2000 ie 2000 ie turbo

Engine

10.

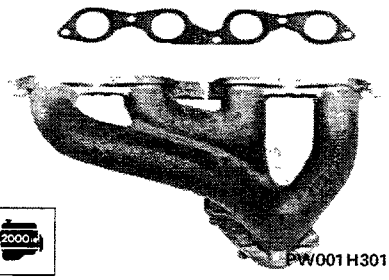
Sequence of operations

- Drain the engine oil using spanner 1850113000 while the engine is raised off the ground by the hoist;
- secure the engine on the rotating stand using brackets 1861001011;
- then remove the parts illustrated in the photos below.

NOTE *The 2000 i.e. turbo engine is fitted to the DELTA, and the 2000 i.e. engine is fitted to the PRISMA. Unless otherwise specified, the dismantling, overhaul and reassembly procedures and the technical data contained in the following pages apply to both engine types.*

The crankcase breather bolt must be slackened to remove the exhaust manifold.

PW001H306



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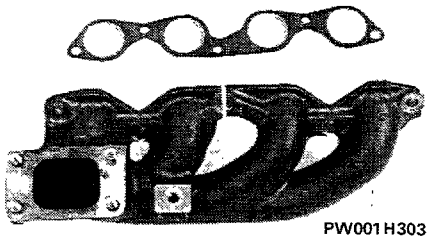

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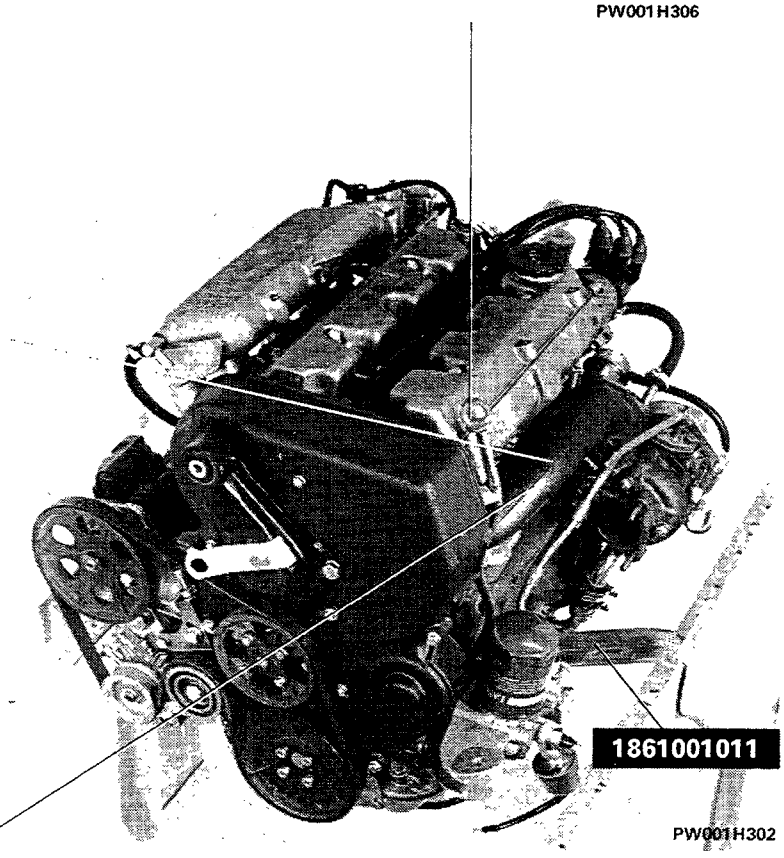

PW001H302

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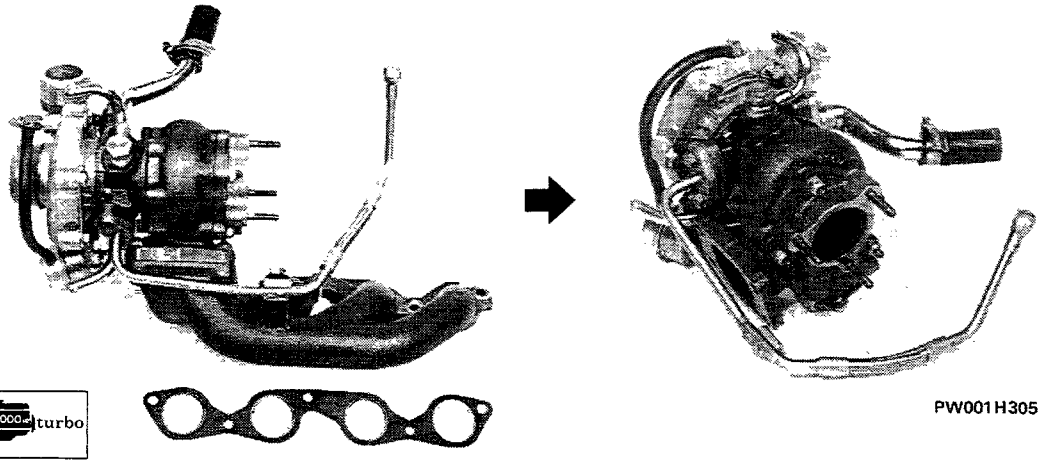
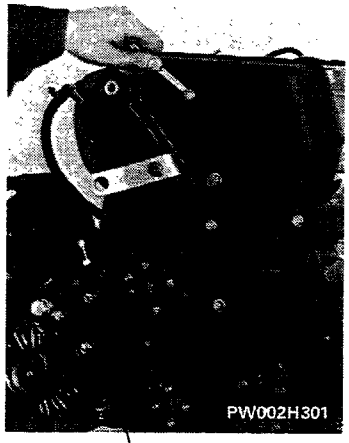
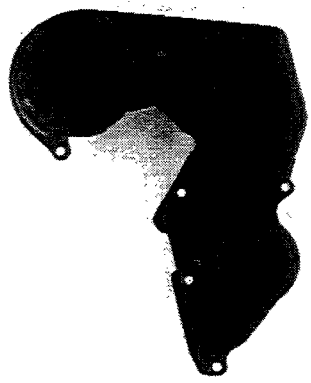


PW001H305

2000 ie | 2000 ie turbo

10.



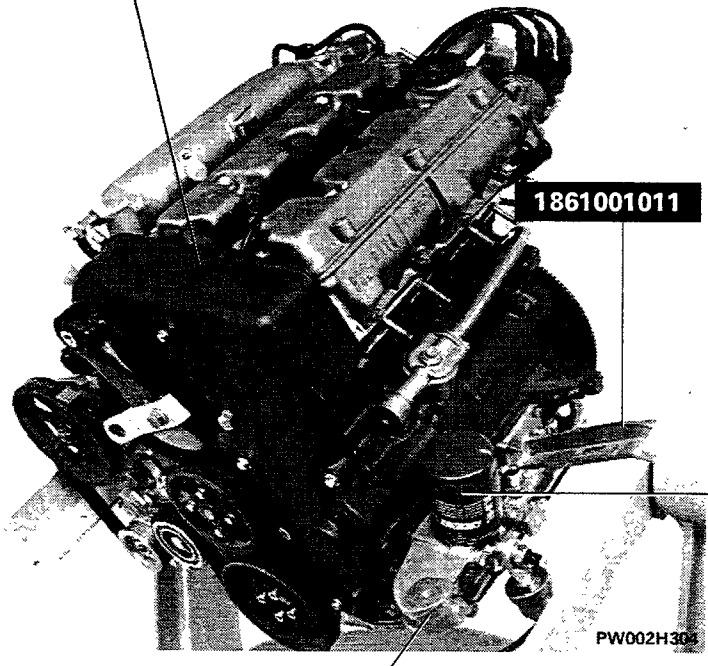

PW002H302

2000 ie

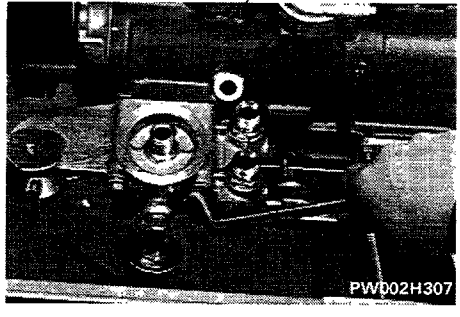
PW002H303

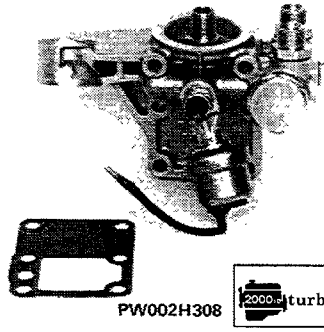
2000 ie turbo

PW002H305

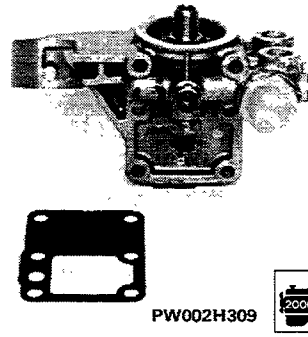


* 2000 ie engine
** 2000 ie turbo engine



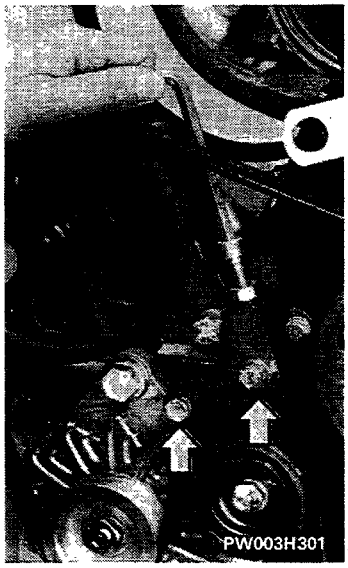

PW002H308

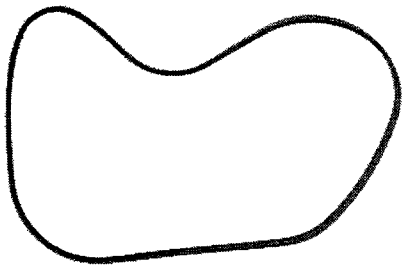
2000 ie turbo


PW002H309

2000 ie

- remove the belt after releasing the tension by slackening the adjustment bolt, then remove the belt tensioner by unscrewing the two bolts indicated.





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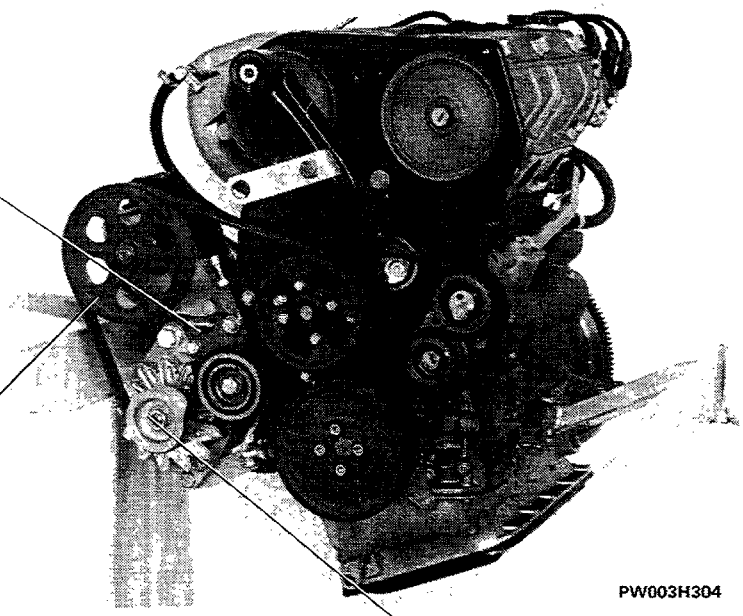
PW003H303



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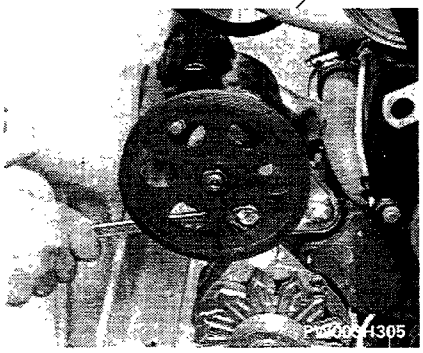

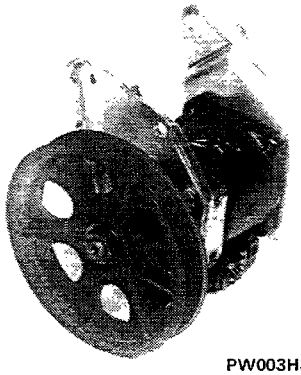

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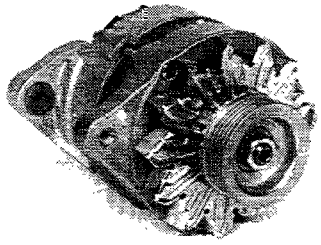
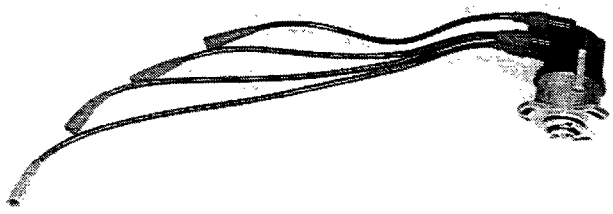


PW003H307

2000 ie | 2000 ie turbo

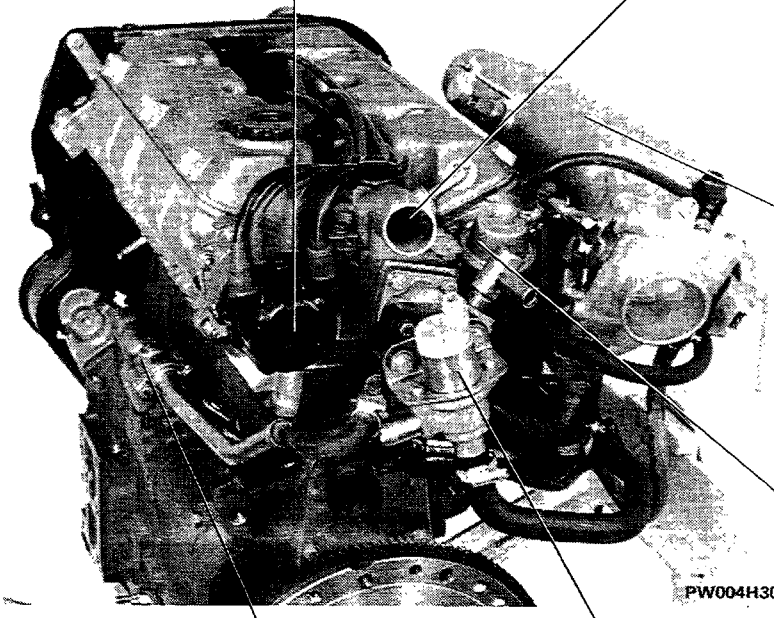
10.



PW004H301

PW004H302

To facilitate removal of the inlet manifold, at least the two central studs should be removed.



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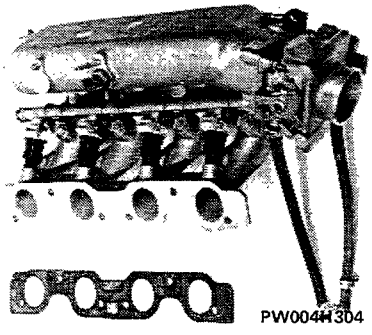

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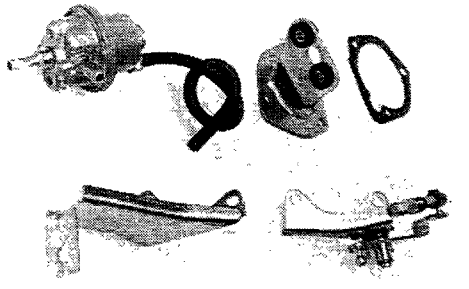

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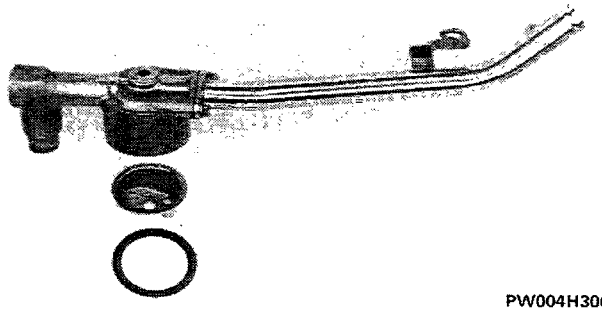

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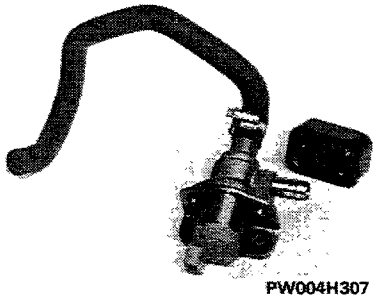

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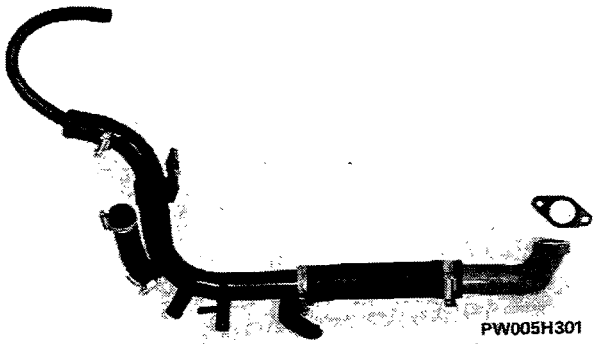

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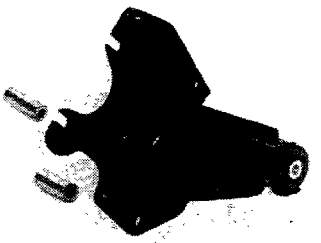

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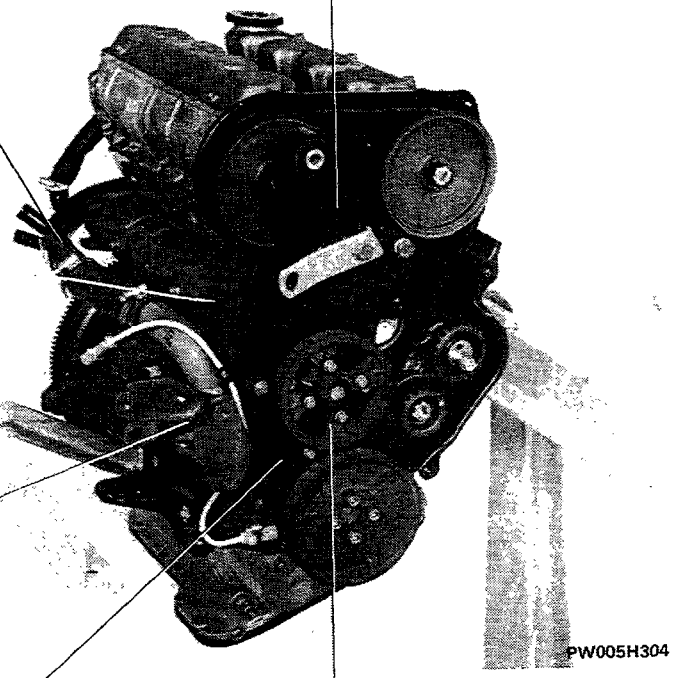

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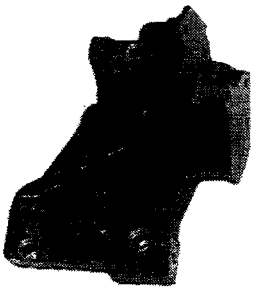

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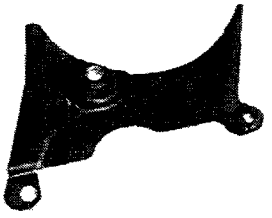

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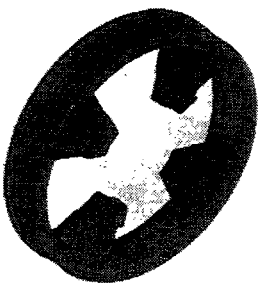

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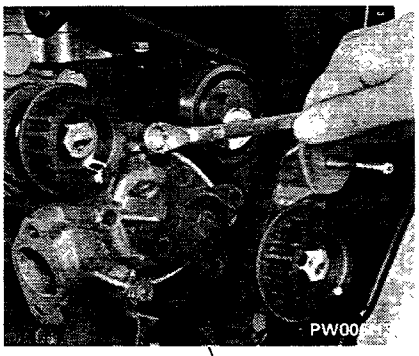

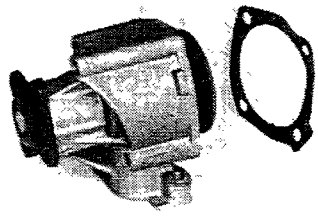

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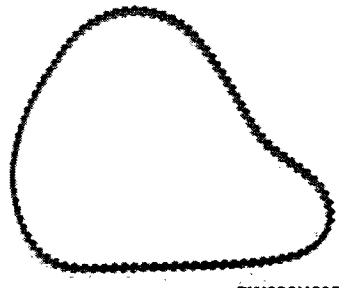

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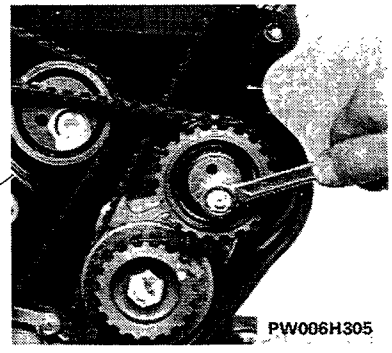

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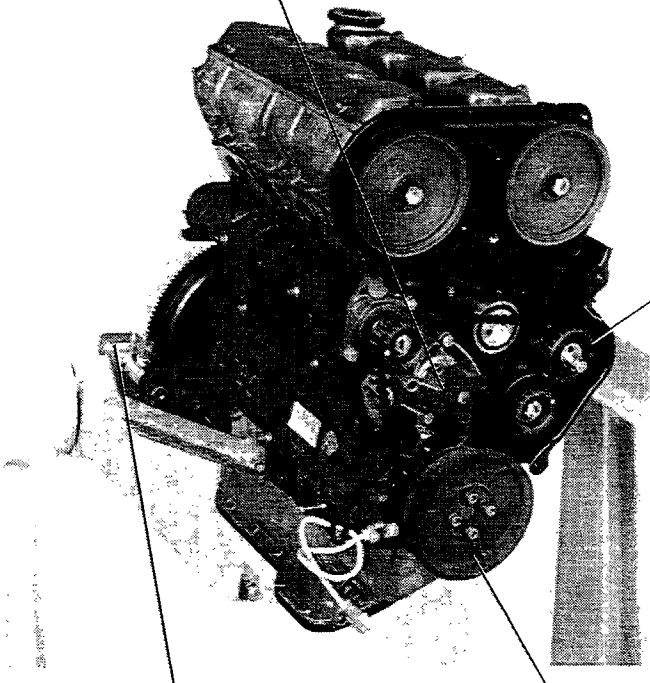

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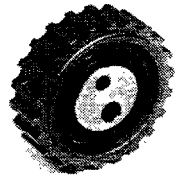

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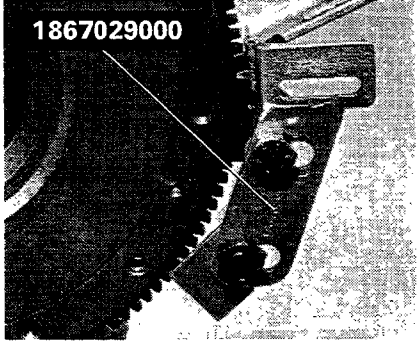
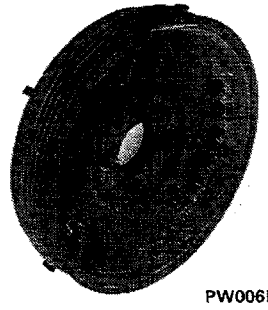


- mount the flywheel locking tool 1867029000

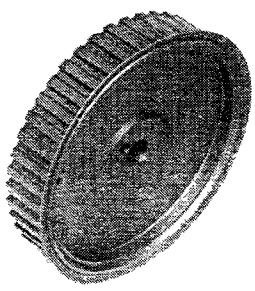
PW006H308

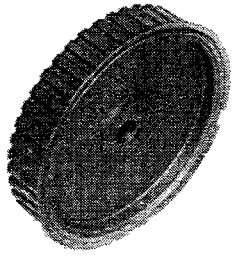


PW006H309

- use the flywheel locking tool 1867029000 when dismantling the water pump pulley

- as a stop for tool 1860473000, use a bolt, shown by the arrow, screwed into the cylinder head





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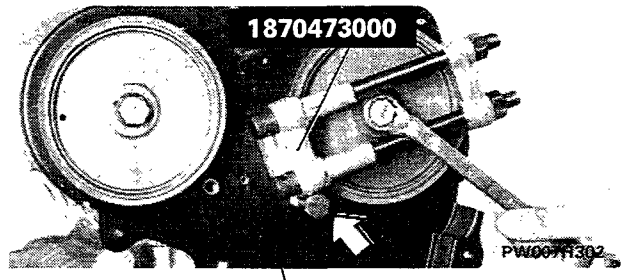
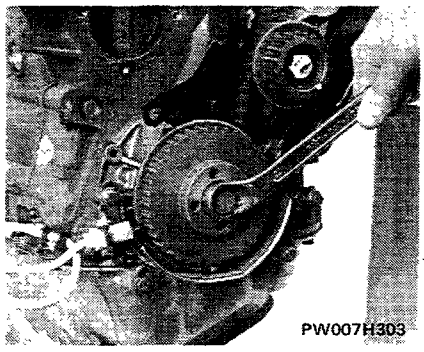


PW007H302

Left-hand threaded bolt



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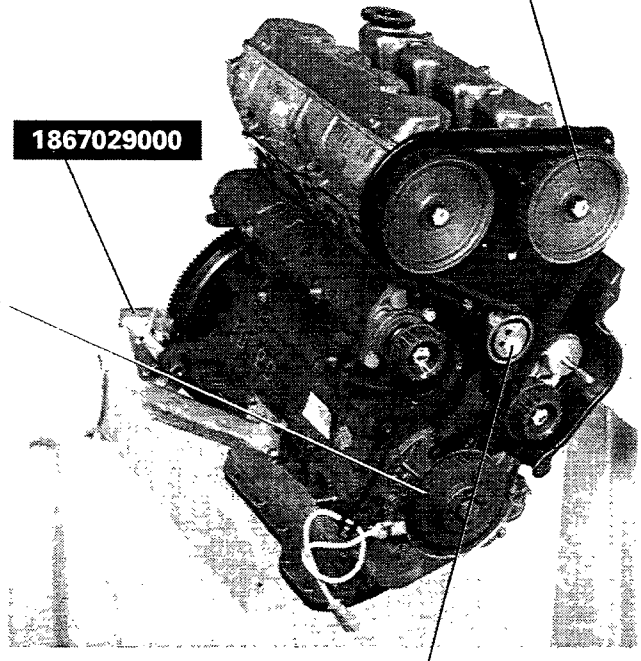

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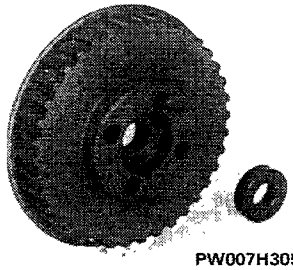
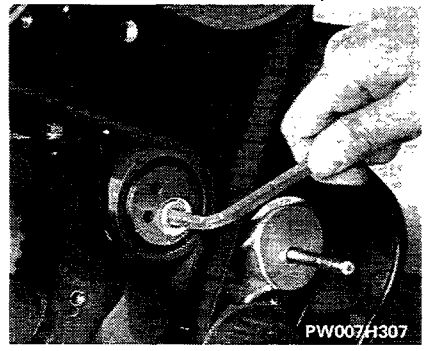


PW007H305

- use the flywheel locking tool 1867029000 to dismantle the sprocket

PW007H306

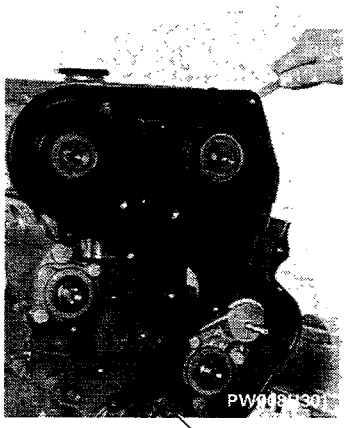


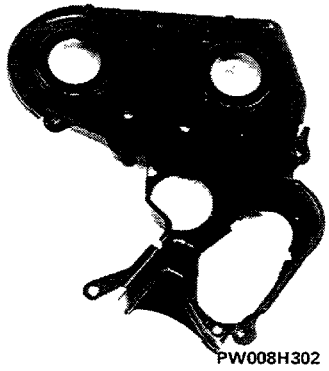
PW007H307

PW007H308

2000 ie 2000 ie turbo

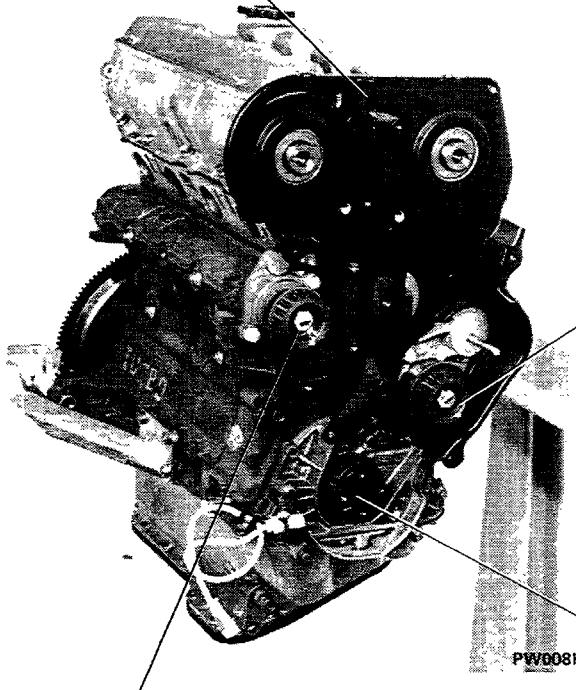
10.




PW008H302


PW008H303

- as a stop for tool 1860473000, use a bolt, shown by the arrow, screwed into the block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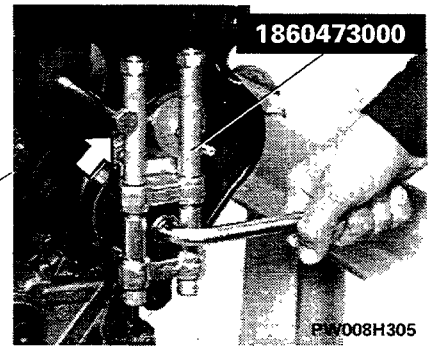
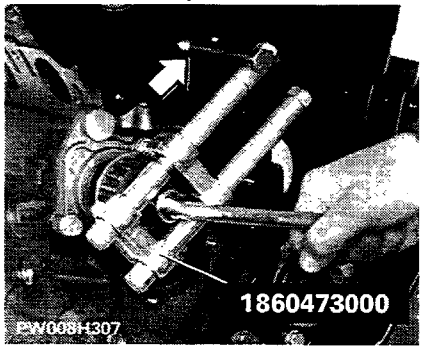


PW008H305


PW008H306

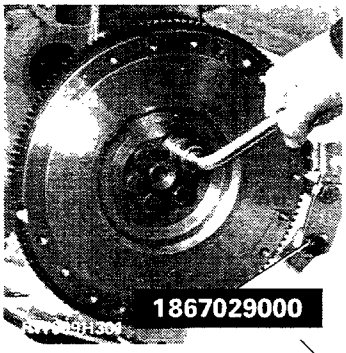


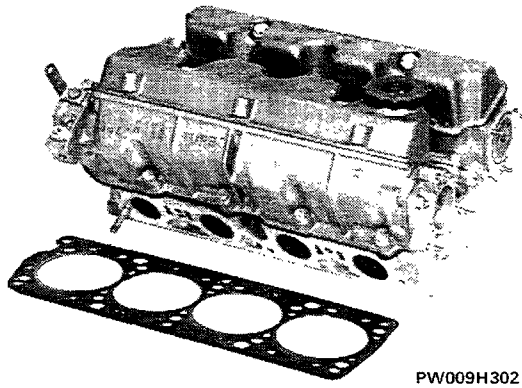
PW008H307


PW008H308


PW008H309

- as a stop for tool 1860473000, use a bolt, shown by the arrows, screwed into the block





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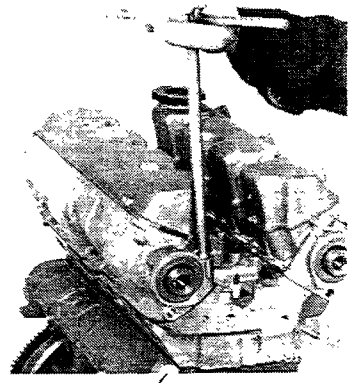

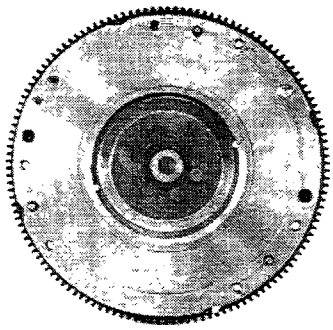

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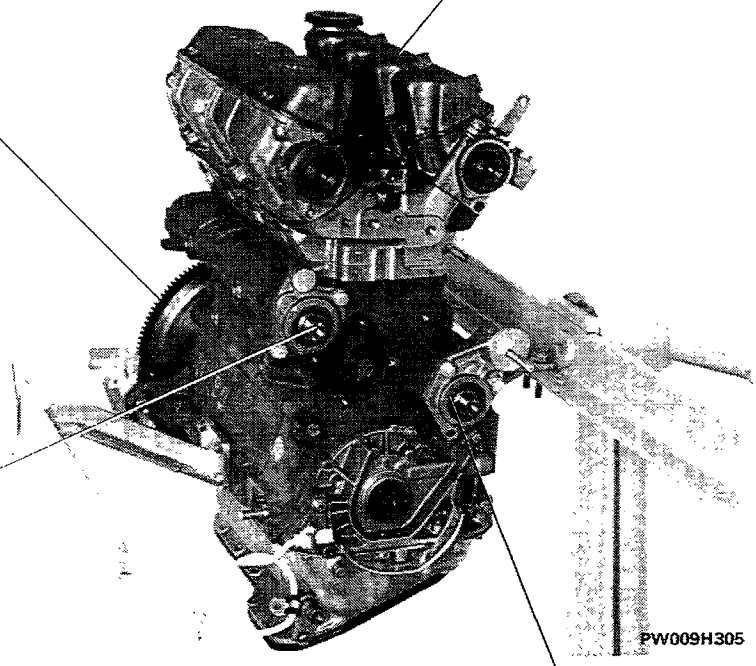

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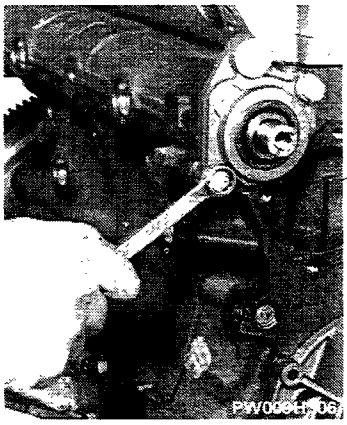

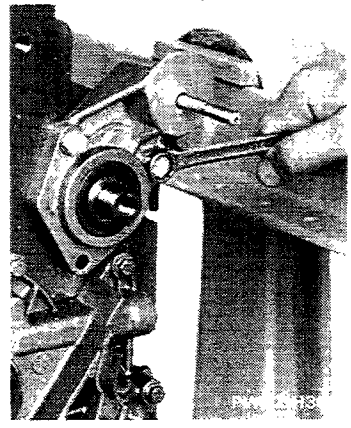

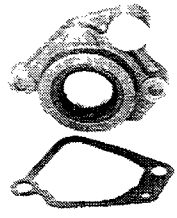

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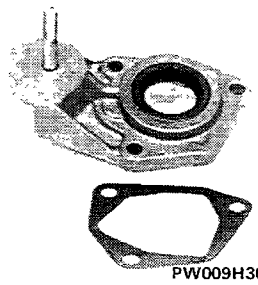
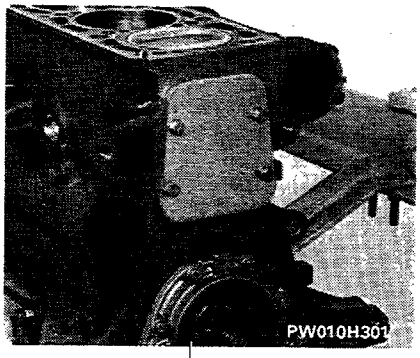


PW009H308

2000 ie | 2000 ie turbo

10.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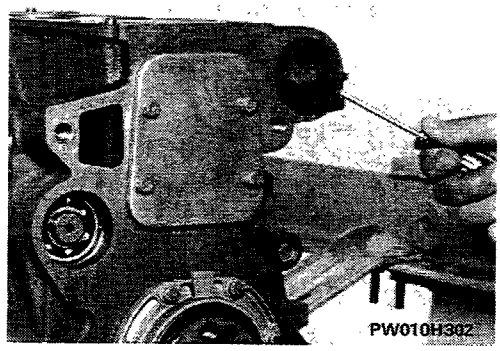
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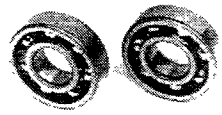
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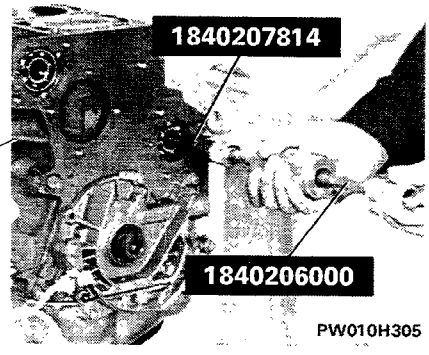
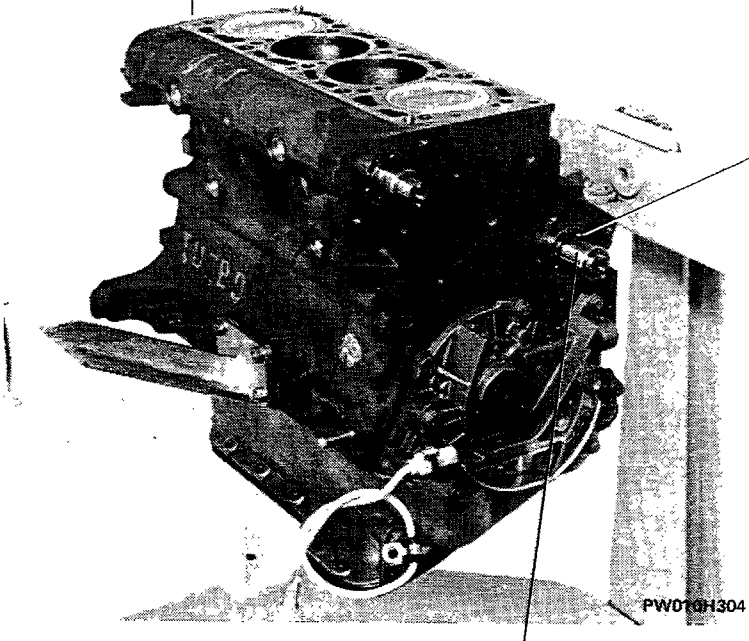


PW010H305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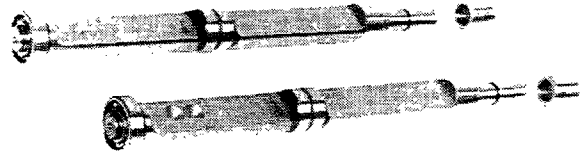
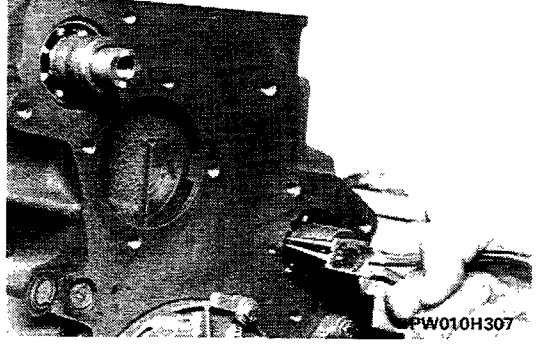
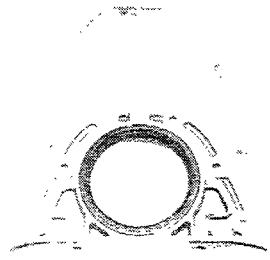

PW010H306


PW010H307

- do the same for the left counter-rotating shaft


PW010H308



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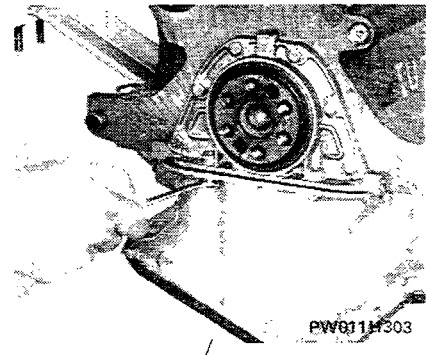

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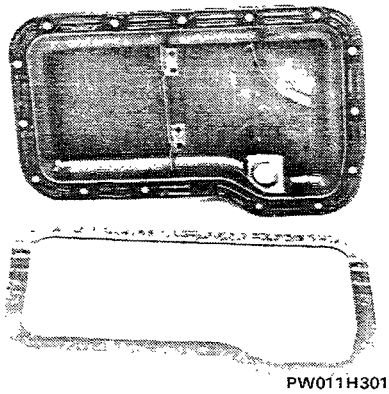

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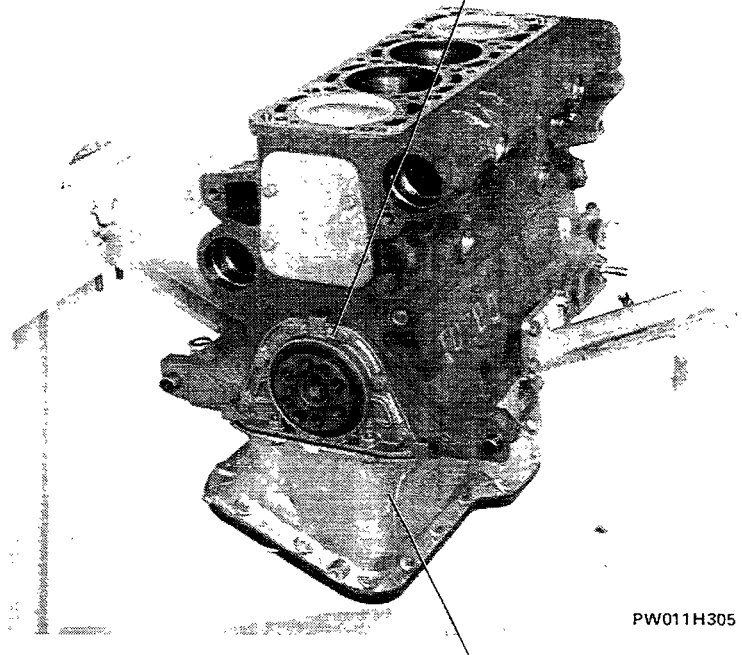

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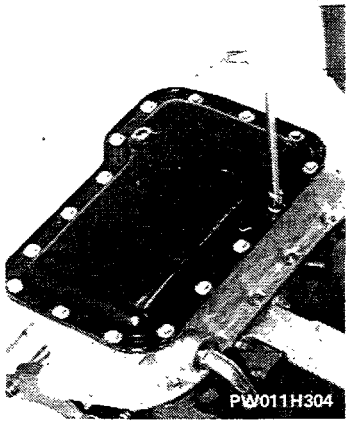

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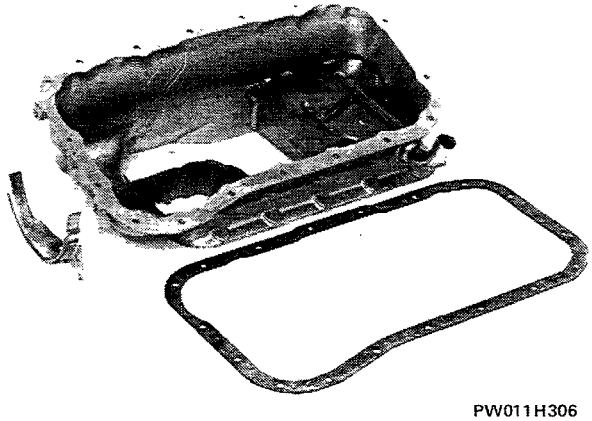

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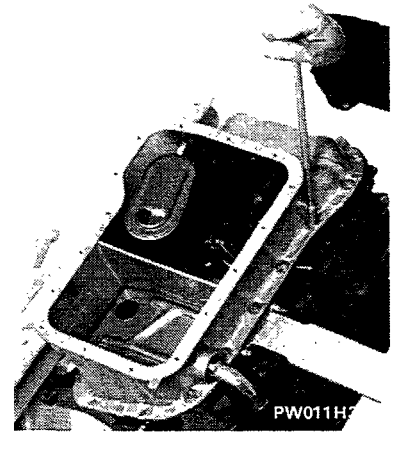
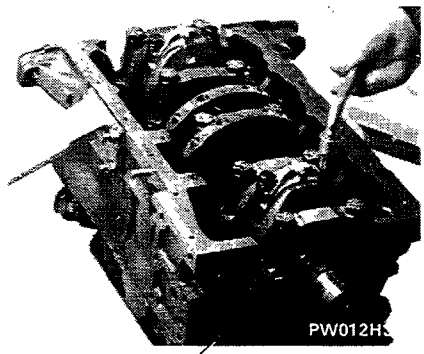


PW011H3

2000 ie 2000 ie turbo

10.



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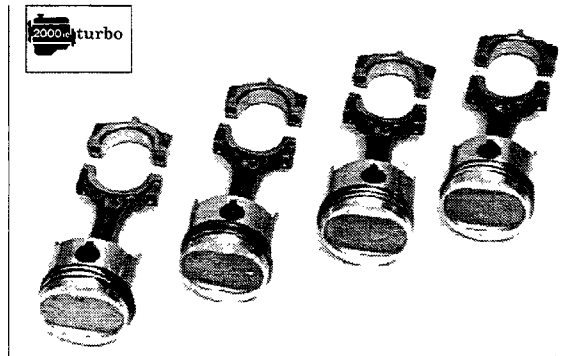

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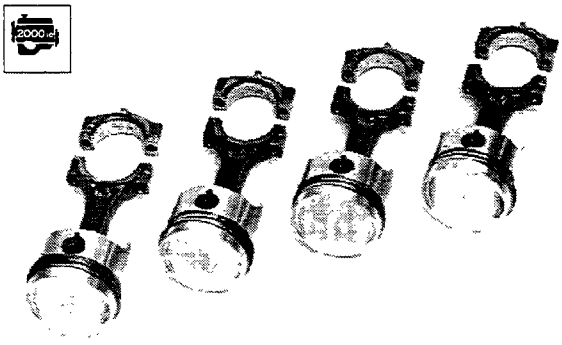

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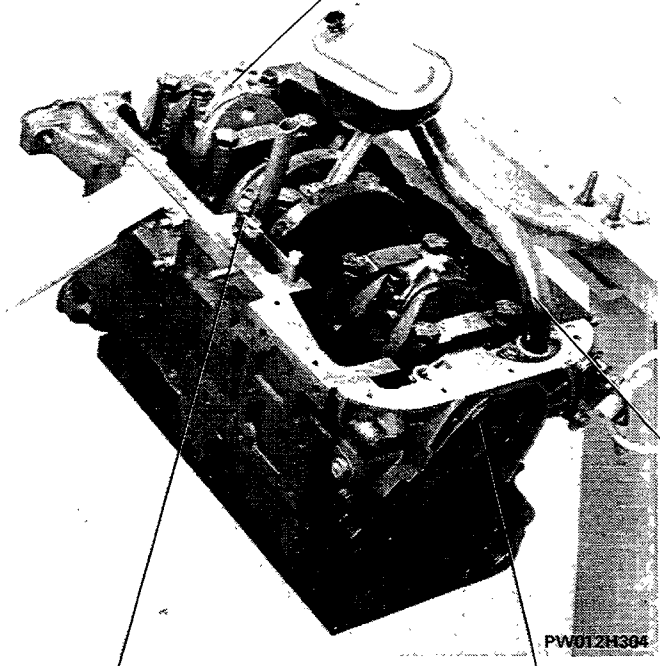

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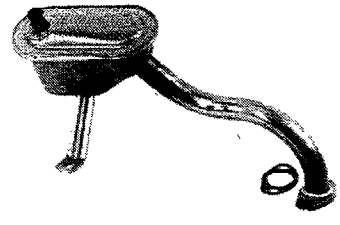
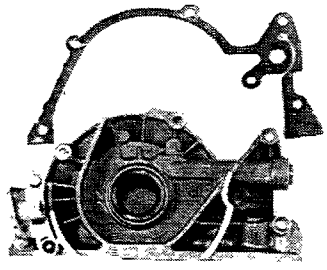


PW012H305

PW012H306



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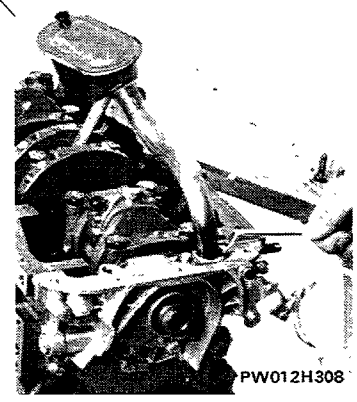

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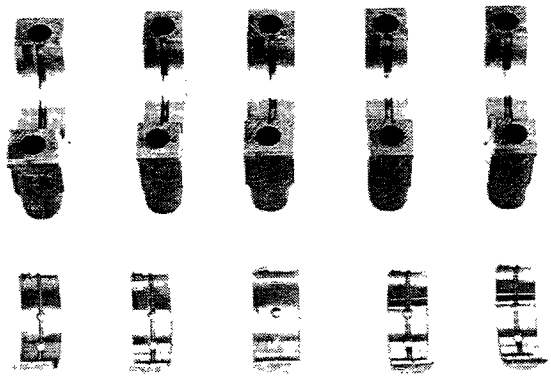
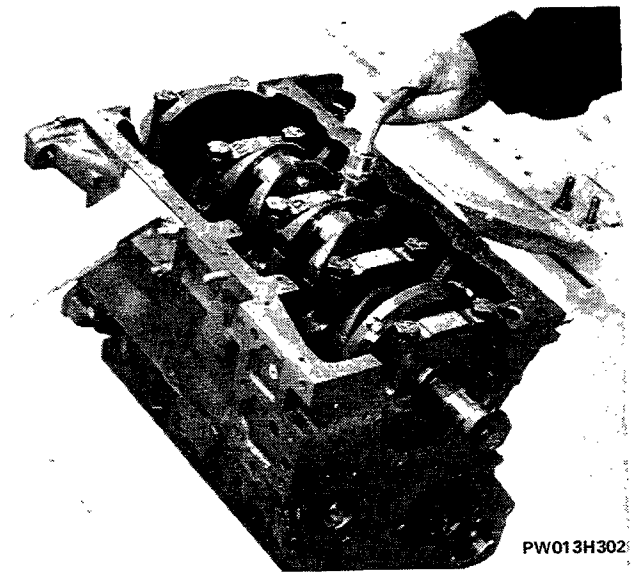
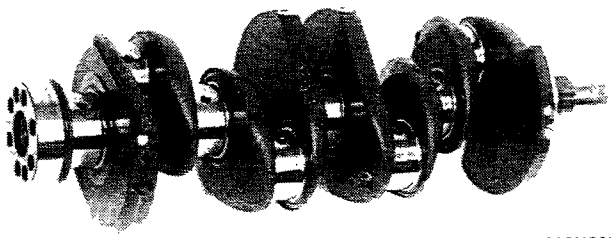


PW013H301

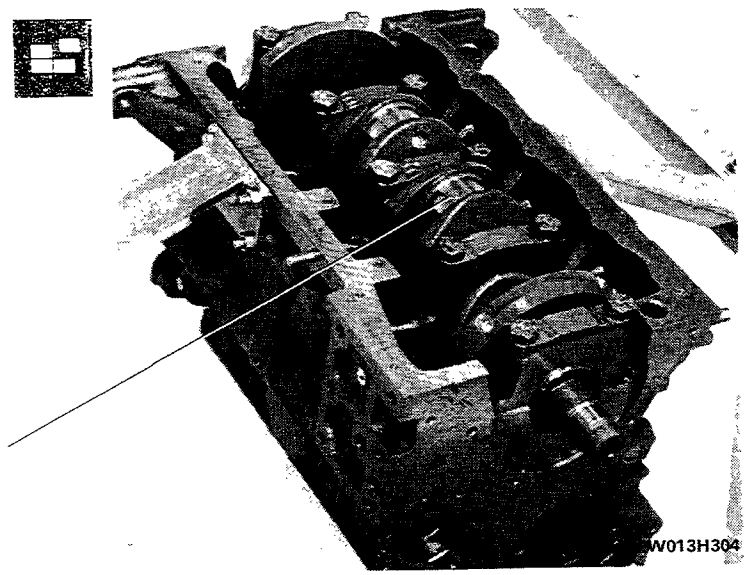


PW013H302

The numbers stamped on the cylinder block and main 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.

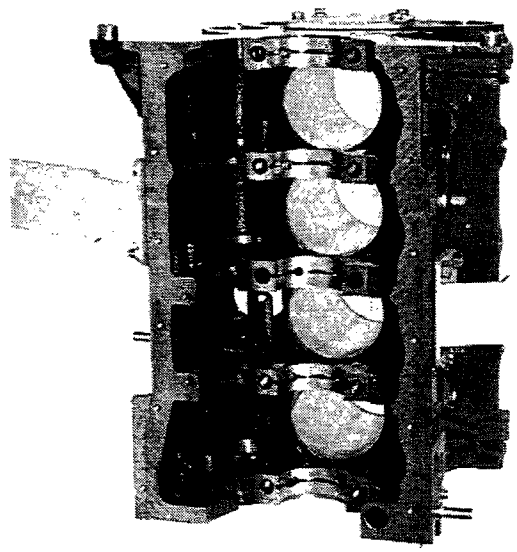


PW013H303



PW013H304

NOTE *After dismantling the engine, thoroughly clean the dismantled parts and check their condition.*
The following pages 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.

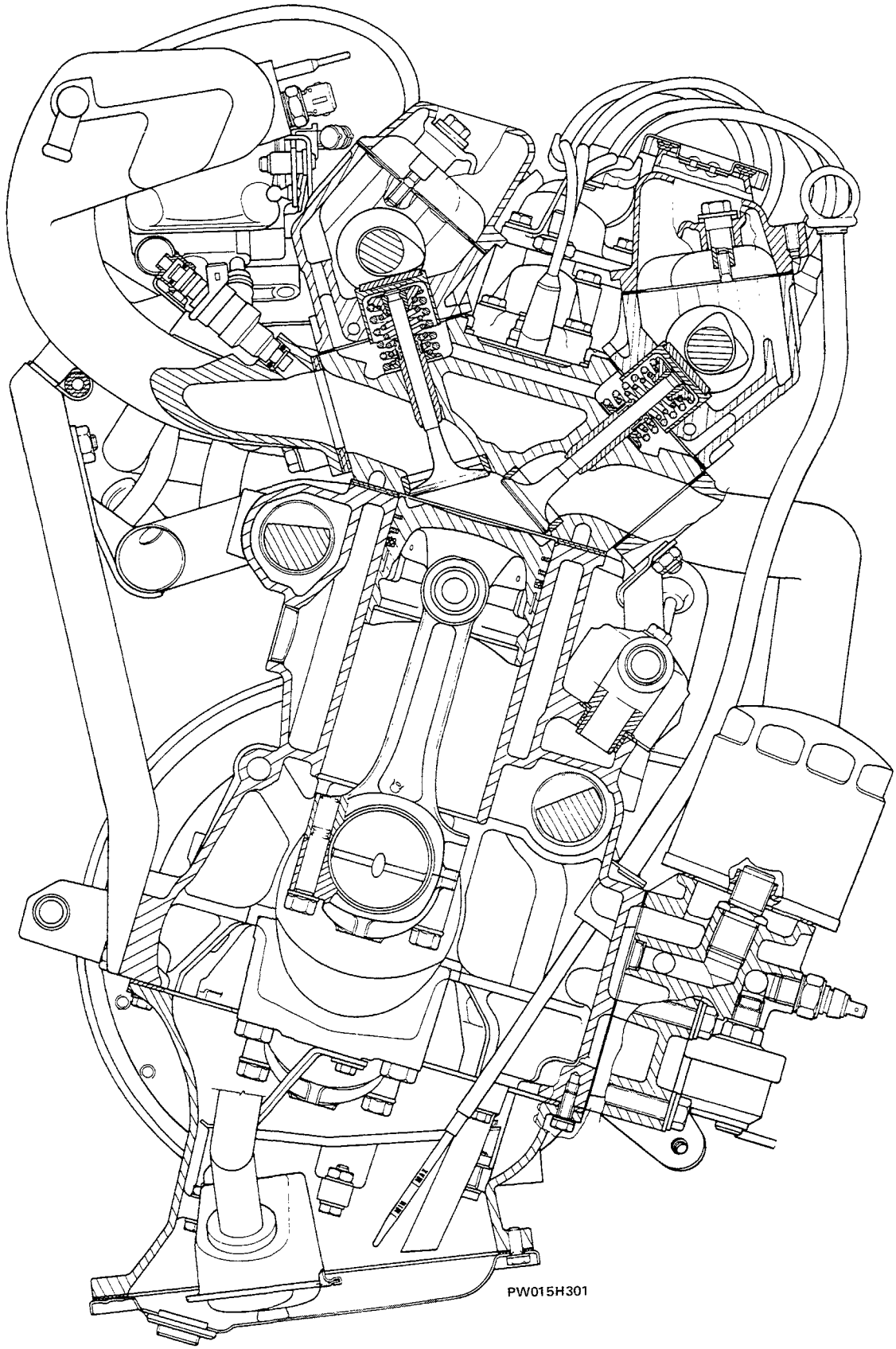


PW013H305

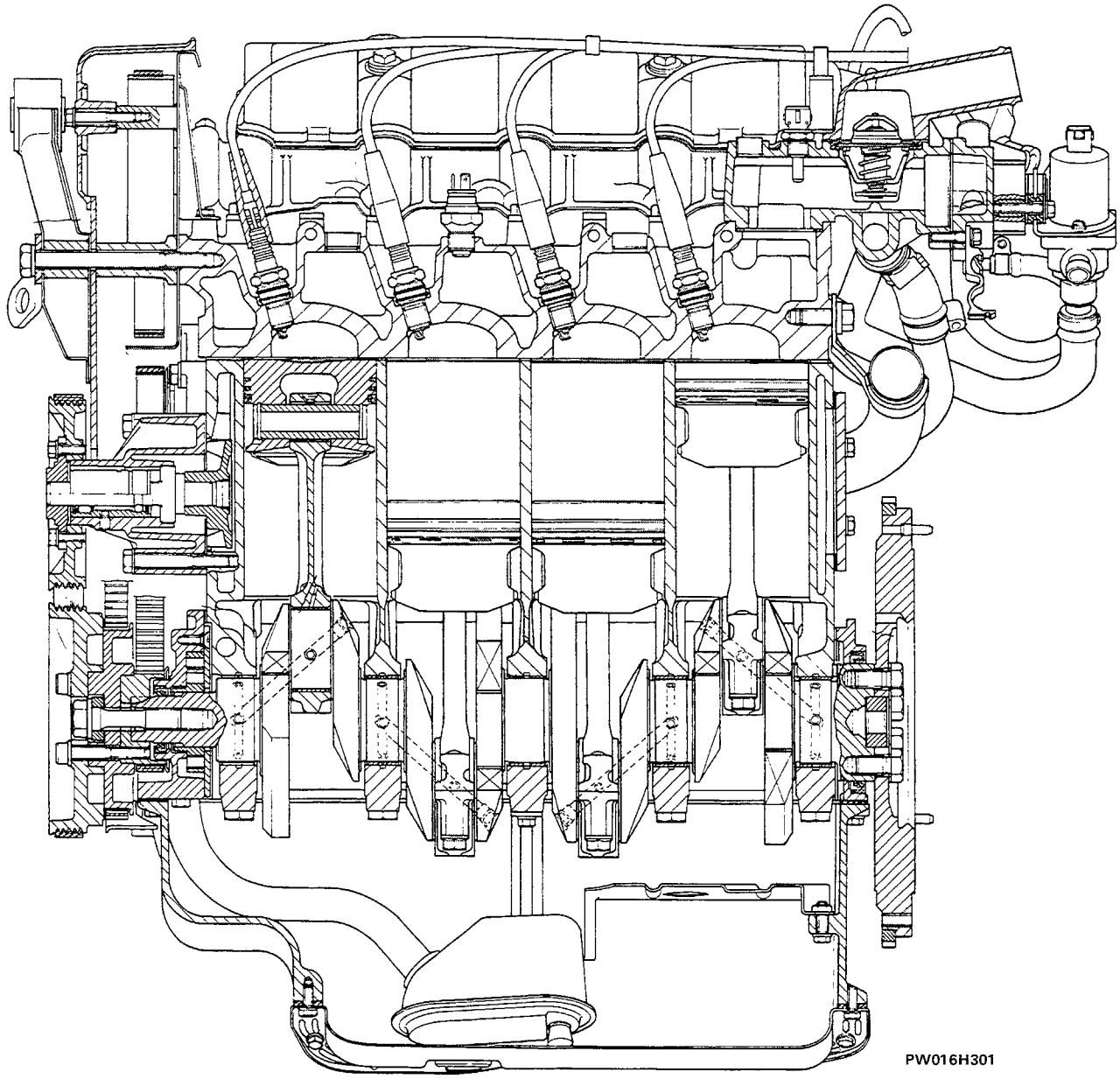
10.

LANCIA **Set of gaskets for engine overhaul**

The gaskets must be renewed whenever parts are dismantled.

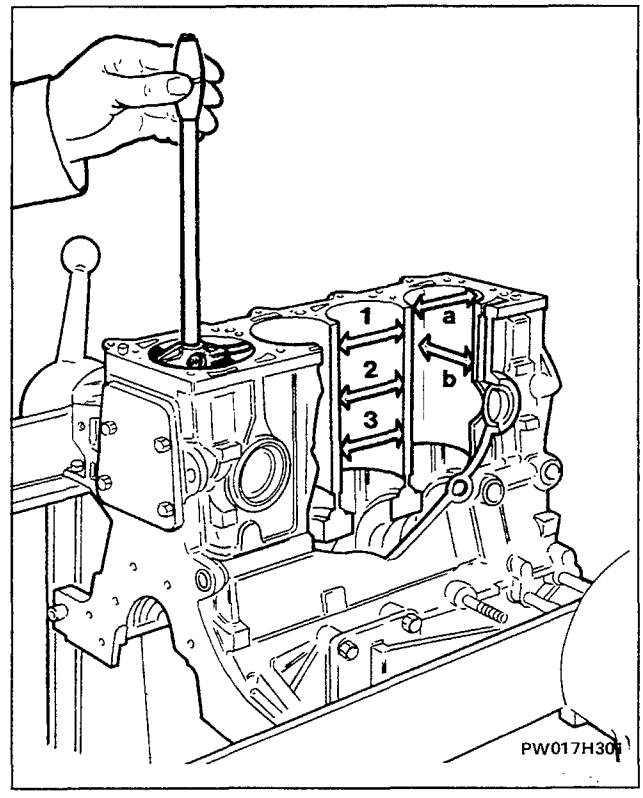


CROSS SECTION 2000 ie



LONGITUDINAL SECTION 2000ie

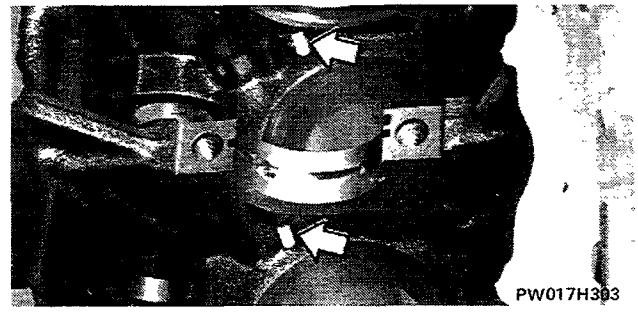
CYLINDER BORES



Checking and measuring

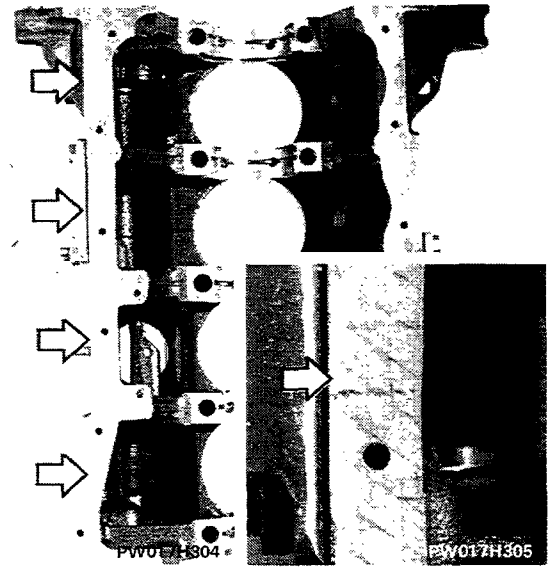
Measure the maximum out-of-round, taper and wear of the cylinder bores.
Visually inspect all sliding surfaces.

NOTE *If rebored, all the cylinders must be machined to the same oversize.*
The permitted tolerances for a cylinder rebore are:
taper (difference between 1st and 3rd measurement) ±0.005 mm;
out-of-round (difference between a and b) ±0.005 mm.



Location of piston cooling jets

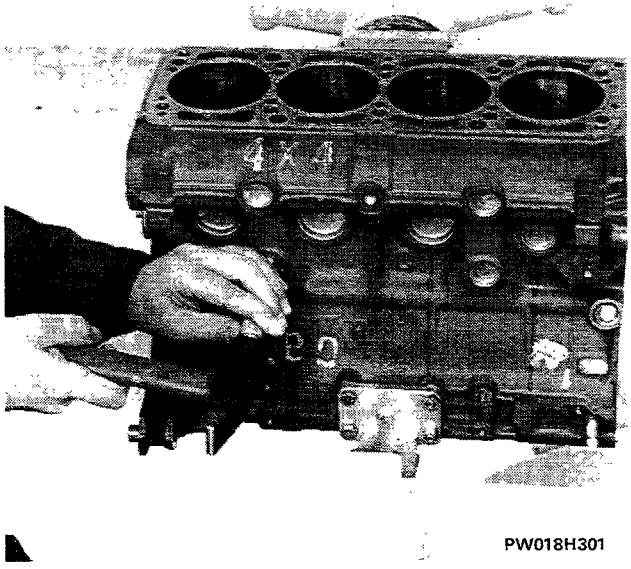
The cylinder block has four jets (two of which are arrowed) fed directly from the main bearings.
These jets serve to cool and lubricate the pistons and gudgeon pins.



Grades of standard diameter cylinder bores

The arrows show the letters identifying the cylinder bore grades.

10.

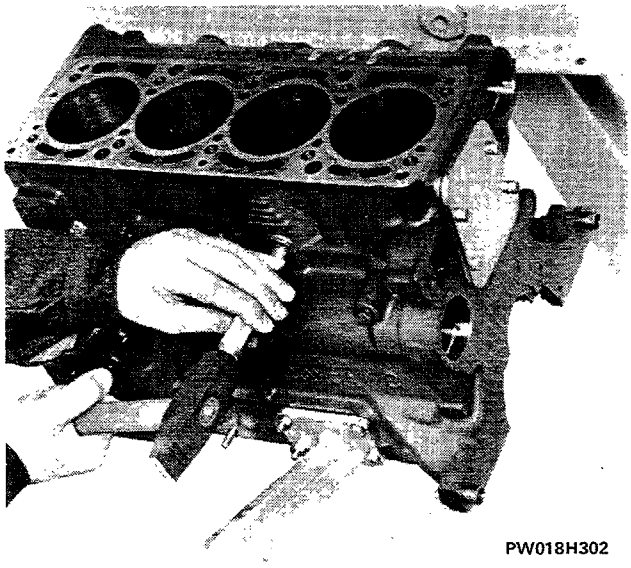


PW018H301

CYLINDER BLOCK

Removing/refitting core plugs in block (inlet manifold side)

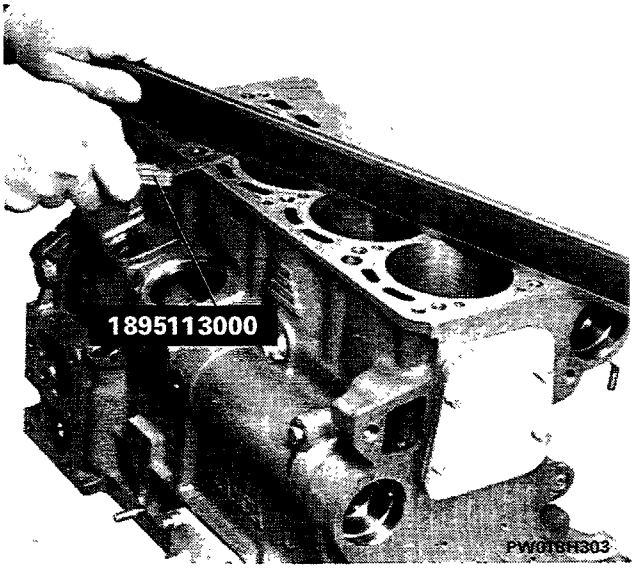
Before fitting the plugs, smear sealing compound over the surfaces in contact with the block.



PW018H302

Removing/refitting plate (flywheel side) and core plug in block (exhaust manifold side)

Before fitting the plug and plate, smear sealing compound over the surfaces in contact with the block.



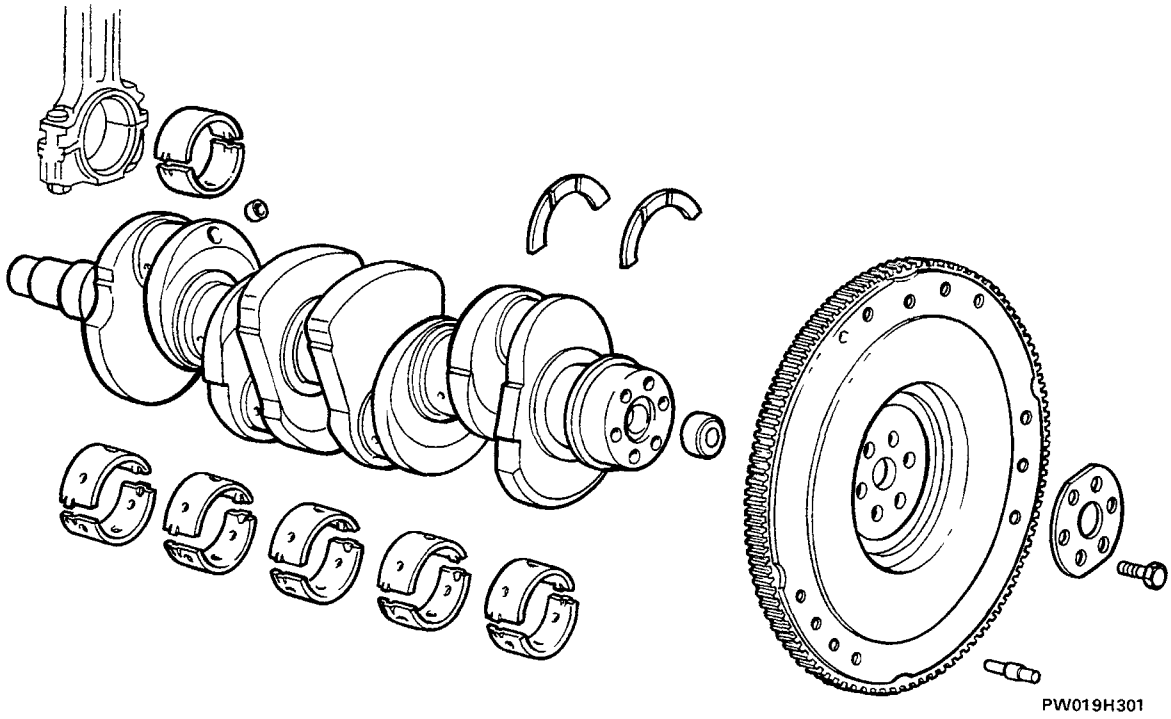
PW018H303

Checking cylinder block top face using a rule and feeler gauge

NOTE *The maximum distortion of the cylinder block top face must not exceed 0.1 mm.*

CRANKSHAFT

NOTE *In order to improve its endurance and wear-resistance properties, the crankshaft has been subjected to a nitriding treatment.*
When the crankshaft is reground, after the main bearing journals and crankpins have been machined to undersize, the crankshaft will have to be re-nitrided to prevent it breaking during operation. It will be necessary to refer this job to a specialist workshop, specifying that the treatment is liquid nitriding.
After treatment, the crankshaft must not be straightened again, although it must be checked that the distortion is within the specified tolerance limits, otherwise the shaft will have to be replaced.


PW019H301

Measuring main journals and crankpins

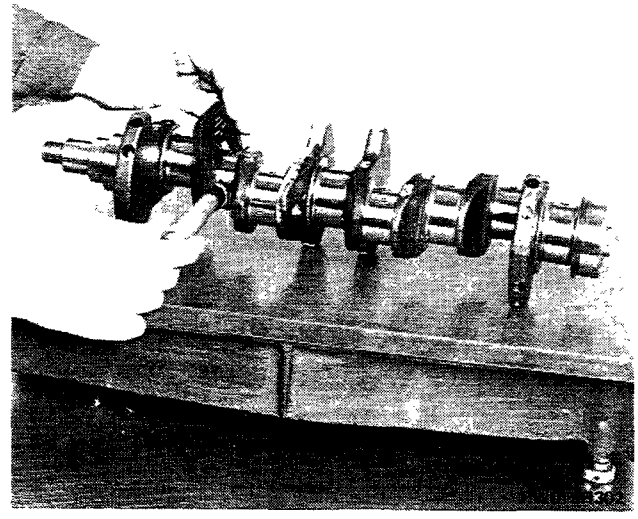
The undersizes are 0.254 and 0.508 mm.

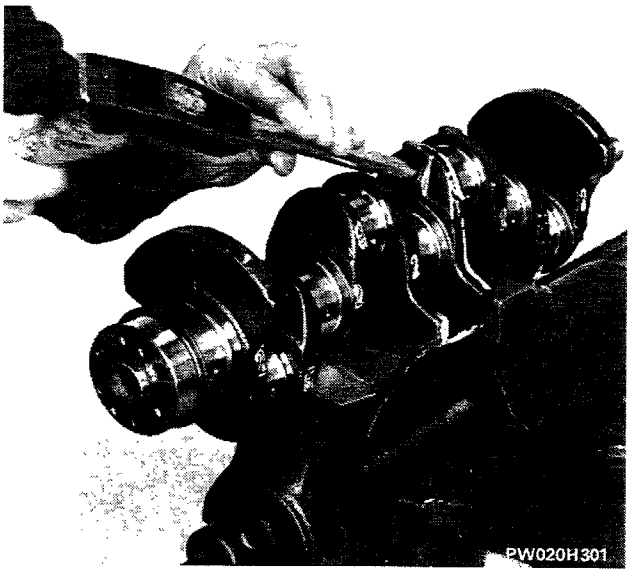
NOTE *The permitted tolerances for a crankshaft regrind are:*

out-of round	*± 0.005 mm*
taper	*± 0.005 mm*
main journal misalignment	*± 0.025 mm*
crankpin misalignment	*± 0.125 mm*

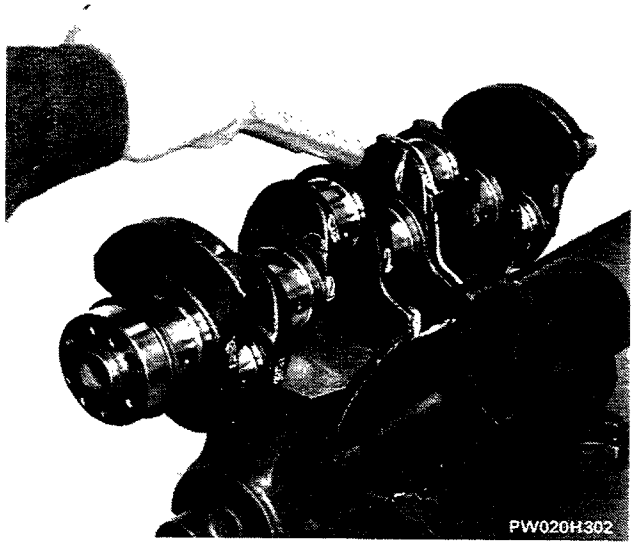
All the journals should always be reground to the same undersize so as not to alter the crankshaft balance.

NOTE *It is generally advisable to replace the crankshaft rather than to regrind it.*



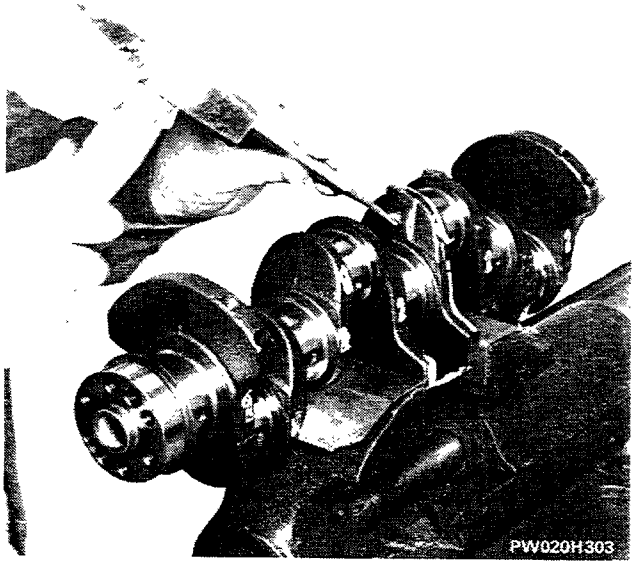


Removing/refitting oilway plugs

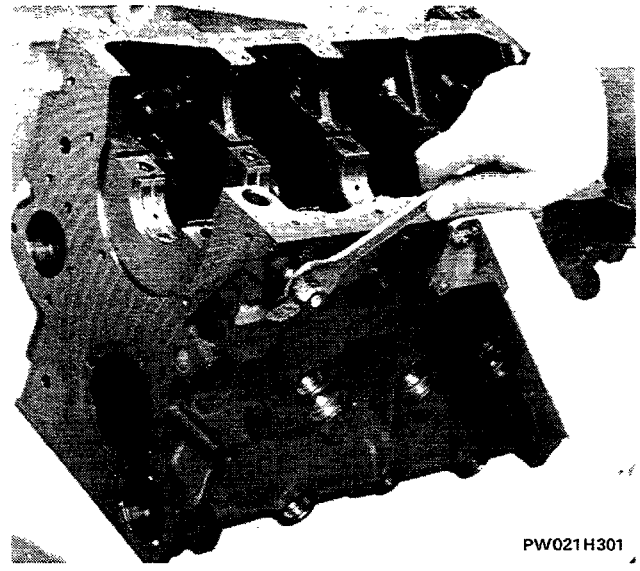


Reaming oilway plug seats

If the crankshaft is reground, it is essential to wash the lubrication channels thoroughly.



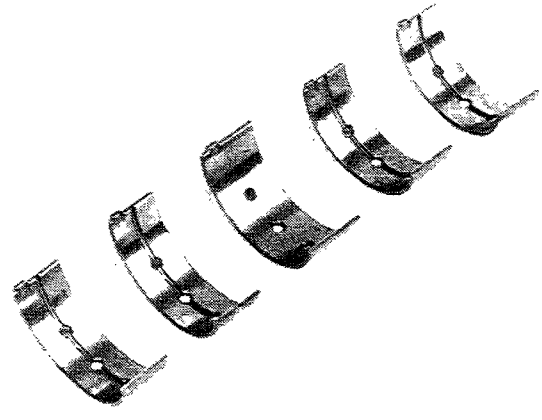
Staking oilway plugs



PW021H301

Removing/refitting stud

MAIN BEARINGS

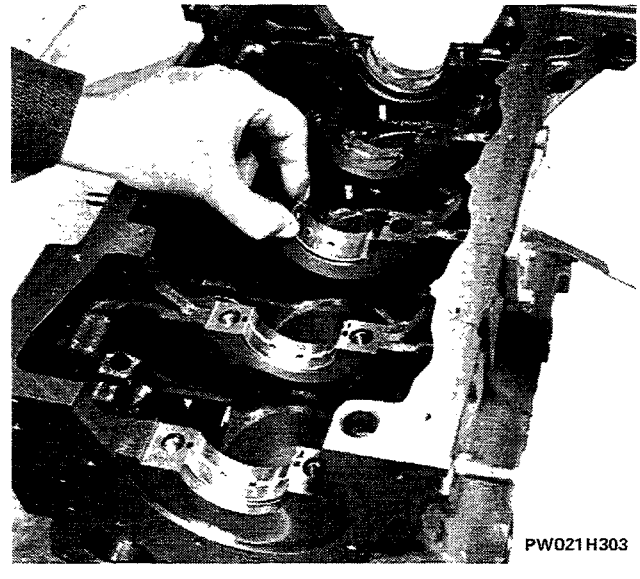


PW021H302

Checking main bearings

NOTE *Replacement main bearings are supplied in undersizes of 0.254 and 0.508 mm.*

Do not attempt to make good the bearing shells.

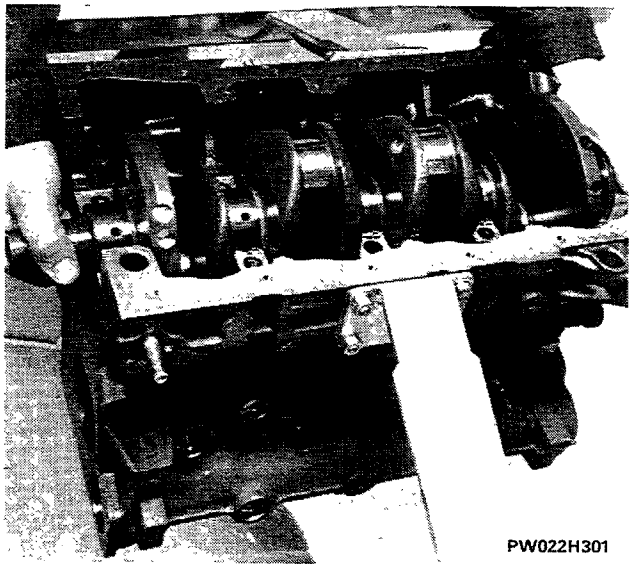


PW021H303

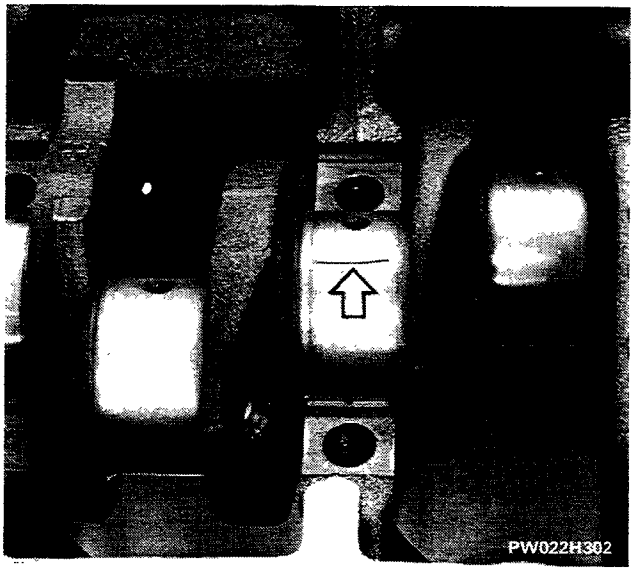
Fitting main bearings

NOTE *Ensure that each bearing shell is fully supported in its location.*

Thoroughly clean the bearing shell outer surfaces and their locations before assembly.


PW022H301

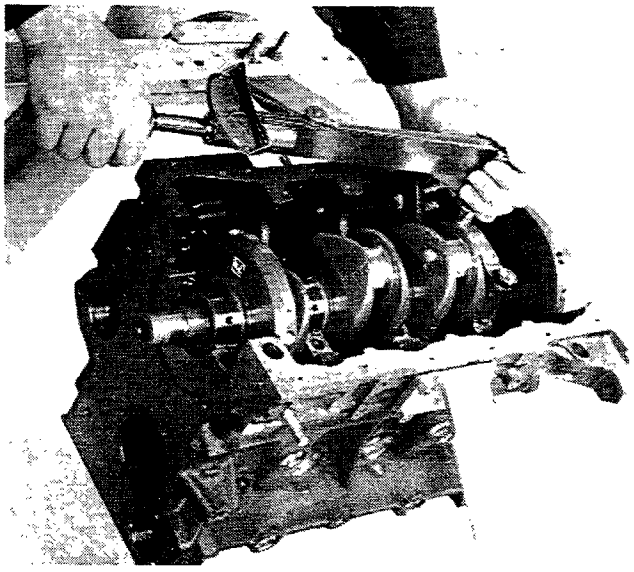
Fitting crankshaft


PW022H302

MEASURING MAIN JOURNAL RUNNING CLEARANCES

Using plastic calibrated filament to measure the running clearance (1st operation)

NOTE *Check one journal at a time without moving the crankshaft during the checking operations.*



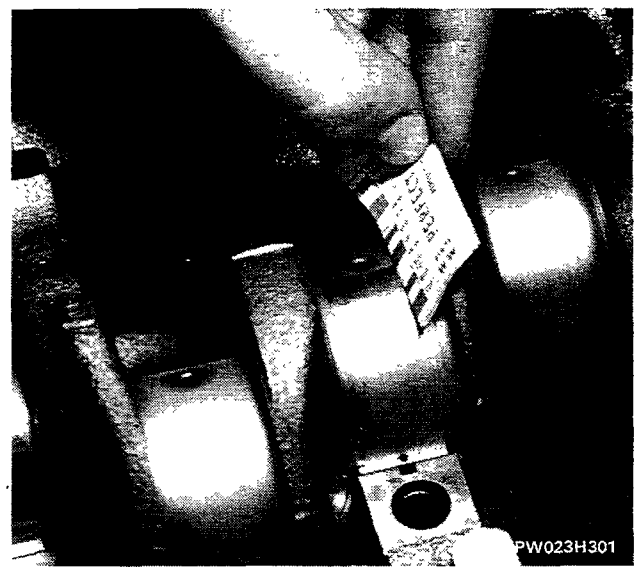
2 daNm

90°: side caps
130°: central cap

Tightening main bearing cap bolts to correct torque (2nd operation)

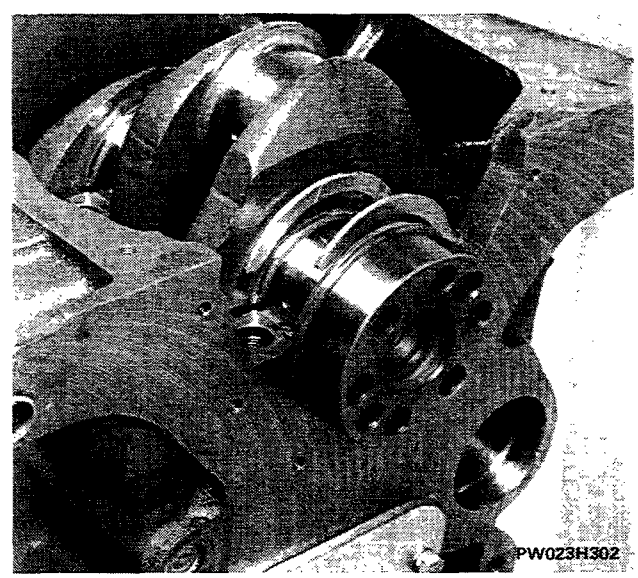
2000 ie: 0.029 ÷ 0.053

2000 ie turbo: 0.025 ÷ 0.049



Measuring main journals with a special gauge (3rd operation)

THRUST WASHERS



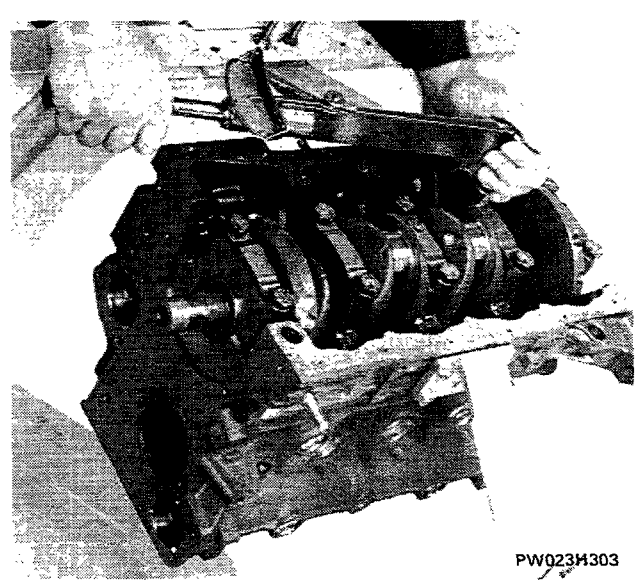
Fitting thrust washers on flywheel side

Fit the thrust washers with the grooved surfaces facing the crankshaft.

Lubricate the parts with engine oil before final assembly.

FITTING MAIN BEARING CAPS

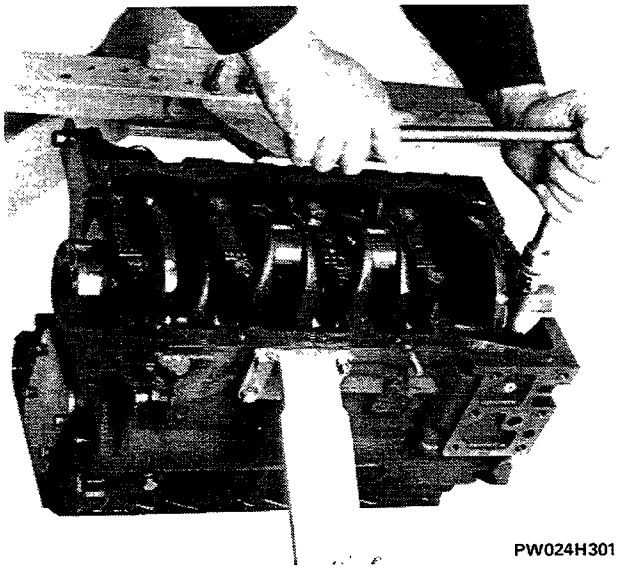
2 daNm



Fitting main bearing caps and tightening the bolts to the correct torque

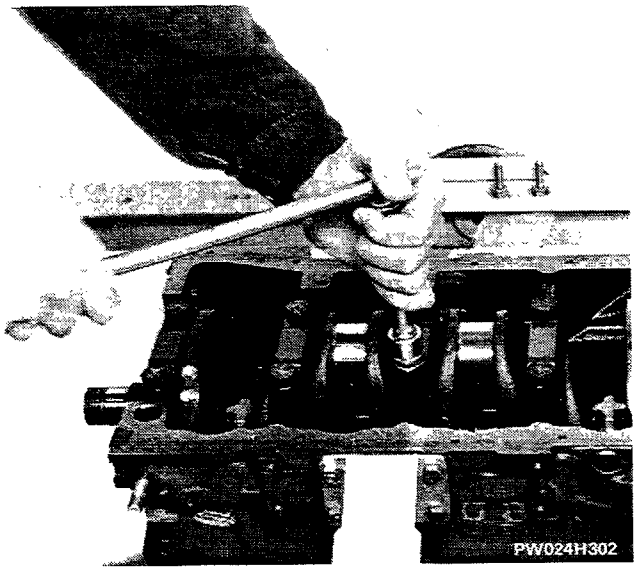
2000 ie | 2000 ie turbo

10.



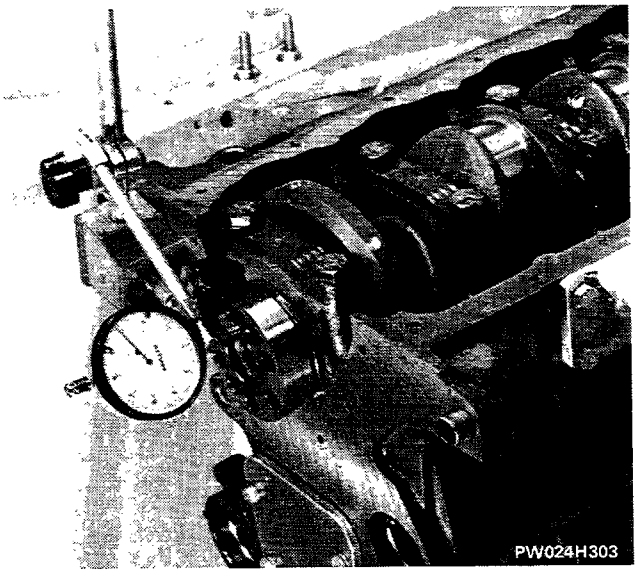
+ 90°

Angle tightening main bearing side caps



+ 130°

Angle tightening main bearing central caps



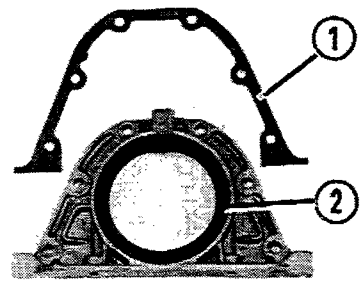
0,055 ÷ 0,305

LANCIA

Checking and measuring crankshaft endfloat

NOTE *Replacement thrust washers are available in 0.127 mm oversize.*

CRANKSHAFT REAR COVER



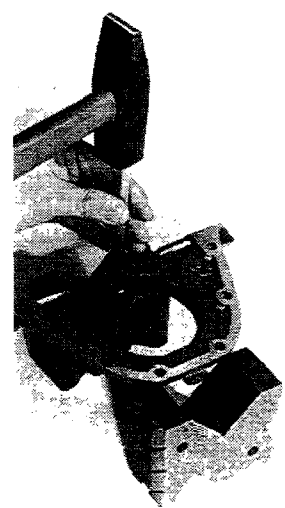
PW025H301

Lubricate the contact surface of the gasket (1) and the lip of the seal (2).

Removing/refitting crankshaft rear oil seal

NOTE *The seal should be removed using a punch inserted in the groove located on the cover inner face.*

PW025H302



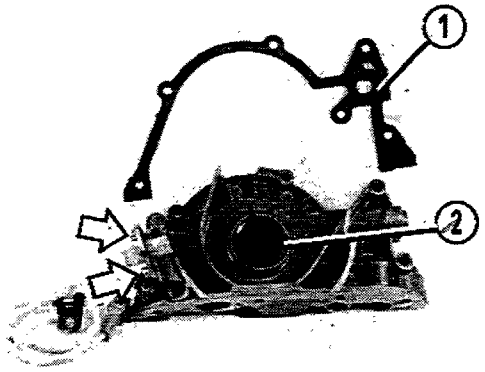
PW025H303

PW025H305

PW025H304

Fitting crankshaft rear cover

CRANKSHAFT FRONT COVER WITH INCORPORATED OIL PUMP



PW026H301

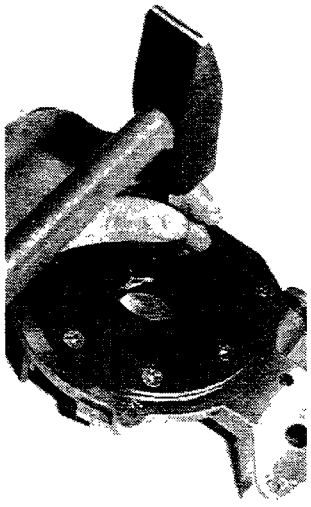
NOTE *Refer to the Lubrication section for the dismantling and dimensional checking procedures on the oil pump incorporated in the crankshaft front cover.*

Before assembly, lubricate the contact surface of the gasket (1) and the lip of the seal (2).

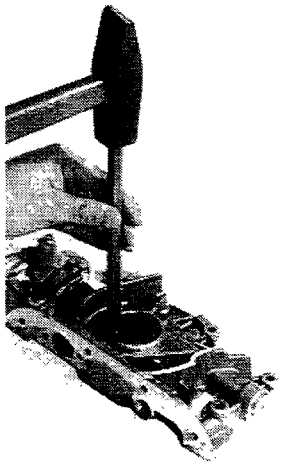
Renewing rpm and TDC sensor

Unscrew the bolts indicated by the arrows and remove the sensor.

Make absolutely sure not to touch the other two bolts, one of which is a shear bolt, which determine the mounting plate adjustment.



PW026H302



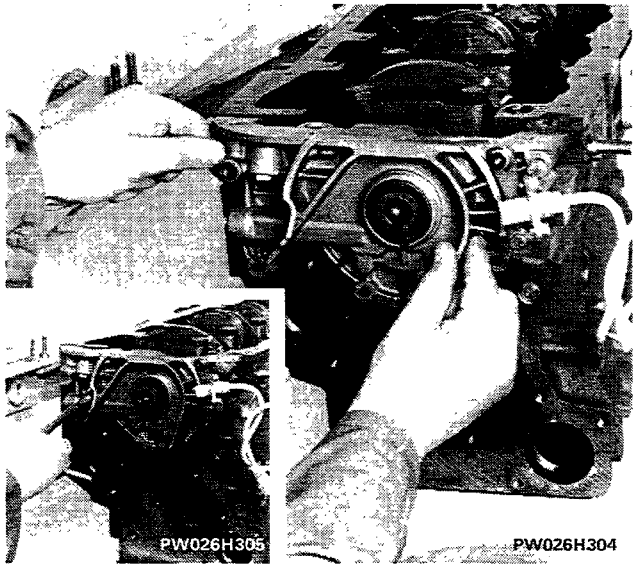
PW026H303

Renewing crankshaft front cover or rpm and TDC sensor mounting plate.

Fit the plate on the cover and secure it by its two bolts, one being a shear bolt, without tightening the bolts until the correct position is obtained (see the procedure described on p. 42).

Removing/refitting crankshaft front oil seal

NOTE *The seal should be removed using a punch inserted in the groove located on the cover inner face.*



PW026H305

PW026H304

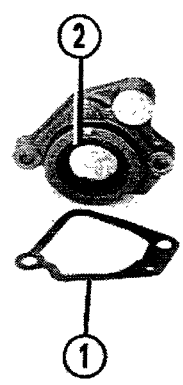
Fitting gasket and front cover with incorporated oil pump

NOTE *Line up the flat part of the front cover with the oil sump contact surface of the block.*

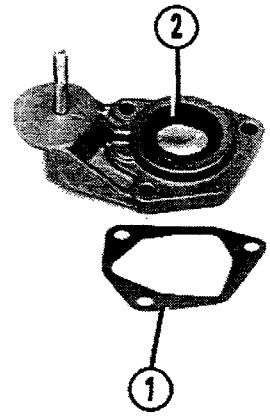
VIBRATION DAMPING SYSTEM WITH COUNTER SHAFTS

Counter shaft covers

Before assembly, lubricate the contact surface of the gasket (1) and the lip of the seal (2).



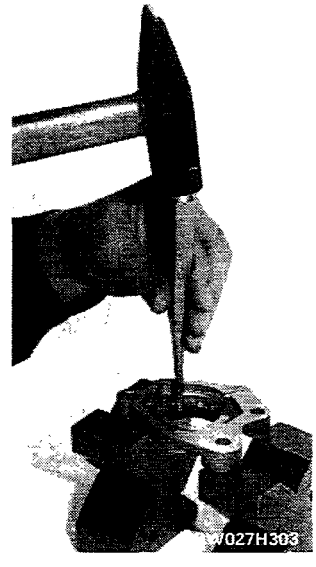
PW027H301



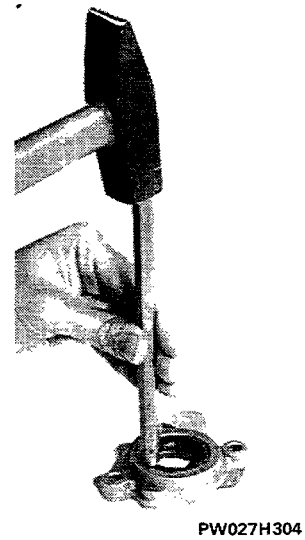
PW027H302

Removing/refitting left counter shaft cover seal

NOTE *The seal should be removed using a punch inserted in the groove located on the cover inner face.*



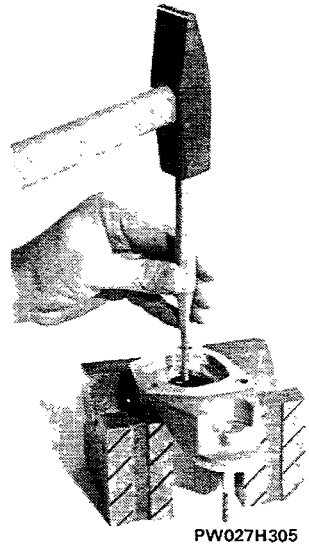
PW027H303



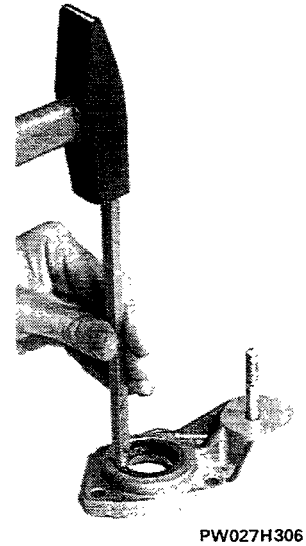
PW027H304

Removing/refitting right counter shaft cover seal

NOTE *The seal should be removed using a punch inserted in the groove located on the cover inner face.*



PW027H305



PW027H306

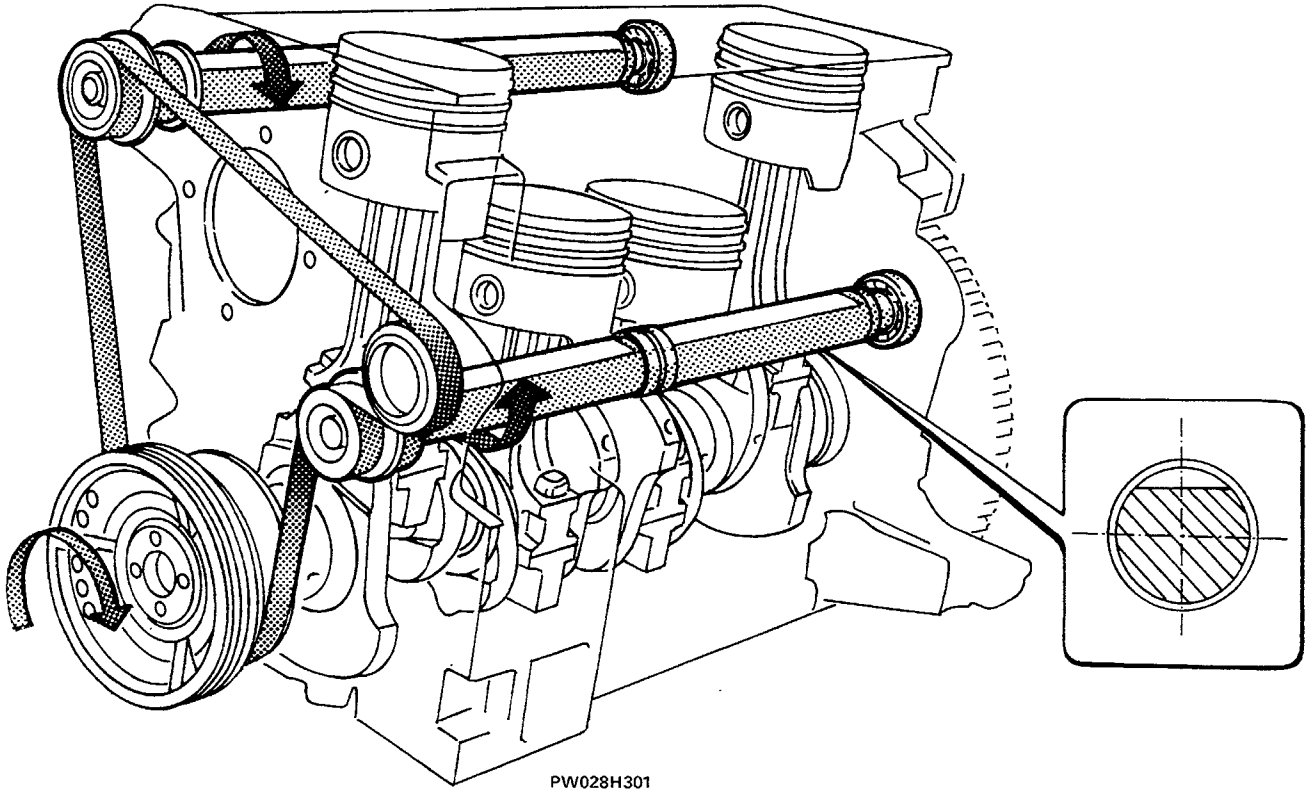
10.

Description of operation

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

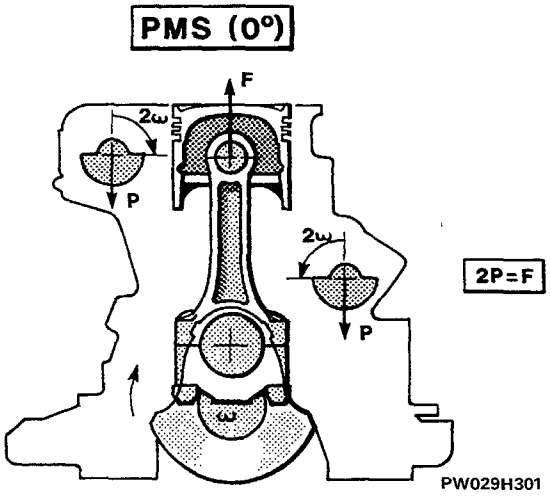
- centrifugal inertial forces, resulting from the rotating masses;
- 1st and 2nd order alternating forces, resulting from the masses with alternating motion.

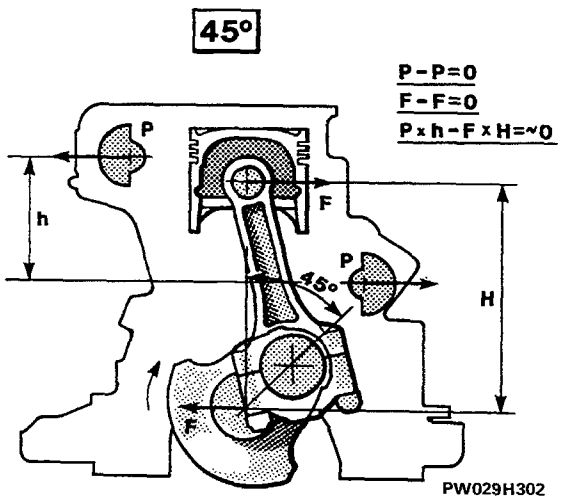
The purpose of balancing the engine is to eliminate the vibrations caused by these imbalances during operation.
The imbalances caused by the centrifugal and 1st order alternating inertial forces are eliminated by suitably counterweighting the crankshaft.
The imbalance caused by the 2nd order alternating 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 a set of sprockets which enable a speed double that of the crankshaft, and perfect synchrony with the latter, to be obtained.

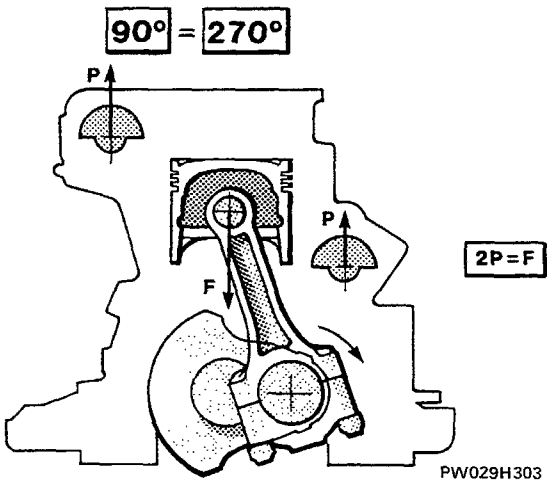


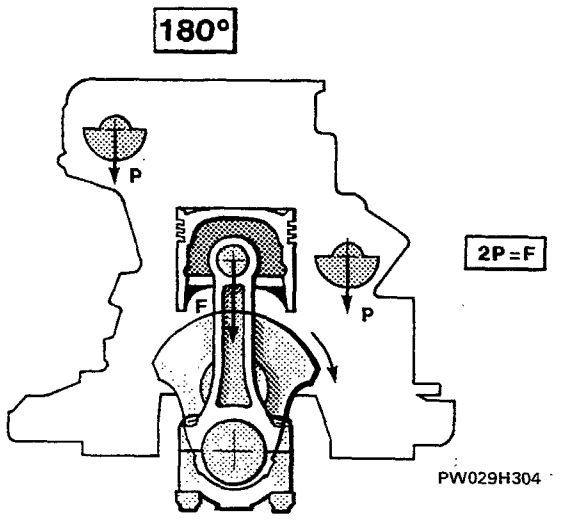
Vibration damping system

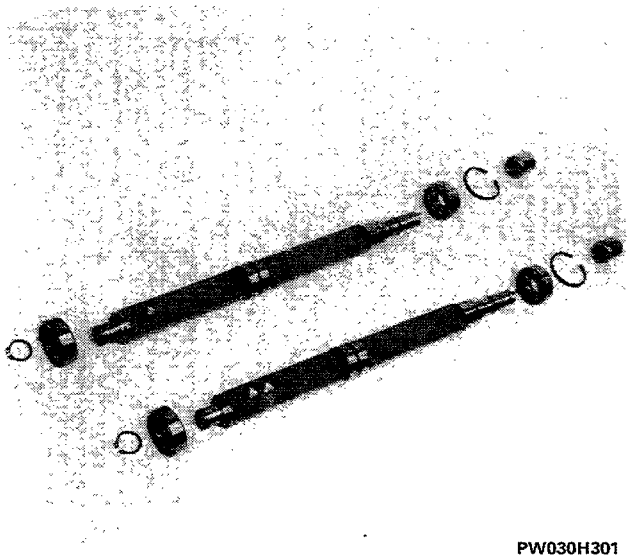
Diagram showing the 2nd order alternating inertial forces and the balancing weights in the principal operating positions





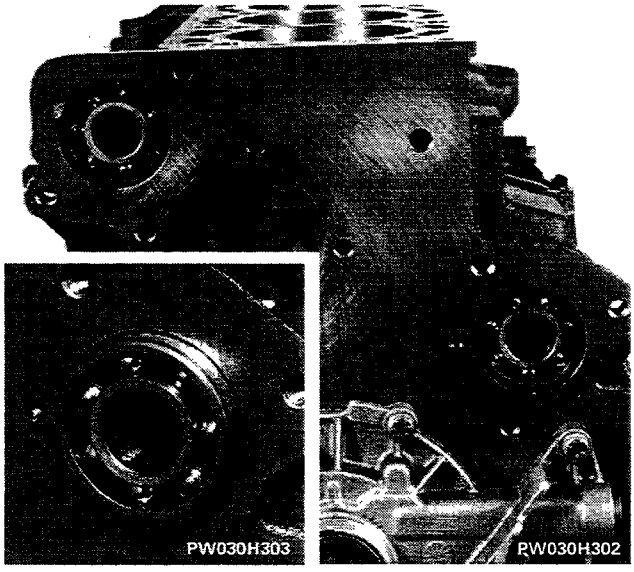






PW030H301

Counter shaft components

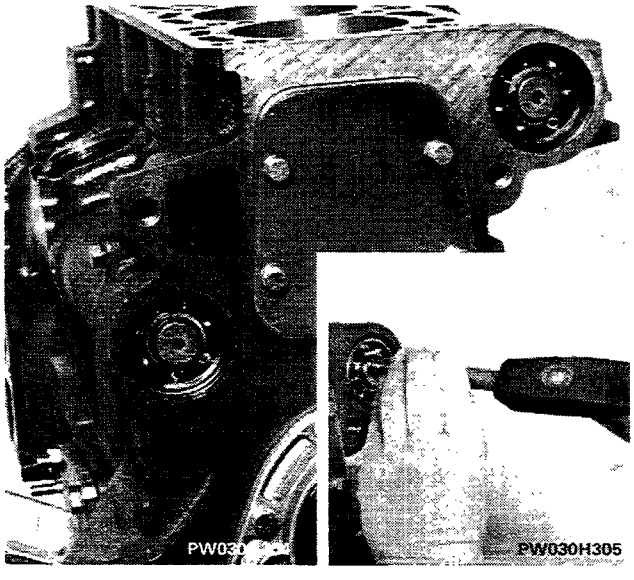


Fitting counter shafts

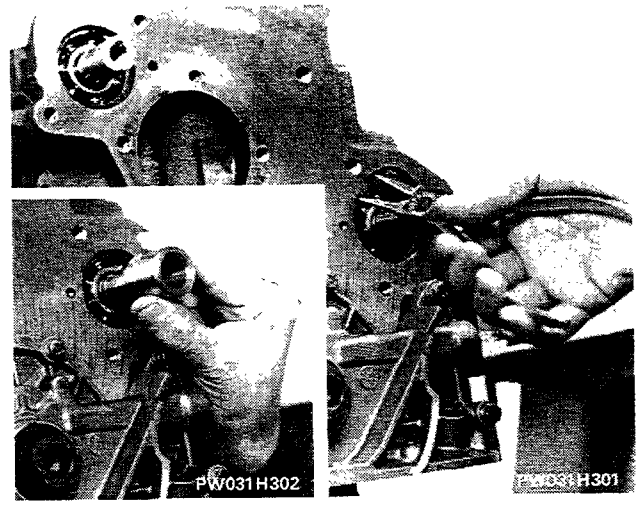
Refit the counter shafts in the cylinder block as follows:

- install the bearings on the timing gear side in their locations, using a suitable drift;

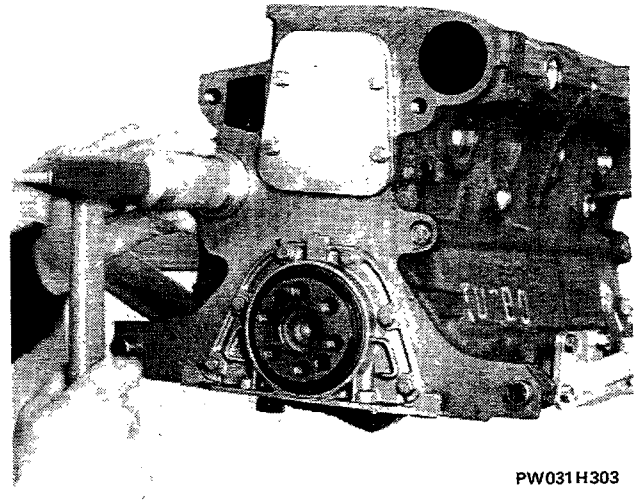
NOTE *The detail photo shows a bearing positioned in its location, before final assembly in the block.*



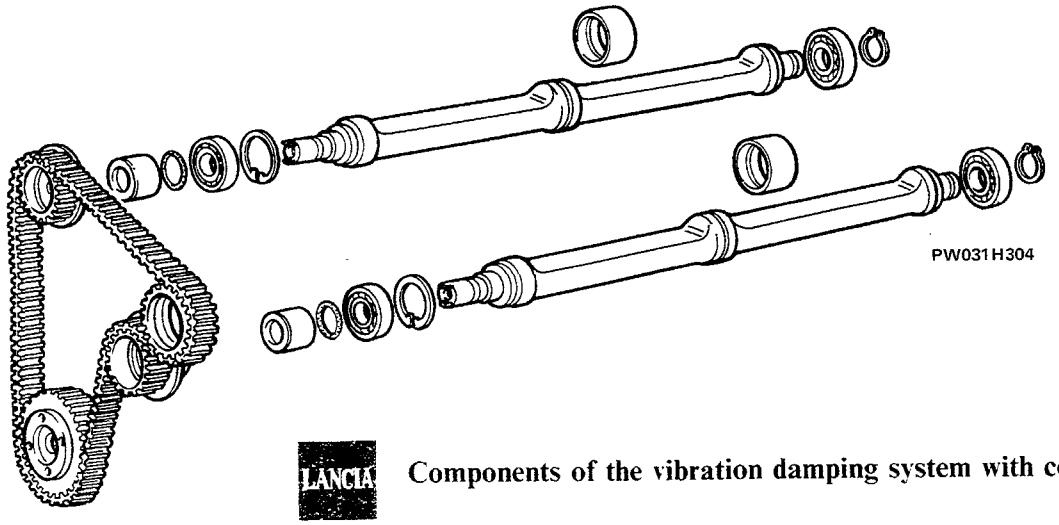
- fit the counter shaft assemblies from the flywheel side, using a suitable drift;



– fit the bearing circlips in their locations (timing gear side):
– fit the spacer bush as shown in the detail photo:

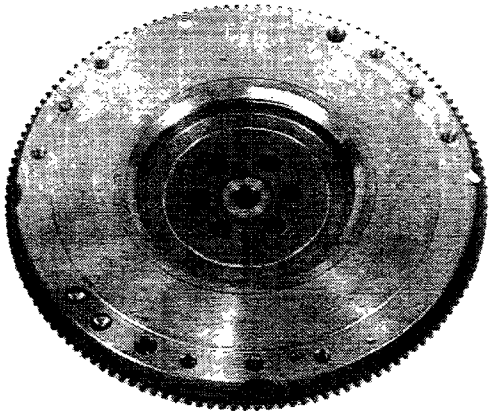

PW031H303

– install the counter shaft covers using a suitable drift (flywheel side).



Components of the vibration damping system with counter shafts

FLYWHEEL

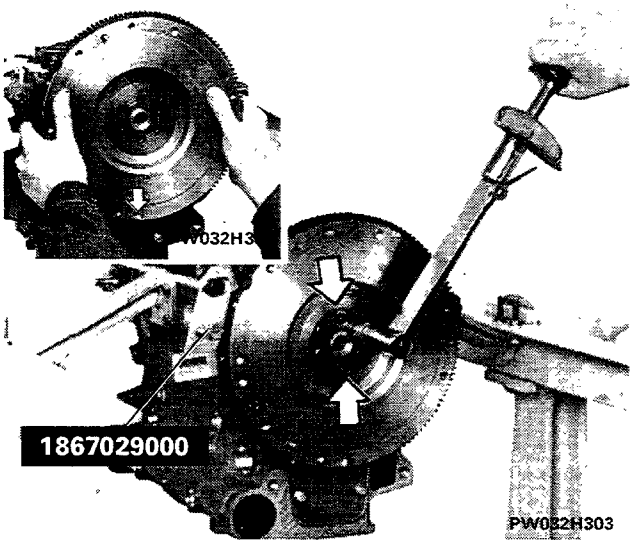


PW032H301

Checking clutch plate contact surface

If the surface is scored, it should be skimmed.

NOTE *To replace the flywheel starter ring, preheat the new ring in an oven at 80 °C and press it onto the flywheel with the bevel on the inner diameter facing the flywheel. To remove, use an ordinary steel drift.*



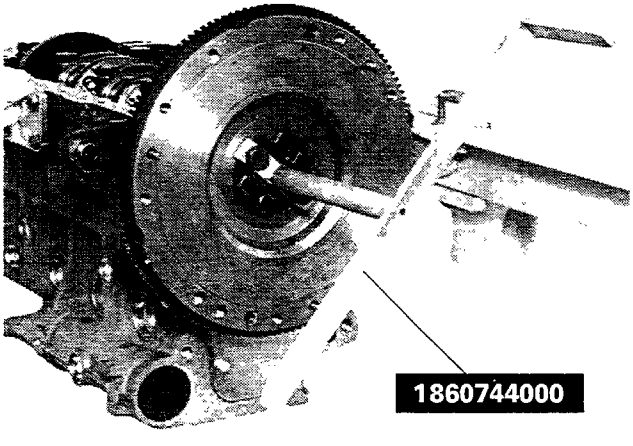
PW032H303

Fitting flywheel and tightening bolts to correct torque

NOTE *Turn the crankshaft until the crankpins of cylinders 1 and 4 are at TDC position, shown by the arrow in the detail photo, facing the cylinder head support surface.*

Mount flywheel locking tool 1867029000.

Tighten only four bolts to torque, leaving two diametrically opposed holes, as shown by the arrows, for fitting the flywheel rotating tool 1860744000. The remaining two bolts should be fitted and tightened to torque after the flywheel rotating tool has been removed at the end of the engine reassembly procedure.



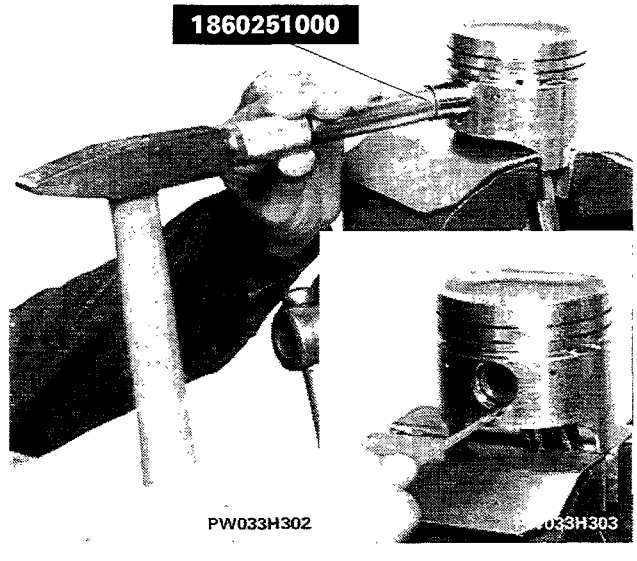
PW032H304

Fitting flywheel rotating handle

The flywheel locking tool 1867029000 should be removed.

PISTON / CONNECTING ROD ASSEMBLY

Removing piston rings



Removing gudgeon pin

NOTE *The parts may be reused if they are undamaged; however, the components must be marked ensure that they are refitted in their original assemblies.*

PISTONS

Measuring piston diameter

Standard: graded like the cylinder bores into five 0.01 mm categories:

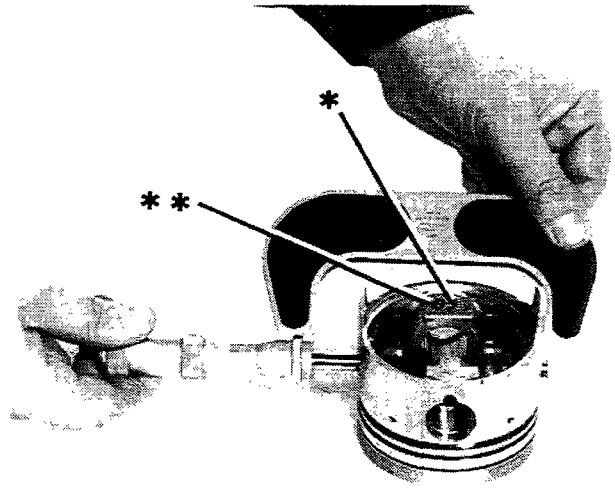
A, B, C, D and E

As spares, A, C and E only.

Oversize:

0.4 mm

with no diameter or category grading for the gudgeon pin boss holes.

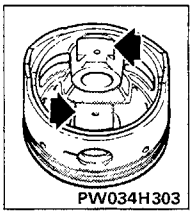


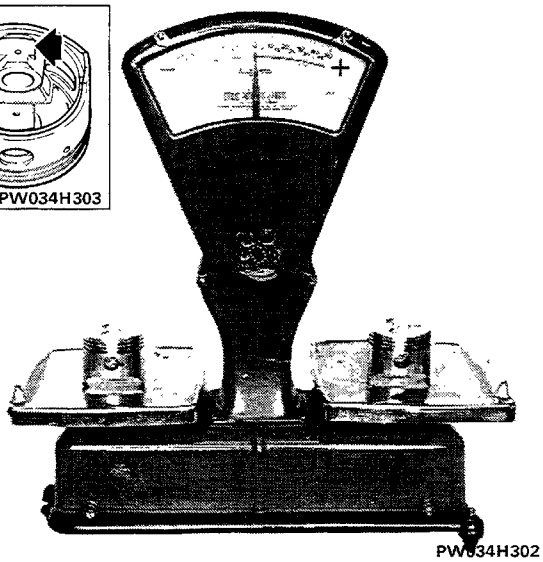
* Number indicating the gudgeon pin category

** Letter indicating the piston grade

10.

Cleaning piston crown





± 5 g

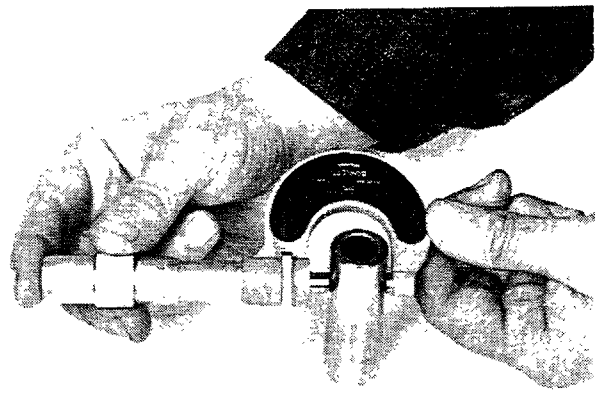
Checking piston weight imbalance

NOTE *The arrows show the areas from where material should be removed to obtain weight balance.*

Checking clearance between piston and cylinder bore

GUDGEON PINS

⌀1	21,991 ÷ 21,994
⌀2	21,994 ÷ 21,997

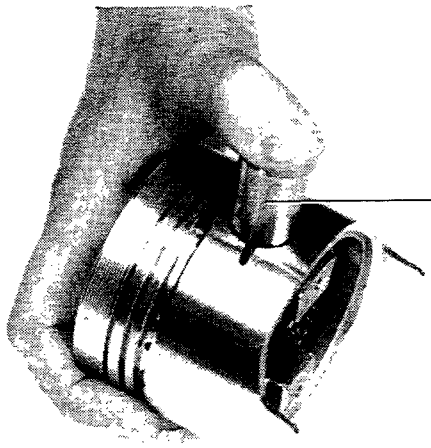


PW035H301

Measuring diameter

Standard pins are graded into categories to match the piston bosses.

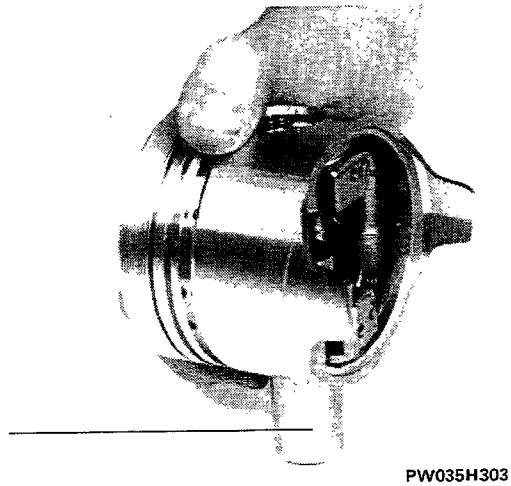
NOTE *Replacement gudgeon pins are also available with 0.2 mm oversize diameter.*



PW035H302

The pin must be a simple thumb push fit.

It must not fall out under its own weight.

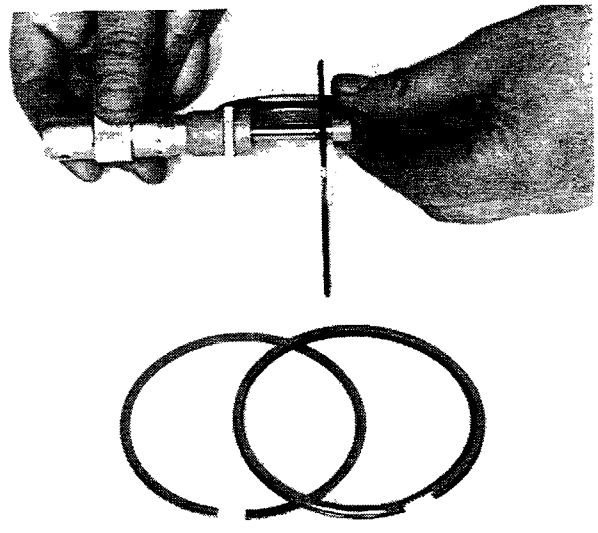


PW035H303

Conditions for correct piston/gudgeon pin match

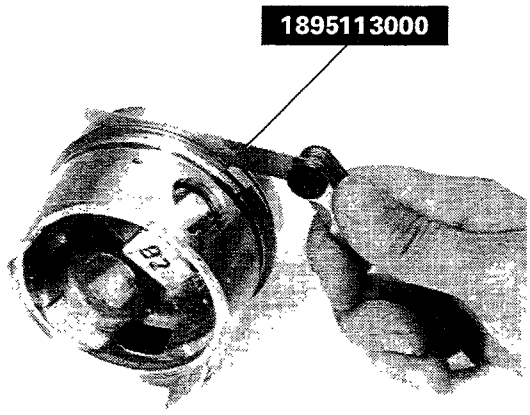
PISTON RINGS

1	1,478 ÷ 1,490
2	1,978 ÷ 1,990
3	3,925 ÷ 3,937



PW035H304

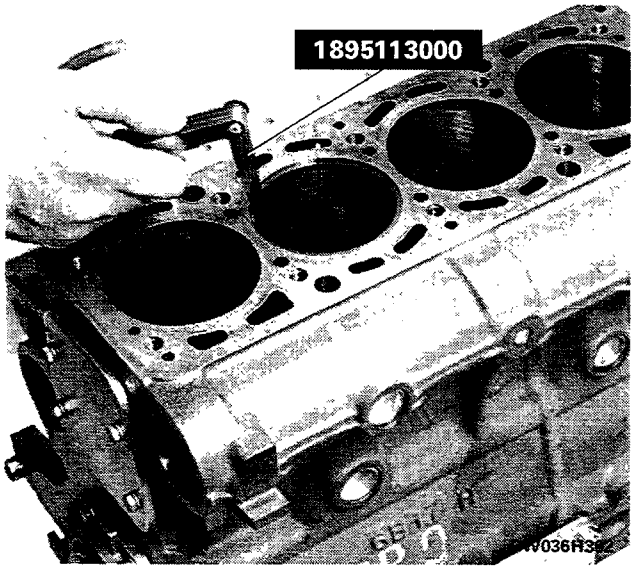
Measuring piston ring thickness



PW036H301

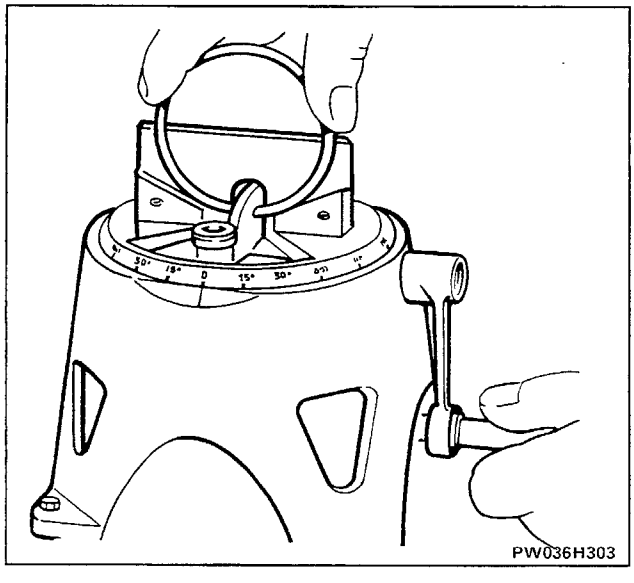
1	0,045 ÷ 0,077
2	0,040 ÷ 0,072
3	0,030 ÷ 0,062

Checking clearance between piston rings and grooves



1	0,030 ÷ 0,045
2	0,030 ÷ 0,045
3	0,025 ÷ 0,040

Checking and measuring piston ring end gaps

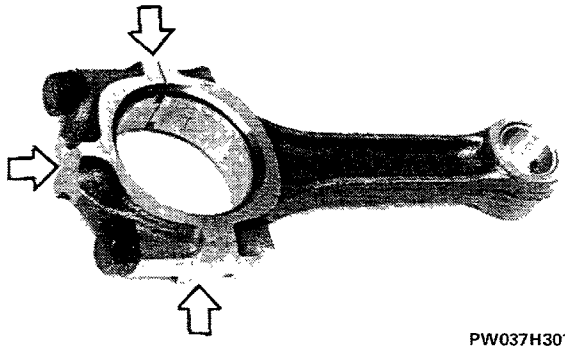


PW036H303

Recutting piston ring ends

Replacement piston rings are also available in 0.4 mm oversize.

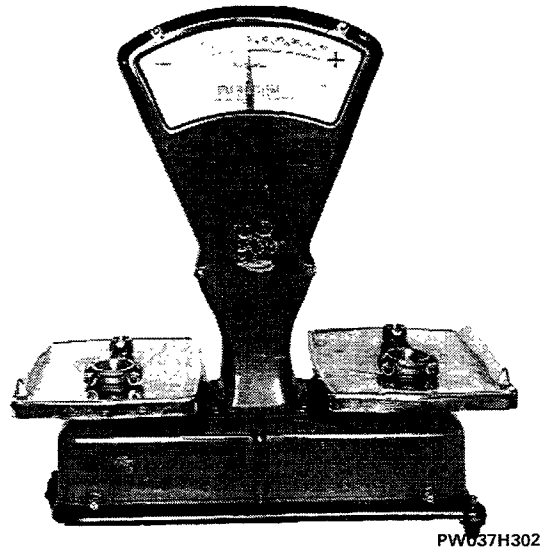
CONNECTING RODS



PW037H301

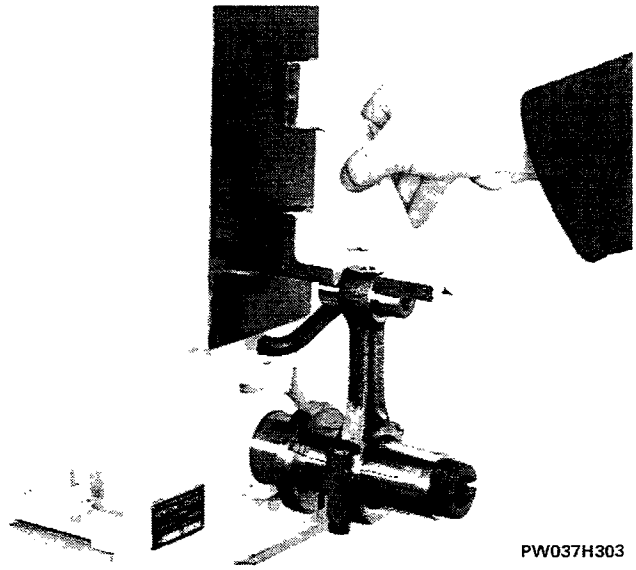
Checking connecting rod weight imbalance

The arrows show the areas from where material may be removed to obtain connecting rod weight balance.



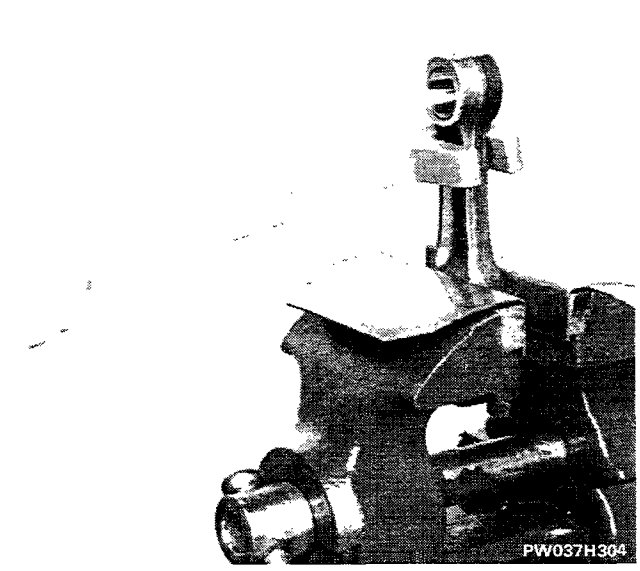
PW037H302

Checking connecting rod alignment



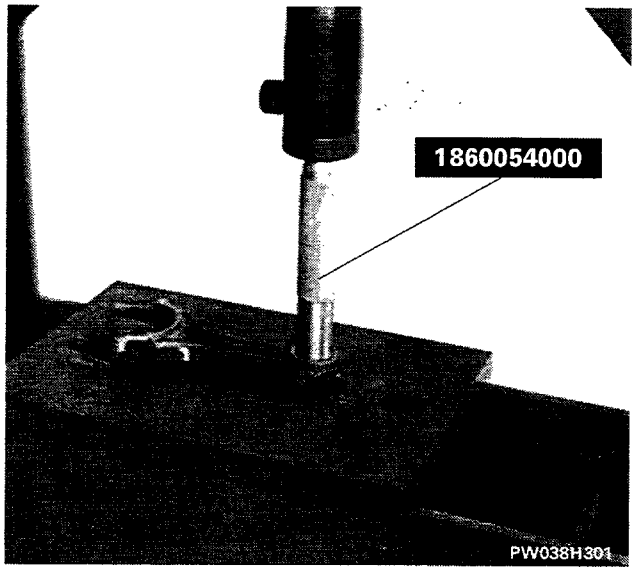
PW037H303

Straightening connecting rod stem

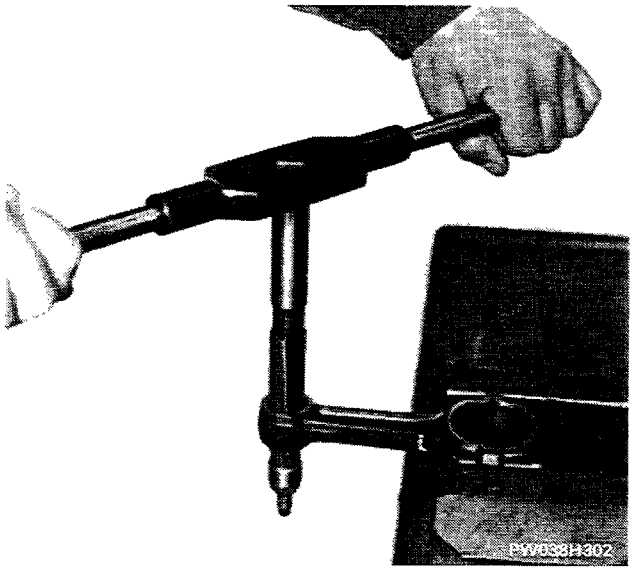


PW037H304

SMALL END BUSHES

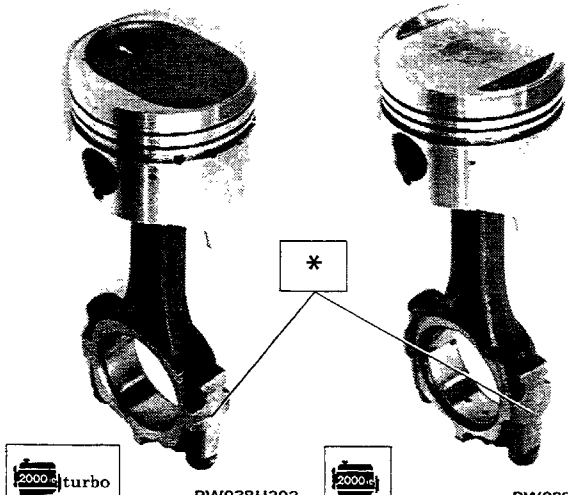


Removing/refitting small end bush



Reaming bush installed in small end

FITTING PISTON/CONNECTING ROD ASSEMBLY

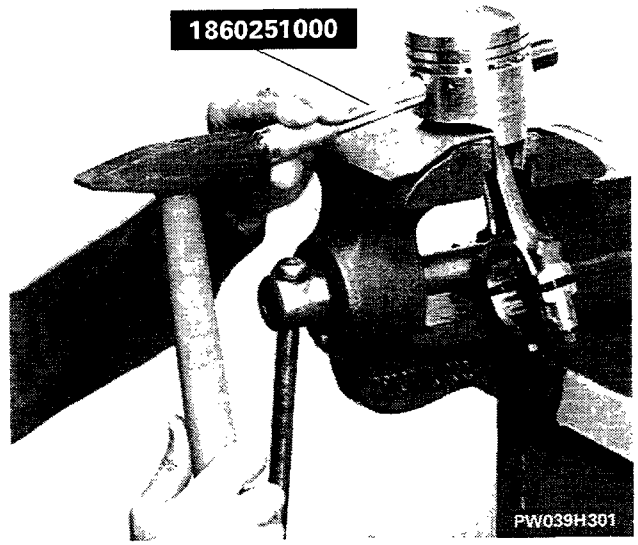


Piston/connecting rod match

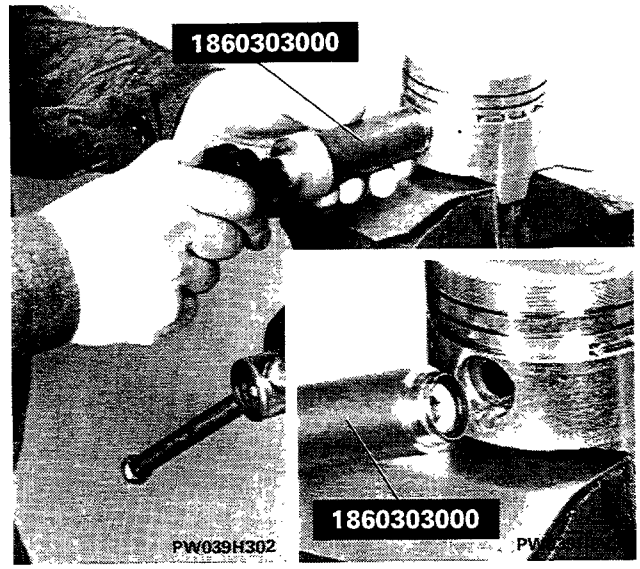
The piston should be fitted so that the arrow (2000 i.e. turbo engine) or smaller recess (2000 i.e. engine) on the crown is on the side opposite that where the cylinder number is engraved on the connecting rod.

If the connecting rod is replaced, the number of its corresponding cylinder should be stamped on the side opposite that of the bearing shell retaining notches.

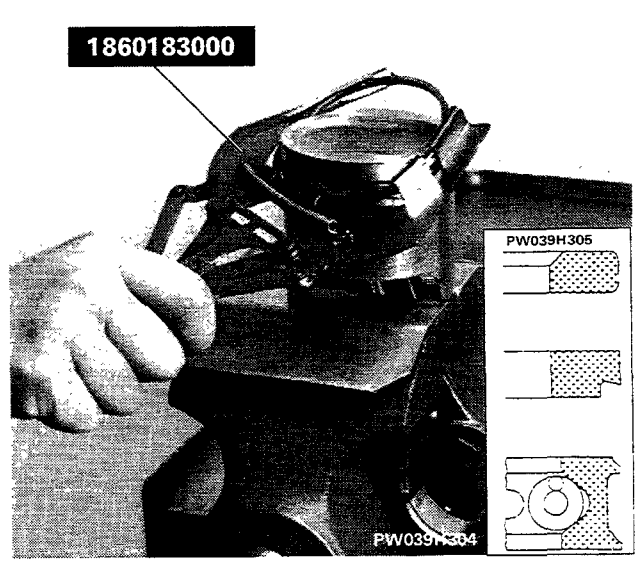
* Number of connecting rod's corresponding cylinder



Fitting gudgeon pin in piston/connecting rod assembly

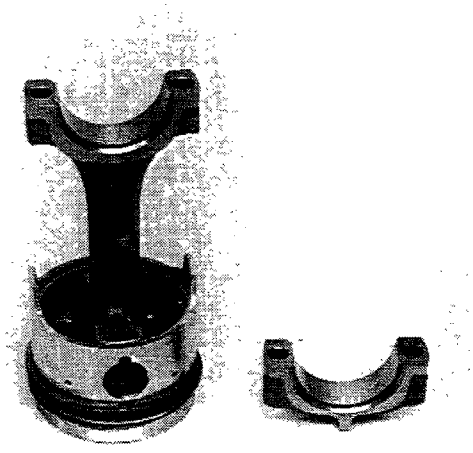


Fitting gudgeon pin circlips



Fitting and positioning piston rings

The piston rings should be fitted with the word "TOP" uppermost.
After assembly, position the piston ring end gaps so that they are staggered by approximately 120°.



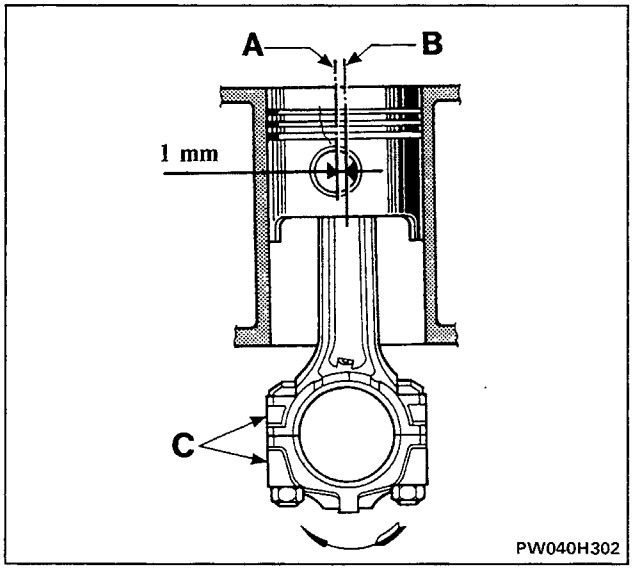
PW040H301

BIG END BEARINGS

Fitting big end bearings

NOTE *Big end bearings are available in undersizes of 0.254 and 0.508 mm.*

Do not attempt to make good the bearing shells. Ensure that the connecting rod location is not out of round; if it is, renew the faulty connecting rod. Thoroughly clean the outer surfaces of the bearings shells and their locations just before assembly.



PW040H302

Diagram of piston/connecting rod assembly and orientation in engine

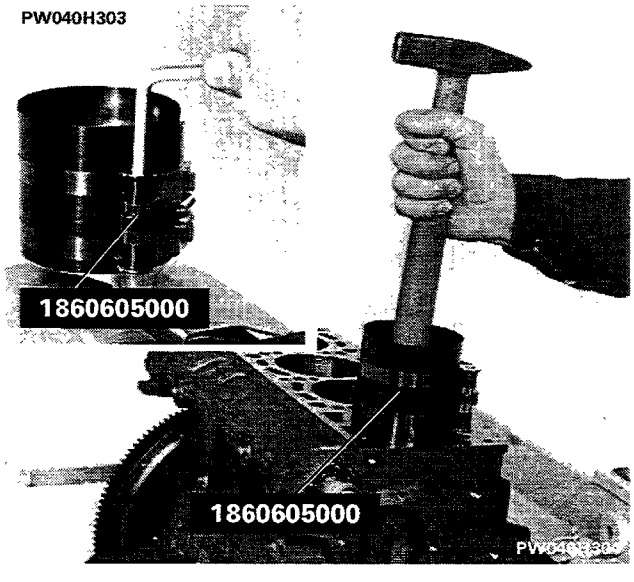
The arrow on the piston crown should face the exhaust manifold side (2000 i.e. turbo engine).

The smaller recess on the piston should be on the exhaust manifold side (2000 i.e. engine).

A. Axis of cylinder
B. Axis of connecting rod
C. Area for stamped number of connecting rod's corresponding cylinder bore

NOTE *The arrow shows the direction of rotation of the engine viewed from the timing gear side.*

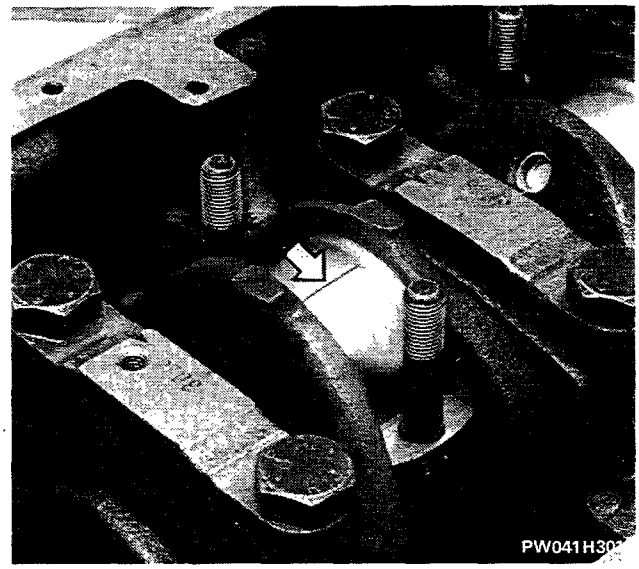
PW040H303



Installing piston/gudgeon pin/connecting rod assembly in cylinder bore

Lubricate the parts with engine oil before final assembly.

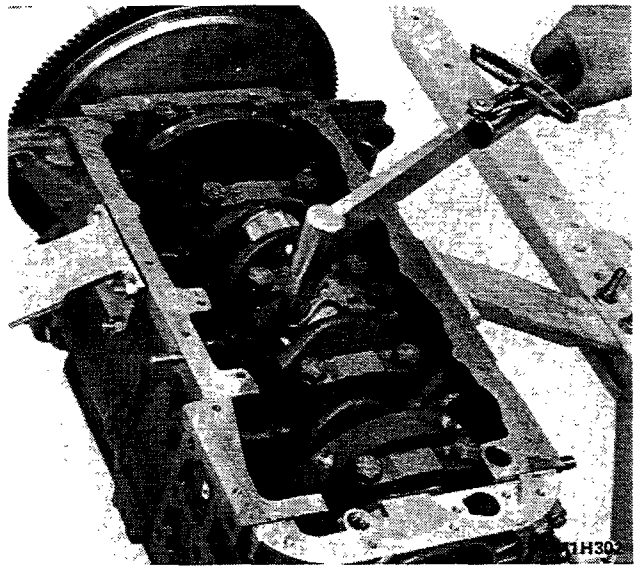
MEASURING CRANKPIN RUNNING CLEARANCES



Using calibrated filament (Plastigage) to measure the crankpin running clearances

The arrow shows the calibrated filament

2.5 daNm + 50°

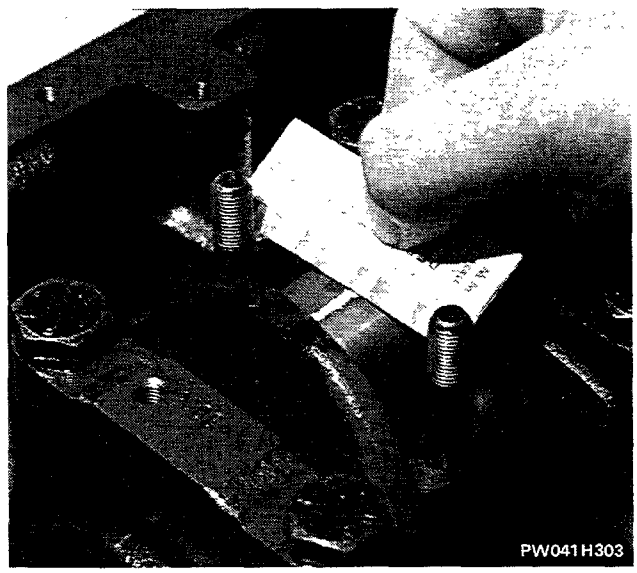


Tightening big end bearing cap bolts to correct torque

2000 ie: 0.029 ÷ 0.053

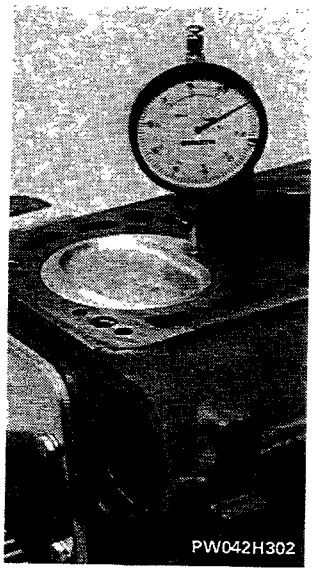
2000 ie turbo: 0.025 ÷ 0.049

2.5 daNm + 50°



Measuring crankpin clearances using a special gauge

Lubricate the parts with engine oil before final assembly.
Tighten the big end bearing cap bolts to the correct torque



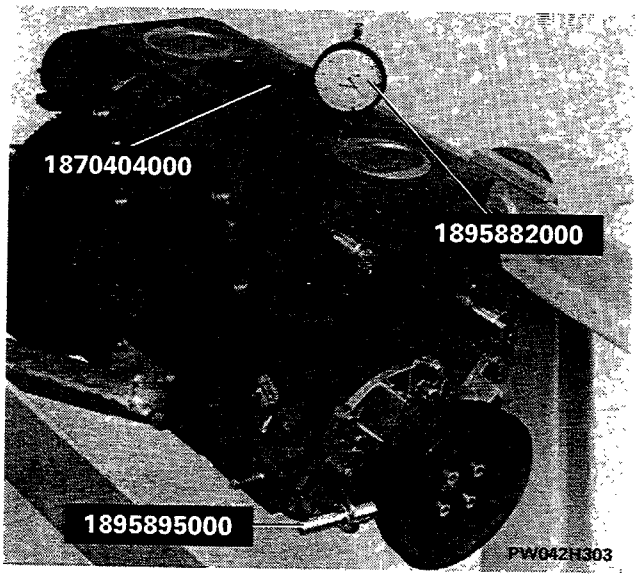
POSITIONING TDC AND RPM SENSOR MOUNTING PLATE

This procedure should be carried out whenever the sensor mounting plate or front cover are separated or replaced.

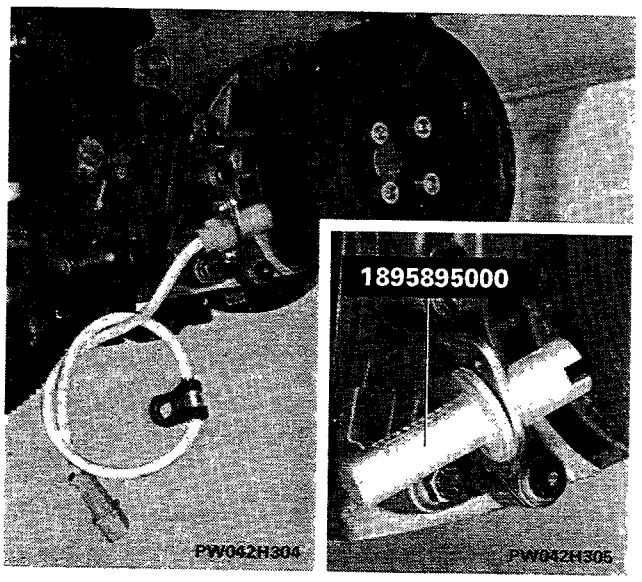
Obtain the correct sensor mounting plate position as follows:

- place the dial indicator 1895882000 with its mounting 1870404000 on the cylinder block top face at cylinder n°1, then reset the indicator with the indicator probe in contact with the cylinder block top face.

- bring the probe level with the crown of piston n°1 and turn the flywheel until the piston reaches TDC. The TDC position is reached when the indicator is reset.

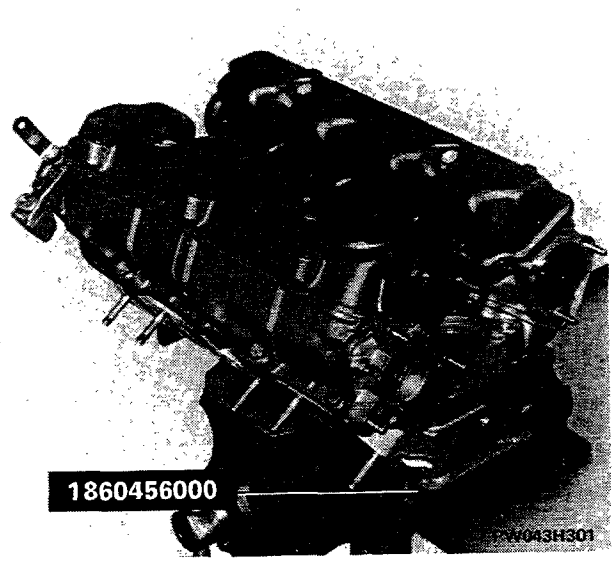


- fit tool 1895895000 onto the mounting plate in place of the sensor, using the sensor's bolts, and check that its end groove fits perfectly over the lug on the inner edge of the crankshaft sprocket, as illustrated in the detail.

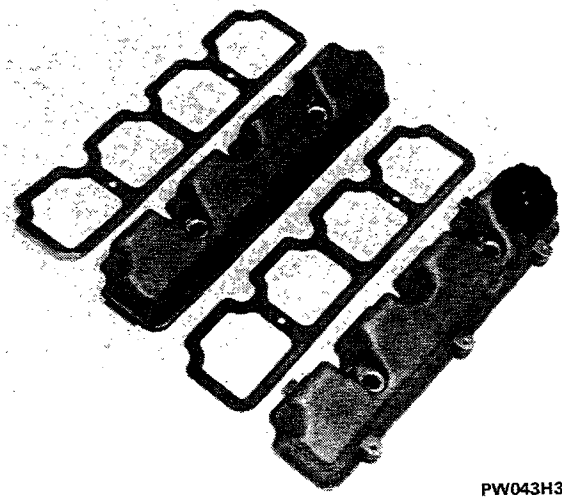


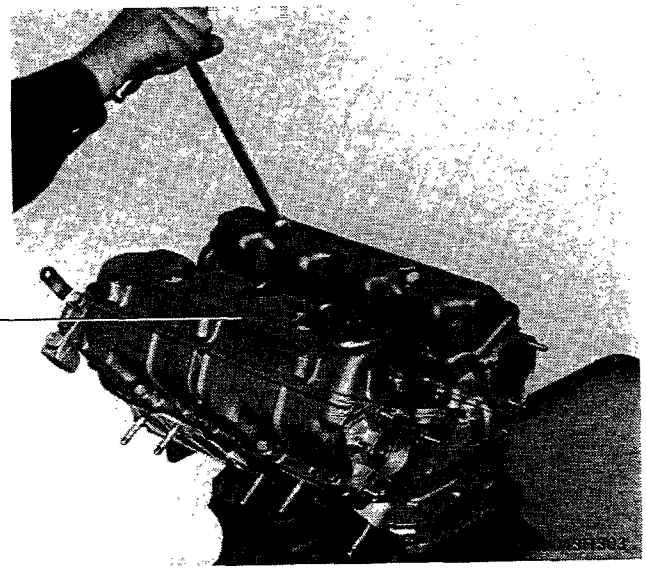
The tool should fit without being forced; if not, slacken the plate's bolts and move the plate until allows easy fitting of the tool.
Only then should the plate's bolts be tightened until the head of the shear bolt breaks, to prevent subsequent tampering.
Remove tool 1895895000 and install the rpm and TDC sensor in its place.

DISMANTLING CYLINDER HEAD



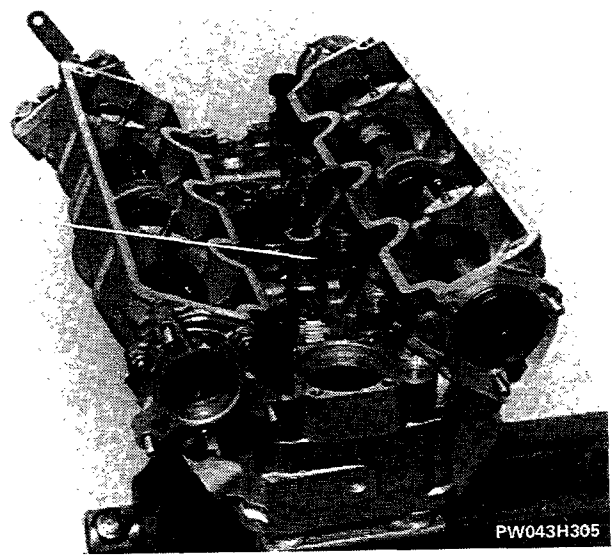
Mounting cylinder head, complete with upper heads, on tool 1860456000


PW043H302

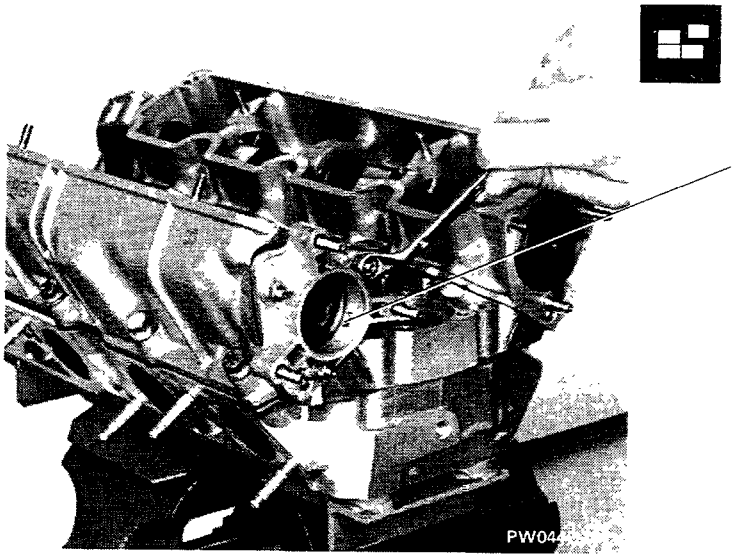


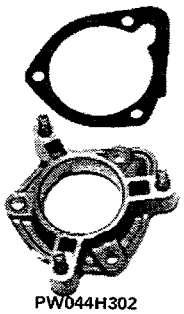
Removing rocker covers


PW043H304



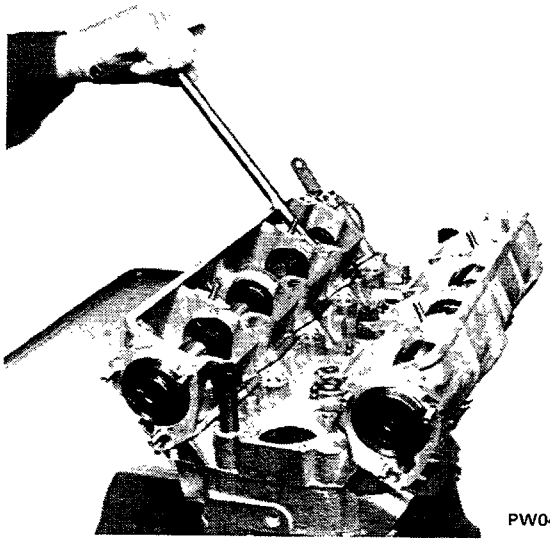
Removing/refitting knock sensor on cylinder head





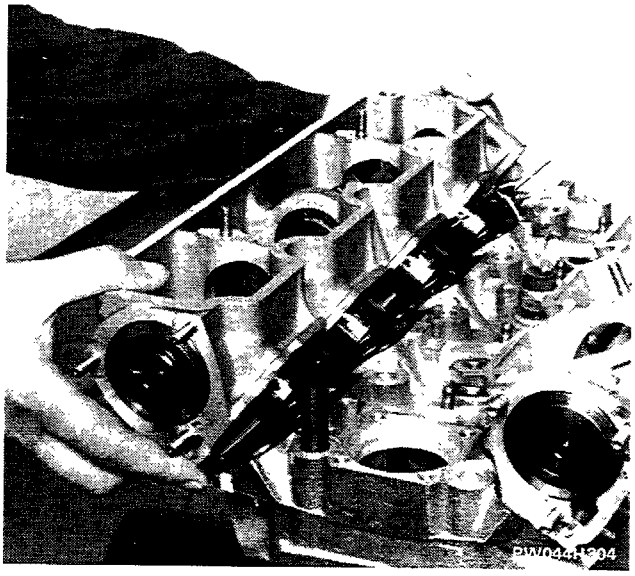
PW044H302

Removing distributor mounting



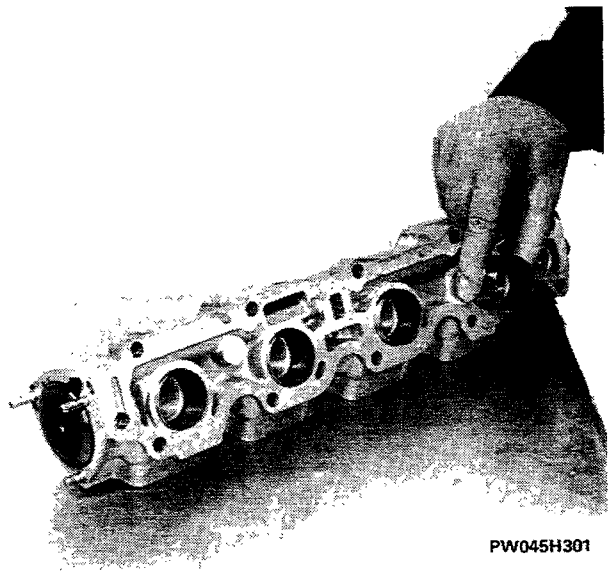
PW044H303

Removing upper heads from cylinder head



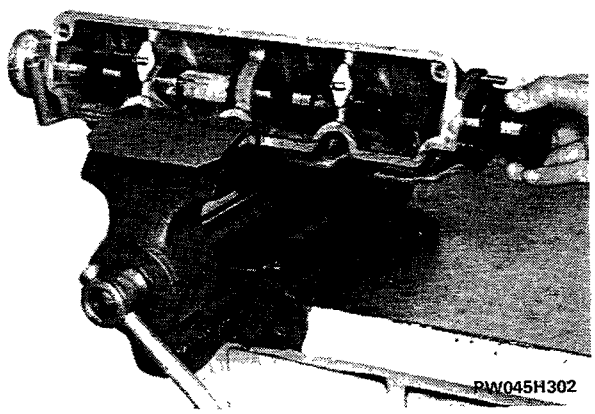
Separating upper heads from cylinder head

NOTE *Turn the upper head outwards to prevent the tappets from slipping out of their locations*



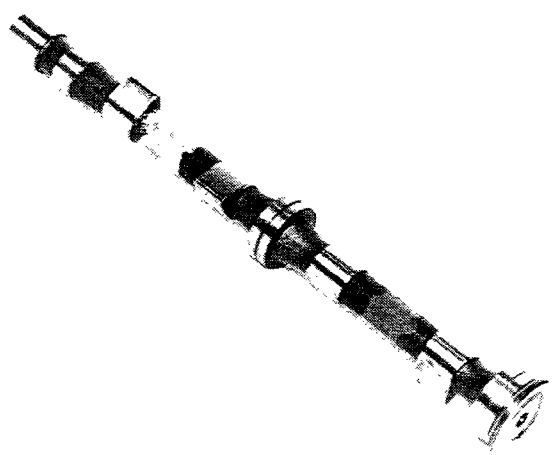
PW045H301

Removing tappets



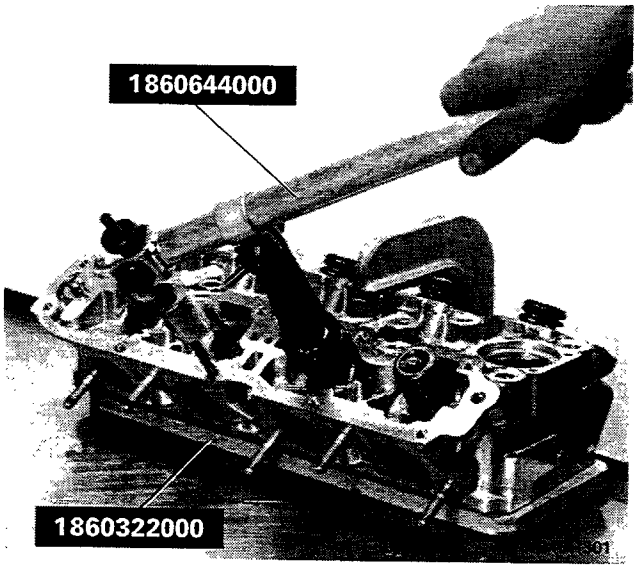
PW045H302

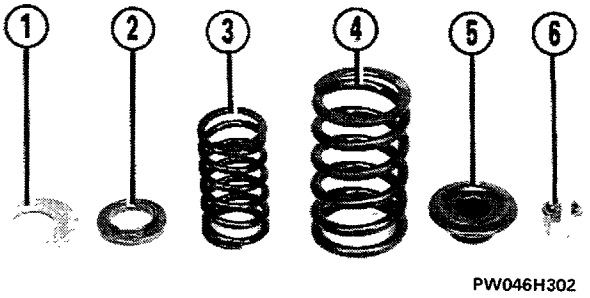
Removing camshaft



PW045H303

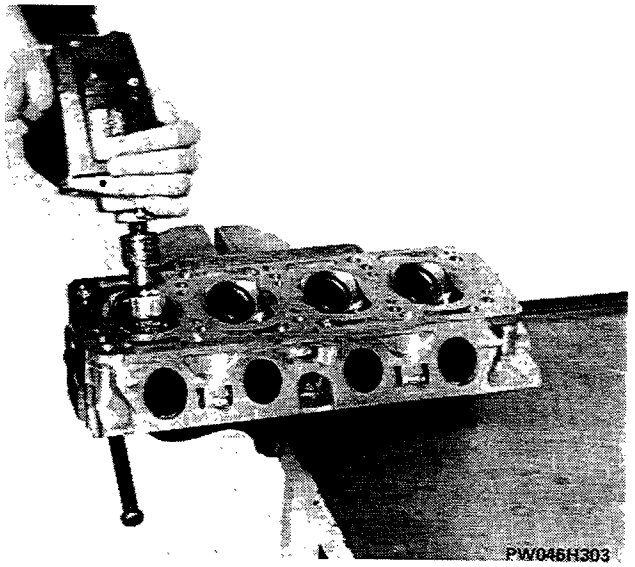
Camshaft





1. Plain washer
2. Bottom cap
3. Inner spring
4. Outer spring
5. Top cap
6. Split taper collets

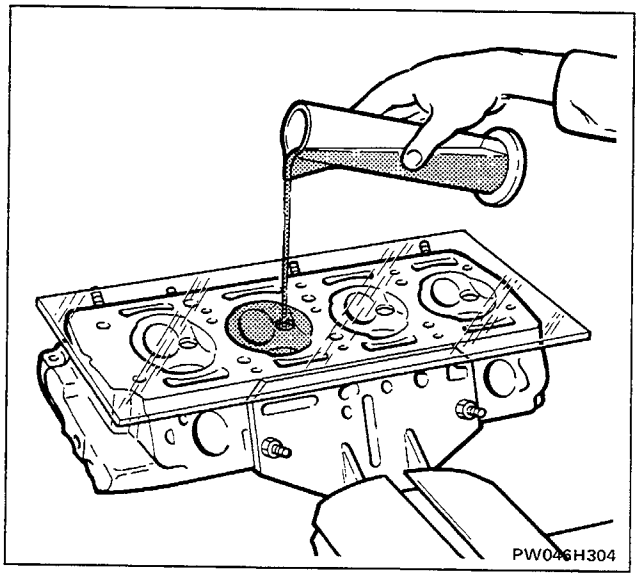
Dismantling split collets, caps, springs, valves



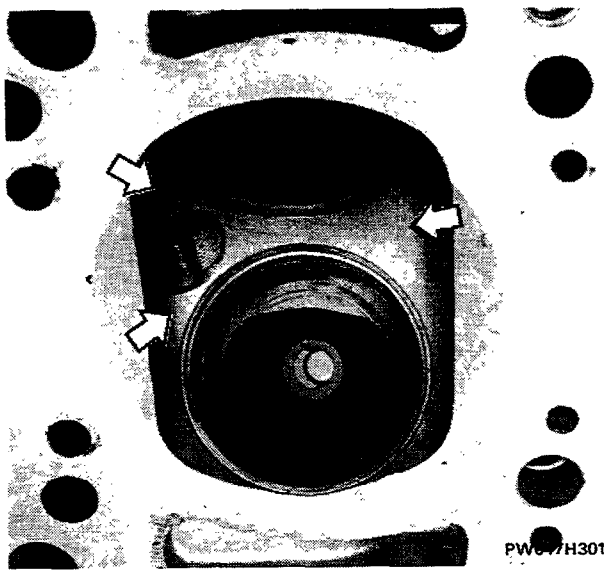
Decarbonizing and cleaning valve seats and passages

Measuring combustion chamber volume

After refacing the cylinder head, check the combustion chamber volume (2000 i.e. turbo: 47.7 cm^3; 2000 i.e.: 48.4 cm^3) as follows:



- fit the valves and spark plugs;
- fill a measuring cylinder with VS 20 or 30 engine oil;
- leave the oil to stand in the cylinder for approximately 10 minutes;
- note the amount of oil put in;
- place a glass plate on the head with holes over the combustion chambers as illustrated;
- completely fill the combustion chamber, taking care not to spill oil outside the hole;
- wait approximately 10 minutes to allow the oil to settle in the cylinder;
- measure the amount of oil remaining and calculate the difference between the contents of the cylinder before and after filling the chamber: the resulting value corresponds to the volume of the chamber.



Areas for removal of material

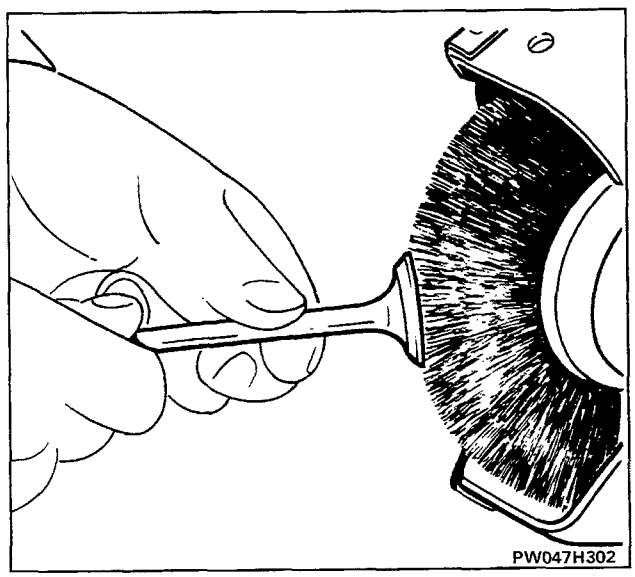
If the volume is below the specified value, material should be removed from inside the chamber until the value is correct.

NOTE *The arrows show the areas for removal of material.*

VALVES

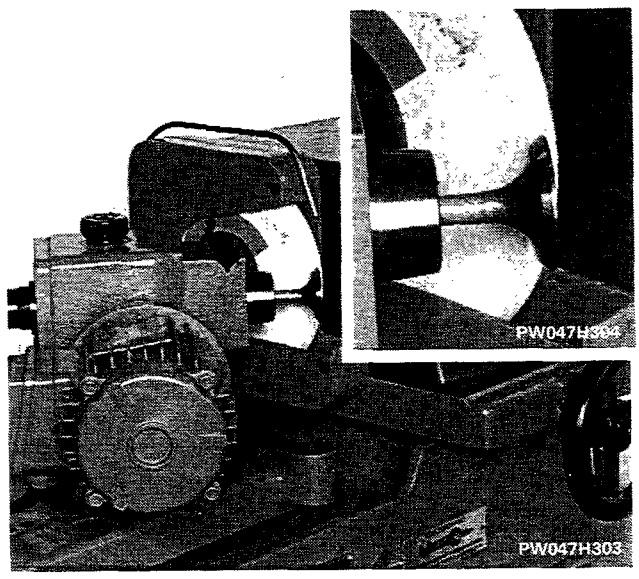
7,974÷7,992

7,974÷7,992



Decarbonizing and checking valves

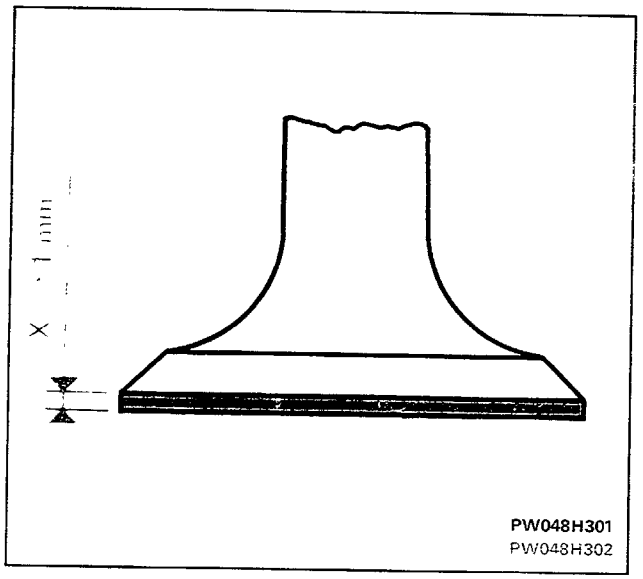
Check that the valve stem does not show signs of seizure or scoring; also check, using a micrometer, that the valve stem diameter is within the tolerance limits.



Valve recutting using a grinder

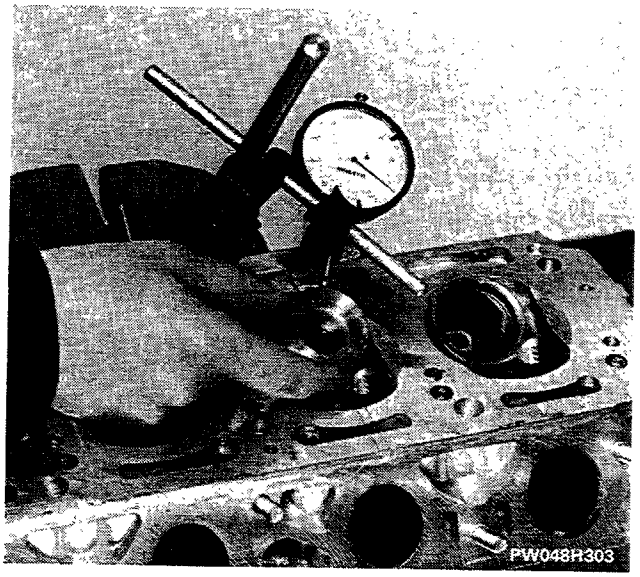
Set the scale to 45° 30' and recut the valve head, removing as little material as possible. If the top of the valve stem is pitted, regrind it, again removing as little material as possible.

It is advisable to renew the valves rather than to regrind them.



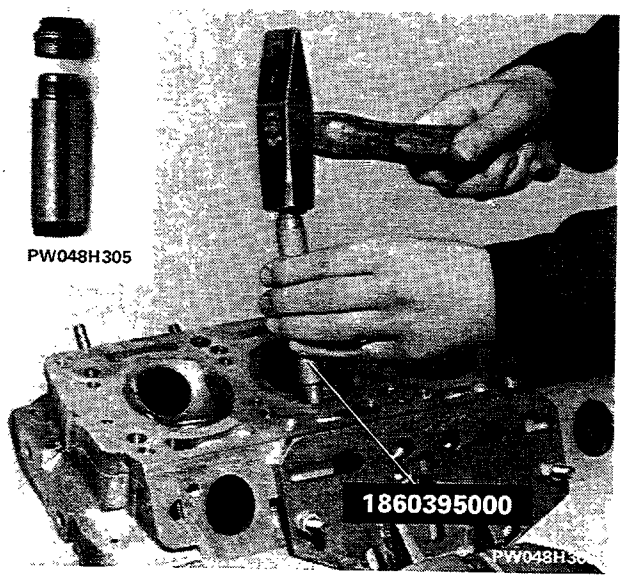
Checking dimension (X)

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



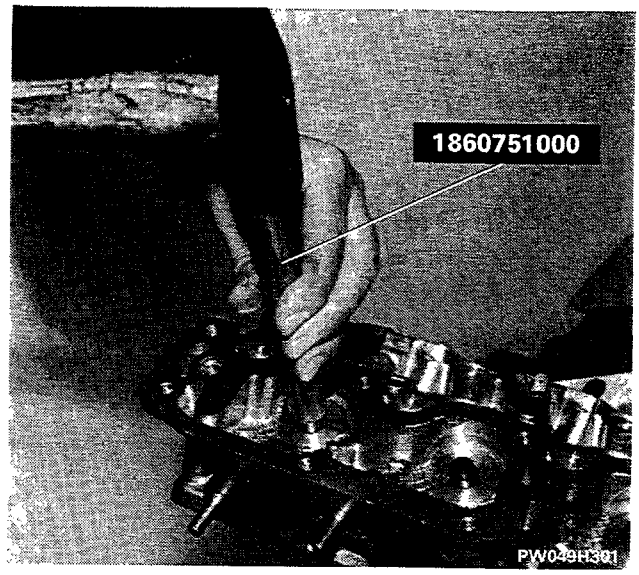
Checking clearance between valve stem and valve guide

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



VALVE GUIDES

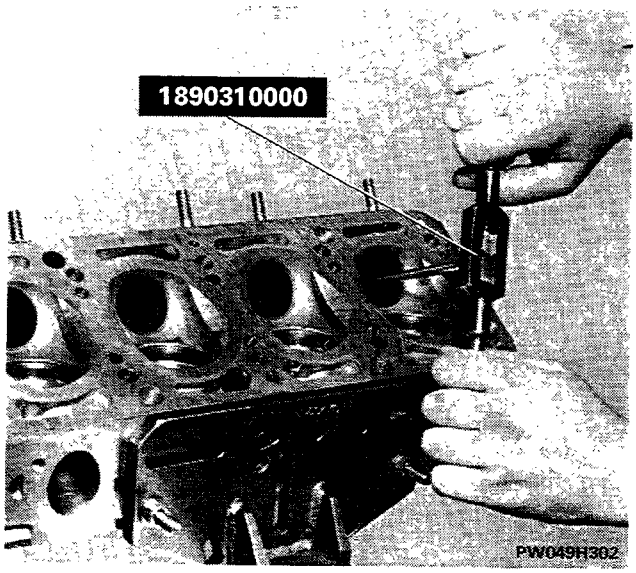
Removing valve guide



Fitting valve guide

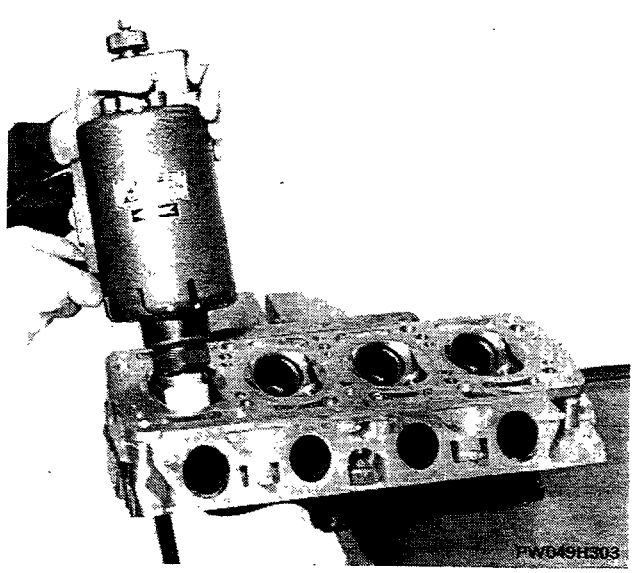
Replacement valve guides are also available in external diameter oversizes of 0.10, 0.20, 0.25 and 0.45 mm.

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



Reaming valve guide inner surface

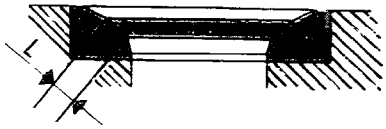
This should be done if slight distortion occurs during installation.

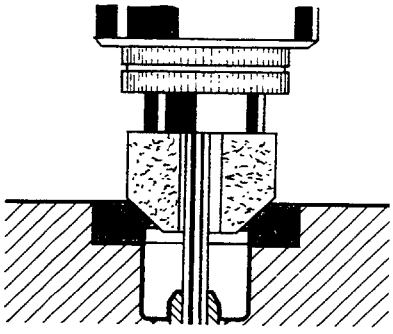


Regrinding valve seats in cylinder head

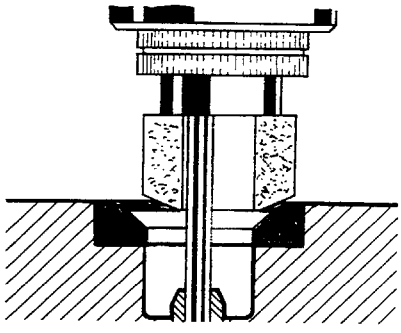
NOTE *The valve seats in the cylinder head should be reground whenever the valves or valve guides are reground or renewed.*

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

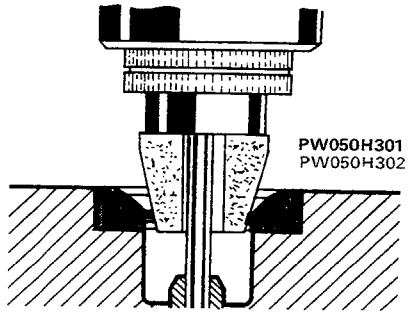




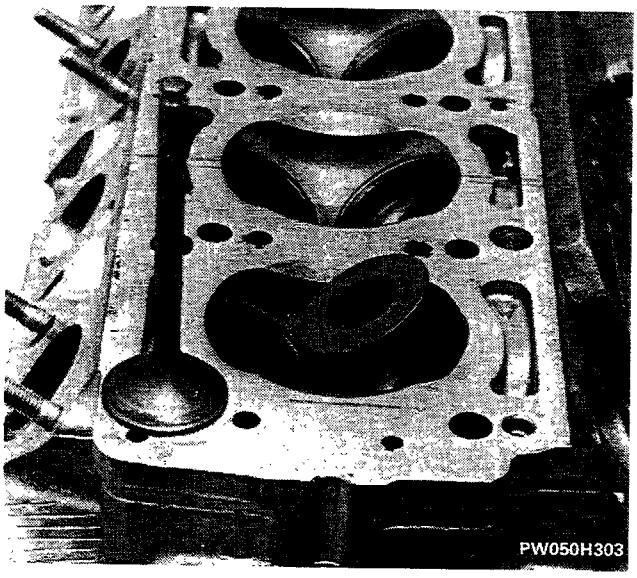
Regrinding valve seat with 44° 30' cutter.



Reducing outer valve seat with 20° cutter

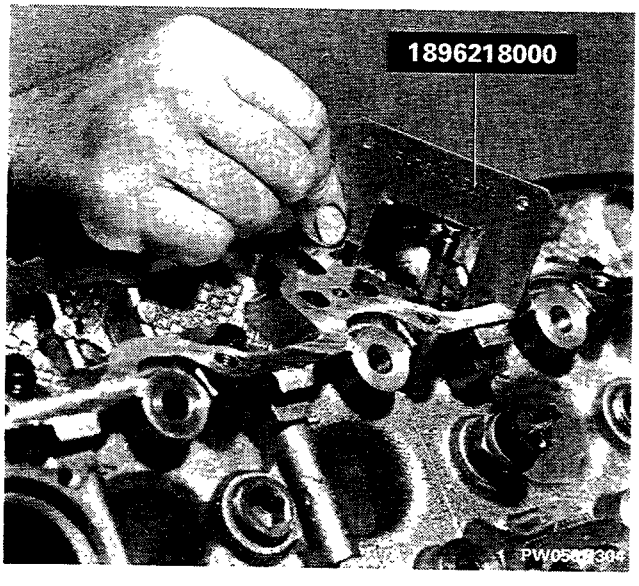


Reducing inner valve seat with 75° cutter



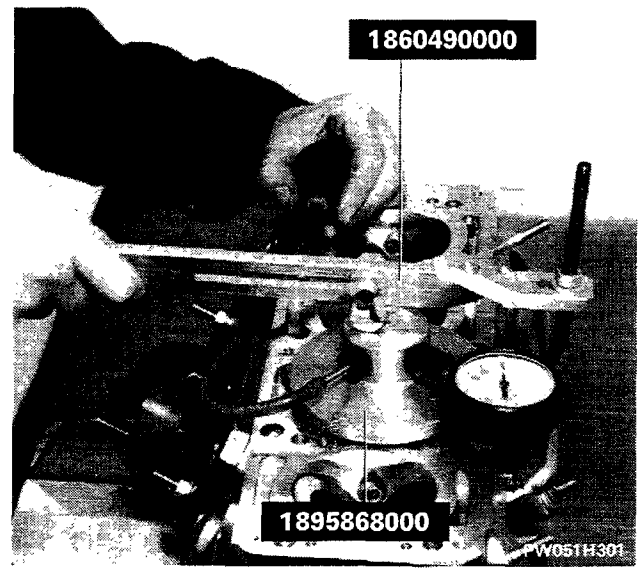
Measuring valve head line of contact on seat

NOTE *If the valve head is not centred in its location, reduce the cylinder head seat as necessary.*
If centring is impossible, renew the valve seat.



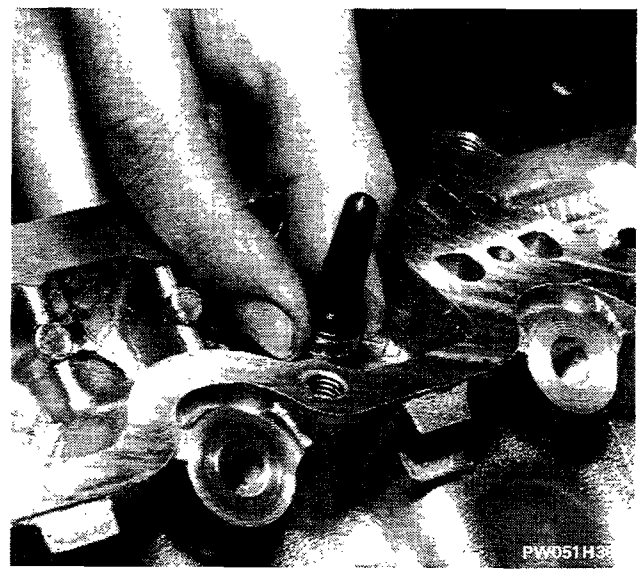
Checking valve stem height after regrinding

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



Compression testing valve seal

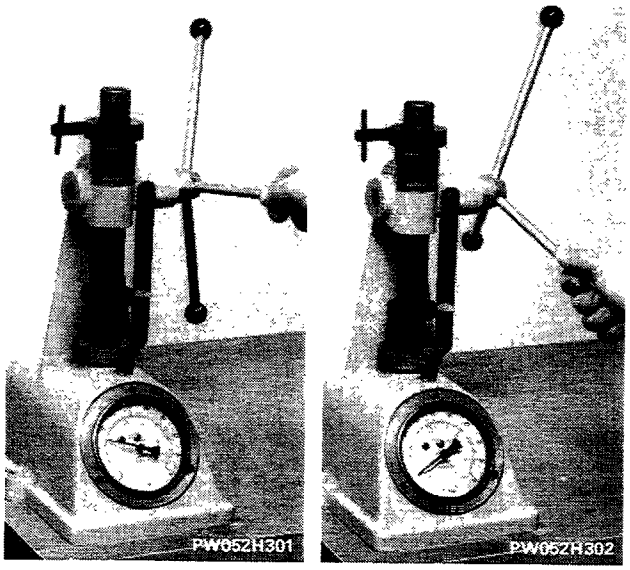
NOTE *The test should be performed with spark plugs fitted.*



Fitting valve guide oil seals

Lubricate the parts with engine oil before final assembly.

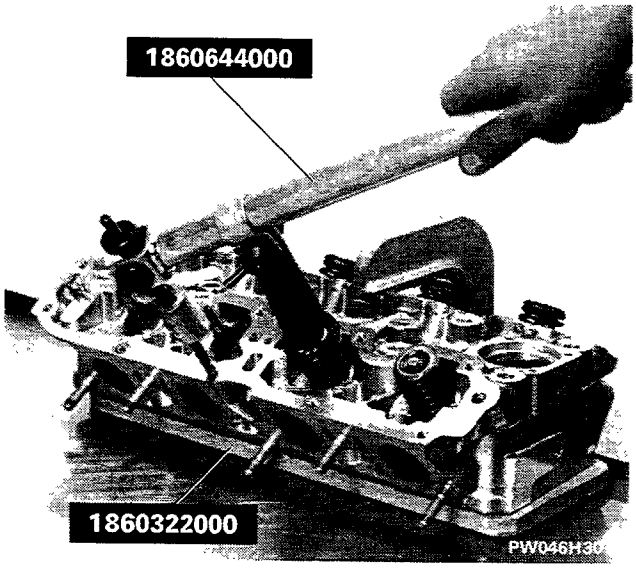
Fitting valve guide oil seals using tool 1860313000



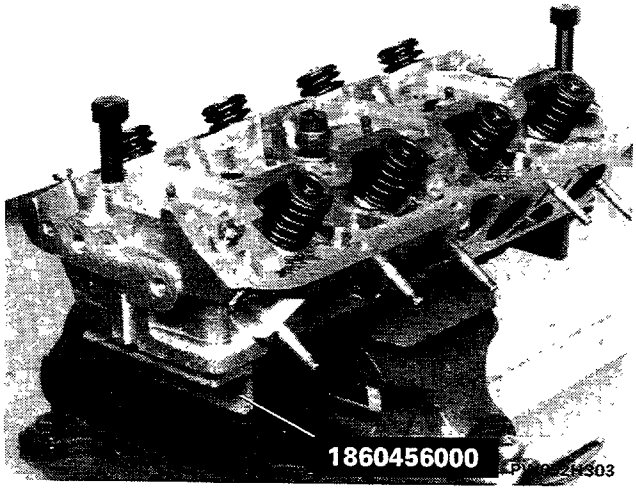
VALVE SPRINGS

Checking valve spring load

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

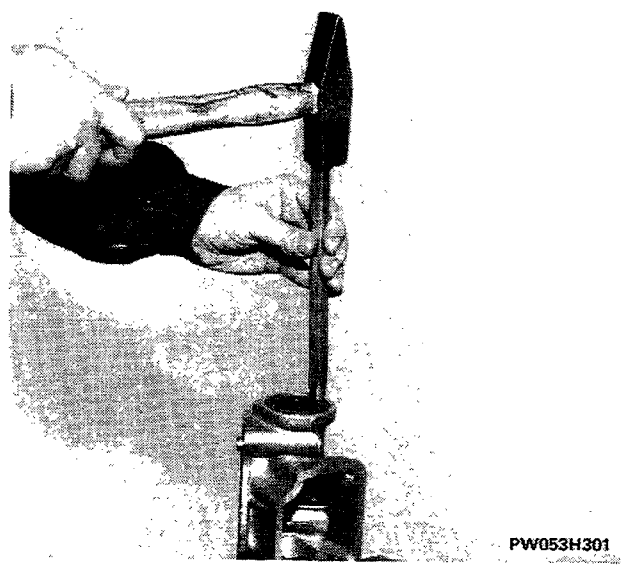


Fitting valve, caps, inner and outer springs and split taper collets



View of cylinder head with valves assembled

UPPER CYLINDER HEAD



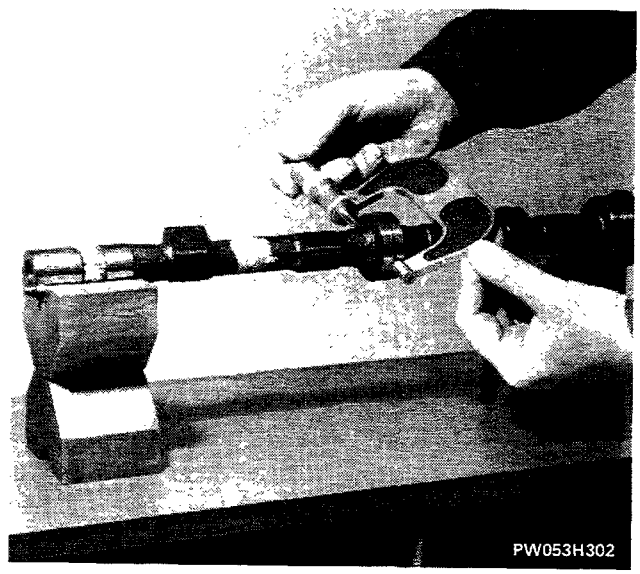
Fitting oil seal on upper head

The oil seal is removed and fitted using an ordinary drift.

NOTE *The camshaft journal locations must not show signs of wear or scoring, otherwise the upper head will have to be renewed.*

CAMSHAFT

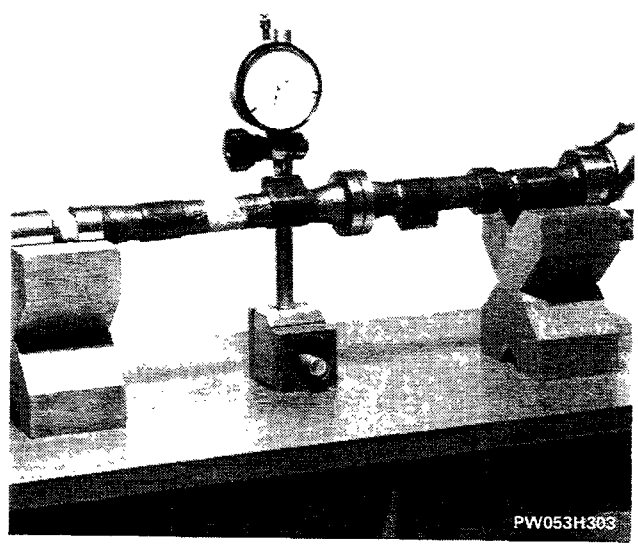
Ø1	29,944 ÷ 29,960
Ø2	45,755 ÷ 45,711
Ø3	46,155 ÷ 46,171



Measuring camshaft journals

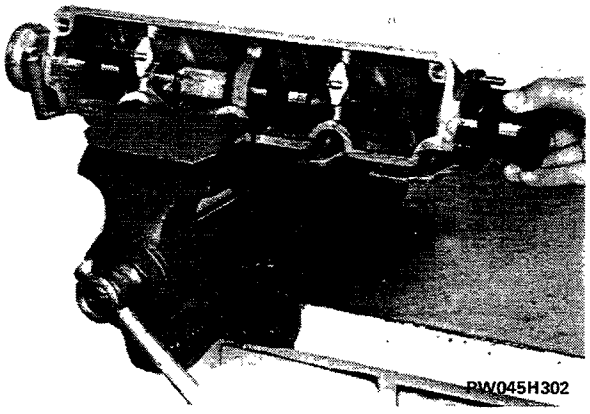
NOTE *The cam and journal surfaces must not show signs of seizure or scoring, otherwise the camshaft will have to be renewed.*

2000 ie turbo	9,1	8,6
2000 ie	10,033	10,033

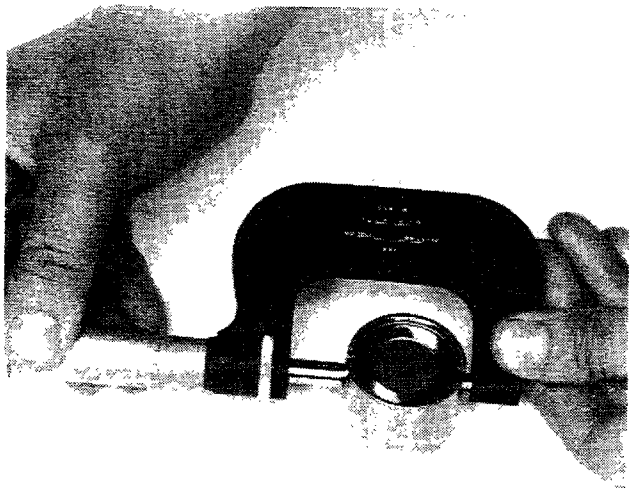


Measuring cam lift

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


PW045H302

Fitting camshaft


PW054H301

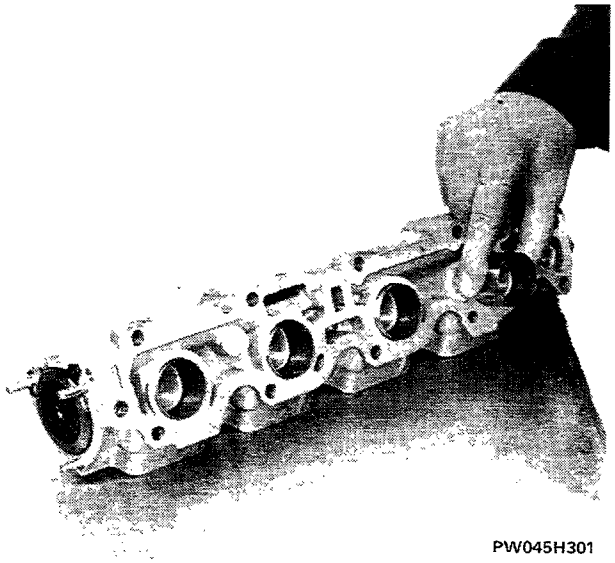
TAPPETS

ø 36,975 ÷ 36,995

LANCIA

Checking tappet diameter

If excessively out of round, the tappets should be renewed.


PW045H301

ø 37,000 ÷ 37,025

LANCIA

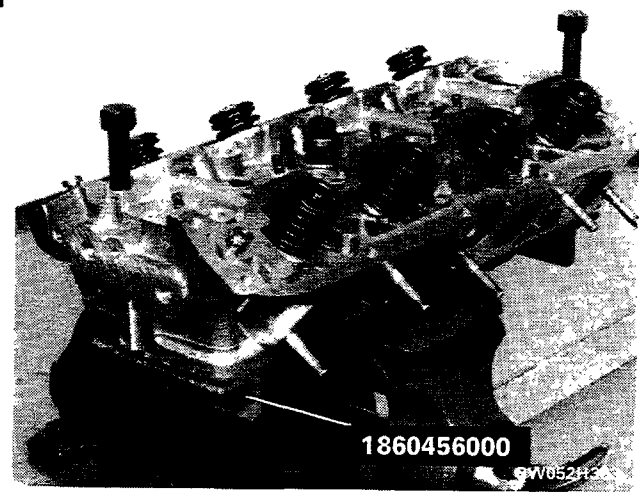
Checking seats and fitting tappets

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

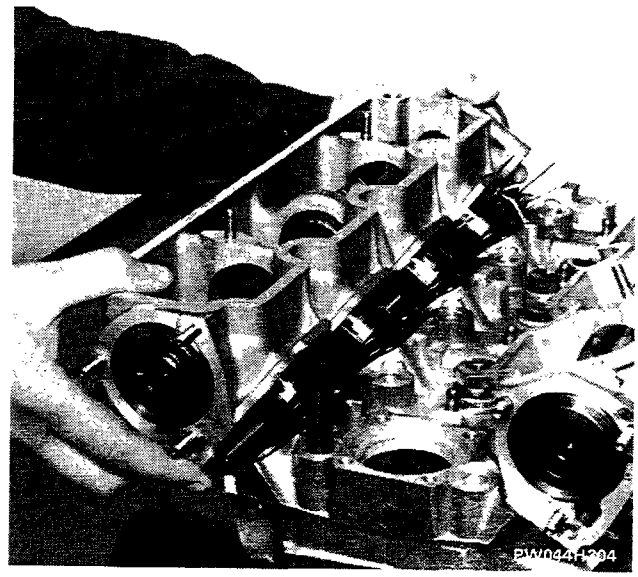
Lubricate the parts with engine oil before final assembly.

FITTING CYLINDER HEAD

- Cylinder head, without upper heads, mounted on tool 1860456000

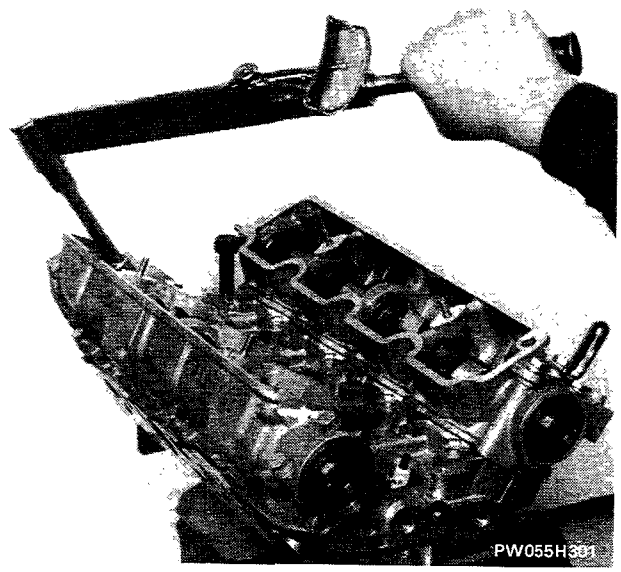


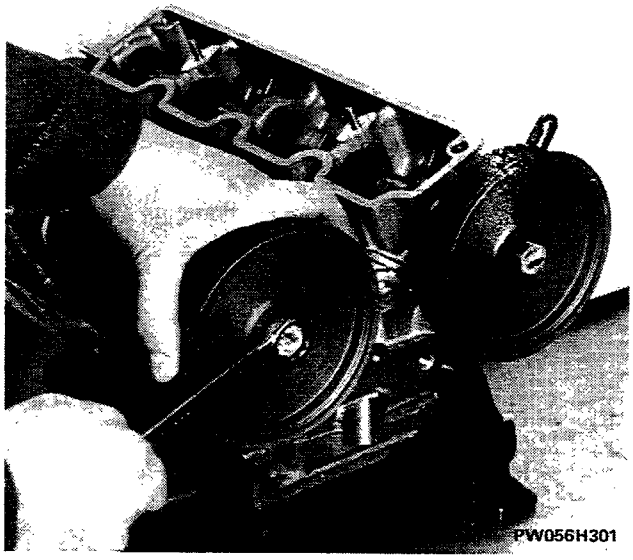
- Fitting gaskets and upper cylinder heads



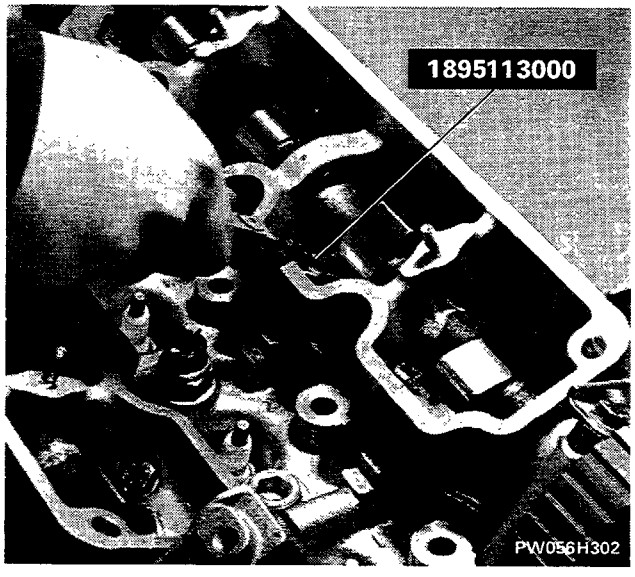
- Tightening upper cylinder head bolts to correct torque

2,2 daNm





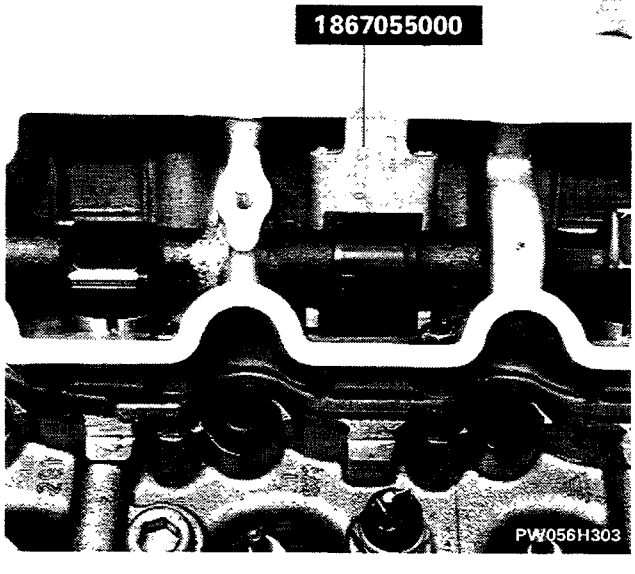
Provisionally fitting camshaft sprockets



ADJUSTING VALVE CLEARANCES

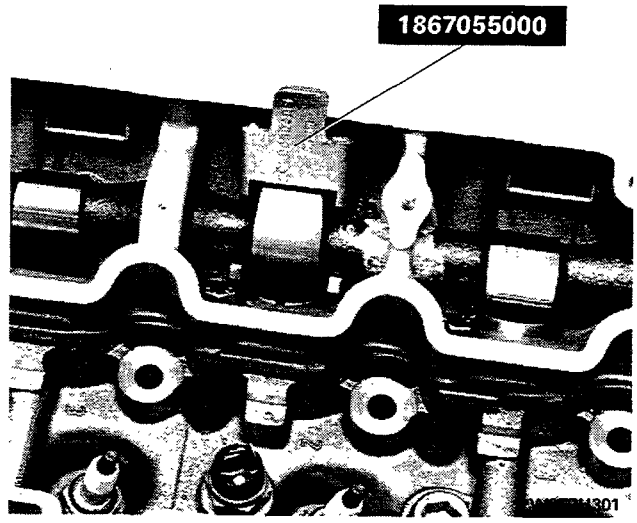
2000 ie	➔	0,40 ± 0,04
	➔	0,48 ± 0,03
2000 ie turbo	➔	0,35 ± 0,04
	➔	0,40 ± 0,04

Checking clearance between tappet and cam



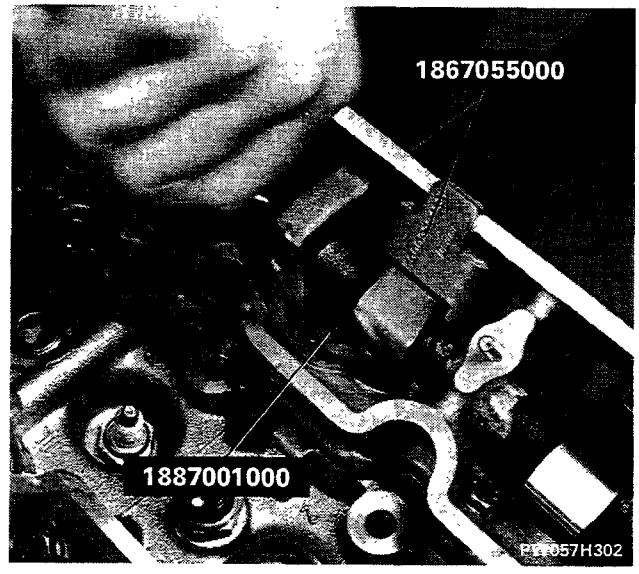
Inserting tappet locking tool 1867055000

Before inserting tool 1867055000, turn the camshaft until the tappet in question is at the position where its corresponding valve is fully open.



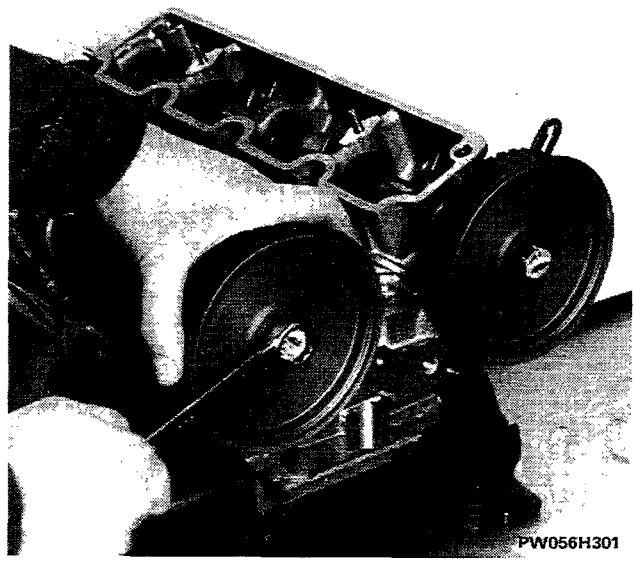
Turning camshaft for subsequent withdrawal of tappet adjustment shim

Turn the camshaft until the tappet in question is at the position where its corresponding valve is fully closed.

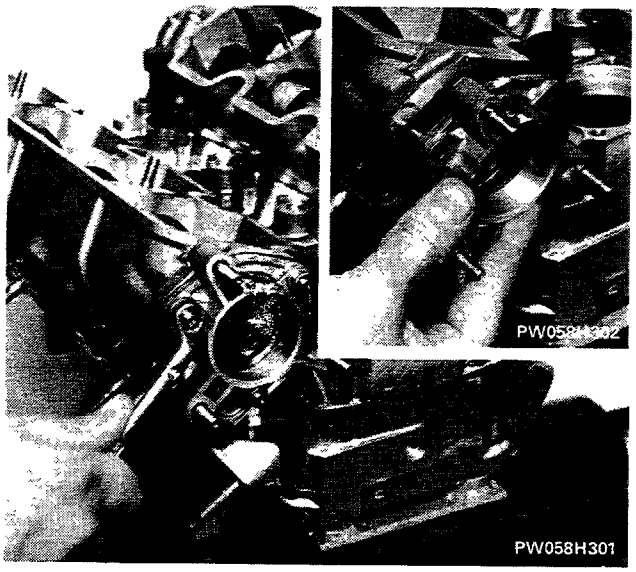


Withdrawing tappet adjustment shim using pliers 1887001000

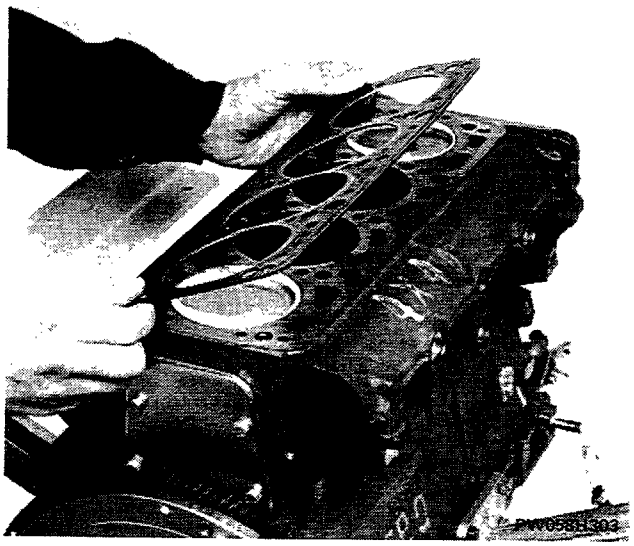
NOTE *Fit a new shim of appropriate thickness to obtain the correct valve clearance.*



Removing camshaft sprockets

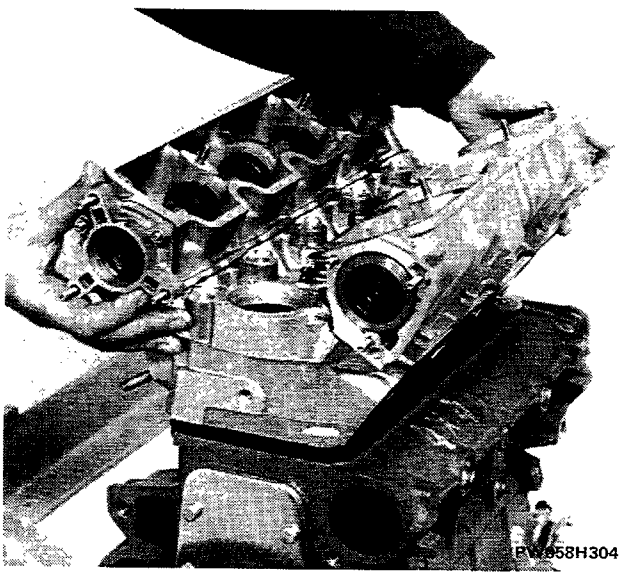


Fitting distributor mounting



Fitting cylinder head gasket

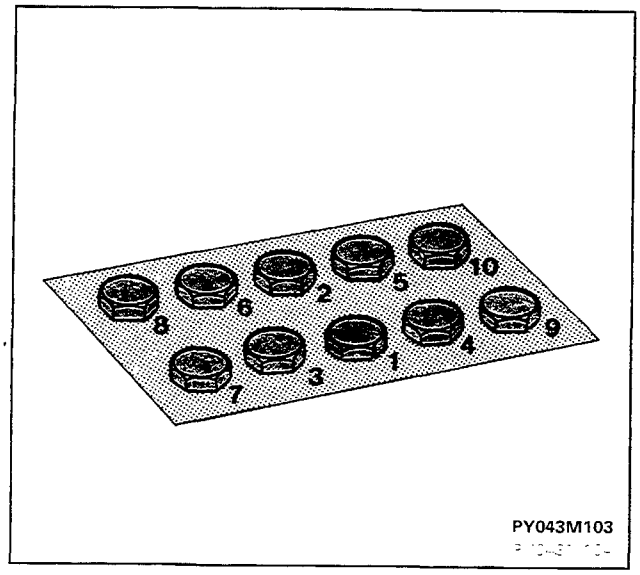
NOTE *Place the cylinder head gasket on the cylinder block with the word "ALTO" facing the fitter.*
This gasket is of the ASTADUR type. Because of the special material from which it is made, it undergoes a polymerization process during engine operation, so it hardens considerably during use.



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

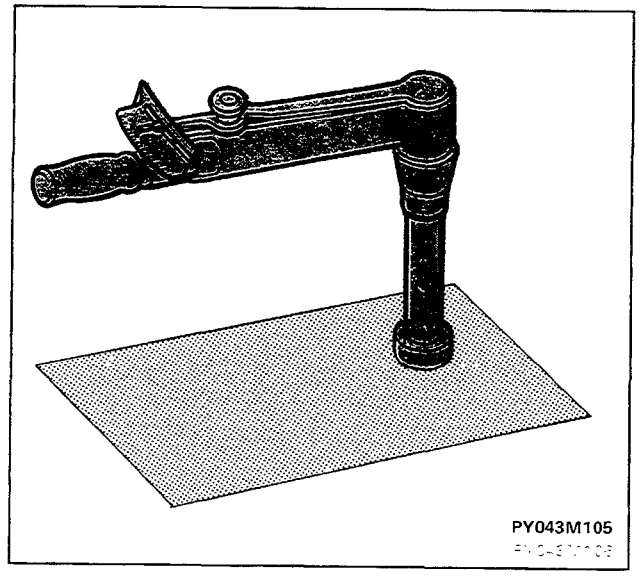


PY043M103

Diagram showing cylinder head bolt tightening sequence

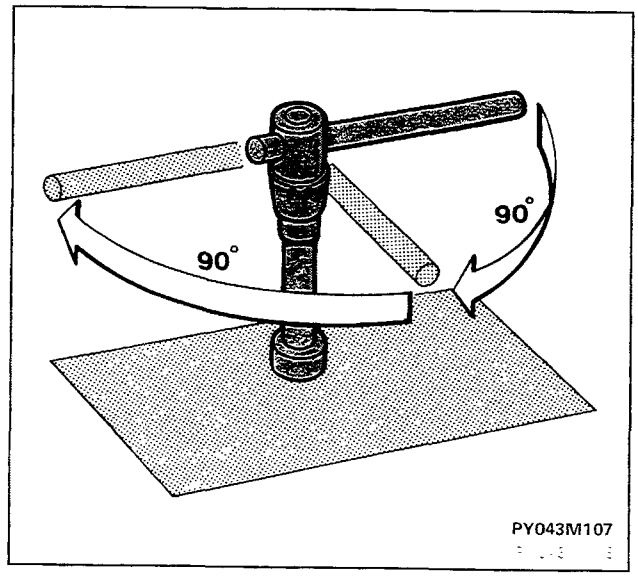
The correct cylinder head bolt tightening procedure is as follows, bearing in mind that for each stage, the tightening sequence is as illustrated:

- lubricate the bolts and washers and allow to drain for at least 30 minutes;


PY043M105

Pretightening cylinder head bolts in two stages with a torque wrench (2 + 2 daNm)

- initially tighten the bolts to 2 daNm;
- tighten to 4 daNm using a torque wrench.



PY043M107

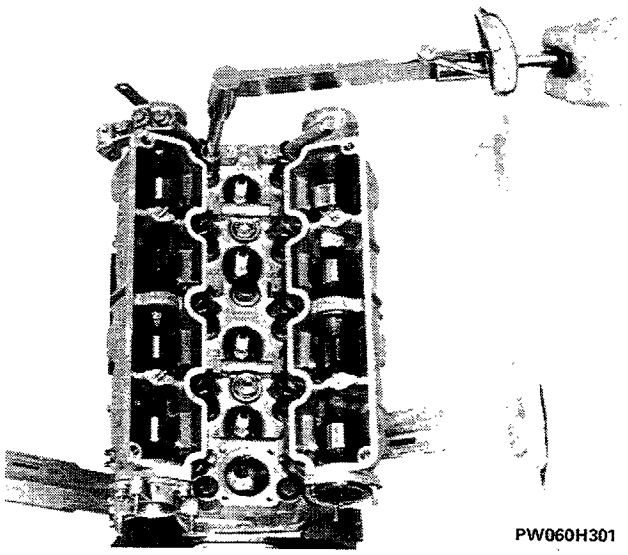
Angle tightening cylinder head bolts in two stages (90° + 90°)

- using an ordinary tommy bar, tighten the bolts again by 180° in two separate stages (90° + 90°), following the correct order for each stage.

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

2000 ie 2000 ie turbo

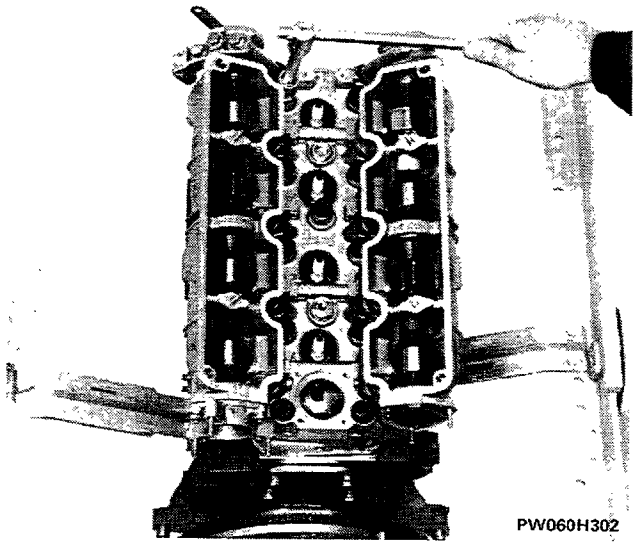
10.



PW060H301

2 + 2 daNm

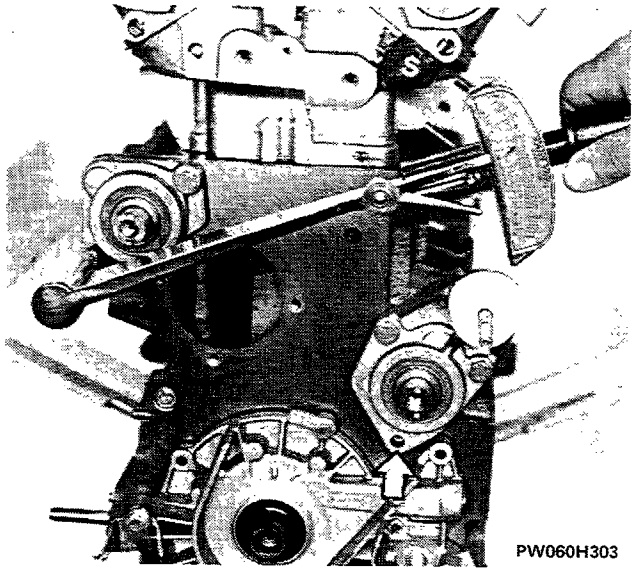
Pretightening cylinder head bolts by torque wrench in two stages (2 + 2 daNm)



PW060H302

90° + 90°

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



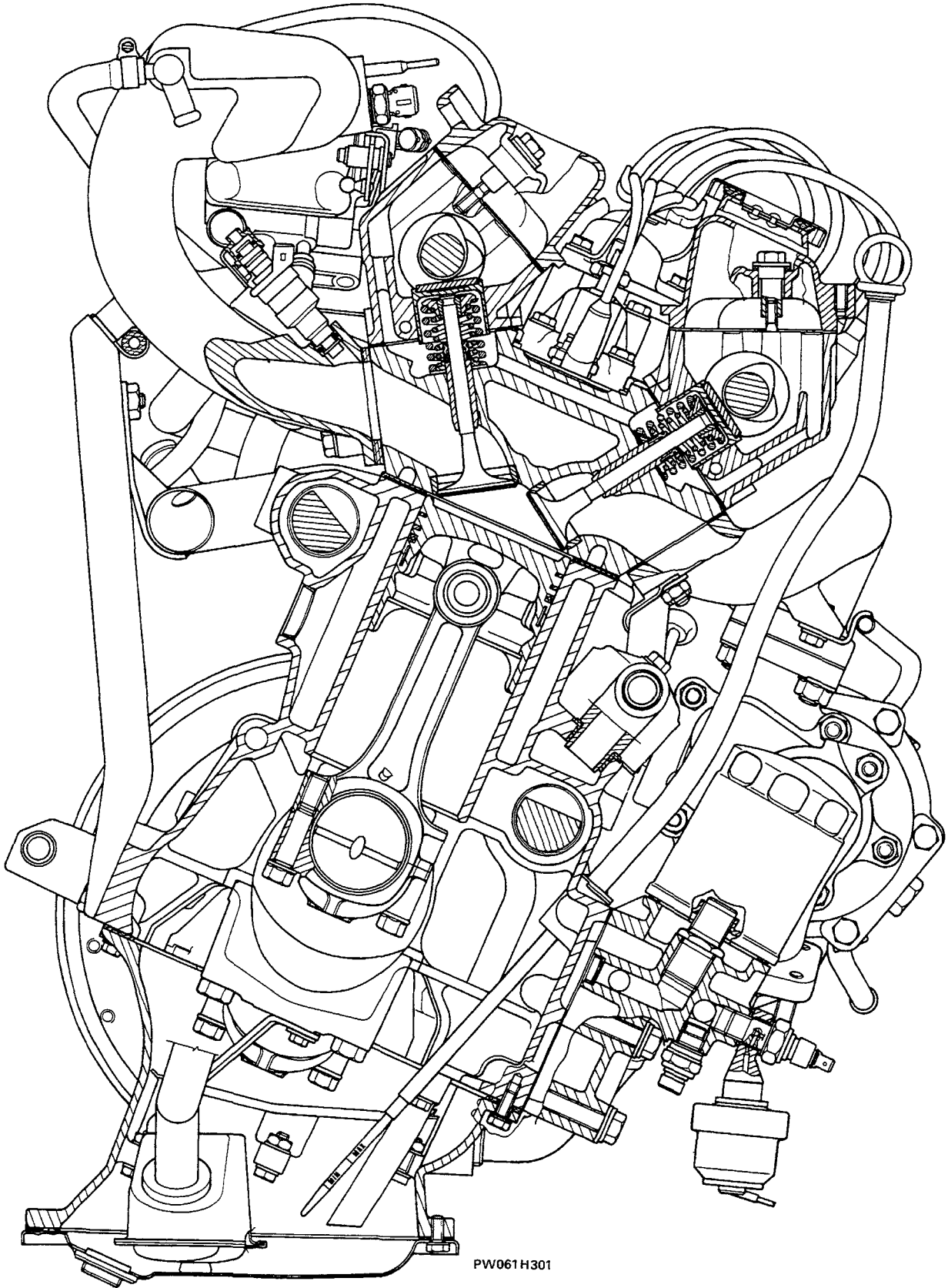
PW060H303

REFITTING VARIOUS COMPONENTS

2,3 daNm

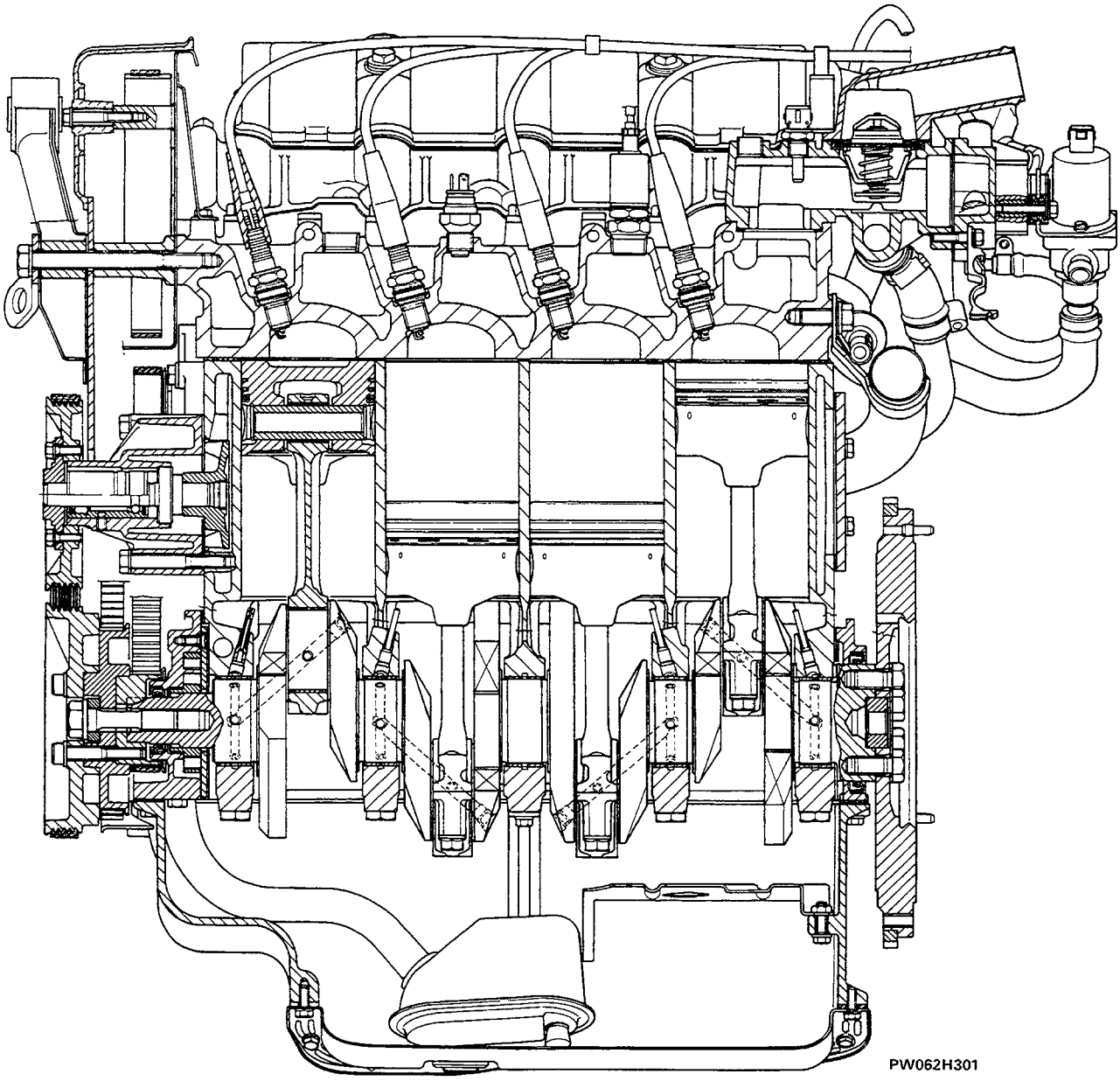
Fitting counter shaft covers and tightening bolts to correct torque

NOTE *The arrows shows the location of the guard bolt, which is fitted subsequently.*

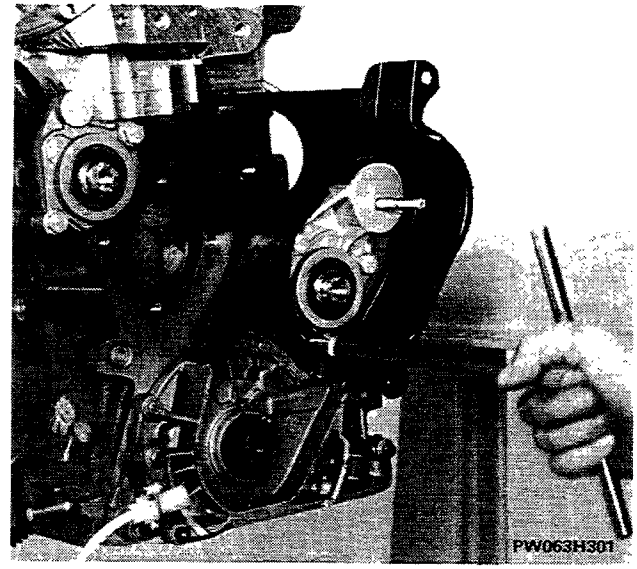


PW061H301

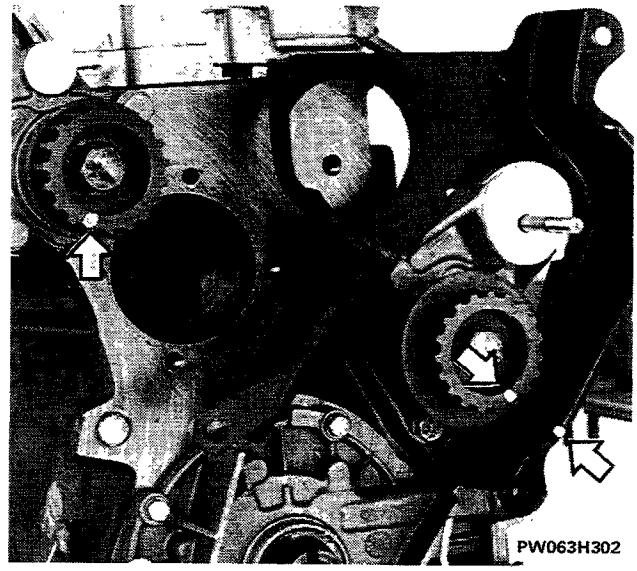
CROSS SECTION 2000 ie turbo



LONGITUDINAL SECTION 2000 ie turbo



Fitting right counter shaft bottom guard

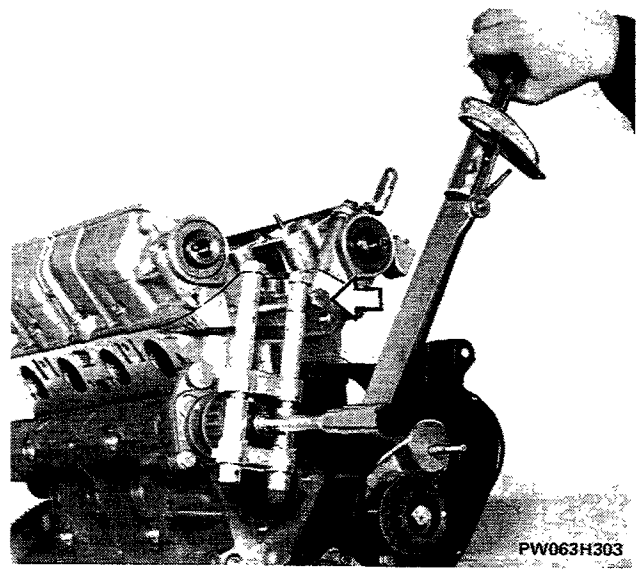


Fitting counter shaft sprockets

When fitting the sprockets on their respective counter shafts, make sure that with the balancing weights facing downwards, the notches on the sprockets are positioned as shown by the arrows in the photo.

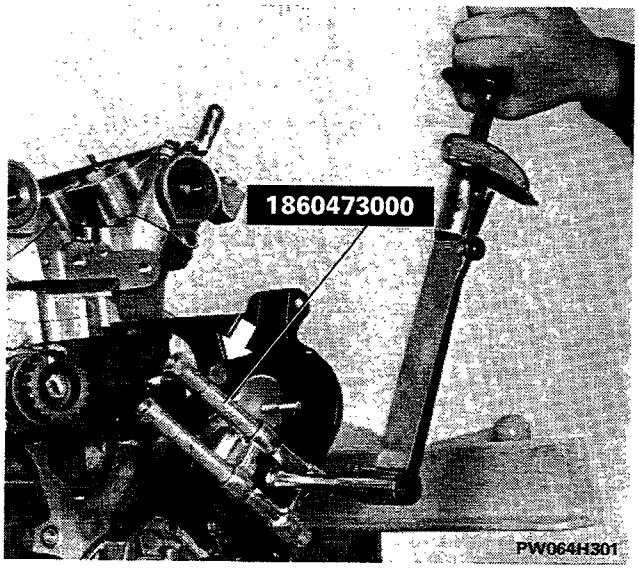
Provisionally tighten the sprocket bolts

11,8 daNm



Tightening left counter shaft sprocket bolt to correct torque

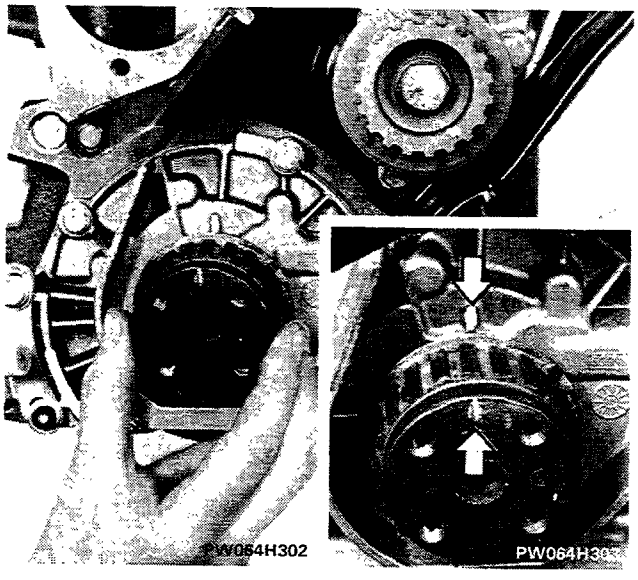
NOTE *As a stop for tool 1860473000, use a bolt, shown by the arrow, screwed into the cylinder head.*



11,8 daNm

Tightening right counter shaft sprocket bolt to correct torque

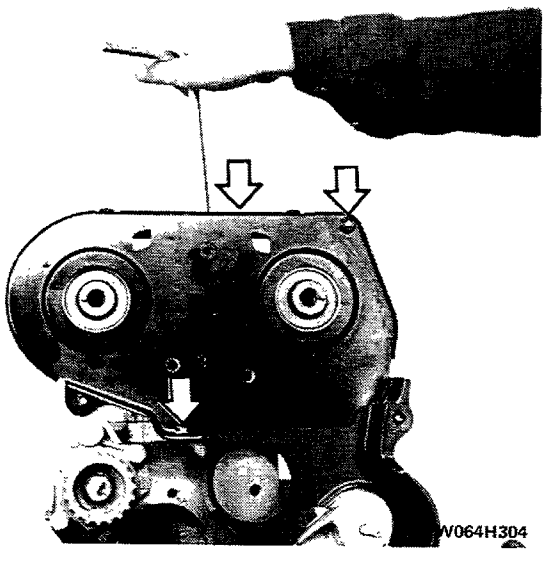
NOTE *As a stop for tool 1860473000, use a bolt, shown by the arrow, screwed into the cylinder block.*



REFITTING TIMING GEAR COMPONENTS

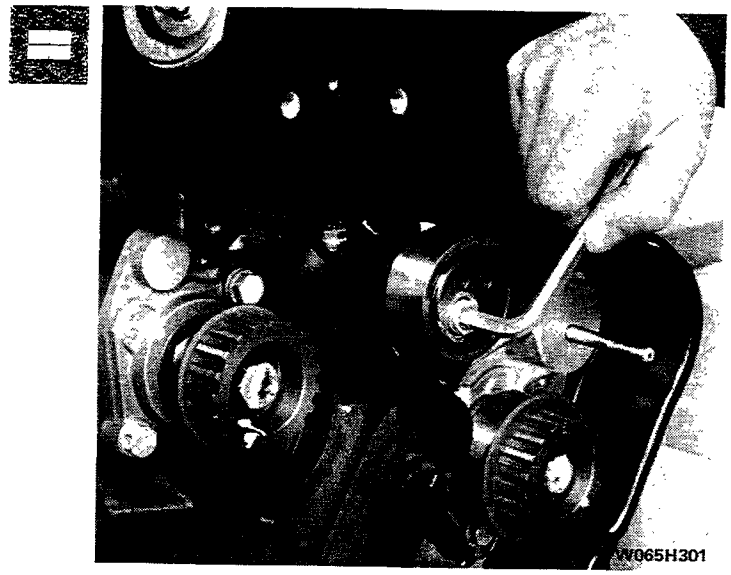
Fitting camshaft sprocket

Turn the crankshaft until the reference mark on the sprocket is lined up with the projection on the front cover, as shown by the arrows in the detail photo.



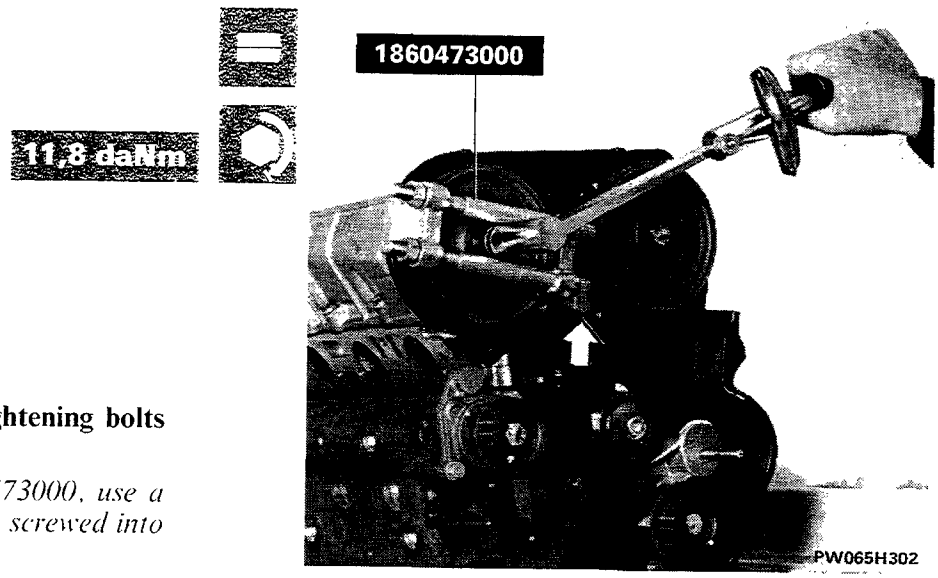
Fitting camshaft sprocket top cover.

NOTE *The arrows show the cover's bolts.*



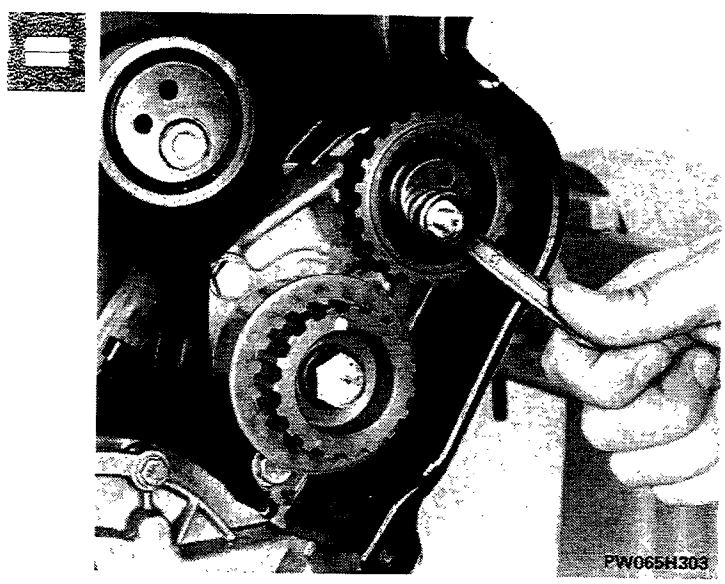
Fitting timing belt tensioner

NOTE *Provisionally tighten the bolt.*



Fitting camshaft sprockets and tightening bolts to correct torque

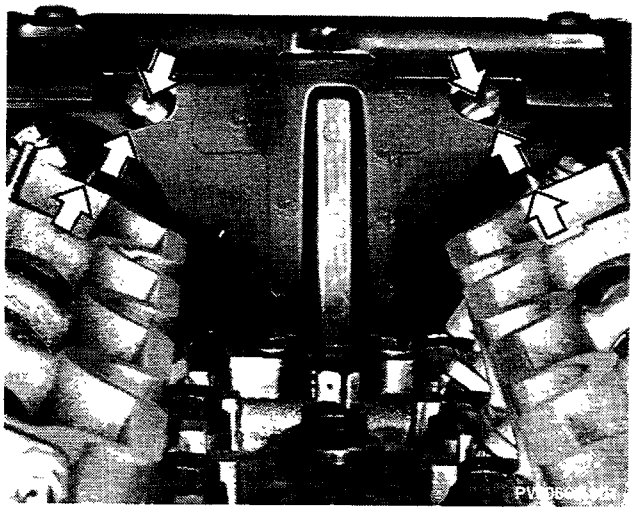
NOTE *As a stop for tool 1860473000, use a bolt, shown by the arrow, screwed into the cylinder head.*



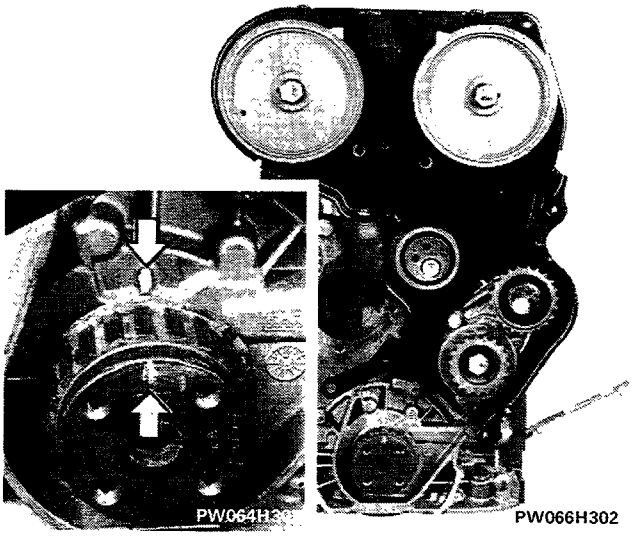
Fitting counter shaft belt tensioner

NOTE *Provisionally tighten the nut.*

ADJUSTING VALVE TIMING

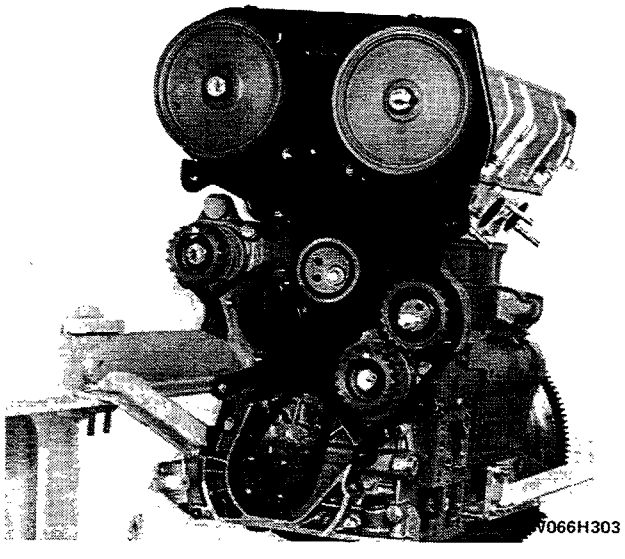


Position the camshaft sprockets so that the notches on the rear of the sprockets line up with the slots on the rear cover and the projections on the upper heads.



Turn the crankshaft until the reference mark on the crankshaft sprocket is lined up with the notch on the front cover.
Then fit the timing belt.

NOTE *Visually check the condition of the timing belt every 40,000 km, and replace it if it is:*
- soaked in oil or coolant;
- cracked or with broken teeth;
- frayed or with a worn tooth profile.
It must be fitted new if removed during repair work.



Fitting timing belt

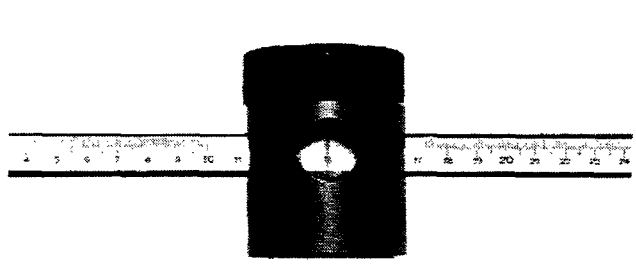
When fitting the timing belt, make sure that the teeth are properly engaged in all the sprockets.

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

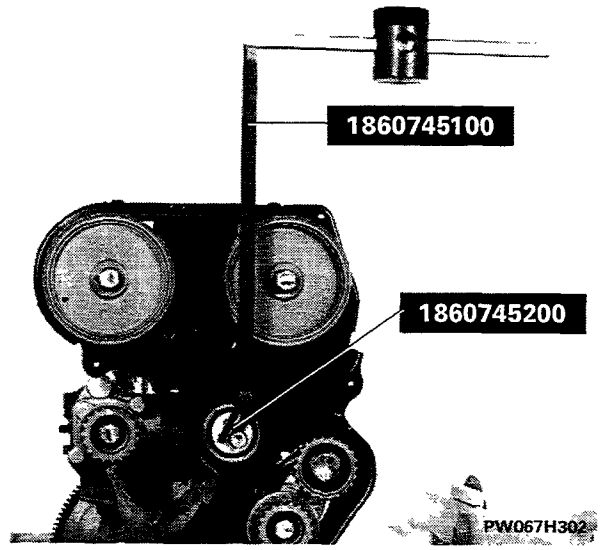
ADJUSTING TIMING BELT TENSION

Fit part 1860745200 to tool 1860745100, then position the weight at 140 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 set the bar on the horizontal.
Allow the belt to bed in by turning the crankshaft two revolutions in its direction of rotationand then tighten the belt tensioner bolt.

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

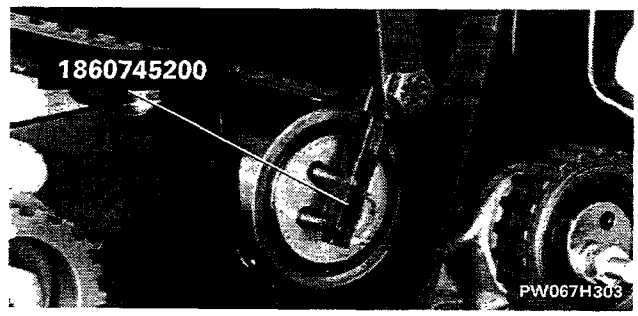


PW067H301



PW067H302

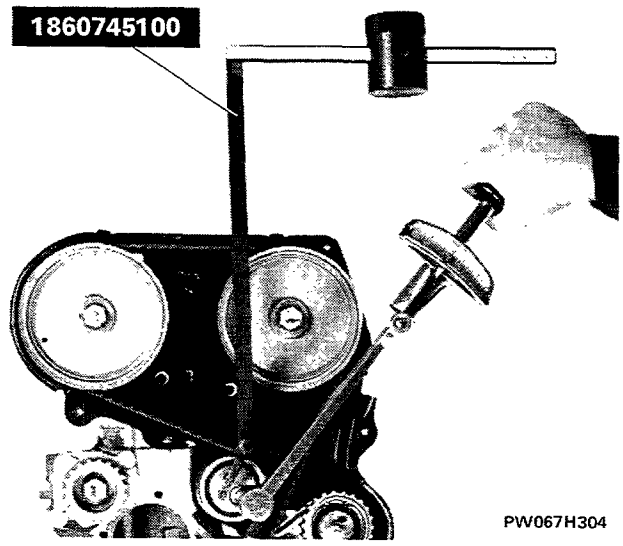
Mounting tool 1860745100 on the belt tensioner



PW067H303

Detail of fitting of tool 1860745200 on belt tensioner

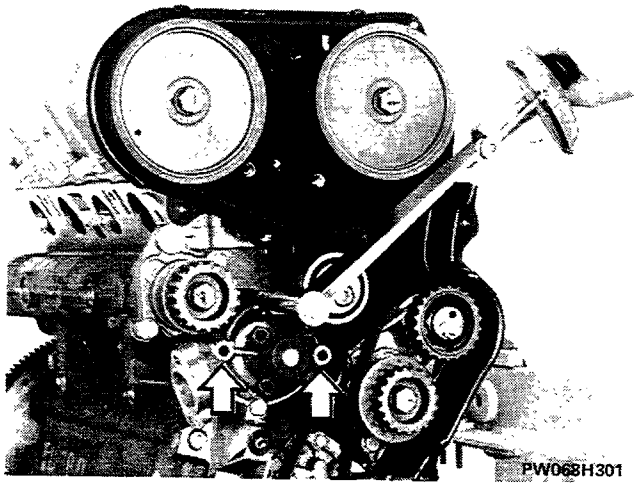
4,4 daNm



PW067H304

Tightening belt tensioner bolt to torque

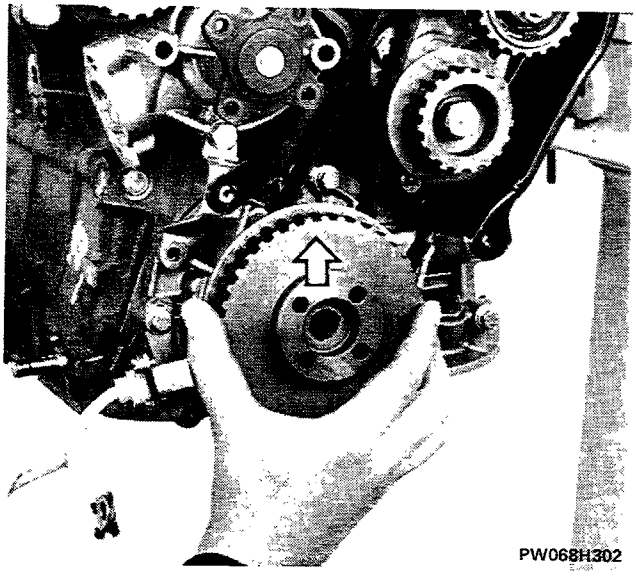
REFITTING VARIOUS COMPONENTS



2,5 daNm

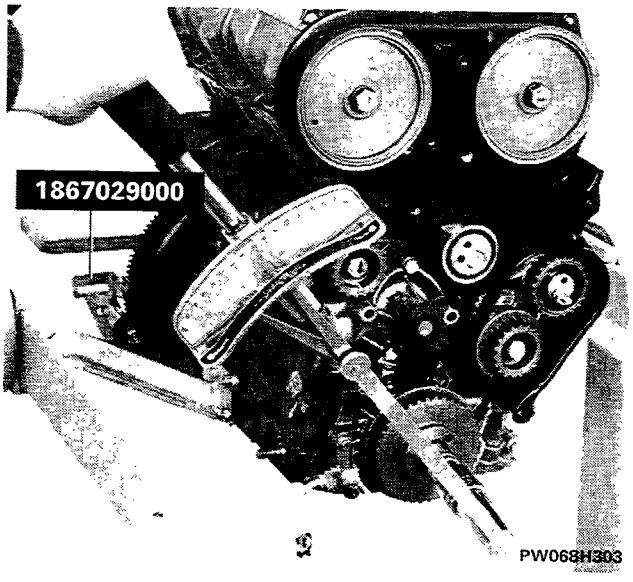
Fitting water pump and tightening its bolts to specified torque

NOTE *The arrows show the locations of the bolts securing the idler gear housing mounting, which are fitted subsequently.*



Fitting counter shaft sprocket

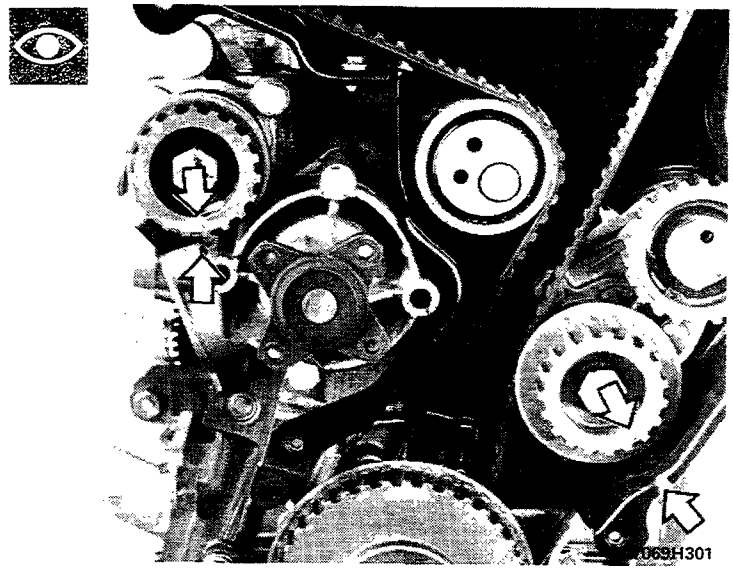
NOTE *Check that the valve timing is correct, and position the counter shaft sprocket so that the reference mark is facing upwards.*



19 daNm

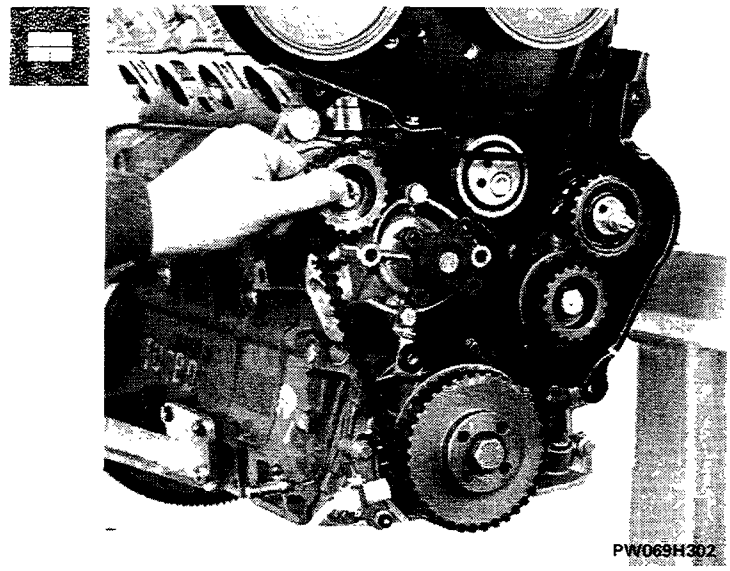
Tightening counter shaft sprocket bolt (left-hand thread) to correct torque

Use flywheel locking tool 1867029000.

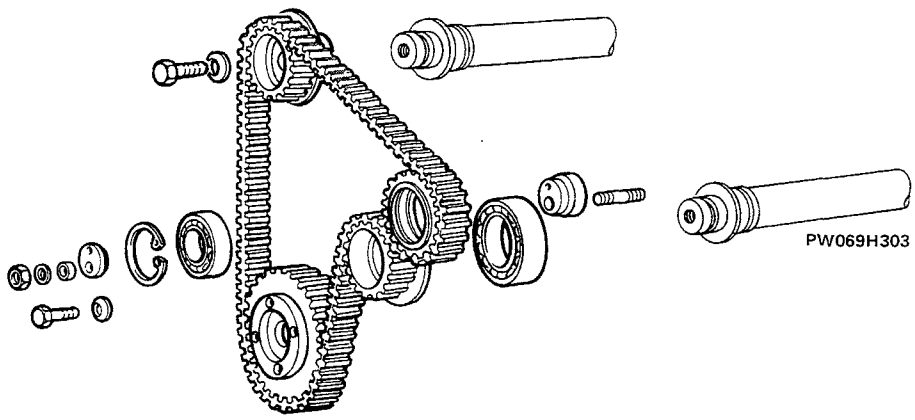


Positioning counter shafts

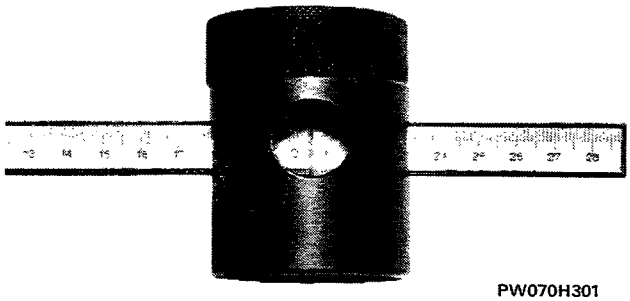
The reference notch on the left sprocket must line up with the projection on the water pump.
The reference notch on the right sprocket must line up with the notch on the counter shaft protective cover.



Fitting counter shaft double-sided toothed belt



Components of the counter shaft drive system


PW070H301

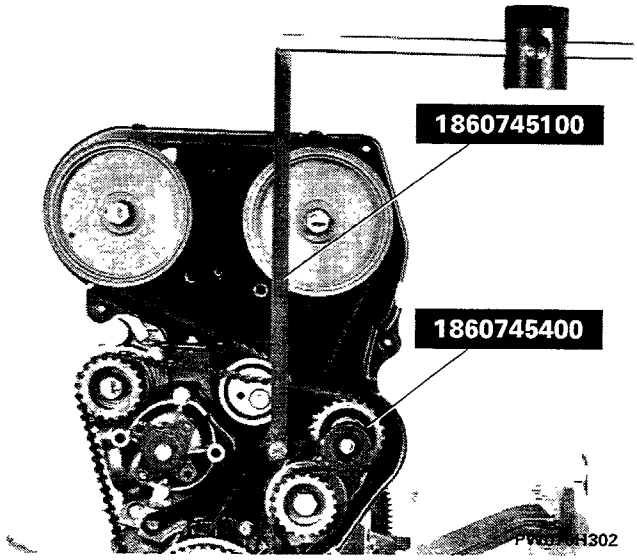
ADJUSTING TENSION OF COUNTER SHAFT DOUBLE-SIDED TOOTHED BELT

Fit part 1860745400 to tool 1860745100, then position the weight at 205 mm on the graduated scale and secure it.

Mount the tool thus prepared on the belt tensioner as illustrated in the photo, and adjust the joint to set the bar on the horizontal.

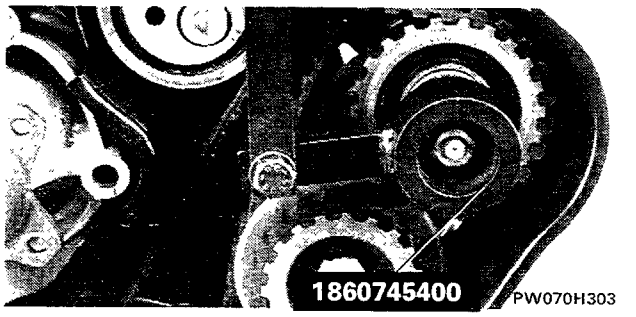
Allow the belt to bed in by turning the crankshaft two revolutions in its direction of rotation and tighten the belt tensioner bolt.

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.*



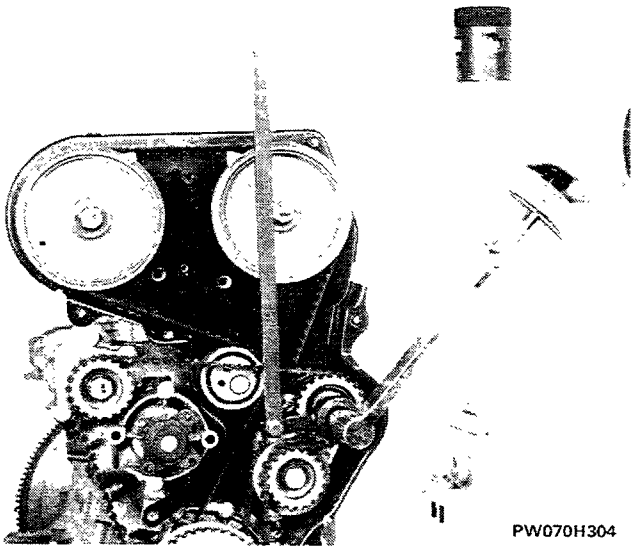
PW070H302

Fitting tool 1860745100 to belt tensioner



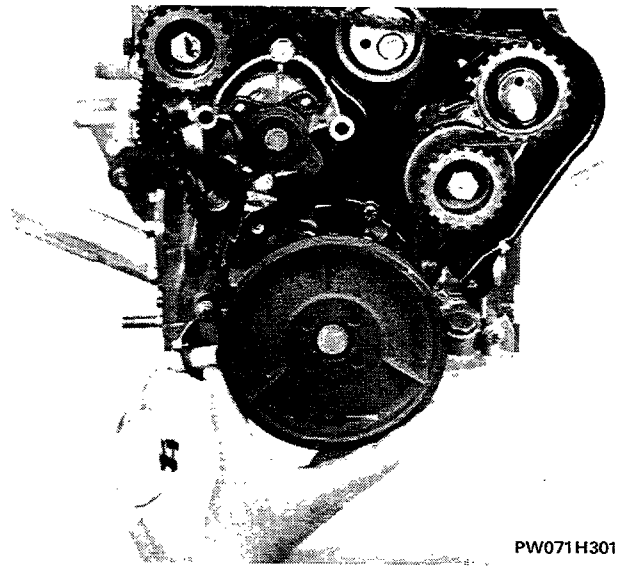
PW070H303

Detail of fitting of tool 1860745400 to belt tensioner


PW070H304

Tightening belt tensioner bolt to torque

COMPLETION OF ASSEMBLY



PW071H301

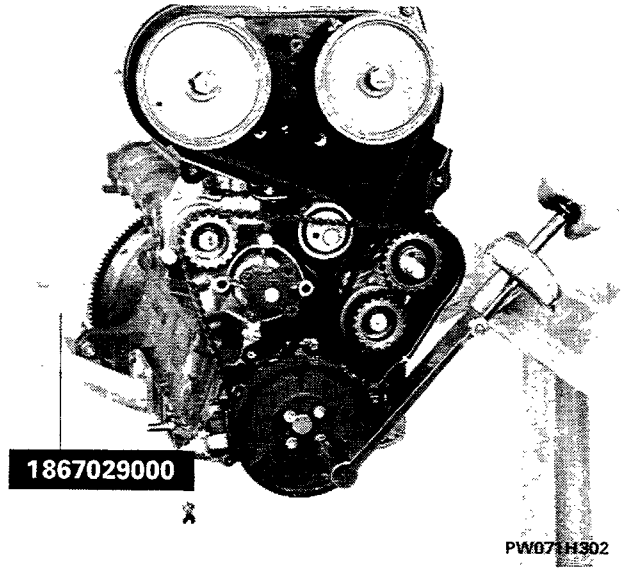
Fitting water pump pulley

2,5 daNm

Tightening water pump pulley bolts to correct torque

Use the flywheel locking tool 1867029000.

After this operation, remove the flywheel locking tool 1867029000.

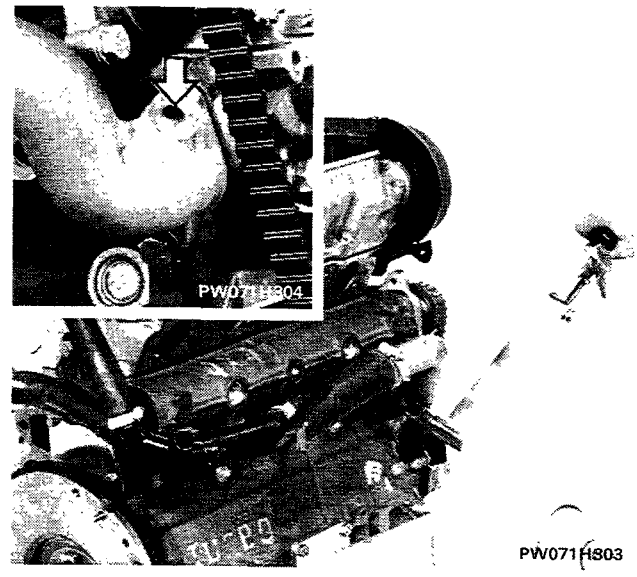


PW071H302

M8: 2,5 daNm
M10: 4,3 daNm

Fitting water pump pipe and tightening bolts to correct torque

NOTE *The arrow in the detail photo indicates the location of the bolt to be fitted subsequently, which secures the pipe, belt side cover and wiring bracket for the rpm and TDC sensor.*

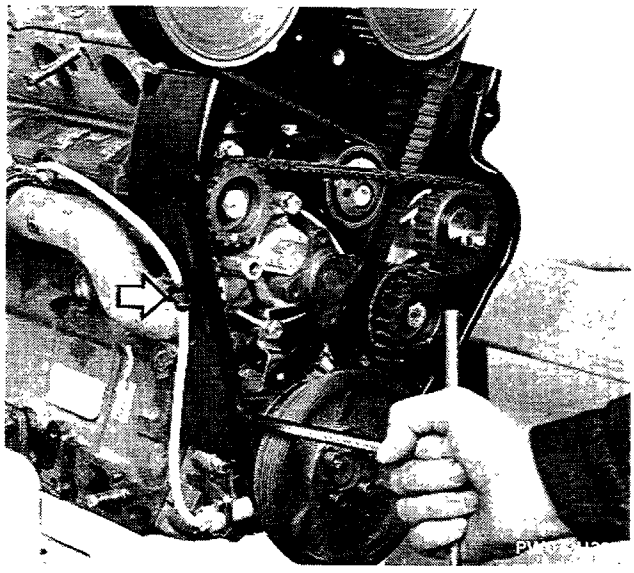


PW071H304

PW071H303

2000 ie 2000 ie turbo

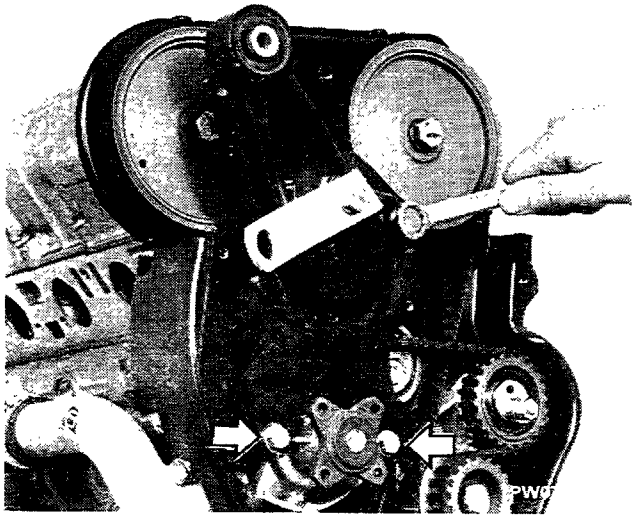
10.



2.5 daNm

Fitting timing gear side cover

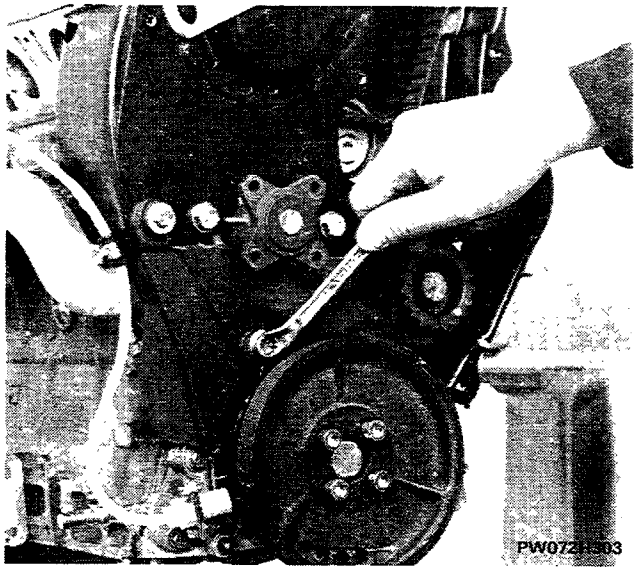
NOTE *The arrow shows the bolt to be tightened to a torque of 2.5 daNm.*



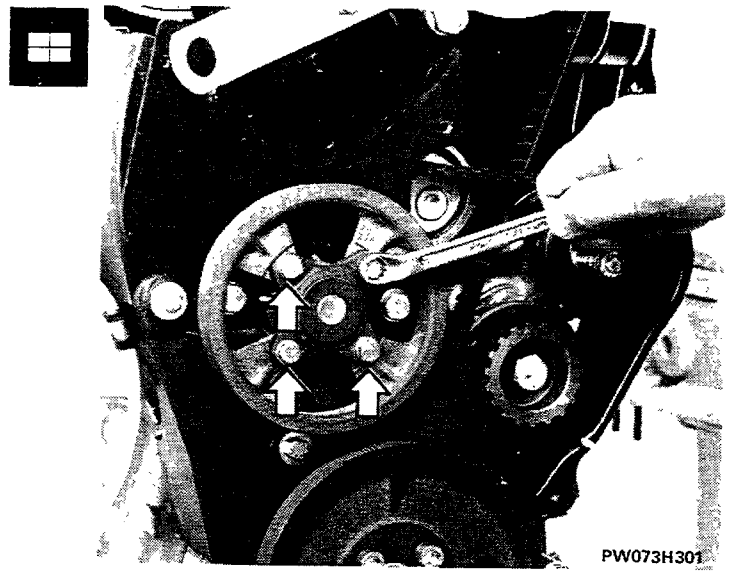
2,5 daNm

Fitting idler gear housing mounting

Tighten to 2.5 daNm the bolts shown by the arrows, which secure both the mounting and the water pump to the cylinder block.

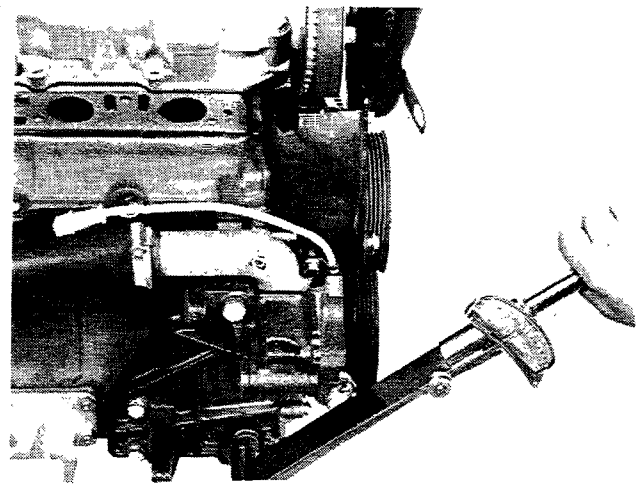


Fitting water pump bottom cover

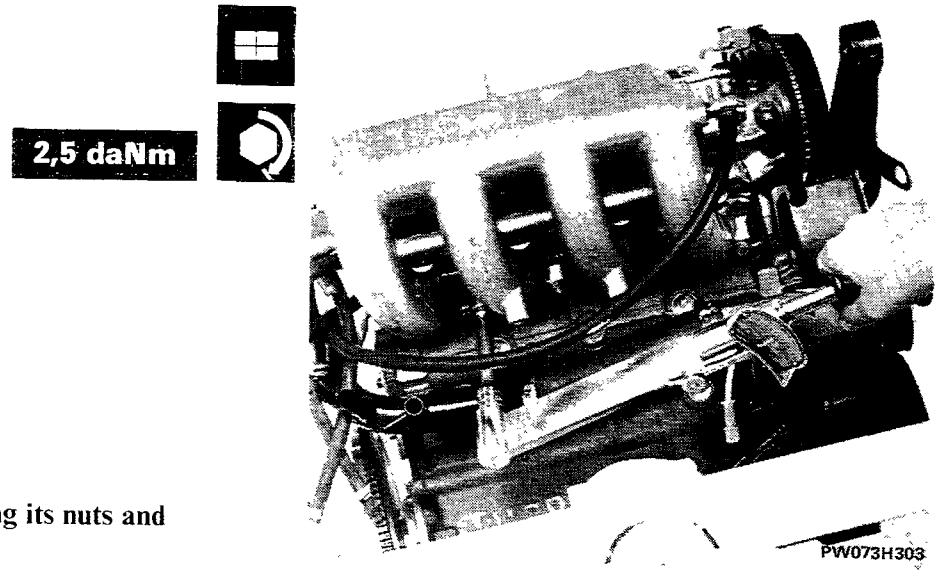


Fitting water pump pulley

NOTE *Tighten the pulley bolts using the necessary counteracting force.*



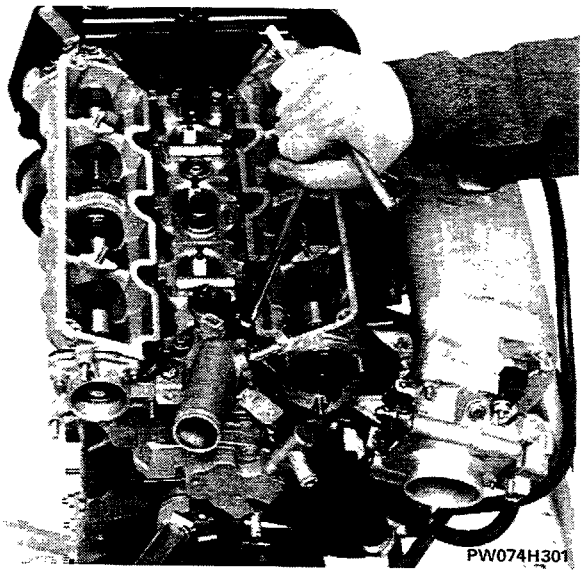
Fitting alternator bracket and tightening its nut and bolts to correct torque



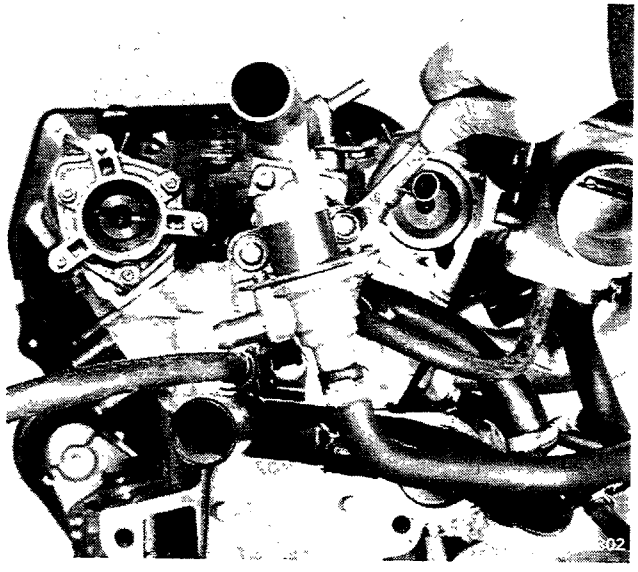
Fitting inlet manifold and tightening its nuts and bolts to correct torque

2000 ie 2000 ie turbo

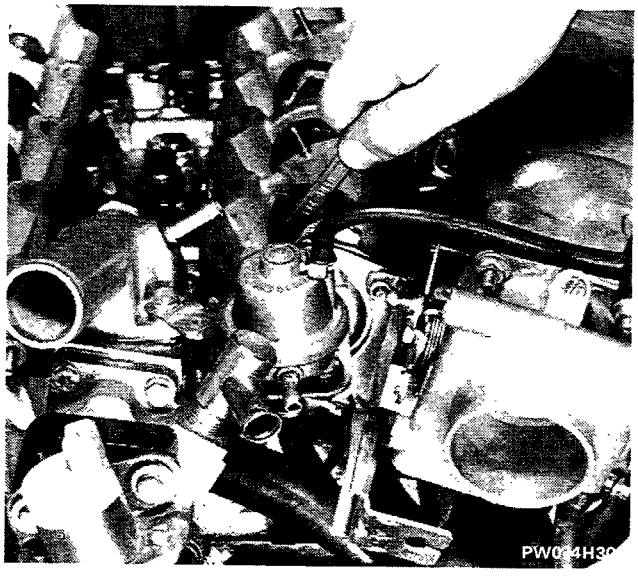
10.



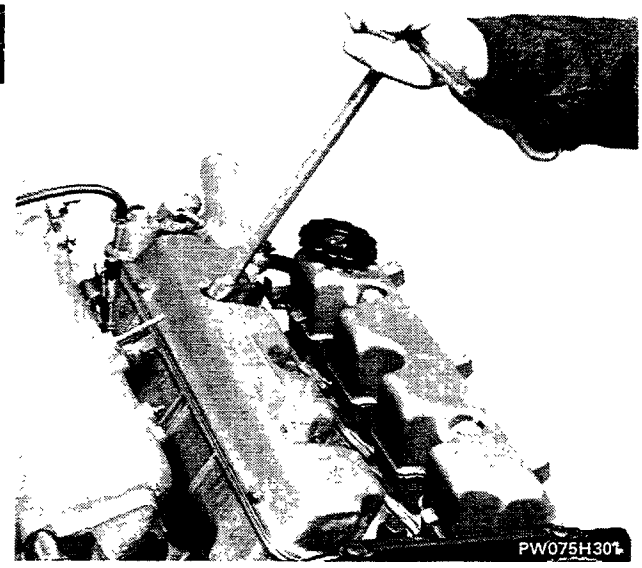
Fitting thermostat assembly to cylinder head



Fitting auxiliary air solenoid for automatic idle adjustment



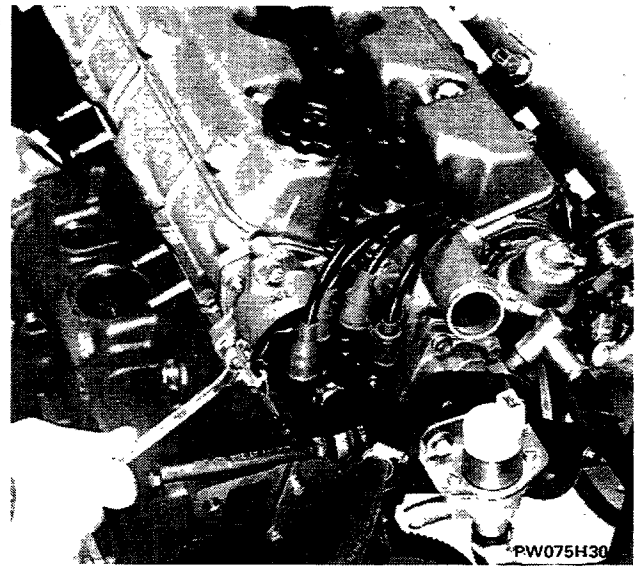
Fitting fuel pressure regulator



Fitting rocker covers

Fitting distributor

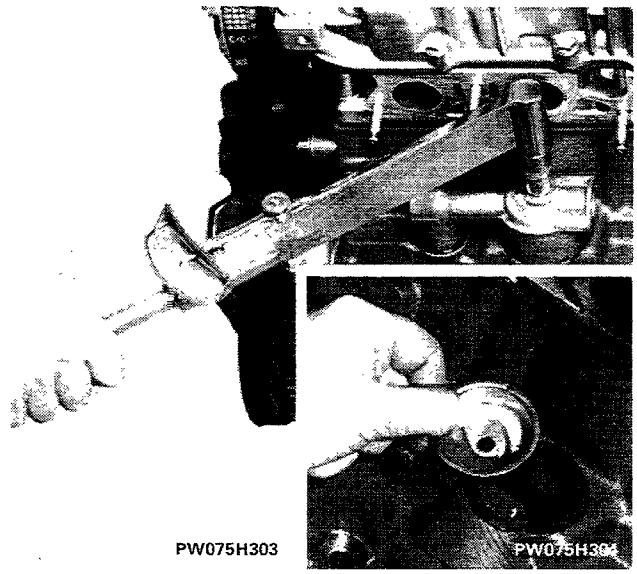
Before fitting the distributor in its mounting, line up the rotor arm halfway point with the reference notch on the dust cover under the distributor cap.
The engine's piston n° 1 should be at TDC on the power stroke.



2,3 daNm

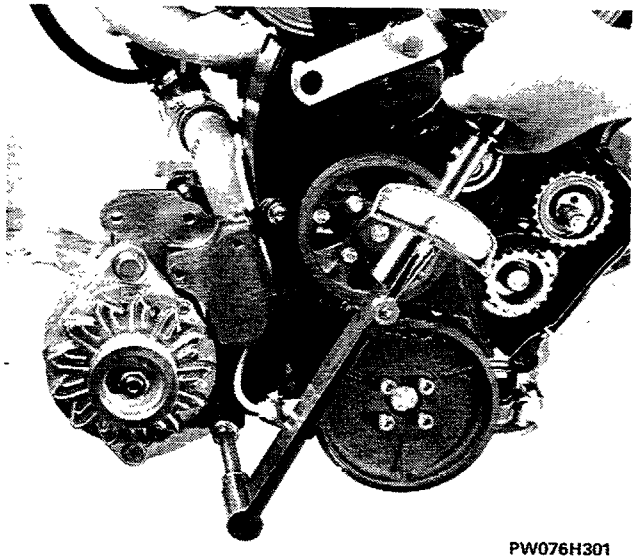
Fitting crankcase breather and tightening bolt to correct torque

NOTE *The pipe should be fitted after the exhaust manifold.*



2000 ie 2000 ie turbo

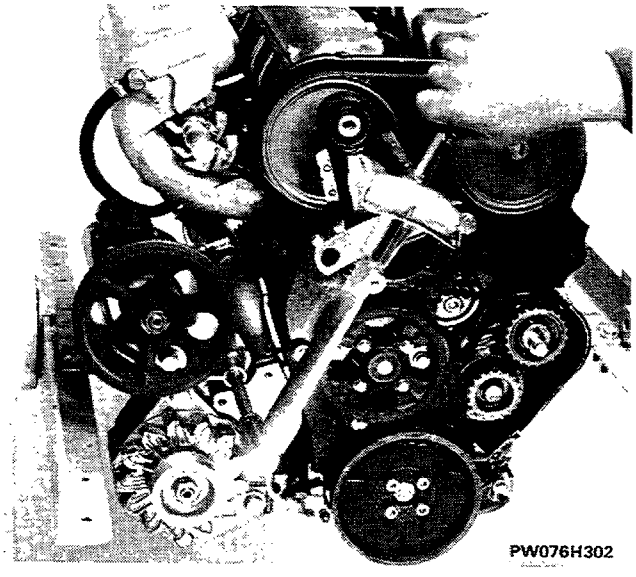
10.



PW076H301

M10: 4,3 daNm
M12: 6,9 daNm

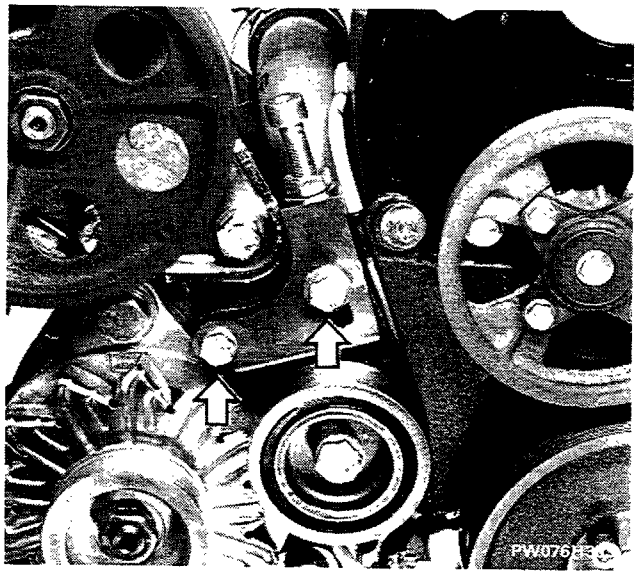
Fitting alternator and tightening its bolts to correct torque



PW076H302

M8: 2 daNm
M10: 4,3 daNm

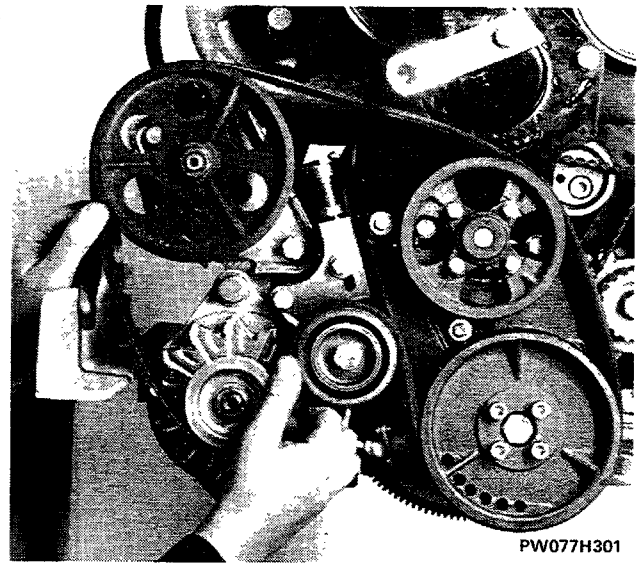
Fitting power steering pump and tightening its bolts to correct torque



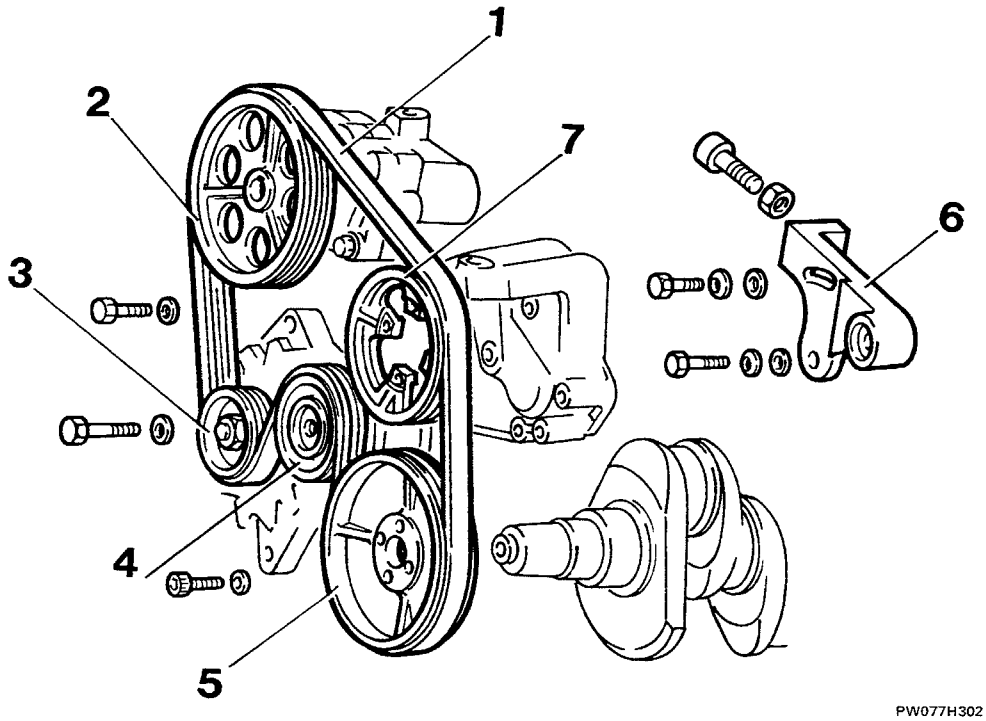
PW076E33

Fitting belt tensioner for alternator, water pump and power steering pump poly-V belt

NOTE *Provisionally tighten the two bolts shown by the arrows.*


PW077H301

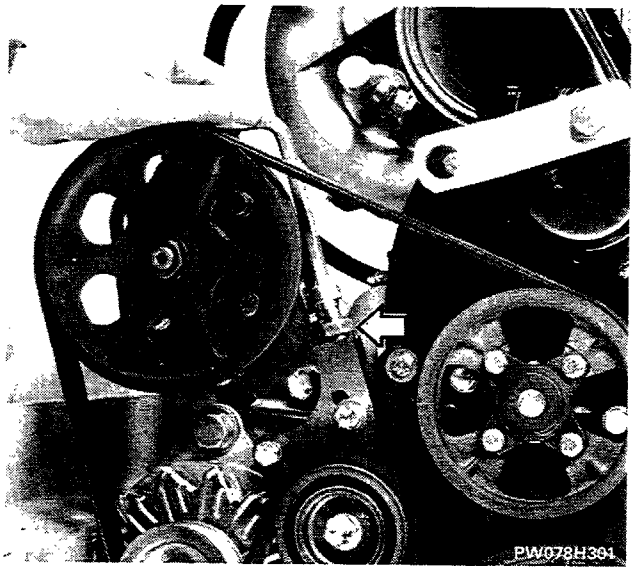
Fitting alternator, water pump and power steering pump poly-V drivebelt



PW077H302

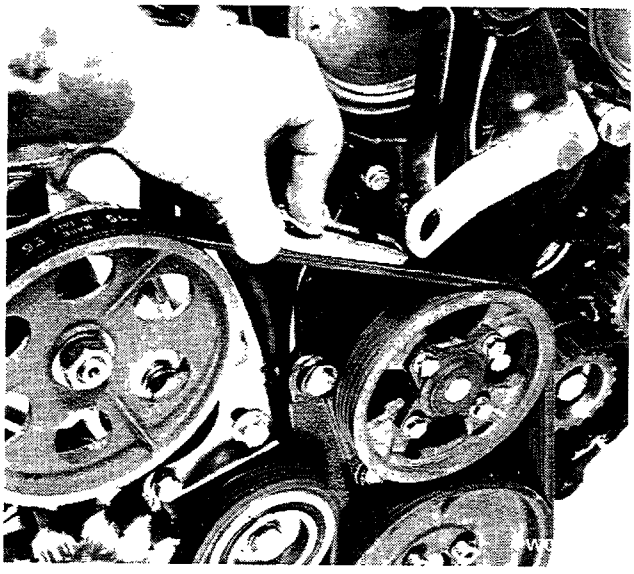
Components of the alternator, water pump and power steering pump drive system

1. Poly-V belt
2. Power steering pump pulley
3. Alternator pulley
4. Belt tensioner
5. Drive pulley
6. Belt tensioner mounting
7. Water pump pulley



Adjusting tension of alternator, water pump and power steering pump poly-V drivebelt

NOTE *Adjust the tension by means of the adjusting bolt, as shown in the photo, then tighten the lock nut as indicated by the arrow.*

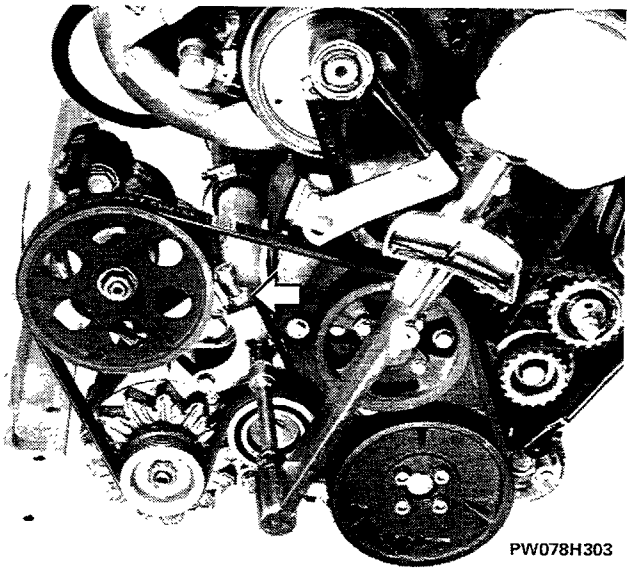


Checking tension of alternator, water pump and power steering pump poly-V belt

Check using tool 1895762000 that the belt tension is between 500 and 600 N.

Periodically check the belt every 20.000-30,000 km, and if the tension is below 250 N, retighten to 350 - 450 N.

The periodical checks on belt tension should be carried out when the engine is cold.

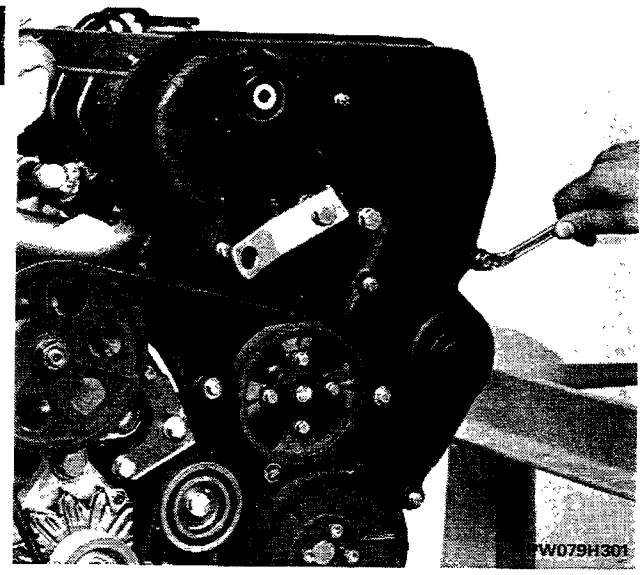


M8: 2,3 daNm
M10: 4,4 daNm

Tightening alternator, water pump and power steering pump poly-V belt tensioner bolts to correct torque

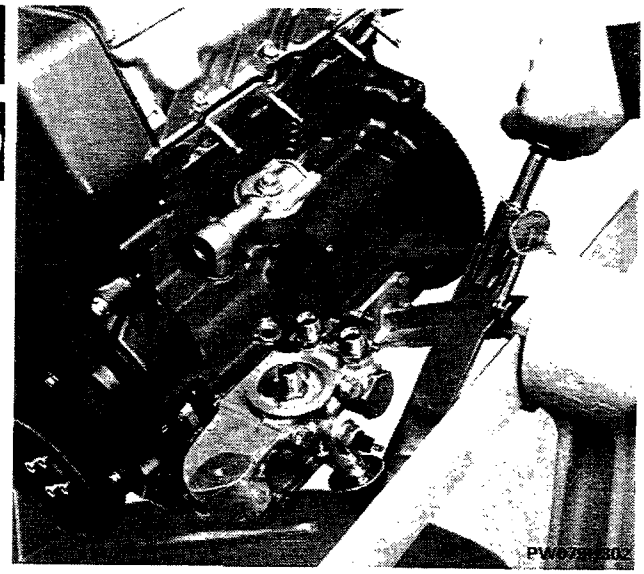
NOTE *The arrow shows the lock nut for the belt tension adjustment bolt, which should be tightened to the specified torque after the belt tension has been checked.*

Remove tool 1860744000 for rotating the flywheel.

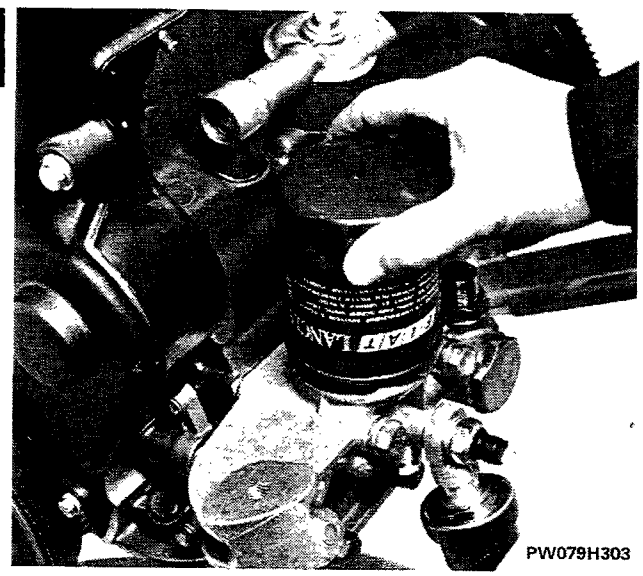


Fitting timing belt front cover

4,3 daNm



Fitting oil filter mounting and tightening its bolts to the correct torque



Fitting cartridge oil filter

NOTE *Before fitting the oil filter, lubricate the seal with engine oil then screw it into its mounting by hand.*

2000 ie 2000 ie turbo

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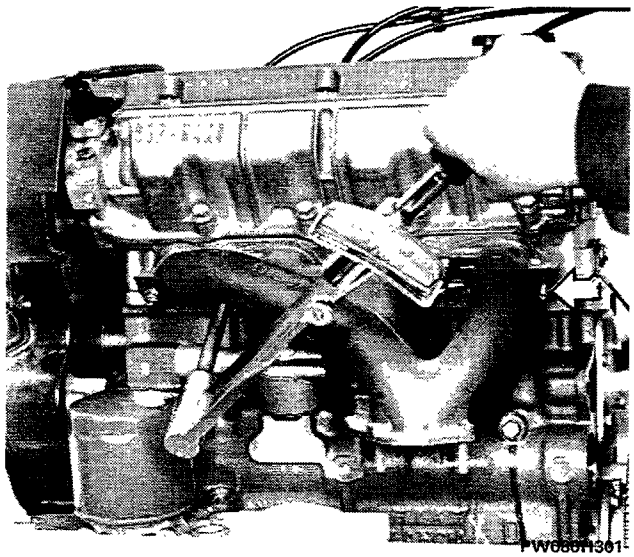
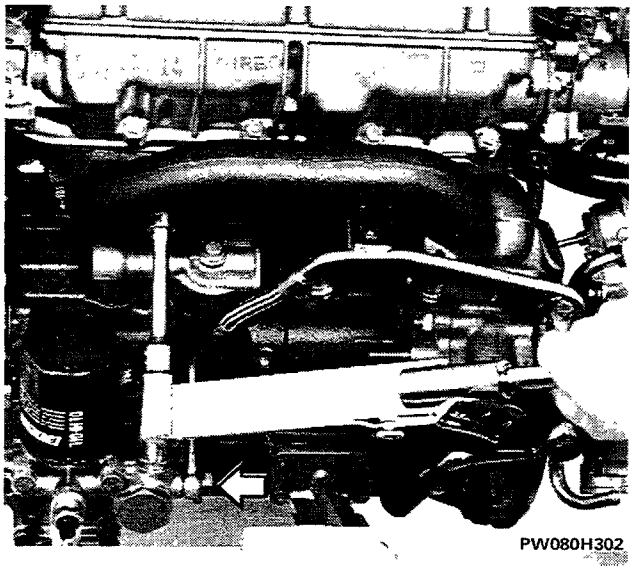


2000 ie

2,9 daNm

Fitting exhaust manifold and tightening its nuts to the correct torque

NOTE *One stud (arrowed) is left without its nut, this should be torque tightened after fitting the crankcase breather pipe.*

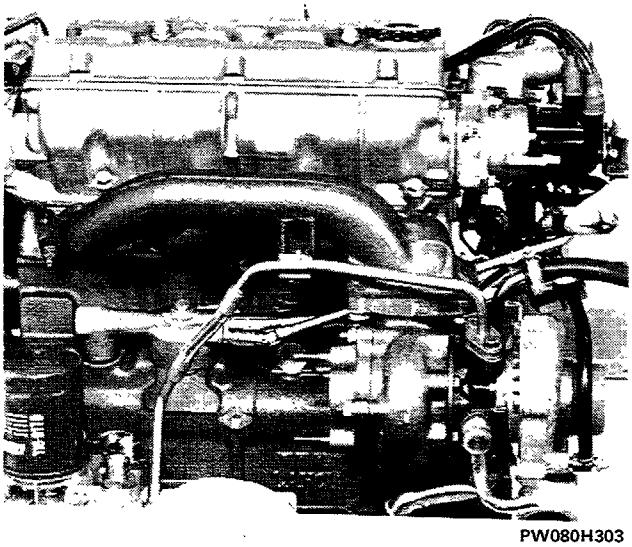


2000 ie turbo

M8: 2,9 daNm
M10: 5,9 daNm

Fitting exhaust manifold complete with turbocompressor and tightening its nuts to correct torque

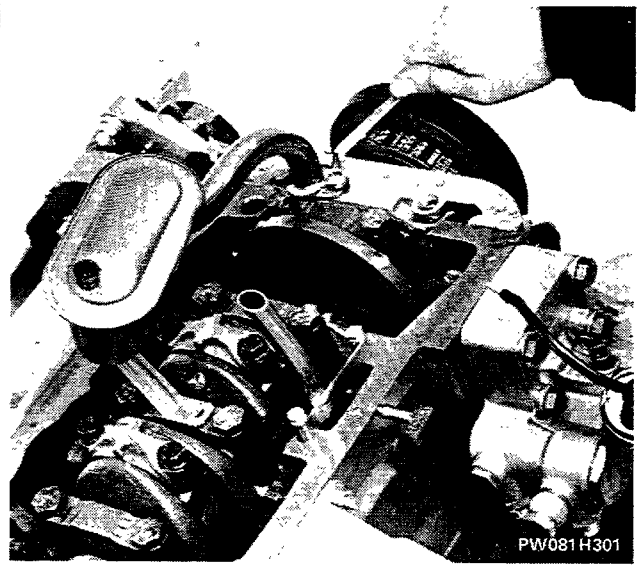
NOTE *The arrow shows the bolt securing the oil delivery pipe to the turbocompressor, which should be tightened to a torque of 2.3 daNm.*



2,9 daNm

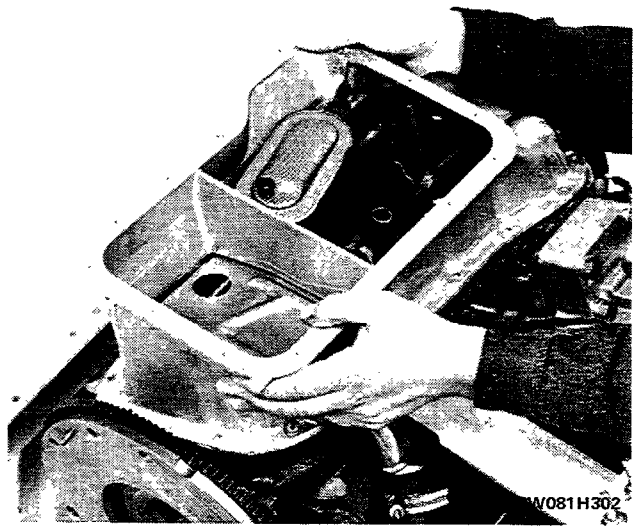
Fitting crankcase breather

Fitting oil pump strainer and crankcase breather pipe on cylinder block

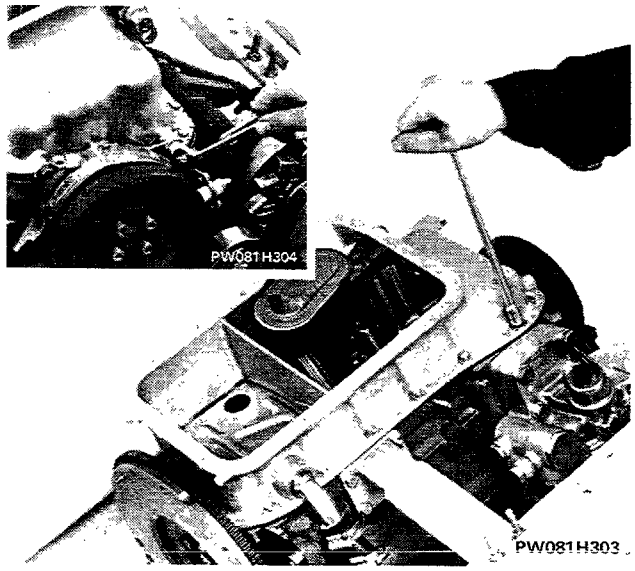


Fitting oil sump and gasket

NOTA *To position the oil sump on the cylinder block without damaging the oil pump strainer, make a rotary movement and then lay it down.*

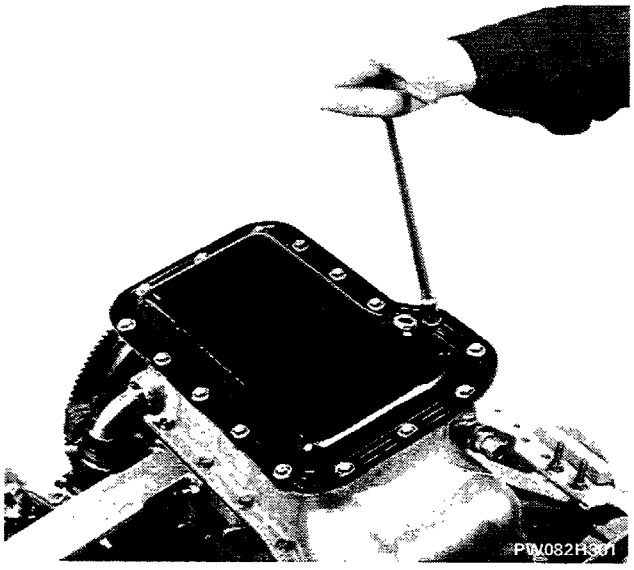


Tightening oil sump bolts on cylinder block and fitting timing belt bottom cover onto sump.

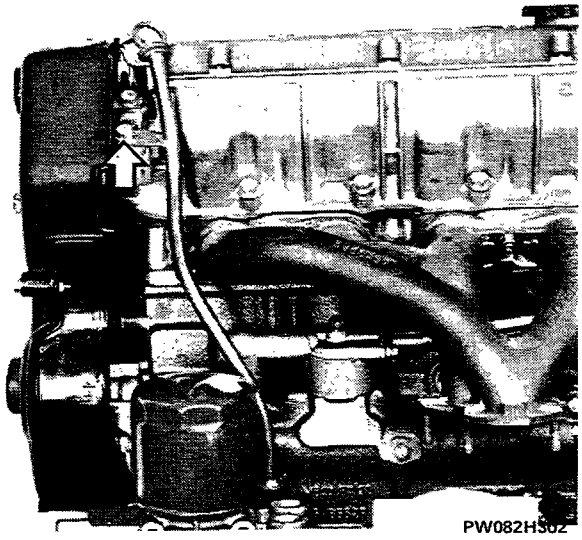


2000 ie 2000 ie turbo

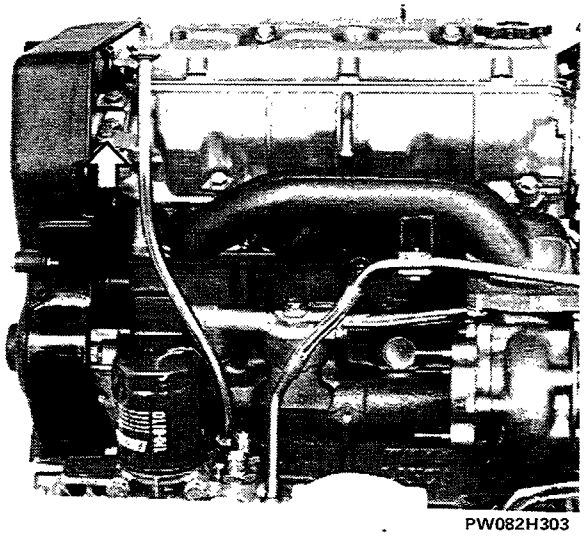
10.



Fitting oil sump cover



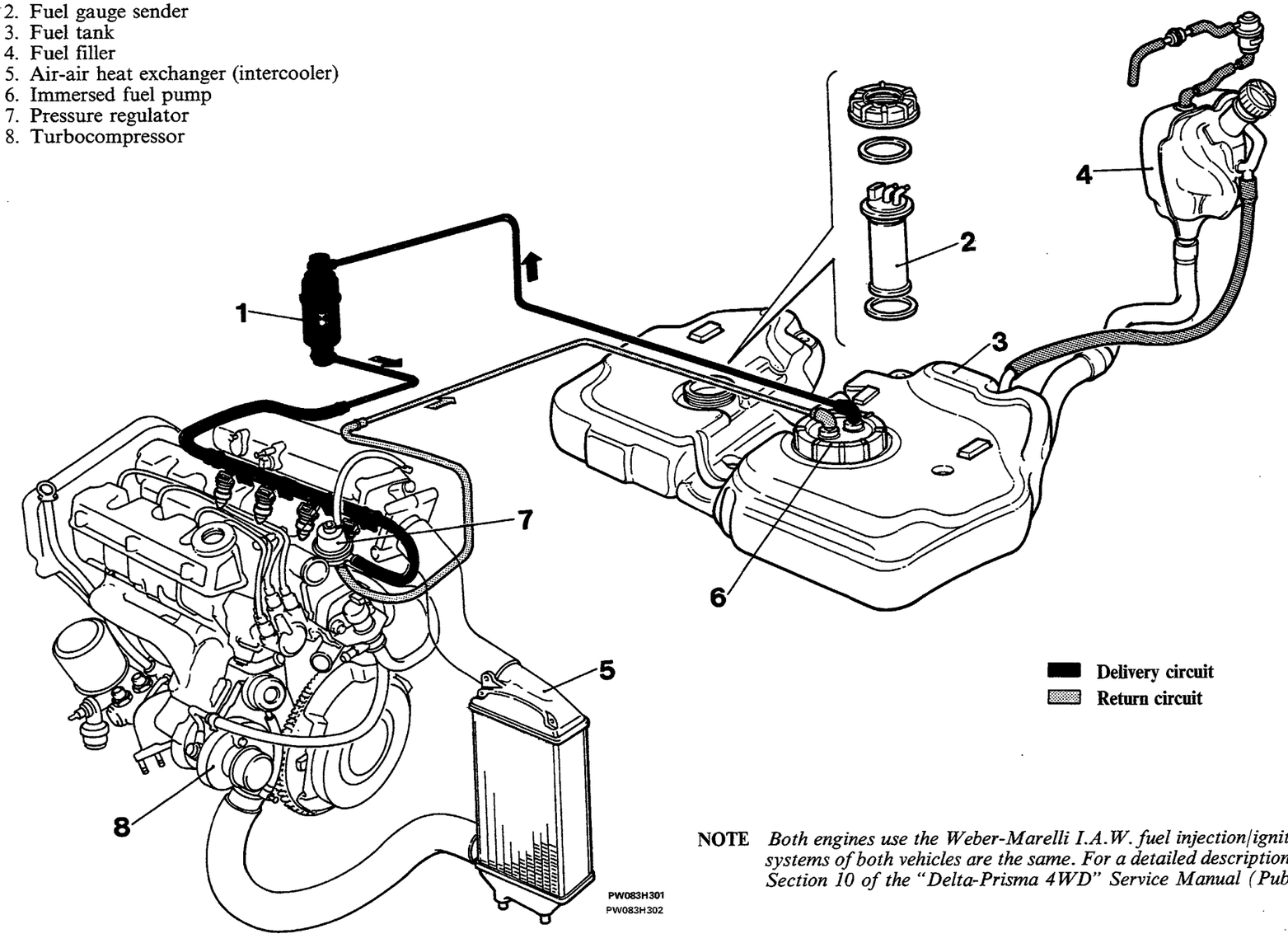
Fitting oil dipstick



Fitting oil dipstick

DIAGRAM OF FUEL SYSTEM
(diagram shows fuel system of DELTA 4WD)

1. Fuel filter
2. Fuel gauge sender
3. Fuel tank
4. Fuel filler
5. Air-air heat exchanger (intercooler)
6. Immersed fuel pump
7. Pressure regulator
8. Turbocompressor

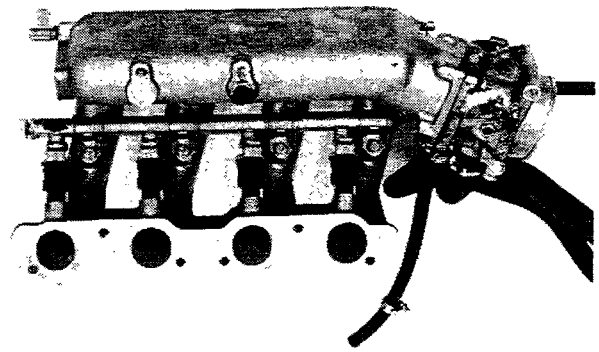


NOTE *Both engines use the Weber-Marelli I.A.W. fuel injection/ignition system, so the fuel systems of both vehicles are the same. For a detailed description of the system, refer to Section 10 of the "Delta-Prisma 4WD" Service Manual (Publication n° 504.787).*

General information

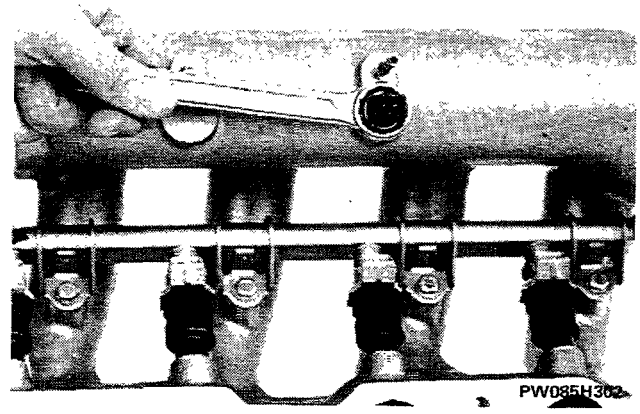
The fuel supply is provided by an electric fuel pump (6) immersed in the tank (3); this pump draws the petrol and delivers it to the filter (1) and then to the injectors. The fuel delivery pressure to the injectors is maintained constant and proportional to the inlet manifold pressure by a pressure regulator (7). This device is particularly important in the case of the turbocharged engine, in order to maintain a constant pressure differential for the injector, whatever the pressure delivered by the turbocompressor (8). Excess petrol flows back unpressurized from the pressure regulator (7) into the tank (3).

REMOVING/REFITTING INLET MANIFOLD



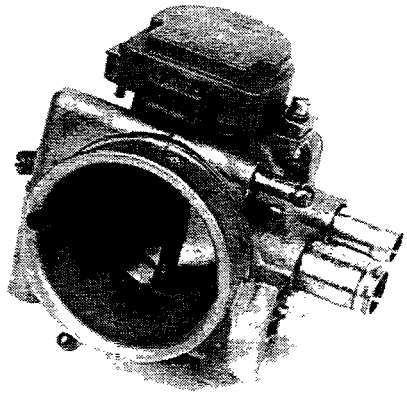
PW085H301

- Inlet manifold assembly

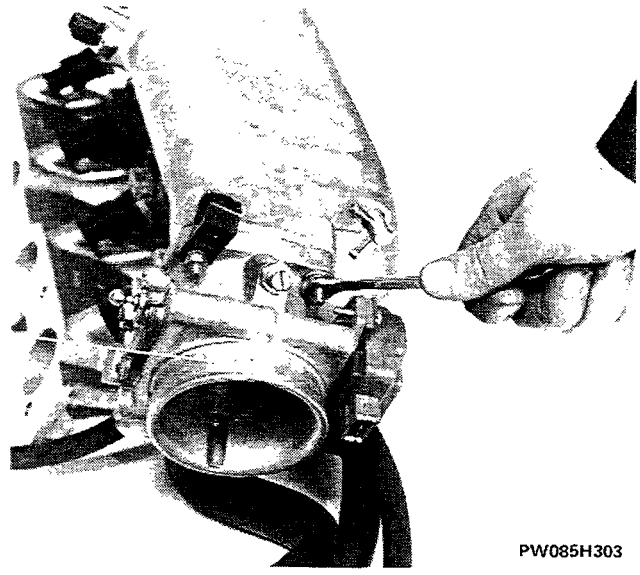


PW085H302

- Removing/refitting air temperature sensor in manifold

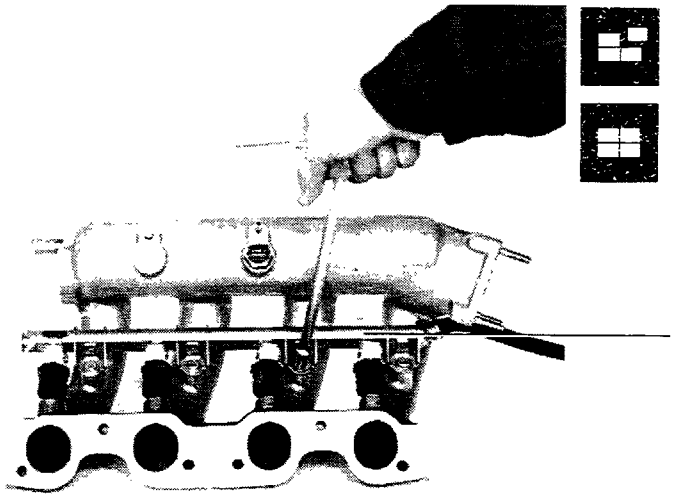


PW085H304

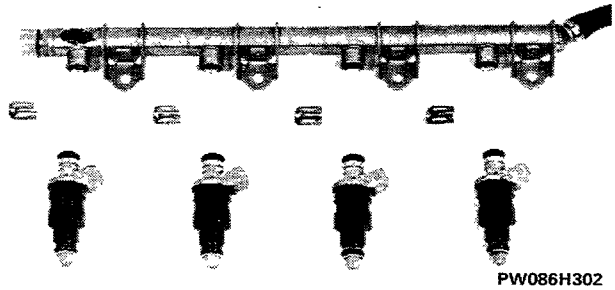


PW085H303

- Removing/refitting throttle body

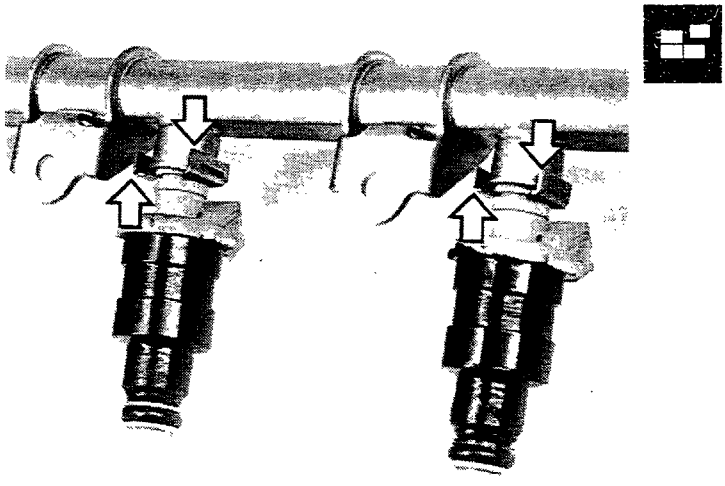


PW086H301



PW086H302

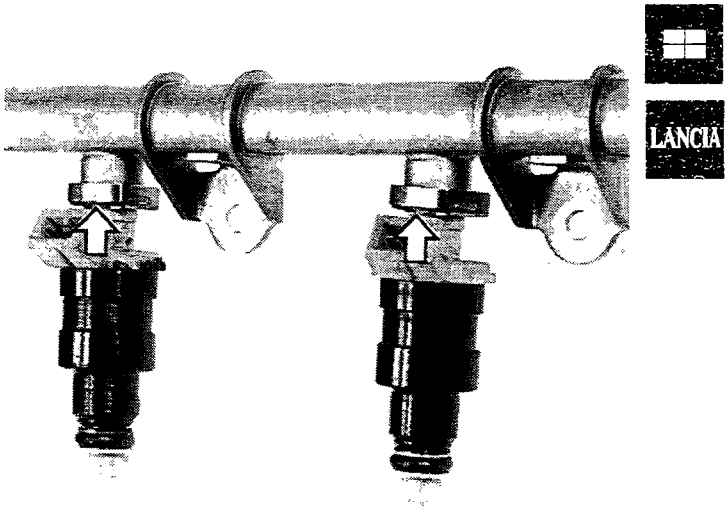
Removing/refitting injector unit



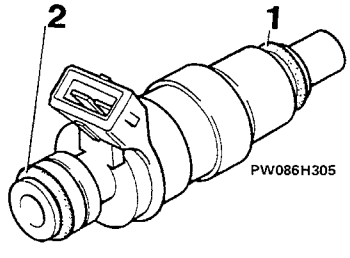
PW086H303

Dismantling injector

NOTE *Slip off the retaining clip by pressing on the points indicated by the arrows, and remove the injector.*



PW086H304



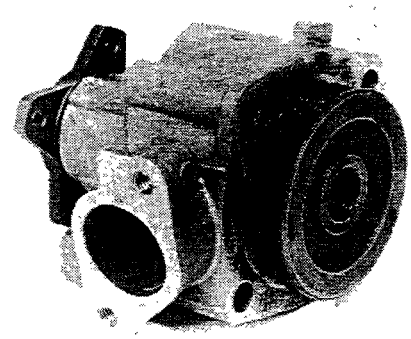
PW086H305

Fitting injector

Before fitting the injector, check the condition of its sealing rings (1) and (2), and renew if necessary.

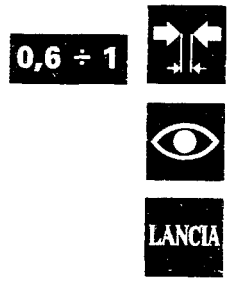
To refit the injector, reverse the order of removal, inserting the retaining clip and pressing at the point arrowed in the photo.

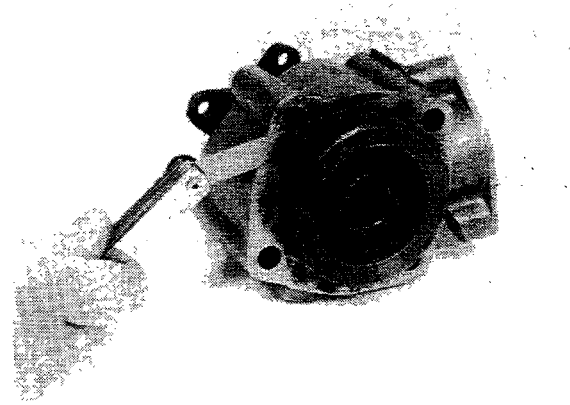
WATER PUMP



Water pump assembly

PW087H301

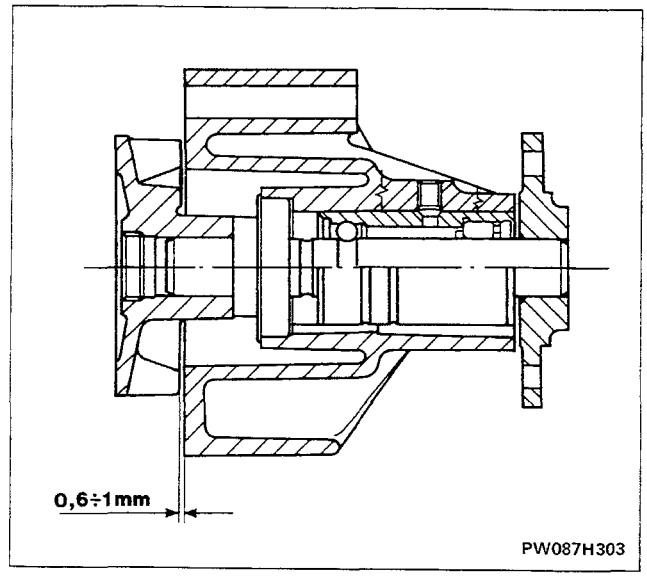




Checking clearance between impeller blades and pump casing

NOTE *The clearance between the impeller blades and pump casing must be between 0.6 and 1 mm. If the clearance is incorrect, or the casing is distorted or cracked, renew the complete pump.*

PW087H302



Section view of water pump

PW087H303

2000 ie 2000 ie turbo

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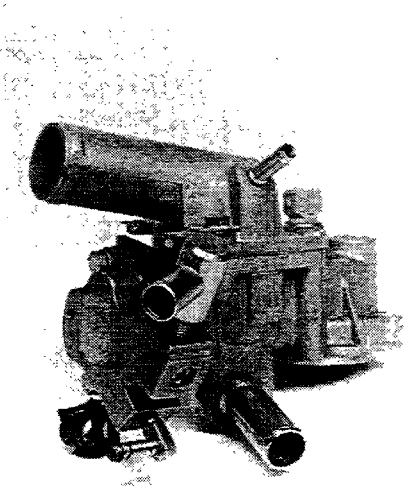
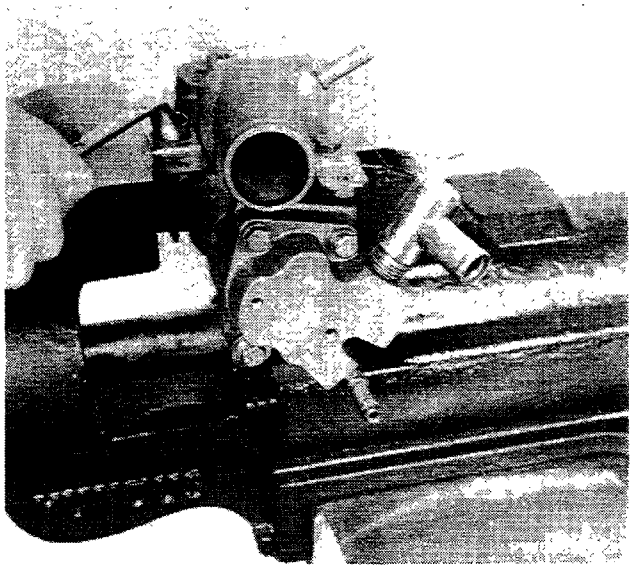
THERMOSTAT

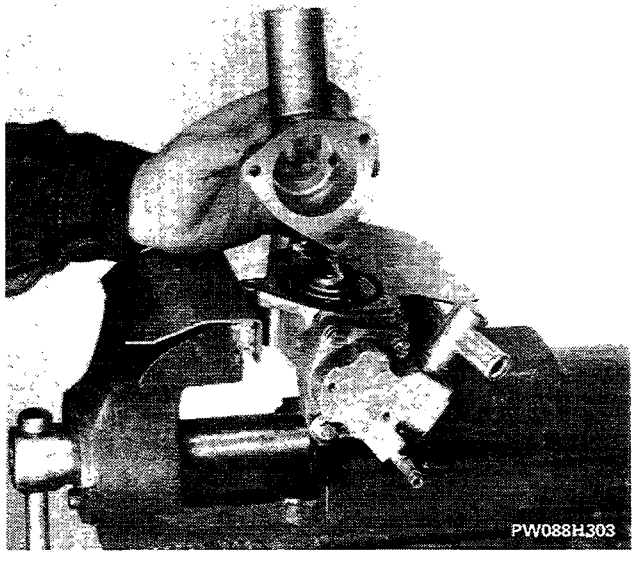


PW088H301

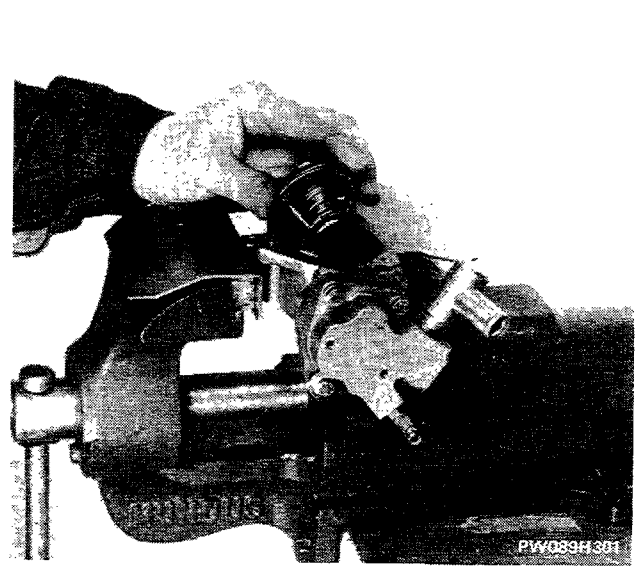
Thermostat assembly



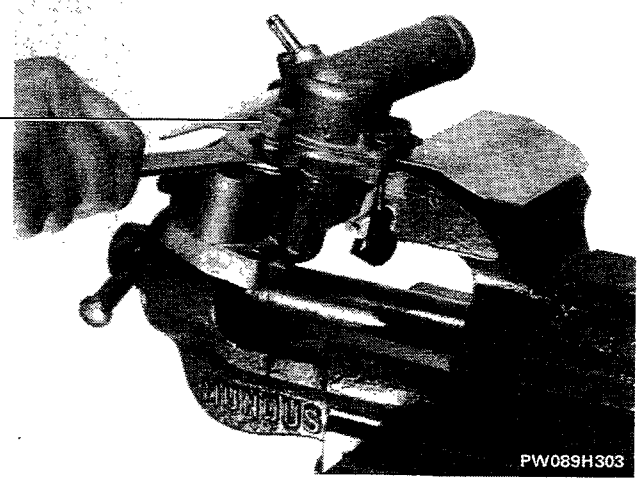
Removing/refitting thermostat



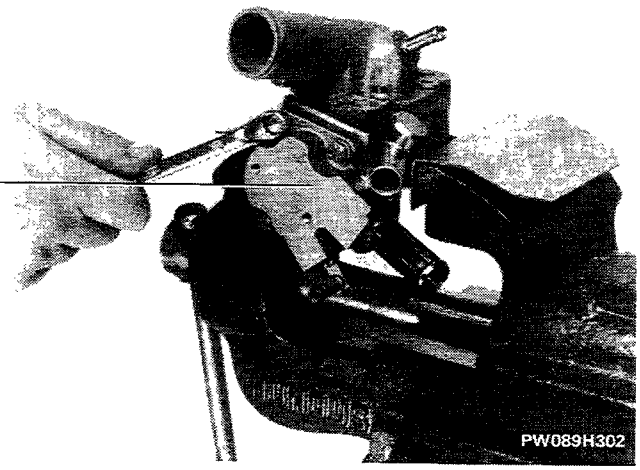
Removing thermostat top cover



Removing/refitting thermostatic valve



Removing/refitting thermal switch



Removing/refitting auxiliary air solenoid mounting plate

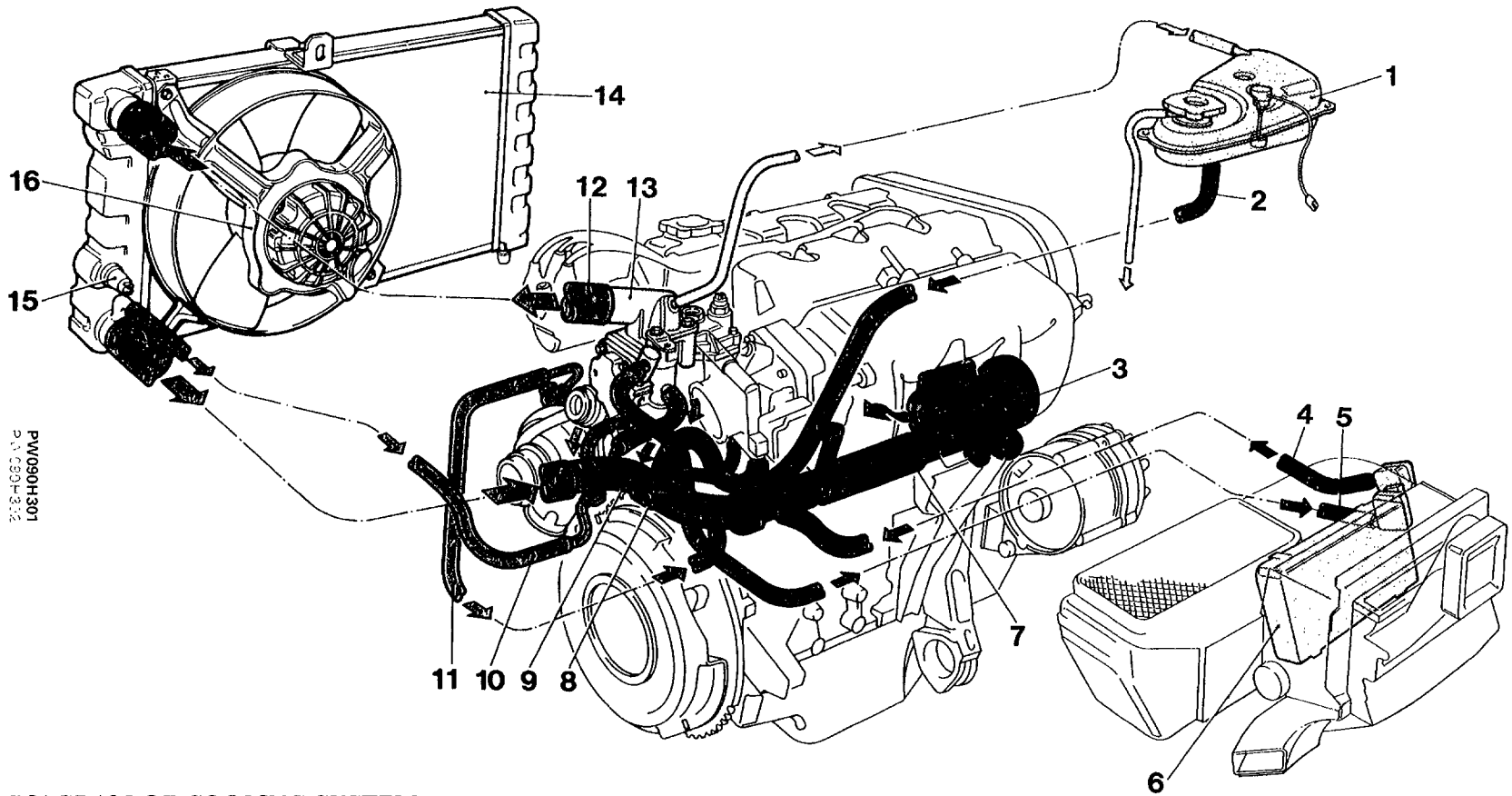


DIAGRAM OF COOLING SYSTEM

1. Expansion tank
2. Return pipe from expansion tank to manifold
3. Water pump
4. Return pipe from heater to manifold
5. Delivery pipe from thermostatic valve to heater
6. Heater
7. Manifold
8. Delivery pipe from thermostat to throttle body
9. Return pipe from throttle body to manifold
10. Delivery pipe from radiator to turbocompressor
11. Return pipe from turbocompressor to manifold
12. Delivery pipe from thermostatic valve to radiator
13. Thermostatic valve
14. Radiator
15. Electric fan thermostatic switch
16. Electric fan

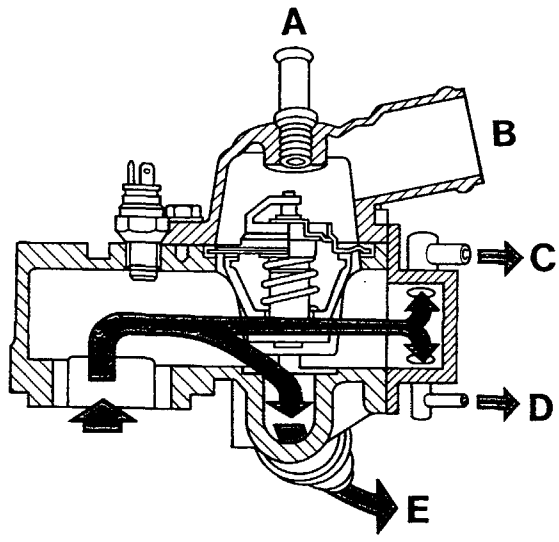
Operation

The coolant is delivered to the cylinder block by the pump (3), which is crankshaft driven via a poly-V belt. After circulating around and cooling the cylinders and cylinder head, the coolant reaches the bypass pipe inside the thermostat body (13). From here, some of it returns directly to the manifold (7) through outlet E, and some of it emerges through outlets C and D and reaches the heater assembly (6) and throttle body. It then returns to the manifold (7), and is drawn in again on the vacuum side of the pump. When the coolant warms up, the thermostatic valve inside the thermostat begins to open, diverting an increasing flow of coolant to the radiator (14) through outlet B and the expansion tank (1) through outlet A. So, when the engine is hot, there is always coolant circulating in the expansion tank.

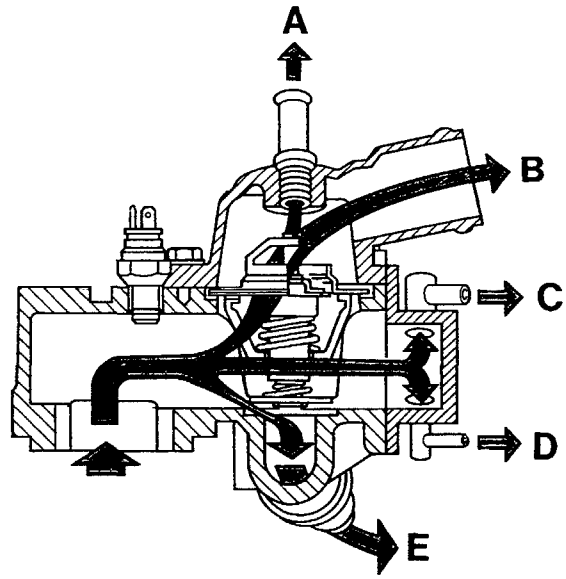
The expansion tank (1) comprises a pressure relief valve for regulating the pressure in the circuit.

When the coolant temperature reaches 85-89°C, a thermostatic switch (15) located at the bottom of the radiator (14) enables the fan (16) to come on and to accelerate the air flow through the radiator, thus increasing the cooling.
The cooling system of the 2000 i.e. turbo (Delta 4WD) uses coolant to cool the turbocompressor body. A pipe (10) draws the coolant directly from the cooling radiator (14) and another pipe (11) draws it at the outlet and delivers it directly into the manifold (7).

Thermostatic valve closed position (cold engine)



Thermostatic valve open position (hot engine)



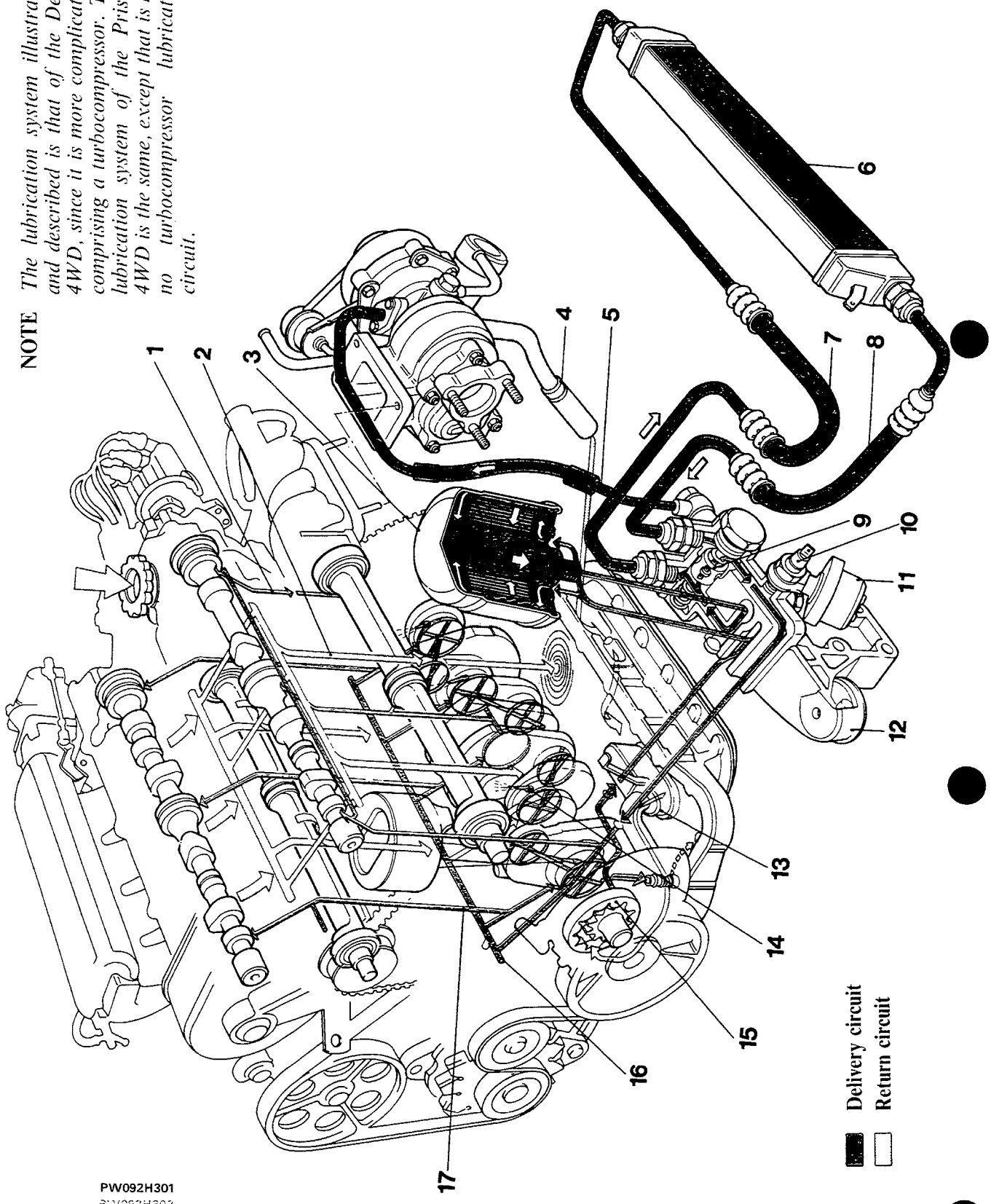
PW091H301
PW091H302

A. Flow to expansion tank
B. Flow to radiator
C. Flow to heater
D. Flow to throttle body
E. Flow to manifold

2000 ie | 2000 ie turbo

DIAGRAM OF LUBRICATION SYSTEM (Delta 4WD)

NOTE *The lubrication system illustrated and described is that of the Delta 4WD, since it is more complicated, comprising a turbocompressor. The lubrication system of the Prisma 4WD is the same, except that is has no turbocompressor lubrication circuit.*



PW092H301
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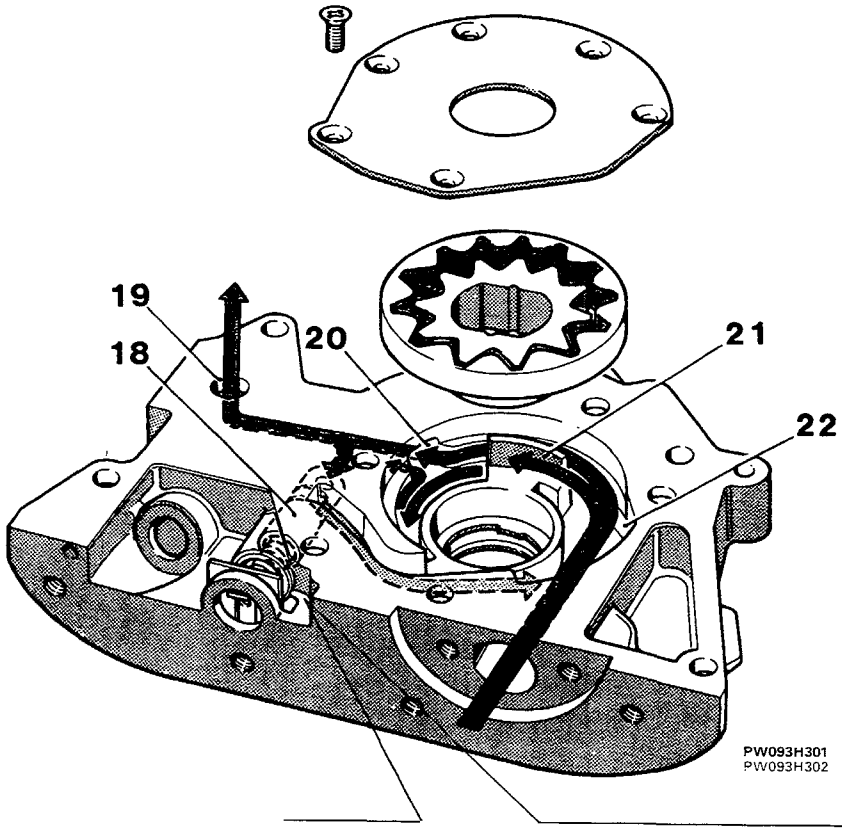
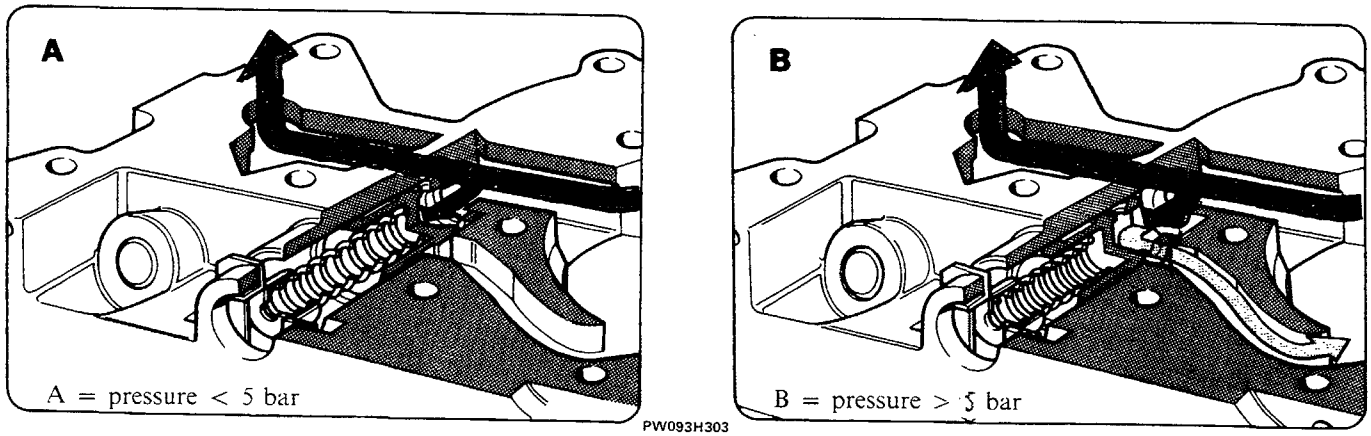


1. Counter shaft lubrication pipe
2. Oil return pipe to cylinder block
3. Full-flow oil filter
4. Oil return pipe from cylinder block to turbocompressor
5. Oil delivery pipe to turbocompressor
6. Oil radiator
7. Oil delivery pipe to radiator
8. Oil return pipe from radiator
9. Thermostatic bypass valve
10. Minimum oil pressure switch
11. Oil pressure switch
12. Oil filter mounting
13. Oil pump pick-up
14. Piston cooling jets
15. Oil pump
16. Oil delivery pipe to main bearings
17. Oil delivery pipe to camshafts
18. Pressure relief valve
19. Oil delivery pipe from pump
20. Pressure chamber
21. Separating wall
22. Low pressure chamber

OPERATION OF THE PRESSURE RELIEF VALVE

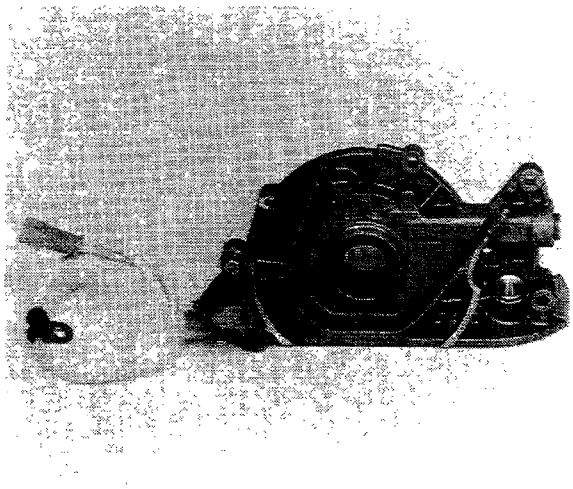


Description

The rotation of the oil pump gears (15), mounted directly on the crankshaft, creates a vacuum in the chamber (22) within the pump casing which draws oil from the sump through the pick-up (13).
The oil delivery pressure is present as from the separating wall (21) in the pump body, and this pressure is maintained constant by the pressure relief valve (18). The valve intervenes at pressures above 5 bar by opening direct communication between the pump's high and low pressure chambers. The oil is sent first to the cartridge filter (3), and then through the delivery pipes (5), (16) and (17) to the turbocompressor, main bearings and camshafts.

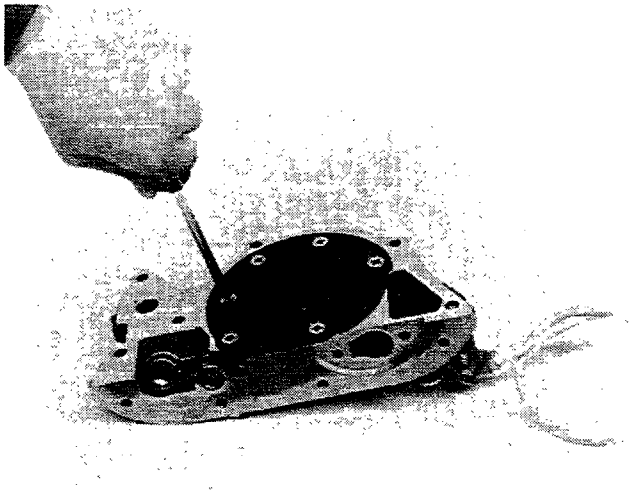
Some of the oil reaching the main bearings is sprayed by a set of jets (14) onto the piston inner surfaces to help cool them.
On the return circuit, the pipe (2) conveys oil to the counter shaft bearings and then to the oil sump.
If the oil temperature exceeds a certain limit, a thermostatic by-pass valve (9) diverts some of the oil flow emerging from the filter to the radiator (6) before it is delivered into the lubrication circuit.
The pressure signal for the instrument panel gauge is taken from the pressure switch (12), while the pulse for the low oil pressure warning light is sent from the switch (10); both sensors are located on the oil filter mounting.

CRANKSHAFT-DRIVEN OIL PUMP



PW094H301

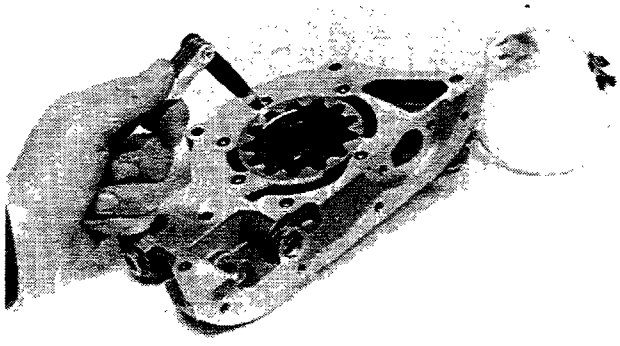
Crankshaft front cover with incorporated oil pump



PW094H302

Removing/refitting oil pump sealing plate

0,080 ÷ 0,186

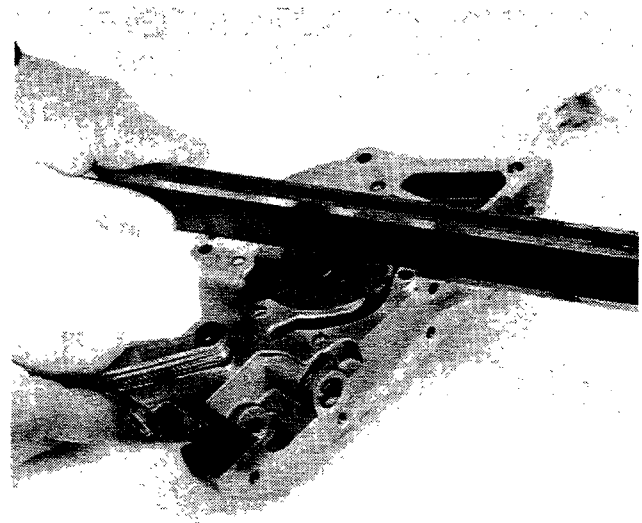


PW094H303

Checking clearance between pump casing and driven gear

0,025 ÷ 0,056

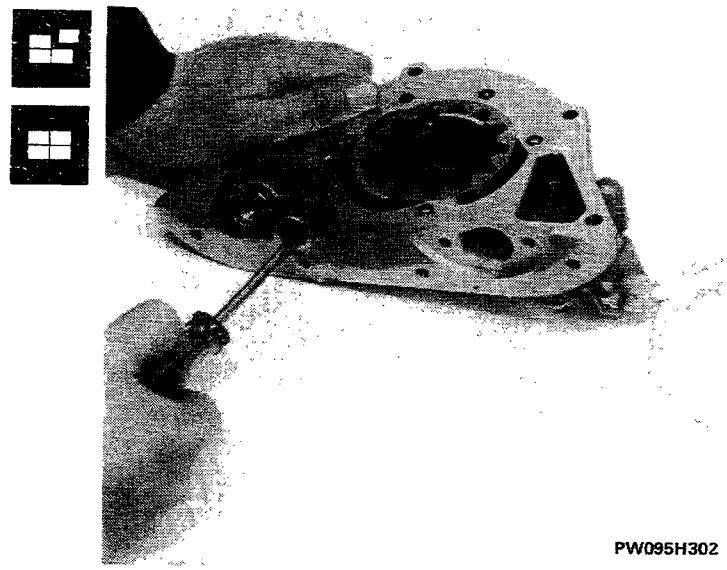
LANCIA



PW095H301

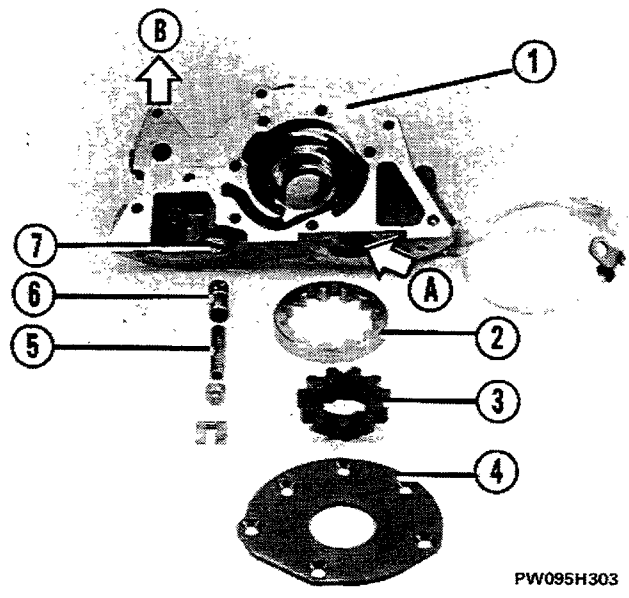
Checking clearance between pump cover supporting surface and pump gear top face

NOTE *If the clearance is incorrect, renew the front cover with incorporated oil pump.*



PW095H302

Removing/refitting oil pressure relief valve spring



PW095H303

Crankshaft front cover with incorporated oil pump

1. Cover body
2. Oil pump driven gear
3. Oil pump drivegear
4. Oil pump sealing plate
5. Relief valve spring
6. Pressure relief valve
7. Relief valve housing

A. Oil inlet pipe from sump
B. Oil delivery pipe to cylinder block

1840207814 Part (∅ 18-22 mm) for extracting counter shaft front bearings from cylinder block (use with 1840206000)
1850087000 Spark plug spanner
1850088000 Spanner for manifold nuts
1850095000 Spanner for water pump pipe bolts on cylinder block
1850113000 Spanner with 1/2" attachment for top cylinder head bolts
1853003000 Spanner (19 mm) for camshaft sprocket bolt, in vehicle
1854033000 Spanner for electric fuel pump or tank fuel filter retainer
1854038000 Spanner for fuel sender retainer
1856131000 Spanner for knock sensor on cylinder head
1858013000 Spanner for holding Bosch alternator pulley while removing/refitting nut
1860054000 Drift for removing and refitting small end bush
1860162000 Pressure gauge with connections for engine oil pressure
1860183000 Pliers for removing/refitting piston rings
1860251000 Drift for removing/refitting crankpin
1860303000 Tool for fitting gudgeon pin circlips
1860313000 Tool for fitting valve guide oil seals
1860322000 Board for supporting cylinder head during valve removal and refitting
1860395000 Drift for removing and refitting valve guides
1860456000 Tool for supporting cylinder head during tappet shim replacement using a vice
1860470000 Tool for supporting cylinder head during overhaul
1860473000 Tool for locking auxiliary components and camshaft sprockets
1860490000 Tool for holding valve seal tester 1895868000 (use with 1860470000)
1860592000 Universal hook for hoisting and transporting engine/gearbox unit
1860605000 Sleeve for installing pistons in cylinders
1860644000 Tool for removing and refitting valves
1860662000 Tool for removing oil filter
1860744000 Tool for rotating crankshaft at the bench
1860745100 Tool for adjusting timing belt tension (use with special parts)
1860745200 Part for adjusting timing belt tension (use with 1860745100)
1860745400 Part for adjusting counter-rotating shaft belt (use with 1860745100)
1860751000 Drift for fitting valve guides
1860757000 Tool for removing cartridge oil filter (2000 i.e. engine)
1860758000 Tool for removing cartridge oil filter (2000 i.e. turbo engine)
1861001011 Pair of brackets for securing engine to rotating stand 1861000000
1867029000 Flywheel locking tool
1867055000 Tool for locking tappets while replacing shims during valve clearance adjustment
1876036000 Lead with contacts for turning engine during valve clearance adjustment
1887001000 Pliers for withdrawing tappet shims
1890310000 Sleeker for valve guide bores
1895362000 Cooling system leak tester
1895683000 Cylinder compression tester
1895683002 Cards for tester 1895683000
1895762000 Tool for checking poly-V belt tension
1895868000 Valve seal tester
1895879000 Tool for checking piston no. 1 TDC for sensor mounting plate positioning (use with 1895881000)
1895895000 Tool for positioning sensor mounting plate, timing gear side (use with 1895879000)
1895896000 Tool for positioning distributor rotor arm (IAW)
1896218000 Gauge for checking valve stem height after recutting seats in cylinder head

PART	Thread	Torque wrench settings
		daNm
ENGINE		
Central main bearing cap bolt	M 12 x 1.25	2 + 130°
Main bearing cap self-locking bolt	M 12 x 1.25	2 + 90°
Nut securing tie-rod to aluminium sump and torque distributor	M 8	2.3
Bolt securing crankcase breather to cylinder block	M 8	2.3
Bolt securing reaction bracket to torque distributor	M 10 x 1.25	5.9
Cylinder head bolt	M 10 x 1.25	4 +90° +90°
Top cylinder head bolt	M 8	2.2
Bolt securing inlet manifold to cylinder head	M 8	2.5
Nut securing inlet manifold to cylinder head	M 8	2.5
Nut securing reaction bracket to inlet manifold	M 8	2.3
Bolt securing reaction bracket to inlet manifold	M 8	2.3
Self-locking nut securing exhaust manifold	M 8	2.9
Bolt securing connecting rod cap	M 10 x 1	2.5 + 50°
Bolt securing flywheel to crankshaft	M 12 x 1.25	14.2
Bolt securing auxiliary components' pulley to camshaft sprocket	M 8	2.5
Bolt securing crankshaft sprocket ▲	M 14 x 1.5	19
Bolt securing belt tensioner bearing to mounting	M 10 x 1.25	4.4
Bolt securing belt tensioner mounting to alternator and power steering pump mounting	M 8	2.3
Lock nut for poly-V belt tension adjustment bolt	M 10 x 1	4.4
Camshaft sprocket bolt	M 12 x 1.25	11.8
Belt tensioner bolt	M 10 x 1.25	4.4

▲ The bolt must **not** be lubricated

PART	Thread	Torque wrench settings
		daNm
Counter-rotating shaft sprocket bolt	M 12 x 1.25	11.8
Counter-rotating shaft cover bolt	M 8	2.3
Nut securing counter-rotating shaft belt tensioner	M 8	2.3
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
Bolt securing turbocompressor bracket to cylinder block	M 8	2.9
Nut securing turbocompressor bracket and exhaust pipe bracket to cylinder block	M 8	2.9
Bolt securing oil delivery pipe to turbocompressor	M 8	2.3
Connection for adjustable connection securing oil delivery pipe to oil filter housing	M 14 x 1.5	5
Bolt securing oil delivery pipe bracket to exhaust manifold	M 10 x 1.25	4.3
Bolt securing oil return pipe from turbocompressor to sump	M 8	2.3
Connection for adjustable union securing turbocompressor cooling water delivery and return pipes	M 16 x 1.5	3.2
Bolt securing oil filter mounting and engine mounting to block	M 10 x 1.25	4.3
Cap for thermostatic valve on oil filter mounting	M 35 x 1.5	11.8
Bolt securing water pump to block	M 8 x 1	2.5
Bolts securing water pump and power unit mounting bracket to block	M 8 x 1	2.5
Bolt securing water pump connector to pump	M 8	2.5
Bolt securing complete water return pipe to cylinder head	M 10 x 1.25	4.3
Nut securing alternator and power steering pump bracket to block	M 10 x 1.25	4.3
Bolts securing alternator and power steering pump bracket to block	M 10 x 1.25	4.3
	M 8	2.5

PART	Thread	Torque wrench settings
		daNm
Bolt securing alternator bracket to mounting	M 10 x 1.25	4.3
Alternator bracket nut	M 10 x 1.25	4.3
Alternator nut	M 12 x 1.25	6.9
Bolt securing brackets to power steering pump	M 8	2
bolt securing power steering pump brackets to mounting	M 10 x 1.25	4.3
Nut securing power steering pump pulley	M 14 x 1.5	9.5
Spark plugs	M 14 x 1.25	3.7
Oil temperature sender	M 14 x 1.5	3.7
Water temperature sender	M 16 x 1.5 tapered	4.9
Oil pressure switch	M 14 x 1.5	3.2
Oil sump plug	M 22 x 1.5 tapered	5