PARTIAL ENGINE ASSY (1NZ–FE/2NZ–FE)

1400Z–01

OVERHAUL

1. REMOVE SPARK PLUG

2. REMOVE ENGINE HANGER NO.1

3. REMOVE THERMOSTAT

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

4. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSY(W/ VVT–i)

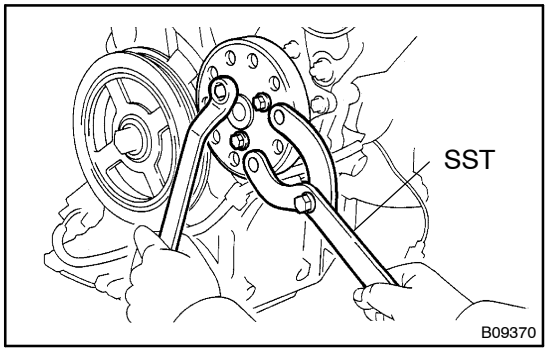
5. REMOVE OIL FILLER CAP SUB–ASSY

6. REMOVE OIL FILLER CAP GASKET

7. REMOVE CRANK POSITION SENSOR

8. REMOVE CYLINDER HEAD COVER SUB–ASSY

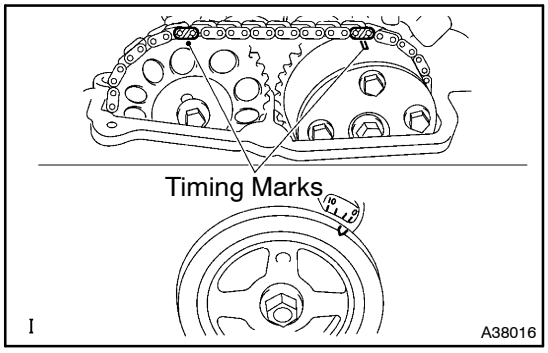
9. REMOVE CYLINDER HEAD COVER GASKET



10. REMOVE WATER PUMP PULLEY

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

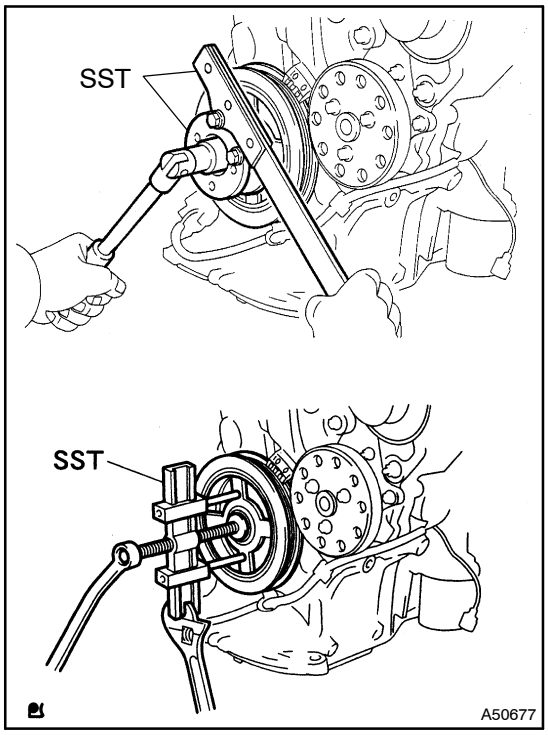
11. REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET



12. REMOVE CRANKSHAFT DAMPER SUB–ASSY

(a) Set No. 1 cylinder to TDC/compression.
  (1) Turn the crankshaft damper, and align its groove with timing mark ”0” of the chain cover.
  (2) Check that both timing marks on the camshaft timing sprocket and valve timing controller assembly are facing right up as shown in the illustration.

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



(b) Using SST, remove the pulley bolt.
  SST 09213–58012 (91111–50845), 09330–00021

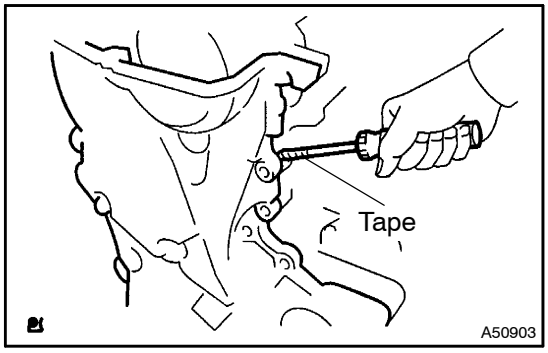
HINT:
If necessary, remove the damper with SST.
  SST 09950–50012 (09951–05010, 09952–05010, 09953–05020, 09954–05020)

13. REMOVE WATER PUMP ASSY

(a) Remove the 3 bolts, 2 nuts and water pump.

14. REMOVE OIL PUMP ASSY

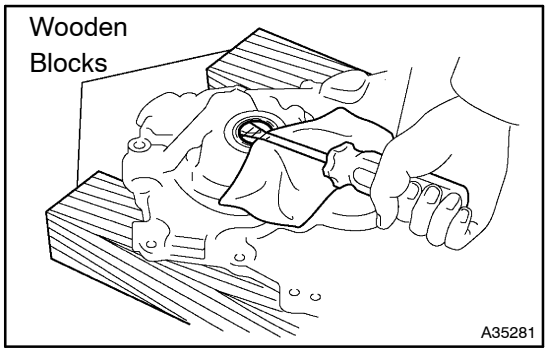
(a) Remove the 15 bolts and nut.



(b) Using a screwdriver with taping its tip, remove the oil pump by prying the portions between the cylinder head and cylinder block.

NOTICE:

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

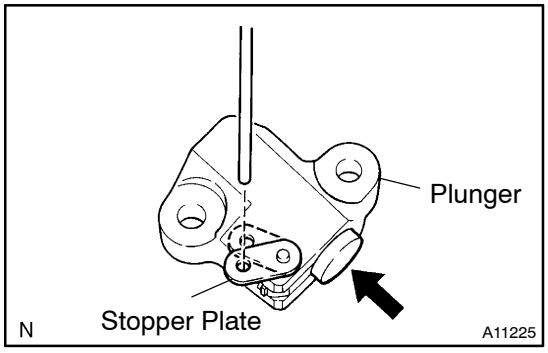


(c) Remove the 2 O–rings from the cylinder block and oil pan No. 1.

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

15. REMOVE OIL PUMP SEAL

(a) Using a screwdriver with taping its tip, remove the oil seal.



16. 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) Using drivers or equipment, 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 2.5 mm (0.098 in.) into the holes in the stopper plate and tensioner to fix the stopper plate.
SST 10514

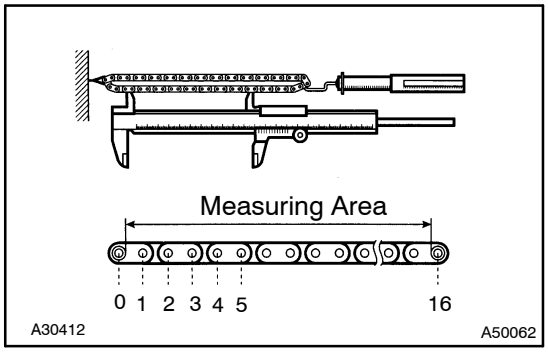
(c) Remove the 2 bolts and chain tensioner.

17. REMOVE CHAIN TENSIONER SLIPPER

18. REMOVE CHAIN VIBRATION DAMPER NO.1

(a) Remove the 2 bolts and damper.

19. REMOVE CHAIN SUB–ASSY



20. INSPECT CHAIN SUB–ASSY

(a) Using a spring scale, pull the timing chain with 140 N (14.3 kgf, 31.5 lb) and measure the length of it.
Maximum chain elongation: 123.2 mm (4.850 in.)

If the elongation is greater than maximum, replace the chain.
HINT:
Make the same measurements pulling at 3 or more places selected at random.

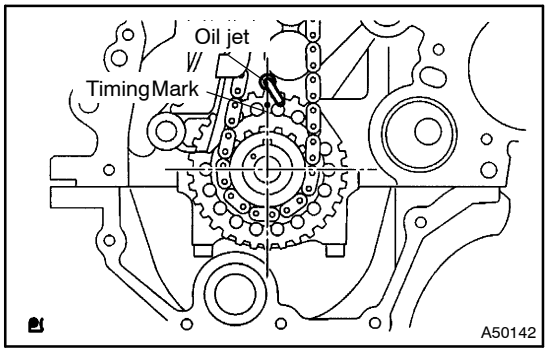
21. REMOVE FUEL DELIVERY PIPE SUB–ASSY

(a) Remove the 3 bolts and delivery pipe with injector.

22. REMOVE FUEL INJECTOR ASSY

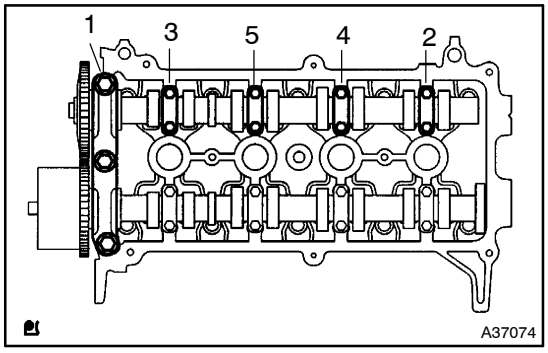
(a) Pull out the 4 injectors form the delivery pipe.

23. REMOVE CAM POSITION SENSOR



24. REMOVE NO.2 CAMSHAFT

NOTICE:
When rotating the camshaft with the timing chain removed, rotate the crankshaft counterclockwise 40° from the TDC and align the oil jet hole with the paint mark before rotating it for the valves not to touch the pistons.



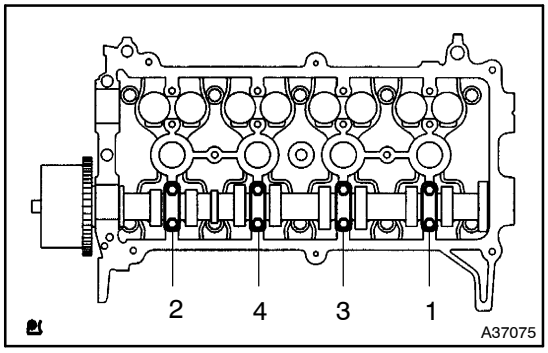
(a) Uniformly loosen and remove the 11 bearing cap blots, in several passes, in the sequence shown, and remove the 5 bearing caps and No. 2 camshaft.

NOTICE:
Loosen the each bolt equally with keeping the camshaft horizontal.

25. REMOVE CAMSHAFT TIMING GEAR OR SPROCKET

(a) Grip the camshaft with a vice.
(b) Remove the fringe bolt and camshaft timing sprocket.

NOTICE:
Be careful not to damage the camshaft.



26. REMOVE CAMSHAFT

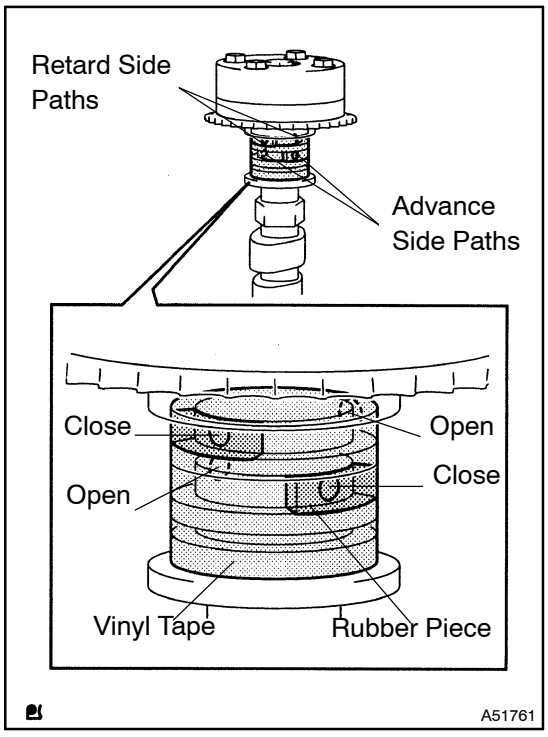
(a) Uniformly loosen and remove the 8 bearing cap blots, in several passes, in the sequence shown, and remove the 4 bearing caps and camshaft.

NOTICE:
Loose the each bolt equally with keeping the camshaft horizontal.

27. INSPECT CAMSHAFT TIMING GEAR ASSY(W/ VVT–i)

(a) Check the lock of camshaft timing gear.
   (1) Grip the camshaft with a vice, and confirm the camshaft timing gear is locked.

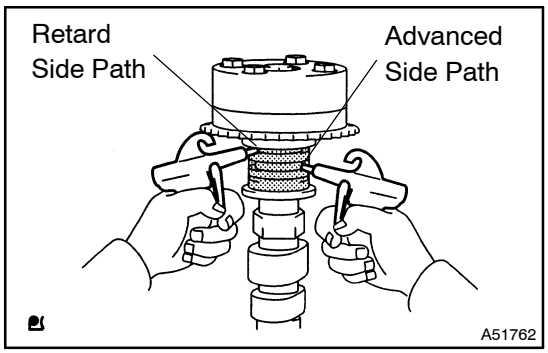
NOTICE:
Be careful not to damage the camshaft.



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

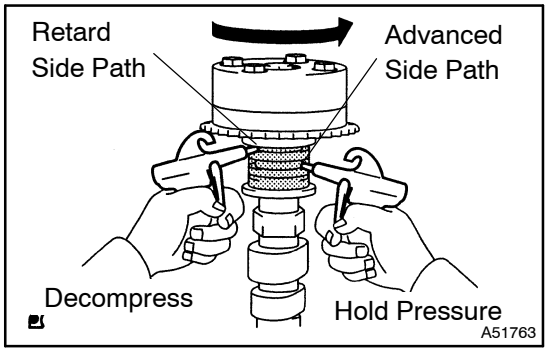
HINT:
The 4 oil paths are provided in the groove of the camshaft. Plug two of the paths with rubber pieces.

   (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 150 kPa (1.5 kgf/cm^2).

NOTICE:
Cover the paths with shop rag to avoid oil splashing.



(4) Confirm if the camshaft timing gear assembly revolves 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, revolves 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.

(c) Check smooth revolution

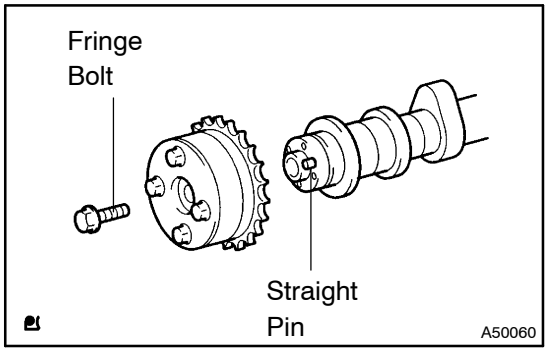
(1) Except the position where the lock pin meets at the most retard angle, let the valve timing controller assembly turn back and forth and check the movable range and that there is no disturbance.

Standard: Movable smoothly in the range about 22.5°

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

(d) Check the lock in the most retarded position.

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



28. REMOVE CAMSHAFT TIMING GEAR ASSY(W/ VVT–i)

(a) Turn the valve timing controller assembly at the maximum advance angle side.

(b) Remove the fringe bolt and camshaft timing gear assembly.

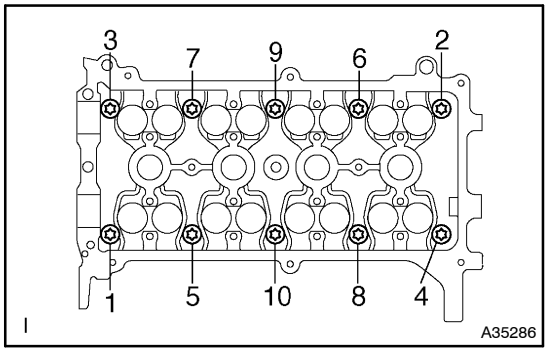
NOTICE:
- **Be sure not to remove the other 4 bolts.**
- **In case of reusing the camshaft timing gear, then release the lock pin.**

29. REMOVE CAMSHAFT TIMING GEAR OR SPROCKET(W/O VVT–i)

(a) Grip the camshaft with a vice.

(b) Remove the fringe bolt and camshaft timing sprocket.

NOTICE:
Be careful not to damage the camshaft.



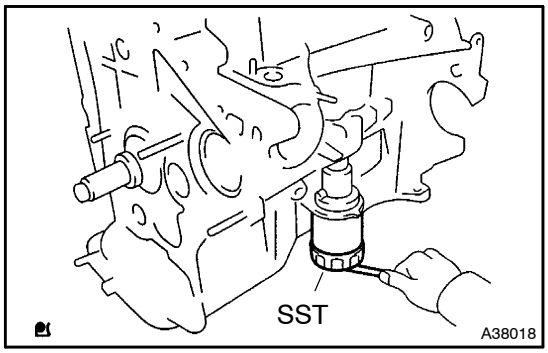
30. REMOVE CYLINDER HEAD SUB–ASSY

(a) Using a 8 mm bi–hexagon wrench, uniformly loosen and remove the 10 cylinder head bolts, in several passes, in the sequence shown. Remove the 10 cylinder head bolts and plate washers.

NOTICE:

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

31. REMOVE CYLINDER HEAD GASKET

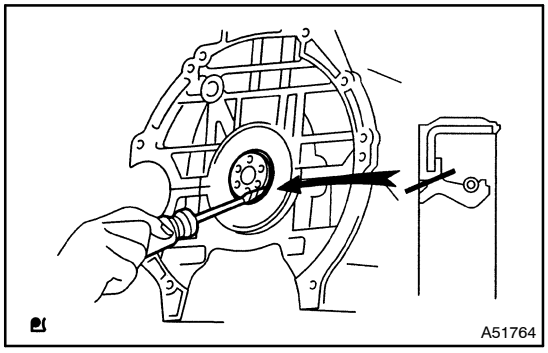


32. REMOVE OIL FILTER SUB–ASSY

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

33. REMOVE OIL FILTER UNION

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



34. REMOVE ENGINE REAR OIL SEAL

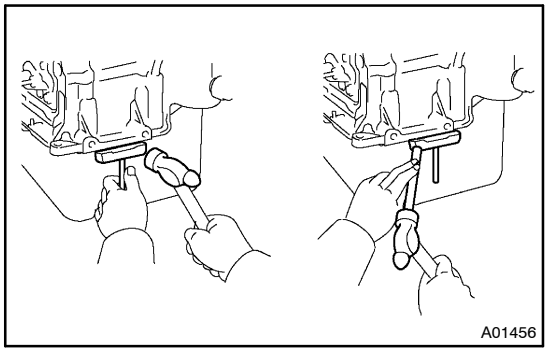
(a) Using a knife, cut off the oil seal lip.
(b) Using a screwdriver with taping its tip, pry out the oil seal.

NOTICE:

After the removal, check if the crankshaft is not damaged. If it is damaged, mend it with a sandpaper (#400).

35. REMOVE OIL PAN SUB–ASSY NO.2

(a) Remove the oil pan drain plug and gasket.
(b) Remove the 9 bolts and 2 nuts.

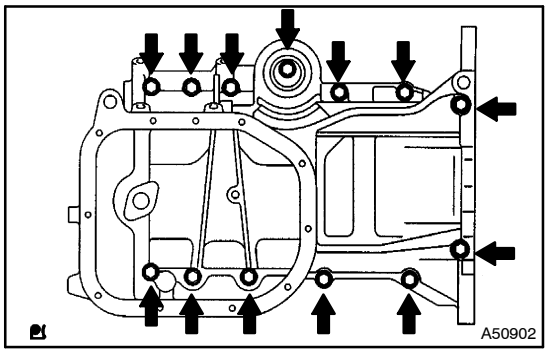


(c) Insert the blade of SST between oil pan No. 1 and oil pan No. 2, and cut off applied sealer and remove the oil pan No. 2.
SST 09032–00100

NOTICE:
Be careful not to damage the oil pan No. 2 contact surface of the oil pan No. 1 and the oil pan No. 2 flange.

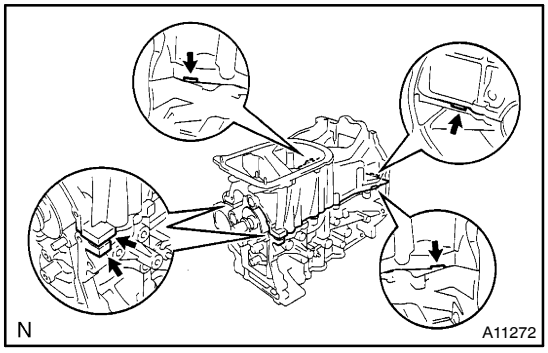
36. REMOVE OIL STRAINER SUB–ASSY

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



37. REMOVE OIL PAN SUB–ASSY

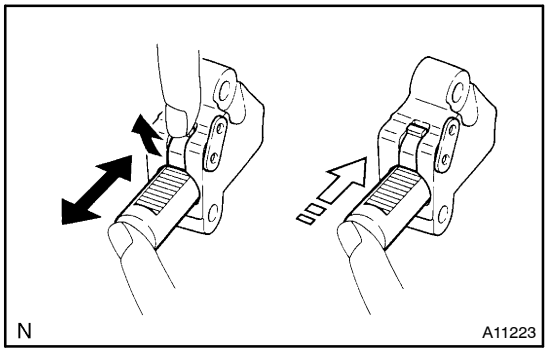
(a) Uniformly loosen and remove the 13 bolts, in several passes, in the sequence shown.



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

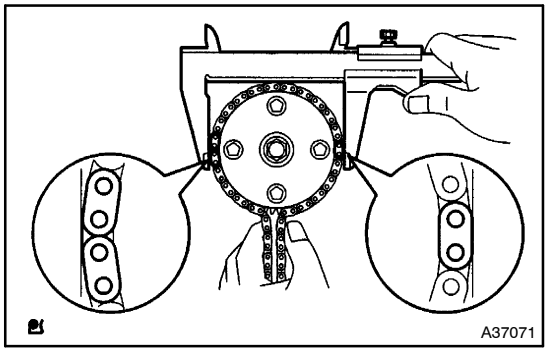
NOTICE:
Be careful not to damage the contact surfaces of the oil pan No. 1 and cylinder block.

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



38. INSPECT CHAIN TENSIONER ASSY NO.1

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

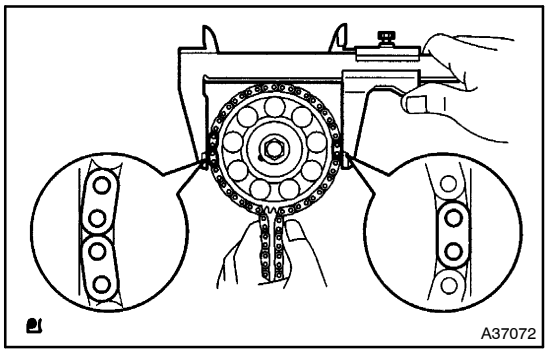


39. INSPECT CAMSHAFT TIMING GEAR ASSY(W/ VVT–i)

(a) Wrap the chain around the timing sprocket.
(b) Using a vernier calipers, measure the timing gear diameter with chain.
Minimum gear diameter (w / chain):
96.2 mm (3.787 in.)

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

NOTICE:
Vernier calipers must contact the chain rollers for measuring.

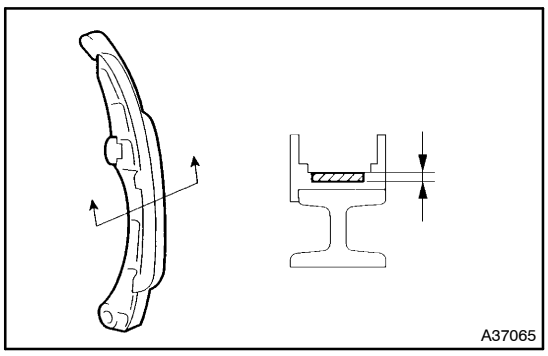


40. INSPECT CAMSHAFT TIMING GEAR OR SPROCKET

(a) Wrap the chain around the timing sprocket.
(b) Using a vernier calipers, measure the timing gear diameter with chain.
Minimum gear diameter (w / chain):
96.2 mm (3.787 in.)

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

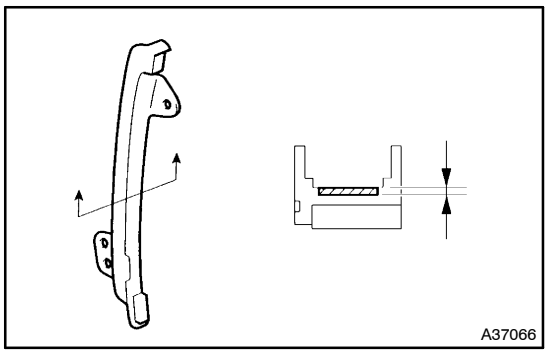
NOTICE:
Vernier calipers must contact the chain rollers for measuring.



41. INSPECT CHAIN TENSIONER SLIPPER

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

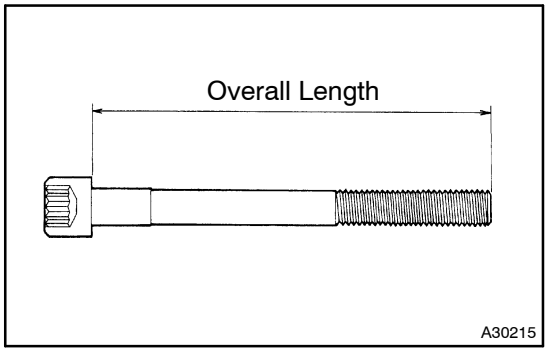
If the wear is greater than maximum, replace the slipper.



42. INSPECT CHAIN VIBRATION DAMPER NO.1

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

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



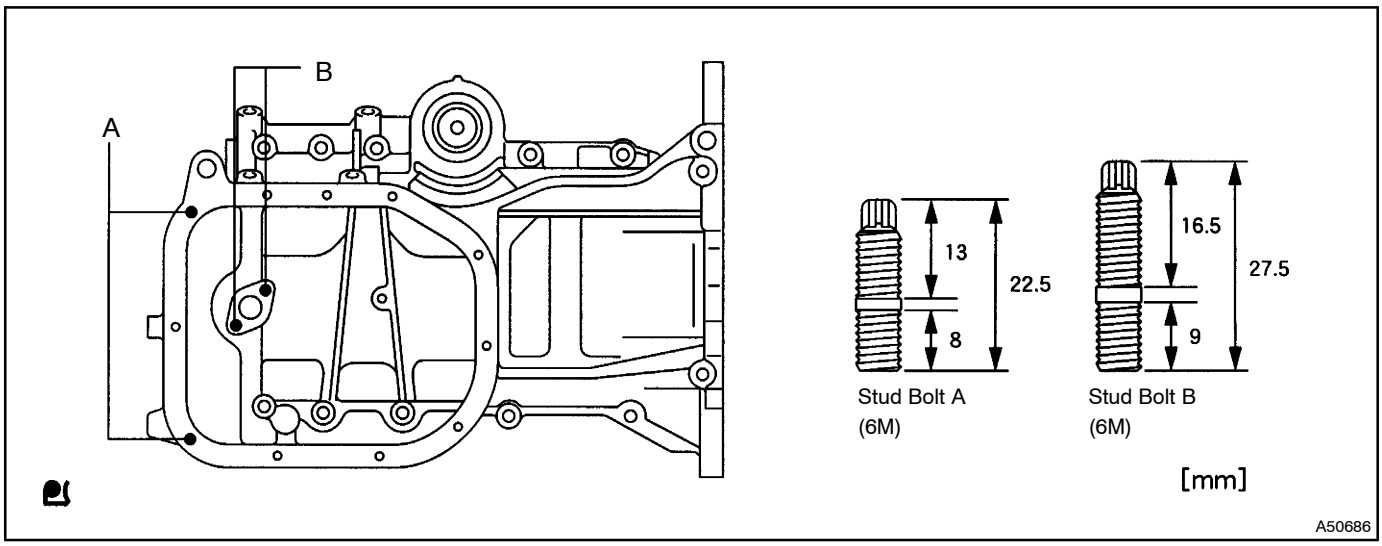
43. INSPECT CYLINDER HEAD SET BOLT

(a) Using vernier calipers, measure the length of head bolts from the seat to the end.
Standard bolt length:
142.8 – 144.2 mm (5.622 – 5.677 in.)
Maximum bolt length: 147.1 mm (5.791 in.)

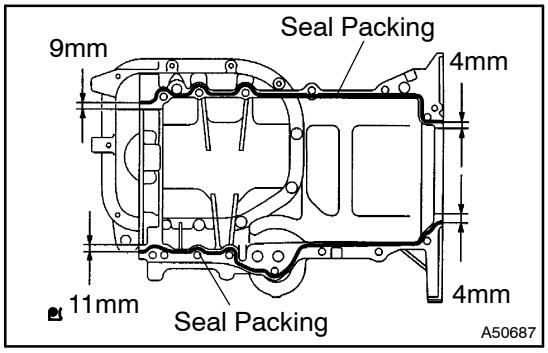
If the length surpasses the maximum, replace the bolt.

44. INSTALL OIL PAN SUB–ASSY

(a) Install the 4 stud bolts.
Torque: 5.0 N·m (50 kgf·cm, 44 in.·lbf)



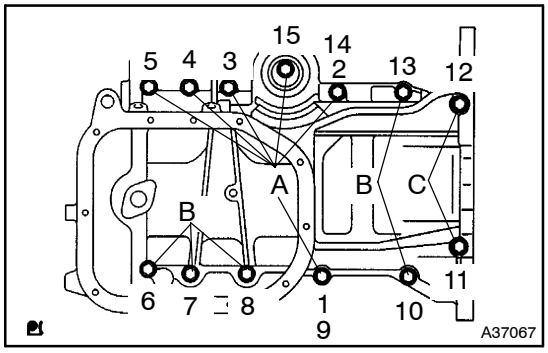
(b) Remove any old packing material from the contact surface.



(c) Apply seal packing in the shape of bead (Diameter 2 mm – 3 mm (0.0787 – 0.1181 in.)) consequently as shown in the illustration.
Seal packing:
Part No. 08826–00080 or equivalent

NOTICE:
- **Remove any oil from the contact surface.**
- **Install the oil pan within 3 minutes after applying seal packing.**
- **Do not put into engine oil within 2 hours after installing.**

(d) Install 2 new O–rings to the cylinder block.



(e) Install and uniformly tighten the 13 bolts, in several passes, in the sequence shown.
Torque: 24 N·m (245 kgf·cm, 18 ft·lbf)

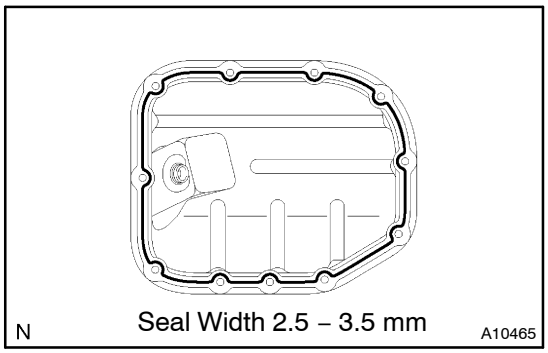
HINT:
Each bolt length in indicated in the illustration.
Bolt A 49 mm (1.929 in.)
Bolt B 88 mm (3.465 in.)
Bolt C 144 mm (5.669 in.)

45. INSTALL OIL STRAINER SUB–ASSY

(a) Install a new gasket and the oil strainer with the 2 nuts and bolt.
Torque: 11 N·m (112 kgf·cm, 8 ft·lbf)

46. INSTALL OIL PAN SUB–ASSY NO.2

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



(b) Apply seal packing in the shape of bead (Diameter 2.5 – 3.5 mm (0.0984 – 0.1378 in.)) consequently as shown in the illustration.
Seal packing: Part No. 08826–00080 or equivalent

NOTICE:
- **Remove any oil from the contact surface.**
- **Install the oil pan within 3 minutes after applying seal packing.**
- **Do not put into engine oil within 2 hours after installing.**
- **Do not start the engine within 2 hours after installing.**

(c) Install the oil pan No. 2 with the 9 bolts and 2 nuts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

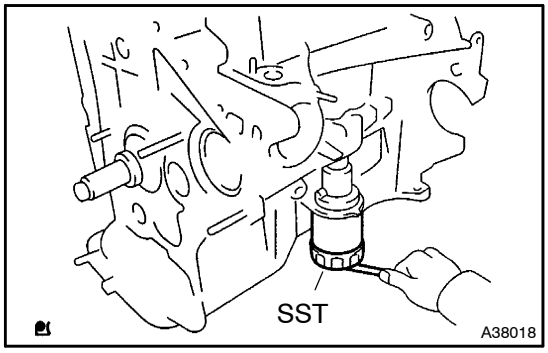
(d) Install the drain plug with a new gasket.
Torque: 38 N·m (382 kgf·cm, 28 ft·lbf)

47. INSTALL OIL FILTER UNION

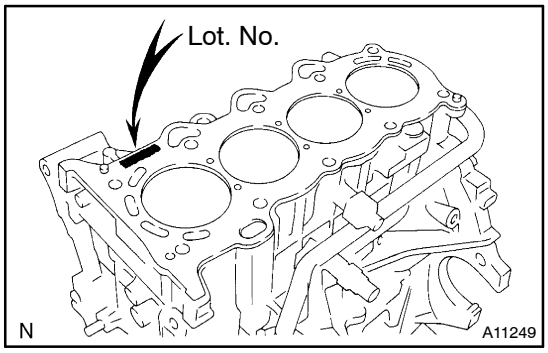
(a) Using a 12 mm hexagon wrench, install the oil filter union.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)

48. INSTALL OIL FILTER SUB–ASSY

(a) Check and clean the oil filter installation surface.
(b) Apply clean engine oil to the gasket of a new oil filter.
(c) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.



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

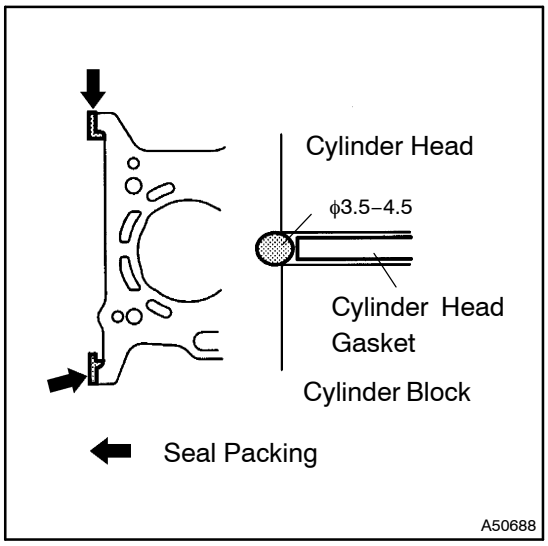


49. INSTALL CYLINDER HEAD GASKET

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

NOTICE:

- **Remove any oil from the contact surface.**
- **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.**



50. INSTALL CYLINDER HEAD SUB–ASSY

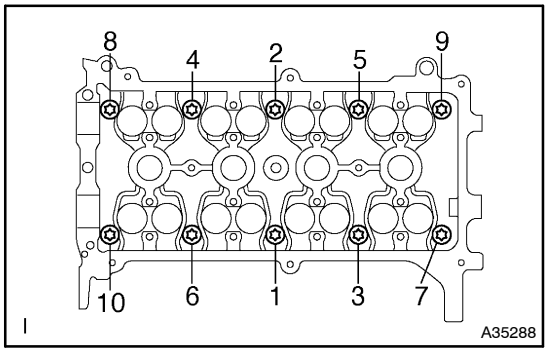
HINT:
The cylinder head bolts are tightened in 2 progressive steps.

(a) Apply seal packing in the shape of bead (Diameter 3.5 – 4.5 mm (0.1378 – 0.1772 in.)) consequently as shown in the illustration.

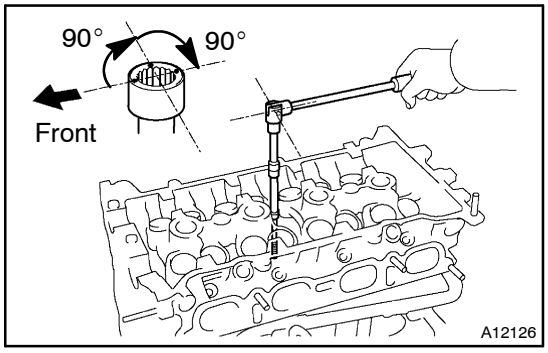
NOTICE:

- **Remove any oil from the contact surface.**
- **Install the oil pan within 3 minutes after applying seal packing.**

(b) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.



(c) Using a 8 mm bi–hexagon wrench, install and uniformly tighten the 10 cylinder head bolts and plate washers, in several passes, in the sequence shown.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)



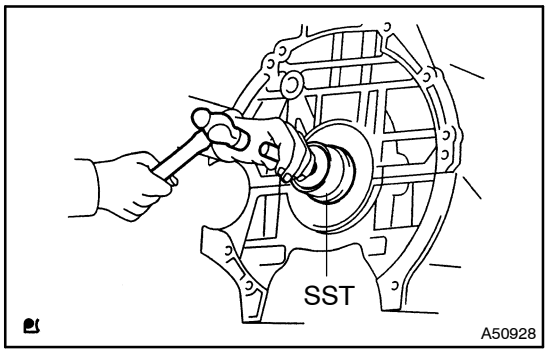
(d) Mark the front of the cylinder head bolt with paint.
(e) Retighten the cylinder head bolts by 90° and 90° in the numerical order shown.
(f) Check that the paint mark is now at a 180° angle to the front.

51. INSTALL ENGINE REAR OIL SEAL

(a) Apply MP grease to a new oil seal lip.

NOTICE:

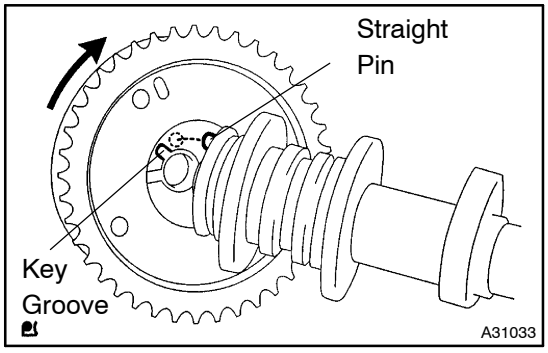
Keep the lip off foreign materials.



(b) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223–56010

NOTICE:

- **Be careful not to tap the oil seal slantingly.**
- **Wipe off extra grease on the crank shaft.**



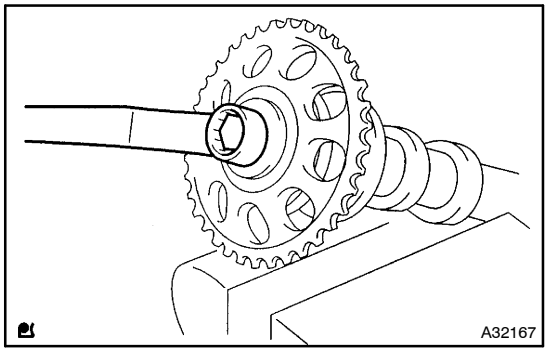
52. INSTALL CAMSHAFT TIMING GEAR ASSY(W/ VVT–i)

(a) Put the camshaft timing gear assembly and the camshaft together with the straight pin off the key groove.
(b) Turn the camshaft timing gear assembly to the left direction (as shown in the illustration) with pushing it lightly against the camshaft. Push further at the position where the pin gets into the groove.

NOTICE:

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

(c) Check that there is no clearance between the gear's fringe and the camshaft.
(d) Tighten the fringe bolt with the camshaft timing gear fixed.
Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)
(e) Check that the camshaft timing gear assembly can move to the retard angle side (the right angle), and is locked at the most retarded position.



53. INSTALL CAMSHAFT TIMING GEAR OR SPROCKET(W/O VVT–i)

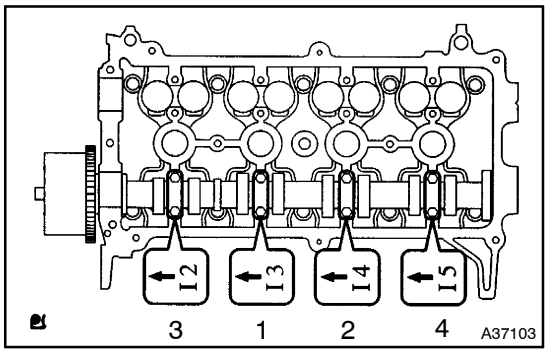
(a) Grip the camshaft with a vice.
(b) Align the knock pin hole in the camshaft timing sprocket with the knock pin of the camshaft, and install the camshaft timing sprocket.
Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

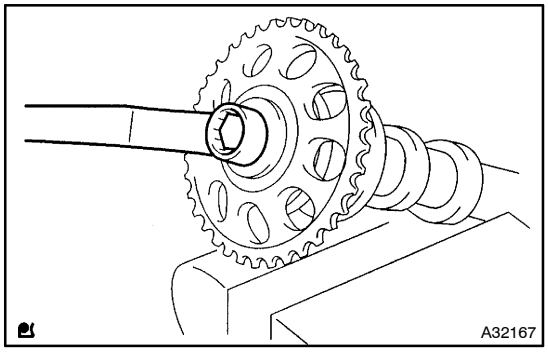
NOTICE:
Be careful not to damage the camshaft.

54. INSTALL CAMSHAFT

(a) Apply light coat of engine oil on the camshaft journals.
(b) Place the camshaft on the cylinder head with timing mark on the camshaft timing gear assembly upward.
(c) Examine the front marks and numbers and tighten the bolts in the order shown in the illustration.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

NOTICE:
Tighten the each bolt equally with keeping the camshaft horizontal.





55. INSTALL CAMSHAFT TIMING GEAR OR SPROCKET

(a) Grip the camshaft with a vice.
(b) Align the knock pin hole in the camshaft timing sprocket with the knock pin of the camshaft, and install the camshaft timing sprocket.
Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

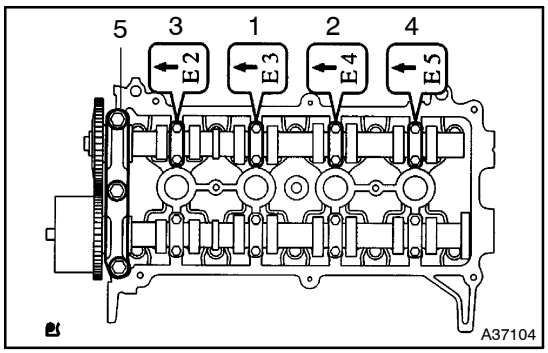
NOTICE:
Be careful not to damage the camshaft.

56. INSTALL NO.2 CAMSHAFT

(a) Apply light coat of engine oil on the camshaft journals.
(b) Place the camshaft on the cylinder head with timing mark on the camshaft timing gear upward.
(c) Examine the front marks and numbers and tighten the bolts in the order shown in the illustration.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

NOTICE:
Tighten the each bolt equally with keeping the camshaft horizontal.

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



57. INSTALL CAM POSITION SENSOR

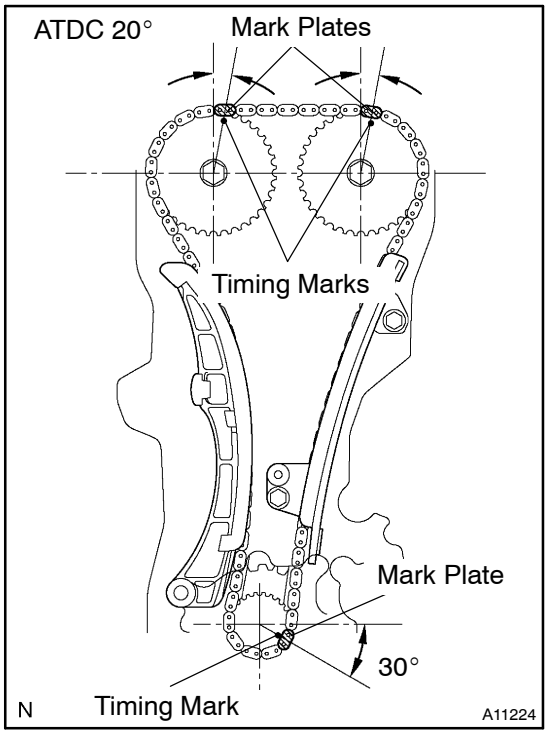
(a) Apply engine oil to the O–ring.

NOTICE:

If the O–ring is damaged, replace the cam position sensor.

(b) Install the cam position sensor with the bolt.

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



58. INSTALL CHAIN SUB–ASSY

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

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

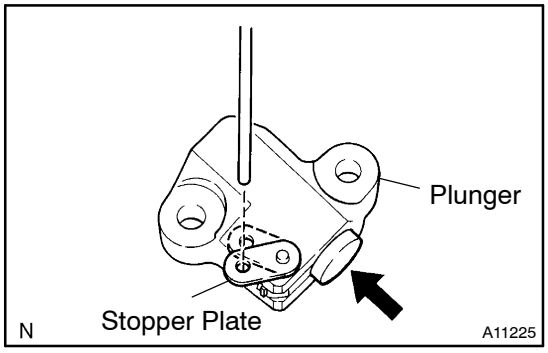
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

(c) Align the match marks of timing chain mark plate (Yellow), camshaft timing sprocket, camshaft timing gear and crankshaft timing sprocket to install the timing chain as shown in the illustration.

HINT:

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

(d) Install the chain tensioner slipper.



(e) While rotating the stopper plate of the tensioner up–ward, push in the plunger of the tensioner as shown in the illustration.

(f) While rotating the stopper plate of the tensioner down–ward, insert a bar of 2.5 mm (0.098 in.) into the holes in the stopper plate and tensioner to fix the stopper plate.

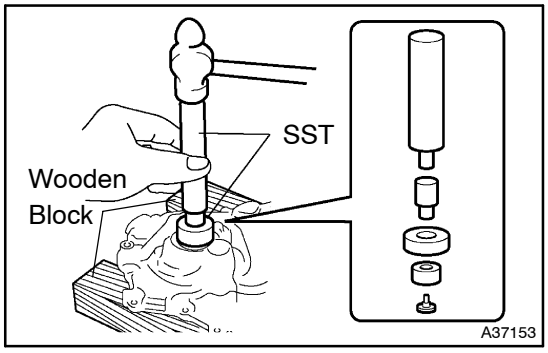
SST 10514

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

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

(h) Remove the bar from the chain tensioner.

(i) Check that the tension between the intake and exhaust camshaft timing sprocket.



59. INSTALL OIL PUMP SEAL

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

NOTICE:

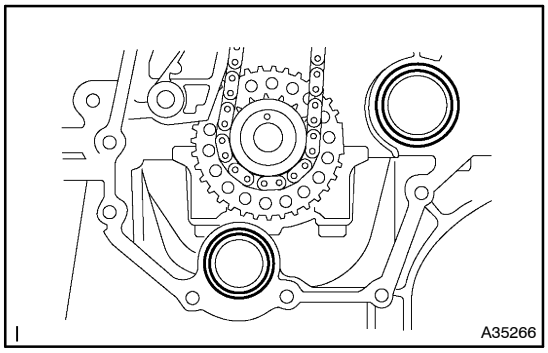
- **Be careful not to tap the oil seal slantingly.**
- **Keep the lip off foreign materials.**

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

60. INSTALL OIL PUMP ASSY

(a) Install 2 new O–rings to 2 locations as shown in the illustration.

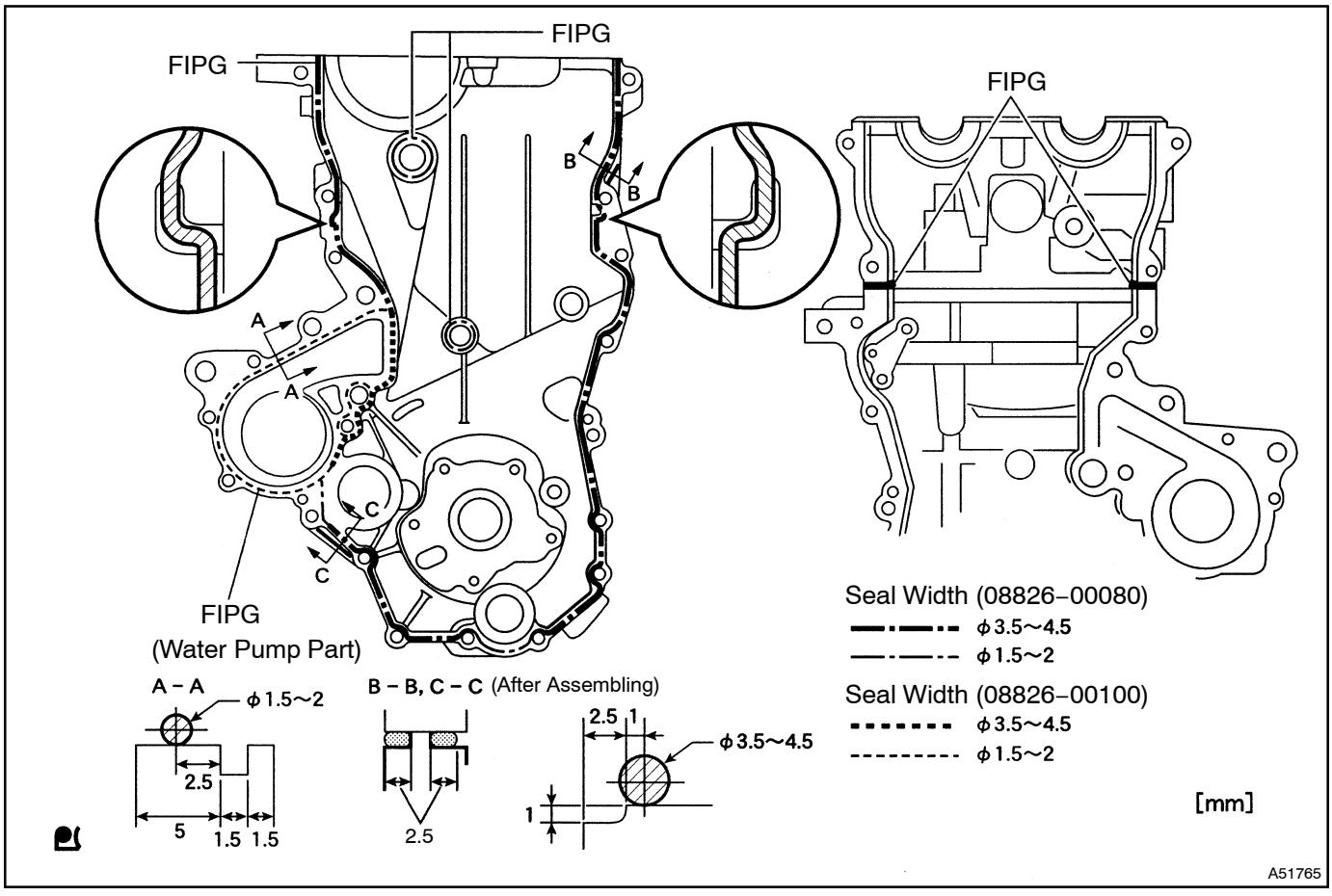
(b) Remove any old packing material from the contact surface.

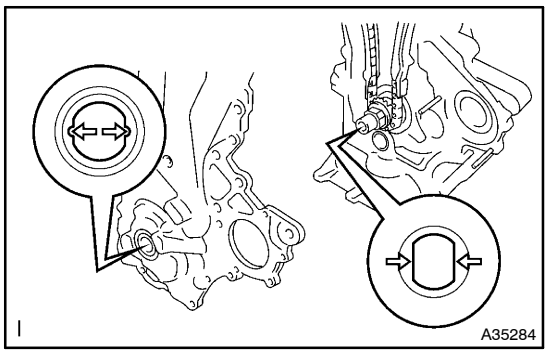


(c) Apply seal packing to the oil pump assembly, cylinder head and cylinder block as shown in the illustration.
Seal packing:
Water pump part part No. 08826 – 00100 or equivalent
Other part part No. 08826 – 00080 or equivalent.

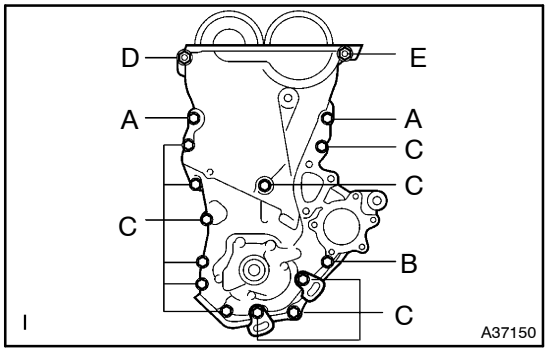
NOTICE:

- **Remove any oil from the contact surface.**
- **Install the oil pan within 3 minutes after applying seal packing.**
- **Do not put into engine oil within 2 hours after installing.**
- **Do not start the engine within 2 hours after installing.**





(d) Engage the spline teeth of the oil pump drive rotor with the large teeth of the crankshaft, and slide the oil pump.

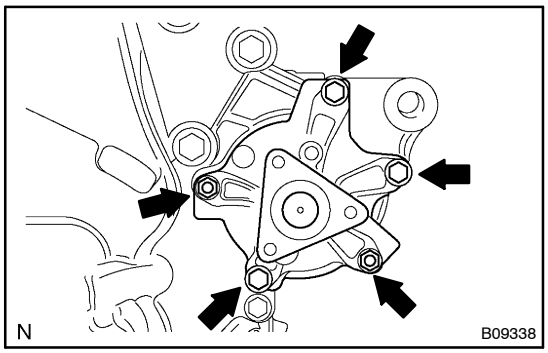


(e) Install the oil pump assembly with the 15 bolts and a nut. Uniformly tighten the bolts and nut in several passes.
Torque:
Bolt A 24 N·m (245 kgf·cm, 18 ft·lbf)
Bolt B 11 N·m (113 kgf·cm, 8 ft·lbf)
Bolt C 11 N·m (113 kgf·cm, 8 ft·lbf)
Nut D 24 N·m (245 kgf·cm, 18 ft·lbf)
Bolt E 24 N·m (245 kgf·cm, 18 ft·lbf)

NOTICE:

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

HINT:
Each bolt length in indicated in the illustration.
A 30 mm (1.181 in.)
B 35 mm (1.378 in.)
C 20 mm (0.787 in.)
E 20 – 14 mm (0.787 – 0.551 in.)

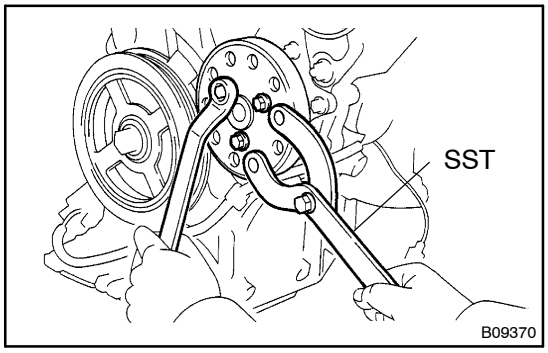


61. INSTALL WATER PUMP ASSY

(a) Install the water pump and a new gasket with the 3 bolts and 2 nuts.
Torque: 11 N·m (113 kgf·cm, 8 ft·lbf)

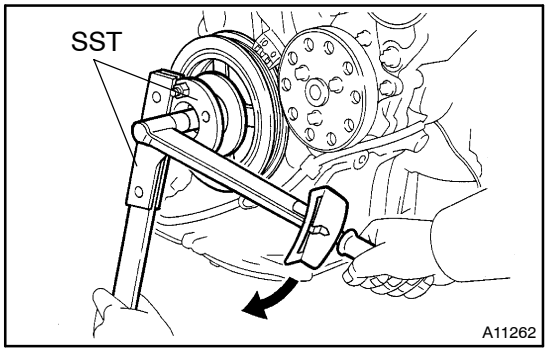
62. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

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



63. INSTALL WATER PUMP PULLEY

(a) Using SST, install the pump pulley with the 3 bolts.
SST 09960–10010 (09962–01000, 09963–01000)
Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)



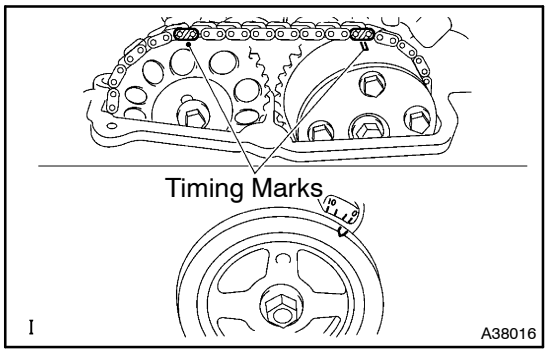
64. INSTALL CRANKSHAFT DAMPER SUB–ASSY

(a) Align the hole in the crankshaft damper with the pin position and install the crankshaft damper.

(b) Using SST, install the pulley bolt.
SST 09330–00021, 09213–58012 (91111–50845)
Torque: 128 N·m (1,300 kgf·cm, 94 ft·lbf)

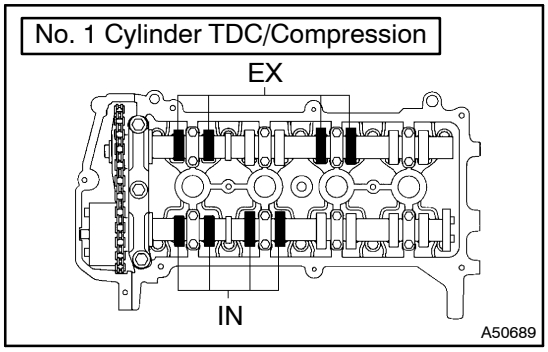
65. INSPECT VALVE CLEARANCE

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



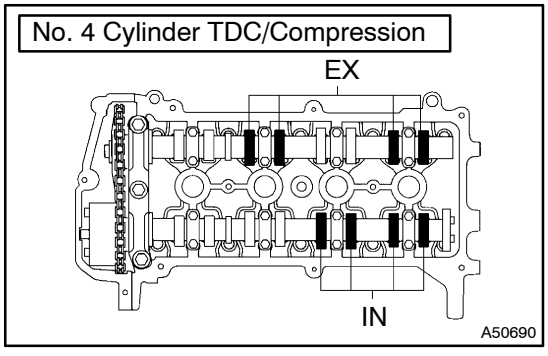
(a) Set the No. 1 cylinder to the TDC/compression.
(1) Turn the crankshaft damper, and align its groove with timing mark ”0” of the chain cover.
(2) Check that both timing marks on the camshaft timing sprocket and valve timing controller assembly are facing right up as shown in the illustration.

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

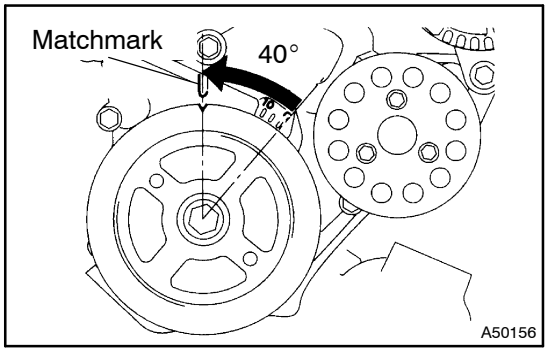


(b) Check only the valves indicated.
(1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
Valve clearance (Cold) :
Intake 0.15 – 0.25 mm (0.006 – 0.010 in.)
Exhaust 0.25 – 0.35 mm (0.010 – 0.014 in.)
(2) Record the out–of–specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

(c) Turn the crankshaft 1 revolution (360°) and align its groove with the timing mark ”0” of the chain cover.



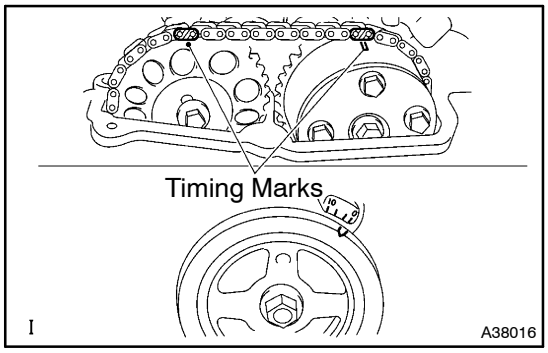
(d) Check only the valves indicated.
(1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
Valve clearance (Cold) :
Intake 0.15 – 0.25 mm (0.006 – 0.010 in.)
Exhaust 0.25 – 0.35 mm (0.010 – 0.014 in.)
(2) Record the out–of–specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.



66. ADJUST VALVE CLEARANCE

NOTICE:

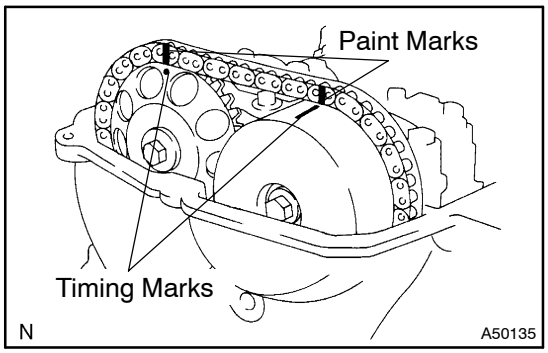
When rotating the camshaft with the timing chain removed, rotate the crankshaft damper counterclockwise 40° from the TDC and align its groove with matchmark of the chain cover for the valves not to touch the pistons.



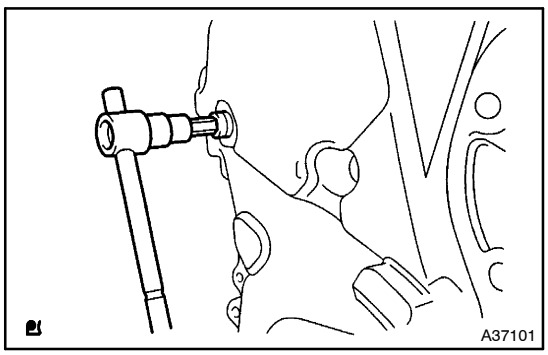
(a) Set the No. 1 cylinder to the TDC/compression.
  (1) Turn the crankshaft damper, and align its groove with timing mark ”0” of the chain cover.
  (2) Check that both timing marks on the camshaft timing sprocket and valve timing controller assembly are facing right up as shown in the illustration.

HINT:

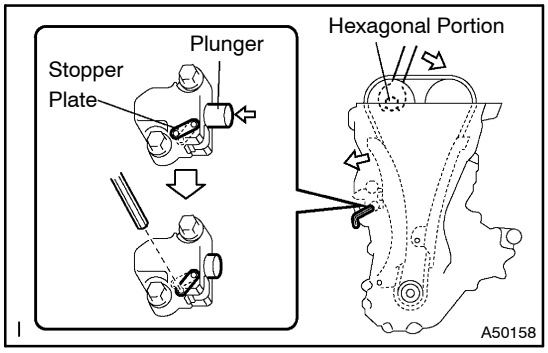
If not, turn the crankshaft 1 revolution (360°) and align the marks as above.



(b) Place matchmarks on the timing chain and camshaft timing sprockets.



(c) Using a hexagon wrench 8, remove the screw plug.

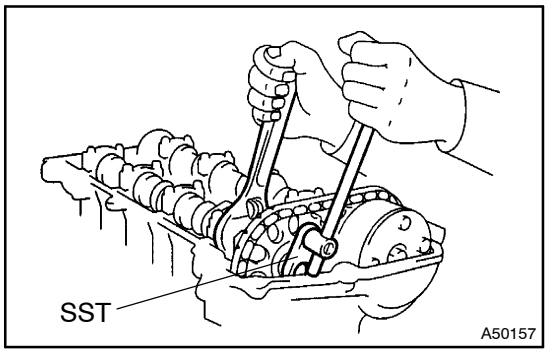


(d) Using drivers or equipment, while rotating the stopper plate of the tensioner upward, turn the exhaust camshaft right a little and push in the plunger of the chain tensioner as shown in the illustration.

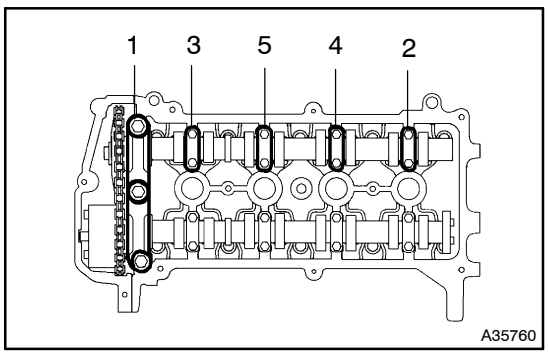
(e) Insert a bar of ϕ 2 – 3 mm (0.08 – 0.12 in.) into the holes in the stopper plate and tensioner to fix the stopper plate.
SST 10514

HINT:

- At this time, it is easier to fix by installing the bar while rotate the camshaft right and left a little.
- Fix the bar with tape so that the bar does not come off.



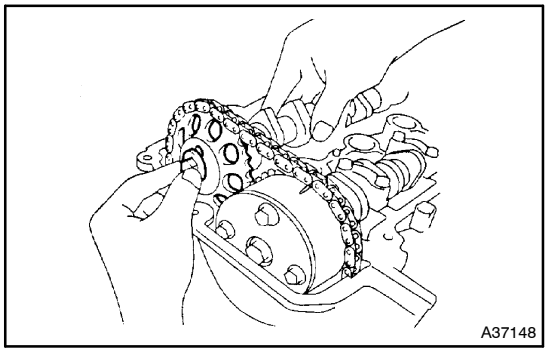
(f) Hold the hexagonal portion of the camshaft with a wrench, and remove the bolt.
SST 09023–38400



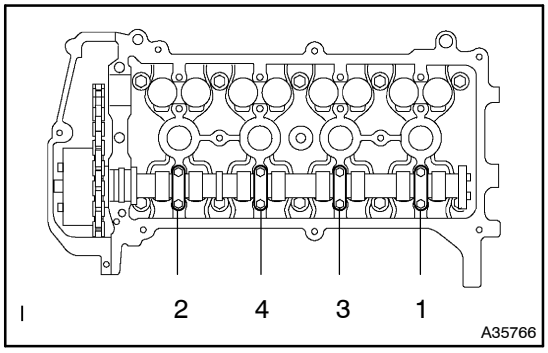
(g) Uniformly loosen and remove the 11 bearing cap blots, in several passes, in the sequence shown, and remove the 5 bearing caps.

NOTICE:

Loosen the each bolt equally with keeping the camshaft horizontal.



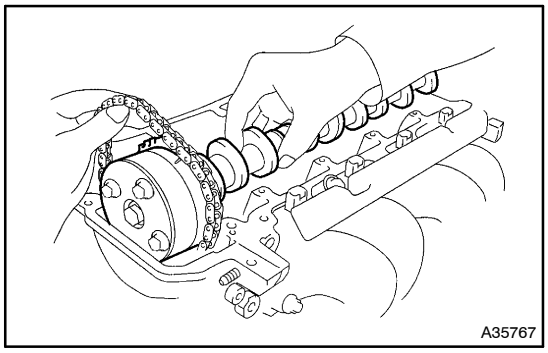
(h) Remove the fringe bolt with lifting up the No. 2 camshaft, then detach the No. 2 camshaft and the camshaft timing sprocket.



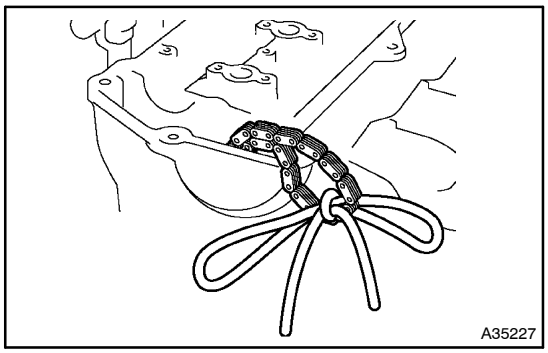
(i) Uniformly loosen and remove the 8 bearing cap blots, in several passes, in the sequence shown, and remove the 4 bearing caps.

NOTICE:

Loosen the each bolt equally with keeping the camshaft horizontal.



(j) Hold the timing chain with your hand, and remove the camshaft and camshaft timing gear assembly.

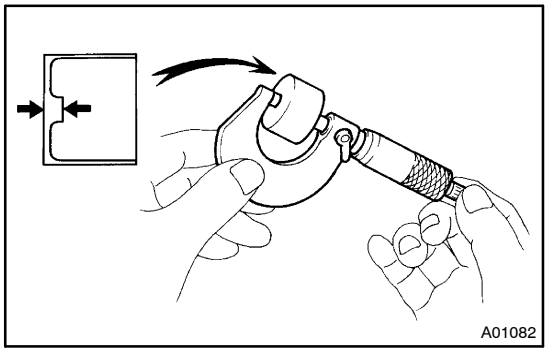


(k) Tie the timing chain with a string as shown in the illustration.

NOTICE:

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

(l) Remove the valve lifters.



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

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

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

Specified value (Cold):

Intake A = B + (C – 0.20 mm (0.008 in.))

Exhaust A = B + (C – 0.30 mm (0.012 in.))

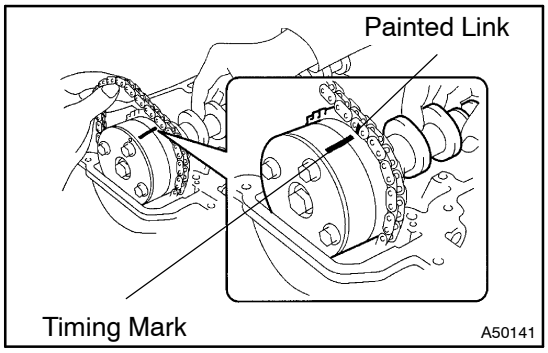
(o) Select a new lifter with a thickness as close as possible to the calculated values.

HINT:

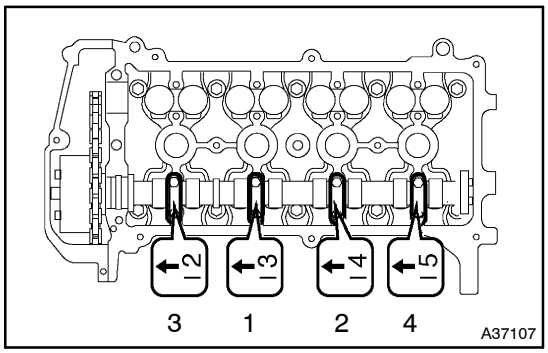
Lifters are available in 35 sizes in increments of 0.020 mm (0.0008 in.), form 5.060 mm (0.1992 in.) to 5.740 mm (0.2260 in.).

(p) Reinstall the valve lifters.

(q) Apply light coat of engine oil on the camshaft journals.



(r) As shown in the illustration, install the timing chain on the camshaft timing gear, with the painted links aligned with the timing marks on the camshaft timing gear.

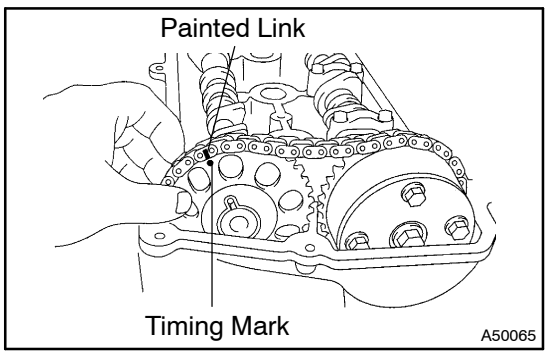


(s) Examine the front marks and numbers and tighten the bolts in the order shown in the illustration.

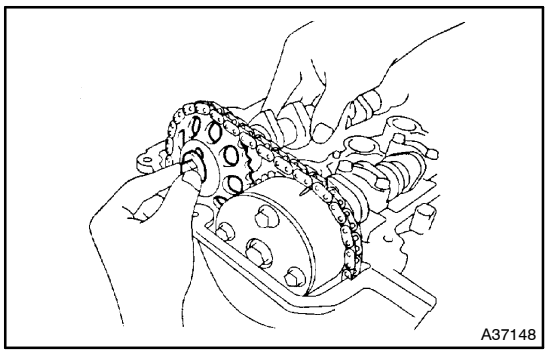
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

NOTICE:

Tighten the each bolt equally with keeping the camshaft horizontal.

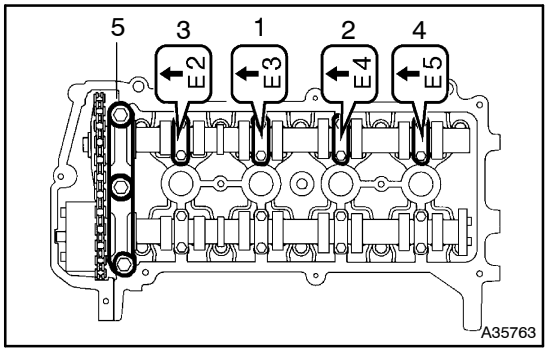


(t) Hold the timing chain, and align the match marks on the timing chain and camshaft timing sprocket.



(u) Align the knock pin hole in the camshaft timing sprocket with the knock pin of the camshaft, and install the sprocket to the camshaft.

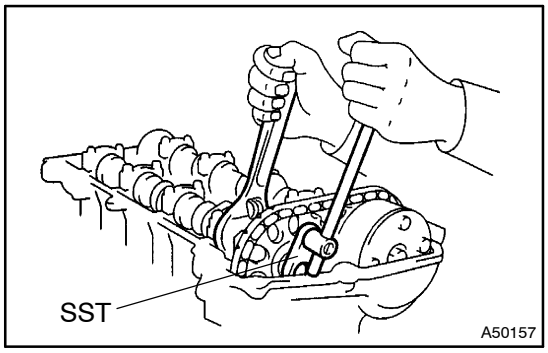
(v) Temporarily install the timing sprocket bolt.



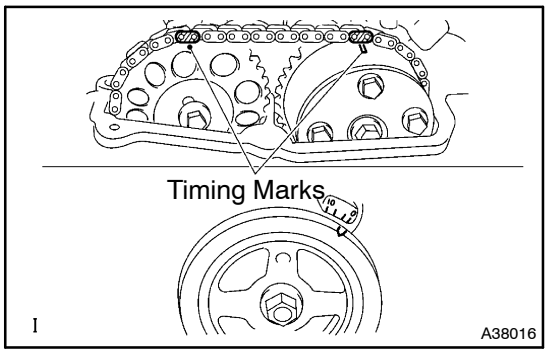
(w) Examine the front marks and numbers and tighten the bolts in the order shown in the illustration.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

NOTICE:
Tighten the each bolt equally with keeping the camshaft horizontal.

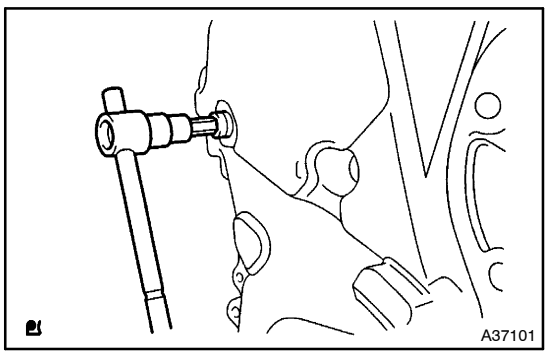
(x) Install the bearing cap No. 1.
Torque: 23 N·m (235 kgf·cm, 17 ft·lbf)



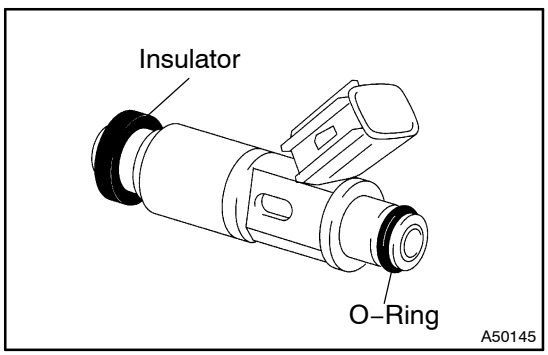
(y) Hold the hexagon head portion of the camshaft with a wrench, and install the bolt.
SST 09023–38400
Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)



(z) Remove the bar from the timing chain tensioner.
(aa) Turn the crankshaft damper, and align its groove with the timing mark ”0” of the chain cover.
(ab) Check that the match marks on the timing chain and camshaft timing sprockets.

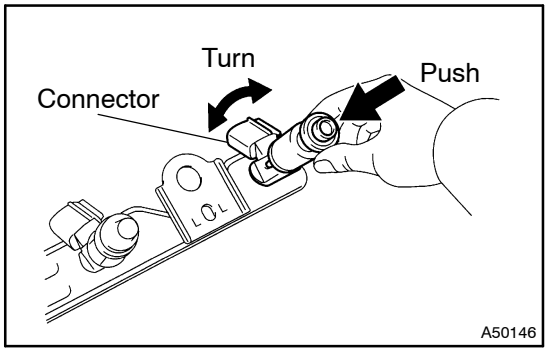


(ac) Apply seal packing to 2 or 3 threads of the screw plug end.
Seal packing:
Part No. 08833 – 00070 or equivalent
(ad) Using a hexagon wrench 8, install the screw plug.
Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)



67. INSTALL FUEL INJECTOR ASSY

(a) Install a new insulator and O–ring to each injector.
(b) Apply a light coat of spindle oil or gasoline on the place where a delivery pipe touches on O–ring.



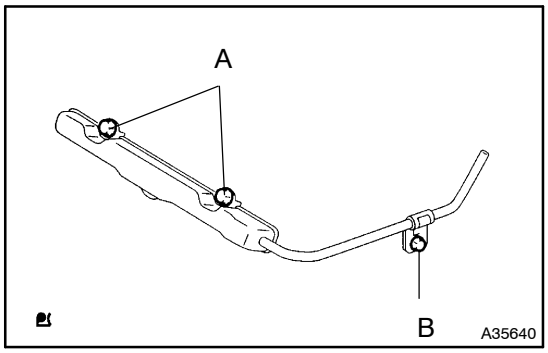
(c) While turning the injector clockwise and counterclockwise, push it to the delivery pipe.

NOTICE:

- **Be careful not twist the O–ring.**
- **After installing injectors, check that they turns smoothly. If an injector does not, reinstall it with a new O–ring.**

68. INSTALL FUEL DELIVERY PIPE SUB–ASSY

(a) Install the spacer to the cylinder head.



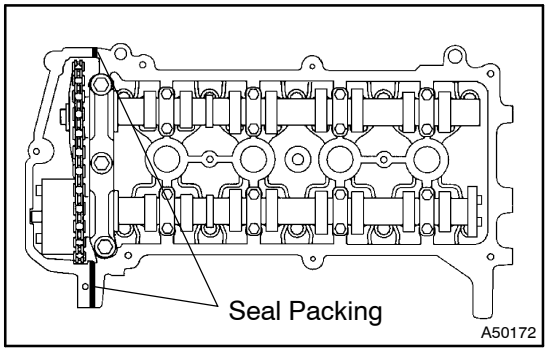
(b) Install the delivery pipe with the 4 injectors.
Torque:
Bolt A 19 N·m (194 kgf·cm, 14 ft·lbf)
Bolt B 9.0N·m (92 kgf·cm, 80 in.·lbf)

NOTICE:

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

69. INSTALL CYLINDER HEAD COVER SUB–ASSY

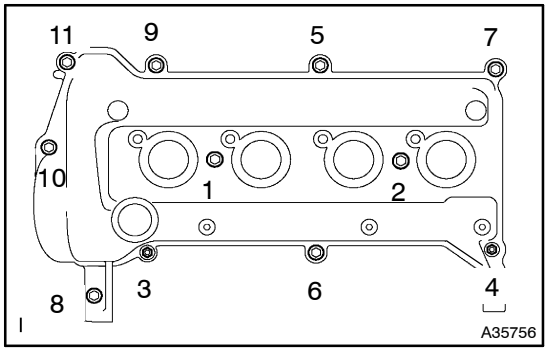
(a) Install the gasket to the cylinder head cover.



(b) Apply seal packing to 2 locations as shown in the illustration.
Seal packing:
Part No. 08826 – 00080 or equivalent

NOTICE:

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



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

(d) Uniformly tighten the bolts and nuts, in the several passes, in the sequence shown.
Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)

70. INSTALL CRANK POSITION SENSOR

(a) Apply engine oil to the O–ring.

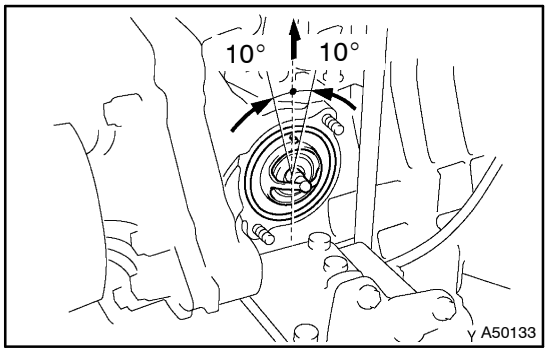
NOTICE:

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

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

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

71. INSTALL THERMOSTAT



(a) Install a new gasket to the thermostat.

(b) Install the thermostat with the jiggle valve upward.

HINT:

The jiggle valve may be set within 10° at either side of the prescribed position.

(c) Install the water inlet with the 2 nuts.

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

72. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSY(W/ VVT–i)

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

73. INSTALL SPARK PLUG

Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)