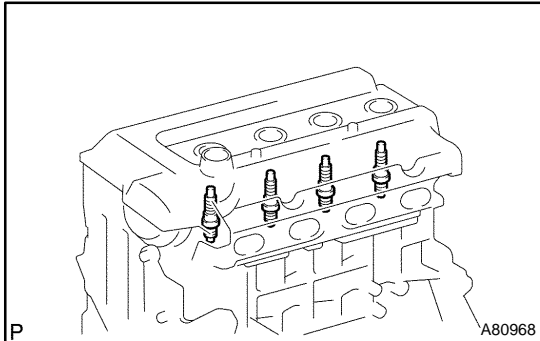
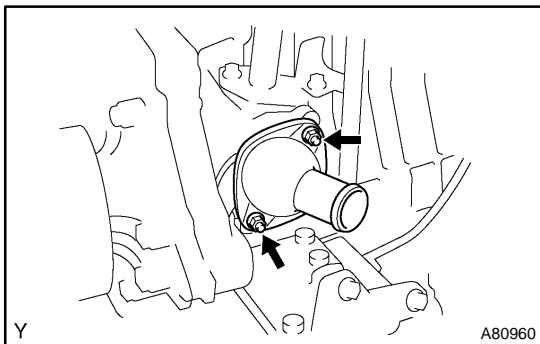


OVERHAUL



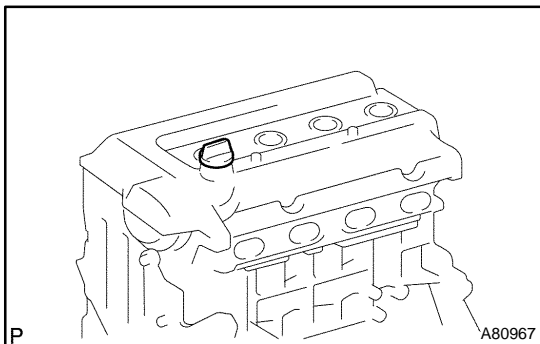
1. REMOVE SPARK PLUG

- (a) Using a spark plug wrench, remove the spark plugs.



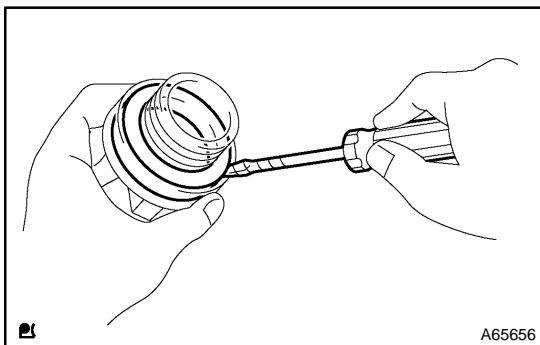
2. REMOVE THERMOSTAT

- (a) Remove the 2 nuts and water inlet.
 (b) Remove the thermostat.
 (c) Remove the gasket from the thermostat.



3. REMOVE OIL FILLER CAP SUB-ASSY

- (a) Remove the oil filler cap from the cylinder head cover.

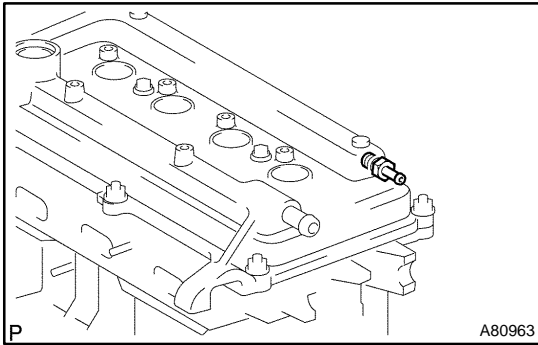


4. REMOVE OIL FILLER CAP GASKET

- (a) Using a screwdriver, remove the gasket from the oil filler cap.

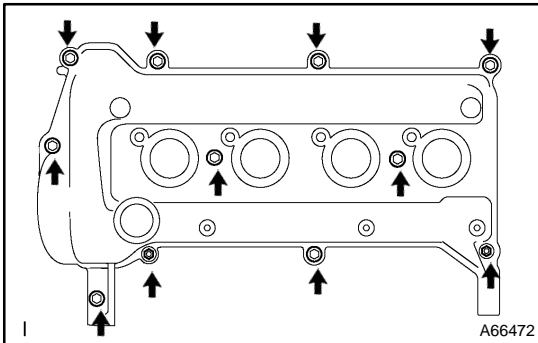
5. REMOVE CRANKSHAFT POSITION SENSOR

- (a) Remove the bolt and crankshaft position sensor.



6. REMOVE VENTILATION VALVE SUB-ASSY

- (a) Remove the ventilation valve from the cylinder head cover.

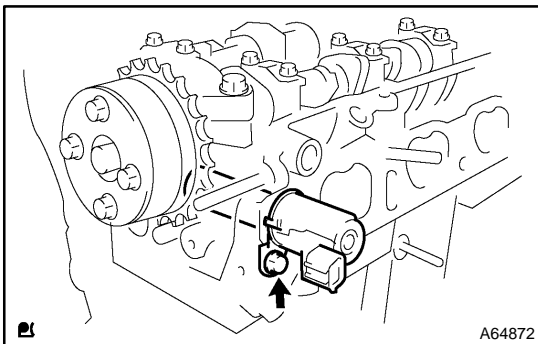


7. REMOVE CYLINDER HEAD COVER SUB-ASSY

- (a) Remove the 9 bolts and 2 nuts, and then remove the cylinder head cover.

8. REMOVE CYLINDER HEAD COVER GASKET

- (a) Remove the gasket from the cylinder head cover.

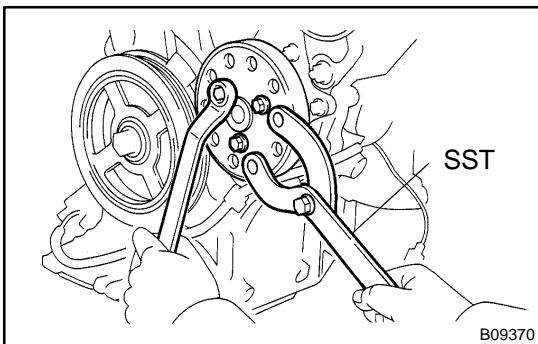


9. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSY

- (a) Remove the bolt and camshaft timing oil control valve.

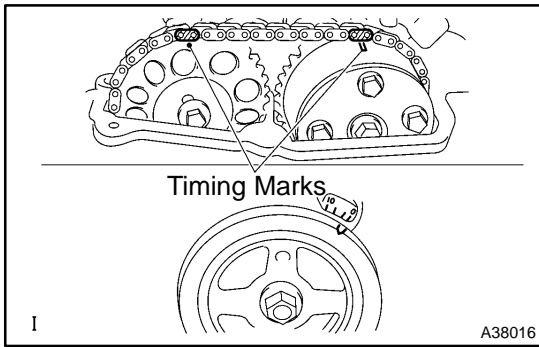
10. REMOVE OIL LEVEL GAGE GUIDE

- (a) Remove the bolt and oil level gage guide.



11. REMOVE WATER PUMP PULLEY

- (a) Using SST, hold the pump pulley.
SST 09960-10010 (09962-01000, 09963-00600)
- (b) Remove the 3 bolts and pump pulley.

**12. REMOVE CRANKSHAFT DAMPER SUB-ASSY**

- (a) Set the No. 1 cylinder to the TDC/compression.
 - (1) Turn the crankshaft damper, and align its timing notch with the timing mark "0" of the chain cover.
 - (2) Check that both timing marks on the camshaft timing sprocket and the camshaft timing gear are facing upward as shown in the illustration.

HINT:

If not, turn the crankshaft 1 complete revolution (360°) and align the marks as above.

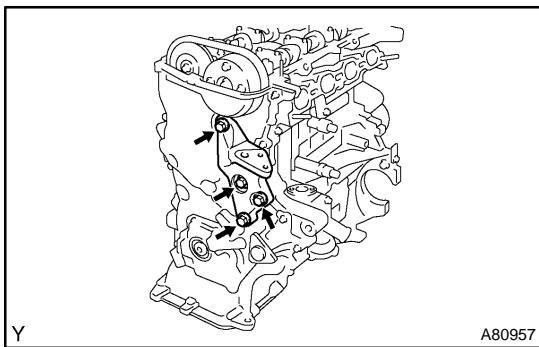
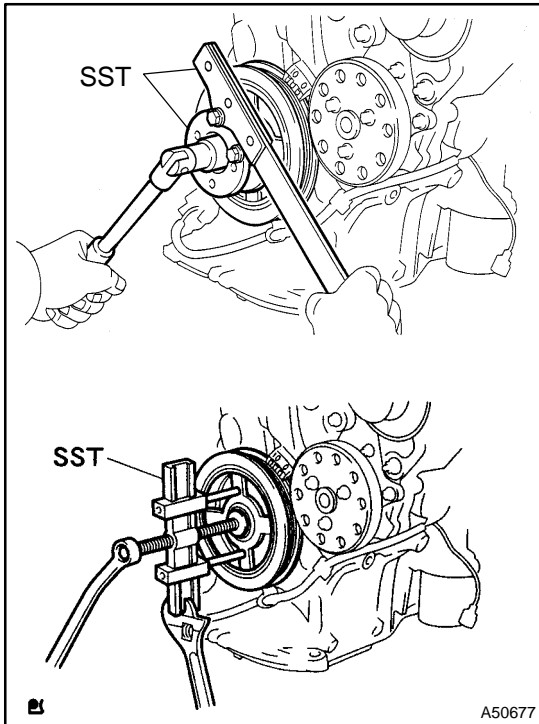
- (b) Using SST, remove the pulley bolt.

SST 09213-58012 (91111-50845), 09330-00021

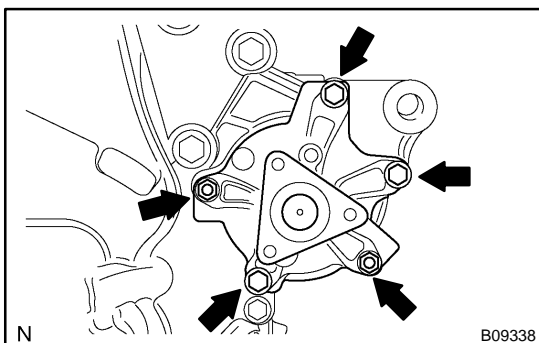
HINT:

If necessary, remove the damper with SST.

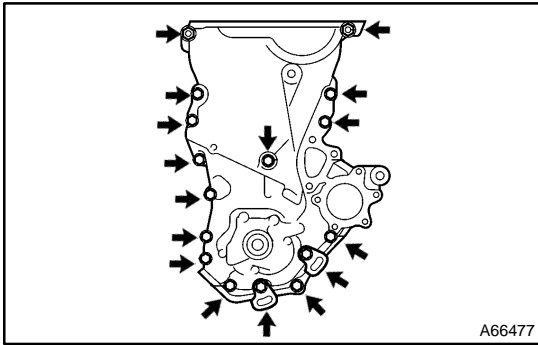
SST 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05021)

**13. REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET**

- (a) Remove the 4 bolts and engine mounting bracket RH.

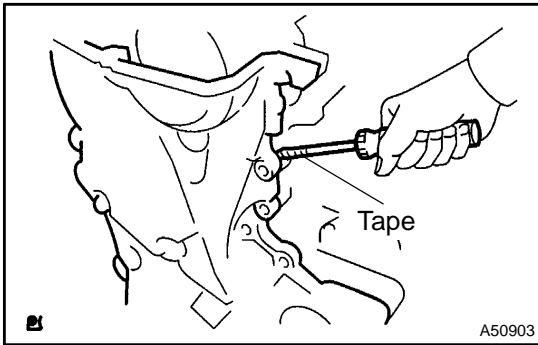
**14. REMOVE WATER PUMP ASSY**

- (a) Remove the 3 bolts and 2 nuts.
- (b) Remove the water pump and gasket.



15. REMOVE OIL PUMP ASSY

(a) Remove the 15 bolts and nut.



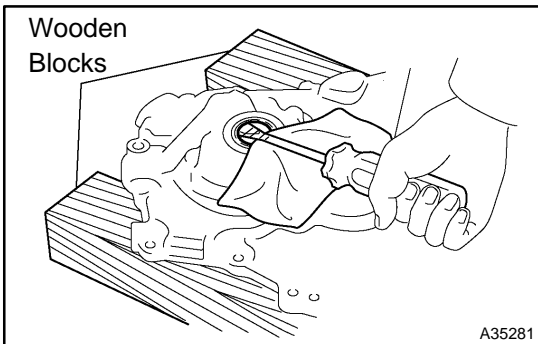
(b) Using a screwdriver with the tip wrapped in tape, remove the oil pump by prying between the cylinder head and cylinder block.

NOTICE:

Be careful not to damage the contact surfaces of the oil pump, cylinder head and cylinder block.

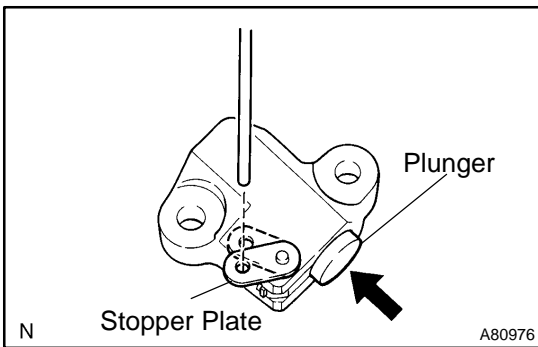
(c) Remove the 2 O-rings from the cylinder block and oil pan No. 1.

(d) Using an 8 mm hexagon wrench, remove the screw plug from the oil pump.



16. REMOVE OIL PUMP SEAL

(a) Using a screwdriver with the tip wrapped in tape, remove the oil seal.



17. REMOVE CHAIN TENSIONER ASSY NO.1

NOTICE:

- Do not rotate the crankshaft with the chain tensioner removed.
- When rotating the camshaft with the timing chain removed, rotate the crankshaft counterclockwise 40° from the TDC first.

(a) Rotate the stopper plate of the chain tensioner upward with a screwdriver, push in the plunger of the tensioner as shown in the illustration.

(b) Rotate the stopper plate of the tensioner downward, insert a 2.5 mm (0.098 in.) diameter bar into the holes of the stopper plate and tensioner to hold the stopper plate.

(c) Remove the 2 bolts and chain tensioner.

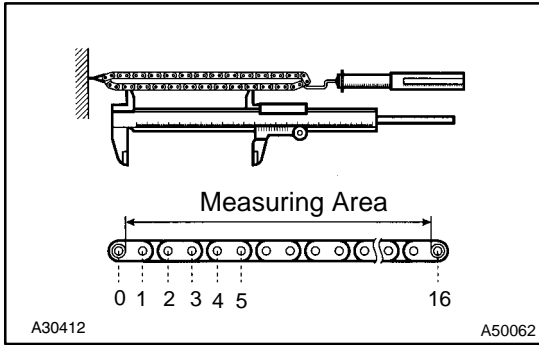
18. REMOVE CHAIN TENSIONER SLIPPER

(a) Remove the bolt and chain tensioner slipper.

19. REMOVE CHAIN VIBRATION DAMPER NO.1

(a) Remove the 2 bolts and chain vibration damper.

20. REMOVE CHAIN SUB-ASSY



21. INSPECT CHAIN SUB-ASSY

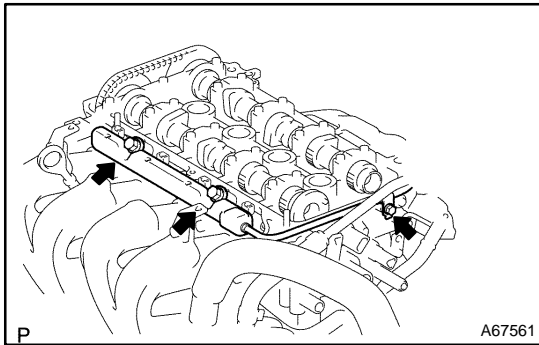
- (a) Using a spring scale, pull the timing chain with 140 N (14.3 kgf, 31.5 lb) and measure the length of it.

Maximum chain elongation: 123.2 mm (4.850 in.)

If the elongation is greater than maximum, replace the chain.

HINT:

Perform the same measurement by pulling at 3 or more random places to obtain an average length.

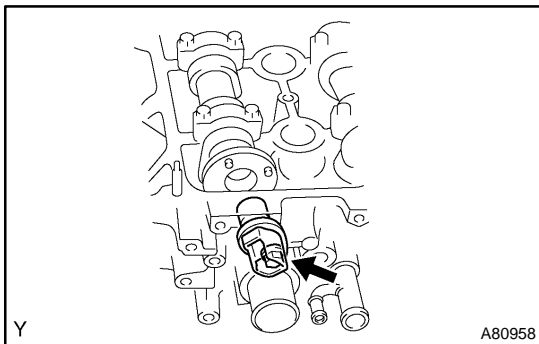


22. REMOVE FUEL DELIVERY PIPE SUB-ASSY

- (a) Remove the 3 bolts and fuel delivery pipe together with the 4 fuel injectors.

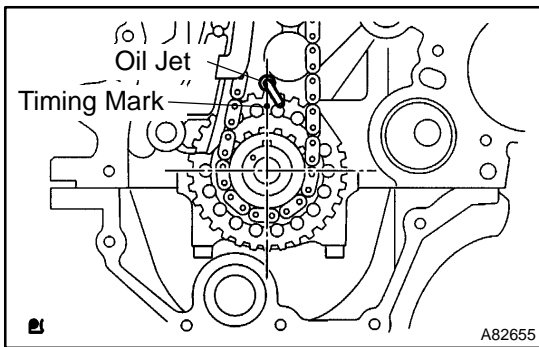
23. REMOVE FUEL INJECTOR ASSY

- (a) Pull out the 4 injectors from the delivery pipe.



24. REMOVE CAMSHAFT POSITION SENSOR

- (a) Remove the bolt and camshaft position sensor.

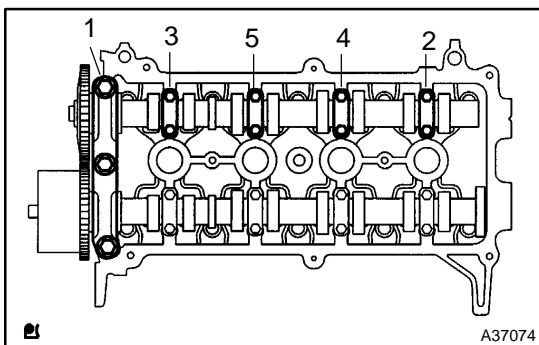


25. REMOVE NO.2 CAMSHAFT

NOTICE:

When rotating the camshaft with the timing chain removed, rotate the crankshaft counterclockwise 40° from the TDC first, and align the oil jet hole with the paint mark.

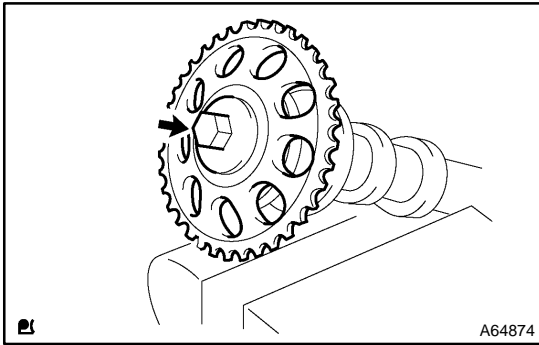
This prevents contact of the pistons with the valves.



- (a) Using several steps, loosen and remove the 11 bearing cap bolts uniformly in the sequence shown in the illustration, then remove the 5 bearing caps and No. 2 camshaft.

NOTICE:

Loosen each bolt uniformly keeping the camshaft level.

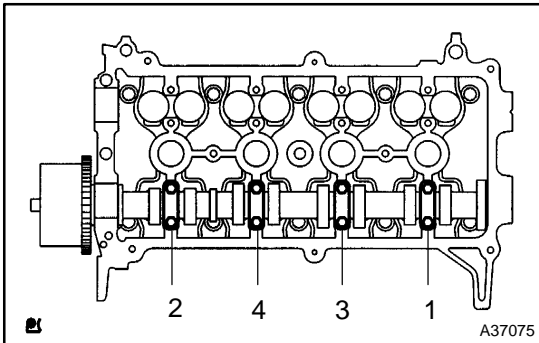


26. REMOVE CAMSHAFT TIMING GEAR OR SPROCKET

- (a) Clamp the camshaft in a vise.
- (b) Remove the fringe bolt and camshaft timing sprocket.

NOTICE:

Be careful not to damage the camshaft.



27. REMOVE CAMSHAFT

- (a) Using several steps, loosen and remove the 8 bearing cap bolts uniformly in the sequence shown in the illustration, then remove the 4 bearing caps and camshaft.

NOTICE:

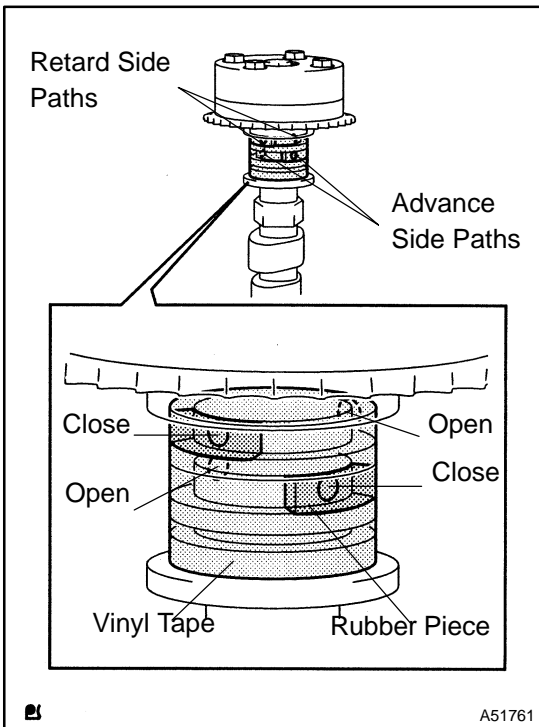
Loosen each bolt uniformly keeping the camshaft level.

28. INSPECT CAMSHAFT TIMING GEAR ASSY

- (a) Check the lock of the camshaft timing gear.
 - (1) Clamp the camshaft in a vise, and check that the camshaft timing gear is locked.

NOTICE:

Be careful not to damage the camshaft.

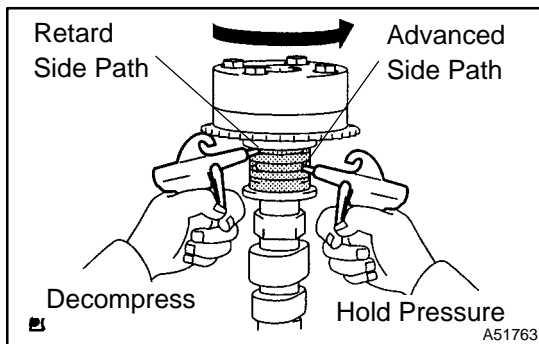
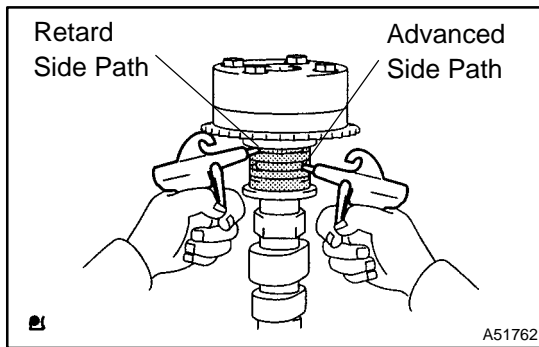


- (b) Release the lock pin.
 - (1) Cover the 4 oil paths of the cam journal with tape as shown in the illustration.

HINT:

One of the 2 grooves located on the cam journal is for retarding cam timing (upper) and the other is for advancing cam timing (lower). Each groove has 2 oil paths. Plug one of the oil paths for each groove with rubber pieces before wrapping the cam journal with the tape.

- (2) Punctuate the tape for the advance oil path and for the retard oil path on the opposite side from the advance oil path.



- (3) Put air pressure into two broken paths (the advance side path and the retard side path) with about 150 kPa (1.5 kgf/cm²).

NOTICE:

Cover the paths with shop rag prevent oil splashing.

- (4) Confirm if the camshaft timing gear assembly revolves in the timing advance direction when reducing the air pressure of the timing retard path.

HINT:

The lock pin is released, and the camshaft timing gear revolves in the timing advance direction.

- (5) When the camshaft timing gear reaches the most advanced position, remove the air pressure of the timing retard side path, and then release the air pressure of the timing advance side path.

NOTICE:

Camshaft timing assembly gear occasionally shifts to the retard side abruptly, if the air compression of the advanced side path is released first. It often results in the breakage of the lock pin.

- (c) Check smooth revolution.

- (1) Except the position where the lock pin meets at the most retarded angle, let the valve timing controller assembly turn back and forth and check the movable range and that there is no disturbance.

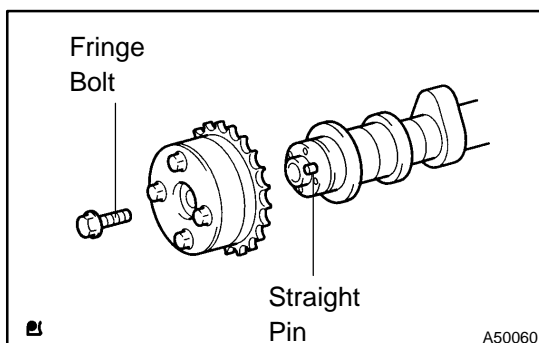
Standard: Smooth movable range is about 22.5°

NOTICE:

Be sure to perform this check by hand, instead of air pressure.

- (d) Check the lock is at the most retarded position.

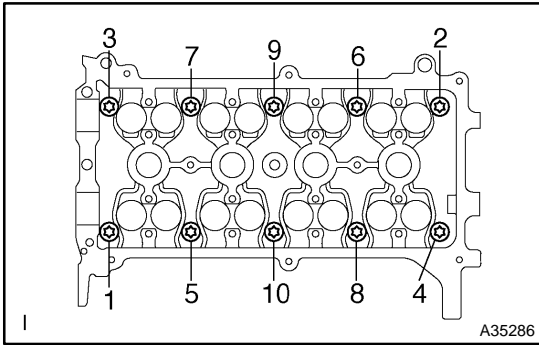
- (1) Confirm that the camshaft timing gear assembly is locked at the most retarded position.

**29. REMOVE CAMSHAFT TIMING GEAR ASSY**

- (a) Turn the valve timing controller assembly at the most advanced angle.
- (b) Remove the fringe bolt and camshaft timing gear assembly.

NOTICE:

- Be careful not to remove the other 4 bolts.
- If reusing the camshaft timing gear, unlock the lock pin inside the camshaft timing gear first.



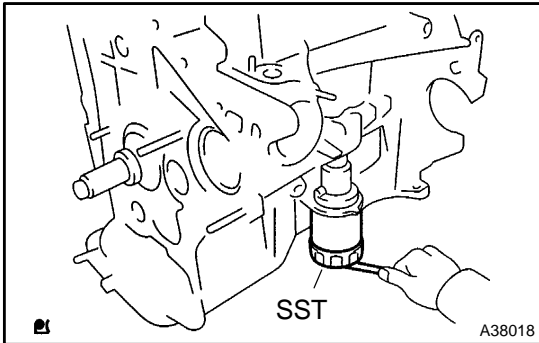
30. REMOVE CYLINDER HEAD SUB-ASSY

- (a) Using several steps, loosen and remove the 10 cylinder head bolts uniformly with an 8 mm bi-hexagon wrench in the sequence shown in the illustration. Remove the 10 cylinder head bolts and plate washers.

NOTICE:

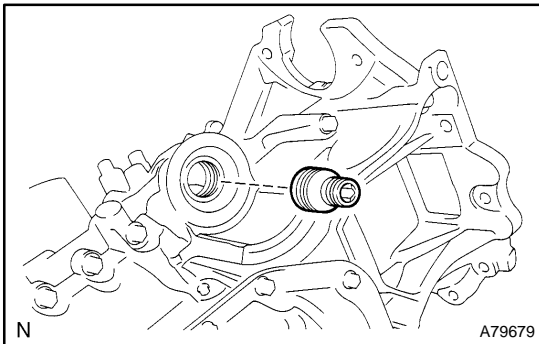
- Be careful not to drop washers into the cylinder head.
- Head warpage or cracking could result from removing bolts in an incorrect order.

31. REMOVE CYLINDER HEAD GASKET



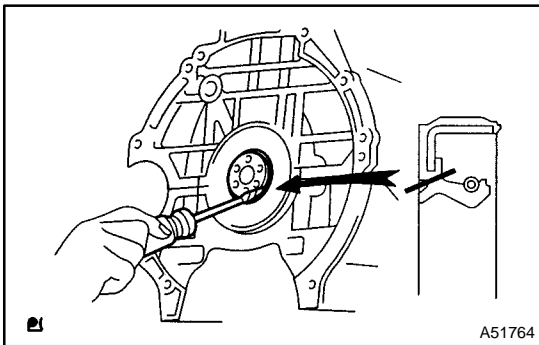
32. REMOVE OIL FILTER SUB-ASSY

- (a) Using SST, remove the oil filter.
SST 09228-06501



33. REMOVE OIL FILTER UNION

- (a) Using a 12 mm hexagon wrench, remove the oil filter union.



34. REMOVE ENGINE REAR OIL SEAL

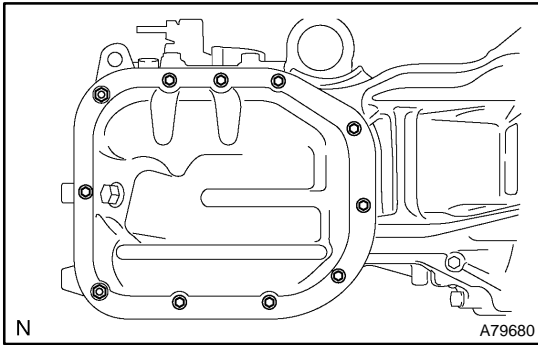
- (a) Using a knife, cut off the oil seal lip.
- (b) Using a screwdriver with the tip wrapped in tape, pry out the oil seal.

NOTICE:

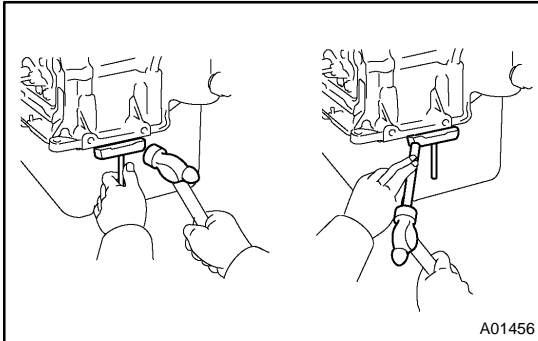
After removal, check if the crankshaft is not damaged. If it is damaged, smooth the surface with 400 – grit sandpaper.

35. REMOVE OIL PAN SUB-ASSY NO.2

- (a) Remove the oil pan drain plug and gasket.



- (b) Remove the 9 bolts and 2 nuts.

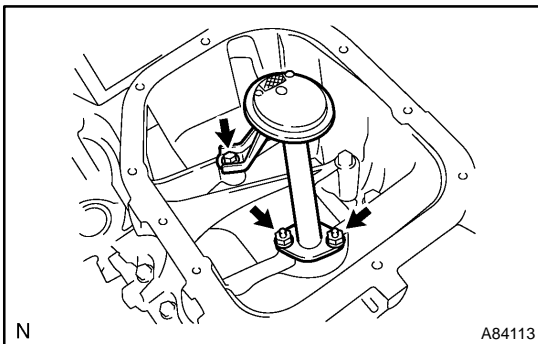


- (c) Insert the blade of SST between the oil pan No. 1 and oil pan No. 2, and cut off the applied sealer and remove the oil pan No. 2.

SST 09032-00100

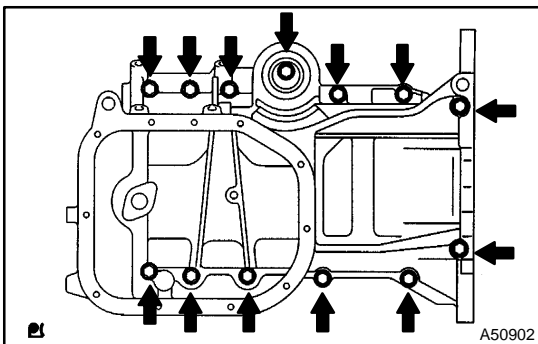
NOTICE:

Be careful not to damage the oil pan No. 1 and oil pan No. 2.



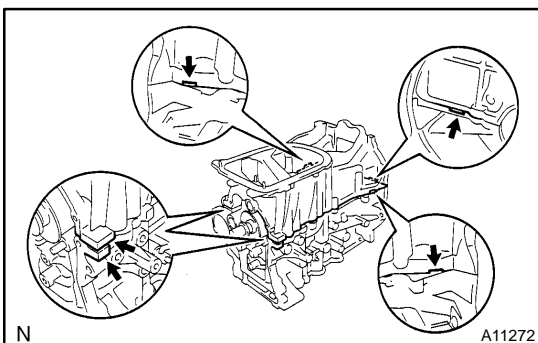
36. REMOVE OIL STRAINER SUB-ASSY

- (a) Remove the bolt and 2 nuts.
 (b) Remove the oil strainer and gasket.



37. REMOVE OIL PAN SUB-ASSY

- (a) Loosen and remove the 13 bolts uniformly in several steps.

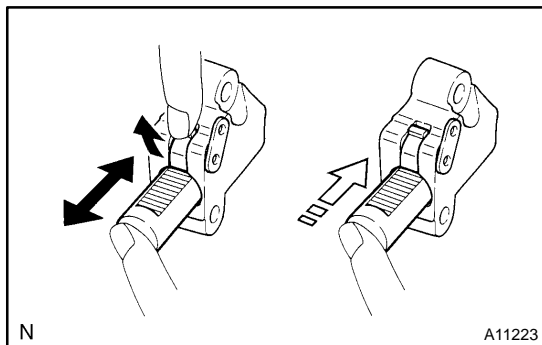


- (b) Using screwdriver, remove the oil pan No. 1 by prying between the cylinder block and oil pan No. 1.

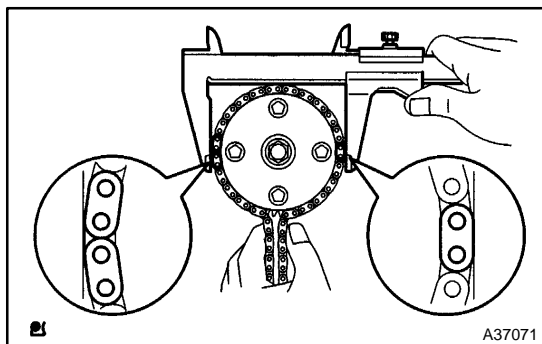
NOTICE:

Be careful not to damage the contact surfaces of the oil pan No. 1 and cylinder block.

- (c) Remove the 2 O-rings from the cylinder block.
 (d) Remove the 4 stud bolts.

**38. INSPECT CHAIN TENSIONER ASSY NO.1**

- (a) Check that the plunger moves smoothly when the ratchet pawl is raised with your finger.
- (b) Release the ratchet pawl and check that the plunger is locked in place by the ratchet pawl and does not move when pushing with your finger.

**39. INSPECT CAMSHAFT TIMING GEAR ASSY**

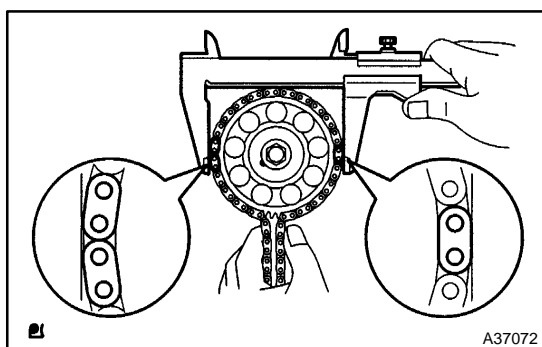
- (a) Wrap the chain around the timing sprocket.
- (b) Using vernier calipers, measure a diameter of the timing gear with the chain wrapped.

Minimum gear diameter (w / chain):
96.2 mm (3.787 in.)

If the diameter is less than minimum, replace the sprocket.

NOTICE:

Vernier calipers must contact the chain link for measuring.

**40. INSPECT CAMSHAFT TIMING GEAR OR SPROCKET**

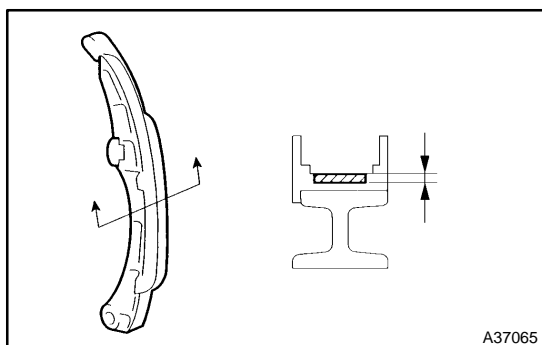
- (a) Wrap the chain around the timing sprocket.
- (b) Using vernier calipers, measure the diameter of the timing gear with the chain wrapped.

Minimum gear diameter (w / chain):
96.2 mm (3.787 in.)

If the diameter is less than minimum, replace the sprocket.

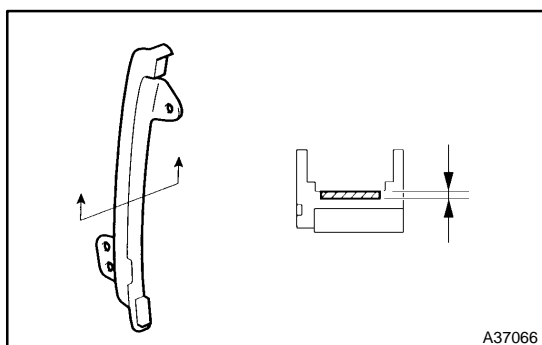
NOTICE:

Vernier calipers must contact the chain link for measuring.

**41. INSPECT CHAIN TENSIONER SLIPPER**

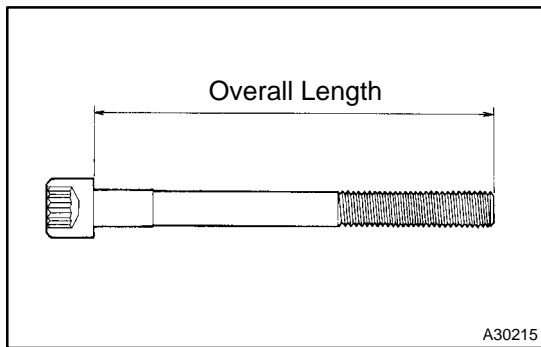
- (a) Measure the chain tensioner slipper wear.
Maximum wear: 1.0 mm (0.039 in.)

If the wear is greater than maximum, replace the slipper.

**42. INSPECT CHAIN VIBRATION DAMPER NO.1**

- (a) Measure the vibration damper wear.
Maximum wear: 1.0 mm (0.039 in.)

If the wear is greater than maximum, replace the damper.

**43. INSPECT CYLINDER HEAD SET BOLT**

- (a) Using vernier calipers, measure the length of head bolts from the seat to the end.

Standard bolt length:

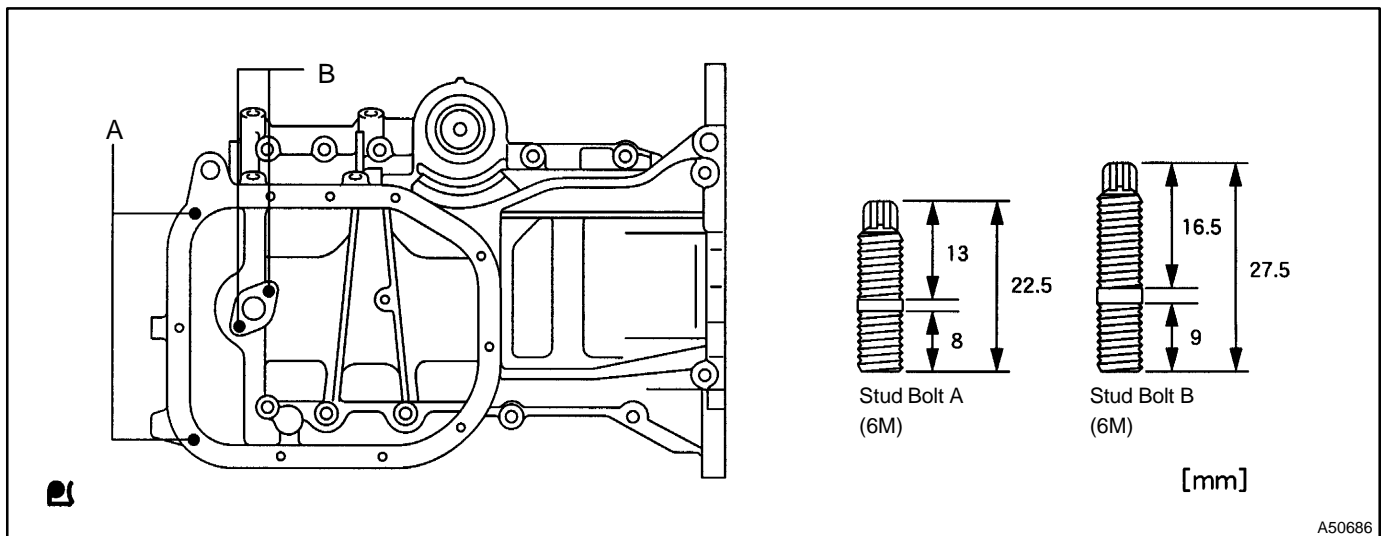
142.8 to 144.2 mm (5.622 to 5.677 in.)

Maximum bolt length: 147.1 mm (5.791 in.)

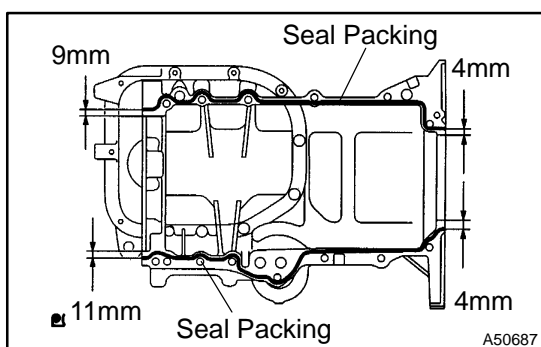
- If the length exceeds the maximum, replace the bolt.

44. INSTALL OIL PAN SUB-ASSY

- (a) Using a torx socket wrench E5, install the 4 stud bolts.
Torque: 5.0 N·m (50 kgf·cm, 44 in.-lbf)



- (b) Remove any old packing material from the contact surface.



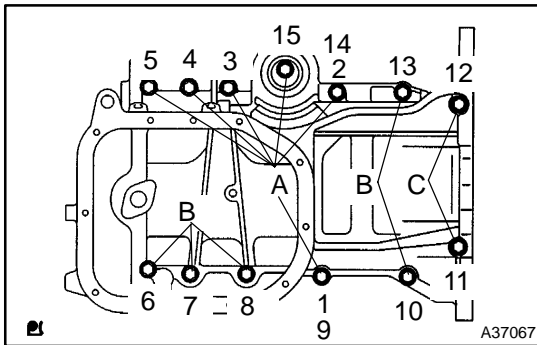
- (c) Apply a continuous bead of seal packing (Diameter 2.0 mm to 3.0 mm (0.079 to 0.118 in.)) to the oil pan mating surface as shown in the illustration.

Seal packing:

Part No. 08826-00080 or equivalent

NOTICE:

- Remove any oil from the contact surface.
 - Install the oil pan within 3 minutes after applying the seal packing.
 - Do not expose the seal to engine oil within 2 hours of installation.
- (d) Install 2 new O-rings to the cylinder block.



- (e) Using several steps, install and tighten the 13 bolts uniformly in the sequence shown in the illustration.

Torque: 24 N·m (245 kgf·cm, 18 ft·lbf)

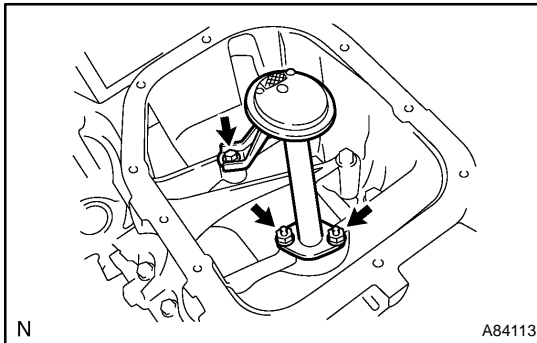
HINT:

Each bolt length as follows.

Bolt A 49 mm (1.93 in.)

Bolt B 88 mm (3.47 in.)

Bolt C 144 mm (5.67 in.)



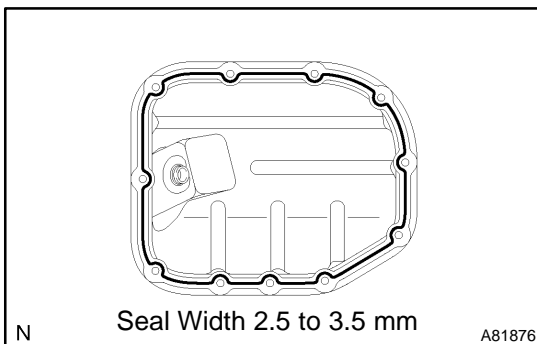
45. INSTALL OIL STRAINER SUB-ASSY

- (a) Install a new gasket and the oil strainer with the 2 nuts and bolt.

Torque: 11 N·m (112 kgf·cm, 8.1 ft·lbf)

46. INSTALL OIL PAN SUB-ASSY NO.2

- (a) Remove any old packing material from the contact surface.



- (b) Apply a continuous bead of seal packing (Diameter 2.5 to 3.5 mm (0.0984 to 0.1378 in.)) to the oil pan mating surface as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

- Remove any oil from the contact surface.
- Install the oil pan within 3 minutes after applying the seal packing.
- Do not expose the seal to engine oil within 2 hours of installation.
- Do not start the engine within 2 hours of installation.

- (c) Install the oil pan No. 2 with the 9 bolts and 2 nuts.

Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)

- (d) Install the drain plug with a new gasket.

Torque: 38 N·m (382 kgf·cm, 28 ft·lbf)

47. INSTALL OIL FILTER UNION

- (a) Using a 12 mm hexagon wrench, install the oil filter union.

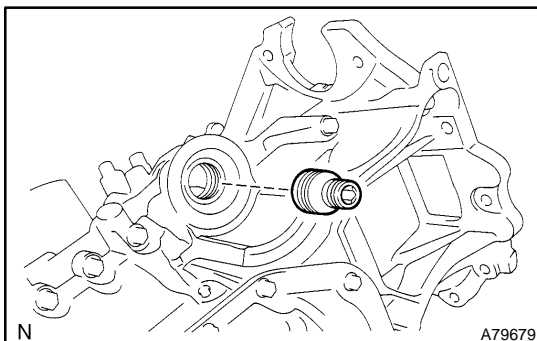
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)

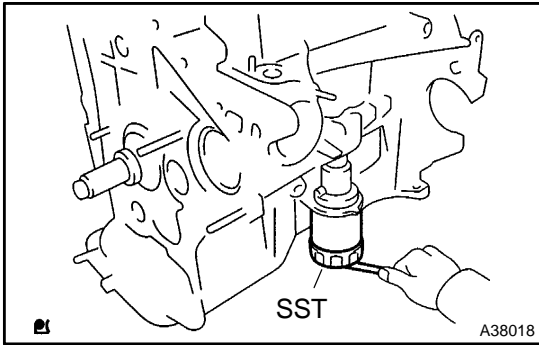
48. INSTALL OIL FILTER SUB-ASSY

- (a) Check and clean the oil filter installation surface.

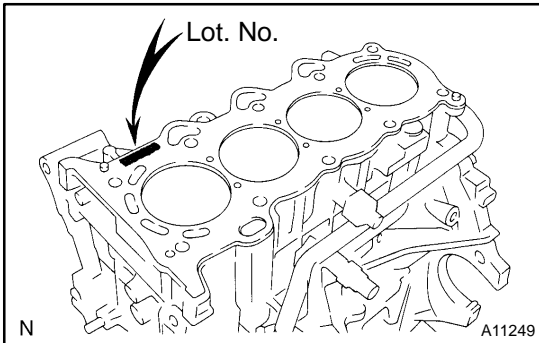
- (b) Apply clean engine oil to the gasket of a new oil filter.

- (c) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.





- (d) Using SST, tighten it an additional 3/4 turn.
SST 09228-06501

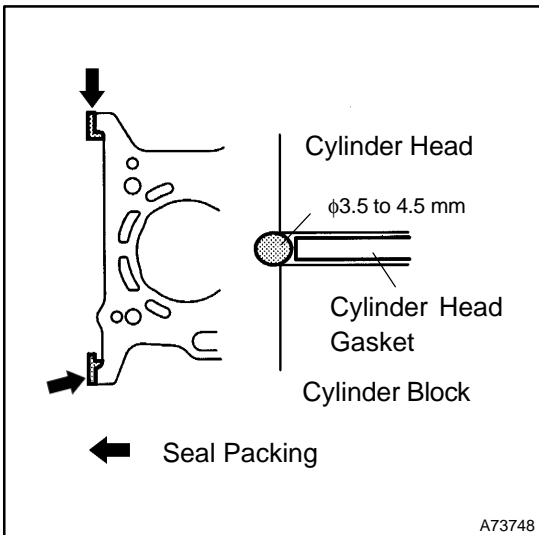


49. INSTALL CYLINDER HEAD GASKET

- (a) Place a new cylinder head gasket on the cylinder block with the Lot No. stamp facing upward.

NOTICE:

- Remove any oil from the contact surface.
- Pay attention to the mounting orientation of the cylinder head gasket.
- Place the cylinder head on the cylinder head gently in order not to damage the gasket at the bottom part of the head.



50. INSTALL CYLINDER HEAD SUB-ASSY

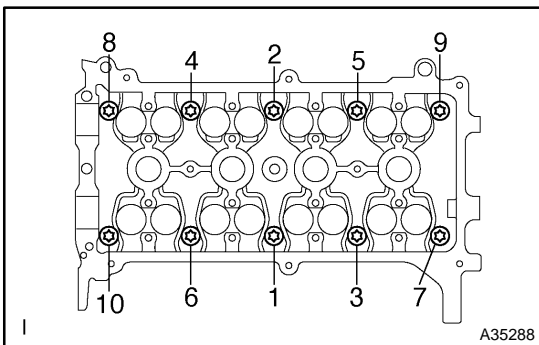
HINT:

The cylinder head bolts are tightened in 2 successive steps.

- (a) Apply a continuous bead of seal packing (Diameter 3.5 to 4.5 mm (0.138 to 0.177 in.)) as shown in the illustration.

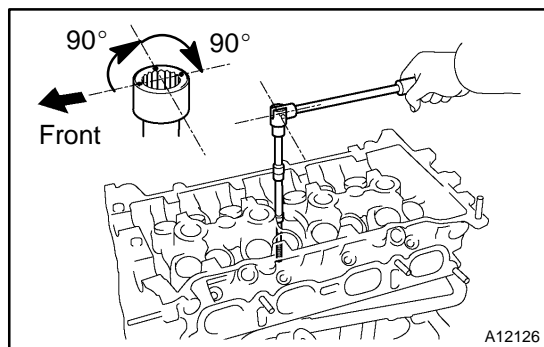
NOTICE:

- Remove any oil from the contact surface.
 - Install the oil pan within 3 minutes after applying seal packing.
- (b) Apply a light coat of engine oil on the threads of the cylinder head bolts.



- (c) Using several steps, install and tighten the 10 cylinder head bolts and plate washers uniformly with an 8 mm bi-hexagon wrench in the sequence shown in the illustration.

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)



- (d) Mark the front of the cylinder head bolt with paint.
- (e) Using the same sequence as step (c), retighten the cylinder head bolts by additional 90° and one more additional 90° as shown in the illustration.
- (f) Check that each paint mark is now at the 180° angle to the front.

51. INSTALL ENGINE REAR OIL SEAL

- (a) Apply multi-purpose grease to a new oil seal lip.

NOTICE:

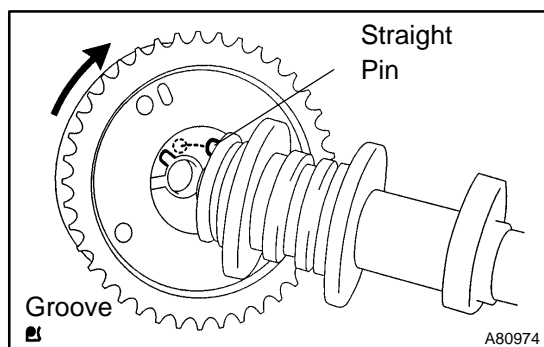
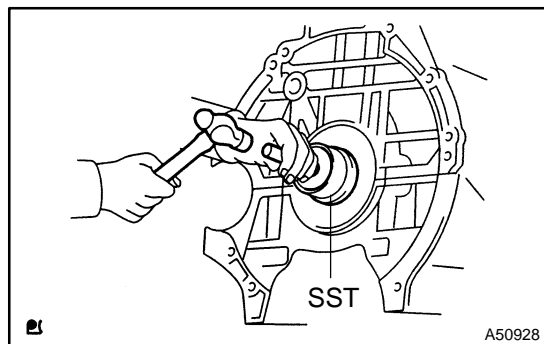
Keep the lip free of foreign materials.

- (b) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.

SST 09223-56010

NOTICE:

- **Be careful not to tap the oil seal at an angle.**
- **Wipe off extra grease on the crankshaft.**



52. INSTALL CAMSHAFT TIMING GEAR ASSY

- (a) Put the camshaft timing gear assembly and camshaft together with the straight pin off the groove.
- (b) Turn the camshaft timing gear assembly clockwise while pushing it lightly towards the camshaft. Push further at the position where the pin fits into the groove.

NOTICE:

Be careful not to turn the camshaft timing gear to the retard angle side (to the right).

- (c) Check that there is no clearance between the gear fringe and camshaft.
- (d) Tighten the fringe bolt with the camshaft timing gear fixed.
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)
- (e) Check that the camshaft timing gear assembly can move to the retard angle (to the right) and is locked at the most retarded position.

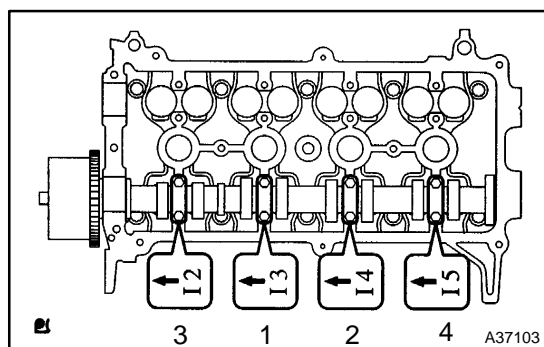
53. INSTALL CAMSHAFT

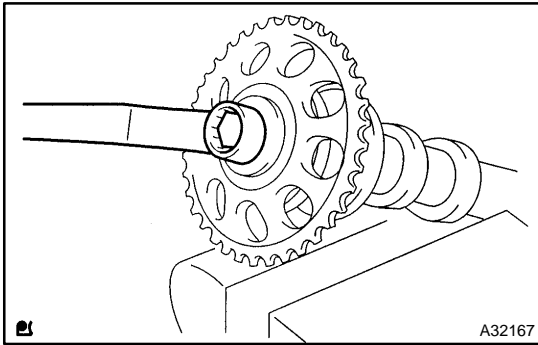
- (a) Apply a light coat of engine oil on the camshaft journals.
- (b) Place the camshaft on the cylinder head with the timing mark on the camshaft timing gear facing upward.
- (c) Examine the front marks and numbers and tighten the bolts in the sequence shown in the illustration.

Torque: 13 N·m (129 kgf·cm, 9.4 ft·lbf)

NOTICE:

Tighten each bolt uniformly keeping the camshaft level.



**54. INSTALL CAMSHAFT TIMING GEAR OR SPROCKET**

- (a) Clamp the camshaft in a vise.
- (b) Align the knock pin hole of the camshaft timing sprocket with the knock pin of the camshaft, and install the camshaft timing sprocket.

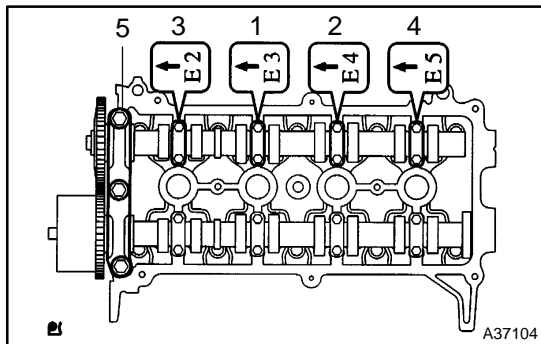
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)

NOTICE:

Be careful not to damage the camshaft.

55. INSTALL NO.2 CAMSHAFT

- (a) Apply a light coat of engine oil on the camshaft journals.
- (b) Place the camshaft on the cylinder head with the timing mark on the camshaft timing gear facing upward.



- (c) Examine the front marks and numbers and tighten the bolts in the sequence shown in the illustration.

Torque: 13 N·m (129 kgf·cm, 9.4 ft·lbf)

NOTICE:

Tighten each bolt uniformly keeping the camshaft level.

- (d) Install the bearing cap No. 1.

Torque: 23 N·m (235 kgf·cm, 17 ft·lbf)

56. INSTALL CAMSHAFT POSITION SENSOR

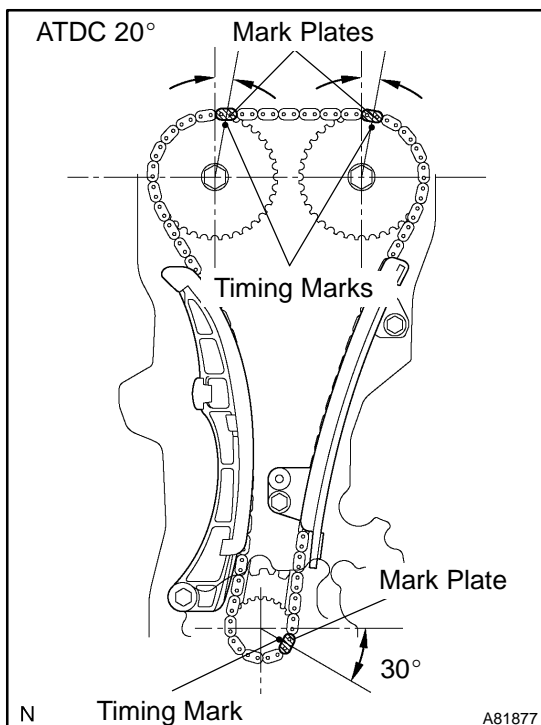
- (a) Apply engine oil to the O-ring.

NOTICE:

If the O-ring is damaged, replace the camshaft position sensor.

- (b) Install the camshaft position sensor with the bolt.

Torque: 8.0 N·m (82 kgf·cm, 71 in·lbf)

**57. INSTALL CHAIN SUB-ASSY**

- (a) After setting the crankshaft at ATDC 40 to 140°, set cams of intake and exhaust timing sprockets at ATDC 20° and then reset the crankshaft at ATDC 20°.

- (b) Install the chain vibration damper with the 2 bolts.

Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)

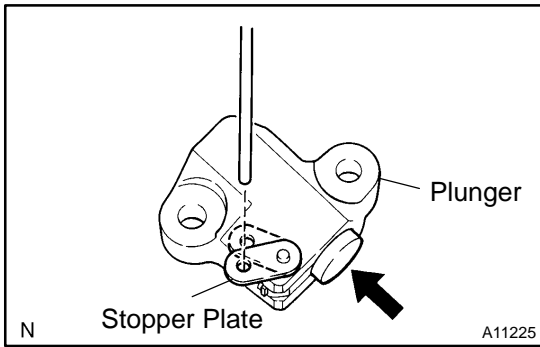
- (c) Align the matchmarks of the camshaft timing sprocket, camshaft timing gear and crankshaft timing sprocket with each mark plate (colored in yellow) of the timing chain.

HINT:

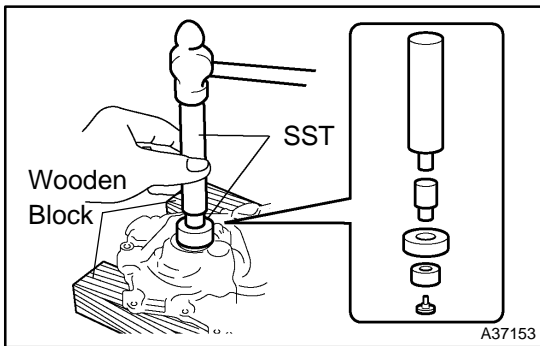
To prevent the exhaust camshaft from springing back, turn it using a wrench and set it at the mark on the chain.

- (d) Install the chain tensioner slipper with the bolt.

Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)



- (e) Rotate the stopper plate of the chain tensioner upward as shown in the illustration, push in the plunger of the tensioner.
- (f) Rotate the stopper plate of the tensioner downward, insert a 2.5 mm (0.098 in.) diameter bar into the holes of the stopper plate and tensioner to hold the stopper plate.
- (g) Install the chain tensioner with the 2 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.-lbf)
- (h) Remove the bar from the chain tensioner.
- (i) Check the tension between the intake and exhaust camshaft timing sprockets.

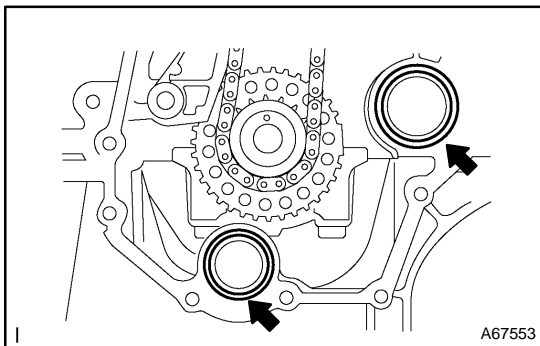


58. INSTALL OIL PUMP SEAL

- (a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing chain cover edge.
SST 09950-60010 (09951-00250, 09951-00380, 09952-06010), 09950-70010 (09951-07100)

NOTICE:

- **Be careful not to tap the oil seal at an angle.**
- **Keep the lip free of foreign objects.**
- (b) Apply multi-purpose grease to the oil seal lip.



59. INSTALL OIL PUMP ASSY

- (a) Install 2 new O-rings to the 2 locations as shown in the illustration.
- (b) Remove any old packing material from the contact surface.

(c) Apply seal packing to the oil pump assembly, cylinder head and cylinder block as shown in the illustration below.

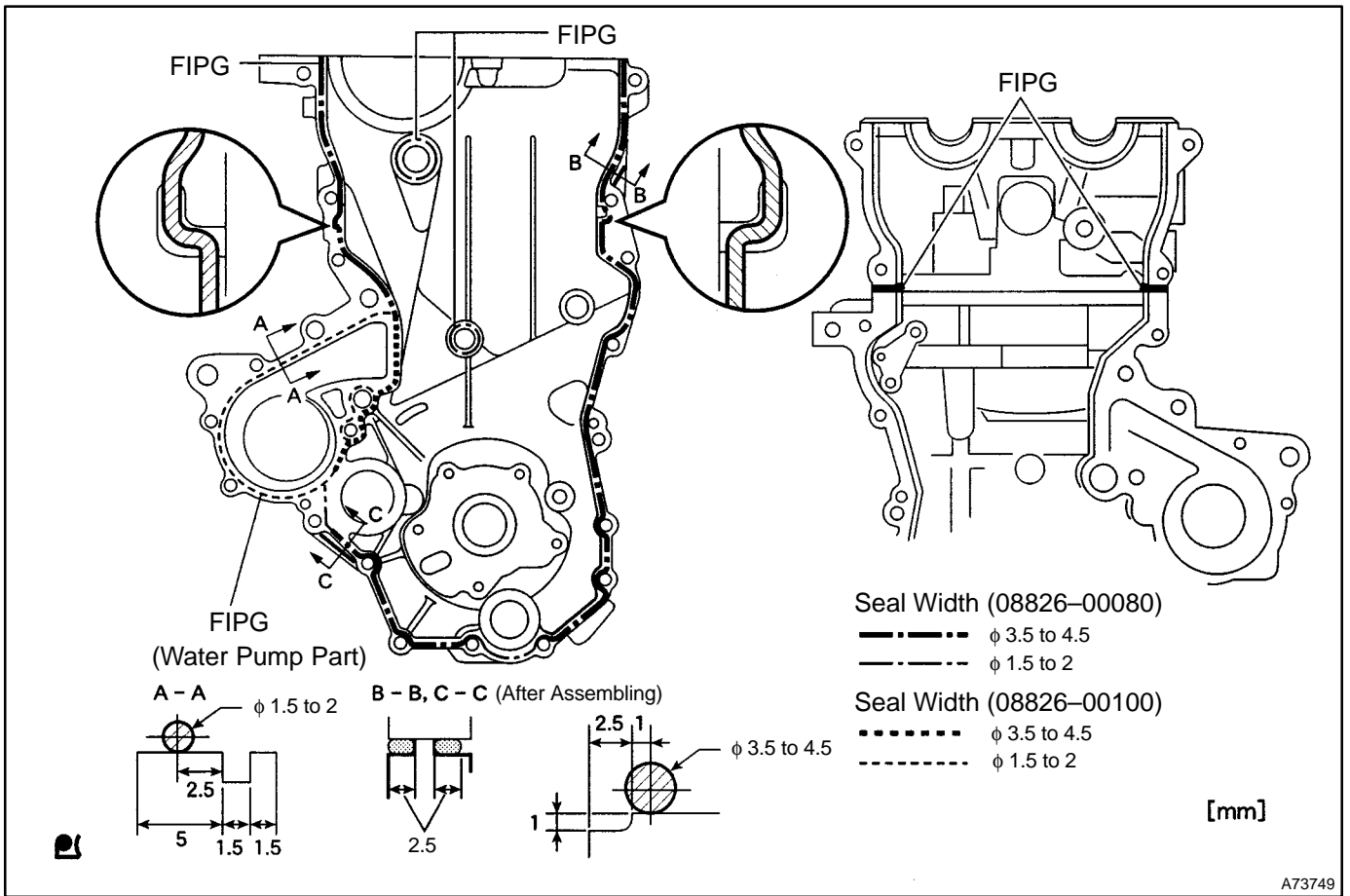
Seal packing:

Water pump part part No. 08826 - 00100 or equivalent

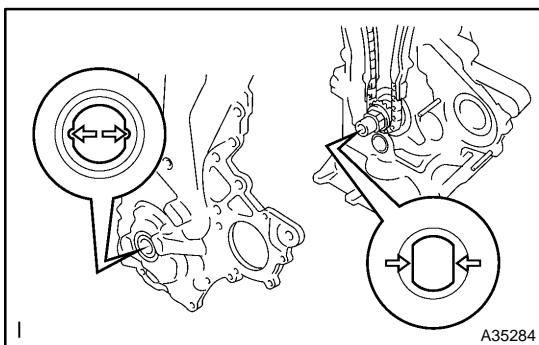
Other part part No. 08826 - 00080 or equivalent

NOTICE:

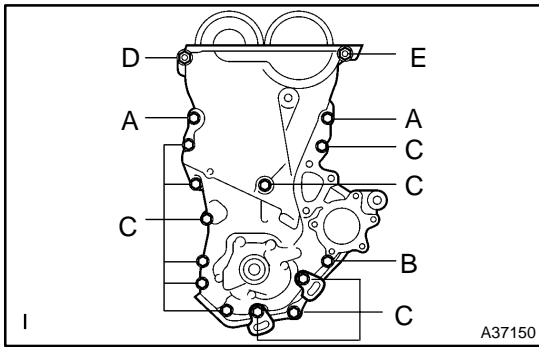
- Remove any oil from the contact surface.
- Install the oil pump within 3 minutes after applying the seal packing.
- Do not expose the seal to engine oil within 2 hours of installation.
- Do not start the engine within 2 hours of installation.



A73749



(d) Align the keyway of the oil pump drive rotor with the rectangular portion of the crankshaft, and slide the oil pump into place.



- (e) Install the oil pump assembly with the 15 bolts and nut. Tighten the bolts and nut uniformly in several steps.

Torque:

- Bolt A** 24 N·m (245 kgf·cm, 18 ft·lbf)
- Bolt B** 11 N·m (112 kgf·cm, 8.1 ft·lbf)
- Bolt C** 11 N·m (112 kgf·cm, 8.1 ft·lbf)
- Nut D** 24 N·m (245 kgf·cm, 18 ft·lbf)
- Bolt E** 24 N·m (245 kgf·cm, 18 ft·lbf)

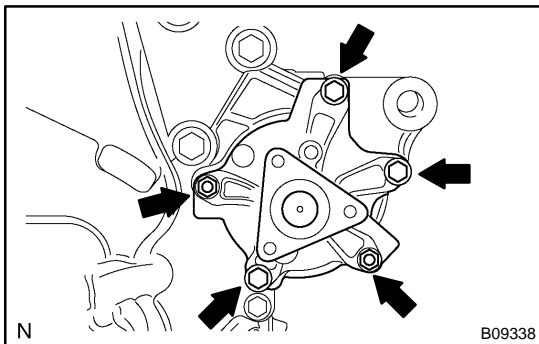
NOTICE:

- Pay attention not to disturb the seal packing.
- After installing the oil pump assembly, the mounting bracket and water pump must be installed within 15 minutes.

HINT:

Each bolt length is as follows.

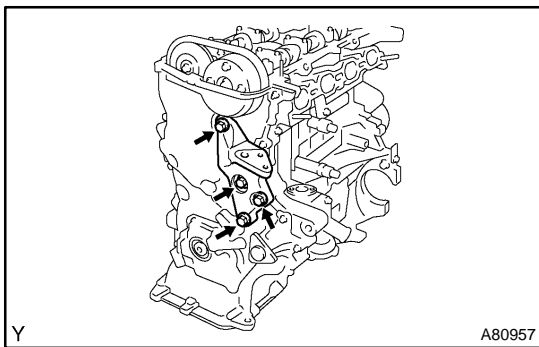
- A 30 mm (1.18 in.)
- B 35 mm (1.38 in.)
- C 20 mm (0.79 in.)
- E 20 and 14 mm (0.79 and 0.55 in.) double ended bolt



60. INSTALL WATER PUMP ASSY

- (a) Install the water pump and a new gasket with the 3 bolts and 2 nuts.

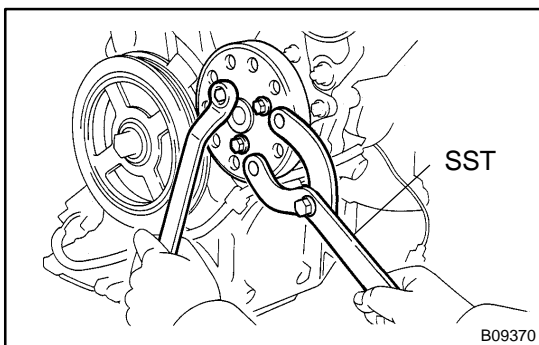
Torque: 11 N·m (112 kgf·cm, 8.1 ft·lbf)



61. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

- (a) Install the engine mounting bracket RH with the 4 bolts.

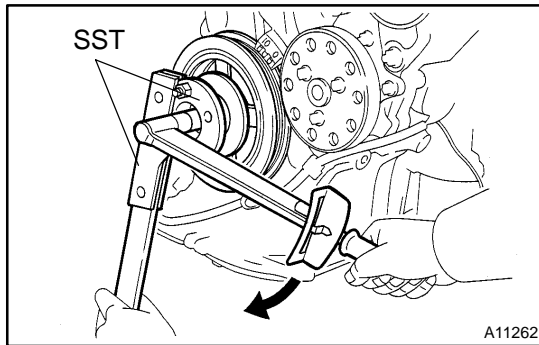
Torque: 55 N·m (561 kgf·cm, 41 ft·lbf)



62. INSTALL WATER PUMP PULLEY

- (a) Using SST, install the pump pulley with the 3 bolts.
SST 09960-10010 (09962-01000, 09963-00600)

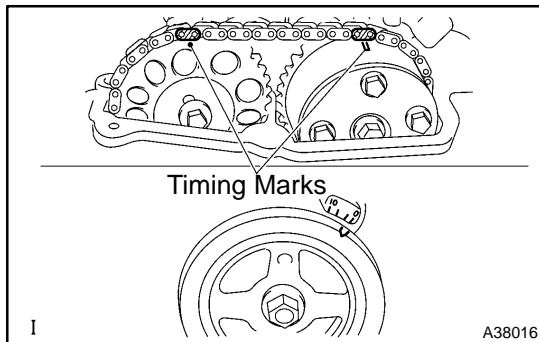
Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)

**63. INSTALL CRANKSHAFT DAMPER SUB-ASSY**

- (a) Align the hole of the crankshaft damper with the pin position and install the crankshaft damper.
- (b) Using SST, install the pulley bolt.
SST 09330-00021, 09213-58012 (91111-50845)
Torque: 128 N·m (1,305 kgf·cm, 95 ft·lbf)

64. INSPECT VALVE CLEARANCE**HINT:**

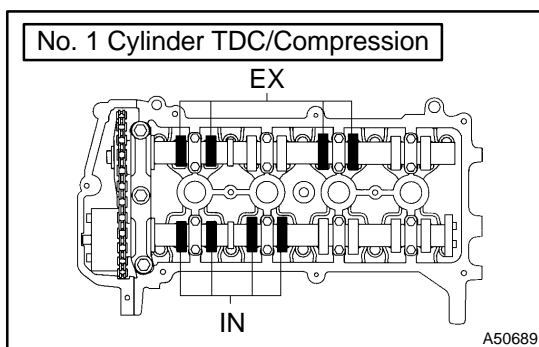
Inspect and adjust the valve clearance when the engine is cold.



- (a) Set the No. 1 cylinder to the TDC/compression.
 - (1) Turn the crankshaft damper, and align its timing notch with the timing mark "0" of the chain cover.
 - (2) Check that both timing marks on the camshaft timing sprocket and camshaft timing gear are facing upward as shown in the illustration.

HINT:

If not, turn the crankshaft 1 complete revolution (360°) and align the marks as above.



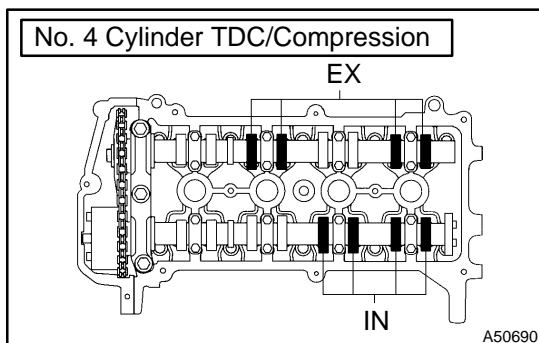
- (b) Check the valves indicated in the illustration.
 - (1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

Valve clearance (Cold) :

Intake 0.15 to 0.25 mm (0.006 to 0.010 in.)

Exhaust 0.25 to 0.35 mm (0.010 to 0.014 in.)

- (2) Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.
- (c) Turn the crankshaft 1 complete revolution (360°) and align its timing notch with the timing mark "0" of the chain cover.



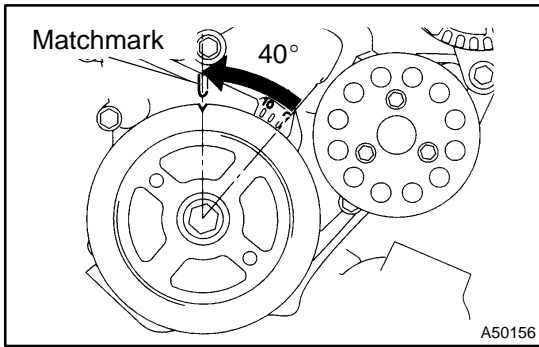
- (d) Check the valves indicated in the illustration.
 - (1) Using a feeler gauge, measure the clearance between the valve lifter and the camshaft.

Valve clearance (Cold) :

Intake 0.15 to 0.25 mm (0.006 to 0.010 in.)

Exhaust 0.25 to 0.35 mm (0.010 to 0.014 in.)

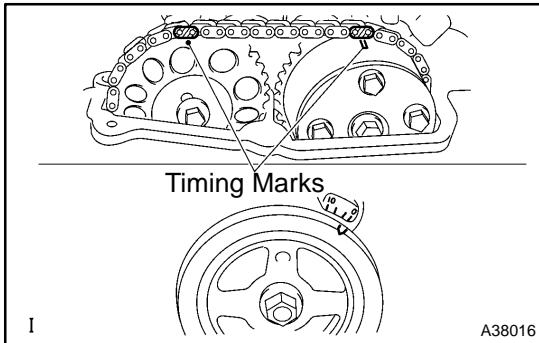
- (2) Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.



65. ADJUST VALVE CLEARANCE

NOTICE:

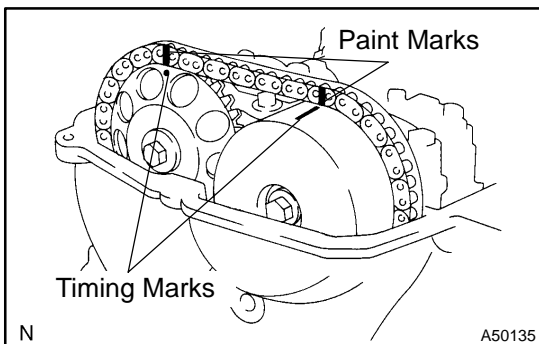
When rotating the camshaft with the timing chain removed, rotate the crankshaft damper counterclockwise 40° from the TDC and align its timing notch with timing mark of the chain cover to prevent contact of the pistons with the valves.



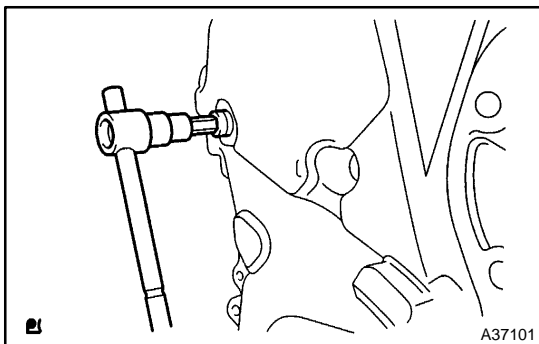
- (a) Set the No. 1 cylinder to the TDC/compression.
 - (1) Turn the crankshaft damper, and align its timing notch with the timing mark "0" of the chain cover.
 - (2) Check that both timing marks on the camshaft timing sprocket and camshaft timing gear are facing upward as shown in the illustration.

HINT:

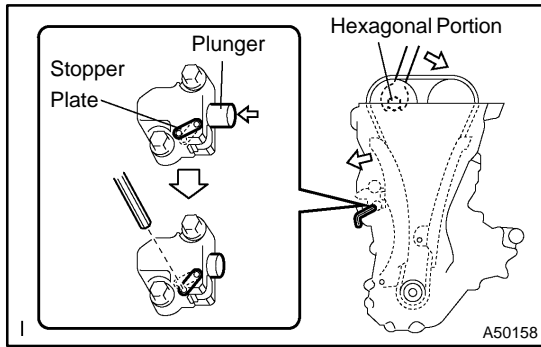
If not, turn the crankshaft 1 complete revolution (360°) and align the marks as above.



- (b) Put paint marks on the timing chain in place where the timing marks of the camshaft timing sprocket and camshaft timing gear are located.



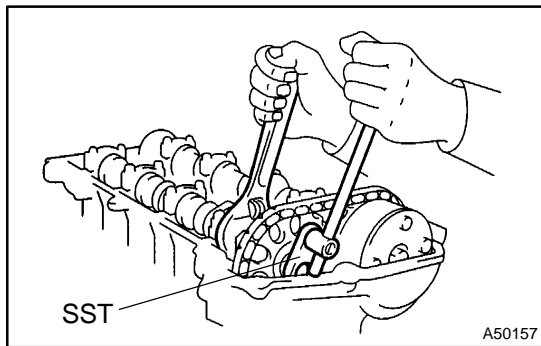
- (c) Using an 8 mm hexagon wrench, remove the screw plug.



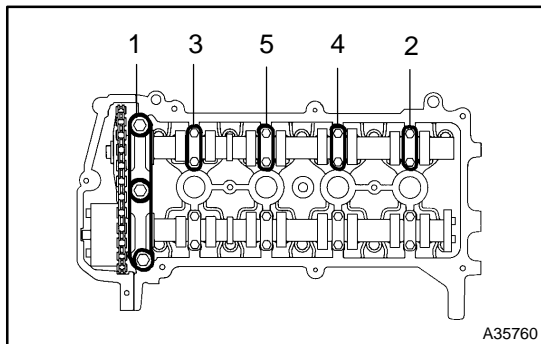
- (d) Insert a screwdriver into service hole of the chain tensioner to hold the stopper plate of the chain tensioner at upward position.
- (e) Using a wrench, rotate the camshaft No. 2 clockwise to push in the plunger of the chain tensioner.
- (f) Remove the screwdriver from the service hole, then align the hole of the stopper plate with the service hole and insert a 2 to 3 mm (0.08 to 0.12 in.) diameter bar into the holes to hold the stopper plate.

HINT:

- Fix the stopper plate using the bar while rotating the camshaft right and left slightly.
- Hold the bar with tape so that the bar does not come off.



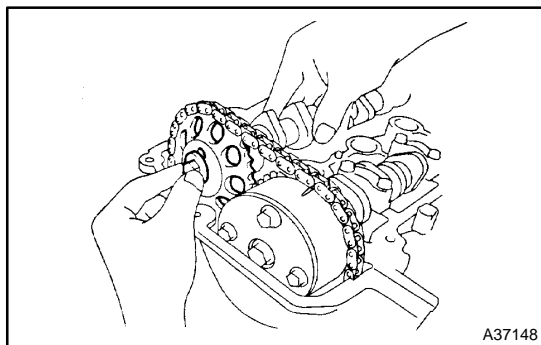
- (g) Hold the camshaft with a wrench on the hexagonal lobe, and remove the bolt.



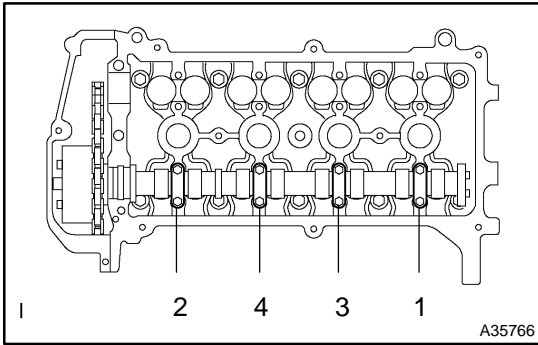
- (h) Using several steps, loosen and remove the 11 bearing cap bolts uniformly in the sequence shown in the illustration, then remove the 5 bearing caps.

NOTICE:

Loosen each bolt uniformly keeping the camshaft level.



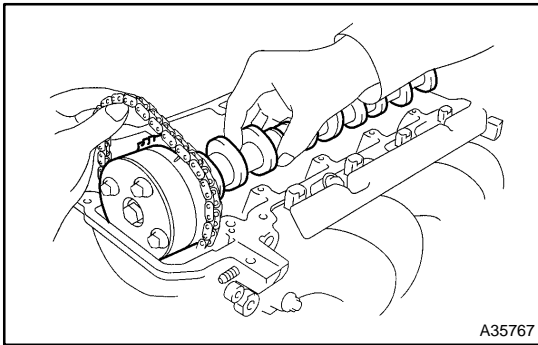
- (i) Remove the fringe bolt with the No. 2 camshaft lifted up, then detach the No. 2 camshaft and camshaft timing sprocket.



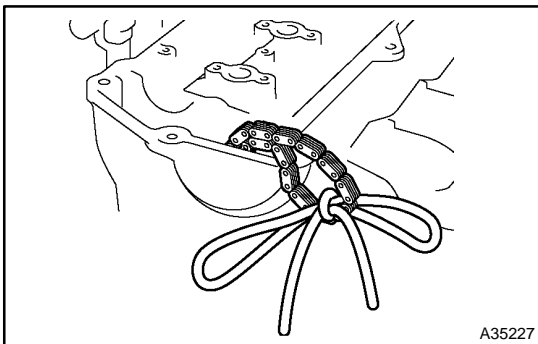
- (j) Using several steps, loosen and remove the 8 bearing cap bolts uniformly in the sequence shown in the illustration, then remove the 4 bearing caps.

NOTICE:

Loosen each bolt uniformly keeping the camshaft level.



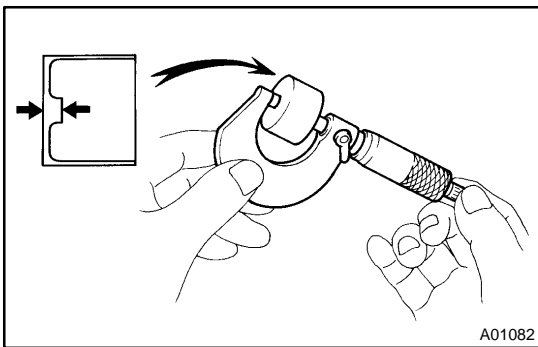
- (k) Hold the timing chain by hand, and remove the camshaft and camshaft timing gear assembly.



- (l) Tie the timing chain with a string as shown in the illustration.

NOTICE:

Be careful not to drop anything inside the timing chain cover.



- (m) Remove the valve lifters.
- (n) Using a micrometer, measure the thickness of the removed lifter.
- (o) Calculate the thickness of a new lifter so that the valve clearance comes within the specified value.

A	Thickness of new lifter
B	Thickness of used lifter
C	Measured valve clearance

Specified value (Cold):

Intake $A = B + (C - 0.20 \text{ mm (0.008 in.)})$

Exhaust $A = B + (C - 0.30 \text{ mm (0.012 in.)})$

- (p) Select a new lifter with a thickness as close to the calculated values as possible .

EXAMPLE (Intake):

Measured valve clearance = 0.40 mm (0.0158 in.)

0.40 mm (0.0158 in.) – 0.20 mm (0.0079 in.) = 0.20 mm (0.0079 in.)

(Measured – Specification = Excess clearance)

Used lifter measurement = 5.25 mm (0.2067 in.)

0.20 mm (0.0079 in.) + 5.25 mm (0.2067 in.) = 5.45 mm (0.2146 in.)

(Excess clearance + Used lifter = Ideal new lifter)

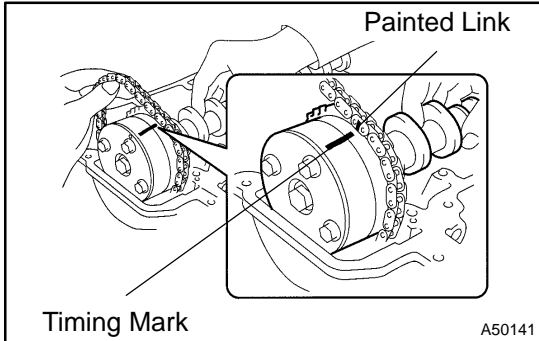
Closest new lifter = 5.45 mm (0.2146 in.)

Select No. 46 lifter (5.46 mm (0.2150 in.))

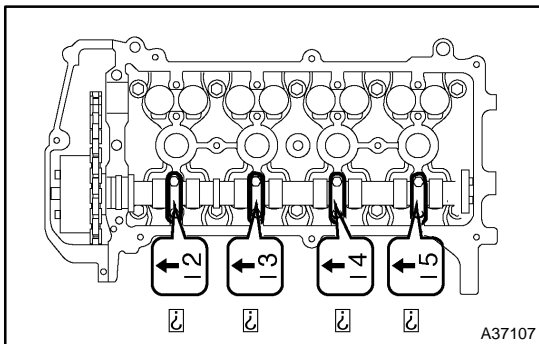
HINT:

- Lifters are available in 35 sizes in increments of 0.020 mm (0.0008 in.), from 5.060 mm (0.1992 in.) to 5.740 mm (0.2260 in.)
- Refer to the New Lifter Thickness table on the next 2 pages.

- (q) Reinstall the valve lifters.
- (r) Apply a light coat of engine oil on the camshaft journals.

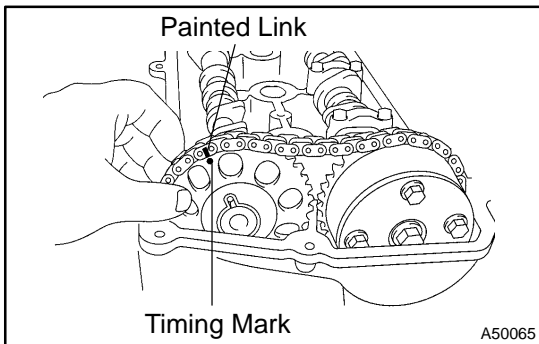


- (s) Install the timing chain to the camshaft timing gear with the painted link and timing marks are aligned as shown in the illustration.

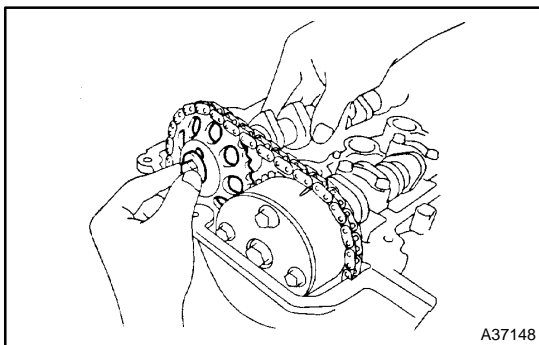


- (t) Examine the front marks and numbers and tighten the bolts in the sequence shown in the illustration.
Torque: 13 N·m (129 kgf·cm, 9.4 ft·lbf)

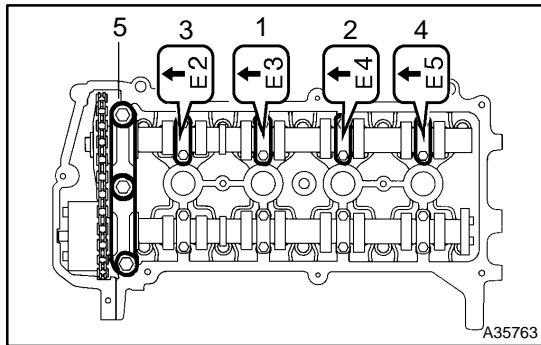
NOTICE:
Tighten each bolt uniformly keeping the camshaft level.



- (u) Hold the timing chain, and align the timing mark on the camshaft timing sprocket with the painted link on the timing chain.



- (v) Align the alignment pin hole on the camshaft timing sprocket with the alignment pin of the camshaft, and install the sprocket to the camshaft.
- (w) Temporarily install the timing sprocket bolt.

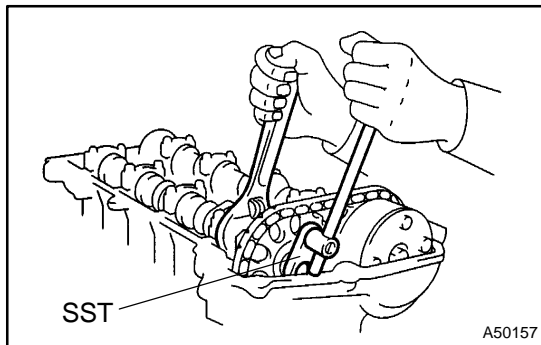


- (x) Examine the front marks and numbers and tighten the bolts in the sequence shown in the illustration.
Torque: 13 N·m (129 kgf·cm, 9.4 ft·lbf)

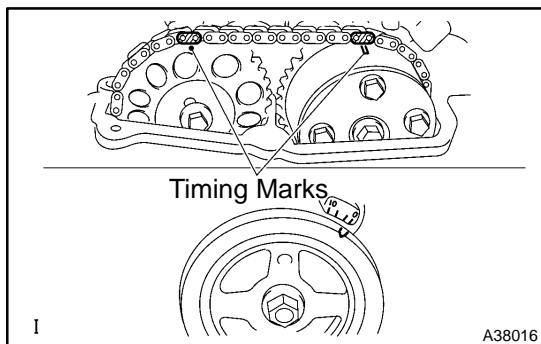
NOTICE:

Tighten each bolt uniformly keeping the camshaft level.

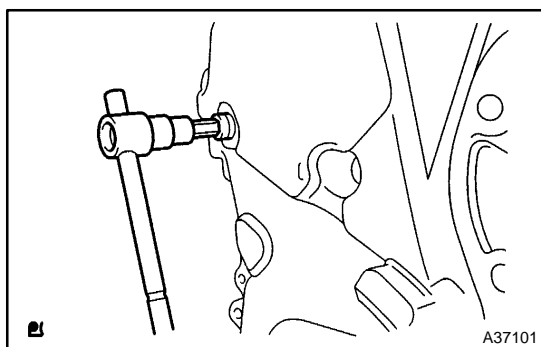
- (y) Install the bearing cap No. 1.
Torque: 23 N·m (235 kgf·cm, 17 ft·lbf)



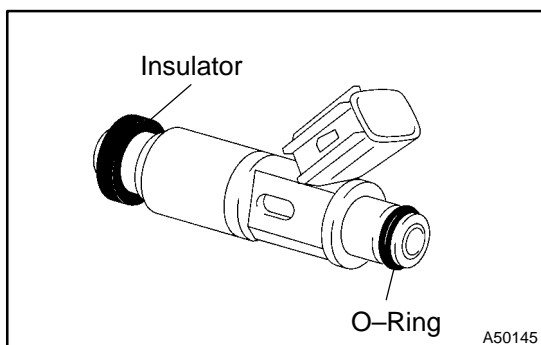
- (z) Hold the camshaft with a wrench on the hexagonal lobe, and install the bolt.
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)
- (aa) Remove the bar from the timing chain tensioner.



- (ab) Turn the crankshaft damper, and align its timing notch with the timing mark "0" of the chain cover.
- (ac) Check that all the pairs of the matchmarks are aligned.

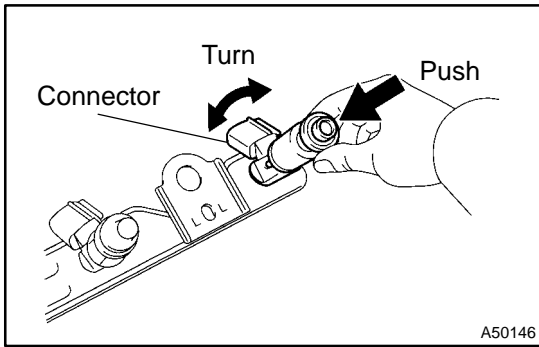


- (ad) Apply the seal packing 2 or 3 threads to the screw plug end.
Seal packing:
Part No. 08833 – 00070 or equivalent
- (ae) Using an 8 mm hexagon wrench, install the screw plug.
Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)



66. INSTALL FUEL INJECTOR ASSY

- (a) Install new insulators to each fuel injector.
- (b) Apply a light coat of grease or gasoline to a new O-ring and install it to each fuel injector.
- (c) Apply a light coat of grease or gasoline on the place where a delivery pipe contacts the O-ring.



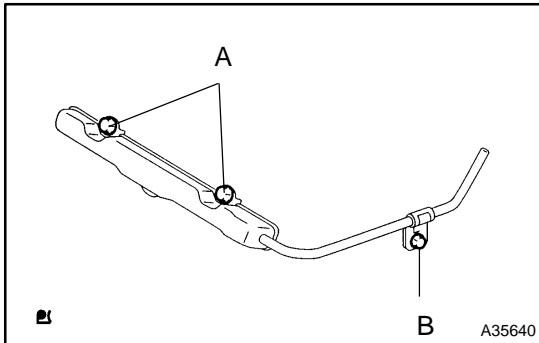
- (d) While turning the injector clockwise and counterclockwise, push it to the delivery pipe.

NOTICE:

- Be careful not to twist the O-ring.
- After installing the fuel injectors, check that they turn smoothly. If not, replace it with a new O-ring.

67. INSTALL FUEL DELIVERY PIPE SUB-ASSY

- (a) Install the 2 spacers to the cylinder head.



- (b) Install the fuel delivery pipe and 4 fuel injectors together.

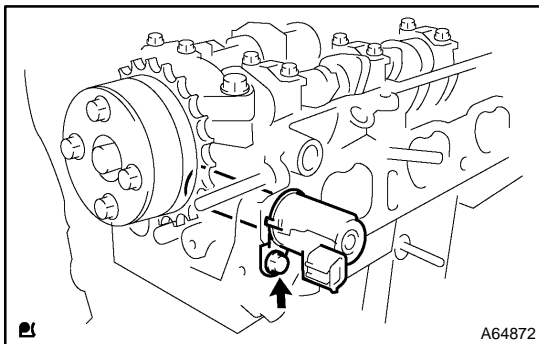
Torque:

Bolt A 19 N·m (194 kgf·cm, 14 ft·lbf)

Bolt B 9.0N·m (92 kgf·cm, 80 in·lbf)

NOTICE:

- Be careful not to drop the fuel injectors when installing the fuel delivery pipe.
- Check that the fuel injectors rotate smoothly after installing the fuel delivery pipe.



68. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSY

- (a) Apply a light coat of engine oil to a new O-ring, and install it to the camshaft timing oil control valve.
- (b) Install the camshaft timing oil control valve with the bolt.

Torque: 7.5 N·m (76 kgf·cm, 66 in·lbf)

NOTICE:

Be careful not to twist the O-ring.

69. INSTALL CYLINDER HEAD COVER SUB-ASSY

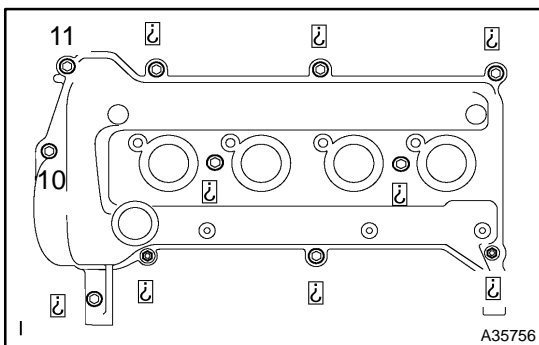
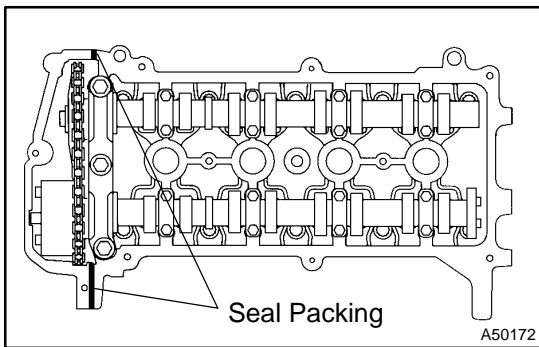
- (a) Install the gasket to the cylinder head cover.
- (b) Apply the seal packing to the 2 locations as shown in the illustration.

Seal packing:

Part No. 08826 - 00080 or equivalent

NOTICE:

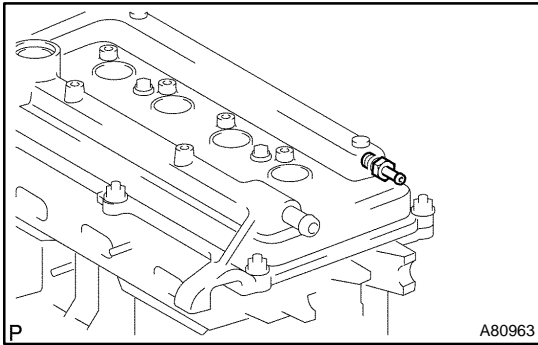
- Remove any oil from the contact surface.
- Install the cylinder head cover within 3 minutes after applying the seal packing.
- Do not start the engine within 2 hours of installation.



- (c) Install the cylinder head cover with the 9 bolt, 2 seal washers and 2 nuts.

- (d) Using several steps, tighten the bolts and nuts uniformly in the sequence shown in the illustration.

Torque: 10 N·m (102 kgf·cm, 7.4 ft·lbf)

**70. INSTALL VENTILATION VALVE SUB-ASSY**

- (a) Install the ventilation valve to the cylinder head cover.
Torque: 27 N·m (275 kgf·cm, 20 ft·lbf)

71. INSTALL OIL LEVEL GAGE GUIDE

- (a) Apply engine oil to a new O-ring.
 (b) Install the oil level gauge guide with the bolt.
Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)

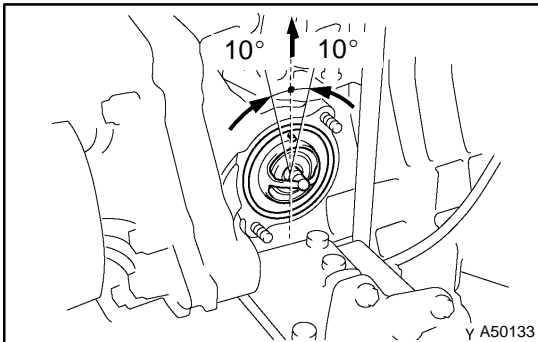
72. INSTALL CRANKSHAFT POSITION SENSOR

- (a) Apply a light coat of engine oil to the O-ring on the crankshaft position sensor.

NOTICE:

If the O-ring is damaged, replace the crankshaft position sensor.

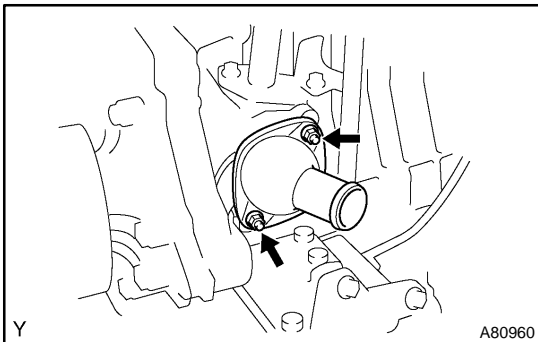
- (b) Install the crankshaft position sensor with the bolt.
Torque: 7.5 N·m (76 kgf·cm, 66 in·lbf)

**73. INSTALL THERMOSTAT**

- (a) Install a new gasket to the thermostat.
 (b) Install the thermostat with the jiggle valve facing upward.

HINT:

The jiggle valve may be set within 10° at either side as shown in the illustration.



- (c) Install the water inlet with the 2 nuts.
Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)

74. INSTALL SPARK PLUG

- (a) Using a spark plug wrench, install the spark plugs.
Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)