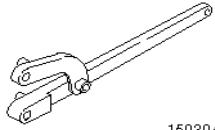


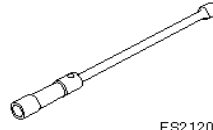
Camshaft - Remove and Install (21 283 0)

Special Tools



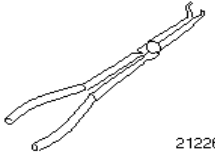
15030A

15-030 A Universal flange holding wrench



ES21202

21-202 Socket wrench, spark plugs



21226

21-226 Pliers, spark plug connectors

Materials

Spark plug lubricant 'Never-Seeze'	ESE-M1244-A
Coolant	ESD-M97B-49A
Engine oil	Refer to General Specifications
Cable ties	
Silicone grease	A960-M1C171-AA

Remove

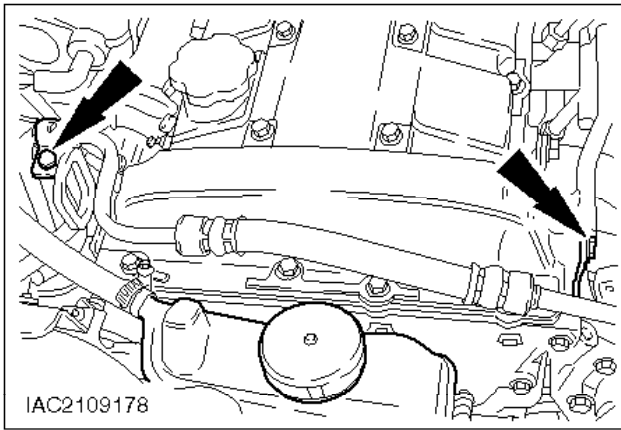
1. Standard preparatory measures.
 - Make a note of the radio keycode.
 - Make a note of the pre-set radio stations.



CAUTION:

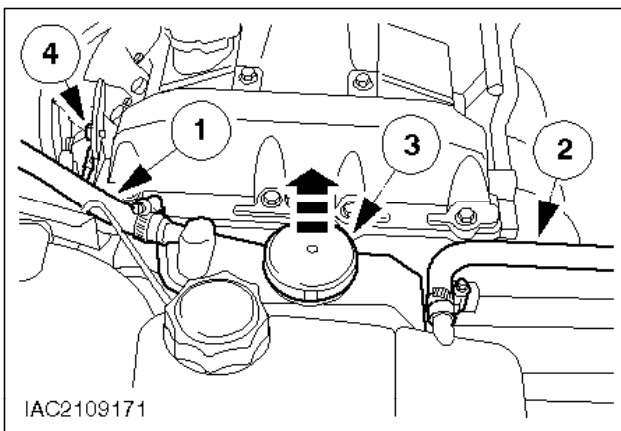
Disconnect the battery negative lead.

- Cut the cable ties where necessary and renew them on installation.
- Lay protective coverings on the fenders.
- Open the coolant expansion tank.
- Raise the vehicle.
- Drain off the coolant via the radiator drain plug and refit the drain plug.
- Lower the vehicle.



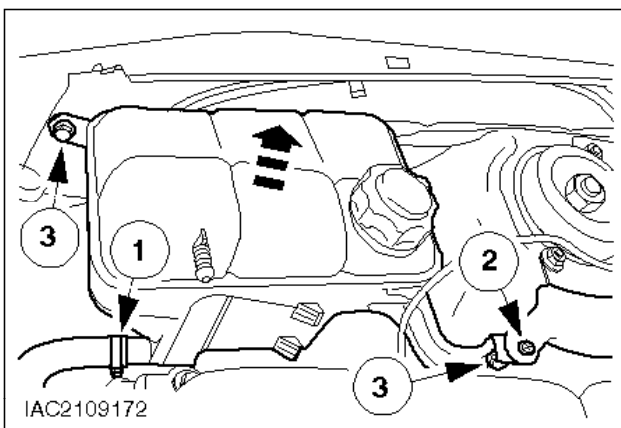
Only vehicles with air conditioning.

- Ⓒ 2. Detach the power steering pipe.



- Ⓒ 3. Detach the power steering reservoir.

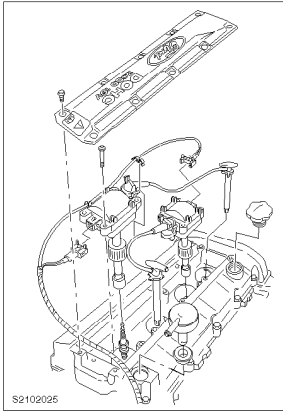
- 1 Disconnect the upper hydraulic hose from the power steering reservoir.
- 2 Disconnect the coolant hose from the coolant expansion tank.
- 3 Lift out the power steering reservoir and place to one side.
- 4 Detach the ground cable.



- Ⓒ 4. Remove the coolant expansion tank.

- 1 Detach the lower coolant hose from the expansion tank.
- 2 Detach the bracket for the manifold absolute pressure sensor (MAP sensor).

- 3 Detach the expansion tank.
Remove the expansion tank.



CAUTION:

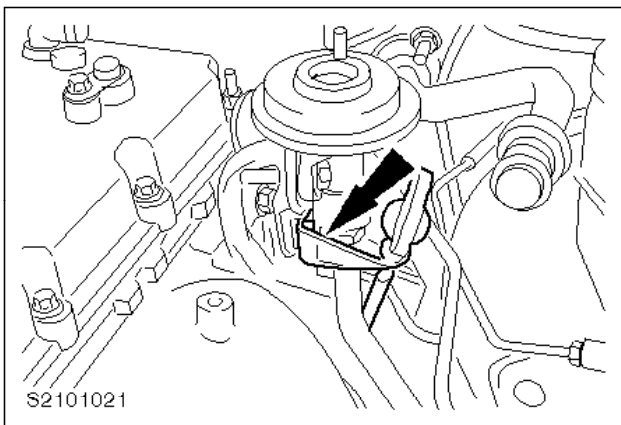
Do not pull on the cable when unplugging the spark plug connectors. If necessary disconnect the ignition cables from the ignition coil to prevent kinking of the cables. Slightly twist the spark plug connectors before pulling them off in order to release the seals.



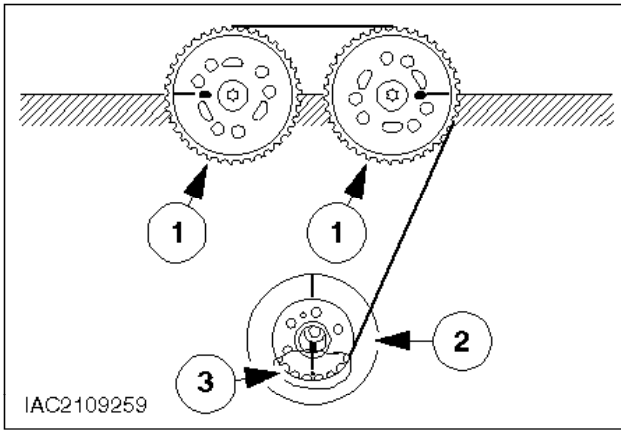
CAUTION:

Pull off the spark plug connectors in a straight line with the axis of the spark plug (use Special Tool 21-226 for angled spark plug connectors).

5. Remove the cylinder head cover.
 - Detach the cover from the cylinder head cover.
 - Disconnect the plugs from the ignition coils and remove the engine wiring loom.
 - Remove the ignition coils and the spark plug connectors.
 - Remove the spark plugs using special tool 21-202.
 - Disconnect the positive crankcase ventilation.
 - Detach the cylinder head cover (11 bolts and 4 nuts).

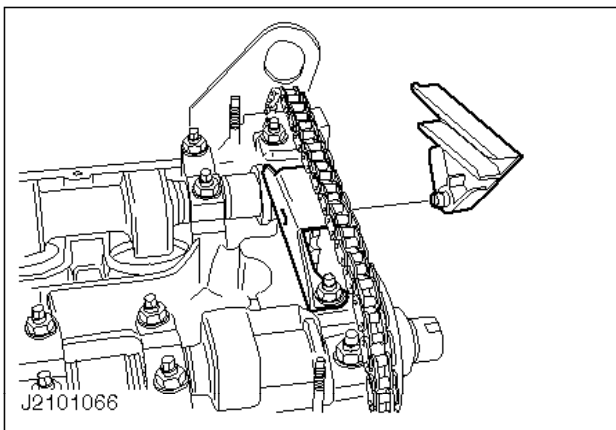


6. Detach the upper timing chain cover (7 bolts).



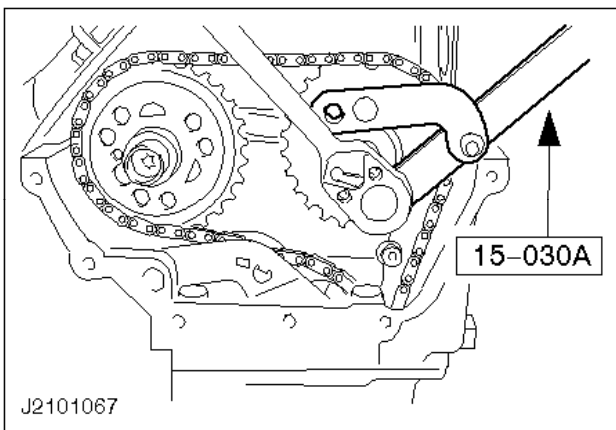
7. Set the camshaft sprockets to the mark.

- 1 Position - camshaft sprockets
- 2 Timing Chain
- 3 Position - crankshaft



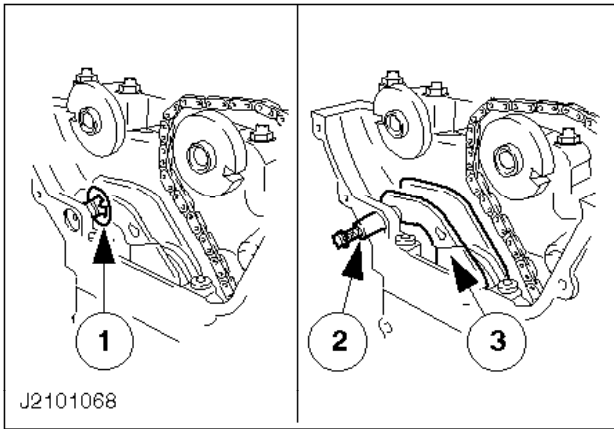
Note:
The chain guide must be renewed on installation.

8. Detach the chain guide rail.



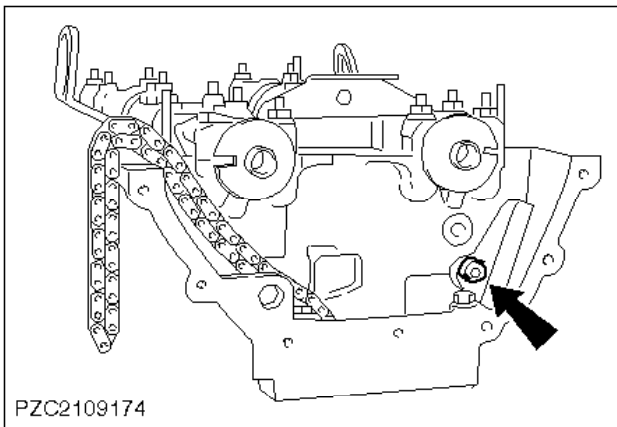
Note:
Counterhold with the special tool.

9. Detach the camshaft sprockets.

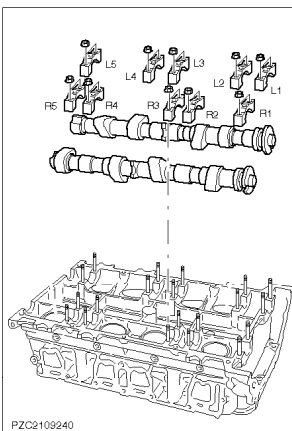


➤ 10. Remove the chain tensioning arm.

- 1 Pull off the circlip using pliers.
- 2 Pull out the chain tensioner pivot pin using a bolt (M6).
- 3 Remove the chain tensioning arm from the housing.

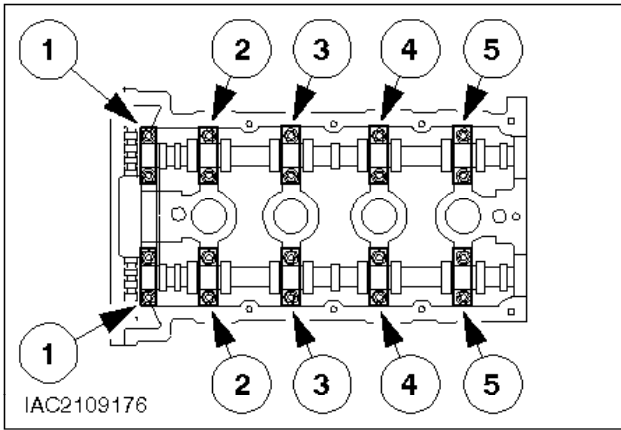


➤ 11. Unscrew the upper bolt of the chain guide.



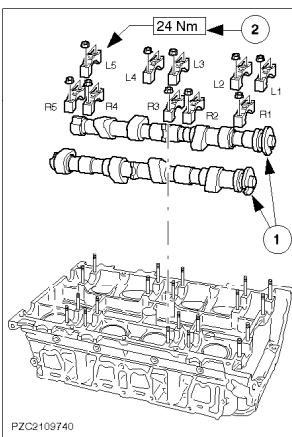
➤ 12. Remove the camshafts.

Detach the bracket for the chain guide rail with the front bearing caps.



Install

- 13. Tightening sequence for camshaft bearing caps.



- 14. Install the camshafts.



CAUTION:

Before installing the camshafts, the piston of cylinder no. 1 must be set to approx. 25 mm before TDC.



CAUTION:

After the camshafts have been installed, wait 15 minutes before cranking the engine.

- Oil the bearings.
- 1 Fit the camshafts so that none of the cams is at full lift.

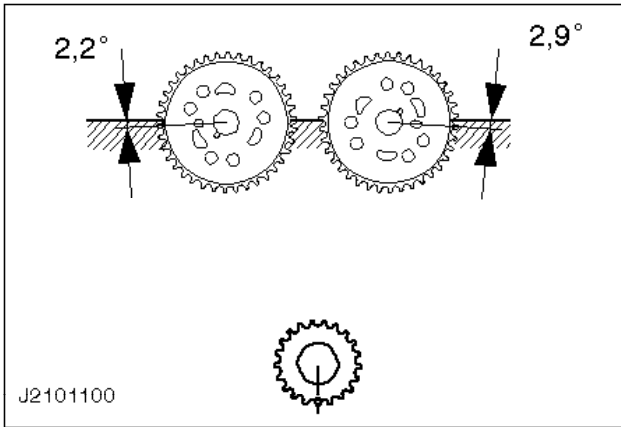
Note:

R is the inlet side and L is the exhaust side.

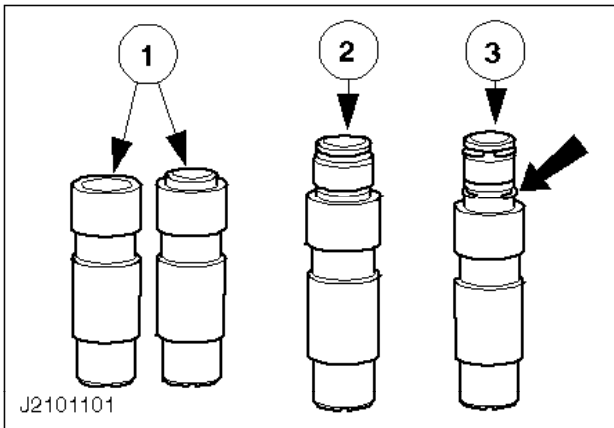
Note:

Follow the tightening sequence from the previous step.

- 2 Fit the camshaft bearing caps so that the position marks can be seen from behind.
- Attach the chain guide bracket with the front bearing caps.



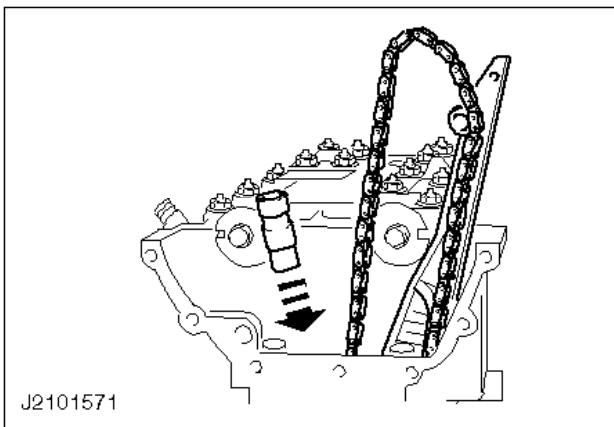
15. Turn the camshafts and crankshaft to TDC.



CAUTION:

Fully and partially released chain tensioner hydraulic plungers (new or used) must not be installed.

16. Check the new chain tensioner hydraulic plunger.
- 1 Chain tensioner hydraulic plunger latched.
 - 2 Chain tensioner hydraulic plunger partially released.
 - 3 Chain tensioner hydraulic plunger fully released (the detent ring is visible).





CAUTION:

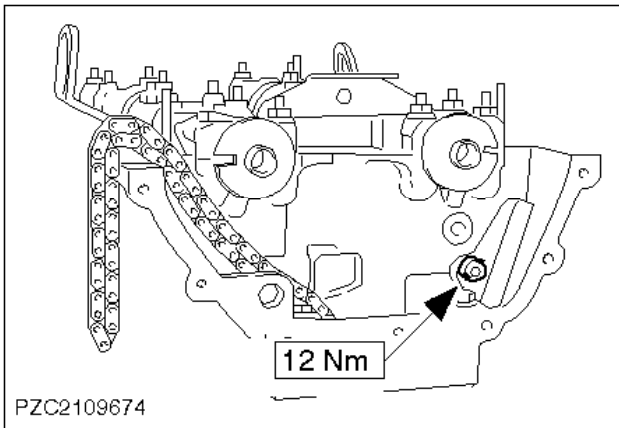
Only use a new, latched chain tensioner hydraulic plunger.

- ☛ 17. Install the chain tensioner hydraulic plunger.

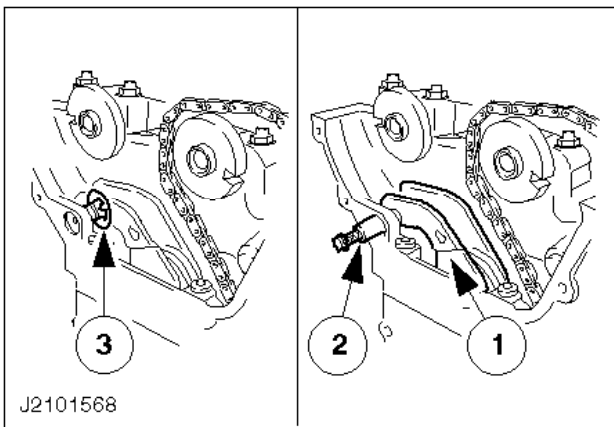
Note:

Do not tighten the chain guide.

18. Fit the timing chain with the chain guide.

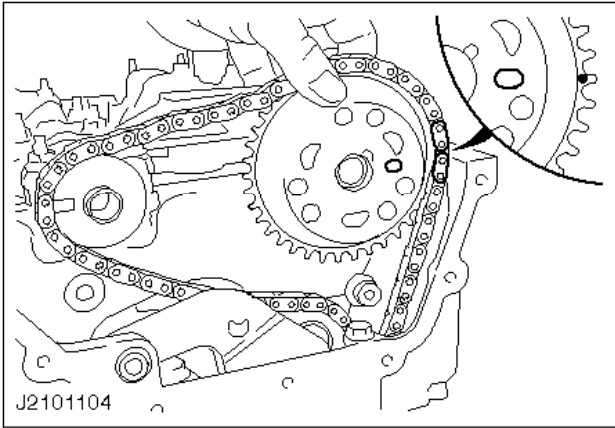


- ☛ 19. Screw in the upper chain guide bolt.



- ☛ 20. Install the chain tensioner.

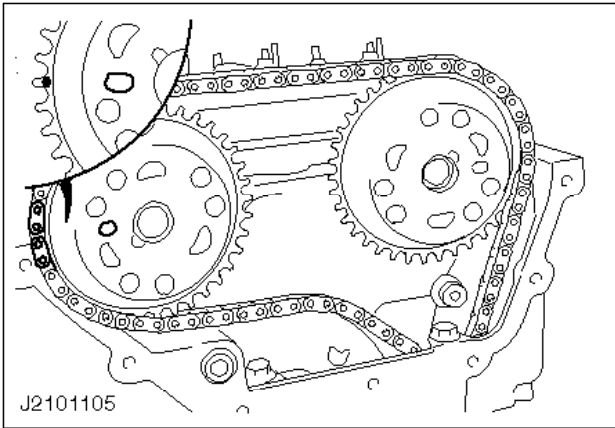
- 1 Fit the chain tensioner.
- 2 Fit the pivot pin.
- 3 Fit the circlip.



Note:

The timing chain must be taut on the long side. If necessary, turn the camshaft slightly.

- 21. Fit the timing chain at the top.

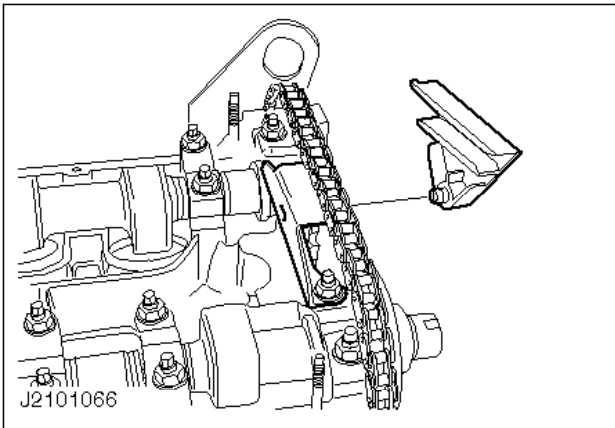


Note:

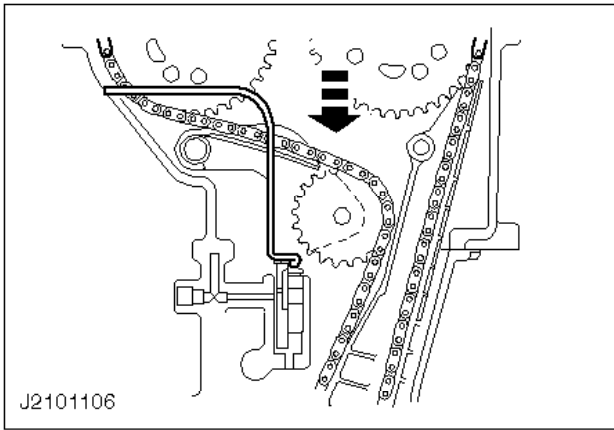
The timing chain may hang down slightly between the camshaft sprockets.

- 22. Fit the timing chain at the top (continued).

Screw in the bolts of the camshaft sprockets (do not tighten the bolts).



- 23. Attach the new chain guide rail to the bracket.

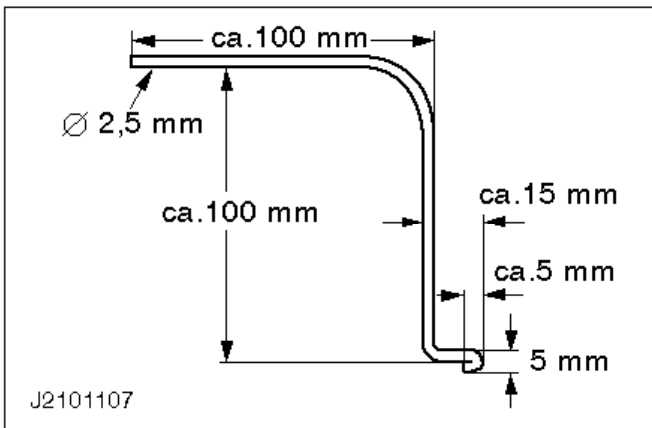


24. Relax the tappet of the chain tensioner.

Note:

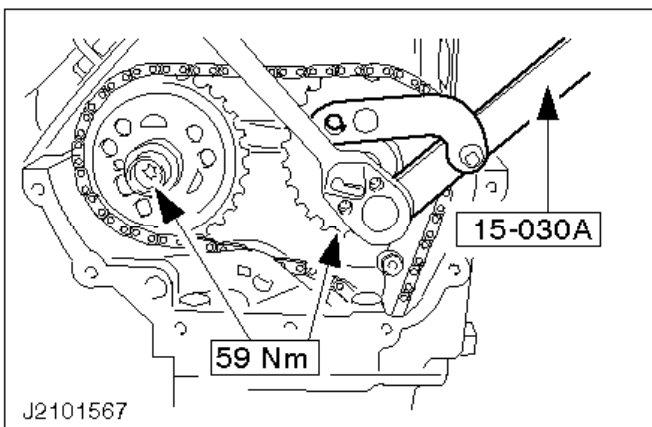
If the chain tensioner mounting does not reach the tappet, the tappet must be relaxed using an auxiliary tool.

Press down the chain tensioning arm manually and release the tappet.



25. Make the auxiliary tool.

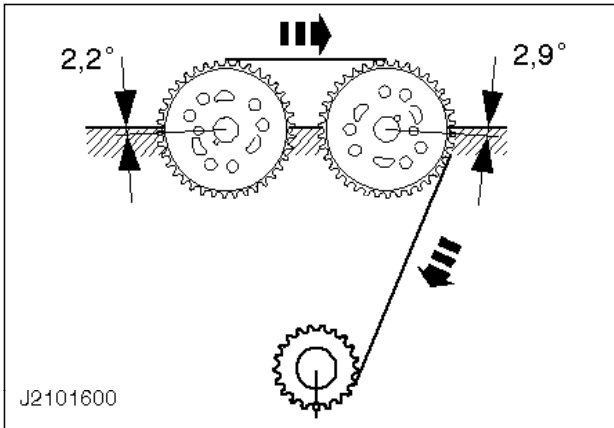
Use a piece of 2,5 mm welding rod approx. 220 mm in length.



Note:

Counterhold with the special tool.

- ⌚ 26. Tighten the camshaft sprockets.

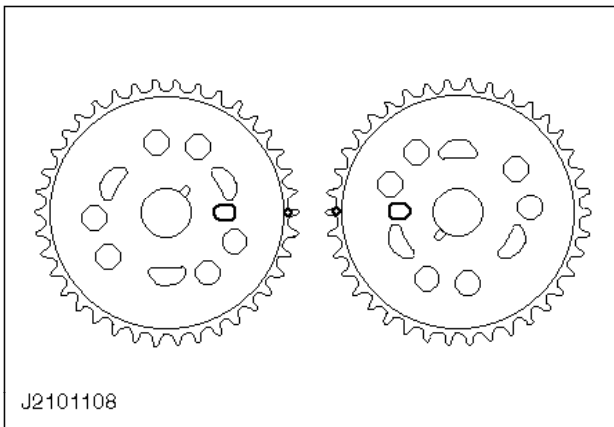


Note:

If it is necessary to correct the valve timings, i.e. the timing chain has to be released, a new chain tensioner hydraulic plunger must be fitted.

- ⌚ 27. Check the valve timings.

Crank the engine in the normal direction of rotation and set it to the mark.

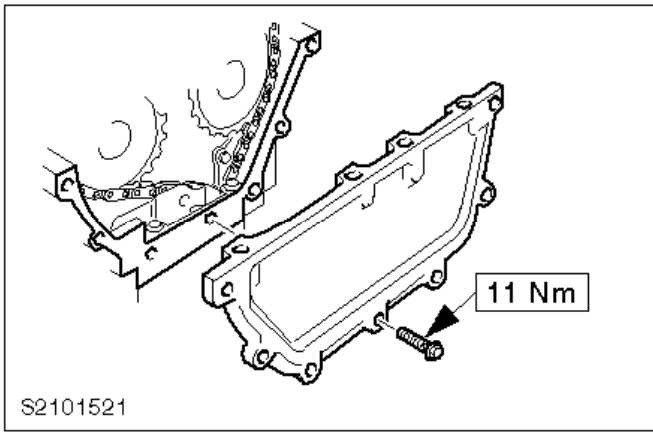


Note:

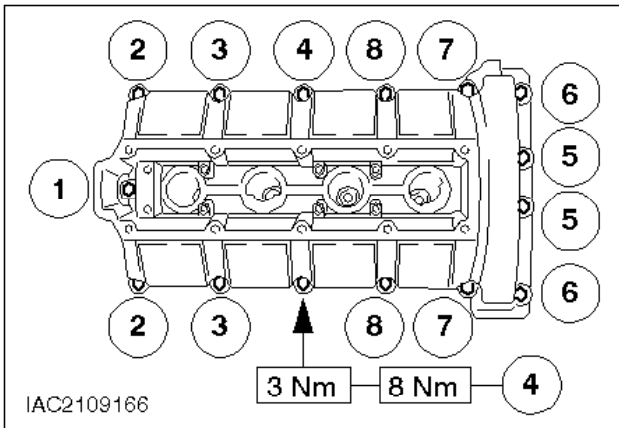
The marks on the camshaft sprockets must line up level with the top edge of the cylinder head.

- ⌚ 28. Check the valve timings (continued).

Turn the engine in the normal direction of rotation to the next TDC.



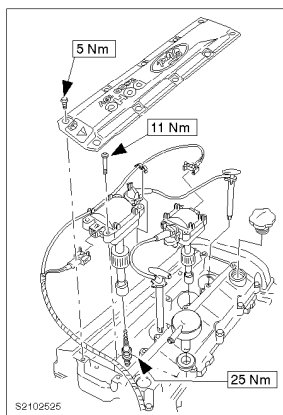
- 29. Attach the upper timing chain cover (7 bolts).



Note:

Tighten the bolts in the specified order.

- 30. Install the cylinder head cover.



CAUTION:

Use a blunt object to apply the silicone grease (e.g. a plastic cable tie) to avoid damaging the spark plug connector seal.



CAUTION:

Push on the spark plug connectors in a straight line with the axis of the spark plug.

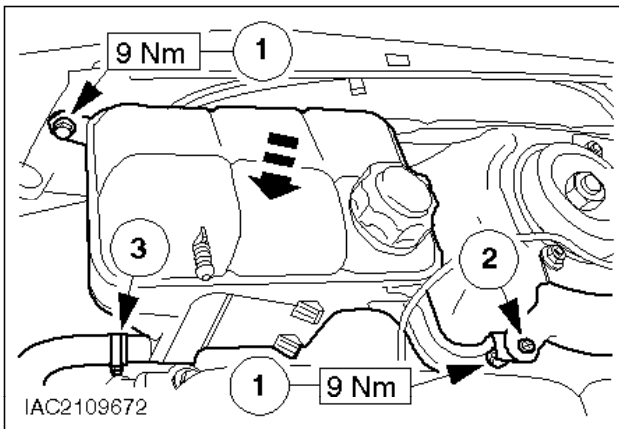
Note:

Coat the inside of the spark plug connectors to a depth of 5-10 mm with silicone grease (A960-M1C171-AA).

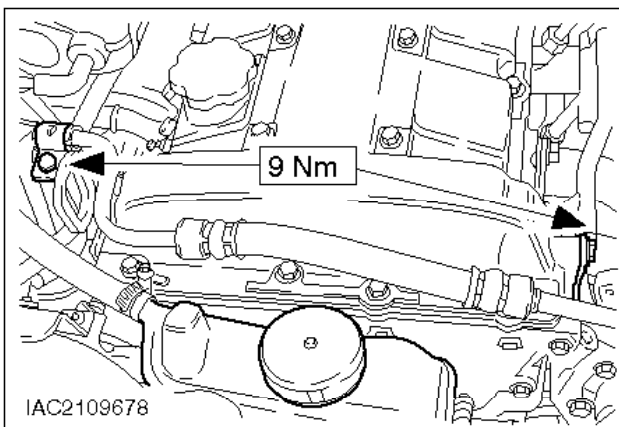
Note:

Apply lubricant 'Never Seize' (ESE-M1244-A) to the spark plug thread.

- ☛ 31. Fit the cover to the cylinder head cover.
- Connect the positive crankcase ventilation.
 - Install the spark plugs using special tool 21-202.
 - Install the ignition coils and spark plug connectors.
 - Lay the engine wiring loom in the cylinder head cover and connect the ignition coil plugs.
 - Attach the cover to the cylinder head cover.

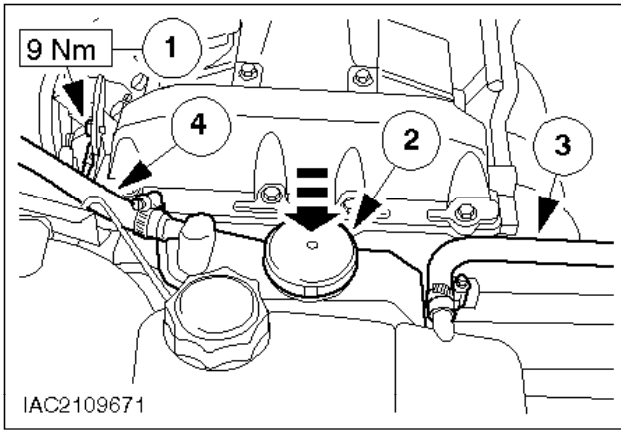


- ☛ 32. Install the coolant expansion tank.
- 1 Attach the expansion tank.
 - 2 Attach the bracket of the MAP sensor.
 - 3 Attach the lower coolant hose to the coolant expansion tank.



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- ☛ 33. Attach the power steering pipes.



⌚ 34. Fit the power steering reservoir.

- 1 Attach the ground cable.
- 2 Slide the power steering reservoir onto the coolant expansion tank.
- 3 Attach the coolant hose to the coolant expansion tank.
- 4 Connect the upper hose to the power steering reservoir.

35. Standard finishing operations.

- Top up with coolant (ESD-M97B-49A).
 - Connect the battery negative lead.
 - Check the fluid levels and rectify as necessary.
 - Check the routing of vacuum hoses and wiring and secure with cable ties.
 - Remove the protective coverings.
 - Enter the radio keycode.
 - Reprogram the radio stations.
 - Adjust the clock.
 - Carry out a road test to enable the PCM to collect data.
-