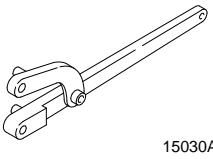
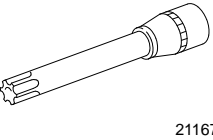
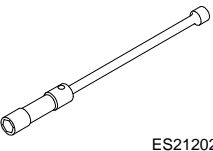
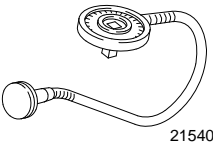
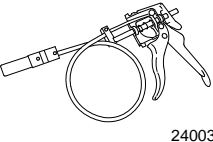


Cylinder Head – Remove and Install (21 163 0)

Special Tools

	15-030A Universal flange-holding wrench
	21-167 Wrench for cylinder head bolts
	21-202 Socket, spark plugs
	21-540 Bolt tightening angle gauge
	24-003 Remover/installer, cooling hose clamp

Proprietary Tools

Steel straight edge (at least 500 mm long and 5 mm wide)
Depth gauge
Brass drift
Feeler gauge

Materials

Lubricant (Never-Seeze)	ESE-M1244-A
Bolt M6 X 60	

Remove

1. General note.

When removing and installing coolant or breather hoses, if necessary use Remover/Installer 24-003.

2. Preparatory measures.

- Make a note of the radio keycode.
- Make a note of the preset radio stations.
- Detach the battery cover



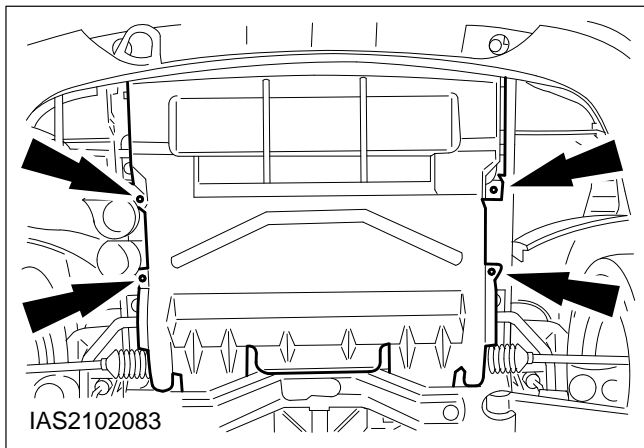
CAUTION: Disconnect the battery earth lead.

Withdraw the automatic transmission dipstick.

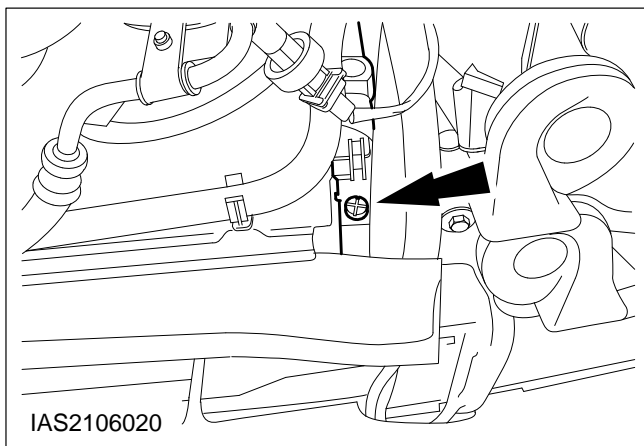


WARNING: There is a risk of scalding when the engine is warm.

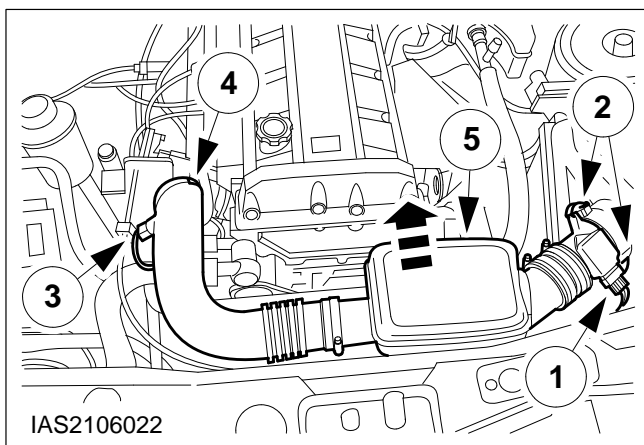
Unscrew the lid from the coolant expansion tank.



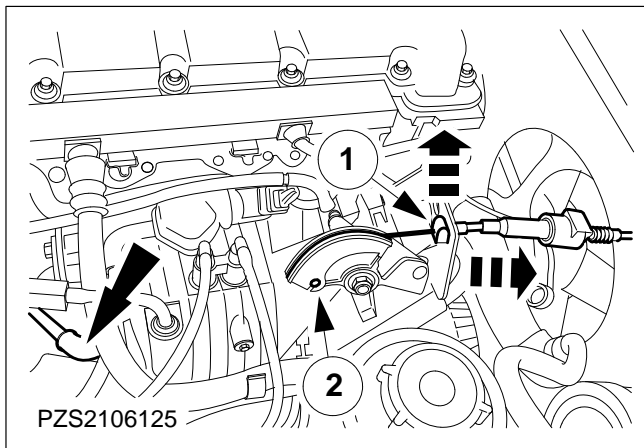
3. Raise the vehicle.
4. Remove the engine undershield.



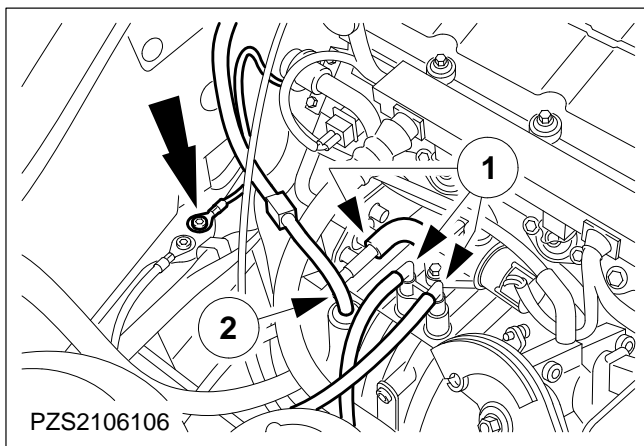
5. Drain off the coolant.



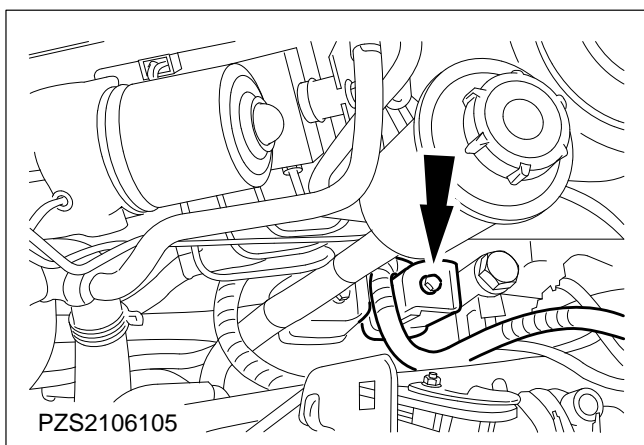
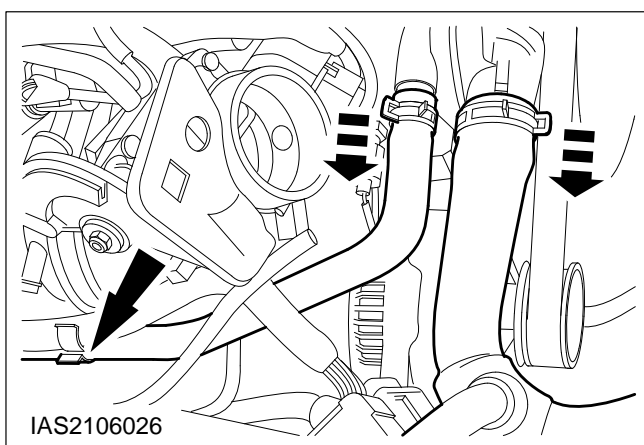
6. Lower the vehicle.
7. Remove the air intake pipe.
 - 1 Disconnect the multiplug from the intake air temperature sensor (IAT sensor).
 - 2 Detach the air intake pipe from the air cleaner housing (two clips).
 - 3 Disconnect the mass air flow (MAF) sensor plug.
 - 4 Detach the air intake pipe.
 - 5 Lift the resonator (push-fit) and remove the air intake pipe complete.

**8. Detach the accelerator cable.**

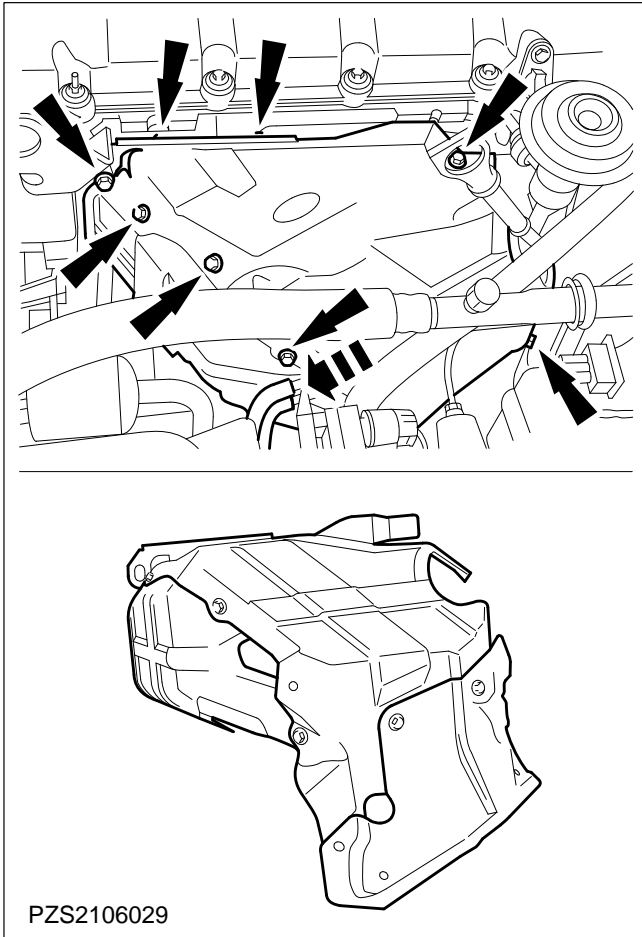
- 1 Pull off the retaining clip from above.
- 2 Unhook the cable.

9. Disconnect the crankcase breather hose.**10. Disconnect the vacuum hoses and vacuum line.**

- 1 Vacuum hoses
- 2 Vacuum line to the brake servo.

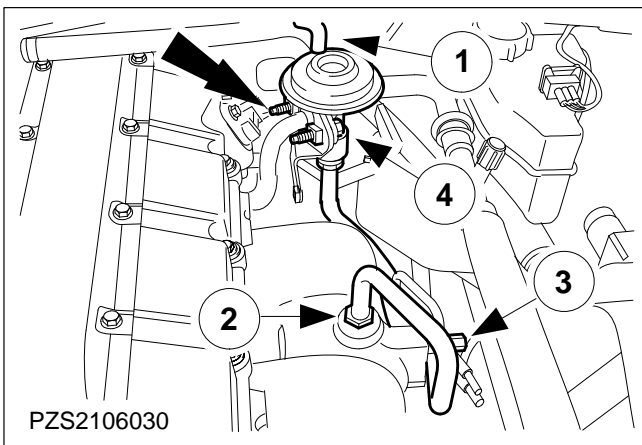
11. Detach the earth lead from the bulkhead.**12. Detach the main wiring loom plug.****13. Detach the coolant hoses from the thermostat housing.**

Unclip the coolant hose.



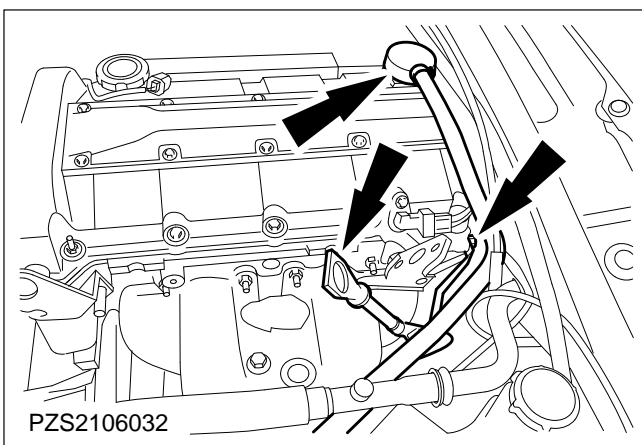
14. Remove the three-part exhaust manifold heatshield.

15. Disconnect the two vacuum hoses.



16. Detach the exhaust gas recirculation valve (EGR valve) and the EGR pipe.

- 1 Disconnect the vacuum hose.
- 2 Detach the EGR pipe.
- 3 Detach the EGR pipe bracket.
- 4 Detach the EGR valve from the bracket.

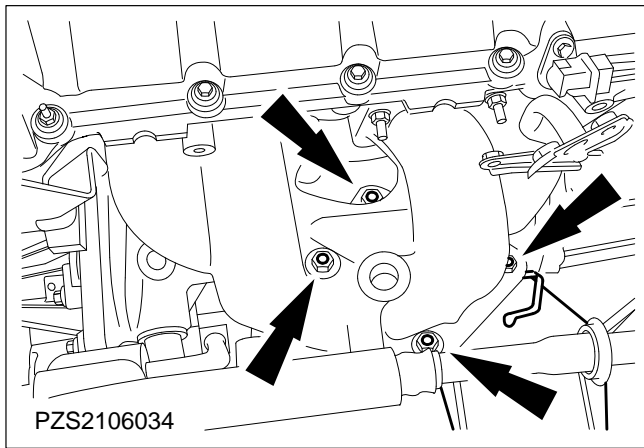


17. Disconnect the valve with the crankcase breather hose and unclip it.

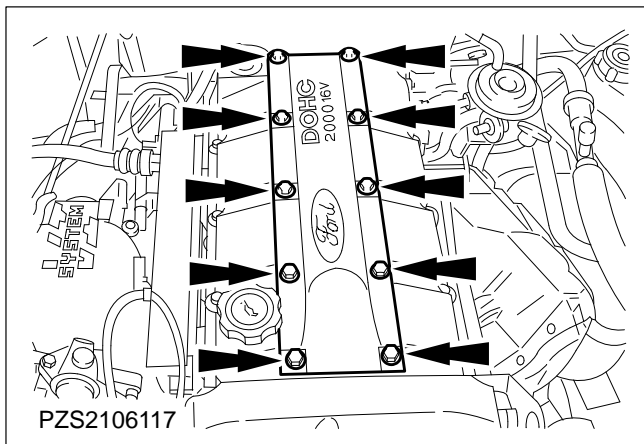
NOTE: Only loosen the bolt.

18. Detach the oil dipstick tube bracket.

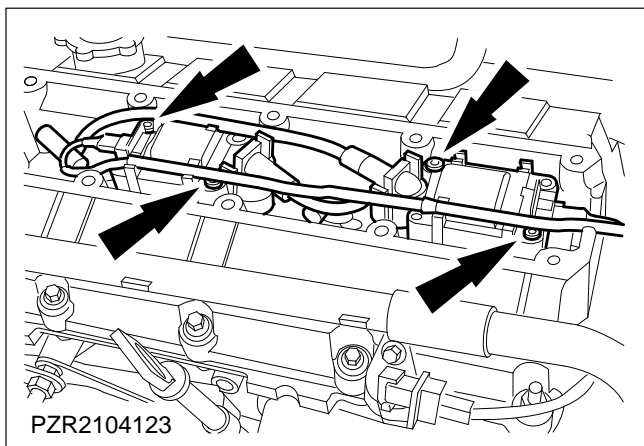
Withdraw the oil dipstick.



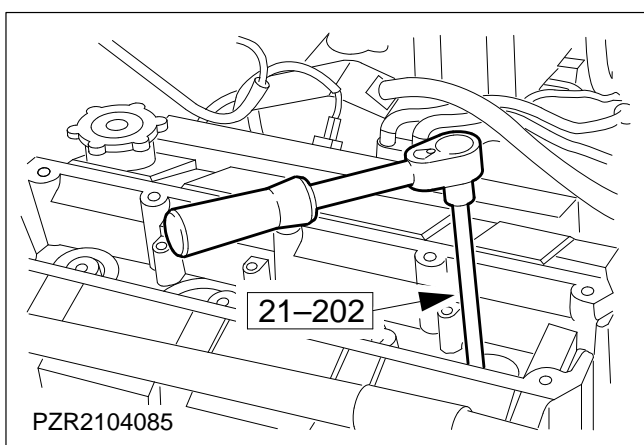
19. Detach the catalytic converter from the exhaust manifold.



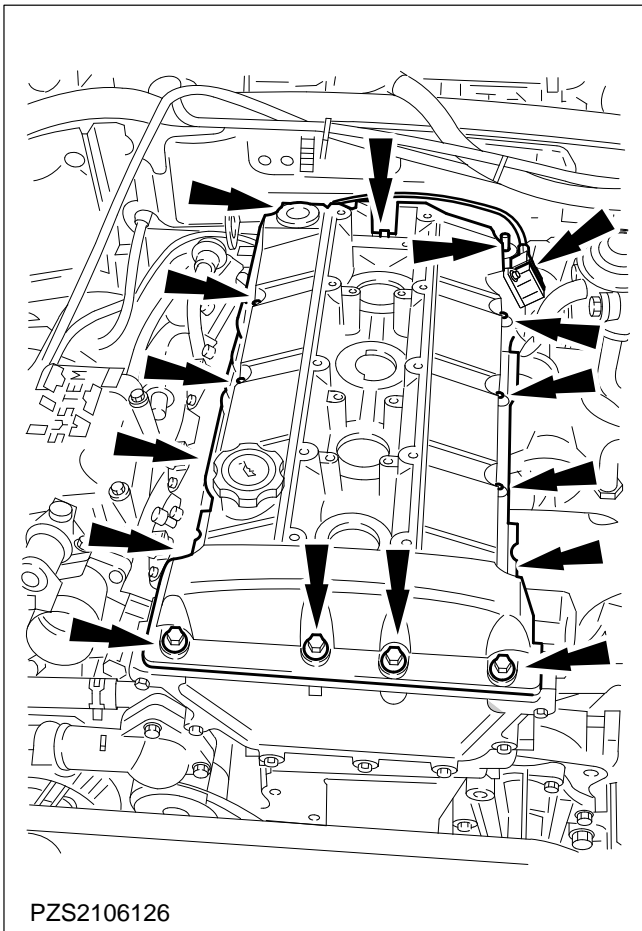
20. Remove the ignition coil cover.



21. Disconnect the spark plug connectors and remove the ignition coils.



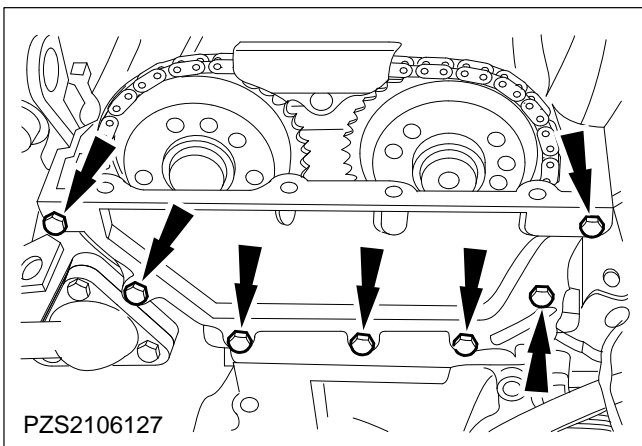
22. Remove the spark plugs.



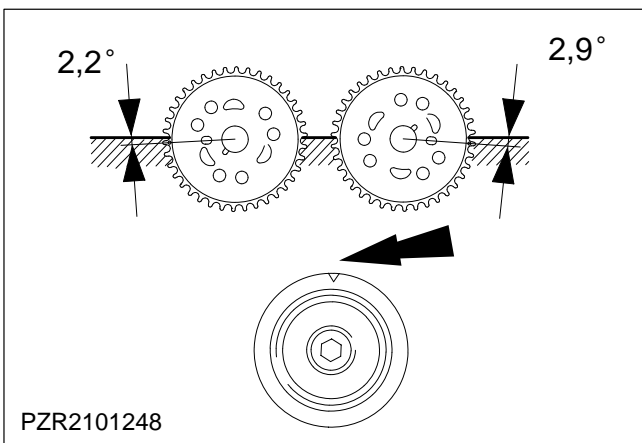
23. Disconnect the plug of the camshaft position sensor (CMP sensor).

24. Remove the cylinder head cover (eleven bolts, four nuts).

Remove the gasket.

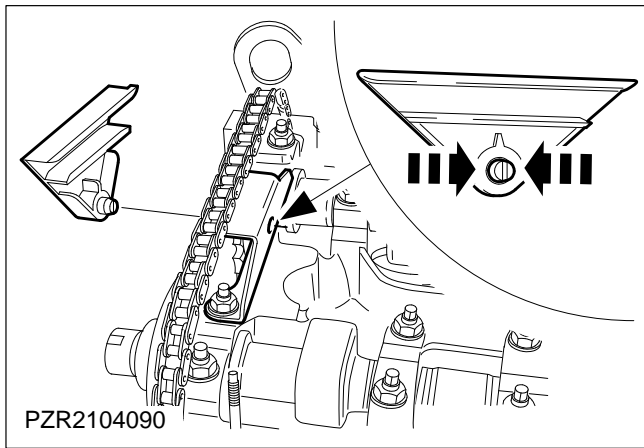


25. Remove the upper timing chain cover.

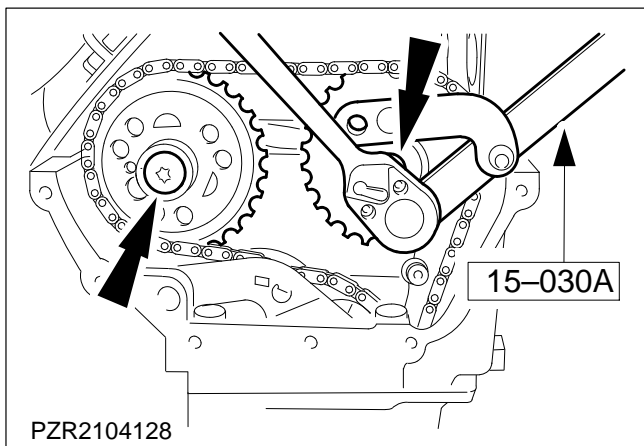


26. Set the crankshaft to the TDC position of cylinder no. 1.

The marking on the crankshaft pulley/vibration damper should lie vertically uppermost.

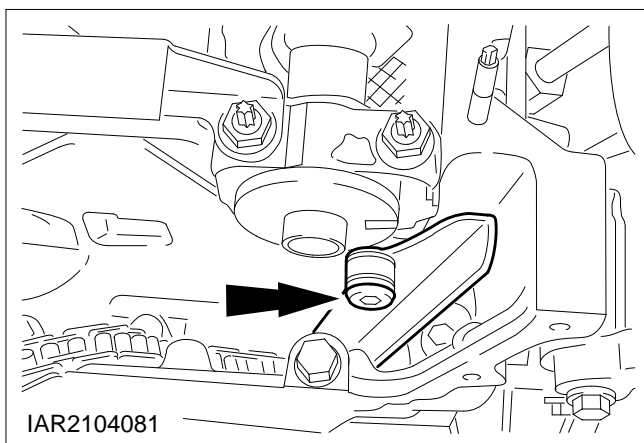


27. Remove the upper chain guide.

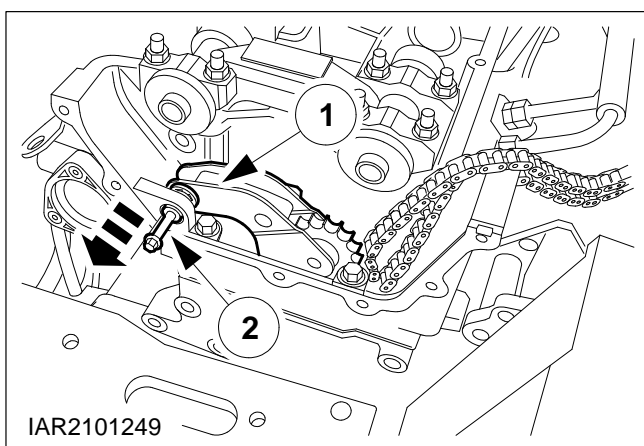


NOTE: Counter hold them to stop them from turning.

28. Remove the camshaft sprockets.



29. Undo the top bolt of the timing chain guide.

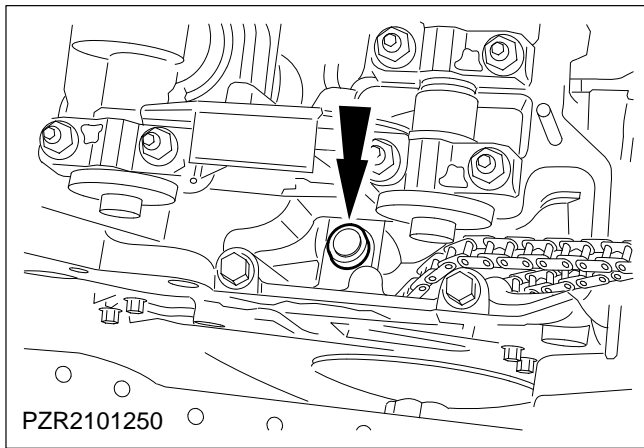


⚠ CAUTION: Secure the lock washer to prevent it from dropping down.

NOTE: Secure the timing chain.

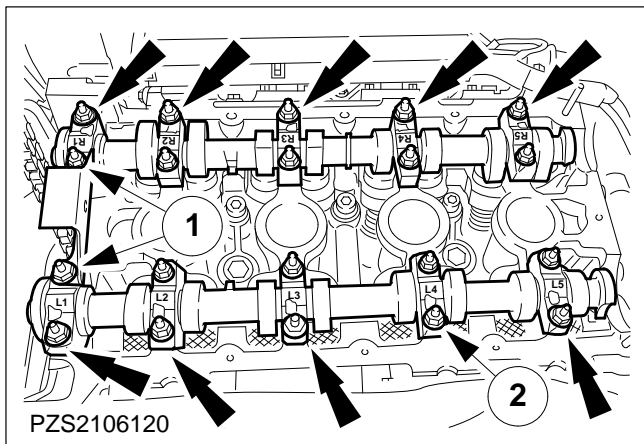
30. Remove the chain tensioner.

- 1 Remove the lock washer.
- 2 Extract the chain tensioner pivot bolt using an M6 x 60 bolt.



CAUTION: Do not re-use the chain tensioner hydraulic plunger.

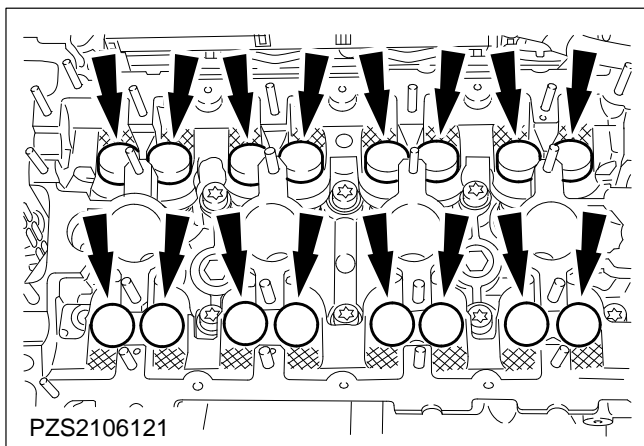
31. Withdraw the chain tensioner hydraulic plunger.



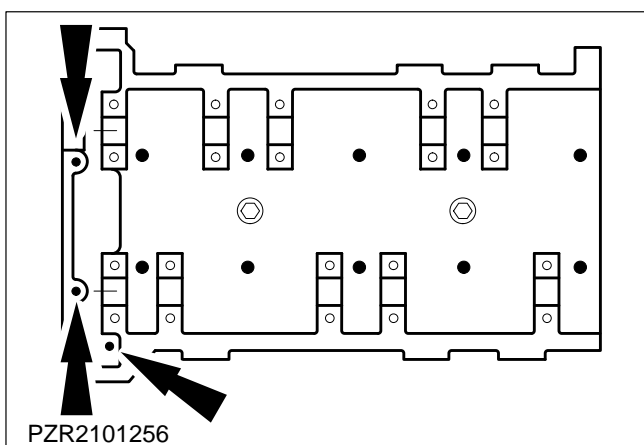
NOTE: Remove the camshaft bearing caps and the camshafts in order.

32. Remove the camshafts.

- 1 Remove the bracket of the timing chain guide.
- 2 Remove the camshaft bearing caps.
Remove the camshafts.

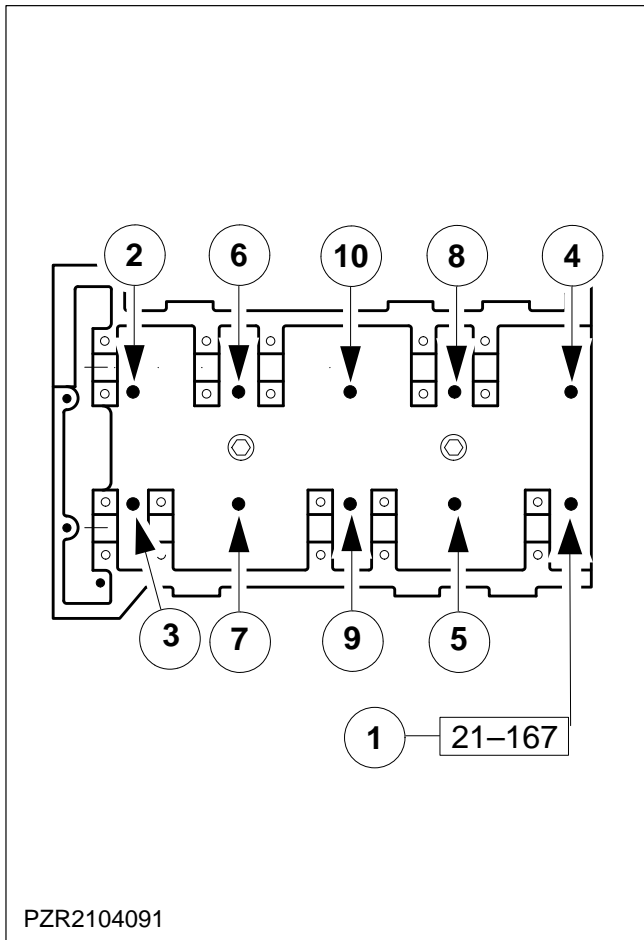


33. Remove the hydraulic tappets.



CAUTION: The cylinder head must be cooled down to at least 30 °C before the bolts are loosened.

34. Remove the three bolts.



CAUTION: Do not reuse the cylinder head bolts.

NOTE: Bolt-slackening sequence.

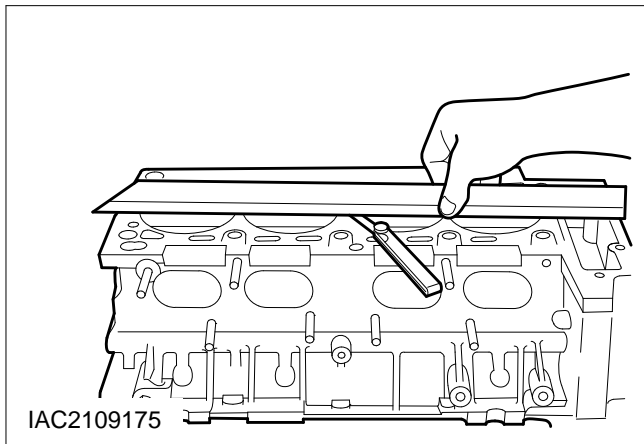
35. Detach the cylinder head.

Remove the gasket.

Install

NOTE: Renew the seals, circlips and self-locking nuts.

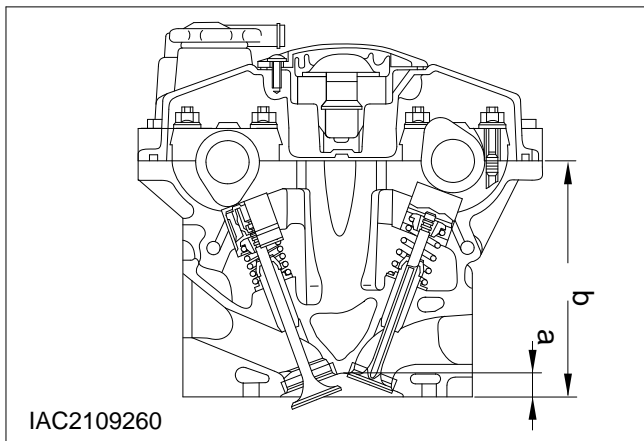
36. Thoroughly clean all mating faces and reusable components and check them for damage.



NOTE: The steel straight edge must be at least 500 mm long and 5 mm wide.

37. Check the cylinder head for distortion.

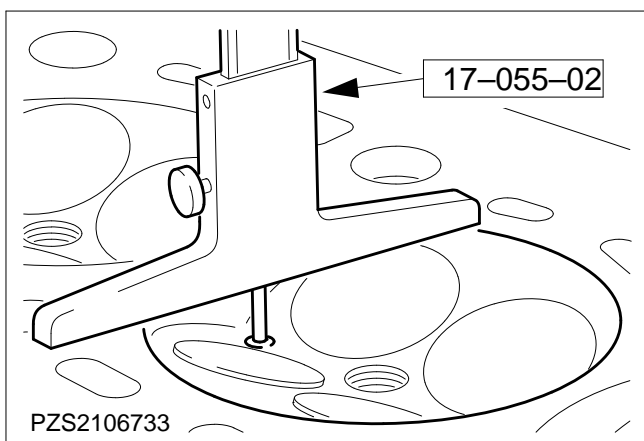
- Maximum allowable distortion over the combustion chamber steps: Across the cylinder head: 0,05 mm. Lengthways and diagonally along the cylinder head: 0,10 mm.
- Lay the steel straight edge across all the combustion chamber steps and check each at three points.
- Lay the steel straight edge lengthways along the cylinder head and check at each combustion chamber step.
- Lay the steel straight edge diagonally along the cylinder head and check at each combustion chamber step.
- If necessary, re-work the cylinder head as described in sub-operation 38.



38. Notes on re-working the cylinder head.

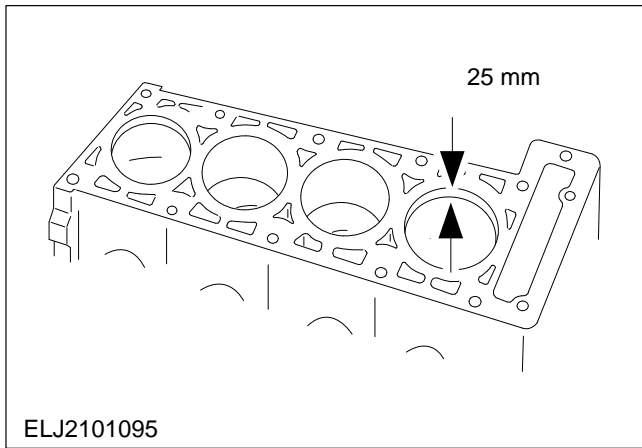
NOTE: Keep the average peak-to-valley height (Rz) at 0,0135 mm on re-working.

Re-work the cylinder head to a maximum of 0,20 mm (by milling or surface grinding). Measurement "a" must not be less than 16,55 mm (see sub-operation 39.) and measurement "b" must not be less than 147,45 mm.

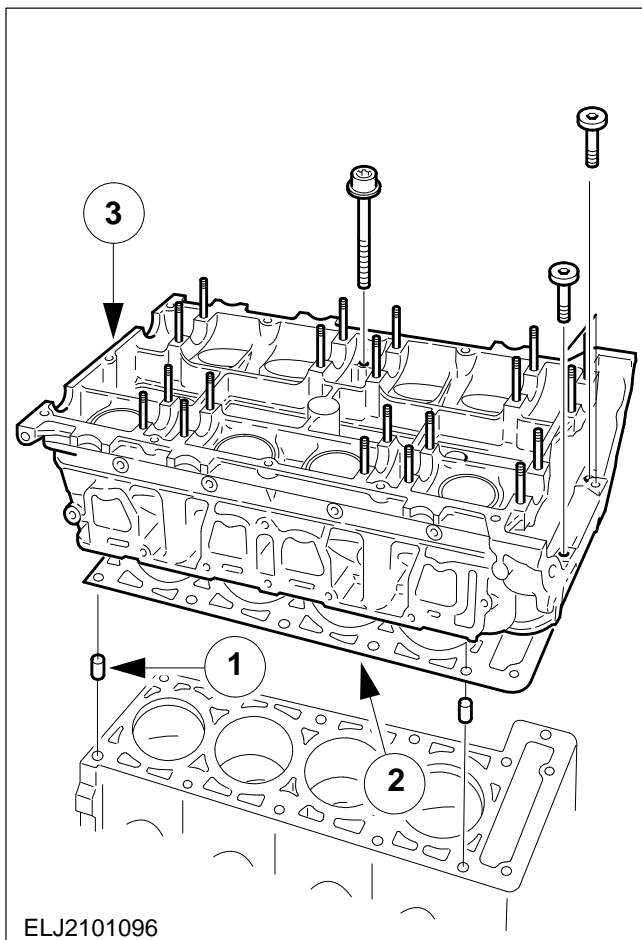


NOTE: Remove any carbon deposit where the measurement is to be made.

39. Measurement point in the combustion chamber for measurement "a".

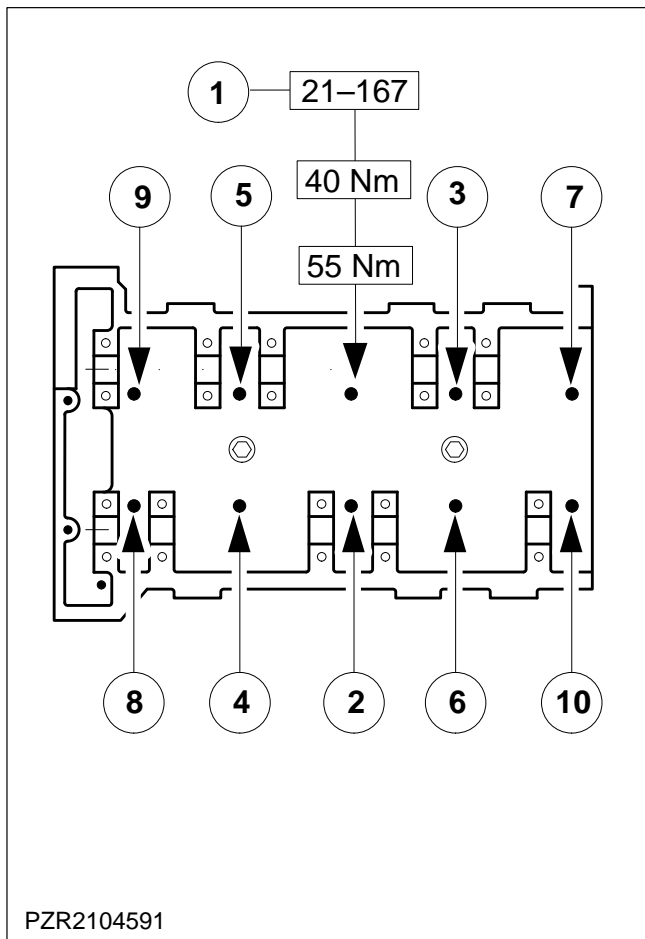


40. Set the piston of cylinder no. 1 to 25 mm before TDC.



41. Fit the cylinder head (shown without ancillary components).

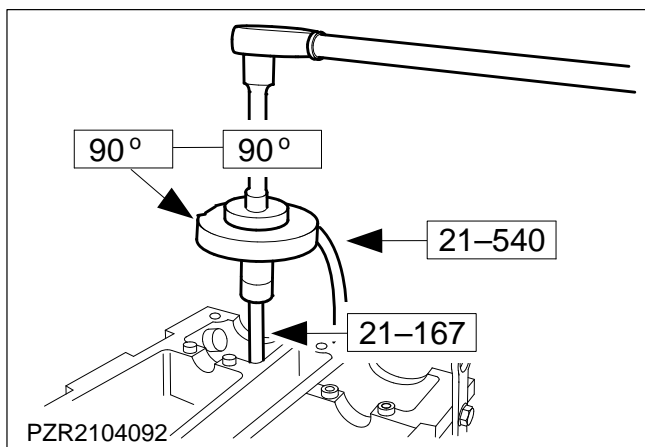
- 1 Fit the guide sleeves.
- 2 Lay a new cylinder head gasket in place.
- 3 Fit the cylinder head.



CAUTION: Use new cylinder head bolts.

NOTE: Bolt-tightening sequence.

42. Tighten the cylinder head bolts.

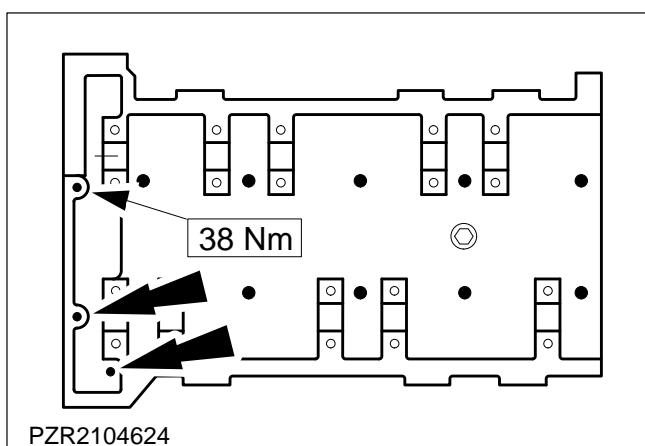


CAUTION: Do not re-torque the cylinder head bolts.

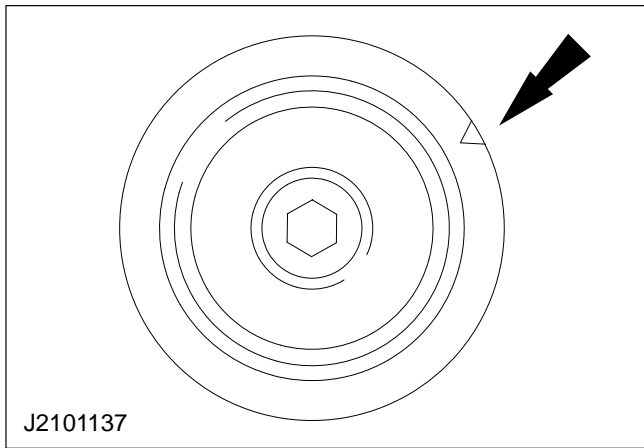
NOTE: Tighten them in two stages.

NOTE: Bolt-tightening sequence.

43. Tighten the cylinder head bolts (continued).

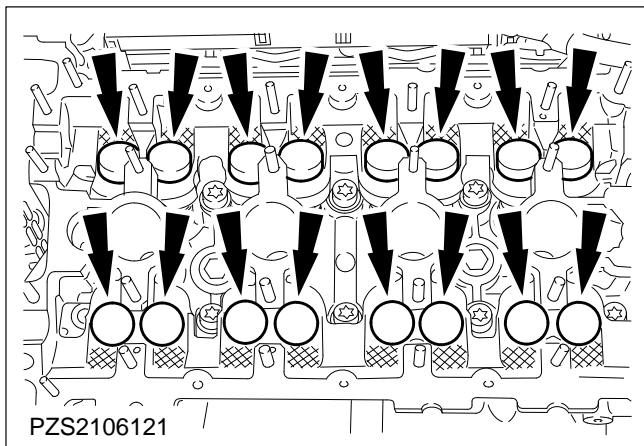


44. Screw in the three bolts and tighten them.

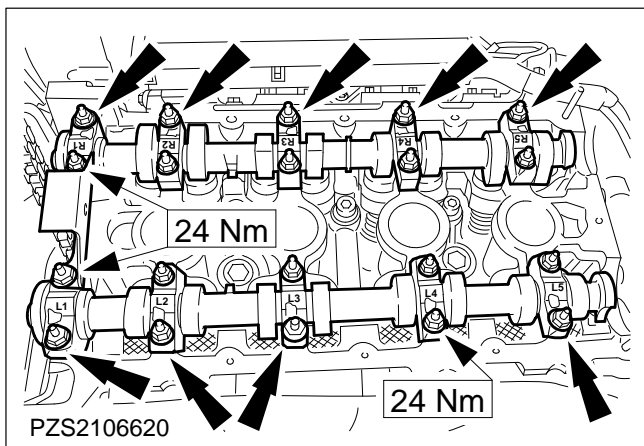


45. Make sure that the piston of cylinder no. 1 is approx. 25 mm before TDC.

Position of the crankshaft pulley/vibration damper.



46. Lubricate the new hydraulic tappets with engine oil and insert them.



CAUTION: After tightening the camshafts, the crankshaft must not be turned for a quarter of an hour.

47. Install the camshafts.

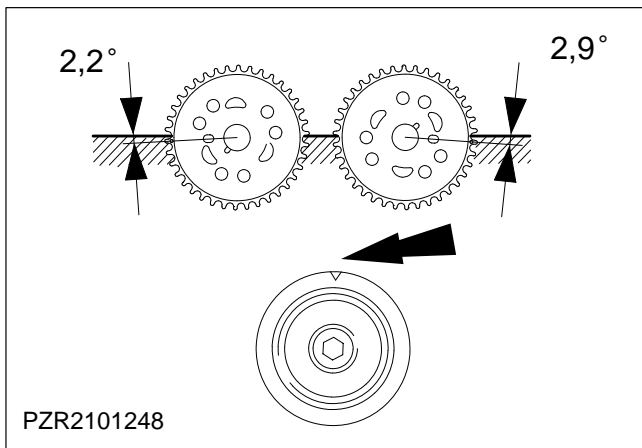
Lubricate the bearing points with engine oil.

NOTE: R is the intake side, L the exhaust side.

Lubricate the camshafts with engine oil and fit them so that none of the cams is at full lift.

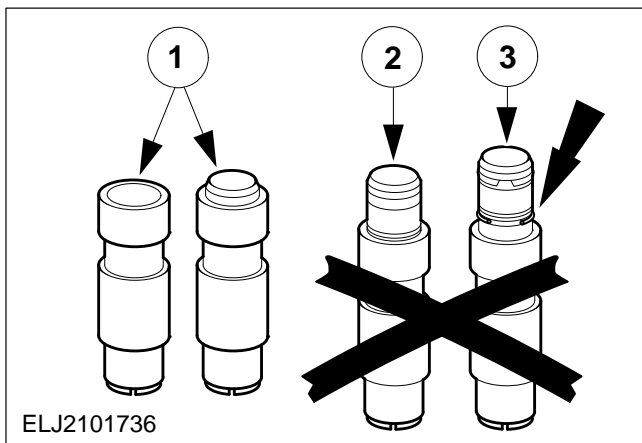
NOTE: Install the timing chain guide bracket with the front camshaft bearing caps.

Install the camshaft bearing caps. The position markings are legible from the rear.



48. Set the camshafts and the crankshaft at the TDC position for cylinder no. 1.

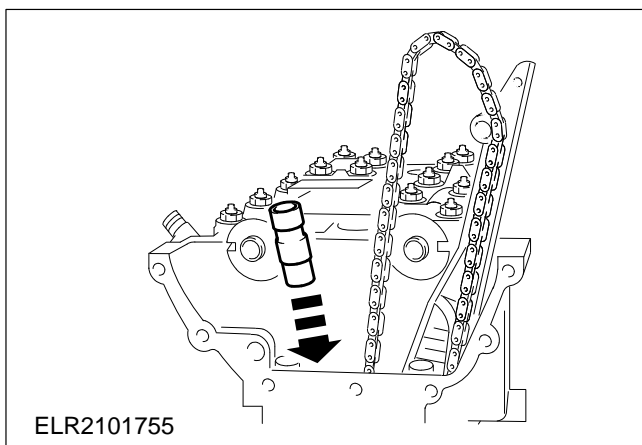
The marking on the crankshaft pulley/vibration damper should be vertically uppermost.



CAUTION: A fully or partially released chain tensioner plunger (whether new or used) must not be fitted.

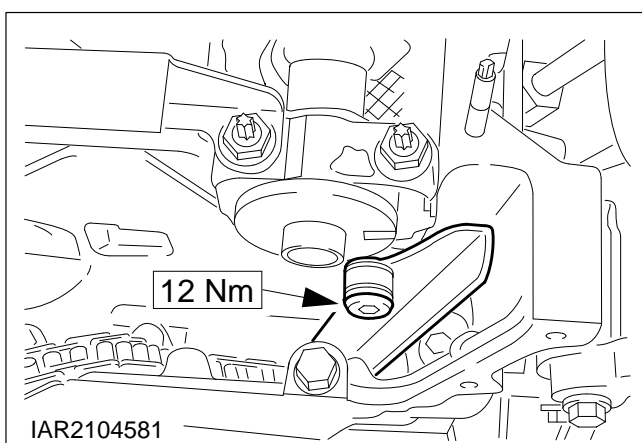
49. Check the new chain tensioner plunger.

- 1 Plunger latched
- 2 Plunger partially released
- 3 Plunger fully released (the detent ring is visible).

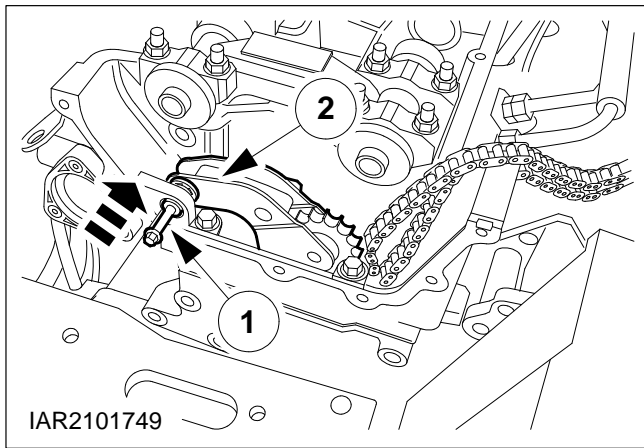


CAUTION: Only use a new and latched chain tensioner plunger.

50. Install the chain tensioner plunger.



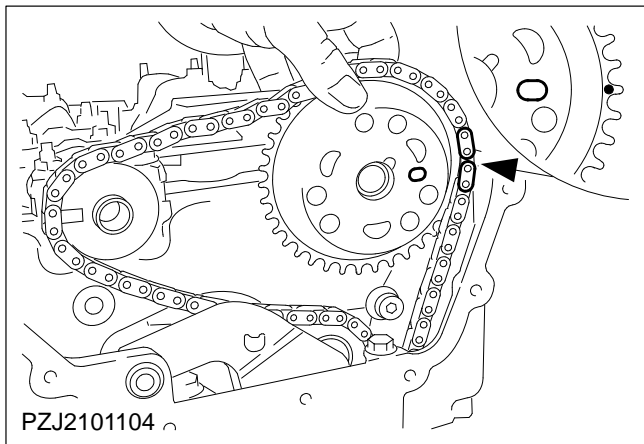
51. Tighten the top bolt of the timing chain guide.



CAUTION: Secure the lock washer to prevent it from dropping down.

52. Install the chain tensioner.

- 1 Insert the pivot bolt using an M6 x 60 bolt.
 - 2 Install the lock washer.
- Unscrew the M6 x 60 bolt.



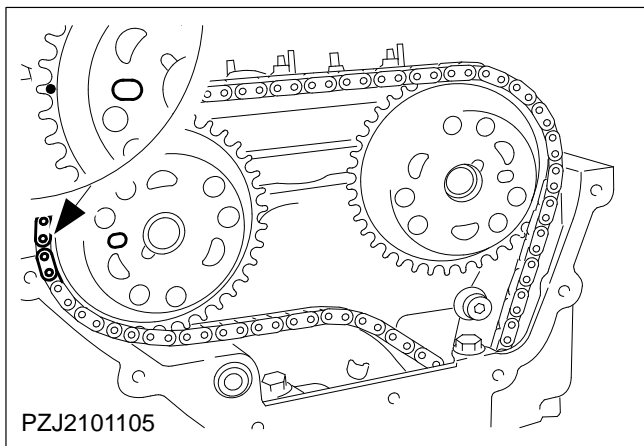
NOTE: The timing chain must be taut on the long side.

CAUTION: The camshaft sprockets must engage in the camshaft groove.

NOTE: Copper chain links must line up with the markings on the sprockets.

53. Fit the camshaft sprocket with the timing chain (in the TDC position).

If necessary, turn the camshaft slightly.

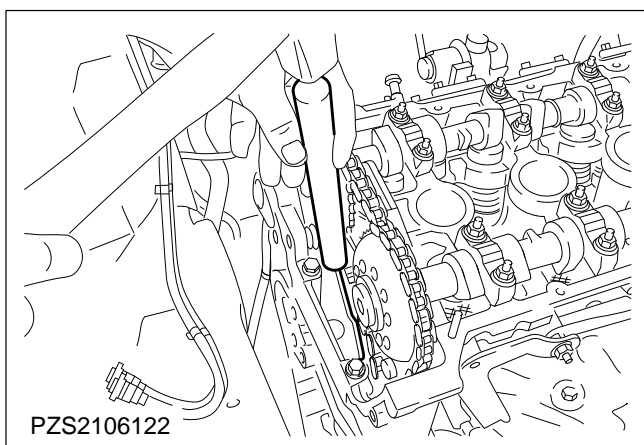


NOTE: The timing chain may sag slightly between the camshaft sprockets.

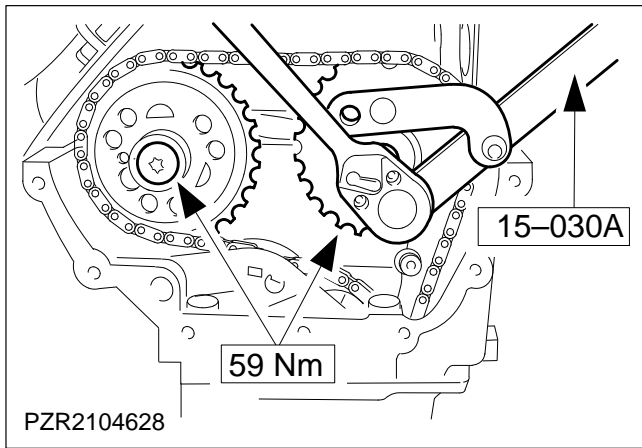
NOTE: Copper chain links must line up with markings on the sprockets.

54. Fit the camshaft sprocket with the timing chain (in the TDC position).

55. Screw in the bolts of the camshaft sprockets finger tight.

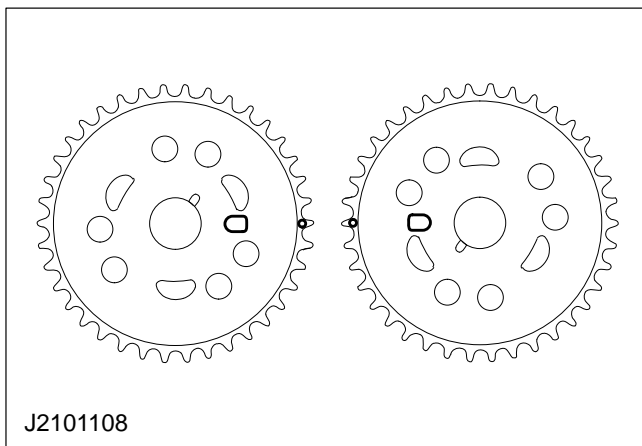


56. Release the chain tensioner plunger with a light tap on the chain tensioner with the brass drift.



NOTE: Counter hold them to stop them from turning.

57. Tighten the camshaft sprocket bolts.

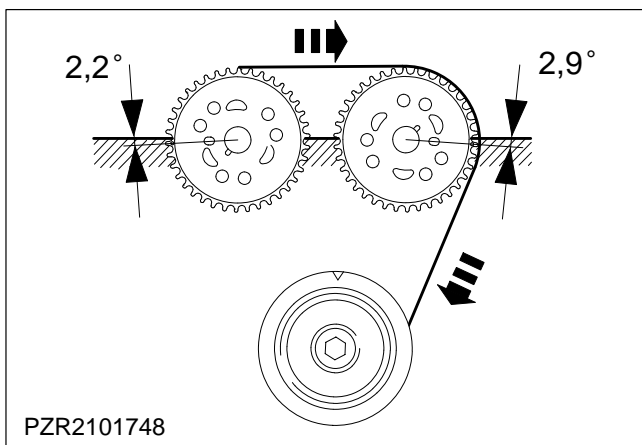


58. Set the crankshaft to the TDC position of cylinder no. 2.

NOTE: If it is necessary to correct the valve timings, i.e. release the timing chain, a new chain tensioner plunger must also be fitted as described in sub-operations 49., 50. and 56.

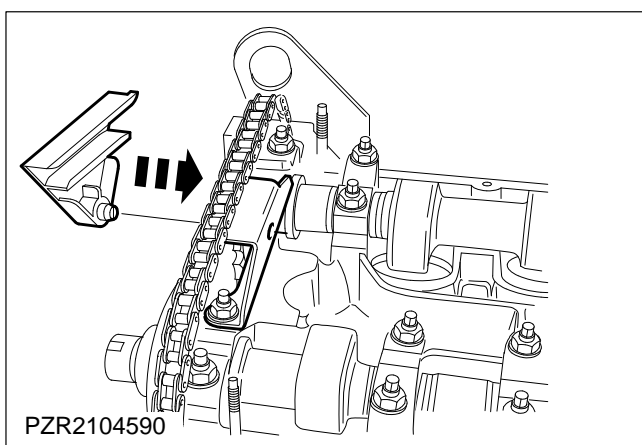
59. Check the valve timing.

The markings on the camshaft sprockets must be opposite one another on the level of the top edge of the cylinder head.

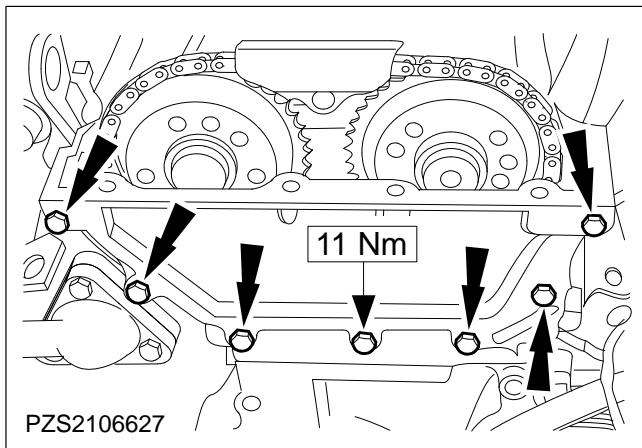


60. Check the valve timing (continued).

Turn the crankshaft a further revolution in the normal running direction and set it to the mark.



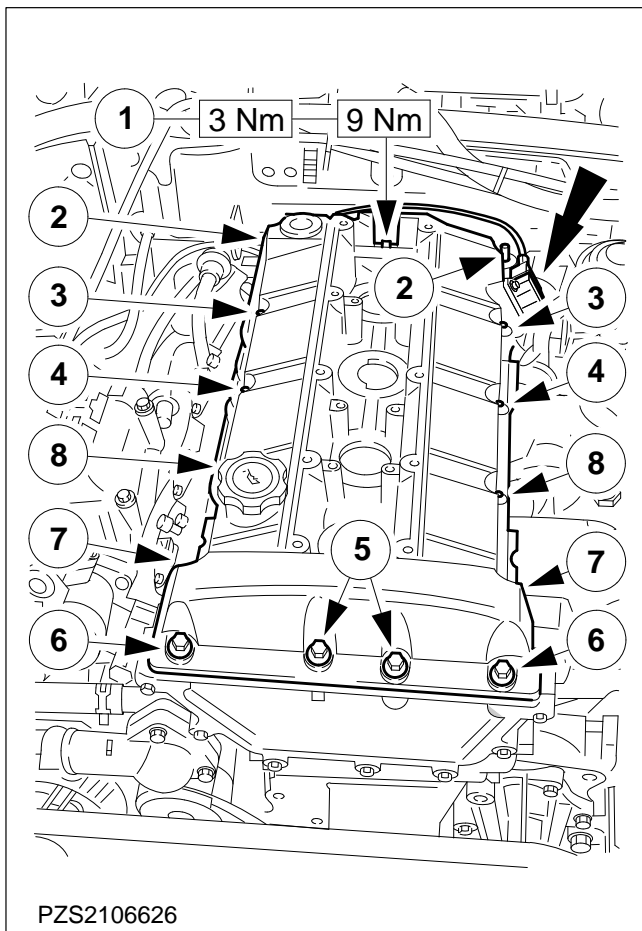
61. Install a new chain guide at the top.



NOTE: Use a new gasket.

NOTE: Align the top edge of the upper cover with the cylinder head mating face (the maximum downward misalignment is 0,13 mm).

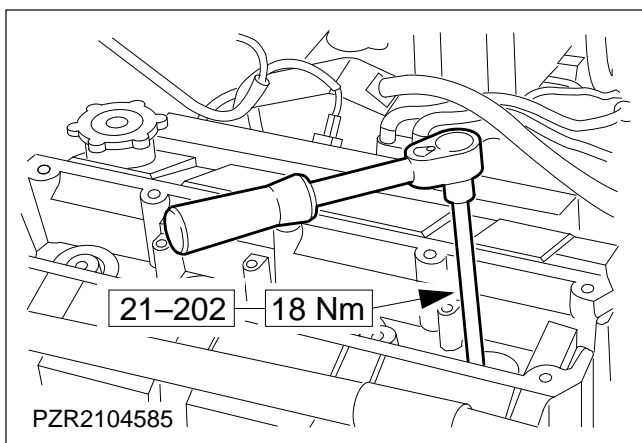
62. Install the upper timing chain cover.



NOTE: Bolt-tightening sequence.

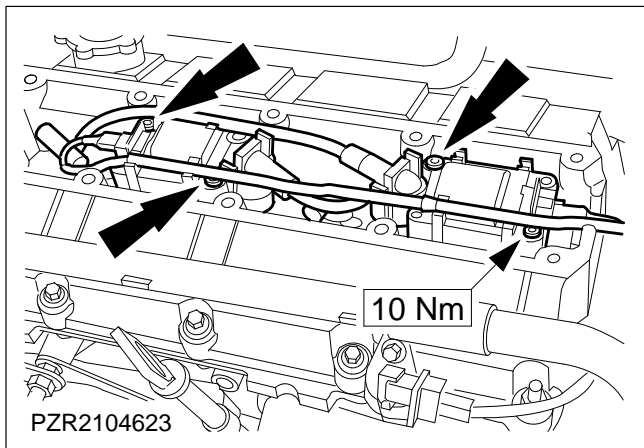
63. Install the cylinder head cover using a new gasket (eleven bolts, four nuts).

64. Connect the CMP sensor plug.

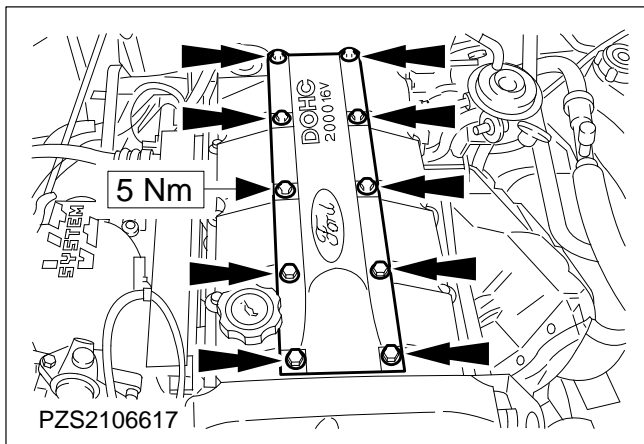


NOTE: Coat the spark plug threads with lubricant (ESE-M1244-A).

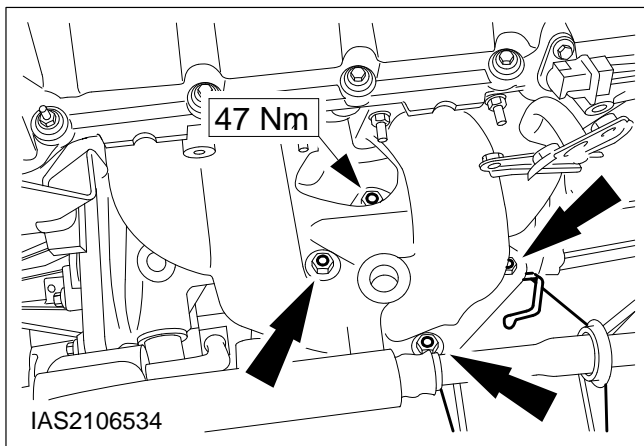
65. Install the spark plugs.



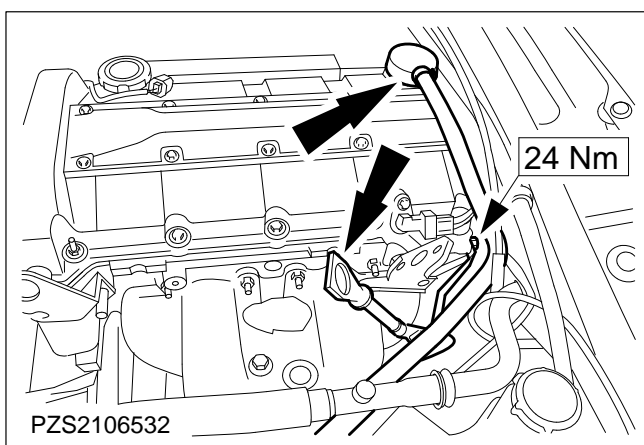
66. Install the ignition coils and connect the spark plug connectors.



67. Install the ignition coil cover.



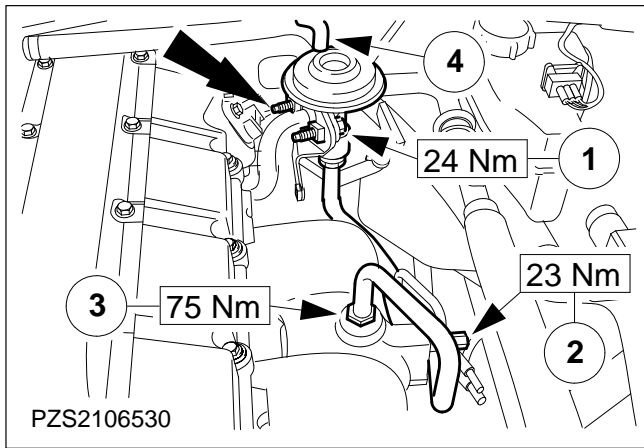
68. Attach the catalytic converter to the exhaust manifold using a new gasket.



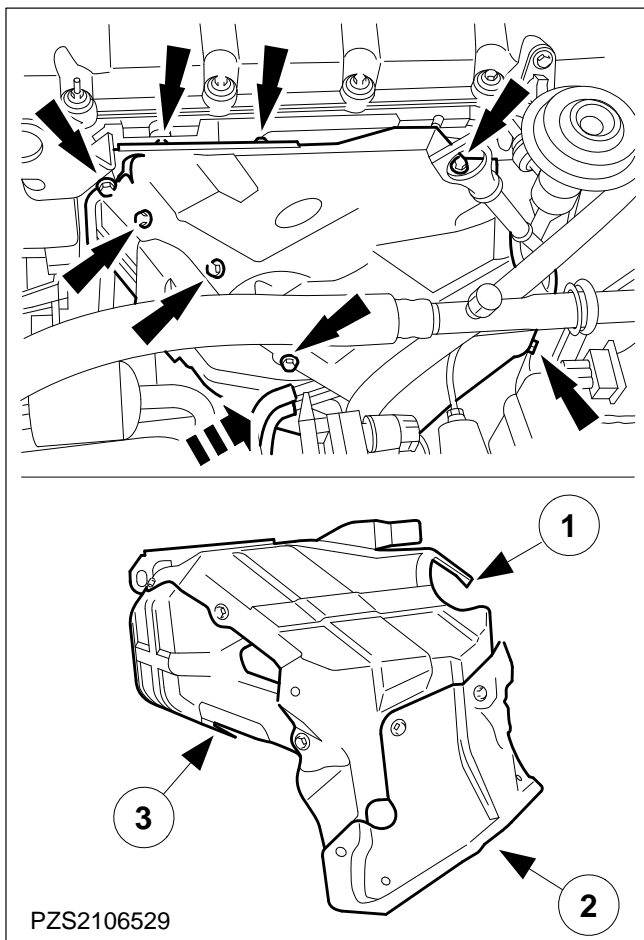
69. Fit the valve with crankcase breather hose and clip it into place.

70. Fit the oil dipstick tube bracket.

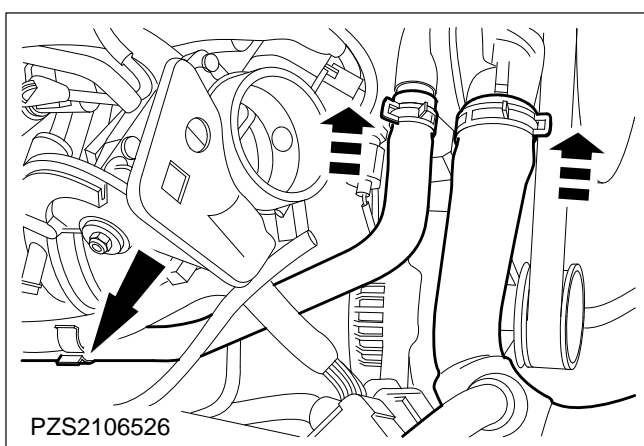
Insert the oil dipstick.

**71. Fit the EGR valve and the EGR pipe.**

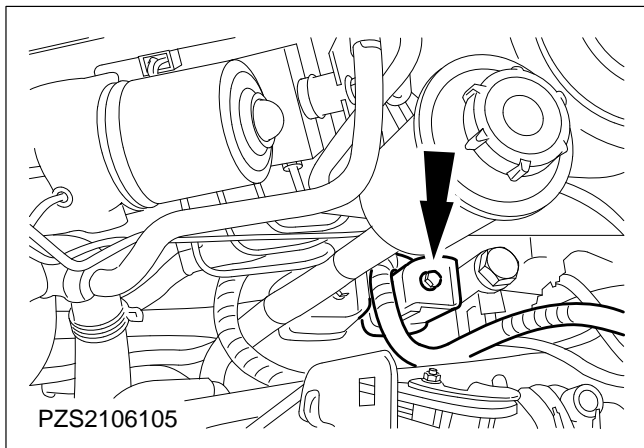
- 1 Attach the EGR valve to the bracket.
- 2 Fit the EGR pipe bracket.
- 3 Fit the EGR pipe.
- 4 Connect the vacuum hose.

**72. Fit the three-part exhaust manifold heatshield.**

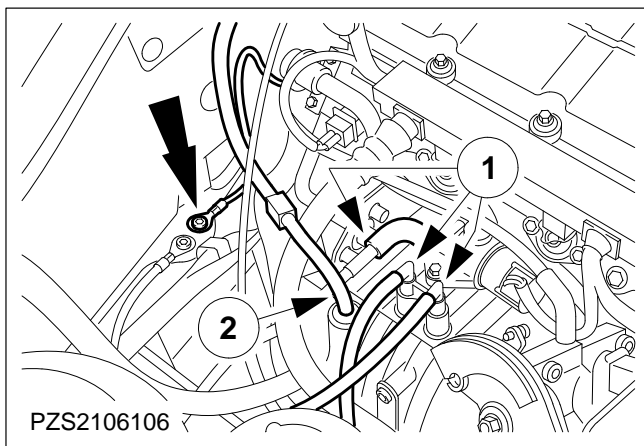
- Loosely fit the parts in the order shown.
- Tighten the bolts.

73. Connect the two vacuum hoses.**74. Attach the coolant hoses to the thermostat housing.**

Clip the coolant hose into place.



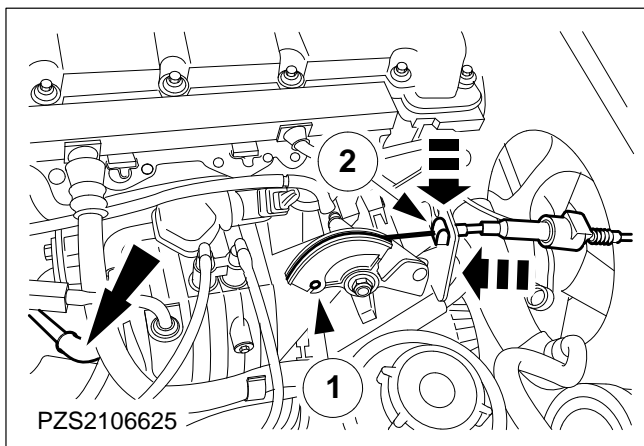
75. Fit the main wiring loom plug.



76. Connect the vacuum hoses and the vacuum line.

- 1 Vacuum hoses
- 2 Vacuum line to the brake servo.

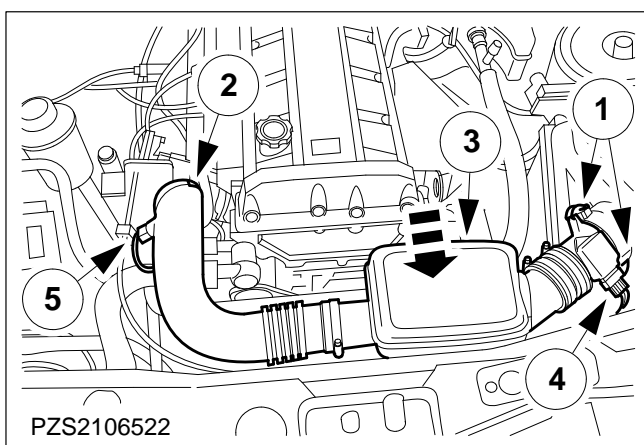
77. Attach the earth lead to the bulkhead.



78. Attach the throttle cable.

- 1 Hook the cable in place.
- 2 Push the circlip into place.

79. Connect the crankcase breather hose.

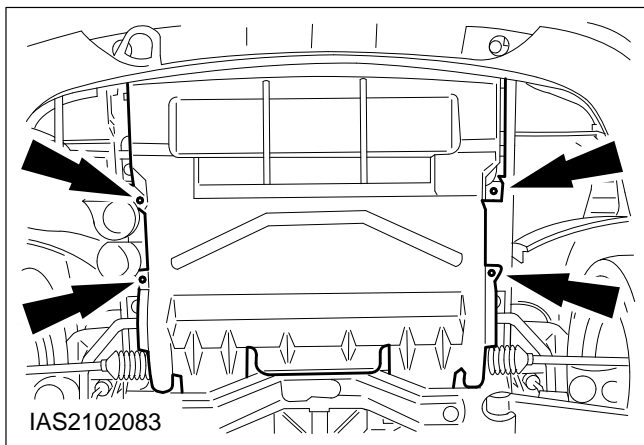


80. Install the air intake pipe.

- 1 Attach the air intake pipe to the air cleaner housing (two clips).
- 2 Fit the air intake pipe.
- 3 Move the resonator into the installation position (push-fit).
- 4 Connect the IAT sensor plug.
- 5 Connect the MAF sensor plug.

81. Standard finishing operations.

- Top up the coolant.
- Fix the wiring and hoses in place with cable ties.
- Connect the battery earth lead.
- Bleed the cooling system.
- Bring the engine up to operating temperature and check it for leaks (visual check).
- Check the fluid levels and rectify as necessary.
- Enter the radio keycode.
- Reprogramme the preset radio stations.
- Reset the clock.

**82. Raise the vehicle.****83. Fit the engine undershield.****84. Lower the vehicle.****85. Carry out a road test to enable the PC module (EEC V) to collect data.**