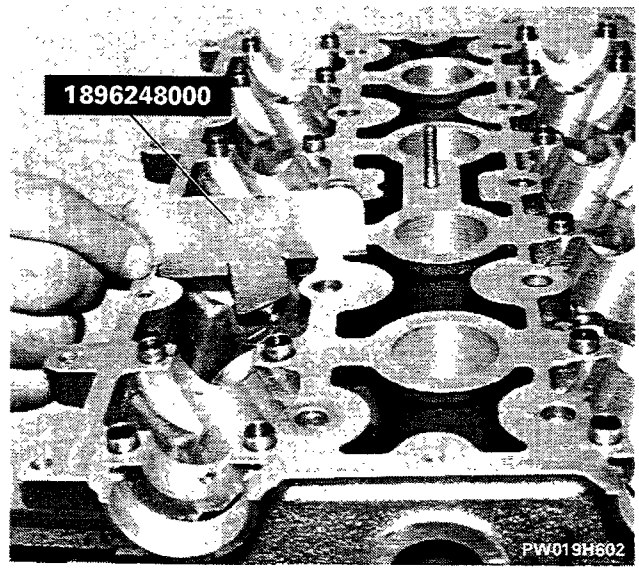


Reducing inner valve seat with 75° cutter.



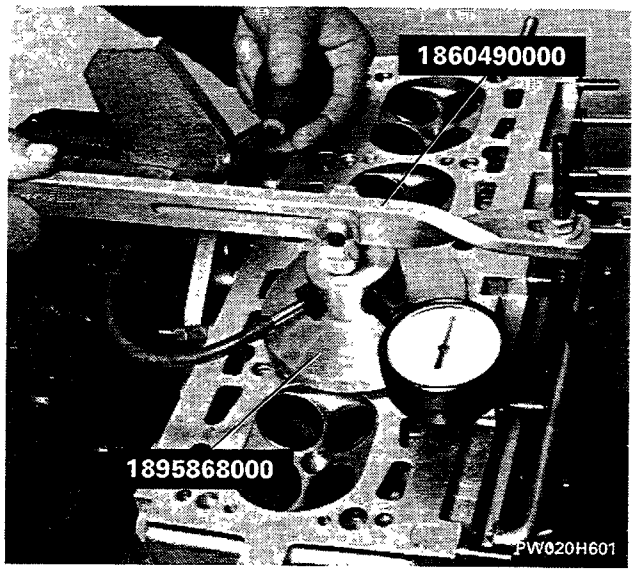
Measuring valve's line of contact on its seating

NOTE *If the valve head is not centred in its cylinder head location, regrind the cylinder head seats accordingly.*
If centring is impossible, renew the valve seat.



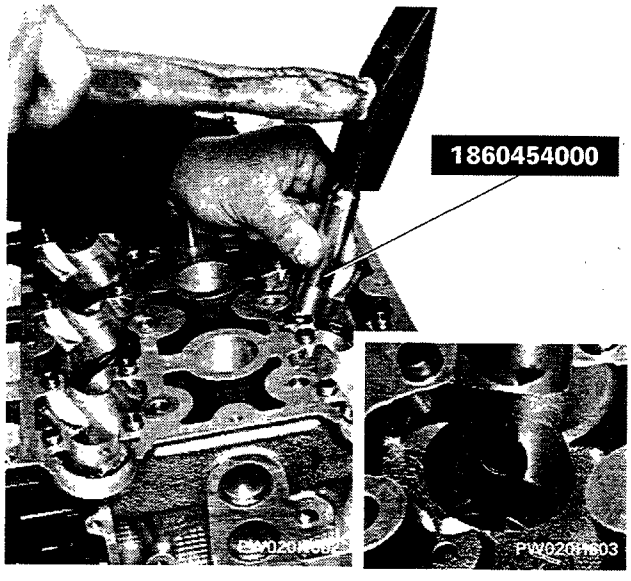
Checking valve stem height after regrinding

NOTE *If the stem is too high, shorten it by grinding.*



Valve leak compression test

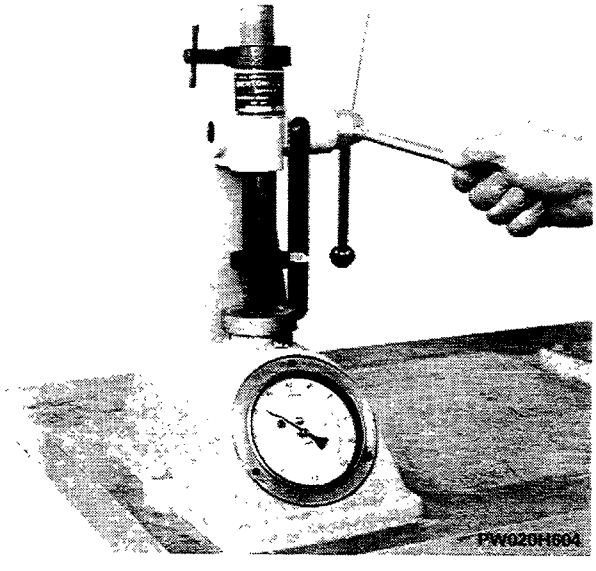
NOTE *The test is carried out with spark plugs fitted.*



Fitting valve guide oil seals

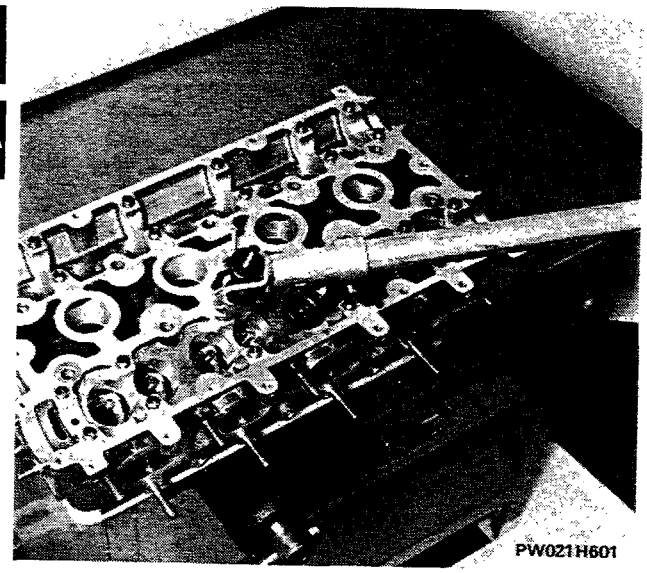
Lubricate the parts with engine oil before final assembly.

VALVE SPRINGS



Checking valve spring load

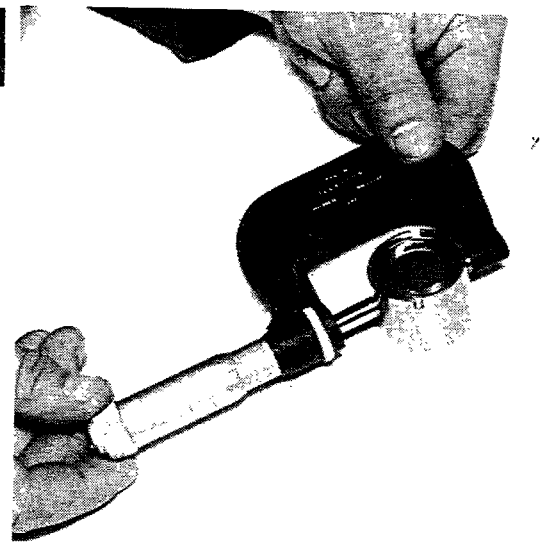
NOTE *Before assembly, the inner and outer valve springs should be checked to ensure that the minimum loads are within the specified limits.*



Fitting valve, caps, inner and outer spings and split taper collets

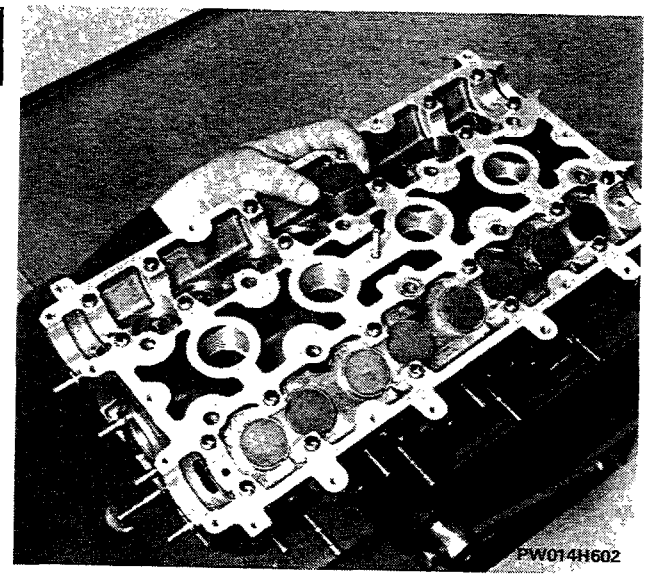
TAPPETS

36,975 ÷ 36,995



Checking tappet diameter

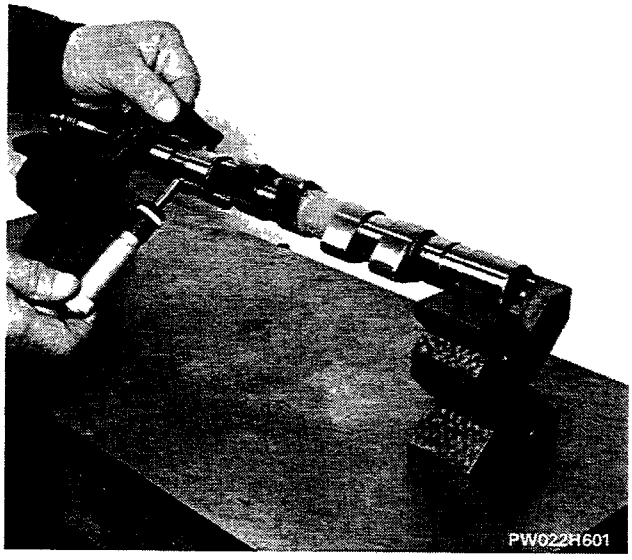
If a tappet shows excessive out of round, it should be renewed.



Fitting tappets

If the tappet location is excessively worn, renew the cylinder head.

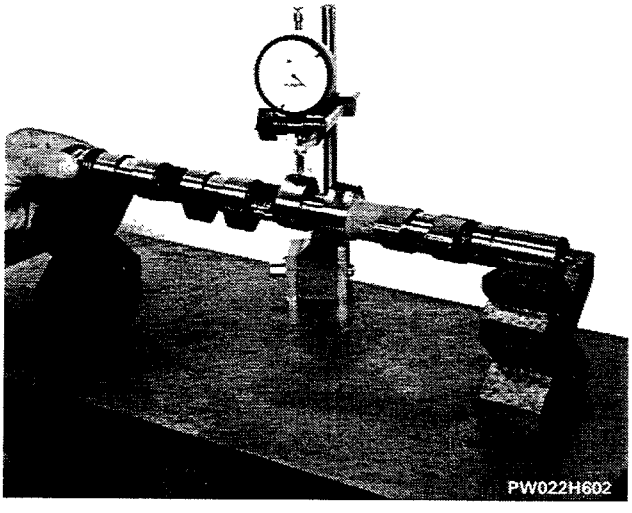
Lubricate the parts with engine oil before final assembly.



CAMSHAFT

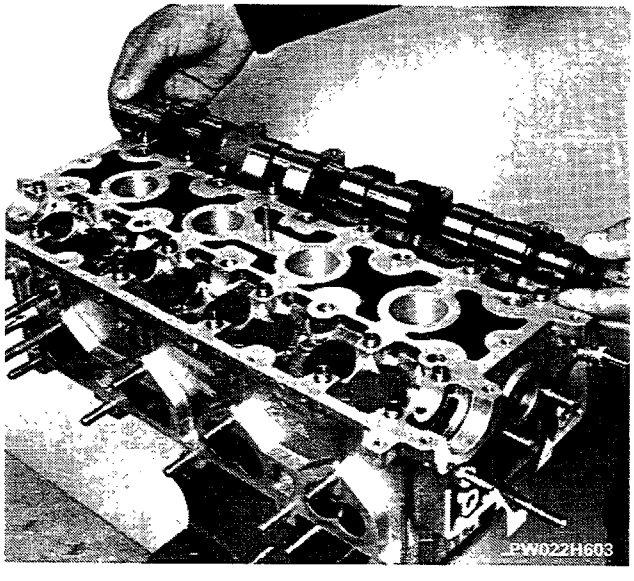
Measuring camshaft journals

NOTE *The cam and journal surfaces must not show signs of seizure or scoring, otherwise the camshaft will have to be renewed.*



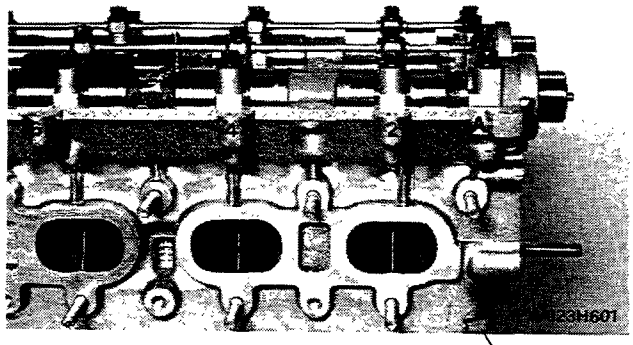
Measuring cam height

The camshaft must be renewed even if only one cam is excessively worn.

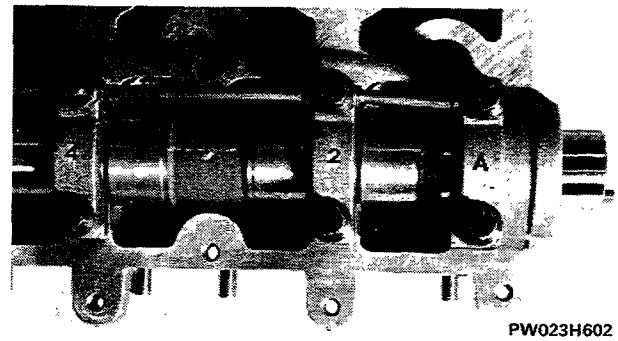


Installing camshaft

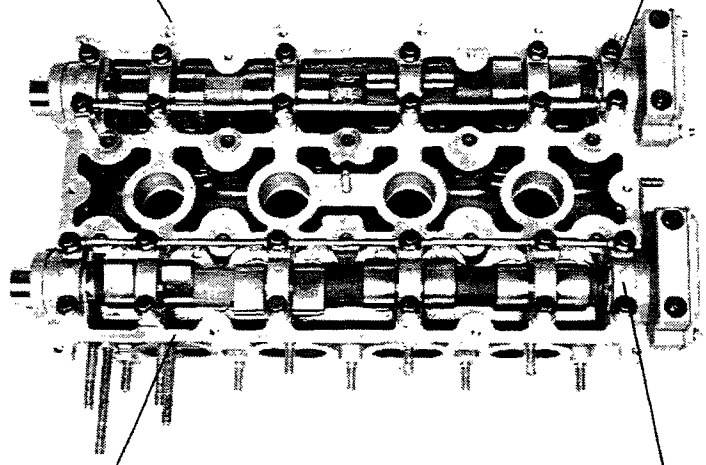
Numbering inlet valve camshaft caps on cylinder head

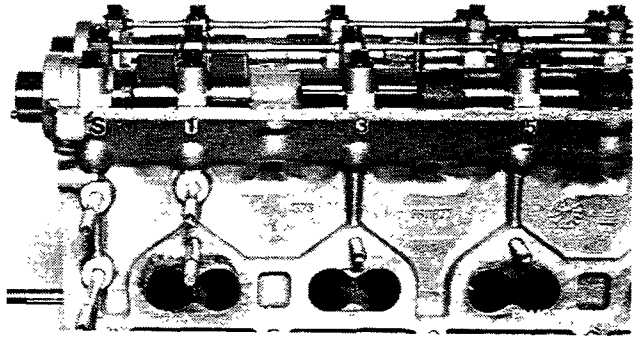


Numbering inlet valve camshaft caps

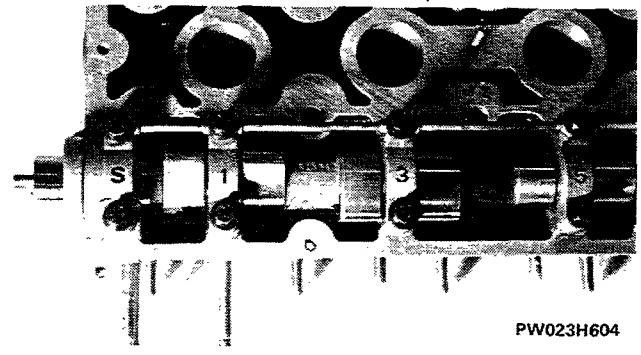


NOTE *To prevent difficulties in camshaft rotation, the caps must be fitted exactly as illustrated in the photos.*

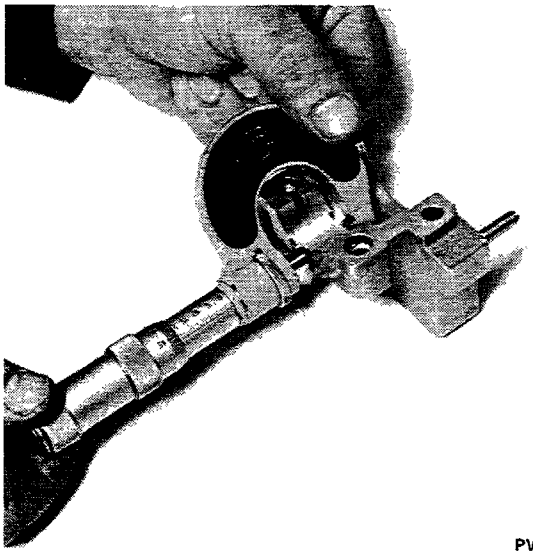




Numbering exhaust valve camshaft caps on cylinder head



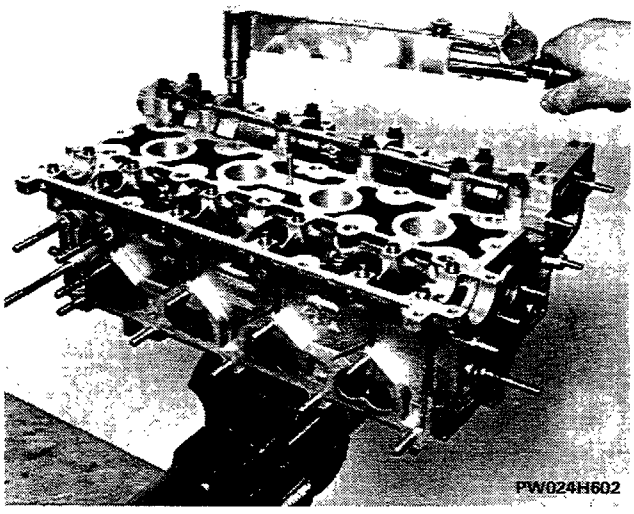
Numbering exhaust valve camshaft caps



PW024H601

19,950 ÷ 20,020

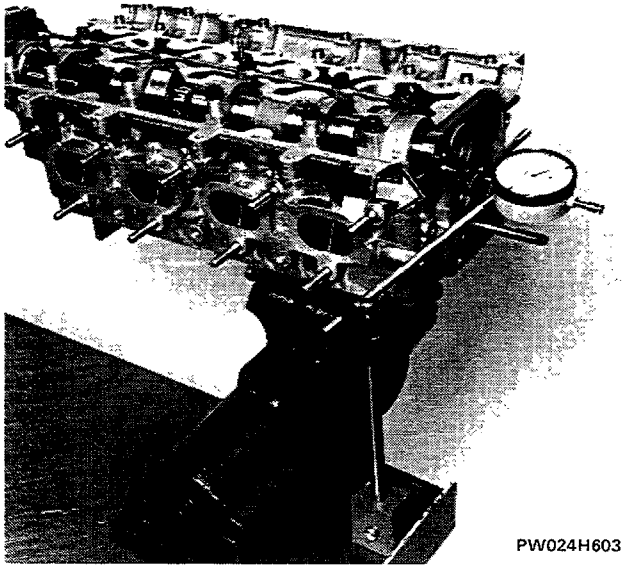
Measuring thickness of camshaft rear thrust cap



PW024H602

2,5 daNm

Fitting camshaft cap bolts and tightening by torque wrench

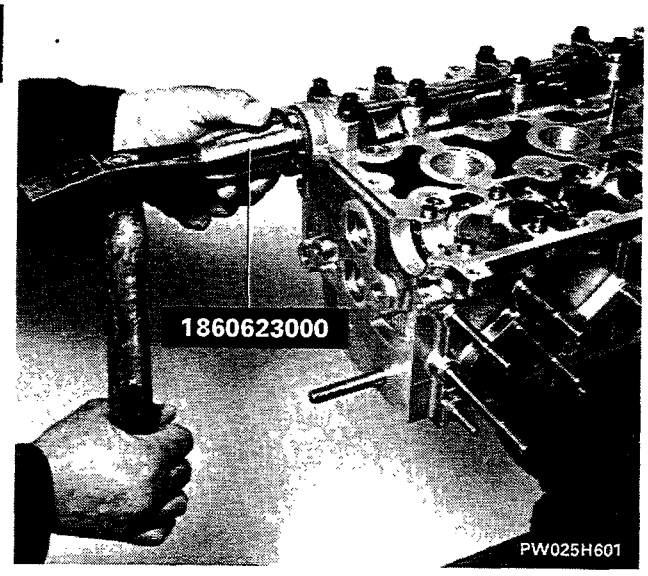


PW024H603

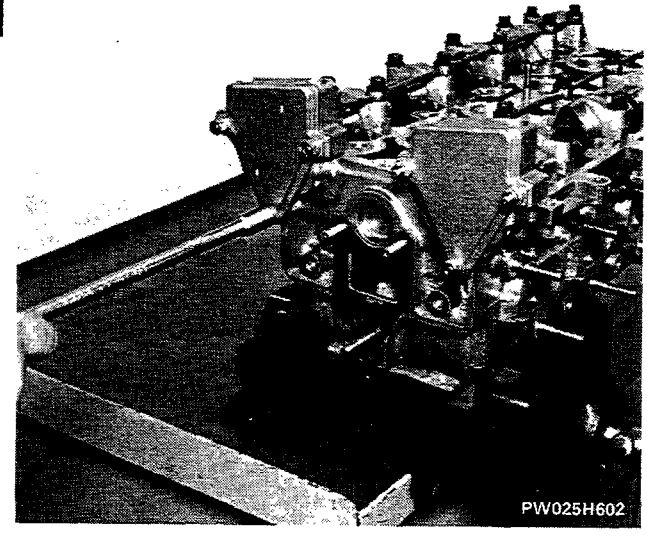
0,080 ÷ 0,230

Checking camshaft endfloat

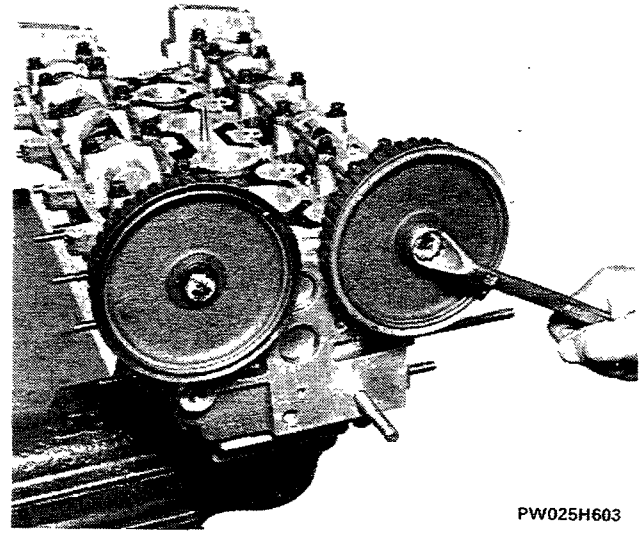
Fitting camshaft front cap oil seal



Fitting camshaft rear cap side covers

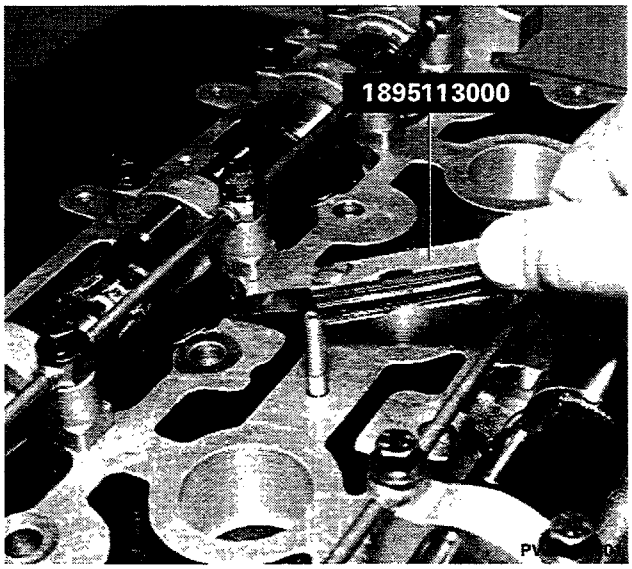


Provisional assembly of camshaft sprockets



2000 ie 16V 2000 ie 16V turbo

10.



ADJUSTING VALVE CLEARANCES

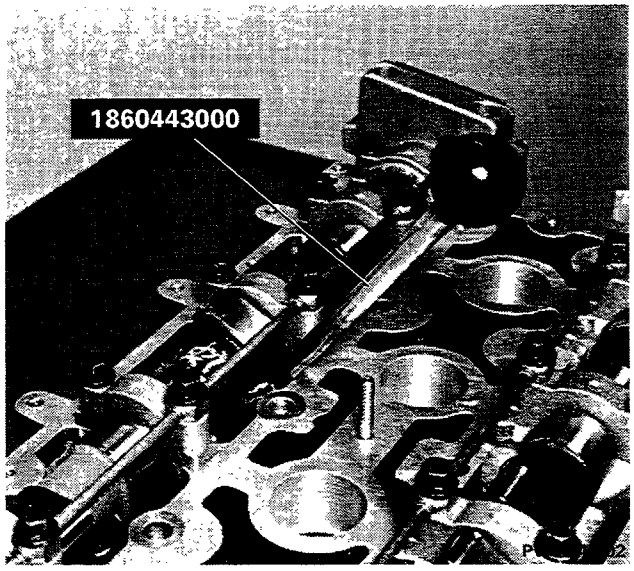
Checking clearance between tappet and camshaft cam

2000 ie 16V

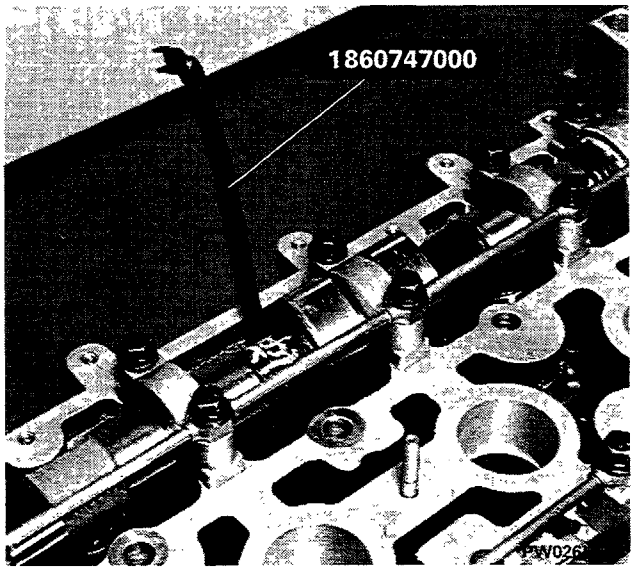
0,38 ± 0,03	
0,43 ± 0,03	

2000 ie 16V turbo

0,35 ± 0,04	
0,40 ± 0,04	

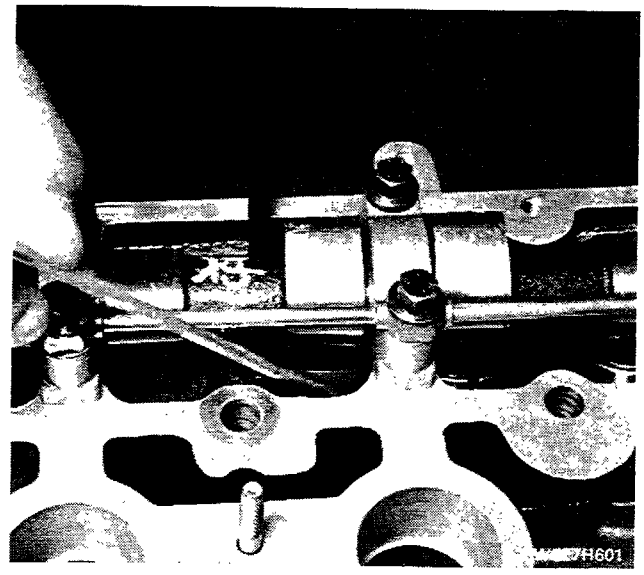


Mounting pressure lever 1860443000



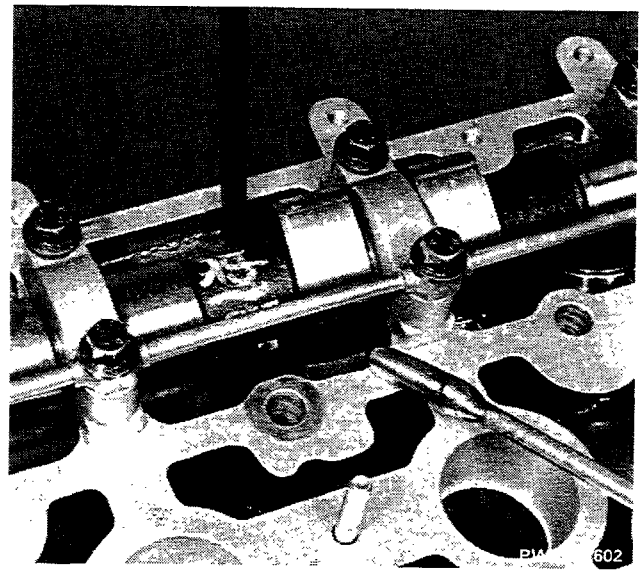
Positioning tappet locking tool 1860747000

Position the cuts on the tappet edges so as to facilitate the subsequent withdrawal of shims to be replaced.



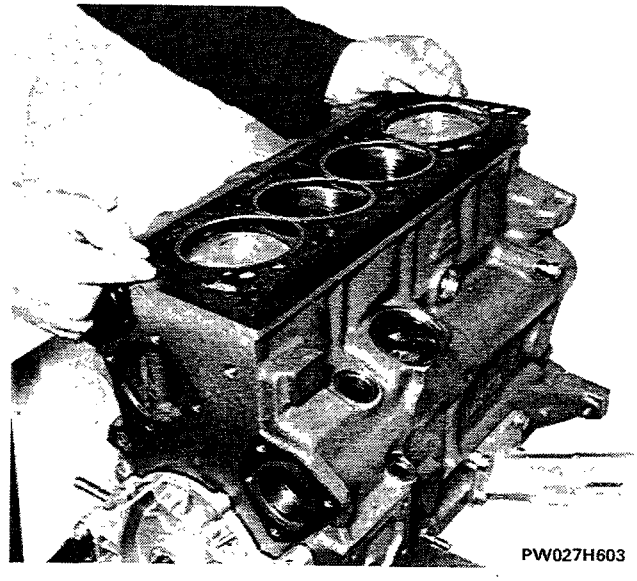
Withdrawing tappet adjustment shim using a scribe and magnet

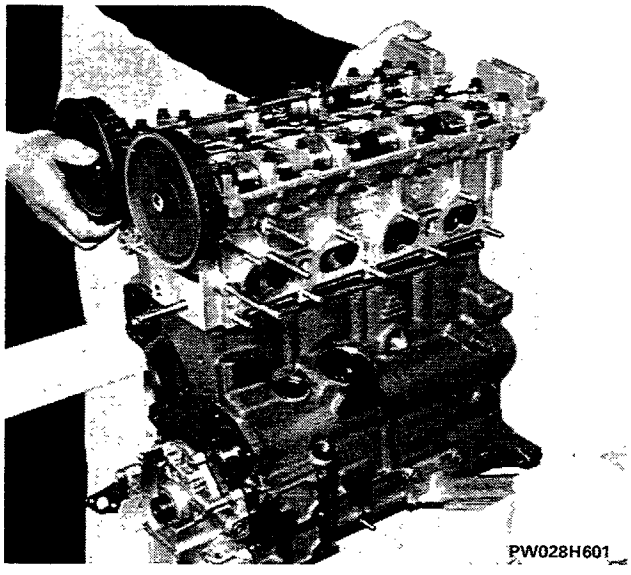
NOTE *Replace the shim with another of appropriate thickness to obtain the correct valve clearance.*



Fitting cylinder head gasket

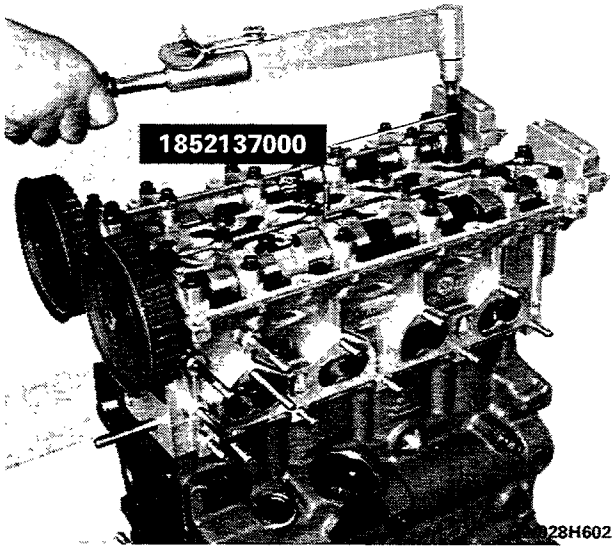
NOTE *Place the cylinder head gasket on the block with the word "ALTO" facing the fitter.*
The cylinder head gasket is of the ASTADUR type. Because of the special material from which it is made, it undergoes a polymerization process during engine operation, so it hardens considerably during use.





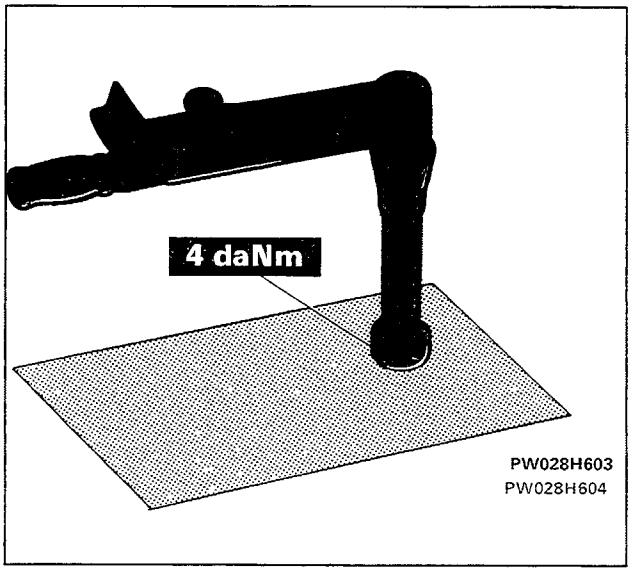
Fitting cylinder head

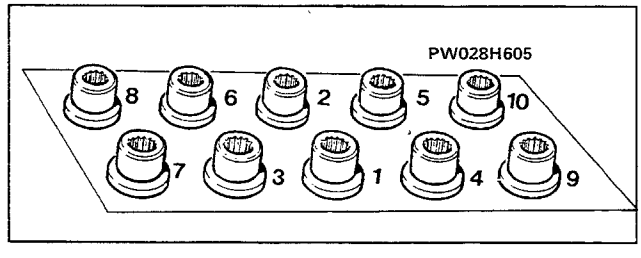
The following precautions are necessary to ensure polymerization of the cylinder head gasket:
- *keep the gasket sealed in its nylon wrapper;*
- *do not unwrap until just before assembly;*
- *do not lubricate or dirty the gasket with oil, and make sure that the cylinder head and block surfaces are thoroughly clean.*



TIGHTENING CYLINDER HEAD

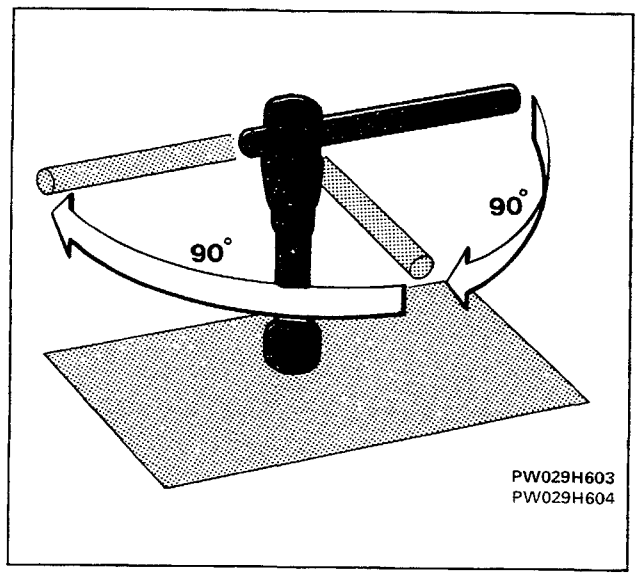
The correct cylinder head bolt tightening procedure is as follows, bearing in mind that for each stage, the tightening sequence is as illustrated below:
- lubricate the bolts and washers and leave them to drain for at least 30 minutes;
- initially tighten the bolts to 2 daNm;
- tighten to 4 daNm using a torque wrench
- with an ordinary tommy bar, tighten the bolts again by an angle of 180° in two separate stages (90° + 90°), following the correct order at each stage.





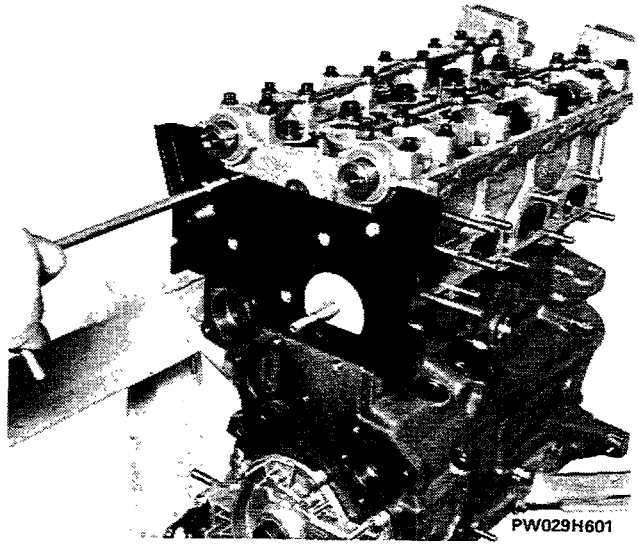
Pre-tightening cylinder head bolts with torque wrench in two stages (2 + 2 daNm)

The ASTADUR gaskets are used with cylinder head bolts of the ***yield point type.***
These bolts should be renewed after being used 4 times.

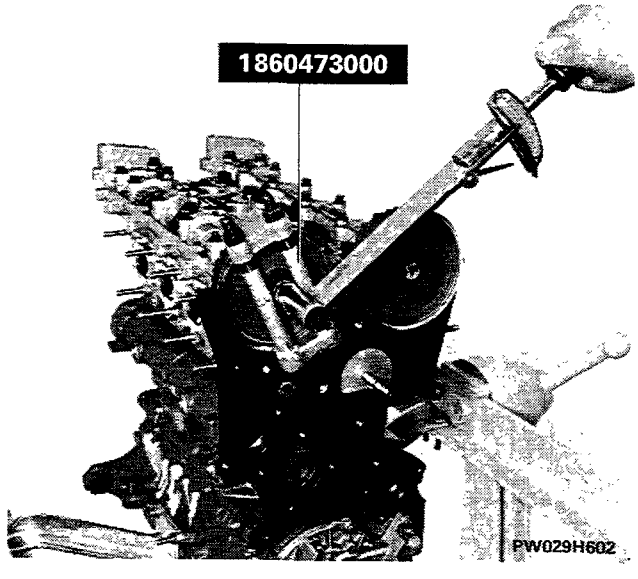


Angle tightening cylinder head bolts in two stages (90° + 90°)

NOTE *Since an ASTADUR gasket is used, the cylinder head bolts need not be retightened after 1000-1500 km.*



Fitting camshaft sprocket rear cover



Fitting and tightening camshaft sprocket bolts by torque wrench

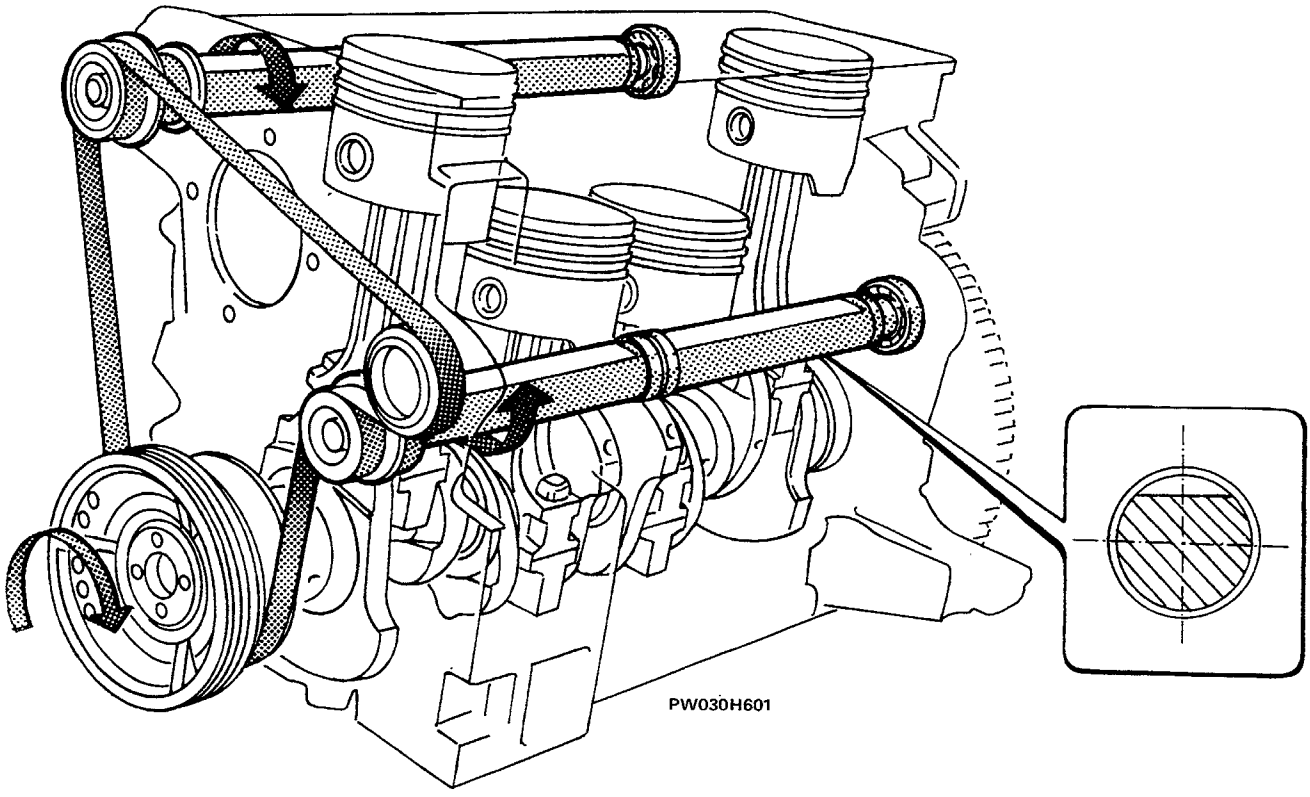
10.

VIBRATION DAMPING SYSTEM WITH COUNTER SHAFTS

In addition to forces on the piston crowns. caused by expanding gases, the following are present in internal combustion engines:

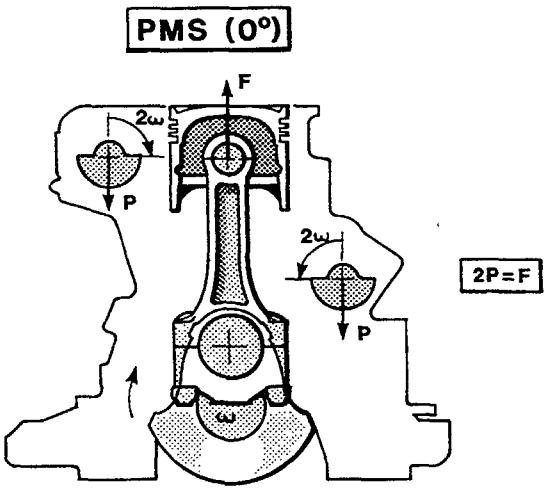
- centrifugal inertial forces. resulting from the rotating masses;
- 1st and 2nd order alternating inertial forces, resulting from the masses with alternating motion.

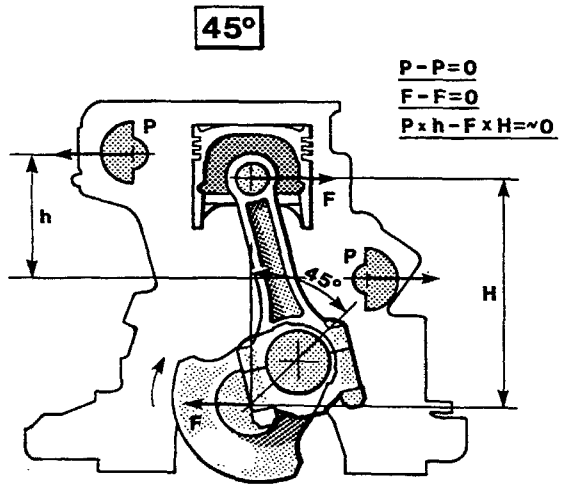
The purpose of balancing the engine is to eliminate the vibrations causd by these imbalances during operation.
The imbalances caused by centrifugal forces and 1st order alternating inertial forces are eliminated by suitably counterweighting the crankshaft.
The imbalance caused by 2nd order alternating inertial forces, is not usually eliminated in 4 in-line engines; it is left to the engine bearings to partially absorb it.
This engine instead adopts a system which cancels the vibrations caused by these forces; it comprises 2 counter-rotating shafts, with eccentric weights, located in the cylinder block.
The counter shafts are driven by a special double-sided toothed belt and set of sprockets which enable a speed double that of the crankshaft, and perfect synchrony with the latter, to be obtained.

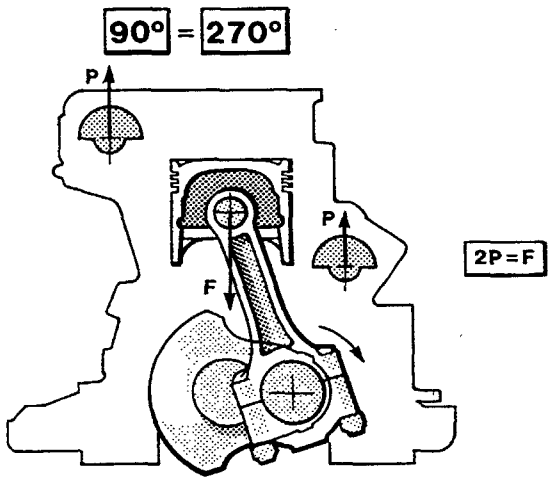


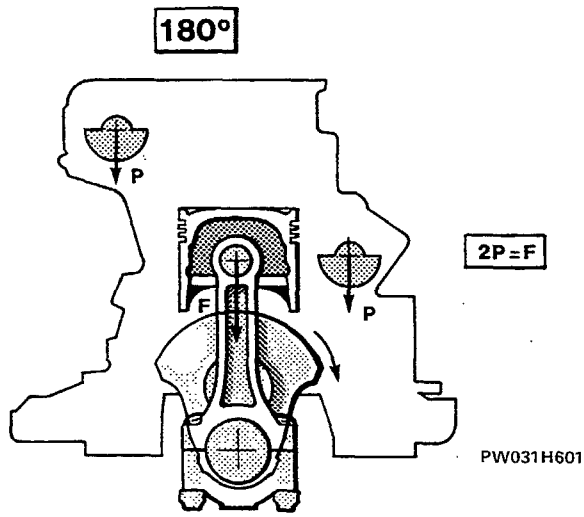
Vibration damping system

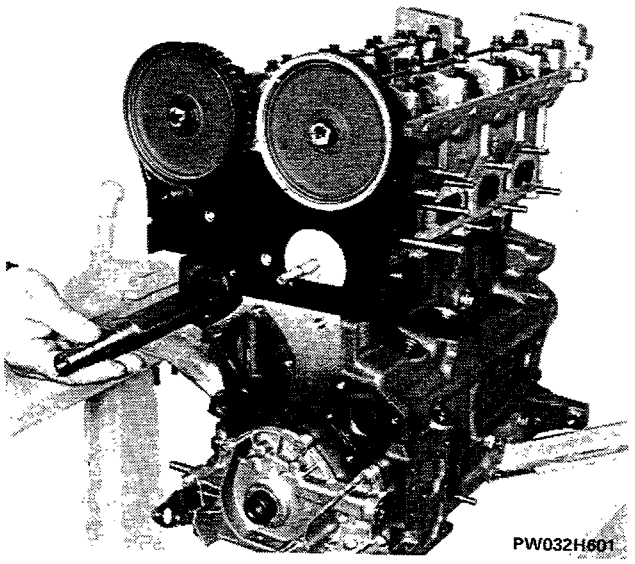
Diagrams representing the 2nd order alternating inertial forces and the balancing weights in the principal operating positions





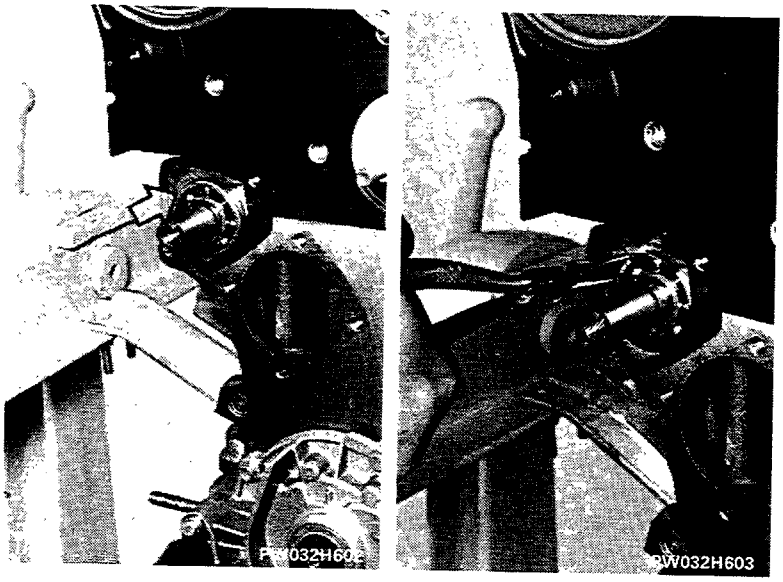




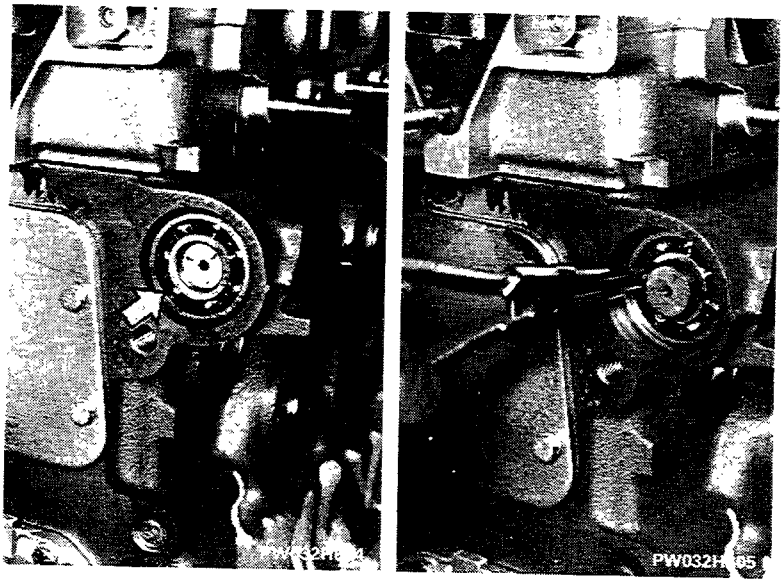


ASSEMBLY

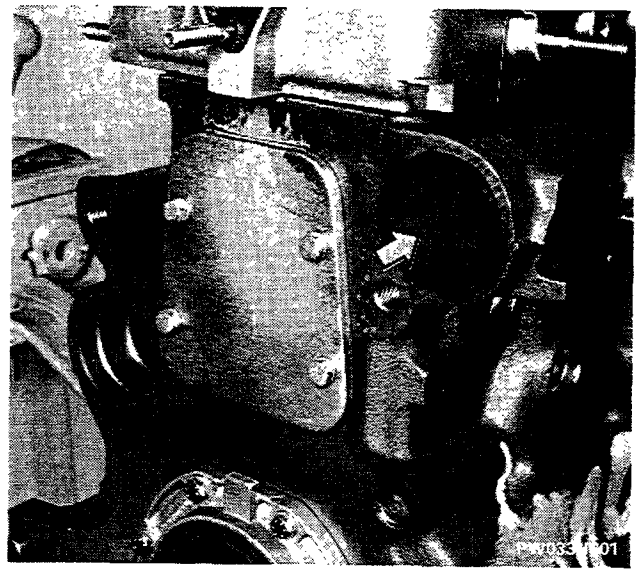
Fitting counter shafts



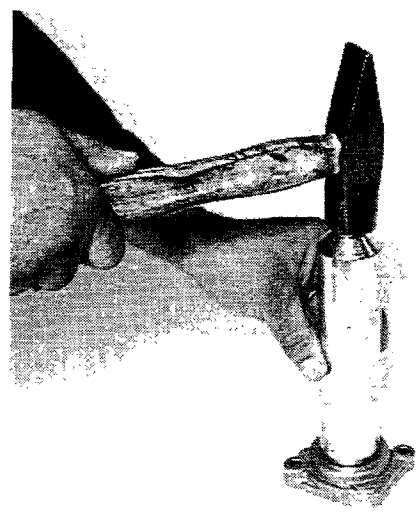
Fitting counter shaft front bearings



Fitting counter shaft rear bearings



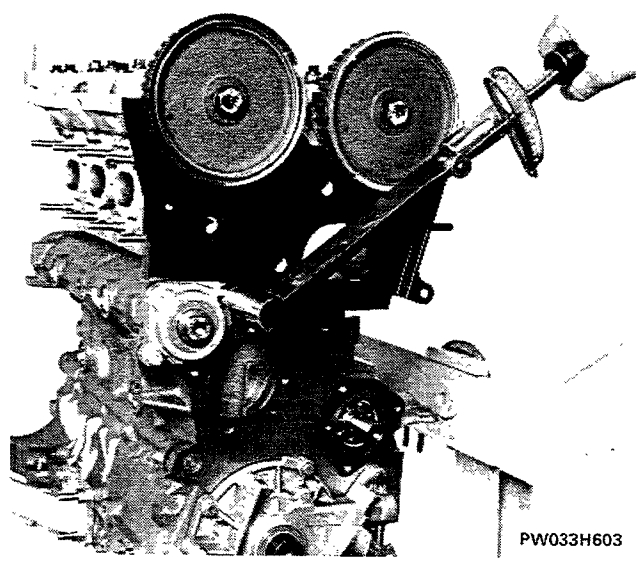
Fitting protective caps on counter shaft rear bearings



Fitting left counter shaft oil seal

PW033H602

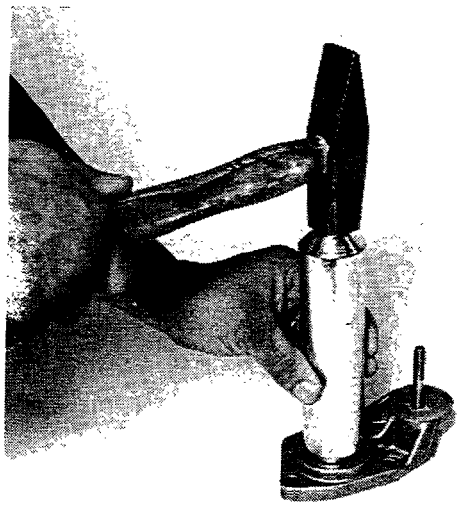
2,3 daNm



Fitting left counter shaft cover bolts and tightening to correct torque

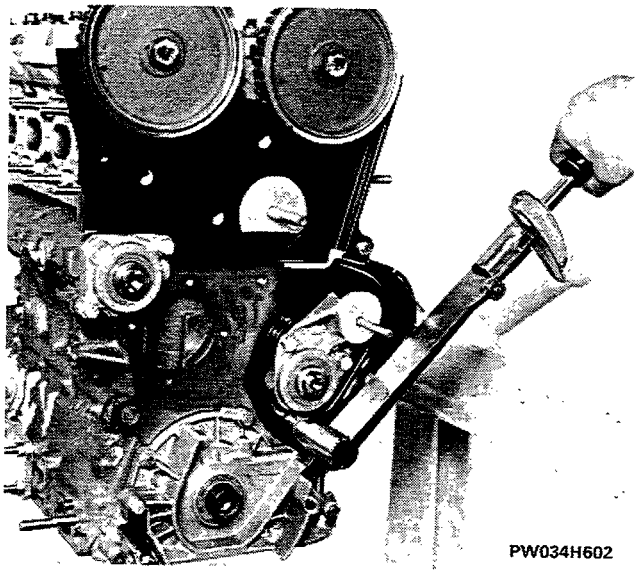
PW033H603

10.



PW034H601

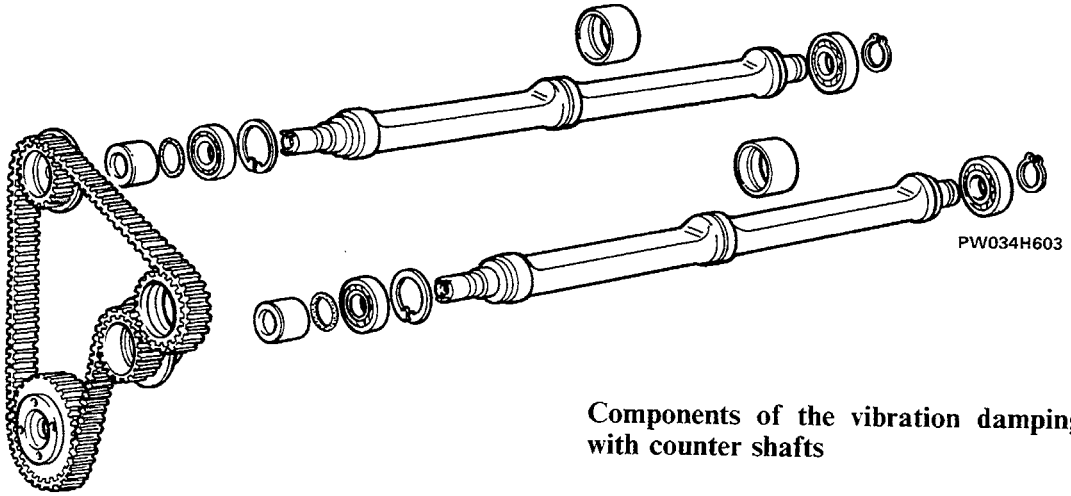
Fitting right counter shaft oil seal



PW034H602

2,3 daNm

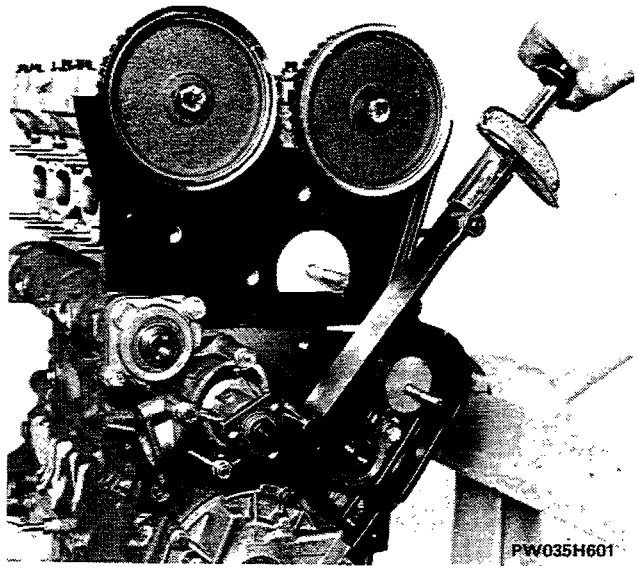
Fitting right counter shaft cover bolts and tightening to correct torque



PW034H603

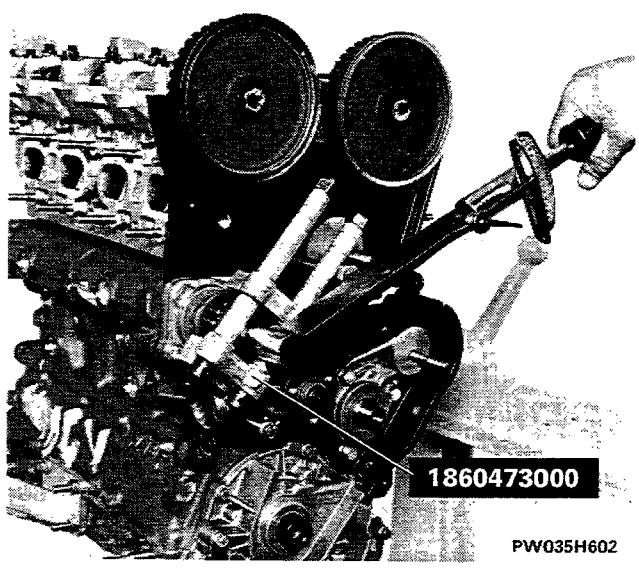
Components of the vibration damping system with counter shafts

2,5 daNm



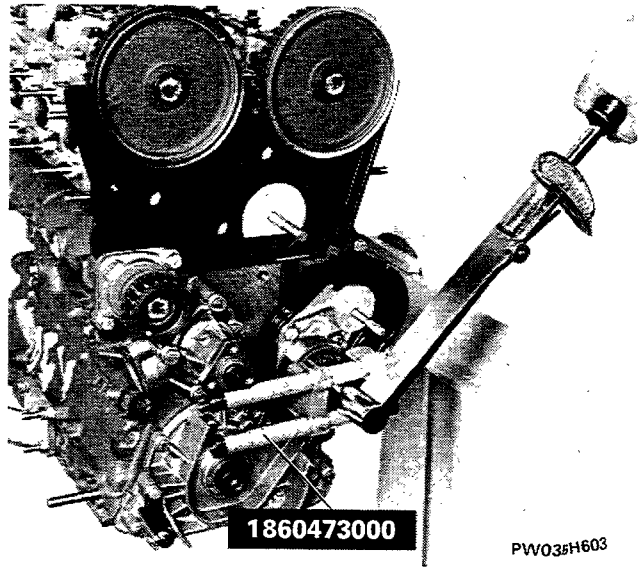
Fitting water pump bolts and tightening to correct torque

11,8 daNm



Fitting left counter shaft sprocket and tightening to torque

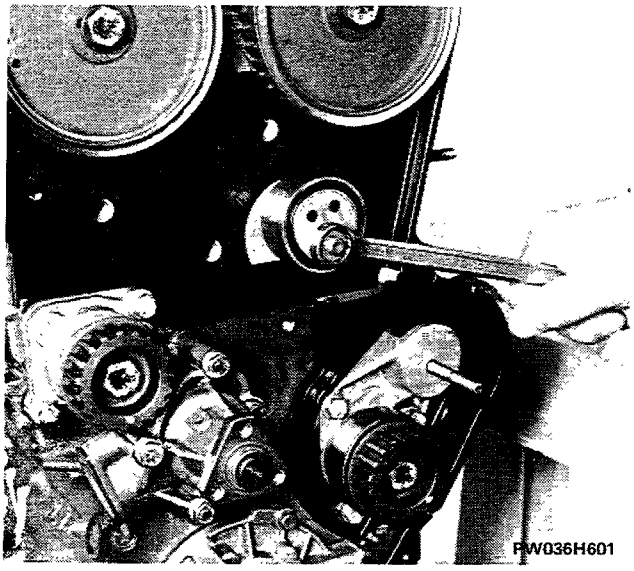
11,8 daNm



Fitting right counter shaft sprocket and tightening to torque

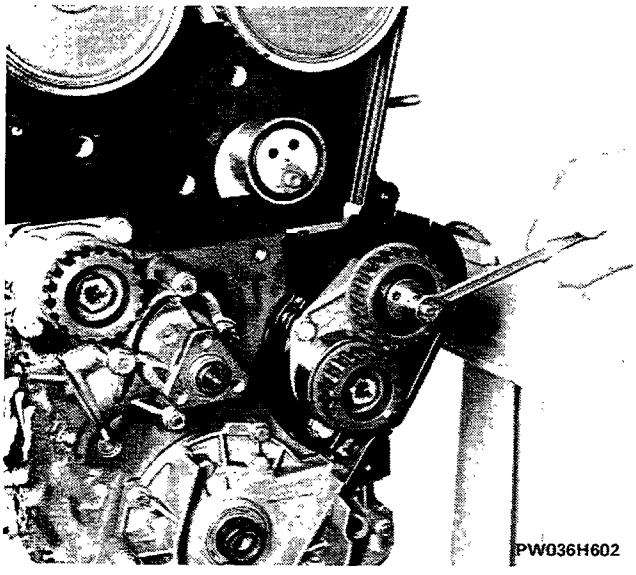
2000 ie 16V 2000 ie 16V turbo

10.



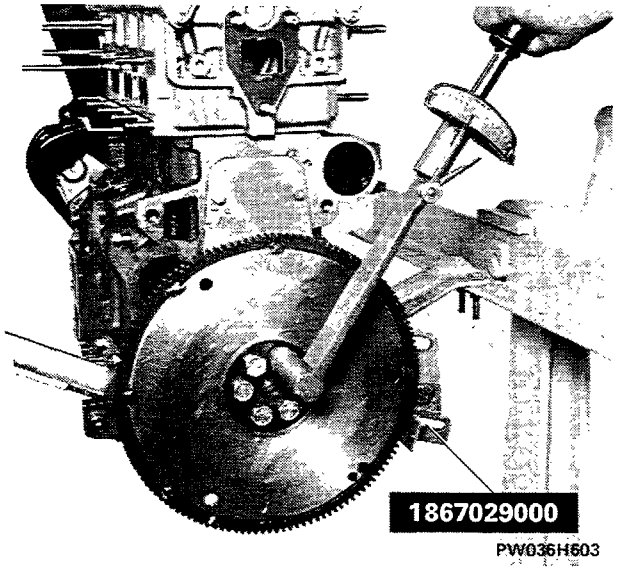
Fitting timing belt tensioner

NOTE *Provisionally tighten the bolt*



Fitting counter shaft belt tensioner

NOTE *Provisionally tighten the nut*

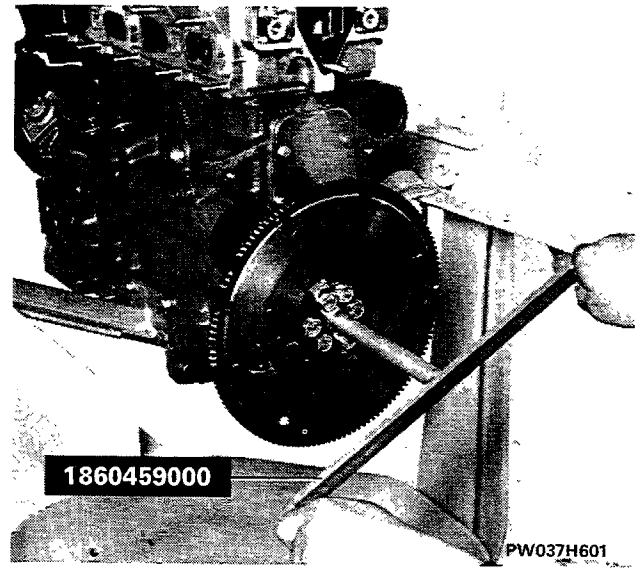


14,2 daNm

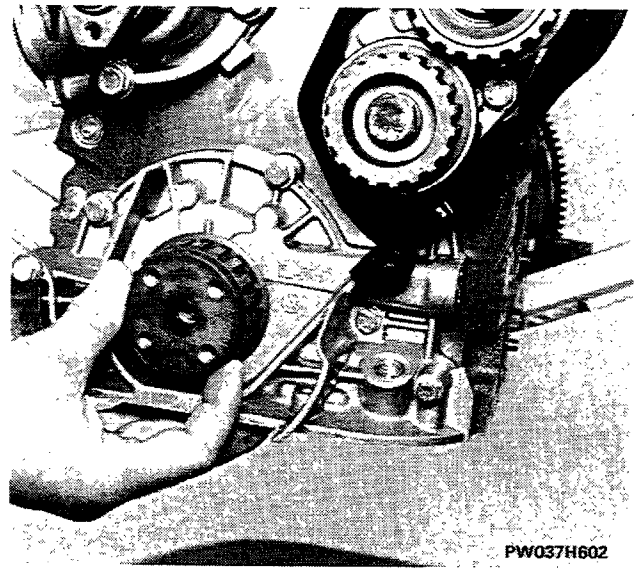
Fitting flywheel bolts and tightening to torque

Mounting crankshaft rotating handle

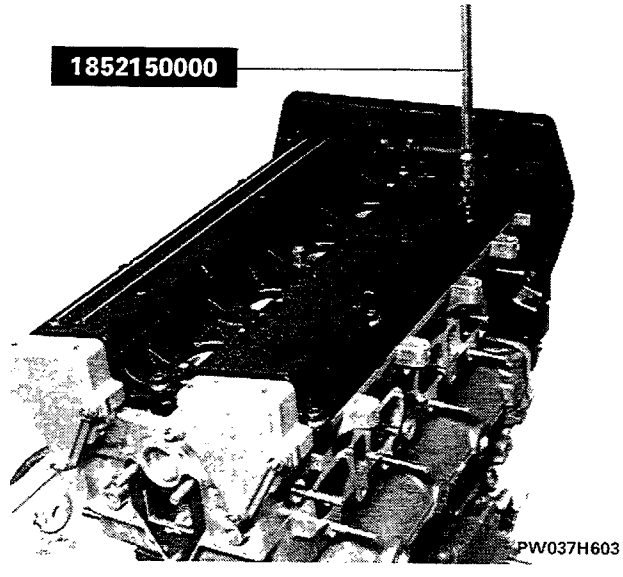
NOTE *The pair of studs 1867028000 may be mounted instead of the handle*

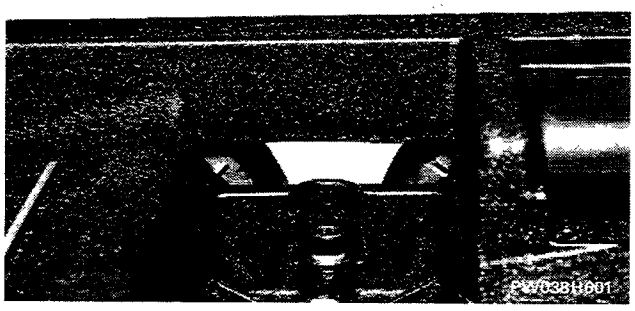


Fitting crankshaft sprocket



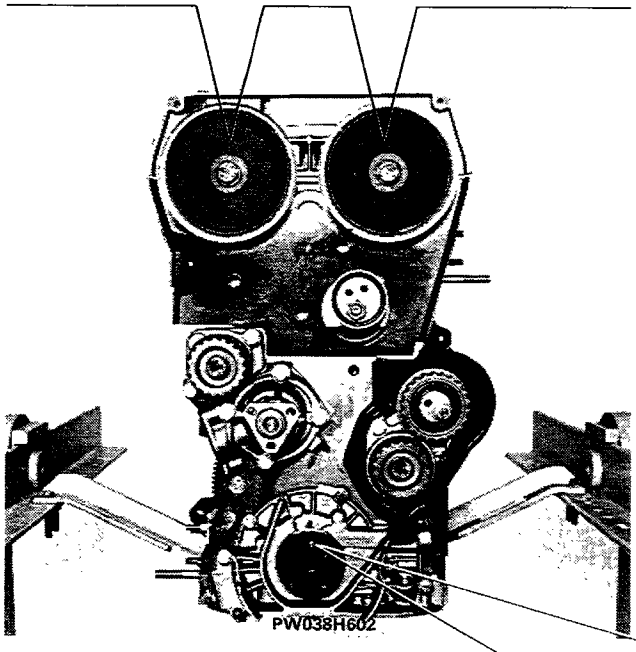
Fitting rocker cover

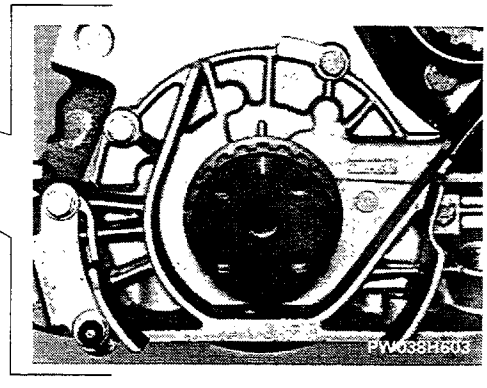




ADJUSTING TIMING

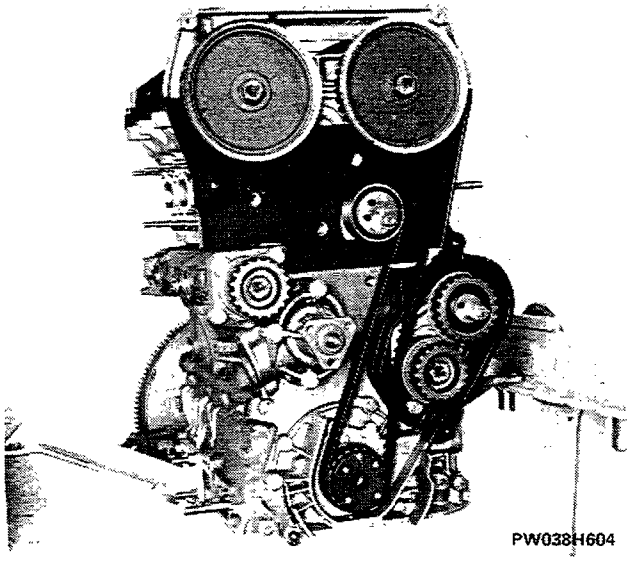
Position the camshaft sprockets so that the notches on the rear of the sprockets line up with the bottom tips of the slot on the rocker cover. Turn the crankshaft until the crankshaft sprocket reference mark is lined up with the projection on the front cover.





NOTE *Every 20,000 km visually check the condition of the timing belt and renew it if it is:*
- *soaked in oil or coolant;*
- *cracked or with broken teeth;*
- *frayed or with a worn tooth profile.*

It must be renewed if dismantled during repair work.



Fitting timing belt

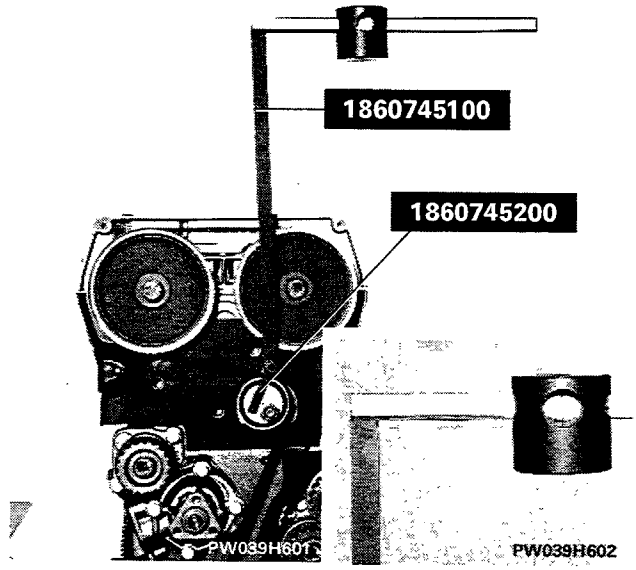
When fitting the timing belt, check that the teeth are properly engaged on all the sprockets.

NOTE *To avoid damaging the belt fibres during assembly of the timing belt, take the utmost care not to bend it into tight angles.*

ADJUSTING TIMING BELT TENSION

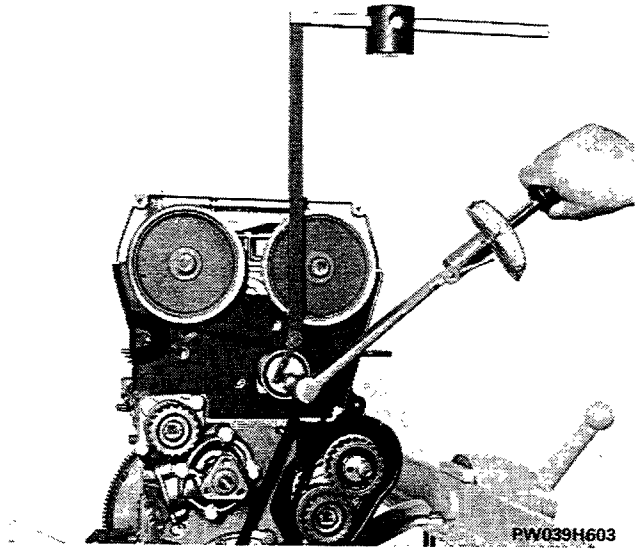
Fit part 1860745200 onto tool 1860745100, then position the weight, without the knurled part, at 100 mm on the graduated rod and secure it.
Mount the tool thus prepared on the belt tensioner as illustrated in the photo, then adjust the joint to position the graduated bar on the horizontal.
Bed in the belt by turning the crankshaft two revolutions in its direction of rotation and tighten the belt tensioner bolt.

NOTE *During the final stage, the graduated bar may move from its horizontal position; if this occurs, readjust the joint to set the bar in its original horizontal position and repeat the procedure.*



4,4 daNm

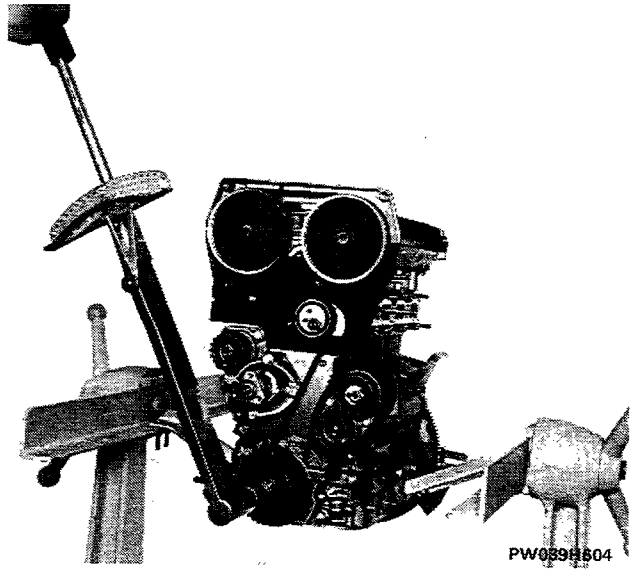
Tightening belt tensioner bolt to torque

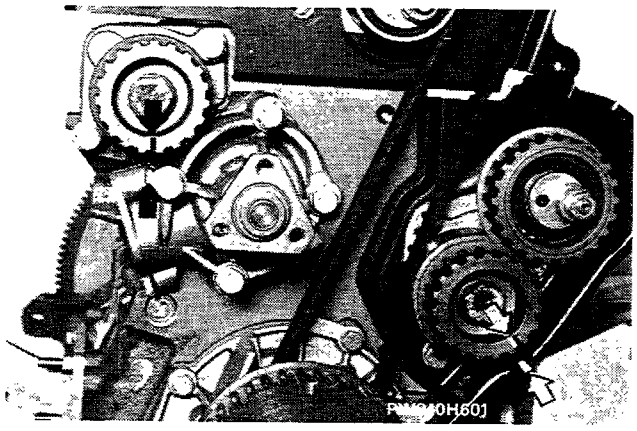


19 daNm

Fitting counter shaft sprocket bolt (left-hand thread)

Check that the valve timing is correct and position the counter shaft sprocket so that the reference mark is facing upwards.

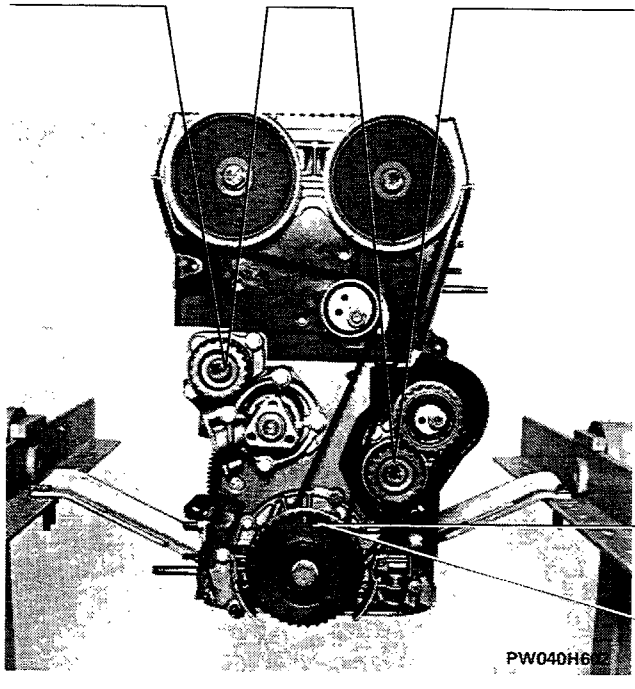


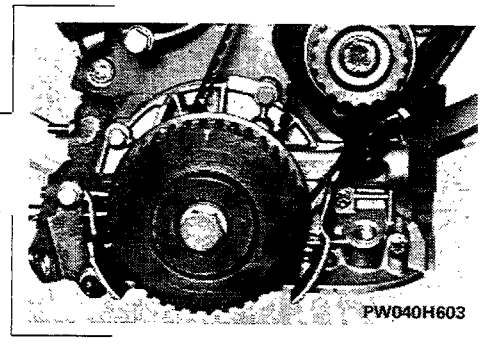


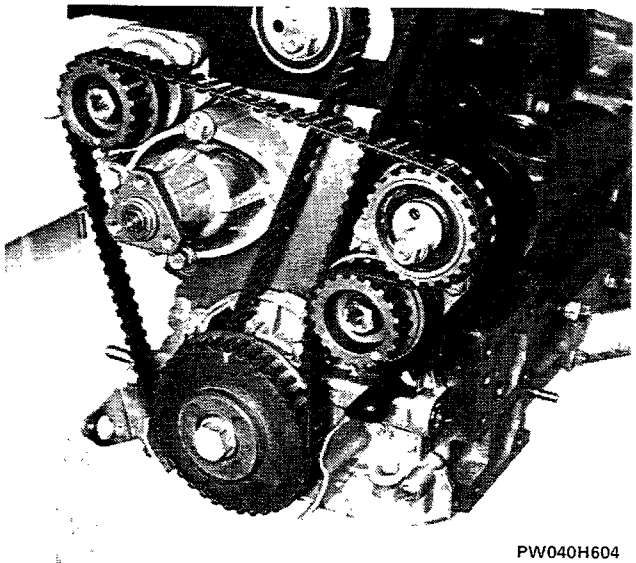
POSITIONING COUNTER SHAFTS

Position the counter shaft sprockets so that their reference marks are lined up with the reference on the water pump for the left counter shaft, and the reference on the sheet steel cover for the right counter shaft.
Also make sure that the reference on the counter shaft sprocket located on the crankshaft is facing upwards.

NOTE *Visually examine the condition of the timing belt every 20,000 km, and renew it if it is:*
– soaked in oil or coolant;
– cracked or with broken teeth;
– frayed or with a worn tooth profile.
It must be renewed if dismantled during repair work.







Fitting counter shaft drivebelt

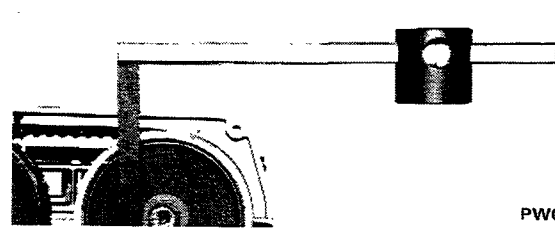
When fitting the timing belt, check that the teeth are properly engaged on all the sprockets.

NOTE *To avoid damaging the belt fibres during assembly of the timing belt, take the utmost care not to bend it into tight angles.*

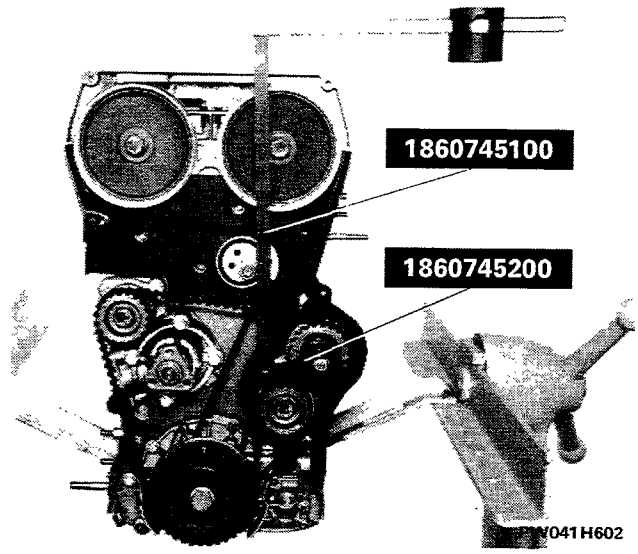
ADJUSTING TIMING BELT TENSION

Fit part 1860745200 to tool 1860745100, then position the weight, without the knurled part, at 205 mm on the graduated bar and secure it. Mount the tool thus prepared on the belt tensioner as illustrated in the photo, then adjust the joint to position the graduated bar on the horizontal.
Bed in the belt by turning the crankshaft two revolutions in its direction of rotation andtighten the belt tensioner bolt.

NOTE *During the final stage, the graduated bar may move from its horizontal position; if this occurs, readjust the joint to set the bar in its original horizontal position and repeat the procedure.*

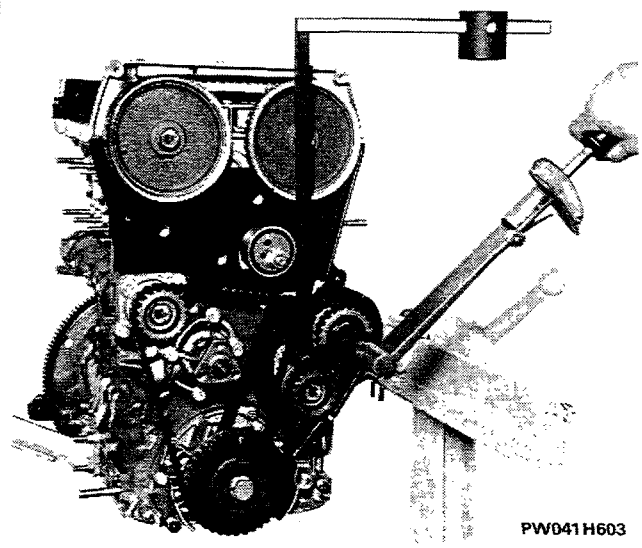


PW041H601



PW041H602

2,3 daNm

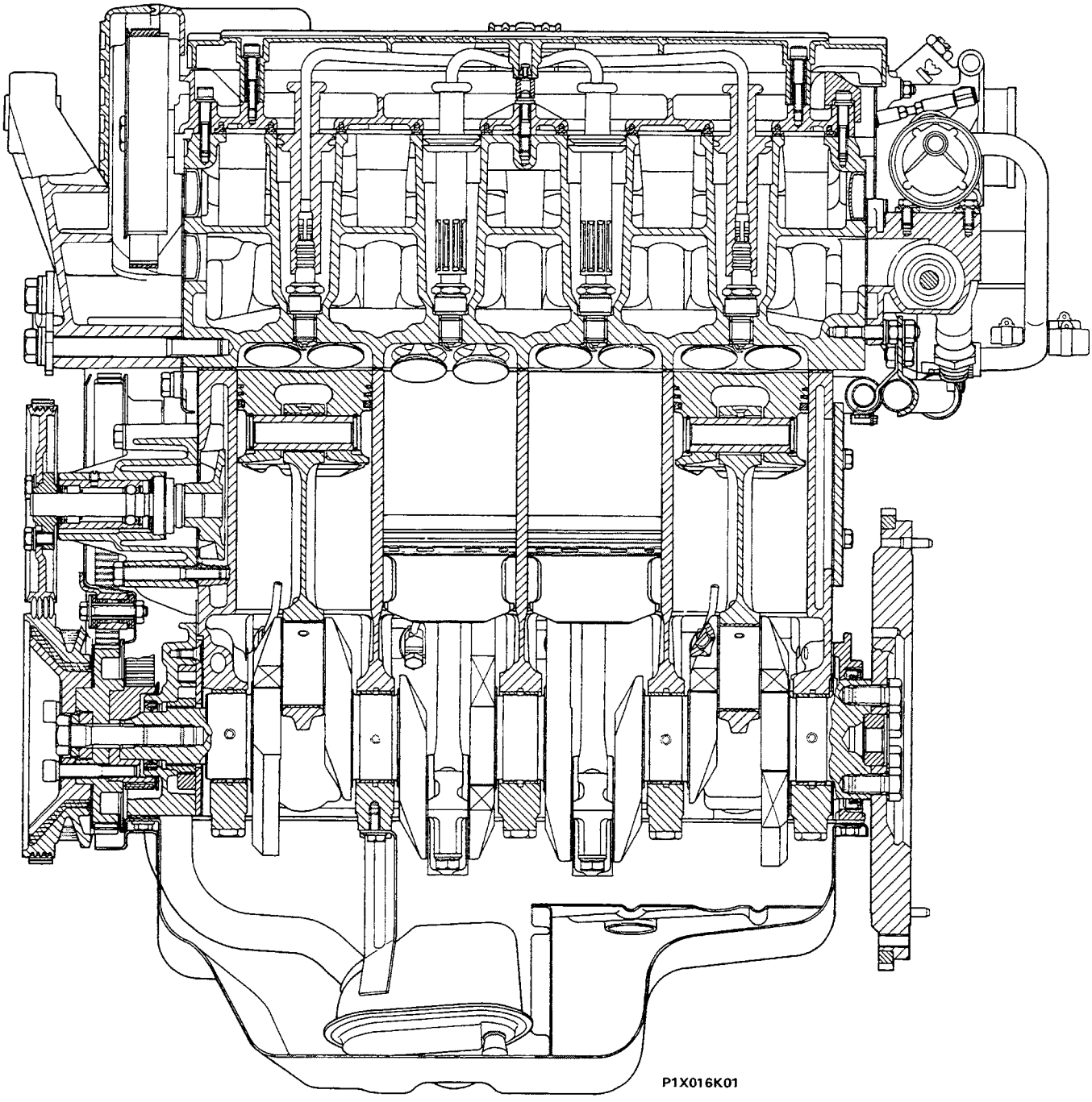


PW041H603

Tightening belt tensioner bolt to torque

10.

LONGITUDINAL SECTION OF 2000 i.e. 16V ENGINE



P1X016K01

1840207814	Part (Ø 18-22 mm) for removing counter shaft front bearings from the block (use with 1840206000)
1850088000	Spanner (13 mm) for manifold nuts
1850113000	Spanner (12 mm) for engine oil drain plug
1852137000	Spanner, 1/2" attachment, for cylinder head bolts
1852150000	Spanner for rocker cover bolts
1853003000	Spanner (19 mm) for camshaft sprocket bolt, on vehicle
1854033000	Spanner for electric fuel pump or tank fuel filter retainer
1854038000	Spanner for fuel gauge sender retainer
1860054000	Drift (Ø 22 mm) for removing and refitting small end bush
1860162000	Pressure gauge with connections for checking oil pressure (0-9.81 bar scale)
1860183000	Pliers (Ø 75-110 mm) for removing and refitting piston rings
1860303000	Tool for fitting gudgeon pin circlips
8860443000	Pressure lever for inserting tool for locking tappets during valve clearance adjustment
1860395000	Drift for removing valve guides
y860454000	Tool for fitting valve guide oil seals
1860456000	Tool for supporting cylinder head during tappet shim replacement (operation using vice)
1860470000	Tool for supporting cylinder head during overhaul
1860473000	Tool for locking camshaft sprocket or auxiliary components sprocket
1860486000	Drift for fitting valve guides
1860490000	Tool for supporting valve seal tester 1895868000 (use with 1860470000)
1860592000	Universal hook for hoisting and transporting engine/gearbox unit
1860592010	Part for removing and refitting engine/gearbox unit (use with 1860592000)
1860605000	Sleeve (Ø 60-125 mm) for installing standard and oversize pistons in cylinders
1860644000	Tool for removing and refitting valves
1860699000	Drift for fitting crankshaft rear oil seal (use with 1870007000)
1860745100	Tool for adjusting timing belt tension (use with specific parts)
1860745200	Part for adjusting timing belt tension (use with 1860745100)
1860745400	Part for adjusting counter shaft belt tension (use with 1860745100)
1860747000	Tool for locking tappets while replacing shims during valve clearance adjustment (use with 1860443000)
1860757000	Tool for removing cartridge oil filter
1860768000	Part for rotating crankshaft in vehicle
1860769000	Board for supporting cylinder head during valve removal and refitting
1860770000	Drift for fitting camshaft oil seals and crankshaft front oil seal
1861001011	Pair of brackets securing engine to rotating stand 1861000000
1867028000	Pair of threaded pins for rotating crankshaft (at the bench)
1867029000	Flywheel locking tool
1867030000	Tool for locking flywheel while removing/refitting crankshaft sprocket nut, manual gearbox
1876036000	Lead with contacts for turning engine during valve clearance adjustment
1890385000	Sleeker (Ø 7 mm) for valve guide bores
1895362000	Cooling system leak tester
1895683000	Cylinder compression tester (4.05 - 18.2 bar scale)
1895683002	Cards for device 1895683000
1895762000	Dynamometer for checking V-belt and poly-V belt tension
1895868000	Valve leak tester
1895890000	Pressure gauge with connections for measuring electric pump supply pressure
1895890030	Connections for measuring electric fuel pump supply pressure (use with 1895890000)

Engine
Torque wrench settings
10.

2000 ie 16V 2000 ie 16V turbo

PART	Thread	Torque wrench settings daNm	ENGINE 2000 ie 16V	ENGINE 2000 ie 16V turbo
Central bearing cap bolt	M 12 x 1.25	2 + 130°	●	●
Bearing cap self-locking bolt	M 12 x 1.25	2 + 90°	●	●
Belt cover bolt	M 8	2.3	●	●
Crankcase breather bolt	M 8	2.3	●	●
Flywheel bolt	M 12 x 1.25	14.2	●	●
Big end bearing cap bolt	M 10 x 1	2.5 + 50°	●	●
Cylinder head bolt	M 10 x 1.25	4 +90° +90°	●	●
Inlet manifold nut	M 8	2.5	●	●
Exhaust manifold nut	M 8	2.5	●	
Bolt securing exhaust manifold bracket to manifold	M 8	2.5	●	●
Exhaust manifold bracket bolt	M 10 x 1.25	5	●	●
Bolt securing crankshaft sprocket and pulley	M 14 x 1.5 Left-hand	19	●	●
Camshaft sprocket bolt	M 12 x 1.25	11.8	●	●
Belt tensioner nut	M 10 x 1.25	4.4	●	●
Accelerator bracket bolt	M 8	2.5	●	●
Accelerator link nut	M 8	2.5	●	●
Self-locking nut securing turbocompressor to exhaust manifold	M 10 x 1.5	5.9		●
Self-locking nut securing flange to turbocompressor	M 8	2.9		↙

PART	Thread	Torque wrench settings	ENGINE	
		daNm	2000 ie 16V	2000 ie 16V turbo
Bolt securing turbocompressor bracket to exhaust manifold	M 10 x 1.25	5.9		●
Bolt securing oil discharge pipe to bracket	M 8	2.3		●
Bolt securing complete cover to cylinder block	M 8	2.3		●
Bolt securing cover to bracket	M 8	2.3		●
Oil filter mounting bolt	M 10 x 1.25	4.9	●	●
Bolt securing water pump to cylinder block	M 8 x 1	2.5	●	●
Bolt securing water pump pulley	M 8	2.3	●	●
Bolt securing exhaust manifold bracket to cylinder block	M 8	2.5	●	●
Self-locking nut securing exhaust manifold to cylinder head	M 8 x 1.25	2.9		●
Nut securing exhaust manifold bracket to cylinder block	M 8	2.5	●	●
Nut securing thermostat to cylinder head	M 8	2	●	●
Bolt securing alternator to bracket	M 12 x 1.25	6.9	●	●
Bolt securing oil filter mounting to alternator bracket	M 12 x 1.25	6.9	●	●
Nut securing oil filter mounting to alternator bracket	M 12 x 1.25	6.9	●	●
Bolts securing alternator belt tension adjustment brackets	M 8	3.4	●	●
	M 10 x 1.25	4.3	●	●
Bolt securing driveshaft mounting to cylinder block	M 10 x 1.25	5	●	●
	M 8	2.5	↙	●

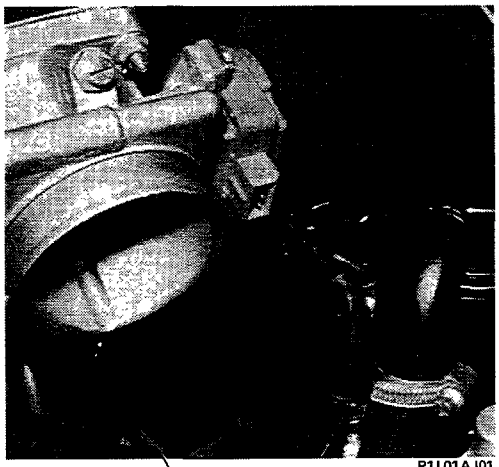
Engine
Torque wrench settings
10.

2000 ie 16V 2000 ie 16V turbo

PART	Thread	Torque wrench settings daNm	ENGINE 2000 ie 16V	ENGINE 2000 ie 16V turbo
Nut securing driveshaft mounting to cylinder block	M 10 x 1.25	5	●	●
Bolt securing power steering pump bracket	M 8	2	●	●
Bolts securing bracket to power steering pump	M 10 x 1.25	5	●	●
	M 8	2	●	●
Bolt securing camshaft caps	M 8 x 1.25	2.5	●	●
Nut securing alternator bracket to cylinder head	M 8	2	●	●
Bolt securing idler gear housing bracket to cylinder head	M 12 x 1.25	9.5	●	●
Nuts securing bracket to power steering mounting	M 8	5	●	●
	M 10 x 1.25	5	●	●
Bolt securing oil sump to mounting	M 6	1	●	●
Bolt securing top and bottom of inlet pipe	M 8	2	●	●
Bolt securing bracket to power steering mounting	M 10 x 1.25	5	●	●
Spark plugs	M 14 x 1.25	3.7	●	●
Bolt securing alternator to bracket	M 10 x 1.25	7	●	●
Nut securing alternator to bracket	M 10 x 1.25	7	●	●
Oil pressure warning sender	M 14 x 1.5	3.7	●	●
Oil temperature warning sender	M 14 x 1.5	3.7	●	●
Water temperature sender	M 16 x 1.5 tapered	3	↙	●

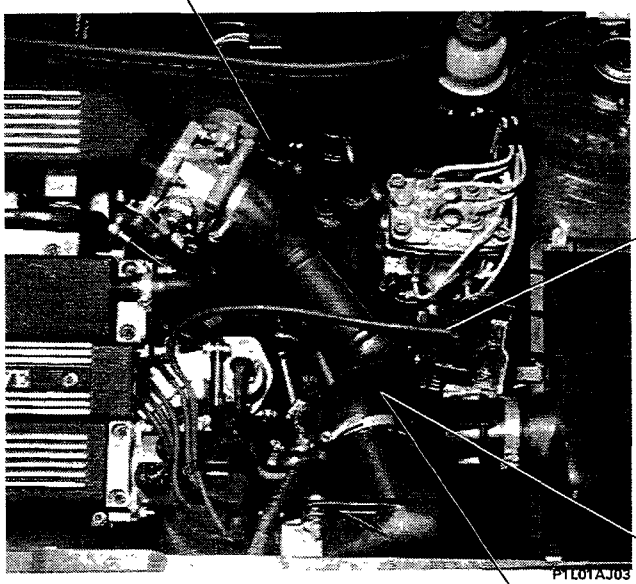
PART	Thread	Torque wrench settings	ENGINE	
		daNm	2000 ie 16V	2000 ie 16V turbo
Oil level warning sender	M 12 x 1.25	2.5	●	●
Oil sump plug	M 22 x 1.5	5	●	●
Bolt securing counter shaft sprocket	M 12 x 1.25	11.8	●	●
Bolt securing counter shaft cover	M 8	2.3	●	●
Nut securing counter shaft belt tensioner	M 8	2.3	●	●
Bolt securing cover for counter shaft radial seal support	M 8 x 1.25	2.4	●	●
Connection securing oil delivery pipe to turbine	M 22 x 1.5	5	●	●

Position the vehicle on a lift.
Then, proceed as follows;
- drain the coolant;
- remove the bonnet lid;
- disconnect the negative lead from the battery;
- remove the items illustrated below:



P1L01AJ01

P1L01AJ02



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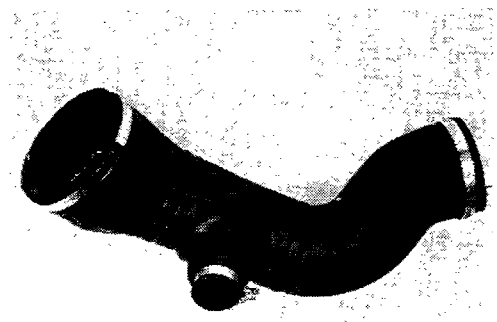

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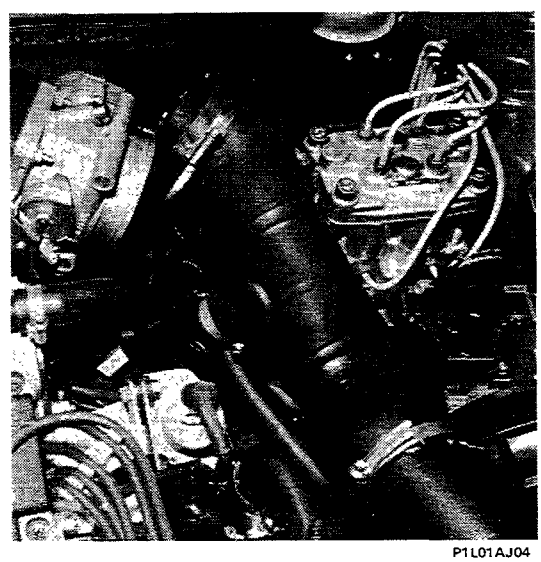

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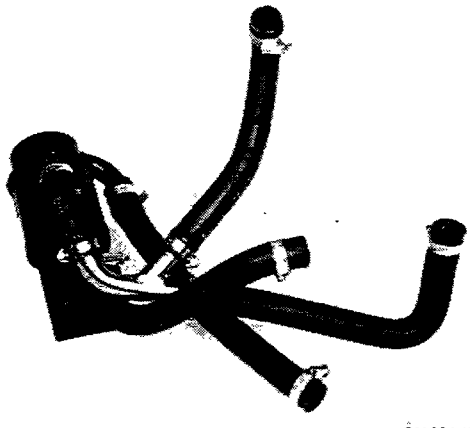

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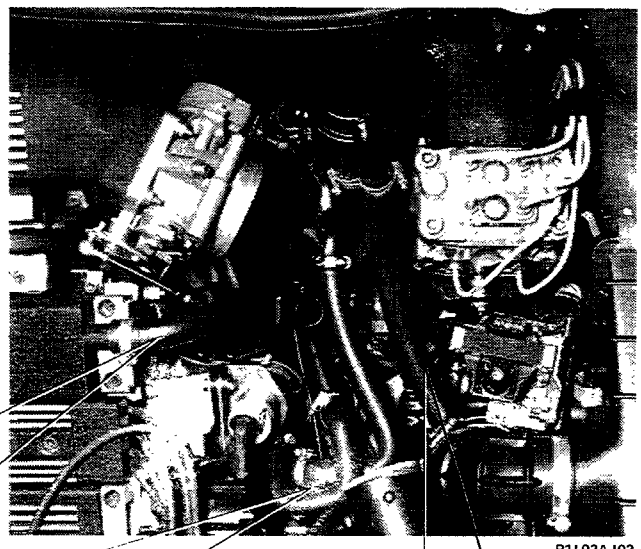

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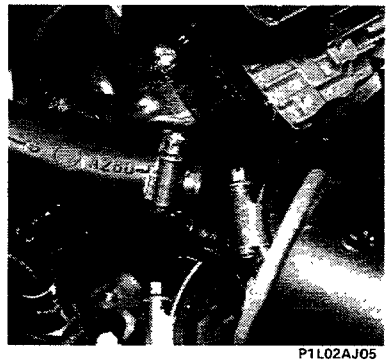
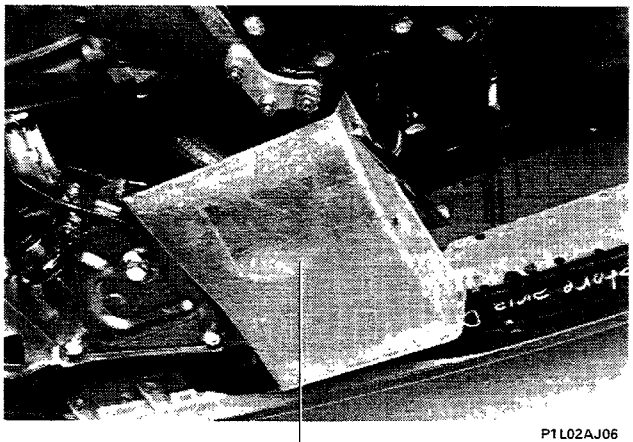
P1L02AJ03

P1L02AJ04



P1L02AJ05

Raise the vehicle and carry out the following operations, from underneath:



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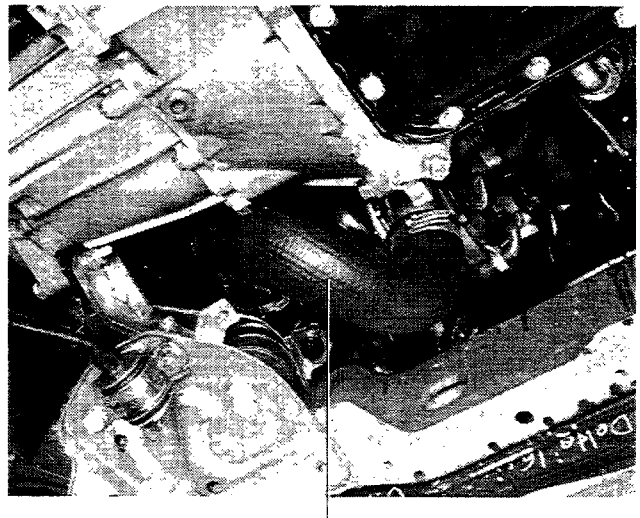

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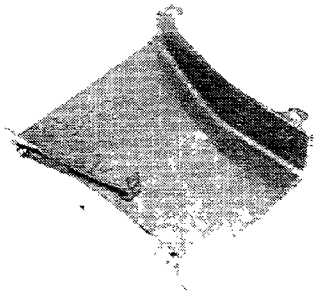

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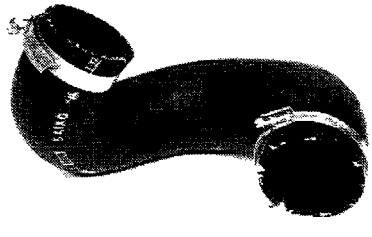
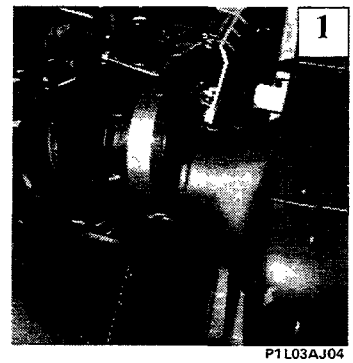


P1L02J09

In order to extract the cooling radiator it must be disconnected from the duct

P1L03AJ03



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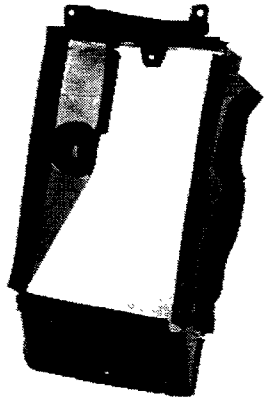

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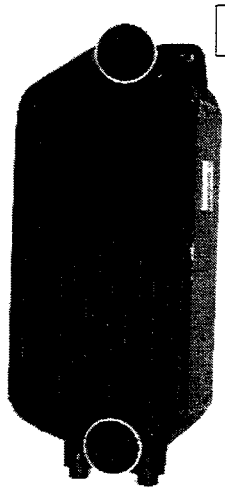

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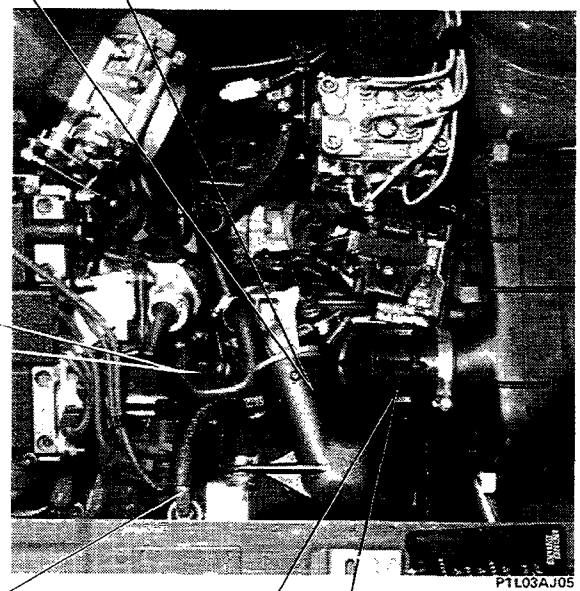
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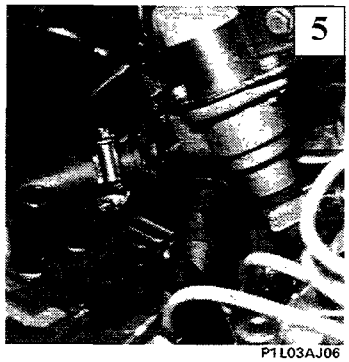
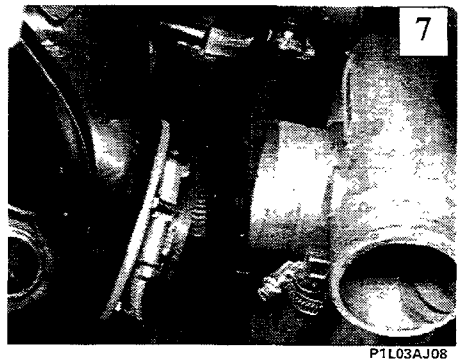


P1L03AJ06

P1L03AJ07

- Disconnect the pipe from the over-boost solenoid valve

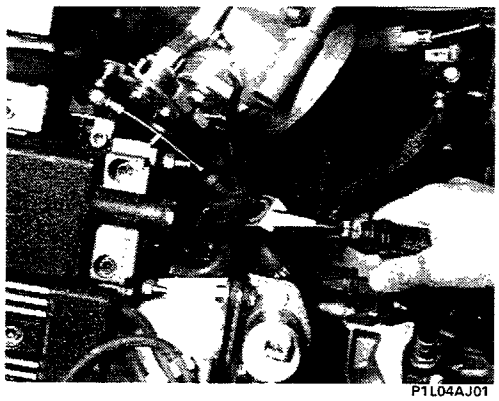


P1L03AJ08

P1L03AJ09

The numbers at the side of the illustrations indicate the order in which the operations should be carried out

10.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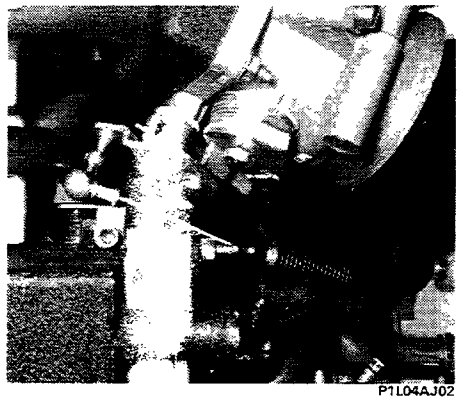
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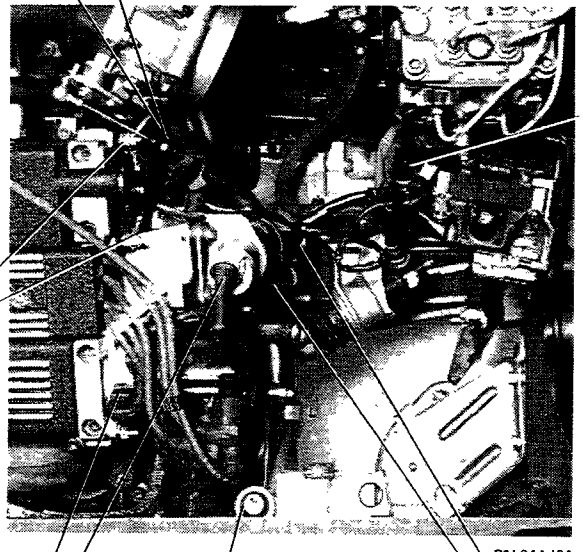
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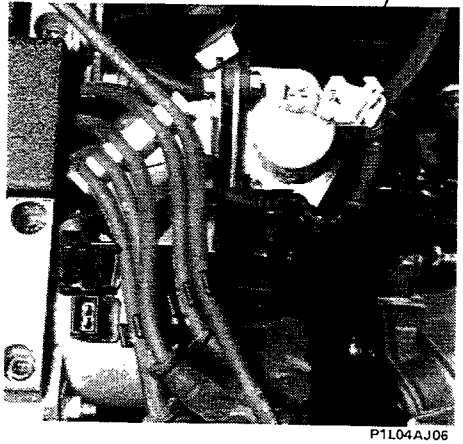
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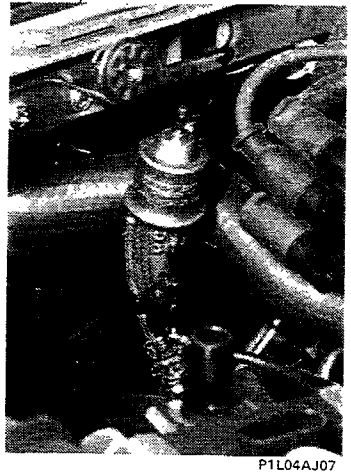
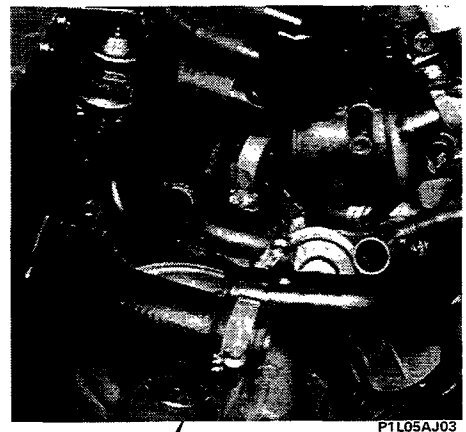

P1L04AJ07


P1L04AJ08

Pipes connecting over-boost solenoid valve to wastegate valve and turbocharger


P1L05AJ02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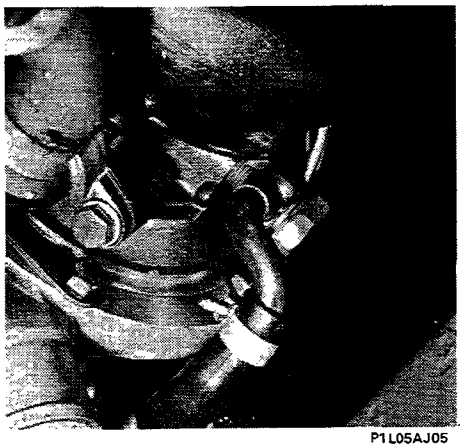
P1L05AJ01

Coolant hose between turbocharger and radiator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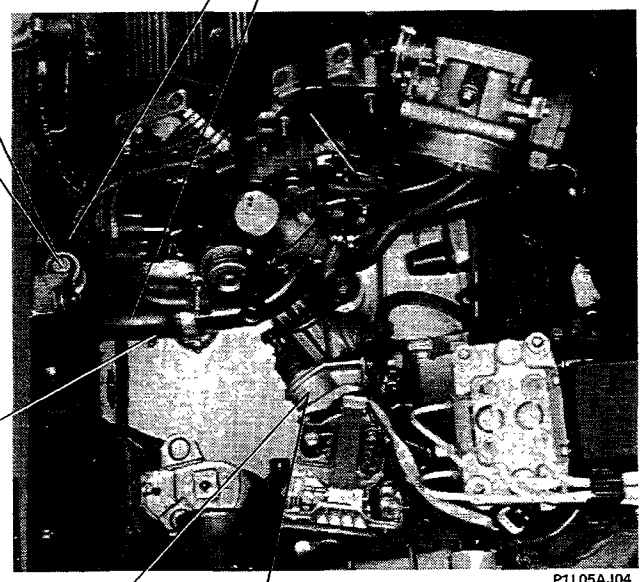
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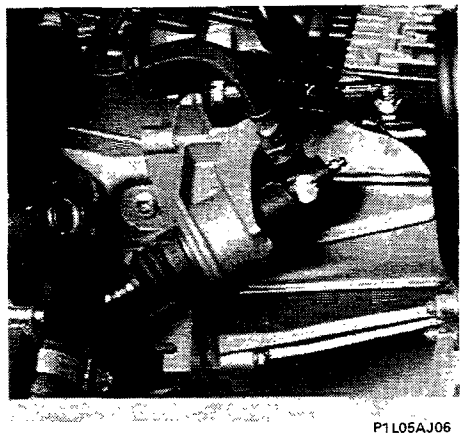
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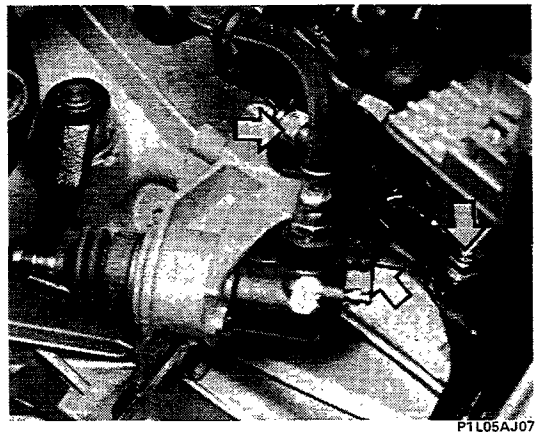
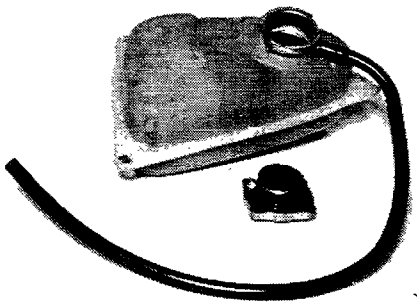

P1L05AJ07

Remove the clutch release operating cylinder and bracket and place it in the engine compartment without removing the oil pipe

10.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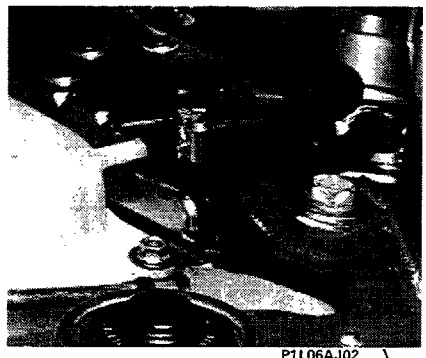
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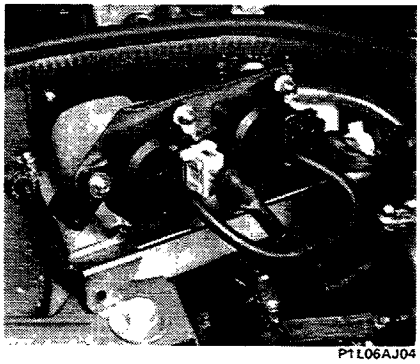
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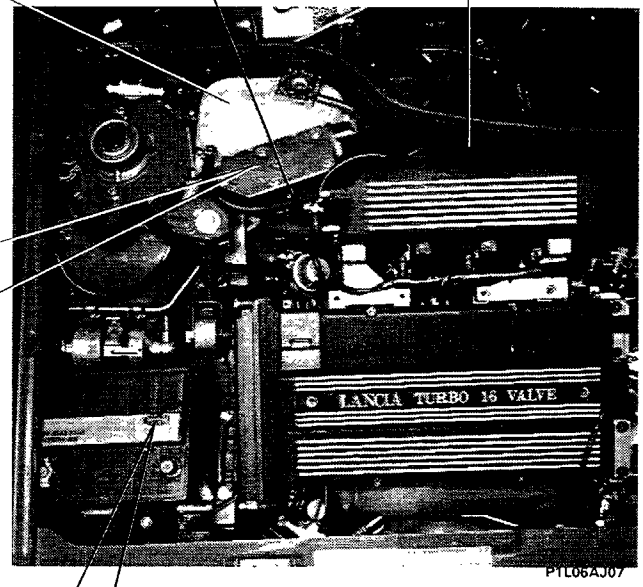

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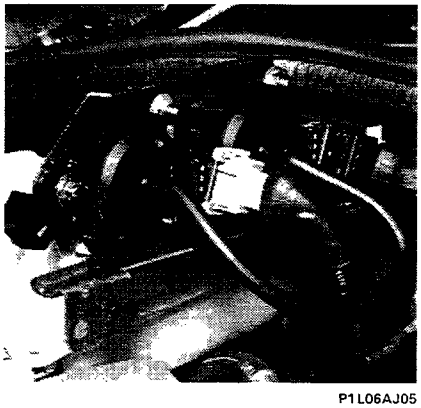
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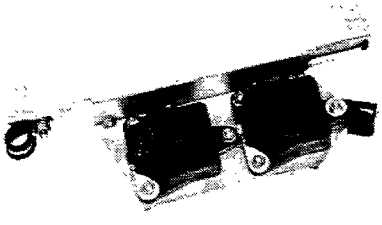
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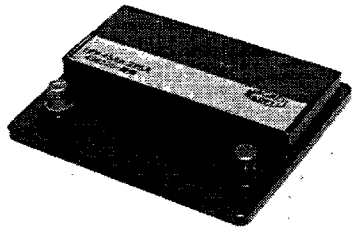
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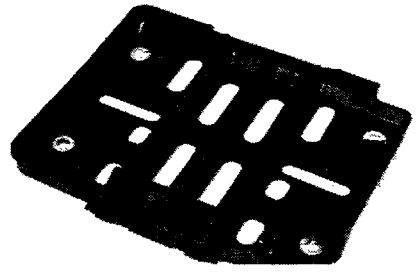
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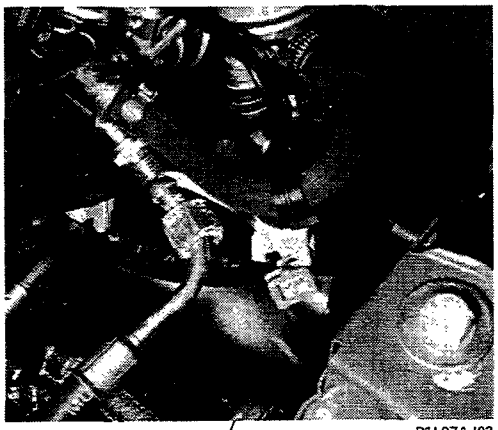
Fuel supply pipe and electrical connection for engine rpm and TDC sensor

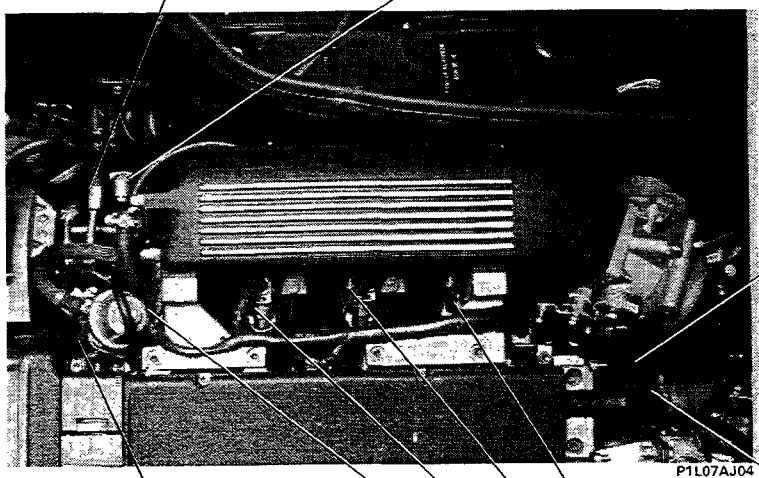

P1L07AJ02


P1L07AJ01

Oil pipes from power assisted steering pump

Electrical connection for detonation sensor


P1L07AJ03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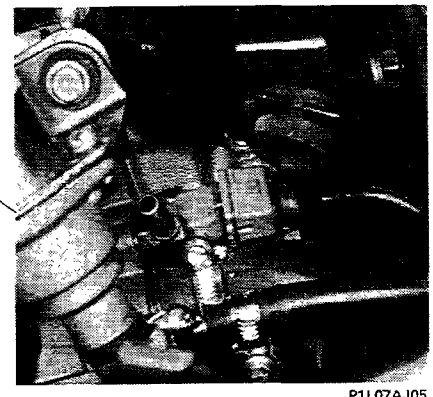
Electrical connection for coolant temperature sensor (for I.A.W. ignition/injection)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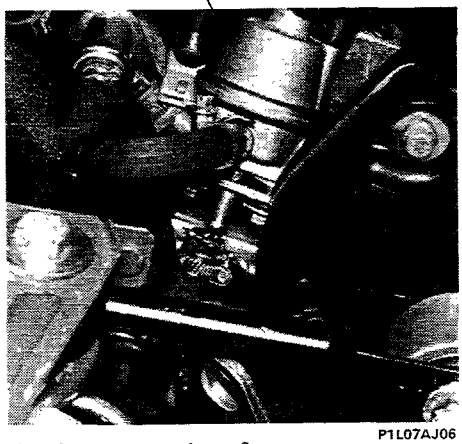
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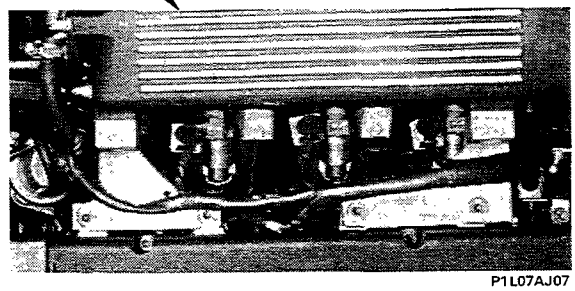
Fuel return pipe from pressure regulator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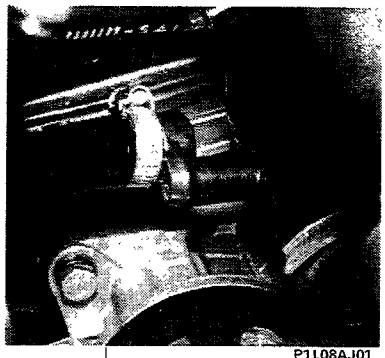
Electrical connections for injectors

10.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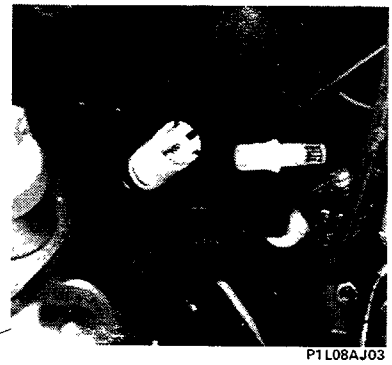
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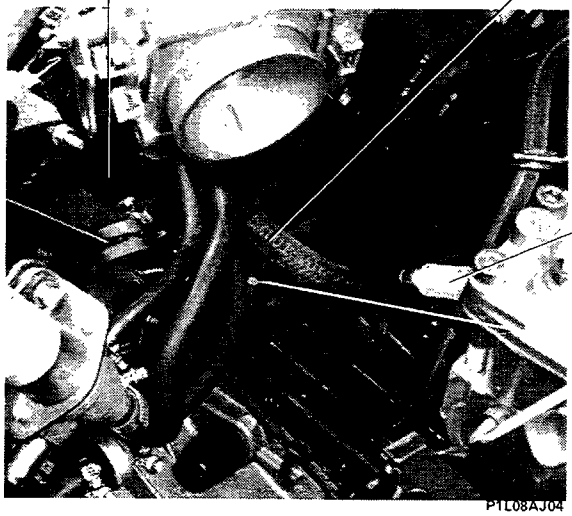
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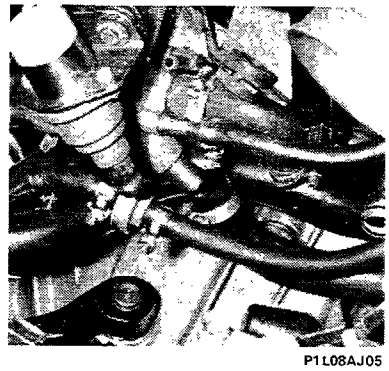
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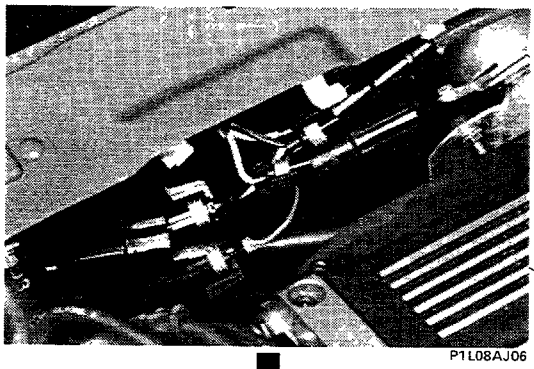
In order to facilitate the removal of the radiator, the front bumper must be moved forwards; in addition, the radiator must be disconnected from the engine oil cooling radiator as well as from the cross member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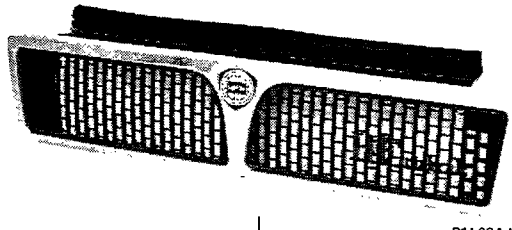
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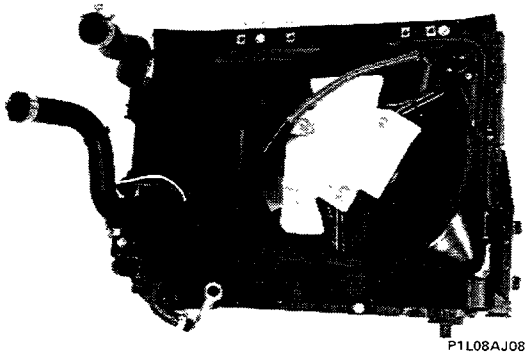
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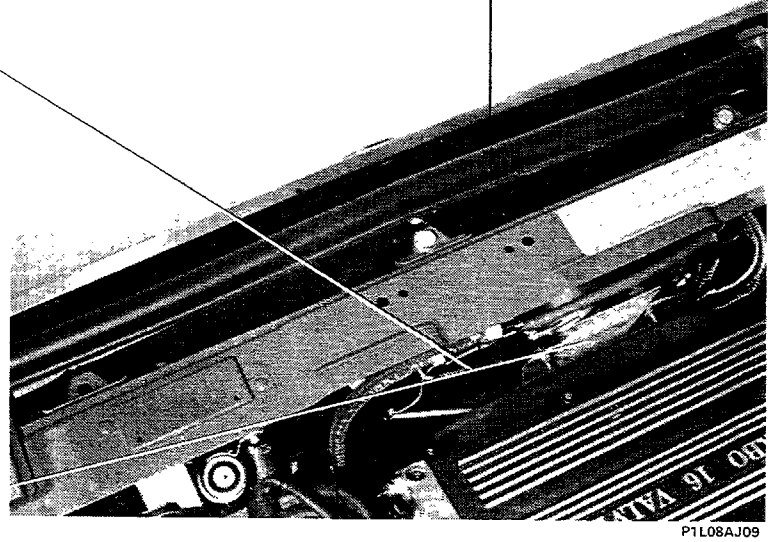
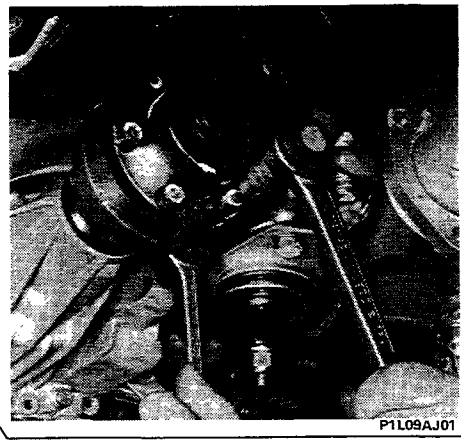

P1L08AJ09

- remove the front wheels and remove the right side wheel arch liner;
- raise the lift and, from underneath the vehicle, drain the gearbox oil; then carry out the following operations: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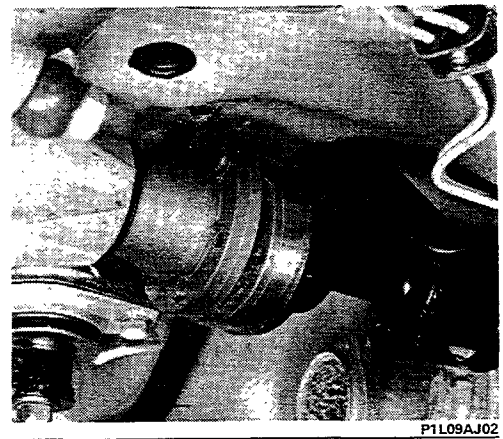
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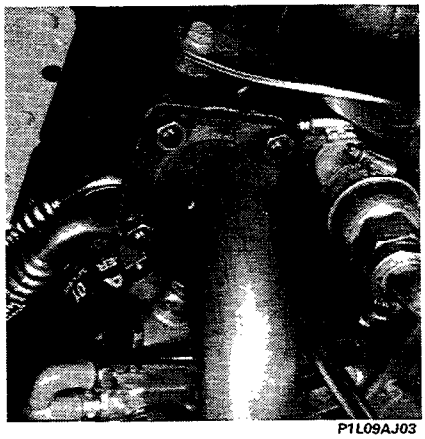
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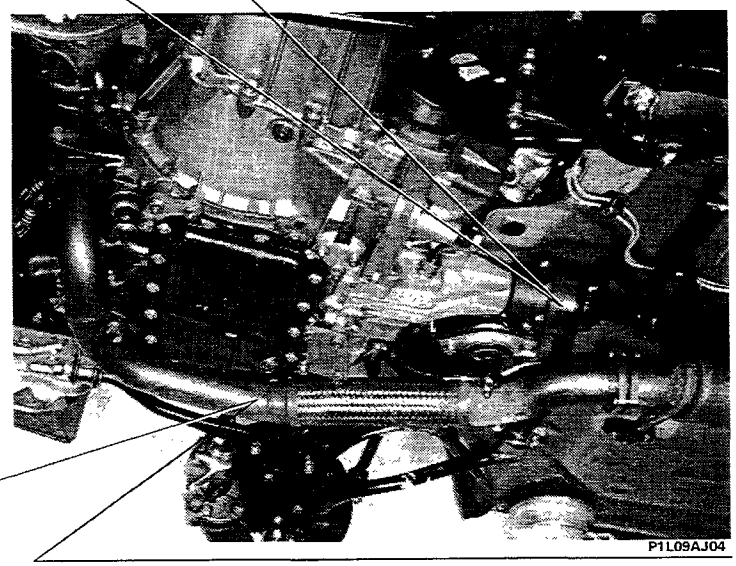
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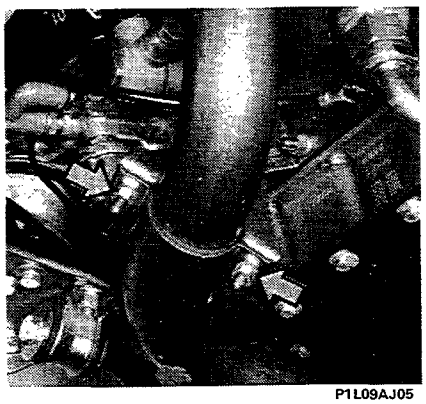
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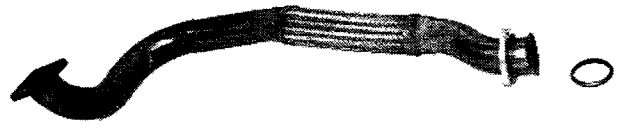
P1L09AJ07


P1L09AJ06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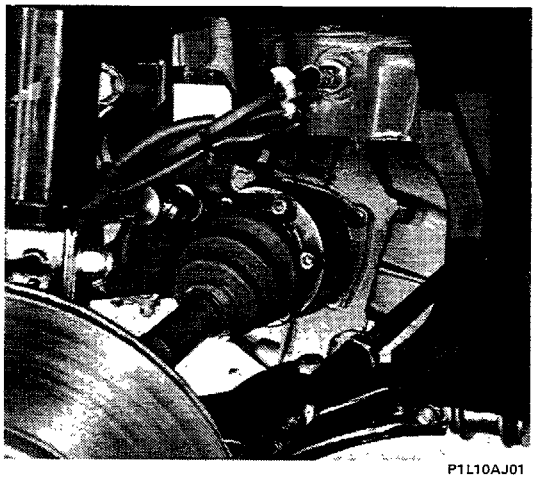

P1L10AJ01

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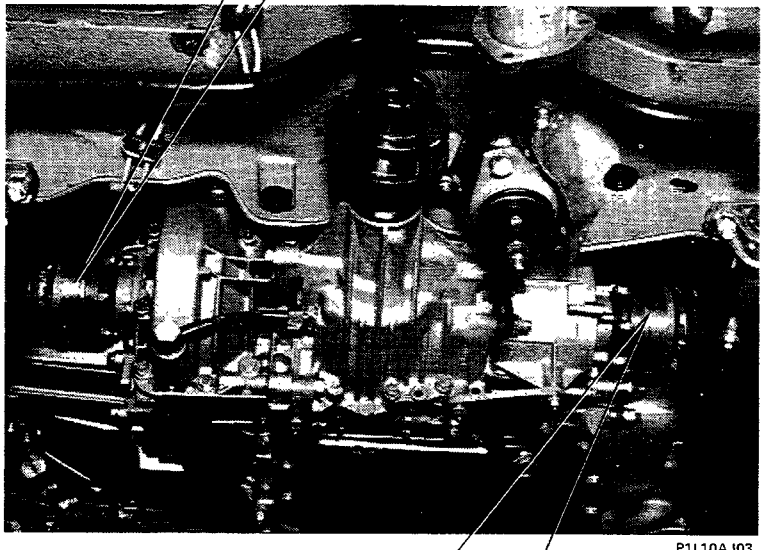

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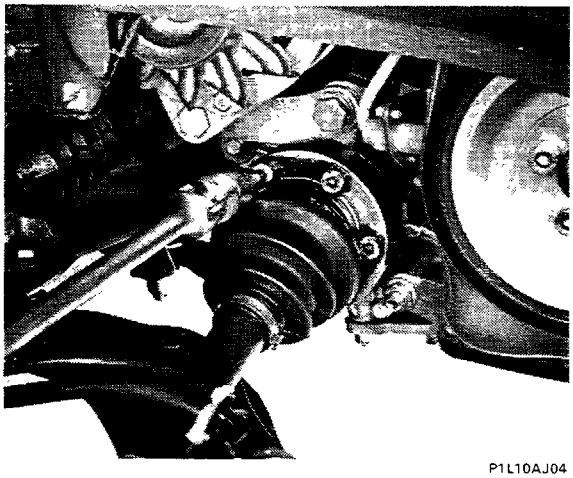

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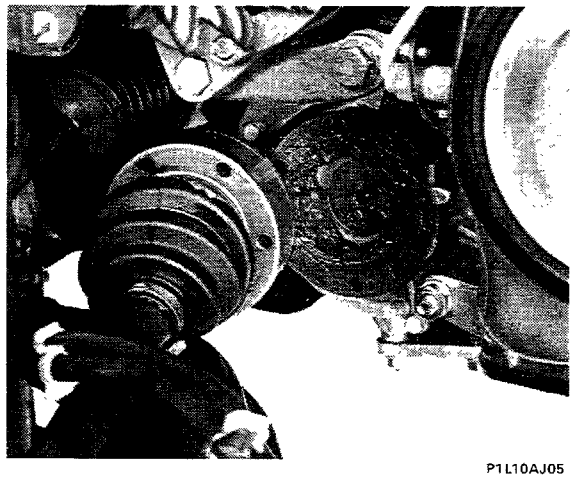

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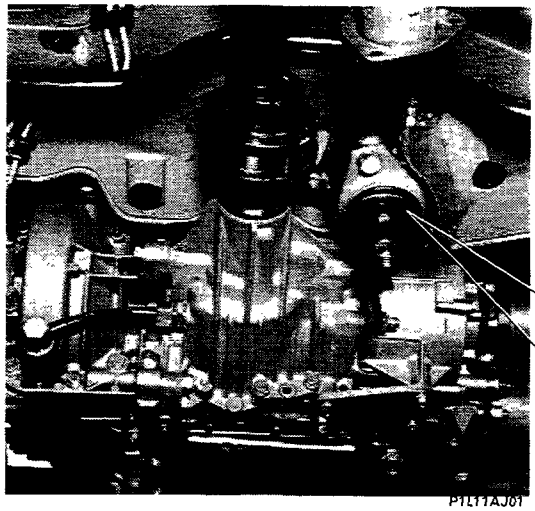
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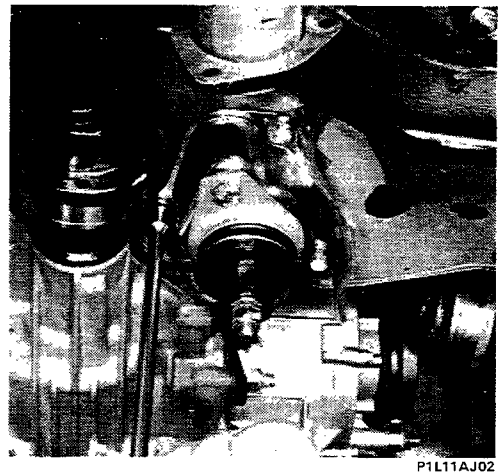
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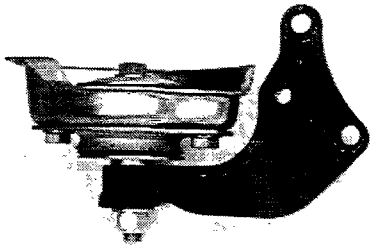
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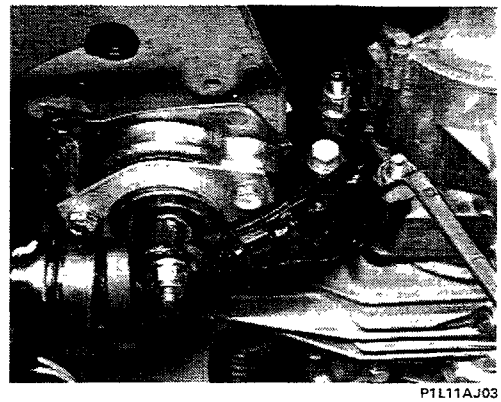
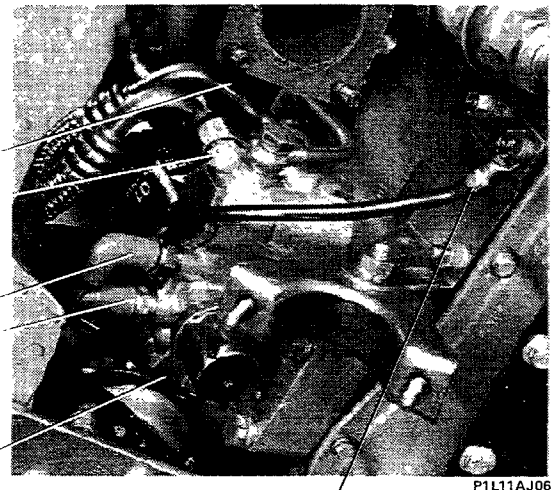

P1L11AJ03

- disconnect the electrical connections from the alternator and from the starter motor


P1L11AJ05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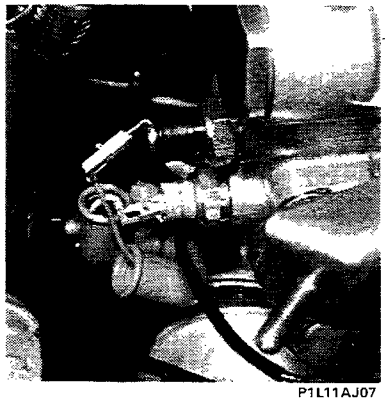
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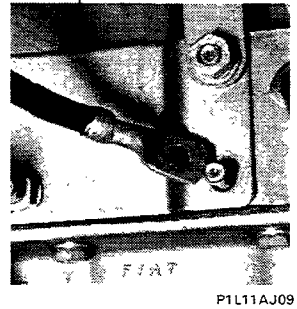
P1L11AJ08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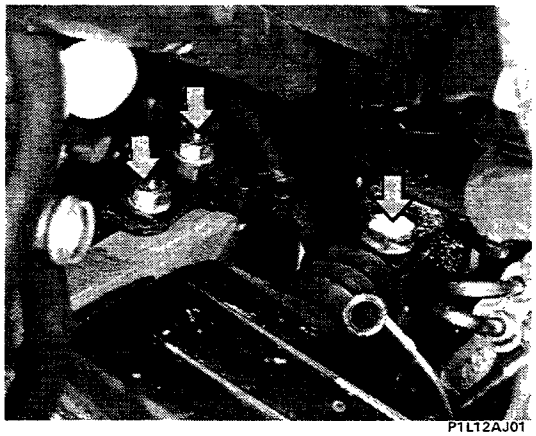
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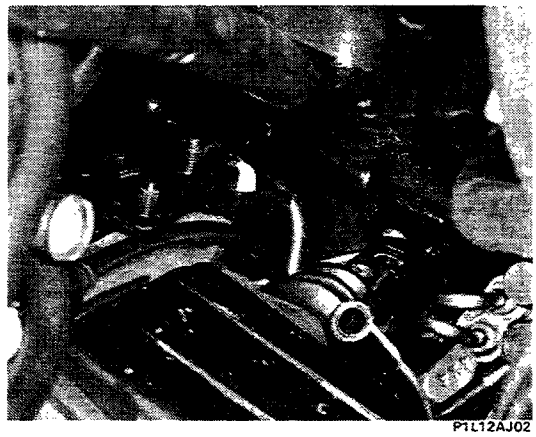
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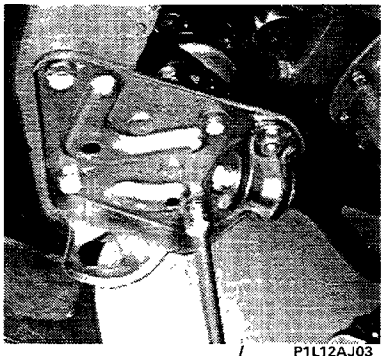
- disconnect the gear engagement and selector rods adjusting the nuts and bolt shown by the arrows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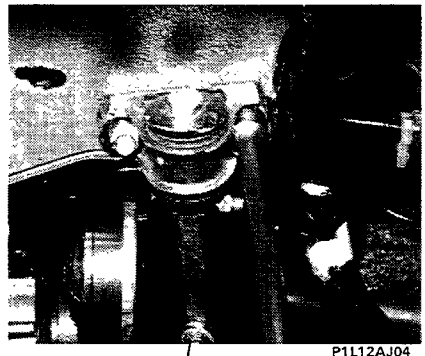
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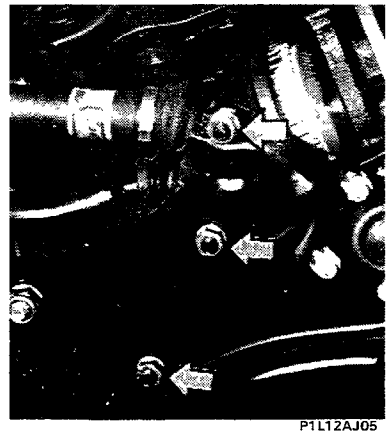
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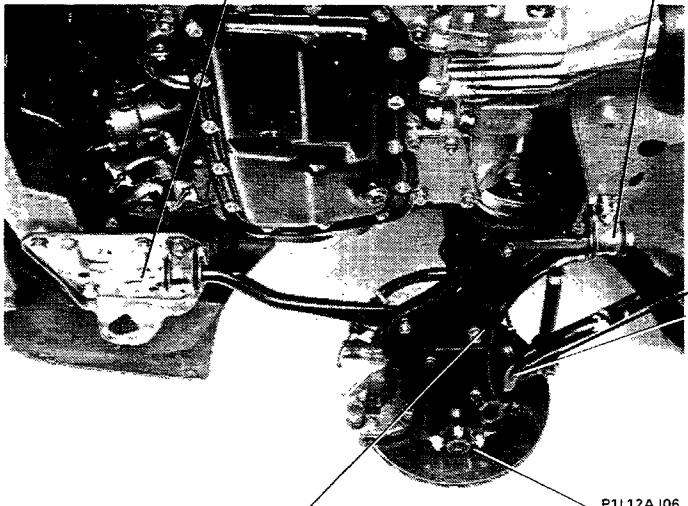
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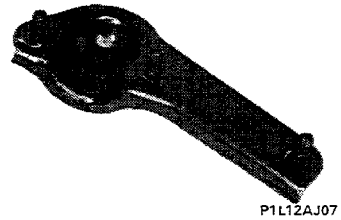
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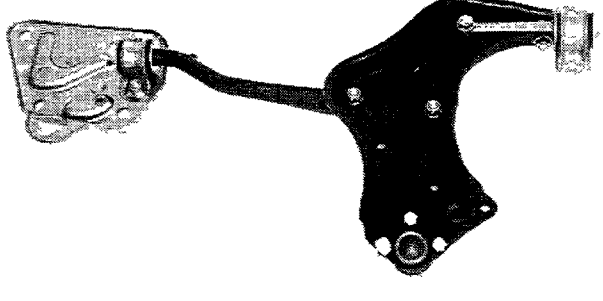
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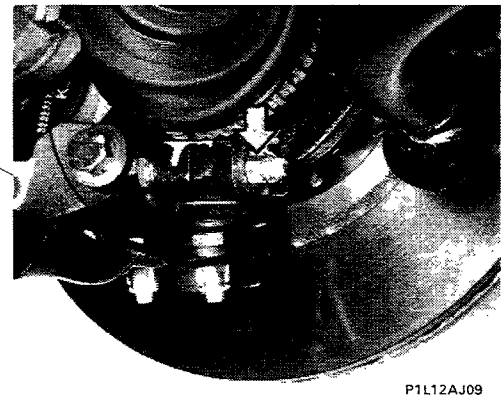
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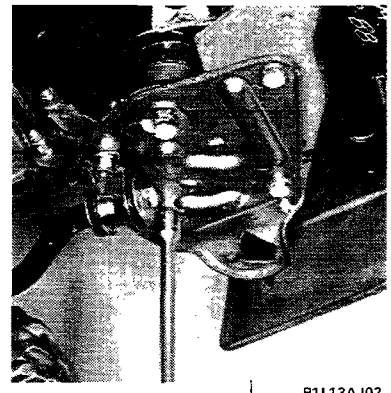
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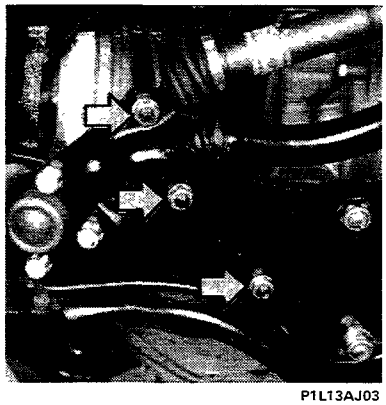
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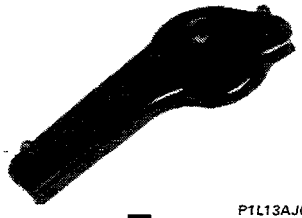
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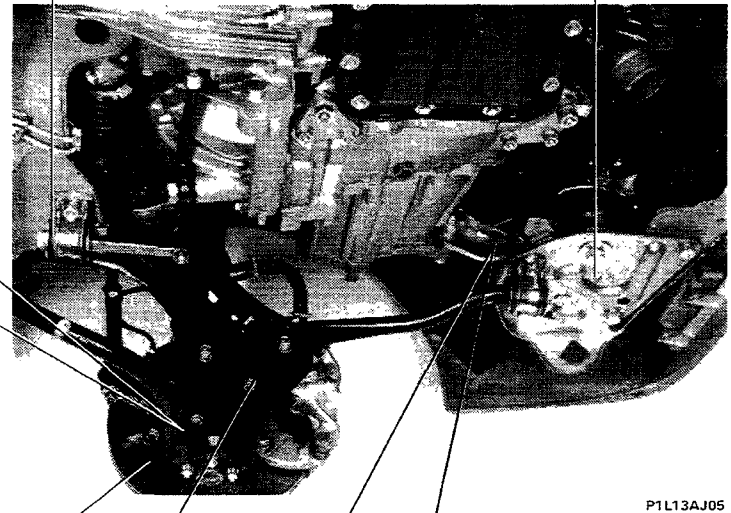
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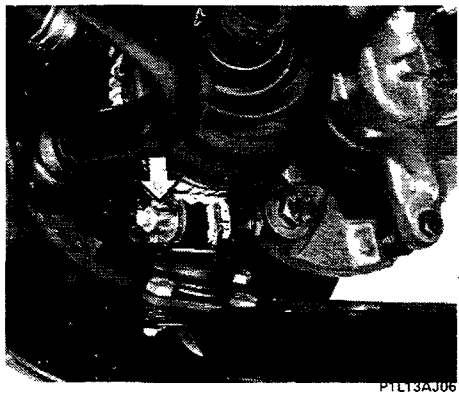
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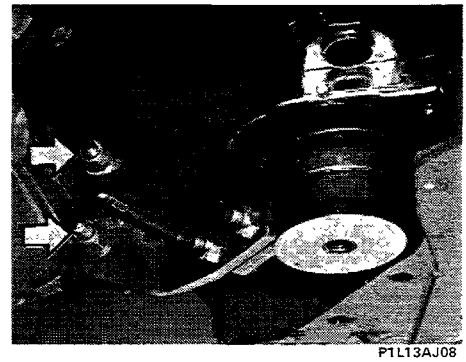
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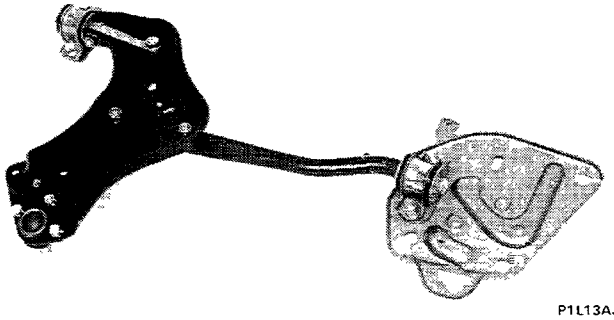
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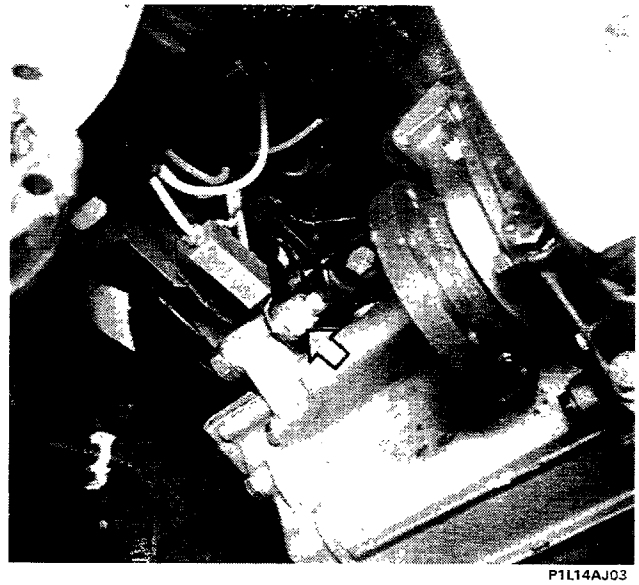
P1L13AJ09

10.

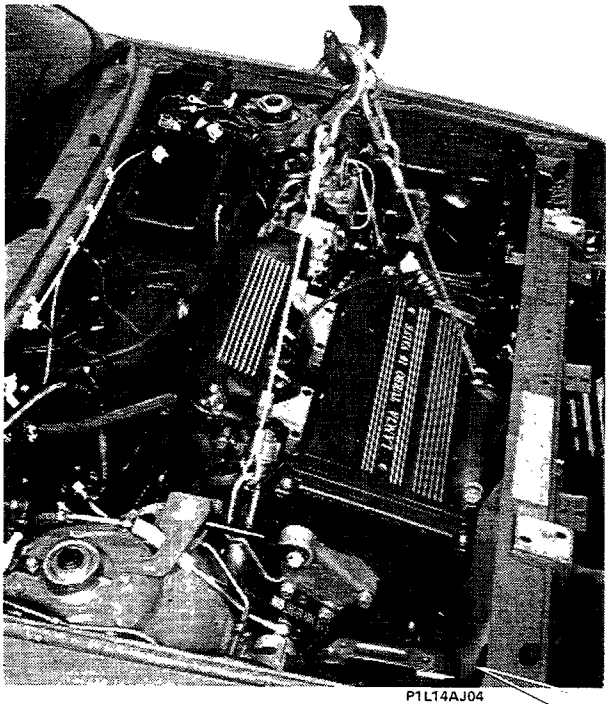
P1L14AJ02

P1L14AJ01



P1L14AJ03

- loosen the bolts fixing the support brackets to the gearbox;
- lower the lift, position the universal hook 186059200 in the special brakcets on the power unit ; then, using the hoist, place the engine under slight pressure;



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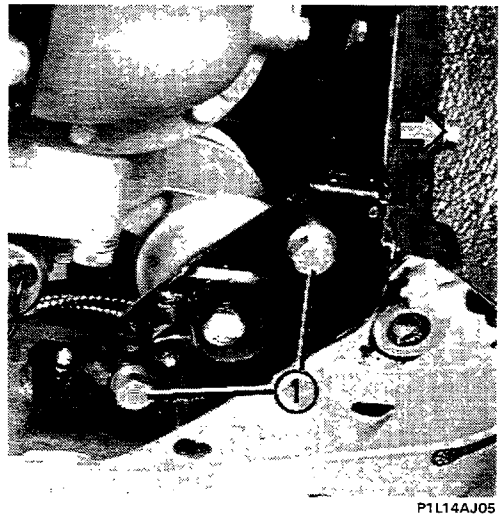
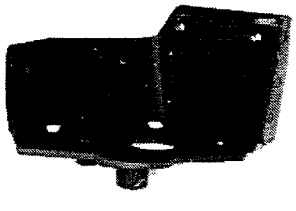


P1L14AJ05

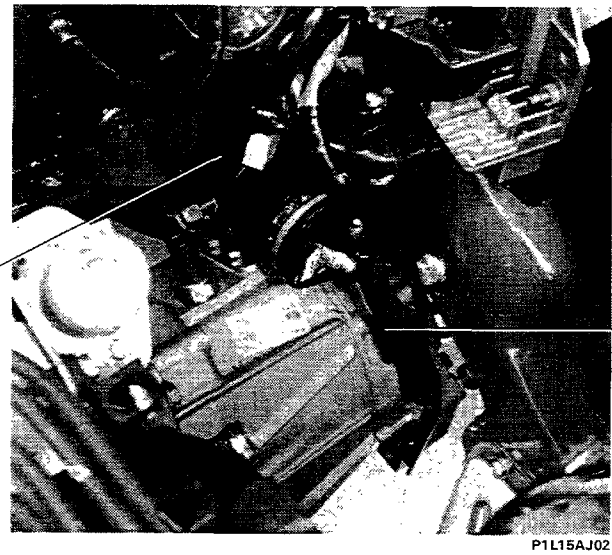
- remove the engine side flexible mounting from the support bracket, acting on the bolts (1); then, remove the bolts shown by the arrows, which fix the support bracket to the bodyshell;



P1L14AJ06

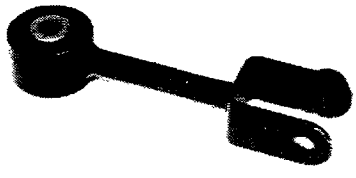
P1L14AJ07


P1L15AJ01


P1L15AJ02


P1L15AJ03

- remove the support brackets from the gearbox and from the flexible joint;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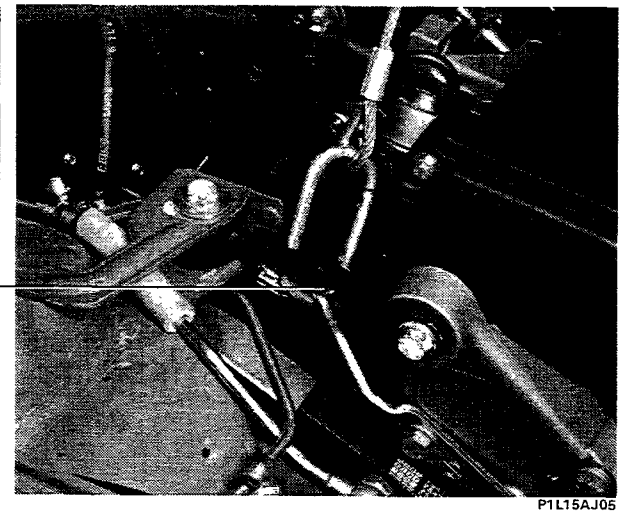

P1L15AJ05

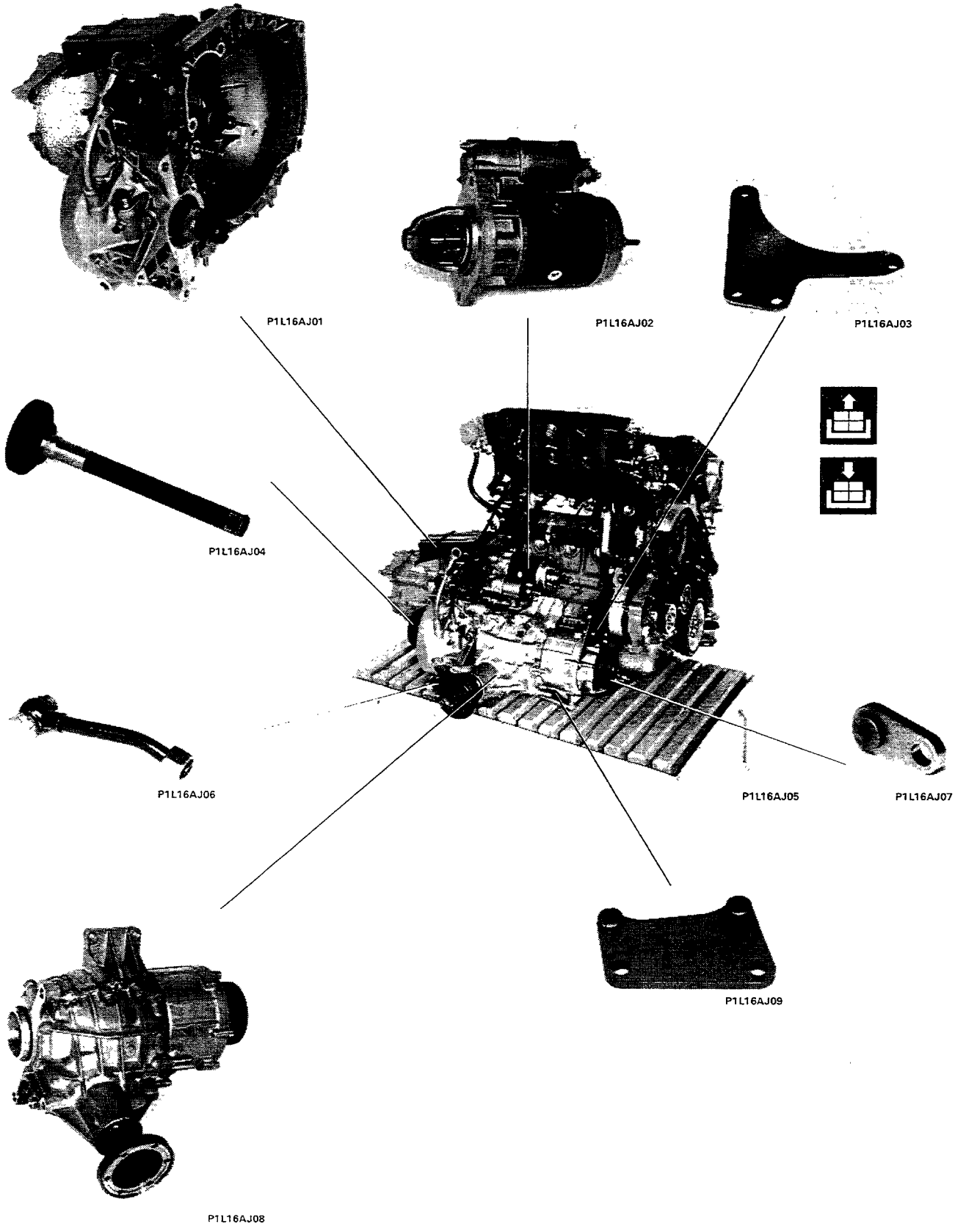
- Remove the rod anchoring the engine to the bodyshell


P1L15AJ06

- lower the power unit to the ground and release the hoist
- raise the vehicle and extract the power unit

10.

- rest the engine on a support and then remove the items illustrated below:



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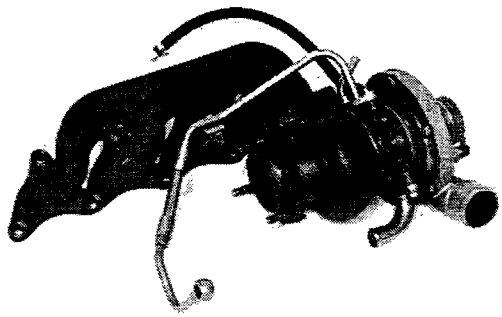
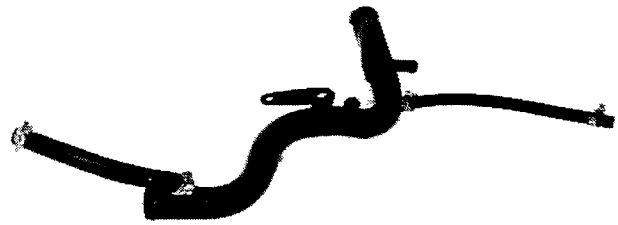


P1L17AJ01



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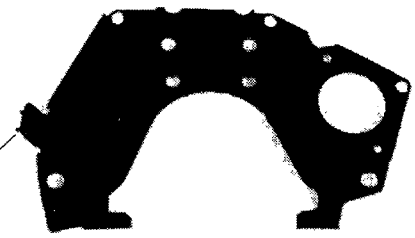

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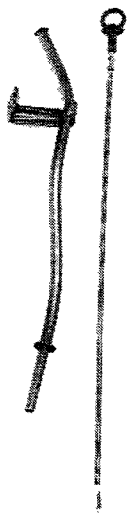

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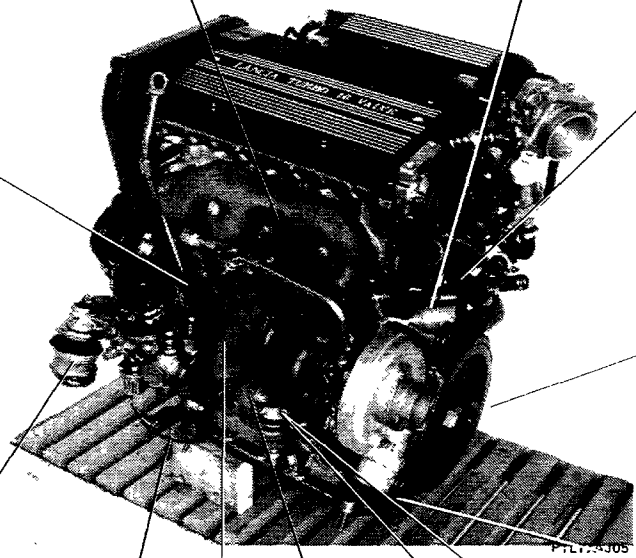

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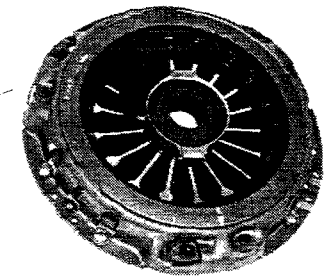

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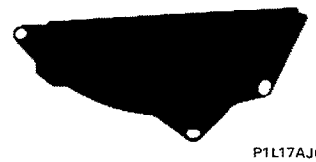

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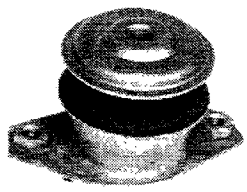

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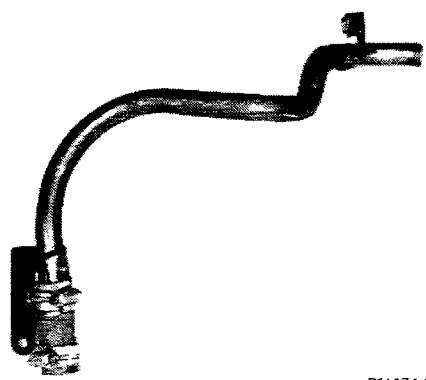

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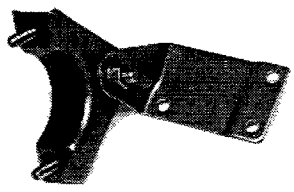

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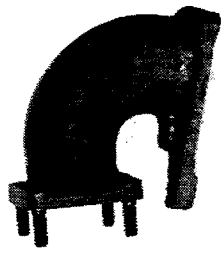
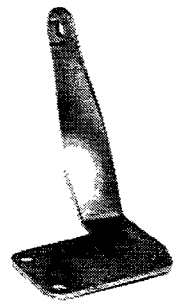


P1L17AJ10

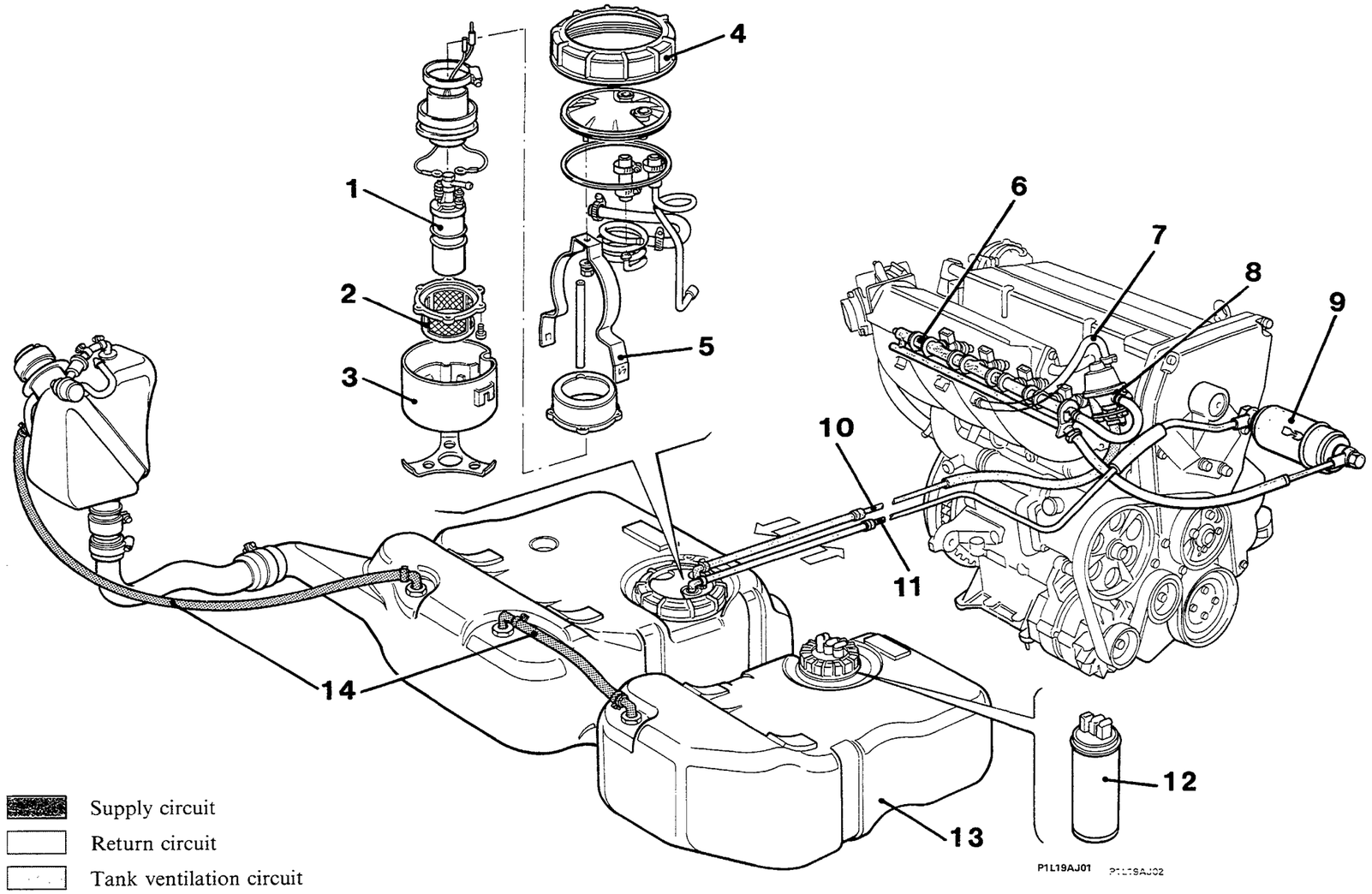


P1L17AJ11

P1L17AJ13

NOTE *To refit the power unit simply reverse the order of the operations carried out for its removal*

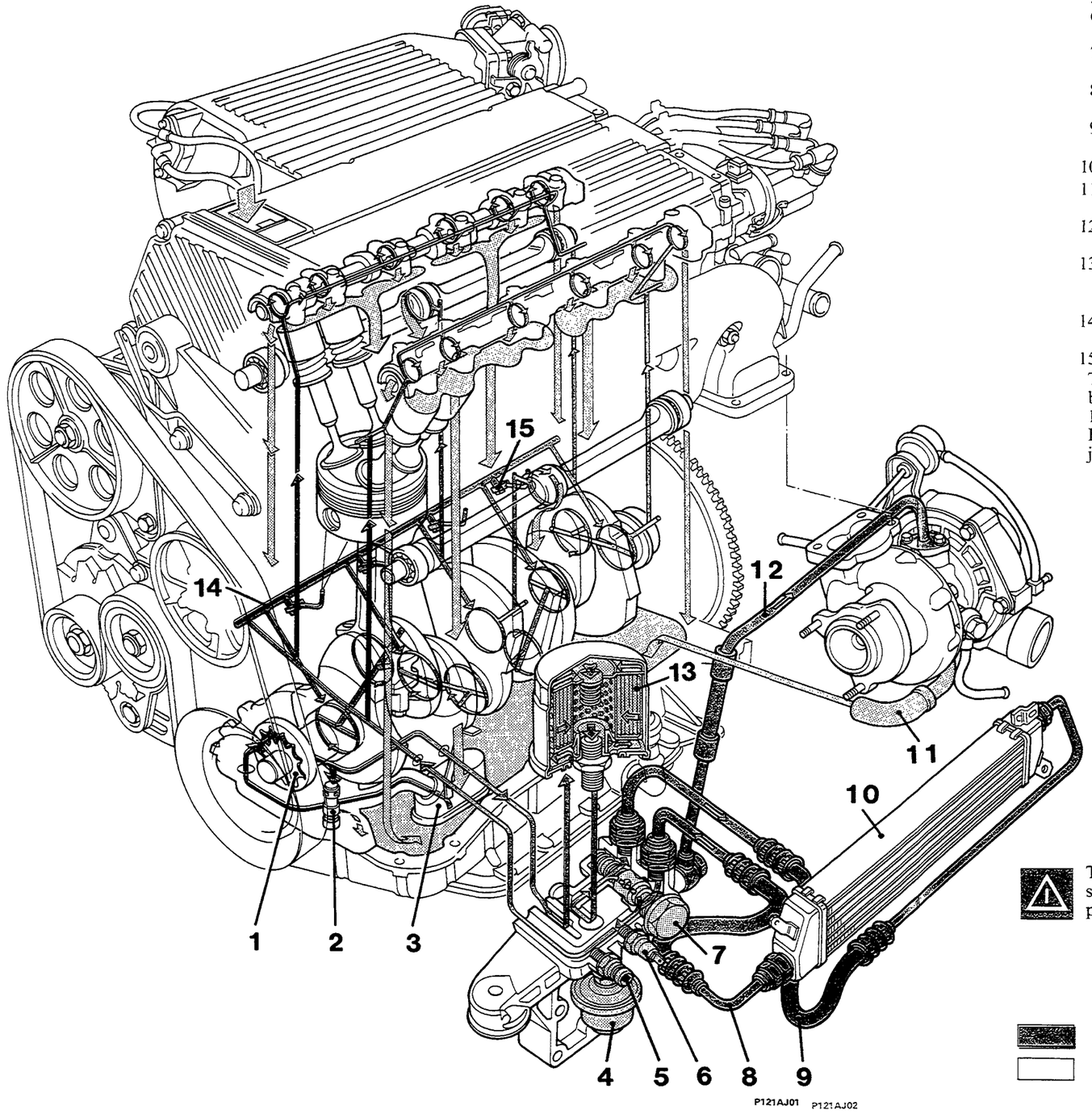
DIAGRAM SHOWING OPERATION OF FUEL SYSTEM



Supply circuit
Return circuit
Tank ventilation circuit

1. Electric fuel pump, located inside tank on flexible mounting.
2. Gauze pre-filter
3. Electric pump - pre-filter container
4. Ring nut fixing fuel passage device
5. Spring fixing electric pump container
6. Fuel manifold supply to the injectors
7. Pipe connecting vacuum pump to fuel pressure regulator
8. Fuel pressure regulator
9. Fuel filter
10. Fuel return pipe from pressure regulator to tank
11. Fuel supply pipe from the tank to the filter
12. Fuel level gauge
13. Fuel tank
14. Fuel tank ventilation and breather pipe

DIAGRAM SHOWING LUBRICATION SYSTEM



P121AJ01 P121AJ02

1. Lobe gear oil pump
2. Oil pressure relief valve
3. Strainer with gauze filter
4. Oil pressure sender unit
5. Oil temperature sender unit
6. Switch signalling insufficient oil pressure
7. Plug for oil radiator thermostatic by-pass valve
8. Oil return pipe from cooling radiator to thermostatic valve
9. Oil supply pipe from thermostatic valve to cooling radiator
10. Engine oil cooling radiator
11. Oil return duct from turbocharger to sump
12. Main duct supplying oil under pressure to turbocharger
13. Full flow cartridge oil filter with safety valve for cutting out filter if filter element is blocked
14. Main duct supplying oil under pressure to various components
15. Piston cooling oil jets

The piston cooling jets (15) have a built in ball valve which opens at a pressure of 1.25 - 1.75 bar.
If it is not working properly, replace the jet

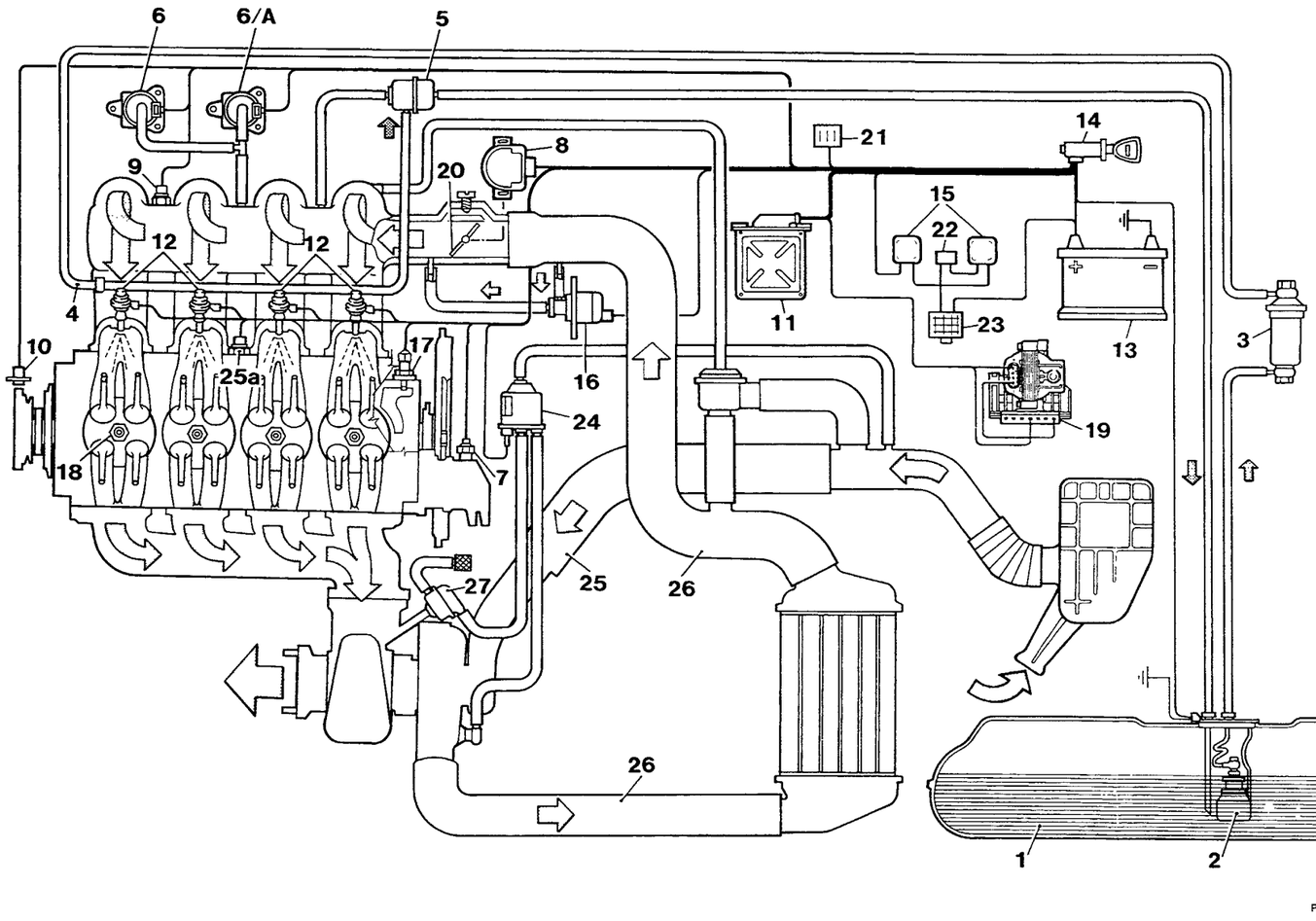
The thermostatic valve, located in the oil filter mounting, has the following function:
a) when the temperature is below 78° ± 2°C, the oil passes directly into the cartridge filter and returns to the engine.
b) when the temperature is above 83,5° the thermostatic valve is open and allows the oil to pass into the cooling radiator and lower the temperature thus guaranteeing improved lubrication.

The thermostatic valve is not available as spares; if it is not working properly, replace the complete oil filter mounting.

Supply circuit

Return circuit

DIAGRAM SHOWING I.A.W. (M.P.I.) INJECTION/IGNITION SYSTEM



1. Fuel tank
2. Electric fuel pump
3. Fuel filter
4. Fuel manifold
5. Fuel pressure regulator
6. Intake air absolute pressure sensor

6A. Intake air absolute pressure sensor

7. HT distributor with injection timing sensor
8. Butterfly valve position sensor
9. Intake air temperature sensor
10. Rpm and TDC sensor
11. Electronic control unit
12. Injectors
13. Battery
14. Ignition switch
15. Injection ignition relay feeds
16. Supplementary air solenoid valve for automatic engine idle adjustment
17. Coolant temperature sensor
18. Spark plugs
19. Ignition coil with power module
20. Butterfly valve
21. Diagnostic socket
22. Fuse
23. Connector block
24. Over-boost solenoid valve
25. Intake air duct from the filter

25A. Detonation sensor

26. Compressed air ducts from turbocharger
27. Supercharging adjustment actuator (waste-gate valve)

Foreword

The I.A.W. injection/ignition system fitted on the Delta HF integrale 16 V is similar to the one fitted on the Delta Hf integrale.
However, certain small modifications have been made to further improve the reliability of the system with the resulting differences: 1 - The use of two absolute pressure sensors rather than one. 2 - A different over-boost solenoid valve with a consequently different intervention strategy. 3 - A different location for the detonation sensor on the cylinder head. 4 - A different butterfly valve control mechanism on the butterfly casing.

NOTE *This section only deals with the variants compared with the I.A.W. system fitted on the Delta HF Integrale which has been extensively covered in section 10 of this binder*

6. Timing sensor
8. Coolant temperature sensor (I.A.W.)
9. Detonation sensor
9/A Over-boost solenoid valve
14. Connector block
19. Solenoid air valve (V.A.E.)
20. Rpm and TDC sensor
22. Ignition distributor
23. Spark plugs
24. Fuel injectors
31. Connector block
32. Connector block
34. Connector block
35. Battery
42. Ignition coil with power module
44. Earth on engine
47. Butterfly valve position sensor
49. Air temperature sensor
50/A. Absolute pressure sensor
50/B Absolute pressure sensor
55. Injector relay feed
56. Electric fuel pump relay feed
59. Instrument panel
D. System failure warning light (I.A.W.)
62. Connector block
62/B System protective fuse (I.A.W.)
72. Connector block
75/A. Connector block
90. Diagnostic socket
100. Ignition switch
116. Injection/ignition electronic control unit - (I.A.W.)
117. Connector
117/A. Connector
142. Electric fuel pump
153. Rear earth cable loom

Injection/ignition system (I.A.W) wiring diagram

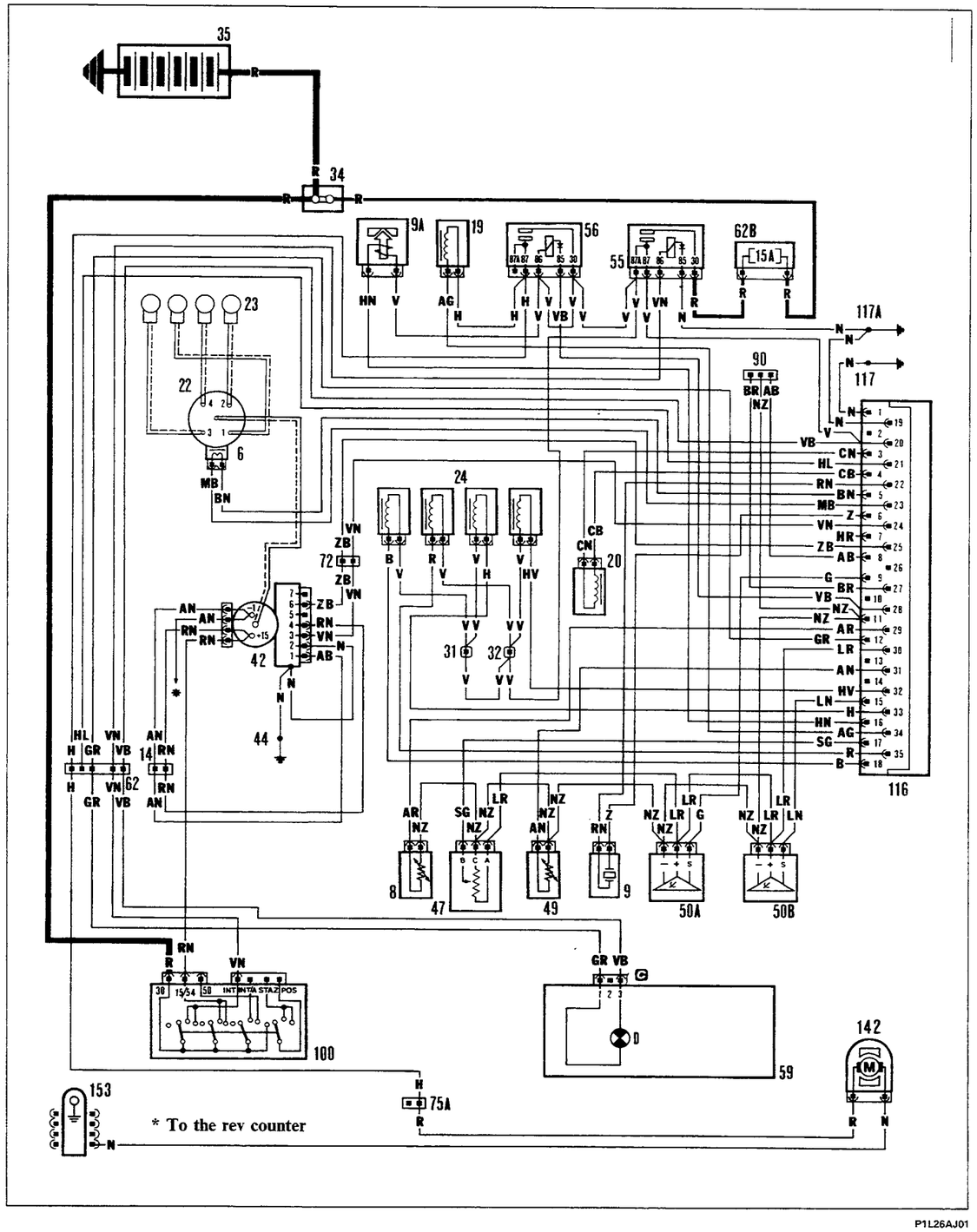


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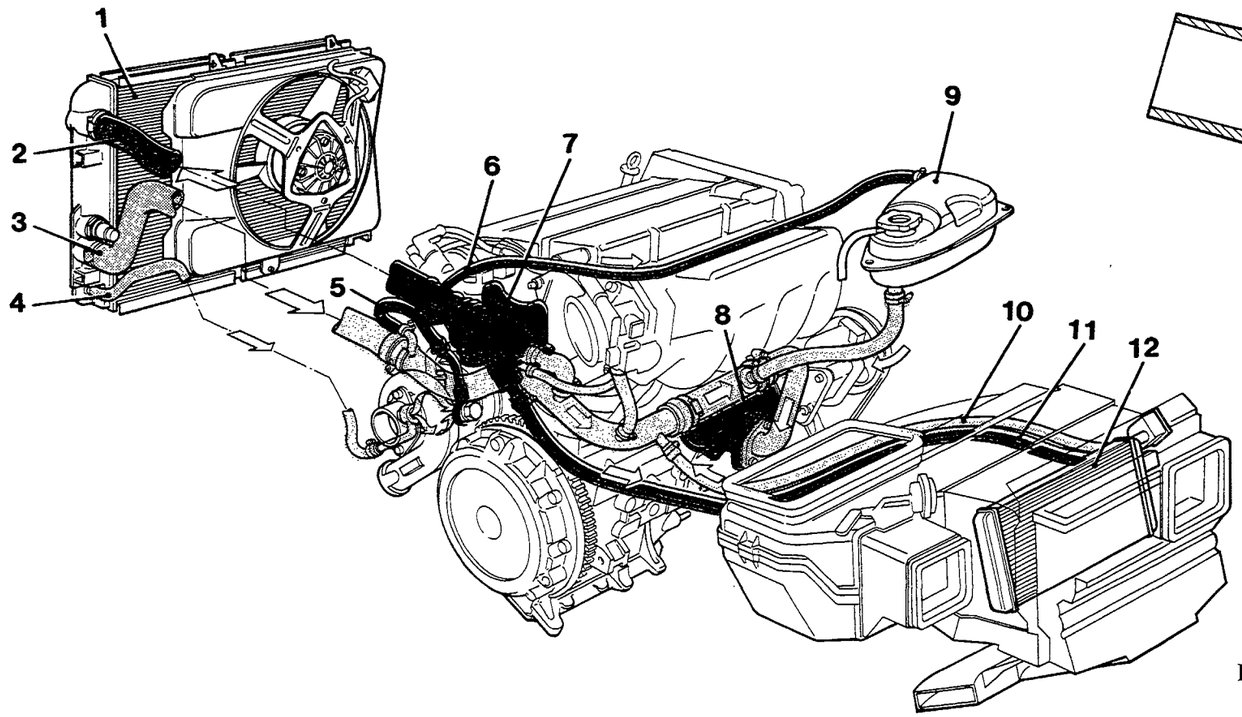
DIAGRAM SHOWING OPERATION OF COOLING SYSTEM



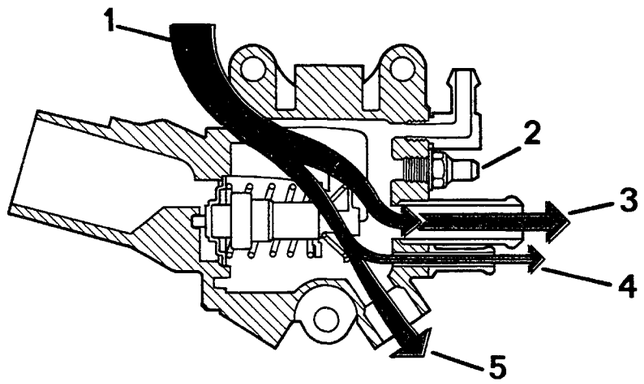
P1L23AJ01 P1L23AJ02

1. Engine coolant radiator
2. Coolant hose between thermostat and radiator
3. Coolant hose between radiator and pump
4. Coolant hose between the radiator and the turbocharger
5. Coolant hose between turbocharger and pump
6. Coolant return hose to expansion tank
7. Controlled by-pass thermostat for coolant mixture
8. Water pump
9. Expansion tank
10. Coolant hose between the car interior heater-radiator and the pump
11. Coolant hose between thermostat and car interior heater-radiator
12. Car interior heater-radiator

Supply circuit

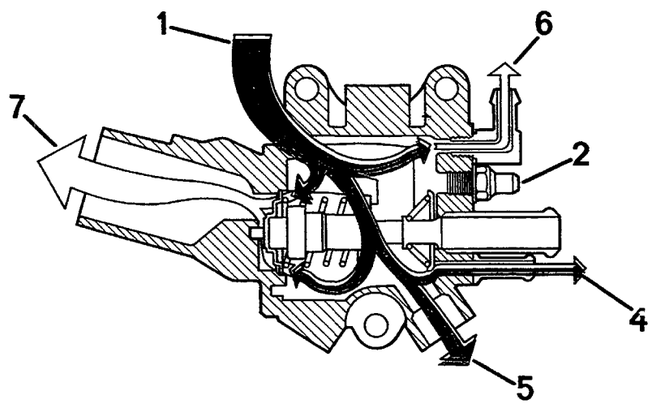
Return circuit

BY-PASS THERMOSTAT CLOSED



P1L23AJ03 P1L23AJ04

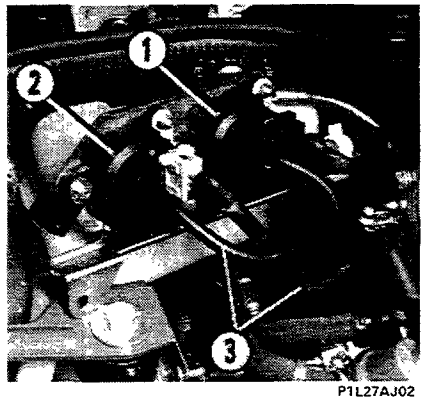
BY-PASS THERMOSTAT OPEN



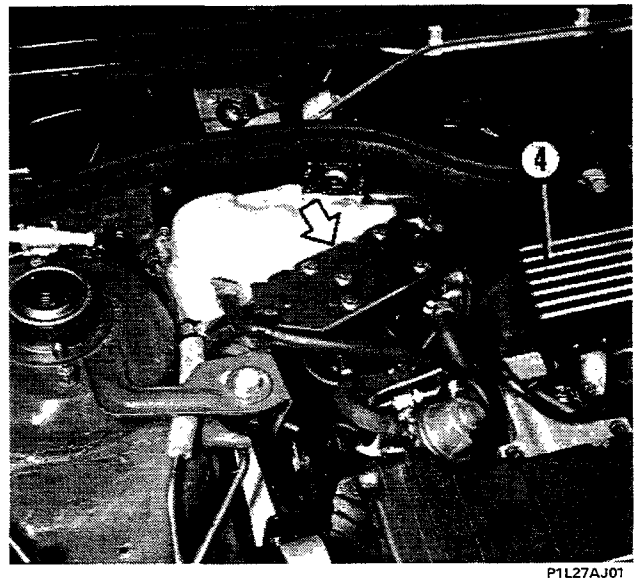
P1L23AJ05 P1L23AJ06

1. From the engine
2. Coolant temperature sender unit
3. To the by-pass
4. To the butterfly casing
5. To the car interior heater
6. To the expansion tank
7. To the coolant radiator

Location of absolute pressure sensors in engine compartment



P1L27AJ02



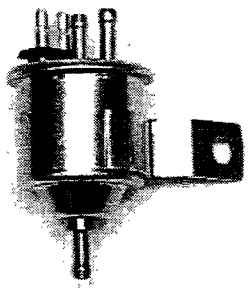
P1L27AJ01

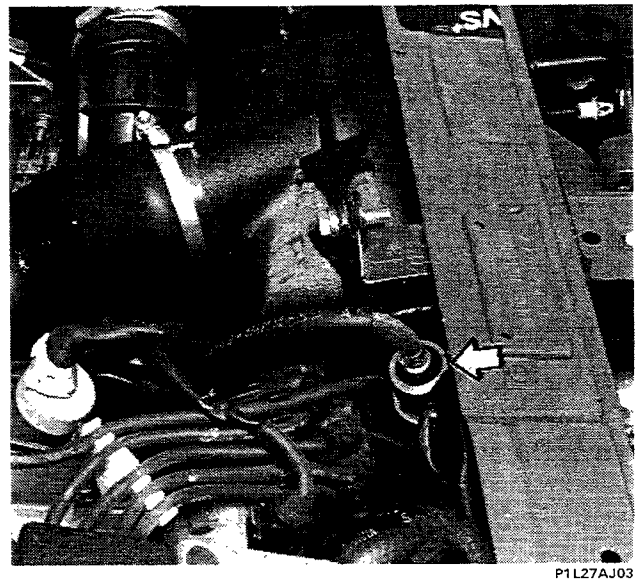
1°) ABSOLUTE PRESSURE SENSORS

Two absolute pressure sensors are fitted on the Delta HF integrale 16 V version. They are connected by a rubber pipe (3) to the inlet manifold (4).
The pressure sensor (1) supplies a voltage signal proportional to the absolute pressure in the inlet manifold for pressure values up to 1600mmHg, whilst the other absolute pressure sensor (2) provides the signal for pressure values up to 2280mmHg. With the use of two absolute pressure sensors the signal is clearer since for pressures greater than 0.7 bar the sensor (1) is no longer sufficient to guarantee a clear signal reading. Therefore when the pressure in the inlet manifold exceeds 0.7 bar, the electronic control unit changes the signal reading to sensor (2).

The base and cover of the sensor are different colours, one is black and the other is grey. If the sensors are removed-refitted, the same colour sensor and electrical connector must always be matched together.

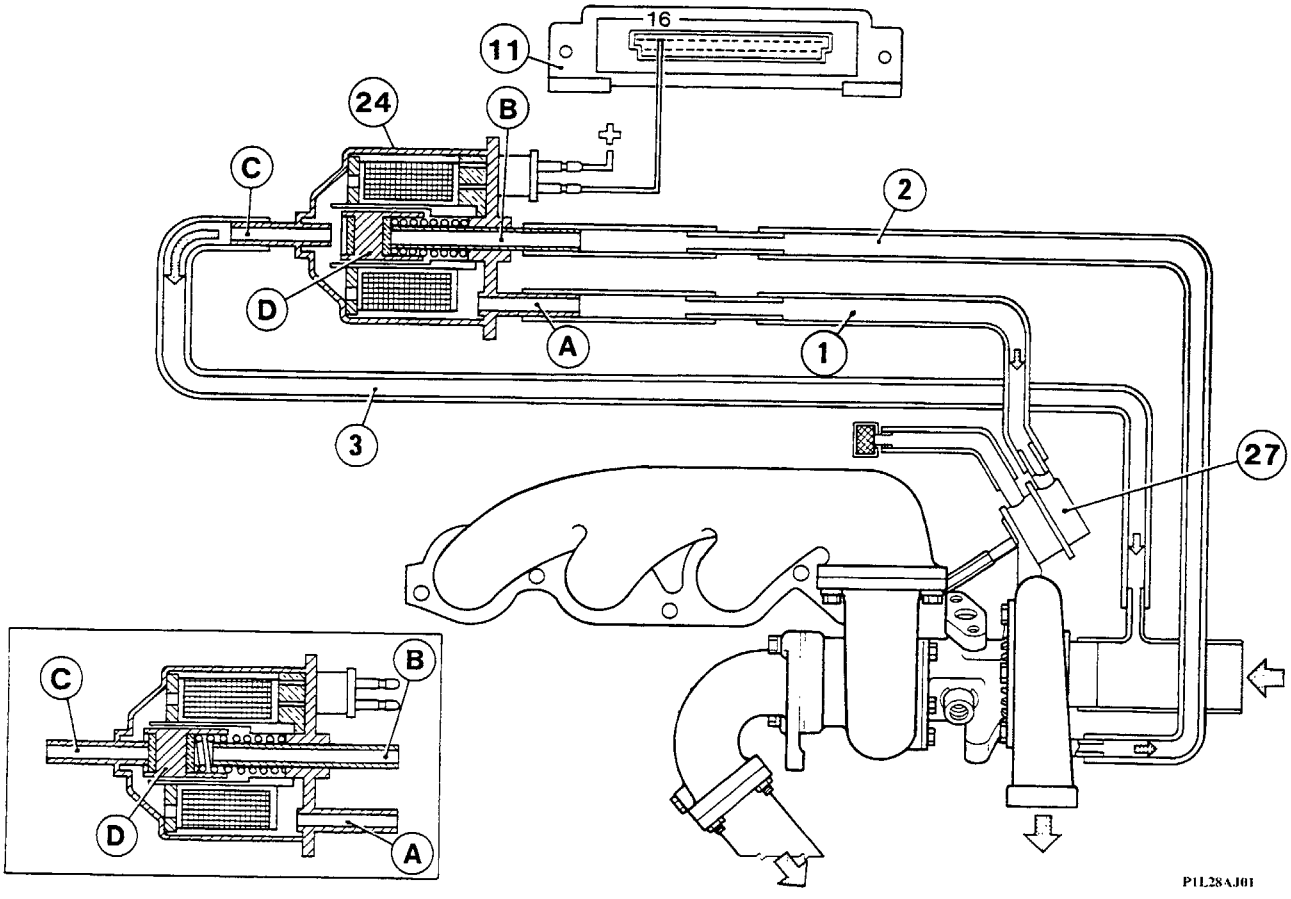
2°) OVER-BOOST DEVICE SOLENOID VALVE


P1L27AJ04


P1L27AJ03

Location on vehicle of over-boost solenoid valve

DIAGRAM SHOWING OVER-BOOST SOLENOID VALVE CONNECTION

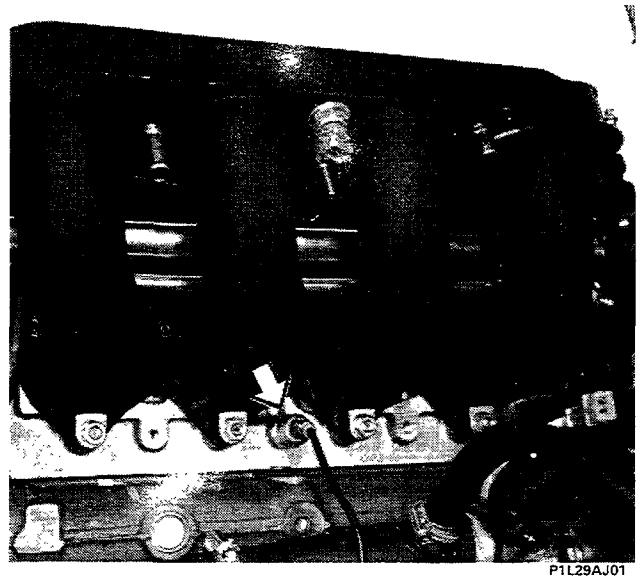


Operation of over-boost device

The over-boost device soleniod valve (24) is permanently controlled by the injection/ignition electronic control unit via terminal (16). The description of the operation of the over-boost device is similar to that previously described in chapter 10 - fuel system - in this binder therefore a description of the operation of the over-boost solenoid valve (24) only follows.
The over-boost device solenoid valve (24) is a three-way A-B-C solenoid valve. Duct A is connected via sleeve (1) to the waste-gate valve actuator (27). Duct B via sleeve (2) is connected to the turbocharger excess pressure duct. Duct C is connected via sleeve (3) to the turbocharger intake duct. When the solenoid valve is not activated by the control unit, cylinder D closes duct C, leaving channels A and B in contact with one another, and the excess pressure arriving in duct B acts on the waste-gate actuator (27), thereby adjusting the excess supply pressure. When the solenoid valve is activated by the electronic control unit, cylinder D, magnetized by the coil winding, starts to pulse, controlled by a Duty-cycle signal, opening duct C for variable lengths of time; these opening frequencies vary according to sample curves memorized in the control unit and the pressure in the inlet manifold plus the engine load conditions.
The opening of duct C allows, via sleeve (3), part of the pressure to be discharged which was formerly acting on the waste-gate valve actuator (27) in the inlet manifold and the turbocharger thus creating the over-boost function.

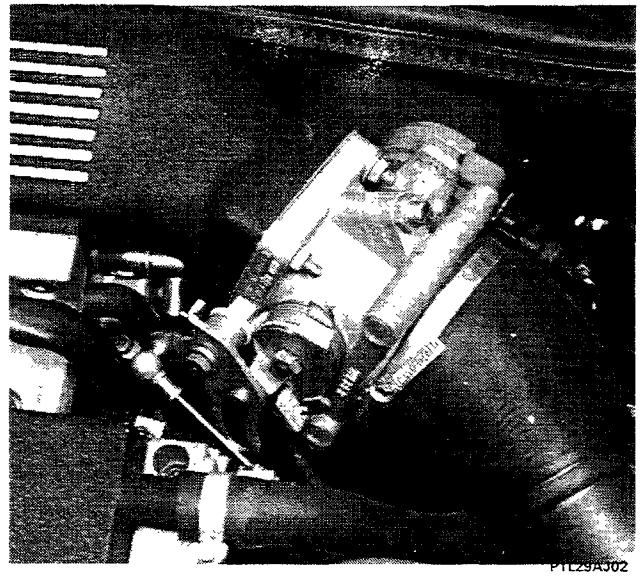
NOTE *The Delta HF integrale 16 V version no longer has an over-boost warning light and instead there is an I.A.W. injection/ignition system failure warning light.*

3°) DETONATION SENSOR

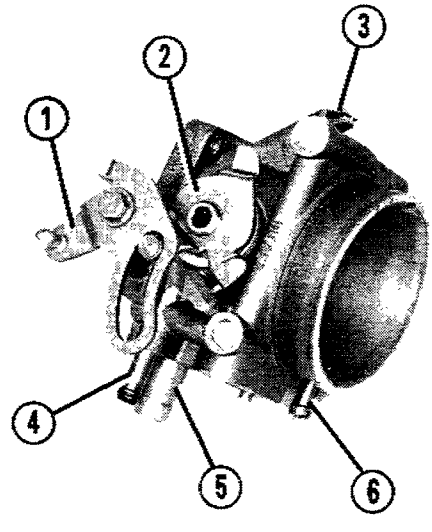

P1L29AJ01

Location of detonation sensor on cylinder head

4°) BUTTERFLY CASING


P1L29AJ02

View of butterfly casing on vehicle



P1L29AJ03

1) Lever for butterfly valve control cable attachment
2) Butterfly valve control lever
3) Engine idle speed adjustment screw
4) Attachment for coolant supply hose from butterfly casing heating motor.
5) Attachment for supplementary air supply hose from idle speed adjustment solenoid valve (V.A.E)
6) Attachment for coolant return hose from butterfly casing to engine.

page