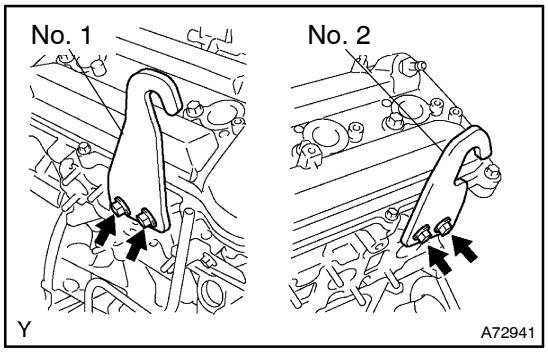
1415O–01

OVERHAUL

HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O–rings and oil seals with new parts.



1. REMOVE ENGINE HANGER NO.1

(a) Remove the 2 bolts and engine hanger No. 1.

2. REMOVE ENGINE HANGER NO.2

(a) Remove the 2 bolts and engine hanger No. 2.

3. REMOVE OIL LEVEL GAUGE GUIDE

(a) Remove the bolt and pull out the oil level gauge guide.

(b) Remove the O–ring from the oil level gauge guide.

4. REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB–ASSY

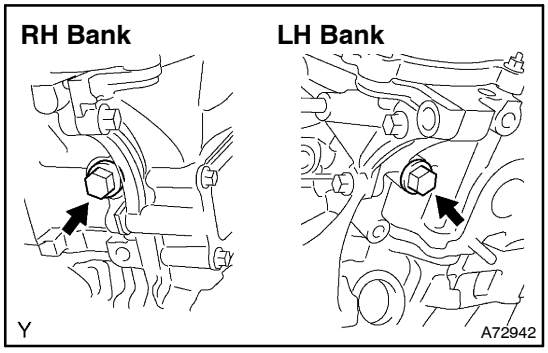
(a) Remove the 2 water drain cocks.

5. REMOVE VVT SENSOR

(a) Remove the 2 bolts and 2 VVT sensors.

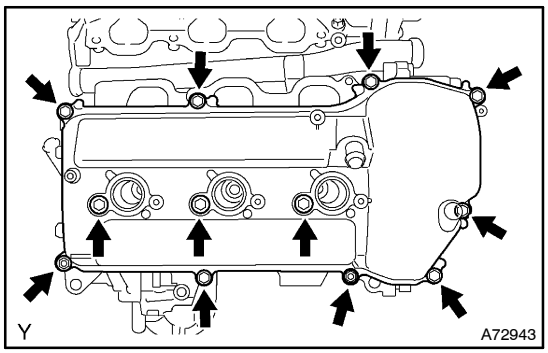
6. REMOVE CRANKSHAFT POSITION SENSOR

(a) Remove the bolt and crankshaft position sensor.



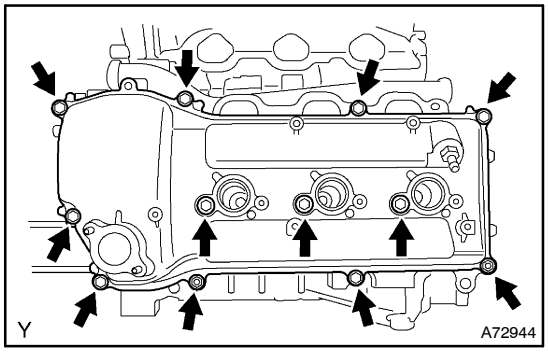
7. REMOVE OIL CONTROL VALVE FILTER

(a) Remove the plug, filter and gasket from each cylinder head.



8. REMOVE CYLINDER HEAD COVER SUB–ASSY

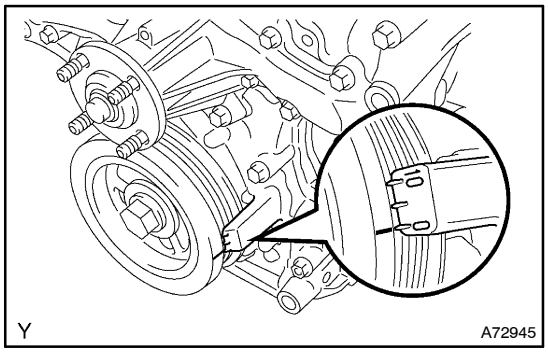
(a) Remove the 10 bolts, 3 seal washers, 2 nuts, cylinder head cover and gasket.



9. REMOVE CYLINDER HEAD COVER SUB–ASSY LH

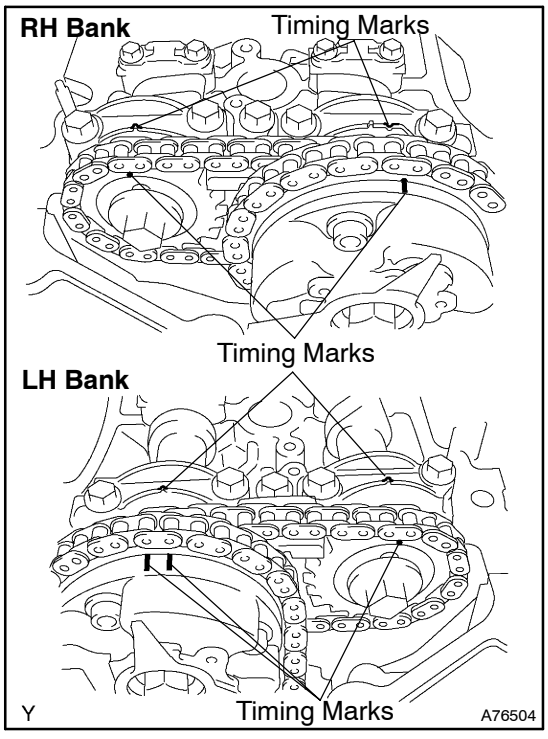
(a) Remove the 10 bolts, 3 seal washers, 2 nuts, cylinder head cover and gasket.

(b) Remove the ventilation valve from the cylinder head cover.



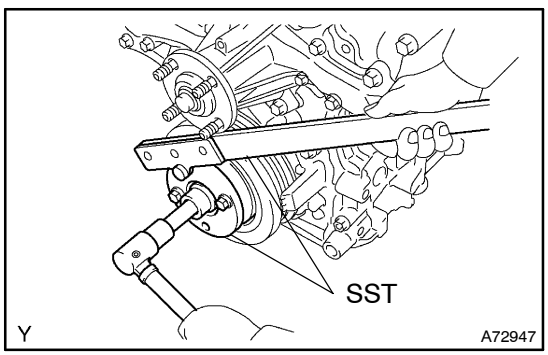
10. REMOVE CRANKSHAFT PULLEY

(a) Turn the crankshaft pulley, and align its groove with the timing mark ”0” of the timing chain cover.



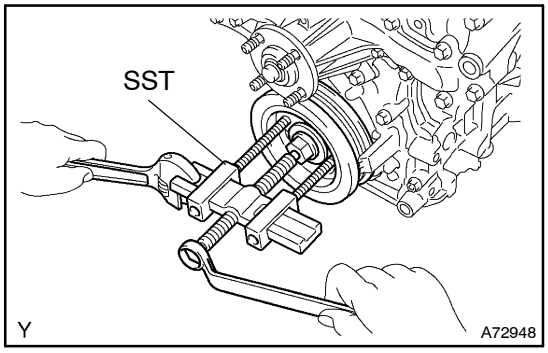
(b) Check that the timing marks of the camshaft timing gears are aligned with the timing marks of the bearing cap as shown in the illustration.

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



(c) Using SST, hold the crankshaft pulley and loosen the pulley set bolt.

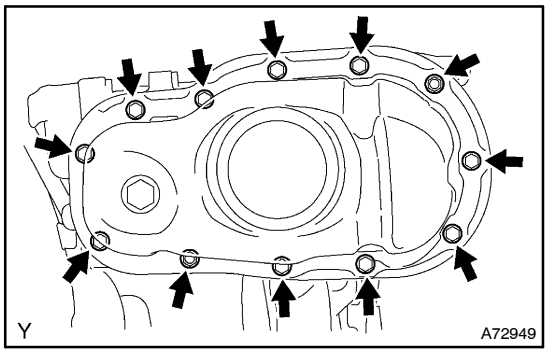
SST 09213–54015 (91651–60855), 09330–00021



(d) Using the pulley set bolt and SST, remove the crankshaft pulley.
SST 09950–50013 (09951–05010, 09952–05010, 09953–05020, 09954–05030)

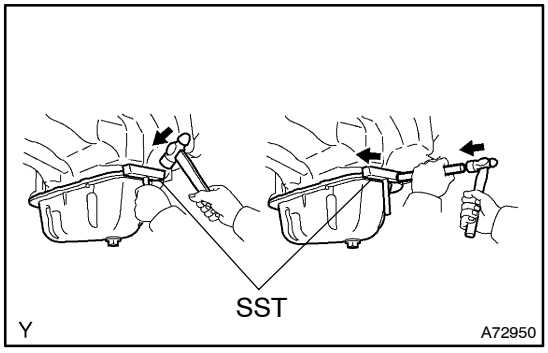
11. REMOVE OIL PAN DRAIN PLUG

(a) Remove the drain plug and gasket.



12. REMOVE OIL PAN SUB–ASSY NO.2

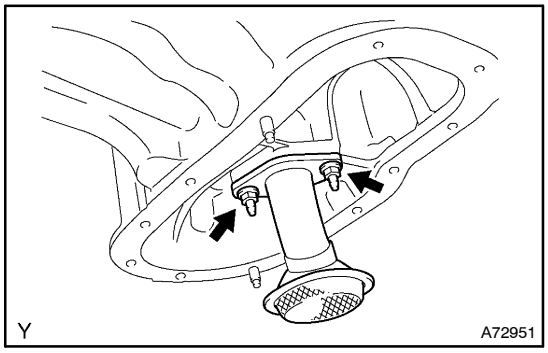
(a) Remove the 10 bolts and 2 nuts.



(b) Insert the blade of SST between the oil pan and oil pan No. 2, cut off applied sealer and remove the oil pan No. 2.
SST 09032–00100

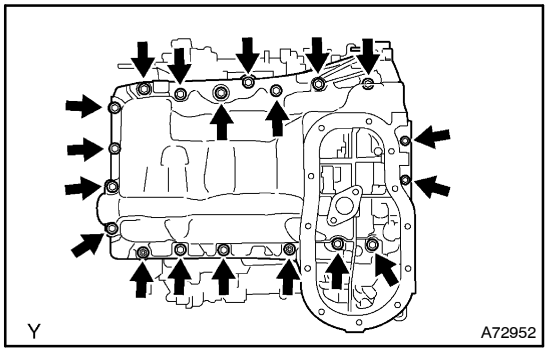
NOTICE:

- **Be careful not to damage the contact surface of the oil pan and oil pan No. 2.**
- **Be careful not to damage the oil pan No. 2 flange.**



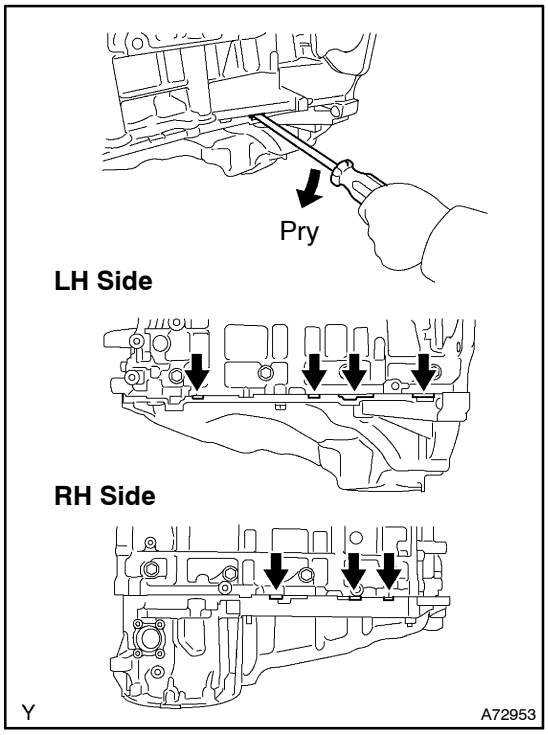
13. REMOVE OIL STRAINER SUB–ASSY

(a) Remove the 2 nuts, oil strainer and gasket.



14. REMOVE OIL PAN SUB–ASSY

(a) Remove 17 bolts and 2 nuts.

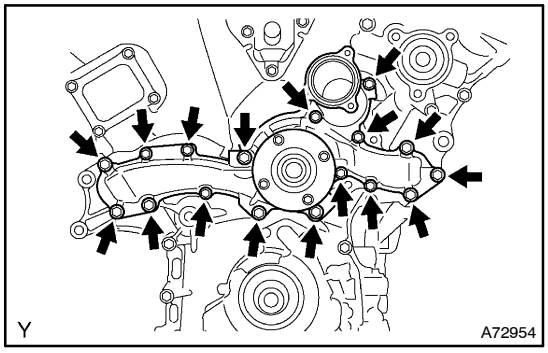


(b) Using a screwdriver, remove the oil pan by prying between the oil pan and cylinder block in the sequence shown.

NOTICE:

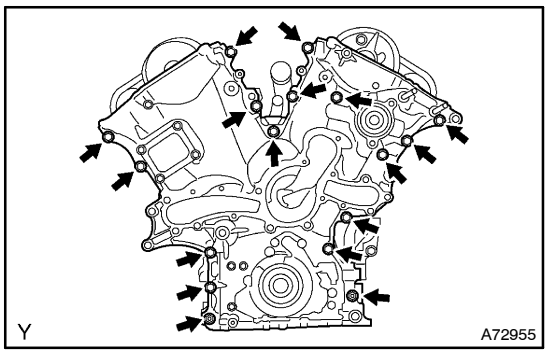
Be careful not to damage the contact surfaces of the cylinder block and oil pan.

(c) Remove the O–ring from the oil pump.



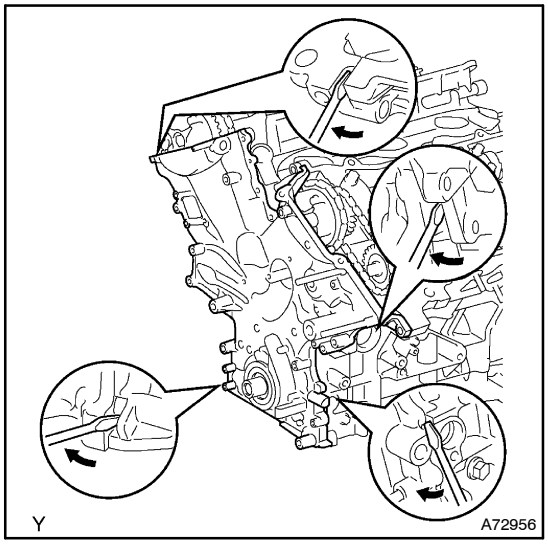
15. REMOVE WATER PUMP ASSY

(a) Remove the 17 bolts, water pump and gasket.



16. REMOVE TIMING CHAIN OR BELT COVER SUB–ASSY

(a) Remove the 15 bolts and 2 nuts.

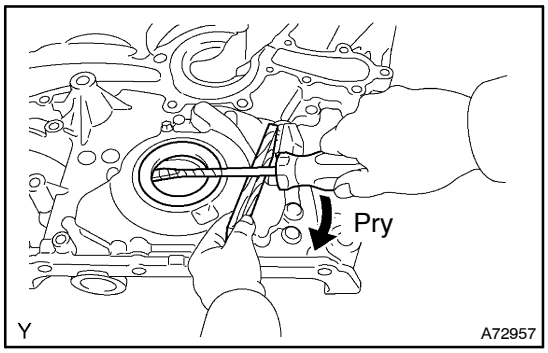


(b) Remove the timing chain cover by prying the portions between the timing chain cover and cylinder head or cylinder block with a screwdriver.

NOTICE:

Be careful not to damage the contact surfaces of the timing chain cover, cylinder block and cylinder head.

(c) Remove the O–ring from the LH cylinder head.



17. REMOVE TIMING GEAR CASE OR TIMING CHAIN CASE OIL SEAL

(a) Using a screwdriver, pry out the oil seal.

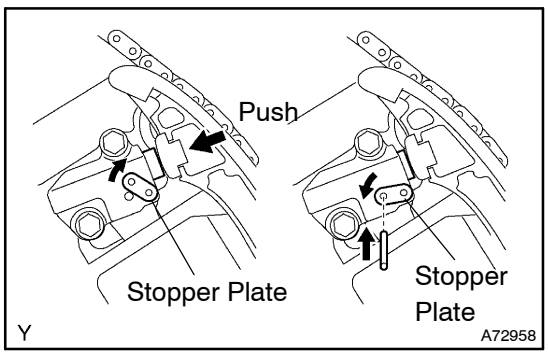
NOTICE:

Be careful not to damage the oil pump body. Tape the screwdriver tip.

18. REMOVE CHAIN TENSIONER ASSY NO.1

NOTICE:

- **Never 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 before rotating it.**

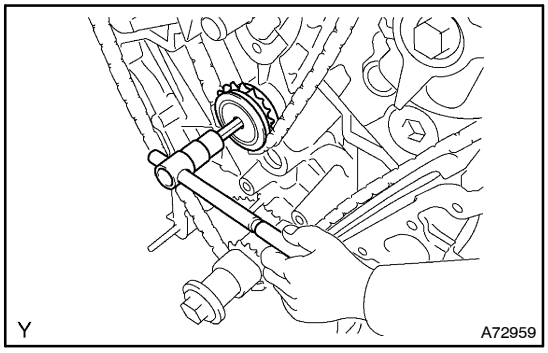


(a) While rotating the stopper plate of the tensioner upward, push in the plunger of the chain tensioner as shown in the illustration.

(b) While rotating the stopper plate of the tensioner downward, insert a bar of ϕ 3.5 mm (0.138 in.) into the holes in the stopper plate and tensioner to fix the stopper plate.

(c) Remove the 2 bolts and chain tensioner.

19. REMOVE CHAIN TENSIONER SLIPPER



20. REMOVE IDLE GEAR NO.1

(a) Using a 10 mm hexagon wrench, remove the idle gear shaft No. 2, idle gear No. 1 and idle gear shaft No. 1.

21. REMOVE CHAIN VIBRATION DAMPER NO.2

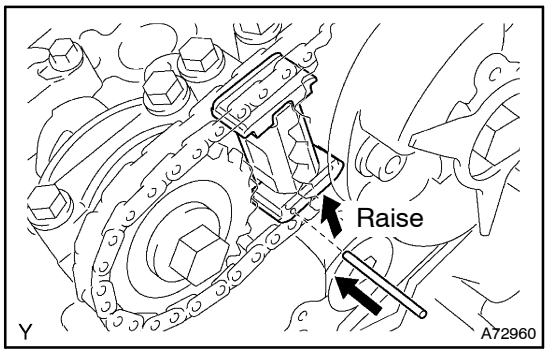
(a) Remove the 2 chain vibration damper No. 2.

22. REMOVE CHAIN SUB–ASSY

23. REMOVE CRANKSHAFT TIMING GEAR OR SPROCKET

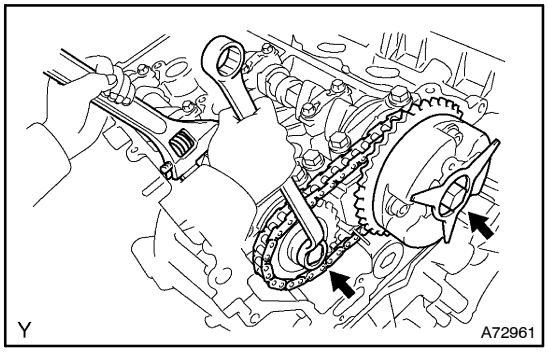
24. REMOVE CHAIN VIBRATION DAMPER NO.1

(a) Remove the 2 bolts and chain vibration damper No. 1.



25. REMOVE CAMSHAFT TIMING GEARS AND NO.2 CHAIN (RH BANK)

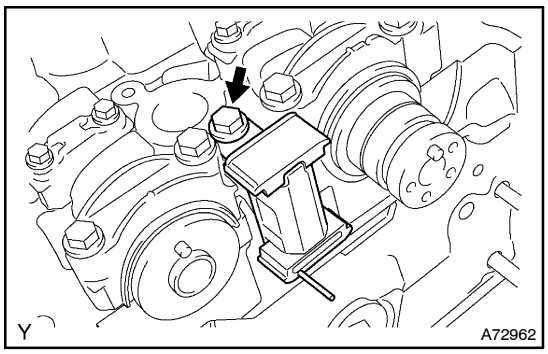
(a) While raising up the chain tensioner No. 2, insert a pin of ϕ 1.0 mm (0.039 in.) into the hole to fix it.



(b) Hold the hexagonal portion of the camshaft with a wrench, and remove the 2 bolts, camshaft timing gear, camshaft timing gear assembly and timing chain No. 2.

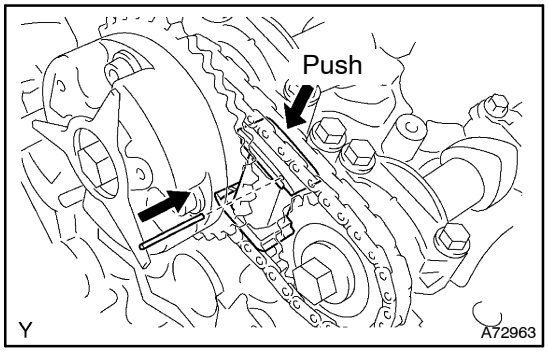
NOTICE:

- **Be careful not to damage the cylinder head and valve lifter with the wrench.**
- **Do not disassemble the camshaft timing gear assembly.**



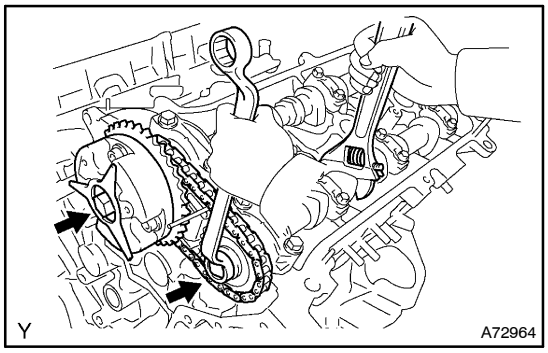
26. REMOVE CHAIN TENSIONER ASSY NO.2

(a) Remove the bolt and chain tensioner No. 2.



27. REMOVE CAMSHAFT TIMING GEARS AND NO.2 CHAIN (LH BANK)

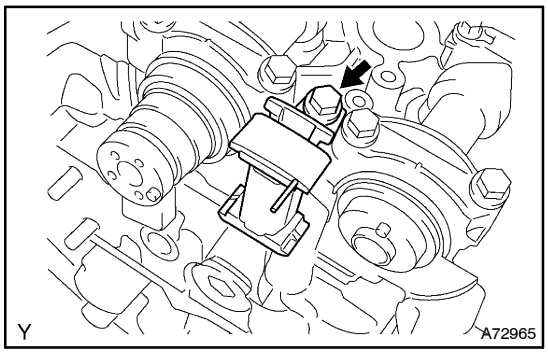
(a) While pushing down the chain tensioner No. 3, insert a pin of ϕ 1.0 mm (0.039 in.) into the hole to fix it.



(b) Hold the hexagonal portion of the camshaft with a wrench, and remove the 2 bolts, camshaft timing gear, camshaft timing gear assembly and timing chain No. 2.

NOTICE:

- **Be careful not to damage the cylinder head and valve lifter with the wrench.**
- **Do not disassemble the camshaft timing gear assembly.**



28. REMOVE CHAIN TENSIONER ASSY NO.3

(a) Remove the bolt and chain tensioner No. 3.

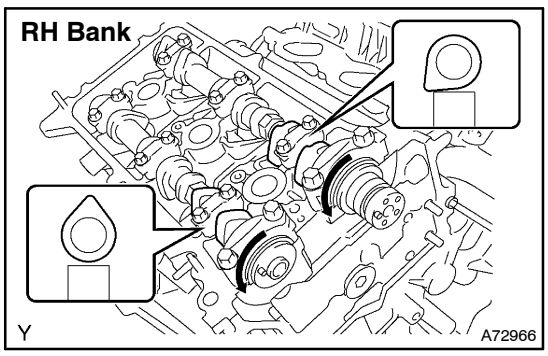
29. REMOVE CAMSHAFTS

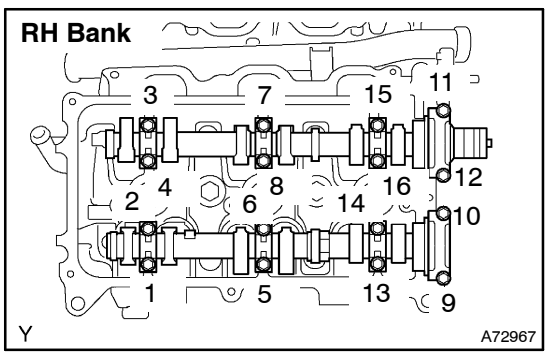
NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.

(a) Remove the camshafts of the RH bank.

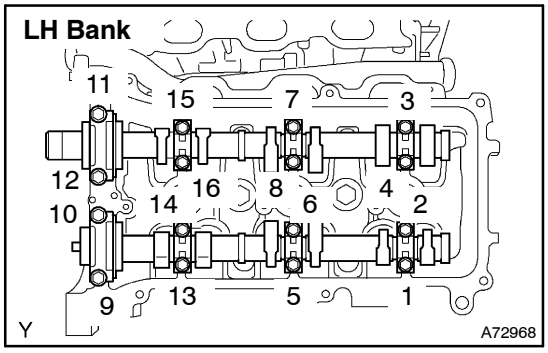
(1) Rotate the camshafts counterclockwise using hexagonal portion of the each camshaft so that the cam lobes of No. 1 cylinder may face as shown in the illustration.





(2) Uniformly loosen and remove the 16 bearing cap bolts in several passes, in the sequence shown.

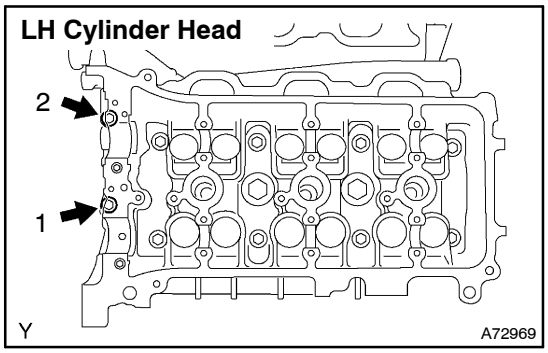
(3) Remove the 8 bearing caps and 2 camshafts.



(b) Remove the camshafts of the LH bank.
(1) Uniformly loosen and remove the 16 bearing cap bolts in several passes, in the sequence shown.
(2) Remove the 8 bearing caps and 2 camshafts.

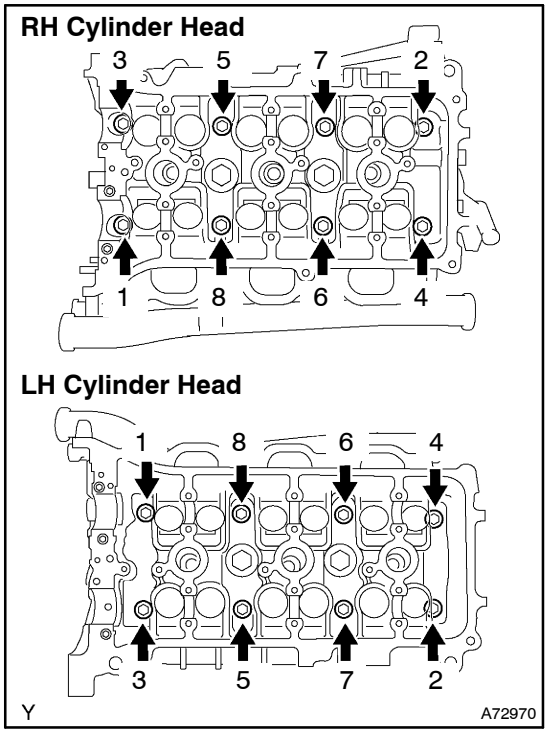
30. REMOVE CAMSHAFT BEARING NO.1

31. REMOVE CAMSHAFT BEARING NO.2



32. REMOVE CYLINDER HEADS

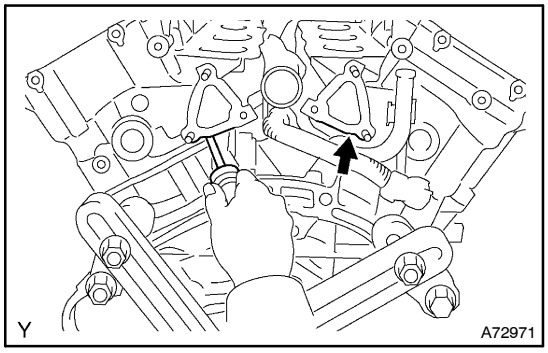
(a) Remove the 2 cylinder head bolts on the LH cylinder head in several passes, in the sequence shown.



(b) Using a 10 mm bi–hexagon wrench, uniformly loosen the 8 cylinder head bolts on each cylinder head, in several passes, in the sequence shown, then repeat for the other side as shown. Remove the 16 cylinder head bolts and plate washers.

NOTICE:

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



(c) Lift the cylinder head from the dowels on the cylinder block, and place the 2 cylinder heads on wooden blocks on a bench.

NOTICE:

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

HINT:

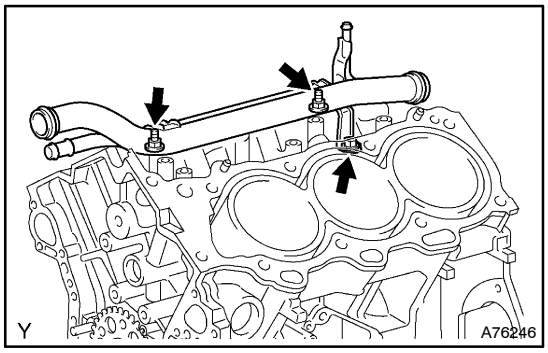
If the cylinder head is difficult to lift off, pry between the cylinder head and cylinder block with a screwdriver.

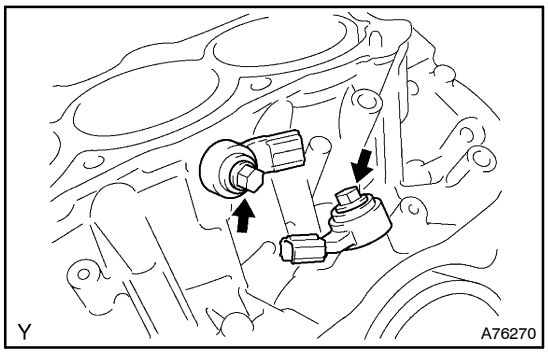
(d) Remove the RH and LH cylinder head gaskets.

33. REMOVE WATER OUTLET PIPE NO.1

(a) Separate the knock sensor wire.

(b) Remove the bolt, 2 nuts and water outlet pipe.

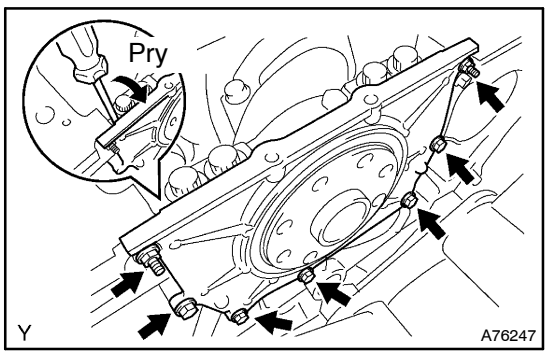




34. REMOVE KNOCK SENSOR

(a) Disconnect the knock sensor connectors.

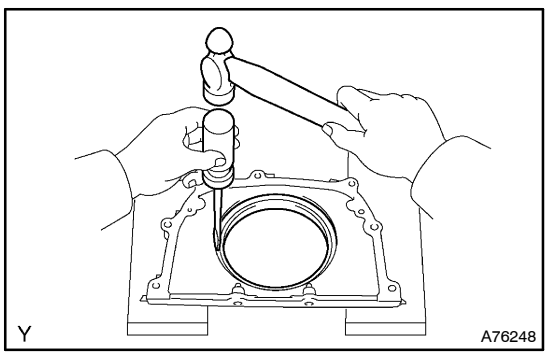
(b) Remove the 2 bolts and 2 knock sensors.



35. REMOVE ENGINE REAR OIL SEAL RETAINER

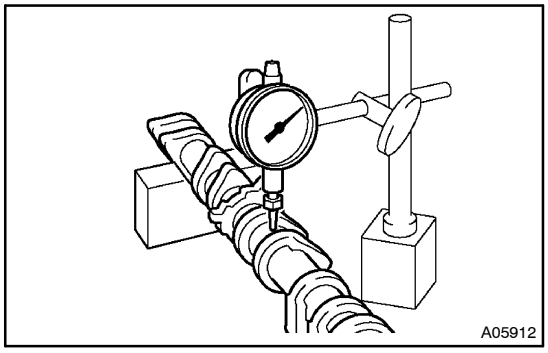
(a) Remove the 5 bolts and 2 nuts.

(b) Using a screwdriver, remove the oil seal retainer by prying the portions between the oil seal retainer and crankshaft bearing cap.



36. REMOVE ENGINE REAR OIL SEAL

(a) Using a screwdriver and hammer, tap out the oil seal.



37. INSPECT CAMSHAFTS

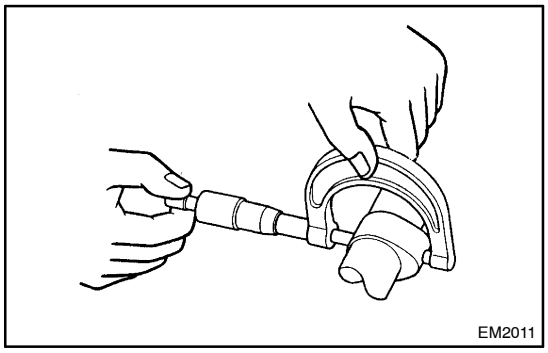
(a) Inspect camshaft for runout.

(1) Place the camshaft on V–blocks.

(2) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.06 mm (0.0024 in.)

If the circle runout is greater than maximum, replace the camshaft .

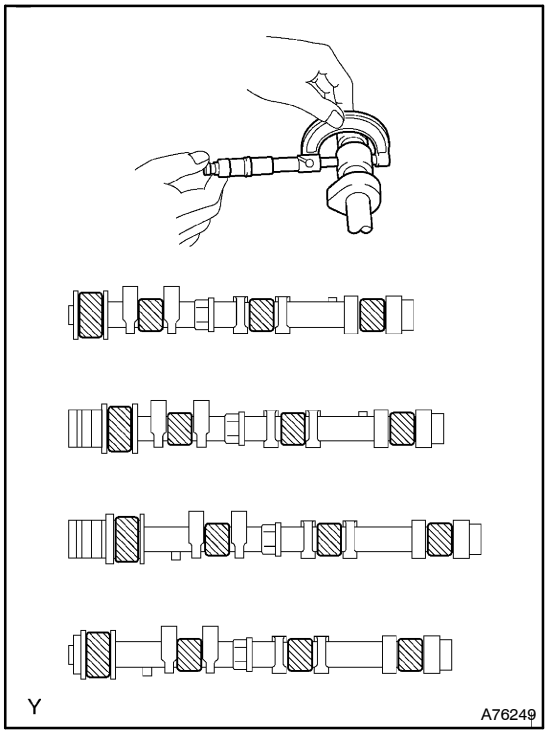


(b) Inspect cam lobes.

(1) Using a micrometer, measure the cam lobe height.

Standard cam lobe height:
Intake 44.168 – 44.268 mm (1.7389 – 1.7428 in.)
Exhaust 44.580 – 44.680 mm (1.7551 – 1.7591 in.)
Minimum cam lobe height:
Intake 44.018 mm (1.7330 in.)
Exhaust 44.430 mm (1.7492 in.)

If the cam lobe height is less than minimum, replace the camshaft.



(c) Inspect camshaft journals.

(1) Using a micrometer, measure the journal diameter.

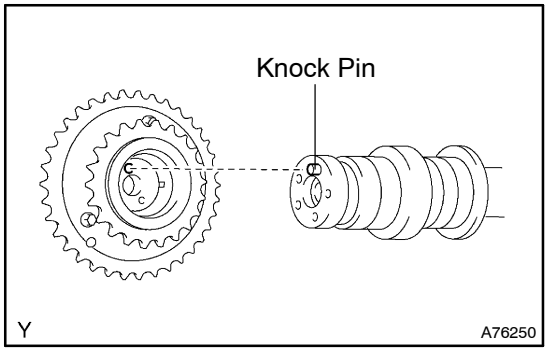
No. 1 journal diameter:
35.971 – 35.985 mm (1.4162 – 1.4167 in.)
Other journal diameter:
22.959 – 22.975 mm (0.9039 – 0.9045 in.)

If the journal diameter is not as specified, check the oil clearance.

38. INSPECT CAMSHAFT TIMING GEAR ASSY

(a) Fix the intake camshaft with a vise.

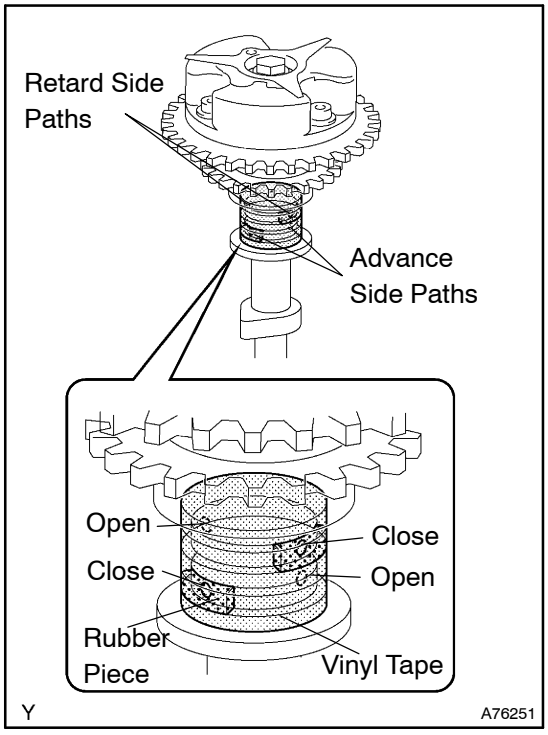
NOTICE:
Be careful not to damage the camshaft.



(b) Align the knock pin hole in the camshaft timing gear assembly with the knock pin of the camshaft, and install the camshaft timing gear assembly with the bolt.

Torque: 100 N·m (1,020 kgf·cm, 74 ft·lbf)

(c) Confirm the camshaft timing gear assembly is locked.



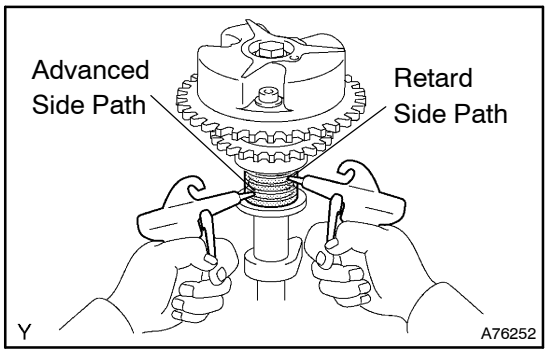
(d) Release lock pin.

(1) Cover 4 oil paths of cam journal with vinyl tape as shown in the illustration.

HINT:

The 4 oil paths are provided in the groove of the camshaft. Plug two of the paths with rubber pieces.

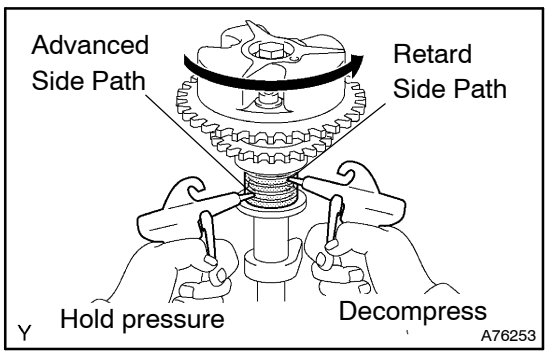
(2) Break through the tapes of the advance side path and the retard side path on the opposite side of the groove.



(3) Put air pressure into two broken paths (the advance side path and the retard side path) with about 200 kPa (2.0 kgf/cm^2).

NOTICE:

Cover the paths with shop rag to avoid oil splashing.



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

HINT:

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

(5) When the camshaft timing gear comes to the most advanced position, take out the air pressure of the timing retard side path, and then, take out that of timing advance side path.

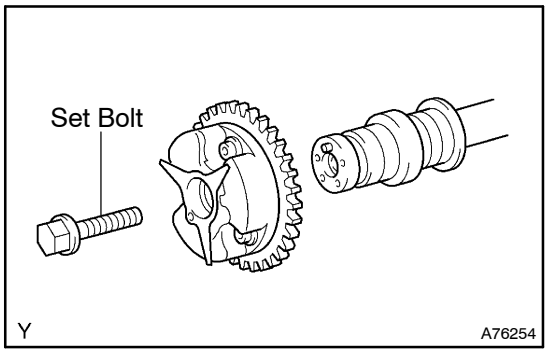
NOTICE:

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

(e) Check smooth revolution.
(1) Except the position where the lock pin meets at the most retard angle, let the camshaft timing gear assembly turn back and forth and check the movable range and that there is no disturbance.
Standard: Movable smoothly in the range about 31 °

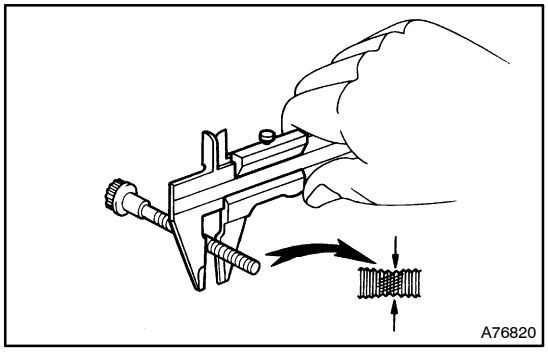
NOTICE:
Be sure to perform this check by hand, instead of air pressure.

(f) Check the lock in the most retarded position.
(1) Confirm that the camshaft timing gear assembly is locked at the most retarded position.



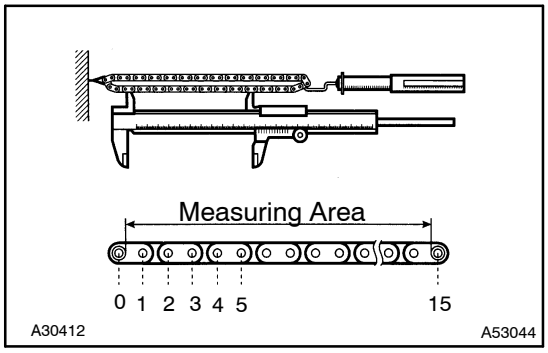
(g) Remove the set bolt and camshaft timing gear assembly.

NOTICE:
Be sure not to remove the other 3 bolts.



39. INSPECT CYLINDER HEAD SET BOLT

(a) Using vernier calipers, measure the thread outside diameter of the bolt.
Standard outside diameter:
10.85 – 11.00 mm (0.4272 – 0.4331 in.)
Minimum outside diameter:
10.7 mm (0.421 in.)

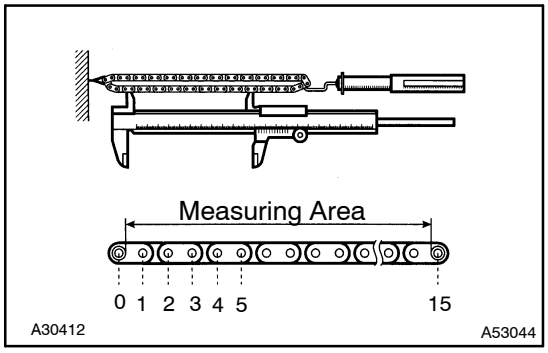


40. INSPECT CHAIN SUB–ASSY

(a) Using a spring scale, pull the chain sub assembly with 147 N (15.0 kgf, 33.1 lbf) and measure the length of the chain sub assembly by vernier calipers.
Maximum chain elongation: 146.8 mm (5.780 in.)

NOTICE:
Make the same measurements pulling at 3 or more places selected at random, and average the length.

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



41. INSPECT NO.2 CHAIN SUB–ASSY

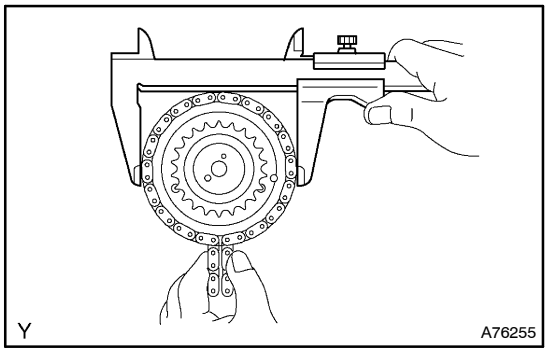
(a) Using a spring scale, pull the chain sub assembly with 147 N (15.0 kgf, 33.1 lbf) and measure the length of the chain sub assembly by vernier calipers.

Maximum chain elongation: 146.8 mm (5.780 in.)

NOTICE:

Make the same measurements pulling at 3 or more places selected at random, and average the length.

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



42. INSPECT CAMSHAFT TIMING GEAR ASSY

(a) Wrap the No. 1 chain around the larger gear of camshaft timing gear assembly.

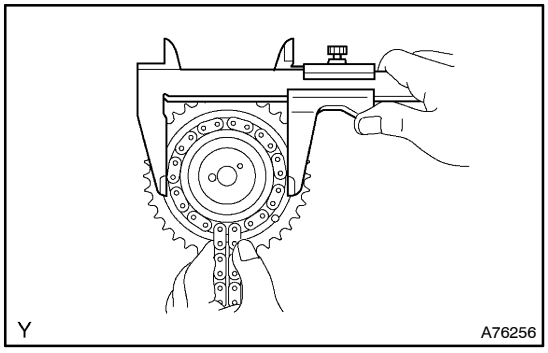
(b) Using vernier calipers, measure the timing gear with the chain.

Minimum gear diameter (w/ chain):
115.5 mm (4.547 in.)

NOTICE:

Vernier calipers must contact the chain rollers for the measuring.

If the diameter is less than minimum, replace the No. 1 chain and camshaft timing gear assembly.



(c) Wrap the No. 2 chain around the smaller gear of camshaft timing gear assembly.

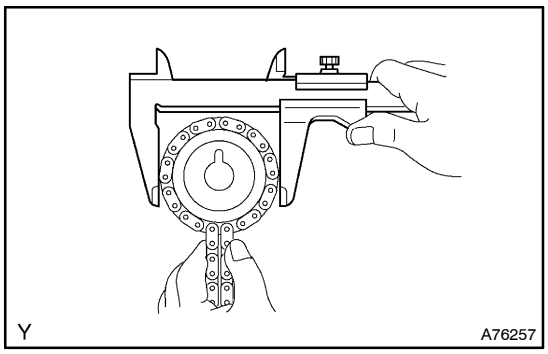
(d) Using vernier calipers, measure the timing gear with the chain.

Minimum gear diameter (w/ chain):
73.1 mm (2.878 in.)

NOTICE:

Vernier calipers must contact the chain rollers for the measuring.

If the diameter is less than minimum, replace the No. 2 chain and camshaft timing gear assembly.



43. INSPECT CAMSHAFT TIMING GEAR OR SPROCKET

(a) Wrap the No. 2 chain around the camshaft timing gear.

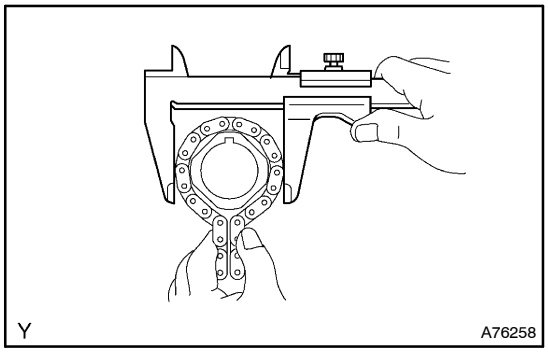
(b) Using vernier calipers, measure the camshaft timing gear diameter with the chain .

Minimum gear diameter (w/ chain):
73.1 mm (2.878 in.)

NOTICE:

Vernier calipers must contact the chain rollers for the measuring.

If the diameter is less than minimum, replace the No. 2 chain and the camshaft timing gear.



44. INSPECT CRANKSHAFT TIMING GEAR OR SPROCKET

(a) Wrap the No. 1 chain around the crankshaft timing gear.

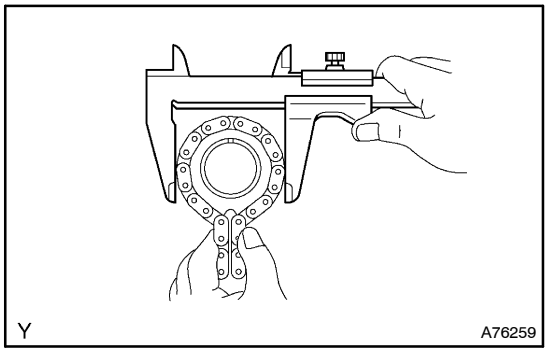
(b) Using vernier calipers, measure the crankshaft timing gear diameter with the chain.

Minimum gear diameter (w/ chain):
61.0 mm (2.402 in.)

NOTICE:

Vernier calipers must contact the chain rollers for the measuring.

If the diameter is less than minimum, replace the No. 1 chain and crankshaft timing gear.



45. INSPECT IDLE GEAR NO.1

(a) Wrap the No. 1 chain around the idle gear.

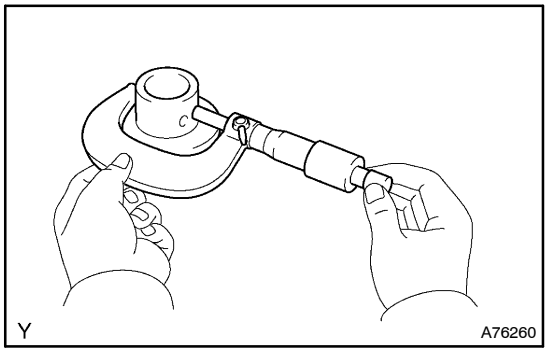
(b) Using vernier calipers, measure the idle gear with the chain.

Minimum gear diameter (w/ chain):
61.0 mm (2.402 in.)

NOTICE:

Vernier calipers must contact the chain rollers for the measuring.

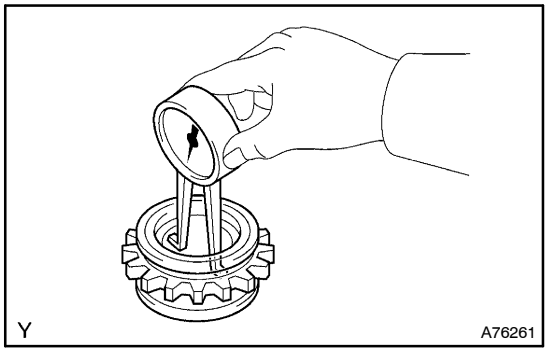
If the diameter is less than minimum, replace the No. 1 chain and idle gear.



46. INSPECT IDLE GEAR SHAFT OIL CLEARANCE

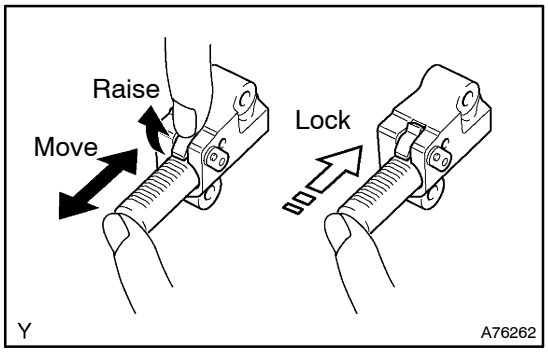
(a) Using a micrometer, measure the idle gear shaft diameter.

Idle gear shaft diameter:
22.987 – 23.000 mm (0.9050 – 0.9055 in.)



(b) Using a caliper gauge, measure the inside diameter of the idle gear.
Idle gear inside diameter:
23.02 – 23.03 mm (0.9063 – 0.9067 in.)

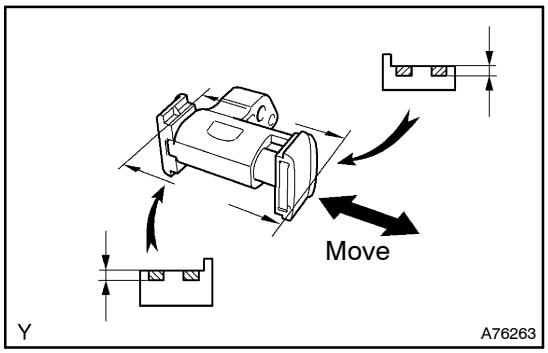
(c) Subtract the idle gear shaft diameter measurement from the idle gear inside diameter measurement.
Standard oil clearance:
0.020 – 0.043 mm (0.0008 – 0.0017 in.)
Maximum oil clearance:
0.093 mm (0.0037 in.)



47. INSPECT CHAIN TENSIONER ASSY NO.1

(a) Check that the plunger moves smoothly when the ratchet pawl is raised with finger.

(b) Release the ratchet pawl and check that the plunger is locked in place by the ratchet pawl and does not move when pushed with finger.

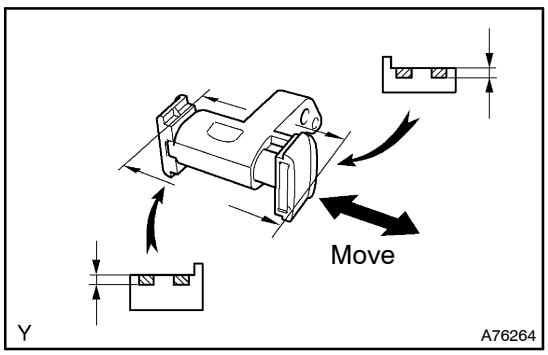


48. INSPECT CHAIN TENSIONER ASSY NO.2

(a) Check that the plunger moves smoothly.

(b) Measure the worn depth of the chain tensioner slipper.
Maximum depth: 1.0 mm (0.039 in.)

If the depth is greater than maximum, replace the chain tensioner No. 2.

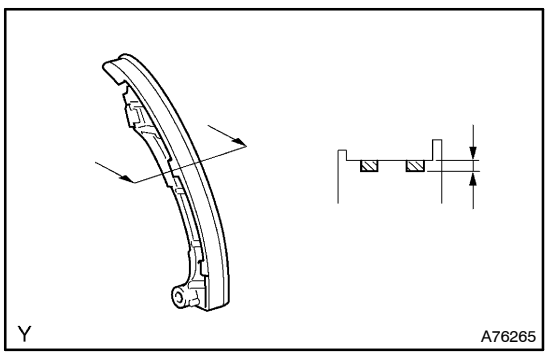


49. INSPECT CHAIN TENSIONER ASSY NO.3

(a) Check that the plunger moves smoothly.

(b) Measure the worn depth of the chain tensioner slipper.
Maximum depth: 1.0 mm (0.039 in.)

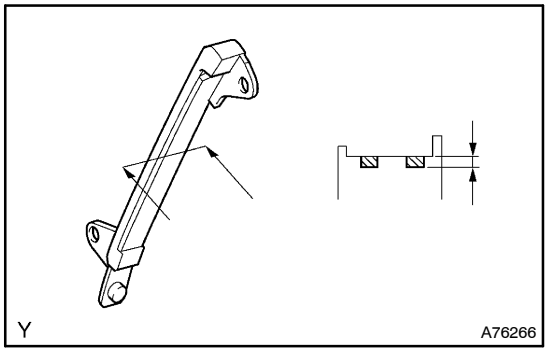
If the depth is greater than maximum, replace the chain tensioner No. 3.



50. INSPECT CHAIN TENSIONER SLIPPER

(a) Measure the worn depth of the chain tensioner slipper.
Maximum depth: 1.0 mm (0.039 in.)

If the depth is greater than maximum, replace the chain tensioner slipper.

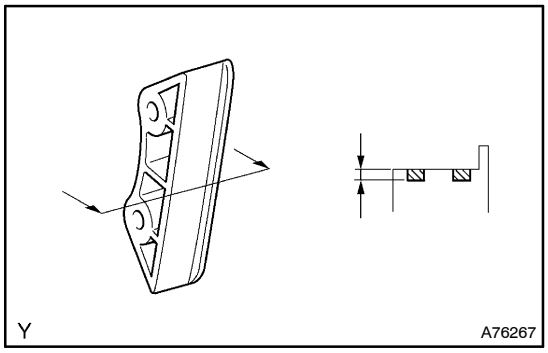


51. INSPECT CHAIN VIBRATION DAMPER NO.1

(a) Measure the worn depth of the chain vibration damper No. 1.

Maximum depth: 1.0 mm (0.039 in.)

If the depth is greater than maximum, replace the chain vibration damper No. 1.

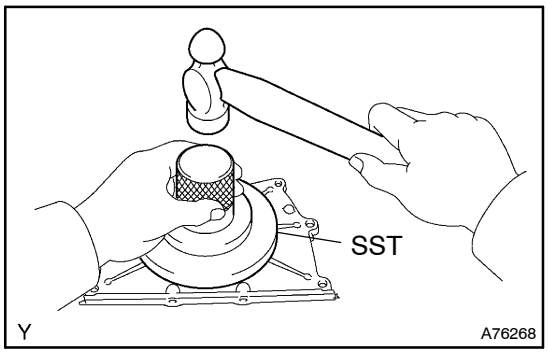


52. INSPECT CHAIN VIBRATION DAMPER NO.2

(a) Measure the worn depth of the chain vibration damper No. 2 .

Maximum depth: 1.0 mm (0.039 in.)

If the depth is greater than maximum, replace the chain vibration damper No. 2.



53. INSTALL ENGINE REAR OIL SEAL

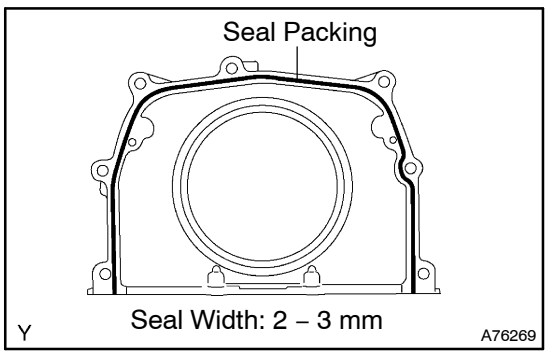
(a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge.

SST 09223–78010

(b) Apply MP grease to the oil seal lip.

54. INSTALL ENGINE REAR OIL SEAL RETAINER

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil seal retainer and cylinder block.



(b) Apply a continuous bead of the seal packing (diameter 2 – 3 mm (0.08 – 0.12 in.)) to the oil seal retainer as shown in the illustration.

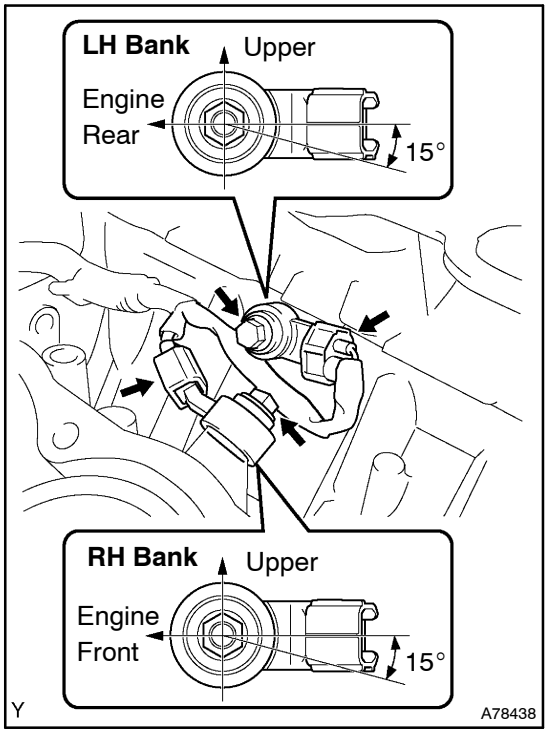
Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

Parts must be assembled within 3 minutes of application. Otherwise the seal packing must be removed and reapplied.

(c) Install the oil seal retainer with the 5 bolts and 2 nuts.

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

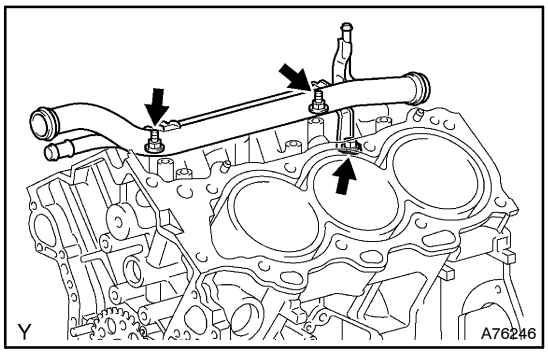


55. INSTALL KNOCK SENSOR

(a) Install the 2 knock sensors with the 2 bolts as shown in the illustration.

Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

(b) Connect the knock sensor connectors.



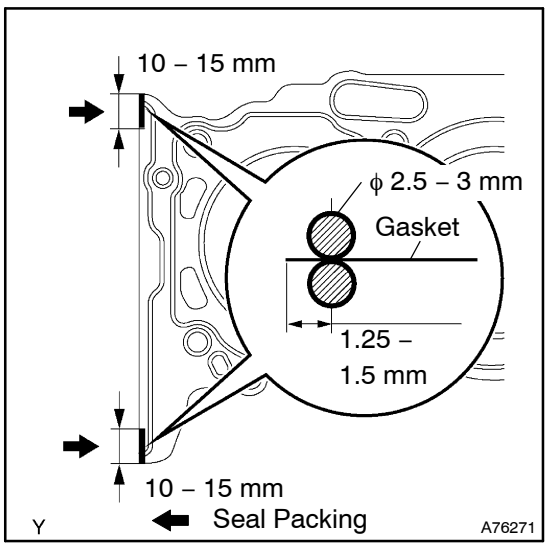
56. INSTALL WATER OUTLET PIPE NO.1

(a) Install the water outlet pipe with the bolt and 2 nuts.

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

57. INSTALL CYLINDER HEAD GASKET

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the cylinder head and cylinder block.

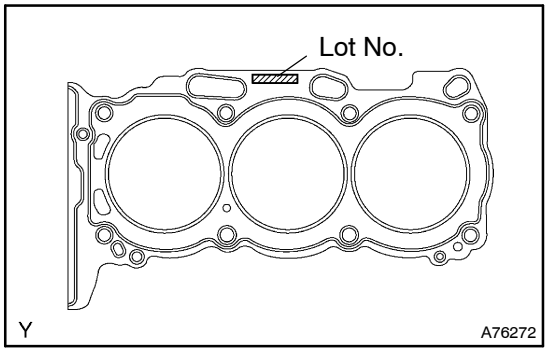


(b) Apply a continuous bead of the seal packing (diameter 2.5 – 3 mm (0.098 – 0.118 in.)) to a new cylinder head gasket as shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

Install the cylinder head within 3 minutes after applying seal packing. After installing it, cylinder head bolts must be tightened within 15 minutes. Otherwise the seal packing must be removed and reapplied.



(c) Place the cylinder head gasket on the cylinder block surface with the Lot No. stamp upward.

NOTICE:

- **Be careful of the installation direction.**
- **Place the cylinder head quietly in order not to damage the gasket with the bottom part of the head.**

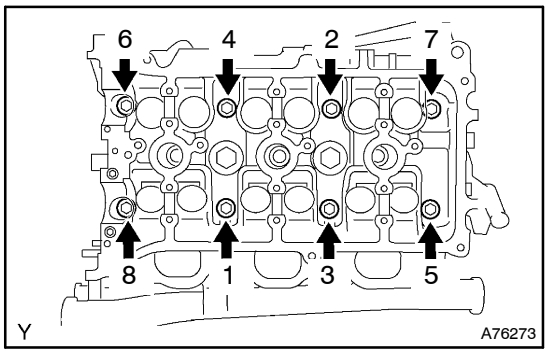
58. INSTALL CYLINDER HEAD SUB–ASSY

(a) Place the RH cylinder head on the cylinder head gasket.

(b) Install the 8 cylinder head bolts.

HINT:

- The cylinder head bolts are tightened in 2 progressive steps (steps (3) and (5)).
- If any cylinder head bolt is broken or deformed, replace it.
  (1) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
  (2) Install the plate washer to the cylinder head bolt.



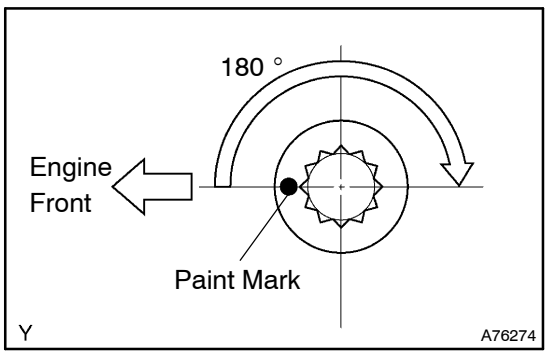
(3) Using a 10 mm bi–hexagon wrench, temporarily tighten each bolts in the several passes, as the sequence shown in the illustration, and fully tighten with specified torque.

Torque: 36 N·m (367 kgf·cm, 27 ft·lbf)

If any one of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.

NOTICE:

Do not drop the washers into the cylinder head.



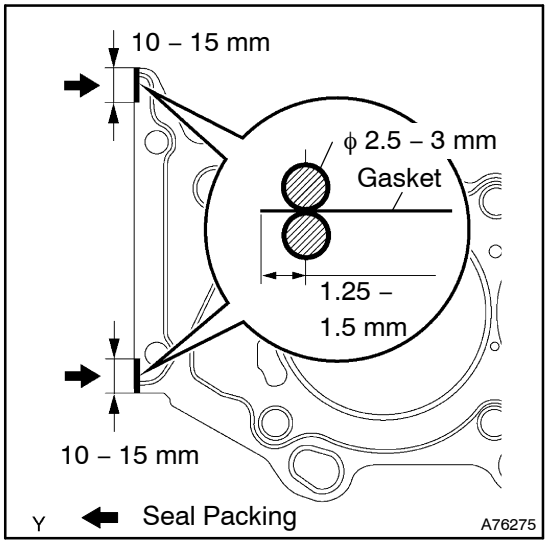
(4) Mark the front side of each cylinder head bolt with paint.

(5) Retighten the cylinder head bolts by 180° in the numerical order shown.

(6) Check that the painted marks are now a 180° angle to the front.

59. INSTALL CYLINDER HEAD GASKET NO.2

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the cylinder head and cylinder block.

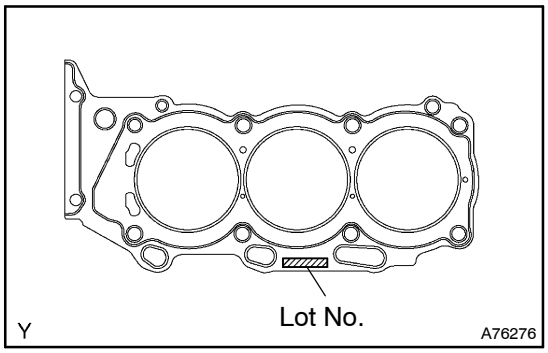


(b) Apply a continuous bead of the seal packing (diameter 2.5 – 3 mm (0.098 – 0.118 in.)) to a new cylinder head gasket as shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

Install the cylinder head within 3 minutes after applying seal packing. After installing it, cylinder head bolts must be tightened within 15 minutes. Otherwise the seal packing must be removed and reapplied.



(c) Place the cylinder head gasket on the cylinder block surface with the Lot No. stamp upward.

NOTICE:

- **Be careful of the installation direction.**
- **Place the cylinder head quietly in order not to damage the gasket with the bottom part of the head.**

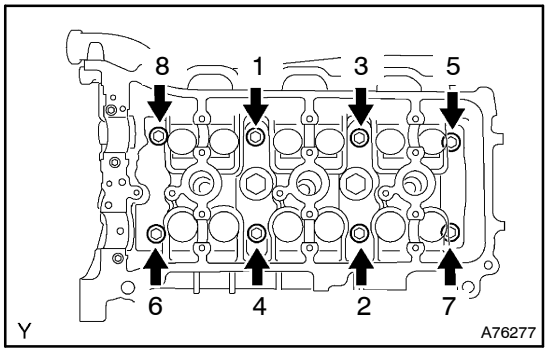
60. INSTALL CYLINDER HEAD LH

(a) Place the LH cylinder head on the cylinder head gasket.

(b) Install the 8 cylinder head bolts.

HINT:

- The cylinder head bolts are tightened in 2 progressive steps (steps (3) and (5)).
- If any cylinder head bolt is broken or deformed, replace it.
  - (1) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
  - (2) Install the plate washer to the cylinder head bolt.



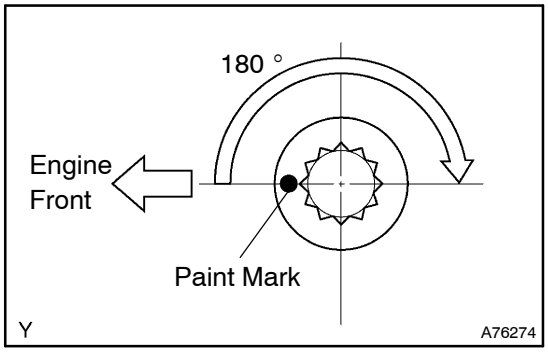
(3) Using a 10 mm bi–hexagon wrench, temporarily tighten each bolts in the several passes, as the sequence shown in the illustration, and fully tighten with specified torque.

Torque: 36 N·m (367 kgf·cm, 27 ft·lbf)

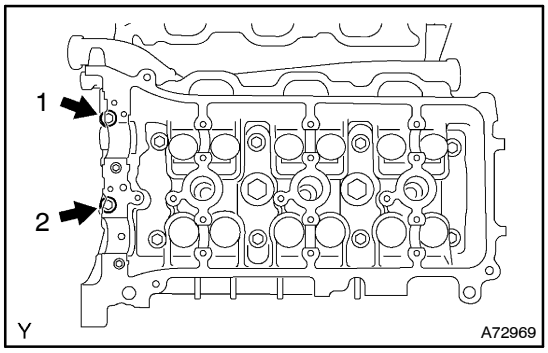
If any one of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.

NOTICE:

Do not drop the washers into the cylinder head.

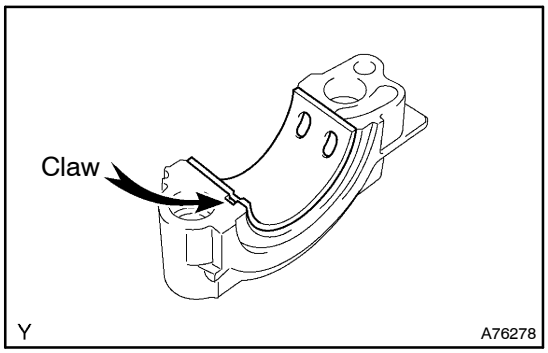


(4) Mark the front side of each cylinder head bolt with paint.
(5) Retighten the cylinder head bolts by 180° in the numerical order shown.
(6) Check that the painted marks are now a 180° angle to the front.



(c) Install the 2 cylinder head bolts.
(1) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
(2) Install and uniformly tighten the 2 cylinder head bolts, in several passes, in the sequence shown.

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

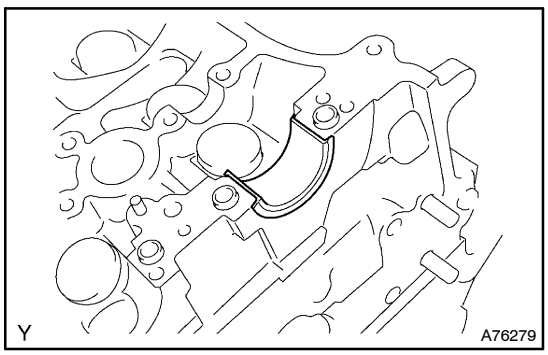


61. INSTALL CAMSHAFT BEARING NO.1

(a) Align the bearing claw with the claw groove of the bearing cap, and push in the camshaft bearing.

NOTICE:

- **Install the bearing while aligning with the oil hole in the bearing cap.**
- **Clean the backside of the bearing and the bearing surface of the bearing cap and let not stick the oils and fats.**



62. INSTALL CAMSHAFT BEARING NO.2

(a) Install the camshaft bearing No. 2 to the cylinder head.

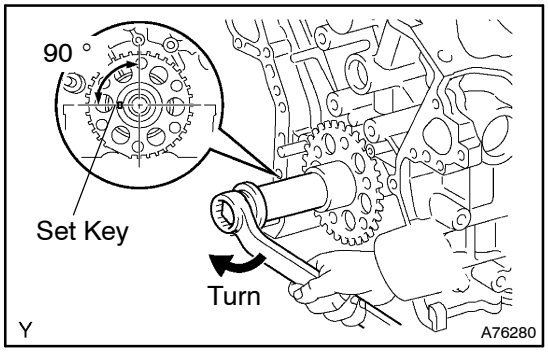
NOTICE:

Clean the backside of the bearing and the bearing surface of the cylinder head and let not stick the oils and fats.

63. INSTALL CAMSHAFTS

NOTICE:

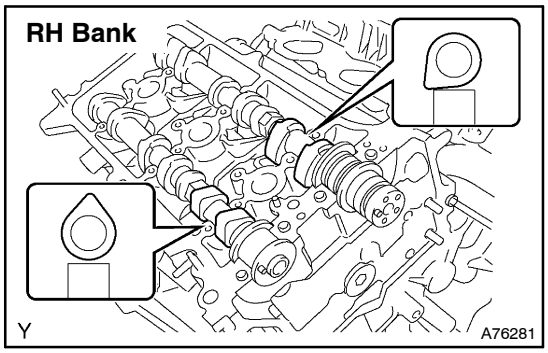
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



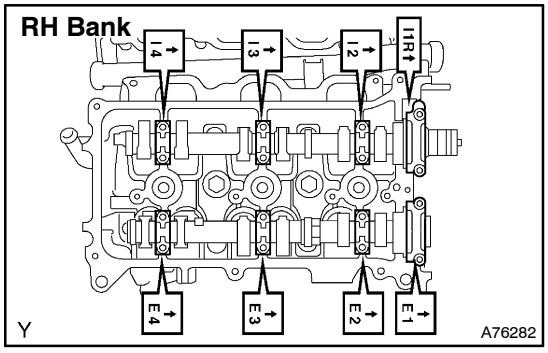
(a) Set the crankshaft position.
  (1) Using the crankshaft pulley set bolt, turn the crankshaft, and set the crankshaft set key into the left horizontal position.

NOTICE:
Having the crankshaft at the wrong angle can cause the piston head and valve head to come into contact with each other when you install the camshaft, causing damage. So always set the crankshaft at the correct angle.

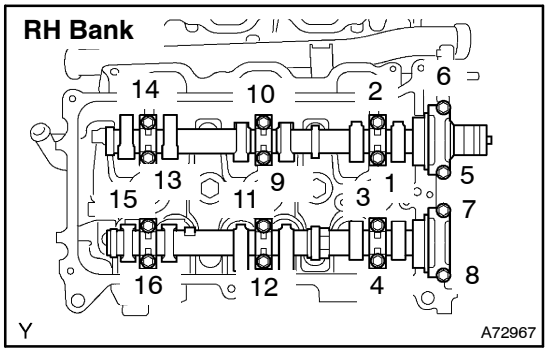
(b) Apply new engine oil to the thrust portion and journal of the camshafts.



(c) Install the camshaft of the RH bank.
  (1) Place the 2 camshafts onto the RH cylinder head with the cam lobes of No. 1 cylinder faced as shown in the illustration.

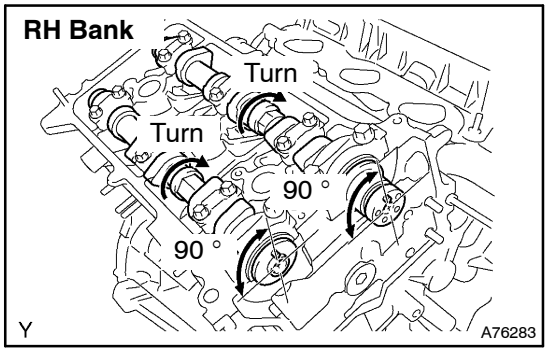


  (2) Install the 8 bearing caps in their proper locations.
  (3) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

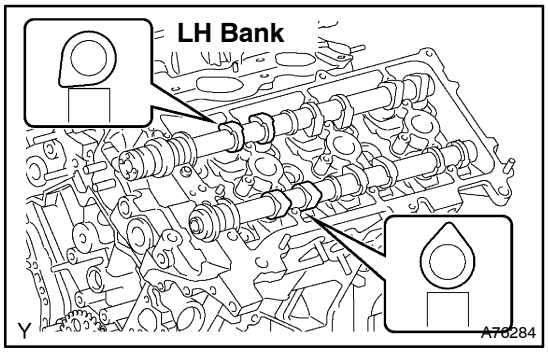


  (4) Install and uniformly tighten the 16 bearing cap bolts, in several passes, in the sequence shown.

Torque:
9.0 N·m (92 kgf·cm, 80 in.·lbf) for 10 mm (0.39 in.) head
24 N·m (245 kgf·cm, 18 ft·lbf) for 12 mm (0.47 in.) head

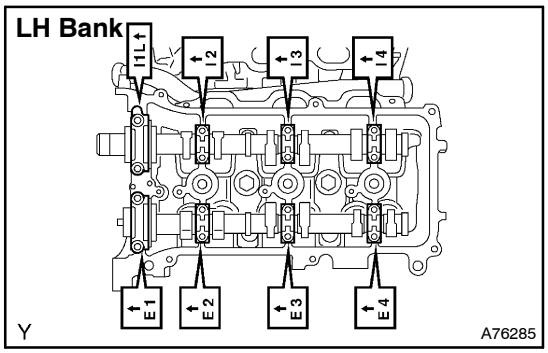


(5) Rotate the camshafts clockwise using hexagonal portion of the each camshaft at 90° angle of the camshaft knock pin on the cylinder head.



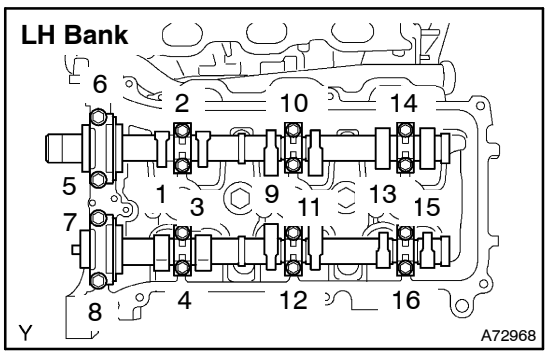
(d) Install the camshafts of the LH bank.

(1) Place the 2 camshafts onto the LH cylinder head with the cam lobes of No. 2 cylinder faced as shown in the illustration.



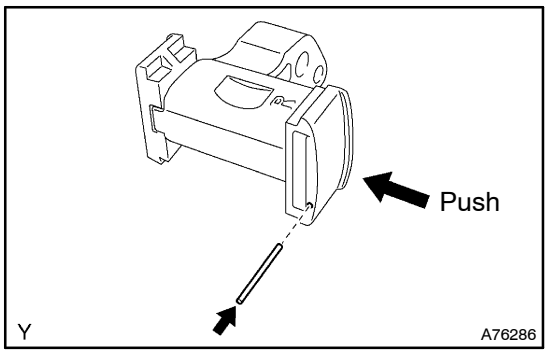
(2) Install the 8 bearing caps in their proper locations.

(3) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.



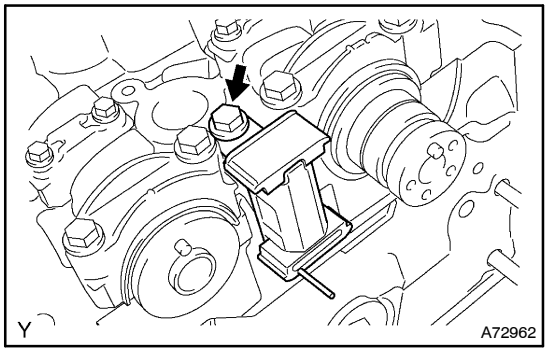
(4) Install and uniformly tighten the 16 bearing cap bolts, in several passes, in the sequence shown.

Torque:
9.0 N·m (92 kgf·cm, 80 in.·lbf) for 10 mm (0.39 in.) head
24 N·m (245 kgf·cm, 18 ft·lbf) for 12 mm (0.47 in.) head

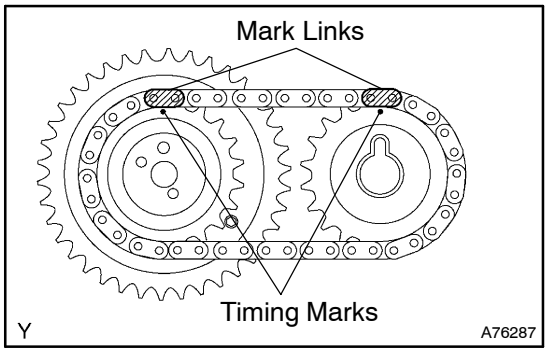


64. INSTALL CHAIN TENSIONER ASSY NO.2

(a) While pushing in the tensioner, insert a pin of ϕ 1.0 mm (0.039 in.) into the hole to fix it.

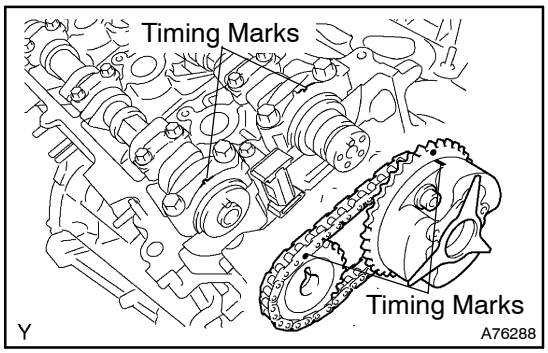


(b) Install the chain tensioner No. 2 with the bolt.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)



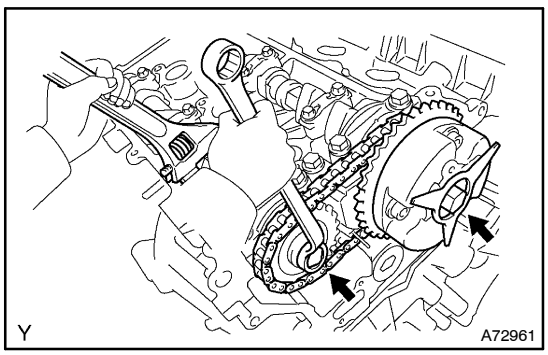
65. INSTALL CAMSHAFT TIMING GEARS AND NO.2 CHAIN (RH BANK)

(a) Align the mark links (yellow) with the timing marks (1 dot mark) of camshaft timing gears as shown in the illustration.

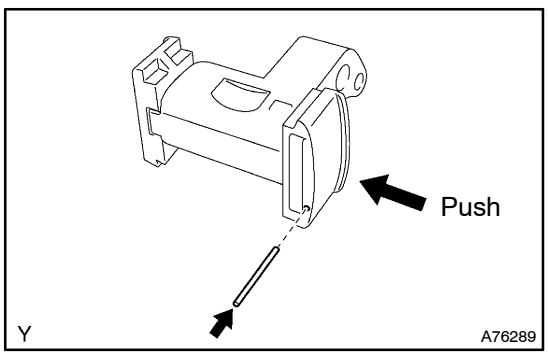


(b) Align the timing marks on the camshaft timing gears with the timing marks on the bearing caps, and install the camshaft timing gears with the chain to the RH camshafts.
(c) Temporarily install the 2 camshaft timing gear bolts.

NOTICE:
Do not push camshaft timing gear assembly to the camshaft forcibly when installing it.

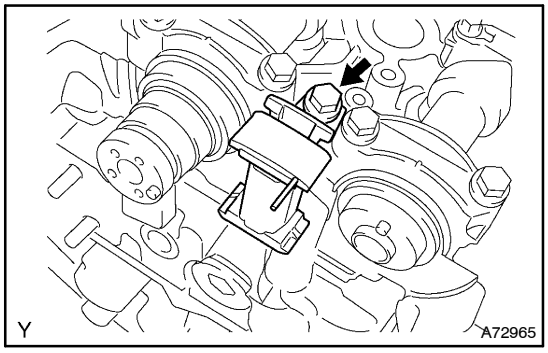


(d) Hold the hexagonal portion of the camshaft with a wrench, and tighten the 2 bolts.
Torque: 100 N·m (1,020 kgf·cm, 74 ft·lbf)
(e) Remove the pin from the chain tensioner No. 2.

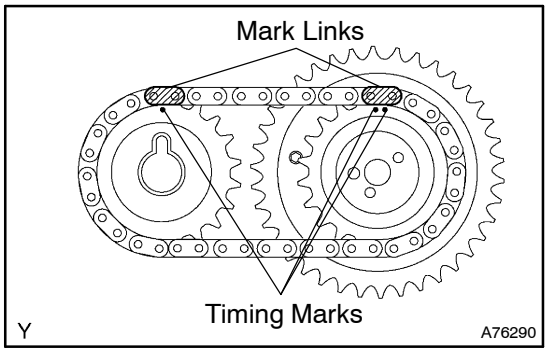


66. INSTALL CHAIN TENSIONER ASSY NO.3

(a) While pushing in the tensioner, insert a pin of ϕ 1.0 mm (0.039 in.) into the hole to hold it.

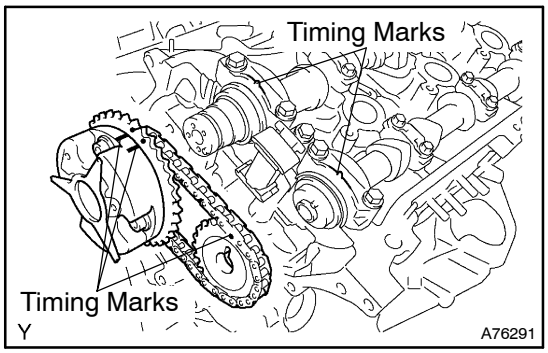


(b) Install the chain tensioner No. 3 with the bolt.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)



67. INSTALL CAMSHAFT TIMING GEARS AND NO.2 CHAIN (LH BANK)

(a) Align the mark links (yellow) with the timing marks (1 dot mark and 2 dot marks) of camshaft timing gears as shown in the illustration.

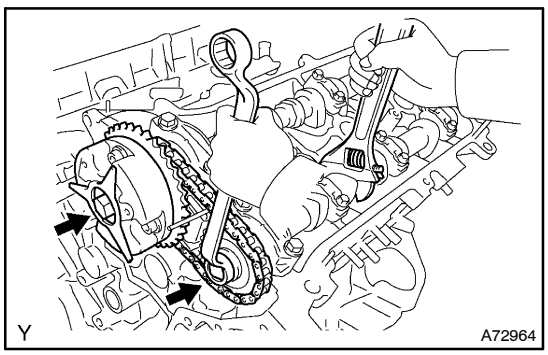


(b) Align the timing marks on the camshaft timing gears with the timing marks on the bearing caps, and install the camshaft timing gears with the chain to the LH camshafts.

(c) Temporarily install the 2 camshaft timing gear bolts.

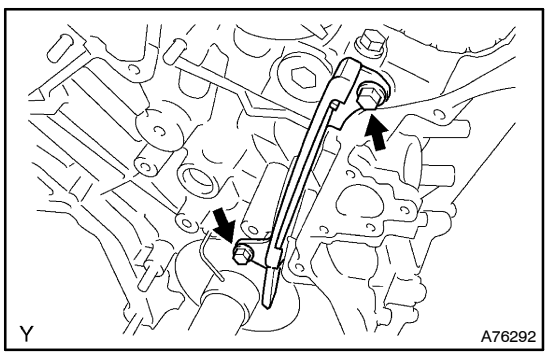
NOTICE:

Do not push camshaft timing gear assembly to the camshaft forcibly when installing it.



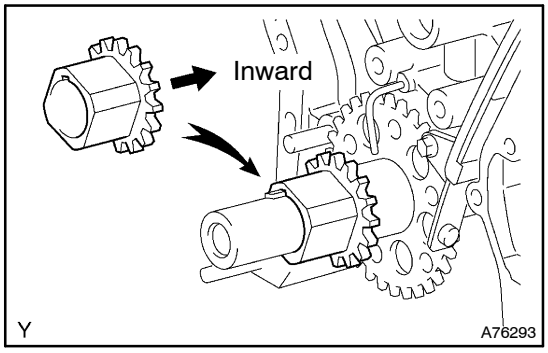
(d) Hold the hexagonal portion of the camshaft with a wrench, and tighten the 2 bolts.
Torque: 100 N·m (1,020 kgf·cm, 74 ft·lbf)

(e) Remove the pin from the chain tensioner No. 3.



68. INSTALL CHAIN VIBRATION DAMPER NO.1

(a) Install the chain vibration damper No. 1 with the 2 bolts.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

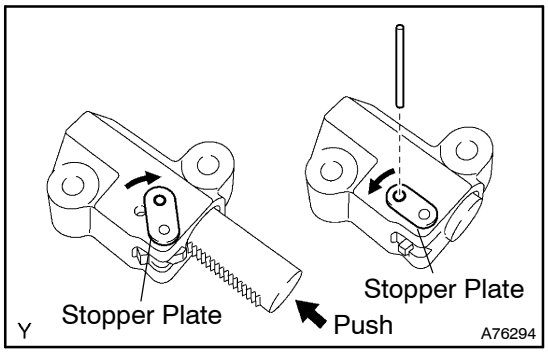


69. INSTALL CRANKSHAFT TIMING GEAR OR SPROCKET

(a) Align the timing gear set key with the key groove of the timing gear.

(b) Install the timing gear onto the crankshaft, facing the gear side inward.

70. INSTALL CHAIN TENSIONER SLIPPER



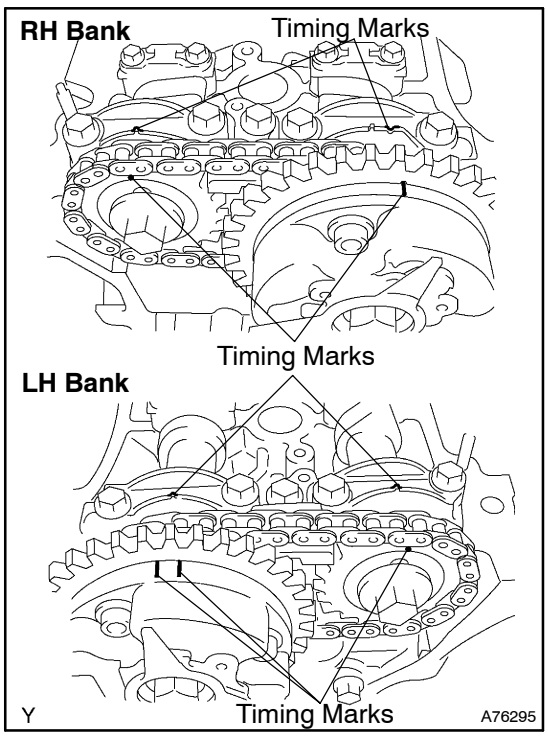
71. INSTALL CHAIN TENSIONER ASSY NO.1

(a) While rotating the stopper plate of the tensioner clockwise, push in the plunger of the tensioner as shown in the illustration.

(b) While rotating the stopper plate of the tensioner counterclockwise, insert a bar of ϕ 3.5 mm (0.138 in.) into the holes in the stopper plate and tensioner to fix the stopper plate.

(c) Install the chain tensioner with the 2 bolts.

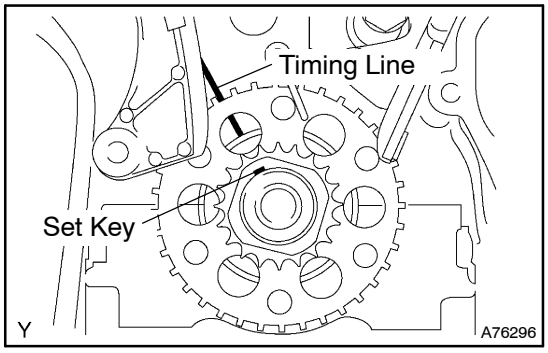
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



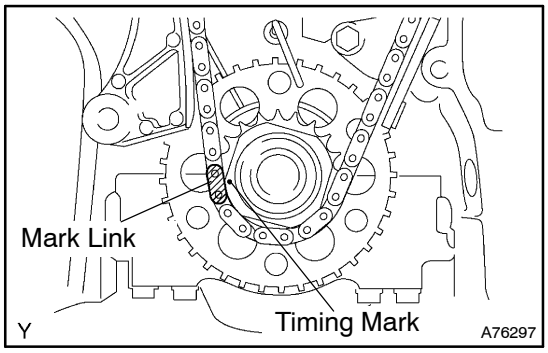
72. INSTALL CHAIN SUB–ASSY

(a) Set the No. 1 cylinder to TDC/ compression.

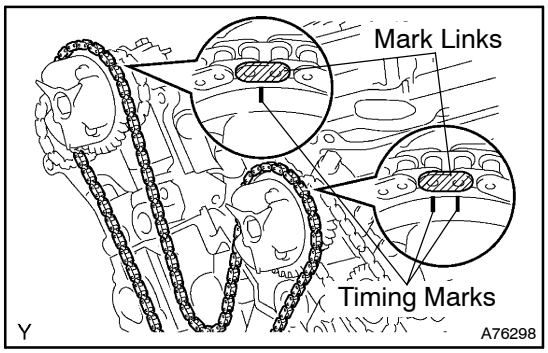
(1) Align the timing marks of the camshaft timing gears and bearing caps.



(2) Using the crankshaft pulley set bolt, turn the crankshaft to align the crankshaft set key with the timing line of the cylinder block.



(b) Align the mark link (yellow) with the timing mark of the crankshaft timing gear.



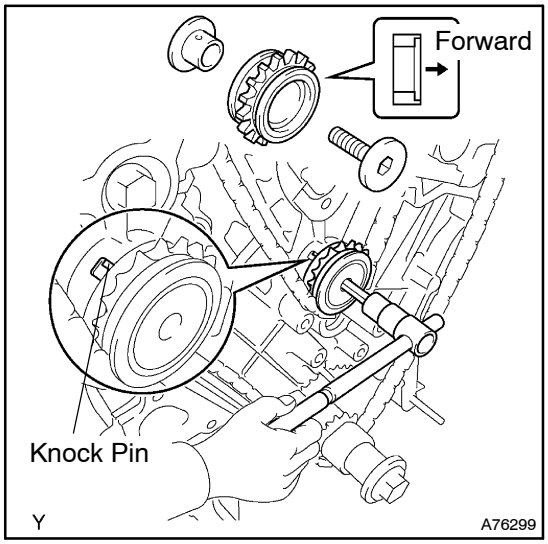
(c) Align the mark links (orange) with the timing marks of the camshaft timing gears, and install the chain.

73. INSTALL CHAIN VIBRATION DAMPER NO.2

(a) Instal the 2 chain vibration damper No. 2.

74. INSTALL IDLE GEAR NO.1

(a) Apply a light coat of engine oil to rotating surface of the idle gear shaft No. 1.



(b) Temporarily install the idle gear shaft No. 1 and idle gear No. 1 with the idle gear shaft No. 2 while aligning the knock pin of the idle gear shaft No. 1 with the knock pin groove of the cylinder block.

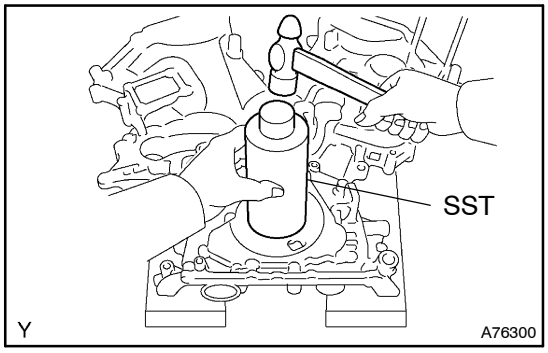
NOTICE:

Be careful of the idle gear direction.

(c) Using a 10 mm hexagon wrench, tighten the idle gear shaft No. 2.

Torque: 60 N·m (612 kgf·cm, 44 ft·lbf)

(d) Remove the bar from the chain tensioner.



75. INSTALL TIMING GEAR CASE OR TIMING CHAIN CASE OIL SEAL

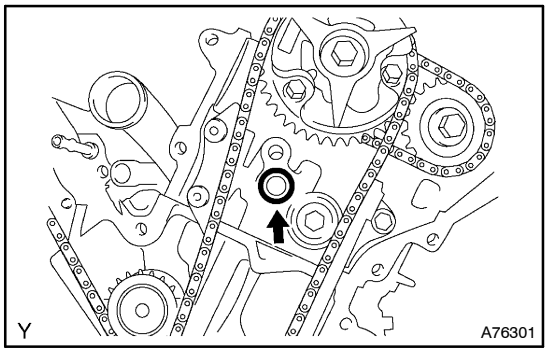
(a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing chain cover edge.
SST 09226–10010

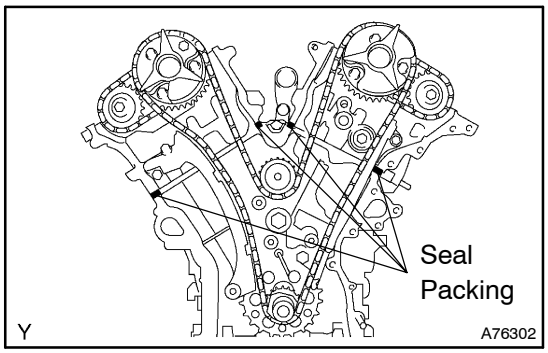
(b) Apply MP grease to the oil seal lip.

76. INSTALL TIMING CHAIN OR BELT COVER SUB–ASSY

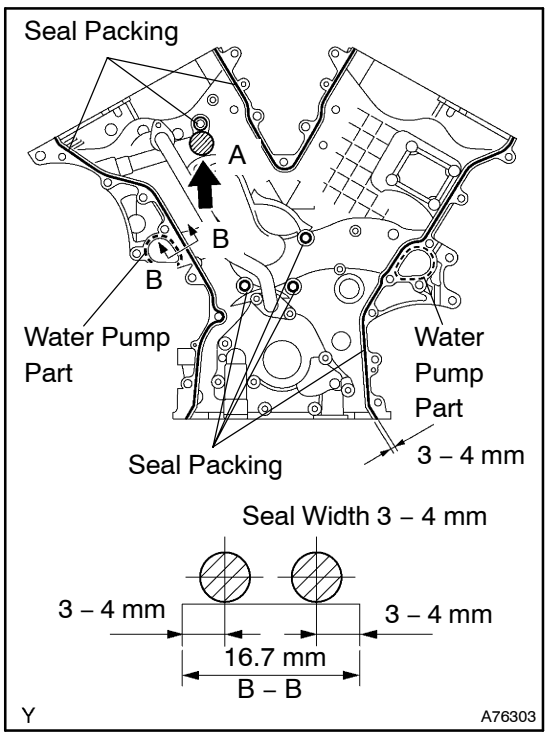
(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the timing chain cover, cylinder head and cylinder block.

(b) Install a new O–ring to the LH cylinder head as shown in the illustration.





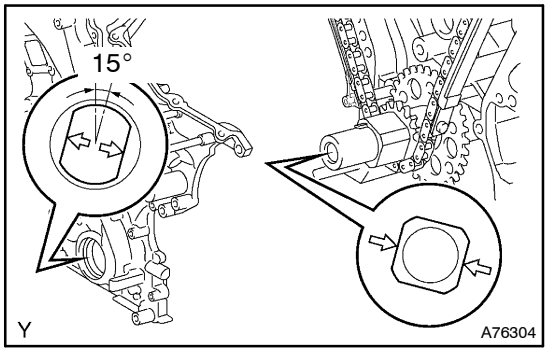
(c) Apply a continuous bead of the seal packing (diameter 3 – 4 mm (0.12 – 0.16 in.)) to 4 locations as shown in the illustration.
Seal packing: Part No. 08826–00080 or equivalent



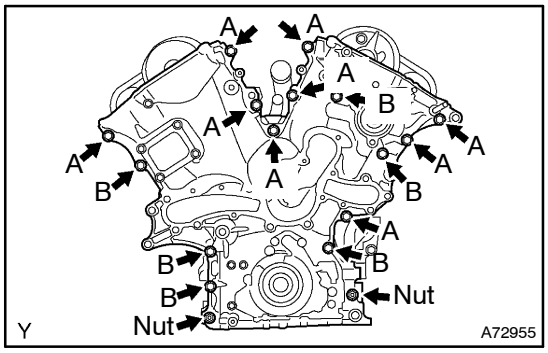
(d) Apply a continuous bead of the seal packing (diameter 3 – 4 mm (0.12 – 0.16 in.)) to the timing chain cover as shown in the illustration.
Seal packing:
Water pump part: Part No. 08826–00100 or equivalent
Other part: Part No. 08826–00080 or equivalent

NOTICE:

- **Install the timing chain cover within 3 minutes after applying seal packing. After installing it, timing chain cover bolts and nuts must be tightened within 15 minutes. Otherwise the seal packing must be removed and reapplied.**
- **Do not apply seal packing to the "A" position.**



(e) Engage the spline teeth of the oil pump drive rotor with the large teeth of the crankshaft timing gear, and slide the timing chain cover.



(f) Install the timing chain cover with the 15 bolts and 2 nuts. Uniformly tighten the bolts and nuts in several passes.
Torque: 23 N·m (235 kgf·cm, 17 ft·lbf)

NOTICE:

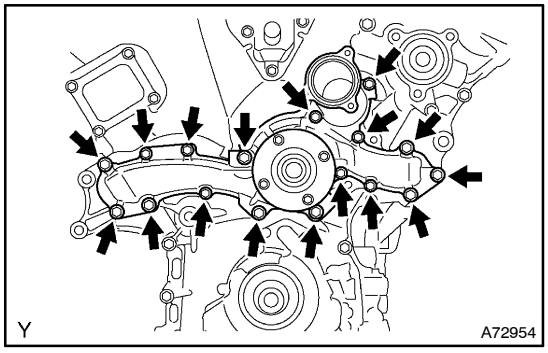
- **Pay attention not to wrap the chain and slipper over the timing chain cover seal line.**
- **After installing the timing chain cover, must install the water pump within 15 minutes.**

HINT:

Each bolt length in indicated in the illustration.

A 25 mm (0.98 in.)

B 55 mm (2.17 in.)

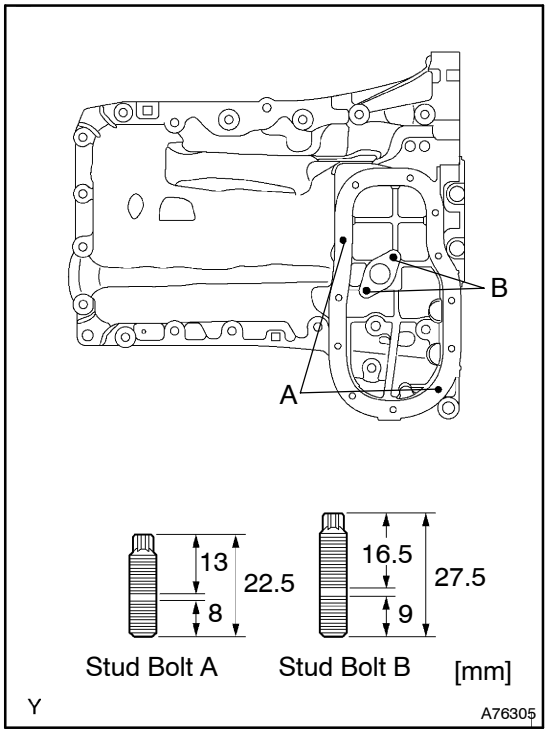


77. INSTALL WATER PUMP ASSY

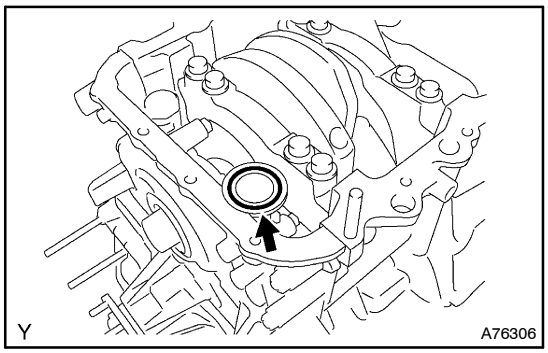
(a) Install a new gasket and the water pump with the 17 bolts.
Torque:
9.0 N·m (92 kgf·cm, 80 in.·lbf) for 10 mm (0.39 in.) head
23 N·m (235 kgf·cm, 17 ft·lbf) for 12 mm (0.47 in.) head

78. INSTALL OIL PAN SUB–ASSY

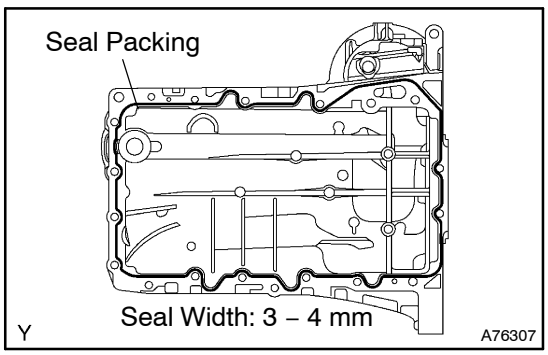
(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the cylinder block, rear oil seal retainer and oil pan.



(b) Install the 4 stud bolts.
Torque: 4.0 N·m (41 kgf·cm, 35 in.·lbf)

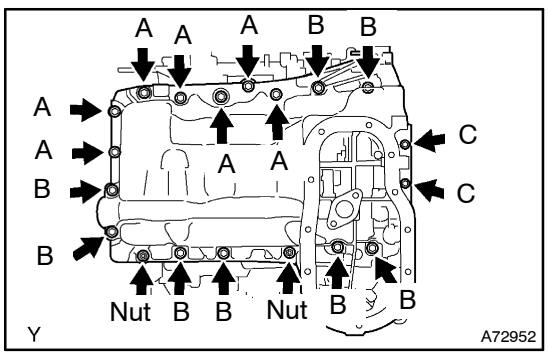


(c) Install a new O–ring to the oil pump.



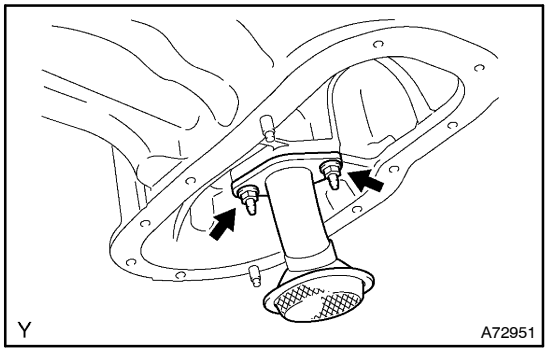
(d) Apply a continuous bead of the seal packing (diameter 3 – 4 mm (0.12 – 0.16 in.)) to the oil pan as shown in the illustration.
Seal packing: Part No. 08826–00080 or equivalent

NOTICE:
Install the oil pan within 3 minutes after applying seal packing. After installing it, oil pan bolts and nuts must be tightened within 15 minutes. Otherwise the seal packing must be removed and reapplied.



(e) Install the oil pan with the 17 bolts and 2 nuts. Uniformly tighten the bolts and nuts in several passes.
Torque:
9.0 N·m (92 kgf·cm, 80 in.·lbf) for 10 mm (0.39 in.) head
19 N·m (194 kgf·cm, 14 ft·lbf) for 12 mm (0.47 in.) head

HINT:
Each bolt length in indicated in the illustration.
A 25 mm (0.98 in.)
B 40 mm (1.57 in.)
C 14 mm (0.55 in.)

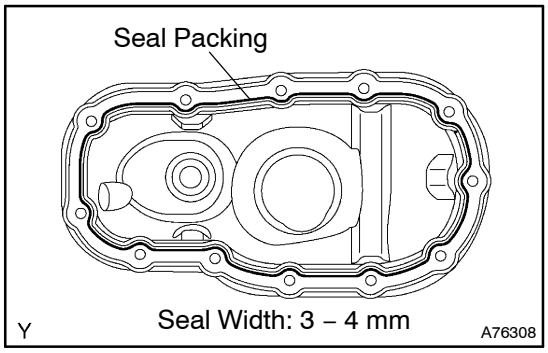


79. INSTALL OIL STRAINER SUB–ASSY

(a) Install a new gasket and the oil strainer with the 2 nuts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

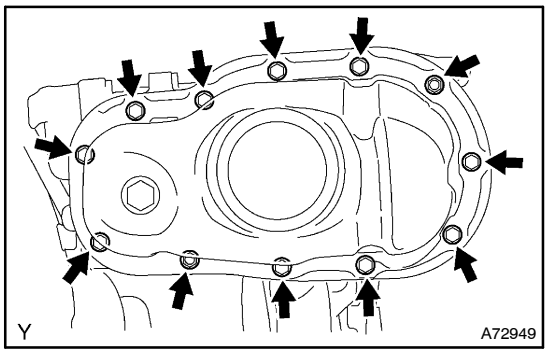
80. INSTALL OIL PAN SUB–ASSY NO.2

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil pan and oil pan No. 2.



(b) Apply a continuous bead of the seal packing (diameter 3 – 4 mm (0.12 – 0.16 in.)) as shown in the illustration.
Seal packing: Part No. 08826–00080 or equivalent

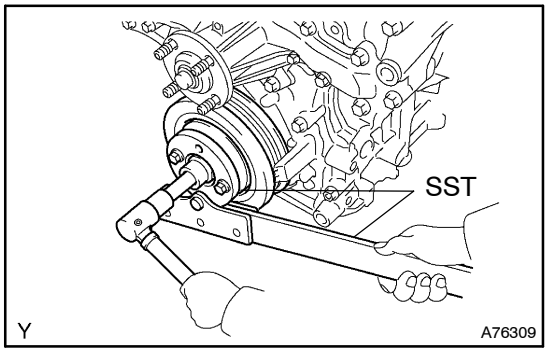
NOTICE:
Install the oil pan No. 2 within 3 minutes after applying seal packing. After installing it, oil pan No. 2 bolts and nuts must be tightened within 15 minutes. Otherwise the seal packing must be removed and reapplied.



(c) Install the oil pan No. 2 with the 10 bolts and 2 nuts. Uniformly tighten the bolts and nuts in several passes.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

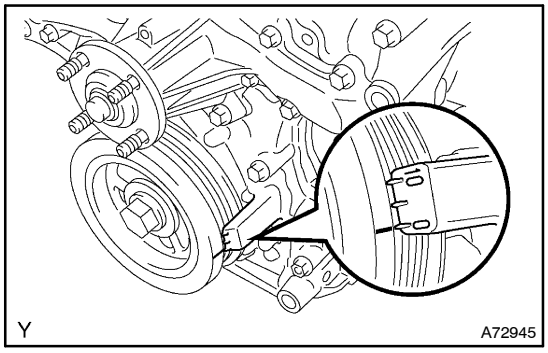
81. INSTALL OIL PAN DRAIN PLUG

(a) Install the drain plug with a new gasket.
Torque: 40 N·m (408 kgf·cm, 30 ft·lbf)



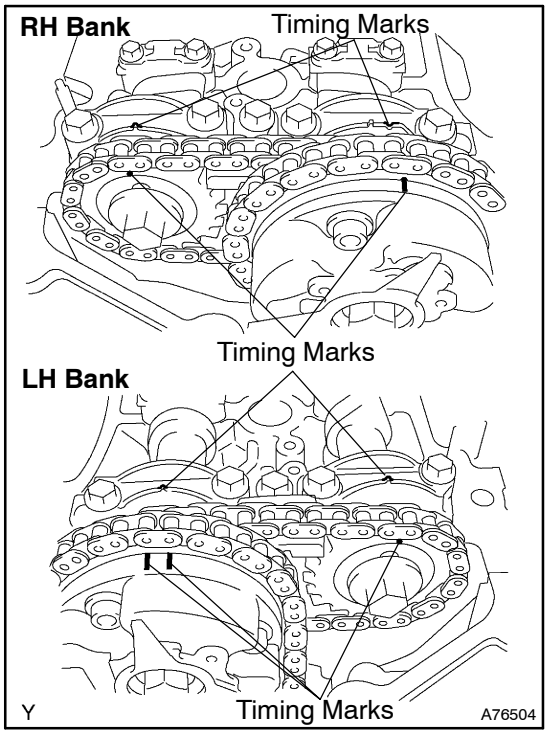
82. INSTALL CRANKSHAFT PULLEY

(a) Using SST, install the pulley set bolt.
SST 09213–54015 (91651–60855), 09330–00021
Torque: 250 N·m (2,549 kgf·cm, 184 ft·lbf)



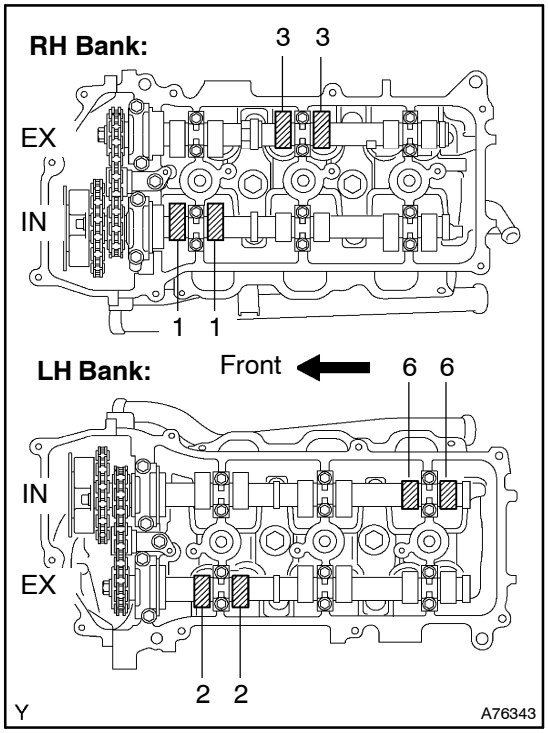
83. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley, and align its groove with the timing mark ”0” of the timing chain cover.



(b) Check that the timing marks of the camshaft timing gears are aligned with the timing marks of the bearing cap as shown in the illustration.

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



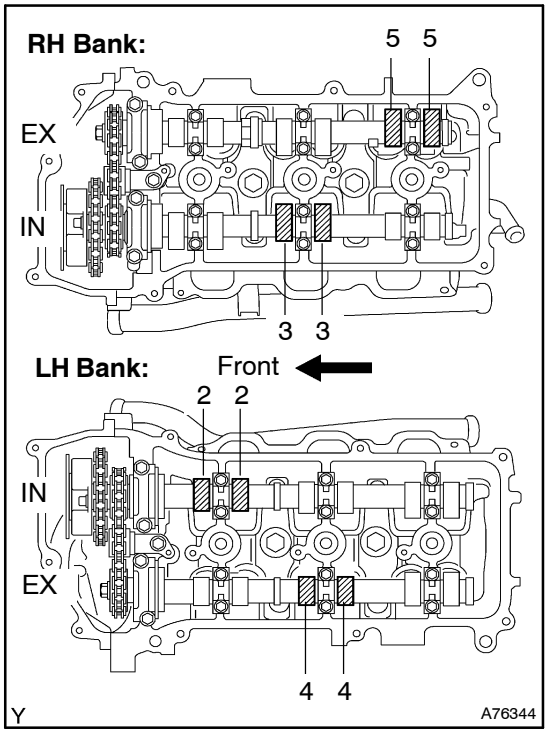
84. INSPECT VALVE CLEARANCE

(a) Check only 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 – 0.25 mm (0.006 – 0.010 in.)
Exhaust 0.29 – 0.39 mm (0.011 – 0.015 in.)

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

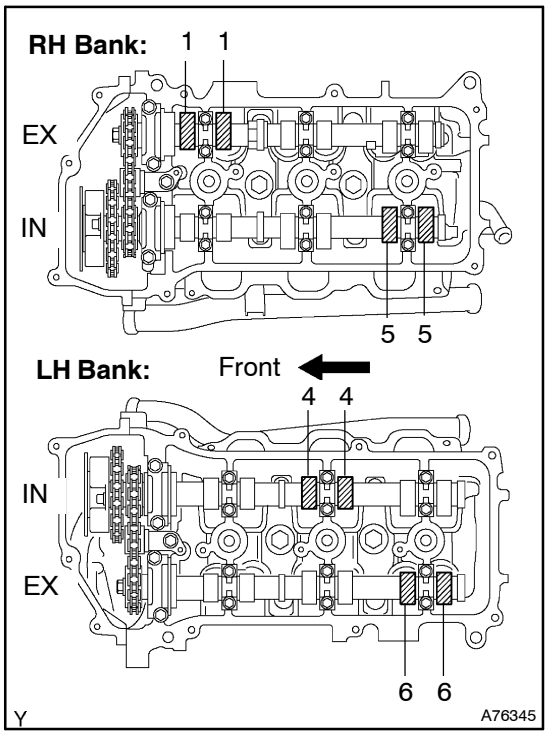


(b) Turn the crankshaft 2/3 of a revolution (240°), and check only the valves indicated in the illustration.

(1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

Valve clearance (Cold):
Intake 0.15 – 0.25 mm (0.006 – 0.010 in.)
Exhaust 0.29 – 0.39 mm (0.011 – 0.015 in.)

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

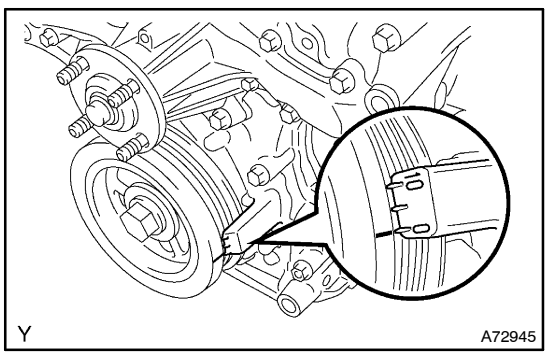


(c) Turn the crankshaft 2/3 of a revolution (240°), and check only the valves indicated in the illustration.

(1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

Valve clearance (Cold):
Intake 0.15 – 0.25 mm (0.006 – 0.010 in.)
Exhaust 0.29 – 0.39 mm (0.011 – 0.015 in.)

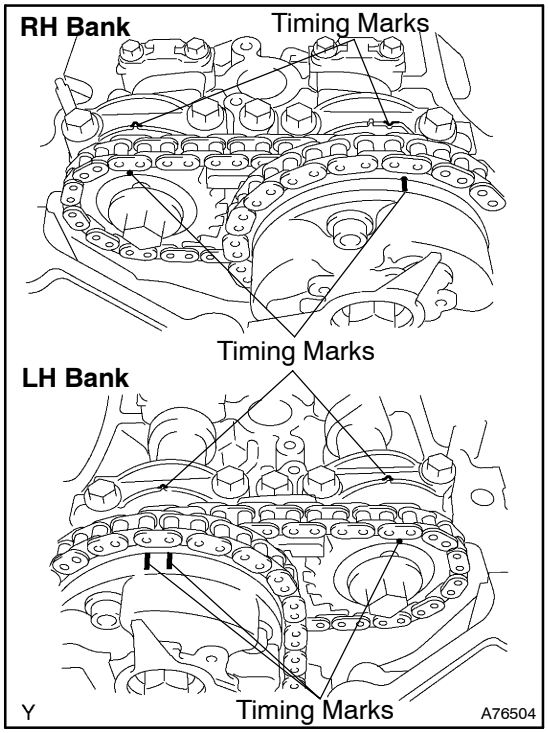
(2) Record the out–of–specification valve clearance measurements. They will be used later to determine the required replacement valve lifter.



85. ADJUST VALVE CLEARANCE

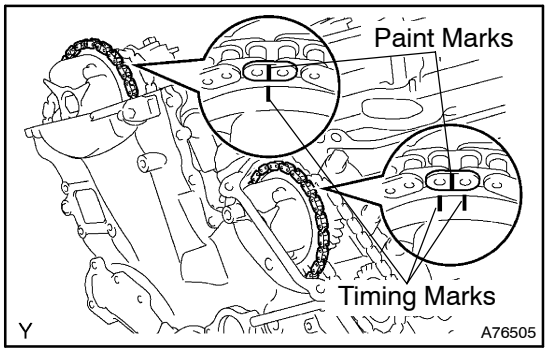
(a) Set No. 1 cylinder to TDC/compression.

(1) Turn the crankshaft pulley, and align its groove with the timing mark ”0” of the timing chain cover.



(2) Check that the timing marks of the camshaft timing gears are aligned with the timing marks of the bearing cap as shown in the illustration.

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



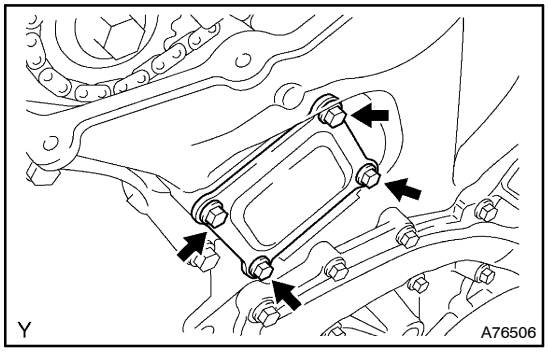
(3) Place paint marks on the No. 1 chain links that correspond with the timing marks of the camshaft timing gears.

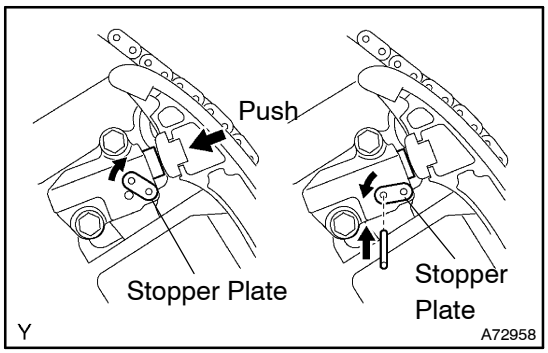
(b) Remove the chain tensioner assy No. 1.

NOTICE:

- **Never 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 before rotating it.**

(1) Remove the 4 bolts, timing chain cover plate and gasket.





(2) While rotating the stopper plate of the tensioner upward, push in the plunger of the chain tensioner as shown in the illustration.

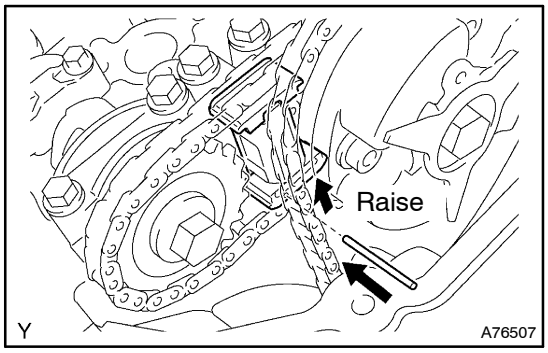
(3) While rotating the stopper plate of the tensioner downward, insert a bar of ϕ 3.5 mm (0.138 in.) into the holes in the stopper plate and tensioner to fix the stopper plate.

(4) Remove the 2 bolts and chain tensioner.

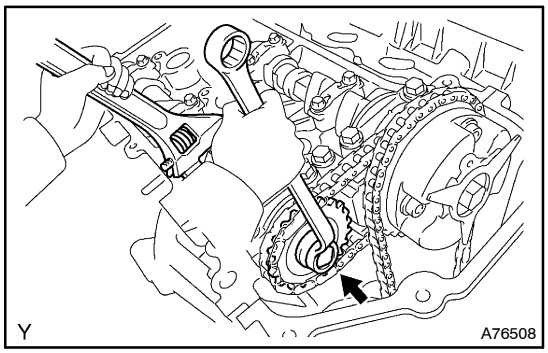
(c) Remove the No. 2 camshaft.

NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



(1) While raising up the chain tensioner No. 2, insert a pin of ϕ 1.0 mm (0.039 in.) into the hole to fix it.

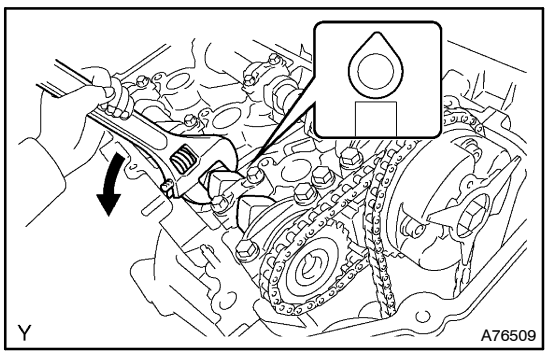


(2) Hold the hexagonal portion of the No. 2 camshaft with a wrench, and remove the camshaft timing gear set bolt.

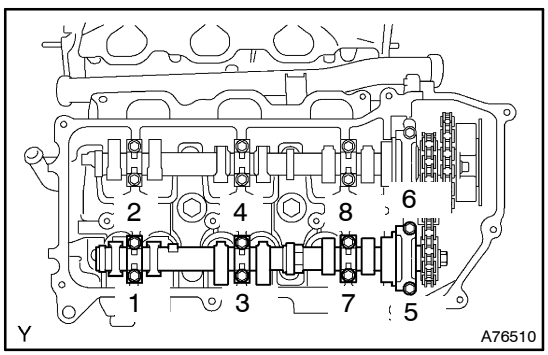
NOTICE:

Be careful not to damage the cylinder head and valve lifter with the wrench.

(3) Separate the camshaft timing gear from the No. 2 camshaft.

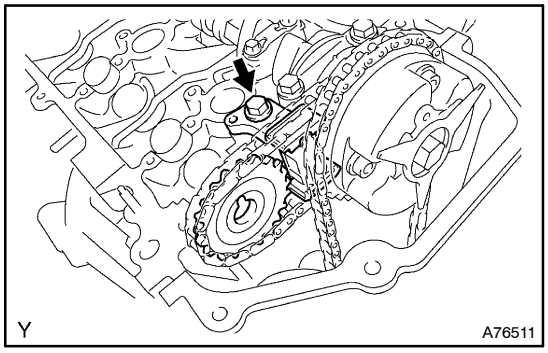


(4) Rotate the camshaft counterclockwise using hexagonal portion of the No. 2 camshaft so that the cam lobes of No. 1 cylinder may face as shown in the illustration.



(5) Uniformly loosen and remove the 8 bearing cap bolts in several passes, in the sequence shown.

(6) Remove the 4 bearing caps and No. 2 camshaft.

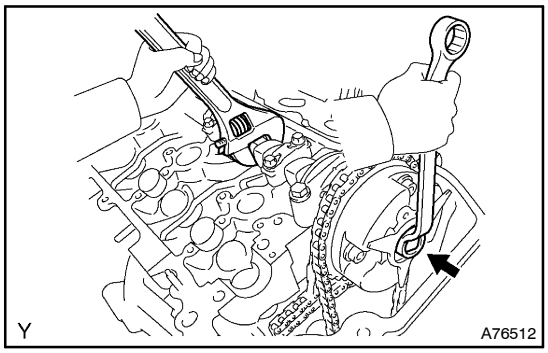


(d) Remove the chain tensioner assy No. 2.
  (1) Remove the chain tensioner No. 2 bolt, and then remove the chain tensioner No. 2 and camshaft timing gear.

(e) Remove the camshaft.

NOTICE:

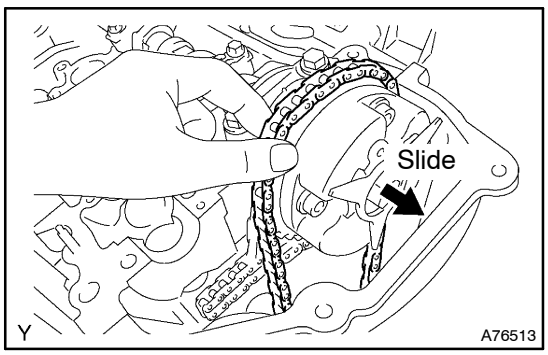
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



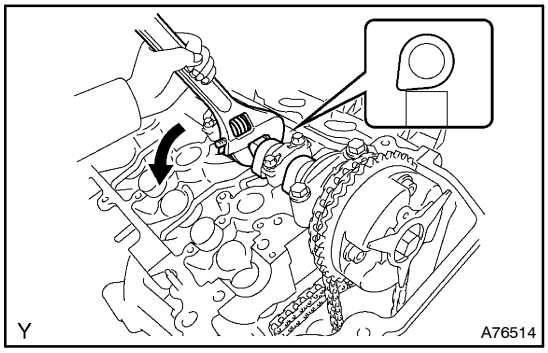
  (1) Hold the hexagonal portion of the No. 1 camshaft with a wrench, and loosen the camshaft timing gear set bolt.

NOTICE:

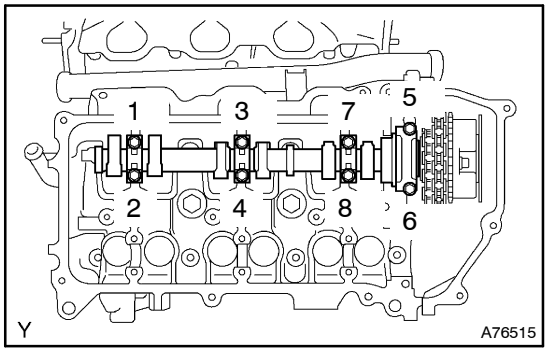
- **Be careful not to damage the cylinder head and valve lifter with the wrench.**
- **Do not disassemble the camshaft timing gear assembly.**



  (2) Slide the camshaft timing gear and separate the No. 1 chain from the camshaft timing gear.

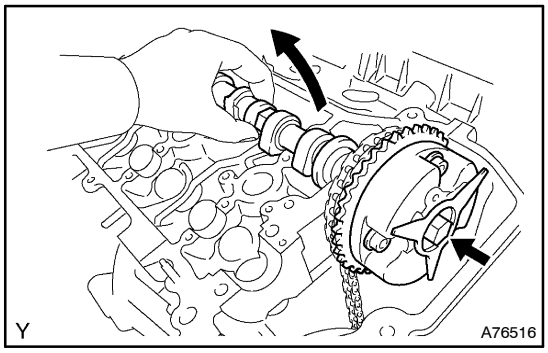


  (3) Rotate the No. 1 camshaft counterclockwise using hexagonal portion of the No. 1 camshaft so that the cam lobes of No. 1 cylinder may face as shown in the illustration.

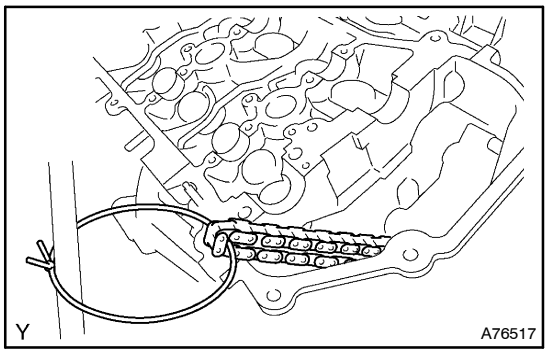


(4) Uniformly loosen and remove the 8 bearing cap bolts in several passes, in the sequence shown.

(5) Remove the 4 bearing caps.



(6) Remove the camshaft timing gear set bolt with the No. 1 camshaft lifted up, and then remove the No. 1 camshaft and camshaft timing gear w/ No. 2 chain.



(7) Tie the No. 1 chain with a string as shown in the illustration.

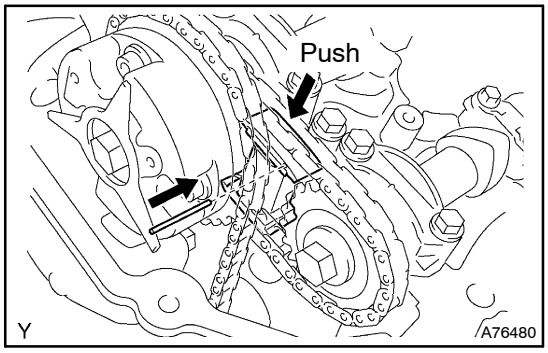
NOTICE:

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

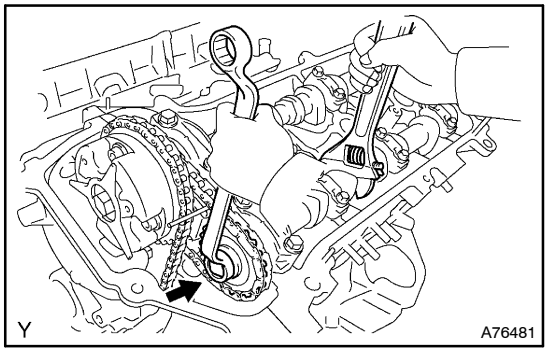
(f) Remove the No. 4 camshaft sub–assy.

NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



(1) While pushing down the chain tensioner No. 3, insert a pin of ϕ 1.0 mm (0.039 in.) into the hole to fix it.

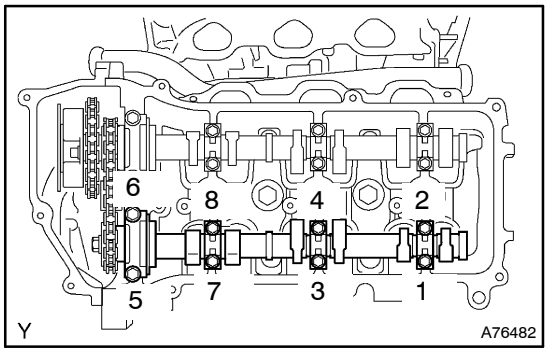


(2) Hold the hexagonal portion of the No. 4 camshaft with a wrench, and remove the camshaft timing gear set bolt.

NOTICE:

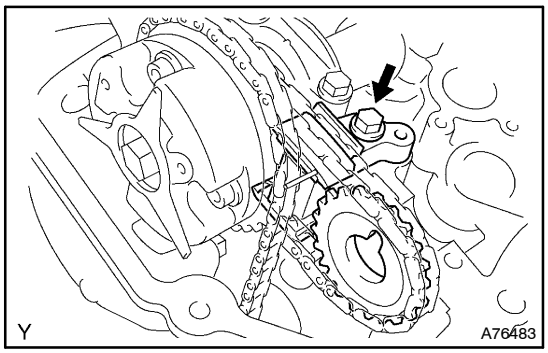
Be careful not to damage the cylinder head and valve lifter with the wrench.

(3) Separate the camshaft timing gear from the No. 4 camshaft.



(4) Uniformly loosen and remove the 8 bearing cap bolts in several passes, in the sequence shown.

(5) Remove the 4 bearing caps and No. 4 camshaft.



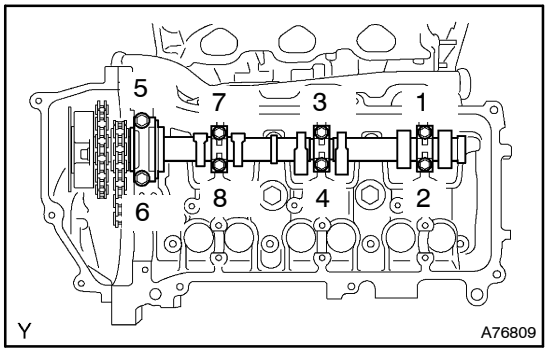
(g) Remove the chain tensioner assy No. 3.

(1) Remove the chain tensioner No. 3 bolt, and then remove the chain tensioner No. 3 and camshaft timing gear.

(h) Remove the No. 3 camshaft sub–assy.

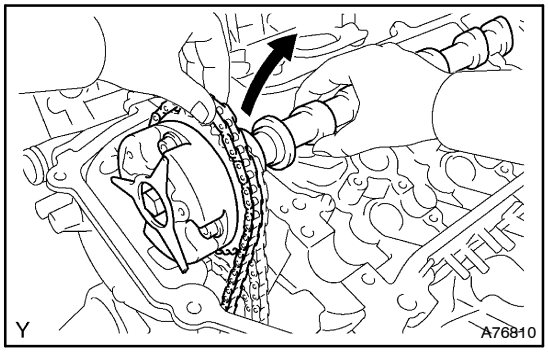
NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.

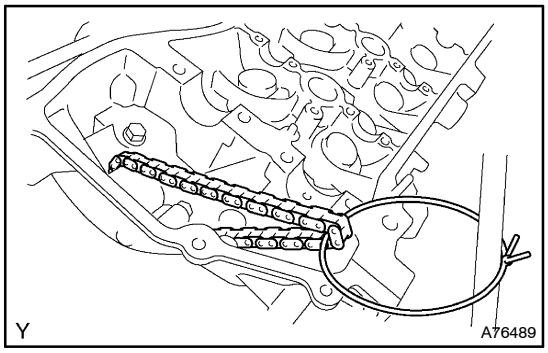


(1) Uniformly loosen and remove the 8 bearing cap bolts in several passes, in the sequence shown.

(2) Remove the 4 bearing caps.



(3) Hold the No. 1 chain, and remove the No. 3 camshaft, camshaft timing gear and No. 2 chain.

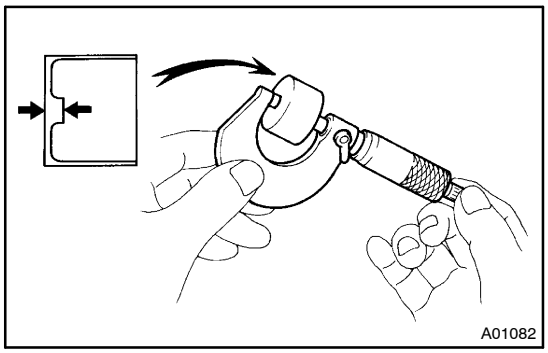


(4) Tie the No. 1 chain with a string as shown in the illustration.

NOTICE:

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

(i) Remove the valve lifters.



(j) Determine the replacement valve lifter size according to these Formula or Charts:

(1) Using a micrometer, measure the thickness of the removed lifter.

(2) Calculate the thickness of a new lifter so that the valve clearance comes within the specified value.

T: Thickness of removed lifter

A: Measured valve clearance

N: Thickness of new lifter

Intake:

N = T + (A – 0.20 mm (0.008 in.))

Exhaust:

N = T + (A – 0.30 mm (0.012 in.))

(3) Select a new lifter with a thickness as close as possible to the calculated value.

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.).

Valve Lifter Selection Chart (Intake)

Measure clearance mm (in.) \ Installed lifter thickness mm (in.)	5.060 (0.1992)	5.080 (0.2000)	5.100 (0.2008)	5.120 (0.2016)	5.140 (0.2024)	5.160 (0.2031)	5.180 (0.2039)	5.200 (0.2047)	5.210 (0.2051)	5.220 (0.2055)	5.230 (0.2059)	5.240 (0.2063)	5.250 (0.2067)	5.260 (0.2071)	5.270 (0.2075)	5.280 (0.2079)	5.290 (0.2083)	5.300 (0.2087)	5.310 (0.2091)	5.320 (0.2094)	5.330 (0.2098)	5.340 (0.2102)	5.350 (0.2106)	5.360 (0.2110)	5.370 (0.2114)	5.380 (0.2118)	5.390 (0.2122)	5.400 (0.2126)	5.410 (0.2130)	5.420 (0.2134)	5.430 (0.2138)	5.440 (0.2142)	5.450 (0.2146)	5.460 (0.2150)	5.470 (0.2154)	5.480 (0.2157)	5.490 (0.2161)	5.500 (0.2165)	5.510 (0.2169)	5.520 (0.2173)	5.530 (0.2177)	5.540 (0.2181)	5.550 (0.2185)	5.560 (0.2189)	5.570 (0.2193)	5.580 (0.2197)	5.590 (0.2201)	5.600 (0.2205)	5.620 (0.2213)	5.640 (0.2220)	5.660 (0.2228)	5.680 (0.2236)	5.700 (0.2244)	5.720 (0.2252)	5.740 (0.2260)
0.000 - 0.020 (0.0000 - 0.0008)													06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	44	46	48	50	52	54	56
0.021 - 0.040 (0.0008 - 0.0016)											06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	46	48	50	52	54	56	58
0.041 - 0.060 (0.0016 - 0.0024)									06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	48	50	52	54	56	58	60
0.061 - 0.080 (0.0024 - 0.0031)								08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	50	52	54	56	58	60	62
0.081 - 0.100 (0.0032 - 0.0039)							08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	50	52	54	56	58	60	62	64
0.101 - 0.120 (0.0040 - 0.0047)						08	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	54	56	58	60	62	64	66
0.121 - 0.140 (0.0048 - 0.0055)					08	10	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	56	58	60	62	64	66	68
0.141 - 0.149 (0.0056 - 0.0059)				06	08	10	12	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	58	60	62	64	66	68
0.251 - 0.270 (0.0099 - 0.0106)	12	14	16	18	20	22	24	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	70	72									
0.271 - 0.290 (0.0107 - 0.0114)	14	16	18	20	22	24	26	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	72									
0.291 - 0.310 (0.0115 - 0.0122)	16	18	20	22	24	26	28	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72										
0.311 - 0.330 (0.0122 - 0.0130)	18	20	22	24	26	28	30	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72											
0.331 - 0.350 (0.0130 - 0.0138)	20	22	24	26	28	30	32	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74												
0.351 - 0.370 (0.0138 - 0.0146)	22	24	26	28	30	32	34	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74													
0.371 - 0.390 (0.0146 - 0.0154)	24	26	28	30	32	34	36	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74														
0.391 - 0.410 (0.0154 - 0.0161)	26	28	30	32	34	36	38	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																
0.411 - 0.430 (0.0162 - 0.0169)	28	30	32	34	36	38	40	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																	
0.431 - 0.450 (0.0170 - 0.0177)	30	32	34	36	38	40	42	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																		
0.451 - 0.470 (0.0178 - 0.0185)	32	34	36	38	40	42	44	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																			
0.471 - 0.490 (0.0185 - 0.0193)	34	36	38	40	42	44	46	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																				
0.491 - 0.510 (0.0193 - 0.0201)	36	38	40	42	44	46	48	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																					
0.511 - 0.530 (0.0201 - 0.0209)	38	40	42	44	46	48	50	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																						
0.531 - 0.550 (0.0209 - 0.0217)	40	42	44	46	48	50	52	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																							
0.551 - 0.570 (0.0217 - 0.0224)	42	44	46	48	50	52	54	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																								
0.571 - 0.590 (0.0225 - 0.0232)	44	46	48	50	52	54	56	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																									
0.591 - 0.610 (0.0233 - 0.0240)	46	48	50	52	54	56	58	60	62	62	64	64	66	66	68	68	70	70	72	72	74																										
0.611 - 0.630 (0.0241 - 0.0248)	48	50	52	54	56	58	60	62	64	64	66	66	68	68	70	70	72	72	74																												
0.631 - 0.650 (0.0248 - 0.0256)	50	52	54	56	58	60	62	64	66	66	68	68	70	70	72	72	74																														
0.651 - 0.670 (0.0256 - 0.0264)	52	54	56	58	60	62	64	66	68	68	70	70	72	72	74																														
0.671 - 0.690 (0.0264 - 0.0272)	54	56	58	60	62	64	66	68	70	70	72	72	74																														
0.691 - 0.710 (0.0272 - 0.0280)	56	58	60	62	64	66	68	70	72	72	74																														
0.711 - 0.730 (0.0280 - 0.0287)	58	60	62	64	66	68	70	72	74																														
0.731 - 0.750 (0.0288 - 0.0295)	60	62	64	66	68	70	72																														
0.751 - 0.770 (0.0296 - 0.0303)	62	64	66	68	70	72																														
0.771 - 0.790 (0.0304 - 0.0311)	64	66	68	70	72																														
0.791 - 0.810 (0.0311 - 0.0319)	66	68	70	72																															
0.811 - 0.830 (0.0319 - 0.0327)	68	70	72																																
0.831 - 0.850 (0.0327 - 0.0335)	70	72																																	
0.851 - 0.870 (0.0335 - 0.0343)	72																																		

Intake valve clearance (Cold):
0.15 – 0.25 mm (0.0059 – 0.0098 in.)

EXAMPLE:
The 5.250 mm (0.2067 in.) lifter is installed, and the measured clearance is 0.400 mm (0.0158 in.). Replace the 5.250 mm (0.2067 in.) shim with a new No. 46 lifter.

New Lifter Thickness mm (in.)

No.	Thickness	No.	Thickness	No.	Thickness
06	5.060 (0.1992)	30	5.300 (0.2087)	54	5.540 (0.2181)
08	5.080 (0.2000)	32	5.320 (0.2094)	56	5.560 (0.2189)
10	5.100 (0.2008)	34	5.340 (0.2102)	58	5.580 (0.2197)
12	5.120 (0.2016)	36	5.360 (0.2110)	60	5.600 (0.2205)
14	5.140 (0.2024)	38	5.380 (0.2118)	62	5.620 (0.2213)
16	5.160 (0.2031)	40	5.400 (0.2126)	64	5.640 (0.2220)
18	5.180 (0.2039)	42	5.420 (0.2134)	66	5.660 (0.2228)
20	5.200 (0.2047)	44	5.440 (0.2142)	68	5.680 (0.2236)
22	5.220 (0.2055)	46	5.460 (0.2150)	70	5.700 (0.2244)
24	5.240 (0.2063)	48	5.480 (0.2157)	72	5.720 (0.2252)
26	5.260 (0.2071)	50	5.500 (0.2165)	74	5.740 (0.2260)
28	5.280 (0.2079)	52	5.520 (0.2173)		

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Valve Lifter Selection Chart (Exhaust)

Measure clearance mm (in.) \ Installed lifter thickness mm (in.)	5.060 (0.1992)	5.080 (0.2000)	5.100 (0.2008)	5.120 (0.2016)	5.140 (0.2024)	5.160 (0.2031)	5.180 (0.2039)	5.200 (0.2047)	5.210 (0.2051)	5.220 (0.2055)	5.230 (0.2059)	5.240 (0.2063)	5.250 (0.2067)	5.260 (0.2071)	5.270 (0.2075)	5.280 (0.2079)	5.290 (0.2083)	5.300 (0.2087)	5.310 (0.2091)	5.320 (0.2094)	5.330 (0.2098)	5.340 (0.2102)	5.350 (0.2106)	5.360 (0.2110)	5.370 (0.2114)	5.380 (0.2118)	5.390 (0.2122)	5.400 (0.2126)	5.410 (0.2130)	5.420 (0.2134)	5.430 (0.2138)	5.440 (0.2142)	5.450 (0.2146)	5.460 (0.2150)	5.470 (0.2154)	5.480 (0.2157)	5.490 (0.2161)	5.500 (0.2165)	5.510 (0.2169)	5.520 (0.2173)	5.530 (0.2177)	5.540 (0.2181)	5.550 (0.2185)	5.560 (0.2189)	5.570 (0.2193)	5.580 (0.2197)	5.590 (0.2201)	5.600 (0.2205)	5.620 (0.2213)	5.640 (0.2220)	5.660 (0.2228)	5.680 (0.2236)	5.700 (0.2244)	5.720 (0.2252)	5.740 (0.2260)
0.000 - 0.020 (0.0000 - 0.0008)																										06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	30	32	34	36	38	40	42
0.021 - 0.040 (0.0008 - 0.0016)																									06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	32	34	36	38	40	42	44
0.041 - 0.060 (0.0016 - 0.0024)																								06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	34	36	38	40	42	44	46
0.061 - 0.080 (0.0024 - 0.0031)																					06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	36	38	40	42	44	46	48
0.081 - 0.100 (0.0032 - 0.0039)																			06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	38	40	42	44	46	48	50
0.101 - 0.120 (0.0040 - 0.0047)																	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	40	42	44	46	48	50	52
0.121 - 0.140 (0.0048 - 0.0055)															06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	42	44	46	48	50	52	54
0.141 - 0.160 (0.0056 - 0.0063)													06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	44	46	48	50	52	54	56
0.161 - 0.180 (0.0063 - 0.0071)											06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	46	48	50	52	54	56	58
0.181 - 0.200 (0.0071 - 0.0079)									06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	48	50	52	54	56	58	60
0.201 - 0.220 (0.0079 - 0.0087)								08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	50	52	54	56	58	60	62
0.221 - 0.240 (0.0087 - 0.0094)							08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	52	54	56	58	60	62	64
0.241 - 0.260 (0.0095 - 0.0102)						08	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	54	56	58	60	62	64	66
0.261 - 0.280 (0.0103 - 0.0110)					08	10	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	56	58	60	62	64	66	68
0.281 - 0.289 (0.0111 - 0.0114)				06	08	10	12	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	58	60	62	64	66	68
0.391 - 0.410 (0.0154 - 0.0161)	12	14	16	18	20	22	24	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	62	62	64	64	66	66	68	70	72							
0.411 - 0.430 (0.0162 - 0.0169)	14	16	18	20	22	24	26	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	72							
0.431 - 0.450 (0.0170 - 0.0177)	16	18	20	22	24	26	28	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72								
0.451 - 0.470 (0.0178 - 0.0185)	18	20	22	24	26	28	30	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72									
0.471 - 0.490 (0.0185 - 0.0193)	20	22	24	26	28	30	32	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74										
0.491 - 0.510 (0.0193 - 0.0201)	22	24	26	28	30	32	34	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74												
0.511 - 0.530 (0.0201 - 0.0209)	24	26	28	30	32	34	36	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74														
0.531 - 0.550 (0.0209 - 0.0217)	26	28	30	32	34	36	38	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																
0.551 - 0.570 (0.0217 - 0.0224)	28	30	32	34	36	38	40	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																	
0.571 - 0.590 (0.0225 - 0.0232)	30	32	34	36	38	40	42	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																		
0.591 - 0.610 (0.0233 - 0.0240)	32	34	36	38	40	42	44	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																			
0.611 - 0.630 (0.0241 - 0.0248)	34	36	38	40	42	44	46	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																				
0.631 - 0.650 (0.0248 - 0.0256)	36	38	40	42	44	46	48	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																					
0.651 - 0.670 (0.0256 - 0.0264)	38	40	42	44	46	48	50	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																						
0.671 - 0.690 (0.0264 - 0.0272)	40	42	44	46	48	50	52	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																						
0.691 - 0.710 (0.0272 - 0.0280)	42	44	46	48	50	52	54	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																						
0.711 - 0.730 (0.0280 - 0.0287)	44	46	48	50	52	54	56	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74																						
0.731 - 0.750 (0.0288 - 0.0295)	46	48	50	52	54	56	58	60	62	62	64	64	66	66	68	68	70	70	72	72	74																						
0.751 - 0.770 (0.0296 - 0.0303)	48	50	52	54	56	58	60	62	64	64	66	66	68	68	70	70	72	72	74																						
0.771 - 0.790 (0.0304 - 0.0311)	50	52	54	56	58	60	62	64	66	66	68	68	70	70	72	72	74																						
0.791 - 0.810 (0.0311 - 0.0319)	52	54	56	58	60	62	64	66	68	68	70	70	72	72	74																						
0.811 - 0.830 (0.0319 - 0.0327)	54	56	58	60	62	64	66	68	70	70	72	72	74																								
0.831 - 0.850 (0.0327 - 0.0335)	56	58	60	62	64	66	68	70	72	72	74																										
0.851 - 0.870 (0.0335 - 0.0343)	58	60	62	64	66	68	70	72	74																												
0.871 - 0.890 (0.0343 - 0.0350)	60	62	64	66	68	70	72																														
0.891 - 0.910 (0.0351 - 0.0358)	62	64	66	68	70	72																															
0.911 - 0.930 (0.0359 - 0.0366)	64	66	68	70	72																																
0.931 - 0.950 (0.0367 - 0.0374)	66	68	70	72																																	
0.951 - 0.970 (0.0374 - 0.0382)	68	70	72																																		
0.971 - 0.990 (0.0382 - 0.0390)	70	72																																			
0.991 - 1.010 (0.0390 - 0.0398)	72																																				

Exhaust valve clearance (Cold):
0.29 – 0.39 mm (0.0114 – 0.0154 in.)

EXAMPLE:
The 5.340 mm (0.2102 in.) lifter is installed, and the measured clearance is 0.480 mm (0.0189 in.). Replace the 5.340 mm (0.2102 in.) shim with a new No. 48 lifter.

New Lifter Thickness mm (in.)

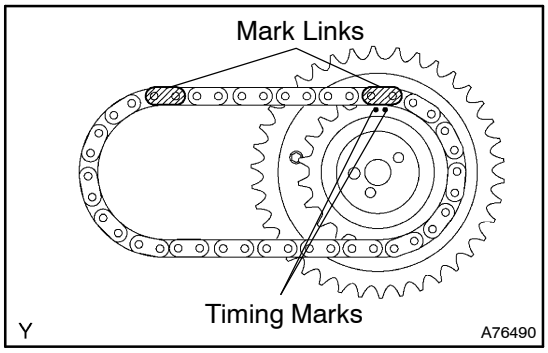
No.	Thickness	No.	Thickness	No.	Thickness
06	5.060 (0.1992)	30	5.300 (0.2087)	54	5.540 (0.2181)
08	5.080 (0.2000)	32	5.320 (0.2094)	56	5.560 (0.2189)
10	5.100 (0.2008)	34	5.340 (0.2102)	58	5.580 (0.2197)
12	5.120 (0.2016)	36	5.360 (0.2110)	60	5.600 (0.2205)
14	5.140 (0.2024)	38	5.380 (0.2118)	62	5.620 (0.2213)
16	5.160 (0.2031)	40	5.400 (0.2126)	64	5.640 (0.2220)
18	5.180 (0.2039)	42	5.420 (0.2134)	66	5.660 (0.2228)
20	5.200 (0.2047)	44	5.440 (0.2142)	68	5.680 (0.2236)
22	5.220 (0.2055)	46	5.460 (0.2150)	70	5.700 (0.2244)
24	5.240 (0.2063)	48	5.480 (0.2157)	72	5.720 (0.2252)
26	5.260 (0.2071)	50	5.500 (0.2165)	74	5.740 (0.2260)
28	5.280 (0.2079)	52	5.520 (0.2173)		

A76342

(k) Install the No. 3 camshaft sub–assy.

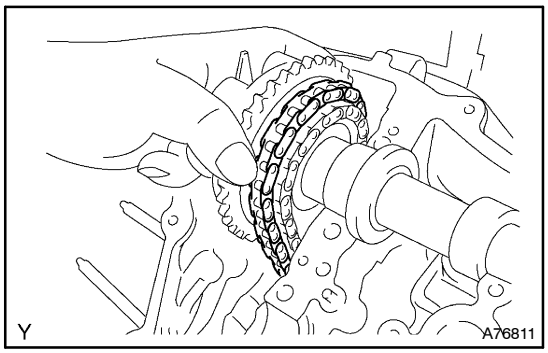
NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.

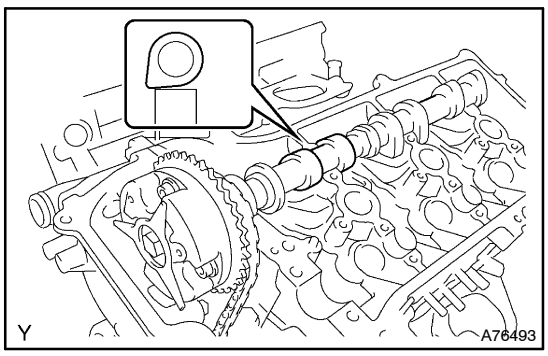


(1) Align the mark link (yellow) with the timing mark (2 dot marks) of the camshaft timing gear as shown in the illustration.

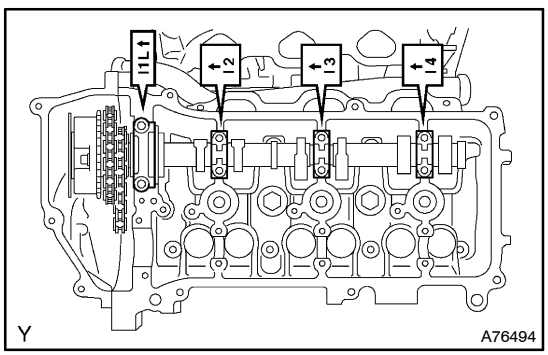
(2) Apply new engine oil to the thrust portion and journal of the camshafts.



(3) Temporarily wrap the No. 1 chain around the No. 2 chain on the camshaft timing gear.

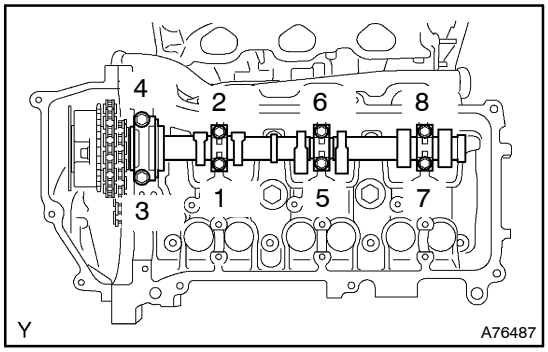


(4) Set the No. 3 camshaft onto the LH cylinder head with the cam lobes of the No. 2 cylinder faced as shown in the illustration.



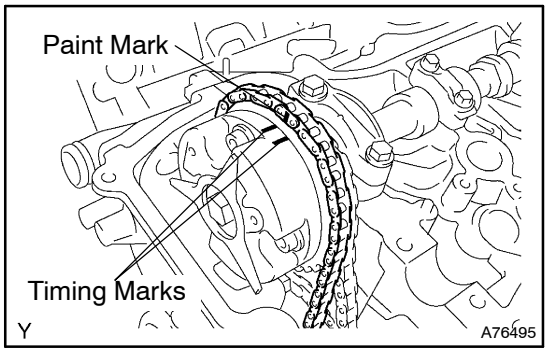
(5) Install the 4 bearing caps in their proper locations.

(6) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

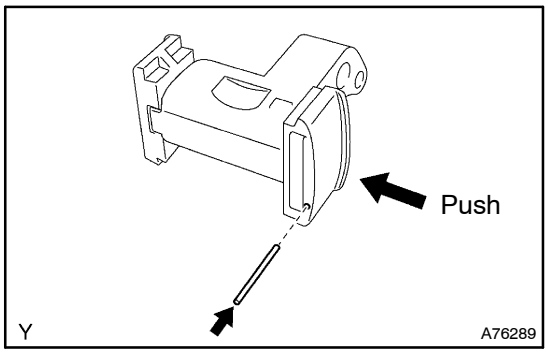


(7) Install and uniformly tighten the 8 bearing cap bolts, in several passes, in the sequence shown.

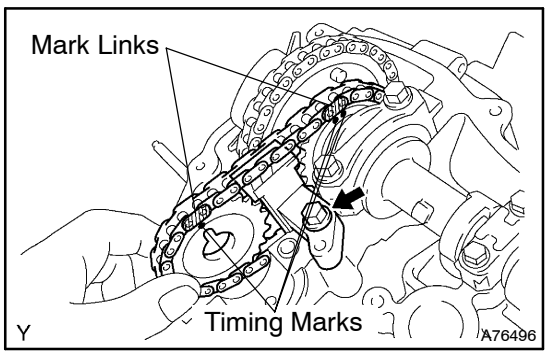
Torque:
9.0 N·m (92 kgf·cm, 80 in.·lbf) for 10 mm (0.39 in.) head
24 N·m (245 kgf·cm, 18 ft·lbf) for 12 mm (0.47 in.) head



(8) Align the paint mark of the No. 1 chain with the timing marks of the camshaft timing gear.



(l) Install the chain tensioner assy No. 3.
(1) While pushing in the tensioner, insert a pin of ϕ 1.0 mm (0.039 in.) into the hole to hold it.



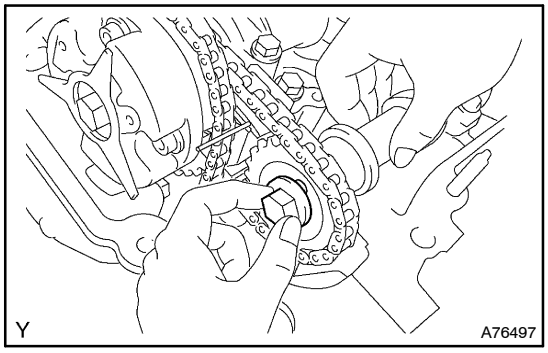
(2) Temporarily install the camshaft timing gear and chain tensioner No. 3 and align the mark links (yellow) with the timing marks (1 dot mark and 2 dot marks) of the camshaft timing gears.
(3) Tighten the chain tensioner No. 3 bolt.

Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

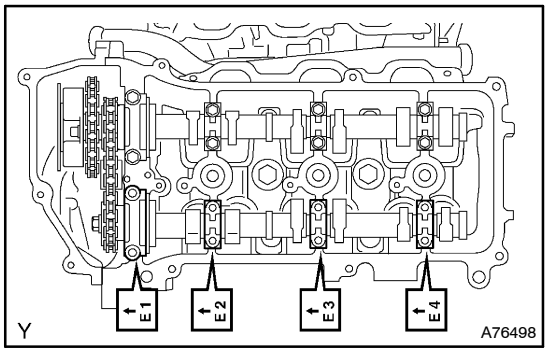
(m) Install the No. 4 camshaft sub–assy.

NOTICE:

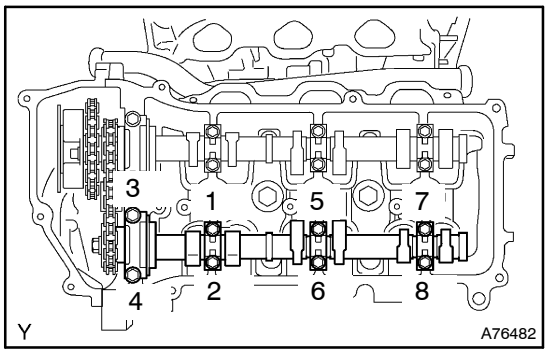
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



(1) Align the knock pin hole in the camshaft timing gear with the knock pin of he No. 4 camshaft, and insert the No. 4 camshaft into the camshaft timing gear.
(2) Temporarily install the camshaft timing gear set bolt.

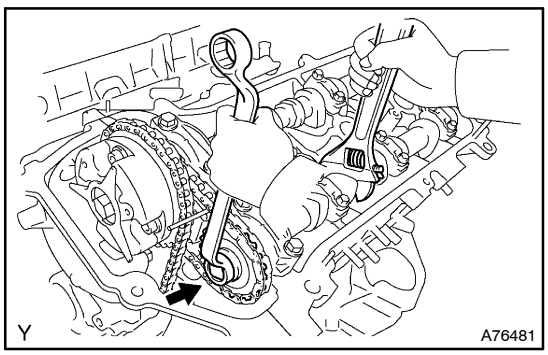


(3) Install the 4 bearing caps in their proper locations.
(4) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.



(5) Install and uniformly tighten the 8 bearing cap bolts, in several passes, in the sequence shown.

Torque:
9.0 N·m (92 kgf·cm, 80 in.·lbf) for 10 mm (0.39 in.) head
24 N·m (245 kgf·cm, 18 ft·lbf) for 12 mm (0.47 in.) head



(6) Hold the hexagonal portion of the No. 4 camshaft with a wrench, and tighten the camshaft timing gear set bolt.

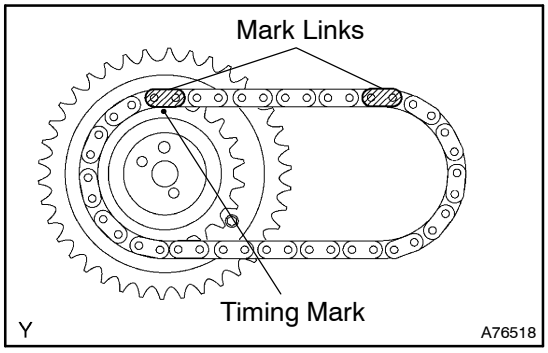
Torque: 100 N·m (1,020 kgf·cm, 74 ft·lbf)

(7) Remove the pin from the chain tensioner No. 3.

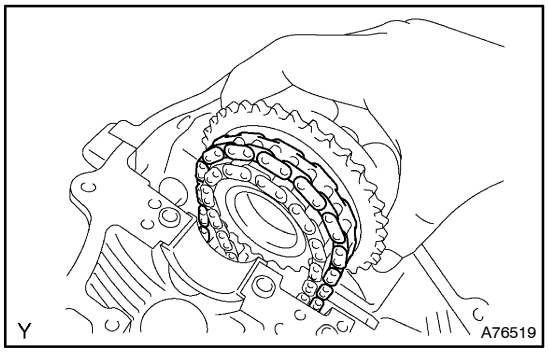
(n) Install the camshaft.

NOTICE:

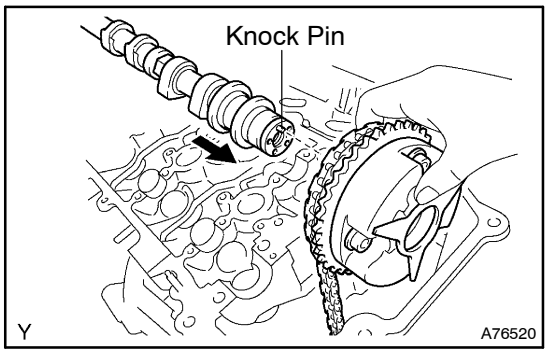
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



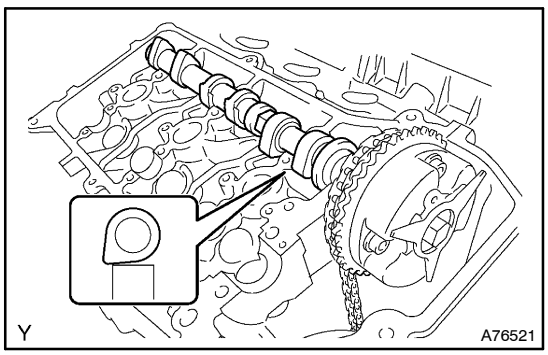
(1) Align the mark link (yellow) with the timing mark (1 dot mark) of the camshaft timing gear as shown in the illustration.
(2) Apply new engine oil to the thrust portion and journal of the camshafts.



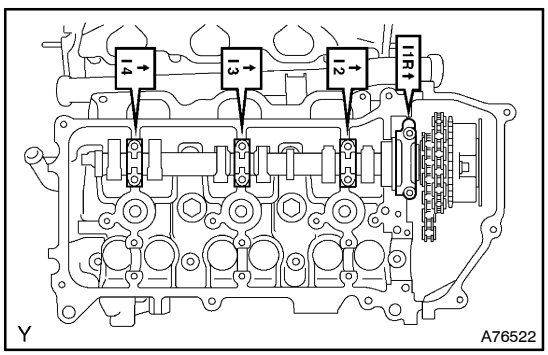
(3) Temporarily wrap the No. 1 chain around the No. 2 chain on the camshaft timing gear.



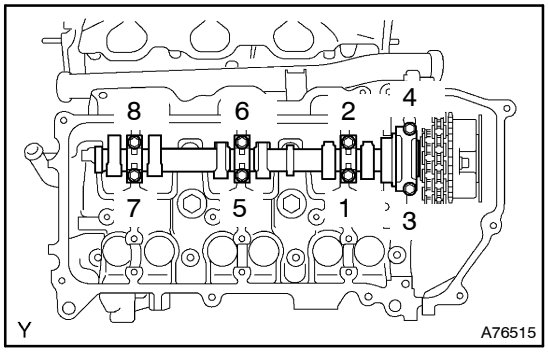
(4) Align the knock pin hole in the camshaft timing gear with the knock pin of the No. 1 camshaft, and insert the No. 1 camshaft into the camshaft timing gear.
(5) Temporarily install the camshaft timing gear set bolt.



(6) Set the No. 1 camshaft onto the RH cylinder head with the cam lobes of the No. 1 cylinder faced as shown in the illustration.

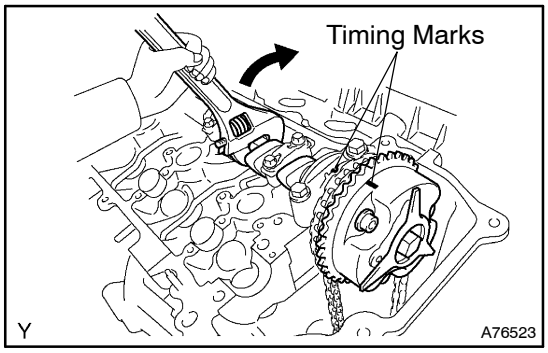


(7) Install the 4 bearing caps in their proper locations.
(8) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

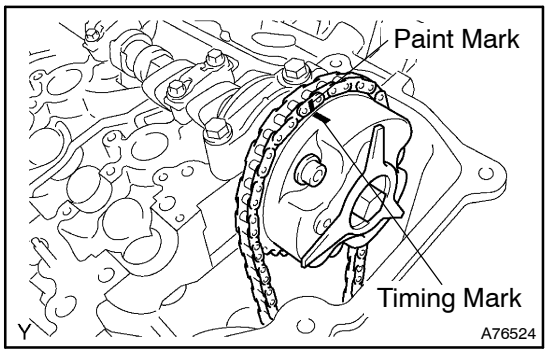


(9) Install and uniformly tighten the 8 bearing cap bolts, in several passes, in the sequence shown.

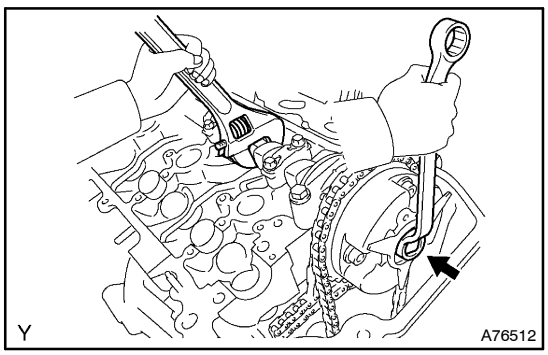
Torque:
9.0 N·m (92 kgf·cm, 80 in.·lbf) for 10 mm (0.39 in.) head
24 N·m (245 kgf·cm, 18 ft·lbf) for 12 mm (0.47 in.) head



(10) Rotate the No. 1 camshaft clockwise using hexagonal portion of the No. 1 camshaft so that the timing mark of the camshaft timing gear is aligned with the timing marks of the camshaft bearing cap.

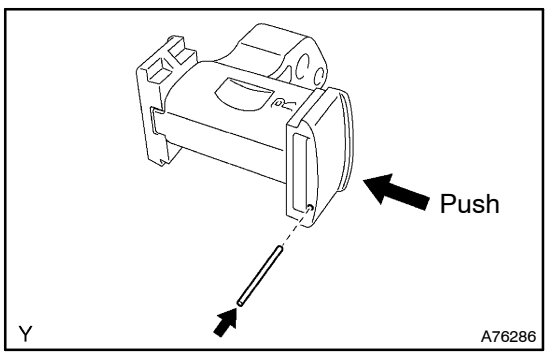


(11) Align the paint mark of the No. 1 chain with the timing mark of the camshaft timing gear.

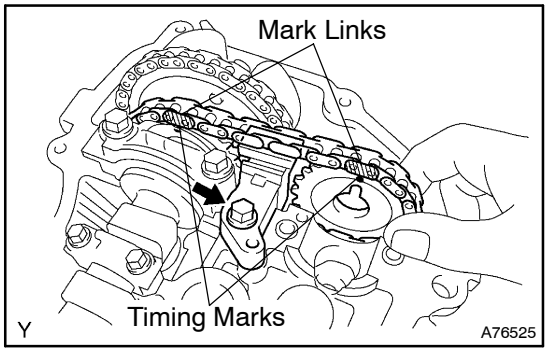


(12) Hold the hexagonal portion of the No. 1 camshaft with a wrench, and tighten the camshaft timing gear set bolt.

Torque: 100 N·m (1,020 kgf·cm, 74 ft·lbf)



(o) Install the chain tensioner assy No. 2.
(1) While pushing in the tensioner, insert a pin of ϕ 1.0 mm (0.039 in.) into the hole to fix it.



(2) Temporarily install the camshaft timing gear and chain tensioner No. 2 and align the mark links (yellow) with the timing marks (1 dot mark) of the camshaft timing gears.

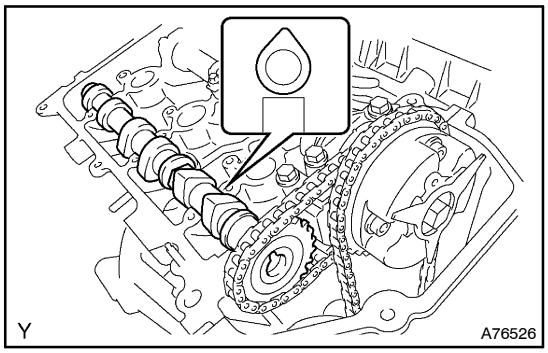
(3) Tighten the chain tensioner No. 2 bolt.

Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

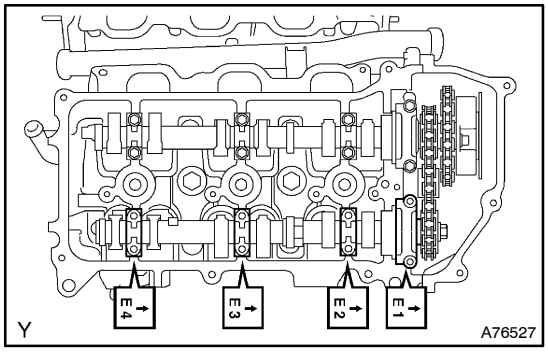
(p) Install the No. 2 camshaft.

NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.

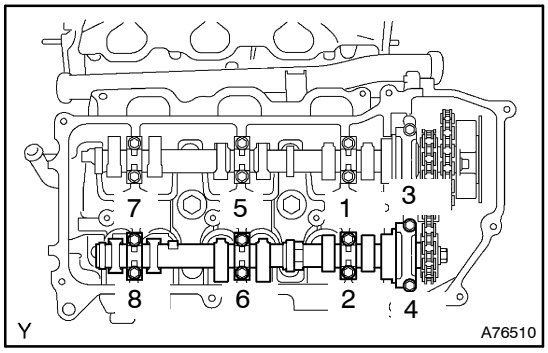


(1) Set the No. 2 camshaft onto the RH cylinder head with the cam lobes of No. 1 cylinder faced as shown in the illustration.



(2) Install the 4 bearing caps in their proper locations.

(3) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

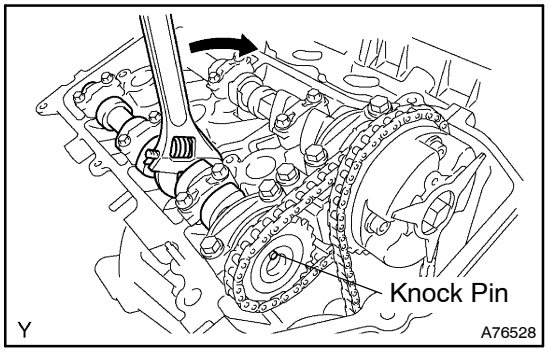


(4) Install and uniformly tighten the 8 bearing cap bolts, in several passes, in the sequence shown.

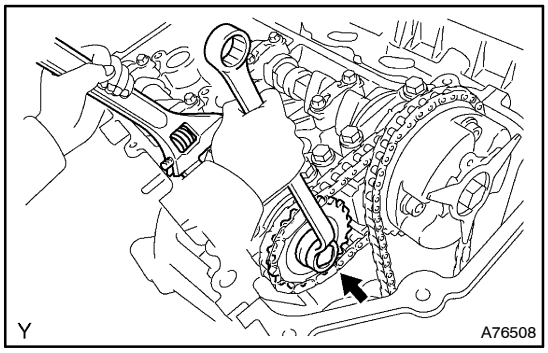
Torque:

9.0 N·m (92 kgf·cm, 80 in.·lbf) for 10 mm (0.39 in.) head

24 N·m (245 kgf·cm, 18 ft·lbf) for 12 mm (0.47 in.) head



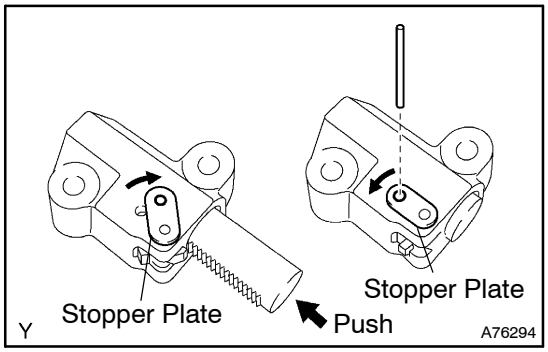
(5) Rotate the No. 2 camshaft clockwise using hexagonal portion of the No. 2 camshaft so that the knock pin of the No. 2 camshaft is aligned with the knock pin hole of the camshaft timing gear.



(6) Hold the hexagonal portion of the No. 2 camshaft with a wrench, and install the camshaft timing gear set bolt.

Torque: 100 N·m (1,020 kgf·cm, 74 ft·lbf)

(7) Remove the pin from the chain tensioner No. 2.



(q) Install the chain tensioner assy No. 1.

(1) While rotating the stopper plate of the tensioner clockwise, push in the plunger of the tensioner as shown in the illustration.

(2) While rotating the stopper plate of the tensioner counterclockwise, insert a bar of ϕ 3.5 mm (0.138 in.) into the holes in the stopper plate and tensioner to fix the stopper plate.

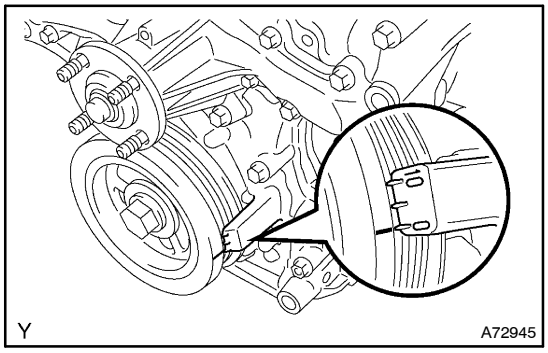
(3) Install the chain tensioner with the 2 bolts.

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

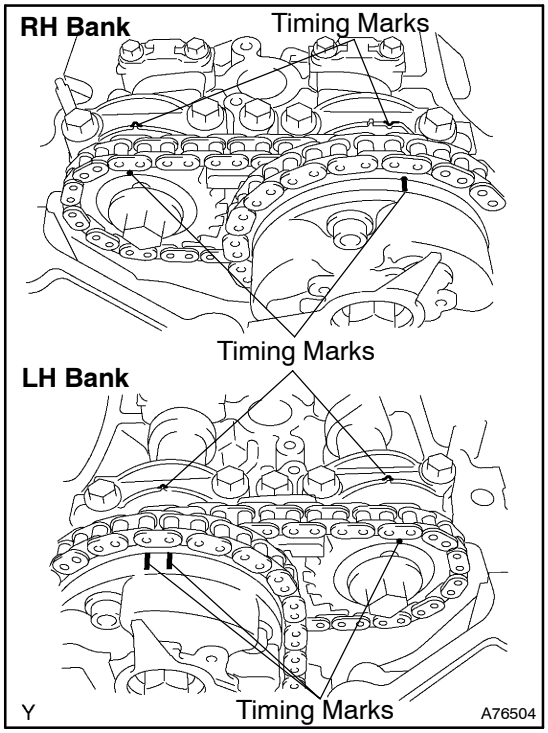
(4) Remove the bar from the chain tensioner.

(5) Install a new gasket and the timing chain cover plate with the 4 bolts.

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



(6) Slowly turn the crankshaft pulley 2 revolutions, and align its groove with the timing mark ”0” of the timing chain cover.

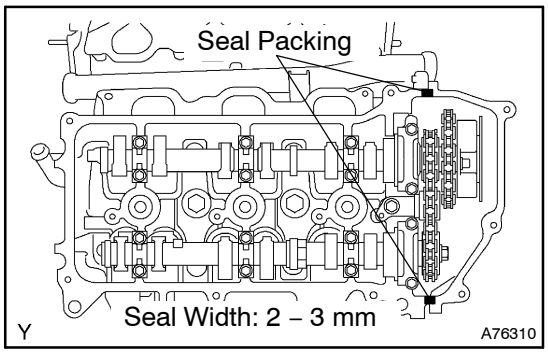


(7) Check that the timing marks of the camshaft timing gears are aligned with the timing marks of the bearing cap as shown in the illustration.

86. INSTALL CYLINDER HEAD COVER SUB–ASSY

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the cylinder head, timing chain cover and cylinder head cover.

(b) Install the gasket to the cylinder head cover.



(c) Apply a continuous bead of the seal packing (diameter 2 – 3 mm (0.08 – 0.12 in.)) to the cylinder head and timing chain cover as shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

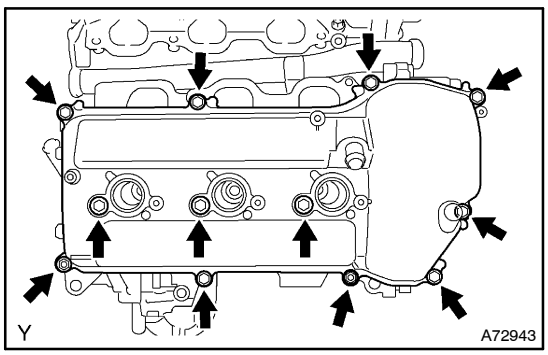
NOTICE:

Install the cylinder head cover within 3 minutes after applying seal packing. After installing it, cylinder head cover bolts and nuts must be tightened within 15 minutes. Otherwise the seal packing must be removed and reapplied.

(d) Install the seal washers to the bolts.

(e) Install the cylinder head cover with the 10 bolts and 2 nuts. Uniformly tighten the bolts and nuts in several passes.

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



87. INSTALL CYLINDER HEAD COVER SUB–ASSY LH

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the cylinder head, timing chain cover and cylinder head cover.

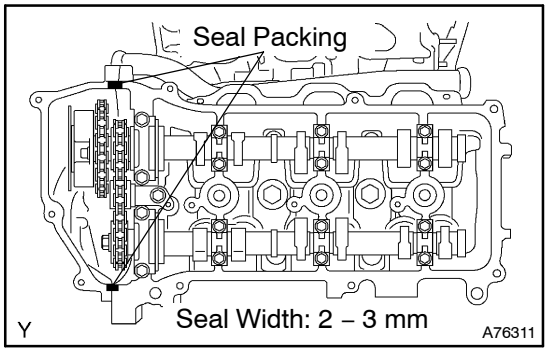
(b) Apply adhesive on the threads of the ventilation valve.

Adhesive: Part No. 08833–00070, THREE BOND 1324 or equivalent

(c) Install the ventilation valve to the cylinder head cover.

Torque: 27 N·m (275 kgf·cm, 20 ft·lbf)

(d) Install the gasket to the cylinder head cover.



(e) Apply a continuous bead of the seal packing (diameter 2 – 3 mm (0.08 – 0.12 in.)) to the cylinder head and timing chain cover as shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

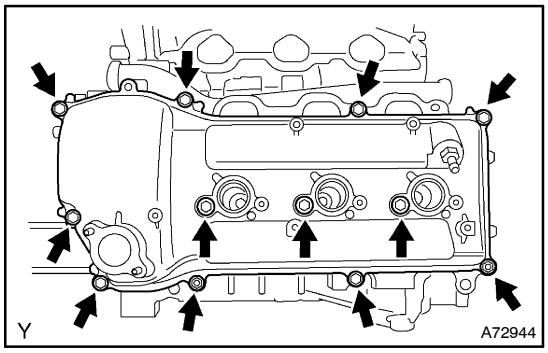
NOTICE:

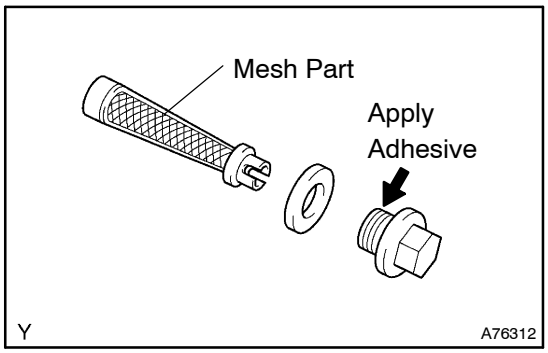
Install the cylinder head cover within 3 minutes after applying seal packing. After installing it, cylinder head cover bolts and nuts must be tightened within 15 minutes. Otherwise the seal packing must be removed and reapplied.

(f) Install the seal washers to the bolts.

(g) Install the cylinder head cover with the 10 bolts and 2 nuts. Uniformly tighten the bolts and nuts in several passes.

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





88. INSTALL OIL CONTROL VALVE FILTER

(a) Check that no foreign objects on the mesh part of the 2 filters.

(b) Install 2 new gaskets to each new plug.

(c) Insert the filters to the plugs.

(d) Apply adhesive to 2 or 3 threads of the plugs.

Adhesive: Part No. 08833–00080, THREE BOND 1344 LOCTITE 242 or equivalent

(e) Install the plugs to each cylinder head.

Torque: 62 N·m (632 kgf·cm, 46 ft·lbf)

89. INSTALL CRANKSHAFT POSITION SENSOR

(a) Install the crankshaft position sensor with the bolt.

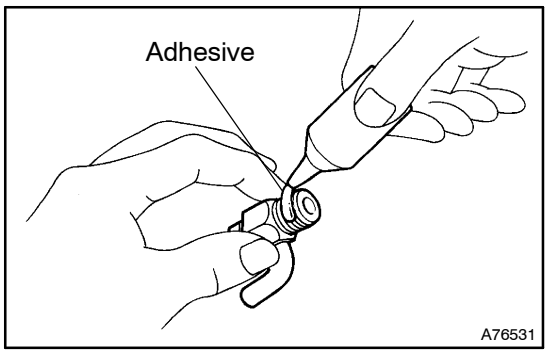
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

90. INSTALL VVT SENSOR

(a) Apply a light coat of engine oil to the O–ring of each VVT sensor.

(b) Install the 2 VVT sensors with the 2 bolts.

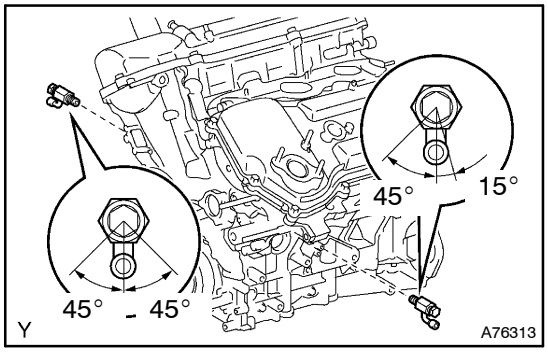
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



91. INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB–ASSY

(a) Apply adhesive to 2 or 3 threads of the drain cocks end.

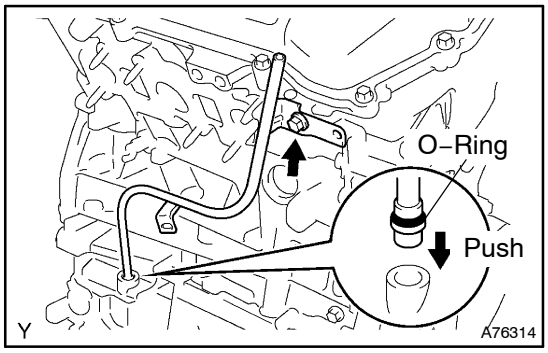
Adhesive: Part No. 08833–00070, THREE BOND 1324 or equivalent



(b) After applying the specified torque, rotate the drain cocks clockwise as shown in the illustration.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

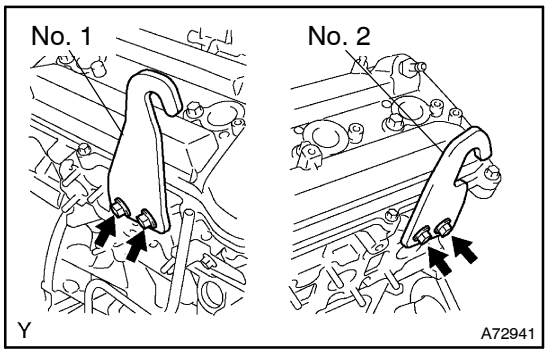
NOTICE:

- **Do not rotate the drain cocks more than 1 revolution (360°) after tightening the drain cocks with the specified torque.**
- **Do not loosen the drain cocks after setting it correctly.**



92. INSTALL OIL LEVEL GAUGE GUIDE

(a) Install a new O–ring to the oil level gauge guide.
(b) Apply a light coat of engine oil to the O–ring.
(c) Push in the oil level gauge guide end into the guide hole of the oil pan.
(d) Install the oil level gauge guide with the bolt.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



93. INSTALL ENGINE HANGER NO.2

(a) Install the engine hanger with the 2 bolts.
Torque: 33 N·m (336 kgf·cm, 24 ft·lbf)

94. INSTALL ENGINE HANGER NO.1

(a) Install the engine hanger with the 2 bolts.
Torque: 33 N·m (336 kgf·cm, 24 ft·lbf)