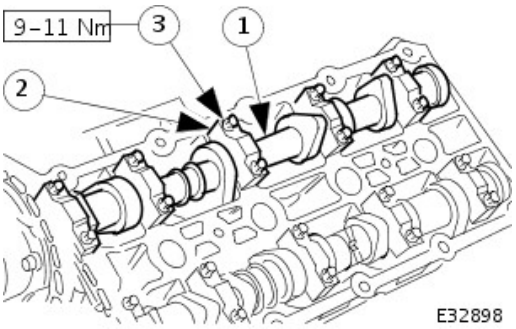
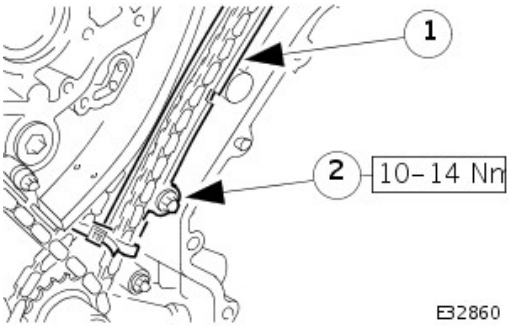


2. Install the camshaft caps to their respective locations (inlet 0 to 4 and exhaust 5 to 9 from the front) and in the correct orientation (arrow to front of engine).

3. Install and tighten the cap securing bolts. Tighten evenly, in stages, to 10 Nm.

19. Install the camshaft locking tool 303 - 530, align the camshafts as necessary.

20. Install the chain guide.

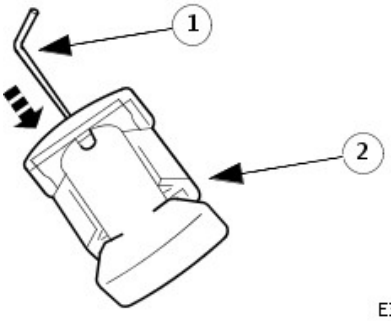


- The chain guide must be installed so that the slotted hole is towards the top, and the raised shoulder to the cylinder block.

1. Install the chain guide to the block and locate it onto the upper retaining pin.

2. Install the retaining bolt and tighten it to 12 Nm.

21. Push the secondary chain tensioner piston into the body to provide clearance for installing the chain.

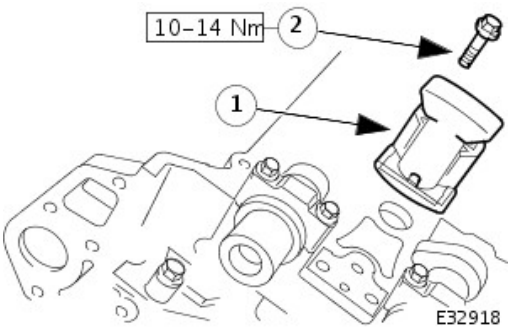


1. Insert a thin rigid wire through the hole in the end of the tensioner piston to displace the ball from the non-return valve seat.

2. With the wire in position, press the piston fully into the tensioner body.

- Remove the wire.

22. Install the secondary chain tensioner to the engine.

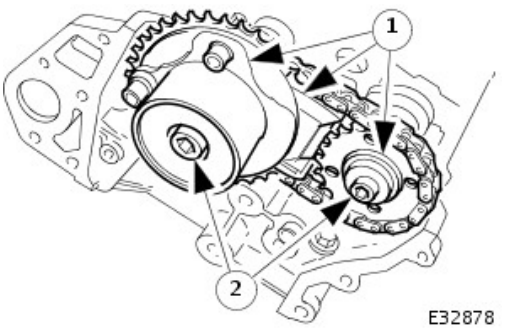


1. Fully seat the tensioner to the cylinder head.

2. Install the two bolts which secure the tensioner and tighten to 12 Nm.

23. NOTE: Assemble the VVT unit, the exhaust camshaft sprocket and the secondary chain, in preparation for installing to the engine.

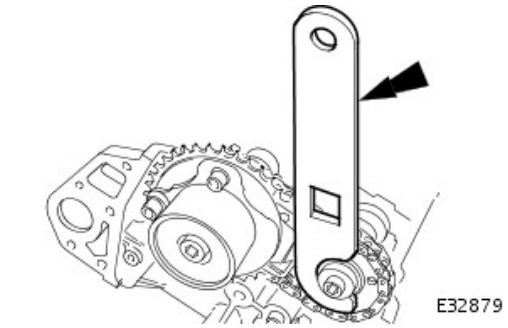
Install the VVT unit to the engine.



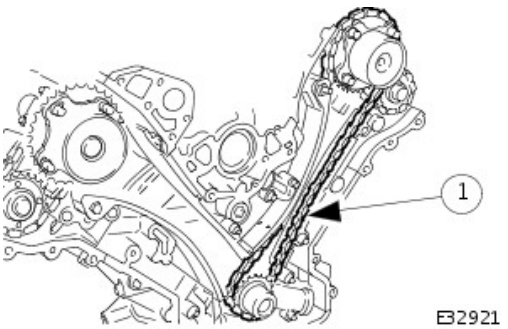
1. Install the above assembly to the camshafts with the chain correctly positioned over the tensioner; VVT unit to the inlet and the sprocket to the exhaust.

2. Install, but do not tighten, each bolt which secures the VVT unit and the exhaust sprocket to the camshafts.

24. Install the chain tensioning tool 303 - 532 to the exhaust camshaft sprocket.



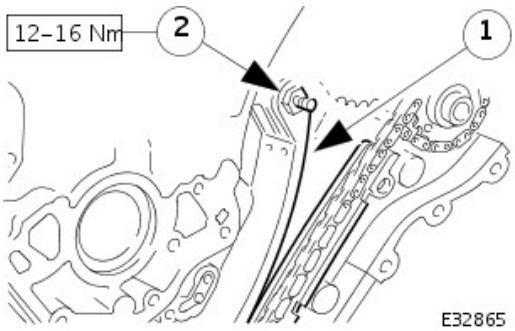
- Reposition the sprocket (and the VVT unit) for the most advantageous position for use of the tool.
- Remove the tool.



25. Install the primary timing chain.

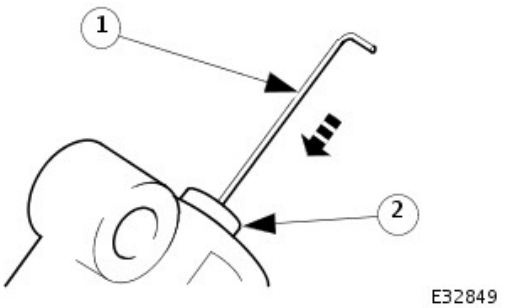
- Reposition the VVT unit forwards on the cam journal (do not rotate it) to allow the chain to clear the head casting. Disconnect the primary chain from the Ty-strap.

1. Install 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.



26. Install the primary chain tensioner blade.

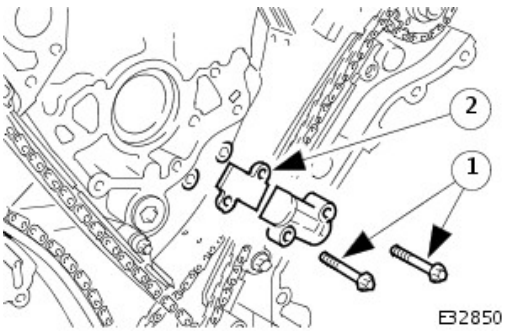
1. Position the tensioner blade to the cylinder block.
2. Install the retaining / pivot bolt and tighten it to 14 Nm.



27. Push the primary chain tensioner piston into the body to provide clearance for installing.

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.

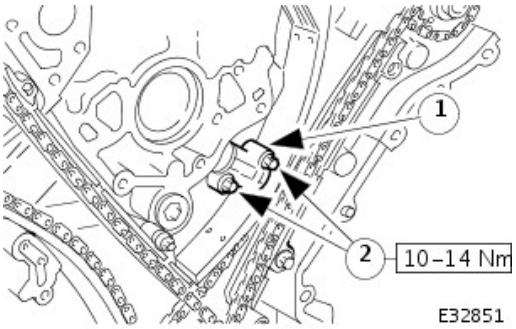


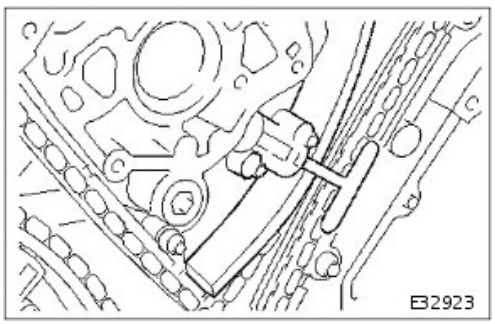
28. Assemble the tensioner.

1. Install the two mounting bolts to the tensioner.
2. Locate the tensioner back-plate to the two bolts.

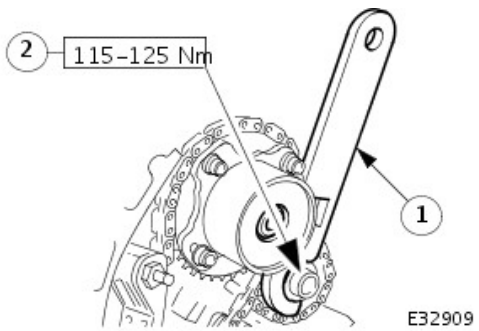
29. Install the tensioner to the cylinder block.

1. Position and align the tensioner to the cylinder block and to the mating slot on the rear face of the tensioner blade.
2. Install and tighten the two bolts to 12 Nm.





30. 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.



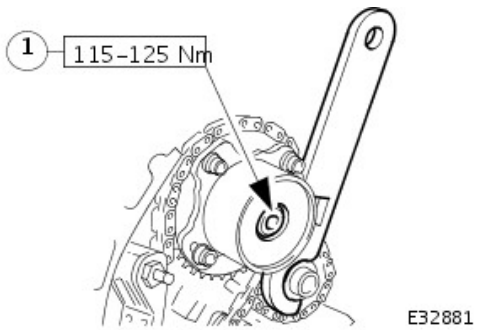
31. CAUTION: Make sure that a new bolt is installed.

Tighten the exhaust camshaft sprocket securing bolt.

1. Install 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 20 Nm +90°.



32. CAUTION: Make sure that a new bolt is installed.

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 20Nm +90°.

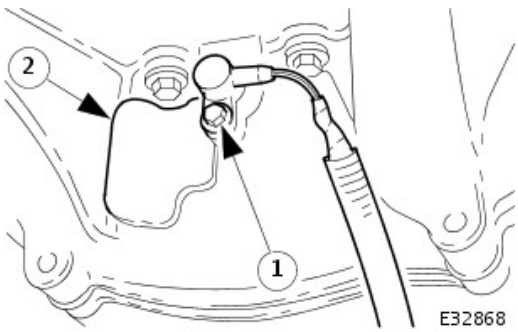
- Remove the chain tensioning tool and the wedge(s).

33. Remove the camshaft locking tool 303 - 530.

34. Raise the vehicle on the ramp.

35. Remove the crankshaft setting tool 303 - 531.

36. Install the crankshaft position sensor.

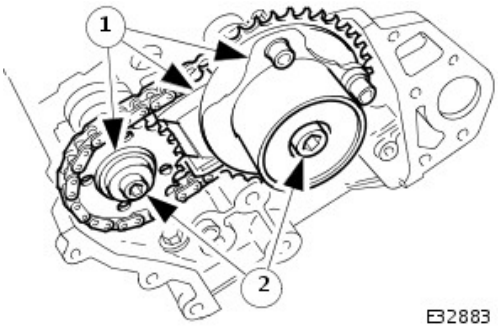


1. Install the sensor to the flywheel housing and install the securing bolt. Tighten to 10 Nm.

2. Install the access grommet to the housing.

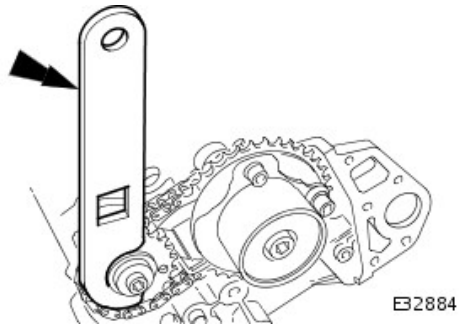
37. Lower the ramp.

38. Install and tighten the nuts which secure the exhaust manifold to the



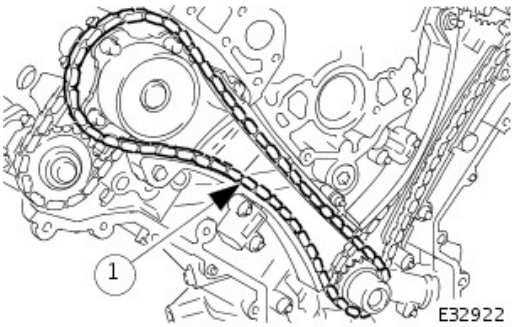
secondary chain, in preparation for installing to the engine.

1. Install 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. Install, but do not tighten, each bolt which secures the VVT unit and the exhaust sprocket to the camshafts.



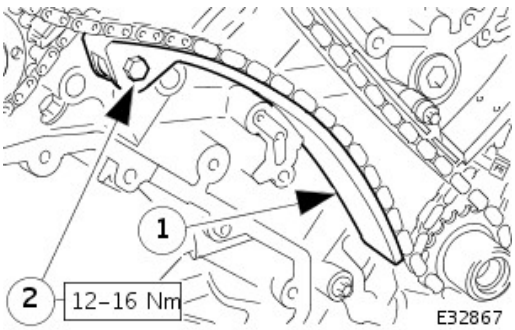
23. Install the chain tensioning tool 303 - 532 to the exhaust camshaft sprocket.

- Reposition the sprocket (and the VVT unit) for the most advantageous position for use of the tool.
- Remove the tool.



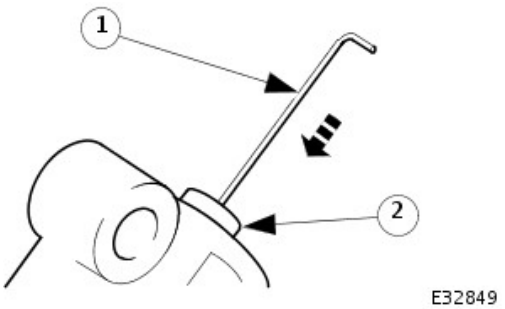
24. Install the primary timing chain.

1. Install 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.



25. Install the primary chain tensioner blade.

1. Position the tensioner blade to the cylinder block.
2. Install the retaining / pivot bolt and tighten it to 14 Nm.



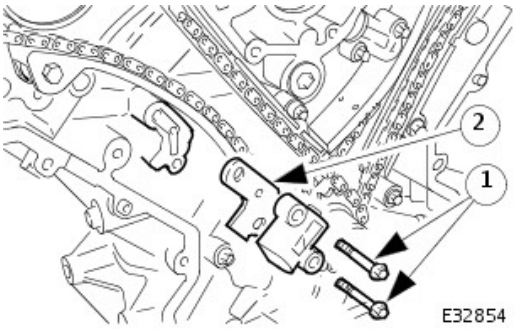
26. Push the primary chain tensioner piston into the body to provide clearance for installing.

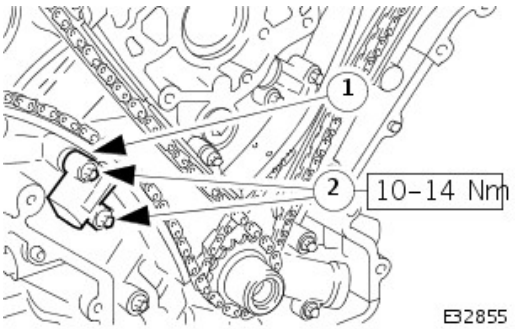
1. Insert a thin rigid wire through the hole in the end of the tensioner piston to displace the ball from the non-return valve seat.
2. With the wire in position, press the piston fully into the tensioner body.

- Remove the wire.

27. Assemble the tensioner.

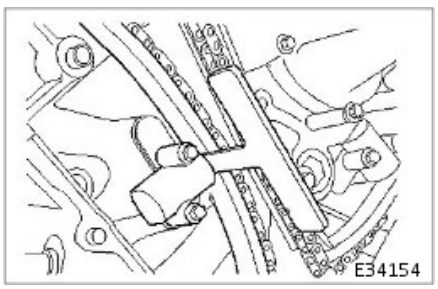
1. Install the two mounting bolts to the tensioner.
2. Locate the tensioner back-plate to the two bolts.



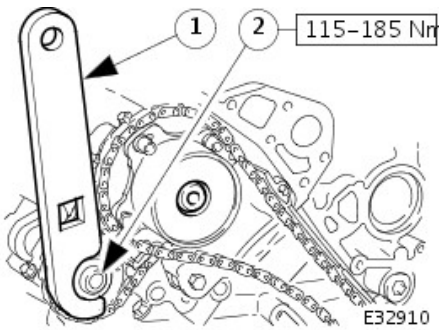


28. Install the tensioner to the cylinder block.

1. Position and align the tensioner to the cylinder block and to the mating slot on the rear face of the tensioner blade.
2. Install and tighten the two bolts to 12 Nm.



29. 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.



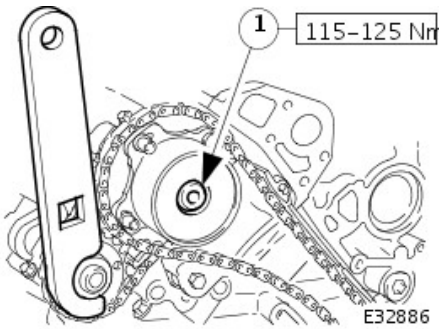
30. CAUTION: Make sure that a new bolt is installed.

Tighten the exhaust camshaft sprocket securing bolt.

1. Instal 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 20 Nm + 90°.



31. CAUTION: Make sure that a new bolt is installed.

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 20 Nm + 90°.

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

32. Remove the camshaft locking tool 303 - 530.

33. Raise the vehicle on the ramp.

34. Remove the crankshaft setting tool 303 - 531.

35. Install the crankshaft position sensor.

1. Install the sensor to the flywheel housing and Install the securing bolt. Tighten to 10 Nm.