CO/HC

EM06B–05

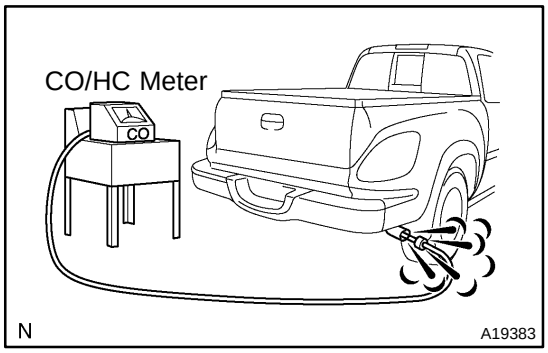
INSPECTION

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
(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 orders are prescribed by the applicable local regulations

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

(1) Check the A/F sensor operation (See page DI–167).

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

CO	HC	Problems	Causes
Normal	High	Rough idle	3. Faulty ignitions: ▲Incorrect timing ▲Fouled, shorted or improperly gapped plugs ▲Open or crossed high–tension codes 4. Incorrect valve clearance 5. Leaky intake and exhaust valves 6. Leaky cylinders
Low	High	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: ▲PCV hose ▲Intake manifold ▲Air intake chamber ▲Intake air connector ▲Throttle body ▲Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Plugged PCV valve 3. Faulty SFI system: ▲Faulty fuel pressure regulator ▲Clogged fuel return line ▲Defective ECT sensor ▲Faulty ECM ▲Faulty injectors ▲Faulty throttle position sensor ▲Faulty MAF meter

COMPRESSION

INSPECTION

EM06C–04

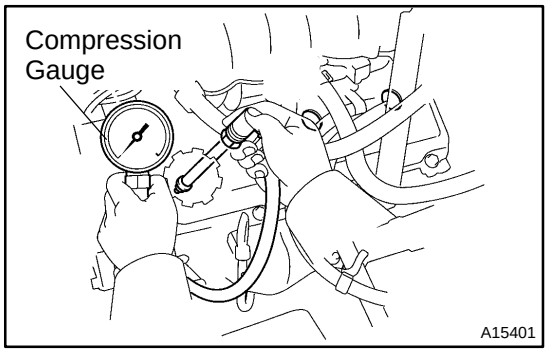
HINT:

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 HIGH–TENSION CORDS WITH IGNITION COILS (See page IG–1)



3. REMOVE SPARK PLUGS

4. CHECK CYLINDER COMPRESSION PRESSURE

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

(b) Fully open the throttle.

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

HINT:

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

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

NOTICE:

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

Compression pressure:
1,200 kPa (12.2 kgf/cm^2, 174 psi) or more
Minimum pressure: 1,000 kPa (10.2 kgf/cm^2, 145 psi)
Difference between each cylinder:
100 kPa (1.0 kgf/cm^2, 15 psi) or less

(e) If the cylinder compression in 1 or more cylinders is low, pour small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for cylinders with low compression.

- If adding oil helps the compression, it is likely that the piston rings and/or cylinder bore are worn or damaged.
- If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.

5. REINSTALL SPARK PLUGS

Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)

6. REINSTALL HIGH–TENSION CORDS WITH IGNITION COILS (See page IG–1)

VALVE CLEARANCE

INSPECTION

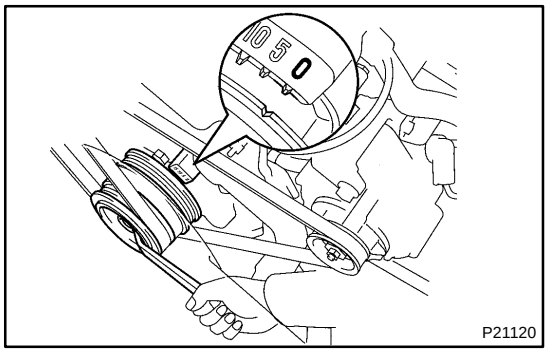
EM06D–04

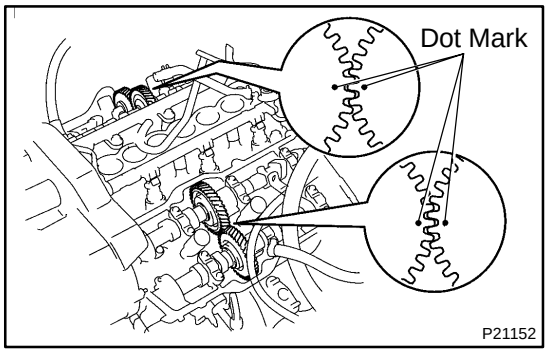
HINT:

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

1. **DRAIN ENGINE COOLANT**
2. **REMOVE INTAKE AIR CONNECTOR (See page EM–64)**
3. **REMOVE CYLINDER HEAD COVERS (See page EM–31)**
4. **SET NO. 1 CYLINDER TO TDC/COMPRESSION**

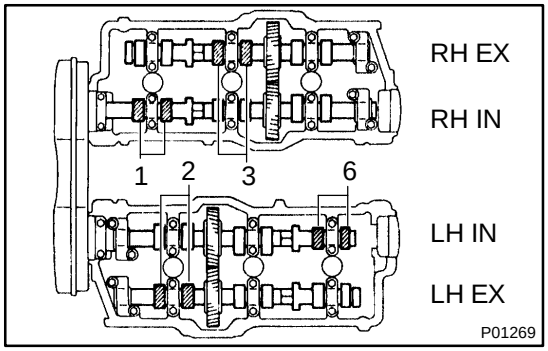
(a) Turn the crankshaft pulley, and align its groove with the timing mark 0 of the No. 1 timing belt cover.





(b) Check that the timing marks (1 dot) of the camshaft drive and driven gears are in straight line on the cylinder heads surface as shown in the illustration.

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



5. **INSPECT VALVE CLEARANCE**

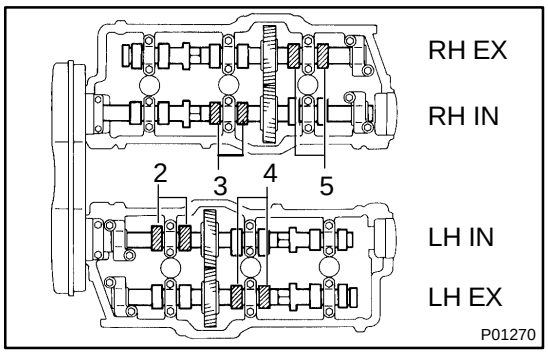
(a) Check only the valves indicated in the illustration.

▲ Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

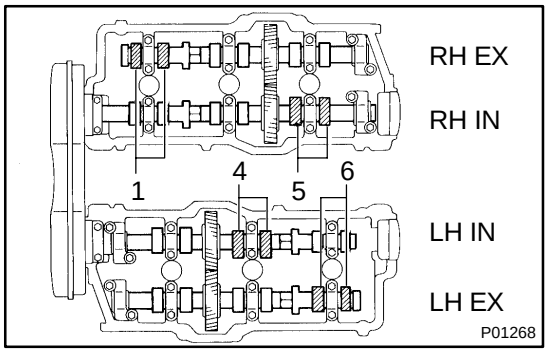
▲ Record out of specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

Valve clearance (Cold):

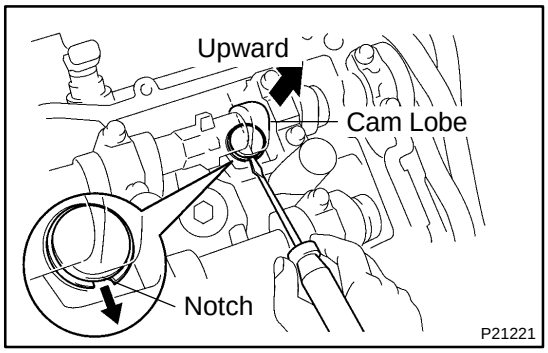
Intake	0.13 – 0.23 mm (0.006 – 0.009 in.)
Exhaust	0.27 – 0.37 mm (0.011 – 0.014 in.)



(b) Turn the crankshaft 2/3 of a revolution (240˚), and check only the valves indicated in the illustration. Measure the valve clearance (See procedure step (a)).



(c) Turn the crankshaft a further 2/3 of a revolution (240˚), and check only the valves indicated in the illustration. Measure the valve clearance (See procedure step (a)).

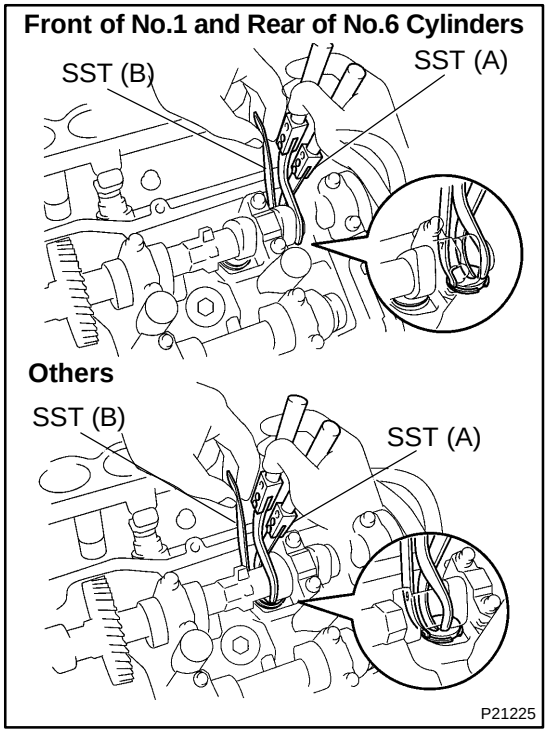


6. ADJUST VALVE CLEARANCE

(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.



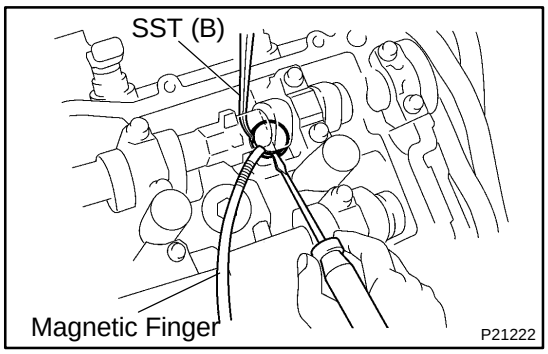
▲ Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

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

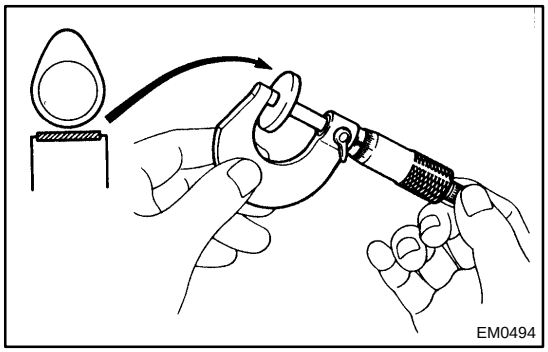
HINT:

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

▲ When SST (B) is inserted too deeply, it will get pinched by the shim. To prevent it from being stuck, insert it gently from the intake side, at a slight angle.



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



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

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

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

T ..... Thickness of used shim
A ..... Measured valve clearance
N ..... Thickness of new shim

Intake	N = T + (A – 0.18 mm (0.007 in.))
Exhaust	N = T + (A – 0.32 mm (0.013 in.))

(3) Select a new shim with 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)
0.000 – 0.020 (0.0000 – 0.0008)									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
0.021 – 0.040 (0.0008 – 0.0016)								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
0.041 – 0.060 (0.0016 – 0.0024)							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
0.061 – 0.080 (0.0024 – 0.0031)						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
0.081 – 0.100 (0.0032 – 0.0039)					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
0.101 – 0.120 (0.0040 – 0.0047)			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
0.121 – 0.129 (0.0048 – 0.0051)		1	1	1	1	1	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
0.130 – 0.230 (0.0051 – 0.0091)
0.231 – 0.240 (0.0091 – 0.0094)	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
0.241 – 0.260 (0.0095 – 0.0102)	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
0.261 – 0.280 (0.0103 – 0.0110)	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
0.281 – 0.300 (0.0111 – 0.0118)	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
0.301 – 0.320 (0.0119 – 0.0126)	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
0.321 – 0.340 (0.0126 – 0.0134)	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
0.341 – 0.360 (0.0134 – 0.0142)	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
0.361 – 0.380 (0.0142 – 0.0150)	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
0.381 – 0.400 (0.0150 – 0.0157)	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
0.401 – 0.420 (0.0158 – 0.0165)	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
0.421 – 0.440 (0.0166 – 0.0173)	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
0.441 – 0.460 (0.0174 – 0.0181)	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
0.461 – 0.480 (0.0181 – 0.0189)	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
0.481 – 0.500 (0.0189 – 0.0197)	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
0.501 – 0.520 (0.0197 – 0.0205)	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
0.521 – 0.540 (0.0205 – 0.0213)	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
0.541 – 0.560 (0.0213 – 0.0220)	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
0.561 – 0.580 (0.0221 – 0.0228)	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
0.581 – 0.600 (0.0229 – 0.0236)	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
0.601 – 0.620 (0.0237 – 0.0244)	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
0.621 – 0.640 (0.0244 – 0.0252)	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
0.641 – 0.660 (0.0252 – 0.0260)	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
0.661 – 0.680 (0.0260 – 0.0268)	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
0.681 – 0.700 (0.0268 – 0.0276)	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
0.701 – 0.720 (0.0276 – 0.0283)	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
0.721 – 0.740 (0.0284 – 0.0291)	12	12	13	13	13	14	14	14	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.741 – 0.760 (0.0292 – 0.0299)	12	13	13	13	14	14	14	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.761 – 0.780 (0.0300 – 0.0307)	13	13	14	14	14	14	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.781 – 0.800 (0.0307 – 0.0315)	13	14	14	14	14	15	15	16	16	16	16	17	17	17	17	17	17	17
0.801 – 0.820 (0.0315 – 0.0323)	14	14	14	15	15	15	16	16	16	17	17	17	17	17	17	17
0.821 – 0.840 (0.0323 – 0.0331)	14	14	15	15	15	16	16	16	17	17	17	17	17	17
0.841 – 0.860 (0.0331 – 0.0339)	14	15	15	15	16	16	16	17	17	17	17	17
0.861 – 0.880 (0.0339 – 0.0346)	15	15	16	16	16	16	17	17	17	17
0.881 – 0.900 (0.0347 – 0.0354)	15	16	16	16	16	17	17	17
0.901 – 0.920 (0.0355 – 0.0362)	16	16	16	17	17	17	17
0.921 – 0.940 (0.0363 – 0.0370)	16	16	17	17	17	17
0.941 – 0.960 (0.0370 – 0.0378)	16	17	17	17	17
0.961 – 0.980 (0.0378 – 0.0386)	17	17	17
0.981 – 1.000 (0.0386 – 0.0394)	17	17
1.001 – 1.020 (0.0394 – 0.0402)	17
1.021 – 1.030 (0.0402 – 0.0406)	17

Measured clearance mm (in.) \ Installed shim thickness mm (in.)	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)	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
0.021 – 0.040 (0.0008 – 0.0016)	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
0.041 – 0.060 (0.0016 – 0.0024)	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
0.061 – 0.080 (0.0024 – 0.0031)	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
0.081 – 0.100 (0.0032 – 0.0039)	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
0.101 – 0.120 (0.0040 – 0.0047)	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
0.121 – 0.129 (0.0048 – 0.0051)	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	12	12	13	13	13	13	14	14	15	15	15	15	16
0.130 – 0.230 (0.0051 – 0.0091)
0.231 – 0.240 (0.0091 – 0.0094)	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
0.241 – 0.260 (0.0095 – 0.0102)	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
0.261 – 0.280 (0.0103 – 0.0110)	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
0.281 – 0.300 (0.0111 – 0.0118)	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
0.301 – 0.320 (0.0119 – 0.0126)	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
0.321 – 0.340 (0.0126 – 0.0134)	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	16	16	16	17	17	17	17
0.341 – 0.360 (0.0134 – 0.0142)	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	17	17	17	17
0.361 – 0.380 (0.0142 – 0.0150)	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	17	17	17	17
0.381 – 0.400 (0.0150 – 0.0157)	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17
0.401 – 0.420 (0.0158 – 0.0165)	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)	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)	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)	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.481 – 0.500 (0.0189 – 0.0197)	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.501 – 0.520 (0.0197 – 0.0205)	16	16	16	16	16	17	17	17	17	17	17	17
0.521 – 0.540 (0.0205 – 0.0213)	16	16	16	17	17	17	17	17	17	17
0.541 – 0.560 (0.0213 – 0.0220)	16	17	17	17	17	17	17	17
0.561 – 0.580 (0.0221 – 0.0228)	17	17	17	17	17	17
0.581 – 0.600 (0.0229 – 0.0236)	17	17	17	17
0.601 – 0.620 (0.0237 – 0.0244)	17	17
0.621 – 0.640 (0.0244 – 0.0252)
0.641 – 0.660 (0.0252 – 0.0260)
0.661 – 0.680 (0.0260 – 0.0268)
0.681 – 0.700 (0.0268 – 0.0276)
0.701 – 0.720 (0.0276 – 0.0283)
0.721 – 0.740 (0.0284 – 0.0291)
0.741 – 0.760 (0.0292 – 0.0299)
0.761 – 0.780 (0.0300 – 0.0307)
0.781 – 0.800 (0.0307 – 0.0315)
0.801 – 0.820 (0.0315 – 0.0323)
0.821 – 0.840 (0.0323 – 0.0331)
0.841 – 0.860 (0.0331 – 0.0339)
0.861 – 0.880 (0.0339 – 0.0346)
0.881 – 0.900 (0.0347 – 0.0354)
0.901 – 0.920 (0.0355 – 0.0362)
0.921 – 0.940 (0.0363 – 0.0370)
0.941 – 0.960 (0.0370 – 0.0378)
0.961 – 0.980 (0.0378 – 0.0386)
0.981 – 1.000 (0.0386 – 0.0394)
1.001 – 1.020 (0.0394 – 0.0402)
1.021 – 1.030 (0.0402 – 0.0406)

V06208

Intake valve clearance (Cold):
0.13 – 0.23 mm (0.006 – 0.009 in.)

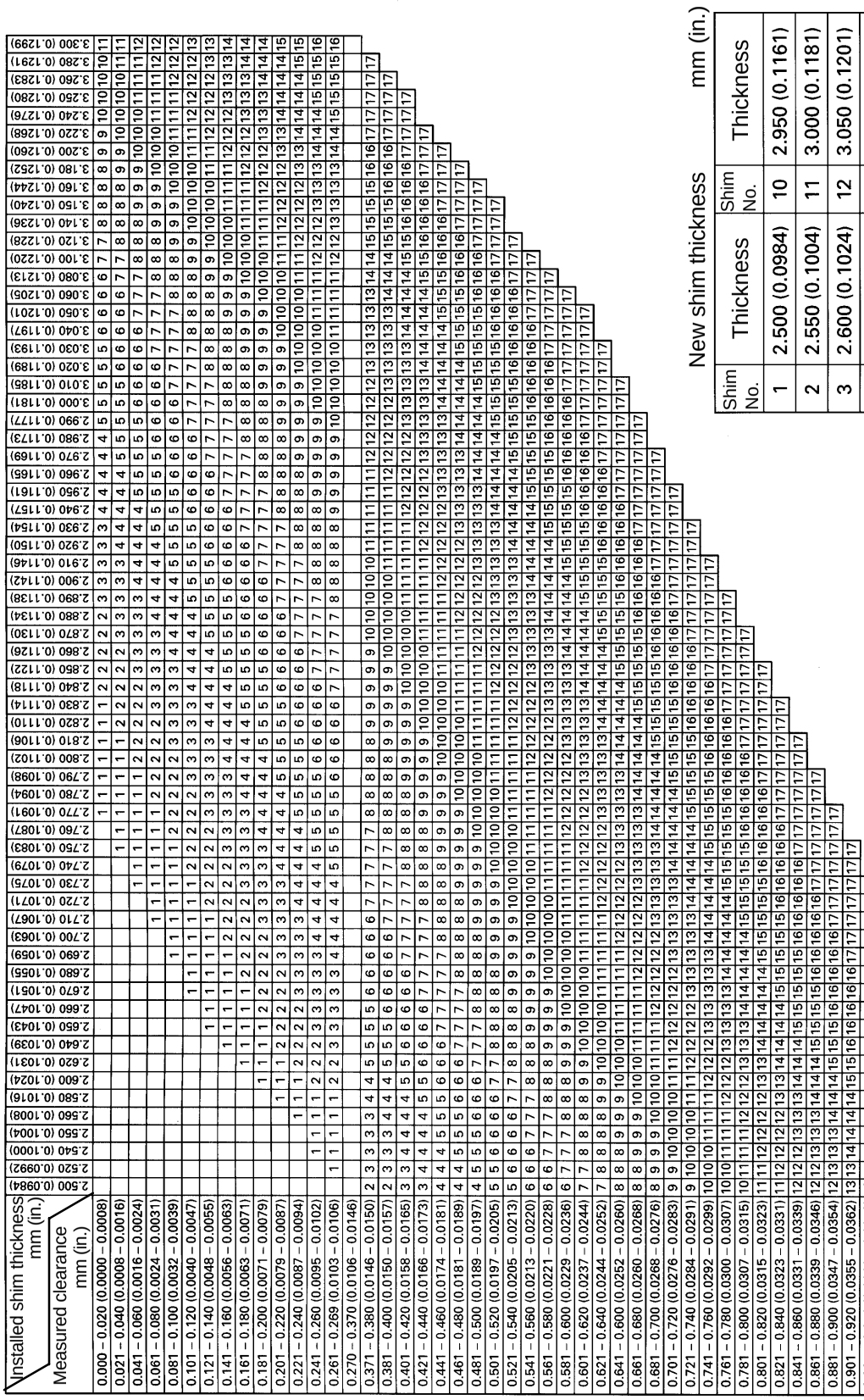
EXAMPLE:
The 2.800 mm (0.1102 in.) shim is installed and measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a No.12 shim.

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):
0.27 – 0.37 mm (0.011 – 0.014 in.)

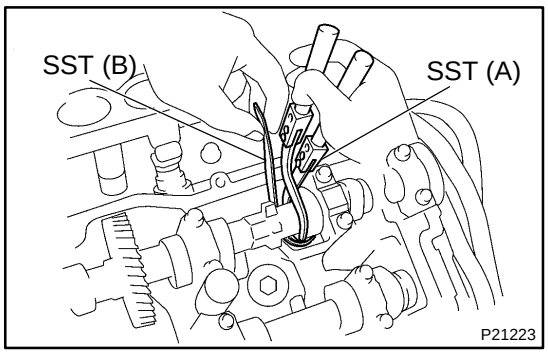
EXAMPLE:
The 2.800 mm (0.1102 in.) shim is installed and measured clearance is 0.450 mm (0.0177 in.).
Replace the 2.800 mm (0.1102 in.) shim with a No.10 shim.

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.

V06209



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

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

(d) Recheck the valve clearance.

7. REINSTALL CYLINDER HEAD COVERS (See page EM–51)

8. REINSTALL INTAKE AIR CONNECTOR (See page EM–67)

9. REFILL WITH ENGINE COOLANT

10. START ENGINE AND CHECK FOR LEAKS

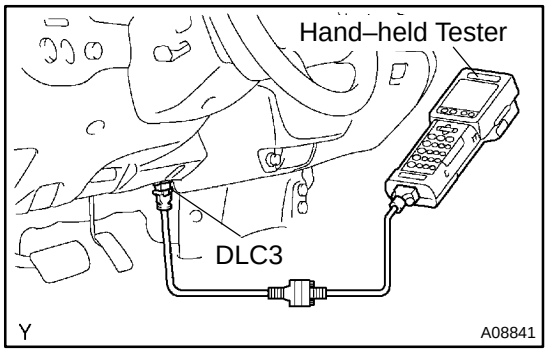
IGNITION TIMING

EM06E–06

INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.



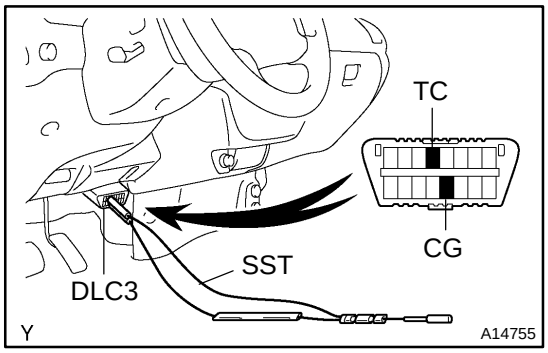
2. CONNECT HAND–HELD TESTER OR OBD II SCAN TOOL

(a) Connect a 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 for further details.

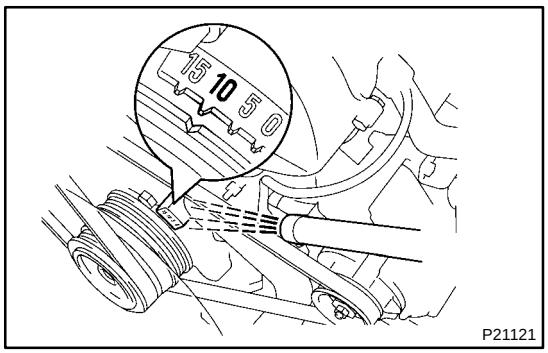
3. CHECK IDLE SPEED (See page EM–11)

4. CONNECT TIMING LIGHT TO ENGINE



5. 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:
8 – 12° BTDC @ idle
(Transmission in neutral position)

(c) Remove the SST from the DLC3.
SST 09843–18020

6. FURTHER CHECK IGNITION TIMING
Ignition timing:
12.5 – 22° BTDC @ idle
(Transmission in neutral position)

HINT:

The timing mark moves in a range between 12.5° and 22°.

7. DISCONNECT TIMING LIGHT FROM ENGINE

8. DISCONNECT HAND–HELD TESTER OR OBD II SCAN TOOL

IDLE SPEED

EM06F–03

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 (See page EM–10)

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

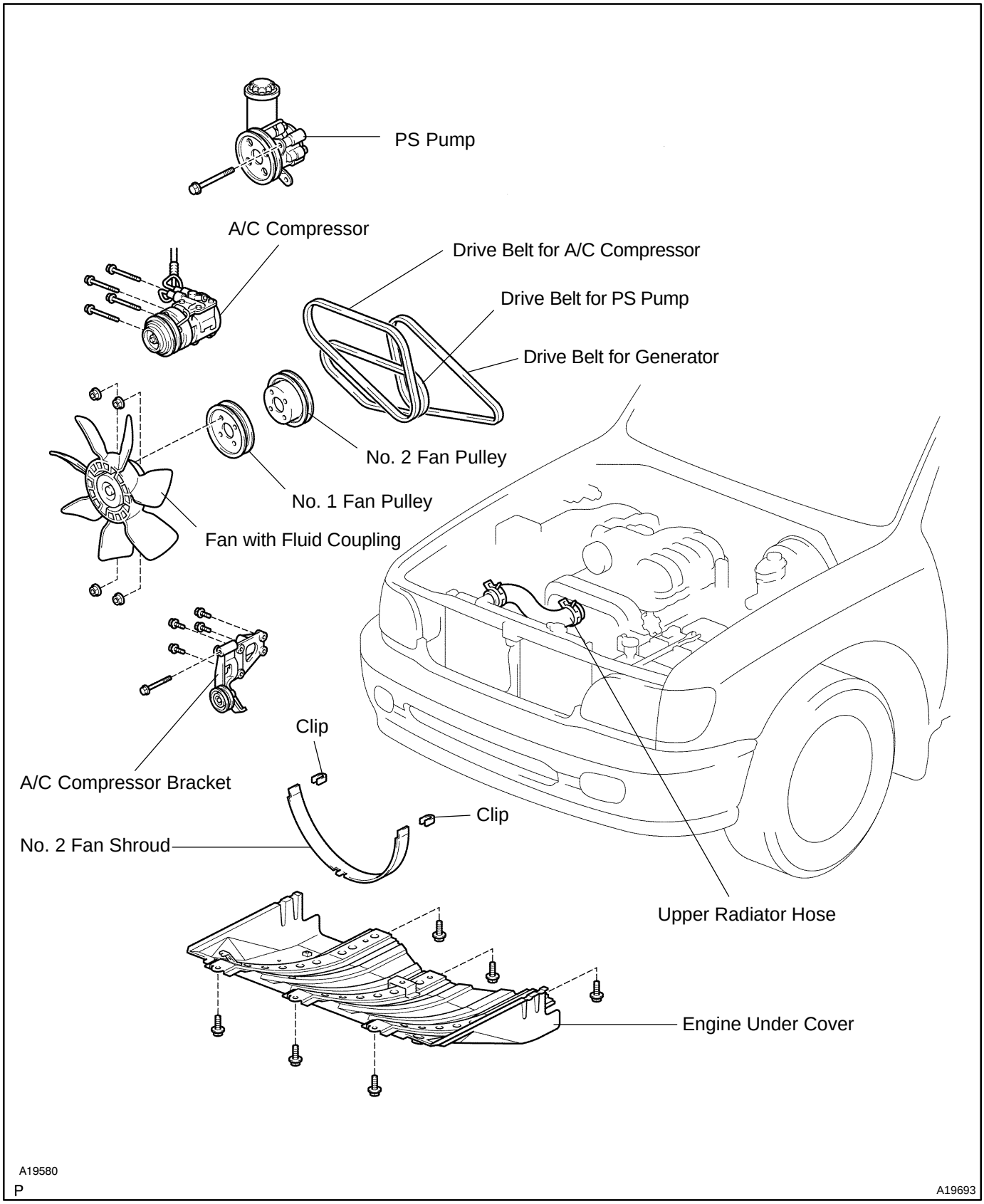
If the idle speed is not as specified, check the air intake system.

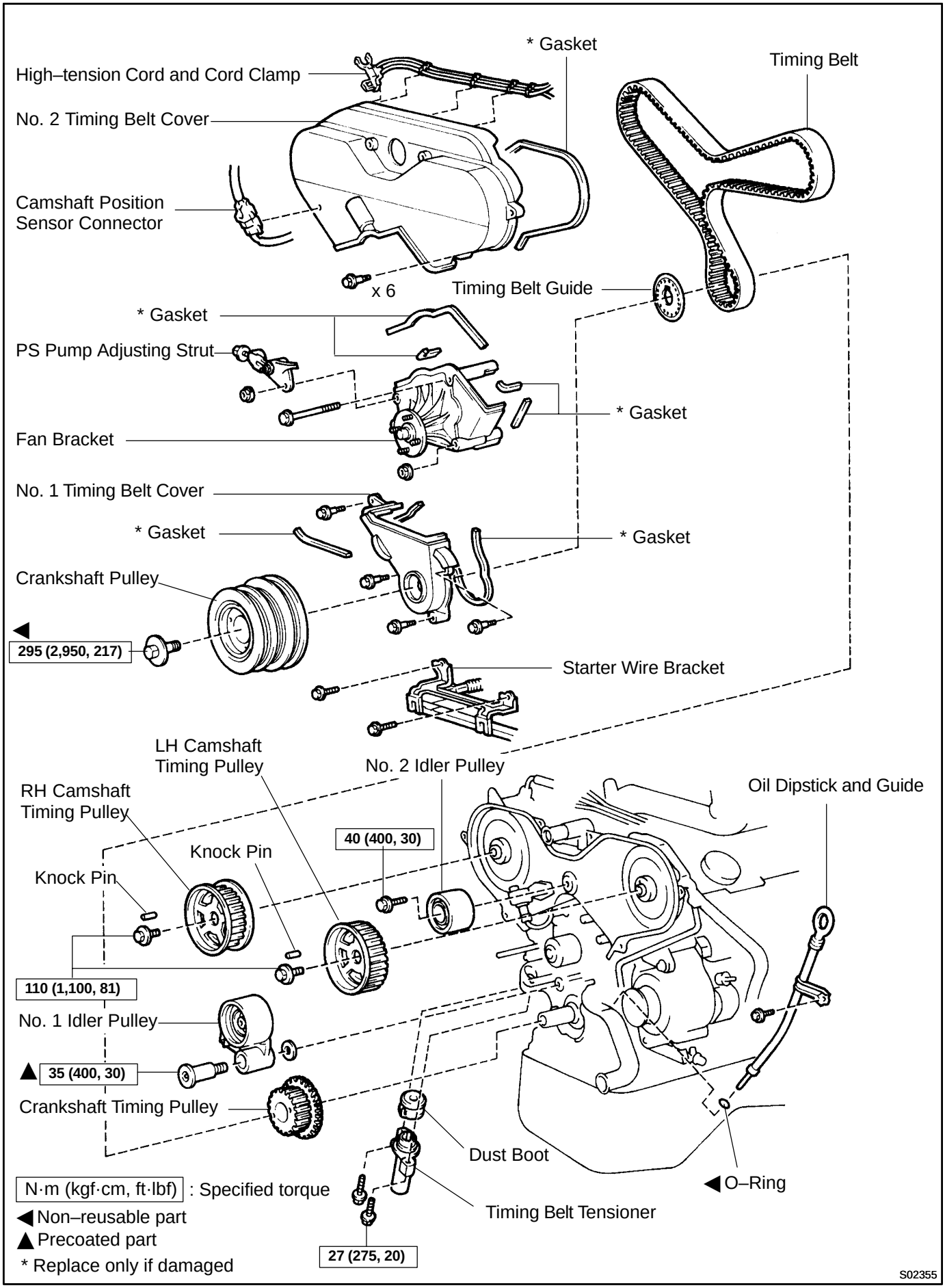
4. DISCONNECT HAND–HELD TESTER OR OBD II SCAN TOOL

TIMING BELT

COMPONENTS

EM06G–04

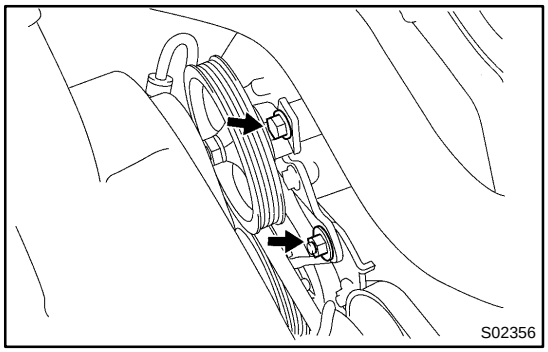



* Gasket
Timing Belt
High–tension Cord and Cord Clamp
No. 2 Timing Belt Cover
Camshaft Position Sensor Connector
x 6
Timing Belt Guide
* Gasket
PS Pump Adjusting Strut
* Gasket
Fan Bracket
No. 1 Timing Belt Cover
* Gasket
* Gasket
Crankshaft Pulley
295 (2,950, 217)
Starter Wire Bracket
LH Camshaft Timing Pulley
No. 2 Idler Pulley
Oil Dipstick and Guide
RH Camshaft Timing Pulley
40 (400, 30)
Knock Pin
Knock Pin
110 (1,100, 81)
No. 1 Idler Pulley
35 (400, 30)
Crankshaft Timing Pulley
Dust Boot
O–Ring
N·m (kgf·cm, ft·lbf) : Specified torque
Non–reusable part
Precoated part
* Replace only if damaged
Timing Belt Tensioner
27 (275, 20)
S02355

EM12C–03

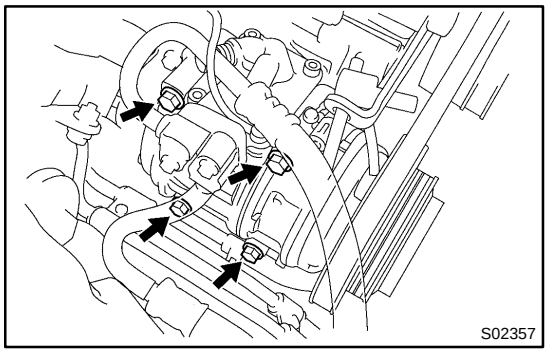
REMOVAL

1. REMOVE ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT
3. DISCONNECT UPPER RADIATOR HOSE



4. DISCONNECT PS PUMP FROM ENGINE

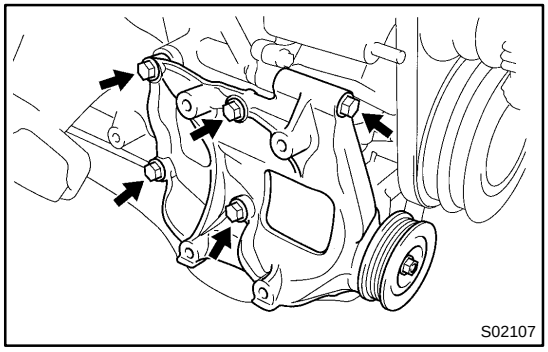
(a) Disconnect the 2 PS air hoses from the air intake chamber and resonator.
(b) Remove the bolt holding the PS pressure tube clamp to the frame.
(c) Remove the drive belt (See page SR–32).
(d) Remove the bolt and nut, and disconnect the PS pump from the engine.



5. DISCONNECT A/C COMPRESSOR FROM ENGINE

(a) Disconnect the A/C compressor connector.
(b) Remove the drive belt (See page AC–17).
(c) Remove the 4 bolts, and disconnect the A/C compressor from the engine.

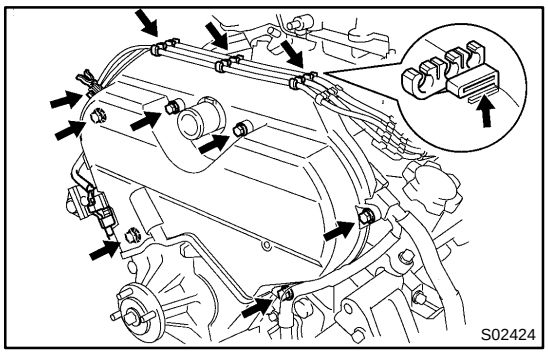
6. LOOSEN FAN WITH FLUID COUPLING AND FAN PULLEYS
7. REMOVE DRIVE BELT FOR GENERATOR
8. REMOVE NO. 2 FAN SHROUD
9. REMOVE FAN WITH FLUID COUPLING AND FAN PULLEYS



10. REMOVE A/C COMPRESSOR BRACKET

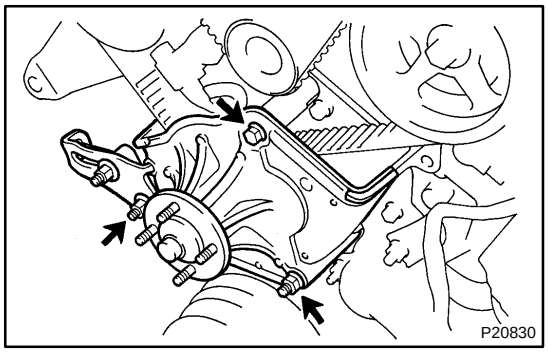
Remove the 5 bolts and A/C compressor bracket.

11. DISCONNECT UPPER RADIATOR HOSE



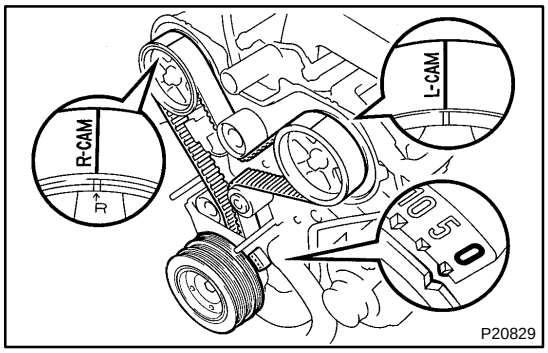
12. REMOVE NO. 2 TIMING BELT COVER

(a) Disconnect the camshaft position sensor connector from the timing belt cover.
(b) Disconnect the 4 high–tension cord clamps from the timing belt cover.
(c) Remove the 6 bolts and timing belt cover.



13. REMOVE FAN BRACKET

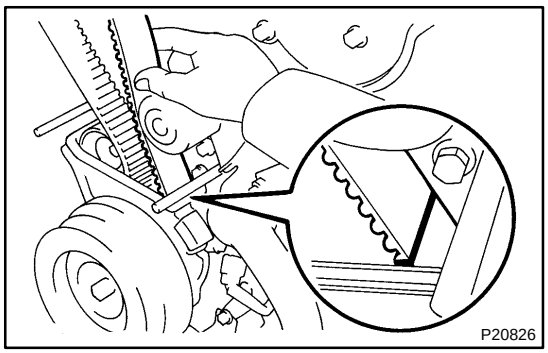
(a) Remove the nut and PS pump adjusting strut.
(b) Remove the bolt, nut and fan bracket.



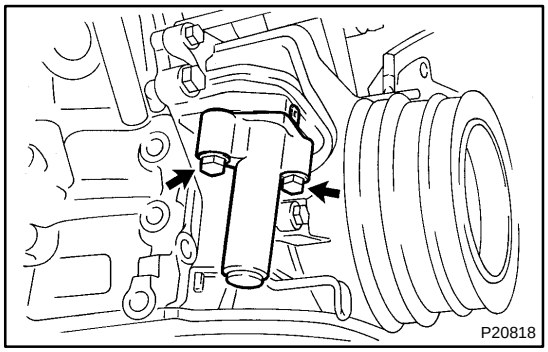
14. SET NO. 1 CYLINDER AT TDC/COMPRESSION

(a) Turn the crankshaft pulley and align its groove with timing mark ”0” of the No. 1 timing belt cover.
(b) Check that the timing marks of the camshaft timing pulleys and No. 3 timing belt cover are aligned.

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



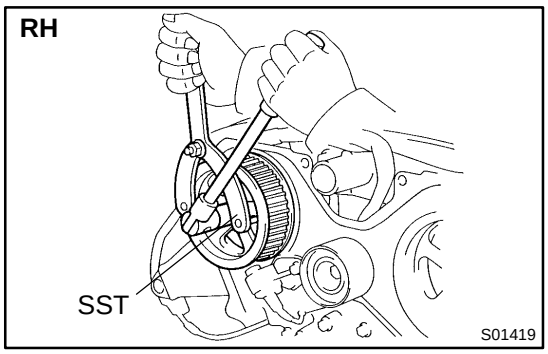
HINT:
When re–using timing belt:
Place the matchmarks on the timing belt and camshaft timing pulleys, and place matchmark on timing belt to match the end of the No.1 timing belt cover.



15. REMOVE TIMING BELT TENSIONER

Alternately loosen the 2 bolts, and remove them, the belt tensioner and dust boot.

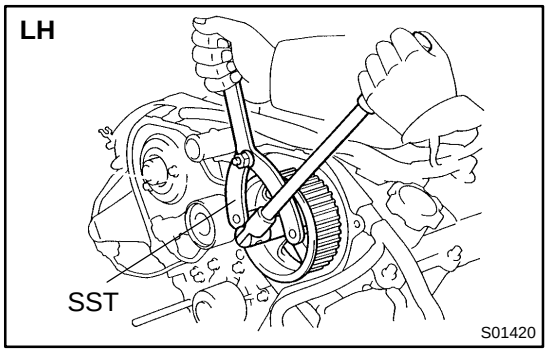
16. REMOVE TIMING BELT



17. REMOVE RH CAMSHAFT TIMING PULLEY

Using SST, loosen the pulley bolt.

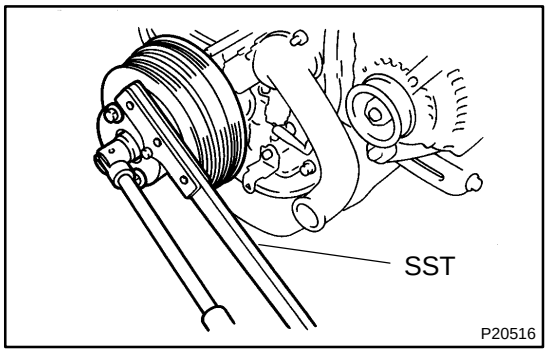
SST 09960–10010 (09962–01000, 09963–01000)



18. REMOVE LH CAMSHAFT TIMING PULLEY

(a) Using SST, loosen the pulley bolt.
SST 09960–10010 (09962–01000, 09963–01000)

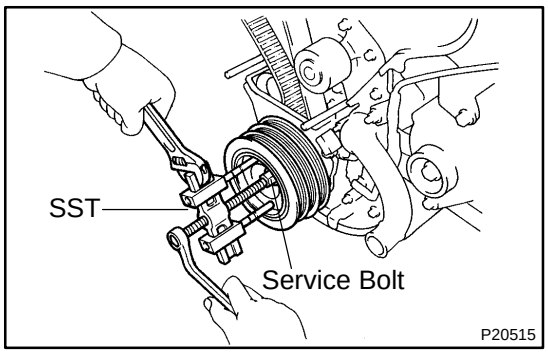
(b) Remove the bolt, knock pin and camshaft timing pulley.



19. REMOVE CRANKSHAFT PULLEY

(a) Using SST, loosen the pulley bolt.
SST 09213–54015 (90119–08216), 09330–00021

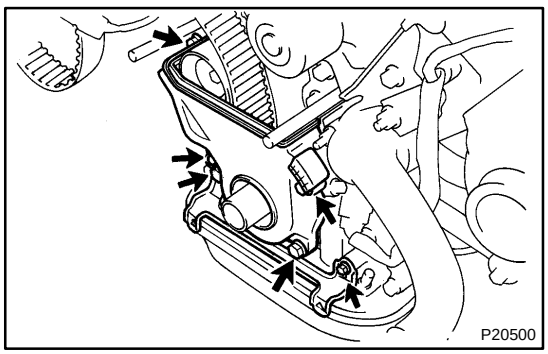
(b) Remove the SST, pulley bolt and pulley.



HINT:

If necessary, remove the pulley with SST and service bolt.

SST 09950–50013 (09551–05010, 09552–05010, 09553–05020, 09554–05031)

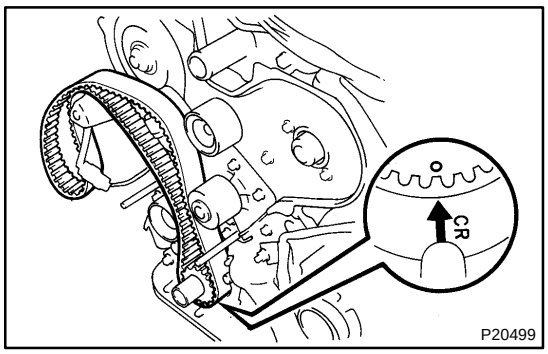


20. REMOVE STARTER WIRE BRACKET AND NO. 1 TIMING BELT COVER

(a) Remove the 2 bolts and starter wire bracket.

(b) Remove the 4 bolts and timing belt cover.

21. REMOVE TIMING BELT GUIDE



22. REMOVE TIMING BELT

HINT:

When re–using timing belt:

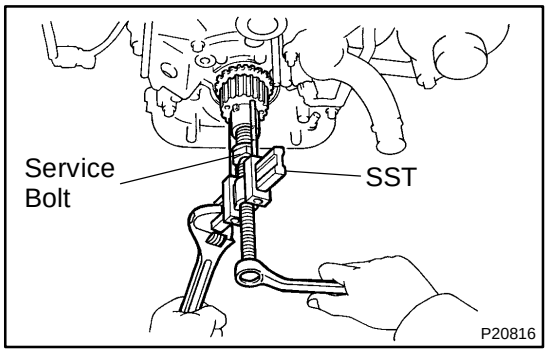
If the installation marks have disappeared, place a new installation mark on the timing belt to match the drilled mark of the crankshaft timing pulley.

23. REMOVE NO. 2 IDLER PULLEY

(a) Remove the bolt and idler pulley.

24. REMOVE NO. 1 IDLER PULLEY

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



25. REMOVE CRANKSHAFT TIMING PULLEY

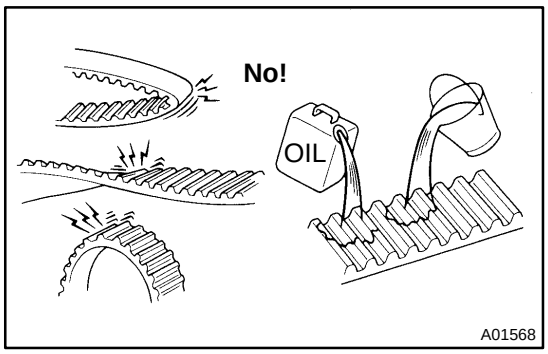
Remove the crankshaft timing pulley.

HINT:

If the pulley cannot be removed by hand, use SST and service bolt to remove the crankshaft timing pulley.

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

EM06I–05



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 is any defect, as shown in the illustration, check these points:

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

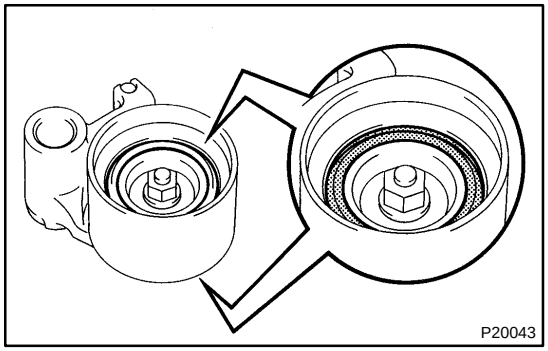
(b) If the belt teeth are cracked or damaged, check to see if either camshaft is locked.

(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 and water pump.

(d) If there is wear or damage on even 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 that gasket has been installed correctly and for foreign material on the pulley teeth.

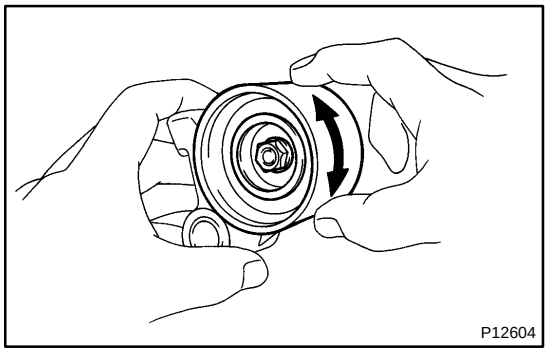
If necessary, replace the timing belt.



2. INSPECT IDLER PULLEYS

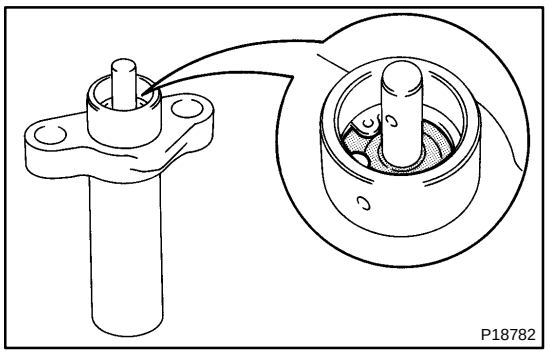
(a) Visually check the seal portion of the idler pulley for oil leakage.

If leakage is found, replace the idler pulley.



(b) Check that the idler pulley turns smoothly.

If necessary, replace the idler pulley.



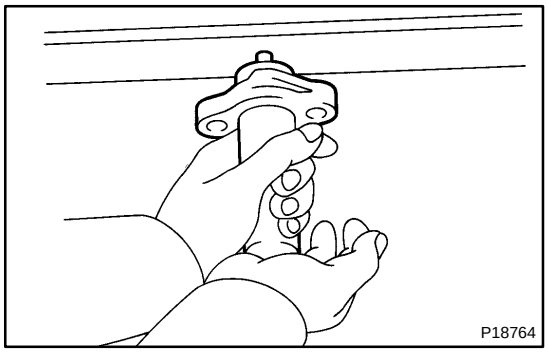
3. INSPECT TIMING BELT TENSIONER

(a) Visually check the seal portion of the 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 the tensioner.

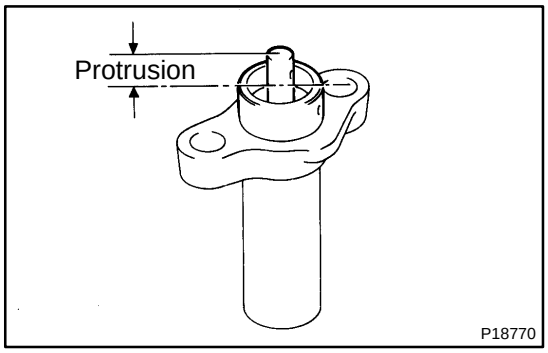


(b) Hold the tensioner with both hands and push the push rod strongly as shown to check that it doesn't move.

If the push rod moves, replace the tensioner.

NOTICE:

Never hold the tensioner push rod facing downward.



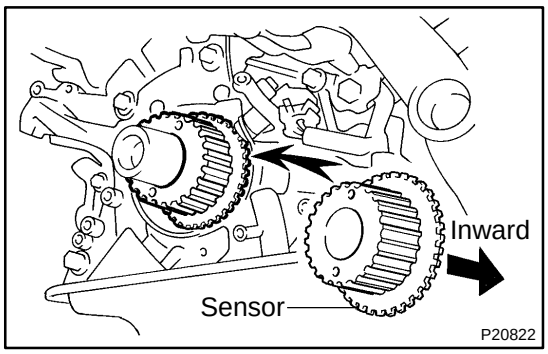
(c) Measure the protrusion of the push rod from the housing end.

Protrusion: 10.0 – 10.8 mm (0.394 – 0.425 in.)

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

EM1V0–01

INSTALLATION



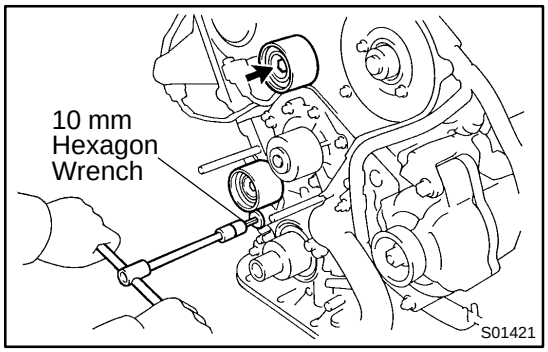
1. INSTALL CRANKSHAFT TIMING PULLEY

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

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

NOTICE:

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



2. INSTALL NO. 1 IDLER PULLEY

(a) Apply adhesive 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 idler pulley with the pivot bolt.

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

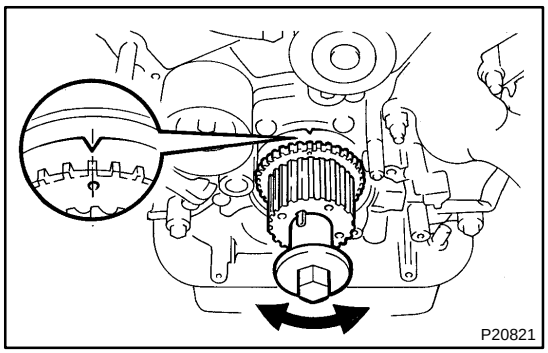
(c) Check that the pulley bracket moves smoothly.

3. INSTALL NO. 2 IDLER PULLEY

(a) Install the idler pulley with the bolt.

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

(b) Check that the pulley moves smoothly.



4. TEMPORARILY INSTALL TIMING BELT

NOTICE:

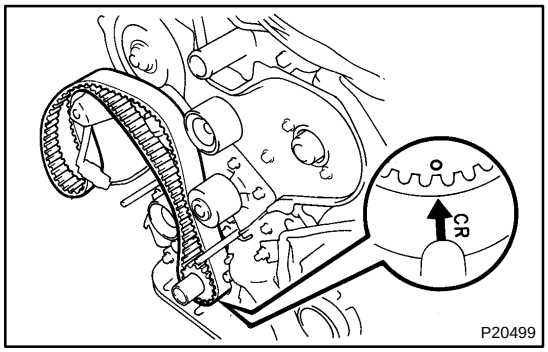
The engine should be cold.

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

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

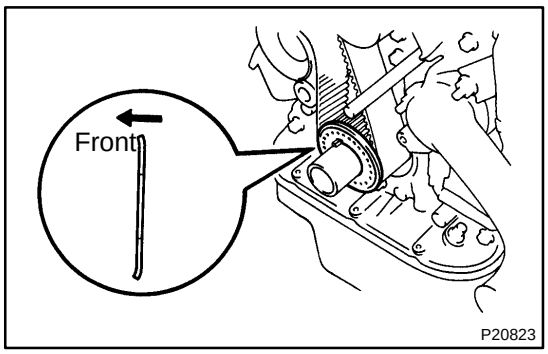
NOTICE:

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



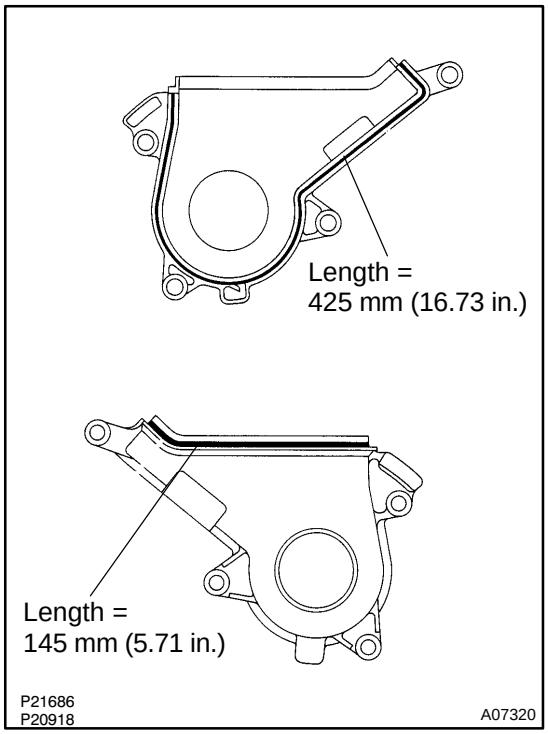
(c) Align the installation mark on the timing belt with the drilled mark of the crankshaft timing pulley.

(d) Install the timing belt on the crankshaft timing pulley, No. 1 idler pulley and water pump pulley.



5. INSTALL TIMING BELT GUIDE

Install the guide, facing the cup side outward.



6. INSTALL NO. 1 TIMING BELT COVER AND STARTER WIRE BRACKET

(a) Check that the timing belt cover gaskets have cracks or peeling, etc.

If the gasket does have cracks or peeling, etc., replace it using these steps. peeling, etc., replace them using these steps.

(1) Using a screwdriver and gasket scraper, remove all the old gasket materials.

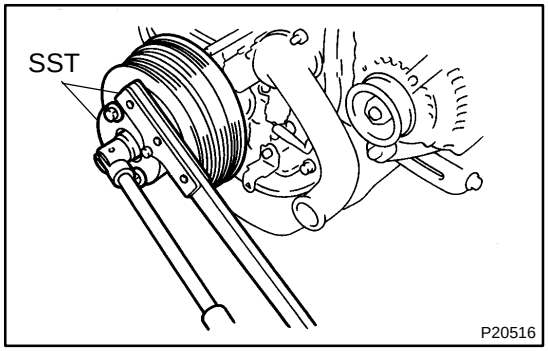
(2) Thoroughly clean all components to remove all the loose material.

(3) Remove the backing paper from a new gasket and install the gasket evenly to the part of the belt cover shaded back in the illustration.

(b) Install the timing belt cover with the 4 bolts.

Torque: 9 N·m (90 kgf·cm, 80 in.·lbf)

(c) Install the starter wire bracket with the 2 bolts.



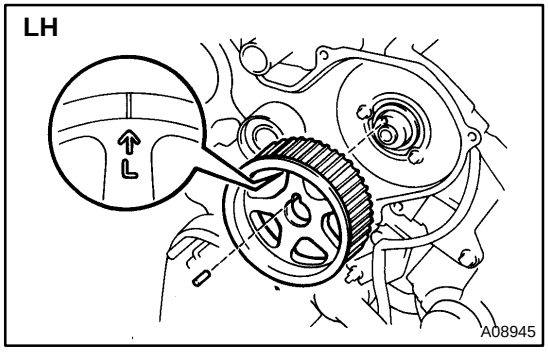
7. INSTALL CRANKSHAFT PULLEY

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

(b) Using SST, install and torque the bolt.

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

Torque: 295 N·m (2,950 kgf·cm, 217 ft·lbf)



8. INSTALL LH CAMSHAFT TIMING PULLEY

(a) Slide the timing pulley, facing the flange side outward.

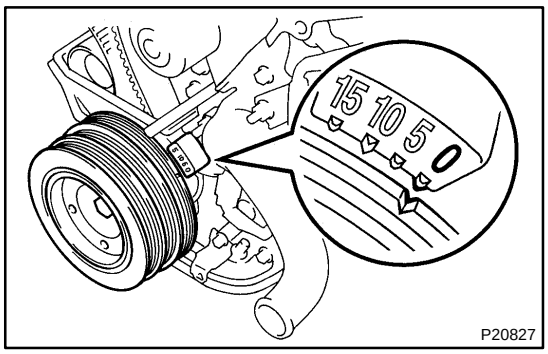
(b) Align the knock pin hole of the camshaft with the knock pin groove of the timing pulley as shown.

(c) Install the knock pin.

(d) Using SST, install and torque the bolt.

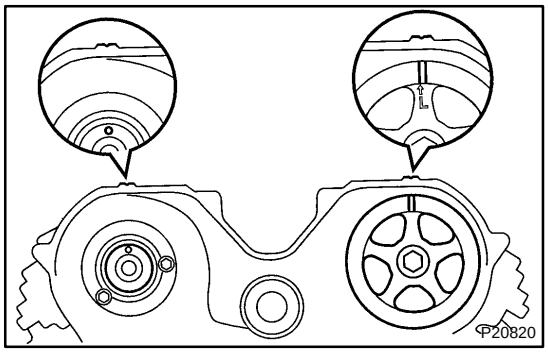
SST 09960–10010 (09962–01000, 09963–01000)

Torque: 110 N·m (1,100 kgf·cm, 81 ft·lbf)



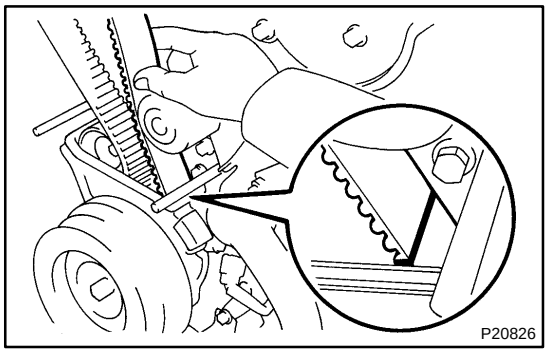
9. SET NO. 1 CYLINDER TO TDC/COMPRESSION

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



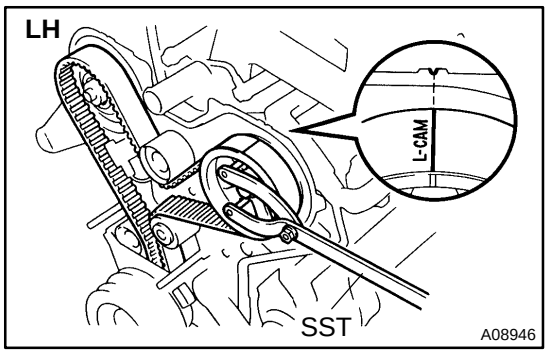
(b) RH Camshaft Position:
Turn the camshaft, and align the knock pin hole of the camshaft with the timing mark of the No. 3 timing belt cover.

(c) LH Camshaft Pulley Position:
Turn the camshaft timing pulley, and align the timing marks of the camshaft timing pulley and No. 3 timing belt cover.



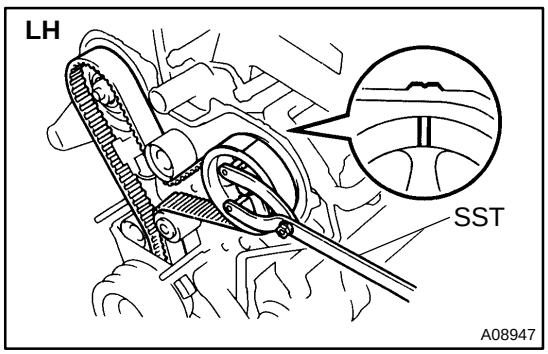
10. INSTALL TIMING BELT TO LH CAMSHAFT TIMING PULLEY

HINT:
When re–using timing belt:
Check that the installation mark on the timing belt matches the end of the No. 1 timing belt cover.
If the installation mark do not align, shift the meshing of the timing belt and crankshaft timing pulley until they align.



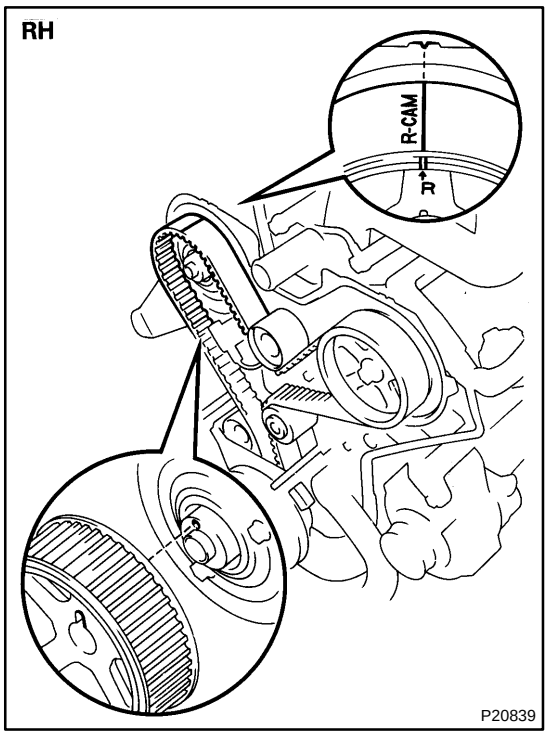
(a) Remove any oil or water on the LH camshaft timing pulley, and keep it clean.

(b) Using SST, slightly turn the LH camshaft timing pulley clockwise. Align the installation mark on the timing belt with the timing mark of the camshaft timing pulley, and hang the timing belt on the LH camshaft timing pulley.
SST 09960–10010 (09962–01000, 09963–01000)



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

(d) Check that the timing belt has tension between the crankshaft timing and LH camshaft timing pulleys.



11. INSTALL RH CAMSHAFT TIMING PULLEY AND TIMING BELT

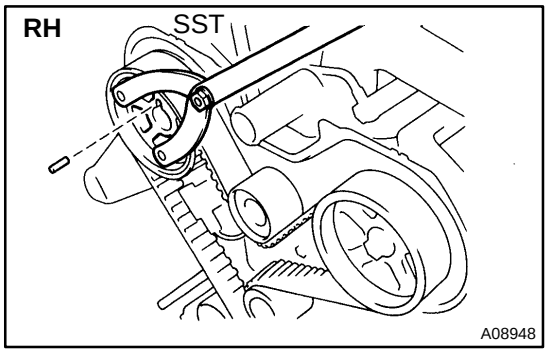
(a) Remove any oil or water on the RH camshaft timing and No. 2 idler pulleys, and keep them clean.

(b) Align the installation mark on the timing belt with the timing mark of the RH camshaft timing pulley as shown.

(c) Hang the timing belt on the RH camshaft timing pulley.

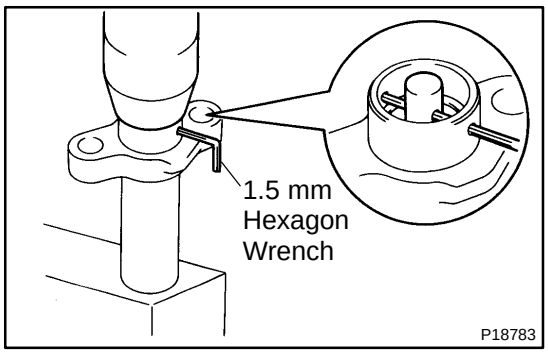
(d) Align the timing marks of the RH camshaft timing pulley and No. 3 timing belt cover.

(e) Slide the RH camshaft timing pulley on the camshaft.



(f) Using SST, align the knock pin hole of the camshaft with knock pin groove marked R of the pulley and install the knock pin.
SST 09960–10010 (09962–01000, 09963–01000)

(g) Using SST, install and torque the bolt.
SST 09960–10010 (09962–01000, 09963–01000)
Torque: 110 N·m (1,100 kgf·cm, 81 ft·lbf)

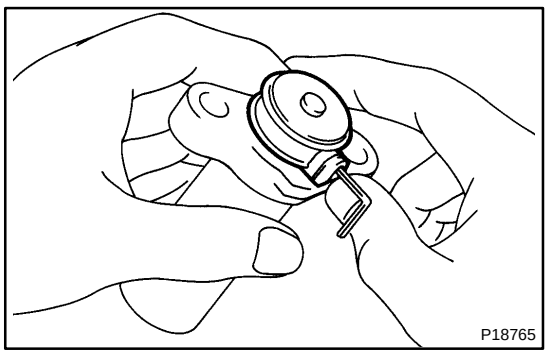


12. SET TIMING BELT TENSIONER

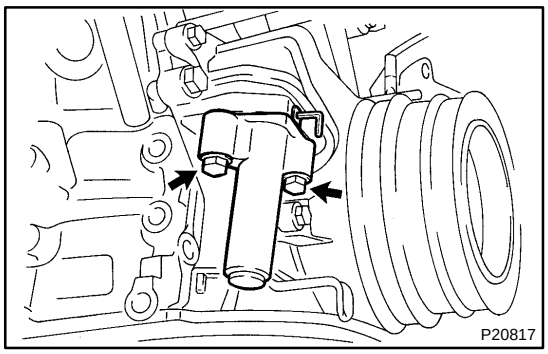
(a) Using a press, slowly press in the push rod using 981 – 9,807 N (100 – 1,000 kgf, 220 – 2,205 lbf) of pressure.

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

(c) Release the press.



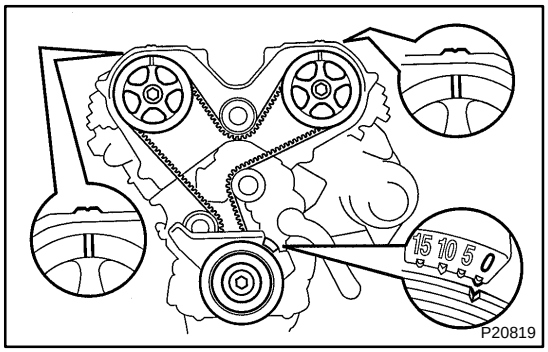
(d) Install the dust boot to the tensioner.



13. INSTALL TIMING BELT TENSIONER

(a) Install the tensioner with the 2 bolts.
Torque: 27 N·m (275 kgf·cm, 20 ft·lbf)

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



14. CHECK VALVE TIMING

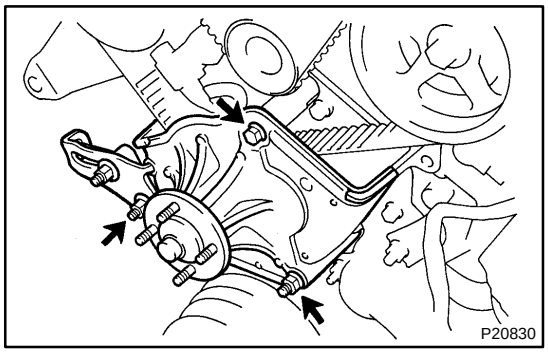
(a) Turn the crankshaft pulley 2 revolutions from TDC to TDC.

NOTICE:

Always turn the crankshaft clockwise.

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

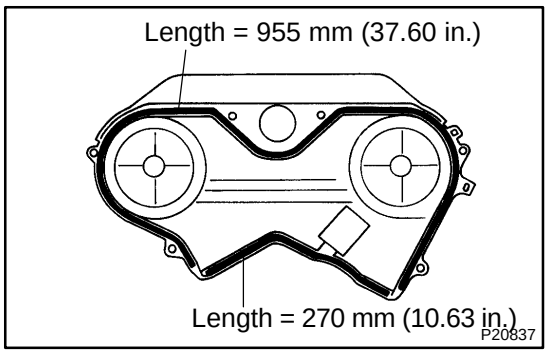
If the marks do not align, remove the timing belt and reinstall it.



15. INSTALL FAN BRACKET

(a) Install the fan bracket with the bolt and nut.

(b) Install the PS pump adjusting strut with the nut.



16. INSTALL NO. 2 TIMING BELT COVER

(a) Check that the timing belt cover gasket has no cracks or peeling, etc.

If the gasket does have cracks or peeling, etc., replace it using these steps.

(1) Using a screwdriver and gasket scrapers, remove all the old gasket materials.

(2) Thoroughly clean all components to remove all the loose material.

(3) Remove the backing paper from a new gasket and install the gasket evenly to the part of the belt cover shaded black in the illustration.

(b) Install the belt cover with the 6 bolts.
Torque: 9 N·m (90 kgf·cm, 80 in.·lbf)

(c) Connect the 4 high–tension cord clamps to the No.2 timing belt cover.

(d) Connect the camshaft position sensor connector to the timing belt cover.

17. INSTALL A/C COMPRESSOR BRACKET
Torque: 47 N·m (479 kgf·cm, 35 ft·lbf)

18. TEMPORARILY INSTALL FAN WITH FLUID COUPLING AND FAN PULLEYS

19. INSTALL NO. 2 FAN SHROUD

20. INSTALL AND ADJUST DRIVE BELT FOR GENERATOR (See page CH–1)

21. TIGHTEN FAN WITH FLUID COUPLING AND FAN PULLEYS

Torque: 5.4 N·m (54 kgf·cm, 48 in.·lbf)

22. CONNECT A/C COMPRESSOR TO ENGINE

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

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

(b) Install and adjust the drive belt (See page AC–18).

(c) Connect the A/C compressor connector.

23. CONNECT PS PUMP TO ENGINE

(a) Temporarily install the PS pump with the bolt and nut.

(b) Install and adjust the drive belt (See page SR–40).

(c) Tighten the bolt and nut.

Torque: 43 N·m (440 kgf·cm, 31 ft·lbf)

(d) Install the PS pressure tube clamp with the bolt.

(e) Connect the 2 PS air hoses to the air intake chamber and resonator.

24. CONNECT UPPER RADIATOR HOSE

25. FILL ENGINE WITH COOLANT

26. START ENGINE CHECK FOR LEAKS

27. INSTALL ENGINE UNDER COVER

28. ROAD TEST VEHICLE

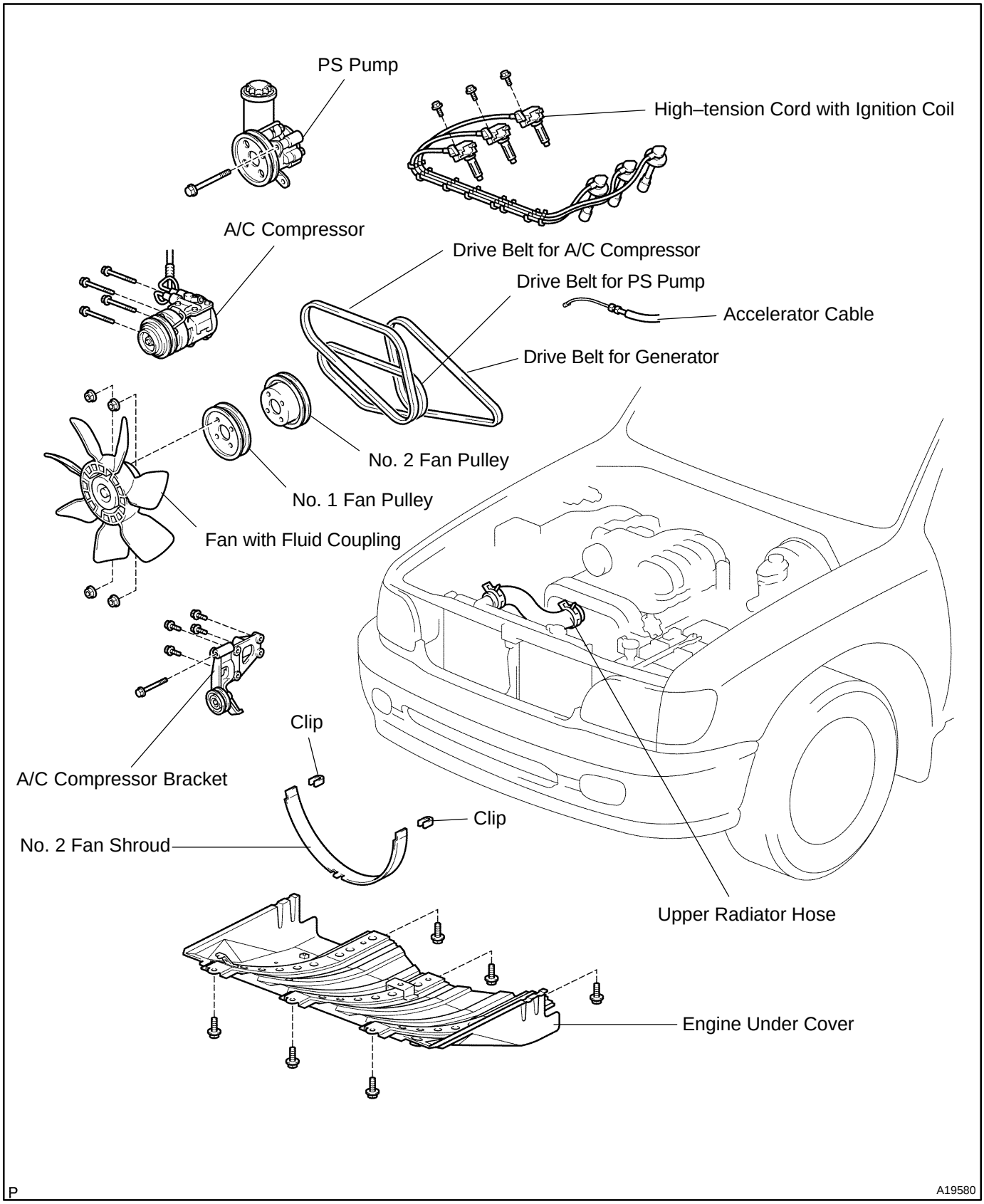
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

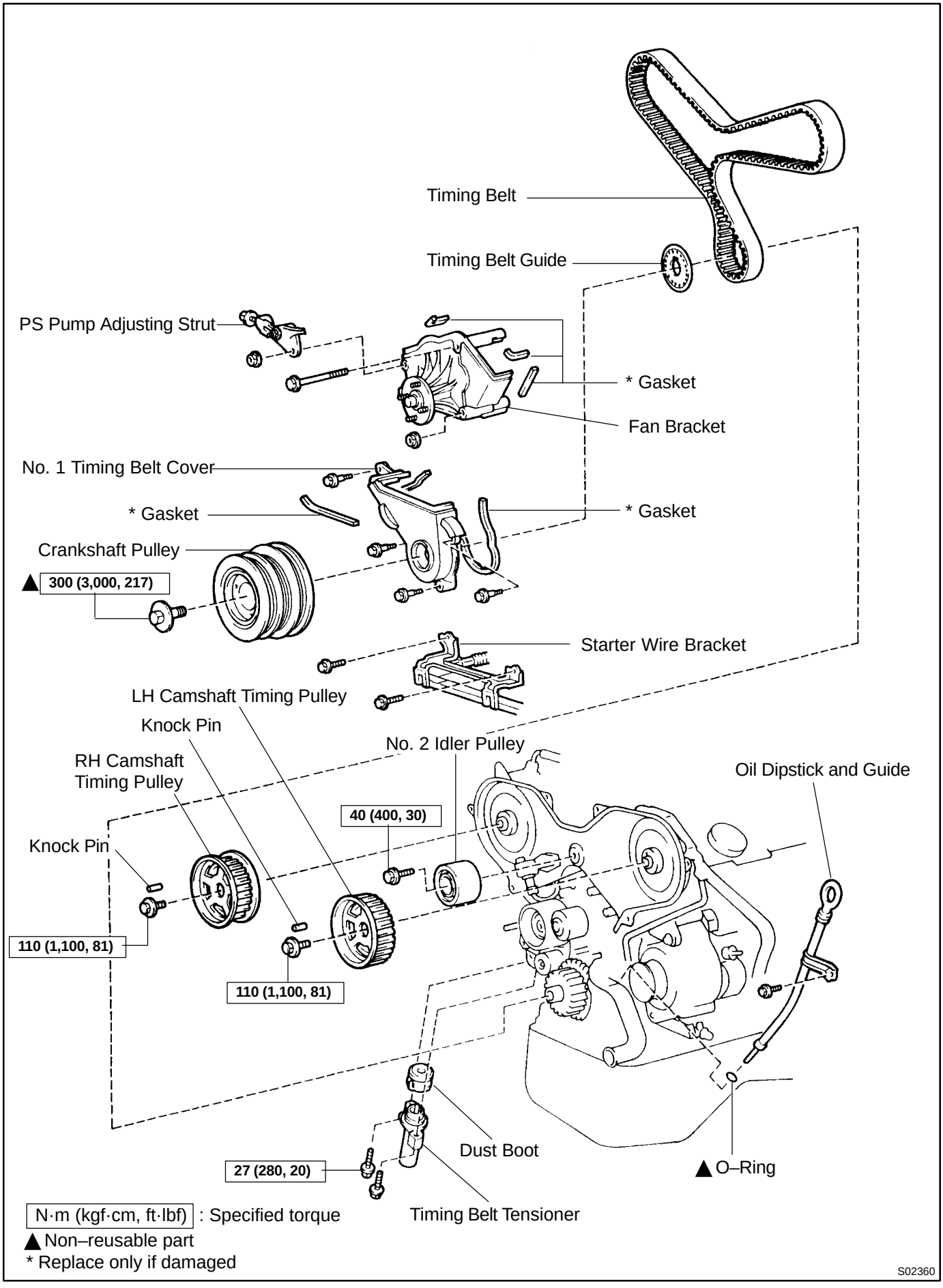
29. RECHECK ENGINE COOLANT LEVEL

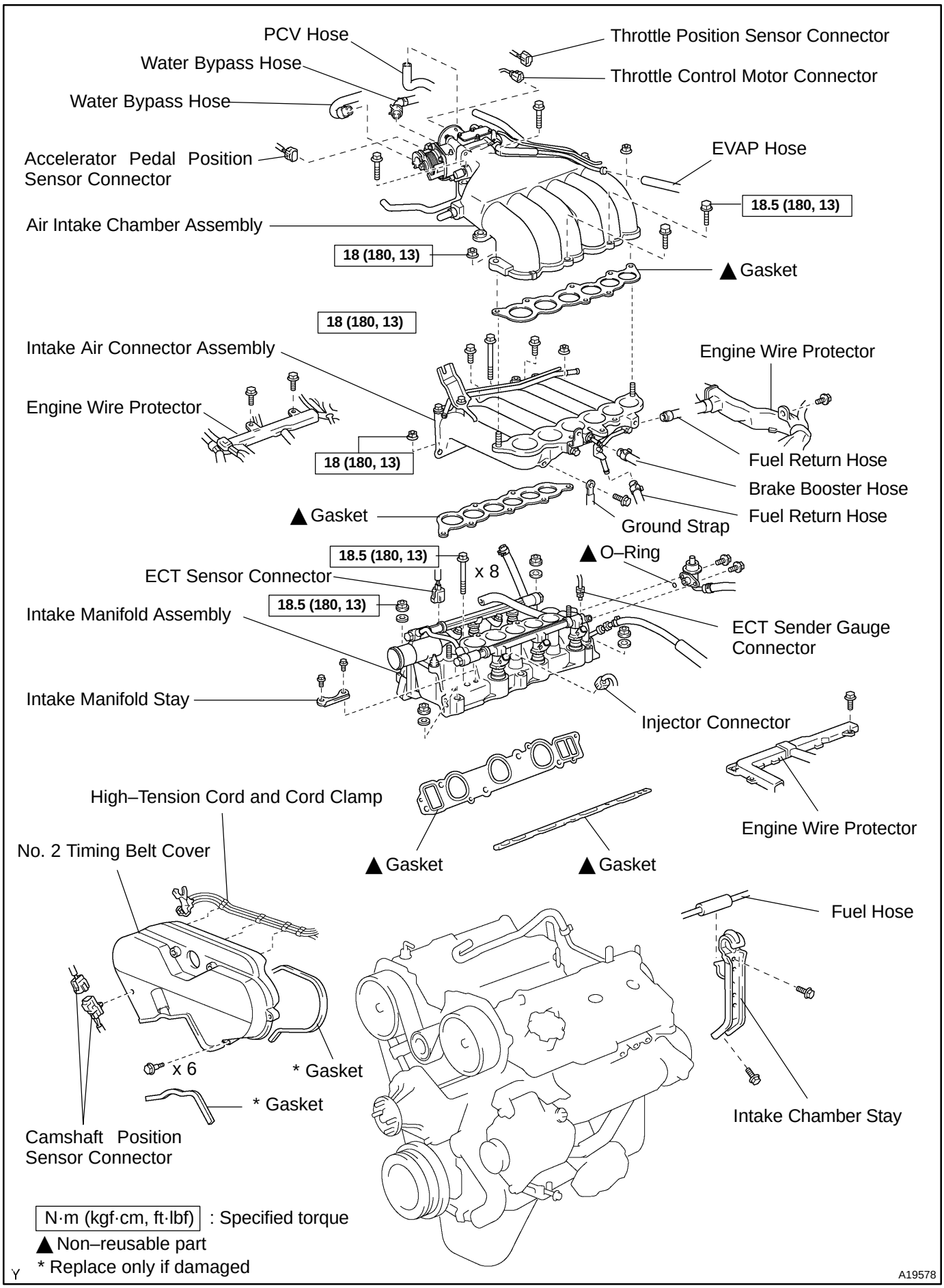
CYLINDER HEAD

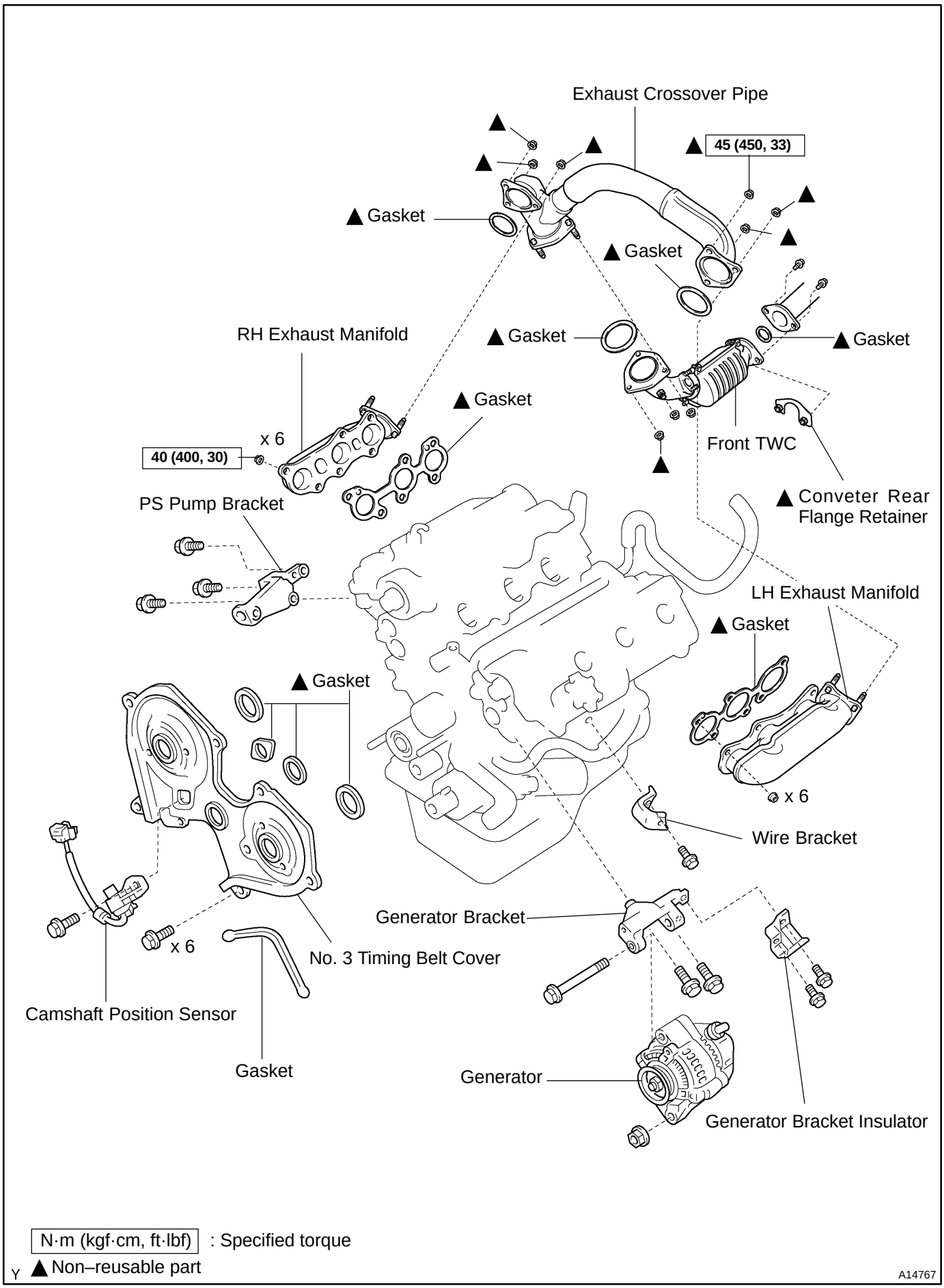
COMPONENTS

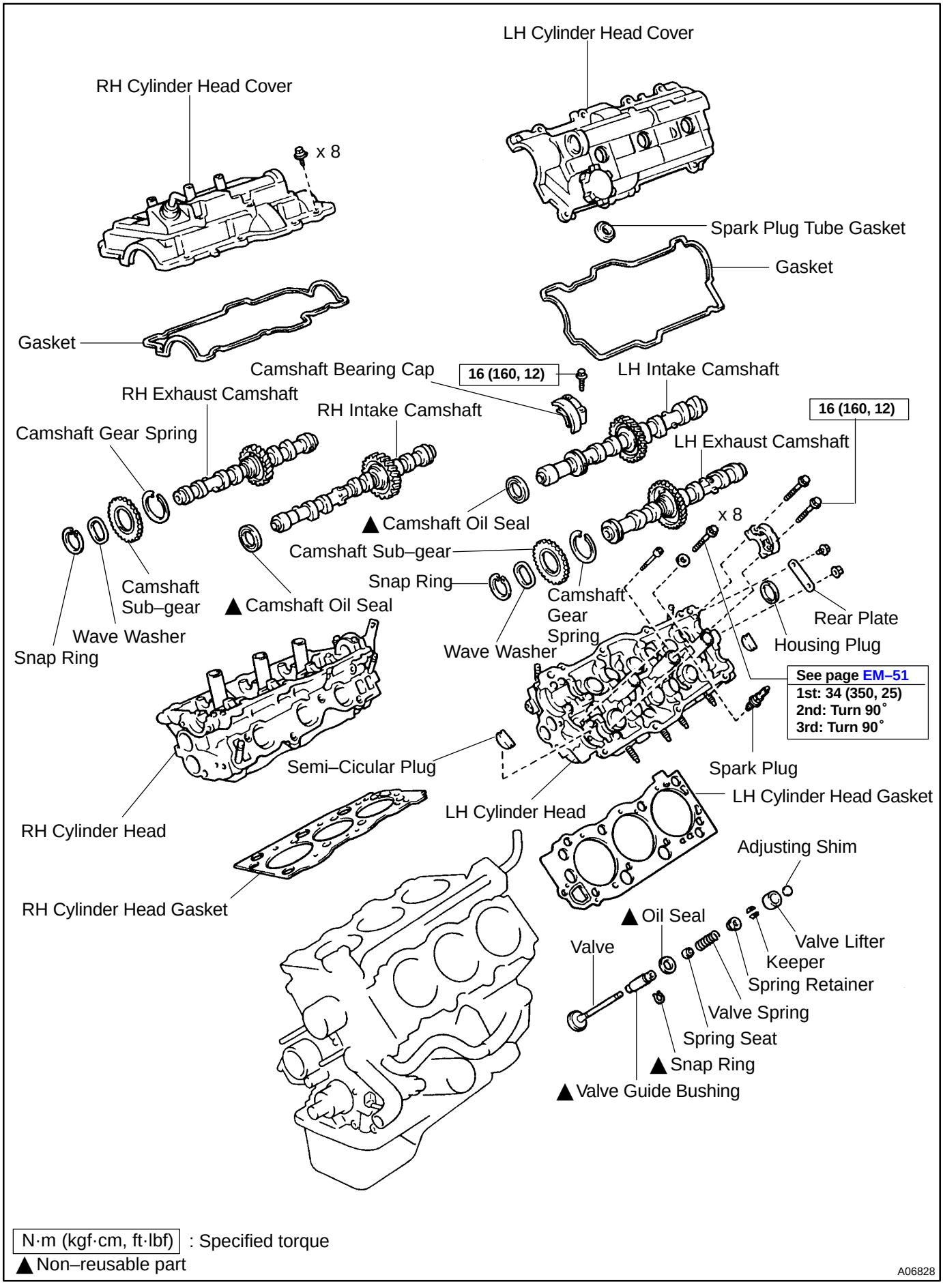
EM1LF–02




Timing Belt
Timing Belt Guide
PS Pump Adjusting Strut
* Gasket
Fan Bracket
No. 1 Timing Belt Cover
* Gasket
* Gasket
Crankshaft Pulley
▲ 300 (3,000, 217)
Starter Wire Bracket
LH Camshaft Timing Pulley
Knock Pin
No. 2 Idler Pulley
RH Camshaft Timing Pulley
Oil Dipstick and Guide
40 (400, 30)
Knock Pin
110 (1,100, 81)
110 (1,100, 81)
Dust Boot
▲ O–Ring
27 (280, 20)
Timing Belt Tensioner
N·m (kgf·cm, ft·lbf) : Specified torque
▲ Non–reusable part
* Replace only if damaged
S02360


PCV Hose
Water Bypass Hose
Water Bypass Hose
Throttle Position Sensor Connector
Throttle Control Motor Connector
Accelerator Pedal Position Sensor Connector
EVAP Hose
18.5 (180, 13)
Air Intake Chamber Assembly
18 (180, 13)
▲ Gasket
18 (180, 13)
Intake Air Connector Assembly
Engine Wire Protector
Engine Wire Protector
18 (180, 13)
Fuel Return Hose
Brake Booster Hose
▲ Gasket
Ground Strap
Fuel Return Hose
18.5 (180, 13)
x 8
▲ O–Ring
ECT Sensor Connector
18.5 (180, 13)
Intake Manifold Assembly
ECT Sender Gauge Connector
Intake Manifold Stay
Injector Connector
High–Tension Cord and Cord Clamp
Engine Wire Protector
No. 2 Timing Belt Cover
▲ Gasket
▲ Gasket
Fuel Hose
x 6
* Gasket
* Gasket
Intake Chamber Stay
Camshaft Position Sensor Connector
N·m (kgf·cm, ft·lbf) : Specified torque
▲ Non–reusable part
* Replace only if damaged
A19578


Exhaust Crossover Pipe
45 (450, 33)
Gasket
Gasket
RH Exhaust Manifold
Gasket
Gasket
Gasket
x 6
40 (400, 30)
Front TWC
Conveter Rear Flange Retainer
PS Pump Bracket
LH Exhaust Manifold
Gasket
Gasket
x 6
Wire Bracket
Generator Bracket
x 6
No. 3 Timing Belt Cover
Camshaft Position Sensor
Gasket
Generator
Generator Bracket Insulator
N·m (kgf·cm, ft·lbf) : Specified torque
▲ Non–reusable part
A14767



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

A06828

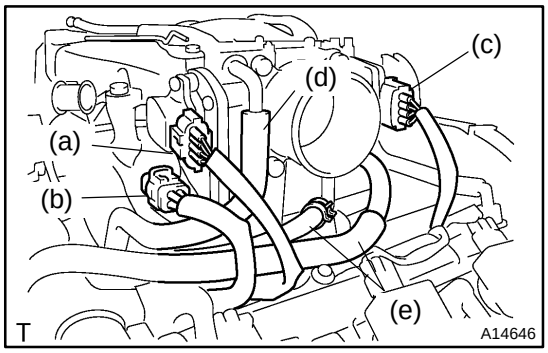
EM1V1–02

REMOVAL

1. REMOVE ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT
3. REMOVE FRONT EXHAUST PIPE (See page EM–103)
4. REMOVE MAF METER, RESONATOR AND AIR CLEANER ASSEMBLY
5. REMOVE HIGH–TENSION CORDS WITH IGNITION COILS AND SPARK PLUGS (See page IG–7)
6. DISCONNECT ACCELERATOR CABLE
7. DISCONNECT HEATER HOSE AND UPPER RADIATOR HOSE
8. REMOVE GENERATOR
9. REMOVE INTAKE CHAMBER STAY

(a) A/T:
Remove the bolt and oil filler tube.

(b) Remove the 2 bolts and intake chamber stay.



10. REMOVE AIR INTAKE CHAMBER ASSEMBLY

(a) Disconnect the throttle position sensor connector.

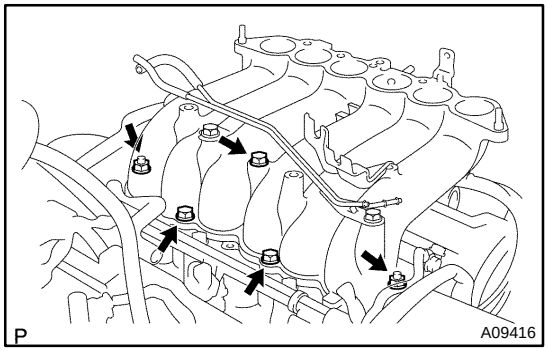
(b) Disconnect the throttle control motor connector.

(c) Disconnect the accelerator pedal position sensor connector.

(d) Disconnect the air hose.

(e) Disconnect the 2 water bypass hoses.

(f) Remove the 3 bolts, 2 nuts, the air intake chamber assembly and gasket.



11. REMOVE INTAKE AIR CONNECTOR

(a) Remove the bolt holding the engine wire to the intake air connector.

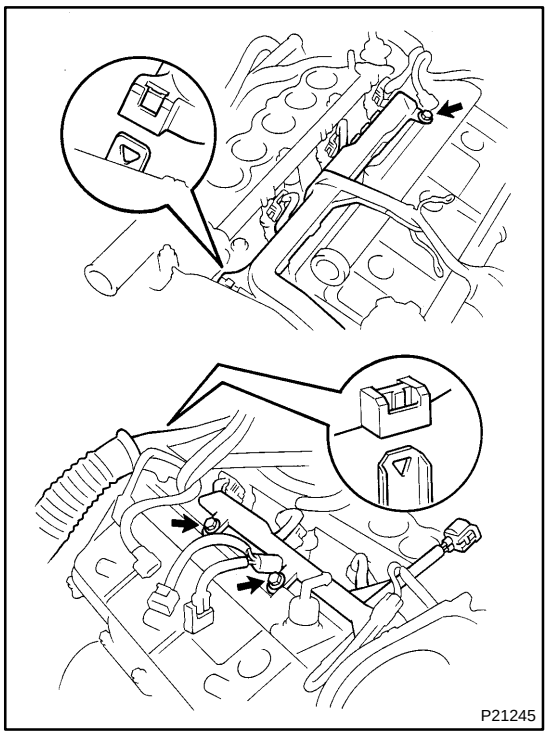
(b) Disconnect the 2 fuel return hoses from the intake air connector.

(c) Disconnect the brake booster vacuum hose from the intake air connector.

(d) Disconnect vacuum sensing hose from the fuel pressure regulator.

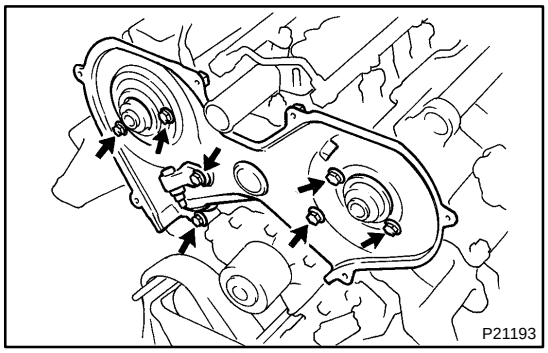
(e) Remove the bolt holding the ground strap to the intake air connector.

(f) Remove the 3 bolts, 2 nuts, intake air connector and gasket.



12. DISCONNECT ENGINE WIRE

(a) Disconnect the oil pressure sensor connector.
(b) Disconnect the crankshaft position sensor connector.
(c) Disconnect the 6 Injector connectors.
(d) Disconnect the ECT sender gauge connector.
(e) Disconnect the ECT sensor connector.
(f) Disconnect the knock sensor connector.
(g) Disconnect the camshaft position sensor connector.
(h) Disconnect the 3 engine wire clamps.
(i) Remove the 3 bolts, and disconnect the engine wire from the cylinder head.

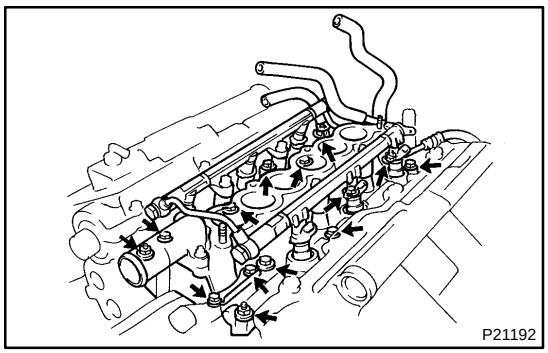


13. REMOVE CAMSHAFT POSITION SENSOR

14. REMOVE NO. 3 TIMING BELT COVER

Remove the 6 bolts and timing belt cover.

15. REMOVE FUEL PRESSURE REGULATOR



16. REMOVE INTAKE MANIFOLD ASSEMBLY

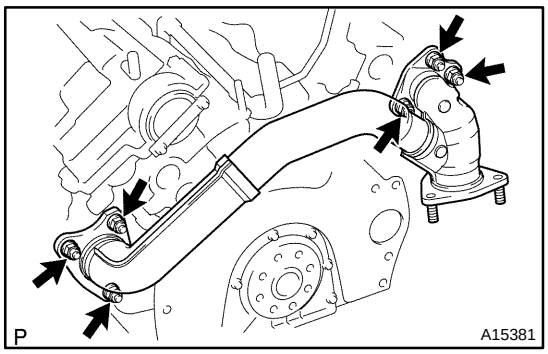
(a) Disconnect the fuel inlet hose.
(b) Remove the 2 bolts and intake manifold stay.
(c) Remove the 8 bolts, 4 nuts, 4 plate washers, the intake manifold, delivery pipes and injectors assembly and 2 gaskets.

17. REMOVE PS PUMP BRACKET

18. REMOVE OIL DIPSTICK AND GUIDE

(a) Remove the 2 bolts holding the dipstick guide to the generator bracket.
(b) Pull out the dipstick guide together with the dipstick from the oil pan.
(c) Remove the O–ring from the dipstick guide.

19. REMOVE GENERATOR BRACKET



20. REMOVE EXHAUST CROSSOVER PIPE

Remove the 6 nuts, crossover pipe and 2 gaskets.

21. REMOVE LH AND RH EXHAUST MANIFOLDS

(a) Remove the 6 nuts, exhaust crossover pipe and 2 gaskets.

(b) Remove the 12 nuts, LH, RH exhaust manifolds and 2 gaskets.

22. REMOVE CYLINDER HEAD COVERS

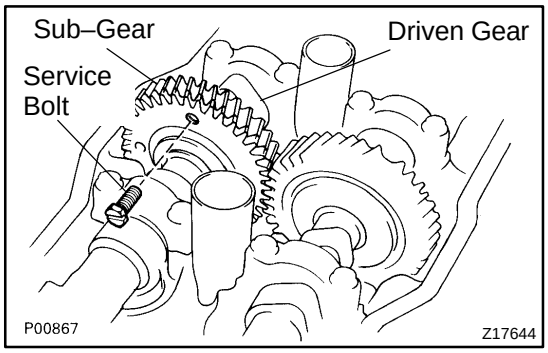
Remove the 8 bolts, seal washers, cylinder head cover and gasket. Remove the 2 cylinder head covers.

23. REMOVE SEMI–CIRCULAR PLUGS

24. REMOVE CAMSHAFTS OF RH CYLINDER HEAD

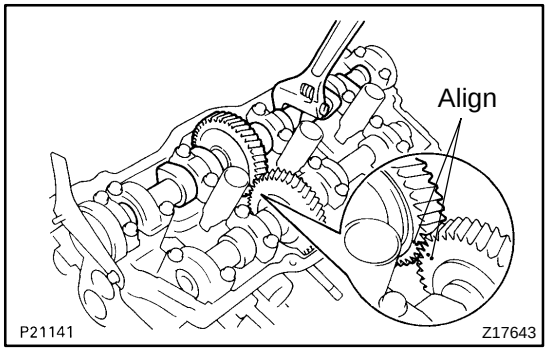
NOTICE:

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



(a) Remove the exhaust camshaft of the RH cylinder head.

(1) Boring the service bolt hole of the driven sub–gear upward by turning the hexagon wrench head portion of the exhaust camshaft with a wrench.



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

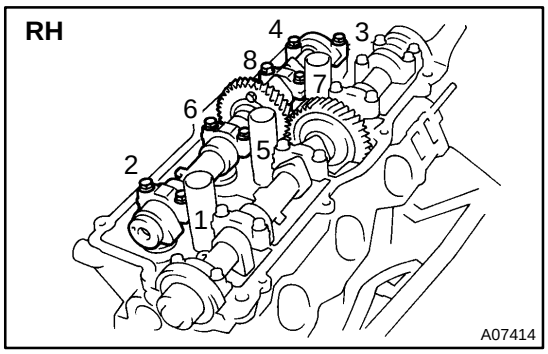
(3) Secure the exhaust camshaft sub–gear to the main gear with a service bolt.

Recommended service bolt:

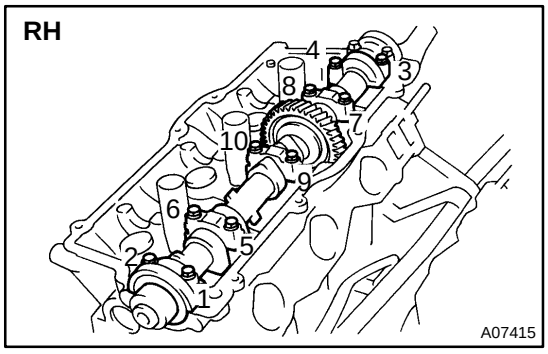
Thread diameter	6 mm
Thread pitch	1.0 mm
Bolt length	16 – 20 mm (0.63 in. – 0.79 in.)

HINT:

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



(4) Uniformly loosen and remove the 8 bearing cap bolts, in several passes, in the sequence shown.
(5) Remove the 4 bearing caps and exhaust camshaft.

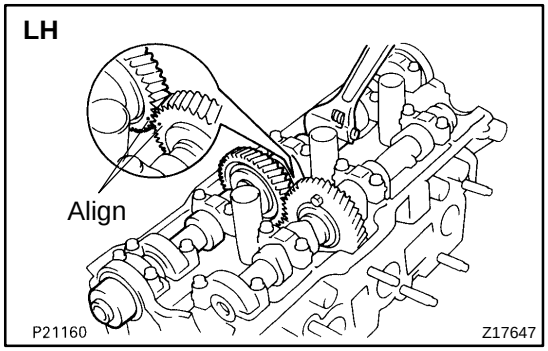


(b) Remove the intake camshaft of the RH cylinder head.
(1) Uniformly loosen and remove the 10 bearing cap bolts, in several passes, in the sequence shown.
(2) Remove the 5 bearing caps, oil seal and intake camshaft.

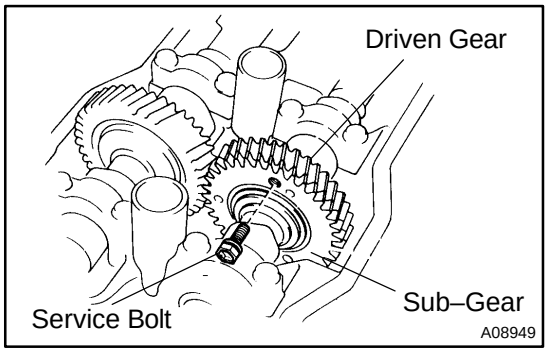
25. REMOVE CAMSHAFTS OF LH CYLINDER HEAD

NOTICE:

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



(a) Remove the exhaust camshaft of the LH cylinder head.
(1) Align the timing marks (1 dot mark) of the camshaft drive and driven gears by turning the hexagon wrench head portion of the exhaust camshaft with a wrench.

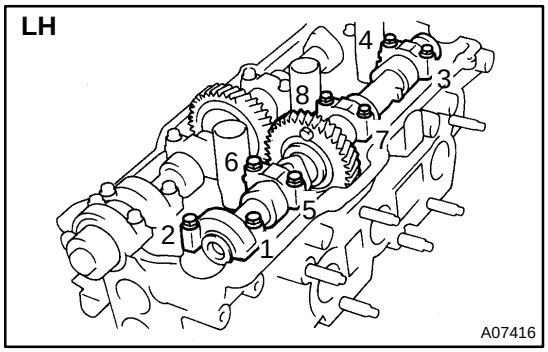


(2) Secure the exhaust camshaft sub–gear to the main gear with a service bolt.

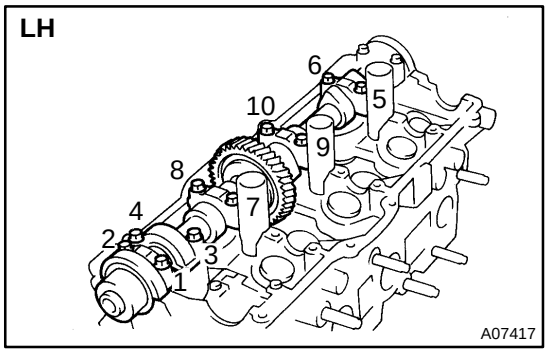
Recommended service bolt:

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

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

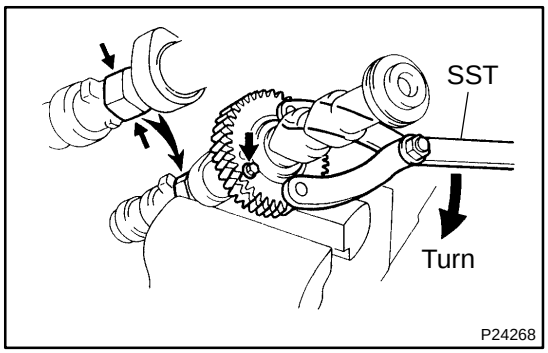


(3) Uniformly loosen and remove the 8 bearing cap bolts, in several passes, in the sequence shown.
(4) Remove the 4 bearing caps and exhaust camshaft.



(b) Remove the intake camshaft of the LH cylinder head.
(1) Uniformly loosen and remove the 10 bearing cap bolts, in several passes, in the sequence shown.
(2) Remove the 5 bearing caps, oil seal and intake camshaft.

HINT:
▲ Arrange the camshafts in the correct order.
▲ Arrange the bearing caps in the correct order.

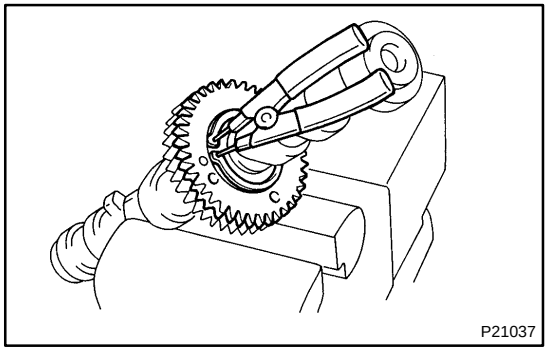


26. DISASSEMBLE EXHAUST CAMSHAFTS

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

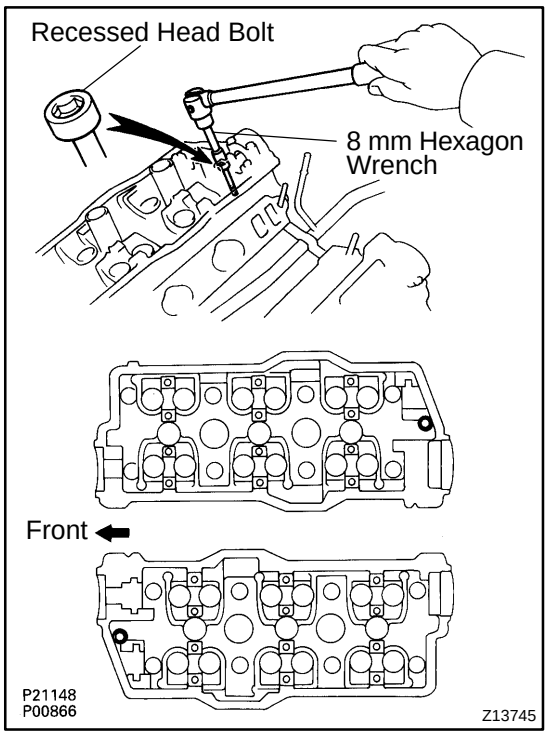
NOTICE:
Be careful not to damage the camshaft.

(b) Using SST, turn the sub–gear clockwise, and remove the service bolt.
SST 09960–10010 (09962–01000, 09963–00600)



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

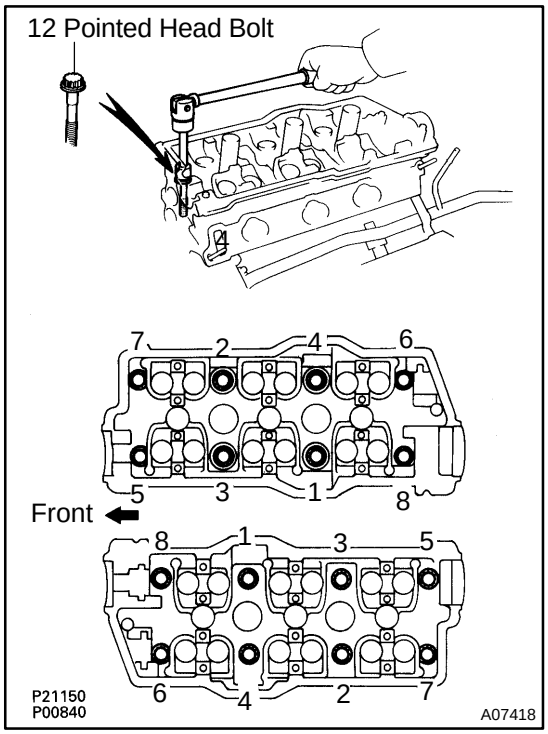
HINT:
Arrange the camshaft sub–gears and gear springs (RH and LH sides).



27. REMOVE CYLINDER HEADS

(a) Remove the bolt and disconnect the ground strap.

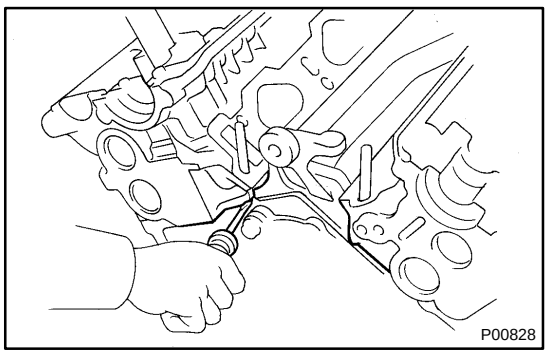
(b) Using an 8 mm hexagon wrench, remove the cylinder head (recessed head) bolt on each cylinder head, then repeat for the other side as shown.



(c) Uniformly loosen and remove the 8 cylinder head (12 pointed head) bolts on each cylinder head, in several passes, in the sequence shown, then repeat for the other side as shown. Remove the 16 cylinder head bolts and plate washers.

NOTICE:

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



(d) Lift the cylinder head from the dowels on the cylinder block and place the 2 cylinder heads on wooden blocks on a bench.

HINT:

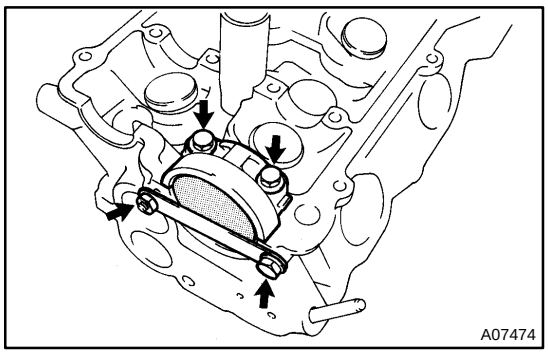
▲ If the cylinder head is difficult to lift off, pry between the cylinder head and cylinder block with a screwdriver.

▲ Arrange the cylinder heads in the correct order.

NOTICE:

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

EM06M–02



DISASSEMBLY

1. REMOVE CAMSHAFT HOUSING PLUGS

(a) Remove the bolt, nut, cylinder head rear plate and ground strap.

(b) Remove the 2 bolts and camshaft bearing cap.

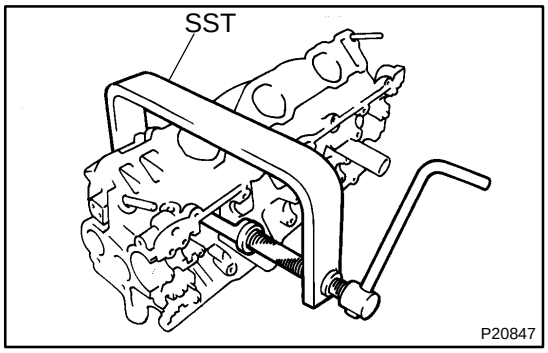
(c) Remove the housing plug.

2. REMOVE VALVE LIFTERS AND SHIMS

Pull out the valve lifter and shim by hand.

HINT:

Arrange the valve lifters and shims in correct order.

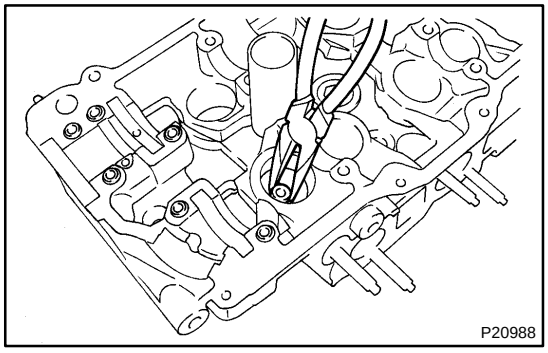


3. REMOVE VALVES

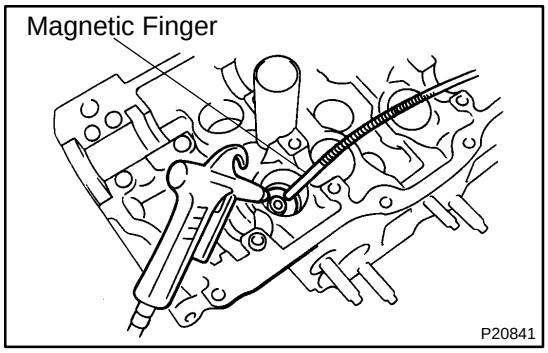
(a) Using SST, compress the valve spring and remove the 2 keepers.

SST 09202–70020 (09202–00010)

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



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



(d) Using compressed air and a magnetic finger, remove the spring seat by blowing air.

HINT:

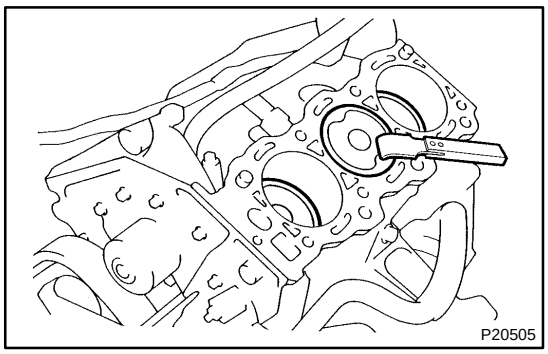
Arrange the valves, valve springs, spring seats and spring retainers in the correct order.

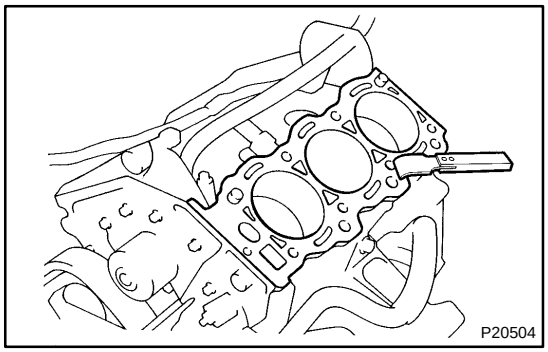
EM12H–01

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 surfaces.



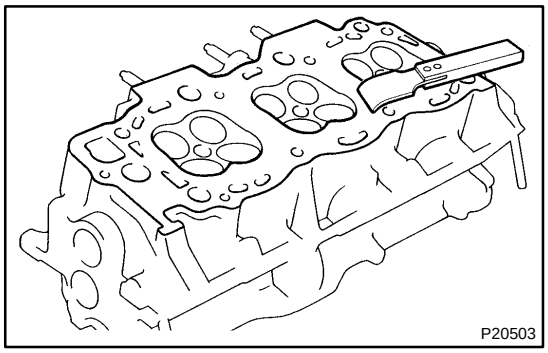


(b) Using a gasket scraper, remove all the gasket material from the surface contacting the cylinder block.

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

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

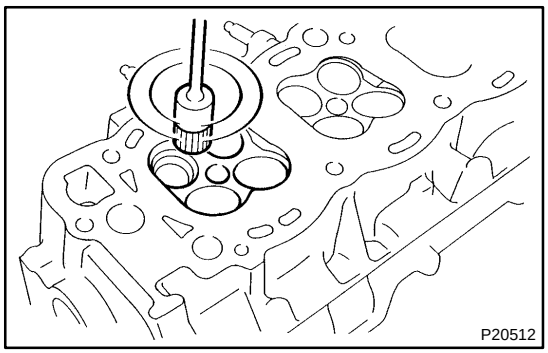
2. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS



3. CLEAN CYLINDER HEADS

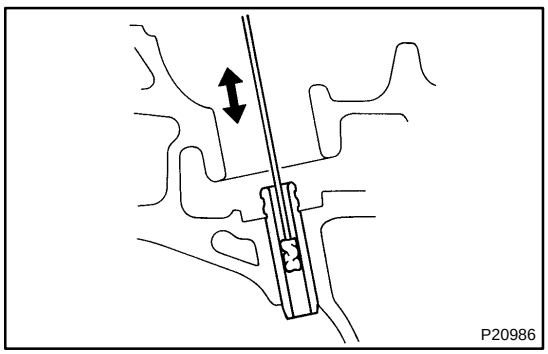
(a) Using a gasket scraper, remove all the gasket material from the surface contacting the cylinder block contact surface.

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

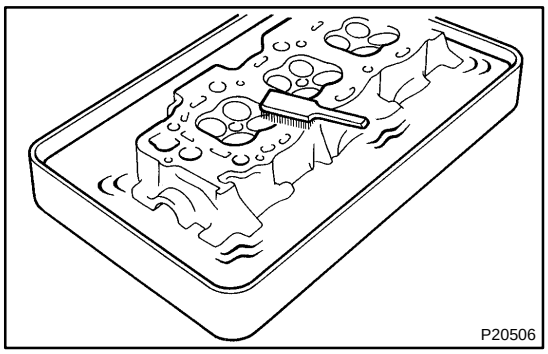


(b) Using a wire brush, remove all the carbon from the combustion chambers.

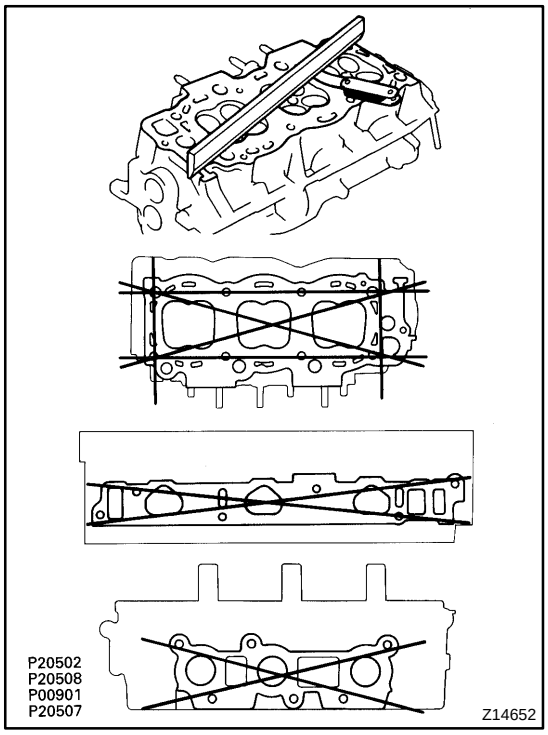
NOTICE:
Be careful not to scratch the surface contacting the cylinder block.



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



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



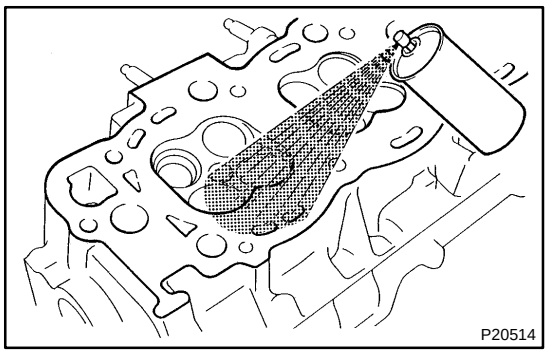
4. INSPECT CYLINDER HEADS

(a) Inspect flatness.

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

Maximum warpage: 0.10 mm (0.0039 in.)

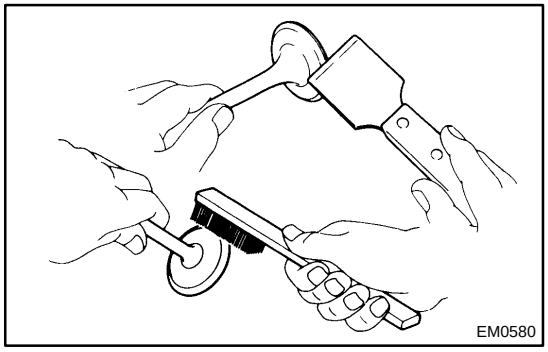
If warpage is greater than maximum, replace the cylinder head.



(b) Inspect for cracks.

Using a dye penetrate, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.

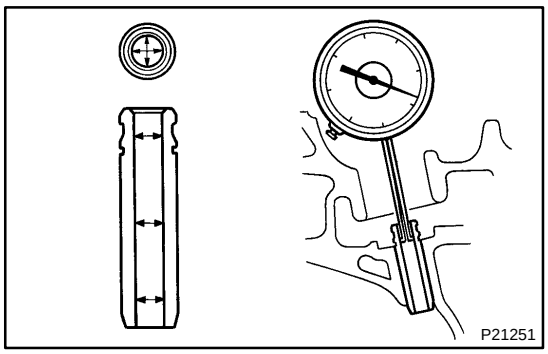
If cracked, replace the cylinder head.



5. CLEAN VALVES

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

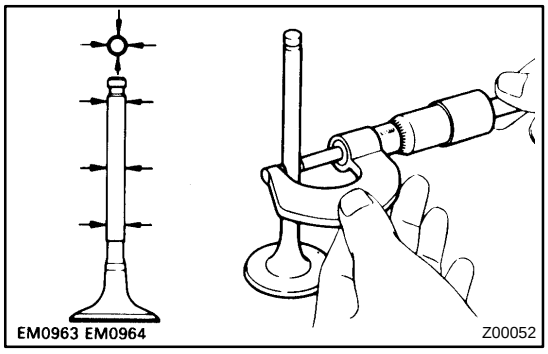
(b) Using a wire brush, thoroughly clean the valve.



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:

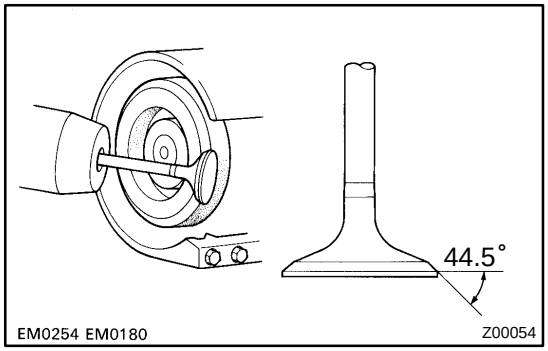
Intake	5.970 – 5.985 mm (0.2350 – 0.2356 in.)
Exhaust	5.965 – 5.980 mm (0.2348 – 0.2354 in.)

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

Oil clearance:

Intake	STD	0.025 – 0.060 mm (0.0010 – 0.0024 in.)
	Maximum	0.08 mm (0.0031 in.)
Exhaust	STD	0.030 – 0.065 mm (0.0012 – 0.0026 in.)
	Maximum	0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the valve and guide bushing (See page EM–47).

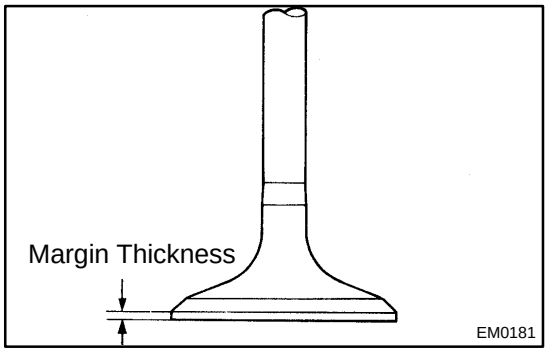


7. INSPECT AND GRIND VALVES

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

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

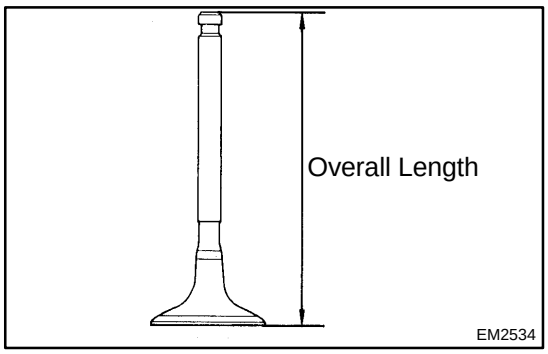
Valve face angle: 44.5°



(c) Check the valve head margin thickness.

Standard margin thickness: 1.0 mm (0.039 in.)
Minimum margin thickness: 0.5 mm (0.020 in.)

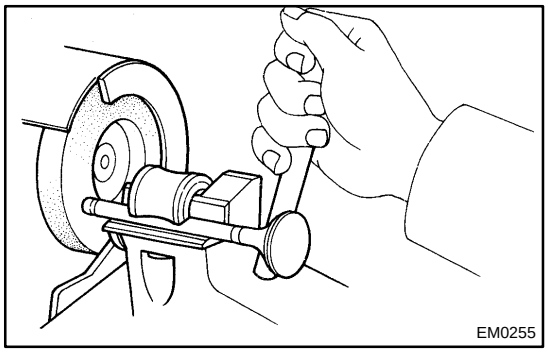
If the margin thickness is less than minimum, replace the valve.



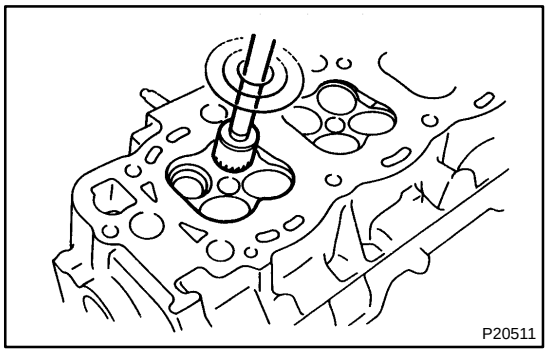
(d) Check the valve overall length.
Overall length:

Intake	STD	95.15 mm (3.7461 in.)
	Minimum	94.60 mm (3.7244 in.)
Exhaust	STD	94.90 mm (3.7362 in.)
	Minimum	94.40 mm (3.7165 in.)

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

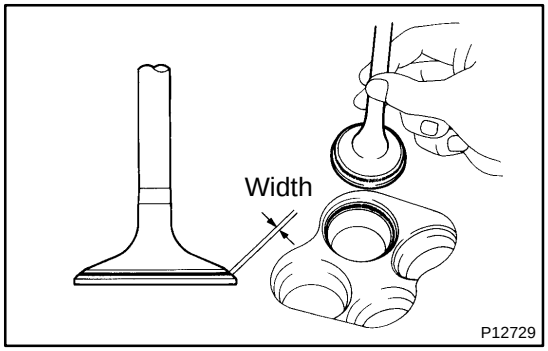


(e) Check the surface of the valve stem tip for wear.
If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.
NOTICE:
Do not grind off more than the minimum.



8. INSPECT AND CLEAN VALVE SEATS

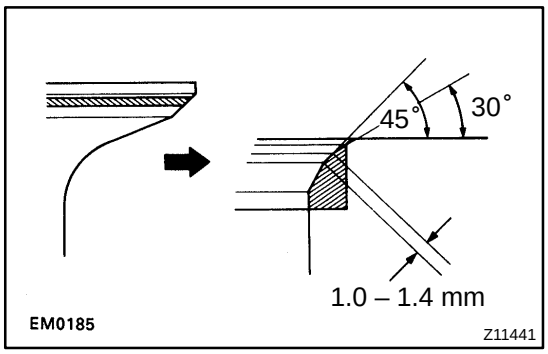
(a) Using a 45° carbide cutter, resurface the valve seats. Remove only enough metal to clean the seats.



(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.

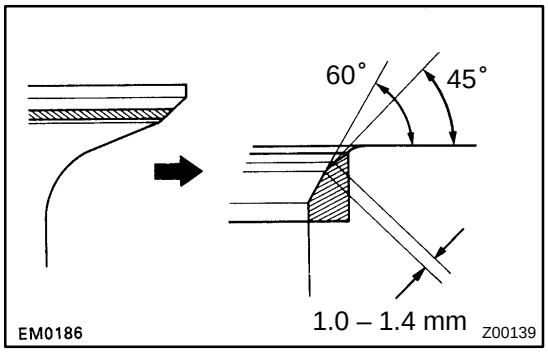
(c) Check the valve face and seat for these:
- ▲ If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- ▲ If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
- ▲ Check that the seat contact is in the middle of the valve face with these width.

1.0 – 1.4 mm (0.039 – 0.055 in.)

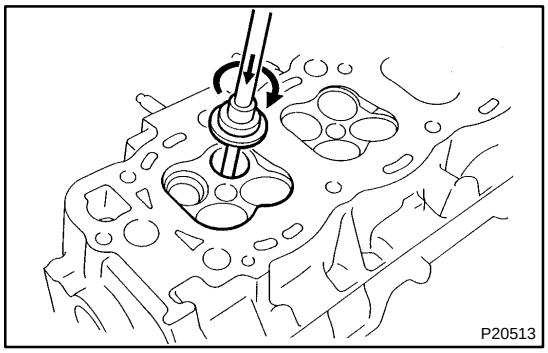


If not, correct the valve seats as follows:

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

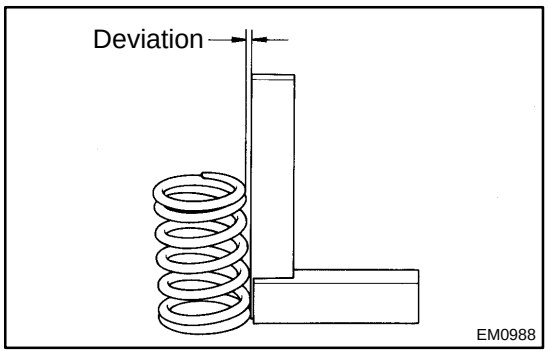


(2) If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.



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

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

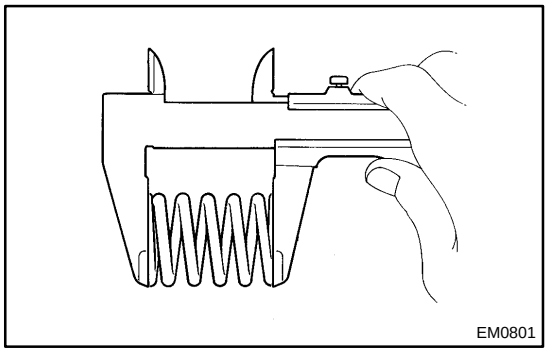


9. INSPECT VALVE SPRINGS

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

Maximum deviation: 2.0 mm (0.079 in.)

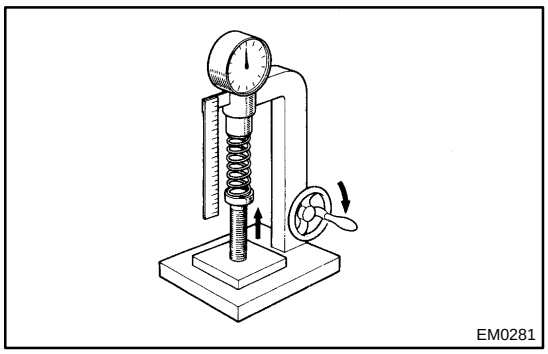
If deviation is greater than maximum, replace the valve spring.



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

Free length: 44.78 mm (1.7630 in.)

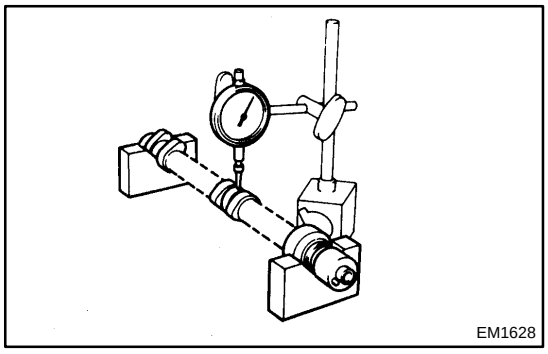
If the free length is not as specified, replace the valve spring.


EM0281

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

Installed tension:
186 – 206 N (19.0 – 21.0 kgf, 41.9 – 46.3 lbf)
at 33.3 mm (1.311 in.)

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


EM1628

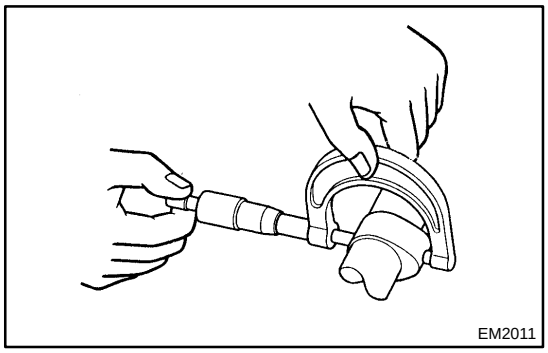
10. INSPECT CAMSHAFT FOR RUNOUT

(a) Place the camshaft on V–blocks.

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

Maximum circle runout: 0.06 mm (0.0024 in.)

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


EM2011

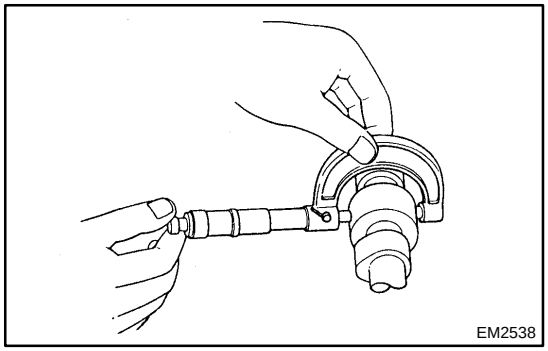
11. INSPECT CAM LOBES

Using a micrometer, measure the cam lobe height.

Cam lobe height:

Intake	STD	42.31 – 42.41 mm (1.6657 – 1.6697 in.)
	Minimum	42.16 mm (1.6598 in.)
Exhaust	STD	41.96 – 42.06 mm (1.6520 – 1.6559 in.)
	Minimum	41.81 mm (1.6461 in.)

If the cam lobe height is greater than maximum, replace the camshaft.


EM2538

12. INSPECT CAMSHAFT JOURNALS

Using a micrometer, measure the journal diameter.

Journal diameter:
26.949 – 26.965 mm (1.0610 – 1.0616 in.)

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

13. INSPECT CAMSHAFT BEARINGS

Check the bearings for flaking and scoring.

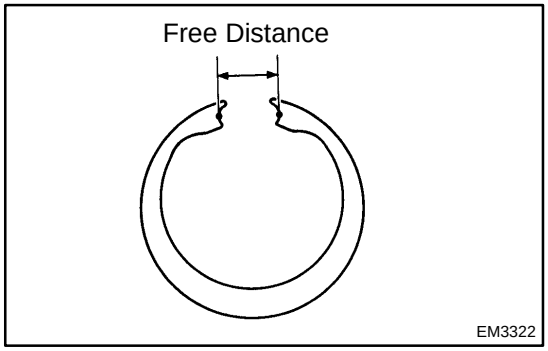
If the bearings are damaged, replace the bearing caps and cylinder head as a set.

14. INSPECT CAMSHAFT GEAR SPRING

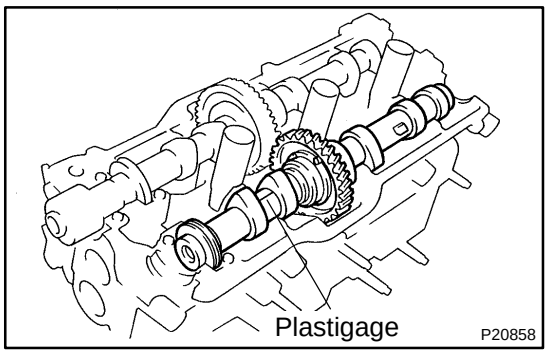
Using vernier calipers, measure the free distance between the spring ends.

Free distance: 18.2 – 18.8 mm (0.712 – 0.740 in.)

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



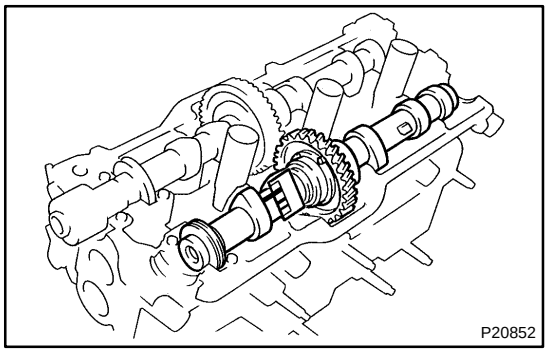
EM3322



15. 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–51).

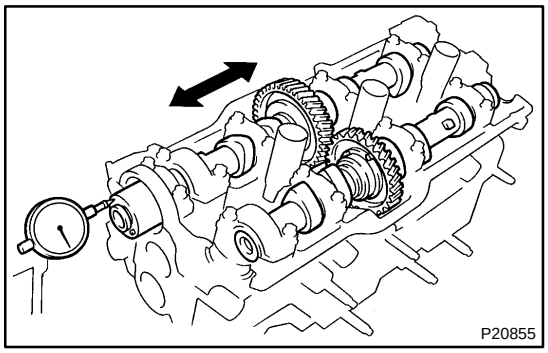
NOTICE:
Do not turn the camshaft.



(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.

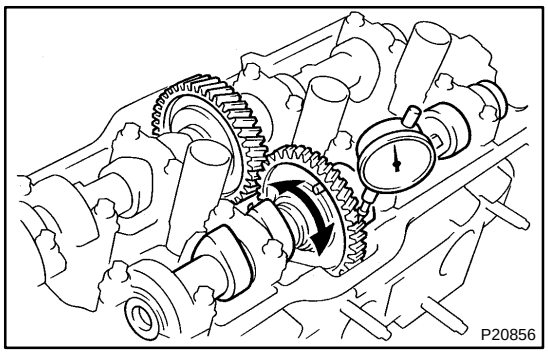
(g) Completely remove the Plastigage.



16. INSPECT CAMSHAFT THRUST CLEARANCE

(a) Install the camshafts (See page EM–51).
(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.
Standard thrust clearance:
0.033 – 0.080 mm (0.0013 – 0.0031 in.)
Maximum thrust clearance: 0.12 mm (0.0047 in.)

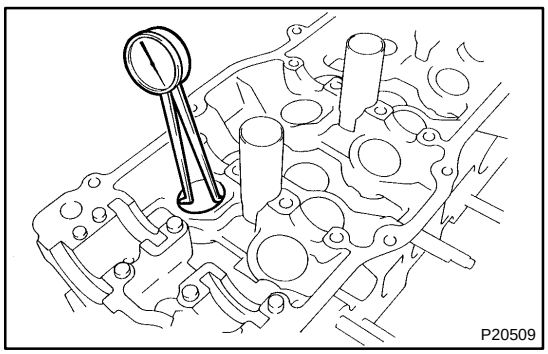
If the thrust clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.



17. INSPECT CAMSHAFT GEAR BACKLASH

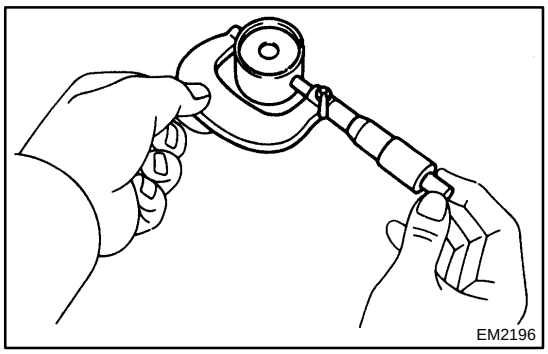
(a) Install the camshafts without installing the exhaust camshaft sub–gear (See page EM–51).
(b) Using a dial indicator, measure the backlash.
Standard backlash:
0.020 – 0.200 mm (0.0008 – 0.0079 in.)
Maximum backlash: 0.30 mm (0.0188 in.)

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



18. 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 – 31.018 mm (1.2205 – 1.2212 in.)


EM2196

(b) Using a micrometer, measure the lifter diameter.
Lifter diameter:
30.966 – 30.976 mm (1.2191 – 1.2195 in.)

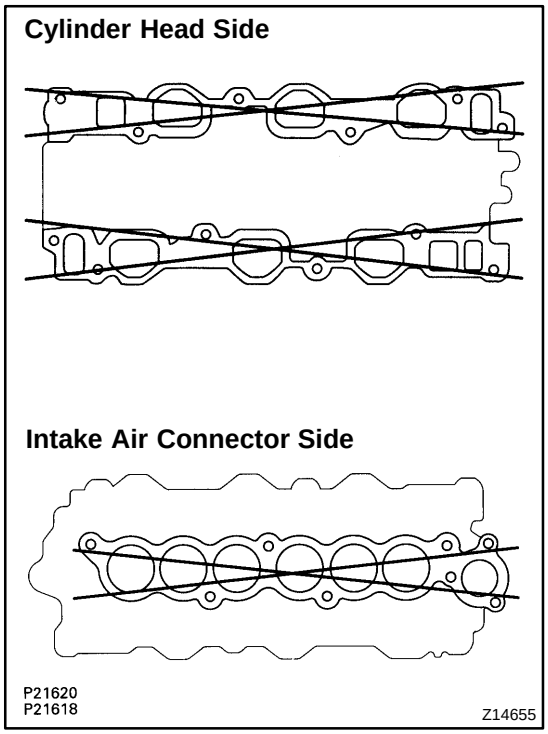
(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.
Standard oil clearance:
0.024 – 0.052 mm (0.0009 – 0.0020 in.)
Maximum oil clearance: 0.08 mm (0.0031 in.)

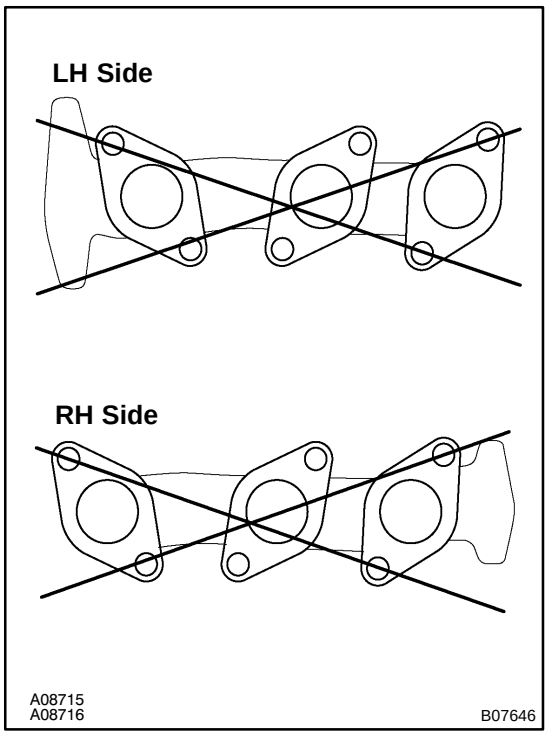
If the oil clearance is greater than maximum, replace the lifter. If necessary, replace the cylinder head.

19. INSPECT INTAKE MANIFOLD, EXHAUST MANIFOLDS, AIR INTAKE CHAMBER AND INTAKE AIR CONNECTOR

(a) Intake Manifold:
Using precision straight edge and feeler gauge, measure the surfaces contacting the cylinder head and intake air connector for warpage.
Maximum warpage: 0.10 mm (0.0039 in.)

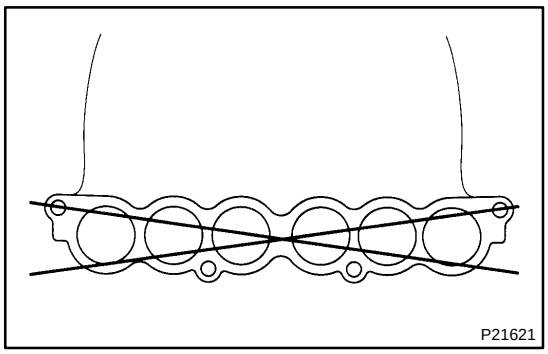
If warpage is greater than maximum, replace the intake manifold.





(b) Exhaust Manifolds:
Measure the surfaces contacting the cylinder head for warpage.
Maximum warpage: 1.00 mm (0.0394 in.)

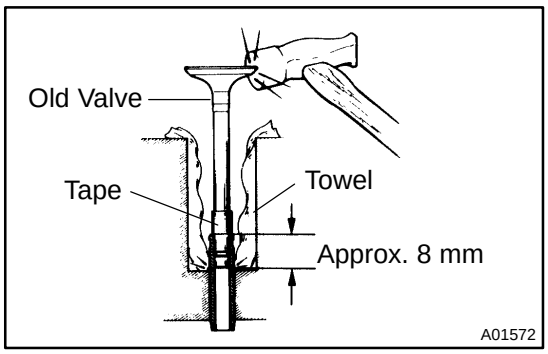
If warpage is greater than maximum, replace the exhaust manifold.



(c) Air Intake Chamber and Intake Air Connector:
Measure the surfaces contacting the intake manifold and intake air connector for warpage.
Maximum warpage: 0.10 mm (0.0039 in.)

If warpage is greater than maximum, replace the air intake chamber or intake air connector.

EM12G–01



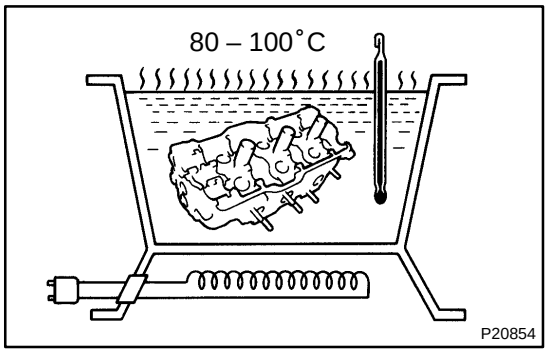
REPLACEMENT

1. REPLACE VALVE GUIDE BUSHINGS

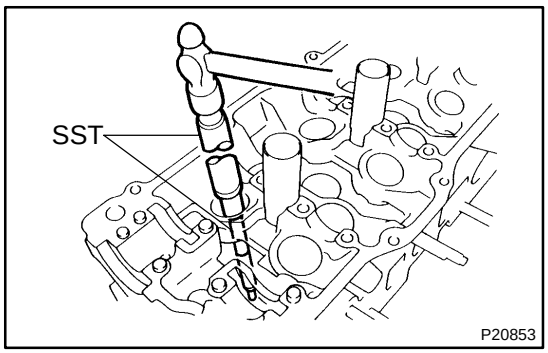
(a) w/ Snap ring:
Insert an old valve wrapped with tape into the valve guide bushing, and break off the valve guide bushing by hitting it with a hammer. Remove the snap ring.

HINT:
Wrap the tape approx. 8 mm (0.31 in.) from the valve stem end.

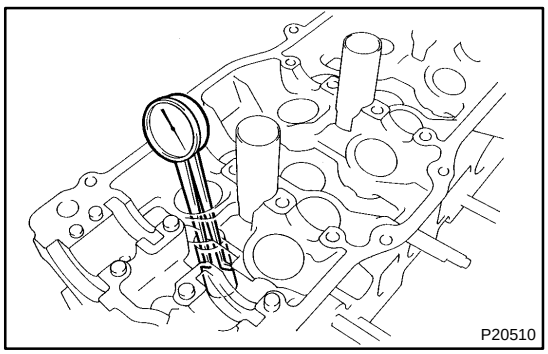
NOTICE:
Be careful not to damage the valve lifter hole.



(b) Gradually heat the cylinder head to 80 – 100˚C (176 – 212˚F).



(c) Using SST and a hammer, tap out the guide bushing.
SST 09201–10000 (09201–01060), 09950–70010 (09951–07150)



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

(e) Select a new guide bushing (STD size or O/S 0.05).
Both intake and exhaust:

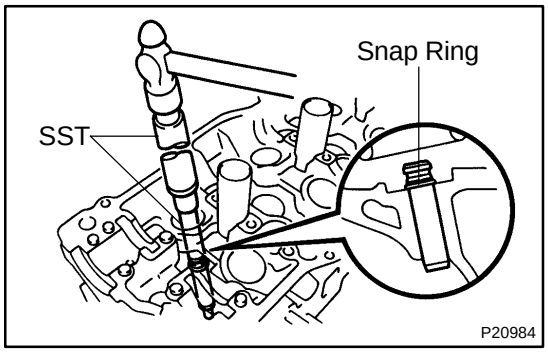
Bushing bore diameter	Bushing size
10.985 – 11.027 mm (0.4350 – 0.4341 in.)	Use STD
11.050 – 11.077 mm (0.4350 – 0.4361 in.)	Use O/S 0.05

If the bushing bore diameter of the cylinder head is greater than 11.027 mm (0.4341 in.), machine the bushing bore to these dimension:

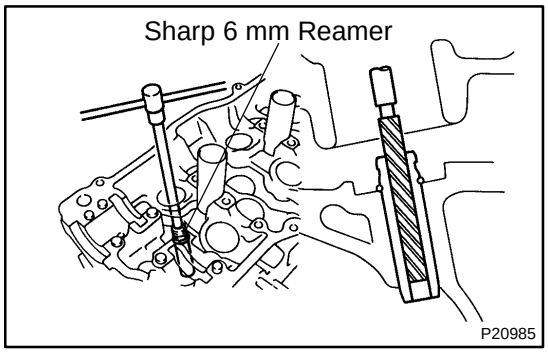
11.050 – 11.077 mm (0.4350 – 0.4361 in.)

If the bushing bore diameter of the cylinder head is greater than 11.077 mm (0.4361 in.), replace the cylinder head.

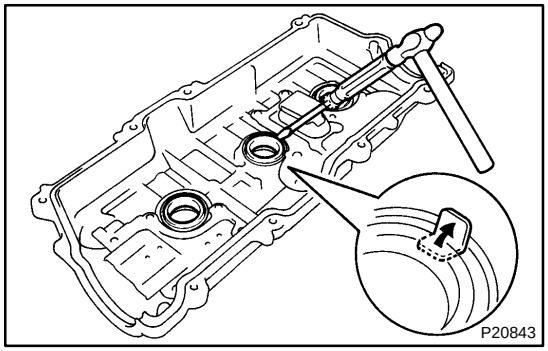
(f) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).



(g) Using SST and a hammer, tap in a new guide bushing until the snap ring makes contact with the cylinder head.
SST 09201–10000 (09201–01060), 09950–70010 (09951–07150)



(h) Using a sharp 6 mm reamer, ream the guide bushing to obtain the standard specified clearance (See page EM–38) between the guide bushing and valve stem.



2. REPLACE SPARK PLUG TUBE GASKETS

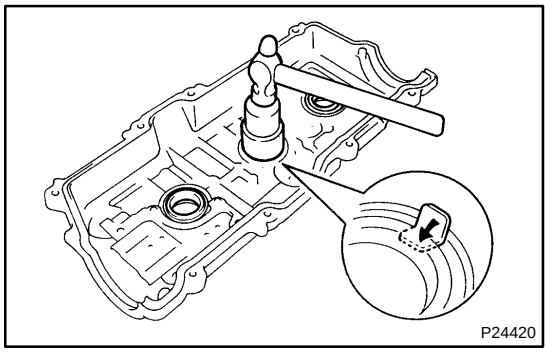
(a) Bend up the tab on the ventilation baffle plate which prevents the gasket from the slipping out.

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

NOTICE:

Do not scratch or damage the joint of the cylinder head cover.

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



(d) Using a 32 mm socket wrench and hammer, tap in a new gasket until its surface is flush with the upper edge of the cylinder head cover.

(e) Apply a light coat of MP grease to the gasket lip.

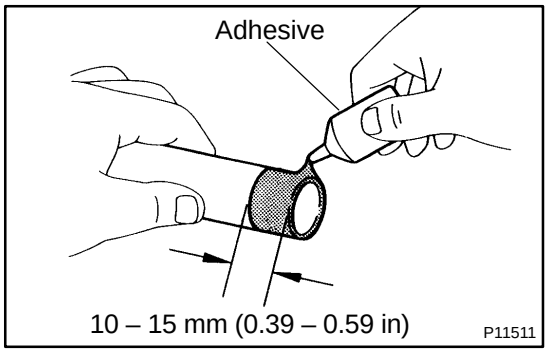
(f) Return the ventilation plate tab to its original position.

EM06O–02

REASSEMBLY

HINT:

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

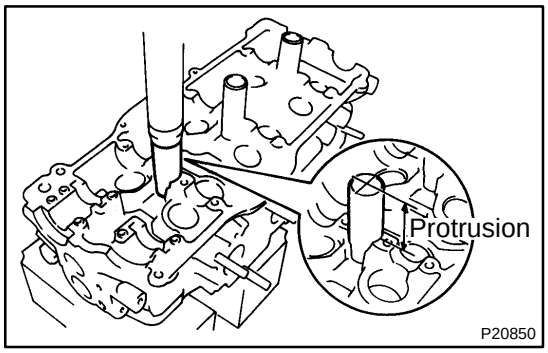


1. INSTALL SPARK PLUG TUBES

HINT:

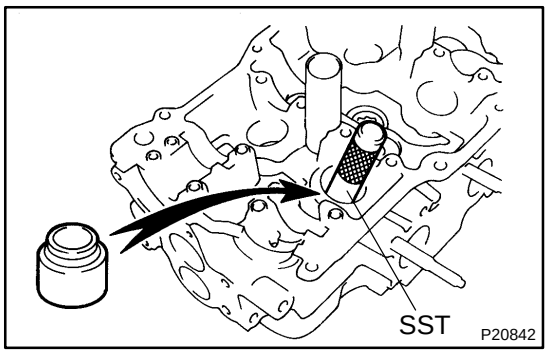
When using a new cylinder head, spark plug tubes must be installed.

(a) Apply adhesive to the end of the spark plug tube.
Adhesive:
Part No. 08833–00070, THREE BOND 1324 or equivalent



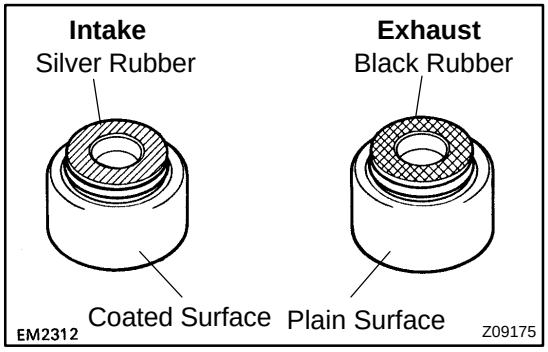
(b) Using a press, press in a new spark plug tube until there is 49.0 – 49.4 mm (1.929 – 1.945 in.) protruding from the camshaft bearing cap installation surface of the cylinder head.

NOTICE:
Avoid pressing a new spark plug tube too far for measuring the amount of the protrusion while pressing.



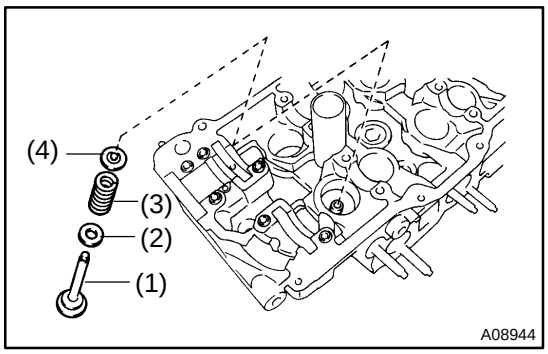
2. INSTALL VALVES

(a) Using SST, push in a new oil seal.
SST 09201–41020

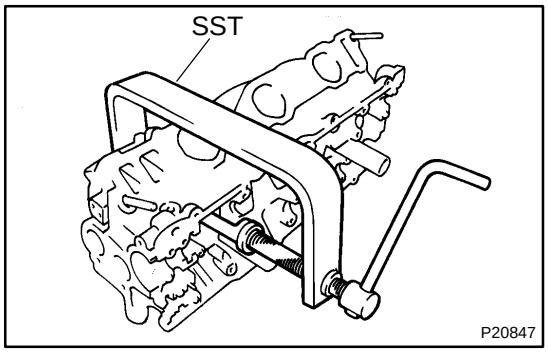


HINT:

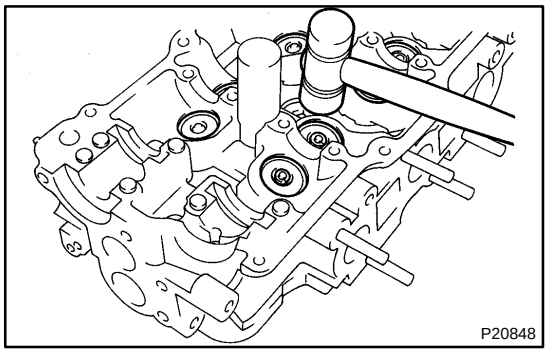
The intake valve oil seal is silver and the exhaust valve oil seal is black.



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



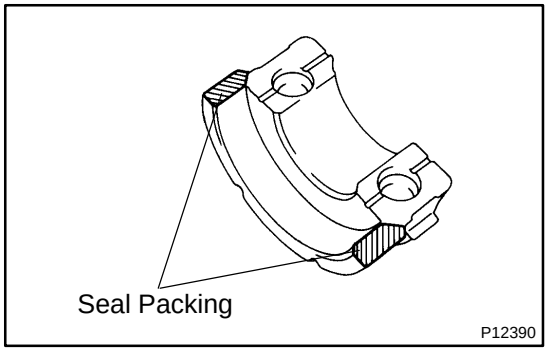
(c) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
SST 09202–70020 (09202–00010)



(d) Using a plastic–faced hammer, lightly tap the valve stem tip to ensure a proper fit.

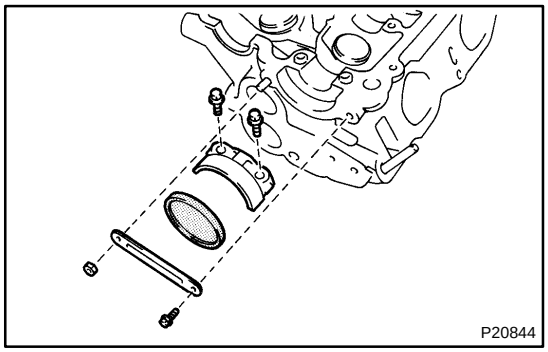
3. INSTALL VALVE LIFTERS AND SHIMS

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



4. INSTALL CAMSHAFT HOUSING PLUGS

(a) Remove any old packing (FIPG) material.
(b) Apply seal packing to the bearing cap as shown.
Seal packing: Part No. 08826–00080 or equivalent

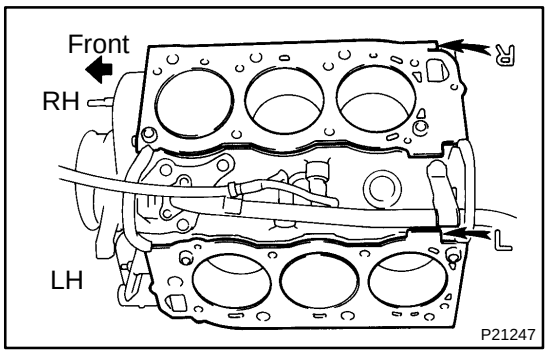


(c) Place a new housing plug in position on the cylinder head, facing the cap side inward.
(d) Install the camshaft bearing cap with the 2 bolts.
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)
(e) Install the cylinder head rear plate and ground strap with the bolt and nut.
Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)

EM1LP–02

INSTALLATION

1. INSTALL CYLINDER HEAD

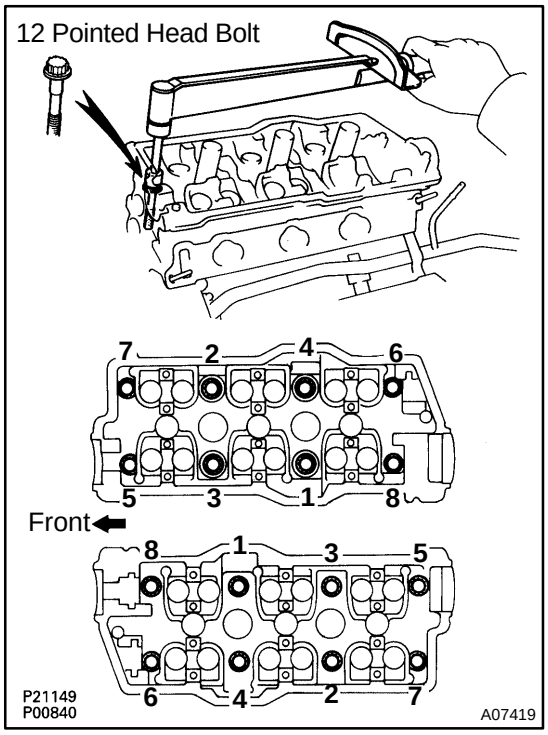


(a) Place 2 new cylinder head gaskets in position on the cylinder block.

NOTICE:

Be careful of the installation direction.

(b) Place the 2 cylinder heads in position on the cylinder head gaskets.



(c) Install the 12 pointed head bolts.

HINT:

▲ The cylinder head bolts are tightened in 3 progressive steps (steps (2), (4) and (5)).

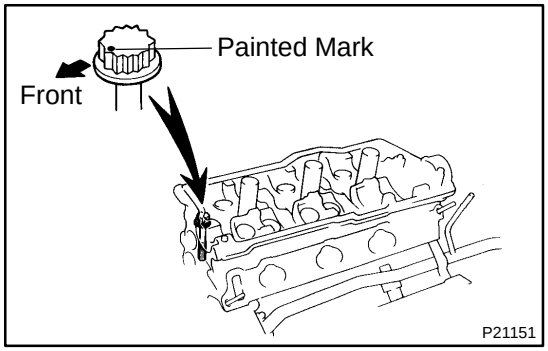
▲ If any bolt is broken or deformed, replace it.

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

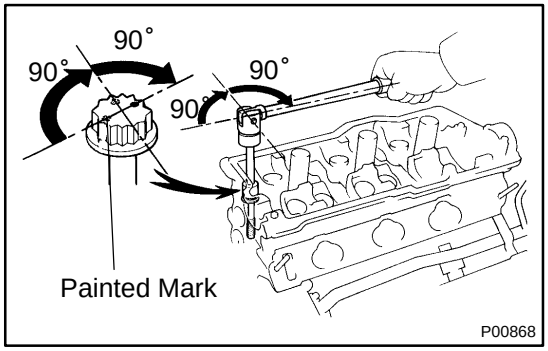
(2) Install and uniformly tighten the cylinder head bolts on each cylinder head, in several passes, in the sequence shown, then repeat for the other side, as shown.

Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)

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



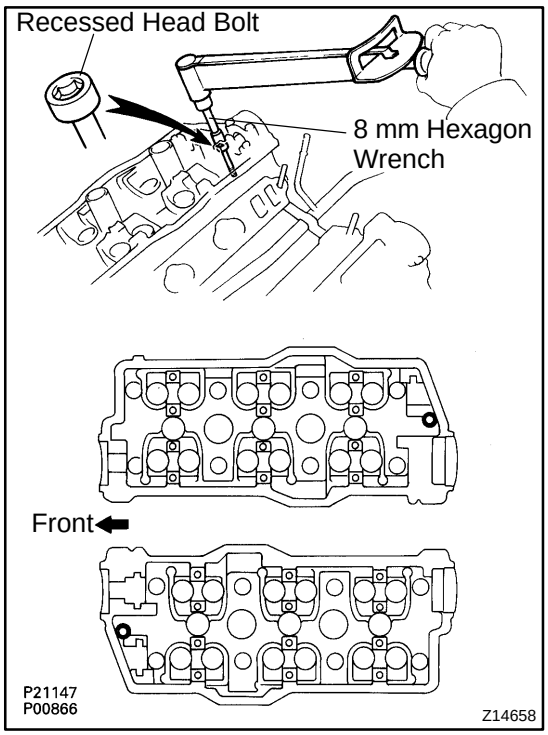
(3) Mark the front of the cylinder head bolt with paint.



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

(5) Retighten the cylinder head bolts by an additional 90°.

(6) Check that the painted mark is now facing rearward.

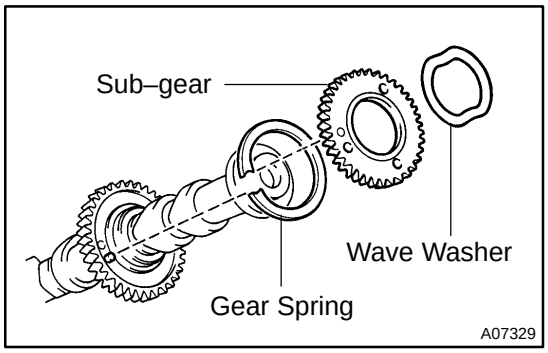


(d) Install recessed head bolts.
(1) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
(2) Using an 8 mm hexagon wrench, install the cylinder head bolt on each cylinder head, then repeat for the other side, as shown.

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

2. CONNECT GROUND STRAP

Install the bolt and connect the ground strap.



3. ASSEMBLE EXHAUST CAMSHAFTS

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

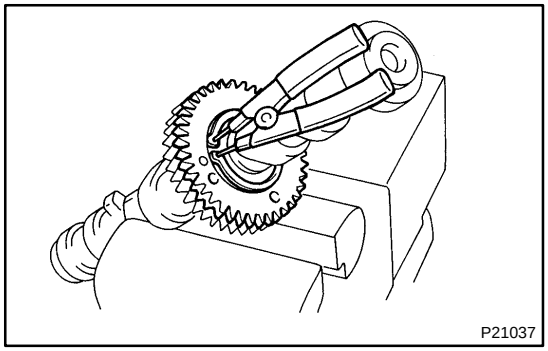
NOTICE:

Be careful not to damage the camshaft.

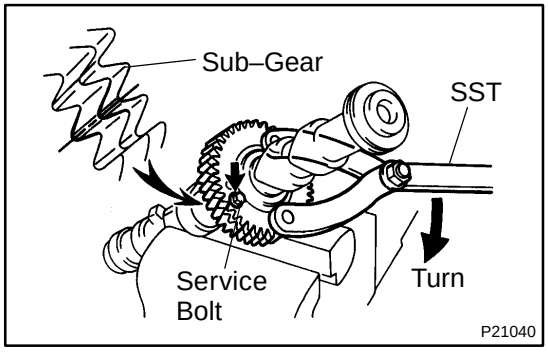
(b) Install the camshaft gear spring, camshaft sub – gear and wave washer.

HINT:

Attach the pins on the gears to the gear spring ends.



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



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

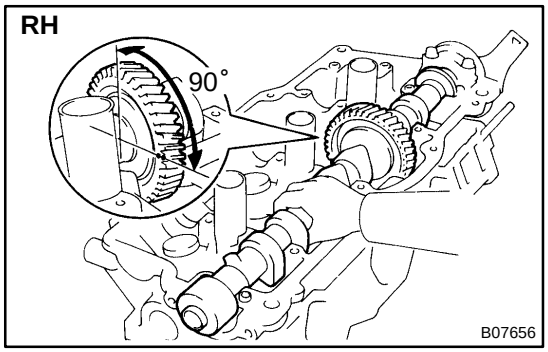
SST 09960–10010 (09962–01000, 09963–00600)

(e) Align the gear teeth of the main gear and sub–gear, and tighten the service bolt.

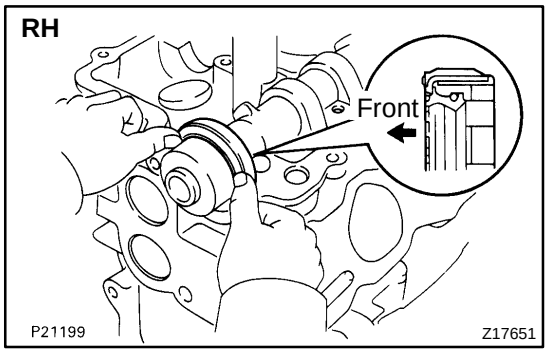
4. INSTALL CAMSHAFTS OF RH CYLINDER HEAD

NOTICE:

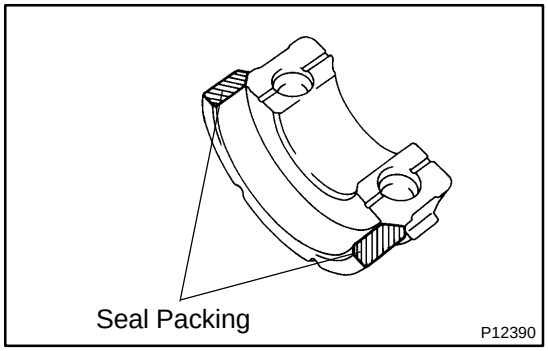
Since the thrust clearance of the camshaft is small, the camshaft must be held level while it is being installed. If the camshaft is not level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, these steps should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



(a) Install the intake camshaft of the RH cylinder head.
  (1) Apply fresh engine oil to the thrust portion and journal of the camshaft.
  (2) Place the intake camshaft at 90° angle of timing mark (2 dot marks) on the cylinder head.

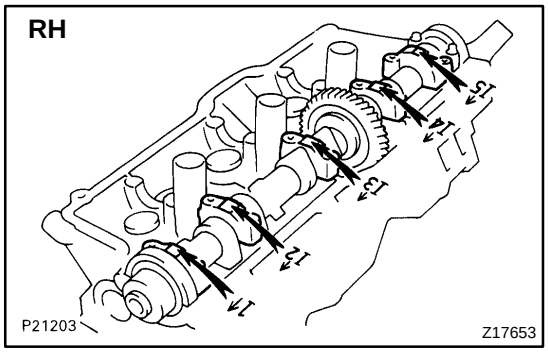


  (3) Apply MP grease to a new oil seal lip.
  (4) Install the oil seal to the camshaft.

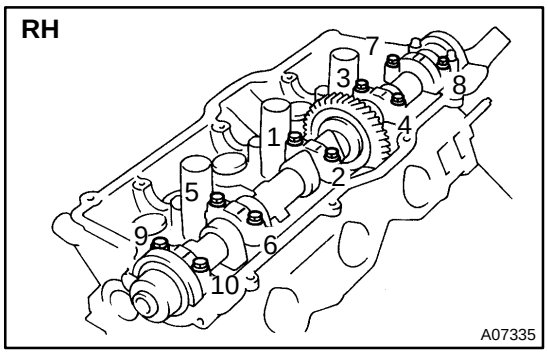


  (5) Remove any old packing (FIPG) material.
  (6) Apply seal packing to the No. 1 bearing cap as shown.

Seal packing: Part No. 08826–00080 or equivalent

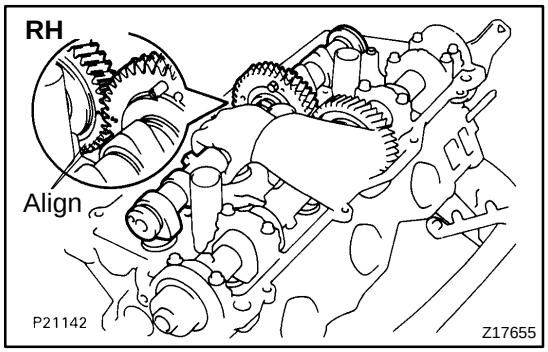


  (7) Install the 5 bearing caps in their proper locations.

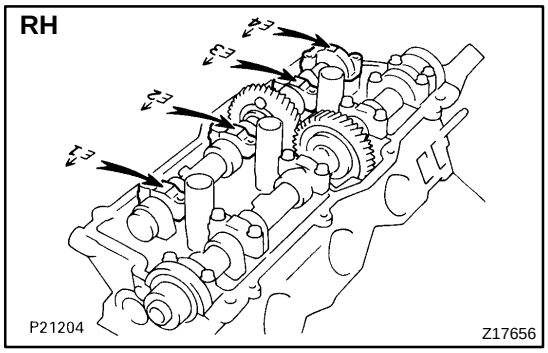


(8) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
(9) Install and uniformly tighten the 10 bearing cap bolts, in several passes, in the sequence shown.

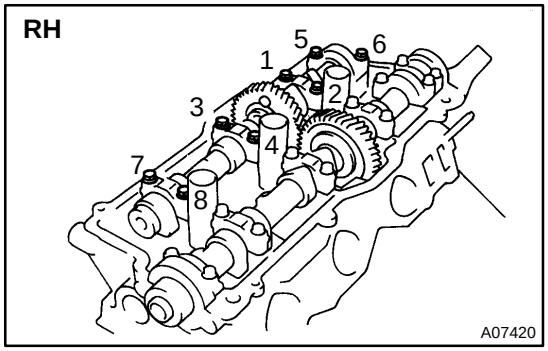
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)



(b) Install the exhaust camshaft of the RH cylinder head.
(1) Apply fresh engine oil to the thrust portion and journal of the camshaft.
(2) Align the timing marks (2 dot marks) of the camshaft drive and driven gears.
(3) Place the exhaust camshaft on the cylinder head.



(4) Install the 4 bearing caps in their proper locations.



(5) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
(6) Install and uniformly tighten the 8 bearing cap bolts, in several passes, in the sequence shown.

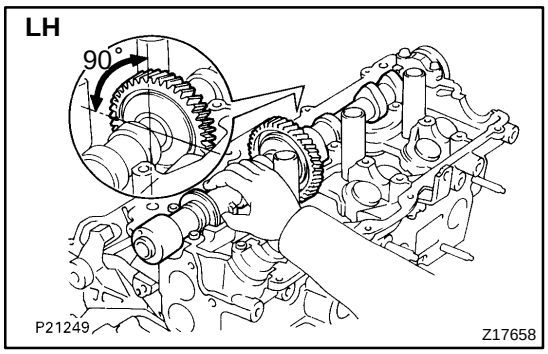
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)

(7) Remove the service bolt.

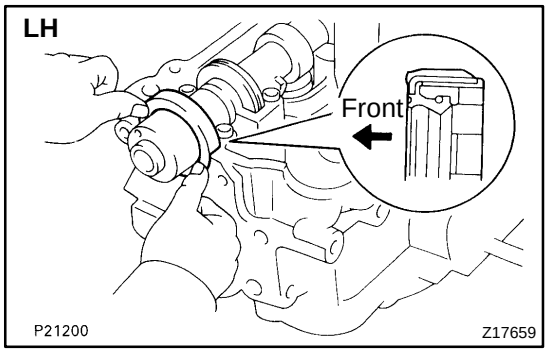
5. INSTALL CAMSHAFTS OF LH CYLINDER HEAD

NOTICE:

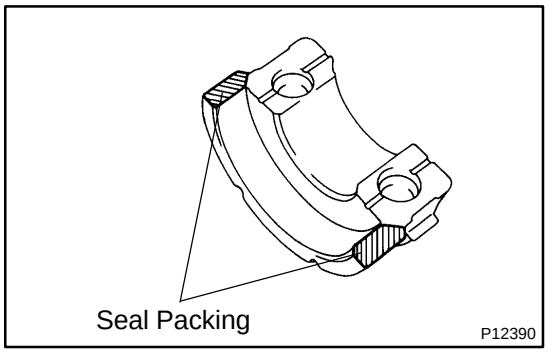
Since the thrust clearance of the camshaft is small, the camshaft must be held level while it is being installed. If the camshaft is not level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, these steps should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



(a) Install the intake camshaft of the LH cylinder head.
(1) Apply fresh engine oil to the thrust portion and journal of the camshaft.
(2) Place the intake camshaft at 90° angle of timing mark (1 dot mark) on the cylinder head.

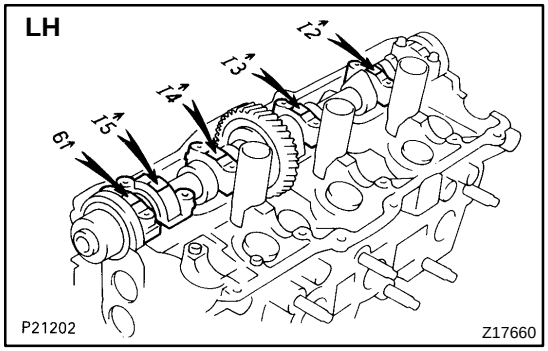


(3) Apply MP grease to a new oil seal lip.
(4) Install the oil seal to the camshaft.

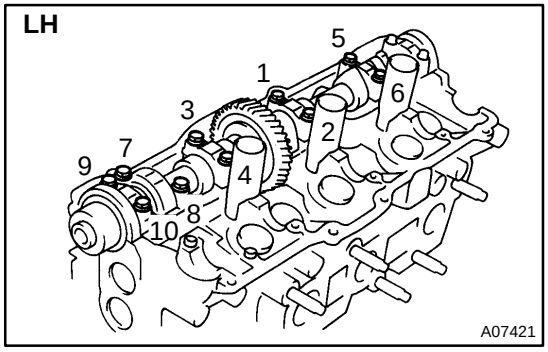


(5) Remove any old packing (FIPG) material.
(6) Apply seal packing to the No. 1 bearing cap.

Seal packing: Part No. 08826–00080 or equivalent

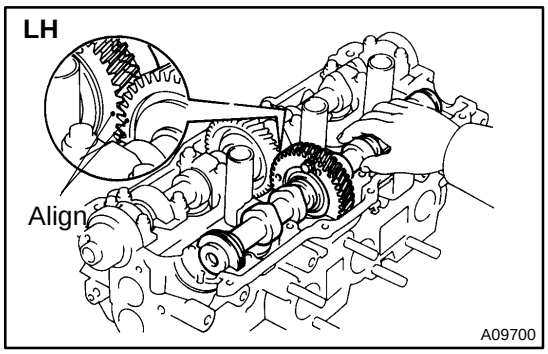


(7) Install the 5 bearing caps in their proper locations.

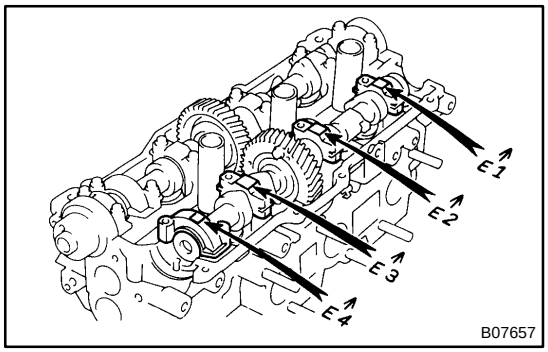


(8) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
(9) Install and uniformly tighten the 10 bearing cap bolts, in several passes, in the sequence shown.

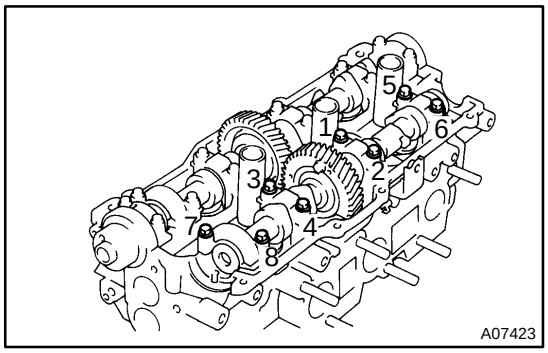
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)



(b) Install the exhaust camshaft of the LH cylinder head.
(1) Apply fresh engine oil to the thrust portion and journal of the camshaft.
(2) Align the timing marks (1 dot mark) of the camshaft drive and driven gears.
(3) Place the exhaust camshaft on the cylinder head.



(4) Install the 4 bearing caps in their proper locations.

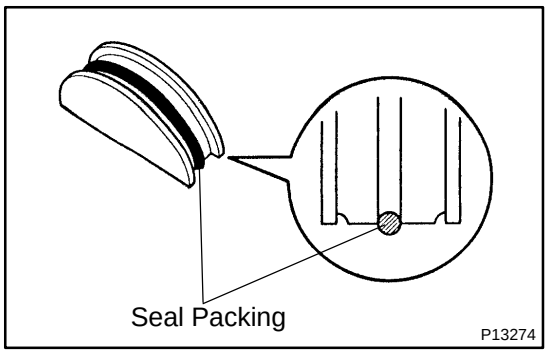


(5) Apply a light coat of engine oil on the threads and under the heads of bearing cap bolts.
(6) Install and uniformly tighten the 8 bearing cap bolts, in several passes, in the sequence shown.

Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)

(7) Remove the service bolt.

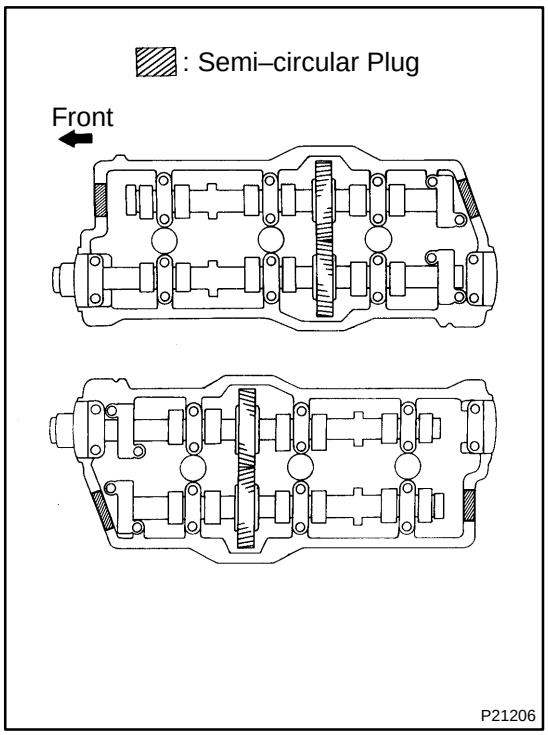
6. CHECK AND ADJUST VALVE CLEARANCE (See page EM–4)



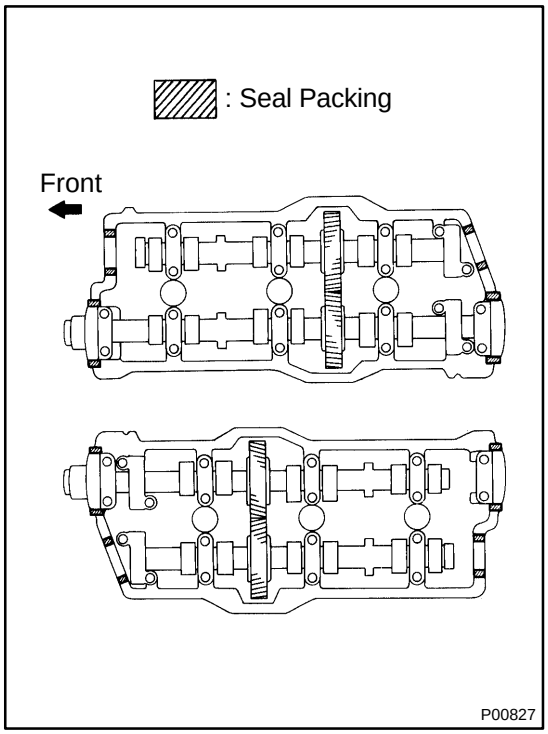
7. INSTALL SEMI–CIRCULAR PLUGS

(a) Remove any old packing (FIPG) material.
(b) Apply seal packing to the semi–circular plug grooves.

Seal packing: Part No. 08826–00080 or equivalent



(c) Install the 4 semi–circular plugs to the cylinder heads.

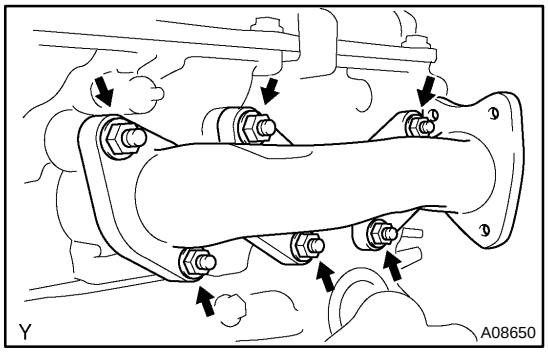


8. INSTALL CYLINDER HEAD COVERS

(a) Apply seal packing to the cylinder heads as shown in the illustration.
Seal packing: Part No. 08826–00080 or equivalent

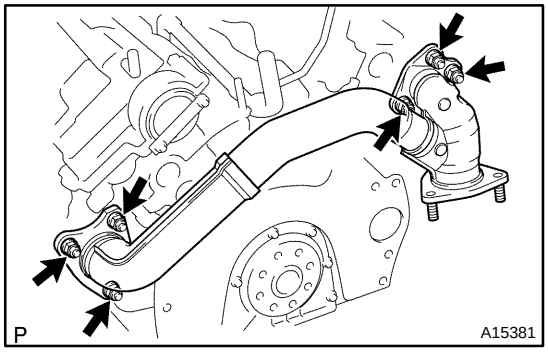
(b) Install the gasket to the cylinder head cover.

(c) Install the cylinder head cover with the 8 bolts. Uniformly tighten the bolts in several passes. Install the 2 cylinder head covers.
Torque: 6 N·m (60 kgf·cm, 53 in.·lbf)



9. INSTALL RH AND LH EXHAUST MANIFOLDS

Install 2 new gaskets and the RH and LH exhaust manifolds with the 12 nuts.
Torque: 40 N·m (400 kgf·cm, 30 ft·lbf)



10. INSTALL EXHAUST CROSSOVER PIPE

Install 2 new gaskets and the crossover pipe with 6 new nuts.

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

11. INSTALL GENERATOR BRACKET

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

12. INSTALL OIL DIPSTICK AND GUIDE

(a) Install a new O–ring to the dipstick guide.

(b) Apply soapy water to the O–ring.

(c) Push in the dipstick guide end into the guide hole of the oil pan.

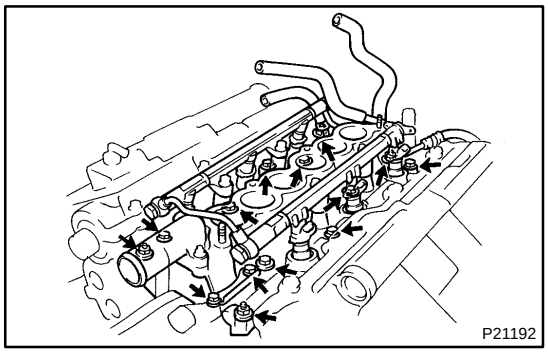
(d) Install the dipstick guide with the 2 bolts.

Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)

(e) Install the dipstick.

13. INSTALL PS PUMP BRACKET

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



14. INSTALL INTAKE MANIFOLD ASSEMBLY

(a) Install 2 new gaskets and the intake manifold, the delivery pipe and injectors assembly with the 8 bolts, 4 plate washers and 4 nuts.

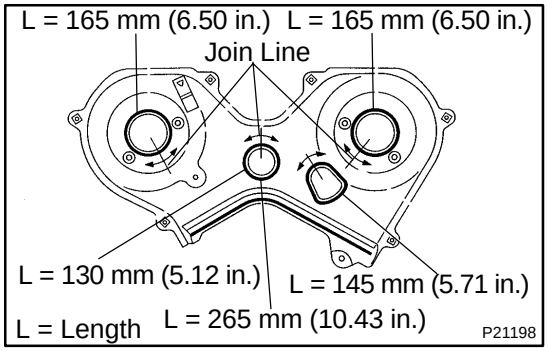
Torque: 18.5 N·m (185 kgf·cm, 13 ft·lbf)

(b) Install the intake manifold stay with the 2 bolts.

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

(c) Connect the fuel inlet hose.

15. INSTALL FUEL PRESSURE REGULATOR



16. INSTALL NO. 3 TIMING BELT COVER

(a) Check that the timing belt cover gaskets have no cracks or peeling, etc.

If the gaskets do have cracks or peeling etc., replace them using these steps:

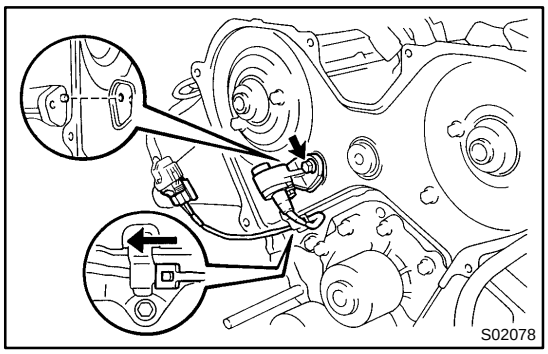
(1) Using a screwdriver and gasket scraper, remove all the old gasket materials.

(2) Thoroughly clean all components to remove all the loose material.

(3) Remove the backing paper from a new gasket and install the gasket evenly to the part of the timing belt cover shaded black in the illustration.

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

Torque: 9 N·m (90 kgf·cm, 80 in.·lbf)



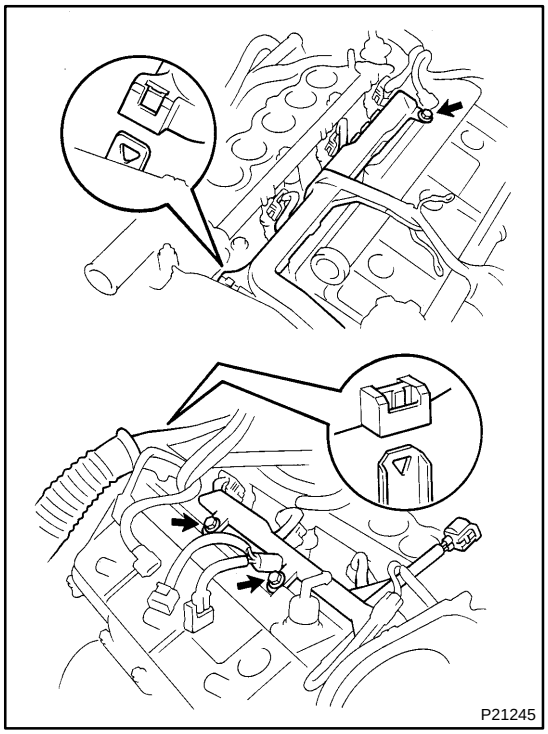
17. INSTALL CAMSHAFT POSITION SENSOR

(a) Install the camshaft position sensor with the bolt.
Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)

HINT:
Match the protrusion of the sensor with the indentation of the RH cylinder head.

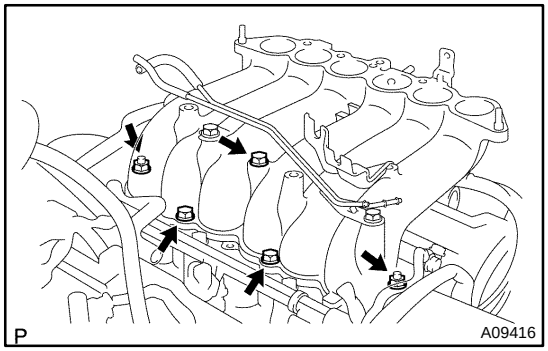
(b) Connect the clamp to the No.3 timing belt cover.
(c) Connect the camshaft position sensor connector.

18. INSTALL TIMING BELT (See page EM–20)



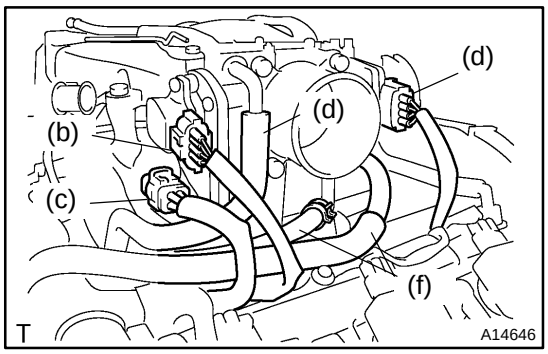
19. CONNECT ENGINE WIRE

(a) Install the engine wire with the 3 bolts.
(b) Connect the 3 engine wire clamps.
(c) Connect the oil pressure sensor connector.
(d) Connect the crankshaft position sensor connector.
(e) Connect the 6 injector connectors.
(f) Connect the ECT sender gauge connector.
(g) Connect the ECT sensor connector.
(h) Connect the knock sensor connector.
(i) Connect the camshaft position sensor connector.



20. INSTALL INTAKE AIR CONNECTOR

(a) Install a new gasket and the intake air connector with the 3 bolts and 2 nuts.
Torque: 18.5 N·m (185 kgf·cm, 13 ft·lbf)
(b) Install the bolt holding the ground strap to the intake air connector.
(c) Connect the brake booster vacuum hose to the intake air connector.
(d) Connect the 2 fuel return hoses.
(e) Connect the vacuum sensing hose.
(f) Install the bolt holding the engine wire to the intake air connector.



21. INSTALL AIR INTAKE CHAMBER ASSEMBLY

(a) Install a new gasket and the air intake chamber assembly with the 4 bolts and 2 nuts.
Torque:18.5 N·m (185 kgf·cm, 13 ft·lbf)

(b) Connect the throttle position sensor connector.

(c) Connect the throttle control motor connector.

(d) Connect the accelerator pedal position sensor connector.

(e) Connect the air hose.

(f) Connect the 2 water bypass hoses.

22. INSTALL AIR INTAKE CHAMBER STAY

(a) Install the air intake chamber stay with the 2 bolts.
Torque:
18.5 N·m (185 kgf·cm, 13 ft·lbf) for 12 mm head
40 N·m (400 kgf·cm, 30 ft·lbf) for 14 mm head

(b) A/T:
Install the oil filler tube.

(1) Install a new O–ring to the oil filler tube.

(2) Apply soapy water to the O–ring.

(3) Push in the oil filler tube end into the tube hole of the oil pan.

(4) Install the oil filler tube clamp with the bolt.

(5) Install the dipstick.

23. INSTALL GENERATOR

24. INSTALL NO. 2 IDLER PULLEY

25. CONNECT HEATER HOSE AND UPPER RADIATOR HOSE

26. CONNECT ACCELERATOR CABLE

27. INSTALL SPARK PLUGS

28. INSTALL HIGH–TENSION CORDS WITH IGNITION COILS (See page IG–1)

29. INSTALL MAF METER, RESONATOR AND AIR CLEANER CAP ASSEMBLY

30. INSTALL FRONT EXHAUST PIPE (See page EM–103)

31. FILL WITH ENGINE COOLANT

32. START ENGINE AND CHECK FOR LEAKS

33. INSTALL ENGINE UNDER COVER

34. ROAD TEST VEHICLE

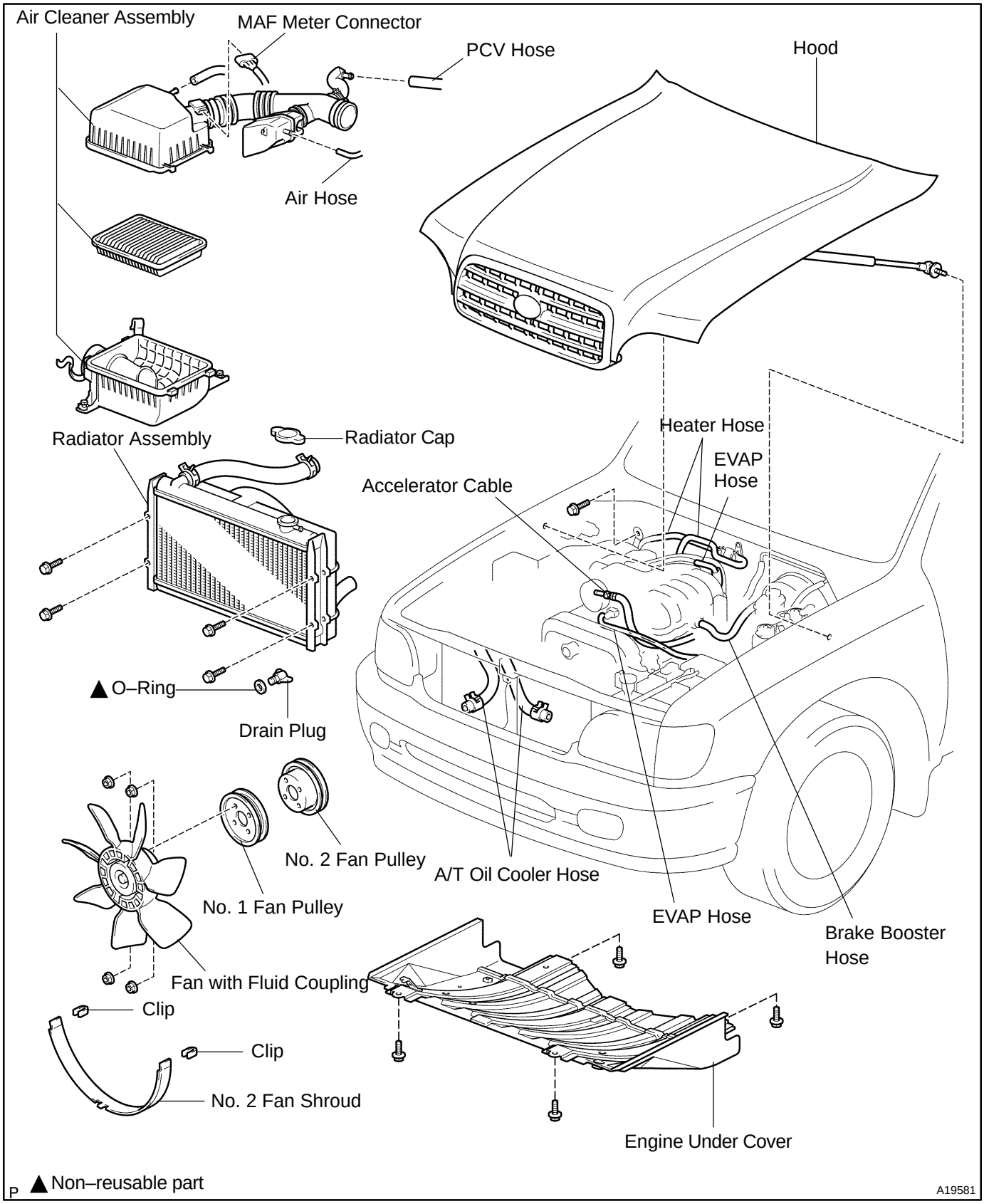
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

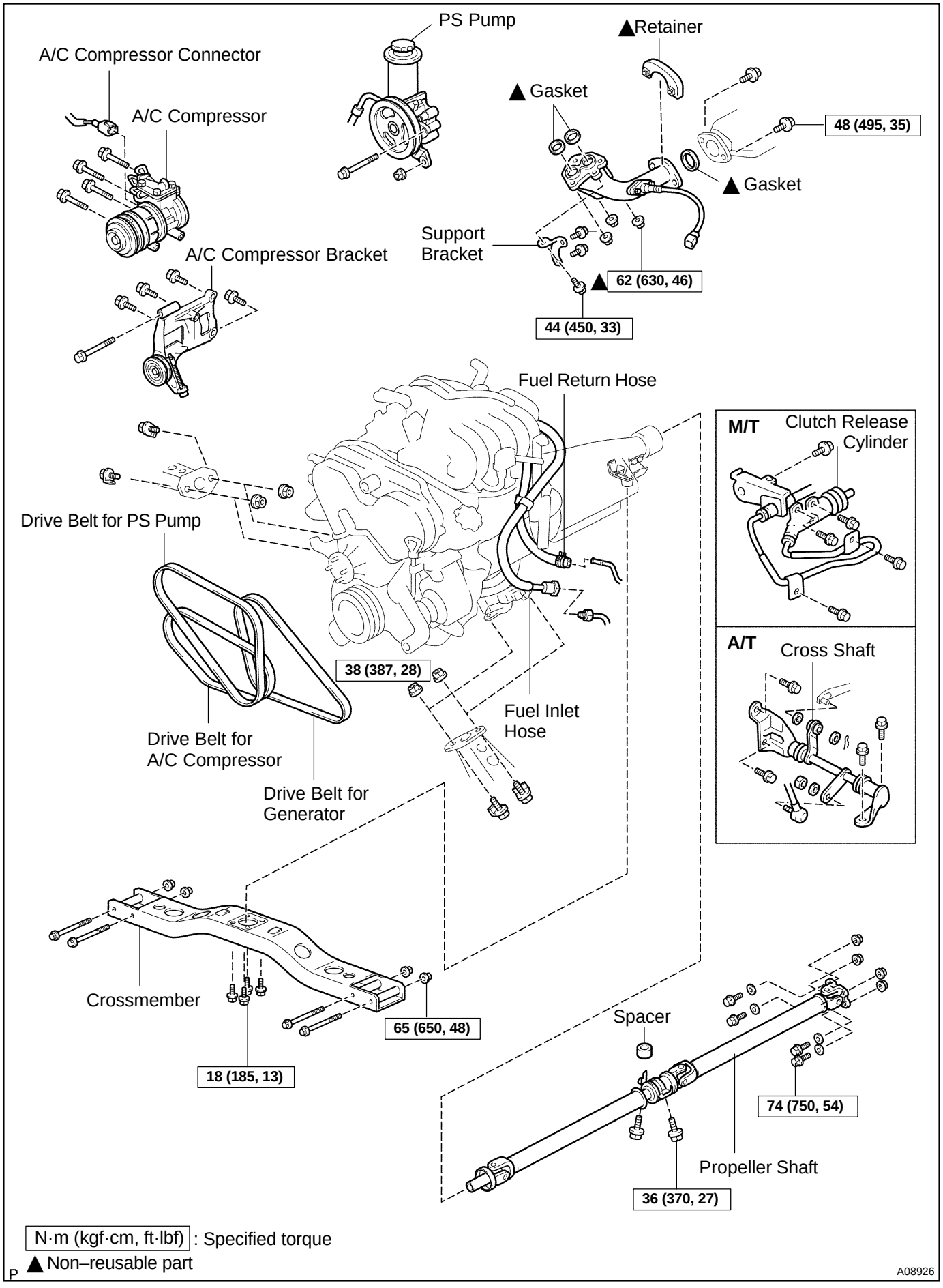
35. RECHECK ENGINE COOLANT LEVEL

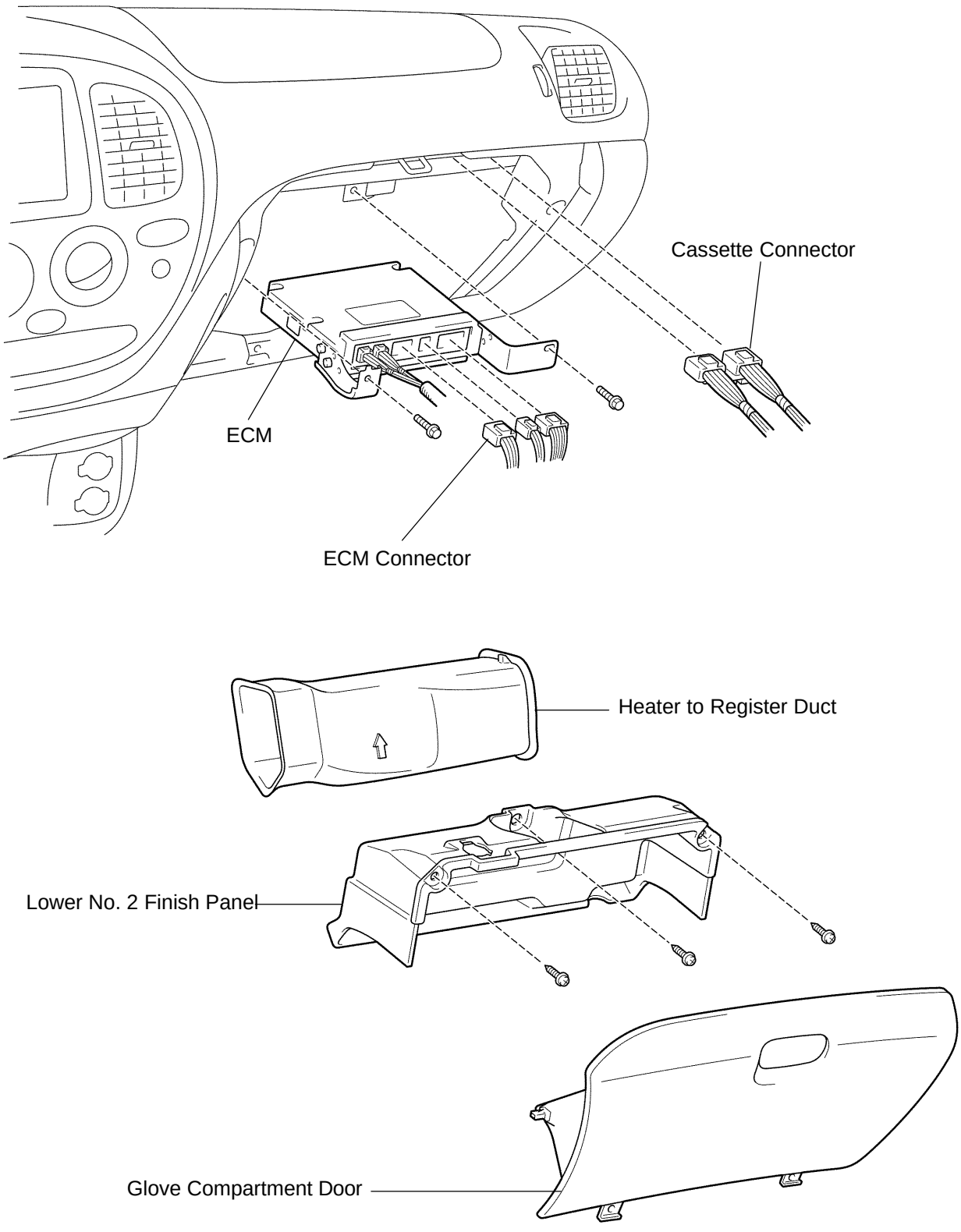
ENGINE UNIT (2WD)

EM07R–05

COMPONENTS



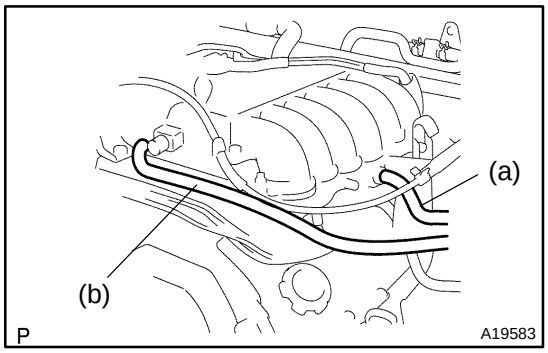

PS Pump
Retainer
A/C Compressor Connector
A/C Compressor
Gasket
48 (495, 35)
Gasket
Support Bracket
A/C Compressor Bracket
62 (630, 46)
44 (450, 33)
Fuel Return Hose
M/T
Clutch Release Cylinder
Drive Belt for PS Pump
38 (387, 28)
A/T
Cross Shaft
Fuel Inlet Hose
Drive Belt for A/C Compressor
Drive Belt for Generator
Crossmember
65 (650, 48)
18 (185, 13)
Spacer
74 (750, 54)
Propeller Shaft
36 (370, 27)
N·m (kgf·cm, ft·lbf) : Specified torque
Non–reusable part
A08926


Cassette Connector
ECM
ECM Connector
Heater to Register Duct
Lower No. 2 Finish Panel
Glove Compartment Door
P
A09155

EM12J–02

REMOVAL

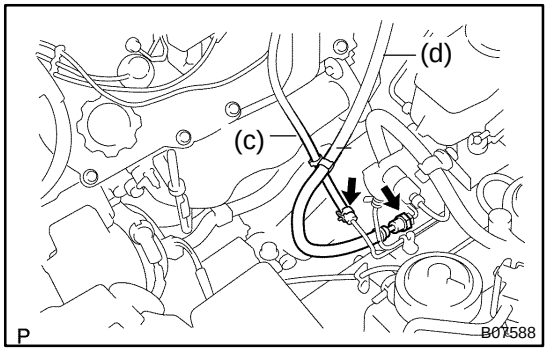
1. REMOVE ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT AND OIL
3. DRAIN TRANSMISSION OIL
4. REMOVE HOOD
5. REMOVE RADIATOR ASSEMBLY (See page CO–1)
6. DISCONNECT HEATER HOSES
7. REMOVE FAN WITH FLUID COUPLING AND FAN PULLEYS
8. REMOVE AIR CLEANER ASSEMBLY
9. DISCONNECT ACCELERATOR CABLE



10. DISCONNECT HOSES

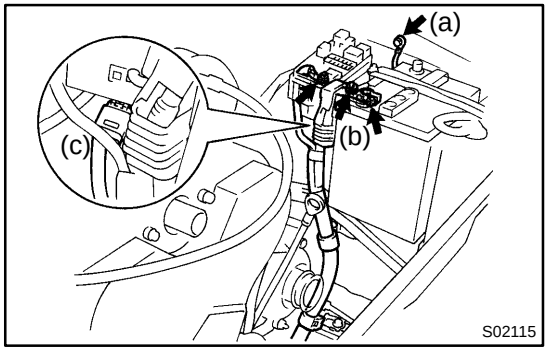
(a) Disconnect the brake booster vacuum hose.

(b) Disconnect the EVAP hose.



(c) Disconnect the fuel return hose.

(d) Disconnect the fuel inlet hose.



11. DISCONNECT STARTER WIRE AND CONNECTORS

(a) Remove the bolt, and disconnect the ground strap.

(b) Remove the 2 nuts, disconnect the positive (+) terminal cable from the battery.

(c) Disconnect the 2 starter wire clamps and 2 connectors.

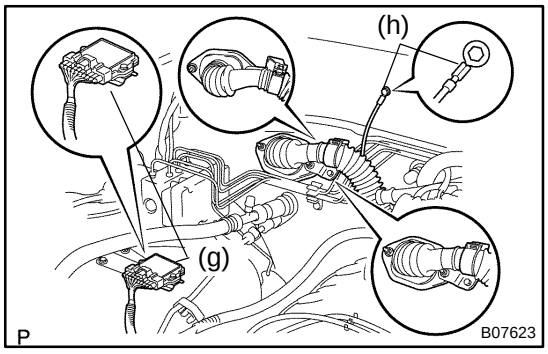
(d) Remove the nut, and disconnect the starter wire from the relay block No. 2.

12. DISCONNECT GENERATOR WIRE

13. DISCONNECT ENGINE WIRE FROM CABIN

(a) Remove the glove compartment door.

(b) Remove the lower finish No. 2 panel.
(c) Remove the heater to register duct.
(d) Remove the 2 bolts and ECM.
(e) Disconnect the 3 ECM connectors.
(f) Disconnect the 2 cassette connectors.



(g) Disconnect the igniter connector.
(h) Disconnect the ground strap.
(i) Disconnect the engine wire from the engine wire bracket, and remove the bolt, 2 nuts and bracket.
(j) Pull out the engine wire from the cabin.

14. M/T:
REMOVE SHIFT LEVER ASSEMBLY

(a) Remove the shift lever knob.
(b) Remove the 4 screws and shift lever boot.
(c) Remove the 6 bolts, the shift lever assembly and gasket.

15. REMOVE PROPELLER SHAFT (See page PR–3)

16. DISCONNECT SPEEDOMETER CABLE

NOTICE:
Do not lose the felt protector and washers.

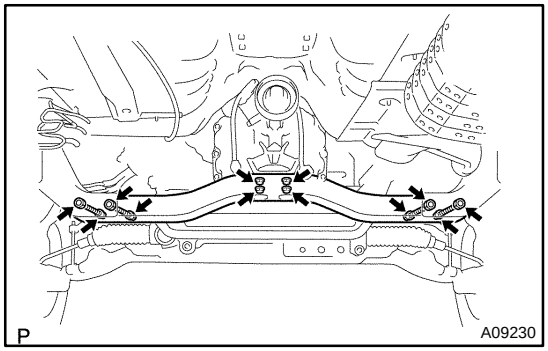
17. REMOVE FRONT EXHAUST PIPE (See page EM–103)

18. M/T:
REMOVE CLUTCH RELEASE CYLINDER

Remove the 2 bolts, and disconnect the clutch clutch release cylinder.

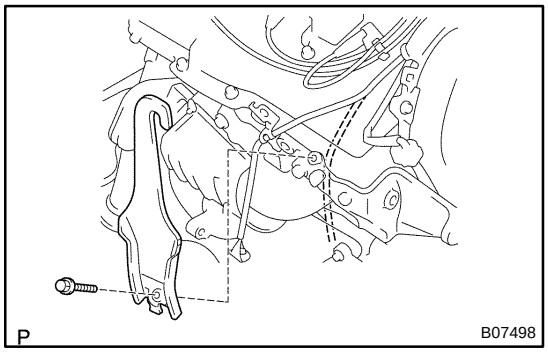
19. PLACE JACK UNDER TRANSMISSION

20. REMOVE REAR CROSSMEMBER

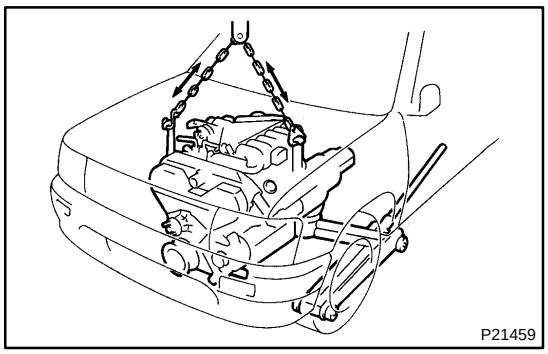


(a) Remove the 4 bolts and mounting bracket from the cross-member.
(b) Remove the 4 bolts, nuts and crossmember.

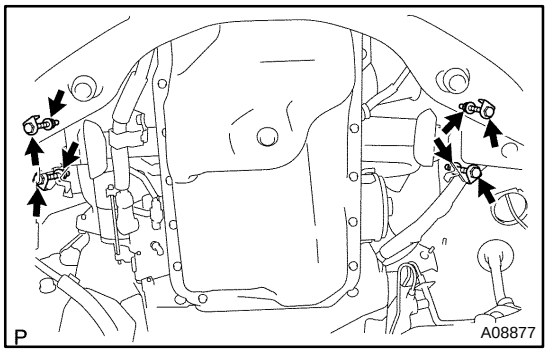
21. REMOVE ENGINE WITH TRANSMISSION



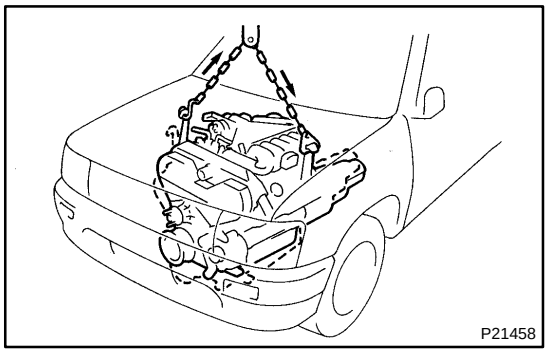
(a) Remove the bolt, and disconnect the A/C compressor wire clamp.
(b) Install a No. 2 engine hanger in the correct direction.
No. 2 engine hanger: Part No. 12282–62050
Bolt: Part No. 91512–61020
Torque: 40 N·m (400 kgf·cm, 30 ft·lbf)



(c) Attach the engine hoist chain to the 2 engine hangers.



(d) Remove the 4 bolts and nuts holding the engine front mounting insulators to the frame.



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

NOTICE:

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

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

22. SEPARATE ENGINE AND TRANSMISSION

EM06Y–04

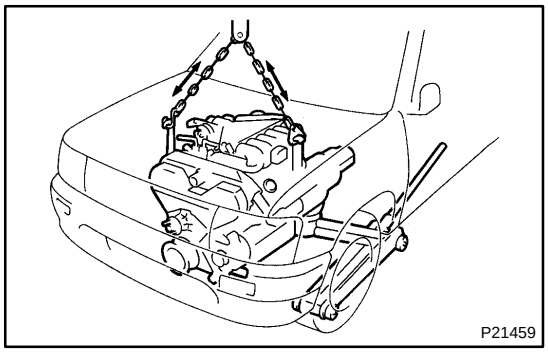
INSTALLATION

1. INSTALL TRANSMISSION TO ENGINE
(A/T: See page AT–28)
(M/T: See page MT–3)

2. INSTALL ENGINE AND TRANSMISSION ASSEMBLY IN VEHICLE

(a) Attach the engine hoist chain to the engine hangers.

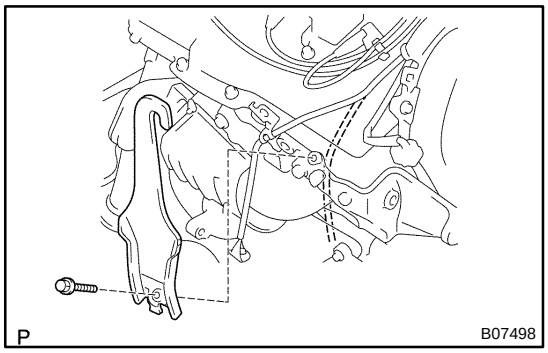
(b) Lower the engine and transmission assembly into the engine compartment.



(c) Keep the engine level, and align the RH and LH mountings and body mountings.

(d) Attach the RH and LH mounting insulators to the body mountings, and temporarily install the 4 bolts and nuts.

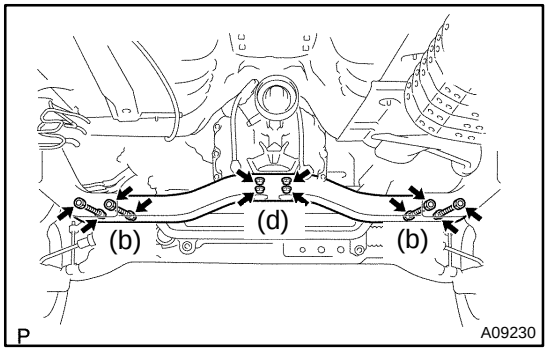
(e) Jack up and put the transmission onto the frame.



(f) Remove the engine chain hoist from the engine.

(g) Remove the 2 bolts and No. 2 engine hanger.

(h) Connect the A/C compressor wire with the bolt.



3. INSTALL ENGINE REAR CROSSMEMBER

(a) Raise the transmission slightly by raising the engine with a jack and a wooden block under the transmission.

(b) Install the 4 bolts, nuts and crossmenber.
Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)

(c) Lower the transmission and rest it on the extension housing.

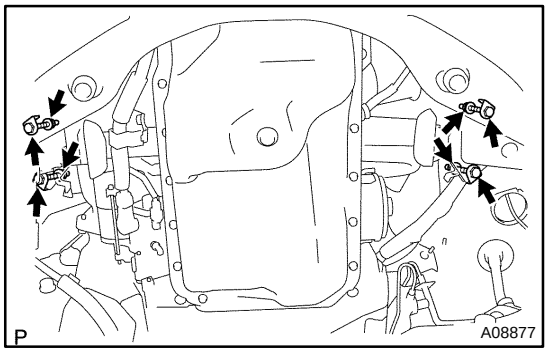
(d) Install the crossmember mounting bracket with the 4 bolts.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

4. TIGHTEN RH AND LH ENGINE MOUNTING INSULATOR BOLTS AND NUTS

Tighten the 4 bolts and nuts holding the mounting insulators to the body mountings.
Torque: 38 N·m (387 kgf·cm, 28 ft·lbf)

5. M/T:
INSTALL CLUTCH RELEASE CYLINDER

Install the clutch release cylinder with the 2 bolts.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)



6. INSTALL FRONT EXHAUST PIPE (See page EM–103)

7. CONNECT SPEEDOMETER CABLE

8. INSTALL PROPELLER SHAFT (See page PR–8)

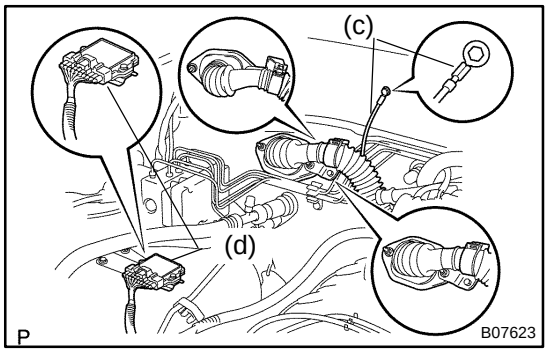
9. M/T:

INSTALL SHIFT LEVER ASSEMBLY

(a) Install a new gasket and the shift lever assembly with the 6 bolts.

(b) Install the shift lever boot with the 4 screws.

(c) Install the shift lever knob.



10. CONNECT ENGINE WIRE TO CABIN

(a) Push in the engine wire through the cowl panel.

(b) Install the bolt and 2 nuts.

(c) Connect the ground strap.

(d) Connect the igniter connector.

(e) Connect the 3 ECM connectors.

(f) Connect the 2 cassette connectors.

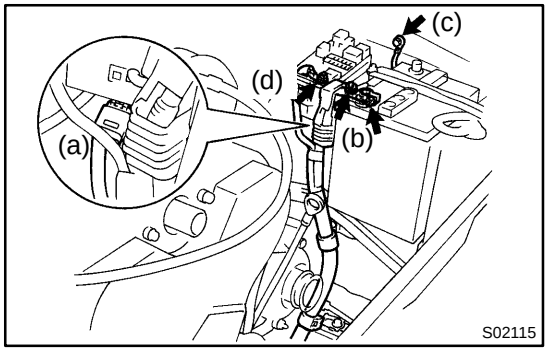
(g) Install the ECM with the 2 bolts.

(h) Install the heater to register duct.

(i) Install the lower finish No. 2 panel.

(j) Install the glove compartment door.

11. CONNECT GENERATOR WIRE (See page CH–15)



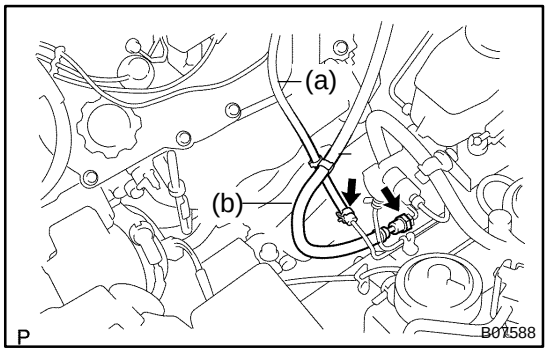
12. CONNECT STARTER WIRE AND CONNECTOR

(a) Connect the 2 starter wire clamps and connector.

(b) Connect the positive (+) terminal cable to the battery with the 2 nuts.

(c) Connect the ground strap with the bolt.

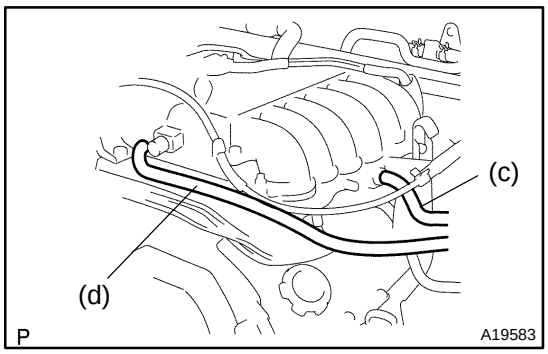
(d) Connect the stater wire to the relay block No. 2 with the nut.



13. CONNECT HOSES

(a) Connect the fuel return hose.

(b) Connect the fuel inlet hose (See page SF–1).



(c) Connect the brake booster vacuum hose.
(d) Connect the EVAP hose.
(e) Connect the heater hoses.

14. CONNECT ACCELERATOR CABLE
15. INSTALL FAN WITH FLUID COUPLING AND FAN PULLEYS
16. INSTALL RADIATOR ASSEMBLY (See page CO–24)
17. INSTALL AIR CLEANER ASSEMBLY
18. FILL WITH ENGINE OIL AND COOLANT
19. FILL TRANSMISSION OIL
20. START ENGINE AND CHECK FOR LEAKS
21. INSTALL ENGINE UNDER COVER
22. INSTALL HOOD
23. ROAD TEST VEHICLE

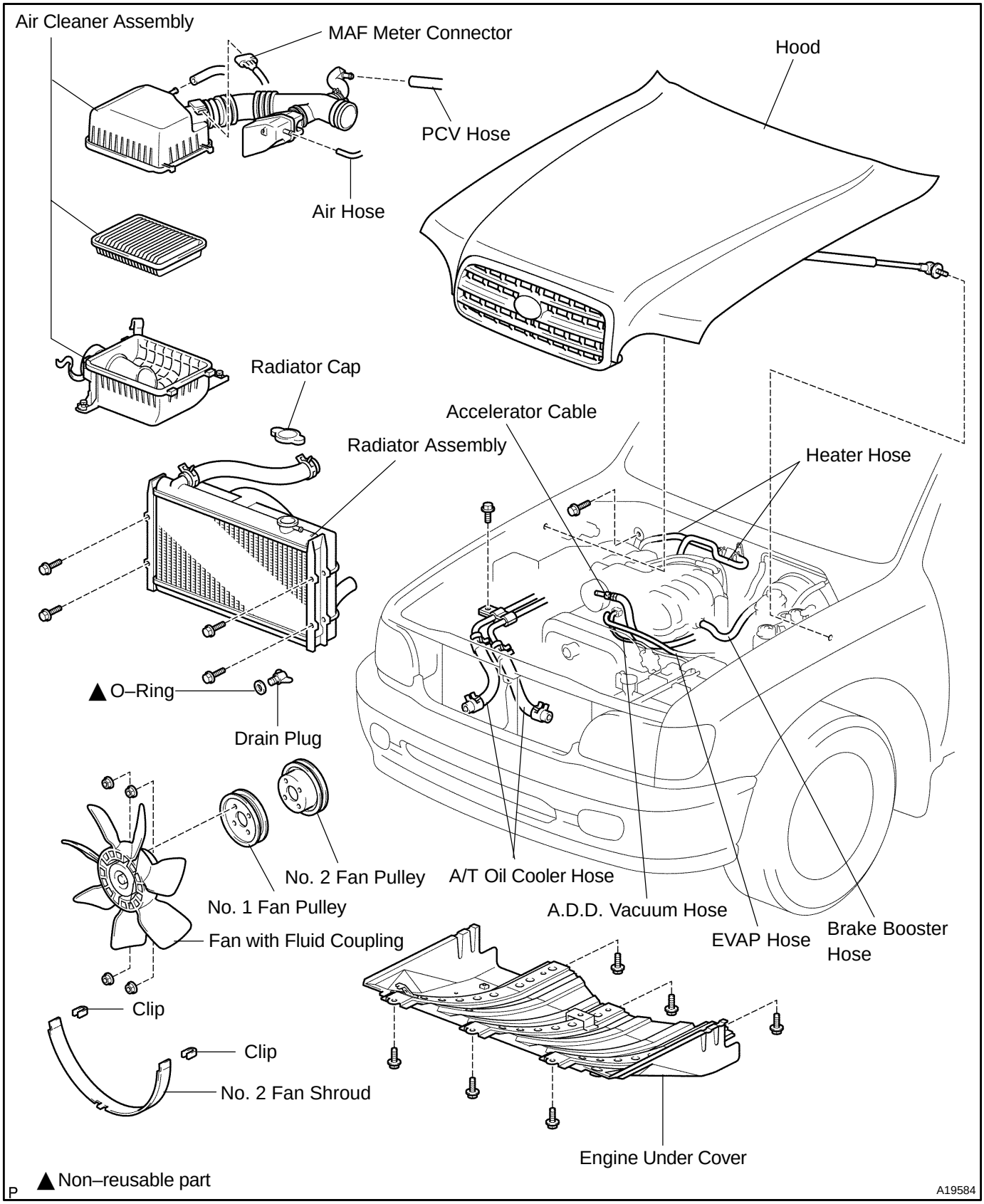
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

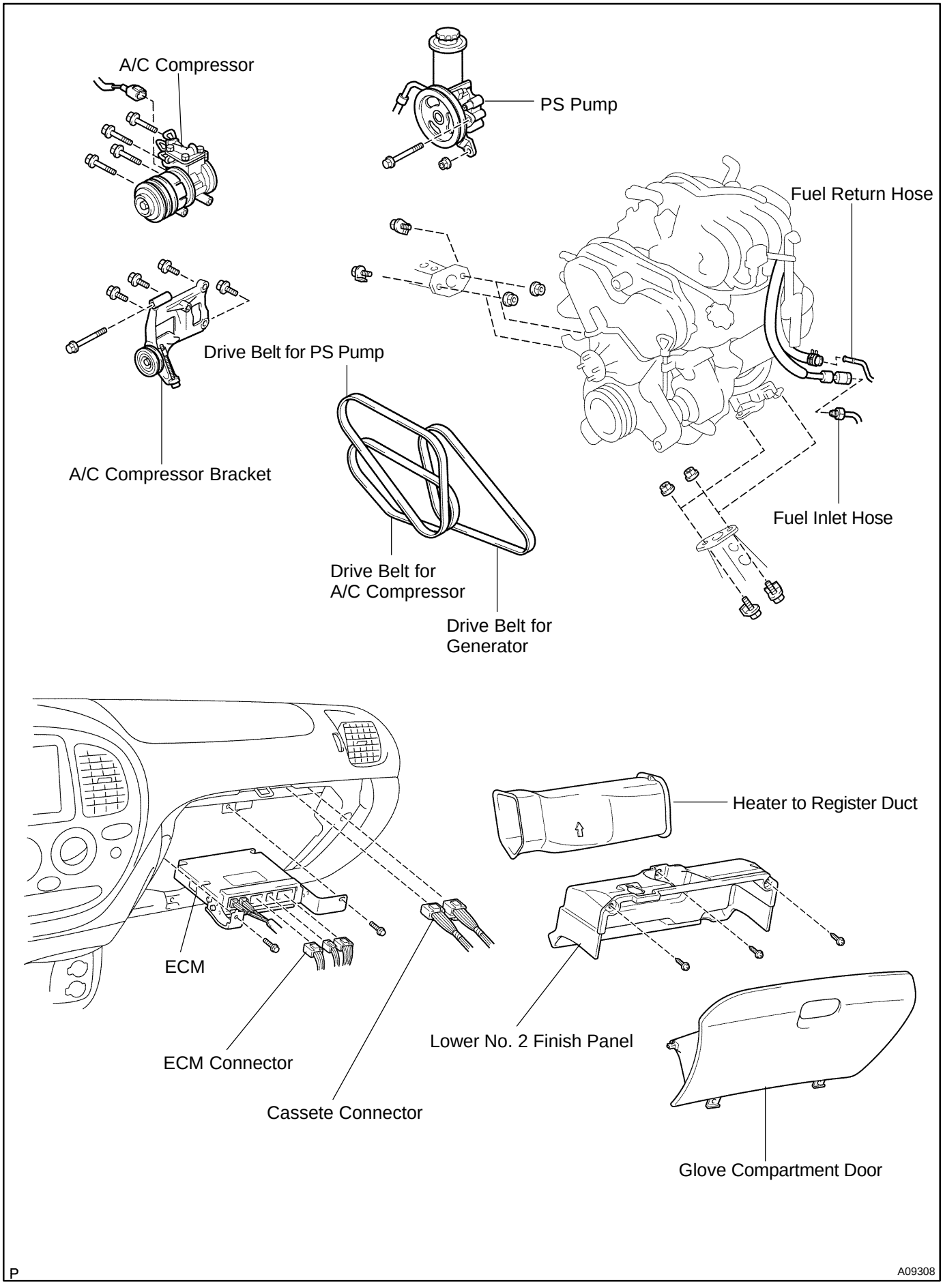
24. RECHECK ENGINE COOLANT AND ENGINE OIL LEVELS

ENGINE UNIT (4WD)

EM07S–03

COMPONENTS

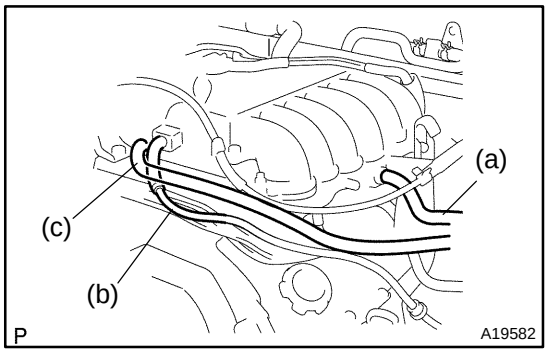



A/C Compressor
PS Pump
Fuel Return Hose
Drive Belt for PS Pump
A/C Compressor Bracket
Fuel Inlet Hose
Drive Belt for
A/C Compressor
Drive Belt for
Generator
Heater to Register Duct
ECM
ECM Connector
Cassete Connector
Lower No. 2 Finish Panel
Glove Compartment Door
P
A09308

EM12K–02

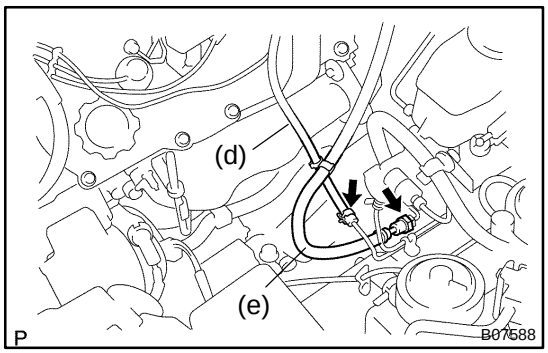
REMOVAL

1. REMOVE ENGINE UNDER COVER
2. REMOVE TRANSMISSION (See page MT–3)
3. DRAIN ENGINE COOLANT
4. DRAIN ENGINE OIL
5. REMOVE HOOD
6. REMOVE AIR CLEANER CAP, MAF METER AND RESONATOR
7. REMOVE AIR CLEANER ASSEMBLY
8. REMOVE RADIATOR ASSEMBLY (See page CO–19)
9. REMOVE FAN WITH FLUID COUPLING AND FAN PULLEYS (See page EM–14)
10. REMOVE A/C COMPRESSOR BRACKET
11. DISCONNECT ACCELERATOR CABLE
12. DISCONNECT HEATER HOSES

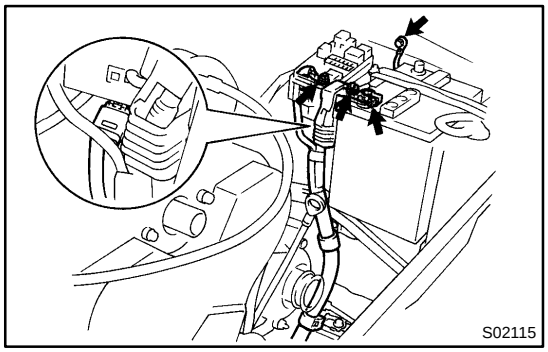


13. DISCONNECT HOSES

(a) Disconnect the brake booster vacuum hose.
(b) Disconnect the A.D.D. vacuum hose.
(c) Disconnect the EVAP hose.

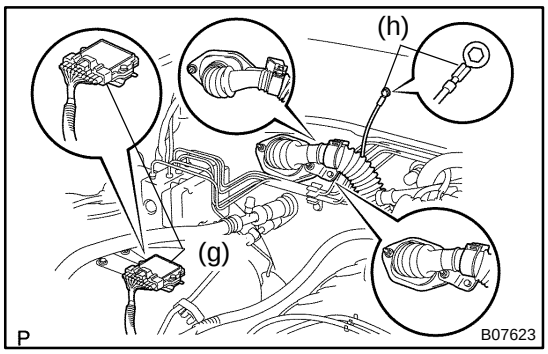


(d) Disconnect the fuel return hose.
(e) Disconnect the fuel inlet hose.



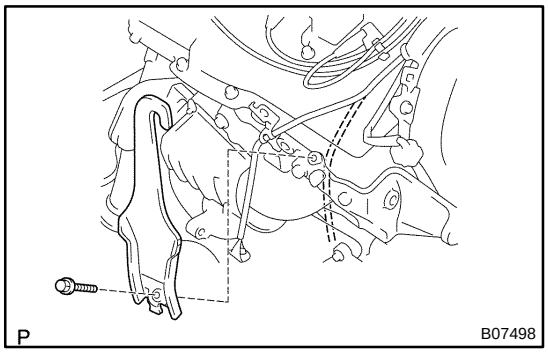
14. DISCONNECT STARTER WIRE AND CONNECTORS

(a) Remove the bol,t and disconnect the ground strap.
(b) Remove the 2 nut, and disconnect the positive (+) terminal cable from the battery.
(c) Disconnect the 3 starter wire clamps and connector.
(d) Disconnect the stater wire with the nut from the relay block No. 2.



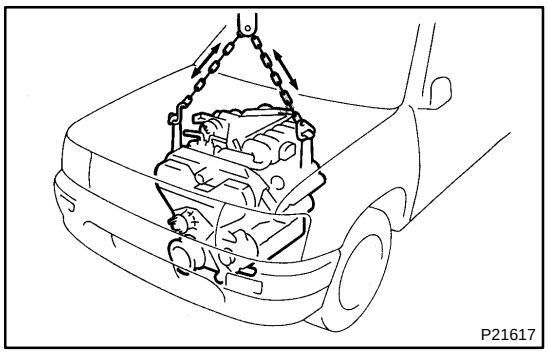
15. DISCONNECT ENGINE WIRE FROM CABIN

(a) Remove the glove compartment door.
(b) Remove the lower finish No. 2 panel.
(c) Remove the heater to register duct.
(d) Remove the 2 bolts and ECM.
(e) Disconnect the 3 ECM connectors.
(f) Disconnect the 2 cassette connectors.
(g) Disconnect the igniter connector.
(h) Disconnect the ground strap.
(i) Remove the bolt and 2 nuts.
(j) Pull out the engine wire from the cabin.

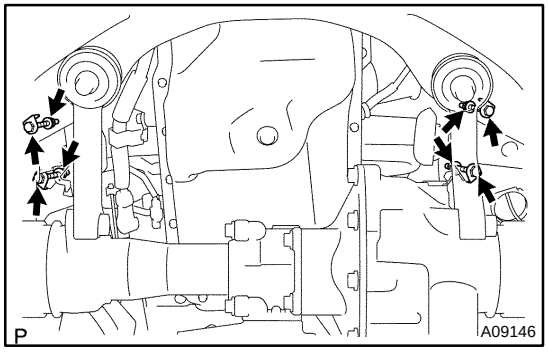


16. REMOVE ENGINE

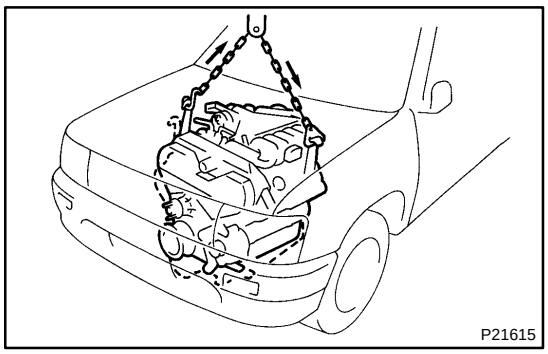
(a) Remove the bolt, and disconnect the A/C compressor wire clamp.
(b) Install a engine hanger No.2 in the correct direction.
No. 2 engine hanger: Part No. 12282–62050
Bolt: Part No. 91512–61020



(c) Attach the engine hoist chain to the 2 engine hangers.



(d) Remove the 4 bolts and nuts holding the engine front mounting insulators to the frame.



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

NOTICE:

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

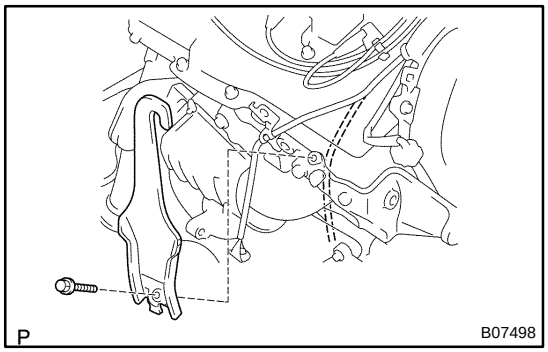
(f) Place the engine assembly onto the stand.

EM1UZ–01

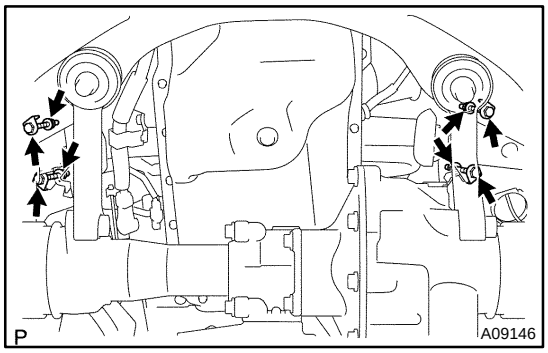
INSTALLATION

1. INSTALL ENGINE ASSEMBLY IN VEHICLE

(a) Attach the engine hoist chain to the engine hangers.
(b) Lower the engine assembly into the engine compartment.
(c) Keep the engine level, and align the RH, LH mountings and body mountings.
(d) Attach the RH and LH mounting insulators to the body mountings, and temporarily install the 4 bolts and nuts.
(e) Remove the engine chain hoist from the engine.



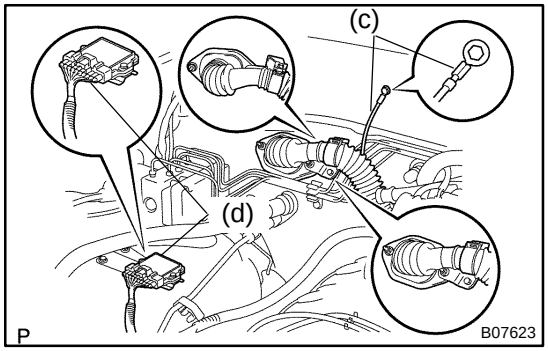
(f) Remove the bolt and No. 2 engine hanger.
(g) Install the bolt and connect the A/C compressor wire.



2. TIGHTEN RH AND LH ENGINE MOUNTING INSULATOR BOLTS AND NUTS

Tighten the 4 bolts and nuts holding the mounting insulators to the body mountings.

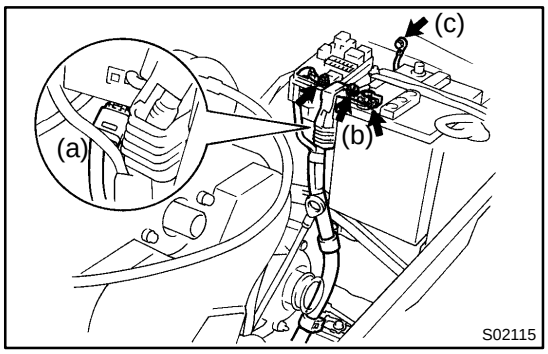
Torque: 38 N·m (385 kgf·cm, 28 ft·lbf)



3. CONNECT ENGINE WIRE TO CABIN

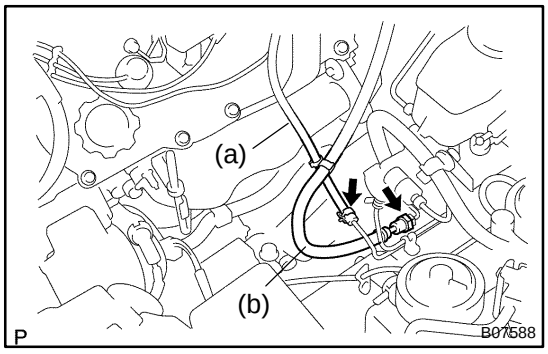
(a) Push in the engine wire through the cowl panel.
(b) Install the engine wire bracket with the bolt and 2 nuts, and connect the wire to the bracket.
(c) Connect the ground strap.
(d) Connect the igniter connector.
(e) Connect the 3 ECM connectors.
(f) Connect the 2 cassette connectors.
(g) Install the ECM with the 2 bolts.
(h) Install the heter to register duct.
(i) Install the lower finish No. 2 panel.
(j) Install the glove compartment door.

4. CONNECT GENERATOR WIRE (See page CH–15)



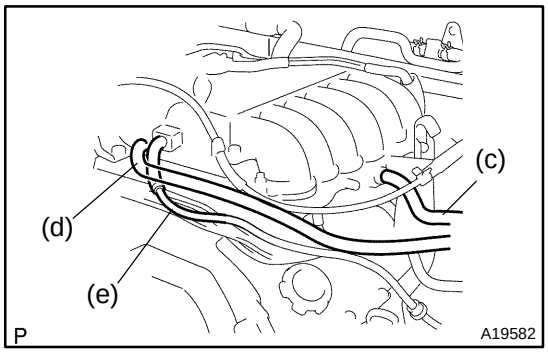
5. CONNECT STARTER WIRE AND CONNECTOR

(a) Connect the 3 starter wire clamps and connector.
(b) Connect the positive (+) terminal cable to the battery with the 2 nuts.
(c) Connect the ground strap with the bolt.
(d) Connect the stater wire with the nut to the relay block No. 2.



6. CONNECT HOSES

(a) Connect the fuel return hose.
(b) Connect the fuel inlet hose.



(c) Connect the brake booster vacuum hose.
(d) Connect the EVAP hose.
(e) Connect the A.D.D. vacuum hose.
(f) Connect the heater hoses.

7. CONNECT HEATER HOSES

8. CONNECT ACCELERATOR CABLE:

9. INSTALL A/C COMPRESSOR BRACKET

10. INSTALL FAN WITH FLUID COUPLING AND FAN PULLEYS (See page EM–20)

11. INSTALL RADIATOR ASSEMBLY (See page CO–24)

12. INSTALL AIR CLEANER CASE AND AIR FILTER

13. INSTALL MAF METER, RESONATOR AND AIR CLEANER CAP

14. FILL WITH ENGINE OIL

15. FILL WITH ENGINE COOLANT

16. INSTALL ENGINE UNDER COVER

17. INSTALL TRANSMISSION (See page MT–3)

18. INSTALL HOOD

19. PERFORM ROAD TEST

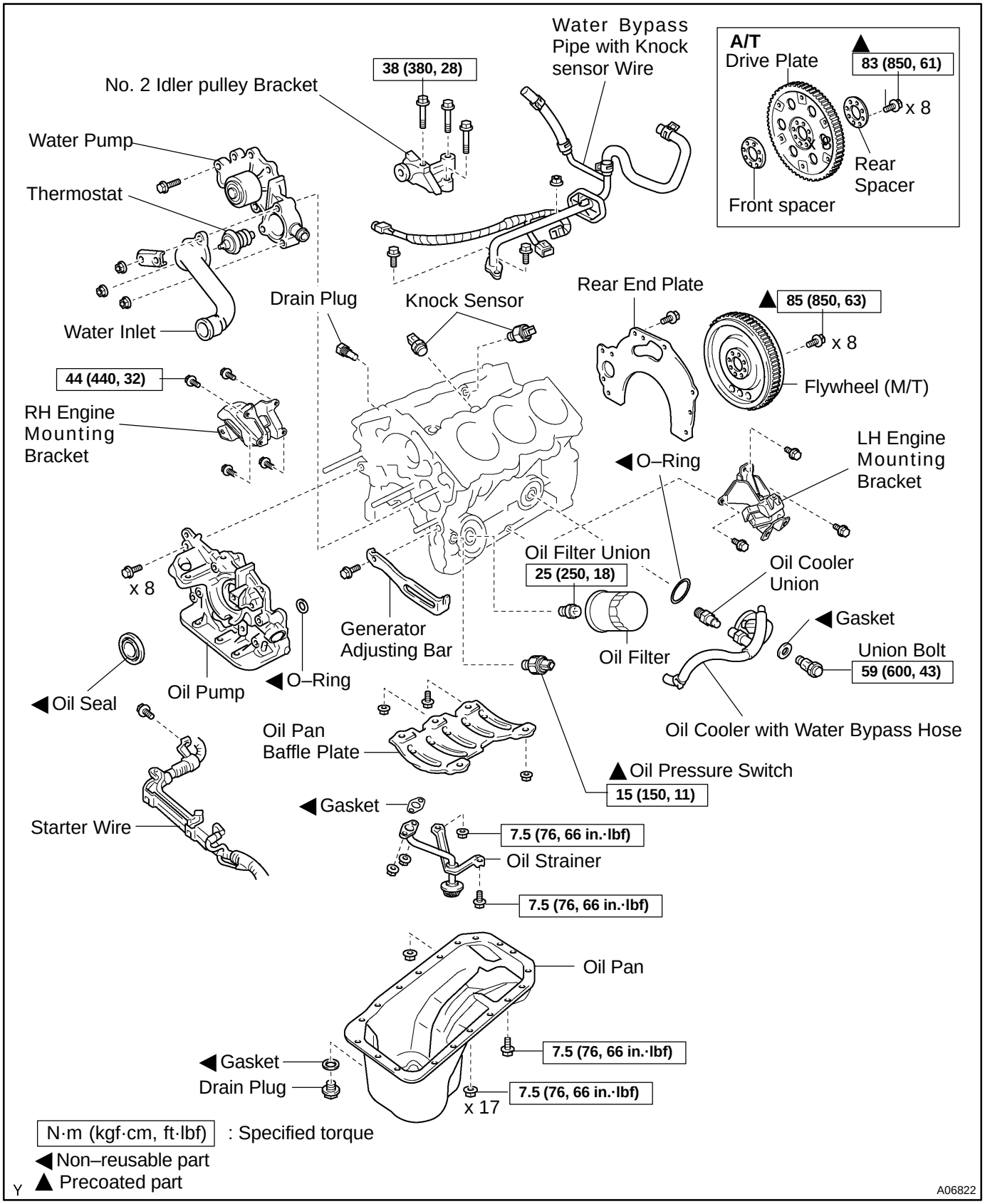
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

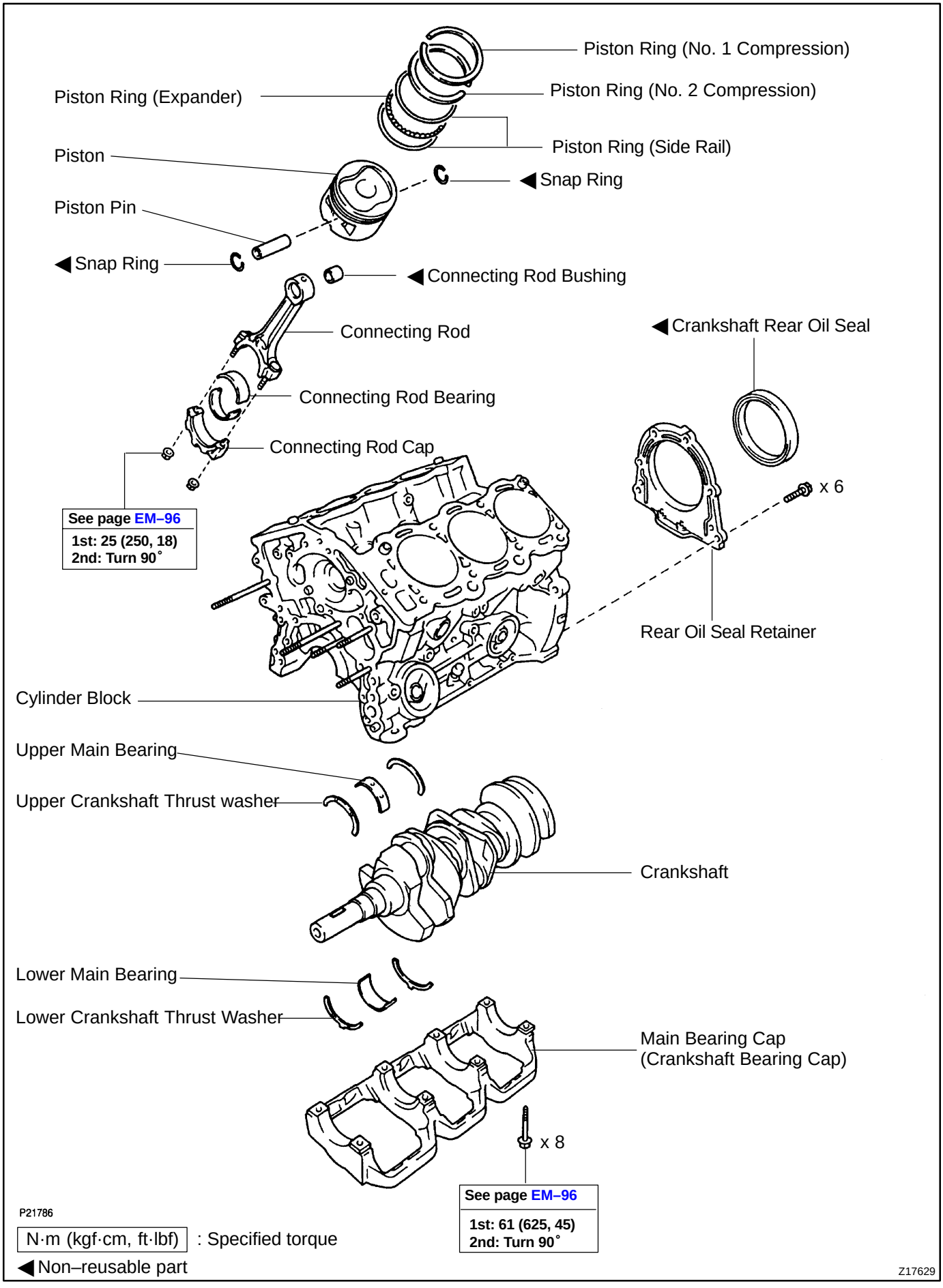
20. RECHECK ENGINE COOLANT AND ENGINE OIL LEVELS

CYLINDER BLOCK

COMPONENTS

EM12M–01




Piston Ring (No. 1 Compression)
Piston Ring (Expander)
Piston Ring (No. 2 Compression)
Piston Ring (Side Rail)
Piston
◀ Snap Ring
Piston Pin
◀ Snap Ring
◀ Connecting Rod Bushing
Connecting Rod
◀ Crankshaft Rear Oil Seal
Connecting Rod Bearing
Connecting Rod Cap
x 6
See page EM–96
1st: 25 (250, 18)
2nd: Turn 90°
Rear Oil Seal Retainer
Cylinder Block
Upper Main Bearing
Upper Crankshaft Thrust washer
Crankshaft
Lower Main Bearing
Lower Crankshaft Thrust Washer
Main Bearing Cap
(Crankshaft Bearing Cap)
x 8
See page EM–96
1st: 61 (625, 45)
2nd: Turn 90°
P21786
N·m (kgf·cm, ft·lbf) : Specified torque
◀ Non–reusable part
Z17629

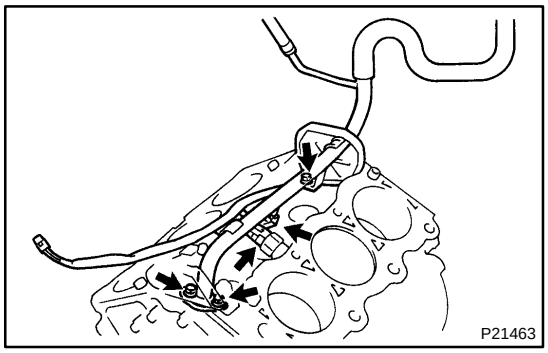
EM07V–02

DISASSEMBLY

1. **M/T:**
   REMOVE FLYWHEEL
2. **A/T:**
   REMOVE DRIVE PLATE
3. **REMOVE REAR END PLATE**

Remove the bolt and end plate.

4. **INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY**
5. **REMOVE TIMING BELT AND PULLEYS (See page EM–14)**
6. **REMOVE CYLINDER HEADS (See page EM–31)**

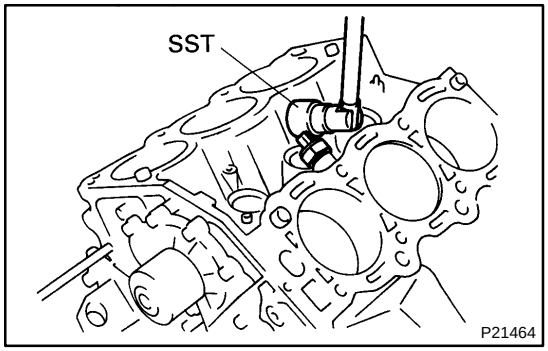


7. **REMOVE WATER BYPASS PIPE WITH KNOCK SENSOR WIRE**

(a) Disconnect the 2 knock sensor connectors.
(b) Remove the 2 bolts, nut and water bypass pipe.

8. **REMOVE NO. 2 IDLER PULLEY BRACKET**

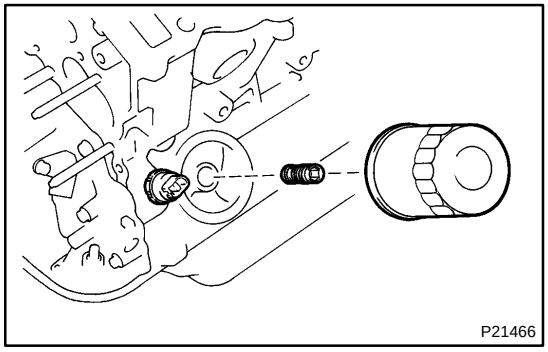
Remove the 3 bolts and idler pulley bracket.



9. **REMOVE KNOCK SENSORS**

Using SST, remove the 2 knock sensors.
SST 09817–16011

10. **REMOVE WATER PUMP (See page CO–6)**
11. **REMOVE GENERATOR ADJUSTING BAR**



12. **REMOVE OIL FILTER AND OIL FILTER UNION**

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

13. **REMOVE OIL PRESSURE SWITCH**

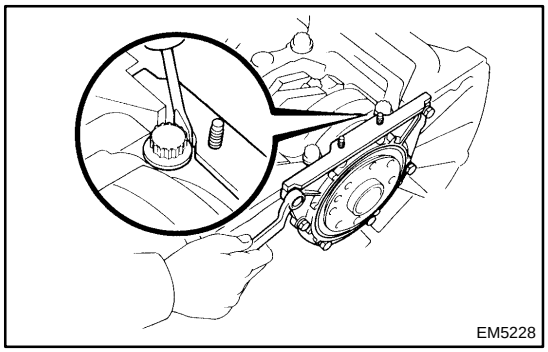
Using SST, remove the oil pressure switch.
SST 09816–30010

14. **REMOVE RH AND LH ENGINE MOUNTING BRACKETS**
15. **REMOVE COOLANT DRAIN COCK**

16. w/o Oil Cooler:
REMOVE OIL HOLE COVER PLATE

17. w/ Oil Cooler:
REMOVE OIL COOLER WITH WATER BYPASS HOSE AND OIL COOLER UNION (See page LU–19)

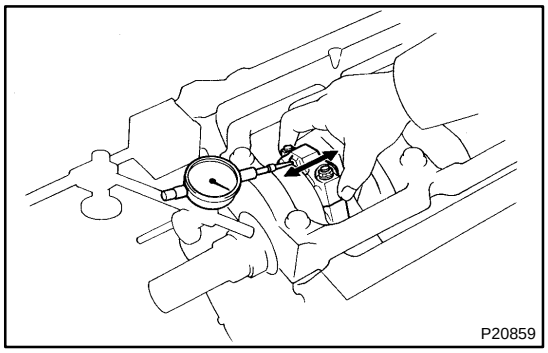
18. REMOVE OIL PUMP (See page LU–9)



19. REMOVE REAR OIL SEAL RETAINER

(a) Remove the 6 bolts.

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

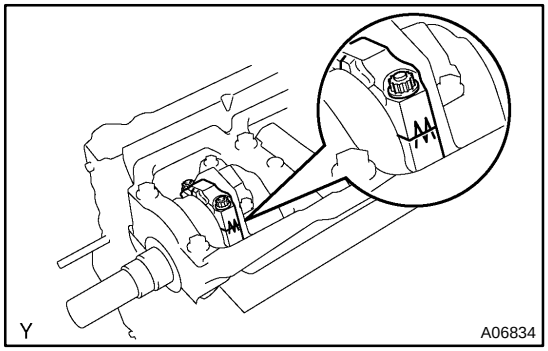


20. CHECK CONNECTING ROD THRUST CLEARANCE

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

Standard thrust clearance:
0.150 – 0.330 mm (0.0059 – 0.0130 in.)
Maximum thrust clearance: 0.38 mm (0.0150 in.)

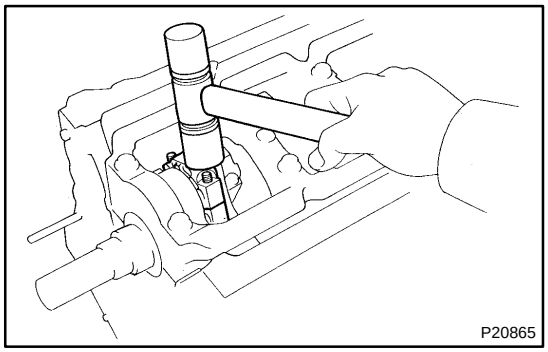
If the thrust clearance is greater than maximum, replace the connecting rod assembly. If necessary, replace the crankshaft.



21. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

(a) Check the matchmarks on the connecting rod and cap are aligned to ensure correct order.

(b) Remove the 2 connecting rod cap nuts.



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

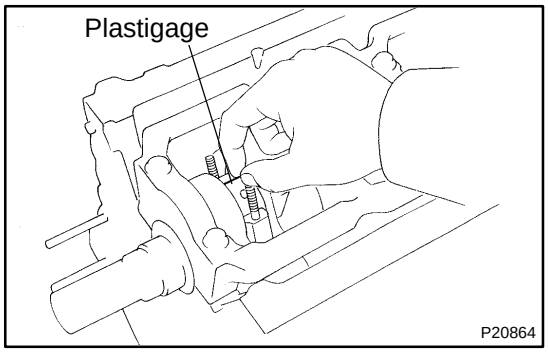
HINT:
Keep the lower bearing inserted with the connecting rod cap.

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

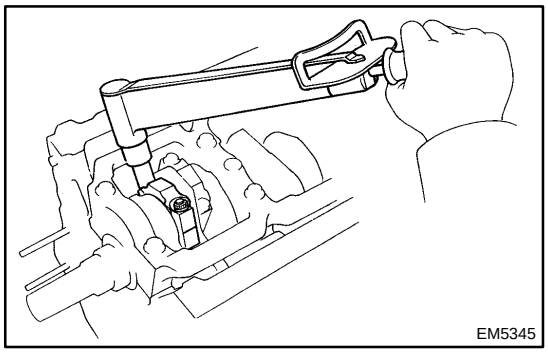
(e) Clean the crank pin and bearing.

(f) Check the crank pin and bearing for peeling and scratches.

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



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

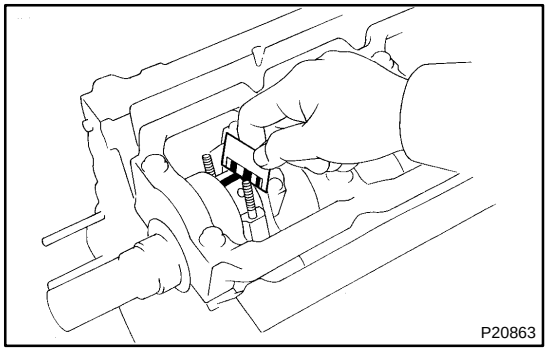


(h) Install the connecting rod cap with the 2 nuts (See page EM–96).

NOTICE:

Do not turn the crankshaft.

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



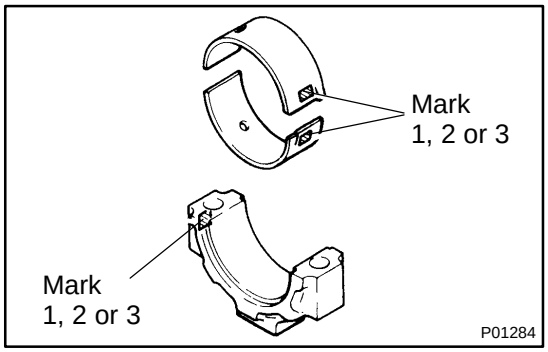
(j) Measure the Plastigage at its widest point.

Standard oil clearance:

STD	0.024 – 0.053 mm (0.0009 – 0.0021 in.)
U/S 0.25	0.023 – 0.069 mm (0.0009 – 0.0027 in.)

Maximum oil clearance: 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:

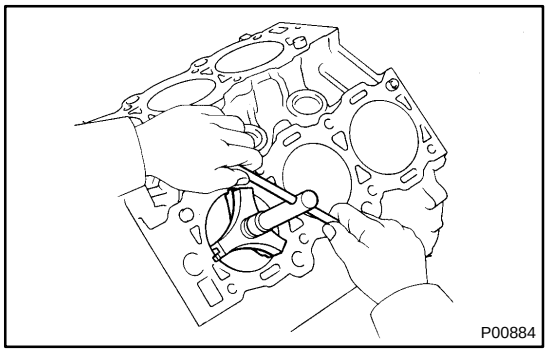
If using a standard bearing, replace with one having the same number marked on the connecting rod cap. There are 3 sizes of standard bearings, marked 1, 2 and 3 accordingly.

Reference

Standard bearing center wall thickness:

Mark 1	1.484 – 1.488 mm (0.0584 – 0.0586 in.)
Mark 2	1.488 – 1.492 mm (0.0586 – 0.0587 in.)
Mark 3	1.492 – 1.496 mm (0.0587 – 0.0589 in.)

(k) Completely remove the Plastigage.



22. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

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

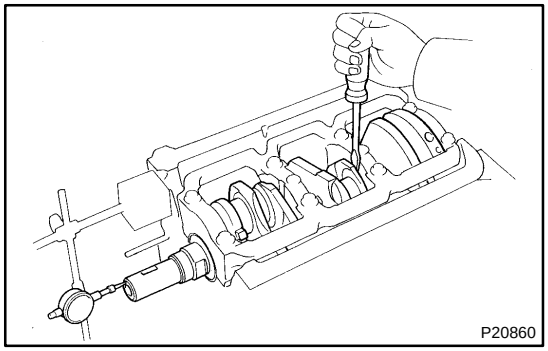
(b) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.

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

HINT:

▲ Keep the bearings, connecting rod and cap together.

▲ Arrange the piston and connecting rod assemblies in correct order.



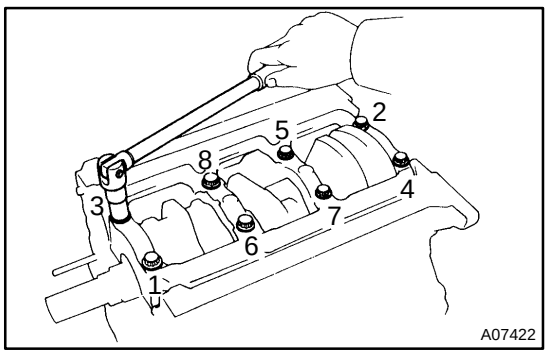
23. CHECK CRANKSHAFT THRUST CLEARANCE

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

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

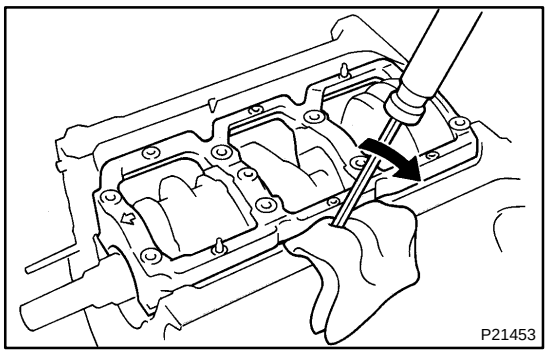
If the thrust clearance is greater than maximum, replace the thrust washers as a set.

Thrust washer thickness:
2.440 – 2.490 mm (0.0961 – 0.0980 in.)



24. REMOVE MAIN BEARING CAP AND CHECK OIL CLEARANCE

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



(b) Using a screwdriver, pry up the main bearing cap, and remove the main bearing cap, lower main bearings and lower thrust washers (No.2 journal position of main bearing cap only).

HINT:

Keep the lower main bearings and lower thrust washers together with the main bearing cap.

(c) Lift out the crankshaft.

HINT:

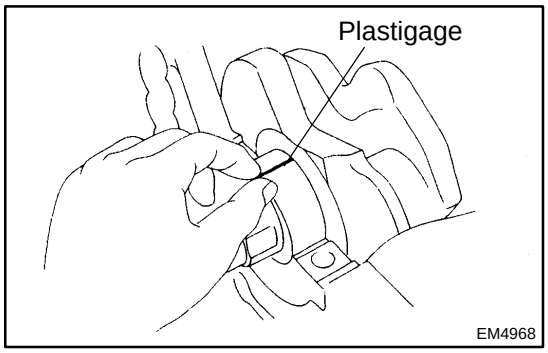
Keep the upper main bearings and upper thrust washers together with the cylinder block.

(d) Clean each main journal and bearing.

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

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

(f) Place the crankshaft on the cylinder block.



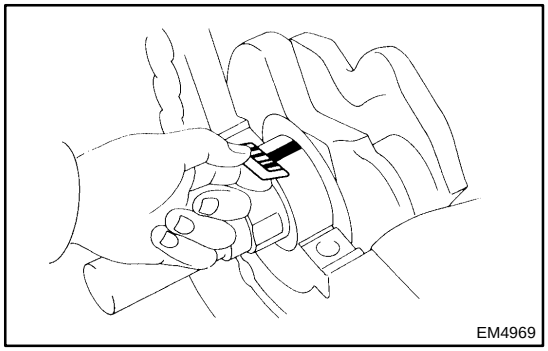
(g) Lay a strip of plasting across each journal.

(h) Install the main bearing cap with the 8 bolts (See page EM–96).

NOTICE:

Do not turn the crankshaft.

(i) Remove the 8 bolts and main bearing cap (See procedure (a) and (b) above).



(j) Measure the Plastigage at its widest point.

Standard clearance:

No. 1

STD	0.020 – 0.038 mm (0.0008 – 0.0015 in.)
U/S 0.25	0.019 – 0.059 mm (0.0007 – 0.0023 in.)

Others

STD	0.024 – 0.042 mm (0.0009 – 0.0017 in.)
U/S 0.25	0.023 – 0.063 mm (0.0009 – 0.0025 in.)

Maximum clearance: 0.08 mm (0.0031 in.)

HINT:

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

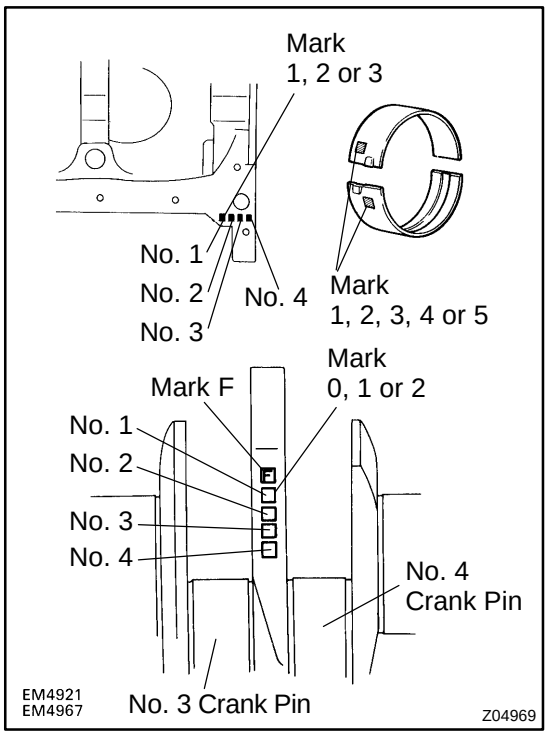
No. 1

0.010 – 0.049 mm (0.0004 – 0.0020 in.)

Others

0.014 – 0.053 mm (0.0006 – 0.0021 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 selecting the bearing with the same number as the total. There are 5 sizes of standard bearings, marked 1, 2, 3, 4 and 5 accordingly.

	Number marked								
Cylinder block	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: Cylinder block ”2” + Crankshaft ”1”
= Total number 3 (Use bearing ”3”)

Reference

Standard sized bearing center wall thickness:

No. 1

Mark 1	1.991 – 1.994 mm (0.0784 – 0.0785 in.)
Mark 2	1.994 – 1.997 mm (0.0785 – 0.0786 in.)
Mark 3	1.997 – 2.000 mm (0.0786 – 0.0787 in.)
Mark 4	2.000 – 2.003 mm (0.0787 – 0.0789 in.)
Mark 5	2.003 – 2.006 mm (0.0789 – 0.0790 in.)

Others

Mark 1	1.989 – 1.992 mm (0.0783 – 0.0784 in.)
Mark 2	1.992 – 1.995 mm (0.0784 – 0.0785 in.)
Mark 3	1.995 – 1.998 mm (0.0785 – 0.0787 in.)
Mark 4	1.998 – 2.001 mm (0.0787 – 0.0788 in.)
Mark 5	2.001 – 2.004 mm (0.0788 – 0.0789 in.)

Cylinder block main journal bore diameter:

Mark 1	68.010 – 68.016 mm (2.6776 – 2.6778 in.)
Mark 2	68.016 – 68.022 mm (2.6778 – 2.6780 in.)
Mark 3	68.022 – 68.028 mm (2.6780 – 2.6783 in.)

Crankshaft main journal diameter:

Mark 0	63.996 – 64.000 mm (2.5195 – 2.5197 in.)
Mark 1	63.990 – 63.996 mm (2.5193 – 2.5195 in.)
Mark 2	63.985 – 63.990 mm (2.5191 – 2.5193 in.)

(k) Completely remove the Plastigage.

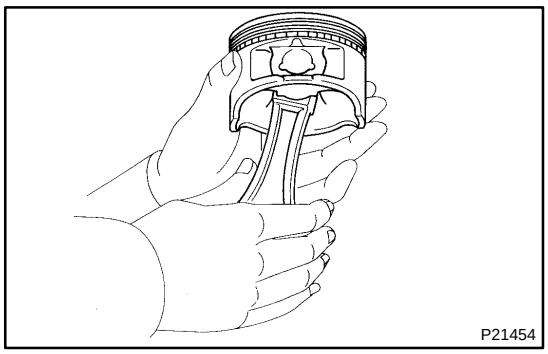
25. REMOVE CRANKSHAFT

(a) Lift out the crankshaft.

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

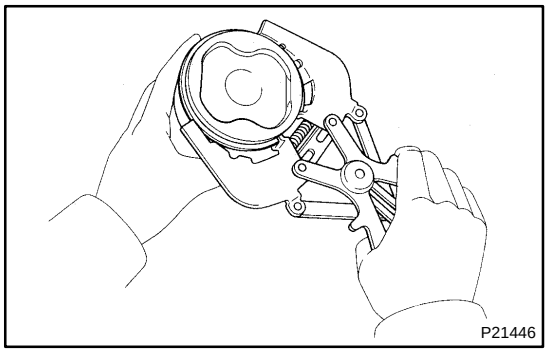
HINT:

Arrange the main bearings and thrust washers in correct order.



26. CHECK FIT BETWEEN PISTON AND PISTON PIN

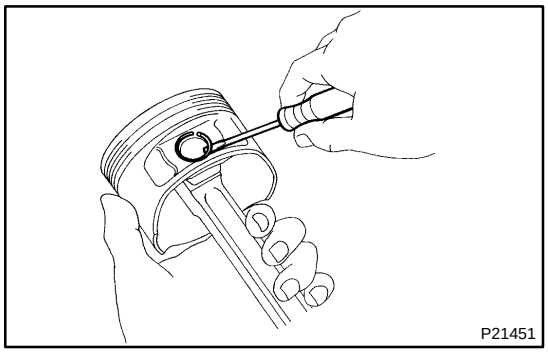
Try to move the piston back and forth on the piston pin.
If any movement is felt, replace the piston and pin as a set.



27. REMOVE PISTON RINGS

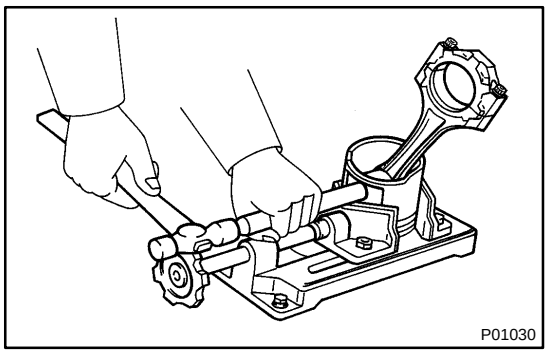
(a) Using a piston ring expander, remove the 2 compression rings.
(b) Remove the 2 side rails and oil ring by hand.

HINT:
Arrange the piston rings in the correct order only.



28. DISCONNECT CONNECTING ROD FROM PISTON

(a) Using a small screwdriver, pry out the 2 snap rings.
(b) Gradually heat the piston to about 60˚C (140˚F).



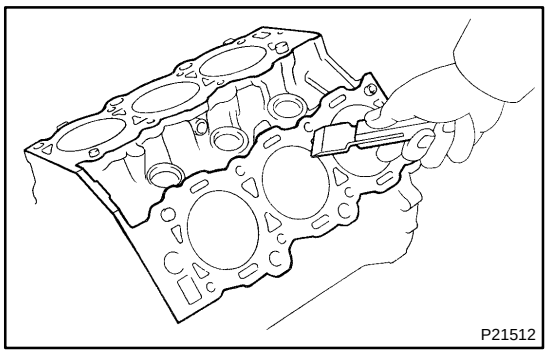
(c) Using a plastic–faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.

HINT:

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

EM1V2–01

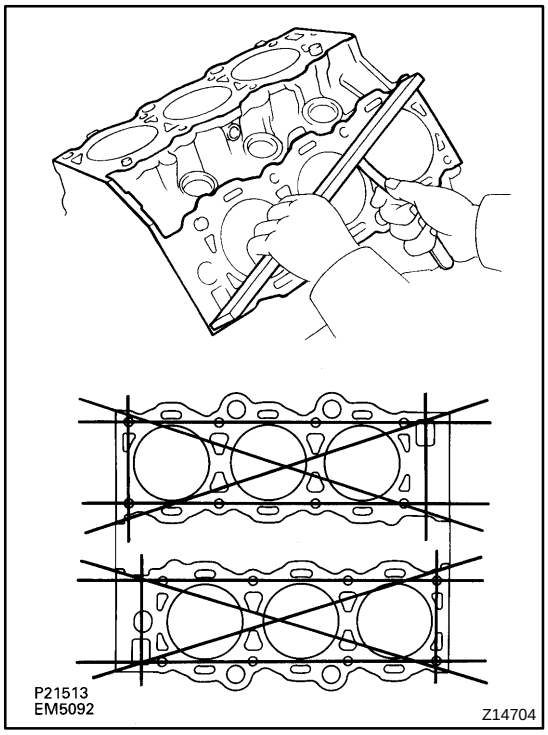
INSPECTION



1. CLEAN CYLINDER BLOCK

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

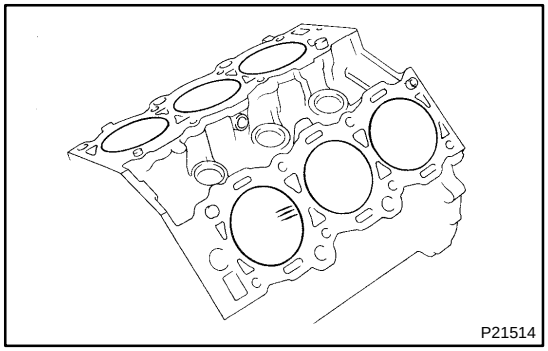
(b) Clean the cylinder block.
Using a soft brush and solvent, thoroughly clean the cylinder block.



2. INSPECT CYLINDER BLOCK

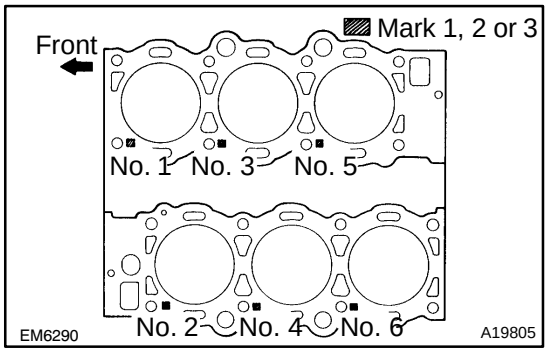
(a) Inspect for flatness.
Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder head gasket for warpage.
Maximum warpage: 0.05 mm (0.0020 in.)

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



(b) Visually check the cylinder for vertical scratches.

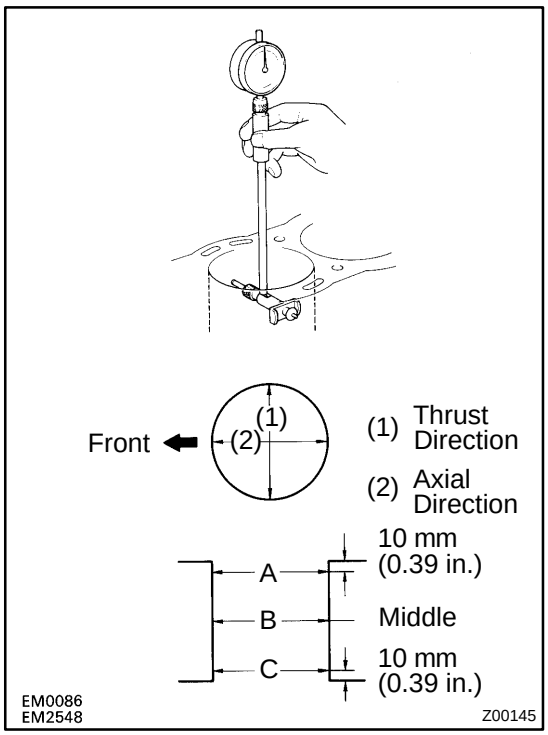
If deep scratches are present, rebore all the 6 cylinders and replace all the 6 pistons. If necessary, replace the cylinder block.



(c) Inspect the cylinder bore diameter.

HINT:

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



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

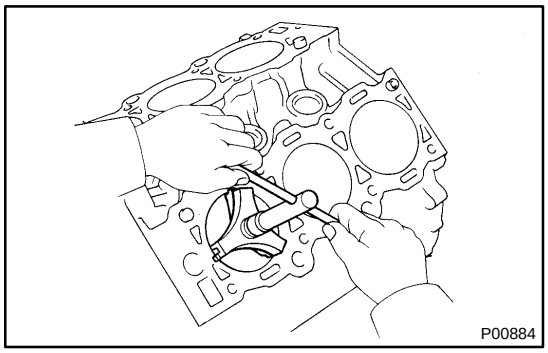
Standard diameter:

Mark 1	93.500 – 93.510 mm (3.6811 – 3.6815 in.)
Mark 2	93.510 – 93.520 mm (3.6815 – 3.6819 in.)
Mark 3	93.520 – 93.530 mm (3.6819 – 3.6823 in.)

Maximum diameter:

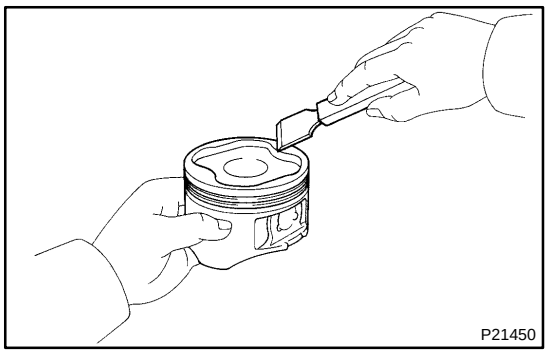
STD	93.730 mm (3.6902 in.)
O/S 0.50	94.230 mm (3.7098 in.)

If the diameter is greater than maximum, rebore all the 6 cylinders and replace all the 6 pistons. If necessary, replace the cylinder block.



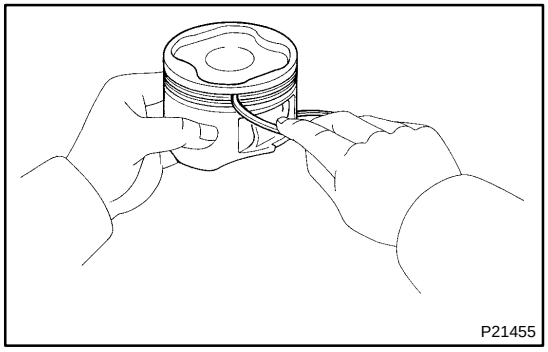
3. REMOVE CYLINDER RIDGE

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

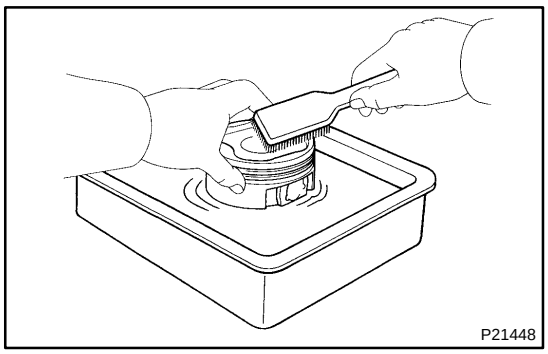


4. CLEAN PISTON

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



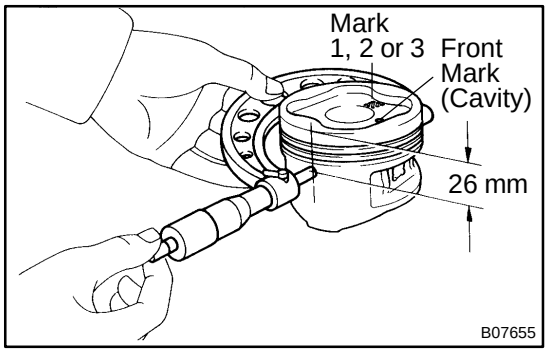
(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



(c) Using solvent and a brush, thoroughly clean the piston.

NOTICE:

Do not use a wire brush.



5. INSPECT PISTON AND CONNECTING ROD

(a) Inspect the piston oil clearance.

HINT:

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

(1) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 26 mm (1.02 in.) from the piston head.

Piston diameter:

STD	Mark 1	93.356 – 93.366 mm (3.6754 – 3.6758 in.)
	Mark 2	93.367 – 93.376 mm (3.6759 – 3.6762 in.)
	Mark 3	93.377 – 93.386 mm (3.6763 – 3.6766 in.)
O/S 0.50		93.856 – 93.886 mm (3.6951 – 3.6963 in.)

(2) Measure the cylinder bore diameter in the thrust directions (See step 2).

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

Standard oil clearance:

0.134 – 0.154 mm (0.0053 – 0.0060 in.)

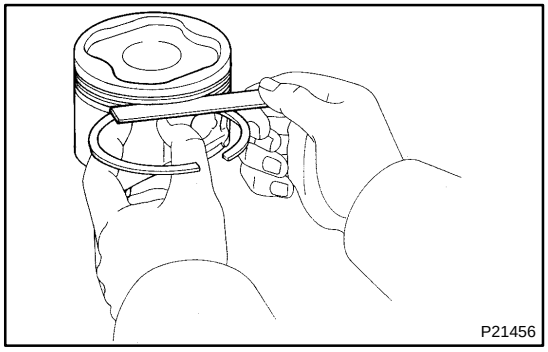
Maximum oil clearance: 0.174 mm (0.0069 in.)

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

HINT:

Use new cylinder block:

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



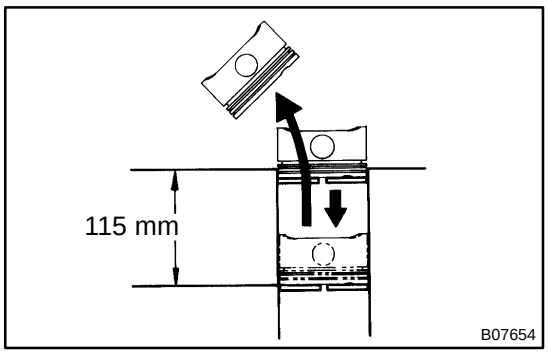
(b) Inspect the piston ring groove clearance.

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

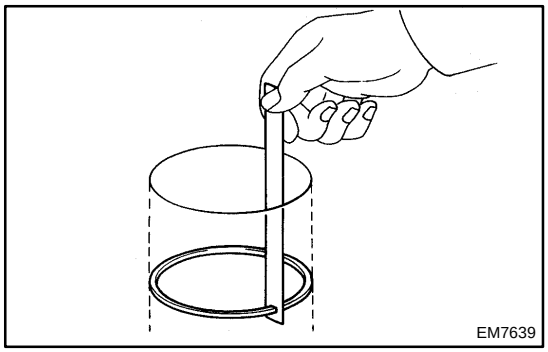
Standard ring groove clearance:

No. 1	0.040 – 0.080 mm (0.0016 – 0.0031 in.)
No. 2	0.030 – 0.070 mm (0.0012 – 0.0028 in.)

If the clearance not as specified, replace the piston.



(c) Inspect piston ring end gap.
(1) Insert the piston ring into the cylinder bore.
(2) Using a piston, push the piston ring a little to the bottom of the ring travel, 115 mm (4.53 in.) from the top of the cylinder block.



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

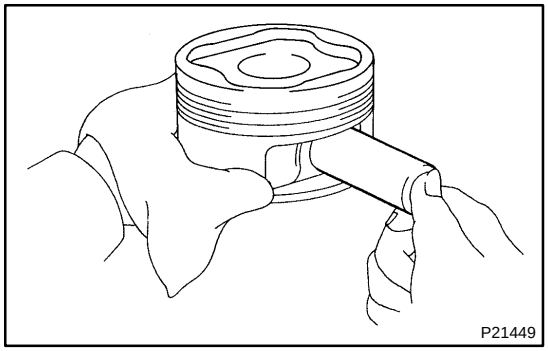
Standard ring end gap:

No. 1	0.300 – 0.500 mm (0.0118 – 0.0197 in.)
No. 2	0.400 – 0.600 mm (0.0157 – 0.0236 in.)
Oil (Side rail)	0.150 – 0.550 mm (0.0059 – 0.0217 in.)

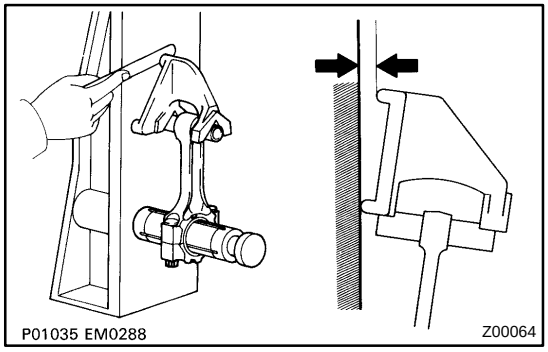
Maximum ring end gap:

No. 1	1.100 mm (0.0433 in.)
No. 2	1.200 mm (0.0472 in.)
Oil (Side rail)	1.150 mm (0.0453 in.)

If the end gap is greater than maximum, replace the piston ring.
If the end gap is greater than maximum, even with a new piston ring, rebore all the 6 cylinders or replace the cylinder block.



(d) Inspect the piston pin fit.
At 60˚C (140˚F), you should be able to push the piston pin into the piston pin hole with your thumb.

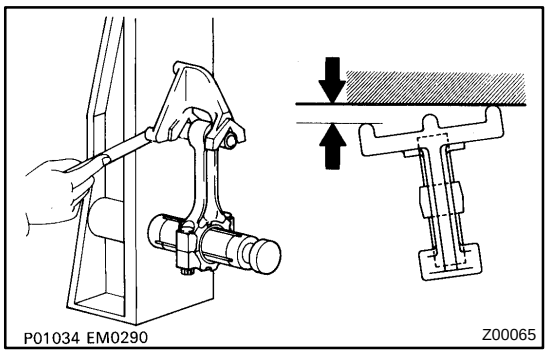


(e) Using a rod aligner and feeler gauge, check the connecting rod alignment.
(1) Check for bend.

Maximum bend:

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

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

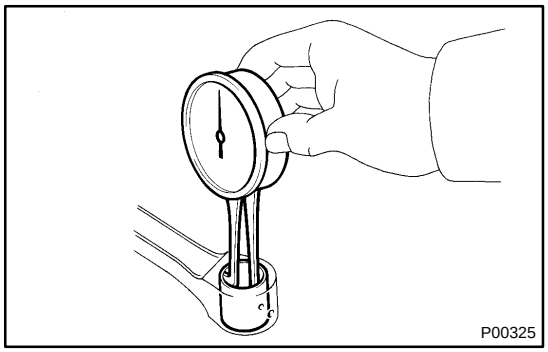


(2) Check for twist.

Maximum twist:

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

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

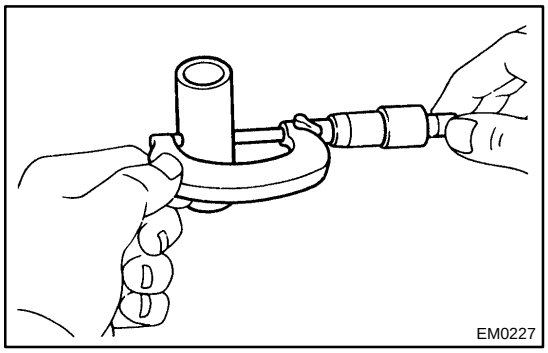


(f) Inspect the piston clearance.

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

Bushing inside diameter:

22.005 – 22.017 mm (0.8663 – 0.8668 in.)



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

Piston pin diameter:

21.997 – 22.009 mm (0.8660 – 0.8665 in.)

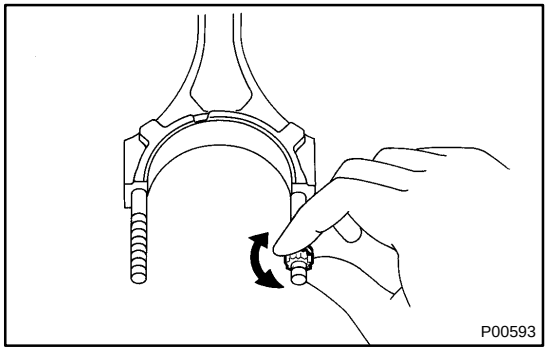
(3) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.

Standard oil clearance:

0.005 – 0.011 mm (0.0002 – 0.0004 in.)

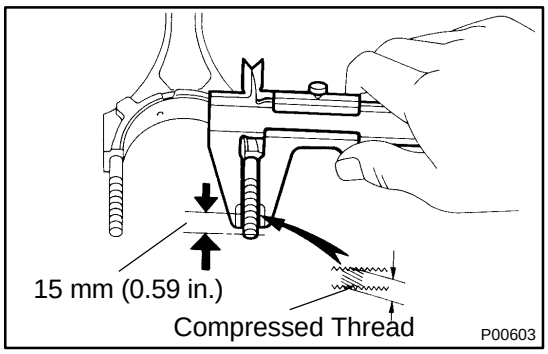
Maximum oil clearance: 0.05 mm (0.0020 in.)

If the oil clearance is greater than maximum, replace the bushing (See page EM–93). If necessary, replace the piston and piston pin as a set.



(g) Inspect the connecting rod bolt.

(1) Install the cap nut to the connecting rod bolt. Check that the rod cap nut can be turned easily by hand to the end of the thread.

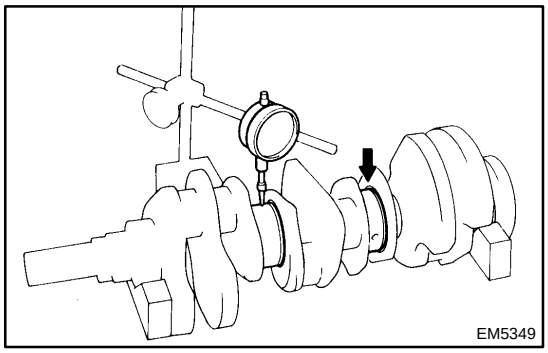


(2) If the cap nut cannot be turned easily, measure the outer diameter of the compressed thread with vernier calipers.

Standard outer diameter:
7.860 – 8.000 mm (0.3094 – 0.3150 in.)
Minimum outer diameter: 7.600 mm (0.2992 in.)

HINT:
If the location of this area cannot be judged by visual inspection, measure the outer diameter at the location shown in the illustration.

If the outer diameter is less than minimum, replace the connecting rod and rod cap nut as a set.



6. INSPECT CRANKSHAFT

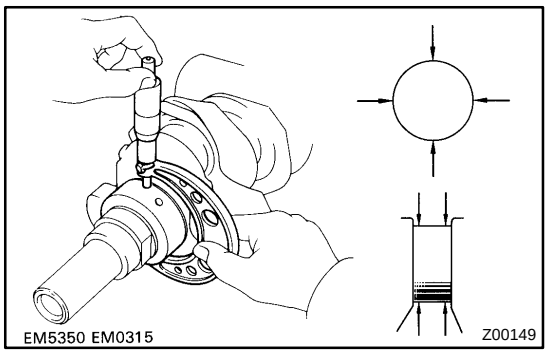
(a) Inspect the for circle runout.

(1) Place the crankshaft on V–blocks.

(2) Using a dial indicator, measure the circle runout at the No. 2 and No. 3 journals.

Maximum circle runout: 0.06 mm (0.0024 in.)

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



(b) Inspect the main journals and crank pins.

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

Main journal diameter:

STD	63.985 – 64.000 mm (2.5191 – 2.5197 in.)
U/S 0.25	63.745 – 63.755 mm (2.5096 – 2.5100 in.)

Crank pin diameter:

STD	54.987 – 55.000 mm (2.1648 – 2.1654 in.)
U/S 0.25	54.745 – 54.755 mm (2.1553 – 2.1557 in.)

If the diameter is not as specified, check the oil clearance (See page EM–79).

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

Maximum taper and out–of–round:
0.02 mm (0.0008 in.)

If the taper or out–of–round is greater than maximum, grind or replace the crankshaft.

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

(a) Grind and hone the main journals and/or crank pins to the finished undersized diameter (See procedure step 7 (b)).
(b) Install new main journal and/or crank pin to undersized bearings.

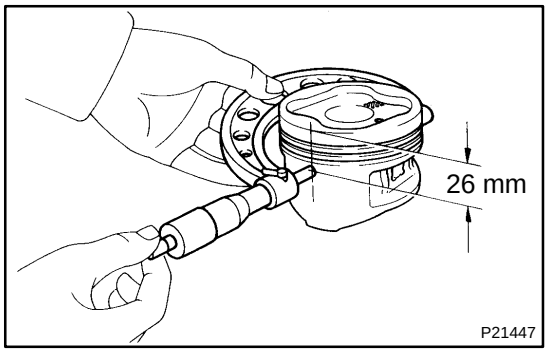
EM1V3–01

REPLACEMENT

1. REPLACE OVERSIZED (O/S) PISTON

HINT:

- ▲ Bore all the 6 cylinders for the oversized piston outside diameter.
- ▲ Replace all the piston rings with ones to match the oversized pistons.

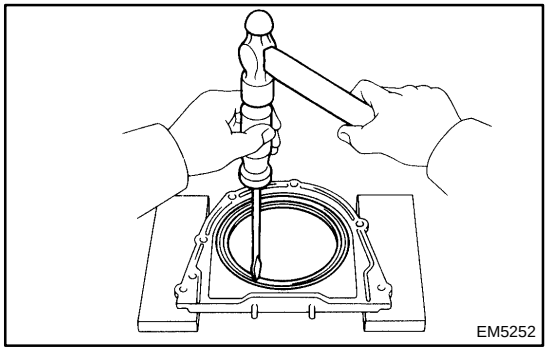


(a) Keep the oversized pistons.
Oversized piston diameter:
O/S 0.50: 93.856 – 93.886 mm (3.6951 – 3.6963 in.)

(b) Calculate amount to the bore cylinders.
(1) Using a micrometer, measure the piston diameter at right angle to the piston pin center line, 26 mm (1.02 in.) from the piston head.
(2) Calculate the amount of each cylinder to be rebored is as follows.
Size to be rebored = P + C – H
P = Piston diameter
C = Piston oil clearance
0.134 – 0.154 mm (0.0053 – 0.0060 in.)
H = Allowance for honing
0.02 mm (0.0008 in.) or less
(3) Bore and hone the cylinder to calculated dimensions.
Maximum honing: 0.02 mm (0.0008 in.)

NOTICE:
Excess honing will destroy the finished roundness.

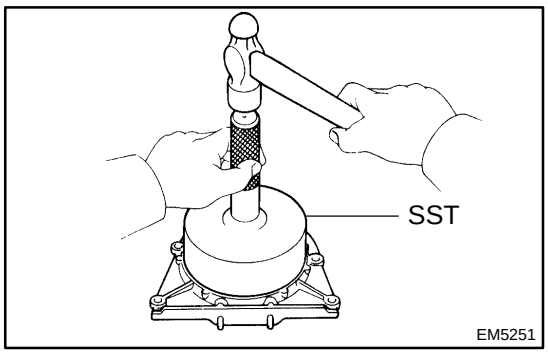
2. REPLACE CRANKSHAFT FRONT OIL SEAL (See page EM–93)



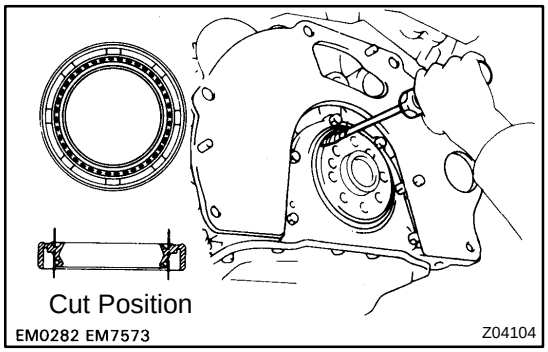
3. REPLACE CRANKSHAFT REAR OIL SEAL

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.



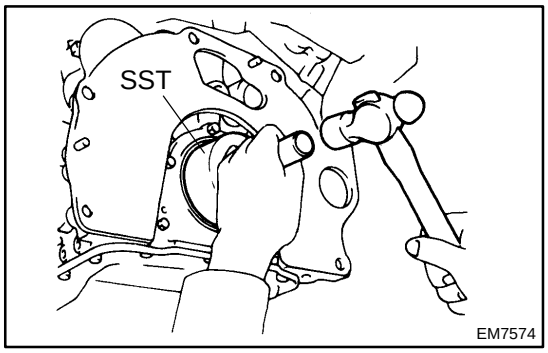
(2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223–15030, 09950–70010 (09951–07150)
(3) Apply MP grease to the oil seal lip.



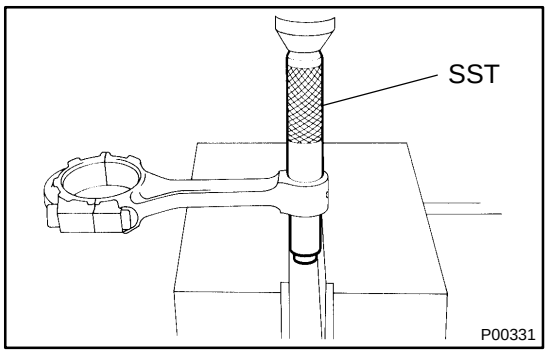
(b) If the rear oil seal retainer is installed to the cylinder block:
(1) Using a knife, cut off the oil seal lip.
(2) Using a screwdriver, pry out the oil seal.

NOTICE:

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

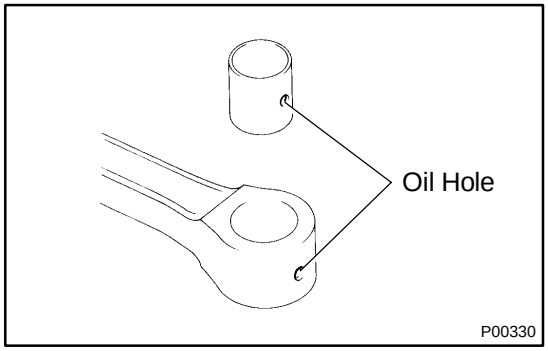


(3) Apply MP grease to a new oil seal lip.
(4) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223–15030, 09950–70010 (09951–07150)

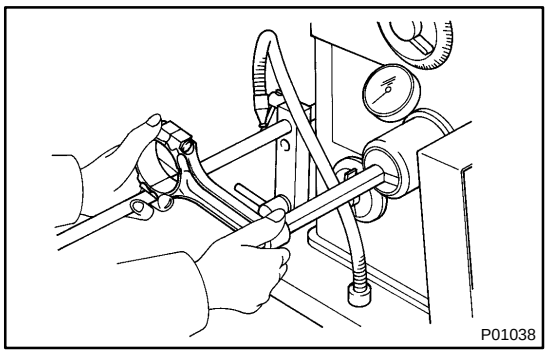


4. REPLACE CONNECTING ROD BUSHING

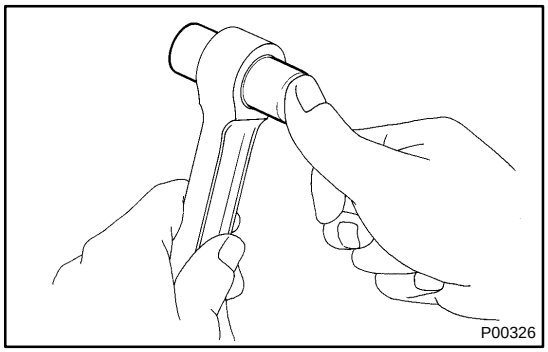
(a) Using SST and a press, press out the bushing.
SST 09222–30010



(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, hone the bushing to obtain the standard specified clearance (see page EM–86) between the bushing and piston pin.



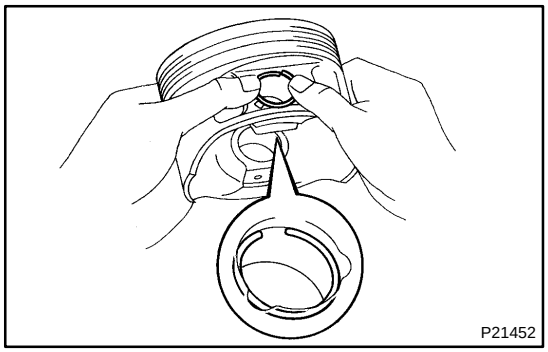
(e) Check the piston pin fit at normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.

EM12P–01

REASSEMBLY

HINT:

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



1. ASSEMBLE PISTON AND CONNECTING ROD

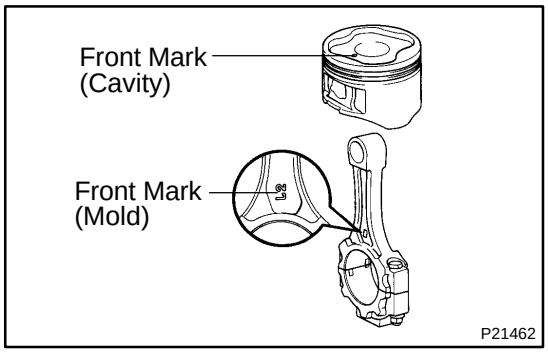
(a) Using a small screwdriver, install a new snap ring at one end of the piston pin hole.

NOTICE:

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 60˚C (140˚F).

(c) Coat the piston pin with engine oil.

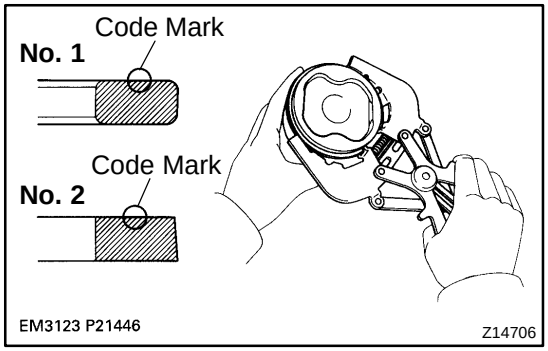


(d) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb.

(e) Using a small screwdriver, install a new snap ring on the other end of the piston pin hole.

NOTICE:

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



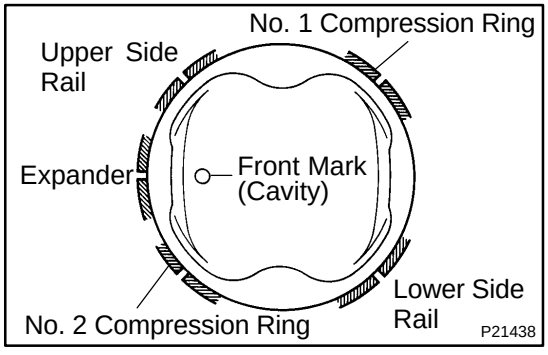
2. INSTALL PISTON RINGS

(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 upward.

Code mark:

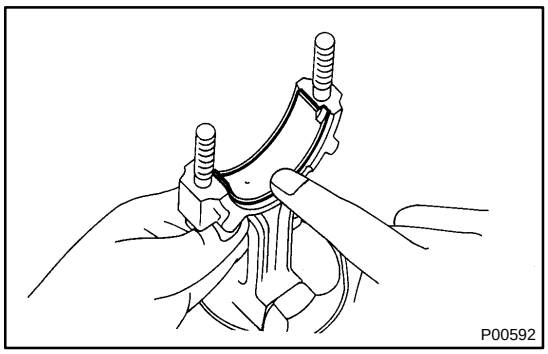
No. 1	1R or T
No. 2	2R or T



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

NOTICE:

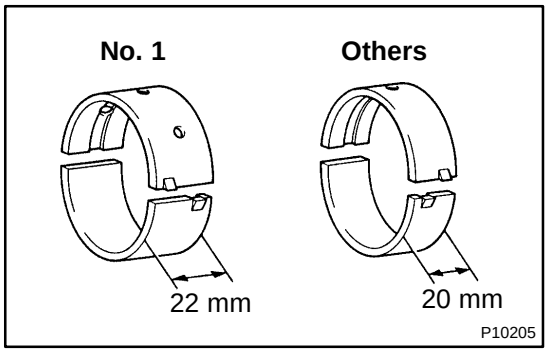
Do not align the ring ends.


P00592

3. INSTALL BEARINGS

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

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



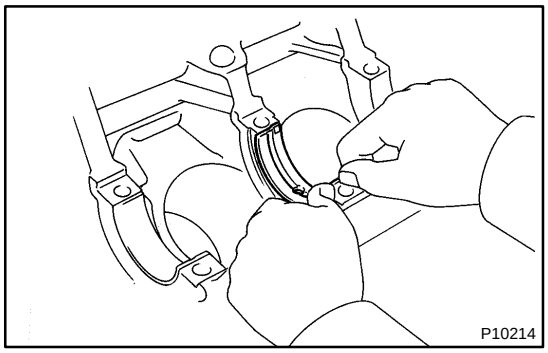
P10205

4. INSTALL MAIN BEARINGS

HINT:

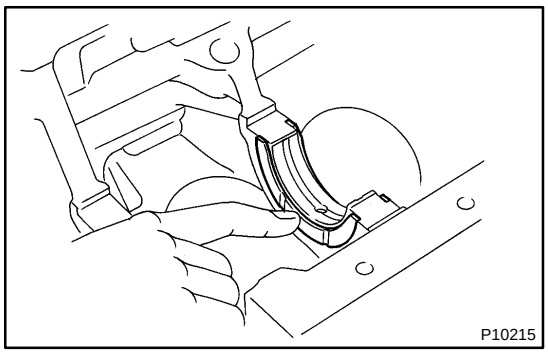
▲ Main bearings come in widths of 20 mm (0.79 in.) and 22 mm (0.87 in.). Install the 22 mm (0.87 in.) bearings in the No. 1 cylinder block journal position with the main bearing caps. Install the 20 mm (0.79 in.) bearings in the other positions.

▲ Upper bearings have an oil holes lower bearings do not.


P10214

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

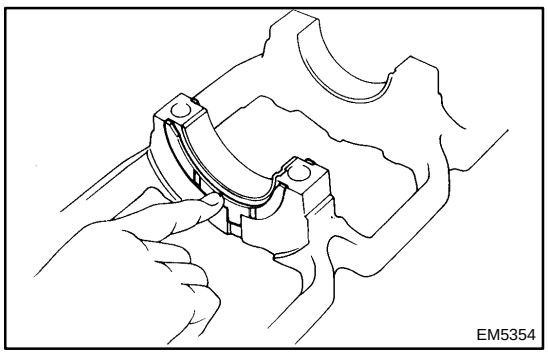
(b) Install the bearings in the cylinder block and main bearing cap.


P10215

5. INSTALL UPPER THRUST WASHERS

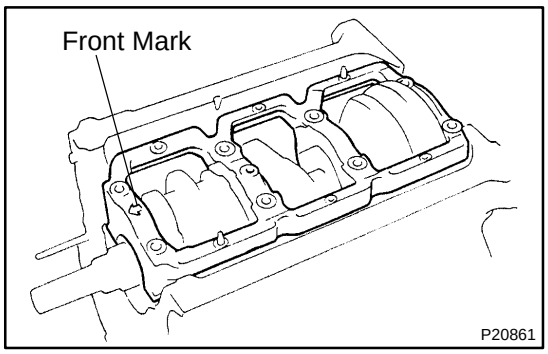
Install the thrust washers under the No.2 journal position of the cylinder block with the oil grooves facing outward.

6. PLACE CRANKSHAFT ON CYLINDER BLOCK


EM5354

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

(a) Install the thrust washers on the No.2 journal position of the bearing cap with the grooves facing outward.

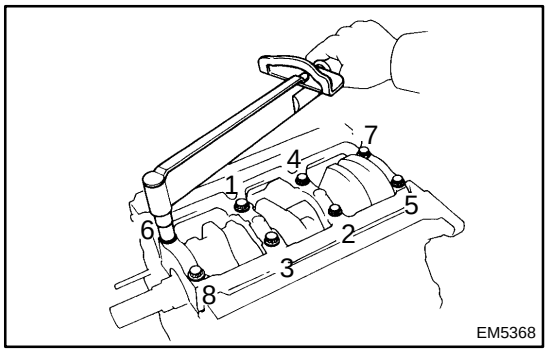


(b) Install the main bearing cap with the front mark facing forward.

8. INSTALL MAIN BEARING CAP BOLTS

HINT:

- ▲ The main bearing cap bolts are tightened in 2 progressive steps (steps (b) and (d)).
- ▲ If any main bearing cap bolt is broken or deformed, replace it.

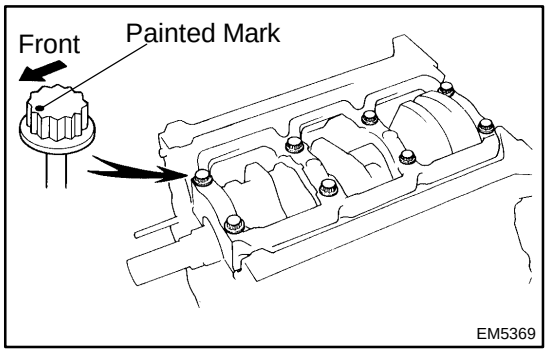


(a) Apply a light coat of engine oil on the threads and under the heads of the main bearing cap bolts.

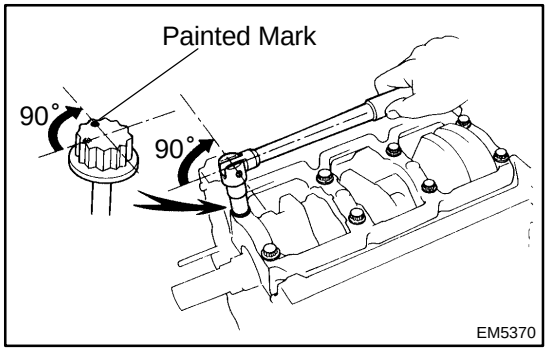
(b) Install and uniformly tighten the 8 main bearing cap bolts, in several passes, in the sequence shown.

Torque: 61 N·m (625 kgf·cm, 45 ft·lbf)

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



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

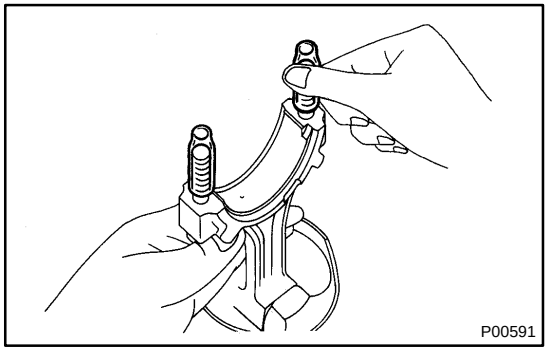


(d) Retighten the main bearing cap bolts by 90° in the numerical order shown.

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

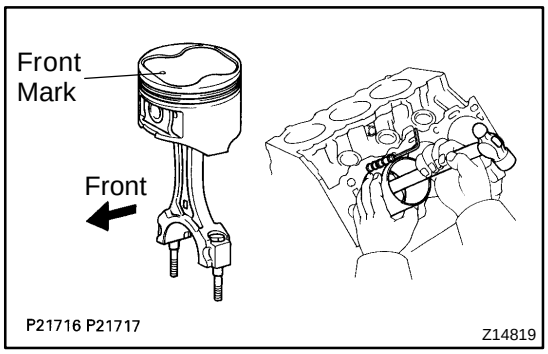
(f) Check that the crankshaft turns smoothly.

(g) Check the crankshaft thrust clearance (See page EM–86).

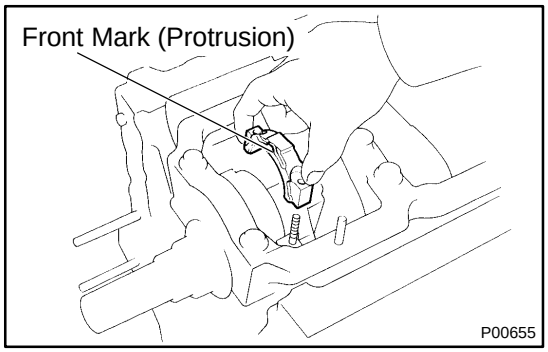


9. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

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



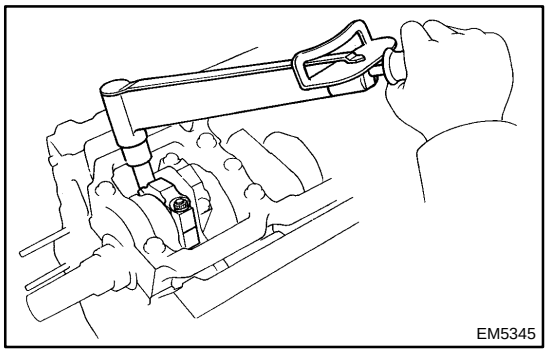
(b) Using a piston ring compressor, push correctly the numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.



10. 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 the front mark facing forward.



11. INSTALL CONNECTING ROD CAP NUTS

HINT:

▲ The connecting rod cap nuts are tightened in 2 progressive steps (steps (b) and (d)).

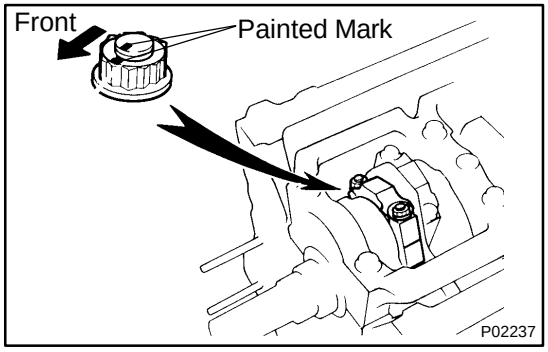
▲ If any connecting rod bolt is broken or deformed, replace it.

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

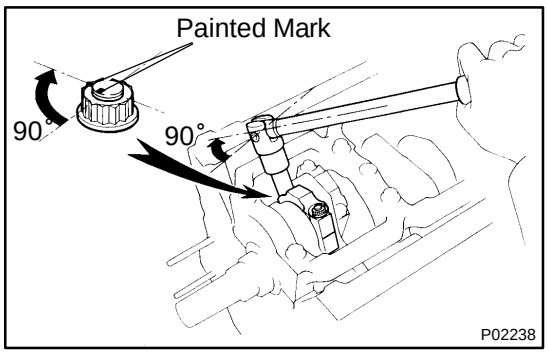
(b) Install and alternately tighten the nuts of the connecting rod cap in several passes.

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

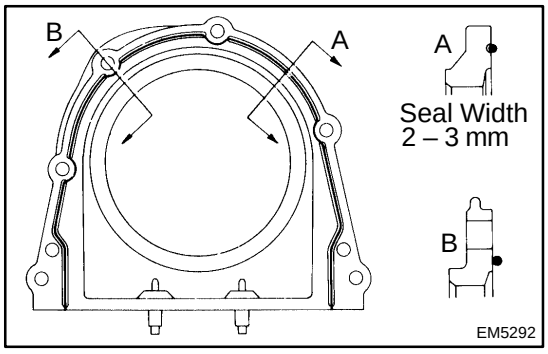
If any one of the connecting rod cap nuts does not meet the torque specification, replace the cap nut.



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



(d) Retighten the connecting rod cap nuts by 90° as shown.
(e) Check that the painted mark is now at a 90° angle to the front.
(f) Check that the crankshaft turns smoothly.
(g) Check the connecting rod thrust clearance (See page EM–86).



12. INSTALL REAR OIL SEAL RETAINER

(a) Remove any old packing (FIPG) materials and be careful not to drop any oil on the contacting 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 the loose material.
- ▲ Using a non–residue solvent, clean both sealing surfaces.

(b) Apply seal packing to the oil seal 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 5 minutes of application. Otherwise the material must be removed and reapplied.
- ▲ Immediately remove nozzle from the tube and reinstall cap.

(c) Install the oil seal retainer with the 6 bolts.
Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)

13. INSTALL OIL PUMP (See page LU–15)

14. w/ Oil Cooler:
INSTALL OIL COOLER WITH WATER BYPASS HOSE AND OIL COOLER UNION (See page LU–21)

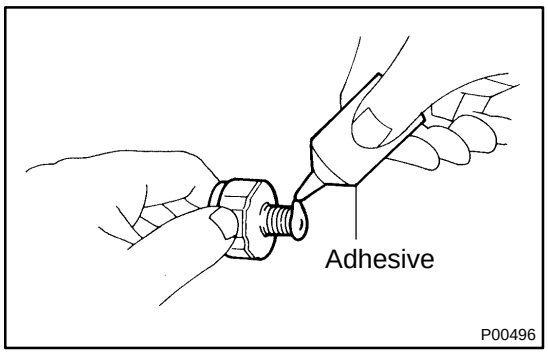
15. w/o Oil Cooler:
INSTALL OIL HOLE COVER PLATE
Torque: 60 N·m (600 kgf·cm, 44 ft·lbf)

16. INSTALL COOLANT DRAIN COCK
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

17. INSTALL RH AND LH ENGINE MOUNTING BRACKETS
Torque: 44 N·m (440 kgf·cm, 32 ft·lbf)

18. INSTALL OIL FILTER UNION
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

19. INSTALL OIL FILTER (See page LU–3)



20. INSTALL OIL PRESSURE SWITCH

(a) Apply adhesive to 2 or 3 threads of the oil pressure switch.
Adhesive:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Using SST, install the oil pressure switch.
SST 09816–30010
Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)

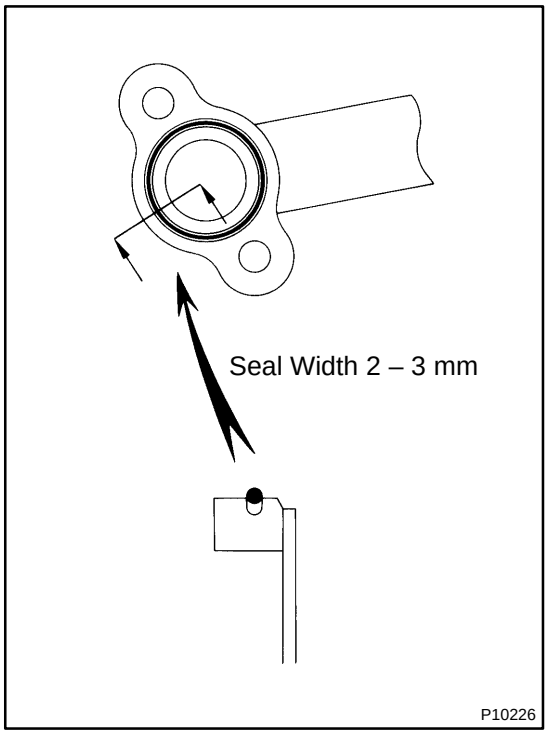
21. INSTALL GENERATOR ADJUSTING BAR
Torque: 42 N·m (420 kgf·cm, 31 ft·lbf)

22. INSTALL WATER PUMP (See page CO–8)

23. INSTALL KNOCK SENSORS

Using SST, install the 2 knock sensors.
SST 09817–16011
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

24. INSTALL NO. 2 IDLER PULLEY BRACKET
Torque: 38 N·m (380 kgf·cm, 28 ft·lbf)



25. INSTALL WATER BYPASS PIPE WITH KNOCK SENSOR WIRE

(a) Remove any old packing (FIPG) materials and be careful not to drop any oil on the contact surfaces of the bypass 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 the loose material.
- ▲ Using a non–residue solvent, clean both sealing surfaces.

(b) Apply seal packing to the groove of the bypass pipe.
Seal packing: Part No. 08826–00100 or equivalent
- ▲ Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.

HINT:
Avoid applying an excessive amount to the surface.
- ▲ Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- ▲ Immediately remove nozzle from the tube and reinstall cap.

(c) Install the bypass pipe with the 2 bolts and nut.
Torque: 8.5 N·m (85 kgf·cm, 75 in.·lbf)

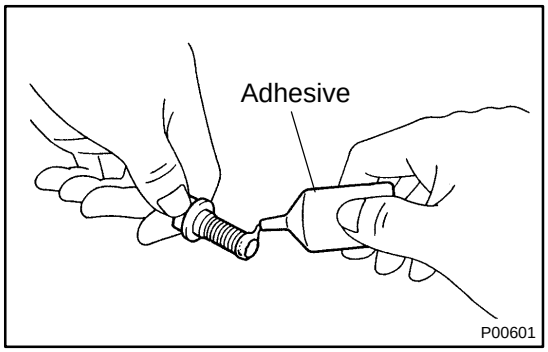
(d) Connect the 2 knock sensor connectors.

26. INSTALL CYLINDER HEADS

27. INSTALL PULLEYS AND TIMING BELT (See page EM–20)

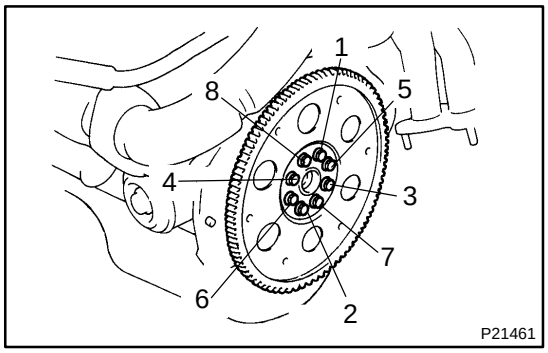
28. REMOVE ENGINE STAND

29. INSTALL REAR END PLATE
Torque: 7.5 N·m (75 kgf·cm, 66 in.·lbf)



30. A/T:
INSTALL DRIVE PLATE

(a) Apply adhesive to 2 or 3 threads of the mounting bolt end.
Adhesive:
Part No. 08833–00070, THREE BOND 1324 or equivalent



(b) Install the drive plate on the crankshaft.
(c) Install and uniformly tighten the 8 mounting bolts in several passes, in the sequence shown.
Torque: 83 N·m (850 kgf·cm, 61 ft·lbf)

31. M/T:
INSTALL FLYWHEEL
Torque: 85 N·m (850 kgf·cm, 63 ft·lbf)

EXHAUST SYSTEM

EM1LG–01

COMPONENTS