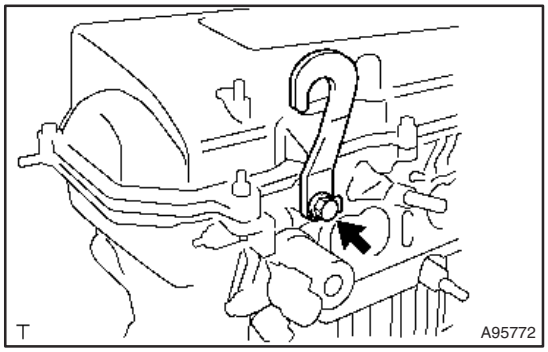
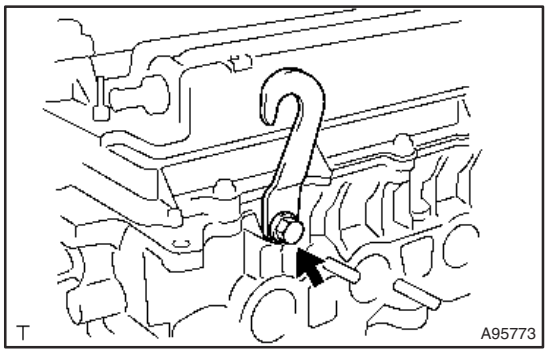
141TM–01

OVERHAUL



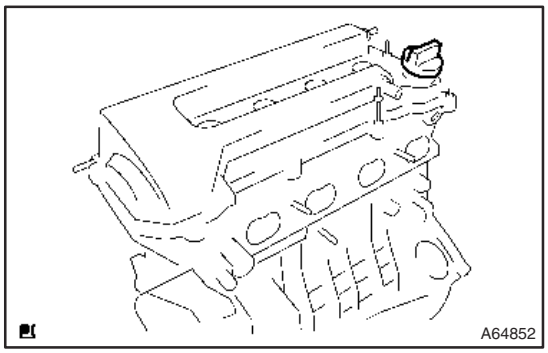
1. REMOVE ENGINE HANGER NO.1

(a) Remove the bolt, then remove engine hanger No. 1.



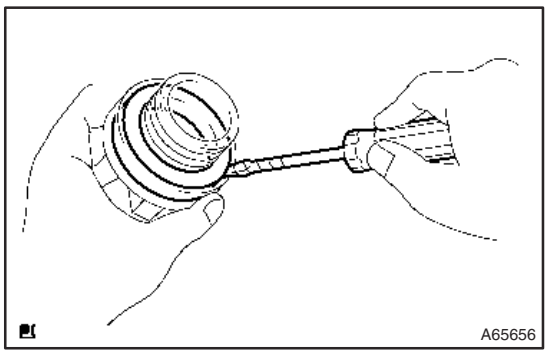
2. REMOVE ENGINE HANGER NO.2

(a) Remove the bolt, then remove engine hanger No. 2.



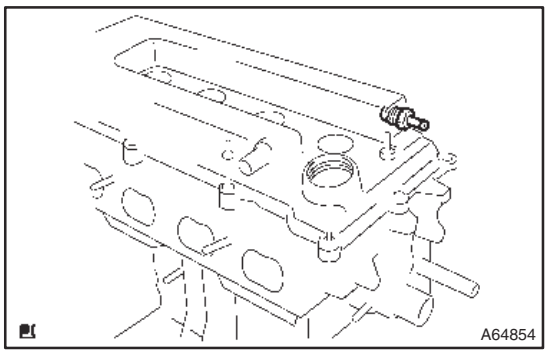
3. REMOVE OIL FILLER CAP SUB–ASSY

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



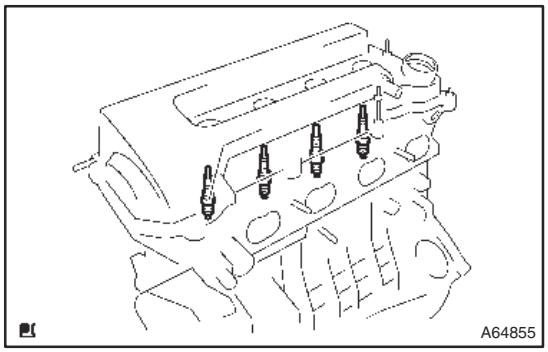
4. REMOVE OIL FILLER CAP GASKET

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



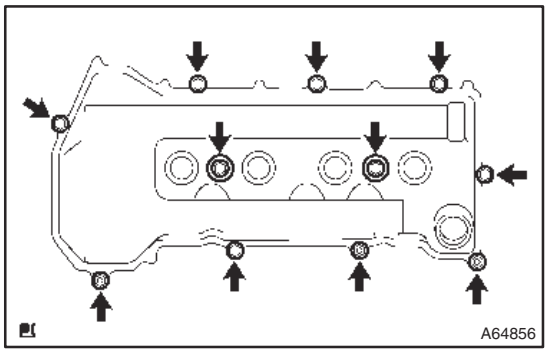
5. REMOVE VENTILATION VALVE SUB–ASSY

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



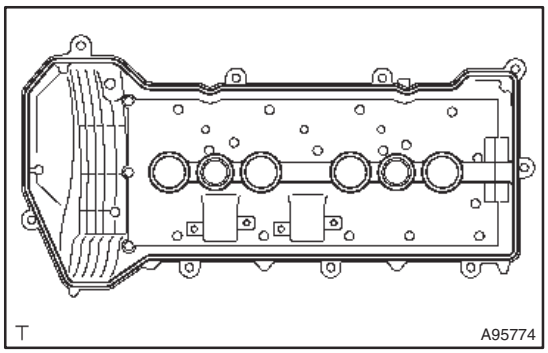
6. REMOVE SPARK PLUG

(a) Using a spark plug wrench, remove the 4 spark plugs.



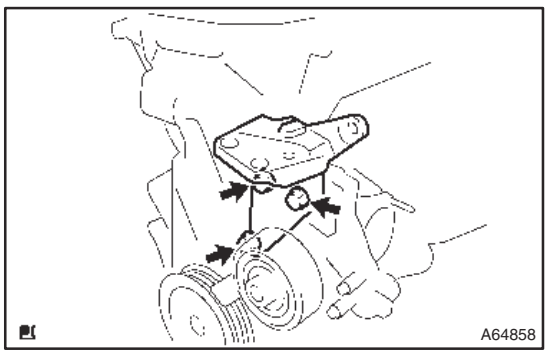
7. REMOVE CYLINDER HEAD COVER SUB–ASSY

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



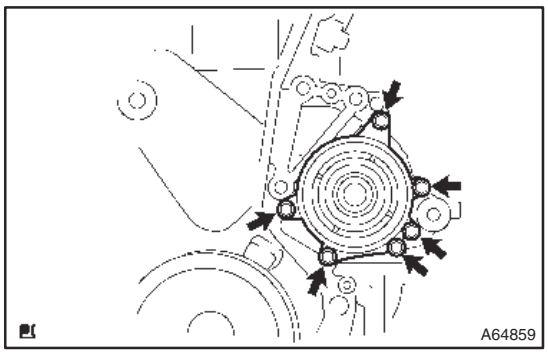
8. REMOVE CYLINDER HEAD COVER GASKET

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



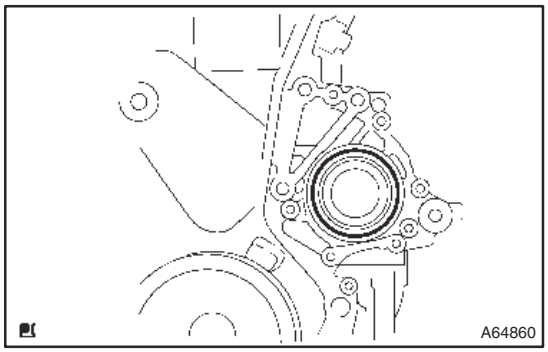
9. REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

(a) Remove the 3 bolts, then remove the transverse engine engine mounting bracket.



10. REMOVE WATER PUMP ASSY

(a) Remove the 6 bolts, then remove the water pump.



11. REMOVE WATER PUMP O–RING

(a) Remove the water pump O–ring from the timing chain cover.

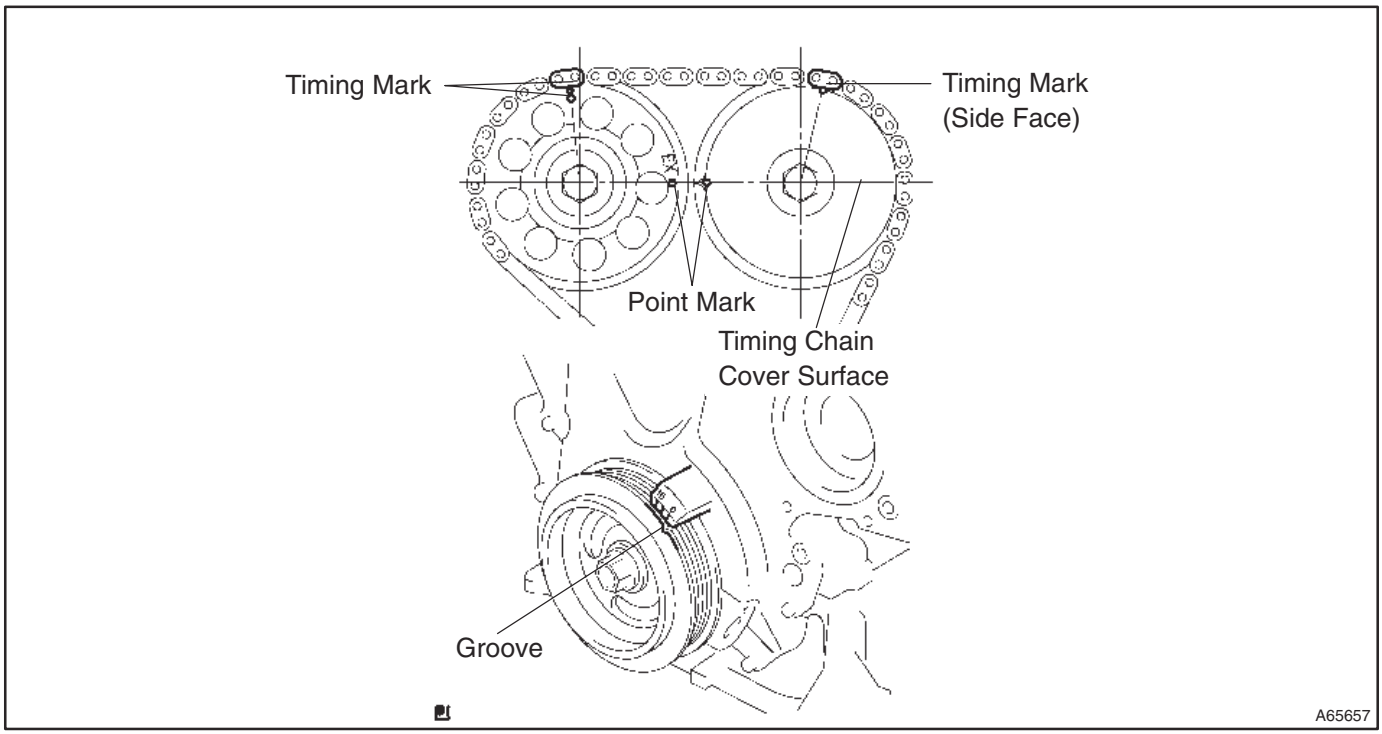
12. REMOVE CRANKSHAFT PULLEY

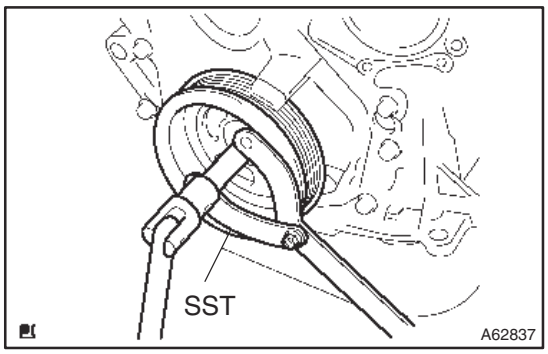
(a) Set the No. 1 cylinder to the TDC/compression.

(1) Turn the crankshaft pulley, then adjust the crankshaft so that the groove and the timing mark ”0” of the timing chain are aligned.

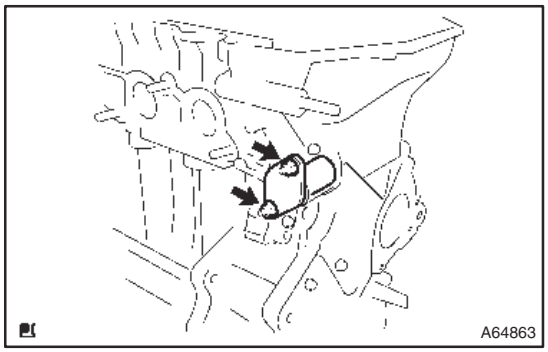
(2) Check that the point marks of the camshaft timing gears are in a straight line on the timing chain cover surface as shown in the illustration.

If not, turn the crankshaft 1 revolution (360°), then adjust the crankshaft so that the marks are aligned as above.



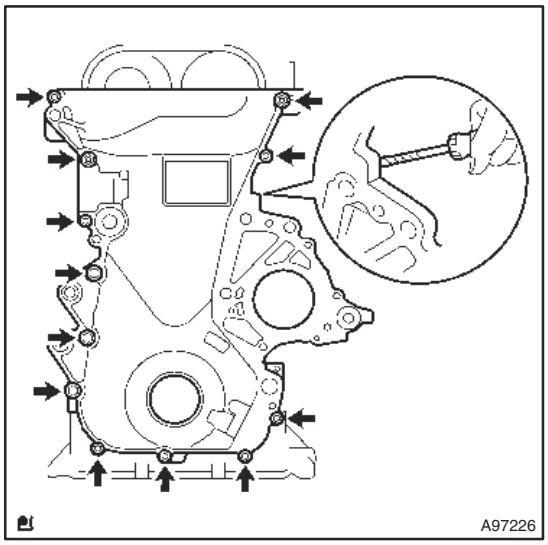


(b) Using SST, remove the crankshaft pulley bolt.
SST 09960–10010 (09962–01000, 09963–01000)
(c) Remove the crankshaft pulley from the crankshaft.



13. REMOVE CHAIN TENSIONER ASSY NO.1

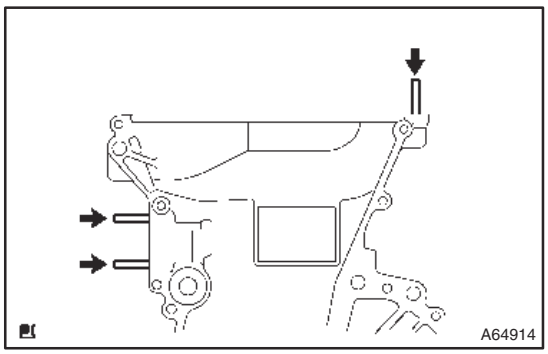
(a) Remove the 2 nuts, then remove chain tensioner No. 1.



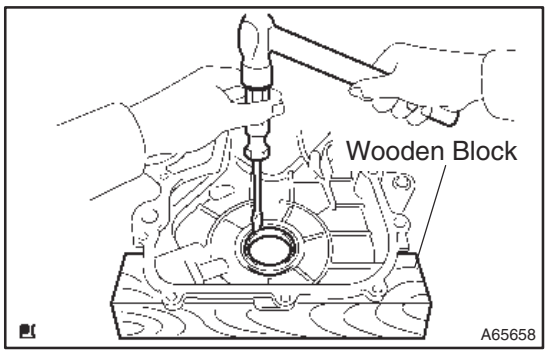
14. REMOVE TIMING CHAIN OR BELT COVER SUB–ASSY

(a) Remove the 10 bolts and 2 nuts.
(b) Remove the timing chain cover by prying the portions between the timing chain cover, cylinder head and cylinder block with a screwdriver.

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



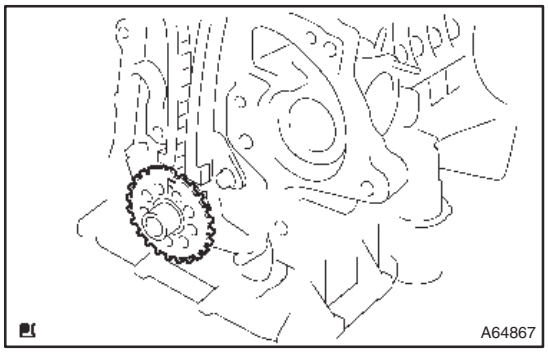
(c) Using a Torx socket wrench E5, remove the 3 stud bolts.



15. REMOVE TIMING CHAIN OR BELT COVER OIL SEAL

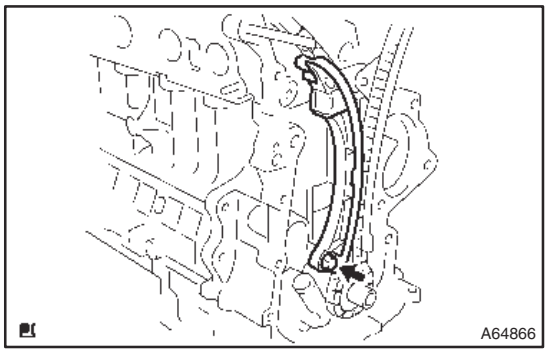
(a) Place the timing chain cover on wooden blocks.

(b) Using a screwdriver, remove the timing chain or belt cover oil seal.



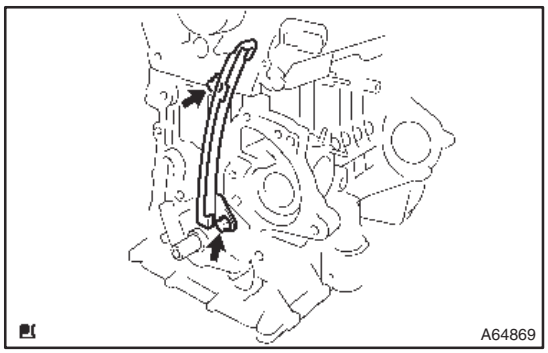
16. REMOVE CRANKSHAFT POSITION SENSOR PLATE NO.1

(a) Remove crankshaft position sensor plate No. 1 from the crankshaft.



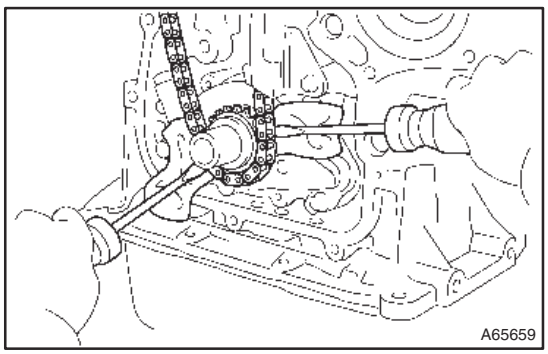
17. REMOVE CHAIN TENSIONER SLIPPER

(a) Remove the bolt, then remove the chain tensioner slipper.



18. REMOVE CHAIN VIBRATION DAMPER NO.1

(a) Remove the 2 bolts, then remove chain vibration damper No. 1.

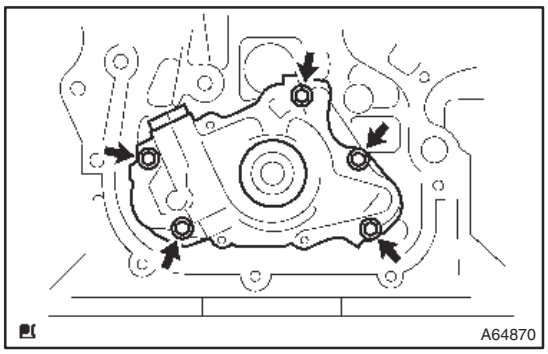


19. REMOVE CHAIN SUB–ASSY

(a) Using 2 screwdrivers, pry out the chain together with the crankshaft timing gear as shown in the illustration.

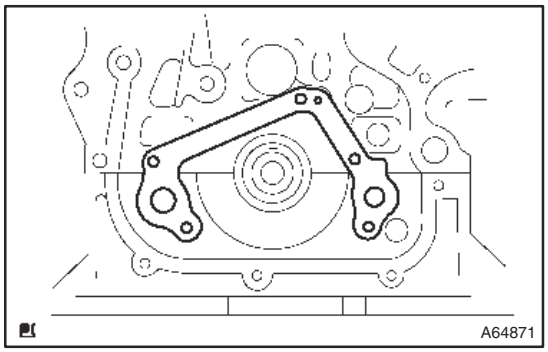
NOTICE:

- **Put a shop rag to protect the engine.**
- **In case of revolving the camshafts with the chain off the gears, turn the crankshaft 1/4 revolution to prevent contact of the valves with the pistons.**



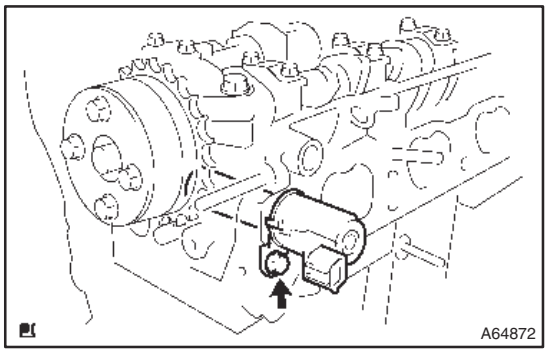
20. REMOVE OIL PUMP ASSY

(a) Remove the 5 bolts, then remove the oil pump.



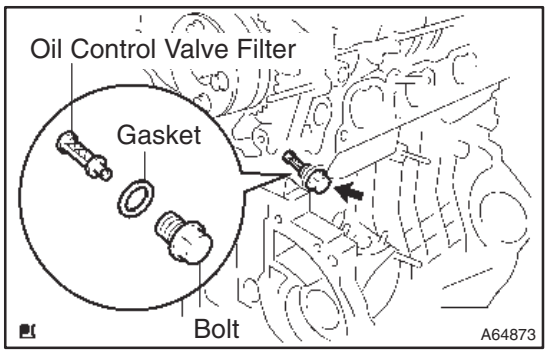
21. REMOVE OIL PUMP GASKET

(a) Remove the oil pump gasket from the cylinder block.



22. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSY

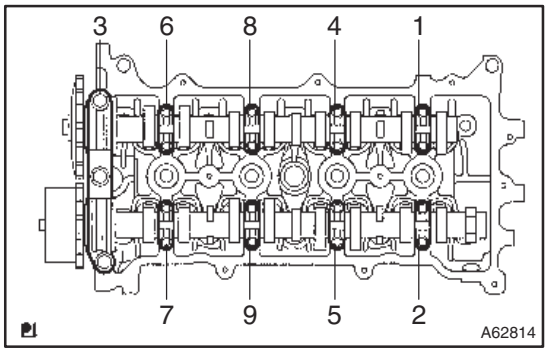
(a) Remove the bolt, then remove the camshaft timing oil control valve.



23. REMOVE OIL CONTROL VALVE FILTER

(a) Remove the bolt with the gasket and oil control valve filter.

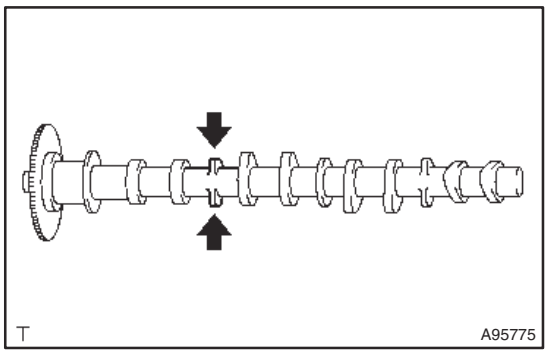
(b) Remove the gasket and oil control valve filter from the bolt.



24. REMOVE CAMSHAFT

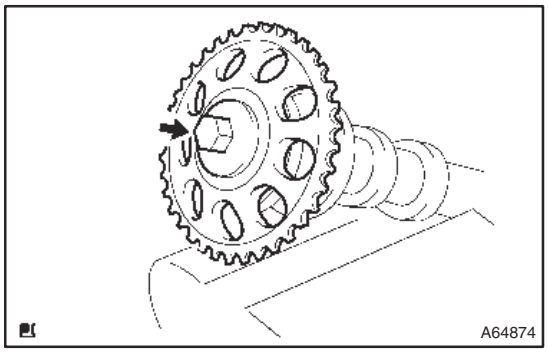
(a) Using several steps, loosen and remove the 19 bolts uniformly in the sequence shown in the illustration.

(b) Remove the 2 camshafts from the cylinder head.



25. REMOVE CAMSHAFT TIMING GEAR OR SPROCKET

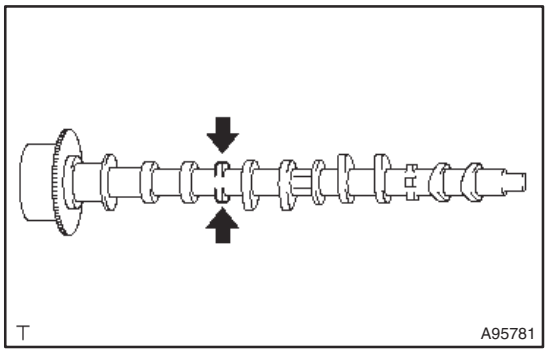
(a) Clamp the portion of the No. 2 camshaft indicated with arrow in a vise.



(b) Remove the bolt, then remove the camshaft timing gear or sprocket.

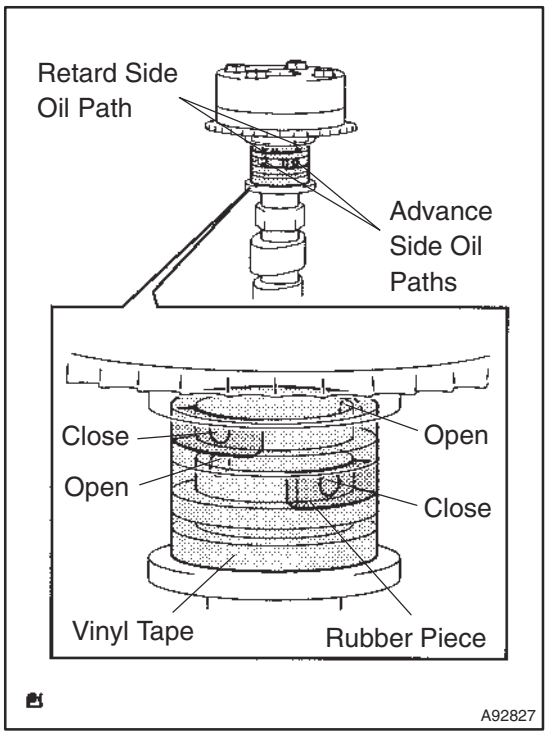
NOTICE:

Be careful not to damage the camshaft.



26. REMOVE CAMSHAFT TIMING GEAR ASSY

(a) Clamp the portion of the camshaft indicated with arrow in a vise.



(b) Check that the camshaft timing gear assembly does not rotate.

NOTICE:

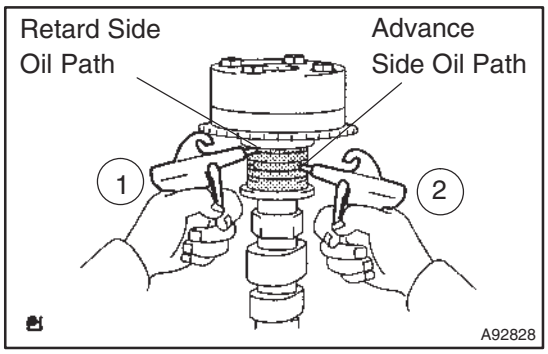
Do not damage the camshaft by clamping it in a vise too tightly.

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

HINT:

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

(d) Punctuate the tape which covers the advance side path and retard side path on the opposite side.

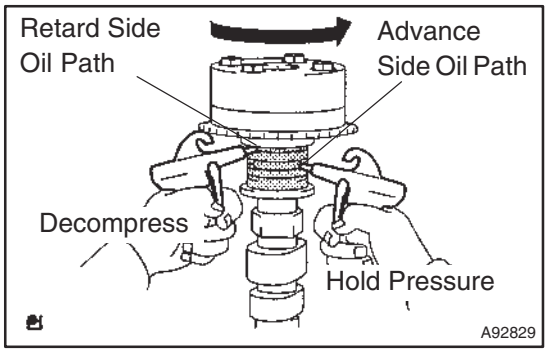


(e) Apply approximately 150 kPa (1.5 kgf/cm^2) of air pressure into the retard side oil path.

NOTICE:

When applying air pressure, cover the paths with a shop rag to prevent oil splashes.

(f) Apply approximately 150 kPa (1.5 kgf/cm^2) of air pressure into the advance side oil path.



(g) Confirm that the camshaft timing gear assembly revolves in the advance direction when reducing the air pressure of the retard side path.

HINT:

- If the timing gear assembly does not revolve in the advance direction by air pressure, turn it forcibly by hand after air pressure is applied to both oil pathes. When revolving, first turn it in the retard direction, then in the advance direction.
- The lock pin is released, and the camshaft timing gear revolves in the advance direction.

(h) When the camshaft timing gear assembly reaches the most advanced position, release the air pressure of the retard side path, then release the air pressure of the advance side path.

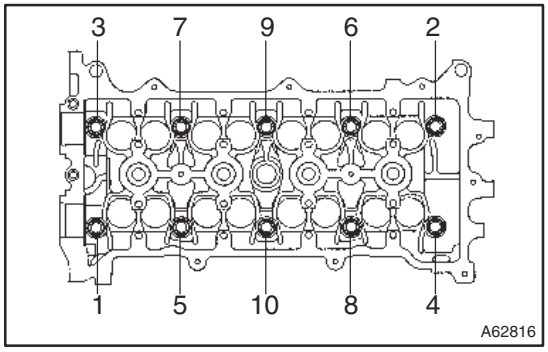
NOTICE:

If the air pressure of the advance side path is released first, the camshaft timing gear assembly occasionally shifts in the retard direction abruptly, which may damage the lock pin. Be sure to release the air pressure of the retard side path first.

(i) Remove the bolt and camshaft timing gear assembly.

NOTICE:

- **Do not remove the other 4 bolts.**
- **If reusing the camshaft timing gear assembly, unlock the lock pin inside the camshaft timing gear first.**



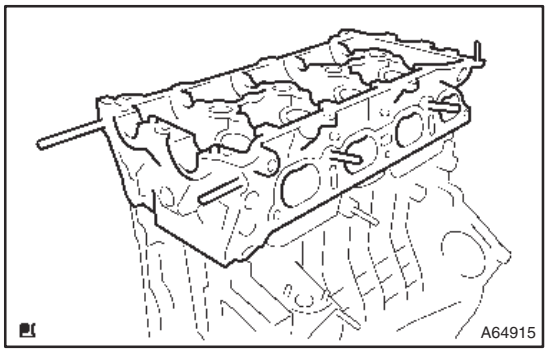
27. REMOVE CYLINDER HEAD SUB–ASSY

(a) Using a bi–hexagon wrench 10, uniformly loosen the 10 cylinder head bolts, in several passes, in the sequence shown.

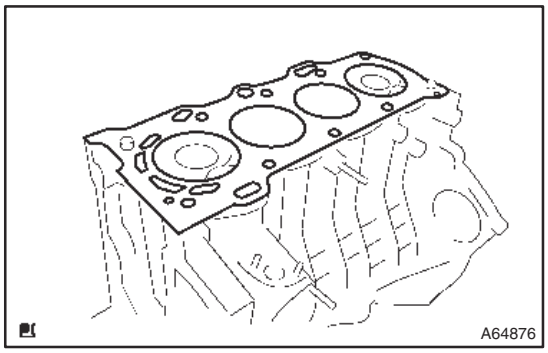
(b) Remove the 10 cylinder head bolts and 10 plate washers.

NOTICE:

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

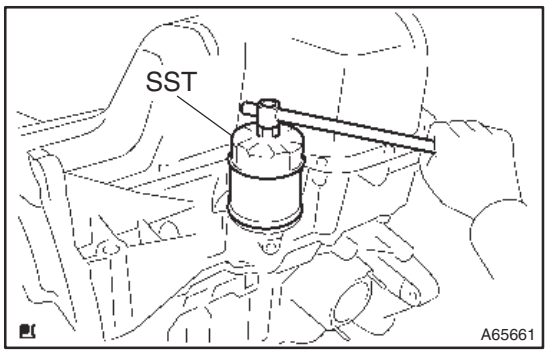


(c) Remove the cylinder head from the cylinder block.



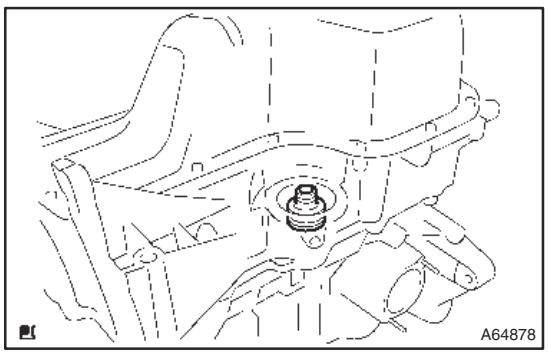
28. REMOVE CYLINDER HEAD GASKET

(a) Remove the cylinder head gasket from the cylinder block.



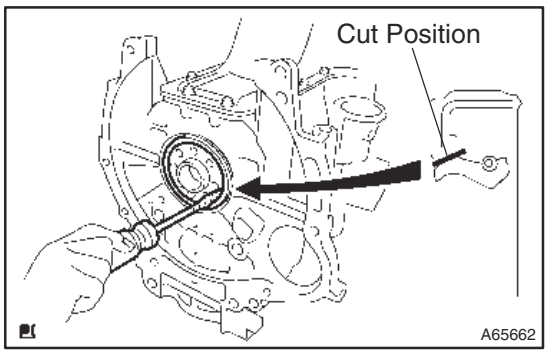
29. REMOVE OIL FILTER SUB–ASSY

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



30. REMOVE OIL FILTER UNION

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



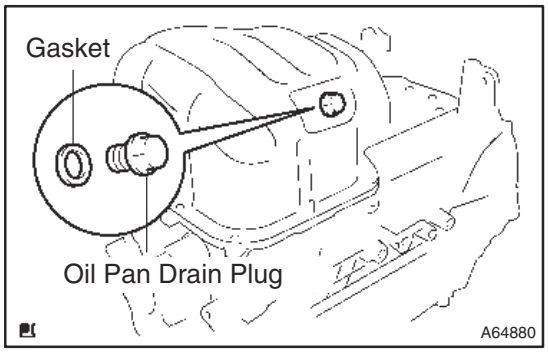
31. REMOVE ENGINE REAR OIL SEAL

(a) Using a knife, cut off the oil seal lip.

(b) Using a screwdriver with its tip taped, pry out the oil seal.

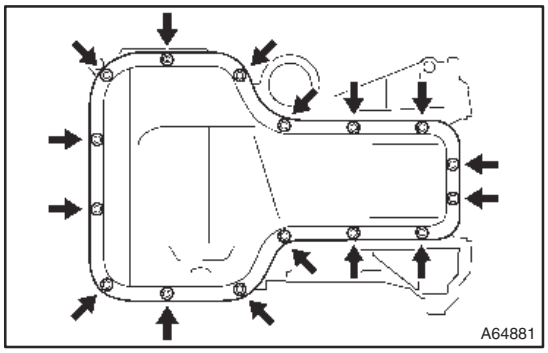
NOTICE:

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



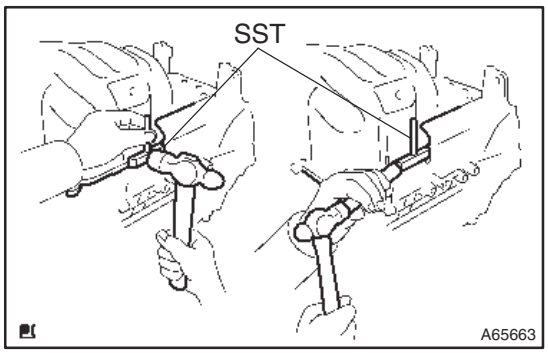
32. REMOVE OIL PAN DRAIN PLUG

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



33. REMOVE OIL PAN SUB–ASSY

(a) Remove the 14 bolts and 2 nuts.

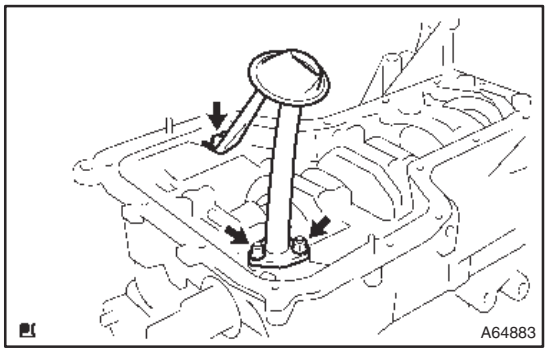


(b) Insert the blade of SST between the bearing cap and oil pan, then cut off the applied sealer and remove the oil pan.

SST 09032–00100

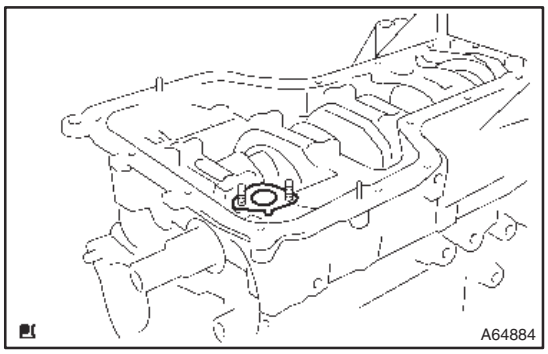
NOTICE:

Be careful not to damage the oil pan contact surface of the bearing cap and oil pan.



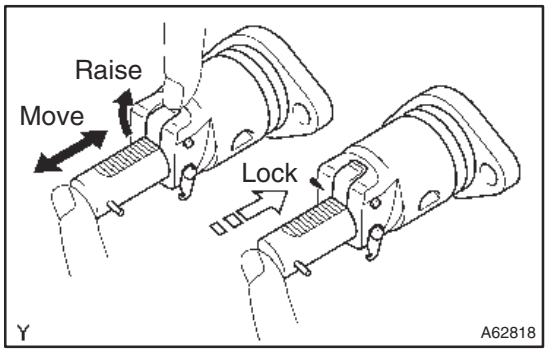
34. REMOVE OIL STRAINER SUB–ASSY

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



35. REMOVE OIL STRAINER FLANGE GASKET

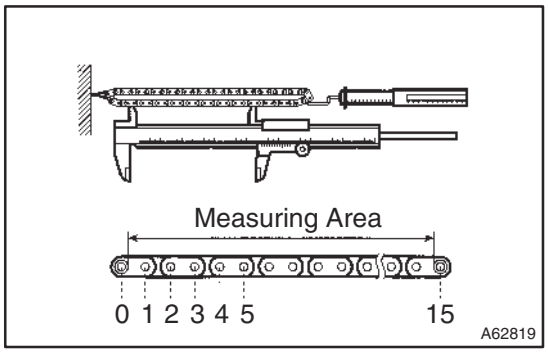
(a) Remove the oil strainer flange gasket from the cylinder block.



36. 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, then check that the plunger is locked in place by the ratchet pawl and does not move when pushed with your finger.



37. INSPECT CHAIN SUB–ASSY

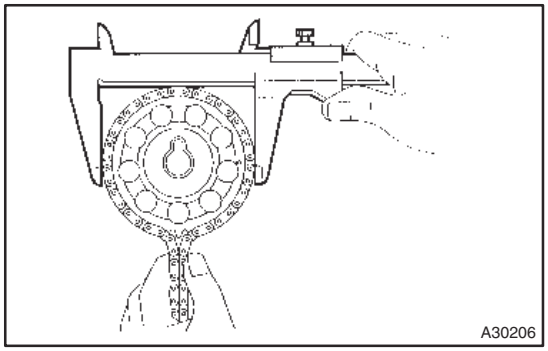
(a) Using a spring tension gauge and vernier calipers, pull the timing chain with 140 N (14.3 kgf, 31.5 lb), then measure its length.

Maximum chain elongation: 115.3 mm (4.539 in.)

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

HINT:

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



38. INSPECT CAMSHAFT TIMING GEAR OR SPROCKET

(a) Wrap the chain around the camshaft timing gear.

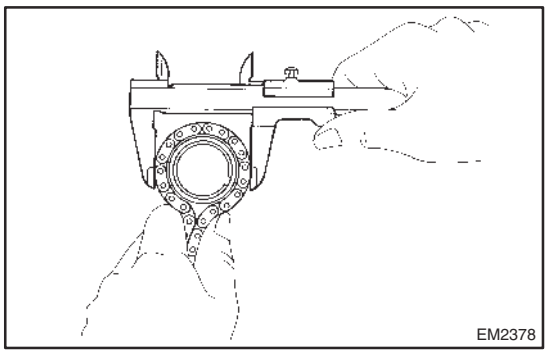
(b) Using vernier calipers, measure the camshaft timing gear diameter with the chain.

Minimum gear diameter (w/ chain): 96.8 mm (3.811 in.)

NOTICE:

Vernier calipers must be in contact with the chain rollers when measuring.

If the gear diameter is less than minimum, replace the chain and camshaft timing gear.



39. INSPECT CRANKSHAFT TIMING GEAR OR SPROCKET

(a) Wrap the chain around the crankshaft timing gear.

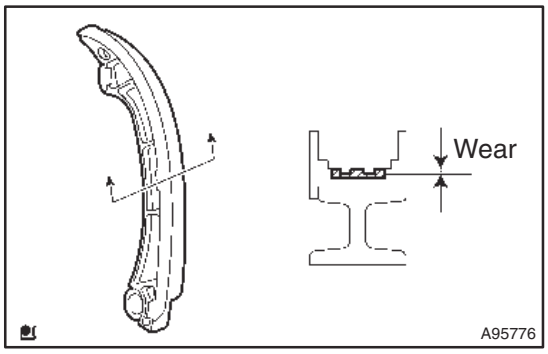
(b) Using vernier calipers, measure the crankshaft timing gear diameter with the chain.

Minimum gear diameter (w/ chain): 51.0 mm (2.008 in.)

NOTICE:

Vernier calipers must be in contact with the chain rollers when measuring

If the gear diameter is less than minimum, replace the chain and crankshaft timing gear.

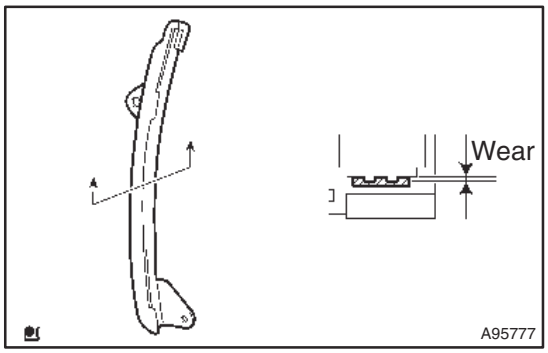


40. INSPECT CHAIN TENSIONER SLIPPER

(a) Using vernier calipers, measure the chain tensioner slipper wear.

Maximum wear: 1.0 mm (0.039 in.)

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

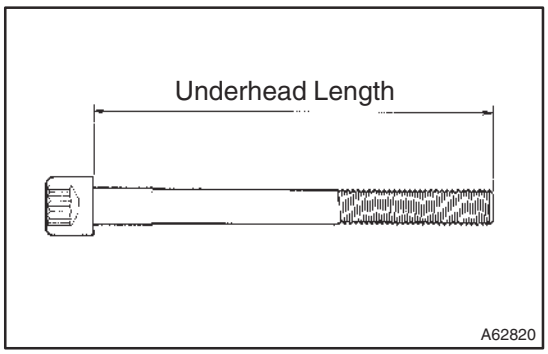


41. INSPECT CHAIN VIBRATION DAMPER NO.1

(a) Using vernier calipers, measure the vibration damper wear.

Maximum wear: 1.0 mm (0.039 in.)

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



42. INSPECT CYLINDER HEAD SET BOLT

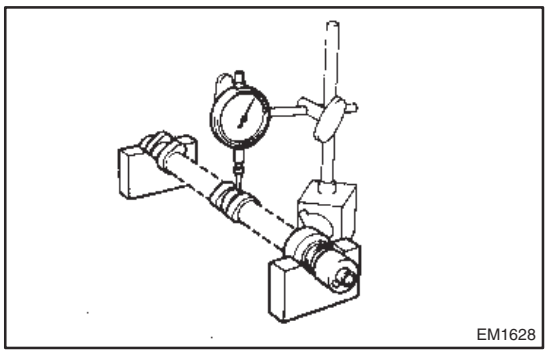
(a) Using vernier calipers, measure the length of the cylinder head bolts from the seat to end.

Standard bolt length:

146.8 to 148.2 mm (5.780 to 5.835 in.)

Maximum bolt length: 148.5 mm (5.846 in.)

If the bolt length is greater than maximum, replace the cylinder head set bolt.

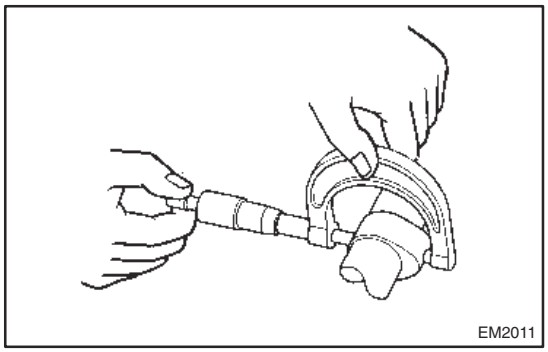


43. INSPECT CAMSHAFT

(a) Inspect the 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.)

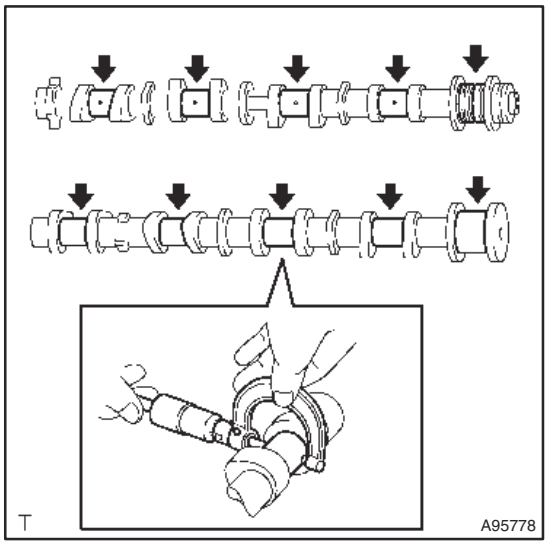
If the circle runout is greater than maximum, replace the camshaft.



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

Standard cam lobe height:
44.333 to 44.433 mm (1.7454 to 1.7493 in.) for intake
43.761 to 43.861 mm (1.7229 to 1.7268 in.) for exhaust
Minimum cam lobe height:
44.18 mm (1.7394 in.) for intake
43.61 mm (1.7169 in.) for exhaust

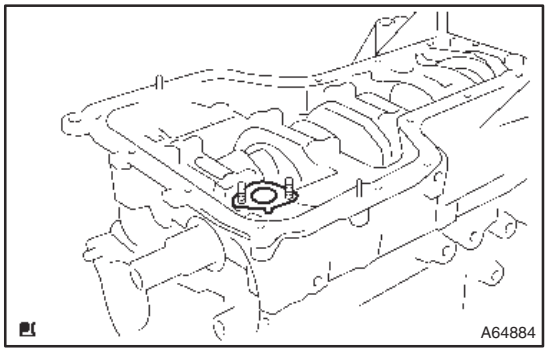
If the cam lobe height is less than minimum, replace the camshaft.



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

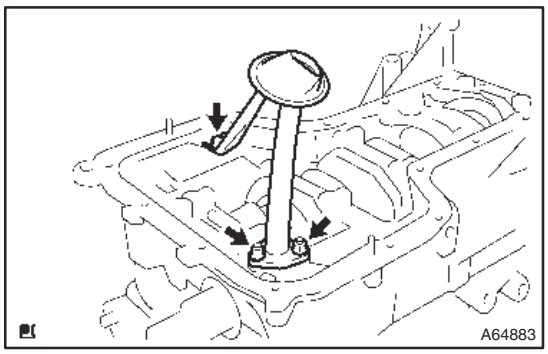
No. 1 journal diameter:
34.449 to 34.465 mm (1.3563 to 1.3569 in.)
Other journal diameter:
22.949 to 22.965 mm (0.9035 to 0.9041 in.)

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



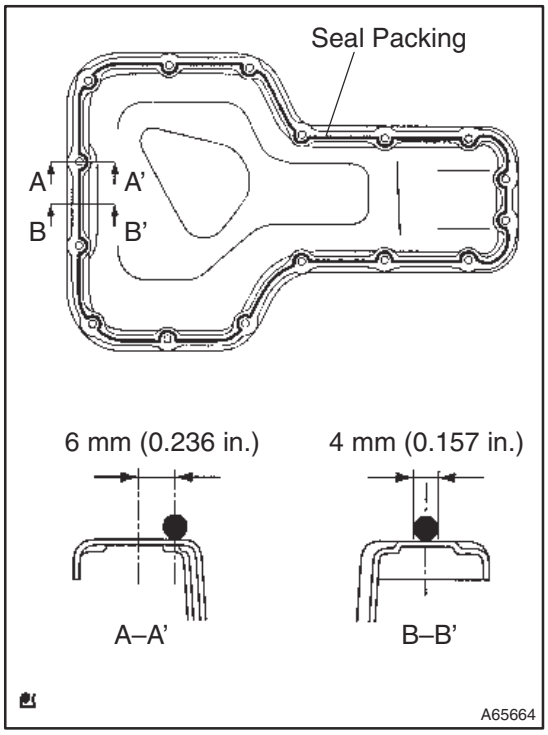
44. INSTALL OIL STRAINER FLANGE GASKET

(a) Install a new oil strainer flange gasket onto the cylinder block.



45. INSTALL OIL STRAINER SUB–ASSY

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



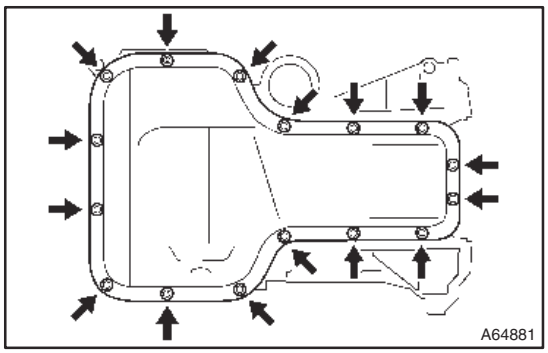
46. INSTALL OIL PAN SUB–ASSY

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

(b) Apply a continuous bead of seal packing (Diameter 3.5 to 4.5 mm (0.138 to 0.177 in.)) as shown in the illustration.
Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

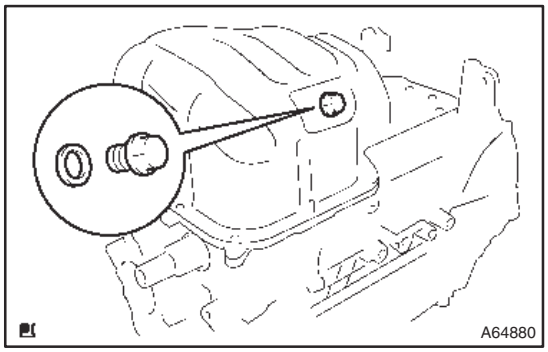
- **Remove any oil from the contact surface.**
- **Install the oil pan within 3 minutes after applying seal packing.**
- **Do not put into engine oil for at least 2 hours after installation.**



(c) Install the oil pan with the 14 bolts and 2 nuts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

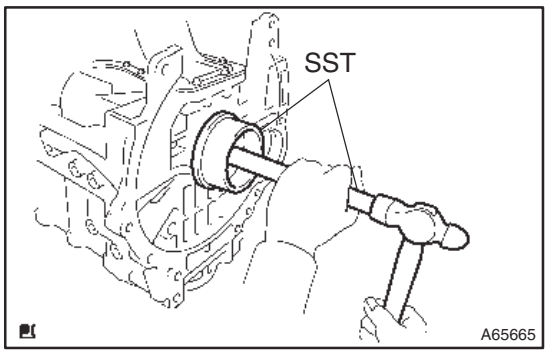
NOTICE:

- **Tighten the bolts and nuts in twice to the specified torque.**
- **Tighten bolts and nuts within 15 minutes after applying sealant (if possible within 3 minutes).**



47. INSTALL OIL PAN DRAIN PLUG

(a) Place a new gasket on the oil pan drain plug, then install it onto the oil pan.
Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)



48. INSTALL ENGINE REAR OIL SEAL

(a) Apply a light coat of multi–purpose grease to a new oil seal lip.

NOTICE:

Keep the lip free of foreign materials.

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

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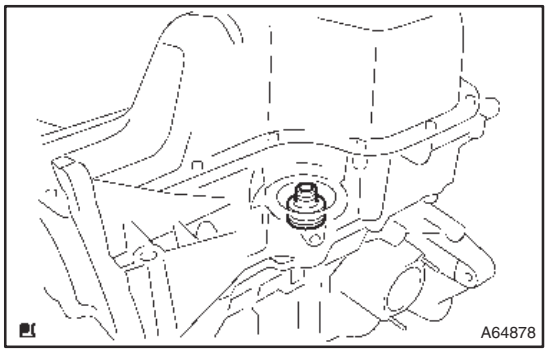
NOTICE:

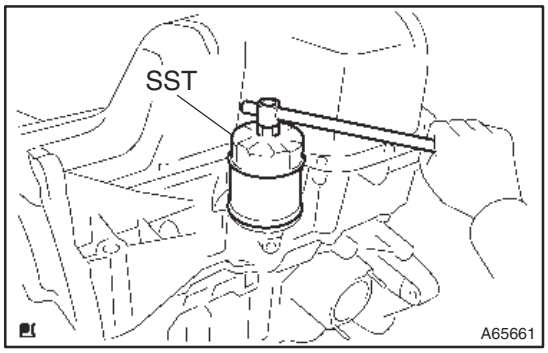
Wipe off extra grease on the crankshaft.



49. INSTALL OIL FILTER UNION

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

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



50. INSTALL OIL FILTER SUB–ASSY

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

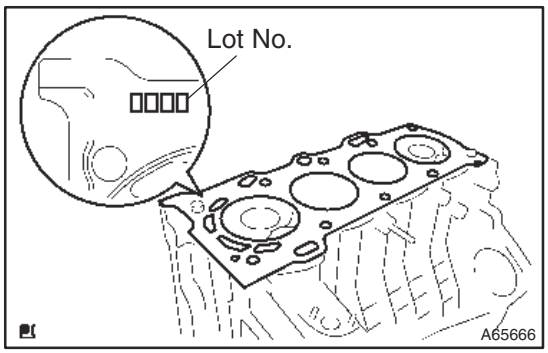
(b) Apply clean engine oil to the gasket of a new oil filter.

(c) Lightly screw the oil filter into place, then tighten it until the gasket comes into contact with the seat.

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

SST 09228–06501

Torque: 13 N·m (133 kgf·cm, 9.6 ft·lbf)

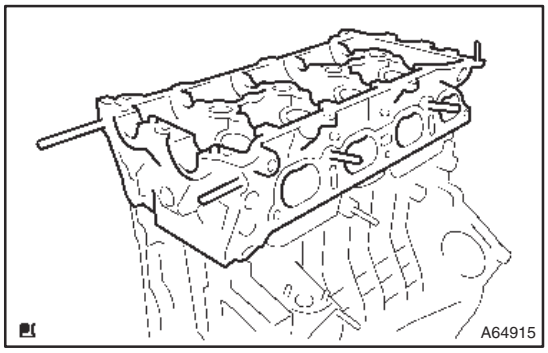


51. INSTALL CYLINDER HEAD GASKET

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

NOTICE:

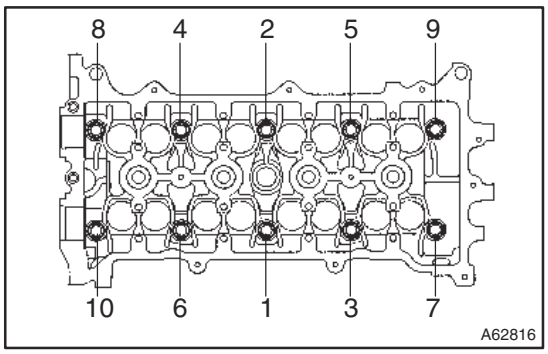
- **Pay attention to the installation direction.**
- **Place the cylinder head gently in order not to damage the gasket.**



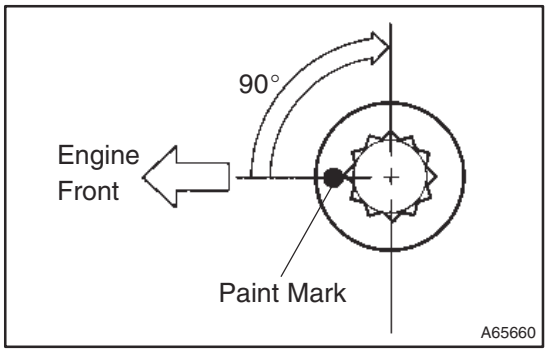
52. INSTALL CYLINDER HEAD SUB–ASSY

(a) Place the cylinder head on the cylinder block.

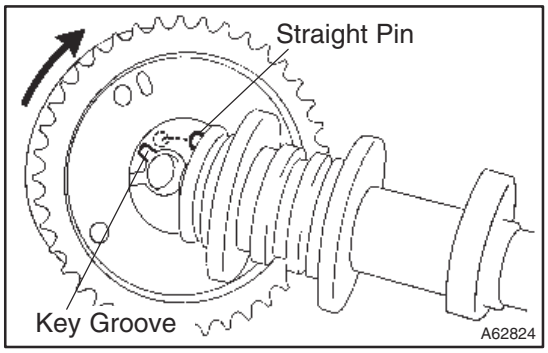
(b) Apply a light coat of engine oil to the threads and the bottom of the heads of the cylinder head bolts.



(c) Using a bi–hexagon wrench 10, install and uniformly tighten the 10 cylinder head bolts with plate washers, in several passes, in the sequence shown.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)



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

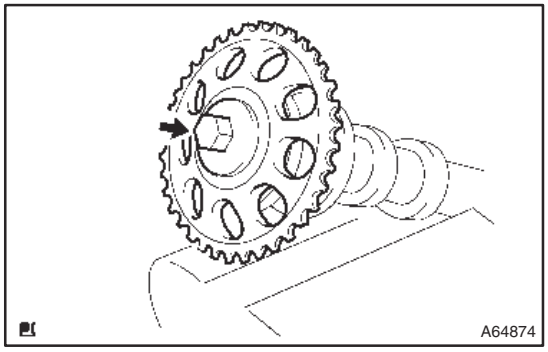


53. INSTALL CAMSHAFT TIMING GEAR ASSY

(a) Put the camshaft timing gear together with the camshaft with the straight pin off the key groove.
(b) Turn the camshaft timing gear in the left direction as shown in the illustration while pushing it lightly against the camshaft. Push the camshaft timing gear until its pin is fitted into the key.

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

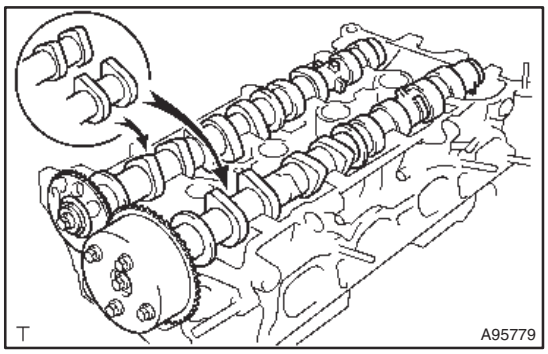
(c) Check that there is no clearance between the gear's fringe and camshaft.
(d) Tighten the fringe bolt with the camshaft timing gear fixed.
Torque: 54 N·m (551 kgf·cm 40 ft·lbf)
(e) Check that the camshaft timing gear assembly can move to the retard angle side (the right angle), and is locked at the most retarded position.



54. INSTALL CAMSHAFT TIMING GEAR OR SPROCKET

(a) Clamp the camshaft in a vise, then install the camshaft timing gear with the bolt.
Torque: 54 N·m (551 kgf·cm 40 ft·lbf)

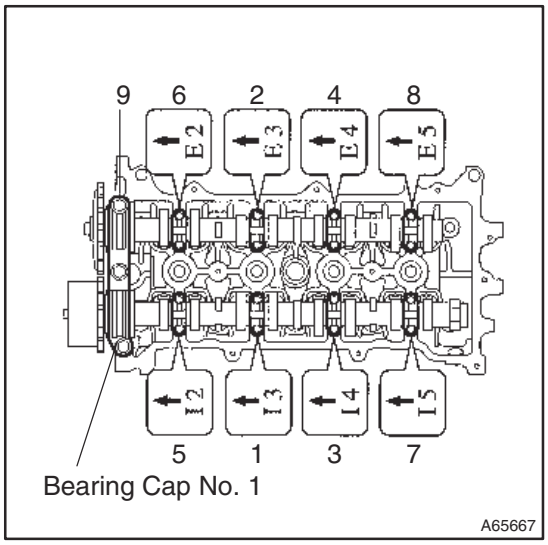
NOTICE:
Be careful not to damage the camshaft.



55. INSTALL CAMSHAFT

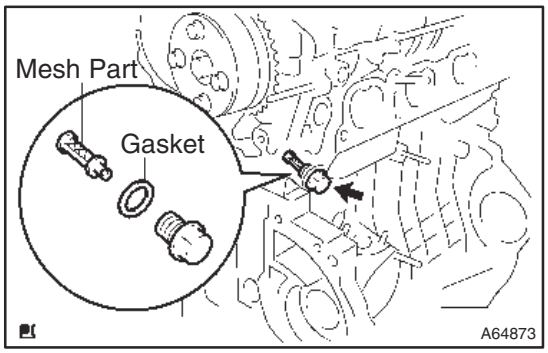
(a) Apply a light coat of engine oil to the camshaft journals.

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



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

Torque:
23 N·m (235 kgf·cm, 17 ft·lbf) for bearing cap No. 1
13 N·m (133 kgf·cm, 10 ft·lbf) for the other bearing caps

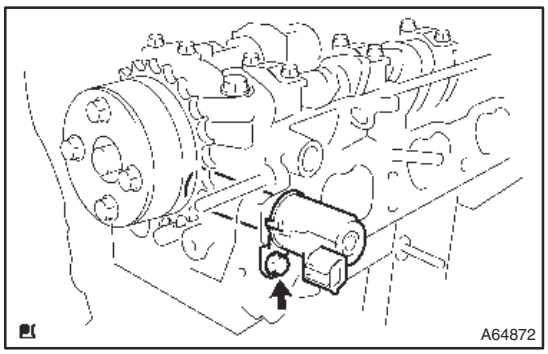


56. INSTALL OIL CONTROL VALVE FILTER

(a) Check that there is no foreign objects on the mesh part of the oil control valve filter.

(b) Install a new gasket and the oil control valve filter onto the bolt, then install it.

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



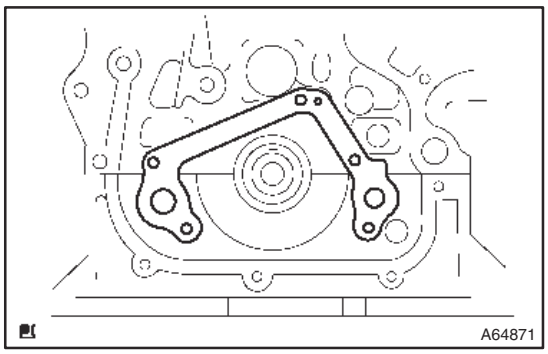
57. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSY

(a) Apply a light coat of engine oil to a new O–ring, then install it onto the camshaft timing oil control valve.

(b) Install the camshaft timing oil control valve with the bolt.

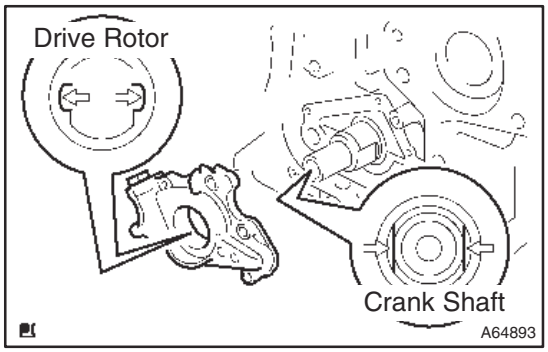
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

NOTICE:
Be careful not to twist the O–ring.



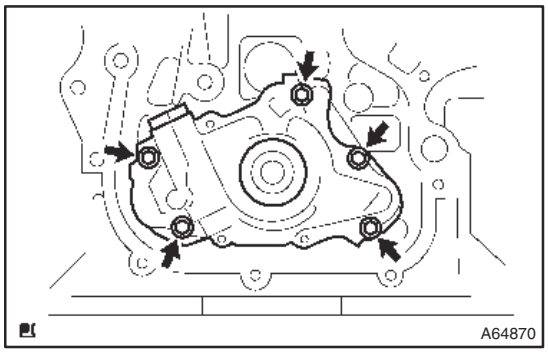
58. INSTALL OIL PUMP GASKET

(a) Install a new gasket onto the cylinder block.

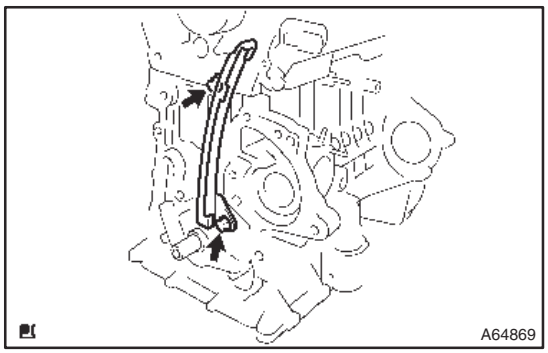


59. INSTALL OIL PUMP ASSY

(a) Align the spline teeth of the oil pump drive rotor with the large teeth of the crankshaft, then slide the oil pump.

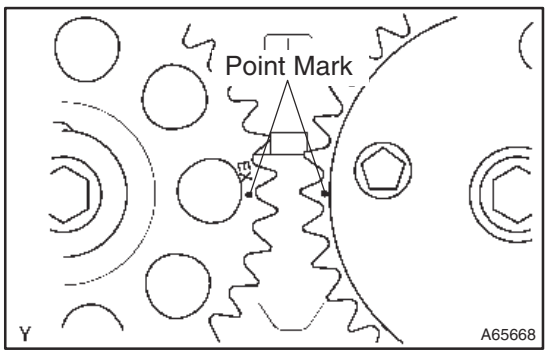


(b) Install the oil pump with the 5 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



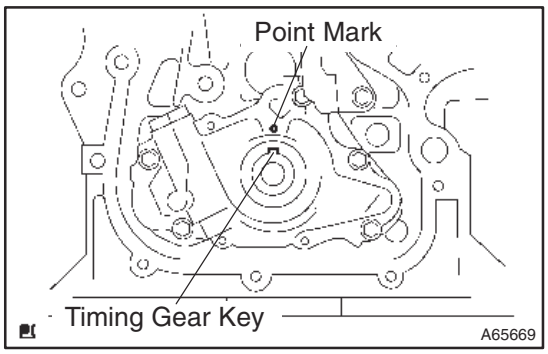
60. INSTALL CHAIN VIBRATION DAMPER NO.1

(a) Install chain vibration damper No. 1 with the 2 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

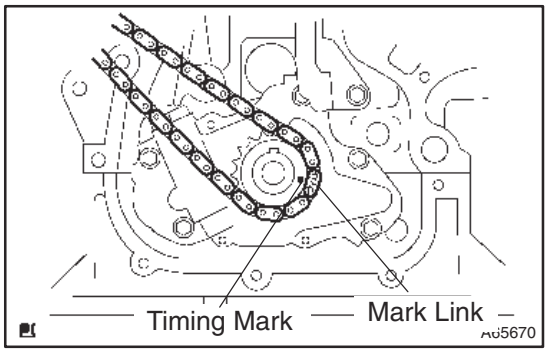


61. INSTALL CHAIN SUB–ASSY

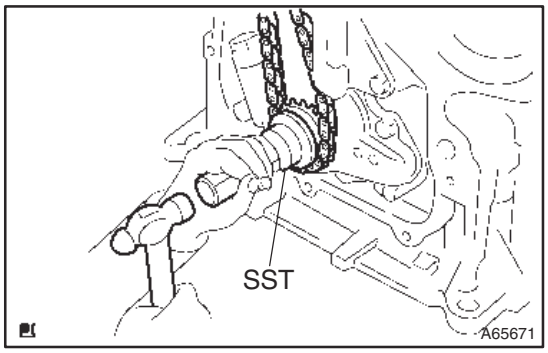
(a) Set No. 1 cylinder to the TDC/compression.
(1) Turn the hexagonal wrench head portion of the camshafts until the point marks of the camshaft timing gears are aligned.



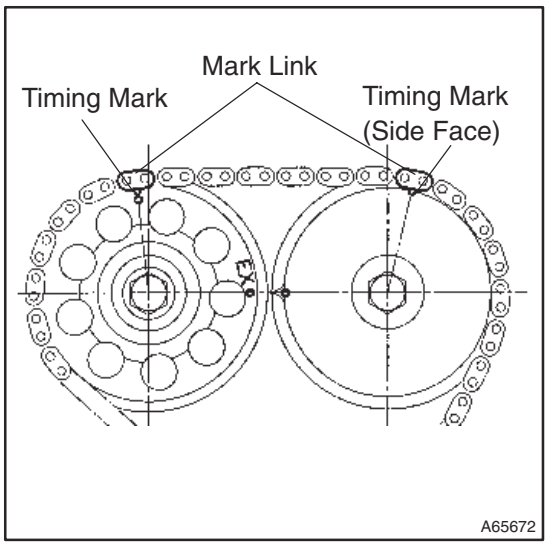
(2) Using a crankshaft pulley bolt, turn the crankshaft to align the timing gear key with the point mark on the oil pump.



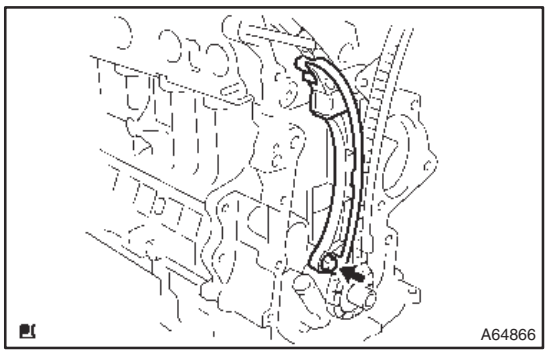
(b) Install the chain onto the crankshaft timing gear with the yellow mark link aligned with the timing mark on the crankshaft timing gear.



(c) Using SST, install the crankshaft timing gear.
SST 09223–22010

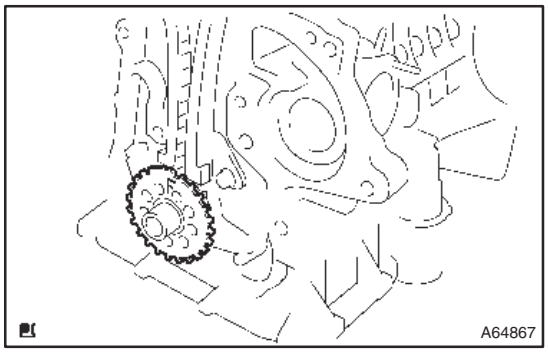


(d) Install the chain onto the camshaft timing gears with the yellow mark links aligned with the timing marks on the camshaft timing gears.



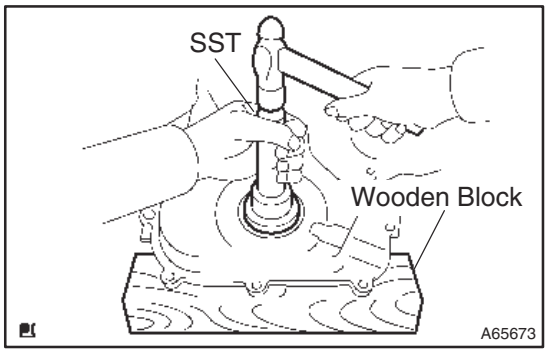
62. INSTALL CHAIN TENSIONER SLIPPER

(a) Install the chain tensioner slipper with the bolt.
Torque: 19 N·m (189 kgf·cm, 14 ft·lbf)



63. INSTALL CRANKSHAFT POSITION SENSOR PLATE NO.1

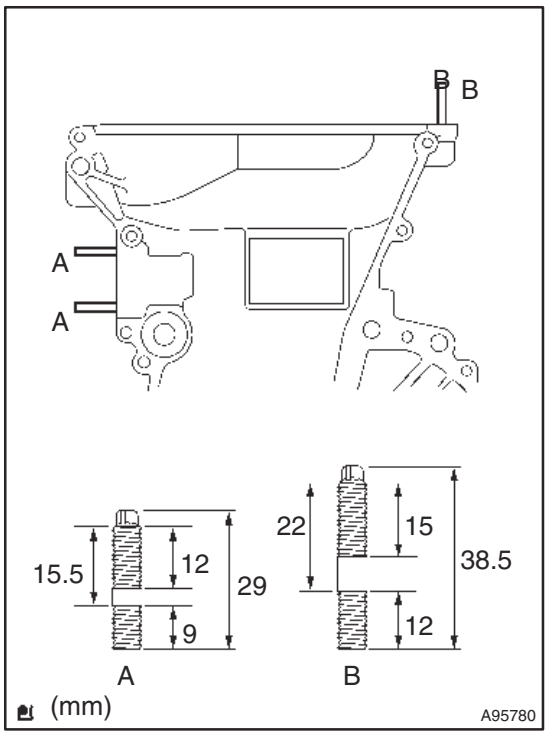
(a) Install the crankshaft position sensor plate with the ”F” mark facing forward.



64. INSTALL TIMING CHAIN OR BELT COVER OIL SEAL

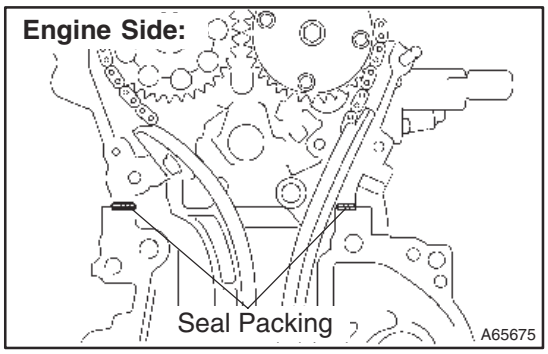
(a) Apply a light coat of multi–purpose grease to a new oil seal lip.
(b) Place the timing chain cover on wooden blocks.
(c) Using SST, tap in the new oil seal until its surface is flush with the timing chain cover edge.
SST 09223–22010

NOTICE:
Keep the lip free of foreign objects.



65. INSTALL TIMING CHAIN OR BELT COVER SUB–ASSY

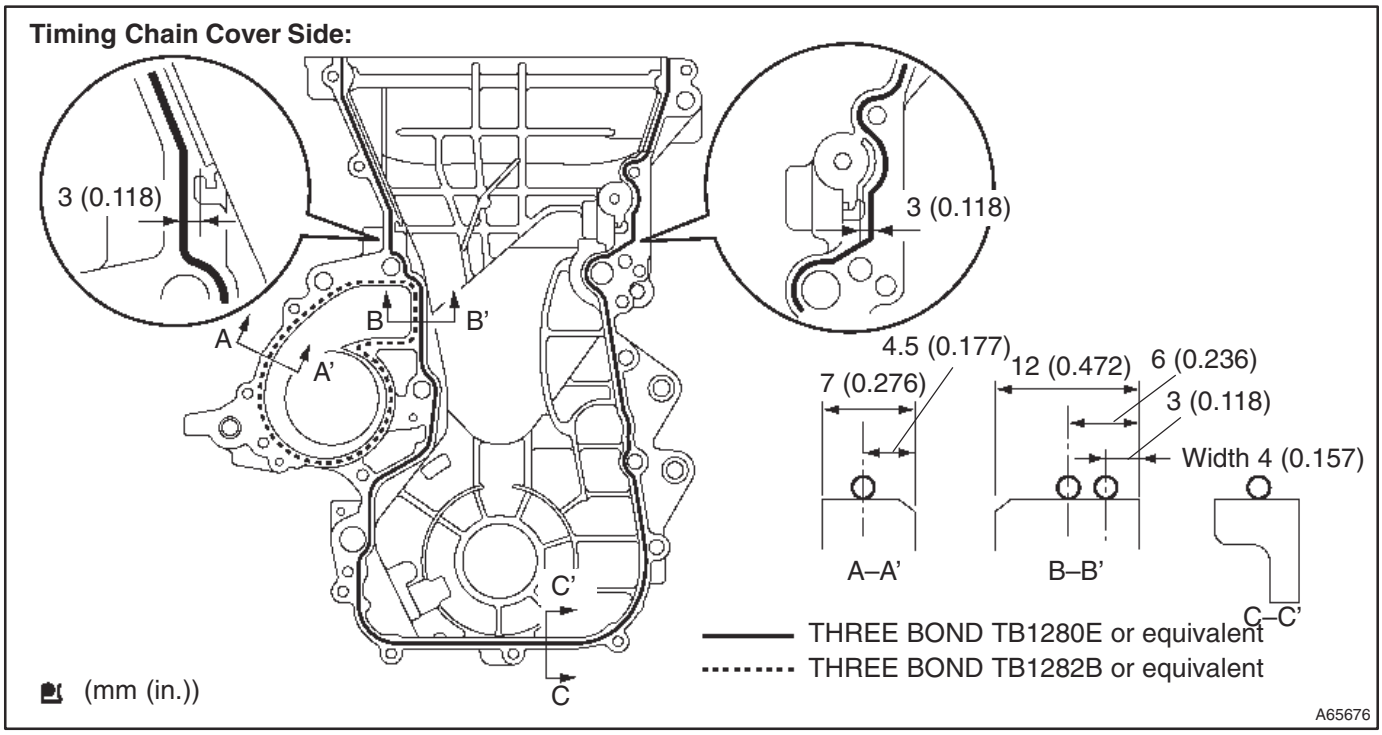
(a) Remove any old packing material from the contact surface.
(b) Using a Torx socket wrench E5, install the 3 stud bolts.
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

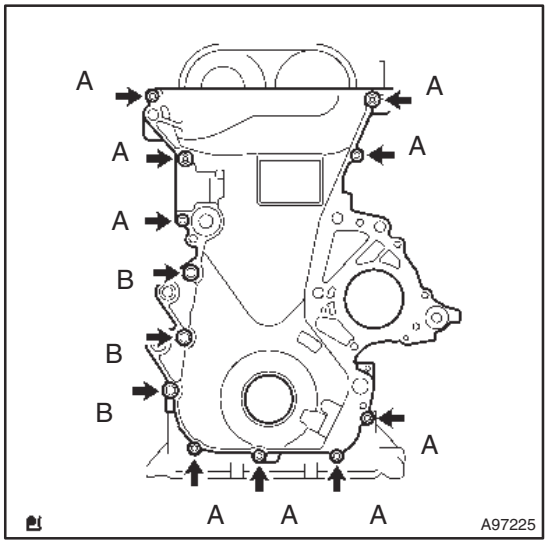


(c) Apply a continuous bead of seal packing (Diameter; 3.5 to 4.5 mm (0.138 to 0.177 in.)) as shown in the illustration.
Seal packing:
Water pump part: THREE BOND TB1282B or equivalent
Other part: THREE BOND TB1280E or equivalent

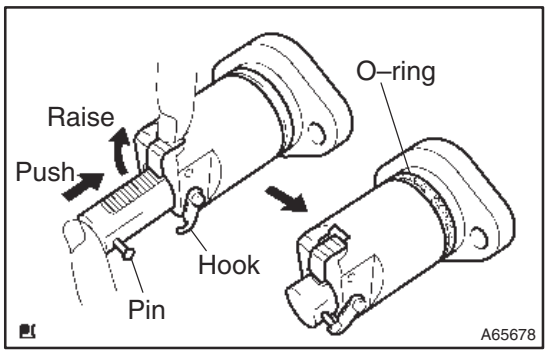
NOTICE:

- **Remove any oil from the contact surface.**
- **Install the chain cover within 3 minutes after applying seal packing.**
- **Do not put into engine oil for at least 2 hours after installation.**
- **Be careful to only apply the specified thickness/volume of seal packing.**





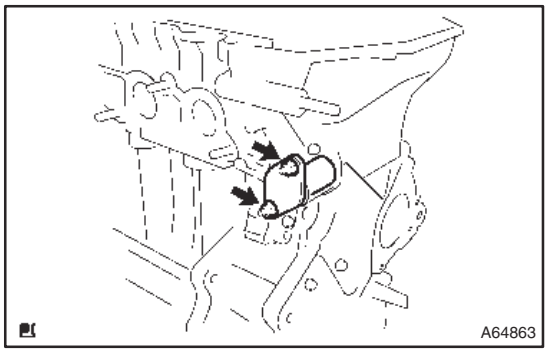
(d) Install the timing chain cover with the 10 bolts and 2 nuts.
Torque:
13 N·m (133 kgf·cm, 10 ft·lbf) for A
19 N·m (189 kgf·cm, 14 ft·lbf) for B



66. INSTALL CHAIN TENSIONER ASSY NO.1

(a) Check that the O–ring is clean, then set the hook as shown in the illustration.

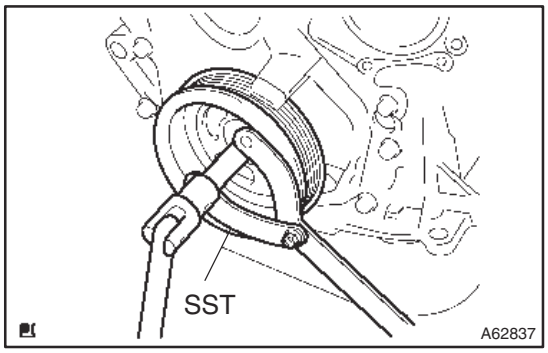
(b) Apply a light coat of engine oil to the O–ring.



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

NOTICE:

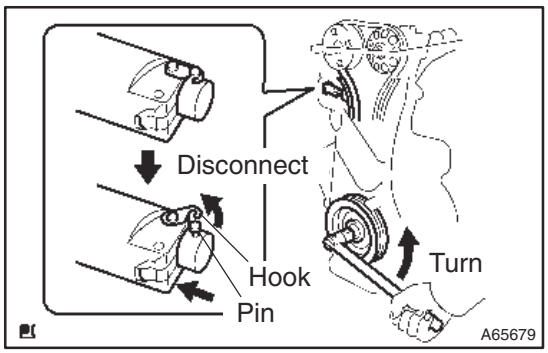
- **Be careful not to twist the O–ring.**
- **When installing the chain tensioner, reset the hook if the hook releases the plunger.**



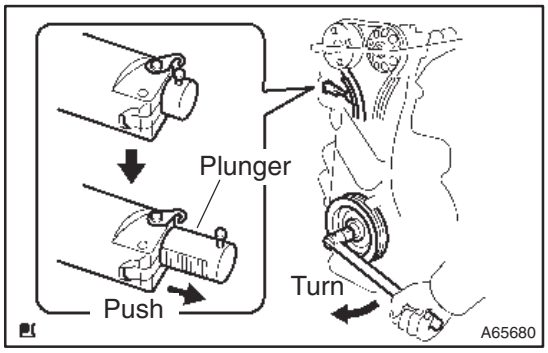
67. INSTALL CRANKSHAFT PULLEY

(a) Align the pulley set key with the key groove of the crankshaft pulley, then slide it on the crankshaft pulley.

(b) Using SST, install the crankshaft pulley bolt.
SST 09960–10010 (09962–01000, 09963–01000)
Torque: 138 N·m (1,407 kgf·cm, 102 ft·lbf)



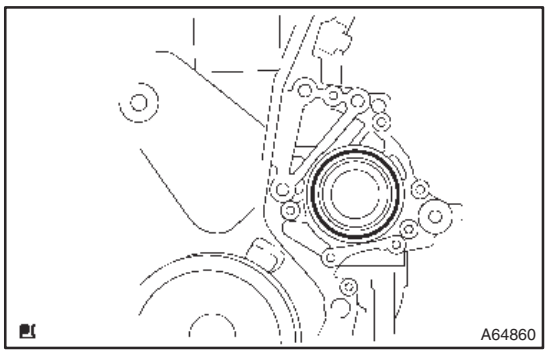
(c) Turn the crankshaft counterclockwise, then disconnect the plunger knock pin from the hook.



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

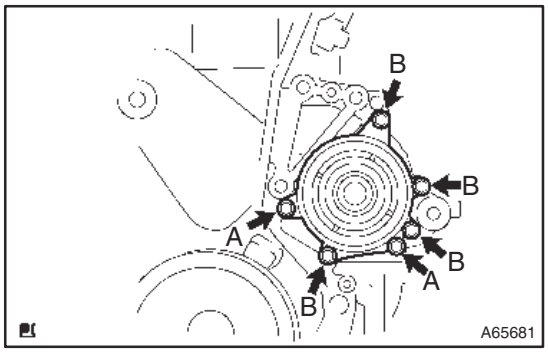
HINT:

If the plunger is not extended, press the slipper into the chain tensioner using a screwdriver so that the hook is taken from the knock pin and that the plunger can be extended.



68. INSTALL WATER PUMP O–RING

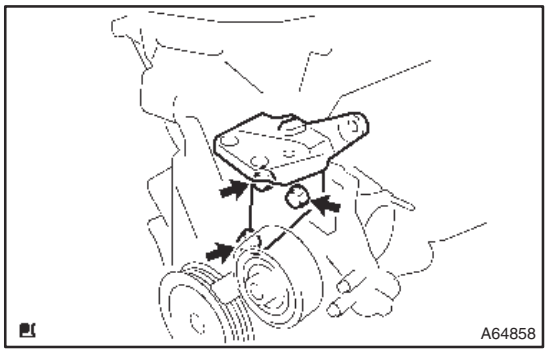
(a) Install a new water pump O–ring onto the timing chain cover.



69. INSTALL WATER PUMP ASSY

(a) Install the water pump with the 6 bolts.

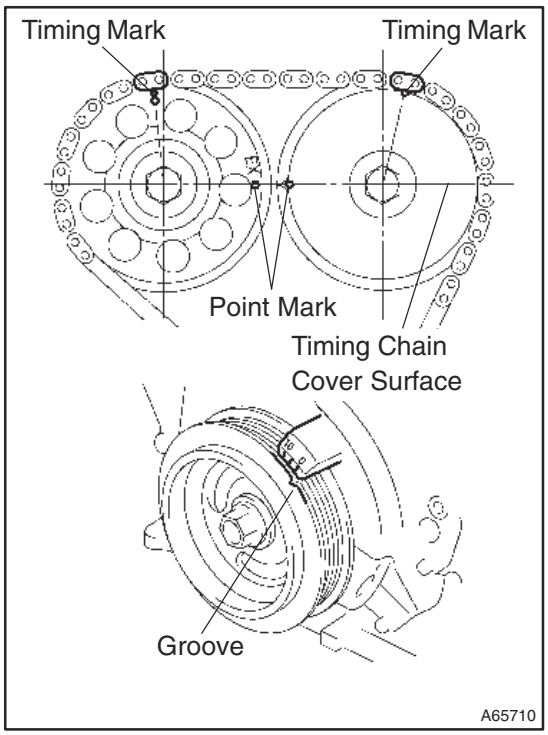
Torque:
9.0 N·m (92 kgf·cm, 80 in·lbf) for bolt A
11 N·m (112 kgf·cm, 8 ft·lbf) for bolt B



70. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

(a) Install the transverse engine engine mounting bracket with the 3 bolts.

Torque: 47 N·m (479 kgf·cm, 35 ft·lbf)

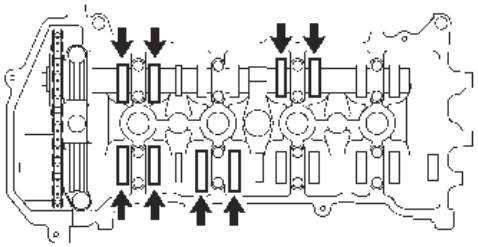


71. INSPECT VALVE CLEARANCE

(a) Set the No. 1 cylinder to the TDC/compression.
  (1) Turn the crankshaft pulley until the groove is aligned with the timing mark ”0” of the timing chain cover.
  (2) Check that the point marks of the camshaft timing gears are in a straight line on the timing chain cover surface as shown in the illustration.

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

No. 1 Cylinder TDC/Compression:



A65682

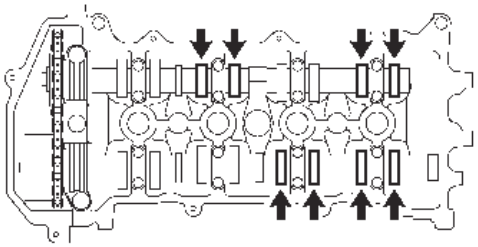
(b) Check the valves indicated with arrow.
(1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
(2) Record the out–of–specification valve clearance measurements. They will be used later to determine the required replacement valve lifters.

Valve clearance (Cold):
0.15 to 0.25 mm (0.0059 to 0.0098 in.) for intake
0.25 to 0.35 mm (0.0098 to 0.0138 in.) for exhaust

If the valve clearance is not as specified, replace the valve lifters.

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

No. 4 Cylinder TDC/Compression:

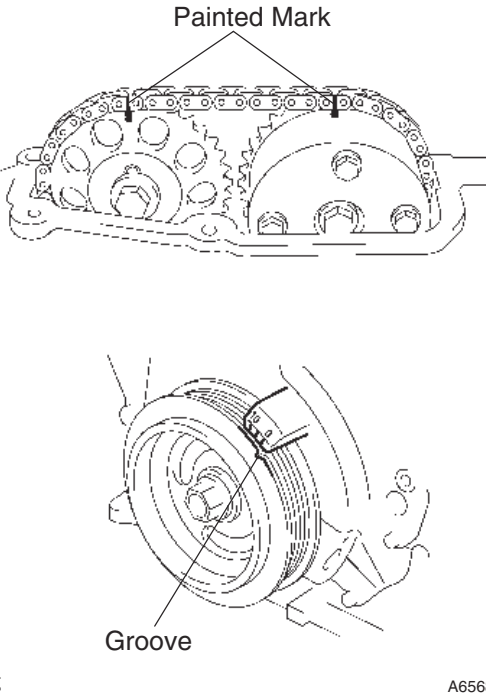


A65683

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

Valve clearance (Cold):
0.15 to 0.25 mm (0.0059 to 0.0098 in.) for intake
0.25 to 0.35 mm (0.0098 to 0.0138 in.) for exhaust

If the valve clearance is not as specified, replace the valve lifters.

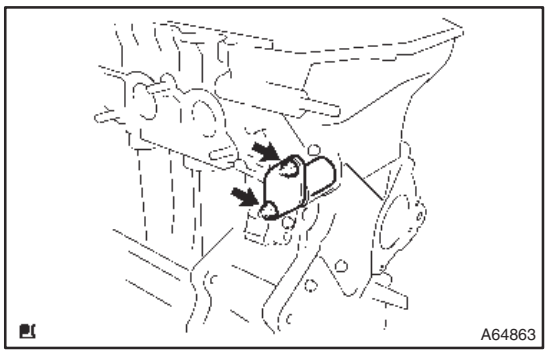


A65684

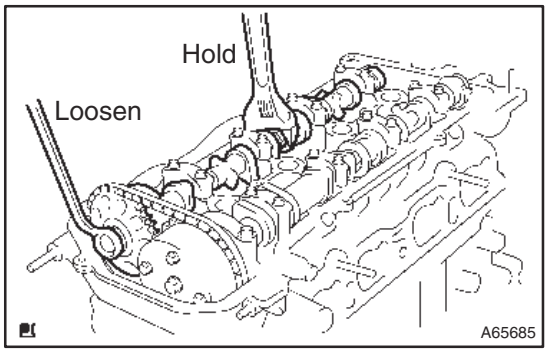
72. ADJUST VALVE CLEARANCE

NOTICE:
Be sure not to revolve the crankshaft without the chain tensioner.

(a) Set the No. 1 cylinder to the TDC/compression.
(b) Place painted marks on the chain and camshaft timing gears.

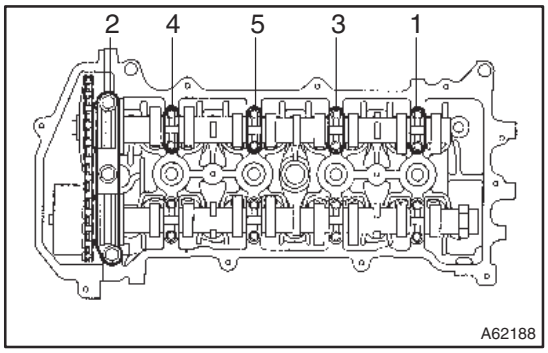


(c) Remove the 2 nuts and chain tensioner.

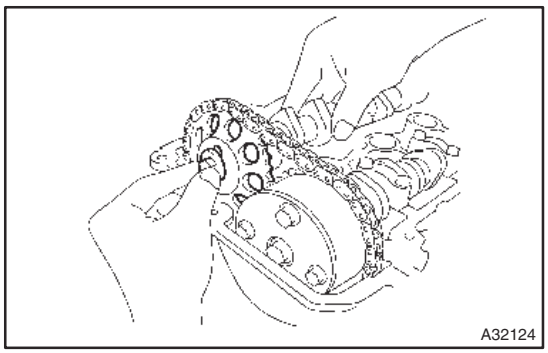


(d) Hold the camshaft with a wrench and so on, then loosen the camshaft timing gear set bolt.

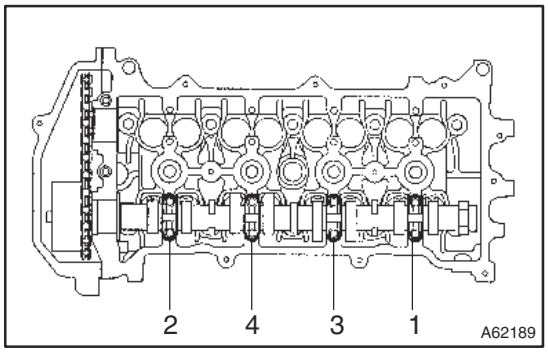
NOTICE:
Be careful not to damage the valve lifter.



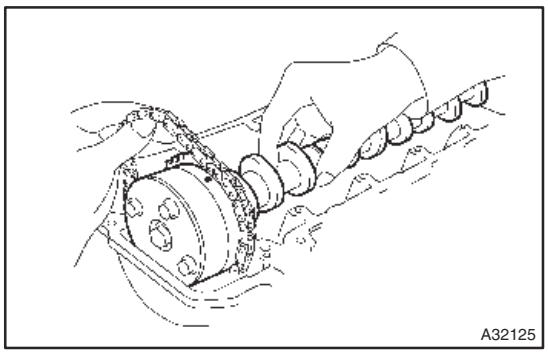
(e) Loosen the bearing cap bolts on the No. 2 camshaft in the order as shown in the illustration, in several passes, then remove the bearing caps.



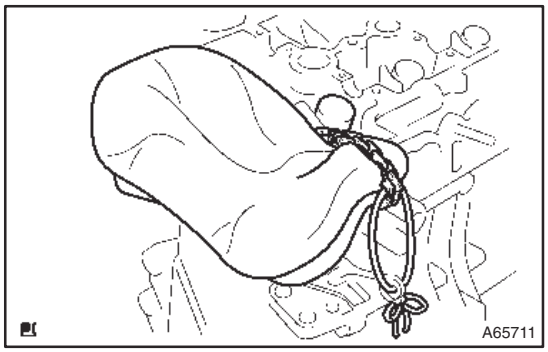
(f) Remove the camshaft timing gear as shown in the illustration.



(g) Loosen the bearing cap bolts on the camshaft in the order as shown in the illustration, in several passes, then remove the bearing caps.



(h) Remove the camshaft while holding the chain.

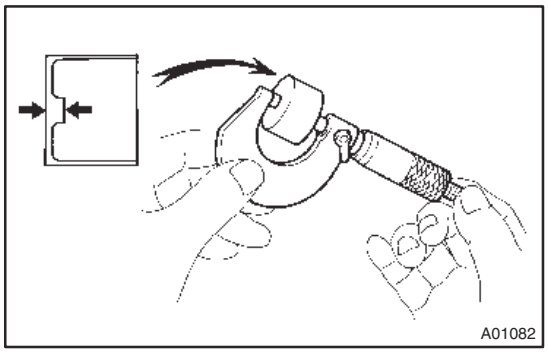


(i) Tie the chain with a string as shown in the illustration.

NOTICE:

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

(j) Remove the valve lifters.



(k) Using a micrometer, measure the thickness of the removed valve lifters.

(l) 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

Valve clearance:
Intake A = B + (C – 0.20 mm (0.0079 in.))
Exhaust A = B + (C – 0.30 mm (0.0118 in.))

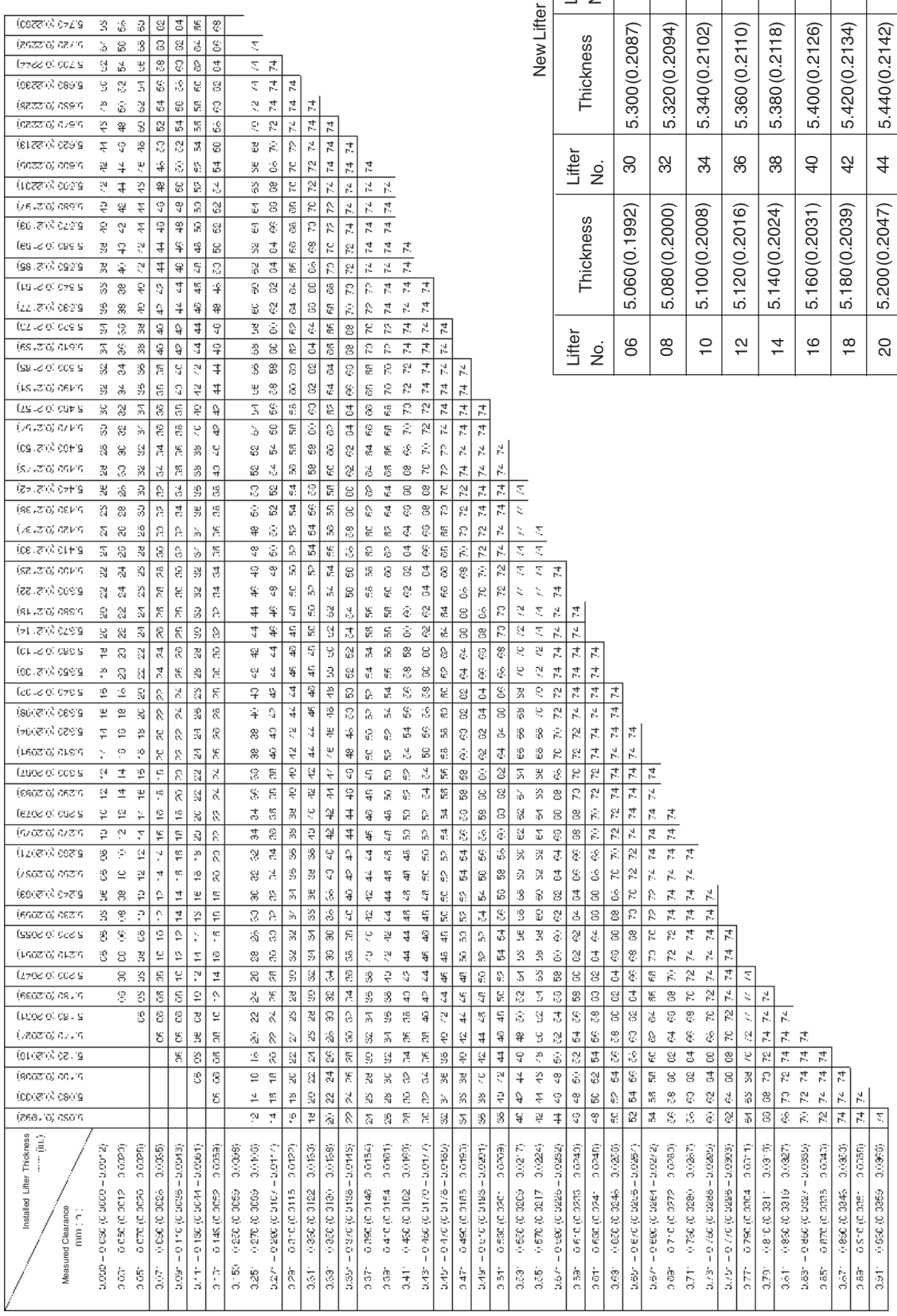
Example (Intake):
Measured intake valve clearance = 0.40 mm (0.0158 in.)
0.40 mm (0.0158 in.) – 0.20 mm (0.0079 in.) = 0.20 mm (0.0079 in.)
(Measured – Specification = Excess clearance)
Used lifter measurement = 5.250 mm (0.2067 in.)
0.20 mm (0.0079 in.) + 5.250 mm (0.2067 in.) = 5.450 mm (0.2146 in.)
(Excess clearance + Used lifter = Ideal new lifter)
Closest new lifter = 5.460 mm (0.2150 in.)
Select No. 46 lifter

HINT:

- Select a new lifter with a thickness as close to the calculated values as possible.
- Lifter are available in 35 sizes in increments of 0.020 mm (0.0008 in.), from 5.060 mm (0.1992 in.) to 5.740 mm (0.2260 in.).
- Refer to the New Lifter Thickness Table on the next 2 pages.

A79322

Valve Lifter Selection Chart (Intake)



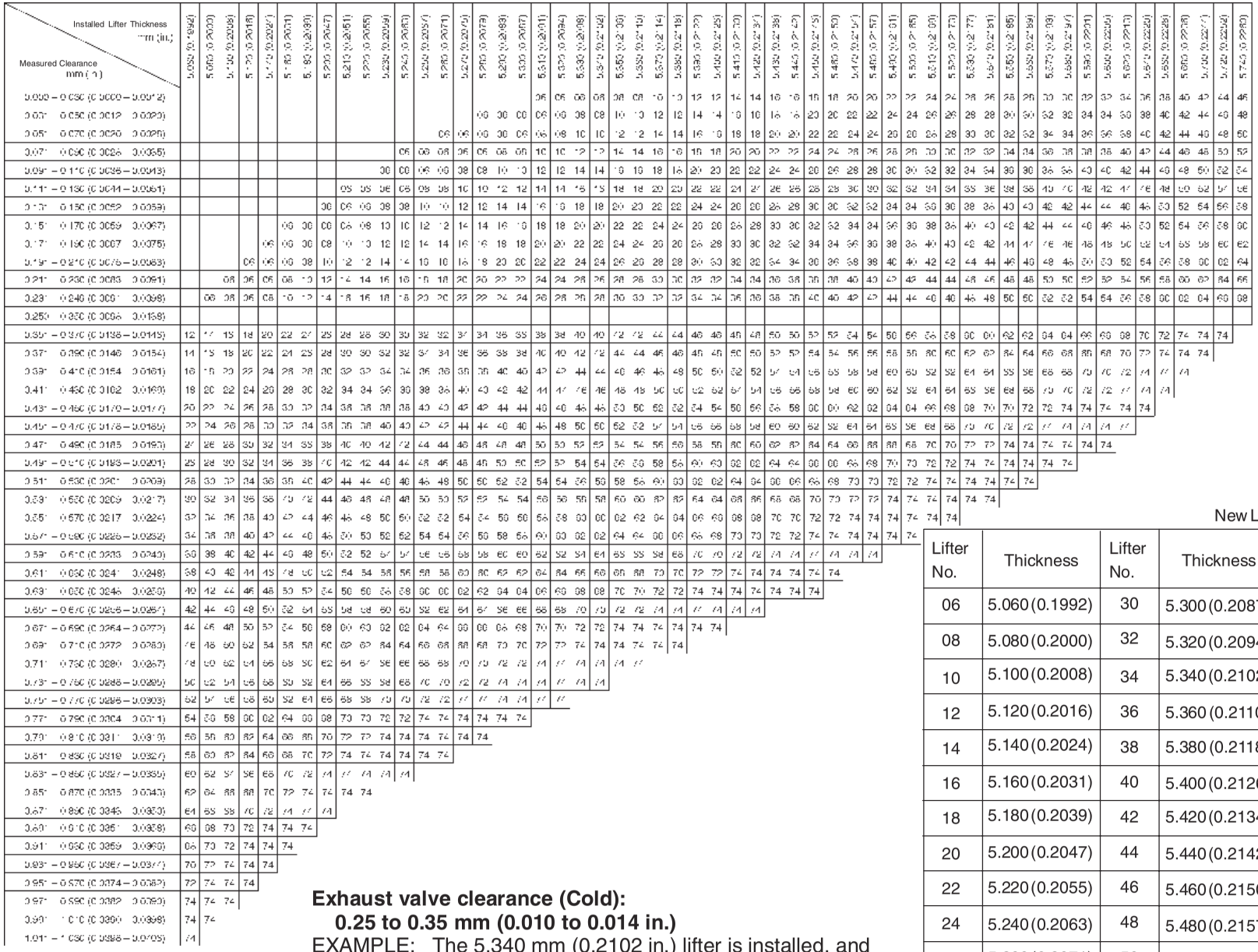
New Lifter Thickness mm (in.)

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

Intake valve clearance (Cold):
0.15 to 0.25 mm (0.006 to 0.010 in.)
EXAMPLE: The 5.250 mm (0.2067 in.) lifter is installed, and the measured clearance is 0.400 mm (0.0157 in.).
Replace the 5.250 mm (0.2067 in.) lifter with a new No. 46 lifter.

A96652

Valve Lifter Selection Chart (Exhaust)

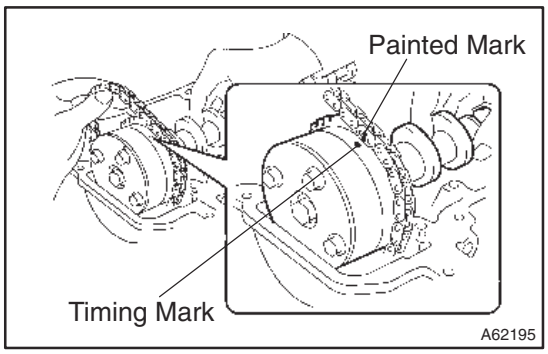


Exhaust valve clearance (Cold):
0.25 to 0.35 mm (0.010 to 0.014 in.)

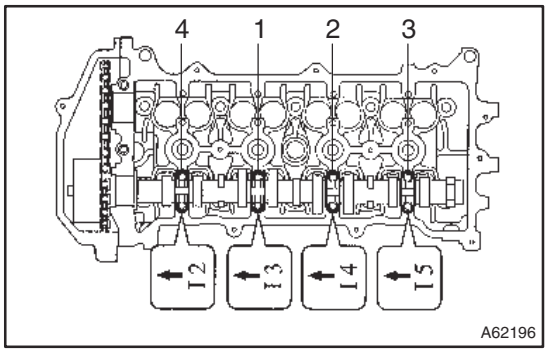
EXAMPLE: The 5.340 mm (0.2102 in.) lifter is installed, and the measured clearance is 0.440 mm (0.0173 in.).
Replace the 5.340 mm (0.2102 in.) lifter with a new No. 48 lifter.

New Lifter Thickness mm (in.)

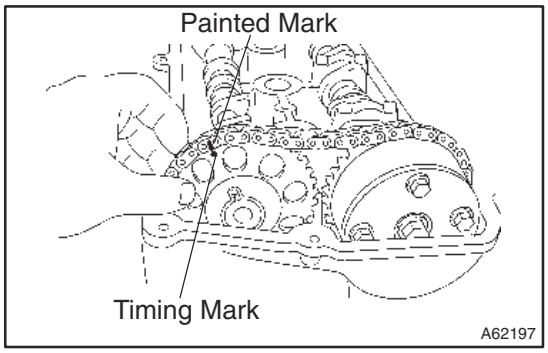
Lifter No.	Thickness	Lifter No.	Thickness	Lifter No.	Thickness
06	5.060 (0.1992)	30	5.300 (0.2087)	54	5.540 (0.2181)
08	5.080 (0.2000)	32	5.320 (0.2094)	56	5.560 (0.2189)
10	5.100 (0.2008)	34	5.340 (0.2102)	58	5.580 (0.2197)
12	5.120 (0.2016)	36	5.360 (0.2110)	60	5.600 (0.2205)
14	5.140 (0.2024)	38	5.380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



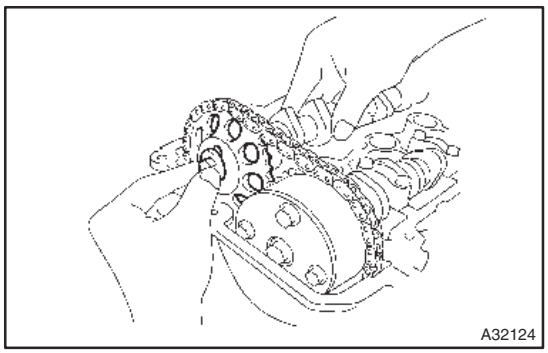
(m) As shown in the illustration, install the chain onto the camshaft timing gear with the painted mark aligned with the timing mark on the camshaft timing gear.



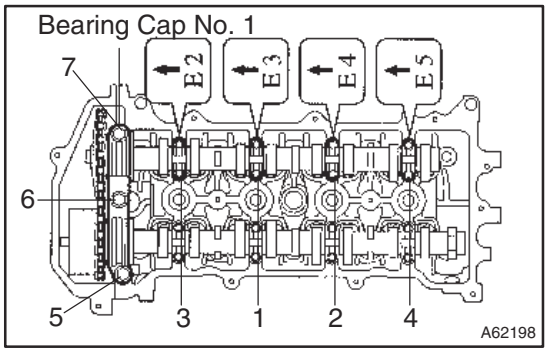
(n) Examine the front marks and numbers, then tighten the bolts in the order shown in the illustration.
Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)



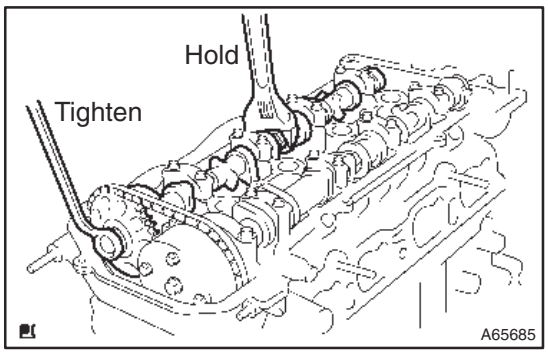
(o) Put the camshaft No. 2 on the cylinder head with the painted mark of the chain aligned with the timing mark on the camshaft timing gear.



(p) Tighten the set bolt temporarily while raising the camshaft.



(q) Examine the front marks and numbers, then tighten the bolts in the order shown in the illustration.
Torque:
23 N·m (235 kgf·cm, 17 ft·lbf) for bearing cap No. 1
13 N·m (133 kgf·cm, 10 ft·lbf) for the other bearing caps.

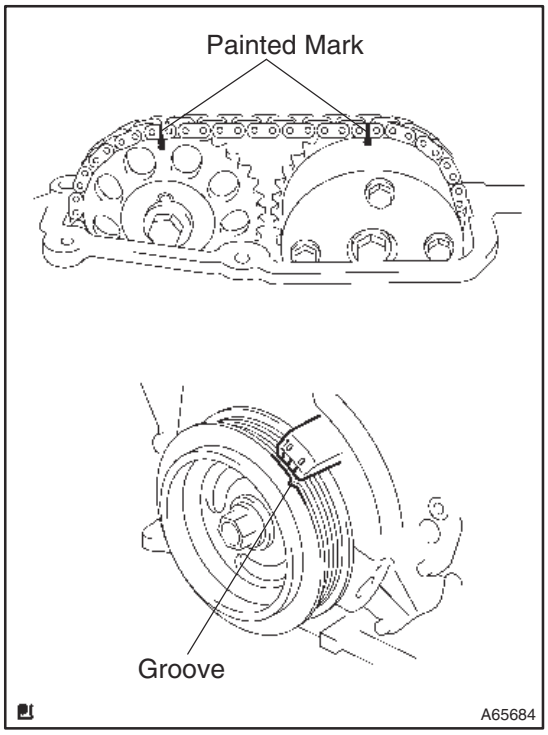


(r) Hold the camshaft with a wrench and so on, then tighten the camshaft timing gear set bolt.

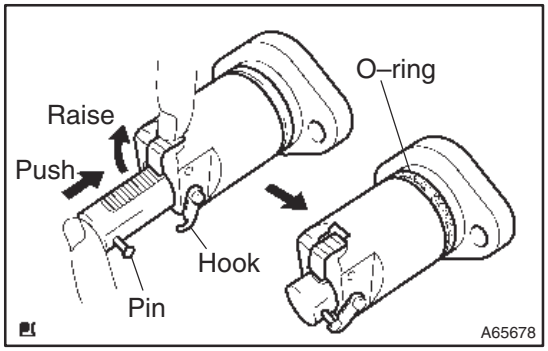
Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)

NOTICE:

Be careful not to damage the valve lifter.



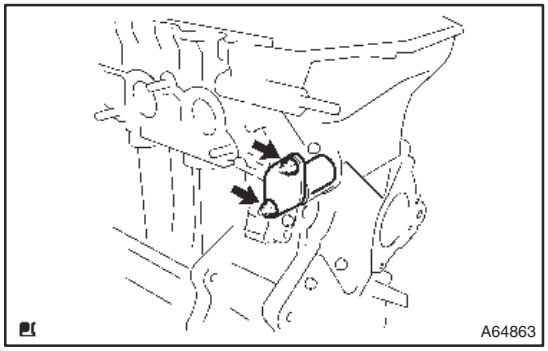
(s) Check the painted marks on the chain and camshaft timing gears, and that the camshaft pulley groove is aligned with the timing mark ”0” of the timing chain cover.



(t) Check the chain tensioner.

(1) Check that the O–ring is clean, then set the hook as shown in the illustration.

(2) Apply a light coat of engine oil to the O–ring.

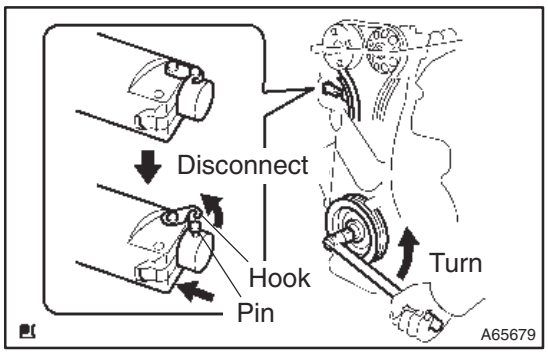


(3) Install the chain tensioner with the 2 nuts.

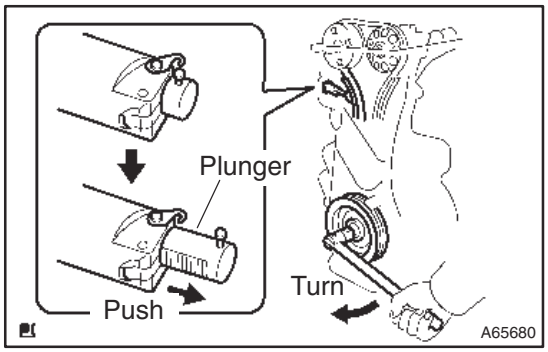
Torque: 9.0 N·m (92 kgf·cm, 80 in·lbf)

NOTICE:

- **Be careful not to twist the O–ring.**
- **When installing the tensioner, reset the hook if the hook releases the plunger.**

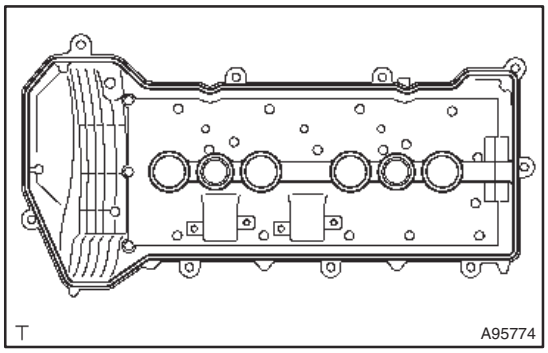


(4) Turn the crankshaft counterclockwise, then disconnect the plunger knock pin from the hook.



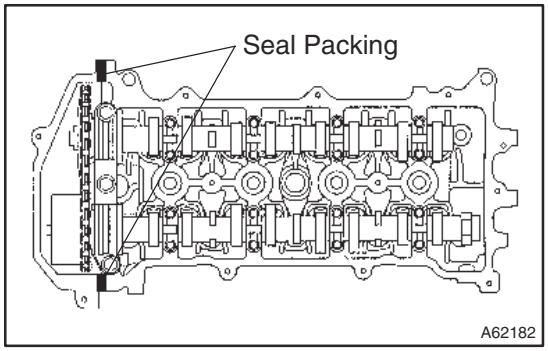
(5) Turn the crankshaft clockwise, then check that the slipper is pushed by the plunger.

HINT:
If the plunger is not extended, press the slipper into the chain tensioner using a screwdriver so that the hook is taken from the knock pin and that the plunger can be extended.



73. INSTALL CYLINDER HEAD COVER GASKET

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



74. INSTALL CYLINDER HEAD COVER SUB–ASSY

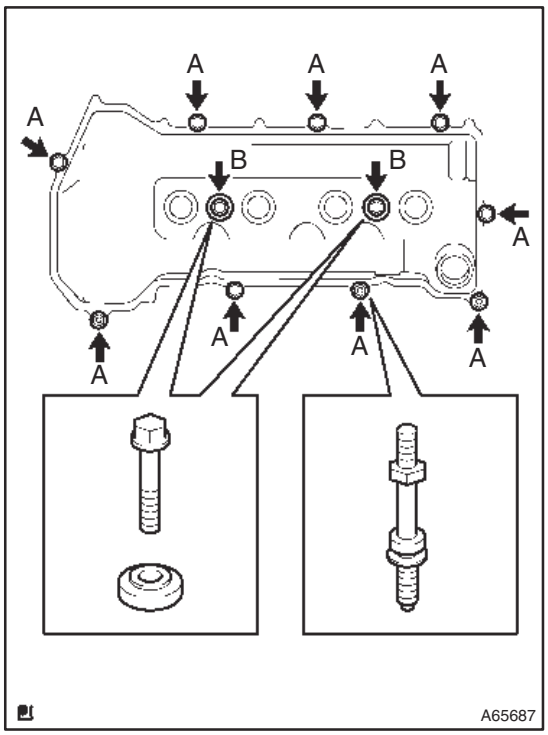
(a) Remove any old packing (FIPG) material.

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

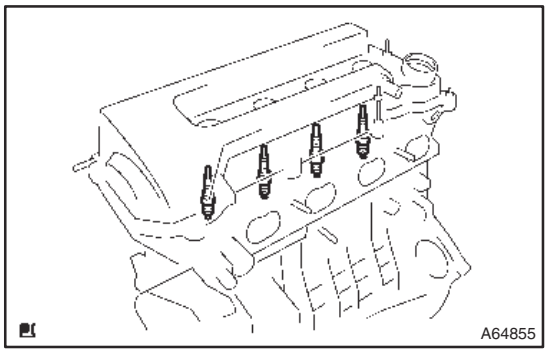
Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

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

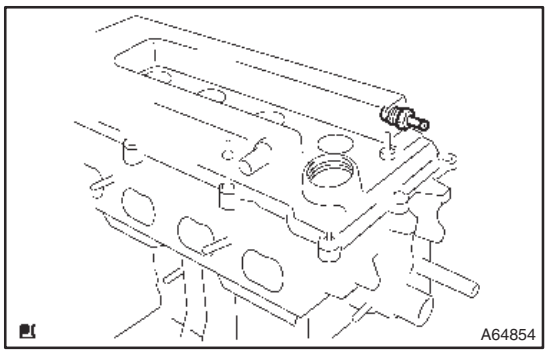


(c) Install the cylinder head cover with the 9 bolts, 2 seal washers and 2 nuts.
Torque:
11 N·m (112 kgf·cm, 8 ft·lbf) for A
9.0 N·m (92 kgf·cm, 80 in·lbf) for B



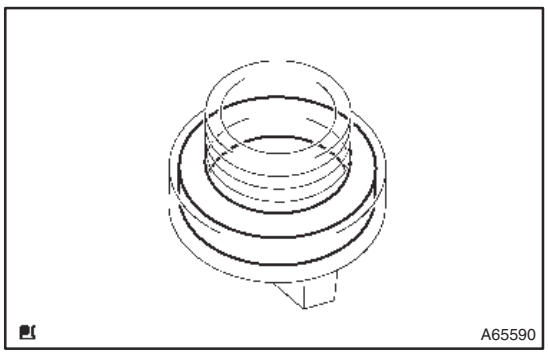
75. INSTALL SPARK PLUG

(a) Using a spark plug wrench, install the 4 spark plugs.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)



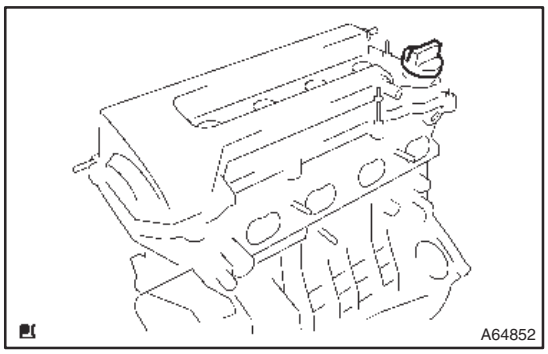
76. INSTALL VENTILATION VALVE SUB–ASSY

(a) Install the ventilation valve into the cylinder head cover.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)



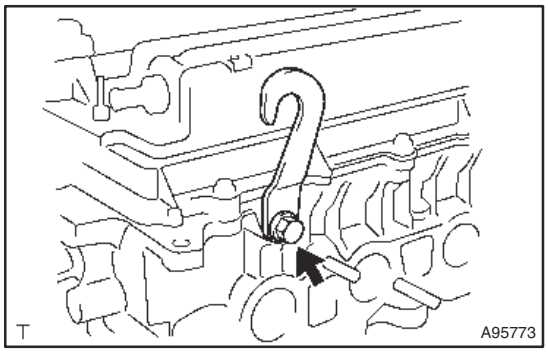
77. INSTALL OIL FILLER CAP GASKET

(a) Install the gasket onto the oil filler cap.



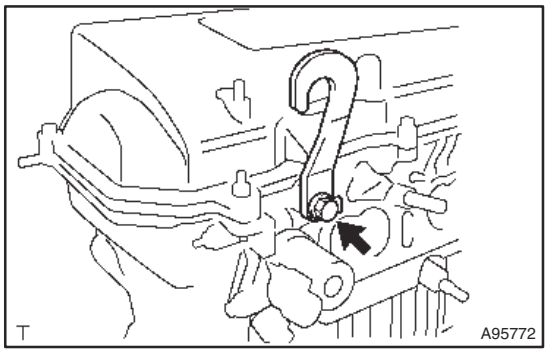
78. INSTALL OIL FILLER CAP SUB–ASSY

(a) Install the oil filler cap onto the cylinder head cover.



79. INSTALL ENGINE HANGER NO.2

(a) Install engine hanger No. 2 with the bolt.
Torque: 38 N·m (387 kgf·cm, 28 ft·lbf)



80. INSTALL ENGINE HANGER NO.1

(a) Install engine hanger No. 1 with the bolt.
Torque: 38 N·m (387 kgf·cm, 28 ft·lbf)