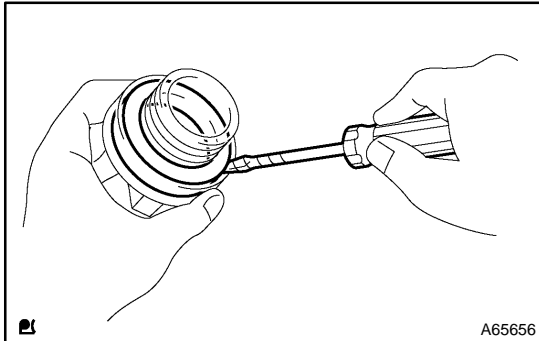


OVERHAUL

1. REMOVE OIL FILLER CAP SUB-ASSY

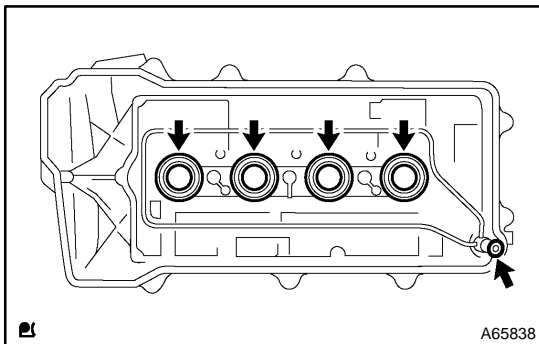


2. REMOVE OIL FILLER CAP GASKET

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

3. REMOVE VENTILATION VALVE SUB-ASSY

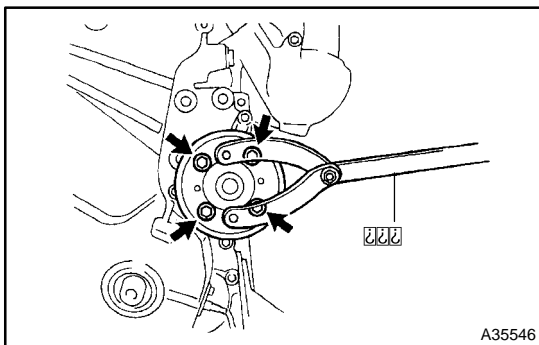
4. REMOVE SPARK PLUG



5. REMOVE CYLINDER HEAD COVER SUB-ASSY

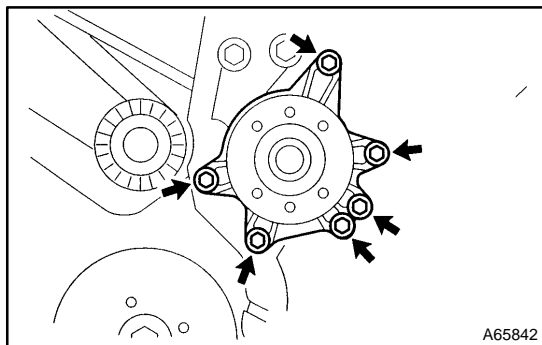
- (a) Remove the 9 bolts and cylinder head cover.
- (b) Remove the spark plug tube gasket and O-ring.

6. REMOVE CYLINDER HEAD COVER GASKET

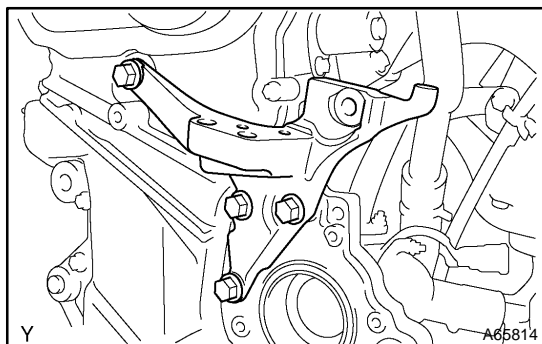
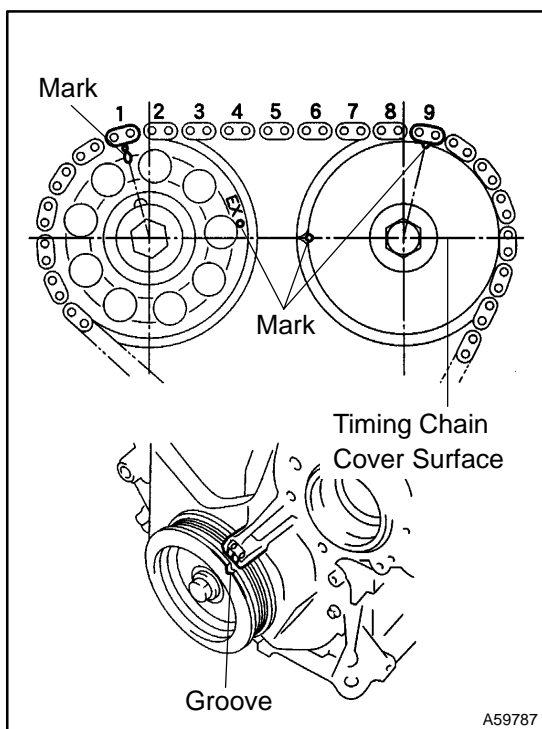


7. REMOVE WATER PUMP PULLEY

- (a) Using SST, remove the water pump pulley
SST 09960-10010 (09962-01000, 09963-00600)

**8. REMOVE WATER PUMP ASSY**

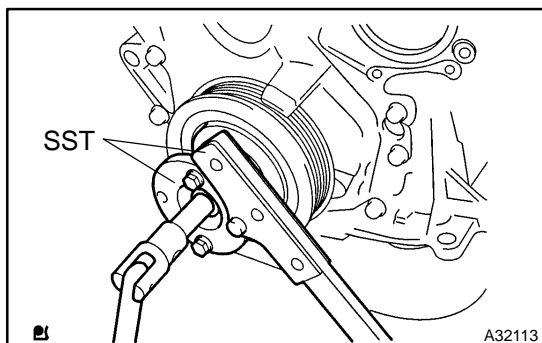
- (a) remove the 6 bolts, water pump and O-ring.

**9. REMOVE TRANSVERSE ENGINE MOUNTING BRACKET****10. REMOVE CRANKSHAFT PULLEY**

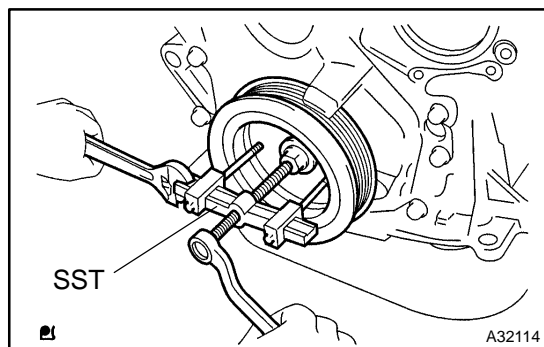
- (a) Set No. 1 cylinder to TDC/compression.
- (1) Turn the crankshaft pulley, and align its groove with timing mark "0" of the timing chain cover.
 - (2) Check that the point marks of the camshaft timing sprocket and VVT timing sprocket are in straight line on the timing chain cover surface as shown in the illustration.

HINT:

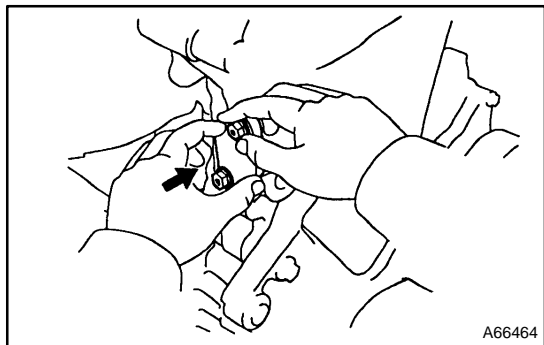
If not, turn the crankshaft 1 revolution (360°) and align the marks as above.



- (b) Using SST, remove the pulley bolt.
SST 09213-70011 (09213-70020), 09330-00021



- (c) Using SST, remove the crankshaft pulley.
SST 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05021)

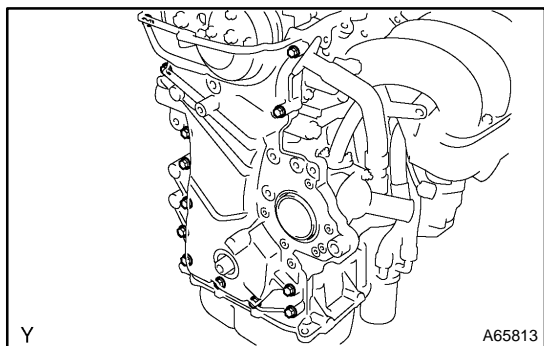


11. REMOVE CHAIN TENSIONER ASSY NO.1

- (a) Remove the 2 nuts and chain tensioner.

NOTICE:

Be sure not to revolve the crank shaft without the chain tensioner.



12. REMOVE TIMING CHAIN OR BELT COVER SUB-ASSY

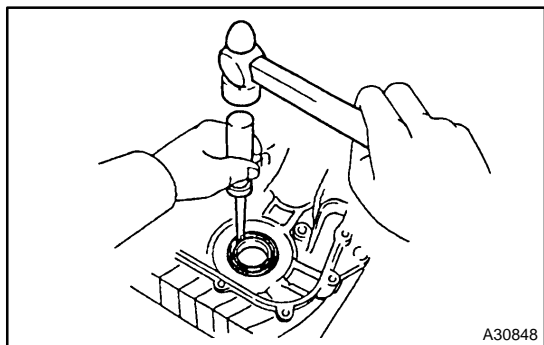
- (a) Remove the 13 bolts.
(b) Remove the stud bolt.

NOTICE:

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

13. REMOVE TIMING GEAR (OR CHAIN) COVER GASKET

14. REMOVE TIMING CHAIN COVER GASKET NO.2



15. REMOVE TIMING GEAR COVER OIL SEAL

- (a) Using a screwdriver, remove the oil seal.

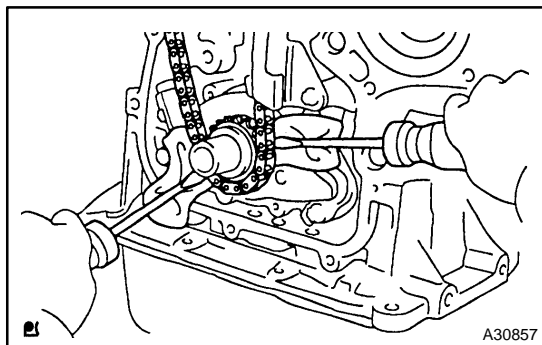
16. REMOVE CHAIN TENSIONER SLIPPER

- (a) Remove the bolt and chain tensioner slipper.

17. REMOVE CHAIN VIBRATION DAMPER NO.1

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

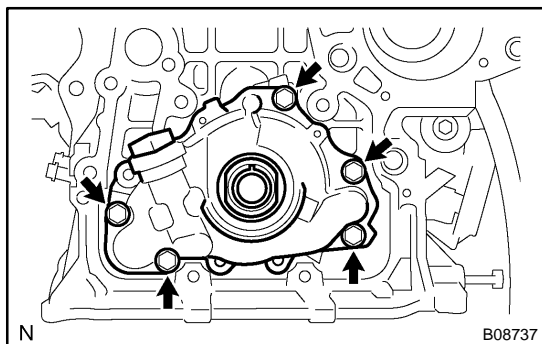
18. REMOVE CRANKSHAFT POSITION SENSOR PLATE NO.1

**19. REMOVE CHAIN SUB-ASSY**

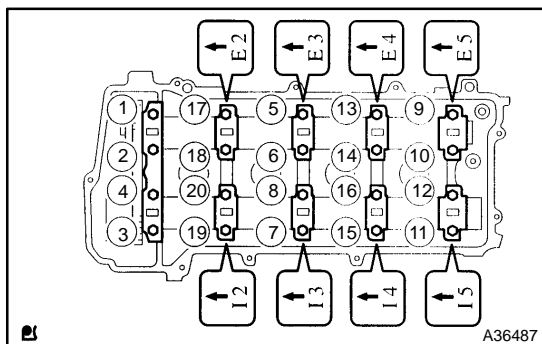
- (a) Using screwdrivers, pry out the timing chain with the crankshaft timing gear as shown in the illustration.

NOTICE:

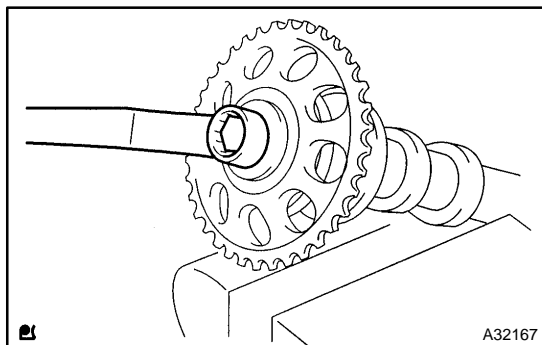
- Put shop rag to protect the engine.
- In case of revolving the camshafts with the chain off the sprockets, turn the crankshaft 1/4 revolution for valves not to touch the pistons.

**20. REMOVE OIL PUMP ASSY**

- (a) Remove the 5 bolts and oil pump.

21. REMOVE OIL PUMP GASKET**22. REMOVE CAMSHAFT**

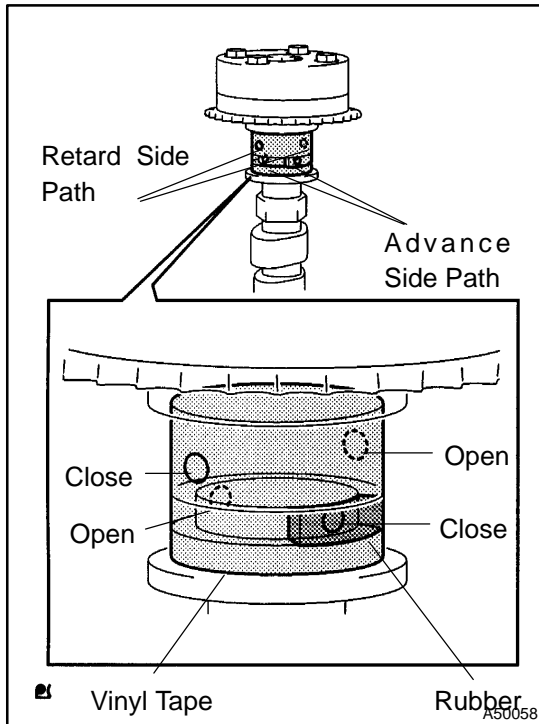
- (a) Uniformly loosen and remove the 20 bearing cap bolts, in several passes, in the sequence shown, and remove the 9 bearing caps, intake and exhaust camshafts.

**23. REMOVE CAMSHAFT TIMING GEAR OR SPROCKET**

- (a) Grip the camshaft No.2 with a vice, and remove the camshaft timing gear.

NOTICE:

Be careful not to damage the camshaft.



24. INSPECT CAMSHAFT TIMING GEAR ASSY

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

NOTICE:

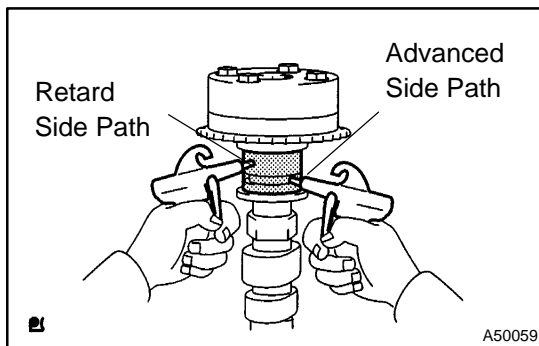
Be careful not to damage the camshaft.

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

HINT:

Two advance side paths are provided in the groove of the camshaft. Plug one of the path with a rubber piece.

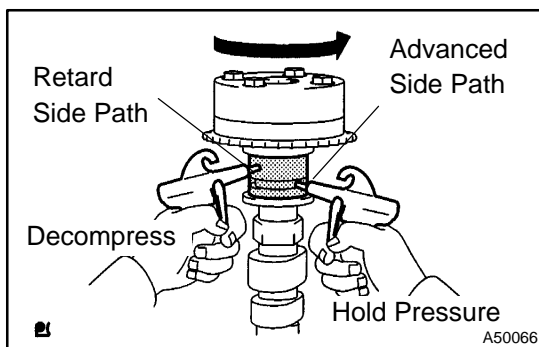
- (2) Break through the tapes of the advance side path and the retard side path on the opposite side of the groove.



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

CAUTION:

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.

CAUTION:

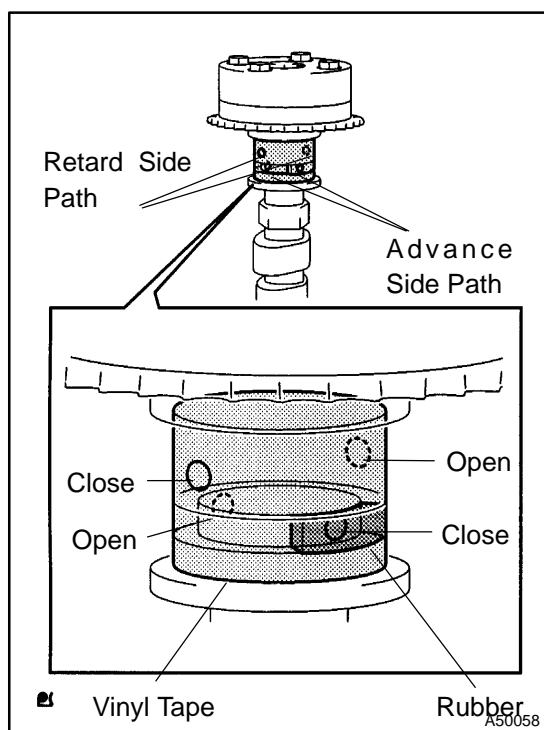
Camshaft timing assembly gear occasionally shifts to the retard side abruptly, if the air compression of the advanced side path is released before retard side path. It often causes the breakage of the lock pin.

- (c) Check smooth revolution
 - (1) Revolve the camshaft timing gear assembly within the movable range except for the most retarded position several times, and check the smooth revolution.

CAUTION:

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.

**25. REMOVE CAMSHAFT TIMING GEAR ASSY**

- (a) Grip the camshaft with a vice, and confirm that the gear is locked.

CAUTION:

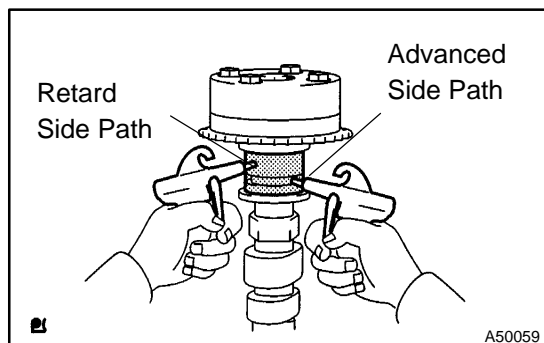
Be careful not to damage the camshaft.

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

HINT:

Two advance side paths are provided in the groove of the camshaft. Plug one of the path with a rubber piece.

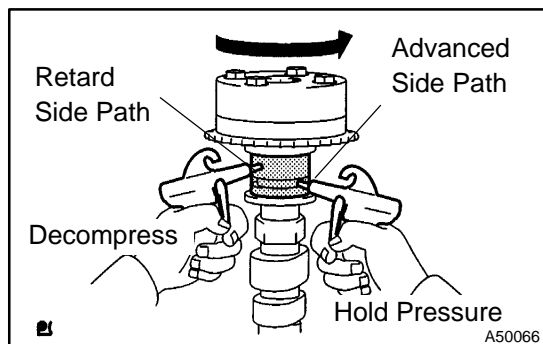
- (c) Break through the tapes of the advance side path and the retard side path on the opposite side of the groove.



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

CAUTION:

Cover the paths with shop rag to avoid oil splashing.



- (e) 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.

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

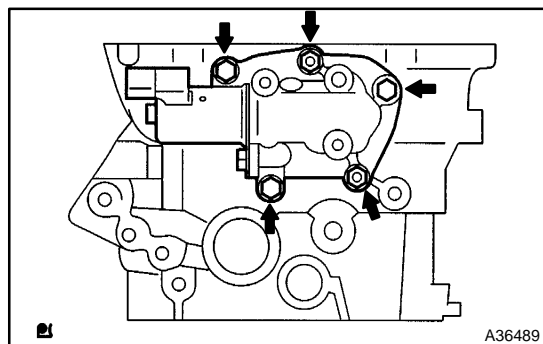
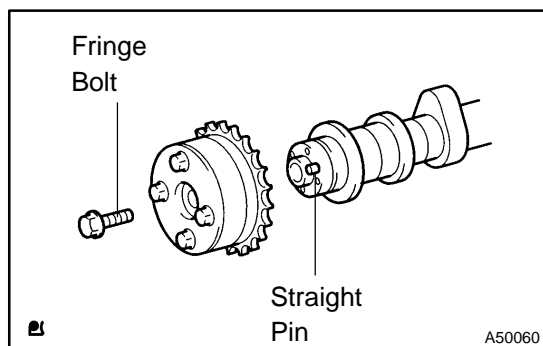
CAUTION:

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

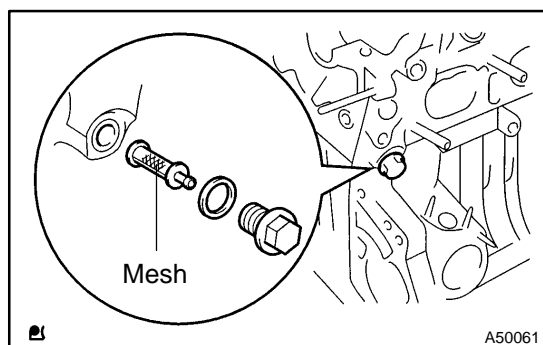
- (g) Remove the fringe bolt of camshaft timing gear assembly.

NOTICE:

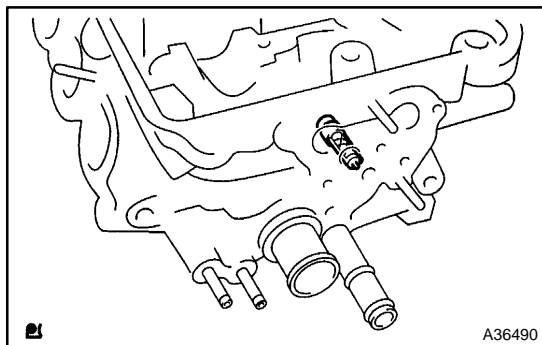
- Be sure not to remove the other 4 bolts.
- In case of reusing the camshaft timing gear, release the strait pin locking first, and then install the gear.

**26. REMOVE CAM TIMING CONTROL VALVE HOUSING**

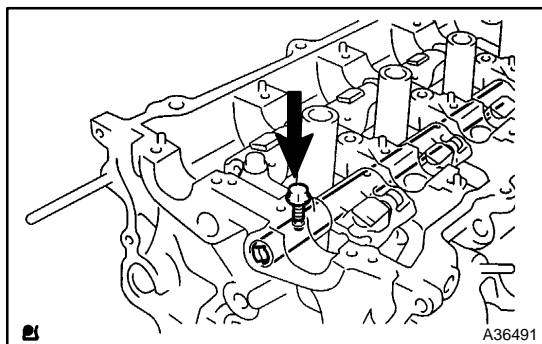
- (a) Remove the 3 bolts, 2 nuts and cam timing oil control valve housing.

27. REMOVE CAM TIMING OIL CONTROL VALVE HOUSING GASKET**28. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSY****29. REMOVE OIL CONTROL VALVE FILTER**

- (a) Remove the plug and oil control valve filter.(Front side)

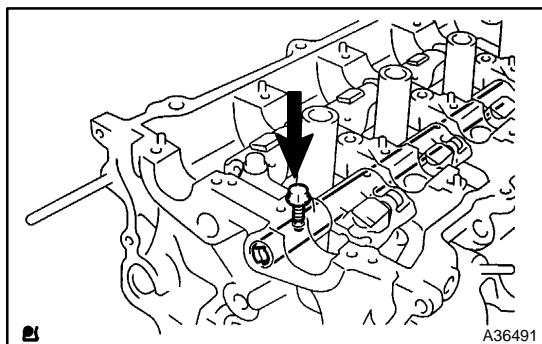


- (b) Remove the oil control valve filter.(Rear side)



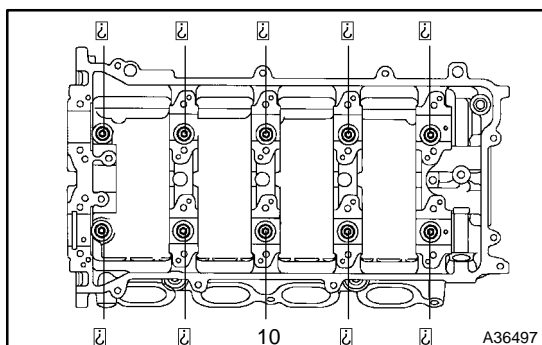
30. REMOVE VALVE ROCKER SHAFT SUB-ASSY NO.1

- (a) Remove the bolt and the rocker shaft No.1.
(b) Remove the valve rocker arm.



31. REMOVE VALVE ROCKER SHAFT SUB-ASSY NO.2

- (a) Remove the bolt and the rocker shaft No.2.
(b) Remove the valve rocker arm.



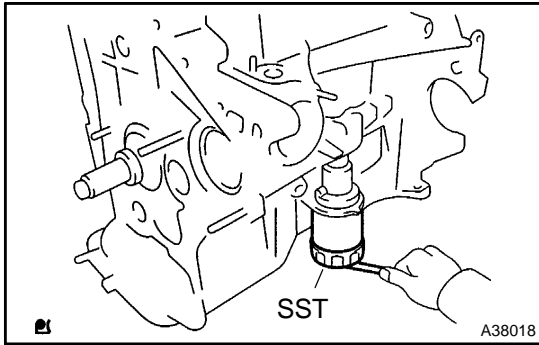
32. REMOVE CYLINDER HEAD SUB-ASSY

- (a) Using a 10 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.

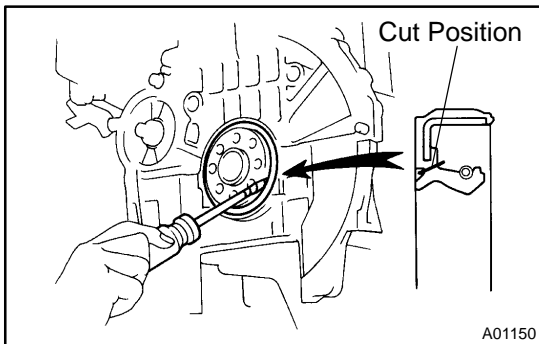
33. REMOVE CYLINDER HEAD GASKET

**34. REMOVE OIL FILTER SUB-ASSY**

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

35. REMOVE OIL FILTER UNION

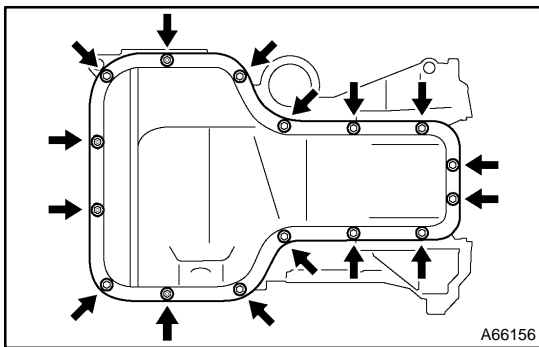
- (a) Using a 12 mm socket hexagon wrench, remove the oil filter union.

**36. REMOVE ENGINE REAR OIL SEAL**

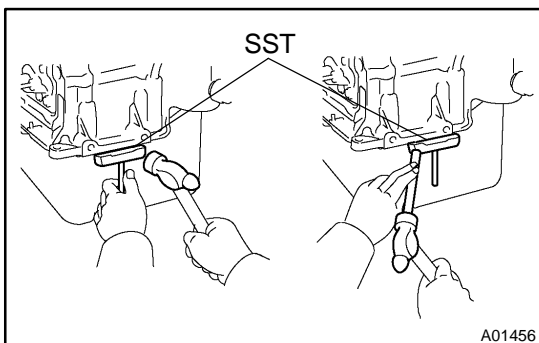
- (a) Using a knife, cut off the oil seal lip.
(b) Using a screwdriver with its tip taped, pry out the oil seal.

NOTICE:

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

37. REMOVE OIL PAN DRAIN PLUG**38. REMOVE OIL PAN DRAIN PLUG GASKET****39. REMOVE OIL PAN SUB-ASSY**

- (a) Remove the 12 bolts and 4 nuts.



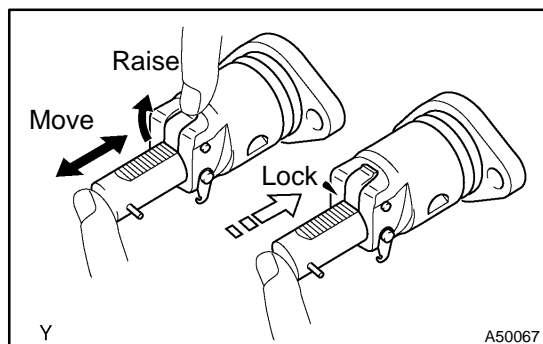
- (b) Insert the blade of SST between the bearing cap sub-assembly and oil pan, and cut off applied sealer and remove the oil pan.

SST 09032-00100

NOTICE:

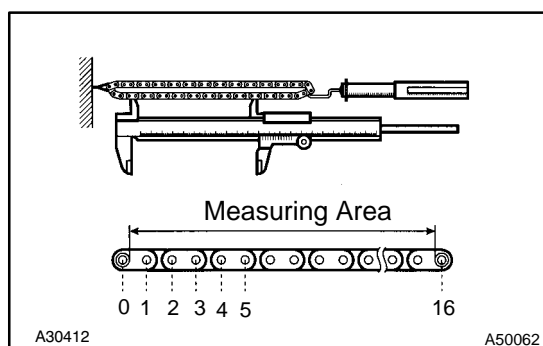
Be careful not to damage the oil pan contact surface of the bearing cap sub-assembly and the oil pan flange.

40. REMOVE OIL STRAINER SUB-ASSY
41. REMOVE OIL STRAINER FLANGE GASKET
42. REMOVE OIL PAN BAFFLE PLATE



43. 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.

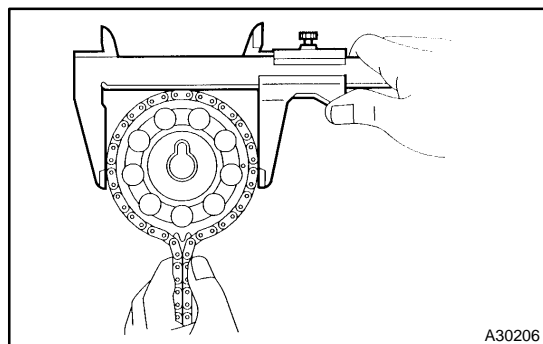


44. INSPECT CHAIN SUB-ASSY

- (a) Using a spring scale, pull the timing chain with 140 N (4.3 kgf, 315 lb) and measure the length of it.
Maximum chain elongation : 122.6 mm (4.827 in.)
- (b) If the elongation is greater than maximum, replace the chain.

HINT:

Make the same measurements pulling at 3 or more places selected at random.



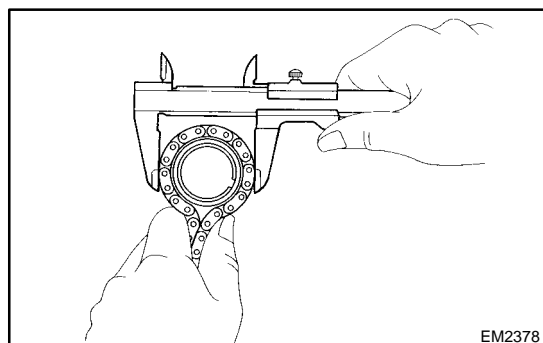
45. INSPECT CAMSHAFT TIMING GEAR OR SPROCKET

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

**Minimum sprocket diameter (w / chain):
97.3mm (3.831 in.)**

NOTICE:

Vernier calipers must contact the chain rollers for measuring.



46. INSPECT CRANKSHAFT TIMING GEAR OR SPROCKET

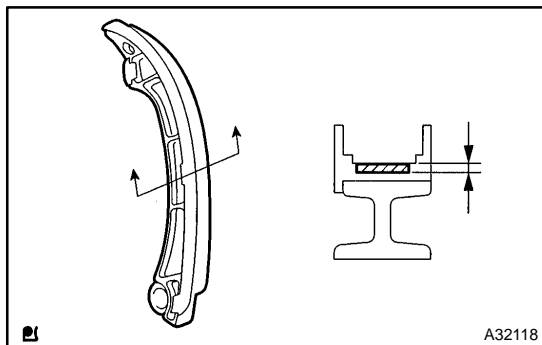
- (a) Wrap the chain around the timing sprocket.
- (b) Using a vernier calipers, measure the timing sprocket diameter with the chain.

NOTICE:

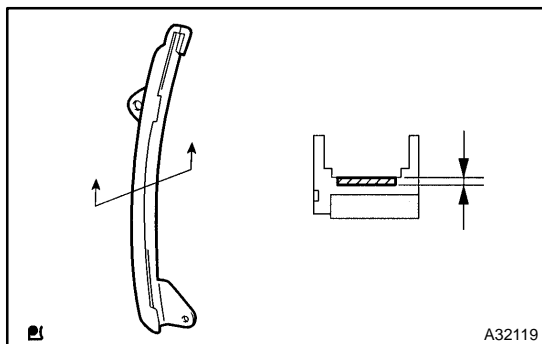
Vernier calipers must contact the chain rollers for the measuring.

**Minimum sprocket diameter (w / chain):
51.6mm (2.031 in.)**

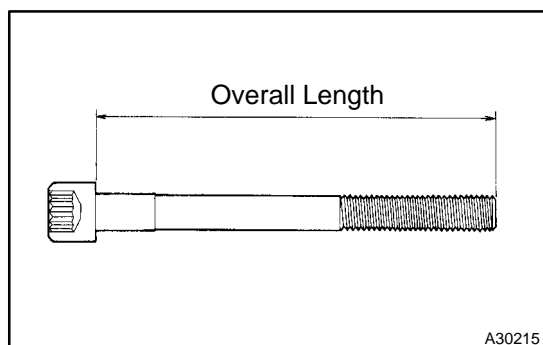
If the diameter is less than minimum, replace the chain and sprockets.

**47. INSPECT CHAIN TENSIONER SLIPPER**

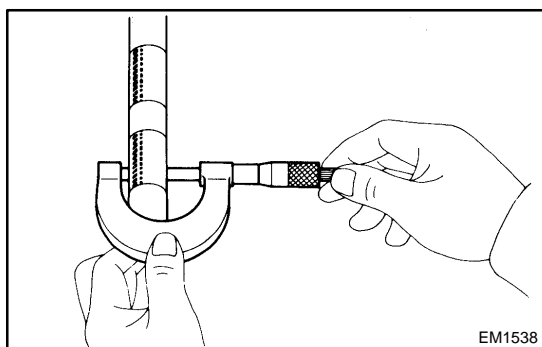
- (a) Measure the chain tensioner slipper wears.
Maximum wear: 1.0 mm (0.039 in.)
- (b) If the wear is greater than maximum, replace the slipper.

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

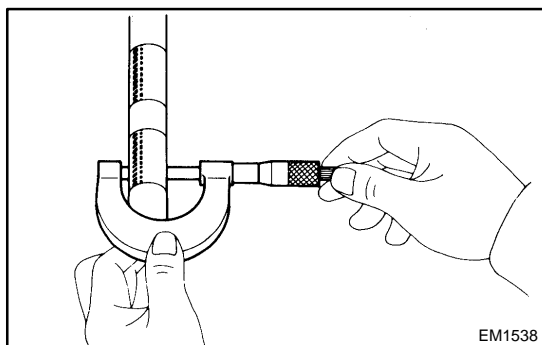
- (a) Measure the vibration damper wears.
Maximum wear: 1.0 mm (0.039 in.)
- (b) If the wear is greater than maximum, replace the damper.

**49. INSPECT CYLINDER HEAD BOLT**

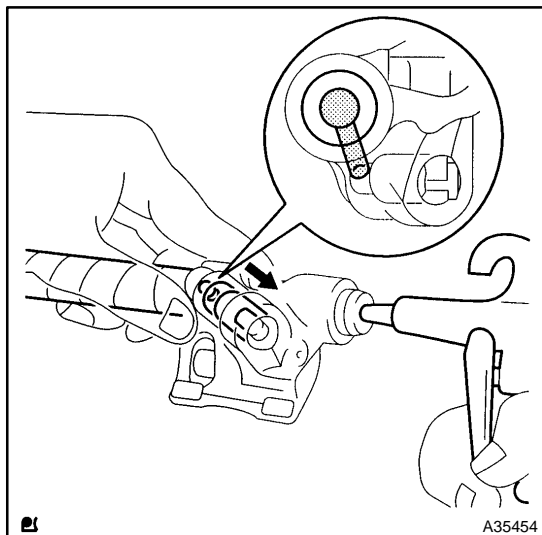
- (a) Using vernier calipers, measure the length of head bolts from the seat to the end.
Standard bolt length: 146.8 – 148.2 mm (5.780–5.835 in.)
Maximum bolt length: 148.5 mm (5.846 in.)
- (b) If the length surpasses the maximum, replace the bolt.

**50. INSPECT VALVE ROCKER SHAFT SUB-ASSY NO.1**

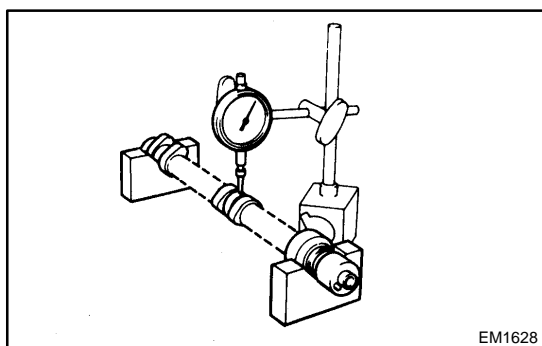
- (a) Using a micrometer, measure the rocker No.1 shaft diameter.
Standard : 15.965 – 15.985 mm (0.6285 – 0.6293 in)

**51. INSPECT VALVE ROCKER SHAFT SUB-ASSY NO.2**

- (a) Using a micrometer, measure the rocker No.2 shaft diameter.
Standard : 15.965 – 15.985 mm (0.6285 – 0.6293 in)

**52. INSPECT VALVE ROCKER ARM**

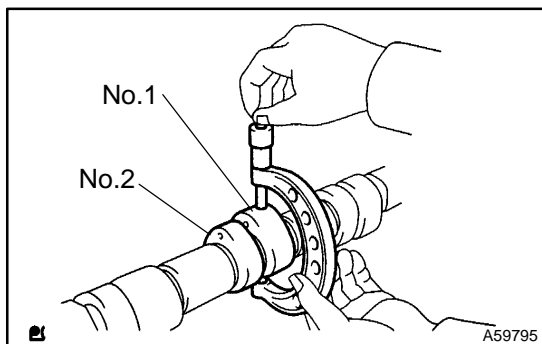
- (a) Cover oil paths of the rocker arm shaft except 2 paths with vinyl type.
- (b) Align the oil path of the rocker arm shaft to the oil path of the rocker arm.
- (c) Check that the posfon inside of the rocker arm noves when air pressure 150 kpa {1.5kgf/cm²} is put to the oil paths.

**53. INSPECT CAMSHAFT**

- (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: 0.03 mm (0.0012 in.)

- (b) If the circle runout is greater than maximum, replace the camshaft.



- (c) Inspect cam lobes.
 - (1) Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

No.1: 40.607 – 40.707 mm (1.5987 – 1.6026 in.)

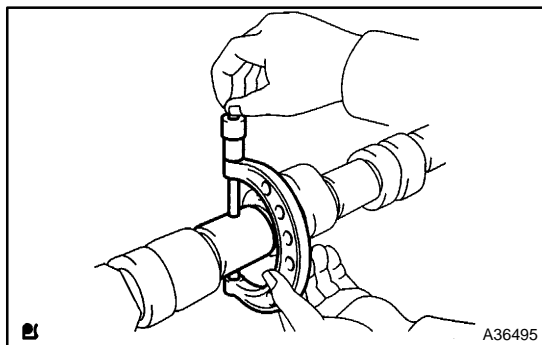
No.2: 38.769 – 38.869 mm (1.5236 – 1.5303 in.)

Minimum cam lobe height:

No.1: 40.45 mm (1.5925 in.)

No.2: 38.61 mm (1.5201 in.)

- (2) If the cam lobe height is less than minimum, replace the camshaft.



- (d) Inspect camshaft journals.
 - (1) Using a micrometer, measure the journal diameter.

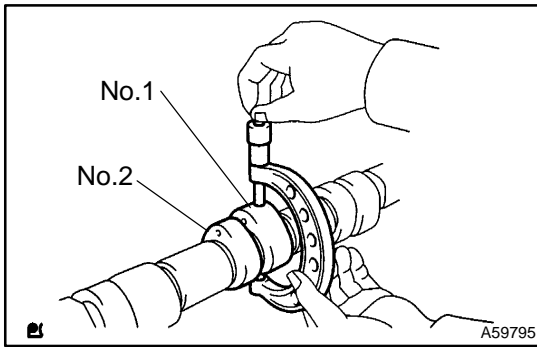
No. 1 journal diameter:

34.449 – 34.465 mm (1.3563 – 1.3569 in.)

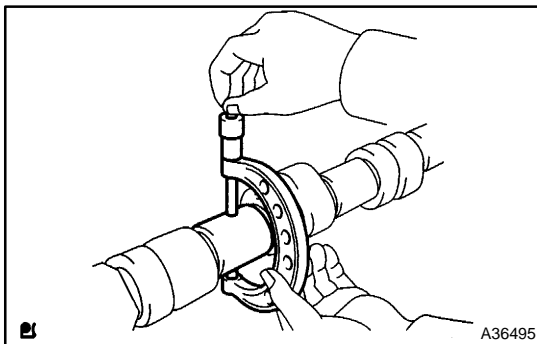
Others journal diameter:

27.949 – 27.965 mm (1.1004 – 1.1010 in.)

- (2) If the journal diameter is not as specified, check the oil clearance.

**54. INSPECT NO.2 CAMSHAFT**

- (a) Inspect cam lobes.
- (1) Using a micrometer, measure the cam lobe height.
- Standard cam lobe height:**
No.1: 40.019 – 40.119 mm (1.5756 – 1.5795 in.)
No.2: 38.863 – 38.963 mm (1.5300 – 1.5340 in.)
- Minimum cam lobe height:**
No.1: 39.86 mm (1.5693 in.)
No.2: 38.71 mm (1.5240 in.)
- (2) If the cam lobe height is less than minimum, replace the camshaft.



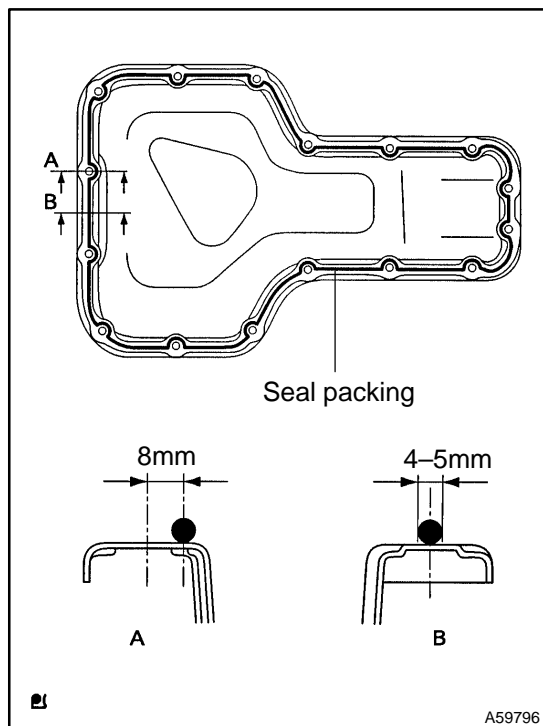
- (b) Inspect camshaft journals.
- (1) Using a micrometer, measure the journal diameter.
- No. 1 journal diameter:**
34.449 – 34.465 mm (1.3563 – 1.3569 in.)
- Others journal diameter:**
27.949 – 27.965 mm (1.1004 – 1.1010 in.)
- (2) If the journal diameter is not as specified, check the oil clearance.

55. INSTALL OIL PAN BAFFLE PLATE

- (a) Install the oil pan baffle plate with the 2 bolts and 2 nuts.
- Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)**

56. INSTALL OIL STRAINER SUB-ASSY

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

**57. INSTALL OIL PAN SUB-ASSY**

- Remove any old packing material from the contact surface.
- Apply seal packing in the shape of bead (Diameter 3.5 mm – 4.5 mm (0.1379 – 0.177 in)) consequently as shown in the illustration.

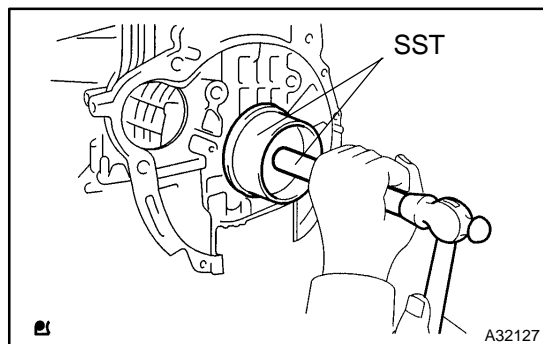
Seal packing: Part No. 08826-00080 or equivalent

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.
- Install the oil pan with the 12 bolts and 2 nuts.
- Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)**

58. INSTALL OIL PAN DRAIN PLUG

- Place a new gasket on the drain plug and install the oil pan drain plug.
- Torque: 37 N·m (378 kgf·cm, 27 ft·lbf)**

**59. INSTALL ENGINE REAR OIL SEAL**

- Apply MP grease to a new oil seal lip.

NOTICE:

Keep the lip off foreign materials.

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

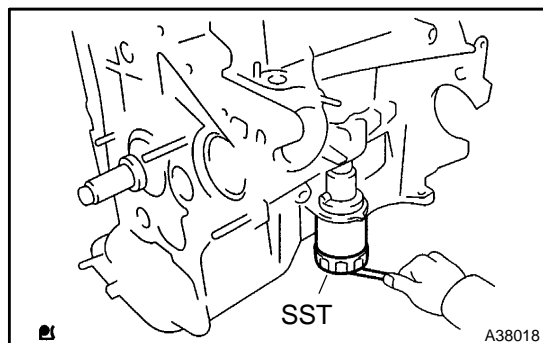
SST 09223-15030, 09950-70010 (09951-07100)

NOTICE:

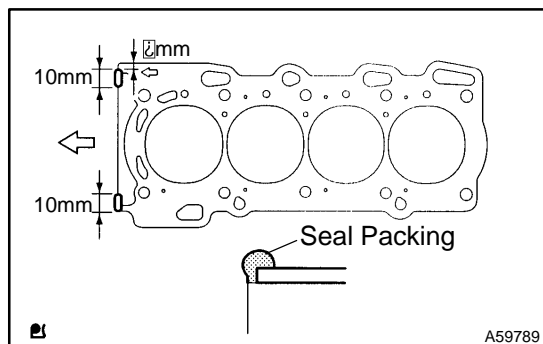
Wipe off extra grease on the crank shaft.

60. INSTALL OIL FILTER UNION

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

**61. INSTALL OIL FILTER SUB-ASSY**

- Check and clean the oil filter installation surface.
 - Apply clean engine oil to the gasket of a new oil filter.
 - Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.
 - Using SST, tighten it an additional 3/4 turn.
- SST 09228-06501

**62. INSTALL CYLINDER HEAD GASKET**

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

NOTICE:

- Pay attention to the installation direction.
 - Place the cylinder head quietly in order not to damage the gasket with the bottom part of the head.
- (b) Apply seal packing to the cylinder head gasket as shown in the illustration.

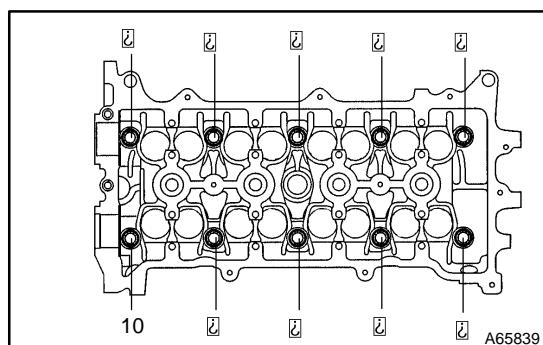
Seal packing:

Part No. 08826-00080 or equivalent

HINT:

avoid applying an excessive amount to the surface.

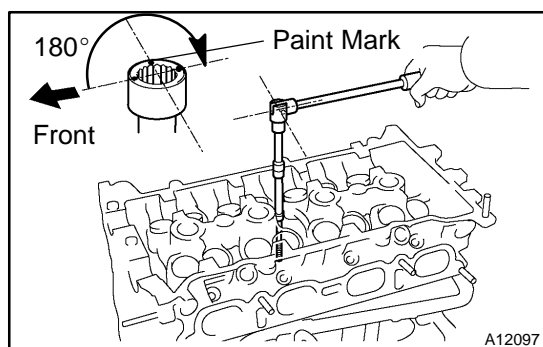
- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

**63. INSTALL CYLINDER HEAD SUB-ASSY****HINT:**

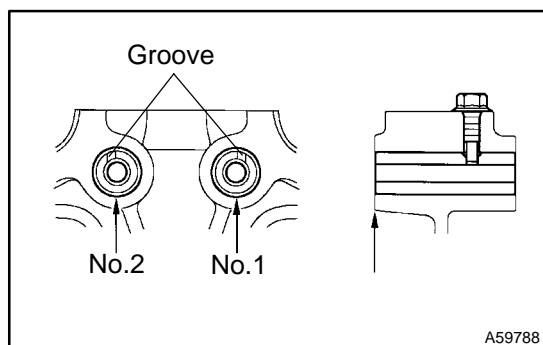
The cylinder head bolts are tightened in 2 progressive steps.

- (a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
- (b) Using a 10 mm bi-hexagon wrench, install and uniformly tighten the 10 cylinder head bolts with plate washers, in several passes, in the sequence shown.

Torque: 35 N·m (357 kgf·cm, 26 ft·lbf)



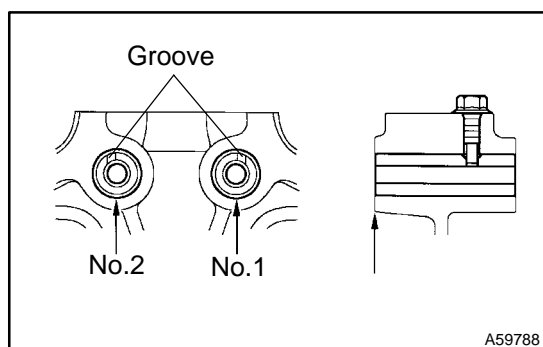
- (c) Mark the front of the cylinder head bolt with paint.
- (d) Retighten the cylinder head bolts 180 ° in the numerical order shown.
- (e) Check that the point marked bolts are moved at 180 ° angle.

**64. INSTALL VALVE ROCKER SHAFT SUB-ASSY NO.2**

- (a) Put the valve rocker shaft through the cylinder head and the hole of the valve rocker arm, and check the direction of the groove.

- (b) Install a bolt to fix the rocker shaft No.2.

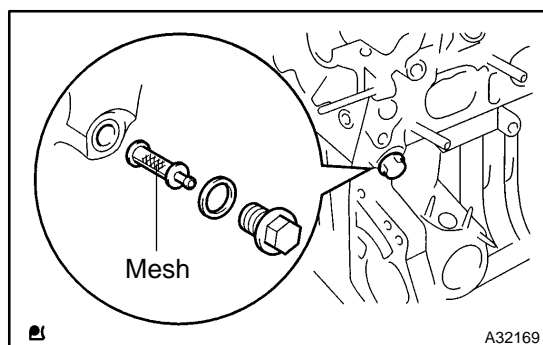
Torque: 9.0 N·m (92 kgf·cm 80 in·lbf)

**65. INSTALL VALVE ROCKER SHAFT SUB-ASSY NO.1**

- (a) Put the valve rocker shaft through the cylinder head and the hole of the valve rocker arm, and check the direction of the groove.

- (b) Install a bolt to fix the rocker shaft No.1.

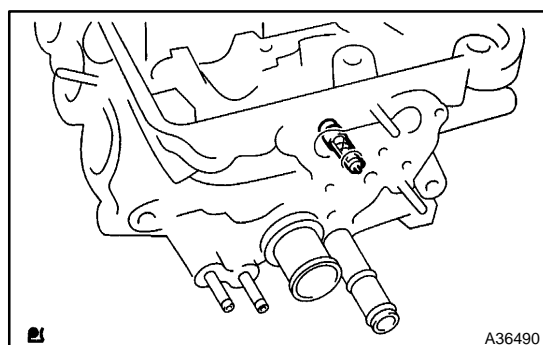
Torque: 9.0 N·m (92 kgf·cm 80 in.·lbf)

**66. INSTALL OIL CONTROL VALVE FILTER**

- (a) Confirm that the filter is clear.

- (b) Place a new gasket on the bolt and install the filter.(Front side)

Torque: 29 N·m (296 kgf·cm, 21 ft·lbf)



- (c) Install the oil control valve filter from the cylinder head.(Rear side)

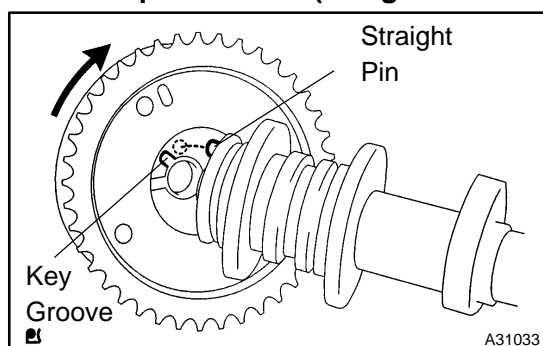
67. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSY

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

68. INSTALL CAM TIMING CONTROL VALVE HOUSING

- (a) Install the cam timing control valve housing with a new gasket.

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

**69. INSTALL CAMSHAFT TIMING GEAR ASSY**

- (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.

CAUTION:

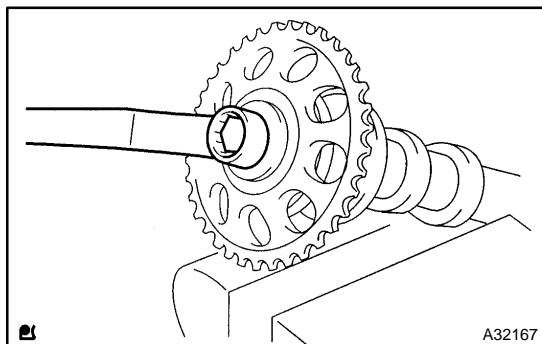
Be sure not to turn the camshaft timing gear to the retard angle side (to the right angle).

- (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: 54 N·m (551 kgf·cm 40 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.



70. INSTALL CAMSHAFT TIMING GEAR OR SPROCKET

- (a) Grip the camshaft with a vice, and install the camshaft timing gear.

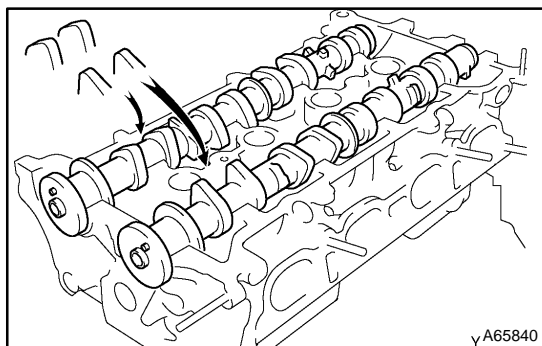
Torque: 54 N·m (551 kgf·cm 40 ft·lbf)

NOTICE:

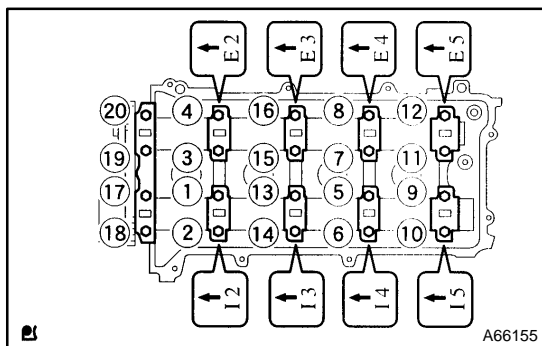
Be careful not to damage the camshaft.

71. INSTALL CAMSHAFT

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



- (b) Place the 2 camshafts on the cylinder head with the No. 1 cam lobes facing as shown the illustration.

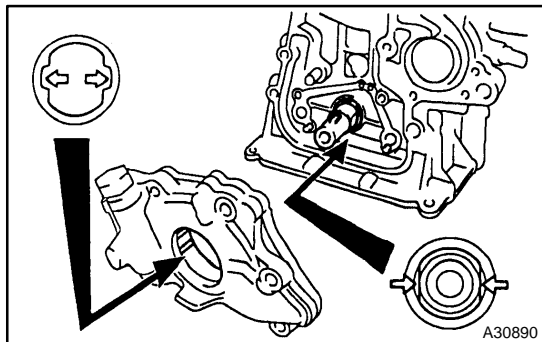


- (c) Examine the front marks and numbers and tighten the bolts in the order shown in the illustration.

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

72. INSTALL OIL PUMP GASKET

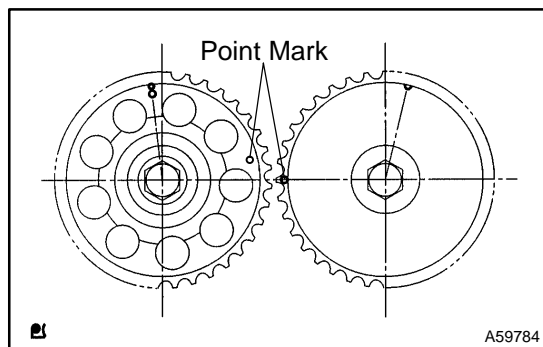
- (a) Place a new gasket on the cylinder block.



73. INSTALL OIL PUMP ASSY

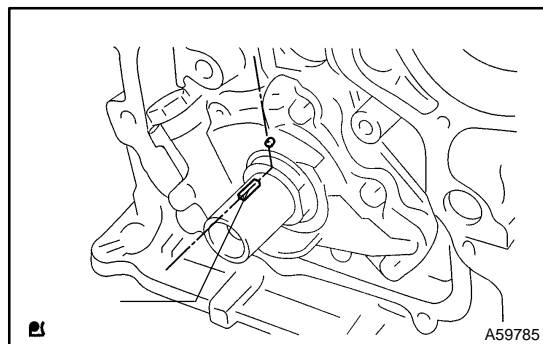
- (a) Engage the spline teeth of the oil pump drive rotor with the large teeth of the crankshaft, and side the oil pump.
(b) Install the oil pump with the 5 bolts.

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

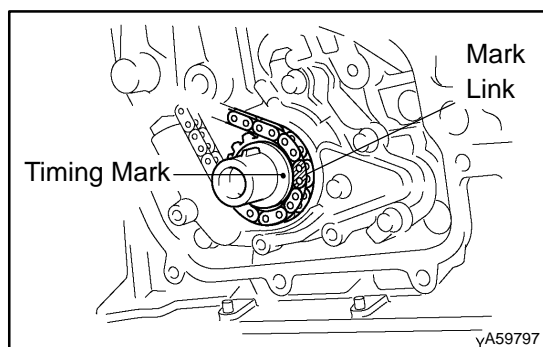


74. INSTALL CHAIN SUB-ASSY

- (a) Set No. 1 cylinder to TDC/compression.
- (1) Turn the hexagonal wrench head portion of the camshafts, and align the point marks of the camshaft timing sprockets.



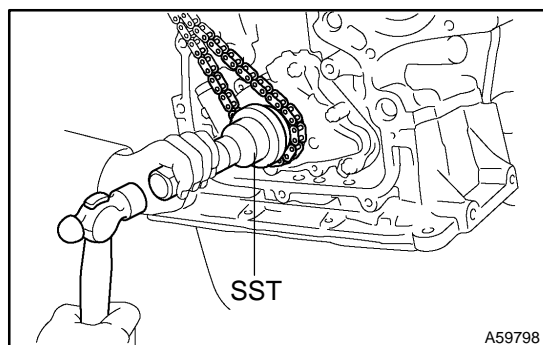
- (2) Turn the crankshaft and set the set key on the crankshaft upward.



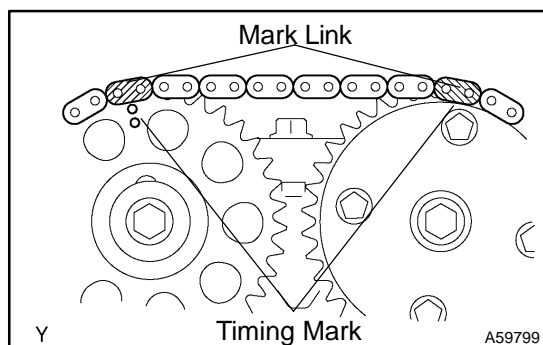
- (b) Install the timing chain on the crankshaft timing sprocket with the mark link (yellow color link) aligned with the timing mark on the crankshaft timing sprocket.

HINT:

A yellow color link and 2 orange color links are on the chain.



- (c) Using a SST, install the sprocket.
SST 09223-22010



- (d) Install the timing chain on the camshaft timing sprockets with the mark link (orange color links) aligned with the timing marks on the camshaft timing sprockets.

75. INSTALL CHAIN VIBRATION DAMPER NO.1

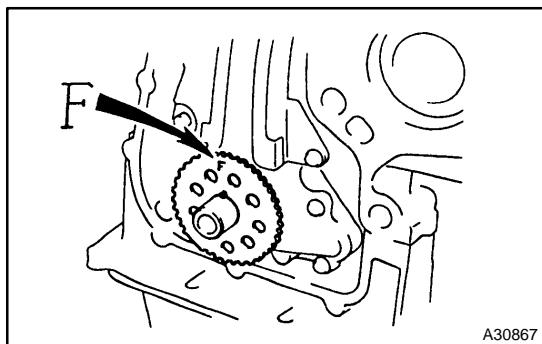
- (a) Install the 2 bolts and the chain vibration damper No.1.

Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)

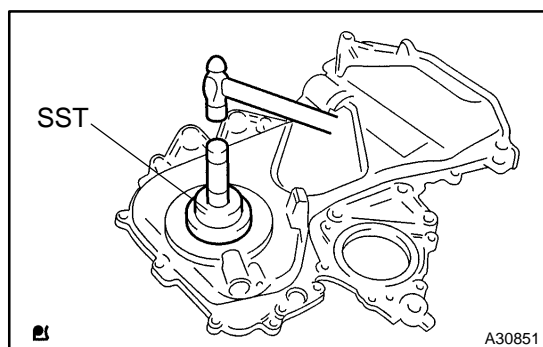
76. INSTALL CHAIN TENSIONER SLIPPER

- (a) Install the bolt and the chain tensioner slipper.

Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)

**77. INSTALL CRANKSHAFT POSITION SENSOR PLATE NO.1**

- (a) Install the plate with the "F" mark facing forward.

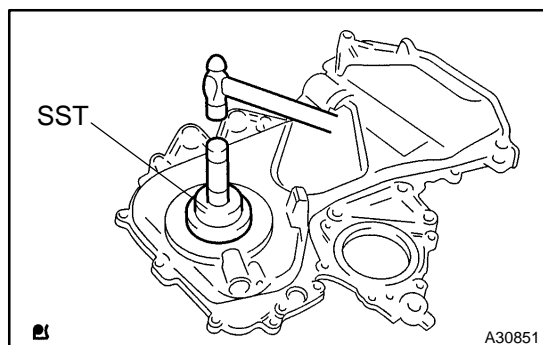
**78. INSTALL TIMING GEAR COVER OIL SEAL**

- (a) Apply MP grease to the oil seal lip.
 (b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing chain cover edge.

SST 09223-22010

NOTICE:

Keep the lip off foreign materials.

**79. 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 surface of the timing chain cover, cylinder head and cylinder block.
- Using a razor blade and a gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
 - Thoroughly clean all components to remove all the loose material.
 - Using a non-residue solvent, clean both sealing surfaces.

- (b) Apply seal packing to the timing chain cover as shown in the illustration.

Seal packing:

Part No. 08826-00100 or equivalent

- Install a nozzle that has been cut to a 1.5 mm opening.

HINT:

Avoid applying an excessive amount to the surface.

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

- (c) Install the 2 gaskets to the timing chain cover as shown in the illustration.

- (d) Apply seal packing to 4 locations as shown in the illustration.

Seal packing:

Part No. 08826-00080 or equivalent

- Install a nozzle that has been cut to a 4 – 5 mm (0.16 – 0.20 in.) opening.

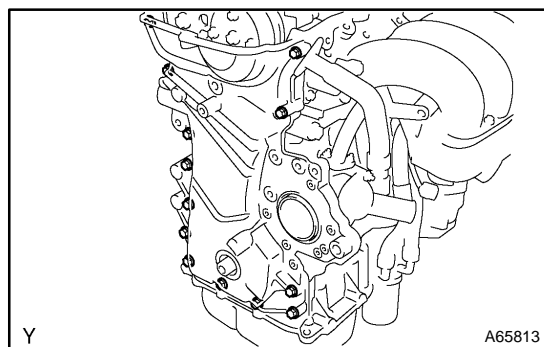
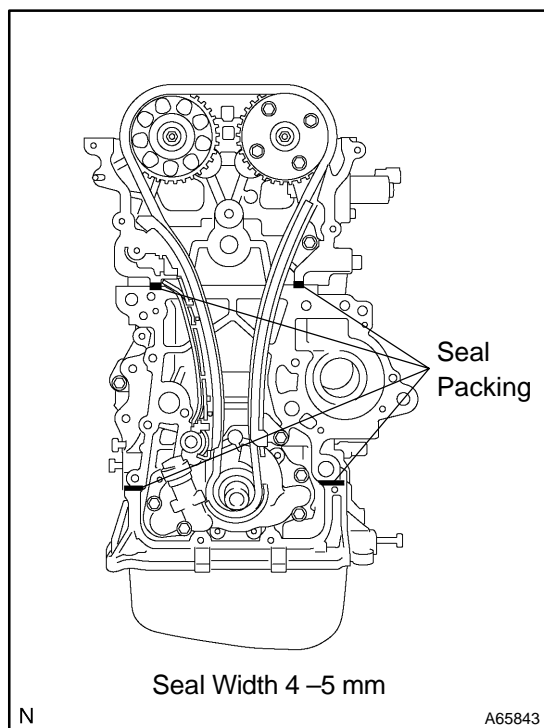
HINT:

Avoid applying an excessive amount to the surface.

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

NOTICE:

- Do not put into engine oil within 2 hours after installing.



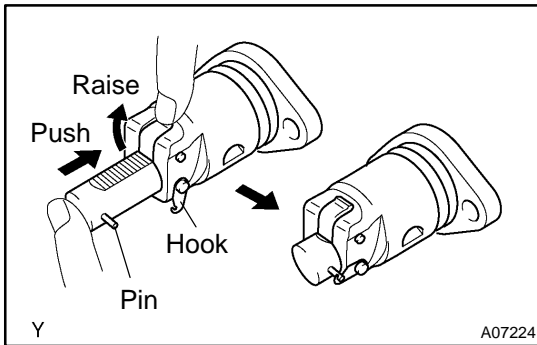
- (e) Install the timing chain cover, with the 13 bolts.

Torque:

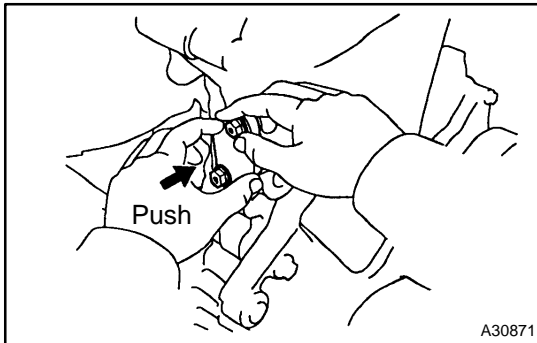
21 N·m (214 kgf·cm, 15 ft·lbf) (M8)

11 N·m (112 kgf·cm, 8 ft·lbf) (M6)

- (f) Install the stud bolt.

**80. INSTALL CHAIN TENSIONER ASSY NO.1**

- (a) Check the O-ring is clean, and set the hook as shown in the illustration.

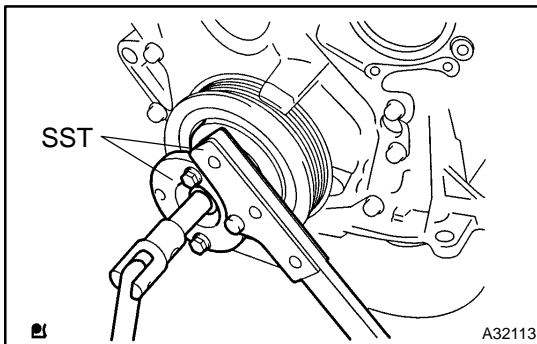


- (b) Apply engine oil to the chain tensioner and install it.

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

NOTICE:

When installing the tensioner, set the hook again if the hook releases the plunger.

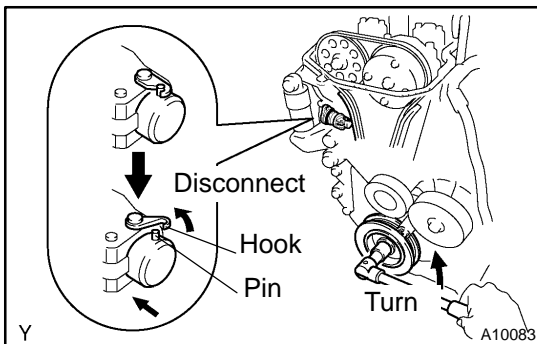
**81. INSTALL CRANKSHAFT PULLEY**

- (a) Align the pulley set key with the key groove of the pulley, and slide on the pulley.

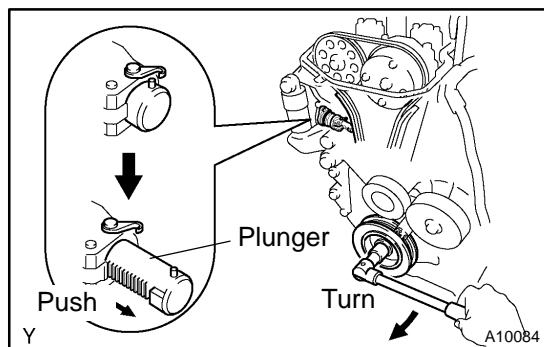
- (b) Using SST, install the pulley bolt.

SST 09213-70011(09213 – 70020), 09330-00021

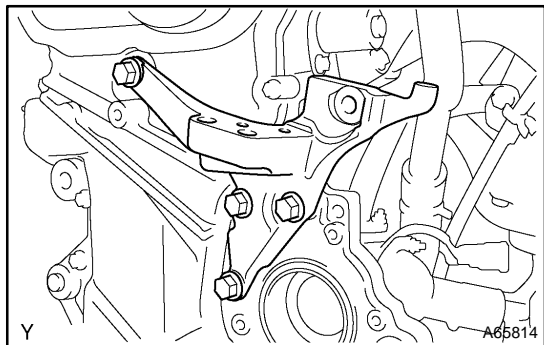
Torque: 118 N·m (1,203 kgf·cm, 87 ft-lbf)



- (c) Turn the crankshaft counterclockwise, and disconnect the plunger knock pin from the hook.

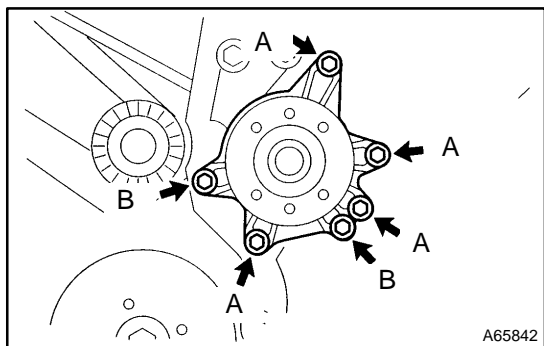


- (d) Turn the crankshaft clockwise, and check that the slipper is pushed by the plunger.



82. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)



83. INSTALL WATER PUMP ASSY

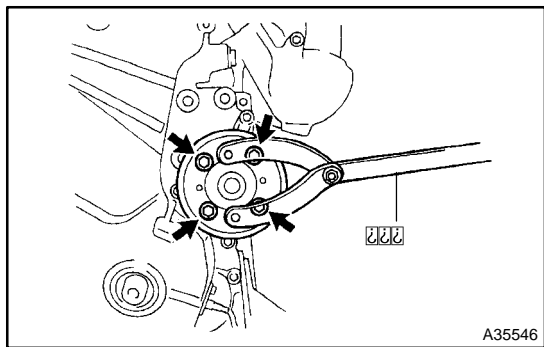
- (a) Place a new O-ring on the timing chain cover.
(b) Install the water pump with the 6 bolts.

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

HINT:

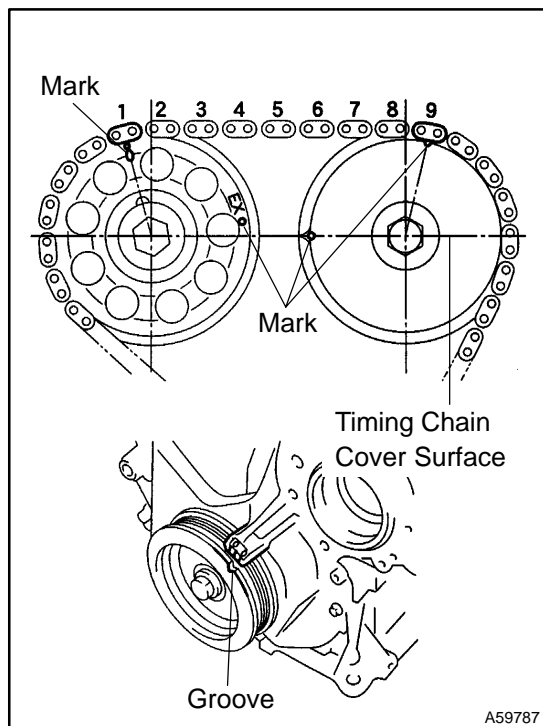
Each bolt length is indicated in the illustration.

Bolt A	35 mm (1.38 in.)
Bolt B	28 mm (1.10 in.)



84. INSTALL WATER PUMP PULLEY

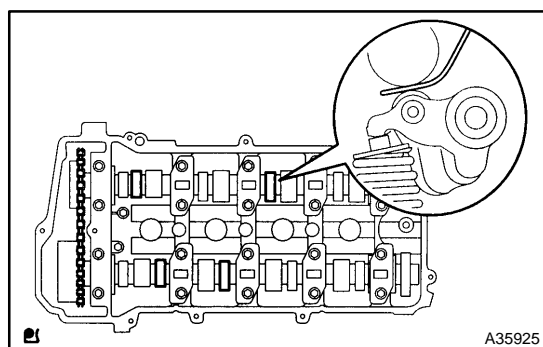
- (a) Using SST the water pump pulley.
SST 09960-10010 (09962-01000, 09963-00600)
Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)

**85. INSPECT VALVE CLEARANCE**

- (a) Set No. 1 cylinder to TDC/compression.
- (1) Turn the crankshaft pulley, and align its groove with timing mark "0" of the timing chain cover.
 - (2) Check that the point marks of the camshaft timing sprocket and VVT timing sprocket are in straight line on the timing chain cover surface as shown in the illustration.

HINT:

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

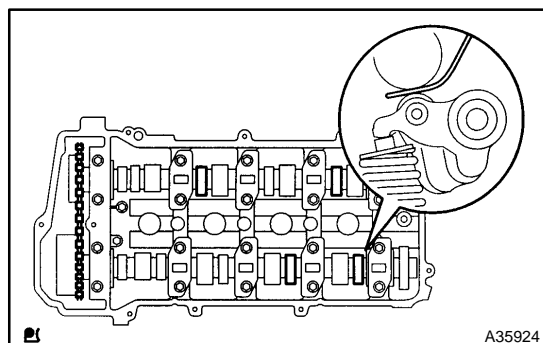


- (b) Check only the valves indicated.
- (1) Using a feeler gauge, measure the clearance between the valve rocker arm and camshaft.
 - (2) Record the out-of specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

Valve clearance (Cold)

Intake	0.08 – 0.18 mm (0.0031 – 0.0070 in.)
Exhaust	0.22 – 0.32 mm (0.0087 – 0.0126 in.)

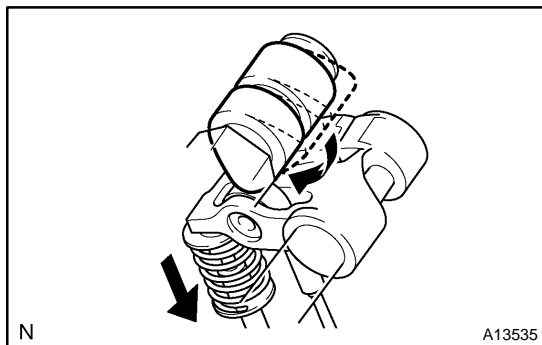
- (c) Turn the crankshaft 1 revolution (360 °) and set No. 4 cylinder to TDC/compression.



- (d) Check only the valves indicated.
- (1) Using a feeler gauge, measure the clearance between the valve rocker arm and camshaft.
 - (2) Record the out-of specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

Valve clearance (Cold)

Intake	0.08 – 0.18 mm (0.0031 – 0.0070 in.)
Exhaust	0.22 – 0.32 mm (0.0087 – 0.0126 in.)

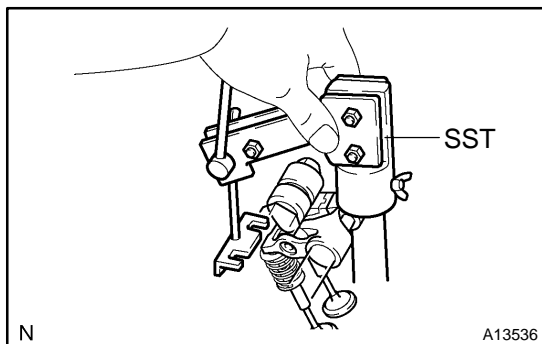


86. ADJUST VALVE CLEARANCE

(a) Set the SST.

NOTICE:

Remove the spark plug and take off the compression.

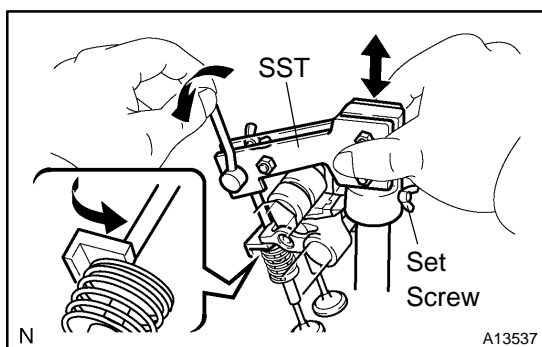


(1) Insert SST into the plug tube.

SST 09248-77010(09248-07010)

NOTICE:

- SST cannot be inserted unless the set screw is loosened.
- Make sure that the camshaft is in the same condition as step (1).



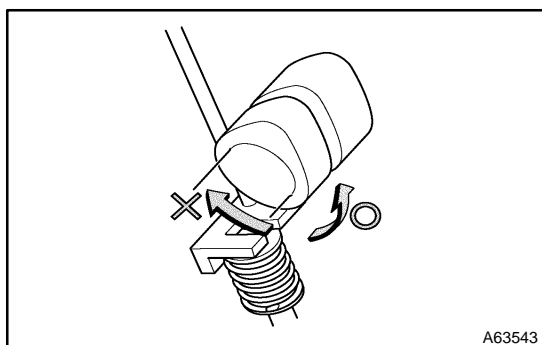
(2) Operate the lever so that SST's seat surface comes to contact with the valve retainer and lock them with the set screw.

NOTICE:

- Clearance between the valve retainer and SST's seat surface is not allowed.
- Care should be taken not to make clearance when inserting SST, since a presence of clearance may unlock the keeper.

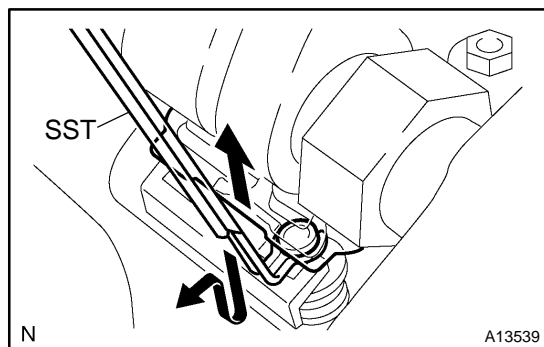
(3) lock the set screw on the plug tube side of SST.

(4) Rotate the crankshaft so that the camshaft is positioned as shown in the illustration.



NOTICE:

- Pay attention to the direction of the rotation to prevent the nose of the camshaft from interfering with the SST's shaft.
- Do not rotate the crankshaft excessively.



(b) Remove the adjusting shim.

- (1) Lift the rocker arm to make a room and remove the adjusting shim using SST.

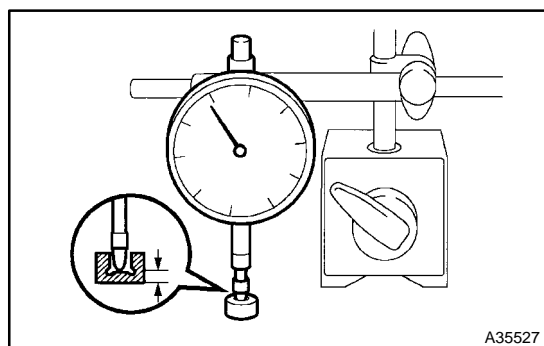
SST 09248-77010(09248-07010)

NOTICE:

Do not remove SST in the condition that adjusting shim is removed.

HINT:

- Setting SST from the right above makes the removal easy.
- If there is not enough room, reset SST.



- (2) Determine the size of the replaced shim according to there Formula or Charts:

- Using a dial indicator, measure the thickness of the removed shim.
- Calculate the thickness of a new shim so that the valve clearance comes within the specified value.

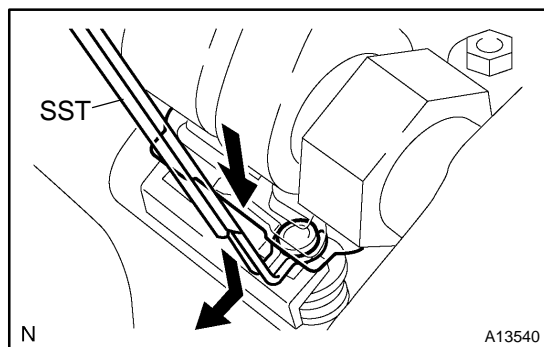
A	Thickness of new shim
B	Thickness of used shim
C	Measured valve clearance

Intake: $A = B + (C - 0.13 \text{ mm (0.005 in.)}) \times 1.5$

Exhaust: $A = B + (C - 0.27 \text{ mm (0.011 in.)}) \times 1.5$

HINT:

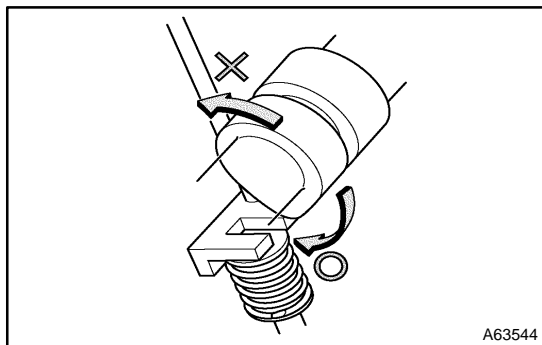
Shim are available in 41 sizes in increments of 0.020 mm (0.0008 in.), from 2.000 mm (0.0787 in.) to 2.800 mm (0.1102 in.).



- (c) Lift the rocker arm to make a room and use SST, install the adjusting shim.

HINT:

- Setting SST from the right above makes the removal easy.
- To remove SST from the adjusting shim, it is advisable to push down the rocker arm.



- (d) Turn the crankshaft so that the related rocker arm, where the valve clearance is adjusted, is fully pushed down.

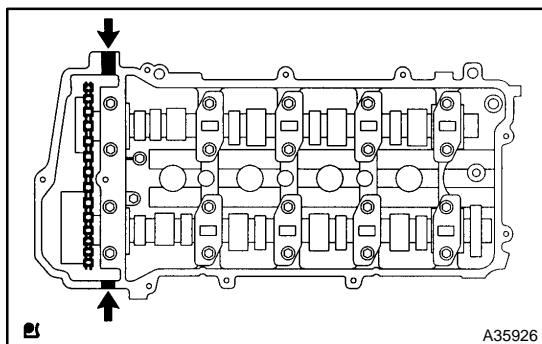
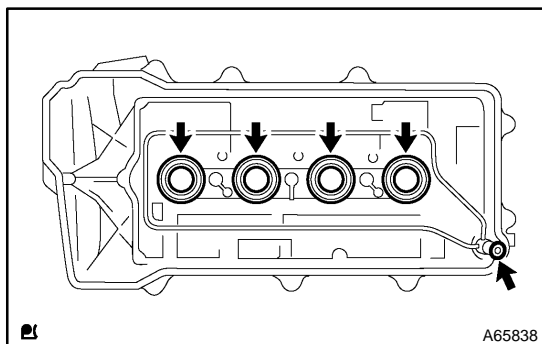
NOTICE:

- Pay attention to the direction of the rotation to prevent the nose of the camshaft from interfering with the SST's shaft.
 - Do not rotate the crankshaft excessively.
- (e) After loosening the 2 set screws of SST, remove SST itself.

SST 09248-77010(09248-07010)

87. INSTALL CYLINDER HEAD COVER SUB-ASSY

- (a) Remove any old packing (FIPG) material.
- (b) Install the new cylinder head cover gasket to the cylinder head cover.
- (c) Install the new spark plug tube gasket and a new O-ring to the cylinder head cover.

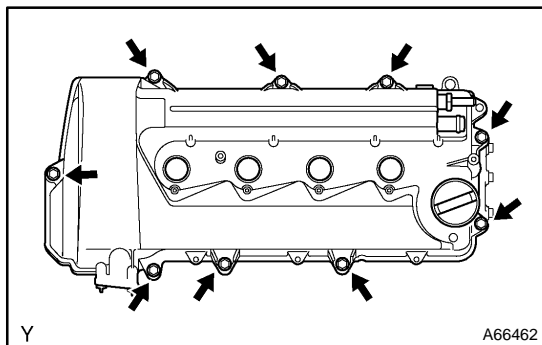


- (d) Apply seal packing to 2 locations as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

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



- (e) Install the cylinder head cover and cable bracket with the 9 bolts.

Uniformly tighten the bolts, in the several passes, in the sequence shown.

Torque: 10 N·m (102 kgf·cm, 89 in.·lbf)

88. INSTALL SPARK PLUG

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

89. INSTALL VENTILATION VALVE SUB-ASSY

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