PARTIAL ENGINE ASSY (1MZ–FE)

140HP–01

OVERHAUL

1. REMOVE SPARK PLUG

2. REMOVE OIL FILLER CAP SUB–ASSY

3. REMOVE OIL FILLER CAP GASKET

4. REMOVE CYLINDER HEAD COVER SUB–ASSY LH

5. REMOVE CYLINDER HEAD COVER GASKET NO.2

6. REMOVE CYLINDER HEAD COVER SUB–ASSY

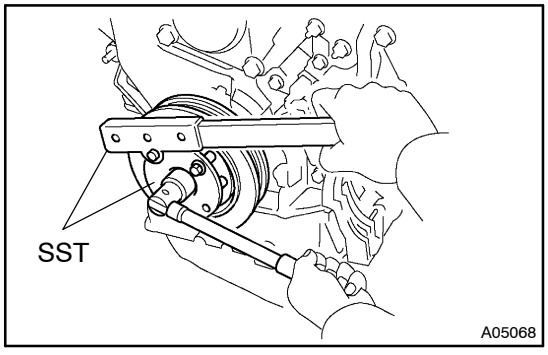
7. REMOVE CYLINDER HEAD COVER GASKET

8. REMOVE VENTILATION VALVE SUB–ASSY

9. REMOVE CAMSHAFT POSITION SENSOR

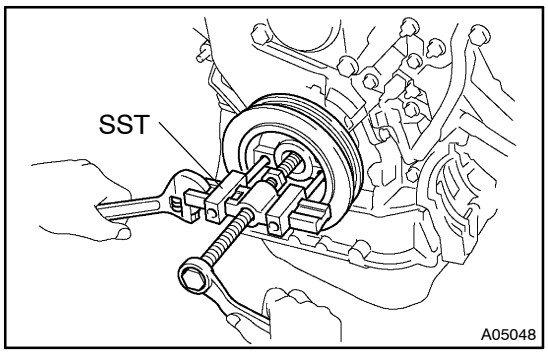
10. REMOVE OIL LEVEL GAGE SUB–ASSY

11. REMOVE OIL LEVEL GAGE GUIDE



12. REMOVE CRANKSHAFT PULLEY

(a) Using SST, loosen the pulley bolt.
SST 09213–54015 (91651–60855), 09330–00021



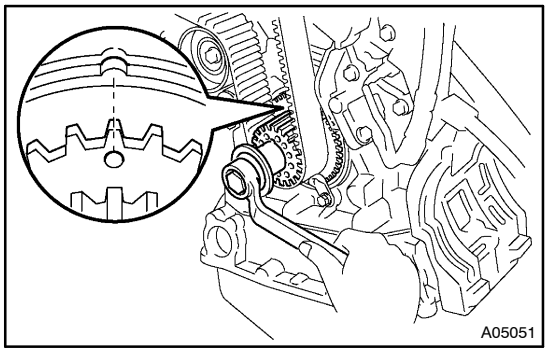
(b) Using SST and the pulley bolt, remove the pulley.
NOTICE:
Before using SST, apply lubricating oil on the threads and tip of the center bolt 100.
SST 09950–50013 (09951–05010, 09952–05010, 09953–05010, 09954–05030)

13. REMOVE TIMING BELT NO.1 COVER

14. REMOVE TIMING BELT NO.2 COVER

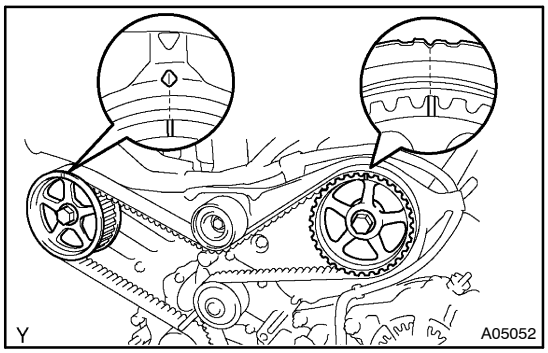
15. REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

16. REMOVE TIMING BELT GUIDE NO.2



17. REMOVE TIMING BELT

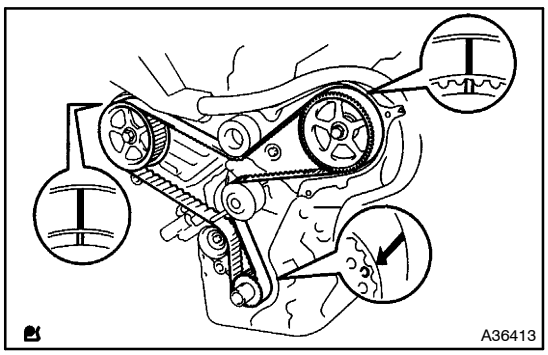
(a) Set No. 1 cylinder to TDC/compression.
  (1) Temporarily install the crankshaft pulley bolt with the washer to the crankshaft.
  (2) Turn the crankshaft clockwise, and align the timing marks of the crankshaft timing pulley and oil pump body.



  (3) Check that timing marks of the camshaft timing pulleys and No. 3 timing belt cover are aligned.

If not, turn the crankshaft 1 revolution (360°).

  (4) Remove the crankshaft pulley bolt.



(b) Place 3 installation marks and front mark on the timing belt.

HINT:

It is not necessary if the marks are still existed.

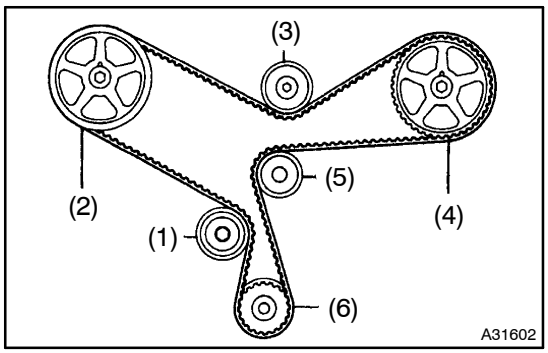
  (1) Place 3 new installation marks on the timing belt to match the timing marks of the timing pulleys.
  (2) Place a new front mark on the timing belt.

(c) Remove the timing belt tensioner.

NOTICE:

Do not install the tensioner as it removed.

(d) Remove the timing belt in this order.



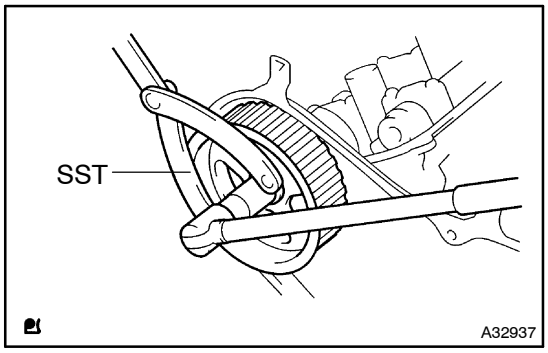
1st	No. 1 idler pulley
2nd	RH camshaft timing pulley
3rd	No. 2 idler pulley
4th	LH camshaft timing pulley
5th	Water pump pulley
6th	Crankshaft timing pulley

18. REMOVE TIMING BELT IDLER SUB–ASSY NO.1

(a) Using a 10 mm hexagon wrench, remove the bolt, idler pulley and plate washer.

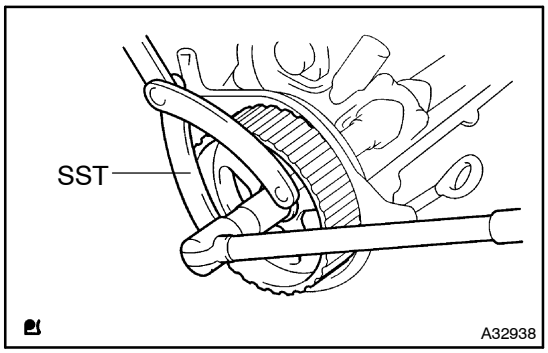
19. REMOVE TIMING BELT IDLER SUB–ASSY NO.2

20. REMOVE CRANK POSITION SENSOR



21. REMOVE CAMSHAFT TIMING PULLEY

(a) Using SST, remove the bolt and RH timing pulley.
SST 09960–10010 (09962–01000, 09963–01000)



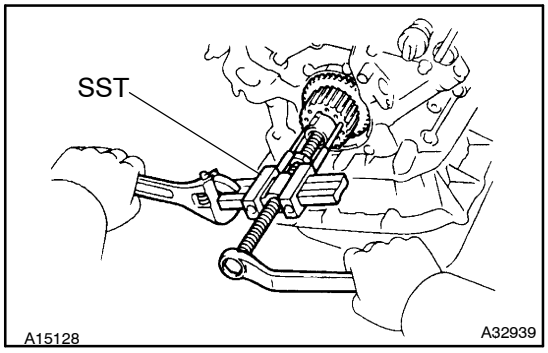
(b) Using SST, remove the bolt and LH timing pulley.
SST 09960–10010 (09962–01000, 09963–01000)

HINT:
Arrange the camshaft timing pulleys (RH and LH sides).

22. REMOVE TIMING BELT NO.3 COVER

23. REMOVE TIMING BELT IDLER BRACKET

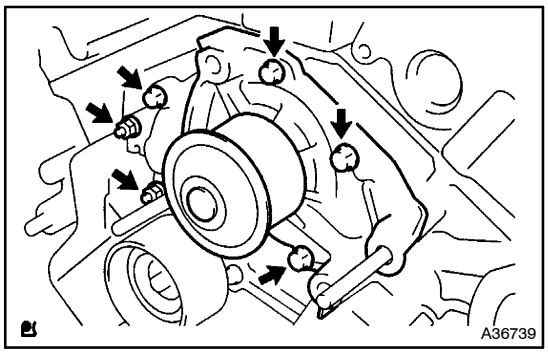
24. REMOVE TIMING BELT PLATE



25. REMOVE CRANKSHAFT TIMING PULLEY

(a) Install the pulley bolt to the crankshaft.
(b) Using SST, remove the crankshaft timing pulley.
SST 09950–50013 (09951–05010, 09952–05010, 09953–05020, 09954–05010)

NOTICE:
- **Do not scratch the sensor part of the crankshaft timing pulley.**
- **Before using SST, apply lubricating oil on the threads and tip of the center bolt 150.**

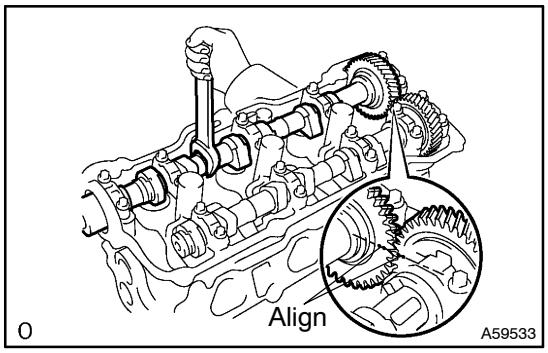


26. REMOVE WATER PUMP ASSY

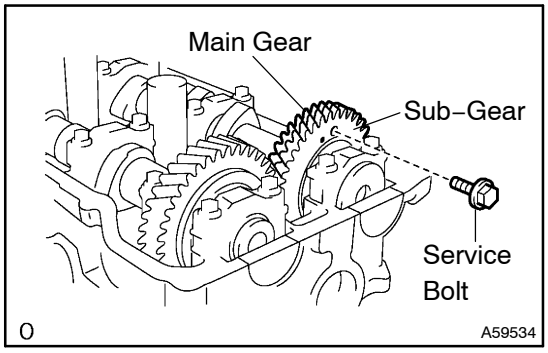
(a) Remove the 4 bolts, 2 nuts, water pump and gasket.

27. REMOVE CAMSHAFT

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



(a) Align the timing marks (2 dot marks) of the camshaft drive and driven gears by turning the camshaft with a wrench.



(b) Secure the exhaust camshaft sub–gear to the main gear with a service bolt.

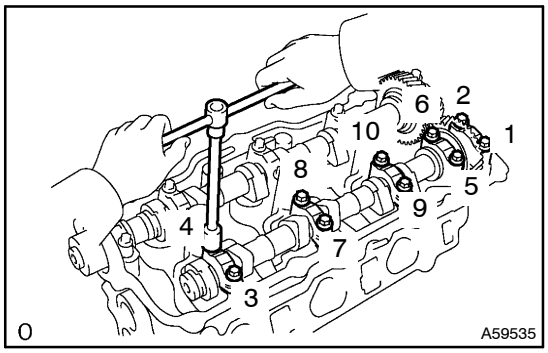
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

Recommended service bolt

Thread diameter	6 mm
Thread pitch	1.0 mm
Bolt length	16 – 20 mm

HINT:

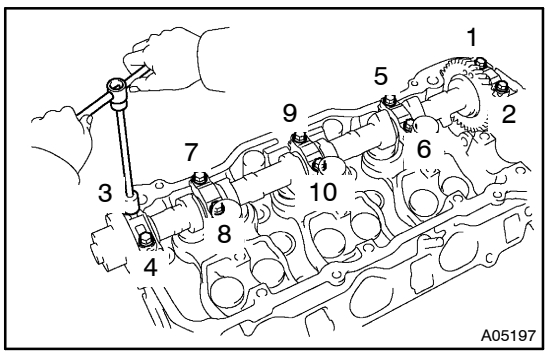
When removing the camshaft, make certain that the torsional spring force of the sub–gear has been eliminated by the above operation.



(c) Uniformly loosen and remove the 10 bearing cap bolts, in several passes, in the sequence shown, and remove the 5 bearing caps and camshaft.

NOTICE:

- **Do not pry out the camshaft.**
- **Be careful no to damage the portion of the cylinder head receiving the shaft thrust.**



28. REMOVE NO.2 CAMSHAFT

(a) Uniformly loosen and remove the 10 bearing cap bolts, in several passes, in the sequence shown, and remove the 5 bearing caps and No. 2 camshaft.

NOTICE:

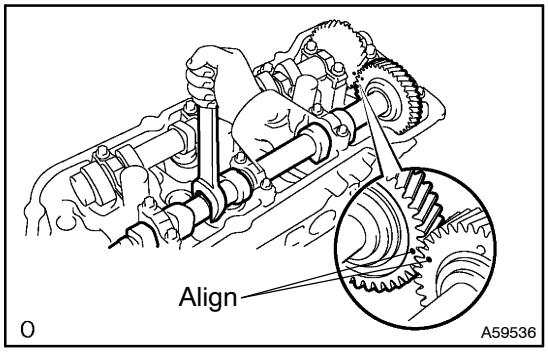
- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**

(b) Remove the oil seal from the No. 2 camshaft.

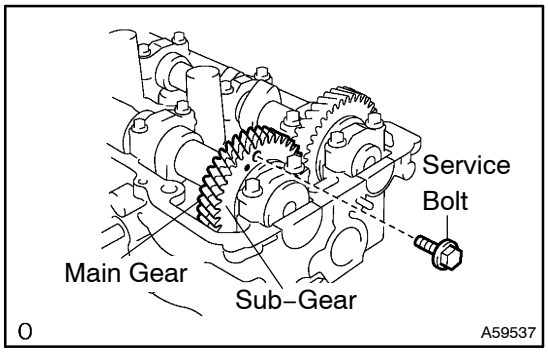
29. REMOVE NO.3 CAMSHAFT SUB–ASSY

NOTICE:

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



(a) Align the timing marks(1 dot marks) of the camshaft drive and driven gears by turning the camshaft with a wrench.



(b) Secure the exhaust camshaft sub–gear to the main gear with a service bolt.

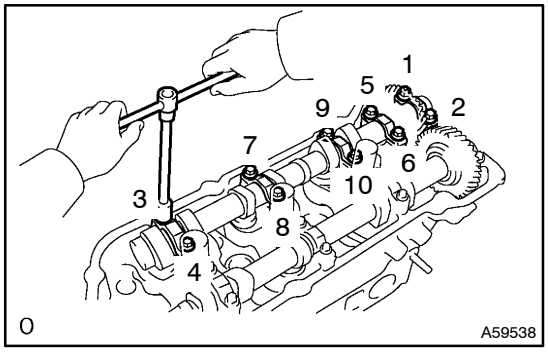
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

Recommended service bolt

Thread diameter	6 mm
Thread pitch	1.0 mm
Bolt length	16 – 20 mm

HINT:

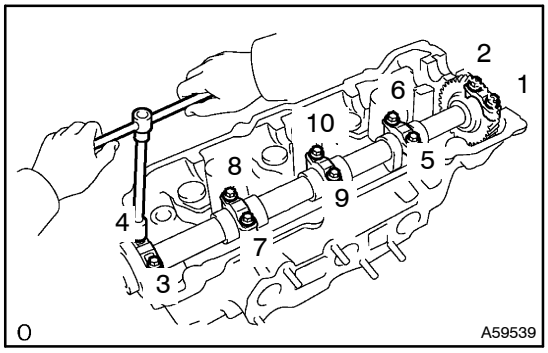
When removing the camshaft, make certain that the torsional spring force of the sub–gear has been eliminated by the above operation.



(c) Uniformly loosen and remove the 10 bearing cap bolts, in several passes, in the sequence shown, and remove the 5 bearing caps and No. 3 camshaft.

NOTICE:

- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**



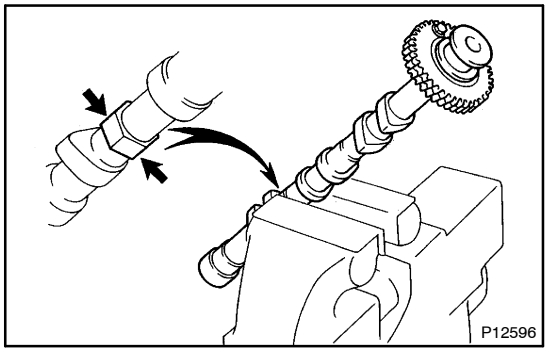
30. REMOVE NO.4 CAMSHAFT SUB–ASSY

(a) Uniformly loosen and remove the 10 bearing cap bolts, in several passes, in the sequence shown, and remove the 5 bearing caps and No. 4 camshaft.

NOTICE:

- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**

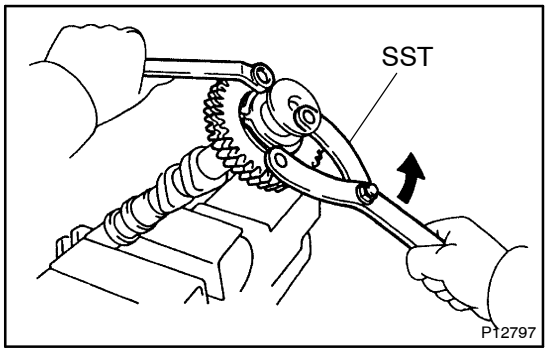
(b) Remove the oil seal from the No. 4 camshaft.



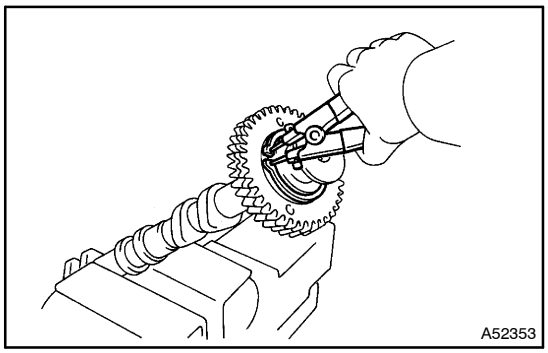
31. REMOVE CAMSHAFT SUB GEAR

(a) Fix the hexagonal wrench head portion of the camshaft in a vise.

NOTICE:
Be careful not to damage the camshaft.



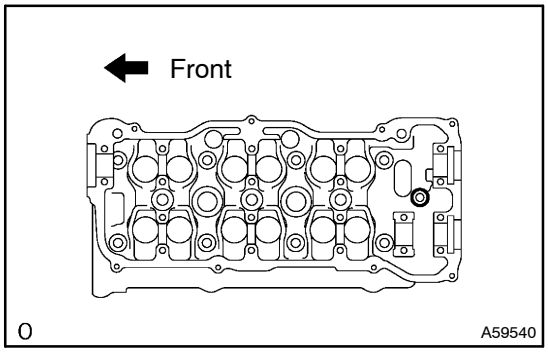
(b) Using SST, turn the sub–gear counterclockwise, and remove the service bolt.
SST 09960–10010 (09962–01000, 09963–00500)



(c) Using snap ring pliers, remove the snap ring.
(d) Remove the wave washer, camshaft sub–gear and camshaft gear spring.

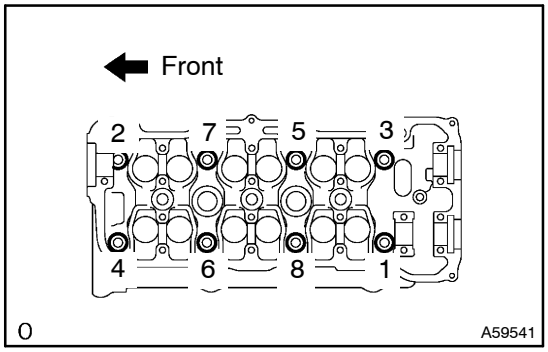
HINT:
Arrange the camshaft sub–gears and gear springs (RH and LH sides).

32. REMOVE ENGINE HANGER NO.2



33. REMOVE CYLINDER HEAD SUB–ASSY

(a) Using an 8 mm hexagon wrench, remove the hexagon bolt.

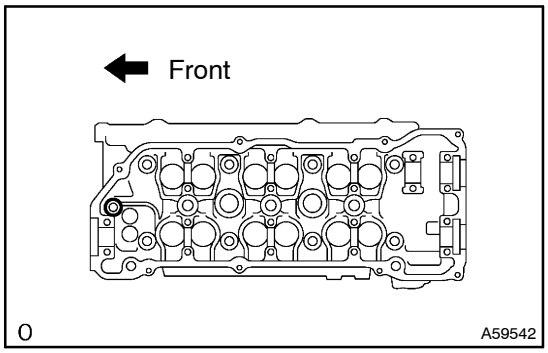


(b) Uniformly loosen the 8 cylinder head bolts, in several passes, in the sequence shown. Remove the 8 cylinder head bolts and plate washers.

NOTICE:

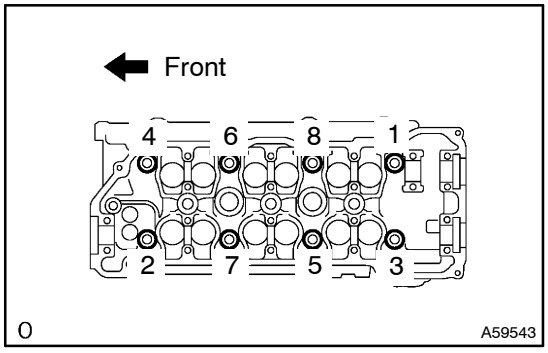
- **Be careful not to drop washers into the cylinder head.**
- **Head warpage or cracking could result from removing bolts in an incorrect order.**

34. REMOVE CYLINDER HEAD GASKET



35. REMOVE CYLINDER HEAD LH

(a) Using an 8 mm hexagon wrench, remove the hexagon bolt.

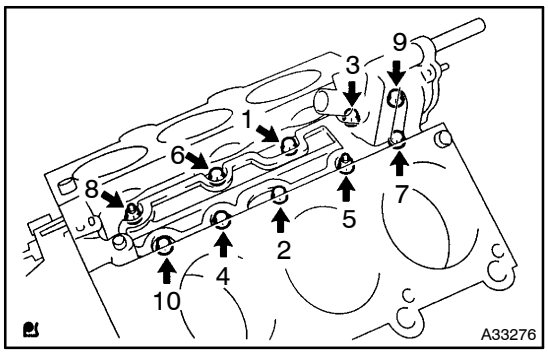


(b) Uniformly loosen the 8 cylinder head bolts, in several passes, in the sequence shown. Remove the 8 cylinder head bolts and plate washers.

NOTICE:

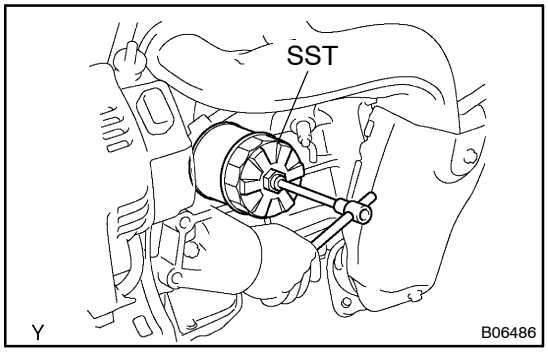
- **Be careful not to drop washers into the cylinder head.**
- **Head warpage or cracking could result from removing bolts in an incorrect order.**

36. REMOVE CYLINDER HEAD GASKET NO.2



37. REMOVE WATER INLET HOUSING

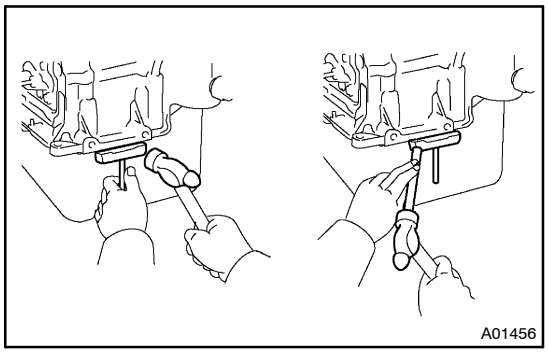
(a) Remove the 8 bolts, 2 nuts and water inlet housing.



38. REMOVE OIL FILTER SUB–ASSY

(a) Using SST, remove the oil filter.
SST 09228–07501
(b) Using a 12 mm socket hexagon wrench, remove the oil filter union.

39. REMOVE OIL PAN DRAIN PLUG



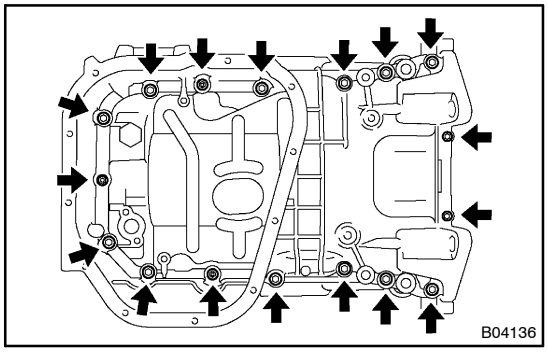
40. REMOVE OIL PAN SUB–ASSY NO.2

(a) Remove the 10 bolts and 2 nuts.
(b) Insert the blade of SST between No. 1 oil pan and No. 2 oil pan, and cut off applied sealer and remove the No. 2 oil pan.
SST 09032–00100

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

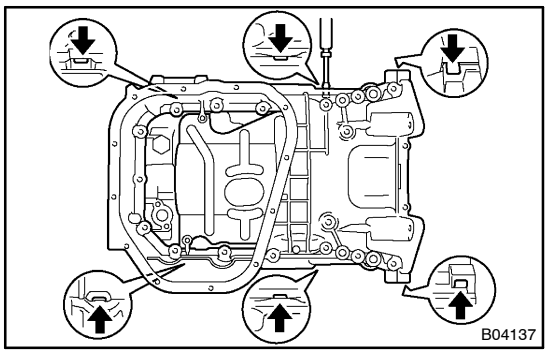
41. REMOVE OIL STRAINER SUB–ASSY

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



42. REMOVE OIL PAN SUB–ASSY

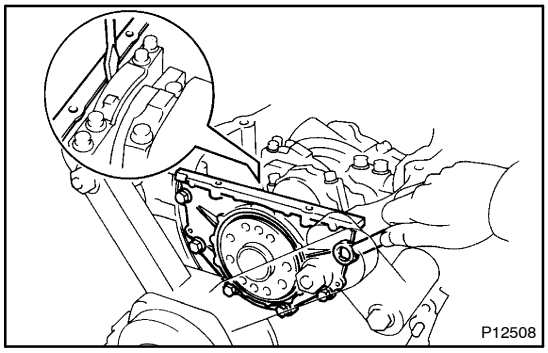
(a) Uniformly loosen and remove the 15 bolts and 2 nuts.



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

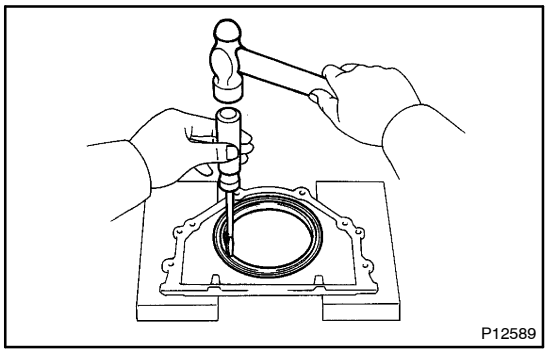
NOTICE:
Be careful not to damage the contact surfaces of the No. 1 oil pan and cylinder block.

43. REMOVE OIL PAN BAFFLE PLATE



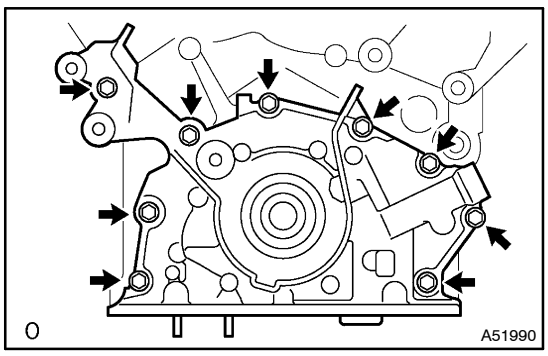
44. REMOVE ENGINE REAR OIL SEAL RETAINER

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



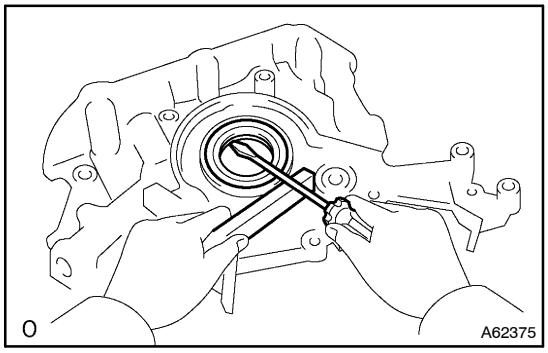
45. REMOVE ENGINE REAR OIL SEAL

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



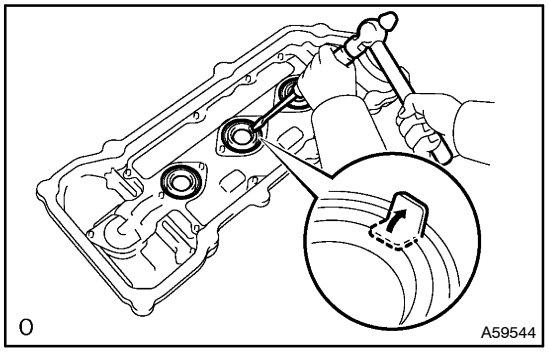
46. REMOVE OIL PUMP ASSY

(a) Remove the 9 bolts.
(b) Remove the oil pump by prying a screwdriver between the oil pump and main bearing cap.
(c) Remove the O–ring.



47. REMOVE OIL PUMP SEAL

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



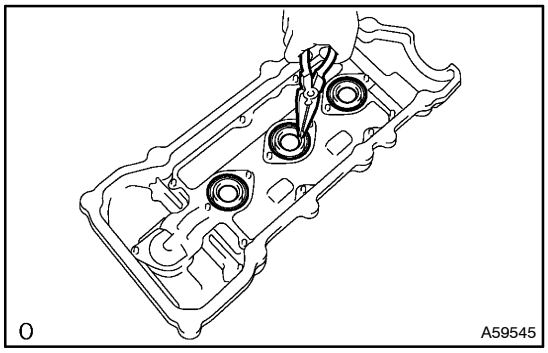
48. REMOVE SPARK PLUG TUBE GASKET

(a) Bend up the tab on the ventilation baffle plate which prevents the gasket from the slipping out.

NOTICE:

Be careful not to damage the baffle plate of the cylinder head cover.

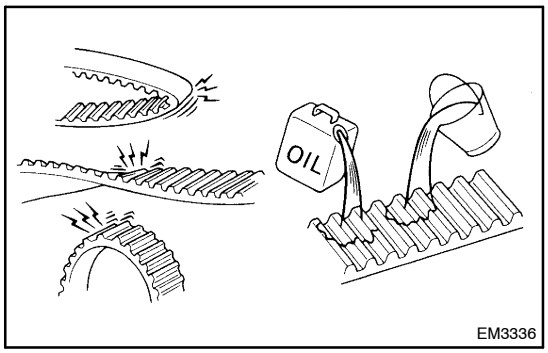
(b) Using a screwdriver and a hammer, tap out the gasket.



(c) Using needle–nose pliers, pry out the gasket.

NOTICE:

Be careful not to damage the cylinder head cover.



49. INSPECT TIMING BELT

NOTICE:

- **Do not bend, twist or turn the timing belt inside out.**
- **Do not allow the timing belt to come into contact with oil, water or steam.**
- **Do not utilize timing belt tension when installing or re moving the mount bolt of the camshaft timing pulley.**

If there are any defects, as shown in the illustrations, check these points below.

(a) If there is premature parting,
- Check for proper installation.
- Check the timing cover gasket for damage and proper installation.

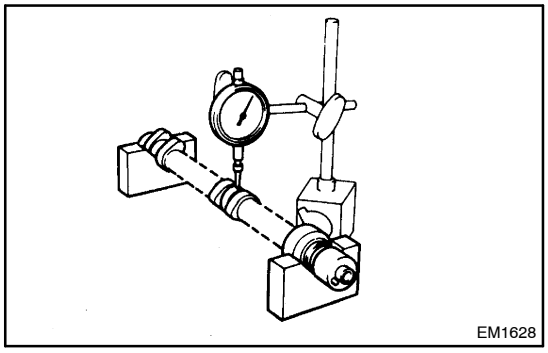
(b) If the belt teeth are cracked or damaged, check to see if either camshaft is locked.

(c) If there is noticeable wear or cracks on the belt face, check to see if there are nicks on the side of the idler pulley lock and water pump.

(d) If there is wear or damage on only one side of the belt, check the belt guide and the alignment of each pulley.

(e) If there is noticeable wear on the belt teeth,
- Check timing cover for damage.
- Check gasket has been installed correctly.
- Check for foreign material on the pulley teeth.

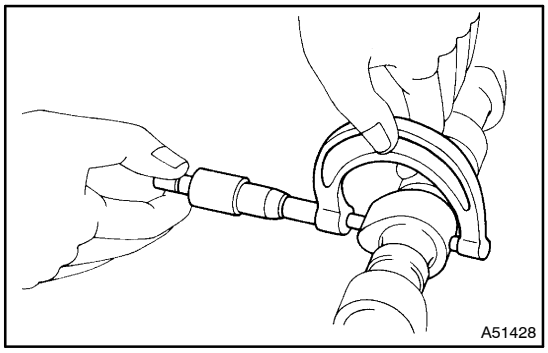
If necessary, replace the timing belt.


EM1628

50. INSPECT CAMSHAFT

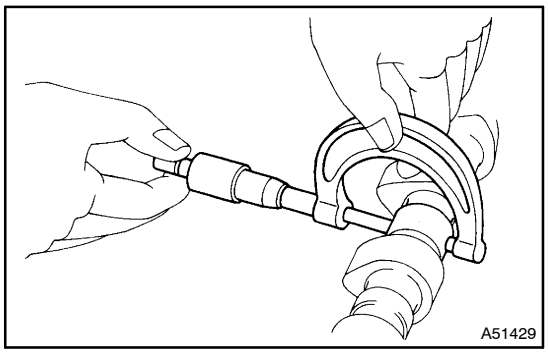
(a) Inspect camshaft for runout.
(1) Place the camshaft on V–blocks.
(2) Using a dial indicator, measure the circle runout at the center journal.
Maximum circle runout: 0.06 mm (0.0024 in.)

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


A51428

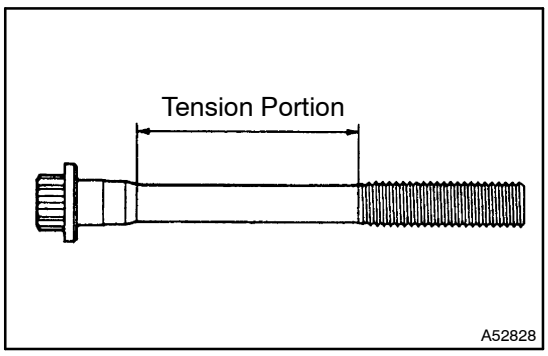
(b) Inspect cam lobes.
(1) Using a micrometer, measure the cam lobe height.
Standard cam lobe height:
Intake 42.11 – 42.21 mm (1.6579 – 1.6618 in.)
Exhaust 41.96 – 42.06 mm (1.6520 – 1.6559 in.)
Minimum cam lobe height:
Intake 41.96 mm (1.6520 in.)
Exhaust 41.81 mm (1.6461 in.)

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


A51429

(c) Inspect camshaft journals.
(1) Using a micrometer, measure the journal diameter.
Journal diameter:
26.959 – 26.975 mm (1.0614 – 1.0620 in.)

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

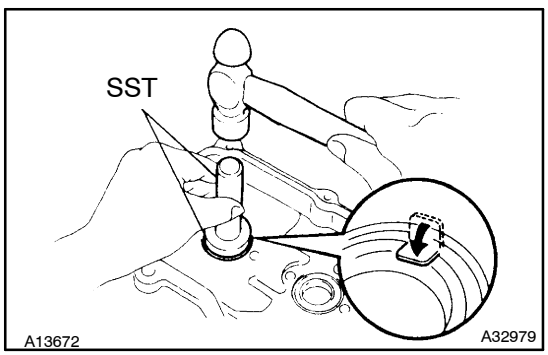


A52828

51. INSPECT CYLINDER HEAD SET BOLT

(a) Using vernier calipers, measure the tension portion diameter of the bolt.
Standard outside diameter:
8.95 – 9.05 mm (0.3524 – 0.3563 in.)
Minimum outside diameter: 8.75 mm (0.3775 in.)

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

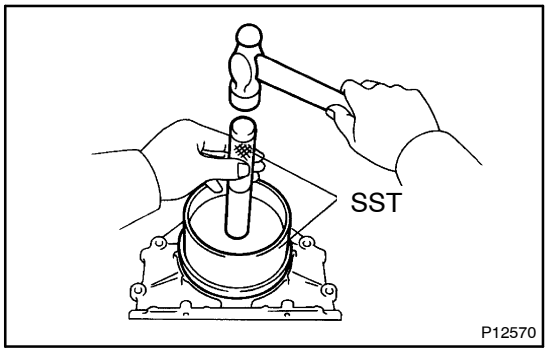


A13672 A32979

52. INSTALL SPARK PLUG TUBE GASKET

(a) Using SST and a hammer, tap in a new gasket until its surface is flush with the upper edge of the cylinder head cover.
SST 09950–60010 (09951–00430), 09950–70010 (09951–07100)
(b) Return the ventilation plate tab to its original position.
(c) Apply a light coat of MP grease to the gasket lip.

53. INSTALL ENGINE REAR OIL SEAL



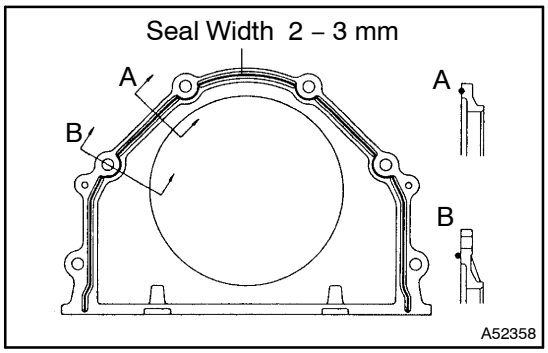
(a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223–15030, 09950–70010 (09951–07100)

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

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

54. INSTALL ENGINE REAR OIL SEAL RETAINER

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

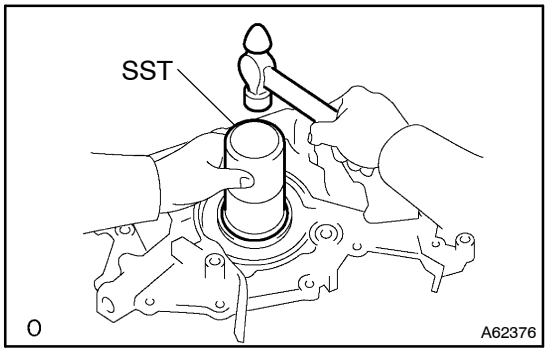


(b) Apply seal packing in the shape of bead (Diameter 2 – 3 mm (0.08 – 0.12 in.)) consequently as shown in the illustration.
Seal packing: Part No. 08826–00080 or equivalent

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

(c) Install the oil seal retainer with the 6 bolts, uniformly tighten the bolt in several passes.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

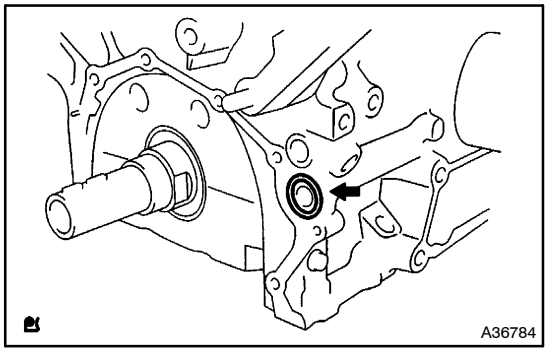
55. INSTALL OIL PUMP SEAL



(a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump body edge.
SST 09223–00010

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

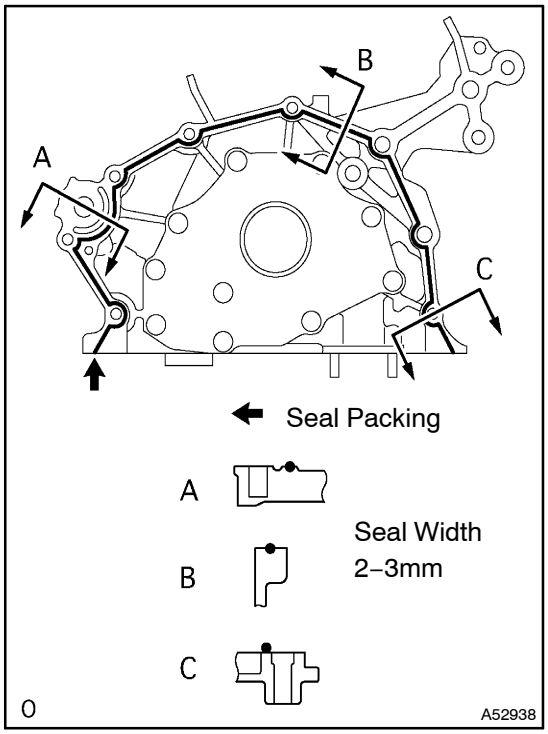
(b) Apply MP grease to the oil seal lip.



56. INSTALL OIL PUMP ASSY

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

(b) Apply a light coat of engine oil to a new O–ring and place it on the cylinder block.

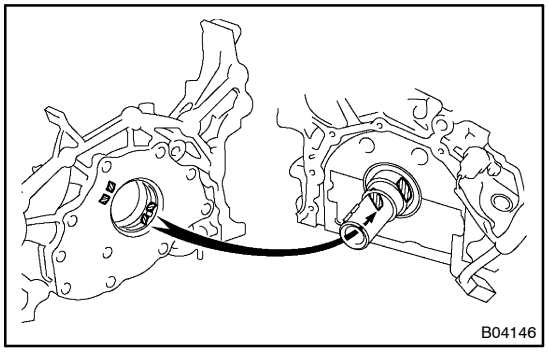


(c) Apply seal packing in the shape of bead (Diameter 2 – 3 mm (0.08 – 0.12 in.)) consequently as shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

- **Apply seal packing to the inner side of the bolt hole.**
- **Remove any oil from contact surface.**
- **Install the oil pump within 3 minutes after applying seal packing.**
- **Do not put into engine oil within 2 hours after installing.**



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

(e) Install the oil pump with the 9 bolts. Uniformly tighten the bolts in several passes.

Torque:
10 mm head 8.0 N·m (82 kgf·cm, 71 in.·lbf)
12 mm head 20 N·m (199 kgf·cm, 14 ft·lbf)
14 mm head 43 N·m (439 kgf·cm, 32 ft·lbf)

57. INSTALL CRANK POSITION SENSOR

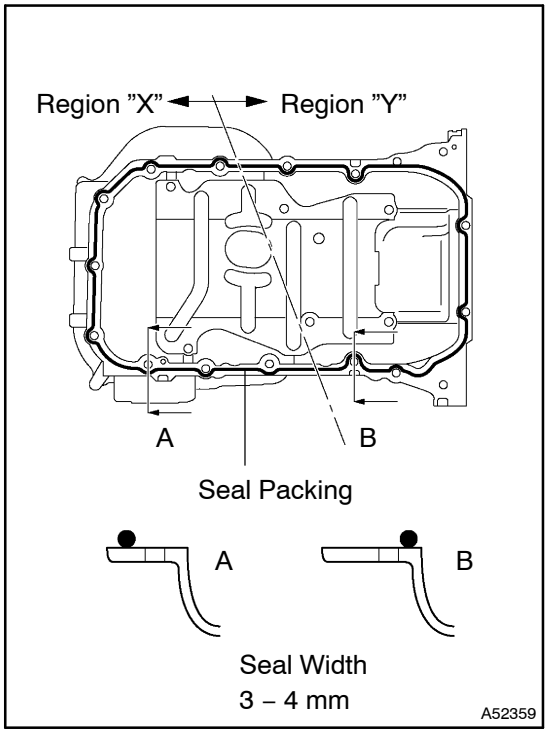
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

58. INSTALL OIL PAN BAFFLE PLATE

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

59. INSTALL OIL PAN SUB–ASSY

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



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

NOTICE:

- **Apply seal packing to the outer side of the bolt hole in the region ”X”.**
- **Apply seal packing to the inner side of the bolt hole in the region ”Y”.**
- **Remove any oil from the contact surface.**
- **Install the No. 1 oil pan within 3 minutes after applying seal packing.**
- **Do not put into engine oil within 2 hours after installing.**

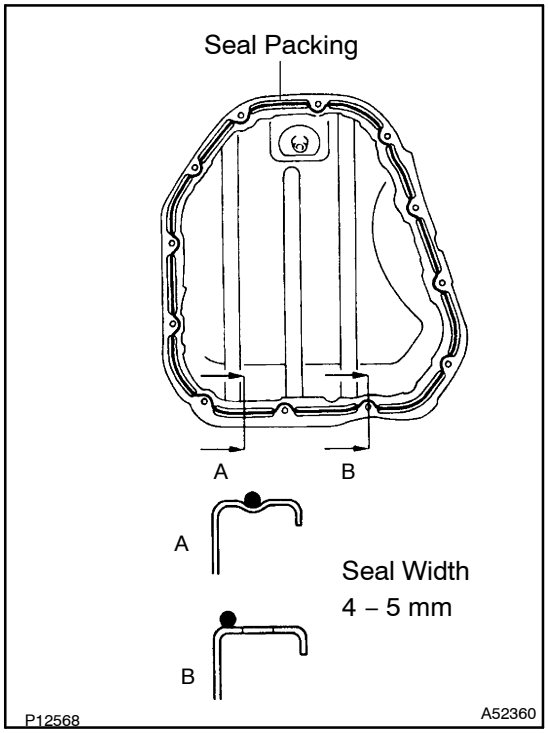
(c) Install the No. 1 oil pan with the 15 bolts and 2 nuts. Uniformly tighten the bolts in several passes.
Torque:
10 mm head 8.0 N·m (82 kgf·cm, 71 in.·lbf)
12 mm head 20 N·m (199 kgf·cm, 14 ft·lbf)

60. INSTALL OIL STRAINER SUB–ASSY

(a) Install a new gasket and the oil strainer with the bolt and 2 nuts.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

61. INSTALL OIL PAN SUB–ASSY NO.2

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



(b) Apply seal packing in the shape of bead (Diameter 4 – 5 mm (0.16 – 0.20 in.)) consequently as shown in the illustration.
Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

- **Remove any oil from the contact surface.**
- **Apply seal packing to the inner side of the bolt hole.**
- **Install the oil pan within 3 minutes after applying seal packing.**
- **Do not put into engine oil within 2 hours after installing.**

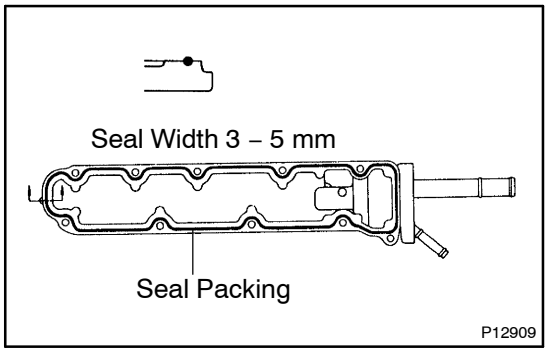
(c) Install the No. 2 oil pan with the 10 bolts and 2 nuts.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

62. INSTALL OIL PAN DRAIN PLUG

(a) Install the drain plug with a new gasket.
Torque: 45 N·m (459 kgf·cm, 33 ft·lbf)

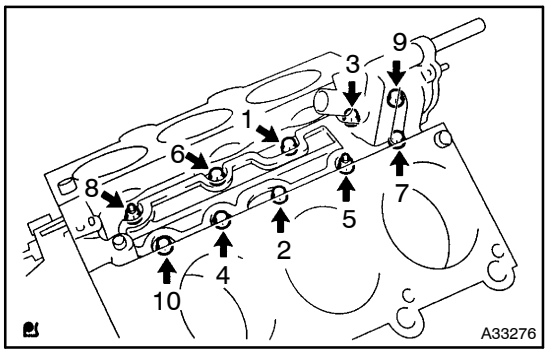
63. INSTALL WATER INLET HOUSING

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

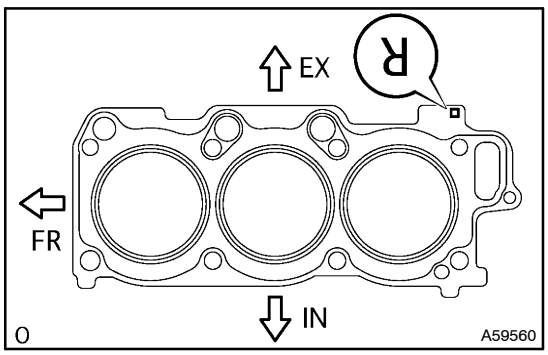


(b) Apply seal packing in the shape of bead (Diameter 3 – 5 mm (0.12 – 0.20 in.)) consequently as shown in the illustration.
Seal packing: Part No. 08826–00100 or equivalent

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



(c) Install the water inlet housing with the 8 bolts and 2 nuts. Uniformly tighten the bolts and nuts in several passes, in the sequence shown.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



64. INSTALL CYLINDER HEAD GASKET

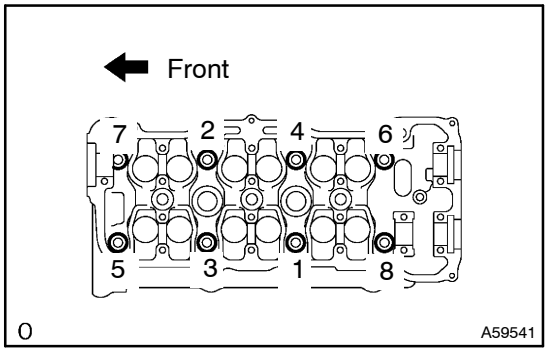
(a) Place a new cylinder head gasket on the cylinder block surface with the R mark upward.

NOTICE:
- **Remove any oil from the contact surface.**
- **Be careful of the installation direction.**
- **Place the cylinder head quietly in order not to damage the gasket at the bottom part of the head.**

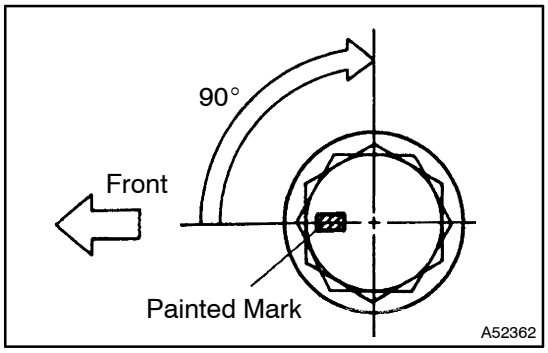
65. INSTALL CYLINDER HEAD SUB–ASSY

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

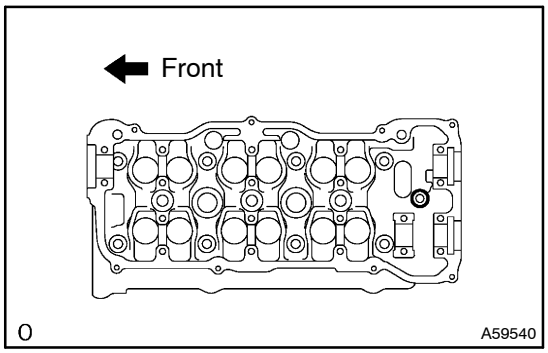
(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
(b) Install the plate washer to the cylinder head bolt.



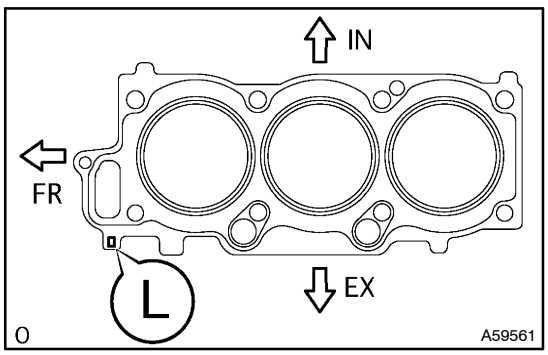
(c) Install and uniformly tighten the 8 cylinder head bolts, in several passes, in the sequence shown.
Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)



(d) Mark the front side of each cylinder head bolt head with paint.
(e) Retighten the cylinder head bolts by 90° in the sequence shown.
(f) Check that the painted mark is now at a 90° angle to the front.



(g) Using an 8 mm socket hexagon wrench, install the hexagon bolt.
Torque: 19 N·m (189 kgf·cm, 14 ft·lbf)



66. INSTALL CYLINDER HEAD GASKET NO.2

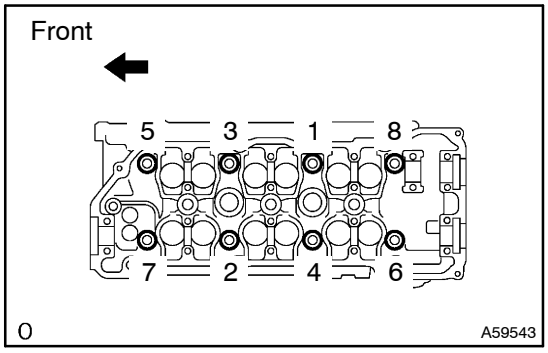
(a) Place a new cylinder head gasket on the cylinder block surface with the L mark upward.

NOTICE:
- **Remove any oil from the contact surface.**
- **Be careful of the installation direction.**
- **Place the cylinder head quietly in order not to damage the gasket at the bottom part of the head.**

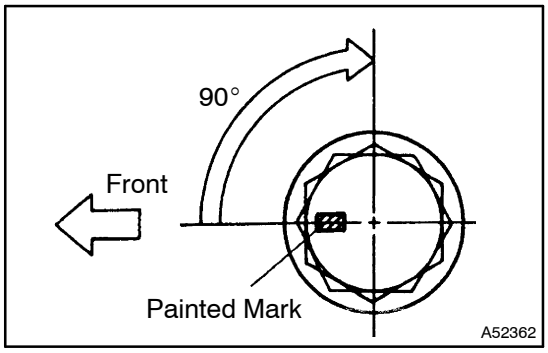
67. INSTALL CYLINDER HEAD LH

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

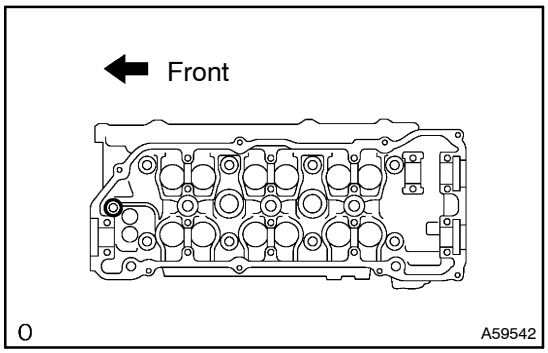
(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
(b) Install the plate washer to the cylinder head bolt.



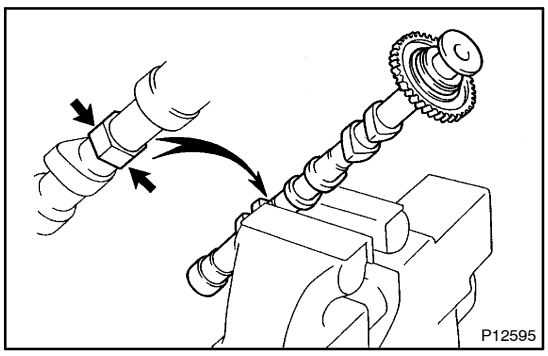
(c) Install and uniformly tighten the 8 cylinder head bolts, in several passes, in the sequence shown.
Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)



(d) Mark the front side of each cylinder head bolt head with paint.
(e) Retighten the cylinder head bolts by 90° in the sequence shown.
(f) Check that the painted mark is now at a 90° angle to the front.



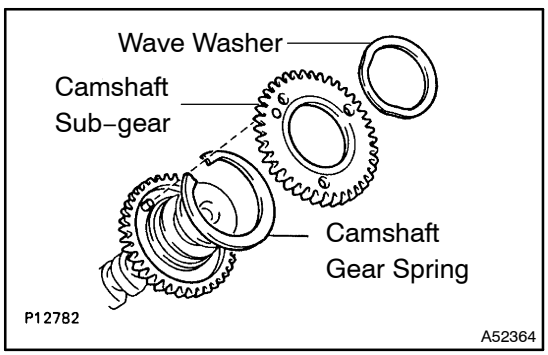
(g) Using an 8 mm socket hexagon wrench, install the hexagon bolt.
Torque: 19 N·m (189 kgf·cm, 14 ft·lbf)



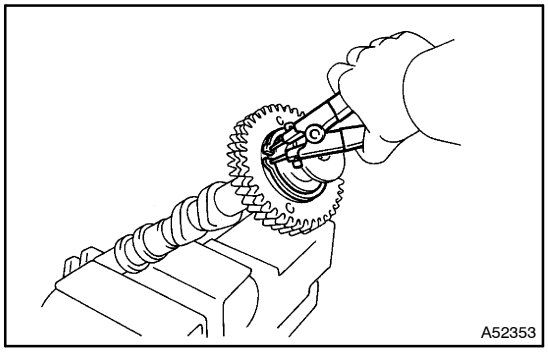
68. INSTALL CAMSHAFT SUB GEAR

(a) Fix the hexagonal wrench head portion of the camshaft in a vise.

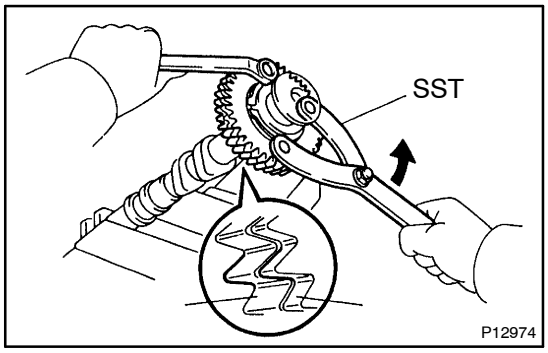
NOTICE:
Be careful not to damage the camshaft.



(b) Install the camshaft gear spring and camshaft sub–gear.
HINT:
Attach the pins on the gears to the gear spring ends.
(c) Install the wave washer.



(d) Using snap ring pliers, install the snap ring.



(e) Using SST, align the holes of the camshaft main gear and sub–gear by turning camshaft sub–gear counterclockwise, and temporarily install a service bolt.
SST 09960–10010 (09962–01000, 09963–00500)

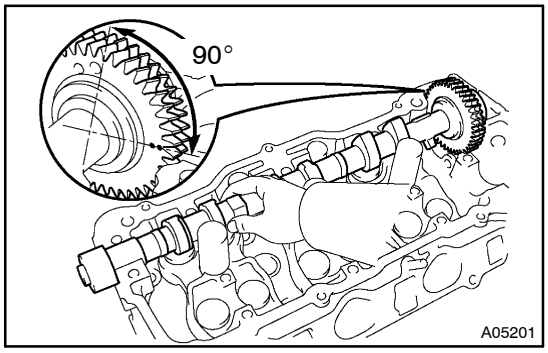
(f) Align the gear teeth of the main gear and sub–gear, and tighten the service bolt.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

NOTICE:
Be careful not to damage the camshaft journals.
HINT:
When installing the camshaft, make certain that the torsional spring force of the sub–gear has been eliminated by the above operation.

69. INSTALL NO.2 CAMSHAFT

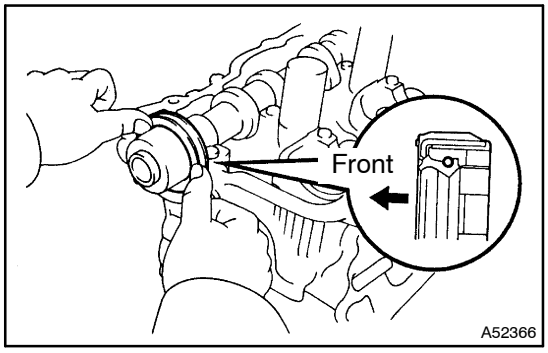
NOTICE:
Since the thrust clearance of the camshaft is small, the camshaft must be held level while it is being installed. If the camshaft is not level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following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

(a) Apply new engine oil to the thrust portion and journal of the camshaft.



(b) Place the No. 2 camshaft at a 90° angle of timing mark (2 dot marks) on the cylinder head.

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

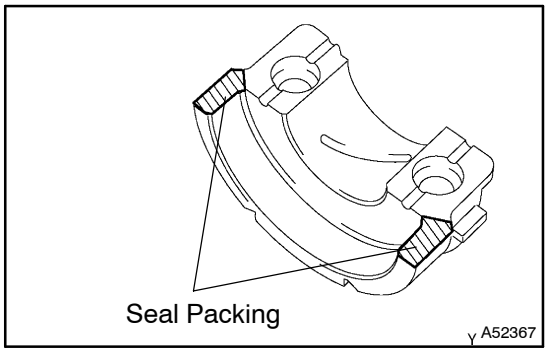


(d) Install the oil seal to the camshaft.

NOTICE:

- **Do not turn over the oil seal lip.**
- **Insert the oil seal until it stops.**

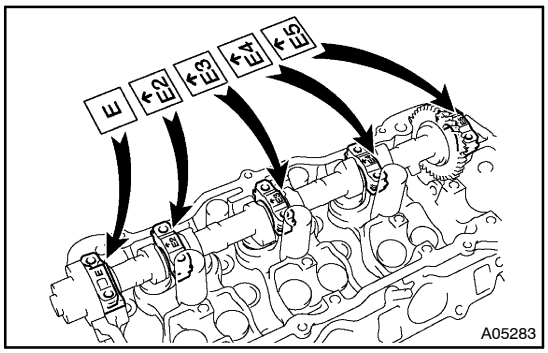
(e) Remove any old packing material from the contact surface.



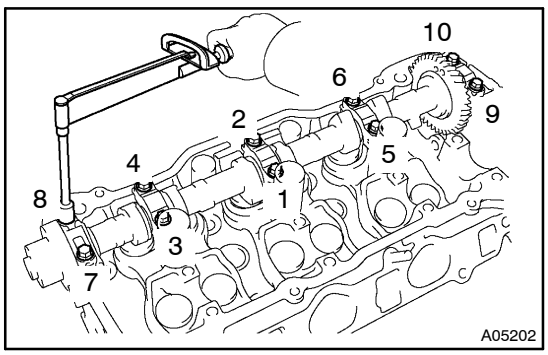
(f) Apply seal packing to the No. 1 bearing cap as shown.
Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

- **Install the No. 1 bearing cap within 5 minutes after applying seal packing.**
- **Do not put into engine oil within 2 hours after installing.**



(g) Install the 5 bearing caps in their proper locations.
(h) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.



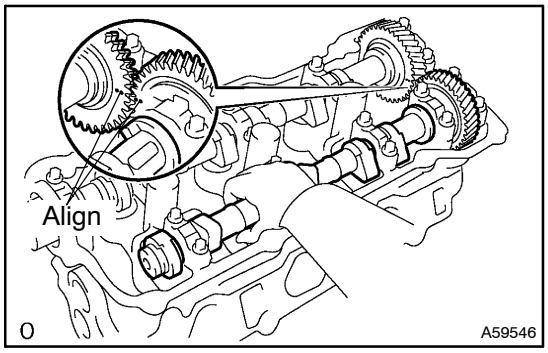
(i) Install and uniformly tighten the 10 bearing cap bolts, in several passes, in the sequence shown.
Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)

70. INSTALL CAMSHAFT

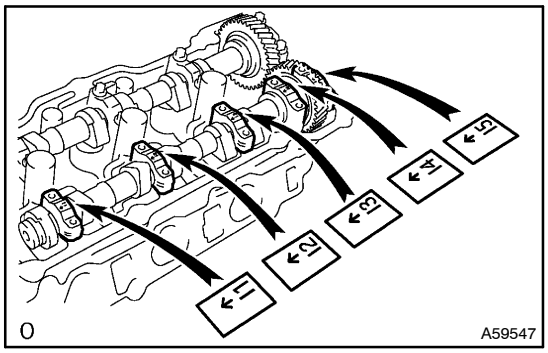
NOTICE:

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

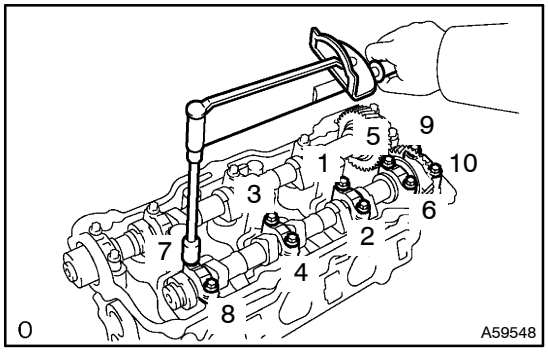
(a) Apply new engine oil to the thrust portion and journal of the camshaft.



(b) Align the timing marks (2 dot marks) of the camshaft drive with driven gears.
(c) Place the camshaft on the cylinder head.



(d) Install the 5 bearing caps in their proper locations.
(e) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

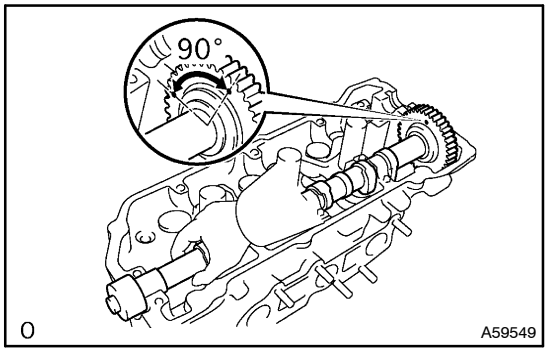


(f) Install and uniformly tighten the 10 bearing cap bolts, in several passes, in the sequence shown.
Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)
(g) Remove the service bolt.

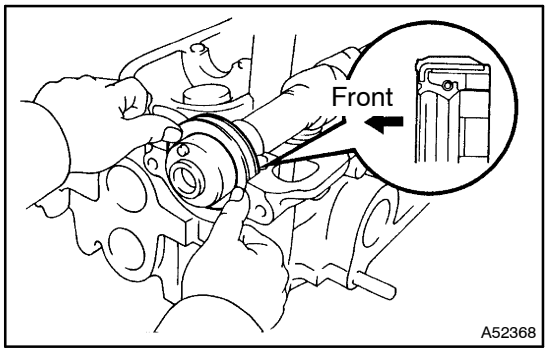
71. INSTALL NO.4 CAMSHAFT SUB–ASSY

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

(a) Apply new engine oil to the thrust portion and journal of the camshaft.



(b) Place the No. 4 camshaft at a 90° angle of timing mark (2 dot marks) on the cylinder head.
(c) Apply MP grease to a new oil seal lip.

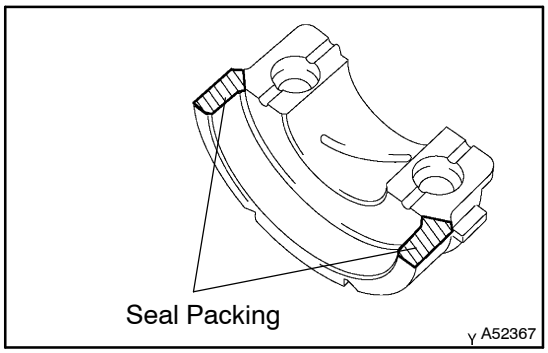


(d) Install the oil seal to the camshaft.

NOTICE:

- **Do not turn over the oil seal lip.**
- **Insert the oil seal until it stops.**

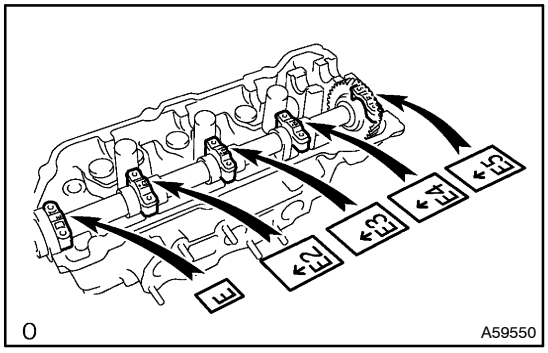
(e) Remove any old packing material from the contact surface.



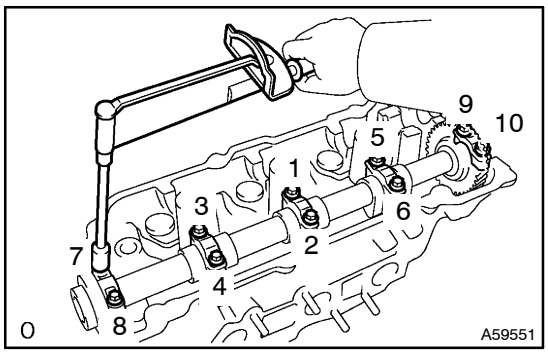
(f) Apply seal packing to the No. 1 bearing cap as shown.
Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

- **Install the No. 1 bearing cap within 5 minutes after applying seal packing.**
- **Do not put into engine oil within 2 hours after installing.**



(g) Install the 5 bearing caps in their proper locations.
(h) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

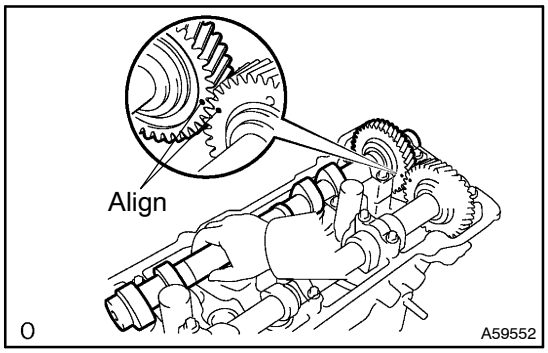


(i) Install and uniformly tighten the 10 bearing cap bolts, in several passes, in the sequence shown.
Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)

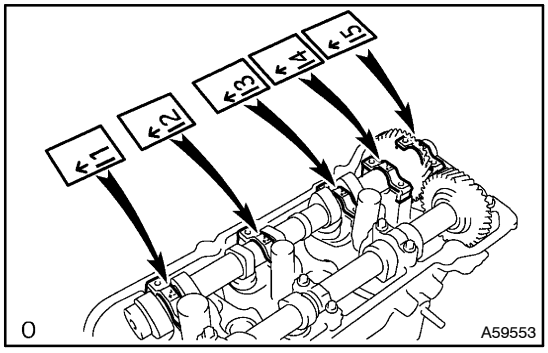
72. INSTALL NO.3 CAMSHAFT SUB–ASSY

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

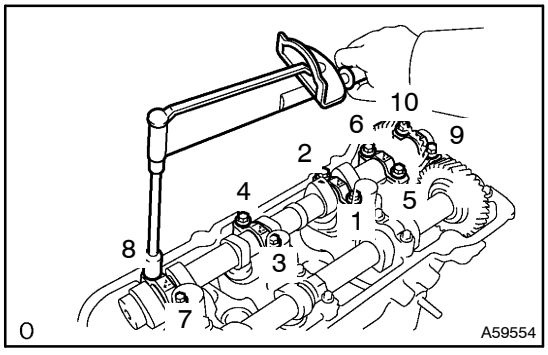
(a) Apply new engine oil to the thrust portion and journal of the camshaft.



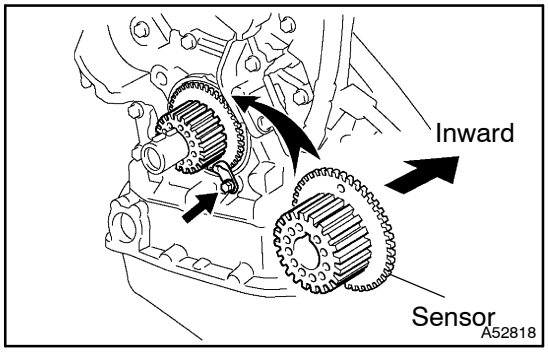
(b) Align the timing marks (1 dot marks) of the camshaft drive with driven gears. Place the camshaft on the cylinder head.



(c) Install the 5 bearing caps in their proper locations.
(d) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.



(e) Install and uniformly tighten the 10 bearing cap bolts, in several passes, in the sequence shown.
Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)
(f) Remove the service bolt.

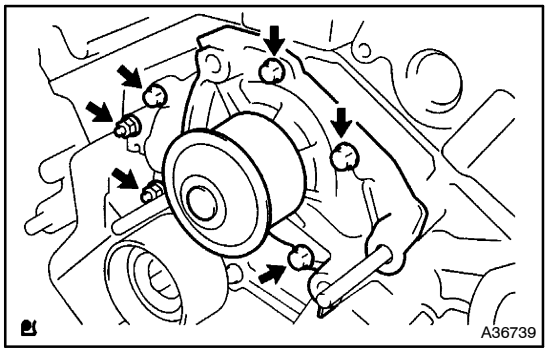


73. INSTALL CRANKSHAFT TIMING PULLEY

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

NOTICE:
Do not scratch the sensor part of the crankshaft timing pulley.

(b) Install the timing belt plate with the bolt.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



74. INSTALL WATER PUMP ASSY

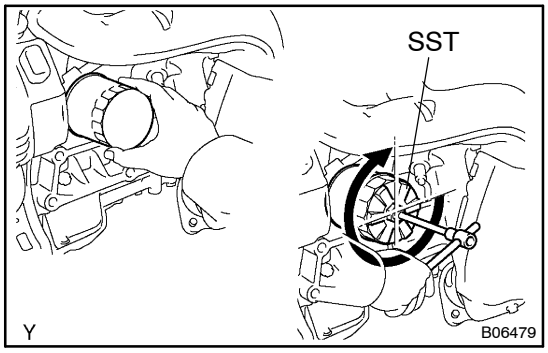
(a) Install a new gasket and the water pump with the 4 bolts and 2 nuts.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

75. INSTALL OIL LEVEL GAGE GUIDE

(a) Apply a light coat of engine oil to a new O–ring and install it to the level gage guide.
(b) Install the level gage guide.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

76. INSTALL OIL FILTER SUB–ASSY

(a) Using a 12 mm socket hexagon wrench, install the oil filter union.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)
(b) Check and clean the oil filter installation surface.
(c) Apply clean engine oil to the gasket of a new oil filter.
(d) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.



(e) Using SST, tighten it an additional 3/4 turn.
SST 09228–07501

77. INSTALL TIMING BELT IDLER BRACKET

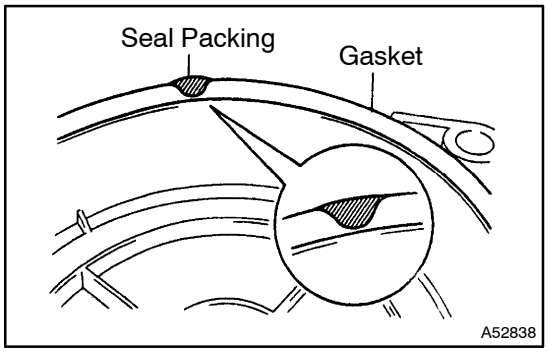
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)

78. INSTALL TIMING BELT NO.3 COVER

(a) Visually check the crack and break in the gasket of the timing belt cover.

NOTICE:

If it is judged that water is entering at the visual check, repair it with seal packing when the crack length is within 2 – 3 cm (0.79 – 1.18 in.). Change the gasket when the crack length is 3 – 4 cm (1.18 – 1.57 in.) and more.



(b) In case of repairing the timing belt cover gasket, follow the procedure below.

(1) Repair the crack and break portion applying the seal packing.

Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

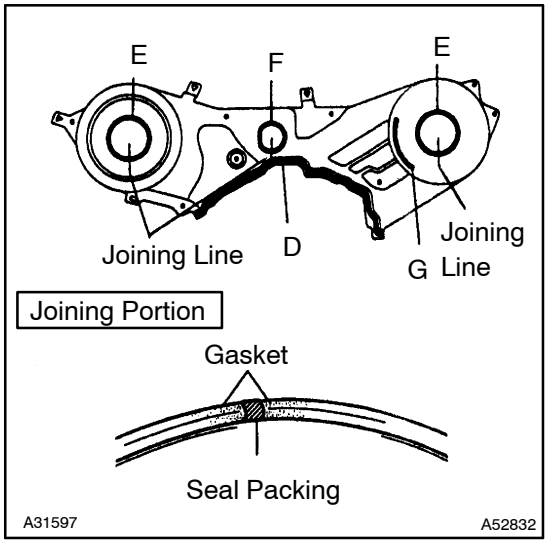
In case of applying the seal packing, apply it as wide and high as the gasket.

(c) In case of replacing the timing belt cover gasket, follow the procedure below.

(1) Using a screwdriver and gasket scraper, remove the remained gasket.

NOTICE:

Be careful not to damage the timing belt cover.



(2) Remove the backing paper from a new gasket, and affix the gasket along the groove of the timing belt cover as shown in the illustration.

NOTICE:

- **Affix the gasket in the center of the groove.**
- **At the corner, affix it without making the thickness of the gasket less.**

HINT:

Gasket	D	E	F	G
Length	335 mm (13.19 in.)	180 mm (7.09 in.)	133 mm (5.24 in.)	72 mm (2.83 in.)

(3) In case of having clearance at the joining portion of the gasket, apply the seal packing.

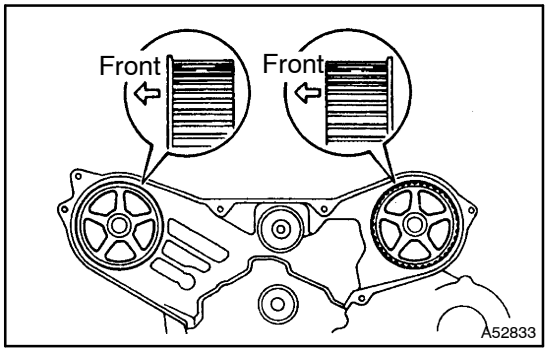
Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

In case of applying the seal packing, apply it as wide and high as the gasket.

(d) Install the timing belt cover with the 6 bolts.

Torque: 8.5 N·m (87 kgf·cm, 76 in.·lbf)

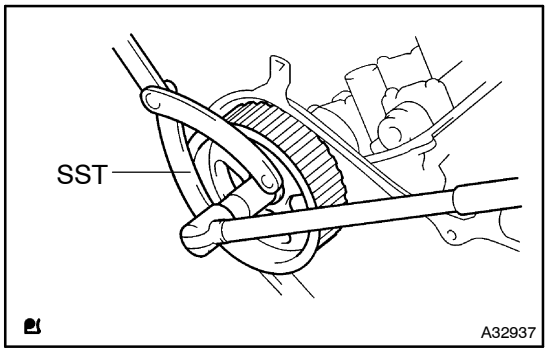


79. INSTALL CAMSHAFT TIMING PULLEY

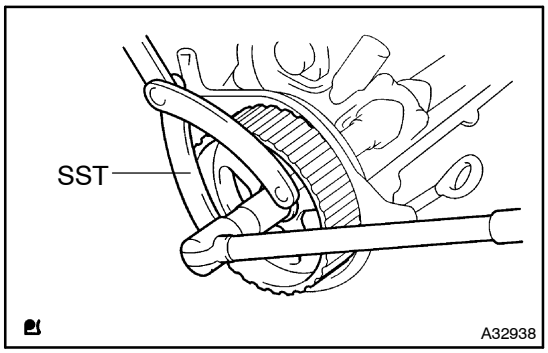
(a) Pay attention to the direction of the belt guide, install the camshaft timing pulley and tighten the bolt temporally.

HINT:

- Face the belt guide of the RH timing pulley toward the engine front.
- Face the belt guide of the LH timing pulley toward the engine rear.



(b) Using SST, tighten the RH pulley bolt.
SST 09960–10010 (09962–01000, 09963–01000)
Torque: 125 N·m (1,275 kgf·cm, 92 ft·lbf)



(c) Using SST, tighten the LH pulley bolt.
SST 09960–10010 (09962–01000, 09963–01000)
Torque: 125 N·m (1,275 kgf·cm, 92 ft·lbf)

80. INSTALL TIMING BELT IDLER SUB–ASSY NO.2

Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)

81. INSTALL TIMING BELT IDLER SUB–ASSY NO.1

(a) Using a 10 mm socket hexagon wrench, install the plate washer and idler pulley.
Torque: 34 N·m (347 kgf·cm, 25 ft·lbf)

82. INSTALL TIMING BELT

(a) Remove any oil or water on the pulleys, and keep them clean.

NOTICE:

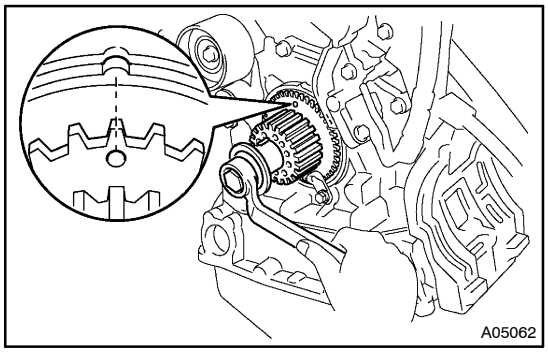
- **If adherence of water and/or oil to the timing belt is found, restore the leakage and install a new timing belt.**
- **Wipe only the pulleys; do not use any cleansing agent.**

(b) Inspect the idler pulleys.
(1) Check that the idler pulley turns smoothly.

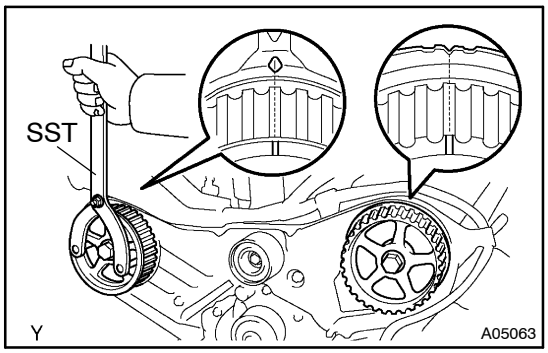
(2) Visually check the seal portion of the idler pulley for grease leakage.

(c) Inspect the water pump.
(1) Turn the pulley, and check that water pump bearing moves smoothly and quitely.
(2) Visually check the drain hole for coolant leakage.

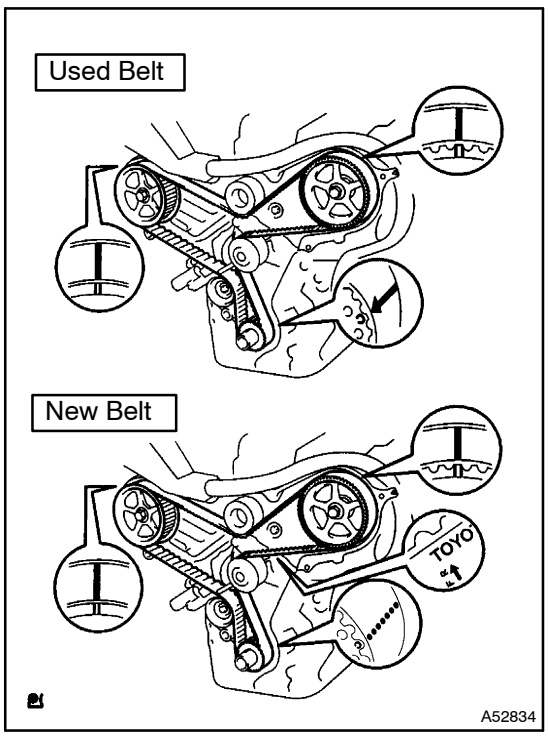
(d) Temporarily install the crankshaft pulley bolt and washer to the crankshaft.



(e) Turn the crankshaft, and align the timing marks of the crankshaft timing pulley and oil pump body.

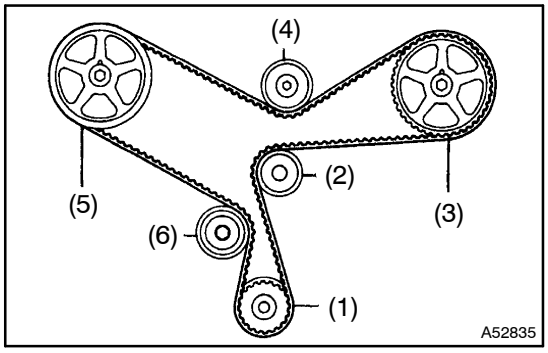


(f) Using SST, turn the camshaft pulley, align the timing marks of the timing pulley and No. 3 timing belt cover.
SST 09960–10010 (09962–01000, 09963–01000)



(g) Face the front mark on the timing belt forward.
(h) Align the installation mark on the timing belt with the timing mark of the crankshaft timing pulley.
(i) Align the installation marks on the timing belt with the timing marks of the camshaft timing pulleys.

HINT:
The installation marks are placed when the timing belt is removed, or printed originally are used as match marks.

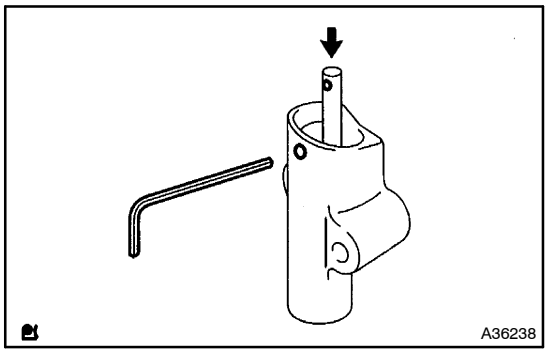


(j) Install the timing belt in this order.

1st	Crankshaft timing pulley
2nd	Water pump pulley
3rd	LH camshaft timing pulley
4th	No. 2 idler pulley
5th	RH camshaft timing pulley
6th	No. 1 idler pulley

83. INSTALL CHAIN TENSIONER ASSY NO.1

(a) Set the timing belt tensioner upright on the press.



(b) Slowly press in the push rod.

NOTICE:

Do not apply pressure more than 9.8 kN (1,000 kgf, 2,205 lbf) to the rod.

(c) Align the holes of the push rod and housing, pass a 1.5 mm hexagon wrench through the holes to keep the setting position of the push rod.

(d) Release the press.

(e) Temporarily install the tensioner with the 2 bolts. Alternately tighten the 2 bolts.

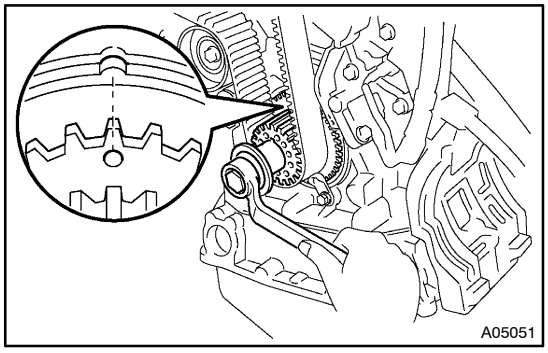
Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)

NOTICE:

Be sure to tighten the bolts equally. Installing the tensioner slantingly may cause failure of its proper operation.

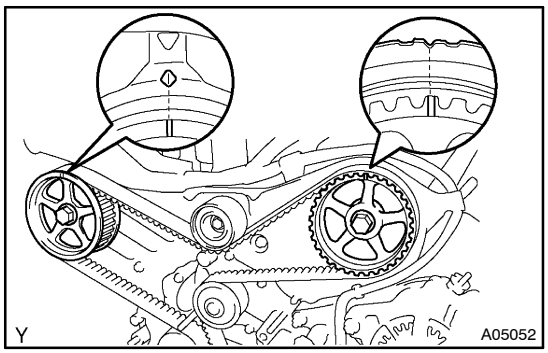
(f) Remove the 1.5 mm hexagon wrench from the tensioner.

(g) Slowly turn the crankshaft 2 revolutions, and align the timing marks of the crankshaft timing pulley with oil pump body.



NOTICE:

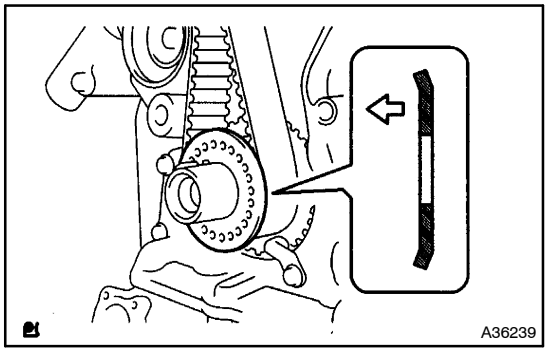
Always turn the crankshaft clockwise.



(h) Check the timing marks of the RH and LH timing pulleys with the timing marks of the No. 3 timing belt cover as shown in the illustration.

If the marks do not align, remove the timing belt and reinstall it.

(i) Remove the crankshaft pulley bolt.



84. INSTALL TIMING BELT GUIDE NO.2

(a) Install the timing belt guide, facing the cup side toward the engine front.

85. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)

86. INSTALL TIMING BELT NO.2 COVER

(a) Visually check the crack and break in the gasket of the timing belt cover.

HINT:

If it is judged that water is entering at the visual check, replace the timing belt cover.

(b) Install the timing belt cover.

Torque: 8.5 N·m (87 kgf·cm, 76 in.·lbf)

87. INSTALL TIMING BELT NO.1 COVER

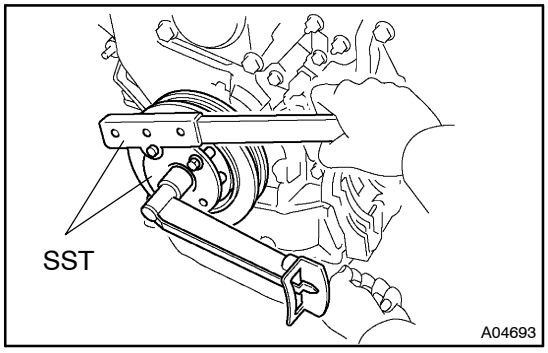
(a) Visually check the crack and break in the gasket of the timing belt cover.

HINT:

If it is judged that water is entering at the visual check, replace the timing belt cover.

(b) Install the timing belt cover.

Torque: 8.5 N·m (87 kgf·cm, 76 in.·lbf)



88. INSTALL CRANKSHAFT PULLEY

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

(b) Using SST, install the pulley bolt.

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

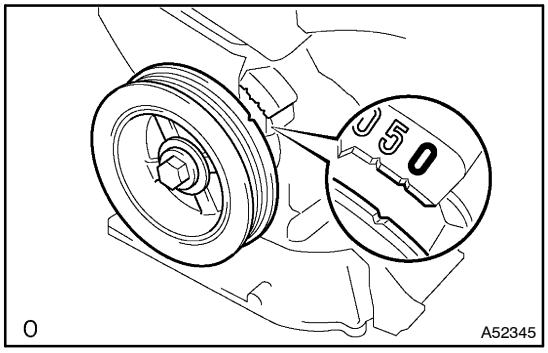
Torque: 215 N·m (2,192 kgf·cm, 159 ft·lbf)

89. INSTALL CAMSHAFT POSITION SENSOR

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

90. INSTALL ENGINE HANGER NO.2

Torque: 20 N·m (199 kgf·cm, 14 ft·lbf)

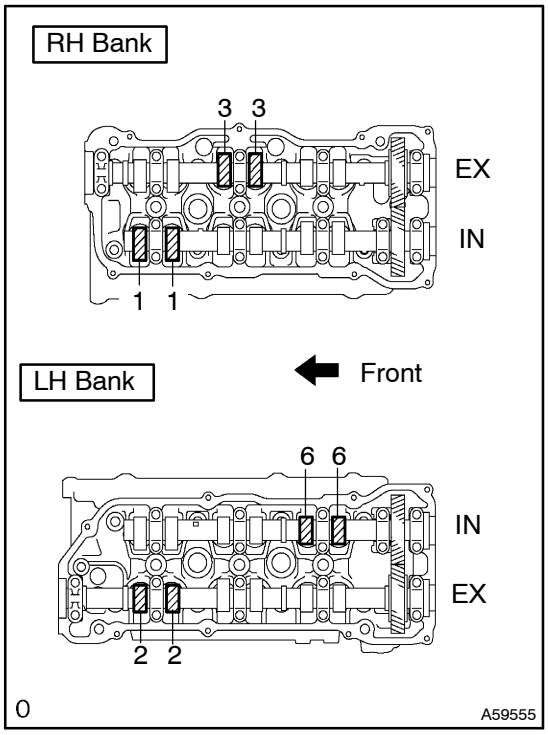


91. INSPECT VALVE CLEARANCE

(a) Turn the crankshaft pulley, and align its groove with the timing mark ”0” of the No. 1 timing belt cover.

(b) Check that the valve lifters on the No. 1 (IN and EX) are loose.

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

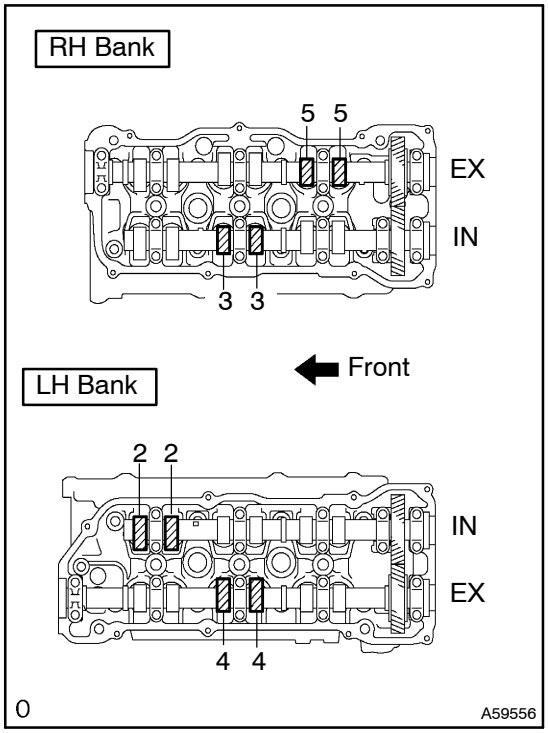


(c) Check only those valves indicated in the illustration.

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

Valve clearance (Cold):
Intake 0.15 – 0.25 mm (0.006 – 0.010 in.)
Exhaust 0.25 – 0.35 mm (0.010 – 0.014 in.)

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

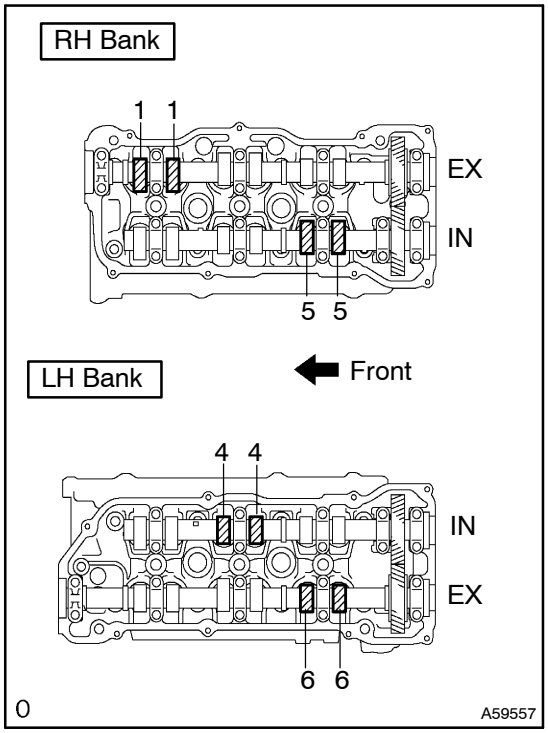


(d) Turn the crankshaft 2/3 of a revolution (240°), and check only the valves indicated in the illustration.

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

Valve clearance (Cold):
Intake 0.15 – 0.25 mm (0.006 – 0.010 in.)
Exhaust 0.25 – 0.35 mm (0.010 – 0.014 in.)

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

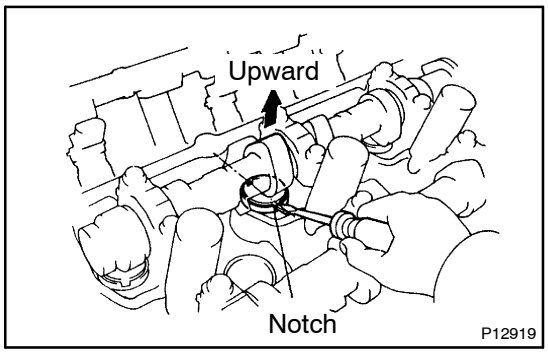


(e) Turn the crankshaft 2/3 of a revolution (240°), and check only the valves indicated in the illustration.

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

Valve clearance (Cold):
Intake 0.15 – 0.25 mm (0.006 – 0.010 in.)
Exhaust 0.25 – 0.35 mm (0.010 – 0.014 in.)

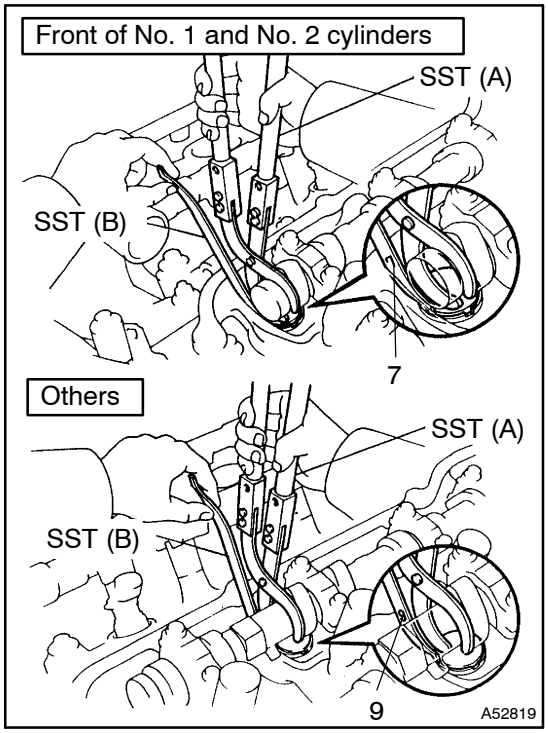
(2) Record out–of–specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.



92. ADJUST VALVE CLEARANCE

(a) Turn the camshaft so that the cam lobe for the valve to be adjusted faces up.

(b) Turn the valve lifter with a screwdriver so that the notches are perpendicular to the camshaft.



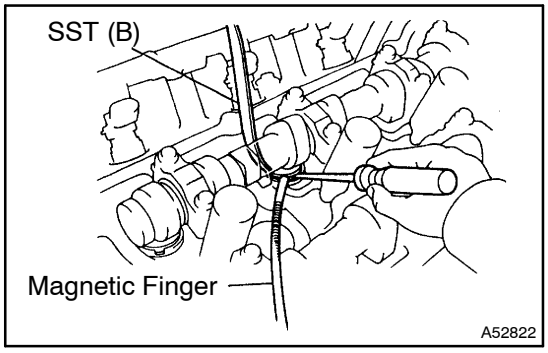
(c) Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

SST 09248–55040 (09248–05410, 09248–05420)

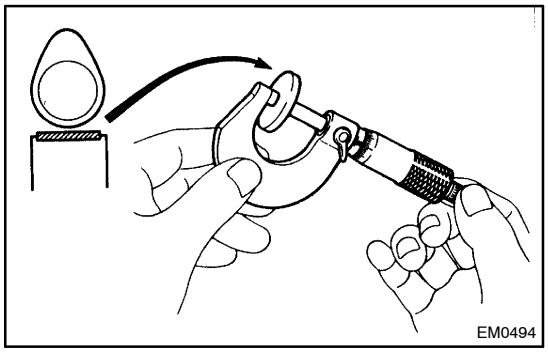
HINT:

- Apply SST (B) at a slight angle on the side marked with ”9” or ”7”, at the position shown in the illustration.
- When SST (B) is inserted too deeply, it will get pinched by the shim. To prevent it from being stuck, insert it gently from the intake side, at a slight angle.

SST (A)	09248–05410
SST (B)	09248–05420



(d) Using a small screwdriver and magnetic finger, remove the adjusting shim.



(e) Using a micrometer, measure the thickness of the removed shim.

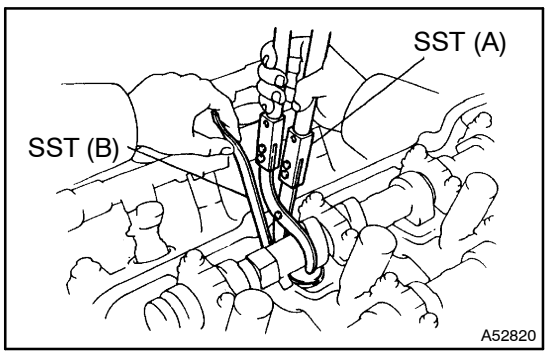
(f) Calculate the thickness of a new shim so the valve clearance comes within the specified value.

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

Specified value (Cold):
Intake A = B + (C – 0.20 mm (0.008 in.))
Exhaust A = B + (C – 0.30 mm (0.012 in.))

(g) Select a new shim with a thickness as close as possible to the calculated values.

HINT:
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.).



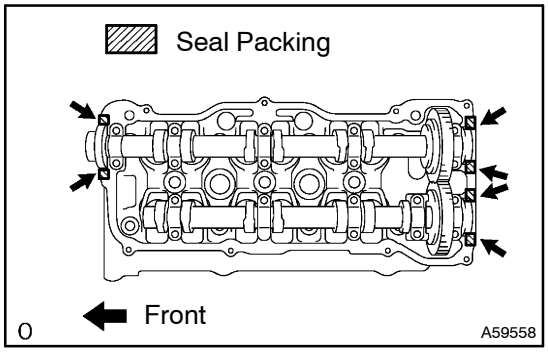
(h) Place a new adjusting shim on the valve lifter, with imprinted numbers facing down.

(i) Press down the valve lifter with SST (A), and remove SST (B).
SST 09248–55040 (09248–05410, 09248–05420)

(j) Recheck the valve clearance.

93. INSTALL CYLINDER HEAD COVER SUB–ASSY

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



(b) Apply seal packing to the cylinder head as shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

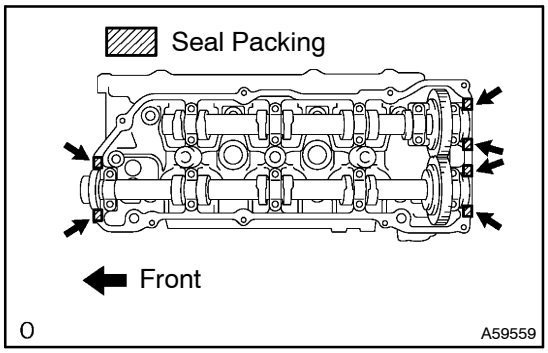
- **Remove any oil from the contact surface.**
- **Install the cylinder head cover within 3 minutes after applying seal packing.**
- **Do not start the engine within 2 hours after installing.**

(c) Install the cylinder head cover with the 9 bolts. Uniformly tighten the bolts, in several passes.

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

94. INSTALL CYLINDER HEAD COVER SUB–ASSY LH

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



(b) Apply seal packing to the cylinder head 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 start the engine within 2 hours after installing.**

(c) Install the cylinder head cover with the 9 bolts. Uniformly tighten the bolts, in several passes.

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

95. INSTALL SPARK PLUG

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