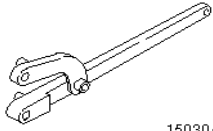


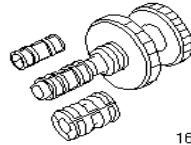
Engine - Disassemble and Assemble (engine removed) (21 134 8)

Special Tools



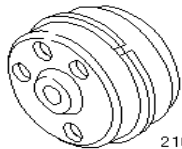
15030A

15-030 A Universal flange holding wrench



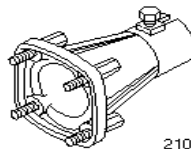
16067

16-067 Locator, clutch disc



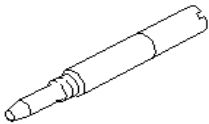
21011F

21-011 F Crankshaft rear oil seal installer



21031B

21-031 B Mounting bracket, engine



21104

21-104 Timing peg, TDC



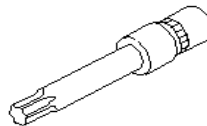
21148

21-148 A Aligner/installer, oil seal



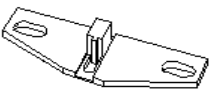
21162A

21-162A Timing tool, camshaft alignment



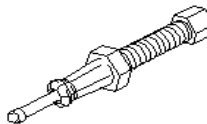
21164

21-164 Socket, cylinder head bolts



21168

21-168 Locking tool, crankshaft



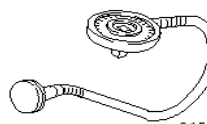
ES21200

21-200 Remover, crankshaft timing pulley



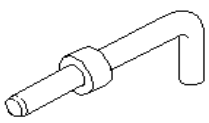
IA21217

21-217 Aligner, crankshaft rear oil seal



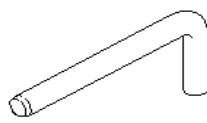
21540

21-540 Angle gauge



23019

23-019 Timing pin, camshaft toothed belt



23029

23-029 Timing pin, injection pump

1. General note.

⚠ CAUTION:

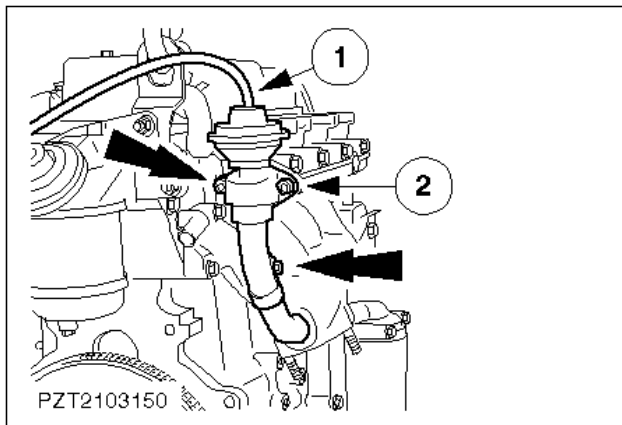
In MJ '96 the camshaft timing belt was revised. Coolant pumps and timing belt tensioners with different idler pulleys are fitted in production. In service there are now only coolant pumps with two edges on the idler pulley available. It should be noted that when renewing the timing belt tensioner, a tensioner without an edge must not be fitted in conjunction with a coolant pump without edges. Converting a mechanical timing belt tensioner to an automatic timing belt tensioner is NOT permissible. In addition, since MY '96 PTFE oil seals have been fitted at the front and rear of the crankshaft instead of the familiar Viton oil seals.

⚠ CAUTION:

Since 08.98 (build code WP), a revised oil pump has been fitted in conjunction with a revised oil pressure switch (green cover), and 5W 30 engine oil has been used. It should be noted that up to and including 07.98 (build code WM), an oil pressure switch with a black cover was fitted, and 10W-40 engine oil was used.

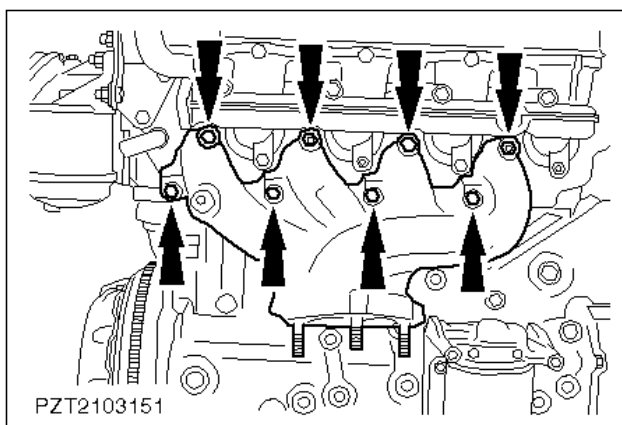
Note:

Installation position of the timing belt tensioner spring and the fuel-injection pump spring. DO NOT mix up the springs.

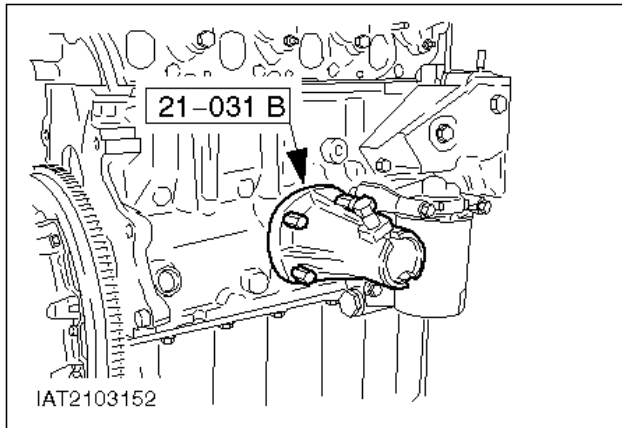


μ 2. Detach the exhaust gas recirculation valve (EGR valve).

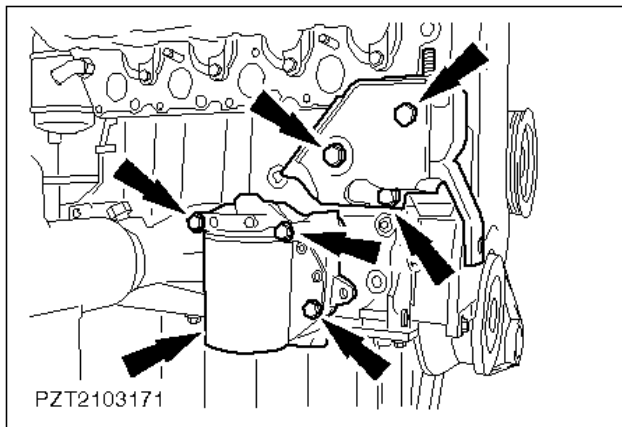
- 1 Disconnect the hose.
- 2 Unscrew the bolts.



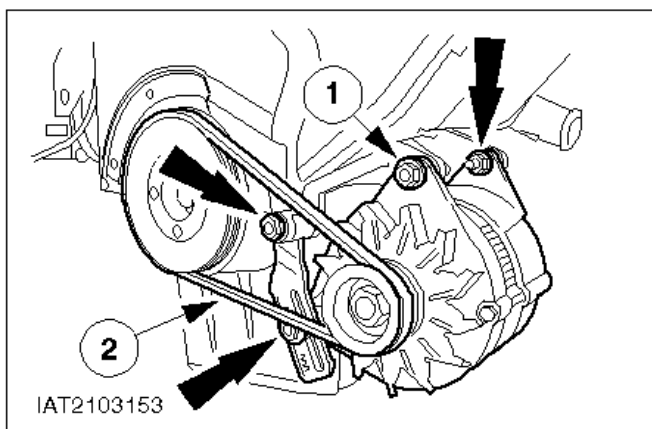
μ 3. Detach the exhaust manifold.



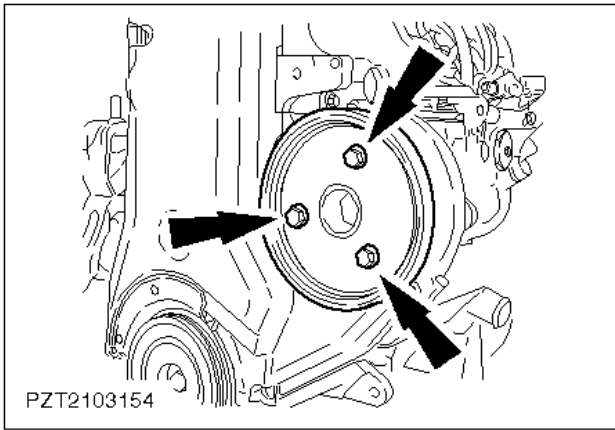
- μ 4. Mount the engine on an assembly stand.
 - Fit the mounting bracket.
 - Mount the engine on the assembly stand.
- 5. Drain the engine oil.



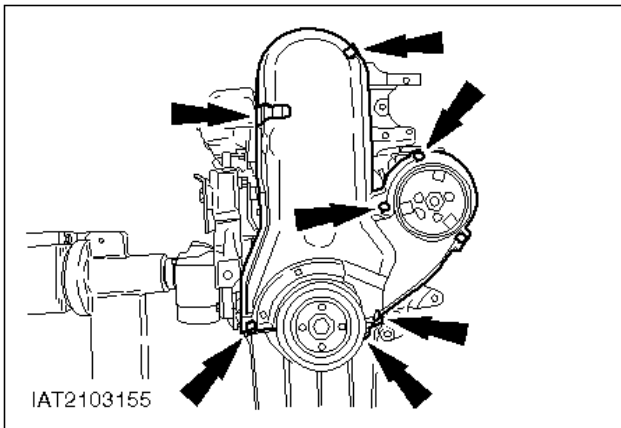
- μ 6. Detach the engine mounting.
- Note:
Watch out for escaping oil.
- 7. Detach the oil pump with the oil filter.



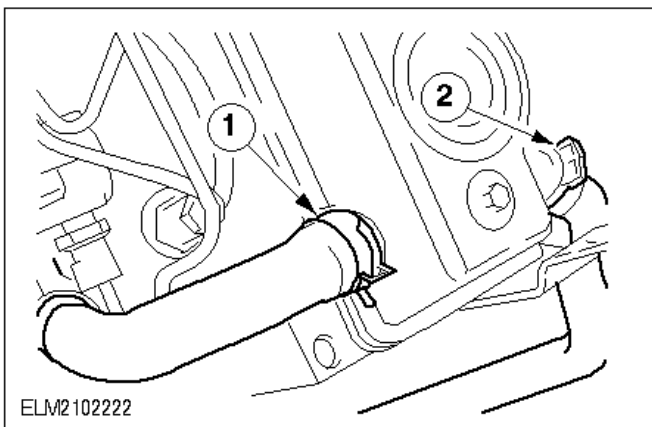
- μ 8. Detach the alternator.
 - 1 Undo the bolts.
 - 2 Slacken the timing belt and remove it.
Detach the alternator.



μ 9. Detach the injection pump belt pulley.

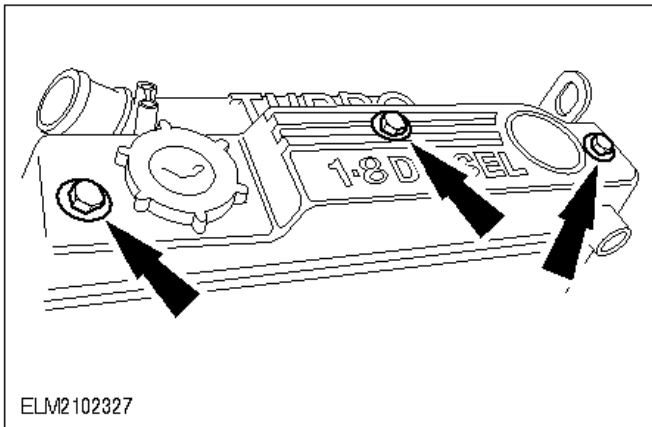


μ 10. Detach the upper and lower timing belt covers.



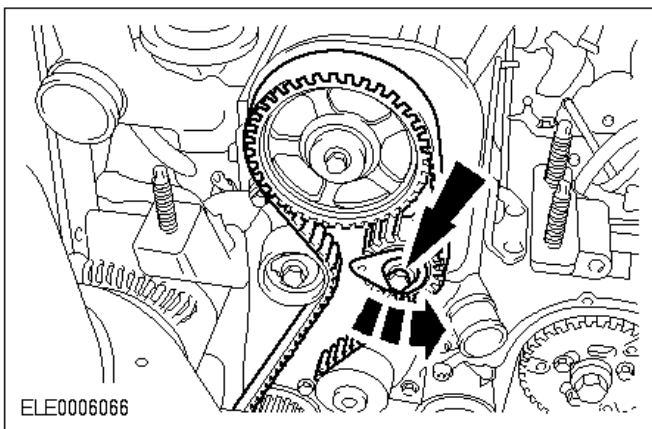
μ 11. Detach the crankcase ventilation hose.

- 1 To the cylinder block.
- 2 To the turbocharger.



μ 12. Detach the cylinder head cover.

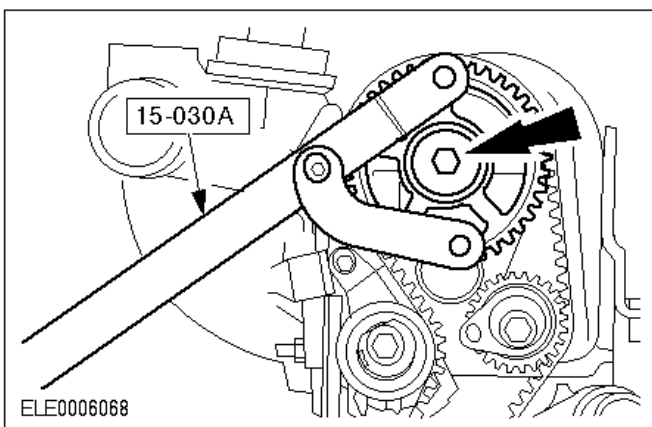
- Remove the gasket.



Engines fitted with an automatic camshaft timing belt tensioner.

μ 13. Undo the bolt of the adjusting cam.

Turn the adjusting cam to 6 o'clock.



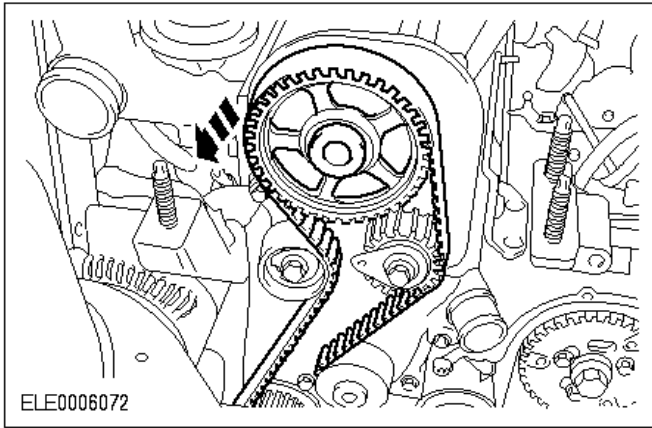
Engines fitted with an automatic camshaft timing belt tensioner.

μ 14. Undo the camshaft timing pulley.

Note:

Stop the camshaft timing pulley from turning using the special tool.

- Undo the camshaft timing pulley bolt three turns.



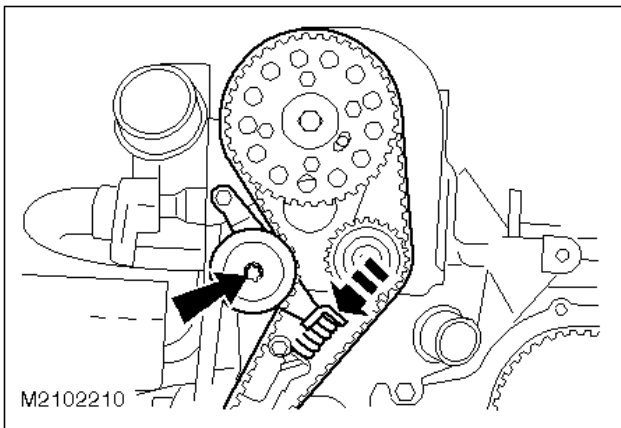
Engines fitted with an automatic camshaft timing belt tensioner.

Note:

The timing belt must not be reused.

μ 15. Remove the camshaft timing pulley.

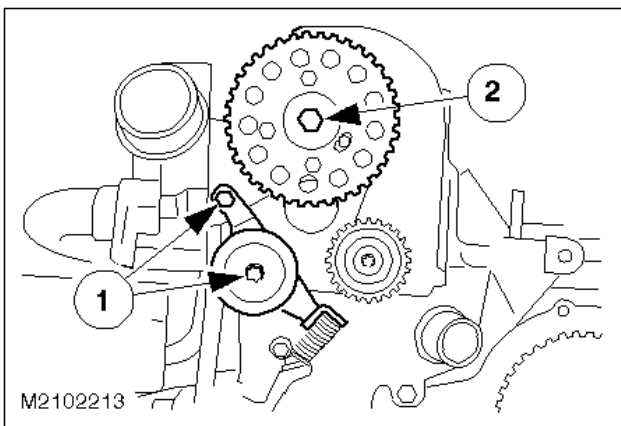
- Detach the camshaft timing pulley and take it off with the camshaft timing belt.
- Discard the timing belt.



Engines fitted with a mechanical camshaft timing belt tensioner.

μ 16. Detach the camshaft timing belt.

- Undo the timing belt tensioner clamp bolt and slacken the timing belt.
- Remove the timing belt.
- Tighten the timing belt tensioner clamp bolt.
- Discard the timing belt.



Engines fitted with a mechanical camshaft timing belt tensioner.



CAUTION:

The timing belt tensioner is spring-loaded.

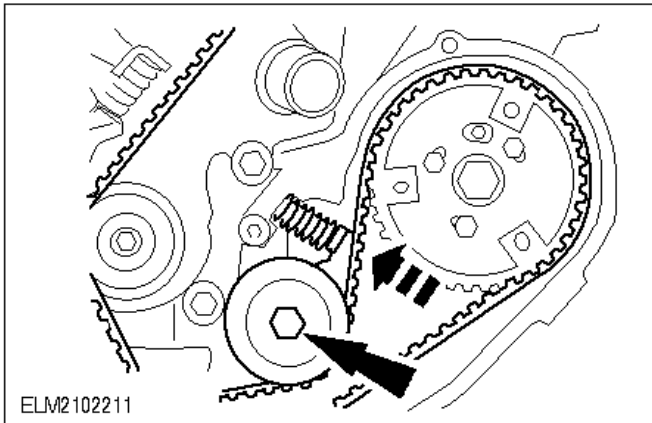
- μ 17. Detach the timing belt tensioner and the camshaft timing pulley.

- 1 Timing belt tensioner bolt

Note:

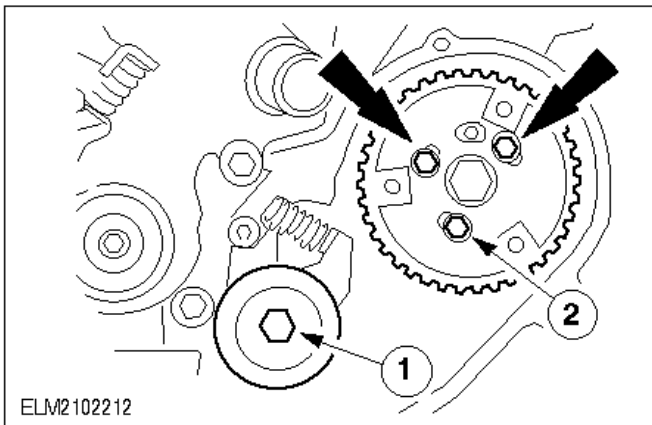
Remove the timing pulley using a two-legged puller.

- 2 Timing pulley bolt.



- μ 18. Detach the injection pump timing belt.

- Undo the timing belt tensioner clamp bolt and slacken the timing belt.
- Tighten the timing belt tensioner clamp bolt.
- Remove the timing belt.

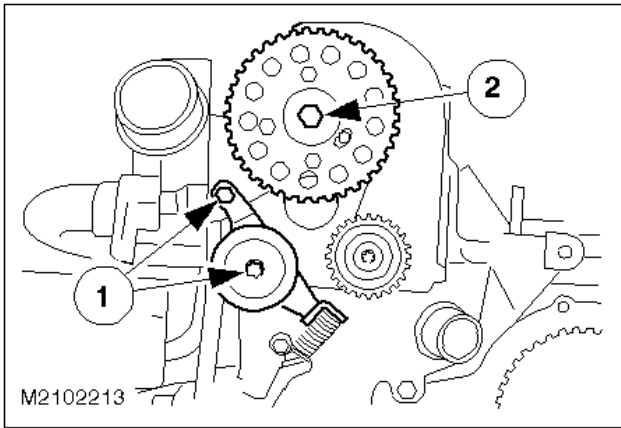


CAUTION:

The timing belt tensioner is spring-loaded.

- μ 19. Detach the timing belt tensioner and the injection pump timing pulley.

- 1 Timing belt tensioner
- 2 Timing belt pulley



⚠ CAUTION:

The timing belt tensioner is spring-loaded.

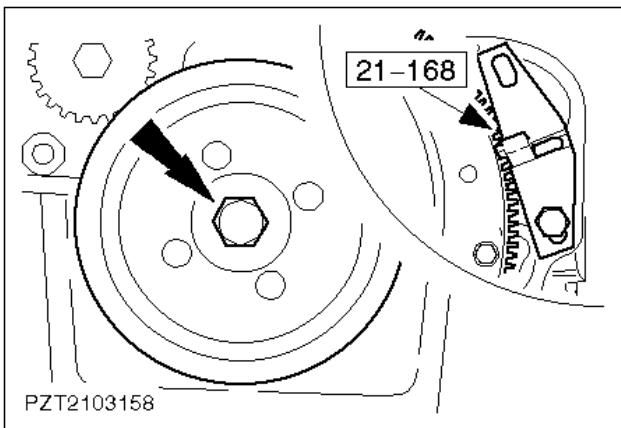
μ 20. Detach the timing belt tensioner and the camshaft timing pulley.

1 Detach the camshaft timing belt tensioner.

Note:

Remove the camshaft timing pulley using a two-legged puller.

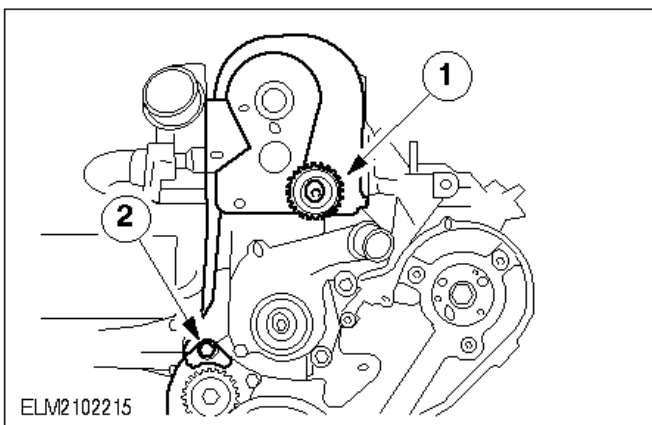
2 Detach the camshaft timing pulley.



Note:

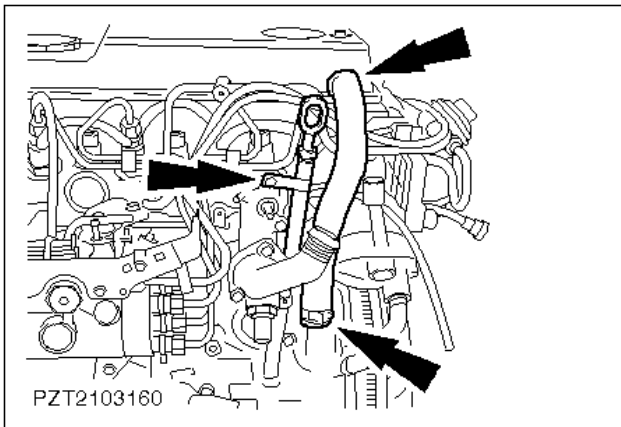
Lock the flywheel using the Special Tool.

μ 21. Detach the crankshaft vibration damper.

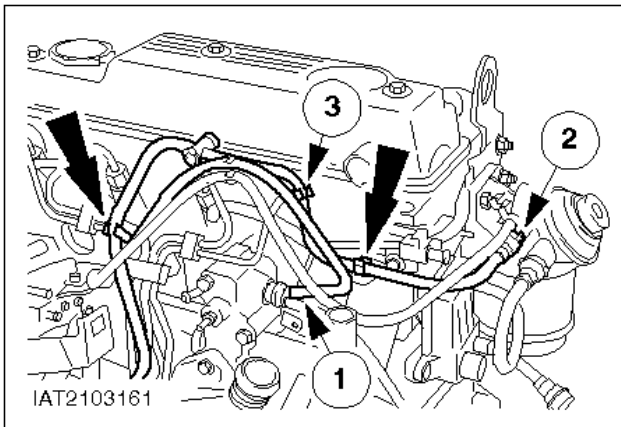


μ 22. Remove the rear timing belt covers.

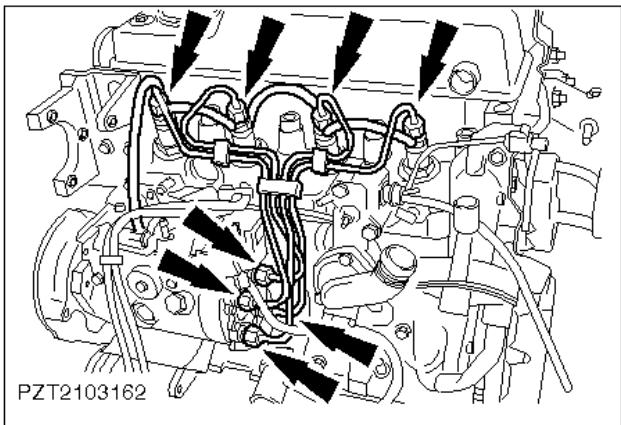
- 1 Detach the timing pulley.
 - 2 Remove the rear cover bolt.
- Remove the covers.



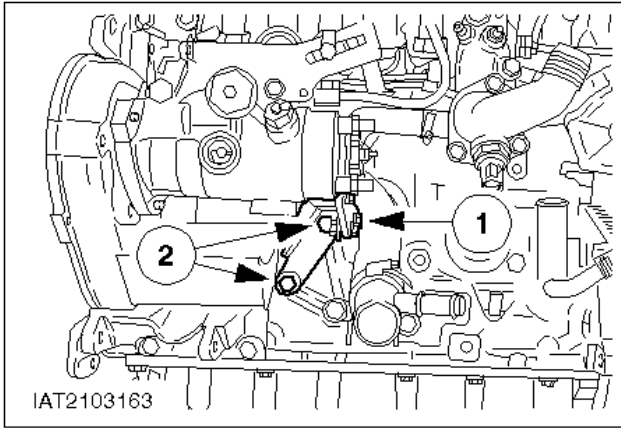
- μ 23. Remove the oil dipstick tube together with the mounting.
- 24. Detach the crankcase ventilation hose.



- μ 25. Detach the fuel delivery pipe.
 - 1 Disconnect the hose.
 - 2 Undo the quick-release coupling by pressing it together.
 - 3 Unclip the pipe.

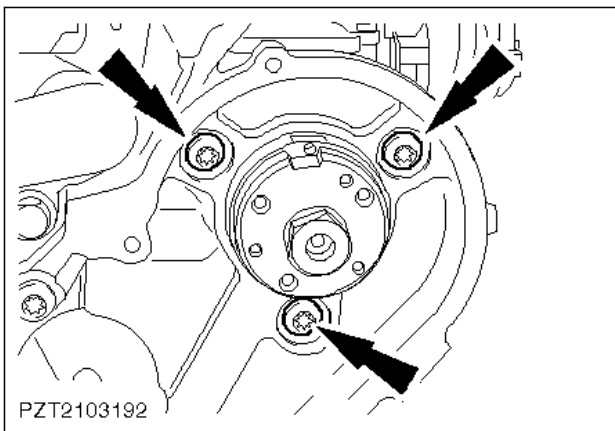


- μ 26. Detach the injection pipes and leak-off hoses.

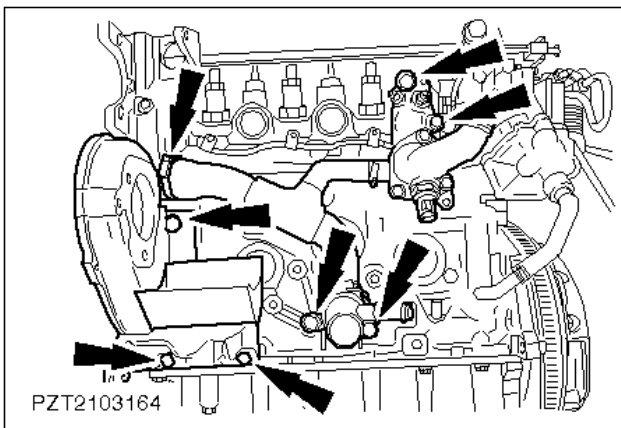


μ 27. Remove the fuel-injection pump bracket.

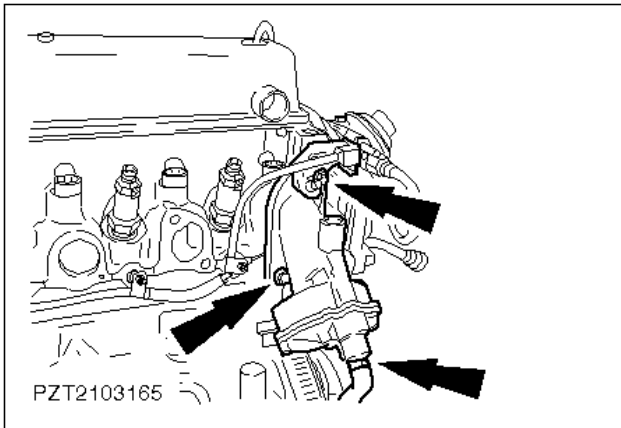
- 1 Slacken the two bolts.
- 2 Unscrew the two bolts.



μ 28. Detach the injection pump.

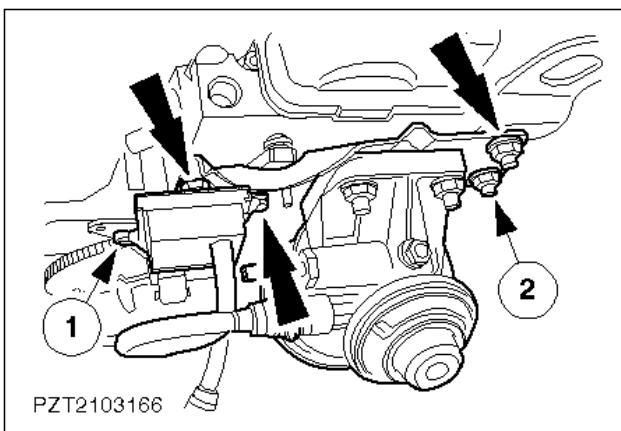


- μ 29. Detach the thermostat housing and the coolant hose.
30. Detach the alternator bracket.



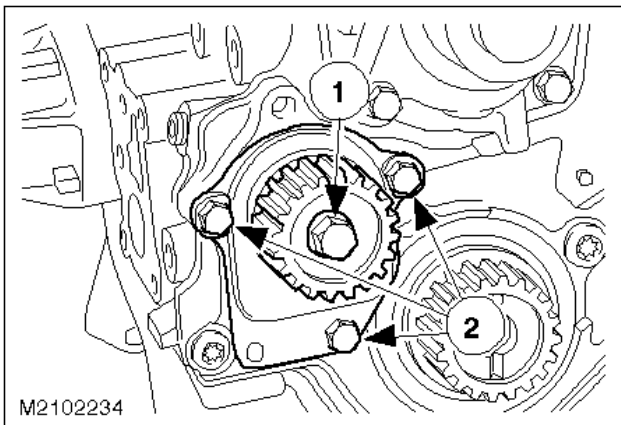
μ 31. Detach the vacuum pump.

Detach the vacuum pump oil return hose.



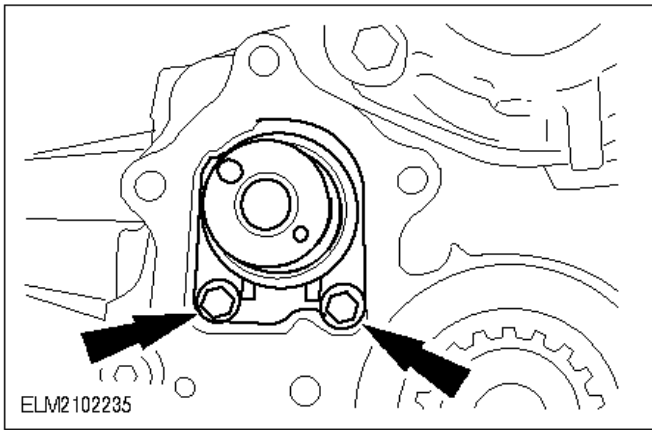
μ 32. Detach the fuel filter.

- 1 Detach the diesel fuel heater from the bracket.
- 2 Detach the diesel fuel heater and the bracket.

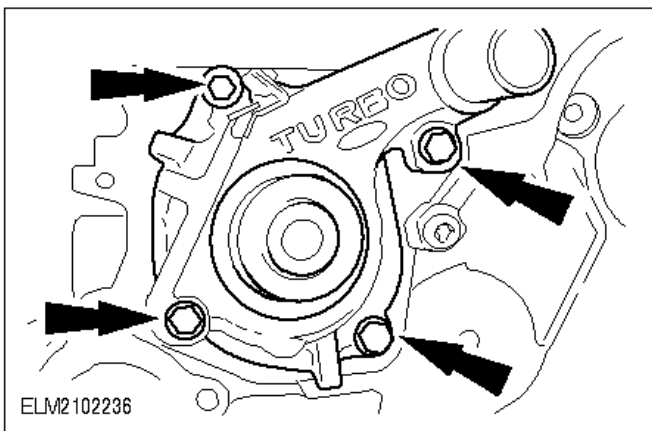


μ 33. Remove the auxiliary shaft timing pulley and oil seal carrier.

- 1 Remove the auxiliary shaft timing pulley.
- 2 Remove the auxiliary shaft oil seal carrier.

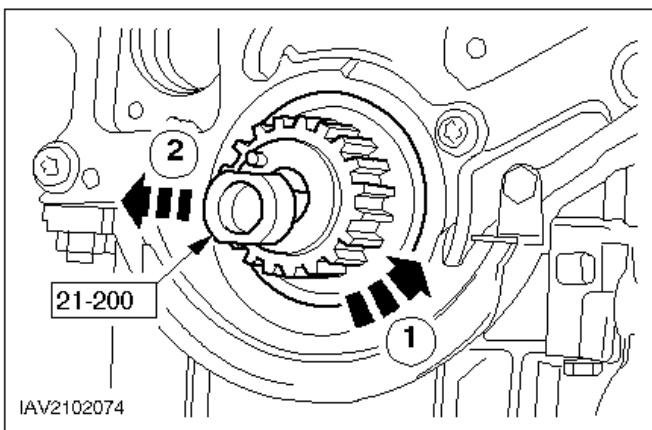


- μ 34. Remove the auxiliary shaft.
- Unscrew the thrust plate bolts.
 - Withdraw the auxiliary shaft with the thrust plate.



Note:
One bolt holds the bracket for the timing belt tensioner spring.

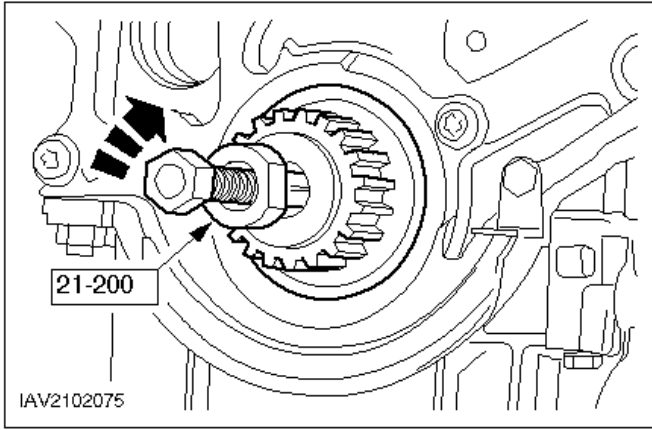
- μ 35. Detach the coolant pump.



CAUTION:

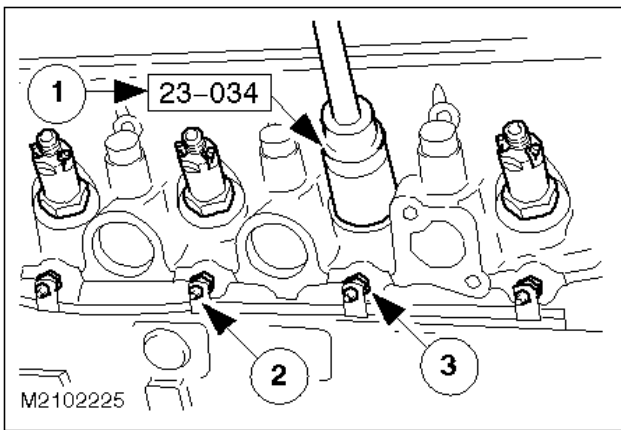
Insert the expanding part of the puller only, without the centre spindle.

- μ 36. Remove the timing pulley from the crankshaft.
- 1 Insert the expanding puller.
 - 2 Pull back the expanding puller until it reaches the stop.



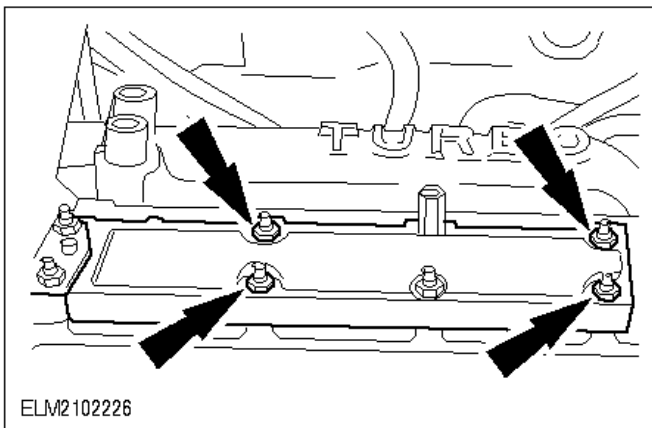
μ 37. Remove the timing pulley from the crankshaft (cont.).

Insert the puller spindle and pull the timing pulley off the crankshaft.

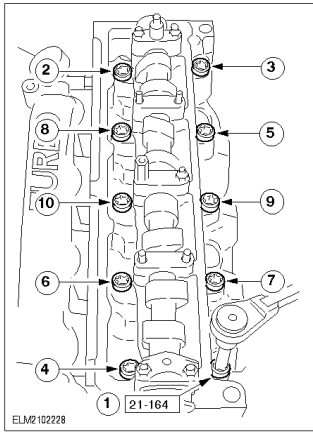


μ 38. Remove the injectors and glow plugs.

- 1 Remove the injectors.
Remove the heat shields.
- 2 Remove the glow plug power supply.
- 3 Remove the glow plugs.

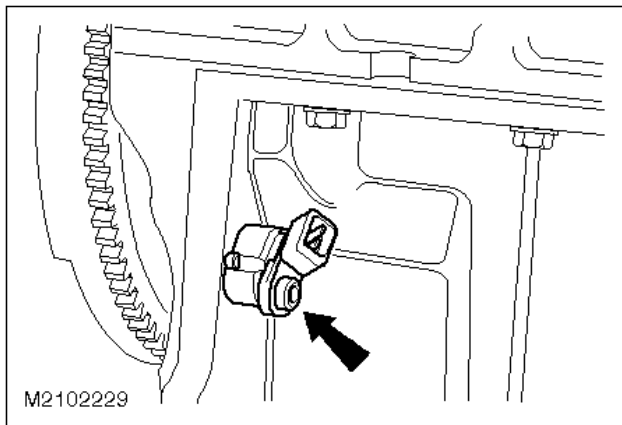


μ 39. Detach the oil baffle.

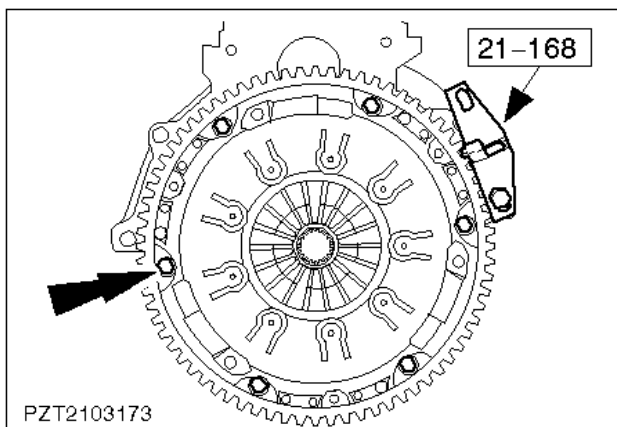


μ 40. Detach the cylinder head.

- Undo and remove the cylinder head bolts in the specified order.
- Remove the cylinder head and put it down on a soft surface.
- Remove the gasket.



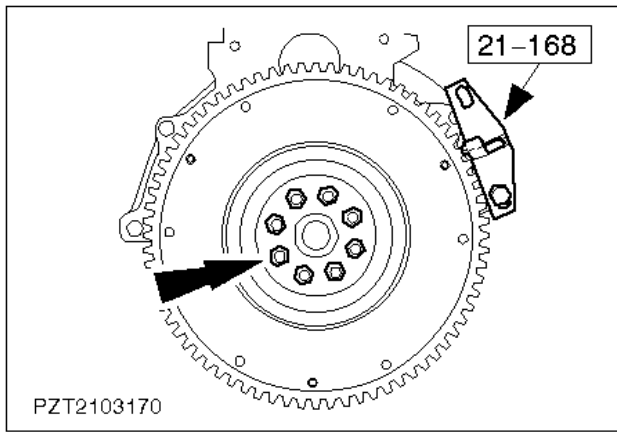
μ 41. Remove the crankshaft position sensor with its bracket.



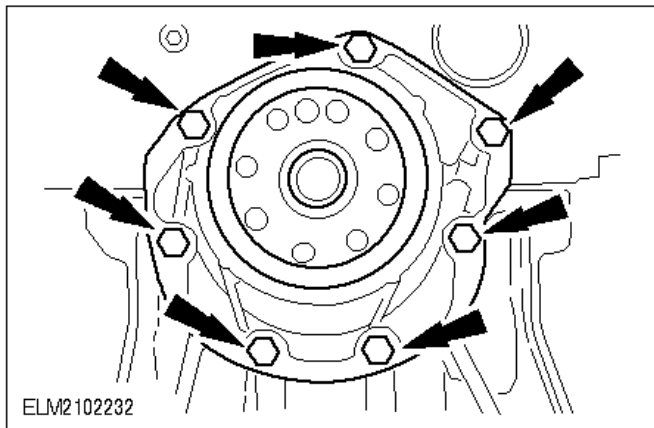
Note:

Lock the flywheel using the Special Tool.

μ 42. Remove the clutch.



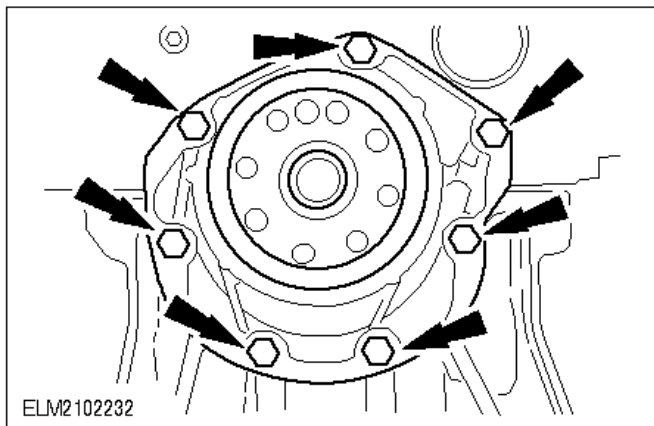
- μ 43. Remove the flywheel.



Viton oil seals only

- μ 44. Remove the crankshaft rear radial oil seal carrier.

Drive out the oil seal on a flat surface.

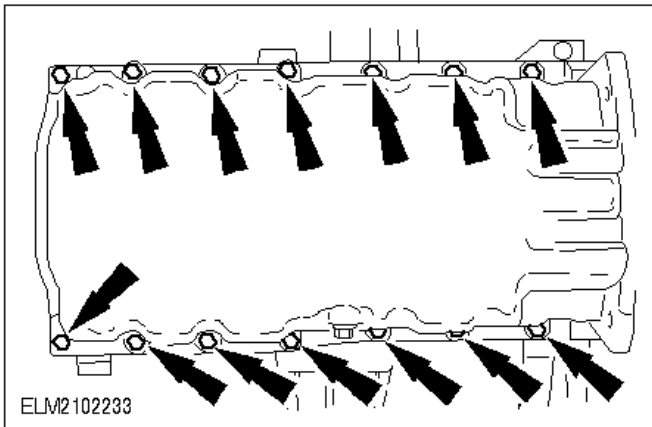


PTFE oil seals only

Note:

The oil seal carrier is renewed as a unit with the oil seal.

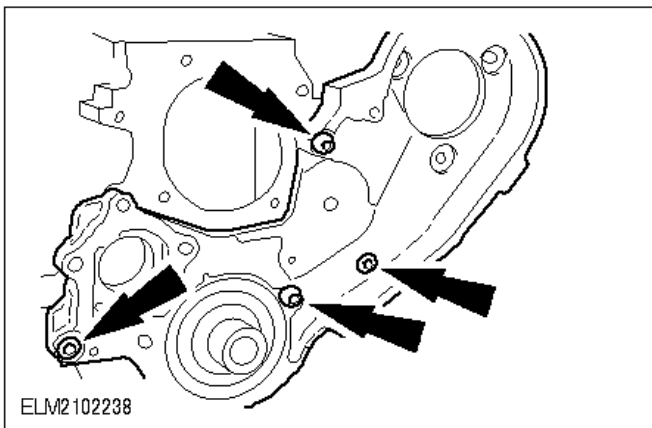
- μ 45. Remove the crankshaft rear radial oil seal carrier.



Note:

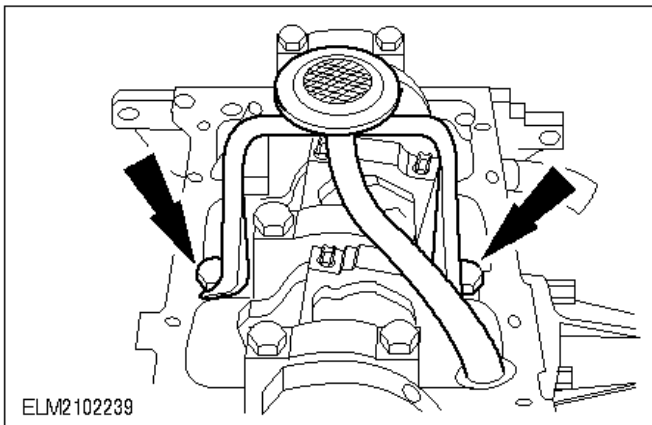
Remove the sump downwards so that no oil sludge or debris can enter the engine.

- μ 46. Detach the sump (14 bolts).



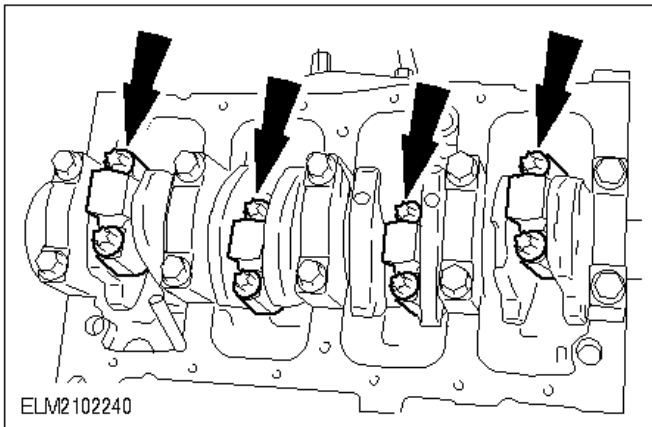
- μ 47. Detach the front plate.

Prise out the radial oil seal.



- μ 48. Remove the oil intake pipe with its bracket.

Remove the O-ring.



CAUTION:

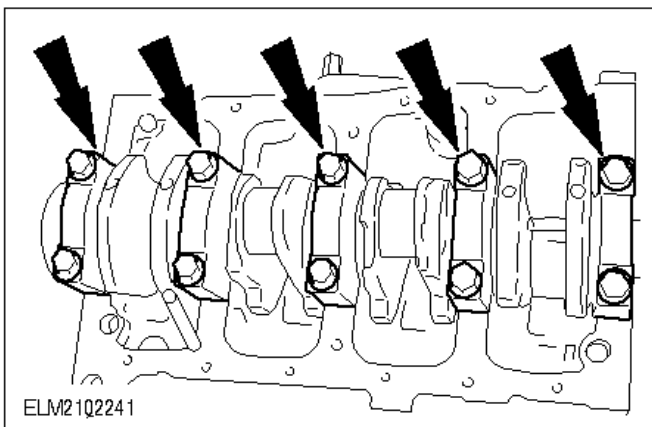
Do not damage the cylinder bore.

- μ 49. Remove the pistons with the connecting rods.
 - Detach the big-end bearing caps.
 - Remove the crown of carbon around the top of the cylinders using a plastic scraper.

Note:

Keep the big-end shells and caps in removal order, ready for re-fitting.

- Push the pistons and bearing shells out and keep them in order.



Note:

Keep the bearing shells and caps in removal order, ready for re-fitting.

- μ 50. Remove the crankshaft.
 - Detach the main bearing caps.
 - Remove the crankshaft.
 - Remove the bearing shells and thrust half washers and set them aside in order for re-use.

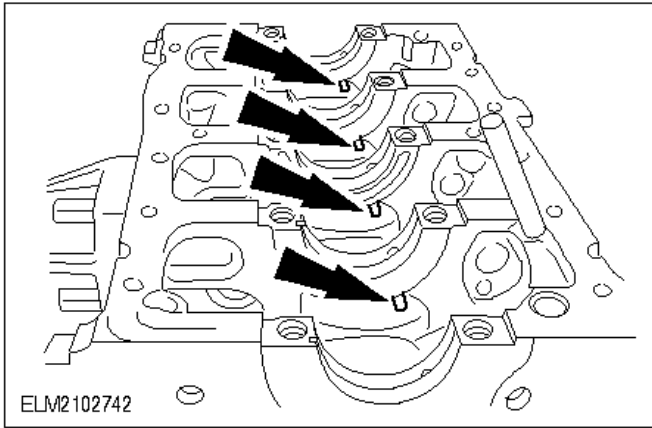
Reassemble



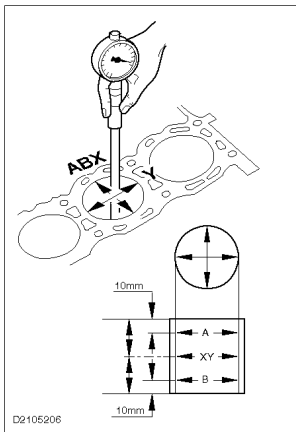
CAUTION:

A revised timing belt drive has been fitted in production since '96 MY. The timing pulleys, the timing belt tensioner and the timing belt cannot be replaced by components from previous years.

- 51. Thoroughly clean all mating faces and re-useable parts and check them for damage.



- μ 52. Clean the piston cooling oil splash nozzles and oilways.

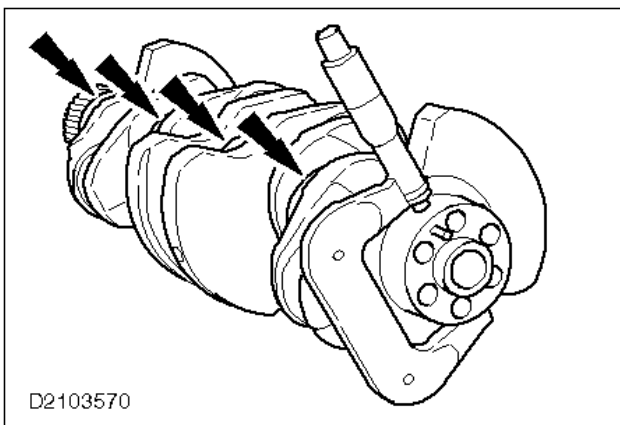


Note:

The main bearing caps must be fitted without the main bearing shells, and tightened to the specified torque.

- μ 53. Measure the cylinder bores using an internal gauge.

If the measured cylinder bore diameter is too large for the piston classification then the cylinder block must be overhauled or renewed.



Note:

Repeat the measuring operation at intervals of 90°.

- μ 54. Measure the diameters of the main and big-end bearing journals.

- Different sizes of crankshaft are used in production. The different crankshafts are not marked.

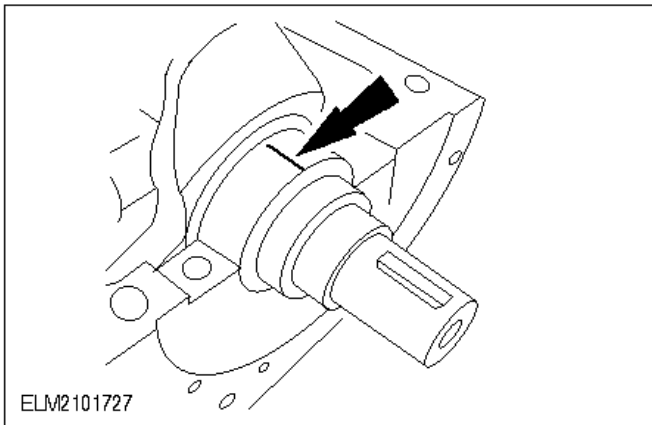
- If the measurements do not agree with those given in the General Specifications, then the crankshaft must be overhauled or renewed.

55. Preparations for measuring the bearing clearance.

Note:

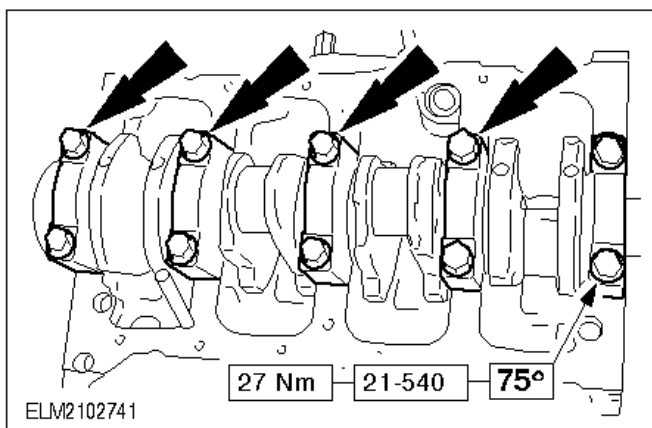
Carry out the following steps exactly as described.

- Measure each bearing surface individually with Plastigage.
- Only the bearing cap of the bearing being measured is fitted and torqued down to specification.
- The bearing shells and the journals must be free of oil.
- The measurement should be carried out near the respective dead centre position.



μ 56. Measure the crankshaft main bearing clearances.

- Place the matching bearing shells in the cylinder block, free of oil.
- Place the crankshaft in the cylinder block, free of oil.
- Lay a length of Plastigage thread across the bearing on the bearing journal.

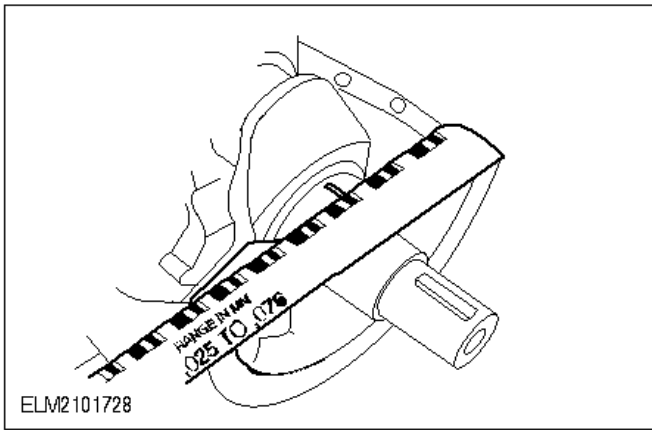


Note:

The bearing cap numbering starts at the timing belt end to which the arrows also point.

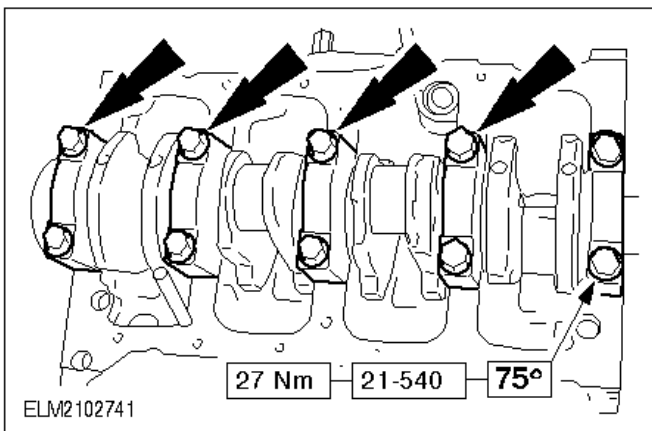
μ 57. Measure the main bearing clearances (continued).

- Locate each bearing cap in place with its associated bearing shell and tighten it up.
- Detach the bearing cap.



μ 58. Measure the main bearing clearances (continued).

- The measured value shows the bearing clearance.
- Renew the bearing shells as necessary.



Note:

Coat the main bearing journals, the bearing shells and the thrust half washers with engine oil.

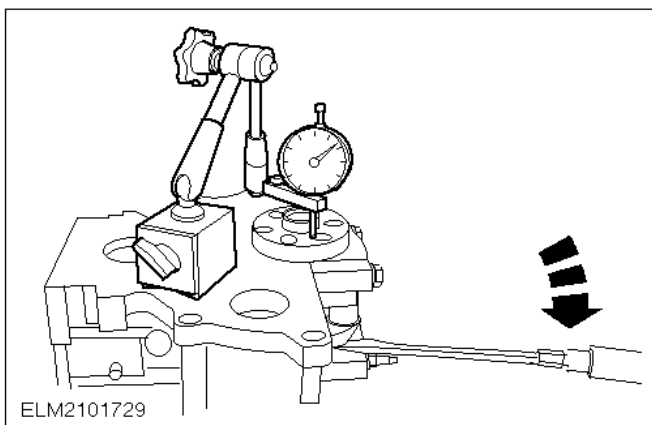
μ 59. Install the crankshaft.

- Place the thrust half washers in the second main bearing, with the lubrication groove facing outwards.

Note:

The bearing cap numbering starts at the timing belt end to which the arrows also point. Do not strike the bearing caps.

- Fit the crankshaft main bearing caps with the associated bearing shells.
- Tighten the bolts.

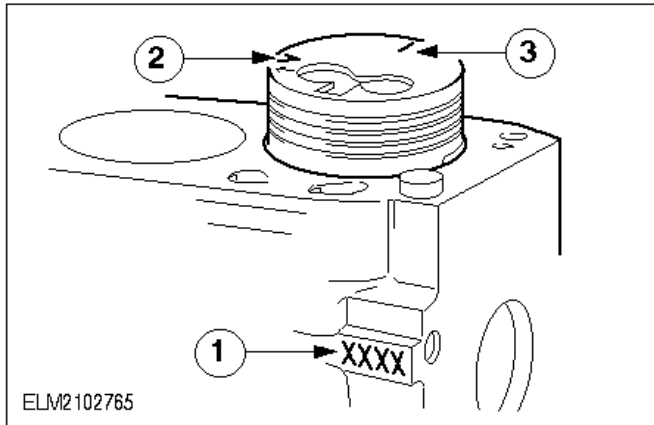


Note:

Correct any end float as necessary with the thrust washers at the second main bearing.

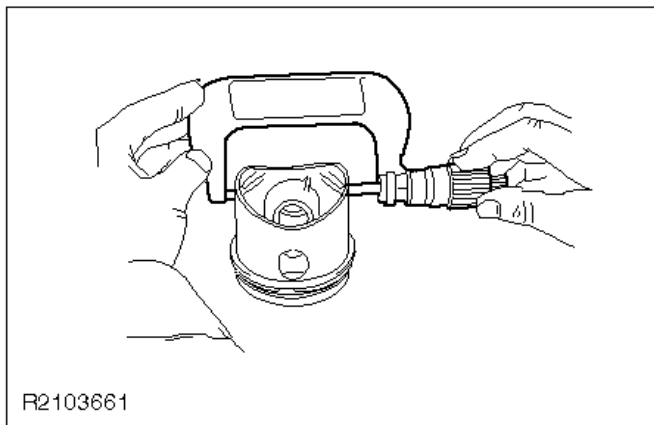
μ 60. Check the crankshaft end float.

- Set up the dial gauge.
- Measure the end float by lifting the crankshaft with a screwdriver.



μ 61. Piston classification.

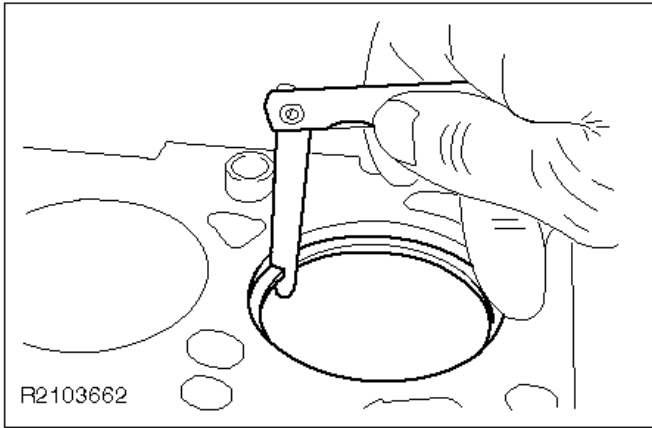
- 1 Cylinder bore classification.
- 2 Piston diameter classification.
- 3 The weight classes are marked with '+' and '-'.



Note:

Piston classification, in case a piston must be replaced.

μ 62. Measure the piston diameters.

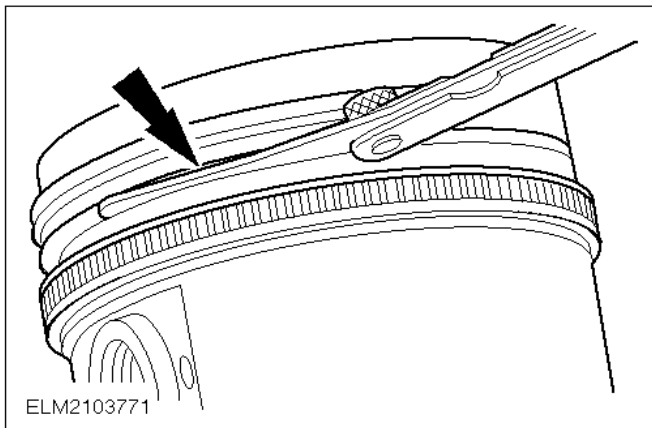


CAUTION:

Do not mix up the piston rings. Replace the rings in the same grooves and at the same position.

- μ 63. Measure the piston ring gaps.

The values given in General Specifications were obtained with a gauge ring used in production. When measured in the cylinder, the values may be exceeded by 0,15 mm.

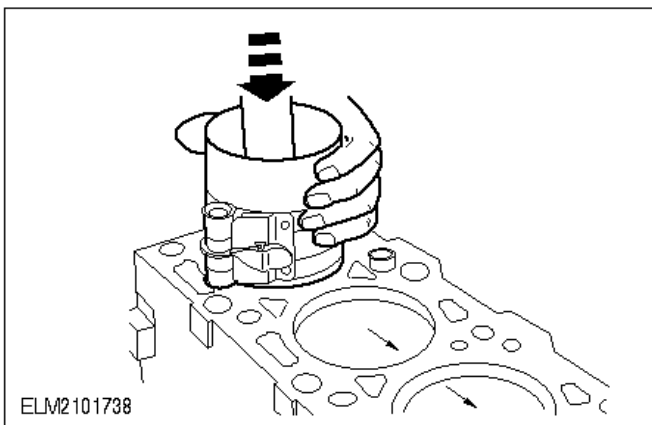


Note:

The piston ring axial clearance must be measured with the ring projecting from its groove.

- μ 64. Measure the piston ring clearance.

- The maximum piston ring clearance in the piston groove for the upper compression ring is 0,2 mm.
- The maximum clearance in the groove for the second compression ring is 0,1 mm.



Note:

Lubricate the pistons and cylinder bores with engine oil.

μ 65. Install the pistons and connecting rods.

- Distribute the piston ring gaps evenly around the circumference. This also applies to the elements of the oil control ring.

Note:

The numbering of the connecting rods starts at the timing belt end. The arrow on the piston crown points to the timing belt end.

- Compress the piston rings using a piston ring compressor.



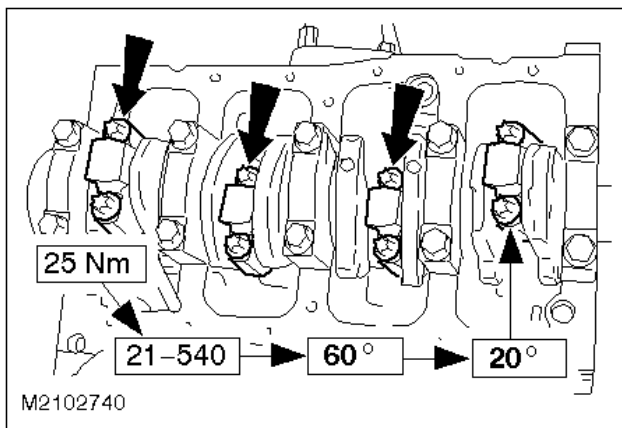
CAUTION:

Do not damage the cylinder bores and bearing surfaces.

Note:

The big-end journal must be at BDC position.

- Press the pistons on cylinders 1 and 4 into the cylinder with the handle of a hammer while guiding the connecting rods onto the big-end bearing journals.
- Place the clean and oil-free bearing shells in their matching big-ends.
- Fit the pistons on cylinders 2 and 3 in the way described above.



μ 66. Measure the big-end bearing clearances and fit the bearing caps.

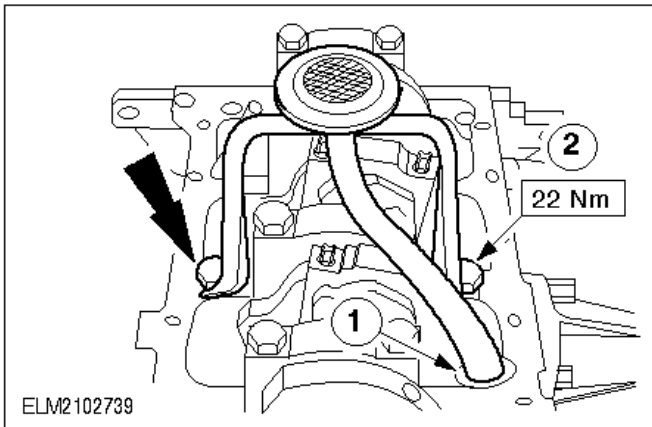
Measure the big end bearing clearances as described in steps to above.

67. Coat the bearing shells and journals with engine oil.

Note:

The numbering of the connecting rods and big-end bearing caps must be the same.

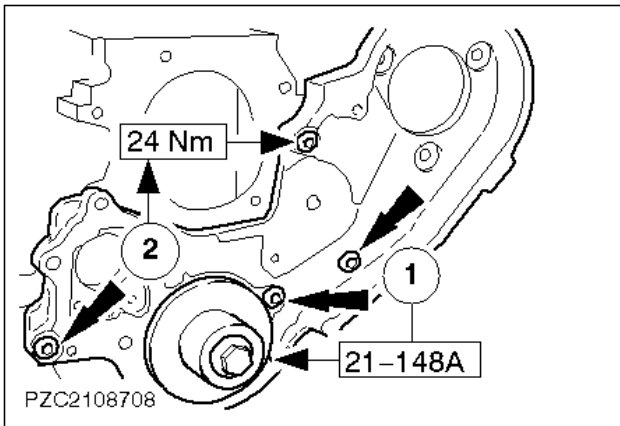
Fit the appropriate big-end bearing caps and bearing shells and tighten the bolts.



Note:

Make sure the O-ring is seated correctly.

- μ 68. Fit the oil intake pipe with its bracket.
 - 1 Fit the oil intake pipe using a new O-ring.
 - 2 Fit the bracket.



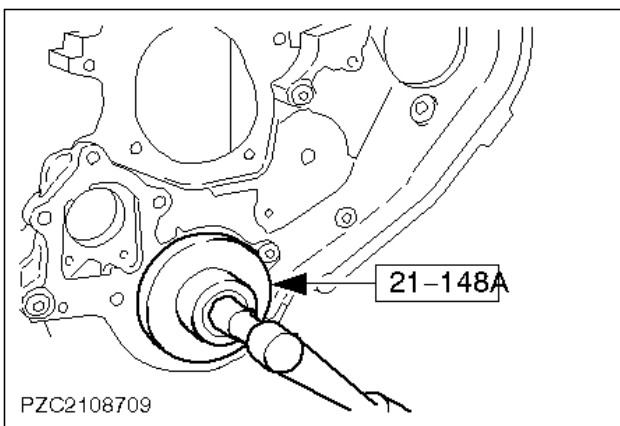
Note:

The mating face of the front plate must be flush with the lower edge of the cylinder block (tolerance $\pm 0,1\text{mm}$).

- μ 69. Fit the front plate.

Fit the front plate with a new gasket and new rubber oil seals for the oil channels.

 - 1 Centre the front plate using the special tool.
 - 2 Tighten the front plate (4 bolts).

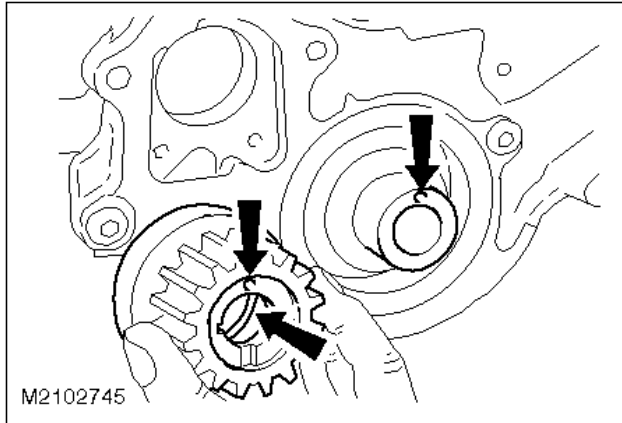


⚠ CAUTION:

If a PTFE oil seal (teflon ring) is used, step should be carried out immediately to stop the oil seal from contracting. Do not remove the support ring from the oil seal until it is about to be fitted.

- μ 70. Install the crankshaft front oil seal.

Fit the oil seal using the special tool and the bolt of the vibration damper.



⚠ CAUTION:

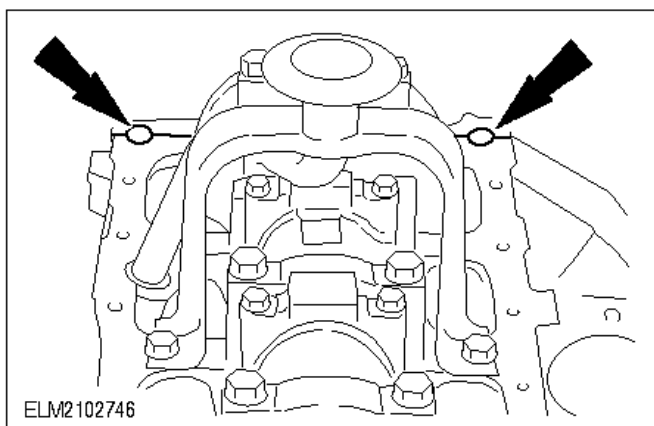
A revised timing belt drive has been fitted in production since '96 MY. The timing pulleys, the timing belt tensioner and the timing belt cannot be replaced by components from previous years.

- μ 71. Fit the crankshaft timing pulley.

Note:

Condition of O-ring in timing pulley.

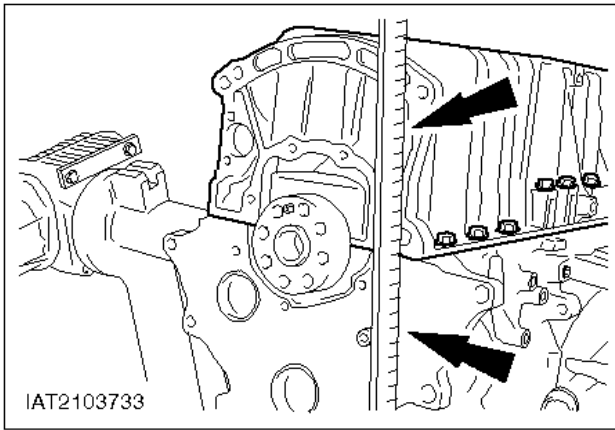
- Lubricate the O-ring and the end of the crankshaft with engine oil.
- Carefully slide on the pulley as far as it will go.
- The locating pin on the end of the crankshaft and the hole in the timing pulley must line up.



Note:

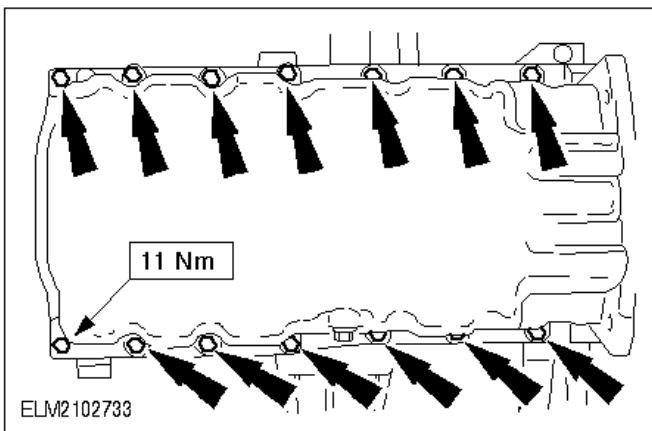
The sump bolts must be tightened within 20 minutes of applying the sealer.

- μ 72. Apply sealer (SPM-4G-9112-H) to the joints on the cylinder block mating face.

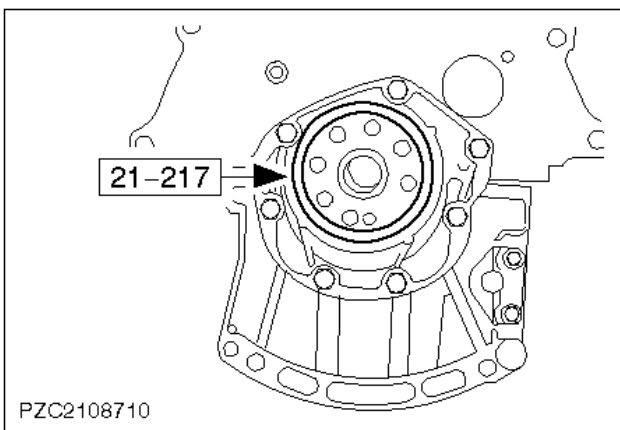


μ 73. Fit the sump.

- Locate the sump in place with a new gasket and screw in the bolts (x14) finger tight.
- Make sure that the sump is flush with the cylinder block.



μ 74. Tighten the sump bolts.



PTFE oil seals only



CAUTION:

The seal lip of the oil seal and the sealing surface on the crankshaft must be free of oil.

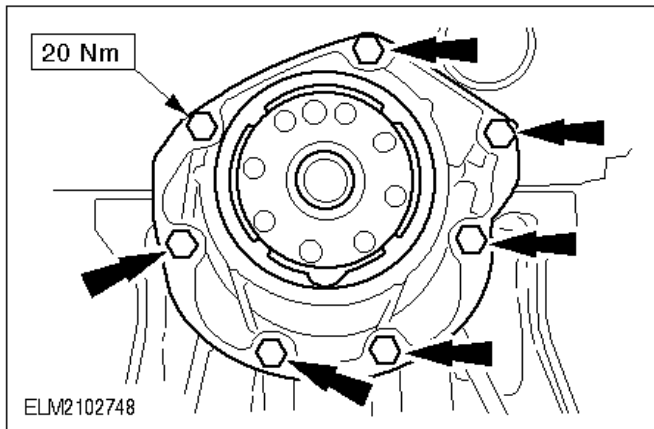


CAUTION:

The support ring is automatically pushed out of the oil seal when the oil seal carrier is fitted in place. Do not remove it beforehand.

μ 75. Fit a new crankshaft rear oil seal carrier.

- Locate a new oil seal carrier with integrated oil seal together with the bolts in installation position.
- Insert the bolts.
- Insert the special tool and centrally align the oil seal carrier on the crankshaft.



PTFE oil seals only

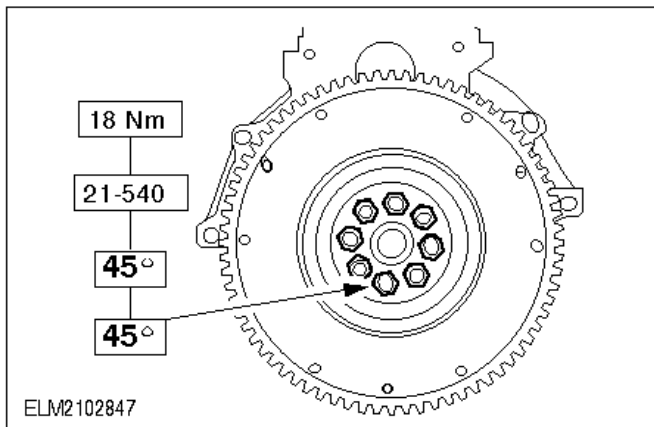


CAUTION:

If the special tool cannot be removed, then the sump must be re-aligned.

μ 76. Tighten the bolts on the crankshaft oil seal carrier.

Remove the special tool.

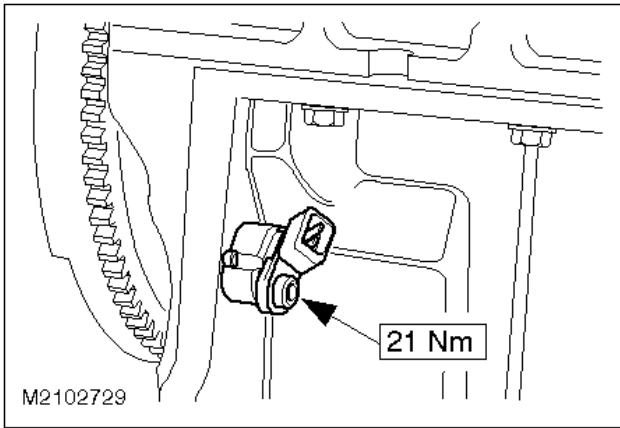


CAUTION:

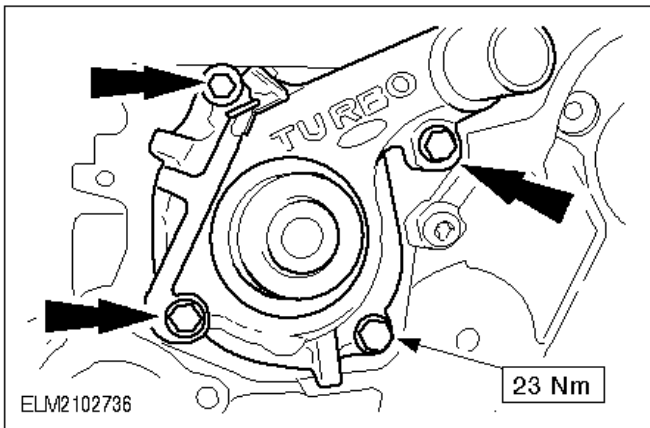
Renew the bolts.

μ 77. Fit the flywheel (8 bolts).

Lock the crankshaft using Special Tool 21-168.

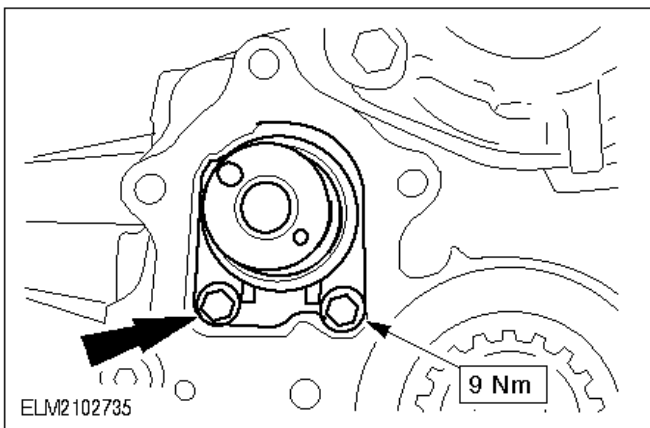


- μ 78. Fit the CKP sensor together with its bracket.



- μ 79. Fit the coolant pump.

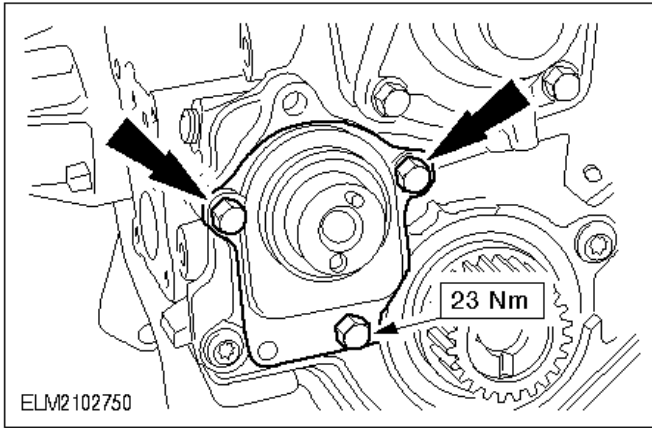
Locate the coolant pump in installation position, together with a new gasket and the bracket for the timing belt tensioner spring.



Note:

The lubricating grooves on the thrust plate must face outwards.

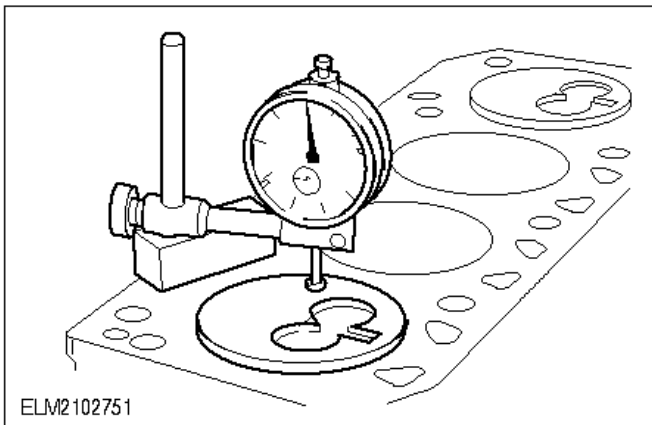
- μ 80. Fit the auxiliary shaft.
- Lubricate the auxiliary shaft, the bearing bush in the cylinder block and the thrust plate with engine oil.
 - Fit the auxiliary shaft with the thrust plate.



CAUTION:

If the plastic fitting bush is removed from the oil seal carrier before assembly then the oil seal is rendered useless.

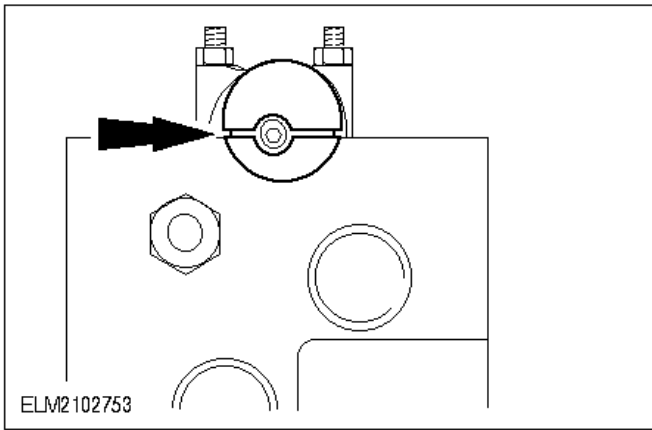
- μ 81. Fit the auxiliary shaft oil seal carrier.
 - Lubricate the end of the auxiliary shaft with engine oil.
 - Push a new oil seal carrier with an integrated oil seal and plastic fitting bush onto the end of the auxiliary shaft.
 - Tighten the bolts on the oil seal carrier.
 - After securing the oil seal housing, detach the plastic fitting bush and check that the seal is seated correctly.



Note:

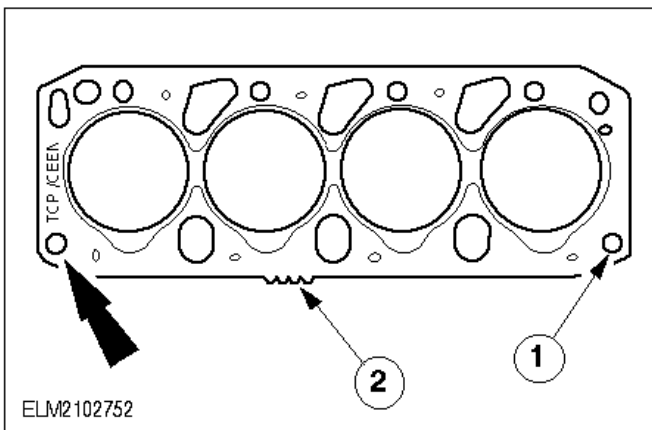
Make two measurements per cylinder, five millimetres in from the piston edge.

- μ 82. Measure the piston protrusion.
 - Measure the piston protrusion of each cylinder when it is at TDC
 - Measure the difference in height between the piston crown and the cylinder block.
 - The largest measurement decides the thickness of the cylinder head gasket (see General Specifications).



μ 83. Line up the crankshaft and camshaft.

- Turn the crankshaft until the piston of cylinder no. 1 is at TDC.
- Turn the camshaft until the slot in the eccentric on the camshaft is parallel with the upper edge of the cylinder head (with the larger semi-circle at the top).
- The crankshaft and camshaft must not be turned any further.

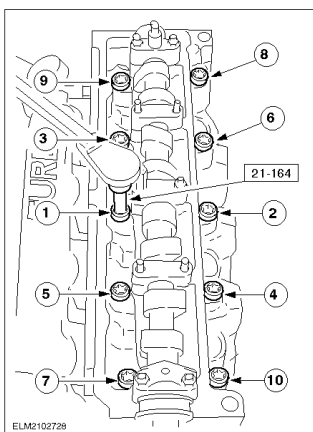


Note:

The cylinder head gasket is marked "TOP/OBER".

μ 84. Fit the new cylinder head gasket.

- 1 Check that the locating sleeves are seated correctly.
- 2 Thickness identification notches.

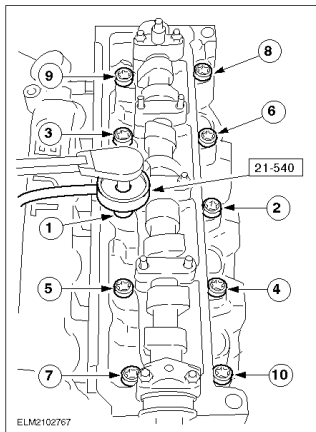


Note:

Renew the cylinder head bolts.

μ 85. Tighten the cylinder head bolts.

- Screw in the cylinder head bolts.
- Tighten the cylinder head bolts in two stages in the specified sequence.



Note:

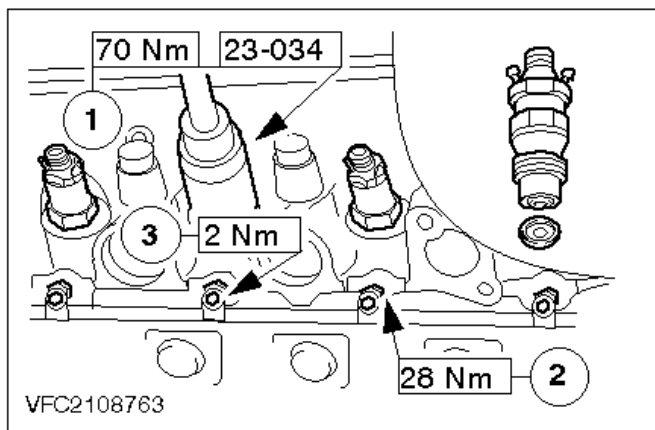
The cylinder head bolts must not be re-tightened.

μ 86. Tighten the cylinder head bolts (cont.).



CAUTION:

For the third stage, first undo one bolt by the angle shown, then tighten it to the specified torque and then apply the angular torque. Only then move on to the next bolt. Wait three minutes and then tighten the cylinder head bolts to stage 3 in the specified sequence.

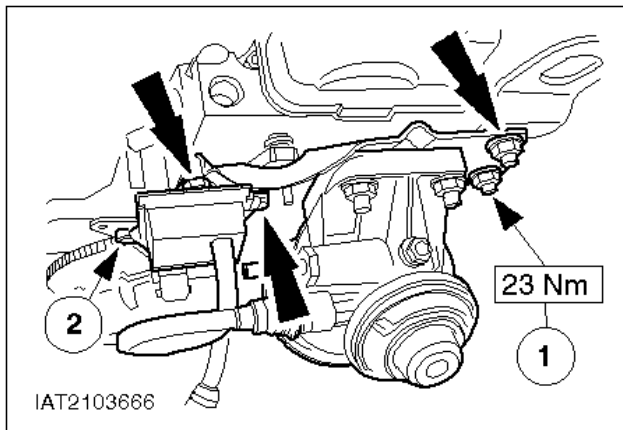


Note:

The heat shield is correctly installed with the conical side downwards. Use new heat shields.

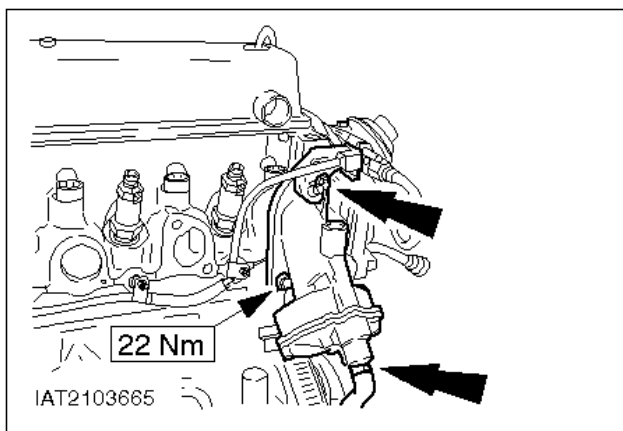
μ 87. Install the injectors and glow plugs.

- 1 Install the injectors with the heat shields.
- 2 Install the glow plugs.
- 3 Install the glow plug power supply.



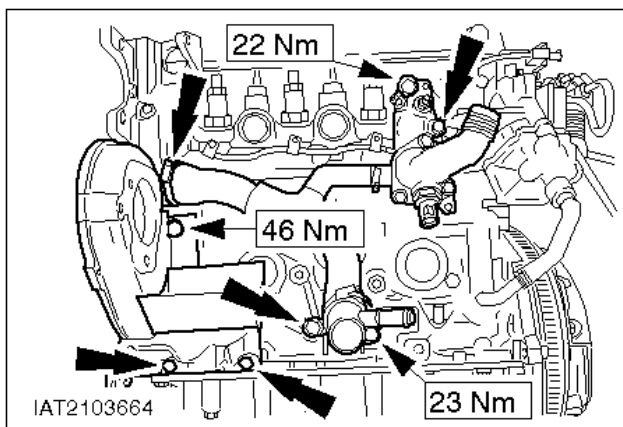
μ 88. Fit the fuel filter.

- 1 Fit the bracket with the fuel filter.
- 2 Attach the diesel fuel heater to the bracket.

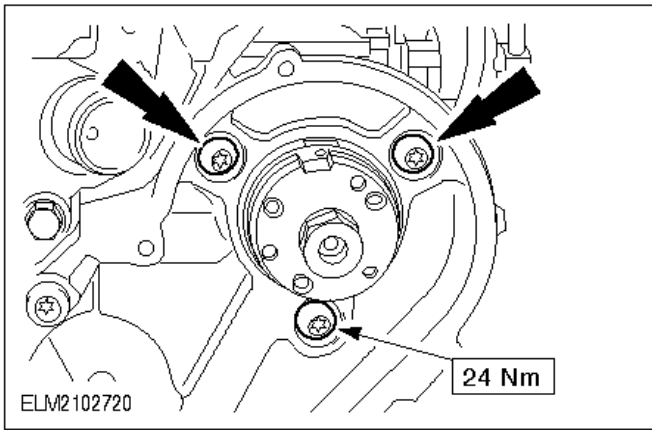


μ 89. Fit the vacuum pump.

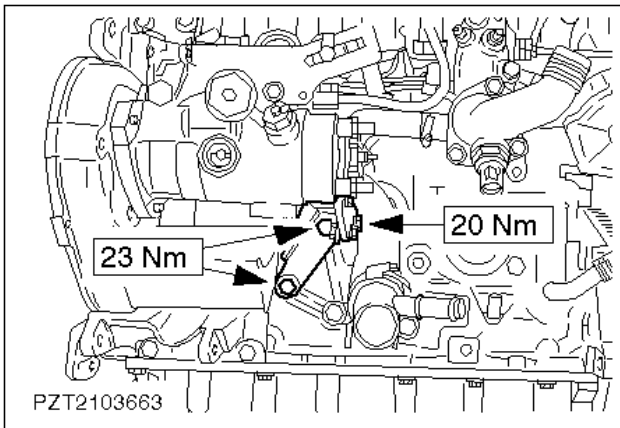
- Connect the oil return hose.
- Place the vacuum pump and new O-ring, glow plug bracket and vacuum pump bolts in position.
- Tighten the bolts.



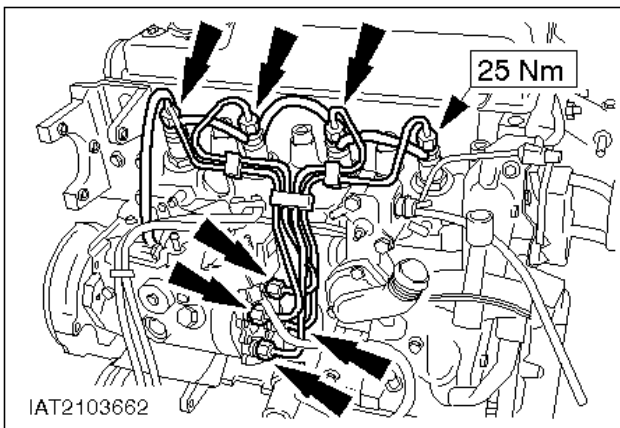
μ 90. Fit the thermostat housing and the coolant hose.
 91. Fit the alternator bracket.



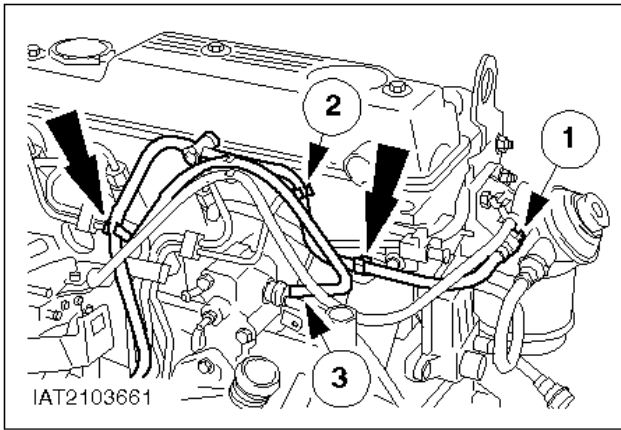
μ 92. Fit the fuel-injection pump.



μ 93. Fit the fuel-injection pump bracket.

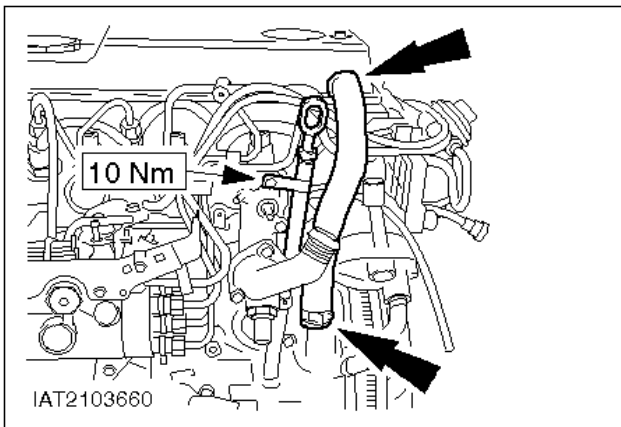


μ 94. Connect the injection pipes and the leak-off hoses.

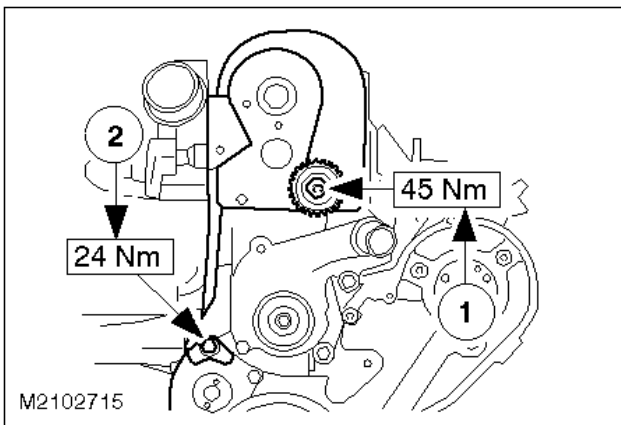


μ 95. Install the fuel feed pipe.

- 1 Fuel pipe quick-release coupling
- 2 Clip the pipe in place.
- 3 Connect the hose.

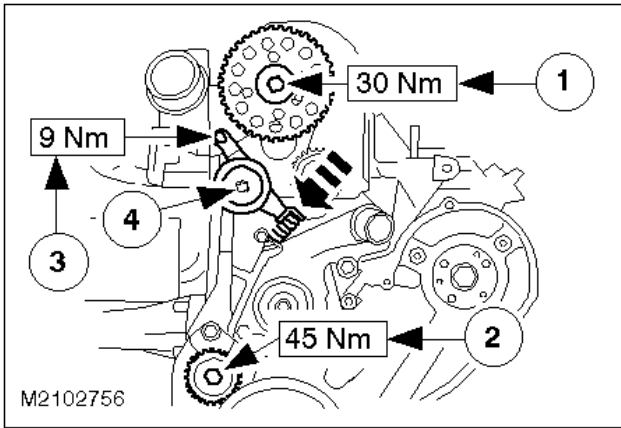


μ 96. Fit the dipstick tube together with its bracket.
 97. Install the crankcase ventilation hose.



μ 98. Fit the rear timing belt covers.

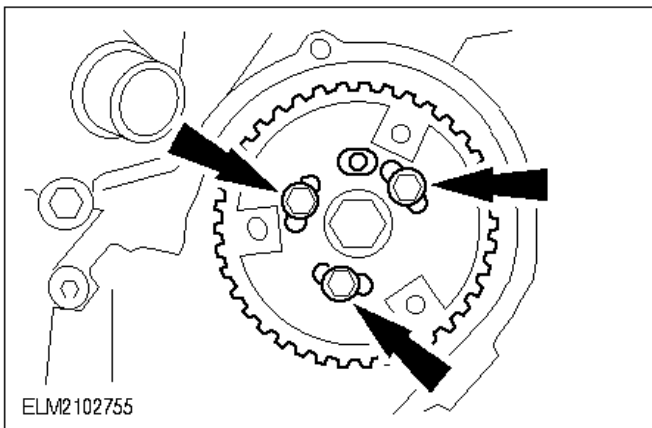
- Locate the covers in installation position.
- 1 Install the timing pulley.
 - 2 Screw in the bolt.



Note:

The auxiliary shaft locating pin and the hole in the timing pulley must line up.

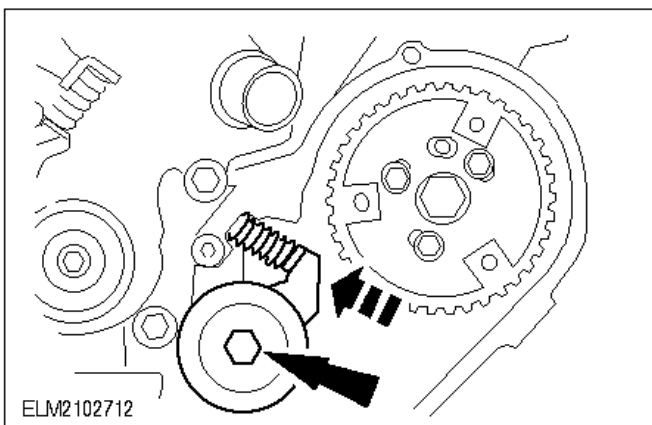
- μ 99. Fit the pulleys and the camshaft timing belt tensioner.
 - 1 Fit the camshaft timing pulley.
 - 2 Fit the auxiliary shaft pulley (one bolt).
 - 3 Secure the timing belt tensioner (2 bolts).
 - 4 Compress timing belt tensioner spring and lock it using a bolt.



Note:

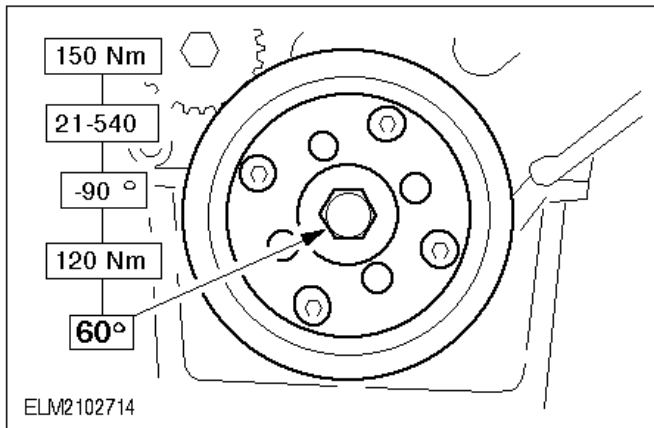
Do not tighten the bolts.

- μ 100. Fit the injection pump timing pulley.
- Set the pulley so that the bolts are central in the slots.



- μ 101. Fit the injection pump timing belt tensioner.

Compress timing belt tensioner spring and lock it using a bolt.



Note:

Use a new bolt.

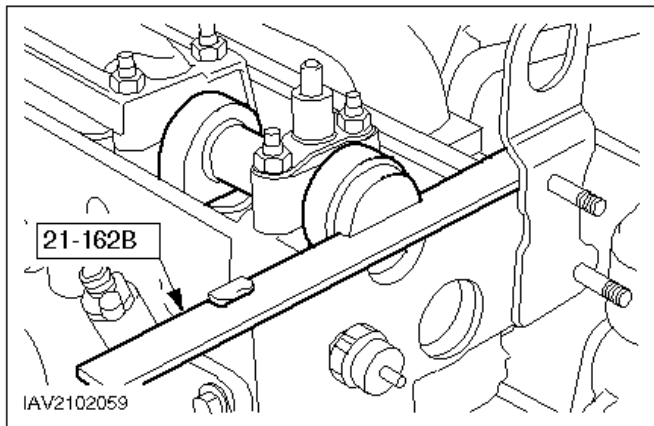
μ 102. Fit the crankshaft vibration damper.

- Lock the crankshaft.

Note:

The lug and the notch must line up.

- Coat the underside of the bolt head on the vibration damper with engine oil and tighten it to the specified torque.



Engines fitted with an automatic camshaft timing belt tensioner.

μ 103. Fit the special tool in the camshaft groove.

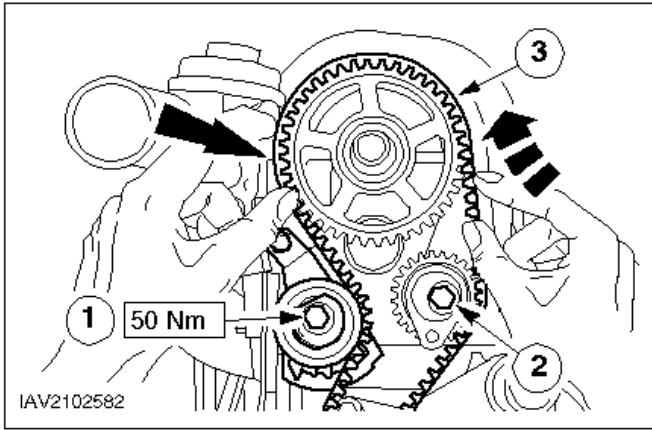
104. Set the crankshaft to TDC.

- Remove the retaining bolt from the cylinder block.

Note:

Screw in the special tool as far as it will go.

- Fit Special Tool 21-104 and carefully turn the crankshaft in the direction of rotation of the engine until it comes up against the special tool.



Engines fitted with an automatic camshaft timing belt tensioner.



CAUTION:

Always renew the camshaft timing belt and the fuel pump timing belt.



CAUTION:

Only carry out work on the timing belt at workshop temperature.

Note:

The crankshaft must be touching Special Tool 21-104 and Special Tool 21-162B must be inserted in the camshaft.

Note:

The direction of rotation is marked.

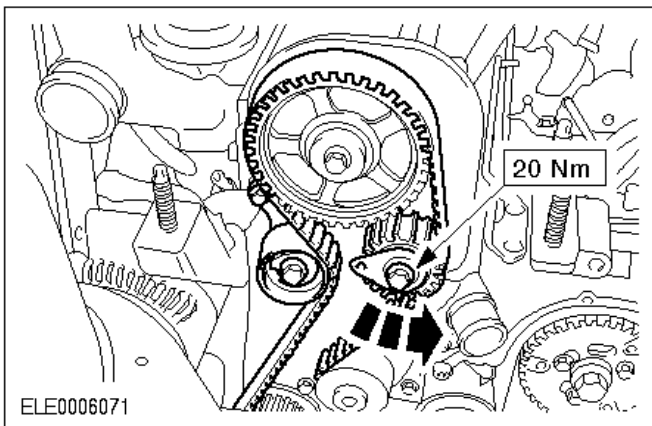
Note:

Make sure the timing belt is seated correctly.

μ 105. Fit the new camshaft timing belt.

- 1 Install the camshaft timing belt tensioner.
- 2 Install the adjusting cam.
- 3 Locate the timing belt in position.

Slide the camshaft timing pulley onto the taper and tighten the bolt until the pulley only just turns on the camshaft.



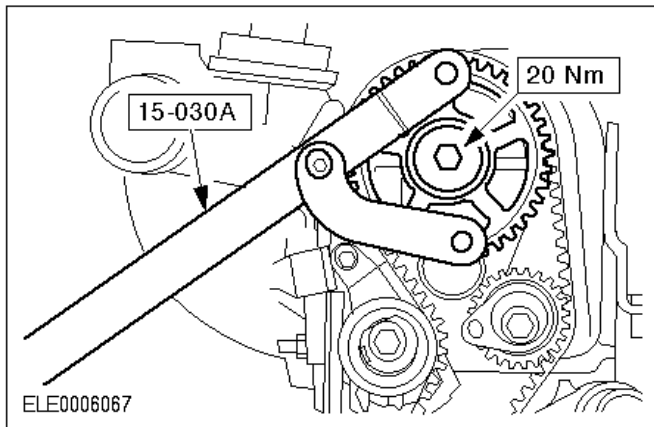
Engines fitted with an automatic camshaft timing belt tensioner.

μ 106. Pre-tension the camshaft timing belt.

Note:

Coat the bolt contact surface of the adjusting cam with engine oil.

Turn the adjusting cam clockwise to 9 o'clock and tighten the adjuster bolt.



Engines fitted with an automatic camshaft timing belt tensioner.

Note:

Stop the camshaft timing pulley from turning using the special tool.

μ 107. Tighten the camshaft timing pulley bolt.

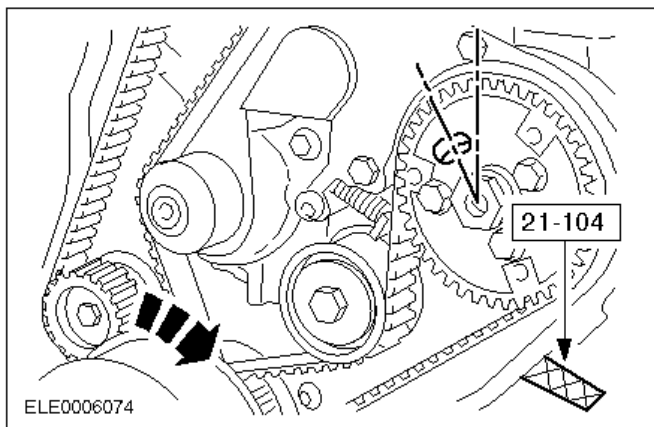
Engines fitted with an automatic camshaft timing belt tensioner.



CAUTION:

Remove Special Tools 21-104 and 21-162B.

108. Turn the crankshaft six turns in its running direction.



Engines fitted with an automatic camshaft timing belt tensioner.

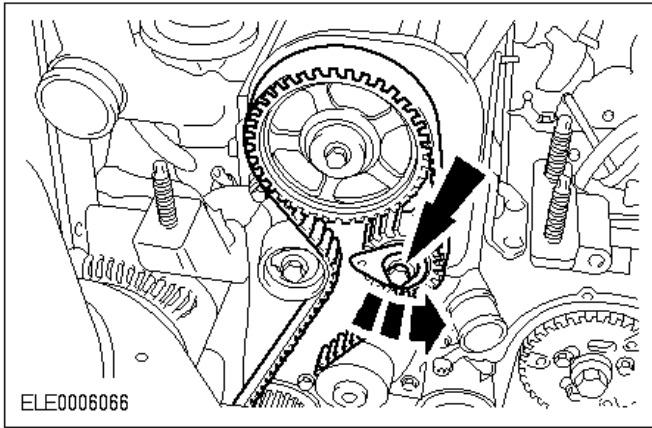
μ 109. Preparations for tensioning the timing belt.

- Turn the crankshaft in the normal direction of rotation until the slot on the injection pump timing pulley is at 11 o'clock.

Note:

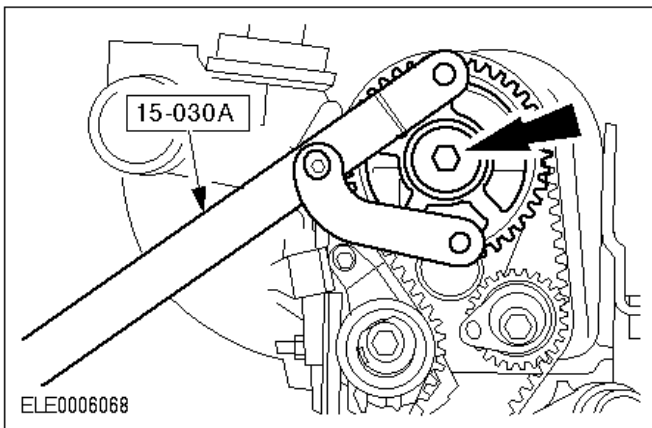
The special tool must be screwed in as far as it will go.

- Screw in the special tool.
- Carefully turn the crankshaft in the normal direction of rotation of the engine until it comes up against the special tool.



Engines fitted with an automatic camshaft timing belt tensioner.

- μ 110. Undo the bolt on the adjusting cam half a turn.

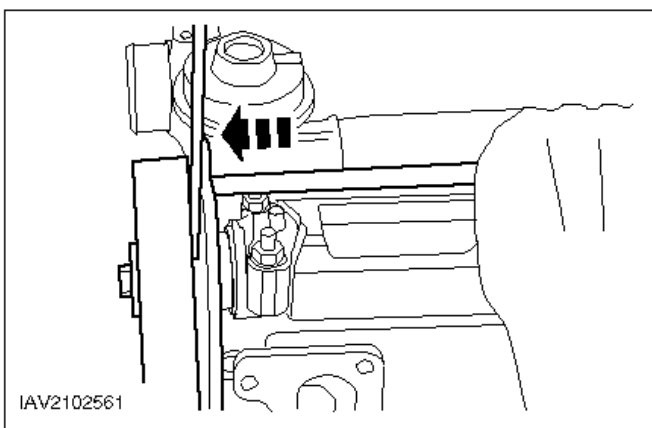


Engines fitted with an automatic camshaft timing belt tensioner.

Note:

Stop the camshaft timing pulley from turning using the special tool.

- μ 111. Undo the camshaft timing pulley bolt three turns.

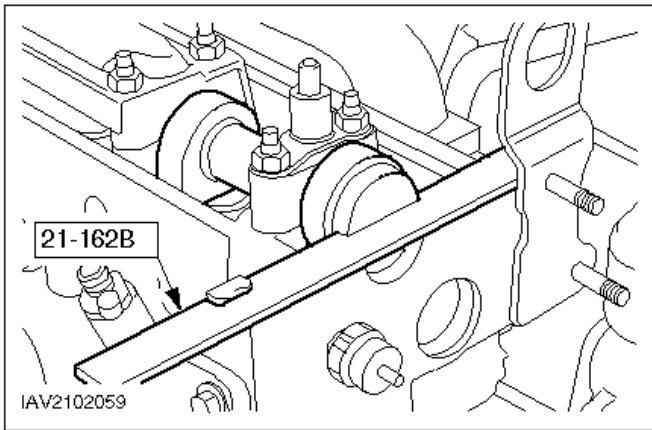


Engines fitted with an automatic camshaft timing belt tensioner.

Note:

Insert a screwdriver between the camshaft timing pulley and the timing belt rear cover.

- μ 112. Loosen the camshaft timing pulley from the taper by lightly tapping the light-metal drift.

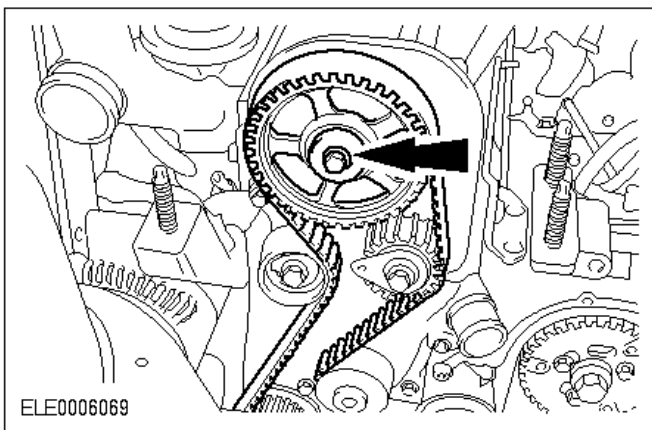


Engines fitted with an automatic camshaft timing belt tensioner.

Note:

If necessary, rotate the camshaft until the timing tool can be inserted.

- μ 113. Insert the special tool.

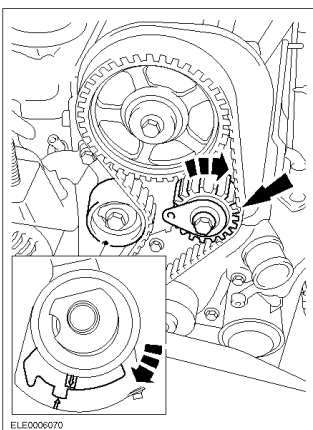


Engines fitted with an automatic camshaft timing belt tensioner.

Note:

Check that the camshaft timing pulley is still free to turn on the camshaft.

- μ 114. Tighten the camshaft timing pulley bolt finger tight and loosen one half turn.



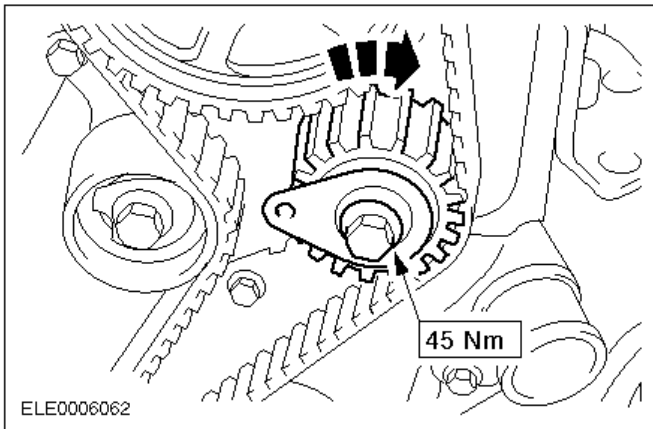
Engines fitted with an automatic camshaft timing belt tensioner.

- μ 115. Tension the camshaft timing belt.

Note:

The adjustment range of the adjusting cam lies between 6 o'clock (MIN) and 12 o'clock (MAX).

Tension the camshaft timing belt by turning the adjusting cam clockwise so that the arrow of the automatic camshaft timing belt tensioner is located in the right-hand corner of the adjustment range.

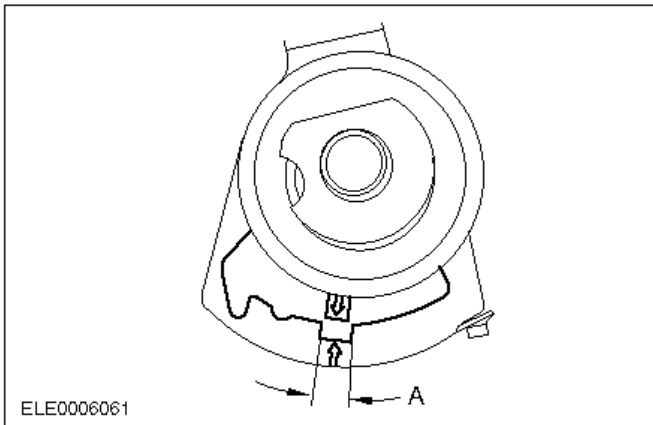


Engines fitted with an automatic camshaft timing belt tensioner.

Note:

Hold the adjusting cam in position.

μ 116. Tighten the adjusting cam bolt evenly.



Engines fitted with an automatic camshaft timing belt tensioner.

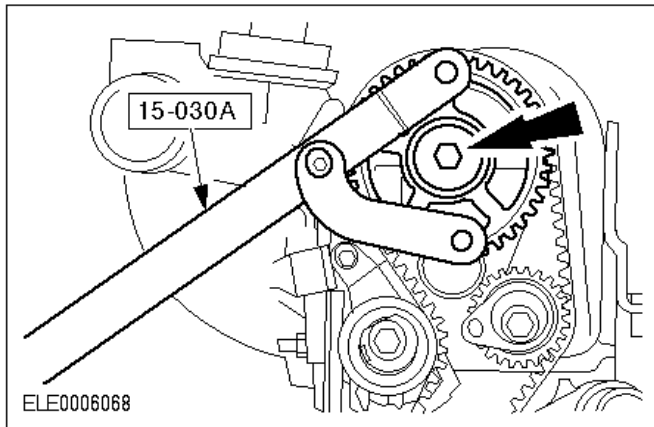
μ 117. Checking the position of the automatic camshaft timing belt tensioner.

- If the pointer is in range A: proceed to the next step.
- If the pointer is outside range A, tension the camshaft timing belt again as described.



CAUTION:

To avoid damage to the engine, make sure that the pointer is in range "A".



Engines fitted with an automatic camshaft timing belt tensioner.

Note:

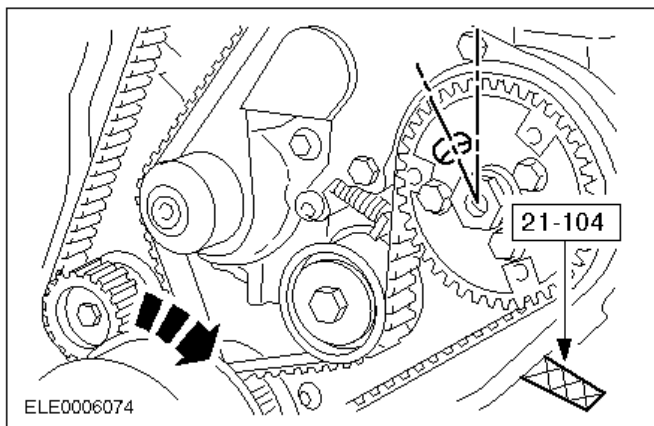
Stop the camshaft timing pulley from turning using the special tool.

μ 118. Tighten the bolt of the camshaft timing pulley.

- Tightening torque for M8 bolt: 35 Nm
- Tightening torque for M10 bolt: 48 Nm

Engines fitted with an automatic camshaft timing belt tensioner.

119. Remove Special Tools 21-104 and 21-162B.



Engines fitted with an automatic camshaft timing belt tensioner.

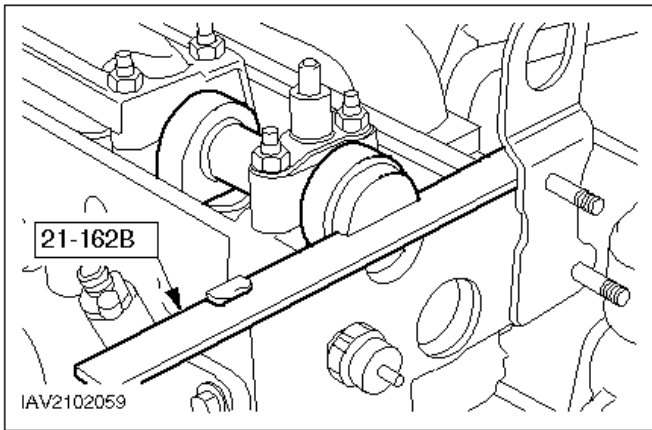
μ 120. Checking the valve timing.

- Turn the crankshaft in the normal direction of rotation until the slot on the injection pump timing pulley is at 11 o'clock.

Note:

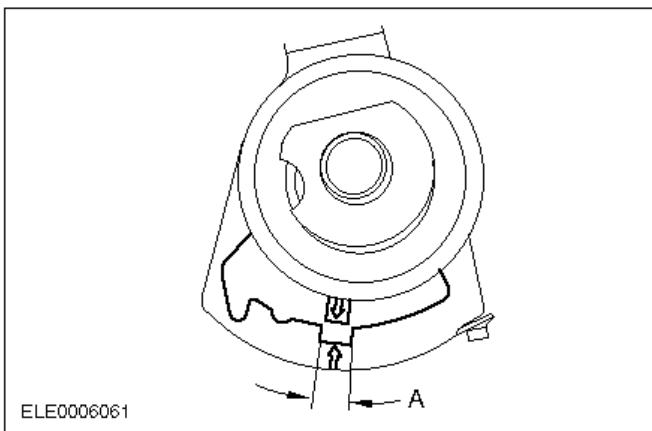
The special tool must be screwed in as far as it will go.

- Screw in the special tool.
- Carefully turn the crankshaft in the normal direction of rotation of the engine until it comes up against the special tool.



Engines fitted with an automatic camshaft timing belt tensioner.

- μ 121. Install the special tool. If the special tool cannot be inserted, tension the camshaft timing belt again as described.



Engines fitted with an automatic camshaft timing belt tensioner.

- μ 122. Checking the position of the automatic timing belt tensioner.

- If the pointer is in range A: proceed to the next step.
- If the pointer is outside range A, tension the camshaft timing belt again as described.

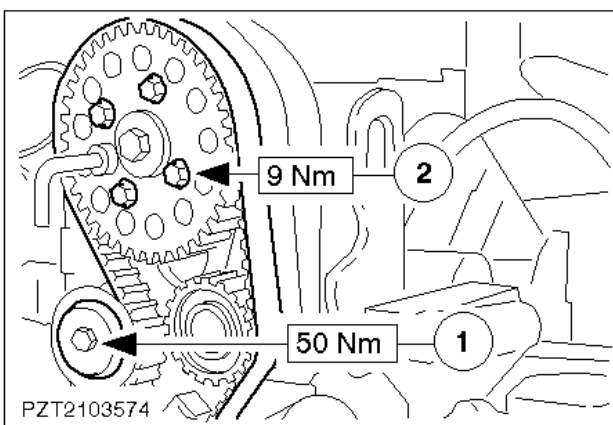


CAUTION:

To avoid damage to the engine, ensure that the pointer is located within range "A".

Engines fitted with an automatic camshaft timing belt tensioner.

- 123. Remove Special Tools 21-162B and 21-104.



Engines fitted with a mechanical camshaft timing belt tensioner.



CAUTION:

Always renew the camshaft timing belt and the injection pump timing belt.

Note:

The springs of the timing belt tensioners are not interchangeable.

μ 124. Fit the new camshaft timing belt.

- Insert Special Tool 23-019.

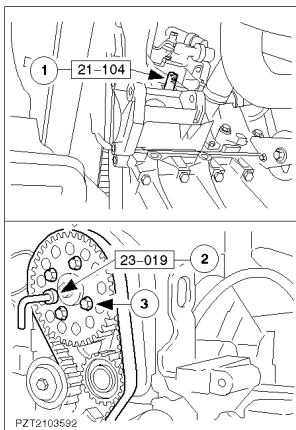
Note:

Make sure the timing belt is seated correctly and positioned in the correct direction of rotation.

Note:

Slots. The bolts of the camshaft timing belt pulley must be central in the slots.

- Fit a new camshaft timing belt anti-clockwise starting from the crankshaft.
 - Undo the mechanical belt tensioner clamp bolt and allow the tensioner to snap against the belt.
- 1 Tighten the bolt of the mechanical timing belt tensioner.
 - 2 Tighten the bolts of the camshaft timing belt pulley.



Engines fitted with a mechanical camshaft timing belt tensioner.

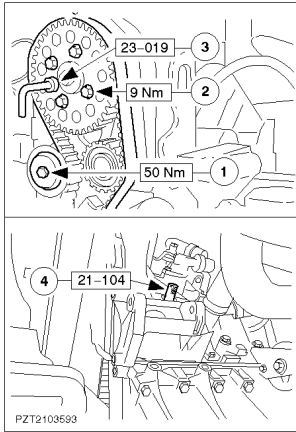
μ 125. Preparations for tensioning the timing belt.



CAUTION:

Remove Special Tools 21-104 and 23-019.

- Carefully turn the crankshaft six revolutions in the normal direction of rotation.
- 1 Screw in the special tool.
- Carefully turn the crankshaft in the normal direction of rotation of the engine until it comes up against the special tool.
- 2 It must be possible to insert the special tool into the camshaft timing pulley.
 - 3 Undo the bolts of the camshaft timing belt pulley.



Engines fitted with a mechanical camshaft timing belt tensioner.



CAUTION:

A used timing belt cannot be re-tensioned.

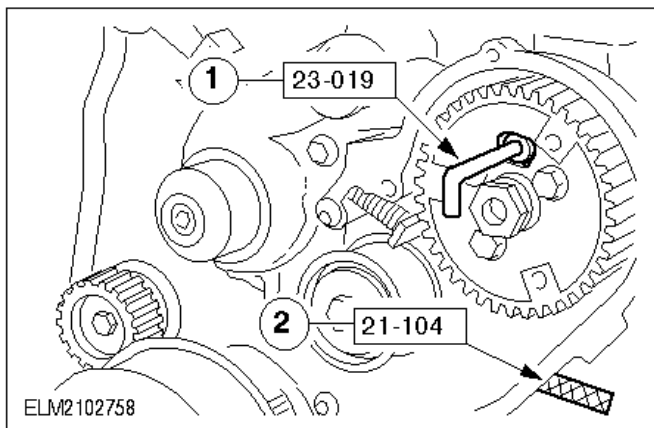
μ 126. Tension the timing belt.

- Slacken the bolts of the mechanical camshaft timing belt tensioner a quarter of a turn so that the timing belt tensioner presses against the timing belt.

Note:

Check the special tools are seated correctly.

- 1 Tighten the bolts of the mechanical camshaft timing belt tensioner.
- 2 Tighten the bolts of the camshaft timing belt pulley.
- 3 Remove the special tool.
- 4 Remove the special tool and tighten the retaining bolt to 24 Nm.



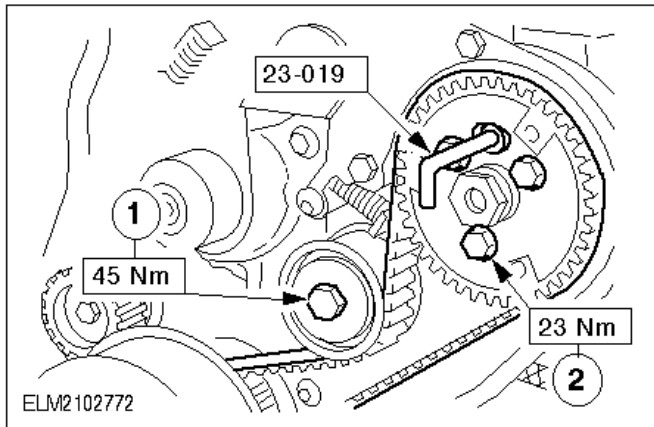
μ 127. Align the injection pump timing belt pulley.

- 1 Using the special tool or a new 6 mm drill bit, align the injection pump timing belt pulley through the timing pulley recess and the hole in the injection pump housing. Unscrew the blanking plug from the hole for TDC adjustment in the cylinder block.
- 2 Screw the special tool into the cylinder block.

Note:

The special tool must be screwed in as far as it will go. The crankshaft must be touching the special tool.

Carefully turn the crankshaft in the normal direction of rotation of the engine until it comes up against the special tool.



CAUTION:

Use a new timing belt.

Note:

The direction of rotation is marked.

Note:

Make sure the timing belt is seated correctly.

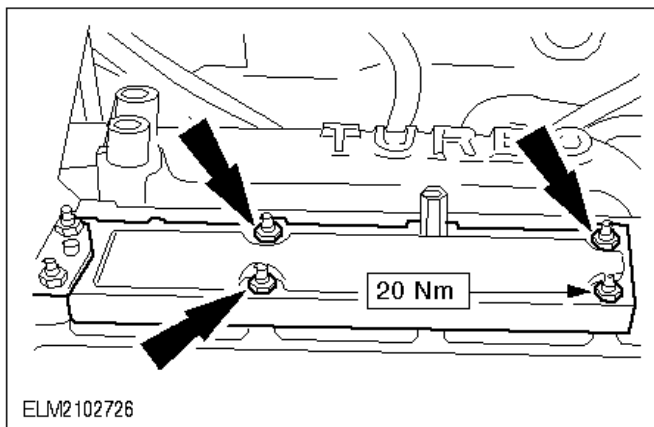
μ 128. Fit the injection pump timing belt.

- Fit a new timing belt anti-clockwise starting from the crankshaft.
- Undo the belt tensioner clamp bolt and allow the tensioner to snap against the belt.
- 1 Tighten the belt tensioner clamp bolt.

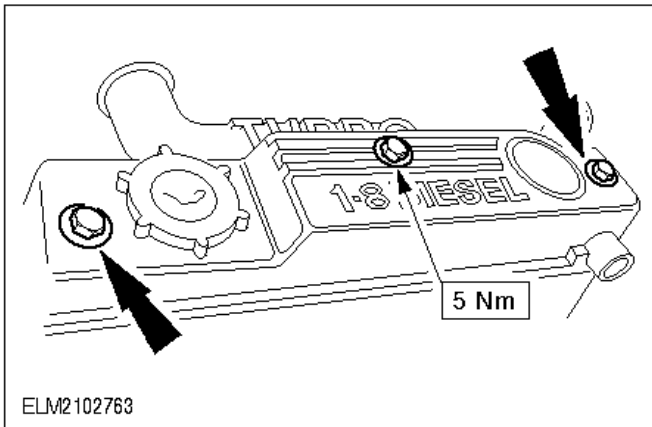
Note:

The bolts must not be at the ends of the slots.

- 2 Tighten the bolts of the fuel-injection pump pulley.
- Remove the special tool.



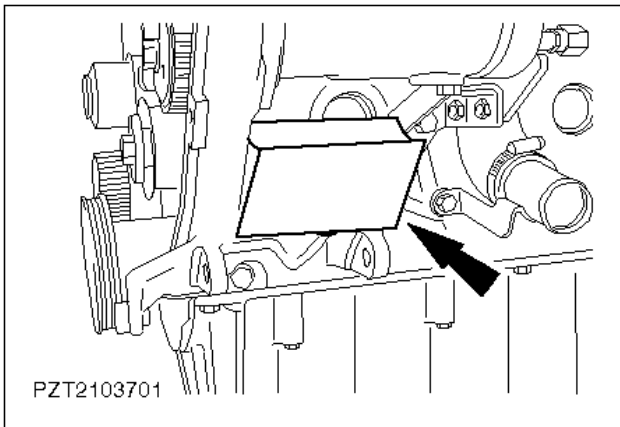
- μ 129. Check the valve clearances and adjust them if necessary as described in «[Operation Number 21 213 0](#)».
130. Fit the oil baffle.



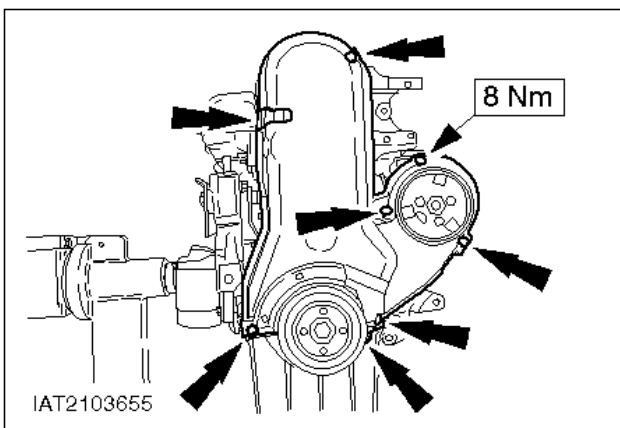
Note:

Clean the gasket, check it for damage and coat it with engine oil. If necessary, renew it (it can be used several times).

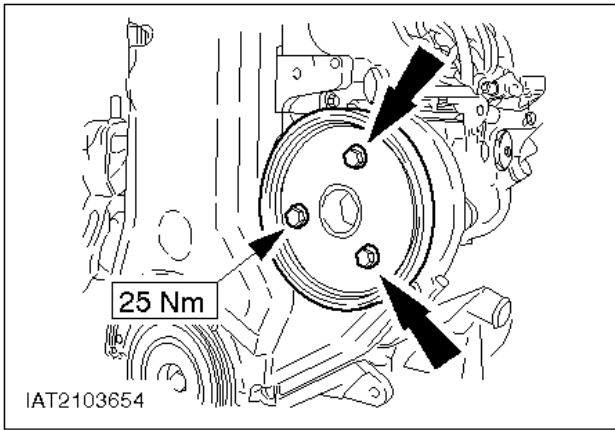
- μ 131. Fit the cylinder head cover.



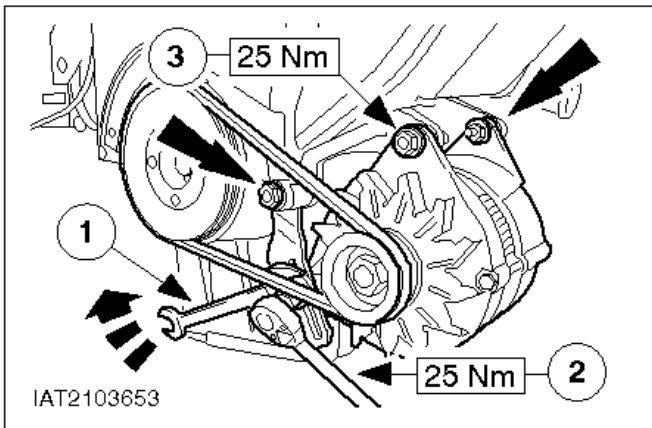
- μ 132. Insert the plastic tray in the alternator bracket.



- μ 133. Install the upper and lower timing belt covers.

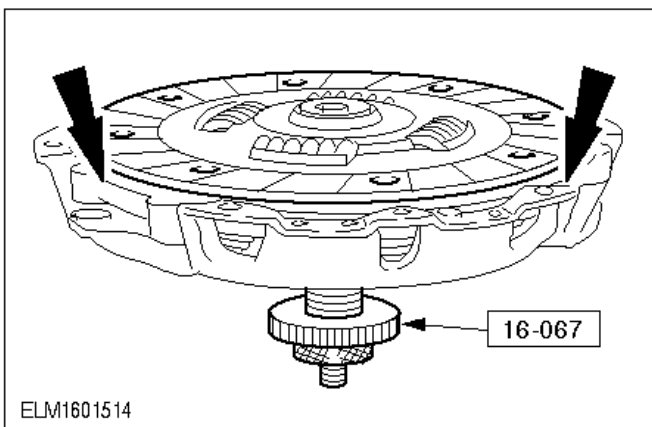


μ 134. Fit the injection pump belt pulley.

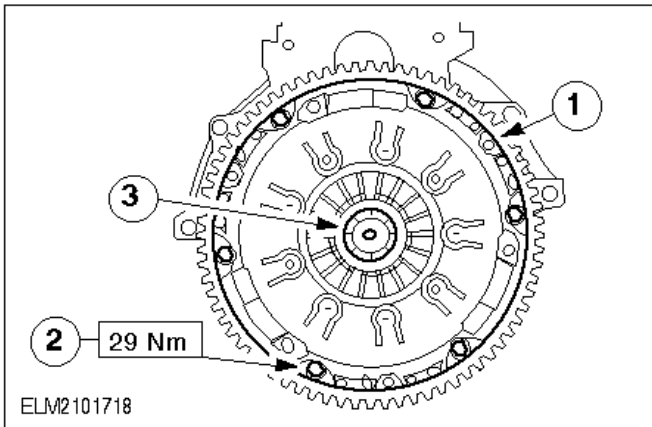


μ 135. Fit the alternator.

- Insert the bolts.
- Lay the drive belt in place.
- 1 Tension the drive belt.
- 2 Tighten the bolt.
- 3 Tighten the remaining bolts.

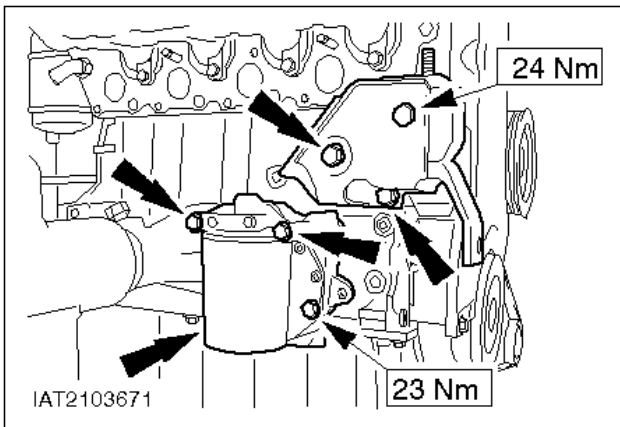


μ 136. Centre the clutch disc on the clutch pressure plate.



μ 137. Install the clutch.

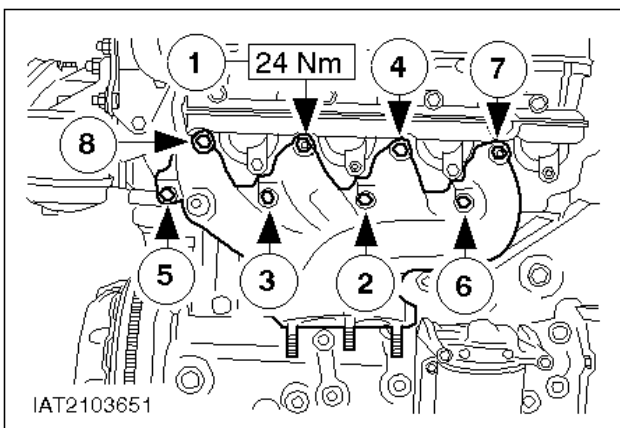
- 1 Install the clutch pressure plate/centred clutch disc assembly.
- 2 Tighten the six bolts uniformly, working diagonally.
- 3 Remove the special tool.



Note:
Use a new gasket.

Note:
Coat the oil pump drive gear with oil.

- μ 138. Fit the oil pump and oil filter.
139. Remove engine mounting bracket.



- μ 140. Remove the engine from assembly stand.

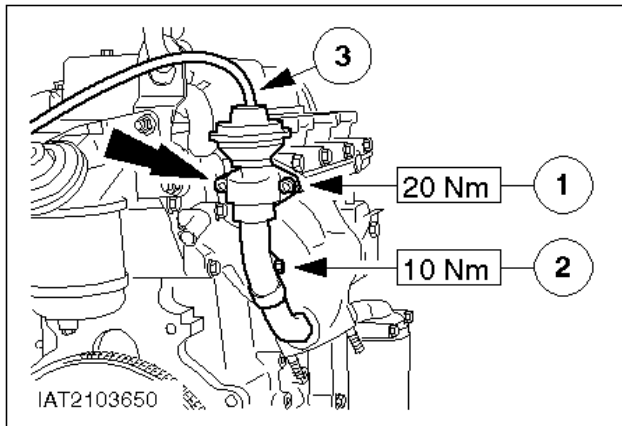
Note:

Tightening order.

Note:

Plastic sleeve on right-hand upper stud (no. 7).

141. Fit the exhaust manifold with a new gasket.



μ 142. Fit the EGR valve with a new seal.

- 1 Tighten the bolts.
 - 2 Tighten the clamp bolt.
 - 3 Connect the hose.
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