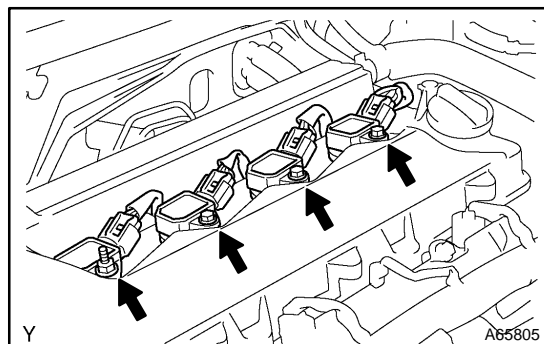# VALVE CLEARANCE (2ZZ–GE)

ADJUSTMENT

140R6–01

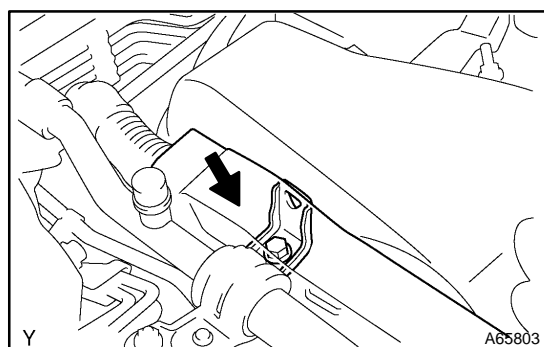**1. REMOVE ENGINE UNDER COVER RH**

2. REMOVE CYLINDER HEAD COVER NO.2

(a) Remove the 3 bolts, the nut and the cylinder head cover No. 2.

3. REMOVE IGNITION COIL ASSY

(a) Remove the 3 bolts and the nut, and disconnect the 4 connectors, and remove the 4 ignition coils.

4. REMOVE WIRE HARNESS CLAMP

(a) Disconnect the engine wire harness.

(b) Remove the bolt and wiring harness clamp bracket.
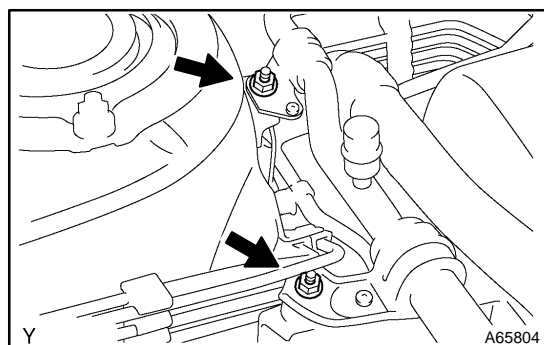
5. DISCONNECT SUCTION HOSE SUB–ASSY

(a) Remove the 2 nuts installing the suction hose sub–assy.

(b) Disconnect the suction hose sub–assy.

6. REMOVE CYLINDER HEAD COVER SUB–ASSY

(a) Disconnect the fuel hose clamp and 2 PCV hoses from the cylinder head cover.
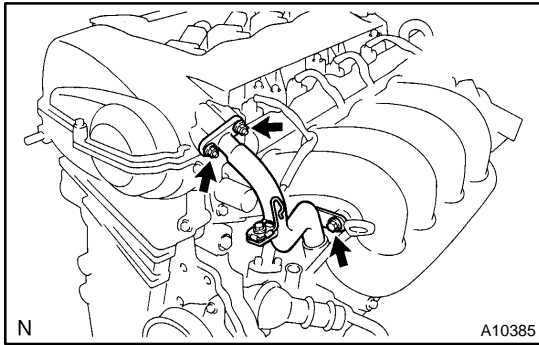
(b) Remove the 2 nuts, bolt and disconnect the No. 3 ventilation hose from the No. 1 ventilation pipe.

(c) Disconnect the ventilation No. 1 tube and gasket.
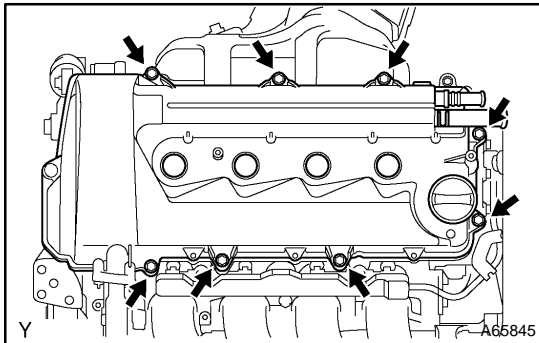
(d) Remove the 8 bolts, wire harness protector, cylinder head cover and gasket.

(e) Remove the O–ring from the cylinder head cover.
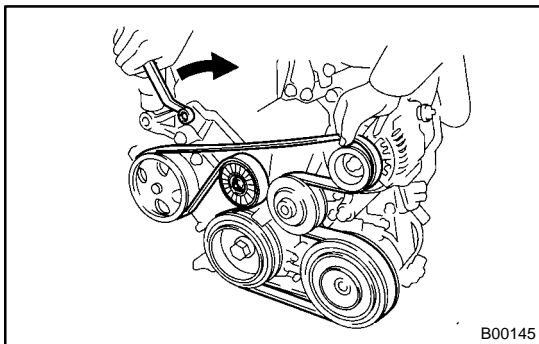
7. REMOVE FAN AND GENERATOR V BELT

(a) Turn the drive belt tensioner slowly clockwise and loosen it. Then, remove the drive belt and put back the drive belt tensioner little by little and fix it quietly.
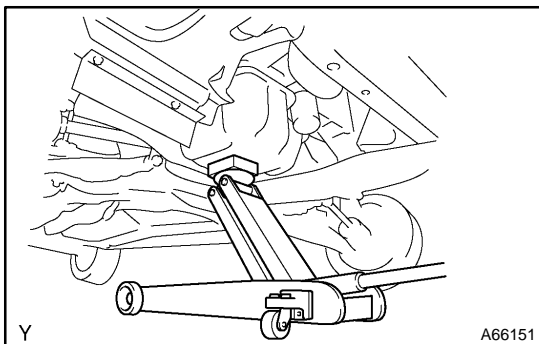
8. REMOVE ENGINE MOUNTING INSULATOR SUB–ASSY RH

(a) Set the jack to the engine.

HINT:

Place a wooden block between the jack and engine.
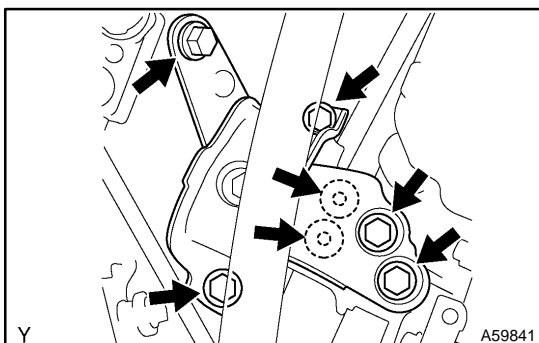
(b) Remove the 5 bolts, 2 nuts and engine mounting insulator sub–assy RH.

Mark

1 2 3 4 5 6 7 8 9

Mark

Timing Chain
Cover Surface

Groove

A59787
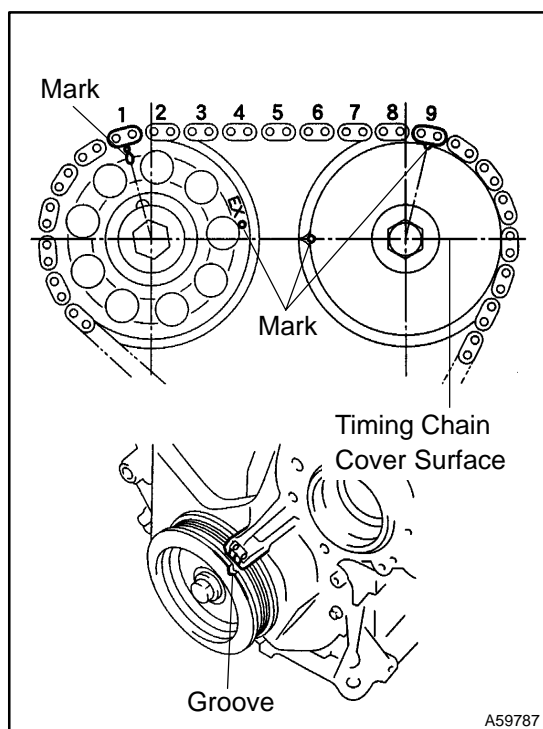
9. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley, and align its groove with timing mark "0" of the timing chain cover.

(b) Check that the point marks of the camshaft timing sprocket and VVT timing sprocket are in straight line on the timing chain cover surface as shown in the illustration.

HINT:

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

10. REMOVE V–RIBBED BELT TENSIONER ASSY

HINT:

Handle a jack up and down to remove the bolt.

A35925
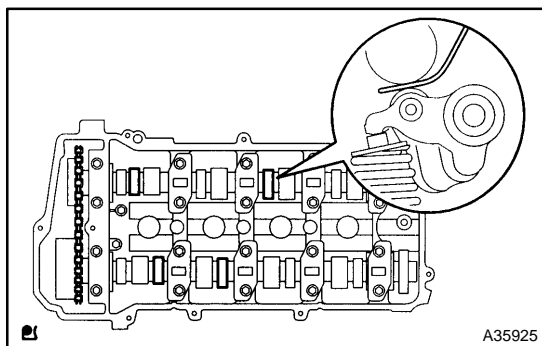
11. INSPECT VALVE CLEARANCE

(a) Check only the valves indicated.

(1) Using a feeler gauge, measure the clearance between the valve rocker arm and camshaft.

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

Valve clearance (Cold)

Intake	0.08 – 0.18 mm (0.0031 – 0.0071 in.)
Exhaust	0.22 – 0.32 mm (0.0087 – 0.0126 in.)

(b) Turn the crankshaft 1 revolution (360°) and set No. 4 cylinder to TDC/compression.
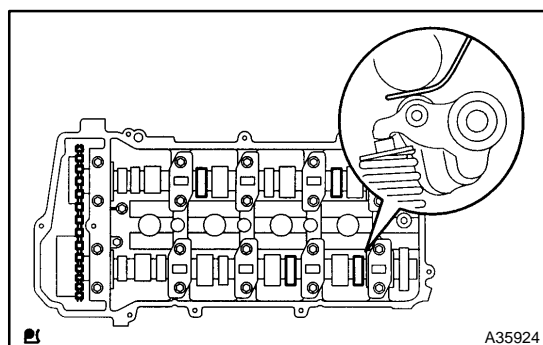
A35924

(c) Check only the valves indicated.

(1) Using a feeler gauge, measure the clearance between the valve rocker arm and camshaft.

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

Valve clearance (Cold)

Intake	0.08 – 0.18 mm (0.0031 – 0.0071 in.)
Exhaust	0.22 – 0.32 mm (0.0087 – 0.0126 in.)

2003 COROLLA MATRIX   218W   (RM940U)
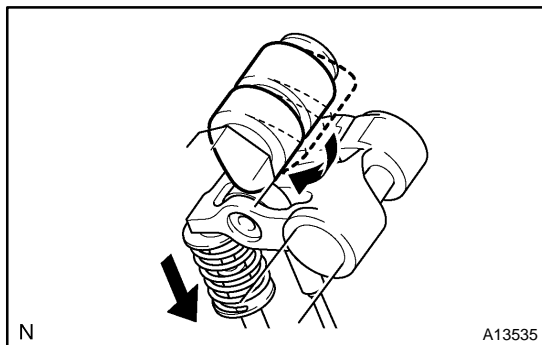
12. ADJUST VALVE CLEARANCE
(a) Set the SST.
(1) Turn the crankshaft so that the related rocker arm,where the valve clearance is adjusted, is fully pushed down.

NOTICE:
Remove the spark plug and take off the compression.
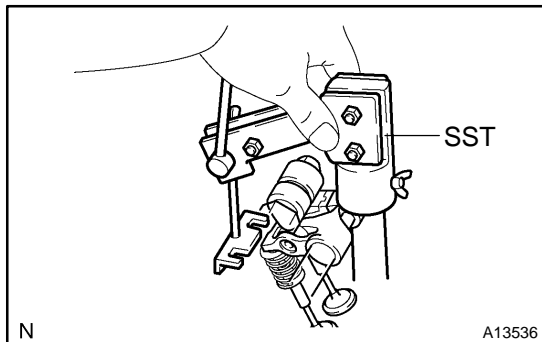
(2) Insert SST into the plug tube.
SST   09248–77010 (09248–07010)

NOTICE:
• **SST cannot be inserted unless the set screw is loosened.**
• **Make sure that the camshaft is in the same condition as step (1).**
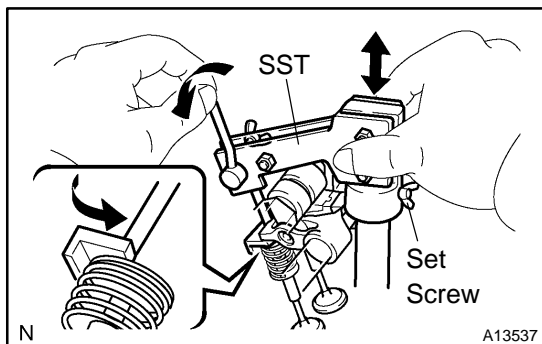
(3) Operate the lever so that SST's seat surface comes to contact with the valve retainer and lock them with the set screw.

NOTICE:
• **Clearance between the valve retainer and SST's seat surface is not allowed.**
• **Care should be taken not to make clearance when inserting SST, since a presence of clearance may unlock the keeper.**
(4) lock the set screw on the plug tube side of SST.
(5) Rotate the crankshaft so that the camshaft is positioned as shown in the illustration.

NOTICE:
• **Pay attention to the direction of the rotation to prevent the nose of the camshaft from interfering with the SST's shaft.**
• **Do not rotate the crankshaft excessively.**
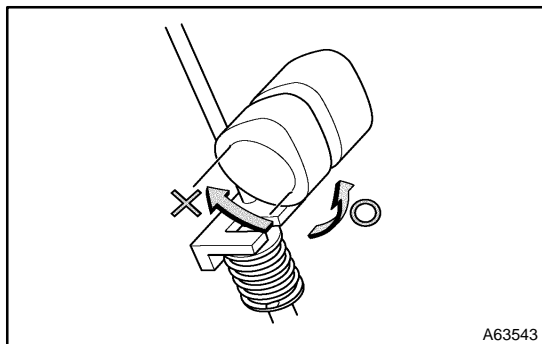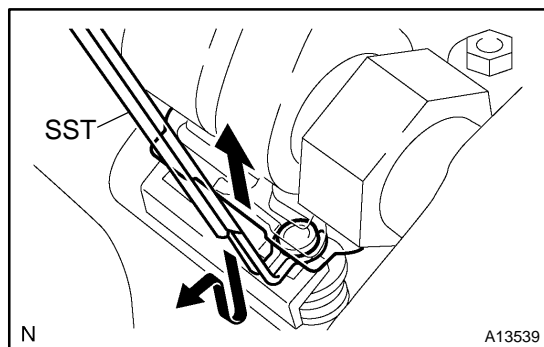
(b) Remove the adjusting shim.
  (1) Lift the rocker arm to make a room and remove the adjusting shim using SST.
  SST   09248–77010 (09248–07010)

NOTICE:
Do not remove SST in the condition that adjusting shim is removed.

HINT:
- Setting SST from the right above makes the removal easy.
- If there is not enough room, reset SST.
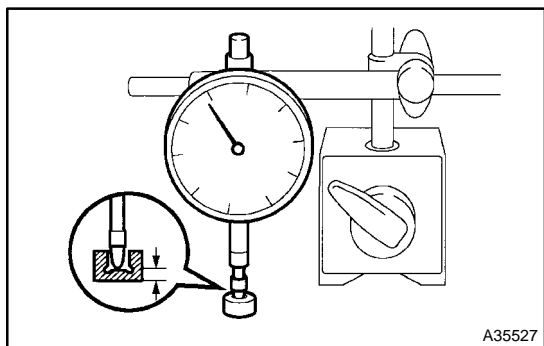
(2) Determine the size of the replaced shim according to there Formula or Charts:
  - Using a dial indicator, measure the thickness of the removed shim.
  - Calculate the thickness of a new shim so that the valve clearance comes within the specified value.

A	Thickness of new shim
B	Thickness of used shim
C	Measured valve clearance

Intake: A = B + (C − 0.13 mm (0.005 in.)) × 1.5
Exhaust: A = B + (C − 0.27 mm (0.011 in.)) × 1.5

HINT:
Shim are available in 41 sizes in increments of 0.020 mm (0.0008 in.), from 2.000 mm (0.0787 in.) to 2.800 mm (0.1102 in.).

2ZZ–GE: Valve Shim Selection Chart (Intake)

Measure clearance mm(in.) \ Installed shim thickness mm(in.)	2.000 (0.0787)	2.020 (0.0795)	2.040 (0.0803)	2.060 (0.0811)	2.080 (0.0819)	2.100 (0.0827)	2.120 (0.0835)	2.140 (0.0843)	2.160 (0.0850)	2.180 (0.0858)	2.190 (0.0862)	2.200 (0.0866)	2.210 (0.0870)	2.220 (0.0874)	2.230 (0.0878)	2.240 (0.0882)	2.250 (0.0886)	2.260 (0.0890)	2.270 (0.0894)	2.280 (0.0898)	2.290 (0.0902)	2.300 (0.0906)	2.310 (0.0909)	2.320 (0.0913)	2.330 (0.0917)	2.340 (0.0921)	2.350 (0.0925)	2.360 (0.0929)	2.370 (0.0933)	2.380 (0.0937)	2.390 (0.0941)	2.400 (0.0945)	2.410 (0.0949)	2.420 (0.0953)	2.430 (0.0957)	2.440 (0.0961)	2.450 (0.0965)	2.460 (0.0969)	2.470 (0.0972)	2.480 (0.0976)	2.490 (0.0980)	2.500 (0.0984)	2.510 (0.0988)	2.520 (0.0992)	2.530 (0.0996)	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)	2.660 (0.1047)	2.680 (0.1055)	2.700 (0.1063)	2.720 (0.1071)	2.740 (0.1079)	2.760 (0.1087)	2.780 (0.1094)	2.800 (0.1102)
0.000 – 0.030 (0.0000 – 0.0012)									00	02	02	04	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	42	44	46	48	50	52	54	56	58	60	62	64
0.031 – 0.050 (0.0012 – 0.0020)								00	02	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	46	48	50	52	54	56	58	60	62	64	66	68
0.051 – 0.070 (0.0020 – 0.0028)							00	02	04	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	48	50	52	54	56	58	60	62	64	66	68	70
0.071 – 0.090 (0.0028 – 0.0035)						00	02	04	06	08	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74
0.091 – 0.099 (0.0036 – 0.0039)						00	02	04	06	08	10	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	54	56	58	60	62	64	66	68	70	72	74	76
0.100 – 0.160 (0.0039 – 0.0063)																																																													
0.161 – 0.180 (0.0063 – 0.0071)	06	80	10	12	14	16	18	20	22	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	50	52	52	54	54	56	56	58	58	60	60	62	62	64	66	68	70	72	74	76	78	80					
0.181 – 0.200 (0.0071 – 0.0079)	10	12	14	16	18	20	22	24	26	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	68	70	72	74	76	78	80						
0.201 – 0.220 (0.0079 – 0.0087)	12	14	16	18	20	22	24	26	28	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	70	72	74	76	78	80							
0.221 – 0.240 (0.0087 – 0.0094)	16	18	20	22	24	26	28	30	32	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	74	76	78	80	82								
0.241 – 0.260 (0.0095 – 0.0102)	18	20	22	24	26	28	30	32	34	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	76	78	80									
0.261 – 0.280 (0.0103 – 0.0110)	22	24	26	28	30	32	34	36	38	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	76	76	78	78	80										
0.281 – 0.300 (0.0111 – 0.0118)	24	26	28	30	32	34	36	38	40	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	76	76	78	78	80	80											
0.301 – 0.320 (0.0119 – 0.0126)	28	30	32	34	36	38	40	42	44	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	76	76	78	78	80	80													
0.321 – 0.340 (0.0126 – 0.0134)	30	32	34	36	38	40	42	44	46	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	76	76	78	78	80	80															
0.341 – 0.360 (0.0134 – 0.0142)	34	36	38	40	42	44	46	48	50	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	76	76	78	78	80	80																			
0.361 – 0.380 (0.0142 – 0.0150)	36	38	40	42	44	46	48	50	52	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	76	76	78	78	80	80																					
0.381 – 0.400 (0.0150 – 0.0157)	40	42	44	46	48	50	52	54	56	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	76	76	78	78	80	80																								
0.401 – 0.420 (0.0158 – 0.0165)	42	44	46	48	50	52	54	56	58	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	76	76	78	78	80	80																										
0.421 – 0.440 (0.0166 – 0.0173)	46	48	50	52	54	56	58	60	62	64	66	66	68	68	70	70	72	72	74	74	76	76	78	78	80	80																														
0.441 – 0.460 (0.0174 – 0.0181)	48	50	52	54	56	58	60	62	64	66	68	68	70	70	72	72	74	74	76	76	78	78	80	80																																
0.461 – 0.480 (0.0181 – 0.0189)	52	54	56	58	60	62	64	66	68	70	72	72	74	74	76	76	78	78	80	80																																				
0.481 – 0.500 (0.0189 – 0.0197)	54	56	58	60	62	64	66	68	70	72	74	74	76	76	78	78	80	80																																					
0.501 – 0.520 (0.0197 – 0.0205)	58	60	62	64	66	68	70	72	74	76	78	78	80	80																																									
0.521 – 0.540 (0.0205 – 0.0213)	60	62	64	66	68	70	72	74	76	78	80	80																																											
0.541 – 0.560 (0.0213 – 0.0220)	64	66	68	70	72	74	76	78	80																																													
0.561 – 0.580 (0.0221 – 0.0228)	66	68	70	72	74	76	78	80																																														
0.581 – 0.600 (0.0229 – 0.0236)	70	72	74	76	78	80																																																
0.601 – 0.620 (0.0237 – 0.0244)	72	74	76	78	80																																																	
0.621 – 0.640 (0.0244 – 0.0252)	76	78	80																																																			
0.641 – 0.660 (0.0252 – 0.0260)	78	80																																																				
0.661 – 0.680 (0.0260 – 0.0268)	80																																																					

Intake valve clearance (Cold):
  0.08 – 0.18 mm (0.0031 – 0.0071 in.)
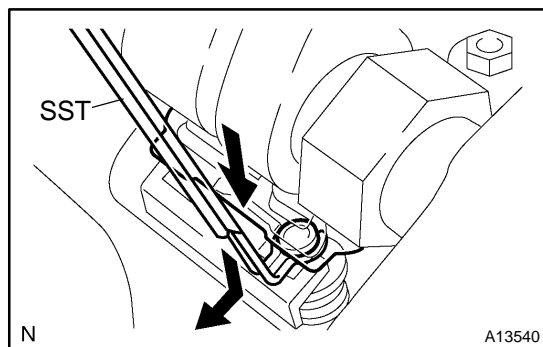EXAMPLE: The 2.200 mm (0.0826 in.) shim is installed, and the measured clearance is 0.400 mm (0.0157 in.).
Replace the 2.600 mm (0.1024 in.) shim with a new No. 60 shim.

New Shim thickness   mm (in.)

Shim No.	Thickness	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)		

2ZZ–GE: Valve Shim Selection Chart (Exhaust)

Installed shim thickness mm(in.): 2.000 (0.0787), 2.020 (0.0795), 2.040 (0.0803), 2.060 (0.0811), 2.080 (0.0819), 2.100 (0.0827), 2.120 (0.0835), 2.140 (0.0843), 2.160 (0.0850), 2.180 (0.0858), 2.190 (0.0862), 2.200 (0.0866), 2.210 (0.0870), 2.220 (0.0874), 2.230 (0.0878), 2.240 (0.0882), 2.250 (0.0886), 2.260 (0.0890), 2.270 (0.0894), 2.280 (0.0898), 2.290 (0.0902), 2.300 (0.0906), 2.310 (0.0909), 2.320 (0.0913), 2.330 (0.0917), 2.340 (0.0921), 2.350 (0.0925), 2.360 (0.0929), 2.370 (0.0933), 2.380 (0.0937), 2.390 (0.0941), 2.400 (0.0945), 2.410 (0.0949), 2.420 (0.0953), 2.430 (0.0957), 2.440 (0.0961), 2.450 (0.0965), 2.460 (0.0969), 2.470 (0.0972), 2.480 (0.0976), 2.490 (0.0980), 2.500 (0.0984), 2.510 (0.0988), 2.520 (0.0992), 2.530 (0.0996), 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), 2.660 (0.1047), 2.680 (0.1055), 2.700 (0.1063), 2.720 (0.1071), 2.740 (0.1079), 2.760 (0.1087), 2.780 (0.1094), 2.800 (0.1102)

Measure clearance mm(in.):
- 0.000 – 0.030 (0.0000 – 0.0012)
- 0.031 – 0.050 (0.0012 – 0.0020)
- 0.051 – 0.070 (0.0020 – 0.0028)
- 0.071 – 0.090 (0.0028 – 0.0035)
- 0.091 – 0.110 (0.0036 – 0.0043)
- 0.111 – 0.130 (0.0044 – 0.0051)
- 0.131 – 0.150 (0.0052 – 0.0059)
- 0.151 – 0.170 (0.0059 – 0.0067)
- 0.171 – 0.190 (0.0067 – 0.0075)
- 0.191 – 0.210 (0.0075 – 0.0083)
- 0.211 – 0.230 (0.0083 – 0.0091)
- 0.231 – 0.239 (0.0091 – 0.0094)
- 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)

(The body of the chart is a diagonal matrix of shim numbers (00, 02, 04, … 80) mapping each measured clearance row to the installed shim thickness column.)

Exhaust valve clearance (Cold):
0.22 – 0.32 mm (0.0087 – 0.0126 in.)
EXAMPLE: The 2.200 mm (0.0862 in.) shim is installed, and the measured clearance is 0.500 mm (0.0197 in.).
Replace the 2.540 mm (0.1000 in.) shim with a new No. 54 shim.

New Shim thickness   mm (in.)

Shim No.	Thickness	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)		

(c) Lift the rocker arm to make a room and use SST, install the adjusting shim.

HINT:
- Setting SST from the right above makes the removal easy.
- To remove SST from the adjusting shim, it is advisable to push down the rocker arm.
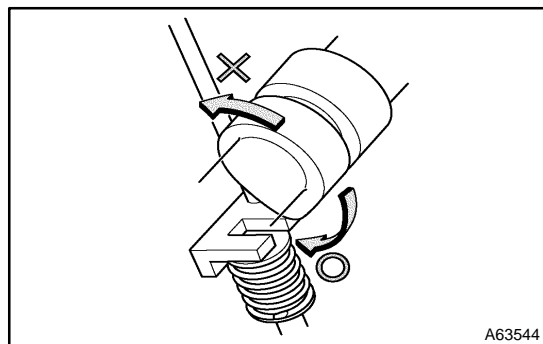
(d) Turn the crankshaft so that the related rocker arm, where the valve clearance is adjusted, is fully pushed down.

NOTICE:
- **Pay attention to the direction of the rotation to prevent the nose of the camshaft from interfering with the SST's shaft.**
- **Do not rotate the crankshaft excessively.**

(e) After loosening the 2 set screws of SST, remove SST itself.

SST   09248–77010(09248–07010)

13. **INSTALL V–RIBBED BELT TENSIONER ASSY**
   Torque:
   Nut 29 N·m (296 kgf·cm, 21 ft·lbf)
   Bolt 100 N·m (1,020 kgf·cm, 74 ft·lbf)
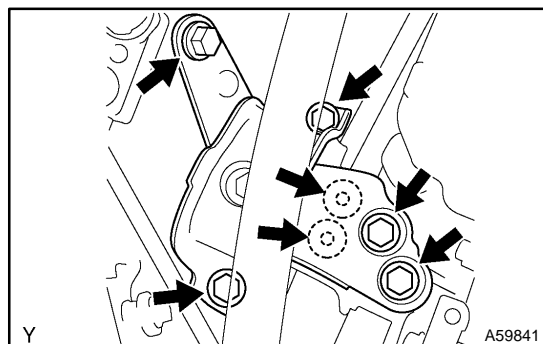
14. **INSTALL ENGINE MOUNTING INSULATOR SUB–ASSY RH**

(a) Install the engine mounting insulator sub–assy RH with the 5 bolts and the 2 nuts.
   Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

15. **INSTALL CYLINDER HEAD COVER SUB–ASSY**

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

HINT:
When FIPG on the head cover gasket side cannot be eliminated completely, replace the gasket.
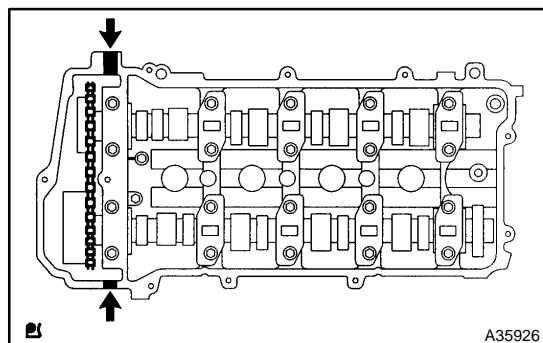
(b) Apply seal packing to 2 locations as shown in the illustration.
   Seal packing: Part No. 08826–00080 or equivalent

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

HINT:
Part must be assembled within 3 minutes of application. Otherwise the material must be remove and reapplied.
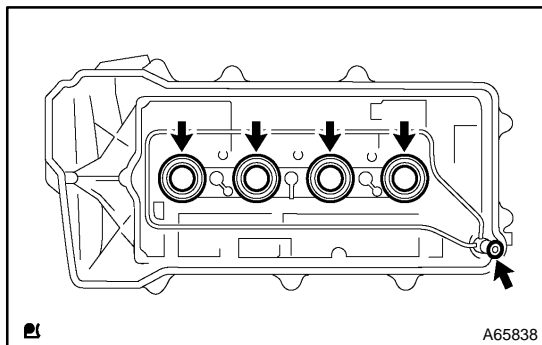
(d) Install the new spark plug tube gasket and a new O–ring to the cylinder head cover.
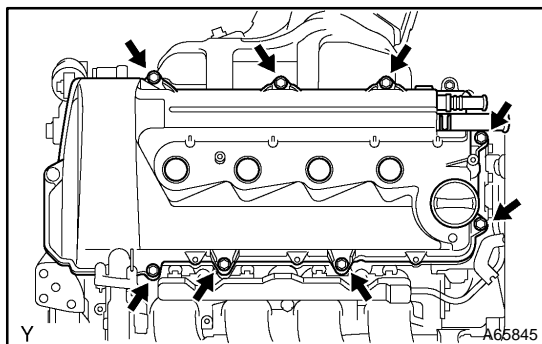
(e) Install the cylinder head cover and wire harness protector with the 8 bolts. Uniformly tighten the bolts, in the several passes, in the sequence shown.
Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)

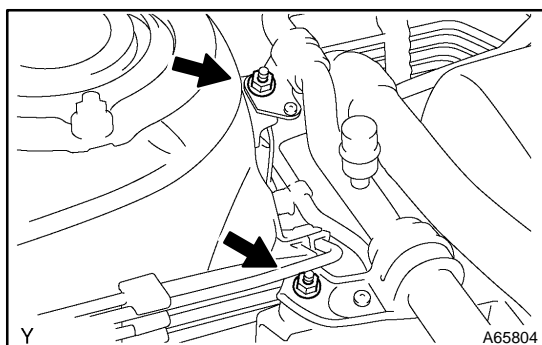(f) Connect the PCV hoses to the cylinder head cover.

(g) Install a new gasket and No. 1 ventilation pipe with 2 nuts and bolt.
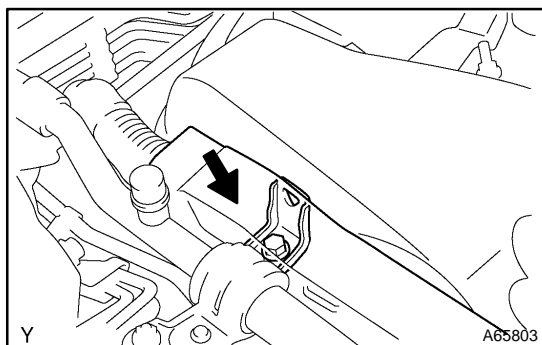**Torque:**
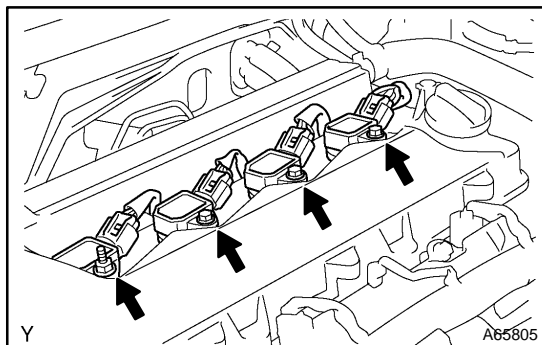**Nut 10 N·m (102 kgf·cm, 7 ft·lbf)**
Bolt 24 N·m (245 kgf·cm, 18 ft·lbf)

(h) Connect the No. 3 ventilation hose to the No. 1 ventilation pipe.

16. INSTALL SUCTION HOSE SUB–ASSY
Torque: 9.8 N·m (100 kgf·cm, 87 in.·lbf)

17. INSTALL WIRE HARNESS CLAMP
Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)

18. INSTALL IGNITION COIL ASSY
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

19. INSTALL CYLINDER HEAD COVER NO.2
Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)
20. INSPECT OIL LEAK