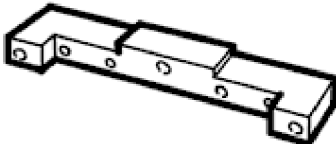


1997 XK RANGE - Engine - 303-01

Cylinder Head LH 12.29.02

Special Service tools



E36401

Camshaft setting
303-530



E36402

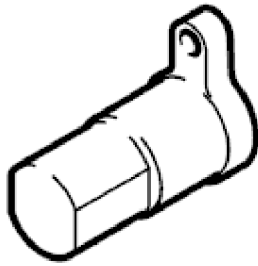
Timing chain tensioning
303-532



E36407

Wedges, primary chain
303-533

1997 XK RANGE - Engine - 303-01

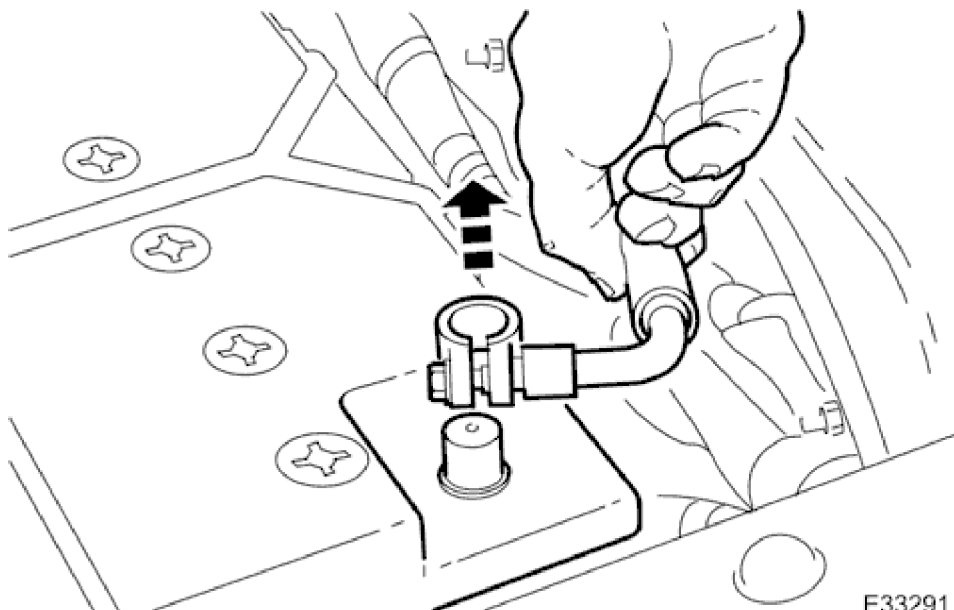


E36408

Crankshaft setting
303-531

Removal

1. Open the engine compartment and fit paintwork protection sheets.
2. Set the engine compartment cover to the service access position.

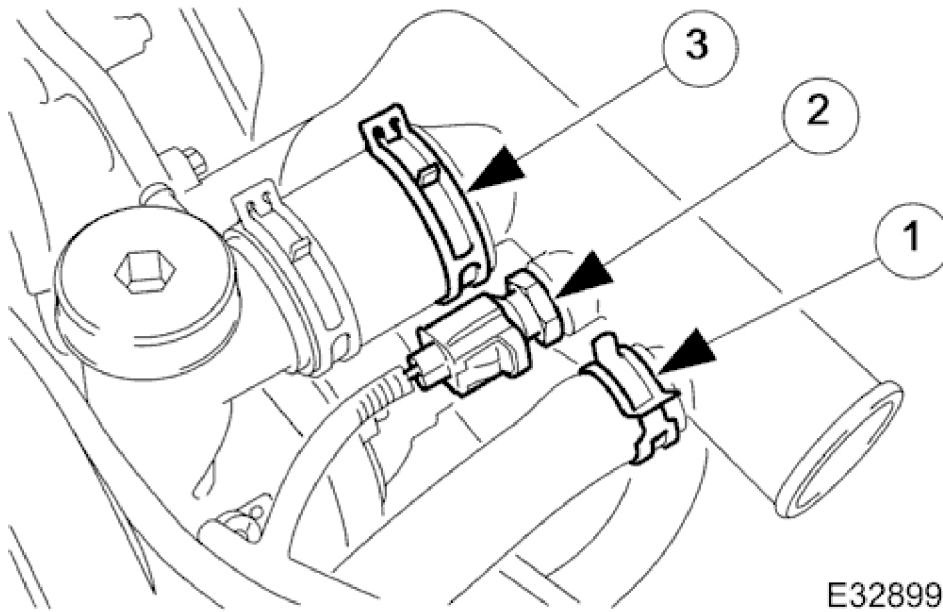


3. Disconnect the battery ground cable.
 - Remove the battery cover.

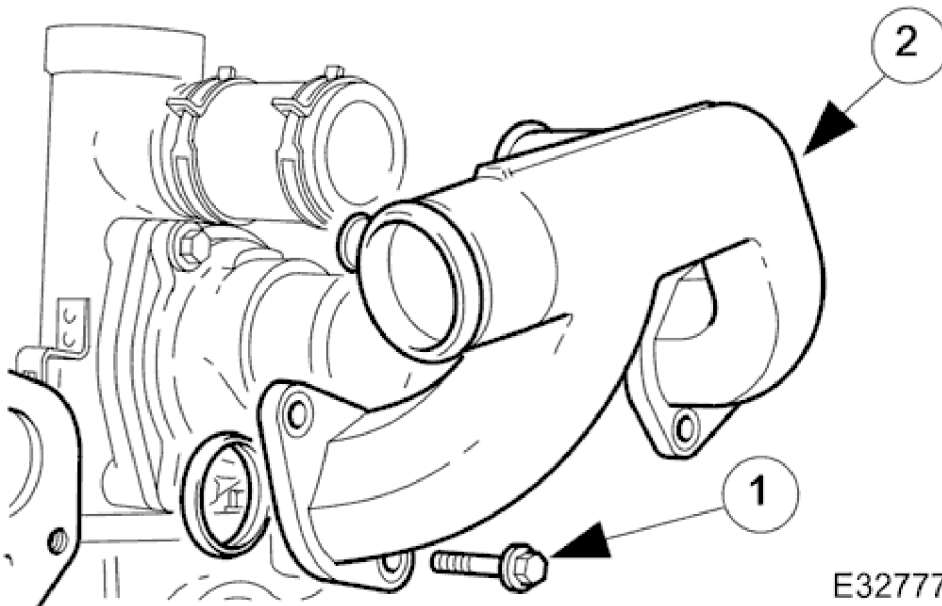
4. Remove the Timing Cover. Refer to Operation <<12.65.01>> in this Section. This operation includes draining the coolant from the radiator and removing the cam covers.

5. Remove the Inlet Manifold. Refer to Operation 30.15.01 in this Section. This operation includes depressurising the fuel system and removing the throttle housing.

1997 XK RANGE - Engine - 303-01

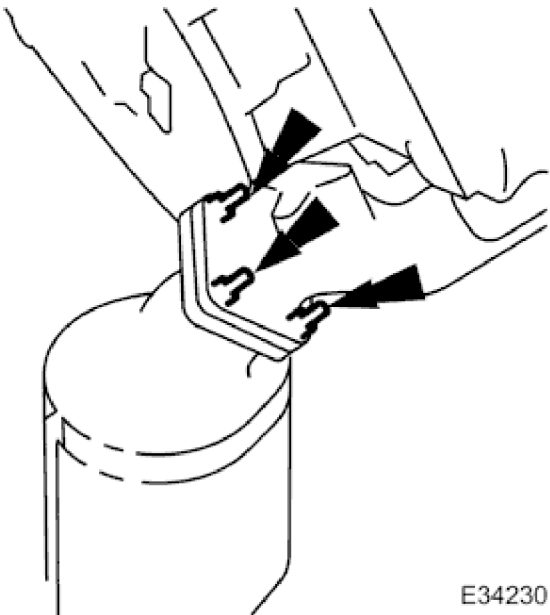


6. Disconnect the hoses and multi-plug from the coolant outlet pipe.
1. Release and reposition the hose clip, and disconnect the heater hose.
 2. Disconnect the multi-plug from the temperature sensor.
 3. Release and reposition the hose clip along the bypass hose.

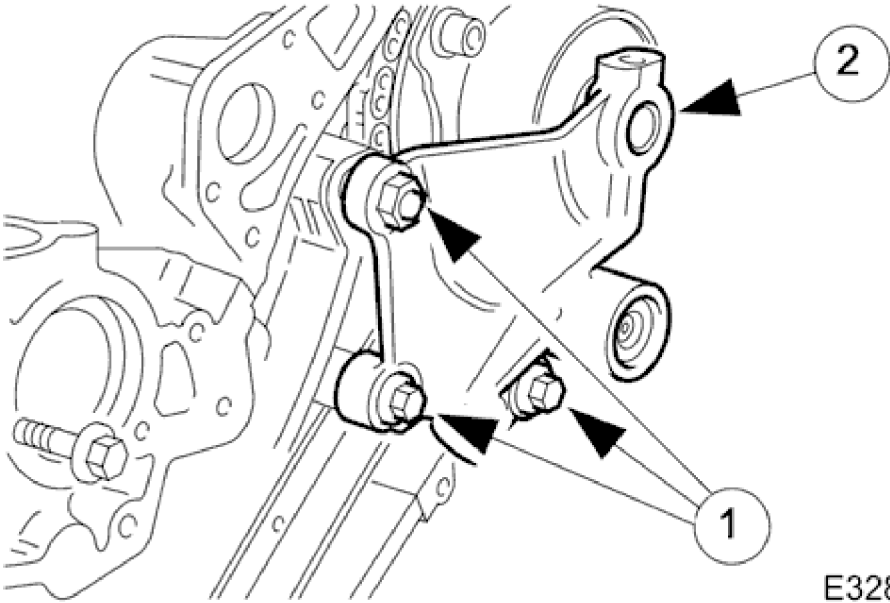


7. Remove the coolant outlet pipe.
1. Remove the four bolts which secure the outlet pipe.
 2. Remove the outlet pipe from the bypass hose and from the cylinder heads.
8. Remove and discard the sealing rings from the outlet pipe grooves.

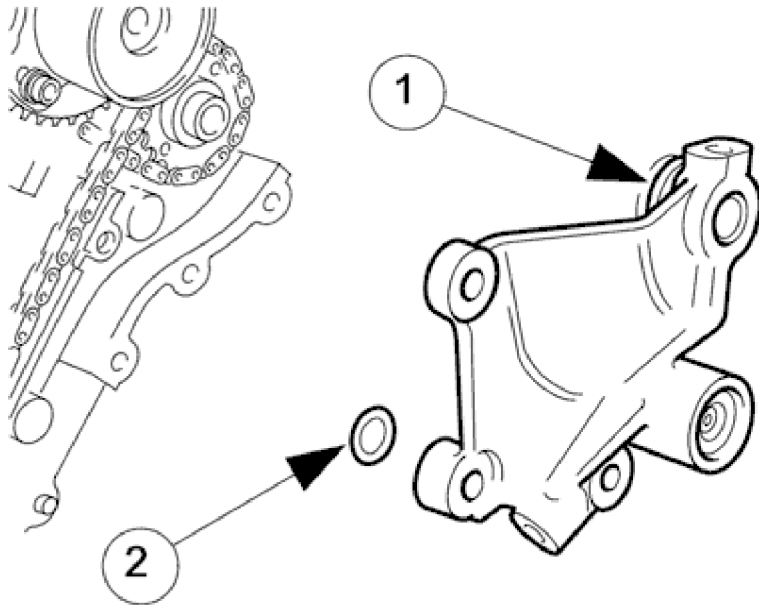
1997 XK RANGE - Engine - 303-01



9. Remove the nuts which secure the catalytic converter to the B-Bank exhaust manifold flange.



10. Remove the VVT bush carrier.
1. Remove the two bolts and one nut which secure the carrier to the cylinder block.
2. Release the carrier from the two ring dowels and remove it.

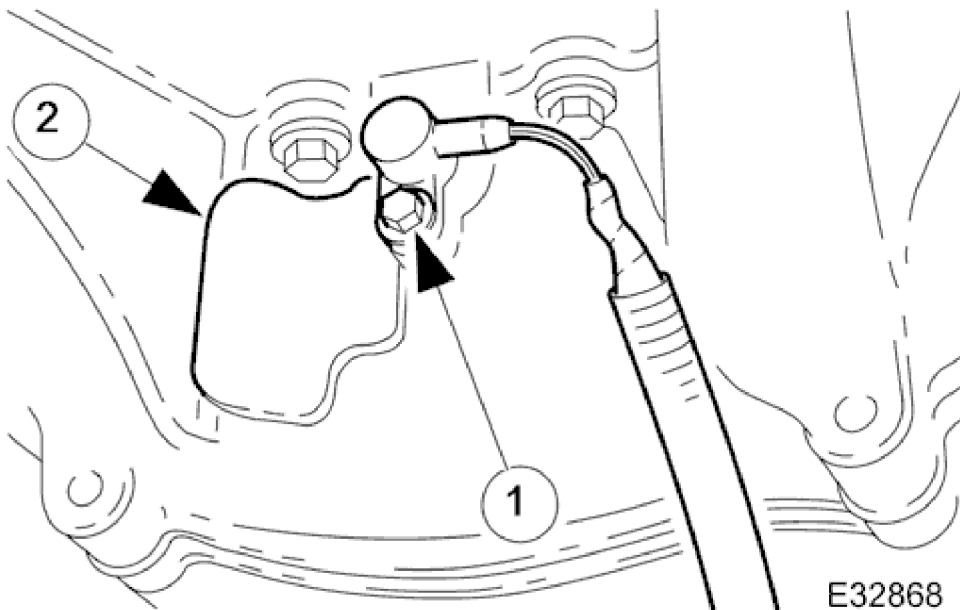


E32842

11. Remove the seals from the bush carrier.

1. Remove the sealing ring (scarf jointed) from the carrier bush groove.
2. Remove the O-ring from the carrier oil-way recess.

12. Raise the vehicle on a ramp.



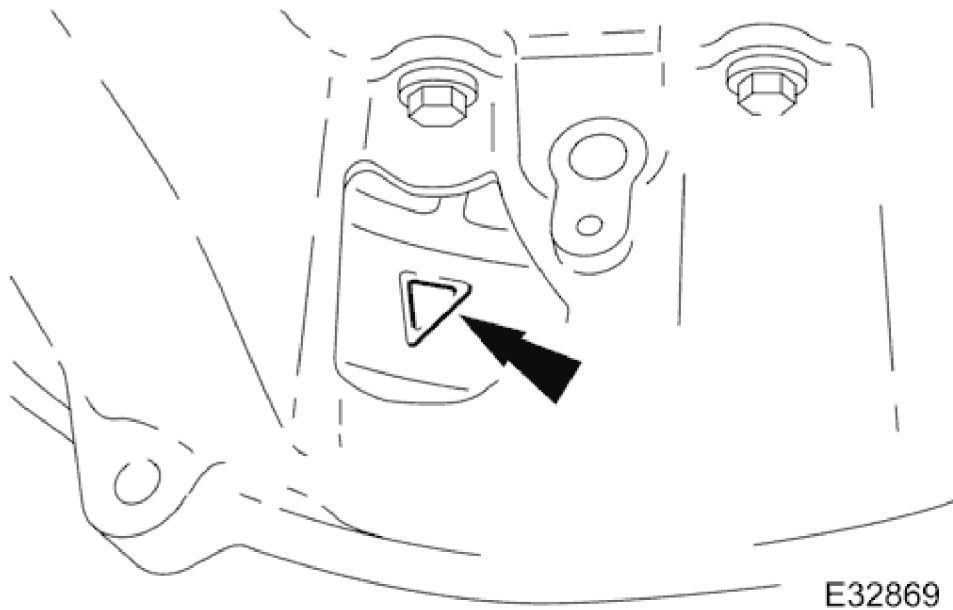
E32868

13. Remove the crankshaft position sensor.

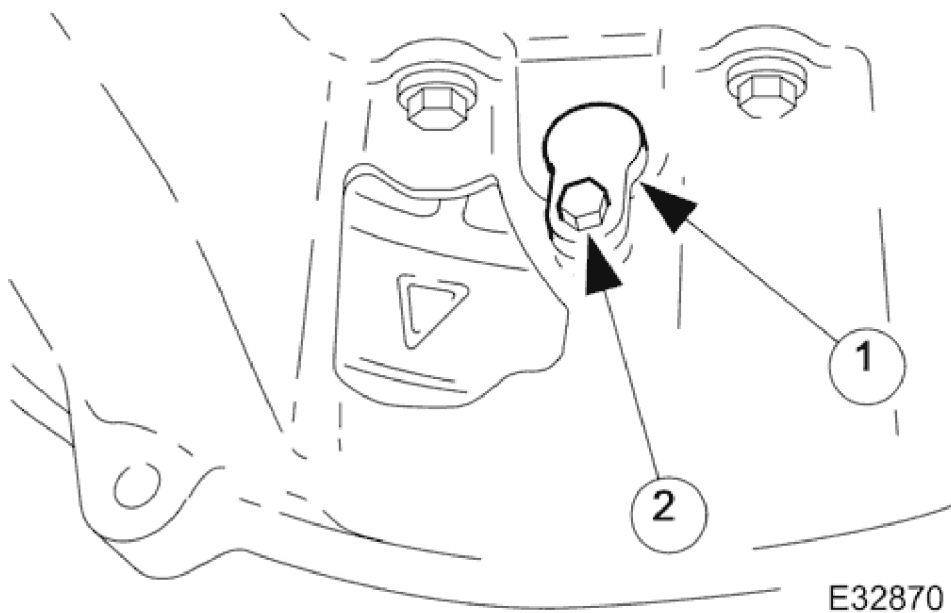
1. Remove the bolt which secures the crankshaft position sensor to the flywheel housing.
- Remove the sensor and allow it to hang free under the engine.
2. Remove the access grommet (for torque converter bolts) from the housing.

14. Fit the damper securing bolt (old one) to the crankshaft, hand-tight only.

1997 XK RANGE - Engine - 303-01



15. Rotate the crankshaft until the triangular arrow indent on the drive plate is visible through the access hole; confirm that the timing flat on each camshaft is uppermost.



16. Fit the crankshaft setting peg 303 - 531 to the crankshaft position sensor location.

1. Fit the crankshaft setting peg 303 - 531.

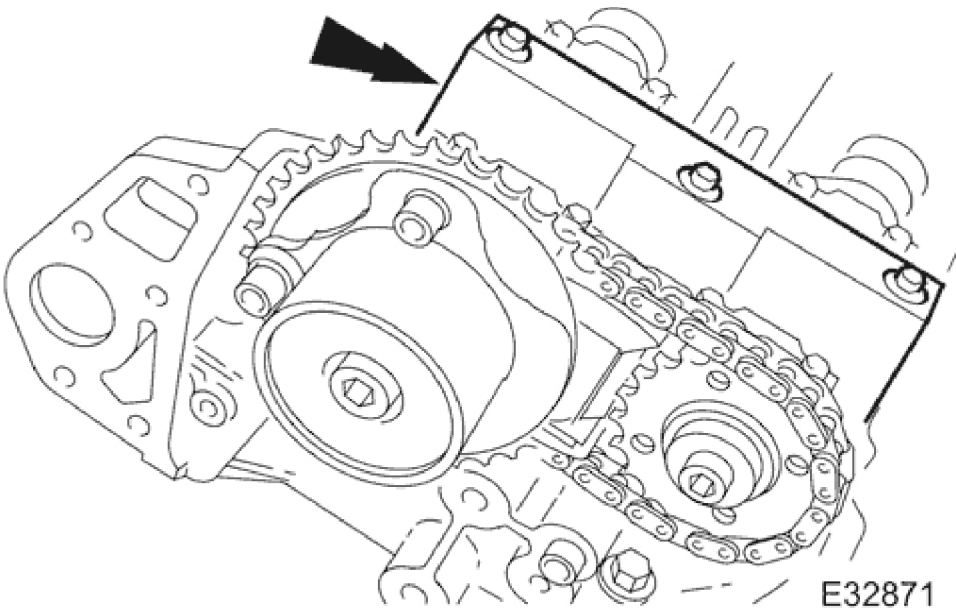
- Position the crankshaft so that the setting peg engages fully into the timing slot.

2. Fit and tighten the bolt to secure the setting peg.

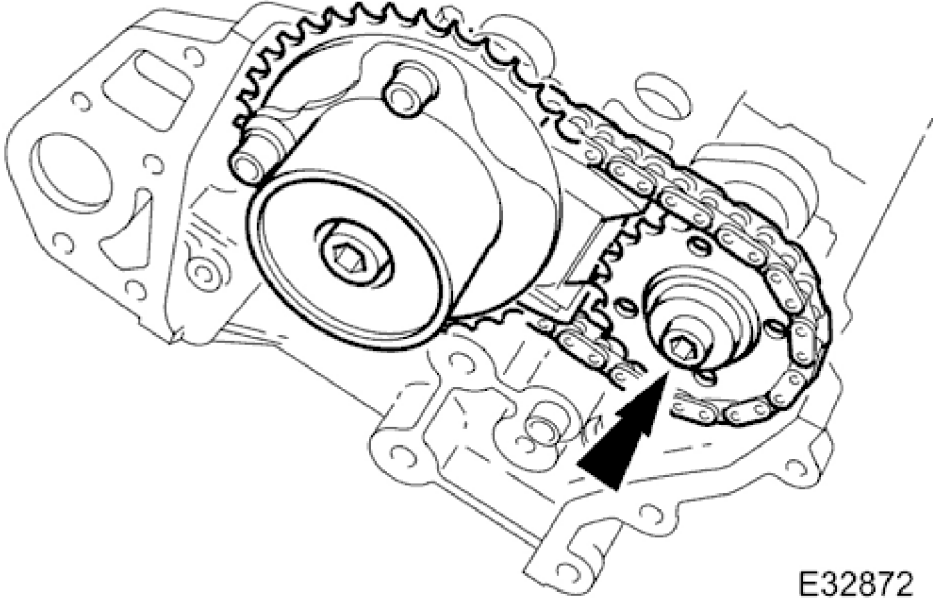
17. Remove the damper securing bolt from the crankshaft.

18. Lower the vehicle on the ramp.

1997 XK RANGE - Engine - 303-01

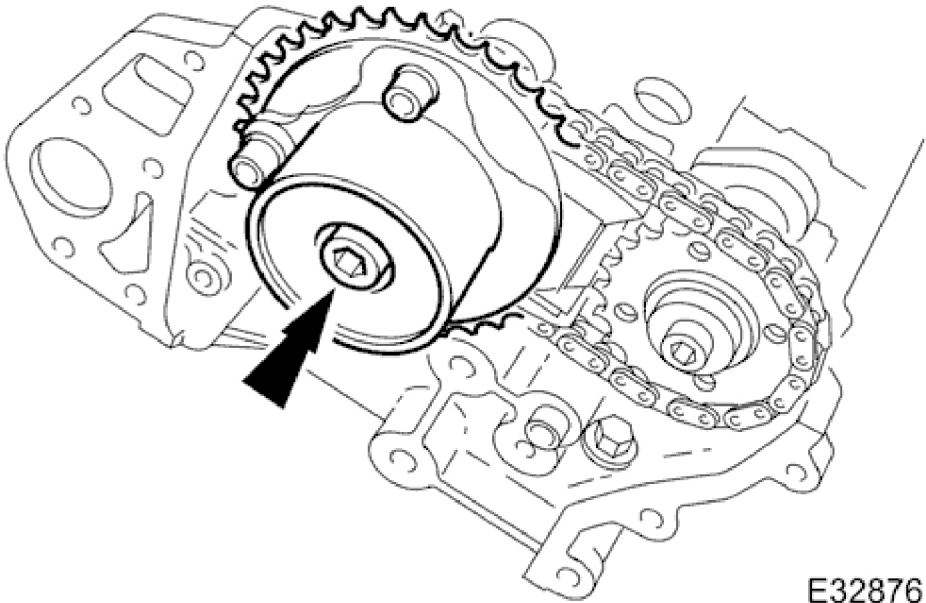


19. Fit the camshaft locking tool 303 - 530 to the B-Bank camshafts, aligning the shafts slightly as necessary.



20. Loosen the bolt which secures the sprocket to the camshaft.

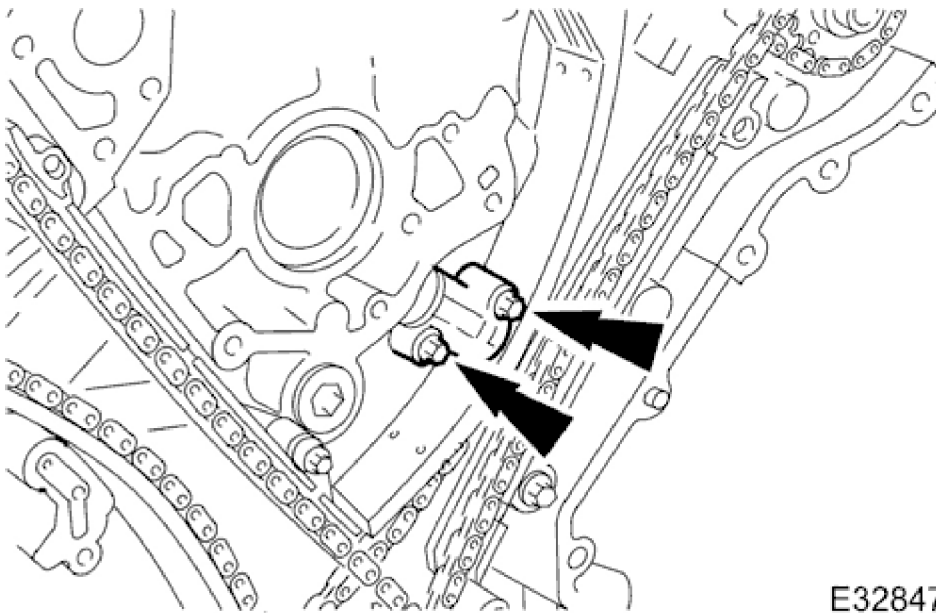
1997 XK RANGE - Engine - 303-01



E32876

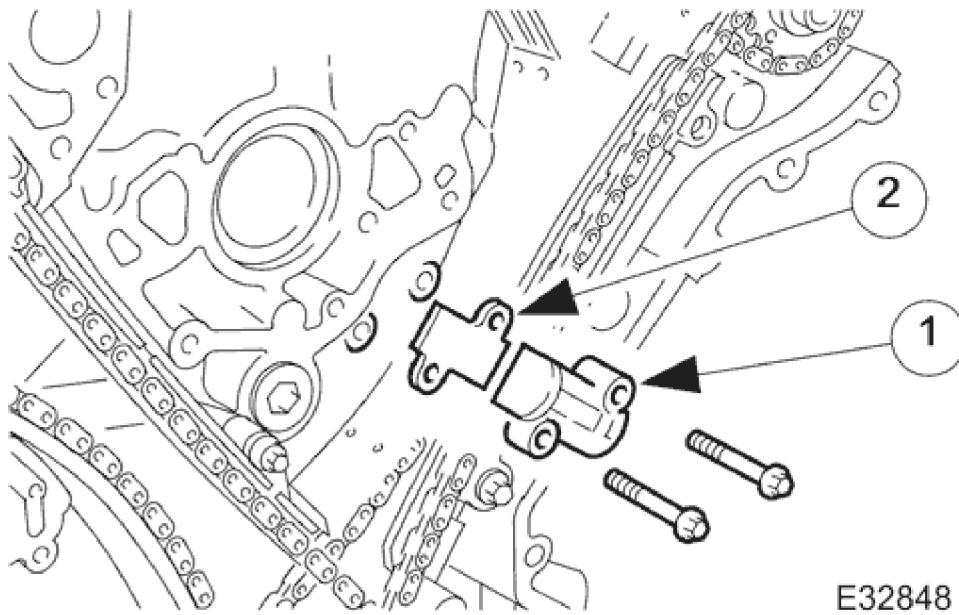
21. Loosen the bolt which secures the VVT unit to the camshaft.

22. Remove the camshaft locking tool 303 - 530 (fitted for previous operation).

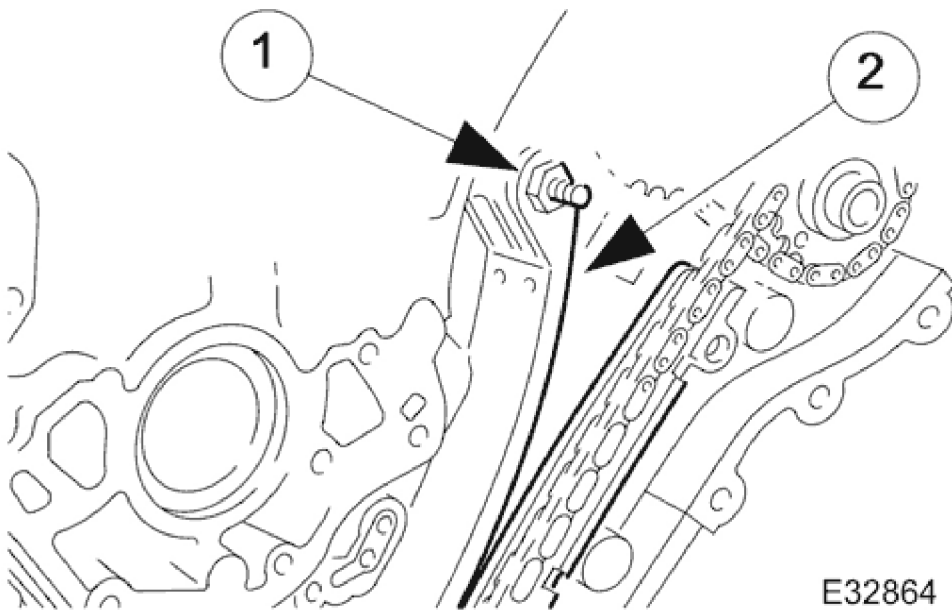


E32847

23. Remove the primary chain tensioner bolts.

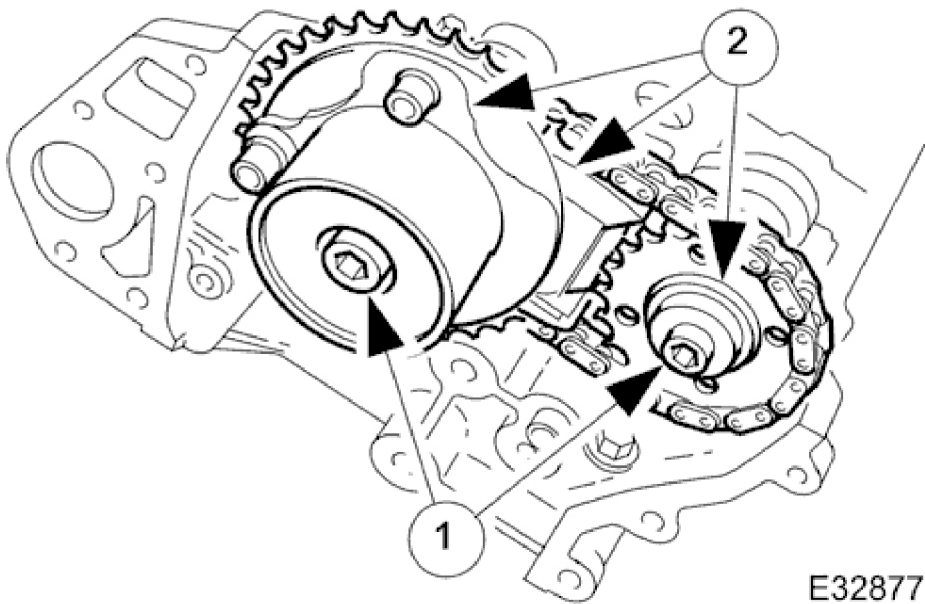


24. Remove the tensioner assembly.
1. Remove the tensioner.
 2. Remove the tensioner back-plate.

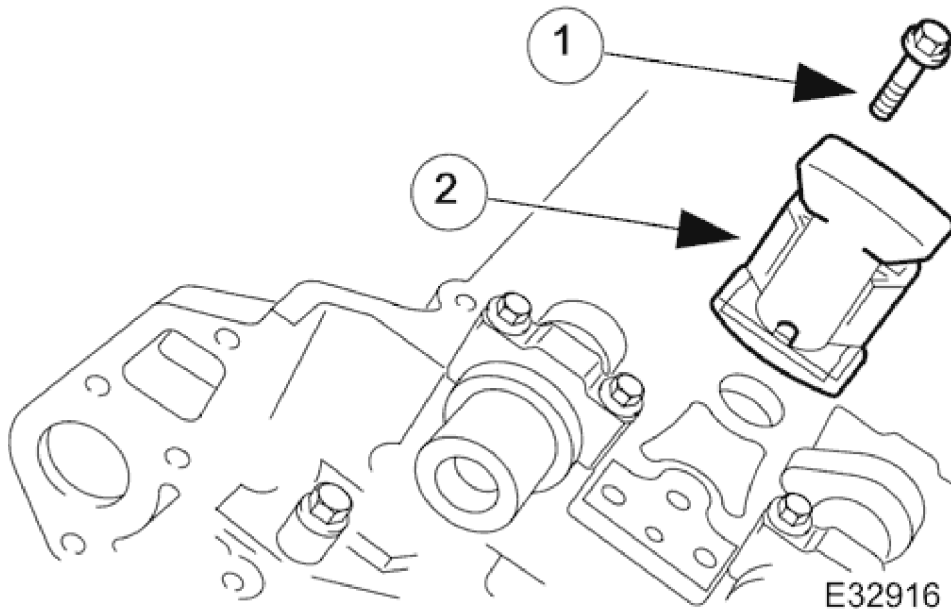


25. Remove the primary chain tensioner blade.
1. Remove the pivot bolt which secures the tensioner blade.
 2. Remove the tensioner blade.

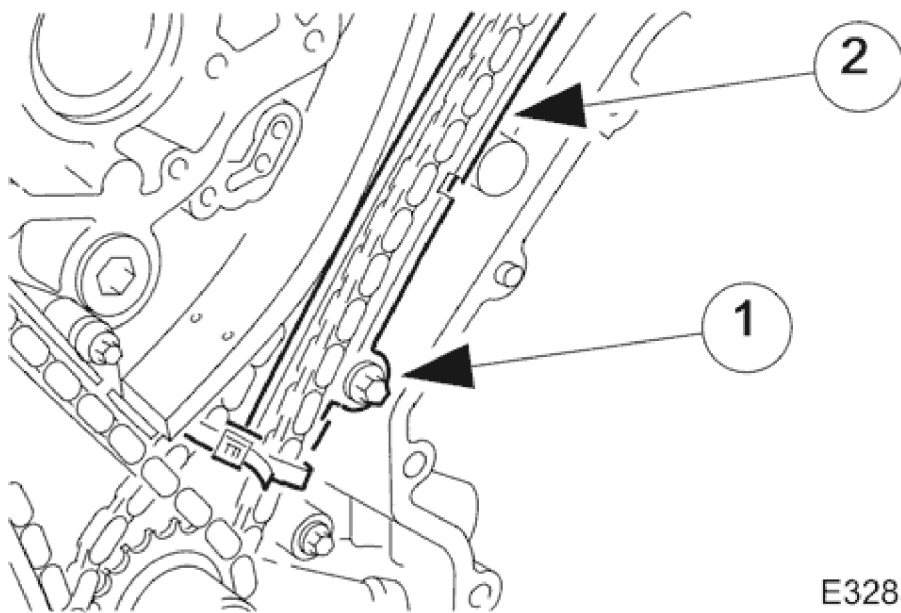
26. Reposition the VVT unit along the cam journal to allow the chain to clear the head casting.
- Disconnect the primary chain from the VVT unit and secure it to the bypass hose retaining clip, using a Ty-strap.



27. Remove the VVT unit and exhaust camshaft sprocket.
1. Remove the securing bolt from both the VVT unit and the exhaust cam sprocket.
 2. Remove the VVT unit, exhaust sprocket and secondary chain as an assembly (release the chain from the tensioner which is still secured to the cylinder head).
- Remove the secondary chain from the VVT unit and the sprocket.

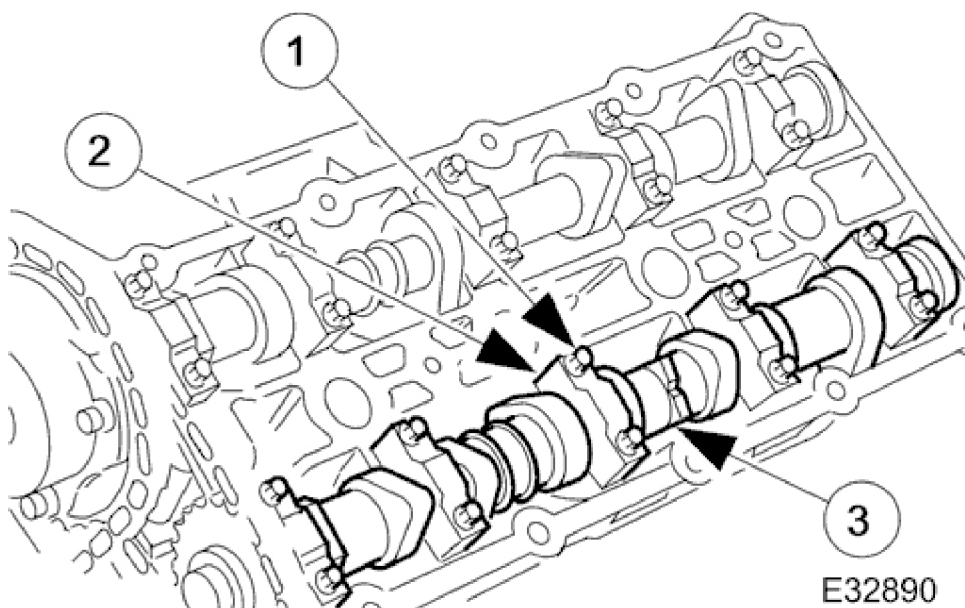


28. Remove the secondary chain tensioner.
1. Remove the two bolts which secure the chain tensioner to the cylinder head.
 2. Remove the tensioner.



E32859

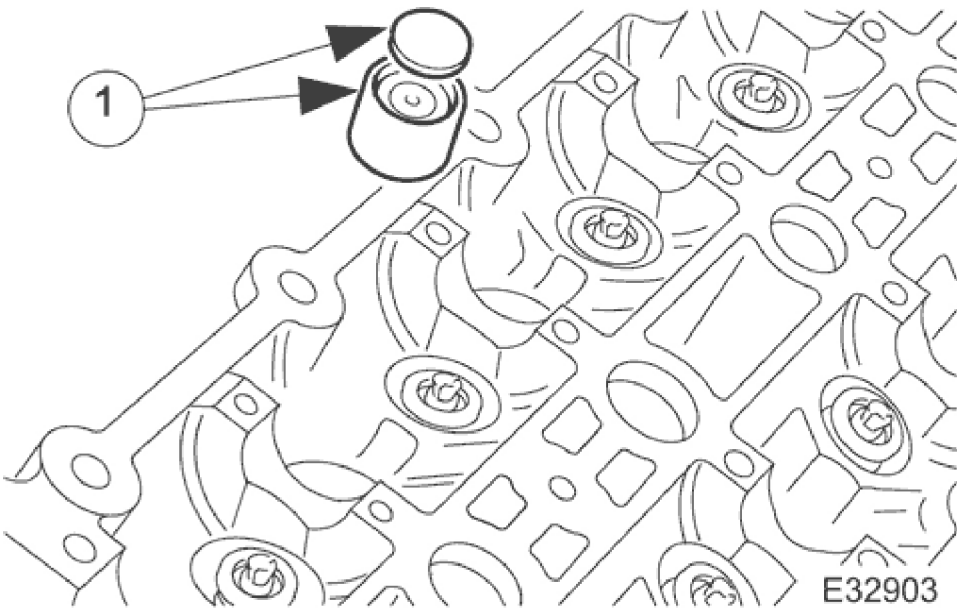
29. Remove the primary chain guide.
1. Remove the bolt which secures the chain guide.
 2. Note the orientation of the chain guide and remove it from the upper retaining pin.



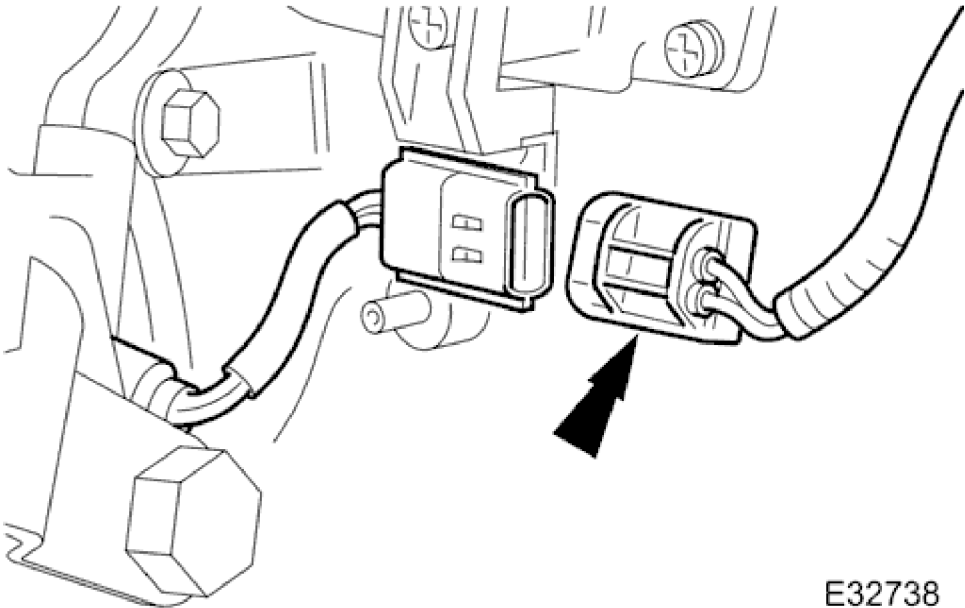
E32890

30. Remove the camshafts.
1. Remove the bolts which secure the camshaft caps; loosen them evenly, in stages.
 2. Remove the camshaft caps. Note their orientation and markings - each is marked with its position (a number) and orientation (an arrow).
 3. Remove the camshafts from the engine.

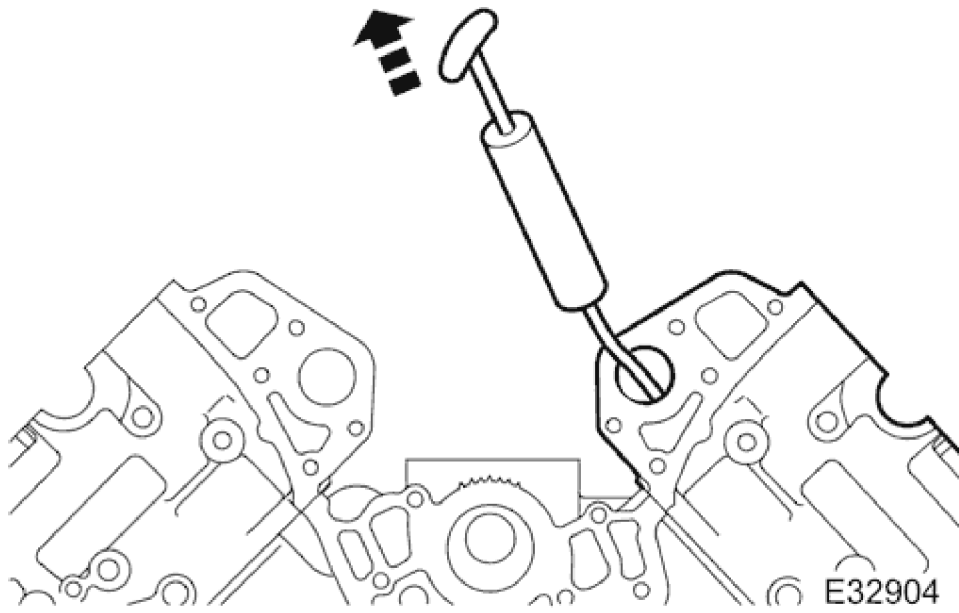
1997 XK RANGE - Engine - 303-01



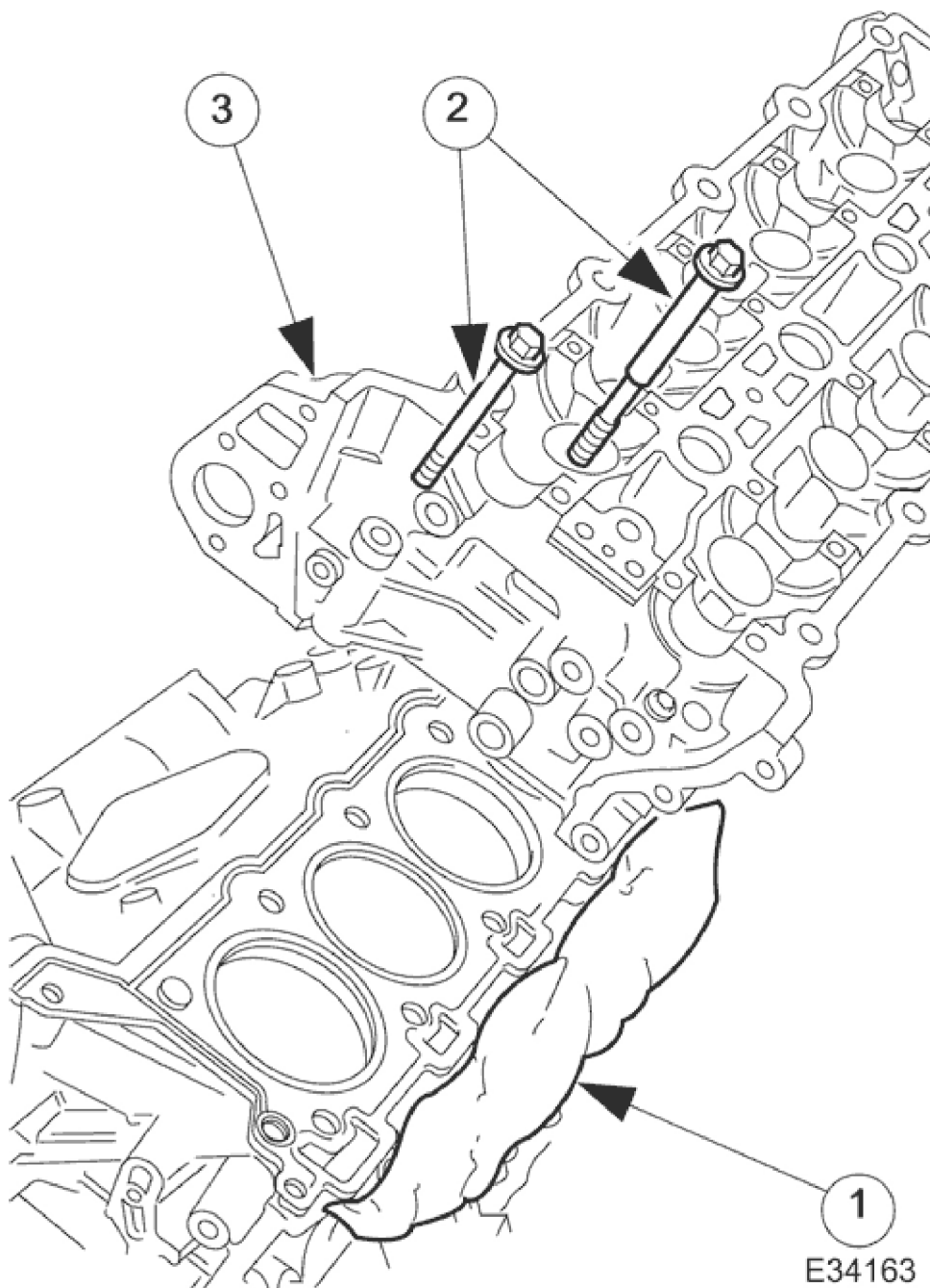
31. Remove the tappets and shims.
- 1. Note the position of each tappet, for reassembly, and remove each tappet and shim assembly - retain each shim with its original tappet.
 - Mark the inside face of each tappet in pencil or felt tipped pen, with its original position within the cylinder head.



32. Disconnect the plug from the engine position sensor, at the rear of the cylinder head.

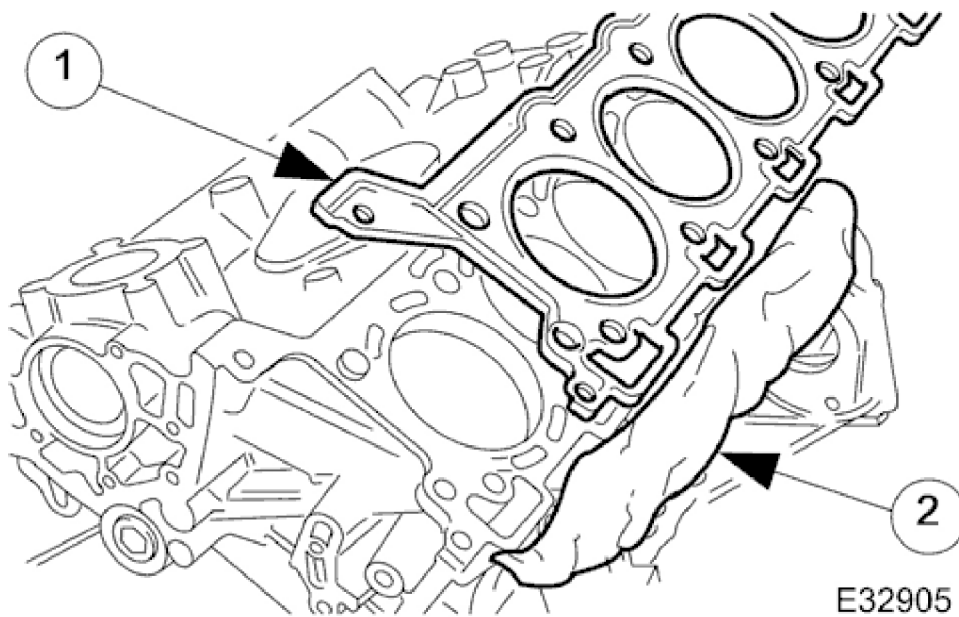


33. Remove residual coolant from the cylinder head.
1. Place a drain tray under the engine.
 2. Use a syringe with a length of thin rubber pipe connected, to drain the residual coolant from the outlet pipe water-way.
- A suitable syringe is Snap On YA 745.



34. Remove the cylinder head.

1. Place cloth around the area of the cylinder head to absorb coolant spillage, when removing the head.
2. Remove the bolts (10xM10 and 2xM8) which secure the cylinder head.
3. With assistance, remove the cylinder head.



35. Remove the cylinder head gasket.

1. Note how the gasket is fitted and remove it.
 2. Remove and discard the cloth, placed previously to absorb coolant spillage.
- Wipe up any leaked coolant.

36. Remove the coolant drain tray from under the engine.

37. Remove and discard the gasket from the downpipe catalyst.

- Clean the gasket faces of the catalyst and the exhaust manifold.

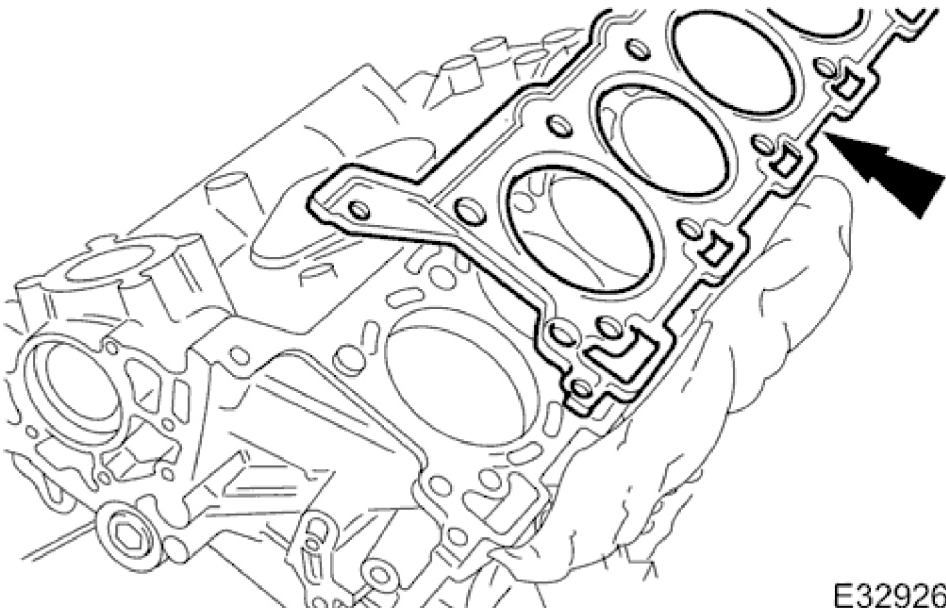
38. Clean cylinder head and cylinder block gasket faces.

- Ensure that all threaded holes in the cylinder block face are clean and free from oil.
- Clean and inspect the cylinder head bolts. They may be re-used on two occasions. When re-used, each bolt head should be marked with one dot from an automatic centre punch.

39. Clean and inspect all relevant components and mating faces.

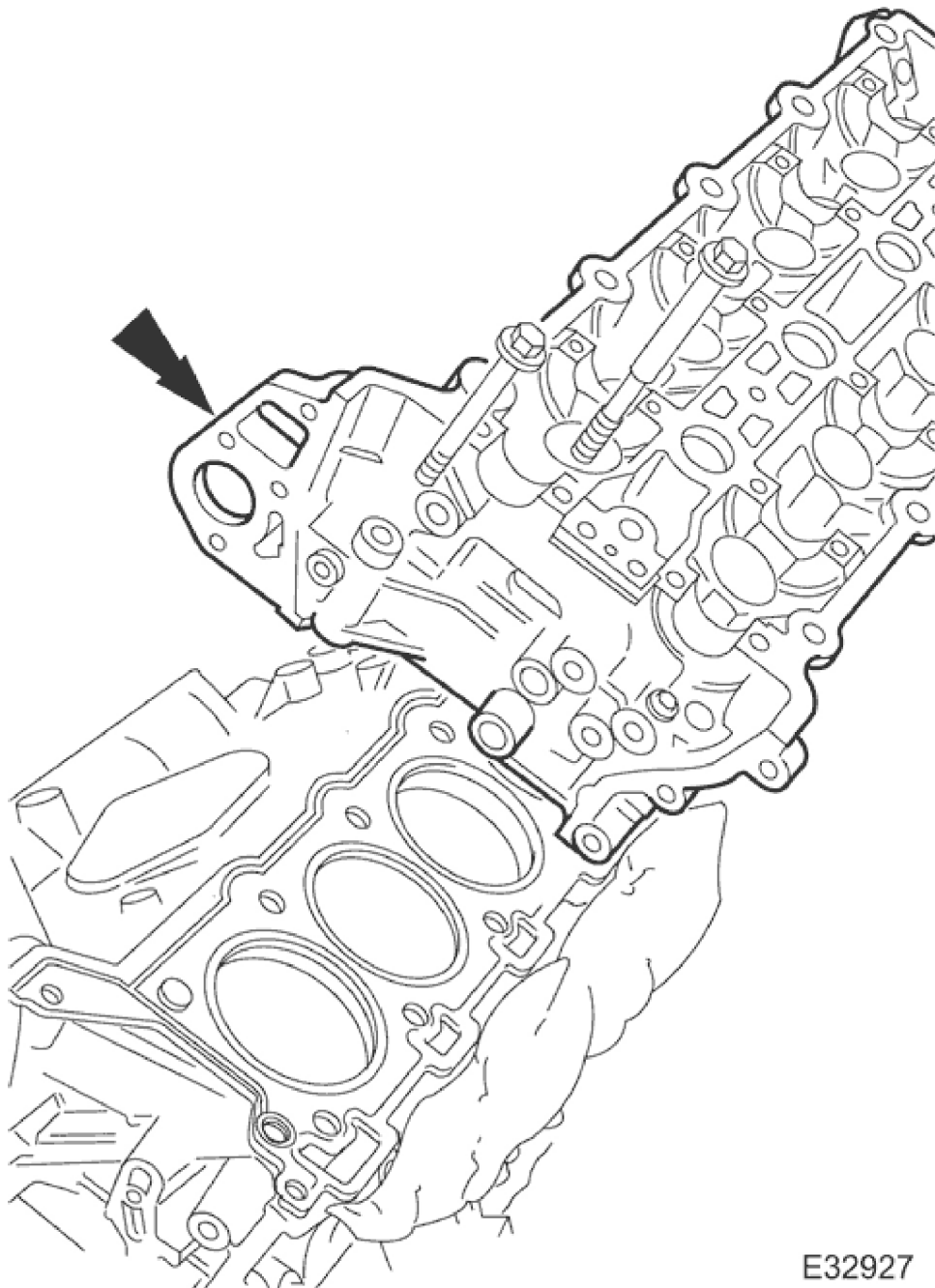
Installation

1. Fit a new gasket to the downpipe catalyst flange.



E32926

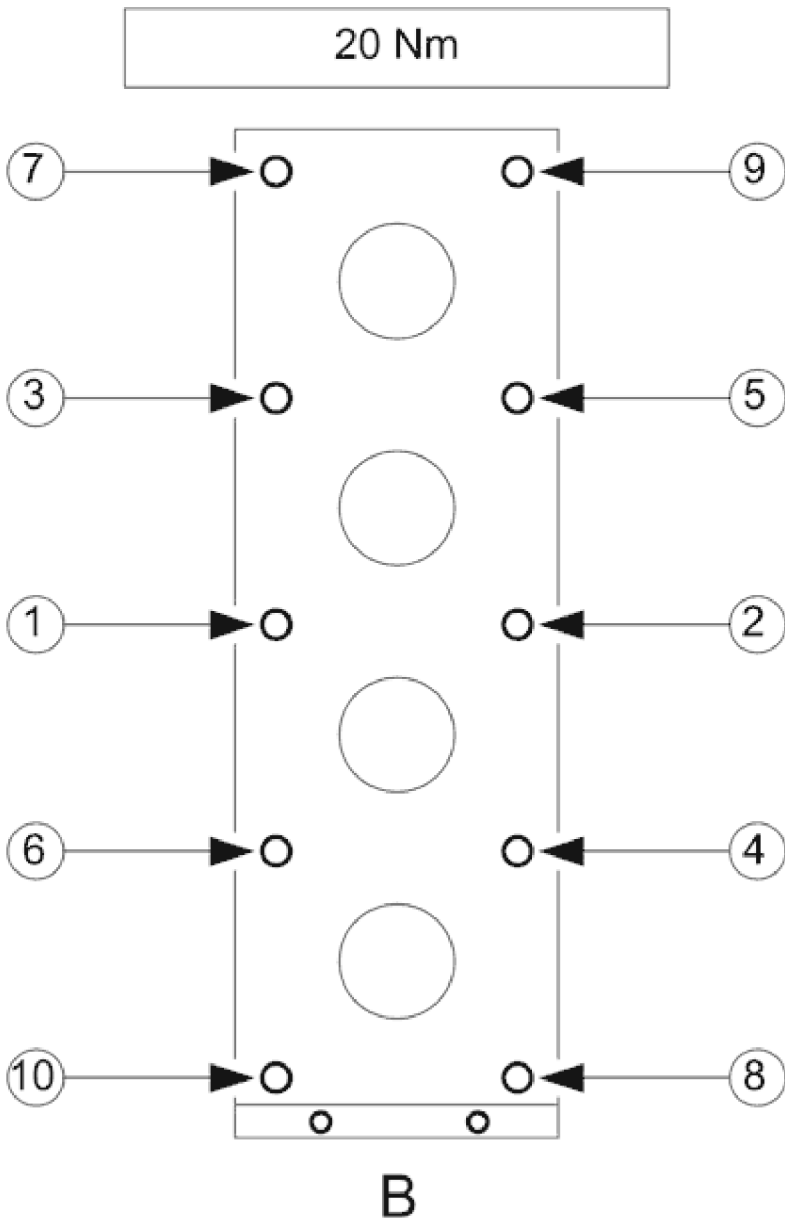
2. Fit and align a new cylinder head gasket to the cylinder block face.



E32927

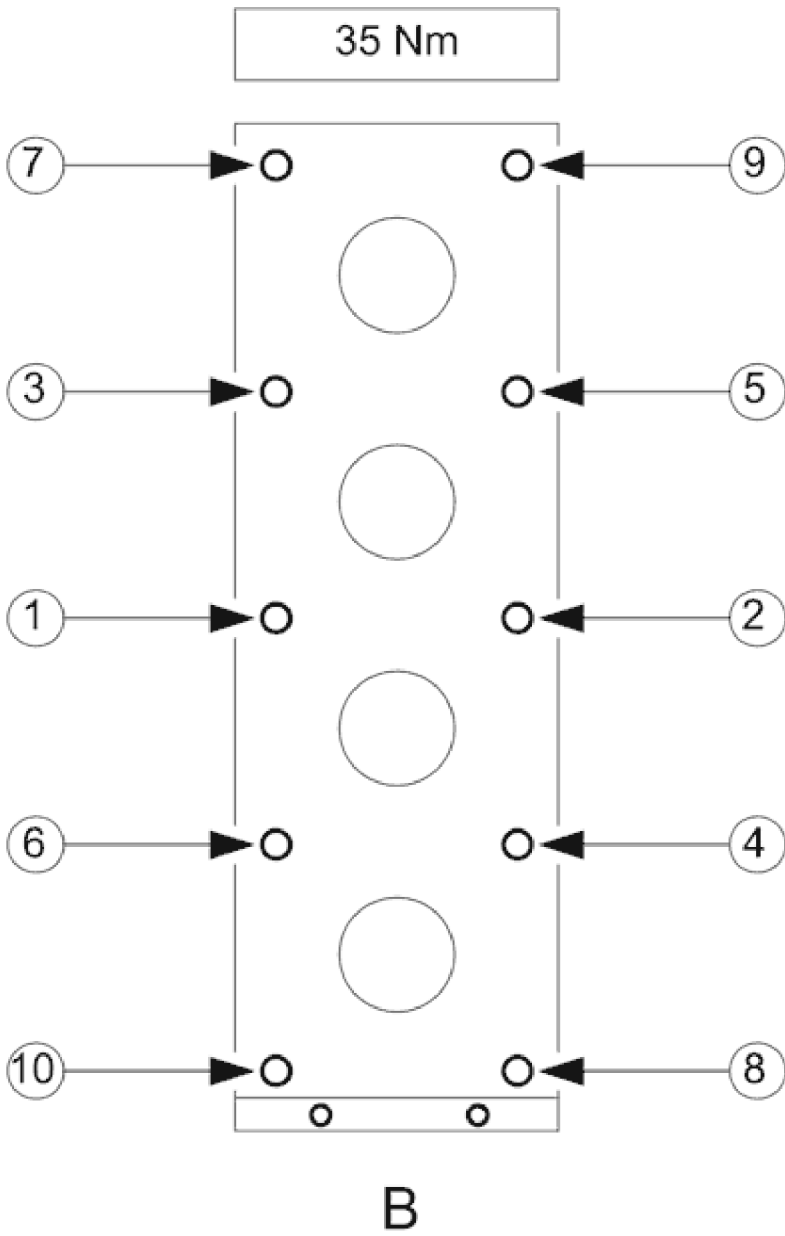
3. With assistance, refit the cylinder head.
 - Engage the cylinder head with the dowels on the block face, and the exhaust manifold flange with the studs on the downpipe catalyst.

4. Fit the cylinder head bolts, hand tight only.



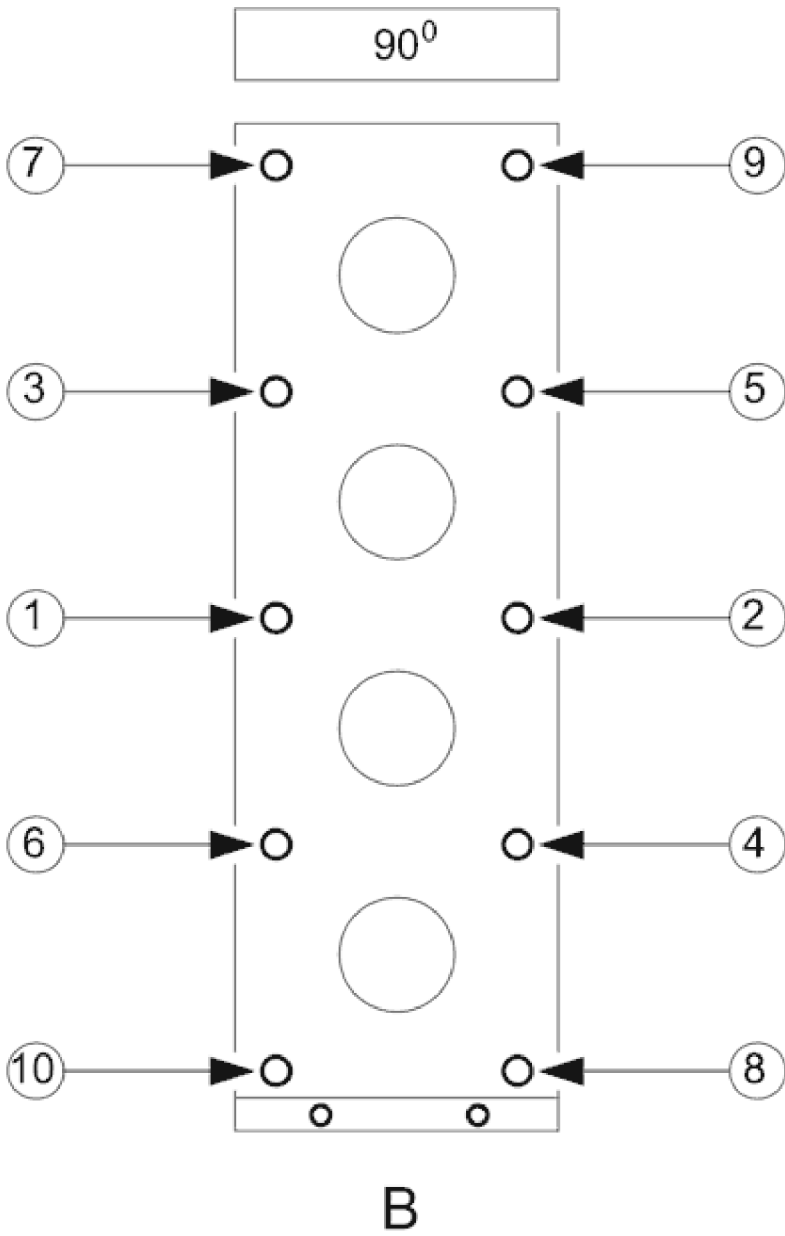
E35338

- 5. Tighten the cylinder head bolts in stages, in the sequence shown, using the following procedure:
 - Stage 1 - tighten all M10 bolts in sequence, to 20 Nm.



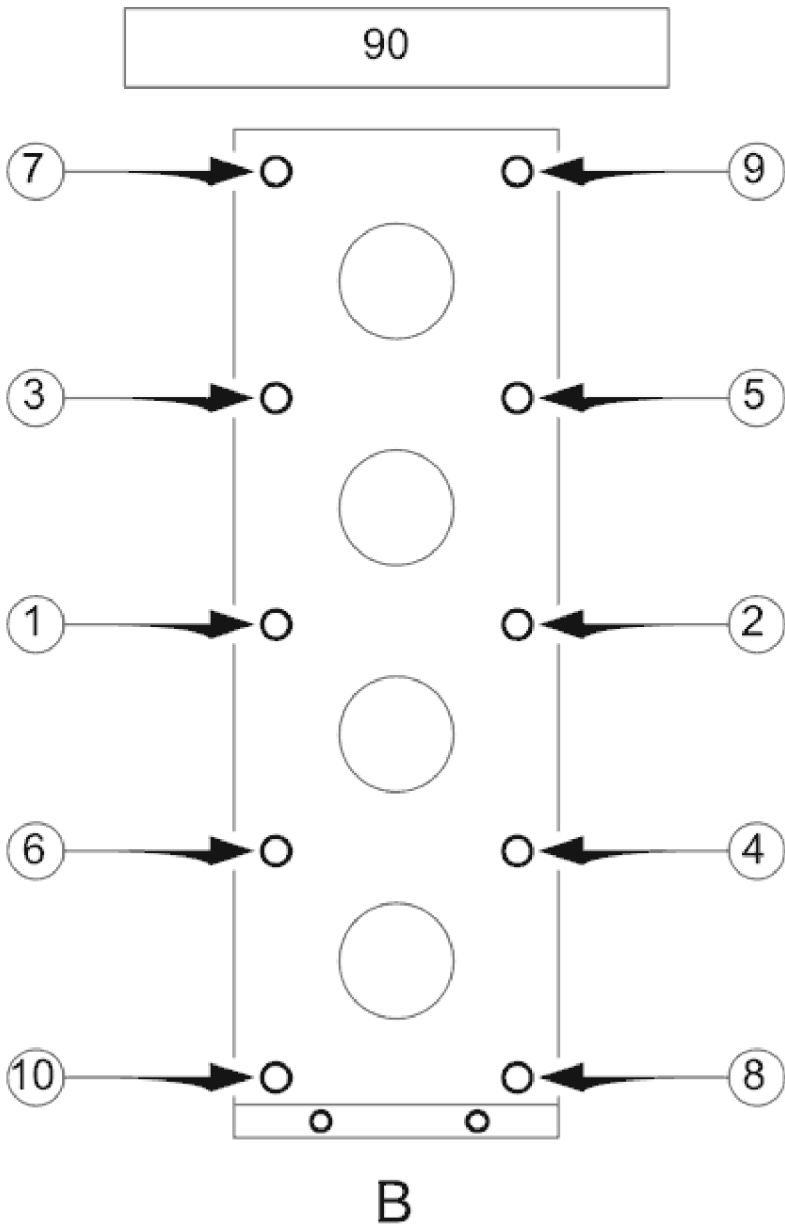
E35339

6. Stage 2 - tighten all M10 bolts in sequence, to 35 Nm.



E35340

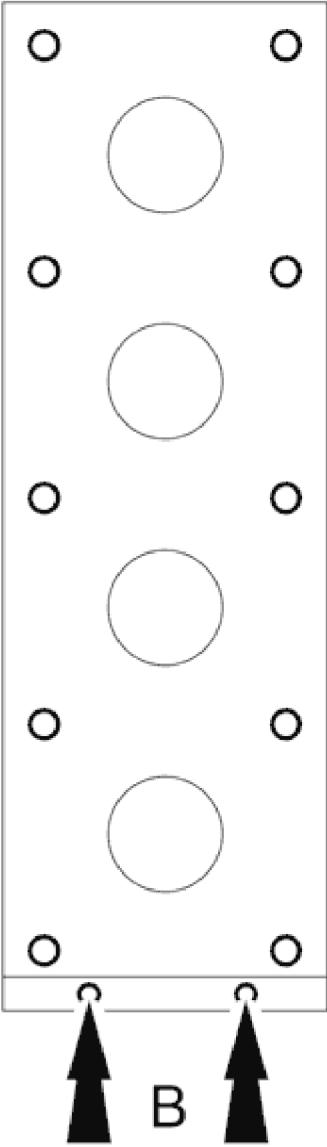
7. Stage 3 - tighten all M10 bolts in sequence by 90°.



E33888

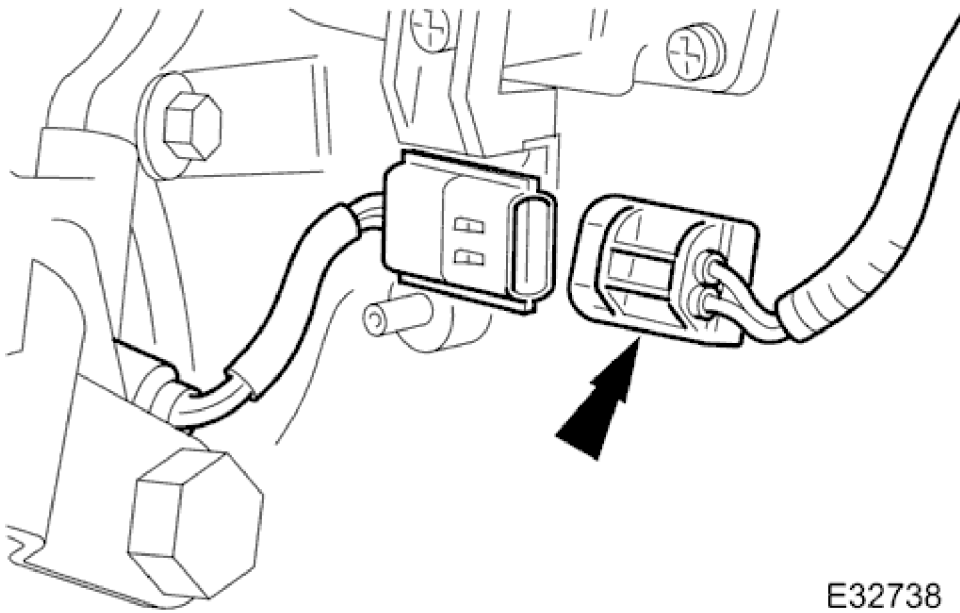
8. Stage 4 - tighten all M10 bolts in sequence by 90°.

23-27 Nm



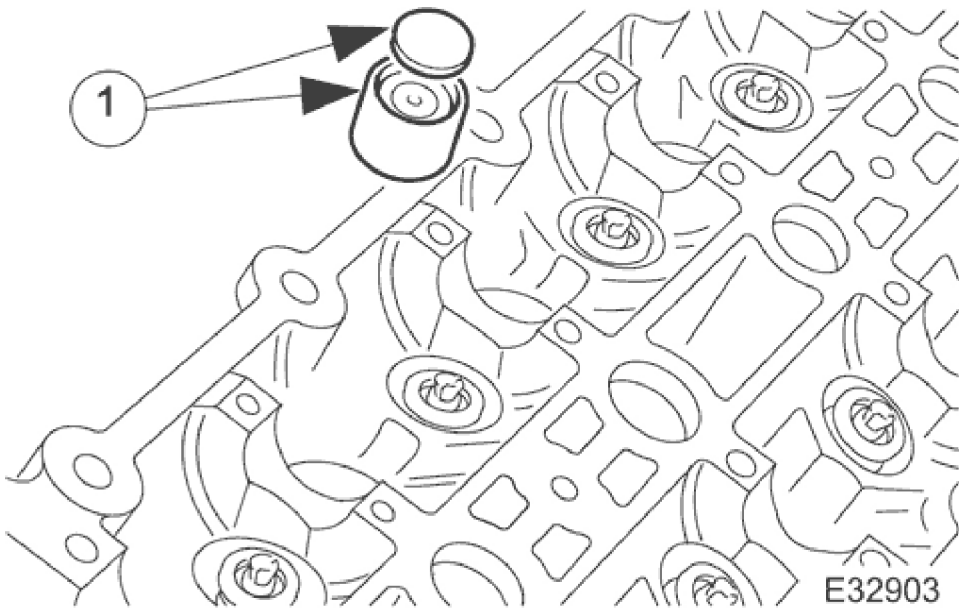
E35341

9. Stage 5 - tighten the two M8 bolts at the front of the cylinder head to 23-27 Nm.



E32738

10. Connect the plug to the engine position sensor, at the rear of the cylinder head.

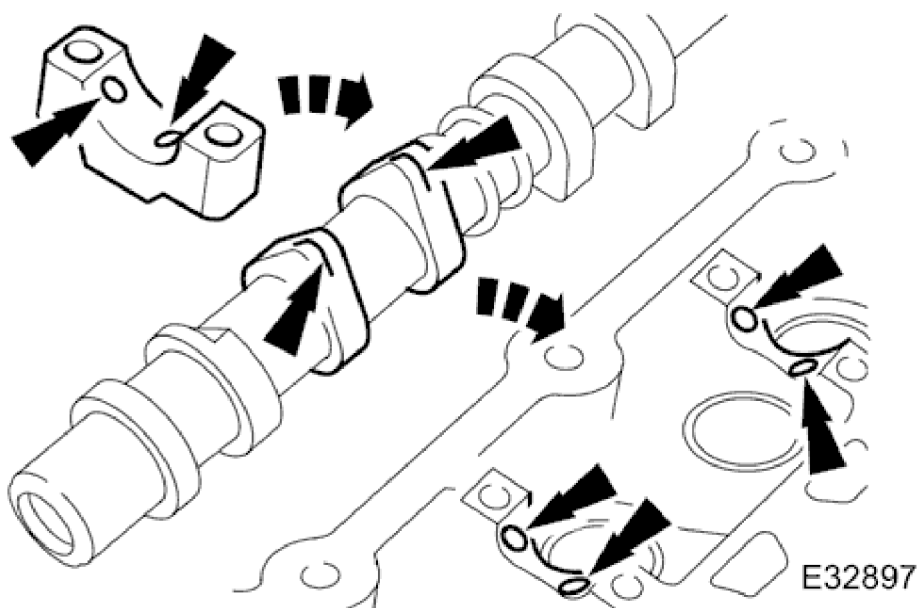


E32903

11. Fit the tappet and shim assemblies.

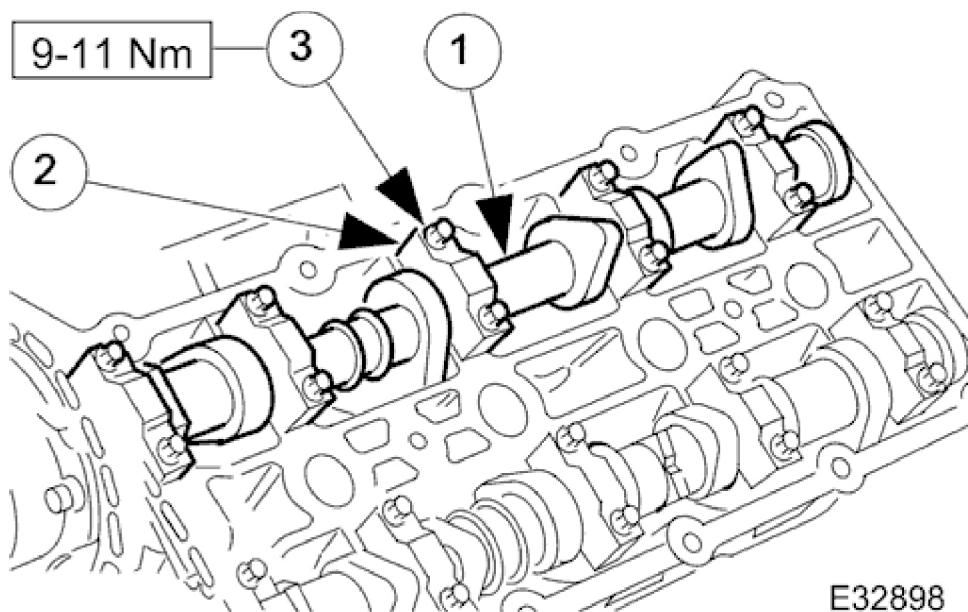
- Lubricate each tappet assembly.

1. Fit each tappet and shim assembly to its previously identified position in the cylinder head.



12. Apply oil (EP-90) to the camshaft and bearing surfaces, as follows:

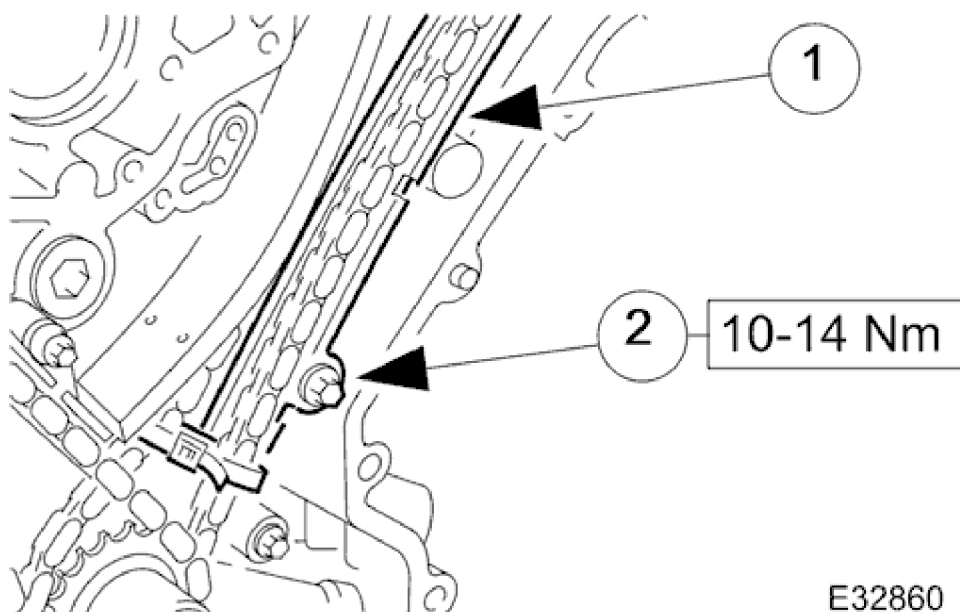
- To the upper face of each bearing surface (two places) in the cylinder head.
- To the upper face of each bearing surface (two places) in each bearing cap.
- On the cam lobes ONLY, not on the base circle area.



13. Refit the camshafts.

1. Fit the camshafts to position in the cylinder head, with the timing flats uppermost.
2. Fit the camshaft caps to their respective locations (inlet 0 to 4 and exhaust 5 to 9 from the front) and in the correct orientation (arrow to front of engine).
3. Fit and tighten the cap securing bolts. Tighten evenly, in stages, to 9-11 Nm.

14. Fit the camshaft locking tool 303 - 530, align the camshafts as necessary.

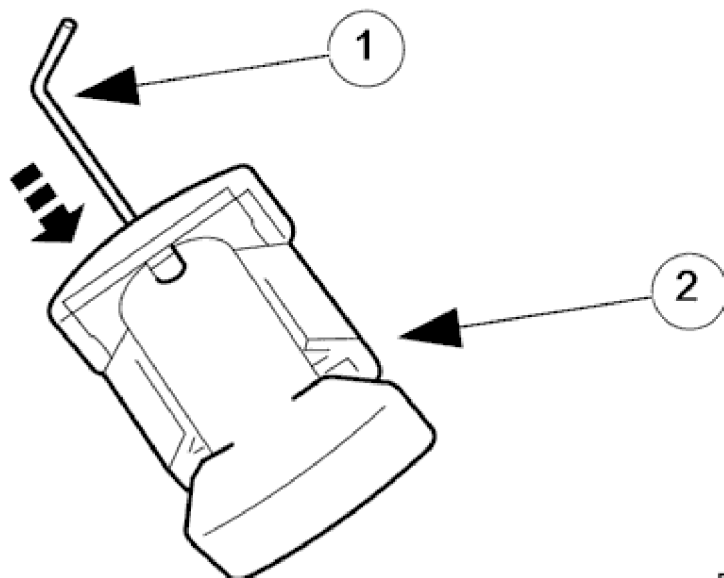


E32860

15. Fit the chain guide.

- The chain guide must be fitted so that the slotted hole is towards the top, and the raised shoulder to the cylinder block.

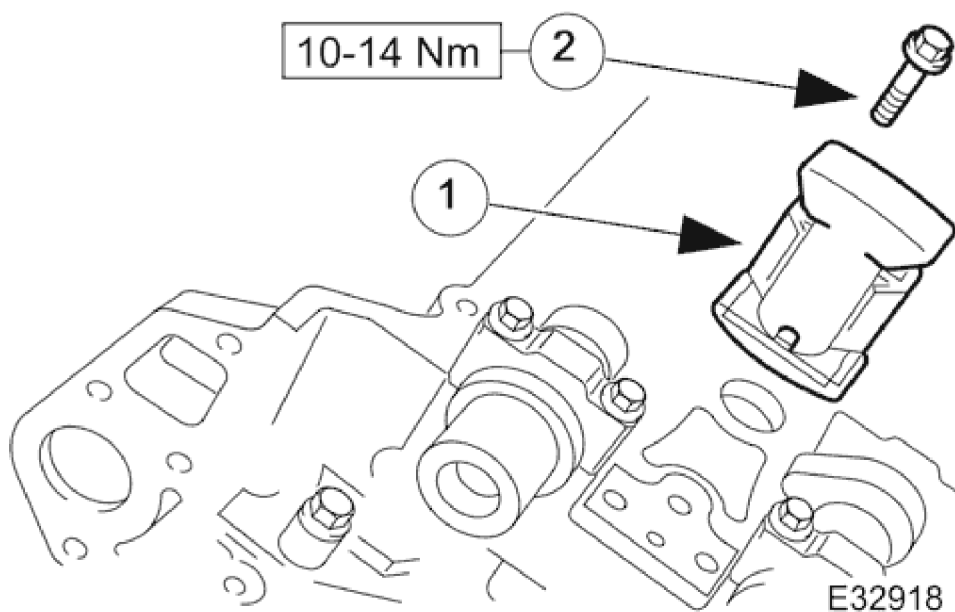
1. Fit the chain guide to the block and locate it onto the upper retaining pin.
2. Fit the retaining bolt and tighten it to 10-14 Nm.



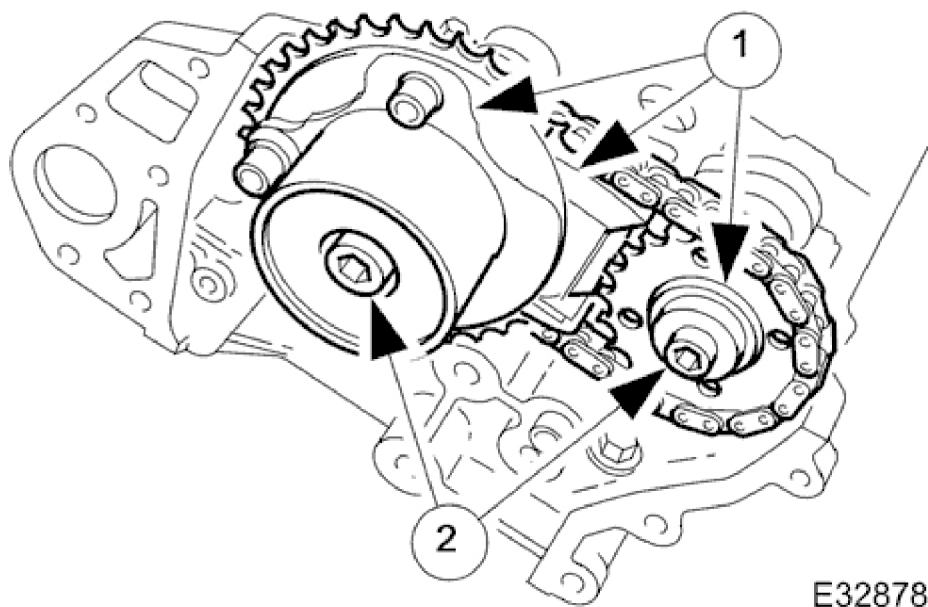
E32920

16. Push the secondary chain tensioner piston into the body to provide clearance for fitting the chain.

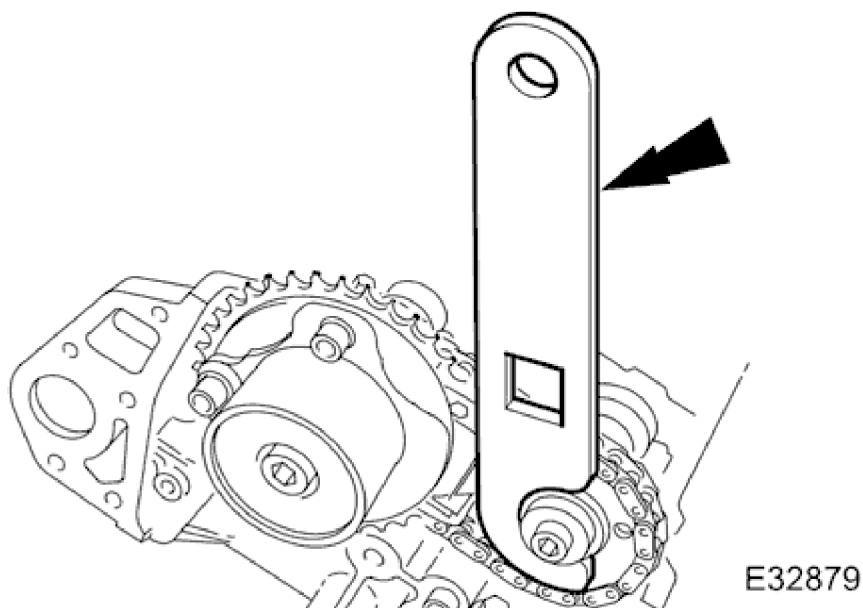
1. Insert a thin rigid wire through the hole in the end of the tensioner piston to displace the ball from the non-return valve seat.
 2. With the wire in position, press the piston fully into the tensioner body.
- Remove the wire.



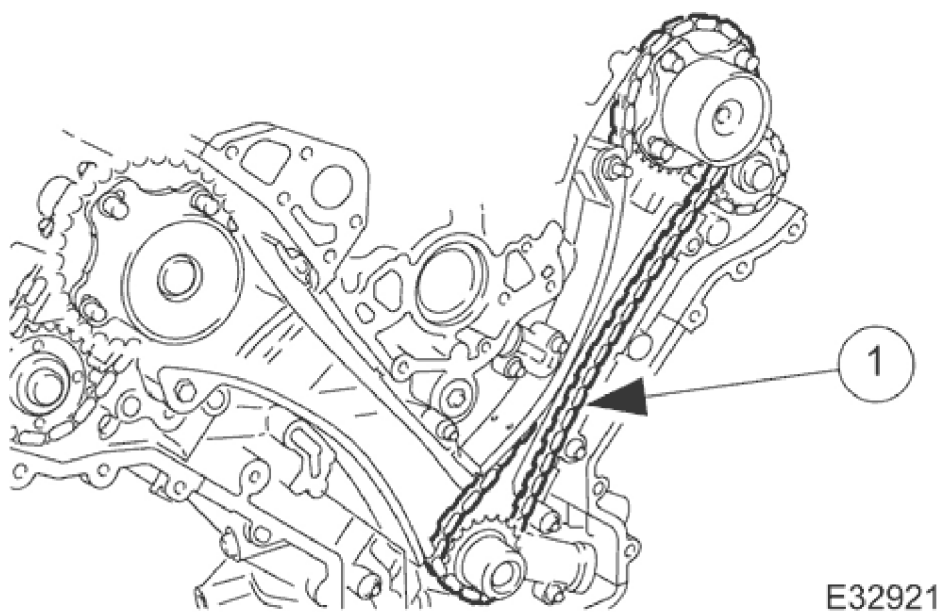
17. Fit the secondary chain tensioner to the engine.
1. Fully seat the tensioner to the cylinder head.
 2. Fit the two bolts which secure the tensioner and tighten to 10-14 Nm.



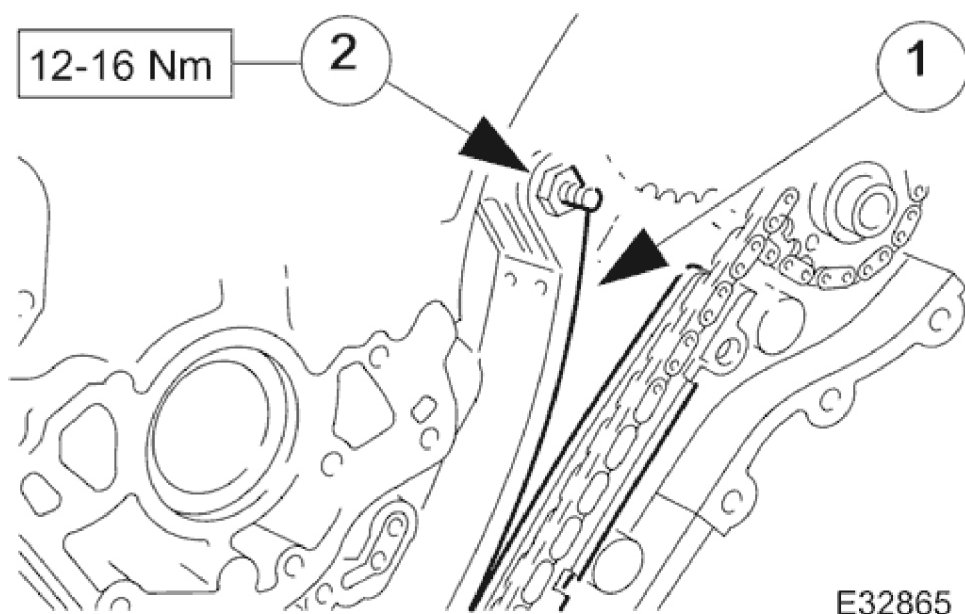
18. Fit the VVT unit to the engine.
- Assemble the VVT unit, the exhaust camshaft sprocket and the secondary chain, in preparation for fitting to the engine.
1. Fit the above assembly to the camshafts with the chain correctly positioned over the tensioner; VVT unit to the inlet and the sprocket to the exhaust.
 2. Fit, but do not tighten, each bolt which secures the VVT unit and the exhaust sprocket to the camshafts.



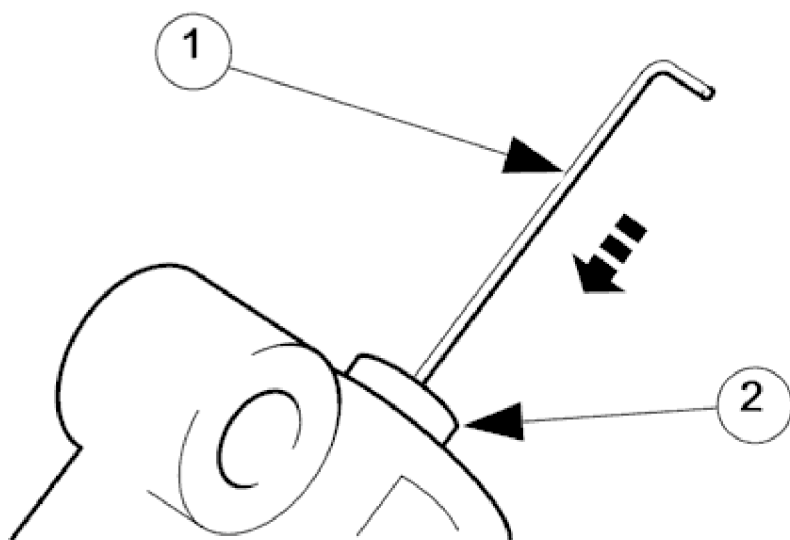
19. Fit the chain tensioning tool 303 - 532 to the exhaust camshaft sprocket.
- Reposition the sprocket (and the VVT unit) for the most advantageous position for use of the tool.
 - Remove the tool.



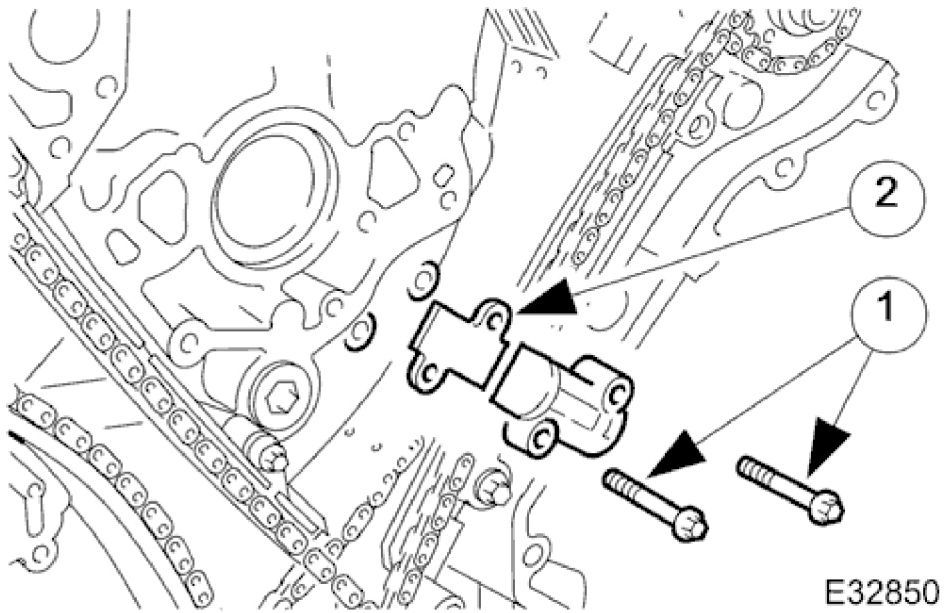
20. Refit the primary timing chain.
- Reposition the VVT unit forwards on the cam journal (do not rotate it) to allow the chain to clear the head casting. Disconnect the primary chain from the Ty-strap.
1. Fit the primary chain to position over the crankshaft sprocket and the VVT unit sprocket. There must be no slack on the drive side of the primary chain and the VVT unit must not be rotated on the camshaft.



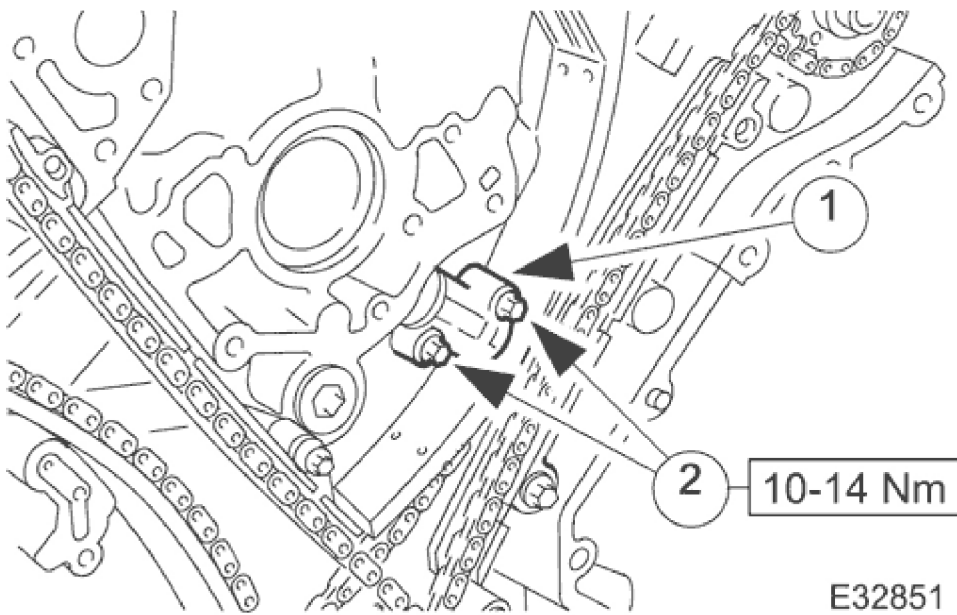
21. Fit the primary chain tensioner blade.
1. Position the tensioner blade to the cylinder block.
 2. Fit the retaining / pivot bolt and tighten it to 12-16 Nm.



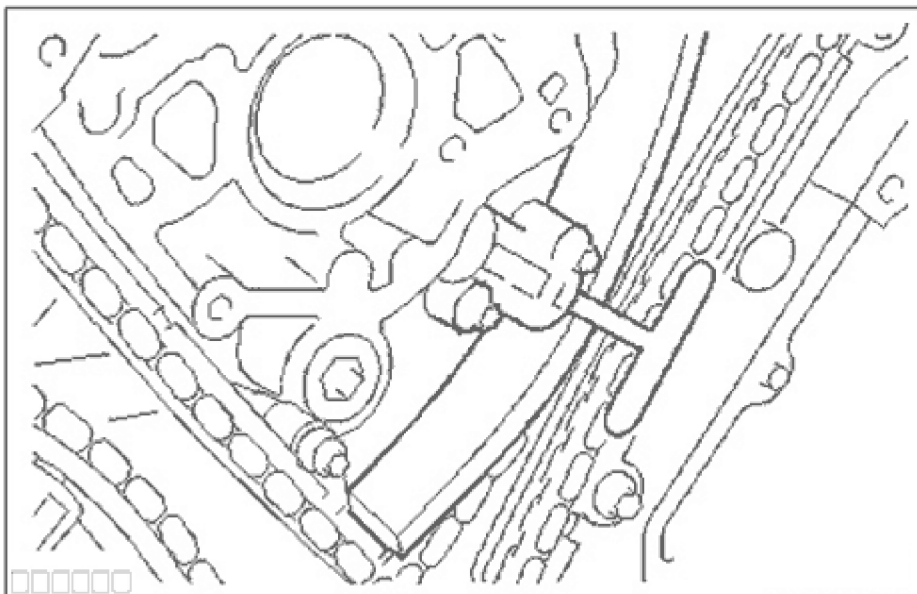
22. Push the primary chain tensioner piston into the body to provide clearance for fitting.
1. Insert a thin rigid wire through the hole in the end of the tensioner piston to displace the ball from the non-return valve seat.
 2. With the wire in position, press the piston fully into the tensioner body.
- Remove the wire.



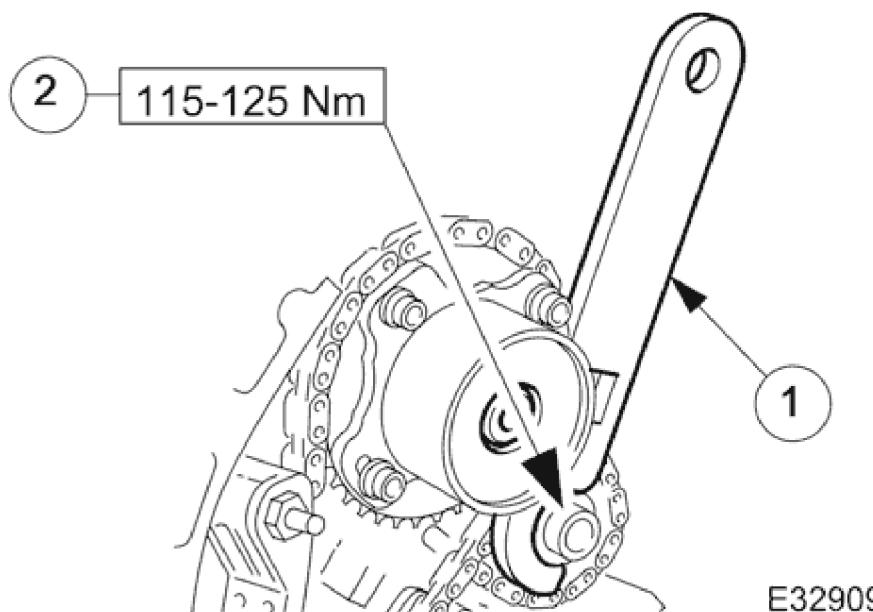
23. Assemble the tensioner.
1. Fit the two mounting bolts to the tensioner.
 2. Locate the tensioner back-plate to the two bolts.



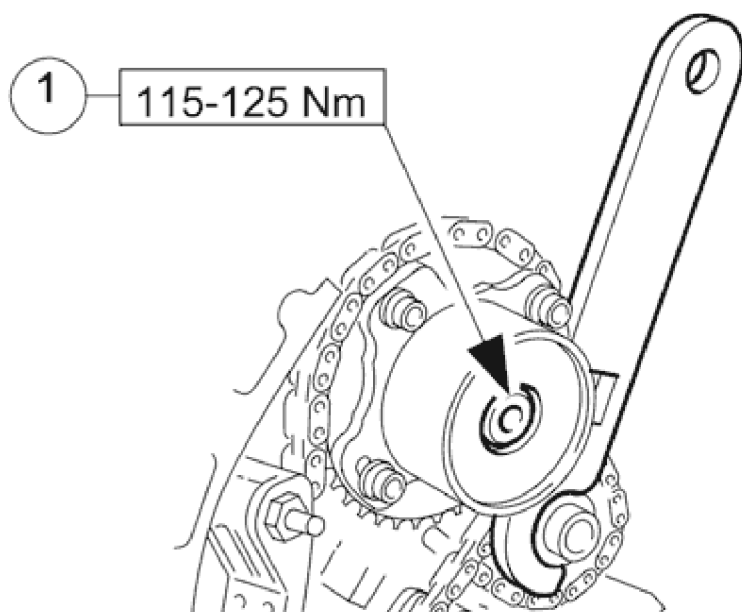
24. Fit the tensioner to the cylinder block.
1. Position and align the tensioner to the cylinder block and to the mating slot on the rear face of the tensioner blade.
 2. Fit and tighten the two bolts to 10-14 Nm.



25. Use a wedge 303 - 533 (or two if required) between the primary chain tensioner and tensioner blade, to take up the slack in the chain, for tightening the VVT unit and exhaust camshaft sprocket.



26. Tighten the exhaust camshaft sprocket securing bolt.
1. Fit the chain tensioner tool 303 - 532 to the sprocket holes.
 - Apply force to the tool in an anti-clockwise direction to tension the chain on its drive side.
 2. Whilst applying the opposing force to the sprocket and chain, tighten the sprocket securing bolt to 115 - 125 Nm.



E32881

27. Tighten the VVT unit securing bolt.

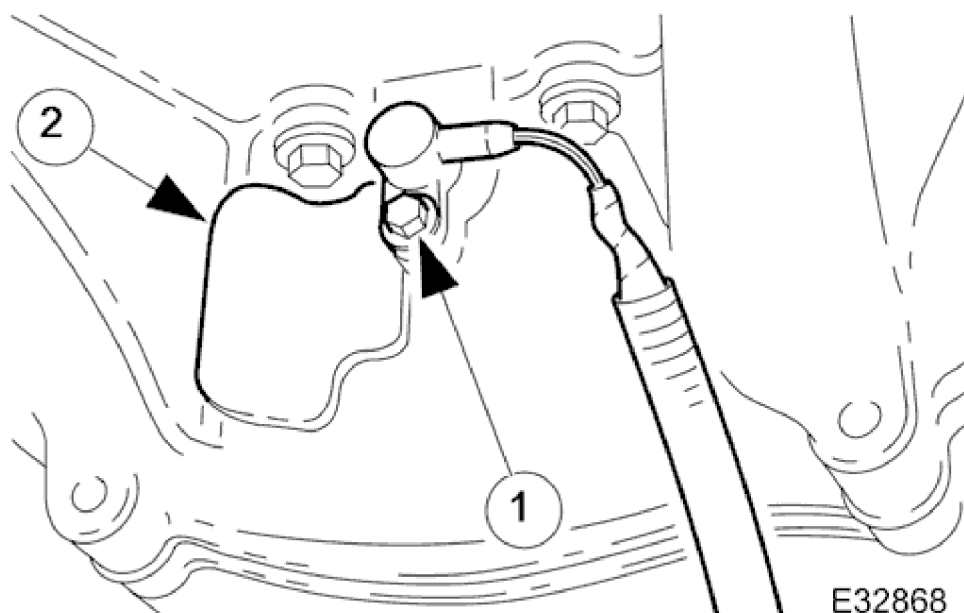
1. Whilst still applying the opposing force to the sprocket and chain (using 303 - 532), check that the wedges are still in place, tighten the VVT unit securing bolt to 115 - 125 Nm.

- Remove the chain tensioning tool and the wedge(s).

28. Remove the camshaft locking tool 303 - 530.

29. Raise the vehicle on the ramp.

30. Remove the crankshaft setting tool 303 - 531.

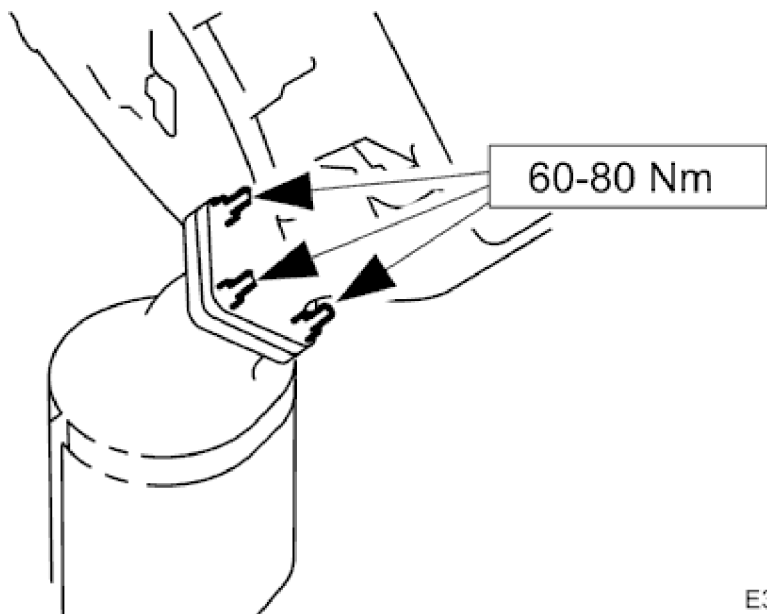


E32868

31. Refit the crankshaft position sensor.

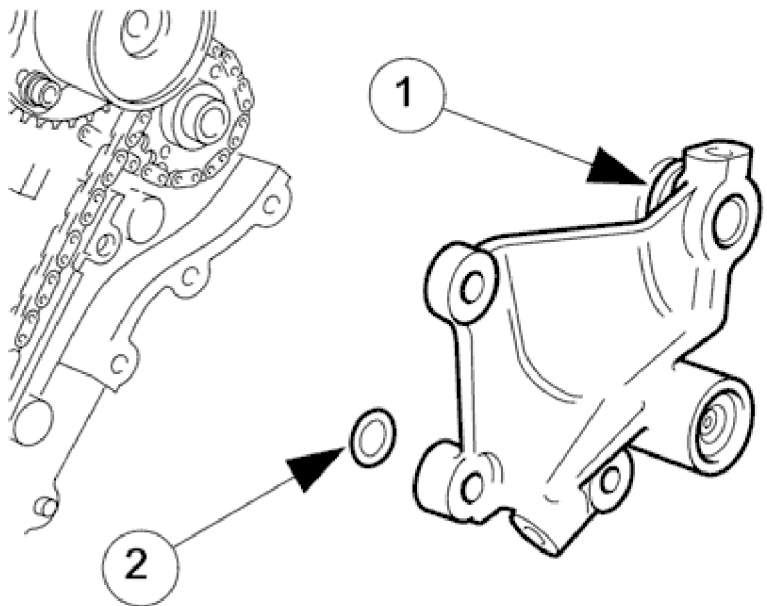
1. Fit the sensor to the flywheel housing and fit the securing bolt. Tighten to 8-12 Nm.
2. Refit the access grommet to the housing.

32. Lower the ramp.



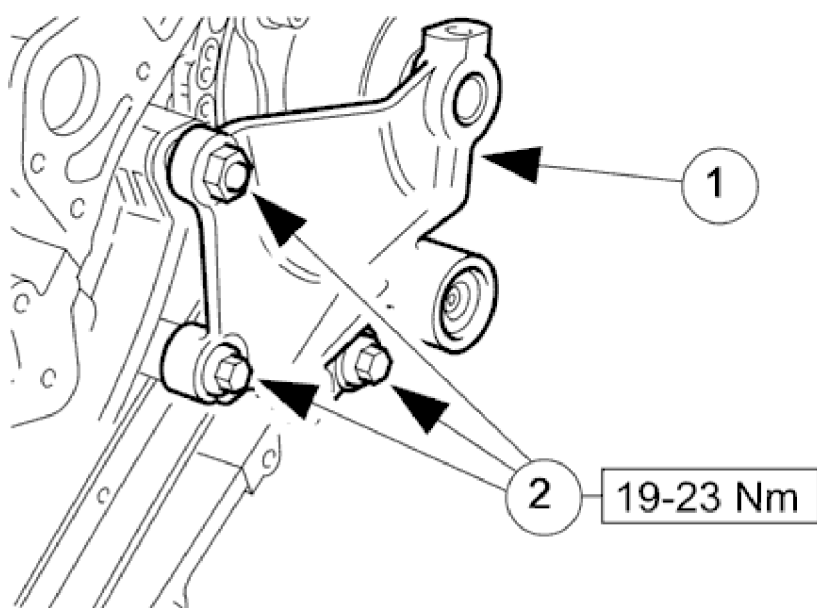
E34231

33. Fit and tighten the nuts which secure the exhaust manifold to the downpipe catalyst.



E32842

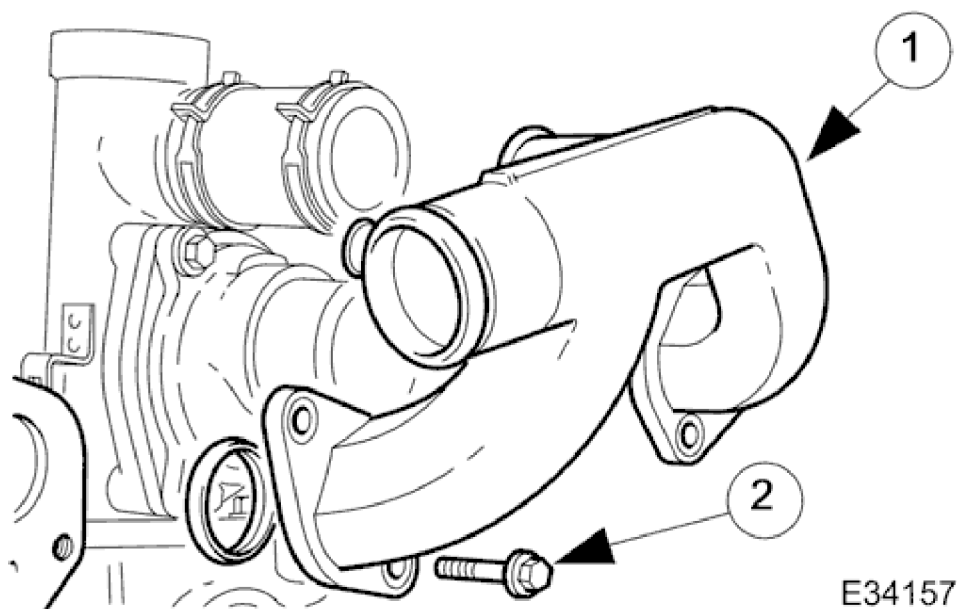
34. Fit new seals to the B-Bank VVT bush carrier.
1. Fit the new sealing ring (scarf jointed) to the carrier bush groove.
2. Fit a new O-ring to the carrier oil-way.



35. Fit the bush carrier to the cylinder block.

- Lubricate the seal (scarf jointed) and the bush.
 1. Fit the bush carrier assembly.
 - Check that the seals are in place and that the ring dowels are engaged squarely. Fully locate the assembly as much as possible by hand pressure.
 2. Fit the two securing bolts and one nut. Tighten to 19-23 Nm.

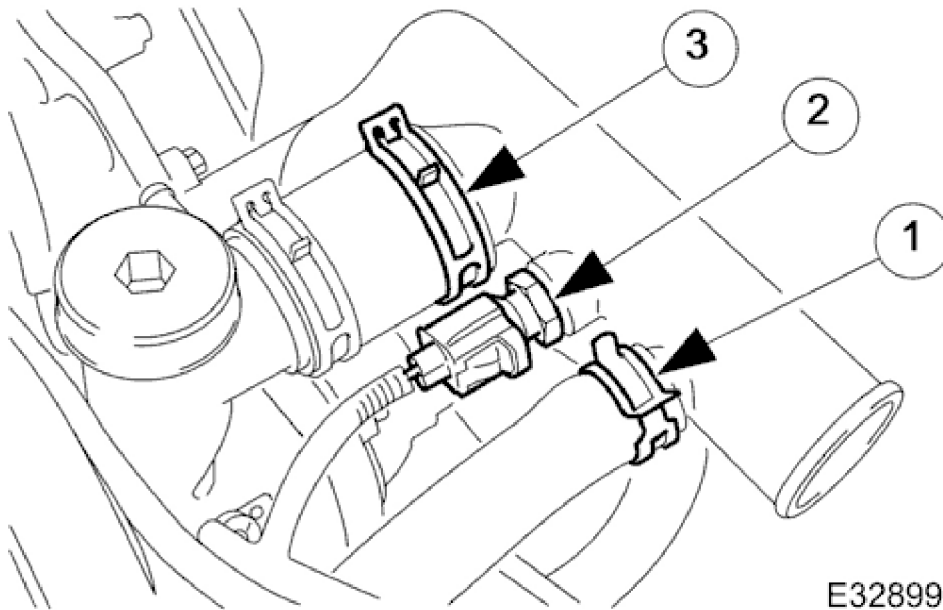
36. Fit new sealing rings to the coolant outlet pipe grooves.



37. Fit the coolant outlet pipe.

1. Fit the outlet pipe to the bypass hose and to the cylinder heads.
2. Fit the four bolts which secure the outlet pipe.

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38. Connect the hoses and multi-plug to the coolant outlet pipe.

1. Connect the heater hose and reposition the hose clip.

2. Connect the multi-plug to the temperature sensor.

3. Expand and reposition the hose clip along the bypass hose.

39. Fit the Inlet Manifold. Refer to Operation 30.15.01 in this Section. This operation includes refitting the throttle housing.

40. Fit the Timing Cover. Refer to Operation <<12.65.01>> in this Section. This operation includes fitting the top hose, refilling the coolant and refitting the cam covers.

41. Move the engine compartment cover from the service position and connect the gas struts.

42. Remove the paint protection sheets and close the cover.

43. Connect the battery and fit the battery cover.

- Refer to the Battery Reconnection Procedure <<86.15.15>>.



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