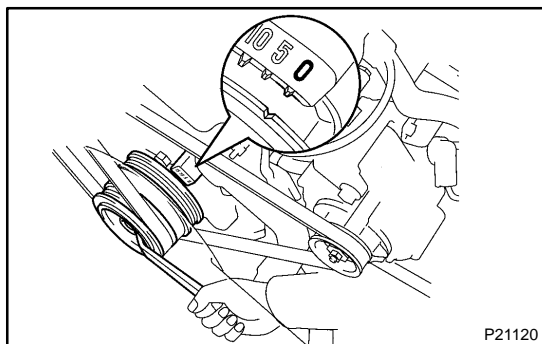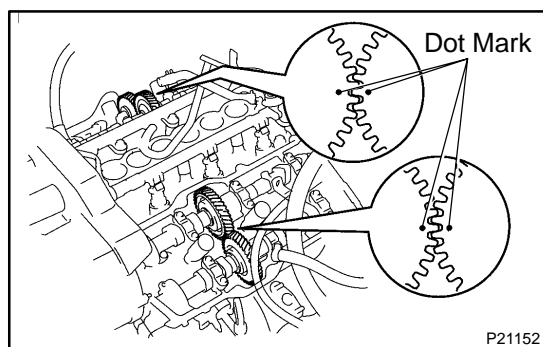# VALVE CLEARANCE

INSPECTION

EM01E-08

HINT:

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

1. **REMOVE INTAKE AIR CONNECTOR**
   (See page EM-29)
2. **REMOVE CYLINDER HEAD COVERS**
   (See page EM-29)

3. **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.

Dot Mark
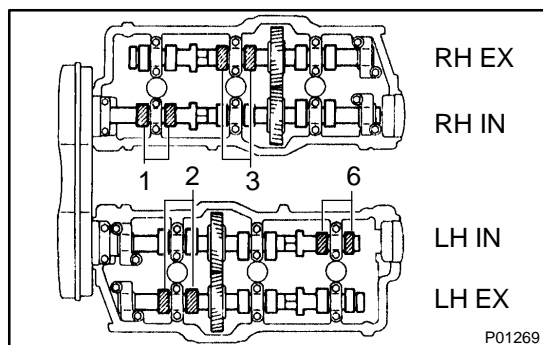
4. **INSPECT VALVE CLEARANCE**
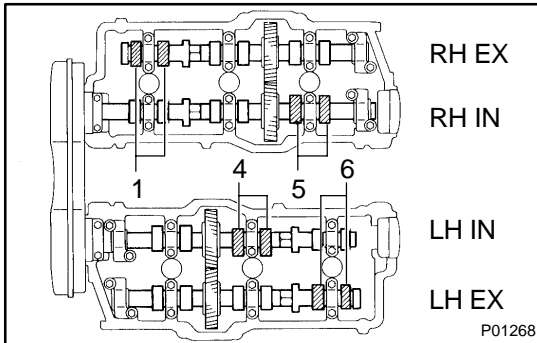(a) Check only those valves indicated in the illustration.
   (1) Using a thickness gauge, measure the clearance between the valve lifter and camshaft.
   (2) Record out of specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.
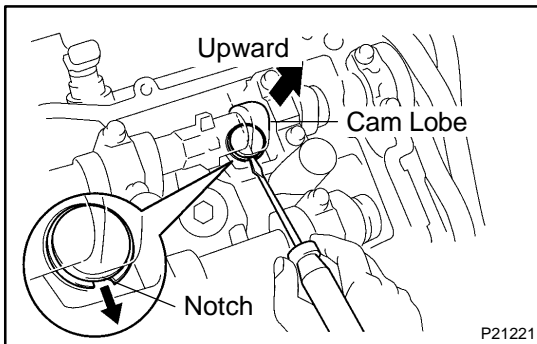
Valve clearance (Cold):

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

RH EX

RH IN

1 2 3   6

LH IN

LH EX

P01270
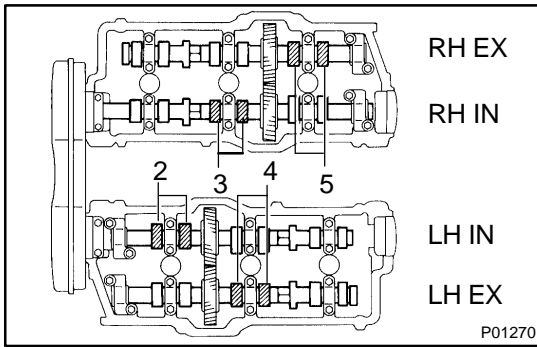
(b) Turn the crankshaft 2/3 of a revolution (240˚), and check only the valves indicated in the illustration. Measure the valve clearance. (See step (a))


P01268

(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 step (a))

P21221

5.   ADJUST VALVE CLEARANCE
(a)   Remove the adjusting shim.
   (1)   Turn the camshaft so that the cam lobe for the valve to be adjusted faces up.
   (2)   Turn the valve lifter with a screwdriver so that the notches are perpendicular to the camshaft.

**Front of No.1 and Rear of No.6 Cylinders**

Others

P21225
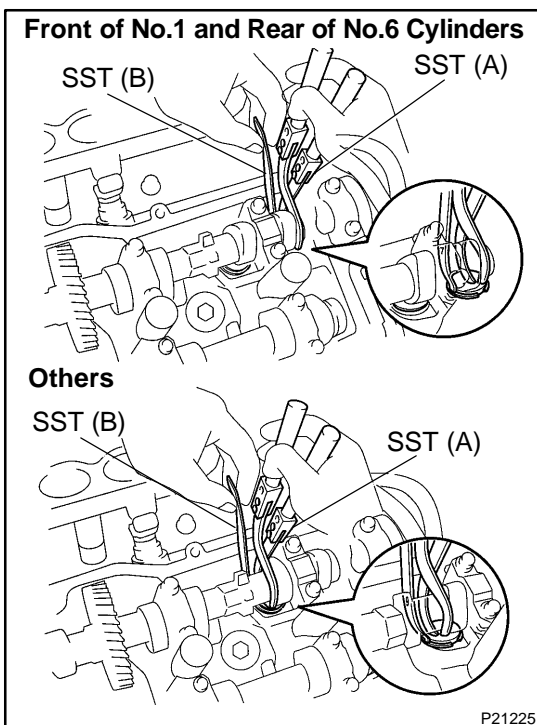
   (3)   Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).
   SST   09248-55040 (09248-05410, 09248-05420)
HINT:
•   Apply SST (B) at a slight angle on the side marked with "9" or "7", at the position shown in the illustration.
•   When SST (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.

Magnetic Finger

P21222
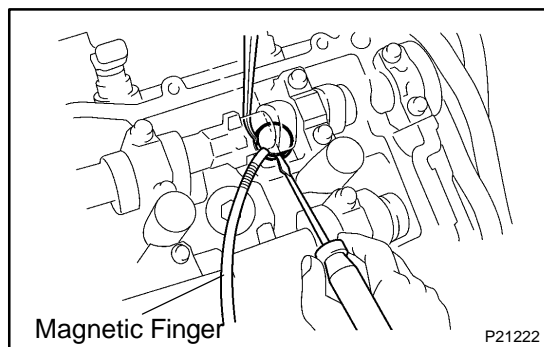
(4) Using a small screwdriver and magnetic finger, remove the adjusting shim.

EM0494
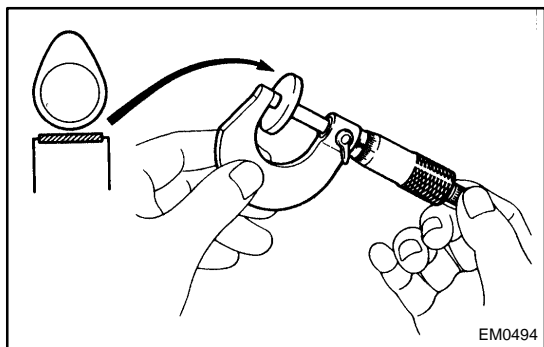
(b) Determine the replacement adjusting shim size according to these Formula or Charts:
(1) Using a micrometer, measure the thickness of the removed shim.
(2) Calculate the thickness of a new shim so the valve clearance comes within the specified value.
T .... Thickness of used shim
A .... Measured valve 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 a thickness as close as possible to the calculated values.

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

SST (B)   SST (A)

P21223
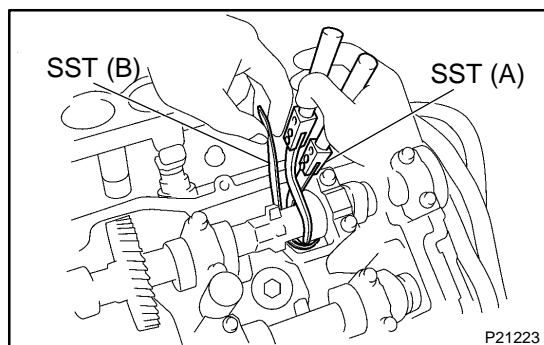
(c) Install a new adjusting shim.
(1) Place a new adjusting shim on the valve lifter, with imprinted numbers facing down.
(2) Press down the valve lifter with SST (A), and remove SST (B).
SST   09248-55040 (09248-05410, 09248-05420)
(d) Recheck the valve clearance.
6. **INSTALL CYLINDER HEAD COVERS**
(See page EM-52)
7. **INSTALL INTAKE AIR CONNECTOR**
(See page EM-52)

Adjusting Shim Selection Chart (Intake)

Installed shim thickness mm (in.) / Measured clearance mm (in.)

Column headers (Installed shim thickness mm (in.)): 2.500 (0.0984), 2.520 (0.0992), 2.540 (0.1000), 2.550 (0.1004), 2.560 (0.1008), 2.580 (0.1016), 2.600 (0.1024), 2.620 (0.1031), 2.640 (0.1039), 2.650 (0.1043), 2.660 (0.1047), 2.670 (0.1051), 2.680 (0.1055), 2.690 (0.1059), 2.700 (0.1063), 2.710 (0.1067), 2.720 (0.1071), 2.730 (0.1075), 2.740 (0.1079), 2.750 (0.1083), 2.760 (0.1087), 2.770 (0.1091), 2.780 (0.1094), 2.790 (0.1098), 2.800 (0.1102), 2.810 (0.1106), 2.820 (0.1110), 2.830 (0.1114), 2.840 (0.1118), 2.850 (0.1122), 2.860 (0.1126), 2.870 (0.1130), 2.880 (0.1134), 2.890 (0.1138), 2.900 (0.1142), 2.910 (0.1146), 2.920 (0.1150), 2.930 (0.1154), 2.940 (0.1157), 2.950 (0.1161), 2.960 (0.1165), 2.970 (0.1169), 2.980 (0.1173), 2.990 (0.1177), 3.000 (0.1181), 3.010 (0.1185), 3.020 (0.1189), 3.030 (0.1193), 3.040 (0.1197), 3.050 (0.1201), 3.060 (0.1205), 3.080 (0.1213), 3.100 (0.1220), 3.120 (0.1228), 3.140 (0.1236), 3.150 (0.1240), 3.160 (0.1244), 3.180 (0.1252), 3.200 (0.1260), 3.220 (0.1268), 3.240 (0.1276), 3.250 (0.1280), 3.260 (0.1283), 3.280 (0.1291), 3.300 (0.1299)

Measured clearance rows (mm (in.)):

- 0.000 – 0.020 (0.0000 – 0.0008)
- 0.021 – 0.040 (0.0008 – 0.0016)
- 0.041 – 0.060 (0.0016 – 0.0024)
- 0.061 – 0.080 (0.0024 – 0.0031)
- 0.081 – 0.100 (0.0032 – 0.0039)
- 0.101 – 0.120 (0.0040 – 0.0047)
- 0.121 – 0.129 (0.0048 – 0.0051)
- 0.130 – 0.230 (0.0051 – 0.0091) *(no values — target clearance range)*
- 0.231 – 0.240 (0.0091 – 0.0094)
- 0.241 – 0.260 (0.0095 – 0.0102)
- 0.261 – 0.280 (0.0103 – 0.0110)
- 0.281 – 0.300 (0.0111 – 0.0118)
- 0.301 – 0.320 (0.0119 – 0.0126)
- 0.321 – 0.340 (0.0126 – 0.0134)
- 0.341 – 0.360 (0.0134 – 0.0142)
- 0.361 – 0.380 (0.0142 – 0.0150)
- 0.381 – 0.400 (0.0150 – 0.0157)
- 0.401 – 0.420 (0.0158 – 0.0165)
- 0.421 – 0.440 (0.0166 – 0.0173)
- 0.441 – 0.460 (0.0174 – 0.0181)
- 0.461 – 0.480 (0.0181 – 0.0189)
- 0.481 – 0.500 (0.0189 – 0.0197)
- 0.501 – 0.520 (0.0197 – 0.0205)
- 0.521 – 0.540 (0.0205 – 0.0213)
- 0.541 – 0.560 (0.0213 – 0.0220)
- 0.561 – 0.580 (0.0221 – 0.0228)
- 0.581 – 0.600 (0.0229 – 0.0236)
- 0.601 – 0.620 (0.0237 – 0.0244)
- 0.621 – 0.640 (0.0244 – 0.0252)
- 0.641 – 0.660 (0.0252 – 0.0260)
- 0.661 – 0.680 (0.0260 – 0.0268)
- 0.681 – 0.700 (0.0268 – 0.0276)
- 0.701 – 0.720 (0.0276 – 0.0283)
- 0.721 – 0.740 (0.0284 – 0.0291)
- 0.741 – 0.760 (0.0292 – 0.0299)
- 0.761 – 0.780 (0.0300 – 0.0307)
- 0.781 – 0.800 (0.0307 – 0.0315)
- 0.801 – 0.820 (0.0315 – 0.0323)
- 0.821 – 0.840 (0.0323 – 0.0331)
- 0.841 – 0.860 (0.0331 – 0.0339)
- 0.861 – 0.880 (0.0339 – 0.0346)
- 0.881 – 0.900 (0.0347 – 0.0354)
- 0.901 – 0.920 (0.0355 – 0.0362)
- 0.921 – 0.940 (0.0363 – 0.0370)
- 0.941 – 0.960 (0.0370 – 0.0378)
- 0.961 – 0.980 (0.0378 – 0.0386)
- 0.981 – 1.000 (0.0386 – 0.0394)
- 1.001 – 1.020 (0.0394 – 0.0402)
- 1.021 – 1.030 (0.0402 – 0.0406)

The body of the chart is a grid in which each cell lists the required replacement shim number (1–17) for the intersection of measured clearance and installed shim thickness. The shim numbers increase progressively from the upper-left region toward the lower-right region of the grid, diagonally shifting by one column per clearance step.

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)		

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.

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

Adjusting Shim Selection Chart (Exhaust)

Installed shim thickness mm (in.) / Measured clearance mm (in.)	2.500 (0.0984)	2.520 (0.0992)	2.540 (0.1000)	2.550 (0.1004)	2.560 (0.1008)	2.580 (0.1016)	2.600 (0.1024)	2.620 (0.1031)	2.640 (0.1039)	2.650 (0.1043)	2.660 (0.1047)	2.670 (0.1051)	2.680 (0.1055)	2.690 (0.1059)	2.700 (0.1063)	2.710 (0.1067)	2.720 (0.1071)	2.730 (0.1075)	2.740 (0.1079)	2.750 (0.1083)	2.760 (0.1087)	2.770 (0.1091)	2.780 (0.1094)	2.790 (0.1098)	2.800 (0.1102)	2.810 (0.1106)	2.820 (0.1110)	2.830 (0.1114)	2.840 (0.1118)	2.850 (0.1122)	2.860 (0.1126)	2.870 (0.1130)	2.880 (0.1134)	2.890 (0.1138)	2.900 (0.1142)	2.910 (0.1146)	2.920 (0.1150)	2.930 (0.1154)	2.940 (0.1157)	2.950 (0.1161)	2.960 (0.1165)	2.970 (0.1169)	2.980 (0.1173)	2.990 (0.1177)	3.000 (0.1181)	3.010 (0.1185)	3.020 (0.1189)	3.030 (0.1193)	3.040 (0.1197)	3.050 (0.1201)	3.060 (0.1205)	3.080 (0.1213)	3.100 (0.1220)	3.120 (0.1228)	3.140 (0.1236)	3.150 (0.1240)	3.160 (0.1244)	3.180 (0.1252)	3.200 (0.1260)	3.220 (0.1268)	3.240 (0.1276)	3.250 (0.1280)	3.260 (0.1283)	3.280 (0.1291)	3.300 (0.1299)

The adjusting shim selection matrix is a large cross-reference grid. Representative row labels (Measured clearance) are:

- 0.000 – 0.020 (0.0000 – 0.0008)
- 0.021 – 0.040 (0.0008 – 0.0016)
- 0.041 – 0.060 (0.0016 – 0.0024)
- 0.061 – 0.080 (0.0024 – 0.0031)
- 0.081 – 0.100 (0.0032 – 0.0039)
- 0.101 – 0.120 (0.0040 – 0.0047)
- 0.121 – 0.140 (0.0048 – 0.0055)
- 0.141 – 0.160 (0.0056 – 0.0063)
- 0.161 – 0.180 (0.0063 – 0.0071)
- 0.181 – 0.200 (0.0071 – 0.0079)
- 0.201 – 0.220 (0.0079 – 0.0087)
- 0.221 – 0.240 (0.0087 – 0.0094)
- 0.241 – 0.260 (0.0095 – 0.0102)
- 0.261 – 0.269 (0.0103 – 0.0106)
- 0.270 – 0.370 (0.0106 – 0.0146)
- 0.371 – 0.380 (0.0146 – 0.0150)
- 0.381 – 0.400 (0.0150 – 0.0157)
- 0.401 – 0.420 (0.0158 – 0.0165)
- 0.421 – 0.440 (0.0166 – 0.0173)
- 0.441 – 0.460 (0.0174 – 0.0181)
- 0.461 – 0.480 (0.0181 – 0.0189)
- 0.481 – 0.500 (0.0189 – 0.0197)
- 0.501 – 0.520 (0.0197 – 0.0205)
- 0.521 – 0.540 (0.0205 – 0.0213)
- 0.541 – 0.560 (0.0213 – 0.0220)
- 0.561 – 0.580 (0.0221 – 0.0228)
- 0.581 – 0.600 (0.0229 – 0.0236)
- 0.601 – 0.620 (0.0237 – 0.0244)
- 0.621 – 0.640 (0.0244 – 0.0252)
- 0.641 – 0.600 (0.0252 – 0.0260)
- 0.661 – 0.680 (0.0260 – 0.0268)
- 0.681 – 0.700 (0.0268 – 0.0276)
- 0.701 – 0.720 (0.0276 – 0.0283)
- 0.721 – 0.740 (0.0284 – 0.0291)
- 0.741 – 0.760 (0.0292 – 0.0299)
- 0.761 – 0.780 (0.0300 – 0.0307)
- 0.781 – 0.800 (0.0307 – 0.0315)
- 0.801 – 0.820 (0.0315 – 0.0323)
- 0.821 – 0.840 (0.0323 – 0.0331)
- 0.841 – 0.860 (0.0331 – 0.0339)
- 0.861 – 0.880 (0.0339 – 0.0346)
- 0.881 – 0.900 (0.0347 – 0.0354)
- 0.901 – 0.920 (0.0355 – 0.0362)
- 0.921 – 0.940 (0.0363 – 0.0370)
- 0.941 – 0.960 (0.0370 – 0.0378)
- 0.961 – 0.980 (0.0378 – 0.0386)
- 0.981 – 1.000 (0.0386 – 0.0394)
- 1.001 – 1.020 (0.0394 – 0.0402)
- 1.021 – 1.040 (0.0402 – 0.0409)
- 1.041 – 1.060 (0.0410 – 0.0417)
- 1.061 – 1.080 (0.0418 – 0.0425)
- 1.081 – 1.100 (0.0426 – 0.0433)
- 1.101 – 1.120 (0.0433 – 0.0441)
- 1.121 – 1.140 (0.0441 – 0.0449)
- 1.141 – 1.160 (0.0449 – 0.0457)
- 1.161 – 1.170 (0.0457 – 0.0461)

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.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.