UP TO MACHINE N°139093

ENGINE

- Type	**PERKINS 1004.4 - AA 80812**
- Number of cylinders	4
- Number of strokes	4
- Injection system	Direct
- Ignition sequence	1.3.4.2.
- Clearance of rocker valve (Cold)	
. Inlet	0,20 mm
. Exhaust	0,45 mm
- Capacity	3990 cm^3
- Bore	100 mm
- Stroke	127 mm
- Volumetric ratio	16.5:1
- Nominal running speed	2300 rpm
- Idle speed	775 rpm
- Full speed	2475 rpm
- Power DIN 70.020	82 cv 60,5 kw
- Power DIN 6270 B	80,5 cv 59,3 kw
- Power SAE	85,2 cv 62,9 kw
- Power BS.AU 141 a 1971	83,5 cv 61,5 kw
- Maximum torque	289 Nm to 1450 rpm
- Air cleaner	dry 3 microns

COOLING CIRCUIT

- Type	By water
- Fan	Puller
. Number of blades	6
. Diameter	457 mm
- Thermostat	
. Start opening	77 °C to 85 °C
. Full opening	92 °C to 98 °C

ELECTRIC CIRCUIT

- Earth	Négative
- Battery	12 V - 105 Ah
- Alternator	12 V - 55 A
- Tension regulator	Incorporated into the alternator
- Starter	12 V

TRANSMISSION

- Type	**TURNER POWERTRAIN SYSTEMS BORG AND BECK**
- Torque converter	
- Gear box	
. Number of forward speeds	4
. Number of reverse speeds	4
- Gear reverser	Electrohydraulic
- Rear axle engagement	Electrohydraulic

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Recommended torque tensions

The torque tensions below apply to components lubricated lightly with clean engine oil before they are fitted.

Description	Thread size	Torque		
		Nm	lbf ft	kgf m
Cylinder head assembly				
Setscrews, cylinder head	1/2 UNF	(see	section	12)
Fasteners, rocker shaft brackets:				
- Aluminium brackets	M12	40	30	4,1
- Cast iron and sintered steel brackets	M12	75	55	7,6
Cap nuts, rocker cover	M12	20	15	2,1
Cap nuts, aluminium rocker cover (with shim washer)	M12	30	22	3,0
Setscrews, inlet manifold to cylinder head	M10	44	33	4,5
Nuts (plated), exhaust manifold to cylinder head	M10	44	33	4,5
Nuts (non-plated), exhaust manifold to cylinder head	M10	50	37	5,1
Setscrews, engine lift bracket	M10	44	33	4,5
Piston and connecting rod assemblies				
Nuts, connecting rods	1/2 UNF	125	92	12,7
Setscrews, connecting rods	1/2UNF	155	114	15,8
Banjo bolts, piston cooling jets.	3/4 UNF	20	15	2,0
Crankshaft assembly				
Setscrews, main bearings (4 cylinder engines)	5/8 UNF	250	185	26,0
Setscrews, main bearings (6 cylinder engines)	5/8 UNF	265	196	27,0
Setscrews, crankshaft pulley	7/16 UNF	115	85	11,8
Setscrews, viscous damper to crankshaft pulley	M12	75	55	7,6
Cap screws, viscous damper to crankshaft pulley	M8	35	26	3,6
Cap screws, rubber bonded damper to crankshaft pulley	M8	35	26	3,6
Setscrews, rear oil seal housing to cylinder block	M8	22	16	2,2
Torxscrew, rear oil seal housing to cylinder block	M8	22	16	2,2
Cap screws, bridge piece to cylinder block	M6	16	12	1,6
Cap screws, rear oil seal housing to bridge piece	M8	18	13	1,9
Cap screws, rear oil seal housing to bridge piece	M6	13	10	1,3
Torxscrew, rear oil seal housing to bridge piece	M8	18	13	1,9

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Valve springs

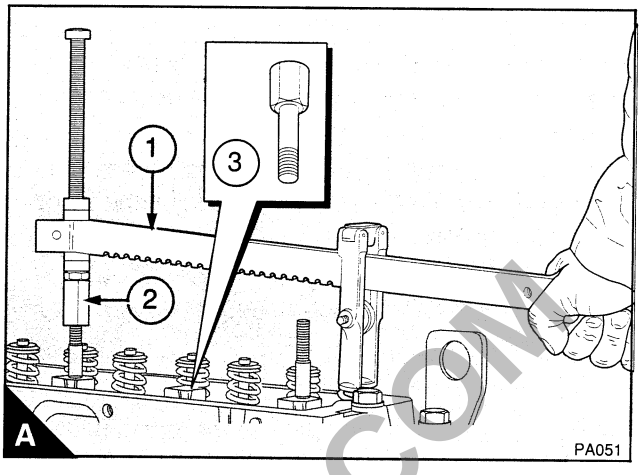
To change the valve springs (with cylinder head fitted) 12A-06

Special tools:

Valve spring compressor, PD.6118B

Stud adaptor used with PD.6118B, PD.6118-7

Setscrew adaptor used with PD.6118B, PD.6118-8



Note: Paragraphs 1 to 12 refer to a change of valve springs for a single cylinder.

Warning! *Wear eye protection during this operation.*

1 Remove the rocker cover, operation 12A-01.

2 Rotate the crankshaft in the normal direction of rotation until the inlet valve of the relevant cylinder has just opened and the exhaust valve has not fully closed. In this position the piston will be at approximately top dead centre (TDC).

3 Remove the rocker assembly, operation 12A-02.

4 Fit the valve spring compressor (A1) and the relevant adaptor (A2 or A3).

5 Compress the valve spring(s) and remove the collets. Ensure that the valve springs are compressed squarely or damage to the valve stem can occur.

Caution: *Do not rotate the crankshaft while the valve springs are removed.*

6 Release the valve spring compressor and remove the valve spring caps and valve spring(s).

7 Put the new valve springs in position. If double valve springs are fitted, ensure that the closed damper coils are towards the cylinder head (12A.16/A4).

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HYDRAULIC DIAGRAM (MC 30 - M 26 / 30. 2 - M 26 / 30. 4) **4**

HYDRAULIC DIAGRAM (M 40. 4 - M 50 .4) **6**

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Rear oil seal assembly - engines which have the standard seal

To remove and to fit **14A-02A**

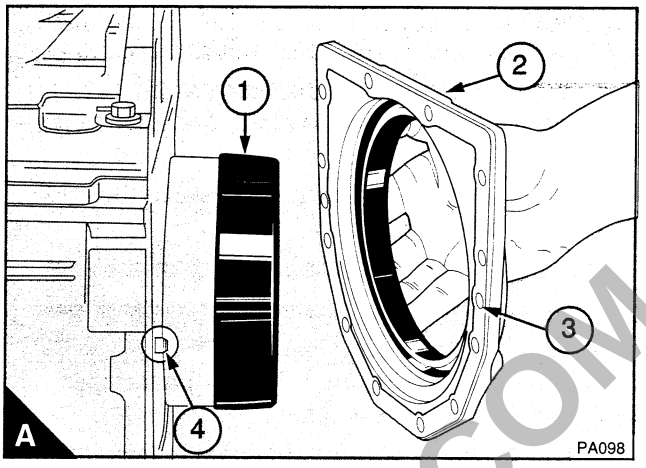
Special tools:

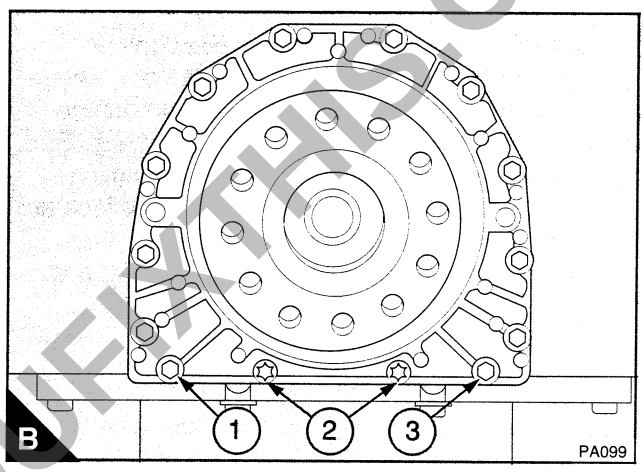
Replacer tool for rear oil seal, PD.145D

Consumable products:

POWERPART Threadlock

POWERPART Silicone rubber sealant





1 Remove the drive components from the rear end of the engine.

2 Remove the flywheel and the flywheel housing, see section 22.

3 Remove the setscrews and the cap screws from the housing and remove the housing and seal assembly.

4 Inspect the seal for wear or for damage to the main lip and renew the seal, if necessary. If there is only a small scratch across the lip, renew the seal.

5 Clean the faces of the cylinder block, the oil seal housing and the crankshaft flange.

6 Check that the seal and the outer circumference of the crankshaft flange are not damaged. Where a new seal has been fitted, check that it is in the correct position in the housing.

7 Ensure that the two dowels (A4) are fitted in the cylinder block. Put a new joint (A3) in position on the dowels, no jointing compound is necessary.

8 Put the seal replacer tool on the crankshaft flange. Lubricate the crankshaft flange, the main lip of the seal and the seal replacer tool with clean engine lubricating oil. The lubrication of the seal is necessary to prevent damage to the seal when the engine is first started.

9 Put the seal and housing (A2) on the replacer tool (A1) and carefully push the assembly into position on the crankshaft flange and onto the dowels. Remove the tool, fit the setscrews and the cap screws. Tighten the setscrews to 22 Nm (16 lbf ft) 2,2 kgf m and tighten the cap screws to 18 Nm (13 lbf ft) 1,9 kgf m.

Note: On the latest engines two torx screws (B2) are fitted instead of cap screws. Tighten the torx screws to 22 Nm (16 lbf ft) 2,2 kgf m. Two extra setscrews (B1 and B3) have also been fitted to later engines.

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20	***Gear box / converter***
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30-3-7 EN	Axle disassembly : 172 - 177 - 272 - 277 - 279
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70-6-M25 EN	Hydraulic diagram
80	***Electricity***
80-6-M25 EN	Electric diagram

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GROUP 0

GENERAL POINTS

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IMPORTANT

* The lift trucks are equipped with **1004.4 or 1004.4 T**
Coded letters AA "Four cylinders with natural aspiration"
AB "Four cylinders, supercharged".

* These codes must be taken into account for all the adjustments given in this manual.

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Cylinder head

To inspect and to correct 12A-12

1 Remove the cylinder head assembly, operation 12A-07.

2 Remove the thermostat housing.

3 Inspect the cylinder head for signs of gas or coolant leakage.

4 Remove the valve springs and the valves, operation 12A-08.

5 Clean the face of the cylinder head and the passages for coolant and for lubricating oil. The water jacket can be cleaned with a special solvent which must be used in accordance with the manufacturer's instructions.

6 Test the cylinder head for leaks at the pressure given in the data and dimensions.

7 When the cylinder head is thoroughly clean, check it for cracks. Examine carefully the areas around the valve seats and around the holes for the atomiser nozzles.

8 The bottom face of the cylinder head can be machined if: there is distortion, see paragraph 9; there are deep scratches; or, for engines without valve seat inserts, the valve depths are below the service limit.

9 Use a straight edge and feeler gauges to check the cylinder head for distortion across and along its bottom face, see the data and dimensions. If the distortion is more than the limit given in the data and dimensions, the bottom face can be machined.

Caution: *Remove only the minimum material and ensure that the thickness of the cylinder head will not be less than 102,48 mm (4.035 in) after the cylinder head has been machined.*

Notes:

- On AE and YE engines the protrusion of the atomiser nozzle below the bottom face of the cylinder head must not be more than 4,82 mm (0.190 in).
- The nozzle protrusion must be measured with the nozzle seat washer fitted.

Caution: *After the cylinder head has been machined the valve seats must be corrected to give the correct valve head depth. It is advisable to work to the minimum limit to allow for later wear.*

10 Check the valve seats for wear and for damage.

11 Before any work is done on the valve seats, new valve guides must be fitted, operation 12A-11.

12 Where there is little damage, the valve and valve seat can be lapped. When the valve seats are lapped keep the seat as narrow as possible and ensure that all the compound used to lap the valve and the seat is removed.

13 More badly damaged valve seats can be corrected by use of the cutter tool, operation 12A-13, or new inserts can be fitted, operation 12A-14.

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To fit

1 Clean the upper half of the shell bearing and lubricate the bearing surface with clean engine lubricating oil.

Caution: *Only the upper half of the bearing has lubrication holes and must be fitted to the side of the cylinder block.*

2 Fit the plain end of the upper half of the bearing between the crankshaft journal and the side of the bearing housing which has the recess for the location tag. Slide the bearing into its housing until the tag on the bearing is fitted correctly in its recess in the housing.

3 Clean the lower half of the bearing and cap, lubricate the bearing surface with clean engine lubricating oil.

4 Fit the bearing into the cap with the tag of the bearing fitted correctly in the recess in the cap.

5 Ensure that the location thimbles are fitted correctly to the cap or to the cylinder block. Fit the bearing cap with the location tags of both bearings on the same side (A1).

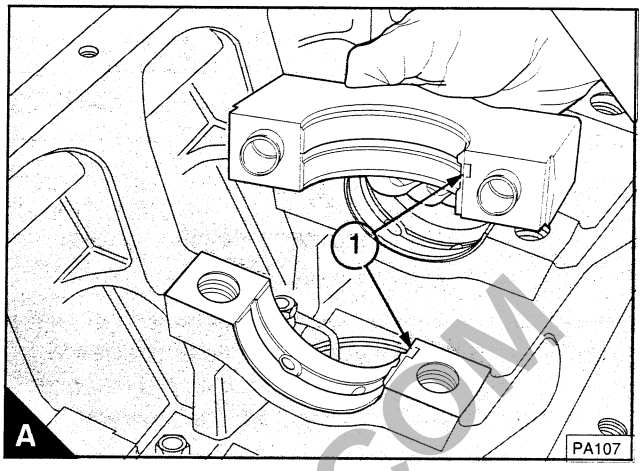
6 Inspect the setscrews for damage and for distortion and renew them if necessary. Lightly lubricate the setscrew threads with clean engine lubricating oil. Fit the setscrews and the washers and tighten the setscrews gradually and evenly to 265 Nm (196 lbf ft) 27,0 kgf m for six cylinder engines and 250 Nm (185 lb ft) 26,0 Kgf m for four cylinder engines.

Note: Washers are not fitted between the setscrews and the bearing caps on the latest engines.

7 Ensure that the crankshaft turns freely. If the thrust washers have been removed and fitted, check the crankshaft end-float, operation 14A-03.

8 Fit all the components which were removed for access to the main bearing cap.

9 Fit the lubricating oil sump, operation 19A-03 and fill it to the correct level with an approved lubricating oil.



To inspect 14A-07

Inspect the bearings for wear and for other damage. If a bearing is worn or damaged, renew both half of the shell bearings and check the condition of the other bearings.

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To assemble

1 Clean thoroughly the new cylinder block. Ensure that all the oil passages are clean and free from debris.

2 Remove the threaded plugs from the old cylinder block and clean the threads. Seal the threads with POWERPART Nutlock, or a similar sealant, and fit the threaded plugs into the new cylinder block.

3 Fit the piston cooling jets, or the spacers and setscrews where jets are not fitted, operation 13A-09.

4 Fit the crankshaft and the rear oil seal assembly, see section 14.

5 Fit the piston and connecting rod assembly, operation 13A-03.

6 Fit the flywheel housing and the flywheel, see section 22.

7 Fit the tappets and the camshaft, operation 15A-08.

8 Fit the lubricating oil pump and the pressure relief valve, see section 19, or fit the balancer unit, operation 14A-10.

9 Fit the timing case and the timing gears, see section 15.

10 Fit the cylinder head assembly, operation 12A-07.

11 Fit the starter motor, operation 23B-01.

12 Fit the fuel lift pump, operation 20A-03 or 20B-03.

13 If necessary, fit the turbocharger, operation 18A-01.

14 Fit the lubricating oil filter assembly and the lubricating oil sump, see section 19.

15 If necessary, fit the lubricating oil cooler, operation 21A-07.

16 Fit the fuel filter, the atomisers and the fuel injection pump, see section 20.

17 If necessary, fit the compressor or the exhauster, see section 24.

18 Fit the fan, the fan drive and the water pump, see section 21.

19 Fit the alternator and its mounting brackets and the alternator drive belts, see section 23.

20 Install the engine into the vehicle or machine.

21 Fill the cooling system.

22 Fill the lubricating oil sump to the correct level with an approved lubricating oil.

23 Eliminate air from the fuel system, see section 20.

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To fit

1 Remove the covers from the pipes, manifolds and the turbocharger.

2 Check that the turbocharger inlets and outlets are clean and free from restriction and that the turbocharger shaft rotates freely. Also check that the openings in the manifolds and the exhaust pipe are clean and free from restriction.

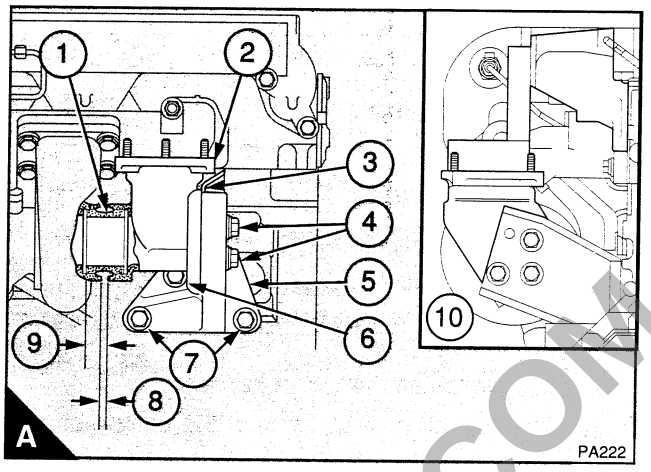
3 Fit a new gasket to the exhaust manifold to turbocharger flange 18A.03/A1. If the original nuts are to be used, ensure that the threads of the studs are clean and apply a suitable compound to the studs to prevent seizure. The threads of new nuts are phosphated to prevent seizure. Fit the turbocharger. Fit the nuts and tighten them to 44 Nm (33 lbf ft) 4,5 kgf m.

4 Lubricate the bearing housing of the turbocharger with clean engine lubricating oil. Fit the oil supply pipe together with a new joint and tighten the flange setscrews. If the lower section of the pipe is flexible, clean the thread of the union connection and apply POWERPART Threadlock (pipe). Ensure that dirt does not enter the oil filter head/adaptor plate. Use a spanner to hold the hexagon on the pipe while the union connection is fitted to the oil filter head/adaptor plate. If an adaptor is used in the oil filter head/adaptor plate, use a spanner to hold the adaptor when the union nut is tightened.

5 Fit the oil drain pipe together with a new joint and tighten the flange setscrews, but do not connect the hose.

6 Where the exhaust elbow has a flange, clean the threads of the studs in the flange of the turbocharger. Apply a suitable compound to the studs to prevent seizure of the nuts. Put a new gasket in position on the flange and fit the elbow. Tighten the nuts to 22 Nm (16 lbf ft) 2,2 kgf m (plated) or 25 Nm (18 lbf ft) 2,5 kgf m (non-plated). Fit or connect the support bracket between the elbow and the cylinder block. Ensure that there is no stress on the exhaust elbow. If necessary fit the heat shield for the fuel lift pump.

7 Where the exhaust elbow (A2) has a sleeve (A1), check that the sleeve protrusion from the end of the elbow is 23 mm (0.90in) (A9).



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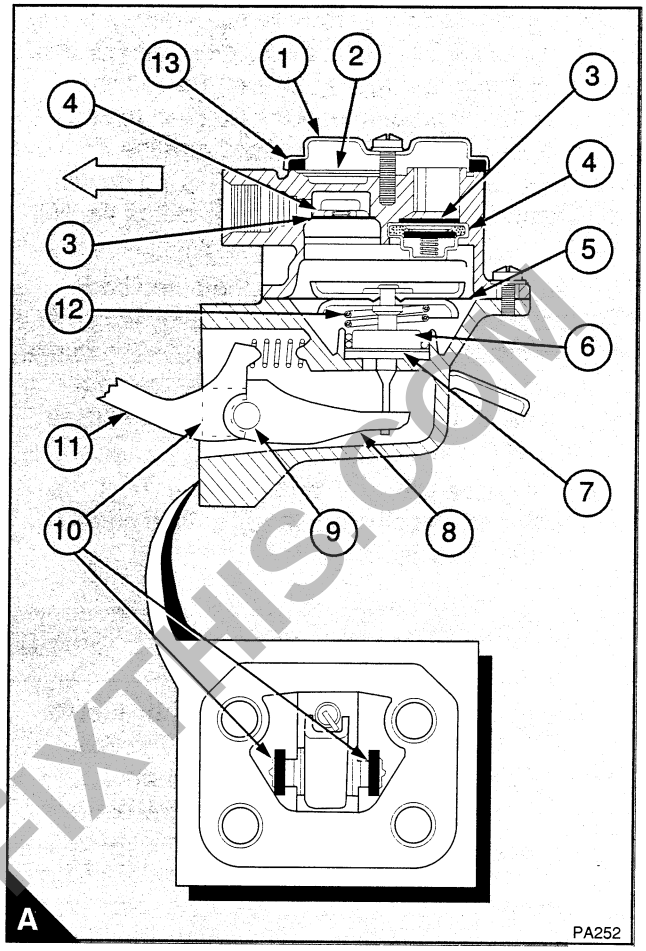
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3 Remove the cover (A1) and the gauze (A2). Release the setscrews and separate the two halves of the pump.

4 Turn the diaphragm assembly (A5) 90° to release the pull rod from the link arm (A8) and remove the diaphragm assembly. Remove the stem seal (A6), the spring seat washer (A7) and the spring (A12) from the pull rod. The diaphragm and pull rod assembly is renewed as an assembly and no service is possible on the diaphragm.

5 The valves (A4) are peened in and can be removed with a suitable lever. Some of the peened metal will have to be removed before the valves can be removed.

6 To remove the link arm: Hold the rocker lever (A11) in a vice and hit the body of the lift pump with a soft face hammer to release the two retainers (A10). Be careful not to damage the joint face of the pump body. Remove the rocker lever, the pin (A9), the link arm and the return spring. Check the components for wear and other damage.



To assemble

1 Thoroughly clean the valve housings. Fit new seat washers (A3) and push the new valves (A4) into position. As the valves are the same, but one valve is fitted in reverse of the other, it is possible to fit the valves upside down. To ensure that the valves are fitted correctly, fit them as shown in A. When the valves are correctly fitted, peen the edge of the valve housings in six places, evenly divided, to keep the valves in position.

2 Fit the rocker lever (A11), pin (A9) and link arm assembly (A8) into the bottom half of the lift pump. Fit the return spring; ensure that the ends of the spring are in their correct location.

3 With a light hammer and a suitable adaptor, fit two new retainers (A10) in their grooves in the casing until they fasten the pin. Peen the open ends of the grooves to fasten the retainers in position.

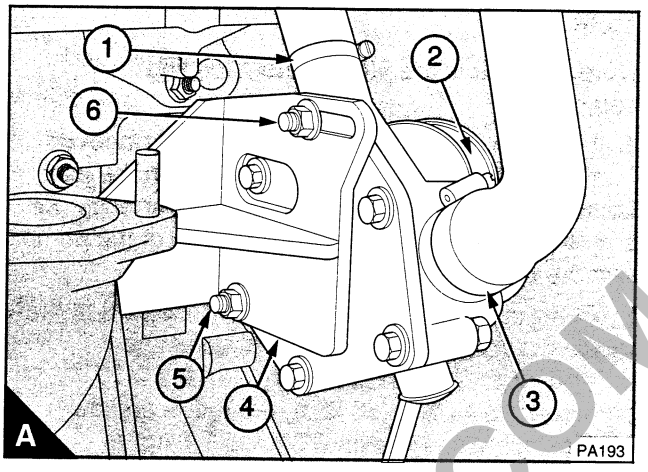
4 Fit the diaphragm spring (A12) into its location under the diaphragm (A5) and put the spring seat washer (A7) and a new stem seal (A6) into position on the pull rod. Ensure that the small diameter at the top of the seal is on the round section of the pull rod.

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Auxiliary coolant pump

An auxiliary coolant pump (A) is used on some high rated engines which have a water-to-air intercooler. The pump which is belt driven from the crankshaft pulley, circulates coolant through the intercooler. The pump is fitted to a mounting bracket on the right side of the engine.



To remove and to fit 21A-02B

To remove

1 Drain the cooling system.

2 Release the hose clips and disconnect the hoses from the inlet (A1) and outlet (A3) of the coolant pump.

3 Loosen the two nuts (A5 and A6) at the rear of the pump which secure the coolant pump to the mounting bracket (A4).

4 Push the pump towards the cylinder block and remove the belt (A2) from the pump pulley. Support the pump, remove the two nuts for the mounting bracket and remove the pump from the engine.

To fit

1 Fit the pump to the mounting bracket and fit loosely the two nuts. Fit the belt to the pump pulley.

2 Check and adjust the belt tension, operation 23A-01 and fully tighten the two nuts (A5 and A6).

3 Connect the hoses to the inlet and outlet of the coolant pump and tighten the hose clips.

4 Fill the cooling system, start the engine and check for leakage.

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POWERPART recommended consumable products

Perkins have made available the products recommended below in order to assist in the correct operation, service and maintenance of your engine and your machine. The instructions for the use of each product are given on the outside of each container. These products are available from your Perkins distributor.

POWERPART Antifreeze

Protects the cooling system against frost and corrosion. Part number 1 litre 21825166 or 5 litres 21825167, see page 5.04 of the User's Handbook.

POWERPART Easy Flush

Cleans the cooling system. Part number 2182501

POWERPART Jointing compound

Universal jointing compound which seals joints. Currently Hylomar. Part number 1861155 or 1861117.

POWERPART Silicone rubber sealant

Silicone rubber sealant which prevents leakage through gaps.Currently Hylosil Part number 1861108.

POWERPART Lay-Up 1

A diesel fuel additive for protection against corrosion. Part number 1772204, see page 7.02 of the User's Handbook.

POWERPART Lay-Up 2

Protects the inside of the engine and of other closed systems. Part number 1762811, see page 7.02 of the User's Handbook.

POWERPART Lay-Up 3

Protects outside metal parts. Part number 1734115, see page 7.02 of the User's Handbook.

POWERPART Chisel

Allows easy removal of old gaskets and joints. Currently Loctite chisel. Part number 21825163.

POWERPART Repel

Dries damp equipment and gives protection against corrosion. Passes through dirt and corrosion to lubricate and to assist removal of components. Currently Loctite repel. Part number 21825164.

POWERPART Threadlock

To retain small fasteners where easy removal is necessary. Currently Loctite 222e. Part number 21820222.

POWERPART Studlock

To permanently retain large fasteners and studs. Currently Loctite 270. Part number 21820270.

POWERPART Nutlock

To retain and seal threaded fasteners and cup plugs where easy removal is necessary. Currently Loctite 242e. Part number 21820242

POWERPART Liquid gasket

To seal flat faces of components where no joint is used. Especially suitable for aluminium components. Currently Loctite 518. Part number 21820518

POWERPART Threadlock (hydraulic/pnuematic)

To retain and seal pipe connections with fine threads. Especially suitable for hydraulic and pneumatic systems. Currently Loctite 542. Part number 21820542

POWERPART Threadlock (pipe)

To retain and seal pipe connections with coarse threads. Pressure systems can be used immediately. Currently Loctite 575. Part number 21820575.

POWERPART Retainer (oil tolerant)

To retain components which have a transition fit. Currently Loctite 603. Part number 21820603.

POWERPART Retainer (high strength)

To retain components which have an interference fit. Currently Loctite 638. Part number 21820638.

POWERPART Atomiser thread sealant

To seal the threads of the atomiser into the cylinder head. Currently Hylomar Advance Formulation. Part number 21825474.

Continued

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Exhaust valves

Diameter of valve stem	8,938/8,960 mm (0.3519/0.3528 in)
Clearance in valve guide	0,040/0,84 mm (0.0016/0.0033 in)
Maximum permissible clearance in valve guide	
- Production limits	0,104 mm (0.0041 in)
- Service limit	0,121 mm (0.011 in)
Diameter of valve head:	
- Engine types, AJ, AK, AM, AP, AQ, YG, YH, YK	40,88/41,12 mm (1.609/1.619 in)
- Engine types AR and AS	41,88/42,12 mm (1.649/1.658 in)
Angle of valve face	45° or 30°
Full length, engine types, AJ, AK, AM, AP, AQ, YG, YH, YK	122,65/123,30 mm (4.829/4.854 in)
Full length, engine types AR and AS	123,75/124,40 mm (4.872/4.897 in)
Seal arrangement	Rubber seal fitted to valve guide, colour brown
Depth of valve head below face of cylinder head:	
- Production limits, engine types, AJ, AK, AM, AP, AQ, YG, YH, YK	1,50/1,80 mm (0.059/0.071 in)
- Service limit, engine types, AJ, AK, AM, AP, AQ, YG, YH, YK	2,05 mm (0.081 in)
- Production limits, engine types AR and AS	0,40/0,60 mm (0.016/0.024 in)
- Service limit, engine types AR and AS	0,805 mm (0.032 in)

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To assemble

1 Ensure that the location spigot (A8) on the rear face of the lubricating oil pump is clean. Clean the contact faces of the lubricating oil pump and the balancer frame. Fit the lubricating oil pump (A16) to the balancer frame and tighten the setscrews to 27 Nm (20 lbf ft) 2,8 kgf m.

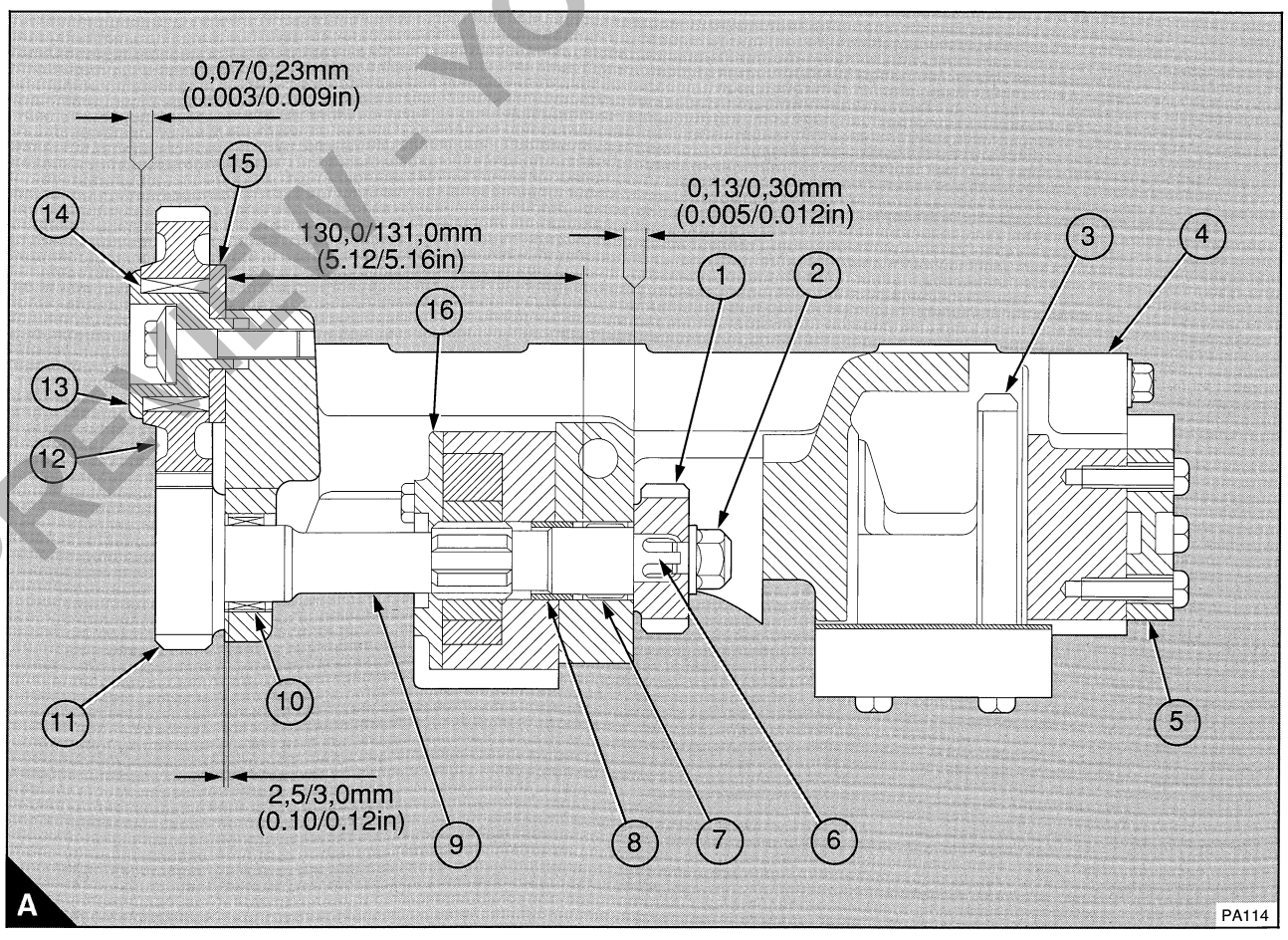
2 Assemble the lubricating oil relief valve, operation 19A-09.

3 Lubricate the needle roller bearings (A7 and A10) with clean engine lubricating oil. Fit the drive shaft (A9) and engage the splines for the lubricating oil pump with the pump rotor. Ensure that the needle roller bearing at the front of the balancer frame is not damaged by the splines on the drive shaft.

4 Clean and dry the splines (A6) and the thread on the end of the drive shaft. Apply a small amount of Loctite Nutlock to the splines and to the thread. Fit the drive gear of the balance weights (A1) with the flat face of the gear towards the rear of the balancer unit. Fit and tighten the nut (A2) to 82 Nm (60 lbf ft) 8,4 kgf m. To tighten the nut, a peg spanner must be made to fit into the two holes in the front of the drive shaft and be suitable for use with a torque wrench. Fit the peg spanner to the front of the drive shaft. Hold the nut with a suitable spanner and apply the torque to the peg spanner.

5 Ensure that the drive shaft turns freely. Check the end-float of the drive shaft with feeler gauges between the front face of the drive gear for the balance weights and the frame (A).

Continued



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Cylinder liner specifications

Caution: *Specialist training and equipment is needed to machine the finish of a partially finished liner. For further information contact your nearest Perkins Distributor.*

Partially finished liner

Interference fit of liner in parent bore	0,025/0,076 mm (0.003/0.001 in)
Inside diameter of partially machined liner	99,162/99,415 mm (3.9040/3.9139 in)

Preliminary bore

Final size of liner before it is honed	99,873/99,924 mm (3.9320/3.9340 in)
Surface finish	Ra 3,2 to 4,0 micrometers
Maximum ovality and taper	0,02 mm (0.0008 in)

Diamond hone

Hone angle (cross hatch)	35°
Finish size, diamond honed	99,95 mm (3.9350 in)
Surface finish	Ra 2,2 to 3,0 micrometers
Maximum ovality and taper	0,012 mm (0.0005 in)

Silicone carbide base hone

Hone angle (cross hatch)	35°
Finish size, silicon carbide base hone	100,012 mm (3.9374 in)
Surface finish	Ra 1,3 to 1,6 micrometers
Maximum ovality and taper	0,010 mm (0.0004 in)

Silicone carbide plateau hone

Final finish size, silicon carbide (plateau hone)	100,017 mm (3.9376 in)
Final surface finish grade	0,65/1,3 micrometers

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Pressure to open valve (Four cylinder engines):

- Without piston cooling jets	340/395 kPa (49/57 lbf/in^2) 3,4/4,0 kgf/cm^2
- With piston cooling jets	415/470 kPa (60/68 lbf/in^2) 4,2/4,8 kgf/cm^2
- Six cylinder engines	345/414 kPa (50/60 lbf/in^2) 3,5/4,2 kgf/cm^2

Oil pressure relief valve (with balancer)

Diameter of bore for plunger	16,00/16,03 mm (0.630/0.631 in)
Outside diameter of plunger	15,95/15,98 mm (0.628/0.629 in)
Clearance of plunger in bore	0,02/0,08 mm (0.0008/0.003 in)
Length of spring (fitted)	42,7 mm (1.7 in)
Load on spring (fitted)	34/38 N (7.6/8.5 lbf) 3,5/3,9 kgf
Pressure to open valve	523 kPa (76 lbf/in^2) 5,3 kgf/cm^2

Oil filter

Type	Full flow, screw-on type canister
Pressure to open by-pass valve in filter	55/83 kPa (8/12 lbf/in^2) 0,6/0,8 kgf/cm^2
Pressure to open by-pass valve in oil cooler	172 kPa (25 lbf/in^2) 1,8 kgf/cm^2

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General description

Coolant from the bottom of the radiator passes through the centrifugal coolant pump, which is fitted onto the front of the timing case to assist the flow of the coolant through the system.

The pump is gear driven from the gear of the fuel injection pump.

On certain four cylinder applications the pump is driven by a "V" belt from the crankshaft pulley.

Some engines are fitted with a belt driven coolant pump in a high position, these are identified by the thermostat housing which is part of the pump rear body. The rear body of these pumps has a connection to a coolant transfer plate, which allows coolant from the pump impeller to pass into the cylinder block.

Two types oil cooler are available for use on four cylinder engines: An integral oil cooler which is fitted to the left side of the cylinder block or a separate (cassette type cooler) fitted to the filter head.

The integral oil cooler has an aluminium cover with plate element and is fitted to the left side of the cylinder block.

The latest integral oil coolers for 6 cylinder engines have a pressed steel cover.

Four cylinder engines

From the pump, the coolant passes through a passage in the timing case to the water jacket in the left side of the cylinder block. Coolant pumps driven by a "V" belt do not pass the coolant through a passage in the timing case but direct to the front of the cylinder block. The coolant continues to the rear of the cylinder block where some of the coolant passes into the lubricating oil cooler, if one is fitted. Some of the coolant passes around the element of the integral cooler and then to the rear of the cylinder block.

Some four cylinder engines have a cassette type oil cooler fitted between the oil filter canister and the oil filter head. If the cassette oil cooler is fitted on the left side of the engine, coolant from the by-pass connection at the rear of the coolant pump passes through a pipe to the oil cooler. If the cassette oil cooler is fitted to the right side of the engine, a pipe is connected between the thermostat housing and the oil cooler. The coolant passes around the plates of the cooler and passes through a pipe to the cylinder block.

The coolant then passes from the rear of the cylinder block and into the cylinder head. The coolant leaves the cylinder head at the front and passes into the thermostat housing.

If the thermostat is closed, the coolant goes directly through a by-pass to the inlet side of the coolant pump. If the thermostat is open, the thermostat closes the by-pass and the coolant passes to the top of the radiator.

Some engines are fitted with two thermostats.

Six cylinder engines

On six cylinder engines the coolant divides as it enters the cylinder block. Most of the coolant passes along the right hand side of the cylinder block and around the outside of the cylinders to the rear of the cylinder block.

The remainder of the coolant passes along a passage on the left hand side of the cylinder block to the lubricating oil cooler.

The coolant flows around the element of the lubricating oil cooler to the rear of the cylinder block. The coolant then passes to the rear of the cylinder head.

Coolant passes forward through the cylinder head and into the thermostat housing. These engines have one thermostat. If the thermostat is closed, the coolant goes, through a by-pass, directly to the inlet side of the coolant pump. If the thermostat is open, the coolant passes to the top of the radiator.

Some engines are fitted with two thermostats.

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Electrical equipment 23

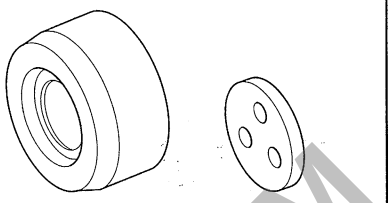
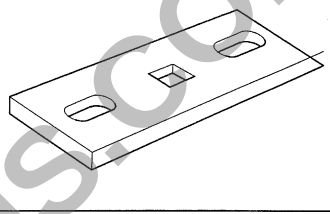
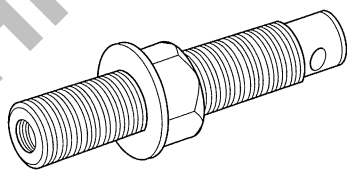
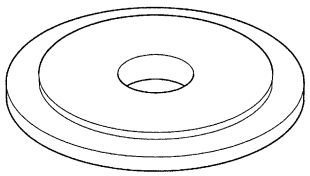
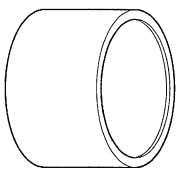
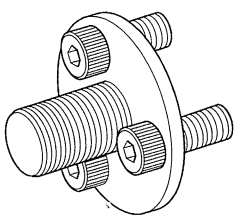
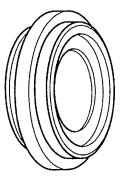
Alternators 23A

Starter motors 23B

Starting aids 23C

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Number	Description	Illustration
PD.163A **MANITOU** **Réf. 474180**	Centralising tool for timing case cover (Six cylinder engines). Part number 21825574	
PD.165B **MANITOU** **Réf. 563035**	crankshaft rotation adaptor for use with a 12,7 mm (0.5 in) square drive. Part number 21825576	
PD.170 **MANITOU** **Réf. 474181**	Replacer tool for seal of timing case cover (main tool). Part number 21825577	
PD.170-1 **MANITOU** **Réf. 474182**	Pressure plate for use with PD.170. Part number 21825578	
PD.170-2 **MANITOU** **Réf. 474183**	Sleeve for use with PD.170. Part number 21825579	
PD.170-3 **MANITOU** **Réf. 474184**	Fastener plate for use with PD.170. Part number 21825580	
PD. (1) **MANITOU** **Réf. 563037**	Adaptor for front seal for use with PD.170. Part number **(1)**	

(1) Refer to your nearest Perkins distributor

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PRESSURE CHECKING

- The transmission oil, (Shell Donax TA), should be at an approximate temperature of 80 degrees C during pressure tests.

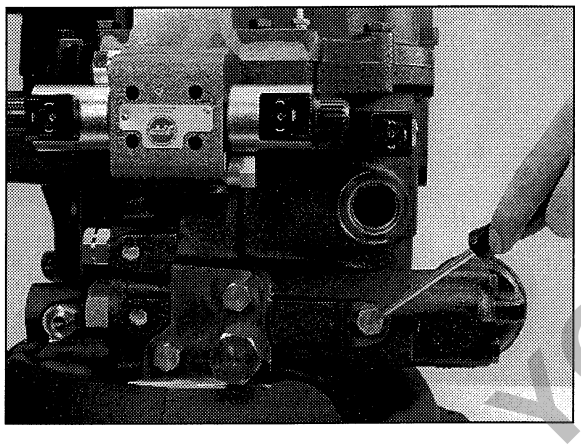
- The handbrake must be applied.

- All test ports have a 9 / 16» UNF thread.

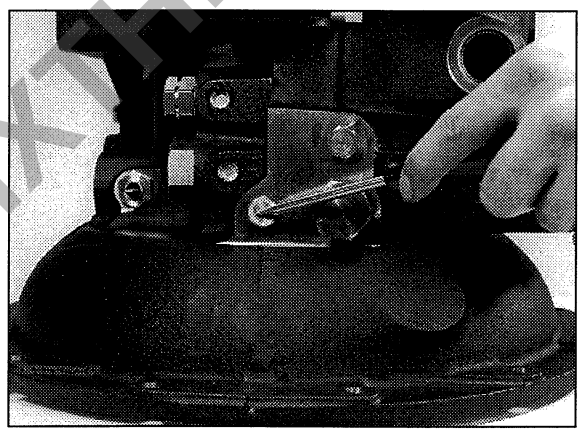
- A manometer of 0-20 bar minimum is necessary.

- For the P / N° of pressure connections, manometers or hoses, please refer to "Gauge Box" catalogue P / N° 547 037.

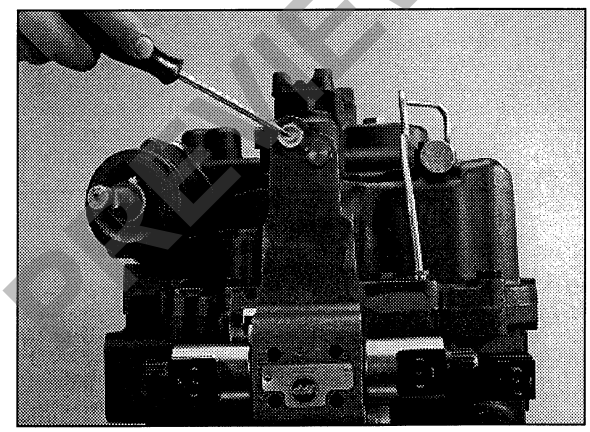
- Forward, reverse and 4WD clutch pack pressures should not be more than 1 bar lower than the oil pump pressure.



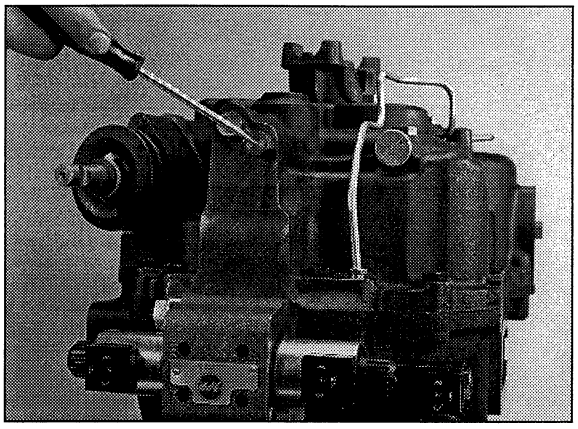
Oil pump pressure test port.
Pressure should be 14,5 ± 1 bar at maximum engine speed (approx. 2500 RPM).



Converter relief pressure test point.
Pressure should be 6,5 ± 1,5 bar at maximum engine speed (approx. 2500 RPM).



Forward clutch pressure test point.
Pressure should be 14,5 ± 1,5 bar at maximum engine speed (approx. 2500 RPM).



Reverse clutch pressure test point. Pressure should be 14,5 ± 1,5 bar at maximum engine speed (approx. 2500 RPM).

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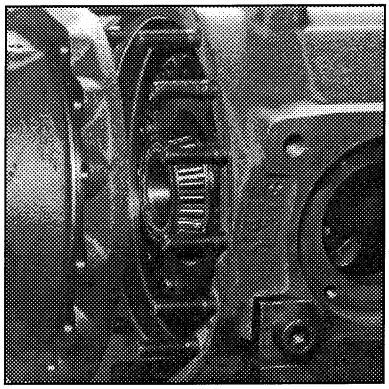
GROUP 30

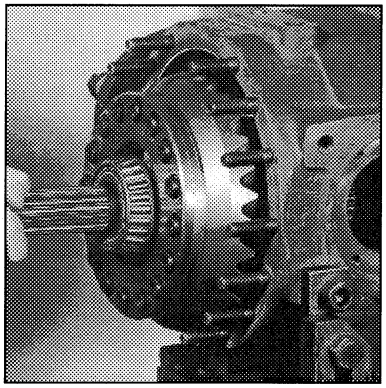
AXLE ASSEMBLY

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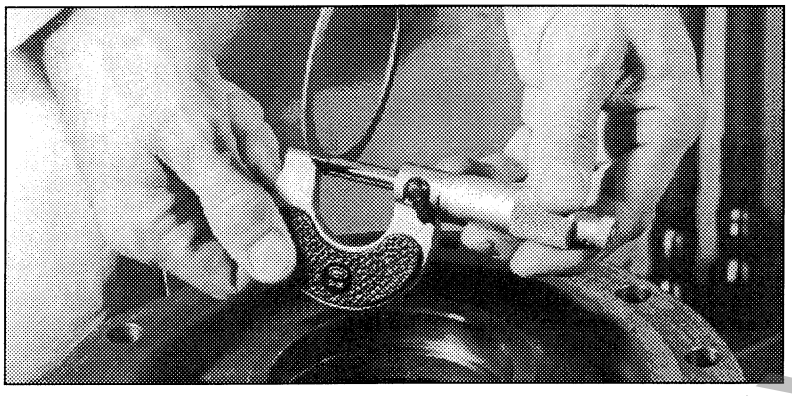
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ADJUSTING BEVEL GEAR SET 172 WITHOUT BRAKE

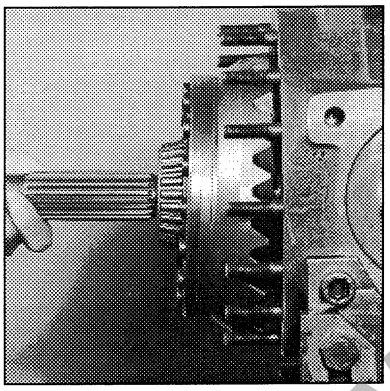


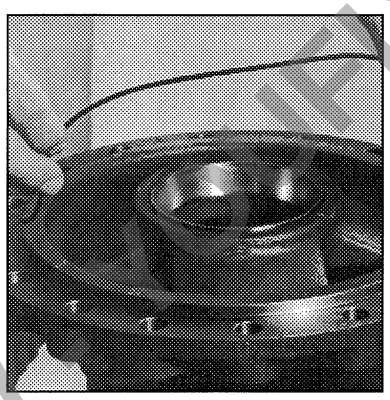


Disassembly.

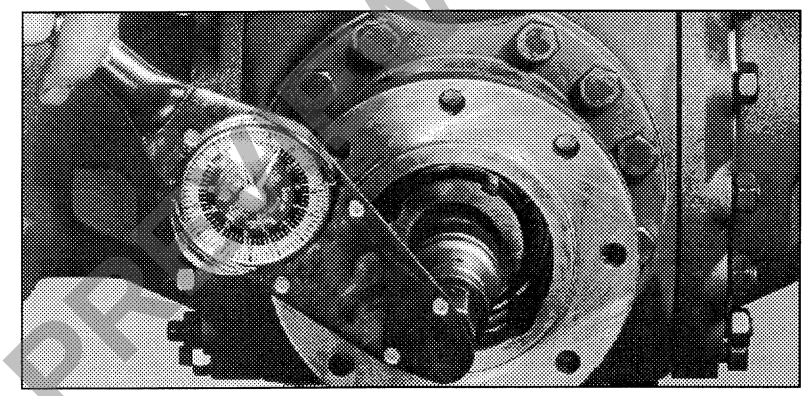


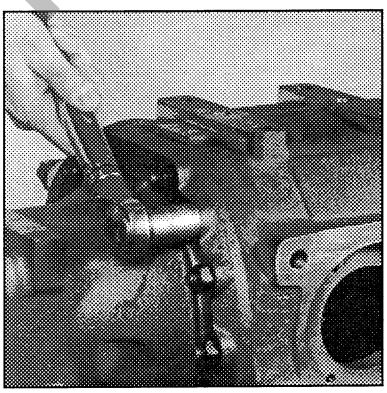
ASSEMBLY AND ADJUSTMENT
Insert an initial shim thickness of 0,8 mm on the crown wheel side and 0,85 mm on the opposite side.

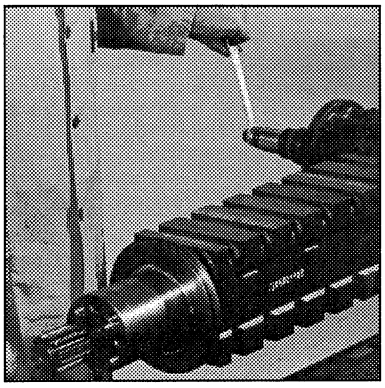




Mount the differential with the lateral axle housings, leaving the bevel gear side nuts loose. Check rotational torque of bevel pinion.







Tighten all nuts of the lateral axle housing.
Seat the taper roller bearings of the differential by tapping on both sides bon the axle shafts while turning the pinion.

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