Engine

Service Manual

Case G 4.0 and G 4.0T

4 Cylinder Diesel Engines

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Bur 7-15480

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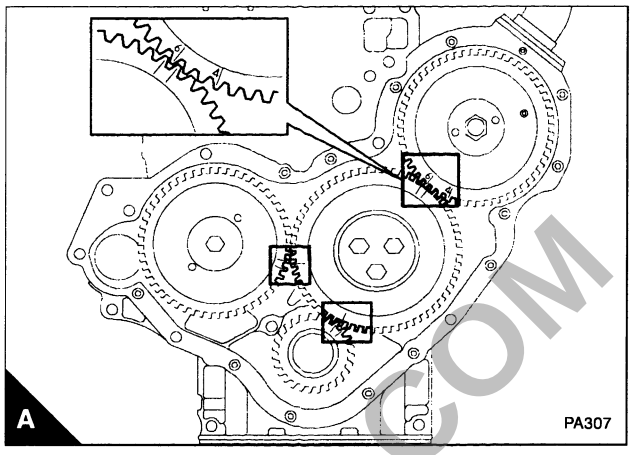
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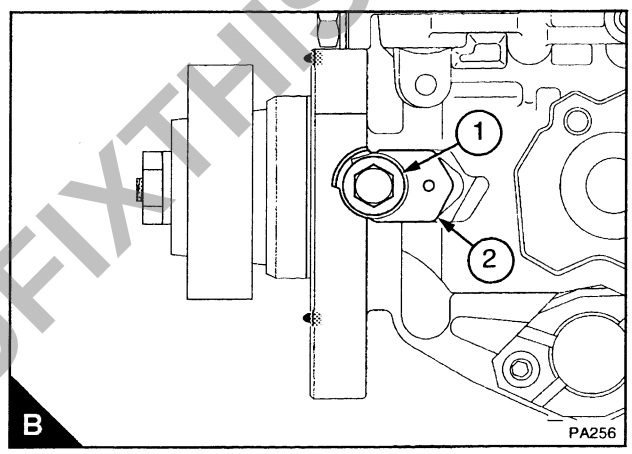
General description

The timing gears are stamped with timing marks to make sure that they are assembled correctly (A). The marked teeth of the crankshaft, the camshaft and the fuel pump gears will be in mesh with the idler gear when number 1 piston is at top dead centre (TDC) on the compression stroke. The marked teeth of the idler gear may not necessarily be in mesh in this position, because of the different speeds at which the gears rotate.



The fuel injection pump is timed at TDC on the compression stroke of number 1 cylinder. There is no timing mark on the rear face of the timing case.

Caution: *For engine type - AK, AP, and AQ, the fuel injection pump has a lock screw (B1) which locks the shaft. It is important that the lock screw is released and the pump shaft is free to turn. The drive shaft of the pump must not be rotated without the spacer (B2) in position under the locking screw. If the drive shaft is rotated with the locking screw tightened onto the shaft the drive shaft will be damaged.*



The fuel pump gear is fastened to the hub of the fuel pump by four setscrews. The setscrews pass through slots in the gear which allow removal of the backlash.

To reach the accurate fuel injection needed for engines to conform to emissions legislation, the fuel injection pumps operate at a static timing very close to TDC.

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To disassemble and to assemble **20A-04**

To disassemble

1 Clean the outside surfaces of the fuel lift pump.

2 Make a mark across the flanges of the two halves of the pump to make sure correct relationship when the pump is assembled.

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.

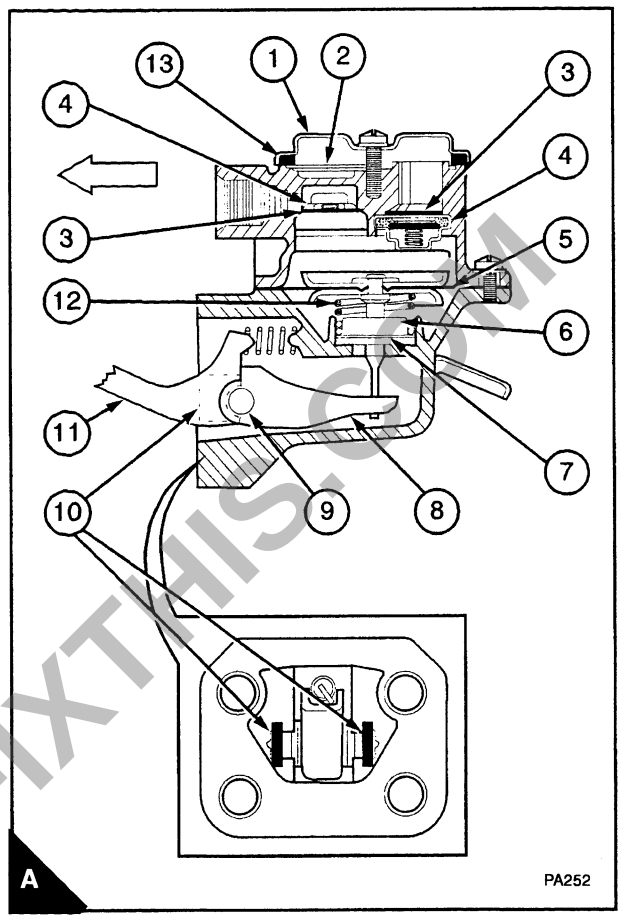
5 The valves (A4) are peened in and can be removed with a suitable lever. Some of the peened metal will have to be removed before the valves can be removed.

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. Install new seat washers (A3) and push the new valves (A4) into position. As the valves are the same, but one valve is installed in reverse of the other, it is possible to install the valves upside down. To make sure that the valves are installed correctly, install them as shown in (A). When the valves are correctly installed, peen the edge of the valve housings in six places, evenly divided, to keep the valves in position.

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



3 With a light hammer and a suitable adaptor, install 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 Install 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. Make sure that the small diameter at the top of the seal is on the round section of the pull rod.

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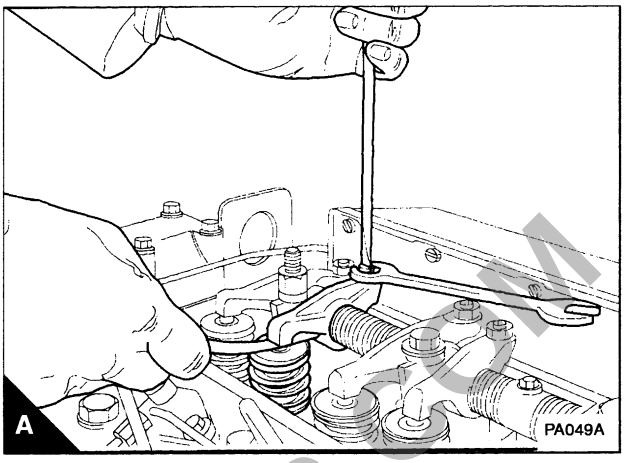
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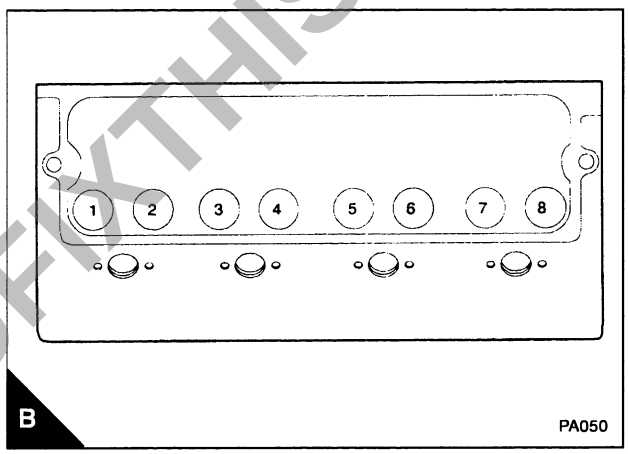
Valve tip clearances

To check and to adjust **12A-05**

Notes:

- The valve tip clearance is measured between the top of the valve stem and the rocker lever (A). With the engine hot or cold, the correct clearances are 0,20 mm (0.008 in) for the inlet valves and 0,45 mm (0.018 in) for the exhaust valves. The valve positions are shown at (B).
- The sequence of valves from number 1 cylinder is shown in the table below. Number 1 cylinder is at the front of the engine.





1 Rotate the crankshaft in the normal direction of rotation until the inlet valve (B7) of number 4 cylinder has just opened and the exhaust valve (B8) of the same cylinder has not closed completely. Check the clearances of the valves (B1 and B2) of number 1 cylinder and adjust them, if necessary.

2 Set the valves (B3 and B4) of number 2 cylinder as indicated above for number 4 cylinder. Then check / adjust the clearances of the valves (B5 and B6) of number 3 cylinder.

3 Set the valves (B1 and B2) of number 1 cylinder. Then check / adjust the clearances of the valves (B7 and B8) of number 4 cylinder.

4 Set the valves (B5 and B6) of number 3 cylinder. Then check / adjust the clearances of the valves (B3 and B4) of number 2 cylinder.

Cylinder and Valve number	1		2		3		4	
	1	2	3	4	5	6	7	8
Valve I = Inlet E = Exhaust	I	E	I	E	I	E	I	E

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General information

Thread sealant

When setscrews or studs are installed into holes which are tapped into the body of the engine, a suitable sealant should be used.

Case have introduced the use of Micro Encapsulated Anaerobic Sealant (M.E.A.S). fasteners. There is no requirement to use any other other jointing compound or sealant when the fasteners are installed into holes through oil or coolant galleries. The fasteners are identified by a red, blue, or other colour sealant around the fastener threads.

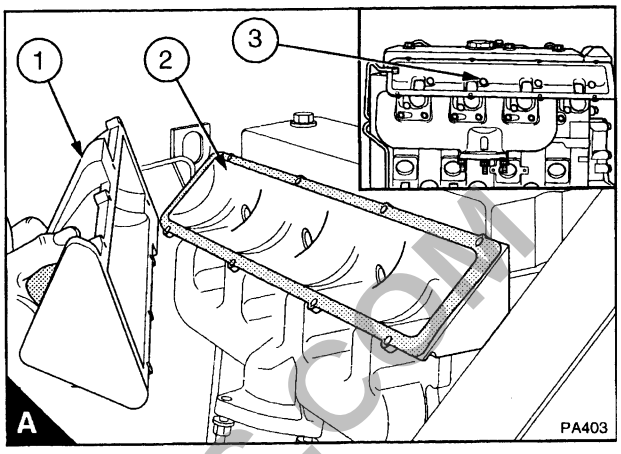
When M.E.A.S. sealed studs are used, make sure that the sealed end is installed into the cylinder head/cylinder block etc. Threaded holes must have a 1,59 mm (0.0625 in) 45˚ chamfer, to prevent the removal of M.E.A.S. sealant when new fasteners are installed. If the fasteners have to be removed and installed again, the threads must be cleaned and a suitable sealant applied.

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Cylinder head assembly

To remove and to install **12A-07**



To remove

1 For engines installed with turbochargers: Remove the air filter/cleaner hose at the compressor inlet of the turbocharger.

2 Remove the tube which is installed between the fuelled starting aid in the induction manifold and the fuel filter.

3 For engines installed with a boost control device: Remove the boost control tube which is installed between the induction manifold and the top of the fuel injection pump.

4 Remove the induction manifold.

Note: *For AS engines, the upper half of the induction manifold (A1) is sealed to the lower half (A2) with liquid sealant and secured with six cap screws. The upper half must be removed to gain access to the four screws (A3), located in the manifold, securing the manifold to the cylinder head.*

5 For engines installed with turbochargers: Disconnect all connections to the turbocharger and remove the turbocharger, operation 18A-01.

6 Release the exhaust manifold fasteners, starting at the No. 2 cylinder port, followed by No. 3 port, No. 4 port and finally No. 1 port.

7 Remove the low-pressure fuel tubes which are installed between the fuel injection pump and the fuel filter.

Remove the fuel tube installed between the fuel lift pump and the fuel filter. Remove the fuel filter bracket together with the fuel filter.

Caution: *Where access to the fuel injection pump outlet fittings is possible, make sure that a separate spanner is used to prevent movement of the fuel injection pump outlets when the connections of the high-pressure tubes are released. Install suitable covers to all open connections on the fuel injection pump.*

8 Remove the high-pressure fuel tubes.

9 Remove the fuel injector leak-off tube.

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To check the valve timing **17A-02**

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

2 Remove the cover for the fuel injection pump gear.

3 Set the piston of number 1 cylinder to TDC on the compression stroke, operation 17A-01A.

4 Fasten a temporary pointer to the timing case cover with its tip near to the outer edge of the crankshaft pulley . Make a suitable mark on the crankshaft pulley to align with the temporary pointer.

5 Remove the timing pin, (A1) from the pump.

6 Rotate the crankshaft, clockwise from the front, until the inlet valve of the rear cylinder is fully open.

7 Set the valve tip clearance of number 1 cylinder inlet valve to 1,5 mm (0.059 in).

8 Rotate the crankshaft, clockwise from the front, until the push rod of number 1 cylinder inlet valve just tightens. In this position, check if the mark on the crankshaft pulley is within +/- 2 1/2˚ of the temporary pointer. Use the formula below to find the measurement which is equal to 2 1/2˚ on the pulley.

$$\frac{C \times P}{360}$$

C = circumference of pulley

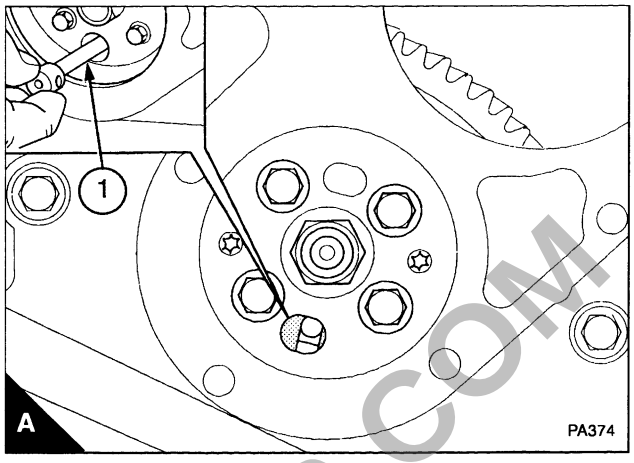
P = 2 1/2˚

9 If the timing is more than 2 1/2˚ out of position, the timing gears are probably not in correct mesh.

Note: *One tooth on the camshaft gear is equivalent to 23 mm (0.9 in) at the circumference of a pulley of 203 mm (8 in) diameter.*

10 Rotate the crankshaft, clockwise from the front, until the inlet valve of the rear cylinder is fully open. Set the valve tip clearance of the inlet valve of number 1 cylinder to 0,20 mm (0.008 in).

11 Install the rocker cover, operation 12A-01.



12 Remove the temporary pointer from the timing case and the timing mark from the pulley.

13 Install the cover for the fuel injection pump gear.

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