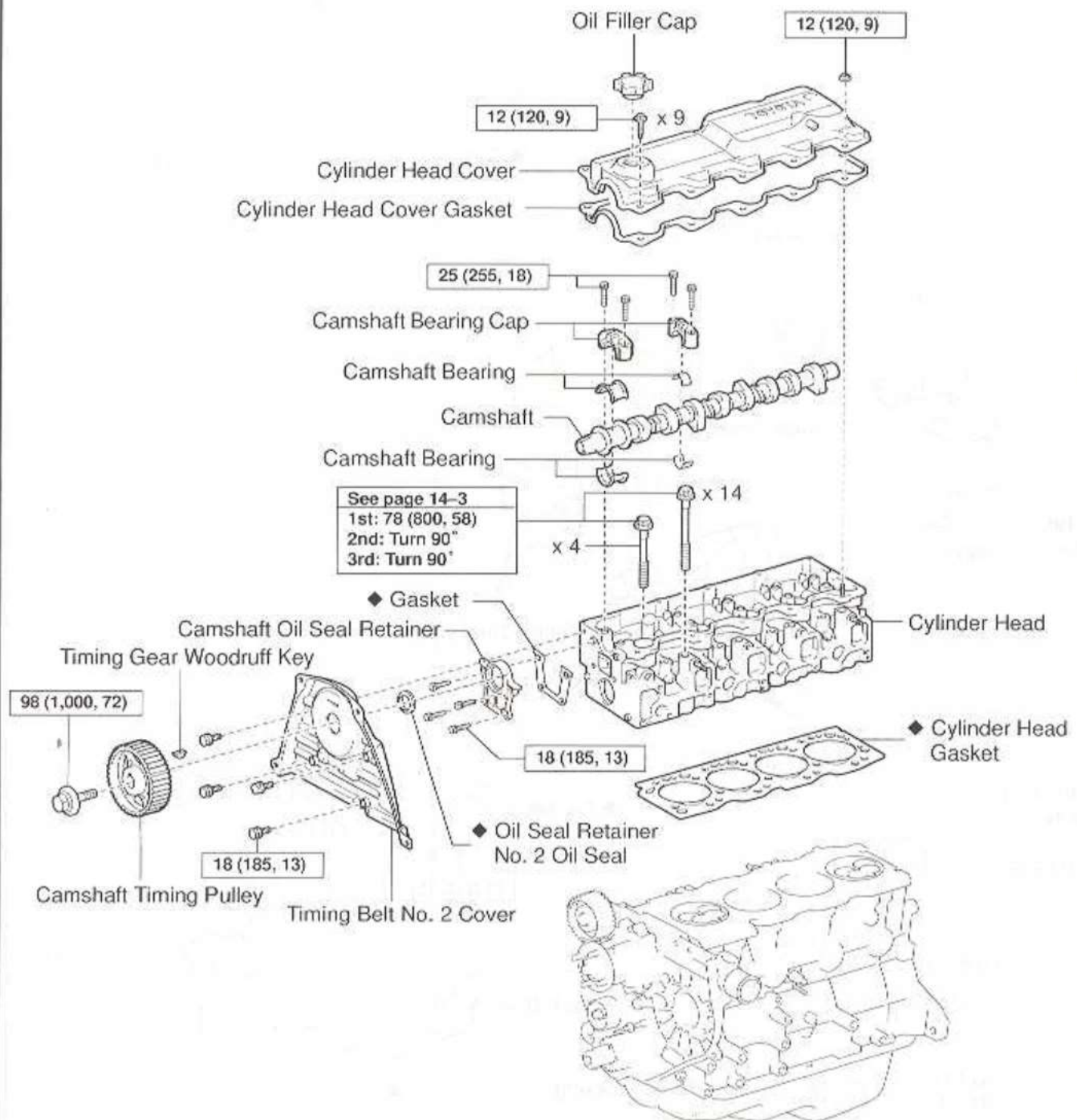


PARTIAL ENGINE ASSY (5L-E) COMPONENTS



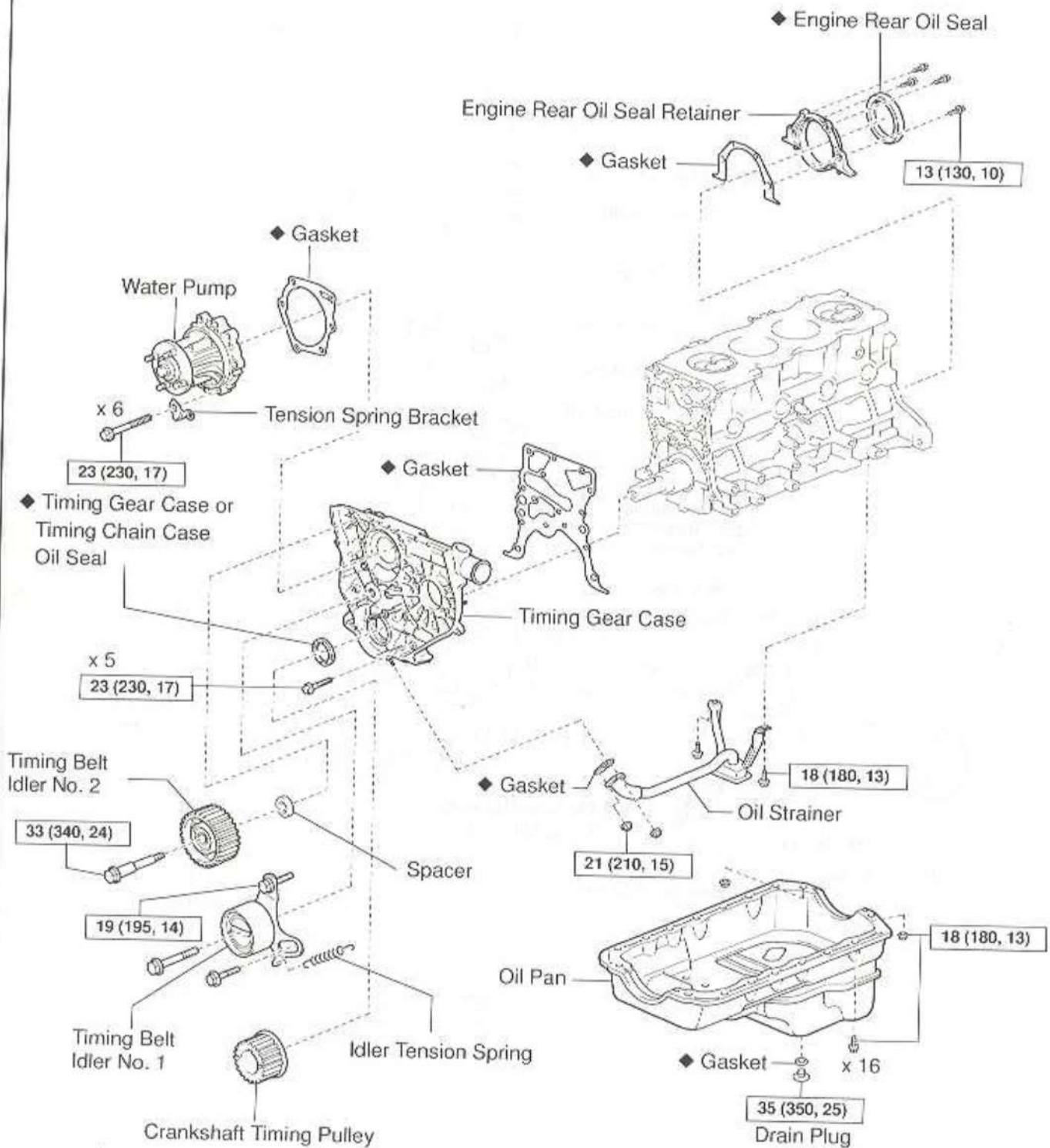
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

A70781

ENGINE MECHANICAL - PARTIAL ENGINE ASSY (5L-E)

14



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

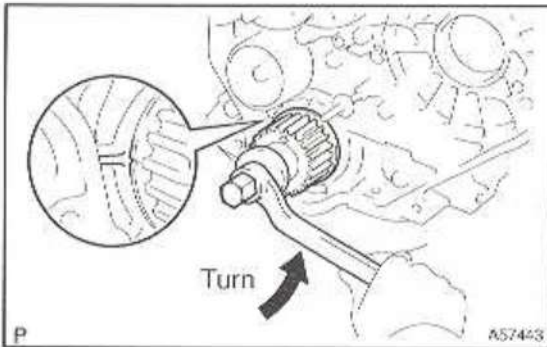
A70792

OVERHAUL

1. REMOVE OIL FILLER CAP SUB-ASSY

2. REMOVE CYLINDER HEAD COVER SUB-ASSY

- (a) Remove the 9 bolts, nut, cylinder head cover and gasket.



3. REMOVE CAMSHAFT TIMING PULLEY

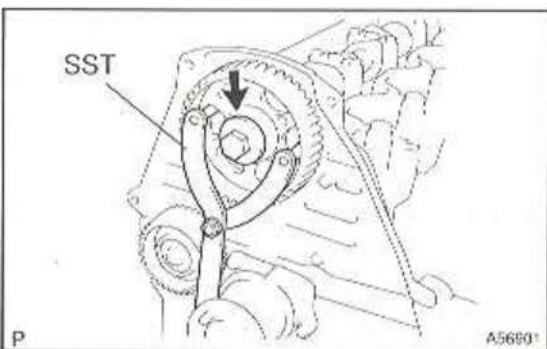
- (a) Set the No. 1 cylinder to approx. 90° BTDC/compression.

HINT:

Set the No.1 cylinder to 90° BTDC/compression to avoid interference with the piston top and valve head.

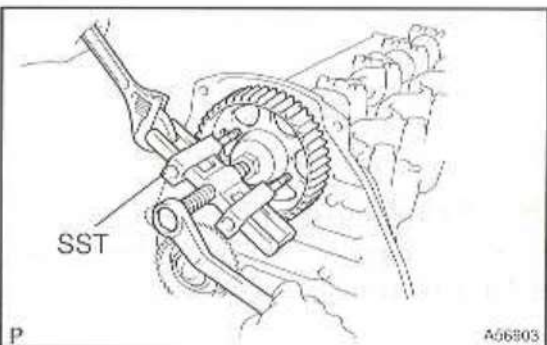
- (1) Using the crankshaft pulley bolt, turn the crankshaft 90° counterclockwise, and put the timing mark of the crankshaft timing pulley with the protrusion of the timing belt case.

14



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

SST 09960-10010 (09962-01000, 09963-01000)



- (c) Using SST, separate the timing pulley from the camshaft.

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

- (d) Remove the pulley bolt and timing pulley.

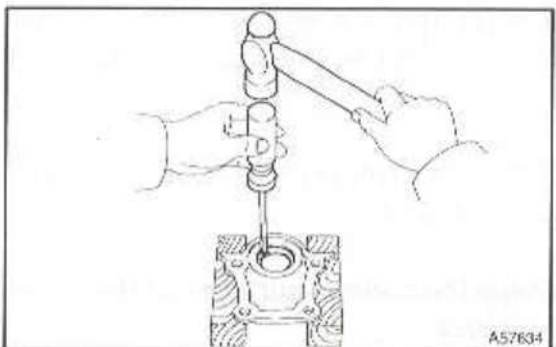
- (e) Remove the timing gear woodruff key.

4. REMOVE TIMING BELT NO.2 COVER

- (a) Remove the 4 bolts and timing belt cover.

5. REMOVE CAMSHAFT OIL SEAL RETAINER

- (a) Remove the 4 bolts, retainer and gasket.



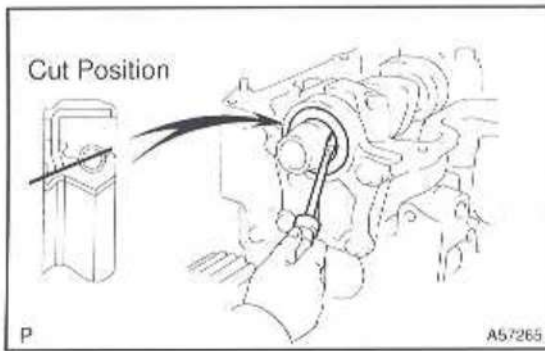
6. REMOVE OIL SEAL RETAINER, NO.2 OIL SEAL

HINT:

There are 2 methods ((a) and (b)) to remove the oil seal.

- (a) If the camshaft oil seal retainer is removed from the cylinder head:

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

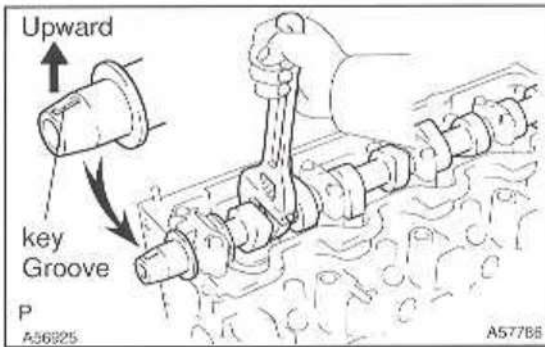


(b) If the camshaft oil seal retainer is installed to the cylinder head:

- (1) Using a knife, cut off the oil seal lip.
- (2) Using a screwdriver, pry out the oil seal.

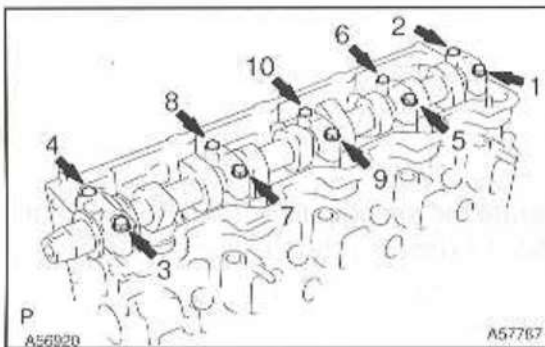
NOTICE:

Be careful not to damage the camshaft. Tape the screwdriver tip.



7. REMOVE CAMSHAFT

(a) Set the key groove of the camshaft, facing upward by turning the camshaft with a wrench.



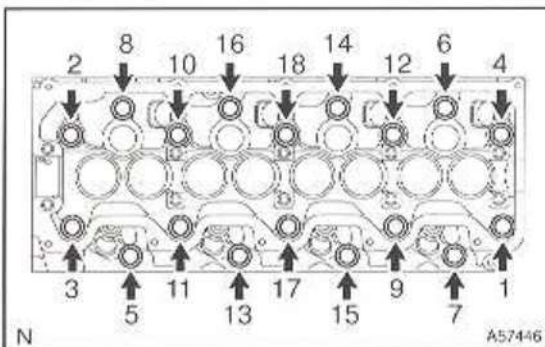
(b) Uniformly loosen and remove the 10 bearing cap bolts, in several passes, in the sequence shown.

(c) Remove the 5 bearing caps and camshaft.

(d) Remove the 10 bearings from the bearing caps and cylinder head.

HINT:

Arrange the bearings in correct order.

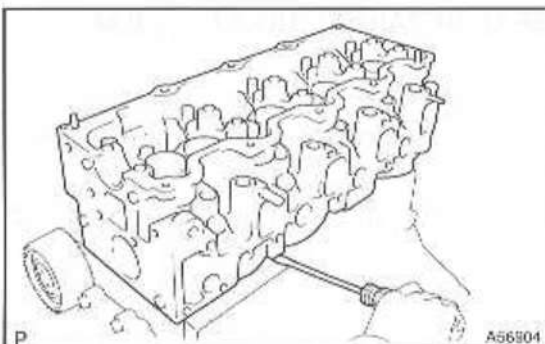


8. REMOVE CYLINDER HEAD SUB-ASSY

(a) Uniformly loosen and remove the 18 cylinder head bolts, in several passes, in the sequence shown.

NOTICE:

Head warpage or cracking could result from removing bolts in incorrect order.



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

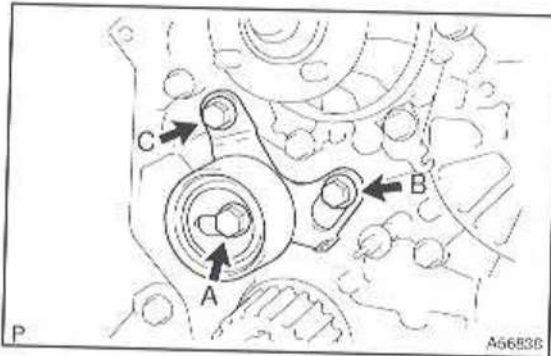
HINT:

If the cylinder head is difficult to lift off, pry with a screwdriver between the cylinder head and block.

NOTICE:

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

9. REMOVE CYLINDER HEAD GASKET

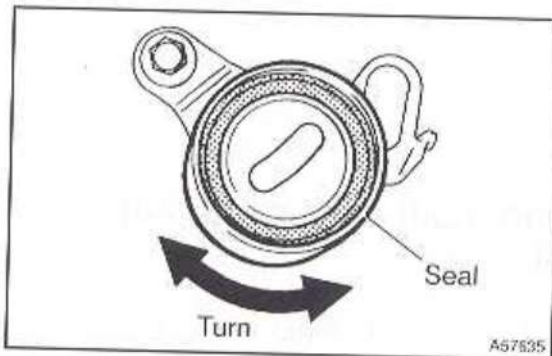


10. REMOVE TIMING BELT IDLER SUB-ASSY NO.1

- Remove the 2 bolts (A and B).
- Loosen the bolt (C), and remove the timing belt idler No. 1.

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

- Remove the bolt, timing belt idler No.2 and spacer.



12. INSPECT TIMING BELT IDLER SUB-ASSY NO.1

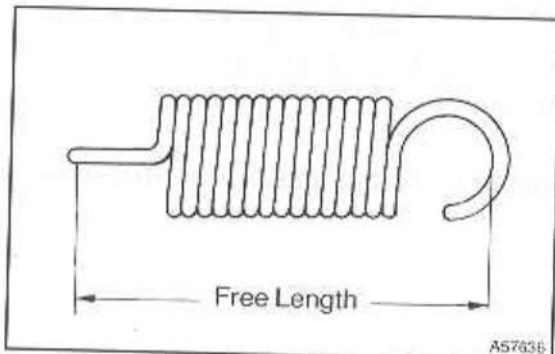
- Visually check the seal portion of the timing belt idler No.1 for oil leakage.

If leakage is found, replace the timing belt idler No.1.

- Check that the timing belt idler No.1 turns smoothly. If necessary, replace the timing belt idler No.1.

13. INSPECT TIMING BELT IDLER SUB-ASSY NO.2

- Check that the timing belt idler No.2 turns smoothly. If necessary, replace the timing belt idler No.2.



14. INSPECT IDLER TENSION SPRING

- Measure the free length of tension spring.

Free length: 44.4 – 45.4 mm (1.748 – 1.787 in.)

If the free length is not as specified, replace the tension spring.

- Measure the tension of the tension spring at the specified installed length.

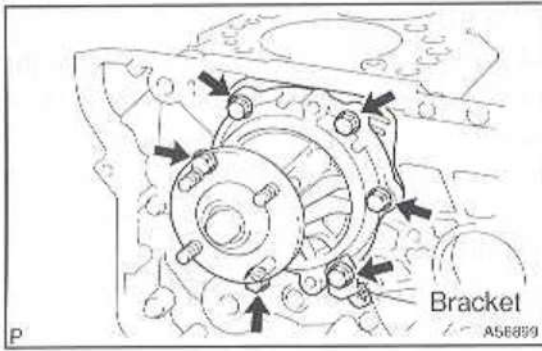
Installed tension:

**53 – 59 N (5.42 – 5.98 kgf, 11.9 – 13.2 lbf)
at 52.1 mm (2.051 in.)**

If the installed tension is not as specified, replace the tension spring.

15. REMOVE WATER PUMP ASSY

- Remove the 6 bolts, tension spring bracket, water pump and gasket.

**31. INSTALL WATER PUMP ASSY**

- (a) Install a new gasket, the water pump and tension spring bracket with the 6 bolts.

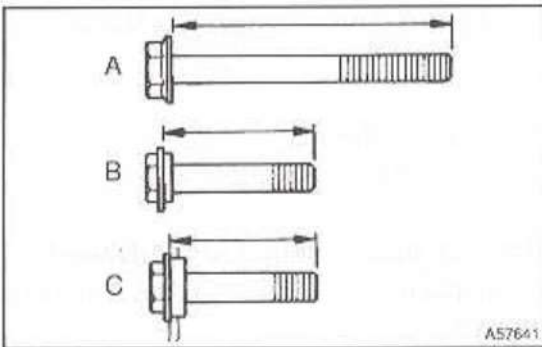
Torque: 23 N·m (230 kgf·cm, 17 ft·lbf)

32. INSTALL TIMING BELT IDLER SUB-ASSY NO.2

- (a) Install the spacer and timing belt idler No.2 with the bolt.

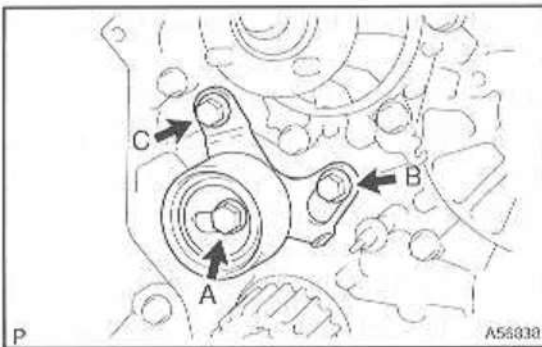
Torque: 33 N·m (340 kgf·cm, 24 ft·lbf)

- (b) Check that the timing belt idler No.2 moves smoothly.

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

HINT:

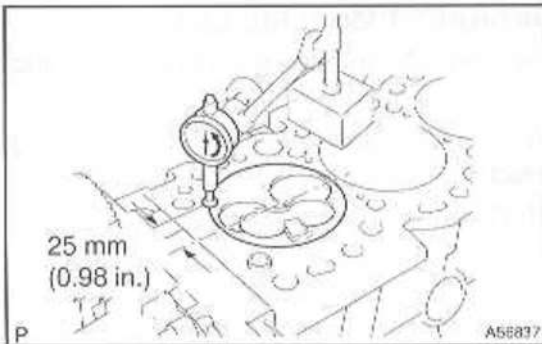
- The bolt lengths for bolt types A, B and C shown in the illustration are:
A: 76.5 mm (3.012 in.)
B: 42.9 mm (1.689 in.), Color: Yellow
C: 41.3 mm (1.626 in.), Color: Silver
- Bolt C is combined with the timing belt idler No.1.



- (a) Install the timing belt idler No.1 with the 3 bolts.

- (b) Tighten the bolt (C).

Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

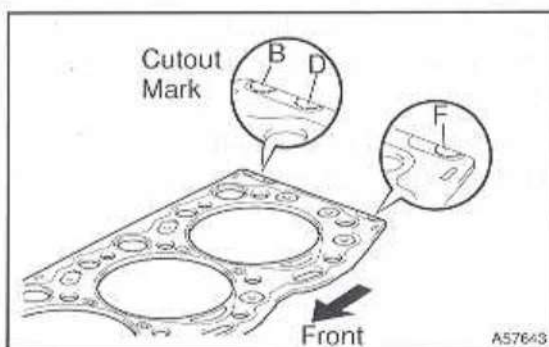
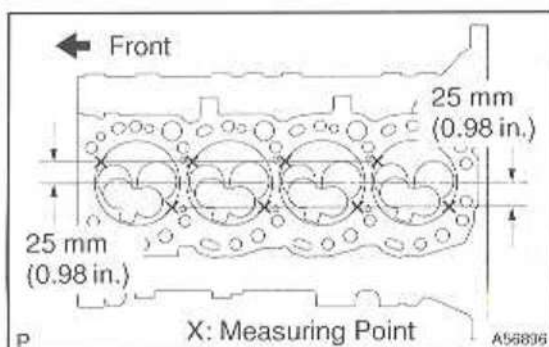
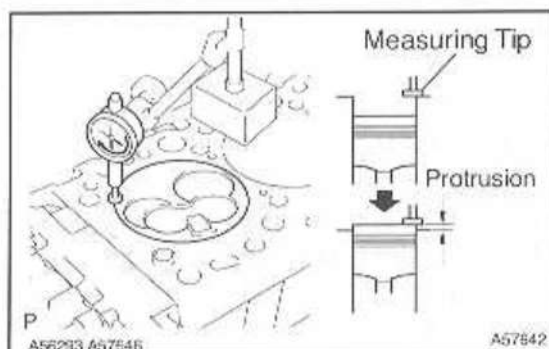
**34. INSTALL CYLINDER HEAD GASKET**

- (a) Check the piston protrusions for each cylinder
- Clean the cylinder block with solvent.
 - Set the piston of the cylinder to be measured to slightly before TDC.
 - Place a dial indicator on the cylinder block, set the measuring tip as shown in the illustration.
 - Set the dial indicator at 0 mm (0 in.).

HINT:

- Use a dial indicator measuring tip as shown in the illustration.
- Make sure that the measuring tip is square to the cylinder block gasket surface and piston head when taking the measurements.

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- (5) Find where the piston head protrudes most by slowly turning the crankshaft clockwise and counter-clockwise.

- (6) Measure each cylinder at 2 places as shown in the illustration, making a total of 8 measurements.

- (7) For the piston protrusion value of each cylinder, use the average of the 2 measurements of each cylinder.

Piston protrusion: 0.68 – 0.97 mm (0.0268 – 0.0382 in.)

HINT:

When removing piston and connecting rod assembly:

If the protrusion is not as specified, remove the piston and connecting rod assembly and reinstall it (See page 14-38).

- (b) Select a new cylinder head gasket.

HINT:

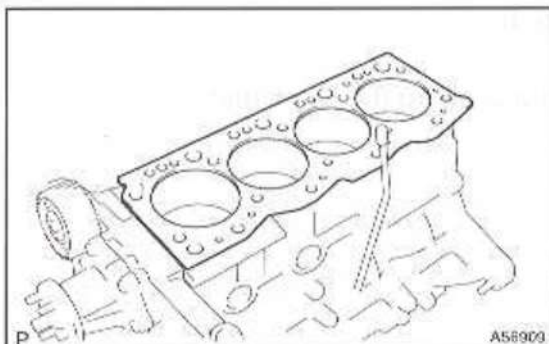
There are 3 sizes of new cylinder head gaskets, marked B, D or F accordingly.

New installed cylinder head gasket thickness:

B	1.40 – 1.50 mm (0.0551 – 0.0591 in.)
D	1.50 – 1.60 mm (0.0591 – 0.0630 in.)
F	1.60 – 1.70 mm (0.0630 – 0.0669 in.)

- (1) Select the largest piston protrusion value from the measurements made, then select a new appropriate gasket according to the table below.

Piston protrusion	Gasket size
0.68 – 0.77 mm (0.0268 – 0.0303 in.)	Use B
0.78 – 0.87 mm (0.0307 – 0.0343 in.)	Use D
0.88 – 0.97 mm (0.0346 – 0.0382 in.)	Use F



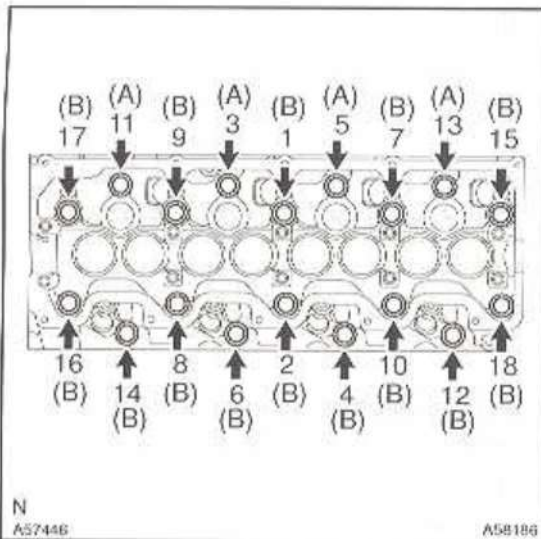
- (c) Place a new cylinder head gasket in position on the cylinder block.

NOTICE:

Be careful of the installation direction.

35. INSTALL CYLINDER HEAD SUB-ASSY

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



(b) Install the cylinder head bolts.

HINT:

- The cylinder head bolts are tightened in 3 progressive steps (steps (2), (4) and (5)).
- If any bolts is broken or deformed, replace it.
- (1) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
- (2) Install and uniformly tighten the 18 cylinder head bolts, in several passes, in the sequence shown.

Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)

HINT:

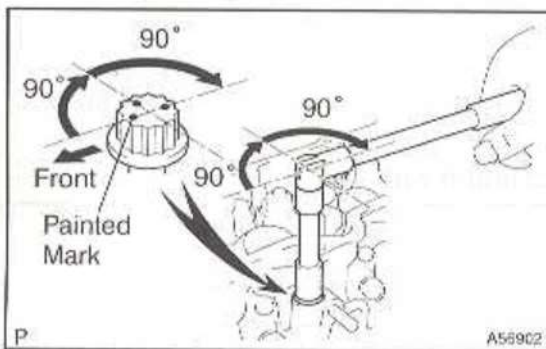
Each bolt length is indicated in the illustration.

Bolt length:

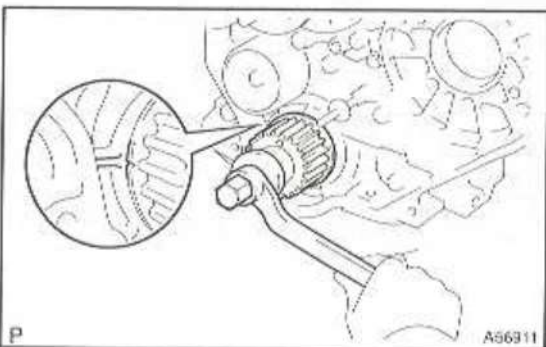
107 mm (4.12 in.) for A

127 mm (5.00 in.) for B

If any one of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.



- (3) Mark the front of the cylinder head bolt with paint.
- (4) Retighten the cylinder head bolts 90° in the numerical order shown.
- (5) Retighten cylinder head bolts by an additional 90°.
- (6) Check that the painted mark is now facing rearward.



36. INSTALL CAMSHAFT

(a) Set the No. 1 cylinder to 90° BTDC/compression.

HINT:

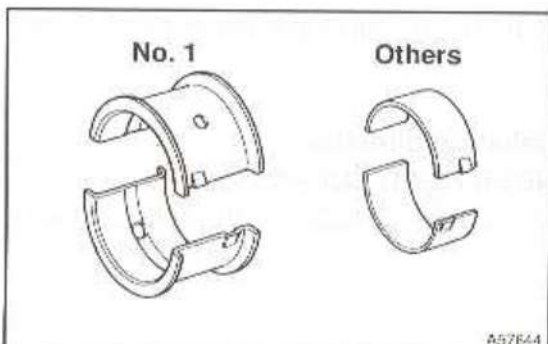
Set the No. 1 cylinder to 90° BTDC/compression to avoid interference with the piston top and valve head.

- (1) Using the crankshaft pulley bolt, turn the crankshaft, and put the timing mark of the crankshaft timing pulley with the protrusion of the timing belt case.

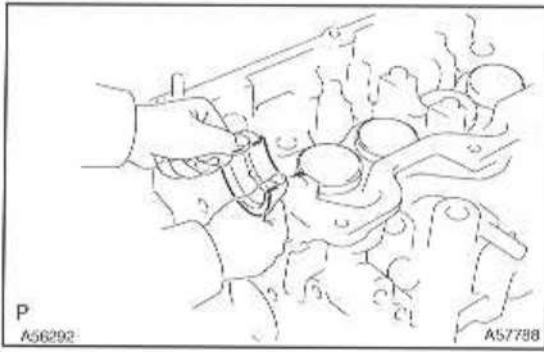
(b) Install the camshaft.

HINT:

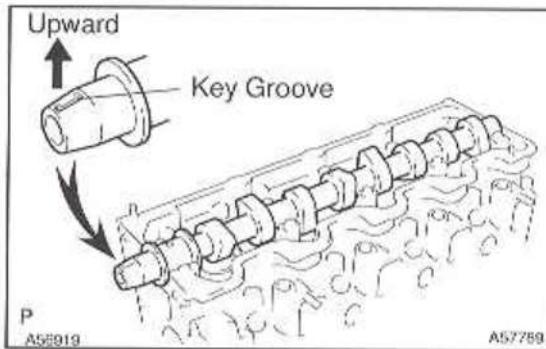
Different the bearing are used for the No. 1 and others.



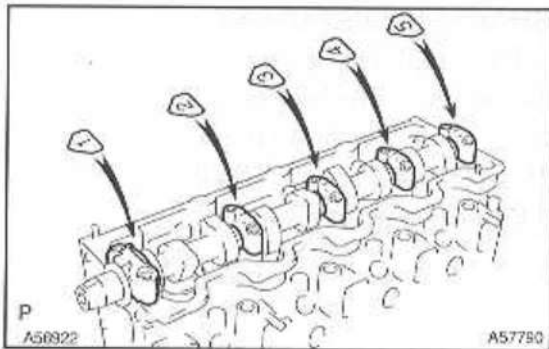
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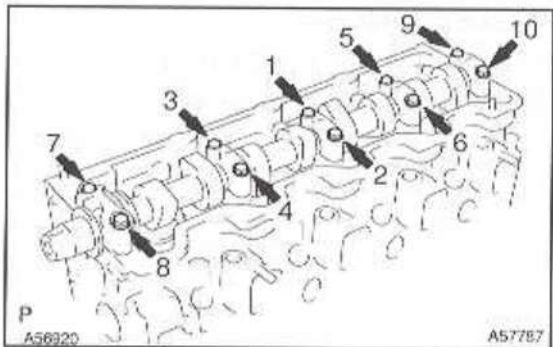
- (1) Install the 10 bearings to the bearing caps and cylinder head.



- (2) Place the camshaft on the cylinder head, facing the key groove upward.



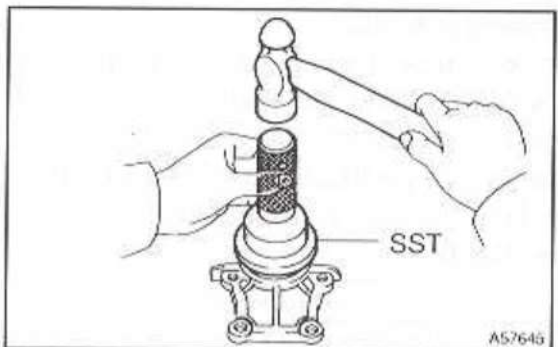
- (3) Install the 5 bearing caps in their proper locations.



- (4) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

- (5) Install and uniformly tighten the 10 bearing cap bolts, in several passes, in the sequence shown.

Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)



37. INSTALL OIL SEAL RETAINER, NO.2 OIL SEAL

HINT:

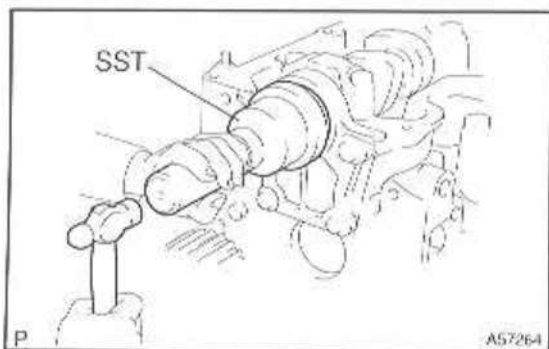
There are 2 methods ((a) and (b)) to install the oil seal.

- (a) If the camshaft oil seal retainer is removed from the cylinder head:

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

SST 09223-46011

- (2) Apply MP grease to the oil seal lip.



- (b) If the camshaft oil seal retainer is installed to the cylinder head:
- (1) Apply MP grease to a new oil seal lip.
 - (2) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil seal retainer edge.
- SST 09223-46011

38. INSTALL CAMSHAFT OIL SEAL RETAINER

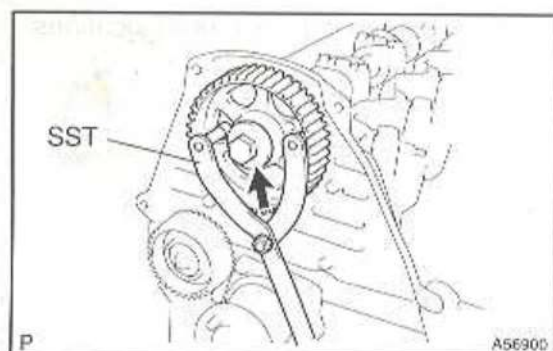
- (a) Install a new gasket and the retainer with the 4 bolts.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

39. INSTALL TIMING BELT NO.2 COVER

- (a) Install the timing belt cover with the 4 bolts.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

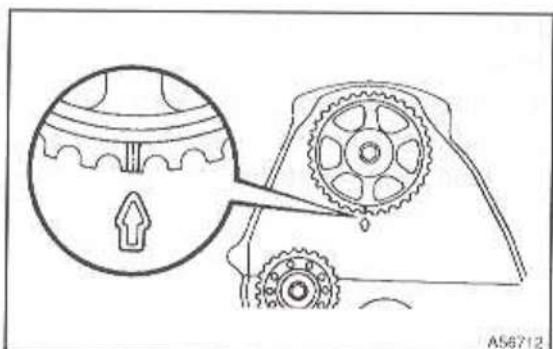


40. INSTALL CAMSHAFT TIMING PULLEY

- (a) Install the woodruff key to the key groove of the camshaft.
- (b) Align the pulley set key with the timing mark outward.
- (c) Using SST, install the pulley with the bolt.

SST 09960-10010 (09962-01000, 09963-01000)

Torque: 98 N·m (1,000 kgf·cm, 72 ft·lbf)



41. INSPECT VALVE CLEARANCE

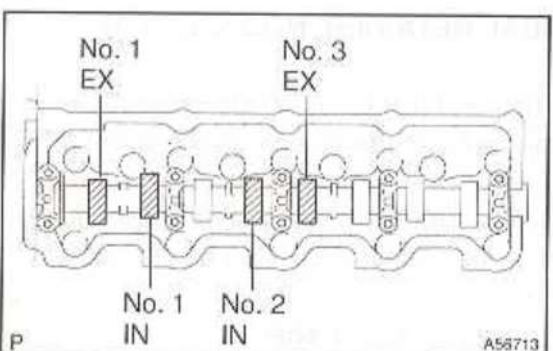
- (a) Align the timing mark of the camshaft timing pulley with the arrow mark of the timing belt No. 2 cover.

- (b) Check only the valves indicated.

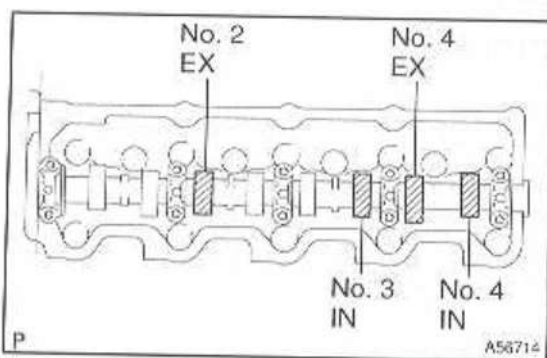
- (1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
- (2) Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

Valve clearance (Cold):

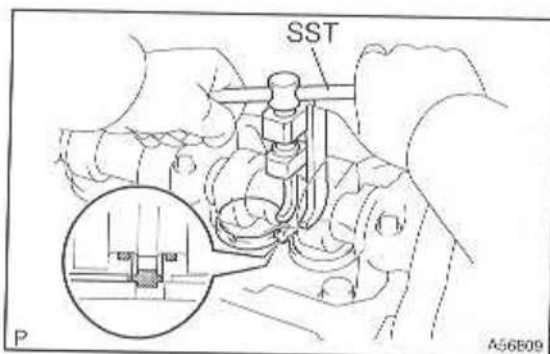
Intake	0.20 - 0.30 mm (0.008 - 0.012 in.)
Exhaust	0.40 - 0.50 mm (0.016 - 0.020 in.)



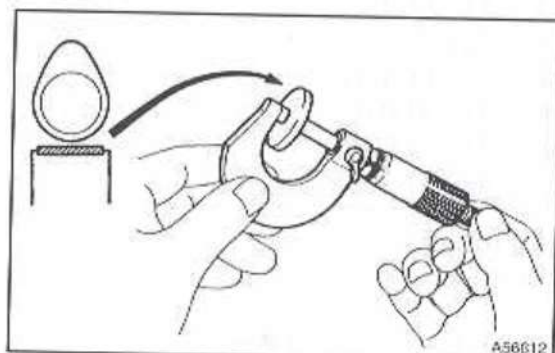
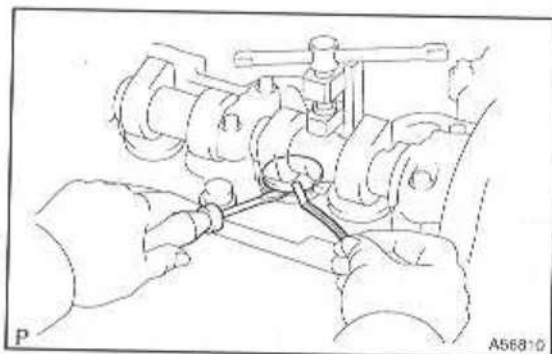
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- (c) Turn the camshaft 1/2 revolutions (180°).
 (d) Check only the valves indicated as shown. Measure the valve clearance (See procedure (b) above).

**42. ADJUST VALVE CLEARANCE**

- (a) Remove the adjusting shim.
- (1) Turn the crankshaft so that the cam lobe of the camshaft on the adjusting valve points upward.
 - (2) Using SST, press down the valve lifter.
SST 09248-64011
 - (3) Position the notch of the valve lifter facing the exhaust manifold side.
- (4) Remove the adjusting shim with a small screwdriver and magnetic finger.



- (b) Determine the replacement adjusting shim size by following the Formula or 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 specified value.

T = Thickness of removed shim

A = Measured valve clearance

N = Thickness of new shim

Intake	$N = T + (A - 0.25 \text{ mm } (0.010 \text{ in.}))$
Exhaust	$N = T + (A - 0.45 \text{ mm } (0.018 \text{ in.}))$

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

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.).

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Adjusting Shim Selection Using Chart (Intake)

Measured clearance mm (in.)	Installed shim thickness mm (in.)																				New shim thickness mm (in.)
	2.500 (0.0984)	2.520 (0.0992)	2.540 (0.1000)	2.560 (0.1008)	2.580 (0.1016)	2.600 (0.1024)	2.620 (0.1031)	2.640 (0.1039)	2.660 (0.1047)	2.680 (0.1055)	2.700 (0.1063)	2.720 (0.1071)	2.740 (0.1079)	2.760 (0.1087)	2.780 (0.1094)	2.800 (0.1102)	2.820 (0.1110)	2.840 (0.1118)	2.850 (0.1123)	2.860 (0.1126)	
0.000 - 0.020 (0.0000 - 0.0008)																					
0.021 - 0.040 (0.0008 - 0.0016)																					
0.041 - 0.060 (0.0016 - 0.0024)																					
0.061 - 0.080 (0.0024 - 0.0031)																					
0.081 - 0.100 (0.0032 - 0.0039)																					
0.101 - 0.120 (0.0040 - 0.0047)																					
0.121 - 0.140 (0.0048 - 0.0055)																					
0.141 - 0.160 (0.0056 - 0.0063)																					
0.161 - 0.180 (0.0063 - 0.0071)																					
0.181 - 0.199 (0.0071 - 0.0078)																					
0.200 - 0.300 (0.0078 - 0.0118)																					
0.301 - 0.320 (0.0119 - 0.0126)																					
0.321 - 0.340 (0.0126 - 0.0134)																					
0.341 - 0.360 (0.0134 - 0.0142)																					
0.361 - 0.380 (0.0142 - 0.0150)																					
0.381 - 0.400 (0.0150 - 0.0157)																					
0.401 - 0.420 (0.0158 - 0.0165)																					
0.421 - 0.440 (0.0166 - 0.0173)																					
0.441 - 0.460 (0.0174 - 0.0181)																					
0.461 - 0.480 (0.0181 - 0.0189)																					
0.481 - 0.500 (0.0189 - 0.0197)																					
0.501 - 0.520 (0.0197 - 0.0205)																					
0.521 - 0.540 (0.0205 - 0.0213)																					
0.541 - 0.560 (0.0213 - 0.0220)																					
0.561 - 0.580 (0.0221 - 0.0228)																					
0.581 - 0.600 (0.0229 - 0.0236)																					
0.601 - 0.620 (0.0237 - 0.0244)																					
0.621 - 0.640 (0.0244 - 0.0252)																					
0.641 - 0.660 (0.0252 - 0.0260)																					
0.661 - 0.680 (0.0260 - 0.0268)																					
0.681 - 0.700 (0.0268 - 0.0276)																					
0.701 - 0.720 (0.0276 - 0.0283)																					
0.721 - 0.740 (0.0284 - 0.0291)																					
0.741 - 0.760 (0.0292 - 0.0299)																					
0.761 - 0.780 (0.0300 - 0.0307)																					
0.781 - 0.800 (0.0307 - 0.0315)																					
0.801 - 0.820 (0.0315 - 0.0323)																					
0.821 - 0.840 (0.0323 - 0.0331)																					
0.841 - 0.860 (0.0331 - 0.0339)																					
0.861 - 0.880 (0.0339 - 0.0346)																					
0.881 - 0.900 (0.0347 - 0.0354)																					
0.901 - 0.920 (0.0355 - 0.0362)																					
0.921 - 0.940 (0.0363 - 0.0370)																					
0.941 - 0.960 (0.0370 - 0.0378)																					
0.961 - 0.980 (0.0378 - 0.0386)																					
0.981 - 1.000 (0.0386 - 0.0394)																					
1.001 - 1.020 (0.0394 - 0.0402)																					
1.021 - 1.040 (0.0402 - 0.0409)																					
1.041 - 1.060 (0.0410 - 0.0417)																					
1.061 - 1.080 (0.0418 - 0.0425)																					
1.081 - 1.100 (0.0426 - 0.0433)																					

Shim No.	Thickness	Shim No.	Thickness
01	2.50 (0.0984)	46	2.95 (0.1161)
42	2.55 (0.1004)	26	3.00 (0.1181)
06	2.60 (0.1024)	47	3.05 (0.1201)
43	2.65 (0.1043)	31	3.10 (0.1220)
11	2.70 (0.1063)	48	3.15 (0.1240)
44	2.75 (0.1083)	36	3.20 (0.1260)
16	2.80 (0.1102)	49	3.25 (0.1280)
45	2.85 (0.1122)	41	3.30 (0.1299)
21	2.90 (0.1142)		

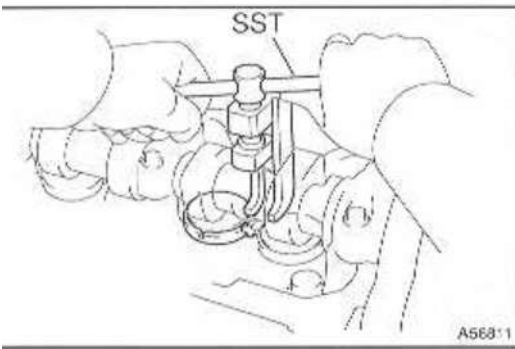
Intake valve clearance (Cold):
0.20 - 0.30 mm (0.008 - 0.012 in.)

EXAMPLE:

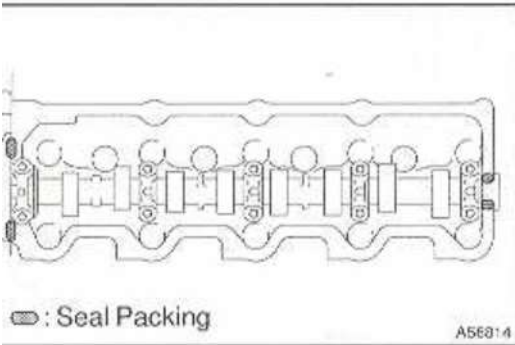
The 2.800 mm (0.1102 in.) shim is installed and the measured clearance is 0.350 mm (0.0138 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 21 shim.

Adjusting Shim Selection Using Chart (Exhaust)

The 2.800 mm (0.1102 in.) shim is installed and the measured is 0.350 mm (0.0138 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 11 shim.



- (c) Install a new adjusting shim.
 - (1) Place a new adjusting shim on the valve lifter.
 - (2) Remove the SST.
- (d) Recheck the valve clearance.



43. INSTALL CYLINDER HEAD COVER SUB-ASSY

- (a) Remove any old packing (FIPG) material.
- (b) Apply seal packing to the cylinder head as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

- (c) Install the gasket to the cylinder head cover.
- (d) Install the cylinder head cover with 9 bolts and nut. Uniformly tighten the bolts and nuts in several passes.

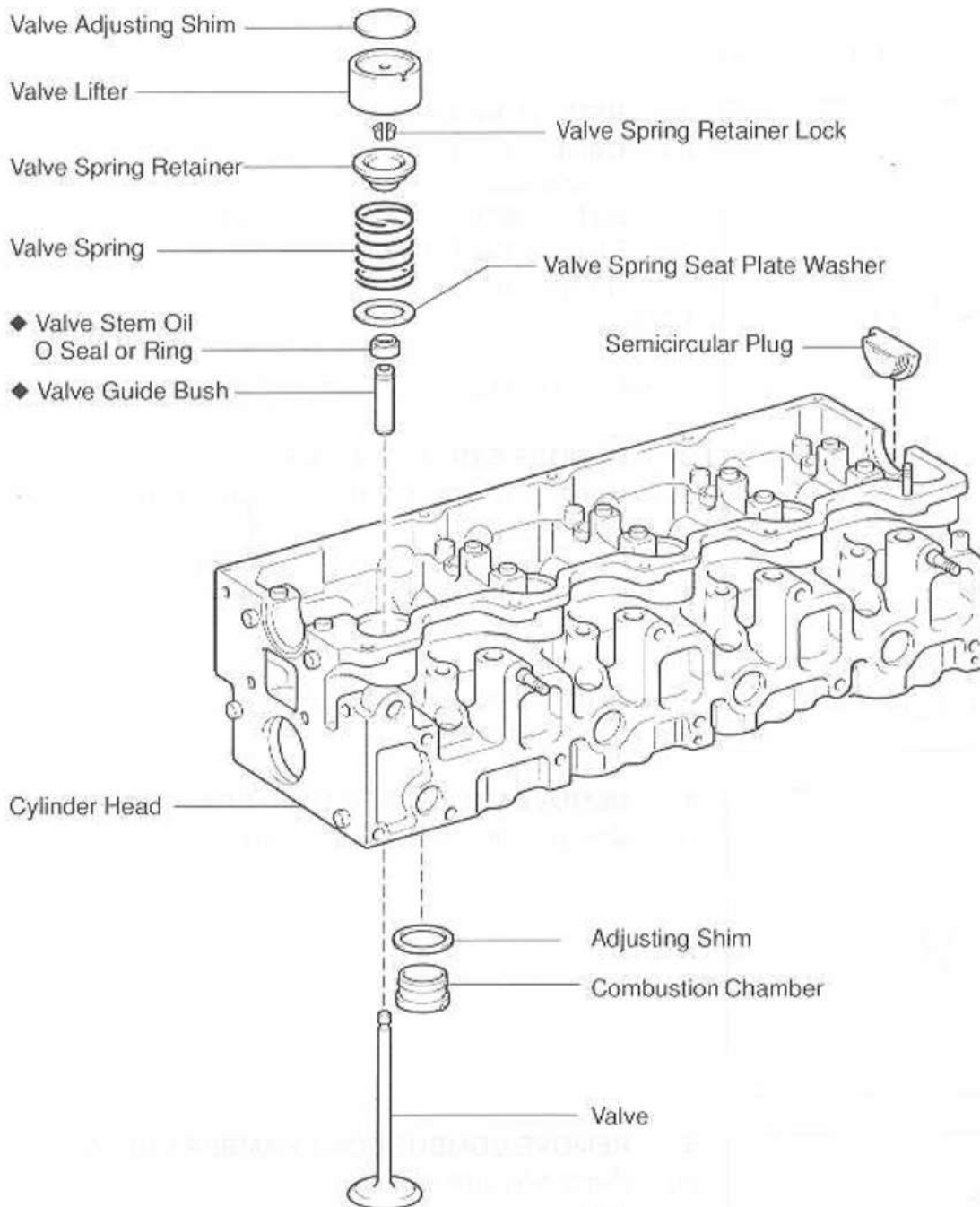
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

I. INSTALL OIL FILLER CAP SUB-ASSY

CYLINDER HEAD ASSY (5L-E)

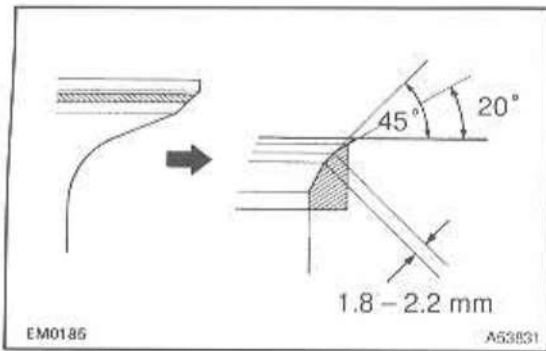
COMPONENTS

14011-01

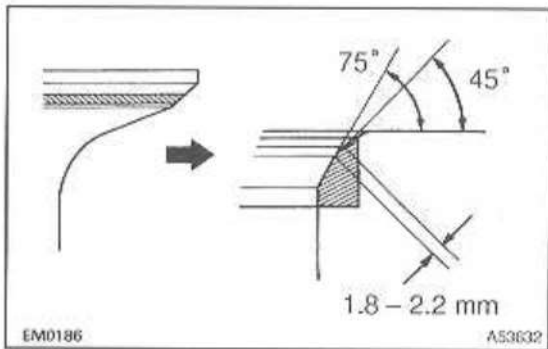


P ◆ Non-reusable part

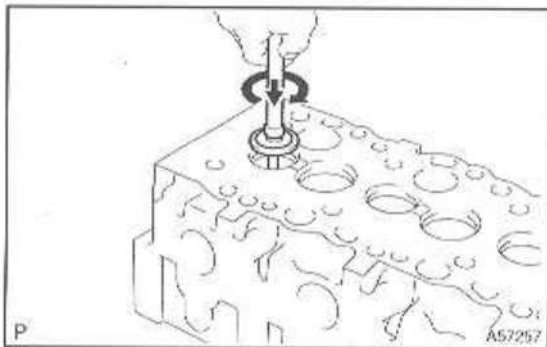
A76745

**22. REPAIR EXHAUST VALVE SEATS**

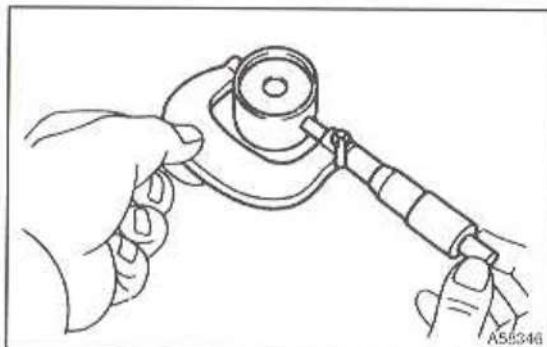
- (a) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.



- (b) If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.



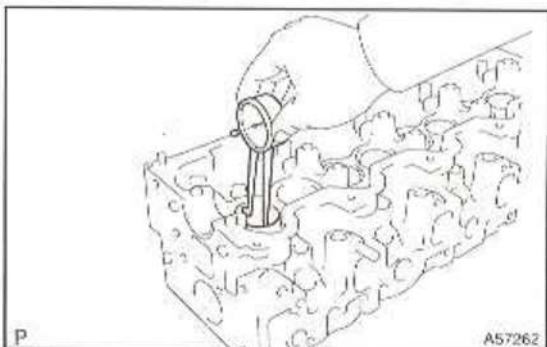
- (c) Hand-lap the valve and valve seat with an abrasive compound.
(d) After hand-lapping, clean the valve and valve seat.

**23. INSPECT VALVE LIFTER**

- (a) Using a micrometer, measure the lifter diameter.

Lifter diameter:

40.892 – 40.902 mm (1.6099 – 1.6103 in.)



- (b) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.

Lifter bore diameter:

40.960 – 40.980 mm (1.6126 – 1.6134 in.)

ENGINE MECHANICAL — CYLINDER HEAD ASSY (5L-E)

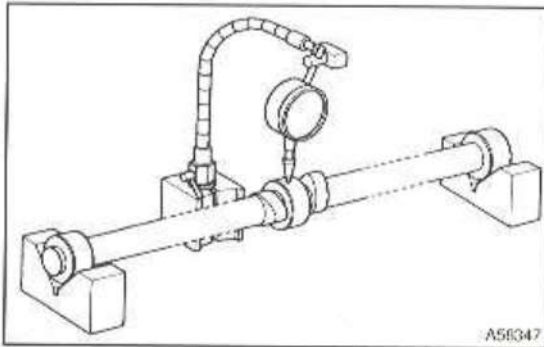
- (c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

Standard oil clearance:

0.058 – 0.088 mm (0.0023 – 0.0035 in.)

Maximum oil clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the lifter.
If necessary, replace the cylinder head.



A56347

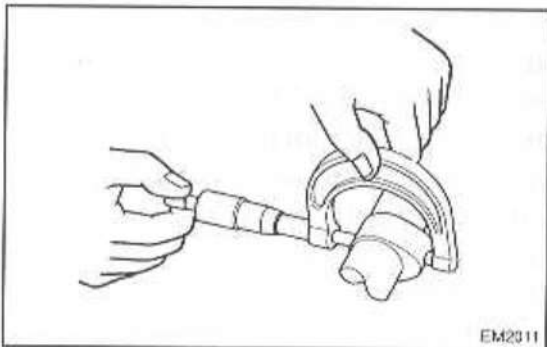
24. INSPECT CAMSHAFT

- (a) Inspect the circle runout.

- (1) Place the camshaft on V-blocks.
- (2) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.10 mm (0.0039 in.)

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



EM2011

- (b) Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

Intake	54.890 – 54.910 mm (2.1610 – 2.1618 in.)
Exhaust	54.990 – 55.010 mm (2.1650 – 2.1657 in.)

Minimum cam lobe height:

Intake	54.39 mm (2.1413 in.)
Exhaust	54.49 mm (2.1453 in.)

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

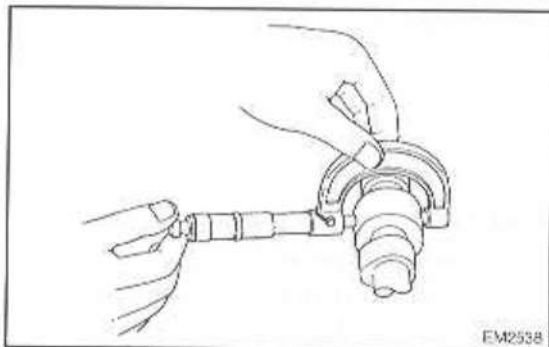
- (c) Inspect the journal diameter of the camshaft.

- (1) Using a micrometer, measure the journal diameter of the camshaft for the camshaft bearing.

Journal diameter:

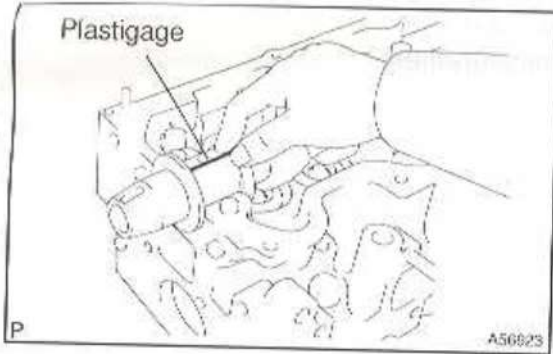
STD	No. 1	34.969 – 34.985 mm (1.3767 – 1.3774 in.)
	Others	27.969 – 27.985 mm (1.1011 – 1.1018 in.)
U/S 0.125	No. 1	34.844 – 34.860 mm (1.3718 – 1.3724 in.)
	Others	27.844 – 27.860 mm (1.0962 – 1.0968 in.)
U/S 0.250	No. 1	34.719 – 34.735 mm (1.3669 – 1.3675 in.)
	Others	27.719 – 27.735 mm (1.0913 – 1.0919 in.)

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



EM2538

ENGINE MECHANICAL — CYLINDER HEAD ASSY (5L-E)



(d) Check the oil clearance.

(1) Clean the bearing caps and journals.

(2) Check that bearings for flaking and scoring.

If the bearings are damaged, If the bearings are damaged, replace the bearings.

(3) Install the bearings to the bearing caps and cylinder head.

(4) Place the camshaft on the cylinder head.

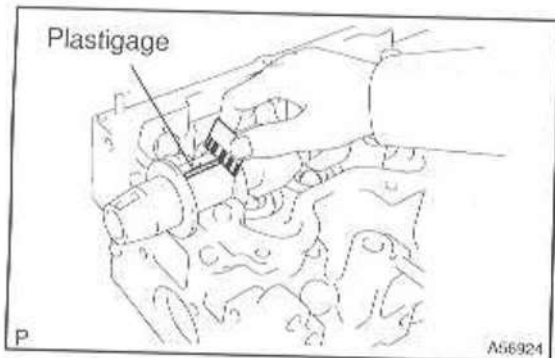
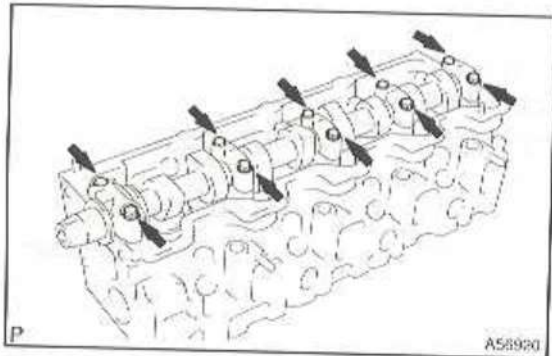
(5) Lay a strip of Plastigage across each of the journals.

(6) Install the bearing caps (See page 14-3).

NOTICE:

Do not turn the camshaft.

(7) Remove the bearing caps.



(8) Measure the Plastigage at its widest point.

Standard oil clearance:

0.022 – 0.074 mm (0.0009 – 0.0029 in.)

Maximum oil clearance: 0.10 mm (0.0039 in.)

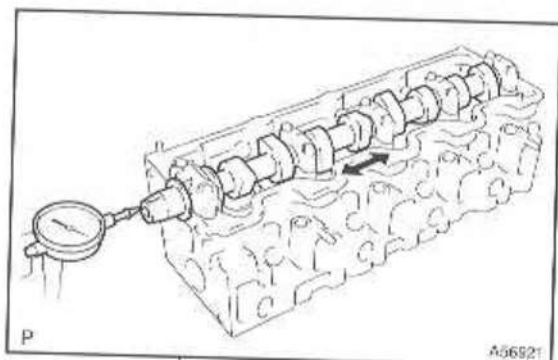
If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the camshaft.

(9) Completely remove the Plastigage.

(10) Remove the camshaft.

(e) If necessary, grind and hone camshaft journals.

(1) Grind and hone the journals to U/S diameter (See procedure (c) above). Install new journal U/S bearings.



(f) Check the thrust clearance.

(1) Install the camshaft (See page 14-3).

(2) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

Standard thrust clearance:

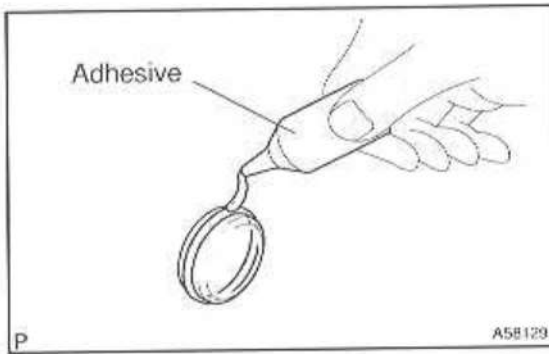
0.080 – 0.280 mm (0.0031 – 0.0110 in.)

Maximum thrust clearance: 0.35 mm (0.0138 in.)

If the thrust clearance is greater than maximum, replace the No.1 bearing. If necessary, replace the camshaft.

25. REMOVE SEMICIRCULAR PLUG

ENGINE MECHANICAL - CYLINDER HEAD ASSY (5L-E)

**26. INSTALL TIGHT PLUG**

- (a) Apply adhesive to the tight plug.

Adhesive:

Part No. 08833-00070, THREE BOND 1324 or equivalent

- (b) Using SST and a hammer, tap in a new tight plug as shown in the illustration.

SST Position A:

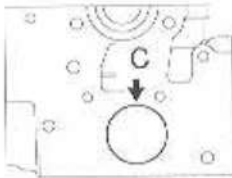
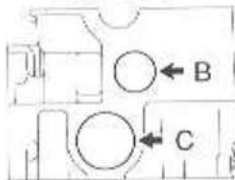
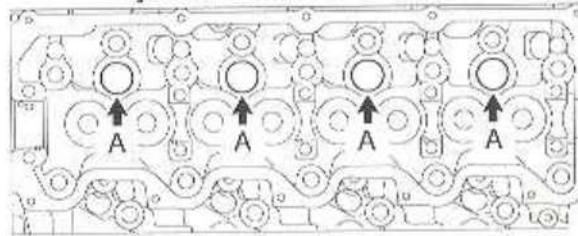
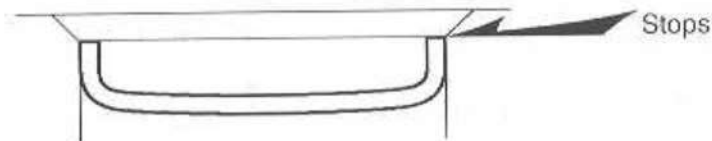
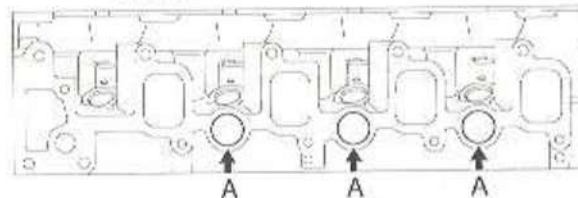
09950-60010 (09951-00250), 09950-70010 (09951-07100)

Position B:

09950-60010 (09951-00300), 09950-70010 (09951-07100)

Position C:

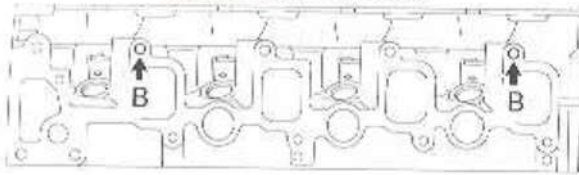
09950-60010 (09951-00450), 09950-70010 (09951-07100)

Front Side**Rear Side****Cylinder Head Cover Side****Intake Manifold Side**

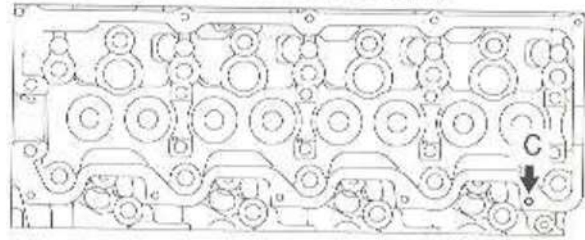
A71262

27. INSTALL STUD BOLT

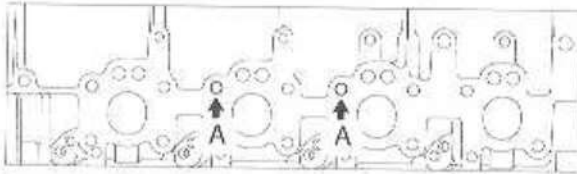
Intake Manifold Side



Cylinder Head Cover Side



Exhaust Manifold Side

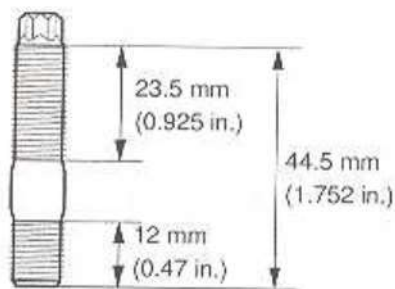


Torque:

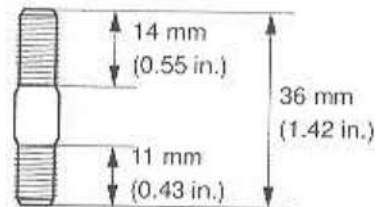
26 N·m (265 kgf·cm, 19 ft·lbf) for A

12 N·m (120 kgf·cm, 9 ft·lbf) for B

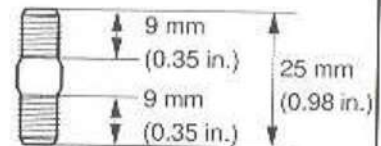
6.0 N·m (60 kgf·cm, 53 in·lbf) for C



A (Thread diameter: 10 mm)



B (Thread diameter: 8 mm)

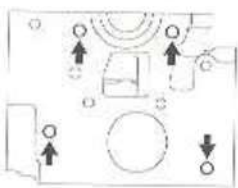


C (Thread diameter: 6 mm)

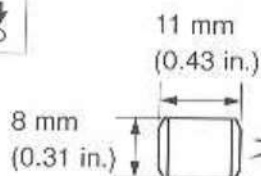
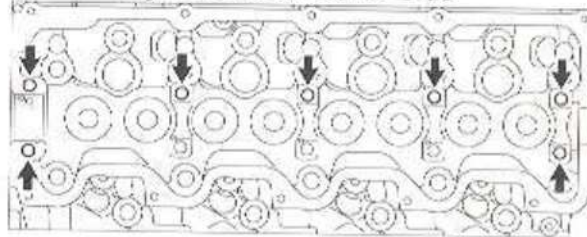
A71263

28. INSTALL RING PIN

Front Side



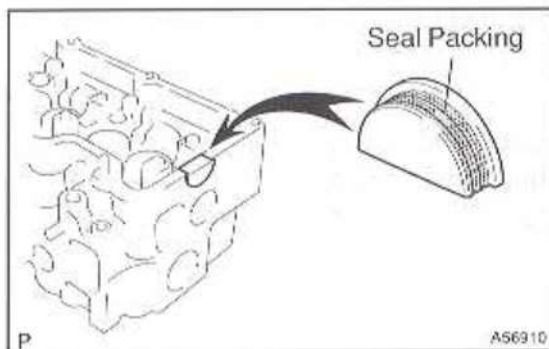
Cylinder Head Cover Side



Until pin stops

A71264

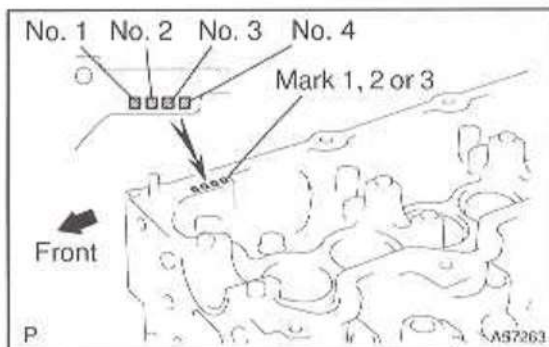
ENGINE MECHANICAL - CYLINDER HEAD ASSY (5L-E)

**29. INSTALL SEMICIRCULAR PLUG**

- Remove any old packing (FIPG) material.
- Apply seal packing to the semicircular plug as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

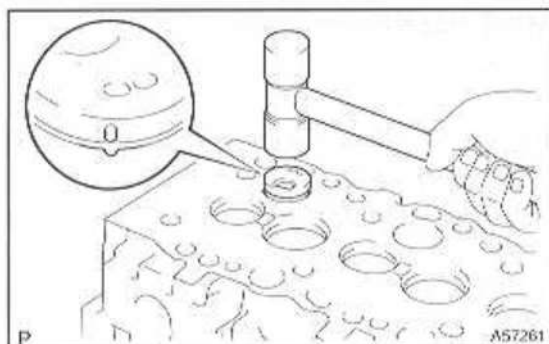
- Install the semicircular plug to the cylinder head.

**30. INSTALL COMBUSTION CHAMBER SUB-ASSY**

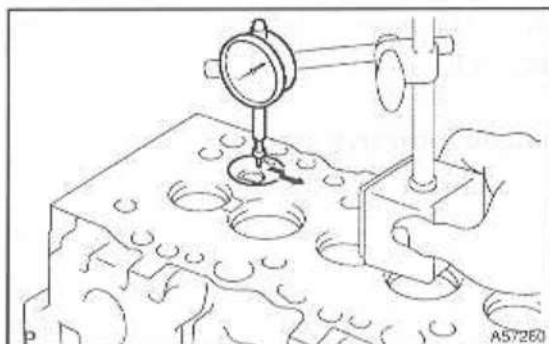
- Select the number of shim, depending on the table below.

Number mark of cylinder head	Number of shim
1	0
2	0
	1
3	1
	2

Shim thickness: 0.03 mm (0.0012 in.)



- Align the combustion chamber knock pin with the cylinder head notch.
- Using a plastic-faced hammer, tap in the combustion chamber.



- Using a dial indicator, check the combustion chamber protrusion.

Combustion chamber protrusion:

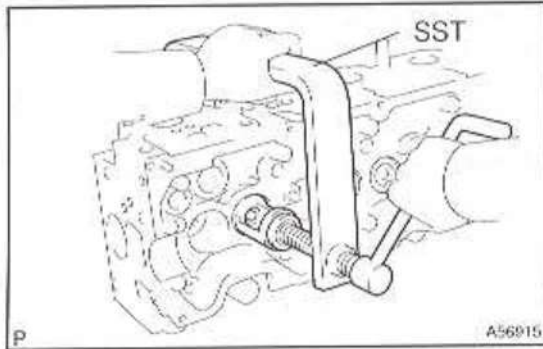
Minus 0.03 – Plus 0.03 mm

(Minus 0.0012 – Plus 0.0012 in.)

If the protrusion is less than specified, adjust with shims.

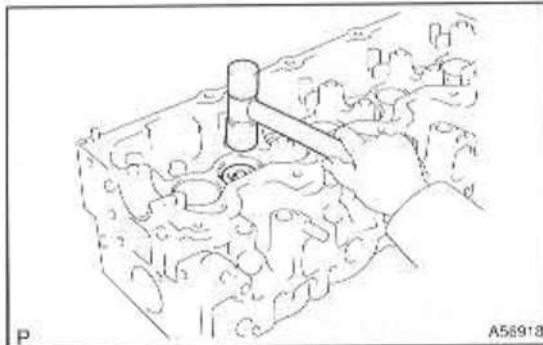
If the protrusion is greater than specified, replace the chamber and recheck the protrusion.

31. INSTALL VALVE STEM OIL O SEAL OR RING

**32. INSTALL INTAKE VALVE**

- (a) Install the valve, spring seat, valve spring and spring retainer.
- (b) Using SST, compress the valve spring and place the 2 retainer locks around the valve stem.

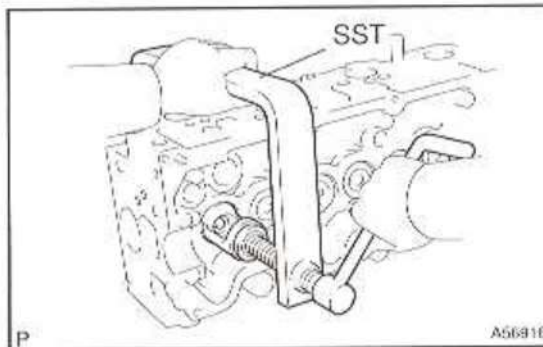
SST 09202-70020 (09202-00030)



- (c) Using a plastic-faced hammer, lightly tap the valve stem tip to assure a proper fit.

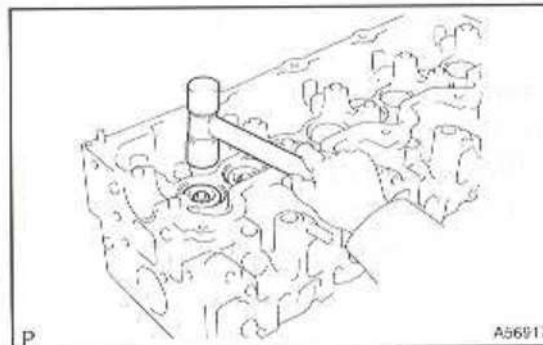
NOTICE:

Be careful not to damage the valve stem tip.

**33. INSTALL EXHAUST VALVE**

- (a) Install the valve, spring seat, valve spring and spring retainer.
- (b) Using SST, compress the valve spring and place the 2 retainer locks around the valve stem.

SST 09202-70020 (09202-00030)



- (c) Using a plastic-faced hammer, lightly tap the valve stem tip to assure a proper fit.

NOTICE:

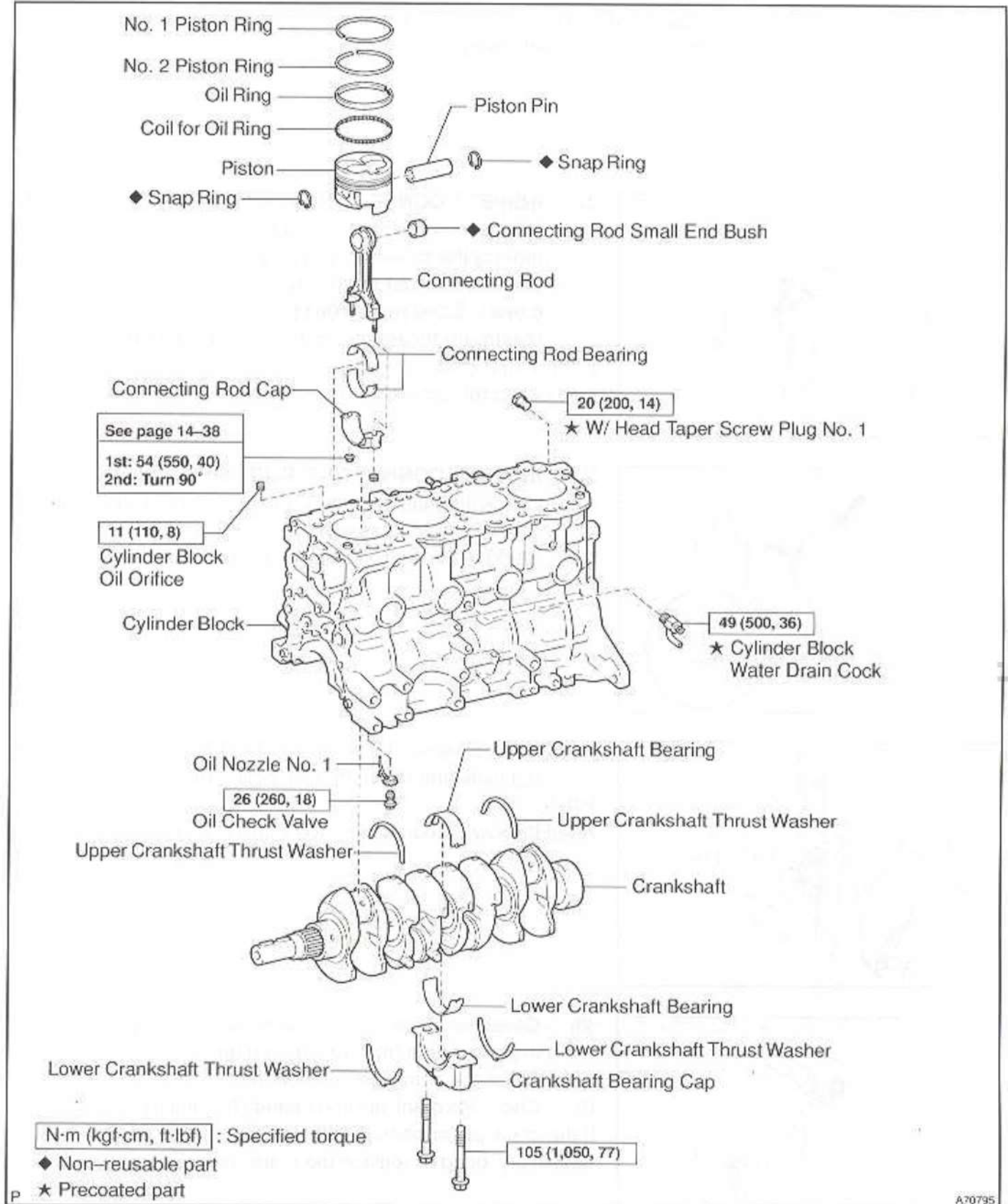
Be careful not to damage the valve stem tip.

34. INSTALL VALVE LIFTER

- (a) Install the valve lifter and shim.
- (b) Check that the valve lifter rotates smoothly by hand.

CYLINDER BLOCK ASSY (5L-E)

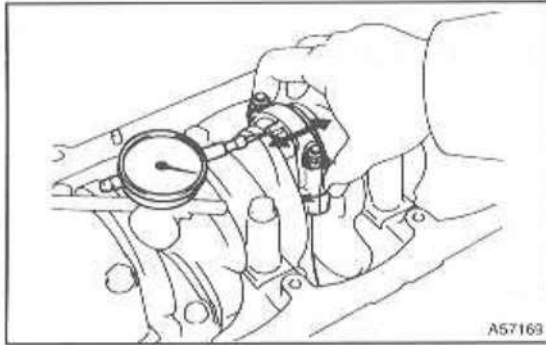
COMPONENTS



OVERHAUL

HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O-rings and oil seals with new parts.



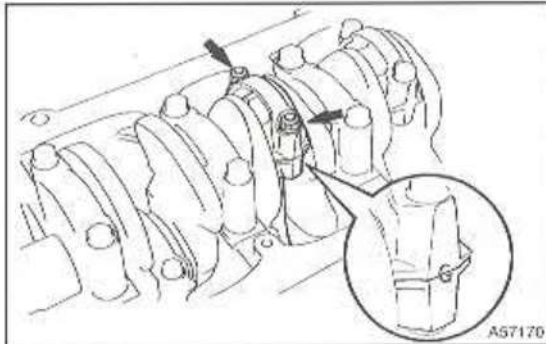
- 1. INSPECT CONNECTING ROD THRUST CLEARANCE**
 - (a) Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance:

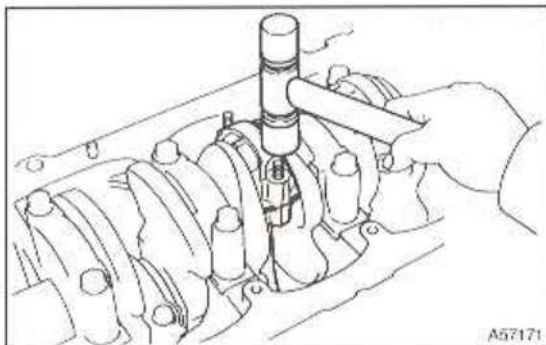
0.080 – 0.300 mm (0.0031 – 0.0118 in.)

Maximum thrust clearance: 0.35 mm (0.0138 in.)

If the thrust clearance is greater than maximum, replace the connecting rod assembly. If necessary, replace the crankshaft.



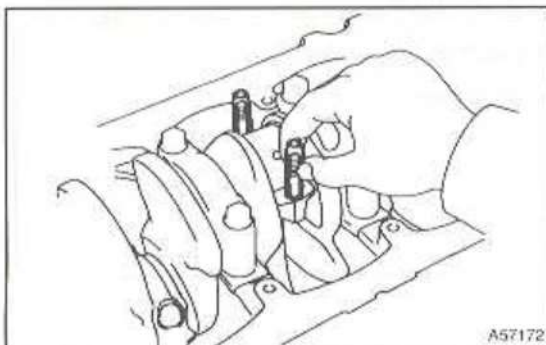
- 2. INSPECT CONNECTING ROD OIL CLEARANCE**
 - (a) Check the matchmarks on the connecting rod and cap to ensure correct reassembly.
 - (b) Remove the 2 connecting rod cap nuts.



- (c) Using a plastic-faced hammer, lightly tap the connecting rod bolts and lift off the connecting rod cap.

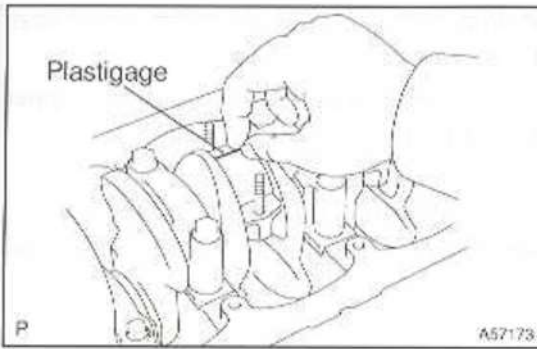
HINT:

Keep the lower bearing inserted with the connecting rod cap.

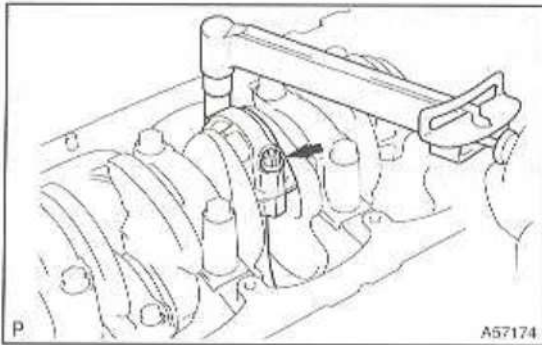


- (d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.
- (e) Clean the crank pin and bearing.
- (f) Check the crank pin and bearing for pitting and scratches. If the crank pin or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.

ENGINE MECHANICAL — CYLINDER BLOCK ASSY (5L-E)



- (g) Lay a strip of plastigage across the crank pin.

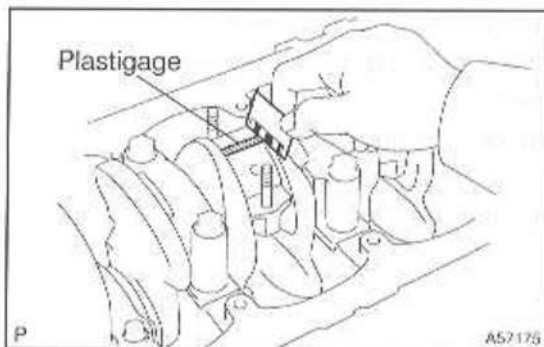


- (h) Install the connecting rod cap with the 2 nuts (See step 40).

NOTICE:

Do not turn the crankshaft.

- (i) Remove the 2 nuts, connecting rod cap and lower bearing (See procedure (b) and (c) above).



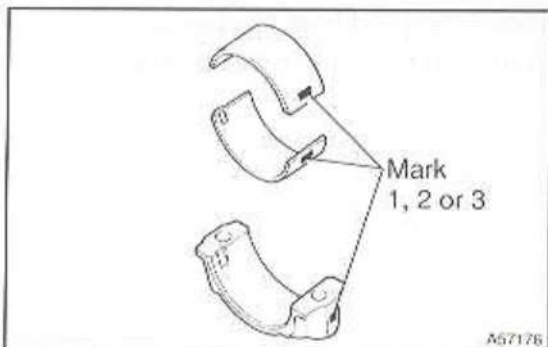
- (j) Measure the plastigage at its widest point.

Standard oil clearance:

STD	0.036 – 0.064 mm (0.0014 – 0.0025 in.)
U/S 0.25, U/S 0.50	0.033 – 0.079 mm (0.0013 – 0.0031 in.)

Maximum oil clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.

**HINT:**

If using a standard bearing, replace it with one having the same number marked on the connecting rod cap. There are 3 sizes of standard bearings, marked 1, 2 and 3 accordingly.

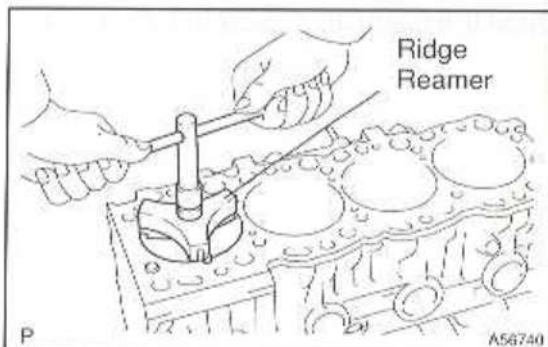
Standard sized bearing center wall thickness:

Mark 1	1.478 – 1.482 mm (0.0582 – 0.0583 in.)
Mark 2	1.482 – 1.486 mm (0.0583 – 0.0585 in.)
Mark 3	1.486 – 1.490 mm (0.0585 – 0.0587 in.)

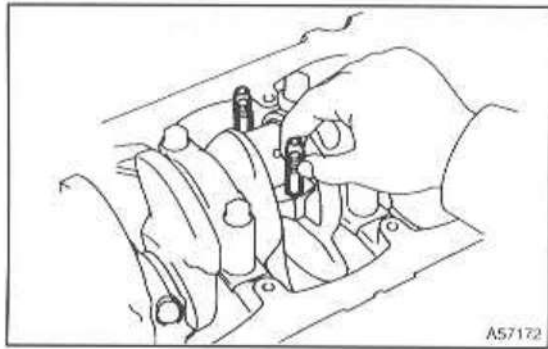
- (1) Completely remove the plastigage.

3. REMOVE PISTON AND CONNECTING ROD

- (a) Using a ridge reamer, remove all the carbon from the top of the cylinder.



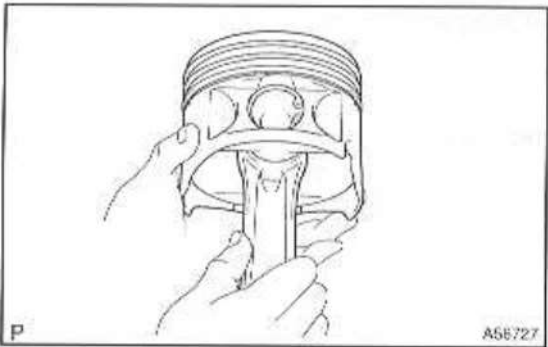
ENGINE MECHANICAL - CYLINDER BLOCK ASSY (5L-E)



- (b) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.
- (c) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

HINT:

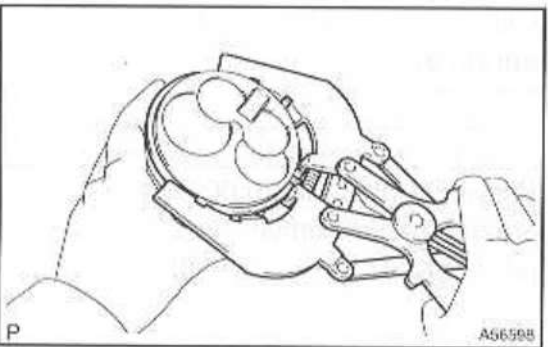
- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in correct order.



4. REMOVE W/PIN PISTON SUB-ASSY

- (a) Check fit between the piston and piston pin.
 - (1) Try to move the piston back and forth on the piston pin.

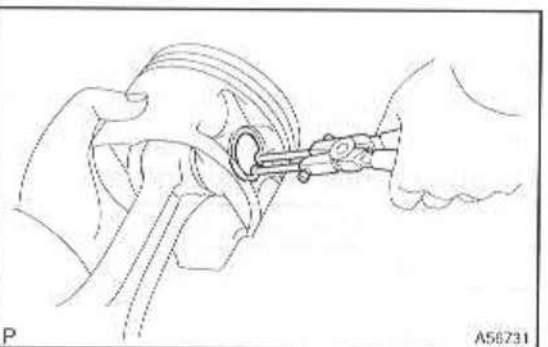
If any movement is felt, replace the piston and pin as a set.



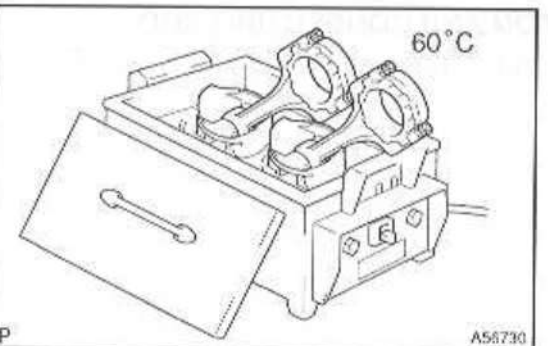
- (b) Remove the piston rings.
 - (1) Using a piston ring expander, remove the 2 compression rings.
 - (2) Remove the oil ring and coil by hand.

HINT:

Arrange the piston rings in correct order only.

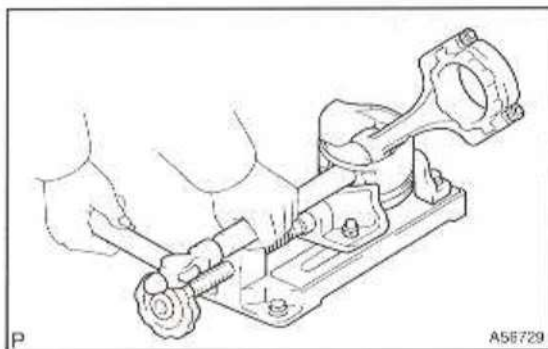


- (c) Disconnect the connecting rod from the piston.
 - (1) Using snap ring pliers, remove the snap rings.



- (2) Gradually heat the piston to approx. 60°C (140°F).

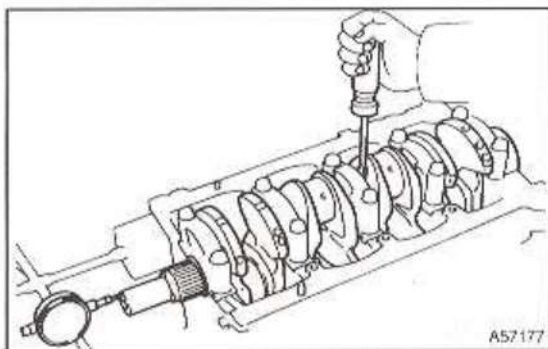
ENGINE MECHANICAL - CYLINDER BLOCK ASSY (5L-E)



- (3) Using a plastic-faced hammer and brass bar, lightly tap out the piston pin and pin and remove the connecting rod.

HINT:

- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in correct order.

**5. INSPECT CRANKSHAFT THRUST CLEARANCE**

- (a) Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance:

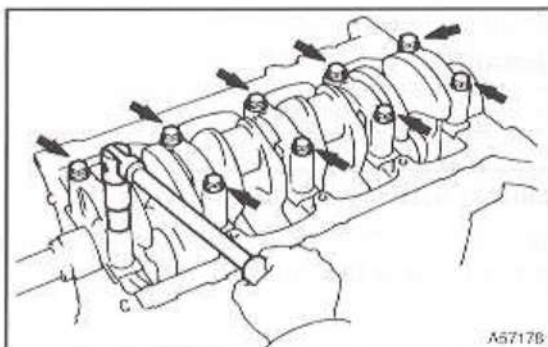
0.040 – 0.250 mm (0.0016 – 0.0098 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

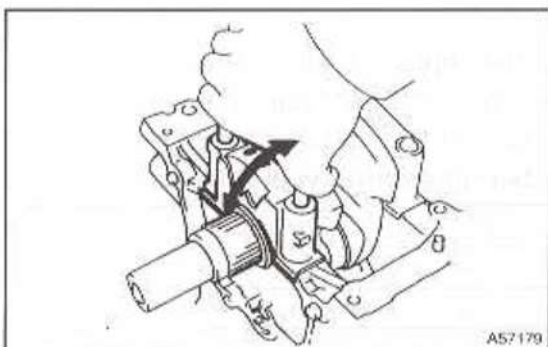
If the thrust clearance is greater than maximum, replace the thrust washers as a set.

Thrust washer thickness:

STD	2.430 – 2.480 mm (0.0957 – 0.0976 in.)
O/S 0.125	2.493 – 2.543 mm (0.0981 – 0.1001 in.)
O/S 0.250	2.555 – 2.605 mm (0.1006 – 0.1026 in.)

**6. INSPECT CRANKSHAFT OIL CLEARANCE**

- (a) Remove the 10 crankshaft bearing cap bolts.



- (b) Using the removed crankshaft bearing cap bolts, pry the cap back and forth, and remove the crankshaft bearing caps, lower bearings and lower thrust washers (No. 3 crankshaft bearing cap only).

HINT:

- Keep the lower bearing and crankshaft bearings cap together.
 - Arrange the thrust washers in correct order.
- (c) Lift out the crankshaft.

HINT:

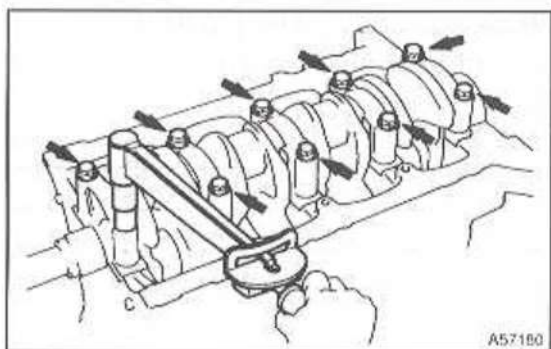
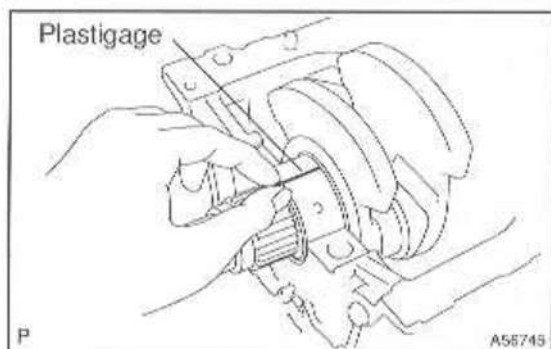
Keep the upper crankshaft bearings and upper thrust washers together with the cylinder block.

- (d) Clean each main journal and bearing.

- (e) Check each main journal and bearing for pitting and scratches.

If the journal or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.

- (f) Place the crankshaft on the cylinder block.
(g) Lay a strip of Plastigage across each journal.

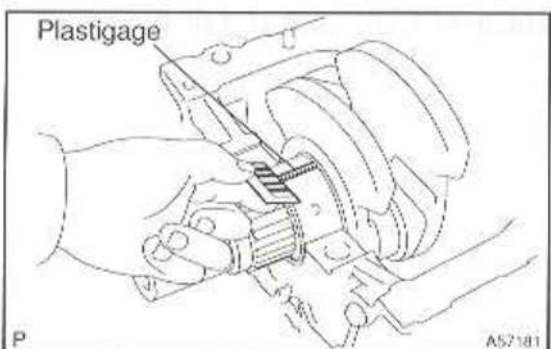


- (h) Install the 5 crankshaft bearing caps with the 10 bolts (See step 39).

NOTICE:

Do not turn the crankshaft.

- (i) Remove the 10 bolts and 5 crankshaft bearing caps (See procedure (a) and (b) above).



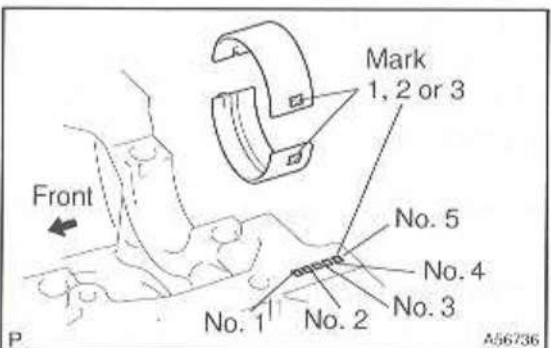
- (j) Measure the plastigage at its widest point.

Standard oil clearance:

STD	0.034 – 0.065 mm (0.0013 – 0.0026 in.)
U/S 0.25, U/S 0.50	0.033 – 0.079 mm (0.0013 – 0.0031 in.)

Maximum clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.



HINT:

If using a standard bearing, replace it with one having the same number marked on the connecting rod cap. There are 3 sizes of standard bearings, marked 1, 2 and 3 accordingly.

Standard sized bearing center wall thickness:

Mark 1	1.979 – 1.983 mm (0.0779 – 0.0781 in.)
Mark 2	1.983 – 1.987 mm (0.0781 – 0.0782 in.)
Mark 3	1.987 – 1.991 mm (0.0782 – 0.0784 in.)

- (k) Completely remove the plastigage.

7. REMOVE CRANKSHAFT

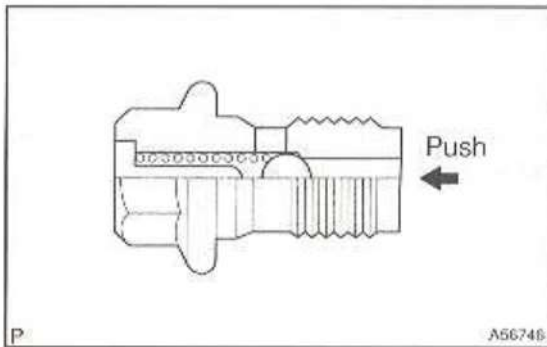
- (a) Lift out the crankshaft.
- (b) Remove the upper bearings and upper thrust washers from the cylinder block.

HINT:

Arrange the crankshaft bearing caps, bearings and thrust washers in correct order.

8. REMOVE SUB-ASSY OIL NOZZLE NO.1

- (a) Remove the 4 check valves and oil nozzles.

**9. INSPECT OIL CHECK VALVE SUB-ASSY**

- (a) Push the valve with a wooden stick to check if it is stuck. If stuck, replace the check valve.

10. INSPECT SUB-ASSY OIL NOZZLE NO.1

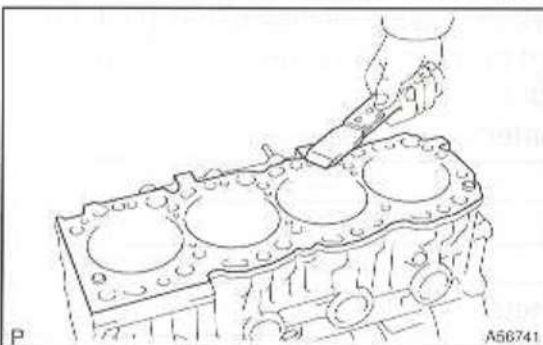
- (a) Check the oil nozzles for damage or clogging. If necessary, replace the oil nozzle.

11. REMOVE CYLINDER BLOCK OIL ORIFICE

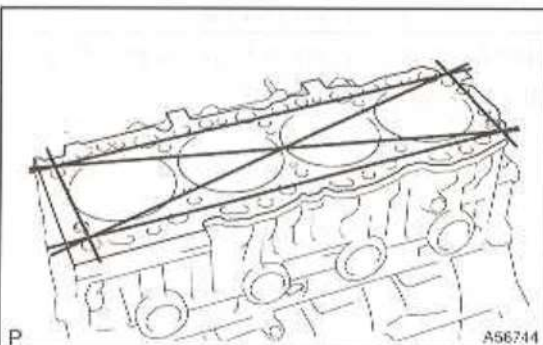
- (a) Using a 6 mm hexagon wrench, remove the oil orifice.

12. INSPECT CYLINDER BLOCK OIL ORIFICE

- (a) Check the oil orifice for damage or clogging. If necessary, replace the oil orifice.

13. REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB-ASSY**14. REMOVE W/HEAD TAPER SCREW PLUG NO.1****15. CLEAN CYLINDER BLOCK SUB-ASSY**

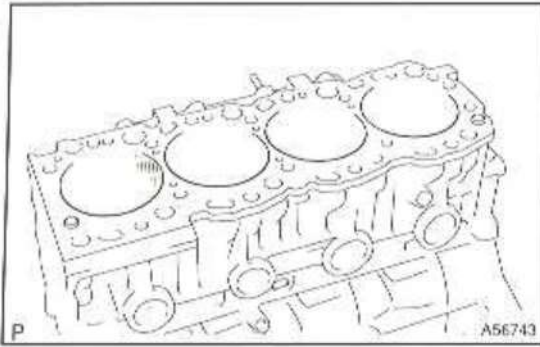
- (a) Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.
- (b) Using a soft brush and solvent, thoroughly clean the cylinder block.

**16. INSPECT CYLINDER BLOCK SUB-ASSY**

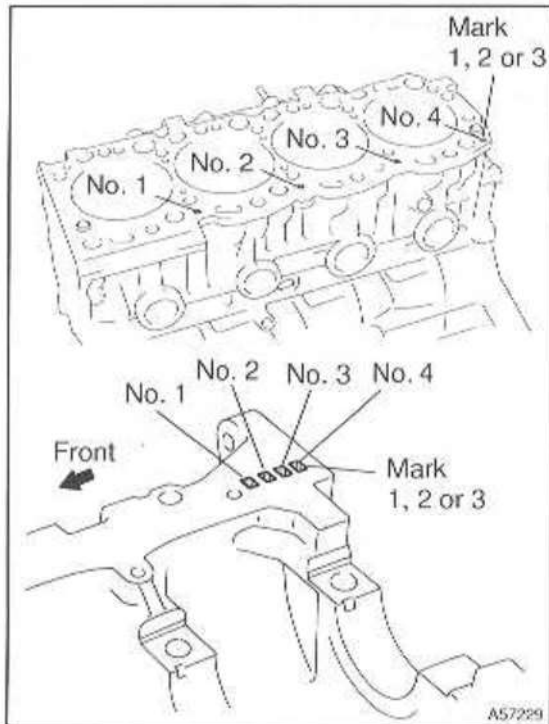
- (a) Inspect for flatness.
 - (1) Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head cap for warpage.

Maximum warpage: 0.20 mm (0.0079 in.)

If warpage is greater than maximum, replace the cylinder block.



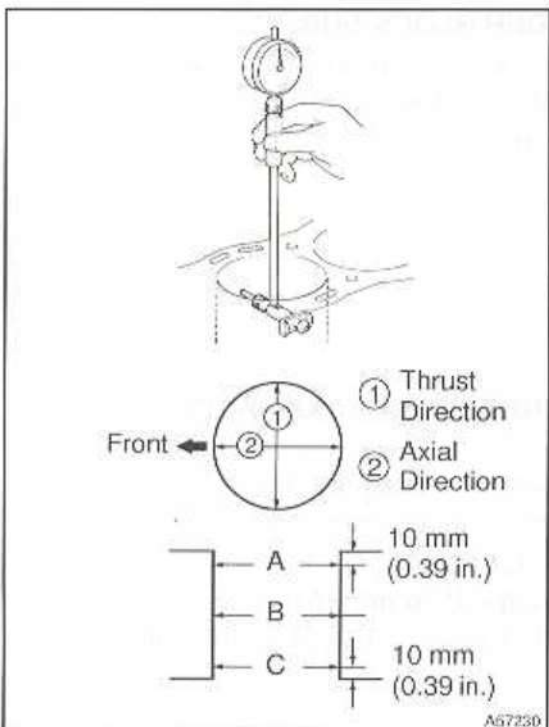
(b) Visually check the cylinder for vertical scratches. If deep scratches are present, rebore all the 4 cylinders. If necessary, replace the cylinder block.



(c) Inspect the cylinder bore diameter.

HINT:

There are 3 sizes of the standard cylinder bore diameter, marked 1, 2 and 3 accordingly. The mark is stamped on the lower left rear of the cylinder block.



(1) Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.

Standard diameter:

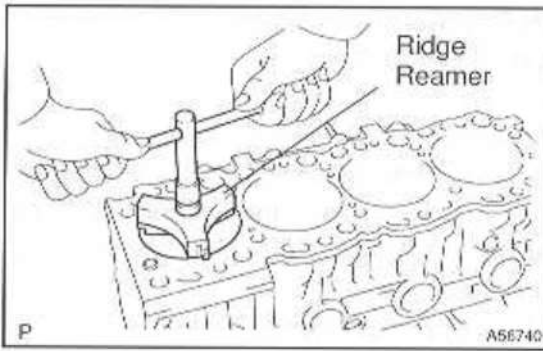
Mark 1	99.500 – 99.510 mm (3.9173 – 3.9177 in.)
Mark 2	99.510 – 99.520 mm (3.9177 – 3.9181 in.)
Mark 3	99.520 – 99.530 mm (3.9181 – 3.9185 in.)

Maximum diameter:

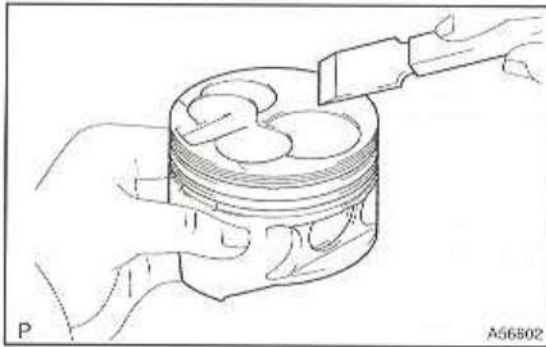
STD	99.73 mm (3.9264 in.)
O/S 0.50	100.23 mm (3.9461 in.)

If the diameter is greater than maximum, rebore all the 4 cylinders. If necessary, replace the cylinder block.

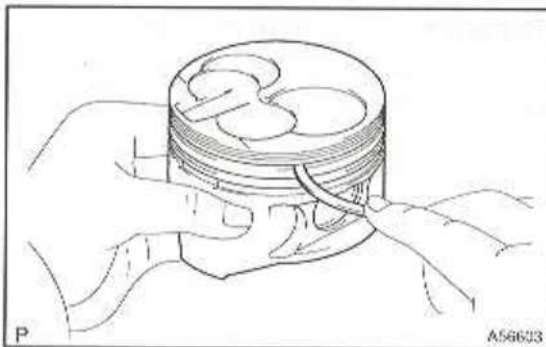
ENGINE MECHANICAL - CYLINDER BLOCK ASSY (5L-E)



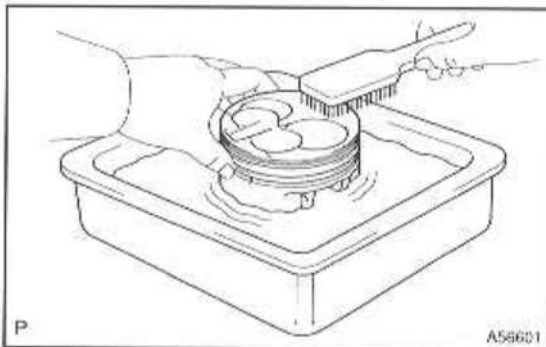
- (d) Remove the cylinder ridge.
If the wear is less than 0.2 mm (0.008 in.), using a ridge reamer, grind the top of the cylinder.

**17. CLEAN W/PIN PISTON SUB-ASSY**

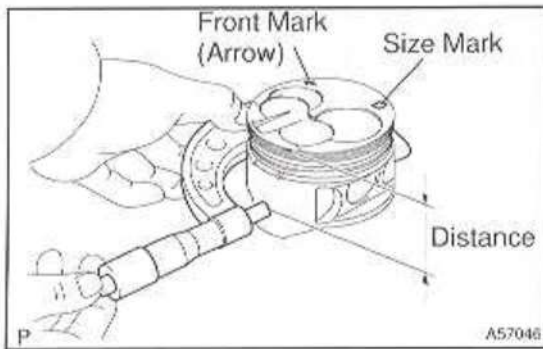
- (a) Using a gasket scraper, remove the carbon from the piston top.



- (b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



- (c) Using solvent and a brush, thoroughly clean the piston.
NOTICE:
Do not use a wire brush.

**18. INSPECT W/PIN PISTON SUB-ASSY**

(a) Inspect the piston oil clearance.

HINT:

There are 3 sizes of the standard piston diameter, marked "1", "2" and "3" accordingly. The mark is stamped on the piston top.

- (1) Using a micrometer, measure the piston diameter at right angles to the piston center line, the indicated distance from the piston head.

Distance: 61.27 – 61.33 mm (2.4122 – 2.4146 in.)

Piston diameter:

STD.	Mark 1	99.450 – 99.460 mm (3.9153 – 3.9157 in.)
	Mark 2	99.460 – 99.470 mm (3.9157 – 3.9161 in.)
	Mark 3	99.470 – 99.480 mm (3.9161 – 3.9165 in.)
O/S 0.50		99.950 – 99.980 mm (3.9350 – 3.9362 in.)

- (2) Measure the cylinder bore diameter in the thrust directions (See step 16).
- (3) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

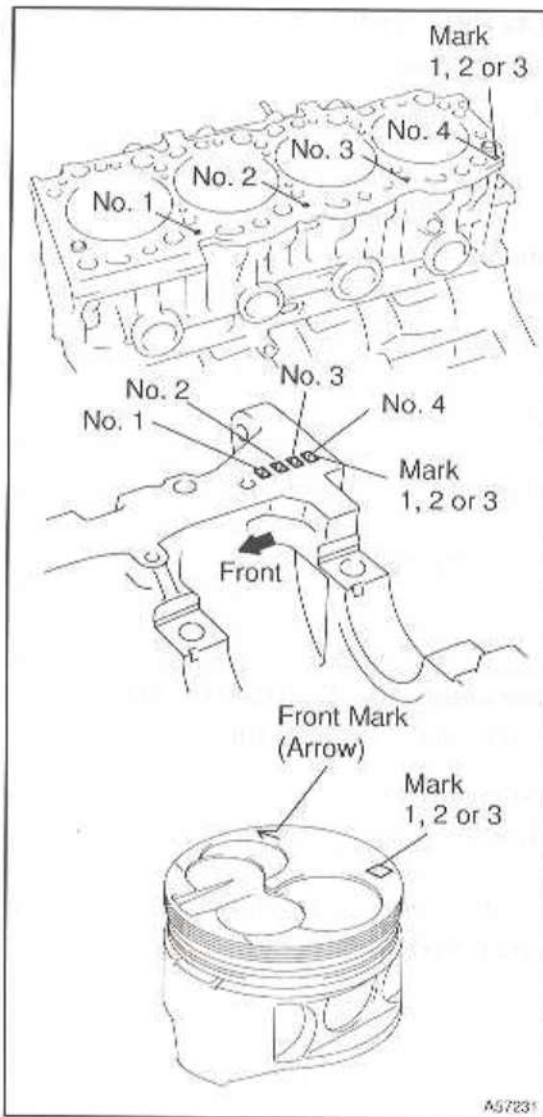
Standard oil clearance:

0.040 – 0.060 mm (0.0016 – 0.0024 in.)

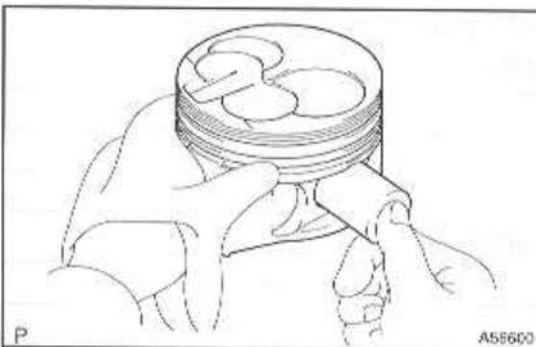
Maximum oil clearance: 0.13 mm (0.0051 in.)

If the oil clearance is greater than maximum, replace all the 4 pistons and rebore all the 4 cylinders. If necessary, replace the cylinder block.

ENGINE MECHANICAL - CYLINDER BLOCK ASSY (5L-E)

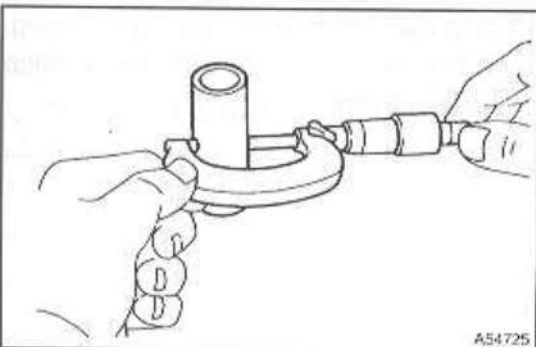
**HINT:**

Use a piston with the same number mark as the cylinder bore diameter marked on the cylinder block.



(b) Inspect the piston pin fit.

- (1) At 60°C (140°F), you should be able to push the piston pin into the piston pin hole with your thumb. If the pin can be installed at a lower temperature, replace the piston and pin as set.

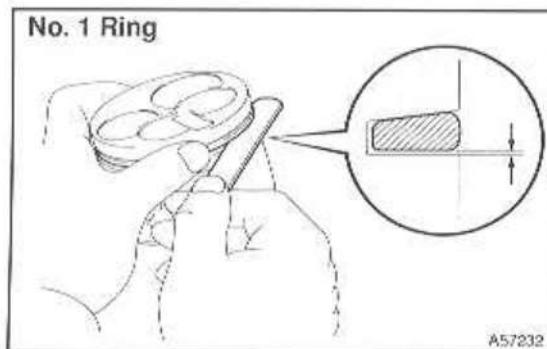


(c) Using a micrometer, measure the piston pin diameter.

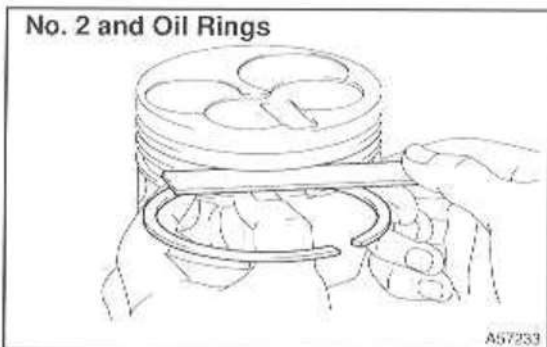
Piston pin diameter:

29.000 – 29.012 mm (1.1417 – 1.1422 in.)

No. 1 Ring



No. 2 and Oil Rings

**19. INSPECT PISTON RING SET**

(a) Inspect the piston ring groove clearance.

(1) No. 1 Ring:

Install a new piston ring to the piston. Using a feeler gauge, measure the clearance between the piston ring and the wall of the ring groove.

Standard groove clearance:**0.057 – 0.101 mm (0.0022 – 0.0040 in.)****Maximum groove clearance: 0.20 mm (0.0079 in.)**

If the clearance is greater than maximum, replace the piston.

(2) No. 2 and Oil Rings:

Using a feeler gauge, measure the clearance between a new piston ring and the wall of the ring groove.

Standard groove clearance:

No. 2	0.060 – 0.100 mm (0.0024 – 0.0039 in.)
Oil	0.030 – 0.070 mm (0.0012 – 0.0028 in.)

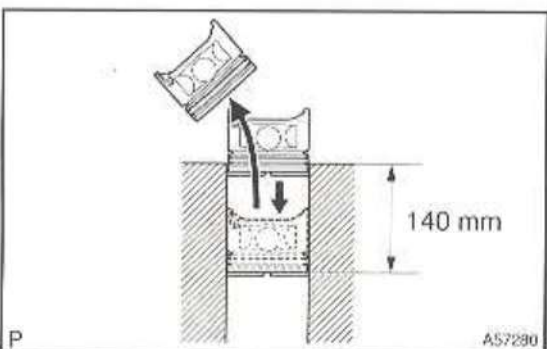
Maximum groove clearance: 0.20 mm (0.0079 in.)

If the clearance is greater than maximum, replace the piston.

(b) Inspect the piston ring end gap.

(1) Insert the piston ring into the cylinder bore.

(2) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 140 mm (5.51 in.) from the top of the cylinder block.



(3) Using a feeler gauge, measure the end gap.

Standard end gap:

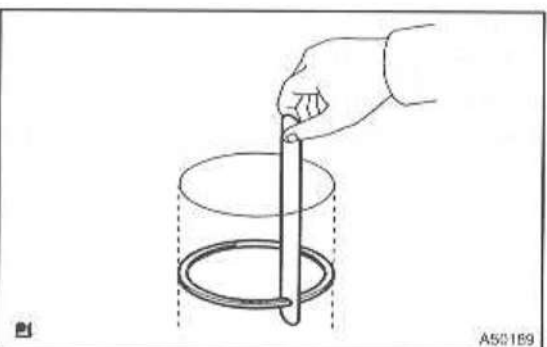
No. 1	0.350 – 0.590 mm (0.0138 – 0.0232 in.)
No. 2	0.470 – 0.720 mm (0.0185 – 0.0283 in.)
Oil	0.200 – 0.520 mm (0.0079 – 0.0205 in.)

Maximum end gap:

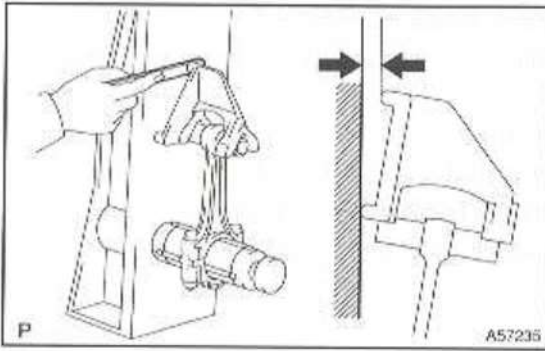
No. 1	1.29 mm (0.0508 in.)
No. 2	1.42 mm (0.0559 in.)
Oil	1.22 mm (0.0480 in.)

If the end gap is greater than maximum, replace the piston ring.

If the end gap is greater than maximum, even with a new piston ring, rebore all the 4 cylinders or replace the cylinder block.



ENGINE MECHANICAL - CYLINDER BLOCK ASSY (5L-E)

**20. INSPECT CONNECTING ROD SUB-ASSY**

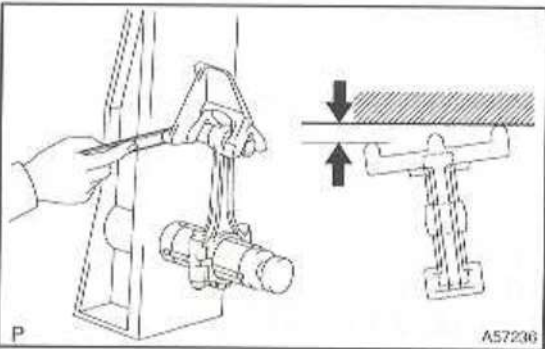
- (a) Using a rod aligner and feeler gauge, check the connecting rod alignment.

- (1) Check for bend.

Maximum bend:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If bend is greater than maximum, replace the connecting rod sub-assy.

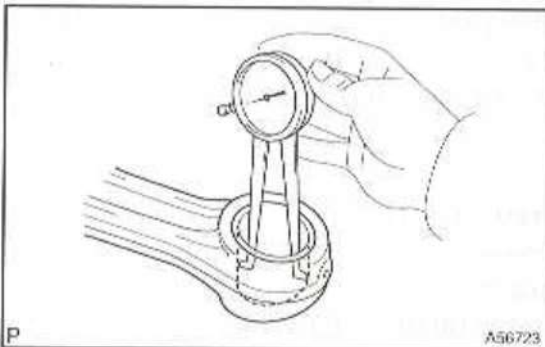


- (2) Check for twist

Maximum twist:

0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

If twist is greater than maximum, replace the connecting rod sub-assy.

**21. INSPECT PISTON PIN OIL CLEARANCE**

- (a) Inspect the piston pin oil clearance.

- (1) Using a caliper gauge, measure the inside diameter of the connecting rod bush.

Bush inside diameter:

29.008 – 29.020 mm (1.1420 – 1.1425 in.)

- (2) Subtract the piston pin diameter measurement (See step 18) from the bush inside diameter measurement.

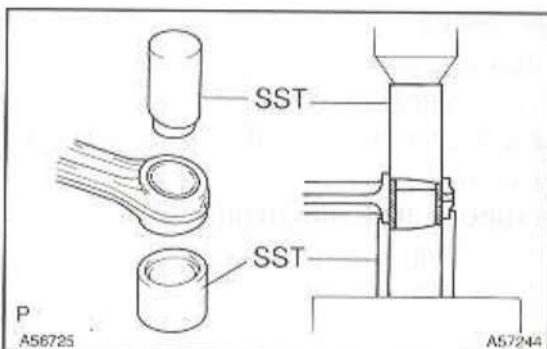
Standard oil clearance:

0.004 – 0.012 mm (0.0002 – 0.0005 in.)

Maximum oil clearance: 0.05 mm (0.0020 in.)

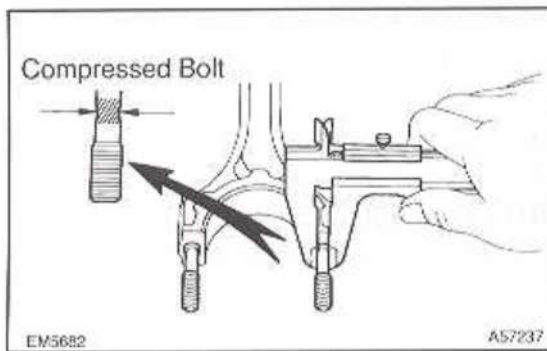
If the oil clearance is greater than maximum, replace the bush.

If necessary, replace the piston and piston pin as a set.

**22. REMOVE CONNECTING ROD SMALL END BUSH**

- (a) Using SST and a press, press out the bush.

SST 09222-54011 (09222-03016, 09222-03026)

**23. INSPECT CONNECTING ROD BOLT**

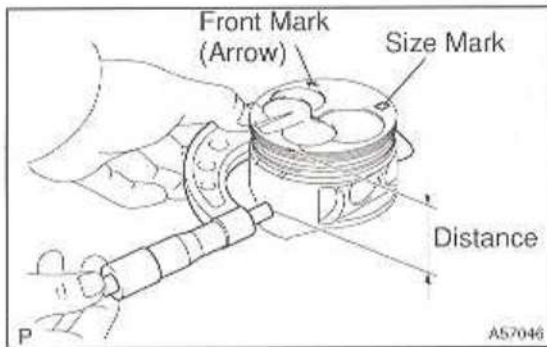
- (a) Using vernier calipers, measure the tension portion of the connecting rod bolt.

Standard diameter:

8.400 – 8.600 mm (0.3307 – 0.3386 in.)

Minimum diameter: 8.20 mm (0.3228 in.)

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

**24. BORE CYLINDER****HINT:**

- Bore all the 4 cylinders for the O/S piston outside diameter.
- Replace all the piston rings with ones to match the O/S pistons.

- (a) Keep 4 new O/S pistons.

O/S 0.50 piston diameter:

99.950 – 99.980 mm (3.9350 – 3.9362 in.)

- (b) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, the indicated distance from the piston head.

Distance: 61.27 – 61.33 mm (2.4122 – 2.4146 in.)

- (c) Calculate the amount each cylinder is to be rebored as follows:

Size to be rebored = P + C – H

P = Piston diameter

C = Piston clearance:

0.040 – 0.060 mm (0.0016 – 0.0024 in.)

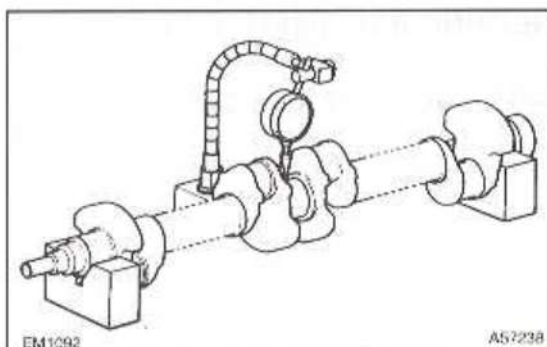
H = Allowance for honing: 0.02 mm (0.0008 in.) or less

- (d) Bore and hone the cylinders to calculated dimensions.

Maximum honing: 0.02 mm (0.0008 in.)

NOTICE:

Excess honing will destroy the finished roundness.

**25. INSPECT CRANKSHAFT**

- (a) Inspect for circle runout.

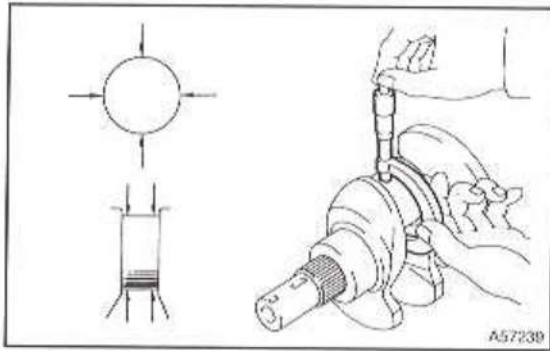
(1) Place the crankshaft on V-blocks.

(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 crankshaft.

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(b) Inspect the main journals and crank pins.

- (1) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:

STD	61.985 – 62.000 mm (2.4403 – 2.4409 in.)
U/S 0.25	61.745 – 61.755 mm (2.4309 – 2.4313 in.)
U/S 0.50	61.495 – 61.505 mm (2.4211 – 2.4215 in.)

Crank pin diameter:

STD	54.988 – 55.000 mm (2.1649 – 2.1654 in.)
U/S 0.25	54.745 – 54.755 mm (2.1553 – 2.1557 in.)
U/S 0.50	54.495 – 54.505 mm (2.1455 – 2.1459 in.)

If the diameter is not as specified, check the oil clearance (See steps 2 and 6). If necessary, grind or replace the crankshaft.

- (2) Check each main journal and crank pin for taper and out-of-round as shown.

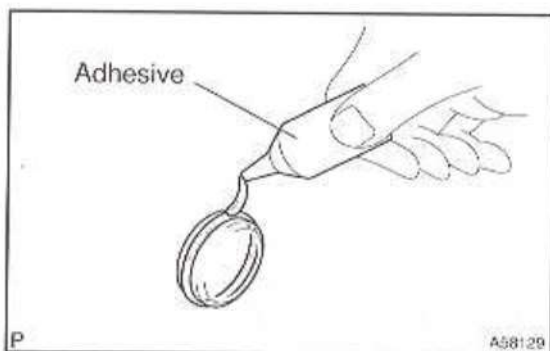
Maximum taper and out-of-round:

0.02 mm (0.0008 in.)

If the taper and out-of-round is greater than maximum, replace the crankshaft.

- (c) If necessary, grind and hone the main journals and/or crank pins.

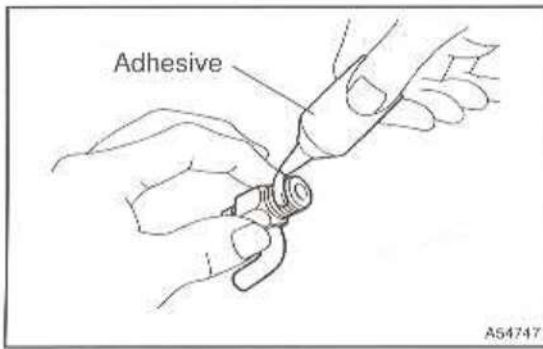
- (1) Grind and hone the main journals and/or crank pins to the finished undersized diameter (See procedure in step (b) above).
- (2) Install new main journal and/or crankshaft pin undersized bearing.

**26. INSTALL TIGHT PLUG**

- (a) Apply adhesive to a new tight plug.

Adhesive:

Part No. 08833-00070, THREE BOND 1324 or equivalent



31. INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB-ASSY

- (a) Apply adhesive to 2 or 3 threads.

Adhesive:

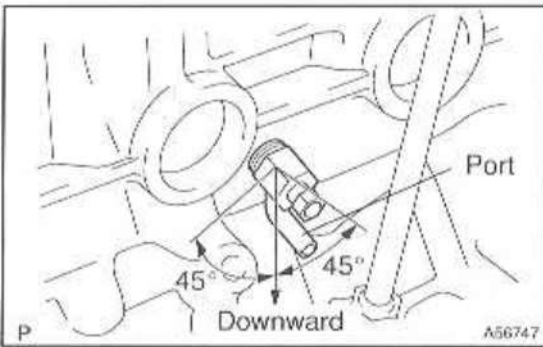
Part No. 08833-00070, THREE BOND 1324 or equivalent

- (b) Install the drain union.

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

HINT:

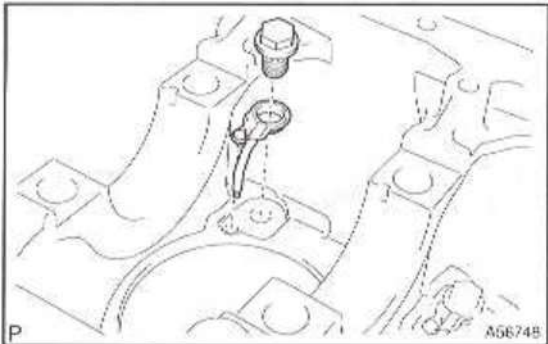
- After applying the specified torque, rotate the drain union clockwise until its drain port is facing downward.
- The drain port may be set within 45° of either side of the prescribed position.



32. INSTALL CYLINDER BLOCK OIL ORIFICE

- (a) Using a 6 mm hexagon wrench, install the oil orifice.

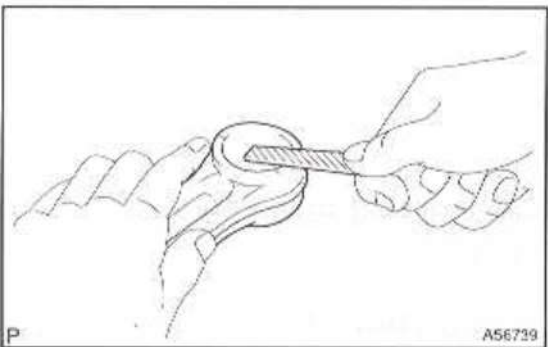
Torque (Reference): 11 N·m (110 kgf·cm, 8 ft·lbf)



33. INSTALL SUB-ASSY OIL NOZZLE NO.1

- (a) Align the pin of the oil nozzle with the pin hole of the cylinder block.
- (b) Install the oil nozzle with the check valve. Install the 4 oil nozzles and check valves.

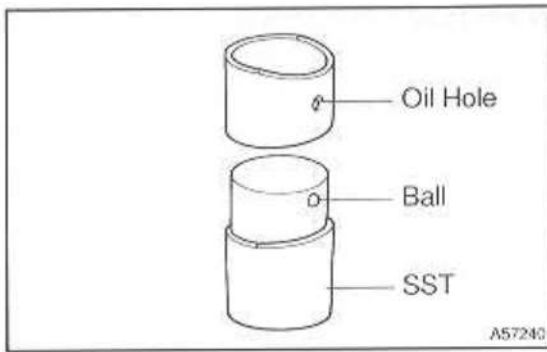
Torque: 26 N·m (260 kgf·cm, 18 ft·lbf)



34. INSTALL CONNECTING ROD SMALL END BUSH

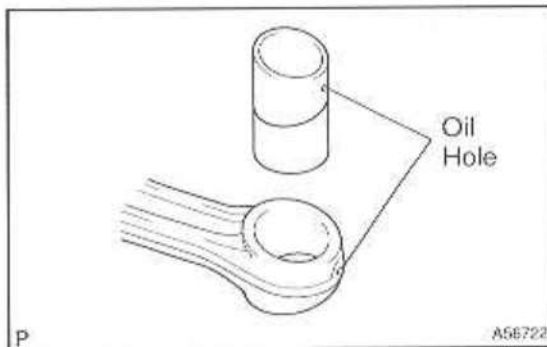
- (a) Using a round file, lightly file off any roughness from the small end of the connecting rod.

ENGINE MECHANICAL - CYLINDER BLOCK ASSY (5L-E)

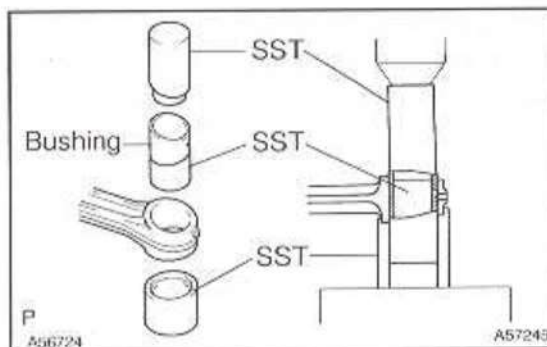


- (b) Attach a new bush to SST with the ball of SST inside the oil hole of the bush.

SST 09222-54011 (09222-03021)

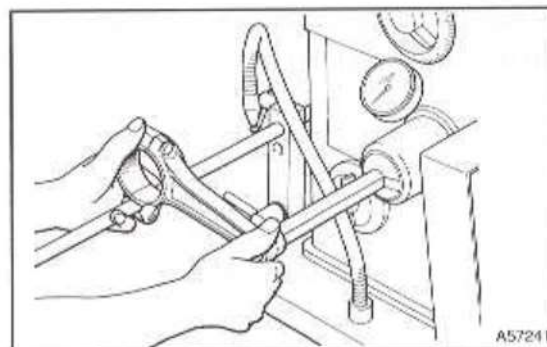


- (c) Align the oil holes of the bush and connecting rod.

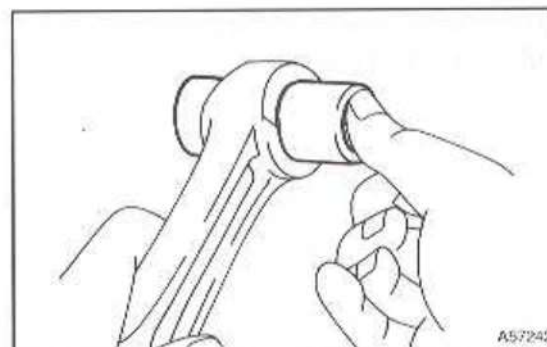


- (d) Using SST and a press, press in the bush.

SST 09222-54011 (09222-03016, 09222-03021, 09222-03026)

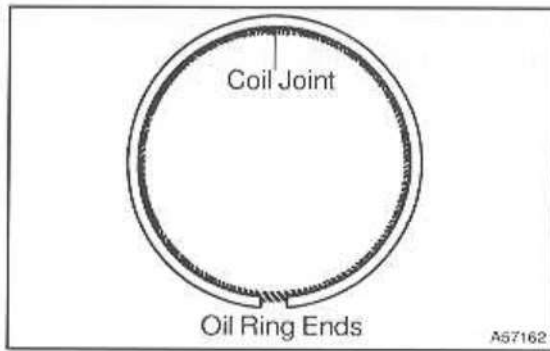


- (e) Using a pin hole grinder, hone the bush to obtain the standard specified clearance (See step 21) between the bush and piston pin.



- (f) Check the piston pin fit at normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.

ENGINE MECHANICAL — CYLINDER BLOCK ASSY (5L-E)

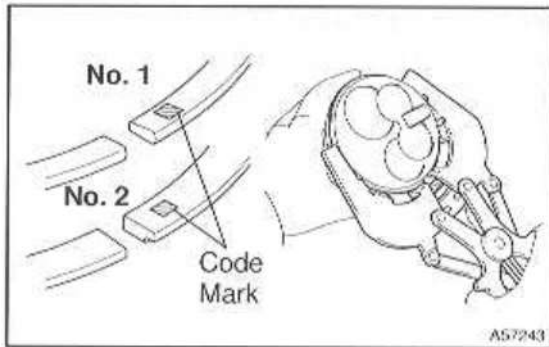


(b) Install the piston rings.

(1) Install the coil and oil ring by hand.

HINT:

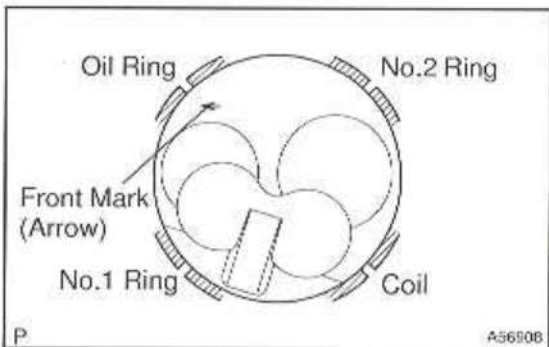
Face the end gap of the oil ring in the opposite direction coil joint.



(2) Using a piston ring expander, install the No. 1 and No. 2 piston rings with the code mark facing upward.

Code mark:

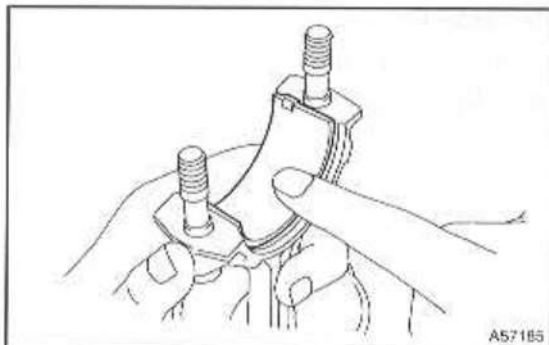
No. 1	1N
No. 2	2N



(3) Position the piston rings so that the ring ends are as shown.

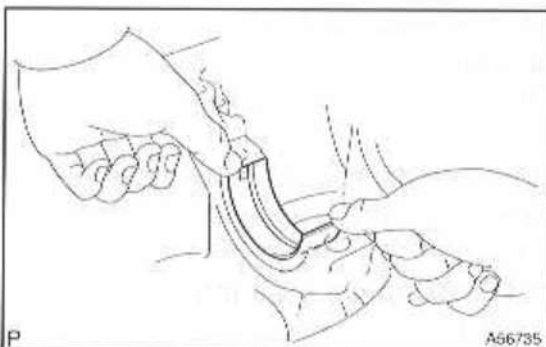
NOTICE:

Do not align the ring ends.



36. INSTALL CONNECTING ROD BEARING

- Align the bearing claw with the groove of the connecting rod or connecting cap.
- Install the bearings in the connecting rod and connecting rod cap.



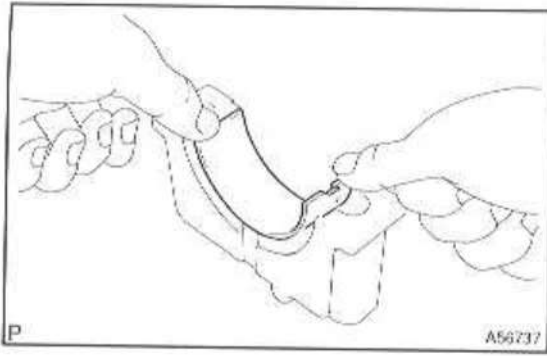
37. INSTALL CRANKSHAFT BEARING

HINT:

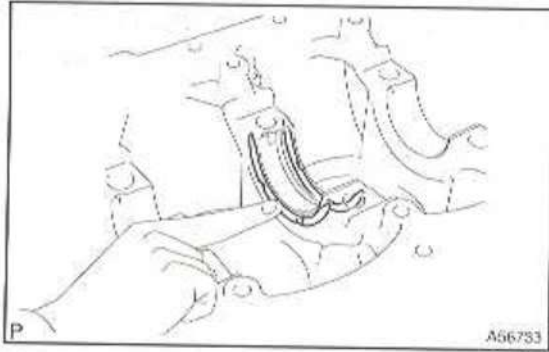
Upper bearings have an oil groove and oil hole; lower bearings do not.

- Align the bearing claw with the claw groove of the cylinder block, and push in the 5 upper bearings.

ENGINE MECHANICAL - CYLINDER BLOCK ASSY (5L-E)

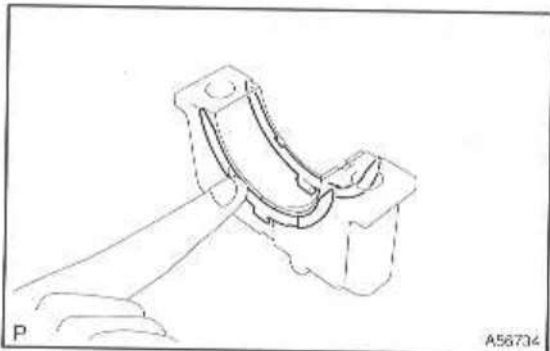


- (b) Align the bearing claw with the claw groove of the crankshaft bearing cap, and push in the 5 lower bearings.

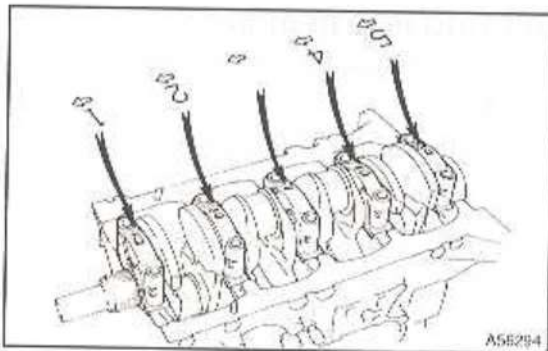


38. INSTALL CRANKSHAFT THRUST WASHER SET

- (a) Install the 2 thrust washers under the No. 3 journal position of the cylinder block with the oil grooves facing outward.

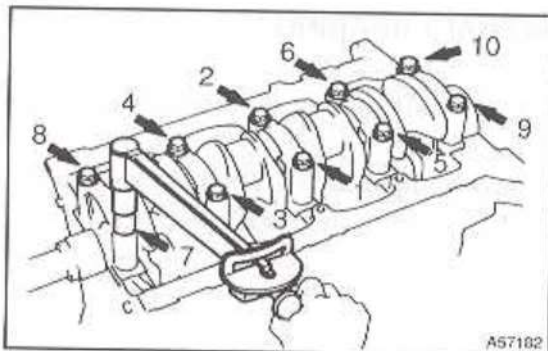


- (b) Install the 2 thrust washers on the No. 3 crankshaft bearing cap with the grooves facing outward.



39. INSTALL CRANKSHAFT

- (a) Place the crankshaft on the cylinder block.
(b) Install the 5 crankshaft bearing caps in their proper locations.

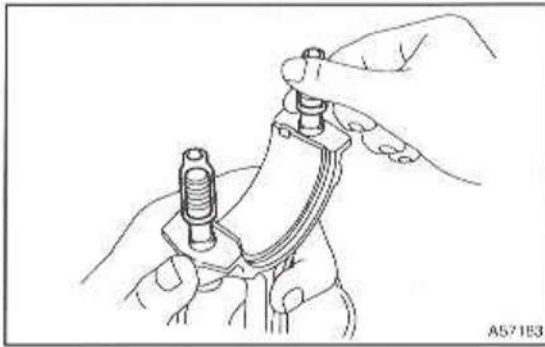


- (c) Install the crankshaft bearing cap bolts.
(1) Apply a light coat of the engine oil on the threads and under the bolt heads of the crankshaft bearing caps.
(2) Install and uniformly tighten the 10 bolts of the crankshaft bearing caps, in several passes, in the sequence shown.

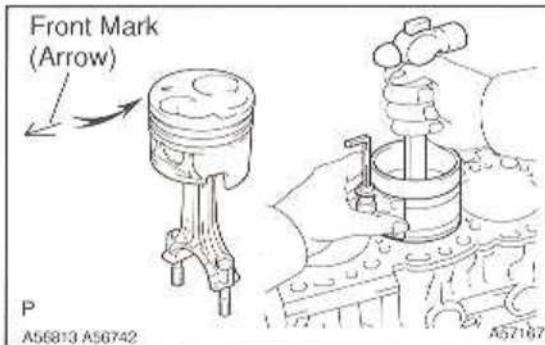
Torque: 105 N·m (1,050 kgf·cm, 77 ft·lbf)

- (d) Check that the crankshaft turns smoothly.
(e) Check the crankshaft thrust clearance (See step 5).

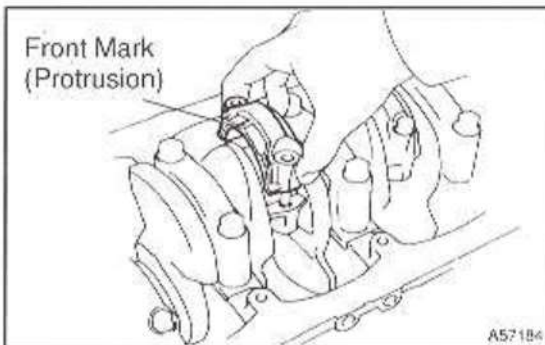
ENGINE MECHANICAL - CYLINDER BLOCK ASSY (5L-E)

**40. INSTALL PISTON AND CONNECTING ROD**

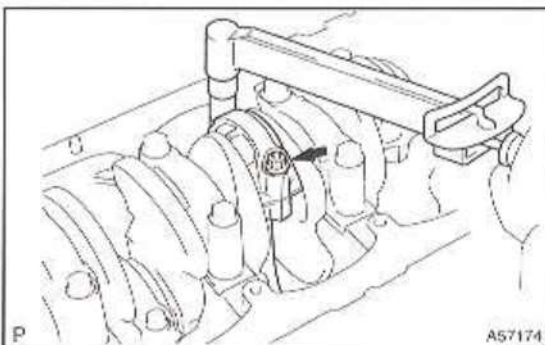
- (a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft and cylinder bore from damage.



- (b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assembly into the cylinder with the front mark of the piston facing forward.



- (c) Place the connecting rod cap on the connecting rod.
- (1) Match the numbered connecting rod cap with the connecting rod.
 - (2) Install the connection rod cap with the front mark facing forward.



- (d) Install the connecting rod cap nuts.

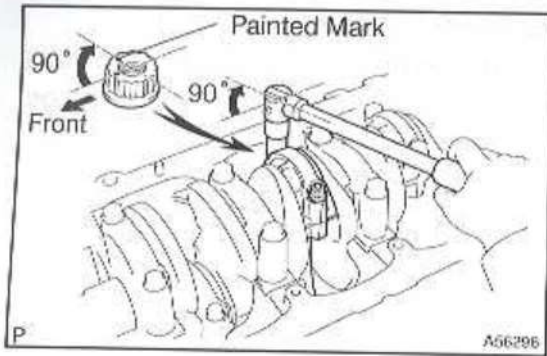
HINT:

- The connecting rod cap nuts are tightened in 2 progressive steps (steps (2) and (4)).
 - If any connecting rod bolt is broken or deformed, replace it.
- (1) Apply a light of engine oil on the threads and under the heads of the connecting rod cap nuts.
 - (2) Install and alternately tighten the nuts of the connecting rod cap in several passes.

Torque: 54 N·m (550 kgf·cm, 40 ft·lbf)

If any one of the connecting rod cap nuts does not meet the torque specification, replace the cap nuts.

ENGINE MECHANICAL - CYLINDER BLOCK ASSY (5L-E)



- (3) Mark the front of the connecting rod cap nuts with paint.
- (4) Retighten the connecting rod cap nuts 90° as shown.
- (5) Check that the painted mark is now at a 90° angle to the front.
- (e) Check that the crankshaft turns smoothly.
- (f) Check the connecting rod thrust clearance (See step 1).

