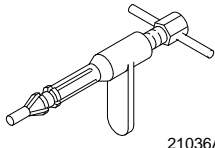
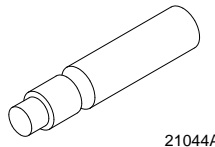
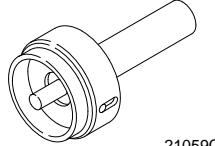
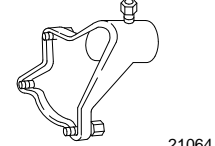
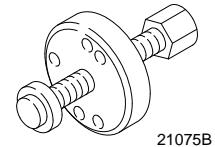
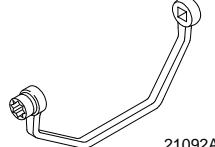
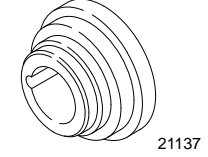
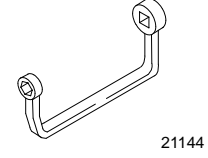
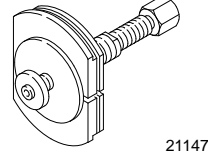


## Engine – Dismantle and Assemble (21 134 8)

### Special Tools

 21036A	<b>21-036A</b> Remover for pilot bearing
 21044A	<b>21-044A</b> Installer/Aligner, Pilot Bearing/Clutch Plate
 21059C	<b>21-059C</b> Installer for radial seal
 21064	<b>21-064</b> Mounting bracket
 21075B	<b>21-075 B</b> Remover for vibration damper
 21092A	<b>21-092 A</b> Inlet manifold wrench

 21137	<b>21-137</b> Oil seal installer/aligner
 21144	<b>21-144</b> Inlet manifold wrench
 21147	<b>21-147</b> Remover, vibration damper
 21168	<b>21-168</b> Crankshaft locking tool
 21540	<b>21-540</b> Bolt tightening angle gauge

### Workshop Equipment

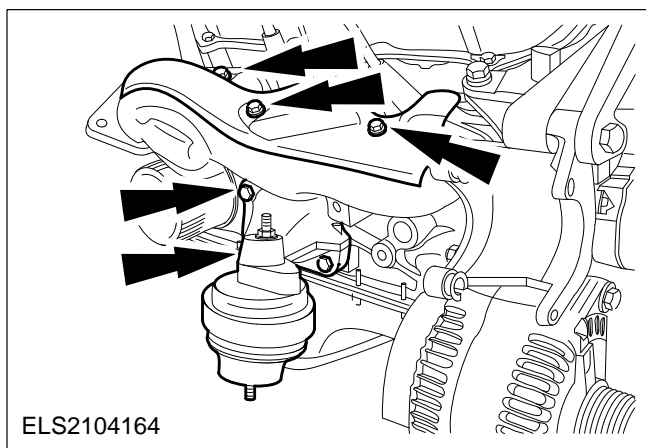
Assembly stand	
----------------	--

### Materials

Plastigage	Obtainable through: Replacement Services Limited, 30 Euston Street, Freemans Industrial Estate, Leicester, LE2 7ST.
M8 threaded rod	
Spark plug thread lubricant (Never Seez)	ESE-M1244-A
Loctite 518	ESKM-4G-269-A
Wellseal	SPM-4G-9112-H
Sealer	SPM-2G-3121-A

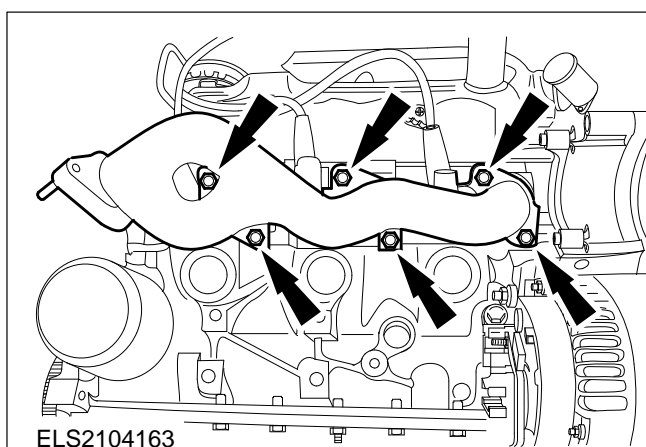
### Proprietary Tools

Oil filter strap wrench
Dial indicator
Magnetic fixture
Micrometer screw
Piston ring pliers
Piston ring compressor
V-belt tension gauge

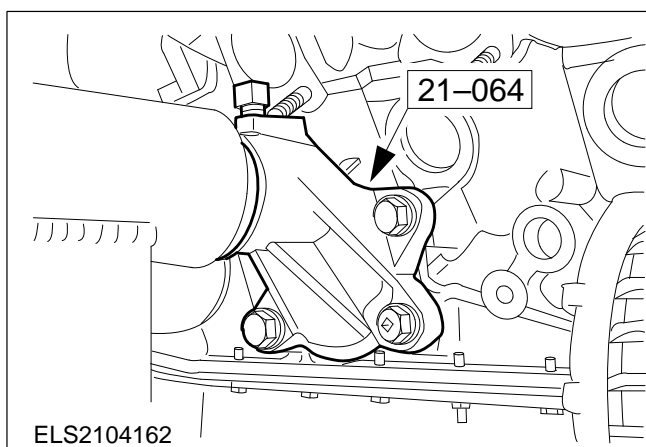


## Dismantle

1. Remove the heat shield from the right-hand exhaust manifold.
2. Remove the bracket with the right-hand engine mounting bracket (four bolts).

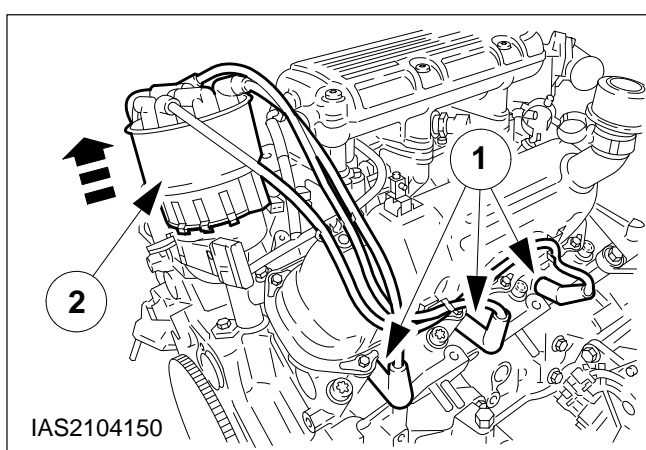


3. Detach the right-hand exhaust manifold.



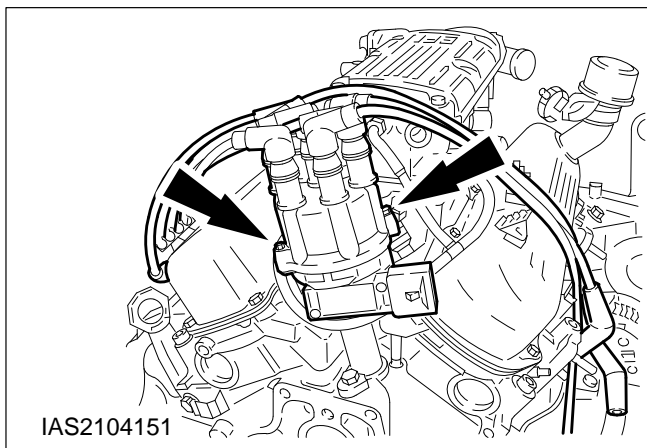
4. Attach the engine to the assembly stand.

- Attach the mounting bracket.
- Attach the engine to the assembly stand.
- Drain off the engine oil.
- Withdraw the oil dipstick.

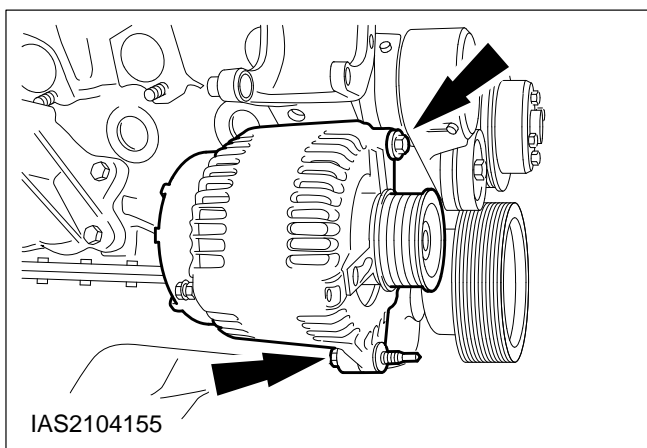


5. Remove the distributor arc shield.

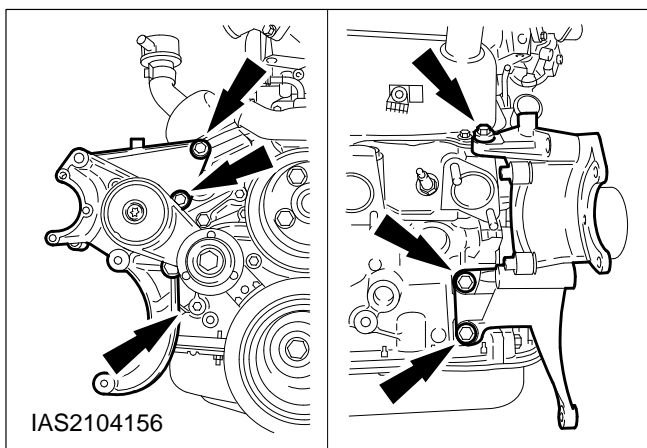
- 1 Pull off all spark plug connectors.
- 2 Remove the arc shield.



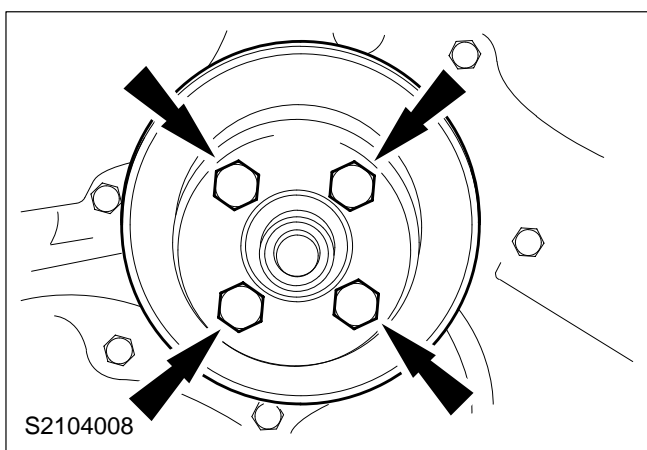
- 6. Remove the distributor cap (two bolts).
- 7. Remove the distributor and the spark plugs.



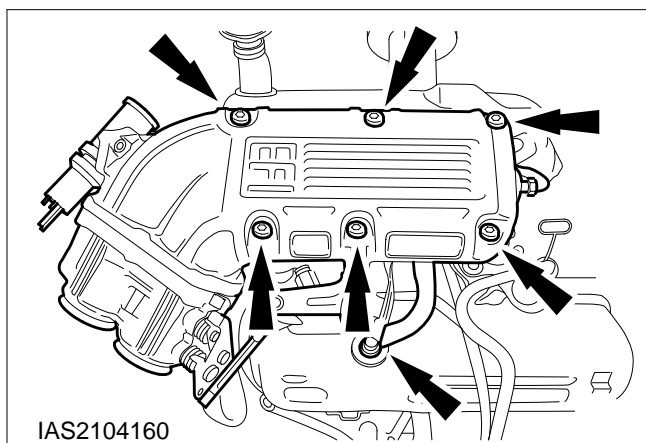
- 8. Remove the alternator (two bolts).



- 9. Detach the alternator bracket.



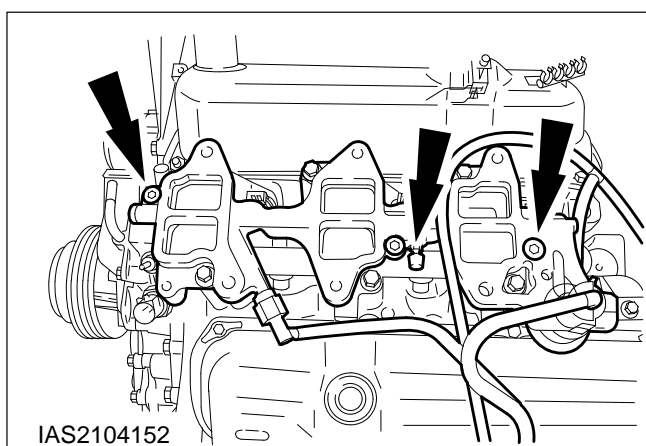
- 10. Remove the coolant pump belt pulley.



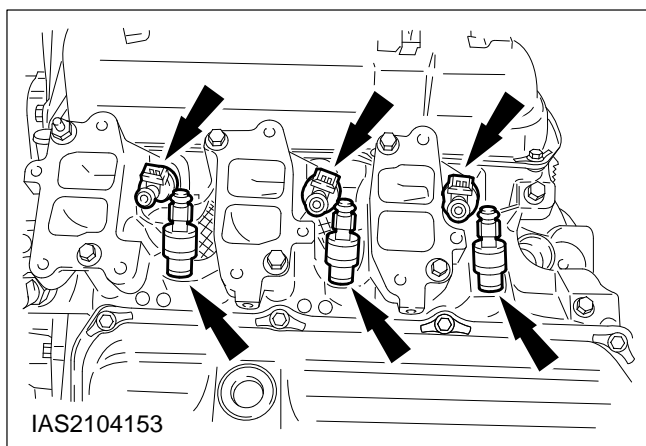
**11. Remove the intake air plenum chamber with the throttle housing.**

**⚠ CAUTION:** Do not use a steel scraper.

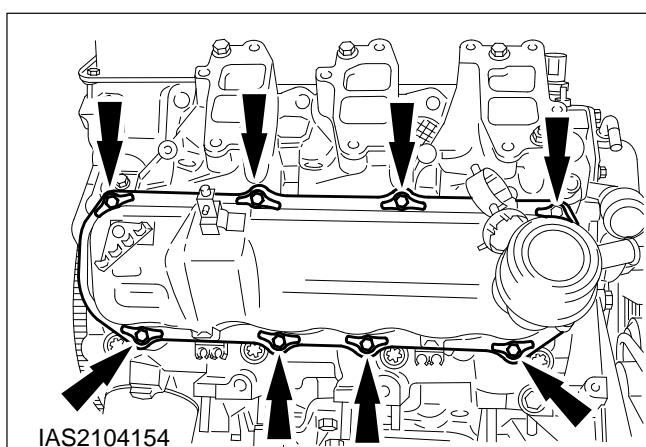
- Remove the gaskets.
- Pull the positive crankcase ventilation (PCV) hose and valve from the cylinder head cover.



**12. Detach the fuel rail (four bolts).**

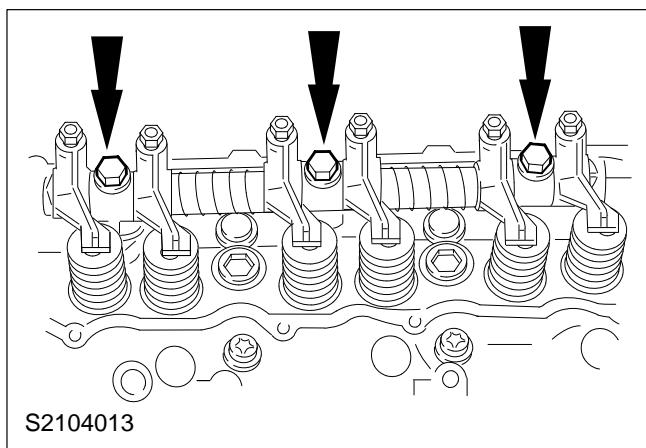


**13. Remove the injectors.**



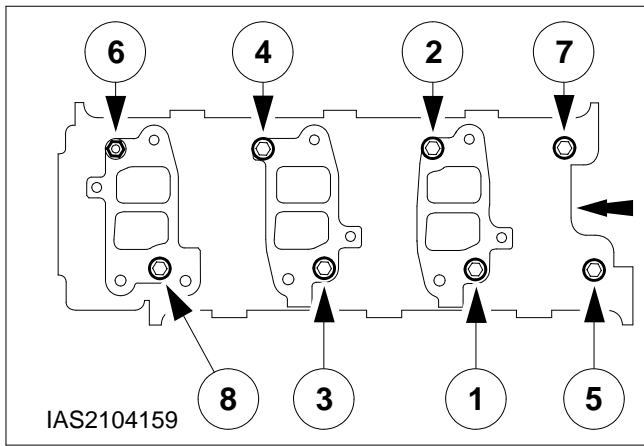
**14. Remove the cylinder head covers (eight bolts and extended washers on each).**

Remove the gaskets.

**15. Detach the two rocker shafts.**

**NOTE:** Do not mix up the rocker shafts and the push rods.

Withdraw the push rods in the correct sequence and keep them in order.

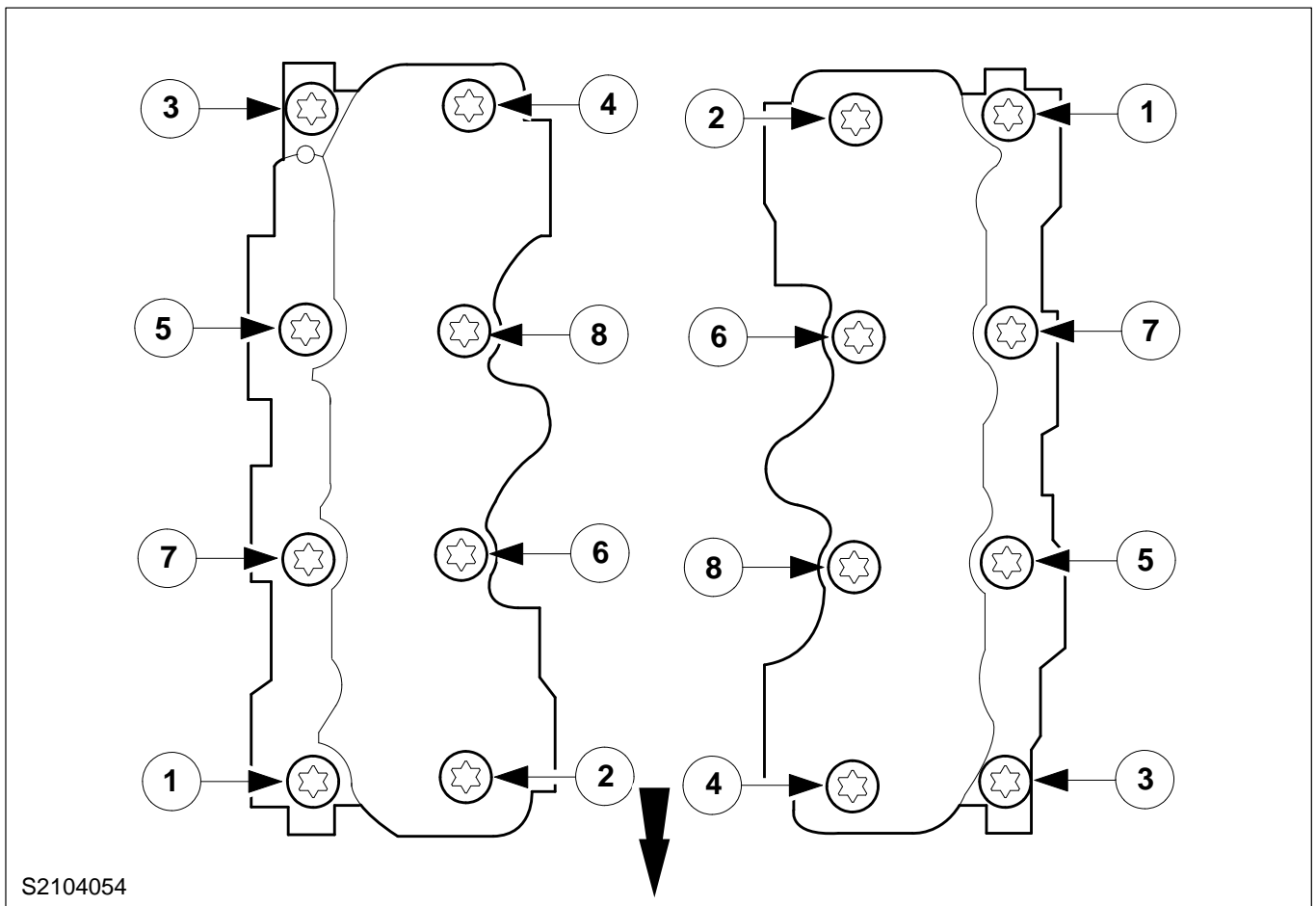


### 16. Detach the inlet manifold.

- Disconnect the connecting hose running to the thermostat housing.

#### NOTE: Bolt-slackening sequence.

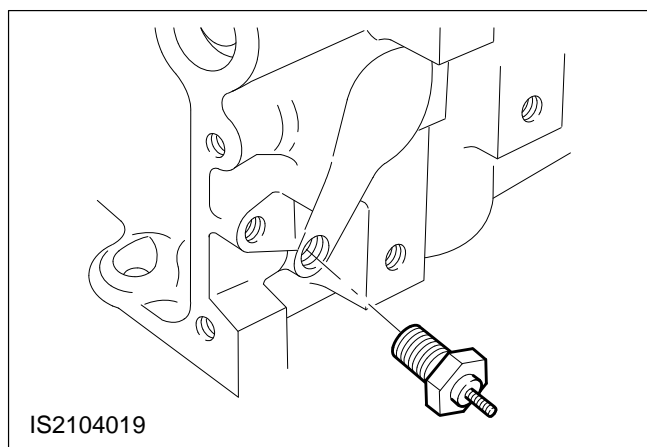
- Detach the inlet manifold (seven bolts, one nut).
- Remove the gasket.



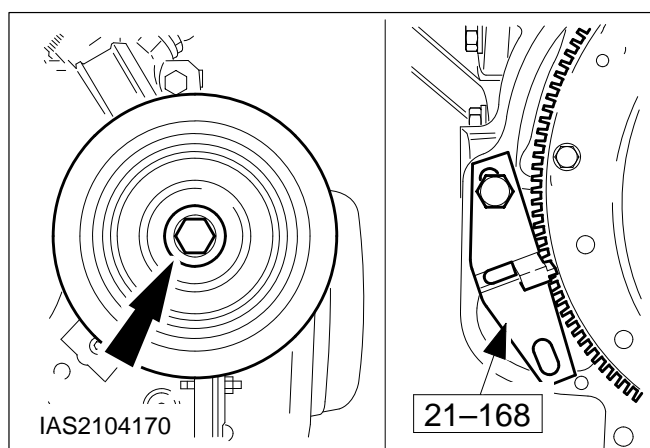
#### NOTE: Bolt-slackening sequence.

### 17. Remove the cylinder heads.

The cylinder head bolts may only be used once.

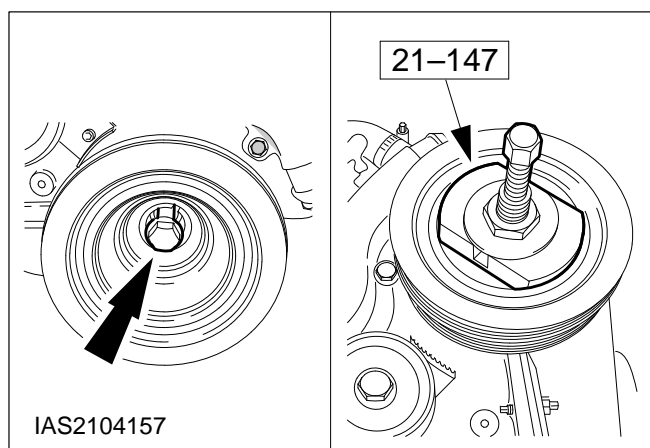


### 18. Remove the oil pressure switch.



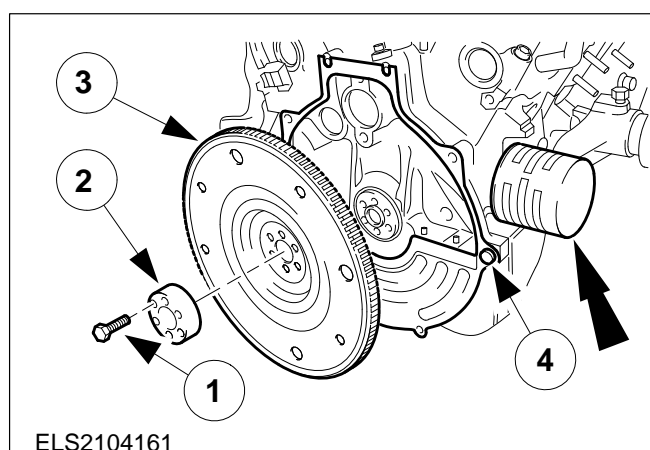
### 19. Detach the belt pulley with the crankshaft vibration damper.

- Lock the flywheel.
- Remove the bolt.



### 20. Detach the belt pulley with the crankshaft vibration damper (continued).

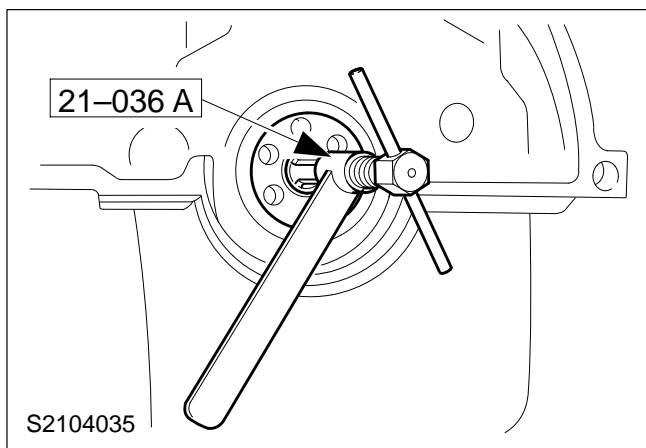
- Screw in the bolt fifteen turns.
- Insert the special tool and pull off the vibration damper.
- Remove the bolt and the Woodruff key.



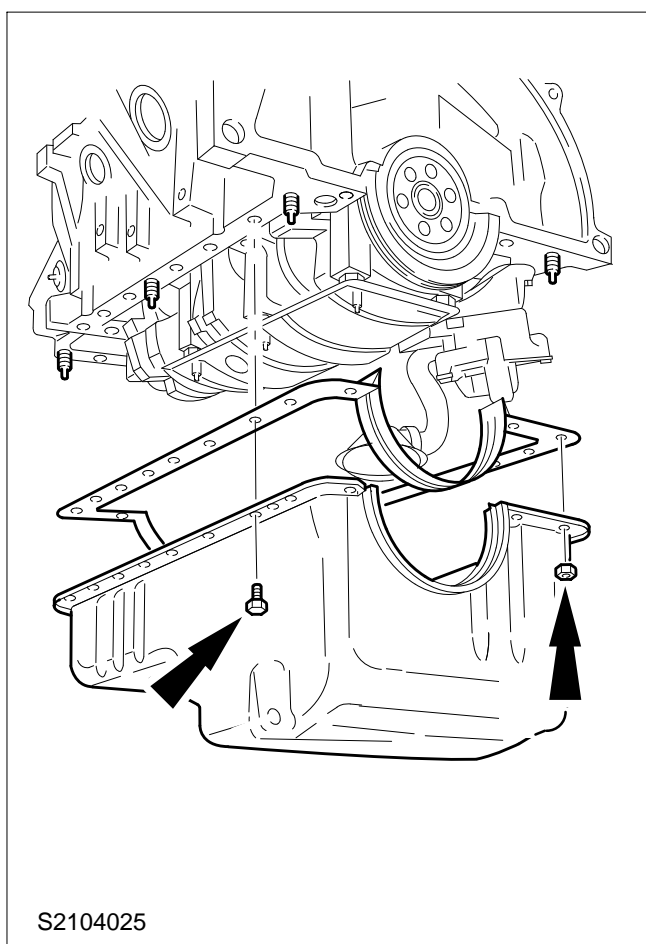
### 21. Detach the flywheel.

- 1 Six bolts.
- 2 Pressure plate.
- 3 Flywheel.
- 4 Adaptor plate.

### 22. Detach the oil filter.

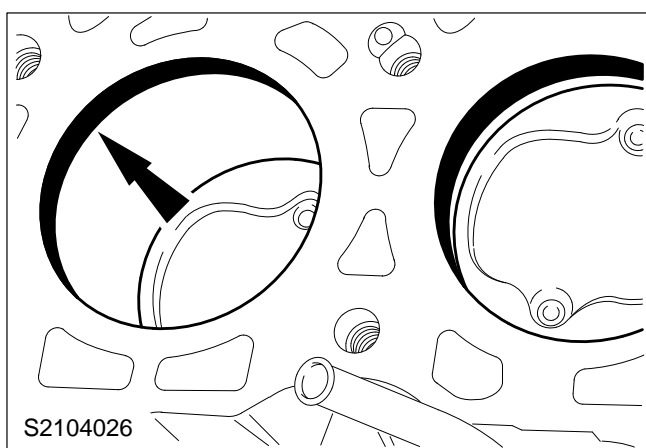


**23. Remove the crankshaft pilot bearing.**



**⚠ CAUTION:** Oil sludge and abraded particles must not get into the engine.

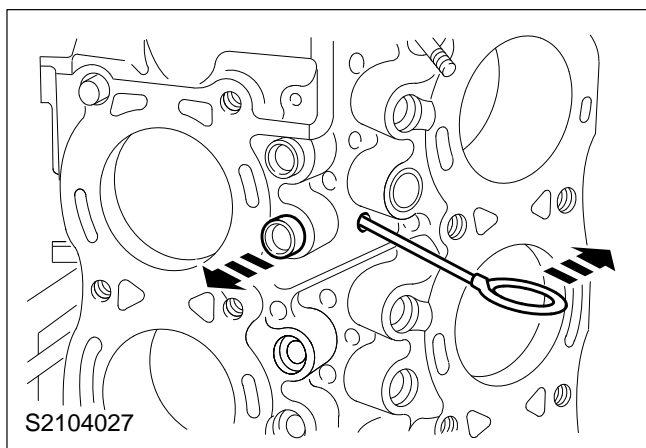
**24. Remove the sump downwards (18 bolts/six nuts).**



**⚠ CAUTION:** Take care not to damage the cylinder liners.

**25. Remove the carbon from the upper edges of the cylinder bores.**

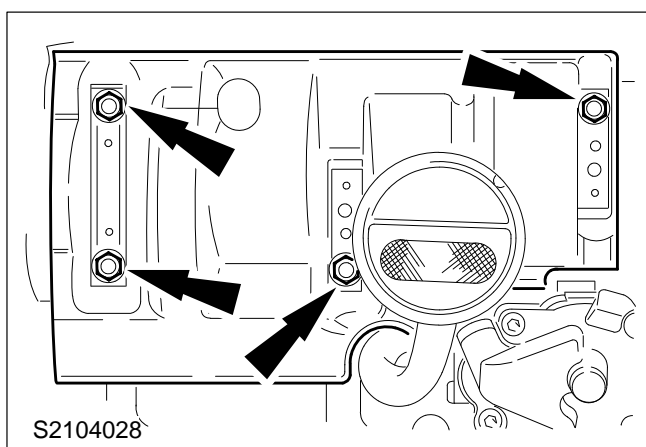
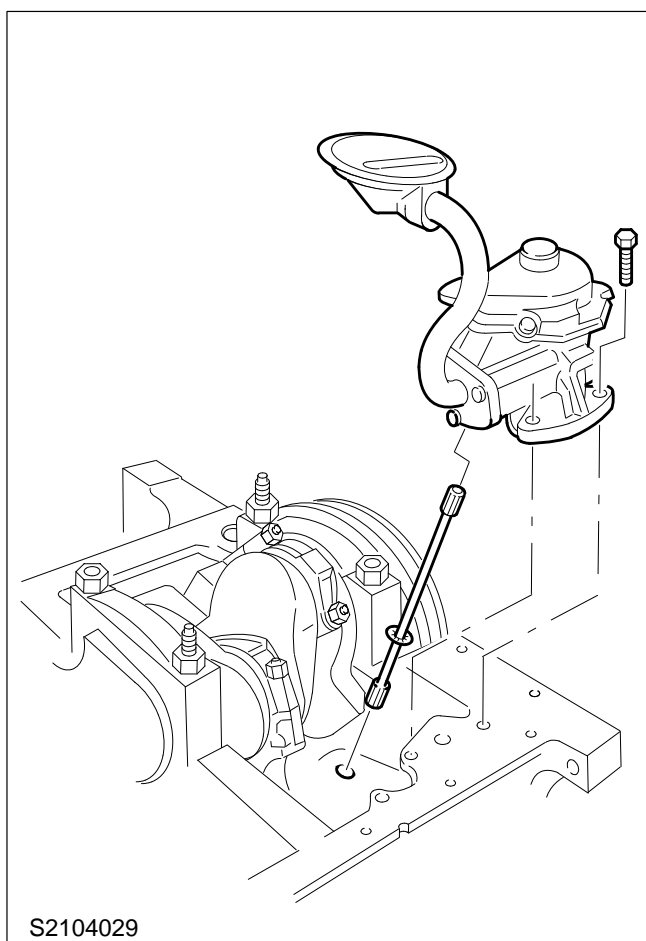


**26. Remove the hydraulic tappets.**

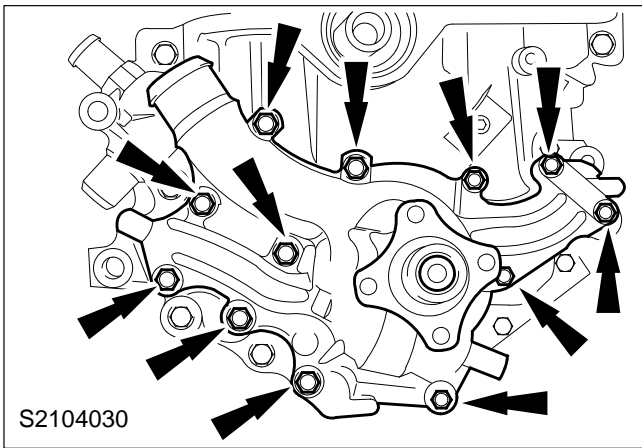
- Place a suitable drain tray under the cylinder block.
- Place the cylinder block in the vertical position.

**NOTE:** Do not mix up the tappets when removing and installing them and do not dismantle them. They are only available as a single part for servicing.

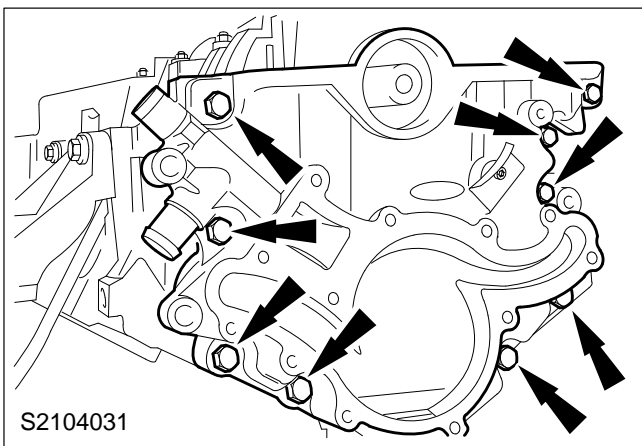
- Press out the hydraulic tappets with a bent piece of brass wire.

**27. Detach the oil baffle.****28. Detach the oil pump with the intake pipe.**

Remove the oil pump drive shaft.

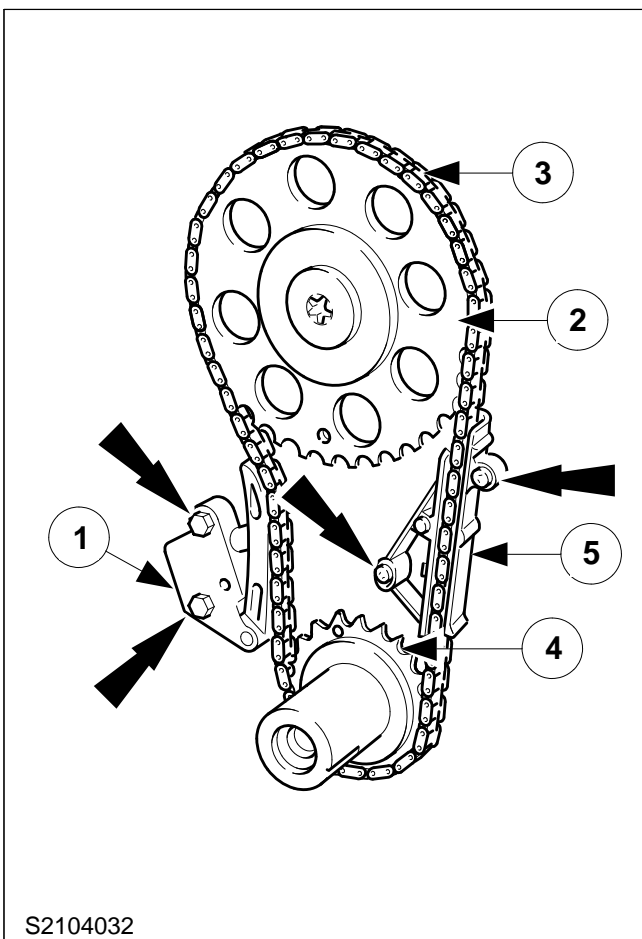


### 29. Detach the coolant pump.



### 30. Detach the timing cover.

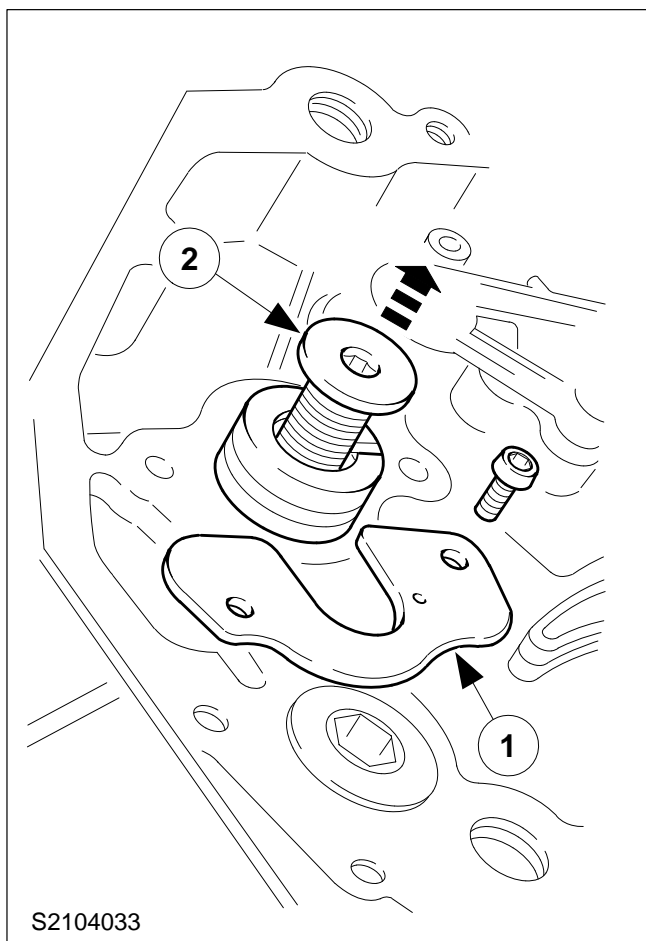
Remove the oil seal from the timing cover.



### 31. Remove the camshaft chain drive complete.

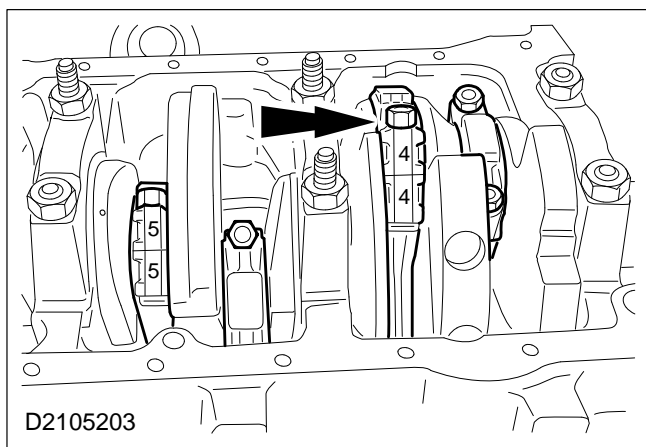
**⚠ CAUTION:** The oil-filled plunger of the chain tensioner is spring-loaded.

- 1 Chain tensioner (two bolts)
- 2 Camshaft sprocket
- 3 Timing chain
- 4 Crankshaft sprocket
- 5 Chain guide (two bolts)



### 32. Remove the camshaft.

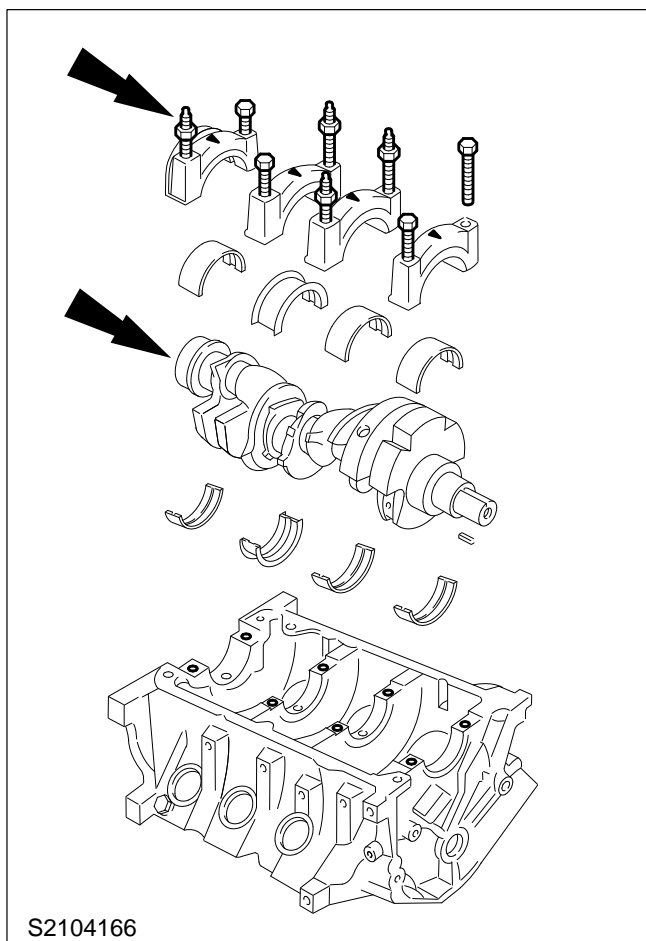
- 1 Detach the thrust plate (two bolts).
  - 2 Carefully withdraw the camshaft with the sprocket bolt.
- Swivel the engine.



**⚠ CAUTION:** Do not damage the crankshaft bearing journal.

### 33. Remove the pistons.

- Detach the big-end bearing caps.
- Remove the bearing shells from the big-end bearing caps and the connecting rods and mark them.
- Press out the pistons with the connecting rods.



### 34. Remove the crankshaft.

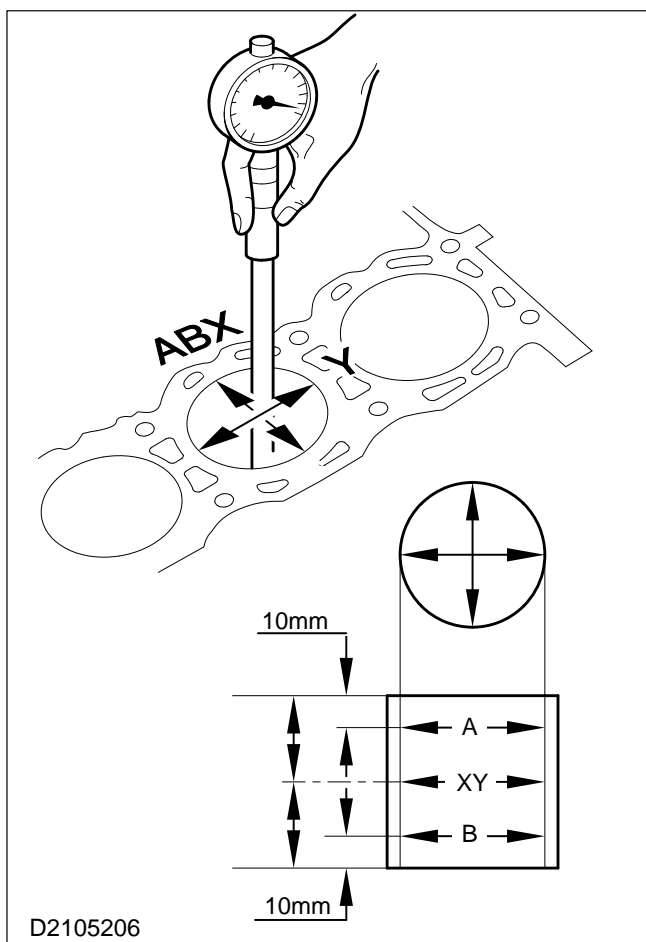
**NOTE:** Four special bolts for securing the oil baffle.

- Detach the main bearing caps.
- Lift out the crankshaft.
- Remove the rear oil seal.
- Remove the bearing shells and mark them for reuse.

### Assemble

### 35. Preparatory measures.

Thoroughly clean all mating and bearing surfaces and re-usable parts and check them for damage.

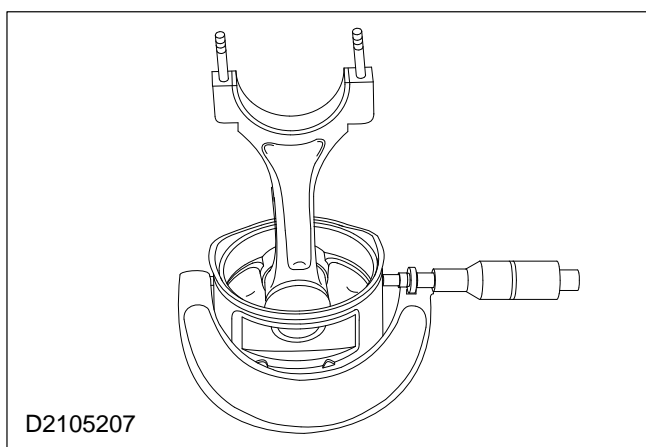


## Measure the cylinder bores

**NOTE:** Machine or renew the cylinder block as necessary.

### 36. Measure the cylinder bores.

- Measure dimensions A, B, and X-Y and compare them with the values in the Technical Data.
- Ovality = X-Y
- Conicity = A-B

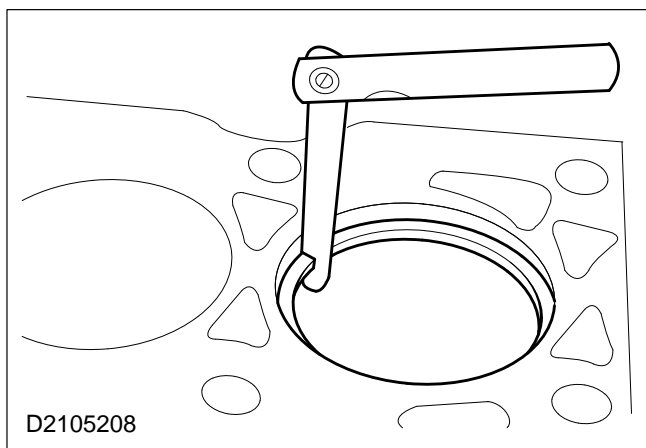


## Measure the piston diameter

**NOTE:** Piston classification, if a piston has to be renewed.

### 37. Measure the piston diameter.

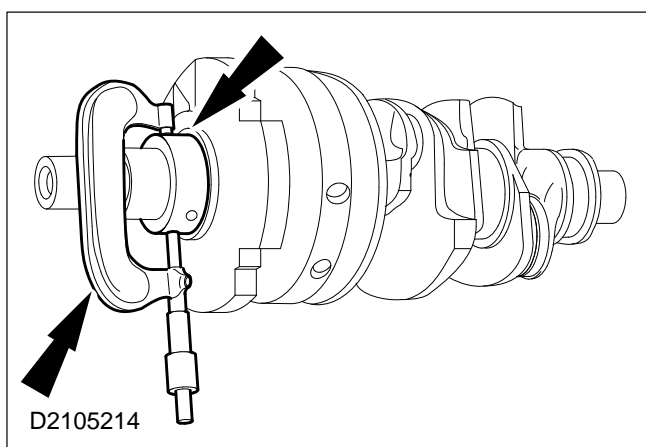
- Measure the piston diameter at the top of the piston pin bore.



**⚠ CAUTION:** Do not mix up the piston rings. Refit the piston rings in the same position as before.

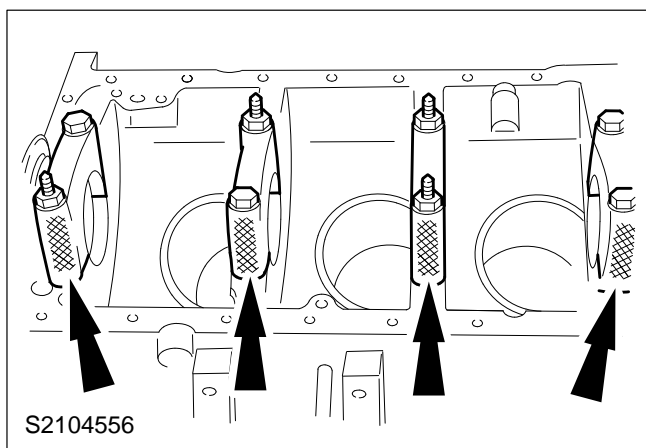
### 38. Check the piston ring gaps.

The figures indicated in the Technical Data are for a gauge ring used in production. The figures measured in the cylinder can exceed these by 0,15 mm.



### 39. Measure the diameter of the main and big-end bearing journals.

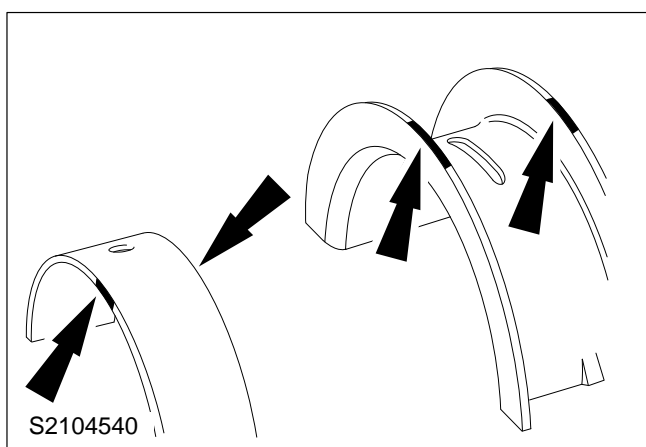
- Repeat each measurement at 90°.
- Overhaul or renew the crankshaft as necessary.



### Measure the bearing clearance

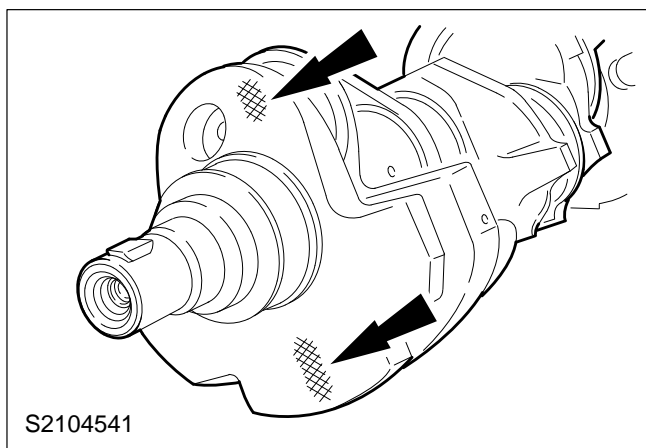
#### 40. Paint marks on the main bearing caps.

- If the parent bore in the cylinder block has standard dimensions, it does not have a mark.
- Bearing caps for a 0,38 mm oversize parent bore have a white paint mark.



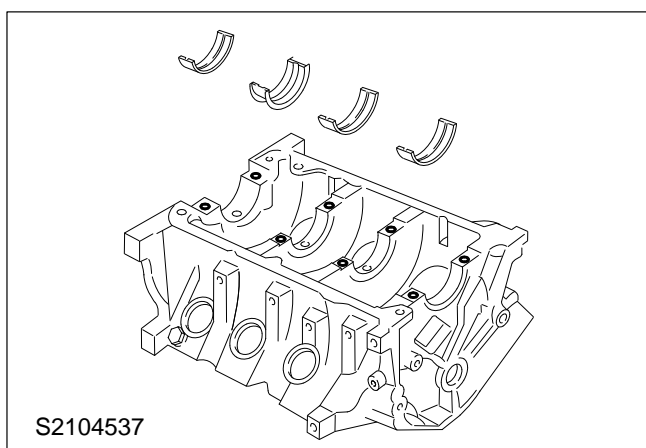
#### 41. Paint marks on the main and big-end bearing shells.

- Standard bearing shells do not have a mark.
- Bearing shells for an oversize cylinder block and an undersize crankshaft are marked on the back as appropriate (see Parts Microfiche).
- If a repair is carried out in production, the bearing shells are provided with paint marks as shown.



#### 42. Paint marks on the main and big-end bearing journals.

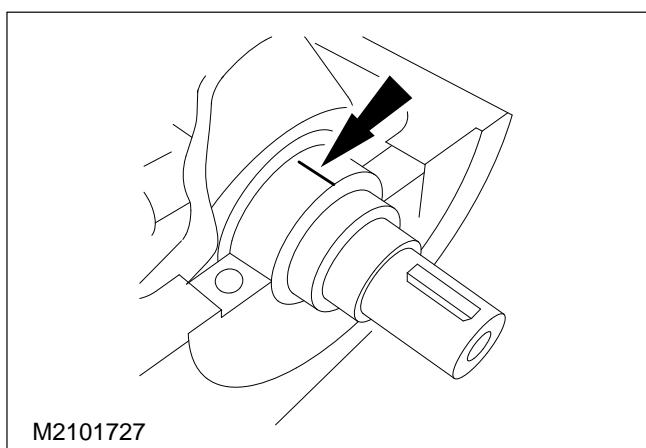
- Main bearing journals with the standard diameter are not marked.
- In the case of bearing journals with 0,25 mm undersize, the first counterweight on the crankshaft has a green paint mark.
- Big-end bearing journals with the standard diameter are not marked.
- In the case of big-end bearing journals with 0,25 mm undersize, the first crankshaft web in relation to the big-end bearing journal is marked with a green spot.



**⚠ CAUTION:** Do not damage the crankshaft bearings during fitment.

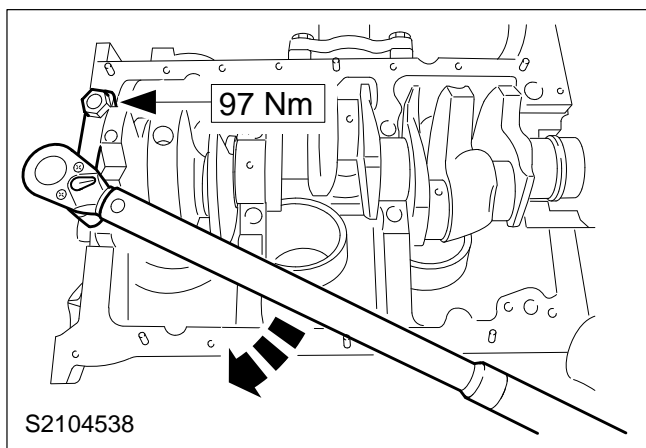
#### 43. Fit the crankshaft.

- Fit the main bearing shells in the cylinder block.
- Fit the crankshaft without lubrication.



#### 44. Measure the crankshaft main bearing clearance.

- Measure the clearance of the bearings in turn in numerical order (1 – 4). The numbering starts at the timing chain end.
- Lay a length of Plastigage thread on the bearing journal across the bearing.



#### 45. Measure the crankshaft main bearing clearance (continued).

- Fit the bearing cap with the associated bearing shell and tighten it.

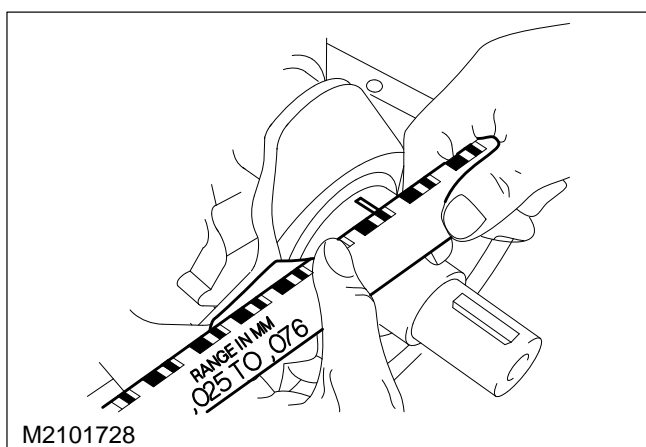
**⚠ CAUTION:** The crankshaft must not be turned during the measuring operation. Do not hit the bearing caps.

- Detach the bearing caps.

**NOTE:** If the measured bearing clearance is outside the specification of 0,008 - 0,062 mm, then the bearing shells should be renewed and the measurement procedure repeated from step 44.

#### 46. Measure the crankshaft main bearing clearance (continued).

- Compare the Plastigage thread with the Plastigage scale.
- The reading corresponds to the bearing clearance.

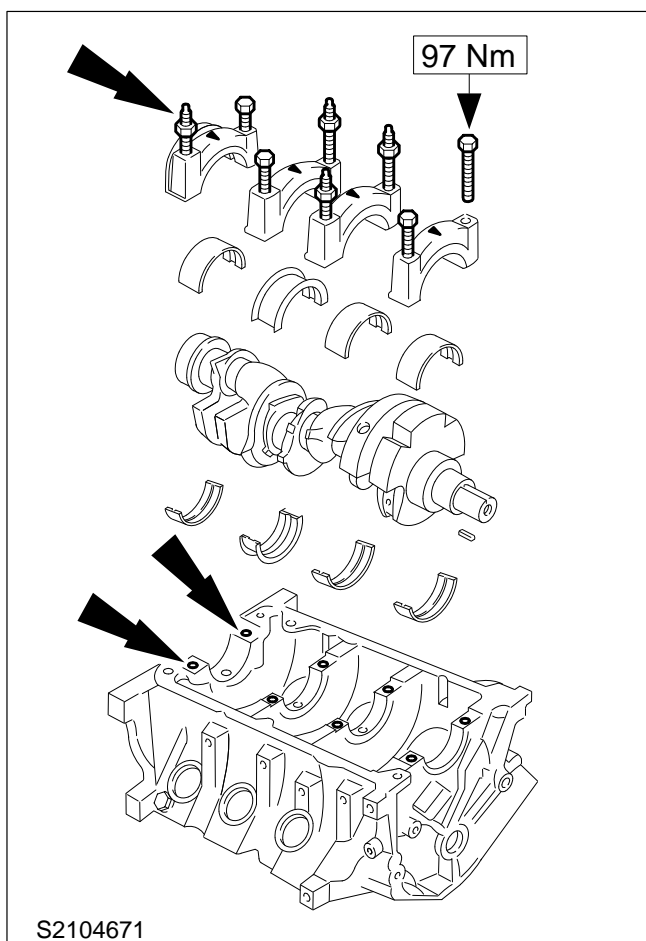


#### 47. Fit the crankshaft.

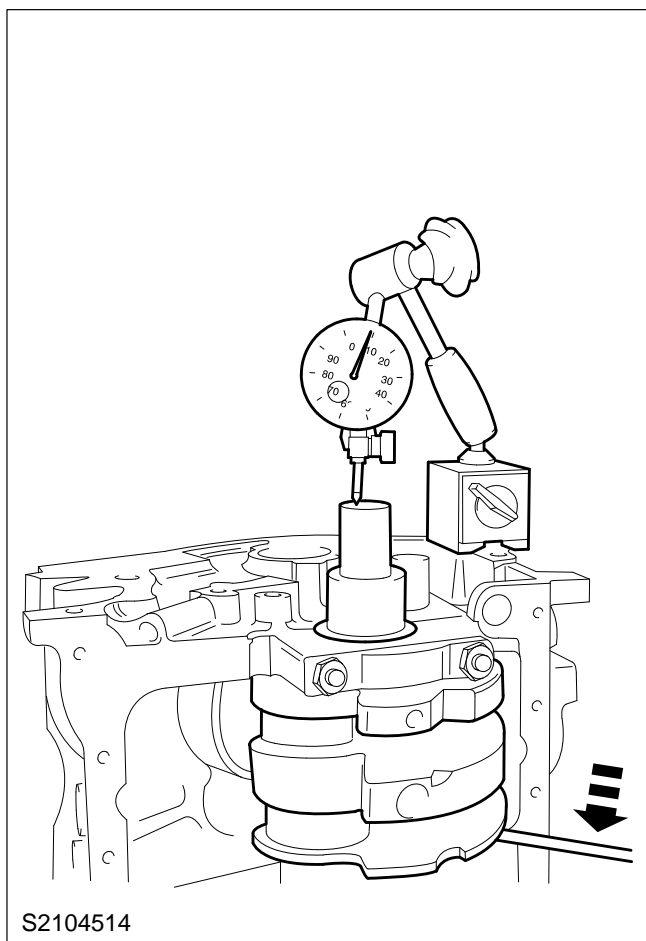
- Coat all main bearing journals, all bearing shells, the threads of all bolts and all bolt contact faces with oil.
- Arrange the bearing shells and fit the crankshaft.
- Thinly coat the seat of the rear main bearing cap with sealer (Loctite 518, ESKM-4G-269-A).
- Fit the main bearing caps with the associated bearing shells.

**NOTE:** The arrows point to the timing chain end. The numbering starts at the timing chain end.

- Tighten the bolts.

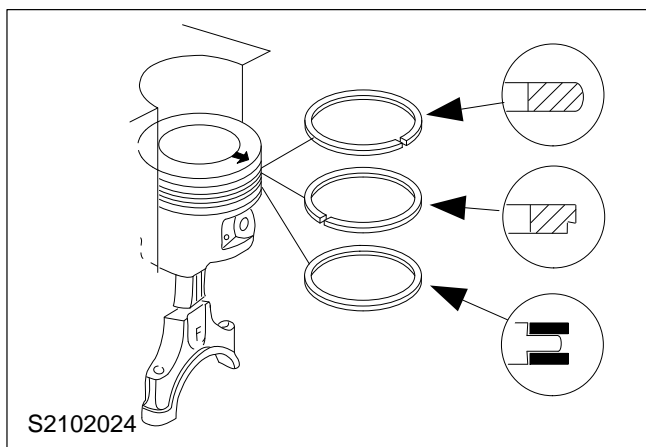






#### 48. Check the crankshaft end float.

- Set up a dial indicator.
- Measure the end float by lifting the crankshaft with the aid of a screwdriver.
- Correct the end float as necessary by fitting new flanged bearing shells.

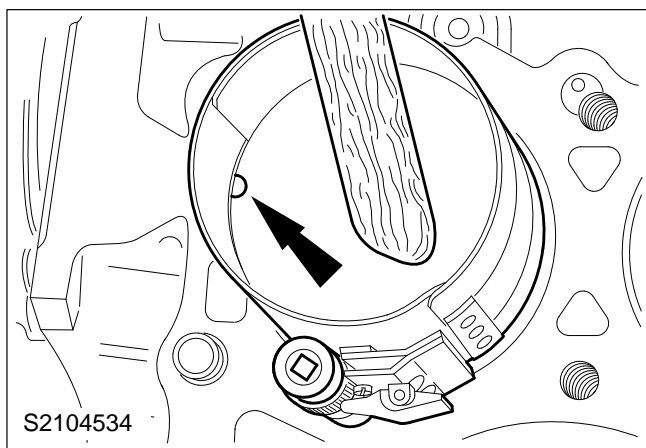


#### 49. Fit the pistons with the connecting rods.

**⚠ CAUTION:** The upper piston rings are coated with molybdenum. This coating must not be damaged.

**NOTE:** The tapered face ring must be fitted so that the "TOP" mark faces the piston crown.

- Fit the piston rings on to the pistons using proprietary piston ring pliers.
- Lubricate the piston and cylinder bore with engine oil.
- Distribute the ring gaps evenly around the circumference (see Technical Data).

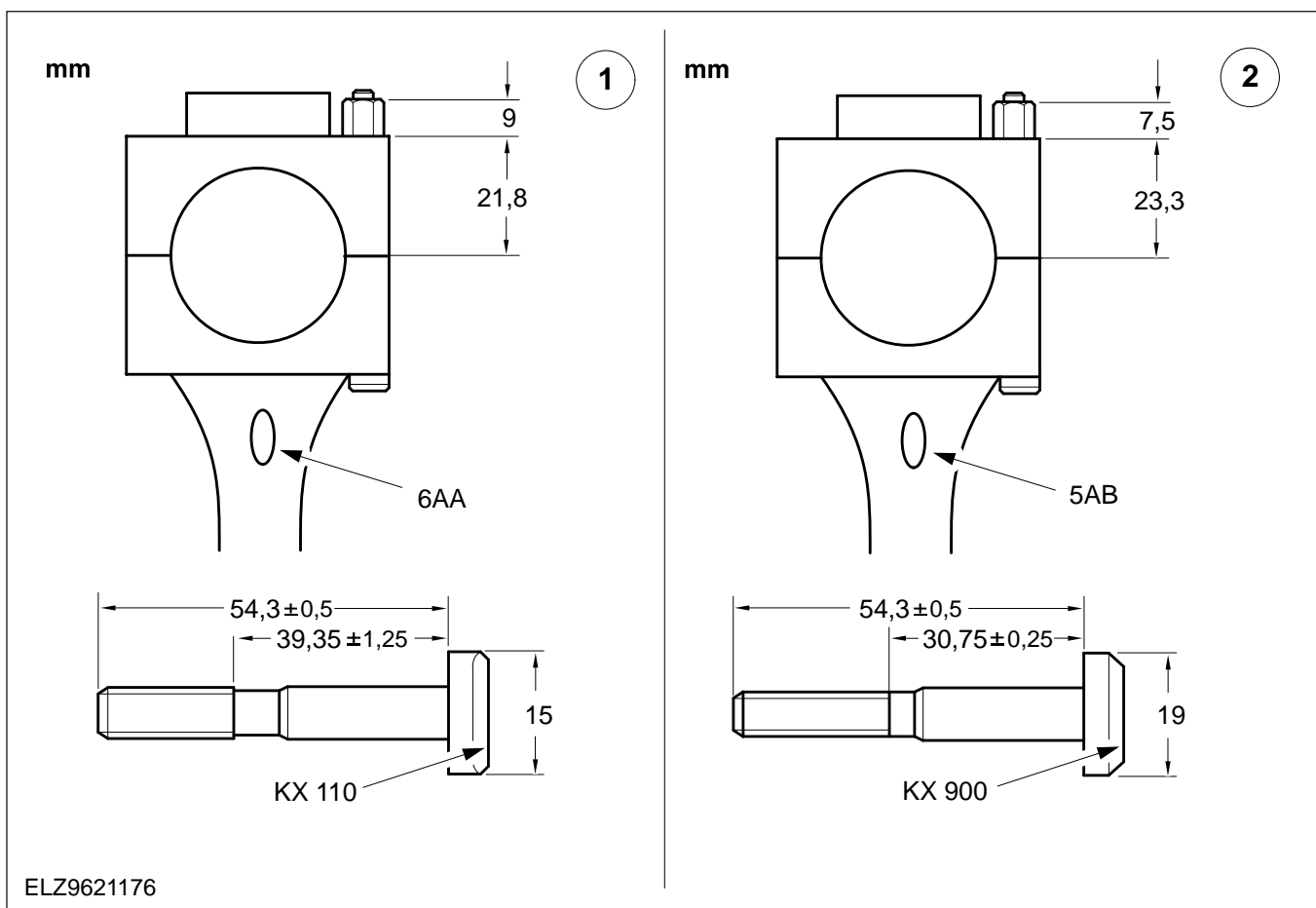


### 50. Fit the pistons with the connecting rods (continued).

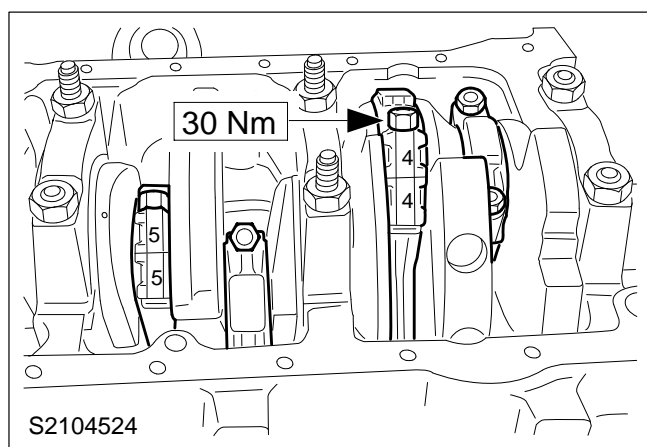
- Compress the piston rings with a proprietary piston ring compressor.

**NOTE:** The front mark on the piston (arrow) must point in the direction of travel. The numbering on the connecting rods starts at the timing chain end.

- Fit the pistons. The associated big-end bearing journal must be at BDC.
- Place the appropriate bearing shells in the connecting rod and bearing cap.
- Fit the bearing caps.



### 51. Identification of the big-end bearing bolts and connecting rods used.



Only engines with connecting rods and big-end bearing journals with the respective identification codes 6AA and KX110.

### 52. Measure the big-end bearing clearance.

- Measure the big-end bearing clearance as described in sub-operations 44. to 46.
- Renew the bearing shell(s) as necessary.

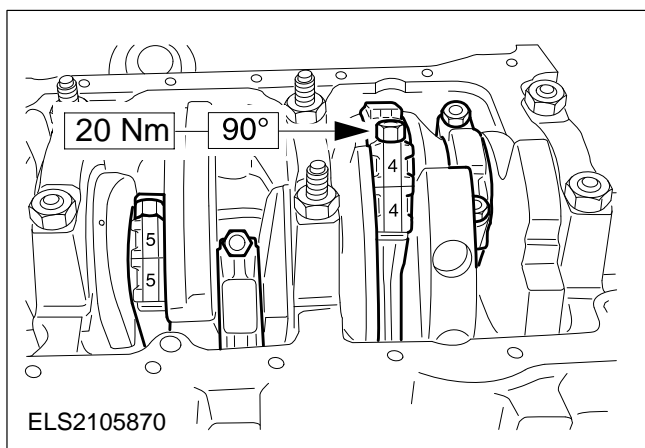
**NOTE:** Check whether the connection rods have the specified end float.

### 53. Fit the big-end bearing caps.

- Lubricate the bearing shells, bearing journals, threads and contact faces of the connecting rod nuts with engine oil.

**NOTE:** The connecting rods and their bearing caps have the same numbers.

- Fit the big-end bearing caps with the bearing shells and tighten them.



Only engines with connecting rods and big-end bearing journals with the respective identification codes 5AB and KX900.

**NOTE:** Use the old bolts to measure the bearing clearance.

#### 54. Measure the big-end bearing clearance.

- Measure the big-end bearing clearance as described in sub-operations 44. to 46.
- Renew the bearing shell(s) as necessary.

**NOTE:** Check whether the connection rods have the specified end float.

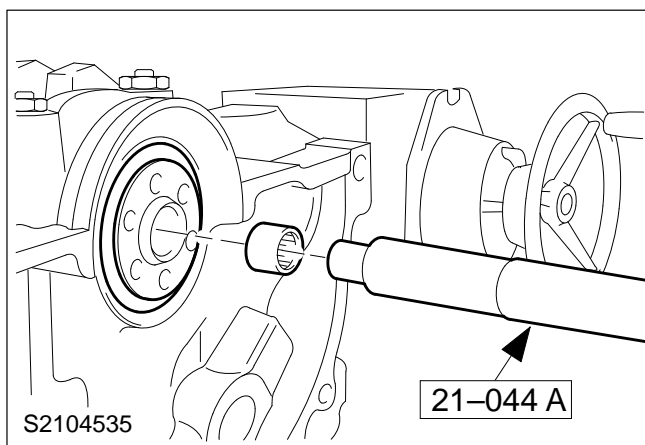
**NOTE:** Use new bolts.

#### 55. Fit the big-end bearing caps.

- Lubricate the bearing shells, bearing journals, threads and contact faces of the connecting rod nuts with engine oil.

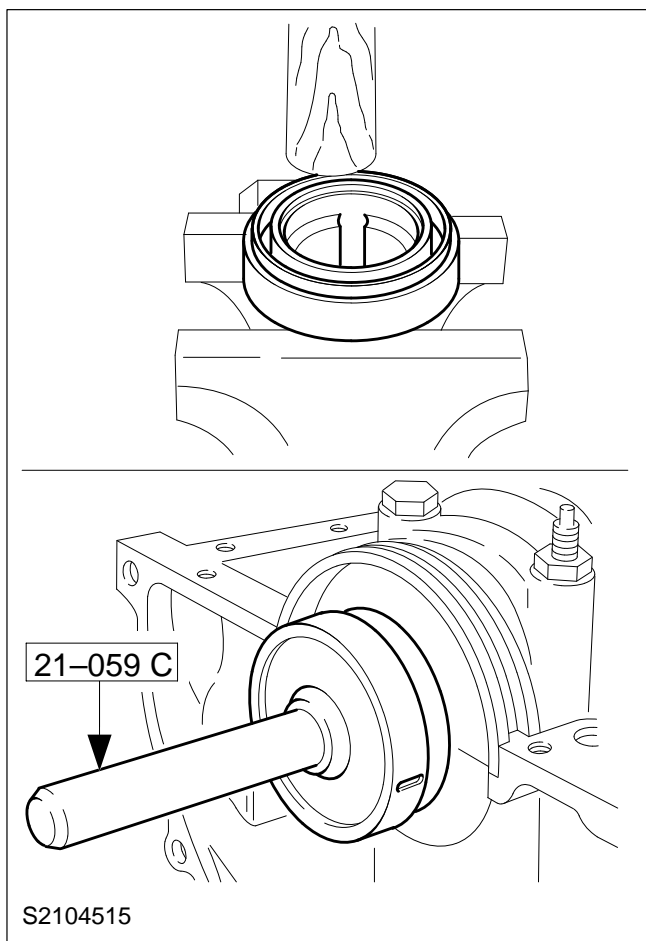
**NOTE:** The connecting rods and their bearing caps have the same numbers.

- Fit the big-end bearing caps with the bearing shells and tighten them.



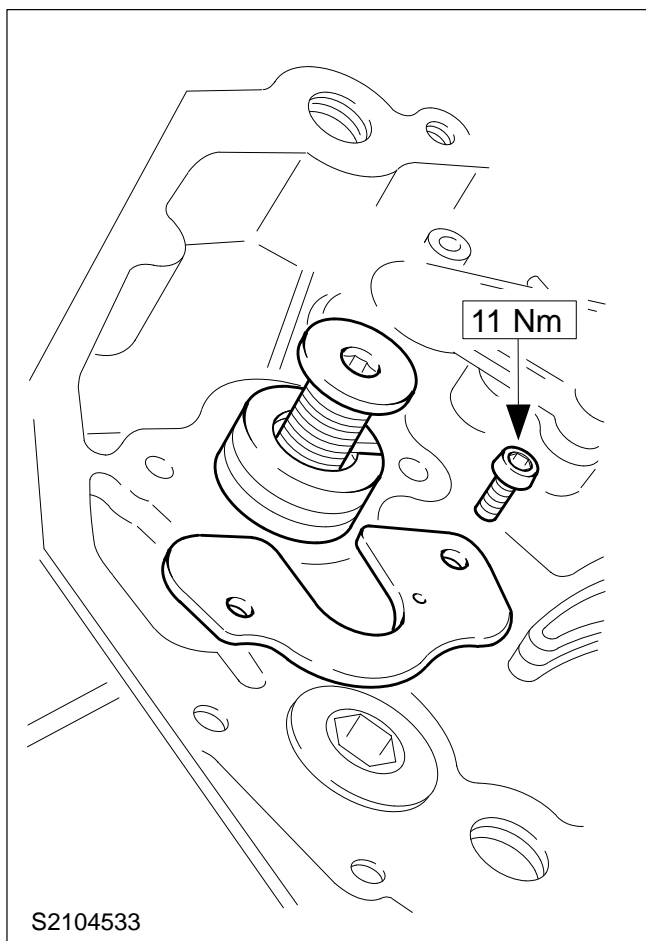
**NOTE:** The oil seal points outwards.

#### 56. Install the crankshaft pilot bearing.



### 57. Fit the crankshaft rear oil seal.

- Lubricate the crankshaft running face and oil seal lip with oil.
- Support the special tool in a vice.
- Insert the oil seal with the open side upwards and drive it in carefully as far as it will go using the handle of a hammer.
- Fit the special tool with the oil seal to the engine.
- Drive in the oil seal evenly as far as it will go.
- Swivel the engine.

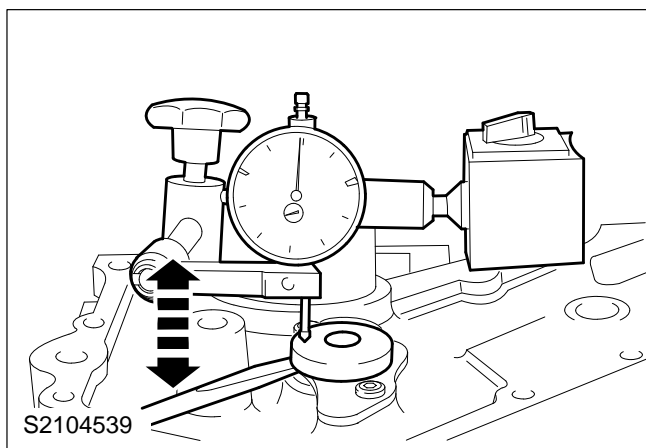


### 58. Install the camshaft.

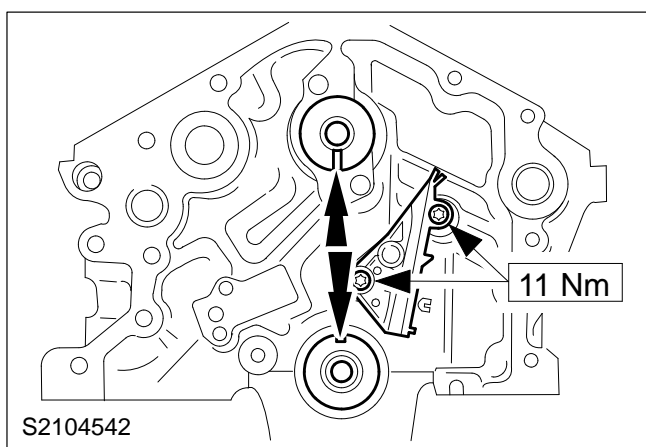
- Lubricate the camshaft bearings, the camshaft and the thrust plate with oil.
- Screw in the sprocket bolt half way and fit the camshaft.

**NOTE:** The oil bore in the thrust plate must be at the bottom.

- Fit the thrust plate.
- Take out the sprocket bolt.



**59. Check the camshaft end float.**

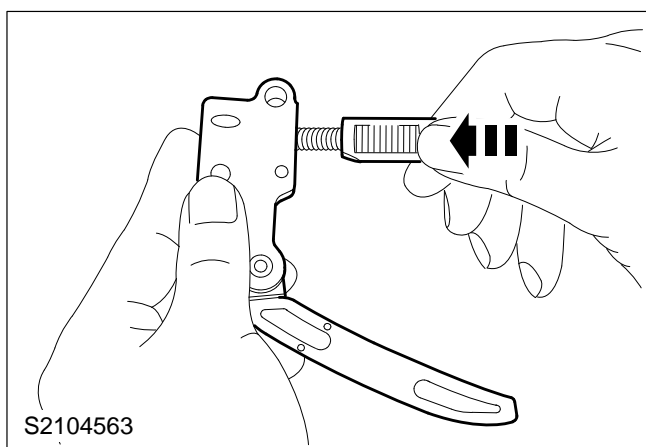


Install the chain drive.

**60. Attach the chain guide.**

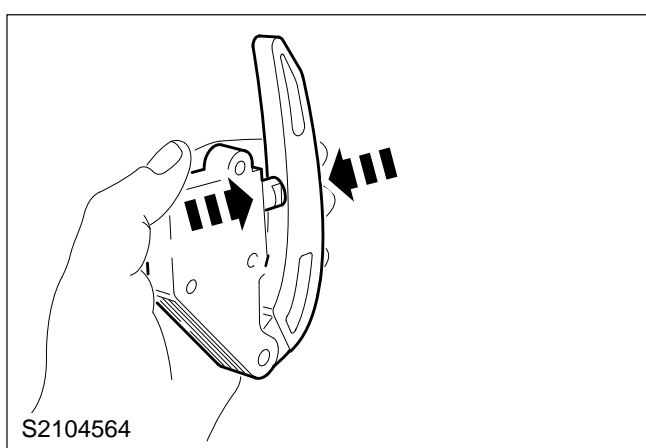
**61. Align the camshaft and crankshaft in relation to one another.**

The recesses on both crankshaft journals must be opposite one another.



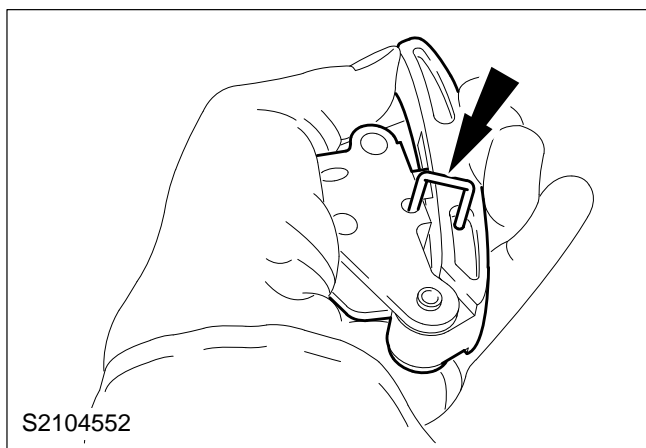
**62. Preload the chain tensioner.**

Press the spring and the oil-filled plunger into the chain tensioner and fit the oil-filled plunger in the sliding block.



**63. Preload the chain tensioner (continued).**

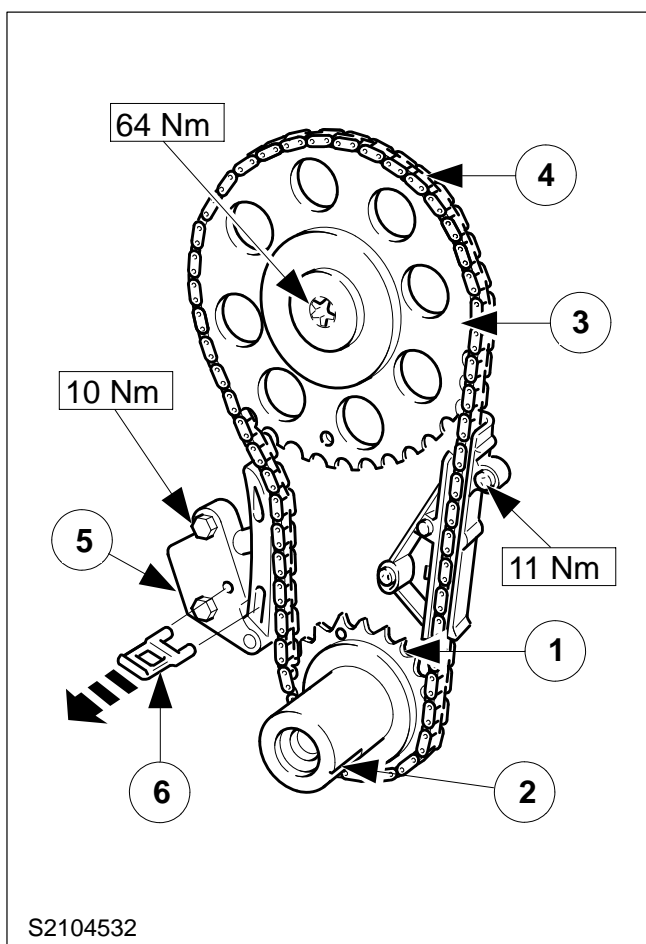
Press the oil-filled plunger and sliding block right into the chain tensioner and hold it in this position.



**NOTE:** A locking clip is supplied with new chain tensioners. If necessary, fabricate a locking clip from welding rod.

#### 64. Preload the chain tensioner (continued).

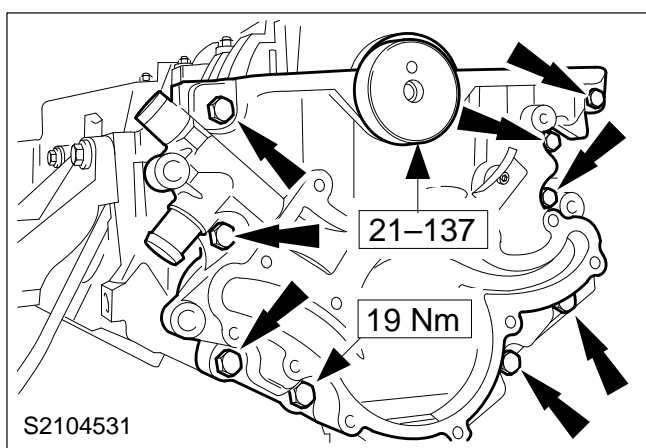
Immobilise the sliding block in this position with a locking clip.



#### 65. Fit the camshaft chain drive.

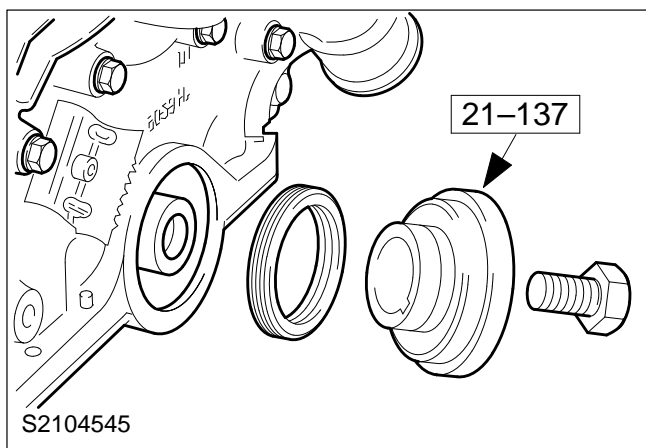
**NOTE:** The dots on the sprockets must be exactly opposite each other on the inside.

- 1 Crankshaft sprocket.
- 2 Crankshaft Woodruff key.
- 3 Camshaft sprocket.
- 4 Timing chain.
- 5 Chain tensioner.
- 6 Remove the locking clip after tensioner has been fitted.



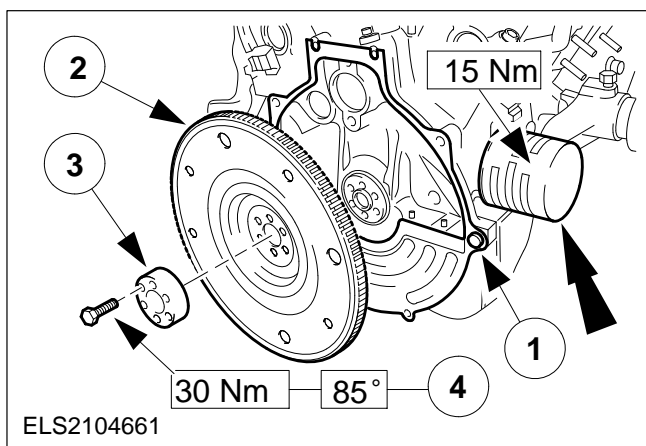
#### 66. Fit the timing cover.

- Fit the timing cover with a gasket and screw the bolts in fingertight.
- Centre the timing cover using the special tool and align it to the sump mating face.
- Tighten the nine bolts.
- Remove the special tool.



### 67. Fit the new crankshaft front oil seal.

- Lubricate the oil seal lip and the crankshaft with oil.
- Insert the oil seal lip as far as it will go.
- Remove the bolt and the special tool.



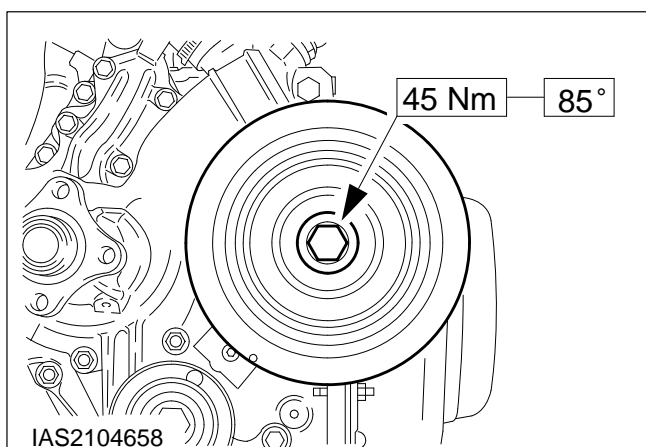
### 68. Fit the adaptor plate in place and attach the flywheel.

**⚠ CAUTION:** Use new bolts.

- Immobilise the crankshaft in the cylinder block.
- 1 Place the adaptor plate on the guide sleeves.
  - 2 Flywheel.
  - 3 Pressure plate.
  - 4 Bolts.

### 69. Attach the oil filter.

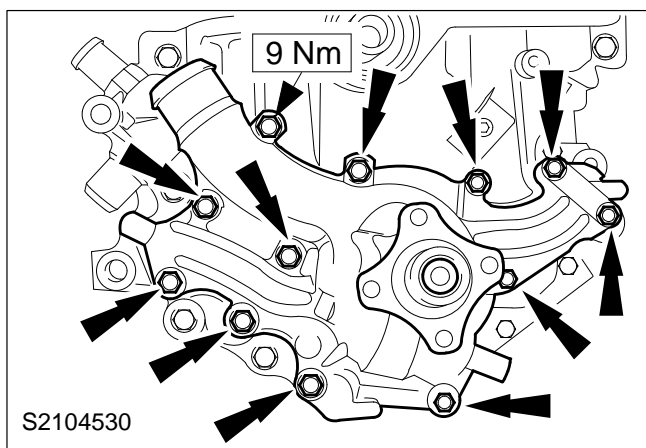
Lubricate the oil seal with clean engine oil.



### 70. Fit the belt pulley with the vibration damper.

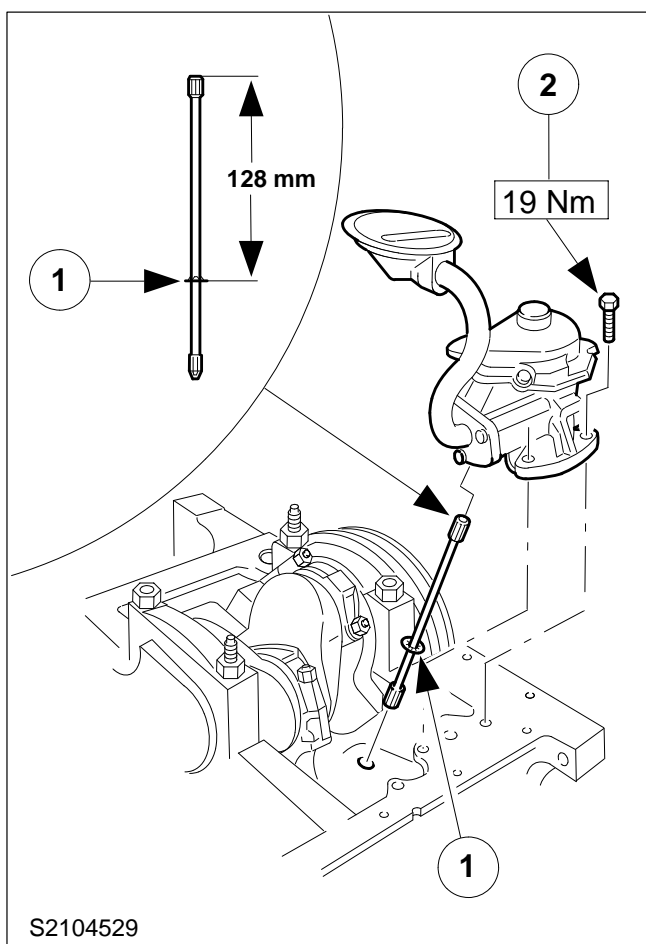
- Immobilise the flywheel.
- Lubricate the belt pulley bore with oil.
- Fit the belt pulley with the bolt by means of the Woodruff key on the crankshaft.
- Loosen the bolt, apply sealer (SPM-2G-3121-A) and re-tighten it.





### 71. Fit the coolant pump.

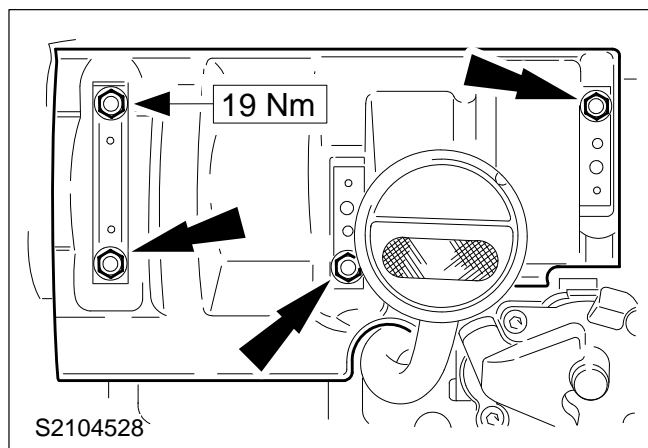
- Coat the coolant pump mating faces and the timing cover with sealer (specification ESKM-4G-269-A).
- Fit the coolant pump with an oil seal.



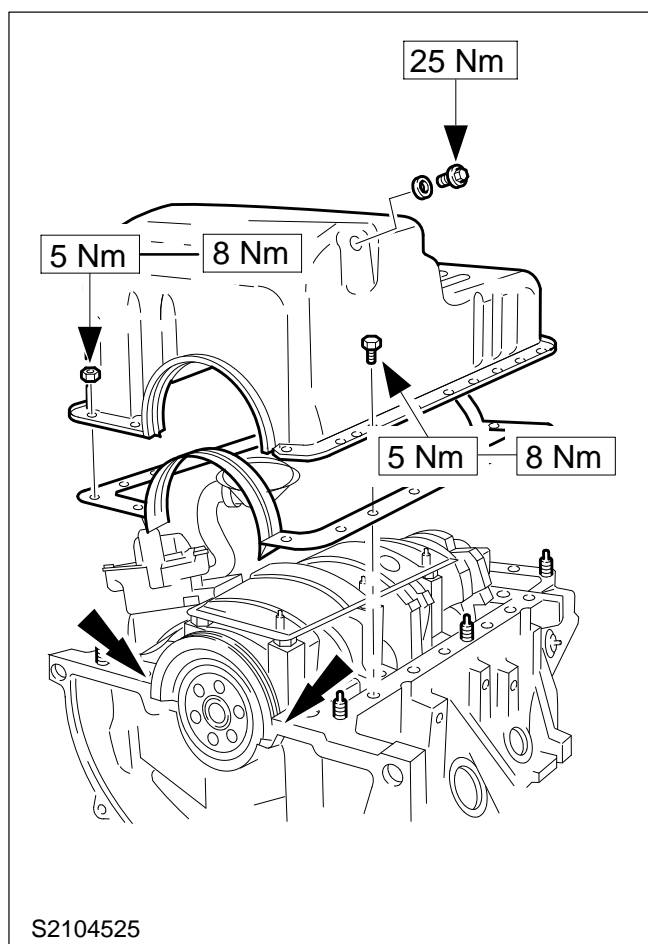
### 72. Fit the driveshaft and the oil pump with the intake pipe.

**NOTE:** The short pointed end of the shaft points towards the distributor.

- 1 Set the retaining ring in its correct position on the drive shaft and fit the shaft.
  - Fill the oil pump with oil through the intake pipe and turn it by hand.
- 2 Fit the oil pump.



### 73. Fit the oil baffle.



Fit the sump.

### 74. Apply sealer (Loctite 518, ESKM-4G-269-A) as follows:

- To the gap at the cylinder block/timing cover mating face.
- To the groove in the rear main bearing cap.

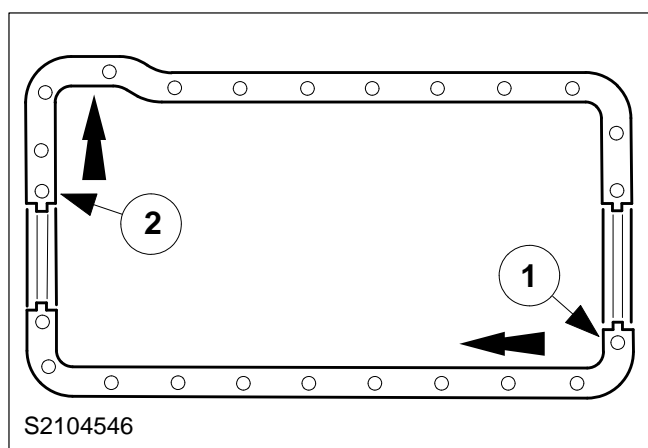
### 75. Fit the sump with a new one-piece gasket.

- Fit the gasket over the studs on the cylinder block.

**NOTE:** The knobs on the sump must engage in the corresponding holes in the gasket.

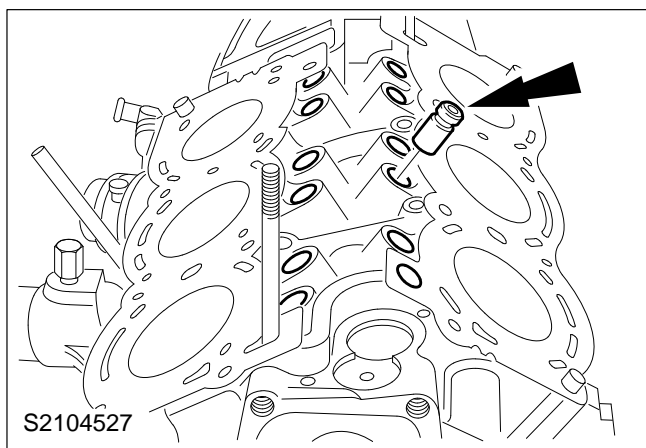
- Fit the sump and screw on the nuts.
- Tighten the nuts and bolts in two stages.

### 76. Fit the oil drain plug using a new seal.



### 77. Tighten the sump nuts and bolts.

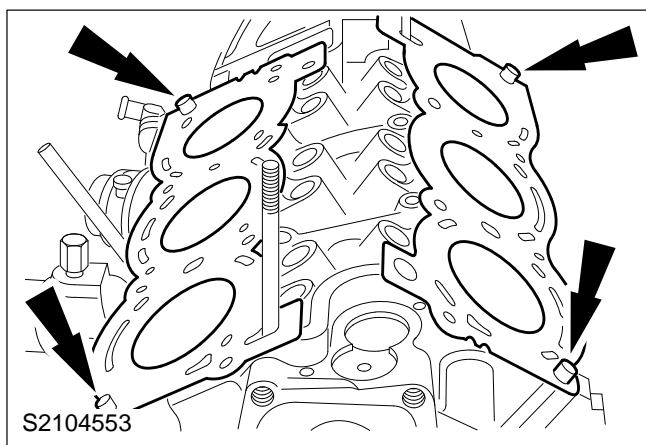
- 1 Start – stage 1.
- 2 Start – stage 2.



**NOTE:** Fit the hydraulic tappets in the correct sequence.

**NOTE:** Hydraulic tappets that are new or contain no oil should be pumped up manually in oil before installation until they cannot be compressed any more.

**78. Fit the hydraulic tappets.**



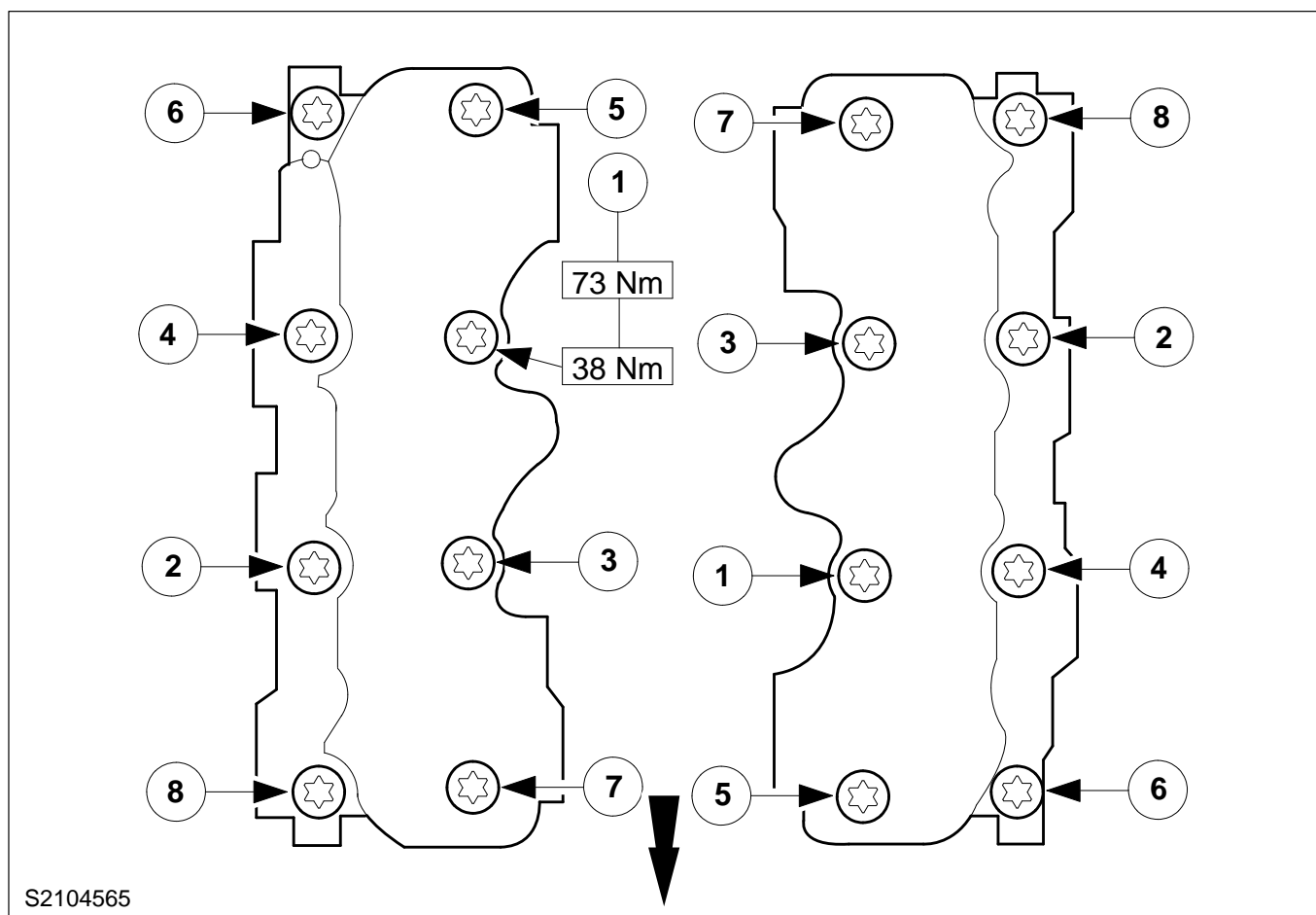
**Install the cylinder heads**

**79. Fit new cylinder head gaskets.**

- The cylinder block and cylinder head mating faces must be dry and clean.
- The gaskets are marked "TOP FRONT" and are guided into place with the locating sleeves.
- The left and right-hand gaskets are different.

**80. Fit the cylinder heads.**

The cylinder heads are guided into locating sleeves.



**⚠ CAUTION:** Use new bolts.

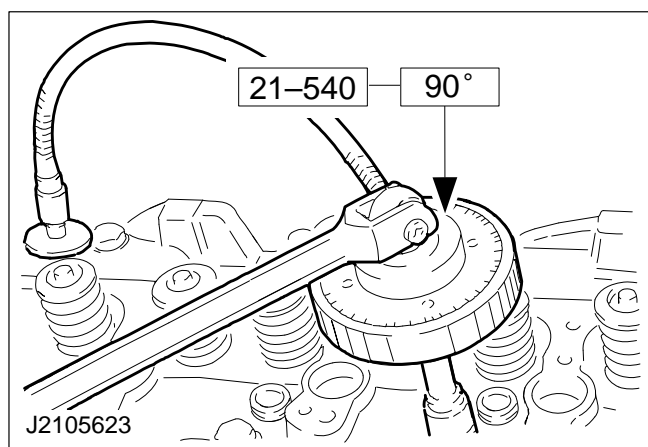
### 81. Pre-tighten the cylinder head bolts.

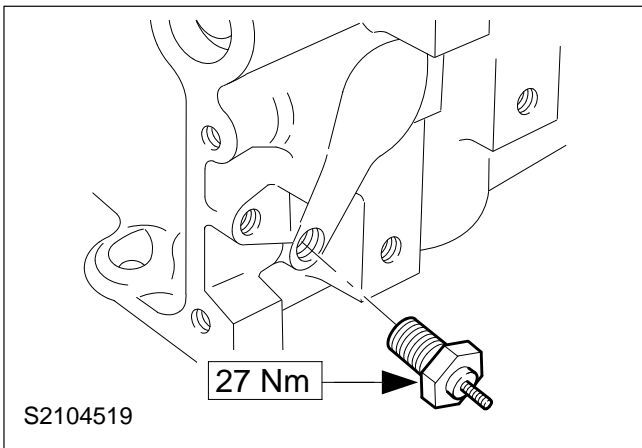
- Oil the heads and the threads of the cylinder head bolts and screw them in.
- Pre-tighten the cylinder head bolts in two stages and in the indicated sequence.

**⚠ CAUTION:** The cylinder head bolts must not be retorqued.

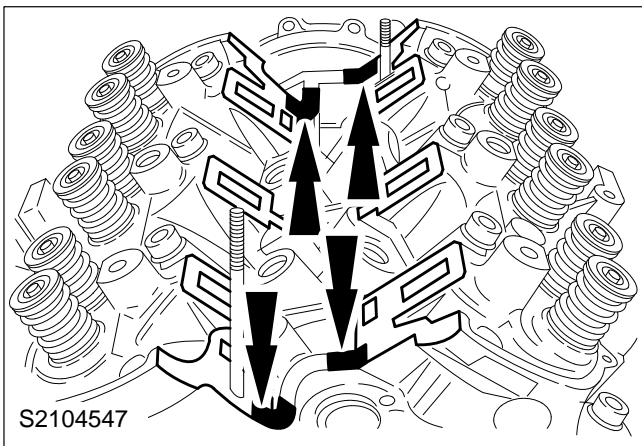
### 82. Tighten the cylinder head bolts.

Wait five minutes after the second stage and then tighten the bolts a further 90°.





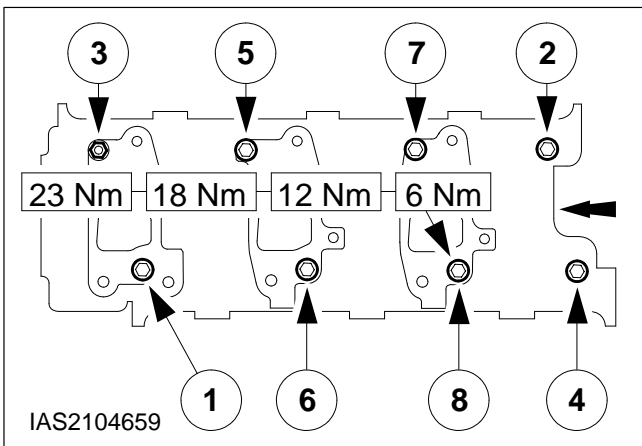
### 83. Fit the oil pressure switch.



### Install the inlet manifold.

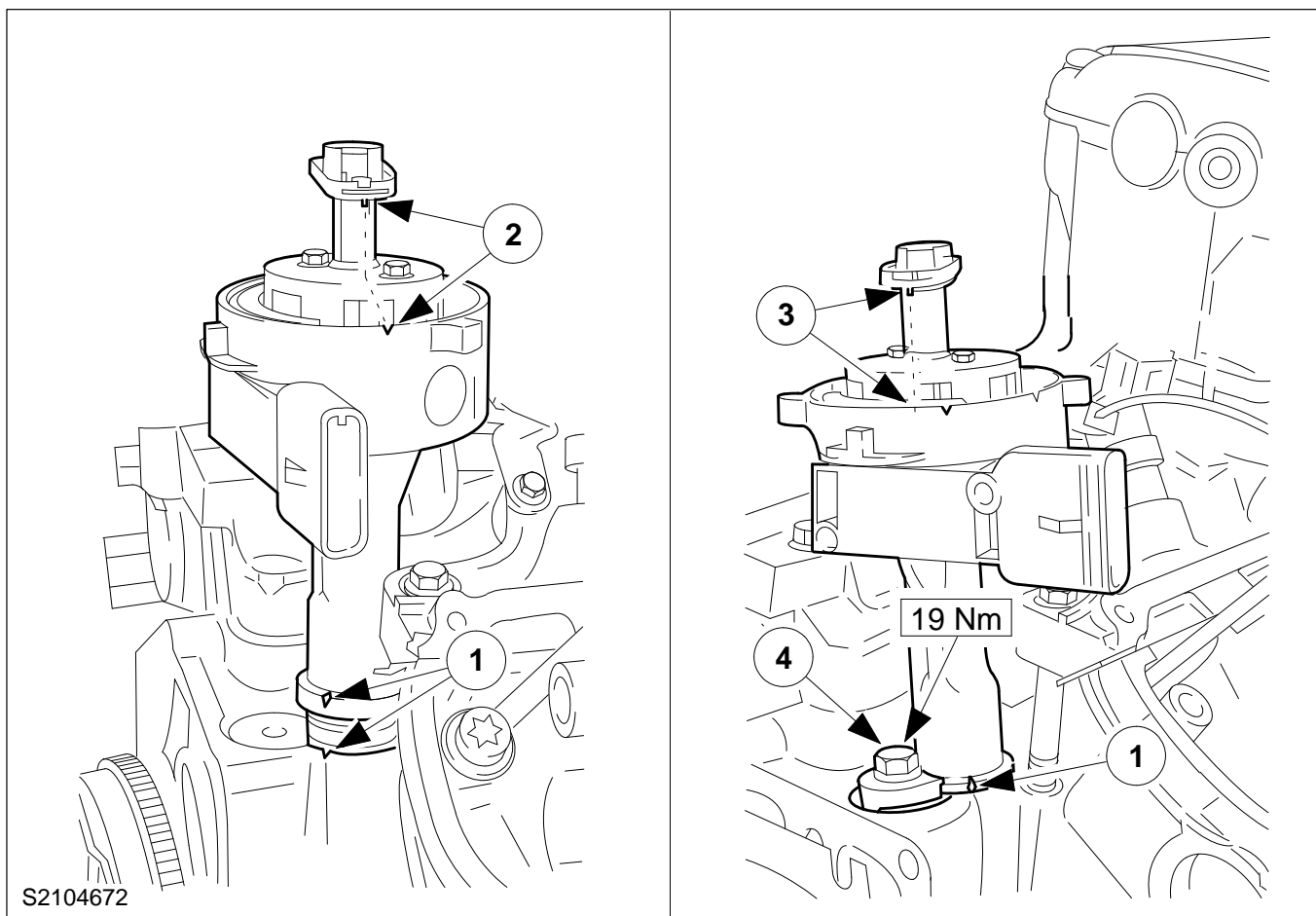
#### 84. Fit the gasket.

- Apply sealer (Wellseal, SPM-4G-9112-H) to the contact faces of the cylinder block and cylinder heads and the inlet manifold flange.
- Fit the gasket.
- Apply sealer (SPM-4G-9112-H) to the four projecting areas of the inlet manifold to cylinder head gasket.



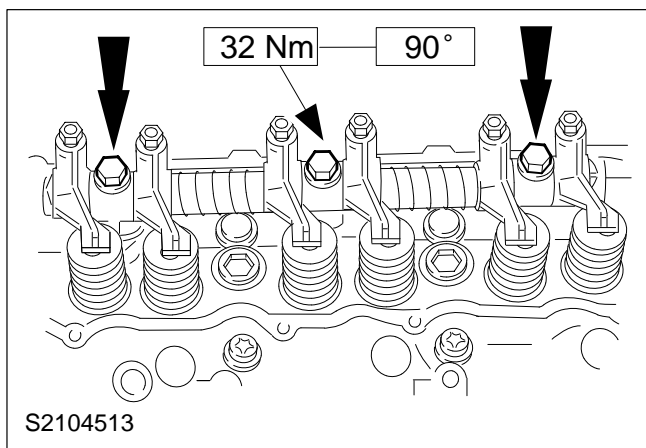
#### 85. Fit the inlet manifold (seven bolts, one nut).

Tighten the inlet manifold in four stages as illustrated.



### 86. Fit the distributor.

- Set cylinder no. 1 to TDC.
- 1 Align the notches on the distributor base and the cylinder block.
  - 2 The distributor rotor points towards the notch on the edge of the distributor.
- Press the distributor down and engage the pinion.
  - Crank the engine and bring the distributor into engagement with the oil pump drive assembly.
- 3 Position of the distributor rotor (cylinder no. 1 in TDC position) with the distributor installed.
  - 4 Secure the distributor with the retaining plate (one bolt).

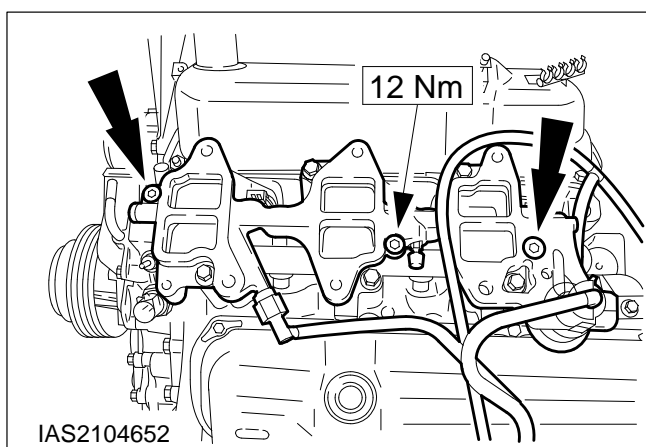


### 87. Fit the rocker shafts.

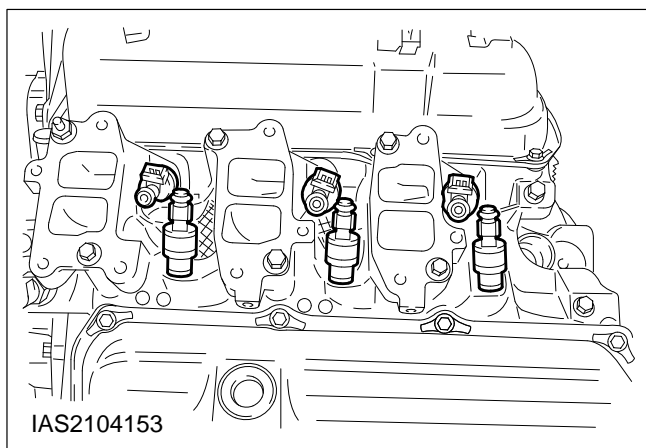
- Lubricate the push rods with oil and fit them.

**⚠ CAUTION:** Do not under any circumstances adjust the rocker arms.

- Fit the rocker shafts in their correct positions and screw in the bolts.
- Tighten the bolts.

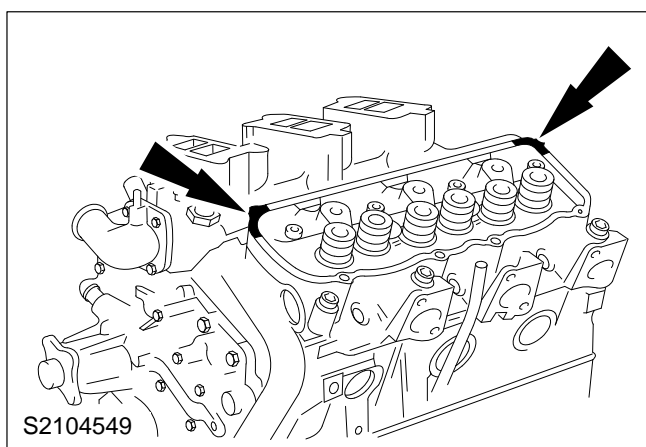


### 88. Fit the fuel rail (four bolts).



**NOTE:** Use new rubber seals at the injectors.

### 89. Fit the injectors.

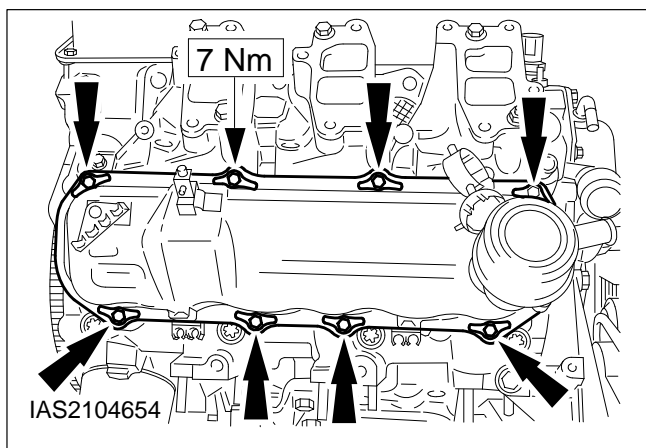


### Attach the cylinder head covers

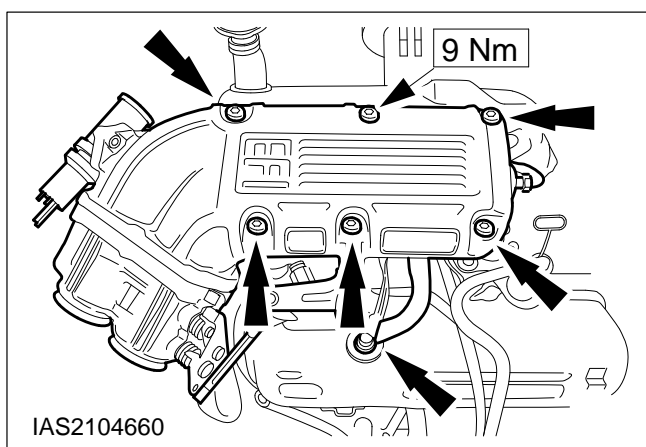
**NOTE:** Stick the gaskets in place with the adhesive-coated side facing the cylinder head cover.

### 90. Coat the contact faces of the cylinder head cover flange with sealer (SPM-2G-3121-A).

Arrange the gaskets in position.

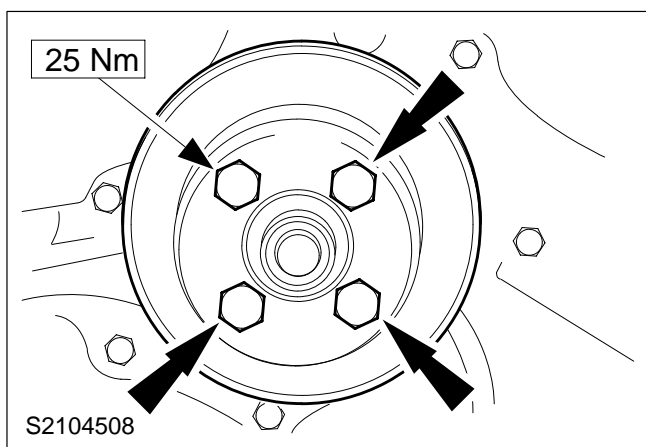


**91. Fit the cylinder head covers (eight bolts and washers each).**

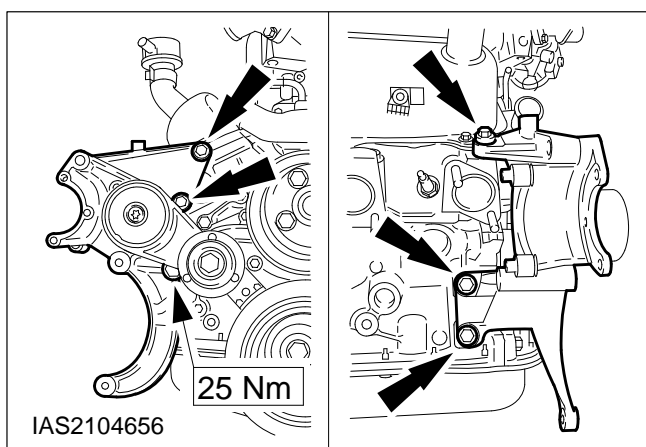


**92. Fit the inlet air plenum chamber and throttle housing.**

Insert the positive crankcase ventilation (PCV) hose into the left-hand cylinder head cover.

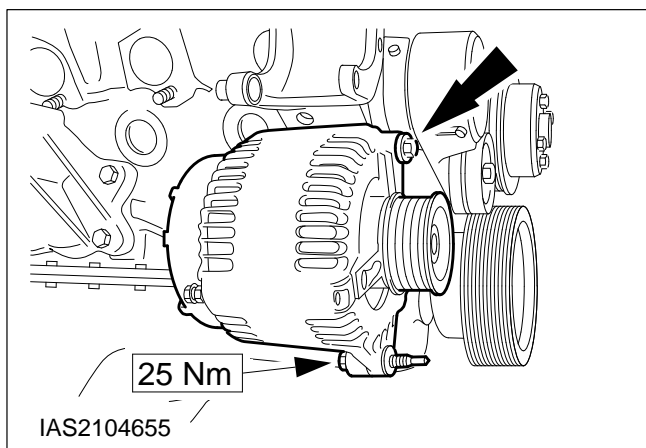


**93. Attach the belt pulley to the coolant pump.**

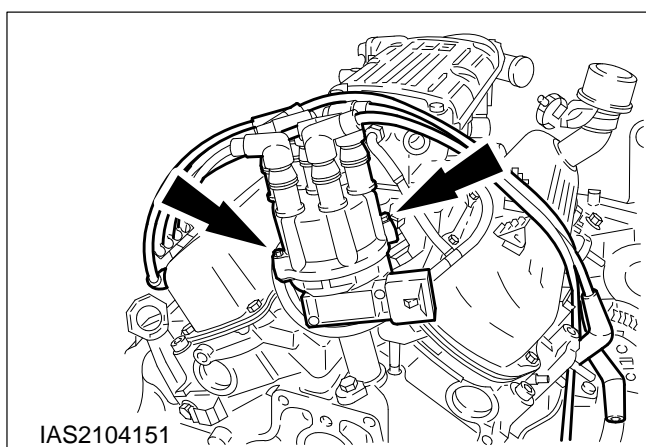


**94. Fit the alternator bracket.**





**95. Fit the alternator.**

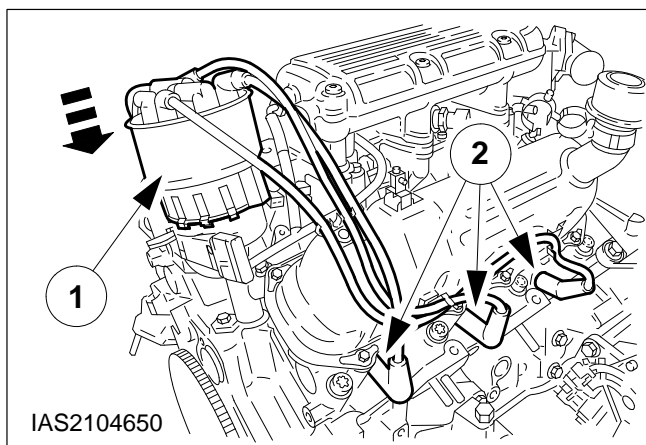


**NOTE:** Apply lubricant (Never Seez, ESE-M1244-A) to the spark plug threads.

**96. Fit the spark plugs.**

Torque: 32 Nm

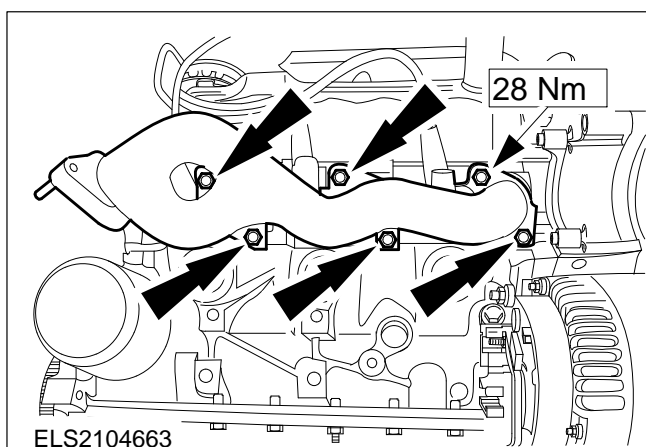
**97. Fit the distributor cap and HT leads.**



**98. Fit the distributor arc shield.**

1 Push the arc shield on and ensure that it engages correctly.

2 Join the spark plug connectors.

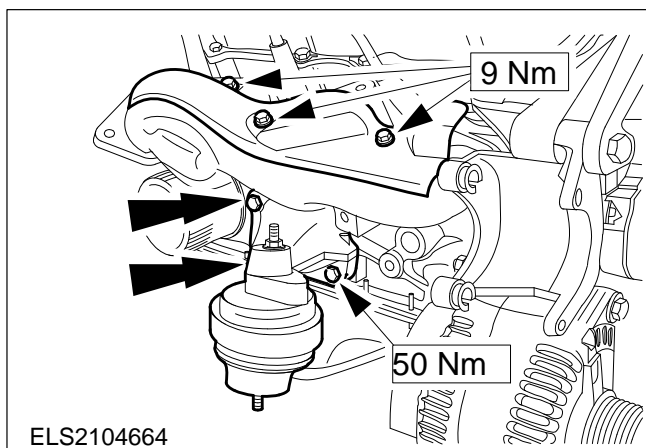


**NOTE:** Use new gaskets.

**99. Top up the engine oil and insert the dipstick.**

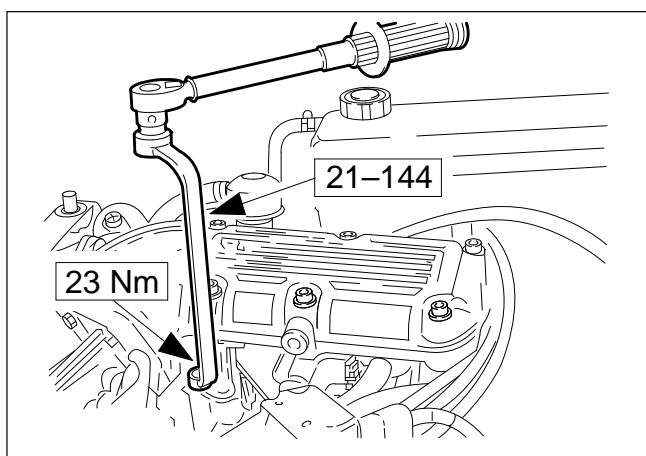
**100. Remove the engine from the assembly stand.**

**101. Fit the right-hand exhaust manifold.**



**102. Fit the heat shield to the right-hand exhaust manifold.**

**103. Fit the bracket with the engine mounting bracket on the cylinder block (four bolts).**



**NOTE:** Bolt-tightening sequence.

**104. Retorque the inlet manifold bolts.**

- Install the engine and let it run to operating temperature.
- Retorque the bolts.
- Retorque the nuts using Special Tool 21-092 A.

