CO/HC

EM0D0-09

INSPECTION

HINT:

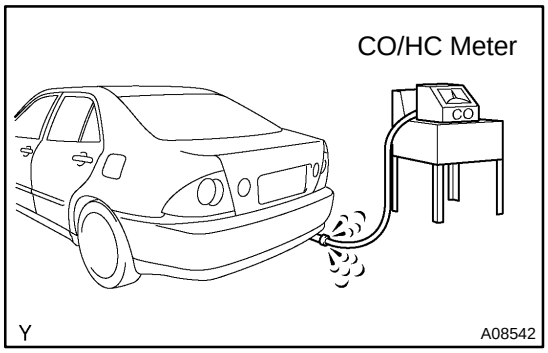
This check is used only to determine whether or not the idle CO/HC complies with regulations.

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) SFI system wiring connectors fully plugged
(g) Ignition timing checked 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 AT LEAST 40 cm (1.3 ft) INTO TAILPIPE DURING IDLING

5. IMMEDIATELY CHECK CO/HC CONCENTRATION AT IDLE AND/OR 2,500 RPM

HINT:

When doing the 2 mode (2,500 rpm and idle) test, follow the measurement order prescribed by the applicable local regulations.

If the CO/HC concentration does not comply with regulations, troubleshoot in the order given below.

(a) Check heated oxygen sensors operation (See page SF-73).

(b) See the table below for possible causes, and then inspect and correct the applicable causes if necessary.

HC	CO	Phenomenon	Causes
High	Normal	Rough idle	4. Faulty ignitions: • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed high-tension cords 5. Incorrect valve clearance 6. Leaky intake and exhaust valves 7. Leaky cylinder
High	Low	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: • PCV hose • Intake manifold • Throttle body • Cylinder head gasket 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Plugged PCV valve 3. Faulty SFI system: • Faulty fuel pressure regulator • Faulty ECM • Faulty injector • Faulty throttle position sensor • Faulty MAF meter

COMPRESSION

EM0D1-09

INSPECTION

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.

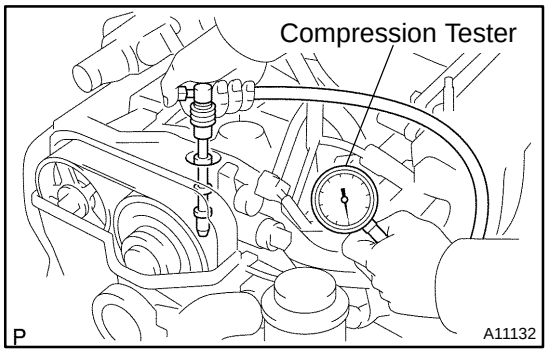
2. REMOVE ENGINE COVER

Remove the 4 nuts and engine cover.

3. DISCONNECT IGNITION COILS AND HIGH-TENSION CORD SET ASSEMBLY (See page IG-7)

4. REMOVE SPARK PLUGS

5. DISCONNECT INJECTOR CONNECTORS



6. CHECK CYLINDER COMPRESSION

(a) Insert a compression tester into the spark plug hole.

(b) While cranking the engine, measure the compression pressure.

HINT:

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

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

NOTICE:

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

Compression:
1,324 kPa (13.5 kgf/cm^2, 192 psi) or more
Minimum pressure: 1,079 kPa (11.0 kgf/cm^2, 156 psi)
Difference between each cylinder:
98 kPa (1.0 kgf/cm^2, 14 psi) or less

(d) If the cylinder compression in 1 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 (b) for the cylinder 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 improper, or there may be leakage past the gasket.

7. RECONNECT INJECTOR CONNECTORS

HINT:

The Nos. 1, 3, 5 injector connectors and dark gray, and the Nos. 2, 4, 6 injector connectors are brown.

8. REINSTALL SPARK PLUGS

9. RECONNECT IGNITION COILS AND HIGH-TENSION CORD SET ASSEMBLY (See page IG-9)

10. INSTALL ENGINE COVER

Install the engine cover with the 4 nuts.

VALVE CLEARANCE

ADJUSTMENT

EM0D2-07

HINT:

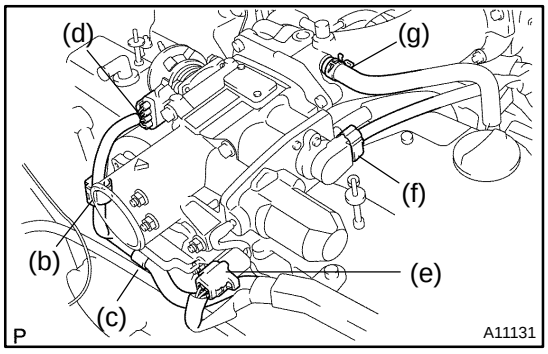
Inspect and adjust the valve clearance when the engine is cold.

1. REMOVE ENGINE COVER

Remove the 4 nuts and engine cover.

2. DRAIN ENGINE COOLANT

3. REMOVE INTAKE AIR RESONATOR



4. REMOVE THROTTLE BODY AND INTAKE AIR CONNECTOR ASSEMBLY

(a) Disconnect the accelerator cable from the throttle body.

(b) Disconnect the engine wire clamp from the clamp bracket of the throttle body.

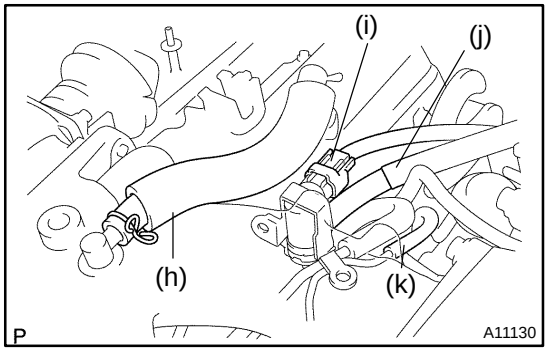
(c) Disconnect the engine wire from the clamp on the throttle body bracket.

(d) Disconnect the accelerator pedal position sensor connector.

(e) Disconnect the throttle control motor connector.

(f) Disconnect the throttle position sensor connector.

(g) Disconnect the air assist hose from the intake air connector.

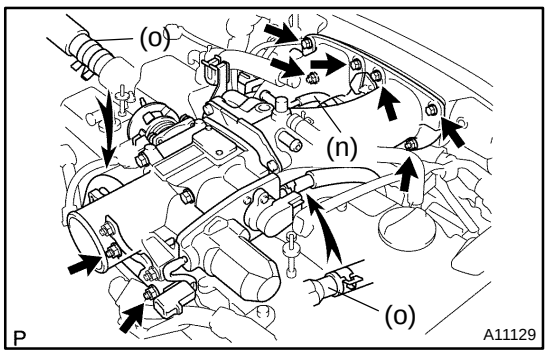


(h) Disconnect the PCV hose from the intake air connector.

(i) Disconnect the VSV connector for EVAP.

(j) Disconnect the EVAP hose (from charcoal canister) from the VSV for EVAP.

(k) Disconnect the vacuum hose (from No. 2 vacuum pipe) from the No. 1 vacuum pipe.



(l) Remove the 2 nuts holding the throttle body bracket to the cylinder head.

(m) Remove the 4 bolts and 2 nuts holding the intake air connector to the air intake chamber.

(n) Disconnect the vacuum hose (from actuator for ACIS) from the No. 1 vacuum pipe.

(o) Disconnect the 2 water bypass hoses from the throttle body, and remove the throttle body together with the intake air connector and gasket.

5. REMOVE NO. 3 TIMING BELT COVER

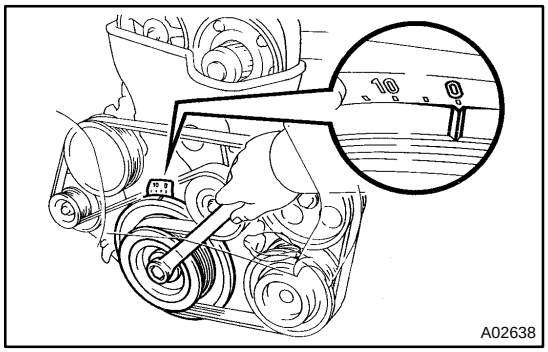
Using a 5 mm hexagon wrench, remove the 4 bolts, oil filler cap, timing belt cover and gasket.

6. REMOVE IGNITION COILS AND HIGH- TENSION CORD SET ASSEMBLY (See page IG-7)

7. REMOVE SPARK PLUGS

8. DISCONNECT ENGINE WIRE FROM CYLINDER HEAD COVERS

9. REMOVE CYLINDER HEAD COVERS (See page EM-34)

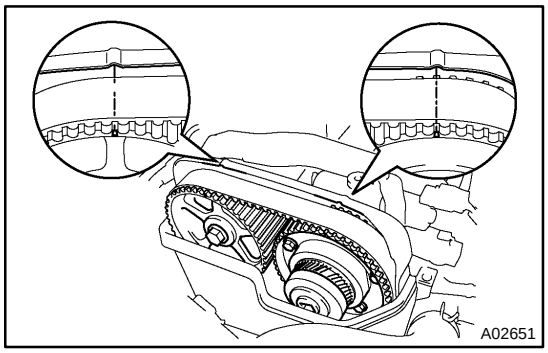


10. SET NO.1 CYLINDER TO TDC/COMPRESSION

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

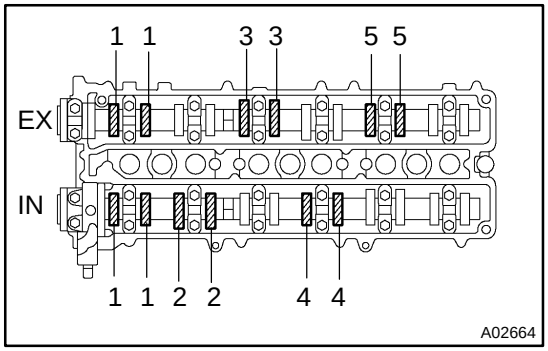
NOTICE:

Always turn the crankshaft clockwise.



(b) Check that the timing marks of the camshaft timing pulleys are aligned with the timing marks of the No. 4 timing belt cover.

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



11. INSPECT VALVE CLEARANCE

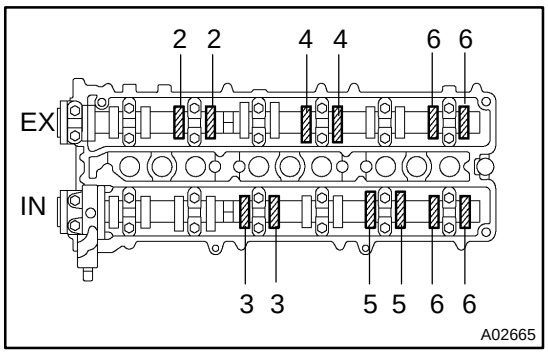
(a) Check only those valves indicated in the illustration.

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

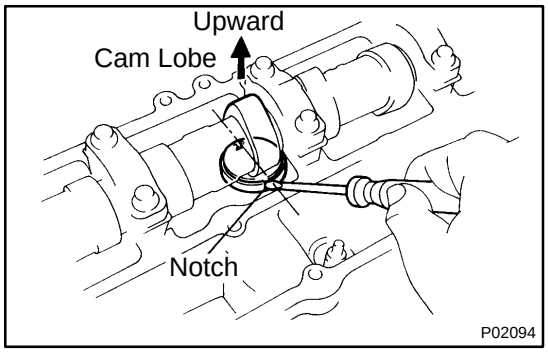
Valve clearance (Cold):

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 pulley 1 revolution (360˚), and align the groove with the timing mark ”0” of the No. 1 timing belt cover.



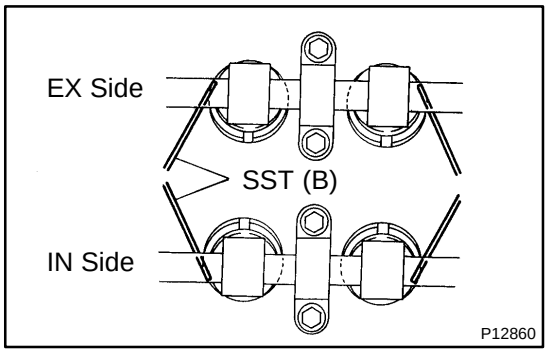
(c) Check only the valves indicated as shown. Measure the valve clearance. (See procedure in step (a))



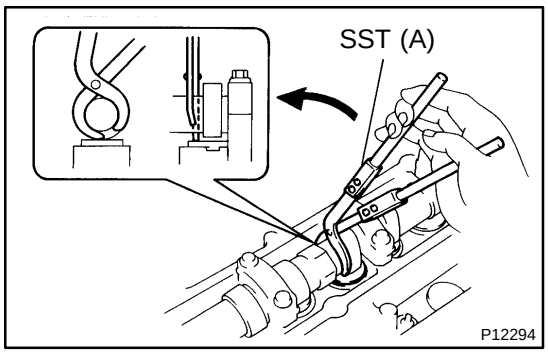
12. ADJUST VALVE CLEARANCE

(a) Remove the adjusting shim.

- Turn the camshaft so that the cam lobe for the valve to be adjusted faces up.
- Turn the valve lifter with a screwdriver so that the notches are perpendicular to the camshaft.

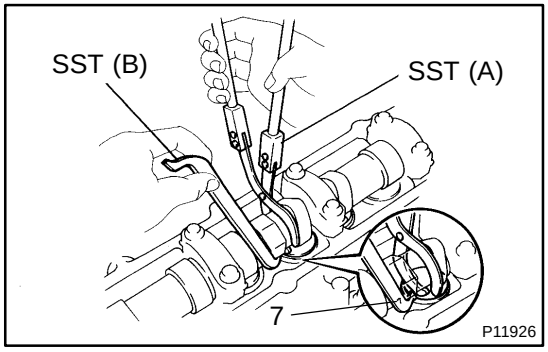


- Insert SST (B) gently from the inside as shown in the illustration.



- Using SST (A), hold the camshaft as shown in the illustration.

SST 09248-55040 (09248-05410)

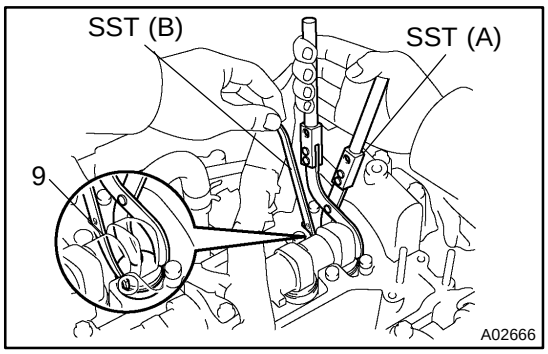


- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

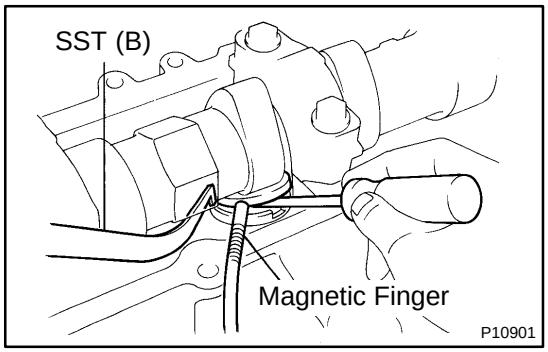
SST 09248-55040 (09248-05410, 09248-05420)

HINT:

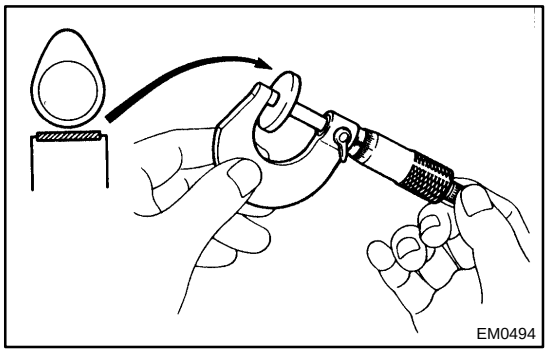
- Apply SST (B) at slight angle on the side marked with ”7” or ”9”, at the position shown in the illustration.



- When the adjusting shim of the No. 1 intake side replace, remove the No. 2 or No. 3 camshaft bearing cap, and insert SST as shown in the illustration.



- Using a small screwdriver and a magnetic finger, remove the adjusting shim.



(b) Determine the replacement adjusting shim size according to the following Formula or Charts:

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

  T ..... Thickness of used shim

  A ..... Measured valve clearance

  N ..... Thickness of new shim

Intake: N = T + (A - 0.20 mm (0.008 in.))

Exhaust: N = T + (A - 0.30 mm (0.012 in.))

- Select a new shim with a thickness as close as possible to the calculated values.

HINT:

Shims are available in 17 sizes in increments of 0.050 mm (0.0020 in.), from 2.500 mm (0.0984 in.) to 3.300 mm (0.1299 in.).

Adjusting Shim Selection Chart (Intake)

Measured Clearance mm (in.) / Installed Shim Thickness mm (in.)	2.500 (0.0984)	2.520 (0.0992)	2.540 (0.1000)	2.550 (0.1004)	2.560 (0.1008)	2.580 (0.1016)	2.600 (0.1024)	2.620 (0.1031)	2.640 (0.1039)	2.650 (0.1043)	2.660 (0.1047)	2.670 (0.1051)	2.680 (0.1055)	2.690 (0.1059)	2.700 (0.1063)	2.710 (0.1067)	2.720 (0.1071)	2.730 (0.1075)	2.740 (0.1079)	2.750 (0.1083)	2.760 (0.1087)	2.770 (0.1091)	2.780 (0.1094)	2.790 (0.1098)	2.800 (0.1102)	2.810 (0.1106)	2.820 (0.1110)	2.830 (0.1114)	2.840 (0.1118)	2.850 (0.1122)	2.860 (0.1126)	2.870 (0.1130)	2.880 (0.1134)	2.890 (0.1138)	2.900 (0.1142)	2.910 (0.1146)	2.920 (0.1150)	2.930 (0.1154)	2.940 (0.1157)	2.950 (0.1161)	2.960 (0.1165)	2.970 (0.1169)	2.980 (0.1173)	2.990 (0.1177)	3.000 (0.1181)	3.010 (0.1185)	3.020 (0.1189)	3.030 (0.1193)	3.040 (0.1197)	3.050 (0.1201)	3.060 (0.1205)	3.080 (0.1213)	3.100 (0.1220)	3.120 (0.1228)	3.140 (0.1236)	3.150 (0.1240)	3.160 (0.1244)	3.180 (0.1252)	3.200 (0.1260)	3.220 (0.1268)	3.240 (0.1276)	3.250 (0.1280)	3.260 (0.1283)	3.280 (0.1291)	3.300 (0.1299)
0.000 – 0.020 (0.0000 – 0.0008)									1	1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	10	10	10	10	11	11	12	12	12	12	13	13
0.021 – 0.040 (0.0008 – 0.0016)								1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14
0.041 – 0.060 (0.0016 – 0.0024)							1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14	14
0.061 – 0.080 (0.0024 – 0.0031)						1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14
0.081 – 0.100 (0.0032 – 0.0039)				1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	11	11	12	12	12	12	13	13	14	14	14	14	15
0.101 – 0.120 (0.0040 – 0.0047)			1	1	1	1	1	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	12	12	12	12	13	13	14	14	14	14	15	15
0.121 – 0.140 (0.0048 – 0.0055)		1	1	1	1	1	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14	15	15	15	16
0.141 – 0.149 (0.0056 – 0.0059)		1	1	1	1	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	12	12	12	13	13	13	14	14	14	15	15	15	16	16
0.150 – 0.250 (0.0059 – 0.0098)																																																																	
0.251 – 0.260 (0.0099 – 0.0102)	2	3	3	3	3	4	4	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	15	15	15	15	16	16	17	17	17	17	17	
0.261 – 0.280 (0.0103 – 0.0110)	2	3	3	3	4	4	4	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	15	15	15	16	16	16	17	17	17	17	17	
0.281 – 0.300 (0.0111 – 0.0118)	3	3	4	4	4	4	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	15	15	16	16	16	16	17	17	17	17	17		
0.301 – 0.320 (0.0119 – 0.0126)	3	4	4	4	4	5	5	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	16	16	16	16	17	17	17	17				
0.321 – 0.340 (0.0126 – 0.0134)	4	4	4	5	5	5	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	16	16	16	17	17	17	17	17					
0.341 – 0.360 (0.0134 – 0.0142)	4	4	5	5	5	6	6	6	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	16	16	16	17	17	17	17	17						
0.361 – 0.380 (0.0142 – 0.0150)	4	5	5	5	6	6	6	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	17	17	17	17	17							
0.381 – 0.400 (0.0150 – 0.0157)	5	5	6	6	6	6	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	16	16	16	16	16	17	17	17	17	17								
0.401 – 0.420 (0.0158 – 0.0165)	5	6	6	6	6	7	7	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17										
0.421 – 0.440 (0.0166 – 0.0173)	6	6	6	7	7	7	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17											
0.441 – 0.460 (0.0174 – 0.0181)	6	6	7	7	7	8	8	8	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17												
0.461 – 0.480 (0.0181 – 0.0189)	6	7	7	7	8	8	8	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17													
0.481 – 0.500 (0.0189 – 0.0197)	7	7	8	8	8	8	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17														
0.501 – 0.520 (0.0197 – 0.0205)	7	8	8	8	8	9	9	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																
0.521 – 0.540 (0.0205 – 0.0213)	8	8	8	9	9	9	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																		
0.541 – 0.560 (0.0213 – 0.0220)	8	8	9	9	9	10	10	10	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																				
0.561 – 0.580 (0.0221 – 0.0228)	8	9	9	9	10	10	10	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																						
0.581 – 0.600 (0.0229 – 0.0236)	9	9	10	10	10	10	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																								
0.601 – 0.620 (0.0237 – 0.0244)	9	10	10	10	10	11	11	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																										
0.621 – 0.640 (0.0244 – 0.0252)	10	10	10	11	11	11	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																												
0.641 – 0.660 (0.0252 – 0.0260)	10	10	11	11	11	12	12	12	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																														
0.661 – 0.680 (0.0260 – 0.0268)	10	11	11	11	12	12	12	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																
0.681 – 0.700 (0.0268 – 0.0276)	11	11	12	12	12	12	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																		
0.701 – 0.720 (0.0276 – 0.0283)	11	12	12	12	12	13	13	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																				
0.721 – 0.740 (0.0284 – 0.0291)	12	12	12	13	13	13	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																						
0.741 – 0.760 (0.0292 – 0.0299)	12	12	13	13	13	14	14	14	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																								
0.761 – 0.780 (0.0300 – 0.0307)	12	13	13	13	14	14	14	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																										
0.781 – 0.800 (0.0307 – 0.0315)	13	13	14	14	14	14	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																												
0.801 – 0.820 (0.0315 – 0.0323)	13	14	14	14	14	15	15	16	16	16	16	17	17	17	17	17	17	17	17																																														
0.821 – 0.840 (0.0323 – 0.0331)	14	14	14	15	15	15	16	16	16	17	17	17	17	17	17	17	17																																																
0.841 – 0.860 (0.0331 – 0.0339)	14	14	15	15	15	16	16	16	17	17	17	17	17	17	17																																																		
0.861 – 0.880 (0.0339 – 0.0346)	14	15	15	15	16	16	16	17	17	17	17	17	17																																																				
0.881 – 0.900 (0.0347 – 0.0354)	15	15	16	16	16	16	17	17	17	17	17																																																						
0.901 – 0.920 (0.0355 – 0.0362)	15	16	16	16	16	17	17	17	17																																																								
0.921 – 0.940 (0.0363 – 0.0370)	16	16	16	17	17	17	17	17																																																									
0.941 – 0.960 (0.0370 – 0.0378)	16	16	17	17	17	17	17																																																										
0.961 – 0.980 (0.0378 – 0.0386)	16	17	17	17	17	17																																																											
0.981 – 1.000 (0.0386 – 0.0394)	17	17	17	17	17																																																												
1.001 – 1.020 (0.0394 – 0.0402)	17	17	17																																																														
1.021 – 1.040 (0.0402 – 0.0409)	17	17																																																															
1.041 – 1.050 (0.0410 – 0.0413)	17																																																																

V00719

Intake valve clearance (Cold):
0.15 - 0.25 mm (0.006 - 0.010 in.)

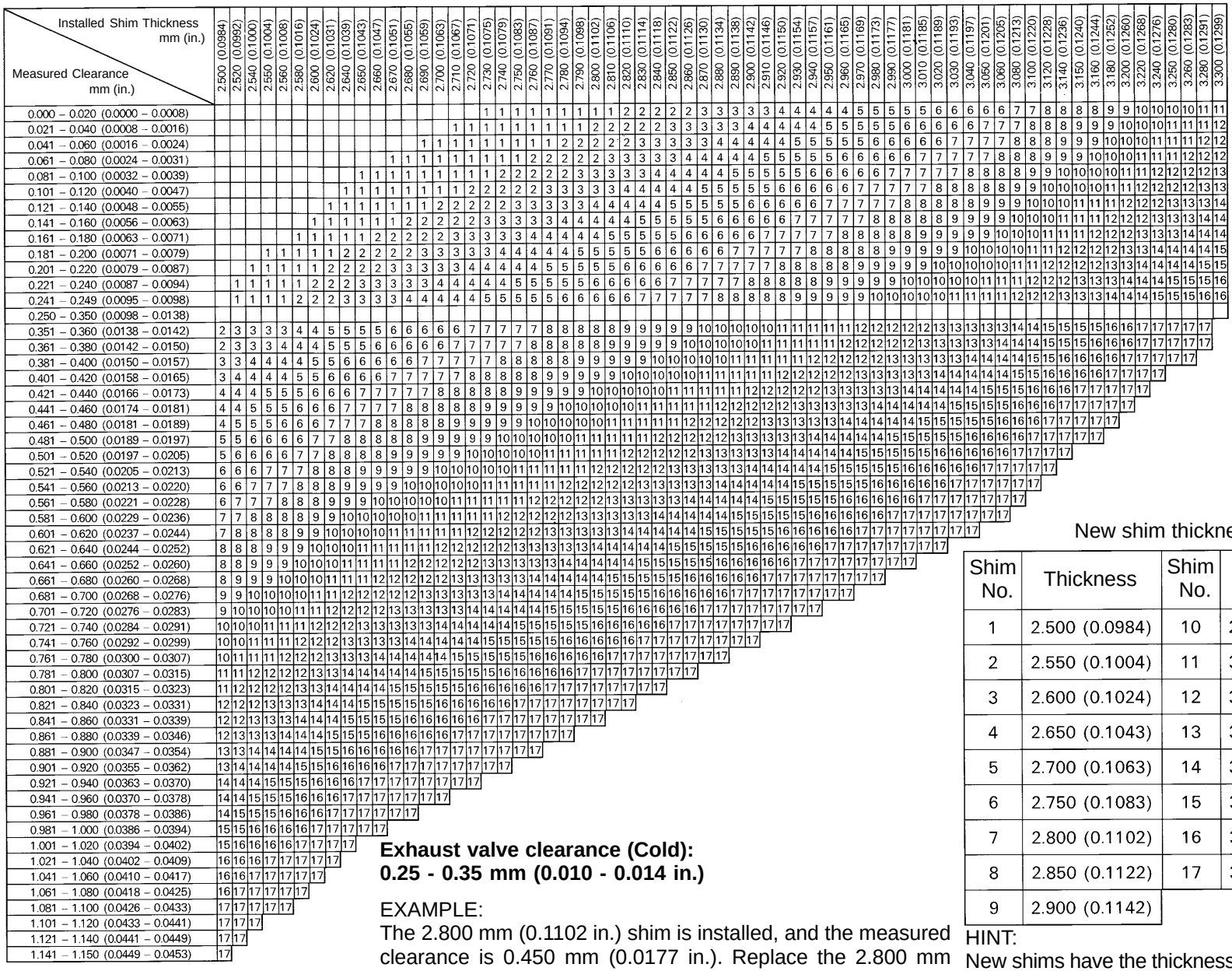
EXAMPLE:
The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a new No. 12 shim.

New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)
8	2.850 (0.1122)	17	3.300 (0.1299)
9	2.900 (0.1142)		

HINT:
New shims have the thickness in millimeters imprinted on the face.

Adjusting Shim Selection Chart (Exhaust)



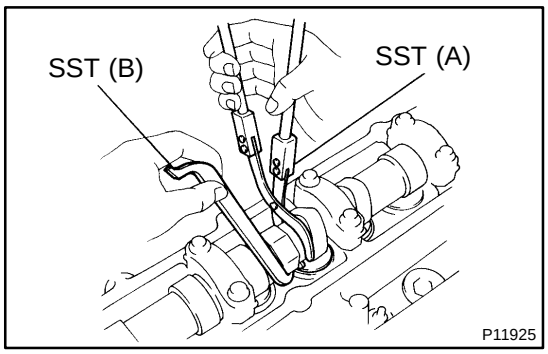
Exhaust valve clearance (Cold):
0.25 - 0.35 mm (0.010 - 0.014 in.)

EXAMPLE:
The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a new No. 10 shim.

New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)
8	2.850 (0.1122)	17	3.300 (0.1299)
9	2.900 (0.1142)		

HINT:
New shims have the thickness in millimeters imprinted on the face.



(c) Install a new adjusting shim.
- Place a new adjusting shim on the valve lifter, with imprinted numbers facing down.
- Press down the valve lifter with SST (A), and remove SST (B).

SST 09248-55040

(d) Recheck the valve clearance.

13. REINSTALL CYLINDER HEAD COVERS (See page EM-53)

14. RECONNECT ENGINE WIRE TO CYLINDER HEAD COVERS

15. REINSTALL SPARK PLUGS

16. REINSTALL IGNITION COILS AND HIGH-TENSION CORD SET ASSEMBLY (See page IG-9)

17. REINSTALL NO. 3 TIMING BELT COVER

(a) Install the gasket to the timing belt cover.

(b) Using a 5 mm hexagon wrench, install the timing belt cover with the 4 bolts.

Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)

(c) Install the oil filler cap.

18. REINSTALL THROTTLE BODY AND INTAKE AIR CONNECTOR ASSEMBLY

(a) Install a new gasket to the air intake chamber.

(b) Place the throttle body together with the intake air connector on the cylinder head.

(c) Connect the vacuum hose (from actuator for ACIS) to the No. 1 vacuum pipe.

(d) Connect the 2 water bypass hoses to the throttle body.

(e) Install the 4 bolts and 2 nuts holding the intake air connector to the air intake chamber.

Torque: 28 N·m (280 kgf·cm, 21 ft·lbf)

(f) Install the 2 nuts holding the throttle body bracket to the cylinder head.

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

(g) Connect the air assist hose to the intake air connector.

(h) Install the PCV hose to the intake air connector.

(i) Install the EVAP hose (from charcoal canister) to the VSV for EVAP.

(j) Install the vacuum hose (from No. 2 vacuum pipe) to the No. 1 vacuum pipe.

(k) Install the throttle position sensor connector.

(l) Install the accelerator pedal position sensor connector.

(m) Install the throttle control motor connector.

(n) Install the VSV connector for EVAP.

(o) Secure the engine wire with the clamp on the throttle body bracket.

(p) Install the engine wire clamp with the clamp bracket of the throttle body.

(q) Connect the accelerator cable to the throttle body.

19. REINSTALL INTAKE AIR RESONATOR

20. REINSTALL ENGINE COVER

Install the engine cover with the 4 nuts.

21. REFILL WITH ENGINE COOLANT

22. START ENGINE AND CHECK FOR LEAKS

IGNITION TIMING

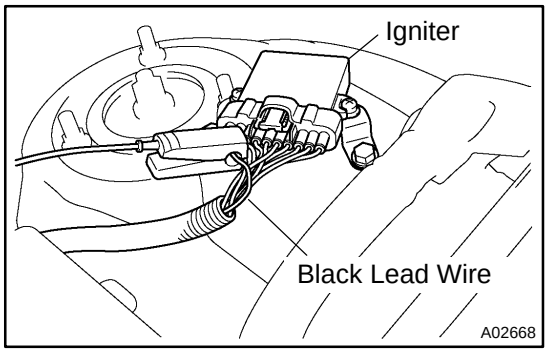
EM1SC-02

INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

2. CHECK IDLE SPEED (See page EM-14)

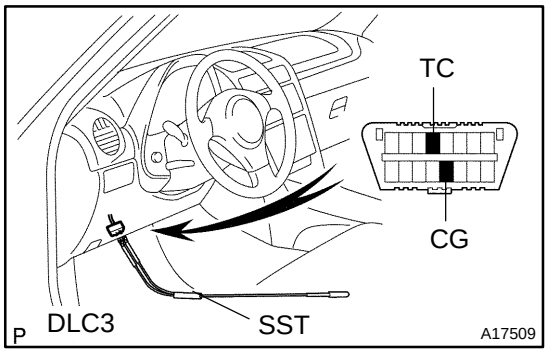


3. CONNECT TIMING LIGHT TO ENGINE

Connect the timing light clip to the black lead wire.

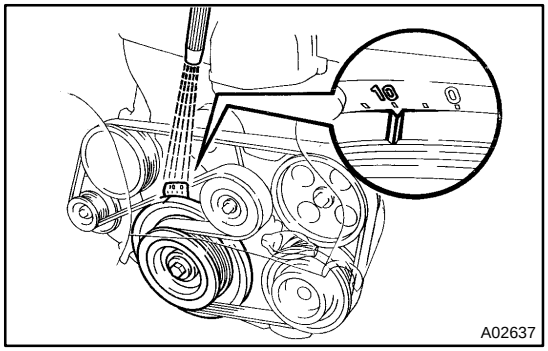
NOTICE:

Use a timing light that can detect the primary signal.



4. INSPECT IGNITION TIMING

(a) Using SST, connect terminals TC and CG of the DLC3.
SST 09843-18040



(b) Using a timing light, check the ignition timing.
Ignition timing:
10 ± 2˚ BTDC @ idle
(Transmission in neutral position)

(c) Remove the SST from the DLC1.

5. FURTHER CHECK IGNITION TIMING
Ignition timing: 6 - 16˚ BTDC @ idle
(Transmission in neutral position)

HINT:

The timing mark moves in a range between 6˚ and 16˚.

6. DISCONNECT TIMING LIGHT FROM ENGINE

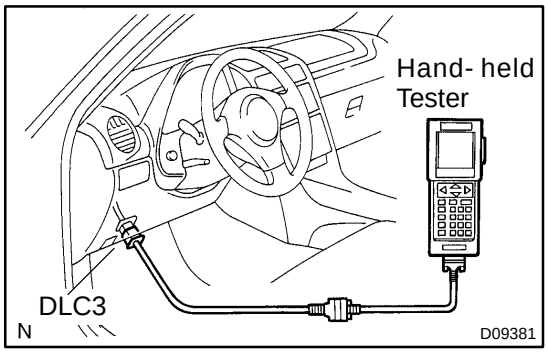
IDLE SPEED

EM1S9-02

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) SFI system wiring connectors fully plugged
(g) Ignition timing checked correctly
(h) Transmission in neutral position



2. CONNECT HAND-HELD TESTER OR OBD II SCAN TOOL

(a) Connect the hand-held tester or OBD II scan tool to the DLC3.
(b) Please refer to the hand-held tester or OBD II scan tool operator's manual for further details.

3. INSPECT IDLE SPEED

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

Idle speed: 700 ± 50 rpm

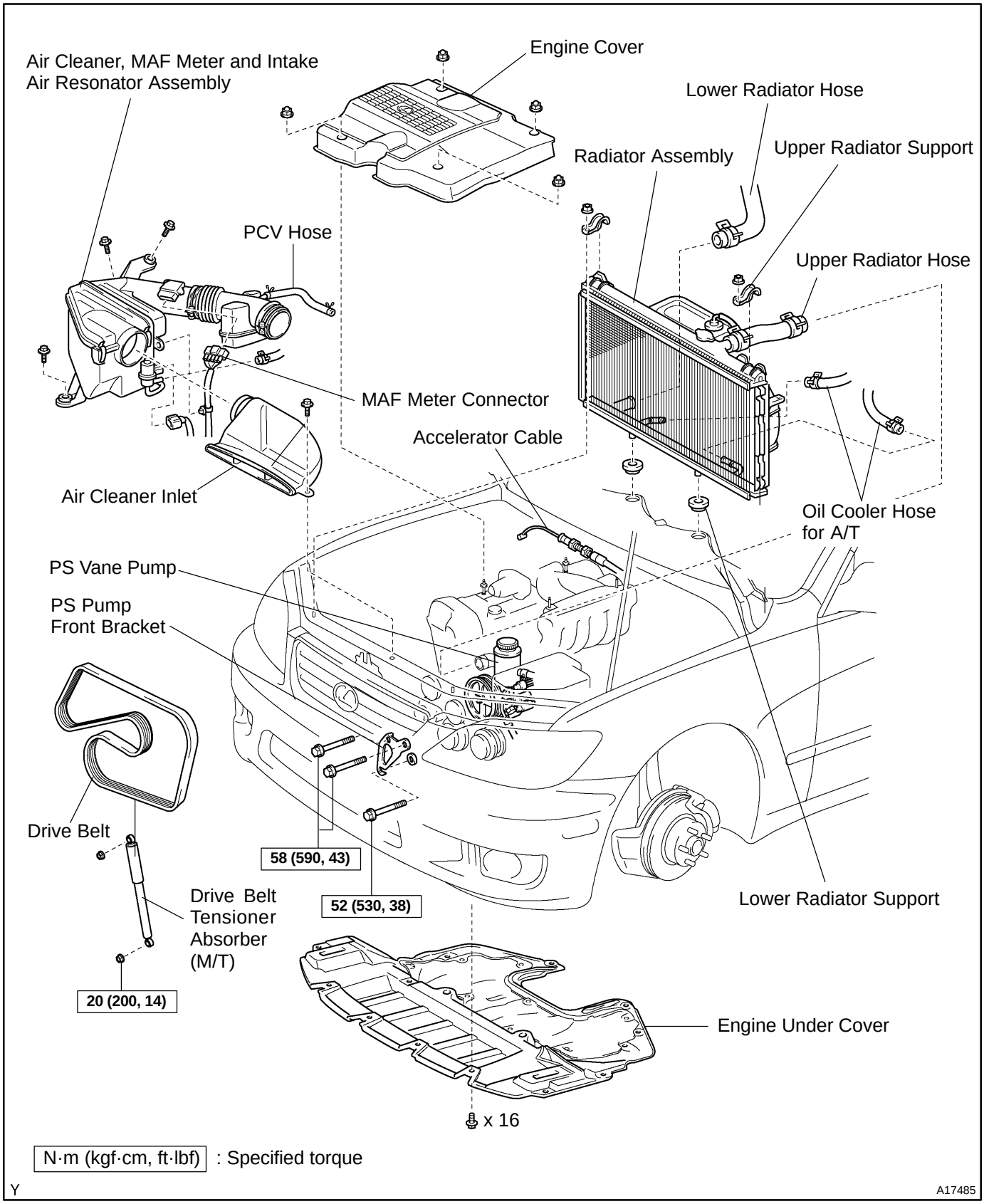
If the idle speed is not as specified, check the throttle body.

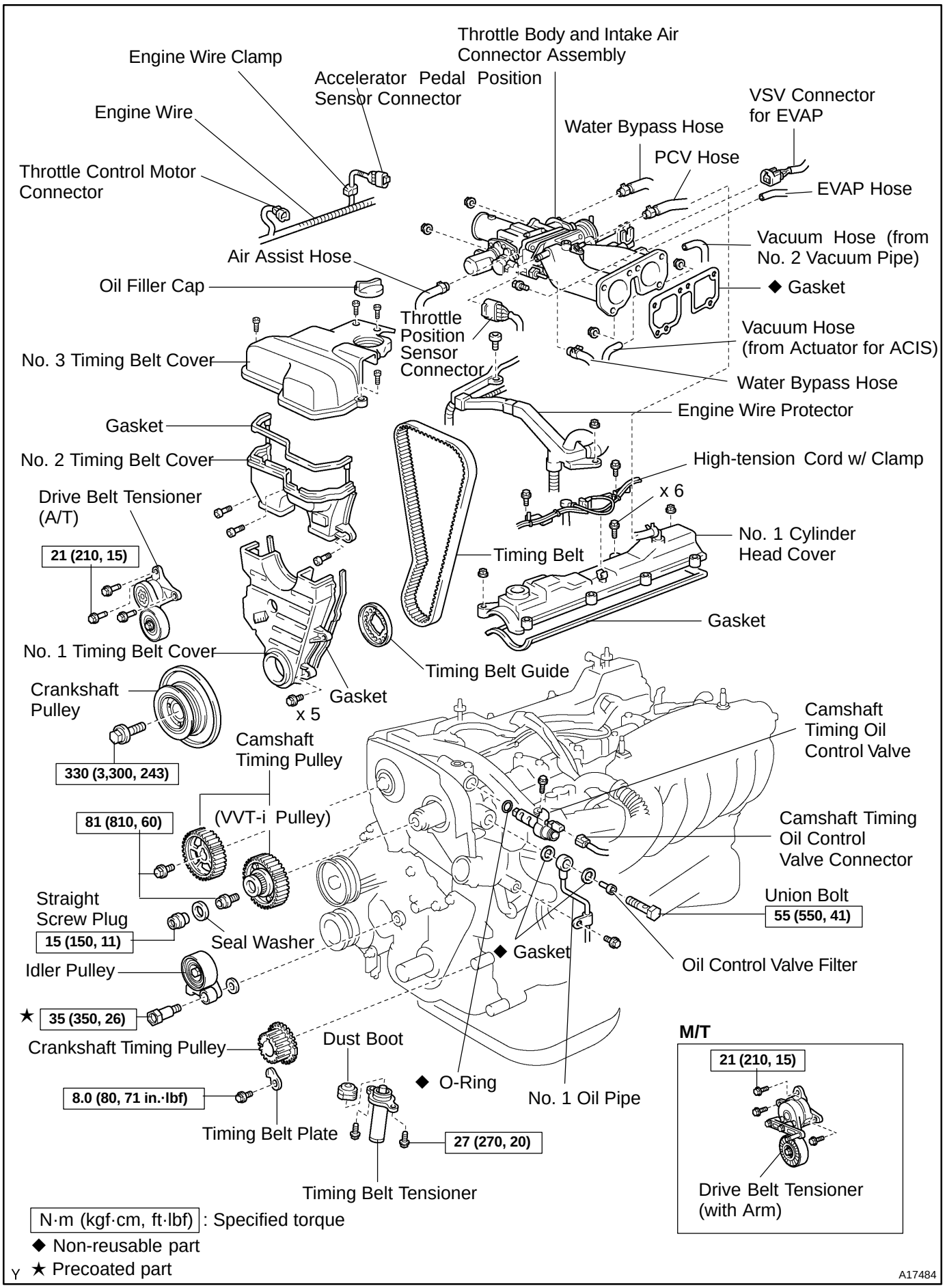
4. DISCONNECT HAND-HELD TESTER OR OBD II SCAN TOOL

TIMING BELT

COMPONENTS

EM0D5-09




Throttle Body and Intake Air Connector Assembly
Engine Wire Clamp
Accelerator Pedal Position Sensor Connector
VSV Connector for EVAP
Engine Wire
Water Bypass Hose
PCV Hose
Throttle Control Motor Connector
EVAP Hose
Vacuum Hose (from No. 2 Vacuum Pipe)
Air Assist Hose
Oil Filler Cap
◆ Gasket
Throttle Position Sensor Connector
Vacuum Hose (from Actuator for ACIS)
No. 3 Timing Belt Cover
Water Bypass Hose
Engine Wire Protector
Gasket
No. 2 Timing Belt Cover
High-tension Cord w/ Clamp
x 6
Drive Belt Tensioner (A/T)
No. 1 Cylinder Head Cover
21 (210, 15)
Timing Belt
Gasket
No. 1 Timing Belt Cover
Timing Belt Guide
Crankshaft Pulley
Gasket
x 5
Camshaft Timing Oil Control Valve
330 (3,300, 243)
Camshaft Timing Pulley
(VVT-i Pulley)
81 (810, 60)
Camshaft Timing Oil Control Valve Connector
Straight Screw Plug
Union Bolt
55 (550, 41)
15 (150, 11)
Seal Washer
◆ Gasket
Oil Control Valve Filter
Idler Pulley
★ 35 (350, 26)
Crankshaft Timing Pulley
Dust Boot
◆ O-Ring
No. 1 Oil Pipe
8.0 (80, 71 in.·lbf)
Timing Belt Plate
27 (270, 20)
Timing Belt Tensioner
M/T
21 (210, 15)
Drive Belt Tensioner (with Arm)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
★ Precoated part
A17484

EM1J7-03

REMOVAL

1. REMOVE ENGINE UNDER COVER

2. DRAIN ENGINE COOLANT

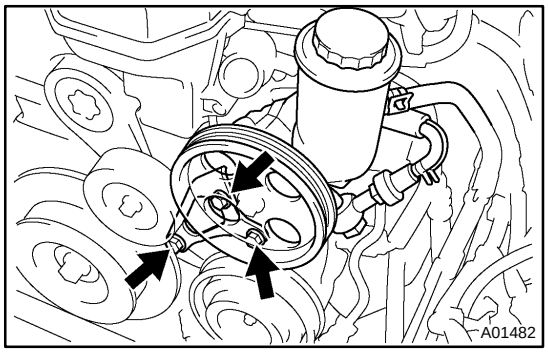
3. REMOVE RADIATOR ASSEMBLY (See page CO-19)

4. M/T:

REMOVE DRIVE BELT TENSIONER ABSORBER

Remove the 2 nuts and absorber.

5. REMOVE DRIVE BELT (See page CH-1)



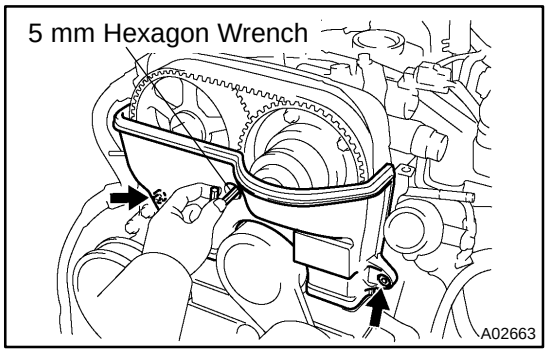
6. REMOVE PS PUMP AND FRONT BRACKET

(a) Remove the 3 bolts, plate washer and pump front bracket.

(b) Disconnect the vane pump from the bracket.

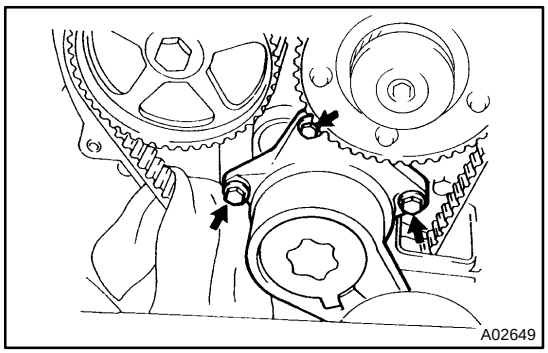
7. REMOVE NO. 3 TIMING BELT COVER

Using a 5 mm hexagon wrench, remove the 4 bolts, oil filler cap, timing belt cover and gasket.



8. REMOVE NO. 2 TIMING BELT COVER

Using a 5 mm hexagon wrench, remove the 3 bolts, timing belt cover and gasket.

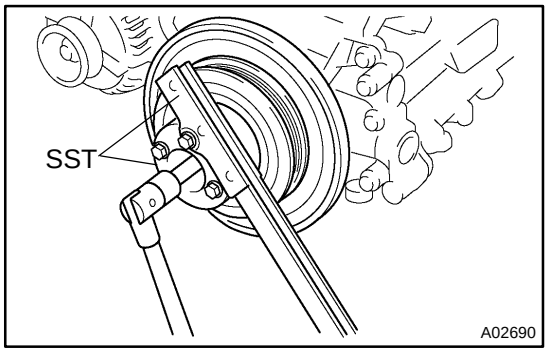


9. REMOVE DRIVE BELT TENSIONER

Remove the 3 bolts and tensioner.

NOTICE:

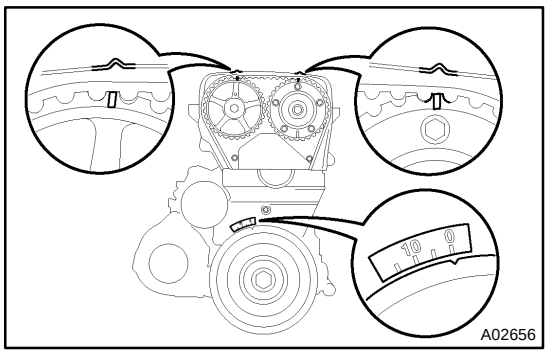
Be careful not to drop the bolts inside the timing belt cover.



10. LOOSEN CRANKSHAFT PULLEY BOLT

Using SST, loosen the pulley bolt.

SST 09213-7001 1, 09330-00021



11. SET NO. 1 CYLINDER TO APPROX. 60˚/ BTDC COMPRESSION

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

NOTICE:

Always turn the crankshaft clockwise.

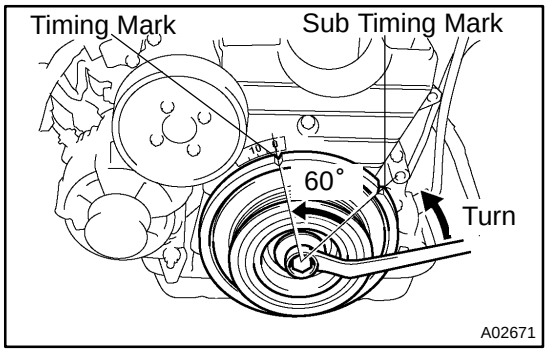
(b) Check that the timing marks (TDC mark) of the camshaft timing pulleys are aligned with the timing marks of the No. 4 timing belt cover.

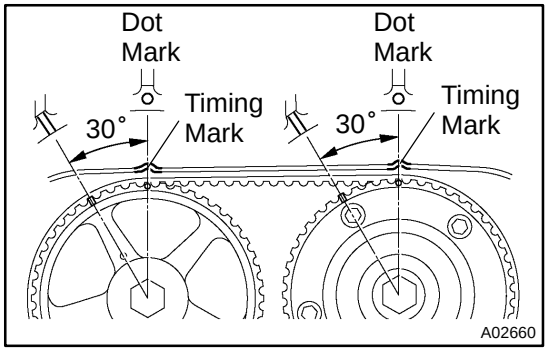
If not, turn the crankshaft 1 revolution (360˚).

(c) Turn the crankshaft pulley 60˚ counterclockwise to place the sub timing mark (60˚ mark BTDC) on the crankshaft pulley at the timing mark ”0” position of the No. 1 timing belt cover.

NOTICE:

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 when you remove the camshaft timing pulleys (steps 13 and 19), thus resulting damage. So, always set the crankshaft pulley at the correct angle.



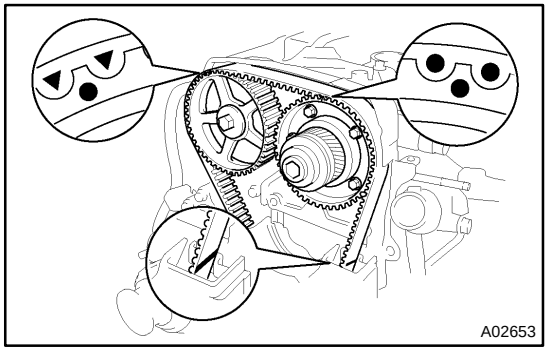


(d) Check that the dot marks (60˚ mark BTDC) of the camshaft timing pulleys are aligned with the timing marks of the No. 4 timing belt cover.

(e) Remove the crankshaft pulley bolt.

NOTICE:

Do not turn the crankshaft pulley.

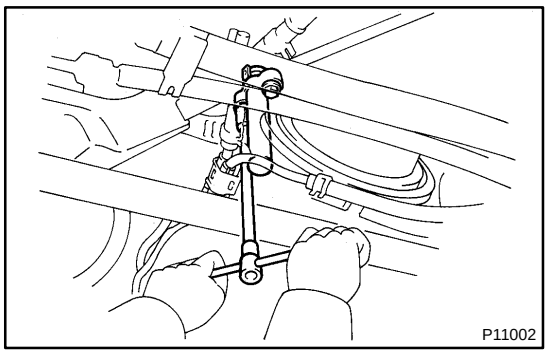


12. REMOVE TIMING BELT FROM CAMSHAFT TIMING PULLEYS

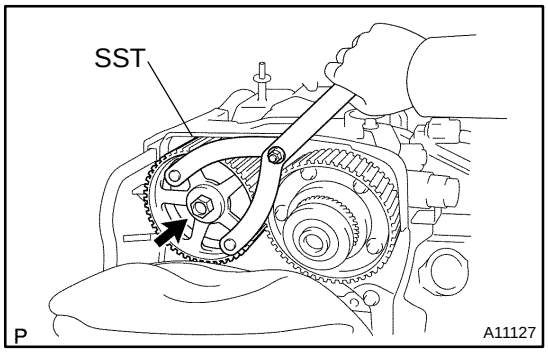
HINT:

Re-using timing belt:

Place matchmarks on the timing belt and camshaft timing pulleys as shown in the illustration.



(a) Alternately loosen the 2 bolts, and remove them, the tensioner and dust boot.
(b) Disconnect the timing belt from the camshaft timing pulleys.



13. REMOVE EXHAUST CAMSHAFT TIMING PULLEY

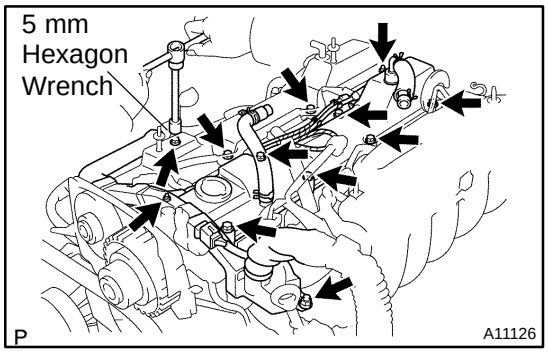
Using SST, remove the bolt and timing pulley.

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

14. REMOVE ENGINE COVER

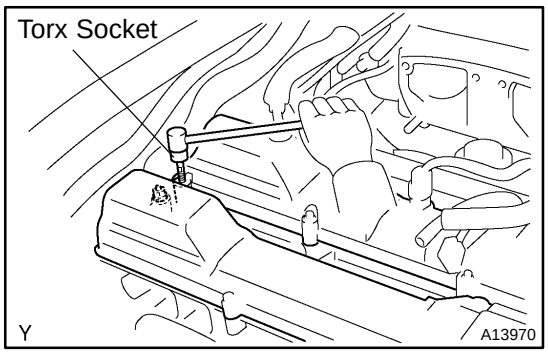
Remove the 4 nuts and engine cover.

15. REMOVE THROTTLE BODY AND INTAKE AIR CONNECTOR ASSEMBLY (See page EM-5)



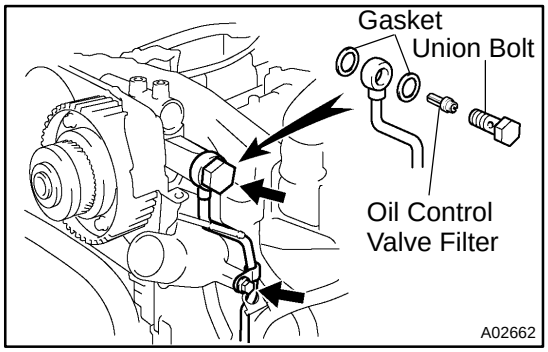
16. REMOVE NO. 1 CYLINDER HEAD COVER

(a) Using a 5 mm hexagon wrench, remove the bolts, and disconnect the engine wire protector from the No. 2 cylinder head cover.
(b) Remove the nut, and disconnect the engine wire protector from the intake manifold.
(c) Remove the 2 bolts, and disconnect the high-tension cords with the clamp from the No. 2 cylinder head.



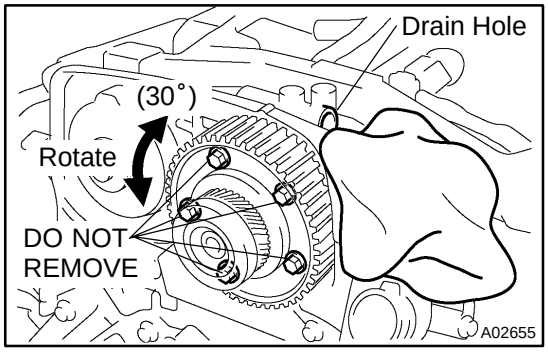
(d) Remove the 2 nuts from the No. 1 cylinder head cover.
(e) Using a torx socket (E5), remove the 2 stud bolts.
(f) Remove the 6 bolts, No. 1 cylinder head cover and gasket.

17. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE (See page SF-43)



18. DISCONNECT NO. 1 OIL PIPE

Remove the bolt, union bolt, oil control valve filter and 2 gaskets, and disconnect the No. 1 oil pipe from the No. 3 camshaft bearing cap.



19. REMOVE VVT-i (INTAKE CAMSHAFT TIMING) PULLEY

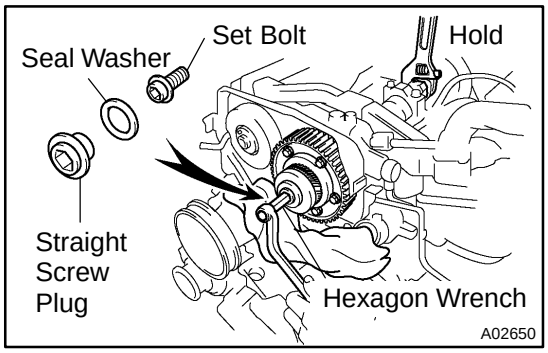
NOTICE:

- **The 5 bolts shown in the illustration determine the backlash of the gear in the timing pulley, so do not remove them.**
  If any of the 5 bolts are removed, install a new camshaft timing pulley assembly.
- **When removing the straight screw plug, follow the prescribed procedure in order to avoid spilling oil on the timing system parts.**

(a) Rotate the VVT-i pulley from left to right 2 to 3 times within its range of movement (30˚) and use a waste cloth to collect the oil from the camshaft timing oil control valve installation hole.

NOTICE:

Approximately 20 cc (1.2 cu in.) of oil will be ejected, so take care not to spill it.



(b) Holding the hexagon portion of camshaft with a wrench.

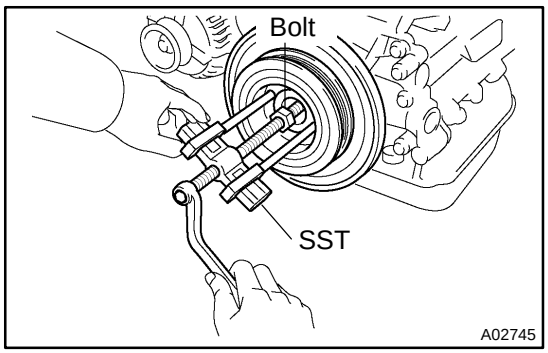
(c) Using a 14 mm hexagon wrench, remove the straight screw plug and seal washer.

NOTICE:

Some oil may spill, so put a waster cloth below the plug white doing the operation.

(d) Using a 10 mm hexagon wrench, and remove the set bolt and VVT-i pulley.

(e) Remove the wrench.



20. REMOVE CRANKSHAFT PULLEY

Using SST and bolt (diameter: 8 mm, pitch: 1.5 mm), remove the crankshaft pulley.

SST 09950-50013 (09951-05010, 09552-05010, 09553-05020, 09554-05031)

Bolt: Part No. 90119-18001

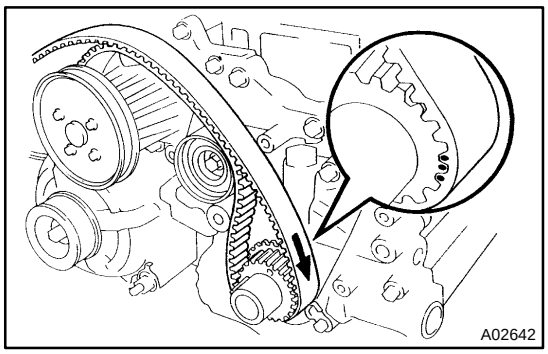
NOTICE:

Do not turn the crankshaft pulley.

21. REMOVE NO. 1 TIMING BELT COVER

Remove the 5 bolts, timing belt cover and gasket.

22. REMOVE TIMING BELT GUIDE

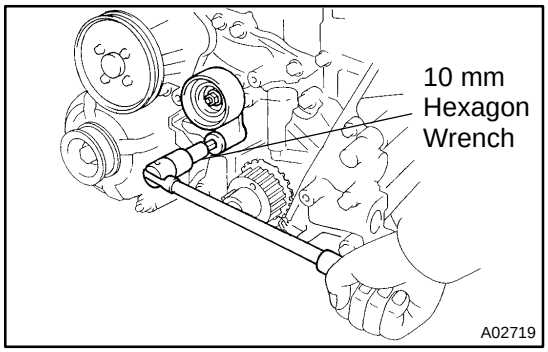


23. REMOVE TIMING BELT

HINT:

When re-using timing belt:

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

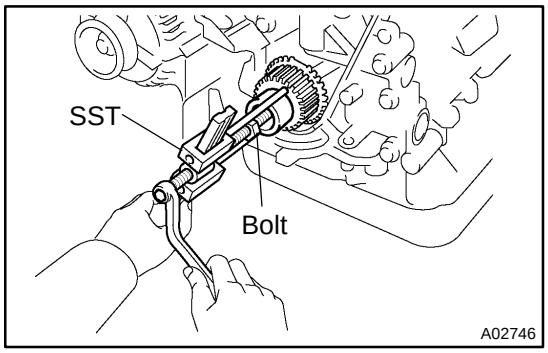


24. REMOVE IDLER PULLEY

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

25. REMOVE CRANKSHAFT TIMING PULLEY

(a) Remove the bolt and timing belt plate.



(b) Remove the crankshaft timing pulley.

If the pulley cannot be removed by hand, use SST and bolt (diameter: 8 mm, pitch: 1.5 mm) to remove the crankshaft timing pulley.

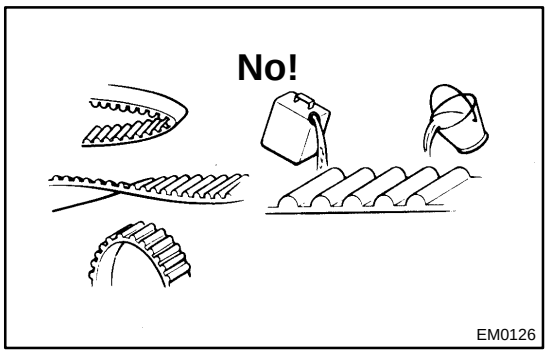
SST 09950- 50013 (09951- 05010, 09952- 05010, 09953-05020, 09954-05011)

Bolt: Part No. 90119-18001

NOTICE:

- **Do not scratch the sensor part the crankshaft timing pulley.**
- **Do not turn the timing pulley.**

EM1SB-02



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 mount bolt of the camshaft timing pulley.**

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

(a) Premature parting
- Check for proper installation.
- Check the timing cover gasket for damage and proper installation.

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

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

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

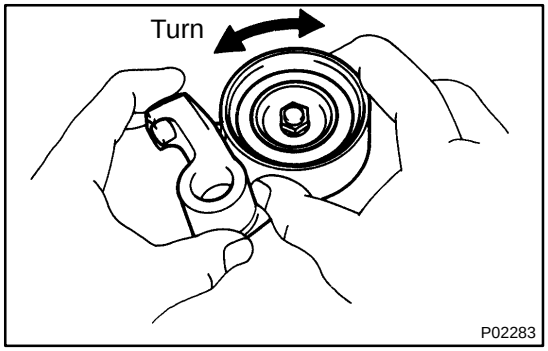
(e) If there is noticeable wear on the belt teeth, check timing cover for damage and check gasket has been installed correctly and for foreign material on the pulley teeth.

If necessary, replace the timing belt.

2. INSPECT DRIVE BELT TENSIONER

Check the turning smoothness of the tensioner.

If necessary, replace the tensioner.



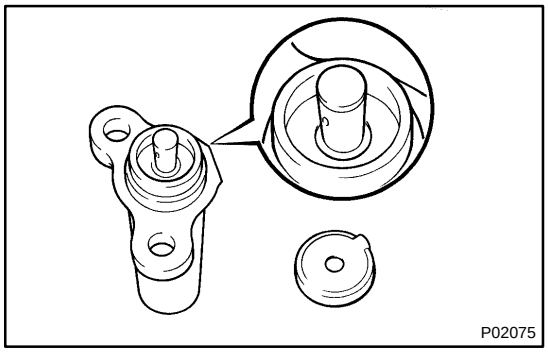
3. INSPECT IDLER PULLEY

(a) Visually check the seal portion of the idler pulley for oil leakage.

If leakage is found, replace the idler pulley.

(b) Check the turning smoothness of the idler pulley.

If necessary, replace the idler pulley.



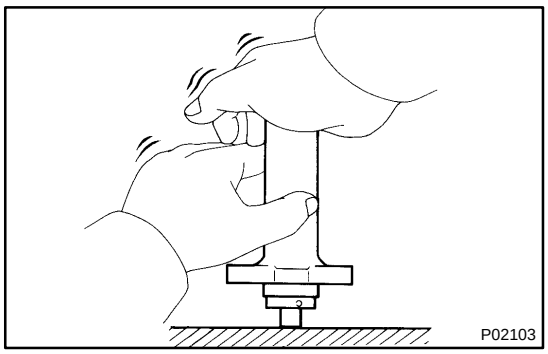
4. INSPECT TIMING BELT TENSIONER

(a) Visually check tensioner for oil leakage.

HINT:

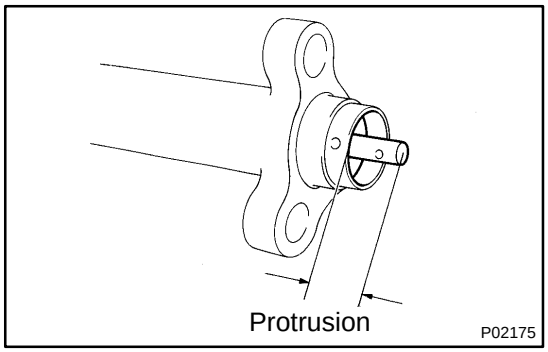
If there is only the faintest trace of oil on the seal on the push rod side, the tensioner is all right.

If leakage is found, replace tensioner.



(b) Hold the tensioner with both hands and push the push rod strongly against the floor or wall to check that it doesn't move.

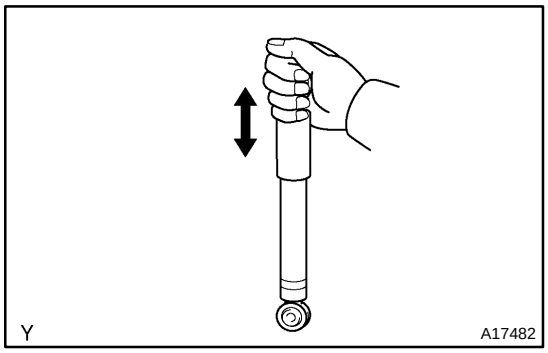
If the push rod moves, replace the tensioner.



(c) Measure the protrusion of the push rod from the housing end.

Protrusion: 8.0 - 8.8 mm (0.315 - 0.346 in.)

If the protrusion is not as specified, replace the tensioner.

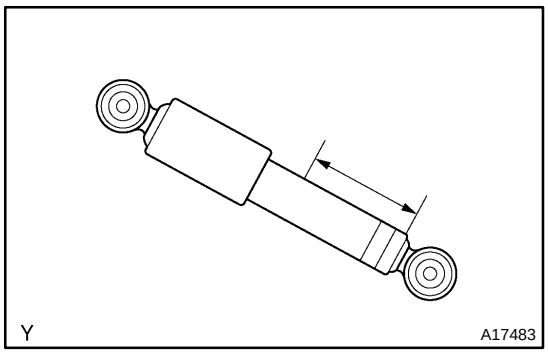


5. M/T:

INSPECT DRIVE BELT TENSIONER ABSORBER

Compress and extend the absorber rod and check that there is no abnormal resistance or unusual operation sounds.

If there is any abnormality, replace the absorber.



NOTICE:

When discarding the absorber, use the these procedure.

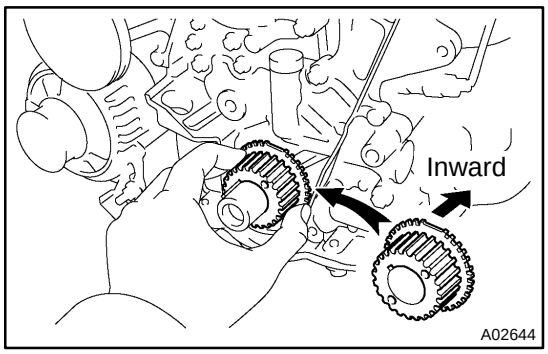
- **Fully extend the absorber rod.**
- **Using a drill, make a hole in the cylinder as shown to release the gas inside.**

CAUTION:

The gas coming out is harmless, but the careful of the chips which may fly up when drilling.

EM1J8-03

INSTALLATION



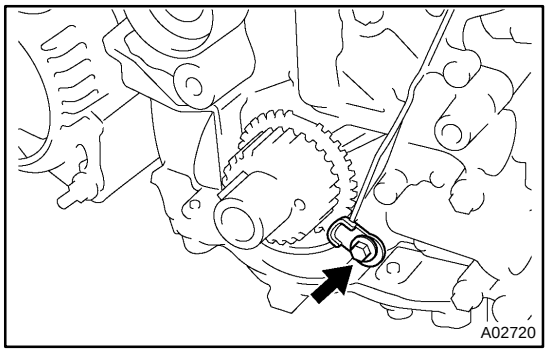
1. INSTALL CRANKSHAFT TIMING PULLEY

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

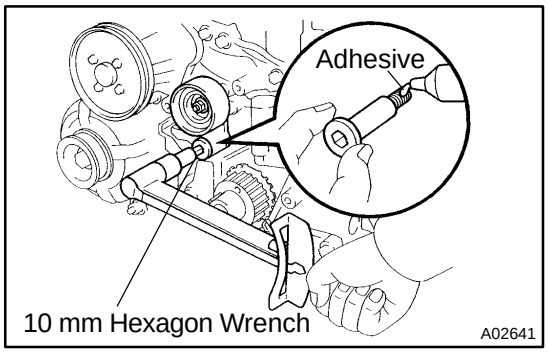
(b) Slide on the timing pulley facing the flange side inward.

NOTICE:

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



(c) Install the timing belt plate with the bolt.
Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)

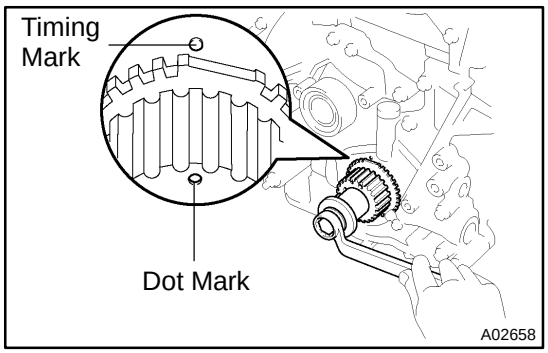


2. INSTALL IDLER PULLEY

(a) Apply adhesive to 2 or 3 threads of the pivot bolt.
Adhesive:
Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Using a 10 mm hexagon wrench, install the plate washer and pulley with the pivot bolt.
Torque: 35 N·m (350 kgf·cm, 26 ft·lbf)

(c) Check that the pulley bracket moves smoothly.



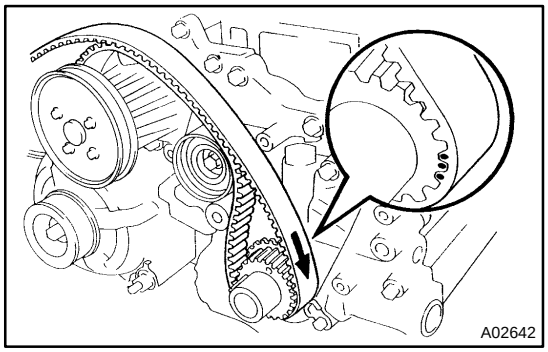
3. TEMPORARILY INSTALL TIMING BELT

NOTICE:

The engine should be cold.

(a) Use the crankshaft pulley bolt to turn the crankshaft, and align the dot mark on the crankshaft timing pulley and the timing mark on the oil pump body.

(b) Remove any oil or water on the crankshaft timing pulley and idler pulley, and keep them clean.

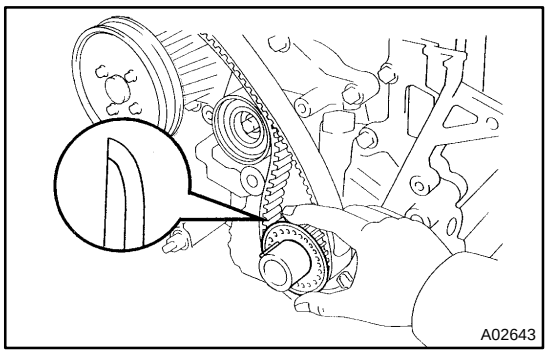


(c) Install the timing belt on the crankshaft timing pulley and idler pulley.

HINT:

When re-using timing belt:

Align the matchmarks of the crankshaft timing pulley and timing belt, and install the belt with the arrow pointing in the direction of engine revolution.



4. INSTALL TIMING BELT GUIDE

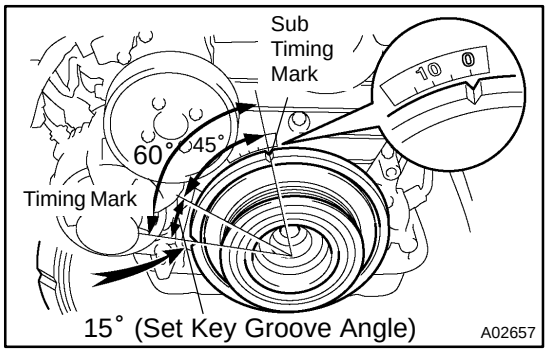
Install the guide, facing the cup side outward.

5. INSTALL NO. 1 TIMING BELT COVER

(a) Install the gasket to the timing belt cover.

(b) Install the timing belt cover with the 5 bolts.

Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)



6. INSTALL CRANKSHAFT PULLEY

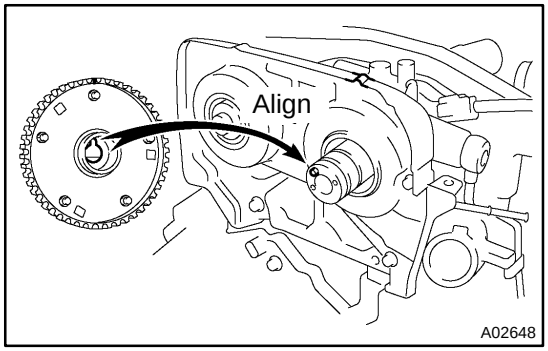
(a) Align the pulley set key with the key groove of the pulley, and slide on the pulley.

(b) Check that the sub timing mark (60° mark BTDC) of the crankshaft pulley is aligned with the timing mark "0" of the No.1 timing belt cover.

HINT:

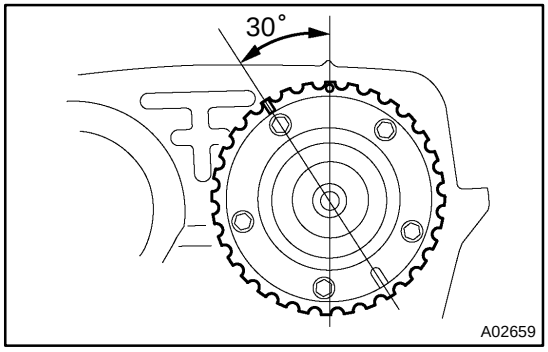
At this time, the crankshaft pulley set key groove and the timing mark (TDC mark) of the crankshaft pulley are as shown the illustration.

(c) Temporarily install the pulley bolt.

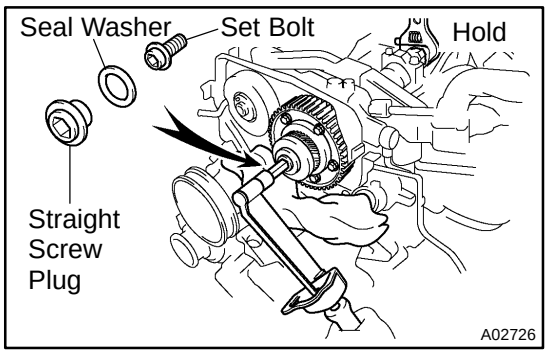


7. INSTALL VVT-i (INTAKE CAMSHAFT TIMING) PULLEY

(a) Align the camshaft knock pin with the VVT-i pulley, and push the VVT-i pulley by hand until you feel it touch the bottom.



(b) Check that the outer circumference of the VVT-i pulley easily rotates through 30°.



(c) Holding the hexagon portion of the camshaft with a wrench.
(d) Using a 10 mm hexagon wrench, and the set bolt.
Torque: 81 N·m (810 kgf·cm, 60 ft·lbf)
(e) Using a 14 mm hexagon wrench, install the straight screw plug with the seal washer to the set bolt.
Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)
(f) Align the dot mark on the camshaft timing pulley with the timing mark of the No. 4 timing belt cover.
(g) Remove the wrench.

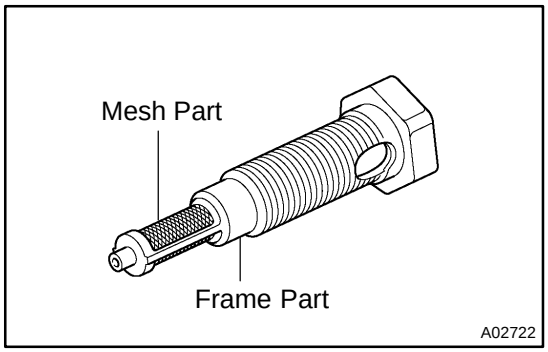
8. CONNECT NO. 1 OIL PIPE

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

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

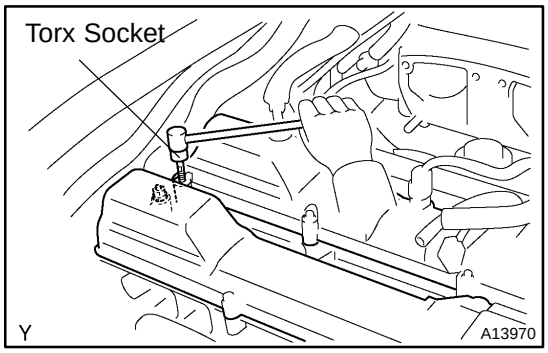
(b) Install the oil pipe with 2 new gasket and the union bolt to the No.3 camshaft bearing cap.
Torque: 55 N·m (550 kgf·cm, 41 ft·lbf)

9. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE (See page SF-43)



10. INSTALL NO. 1 CYLINDER HEAD COVER

(a) Install the cylinder head and gasket with the 6 bolts.
Torque: 8.5 N·m (85 kgf·cm, 75 in.·lbf)
(b) Using a torx socket (E5), install the 2 stud bolts.
Torque: 8.5 N·m (85 kgf·cm, 75 in.·lbf)
(c) Install the 2 nuts to the 2 stud bolts.
Torque: 8.5 N·m (85 kgf·cm, 75 in.·lbf)
(d) Install the high-tension cords and clamps with the 2 bolts.
Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)

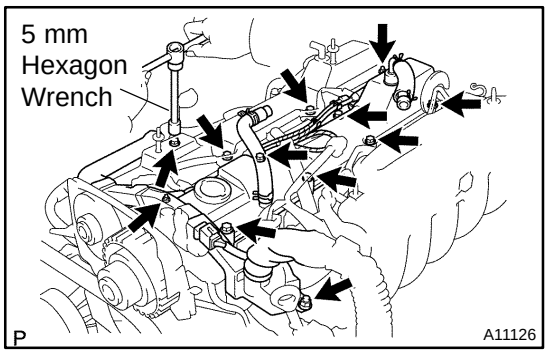


(e) Using a 5 mm hexagon wrench, install the engine wire protector with the bolt and nut.

11. INSTALL THROTTLE BODY AND INTAKE AIR CONNECTOR ASSEMBLY (See page EM-5)

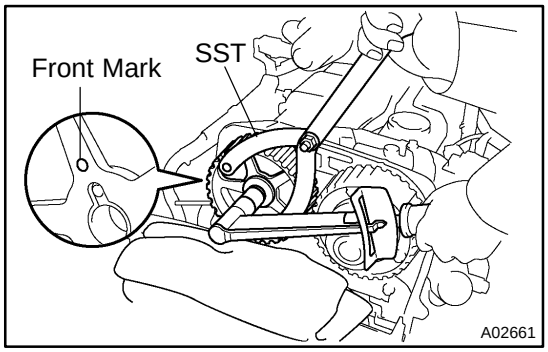
12. INSTALL ENGINE COVER

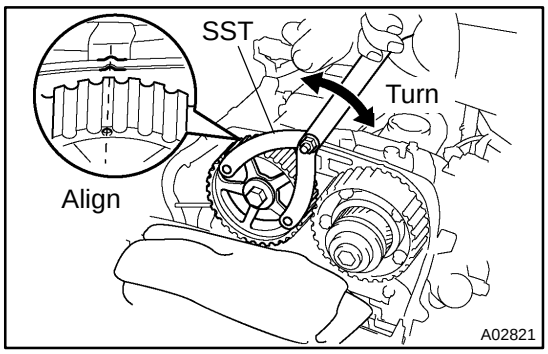
Install the engine cover with the 4 nuts.



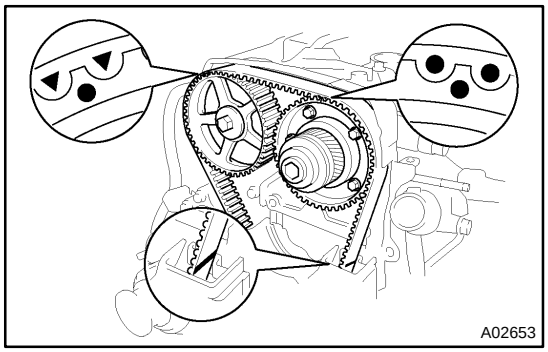
13. INSTALL EXHAUST CAMSHAFT TIMING PULLEY

(a) Align the camshaft knock pin with the groove on the pulley, and slide on the timing pulley.
(b) Slide the timing pulley on the camshaft, facing the front mark forward.
(c) Using SST, install the pulley bolt.
SST 09960-10010 (09962-01000, 09963-01000)
Torque: 81 N·m (810 kgf·cm, 60 ft·lbf)



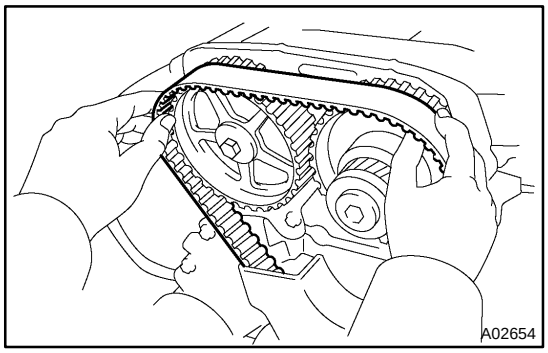


(d) Using SST, align the dot mark on the camshaft timing timing pulley with the timing mark of the No. 4 timing belt cover.
SST 09960-10010 (09962-01000, 09963-01000)

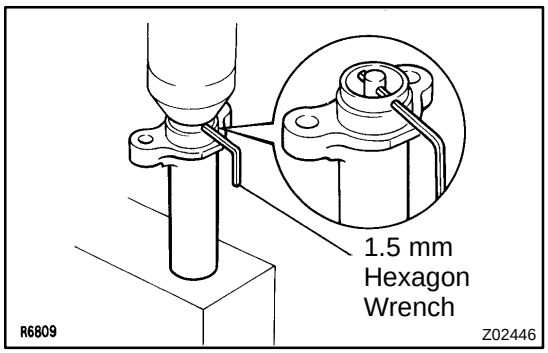


14. CONNECT TIMING BELT TO CAMSHAFT TIMING PULLEYS

HINT:
When re-using timing belt:
- Check that the matchmark on the timing belt matches the end of the No. 1 timing belt cover.
  If the matchmark does not align, shift the meshing of the timing belt and crankshaft timing pulley until they align.
- Align the matchmarks of the timing belt and camshaft timing pulleys.

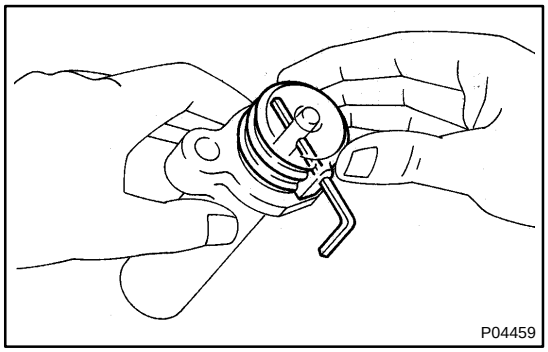


(a) Remove any oil or water on the camshaft timing pulley, and keep it clean.
(b) Install the timing belt, checking the tension between the crankshaft timing pulley and intake camshaft timing pulley.

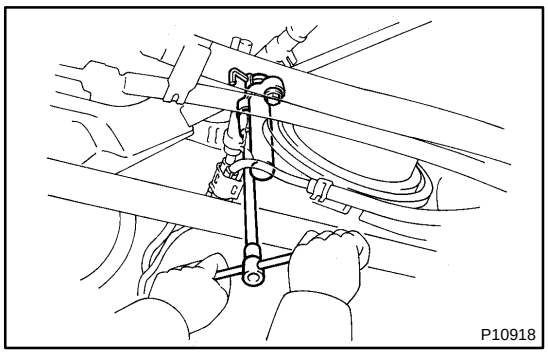


15. SET TIMING BELT TENSIONER

(a) Using a press, slowly press in the push rod using 981 - 9,807 N (100 - 1,000 kgf, 220 - 2,205 lbf) of force.
(b) Align the holes of the push rod and housing, pass a 1.5 mm hexagon wrench through the holes to keep the push rod retracted.
(c) Release the press.



(d) Install the dust boot onto the tensioner.

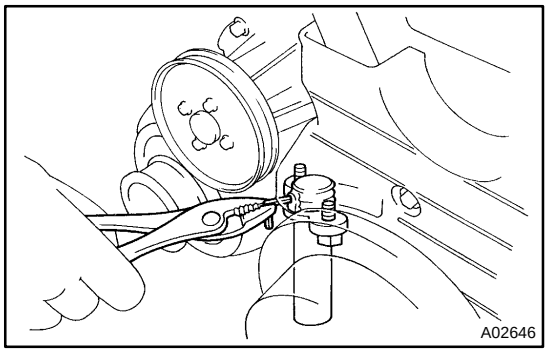


16. INSTALL TIMING BELT TENSIONER

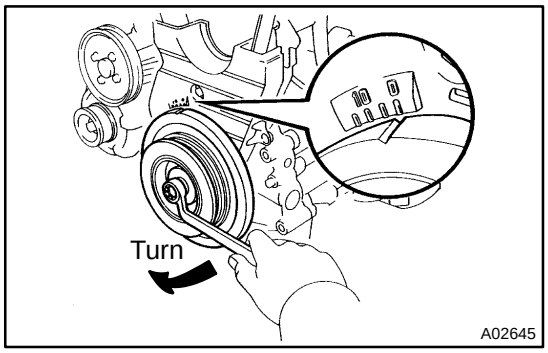
(a) Temporarily install the tensioner with the 2 bolts.

(b) Alternately tighten the 2 bolts.

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



(c) Remove the 1.5 mm hexagon wrench from the tensioner with pliers.

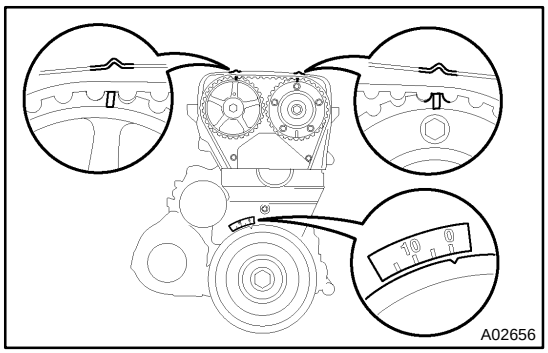


17. CHECK VALVE TIMING

(a) Slowly turn the crankshaft pulley 2 revolutions from TDC to TDC.

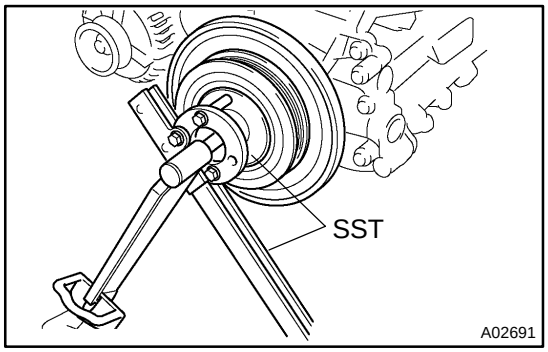
NOTICE:

Always turn the crankshaft clockwise.



(b) Check that each pulley aligns with the timing marks as shown in the illustration.

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



18. TIGHTEN CRANKSHAFT PULLEY BOLT

Using SST, install the pulley bolt.

SST 09213-7001 1, 09330-00021

Torque: 330 N·m (3,300 kgf·cm, 243 ft·lbf)

19. INSTALL DRIVE BELT TENSIONER

Install the tensioner with the 3 bolts.

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

NOTICE:

Be careful not to drop the bolts inside the timing belt cover.

20. INSTALL NO. 2 TIMING BELT COVER

(a) Install the gasket on the timing belt cover.

(b) Using a 5 mm hexagon wrench, install the timing belt cover with the 3 bolts.

Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)

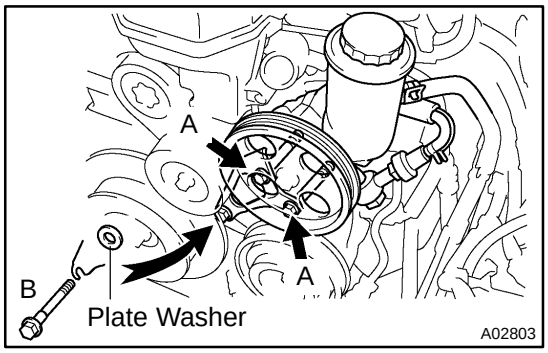
21. INSTALL NO. 3 TIMING BELT COVER

(a) Install the gasket on the timing belt cover.

(b) Using a 5 mm hexagon wrench, install the timing belt cover with the 4 bolts.

Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)

(c) Install the oil filler cap.



22. INSTALL PS PUMP AND FRONT BRACKET

(a) Temporarily install the vane pump to the bracket.

(b) Install the plate washer and front bracket with the 3 bolts.

Torque:
58 N·m (590 kgf·cm, 43 ft·lbf) for bolt A
52 N·m (530 kgf·cm, 38 ft·lbf) for bolt B

23. INSTALL DRIVE BELT (See page CH-1)

24. M/T:

INSTALL DRIVE BELT TENSIONER ABSORBER

Install the absorber with the 2 nuts.

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

25. INSTALL RADIATOR ASSEMBLY (See page CO-24)

26. FILL ENGINE WITH COOLANT

27. START ENGINE CHECK FOR LEAKS

28. INSTALL ENGINE UNDER COVER

29. ROAD TEST

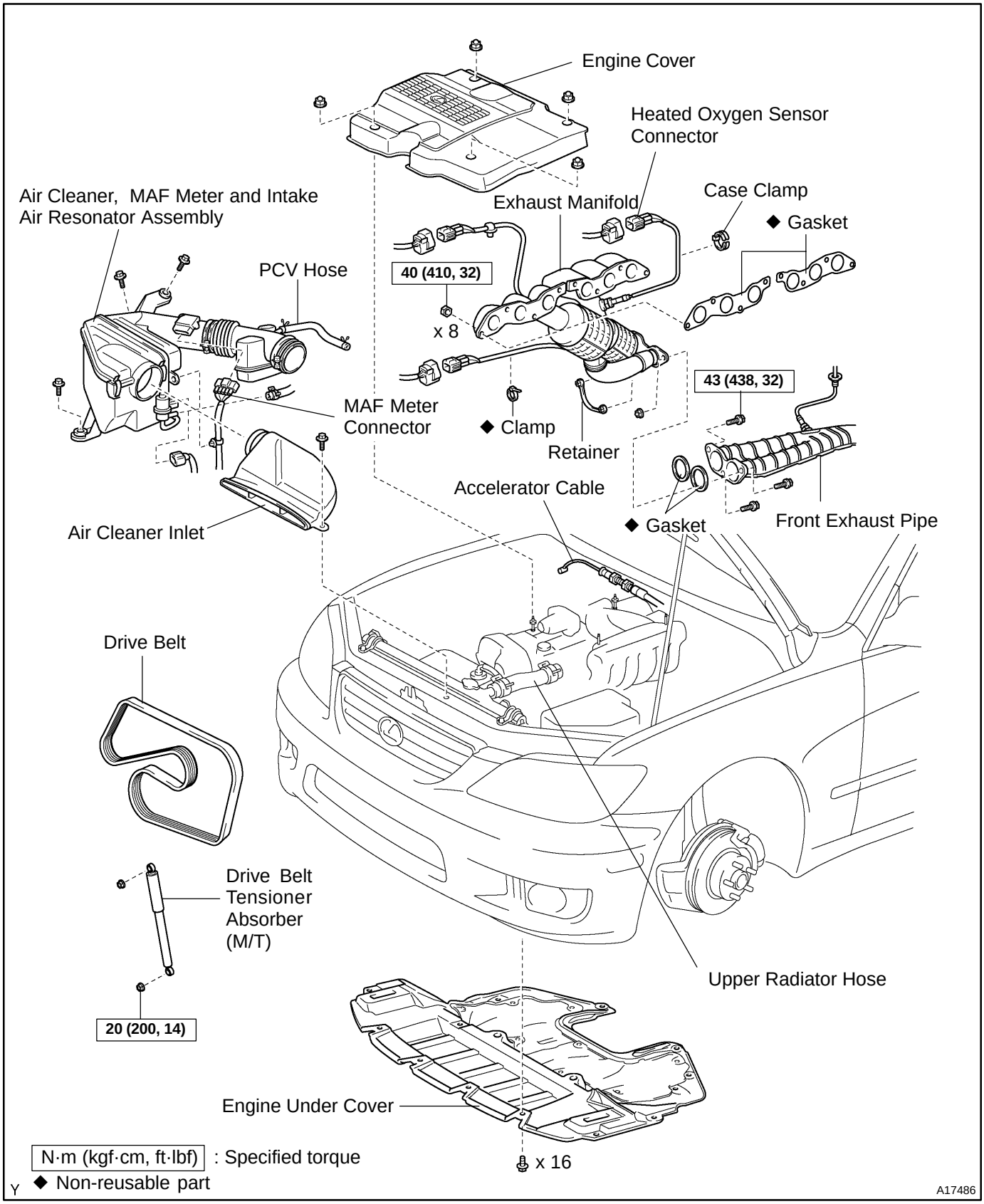
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

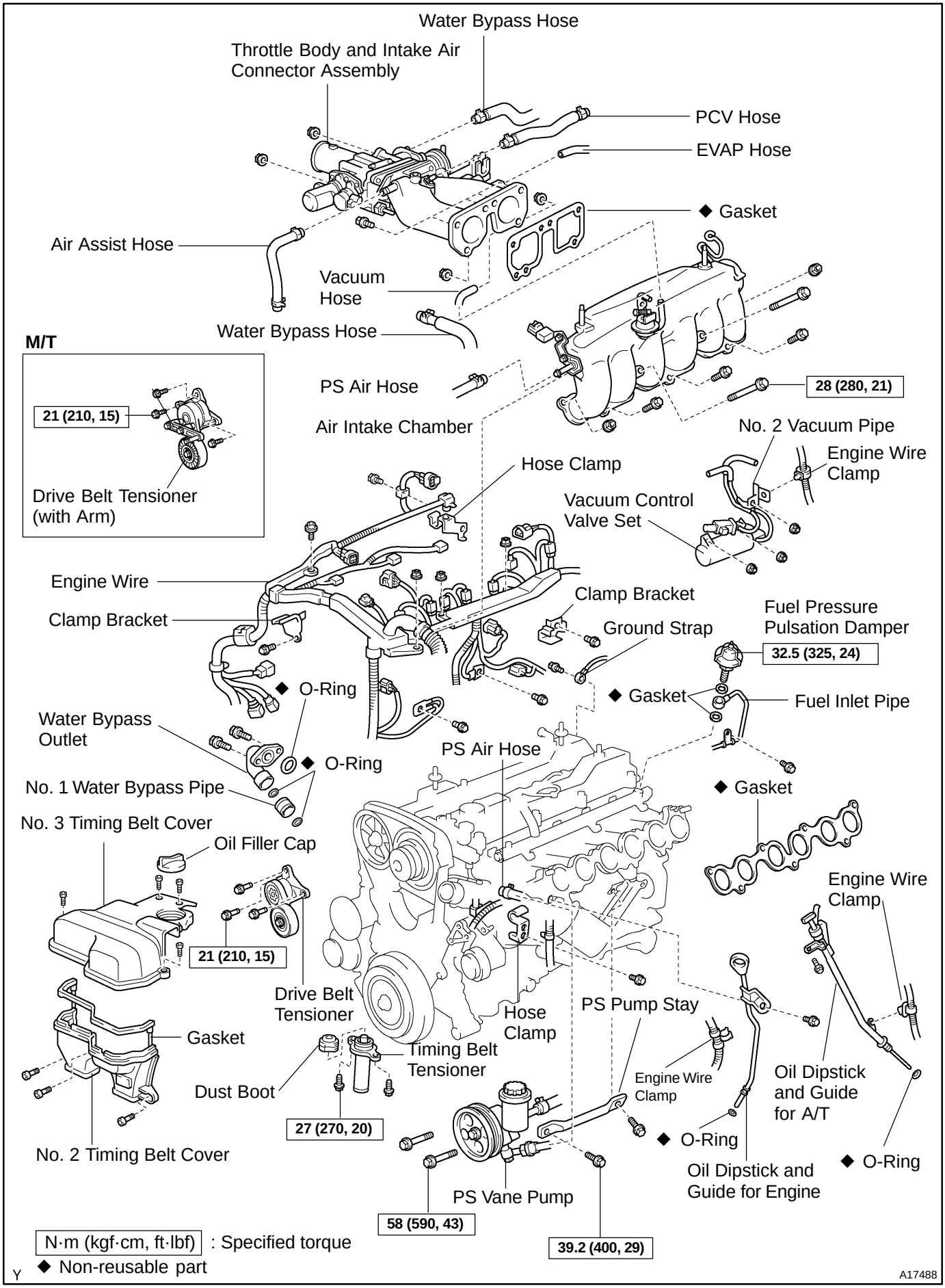
30. RECHECK ENGINE COOLANT LEVEL

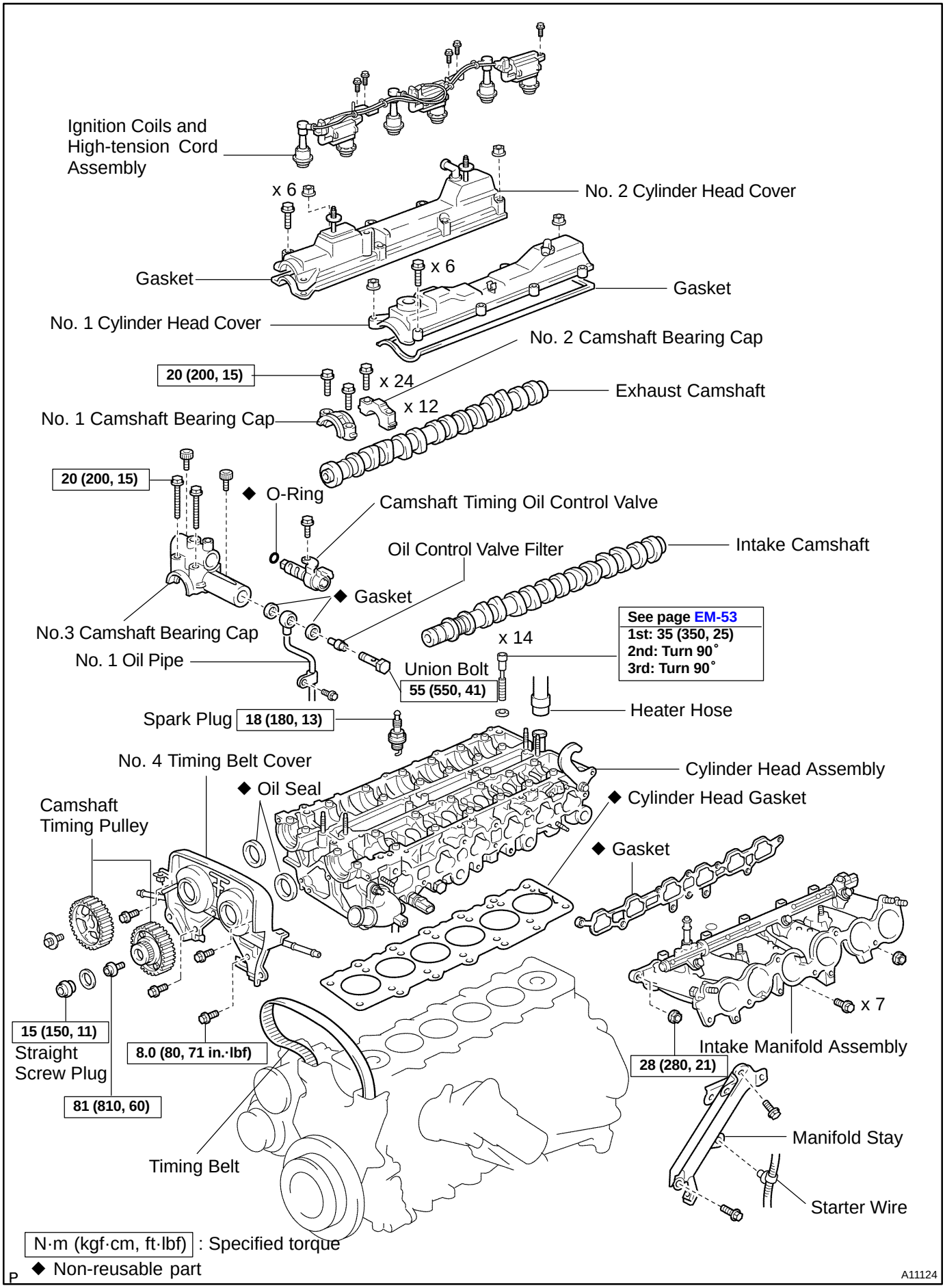
CYLINDER HEAD

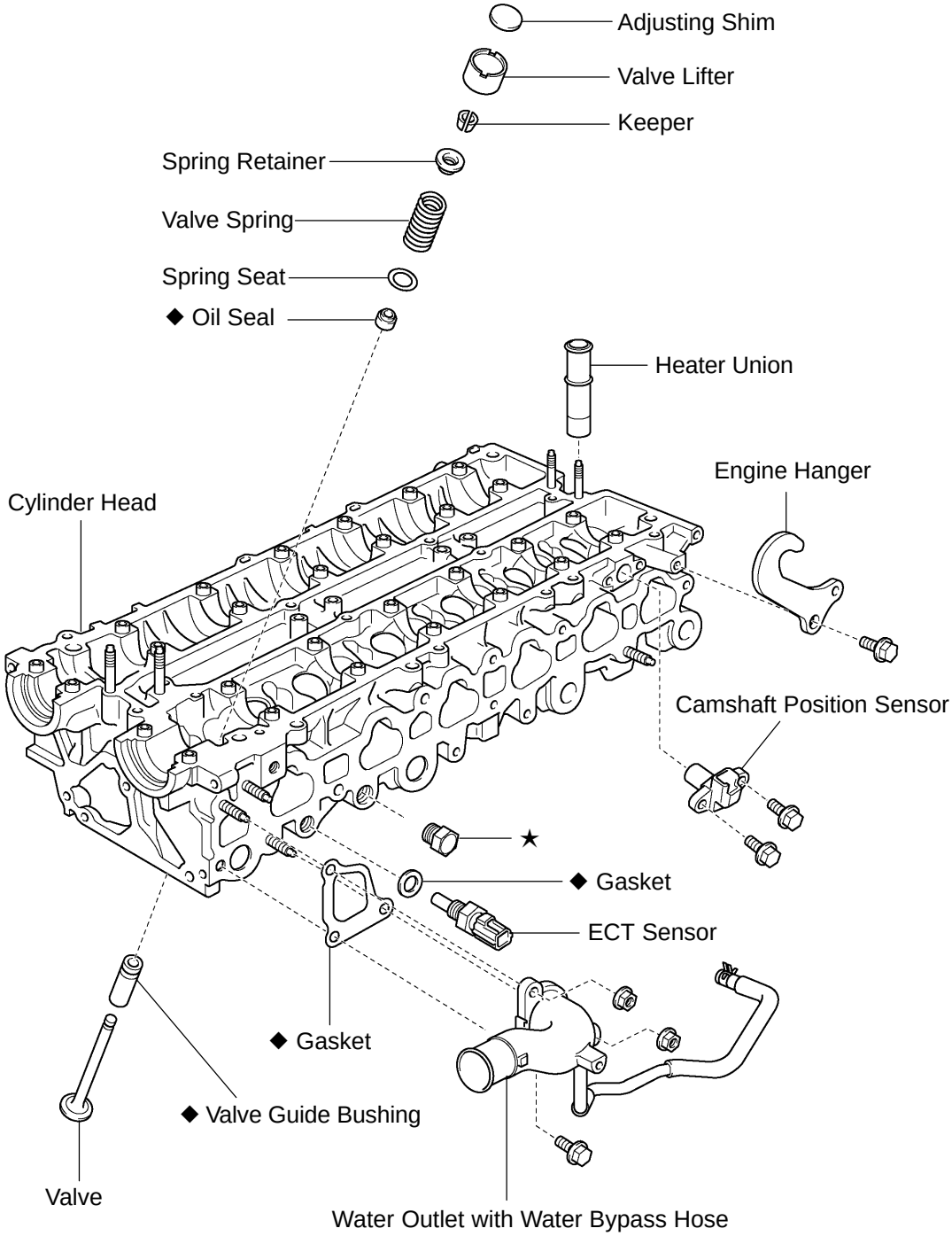
COMPONENTS

EM0D9-09




Water Bypass Hose
Throttle Body and Intake Air Connector Assembly
PCV Hose
EVAP Hose
◆ Gasket
Air Assist Hose
Vacuum Hose
Water Bypass Hose
M/T
21 (210, 15)
Drive Belt Tensioner (with Arm)
PS Air Hose
28 (280, 21)
Air Intake Chamber
No. 2 Vacuum Pipe
Engine Wire Clamp
Hose Clamp
Vacuum Control Valve Set
Engine Wire
Clamp Bracket
Clamp Bracket
Ground Strap
Fuel Pressure Pulsation Damper
32.5 (325, 24)
◆ O-Ring
◆ Gasket
Fuel Inlet Pipe
Water Bypass Outlet
PS Air Hose
◆ O-Ring
No. 1 Water Bypass Pipe
◆ Gasket
No. 3 Timing Belt Cover
Oil Filler Cap
Engine Wire Clamp
21 (210, 15)
Drive Belt Tensioner
Hose Clamp
PS Pump Stay
Gasket
Timing Belt Tensioner
Engine Wire Clamp
Oil Dipstick and Guide for A/T
Dust Boot
27 (270, 20)
◆ O-Ring
◆ O-Ring
No. 2 Timing Belt Cover
Oil Dipstick and Guide for Engine
PS Vane Pump
58 (590, 43)
39.2 (400, 29)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
Y
A17488


Ignition Coils and High-tension Cord Assembly
x 6
No. 2 Cylinder Head Cover
Gasket
x 6
Gasket
No. 1 Cylinder Head Cover
No. 2 Camshaft Bearing Cap
20 (200, 15)
x 24
x 12
Exhaust Camshaft
No. 1 Camshaft Bearing Cap
20 (200, 15)
◆ O-Ring
Camshaft Timing Oil Control Valve
Oil Control Valve Filter
Intake Camshaft
◆ Gasket
No.3 Camshaft Bearing Cap
See page EM-53
1st: 35 (350, 25)
2nd: Turn 90°
3rd: Turn 90°
x 14
No. 1 Oil Pipe
Union Bolt
55 (550, 41)
Heater Hose
Spark Plug 18 (180, 13)
No. 4 Timing Belt Cover
◆ Oil Seal
Cylinder Head Assembly
◆ Cylinder Head Gasket
Camshaft Timing Pulley
◆ Gasket
x 7
15 (150, 11)
Straight Screw Plug
8.0 (80, 71 in.·lbf)
Intake Manifold Assembly
28 (280, 21)
81 (810, 60)
Manifold Stay
Timing Belt
Starter Wire
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
A11124



◆ Non-reusable part
Y ★ Precoated part

A14344

EM1J9-03

REMOVAL

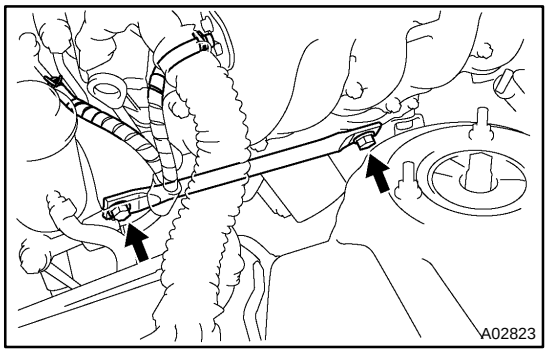
1. **REMOVE ENGINE UNDER COVER**
2. **DRAIN ENGINE COOLANT**
3. **DISCONNECT UPPER RADIATOR HOSE FROM WATER OUTLET**
4. **REMOVE ENGINE COVER**

Remove the 4 nuts and engine cover.

5. **REMOVE AIR CLEANER INLET**
6. **REMOVE AIR CLEANER, MAF METER AND INTAKE AIR RESONATOR ASSEMBLY (See page EM-65)**
7. **M/T:**
   REMOVE DRIVE BELT TENSIONER ABSORBER

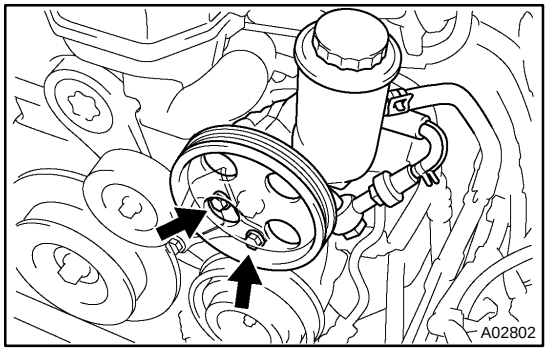
Remove the 2 nuts and absorber.

8. **REMOVE DRIVE BELT (See page CH-1)**



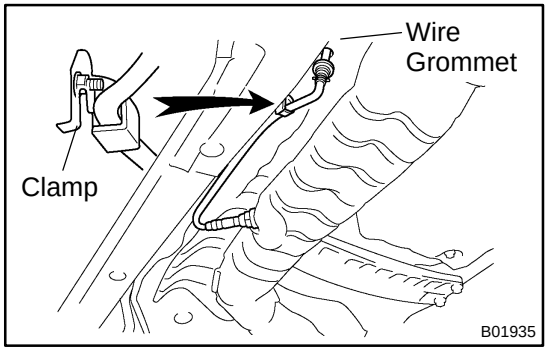
9. **DISCONNECT PS PUMP WITHOUT DISCONNECTING HOSES**

(a) Disconnect the PS air hose from the No. 4 timing belt cover.
(b) Disconnect the PS air hose from the air intake chamber.
(c) Remove the 2 bolts and pump rear stay.



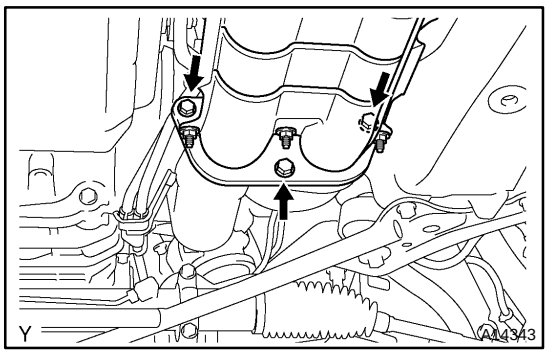
(d) Remove the 2 bolts, and disconnect the vane pump from the pump bracket.

HINT:
Put aside the vane pump, and suspend it.

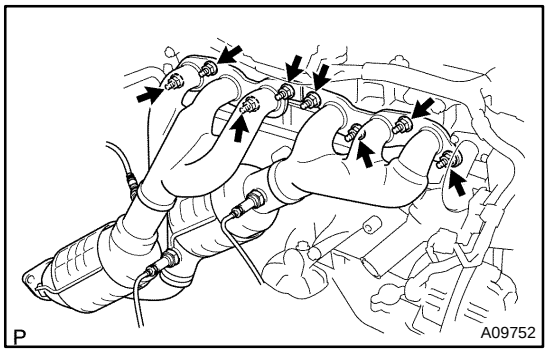


10. **DISCONNECT FRONT EXHAUST PIPE FROM EXHAUST MANIFOLD**

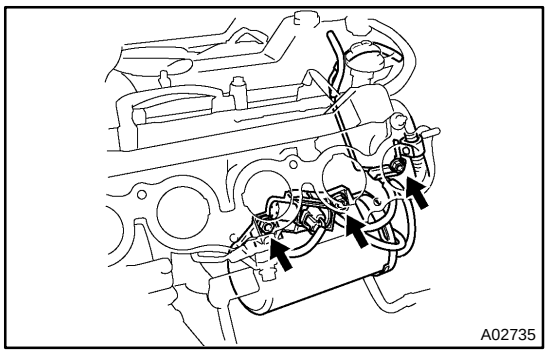
(a) Disconnect the wire grommet and sensor wire of the heated oxygen sensor (bank 2 sensor 2) from the hole and clamp on the floor.



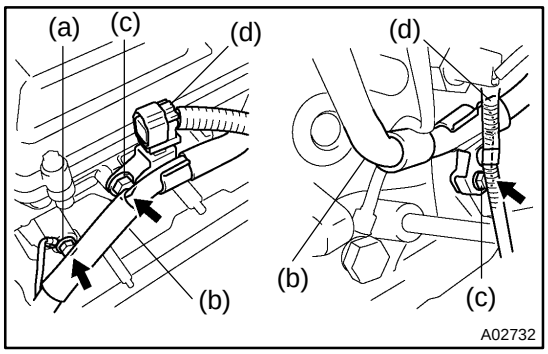
(b) Remove the 3 bolts, nuts and retainer holding the front exhaust pipe to the exhaust manifold.
(c) Disconnect the front exhaust pipe from the exhaust manifold, and remove the 2 gaskets.



11. REMOVE EXHAUST MANIFOLD
(a) Disconnect the 3 heated oxygen sensor connectors and clamp.
(b) Remove the clamp and case clamp.
(c) Using a 14 mm deep socket wrench, remove the 8 nuts, exhaust manifold and 2 gaskets.
12. REMOVE WATER BYPASS OUTLET AND NO. 1 WATER BYPASS PIPE (See page CO-12)
13. REMOVE THROTTLE BODY AND INTAKE AIR CONNECTOR ASSEMBLY (See page EM-5)
14. REMOVE OIL DIPSTICK AND GUIDE FOR ENGINE (See page LU-6)
15. REMOVE OIL DIPSTICK AND GUIDE FOR A/T (See page EM-65)
16. REMOVE AIR INTAKE CHAMBER (See page SF-46)

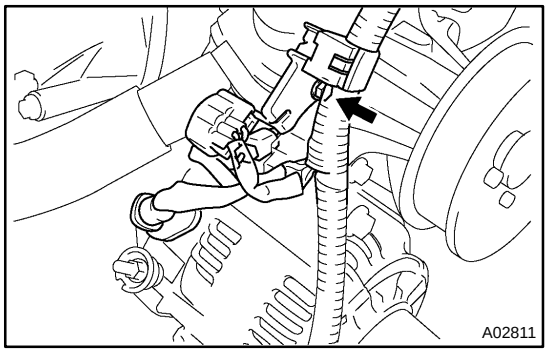


17. REMOVE VACUUM CONTROL VALVE SET AND NO. 2 VACUUM PIPE
(a) Disconnect the VSV connector for the ACIS.
(b) Remove the 3 nuts, vacuum control valve set and No. 2 vacuum pipe.
(c) Disconnect the engine wire clamp from the clamp bracket of the No. 2 vacuum pipe.
18. REMOVE NO. 3 TIMING BELT COVER
19. REMOVE IGNITION COILS AND HIGH- TENSION CORD SET ASSEMBLY (See page IG-7)
20. REMOVE SPARK PLUGS

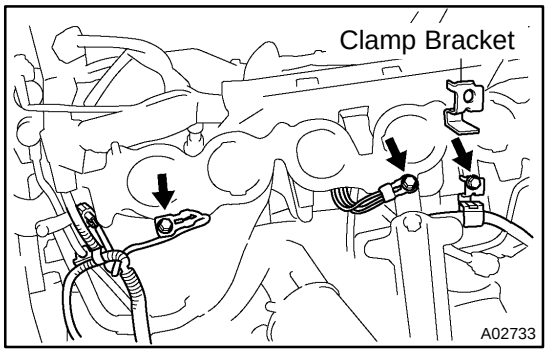


21. DISCONNECT ENGINE WIRE FROM CYLINDER HEAD

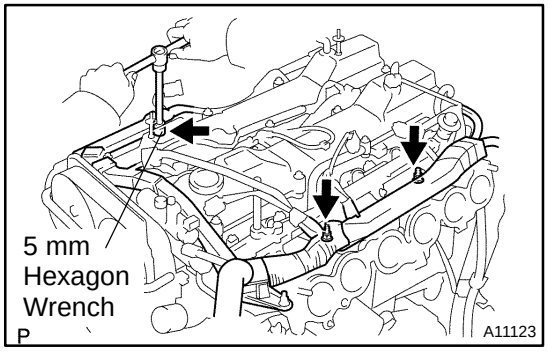
(a) Disconnect the ground strap from the cylinder head.
(b) Disconnect the 2 water bypass hoses from the hose clamps on the cylinder head and oil filter bracket.
(c) Remove the 2 bolts and hose clamps.
(d) Disconnect the heated oxygen sensor (bank 2 sensor 1) connector and engine wire clamp from the hose clamps.



(e) Disconnect the heated oxygen sensor (bank 1 sensor 1) connector.
(f) Disconnect the crankshaft position sensor connector.
(g) Disconnect the generator connector.
(h) Remove the bolt and clamp bracket, and disconnect the engine wire from the water pump.

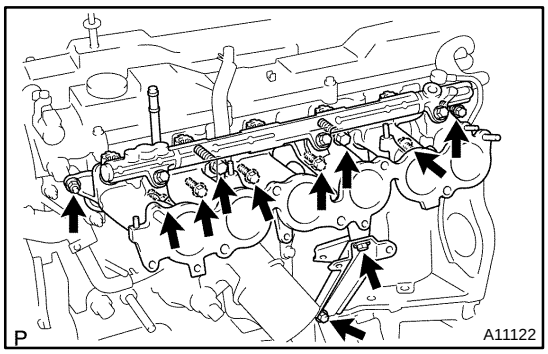


(i) Disconnect the 2 ground terminals from the intake manifold.
(j) Disconnect the 2 engine wire clamps from the No. 1 oil pipe and clamp bracket on the intake manifold.
(k) Remove the bolt and clamp bracket.
(l) Disconnect the ECT sensor connector.
(m) Remove the 2 knock sensor connectors.
(n) Remove the oil pressure switch connector.
(o) Remove the oil level sensor connector.
(p) Remove the starter connector.
(q) Remove the 6 injector connectors.
(r) Remove the camshaft timing oil control valve connector.
(s) Remove the camshaft position sensor connector.



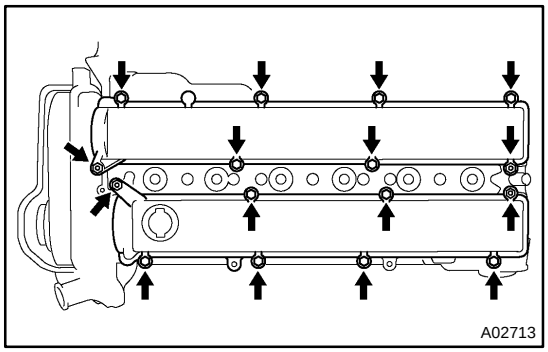
(t) Using a 5 mm hexagon wrench, remove the bolt holding the engine wire protector to the No. 2 cylinder head cover.
(u) Remove the 3 nuts, and disconnect the engine wire protector from the intake manifold.

22. REMOVE FUEL PRESSURE PULSATION DAMPER (See page SF-26)



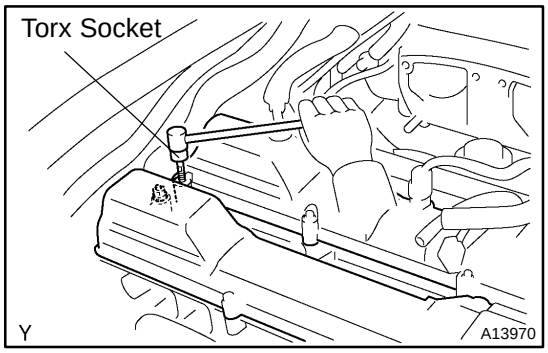
23. REMOVE INTAKE MANIFOLD ASSEMBLY

(a) Disconnect the starter wire from the manifold stay.
(b) Remove the 2 bolts and manifold stay.
(c) Remove the 7 bolts, 2 nuts, the intake manifold and delivery pipe assembly and gasket.

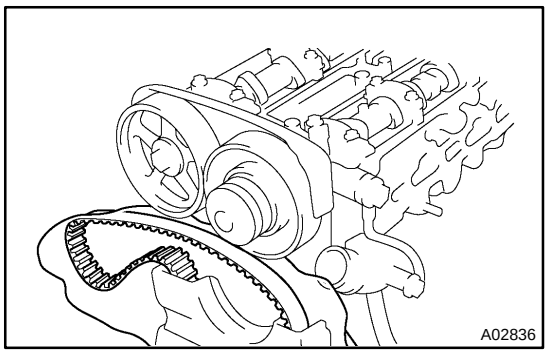


24. REMOVE NO. 1 AND NO. 2 CYLINDER HEAD COVERS

(a) Remove the 12 bolts and 4 nuts.



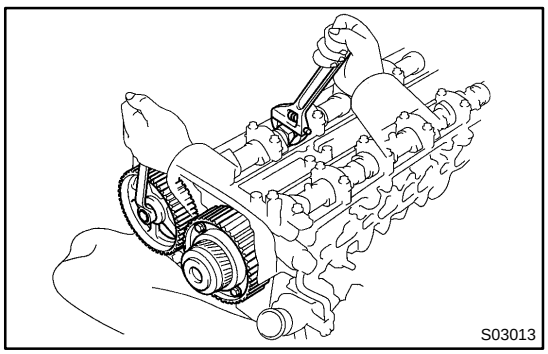
(b) Using a torx socket (E5), remove the 4 stud bolts.
(c) Remove the cylinder head covers and gaskets.



25. DISCONNECT TIMING BELT FROM CAMSHAFT TIMING PULLEYS (See page EM-17)

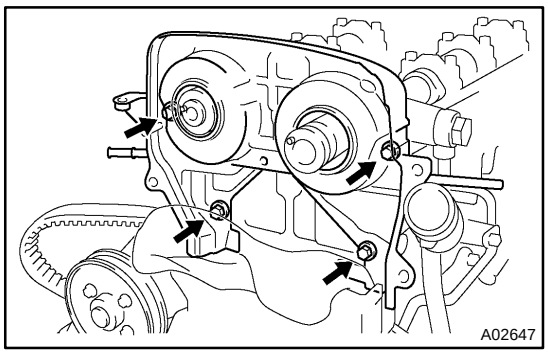
NOTICE:

- **Support the timing belt, so that the measuring of the crankshaft timing pulley and timing belt does not shift.**
- **Be careful not to drop anything inside the timing belt cover.**
- **Do not allow the timing belt to come into contact with oil, water or dust.**



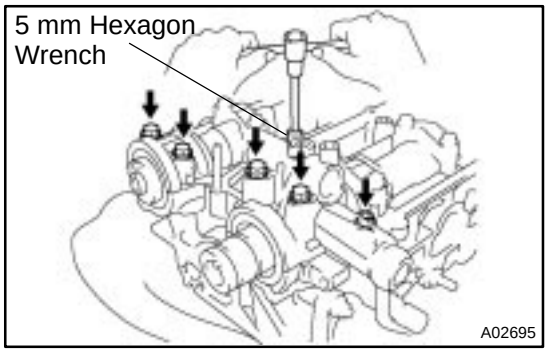
26. REMOVE CAMSHAFT TIMING PULLEYS

(a) Remove the exhaust camshaft timing pulley.
Hold the hexagon portion of the camshaft with a wrench, and remove the pulley bolt and camshaft pulley.
(b) Remove the VVT-i (intake camshaft timing) pulley (See page EM-17).



27. REMOVE NO. 4 TIMING BELT COVER

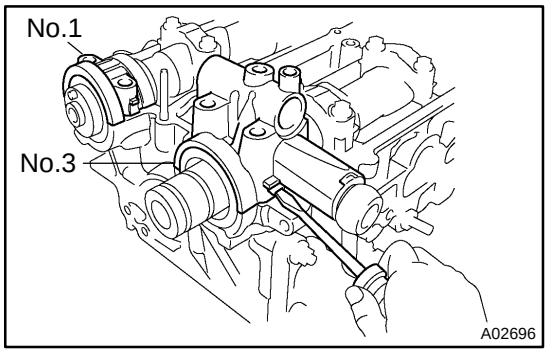
Remove the 4 bolts and timing belt cover.



28. REMOVE CAMSHAFTS

(a) Using a 5 mm hexagon wrench, the 2 No. 3 camshaft bearing cap bolts.

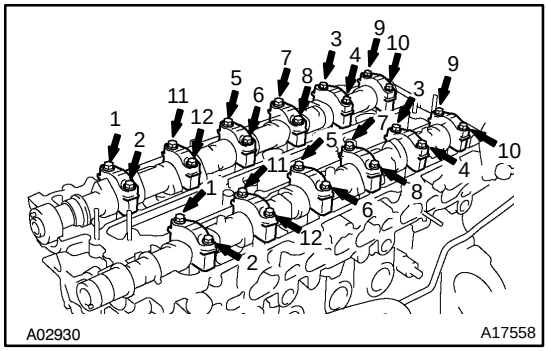
(b) Uniformly loosen and remove the 4 camshaft bearing cap bolts.



(c) Using a screwdriver, pry out the Nos. 1, 3 camshaft bearing caps and oil seals.

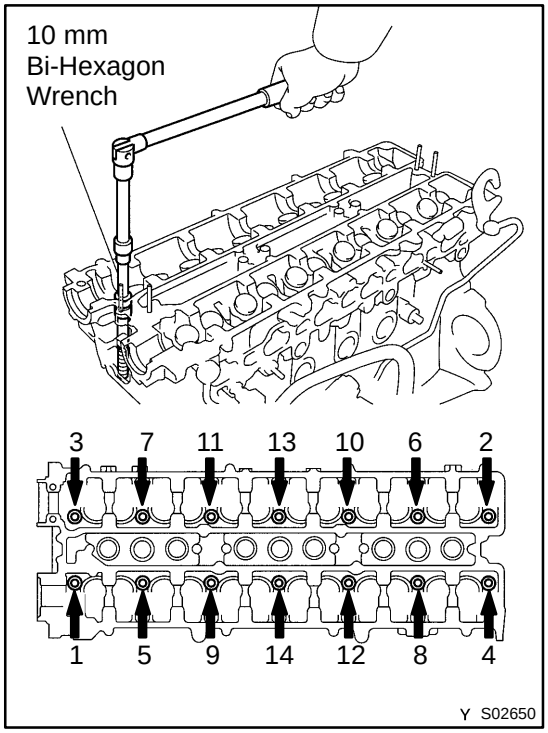
NOTICE:

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



(d) Uniformly loosen and remove the 12 camshaft bearing cap bolts, in several passes, in the sequence shown.

(e) Remove the 6 No. 2 camshaft bearing caps and camshaft. Remove the intake and exhaust camshafts.



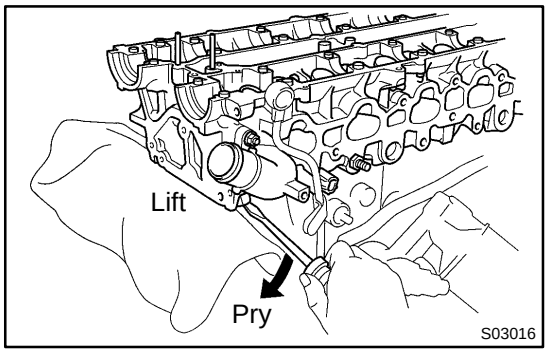
29. REMOVE CYLINDER HEAD ASSEMBLY

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

NOTICE:

Cylinder head warpage or cranking could result from removing in incorrect order.

(b) Remove the 14 plate washers.



(c) Lift the cylinder head from the dowels on the cylinder block.

(d) Disconnect the heater hose from the heater union.

(e) Place the head on wooden blocks on a bench.

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

NOTICE:

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

EM0DB-05

DISASSEMBLY

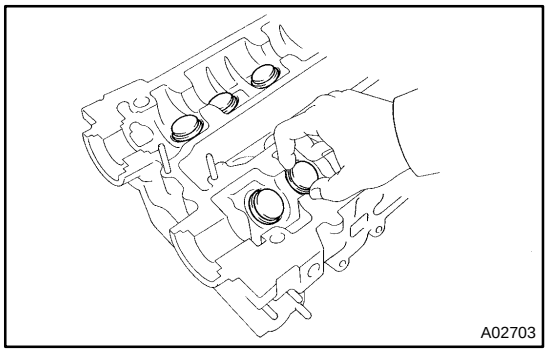
1. REMOVE WATER OUTLET WITH WATER BYPASS HOSE

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

2. REMOVE ENGINE HANGER

3. REMOVE CAMSHAFT POSITION SENSOR

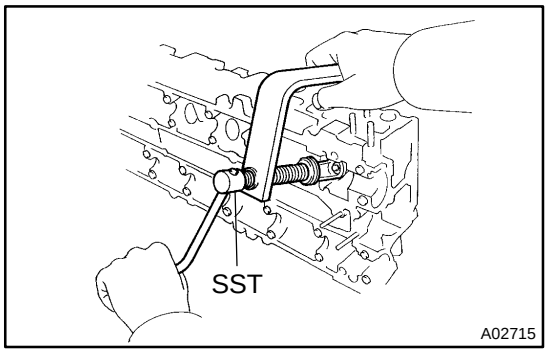
4. REMOVE ECT SENSOR



5. REMOVE VALVE LIFTERS AND SHIMS

HINT:

Store the valve lifters and shims in 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.

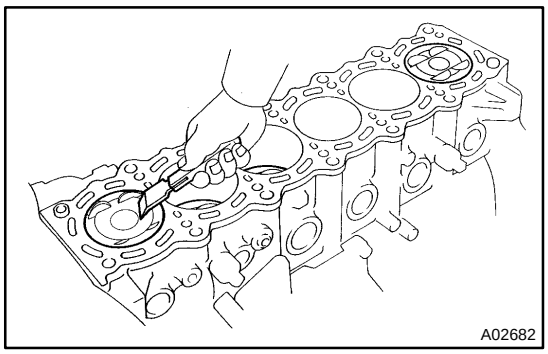
HINT:

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

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

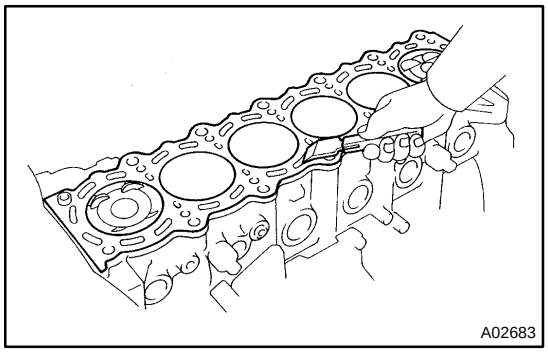
EM0DC-06

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 piston top surface.

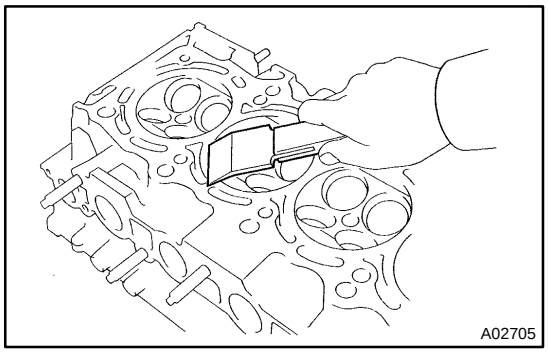


(b) Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

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

CAUTION:
Protect your eyes when using high - pressure compressed air.

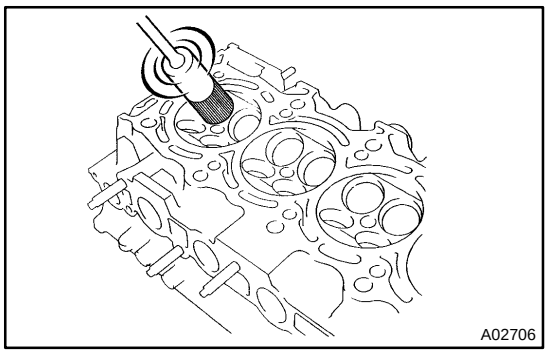
2. INSPECT CYLINDER BLOCK FOR FLATNESS (See page EM-87)



3. CLEAN CYLINDER HEAD

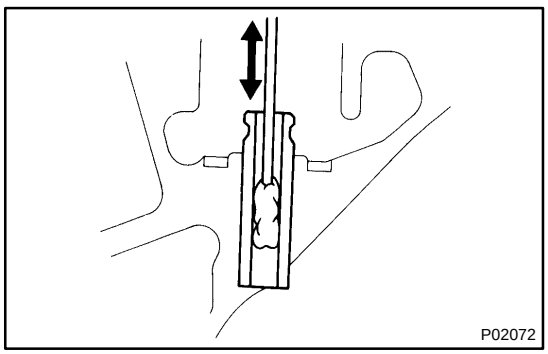
(a) Remove the gasket material.
Using a gasket scraper, remove all the gasket material from the cylinder block surface.

NOTICE:
Be careful not to scratch the cylinder block contact surface.

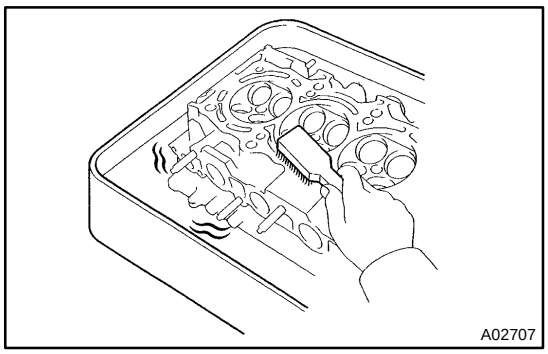


(b) Clean the combustion chambers.
Using a wire brush, remove all the carbon from the combustion chambers.

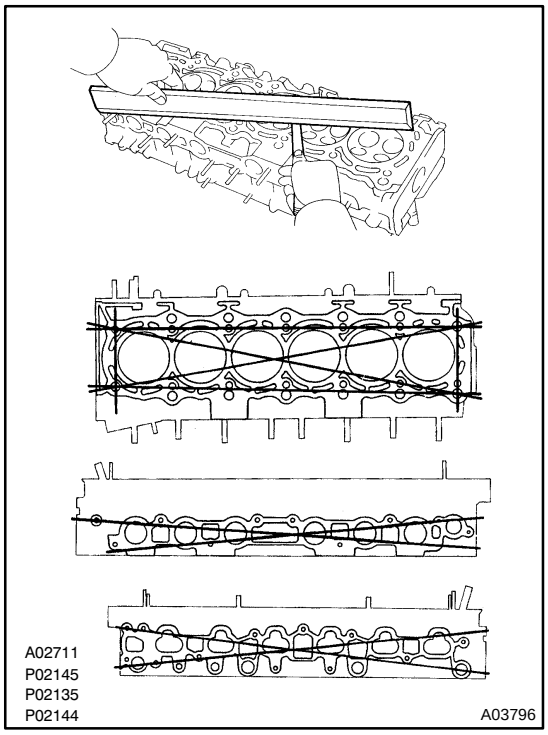
NOTICE:
Be careful not to scratch the cylinder block contact surface.



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



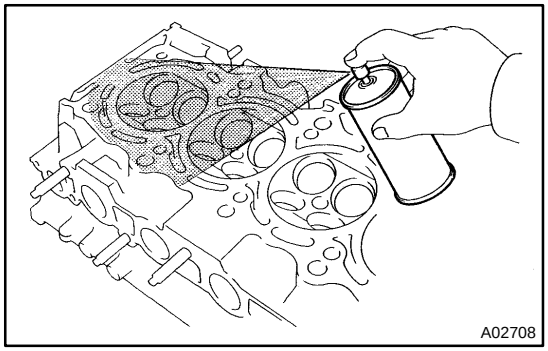
(d) Clean the cylinder head.
Using a soft brush and solvent, thoroughly clean the cylinder head.



4. INSPECT CYLINDER HEAD

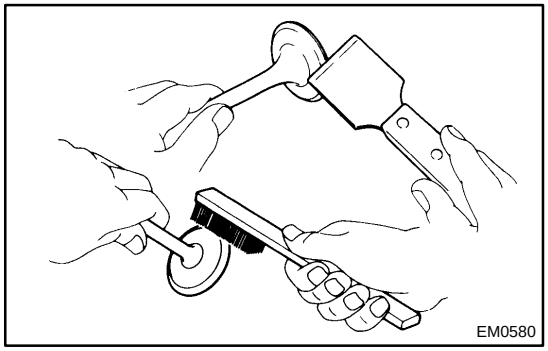
(a) Inspect for the flatness.
Using precision straight edge and feeler gauge, measure the surfaces contacting the cylinder block, intake and exhaust manifolds for warpage.
Maximum warpage: 0.10 mm (0.0039 in.)

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



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

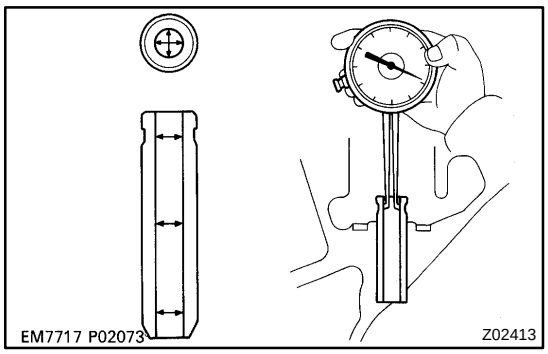
If cracked, replace the cylinder head.



5. CLEAN VALVES

(a) Using a gasket scraper, chip off any carbon from the valve head.

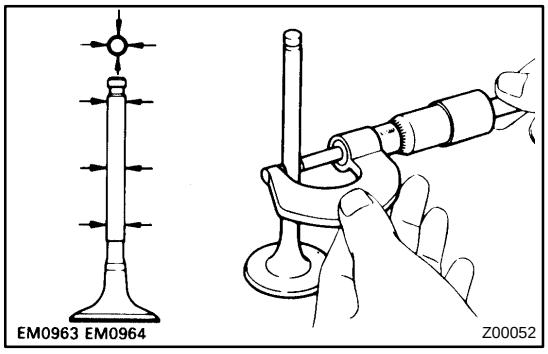
(b) Using a wire brush, thoroughly clean the valve.



6. INSPECT VALVE STEMS AND GUIDE BUSHINGS

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

Bushing inside diameter:
6.010 - 6.030 mm (0.2366 - 0.2374 in.)



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

Valve stem diameter:

Intake	5.970 - 5.985 mm (0.2350 - 0.2356 in.)
Exhaust	5.965 - 5.980 mm (0.2348 - 0.2354 in.)

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

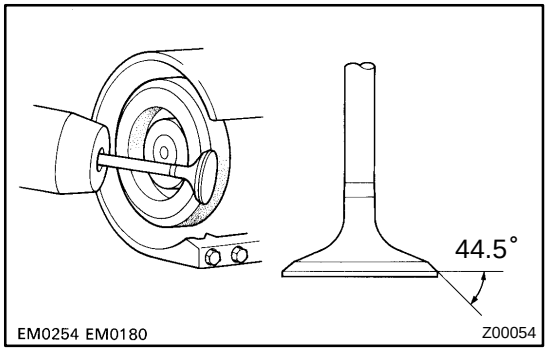
Standard oil clearance:

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-49).

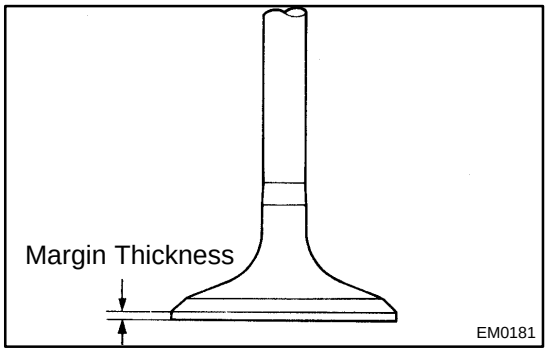


7. INSPECT AND GRIND VALVES

(a) Grind the valve enough to remove pits and carbon.

(b) Check that the valve is ground to the correct valve face angle.

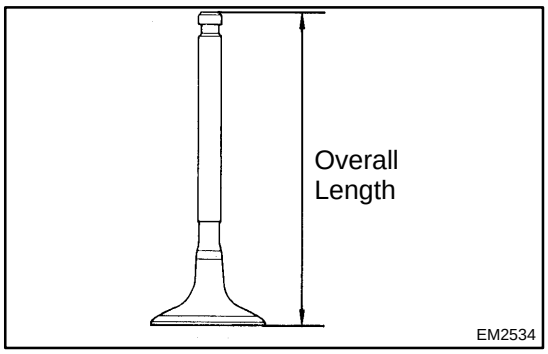
Valve face angle: 44.5°



(c) Check the valve head margin thickness.

Standard margin thickness:
0.8 - 1.2 mm (0.031 - 0.047 in.)
Minimum margin thickness: 0.5 mm (0.020 in.)

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



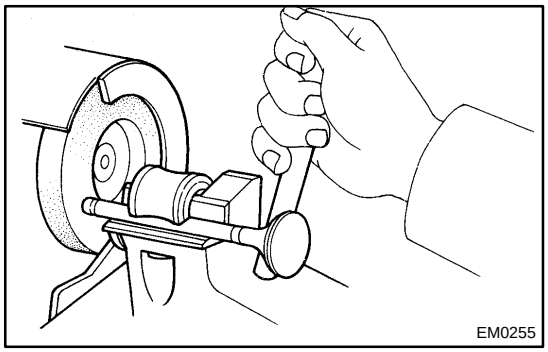
(d) Check the valve overall length.

Standard overall length:

Intake	98.29 - 98.79 mm (3.8697 - 3.8894 in.)
Exhaust	98.84 - 99.34 mm (3.8913 - 3.9110 in.)

Minimum overall length:

Intake	98.19 mm (3.8657 in.)
Exhaust	98.74 mm (3.8874 in.)



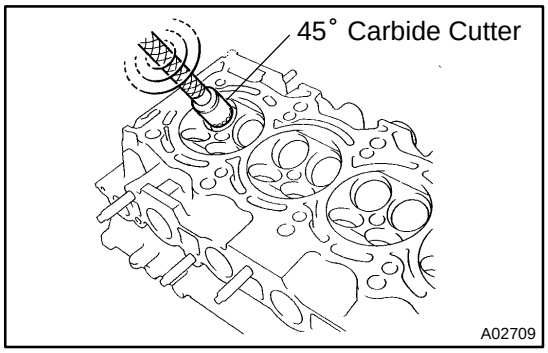
If the overall length is less than minimum, replace the valve.

(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.

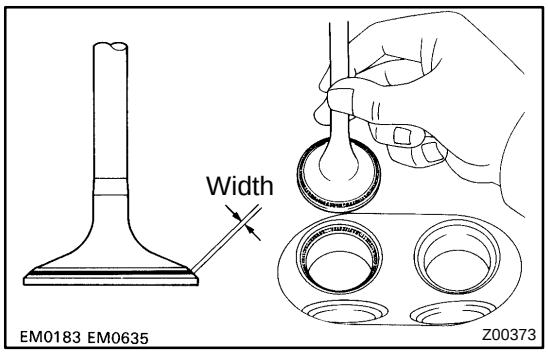
NOTICE:

Do not grind off more than the minimum overall 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.



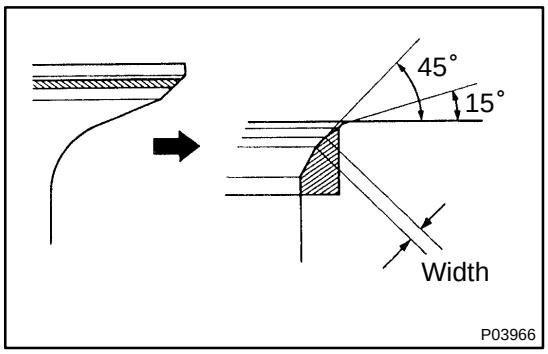
(b) Check the valve seating position.

Apply a thin coat of Prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate the valve.

(c) Check the valve face and seat for the following:

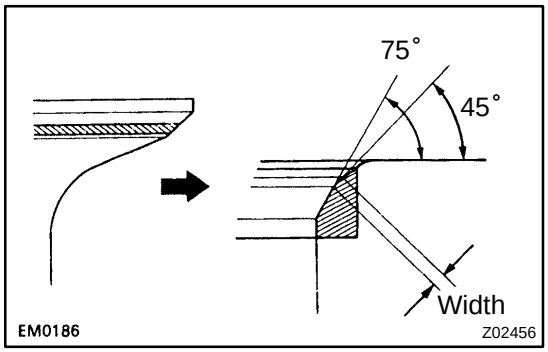
- If blue appears 360˚ around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360˚ around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with the following width:

Intake	1.0 - 1.4 mm (0.039 - 0.055 in.)
Exhaust	1.2 - 1.6 mm (0.047 - 0.063 in.)

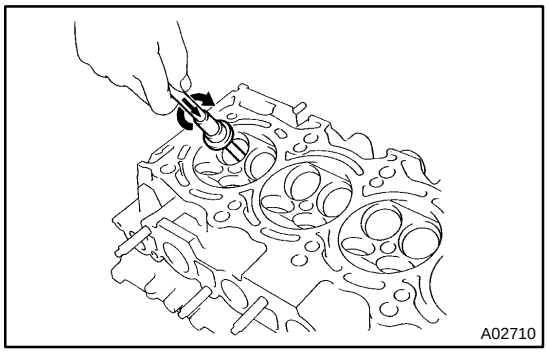


If not, correct the valve seats as follows:

(1) If the seating is too high on the valve face, use 15° and 45° cutters to correct the seat.

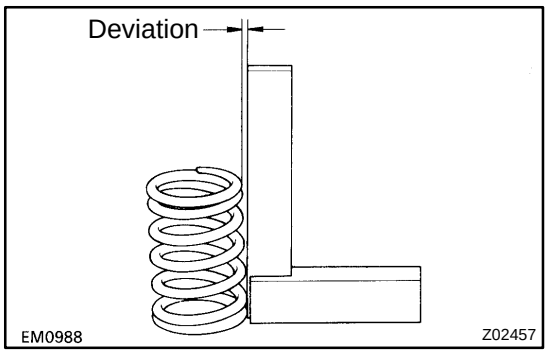


(2) If the seating is too low on the valve face, use 75° and 45° cutters to correct the seat.



(d) Hand-lap the valve and valve seat with an abrasive compound.

(e) After hand-lapping, clean the valve and valve seat.

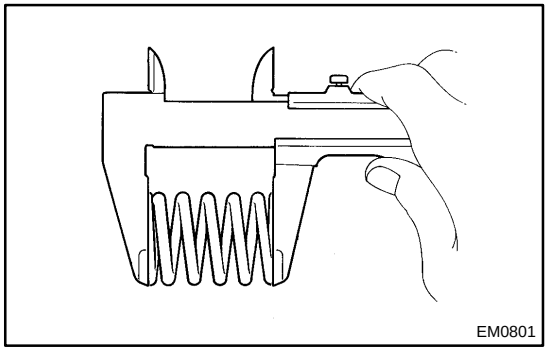


9. INSPECT VALVE SPRINGS

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

Maximum deviation: 2.0 mm (0.079 in.)

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

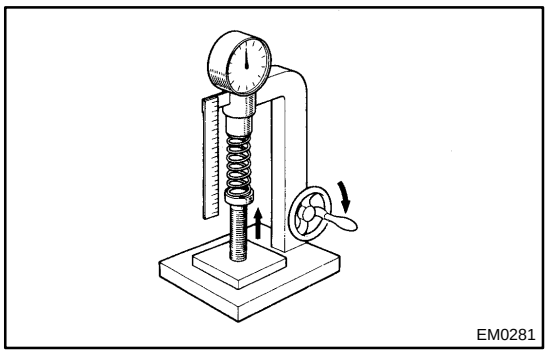


(b) Using vernier calipers, measure the free length of the valve spring.

Free length:

Pink painted mark	43.71 mm (1.7209 in.)
Yellow painted mark	44.10 mm (1.7362 in.)

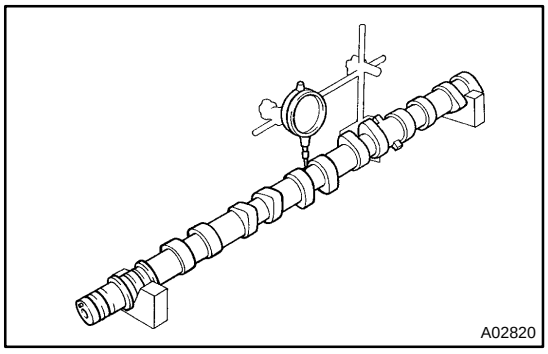
If the free length is not as specified, replace the valve spring.


EM0281

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

Installed tension:
186.2 - 205.8 N (19.0 - 21.0 kgf, 41.9 - 46.3 lbf)
at 34.5 mm (1.358 in.)

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


A02820

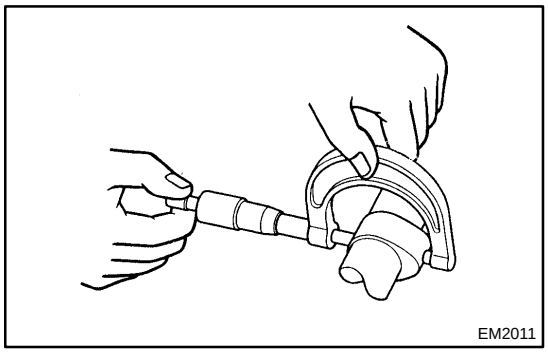
10. INSPECT CAMSHAFTS FOR RUNOUT

(a) Place the camshaft on V-blocks.

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

Maximum circle runout: 0.08 mm (0.0031 in.)

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


EM2011

11. INSPECT CAM LOBES

Using a micrometer, measure the cam lobe height.

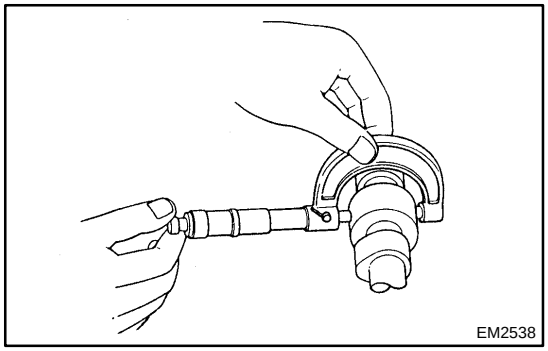
Standard cam lobe height:

Intake	44.310 - 44.360 mm (1.7445 - 1.7465 in.)
Exhaust	44.250 - 44.350 mm (1.7421 - 1.7461 in.)

Minimum cam lobe height:

Intake	44.16 mm (1.7386 in.)
Exhaust	44.10 mm (1.7362 in.)

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


EM2538

12. INSPECT CAMSHAFT JOURNALS

Using a micrometer, measure the journal diameter.

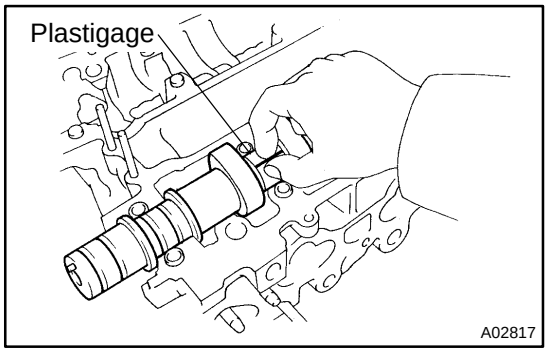
Journal diameter:
28.949 - 28.965 mm (1.1397 - 1.1404 in.)

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

13. INSPECT CAMSHAFT BEARING

Check the bearings for flaking and scoring.

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



A02817

14. INSPECT CAMSHAFT JOURNAL OIL CLEARANCE

(a) Clean the bearing caps and camshaft journals.

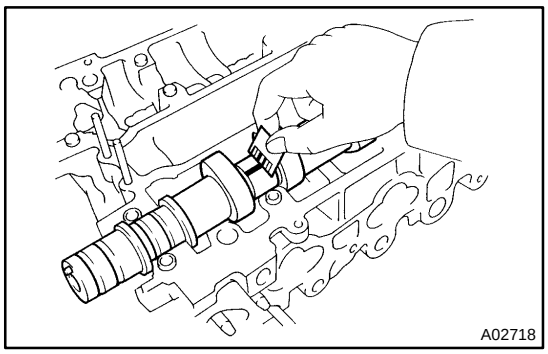
(b) Place the camshafts on the cylinder head.

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

(d) Install the bearing caps (See page EM-53).

NOTICE:
Do not turn the camshaft.

(e) Remove the bearing caps.

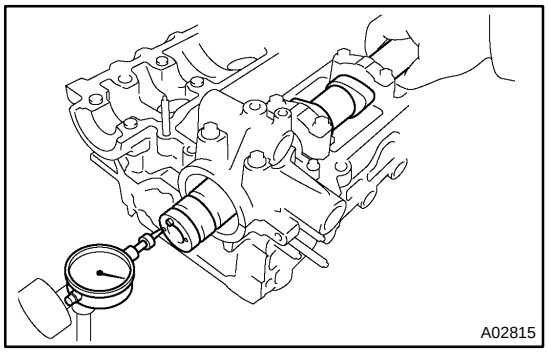


(f) Measure the Plastigage at its widest point.

Standard oil clearance:
0.035 - 0.072 mm (0.0014 - 0.0028 in.)
Maximum oil clearance: 0.10 mm (0.0039 in.)

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

(g) Completely remove the Plastigage.



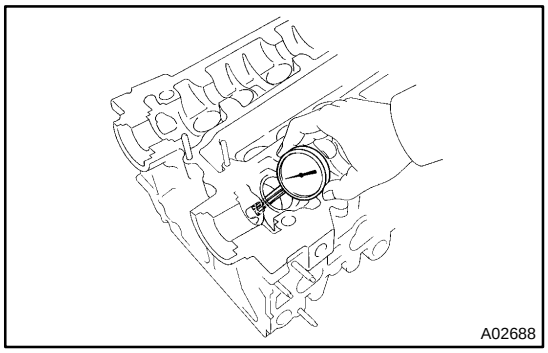
15. INSPECT CAMSHAFT THRUST CLEARANCE

(a) Install the camshafts (See page EM-53).

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

Standard thrust clearance:
0.080 - 0.190 mm (0.0031 - 0.0075 in.)
Maximum thrust clearance: 0.30 mm (0.0118 in.)

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



16. 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 - 31.016 mm (1.2205 - 1.2211 in.)

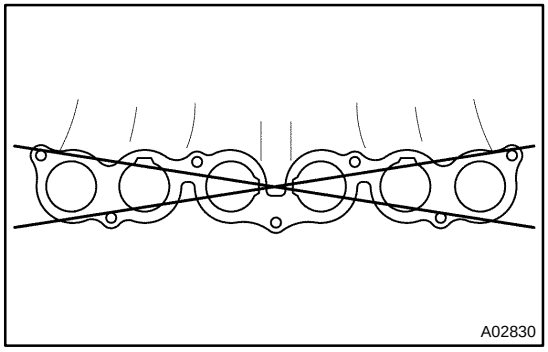
(b) Using a micrometer, measure the lifter diameter.

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 - 0.050 mm (0.0009 - 0.0020 in.)
Maximum oil clearance: 0.07 mm (0.0028 in.)

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

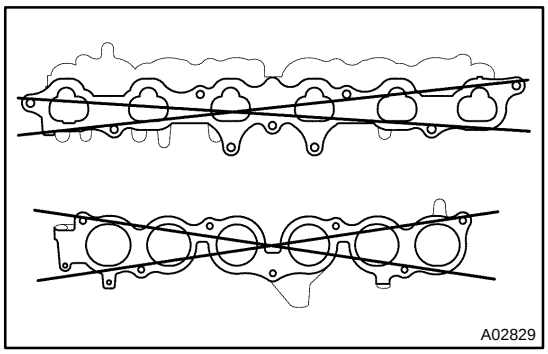


17. INSPECT AIR INTAKE CHAMBER

Using a precision straight edge and feeler gauge, measure the surfaces contacting the intake manifold for warpage.

Maximum warpage: 0.15 mm (0.0059 in.)

If warpage is greater than maximum, replace the chamber.

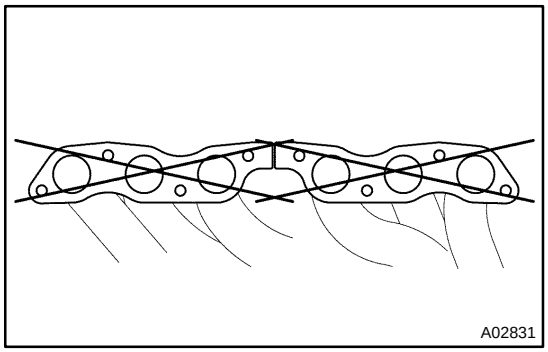


18. INSPECT INTAKE MANIFOLD

Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder head and air intake chamber for warpage.

Maximum warpage: 0.15 mm (0.0059 in.)

If warpage is greater than maximum, replace the manifold.

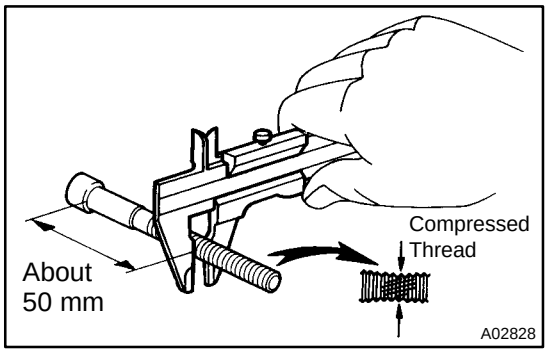


19. INSPECT EXHAUST MANIFOLD

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

Maximum warpage: 0.50 mm (0.0196 in.)

If warpage is greater than maximum, replace the manifold.



20. INSPECT CYLINDER HEAD BOLTS

Using a vernier caliper, measure the thread outside diameter of the bolt.

Standard outside diameter:

10.8 - 11.0 mm (0.425 - 0.433 in.)

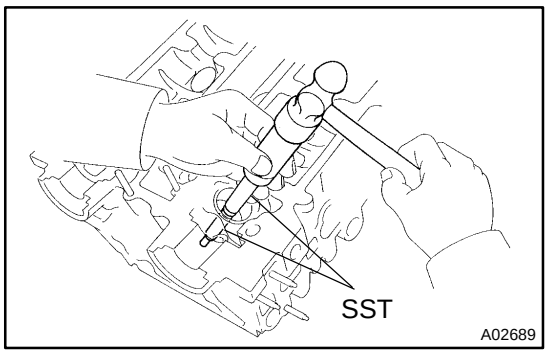
Minimum outside diameter: 10.7 mm (0.421 in.)

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

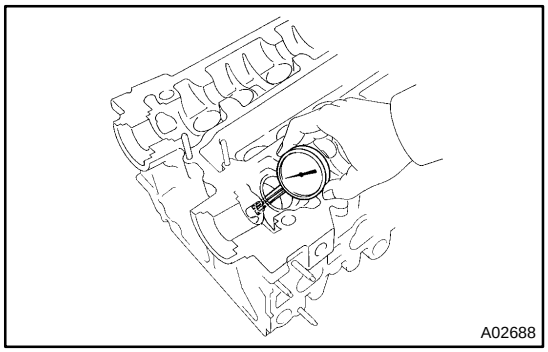
EM0DD-06

REPLACEMENT

REPLACE VALVE GUIDE BUSHINGS



(a) Using SST and a hammer, tap out the guide bushing.
SST 09201- 10000 (09201- 01060), 09950- 70010 (09951-07100)



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

Both intake and exhaust

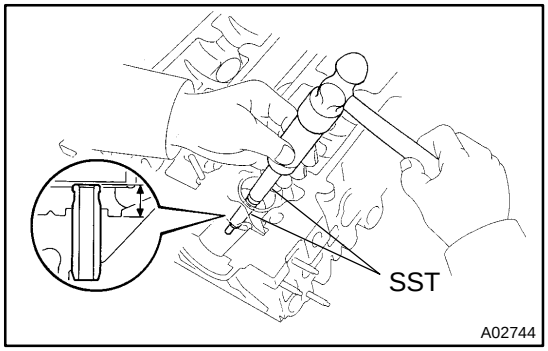
Bushing bore diameter mm (in.)	Bushing size
10.985 - 11.006 mm (0.4325 - 0.4333 in.)	Use STD
11.035 - 11.056 mm (0.4344 - 0.4353 in.)	Use O/S 0.05

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

If the bushing bore diameter of the cylinder head is greater than 11.006 mm (0.4333 in.), machine the bushing bore to the following dimension:

11.035 - 11.056 mm (0.4344 - 0.4353 in.)

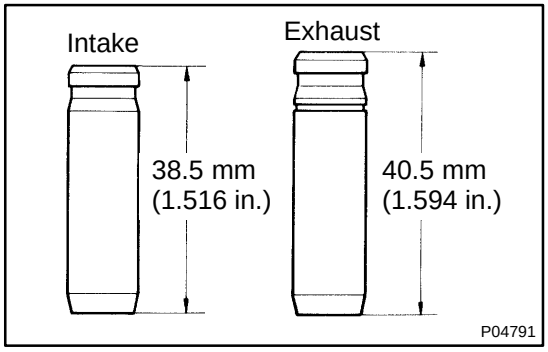
If the bushing bore diameter of the cylinder head is greater than 11.056 mm (0.4353 in.), replace the cylinder head.



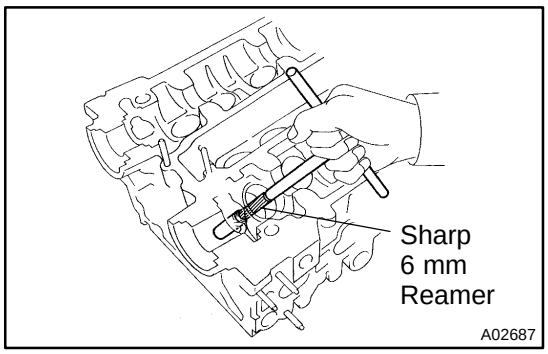
(d) Using SST and a hammer, tap in a new guide bushing to the specified protrusion height.
SST 09201- 10000 (09201- 01060), 09950- 70010 (09951-07100)

Protrusion height:

Intake	12.3 - 12.7 mm (0.484 - 0.500 in.)
Exhaust	11.4 - 11.8 mm (0.449 - 0.465 in.)



HINT:
Different bushings are used for the intake and exhaust.



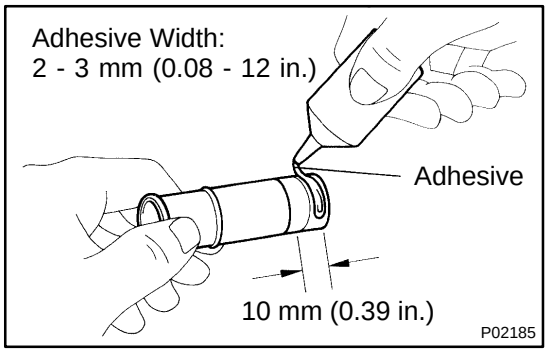
(e) Using a sharp 6 mm reamer, ream the guide bushing to obtain the standard specified clearance (See page EM-41) between the guide bushing and valve stem.

EM0DE-06

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 HEATER UNION

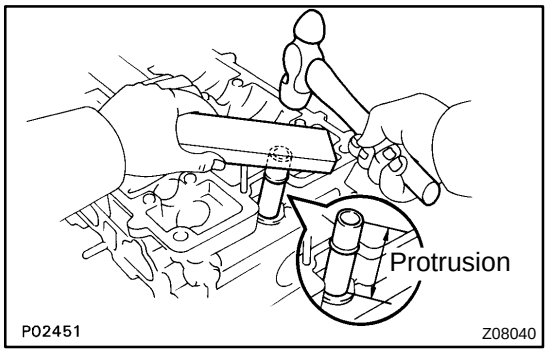
HINT:

When using a new cylinder head, a new heater union must be installed.

(a) Apply adhesive to the end of the heater union as shown in the illustration.

Adhesive:

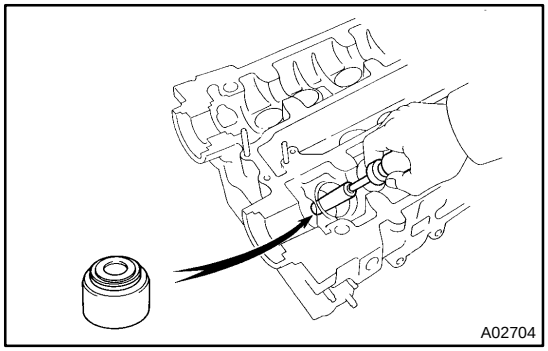
Part No.08833-00070, THREE BOND 1324 or equivalent



(b) Using a wooden block and hammer, tap in a new heater union, leaving 48 mm (1.89 in.) protruding from the cylinder head.

NOTICE:

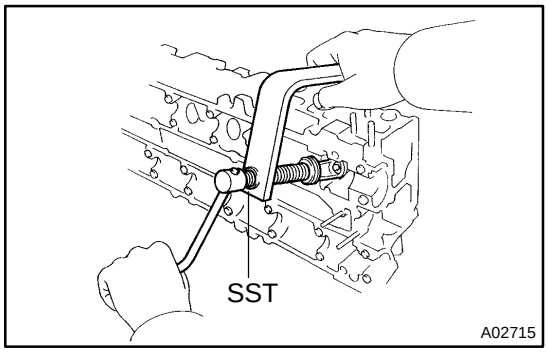
Do not tap it in too far.



2. INSTALL VALVES

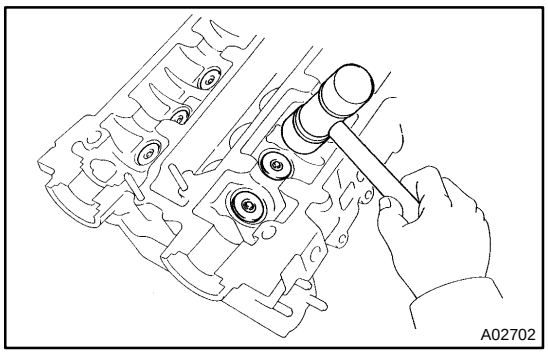
(a) Install a new oil seal on the valve guide bushing.

(b) Install the valve, spring seat, valve spring and spring retainer.



(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, lightly tap the valve stem tip to assure proper fit.

3. INSTALL VALVE LIFTERS AND SHIMS

(a) Install the valve lifter and shim.

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

4. INSTALL ECT SENSOR

Torque: 19.6 N·m (200 kgf·cm, 14 ft·lbf)

5. INSTALL CAMSHAFT POSITION SENSOR

6. INSTALL ENGINE HANGER

Torque: 40 N·m (400 kgf·cm, 30 ft·lbf)

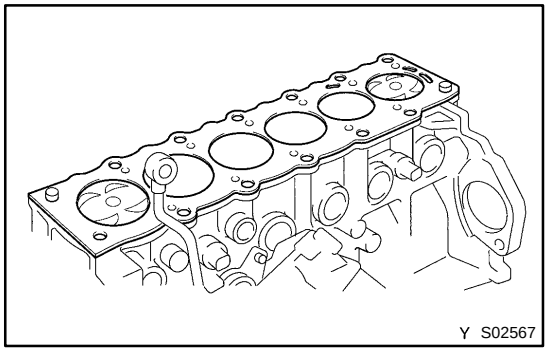
7. INSTALL WATER OUTLET WITH WATER BYPASS HOSE

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

Torque: 28 N·m (280 kgf·cm, 21 ft·lbf)

EM1JA-03

INSTALLATION



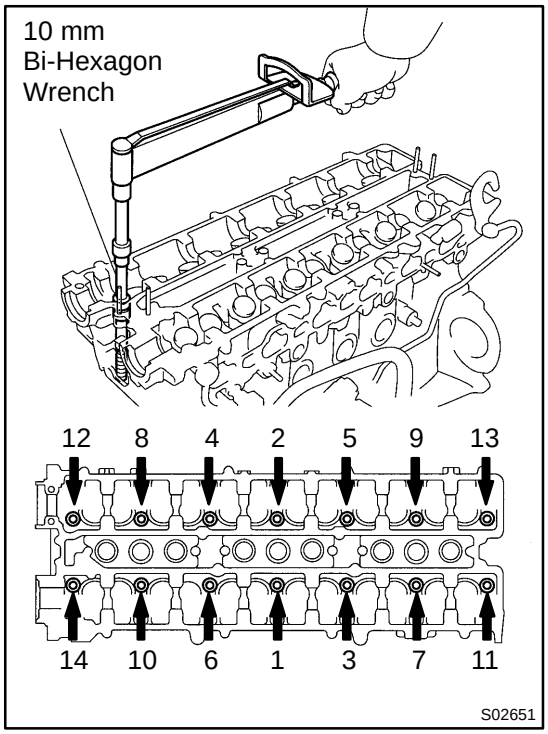
1. PLACE CYLINDER HEAD ON CYLINDER BLOCK

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

NOTICE:

Be sure to install it correctly.

(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 (f)).
- If any of bolts break or deform, replace them.

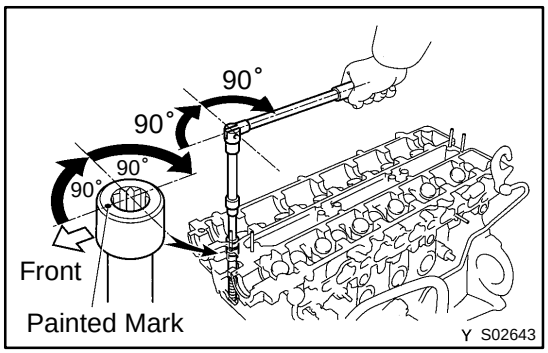
(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

(b) Install the 14 plate washers to each cylinder head bolt.

(c) Using a 10 mm bi-hexagon wrench, uniformly tighten the cylinder head bolts, in several passes, in the sequence shown.

Torque: 35 N·m (350 kgf·cm, 26 ft·lbf)

If any of the bolts do not meet the torque specification, replace the bolt.

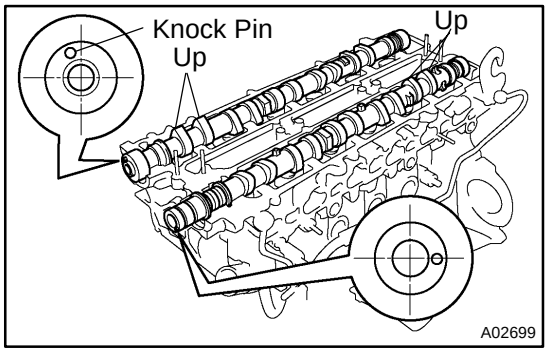


(d) Mark the front of the cylinder head bolt head with paint.

(e) Retighten the cylinder head bolts 90° in the numerical order shown.

(f) Retighten cylinder head bolts by an additional 90° shown.

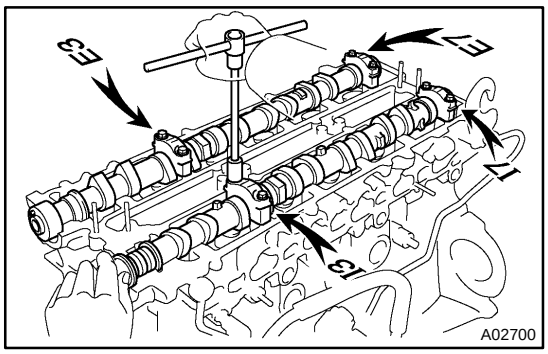
(g) Check that the painted mark is now turned to the rear.



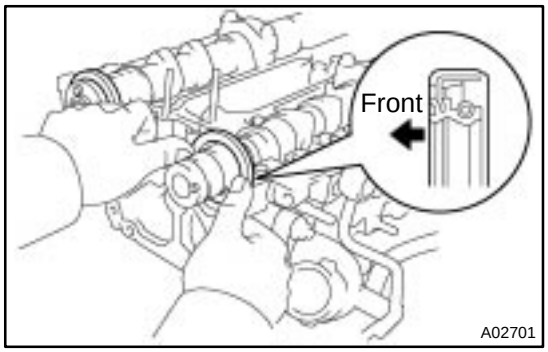
3. INSTALL CAMSHAFTS

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

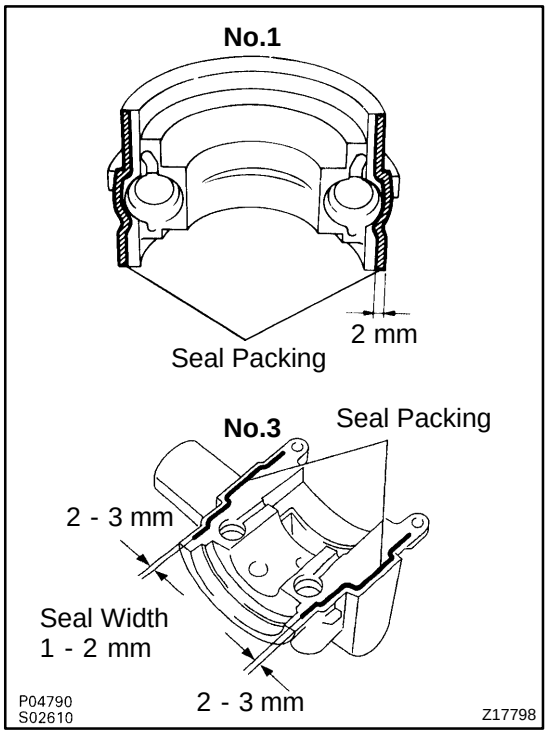
(b) Place the camshaft on the cylinder head with the cam lobe facing up as shown.



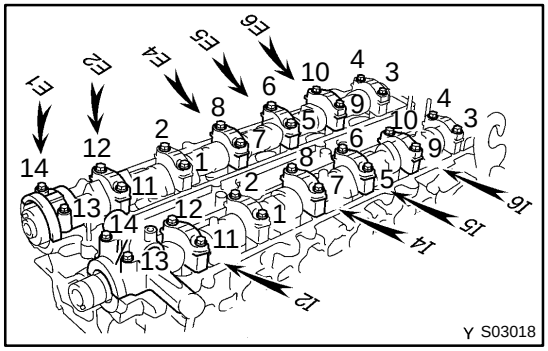
(c) Place the (Nos. 3, 7 journal) camshaft bearing caps in their proper location.
(d) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
(e) Temporarily tighten these bearing cap bolts uniformly and alternately, in several passes, until the bearing caps are snug with the cylinder head.



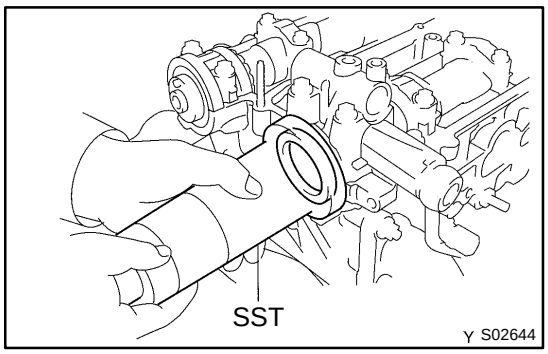
(f) Apply MP grease to a new camshaft oil seal lip.
(g) Install the 2 oil seals to the camshafts.



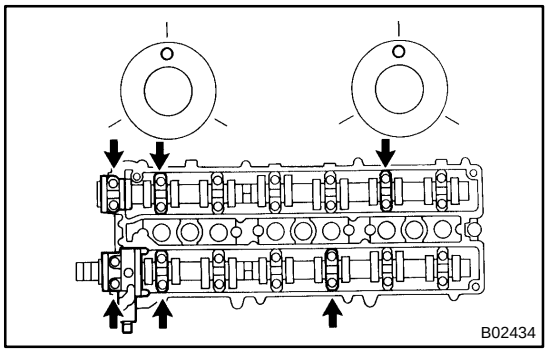
(h) Clean the installed surfaces of the Nos. 1, 3 camshaft bearing cap and cylinder head with cleaner.
(i) Apply seal packing to the bearing caps as shown.
Seal packing: Part No. 08826-00080 or equivalent



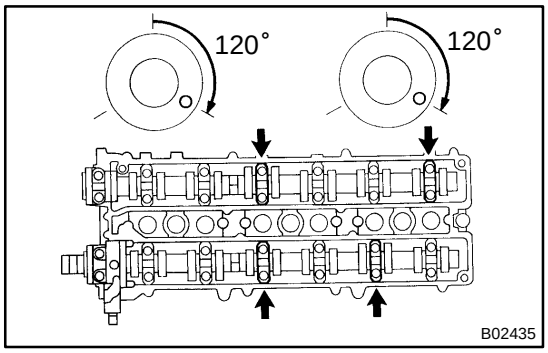
(j) Install the other bearing caps in their proper locations.
(k) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
(l) Install and uniformly tighten the 14 bearing cap bolts on one side, in several passes, in the sequence shown.
Torque: 20 N·m (200 kgf·cm, 15 ft·lbf)
(m) Using a 5 mm hexagon wrench, the 2 No. 3 camshaft bearing cap bolts.
Torque: 5.0 N·m (50 kgf·cm, 44 in.·lbf)



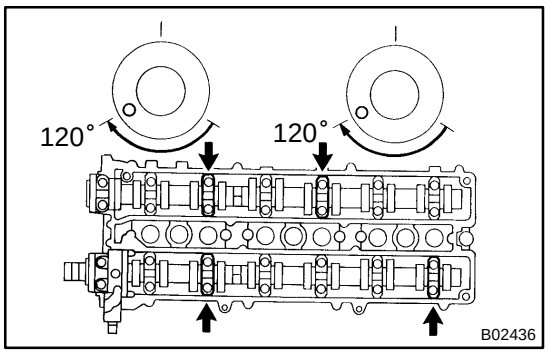
(n) Using SST, push the 2 oil seals in as far as they can go.
SST 09316-6001 1 (09316-00011, 09316-00051)



(o) Rotate the camshaft with a wrench at the hexagon position, bring the forward straight pin up.
(p) Loosen the 12 bearing cap bolts as shown, until they can be turned by hand; retighten in several passes.
Torque: 20 N·m (200 kgf·cm, 15 ft·lbf)



(q) Turn the camshaft 1/3 of a revolution.
(r) Loosen the 8 bearing cap bolts as shown, until they can be turned by hand; retighten in several passes.
Torque: 20 N·m (200 kgf·cm, 15 ft·lbf)

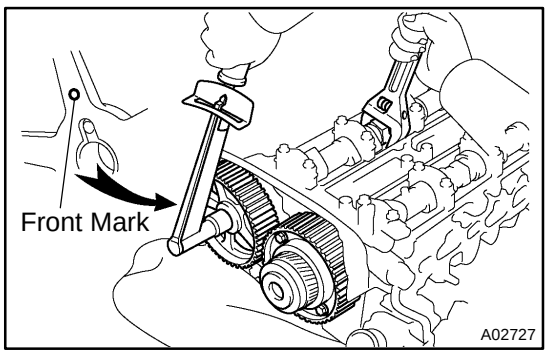


(s) Turn the camshaft a further 1/3 of a revolution.
(t) Loosen the 8 bearing cap bolts as shown, until they can be turned by hand; retighten in several passes.
Torque: 20 N·m (200 kgf·cm, 15 ft·lbf)

4. CHECK AND ADJUST VALVE CLEARANCE (See page EM-5)

5. INSTALL NO. 4 TIMING BELT COVER

Install the timing belt cover with 4 bolts.
Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)

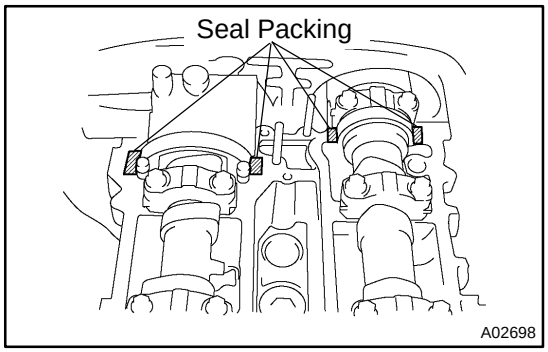


6. INSTALL CAMSHAFT TIMING PULLEYS

(a) Install the exhaust camshaft timing pulley.
(1) Align the camshaft knock pin with the groove in the pulley, and slide on the pulley.
(2) Slide the timing pulley on the camshaft, facing the front mark forward.
(3) Hold the hexagon portion of the camshaft with a wrench, and tighten the timing pulley bolt.
Torque: 81 N·m (810 kgf·cm, 60 ft·lbf)

(b) Install the VV-i (intake camshaft timing) pulley (See page EM-24).

7. CONNECT TIMING BELT TO CAMSHAFT TIMING PULLEYS (See page EM-24)



8. INSTALL NO. 1 AND NO. 2 CYLINDER HEAD COVERS

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

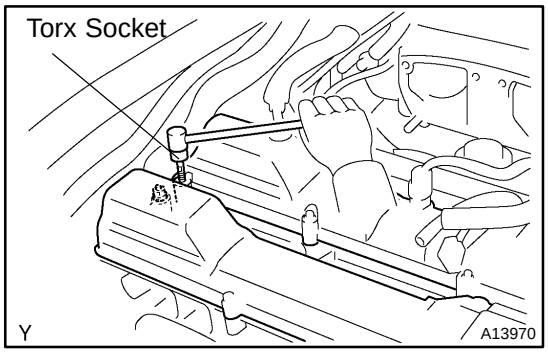
(b) Apply seal packing to the cylinder head as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

(c) Install the gaskets to the cylinder head covers.

(d) Install the cylinder head covers with the 12 bolts.

Torque: 8.5 N·m (85 kgf·cm, 75 in.·lbf)

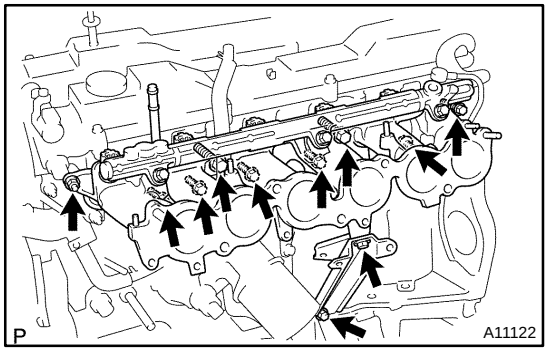


(e) Using a torx socket (E5), install the 4 stud bolts.

Torque: 8.5 N·m (85 kgf·cm, 75 in.·lbf)

(f) Install the 4 nuts to the stud bolts.

Torque: 8.5 N·m (85 kgf·cm, 75 in.·lbf)



9. INSTALL INTAKE MANIFOLD ASSEMBLY

(a) Install a new gasket and the intake manifold and delivery pipe assembly with the 7 bolts and 2 nuts.

Torque: 28 N·m (280 kgf·cm, 21 ft·lbf)

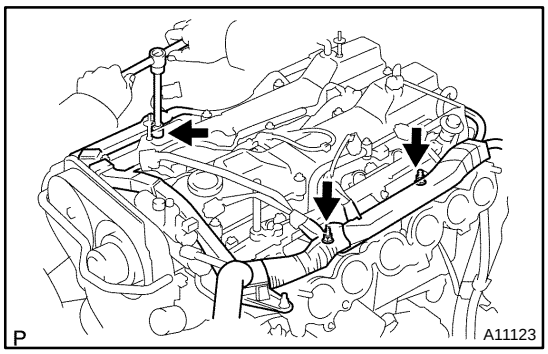
(b) Pass the water bypass hose between the No. 2, No. 3 intake ports of the manifold and delivery pipe.

(c) Install the manifold stay with the 2 bolts.

Torque: 40 N·m (400 kgf·cm, 30 ft·lbf)

(d) Install the starter wire to the manifold stay.

10. INSTALL FUEL PRESSURE PULSATION DAMPER (See page SF-27)



11. CONNECT ENGINE WIRE TO CYLINDER HEAD

(a) Install the engine wire protector with the 3 nuts.

(b) Using a 5 mm hexagon wrench, install the bolt holding the engine wire protector to the No. 2 cylinder head cover.

(c) Connect the 6 injector connectors.

HINT:

The Nos. 1, 3, 5 injector connectors and dark gray, and the Nos. 2, 4, 6 injector connectors are brown.

(d) Connect the camshaft timing oil control valve connector.

(e) Connect the camshaft position sensor connector.

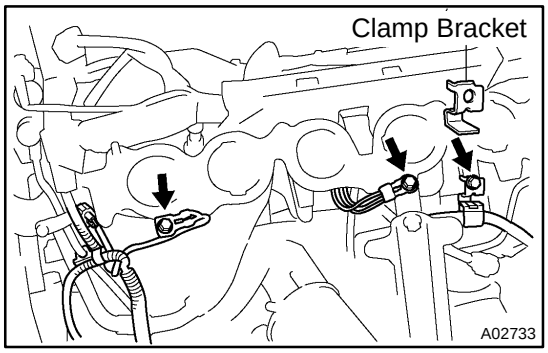
(f) Connect the ECT sensor connector.

(g) Connect the 2 knock sensor connector.

(h) Connect the starter connector.

(i) Connect the oil pressure switch connector.

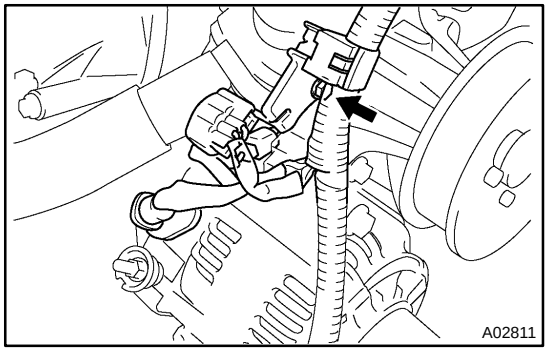
(j) Connect the oil level sensor connector.



(k) Install the clamp bracket to the intake manifold.

(l) Connect the 2 wire clamps to the No. 1 oil pipe and clamp bracket on the intake manifold.

(m) Install the 2 ground terminals to the intake manifold. Tighten so that each calking part should face inside.



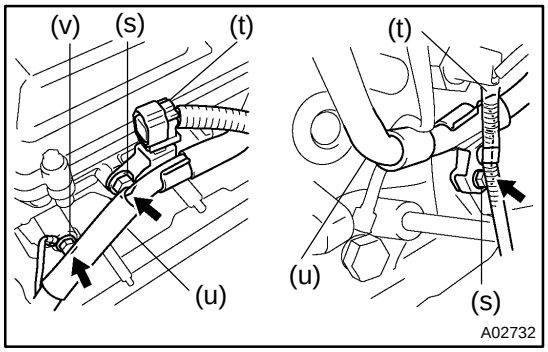
(n) Install the clamp bracket to the water pump.

(o) Connect the generator connector.

(p) Connect the crankshaft position sensor connector.

(q) Connect the heated oxygen sensor (bank 1 sensor 1) connector.

(r) Secure the engine wire with the clamp.



(s) Install the 2 hose clamps to the cylinder head and oil filter bracket.

(t) Install the heated oxygen sensor (bank 2 sensor 1) connector and engine wire clamp to the hose clamps.

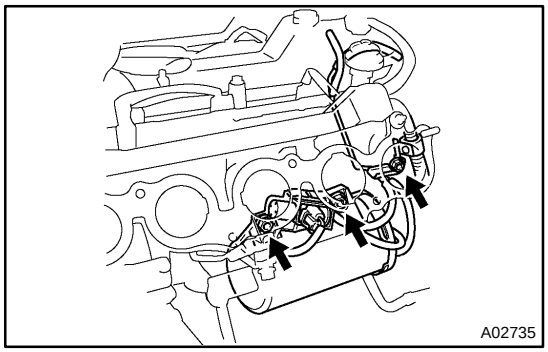
(u) Install the 2 water bypass hoses to the hose clamps on the cylinder head and oil filter bracket.

(v) Install the ground strap to the cylinder head.

12. INSTALL SPARK PLUGS

13. INSTALL IGNITION COILS AND HIGH- TENSION CORD SET ASSEMBLY (See page IG-9)

14. INSTALL NO. 3 TIMING BELT COVER
Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)



15. INSTALL VACUUM CONTROL VALVE SET AND NO. 2 VACUUM PIPE

(a) Install the vacuum control valve set and No. 2 vacuum pipe with the 3 nuts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

(b) Install the engine wire clamp to the clamp bracket of the No. 2 vacuum pipe.

(c) Connect the VSV connector for the ACIS.

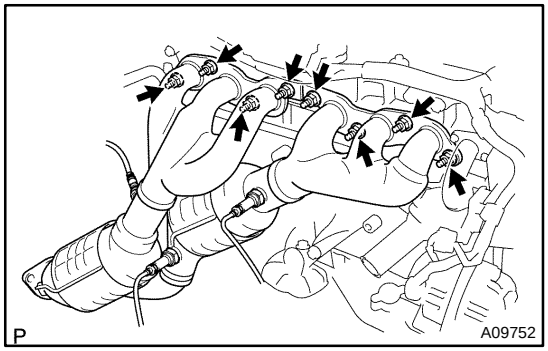
16. INSTALL AIR INTAKE CHAMBER (See page SF-49)

17. INSTALL OIL DIPSTICK AND GUIDE FOR A/T (See page EM-71)

18. INSTALL OIL DIPSTICK AND GUIDE FOR ENGINE (See page LU-12)

19. INSTALL THROTTLE BODY AND INTAKE AIR CONNECTOR ASSEMBLY (See page EM-5)

20. INSTALL WATER BYPASS OUTLET AND NO. 1 WATER BYPASS PIPE (See page CO-14)

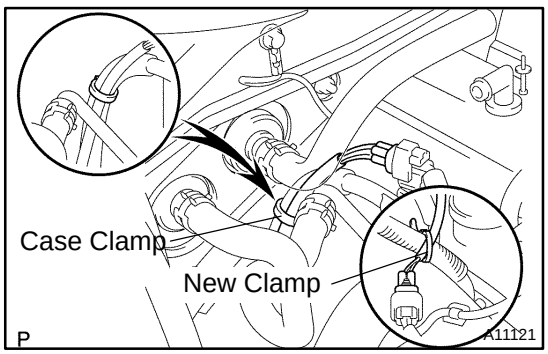


21. INSTALL EXHAUST MANIFOLD

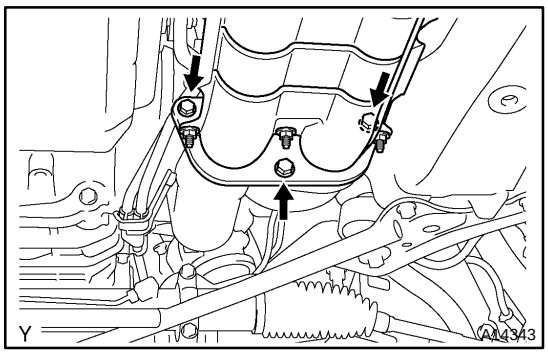
(a) Install 2 new gaskets to the cylinder head.

(b) Using a 14 mm deep socket wrench, install the exhaust manifold with the 8 nuts. Uniformly tighten the nuts in several passes.
Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)

(c) Connect the 3 heated oxygen sensor connectors and clamp.



(d) Install a new clamp and the case clamp as shown in the illustration.

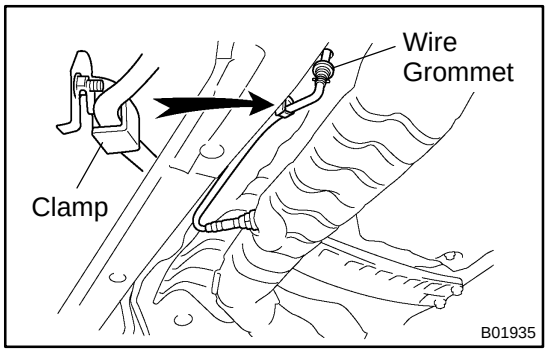


22. CONNECT FRONT EXHAUST PIPE TO EXHAUST MANIFOLD

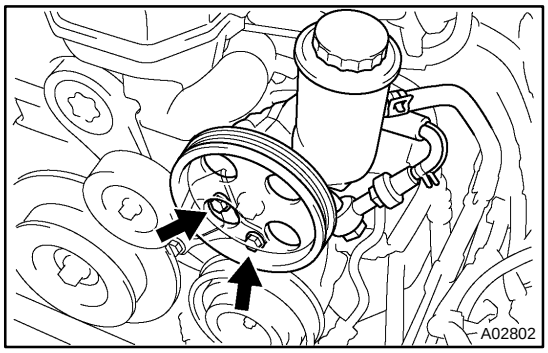
(a) Temporarily install the pipe support bracket to the transmission with the 2 bolts.

(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 nuts and retainer.

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



(c) Connect the wire grommet and sensor wire of the the heated oxygen sensor (bank 2 sensor 2) to the hole and clamp on the floor.



23. INSTALL PS PUMP

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

Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)

(b) Install the pump rear stay with the 2 bolts.

Torque: 39.2 N·m (400 kgf·cm, 29 ft·lbf)

(c) Connect the PS air hose to the No.4 timing belt cover.

(d) Connect the PS air hose to the air intake chamber.

24. INSTALL DRIVE BELT (See page CH-1)

25. M/T:

INSTALL DRIVE BELT TENSIONER ABSORBER

Install the absorber with the 2 nuts.

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

26. INSTALL AIR CLEANER, MAF METER AND INTAKE AIR RESONATOR ASSEMBLY (See page EM-71)

27. INSTALL AIR CLEANER INLET

28. CONNECT UPPER RADIATOR HOSE TO WATER OUTLET

29. INSTALL ENGINE COVER

Install the engine cover with the 4 nuts.

30. FILL WITH ENGINE COOLANT

31. START ENGINE AND CHECK FOR LEAKS

32. INSTALL ENGINE UNDER COVER

33. ROAD TEST

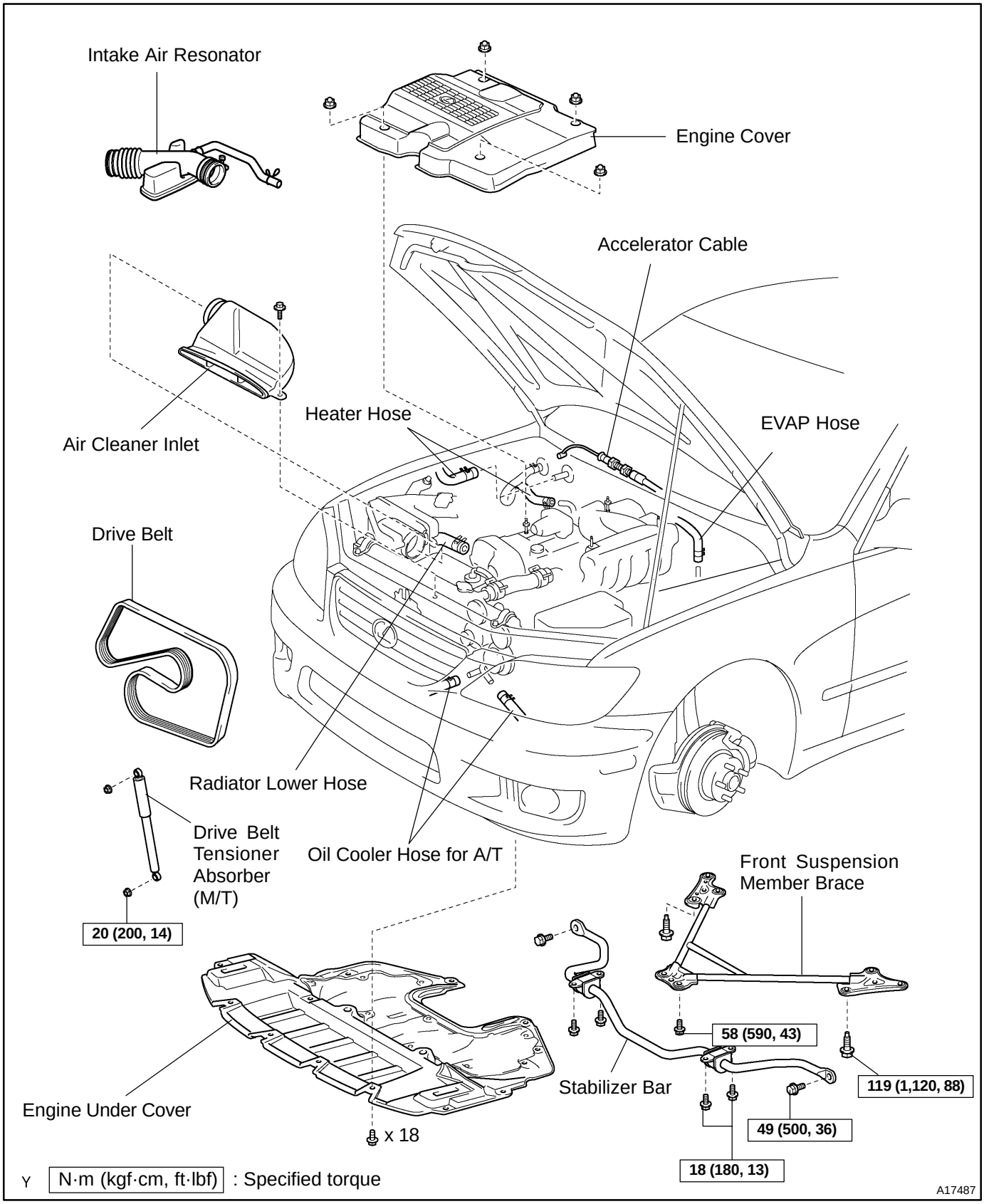
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

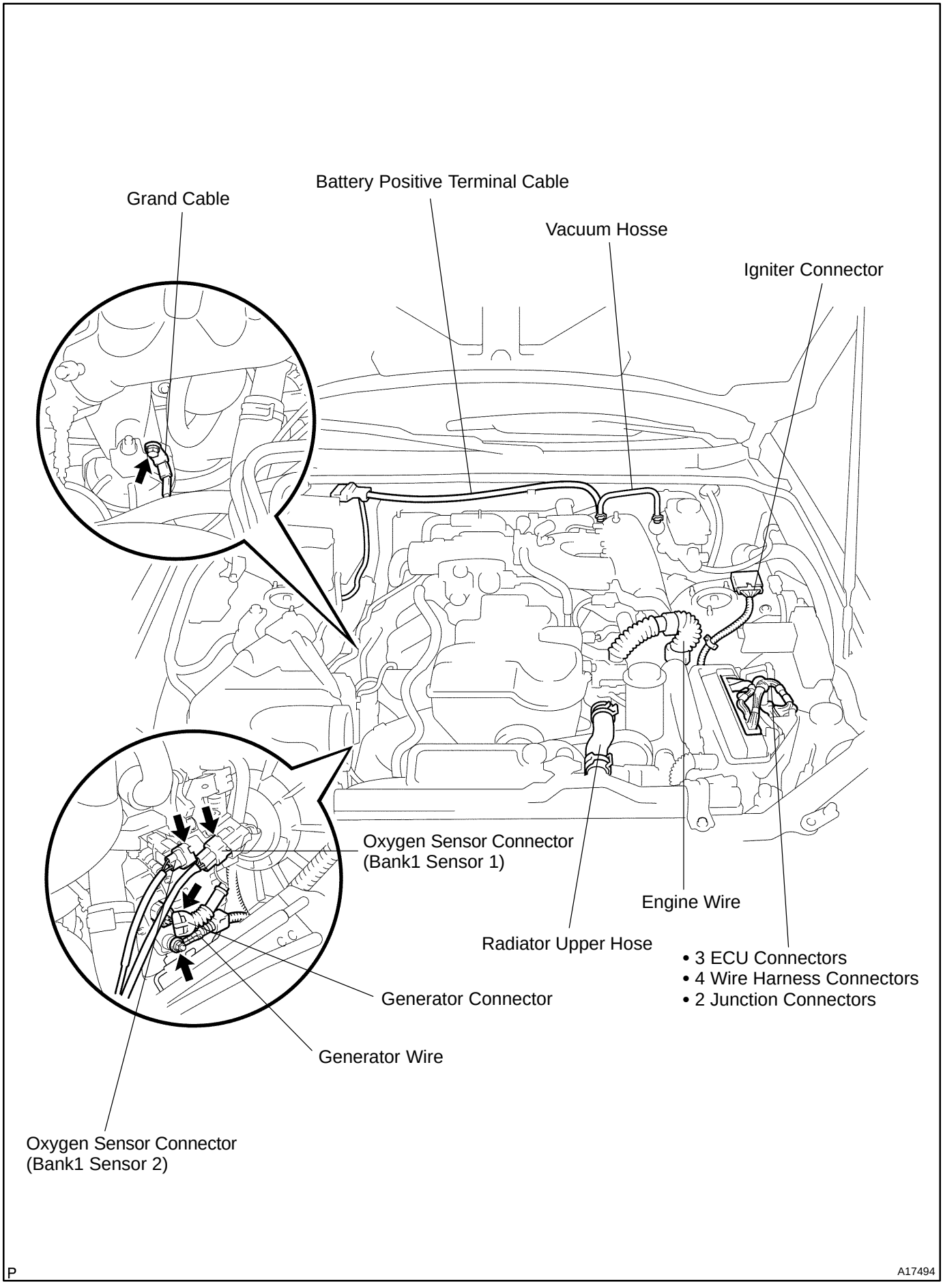
34. RECHECK ENGINE COOLANT LEVEL

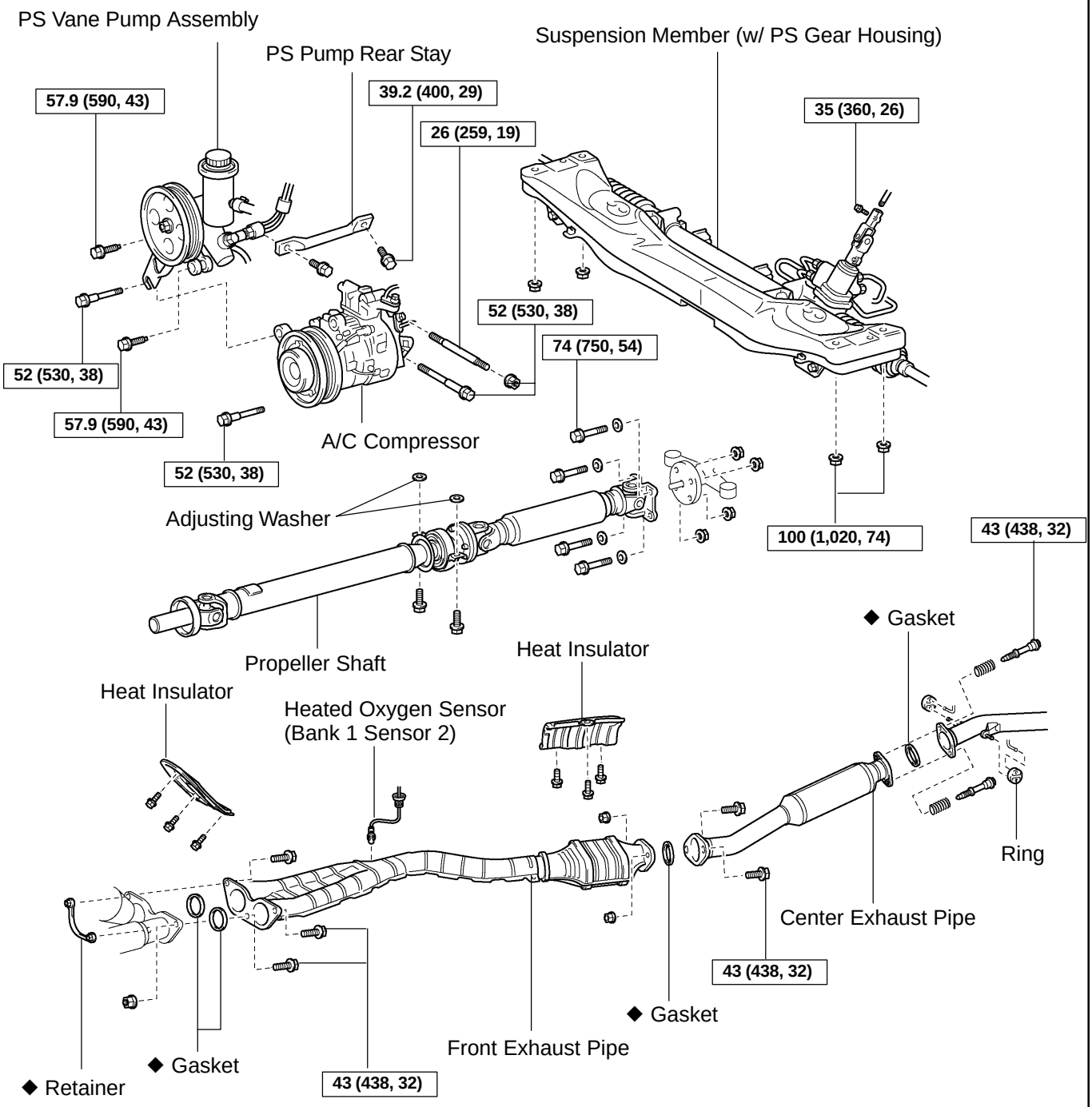
ENGINE UNIT

COMPONENTS

EM1SA-02



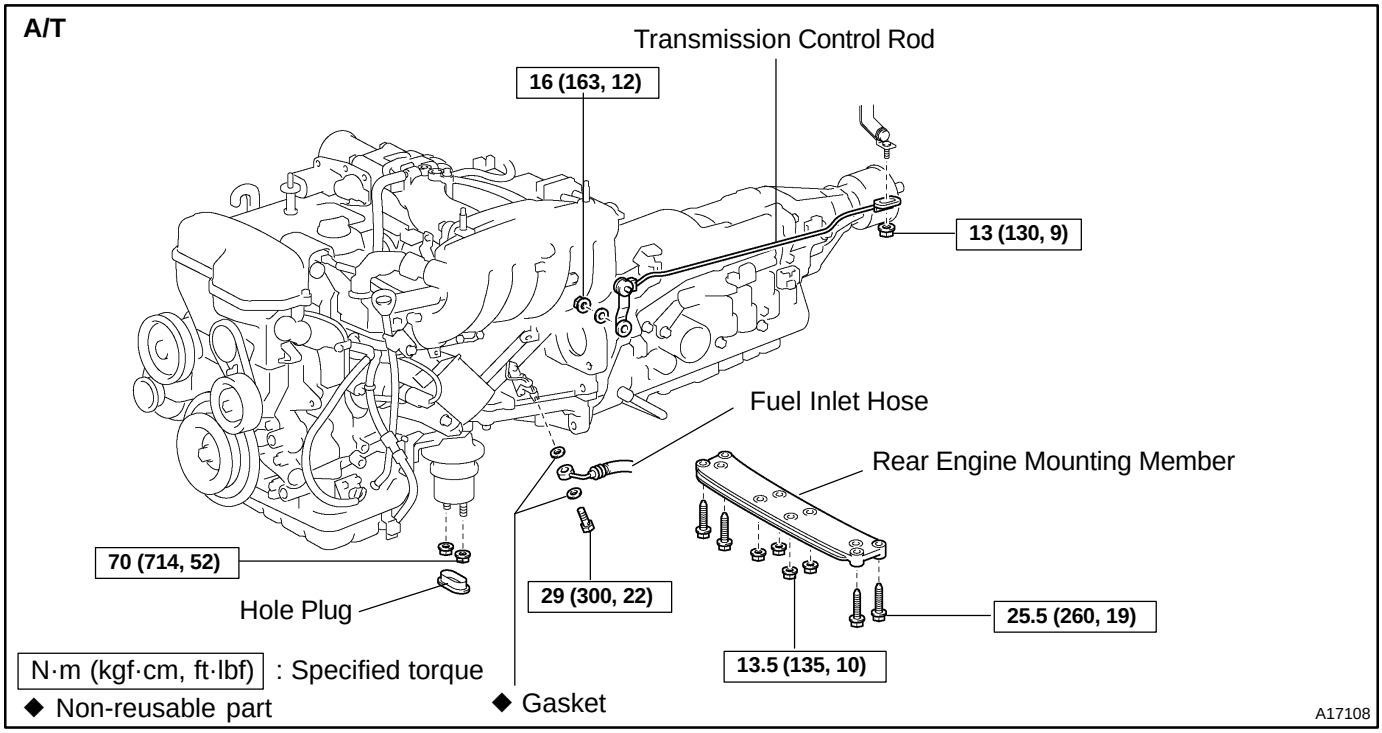

Grand Cable
Battery Positive Terminal Cable
Vacuum Hosse
Igniter Connector
Oxygen Sensor Connector
(Bank1 Sensor 1)
Engine Wire
Radiator Upper Hose
• 3 ECU Connectors
• 4 Wire Harness Connectors
• 2 Junction Connectors
Generator Connector
Generator Wire
Oxygen Sensor Connector
(Bank1 Sensor 2)
P
A17494

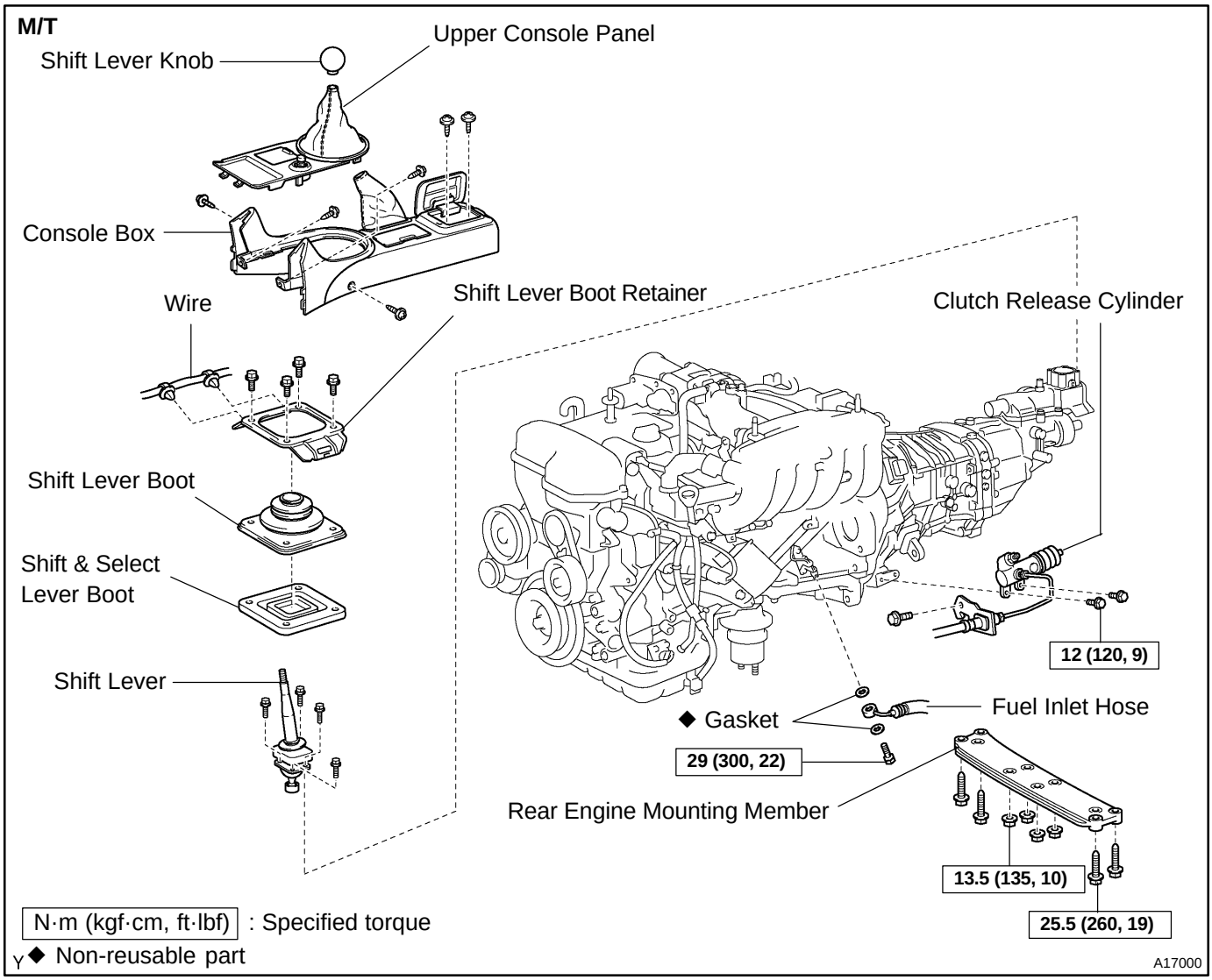


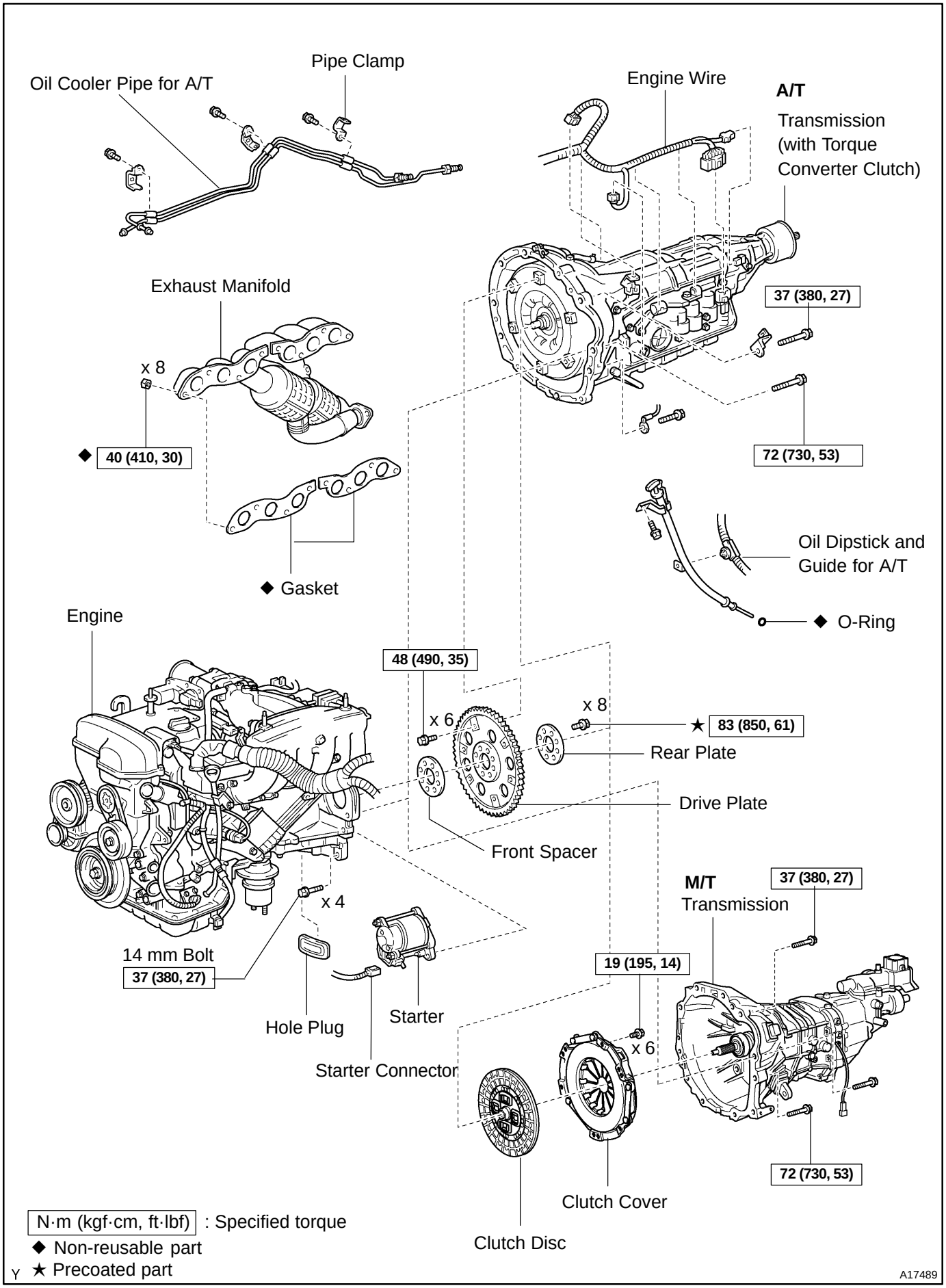
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

A17107


A/T
Transmission Control Rod
16 (163, 12)
13 (130, 9)
Fuel Inlet Hose
Rear Engine Mounting Member
70 (714, 52)
29 (300, 22)
25.5 (260, 19)
Hole Plug
13.5 (135, 10)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
◆ Gasket
A17108


M/T
Upper Console Panel
Shift Lever Knob
Console Box
Wire
Shift Lever Boot Retainer
Clutch Release Cylinder
Shift Lever Boot
Shift & Select
Lever Boot
Shift Lever
12 (120, 9)
◆ Gasket
Fuel Inlet Hose
29 (300, 22)
Rear Engine Mounting Member
13.5 (135, 10)
25.5 (260, 19)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
A17000


Pipe Clamp
Oil Cooler Pipe for A/T
Engine Wire
A/T
Transmission
(with Torque
Converter Clutch)
Exhaust Manifold
x 8
37 (380, 27)
◆ 40 (410, 30)
72 (730, 53)
◆ Gasket
Oil Dipstick and
Guide for A/T
◆ O-Ring
Engine
48 (490, 35)
x 6
x 8
★ 83 (850, 61)
Rear Plate
Drive Plate
Front Spacer
M/T
Transmission
37 (380, 27)
x 4
14 mm Bolt
37 (380, 27)
19 (195, 14)
Hole Plug
Starter
Starter Connector
x 6
72 (730, 53)
Clutch Cover
Clutch Disc
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
★ Precoated part
A17489

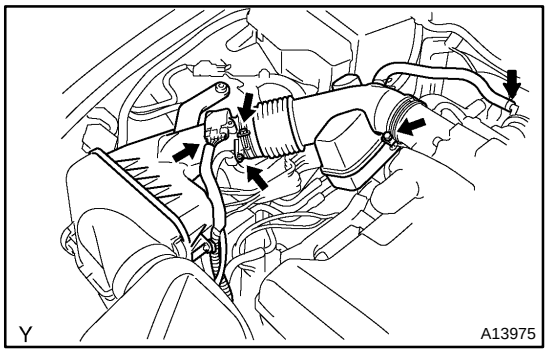
EM1JB-03

REMOVAL

1. **REMOVE ENGINE UNDER COVER**
2. **DRAIN ENGINE COOLANT**
3. **DRAIN ENGINE OIL**
4. **REMOVE ENGINE COVER**

Remove the 4 nuts and engine cover.

5. **REMOVE AIR CLEANER INLET**
6. **DISCONNECT BRAKE BOOSTER VACUUM HOSE**
7. **DISCONNECT RADIATOR UPPER AND LOWER HOSES FROM ENGINE**
8. **DISCONNECT ACCELERATOR CABLE FROM ENGINE**



9. **REMOVE INTAKE AIR RESONATOR**

(a) Disconnect the MAF meter connector.

(b) Disconnect the engine wire clamp from the air cleaner case.

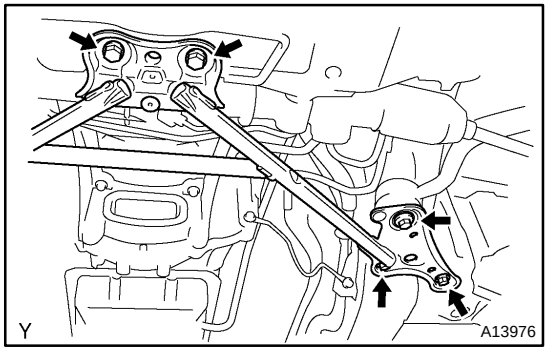
(c) Disconnect the PCV hose from the No. 2 cylinder head cover.

(d) Loosen the 2 hose clamp bolts, remove the intake air resonator from the throttle body.

10. **M/T:**
REMOVE DRIVE BELT TENSIONER ABSORBER

Remove the 2 nuts and absorber.

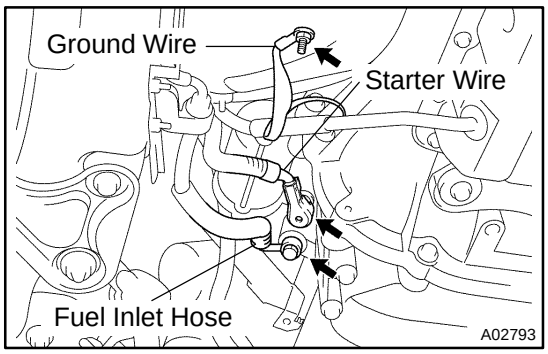
11. **REMOVE DRIVE BELT (See page CH-1)**



12. **REMOVE FRONT SUSPENSION MEMBER BRACE**

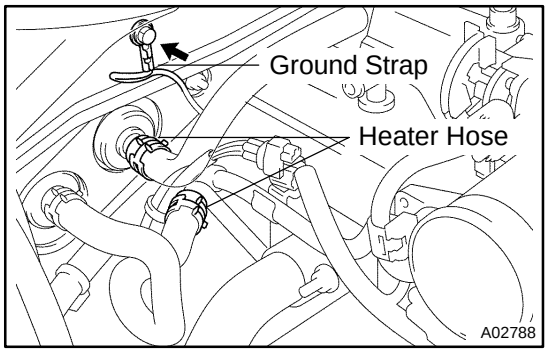
Remove the 8 bolts and brace.

13. **M/T:**
REMOVE TRANSMISSION SHIFT LEVER

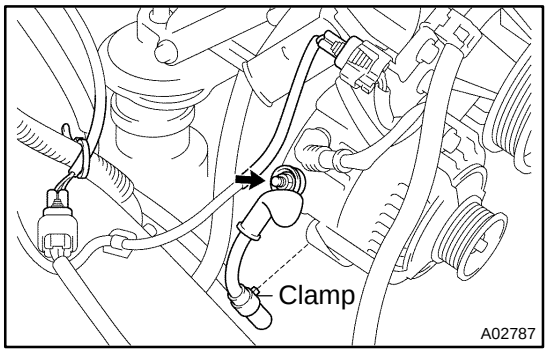


14. DISCONNECT WIRES, CABLE, STRAP, CONNECTORS, HOSES AND CLAMPS

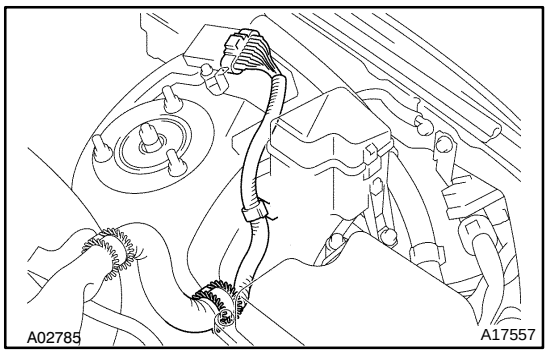
(a) Disconnect the ground wire from the floor.
(b) Disconnect the starter wire from the terminal and manifold stay.
(c) Disconnect the fuel inlet hose from the fuel pipe support.



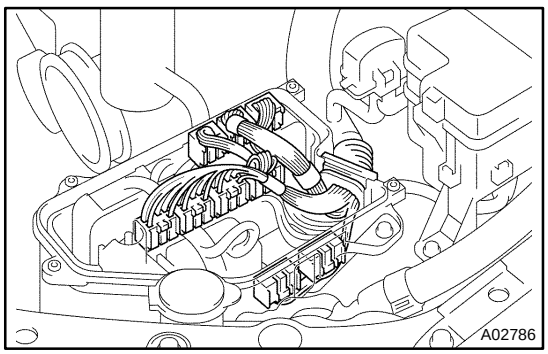
(d) Disconnect the ground strap from the dash panel.
(e) Disconnect the heater hose from the heater pipe.
(f) Disconnect the heater hose from the water bypass pipe.
(g) Disconnect the EVAP hose from the pipe (from charcoal canister).



(h) Disconnect the heater oxygen sensor (bank 1 sensor 1) connector.
(i) Disconnect the heater oxygen sensor (bank 1 sensor 2) connector.
(j) Disconnect the generator wire.
(k) Disconnect the engine wire clamp from the wire clip of generator.
(l) Disconnect the ground cable from the bracket on the cylinder block.

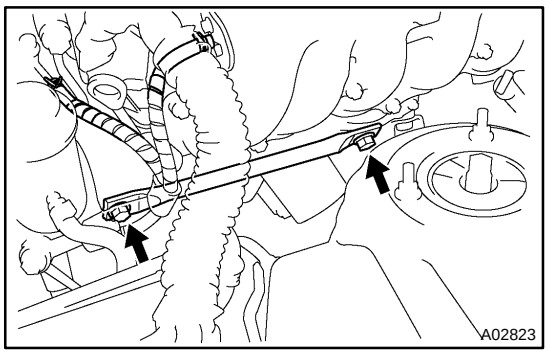


(m) Disconnect the igniter connector.
(n) Disconnect the 2 engine wire clamps from the clamp brackets.



15. DISCONNECT ENGINE WIRE FROM ECM BOX

(a) Remove the ECM hood and ECM cover.
(b) Disconnect the 3 ECM connectors.
(c) Disconnect the 4 wire harness connectors.
(d) Disconnect the 2 junction connectors.
(e) Disconnect the grommet and engine wire from the ECM box.

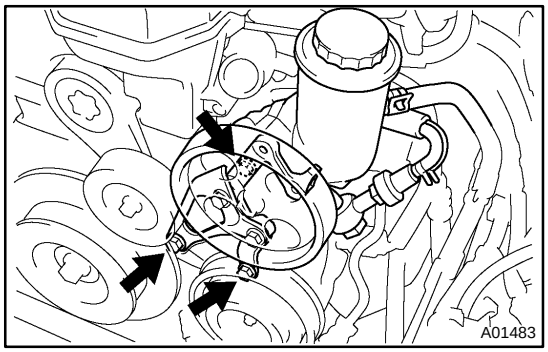


16. DISCONNECT PS PUMP AND A/C COMPRESSOR WITHOUT DISCONNECTING HOSES

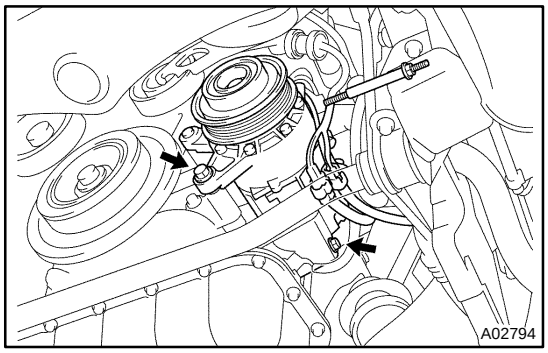
(a) Disconnect the PS air hose from the No. 4 timing belt cover.

(b) Disconnect the PS air hose from the air intake chamber

(c) Remove the 2 bolts and pump rear stay.



(d) Remove the 3 bolts and plate washer, and disconnect the vane pump assembly from the engine.



(e) Loosen the nut.

(f) Using a torx socket (E10), remove the stud bolt and nut.

(g) Disconnect the PPS solenoid valve connector.

(h) Disconnect the A/C compressor connector.

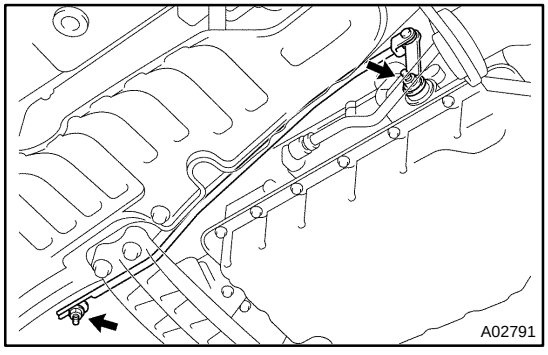
(i) Remove the 2 bolts, and disconnect the compressor from the engine.

HINT:

Put aside the vane pump and compressor, and suspend it securely.

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

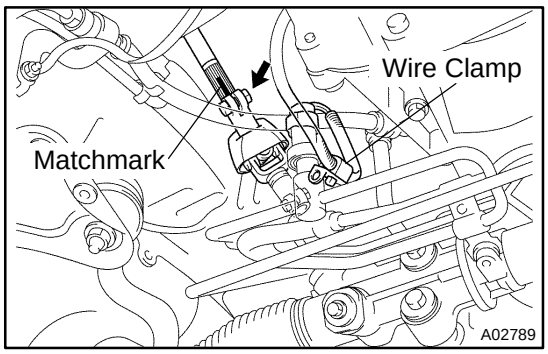
18. REMOVE PROPELLER SHAFT (See page PR-4)



19. A/T:
REMOVE TRANSMISSION CONTROL ROD

Remove the 2 nuts and control rod.

20. REMOVE FRONT AND CENTER EXHAUST PIPES

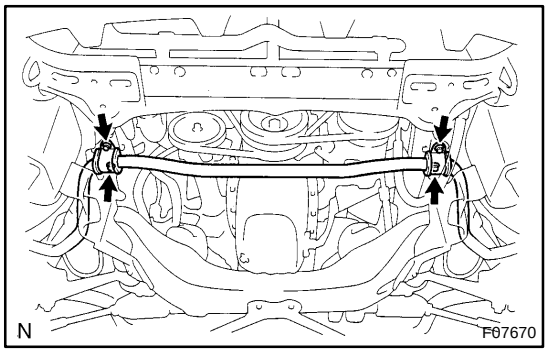


21. DISCONNECT SLIDING YOKE

(a) Check the steering wheel at the straight-ahead position, and place matchmarks on the sliding yoke and intermediate shaft.

(b) Remove the bolt, and disconnect the sliding yoke from the steering intermediate shaft.

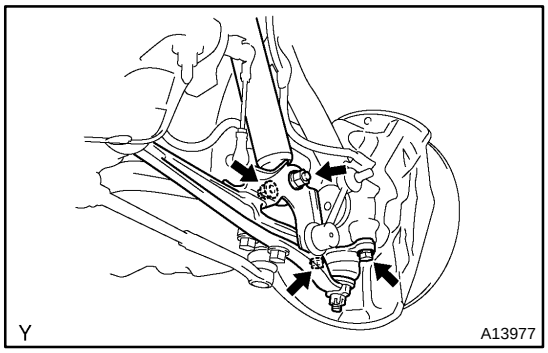
(c) Disconnect the PS pressure switch connector and wire clamp.



22. REMOVE STABILIZER BAR

(a) Remove the 2 nuts from the stabilizer bar links.

(b) Remove the 4 bolts, 2 stabilizer bar brackets and 2 bushings.



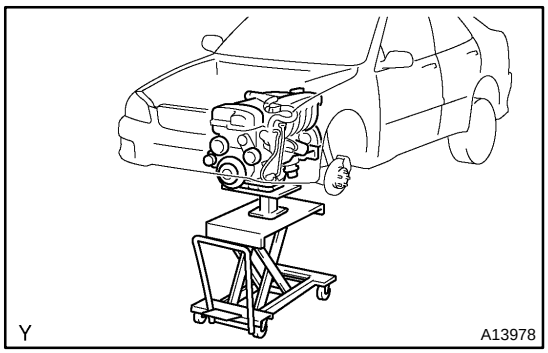
23. DISCONNECT SHOCK ABSORBER

Remove the bolt and nut, and disconnect the shock absorber from the shock absorber bracket.

24. DISCONNECT LOWER ARM

(a) Remove the nut, and disconnect the height level sensor from the lower arm.

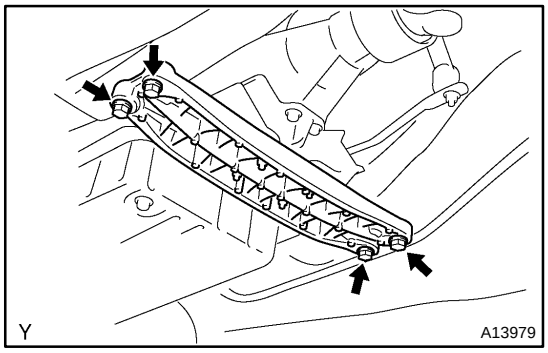
(b) Remove the 2 bolts, and disconnect the lower arm from the steering knuckle.



25. SET ENGINE JACK

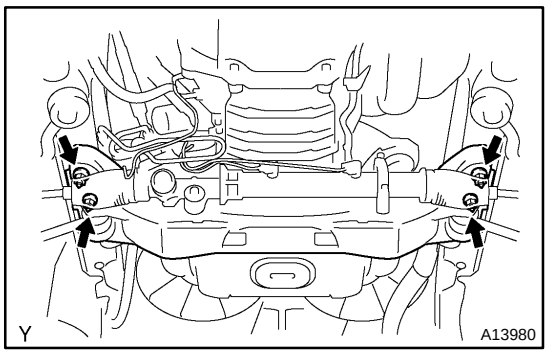
NOTICE:

Using chain, hold the engine tightly.



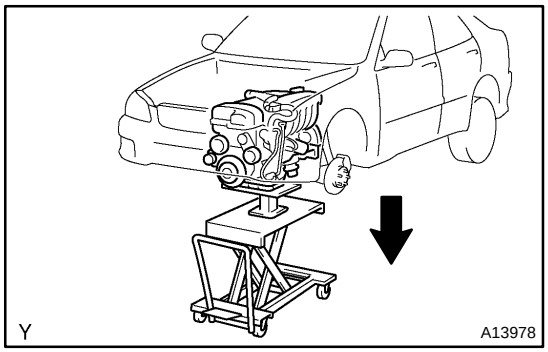
26. DISCONNECT REAR ENGINE MOUNTING MEMBER

Remove the 4 bolts and rear engine mounting member.



27. DISCONNECT SUSPENSION MEMBER

Remove the 4 bolts, and disconnect the suspension member from the body.



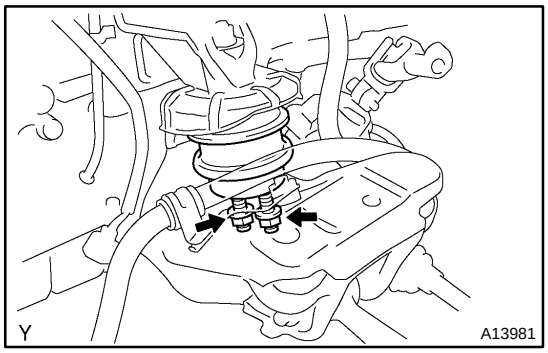
28. REMOVE ENGINE AND TRANSMISSION ASSEMBLY

(a) Remove the engine out of vehicle slowly and carefully.

NOTICE:

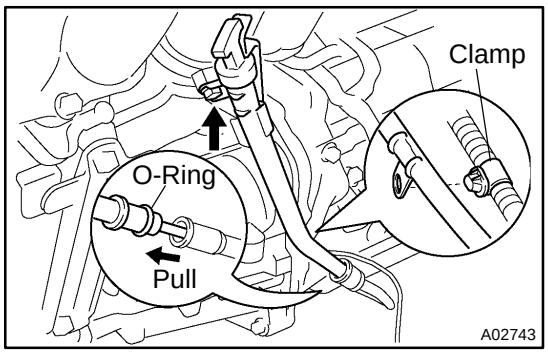
Make sure the engine is clear of all wiring, hoses and cables.

(b) Using a engine sliding device, and place the engine and transaxle assembly onto the stand.



29. REMOVE SUSPENSION MEMBER FROM ENGINE

Remove the 4 nuts and suspension member with the steering gear housing from the engine.



30. A/T:

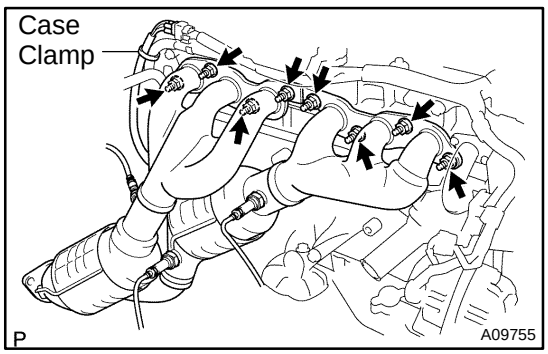
REMOVE OIL DIPSTICK AND GUIDE

(a) Disconnect the engine wire clamp from the dipstick guide.

(b) Remove the bolt.

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

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

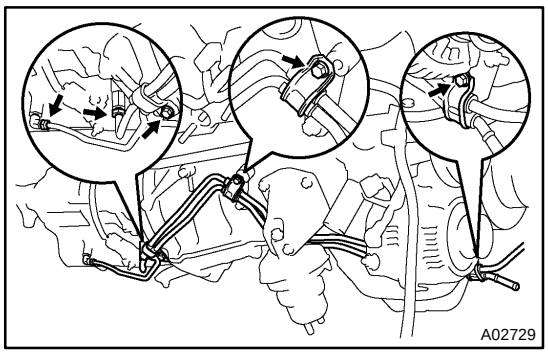


31. REMOVE EXHAUST MANIFOLD

(a) Remove the case clamp.

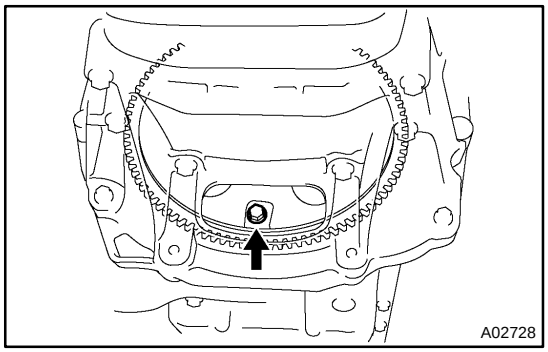
(b) Disconnect the heated oxygen sensor (bank 2 sensor 1) connector.

(c) Remove the 8 nuts, exhaust manifold and 2 gaskets.



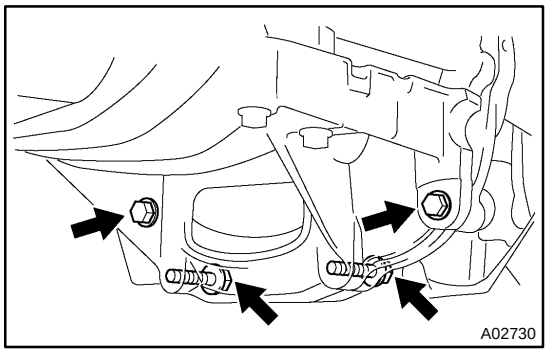
32. A/T:
REMOVE OIL COOLER PIPES

(a) Remove the 3 bolts and pipe clamps.
(b) Loosen the 2 union nuts, and remove the 2 oil cooler pipes.



33. A/T:
REMOVE TORQUE CONVERTER CLUTCH BOLTS

(a) Remove the hole plug.
(b) Turn the crankshaft pulley bolt to gain access to each bolt.
(c) Hold the crankshaft pulley bolt with a wrench, and remove the 6 bolts.



34. REMOVE 4 BOLTS HOLDING NO. 1 OIL PAN TO TRANSMISSION

35. REMOVE STARTER

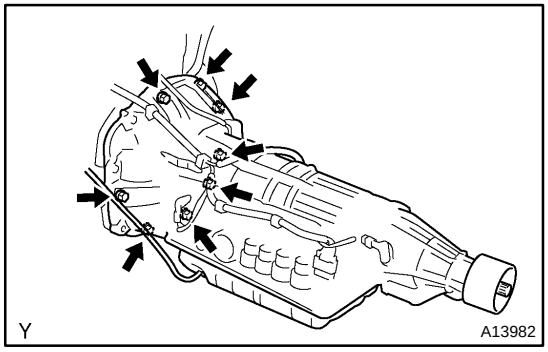
(a) Disconnect the starter connector.
(b) Remove the 2 bolts, clamp bracket and starter.

36. DISCONNECT ENGINE WIRE FROM TRANSMISSION

(a) Disconnect the VSS connector.
(b) Disconnect the PNP switch connector.
(c) Disconnect the solenoid connector.
(d) Disconnect the direct clutch speed sensor connector.
(e) Disconnect the engine wire from the 3 wire clamps.

37. M/T:
DISCONNECT ENGINE WIRE FROM TRANSMISSION

(a) Disconnect the VSS connector.
(b) Disconnect the back-up light switch connector.



38. REMOVE TRANSMISSION FROM ENGINE

(a) Remove the 5 bolts and ground wire.
(b) Remove the transmission together with the torque converter clutch from the engine.

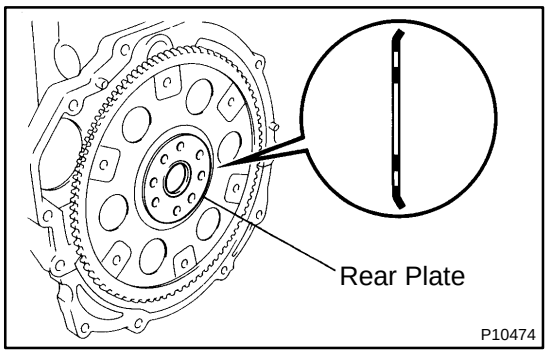
39. A/T:
REMOVE DRIVE PLATE

Remove the 8 bolts, rear plate, drive plate and front spacer.

40. M/T:
REMOVE CLUTCH COVER AND DISC

EM1JC-03

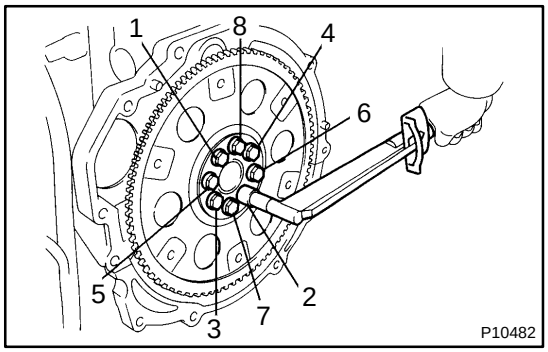
INSTALLATION



1. A/T:

INSTALL DRIVE PLATE

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



(b) Apply adhesive to 2 or 3 threads of the mounting bolt end.

Adhesive:

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

(c) Install the uniformly tighten the 8 mounting bolts in several passes, in the sequence shown.

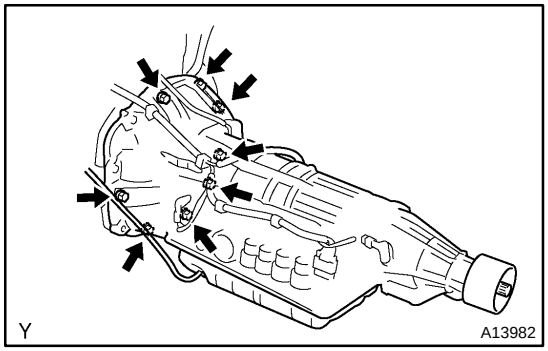
Torque: 83 N·m (850 kgf·cm, 61 ft·lbf)

2. M/T:

INSTALL CLUTCH DISC AND COVER (See page CL-18)

3. A/T:

INSTALL TORQUE CONVERTER CLUTCH INSTALLATION (See page AT-35)



4. INSTALL TRANSMISSION TO ENGINE

(a) Attach the transmission to the engine.

(b) Install the ground wire and 5 bolts.

Torque: 72 N·m (730 kgf·cm, 53 ft·lbf)

5. A/T:

CONNECT ENGINE WIRE TO TRANSMISSION

(a) Connect the VSS connector.

(b) Connect the PNP switch connector.

(c) Connect the solenoid connector.

(d) Connect the direct clutch speed sensor connector.

(e) Connect the engine wire to the 3 wire clamps.

6. M/T:

CONNECT ENGINE WIRE TO TRANSMISSION

(a) Connect the VSS connector.

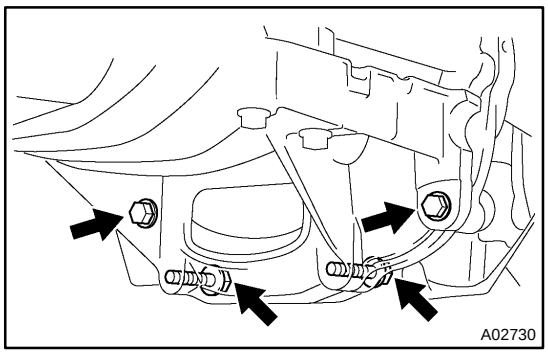
(b) Connect the back-up light switch connector.

7. INSTALL STARTER

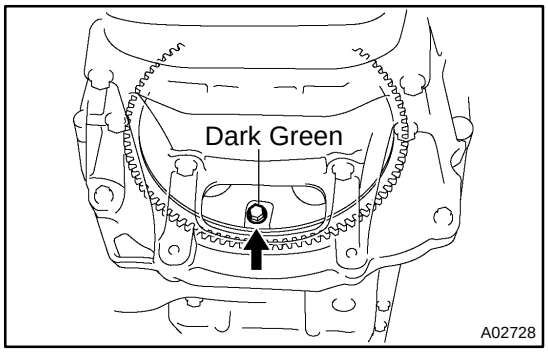
(a) Install the starter and clamp bracket with the 2 bolts.

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

(b) Connect the starter connector.

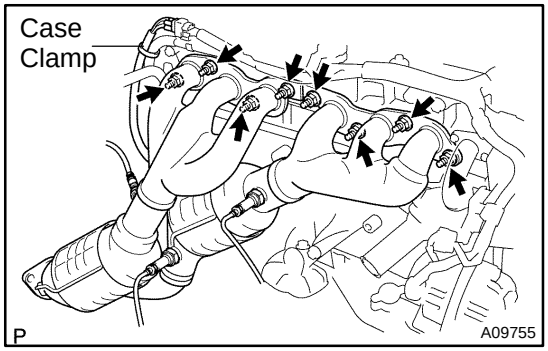


8. INSTALL 4 BOLTS HOLDING NO. 1 OIL PAN TO TRANSMISSION
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

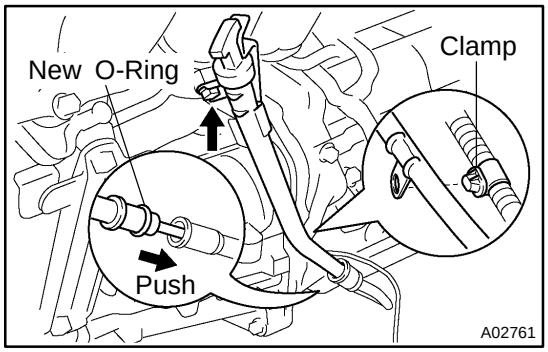


9. A/T:
INSTALL TORQUE CONVERTER CLUTCH BOLTS
(a) Apply adhesive to 2 or 3 threads of the bolt end.
Adhesive:
Part No. 08833-00070, THREE BOND 1324 or equivalent
(b) Hold the crankshaft pulley bolt with a wrench, and install the 6 bolts evenly.
Torque: 48 N·m (490 kgf·cm, 35 ft·lbf)
HINT:
First install the dark green colored bolt, install the other bolts.
(c) Install the hole plug.

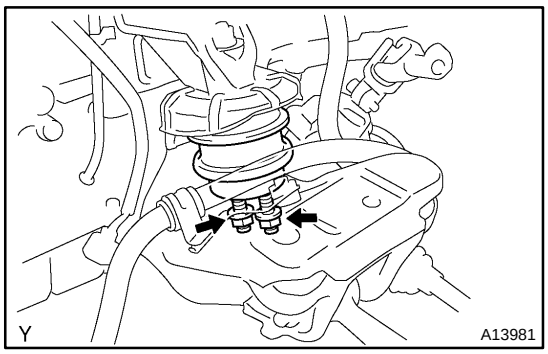
10. A/T:
INSTALL OIL COOLER PIPE



11. INSTALL EXHAUST MANIFOLD
(a) Install 2 new gaskets to the cylinder head.
(b) Using a 14 mm deep socket wrench, install the exhaust manifold with the 8 nuts. Uniformly tighten the nuts in several passes.
Torque: 40 N·m (408 kgf·cm, 30 ft·lbf)
(c) Connect the heated oxygen sensor (bank 2 sensor 1) connector.
(d) Install the case clamp.



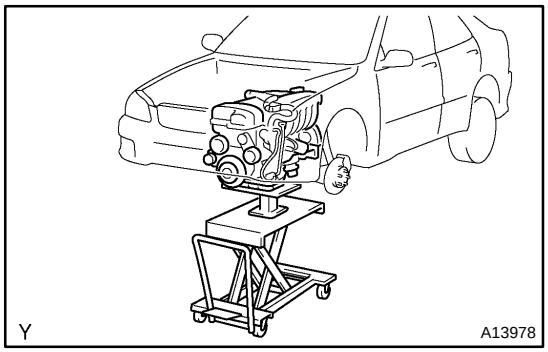
12. A/T:
INSTALL OIL DIPSTICK GUIDE AND DIPSTICK
(a) Install a new O-ring to the dipstick guide.
(b) Push in the dipstick guide end to the dipstick tube of the oil pan.
(c) Install the dipstick guide with the bolt.
(d) Connect the engine wire clamp to the dipstick guide.
(e) Install the dipstick.



13. INSTALL SUSPENSION MEMBER TO ENGINE

Install the suspension member and to the engine with the 4 nuts.

Torque: 70 N·m (714 kgf·cm, 52 ft·lbf)



14. SET ENGINE JACK

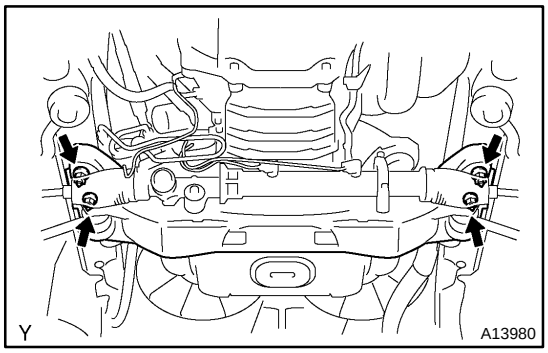
NOTICE:

Using a chain, hold the engine tightly.

15. INSTALL ENGINE AND TRANSMISSION ASSEMBLY IN VEHICLE

(a) Raise the engine into the engine compartment.

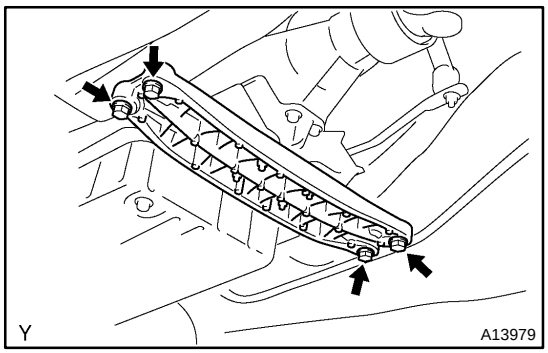
(b) Keep the engine level, and align RH and LH mountings with the insulator.



16. CONNECT SUSPENSION MEMBER

Connect the suspension member with the 4 bolts to the body.

Torque: 70 N·m (714 kgf·cm, 52 ft·lbf)



17. CONNECT REAR ENGINE MOUNTING MEMBER

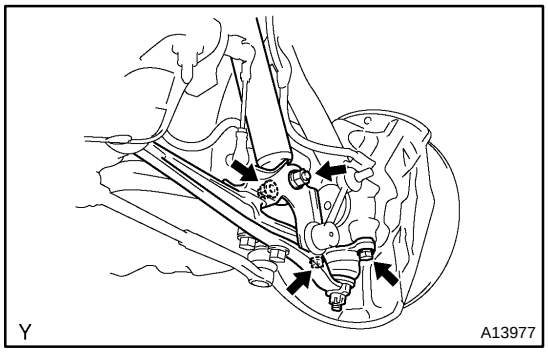
Install the rear engine mounting member with the 4 bolts.

Torque:

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

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

18. REMOVE ENGINE JACK



19. CONNECT LOWER ARM

(a) Connect the lower arm with the 2 bolts to the steering knuckle.

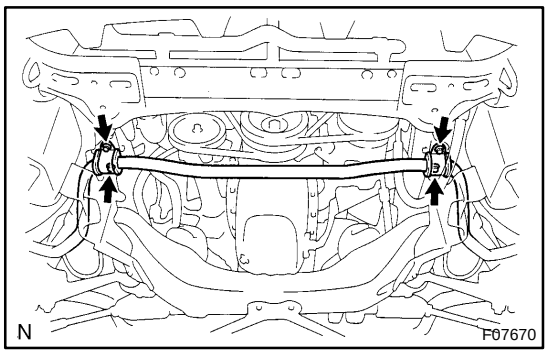
Torque: 245 N·m (2,500 kgf·cm, 181 ft·lbf)

(b) Connect the height level sensor to the lower arm.

20. CONNECT SHOCK ABSORBER

Connect the shock absorber with the bolt and nut.

Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

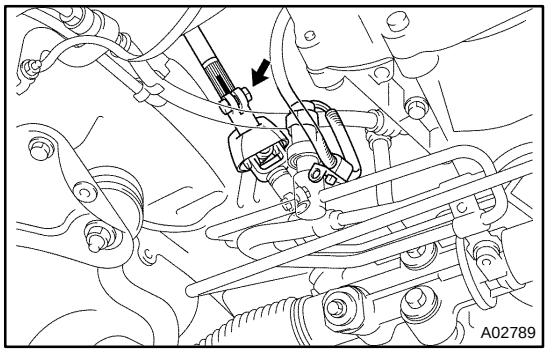


21. INSTALL STABILIZER BAR

(a) Install the 2 bushings and 2 stabilizer bar brackets to the stabilizer bar.

(b) Install the stabilizer bar with the 4 bolts and 2 nuts.

Torque:
18 N·m (180 kgf·cm, 13 ft·lbf) for bolt
49 N·m (500 kgf·cm, 36 ft·lbf) for nut



22. CONNECT SLIDING YOKE

(a) Align the matchmarks and connect the sliding yoke to the steering intermediate shaft.

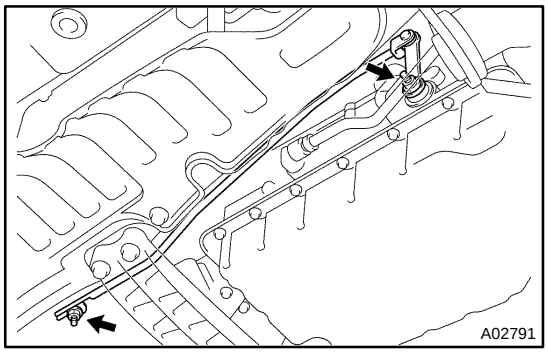
(b) Install the bolt holding the sliding yoke to the steering intermediate shaft.

Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)

(c) Connect the PS pressure switch and wire clamp.

23. INSTALL FRONT AND CENTER EXHAUST PIPE

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

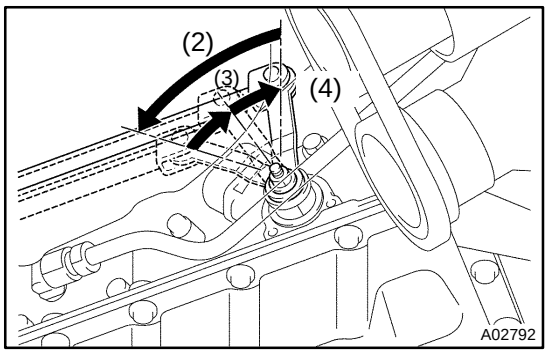


24. A/T:

INSTALL TRANSMISSION CONTROL ROD

Install the control rod with the 2 nuts.

Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)



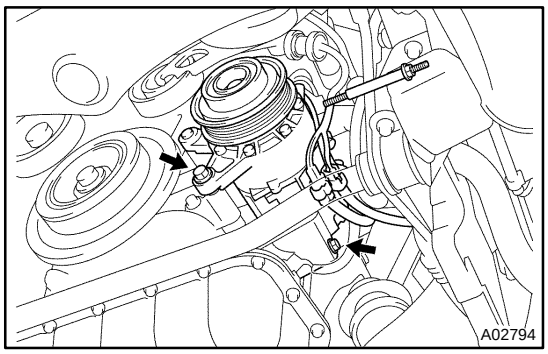
If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

(1) Loosen the nut on the shift lever.
(2) Push the control shaft lever fully rearward.
(3) Return the control shaft lever 2 notches to the N position.
(4) Set the shift lever to the N position.
(5) While holding the shift lever lightly toward the R position side, tighten the nut.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

25. M/T:

INSTALL CLUTCH RELEASE CYLINDER TO TRANSMISSION



26. INSTALL A/C COMPRESSOR AND PS PUMP

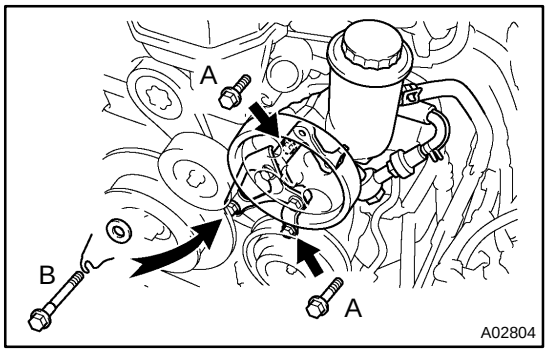
(a) Temporarily install the compressor with the 2 bolts.

(b) Using a torx socket (E10), install the stud bolt.
Torque: 26 N·m (265 kgf·cm, 19 ft·lbf)

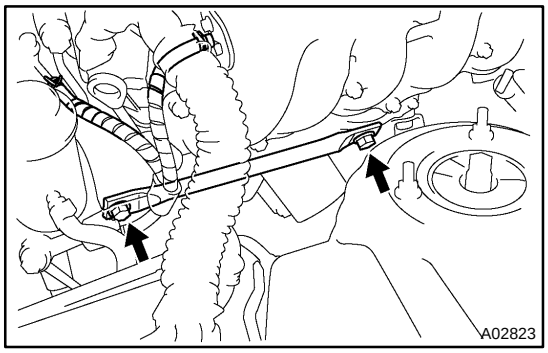
(c) Tighten the nut and 2 bolts.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

(d) Connect the compressor connector.

(e) Connect the PPS solenoid valve connector.



(f) Install the vane pump assembly with the 3 bolts and plate washer.
Torque:
58 N·m (590 kgf·cm, 43 ft·lbf) for bolt A
52 N·m (530 kgf·cm, 38 ft·lbf) for bolt B



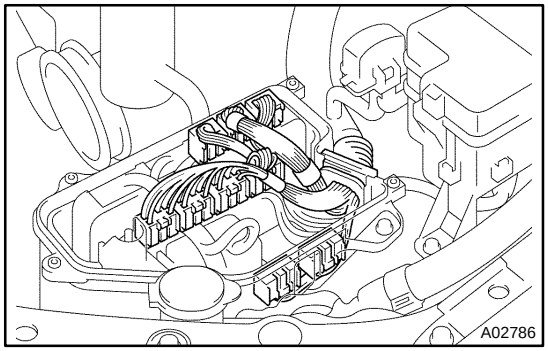
(g) Install the pump rear stay with the 2 bolts.
Torque: 39.2 N·m (400 kgf·cm, 29 ft·lbf)

(h) Connect the PS air hose to the No. 4 timing belt cover.

(i) Connect the PS air hose to the air intake chamber.

27. M/T:
INSTALL TRANSMISSION SHIFT LEVER

(a) Install the shift lever with the 4 bolts.
Torque: 8 N·m (82 kgf·cm, 71 in.·lbf)



28. CONNECT ENGINE WIRE TO ECM BOX

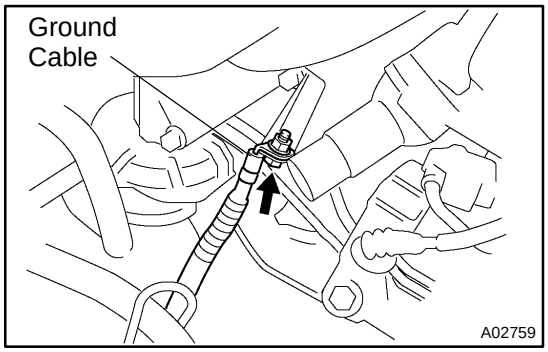
(a) Install the engine wire grommet to the ECM box.

(b) Connect the 3 ECM connectors.

(c) Connect the 4 wire harness connectors.

(d) Connect the 2 junction connectors.

(e) Install the ECM cover and hood.



29. CONNECT CLAMPS, WIRES, CONNECTORS, HOSES, CABLE AND STRAP

(a) Connect the 2 engine wire clamps to the clamp brackets.

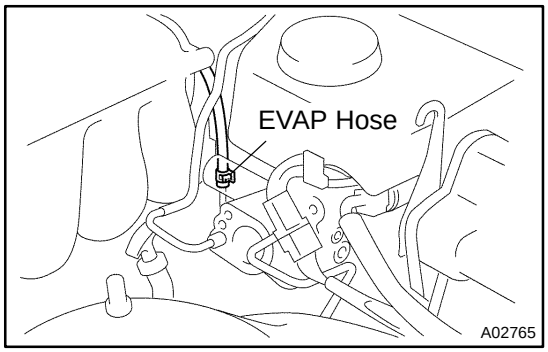
(b) Connect the igniter connector.

(c) Connect the ground cable to the bracket on the cylinder block.

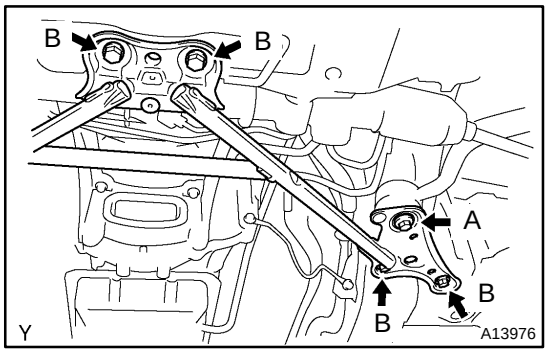
(d) Connect the engine wire clamp to the wire clip of the generator.

(e) Connect the generator wire.

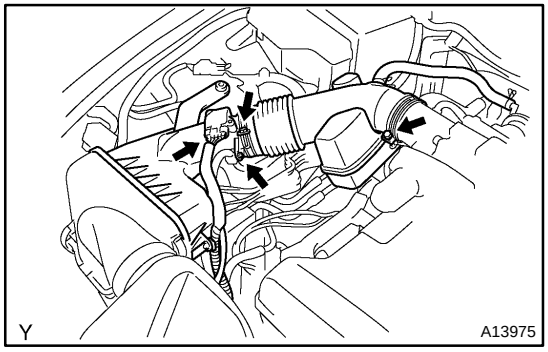
(f) Connect the heated oxygen sensor (bank 1 sensor 1) connector.
(g) Connect the heated oxygen sensor (bank 1 sensor 2) connector.



(h) Connect the EVAP hose to the pipe (from charcoal canister).
(i) Connect the heater hose to the heater pipe.
(j) Connect the heater hose to the water bypass pipe.
(k) Connect the ground strap to the dash panel.
(l) Connect the fuel inlet hose to the fuel pipe support.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)
(m) Connect the starter wire to the terminal and manifold stay.
(n) Connect the ground wire to the floor.



30. INSTALL FRONT SUSPENSION MEMBER BRACE
Install the brace with the 8 bolts.
Torque:
Bolt A: 119 N·m (1,210 kgf·cm, 88 ft·lbf)
Bolt B: 58 N·m (590 kgf·cm, 43 ft·lbf)
31. INSTALL DRIVE BELT (See page CH-1)
32. M/T:
INSTALL DRIVE BELT TENSIONER ABSORBER
Install the absorber with the 2 nuts.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)
33. CONNECT ACCELERATOR CABLE TO ENGINE



34. INSTALL INTAKE AIR RESONATOR
(a) Connect the intake air resonator to the throttle body.
(b) Tighten the hose clamp bolt holding the intake air resonator to the throttle body.
(c) Connect the MAF meter connector.
(d) Connect the engine wire clamp to the air cleaner case.
(e) Connect the PCV hose to the No.2 cylinder head cover.
35. CONNECT RADIATOR UPPER AND LOWER HOSES
36. CONNECT BRAKE BOOSTER VACUUM HOSE
37. INSTALL AIR CLEANER INLET

38. INSTALL ENGINE COVER

Install the engine cover with the 4 nuts.

39. FILL WITH ENGINE COOLANT

40. FILL WITH ENGINE OIL

41. START ENGINE AND CHECK FOR LEAKS

42. INSTALL ENGINE UNDER COVER

NOTICE:

Be careful not to damage the body or glass with the hood end.

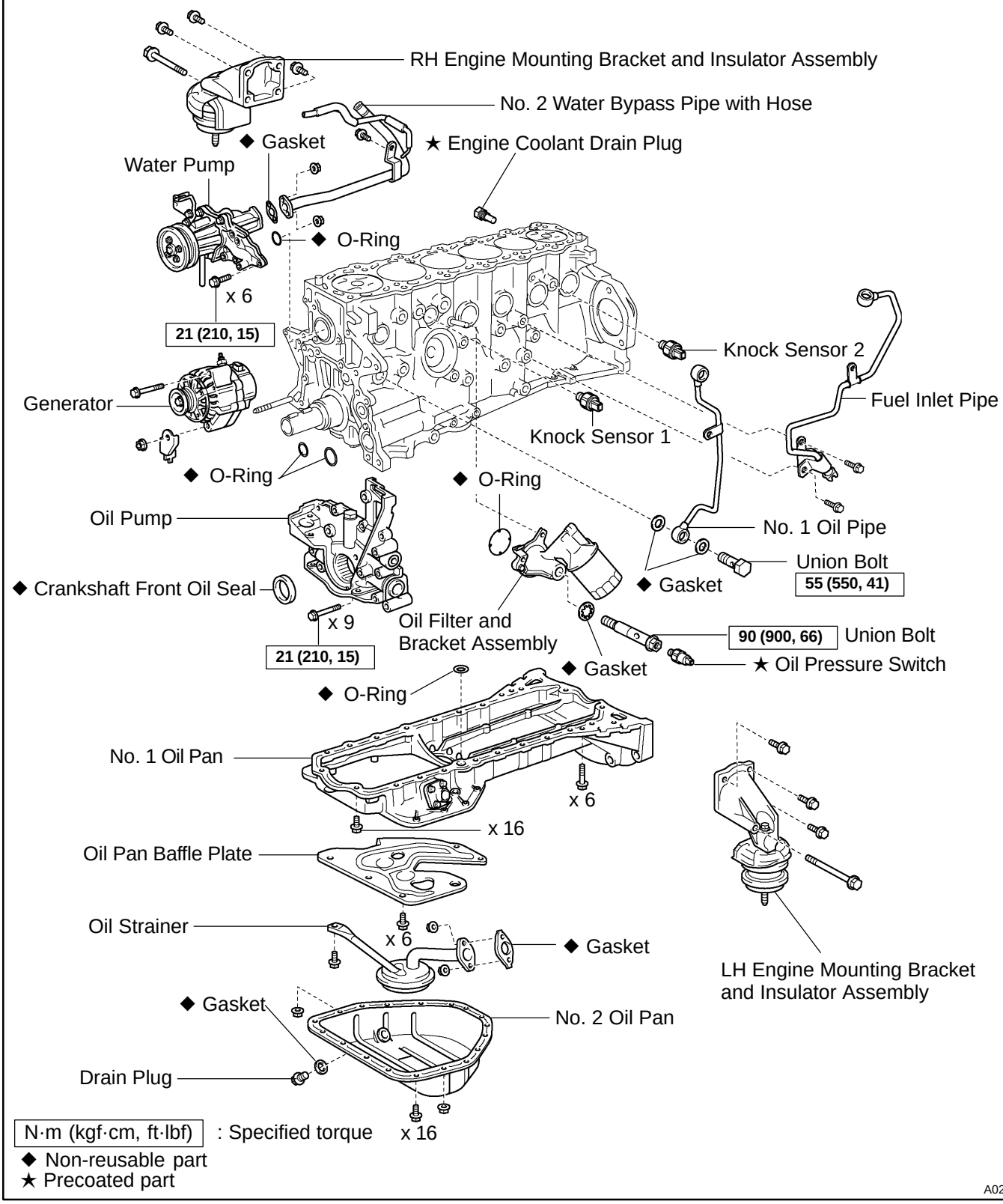
43. PERFORM ROAD TEST

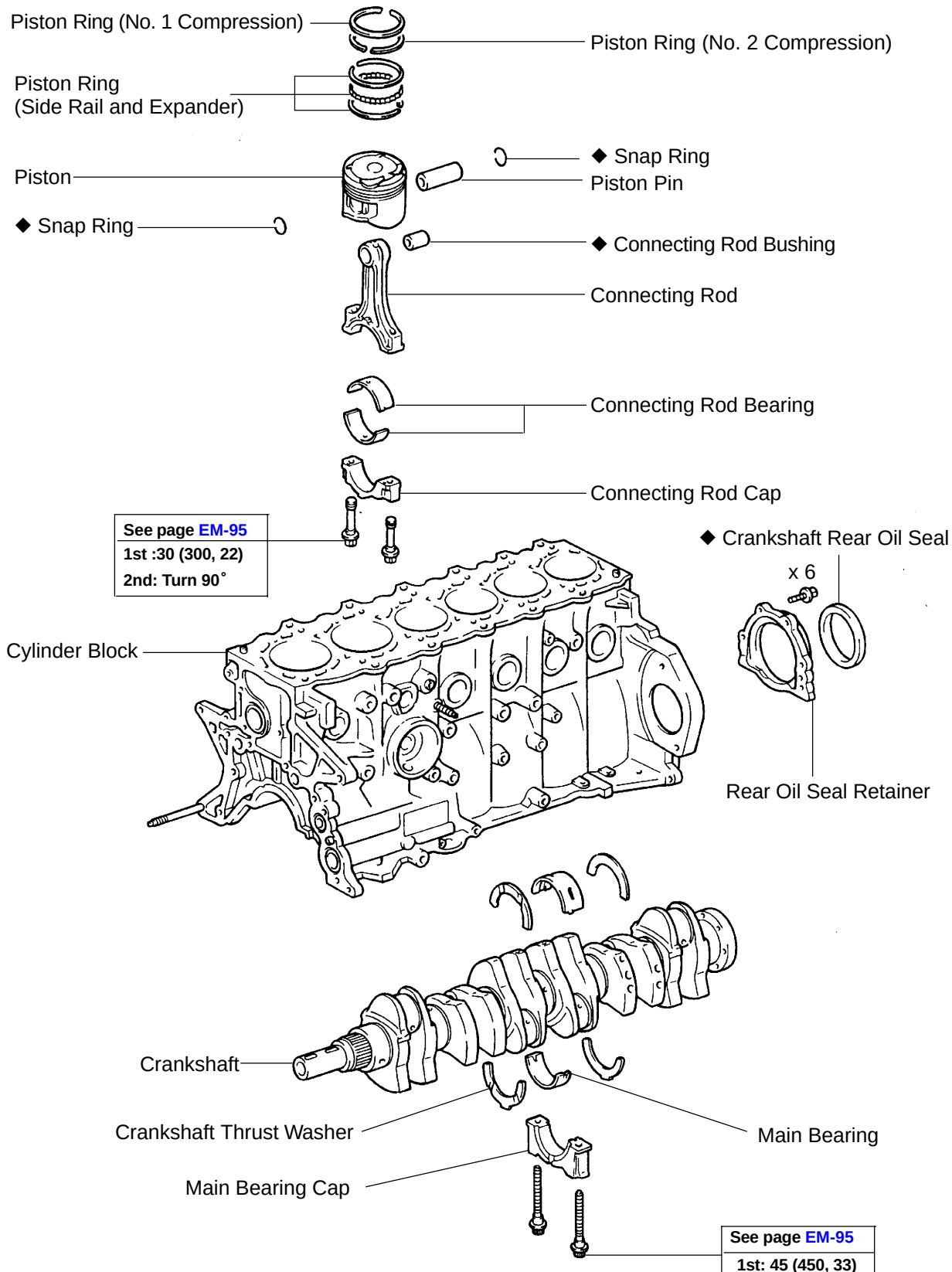
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

44. RECHECK ENGINE COOLANT AND OIL LEVELS

CYLINDER BLOCK COMPONENTS

EM0DJ-06





N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

A02806

EM0DK-06

DISASSEMBLY

1. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY

2. REMOVE GENERATOR

Remove the bolt, nut, pipe bracket and generator.

3. REMOVE TIMING BELT AND PULLEYS (See page EM-17)

4. REMOVE NO. 2 WATER BYPASS PIPE WITH HOSE

Remove the bolt, 2 nuts, water bypass pipe and gasket.

5. REMOVE WATER PUMP

Remove the 6 bolts, water pump and O-ring.

6. REMOVE CYLINDER HEAD (See page EM-34)

7. REMOVE OIL PRESSURE SWITCH (See page LU-1) AND KNOCK SENSORS (See page SF-69)

8. REMOVE OIL FILTER AND BRACKET ASSEMBLY

(a) Remove the union bolt and oil filter bracket.

(b) Remove the gasket from the union bolt.

(c) Remove the O-ring from the oil filter bracket.

9. REMOVE NO. 1 OIL PIPE

Remove the union bolt, oil pipe and 2 gaskets.

10. REMOVE FUEL INLET PIPE

Remove the 2 bolts and fuel inlet pipe.

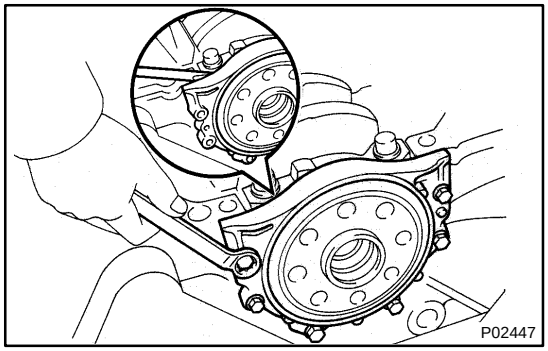
11. REMOVE LH ENGINE MOUNTING BRACKET AND INSULATOR ASSEMBLY

Remove the 4 bolts and mounting bracket.

12. REMOVE RH ENGINE MOUNTING BRACKET AND INSULATOR ASSEMBLY

Remove the 4 bolts and mounting bracket.

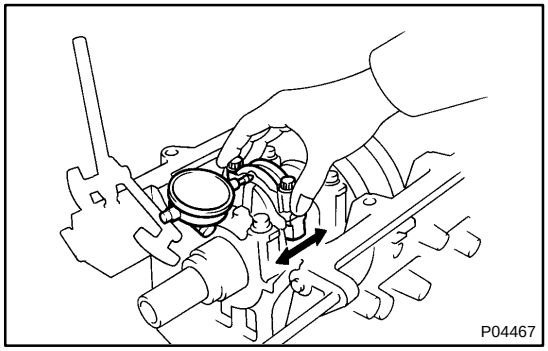
13. REMOVE OIL PUMP (See page LU-6)



14. REMOVE REAR OIL SEAL RETAINER

(a) Remove the 6 bolts of the retainer.

(b) Remove the oil seal retainer by prying the area between the oil seal retainer and main bearing cap with a screwdriver.



15. CHECK CONNECTING ROD THRUST CLEARANCE

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

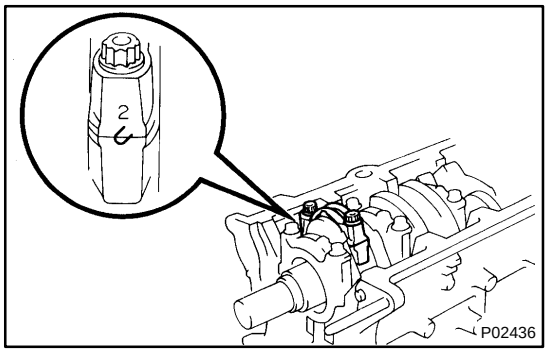
Standard thrust clearance:

0.250 - 0.402 mm (0.0098 - 0.0158 in.)

Maximum thrust clearance: 0.50 mm (0.0197 in.)

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

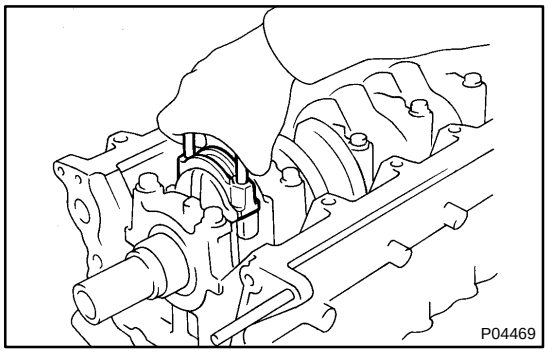
Connecting rod thickness:
25.898 - 25.950 mm (1.0196 - 1.0217 in.)



16. 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 connecting rod cap bolts.

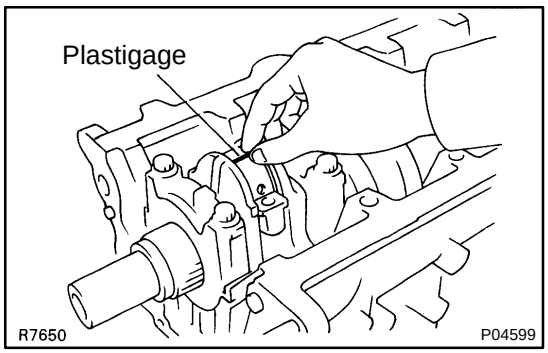


(c) Using the 2 removed connecting rod bolts, remove the connecting rod cap and lower bearing by wiggling the connecting rod cap right and left.

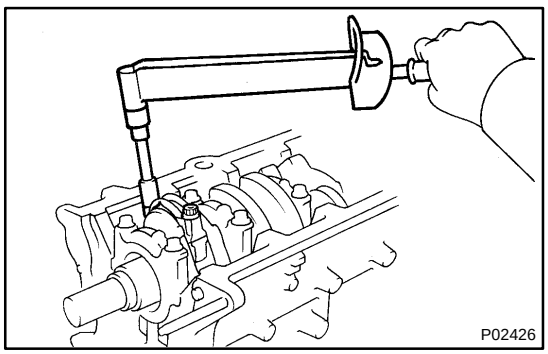
HINT:
Keep the lower bearing inserted with the connecting rod cap.

(d) Clean the crank pin and bearings.

(e) Check the crank pin and bearing for pitting and scratches.
If the crank pin or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.



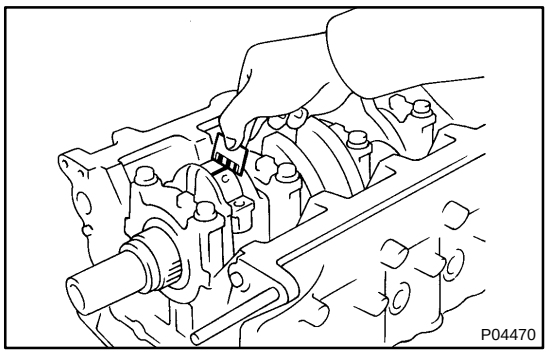
(f) Lay a strip of Plastigage across the crank pin.

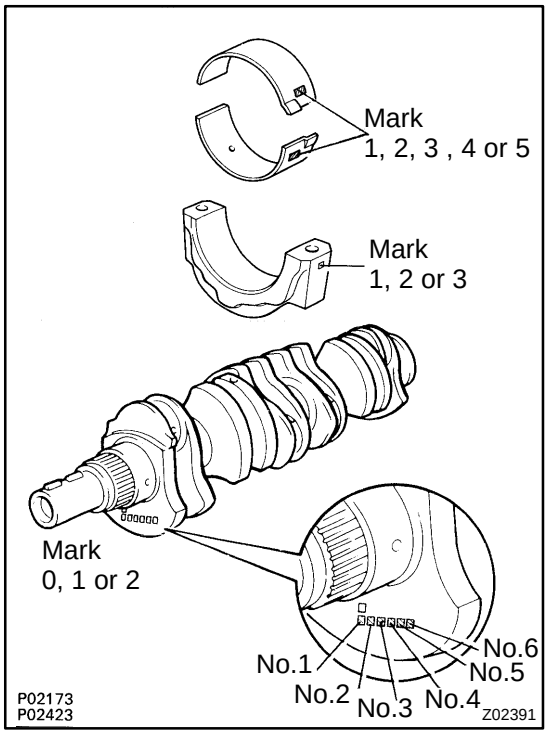


(g) Install the connecting rod cap with the 2 bolts (See page EM-95).

NOTICE:
Do not turn the crankshaft.

(h) Remove the 2 bolts, connecting rod cap and lower bearing (See procedure (b) and (c) above).





(i) Measure the Plastigage at its widest point.

Standard oil clearance:

STD	0.023 - 0.041 mm (0.0009 - 0.0016 in.)
U/S 0.25	0.028 - 0.066 mm (0.0011 - 0.0026 in.)

Maximum oil clearance:

STD	0.07 mm (0.0027 in.)
U/S 0.25	0.08 mm (0.0031 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 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 connecting rod cap 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 mark								
Connecting rod cap	1			2			3		
Crankshaft	0	1	2	0	1	2	0	1	2
Use bearing	1	2	3	2	3	4	3	4	5

EXAMPLE:
Connecting rod cap ”3” + Crankshaft ”1”
= Total number 4 (Use bearing ”4”)

Reference

Connecting rod big end inside diameter:

Mark ”1”	55.025 - 55.031 mm (2.1663 - 2.1666 in.)
Mark ”2”	55.031 - 55.037 mm (2.1666 - 2.1668 in.)
Mark ”3”	55.037 - 55.043 mm (2.1668 - 2.1670 in.)

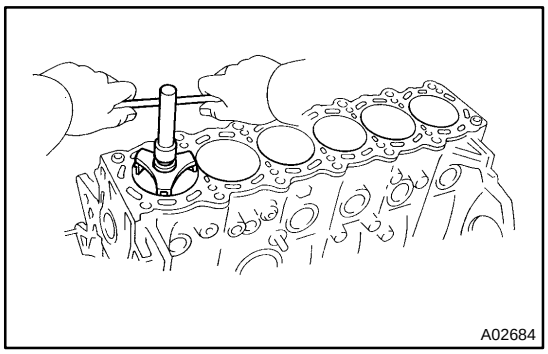
Crankshaft crank pin diameter:

Mark ”0”	51.994 - 52.000 mm (2.0470 - 2.0472 in.)
Mark ”1”	51.988 - 51.994 mm (2.0468 - 2.0470 in.)
Mark ”2”	51.982 - 51.988 mm (2.0465 - 2.0468 in.)

Standard sized bearing center wall thickness:

Mark ”1”	1.498 - 1.501 mm (0.0590 - 0.0591 in.)
Mark ”2”	1.501 - 1.504 mm (0.0591 - 0.0592 in.)
Mark ”3”	1.504 - 1.507 mm (0.0592 - 0.0593 in.)
Mark ”4”	1.507 - 1.510 mm (0.0593 - 0.0594 in.)
Mark ”5”	1.510 - 1.513 mm (0.0594 - 0.0596 in.)

(j) Completely remove the Plastigage.

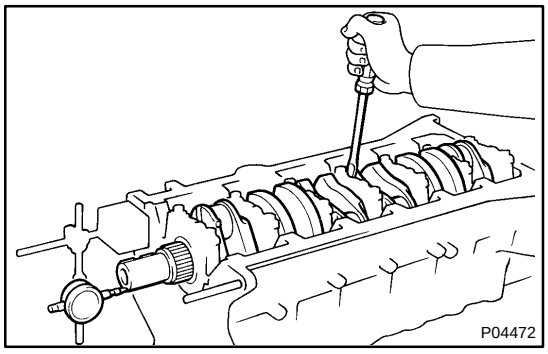


17. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

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

(b) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

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



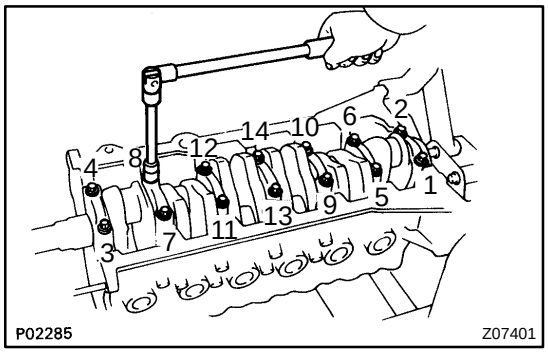
18. CHECK CRANKSHAFT THRUST CLEARANCE

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

Standard thrust clearance:
0.020 - 0.220 mm (0.0008 - 0.0087 in.)
Maximum thrust clearance: 0.30 mm (0.0118 in.)

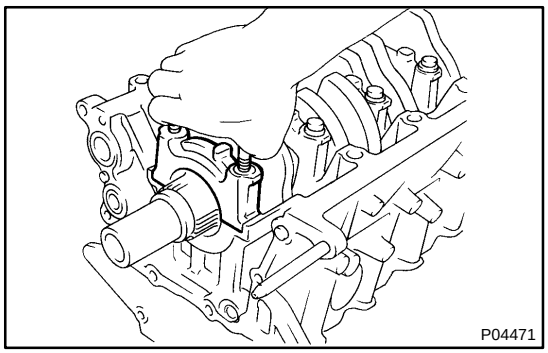
If the thrust clearance is greater than maximum, replace the thrust washers as a set.

Thrust washer thickness:
1.940 - 1.990 mm (0.0764 - 0.0783 in.)



19. 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, pry the main bearing cap back and forth, and remove the main bearing caps, lower bearings and 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 correct order.

(c) Lift out the crankshaft.

HINT:

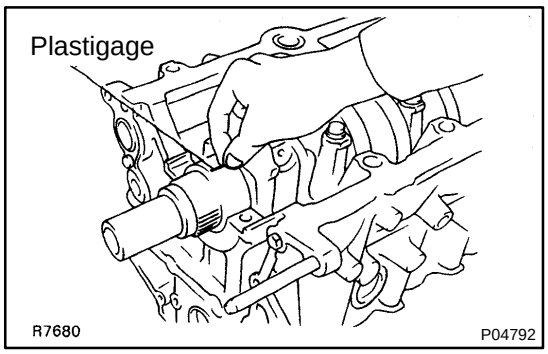
Keep the upper bearing and upper thrust washers together with the cylinder block.

(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.



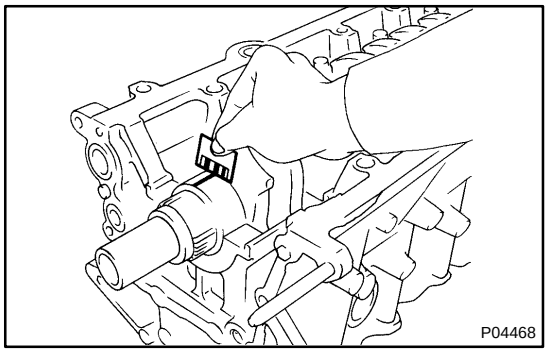
(g) Lay a strip of Plastigage across each journal.

(h) Install the main bearing caps (See page EM-95).

NOTICE:

Do not turn the crankshaft.

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



(j) Measure the Plastigage at its widest point.

Standard clearance:

STD	0.026 - 0.040 mm (0.0010 - 0.0016 in.)
U/S 0.25	0.025 - 0.061 mm (0.0010 - 0.0024 in.)

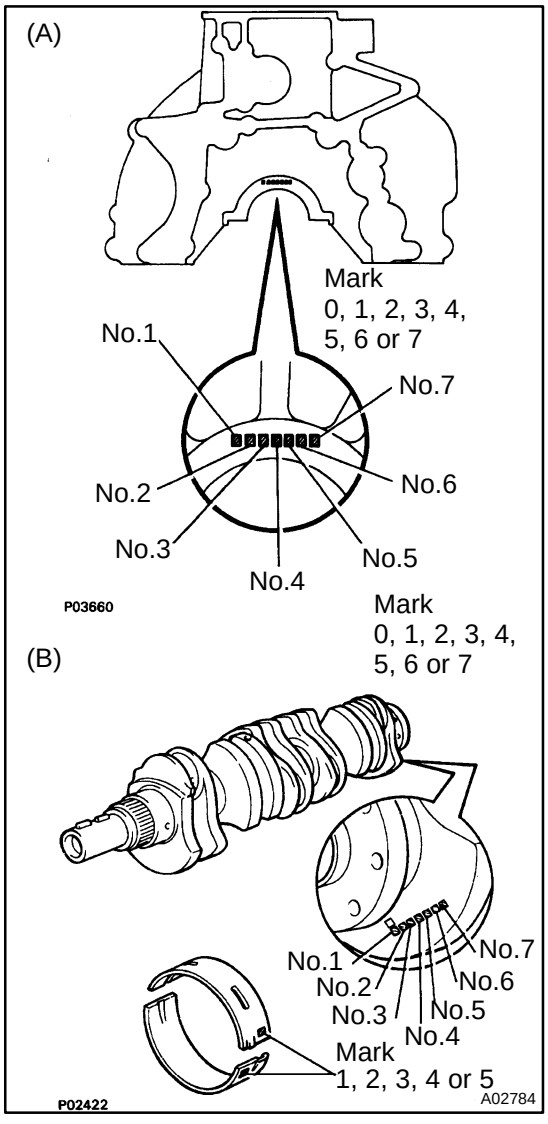
Maximum clearance:

STD	0.06 mm (0.0024 in.)
U/S 0.25	0.08 mm (0.0031 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 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 refer to the table below for the appropriate bearing number. There are 5 sizes of standard bearings, marked ”1”, ”2”, ”3”, ”4” and ”5” accordingly.



	Total number ” ” : Number mark				
Cylinder block (A) + Crankshaft (B) =	0 - 2	3 - 5	6 - 8	9 - 11	12 - 14
Use bearing	”1”	”2”	”3”	”4”	”5”

EXAMPLE:
Cylinder block ”3” (A) + Crankshaft ”4” (B)
= Total number 7 (Use bearing ”3”)

Standard sized bearing selection chart:

Crankshaft number mark	Cylinder block number mark							
	0	1	2	3	4	5	6	7
0	1	1	1	2	2	2	3	3
1	1	1	2	2	2	3	3	3
2	1	2	2	2	3	3	3	4
3	2	2	2	3	3	3	4	4
4	2	2	3	3	3	4	4	4
5	2	3	3	3	4	4	4	4
6	3	3	3	4	4	5	5	5
7	3	3	4	4	5	5	5	5

EXAMPLE:
Cylinder block ”3”, Crankshaft ”4” = Use bearing ”3”

Reference

Cylinder block main journal bore diameter (A):

Mark ”0”	66.020 - 66.022 mm (2.59922 - 2.59929 in.)
Mark ”1”	66.022 - 66.024 mm (2.59929 - 2.59936 in.)
Mark ”2”	66.024 - 66.026 mm (2.59936 - 2.59944 in.)
Mark ”3”	66.026 - 66.028 mm (2.59944 - 2.59952 in.)
Mark ”4”	66.028 - 66.030 mm (2.59952 - 2.59960 in.)
Mark ”5”	66.030 - 66.032 mm (2.59960 - 2.59968 in.)
Mark ”6”	66.032 - 66.034 mm (2.59968 - 2.59976 in.)
Mark ”7”	66.034 - 66.036 mm (2.59976 - 2.59984 in.)

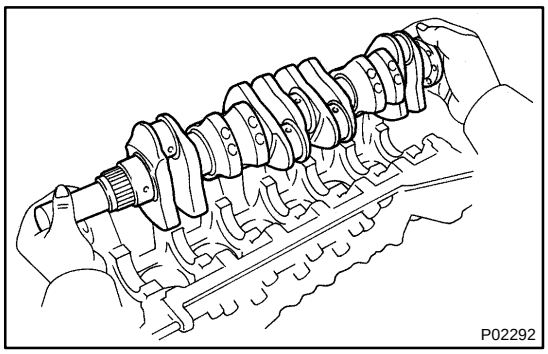
Crankshaft main journal diameter (B):

Mark ”0”	61.998 - 62.000 mm (2.44086 - 2.44094 in.)
Mark ”1”	61.996 - 61.998 mm (2.44078 - 2.44086 in.)
Mark ”2”	61.994 - 61.996 mm (2.44070 - 2.44078 in.)
Mark ”3”	61.992 - 61.994 mm (2.44063 - 2.44070 in.)
Mark ”4”	61.990 - 61.992 mm (2.44055 - 2.44063 in.)
Mark ”5”	61.988 - 61.990 mm (2.44047 - 2.44055 in.)
Mark ”6”	61.986 - 61.988 mm (2.44039 - 2.44047 in.)
Mark ”7”	61.984 - 61.986 mm (2.44031 - 2.44039 in.)

Standard bearing center wall thickness:

Mark ”1”	1.994 - 1.997 mm (0.0785 - 0.0786 in.)
Mark ”2”	1.997 - 2.000 mm (0.0786 - 0.0787 in.)
Mark ”3”	2.000 - 2.003 mm (0.0787 - 0.0789 in.)
Mark ”4”	2.003 - 2.006 mm (0.0789 - 0.0790 in.)
Mark ”5”	2.006 - 2.009 mm (0.0790 - 0.0791 in.)

(k) Completely remove the Plastigage.



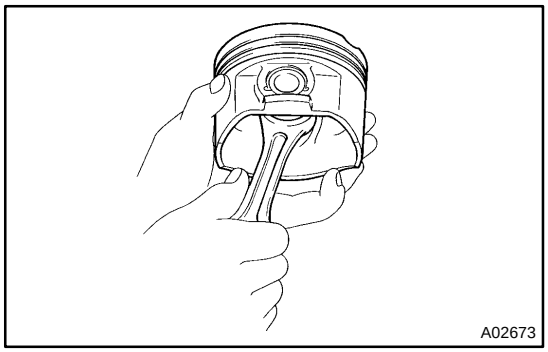
20. REMOVE CRANKSHAFT

(a) Lift out the crankshaft

(b) Remove the upper bearings and upper thrust washers from the cylinder block.

HINT:

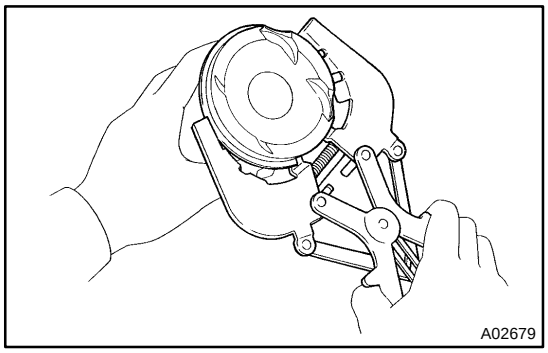
Arrange the main bearing caps, bearings and thrust washers in the correct order.



21. 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.



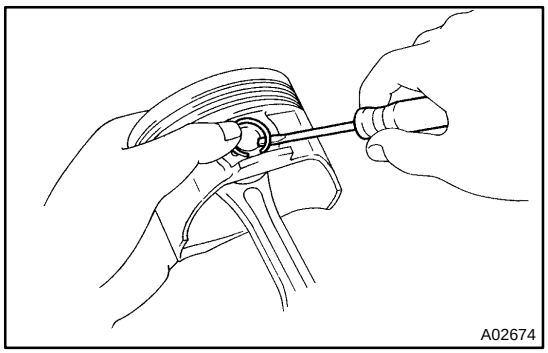
22. REMOVE PISTON RINGS

(a) Using a piston ring expander, remove the 2 compression rings.

(b) Remove the 2 side rails and oil ring expander by hand.

HINT:

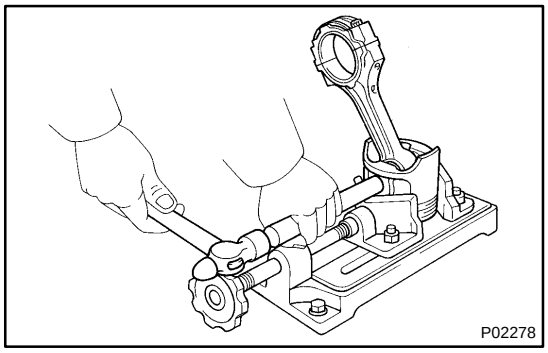
Arrange the piston rings in correct order only.



23. DISCONNECT CONNECTING ROD FROM PISTON

(a) Using a small screwdriver, remove the 2 snap rings.

(b) Gradually heat the piston to about 80˚C (176˚F).



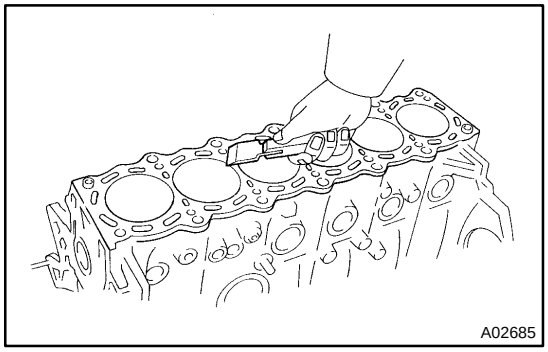
(c) Using a plastic-faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.

HINT:

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

EM0DL-08

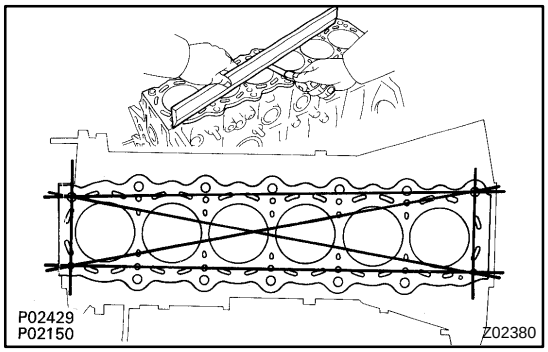
INSPECTION



1. CLEAN CYLINDER BLOCK

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

(b) Clean the cylinder block.
Using a soft brush and solvent, thoroughly clean the cylinder block.

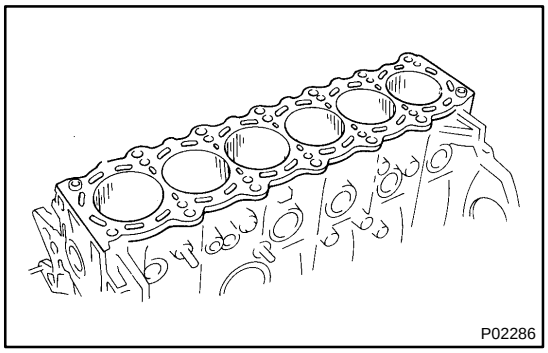


2. INSPECT CYLINDER BLOCK SURFACE FOR FLATNESS

Using precision straight edge and feeler gauge, measure the top surfaces of the cylinder block for warpage.

Maximum warpage: 0.07 mm (0.0028 in.)

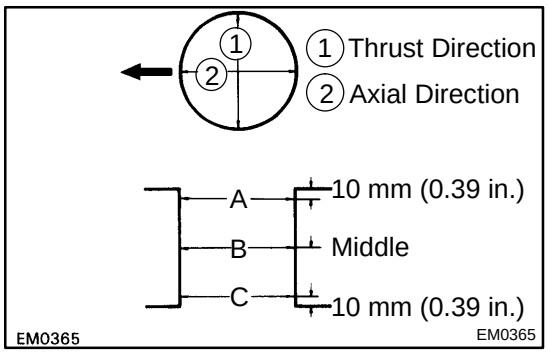
If warpage is greater than maximum, replace the cylinder block.



3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

Visually check the cylinder for vertical scratches.

If deep scratches are present, replace the cylinder block.



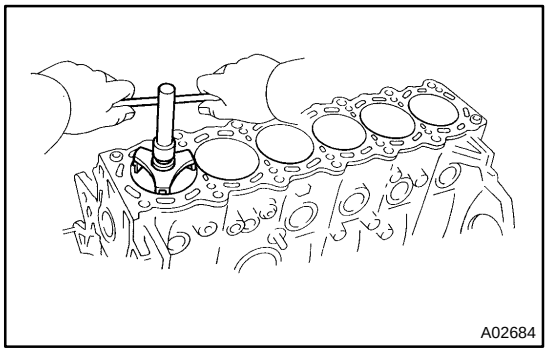
4. INSPECT CYLINDER BORE DIAMETER

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

Standard diameter:
86.000 - 86.013 mm (3.3858 - 3.3863 in.)

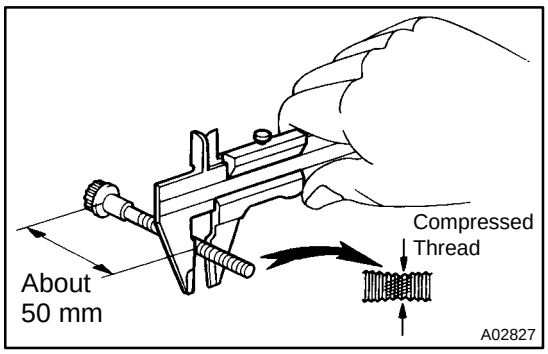
Maximum diameter: 86.02 mm (3.3866 in.)

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



5. REMOVE CYLINDER RIDGE

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

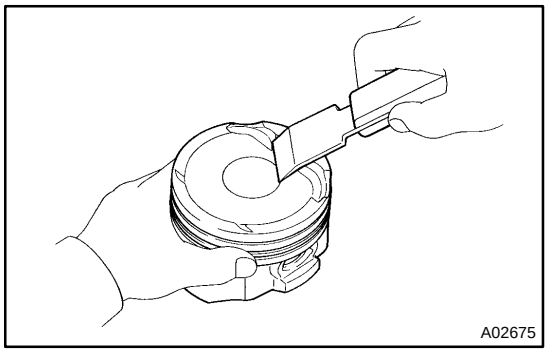


6. INSPECT MAIN BEARING CAP BOLTS

Using vernier calipers, measure the minimum diameter of the compressed thread at the measuring point.

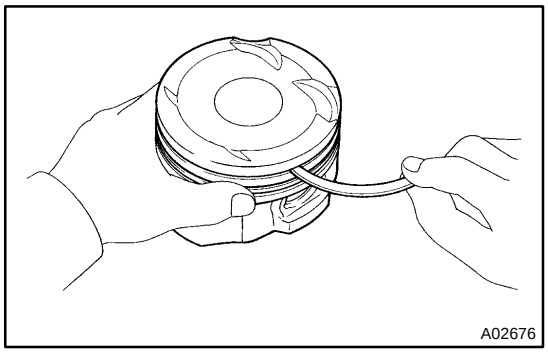
Standard diameter:
9.96 - 9.97 mm (0.3921 - 0.3925 in.)
Minimum diameter: 9.7 mm (0.382 in.)

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



7. CLEAN PISTON

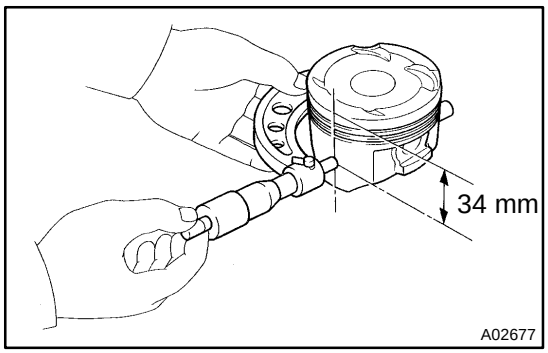
(a) Using a gasket scraper, remove the carbon from the piston top.



(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.



8. INSPECT PISTON OIL CLEARANCE

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 34 mm (1.34 in.) from the piston head.

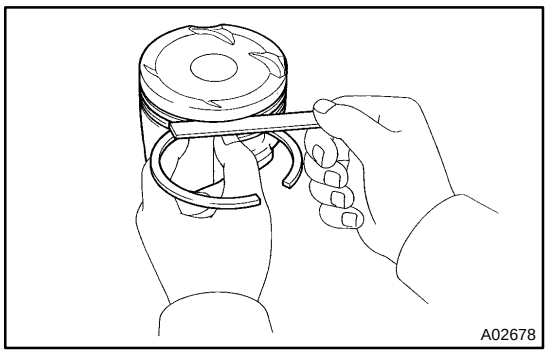
Piston diameter:
85.945 - 85.965 mm (3.3837 - 3.3844 in.)

(b) Measure the cylinder bore diameter in the thrust directions (See step 4).

(c) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:
0.035 - 0.068 mm (0.0014 - 0.0027 in.)
Maximum oil clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace all the 6 pistons. If necessary, replace the cylinder block.



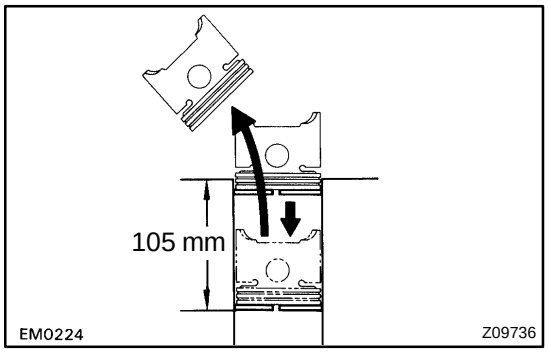
9. INSPECT PISTON RING GROOVE CLEARANCE

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

Ring groove clearance:

No.1	0.011 - 0.070 mm (0.0004 - 0.0028 in.)
No.2	0.030 - 0.070 mm (0.0012 - 0.0028 in.)

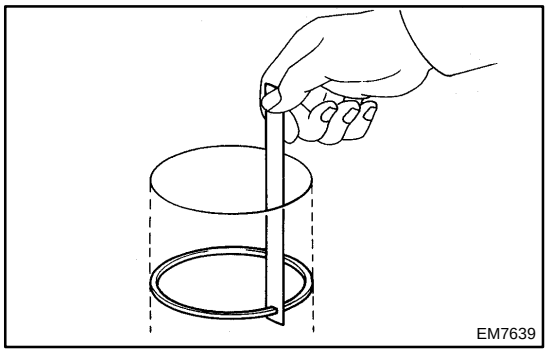
If the clearance is not as specified, replace the piston.



10. INSPECT PISTON RING END GAP

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

(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 105 mm (4.13 in.) from the top of the cylinder block.



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

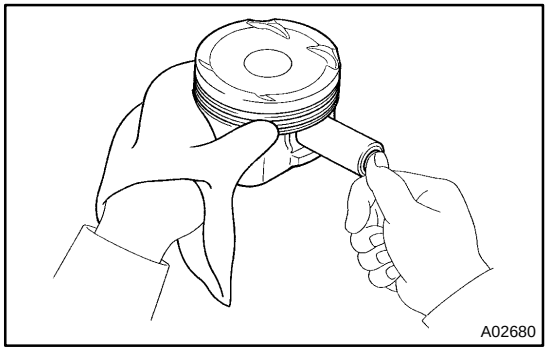
Standard ring end gap:

No.1	0.300 - 0.470 mm (0.0118 - 0.0185 in.)
No.2	0.350 - 0.520 mm (0.0138 - 0.0205 in.)
Oil (Side rail)	0.130 - 0.450 mm (0.0051 - 0.0177 in.)

Maximum ring end gap:

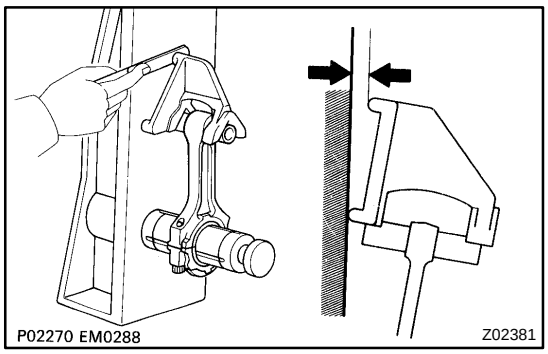
No.1	1.07 mm (0.0421 in.)
No.2	1.12 mm (0.0441 in.)
Oil (Side rail)	1.05 mm (0.0413 in.)

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, replace the cylinder block.



11. INSPECT PISTON PIN FIT

At 80°C (176°F), you should be able to push the piston pin into the piston pin hole with your thumb.



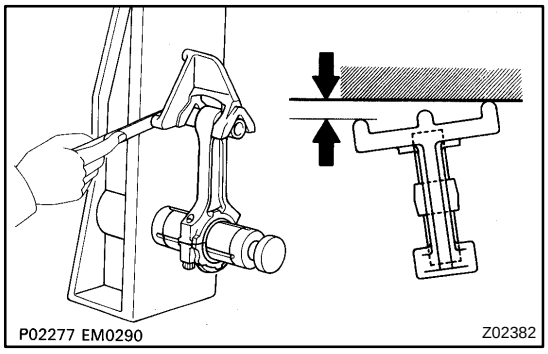
12. INSPECT CONNECTING ROD ALIGNMENT

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

- Check for out-of-alignment.

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

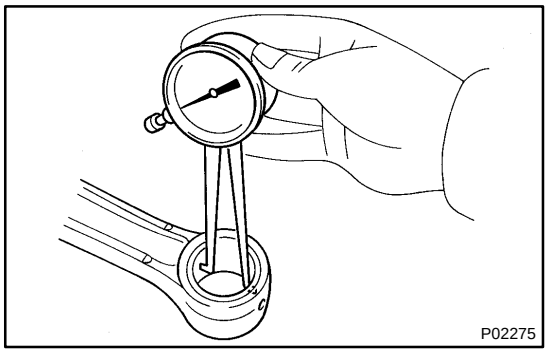
If out-of-alignment is greater than maximum, replace the connecting rod assembly.



- Check for twist.

Maximum twist:
0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

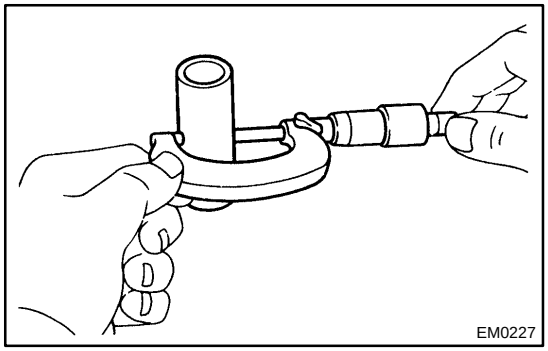
If twist is greater than maximum, replace the connecting rod assembly.



13. INSPECT PISTON PIN OIL CLEARANCE

(a) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.

Bushing inside diameter:
22.005 - 22.014 mm (0.8663 - 0.8667 in.)



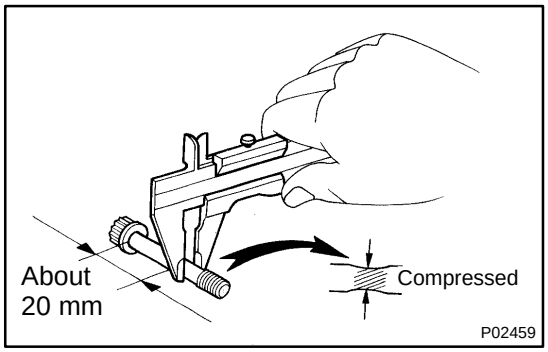
(b) Using a micrometer, measure the piston pin diameter.

Piston pin diameter:
21.997 - 22.006 mm (0.8660 - 0.8664 in.)

(c) Subtract the piston pin diameter measurement from the bushing in side diameter measurement.

Standard oil clearance:
0.005 - 0.011 mm (0.0002 - 0.0004 in.)
Maximum oil clearance: 0.05 mm (0.0020 in.)

If the oil clearance is greater than maximum, replace the bushing. If necessary, replace the piston and piston pin as a set.

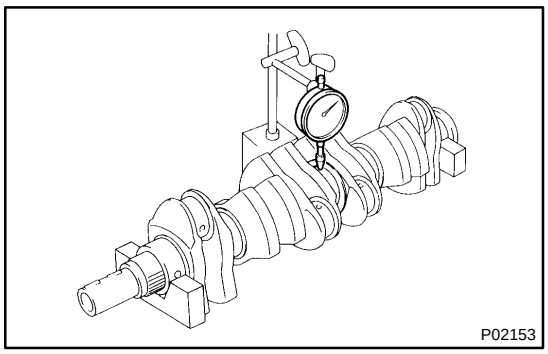


14. INSPECT CONNECTING ROD BOLTS

Using vernier calipers, measure the minimum diameter of the compressed bolt at the measuring point.

Standard diameter: 8.1 - 8.3 mm (0.319 - 0.327 in.)
Minimum diameter: 8.0 mm (0.315 in.)

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



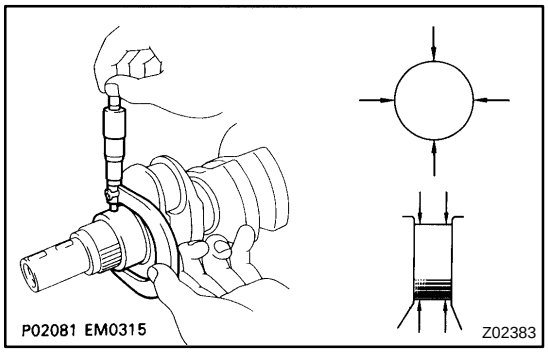
15. INSPECT CRANKSHAFT FOR RUNOUT

(a) Place the crankshaft on V-blocks.

(b) 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.



16. INSPECT MAIN JOURNALS AND CRANK PINS

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

Main journal diameter:

STD	61.984 - 62.000 mm (2.4403 - 2.4409 in.)
U/S 0.25	61.745 - 61.755 mm (2.4309 - 2.4313 in.)

Crank pin diameter:

STD	51.982 - 52.000 mm (2.0465 - 2.0472 in.)
U/S 0.25	51.745 - 51.755 mm (2.0372 - 2.0376 in.)

If the diameter is not as specified, check the oil clearance (See page EM-80).

(b) 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 or out-of-round is greater than maximum, grind or replace the crankshaft.

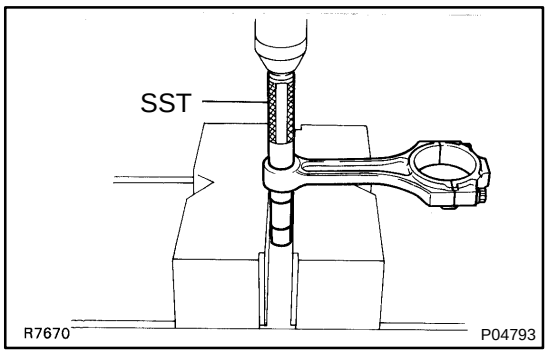
17. IF NECESSARY, GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS

- Grind and hone the main journals and/or crank pins to the finished undersized diameter (See procedure step 16).
- Install new main journal and/or crank pin undersized bearings.

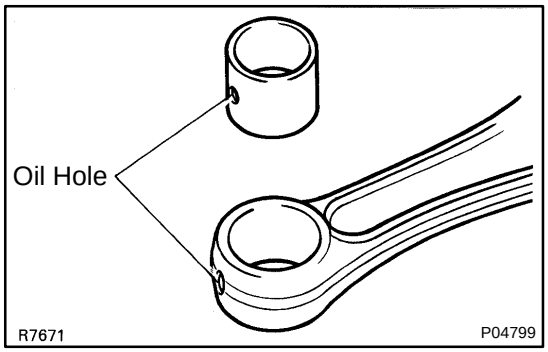
EM0DM-07

REPLACEMENT

1. REPLACE CONNECTING ROD BUSHING

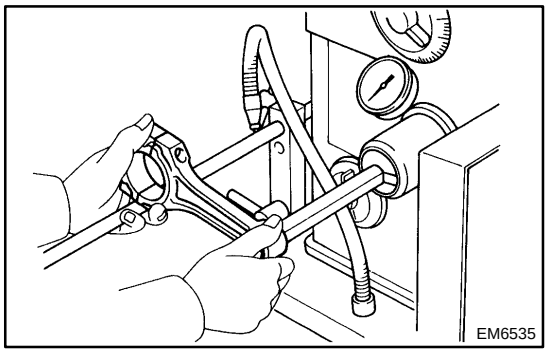


(a) Using SST and a press, press out the bushing.
SST 09222-30010

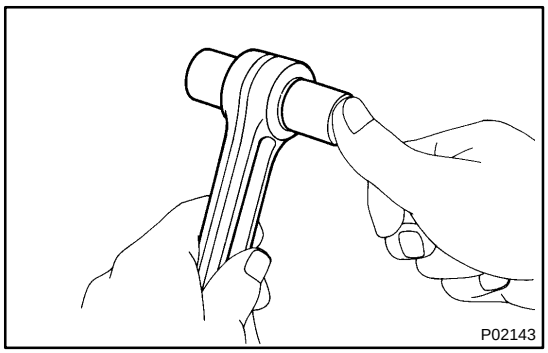


(b) Align the oil holes of a new bushing and the connecting rod.

(c) Using SST and a press, press in the bushing.
SST 09222-30010

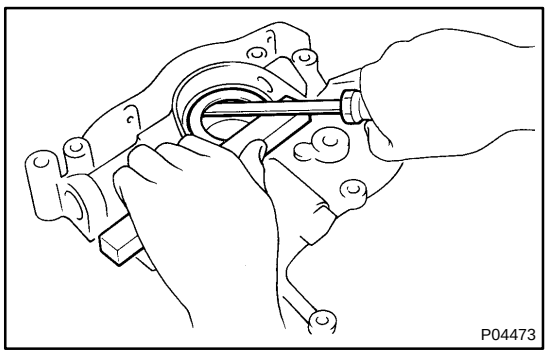


(d) Using a pin hole grinder, bore the bushing to obtain the standard specified clearance (See page EM-87) between the bushing and piston pin.



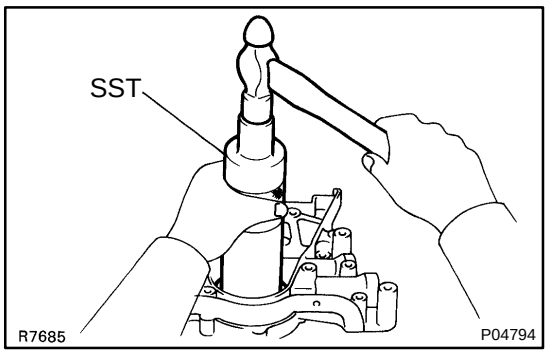
(e) Check the piston pin fit at room temperature.
Coat the piston pin with engine oil and push it into the connecting rod with your thumb.

2. REPLACE CRANKSHAFT FRONT OIL SEAL

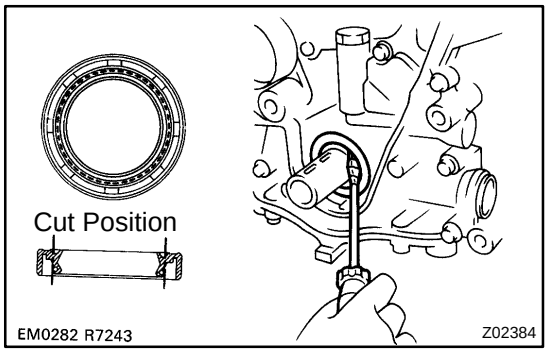


HINT:
There are 2 methods ((a) and (b)) to replace the oil seal.

(a) If the oil pump is removed form the cylinder block.
(1) Using a screwdriver, pry out the oil seal.



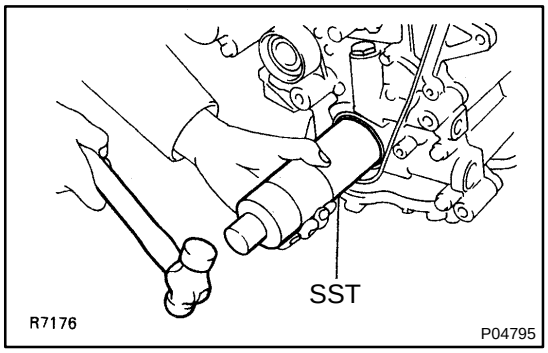
(2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump body edge.
SST 09316-6001 1 (09316-00011)
(3) Apply MP grease to the oil seal lip.



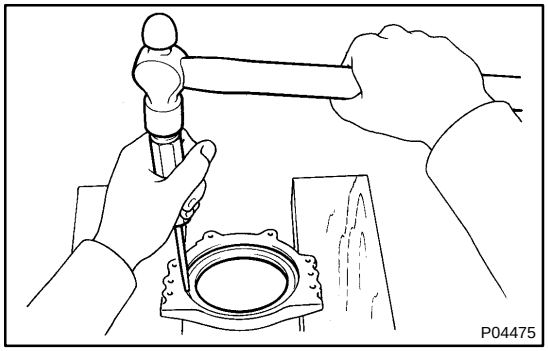
(b) If the pump is installed on the cylinder block.
(1) Using a knife, cut off the oil seal lip.
(2) Using a screwdriver, pry out the oil seal.

NOTICE:

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



(3) Apply MP grease to a new oil seal lip.
(4) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump body edge.
SST 09316-6001 1 (09316-00011)

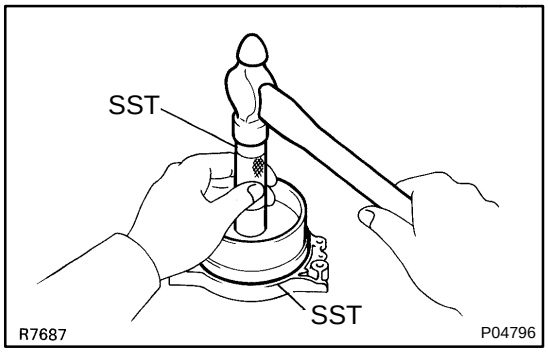


3. REPLACE CRANKSHAFT REAR OIL SEAL

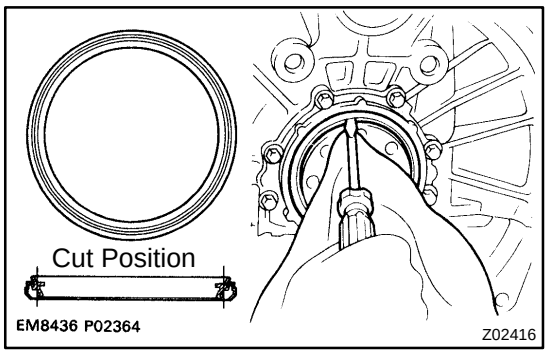
HINT:

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.



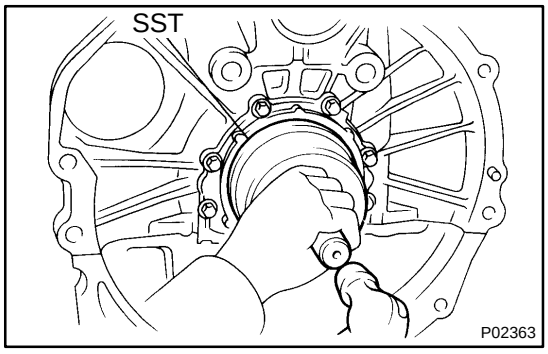
(2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223-15030, 09950-70010 (09951-07100)
(3) Apply MP grease to the oil seal lip.



(b) If the rear seal retainer is installed on 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) Apply MP grease to a new oil seal lip.
(4) 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)

EM0DN-06

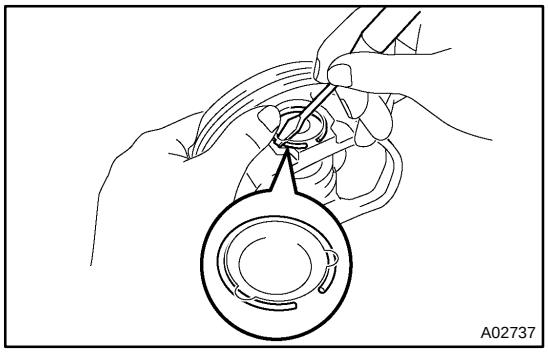
REASSEMBLY

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.

NOTICE:

Apply a generous amount of oil on the sliding surface of the bearing, and not on the back of it or on the surface to which it is installed.



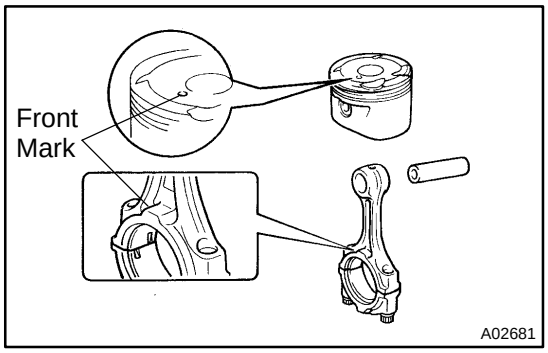
1. ASSEMBLE PISTON AND CONNECTING ROD

(a) Using a small screwdriver, install a new snap ring on one side of the piston pin hole.

HINT:

Be sure that end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.

(b) Gradually heat the piston to about 80˚C (176˚F).



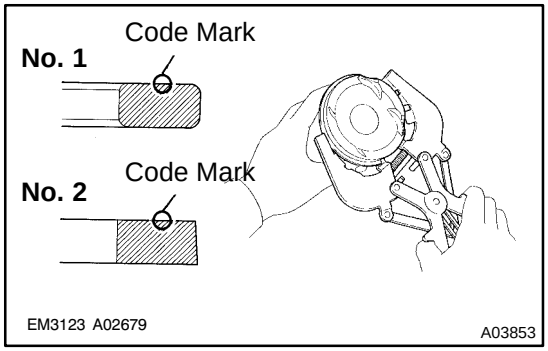
(c) Coat the piston pin with engine oil.

(d) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb.

(e) Install a new snap ring at the other end of the piston pin hole.

HINT:

Be sure that end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.



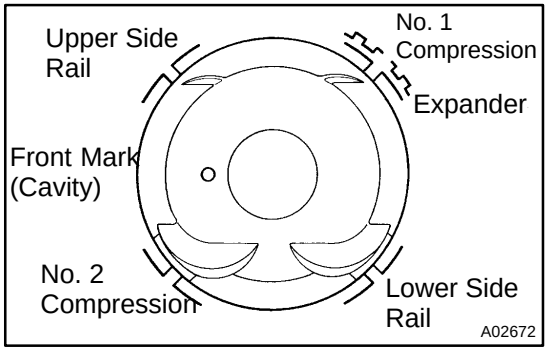
2. INSTALL PISTON RINGS

(a) Install the oil ring expander and 2 side rails by hand.

(b) Using a piston ring expander, install the 2 compression rings with the code mark facing up.

Code mark:

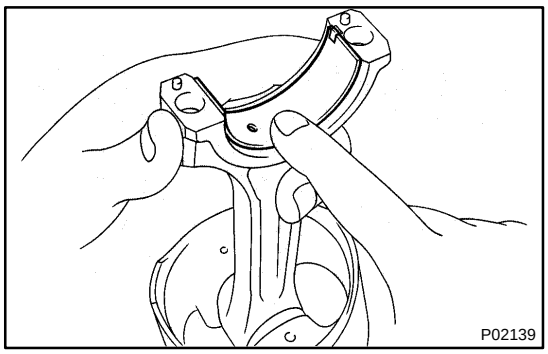
No. 1	1T
No. 2	2T



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

NOTICE:

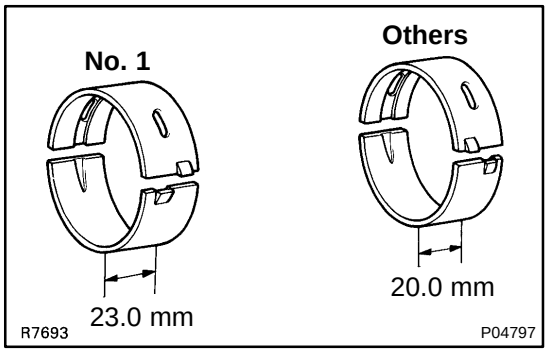
Do not align the piston ring ends.



3. INSTALL BEARINGS

(a) Align the bearing claw with the groove of the connecting rod and connecting cap.

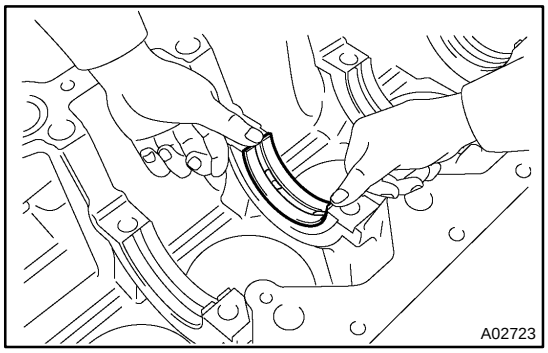
(b) Install the bearings in the connecting rod and connecting rod cap.



4. INSTALL MAIN BEARINGS

HINT:

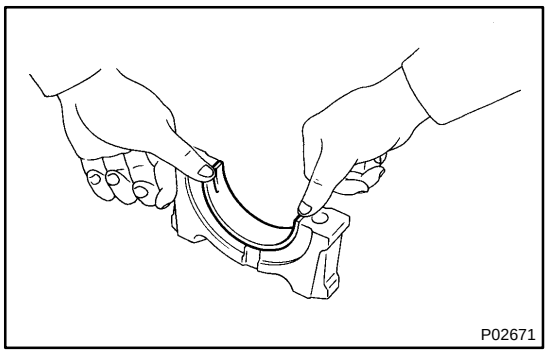
- Main bearings come in widths of 20.0 mm (0.787 in.) and 23.0 mm (0.906 in.). Install the 23.0 mm bearings in the No.1 cylinder block journal position with the main bearing cap. Install the 20.0 mm bearings in the other positions.
- Upper bearings have an oil groove and oil holes; lower bearings do not.



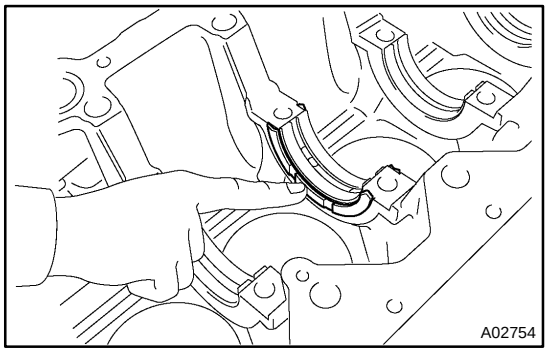
(a) Align the bearing claw with the claw groove of the main bearing cap or cylinder block.

NOTICE:

Install the bearing with the oil hole in the cylinder block.



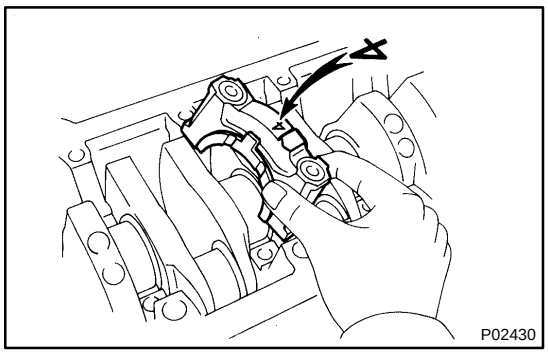
(b) Install the bearings in the cylinder block and main bearing caps.



5. INSTALL UPPER THRUST WASHERS

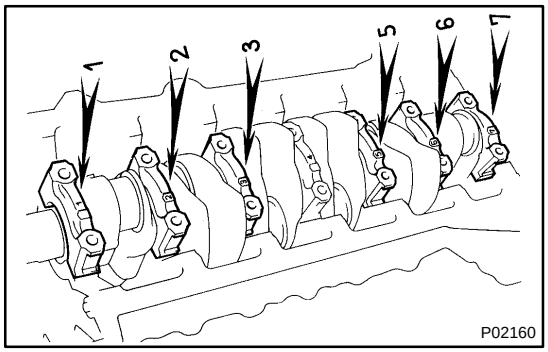
Install the 2 thrust washers under the No.4 main journal position of the cylinder block with the oil grooves facing outward.

6. PLACE CRANKSHAFT ON CYLINDER BLOCK



7. PLACE MAIN BEARING CAP AND LOWER THRUST WASHERS ON CYLINDER BLOCK

(a) Install the lower thrust washers on the No.4 main bearing with the grooves facing outward.

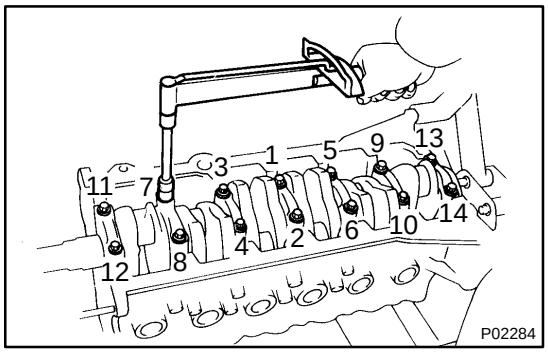


(b) Install the main bearing caps in numerical order with the arrows facing forward.

8. INSTALL MAIN BEARING CAP BOLTS

HINT:

- The main bearing cap bolts are tightened in 2 progressive steps (steps (b) and (d)).
- If any of the main bearing bolts break or deform, replace them.

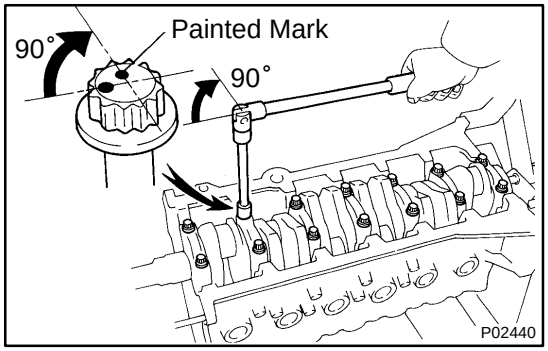


(a) Apply a light coat of engine oil on the threads and under the heads of the main bearing cap bolts.

(b) Install and uniformly tighten the 14 main bearing cap bolts, in several passes, in the sequence shown.

Torque: 45 N·m (450 kgf·cm, 33 ft·lbf)

If any one of the main bearing cap bolts does not meet the torque specification, replace the main bearing cap bolt.



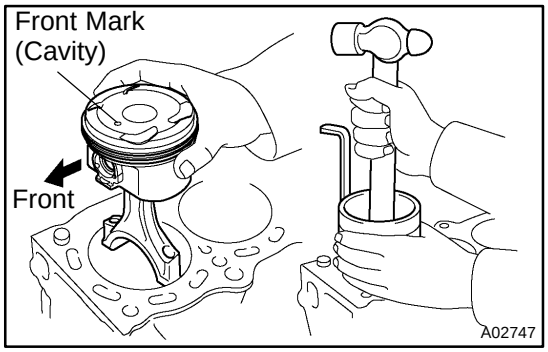
(c) Mark the front of the main bearing cap bolt head with paint.

(d) Retighten the main bearing cap bolts 90° in the numerical order shown above.

(e) Check that the painted mark is now at a 90° angle to the front.

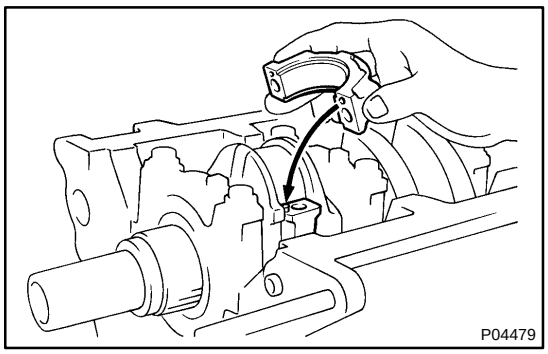
(f) Check that the crankshaft turns smoothly.

9. CHECK CRANKSHAFT THRUST CLEARANCE (See page EM-80)



10. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

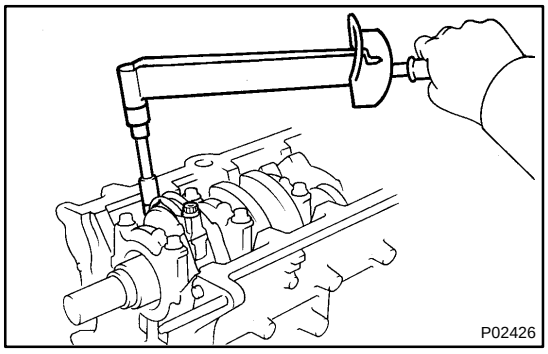
Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.



11. PLACE CONNECTING ROD CAP ON CONNECTING ROD

(a) Match the numbered connecting rod cap with the connecting rod.

(b) Install the connecting rod cap with by aligning the dowel pin to the corresponding hole.



12. INSTALL CONNECTING ROD CAP BOLTS

HINT:

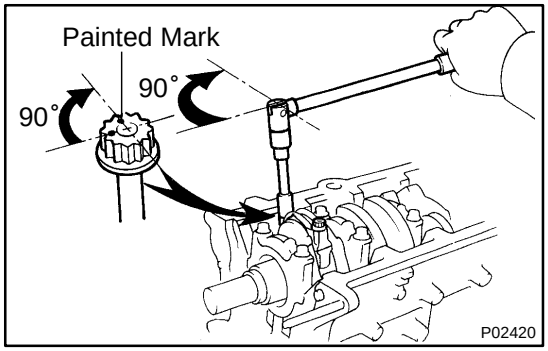
- The connecting rod cap bolts are tightened in 2 progressive steps (steps (b) and (d)).
- If any of the connecting rod bolts break or deform, replace them.

(a) Apply a light coat of engine oil on the threads and under the heads of the connecting rod cap bolts.

(b) Install and alternately tighten the bolts of the connecting rod cap in several passes.

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

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



(c) Mark the front of the connecting rod cap bolt with paint.

(d) Retighten the connecting rod cap bolts 90° in the numerical order shown.

(e) Check that the painted mark is now at a 90° angle to the front.

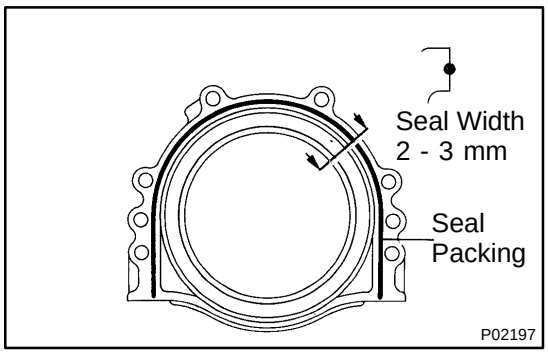
(f) Check that the crankshaft turns smoothly.

13. CHECK CONNECTING ROD THRUST CLEARANCE (See page EM-80)

14. INSTALL REAR OIL SEAL RETAINER

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the retainer and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all debris.
- Using a non-residue solvent, clean both sealing surfaces.



(b) Apply seal packing to the retainer 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 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Install the retainer with the 6 bolts.

Torque: 6.0 N·m (60 kgf·cm, 53 in.·lbf)

15. INSTALL OIL PUMP (See page LU-12)

16. INSTALL RH ENGINE MOUNTING BRACKET AND INSULATOR ASSEMBLY

Install the mounting bracket with the 4 bolts.

Torque: 59 N·m (590 kgf·cm, 44 ft·lbf)

17. INSTALL LH ENGINE MOUNTING BRACKET AND INSULATOR ASSEMBLY

Install the mounting bracket with the 4 bolts.

Torque: 59 N·m (590 kgf·cm, 44 ft·lbf)

18. INSTALL FUEL INLET PIPE

Install the fuel inlet pipe with the 2 bolts.

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

19. INSTALL NO. 1 OIL PIPE

Install the oil pipe with 2 new gaskets and the union bolt.

Torque: 55 N·m (550 kgf·cm, 41 ft·lbf)

20. INSTALL OIL FILTER AND BRACKET ASSEMBLY

(a) Install a new O-ring to the oil filter bracket.

(b) Install a new gasket to the union bolt.

(c) Install the oil filter bracket with the union bolt.

Torque: 90 N·m (900 kgf·cm, 65 ft·lbf)

21. INSTALL OIL PRESSURE SWITCH (See page LU-1) AND KNOCK SENSORS (See page SF-69)

22. INSTALL CYLINDER HEAD (See page EM-53)

23. INSTALL WATER PUMP (See page CO-9)

24. INSTALL NO. 2 WATER BYPASS PIPE WITH HOSE

(a) Install the water bypass pipe with the bolt and 2 nuts.

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

(b) Connect the water bypass hose to the hose clamp.

25. INSTALL TIMING PULLEYS AND BELT (See page EM-24)

26. INSTALL GENERATOR

Install the generator and pipe bracket with the bolt and nut.

Torque: 40 N·m (400 kgf·cm, 30 ft·lbf)

27. REMOVE ENGINE STAND FROM ENGINE

EXHAUST SYSTEM

COMPONENTS

EM0DO-08