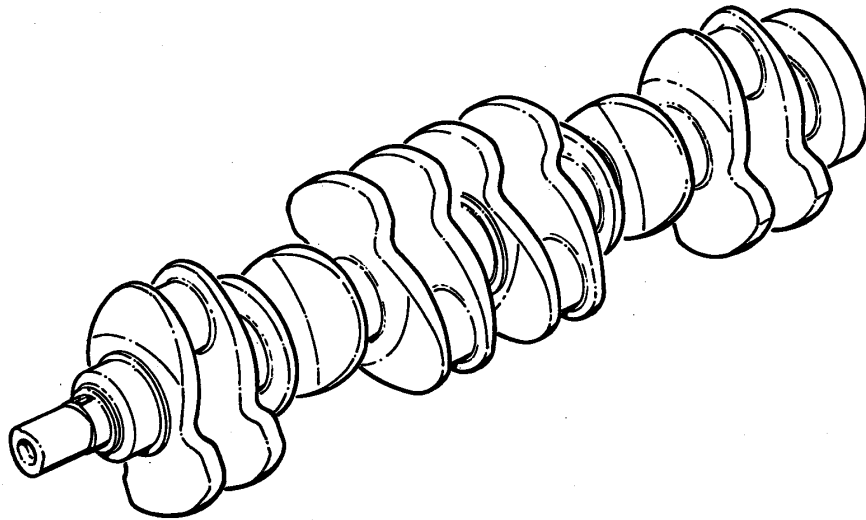


Date	Group	No.	Page
3.2008	216	52	1(24)

Crankshaft, Replacement
Engine Removed
D16F

Crankshaft, Replacement



T2006853

This information covers the crankshaft replacement procedure of the Volvo D16F engine.

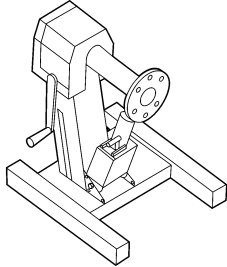
Contents

- "Crankshaft, Replacement" page 3

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

For information on ordering special tools and other special equipment, see Tool Information, group 08.

Special Tools



W2004983

J29109A

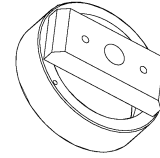
Engine Overhaul Stand



W0001798

9998238

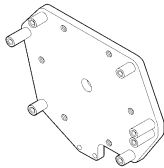
Crankshaft Rear Seal Drift



T0012654

88800021

Crankshaft Front Seal Drift



W0002413

J48281

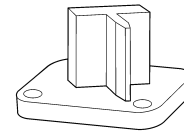
Overhaul Stand Engine Adapter Plate



W0001793

9992000

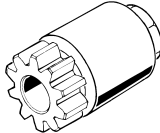
Handle



W0002269

85109131

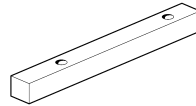
Flywheel Blocking Tool



T0012612

88800014

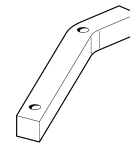
Flywheel Turning Tool



W2005150

85109033A

Timing Cover Alignment Tool (Straight)



W2005151

85109033B

Timing Cover Alignment Tool (Angled)

2161-03-04-01 Crankshaft, Replacement

Engine removed

You must read and understand the precautions and guidelines in Service Information, group 20, "General Safety Practices, Engine" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

Special tools: 9998238, 9992000, 85109131, 88800021, 88800014, 85109033A, 85109033B, J29109A, J48281, 9998170

Removal

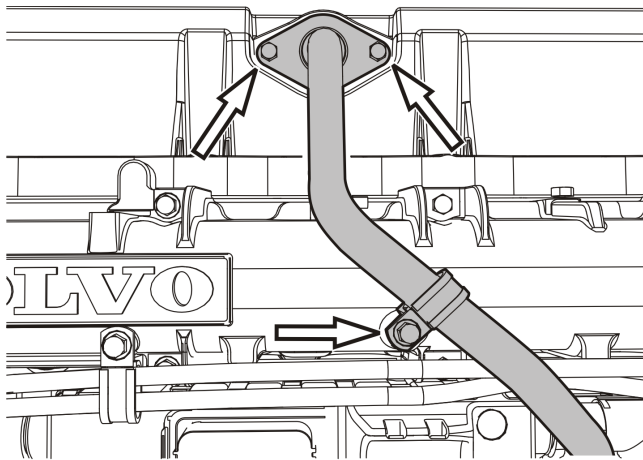
1

Mount the engine in the overhaul stand using the adapter plate.

J29109A, J48281

2

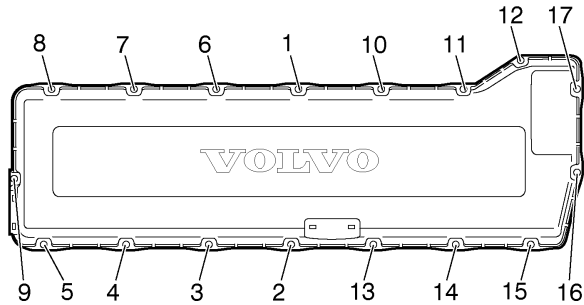
Remove the crankcase ventilation tube from the valve cover and the P-clamp from the intake manifold.



W2005747

3

Remove the fasteners securing the valve cover to the cylinder head. Also remove the engine wiring harness support bracket from the front of the valve cover.



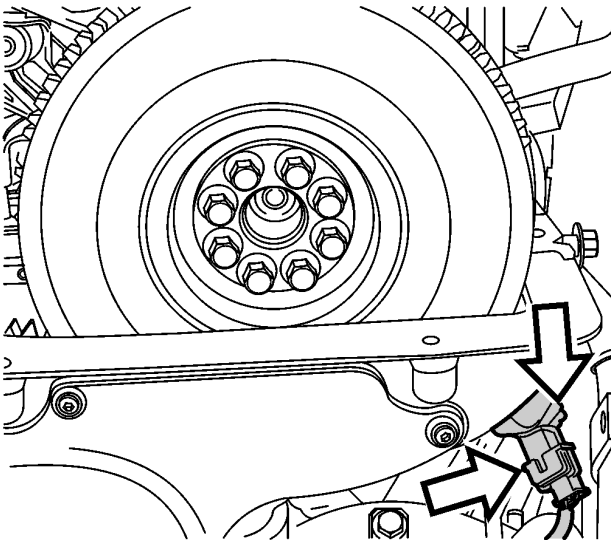
W2005984

4

Remove the valve cover.

5

Disconnect the camshaft position sensor harness connector, remove the bolt and pull out the sensor.



W2005104

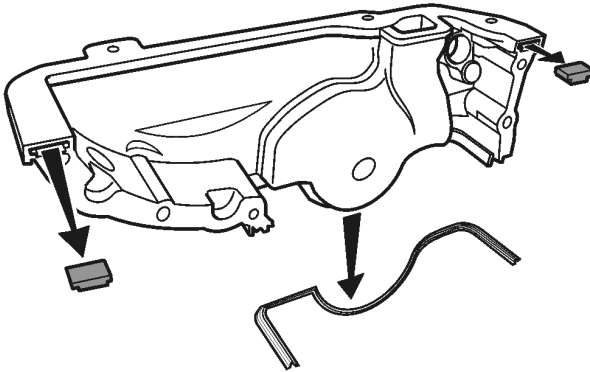
6

Remove the timing gear cover fasteners securing the cover to the cylinder head.

7

Remove the timing gear cover.

- 8**
Remove and discard the timing gear cover seals.



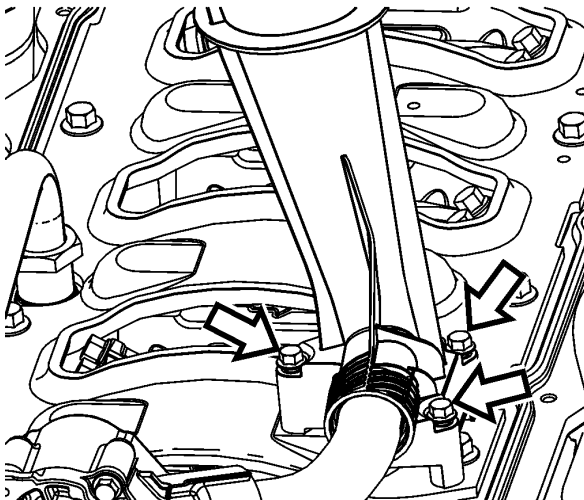
T2019081

- 9**
Drain the engine oil.

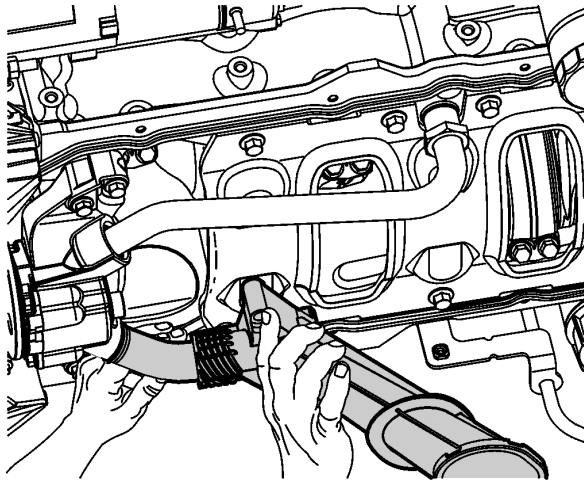
- 10**
Rotate the engine in the overhaul stand.

- 11**
Remove the oil pan fasteners and oil pan.

- 12**
Remove the bolts from the oil strainer.



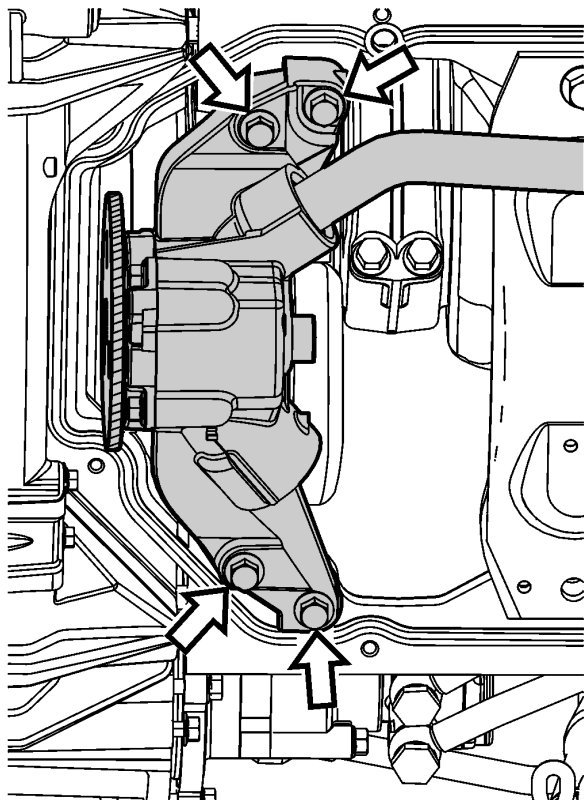
W2004952



W2004957

13

Remove the oil strainer and suction pipe from the oil pump.



W2004955

14

Remove the oil pump and oil pressure pipe from the cylinder block.

15

Remove the engine stiffening frame from the bottom of the cylinder block.

16

Remove the air compressor.

17

Disconnect any fuel lines or power steering lines attached to the fuel pump and power steering pump.

18

Remove the power steering pump bolts and remove the fuel pump and power steering pump as a unit.

19

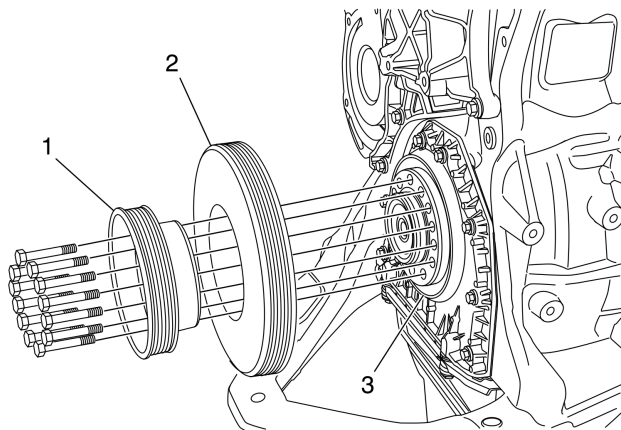
Disconnect the starter motor electrical connections, remove the starter bolts and starter motor.

20

Loosen and remove the drive belts from the front of the engine.

21

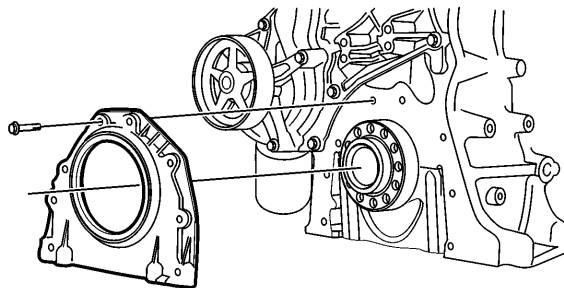
Remove the mounting bolts securing the belt pulley (1) and vibration damper (2) to the crankshaft front hub.



W2005536

22

Remove the crankshaft cover at the front of the cylinder block.

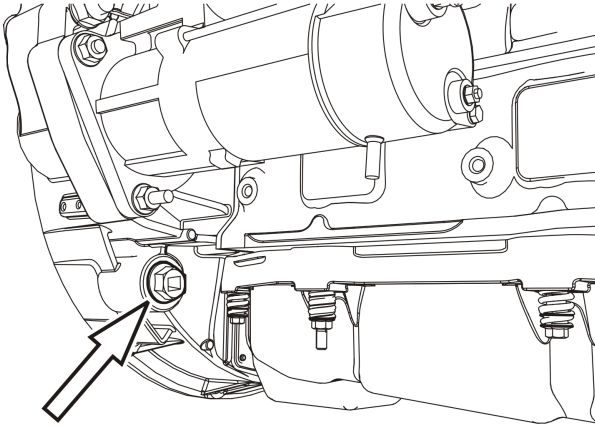


T2020207

23

Remove the plug from the flywheel housing and install the flywheel turning tool 88800014.

88800014

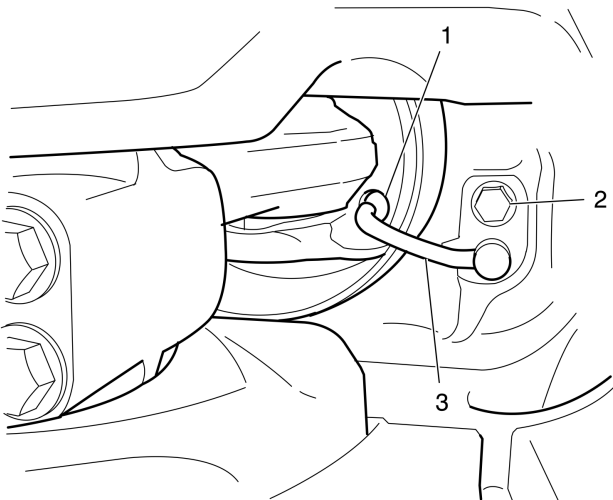


W0002368

24

Remove the piston cooling nozzles as necessary to avoid damaging them during crankshaft removal.

Note: Rotate the crankshaft as needed to gain access to the nozzles.



W2005545

- 1 Piston Cooling Duct
- 2 Attaching Fastener
- 3 Spray Nozzle

25

Rotate the crankshaft so that the No. 3 and No. 4 pistons are near bottom dead center (BDC) so that the connecting rod bearing cap bolts can be accessed. Remove the connecting rod bearing cap bolts and caps. Remove the connecting rod bearings from the connecting rods and bearing caps.

Note: Check for markings on the connecting rods and caps. If there are no factory markings, mark rods and caps for cylinder placement and rod-to-cap orientation before removal (this is important during installation).



CAUTION

Connecting rods and bearing caps are matched sets. Take care not to damage the connecting rod or bearing cap mating surfaces.

88800014

26

Rotate the crankshaft so that the No. 1 and No. 6 pistons are near bottom dead center (BDC) so that the connecting rod bearing cap bolts can be accessed. Remove the connecting rod bearing cap bolts and caps. Remove the connecting rod bearings from the connecting rods and bearing caps.

Note: Check for markings on the connecting rods and caps. If there are no factory markings, mark rods and caps for cylinder placement and rod-to-cap orientation before removal (this is important during installation).



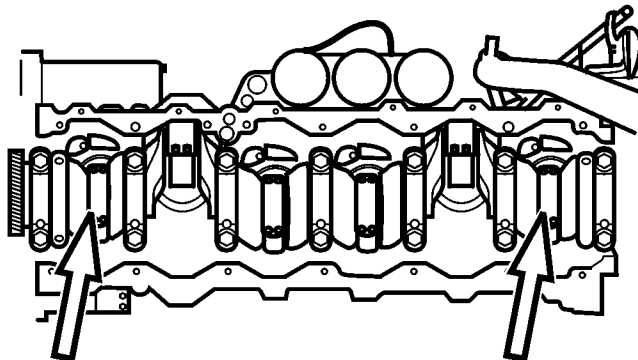
CAUTION

Connecting rods and bearing caps are matched sets. Take care not to damage the connecting rod or bearing cap mating surfaces.

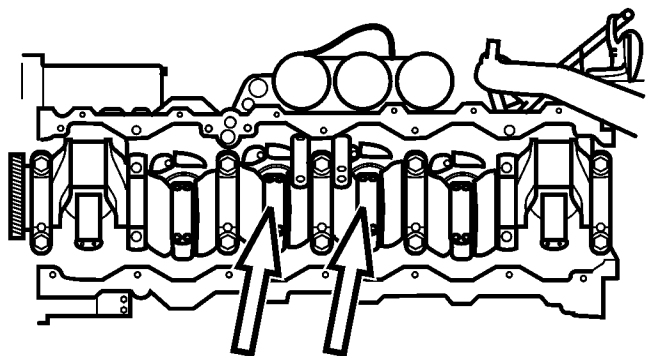
88800014

27

Remove crankshaft main bearing caps No. 2 and No. 6.



T2020991



T2020993

28

Rotate the crankshaft so that the No. 3 and No. 4 pistons are near bottom dead center (BDC) so that the connecting rod bearing cap bolts can be accessed. Remove the connecting rod bearing cap bolts and caps. Remove the connecting rod bearings from the connecting rods and bearing caps.

Note: Check for markings on the connecting rods and caps. If there are no factory markings, mark rods and caps for cylinder placement and rod-to-cap orientation before removal (this is important during installation).



CAUTION

Connecting rods and bearing caps are matched sets. Take care not to damage the connecting rod or bearing cap mating surfaces.

88800014

29

Remove crankshaft main bearing caps No. 1, No. 4 and No. 7.

30

Rotate the crankshaft so that the No. 2 and No. 5 pistons are near bottom dead center (BDC) so that the connecting rod bearing cap bolts can be accessed. Remove the connecting rod bearing cap bolts and caps. Remove the connecting rod bearings from the connecting rods and bearing caps.

Note: Check for markings on the connecting rods and caps. If there are no factory markings, mark rods and caps for cylinder placement and rod-to-cap orientation before removal (this is important during installation).



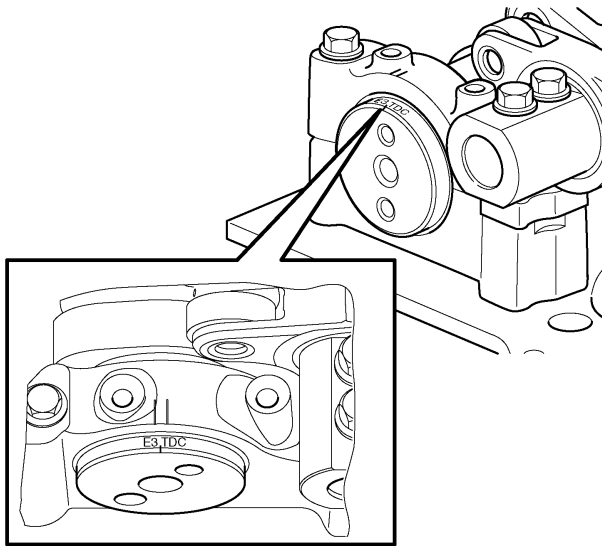
CAUTION

Connecting rods and bearing caps are matched sets. Take care not to damage the connecting rod or bearing cap mating surfaces.

88800014

31

Remove crankshaft main bearing caps No. 3 and No. 5.



W2006173

32

Make sure that the camshaft and flywheel are positioned at top dead center (TDC).

33

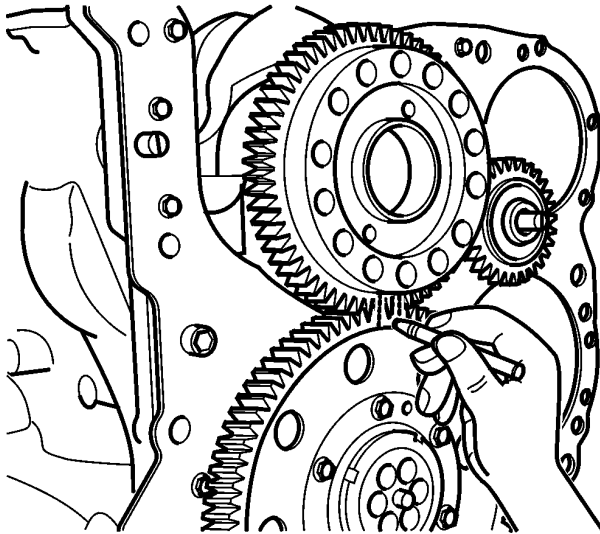
Remove the flywheel and the flywheel housing.

34

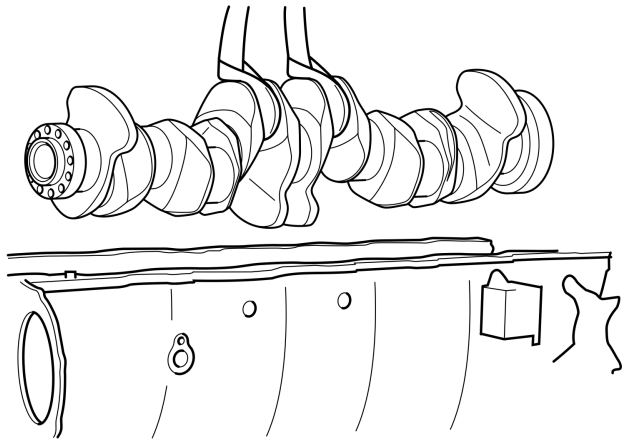
Tap the crankshaft seal out of the flywheel housing.

35

Mark the position between the crankshaft gear and the intermediate (lower) idler gear.



T2020995



T2022551

36

Using lifting straps and a hoist, remove the crankshaft. Make sure that the lifting straps and hoist have the proper lifting capacity to safely support the weight of the crankshaft.

Note: Attach the lifting straps to the No. 3 and No. 4 connecting rod journals of the crankshaft.

37

Remove the gear from the crankshaft rear flange using a suitable gear puller.

38

Remove all crankshaft main bearings from the cylinder block and main bearing caps.

Installation

1

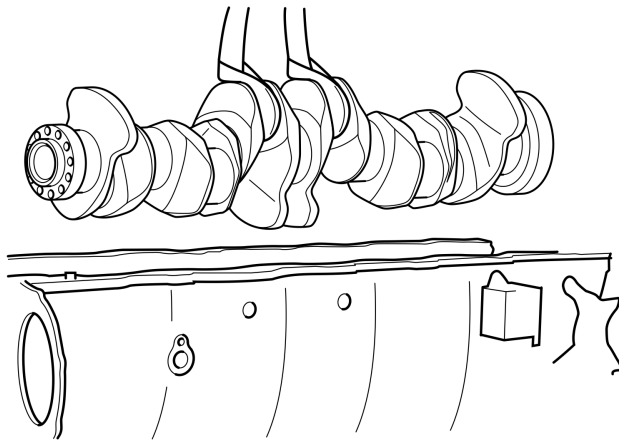
Clean the crankshaft main bearing seats of the cylinder block and install new bearings. Lubricate the bearing surfaces with engine oil.

Note: The backs of the bearings should not be lubricated.

2

Using lifting straps and a hoist, carefully install the new crankshaft.

Note: Carefully attach the lifting straps to the No. 3 and No. 4 connecting rod journals.



T2022551

3

Install new bearings into the crankshaft main bearing caps.

Note: Lubricate the bearing surfaces with engine oil.

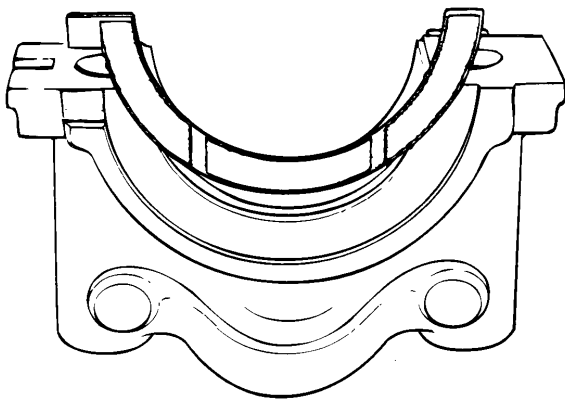
4

Install the upper axial thrust bearings to the milled surfaces of the middle main bearing saddle of the cylinder block.

5

Install all main bearing caps with new bearings.

Note: Install new axial thrust bearings to the middle main bearing cap before installation.



T2006738

6

Install the main bearing cap bolts and tighten to the torque specified in "Specifications", see Group 20.

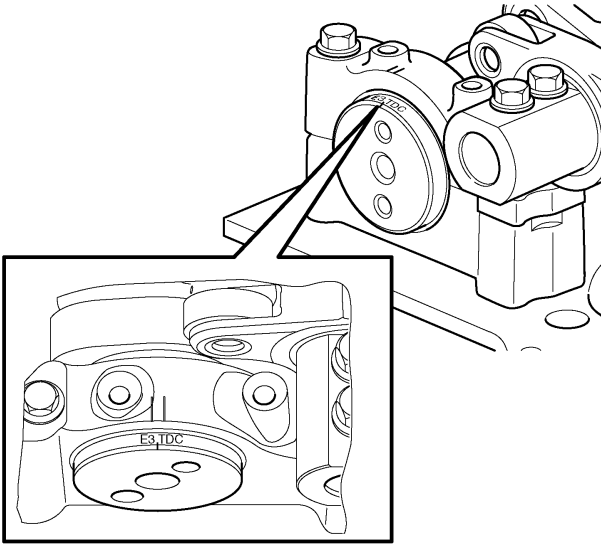
Note: With your hand, make sure the crankshaft can be rotated freely without binding.

7

Install a new O-ring seal onto the crankshaft rear flange.

8

Check that the camshaft is positioned at top dead center (TDC).



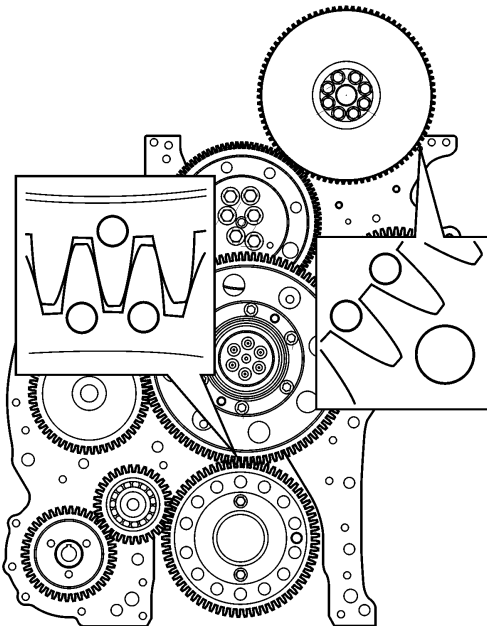
W2006173

9

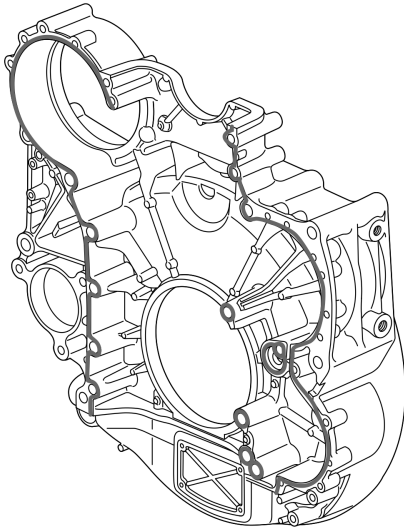
Apply a film of oil to the crankshaft gear inner surface and to the crankshaft rear journal. Install the crankshaft gear and bolts. Torque-tighten as specified in "Specifications", see Group 20.

10

Make sure that the crankshaft gear is aligned with the factory markings, or the marks made during disassembly.



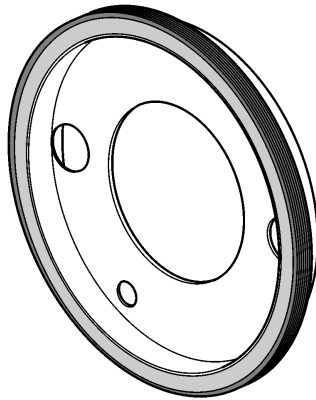
T2022369



T2022591

11

Apply sealing agent to the timing gear plate. Install the flywheel housing and align using the guide pins. Torque-tighten according to "Specifications", see Group 20.



T2022255

12

Using drifts 9998238 and 9992000, install a new crankshaft rear seal.

Note: Thoroughly clean the sealing area in the flywheel housing and the sealing surface of the crankshaft.

Note: The seal comes with a protective sleeve installed in the seal.

9998238, 9992000

13

Install the flywheel. Torque-tighten according to "Specifications", see Group 20. Use the flywheel turning tool and pull handle to prevent the flywheel from rotating while tightening the bolts.

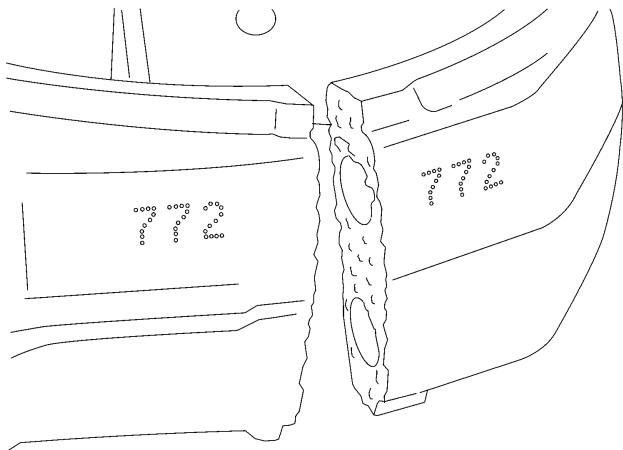
88800014

14

Remove the flywheel turning tool.

15

When installing connecting rod bearing caps, align the markings on the connecting rod and bearing cap.



W2005288



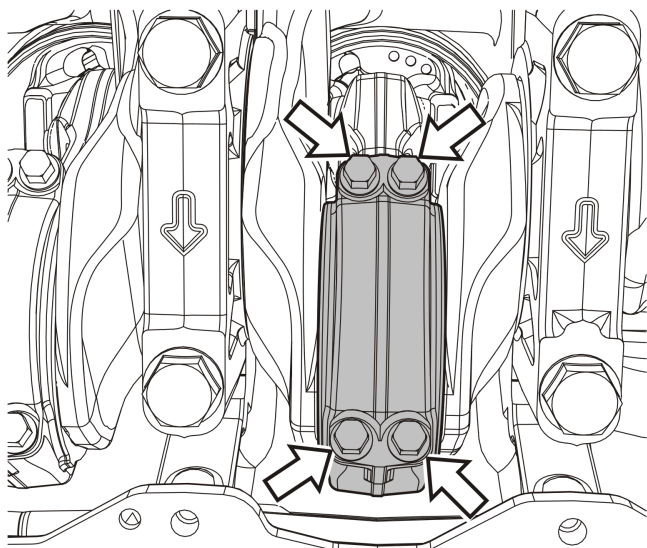
CAUTION

Make sure the connecting rod bearings are aligned and properly in place. Make sure the connecting rod bearing cap is oriented correctly with the connecting rod. The connecting rod is a cracked cap design and must be assembled with the markings on the cap aligned with the markings on the rod.

16

Rotate the crankshaft so that it aligns the No. 2 and No. 5 connecting rods. Lubricate and install new bearings on the No. 2 and No. 5 connecting rods and connecting rod bearing caps. Install the bearing caps and torque-tighten the bolts according to "Specifications", see Group 20.

Note: Make sure that all contact surfaces are thoroughly cleaned.



W2005251

17

Rotate the crankshaft so that it aligns the No. 3 and No. 4 connecting rods. Lubricate and install new bearings on the No. 3 and No. 4 connecting rods and connecting rod bearing caps. Install the bearing caps and torque-tighten the bolts according to "Specifications", see Group 20.

Note: Make sure that all contact surfaces are thoroughly cleaned.

88800014

18

Rotate the crankshaft so that it aligns the No. 1 and No. 6 connecting rods. Lubricate and install new bearings on the No. 1 and No. 6 connecting rods and connecting rod bearing caps. Replace the bearing caps and torque-tighten the bolts according to "Specifications", see Group 20.

Note: Make sure that all contact surfaces are thoroughly cleaned.

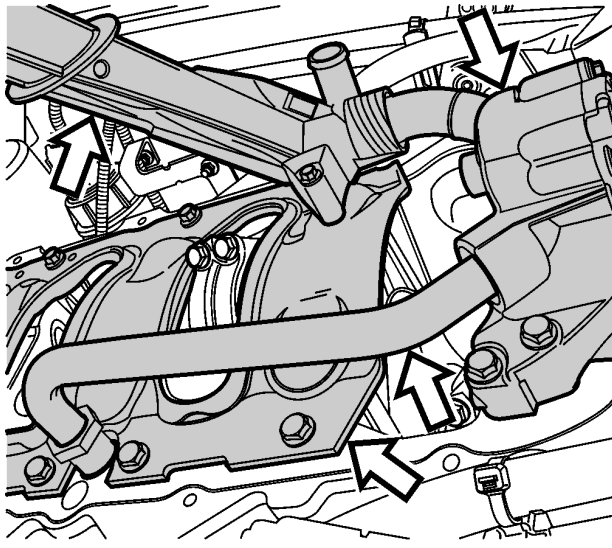
88800014

19

Install the oil pump. Torque-tighten according to "Specifications", see Group 20.

20

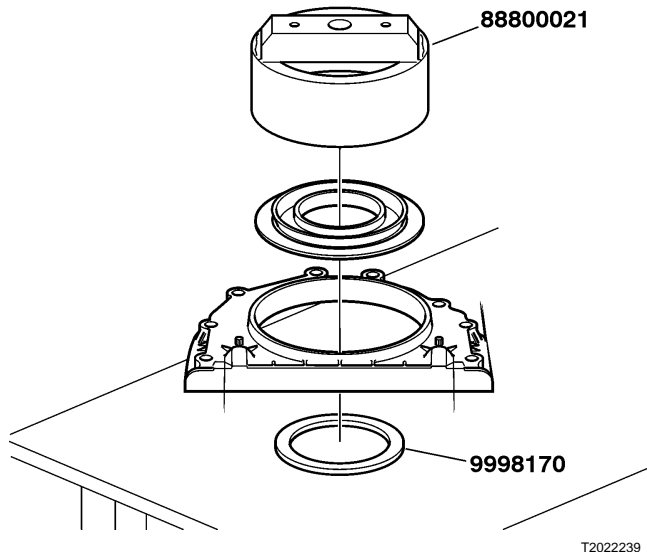
Install the engine stiffening frame, oil pressure pipe, oil strainer and suction pipe. Torque-tighten according to "Specifications", see Group 20.



W2004831

21

Tap the front crankshaft seal out of the cover and discard the seal.



22

Place the crankshaft cover with the spacer 9998170 in the center on a flat surface. Install a new crankshaft seal with plastic ring in the crankshaft cover. The spacer ring prevents the plastic ring from sliding off. Carefully tap the crankshaft seal into the crankshaft cover with drift 88800021 and handle 9992000 until the crankshaft seal is level with the crankshaft cover outer surface.

9992000, 9998170, 88800021

23

Apply sealant to the crankshaft cover sealing surfaces. Centralize the crankshaft cover over the crankshaft with the plastic ring. Install the crankshaft cover. Note that there are two different types of covers. In the later type (B), the LH hole is smaller than the earlier type and the RH hole is oval. The holes permit a later type cover to be correctly aligned.

For the earlier type (A), the following applies:

Install the bolts without tightening them. Using a straight edged ruler, make sure the cover is flush with the bottom edge of the cylinder block.

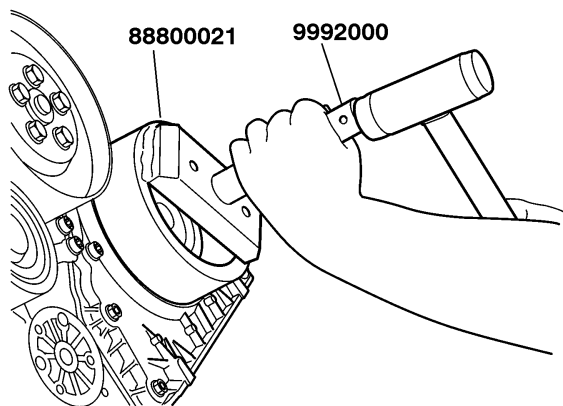
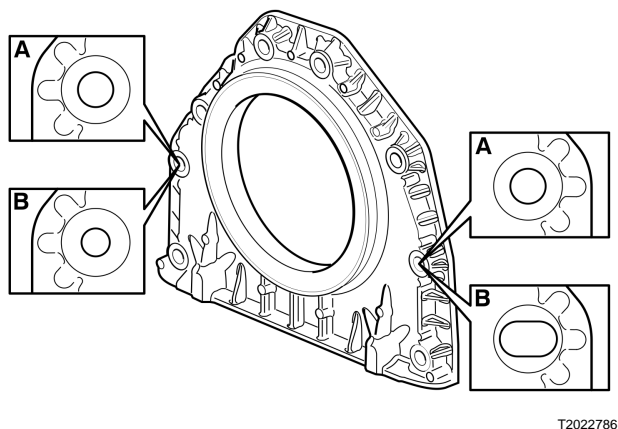
For the later type (B), the following applies:

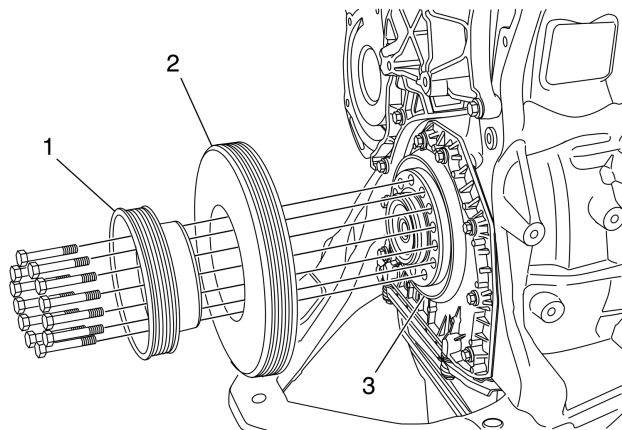
Install the bolts in both bolt holes which align the cover to the correct position. Tighten by hand so that the cover is snug. Install the remaining bolts. Torque-tighten the bolts according to "Specifications", see Group 20. Remove any excess sealant.

24

Remove the plastic ring from the crankshaft. Drive in the crankshaft seal using drift 88800021 and handle 9992000 until the drift bottoms against the crankshaft hub.

9992000, 88800021





W2005536

25

Attach the vibration damper (2), belt pulley (1) and bolts to the crankshaft hub and torque-tighten according to "Specifications", see Group 20.

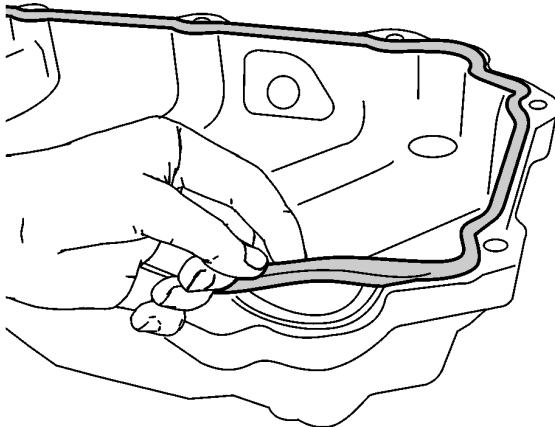
Note: Use caution not to damage the vibration damper.

26

Install the fan and water pump drive belt and the alternator and A/C compressor drive belt.

27

Inspect the oil pan gasket for damage and replace if necessary. Clean the flanges of the oil pan and cylinder block.



W2004878

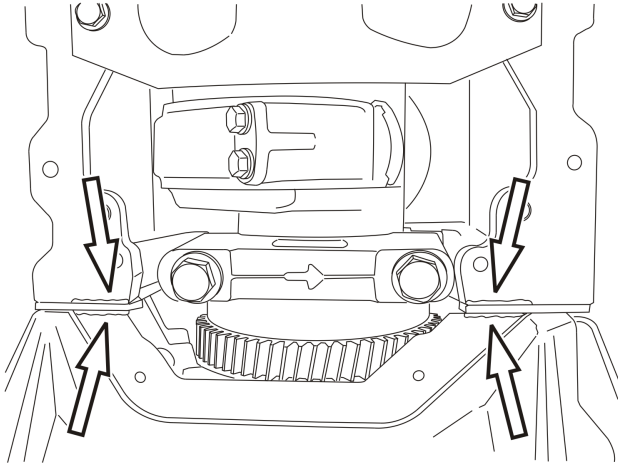
28

Install the oil pan gasket into the oil pan.

29

Apply a two mm (0.08 inch) bead of Volvo sealant to the seams between the flywheel housing and timing gear mounting plate and between the timing gear mounting plate and the cylinder block.

Note: The oil pan must be installed within 20 minutes of the sealant being applied.

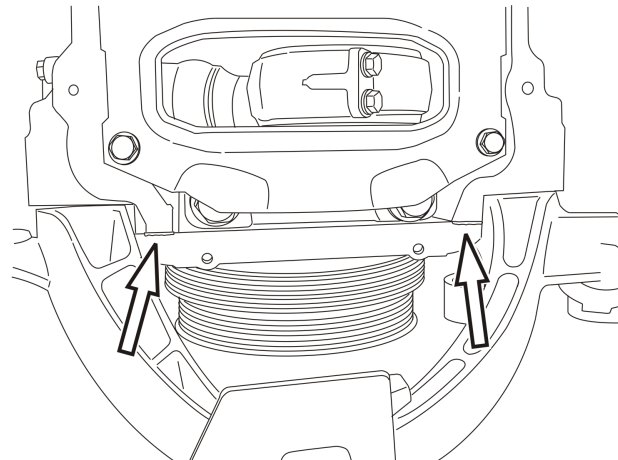


W2005222

30

Apply a two mm (0.08 inch) bead of Volvo sealant to the seam between the crankshaft cover and the cylinder block.

Note: The oil pan must be installed within 20 minutes of the sealant being applied.



W2005223

31

Install the oil pan and fasteners. Torque-tighten the fasteners according to "Specifications", see Group 20.

32

Install the starter motor and fasteners. Torque-tighten the fasteners according to "Specifications", see Group 20. Attach the electrical connections to the starter motor.

33

Install the fuel pump and power steering pump as a unit. Install the bolts and torque-tighten the bolts according to "Specifications", see Group 20.

34

Connect any fuel lines to the fuel pump and any power steering lines to the power steering pump. Torque-tighten according to "Specifications", see Group 20.

35

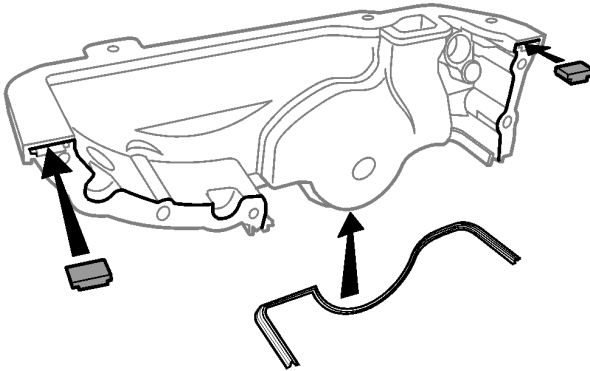
Install the air compressor. Torque-tighten according to "Specifications", see Group 20.

36

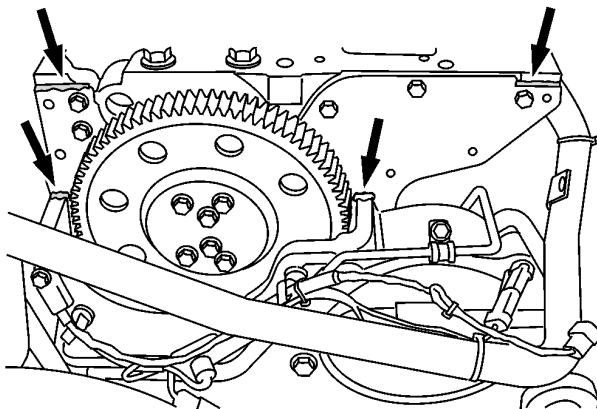
Clean the timing gear cover sealing surfaces of the timing gear mounting plate and the flywheel housing.

37

Clean the timing gear cover and install new seals on the cover.



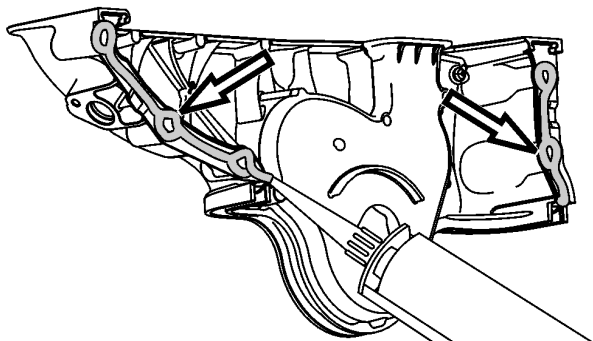
T2019475



W2005102

38

Apply Volvo sealant in the bottom corners where the timing gear plate and the flywheel housing meet. Also, apply Volvo sealant at the top of the timing gear plate in the corner next to the cylinder head.



W2005137

39

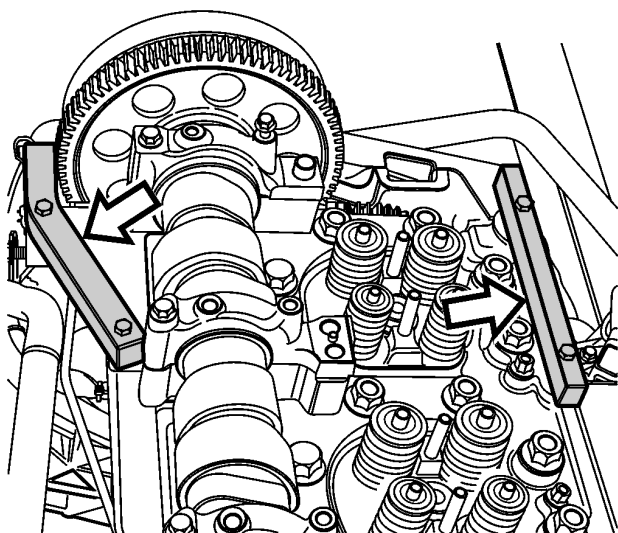
Apply Volvo sealant to the mating surfaces of the timing gear cover; see "Specifications", Group 20.

Note: The timing gear cover must be installed within 20 minutes of applying the sealant.

40

Position the timing gear cover. Install the bolts and tighten to snug the cover in place. Install alignment tools 85109033A and 85109033B. Screw down the tools so that the sealing surface of the timing gear cover is aligned (flush) with the sealing surface of the cylinder head. Torque-tighten the timing gear cover bolts according to "Specifications", see Group 20.

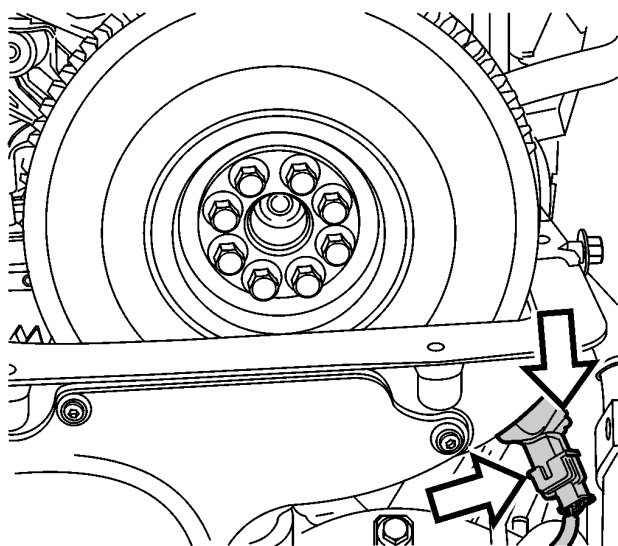
85109033A, 85109033B



W2005138

41

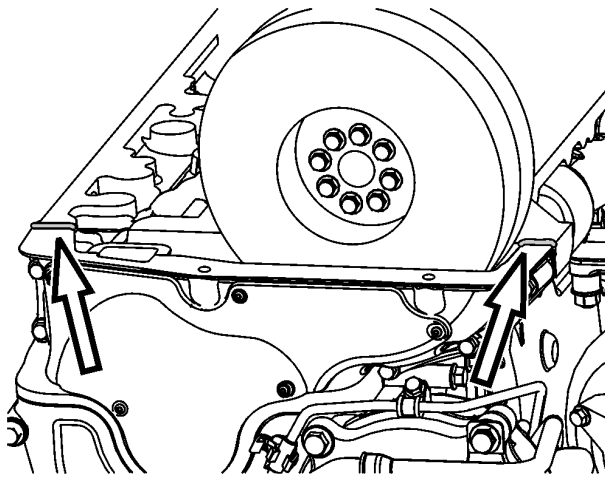
Install the camshaft position sensor with shim(s) and a new O-ring. Secure the sensor with the bolt and plug in the harness connector.



W2005104

42

Clean the valve cover sealing surface of the cylinder head and timing gear cover.



W2005157

43

Apply a two mm (0.08 inch) bead of Volvo sealant across the parting line on the valve cover sealing surface between the timing gear cover and the cylinder head.

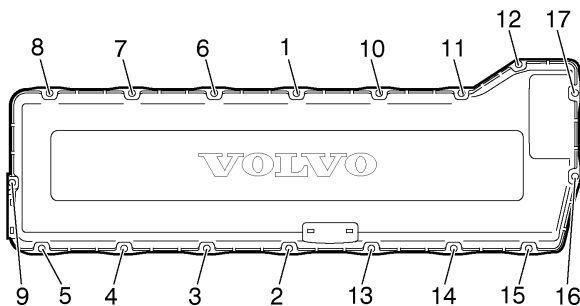
Note: The valve cover must be installed within 20 minutes of applying the sealant.

44

Inspect the valve cover gasket for damage and replace with a new gasket if necessary.

45

Install the valve cover and fasteners. Torque-tighten the fasteners according to "Specifications" following the sequence as shown, see Group 20.



W2005984

46

Install the wiring harness support bracket to the front of the valve cover.

47

Position the crankcase ventilation tube to the valve cover, install the fasteners. Install the P-clamp fastener to the intake manifold. Torque-tighten the fasteners according to "Specifications", see Group 20.

48

Install and torque the oil pan drain plug to specification.

49

Fill the engine with the specified amount and type of engine oil.

50

Remove the engine from the adapter plate and overhaul stand.