

VALVE CLEARANCE INSPECTION

EMOKS-03

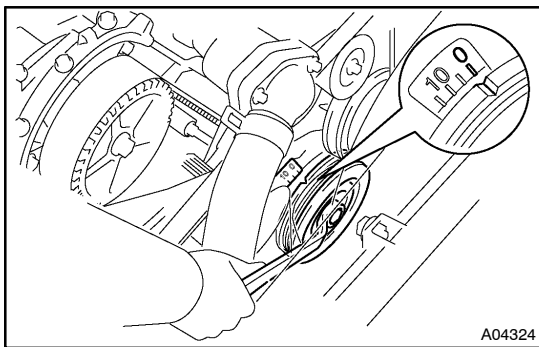
HINT:

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

1. **DRAIN ENGINE COOLANT**
2. **REMOVE BATTERY CLAMP COVER**
3. **REMOVE V-BANK COVER**
4. **REMOVE AIR CLEANER AND INTAKE AIR CONNECTOR ASSEMBLY**
5. **REMOVE NO.3 TIMING BELT COVERS**
(See page [EM-15](#))
6. **REMOVE IGNITION COILS** (See page [IG-6](#))
7. **REMOVE RH CYLINDER HEAD COVER**

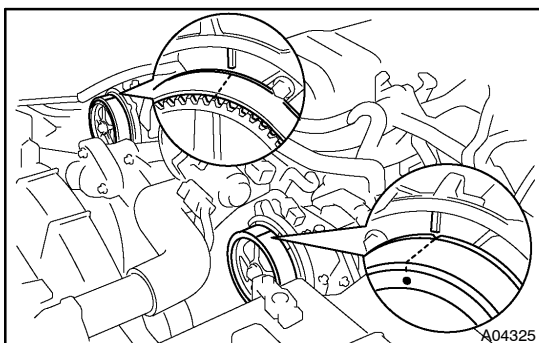
Remove the 9 bolts, 9 seal washers and cylinder head cover.

8. **REMOVE LH CYLINDER HEAD COVER**
 - (a) Remove the oil dipstick for the transmission.
 - (b) Disconnect the PCV hose.
 - (c) Disconnect the engine wire clamp from the wire bracket on the cylinder head cover.
 - (d) Remove the 9 bolts, 9 seal washers and cylinder head cover.

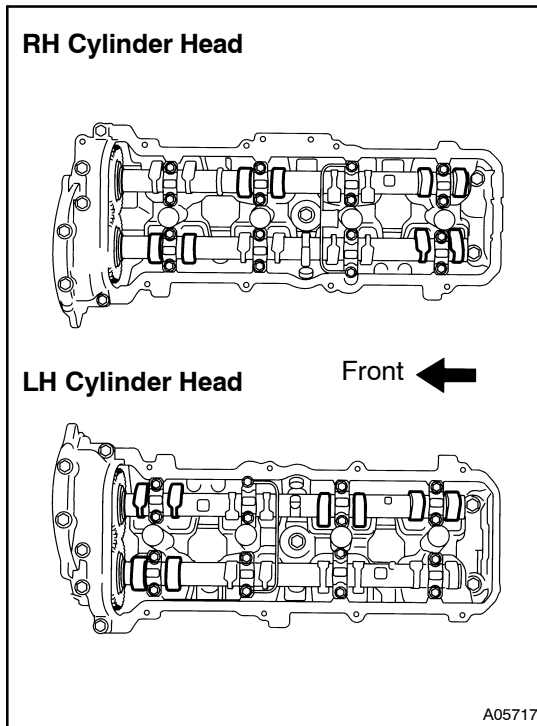


9. SET NO.1 CYLINDER TO TDC/COMPRESSION

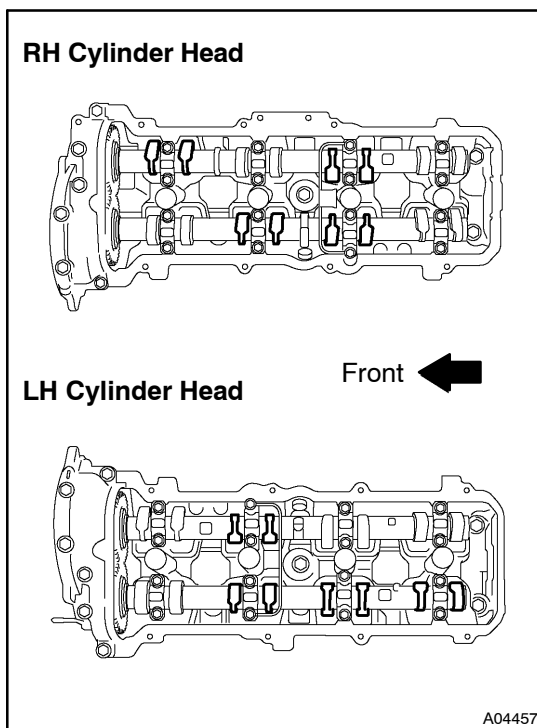
- (a) Turn the crankshaft pulley, and align its groove with timing mark "0" of the No.1 timing belt cover.



- (b) Check that the timing marks of the camshaft timing pulleys and timing belt rear plates are aligned.
If not, turn the crankshaft 1 revolution (360°) and align the mark as above.

**10. INSPECT VALVE CLEARANCE**

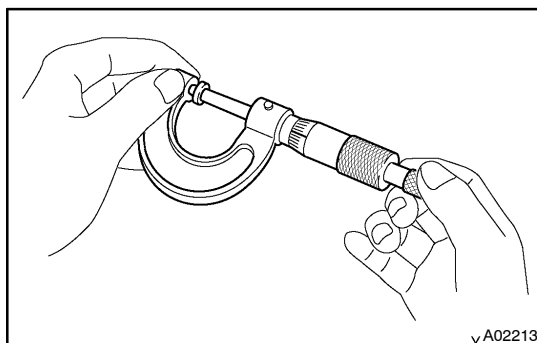
- (a) Check only the valves indicated.
- Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
 - Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

Valve clearance (Cold):**Intake****0.15 – 0.25 mm (0.006 – 0.010 in.)****Exhaust****0.25 – 0.35 mm (0.010 – 0.014 in.)**

- (b) Turn the crankshaft 1 revolution (360°) and align the mark as above (See procedure in step 10).
- (c) Check only the valves indicated as shown. Measure the valve clearance. (See procedure in step (a))

11. ADJUST VALVE CLEARANCE

- (a) Remove the timing belt (See page [EM-15](#)).
- (b) Remove the camshafts (See page [EM-42](#)).
- (c) Remove the valve lifter and adjusting shim.



- (d) Determine the replacement adjusting shim size according to these Formula or Charts:
- Using a micrometer, measure the thickness of the removed shim.
 - Calculate the thickness of a new shim so that the valve clearance comes within the specified value.

T Thickness of removed shim**A Measured valve clearance****N Thickness of new shim**

Intake:

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

Exhaust:

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

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

HINT:

Shims are available in 41 increments of 0.020 mm (0.0008 in.), from 2.00 mm (0.0787 in.) to 2.80 mm (0.1102 in.).

- (e) Place a new adjusting shim on the valve.
- (f) Place the valve lifter.
- (g) Reinstall the camshafts (See page [EM-55](#)).
- (h) Reinstall the timing belt (See page [EM-22](#)).
- (i) Recheck the valve clearance.

12. REINSTALL CYLINDER HEAD COVERS**13. REINSTALL IGNITION COILS****14. REINSTALL NO.3 TIMING BELT COVERS (See page [EM-22](#))****15. REINSTALL AIR CLEANER AND INTAKE AIR CONNECTOR ASSEMBLY****16. REFILL WITH ENGINE COOLANT****17. START ENGINE AND CHECK FOR LEAKS****18. RECHECK ENGINE COOLANT LEVEL****19. REINSTALL V-BANK COVER****20. REINSTALL BATTERY CLAMP COVER**

Adjusting Shim Selection Chart (Intake)

Installed shim thickness mm (in.)		Measured clearance mm (in.)		New shim thickness mm (in.)											
				Shim No.			Thickness			Shim No.			Thickness		
0.000 - 0.030 (0.0000 - 0.0012)		0.000 - 0.030 (0.0000 - 0.0012)		00	2.000 (0.0787)	00	2.000 (0.0787)	28	2.280 (0.0898)	56	2.560 (0.1008)				
0.031 - 0.050 (0.0012 - 0.0020)		0.031 - 0.050 (0.0012 - 0.0020)		01	2.020 (0.0795)	01	2.020 (0.0795)	29	2.300 (0.0906)	57	2.580 (0.1016)				
0.051 - 0.070 (0.0020 - 0.0028)		0.051 - 0.070 (0.0020 - 0.0028)		02	2.040 (0.0803)	02	2.040 (0.0803)	30	2.320 (0.0913)	58	2.600 (0.1024)				
0.071 - 0.090 (0.0028 - 0.0035)		0.071 - 0.090 (0.0028 - 0.0035)		03	2.060 (0.0811)	03	2.060 (0.0811)	31	2.340 (0.0921)	59	2.620 (0.1031)				
0.091 - 0.110 (0.0035 - 0.0043)		0.091 - 0.110 (0.0035 - 0.0043)		04	2.080 (0.0819)	04	2.080 (0.0819)	32	2.360 (0.0929)	60	2.640 (0.1039)				
0.111 - 0.130 (0.0043 - 0.0051)		0.111 - 0.130 (0.0043 - 0.0051)		05	2.100 (0.0827)	05	2.100 (0.0827)	33	2.380 (0.0937)	61	2.660 (0.1047)				
0.131 - 0.149 (0.0051 - 0.0059)		0.131 - 0.149 (0.0051 - 0.0059)		06	2.120 (0.0835)	06	2.120 (0.0835)	34	2.400 (0.0945)	62	2.680 (0.1055)				
0.150 - 0.250 (0.0059 - 0.0098)		0.150 - 0.250 (0.0059 - 0.0098)		07	2.140 (0.0843)	07	2.140 (0.0843)	35	2.420 (0.0953)	63	2.700 (0.1063)				
0.251 - 0.270 (0.0098 - 0.0106)		0.251 - 0.270 (0.0098 - 0.0106)		08	2.160 (0.0851)	08	2.160 (0.0851)	36	2.440 (0.0961)	64	2.720 (0.1071)				
0.271 - 0.290 (0.0107 - 0.0114)		0.271 - 0.290 (0.0107 - 0.0114)		09	2.180 (0.0858)	09	2.180 (0.0858)	37	2.460 (0.0969)	65	2.740 (0.1079)				
0.291 - 0.310 (0.0115 - 0.0122)		0.291 - 0.310 (0.0115 - 0.0122)		10	2.200 (0.0866)	10	2.200 (0.0866)	38	2.480 (0.0976)	66	2.760 (0.1087)				
0.311 - 0.330 (0.0122 - 0.0130)		0.311 - 0.330 (0.0122 - 0.0130)		11	2.220 (0.0874)	11	2.220 (0.0874)	39	2.500 (0.1012)	67	2.780 (0.1094)				
0.331 - 0.350 (0.0130 - 0.0138)		0.331 - 0.350 (0.0130 - 0.0138)		12	2.240 (0.0882)	12	2.240 (0.0882)	40	2.520 (0.1016)	68	2.800 (0.1102)				
0.351 - 0.370 (0.0138 - 0.0146)		0.351 - 0.370 (0.0138 - 0.0146)		13	2.260 (0.0890)	13	2.260 (0.0890)	41	2.540 (0.1000)	69					
0.371 - 0.390 (0.0146 - 0.0154)		0.371 - 0.390 (0.0146 - 0.0154)		14	2.280 (0.0898)	14	2.280 (0.0898)	42	2.560 (0.1004)	70					
0.391 - 0.410 (0.0154 - 0.0161)		0.391 - 0.410 (0.0154 - 0.0161)		15	2.300 (0.0906)	15	2.300 (0.0906)	43	2.580 (0.1012)						
0.411 - 0.430 (0.0161 - 0.0169)		0.411 - 0.430 (0.0161 - 0.0169)		16	2.320 (0.0913)	16	2.320 (0.0913)	44	2.600 (0.1020)						
0.431 - 0.450 (0.0170 - 0.0177)		0.431 - 0.450 (0.0170 - 0.0177)		17	2.340 (0.0921)	17	2.340 (0.0921)	45	2.620 (0.1024)						
0.451 - 0.470 (0.0178 - 0.0185)		0.451 - 0.470 (0.0178 - 0.0185)		18	2.360 (0.0929)	18	2.360 (0.0929)	46	2.640 (0.1039)						
0.471 - 0.490 (0.0185 - 0.0193)		0.471 - 0.490 (0.0185 - 0.0193)		19	2.380 (0.0937)	19	2.380 (0.0937)	47	2.660 (0.1047)						
0.491 - 0.510 (0.0193 - 0.0201)		0.491 - 0.510 (0.0193 - 0.0201)		20	2.400 (0.0945)	20	2.400 (0.0945)	48	2.680 (0.1055)						
0.511 - 0.530 (0.0201 - 0.0209)		0.511 - 0.530 (0.0201 - 0.0209)		21	2.420 (0.0953)	21	2.420 (0.0953)	49	2.700 (0.1063)						
0.531 - 0.550 (0.0209 - 0.0217)		0.531 - 0.550 (0.0209 - 0.0217)		22	2.440 (0.0961)	22	2.440 (0.0961)	50							
0.551 - 0.570 (0.0217 - 0.0224)		0.551 - 0.570 (0.0217 - 0.0224)		23	2.460 (0.0969)	23	2.460 (0.0969)	51							
0.571 - 0.590 (0.0225 - 0.0232)		0.571 - 0.590 (0.0225 - 0.0232)		24	2.480 (0.0976)	24	2.480 (0.0976)	52							
0.591 - 0.610 (0.0233 - 0.0240)		0.591 - 0.610 (0.0233 - 0.0240)		25	2.500 (0.1012)	25	2.500 (0.1012)	53							
0.611 - 0.630 (0.0241 - 0.0248)		0.611 - 0.630 (0.0241 - 0.0248)		26	2.520 (0.1016)	26	2.520 (0.1016)	54							
0.631 - 0.650 (0.0248 - 0.0256)		0.631 - 0.650 (0.0248 - 0.0256)		27	2.540 (0.1000)	27	2.540 (0.1000)	55							
0.651 - 0.670 (0.0256 - 0.0264)		0.651 - 0.670 (0.0256 - 0.0264)		28	2.560 (0.1004)	28	2.560 (0.1004)	56							
0.671 - 0.690 (0.0264 - 0.0272)		0.671 - 0.690 (0.0264 - 0.0272)		29	2.580 (0.1012)	29	2.580 (0.1012)	57							
0.691 - 0.710 (0.0272 - 0.0280)		0.691 - 0.710 (0.0272 - 0.0280)		30	2.600 (0.1020)	30	2.600 (0.1020)	58							
0.711 - 0.730 (0.0280 - 0.0287)		0.711 - 0.730 (0.0280 - 0.0287)		31	2.620 (0.1024)	31	2.620 (0.1024)	59							
0.731 - 0.750 (0.0288 - 0.0295)		0.731 - 0.750 (0.0288 - 0.0295)		32	2.640 (0.1039)	32	2.640 (0.1039)	60							
0.751 - 0.770 (0.0296 - 0.0303)		0.751 - 0.770 (0.0296 - 0.0303)		33	2.660 (0.1047)	33	2.660 (0.1047)	61							
0.771 - 0.790 (0.0304 - 0.0311)		0.771 - 0.790 (0.0304 - 0.0311)		34	2.680 (0.1055)	34	2.680 (0.1055)	62							
0.791 - 0.810 (0.0311 - 0.0319)		0.791 - 0.810 (0.0311 - 0.0319)		35	2.700 (0.1063)	35	2.700 (0.1063)	63							
0.811 - 0.830 (0.0319 - 0.0327)		0.811 - 0.830 (0.0319 - 0.0327)		36	2.720 (0.1071)	36	2.720 (0.1071)	64							
0.831 - 0.850 (0.0327 - 0.0335)		0.831 - 0.850 (0.0327 - 0.0335)		37	2.740 (0.1079)	37	2.740 (0.1079)	65							
0.851 - 0.870 (0.0335 - 0.0343)		0.851 - 0.870 (0.0335 - 0.0343)		38	2.760 (0.1087)	38	2.760 (0.1087)	66							
0.871 - 0.890 (0.0343 - 0.0350)		0.871 - 0.890 (0.0343 - 0.0350)		39	2.780 (0.1094)	39	2.780 (0.1094)	67							
0.891 - 0.910 (0.0350 - 0.0358)		0.891 - 0.910 (0.0350 - 0.0358)		40	2.800 (0.1102)	40	2.800 (0.1102)	68							
0.911 - 0.930 (0.0359 - 0.0366)		0.911 - 0.930 (0.0359 - 0.0366)		41	2.820 (0.1110)	41	2.820 (0.1110)	69							
0.931 - 0.950 (0.0367 - 0.0374)		0.931 - 0.950 (0.0367 - 0.0374)		42	2.840 (0.1118)	42	2.840 (0.1118)	70							
0.951 - 0.970 (0.0374 - 0.0382)		0.951 - 0.970 (0.0374 - 0.0382)		43	2.860 (0.1126)	43	2.860 (0.1126)								
0.971 - 0.990 (0.0382 - 0.0390)		0.971 - 0.990 (0.0382 - 0.0390)		44	2.880 (0.1134)	44	2.880 (0.1134)								
0.991 - 1.010 (0.0390 - 0.0398)		0.991 - 1.010 (0.0390 - 0.0398)		45	2.900 (0.1142)	45	2.900 (0.1142)								
1.011 - 1.030 (0.0398 - 0.0406)		1.011 - 1.030 (0.0398 - 0.0406)		46	2.920 (0.1150)	46	2.920 (0.1150)								
1.031 - 1.050 (0.0406 - 0.0413)		1.031 - 1.050 (0.0406 - 0.0413)		47	2.940 (0.1158)	47	2.940 (0.1158)								

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

Intake valve clearance (Cold):

0.15 – 0.25 mm (0.006 – 0.010 in.)

EXAMPLE:

The 2.300 mm (0.0906 in.) shim is installed, and the measured clearance is 0.440 mm (0.0173 in.). Replace the 2.300 mm (0.0906 in.) shim with a No. 54 shim.

New shim thickness				mm (in.)	
Shim No.	Thickness	Shim No.	Thickness		
00	2.000 (0.0787)	28	2.280 (0.0898)	56	2.560 (0.1008)
02	2.020 (0.0795)	30	2.300 (0.0906)	58	2.580 (0.1016)
04	2.040 (0.0803)	32	2.320 (0.0913)	60	2.600 (0.1024)
06	2.060 (0.0811)	34	2.340 (0.0921)	62	2.620 (0.1031)
08	2.080 (0.0819)	36	2.360 (0.0929)	64	2.640 (0.1039)
10	2.100 (0.0827)	38	2.380 (0.0937)	66	2.660 (0.1047)
12	2.120 (0.0835)	40	2.400 (0.0945)	68	2.680 (0.1055)
14	2.140 (0.0843)	42	2.420 (0.0953)	70	2.700 (0.1063)
16	2.160 (0.0850)	44	2.440 (0.0961)	72	2.720 (0.1071)
18	2.180 (0.0858)	46	2.460 (0.0969)	74	2.740 (0.1079)
20	2.200 (0.0866)	48	2.480 (0.0976)	76	2.760 (0.1087)
22	2.220 (0.0874)	50	2.500 (0.0984)	78	2.780 (0.1094)
24	2.240 (0.0882)	52	2.520 (0.0992)	80	2.800 (0.1102)
26	2.260 (0.0890)	54	2.540 (0.1000)		

2000 LAND CRUISER (RM722U)

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

EXAMPLE:
The 2.300 mm (0.0906 in.) shim is installed, and the measured clearance is 0.440 mm (0.0173 in.). Replace the 2.300 mm (0.0906 in.) shim with a No. 44 shim.