

CO/HC INSPECTION

EM115-01

HINT:

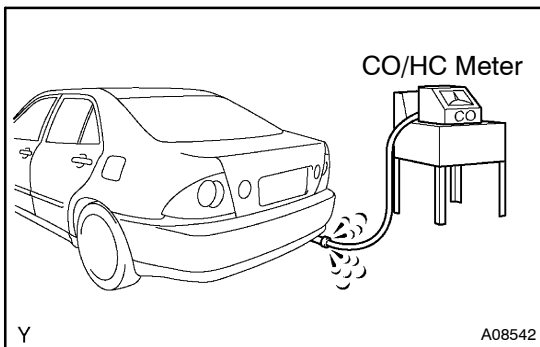
This check is used only to determine whether or not the idle CO/HC complies with specifications.

1. INITIAL CONDITIONS

- (a) Engine at normal operating temperature
- (b) Air cleaner installed
- (c) All pipes and hoses of air induction system connected
- (d) All accessories switched OFF
- (e) All vacuum lines properly connected
- (f) EFI system wiring connectors fully plugged
- (g) Ignition timing check correctly
- (h) Transmission in neutral position
- (i) Tachometer and CO/HC meter calibrated by hand

2. START ENGINE

3. RACE ENGINE AT 2,500 RPM FOR APPROX. 180 SECONDS



4. INSERT CO/HC METER TESTING PROBE INTO TAILPIPE AT LEAST 40 cm (1.3 ft) DURING IDLING

5. CHECK CO/HC CONCENTRATION AT IDLE

Idle CO concentration: 0 – 0.5 %

Idle HC concentration: Applicable local regulation

If the CO/HC concentration does not conform to specifications, perform troubleshooting in the order given below.

- (a) Check oxygen sensor operation.
- (b) See the table next page for possible causes, and then inspect and correct the applicable causes if necessary.

HC	CO	Problems	Causes
Normal	High	Rough idle	1. Faulty ignition: • Incorrect timing • Fouled, shorted or improperly gapped plugs 2. Incorrect valve clearance 3. Leaky intake and exhaust valves 4. Leaky cylinder
Low	High	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: • PCV hoses • Intake manifold • Throttle body • Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Plugged PCV valve 3. Faulty EFI systems: • Faulty pressure regulator • Defective water temp. sensor • Faulty engine ECU • Faulty injectors • Faulty throttle position sensor • Faulty vacuum sensor

COMPRESSION INSPECTION

EM07Y-06

HINT:

If there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

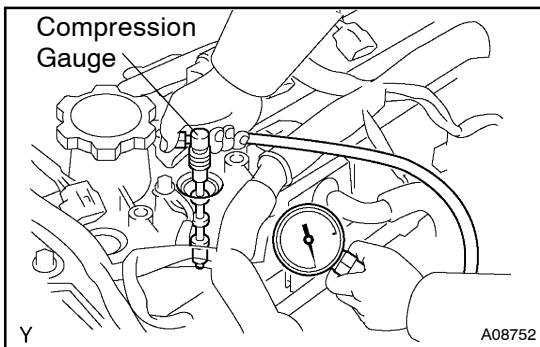
1. WARM UP AND STOP ENGINE

Allow the engine to warm up to normal operating temperature.

2. REMOVE IGNITION COILS (See page G-6)

3. REMOVE SPARK PLUGS (See page G-1)

4. DISCONNECT INJECTOR CONNECTORS



5. INSPECT CYLINDER COMPRESSION PRESSURE

- Insert a compression gauge into the spark plug hole.
- Fully open the throttle.
- While cranking the engine, measure the compression pressure.

HINT:

Always use a fully charged battery to obtain engine speed of 250 rpm or more.

- Repeat steps (a) through (c) for each cylinder.

NOTICE:

This measurement must be done in as short a time as possible.

Compression pressure:

1,255 kPa (12.8 kgf/cm² 182 psi) or more

Minimum pressure: 981 kPa (10.0 kgf/cm² 142 psi)

Difference between each cylinder:

98 kPa (1.0 kgf/cm² 14 psi) or less

- If the cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for cylinders with low compression.
 - If adding oil helps the compression, it is likely that the piston rings and/or cylinder bore are probably worn or damaged.
 - If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.

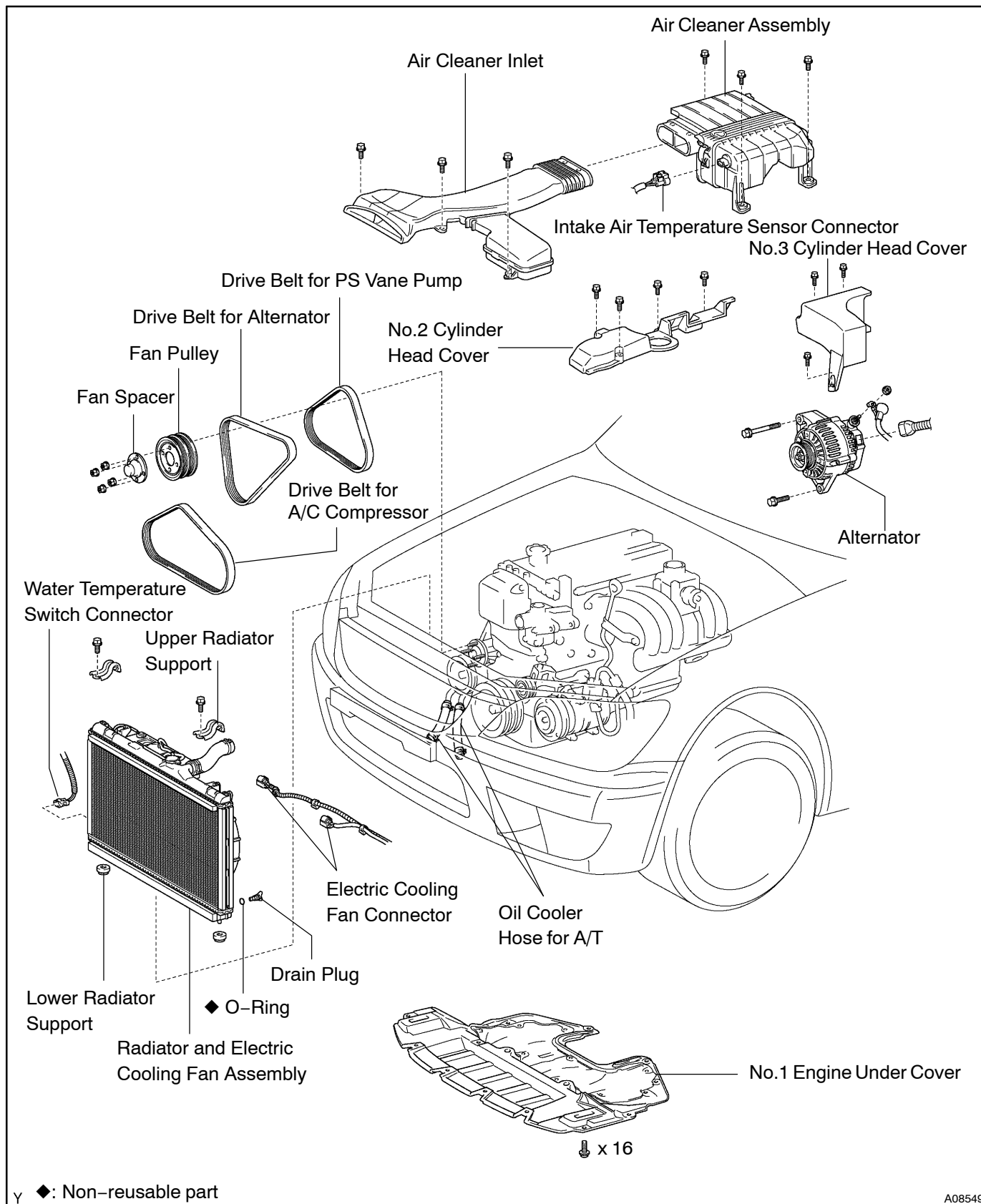
6. RECONNECT INJECTOR CONNECTORS

7. REINSTALL SPARK PLUGS (See page G-1)

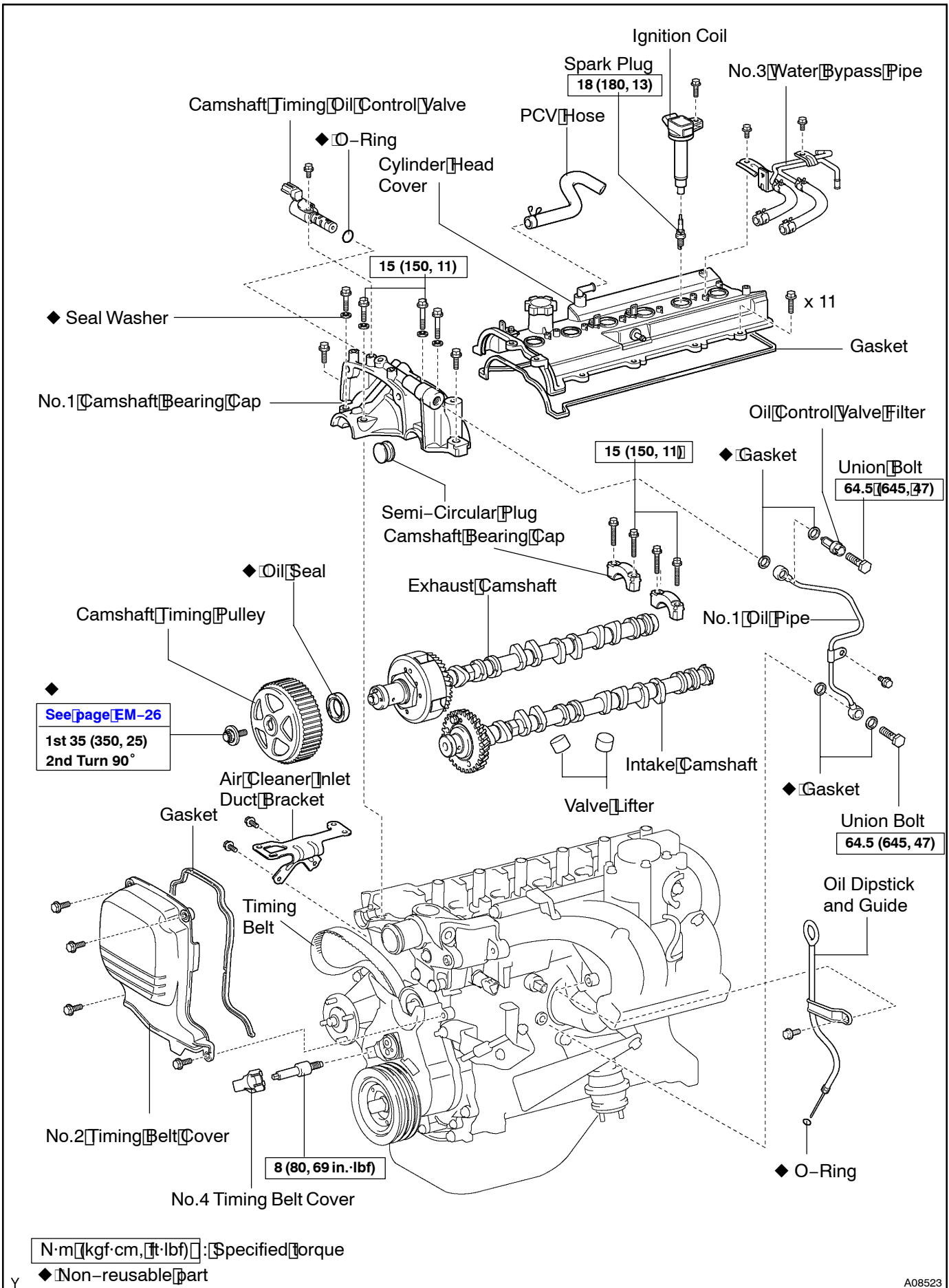
8. RECONNECT IGNITION COILS (See page G-6)

VALVE CLEARANCE COMPONENTS

EM116-01



A08549



A08523

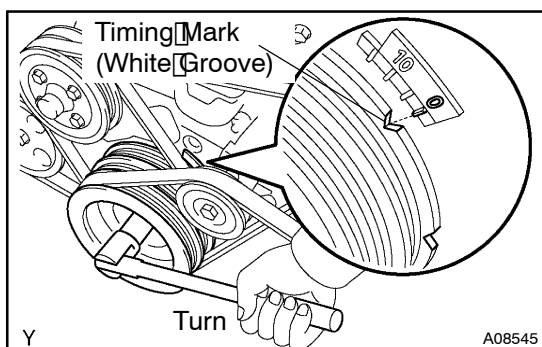
ADJUSTMENT

HINT:

Inspect and adjust the valve clearance when the engine is cold.

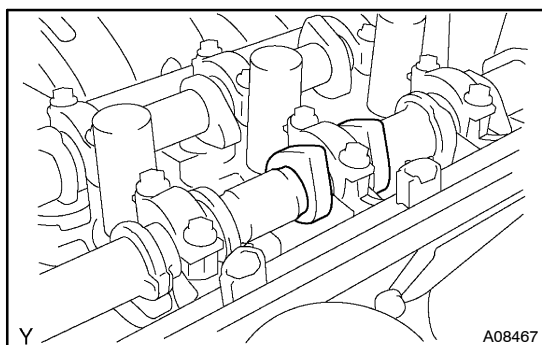
1. REMOVE NO.1 ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT
3. REMOVE AIR CLEANER INLET
4. REMOVE AIR CLEANER ASSEMBLY
5. REMOVE PCV HOSE
6. REMOVE NO.2 CYLINDER HEAD COVER
7. DISCONNECT ENGINE WIRE FROM CYLINDER HEAD
8. REMOVE IGNITION COILS (See page G-6)
9. REMOVE SPARK PLUGS (See page G-1)
10. REMOVE NO.3 WATER BYPASS PIPE
11. REMOVE AIR CLEANER INLET DUCT BRACKET
12. REMOVE CYLINDER HEAD COVER

Remove the 11 bolts, cylinder head cover and gasket.



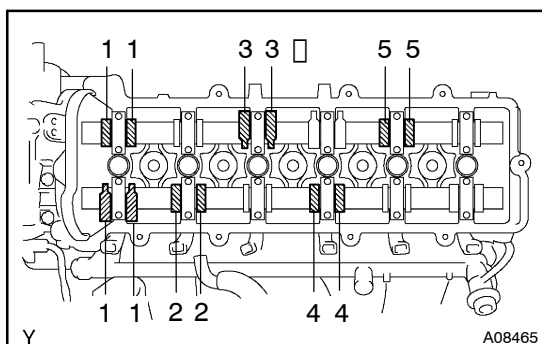
13. SET NO.1 CYLINDER TO TDC/COMPRESSION

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



- (b) Check that the No.4 cylinder cam lobes of the intake camshaft faces nearly straight up.

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



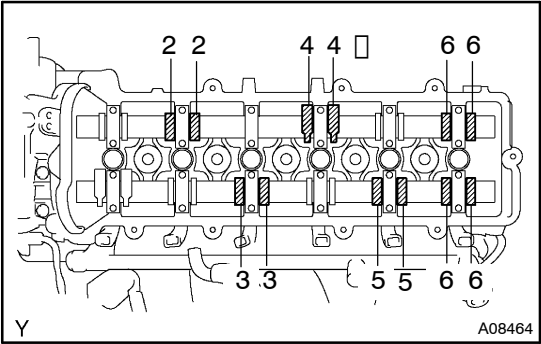
14. INSPECT VALVE CLEARANCE

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

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.)

(b) Turn the crankshaft one revolution (360°) and align the mark as above.



(c) Check only the valves indicated as shown. Measure the valve clearance. (See procedure in step (a))

15. REMOVE RADIATOR ASSEMBLY (See page CO-16)

16. REMOVE DRIVE BELT FOR A/C COMPRESSOR (See page AC-17)

17. REMOVE DRIVE BELT FOR ALTERNATOR (See page CH-6)

HINT:

Before removing the drive belt, loosen the 4 fan pulley nuts.

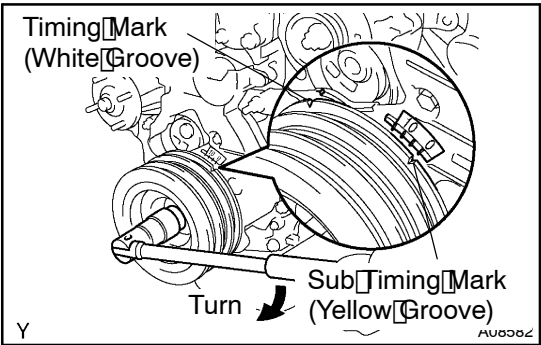
18. REMOVE DRIVE BELT FOR PS VANE PUMP (See page SR-27)

19. REMOVE FAN SPACER AND PULLEY

20. REMOVE NO.2 TIMING BELT COVER

Remove the 4 bolts, timing belt cover and gasket.

21. REMOVE NO.4 TIMING BELT COVER

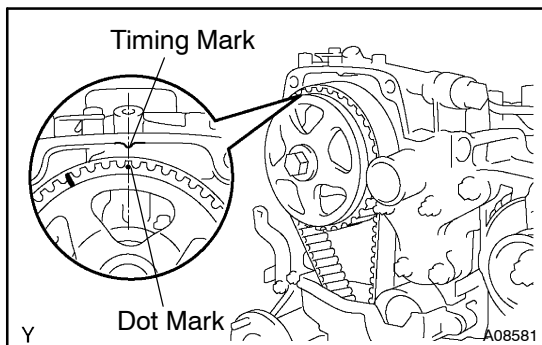


22. SET NO.1 CYLINDER TO APPROX. 60° BTDC/COMPRESSION

(a) Turn the crankshaft pulley, and align the sub timing mark (yellow groove – 60° mark BTDC) with the timing mark "0" of the No.1 timing belt cover.

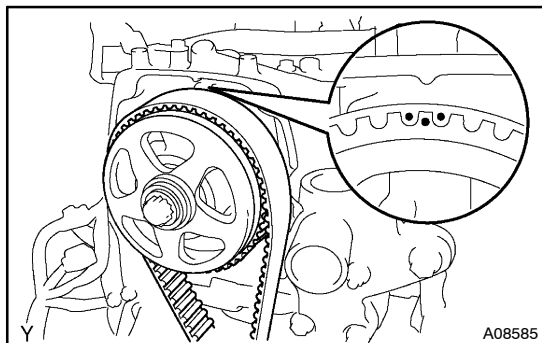
NOTICE:

- Always turn the crankshaft clockwise.
- If the timing belt is disengaged, having the crankshaft pulley at the wrong angle can cause the piston head and valve head to come into contact with each other. Thus results in damage when you remove the camshaft timing pulley (See page EM-59). So, always set the crankshaft pulley at the correct angle.



- (b) Check that the dot mark (60° mark BTDC) of the camshaft timing pulley is aligned with the timing mark of the No.1 bearing cap.

If not, revolve the crankshaft 1 (360°).

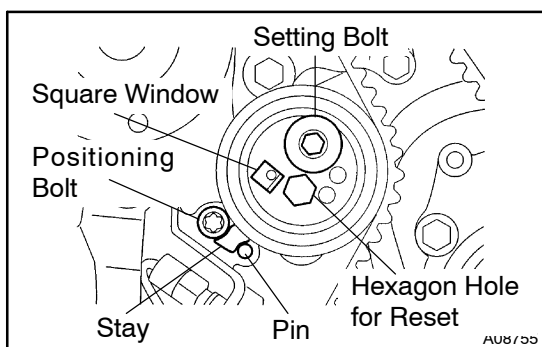


23. DISCONNECT TIMING BELT FROM CAMSHAFT TIMING PULLEY

HINT:

When re-using timing belt:

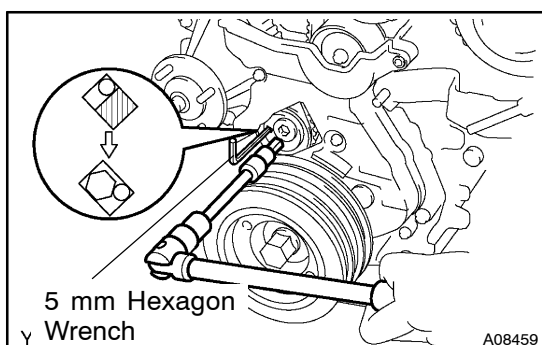
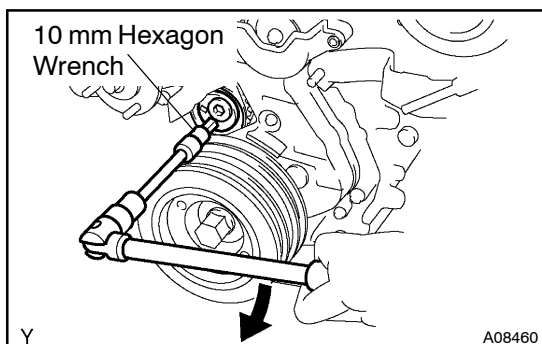
Place the matching marks on the timing belt and the camshaft timing pulley as shown in the illustration.



- (a) Using a 10 mm hexagon wrench, insert the auto tensioner rod inside of the No.1 idler pulley to the hexagon hole for reset in the No.1 idler pulley.

NOTICE:

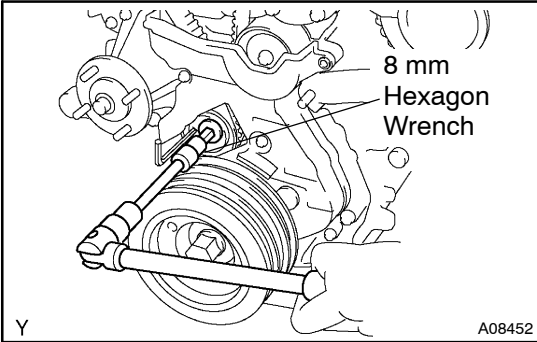
Must not apply torque with more than 39 N·m (400 kgf·cm, 29 ft·lbf).



- (b) After confirming the movement of the pin inside the square window, insert a 5 mm hexagon wrench.

HINT:

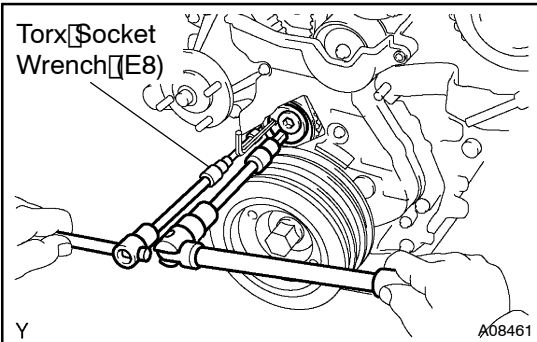
Be sure to insert the wrench only after you feel the knocking while inserting the auto tensioner.



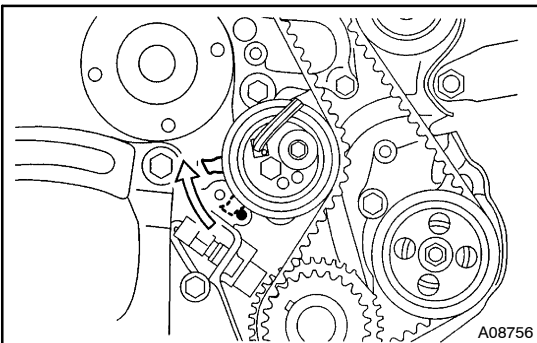
- (c) Using a 8 mm hexagon wrench, loosen the bolt of the No. 1 idler pulley (timing belt tensioner).

NOTICE:

Least necessary losing is required only to move the No. 1 idler pulley.



- (d) Using a 10 mm hexagon wrench, keep holding the No. 1 idler pulley tightly toward the direction of tensioning and take out the positioning bolt using a Torx socket wrench (E8).

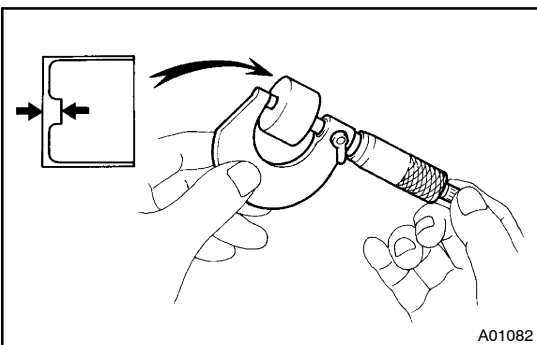


- (e) Move the No. 1 idler pulley by hand toward the direction of loosening the timing belt.
(f) Disconnect the timing belt from the camshaft timing pulley.

24. REMOVE CAMSHAFT TIMING PULLEY AND CAM-SHAFTS (See page EM-36)

25. ADJUST VALVE CLEARANCE

- (a) Remove the valve lifter.



- (b) Determine the replacement valve lifter size by following the Formula or Charts:

- (1) Using a micrometer, measure the thickness of the removed valve lifter.

- (2) Calculate the thickness of a new lifter so that the valve clearance comes within specified value.

T..... Thickness of removed valve lifter

A..... Measured valve clearance

N..... Thickness of new valve lifter

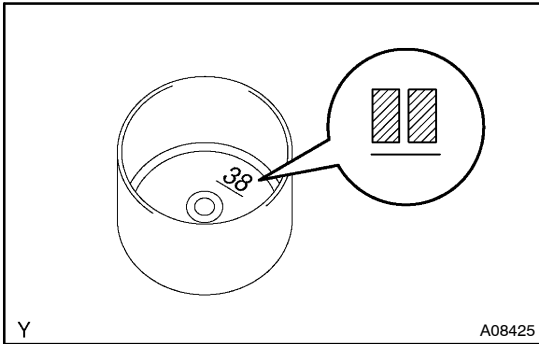
Intake: $N = T + (A - 0.20 \text{ mm (0.008 in.)})$

Exhaust: $N = T + (A - 0.30 \text{ mm (0.012 in.)})$

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

HINT:

- Valve lifters are available in 35 sizes in increments of 0.020 mm (0.0008 in.), from 5.060 mm (0.1992 in.) to 5.740 mm (0.2260 in.).

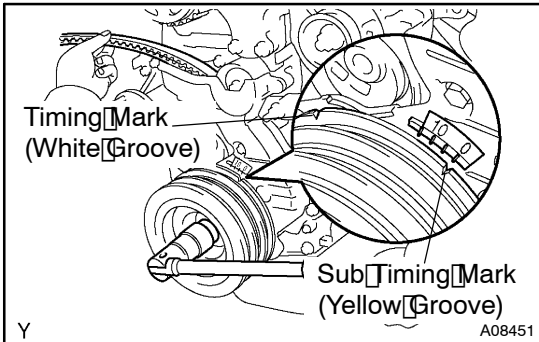


- Identification number inside the valve lifter shows the value of the two decimal places. (The illustration shows 5.380 mm (0.2118 in.).)

(c) Install a new valve lifter.

26. REINSTALL CAMSHAFTS AND CAMSHAFT TIMING PULLEY (See page EM-59)

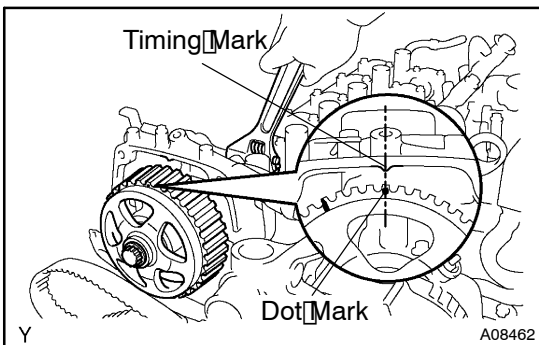
27. RECHECK VALVE CLEARANCE



28. RESET NO.1 CYLINDER TO APPROX. 60° BTDC/ COMPRESSION

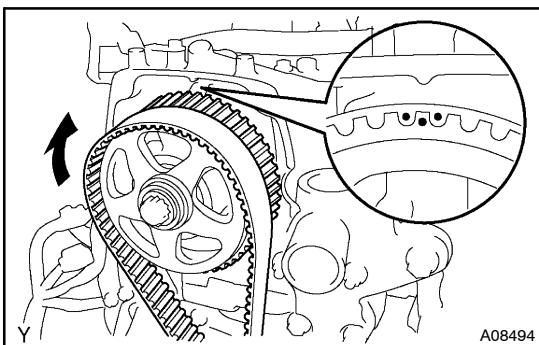
(a) Crankshaft Pulley Position:

Turn the crankshaft pulley, and align the sub timing mark (yellow groove – 60° mark BTDC) with the timing mark "0" of the No.1 timing belt cover.



(b) Camshaft Timing Pulley Position:

Using the hexagon portion of the camshaft, turn the camshaft, align the dot mark (60° mark BTDC) of the camshaft timing pulley with the timing mark of the No.1 bearing cap.



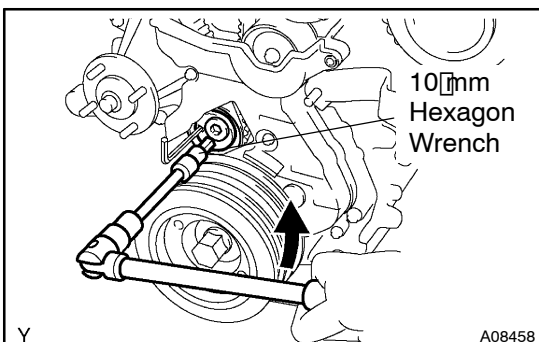
29. RECONNECT TIMING BELT TO CAMSHAFT TIMING PULLEY

(a) Install the timing belt, check the tension between the crankshaft timing pulley, oil pump pulley, No.2 idler pulley and camshaft timing pulley.

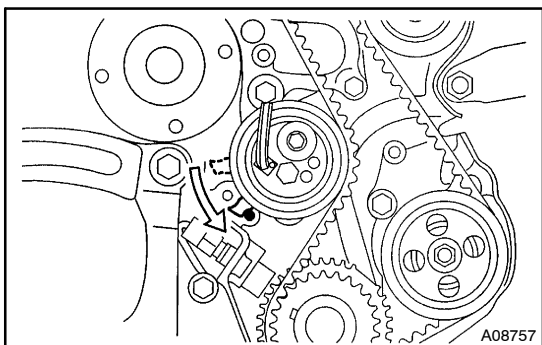
HINT:

When re-using timing belt:

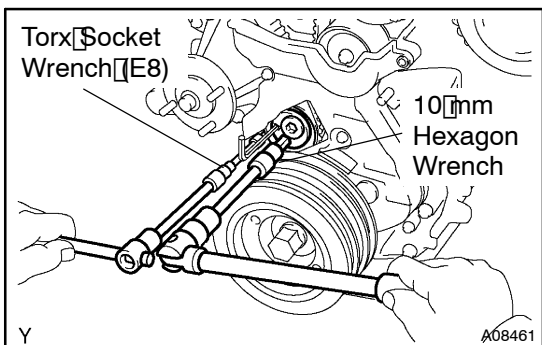
Align the marked points during removal.



(b) Using a 10 mm hexagon wrench, keep holding the No.1 idler pulley toward the direction of tensing the timing belt.



- (c) After confirming that the stay of the No. 1 idler pulley touches the pin, install the positioning bolt by hand.

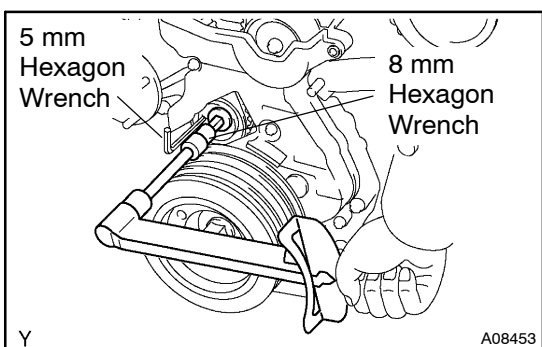


- (d) Using a Torx socket wrench (E8), tighten the positioning bolt.

Torque: 8 N·m (80 kgf·cm, 69 in·lbf)

NOTICE:

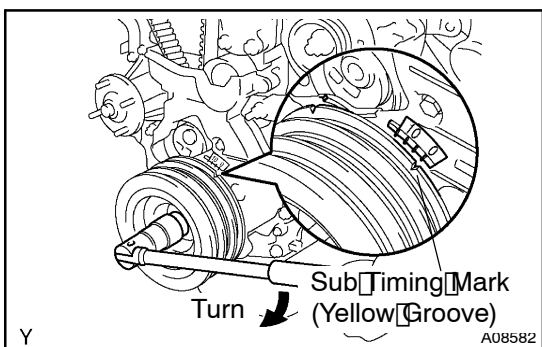
Be careful not to allow the bolt to come onto the stay of the No. 1 idler pulley.



- (e) Using a 8 mm hexagon wrench, tighten the bolt of the No. 1 idler pulley (timing belt tensioner).

Torque: 42.5 N·m (425 kgf·cm, 31 ft·lbf)

- (f) Take the 5 mm hexagon wrench for lock out of the square window.

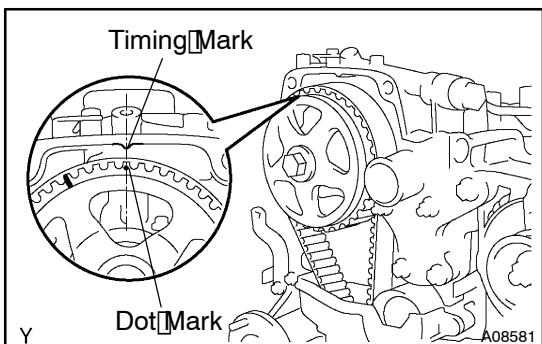


30. CHECK VALVE TIMING

- (a) Slowly revolve the crankshaft 2 times, and align the sub timing mark (yellow groove - 60° mark BTDC) with the timing mark "0" of the No. 1 timing belt cover.

NOTICE:

Always turn the crankshaft clockwise.



- (b) Check that the dot mark (60° mark BTDC) of the camshaft timing pulley is aligned with the timing mark of the No. 1 bearing cap.

31. REINSTALL NO. 4 TIMING BELT COVER

32. REINSTALL NO. 2 TIMING BELT COVER

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

Torque: 6 N·m (60 kgf·cm, 52 in·lbf)

33. REINSTALL CYLINDER HEAD COVER

(See page EM-59)

34. REINSTALL AIR CLEANER INLET DUCT BRACKET
Torque: 18.5 N·m (190 kgf·cm, 14 ft·lbf)
35. REINSTALL NO.3 WATER BYPASS PIPE
Torque: 8.5 N·m (85 kgf·cm, 74 in·lbf)
36. REINSTALL SPARK PLUGS ([See page G-1](#))
37. REINSTALL IGNITION COILS ([See page G-6](#))
38. RECONNECT ENGINE WIRE TO CYLINDER HEAD
39. REINSTALL NO.2 CYLINDER HEAD COVER
Torque: 8.5 N·m (85 kgf·cm, 74 in·lbf)
40. REINSTALL PCV HOSE
41. REINSTALL FAN PULLEY AND SPACER

HINT:

Temporarily install the 4 nuts.

42. REINSTALL DRIVE BELT FOR PS VANE PUMP
([See page SR-37](#))
43. REINSTALL DRIVE BELT FOR ALTERNATOR
([See page CH-15](#))
44. REINSTALL DRIVE BELT FOR A/C COMPRESSOR
([See page AC-18](#))
45. RETIGHTEN MOUNTING NUTS OF FAN PULLEY AND SPACER
Torque: 18.5 N·m (185 kgf·cm, 13 ft·lbf)
46. REINSTALL RADIATOR ASSEMBLY
([See page CO-21](#))
47. REINSTALL AIR CLEANER ASSEMBLY
Torque: 7.5 N·m (75 kgf·cm, 65 in·lbf)
48. REINSTALL AIR CLEANER INLET
Torque: 5 N·m (50 kgf·cm, 43 in·lbf)
49. REFILL ENGINE WITH COOLANT
50. START ENGINE CHECK FOR LEAK
51. REINSTALL NO.1 ENGINE UNDER COVER
52. ROAD TEST
Check abnormal noise, shock, slippage, correct shift points and smooth operation.
53. RECHECK ENGINE COOLANT LEVEL

Valve Lifter Selection Chart (Intake)

Installed lifter thickness mm (in.)		Measured clearance mm (in.)		New lifter																					
						Lifter No.					Thickness					Lifter No.					Thickness				
0.000 - 0.030 (0.0000 - 0.0012)	0.000 - 0.030 (0.0000 - 0.0012)	0.000 - 0.030 (0.0000 - 0.0012)	0.000 - 0.030 (0.0000 - 0.0012)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.031 - 0.050 (0.0012 - 0.0020)	0.031 - 0.050 (0.0012 - 0.0020)	0.031 - 0.050 (0.0012 - 0.0020)	0.031 - 0.050 (0.0012 - 0.0020)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.051 - 0.070 (0.0020 - 0.0028)	0.051 - 0.070 (0.0020 - 0.0028)	0.051 - 0.070 (0.0020 - 0.0028)	0.051 - 0.070 (0.0020 - 0.0028)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.071 - 0.090 (0.0028 - 0.0035)	0.071 - 0.090 (0.0028 - 0.0035)	0.071 - 0.090 (0.0028 - 0.0035)	0.071 - 0.090 (0.0028 - 0.0035)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.091 - 0.110 (0.0036 - 0.0043)	0.091 - 0.110 (0.0036 - 0.0043)	0.091 - 0.110 (0.0036 - 0.0043)	0.091 - 0.110 (0.0036 - 0.0043)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.111 - 0.130 (0.0044 - 0.0051)	0.111 - 0.130 (0.0044 - 0.0051)	0.111 - 0.130 (0.0044 - 0.0051)	0.111 - 0.130 (0.0044 - 0.0051)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.131 - 0.149 (0.0052 - 0.0059)	0.131 - 0.149 (0.0052 - 0.0059)	0.131 - 0.149 (0.0052 - 0.0059)	0.131 - 0.149 (0.0052 - 0.0059)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.150 - 0.250 (0.0059 - 0.0068)	0.150 - 0.250 (0.0059 - 0.0068)	0.150 - 0.250 (0.0059 - 0.0068)	0.150 - 0.250 (0.0059 - 0.0068)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.251 - 0.270 (0.0069 - 0.0106)	0.251 - 0.270 (0.0069 - 0.0106)	0.251 - 0.270 (0.0069 - 0.0106)	0.251 - 0.270 (0.0069 - 0.0106)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.271 - 0.290 (0.0107 - 0.0114)	0.271 - 0.290 (0.0107 - 0.0114)	0.271 - 0.290 (0.0107 - 0.0114)	0.271 - 0.290 (0.0107 - 0.0114)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.291 - 0.310 (0.0115 - 0.0122)	0.291 - 0.310 (0.0115 - 0.0122)	0.291 - 0.310 (0.0115 - 0.0122)	0.291 - 0.310 (0.0115 - 0.0122)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.311 - 0.330 (0.0122 - 0.0130)	0.311 - 0.330 (0.0122 - 0.0130)	0.311 - 0.330 (0.0122 - 0.0130)	0.311 - 0.330 (0.0122 - 0.0130)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.331 - 0.350 (0.0130 - 0.0138)	0.331 - 0.350 (0.0130 - 0.0138)	0.331 - 0.350 (0.0130 - 0.0138)	0.331 - 0.350 (0.0130 - 0.0138)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.351 - 0.370 (0.0138 - 0.0146)	0.351 - 0.370 (0.0138 - 0.0146)	0.351 - 0.370 (0.0138 - 0.0146)	0.351 - 0.370 (0.0138 - 0.0146)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.371 - 0.390 (0.0146 - 0.0154)	0.371 - 0.390 (0.0146 - 0.0154)	0.371 - 0.390 (0.0146 - 0.0154)	0.371 - 0.390 (0.0146 - 0.0154)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.391 - 0.410 (0.0154 - 0.0161)	0.391 - 0.410 (0.0154 - 0.0161)	0.391 - 0.410 (0.0154 - 0.0161)	0.391 - 0.410 (0.0154 - 0.0161)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.411 - 0.430 (0.0162 - 0.0169)	0.411 - 0.430 (0.0162 - 0.0169)	0.411 - 0.430 (0.0162 - 0.0169)	0.411 - 0.430 (0.0162 - 0.0169)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.431 - 0.450 (0.0170 - 0.0177)	0.431 - 0.450 (0.0170 - 0.0177)	0.431 - 0.450 (0.0170 - 0.0177)	0.431 - 0.450 (0.0170 - 0.0177)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.451 - 0.470 (0.0178 - 0.0185)	0.451 - 0.470 (0.0178 - 0.0185)	0.451 - 0.470 (0.0178 - 0.0185)	0.451 - 0.470 (0.0178 - 0.0185)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.471 - 0.490 (0.0185 - 0.0193)	0.471 - 0.490 (0.0185 - 0.0193)	0.471 - 0.490 (0.0185 - 0.0193)	0.471 - 0.490 (0.0185 - 0.0193)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.491 - 0.510 (0.0193 - 0.0201)	0.491 - 0.510 (0.0193 - 0.0201)	0.491 - 0.510 (0.0193 - 0.0201)	0.491 - 0.510 (0.0193 - 0.0201)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.511 - 0.530 (0.0201 - 0.0209)	0.511 - 0.530 (0.0201 - 0.0209)	0.511 - 0.530 (0.0201 - 0.0209)	0.511 - 0.530 (0.0201 - 0.0209)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.531 - 0.550 (0.0209 - 0.0217)	0.531 - 0.550 (0.0209 - 0.0217)	0.531 - 0.550 (0.0209 - 0.0217)	0.531 - 0.550 (0.0209 - 0.0217)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.551 - 0.570 (0.0217 - 0.0224)	0.551 - 0.570 (0.0217 - 0.0224)	0.551 - 0.570 (0.0217 - 0.0224)	0.551 - 0.570 (0.0217 - 0.0224)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.571 - 0.590 (0.0225 - 0.0232)	0.571 - 0.590 (0.0225 - 0.0232)	0.571 - 0.590 (0.0225 - 0.0232)	0.571 - 0.590 (0.0225 - 0.0232)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.591 - 0.610 (0.0233 - 0.0240)	0.591 - 0.610 (0.0233 - 0.0240)	0.591 - 0.610 (0.0233 - 0.0240)	0.591 - 0.610 (0.0233 - 0.0240)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.611 - 0.630 (0.0241 - 0.0248)	0.611 - 0.630 (0.0241 - 0.0248)	0.611 - 0.630 (0.0241 - 0.0248)	0.611 - 0.630 (0.0241 - 0.0248)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.631 - 0.650 (0.0248 - 0.0256)	0.631 - 0.650 (0.0248 - 0.0256)	0.631 - 0.650 (0.0248 - 0.0256)	0.631 - 0.650 (0.0248 - 0.0256)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.651 - 0.670 (0.0256 - 0.0264)	0.651 - 0.670 (0.0256 - 0.0264)	0.651 - 0.670 (0.0256 - 0.0264)	0.651 - 0.670 (0.0256 - 0.0264)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.671 - 0.690 (0.0264 - 0.0272)	0.671 - 0.690 (0.0264 - 0.0272)	0.671 - 0.690 (0.0264 - 0.0272)	0.671 - 0.690 (0.0264 - 0.0272)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.691 - 0.710 (0.0272 - 0.0280)	0.691 - 0.710 (0.0272 - 0.0280)	0.691 - 0.710 (0.0272 - 0.0280)	0.691 - 0.710 (0.0272 - 0.0280)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.711 - 0.730 (0.0280 - 0.0287)	0.711 - 0.730 (0.0280 - 0.0287)	0.711 - 0.730 (0.0280 - 0.0287)	0.711 - 0.730 (0.0280 - 0.0287)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)		
0.731 - 0.750 (0.0288 - 0.0295)	0.731 - 0.750 (0.0288 - 0.0295)	0.731 - 0.750 (0.0288 - 0.0295)	0.731 - 0.750 (0.0288 - 0.0295)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.2087)	06	5.060 (0.1992)	30	5.300 (0.		

Intake valve clearance (Cold):

0.15 – 0.25 mm (0.006 – 0.010 in.)

EXAMPLE: The 5.250 mm (0.2067 in.) lifter is installed, and the measured clearance is 0.400 mm (0.0157 in.).

Replace the 5.250 mm (0.2067 in.) lifter with a new No. 48 lifter.

Lifter No.	New lifter thickness mm (in.)			
	Thickness	Lifter No.	Thickness	Lifter No.
06	5.060 (0.1992)	30	5.300 (0.2087)	54
08	5.080 (0.2000)	32	5.320 (0.2094)	56
10	5.100 (0.2008)	34	5.340 (0.2102)	58
12	5.120 (0.2016)	36	5.360 (0.2110)	60
14	5.140 (0.2024)	38	5.380 (0.2118)	62
16	5.160 (0.2031)	40	5.400 (0.2126)	64
18	5.180 (0.2039)	42	5.420 (0.2134)	66
20	5.200 (0.2047)	44	5.440 (0.2142)	68
22	5.220 (0.2055)	46	5.460 (0.2150)	70
24	5.240 (0.2063)	48	5.480 (0.2157)	72
26	5.260 (0.2071)	50	5.500 (0.2165)	74
28	5.280 (0.2079)	52	5.520 (0.2173)	

Valve Lifter Selection Chart (Exhaust)

Installed lifter thickness mm (in.)	Measured clearance mm (in.)	New lifter thickness mm (in.)																											
		Lifter No.				Thickness				Lifter No.				Thickness				Lifter No.				Thickness				Lifter No.			
0.000 - 0.030 (0.0000 - 0.0012)		06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06
0.031 - 0.050 (0.0012 - 0.0020)		06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06
0.051 - 0.070 (0.0020 - 0.0028)		06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06
0.071 - 0.090 (0.0028 - 0.0035)		06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06
0.091 - 0.110 (0.0035 - 0.0043)		06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06
0.111 - 0.130 (0.0044 - 0.0051)		06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06
0.131 - 0.150 (0.0052 - 0.0059)		06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06
0.151 - 0.170 (0.0059 - 0.0067)		06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06
0.171 - 0.190 (0.0067 - 0.0075)		06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06
0.191 - 0.210 (0.0075 - 0.0083)		06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06
0.211 - 0.230 (0.0083 - 0.0091)		06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06
0.231 - 0.249 (0.0091 - 0.0098)		06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06
0.250 - 0.350 (0.0098 - 0.0138)		12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66
0.351 - 0.370 (0.0138 - 0.0146)		14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68
0.371 - 0.390 (0.0146 - 0.0154)		14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68
0.391 - 0.410 (0.0154 - 0.0161)		16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70
0.411 - 0.430 (0.0162 - 0.0169)		18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72
0.431 - 0.450 (0.0170 - 0.0177)		20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74
0.451 - 0.470 (0.0178 - 0.0185)		22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76
0.471 - 0.490 (0.0185 - 0.0193)		24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78
0.491 - 0.510 (0.0193 - 0.0201)		26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
0.511 - 0.530 (0.0201 - 0.0209)		28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82
0.531 - 0.550 (0.0209 - 0.0217)		30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
0.551 - 0.570 (0.0217 - 0.0224)		32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86
0.571 - 0.590 (0.0225 - 0.0232)		34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88
0.591 - 0.610 (0.0233 - 0.0240)		36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90
0.611 - 0.630 (0.0241 - 0.0248)		38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92
0.631 - 0.650 (0.0248 - 0.0256)		40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94
0.651 - 0.670 (0.0256 - 0.0264)		42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96
0.671 - 0.690 (0.0264 - 0.0272)		44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98
0.691 - 0.710 (0.0272 - 0.0280)		46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100
0.711 - 0.730 (0.0280 - 0.0287)		48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102
0.731 - 0.750 (0.0288 - 0.0295)		50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104
0.751 - 0.770 (0.0295 - 0.0303)		52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106
0.771 - 0.790 (0.0304 - 0.0311)		54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108
0.791 - 0.810 (0.0311 - 0.0319)		56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
0.811 - 0.830 (0.0319 - 0.0327)		58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112
0.831 - 0.850 (0.0327 - 0.0335)		60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114
0.851 - 0.870 (0.0335 - 0.0343)		62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116
0.871 - 0.890 (0.0343 - 0.0350)		64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118
0.891 - 0.910 (0.0351 - 0.0358)		66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120
0.911 - 0.930 (0.0359 - 0.0366)		68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122
0.931 - 0.950 (0.0367 - 0.0374)		70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124
0.951 - 0.970 (0.0374 - 0.0382)		72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126
0.971 - 0.990 (0.0382 - 0.0390)		74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128
0.991 - 1.010 (0.0390 - 0.0398)		74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128
1.011 - 1.030 (0.0398 - 0.0406)		74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128

Exhaust valve clearance (Cold):

0.25 - 0.35 mm (0.010 - 0.014 in.)

EXAMPLE: The 5.340 mm (0.2102 in.) lifter is installed, and the measured clearance is 0.440 mm (0.0173 in.).

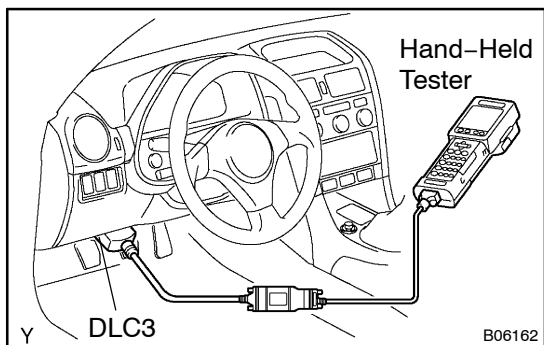
Replace the 5.340 mm (0.2102 in.) lifter with a new No. 48 lifter.

IGNITION TIMING INSPECTION

1. REMOVE AIR CLEANER INLET

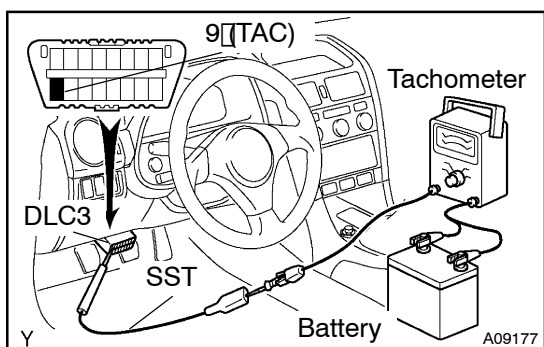
2. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.



3. CONNECT HAND-HELD TESTER

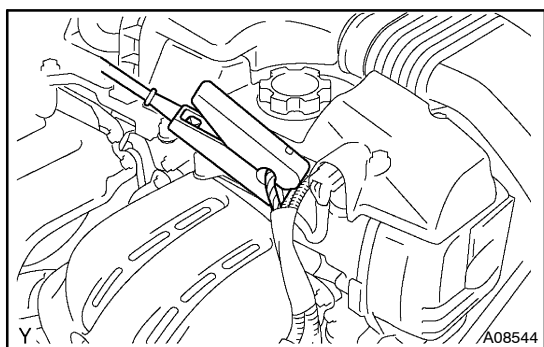
- Connect a hand-held tester to the DLC3.
- Please refer to the hand-held tester operator's manual for further details.



If you have no hand-held tester, connect a tachometer tester probe to terminal 9 (TAC) of the DLC3 with SST.

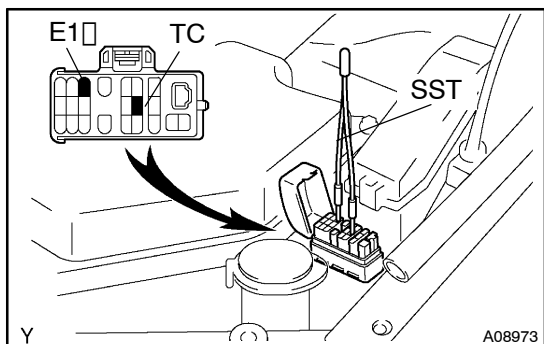
SST 09843-18030

4. CHECK IDLE SPEED (See page EM-17)



5. CONNECT TIMING LIGHT TO ENGINE

Connect the tester clip of the timing light to the wire harness as shown in the illustration.



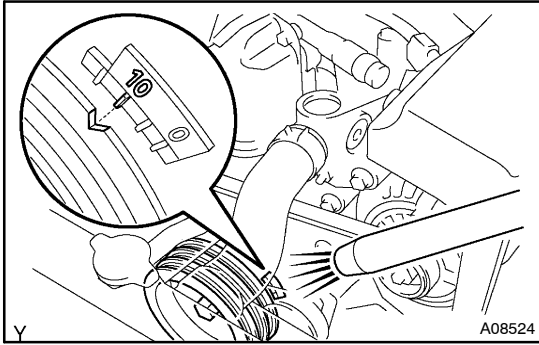
6. INSPECT IGNITION TIMING

- Using SST, connect terminals TC and E1 of the check connector.

SST 09843-18020

HINT:

After engine rpm is kept at 1,000 – 1,500 rpm for 5 seconds, check that it returns to idle speed.



(b) Using a timing light, check the ignition timing.
Ignition timing: 8 – 12° BTDC @ idle
(Transmission in neutral position)

(c) Remove the SST from the check connector.
SST 09843-18020

7. FURTHER CHECK IGNITION TIMING
Ignition timing: 9 – 13° BTDC @ idle
(Transmission in neutral position)

HINT:

The timing mark moves in a range between 9° and 13°.

8. DISCONNECT TIMING LIGHT FROM ENGINE

9. DISCONNECT HAND-HELD TESTER

10. REINSTALL AIR CLEANER INLET

IDLE SPEED

EM118-01

INSPECTION

1. INITIAL CONDITIONS

- (a) Engine at normal operating temperature
- (b) Air cleaner installed
- (c) All pipes and hoses of air induction system connected
- (d) All accessories switched OFF
- (e) All vacuum lines properly connected
- (f) EFI system wiring connectors fully plugged
- (g) Ignition timing checked correctly
- (h) Transmission in neutral position

2. CONNECT HAND-HELD TESTER (See page EM-15)

3. INSPECT IDLE SPEED

- (a) Race the engine speed at 2,500 rpm for approx. 90 seconds.
- (b) Check the idle speed.

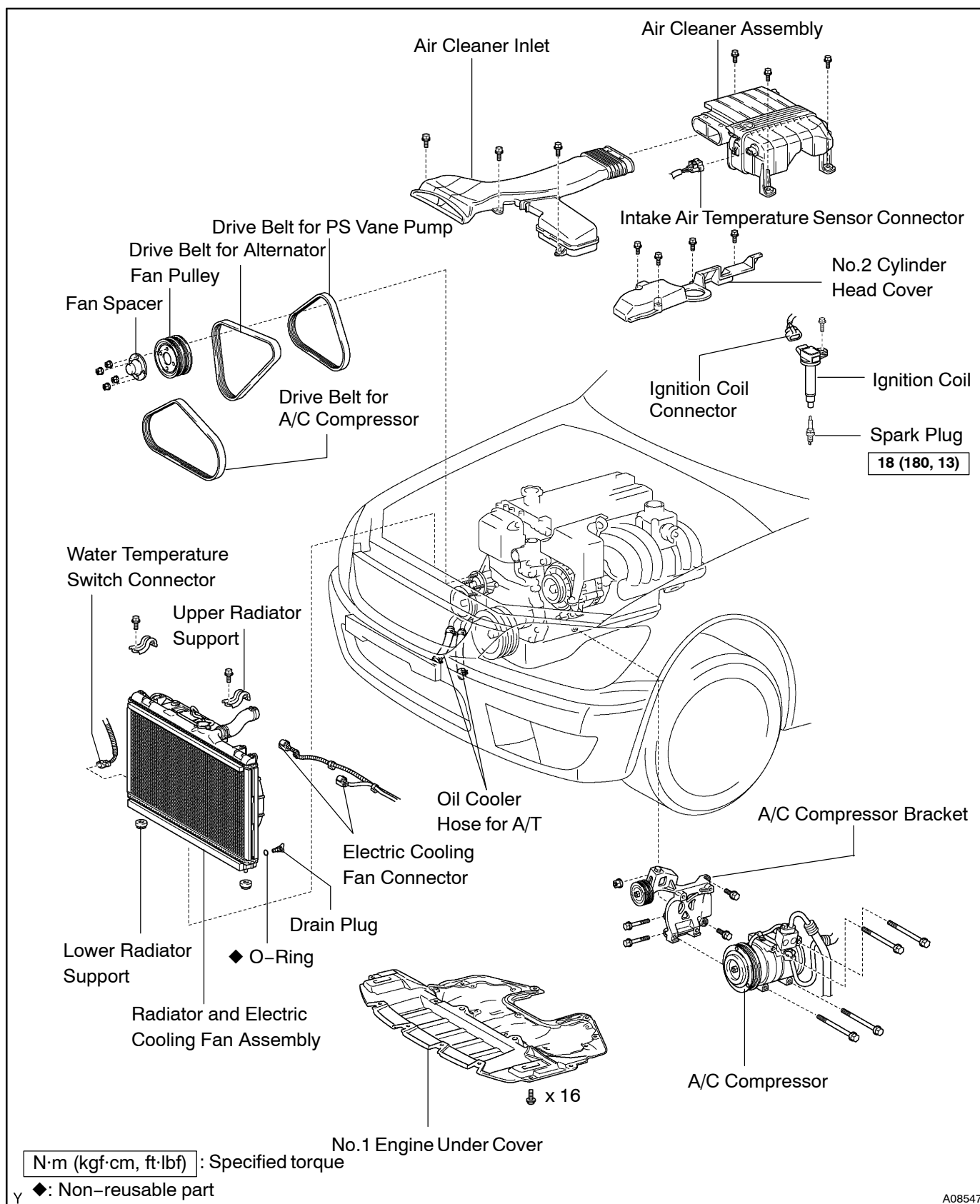
Idle speed: 650 ± 50 rpm

If the idle speed is not as specified, check the throttle body.

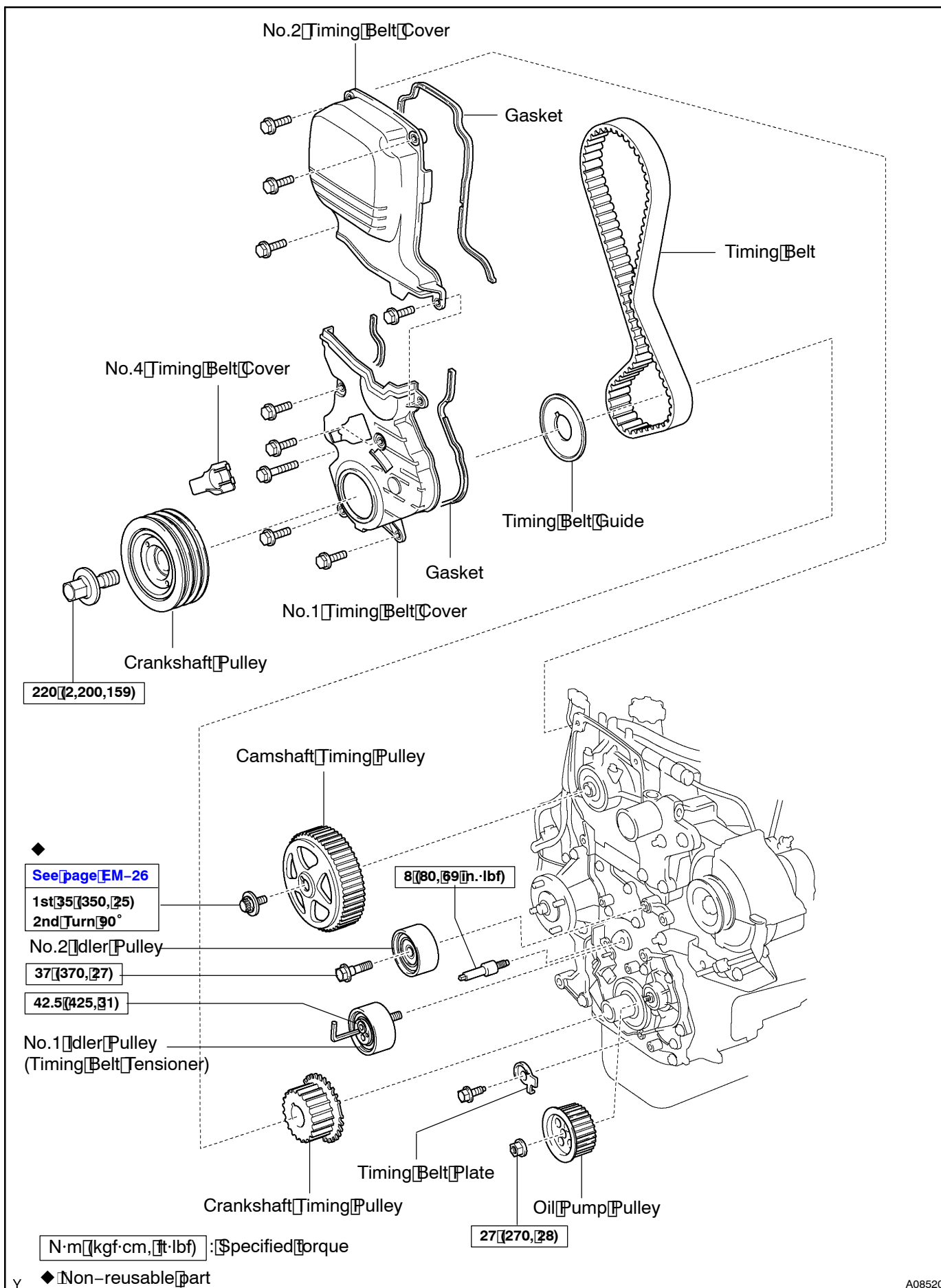
4. DISCONNECT HAND-HELD TESTER

TIMING BELT COMPONENTS

EM083-04



A08547



A08520

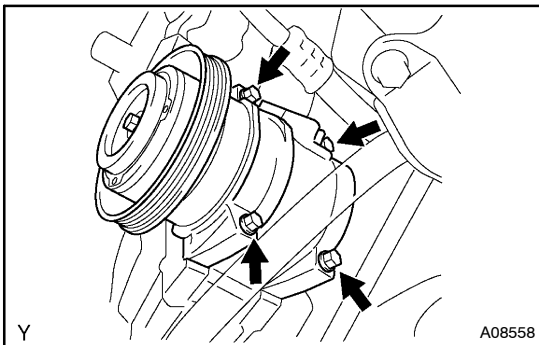
REMOVAL

1. REMOVE NO.1 ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT
3. REMOVE AIR CLEANER INLET
4. REMOVE AIR CLEANER ASSEMBLY
5. REMOVE NO.2 CYLINDER HEAD COVER
6. REMOVE IGNITION COILS (See page IG-6)
7. REMOVE SPARK PLUGS (See page IG-1)
8. REMOVE RADIATOR ASSEMBLY (See page CO-15)
9. REMOVE DRIVE BELT FOR A/C COMPRESSOR (See page AC-17)
10. REMOVE DRIVE BELT FOR ALTERNATOR (See page CH-6)

HINT:

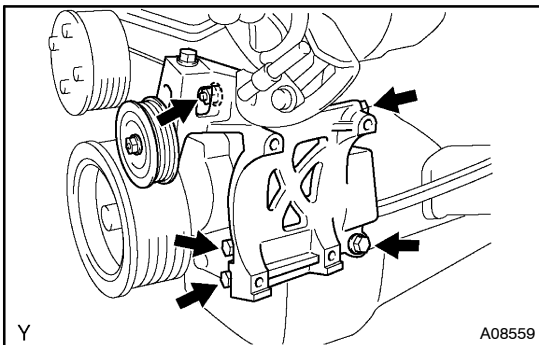
Before removing the drive belt, loosen the 4 fan pulley nuts.

11. REMOVE DRIVE BELT FOR PS VANE PUMP (See page SR-27)
12. REMOVE FAN SPACER AND PULLEY

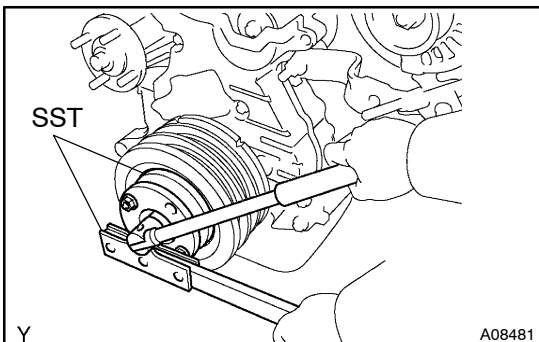


13. REMOVE A/C COMPRESSOR WITHOUT DISCONNECTING HOSES

- (a) Disconnect the A/C compressor connector.
- (b) Remove the 4 bolts, and disconnect the A/C compressor.



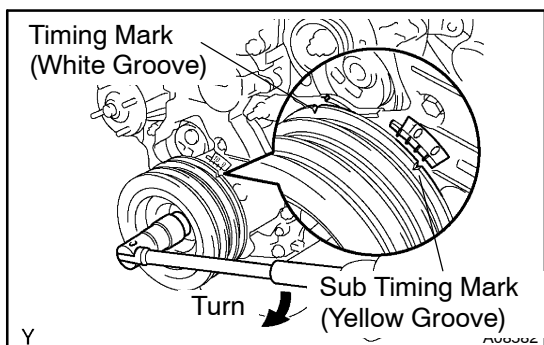
14. REMOVE A/C COMPRESSOR BRACKET
Remove the 4 bolts, nut and compressor bracket.
15. REMOVE NO.2 TIMING BELT COVER
Remove the 4 bolts, timing belt cover and gasket.



16. LOOSEN CRANKSHAFT PULLEY BOLT

Using SST, loosen the pulley bolt.

SST 09213-54015 (90119-08216), 09330-00021

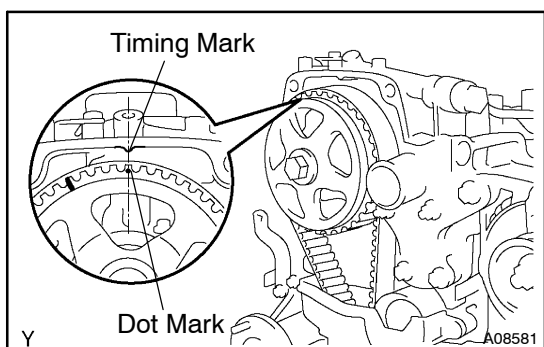


17. SET NO.1 CYLINDER TO APPROX. 60° BTDC/COMPRESSION

- Turn the crankshaft pulley, and align the sub timing mark (yellow groove – 60° mark BTDC) with the timing mark "0" of the No.1 timing belt cover.

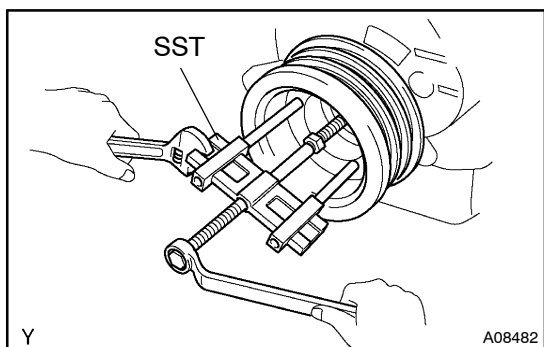
NOTICE:

- Always turn the crankshaft clockwise.
- If the timing belt is disengaged, having the crankshaft pulley at the wrong angle can cause the piston head and valve head to come into contact with each other. Thus results in damage when you remove the camshaft timing pulley (step 22). So, always set the crankshaft pulley at the correct angle.



- Check that the dot mark (60° mark BTDC) of the camshaft timing pulley is aligned with the timing mark of the No.1 bearing cap.

If not, revolve the crankshaft 1 (360°).



18. REMOVE CRANKSHAFT PULLEY

- Remove the crankshaft pulley bolt.

NOTICE:

Do not turn the crankshaft pulley.

- Using SST, remove the crankshaft pulley.
SST 09950-50012 (09951-05010, 09952-05010, 09953-05010, 09953-05020, 09954-05030)

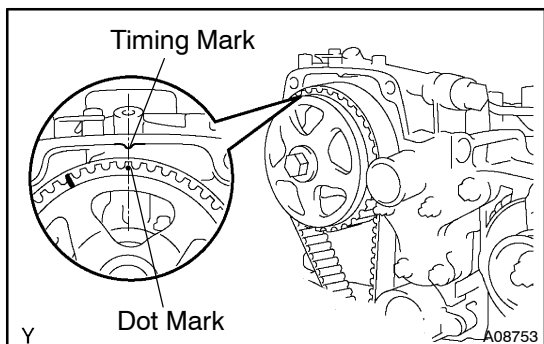
19. REMOVE NO.1 TIMING BELT COVER

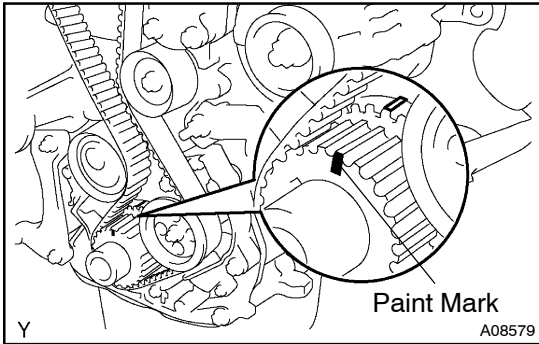
Remove the 4 bolts, timing belt cover and gasket.

20. REMOVE TIMING BELT GUIDE

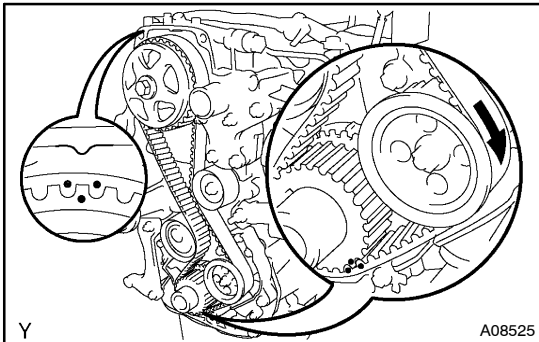
21. REMOVE TIMING BELT

- Check that the dot mark (60° mark BTDC) of the camshaft timing pulley is aligned with the timing mark of the No.1 bearing cap.





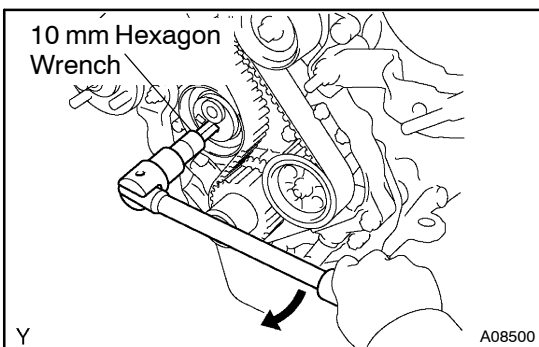
- (b) Align the gear of the crankshaft timing pulley with the protrusion of the timing belt case and mark it with paint as shown in the illustration.



HINT:

When re-using timing belt:

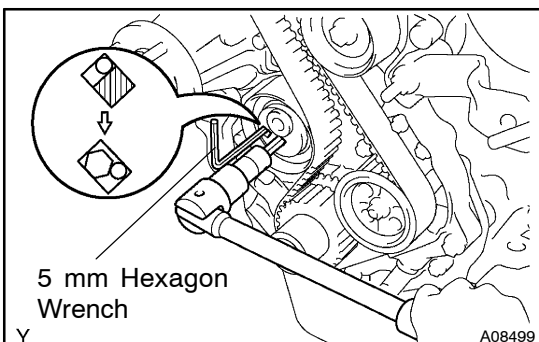
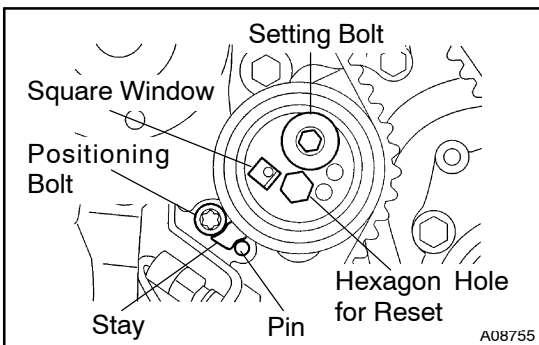
Draw an arrow on the timing belt in the direction of engine revolution, and place the matching marks on the timing belt and the camshaft timing pulley, and the timing belt and the crankshaft timing pulley.



- (c) Using a 10 mm hexagon wrench, insert the auto tensioner rod inside of the No.1 idler pulley to the hexagon hole for reset in the No.1 idler pulley.

NOTICE:

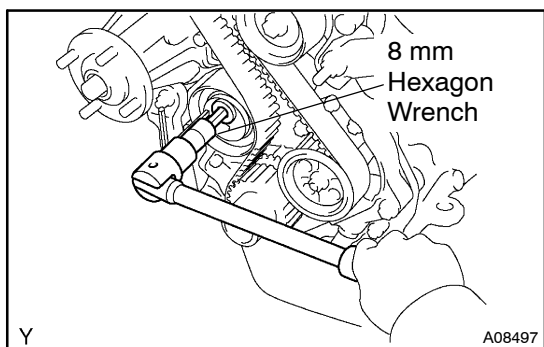
Must not apply torque with more than 39 N·m (400 kgf·cm, 29 ft·lbf).



- (d) After confirming the movement of the pin inside the square window, insert a 5 mm hexagon wrench.

HINT:

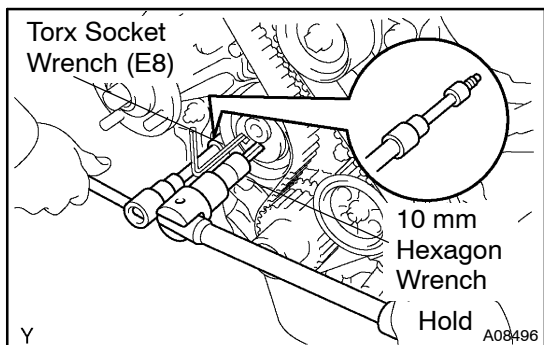
Be sure to insert the wrench only after you feel the knocking while inserting the auto tensioner.



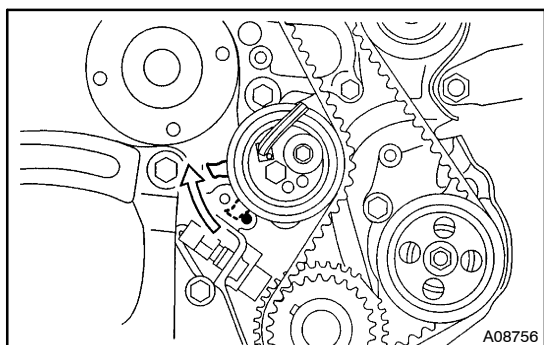
- (e) Using a 8 mm hexagon wrench, loosen the bolt of the No.1 idler pulley (timing belt tensioner).

NOTICE:

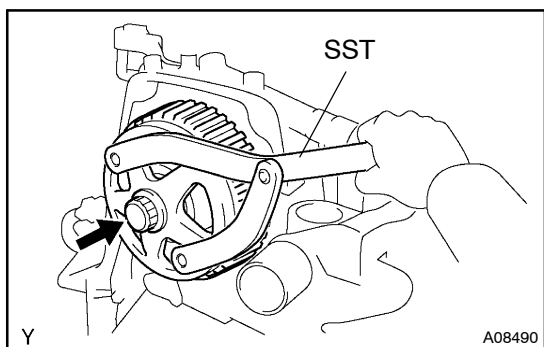
Least necessary losing is required only to move the No.1 idler pulley.



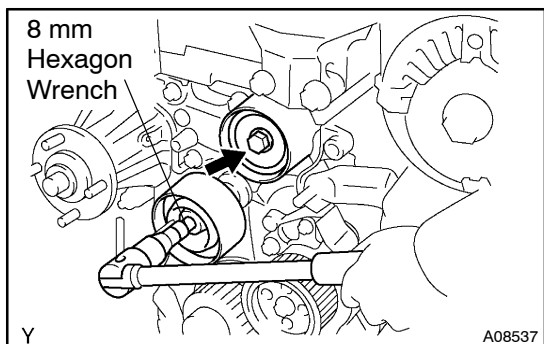
- (f) Using a 10 mm hexagon wrench, keep holding the No.1 idler pulley lightly toward the direction of tensing and take out the positioning bolt using a torx socket wrench (E8).



- (g) Move the No.1 idler pulley by hand toward the direction of loosening the timing belt.
(h) Remove the timing belt.

**22. REMOVE CAMSHAFT TIMING PULLEY**

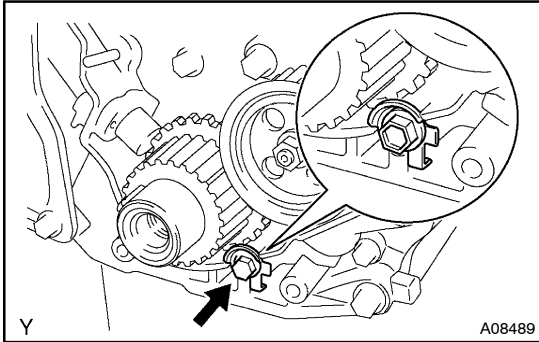
- (a) Using SST, loosen the cam-pulley set bolt.
SST 09960-10010 (09962-01000, 09963-01000)
(b) Remove the bolt and timing pulley.

**23. REMOVE NO.2 IDLER PULLEY**

Remove the bolt and pulley.

24. REMOVE NO.1 IDLER PULLEY (TIMING BELT TENSIONER)

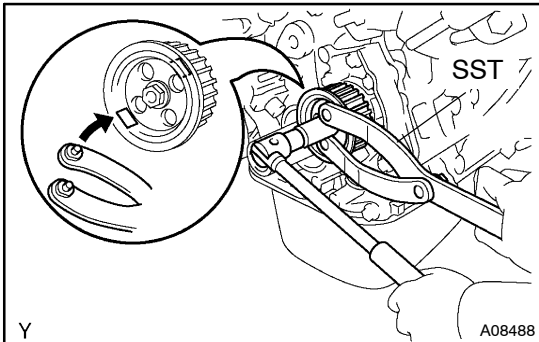
Using a 8 mm hexagon wrench, remove the pulley (tensioner).

**25. REMOVE CRANKSHAFT TIMING PULLEY**

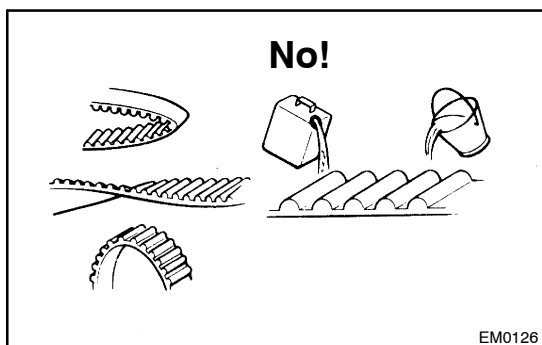
- (a) Remove the bolt and timing belt plate.
- (b) Remove the timing pulley.

NOTICE:

Do not scratch the angle sensor of the timing pulley.

**26. REMOVE OIL PUMP PULLEY**

- (a) Using SST, loosen the pulley nut.
SST 09960-10010 (09962-01000, 09963-00600)
- (b) Remove the nut and pulley.



INSPECTION

1. INSPECT TIMING BELT

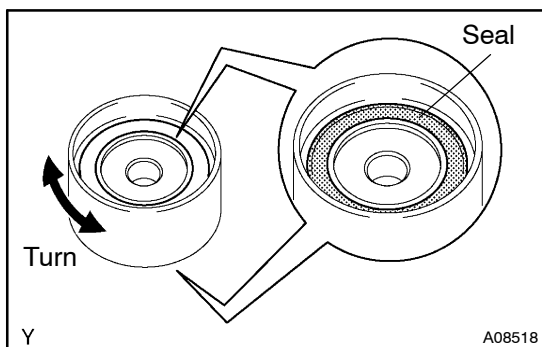
NOTICE:

- 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 removing the mounting bolt of the camshaft timing pulley.

If there are any defects as shown in the illustration, check these points:

- Premature parting
 - Check for proper installation.
 - Check the timing cover gasket for damage and proper installation.
- If the belt teeth are cracked or damaged, check to see if either camshaft or oil pump is locked.
- 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.
- If there is wear or damage on only one side of the belt, check the belt guide and the alignment of each pulley.
- If there is noticeable wear on the belt teeth, check the timing cover for damage and check gasket has been installed correctly and for foreign material on the pulley teeth.

If necessary, replace the timing belt.



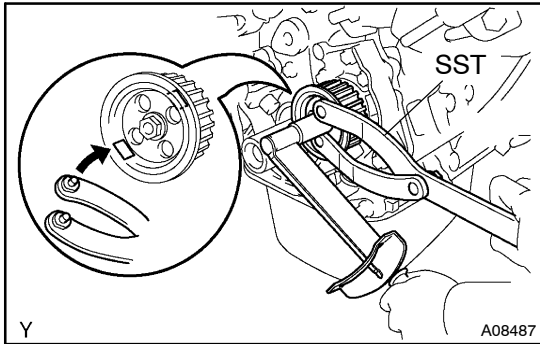
2. INSPECT IDLER PULLEYS

- Visually check the seal portion of the idler pulley for oil leakage.

If leakage is found, replace the idler pulley.

- Check that the idler pulley turns smoothly.

If necessary, replace the idler pulley.



INSTALLATION

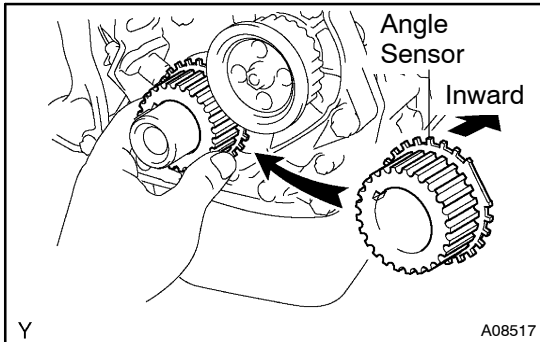
1. INSTALL OIL PUMP PULLEY

- (a) Align the cutouts of the pulley and shaft, and slide on the pulley.

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

SST 09960-10010 (09962-01000, 09963-00600)

Torque: 27 N·m (270 kgf·cm, 20 ft·lbf)



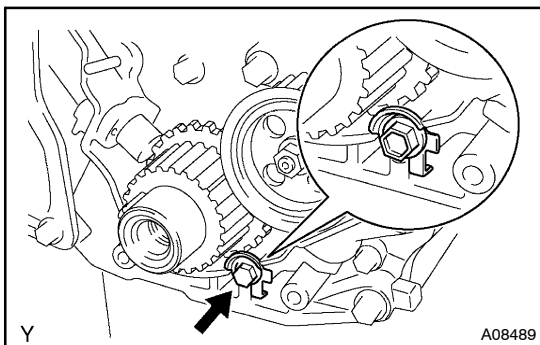
2. INSTALL CRANKSHAFT TIMING PULLEY

- (a) Align the timing pulley set key with the key groove of the pulley.

- (b) Slide on the timing pulley with the angle sensor facing inward.

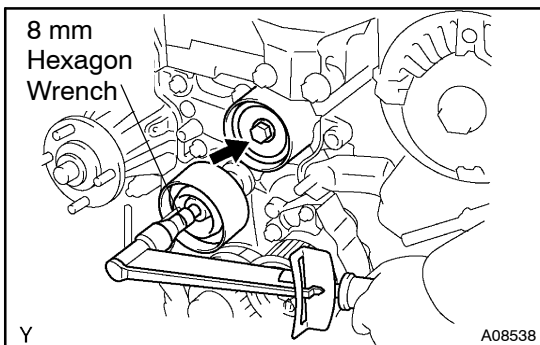
NOTICE:

Do not scratch the angle sensor of the timing pulley.



- (c) Install the timing belt plate with the bolt.

Torque: 9 N·m (90 kgf·cm, 78 in·lbf)



3. INSTALL NO.1 IDLER PULLEY (TIMING BELT TENSIONER)

Using a 8 mm hexagon wrench, temporarily install the pulley (tensioner).

4. INSTALL NO.2 IDLER PULLEY

- (a) Install the pulley with the bolt.

Torque: 37 N·m (370 kgf·cm, 27 ft·lbf)

- (b) Check that the idler pulley moves smoothly.

5. INSTALL CAMSHAFT TIMING PULLEY

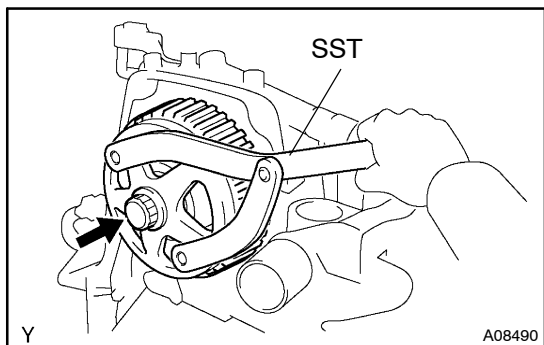
NOTICE:

NEVER reuse the cam-pulley set bolt.

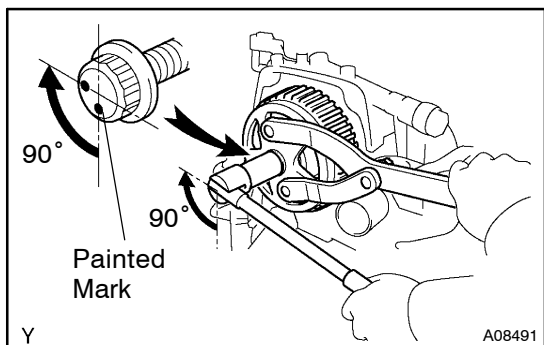
HINT:

The cam-pulley set bolt is tightened in 2 progressive steps (steps (b) and (d)).

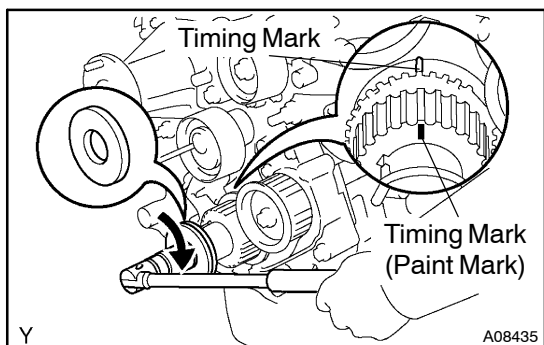
- (a) Align the camshaft knock pin with the groove in the pulley and slide on the pulley.



- (b) Using SST, install and tighten a new cam-pulley set bolt.
SST 09960-10010 (09962-01000, 09963-01000)
Torque: 35 N·m (350 kgf·cm, 25 ft·lbf)

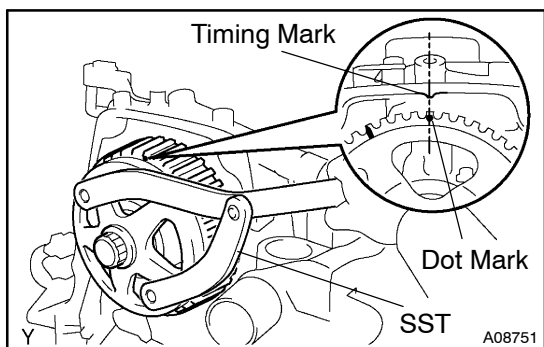


- (c) Mark the cam-pulley set bolt with paint.
(d) Retighten the cam-pulley set bolt by 90°.
(e) Check that the painted mark is now at a 90° angle to (c).



6. SET NO.1 CYLINDER TO APPROX. 60° BTDC/COMPRESSION

- (a) Crankshaft Timing Pulley Position:
Using the crankshaft pulley bolt and plate washer, turn the crankshaft, and align the timing mark (paint mark) of the crankshaft timing pulley with the timing mark of the timing belt case.



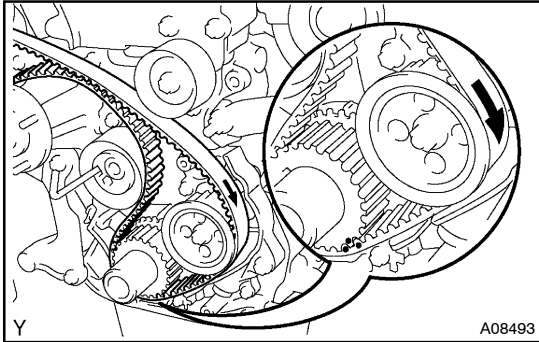
- (b) Camshaft Timing Pulley Position:
Using SST, turn the camshaft pulley, align the dot mark (60° mark BTDC) of the camshaft timing pulley with the timing mark of the No.1 bearing cap.
SST 09960-10010 (09962-01000, 09963-01000)

7. INSTALL TIMING BELT

NOTICE:

The engine should be cold.

- (a) Remove any oil or water on the crankshaft timing pulley, oil pump pulley, No.1 idler pulley, No.2 idler pulley and camshaft timing pulley, and keep them clean.



- (b) Install the timing belt on the crankshaft timing pulley, oil pump pulley, No.1 idler pulley and No.2 idler pulley.

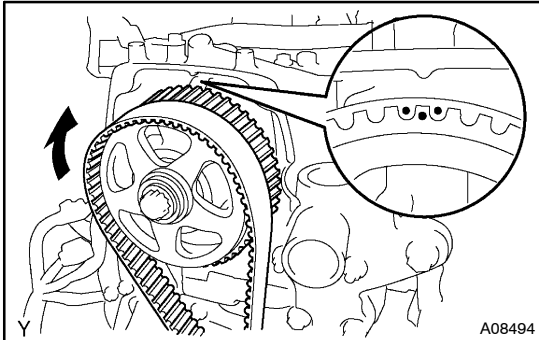
NOTICE:

Only wipe the pulleys; do not use any cleansing agent.

HINT:

When re-using timing belt:

Align the marked points during removal, and install the belt with the arrow pointing to the direction of engine revolution.

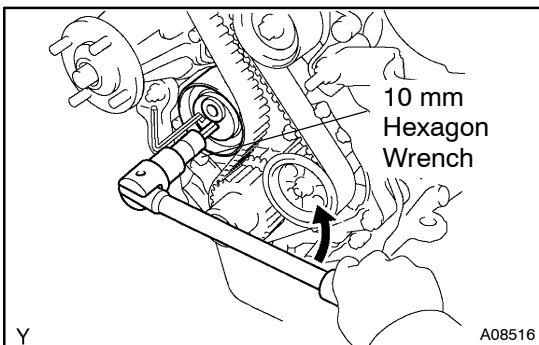


- (c) Install the timing belt, check the tension between the crankshaft timing pulley, oil pump pulley, No.2 idler pulley and camshaft timing pulley.

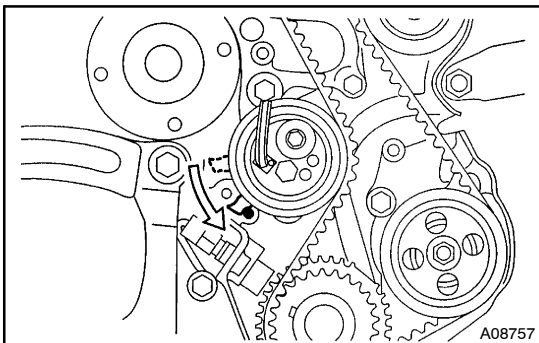
HINT:

When re-using timing belt:

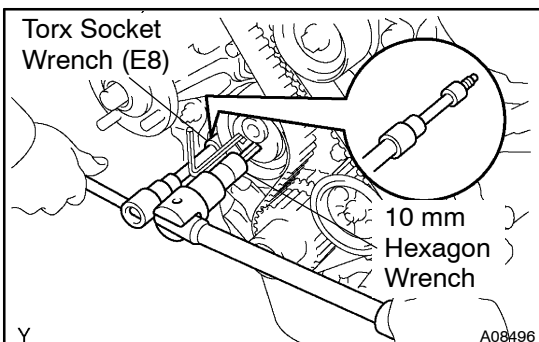
Align the marked points during removal.



- (d) Using a 10 mm hexagon wrench, keep holding the No.1 idler pulley toward the direction of tensing the timing belt.



- (e) After confirming that the stay of the No.1 idler pulley touches the pin, install the positioning bolt by hand.

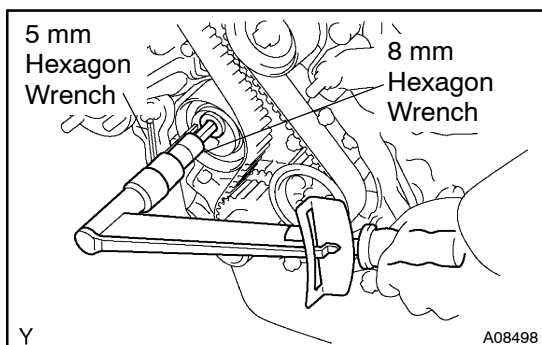


- (f) Using a torx socket wrench (E8), tighten the positioning bolt.

Torque: 8 N·m (80 kgf·cm, 69 in·lbf)

NOTICE:

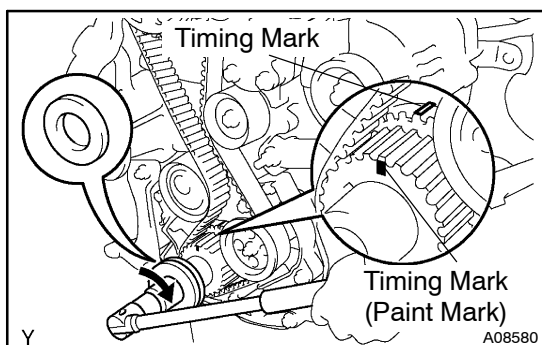
Be careful not to allow the bolt to come onto the stay of the No.1 idler pulley.



- (g) Using a 8 mm hexagon wrench, tighten the bolt of the No.1 idler pulley (timing belt tensioner).

Torque: 42.5 N·m (425 kgf·cm, 31 ft·lbf)

- (h) Take the 5 mm hexagon wrench for lock out of the square window.

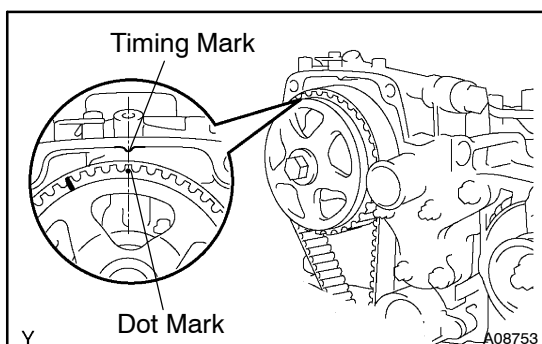


8. CHECK VALVE TIMING

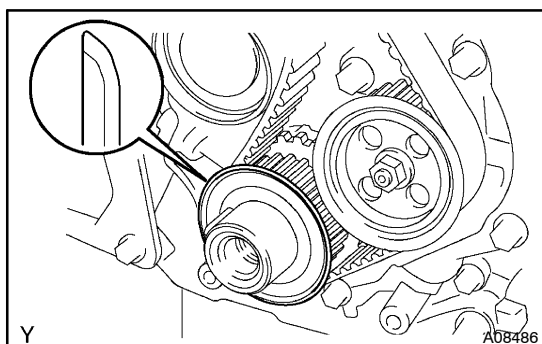
- (a) Temporarily install the crankshaft pulley bolt and plate washer.
- (b) Slowly revolve the crankshaft 2 times, and align the timing mark (paint mark) of the crankshaft timing pulley with the timing mark of the timing belt case.

NOTICE:

Always turn the crankshaft clockwise.



- (c) Check that the dot mark (60° mark BTDC) of the camshaft timing pulley is aligned with the timing mark of the No.1 bearing cap.
- (d) Remove the crankshaft pulley bolt and plate washer.



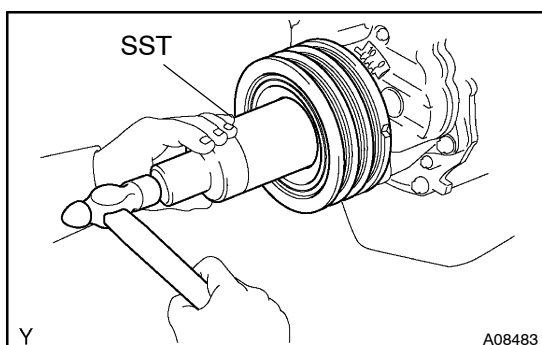
9. INSTALL TIMING BELT GUIDE

Install the guide with the cup side facing outward.

10. INSTALL NO.1 TIMING BELT COVER

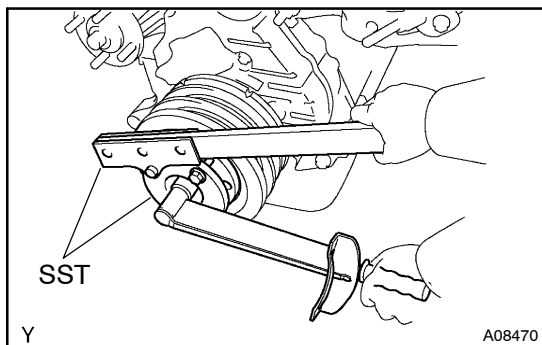
- (a) Install the gasket to the timing belt cover.
- (b) Install the timing belt cover with the 4 bolts.

Torque: 6 N·m (60 kgf·cm, 52 in·lbf)



11. INSTALL CRANKSHAFT PULLEY

- (a) Align the pulley set key with the key groove of the pulley.
- (b) Using SST and a hammer, tap in the pulley.
- SST 09316-60011 (09316-00011)



- (c) Using SST, install the pulley bolt.
 SST 09213-54015 (90119-08216), 09330-00021
Torque: 220 N·m (2,200 kgf·cm, 159 ft·lbf)

12. INSTALL NO.2 TIMING BELT COVER

- (a) Install the gasket to the timing belt cover.
 (b) Install the timing belt cover with the 4 bolts.
Torque: 6 N·m (60 kgf·cm, 52 in·lbf)

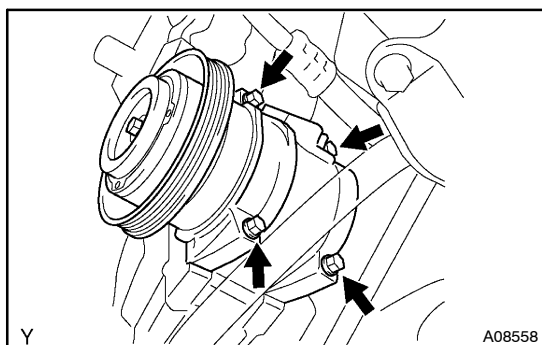
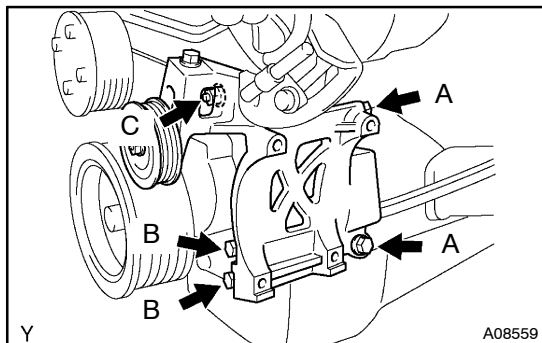
13. INSTALL FAN PULLEY AND SPACER

HINT:

Temporarily install the 4 nuts.

14. INSTALL A/C COMPRESSOR BRACKET

- (a) Install the compressor bracket with the 4 bolts and nut.
 (b) Tighten the bolt B, nut C and bolt A.
Torque: 46.5 N·m (475 kgf·cm, 34 ft·lbf)



15. INSTALL A/C COMPRESSOR

- (a) Install the A/C compressor with the 4 bolts.
Torque: 24.5 N·m (250 kgf·cm, 18 ft·lbf)
 (b) Connect the A/C compressor connector.

16. INSTALL DRIVE BELT FOR PSYANE PUMP (See page SR-37)

17. INSTALL DRIVE BELT FOR ALTERNATOR (See page CH-15)

18. INSTALL DRIVE BELT FOR A/C COMPRESSOR (See page AC-18)

19. TIGHTEN MOUNTING NUTS OF FAN PULLEY AND SPACER **Torque: 18.5 N·m (185 kgf·cm, 13 ft·lbf)**

20. INSTALL RADIATOR ASSEMBLY (See page CO-21)

21. INSTALL SPARK PLUGS (See page IG-1)

22. INSTALL IGNITION COILS (See page IG-6)

23. INSTALL NO.2 CYLINDER HEAD COVER

24. INSTALL AIR CLEANER ASSEMBLY

25. INSTALL AIR CLEANER INLET

26. FILL ENGINE WITH COOLANT

27. START ENGINE AND CHECK FOR LEAK

28. INSTALL NO.1 ENGINE UNDER COVER

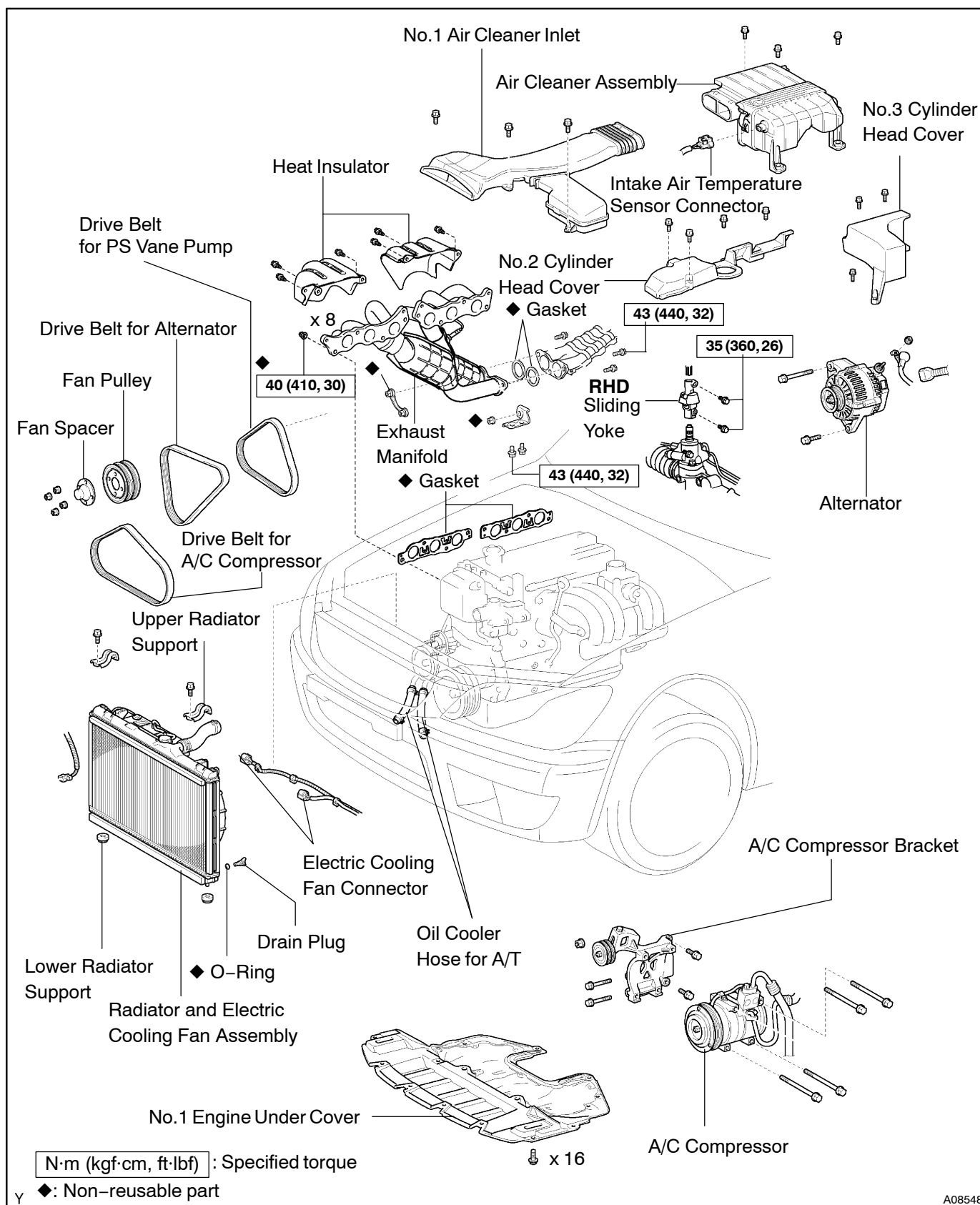
29. ROAD TEST

Check abnormal noise, shock, slippage, correct shift points and smooth operation.

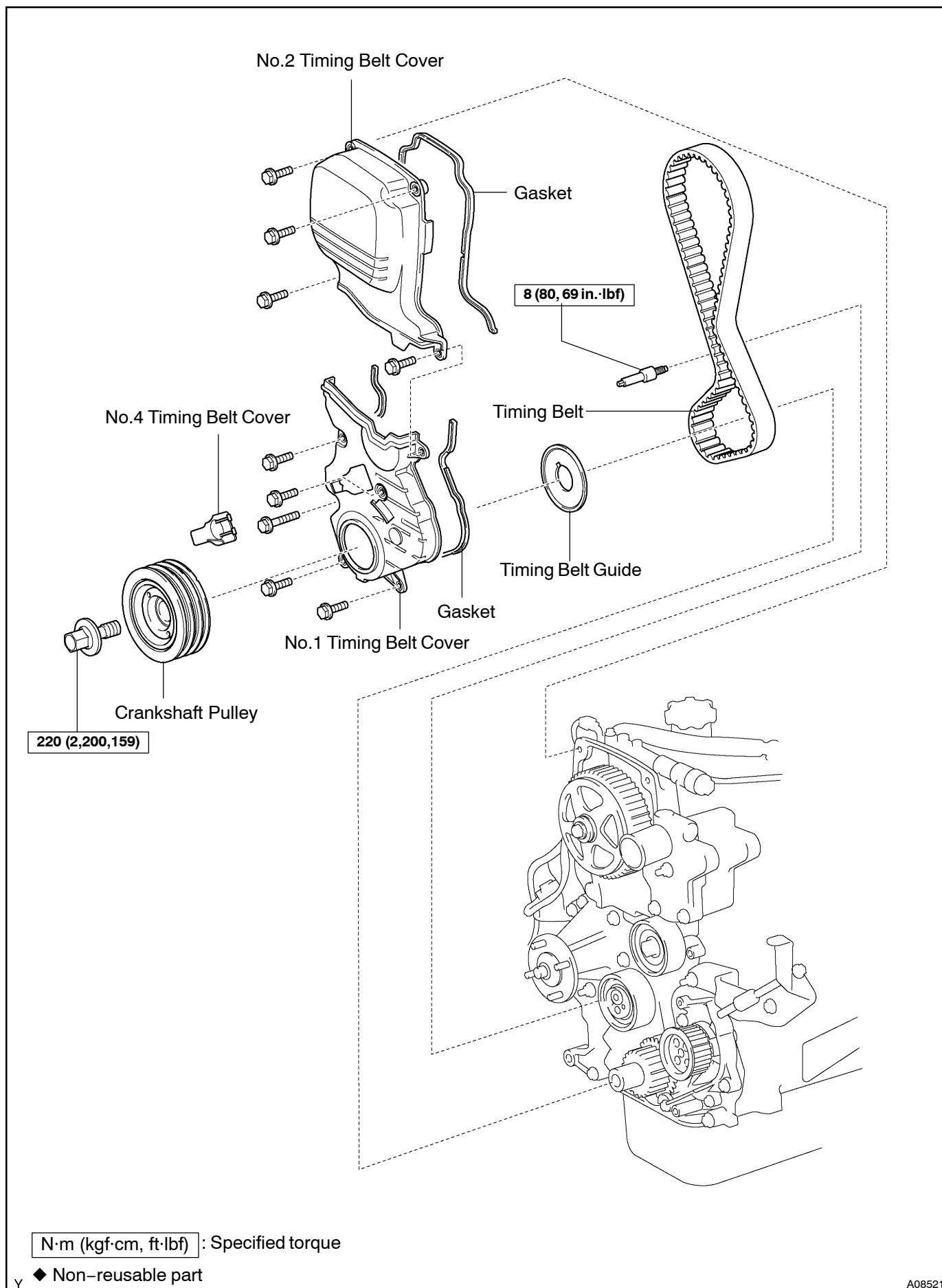
30. RECHECK ENGINE COOLANT LEVEL

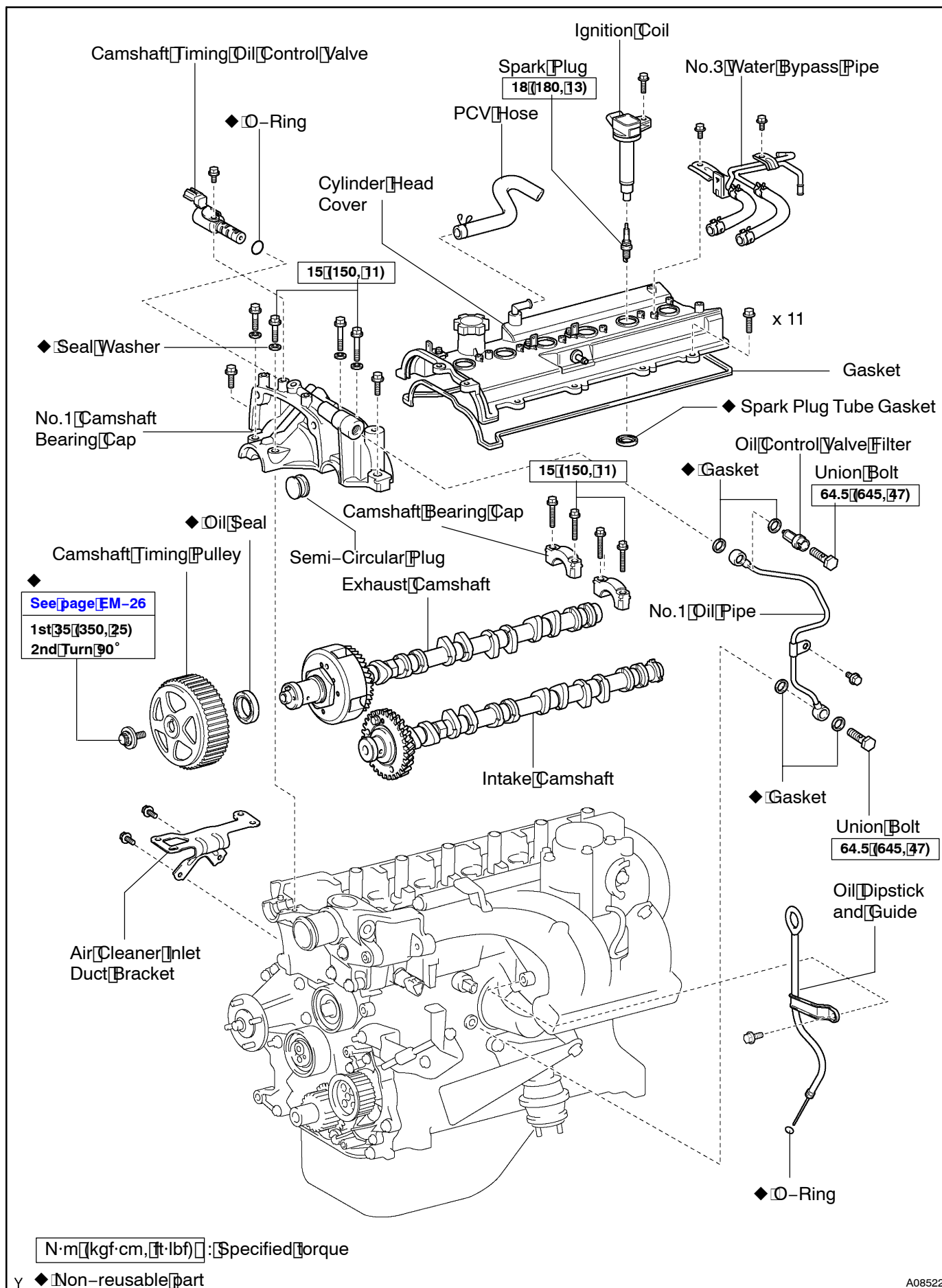
CYLINDER HEAD COMPONENTS

EM11C-01



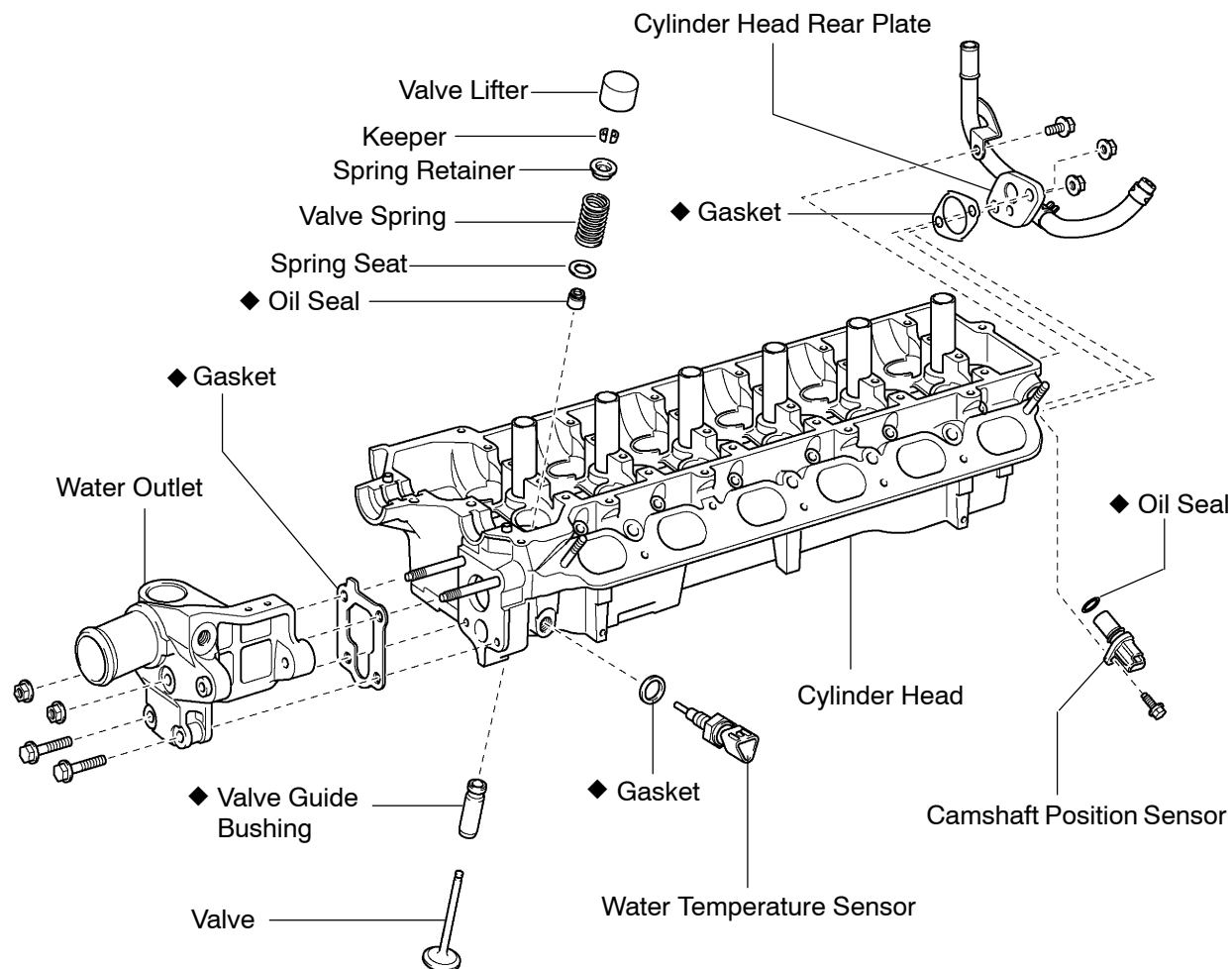
A08548



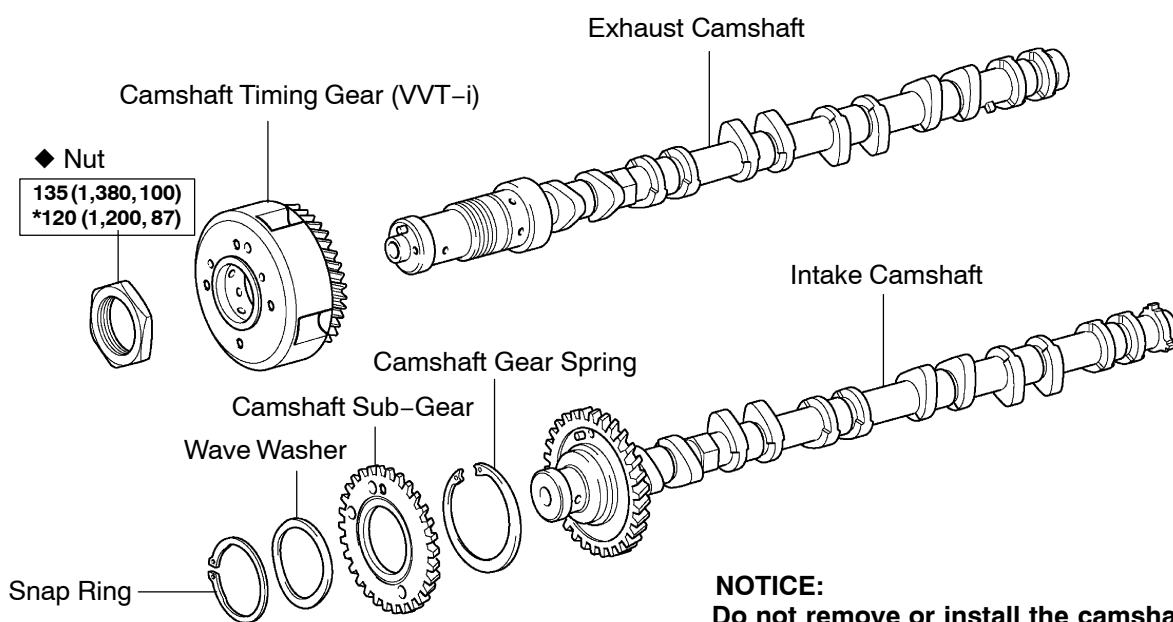


A08522





A08430



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

◆ Non-reusable part

For use with SST

NOTICE:
Do not remove or install the camshaft timing gear (VVT-i) beside changing the camshaft timing gear (VVT-i) or camshaft.

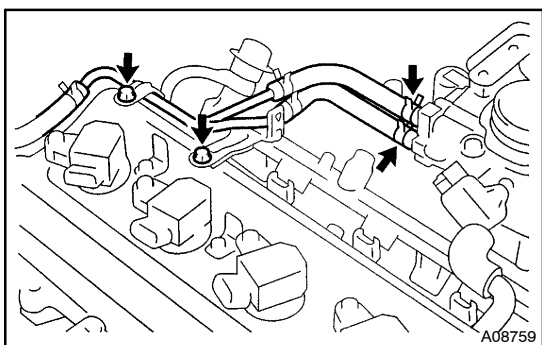
A08429

REMOVAL

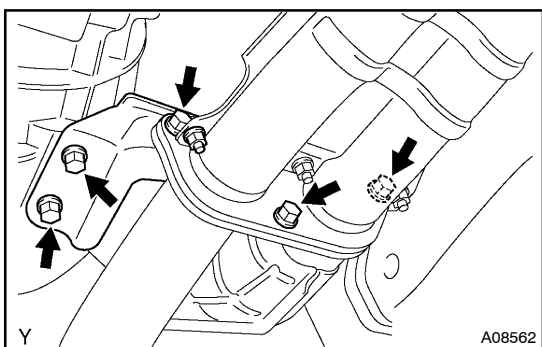
NOTICE:

Do not remove or install the camshaft timing gear (VVT-i) beside changing the camshaft timing gear (VVT-i) or camshaft.

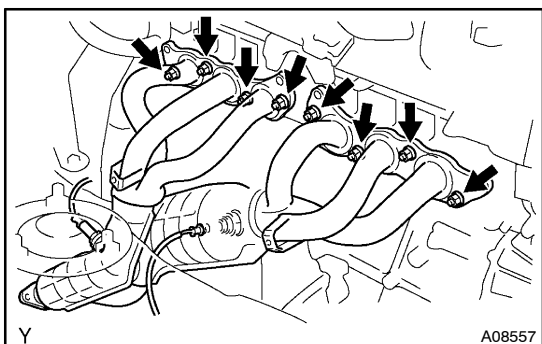
1. REMOVE NO.1 ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT
3. REMOVE AIR CLEANER INLET
4. REMOVE AIR CLEANER ASSEMBLY
5. REMOVE NO.3 CYLINDER HEAD COVER
6. REMOVE ALTERNATOR (See page CH-6)
7. REMOVE PCV HOSE
8. REMOVE NO.2 CYLINDER HEAD COVER
9. DISCONNECT ENGINE WIRE FROM CYLINDER HEAD
10. REMOVE IGNITION COILS (See page IG-6)
11. REMOVE SPARK PLUGS (See page IG-1)



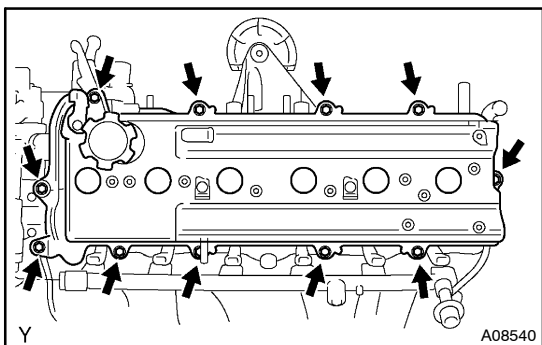
12. REMOVE NO.3 WATER BYPASS PIPE
 - (a) Disconnect the 4 water bypass hoses.
 - (b) Remove the 2 bolts and water bypass pipe.
13. DISCONNECT HEATER HOSE FROM CYLINDER HEAD REAR PLATE
14. M/T:
 - REMOVE CYLINDER HEAD REAR PLATE
 Remove the bolt, 2 nuts, rear plate and gasket.



15. REMOVE EXHAUST MANIFOLD
 - (a) Remove the 3 bolts, retainer and nut holding the front exhaust manifold to the front exhaust pipe.
 - (b) Remove the 2 bolts and exhaust manifold stay.
 - (c) Remove the 6 bolts and 2 heat insulators.
 - (d) Disconnect the 2 oxygen sensor connectors.

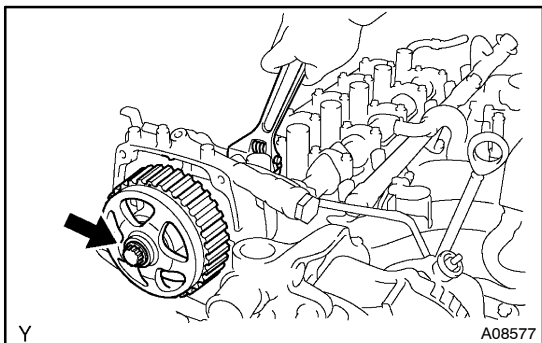


- (e) Remove the 8 nuts, exhaust manifold and 2 gaskets.
16. RHD:
 - REMOVE STEERING SLIDING YOKE (See page SR-12)
17. REMOVE TIMING BELT (See page EM-20)
18. REMOVE AIR CLEANER INLET DUCT BRACKET



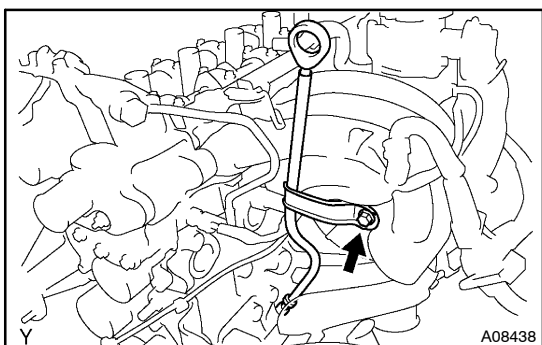
19. REMOVE CYLINDER HEAD COVER

Remove the 11 bolts, cylinder head cover and gasket.



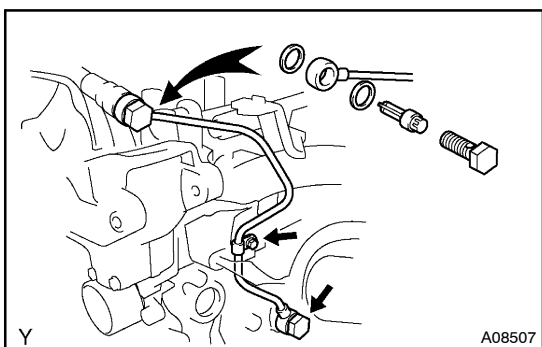
20. REMOVE CAMSHAFT TIMING PULLEY

Hold the hexagon portion of the camshaft with a wrench, and remove the cam-pulley set bolt and camshaft timing pulley.



21. REMOVE OIL DIPSTICK AND GUIDE

- Remove the bolt and pull out the dipstick guide together with the dipstick.
- Remove the O-ring from the dipstick guide.



22. REMOVE NO.1 OIL PIPE

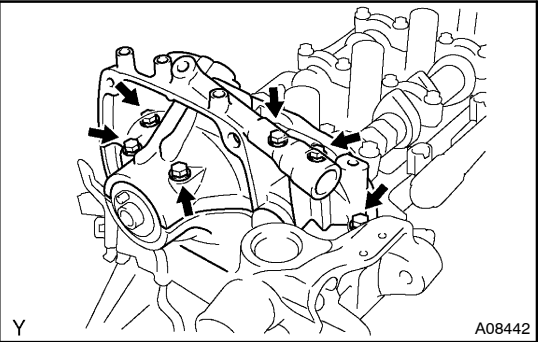
- Remove the bolt holding the oil pipe to the cylinder head.
- Remove the union bolt and 2 gaskets, and disconnect the oil pipe from the cylinder block.
- Remove the union bolt, oil control valve filter, 2 gaskets and oil pipe from the No.1 camshaft bearing cap.

23. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE (See page FI-44)

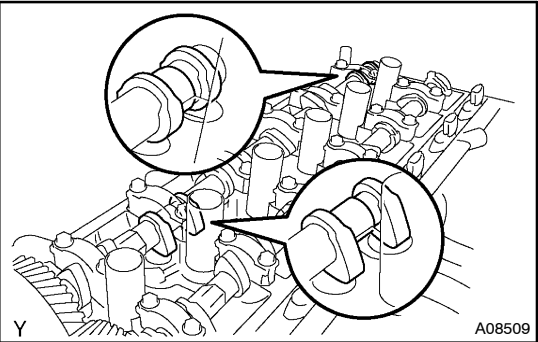
24. REMOVE CAMSHAFTS

NOTICE:

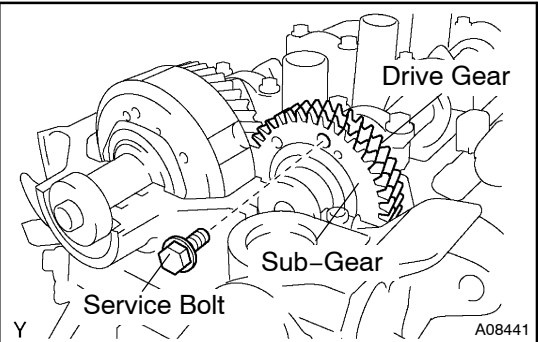
Since the thrust clearance of the camshaft is small, the camshaft must be kept leveled while it is being removed. If the camshaft is not kept leveled, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following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



- (a) Remove the No.1 camshaft bearing cap.
Remove the 6 bolts, 4 seal washers and No.1 camshaft bearing cap.
- (b) Remove the camshaft oil seal and semi-circular plug.



- (c) Remove the exhaust camshaft.
 - (1) Check or set the exhaust camshaft as shown in the illustration so that the No.2 and No.6 cylinder cam lobes face down toward their valve lifters with equal force.

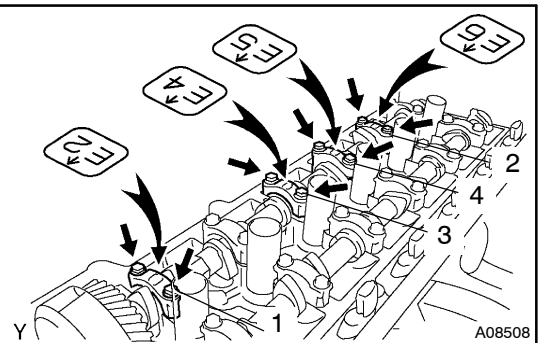


- (2) Secure the intake camshaft sub-gear to the drive gear with a service bolt.

Recommended service bolt:

Thread diameter	6 mm
Thread pitch	1.0 mm
Bolt length	16 – 20 mm (0.63 – 0.79 in.)

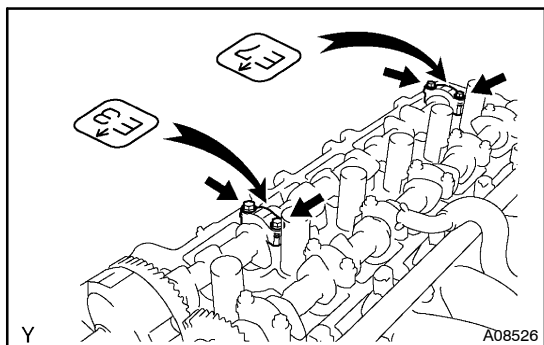
HINT:
When removing the camshaft, make sure that the torsional spring force of the sub-gear has been eliminated by the above operation.



- (3) Uniformly loosen and remove the 8 bearing cap bolts on the No.2, No.4, No.5 and No.6 bearing caps, in several passes, in the sequence shown.

NOTICE:
Do not remove the No.3 and No.7 bearing cap bolts at this stage.

- (4) Remove the No.2, No.4, No.5 and No.6 bearing caps.



- (5) Alternately and uniformly loosen and remove the 4 bearing cap bolts on the No.3 and No.7 bearing caps.

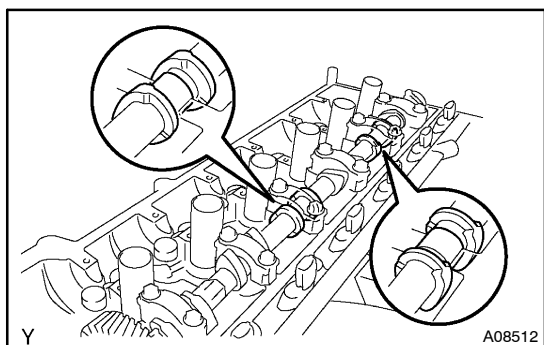
HINT:

- As the 4 No.3 and No.7 bearing cap bolts are loosened, make sure that the camshaft is lifted out straight and level.
- If the camshaft is not being lifted out straight and level, uniformly retighten the 4 No.3 and No.7 bearing cap bolts. Then reverse the order of above steps from (4) to (1) and and repeat steps from (1) to (5) once again.

NOTICE:

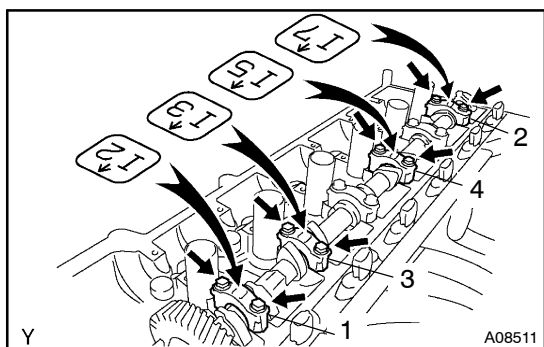
Do not pry on or attempt to force the camshaft with a tool or other object.

- (6) Remove the No.3 and No.7 bearing caps and exhaust camshaft.



- (d) Remove the intake camshaft.

- (1) Check or set the intake camshaft as shown in the illustration so that the No.3 and No.5 cylinder cam lobes face down toward their valve lifters with equal force.

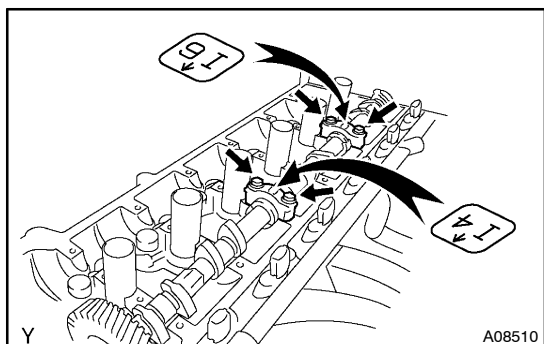


- (2) Uniformly loosen and remove the 8 bearing cap bolts on the No.2, No.3, No.5 and No.7 bearing caps, in several passes, in the sequence shown.

NOTICE:

Do not remove the No.4 and No.6 bearing cap bolts at this stage.

- (3) Remove the No.2, No.3, No.5 and No.7 bearing caps.



- (4) Alternately and uniformly loosen and remove the 4 bearing cap bolts on the No.4 and No.6 bearing caps.

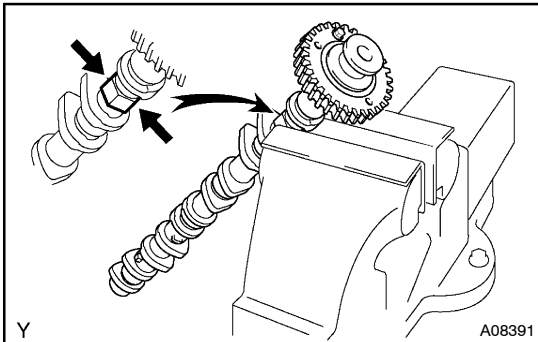
HINT:

- As the 4 No.4 and No.6 bearing cap bolts are loosened, make sure that the camshaft is lifted out straight and level.
- If the camshaft is not being lifted out straight and level, uniformly retighten the 4 No.4 and No.6 bearing cap bolts. Then reverse the order of above steps from (3) to (1) and and repeat steps from (1) to (4) once again.

NOTICE:

Do not pry on or attempt to force the camshaft with a tool or other object.

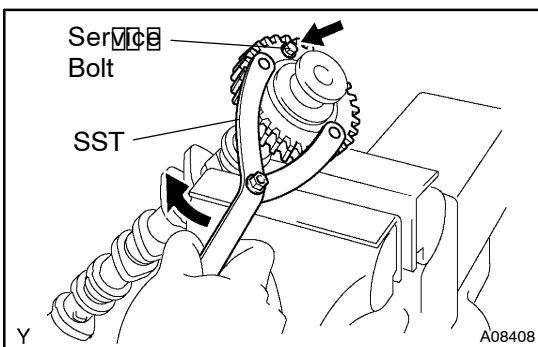
- (5) Remove the No.4 and No.6 bearing caps and intake camshaft.

**25. DISASSEMBLE INTAKE CAMSHAFT**

- (a) Mount the camshaft in a vise.

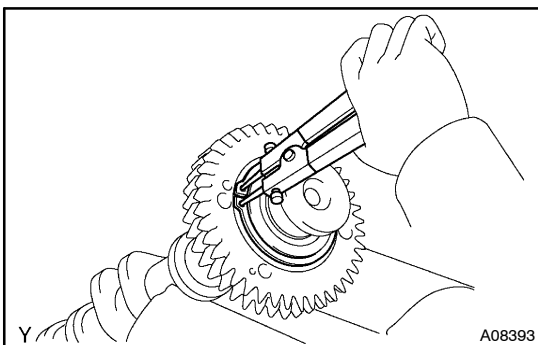
NOTICE:

Be careful not to damage the camshaft.

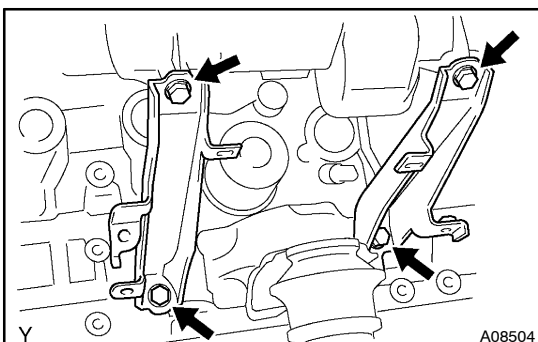


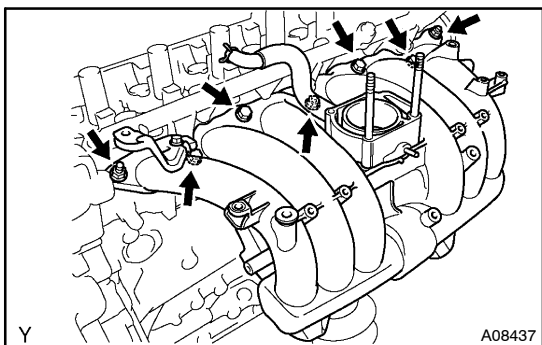
- (b) Using SST, turn the sub-gear clockwise, and remove the service bolt.

SST 09960-10010 (09962-01000, 09963-00500)

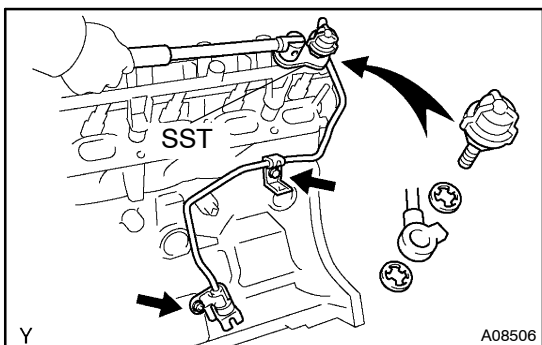


- (c) Using snap ring pliers, remove the snap ring.
(d) Remove the wave washer, camshaft sub-gear and gear spring.

26. REMOVE THROTTLE BODY (See page FI-36)**27. REMOVE NO.1 AND NO.2 AIR INTAKE CHAMBER STAYS**

**28. REMOVE INTAKE MANIFOLD**

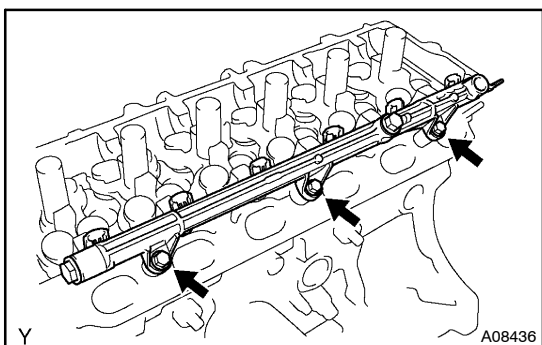
- (a) A/T:
Remove the bolt, and disconnect the oil dipstick guide for the A/T.
- (b) Disconnect the brake booster vacuum hose.
- (c) Remove the 4 bolts, 3 nuts, intake manifold and 6 gaskets.

**29. DISCONNECT NO.1 FUEL PIPE**

- (a) Using SST, remove the fuel pressure pulsation damper and 2 gasket.
SST 09612-24014 (09617-24011)

CAUTION:

- Put a shop towel under the delivery pipe.
 - Slowly loosen the pulsation damper.
- (b) Remove the bolt and nut, and disconnect the No.1 fuel pipe.

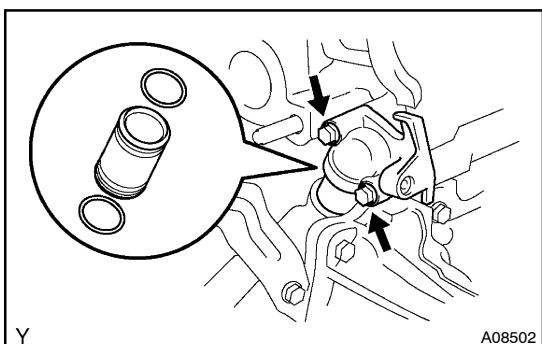
**30. REMOVE DELIVERY PIPE AND INJECTORS**

- (a) Remove the 3 bolts and delivery pipe together with the 6 injectors.

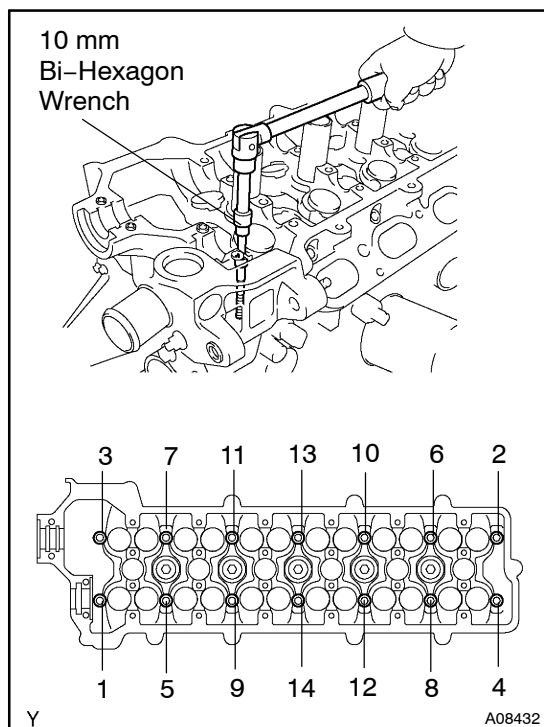
NOTICE:

Be careful not to drop the injectors when removing the delivery pipe.

- (b) Remove the 6 insulators and 3 spacers from the cylinder head.

**31. REMOVE WATER BYPASS OUTLET AND NO.1 WATER BYPASS PIPE**

- (a) Remove the 2 bolts, water bypass outlet, No.1 water bypass pipe and gasket.
- (b) Remove the 2 O-rings from the No.1 water bypass pipe.

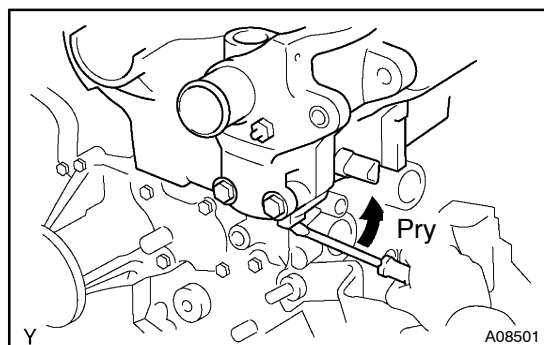


32. REMOVE CYLINDER HEAD

- (a) Using a 10 mm bi-hexagon wrench, uniformly loosen the 14 cylinder head bolts, in several passes, in the sequence shown. Remove the 14 cylinder head bolts and plate washers.

NOTICE:

Cylinder 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 lift off, pry between the cylinder head and cylinder block with a screwdriver.

NOTICE:

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

DISASSEMBLY

1. REMOVE WATER OUTLET

Remove the 2 bolts, 2 nuts, water outlet and gasket.

2. REMOVE WATER TEMPERATURE SENSOR

3. REMOVE CAMSHAFT POSITION SENSOR

- (a) Remove the bolt and position sensor.
- (b) Remove the O-ring from the position sensor.

4. A/T:

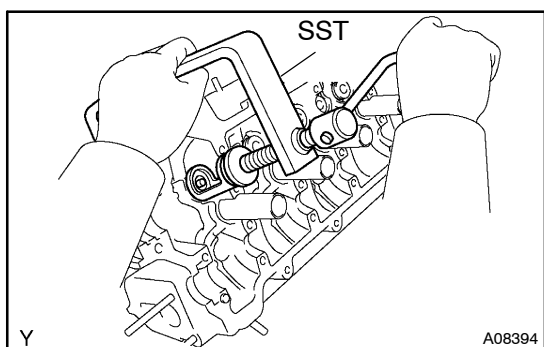
REMOVE CYLINDER HEAD REAR PLATE

Remove the 2 bolts, nut, rear plate and gasket.

5. REMOVE VALVE LIFTERS

HINT:

Arrange the valve lifters in the correct order.



6. REMOVE VALVES

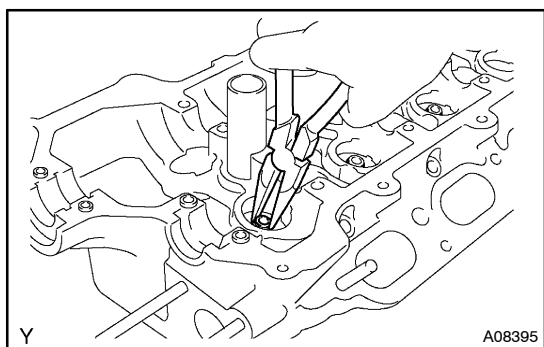
- (a) Using SST, compress the valve spring and remove the 2 keepers.

SST 09202-70020 (09202-00010)

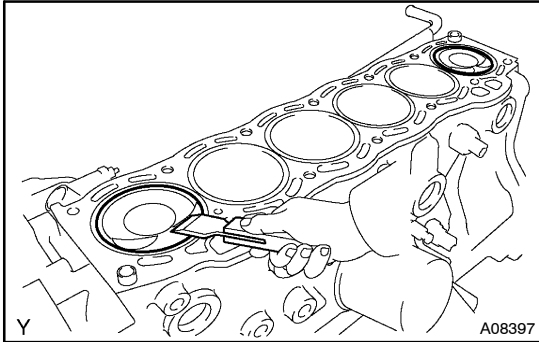
- (b) Remove the spring retainer, valve spring, valve and spring seat.

HINT:

Arrange the valves, valve springs, spring seats and spring retainers in the correct order.



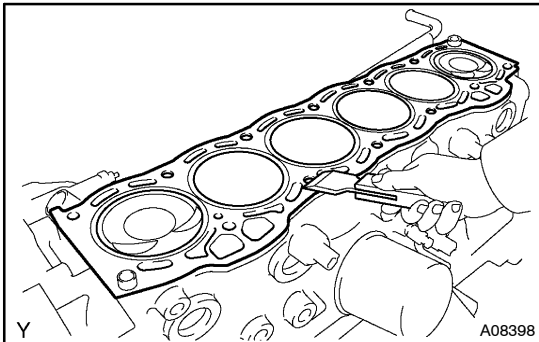
- (c) Using needle-nose pliers, remove the oil seal.



INSPECTION

1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

- (a) Turn the crankshaft, and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the top surface of the piston.



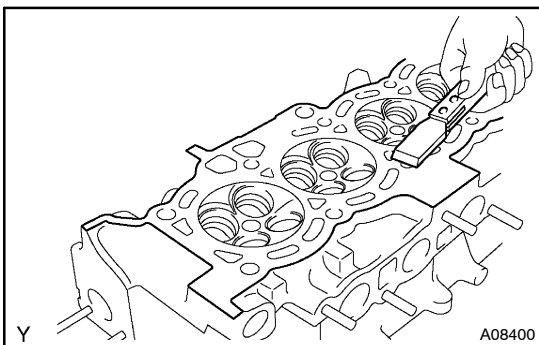
- (b) Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

- (c) Using compressed air, blow carbon and oil from the bolt holes.

CAUTION:

Protect your eyes when using high-pressure compressed air.

2. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS (See page EM-89)

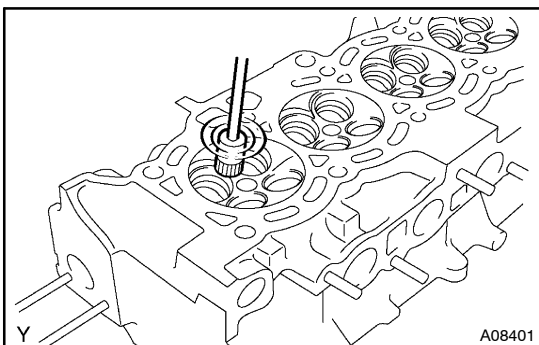


3. CLEAN CYLINDER HEAD

- (a) Using a gasket scraper, remove all the gasket material from the contact surface of the cylinder block.

NOTICE:

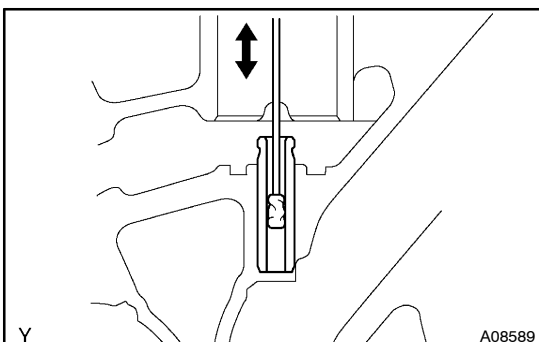
Be careful not to scratch the cylinder block contact surface.



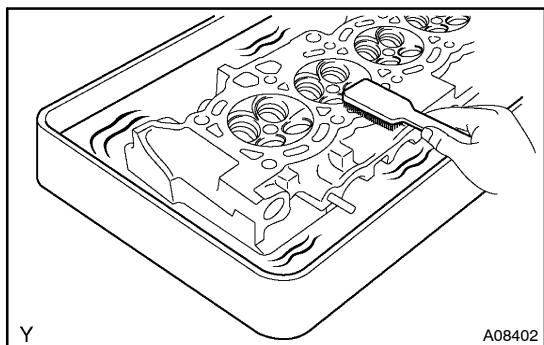
- (b) Using a wire brush, remove all the carbon from the combustion chamber.

NOTICE:

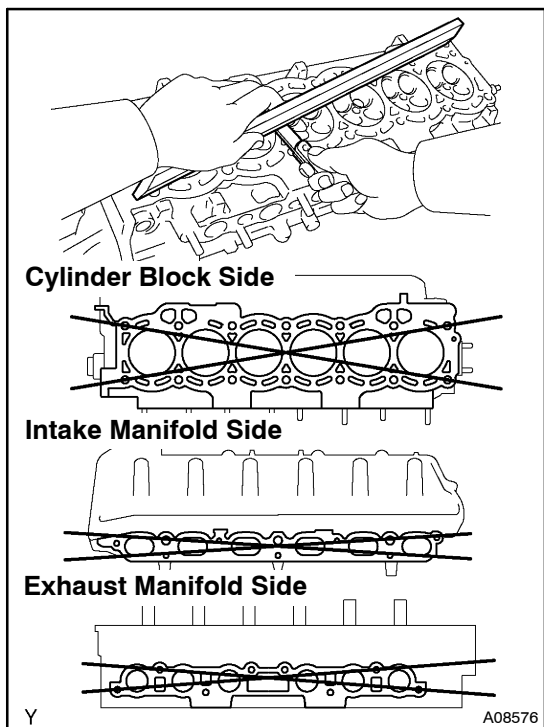
Be careful not to scratch the cylinder block contact surface.



- (c) Using a valve guide bushing brush and solvent, clean all the guide bushings.



- (d) Using a soft brush and solvent, thoroughly clean the cylinder head.



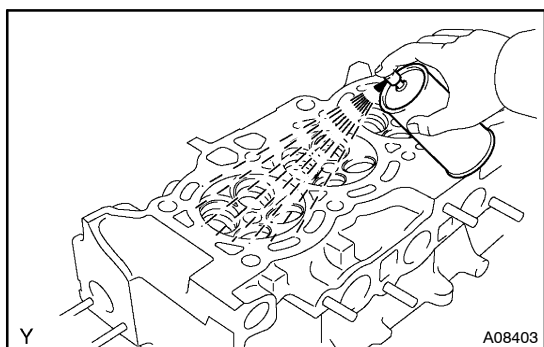
4. INSPECT CYLINDER HEAD

- (a) Inspect for flatness.
Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder block and the manifolds for warpage.

Maximum warpage:

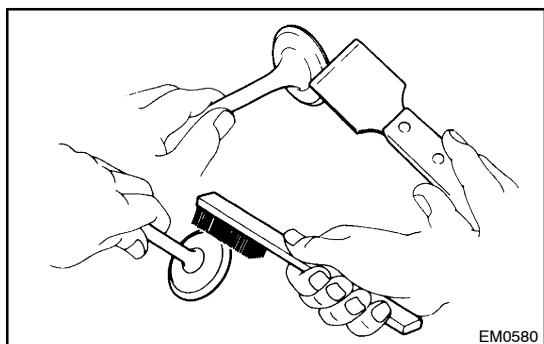
Cylinder block side	0.20 mm (0.0079 in.)
Intake manifold side	0.20 mm (0.0079 in.)
Exhaust manifold side	0.30 mm (0.0118 in.)

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



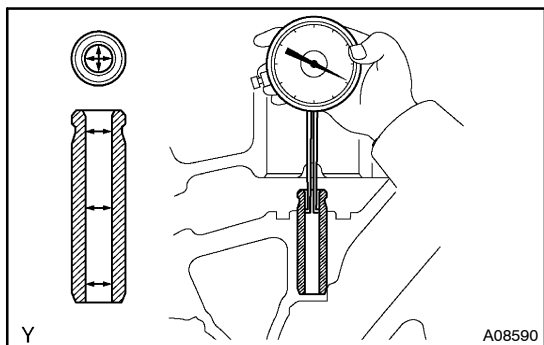
- (b) Inspect for cracks.
Using a dye penetrant, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.

If cracked, replace the cylinder head.



5. CLEAN VALVES

- (a) Using a gasket scraper, chip off any carbon from the valve head.
(b) Using a wire brush, thoroughly clean the valve.

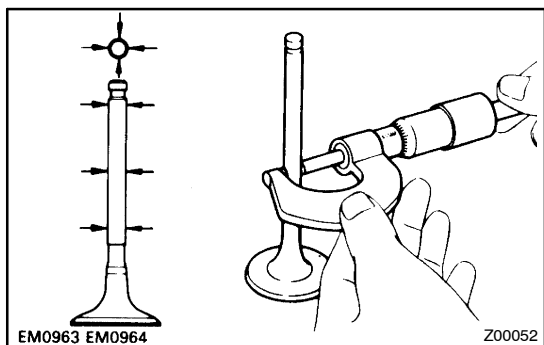


6. INSPECT VALVE STEMS AND GUIDE BUSHINGS

- (a) Using a caliper gauge, measure the inside diameter of the guide bushing.

Bushing inside diameter:

5.010 – 5.030 mm (0.1972 – 0.1980 in.)



- (b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:

Intake	4.970 – 4.985 mm (0.1957 – 0.1963 in.)
Exhaust	4.965 – 4.980 mm (0.1955 – 0.1961 in.)

- (c) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

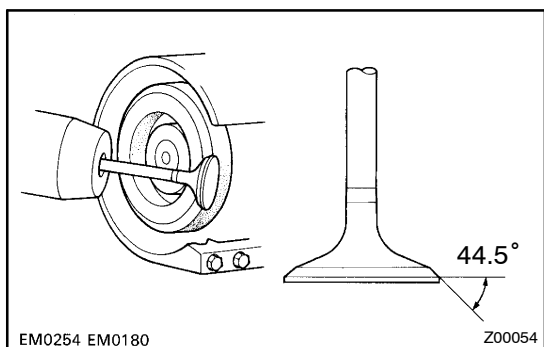
Standard oil clearance:

Intake	0.025 – 0.060 mm (0.0010 – 0.0024 in.)
Exhaust	0.030 – 0.065 mm (0.0012 – 0.0026 in.)

Maximum oil clearance:

Intake	0.08 mm (0.0031 in.)
Exhaust	0.10 mm (0.0039 in.)

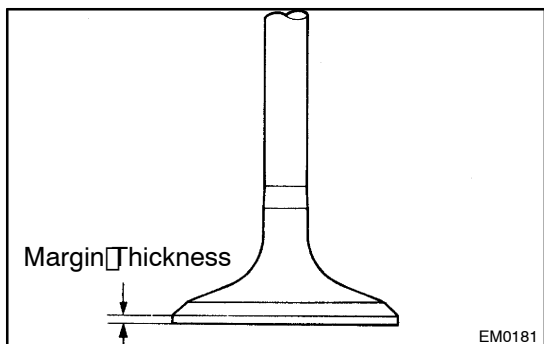
If the clearance is greater than maximum, replace the valve and guide bushing. (See page EM-53)



7. INSPECT AND GRIND VALVES

- (a) Grind the valve enough to remove pits and carbon.
(b) Check that the valve is ground to the correct valve face angle.

Valve face angle: 44.5°



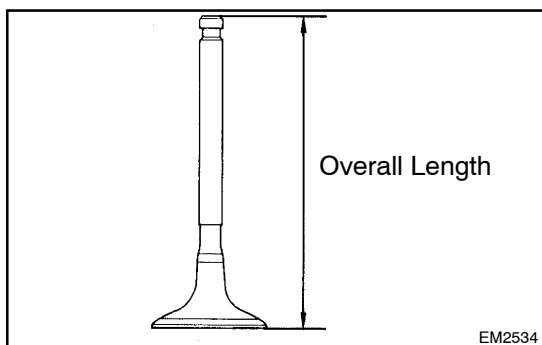
- (c) Check the valve head margin thickness.

Standard margin thickness:

Intake	0.8 mm (0.0315 in.)
Exhaust	1.0 mm (0.0394 in.)

Minimum margin thickness: 0.5 mm (0.020 in.)

If the margin thickness is less than minimum, replace the valve.



- (d) Check the valve overall length.

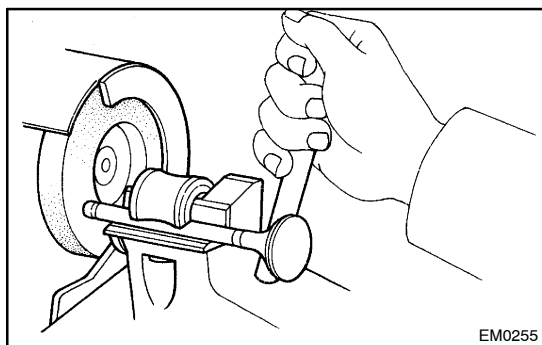
Standard overall length:

Intake	91.75 mm (3.6122 in.)
Exhaust	91.79 mm (3.6138 in.)

Minimum overall length:

Intake	91.25 mm (3.5925 in.)
Exhaust	91.29 mm (3.5941 in.)

If the overall length is less than minimum, replace the valve.

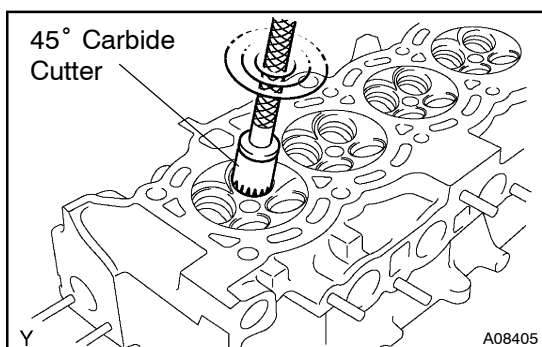


- (e) Check the surface of the valve stem tip for wear.

If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

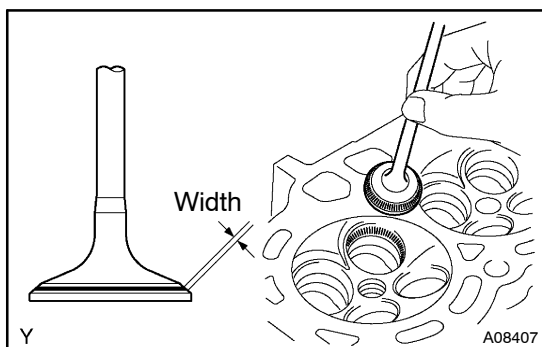
NOTICE:

Do not grind off more than the minimum length.



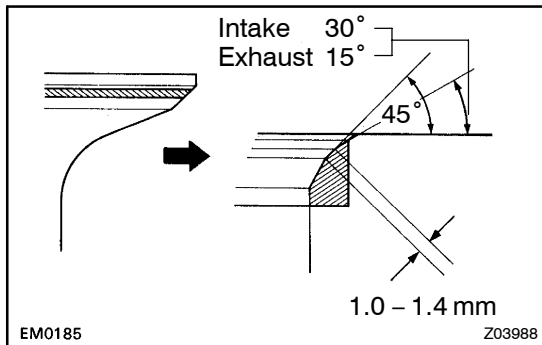
8. INSPECT AND CLEAN VALVE SEATS

- (a) Using a 45° carbide cutter, resurface the valve seats. Remove only enough metal to clean the seats.



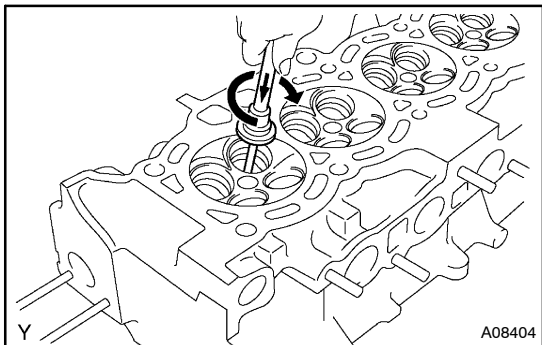
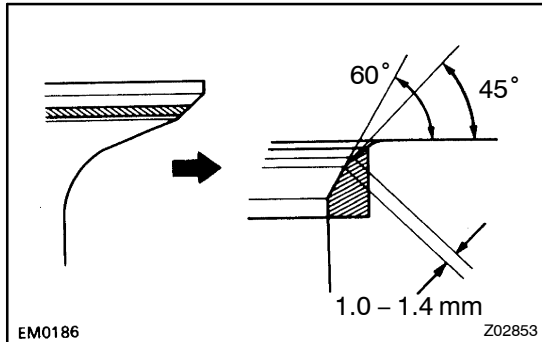
- (b) Check the valve seating position. Apply a light coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate valve.
- (c) Check the valve face and seat for the following:
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
 - If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
 - Check that the seat contact is in the middle of the valve face with the following width:

1.0 – 1.4 mm (0.039 – 0.055 in.)

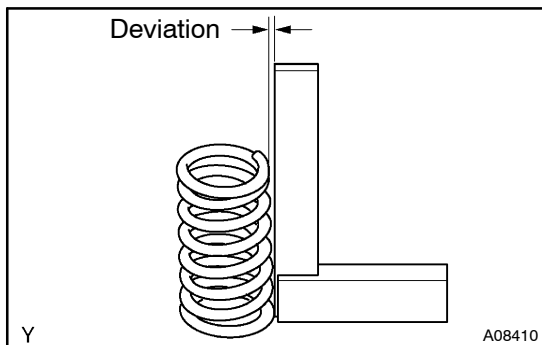


If not, correct the valve seats as follows:

- (1) Intake:
If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.
- (2) Exhaust:
If the seating is too high on the valve face, use 15° and 45° cutters to correct the seat.
- (3) If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.



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

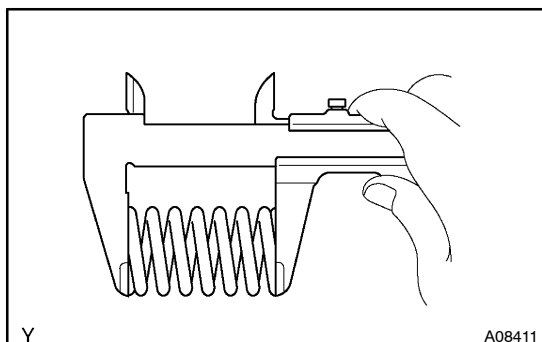


9. INSPECT VALVE SPRINGS

- (a) Using a steel square, measure the deviation of the valve spring.

Maximum deviation: 2.0 mm (0.079 in.)

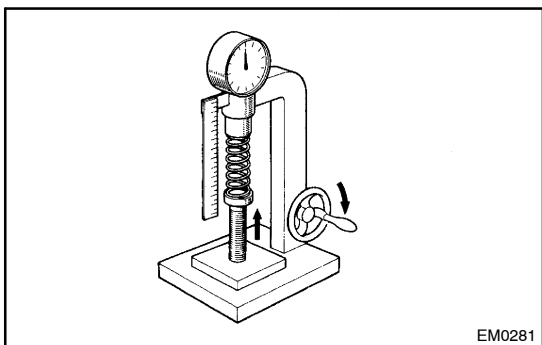
If the deviation is greater than maximum, replace the valve spring.



- (b) Using a vernier caliper, measure the free length of the valve spring.

Free length: 47.3 mm (1.862 in.)

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



EM0281

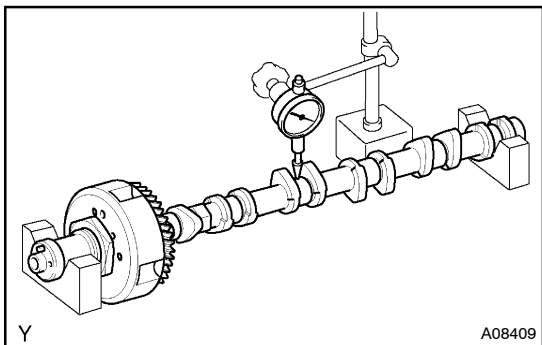
- (c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:

188 – 204 N (19.2 – 20.8 kgf, 42.3 – 45.9 lbf)

at 33.5 mm (1.319 in.)

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



A08409

10. INSPECT CAMSHAFTS AND CAMSHAFT TIMING GEAR (VVT-i)

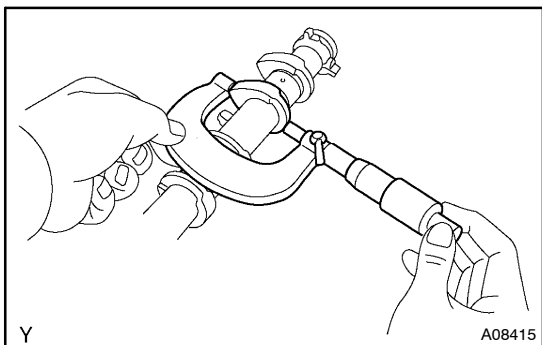
- (a) Inspect the circle runout.

(1) Place the camshaft on V-blocks.

(2) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.06 mm (0.0024 in.)

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



A08415

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

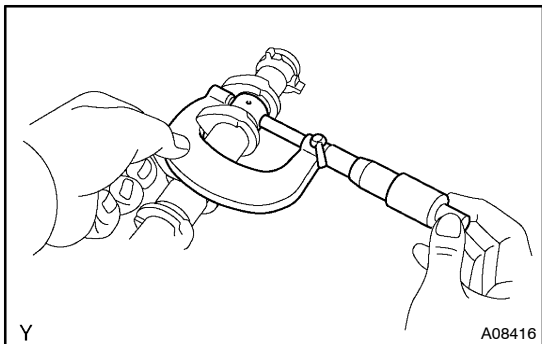
Standard cam lobe height:

Intake	46.75 – 46.85 mm (1.8405 – 1.8445 in.)
Exhaust	46.27 – 46.37 mm (1.8216 – 1.8256 in.)

Minimum cam lobe height:

Intake	46.6 mm (1.8346 in.)
Exhaust	46.1 mm (1.8150 in.)

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



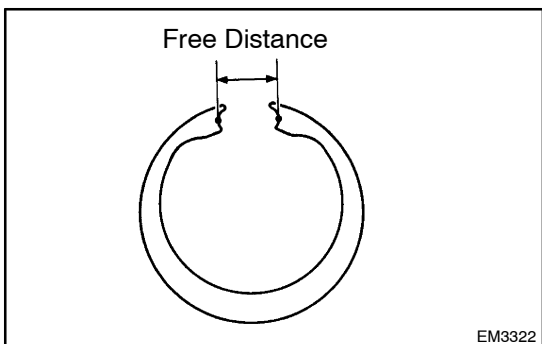
A08416

- (c) 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.

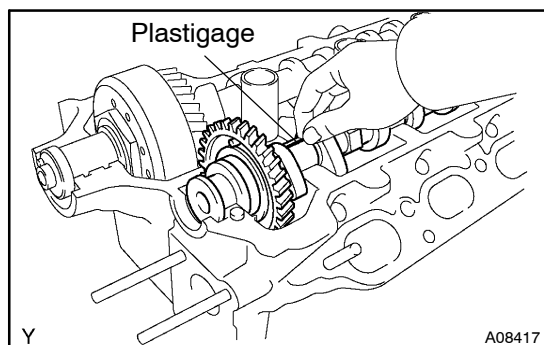


EM3322

- (d) Using vernier calipers, measure the free distance between the gear spring ends.

Free distance: 17.6 – 18.2 mm (0.693 – 0.717 in.)

If the free distance is not as specified, replace the gear spring.



(e) Inspect the journal oil clearance.

- (1) Clean the bearing caps and camshaft journals.
- (2) Check that bearings are free of flaking and scoring.

If the bearings are damaged, replace the bearing caps and cylinder head as a set.

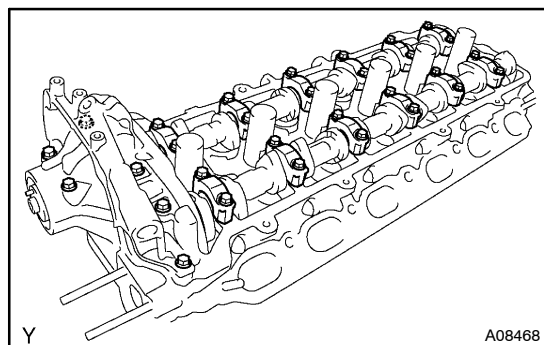
- (3) Place the camshafts on the cylinder head.
- (4) Lay a strip of Plastigage across each of the camshaft journals.

- (5) Install the bearing caps. (See page EM-59)

NOTICE:

Do not turn the camshaft.

- (6) Remove the bearing caps.



- (7) Measure the Plastigage at its widest point.

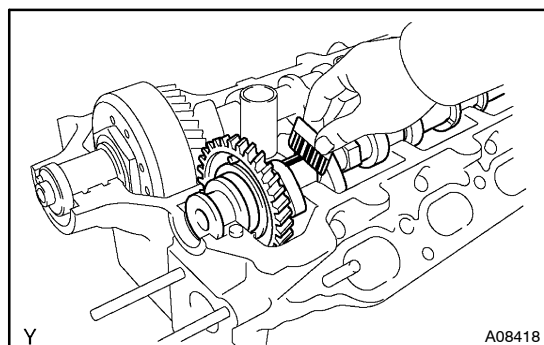
Standard oil clearance:

0.025 – 0.062 mm (0.0010 – 0.0024 in.)

Maximum oil clearance: 0.08 mm (0.0031 in.)

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

- (8) Completely remove the Plastigage.



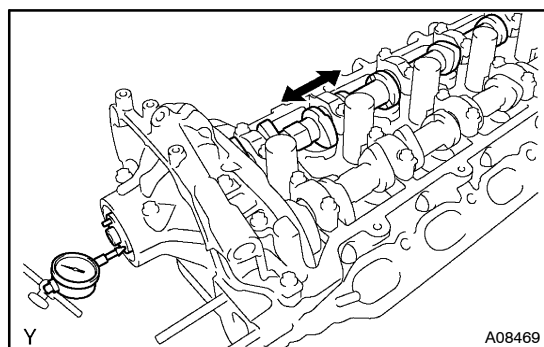
(f) Inspect the camshaft thrust clearance.

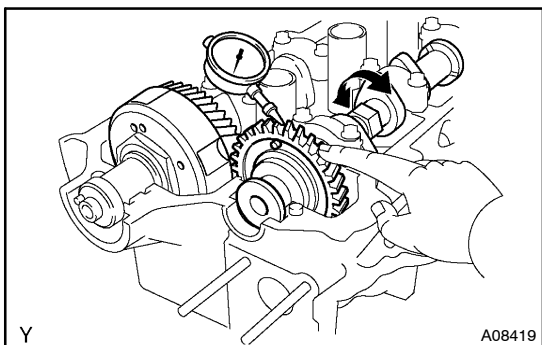
- (1) Install the camshaft. (See page EM-59)
- (2) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

Standard thrust clearance:

Intake	0.045 – 0.100 mm (0.0018 – 0.0039 in.)
Exhaust	0.045 – 0.110 mm (0.0012 – 0.0043 in.)

If the thrust clearance is not as specified, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.





(g) Inspect the camshaft gear backlash.

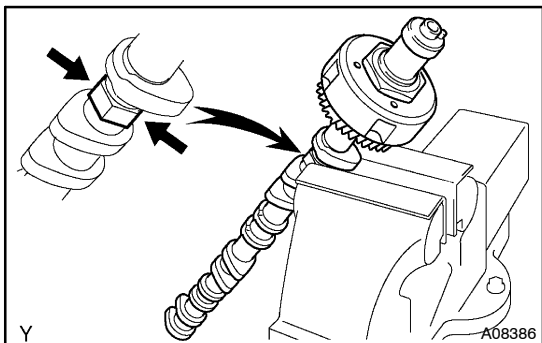
- (1) Install the camshafts without installing the intake cam sub-gear. (See page EM-59)
- (2) Using a dial indicator, measure the backlash.

Standard backlash:

0.020 - 0.200 mm (0.0008 - 0.0079 in.)

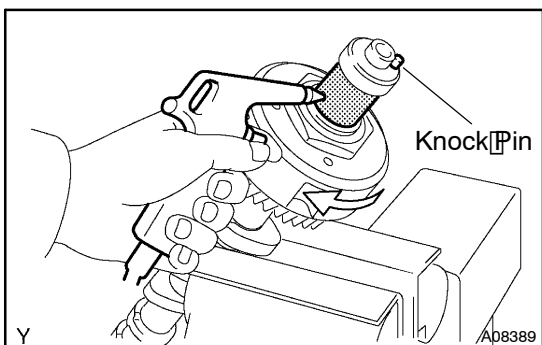
Maximum backlash: 0.30 mm (0.0188 in.)

If the backlash is greater than maximum, replace the camshafts.



(h) Inspect the camshaft timing gear (VVT-i) operation.

- (1) Mount the hexagon wrench head portion of the exhaust camshaft in a vise.
- (2) Check that camshaft timing gear (VVT-i) will not turn.



- (3) Cover the port except the port on the advance angle side shown in the illustration with the vinyl tape.
- (4) Using an air gun, apply about 100 kPa (1 kgf/cm³, 14 psi) of air pressure to the port on the advance side.

NOTICE:

When the oil is splashed, wipe it off with a shop lug and the likes.

HINT:

Perform this in order to release the lock pin for the maximum delay angle locking.

- (5) Under the condition of (4), turn the camshaft timing gear (VVT-i) to the advance angle side (the white arrow marked direction in the illustration) with your hand.

Standard: Must turn

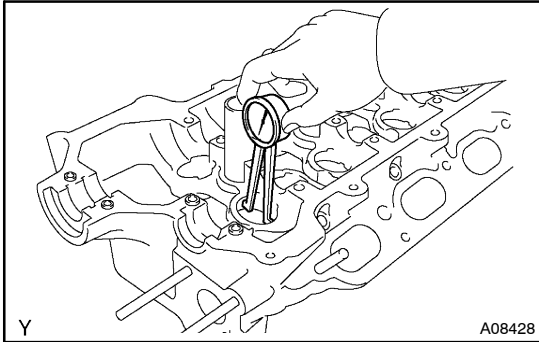
HINT:

Depending on the air pressure, the camshaft timing gear (VVT-i) will turn to the advance angle side without applying force by hand. Also, under the condition that the pressure can be hardly applied because of the air leakage from the port, there may be the case that the lock pin could be hardly released.

- (6) Except the position where the lock pin meets at the maximum delay angle, let the camshaft timing gear (VVT-i) turn back and forth and check the movable range and that there is no disturbance.

Standard: Movable smoothly in the range about 25°

- (7) Turn the camshaft timing gear (VVT-i) with your hand and lock it at the maximum delay angle position.

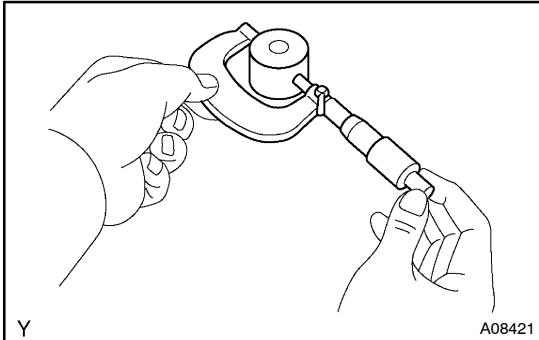


11. INSPECT VALVE LIFTERS AND LIFTER BORES

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

Lifter bore diameter:

31.000 – 31.025 mm (1.2205 – 1.2215 in.)



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

Lifter diameter:

30.966 – 30.976 mm (1.2191 – 1.2195 in.)

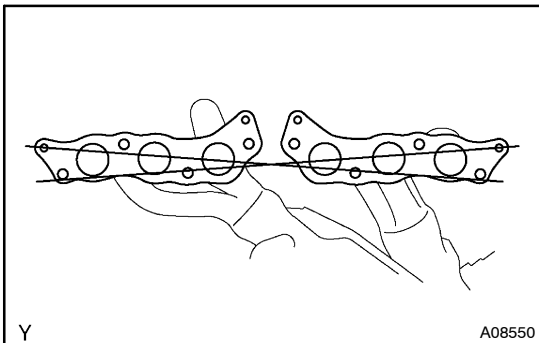
- (c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

Standard oil clearance:

0.024 – 0.059 mm (0.0009 – 0.0023 in.)

Maximum oil clearance: 0.08 mm (0.0031 in.)

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

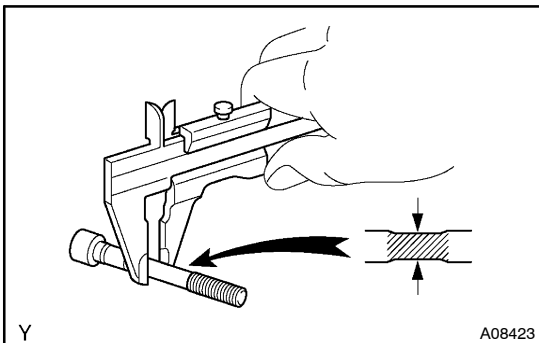


12. INSPECT EXHAUST MANIFOLD

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.

Maximum warpage: 0.70 mm (0.0276 in.)

If warpage is greater than maximum, replace the manifold.



13. INSPECT CYLINDER HEAD BOLTS

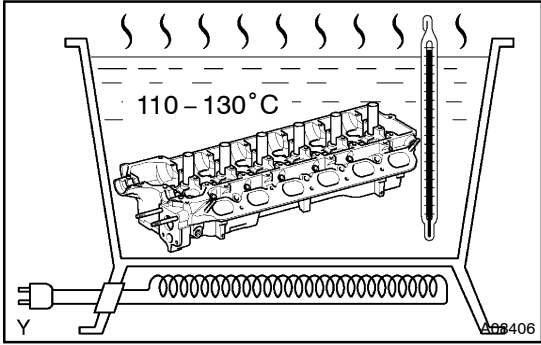
Using vernier calipers, measure the tension portion diameter of the bolt.

Standard outside diameter:

8.7 – 8.8 mm (0.343 – 0.346 in.)

Minimum outside diameter: 8.6 mm (0.339 in.)

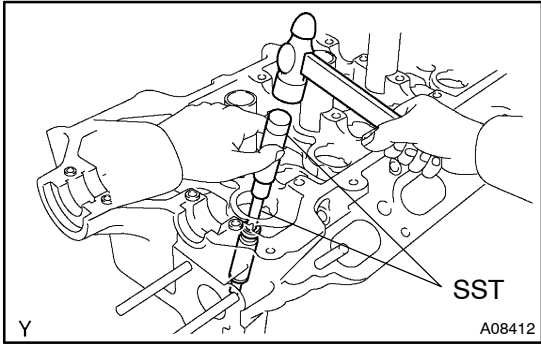
If the diameter is less than minimum, replace the bolt.



REPLACEMENT

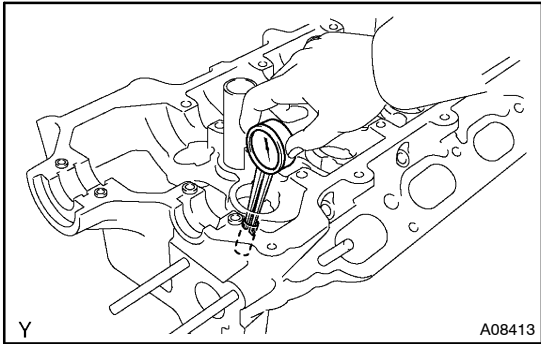
1. REPLACE VALVE GUIDE BUSHINGS

- (a) Gradually heat the cylinder head to 110 - 130°C (230 - 266°F).



- (b) Using SST and a hammer, tap out the guide bushing.

SST 09201-10000 (09201-01050),
09950-70010 (09951-07100)



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

Both intake and exhaust

Bushing bore diameter mm (in.)	Bushing size
9.679 - 9.701 (0.3811 - 0.3819)	Use STD
9.729 - 9.751 (0.3830 - 0.3839)	Use O/S 0.05

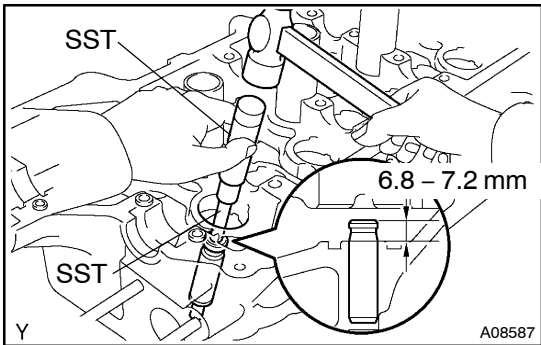
- (d) Select a new guide bushing (STD or O/S 0.05).

If the bushing bore diameter of the cylinder head is greater than 9.701 mm (0.3819 in.), machine the bushing bore to the following dimensions:

9.729 - 9.751 mm (0.3830 - 0.3839 in.)

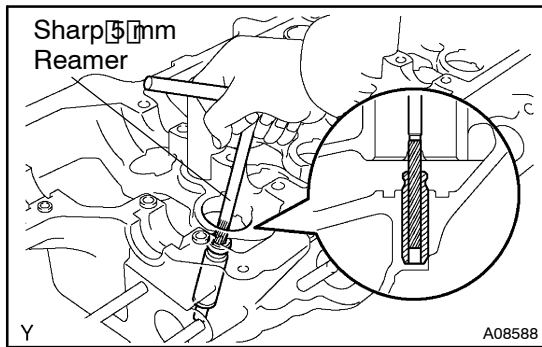
If the bushing bore diameter of the cylinder head is greater than 9.751 mm (0.3839 in.), replace the cylinder head.

- (e) Gradually heat the cylinder head to 110 - 130°C (230 - 266°F).

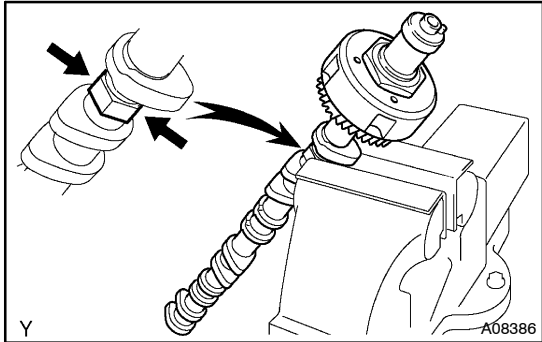


- (f) Using SST and a hammer, tap in a new guide bushing until there is 6.8 - 7.2 mm (0.268 - 0.283 in.) protruding from the cylinder head.

SST 09201-10000 (09201-01050),
09950-70010 (09951-07100)



- (g) Using a sharp 5mm reamer, ream the guide bushing to obtain the specified standard clearance (See page EM-44) between the guide bushing and valve stem.



2. REPLACE CAMSHAFT TIMING GEAR (VVT-i)

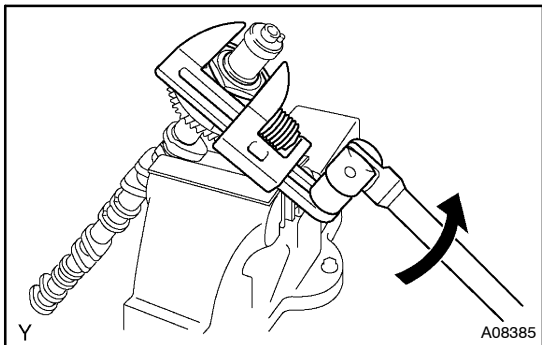
NOTICE:

Do not remove or install the camshaft timing gear (VVT-i) beside changing the camshaft timing gear (VVT-i) or camshaft.

- (a) Mount the hexagon wrench head portion of the camshaft in a vise.

NOTICE:

Be careful not to damage the camshaft.



- (b) Using SST, remove the lock nut and camshaft timing gear (VVT-i).

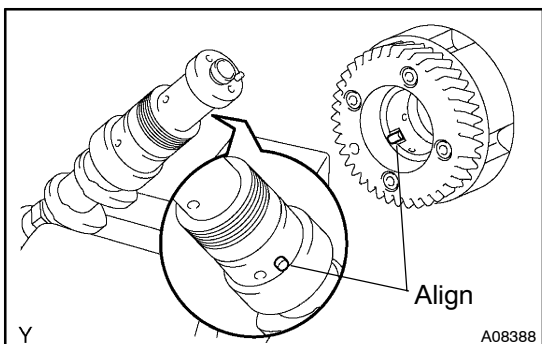
SST 09922-10010

NOTICE:

- Remove it under the condition that the lock pin is operated, and lock at the maximum delay angle position.
- Never remove the 4 bolts on the gear.

HINT:

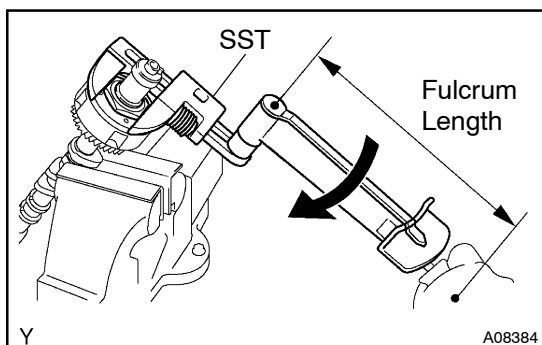
In case of having difficulty to remove the timing gear (VVT-i), apply a slight hitting using a plastic-faced hammer and then remove it.



- (c) Align the knock pin and knock pin groove and install the camshaft timing gear (VVT-i) on the camshaft.

NOTICE:

Install it under the condition that the lock pin is operated and lock at the maximum delay angle position.



- (d) Apply the engine oil on a new nut, the placing surface of the timing gear (VVT-i) and the screw portion.

NOTICE:

Must change the nut to a new one when to change the camshaft timing gear (VVT-i).

HINT:

Be sure to apply the oil, otherwise the prescribed torque cannot be obtained.

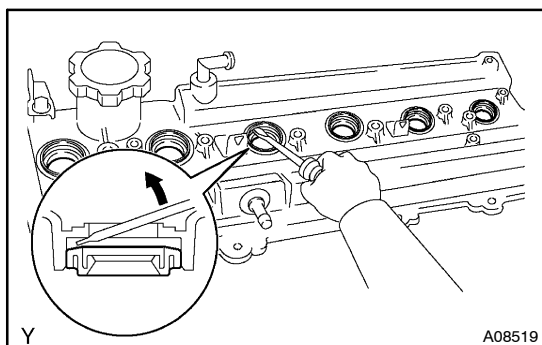
- (e) Using SST, install and torque the lock nut.

SST 09922-10010

Torque: 120 N·m (1,200 kgf·cm, 87 ft·lbf)

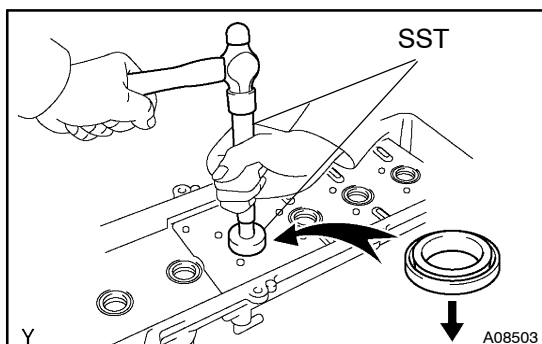
HINT:

Use a torque wrench with a fulcrum length of 380 mm (14.96 in.).



3. REPLACE SPARK PLUG TUBE GASKETS

- (a) Using a screwdriver, pry off the tube gasket.



- (b) Using SST and a hammer, tap in a new tube gasket until its surface is flush with the upper edge of the cylinder head cover.

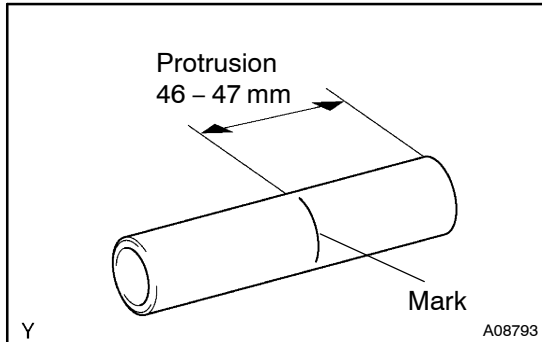
SST 09950-60010 (09951-00240, 09951-00450, 09952-06010), 09950-70010 (09951-07100)

- (c) Apply a light coat of MP grease to the tube gasket lip.

REASSEMBLY

HINT:

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



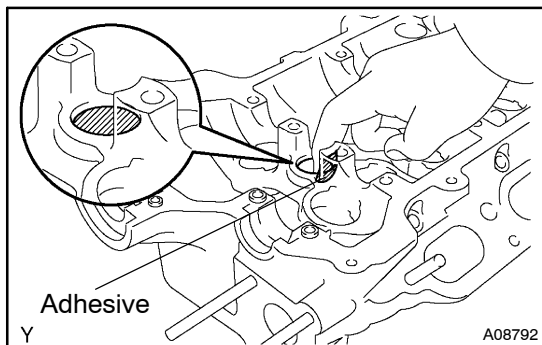
1. INSTALL SPARK PLUG TUBES

HINT:

When using a new cylinder head, spark plug tubes must be installed.

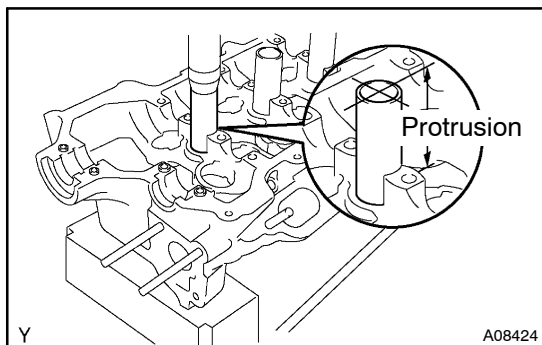
- (a) Mark the standard position away from the edge, onto a new spark plug tube.

Standard protrusion: 46 – 47 mm (1.81 – 1.85 in.)



- (b) Apply adhesive to the spark plug tube hole of the cylinder head.

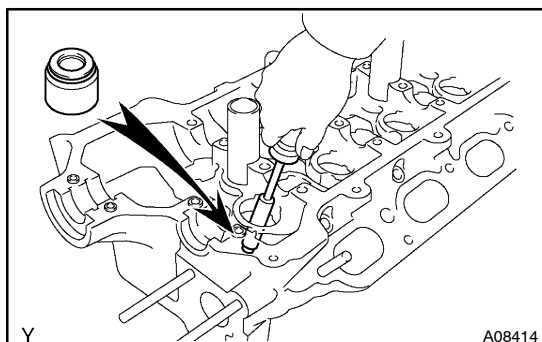
Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent



- (c) Using a press, press in the spark plug tube until there is standard protrusion protruding from the camshaft bearing cap installation surface of the cylinder head.

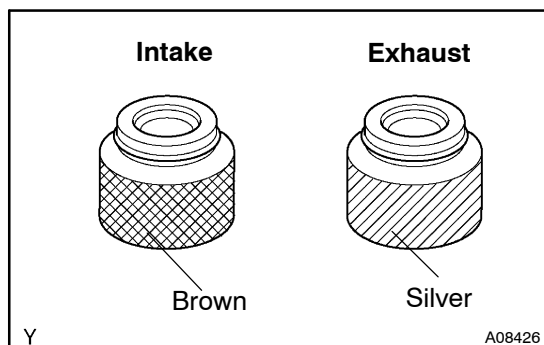
NOTICE:

Avoid pressing a new spark plug tube in too far by measuring the amount of the protrusion while pressing.



2. INSTALL VALVES

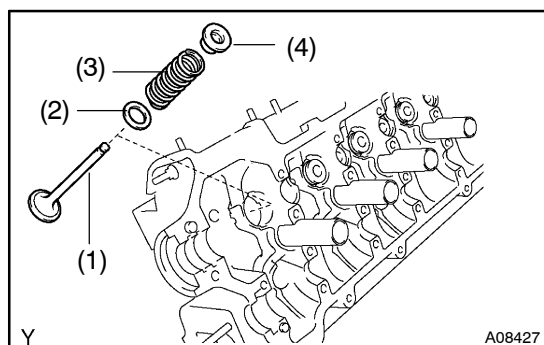
- (a) Install a new oil seal on the valve guide bushing.

**HINT:**

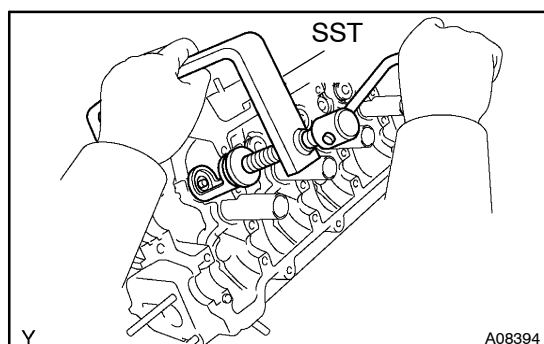
The intake valve oil seal is brown and the exhaust valve oil seal is silver.

NOTICE:

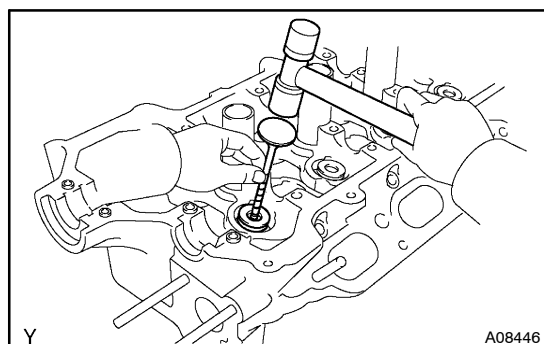
Pay much attention when assembling the oil seal for intake and exhaust. Assembling the wrong one may cause a failure.



- (b) Install the valve (1), spring seat (2), valve spring (3) and spring retainer (4).



- (c) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
SST 09202-70020 (09202-00010)



- (d) Using a plastic-faced hammer and the valve stem (not in use) tip wound with vinyl tape, lightly tap the valve stem tip to assure proper fit.

NOTICE:

Be careful not to damage the valve stem tip.

3. INSTALL VALVE LIFTERS

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

4. A/T:**INSTALL CYLINDER HEAD REAR PLATE**

Install a new gasket and the rear plate with the 2 bolts and nut.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

5. INSTALL CAMSHAFT POSITION SENSOR

- (a) Install a new O-ring to the camshaft position sensor.
(b) Install the camshaft position sensor with the bolt.

Torque: 9 N·m (90 kgf·cm, 78 in·lbf)

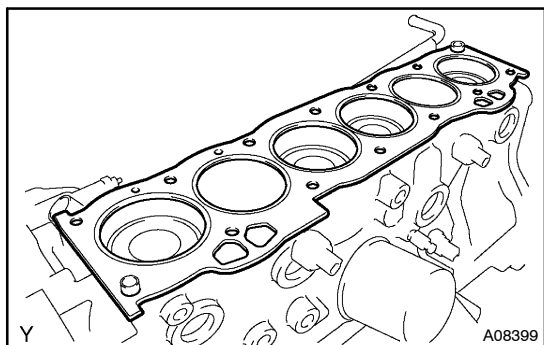
6. INSTALL WATER TEMPERATURE SWITCH

Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

7. INSTALL WATER OUTLET

Install a new gasket and the water outlet with the 2 bolts and 2 nuts.

Torque: 29 N·m (290 kgf·cm, 21 ft·lbf)



INSTALLATION

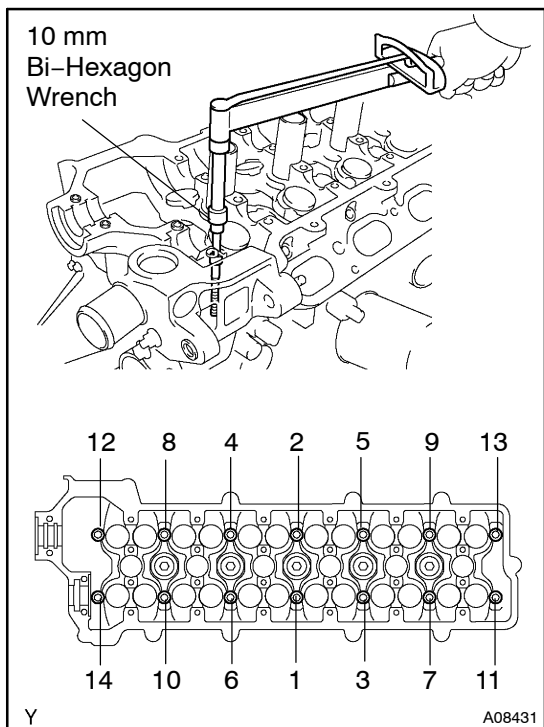
1. PLACE CYLINDER HEAD ON CYLINDER BLOCK

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

NOTICE:

Be careful of the installation direction.

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



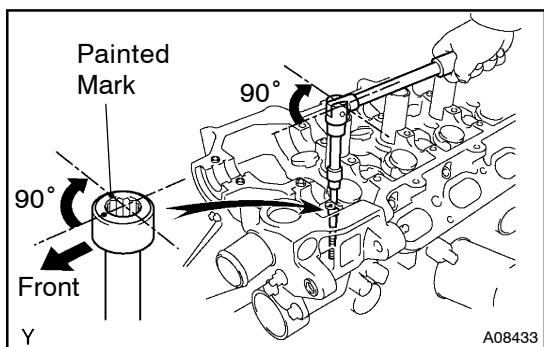
2. INSTALL CYLINDER HEAD BOLTS

HINT:

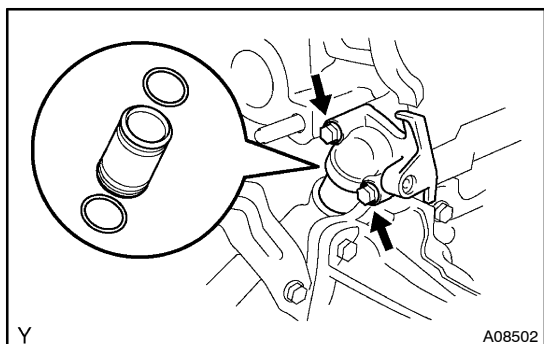
- The cylinder head bolts are tightened in 2 progressive steps (steps (c) and (e)).
 - If any cylinder head bolt is broken or deformed, replace it.
- (a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts and plate washers.
 - (b) Install the plate washer to the cylinder head bolt.
 - (c) Install and uniformly tighten the 14 cylinder head bolts and plate washers, in several passes, in the sequence shown.

Torque: 50 N·m (500 kgf·cm, 36 ft·lbf)

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



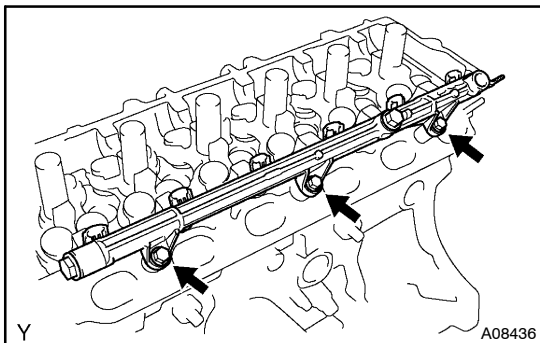
- (d) Mark the front of the cylinder head bolt with paint.
- (e) Retighten the cylinder head bolts by 90° in the numerical order shown.
- (f) Check that the painted mark is now at a 90° angle to the front.



3. INSTALL WATER BYPASS OUTLET AND NO.1 WATER BYPASS PIPE

- (a) Install 2 new O-rings to the No.1 water bypass pipe.
- (b) Install a new gasket, the No.1 water bypass pipe and water bypass outlet with the 2 bolts.

Torque: 9 N·m (90 kgf·cm, 78 in·lbf)



4. INSTALL INJECTORS AND DELIVERY PIPE

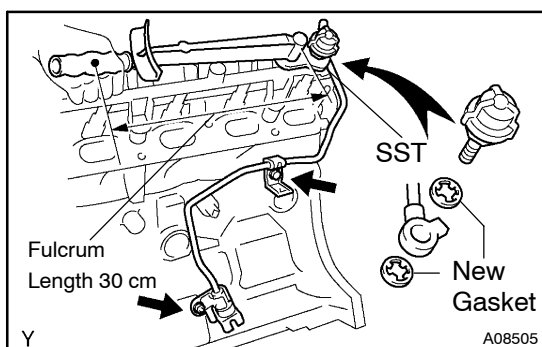
- Place the 3 spacers and 6 insulators in position on the cylinder head.
- Attach the 6 injectors and delivery pipe assembly to the cylinder head.
- Temporarily install the 3 bolts holding the delivery pipe to the cylinder head.
- Check that the injectors rotate smoothly.

HINT:

If injectors do not rotate smoothly, the probable cause is incorrect installation of O-ring. Replace the O-ring.

- Tighten the 3 bolts holding the delivery pipe to the cylinder head.

Torque: 18.5 N·m (185 kgf·cm, 13 ft·lbf)



5. CONNECT NO.1 FUEL PIPE

- Connect the No.1 fuel pipe to the LH engine mounting bracket with the nut by hand.
- Tighten the fuel pressure pulsation damper with 2 new gaskets by hand.
- Using SST, tighten the fuel pressure pulsation damper.
SST 09612-24014 (09617-24011)

Torque: 27 N·m (270 kgf·cm, 20 ft·lbf)

HINT:

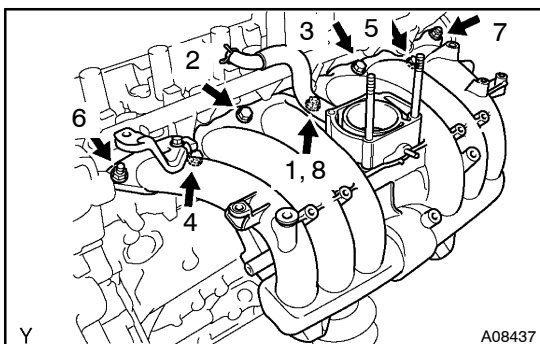
Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).

- Tighten the bolt holding the No.1 fuel pipe to the cylinder head.

Torque: 8.5 N·m (85 kgf·cm, 74 in·lbf)

- Tighten the the nut holding the No.1 fuel pipe to the LH engine mounting bracket.

Torque: 35 N·m (350 kgf·cm, 25 ft·lbf)



6. INSTALL INTAKE MANIFOLD

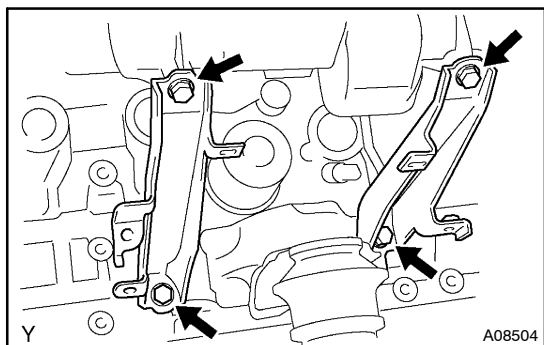
- Install 6 new gasket to the intake manifold.
- Install the intake manifold with the 4 bolts and 3 nuts, in several passes, in the sequence shown.

Torque: 28 N·m (280 kgf·cm, 20 ft·lbf)

- A/T:

Connect the oil dipstick guide for the A/T with the bolt.

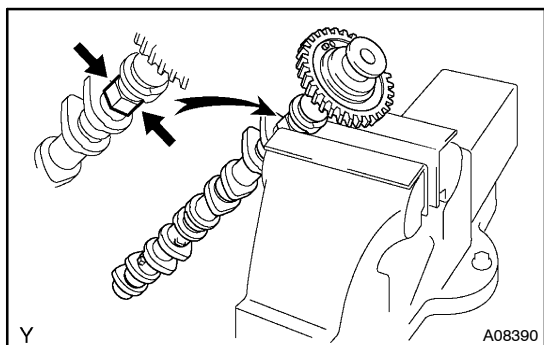
- Connect the brake booster vacuum hose.



7. INSTALL NO.1 AND NO.2 AIR INTAKE CHAMBER STAYS

Torque: 18.5 N·m (185 kgf·cm, 13 ft·lbf)

8. INSTALL THROTTLE BODY (See page FI-41)

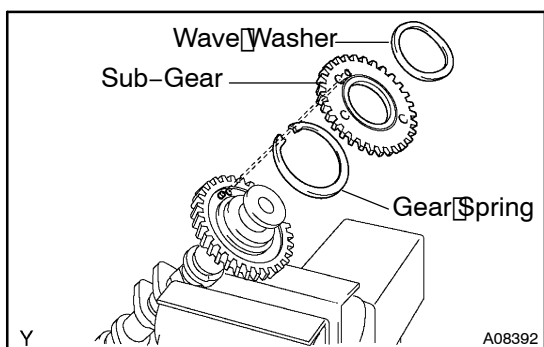


9. ASSEMBLE INTAKE CAMSHAFT

- (a) Mount the hexagon wrench head portion of the camshaft in a vise.

NOTICE:

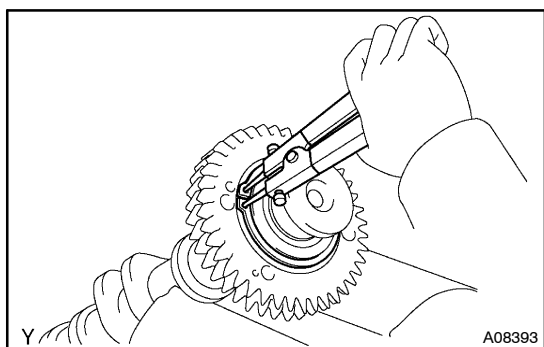
Be careful not to damage the camshaft.



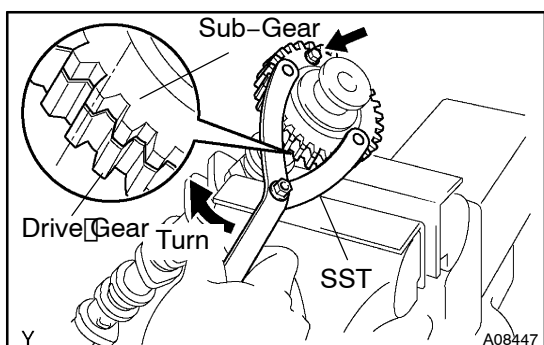
- (b) Install the camshaft gear spring, camshaft sub-gear and wave washer.

HINT:

Align the pins on the gears with the spring ends.



- (c) Using snap ring pliers, install the snap ring.



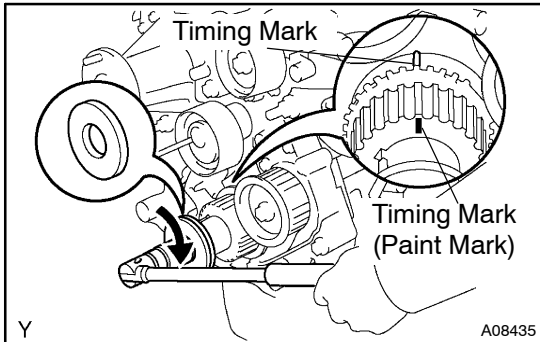
- (d) Using SST, align the holes of the camshaft drive gear and sub-gear by turning camshaft sub-gear clockwise, and install a service bolt.

SST 09960-10010 (09962-01000, 09963-00500)

- (e) Align the gear teeth of the drive gear and sub-gear, and tighten the service bolt.

10. INSTALL CAMSHAFTS**NOTICE:**

Since the thrust clearance of the camshaft is small, the camshaft must be kept leveled while it is being installed. If the camshaft is not kept leveled, 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.

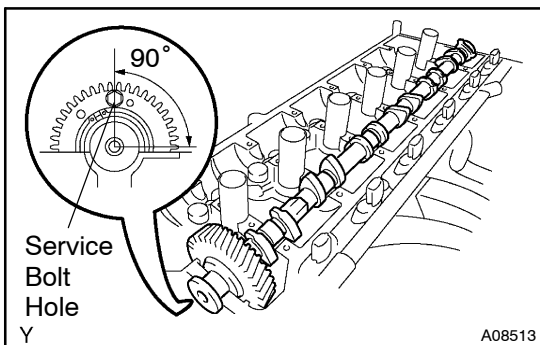


- (a) Set the No.1 cylinder to the approx. 60° BTDC/compression.

Using the crankshaft pulley bolt and plate washer, turn the crankshaft, and align the timing mark (paint mark) of the crankshaft timing pulley with the timing mark of the timing belt case.

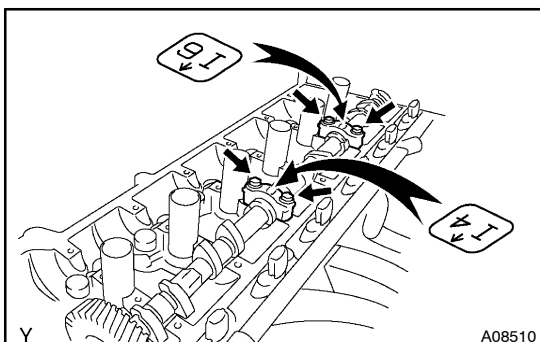
NOTICE:

Having the crankshaft at the wrong angle can cause the piston head and valve head to come into contact with each other. Thus results in damage, when you install the camshafts. So, always set the crankshaft at the correct angle.



- (b) Install the intake camshaft.

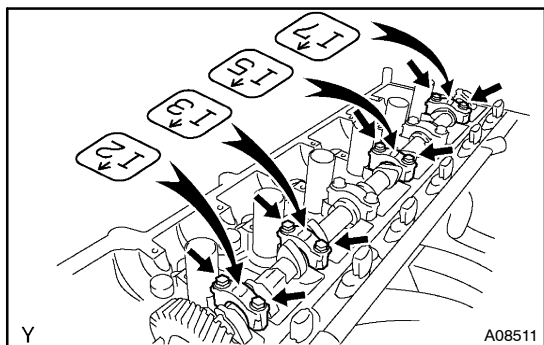
- (1) Apply engine oil to the cam and gear of the camshaft, and the journal of the cylinder head.
- (2) Place the intake camshaft as shown in the illustration so that the service bolt holes of the intake camshaft gears are directly above.



- (3) Place the No.4 and No.6 bearing caps in their proper locations.
- (4) Temporarily tighten the 4 bearing cap bolts uniformly and alternately in several passes until the bearing caps are snug with the cylinder head.

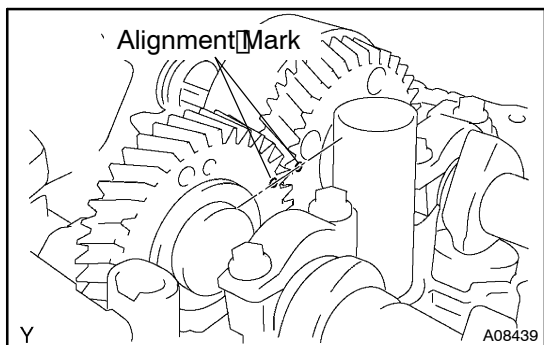
NOTICE:

While tightening the bolts, install the camshaft by keeping it leveled.



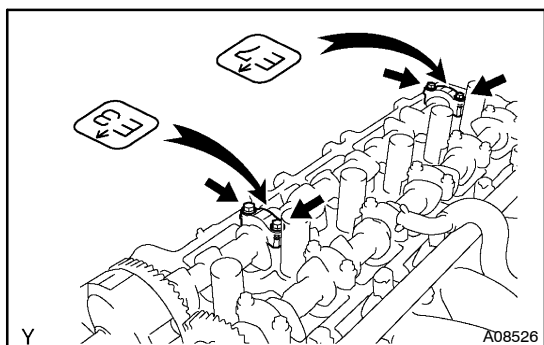
- (5) Place the No.2, No.3, No.5 and No.7 bearing caps in their proper locations.
- (6) Temporarily tighten the 8 bearing cap bolts, alternately tightening the right and left bolts uniformly.
- (7) Uniformly tighten the 12 bearing cap bolts, in several passes.

Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)



(c) Install the exhaust camshaft.

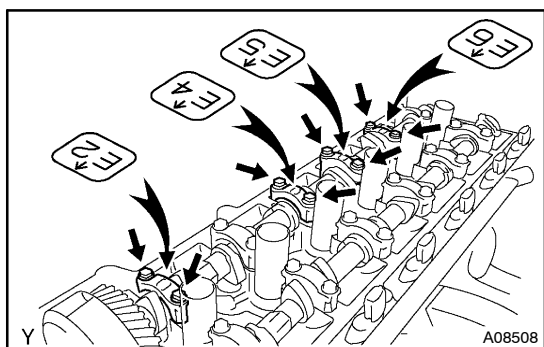
- (1) Apply engine oil to the cam and gear of the camshaft, and the journal of the cylinder head.
- (2) Engage the exhaust camshaft gear to the intake camshaft gear by matching the alignment marks on each gear.
- (3) Roll down the exhaust camshaft onto the bearing journals while engaging gears with each other.



- (4) Place the No.3 and No.7 bearing caps in their proper locations.
- (5) Temporarily tighten the 4 bearing cap bolts uniformly and alternately in several passes until the bearing caps are snug with the cylinder head.

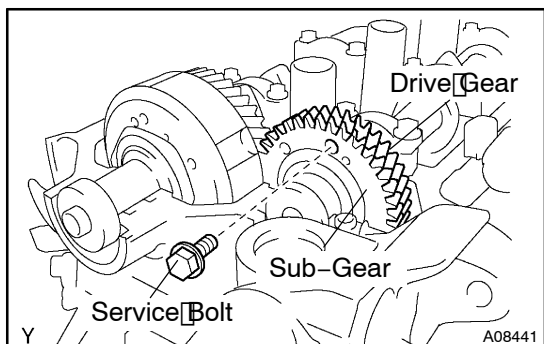
NOTICE:

While tightening the bolts, install the camshaft by keeping it leveled.



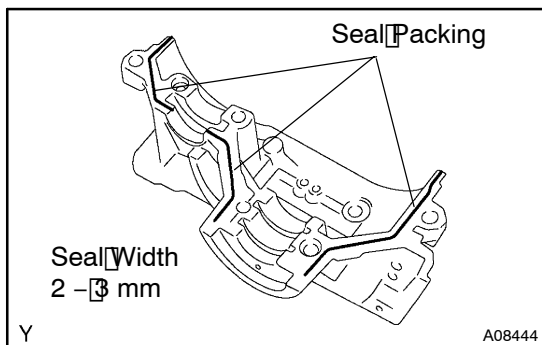
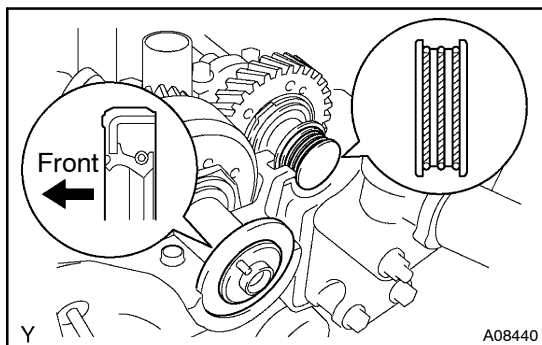
- (6) Place the No.2, No.4, No.5 and No.6 bearing caps in their proper locations.
- (7) Temporarily tighten the 8 bearing cap bolts alternately tightening the right and left bolts uniformly.
- (8) Uniformly tighten the 12 bearing cap bolts, in several passes.

Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)



- (9) Remove the service bolt.
- (d) Check and adjust the valve clearance.
(See [page EM-6](#))

Turn the camshaft and position the cam lobe upward, and inspect and adjust the valve clearance.



(e) Install a new oil seal to the camshaft.

NOTICE:

- Do not rotate the lip.
- Install the oil seal to the deepest of the cylinder head.
- Avoid any flakes or dust on the lip.

(f) Install the semi-circular plug.

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

(2) Apply a seal packing to the semi-circular plug grooves.

Seal packing: Part No. 08826-00080 or equivalent

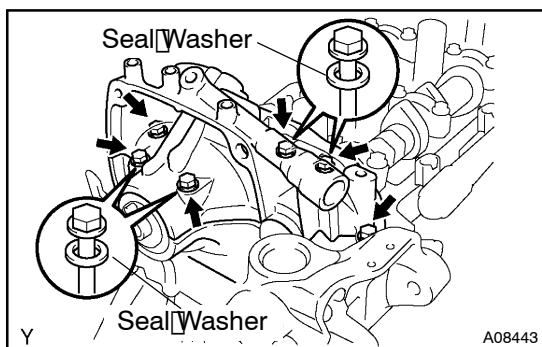
(g) Install the No. 1 camshaft bearing cap.

(1) Remove any old packing (FIPG) material from the bearing cap and cylinder head.

(2) Apply a seal packing to the bearing cap as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

- Install a nozzle that has been cut to a 2 - 3 mm (0.08 - 0.12 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise, the material must be removed and reapplied.
- Immediately remove the nozzle from the tube and reinstall the cap.



(3) Install 4 new seal washers as shown in the illustration.

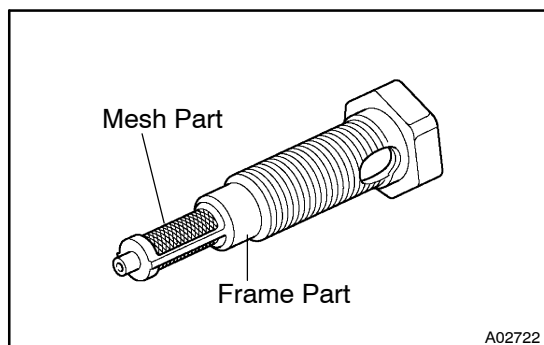
(4) Install the No. 1 bearing cap with the 6 bolts.

Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)

NOTICE:

- Check that there is no clearance between the surfaces contacting with the No. 1 camshaft bearing cap and cylinder head.
- If the No. 1 camshaft bearing cap fits in the cylinder head tightly, push the bearing cap by hand. Do not hit in the bearing cap with a hammer or the likes.

11. **INSTALL CAMSHAFT TIMING OIL CONTROL VALVE**
(See page FI-44)

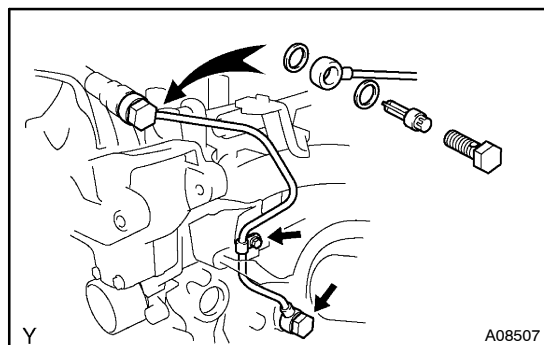


12. INSTALL NO.1 OIL PIPE

- (a) Install the oil control valve filter to the union bolt.

NOTICE:

In case of touching the filter, avoid holding the mesh part and hold the frame part.



- (b) Install the oil pipe to the No.1 camshaft bearing cap with 2 new gaskets and the union bolt.

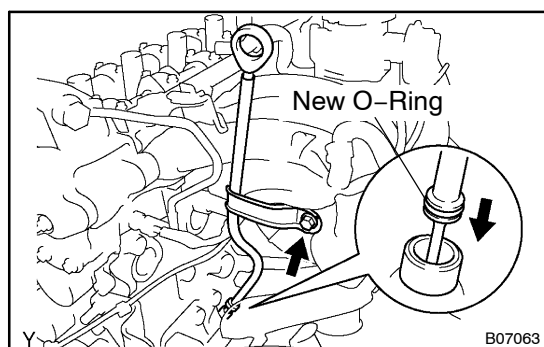
Torque: 64.5 N·m (645 kgf·cm, 47 ft·lbf)

- (c) Install the oil pipe to the cylinder block with 2 new gaskets and the union bolt.

Torque: 64.5 N·m (645 kgf·cm, 47 ft·lbf)

- (d) Install the bolt holding the oil pipe to the cylinder head.

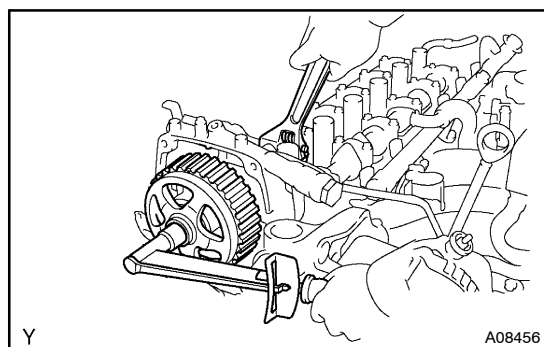
Torque: 8.5 N·m (85 kgf·cm, 74 in·lbf)



13. INSTALL OIL DIPSTICK AND GUIDE

- (a) Install a new O-ring to the dipstick guide.
 (b) Apply engine oil on the O-ring.
 (c) Push in the dipstick guide together with the dipstick into the hole of the oil dipstick guide support.
 (d) Install the dipstick guide with the bolt.

Torque: 5.5 N·m (55 kgf·cm, 48 in·lbf)



14. INSTALL CAMSHAFT TIMING PULLEY

NOTICE:

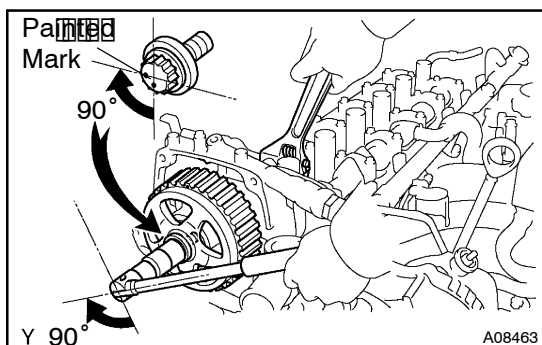
NEVER reuse the cam-pulley set bolt.

HINT:

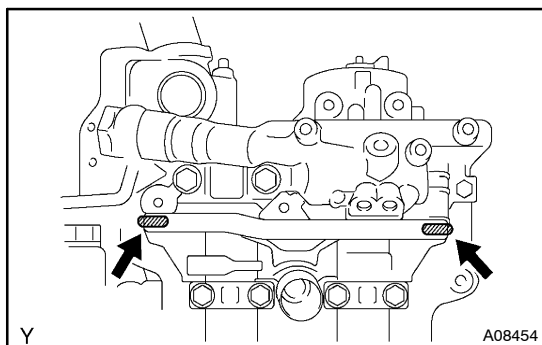
The cam-pulley set bolt is tightened in 2 progressive steps (steps (b) and (d)).

- (a) Align the camshaft knock pin with the groove in the pulley, and slide on the pulley.
 (b) Hold the hexagon portion of the camshaft with a wrench, and tighten a new cam-pulley set bolt.

Torque: 35 N·m (350 kgf·cm, 25 ft·lbf)



- (c) Mark the timing pulley bolt with paint.
- (d) Retighten the timing pulley bolt by 90°.
- (e) Check that the painted mark is now at a 90° angle to (d).



15. INSTALL CYLINDER HEAD COVER

- (a) Remove any old packing (FIPG) material.
- (b) Apply a 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 head cover.
- (d) Install the head cover with the 11 bolts.

Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)

16. INSTALL AIR CLEANER INLET DUCT BRACKET

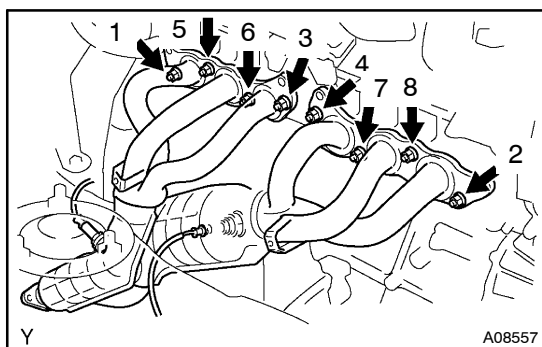
Torque: 18.5 N·m (190 kgf·cm, 14 ft·lbf)

17. INSTALL TIMING BELT (See page EM-26)

18. RHD:

INSTALL STEERING SLIDING YOKE

(See page SR-23)



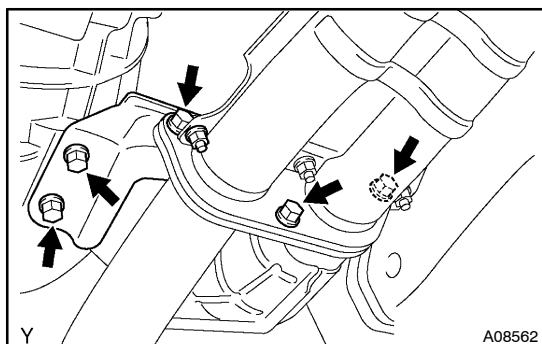
19. INSTALL EXHAUST MANIFOLD

- (a) Install 2 new gaskets to the cylinder head.
- (b) Install the exhaust manifold with 8 new nuts, in several passes, in the sequence shown.

Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)

- (c) Connect the 2 oxygen sensor connectors.
- (d) Install the 2 heat insulators with the 6 bolts.

Torque: 18.5 N·m (190 kgf·cm, 14 ft·lbf)



- (e) Temporarily install the exhaust manifold stay to the transmission with the 2 bolts.

- (f) Install 2 new gaskets to front end of the front exhaust pipe, and connect the front exhaust pipe to the exhaust manifold with the 3 bolts, a new retainer and a new nut.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

- (g) Tighten the 2 bolts holding the exhaust manifold stay to the transmission.

Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)

20. M/T:**INSTALL CYLINDER HEAD REAR PLATE**

Install a new gasket, the rear plate and No.2 water bypass pipe with the bolt and 2 nuts.

Torque: 13 N·m (130 kgf·cm, 90 ft·lbf)

21. CONNECT HEATER HOSE TO CYLINDER HEAD REAR PLATE**22. INSTALL NO.3 WATER BYPASS PIPE**

Torque: 8.5 N·m (85 kgf·cm, 74 in·lbf)

23. INSTALL SPARK PLUGS (See page G-1)**24. INSTALL IGNITION COILS (See page G-6)****25. CONNECT ENGINE WIRE TO CYLINDER HEAD****26. INSTALL NO.2 CYLINDER HEAD COVER**

Torque: 8.5 N·m (85 kgf·cm, 74 in·lbf)

27. INSTALL PCV HOSE**28. INSTALL ALTERNATOR (See page CH-15)****29. INSTALL NO.3 CYLINDER HEAD COVER**

Torque: 7.5 N·m (75 kgf·cm, 65 in·lbf)

30. INSTALL AIR CLEANER ASSEMBLY

Torque: 7.5 N·m (75 kgf·cm, 65 in·lbf)

31. INSTALL AIR CLEANER INLET

Torque: 5 N·m (50 kgf·cm, 43 in·lbf)

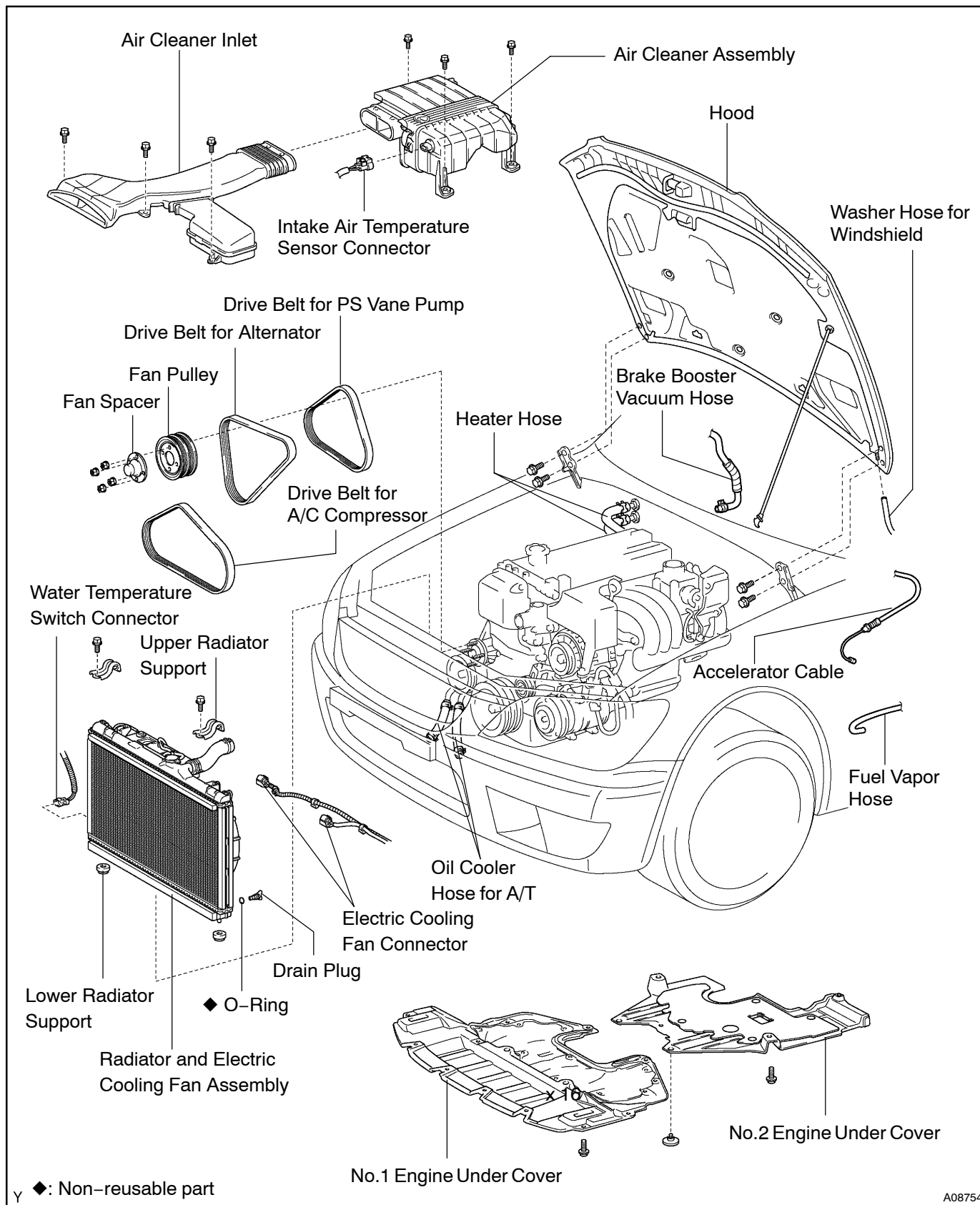
32. FILL WITH ENGINE COOLANT**33. START ENGINE AND CHECK FOR LEAK****34. INSTALL NO.1 ENGINE UNDER COVER****35. ROAD TEST**

Check abnormal noise, shock, slippage, correct shift points and smooth operation.

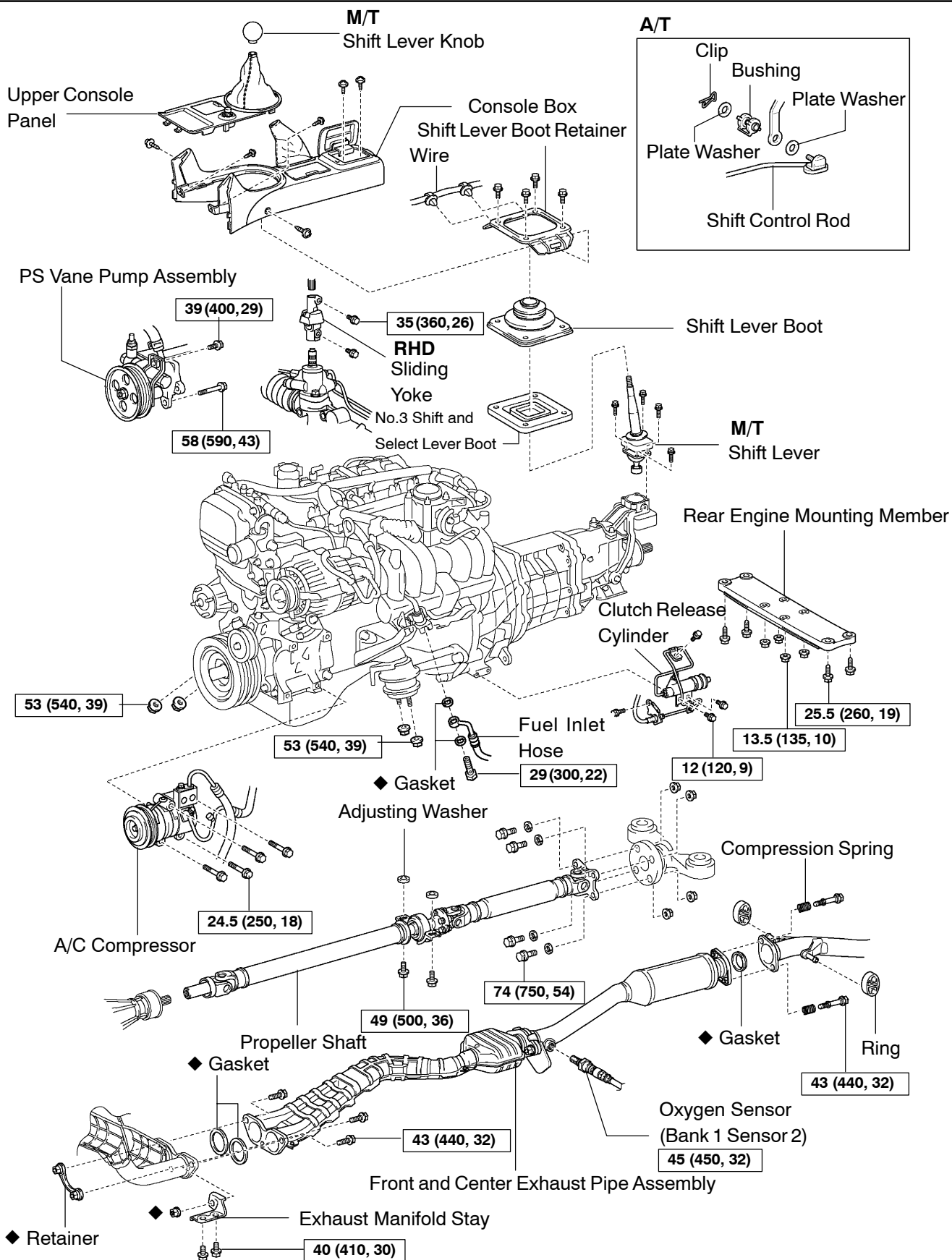
36. RECHECK ENGINE COOLANT LEVEL AND OIL LEVEL

ENGINE UNIT COMPONENTS

EM110-01



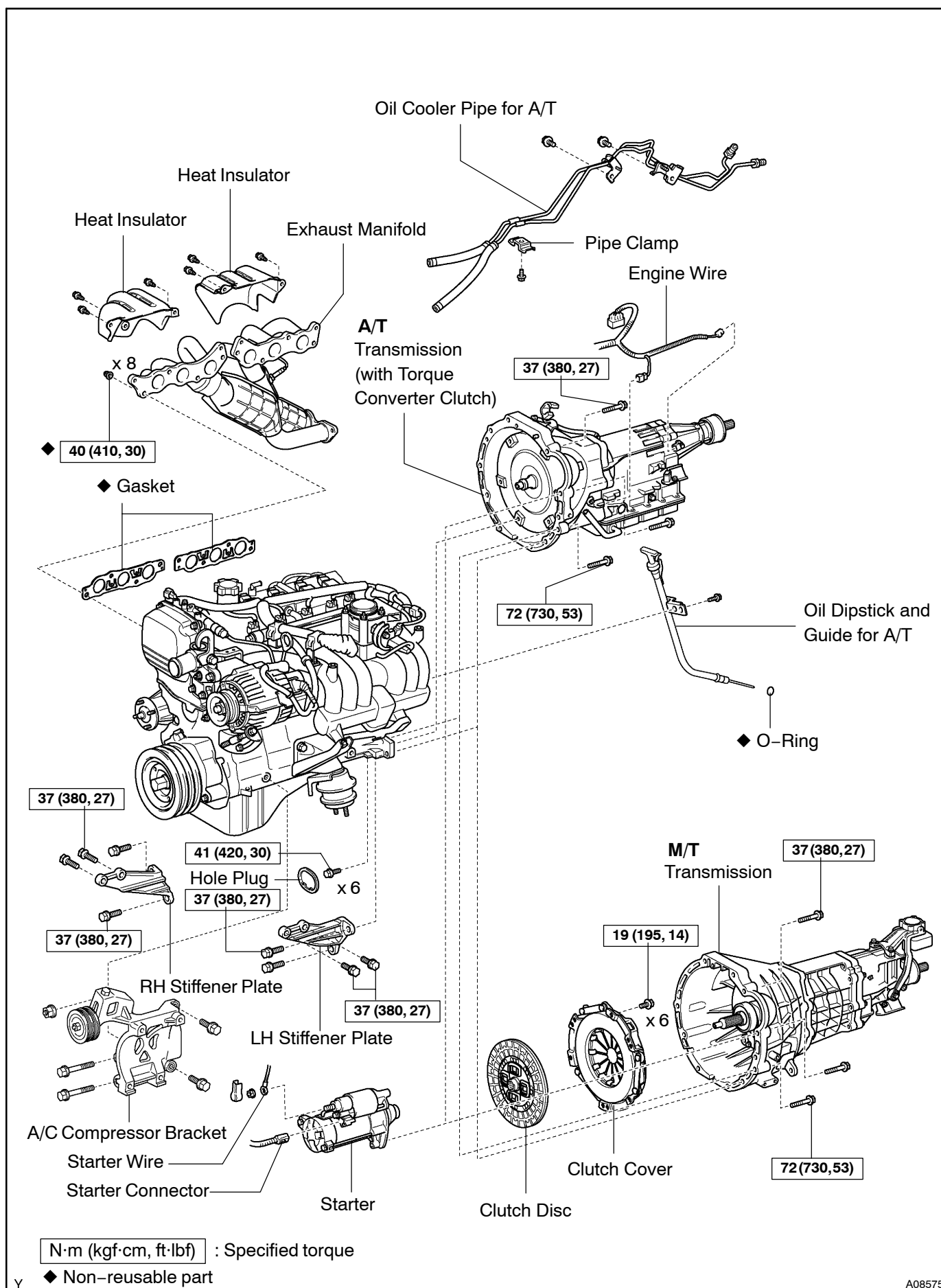
A08754



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

◆ Non-reusable part

A08574



A08575

REMOVAL

1. REMOVE HOOD
2. REMOVE NO.1 AND NO.2 ENGINE UNDER COVERS
3. DRAIN ENGINE COOLANT
4. DRAIN ENGINE OIL
5. DISCONNECT ACCELERATOR CABLE
6. REMOVE AIR CLEANER INLET
7. REMOVE AIR CLEANER ASSEMBLY
8. REMOVE RADIATOR ASSEMBLY (See page CO-16)
9. REMOVE NO.3 CYLINDER HEAD COVER
10. REMOVE DRIVE BELT FOR A/C COMPRESSOR (See page AC-17)
11. REMOVE DRIVE BELT FOR ALTERNATOR (See page CH-6)

HINT:

Before removing the drive belt, loosen the 4 fan pulley nuts.

12. REMOVE DRIVE BELT FOR PS VANE PUMP (See page SR-27)
13. REMOVE FAN SPACER AND PULLEY

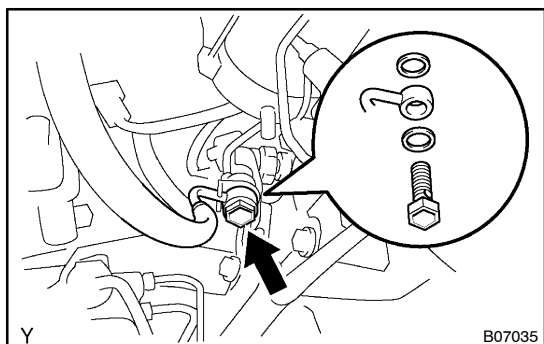
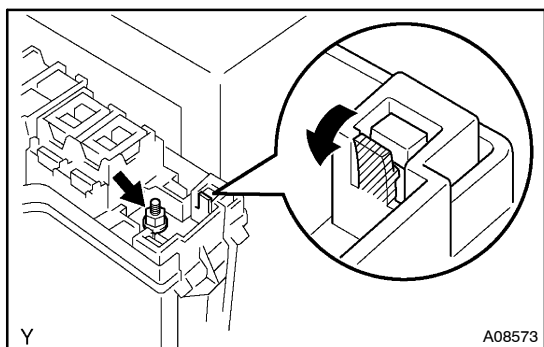
14. DISCONNECT ENGINE WIRE

HINT:

- Disconnect the engine wire from the vehicle side and remove it with engine assembly.
- In order to disconnect the engine room No.2 relay block and alternator wire, first remove the nut and push the tab on the side cover inward and then, pull the alternator wire upward with the side cover to remove.

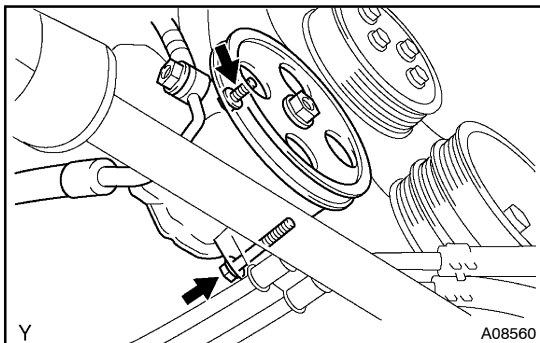
15. DISCONNECT HOSES

- (a) Disconnect the 2 heater hoses.
- (b) Disconnect the brake booster vacuum hose.
- (c) Disconnect the fuel vapor feed hose.



- (d) Disconnect the fuel inlet hose.

16. M/T:
REMOVE TRANSMISSION SHIFT LEVER (See page MT-5)

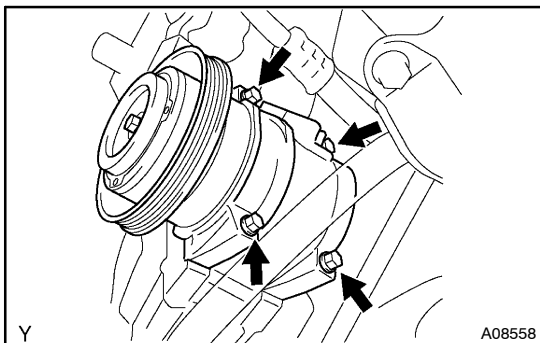


17. REMOVE PS VANE PUMP WITHOUT DISCONNECTING HOSES

- Disconnect the PS solenoid valve connector.
- Remove the 2 bolts, and disconnect the PS vane pump.

HINT:

Put aside the vane pump, and suspend it securely.

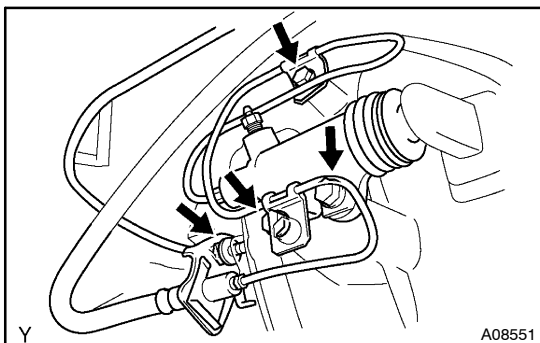


18. REMOVE A/C COMPRESSOR WITHOUT DISCONNECTING HOSES

- Disconnect the A/C compressor connector.
- Remove the 4 bolts, and disconnect the A/C compressor.

HINT:

Put aside the vane pump, and suspend it securely.

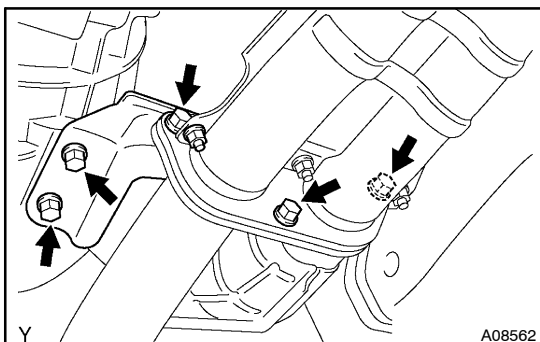


19. M/T: DISCONNECT CLUTCH RELEASE CYLINDER FROM TRANSMISSION

Remove the 4 bolts, and disconnect the clutch release cylinder and tube assembly and ground strap.

HINT:

Put aside the clutch release cylinder, and suspend it securely.



20. REMOVE FRONT AND CENTER EXHAUST PIPE ASSEMBLY

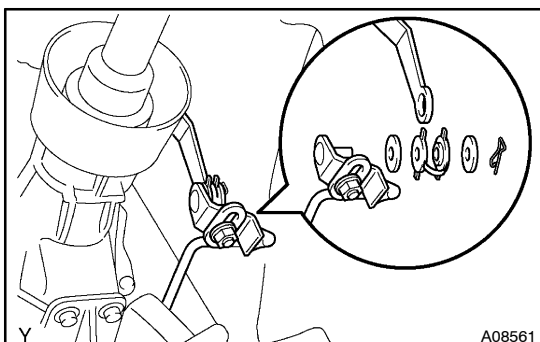
- Remove the 3 bolts, retainer and nut holding the front exhaust manifold to the front exhaust pipe.
- Remove the 2 bolts and exhaust manifold stay.
- Remove the 2 bolts and nuts holding the center exhaust pipe to the tailpipe.
- Remove the front and center exhaust pipe assembly and 3 gaskets.

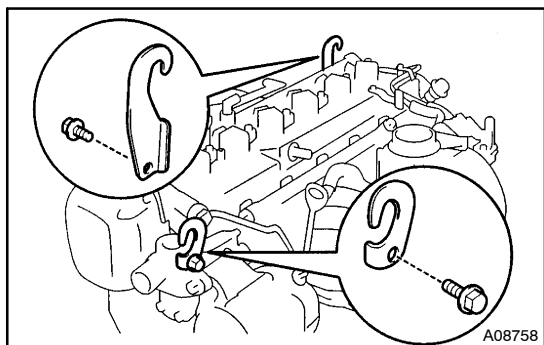
21. REMOVE PROPELLER SHAFT (See page PR-4)

22. A/T: DISCONNECT TRANSMISSION SHIFT CONTROL ROD

- Remove the clip and 2 plate washers, and disconnect the shift control rod.
- Remove the bushing.

23. RHD: REMOVE STEERING SLIDING YOKE (See page SR-23)





24. REMOVE ENGINE AND TRANSMISSION ASSEMBLY FROM VEHICLE

- (a) Install the No.1 and No.2 engine hangers in the correct direction.

Part No.:

No.1 engine hanger 12281-70050

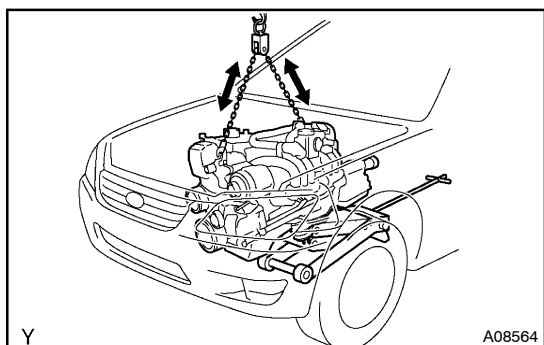
No.2 engine hanger 12282-70020

Bolt 91622-61020

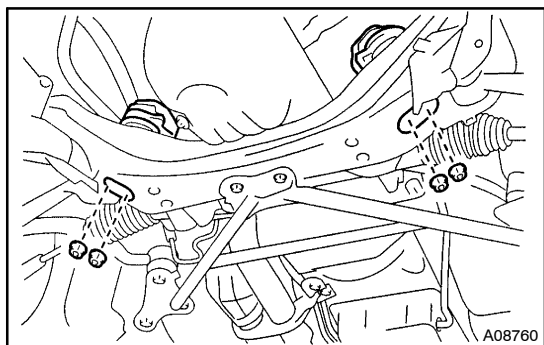
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

NOTICE:

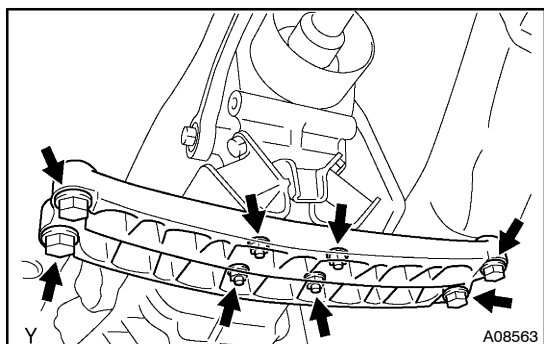
Prepare new bolts.



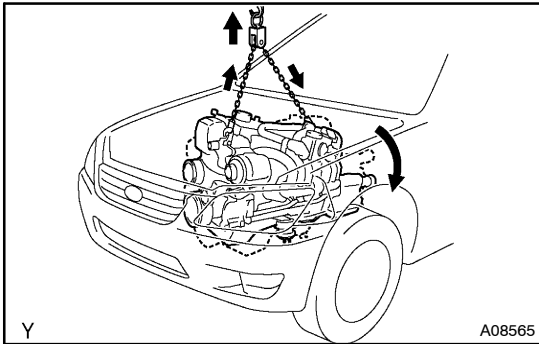
- (b) Attach the engine sling device to the engine hangers.



- (c) Remove the 4 nuts holding the engine mounting insulators to the front suspension crossmember.



- (d) Remove the 4 bolts, 4 nuts and rear engine mounting member.



(e) Lift the engine out of the vehicle slowly and carefully.

NOTICE:

Make sure the engine is clear of all wiring, hoses and cables.

(f) Place the engine and transmission assembly onto the stand.

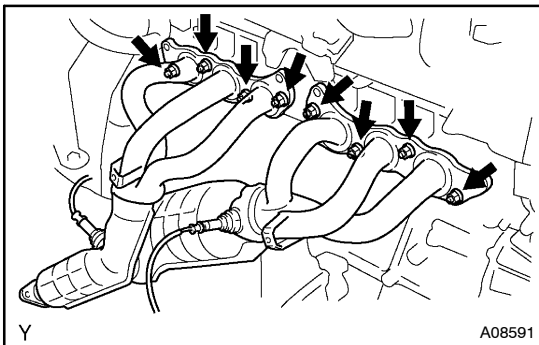
25. A/T:

REMOVE OIL DIPSTICK AND GUIDE FOR A/T

(a) Remove the bolt.

(b) Pull out the dipstick guide and dipstick from the dipstick tube.

(c) Remove the O-ring from the dipstick guide.



26. REMOVE EXHAUST MANIFOLD

(a) Remove the 6 bolts and 2 heat insulators.

(b) Remove the 3 nuts, exhaust manifold and 2 gaskets.

27. A/T:

REMOVE OIL COOLER PIPES

(a) Remove the 3 bolts and pipe clamps.

(b) Loosen the 2 union nuts, and remove the 2 oil cooler pipes.

28. A/T:

REMOVE TORQUE CONVERTER CLUTCH MOUNTING BOLTS (See page AT-29)

29. REMOVE STARTER

30. REMOVE TRANSMISSION

(a) Remove the 3 bolts.

(b) Remove the transmission together with the torque converter clutch (A/T) from the engine.

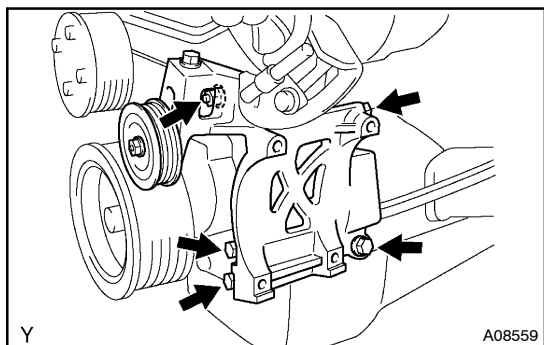
31. M/T:

REMOVE CLUTCH COVER AND DISC

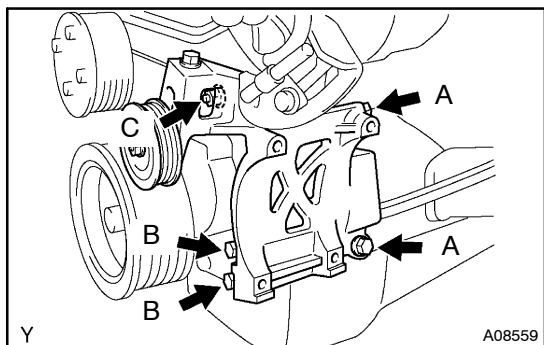
(See page CL-15)

32. REMOVE STIFFENER PLATES

Remove the 4 bolts and 2 stiffener plates.

**33. REMOVE A/C COMPRESSOR BRACKET**

Remove the 4 bolts, nut and compressor bracket.



INSTALLATION

1. INSTALL A/C COMPRESSOR BRACKET

- Install the compressor bracket with the 4 bolts and nut.
- Tighten the bolt B, nut C and bolt A.

Torque: 46.5 N·m (475 kgf·cm, 34 ft·lbf)

2. INSTALL STIFFENER PLATES

Install the LH and RH stiffener plates with the 4 bolts.

Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

3. M/T: INSTALL CLUTCH DISC AND COVER

(See page CL-17)

4. INSTALL TRANSMISSION TO ENGINE

- A/T:
Check the torque converter clutch installation.
(See page AT-32)
- Attach the transmission to the engine.
- Install the 8 bolts.

Torque:

37 N·m (380 kgf·cm, 27 ft·lbf) for 14 mm head

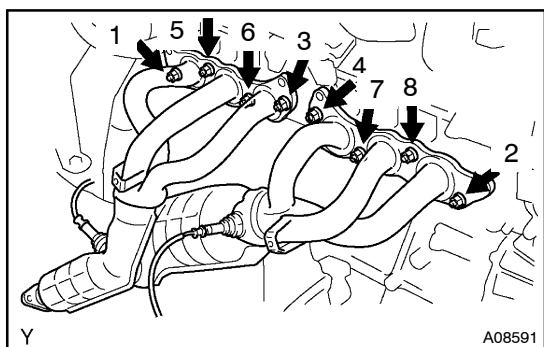
72 N·m (730 kgf·cm, 53 ft·lbf) for 17 mm head

5. INSTALL STARTER (See page ST-17)

Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

6. A/T: INSTALL TORQUE CONVERTER CLUTCH BOLTS (See page AT-32)

7. A/T: INSTALL OIL COOLER PIPE FOR A/T



8. INSTALL EXHAUST MANIFOLD

- Install 2 new gaskets to the cylinder head.
- Install the exhaust manifold with 8 new nuts, in several passes, in the sequence shown.

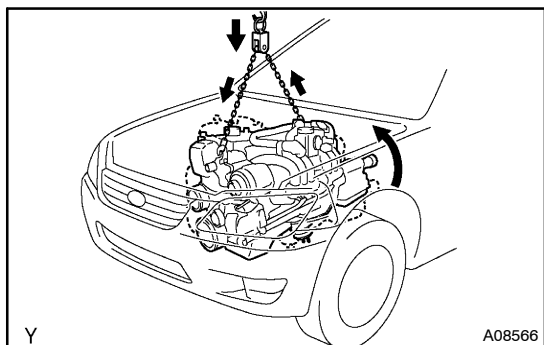
Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)

- Install the 2 heat insulators with the 6 bolts.

Torque: 18.5 N·m (190 kgf·cm, 14 ft·lbf)

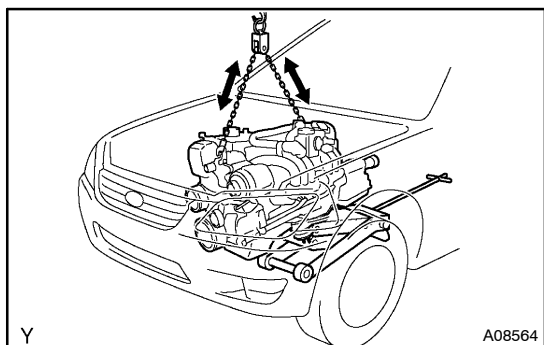
9. A/T: INSTALL OIL DIPSTICK GUIDE AND DIPSTICK FOR A/T

- Install a new O-ring to the dipstick guide.
- Push in the dipstick guide end to the dipstick tube of the transmission oil pan.
- Install the dipstick guide with the bolt.
- Install the dipstick.

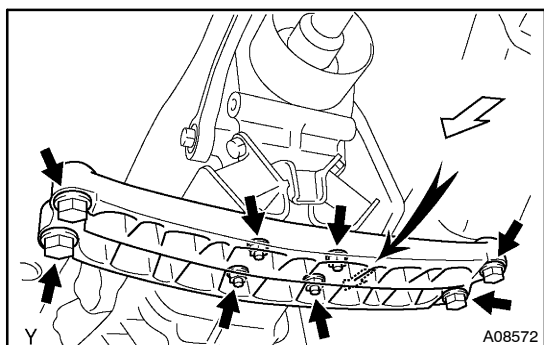


10. INSTALL ENGINE AND TRANSMISSION ASSEMBLY IN VEHICLE

- (a) Attach the engine sling device to the engine hangers.
- (b) Slowly lower the engine and transmission assembly into the engine compartment. Tilt the transmission downward, and lower the engine and transmission assembly.



- (c) Keep the engine level with a jack.



- (d) Install the rear engine mounting member with the 4 bolts and 4 nuts.

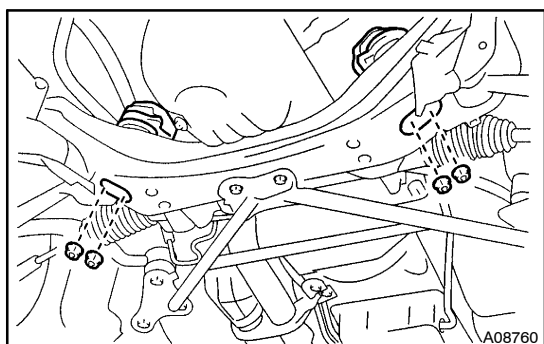
Torque:

25.5 N·m (260 kgf·cm, 19 ft·lbf) for bolts

13.5 N·m (135 kgf·cm, 10 ft·lbf) for nuts

NOTICE:

Be careful of installation direction.



- (e) Install the 4 nuts holding the engine mounting insulators to the front suspension crossmember.

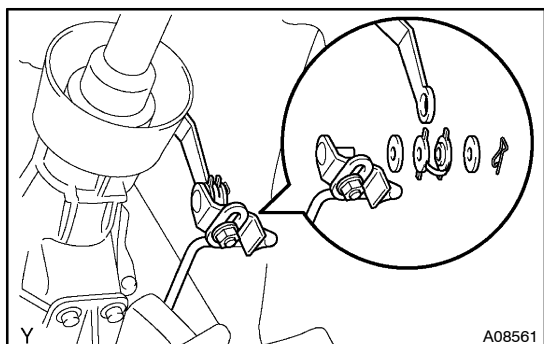
Torque: 53 N·m (540 kgf·cm, 39 ft·lbf)

- (f) Remove the engine sling device.

11. RHD:

INSTALL STEERING SLIDING YOKE

(See page SR-23)

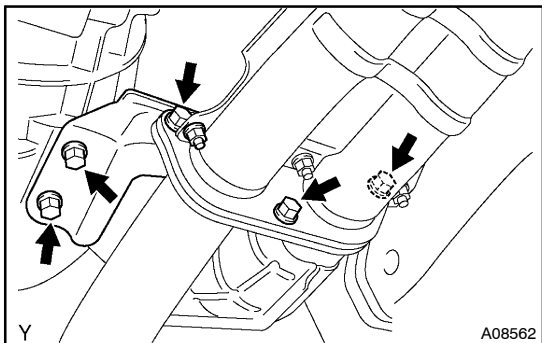


12. A/T:

CONNECT TRANSMISSION SHIFT CONTROL ROD

Connect the shift control rod to the shift lever with the bushing, 2 plate washers and clip.

13. INSTALL PROPELLER SHAFT (See page PR-10)



14. INSTALL FRONT AND CENTER EXHAUST PIPE ASSEMBLY

(a) Temporarily install the exhaust manifold stay to the transmission with the 2 bolts.

(b) Install 2 new gaskets to front end of the front exhaust pipe, and connect the front exhaust pipe to the exhaust manifold with the 3 bolts, a new retainer and a new nut.

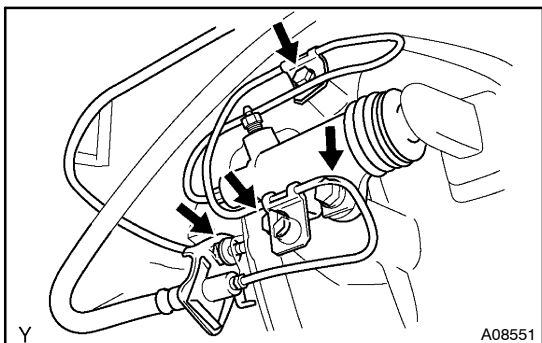
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

(c) Tighten the 2 bolts holding the exhaust manifold stay to the transmission.

Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)

(d) Install a new gasket to rear end of the center exhaust pipe, and connect the center exhaust pipe to the tailpipe with the 2 bolts, 2 compression springs and 2 new nuts.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)



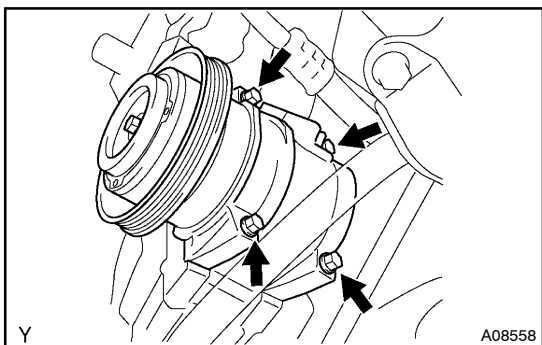
15. M/T: INSTALL CLUTCH RELEASE CYLINDER TO TRANSMISSION

Connect the clutch release cylinder and tube assembly and ground strap with the 4 bolts.

Torque:

12 N·m (120 kgf·cm, 9 ft·lbf) for 12 mm head

72 N·m (730 kgf·cm, 53 ft·lbf) for 17 mm head

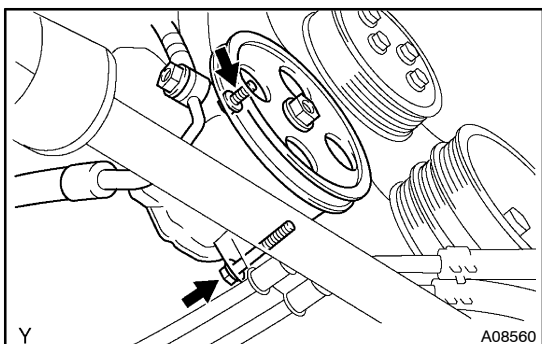


16. INSTALL A/C COMPRESSOR

(a) Install the A/C compressor with the 4 bolts.

Torque: 24.5 N·m (250 kgf·cm, 18 ft·lbf)

(b) Connect the A/C compressor connector.



17. INSTALL PS VANE PUMP

(a) Install the PS vane pump with the 2 bolts.

Torque:

58 N·m (590 kgf·cm, 43 ft·lbf) for pivot bolt

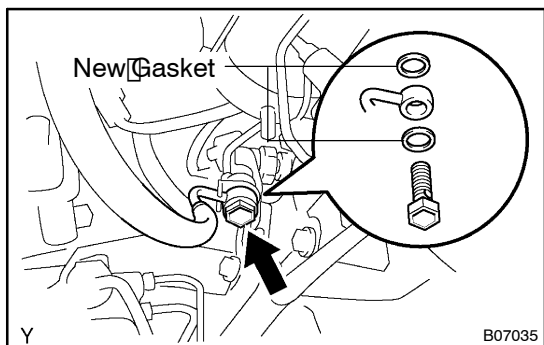
39 N·m (400 kgf·cm, 29 ft·lbf) for adjusting lock bolt

(b) Connect the PS solenoid valve connector.

18. M/T: INSTALL TRANSMISSION SHIFT LEVER (See page MT-8)

19. CONNECT HOSES

- (a) Connect the 2 heater hoses.
- (b) Connect the brake booster vacuum hose.
- (c) Connect the fuel vapor feed hose.



- (d) Connect the fuel inlet hose.

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

20. CONNECT ENGINE WIRE**21. INSTALL FAN PULLEY AND SPACER**

HINT:

Temporarily install the 4 nuts.

22. INSTALL DRIVE BELT FOR PS VANE PUMP
(See page SR-37)**23. INSTALL DRIVE BELT FOR ALTERNATOR**
(See page CH-15)**24. INSTALL DRIVE BELT FOR A/C COMPRESSOR**
(See page AC-18)**25. TIGHTEN MOUNTING NUTS OF FAN PULLEY AND SPACER**

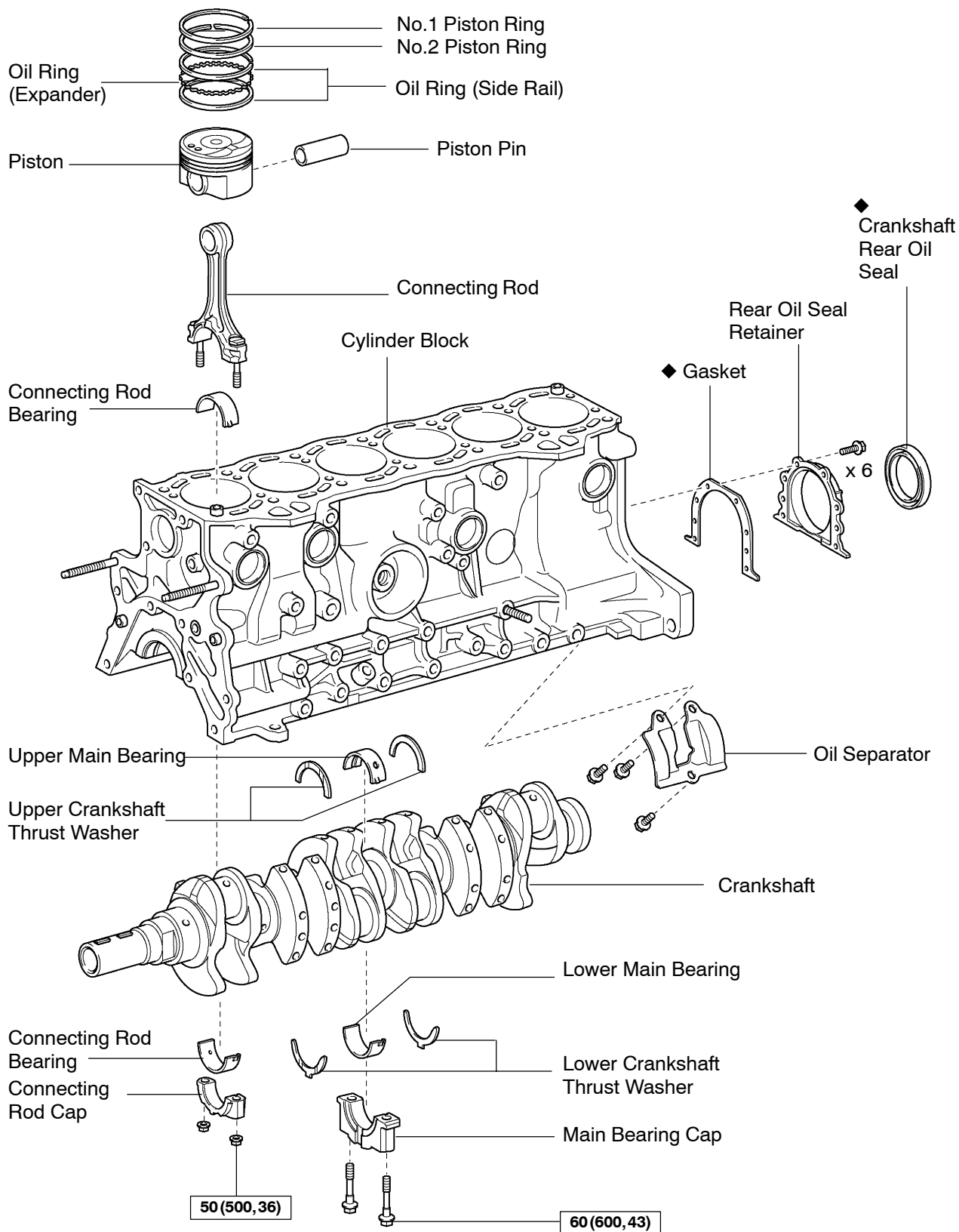
Torque: 18.5 N·m (185 kgf·cm, 13 ft·lbf)

26. INSTALL RADIATOR ASSEMBLY (See page CO-21)**27. INSTALL NO.3 CYLINDER HEAD COVER****28. INSTALL AIR CLEANER ASSEMBLY****29. INSTALL AIR CLEANER INLET****30. CONNECT ACCELERATOR CABLE****31. FILL ENGINE WITH OIL****32. FILL ENGINE WITH COOLANT****33. START ENGINE AND CHECK FOR LEAK****34. RECHECK ENGINE COOLANT AND OIL LEVELS****35. INSTALL NO.1 AND NO.2 ENGINE UNDER COVERS****36. INSTALL HOOD****37. ROAD TEST**

Check abnormal noise, shock, slippage, correct shift points and smooth operation.

EM11K-01





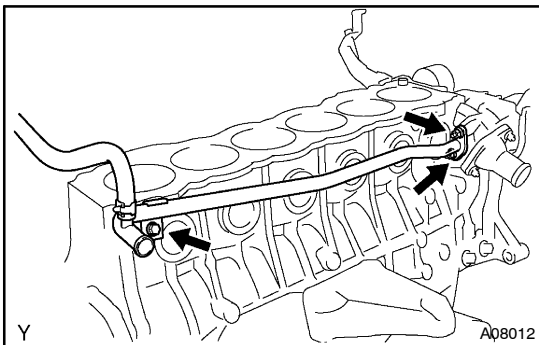
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

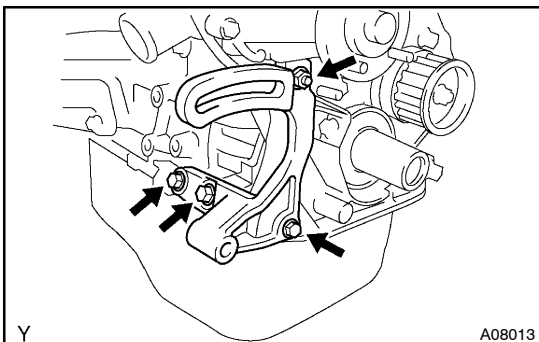
A08383

DISASSEMBLY

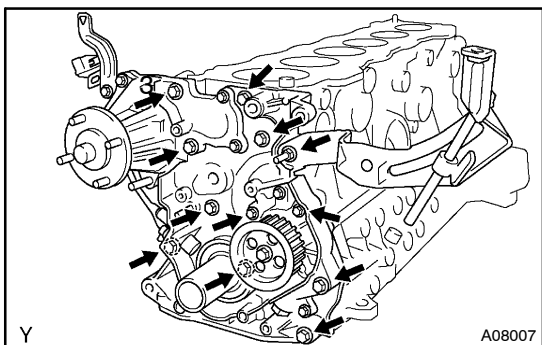
1. REMOVE DRIVE PLATE OR FLYWHEEL
2. REMOVE REAR END PLATE
3. INSTALL ENGINE TO ENGINE STAND FOR DIS-ASSEMBLY
4. REMOVE TIMING BELT AND PULLEYS
(See page EM-20)
5. REMOVE CYLINDER HEAD (See page EM-36)
6. REMOVE KNOCK SENSORS (See page FI-63)
7. REMOVE OIL FILTER (See page LU-3)
8. A/T:
REMOVE OIL FILTER UNION
9. M/T:
REMOVE OIL COOLER (See page LU-17)
10. REMOVE ENGINE COOLANT DRAIN UNION
11. REMOVE OIL PRESSURE SWITCH
(See page LU-1)
12. REMOVE LH ENGINE MOUNTING BRACKET AND INSULATOR ASSEMBLY
13. REMOVE OIL DIPSTICK GUIDE SUPPORT



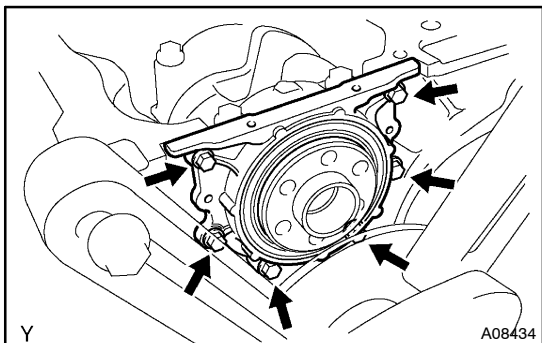
14. REMOVE NO.2 HEATER WATER OUTLET PIPE
Remove the bolt, 2 nuts, No.2 heater water outlet pipe and gasket.
15. REMOVE RH ENGINE MOUNTING BRACKET AND INSULATOR ASSEMBLY
16. REMOVE OIL PAN AND OIL STRAINER
(See page LU-8)



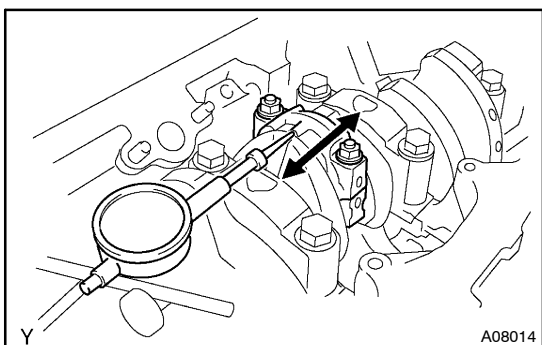
17. REMOVE PS VANE PUMP BRACKET
Remove the 3 bolts, nut and pump bracket.

**18. REMOVE TIMING BELT CASE**

Remove the 11 bolts, nut, timing belt case, alternator adjusting bar and gasket.

**19. REMOVE REAR OIL SEAL RETAINER**

Remove the 6 bolts, retainer and gasket.

**20. CHECK CONNECTING ROD THRUST CLEARANCE**

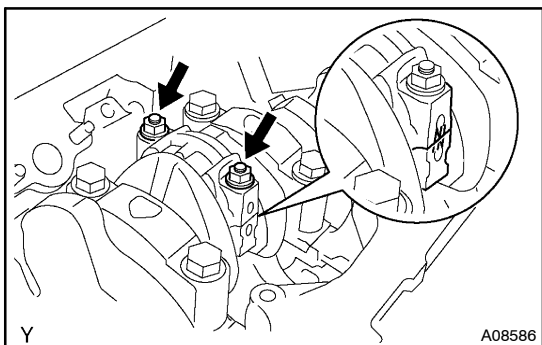
Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance:

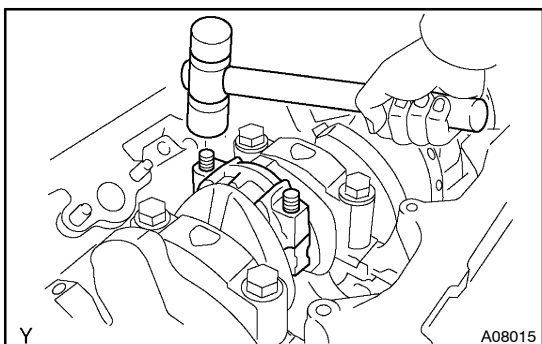
0.200 – 0.402 mm (0.0079 – 0.0158 in.)

Maximum thrust clearance: 0.45 mm (0.0188 in.)

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

**21. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE**

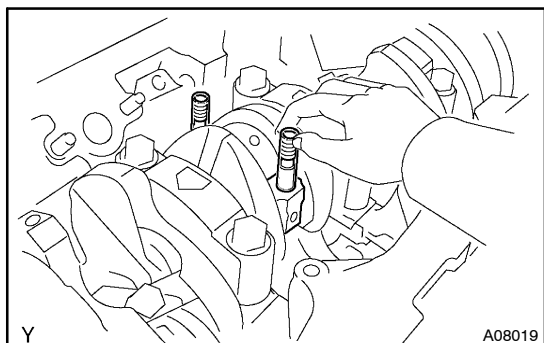
- (a) Check the matchmarks on the connecting rod and cap to ensure correct reassembly.
- (b) Remove the 2 connecting rod cap nuts.



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

HINT:

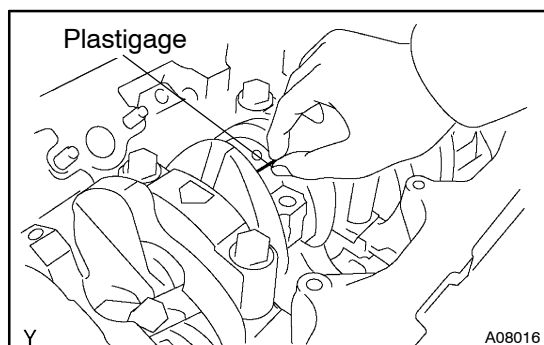
Keep the lower bearing inserted with the connecting rod cap.



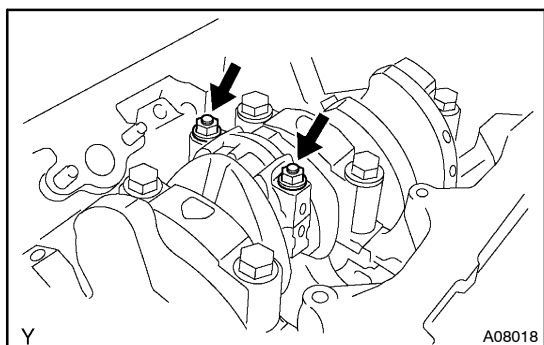
(d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.

(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.



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

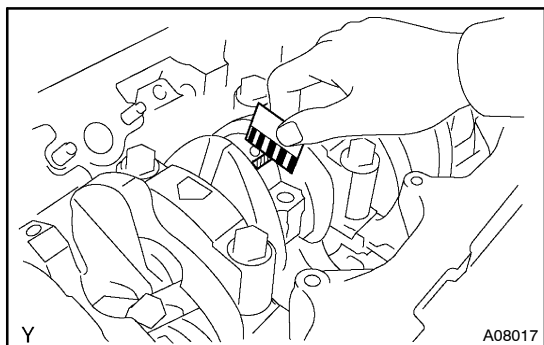


(h) Install the connecting rod cap with the 2 nuts.
(See page EM-97)

NOTICE:

Do not turn the crankshaft.

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



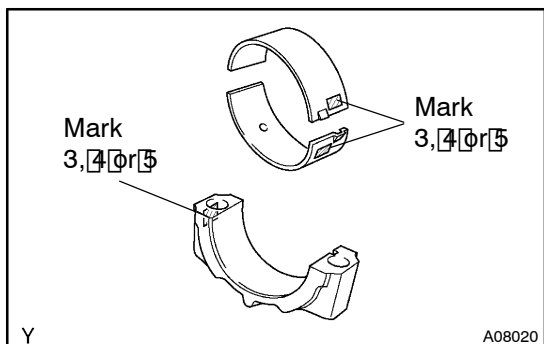
(j) Measure the Plastigage at its widest point.

Standard oil clearance:

STD size	0.016 – 0.047 mm (0.0006 – 0.0019 in.)
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Maximum oil clearance: 0.07 mm (0.0028 in.)

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



HINT:

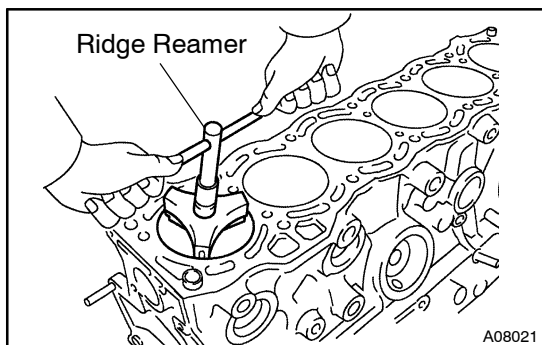
If using a standard bearing, replace it with one having the same number marked on the connecting rod cap. There are 3 sizes of standard bearings, marked "3", "4" and "5" accordingly.

Reference

Standard sized bearing center wall thickness:

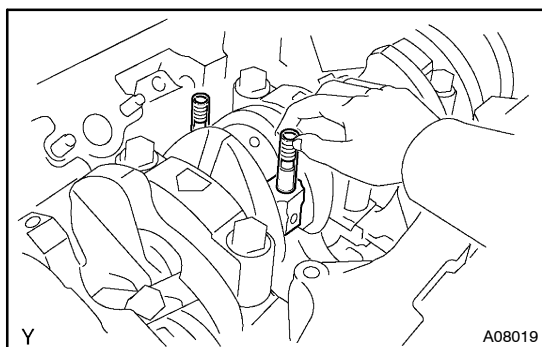
Mark "3"	1.488 – 1.492 mm (0.0586 – 0.0587 in.)
Mark "4"	1.492 – 1.496 mm (0.0587 – 0.0589 in.)
Mark "5"	1.496 – 1.500 mm (0.0589 – 0.0591 in.)

- (k) Completely remove the Plastigage.



22. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

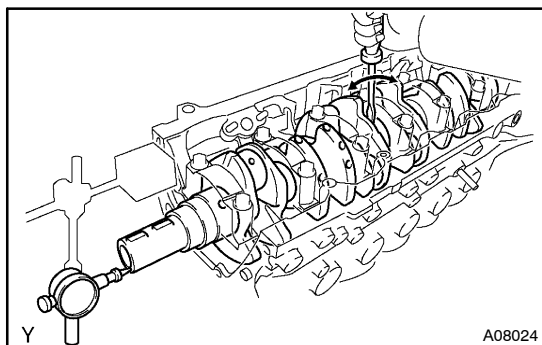
- (a) Using a ridge reamer, remove all the carbon from the top of the cylinder.



- (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 the correct order.



23. CHECK CRANKSHAFT THRUST CLEARANCE

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

Standard thrust clearance:

0.020 – 0.221 mm (0.0008 – 0.0087 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

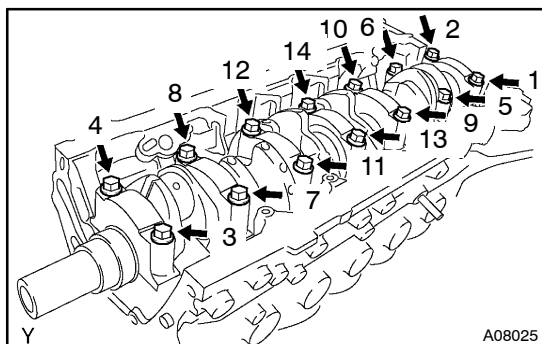
If the thrust clearance is greater than maximum, replace the thrust washer as a set.

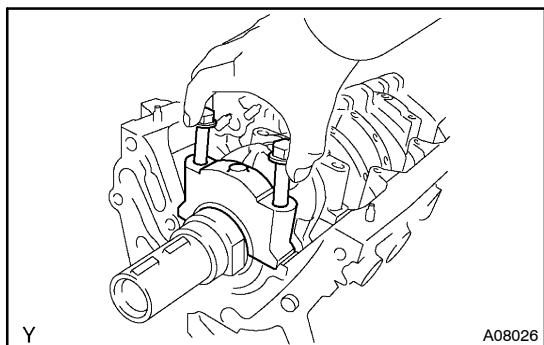
Thrust washer thickness:

1.940 – 1.990 mm (0.0764 – 0.0783 in.)

24. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE

- (a) Uniformly loosen and remove the 14 main bearing cap bolts, in several passes, in the sequence shown.





- (b) Using the removed main bearing cap bolts, wiggle the cap back and forth, and remove the 7 main bearing caps, 7 lower bearings and 2 lower thrust washers (No. 4 main bearing cap only).

HINT:

- Keep the lower bearing and main bearing cap together.
- Arrange the main bearing caps and lower thrust washers in the correct order.

- (c) Lift out the crankshaft.

HINT:

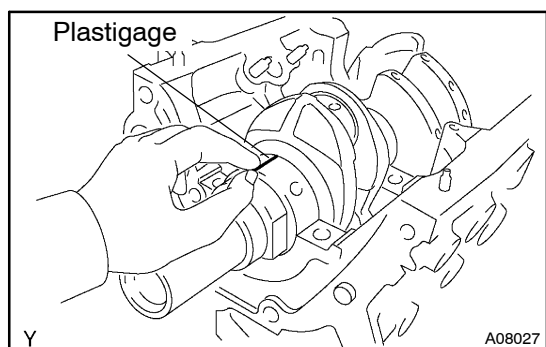
Keep the upper bearing and upper thrust washers together with the cylinder block.

- (d) Clean each main journal and bearing.

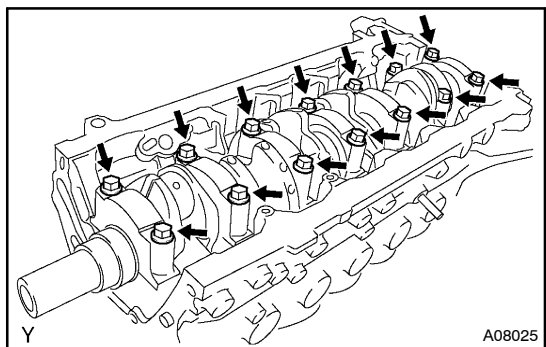
- (e) Check each main journal and bearing for pitting and scratches.

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.

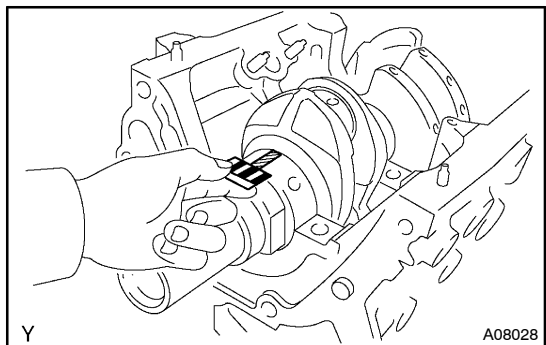


- (h) Install the main bearing caps. (See page EM-97)

NOTICE:

Do not turn the crankshaft.

- (i) Remove the main bearing caps.
(See procedure (a) and (b) above)



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

Standard oil clearance:

No. 4	STD size	0.032 – 0.050 mm (0.0013 – 0.0020 in.)
Others	STD size	0.020 – 0.038 mm (0.0008 – 0.0015 in.)

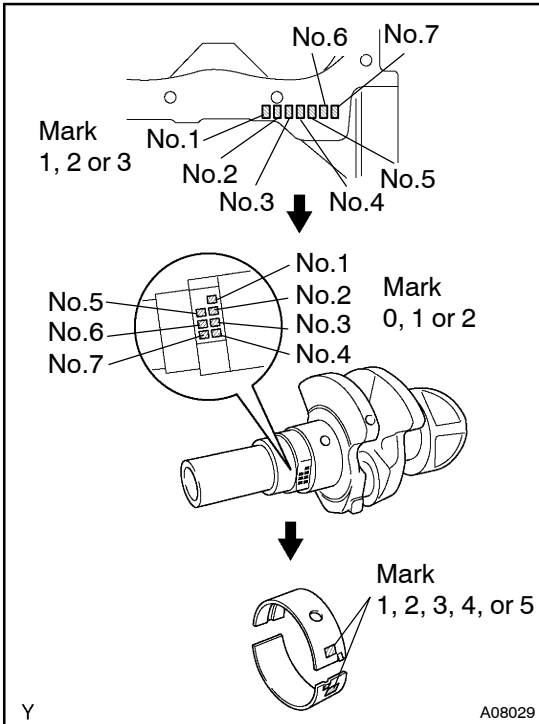
Maximum oil clearance: 0.08 mm (0.0031 in.)

HINT:

If replacing the cylinder block subassembly, the bearing standard clearance will be:

No.4	0.020 – 0.068 mm (0.0008 – 0.0024 in.)
Others	0.008 – 0.050 mm (0.0003 – 0.0020 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. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then selecting the bearing with the same number as the total. There are 5 sizes of standard bearings, marked "1", "2", "3", "4" and "5" accordingly.

	Number marked								
	1			2			3		
Cylinder block									
Crankshaft	0	1	2	0	1	2	0	1	2
Use bearing	1	2	3	2	3	4	3	4	5

EXAMPLE: Cylinder block "2" + Crankshaft "1"
= Total number 3 (Use bearing "3")

Reference

Cylinder block main journal bore diameter:

Mark "1"	59.026 – 59.032 mm (2.3239 – 2.3241 in.)
Mark "2"	59.032 – 59.038 mm (2.3241 – 2.3243 in.)
Mark "3"	59.038 – 59.044 mm (2.3243 – 2.3246 in.)

Crankshaft main journal diameter:

No.4

Mark "0"	54.982 – 54.988 mm (2.1646 – 2.1649 in.)
Mark "1"	54.976 – 54.982 mm (2.1644 – 2.1646 in.)
Mark "2"	54.970 – 54.976 mm (2.1642 – 2.1644 in.)

Others

Mark "0"	54.994 – 55.000 mm (2.1651 – 2.1654 in.)
Mark "1"	54.988 – 54.994 mm (2.1649 – 2.1651 in.)
Mark "2"	54.982 – 54.988 mm (2.1646 – 2.1649 in.)

Standard sized bearing center wall thickness:

Mark "1"	2.000 – 2.003 mm (0.0787 – 0.0789 in.)
Mark "2"	2.003 – 2.006 mm (0.0789 – 0.0790 in.)
Mark "3"	2.006 – 2.009 mm (0.0790 – 0.0791 in.)
Mark "4"	2.009 – 2.012 mm (0.0791 – 0.0792 in.)
Mark "5"	2.012 – 2.015 mm (0.0792 – 0.0793 in.)

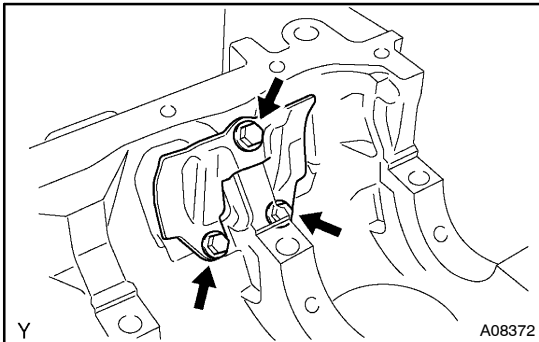
(k) Completely remove the Plastigage.

25. REMOVE CRANKSHAFT

- Lift out the crankshaft.
- Remove the 7 upper bearings and 2 upper thrust washers from the cylinder block.

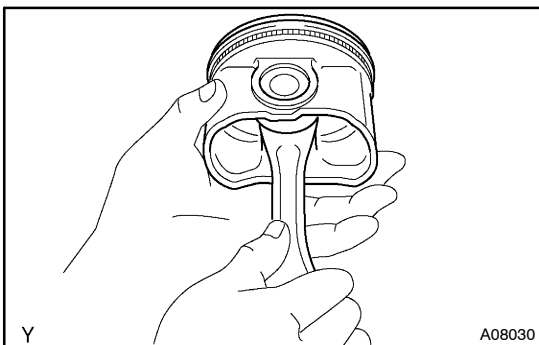
HINT:

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



26. REMOVE OIL SEPARATOR

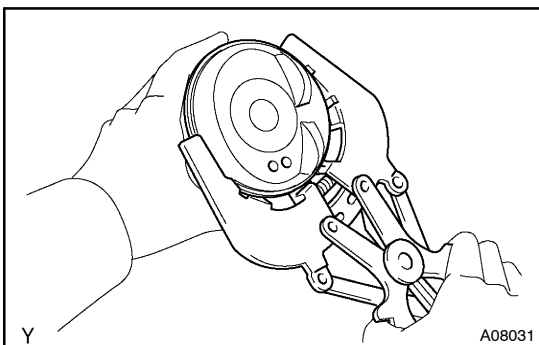
Remove the 3 bolts and oil separator.



27. CHECK FIT BETWEEN PISTON AND PISTON PIN

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.

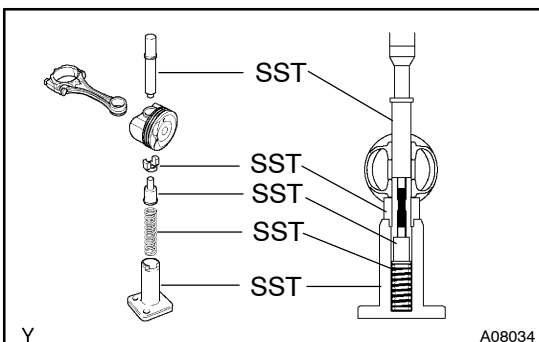


28. REMOVE PISTON RINGS

- Using a piston ring expander, remove the No.1 and No.2 piston rings.
- Remove the 2 side rails and oil ring expander by hand.

HINT:

Arrange the piston rings in correct order only.



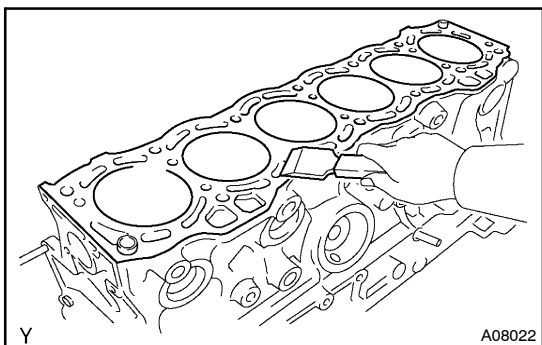
29. DISCONNECT CONNECTING ROD FROM PISTON

Using SST, press out the piston pin from the piston.

SST 09221-25026 (09921-00021, 09221-00030, 09221-00061, 09221-00170, 09221-00210)

HINT:

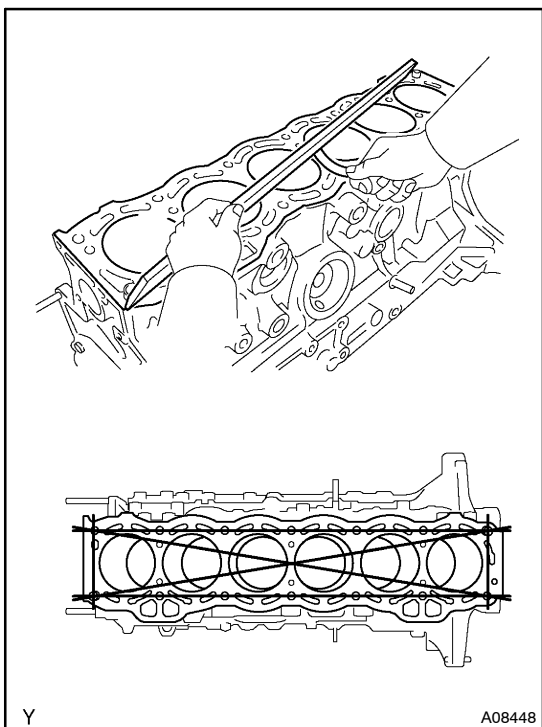
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in the correct order.



INSPECTION

1. CLEAN CYLINDER BLOCK

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

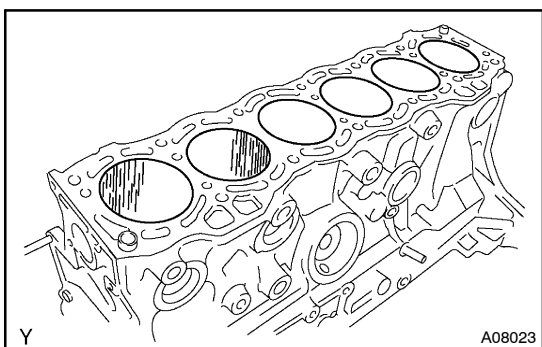


2. INSPECT CYLINDER BLOCK

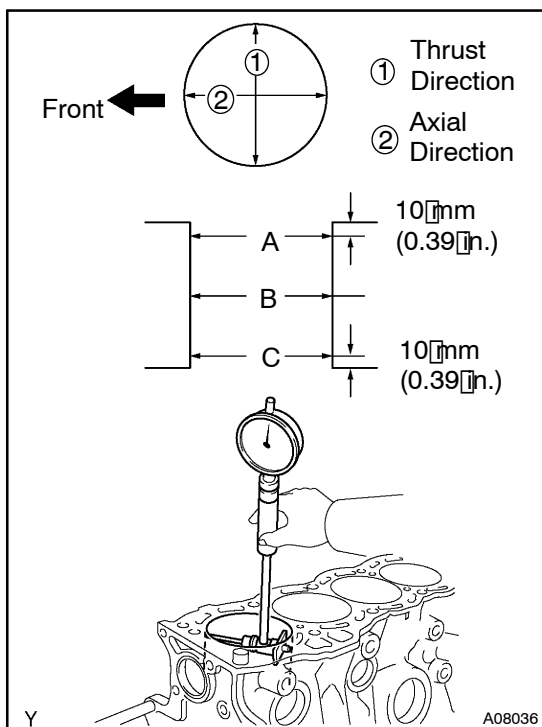
- (a) Inspect for flatness.
Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head gasket for warpage.

Maximum warpage: 0.05 mm (0.0020 in.)

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



- (b) Visually check the cylinder for vertical scratches.
If deep scratches are found, rebore all the 6 cylinders and replace all the 6 pistons. (See page EM-94) If necessary, replace the cylinder block.



(c) Inspect the cylinder bore diameter.

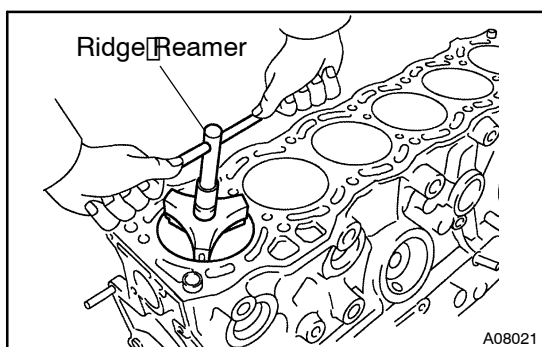
Using a cylinder gauge, measure the cylinder bore diameter at the positions A, B and C in the thrust and axial directions.

Standard diameter:

75.010 – 75.023 mm (2.9531 – 2.9537 in.)

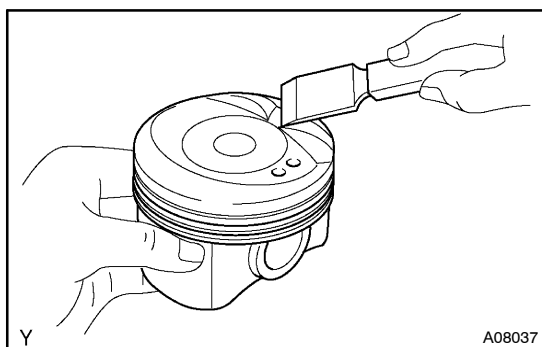
Maximum diameter: 75.223 mm (2.9615 in.)

If the diameter is greater than maximum, rebore all the 6 cylinders and replace all the 6 pistons. (See page EM-94) If necessary, replace the cylinder block.



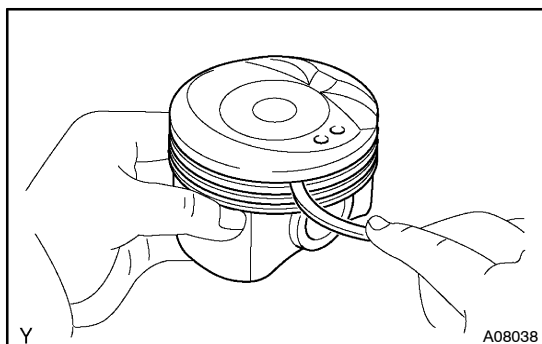
(d) Remove the cylinder ridge.

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

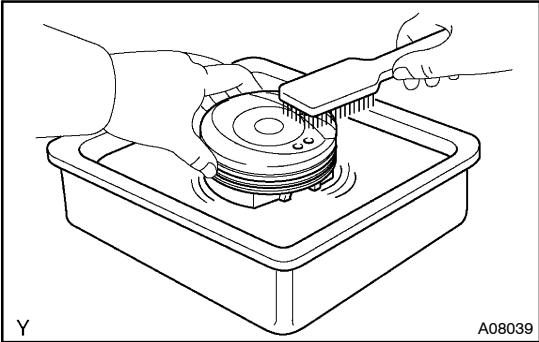


3. CLEAN PISTON

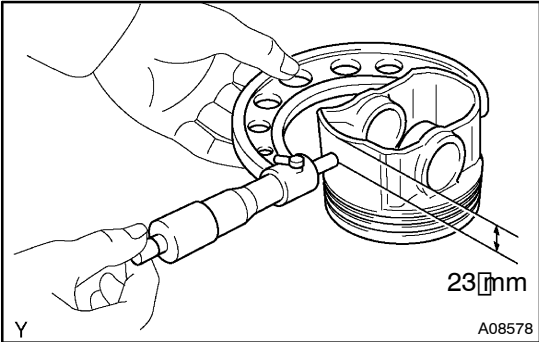
(a) Using a gasket scraper, remove the carbon from the piston top.



(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.



4. INSPECT PISTON AND CONNECTING ROD

- (a) Inspect the piston oil clearance.
 (1) Using a micrometer, measure the piston diameter at a right angles to the piston pin center line, 23 mm (0.91 in.) below the skirt bottom edge.

Piston diameter:

STD	74.93 - 74.94 mm (2.9500 - 2.9504 in.)
O/S 0.50	75.43 - 75.44 mm (2.9697 - 2.9701 in.)

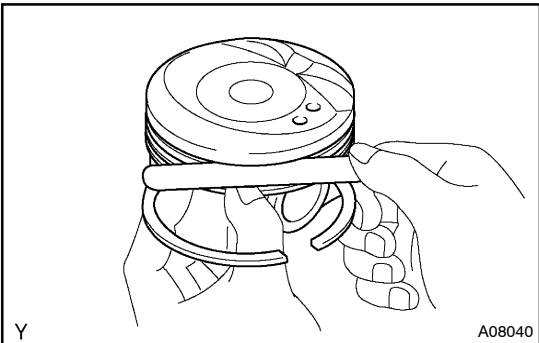
- (2) Measure the cylinder bore diameter in the thrust directions. (See step 2)
 (3) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:

0.070 - 0.093 mm (0.0028 - 0.0037 in.)

Maximum oil clearance: 0.11 mm (0.0043 in.)

If the oil clearance is greater than maximum, replace all the 6 pistons and rebore all the 6 cylinders. (See page EM-94) If necessary, replace the cylinder block.

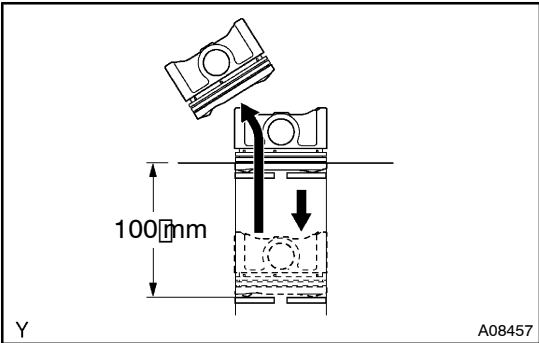


- (b) Inspect the piston ring groove clearance.
 Using a feeler gauge, measure the clearance between new piston ring and the wall of the ring groove.

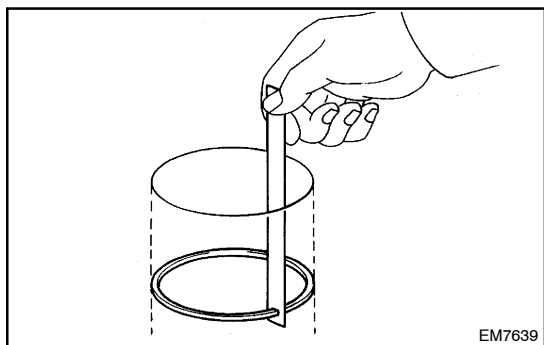
Ring groove clearance:

No.1	0.030 - 0.080 mm (0.0012 - 0.0031 in.)
No.2	0.030 - 0.070 mm (0.0012 - 0.0028 in.)

If the clearance is not as specified, replace the piston.



- (c) 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, 100 mm (3.94 in.) from the top of the cylinder block.



EM7639

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

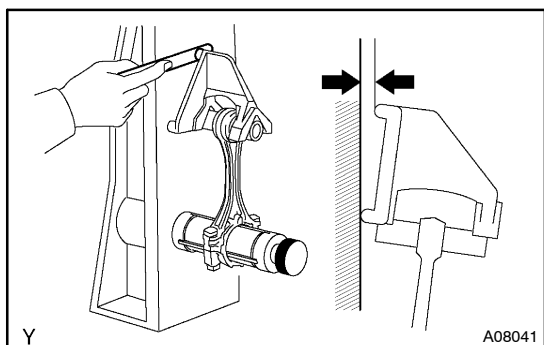
Standard end gap:

No.1	0.20–0.30 mm (0.0078 – 0.0118 in.)
No.2	0.35 – 0.50 mm (0.0138 – 0.0196 in.)
Oil (Side/Jail)	0.15 – 0.40 mm (0.0059 – 0.0157 in.)

Maximum end gap:

No.1	0.90 mm (0.0354 in.)
No.2	1.10 mm (0.0433 in.)
Oil (Side/Jail)	1.00 mm (0.0394 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 cylinders (see page EM-94) or replace the cylinder block.



Y

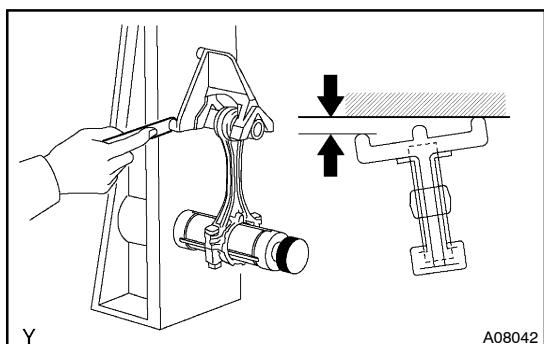
A08041

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

(1) Check for out-of-alignment.

Maximum out-of-alignment:**0.05 mm (0.0020 in.) per 100 mm (3.94 in.)**

If out-of-alignment is greater than maximum, replace the connecting rod assembly.



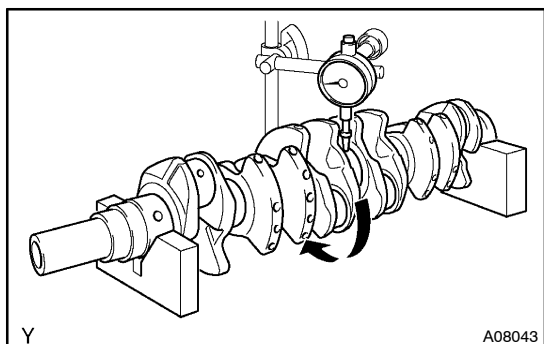
Y

A08042

(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 assembly.



Y

A08043

5. INSPECT CRANKSHAFT

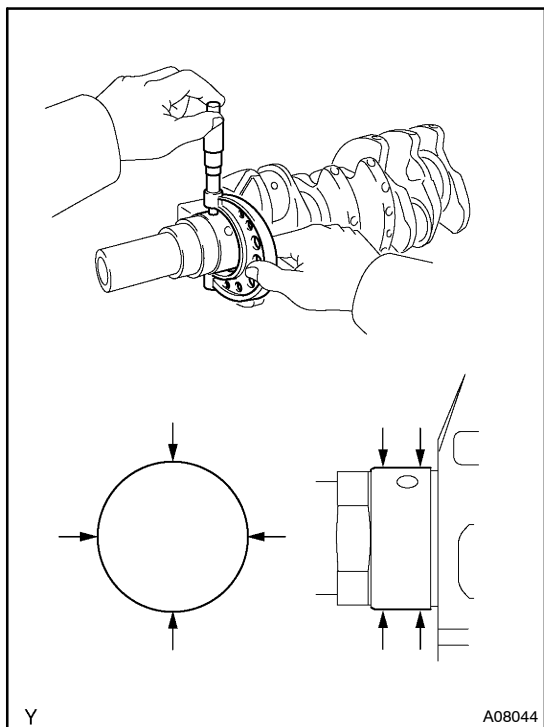
(a) Inspect for circle runout.

(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.



(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:

No.4	STD size	54.970 - 54.988 mm (2.1641 - 2.1649 in.)
Others	STD size	54.982 - 55.000 mm (2.1646 - 2.1654 in.)

Crank pin diameter:

STD size	43.985 - 44.000 mm (1.7317 - 1.7322 in.)
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If the diameter is not as specified, check the oil clearance. (See page EM-82) 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.

6. IF NECESSARY, GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS

Grind and hone the main journals and/or crank pins to the finished undersized diameter. (See procedure in step 5) Install new main journal and/or crankshaft pin undersized bearings.

REPLACEMENT

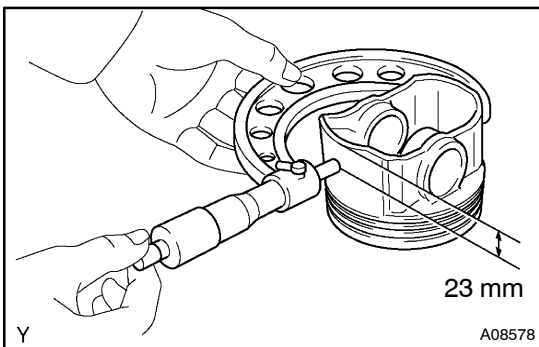
1. REPLACE OVERSIZED (O/S) PISTONS FOR CYLINDER BORING

HINT:

- Bore all the 6 cylinders for the O/S piston outside diameter.
 - Replace all the piston rings with ones to match the O/S pistons.
- (a) Keep 6 new O/S pistons.

O/S 0.50 piston diameter:

75.43 – 75.44 mm (2.9697 – 2.9701 in.)



- (b) Using a micrometer, measure the piston diameter at a right angles to the piston pin center line, 23 mm (0.91 in.) below the skirt bottom edge.
- (c) Calculate the amount of each cylinder to be rebored as follows:

Size to be rebored = P + C – H

P = Piston diameter

C = Piston oil clearance

0.070 – 0.093 mm (0.0028 – 0.0037 in.)

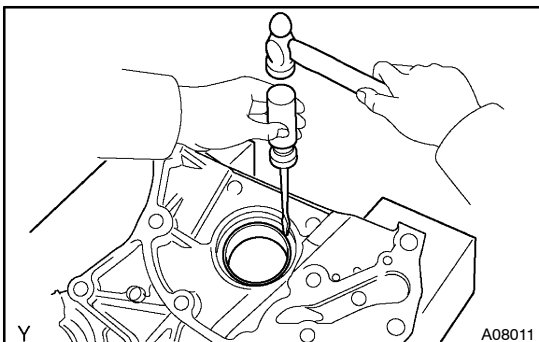
H = Allowance for honing

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.

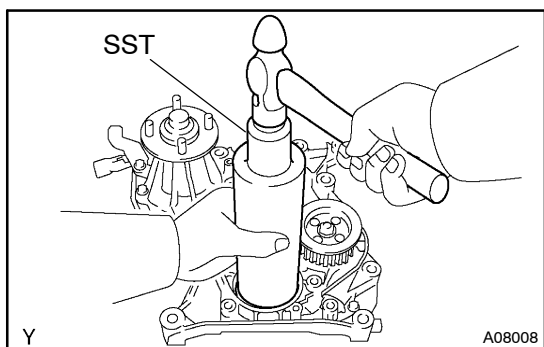


2. REPLACE CRANKSHAFT FRONT OIL SEAL

HINT:

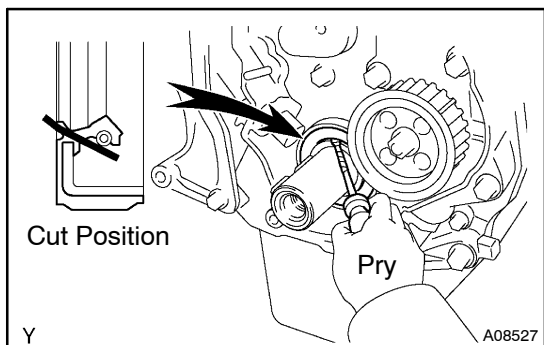
There are 2 methods ((a) and (b)) to replace the oil seal.

- (a) If the timing belt case is removed from the cylinder block:
- (1) Using a screwdriver and hammer, tap out the oil seal.



- (2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing belt case edge.

SST 09316-60011 (09316-00011)



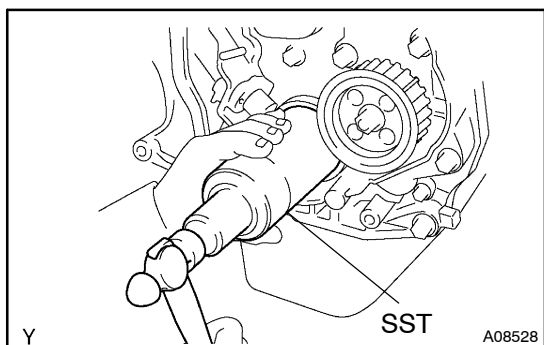
- (b) If the timing belt case is installed to the cylinder block:

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

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

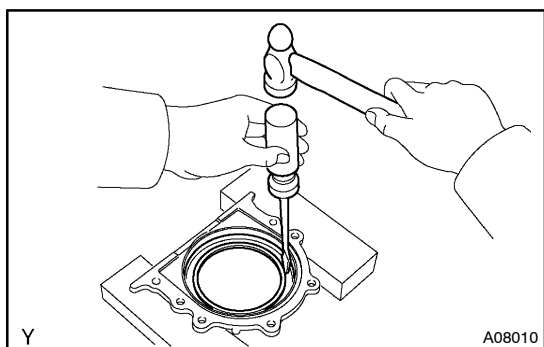
NOTICE:

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



- (3) Using SST and a hammer, tap in the oil seal until its surface is flush with the timing belt case edge.

SST 09316-60011 (09316-00011)



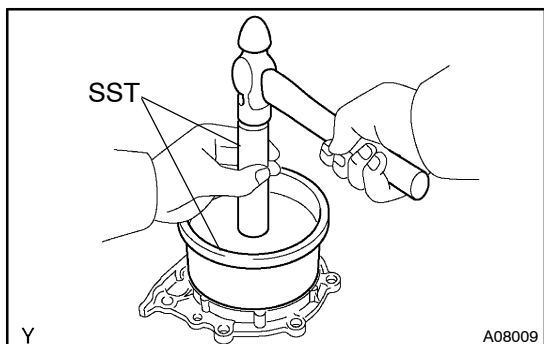
3. REPLACE CRANKSHAFT REAR OIL SEAL

HINT:

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

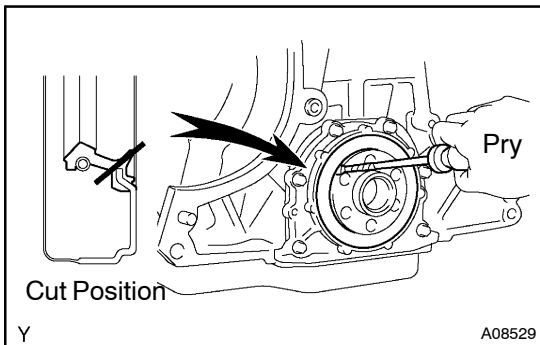
- (a) If the rear oil seal retainer is removed from the cylinder block:

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



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

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

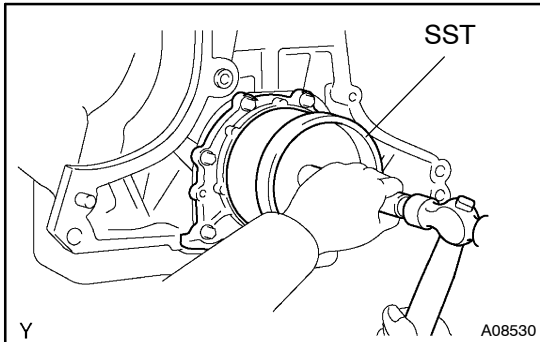


(b) If rear oil seal retainer is installed to cylinder block:

- (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 crankshaft. Tape the screwdriver tip.



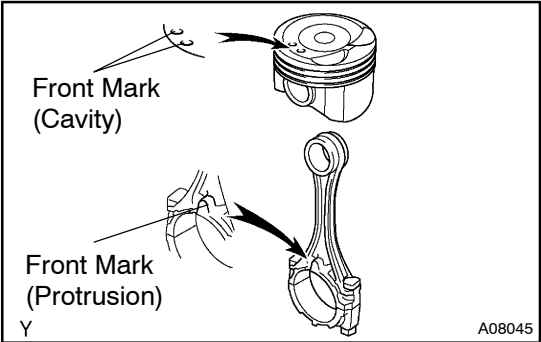
- (3) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.

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

REASSEMBLY

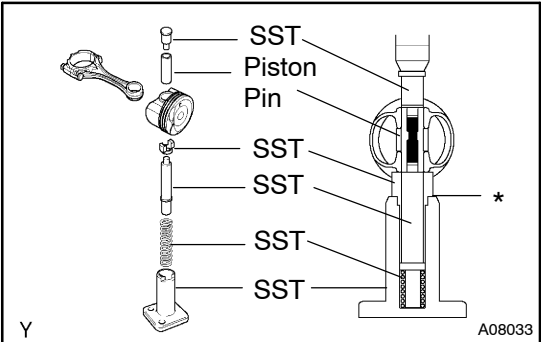
HINT:

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

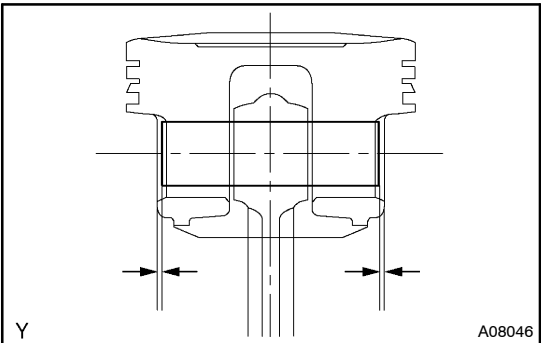


1. ASSEMBLE PISTON AND CONNECTING ROD

- Coat the piston pin and piston hole of the piston with engine oil.
- Align the front marks of the piston and connecting rod.



- Using SST, press in the piston.
SST 09221-25026 (09921-00021, 09221-00030, 09221-00061, 09221-00170, 09221-00210)



- After installing the piston pin, check that when the connecting rod is aligned with the center of the piston the space between the piston and each end of the piston pin is equal on the left and right sides.

HINT:

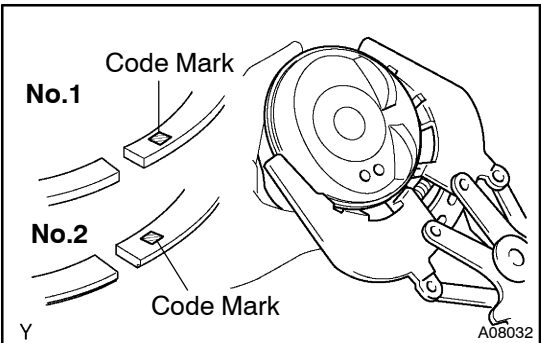
If the piston pin is off-center due to insufficient insertion pressure on piston pin, place a washer at the position indicated by * in the illustration for (c). Then while checking that the space is equal at the ends of the piston pin on the left and right sides, press in the washer.

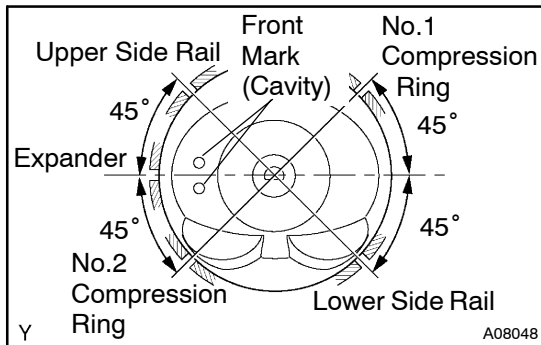
2. INSTALL PISTON RINGS

- Install the oil ring expander and 2 side rails by hand.
- Using a piston ring expander, install the No.2 and No.1 piston rings with the code mark facing upward.

Code mark:

No.1	1R
No.2	2R

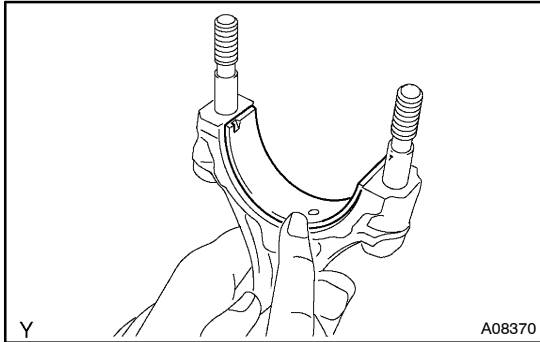




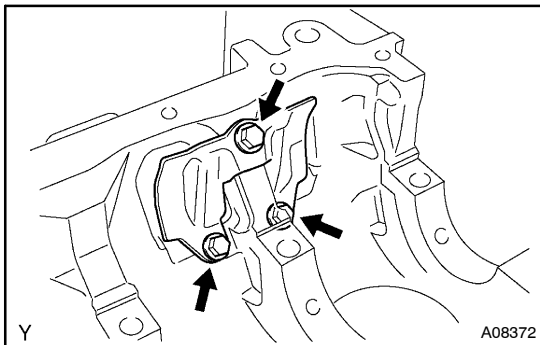
- (c) Position the piston rings so that the ring ends are as shown.

NOTICE:

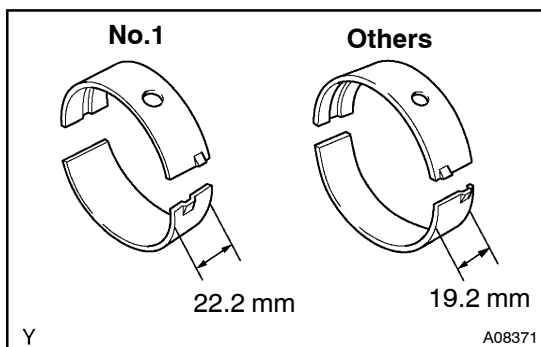
Do not align the ring ends.

**3. INSTALL CONNECTING ROD BEARINGS**

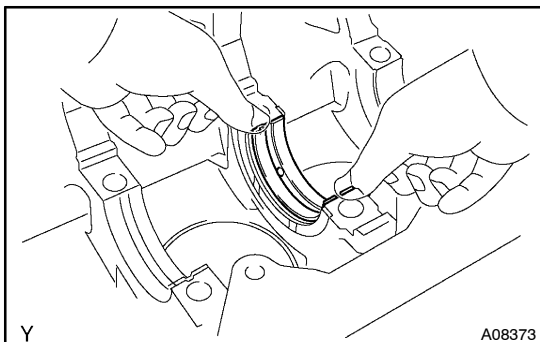
- (a) Align the bearing claw with the groove of the connecting rod or connecting cap.
- (b) Install the bearings in the connecting rod and connecting rod cap.

**4. INSTALL OIL SEPARATOR**

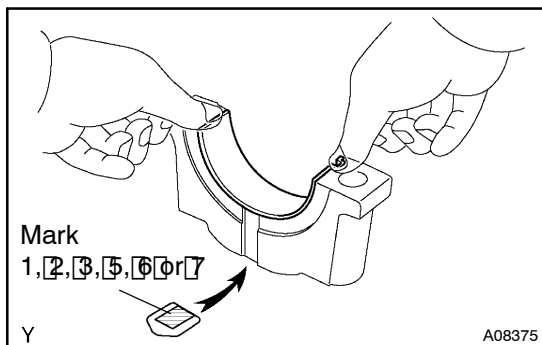
Install the oil separator with the 3 bolts.

**5. INSTALL MAIN BEARINGS****HINT:**

- Main bearings come in widths of 19.2 mm (0.756 in.) and 22.2 mm (0.874 in.). Install the 22.2 mm (0.874 in.) bearings in the No.1 cylinder block journal position with the main bearing cap. Install the 19.2 mm (0.756 in.) bearings in the other positions.
- Upper bearings have an oil groove and oil holes; lower bearings do not.



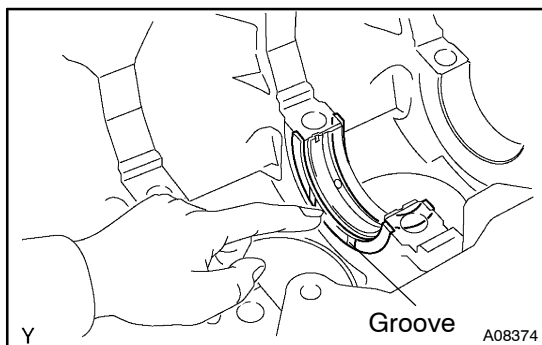
- (a) Align the bearing claw with the claw groove of the cylinder block, and push in the 7 upper bearings.



- (b) Align the bearing claw with the claw groove of the main bearing cap, and push in the 7 lower bearings.

HINT:

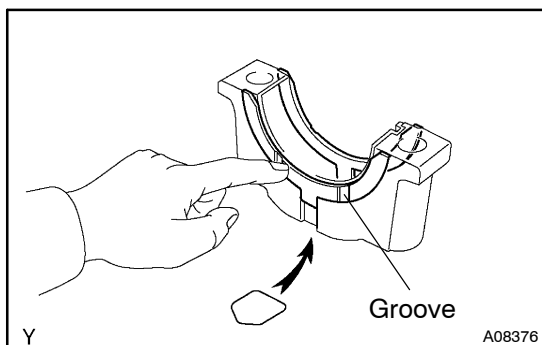
A number is marked on each main bearing cap to indicate the installation position.



6. INSTALL UPPER THRUST WASHERS

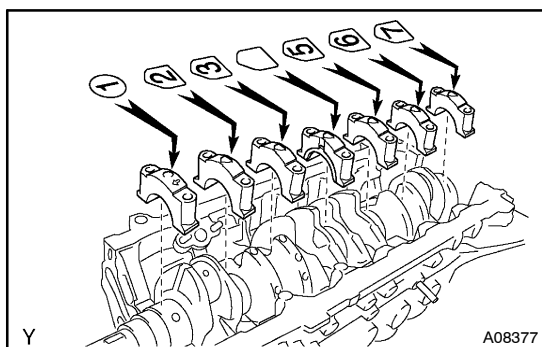
Install the 2 thrust washers under the No. 4 journal position of the cylinder block with the oil grooves facing outward.

7. PLACE CRANKSHAFT ON CYLINDER BLOCK



8. INSTALL MAIN BEARING CAPS AND LOWER THRUST WASHERS

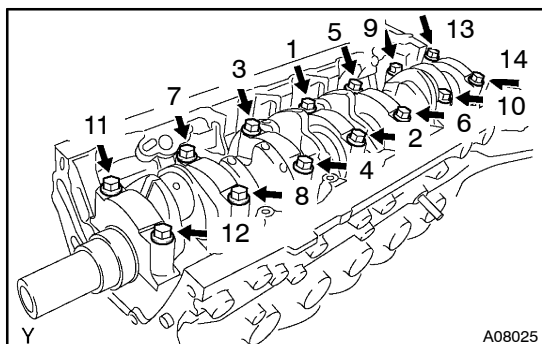
- (a) Install the 2 thrust washers on the No. 4 bearing cap with the oil grooves facing outward.



- (b) Install the 7 main bearing caps in their proper locations.

HINT:

Each bearing cap has a number and a front mark.



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

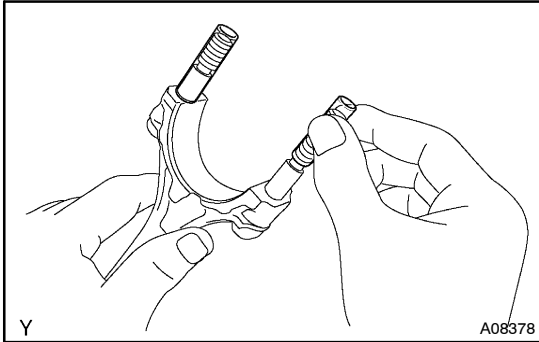
- (d) Install and uniformly tighten the 4 bolts of the main bearing cap, in several passes, in the sequence shown.

Torque: 60 N·m (600 kgf·cm, 43 ft·lbf)

- (e) Check that the crankshaft turns smoothly.

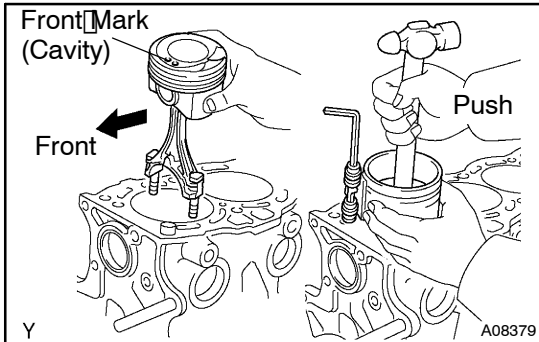
9. CHECK CRANKSHAFT THRUST CLEARANCE

(See page EM-82)

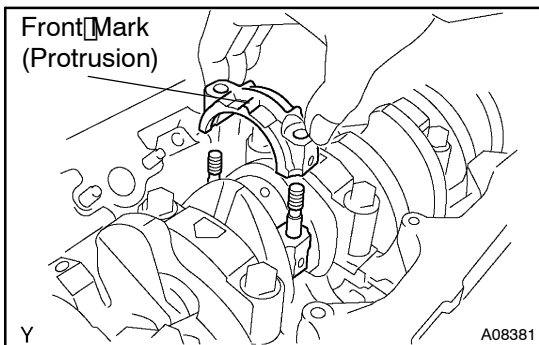


10. INSTALL PISTON AND CONNECTING ROD ASSEMBLES

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

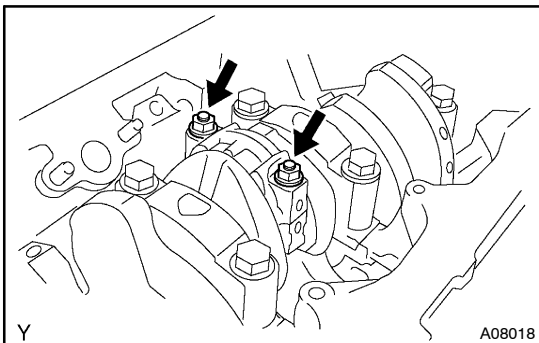


- (b) Using a piston ring compressor, push the correct numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.



11. INSTALL CONNECTING ROD CAP

- (a) Match the numbered connecting rod cap with the connecting rod.
(b) Install the connecting rod cap with the front mark facing forward.



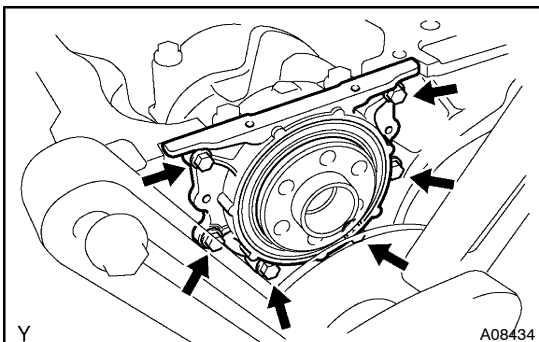
- (c) Apply a light coat of engine oil on the threads and under the nuts of the connecting rod cap.
(d) Install and alternately tighten the 2 cap nuts in several passes.

Torque: 50 N·m (500 kgf·cm, 36 ft·lbf)

- (e) Check that the crankshaft turns smoothly.

12. CHECK CONNECTING ROD THRUST CLEARANCE

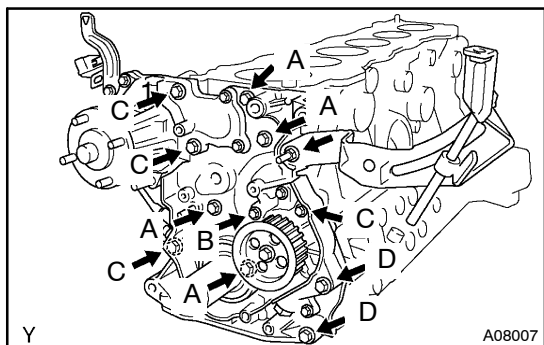
(See page EM-82)



13. INSTALL REAR OIL SEAL RETAINER

Install a new gasket and the retainer with the 6 bolts.

Torque: 8.5 N·m (85 kgf·cm, 74 in·lbf)



14. INSTALL TIMING BELT CASE

Install a new gasket, the timing belt case and alternator adjusting bar with the 11 bolts and nut.

Torque:

18.5 N·m (185 kgf·cm, 13 ft·lbf) for 12 mm head

37.5 N·m (375 kgf·cm, 27 ft·lbf) for 14 mm head

HINT:

Each bolt length is indicated in the illustration.

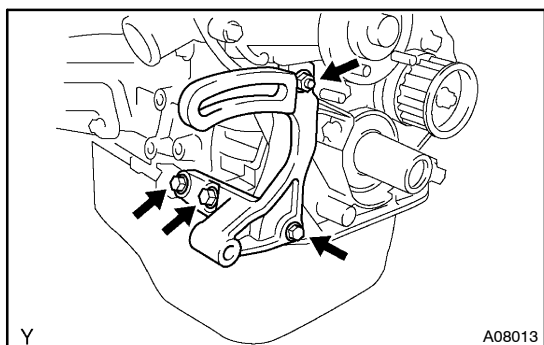
Bolt length:

30 mm (1.18 in.) for A

35 mm (1.38 in.) for B

40 mm (1.57 in.) for C

50 mm (1.97 in.) for D



15. INSTALL PS VANE PUMP BRACKET

Install the pump bracket with the 3 bolts and nut.

Torque:

19.1 N·m (195 kgf·cm, 14 ft·lbf) for 12 mm head

39.2 N·m (400 kgf·cm, 29 ft·lbf) for 14 mm head

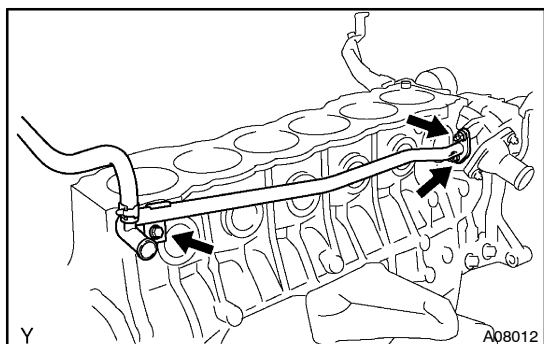
16. INSTALL OIL STRAINER AND OIL PAN

(See page LU-14)

17. INSTALL RH ENGINE MOUNTING BRACKET AND INSULATOR ASSEMBLY

Install the mounting bracket with the 3 bolts and nut.

Torque: 35 N·m (350 kgf·cm, 25 ft·lbf)



18. INSTALL NO.2 HEATER WATER OUTLET PIPE

Install a new gasket and the No.2 heater water outlet pipe with the bolt and 2 nuts.

Torque: 9.5 N·m (95 kgf·cm, 82 in·lbf)

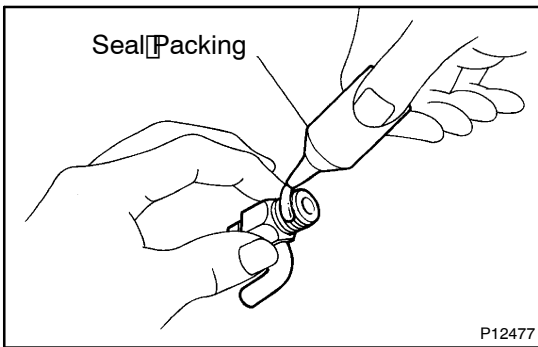
19. INSTALL OIL DIPSTICK GUIDE SUPPORT

20. INSTALL LH ENGINE MOUNTING BRACKET AND INSULATOR ASSEMBLY

Install the mounting bracket with the 3 bolts.

Torque: 35 N·m (350 kgf·cm, 25 ft·lbf)

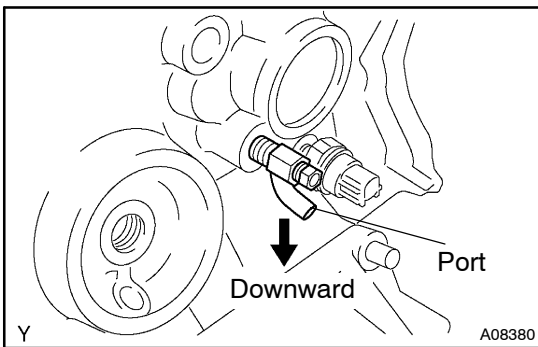
21. INSTALL OIL PRESSURE SWITCH (See page LU-1)



22. INSTALL ENGINE COOLANT DRAIN UNION

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

Seal packing: Part No. 08826-00100 or equivalent



- (b) Install the drain union.

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

HINT:

After applying the specified torque, rotate the drain union clockwise until its drain port is facing downward.

23. A/T:

INSTALL OIL FILTER UNION

Torque: 30 N·m (300 kgf·cm, 22 ft·lbf)

24. M/T:

INSTALL OIL COOLER (See page LU-19)

25. INSTALL OIL FILTER (See page LU-3)

26. INSTALL KNOCK SENSORS (See page FI-63)

27. INSTALL OIL DIPSTICK GUIDE SUPPORT

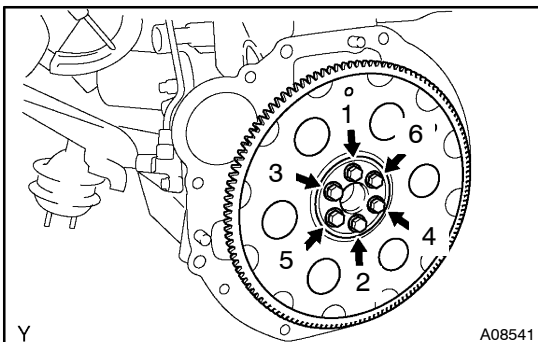
28. INSTALL CYLINDER HEAD (See page EM-59)

29. INSTALL TIMING BELT AND PULLEYS

(See page EM-26)

30. DISCONNECT ENGINE FROM ENGINE STAND

31. INSTALL REAR END PLATE



32. INSTALL DRIVE PLATE OR FLYWHEEL

- (a) A/T:

Install the front spacer, drive plate and rear plate on the crankshaft.

- (b) M/T:

Install the flywheel on the crankshaft.

- (c) Install and uniformly tighten the 6 bolts in several passes, in the sequence shown.

Torque: 75 N·m (750 kgf·cm, 54 ft·lbf)

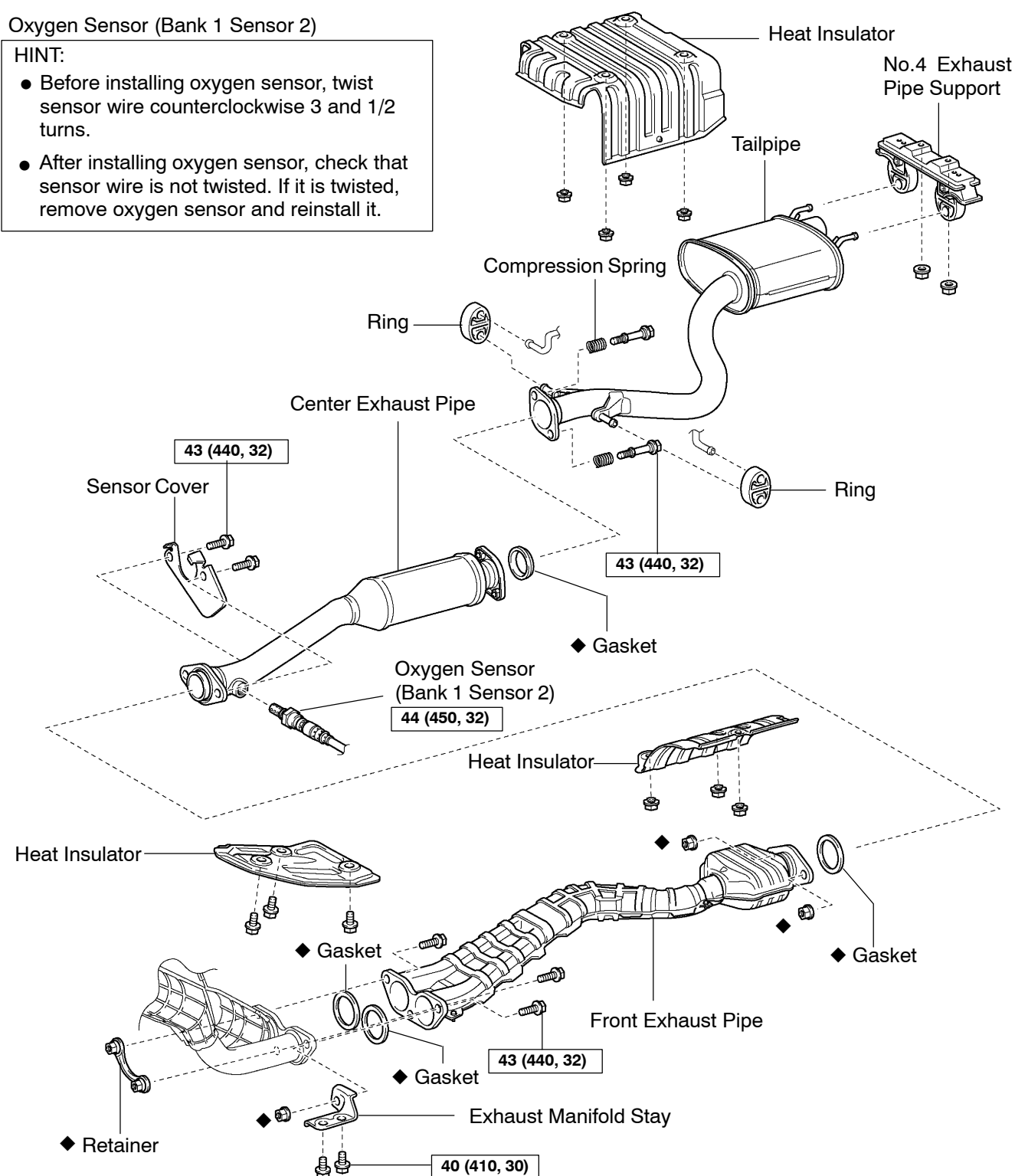
EXHAUST SYSTEM COMPONENTS

EM08M-04

Oxygen Sensor (Bank 1 Sensor 2)

HINT:

- Before installing oxygen sensor, twist sensor wire counterclockwise 3 and 1/2 turns.
- After installing oxygen sensor, check that sensor wire is not twisted. If it is twisted, remove oxygen sensor and reinstall it.



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

γ ◆ Non-reusable part

A08556