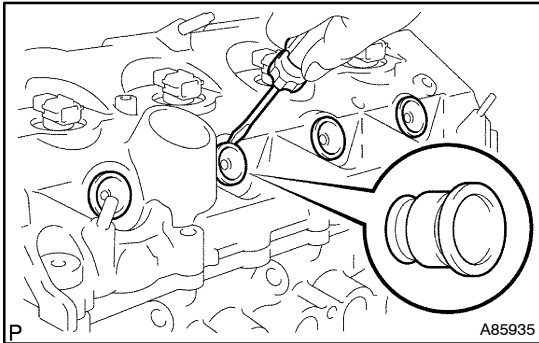


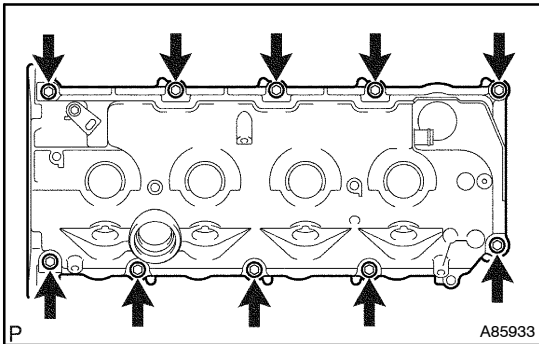
OVERHAUL

1. REMOVE OIL FILLER CAP SUB-ASSY



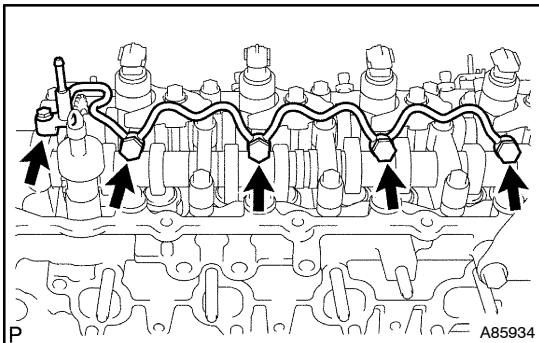
2. REMOVE NOZZLE HOLDER SEAL

- (a) Using a screwdriver, pry out the 4 nozzle holder seals.



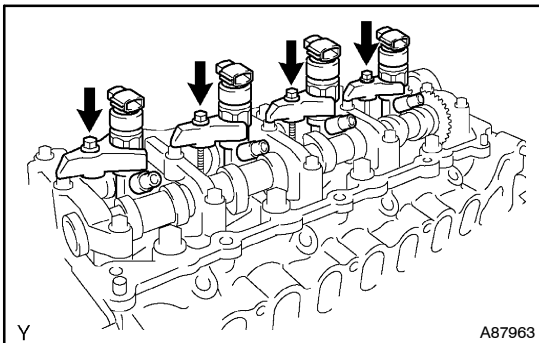
3. REMOVE CYLINDER HEAD COVER SUB-ASSY

- (a) Remove the 10 bolts, cylinder head cover and gasket.



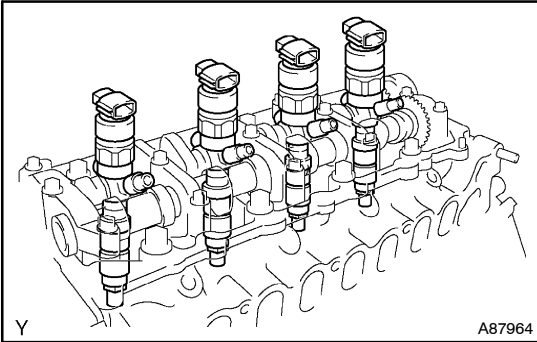
4. REMOVE NOZZLE LEAKAGE PIPE ASSY

- (a) Remove the 4 hollow screws and bolt.
(b) Remove the nozzle leakage pipe and 4 gaskets from the cylinder head and injector.



5. REMOVE NOZZLE HOLDER CLAMP

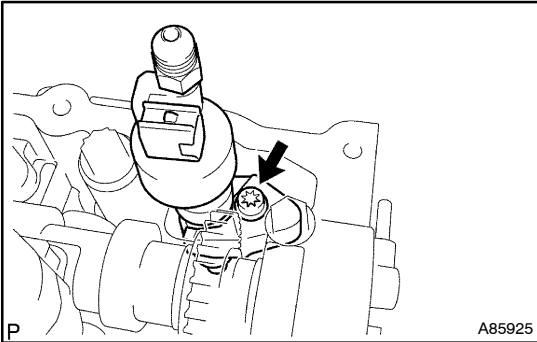
- (a) Remove the 4 bolts, 4 washers and 4 nozzle holder clamps.

**6. REMOVE INJECTOR ASSY**

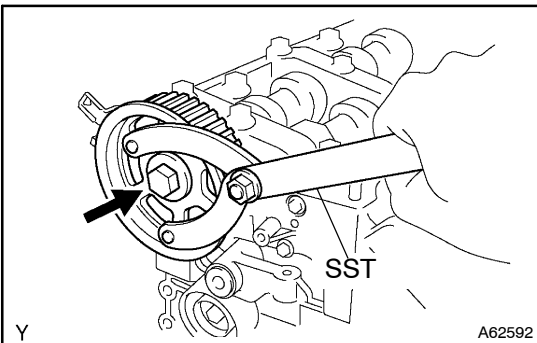
- (a) Remove the 4 injectors from the cylinder head.

HINT:

Arrange the injectors in the correct order.

**7. REMOVE EXHAUST FUEL ADDITION INJECTOR ASSY**

- (a) Using a Torx socket wrench (T40), remove the Torx screw.
 (b) Remove the nozzle holder clamp, addition injector and gasket.

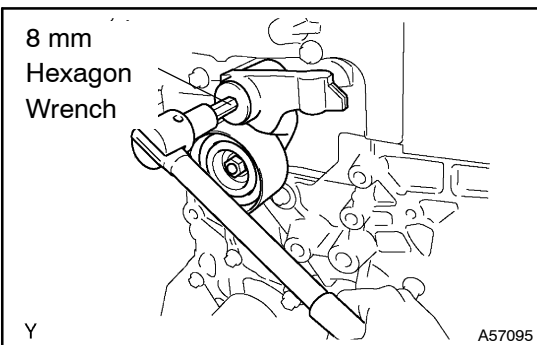
**8. REMOVE CAMSHAFT TIMING PULLEY**

- (a) Using SST, remove the pulley bolt.
 SST 09960-10010 (09962-01000, 09963-01000)
 (b) Remove the timing pulley.

HINT:

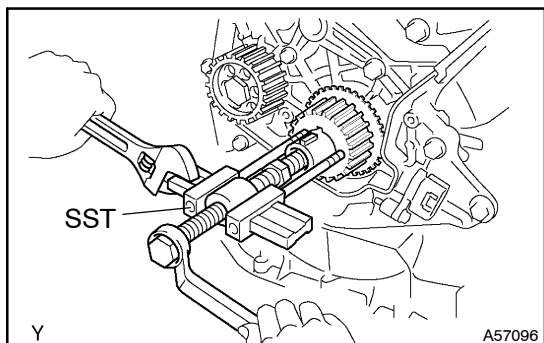
Using a plastic-faced hammer, tap out the pulley.

- (c) Remove the set key.

**9. REMOVE TIMING BELT IDLER SUB-ASSY NO.1**

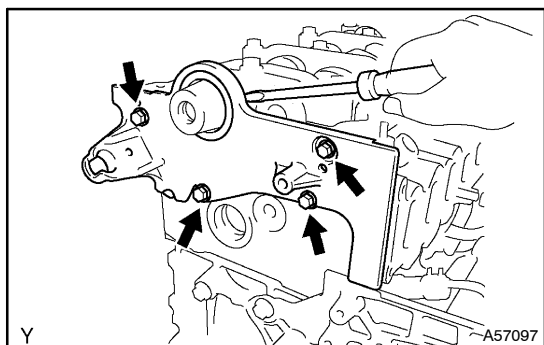
- (a) Using an 8 mm hexagon wrench, remove the idler pulley shaft, idler pulley and plate washer.

10. REMOVE TIMING BELT IDLER SUB-ASSY NO.2

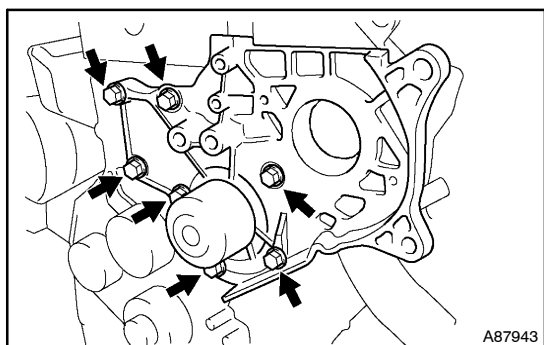
**11. REMOVE CRANKSHAFT TIMING PULLEY**

- (a) If the timing pulley cannot be removed by hand, use SST to remove the pulley.

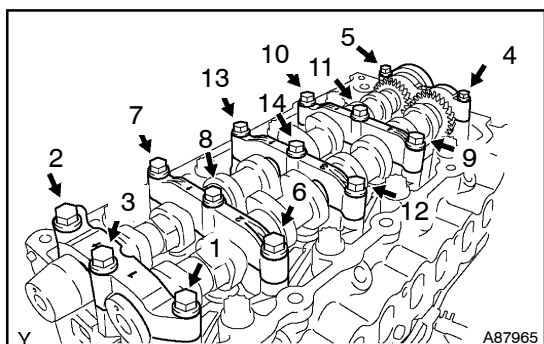
SST 09950-50013 (09951-05010, 09952-05010, 09953-05010, 09953-05020, 09954-05021)

**12. REMOVE CAMSHAFT OIL SEAL RETAINER**

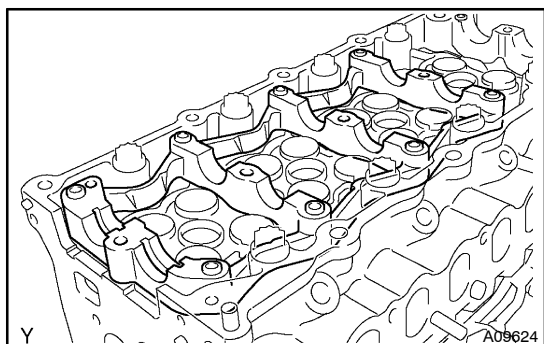
- (a) Remove the 4 bolts.
(b) Using a screwdriver, remove the oil seal retainer by prying between the oil seal retainer and camshaft bearing cap.

**13. REMOVE WATER PUMP ASSY**

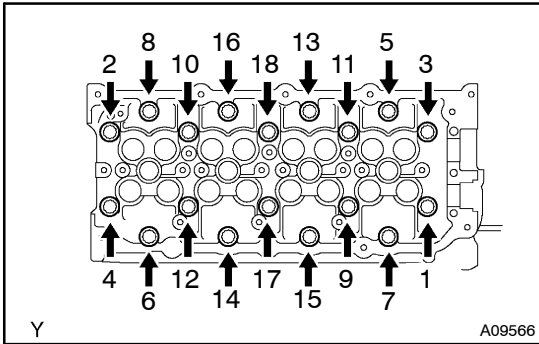
- (a) Remove the 7 bolts, water pump and gasket.

**14. REMOVE CAMSHAFT**

- (a) Using several steps, loosen and remove the 14 bearing cap bolts uniformly in the sequence shown in the illustration.
(b) Remove the 5 bearing caps and camshaft sub-assembly.

**15. REMOVE NO.2 CAMSHAFT**

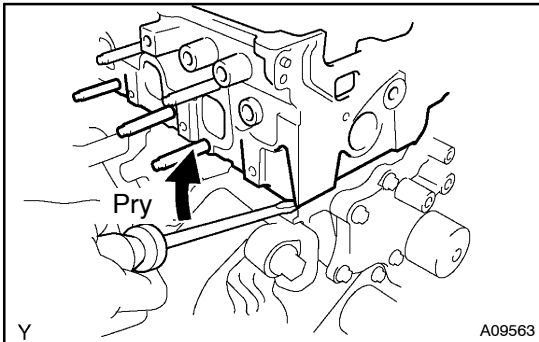
- (a) Remove the camshaft sub-assembly and camshaft carrier.

**16. REMOVE CYLINDER HEAD SUB-ASSY**

- (a) Using several steps, loosen the 18 cylinder head bolts uniformly in the sequence shown in the illustration. Remove the 18 cylinder head bolts and plate washers.

NOTICE:

Removing the bolts in a wrong order could cause warpage or cracks of the cylinder head.



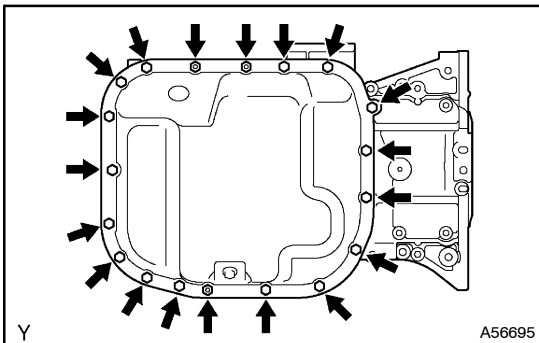
- (b) Lift the cylinder head from the dowels on the cylinder block, then place the cylinder head on wooden blocks on a work bench.

HINT:

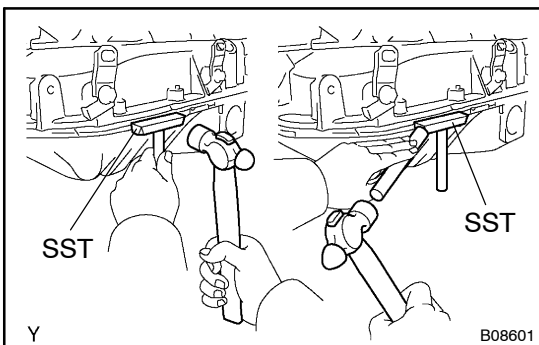
To lift the cylinder head, pry between the cylinder head and cylinder block using a screwdriver.

NOTICE:

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

**17. REMOVE OIL PAN SUB-ASSY NO.2**

- (a) Remove the 16 bolts and 3 nuts.

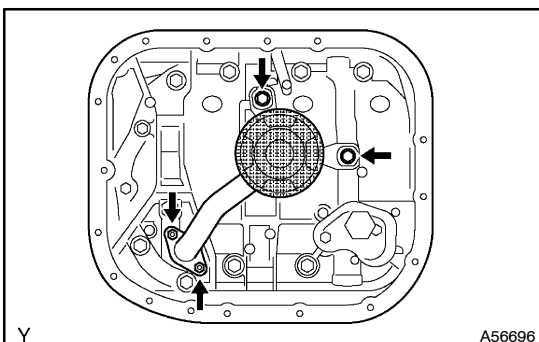


- (b) Insert the blade of SST between the No. 1 and No. 2 oil pans, then cut off the applied sealer and remove the No. 2 oil pan.

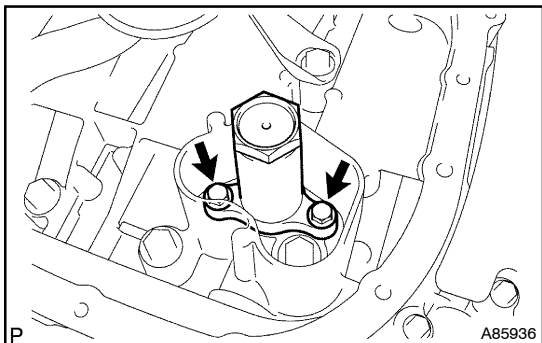
SST 09032-00100

NOTICE:

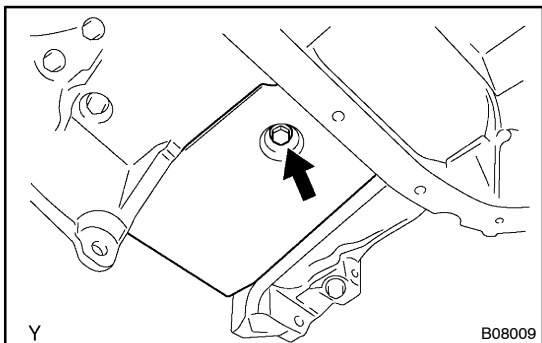
Be careful not to damage the No. 1 and No. 2 oil pans.

**18. REMOVE OIL STRAINER SUB-ASSY**

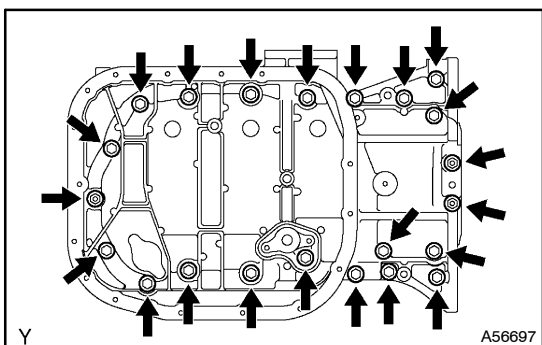
- (a) Remove the 2 bolts and 2 nuts, then remove the oil strainer and gasket.

**19. REMOVE OIL REGULATOR ASSY**

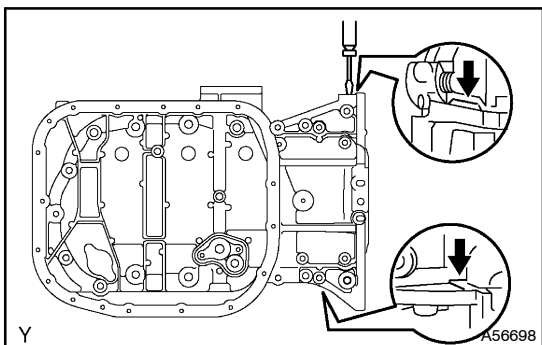
- (a) Remove the 2 bolts and oil regulator.

**20. REMOVE OIL PAN INSULATOR**

- (a) Remove the bolt and oil pan insulator.

**21. REMOVE OIL PAN SUB-ASSY**

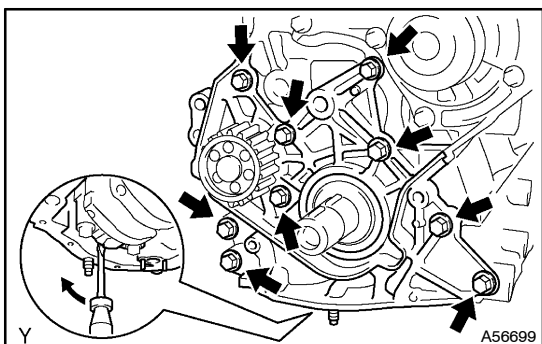
- (a) Remove the 19 bolts and 3 nuts.



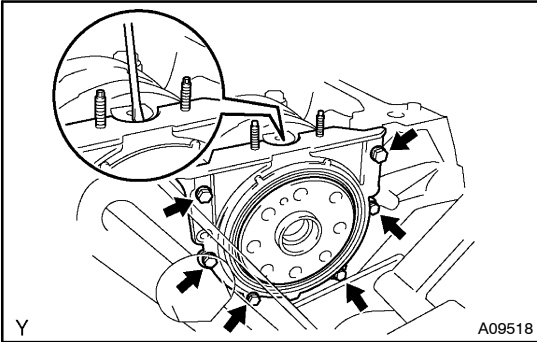
- (b) Using a screwdriver, remove the oil pan by prying between the cylinder block and No. 1 oil pan.

NOTICE:

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

**22. REMOVE OIL PUMP ASSY**

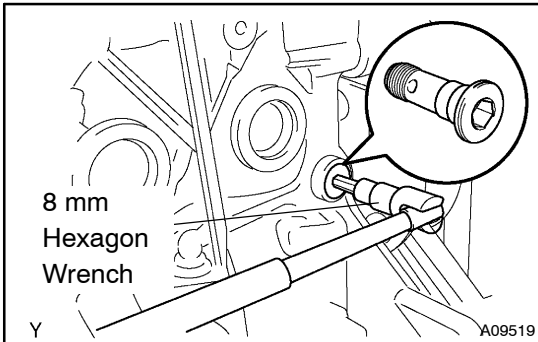
- (a) Remove the 9 bolts.
 (b) Remove the oil pump by prying between the oil pump and main bearing cap using a screwdriver.
 (c) Remove the gasket.

**23. REMOVE ENGINE REAR OIL SEAL RETAINER**

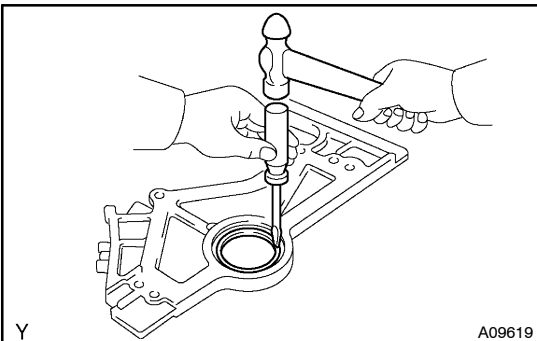
- (a) Remove the 6 bolts.
- (b) Using a screwdriver, remove the oil seal retainer by prying between the oil seal retainer and main bearing cap.

NOTICE:

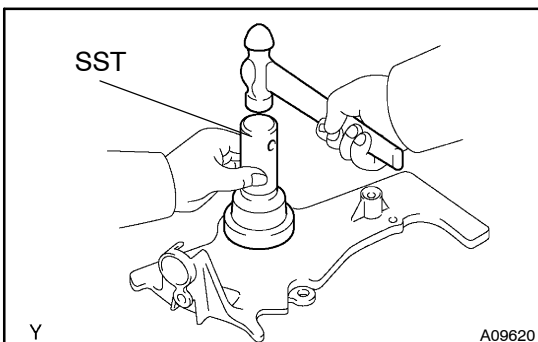
Be careful not to damage the oil seal retainer and main bearing cap.

**24. REMOVE OIL CHECK VALVE SUB-ASSY**

- (a) Using an 8 mm hexagon wrench, remove the check valve and gasket.

25. REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB-ASSY**26. REMOVE CAMSHAFT OIL SEAL**

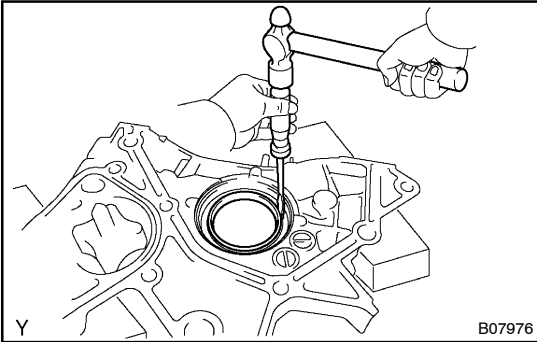
- (a) Using a screwdriver and hammer, tap out the oil seal.

**27. INSTALL CAMSHAFT OIL SEAL**

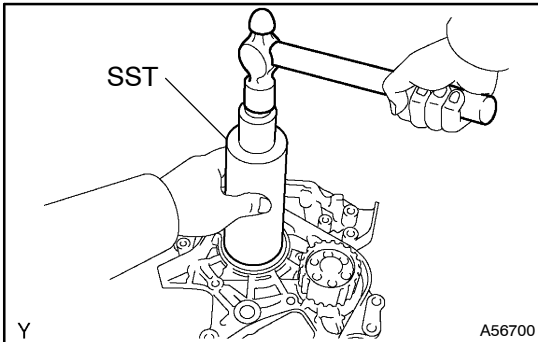
- (a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the camshaft oil seal retainer edge.
SST 09223–46011
- (b) Apply multipurpose grease to a new oil seal lip.

NOTICE:

Keep the lip free of foreign objects.

**28. REMOVE CRANKSHAFT SEAL**

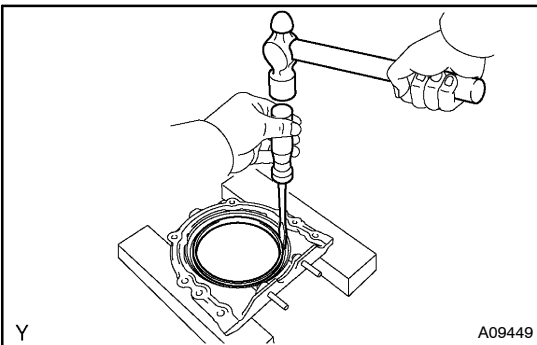
- (a) Using a screwdriver and hammer, tap out the oil seal.

**29. INSTALL CRANKSHAFT SEAL**

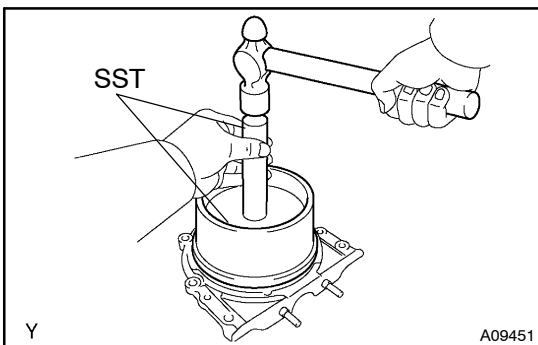
- (a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump edge.
SST 09316-60011 (09316-00011, 09316-00021)
- (b) Apply multipurpose grease to a new oil seal lip.

NOTICE:

Keep the lip free of foreign objects.

**30. REMOVE ENGINE REAR OIL SEAL**

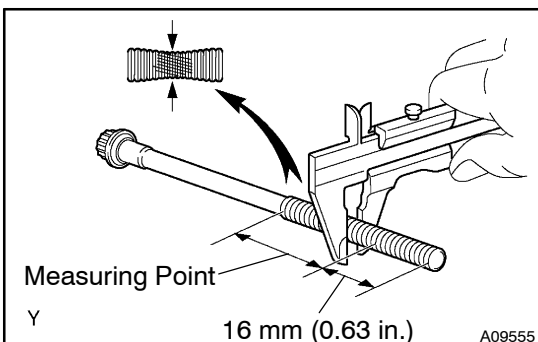
- (a) Using a screwdriver and hammer, tap out the oil seal.

**31. INSTALL ENGINE REAR OIL SEAL**

- (a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223-15030, 09950-70010 (09951-07100)
- (b) Apply multipurpose grease to a new oil seal lip.

NOTICE:

Keep the lip free of foreign objects.

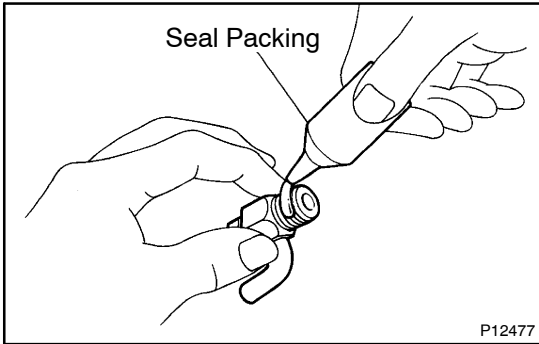
**32. INSPECT CYLINDER HEAD SET BOLT**

- (a) Using vernier calipers, measure the tension portion diameter of the bolt.

Standard outside diameter:

10.40 to 11.00 mm (0.4094 to 0.4331 in.)

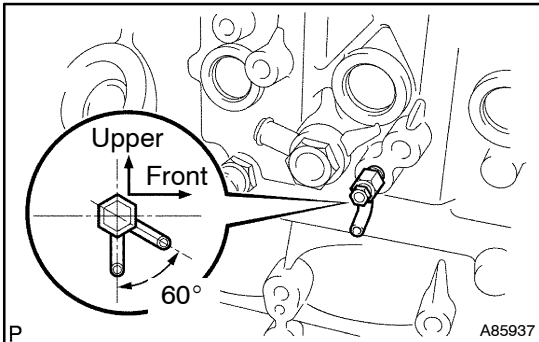
If the diameter is less than minimum, replace the bolt.



33. INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB-ASSY

- (a) Apply seal packing to the 2 or 3 threads.

Seal packing: Part No. 08826–00100 or equivalent

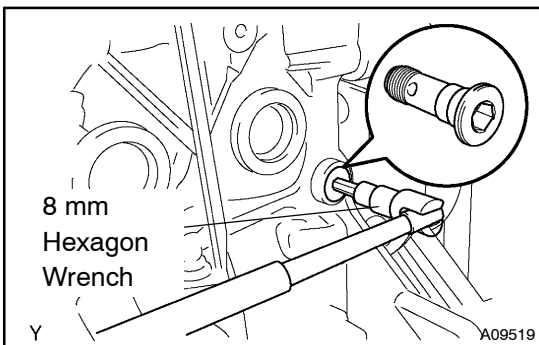


- (b) Install the drain union.

Torque: 29 N·m (291 kgf·cm, 21 ft·lbf)

HINT:

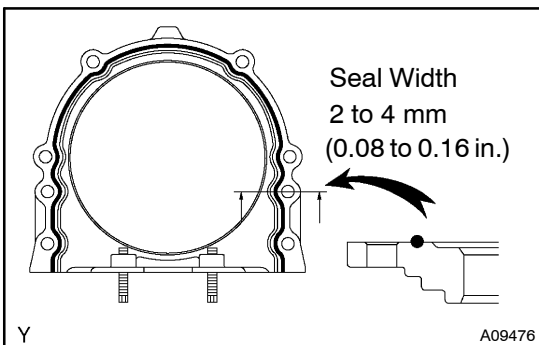
After applying the specified torque, if the drain pipe of the drain union is not located as shown in the illustration, rotate the drain union further clockwise so the drain pipe faces downward.



34. INSTALL OIL CHECK VALVE SUB-ASSY

- (a) Using an 8 mm hexagon wrench, install a new gasket and the check valve.

Torque: 33 N·m (331 kgf·cm, 24 ft·lbf)



35. INSTALL ENGINE REAR OIL SEAL RETAINER

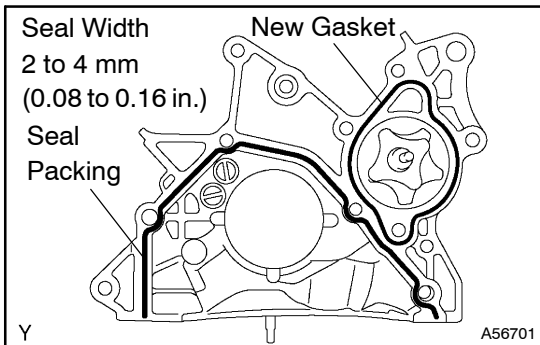
- (a) Apply seal packing to the oil seal retainer as shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

- Install a nozzle of which opening is cut to 2 to 4 mm (0.08 to 0.16 in.).
 - The parts must be set within 3 minutes and must be assembled within 15 minutes after applying seal packing. Otherwise the material must be removed and reapplied.
 - Immediately remove the nozzle from the tube, then re-install the cap.
- (b) Install the oil seal retainer with the 6 bolts. Tighten the bolts uniformly in several steps.

Torque: 7.4 N·m (75 kgf·cm, 65 in·lbf)

**36. INSTALL OIL PUMP ASSY**

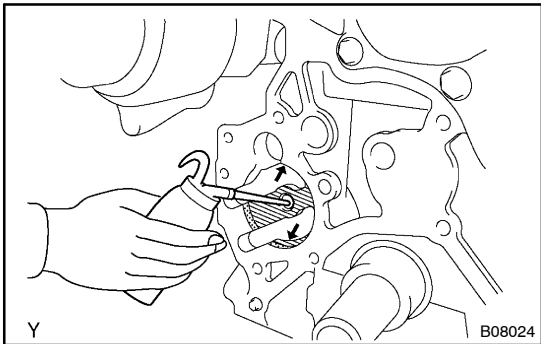
- (a) Apply seal packing to the oil pump as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

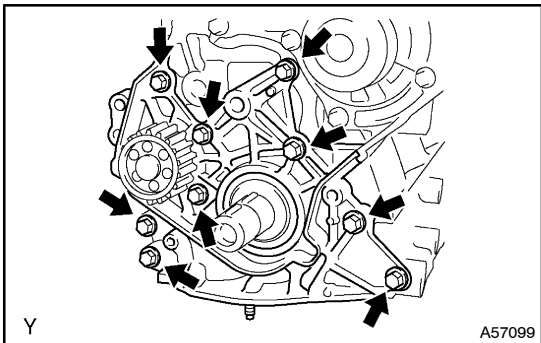
- Avoid applying an excessive amount to the surface.
- Install a nozzle of which opening is cut to 2 to 4 mm (0.08 to 0.16 in.).
- The parts must be set within 3 minutes and must be assembled within 15 minutes after applying seal packing. Otherwise the material must be removed and reapplied.
- Immediately remove the nozzle from the tube, then re-install the cap.

- (b) Install a new gasket to the oil pump.
- (c) Pour 0.5 cm³ (0.03 cu in.) or more of engine oil into the bushing of the cylinder block.
- (d) Apply engine oil to the cylinder block side which contacts the oil pump driven rotor.



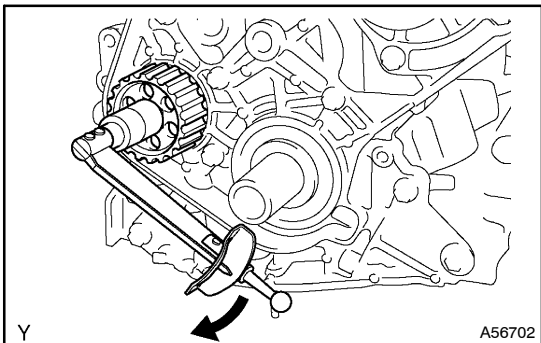
- (e) Install the oil pump with the 9 bolts.

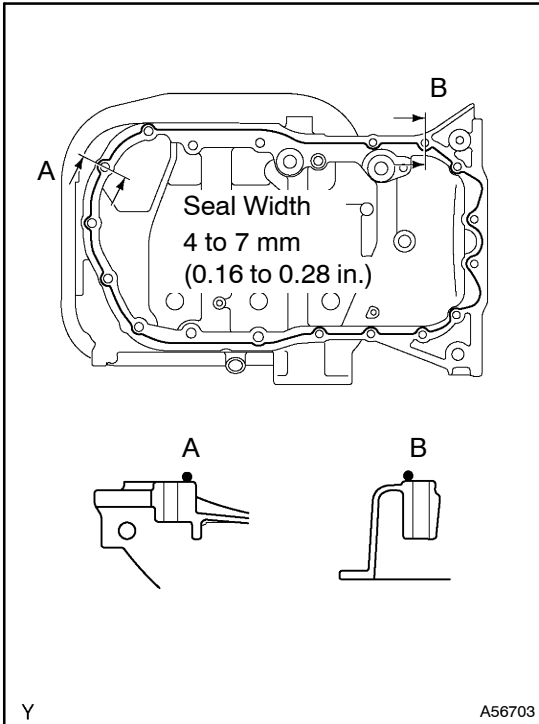
Torque: 31 N·m (320 kgf·cm, 23 ft·lbf)



- (f) Measure the oil pump rotating torque.
- (1) Check that the pump rotates smoothly without making a noise.
 - (2) Using a torque wrench, check the pump rotating torque.

Rotating torque: 3.0 N·m (31 kgf·cm, 27 in·lbf) or less



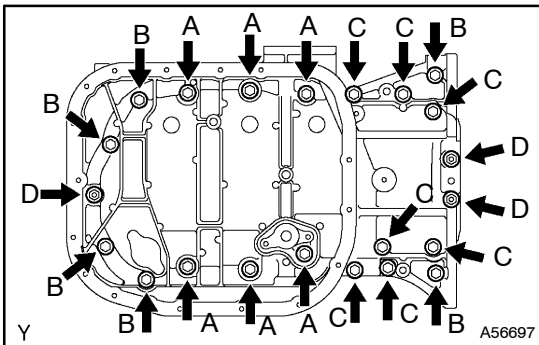
**37. INSTALL OIL PAN SUB-ASSY**

- (a) Apply seal packing to the No. 1 oil pan as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

- Install a nozzle of which opening is cut to 4 to 7 mm (0.16 to 0.28 in.).
- The parts must be set within 3 minutes and must be assembled within 15 minutes after applying seal packing. Otherwise the material must be removed and reapplied.
- Immediately remove the nozzle from the tube, then re-install the cap.



- (b) Install the oil pan with 19 bolts and 3 nuts.

Torque:

42 N·m (428 kgf·cm, 31 ft·lbf) for bolt A

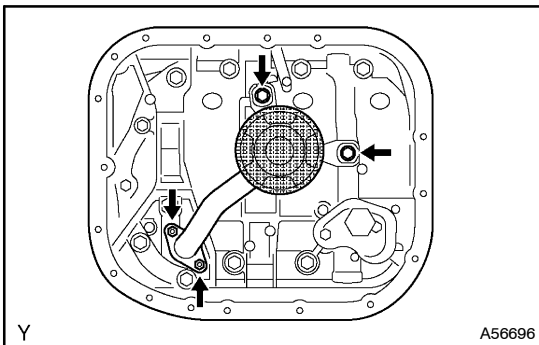
21 N·m (209 kgf·cm, 15 ft·lbf) for bolt B

11 N·m (112 kgf·cm, 8 ft·lbf) for bolt C

11 N·m (112 kgf·cm, 8 ft·lbf) for nut D

38. INSTALL OIL REGULATOR ASSY

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

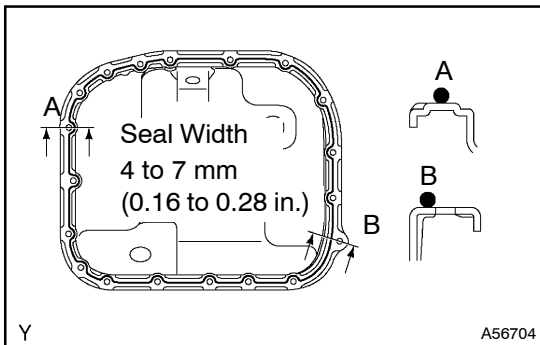
**39. INSTALL OIL STRAINER SUB-ASSY**

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

Torque:

21 N·m (209 kgf·cm, 15 ft·lbf) for bolt

13 N·m (135 kgf·cm, 10 ft·lbf) for nut



40. INSTALL OIL PAN SUB-ASSY NO.2

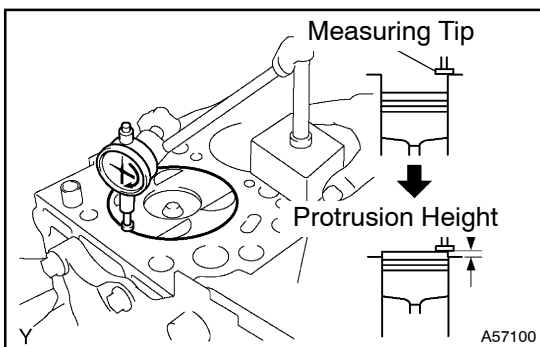
- (a) Apply seal packing to the oil pan as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

- Install a nozzle of which opening is cut to 4 to 7 mm (0.16 to 0.28 in.).
 - The parts must be set within 3 minutes and must be assembled within 15 minutes after applying seal packing. Otherwise the material must be removed and reapplied.
 - Immediately remove the nozzle from the tube, then re-install the cap.
- (b) Install the oil pan with the 16 bolts and 3 nuts. Tighten the bolts and nuts uniformly in several steps.

Torque: 12 N·m (119 kgf·cm, 9 ft·lbf)

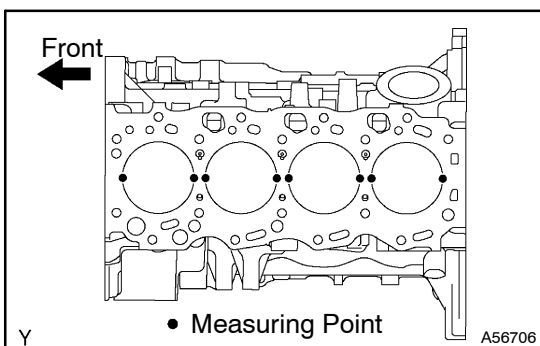


41. INSTALL CYLINDER HEAD SUB-ASSY

- (a) Measure the protrusion height of the piston heads.
- (1) Clean the cylinder block with solvent.
 - (2) Set the piston to measure to slightly before the TDC.
 - (3) Place a dial indicator on the cylinder block, then calibrate the dial indicator at 0 mm (0 in.).

HINT:

- Place the measuring tip of the dial indicator as shown in the illustration.
 - Make sure that the measuring tip is square to the cylinder block gasket and piston head when measuring.
- (4) Find the most overhung position of the piston head by slowly turning the crankshaft clockwise and counterclockwise.
 - (5) Measure the protrusion height of the piston head for each cylinder at 2 places as shown in the illustration. (Total of 8 measurements.)
 - (6) Record the higher protrusion height of the 2 measurements at each cylinder.



(b) Select a new cylinder head gasket.

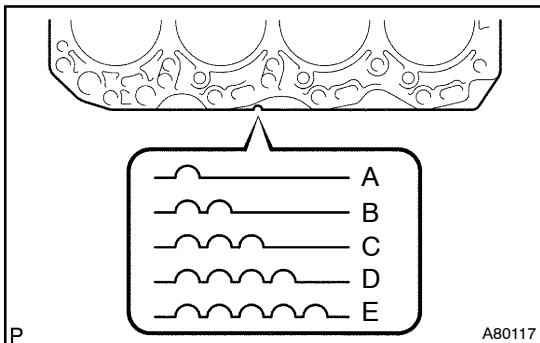
HINT:

There are 5 sizes of new cylinder head gaskets, marked "A", "B", "C", "D", and "E".

New cylinder head gasket thickness:

A	0.85 to 0.95 mm (0.0335 to 0.0374 in.)
B	0.90 to 1.00 mm (0.0354 to 0.0394 in.)
C	0.95 to 1.05 mm (0.0374 to 0.0413 in.)
D	1.00 to 1.10 mm (0.0394 to 0.0433 in.)
E	1.05 to 1.15 mm (0.0413 to 0.0453 in.)

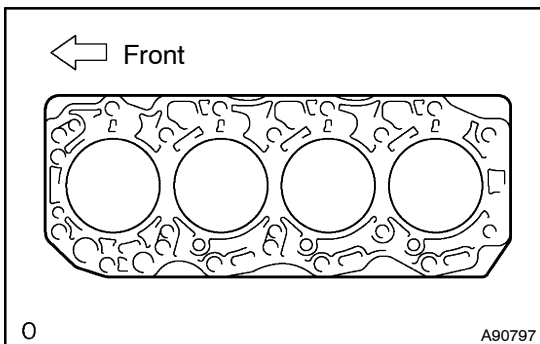
- (1) Find the highest protrusion height among the 4 measurement records. It is used to select a new cylinder head gasket.



- (2) Select a new gasket among A to E using the matrix below.

New gasket matrix:

Piston Protrusion mm (in.)	Gasket Size
0.165 to 0.220 (0.0065 to 0.0087)	A
0.220 to 0.270 (0.0087 to 0.0106)	B
0.270 to 0.320 (0.0106 to 0.0126)	C
0.320 to 0.370 (0.0126 to 0.0146)	D
0.370 to 0.425 (0.0146 to 0.0167)	E

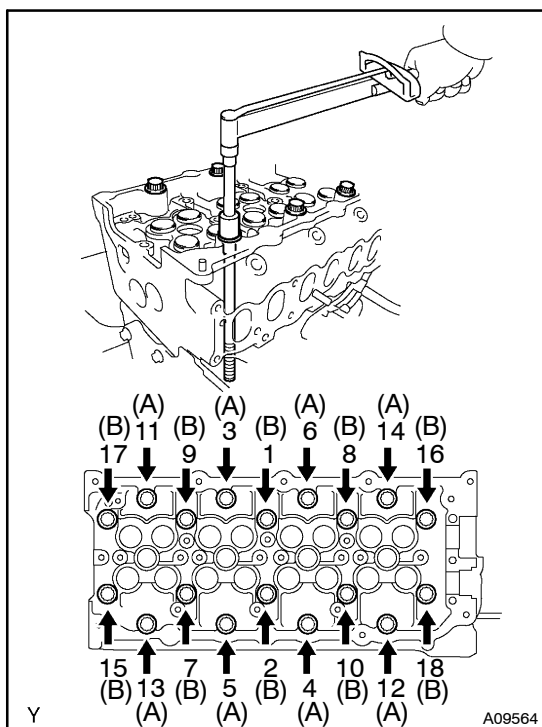


- (c) Place the selected new cylinder head gasket on the cylinder block.

NOTICE:

Pay attention to the mounting orientation.

- (d) Place the cylinder head in position on the cylinder head gasket.



(e) Install the cylinder head bolts.

HINT:

- The cylinder head bolts are tightened in 4 successive steps (steps (3), (5), (6) and (7)).
 - If the cylinder head bolt is broken or deformed, replace it with a new bolt.
- (1) Apply a light coat of engine oil to the threads of the cylinder head bolts and plate washers.
 - (2) Install the plate washer to the cylinder head bolt.
 - (3) Using several steps, install and tighten the 18 cylinder head bolts uniformly in the sequence shown in the illustration.

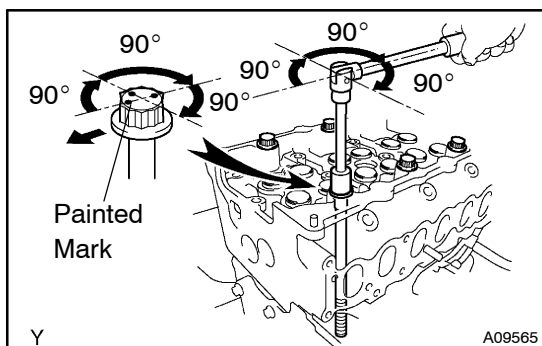
Torque: 45 N·m (459 kgf·cm, 33 ft·lbf)

HINT:

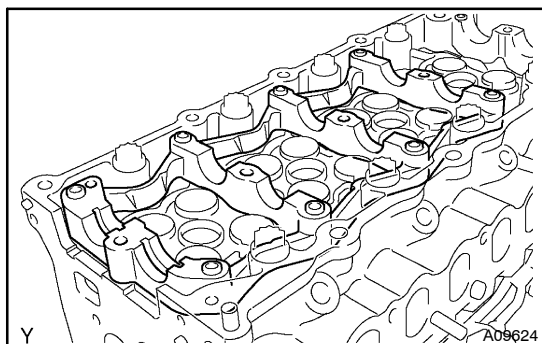
See the table below for the bolt length.

Bolt Type	Bolt Length
(A)	160 mm (6.30 in.)
(B)	104 mm (4.09 in.)

If the cylinder head bolt does not meet the specified torque, replace the cylinder head bolt with a new bolt.

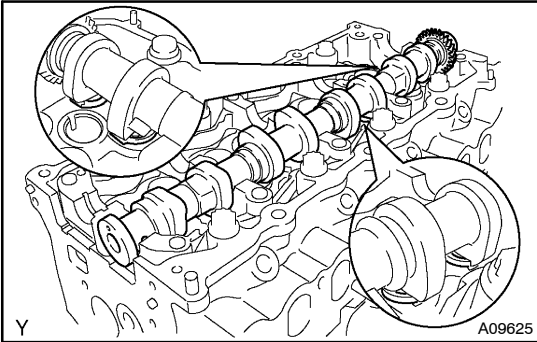


- (4) Mark the front of the cylinder head bolt with paint.
- (5) Retighten the cylinder head bolts by 90° in the same sequence as step (3).
- (6) Retighten the cylinder head bolts by an additional 90° in the same sequence as step (3).
- (7) Retighten the cylinder head bolts by one more additional 90° in the same sequence as step (3).
- (8) Check that each painted mark is now at the intake manifold side.

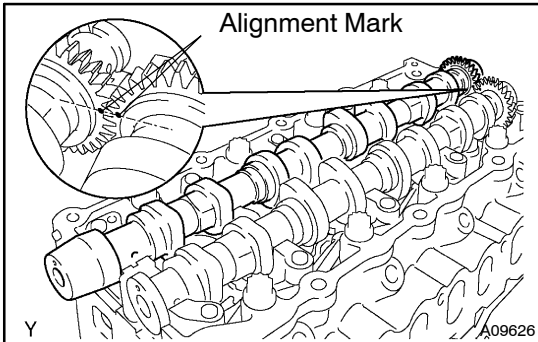


42. INSTALL CAMSHAFT

- (a) Place the camshaft carrier on the cylinder head.

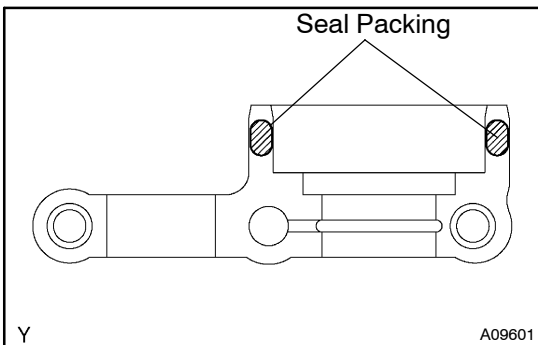


- (b) Install the camshaft.
- (c) Apply engine oil to the cam and gear of the camshaft, and the journal of the camshaft carrier.
- (d) Place the intake camshaft on the camshaft carrier as shown in the illustration so that the No. 3 and No. 4 of the cylinder cam lobes face downward.



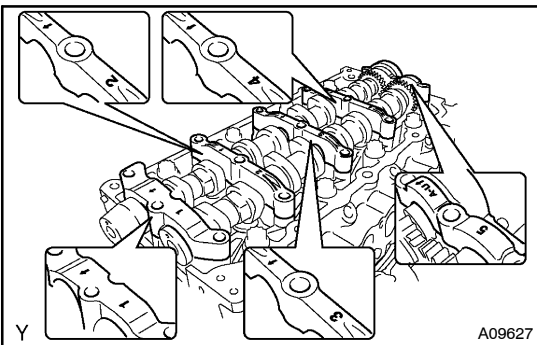
43. INSTALL NO.2 CAMSHAFT

- (a) Install the No. 2 camshaft.
- (b) Apply engine oil to the cam and gear of the camshaft, and the journal of the camshaft carrier.
- (c) Engage the exhaust camshaft gear and intake camshaft gear by matching the alignment marks on each gear.
- (d) Roll down the exhaust camshaft onto the bearing journals while engaging gears with each other.

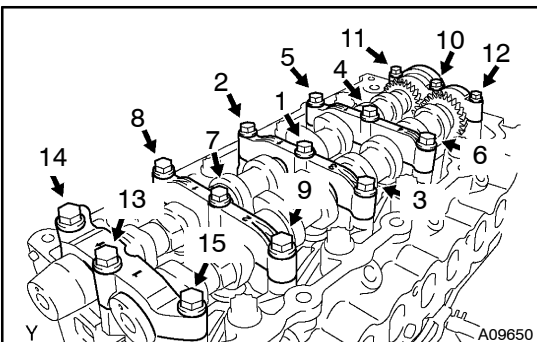


- (e) Install the camshaft bearing caps.
 - (1) Remove any old packing (FIPG) material from the No. 5 camshaft bearing cap.
 - (2) Apply seal packing to the No. 5 camshaft bearing cap as shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

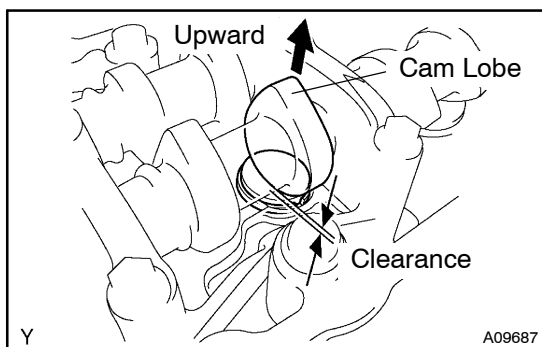


- (3) Place the 5 bearing caps in their proper locations.

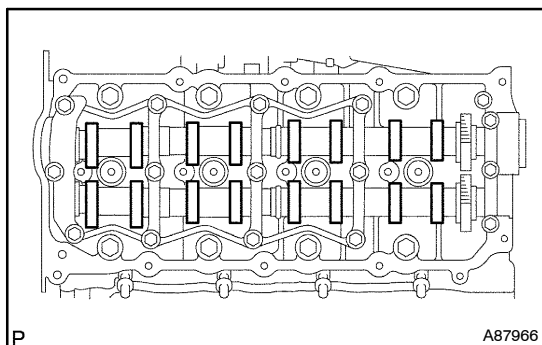


- (4) Using several steps, install and tighten the 15 bearing cap bolts uniformly in the sequence shown in the illustration.

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

**44. INSPECT VALVE CLEARANCE**

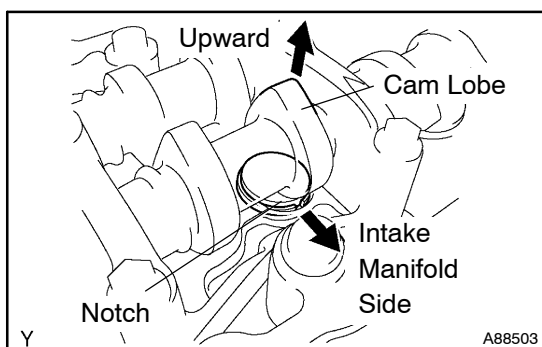
- (a) Turn the crankshaft so that the cam lobe located over the inspecting valve faces upward.
- (b) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.



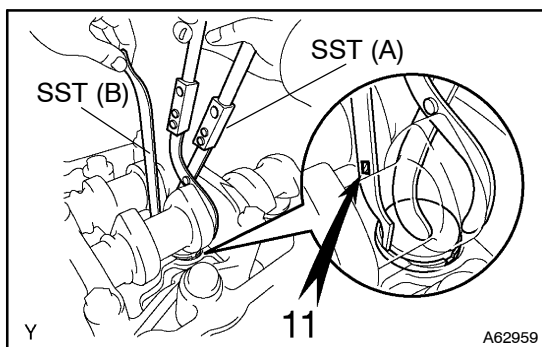
- (c) Measure the clearance at 16 places.
- (d) Record the out-of-specification valve clearance measurements. They will be used later to select an adjusting shim to replace.

Valve clearance (Cold) :

Intake	0.20 to 0.30 mm (0.008 to 0.012 in.)
Exhaust	0.35 to 0.45 mm (0.014 to 0.018 in.)

**45. ADJUST VALVE CLEARANCE**

- (a) Remove the adjusting shim.
 - (1) Turn the crankshaft so that the cam lobe located over the adjusting valve faces upward.
 - (2) Position the notch of the valve lifter toward the intake manifold side.

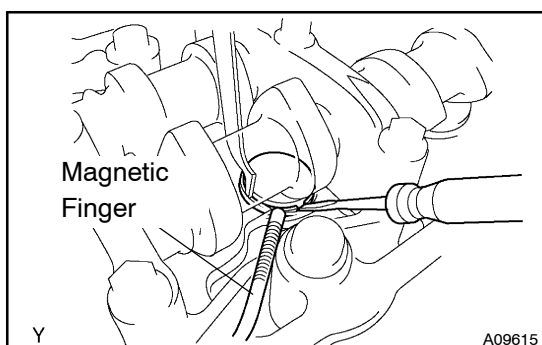


- (3) Using SST (A), press down the valve lifter, then place SST (B) between the camshaft and valve lifter. Remove SST (A).

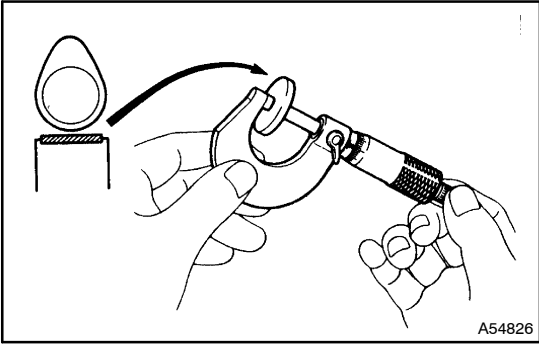
SST 09248-55050 (09248-05510, 09248-05520)

HINT:

Use SST (B) marked with "11".



- (4) Remove the adjusting shim using a small screwdriver and magnetic finger.



(b) Select the size of an adjusting shim to replace by following the formula or the charts:

- (1) Using a micrometer, measure the thickness of the removed shim.
- (2) Calculate the thickness of a new shim so that the valve clearance comes within the specified value.

HINT:

T Thickness of the removed adjusting shim

A Measured valve clearance

N Thickness of a new adjusting shim

Intake: $N = T + (A - 0.25 \text{ mm (0.010 in.)})$

Exhaust: $N = T + (A - 0.40 \text{ mm (0.016 in.)})$

- (3) Select a new shim with a thickness which is as close to the calculated value as possible.

EXAMPLE (Intake):

Measured valve clearance = 0.45 mm (0.0177 in.)

$0.45 \text{ mm (0.0177 in.)} - 0.25 \text{ mm (0.0098 in.)} = 0.20 \text{ mm (0.0078 in.)}$

(Measured – Specification = Excess clearance)

Used shim measurement = 2.80 mm (0.1102 in.)

$0.20 \text{ mm (0.0078 in.)} + 2.80 \text{ mm (0.1102 in.)} = 3.00 \text{ mm (0.1181 in.)}$

(Excess clearance + Used shim = Ideal new shim)

Closest new shim = 3.00 mm (0.1181 in.)

Select No. 21 shim

HINT:

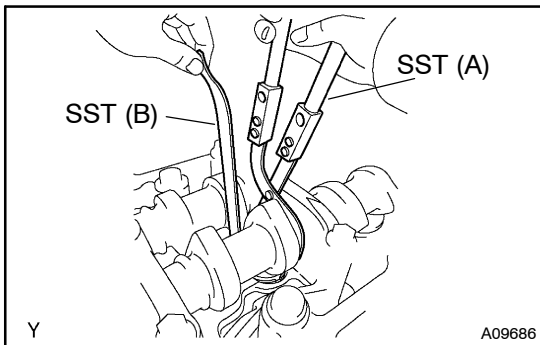
- The shims are available in 17 sizes in increments of 0.05 mm (0.0020 in.), from 2.50 mm (0.0984 in.) to 3.30 mm (0.1299 in.).
- Refer to New Shim Thickness table on the next 2 pages.

Adjusting Shim Selection Chart (Intake)

	2.500 (0.0984)	2.525 (0.0994)	2.550 (0.1004)	2.575 (0.1014)	2.600 (0.1024)	2.625 (0.1033)	2.650 (0.1043)	2.675 (0.1053)	2.700 (0.1063)	2.725 (0.1073)	2.750 (0.1083)	2.775 (0.1093)	2.800 (0.1102)	2.825 (0.1112)	2.850 (0.1122)	2.875 (0.1132)	2.900 (0.1142)	2.925 (0.1152)	2.950 (0.1161)	2.975 (0.1171)	3.000 (0.1181)	3.025 (0.1191)	3.050 (0.1201)	3.075 (0.1211)	3.100 (0.1220)	3.125 (0.1230)	3.150 (0.1240)	3.175 (0.1250)	3.200 (0.1260)	3.225 (0.1270)	3.250 (0.1280)	3.275 (0.1289)	3.300 (0.1299)	
0.000 ~ 0.020 (0.0000 ~ 0.0008)									01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25
0.021 ~ 0.040 (0.0008 ~ 0.0016)									01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	27
0.041 ~ 0.060 (0.0016 ~ 0.0024)								01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	27	29
0.061 ~ 0.080 (0.0024 ~ 0.0031)							01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	27	29
0.081 ~ 0.100 (0.0032 ~ 0.0039)							01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	27	29
0.101 ~ 0.120 (0.0040 ~ 0.0047)							01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	27	29
0.121 ~ 0.140 (0.0048 ~ 0.0055)							01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	27	29	31
0.141 ~ 0.160 (0.0056 ~ 0.0063)							01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	27	29	31
0.161 ~ 0.180 (0.0063 ~ 0.0071)							01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	27	29	31
0.181 ~ 0.199 (0.0071 ~ 0.0078)							01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	27	29	31
0.200 ~ 0.300 (0.0079 ~ 0.0118)																																		
0.301 ~ 0.320 (0.0119 ~ 0.0126)	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	
0.321 ~ 0.340 (0.0126 ~ 0.0134)	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	
0.341 ~ 0.360 (0.0134 ~ 0.0142)	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	
0.361 ~ 0.380 (0.0142 ~ 0.0150)	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	
0.381 ~ 0.400 (0.0150 ~ 0.0157)	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	
0.401 ~ 0.420 (0.0158 ~ 0.0165)	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	
0.421 ~ 0.440 (0.0166 ~ 0.0173)	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	
0.441 ~ 0.460 (0.0174 ~ 0.0181)	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	
0.461 ~ 0.480 (0.0181 ~ 0.0189)	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	
0.481 ~ 0.500 (0.0189 ~ 0.0197)	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	
0.501 ~ 0.520 (0.0197 ~ 0.0205)	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	
0.521 ~ 0.540 (0.0205 ~ 0.0213)	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.541 ~ 0.560 (0.0213 ~ 0.0220)	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.561 ~ 0.580 (0.0221 ~ 0.0228)	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.581 ~ 0.600 (0.0229 ~ 0.0236)	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.601 ~ 0.620 (0.0237 ~ 0.0244)	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.621 ~ 0.640 (0.0244 ~ 0.0252)	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.641 ~ 0.660 (0.0252 ~ 0.0260)	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.661 ~ 0.680 (0.0260 ~ 0.0268)	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.681 ~ 0.700 (0.0268 ~ 0.0276)	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.701 ~ 0.720 (0.0276 ~ 0.0283)	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.721 ~ 0.740 (0.0284 ~ 0.0291)	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.741 ~ 0.760 (0.0292 ~ 0.0299)	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.761 ~ 0.780 (0.0300 ~ 0.0307)	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.781 ~ 0.800 (0.0307 ~ 0.0315)	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.801 ~ 0.820 (0.0315 ~ 0.0323)	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.821 ~ 0.840 (0.0323 ~ 0.0331)	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.841 ~ 0.860 (0.0331 ~ 0.0339)	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.861 ~ 0.880 (0.0339 ~ 0.0346)	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.881 ~ 0.900 (0.0347 ~ 0.0354)	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.901 ~ 0.920 (0.0355 ~ 0.0362)	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.921 ~ 0.940 (0.0363 ~ 0.0370)	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.941 ~ 0.960 (0.0370 ~ 0.0378)	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
0.961 ~ 0.980 (0.0378 ~ 0.0386)	29	31	31	33	33	33	33	33																										

Adjusting Shim Selection Chart (Exhaust)

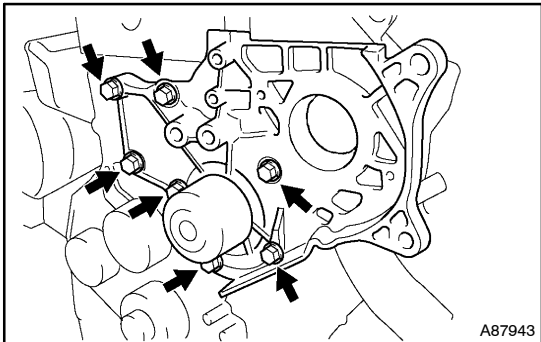
	2.500 (0.0984)	2.525 (0.0994)	2.550 (0.1004)	2.575 (0.1014)	2.600 (0.1024)	2.625 (0.1033)	2.650 (0.1043)	2.675 (0.1053)	2.700 (0.1063)	2.725 (0.1073)	2.750 (0.1073)	2.775 (0.1093)	2.800 (0.1102)	2.825 (0.1112)	2.850 (0.1122)	2.875 (0.1132)	2.900 (0.1142)	2.925 (0.1152)	2.950 (0.1161)	2.975 (0.1171)	3.000 (0.1181)	3.025 (0.1191)	3.050 (0.1201)	3.075 (0.1211)	3.100 (0.1220)	3.125 (0.1230)	3.150 (0.1240)	3.175 (0.1250)	3.200 (0.1260)	3.225 (0.1270)	3.250 (0.1280)	3.275 (0.1289)	3.300 (0.1299)
0.000 ~ 0.020 (0.0000 ~ 0.0008)															01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17
0.021 ~ 0.040 (0.0008 ~ 0.0016)															01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19
0.041 ~ 0.060 (0.0016 ~ 0.0024)														01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19
0.061 ~ 0.080 (0.0024 ~ 0.0031)													01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19
0.081 ~ 0.100 (0.0032 ~ 0.0039)												01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21
0.101 ~ 0.120 (0.0040 ~ 0.0047)										01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	21
0.121 ~ 0.140 (0.0048 ~ 0.0055)										01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23
0.141 ~ 0.160 (0.0056 ~ 0.0063)									01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23
0.161 ~ 0.180 (0.0063 ~ 0.0071)								01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	23
0.181 ~ 0.200 (0.0071 ~ 0.0079)							01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25
0.201 ~ 0.220 (0.0079 ~ 0.0087)						01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	25
0.221 ~ 0.240 (0.0087 ~ 0.0094)						01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	25
0.241 ~ 0.260 (0.0095 ~ 0.0102)					01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27
0.261 ~ 0.280 (0.0103 ~ 0.0110)				01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	27
0.281 ~ 0.300 (0.0111 ~ 0.0118)			01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29
0.301 ~ 0.320 (0.0119 ~ 0.0126)		01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	29
0.321 ~ 0.340 (0.0126 ~ 0.0134)		01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	29
0.341 ~ 0.349 (0.0134 ~ 0.0137)	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31
0.350 ~ 0.450 (0.0138 ~ 0.0177)																																	
0.451 ~ 0.460 (0.0178 ~ 0.0181)	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33
0.461 ~ 0.480 (0.0181 ~ 0.0189)	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33
0.481 ~ 0.500 (0.0189 ~ 0.0197)	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33
0.501 ~ 0.520 (0.0197 ~ 0.0205)	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33
0.521 ~ 0.540 (0.0205 ~ 0.0213)	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33
0.541 ~ 0.560 (0.0213 ~ 0.0220)	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33
0.561 ~ 0.580 (0.0221 ~ 0.0228)	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33
0.581 ~ 0.600 (0.0229 ~ 0.0236)	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33
0.601 ~ 0.620 (0.0237 ~ 0.0244)	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33
0.621 ~ 0.640 (0.0244 ~ 0.0252)	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33
0.641 ~ 0.660 (0.0252 ~ 0.0260)	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33
0.661 ~ 0.680 (0.0260 ~ 0.0268)	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33
0.681 ~ 0.700 (0.0268 ~ 0.0276)	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33
0.701 ~ 0.720 (0.0276 ~ 0.0283)	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33
0.721 ~ 0.740 (0.0284 ~ 0.0291)	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
0.741 ~ 0.760 (0.0292 ~ 0.0299)	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
0.761 ~ 0.780 (0.0300 ~ 0.0307)	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
0.781 ~ 0.800 (0.0307 ~ 0.0315)	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
0.801 ~ 0.820 (0.0315 ~ 0.0323)	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
0.821 ~ 0.840 (0.0323 ~ 0.0331)	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
0.841 ~ 0.860 (0.0331 ~ 0.0339)	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
0.861 ~ 0.880 (0.0339 ~ 0.0346)	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
0.881 ~ 0.900 (0.0347 ~ 0.0354)	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
0.901 ~ 0.920 (0.0355 ~ 0.0362)	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
0.921 ~ 0.940 (0.0363 ~ 0.0370)	23	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
0.941 ~ 0.960 (0.0370 ~ 0.0378)	23	25	25	27	27	29	29	31	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
0.961 ~ 0.980 (0.0378 ~ 0.0386)	25	25	27	27																													



- (c) Install the new adjusting shim.
- (1) Place the new adjusting shim on the valve lifter.
 - (2) Using SST (A), press down the valve lifter and remove SST (B).

SST 09248-55050 (09248-05510, 09248-05520)

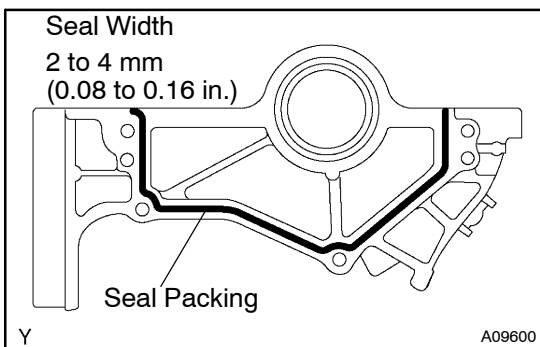
- (d) Recheck the valve clearance.



46. INSTALL WATER PUMP ASSY

- (a) Install a new gasket and water pump with the 7 bolts.

Torque: 31 N·m (320 kgf·cm, 23 ft·lbf)



47. INSTALL CAMSHAFT OIL SEAL RETAINER

- (a) Apply seal packing to the oil seal retainer as shown in the illustration.

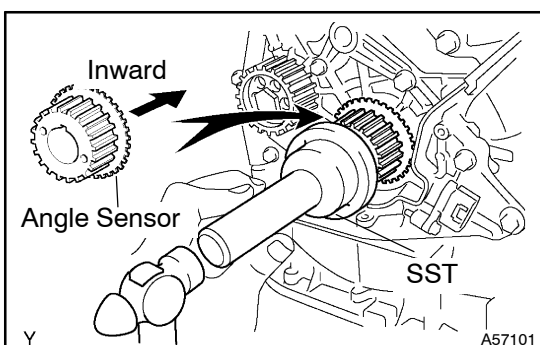
Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

- Install a nozzle of which opening is cut to 2 to 4 mm (0.08 to 0.16 in.).
- The parts must be set within 3 minutes and must be assembled within 15 minutes after applying seal packing. Otherwise the material must be removed and reapplied.
- Immediately remove the nozzle from the tube, then re-install the cap.

- (b) Install the oil seal retainer with 4 bolts. Uniformly tighten the 4 bolts in several passes.

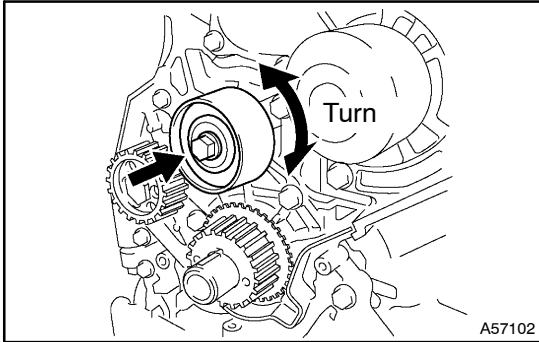
Torque: 9.8 N·m (100 kgf·cm, 7.2 ft·lbf)



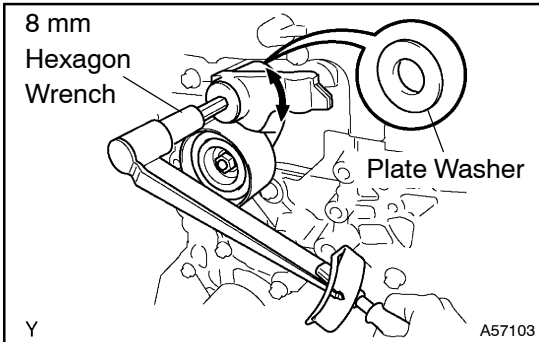
48. INSTALL CRANKSHAFT TIMING PULLEY

- (a) Align the keyway of the timing pulley with the key located on the crankshaft, then slide the pulley into place.
- (b) Using SST and a hammer, tap in the timing pulley with the angle sensor facing inward.

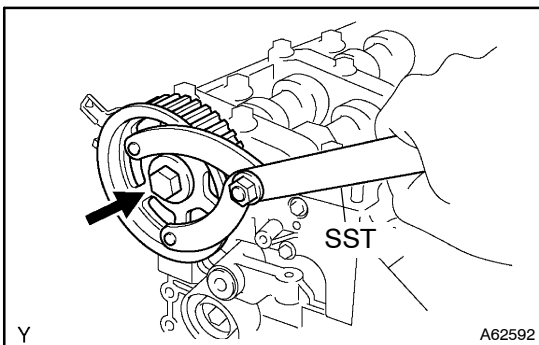
SST 09223-46011

**49. INSTALL TIMING BELT IDLER SUB-ASSY NO.2**

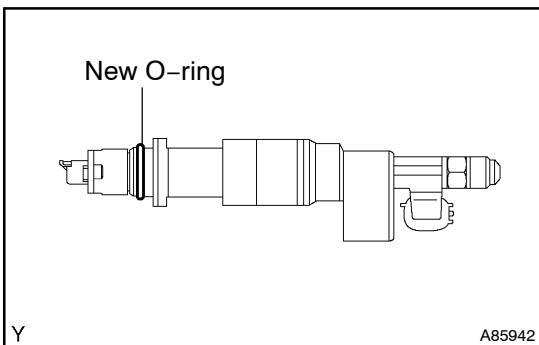
- (a) Install the idler pulley with the bolt.
Torque: 47 N·m (475 kgf·cm, 34 ft·lbf)
- (b) Check that the idler pulley moves smoothly.

**50. INSTALL TIMING BELT IDLER SUB-ASSY NO.1**

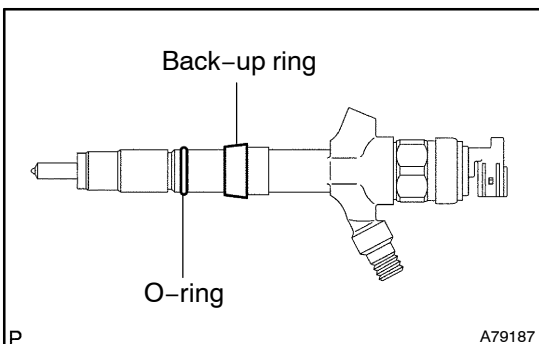
- (a) Using an 8 mm hexagon wrench, install the plate washer and idler pulley with the idler pulley shaft.
Torque: 35 N·m (357 kgf·cm, 26 ft·lbf)
- (b) Check that the pulley bracket moves smoothly.

**51. INSTALL CAMSHAFT TIMING PULLEY**

- (a) Install the pulley set key to the key groove of the camshaft.
- (b) Align the keyway of the timing pulley with the key located on the camshaft, then slide the pulley into place.
- (c) Using SST, install the pulley bolt.
SST 09960-10010 (09962-01000, 09963-01000)
Torque: 88 N·m (899 kgf·cm, 65 ft·lbf)

**52. INSTALL EXHAUST FUEL ADDITION INJECTOR ASSY**

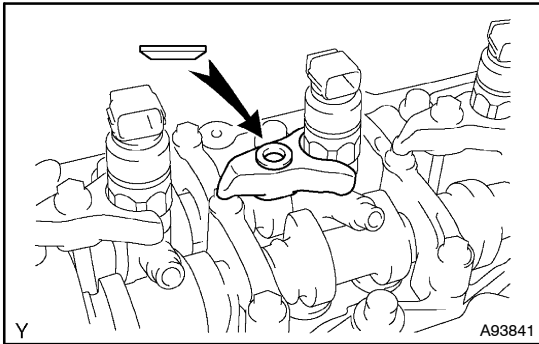
- (a) Install a new gasket to the cylinder head.
- (b) Install a new O-ring to the injector.
- (c) Apply a light coat of engine oil to the O-ring on the injector.
- (d) Install the addition injector and nozzle holder clamp.
- (e) Using a Torx wrench (T40), install the Torx screw.
Torque: 12 N·m (117 kgf·cm, 8.5 ft·lbf)

**53. INSTALL INJECTOR ASSY**

- (a) Install the 4 new nozzle seats to the cylinder head.
- (b) Install new back-up rings and the O-rings to each injector.
- (c) Apply a light coat of engine oil to the O-rings on each injector.
- (d) Install the injector to the cylinder head.

NOTICE:

Fit the injectors to the nozzle seats.



- (e) Install the nozzle holder clamp as shown in the illustration. Tighten the camshaft bearing cap bolt by hand to fix the nozzle holder clamp.

NOTICE:

- Pay attention to the mounting orientation of the washer.
- When temporarily attaching the nozzle holder clamp and mounting bolt, be careful not to orient them at an angle.

HINT:

Apply a light coat of engine oil to the threads of the nozzle holder clamp bolts.

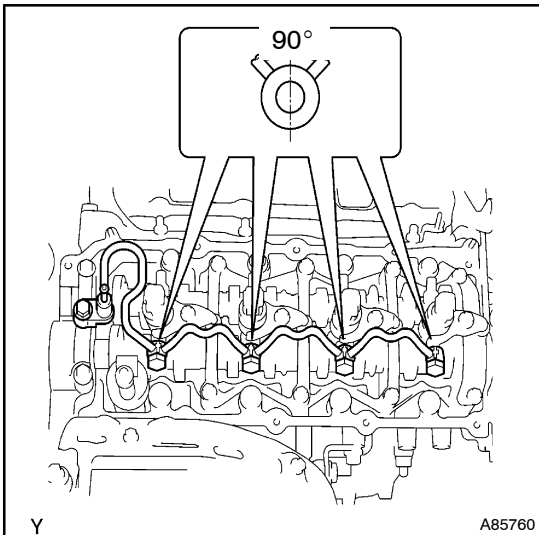
- (f) Install the injection pipe No. 1, No. 2, No. 3 and No. 4, then tighten the nuts by hand.
- (g) Install new 5 gaskets and the leakage pipe No. 1. Tighten the 4 hollow screws by hand.
- (h) Tighten the 4 nozzle holder clamp bolts.

Torque: 26 N·m (265 kgf·cm, 19 ft·lbf)

- (i) Remove the 4 injection pipes.

54. INSTALL NOZZLE LEAKAGE PIPE ASSY

- (a) Remove the bolt which is tightened at the center of the camshaft bearing cap No. 4.



- (b) Install the nozzle leakage pipe and 4 new gaskets.

NOTICE:

When installing the gaskets, pay attention to the mounting orientation. Install the gasket so that the joint of the gasket comes within the ranges shown in the illustration.

- (c) Apply a light coat of engine oil to the 4 hollow screws and bolt.
- (d) Tighten the 4 hollow screws and bolt by hand.
- (e) Tighten the 4 hollow screws and bolt.

Torque:

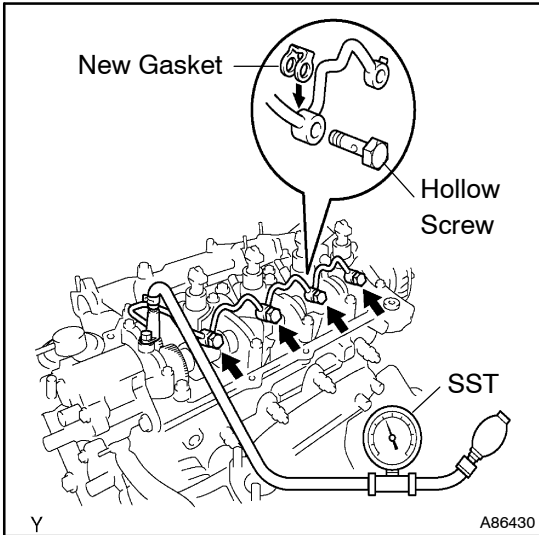
16 N·m (163 kgf·cm, 12 ft·lbf) for hollow screw

20 N·m (204 kgf·cm, 15 ft·lbf) for flange bolt

NOTICE:

In any case, when the torque exceeds the upper limit, replace the leakage pipe hollow screw and gaskets with new ones.

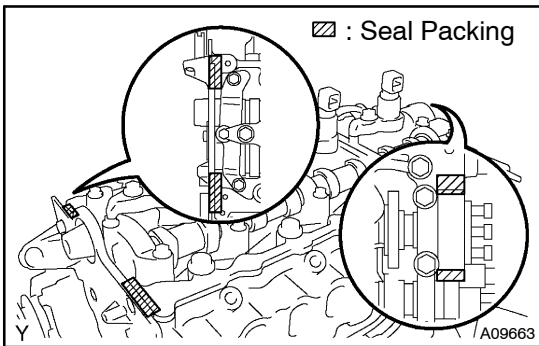
- (f) Check that there are no leaks from the nozzle leakage pipe connection.
- (1) Apply a light coat of soapy water (any fluid to detect fuel leakage) to the nozzle leakage pipe connection.



- (2) Using SST (a turbocharger pressure gauge), attach SST to the fuel return side of the nozzle leakage pipe, then maintain 100 kPa (1.0 kgf/cm², 14.5 psi) of pressure for 60 seconds to check that there are no bubbles from the pipe connection.

SST 09992–00242

- (3) After checking fuel leaks, wipe off soapy water from the pipe connection.



55. INSTALL CYLINDER HEAD COVER SUB-ASSY

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

- (b) Apply seal packing to the cylinder head.

Seal packing: Part No. 08826–00080 or equivalent

- (c) Install the gasket to the head cover.

- (d) Install the cylinder head cover with 10 bolts.

Torque: 13 N·m (135 kgf·cm, 9.7 ft·lbf)