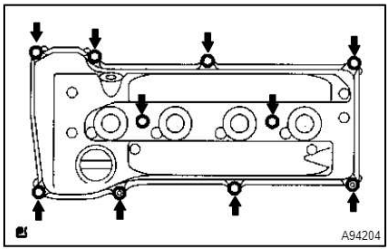
VALVE CLEARANCE (2AZ-FE)

141P2-01

ADJUSTMENT

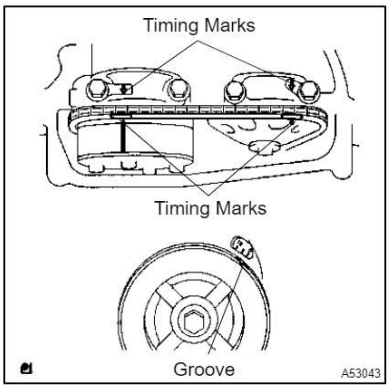
1. REMOVE FRONT WHEEL RH
2. REMOVE FRONT FENDER SPLASH SHIELD FRONT RH
3. REMOVE FRONT FENDER APRON SEAL RH
4. REMOVE ENGINE COVER SUB-ASSY NO.1
5. REMOVE IGNITION COIL ASSY
6. REMOVE SPARK PLUG
7. DISCONNECT VENTILATION HOSE
8. DISCONNECT VENTILATION HOSE NO.2



9. REMOVE CYLINDER HEAD COVER SUB-ASSY

(a) Remove the bolt and disconnect the engine wire harness clamp.

(b) Remove the 8 bolts, 2 nuts, cylinder head cover and gasket.



10. SET NO. 1 CYLINDER TO TDC/COMPRESSION

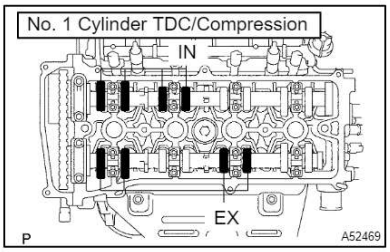
(a) Turn the crankshaft pulley, and align its groove with timing mark 0 of the timing chain cover.

(b) Check that the timing marks of the camshaft timing gear and sprocket are aligned with the timing marks of the bearing cap No. 1 and No. 2 as shown in the illustration.

11. INSPECT VALVE CLEARANCE

HINT:

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



(a) Check only the valve indicated on the left.

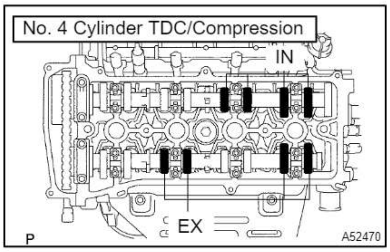
(1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

(2) Record valve clearance measurements that are out of the specified range. These measurements will be used later to determine the size of the adjustment shim to be installed.

Valve clearance (Cold):

Item	Specified Condition
Intake	0.19 to 0.29 mm (0.008 to 0.011 in.)
Exhaust	0.30 to 0.40 mm (0.012 to 0.016 in.)

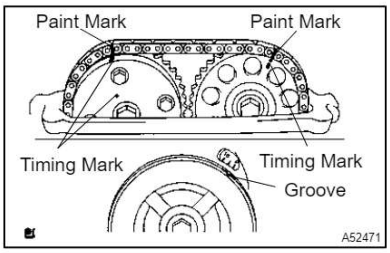
(b) Turn the crankshaft clockwise 1 revolution (360°) and set the No.4 cylinder to TDC/compression.



(c) Check only the valve indicated on the left.
(1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
(2) Record valve clearance measurements that are out of the specified range. These measurements will be used later to determine the size of the adjustment shim to be installed.

Valve clearance (Cold):

Item	Specified Condition
Intake	0.19 to 0.29 mm (0.008 to 0.011 in.)
Exhaust	0.30 to 0.40 mm (0.012 to 0.016 in.)



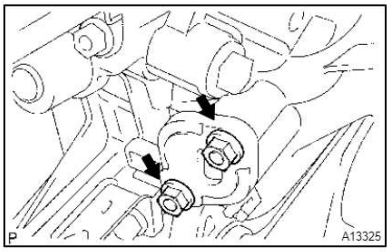
12. ADJUST VALVE CLEARANCE

NOTICE:

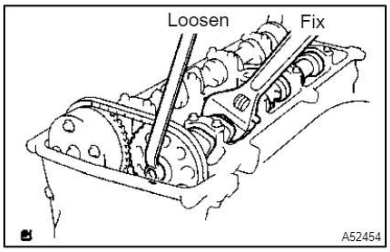
Be sure not to turn the crankshaft without the chain tensioner.

(a) Turn the crankshaft clockwise 1 revolution (360°) and set the No. 1 cylinder to the TDC/compression.

(b) Place paint marks on the timing chain and camshaft timing gear sprocket.

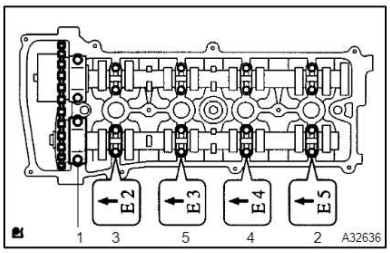


(c) Remove the 2 bolts and chain tensioner.

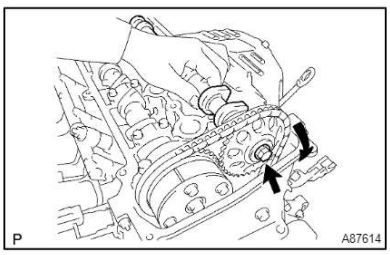


(d) Remove the No. 2 camshaft.
(1) Fix the camshaft with a wrench and then loosen the sprocket bolt.

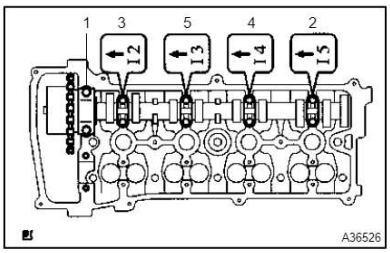
NOTICE:
Be careful not to damage the valve lifter.



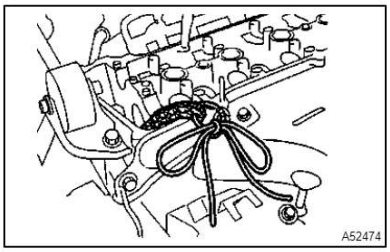
(2) Uniformly loosen and remove the No. 2 camshaft's 10 bearing cap bolts in the sequence shown in the illustration. Then remove the 5 bearing caps.



(3) Raise the No. 2 camshaft and remove it. Then remove the sprocket bolt.
(4) Remove the camshaft timing sprocket and the timing chain from the No. 2 camshaft.
(5) Remove the camshaft timing sprocket from the timing chain.



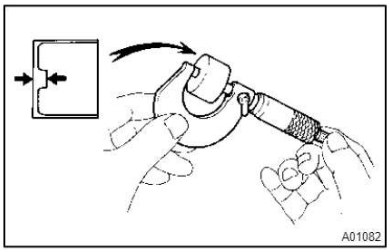
(e) Remove the camshaft.
(1) Uniformly loosen and remove the camshaft's 10 bearing cap bolts in the sequence shown in the illustration. Then remove the 5 bearing caps.
(2) Remove the camshaft.



(f) Tie the timing chain with a string.

NOTICE:
Be careful not to drop anything inside the timing chain cover.

(g) Remove the valve lifters.



(h) Adjust the valve clearance.

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

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

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

Valve clearance:

Item	Specified Condition
Intake	A = B + (C - 0.24 mm (0.0094 in.))
Exhaust	A = B + (C - 0.35 mm (0.0138 in.))

EXAMPLE: (Intake)
Measured valve clearance = 0.44 mm (0.0173 in.)
0.44 mm (0.0173 in.) - 0.24 mm (0.0094 in.) = 0.20 mm (0.0079 in.)
(Measured - Specification = Excess clearance)
Used shim measurement = 5.30 mm (0.2087 in.)
0.20 mm (0.0079 in.) + 5.30 mm (0.2087 in.) = 5.50 mm (0.2165 in.)
(Excess clearance + Used shim = Ideal new shim)
Closest new shim = 5.50 mm (0.2165 in.) = Shim No. ”50”

(3) Select a new lifter with a thickness as close as possible to the calculated values.

HINT:

- Lifters are available in 35 sizes in increments of 0.020 mm (0.0008 in.), from 5.060 mm (0.1992 in.) to 5.740 mm (0.2260 in.).
- Refer to valve lifter selection chart on the following 2 pages.

Valve Lifter Selection Chart (Intake)

Measure clearance mm (in.) \ Installed lifter thickness mm (in.)	5.060 (0.1992)	5.080 (0.2000)	5.100 (0.2008)	5.120 (0.2016)	5.140 (0.2024)	5.160 (0.2031)	5.180 (0.2039)	5.200 (0.2047)	5.210 (0.2051)	5.220 (0.2055)	5.230 (0.2059)	5.240 (0.2063)	5.250 (0.2067)	5.260 (0.2071)	5.270 (0.2075)	5.280 (0.2079)	5.290 (0.2083)	5.300 (0.2087)	5.310 (0.2091)	5.320 (0.2094)	5.330 (0.2098)	5.340 (0.2102)	5.350 (0.2106)	5.360 (0.2110)	5.370 (0.2114)	5.380 (0.2118)	5.390 (0.2122)	5.400 (0.2126)	5.410 (0.2130)	5.420 (0.2134)	5.430 (0.2138)	5.440 (0.2142)	5.450 (0.2146)	5.460 (0.2150)	5.470 (0.2154)	5.480 (0.2157)	5.490 (0.2161)	5.500 (0.2165)	5.510 (0.2169)	5.520 (0.2173)	5.530 (0.2177)	5.540 (0.2181)	5.550 (0.2185)	5.560 (0.2189)	5.570 (0.2193)	5.580 (0.2197)	5.590 (0.2201)	5.600 (0.2205)	5.620 (0.2213)	5.640 (0.2220)	5.660 (0.2228)	5.680 (0.2236)	5.700 (0.2244)	5.720 (0.2252)	5.740 (0.2260)
0.000−0.030 (0.0000−0.0012)													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
0.031−0.050 (0.0012−0.0020)									06	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
0.051−0.070 (0.0020−0.0028)								06	08	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
0.071−0.090 (0.0028−0.0035)							06	08	10	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	46	48	50	52	54	56	58	60	62
0.091−0.110 (0.0036−0.0043)						06	08	10	12	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	48	50	52	54	56	58	60	62	64
0.111−0.130 (0.0044−0.0051)					06	08	10	12	14	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	52	54	56	58	60	62	64	66
0.131−0.150 (0.0052−0.0059)				06	08	10	12	14	16	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	52	54	56	58	60	62	64	66	68
0.151−0.170 (0.0059−0.0067)			06	08	10	12	14	16	18	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	52	54	54	56	58	60	62	64	66	68	70
0.171−0.189 (0.0067−0.0074)		06	08	10	12	14	16	18	20	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	52	54	54	56	56	58	60	62	64	66	68	70	72
0.190−0.290 (0.0075−0.0114)																																																								
0.291−0.310 (0.0115−0.0122)	12	14	16	18	20	22	24	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	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	70	72	74	74	74
0.311−0.330 (0.0122−0.0130)	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	66	68	68	70	72	74	74	74	
0.331−0.350 (0.0130−0.0138)	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	68	70	70	72	74	74	74		
0.351−0.370 (0.0138−0.0146)	18	20	22	24	26	28	30	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	68	70	70	72	72	74	74	74			
0.371−0.390 (0.0146−0.0154)	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	72	74	74	74					
0.391−0.410 (0.0154−0.0161)	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	74	74						
0.411−0.430 (0.0162−0.0169)	24	26	28	30	32	34	36	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	74	74								
0.431−0.450 (0.0170−0.0177)	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	74	74										
0.451−0.470 (0.0178−0.0185)	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	74	74												
0.471−0.490 (0.0185−0.0193)	30	32	34	36	38	40	42	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	74	74														
0.491−0.510 (0.0193−0.0201)	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	74	74																
0.511−0.530 (0.0201−0.0209)	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	74	74																		
0.531−0.550 (0.0209−0.0217)	36	38	40	42	44	46	48	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	74	74																				
0.551−0.570 (0.0217−0.0224)	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	74	74																					
0.571−0.590 (0.0225−0.0232)	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	74	74																								
0.591−0.610 (0.0233−0.0240)	42	44	46	48	50	52	54	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																								
0.611−0.630 (0.0241−0.0248)	44	46	48	50	52	54	56	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																										
0.631−0.650 (0.0248−0.0256)	46	48	50	52	54	56	58	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																										
0.651−0.670 (0.0256−0.0264)	48	50	52	54	56	58	60	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																										
0.671−0.690 (0.0264−0.0272)	50	52	54	56	58	60	62	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																										
0.691−0.710 (0.0272−0.0280)	52	54	56	58	60	62	64	66	68	68	70	70	72	72	74	74	74	74	74	74																										
0.711−0.730 (0.0280−0.0287)	54	56	58	60	62	64	66	68	70	70	72	72	74	74	74	74	74	74																										
0.731−0.750 (0.0288−0.0295)	56	58	60	62	64	66	68	70	72	72	74	74	74	74	74	74																										
0.751−0.770 (0.0296−0.0303)	58	60	62	64	66	68	70	72	74	74	74	74	74																													
0.771−0.790 (0.0304−0.0311)	60	62	64	66	68	70	72	74	74	74																														
0.791−0.810 (0.0311−0.0319)	62	64	66	68	70	72	74																																	
0.811−0.830 (0.0319−0.0327)	64	66	68	70	72	74																																		
0.831−0.850 (0.0327−0.0335)	66	68	70	72	74																																			
0.851−0.870 (0.0335−0.0343)	68	70	72	74																																				
0.871−0.890 (0.0343−0.0350)	70	72	74																																					
0.891−0.910 (0.0351−0.0358)	72	74																																						
0.911−0.930 (0.0359−0.0366)	74																																							

New Lifter Thickness mm (in.)

Lifter No.	Thickness	Lifter No.	Thickness	Lifter No.	Thickness
06	5.060 (0.1992)	30	5.300 (0.2087)	54	5.540 (0.2181)
08	5.080 (0.2000)	32	5.320 (0.2094)	56	5.560 (0.2189)
10	5.100 (0.2008)	34	5.340 (0.2102)	58	5.580 (0.2197)
12	5.120 (0.2016)	36	5.360 (0.2110)	60	5.600 (0.2205)
14	5.140 (0.2024)	38	5.380 (0.2118)	62	5.620 (0.2213)
16	5.160 (0.2031)	40	5.400 (0.2126)	64	5.640 (0.2220)
18	5.180 (0.2039)	42	5.420 (0.2134)	66	5.660 (0.2228)
20	5.200 (0.2047)	44	5.440 (0.2142)	68	5.680 (0.2236)
22	5.220 (0.2055)	46	5.460 (0.2150)	70	5.700 (0.2244)
24	5.240 (0.2063)	48	5.480 (0.2157)	72	5.720 (0.2252)
26	5.260 (0.2071)	50	5.500 (0.2165)	74	5.740 (0.2260)
28	5.280 (0.2079)	52	5.520 (0.2173)		

Intake valve clearance (Cold):
0.19 to 0.29 mm (0.008 to 0.011 in.)

EXAMPLE:

The 5.250 mm (0.2067 in.) lifter is installed, and the measured clearance is 0.400 mm (0.0157 in.). Replace the 5.250 mm (0.2067 in.) lifter with a new No. 42 lifter.

A77296

Valve Lifter Selection Chart (Exhaust)

Measure clearance mm (in.) / Installed lifter thickness mm (in.)	5.060 (0.1992)	5.080 (0.2000)	5.100 (0.2008)	5.120 (0.2016)	5.140 (0.2024)	5.160 (0.2031)	5.180 (0.2039)	5.200 (0.2047)	5.210 (0.2051)	5.220 (0.2055)	5.230 (0.2059)	5.240 (0.2063)	5.250 (0.2067)	5.260 (0.2071)	5.270 (0.2075)	5.280 (0.2079)	5.290 (0.2083)	5.300 (0.2087)	5.310 (0.2091)	5.320 (0.2094)	5.330 (0.2098)	5.340 (0.2102)	5.350 (0.2106)	5.360 (0.2110)	5.370 (0.2114)	5.380 (0.2118)	5.390 (0.2122)	5.400 (0.2126)	5.410 (0.2130)	5.420 (0.2134)	5.430 (0.2138)	5.440 (0.2142)	5.450 (0.2146)	5.460 (0.2150)	5.470 (0.2154)	5.480 (0.2157)	5.490 (0.2161)	5.500 (0.2165)	5.510 (0.2169)	5.520 (0.2173)	5.530 (0.2177)	5.540 (0.2181)	5.550 (0.2185)	5.560 (0.2189)	5.570 (0.2193)	5.580 (0.2197)	5.590 (0.2201)	5.600 (0.2205)	5.620 (0.2213)	5.640 (0.2220)	5.660 (0.2228)	5.680 (0.2236)	5.700 (0.2244)	5.720 (0.2252)	5.740 (0.2260)
0.000-0.030 (0.0000-0.0012)																							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	34	36	38	40	42	44
0.031-0.050 (0.0012-0.0020)																					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	36	38	40	42	44	46
0.051-0.070 (0.0020-0.0028)																			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	38	40	42	44	46	48
0.071-0.090 (0.0028-0.0035)																	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	40	42	44	46	48	50
0.091-0.110 (0.0036-0.0043)															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
0.111-0.130 (0.0044-0.0051)													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	44	46	48	50	52	54
0.131-0.150 (0.0052-0.0059)											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
0.151-0.170 (0.0059-0.0067)									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	44	46	48	50	52	54	56	58
0.171-0.190 (0.0067-0.0075)								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	46	48	50	52	54	56	58	60
0.191-0.210 (0.0075-0.0083)							06	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	46	48	48	50	52	54	56	58	60	62
0.211-0.230 (0.0083-0.0091)						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	48	50	50	52	54	56	58	60	62	64
0.231-0.250 (0.0091-0.0098)					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	52	54	56	58	60	62	64	66
0.251-0.270 (0.0099-0.0106)				06	08	10	12	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	52	54	54	56	58	60	62	64	66	68
0.271-0.290 (0.0107-0.0114)			06	08	10	12	14	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	52	54	54	56	56	58	60	62	64	66	68	70
0.291-0.299 (0.0115-0.0118)		06	08	10	12	14	16	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	52	54	54	56	56	58	58	60	62	64	66	68	70	72
0.300-0.400 (0.0118-0.0157)																																																								
0.401-0.420 (0.0158-0.0165)	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	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	68	70	72	74	74	74	
0.421-0.440 (0.0166-0.0173)	14	16	18	20	22	24	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	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	70	72	74	74	74		
0.441-0.460 (0.0174-0.0181)	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	66	68	68	70	72	74	74	74			
0.461-0.480 (0.0181-0.0189)	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	68	70	70	72	74	74	74				
0.481-0.500 (0.0189-0.0197)	20	22	24	26	28	30	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	68	70	70	72	72	74	74	74					
0.501-0.520 (0.0197-0.0205)	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	72	74	74	74	74						
0.521-0.540 (0.0205-0.0213)	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	76	74							
0.541-0.560 (0.0213-0.0220)	26	28	30	32	34	36	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	74	74	74	74								
0.561-0.580 (0.0221-0.0228)	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	74	74	74	74										
0.581-0.600 (0.0229-0.0236)	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	74	74	74	74												
0.601-0.620 (0.0237-0.0244)	32	34	36	38	40	42	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	74	74	74	74														
0.621-0.640 (0.0244-0.0252)	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	74	74	74	74																
0.641-0.660 (0.0252-0.0260)	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	74	74	74	74																		
0.661-0.680 (0.0260-0.0268)	38	40	42	44	46	48	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	74	74	74	74																				
0.681-0.700 (0.0268-0.0276)	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	74	74	74	74																						
0.701-0.720 (0.0276-0.0283)	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	74	74	74	74																								
0.721-0.740 (0.0284-0.0291)	44	46	48	50	52	54	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																										
0.741-0.760 (0.0292-0.0299)	46	48	50	52	54	56	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																												
0.761-0.780 (0.0300-0.0307)	48	50	52	54	56	58	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																														
0.781-0.800 (0.0307-0.0315)	50	52	54	56	58	60	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																																
0.801-0.820 (0.0315-0.0323)	52	54	56	58	60	62	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																																		
0.821-0.840 (0.0323-0.0331)	54	56	58	60	62	64	66	68	68	70	70	72	72	74	74	74	74	74	74																																				
0.841-0.860 (0.0331-0.0339)	56	58	60	62	64	66	68	70	70	72	72	74	74	74	74	74	74																																						
0.861-0.880 (0.0339-0.0346)	58	60	62	64	66	68	70	72	72	74	74	74	74	74	74																																								
0.881-0.900 (0.0347-0.0354)	60	62	64	66	68	70	72	74	74	74	74	74	74																																										
0.901-0.920 (0.0355-0.0362)	62	64	66	68	70	72	74	74	74	74	74																																												
0.921-0.940 (0.0363-0.0370)	64	66	68	70	72	74	74	74	74																																														
0.941-0.960 (0.0370-0.0378)	66	68	70	72	74	74	74																																																
0.961-0.980 (0.0378-0.0386)	68	70	72	74	74	74																																																	
0.981-1.000 (0.0386-0.0394)	70	72	74	74	74																																																		
1.001-1.020 (0.0394-0.0402)	72	74	74	74																																																			
1.021-1.040 (0.0402-0.0409)	74	74	74																																																				
1.041-1.060 (0.0410-0.0417)	74	74																																																					
1.061-1.080 (0.0418-0.0425)	74																																																						

New lifter thickness mm (in.)

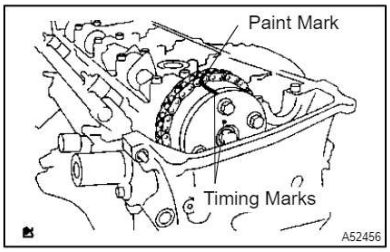
Lifter No.	Thickness	Lifter No.	Thickness	Lifter No.	Thickness
06	5.060 (0.1992)	30	5.300 (0.2087)	54	5.540 (0.2181)
08	5.080 (0.2000)	32	5.320 (0.2094)	56	5.560 (0.2189)
10	5.100 (0.2008)	34	5.340 (0.2102)	58	5.580 (0.2197)
12	5.120 (0.2016)	36	5.360 (0.2110)	60	5.600 (0.2205)
14	5.140 (0.2024)	38	5.380 (0.2118)	62	5.620 (0.2213)
16	5.160 (0.2031)	40	5.400 (0.2126)	64	5.640 (0.2220)
18	5.180 (0.2039)	42	5.420 (0.2134)	66	5.660 (0.2228)
20	5.200 (0.2047)	44	5.440 (0.2142)	68	5.680 (0.2236)
22	5.220 (0.2055)	46	5.460 (0.2150)	70	5.700 (0.2244)
24	5.240 (0.2063)	48	5.480 (0.2157)	72	5.720 (0.2252)
26	5.260 (0.2071)	50	5.500 (0.2165)	74	5.740 (0.2260)
28	5.280 (0.2079)	52	5.520 (0.2173)		

Exhaust valve clearance (Cold):
0.30 to 0.40 mm (0.012 to 0.016 in.)

EXAMPLE:

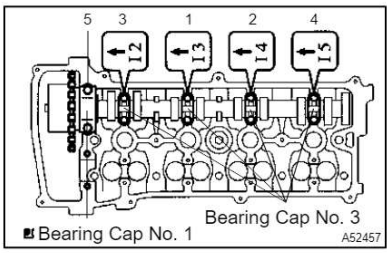
The 5.340 mm (0.2102 in.) lifter is installed, and the measured clearance is 0.440 mm (0.0173 in.). Replace the 5.340 mm (0.2102 in.) lifter with a new No. 44 lifter.

A77297



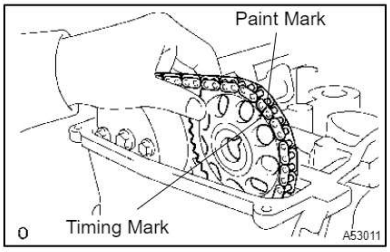
(i) Install the camshaft.

(1) Install the timing chain on the camshaft timing gear, with the paint mark aligned with the timing marks on the camshaft timing gear.



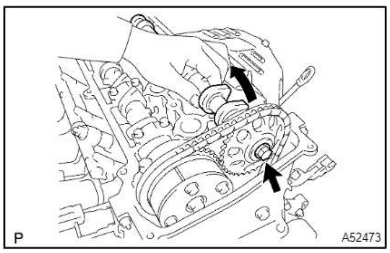
(2) Examine the front marks and numbers of the 5 bearing caps and install them. Then install the 10 bearing cap bolts. Uniformly tighten the bolts in the sequence shown in the illustration.

Torque:
30 N·m (301 kgf·cm, 22 ft·lbf) for bearing cap No. 1
9.0 N·m (92 kgf·cm, 80 in.·lbf) for bearing cap No. 3

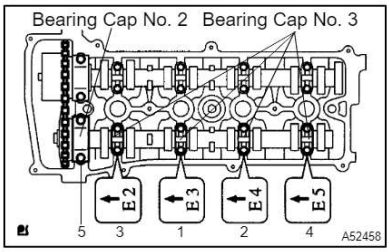


(j) Install the No. 2 camshaft.

(1) Put the No. 2 camshaft on the cylinder head with the paint mark of the chain aligned with the timing mark on the camshaft timing sprocket.

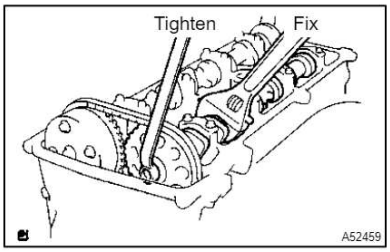


(2) Raise the No. 2 camshaft and temporarily tighten the sprocket bolt.



(3) Examine the front marks and numbers of the 5 bearing caps and install them. Then install the 10 bearing cap bolts. Uniformly tighten the bolts in the sequence shown in the illustration.

Torque:
30 N·m (301 kgf·cm, 22 ft·lbf) for bearing cap No. 2
9.0 N·m (92 kgf·cm, 80 in.·lbf) for bearing cap No. 3

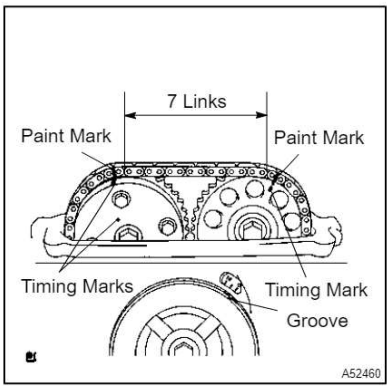


(4) Fix the camshaft with a wrench, then tighten the sprocket bolt.

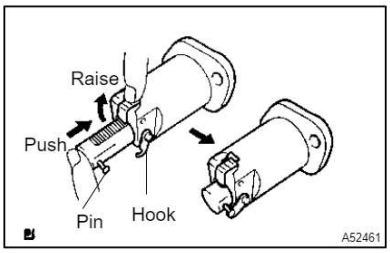
Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)

NOTICE:

Be careful not to damage the valve lifter.

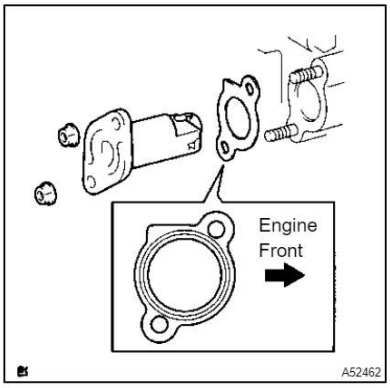


(k) Check that the timing chain paint marks are aligned with the camshaft timing sprocket timing mark and the camshaft timing gear timing mark. Also check the alignment of the pulley groove and chain cover timing mark.



(l) Install the chain tensioner.

(1) Release the ratchet pawl, fully push in the plunger and apply the hook to the pin so that the plunger cannot spring out.

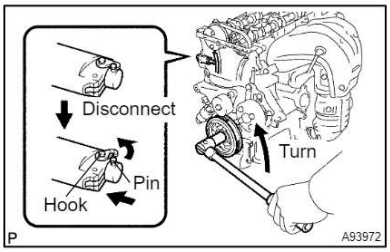


(2) Install a new gasket and the chain tensioner with the 2 nuts.

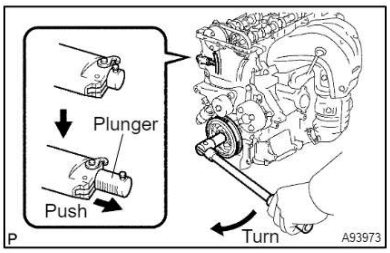
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

NOTICE:

When installing the tensioner, set the hook again if the hook releases the plunger.



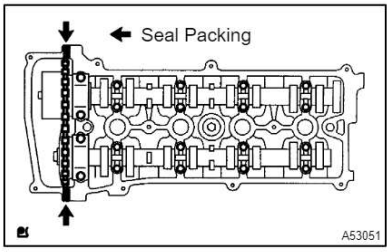
(3) Turn the crankshaft counterclockwise, and disconnect the plunger knock pin from the hook.



(4) Turn the crankshaft clockwise, and check that the slipper is pushed by the plunger.

13. INSTALL CYLINDER HEAD COVER SUB-ASSY

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

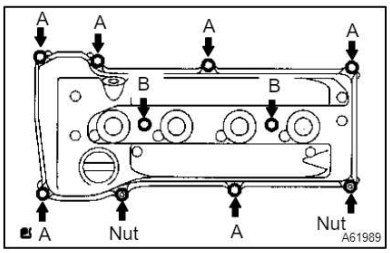


(b) Apply seal packing to 2 locations as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

- **Remove any oil from the contact surface.**
- **Install the cylinder head cover within 5 minutes after applying seal packing.**
- **Do not start the engine for at least 2 hours after installing the cylinder head cover.**



(c) Install the cylinder head cover with the 8 bolts and 2 nuts.

Torque:
11 N·m (112 kgf·cm, 8 ft·lbf) for nut
11 N·m (112 kgf·cm, 8 ft·lbf) for bolt A
14 N·m (143 kgf·cm, 10 ft·lbf) for bolt B

14. INSTALL SPARK PLUG
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

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

16. INSTALL FRONT WHEEL RH

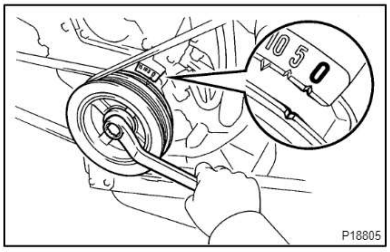
17. CHECK FOR ENGINE COOLANT LEAKS (See page 16-6)

VALVE CLEARANCE (3MZ-FE)

141PH-01

ADJUSTMENT

1. DRAIN ENGINE COOLANT (See page 16-26)
2. REMOVE FR WIPER ARM LH (See page 66-7)
3. REMOVE FR WIPER ARM RH (See page 66-7)
4. REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSY (See page 66-7)
5. REMOVE WINDSHIELD WIPER LINK ASSY (See page 66-7)
6. REMOVE COWL PANEL SUB-ASSY
7. REMOVE FRONT FENDER APRON SEAL RH
8. REMOVE FRONT SUSPENSION BRACE SUB-ASSY UPPER CENTER
9. REMOVE V-BANK COVER SUB-ASSY (See page 14-149)
10. REMOVE AIR CLEANER CAP SUB-ASSY
11. REMOVE EMISSION CONTROL VALVE SET (See page 14-149)
12. REMOVE INTAKE AIR SURGE TANK (See page 14-149)
13. REMOVE RADIATOR HOSE INLET
14. REMOVE IGNITION COIL ASSY
15. REMOVE CYLINDER HEAD COVER SUB-ASSY (See page 14-173)
16. REMOVE CYLINDER HEAD COVER SUB-ASSY LH (See page 14-173)

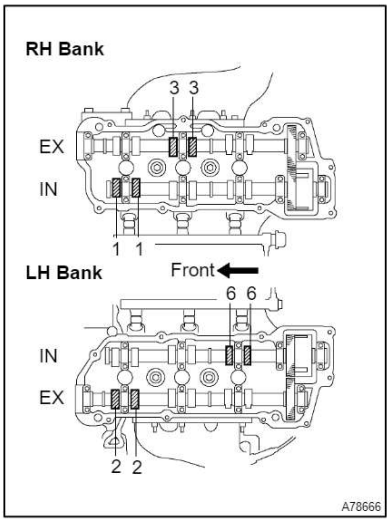


17. INSPECT VALVE CLEARANCE

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

(b) Check that the valve lifters on the No. 1 (IN and EX) are both loose.

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



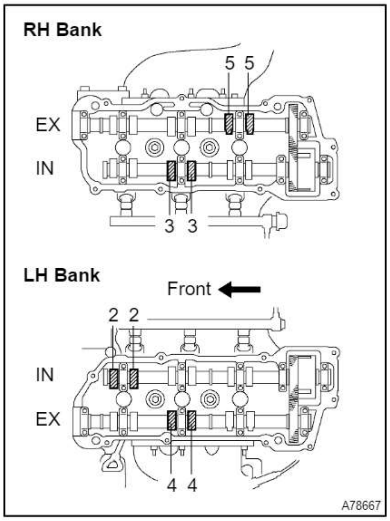
(c) Check the valves indicated in the illustration on the left.

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

Valve clearance (Cold):

Item	Specified Condition
Intake	0.15 to 0.25 mm (0.006 to 0.010 in.)
Exhaust	0.25 to 0.35 mm (0.010 to 0.014 in.)

(2) Record valve clearance measurements that are out of the specified range. These measurements will be used later to determine the size of the adjustment shim to be installed.



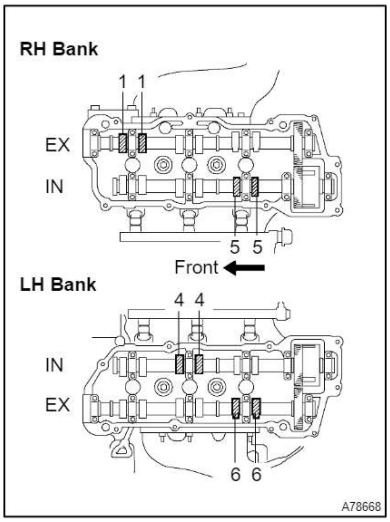
(d) Turn the crankshaft 2/3 of a revolution (240°), and check the valves indicated in the illustration on the left.

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

Valve clearance (Cold):

Item	Specified Condition
Intake	0.15 to 0.25 mm (0.006 to 0.010 in.)
Exhaust	0.25 to 0.35 mm (0.010 to 0.014 in.)

(2) Record valve clearance measurements that are out of the specified range. These measurements will be used later to determine the size of the adjustment shim to be installed.



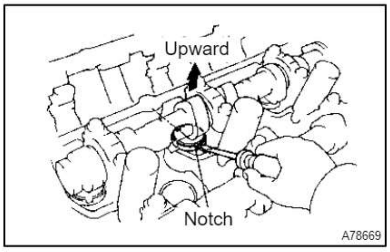
(e) Turn the crankshaft 2/3 of a revolution (240°), and check the valves indicated in the illustration on the left.

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

Valve clearance (Cold):

Item	Specified Condition
Intake	0.15 to 0.25 mm (0.006 to 0.010 in.)
Exhaust	0.25 to 0.35 mm (0.010 to 0.014 in.)

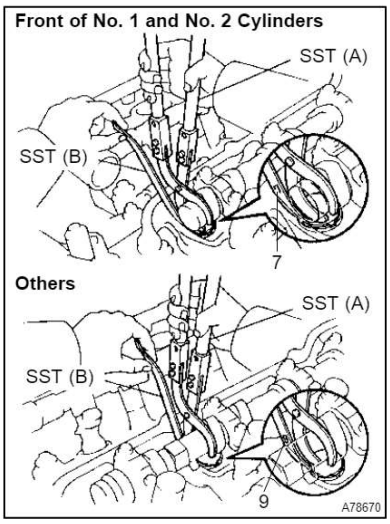
(2) Record valve clearance measurements that are out of the specified range. These measurements will be used later to determine the size of the adjustment shim to be installed.



18. ADJUST VALVE CLEARANCE

(a) Turn the camshaft so that the cam lobe faces upward.

(b) Turn the valve lifter with a screwdriver so that the notches are perpendicular to the camshaft.

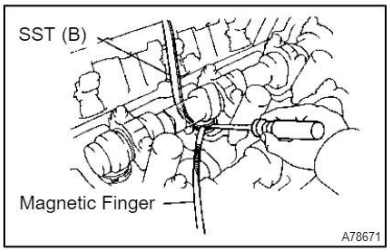


(c) Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

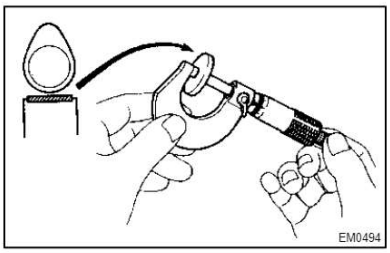
SST 09248-55040 (09248-05410, 09248-05420)

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.



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



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

(f) 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

Specified value (Cold):
Intake A = B + (C - 0.20 mm (0.0079 in.))
Exhaust A = B + (C - 0.30 mm (0.0118 in.))

(g) Select a new shim with a thickness as close as possible to the calculated values.

EXAMPLE (Intake):
Measured valve clearance = 0.45 mm (0.0177 in.)
0.45 mm (0.0177 in.) - 0.20 mm (0.0079 in.) = 0.25 mm (0.0098 in.)
(Measured - Specification = Excess clearance)
Used shim measurement = 2.80 mm (0.1102 in.)
0.25 mm (0.0098 in.) + 2.80 mm (0.1102 in.) = 3.05 mm (0.1201 in.)
(Excess clearance + Used shim = Ideal new shim)
Closest new shim = 3.05 mm (0.1201 in.)
Select No. 12 shim

HINT:

- Shims are available in 17 sizes in increments of 0.05 mm (0.0020 in.), from 2.50 mm (0.0984 in.) to 3.30 mm (0.1299 in.).
- Refer to adjusting shim selection chart on the following 2 pages.

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)
0.000 – 0.020 (0.0000 – 0.0008)									1	1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4
0.021 – 0.040 (0.0008 – 0.0016)								1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4
0.041 – 0.060 (0.0016 – 0.0024)							1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5
0.061 – 0.080 (0.0024 – 0.0031)						1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5
0.081 – 0.100 (0.0032 – 0.0039)				1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6
0.101 – 0.120 (0.0040 – 0.0047)			1	1	1	1	1	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6
0.121 – 0.140 (0.0048 – 0.0055)		1	1	1	1	1	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6
0.141 – 0.149 (0.0056 – 0.0059)		1	1	1	1	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7
0.150 – 0.250 (0.0059 – 0.0098)																													
0.251 – 0.260 (0.0099 – 0.0102)	2	3	3	3	3	4	4	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9
0.261 – 0.280 (0.0103 – 0.0110)	2	3	3	3	4	4	4	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9
0.281 – 0.300 (0.0111 – 0.0118)	3	3	4	4	4	4	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10
0.301 – 0.320 (0.0119 – 0.0126)	3	4	4	4	4	5	5	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10
0.321 – 0.340 (0.0126 – 0.0134)	4	4	4	5	5	5	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10
0.341 – 0.360 (0.0134 – 0.0142)	4	4	5	5	5	6	6	6	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11
0.361 – 0.380 (0.0142 – 0.0150)	4	5	5	5	6	6	6	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11
0.381 – 0.400 (0.0150 – 0.0157)	5	5	6	6	6	6	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12
0.401 – 0.420 (0.0158 – 0.0165)	5	6	6	6	6	7	7	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12
0.421 – 0.440 (0.0166 – 0.0173)	6	6	6	7	7	7	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12
0.441 – 0.460 (0.0174 – 0.0181)	6	6	7	7	7	8	8	8	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13
0.461 – 0.480 (0.0181 – 0.0189)	6	7	7	7	8	8	8	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13
0.481 – 0.500 (0.0189 – 0.0197)	7	7	8	8	8	8	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14
0.501 – 0.520 (0.0197 – 0.0205)	7	8	8	8	8	9	9	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14
0.521 – 0.540 (0.0205 – 0.0213)	8	8	8	9	9	9	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14
0.541 – 0.560 (0.0213 – 0.0220)	8	8	9	9	9	10	10	10	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15
0.561 – 0.580 (0.0221 – 0.0228)	8	9	9	9	10	10	10	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15
0.581 – 0.600 (0.0229 – 0.0236)	9	9	10	10	10	10	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16
0.601 – 0.620 (0.0237 – 0.0244)	9	10	10	10	10	11	11	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16
0.621 – 0.640 (0.0244 – 0.0252)	10	10	10	11	11	11	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16
0.641 – 0.660 (0.0252 – 0.0260)	10	10	11	11	11	12	12	12	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17
0.661 – 0.680 (0.0260 – 0.0268)	10	11	11	11	12	12	12	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17
0.681 – 0.700 (0.0268 – 0.0276)	11	11	12	12	12	12	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17
0.701 – 0.720 (0.0276 – 0.0283)	11	12	12	12	12	13	13	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17
0.721 – 0.740 (0.0284 – 0.0291)	12	12	12	13	13	13	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17		
0.741 – 0.760 (0.0292 – 0.0299)	12	12	13	13	13	14	14	14	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17				
0.761 – 0.780 (0.0300 – 0.0307)	12	13	13	13	14	14	14	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17						
0.781 – 0.800 (0.0307 – 0.0315)	13	13	14	14	14	14	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17								
0.801 – 0.820 (0.0315 – 0.0323)	13	14	14	14	14	15	15	16	16	16	16	17	17	17	17	17	17	17	17										
0.821 – 0.840 (0.0323 – 0.0331)	14	14	14	15	15	15	16	16	16	17	17	17	17	17	17	17	17												
0.841 – 0.860 (0.0331 – 0.0339)	14	14	15	15	15	16	16	16	17	17	17	17	17	17	17														
0.861 – 0.880 (0.0339 – 0.0346)	14	15	15	15	16	16	16	17	17	17	17	17	17																
0.881 – 0.900 (0.0347 – 0.0354)	15	15	16	16	16	16	17	17	17	17	17																		
0.901 – 0.920 (0.0355 – 0.0362)	15	16	16	16	16	17	17	17	17																				
0.921 – 0.940 (0.0363 – 0.0370)	16	16	16	17	17	17	17	17																					
0.941 – 0.960 (0.0370 – 0.0378)	16	16	17	17	17	17	17																						
0.961 – 0.980 (0.0378 – 0.0386)	16	17	17	17	17	17																							
0.981 – 1.000 (0.0386 – 0.0394)	17	17	17	17	17																								
1.001 – 1.020 (0.0394 – 0.0402)	17	17	17																										
1.021 – 1.040 (0.0402 – 0.0409)	17	17																											
1.041 – 1.050 (0.0410 – 0.0413)	17																												

Measured clearance mm (in.) \ Installed shim thickness mm (in.)	2.850 (0.1122)	2.860 (0.1126)	2.870 (0.1130)	2.880 (0.1134)	2.890 (0.1138)	2.900 (0.1142)	2.910 (0.1146)	2.920 (0.1150)	2.930 (0.1154)	2.940 (0.1157)	2.950 (0.1161)	2.960 (0.1165)	2.970 (0.1169)	2.980 (0.1173)	2.990 (0.1177)	3.000 (0.1181)	3.010 (0.1185)	3.020 (0.1189)	3.030 (0.1193)	3.040 (0.1197)	3.050 (0.1201)	3.060 (0.1205)	3.080 (0.1213)	3.100 (0.1220)	3.120 (0.1228)	3.140 (0.1236)	3.150 (0.1240)	3.160 (0.1244)	3.180 (0.1252)	3.200 (0.1260)	3.220 (0.1268)	3.240 (0.1276)	3.250 (0.1280)	3.260 (0.1283)	3.280 (0.1291)	3.300 (0.1299)
0.000 – 0.020 (0.0000 – 0.0008)	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	10	10	10	10	11	11	12	12	12	12	13	13
0.021 – 0.040 (0.0008 – 0.0016)	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14
0.041 – 0.060 (0.0016 – 0.0024)	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14	14
0.061 – 0.080 (0.0024 – 0.0031)	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14
0.081 – 0.100 (0.0032 – 0.0039)	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	11	11	12	12	12	12	13	13	14	14	14	14	15
0.101 – 0.120 (0.0040 – 0.0047)	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	12	12	12	12	13	13	14	14	14	14	15	15
0.121 – 0.140 (0.0048 – 0.0055)	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14	15	15	15	16
0.141 – 0.149 (0.0056 – 0.0059)	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	12	12	12	13	13	13	14	14	14	15	15	15	16	16
0.150 – 0.250 (0.0059 – 0.0098)																																				
0.251 – 0.260 (0.0099 – 0.0102)	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	15	15	15	15	16	16	17	17	17	17	17	
0.261 – 0.280 (0.0103 – 0.0110)	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	15	15	15	16	16	16	17	17	17	17	17	
0.281 – 0.300 (0.0111 – 0.0118)	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	15	15	16	16	16	16	17	17	17	17	17		
0.301 – 0.320 (0.0119 – 0.0126)	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	16	16	16	16	17	17	17	17				
0.321 – 0.340 (0.0126 – 0.0134)	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	16	16	16	17	17	17	17	17					
0.341 – 0.360 (0.0134 – 0.0142)	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	16	16	16	17	17	17	17	17						
0.361 – 0.380 (0.0142 – 0.0150)	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	17	17	17	17	17							
0.381 – 0.400 (0.0150 – 0.0157)	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	16	16	16	16	16	17	17	17	17	17								
0.401 – 0.420 (0.0158 – 0.0165)	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17										
0.421 – 0.440 (0.0166 – 0.0173)	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17											
0.441 – 0.460 (0.0174 – 0.0181)	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17												
0.461 – 0.480 (0.0181 – 0.0189)	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17													
0.481 – 0.500 (0.0189 – 0.0197)	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17														
0.501 – 0.520 (0.0197 – 0.0205)	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																
0.521 – 0.540 (0.0205 – 0.0213)	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																		
0.541 – 0.560 (0.0213 – 0.0220)	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																				
0.561 – 0.580 (0.0221 – 0.0228)	15	16	16	16	16	16	17	17	17	17	17	17	17	17																						
0.581 – 0.600 (0.0229 – 0.0236)	16	16	16	16	17	17	17	17	17	17	17	17																								
0.601 – 0.620 (0.0237 – 0.0244)	16	16	17	17	17	17	17	17	17	17																										
0.621 – 0.640 (0.0244 – 0.0252)	17	17	17	17	17	17	17	17																												
0.641 – 0.660 (0.0252 – 0.0260)	17	17	17	17	17	17																														
0.661 – 0.680 (0.0260 – 0.0268)	17	17	17	17																																
0.681 – 0.700 (0.0268 – 0.0276)	17	17																																		

V00719

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

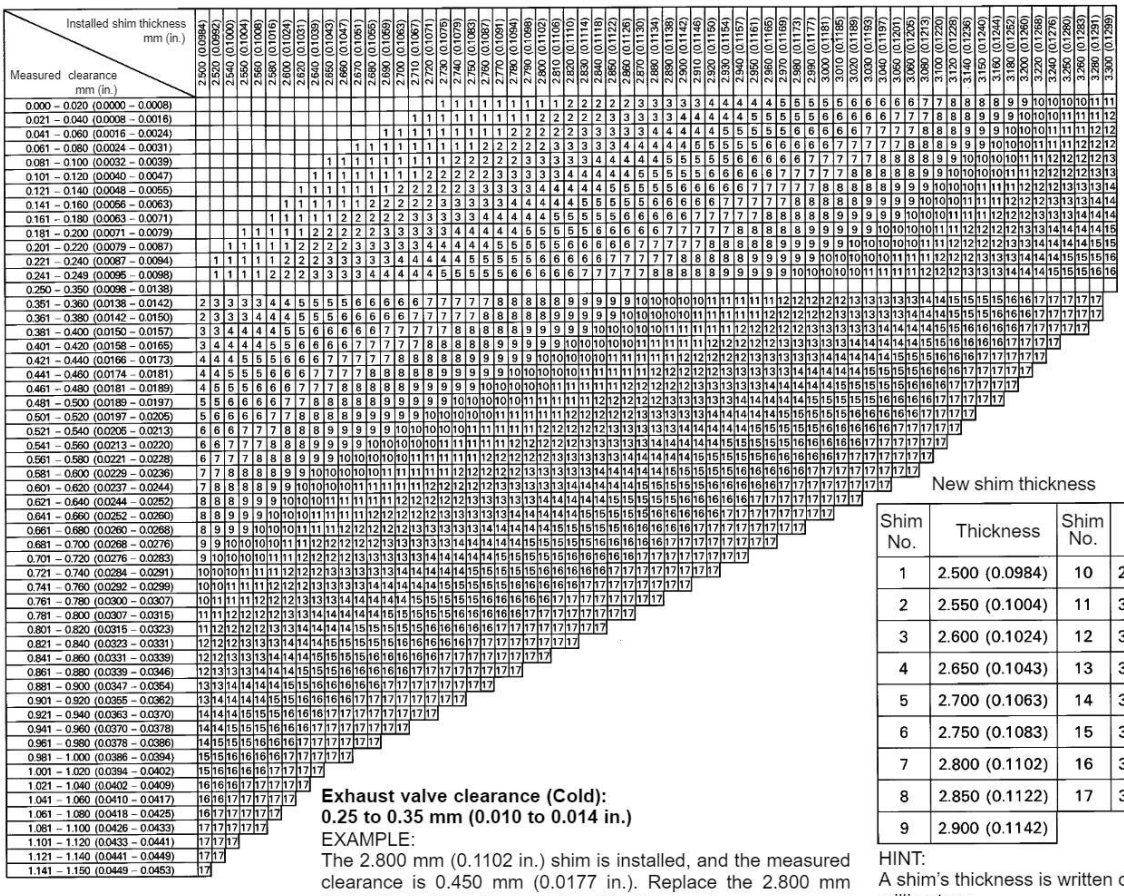
EXAMPLE:
The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a new No. 12 shim.

New shim thickness mm (in.)

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

HINT:
A shim's thickness is written on its face in millimeters.

Adjusting Shim Selection Chart (Exhaust)



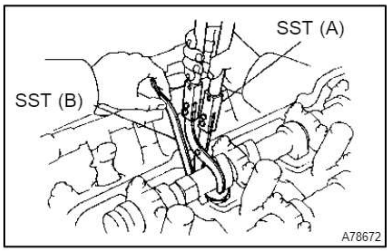
Exhaust valve clearance (Cold):
0.25 to 0.35 mm (0.010 to 0.014 in.)

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

New shim thickness mm (in.)

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

HINT:
A shim's thickness is written on its face in millimeters.



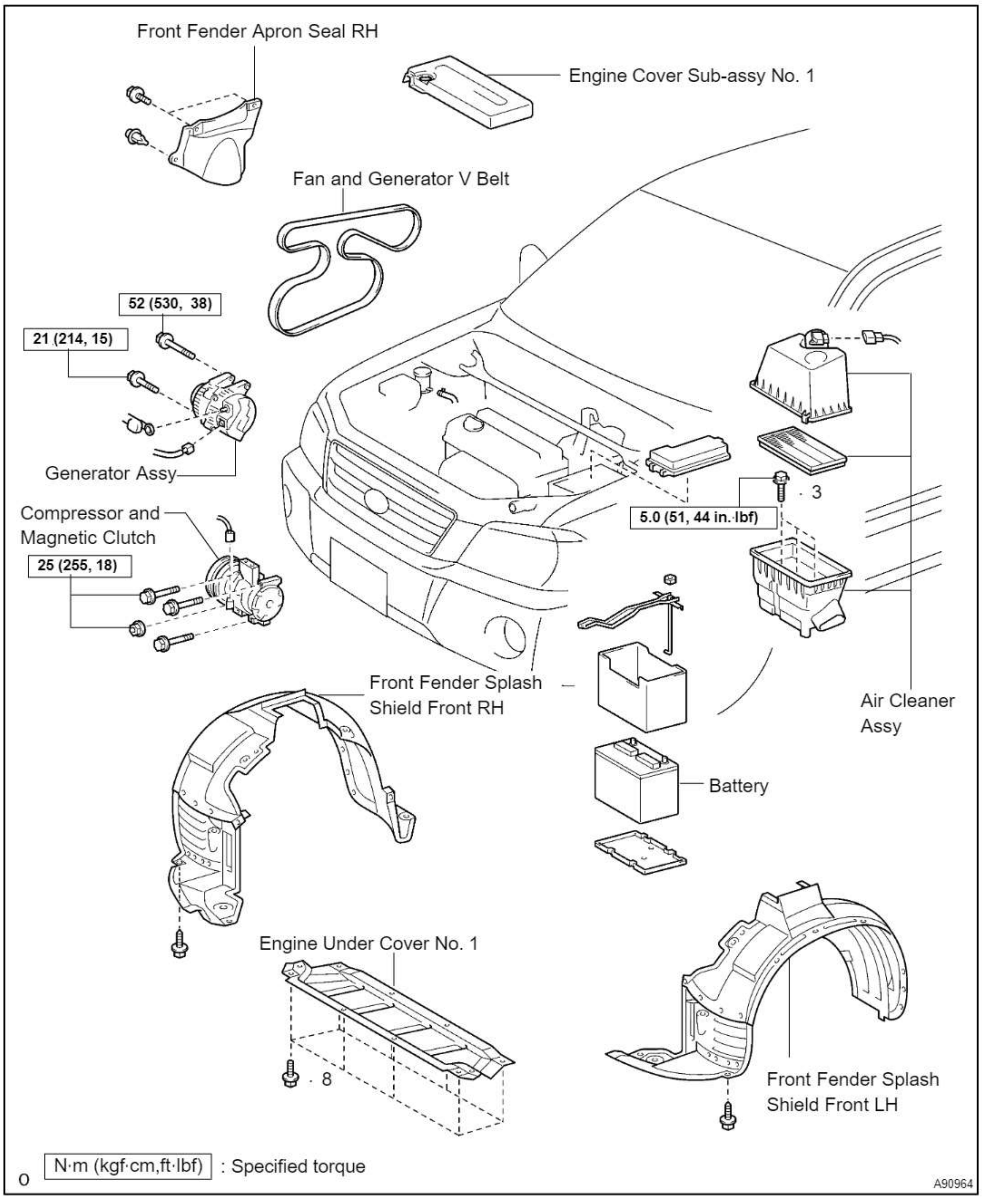
(h) Place a new adjusting shim on the valve lifter with the imprinted number facing down.
(i) Press down the valve lifter with SST (A), and remove SST (B).
SST 09248-55040 (09248-05410, 09248-05420)
(j) Recheck the valve clearance.

19. **INSTALL CYLINDER HEAD COVER SUB-ASSY (See page 14-173)**
20. **INSTALL CYLINDER HEAD COVER SUB-ASSY LH (See page 14-173)**
21. **INSTALL IGNITION COIL ASSY**
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
22. **INSTALL RADIATOR HOSE INLET**
23. **INSTALL INTAKE AIR SURGE TANK (See page 14-149)**
24. **INSTALL EMISSION CONTROL VALVE SET (See page 14-149)**
25. **INSTALL AIR CLEANER CAP SUB-ASSY**
26. **CONNECT VACUUM HOSES (See page 14-149)**
27. **INSTALL V-BANK COVER SUB-ASSY (See page 14-149)**
28. **INSTALL FRONT SUSPENSION BRACE SUB-ASSY UPPER CENTER**
Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)
29. **INSTALL COWL PANEL SUB-ASSY**
30. **INSTALL WINDSHIELD WIPER LINK ASSY (See page 66-7)**
31. **INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSY (See page 66-7)**
32. **INSTALL FR WIPER ARM LH (See page 66-7)**
33. **INSTALL FR WIPER ARM RH (See page 66-7)**
34. **ADD ENGINE COOLANT (See page 16-26)**
35. **CHECK FOR ENGINE COOLANT LEAKS (See page 16-20)**

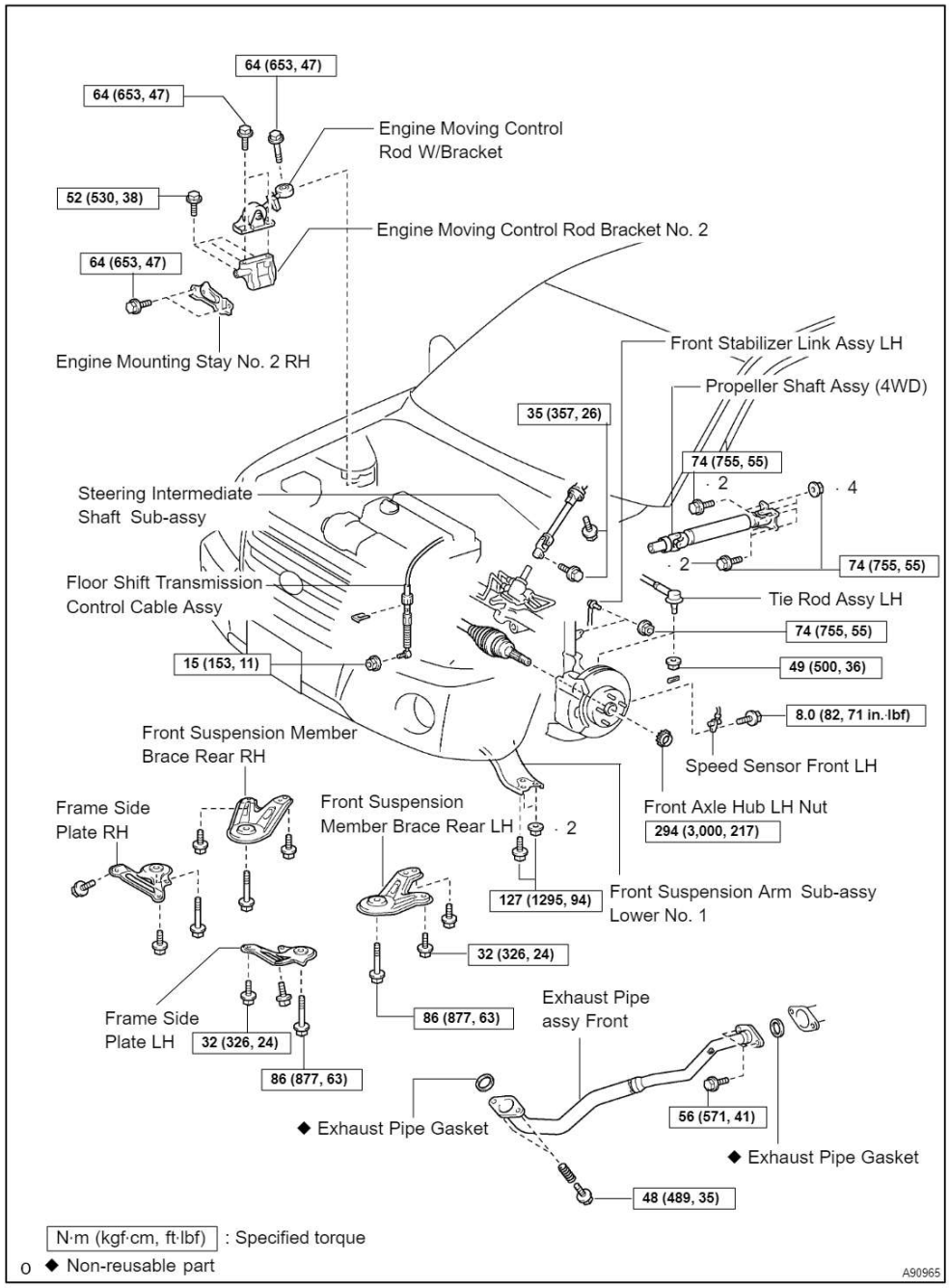
PARTIAL ENGINE ASSY (2AZ-FE)

COMPONENTS

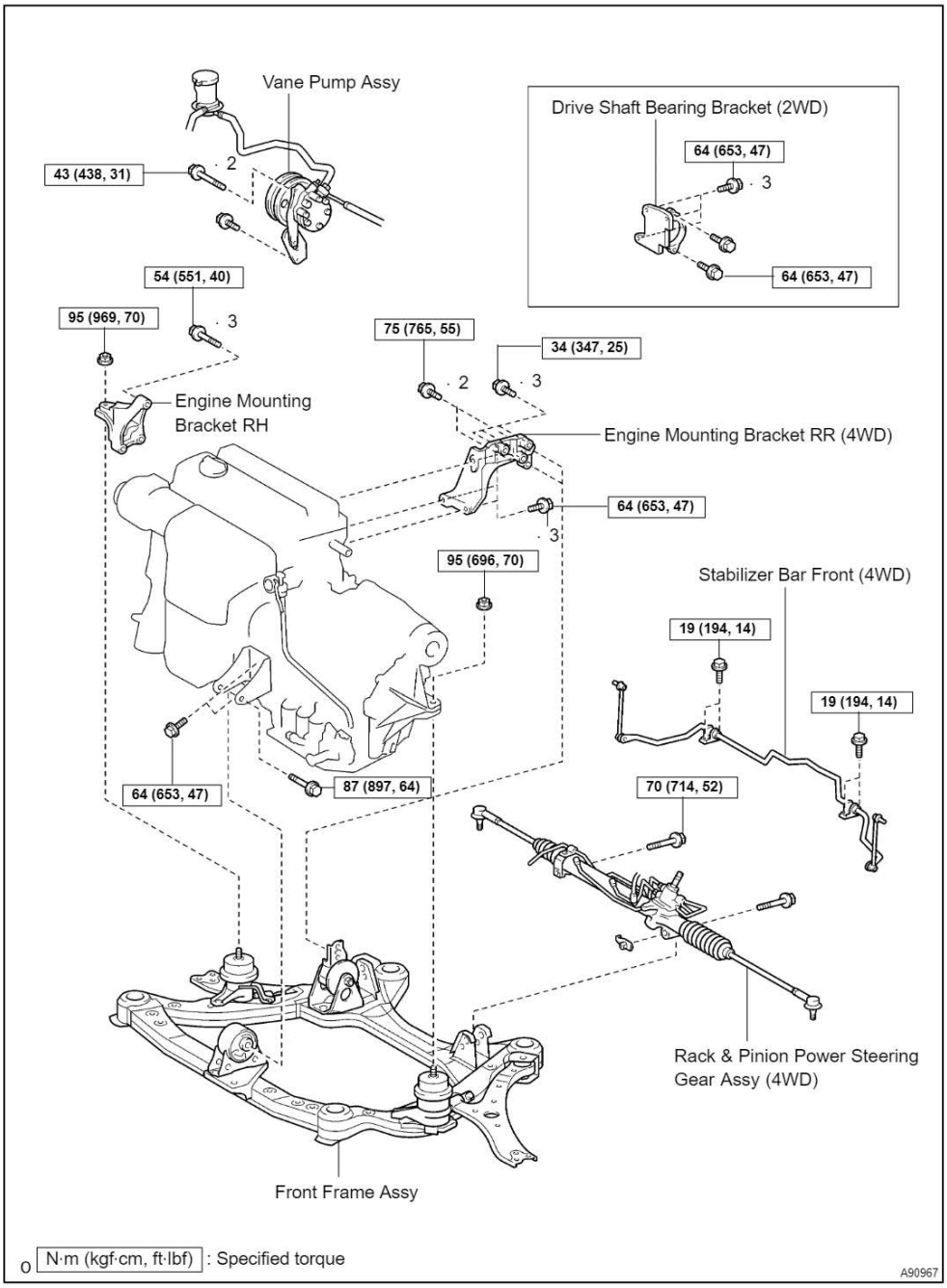
141P3-03



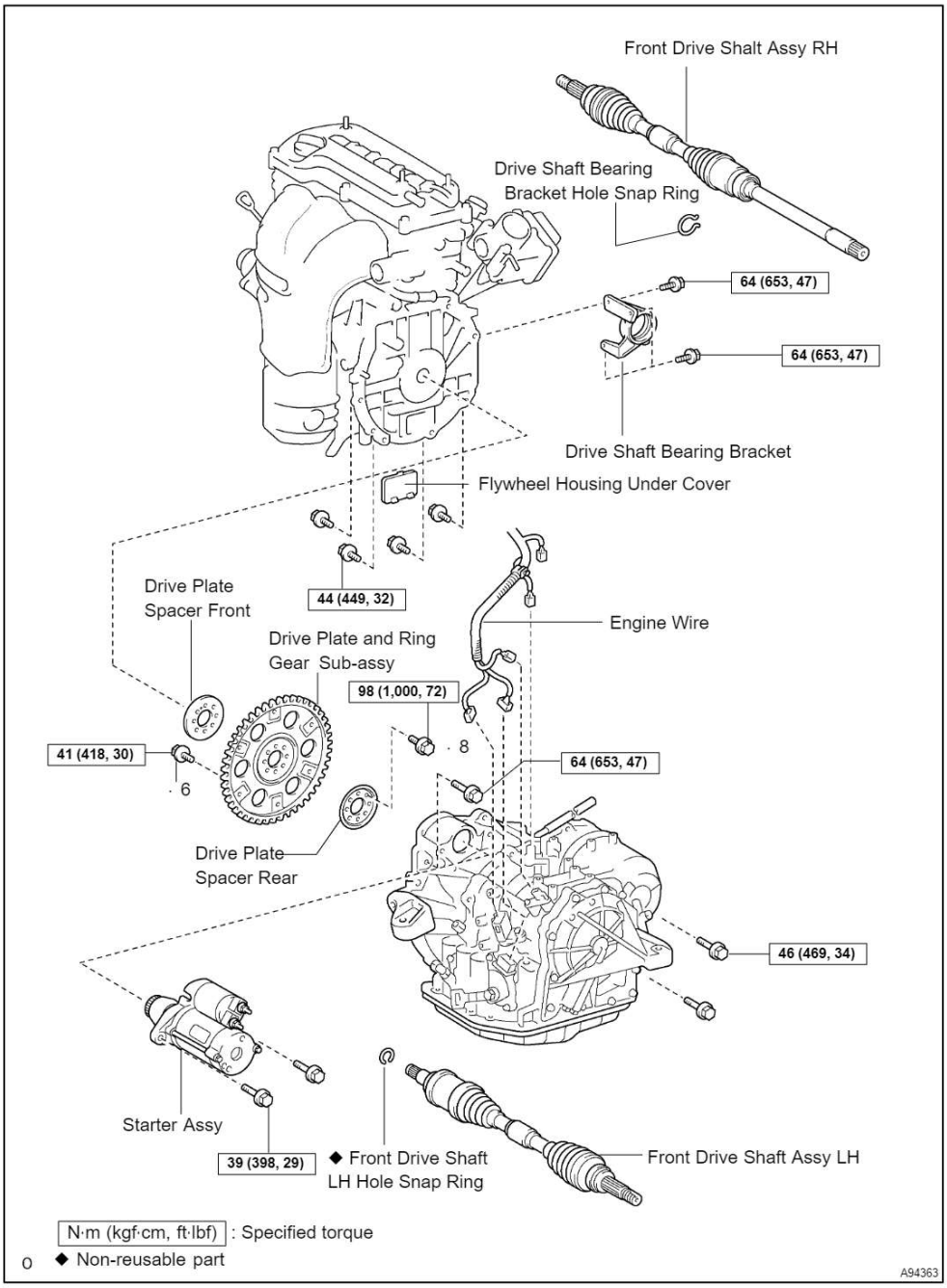
Author : Date : 2508

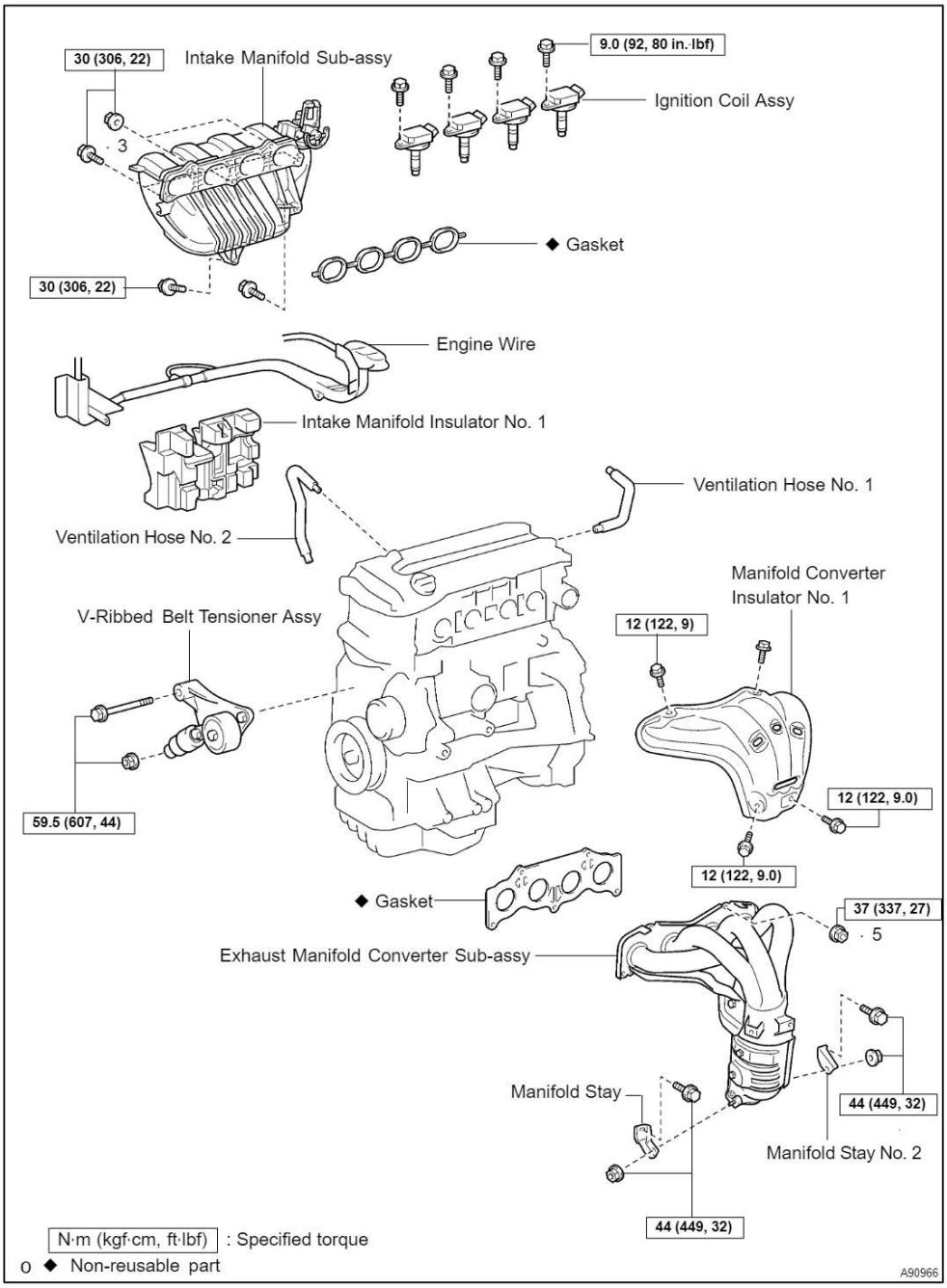


Author : Date : 2509

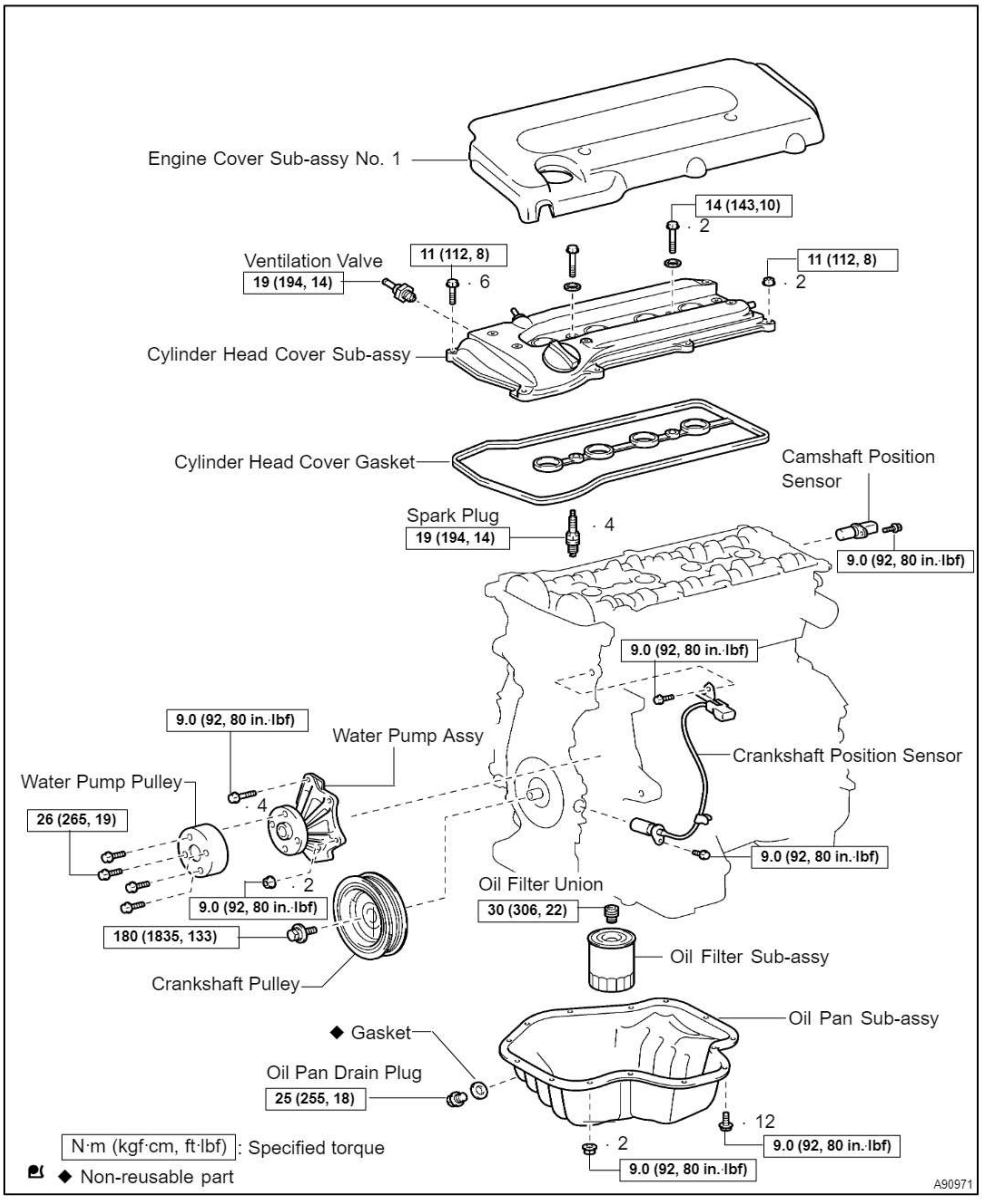


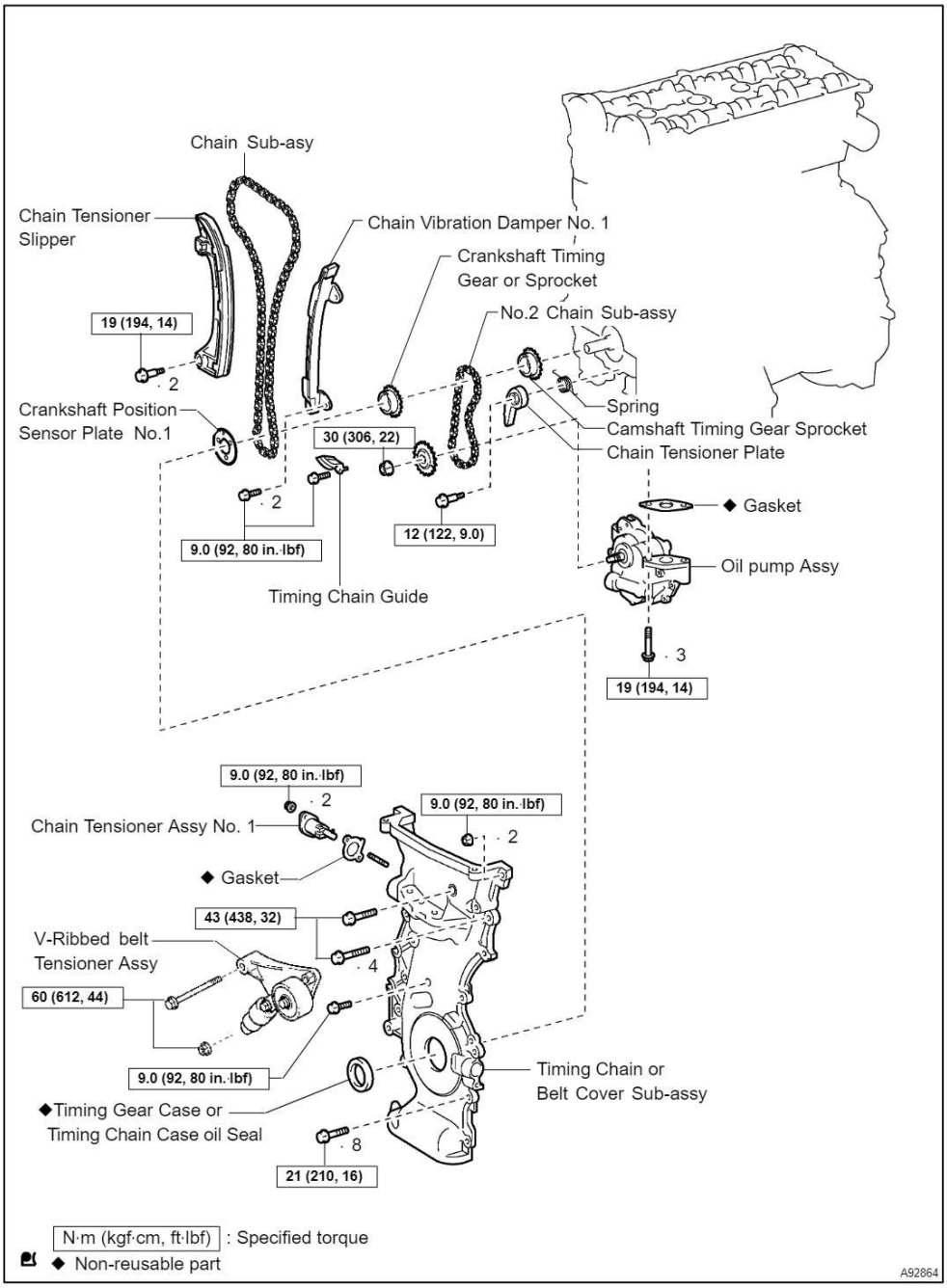
Author : Date : 2510

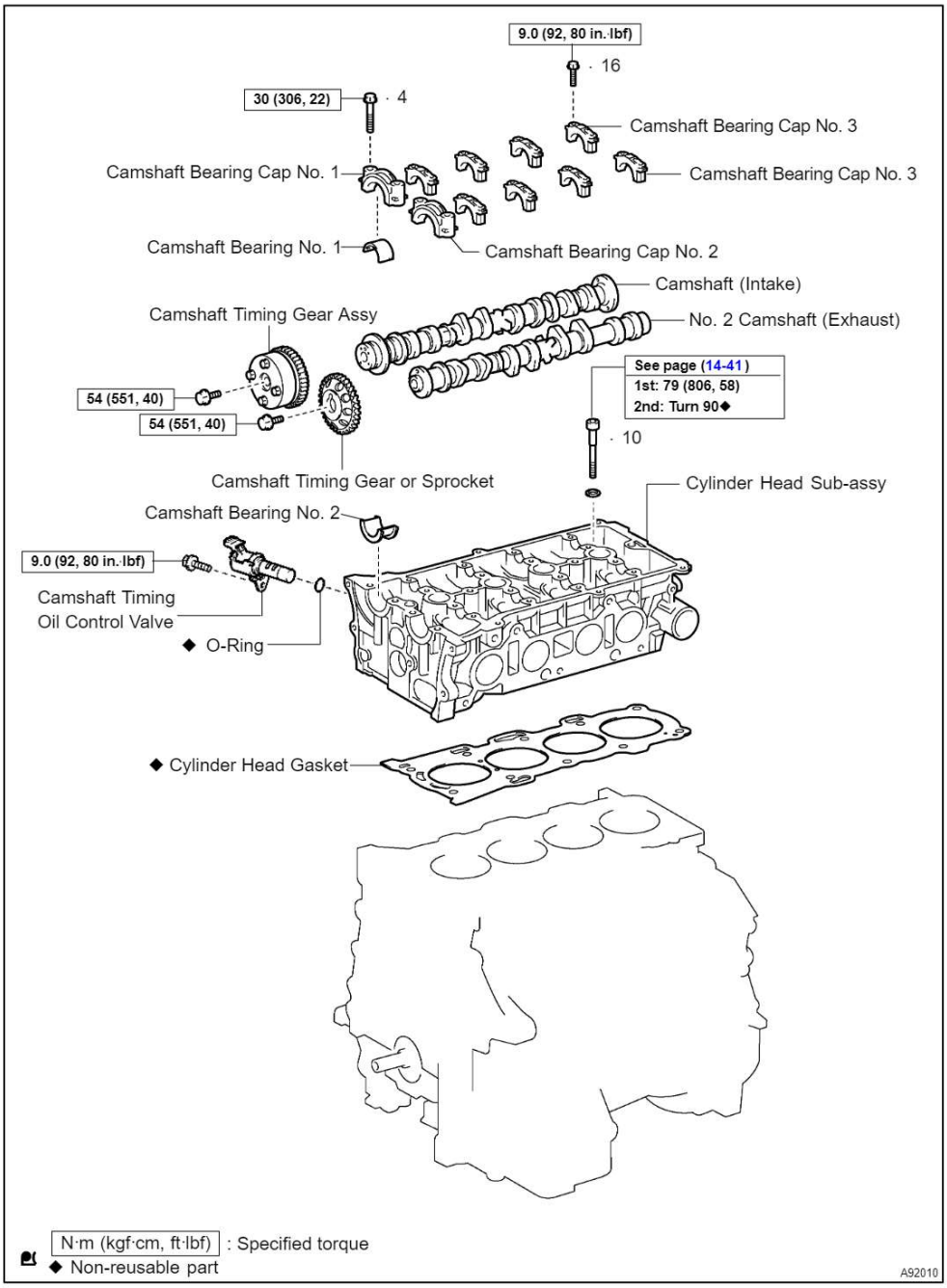

Front Drive Shalt Assy RH
Drive Shaft Bearing Bracket Hole Snap Ring
64 (653, 47)
64 (653, 47)
Drive Shaft Bearing Bracket
Flywheel Housing Under Cover
44 (449, 32)
Drive Plate Spacer Front
Drive Plate and Ring Gear Sub-assy
Engine Wire
98 (1,000, 72)
8
41 (418, 30)
6
64 (653, 47)
Drive Plate Spacer Rear
46 (469, 34)
Starter Assy
39 (398, 29)
◆ Front Drive Shaft LH Hole Snap Ring
Front Drive Shaft Assy LH
N·m (kgf·cm, ft·lbf) : Specified torque
o ◆ Non-reusable part
A94363



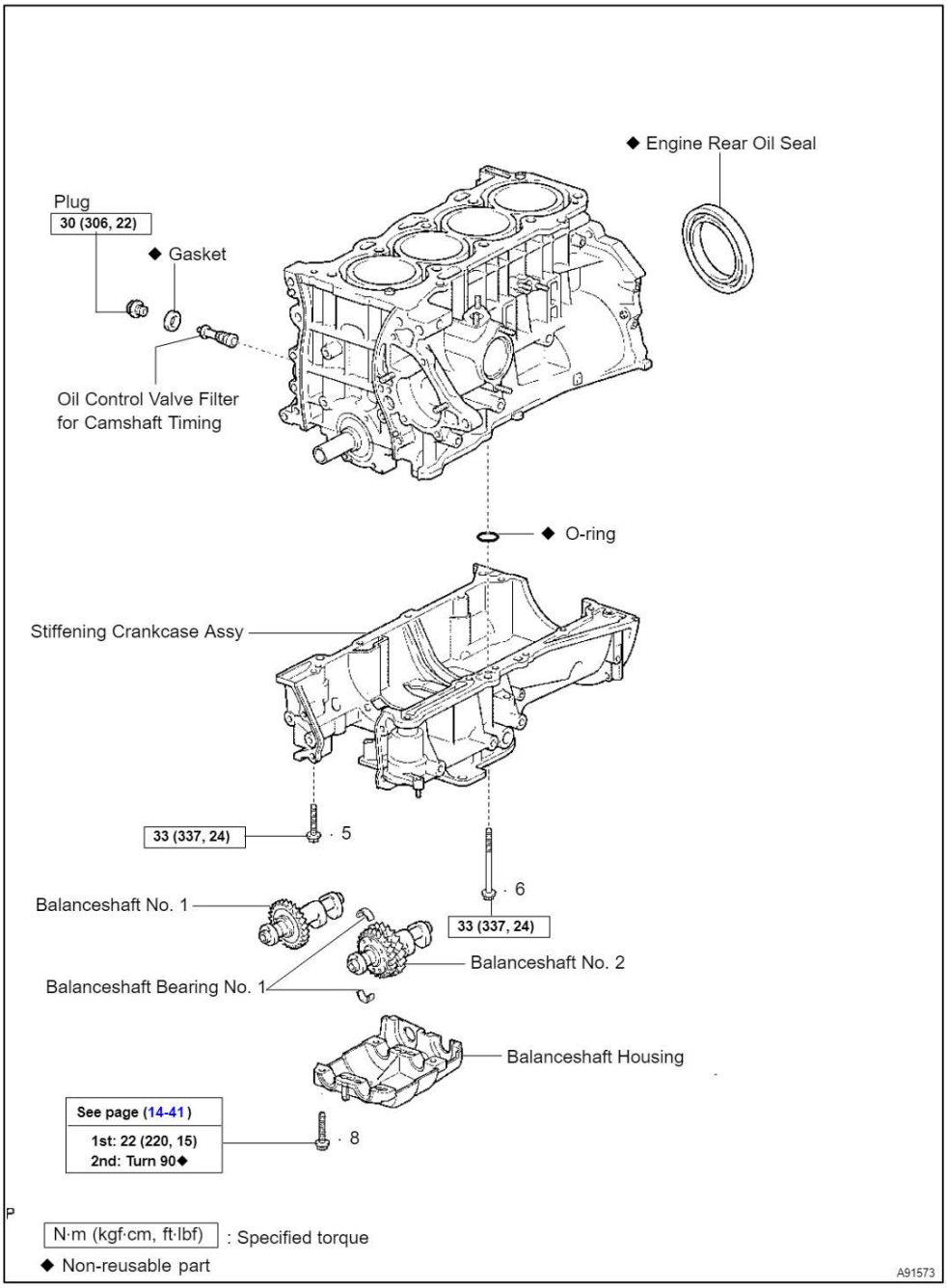
Author : Date : 2512


Engine Cover Sub-assy No. 1
14 (143,10)
· 2
Ventilation Valve
19 (194, 14)
11 (112, 8)
· 6
11 (112, 8)
· 2
Cylinder Head Cover Sub-assy
Cylinder Head Cover Gasket
Camshaft Position Sensor
Spark Plug
19 (194, 14)
· 4
9.0 (92, 80 in.·lbf)
9.0 (92, 80 in.·lbf)
9.0 (92, 80 in.·lbf)
Water Pump Assy
Crankshaft Position Sensor
Water Pump Pulley
26 (265, 19)
· 4
· 2
9.0 (92, 80 in.·lbf)
180 (1835, 133)
Crankshaft Pulley
Oil Filter Union
30 (306, 22)
9.0 (92, 80 in.·lbf)
Oil Filter Sub-assy
Oil Pan Sub-assy
◆ Gasket
Oil Pan Drain Plug
25 (255, 18)
· 12
· 2
9.0 (92, 80 in.·lbf)
9.0 (92, 80 in.·lbf)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
A90971


Chain Sub-asy
Chain Tensioner Slipper
Chain Vibration Damper No. 1
Crankshaft Timing Gear or Sprocket
No.2 Chain Sub-assy
19 (194, 14)
2
Crankshaft Position Sensor Plate No.1
Spring
Camshaft Timing Gear Sprocket
Chain Tensioner Plate
30 (306, 22)
2
9.0 (92, 80 in.·lbf)
12 (122, 9.0)
◆ Gasket
Oil pump Assy
Timing Chain Guide
3
19 (194, 14)
9.0 (92, 80 in.·lbf)
2
9.0 (92, 80 in.·lbf)
Chain Tensioner Assy No. 1
2
◆ Gasket
43 (438, 32)
V-Ribbed belt Tensioner Assy
4
60 (612, 44)
9.0 (92, 80 in.·lbf)
Timing Chain or Belt Cover Sub-assy
◆Timing Gear Case or Timing Chain Case oil Seal
8
21 (210, 16)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
A92864



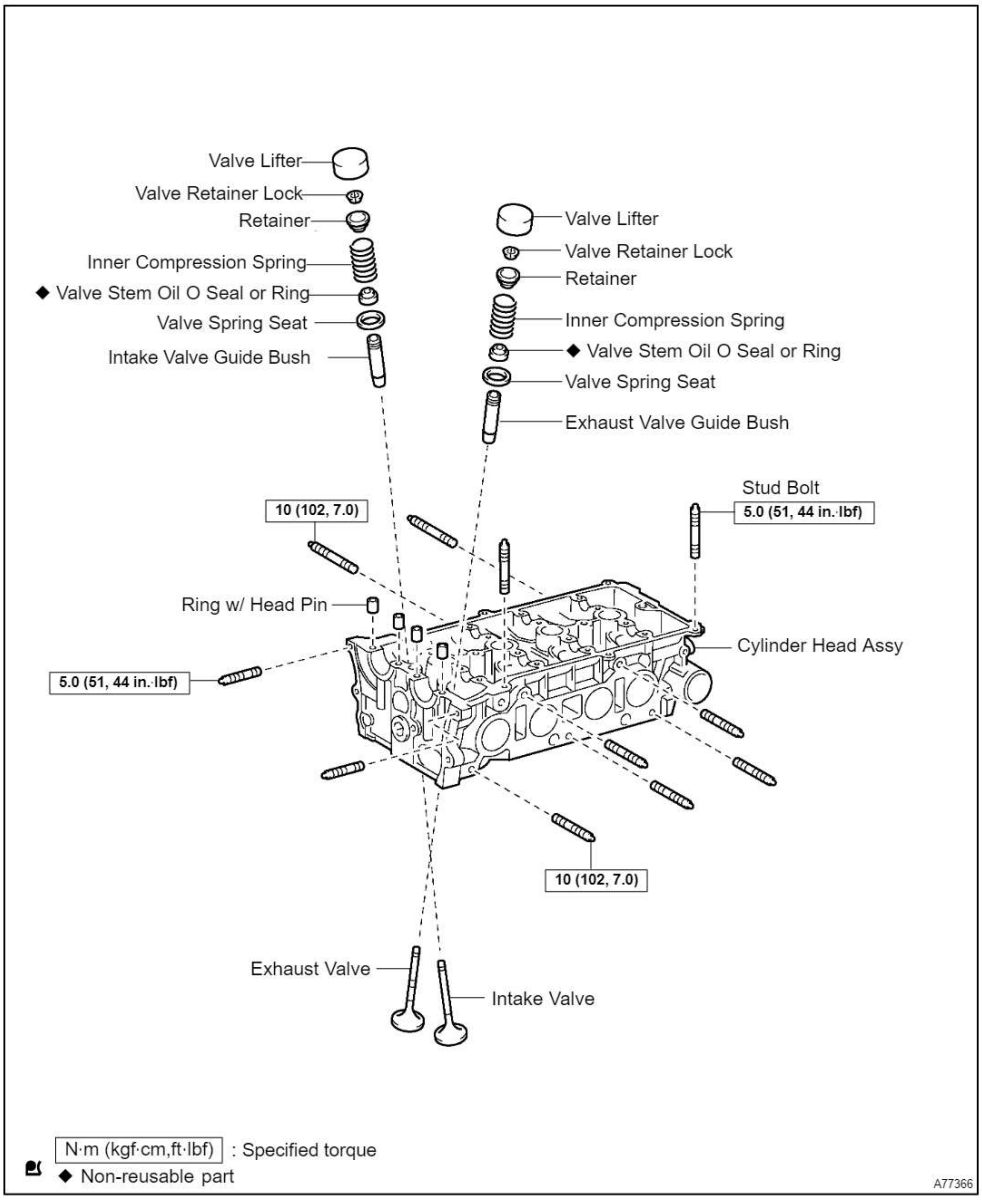
Author : Date : 2515


◆ Engine Rear Oil Seal
Plug
30 (306, 22)
◆ Gasket
Oil Control Valve Filter
for Camshaft Timing
◆ O-ring
Stiffening Crankcase Assy
33 (337, 24)
· 5
· 6
33 (337, 24)
Balanceshaft No. 1
Balanceshaft No. 2
Balanceshaft Bearing No. 1
Balanceshaft Housing
See page (14-41)
1st: 22 (220, 15)
2nd: Turn 90◆
· 8
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
A91573

CYLINDER HEAD ASSY (2AZ-FE)

COMPONENTS

141P6-02

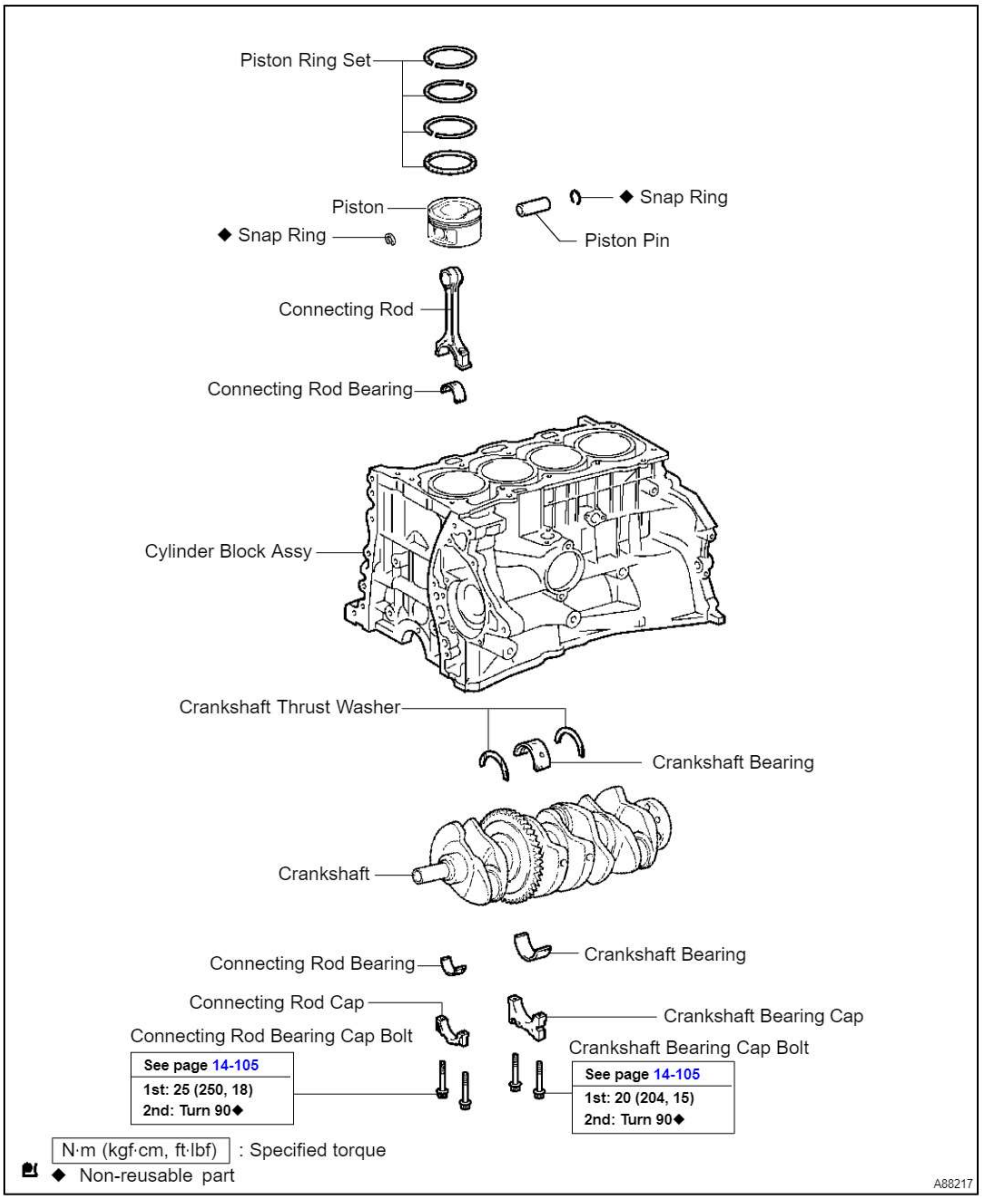


Author : Date : 2584

CYLINDER BLOCK ASSY (2AZ-FE)

COMPONENTS

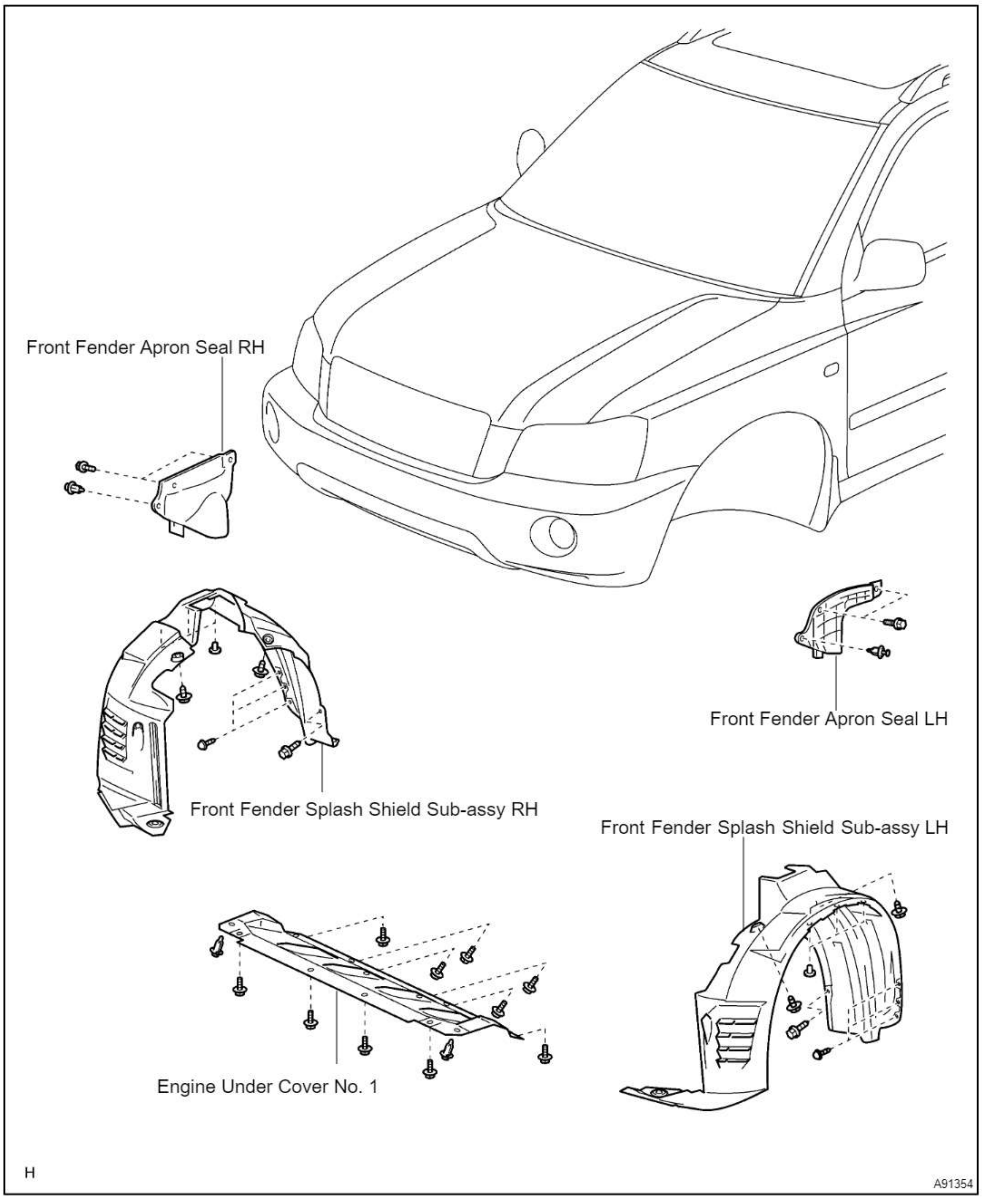
141P6-02



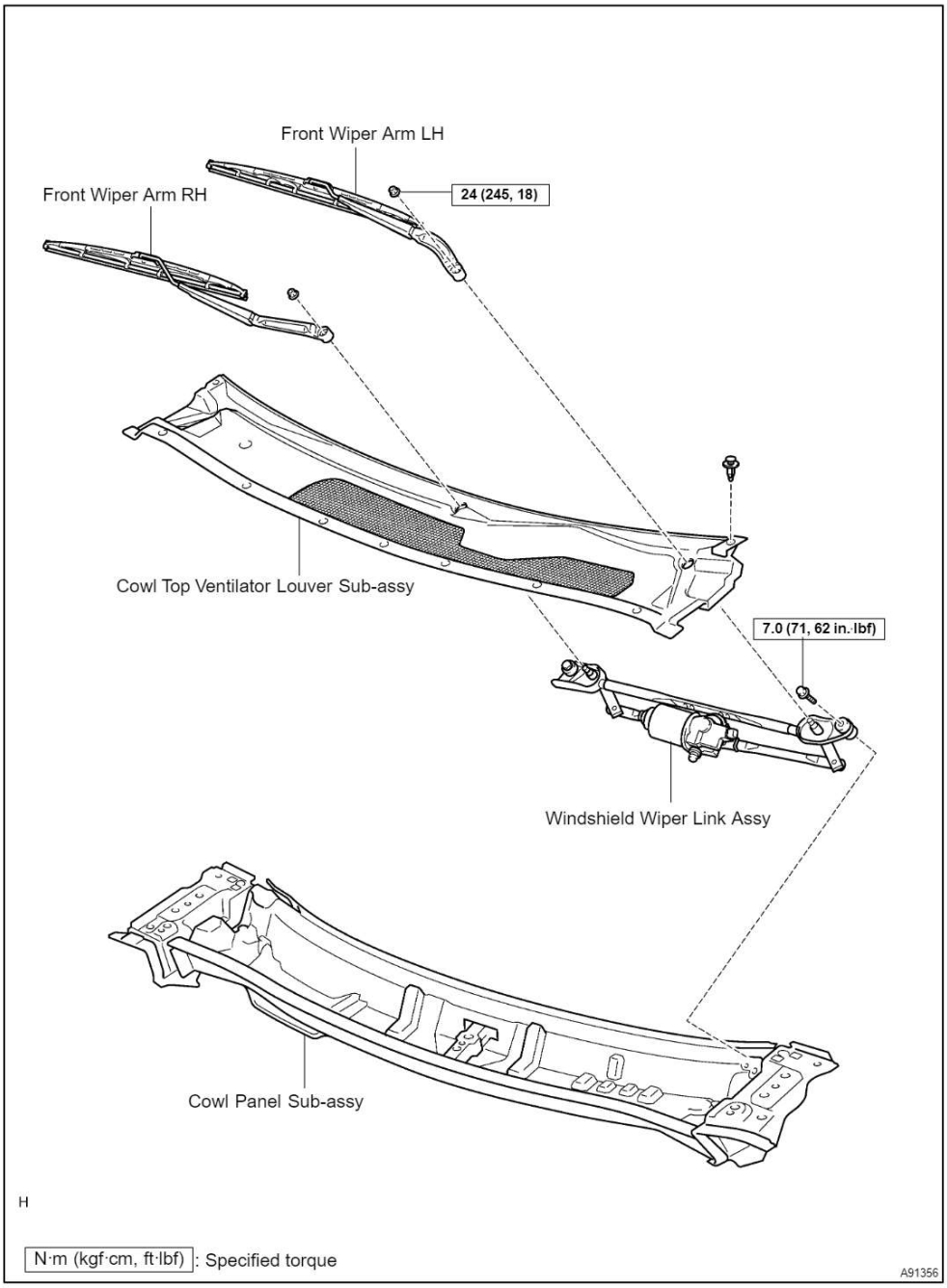
PARTIAL ENGINE ASSY (3MZ-FE)

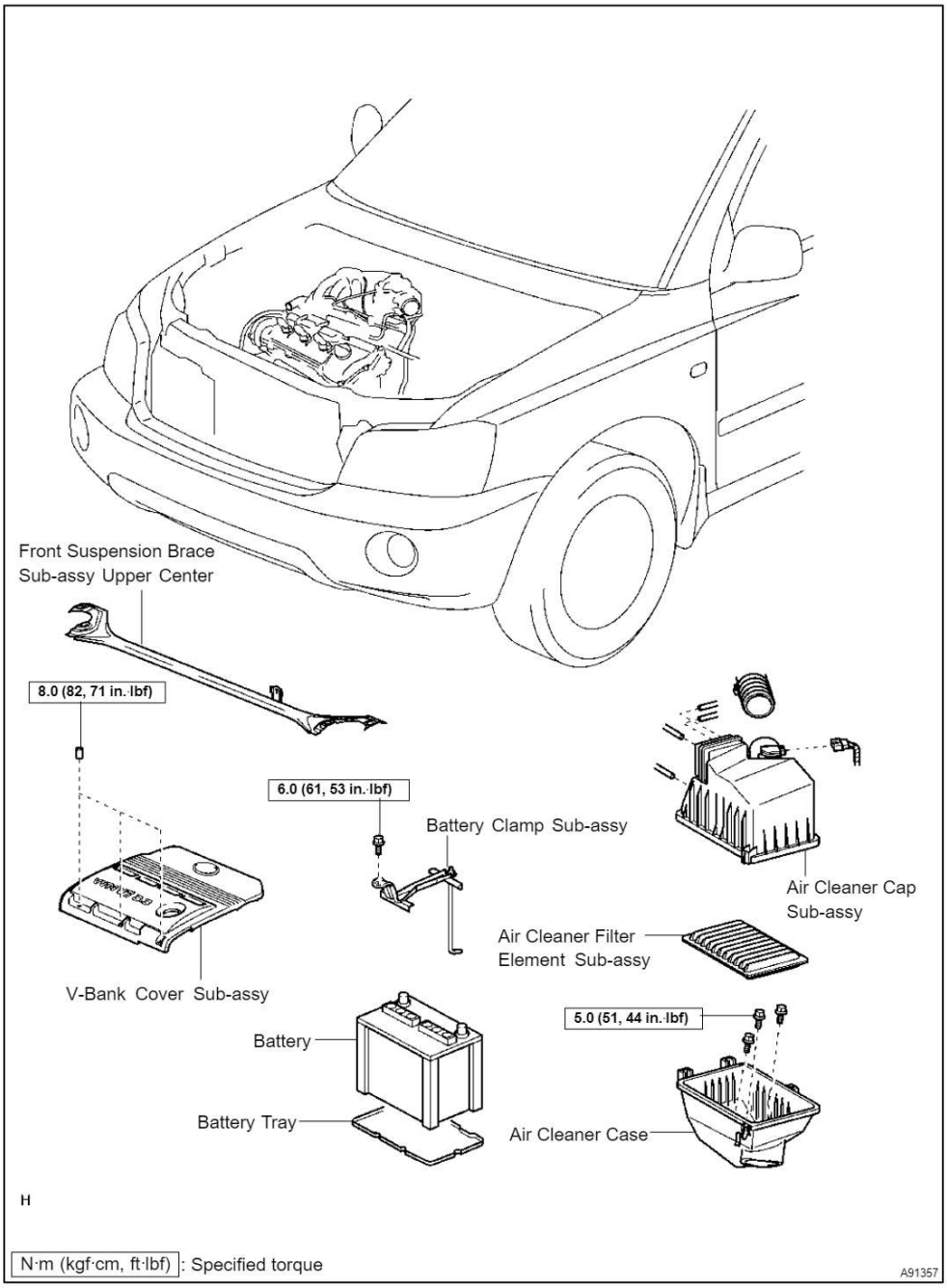
COMPONENTS

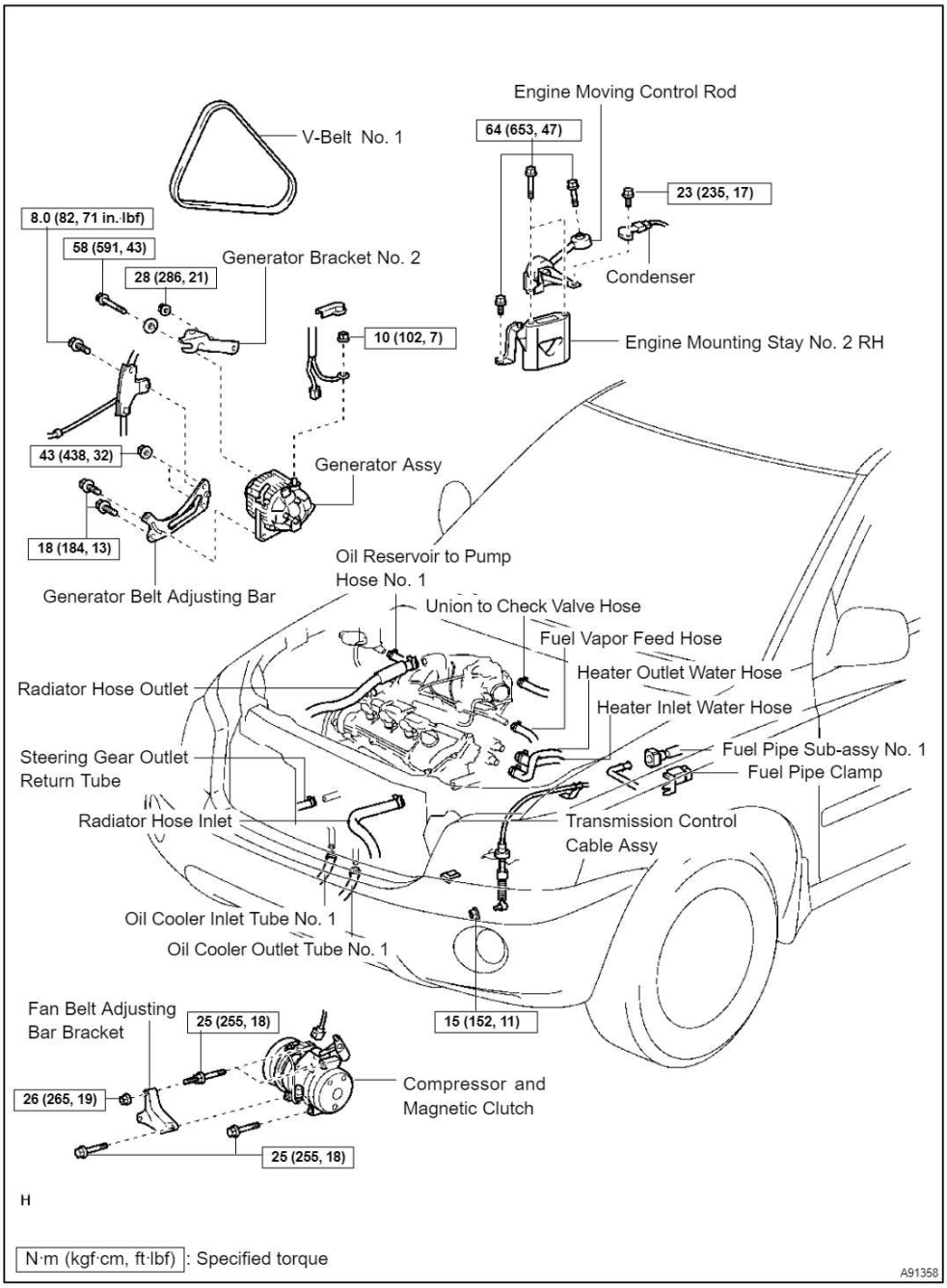
141PI-02

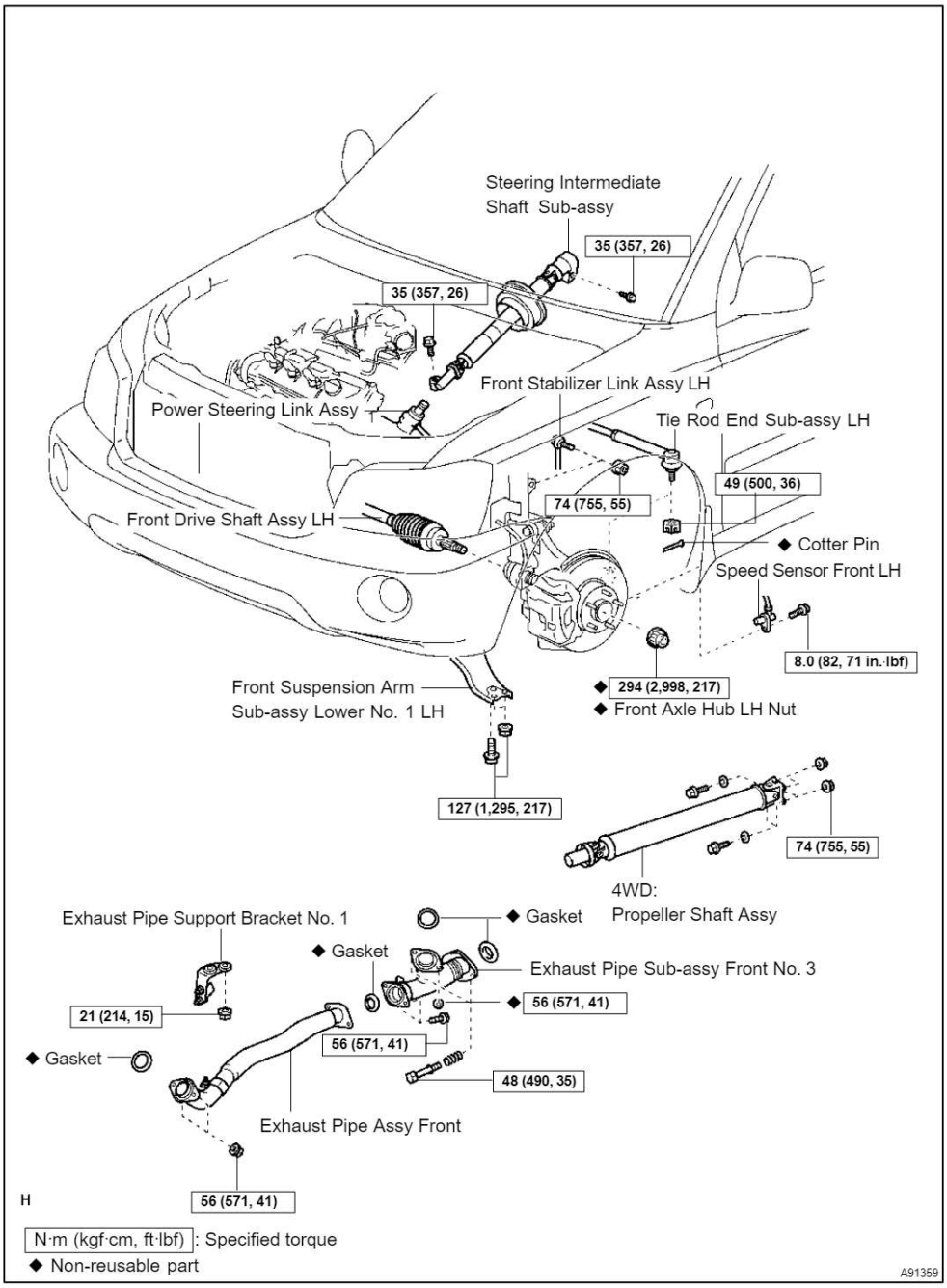


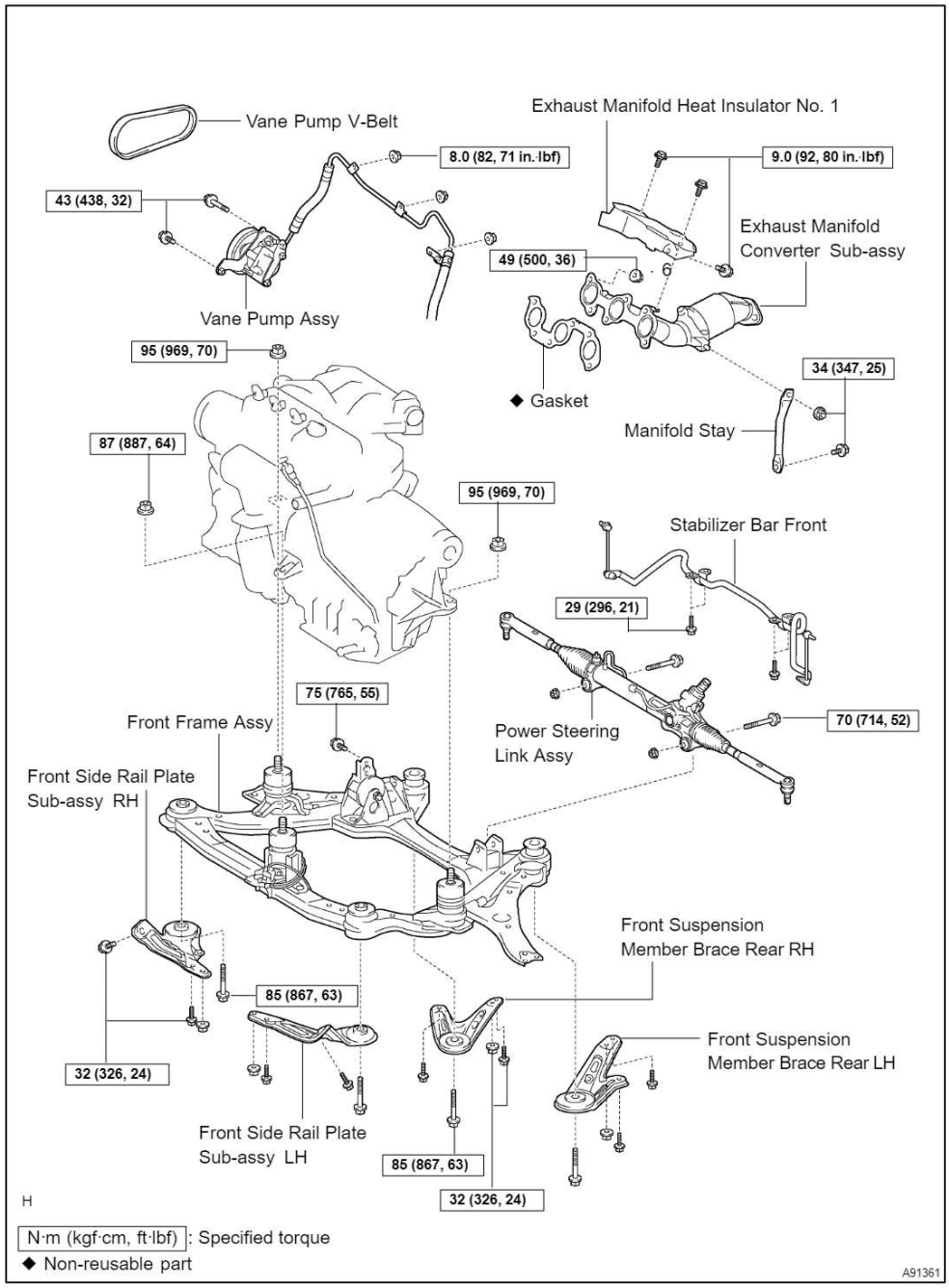
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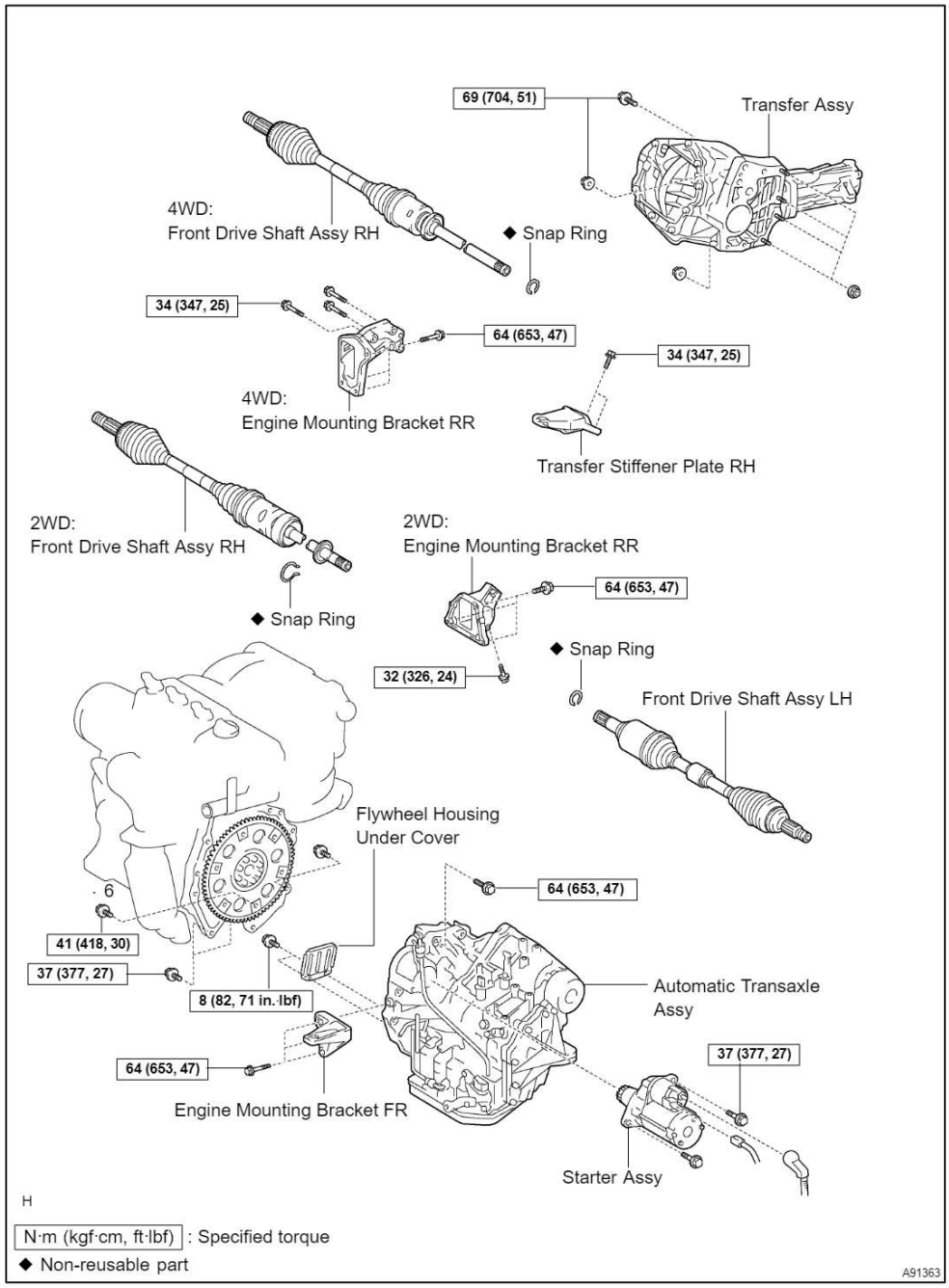

Front Wiper Arm LH
Front Wiper Arm RH
24 (245, 18)
Cowl Top Ventilator Louver Sub-assy
7.0 (71, 62 in.·lbf)
Windshield Wiper Link Assy
Cowl Panel Sub-assy
H
N·m (kgf·cm, ft·lbf) : Specified torque
A91356

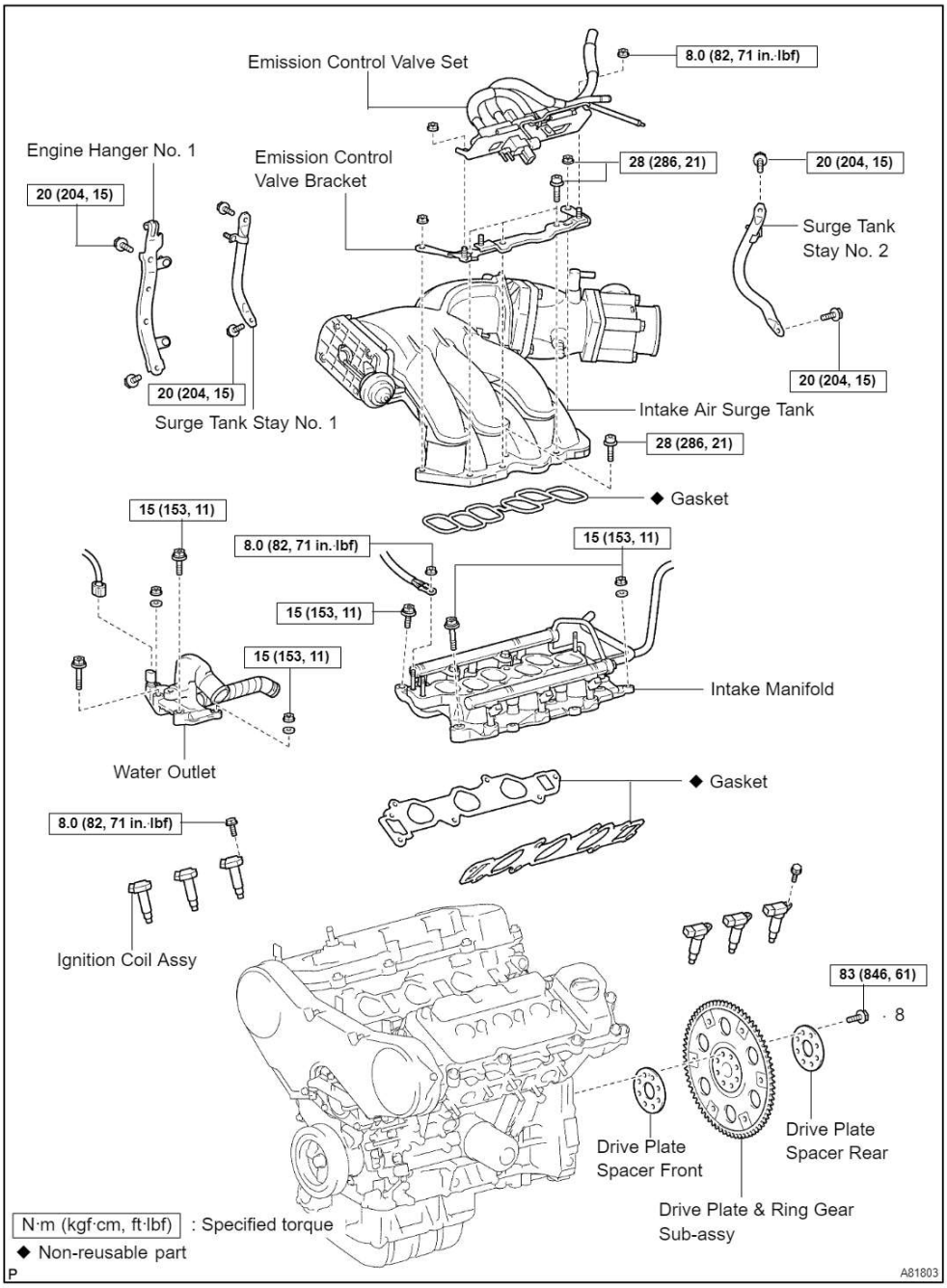

Front Suspension Brace Sub-assy Upper Center
8.0 (82, 71 in. lbf)
6.0 (61, 53 in. lbf)
Battery Clamp Sub-assy
Air Cleaner Cap Sub-assy
Air Cleaner Filter Element Sub-assy
V-Bank Cover Sub-assy
Battery
Battery Tray
5.0 (51, 44 in. lbf)
Air Cleaner Case
H
N·m (kgf·cm, ft·lbf) : Specified torque
A91357

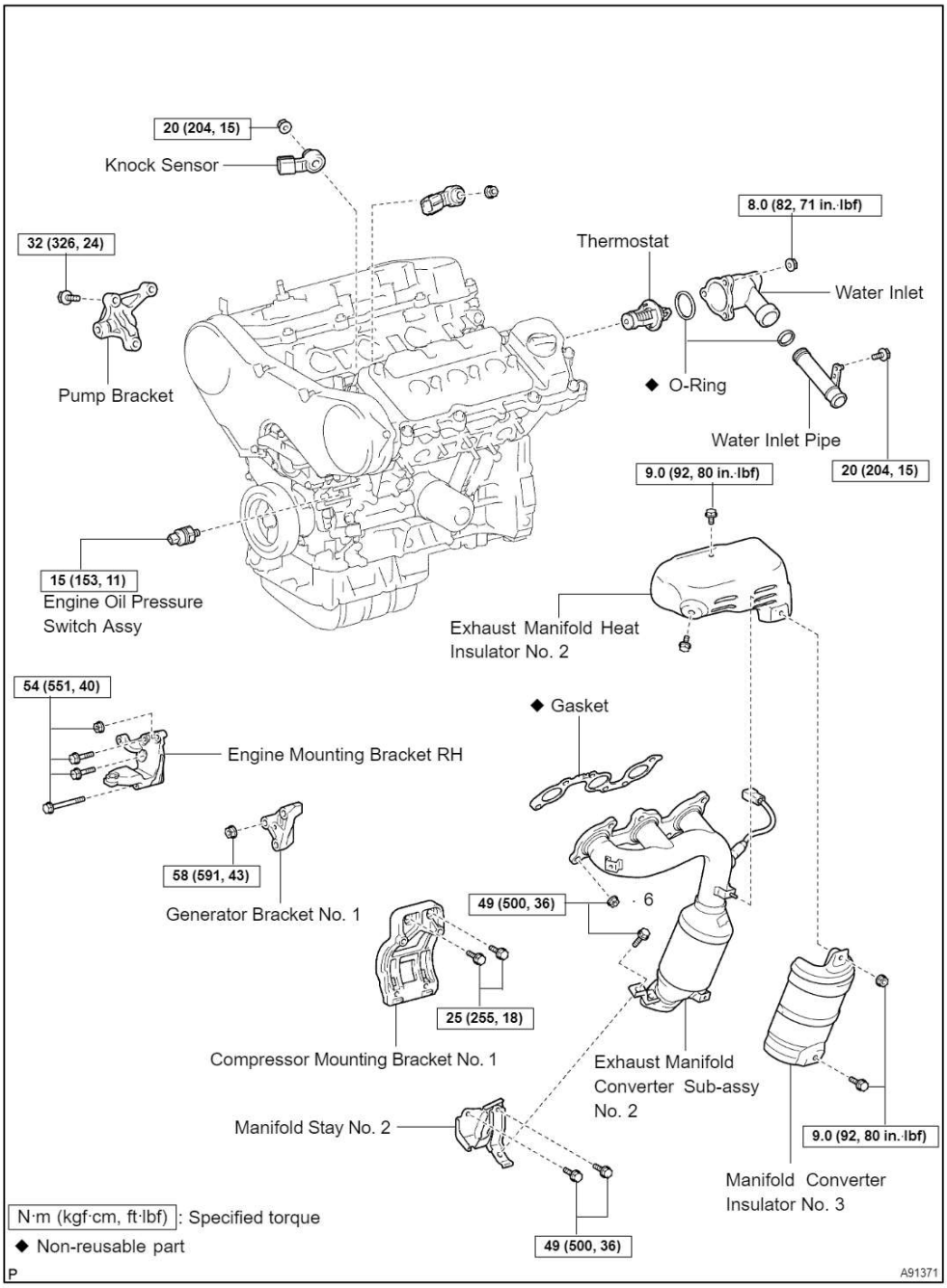

Engine Moving Control Rod
V-Belt No. 1
64 (653, 47)
23 (235, 17)
8.0 (82, 71 in.·lbf)
58 (591, 43)
Generator Bracket No. 2
28 (286, 21)
Condenser
10 (102, 7)
Engine Mounting Stay No. 2 RH
43 (438, 32)
Generator Assy
18 (184, 13)
Oil Reservoir to Pump Hose No. 1
Generator Belt Adjusting Bar
Union to Check Valve Hose
Fuel Vapor Feed Hose
Heater Outlet Water Hose
Radiator Hose Outlet
Heater Inlet Water Hose
Fuel Pipe Sub-assy No. 1
Steering Gear Outlet Return Tube
Fuel Pipe Clamp
Radiator Hose Inlet
Transmission Control Cable Assy
Oil Cooler Inlet Tube No. 1
Oil Cooler Outlet Tube No. 1
15 (152, 11)
Fan Belt Adjusting Bar Bracket
25 (255, 18)
26 (265, 19)
Compressor and Magnetic Clutch
25 (255, 18)
H
N·m (kgf·cm, ft·lbf): Specified torque
A91358

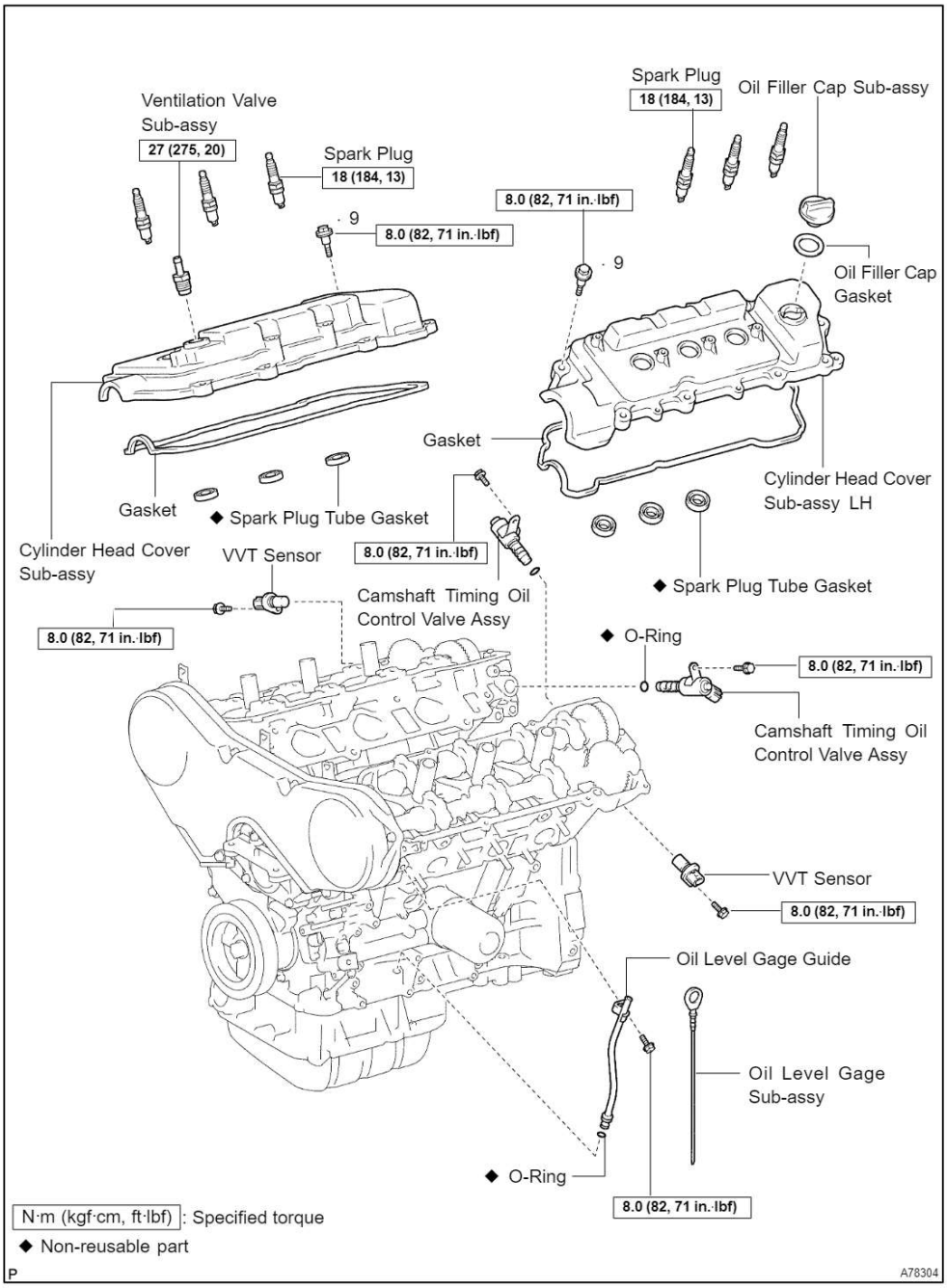

Steering Intermediate Shaft Sub-assy
35 (357, 26)
35 (357, 26)
Front Stabilizer Link Assy LH
Power Steering Link Assy
Tie Rod End Sub-assy LH
49 (500, 36)
74 (755, 55)
Front Drive Shaft Assy LH
◆ Cotter Pin
Speed Sensor Front LH
8.0 (82, 71 in.·lbf)
◆ 294 (2,998, 217)
◆ Front Axle Hub LH Nut
Front Suspension Arm Sub-assy Lower No. 1 LH
127 (1,295, 217)
74 (755, 55)
4WD:
Propeller Shaft Assy
Exhaust Pipe Support Bracket No. 1
◆ Gasket
◆ Gasket
Exhaust Pipe Sub-assy Front No. 3
21 (214, 15)
◆ 56 (571, 41)
56 (571, 41)
◆ Gasket
48 (490, 35)
Exhaust Pipe Assy Front
H
56 (571, 41)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
A91359

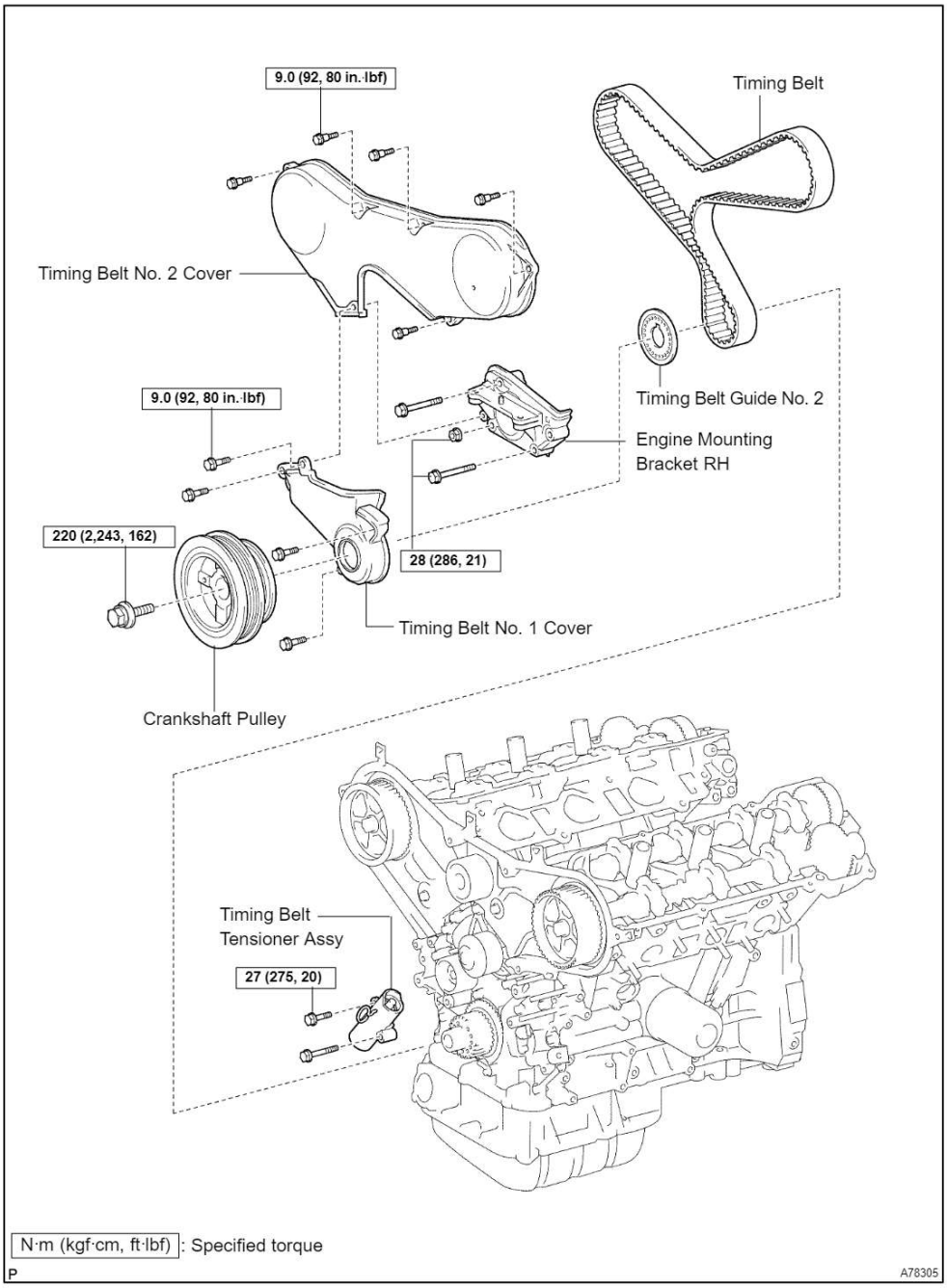

Vane Pump V-Belt
Exhaust Manifold Heat Insulator No. 1
8.0 (82, 71 in.·lbf)
9.0 (92, 80 in.·lbf)
43 (438, 32)
Exhaust Manifold
Converter Sub-assy
49 (500, 36)
Vane Pump Assy
95 (969, 70)
34 (347, 25)
◆ Gasket
Manifold Stay
87 (887, 64)
95 (969, 70)
Stabilizer Bar Front
29 (296, 21)
75 (765, 55)
Front Frame Assy
Power Steering
Link Assy
70 (714, 52)
Front Side Rail Plate
Sub-assy RH
Front Suspension
Member Brace Rear RH
85 (867, 63)
32 (326, 24)
Front Suspension
Member Brace Rear LH
Front Side Rail Plate
Sub-assy LH
85 (867, 63)
32 (326, 24)
H
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
A91361

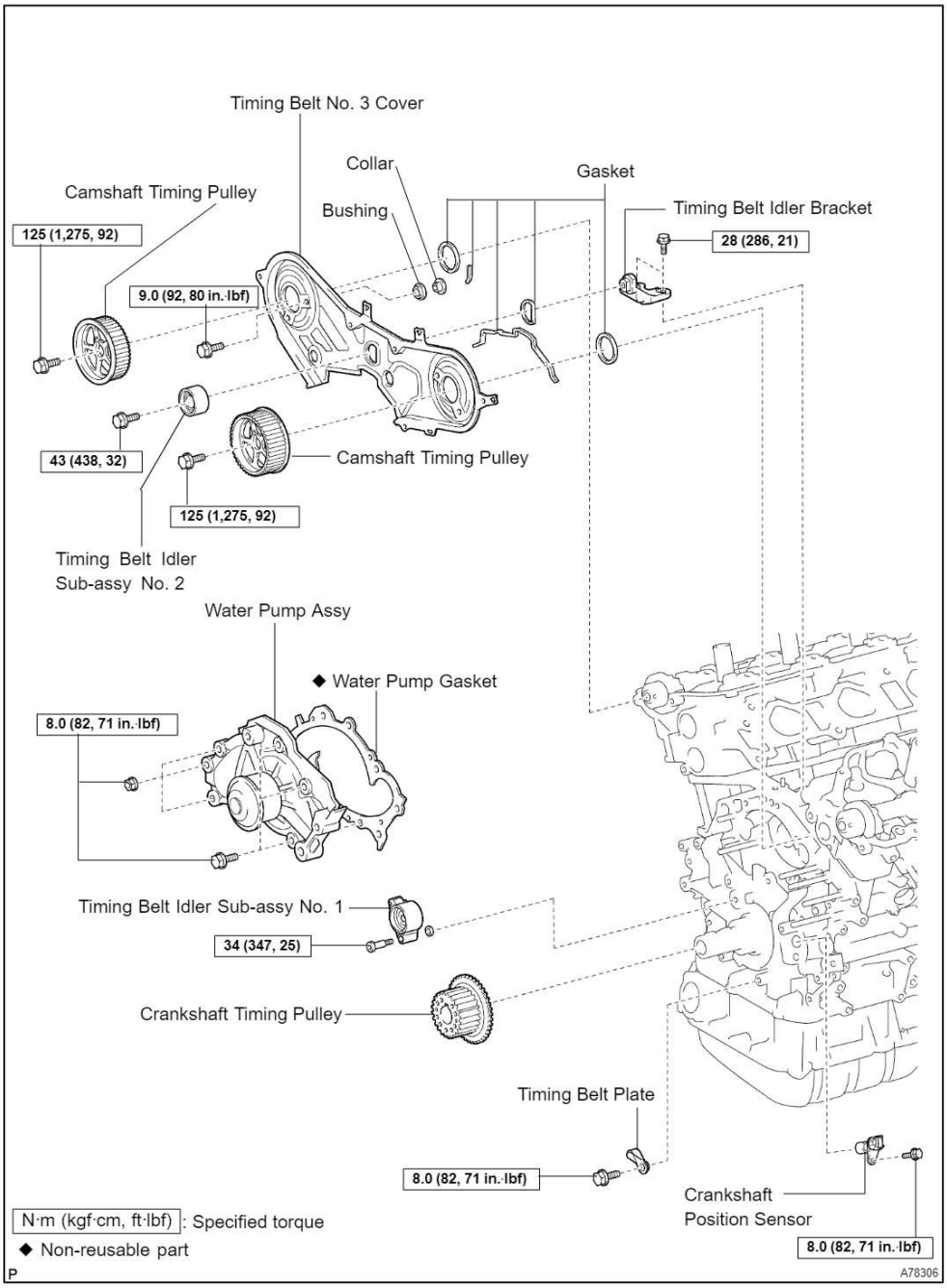

69 (704, 51)
Transfer Assy
4WD:
Front Drive Shaft Assy RH
◆ Snap Ring
34 (347, 25)
64 (653, 47)
34 (347, 25)
4WD:
Engine Mounting Bracket RR
Transfer Stiffener Plate RH
2WD:
Front Drive Shaft Assy RH
◆ Snap Ring
2WD:
Engine Mounting Bracket RR
64 (653, 47)
◆ Snap Ring
32 (326, 24)
Front Drive Shaft Assy LH
Flywheel Housing
Under Cover
6
64 (653, 47)
41 (418, 30)
37 (377, 27)
8 (82, 71 in.·lbf)
Automatic Transaxle
Assy
64 (653, 47)
37 (377, 27)
Engine Mounting Bracket FR
Starter Assy
H
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
A91363

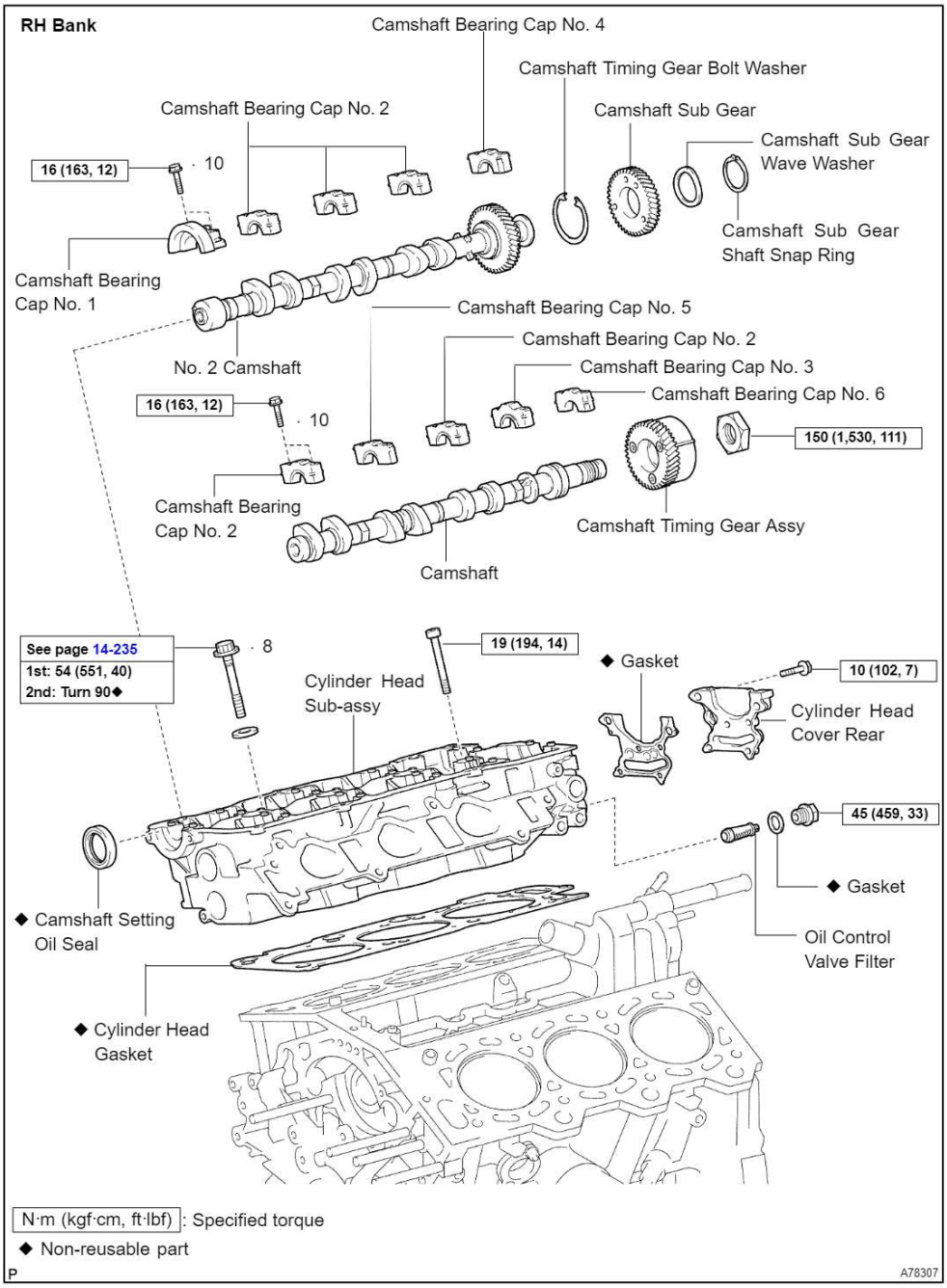

Emission Control Valve Set
8.0 (82, 71 in.·lbf)
Engine Hanger No. 1
Emission Control Valve Bracket
28 (286, 21)
20 (204, 15)
20 (204, 15)
Surge Tank Stay No. 2
20 (204, 15)
20 (204, 15)
Surge Tank Stay No. 1
Intake Air Surge Tank
28 (286, 21)
◆ Gasket
15 (153, 11)
8.0 (82, 71 in.·lbf)
15 (153, 11)
15 (153, 11)
15 (153, 11)
Intake Manifold
Water Outlet
◆ Gasket
8.0 (82, 71 in.·lbf)
Ignition Coil Assy
83 (846, 61)
8
Drive Plate Spacer Front
Drive Plate Spacer Rear
Drive Plate & Ring Gear Sub-assy
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
P
A81803


20 (204, 15)
Knock Sensor
8.0 (82, 71 in.·lbf)
Thermostat
32 (326, 24)
Water Inlet
Pump Bracket
◆ O-Ring
Water Inlet Pipe
20 (204, 15)
9.0 (92, 80 in.·lbf)
15 (153, 11)
Engine Oil Pressure Switch Assy
Exhaust Manifold Heat Insulator No. 2
54 (551, 40)
◆ Gasket
Engine Mounting Bracket RH
58 (591, 43)
Generator Bracket No. 1
49 (500, 36)
6
25 (255, 18)
Compressor Mounting Bracket No. 1
Exhaust Manifold Converter Sub-assy No. 2
Manifold Stay No. 2
9.0 (92, 80 in.·lbf)
Manifold Converter Insulator No. 3
N·m (kgf·cm, ft·lbf): Specified torque
◆ Non-reusable part
49 (500, 36)
P
A91371


Ventilation Valve Sub-assy
27 (275, 20)
Spark Plug
18 (184, 13)
Spark Plug
18 (184, 13)
Oil Filler Cap Sub-assy
8.0 (82, 71 in.·lbf)
· 9
8.0 (82, 71 in.·lbf)
· 9
Oil Filler Cap Gasket
Gasket
Cylinder Head Cover Sub-assy LH
Gasket
◆ Spark Plug Tube Gasket
Cylinder Head Cover Sub-assy
VVT Sensor
8.0 (82, 71 in.·lbf)
Camshaft Timing Oil Control Valve Assy
◆ Spark Plug Tube Gasket
◆ O-Ring
8.0 (82, 71 in.·lbf)
8.0 (82, 71 in.·lbf)
Camshaft Timing Oil Control Valve Assy
VVT Sensor
8.0 (82, 71 in.·lbf)
Oil Level Gage Guide
Oil Level Gage Sub-assy
◆ O-Ring
8.0 (82, 71 in.·lbf)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
P
A78304

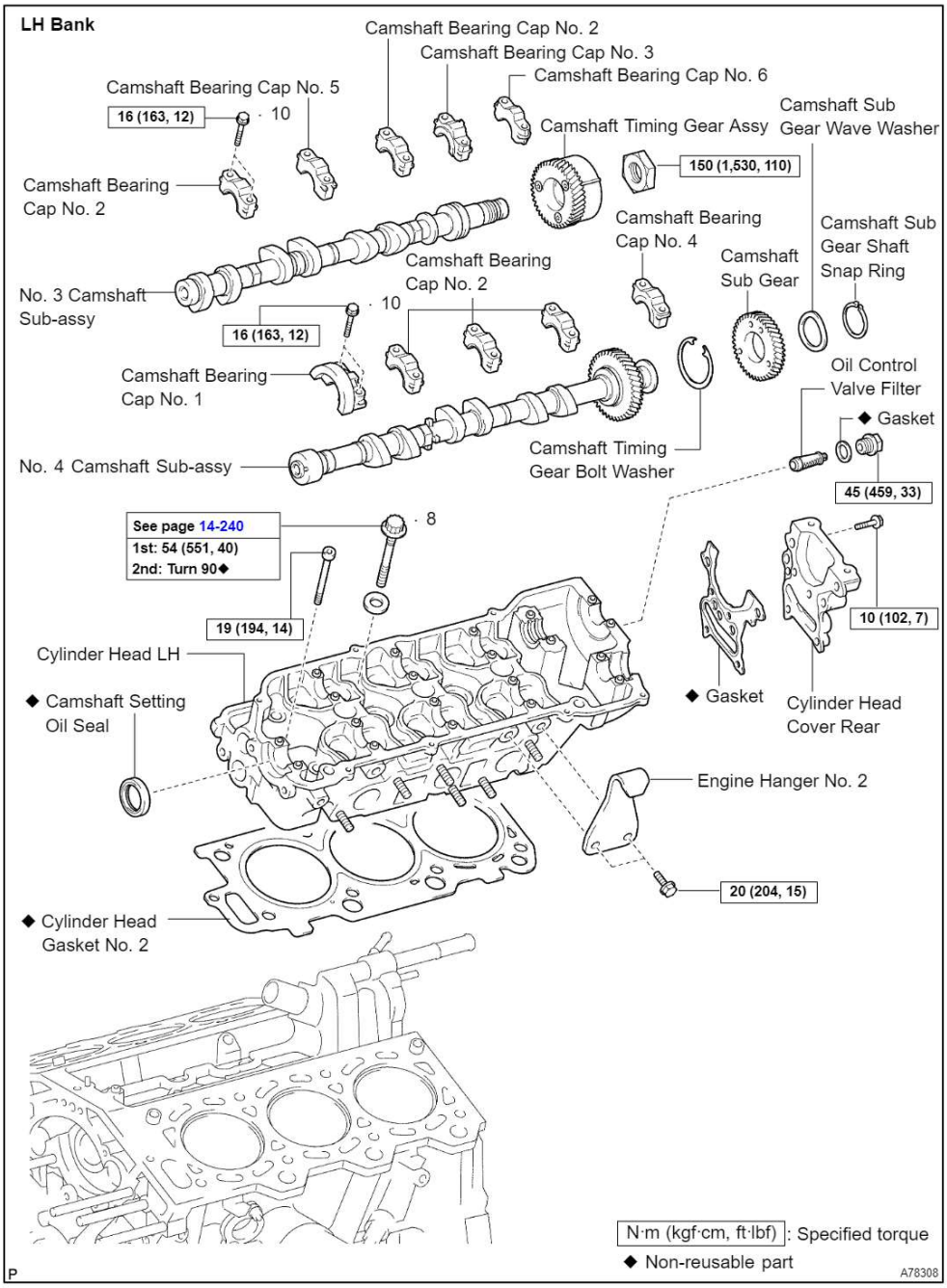

9.0 (92, 80 in.·lbf)
Timing Belt
Timing Belt No. 2 Cover
Timing Belt Guide No. 2
9.0 (92, 80 in.·lbf)
Engine Mounting Bracket RH
220 (2,243, 162)
28 (286, 21)
Timing Belt No. 1 Cover
Crankshaft Pulley
Timing Belt Tensioner Assy
27 (275, 20)
N·m (kgf·cm, ft·lbf) : Specified torque
P
A78305

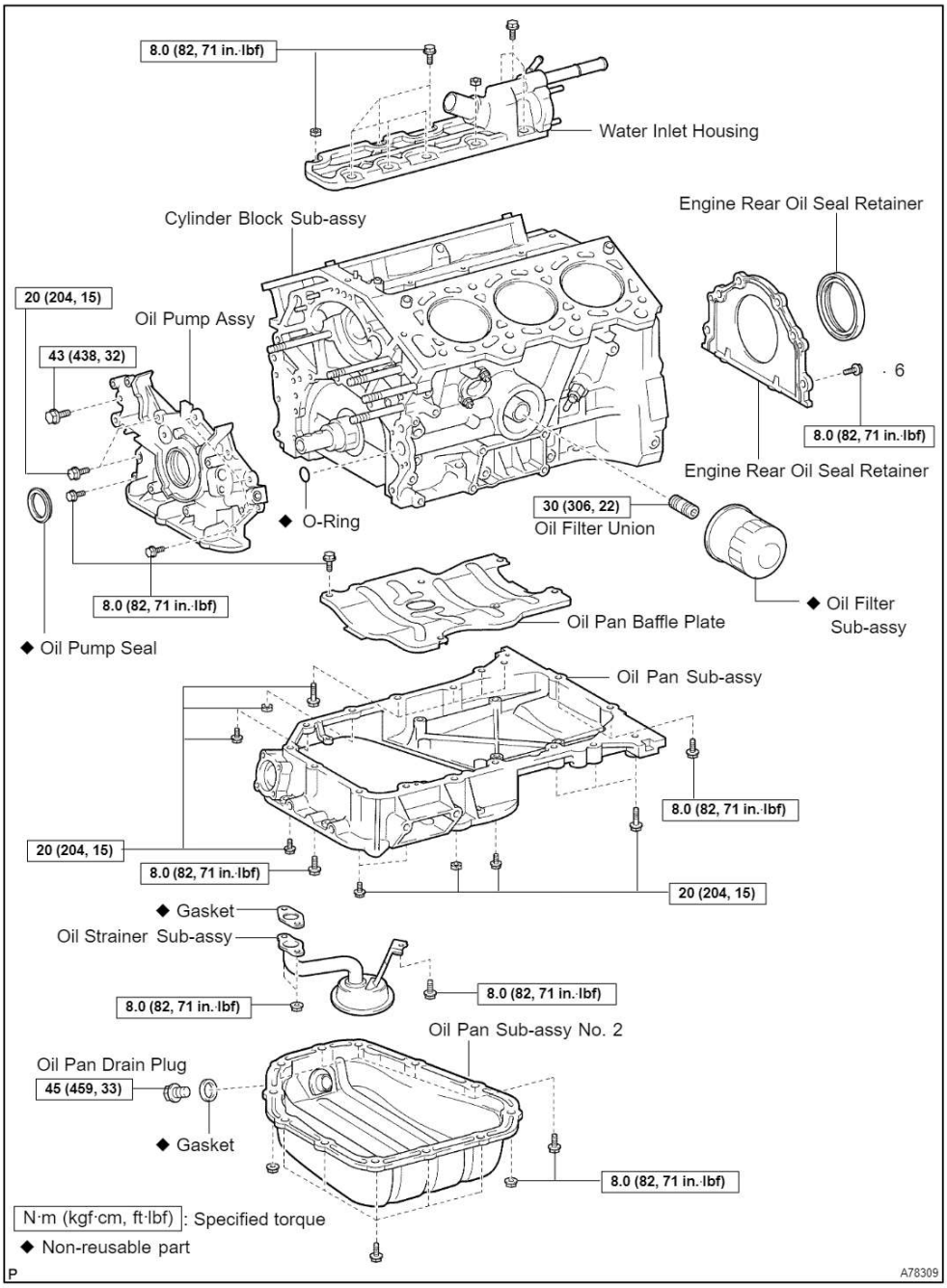

Timing Belt No. 3 Cover
Collar
Gasket
Camshaft Timing Pulley
Bushing
Timing Belt Idler Bracket
125 (1,275, 92)
28 (286, 21)
9.0 (92, 80 in.·lbf)
43 (438, 32)
Camshaft Timing Pulley
125 (1,275, 92)
Timing Belt Idler
Sub-assy No. 2
Water Pump Assy
◆ Water Pump Gasket
8.0 (82, 71 in.·lbf)
Timing Belt Idler Sub-assy No. 1
34 (347, 25)
Crankshaft Timing Pulley
Timing Belt Plate
8.0 (82, 71 in.·lbf)
Crankshaft
Position Sensor
8.0 (82, 71 in.·lbf)
N·m (kgf·cm, ft·lbf): Specified torque
◆ Non-reusable part
P
A78306



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

P A78307

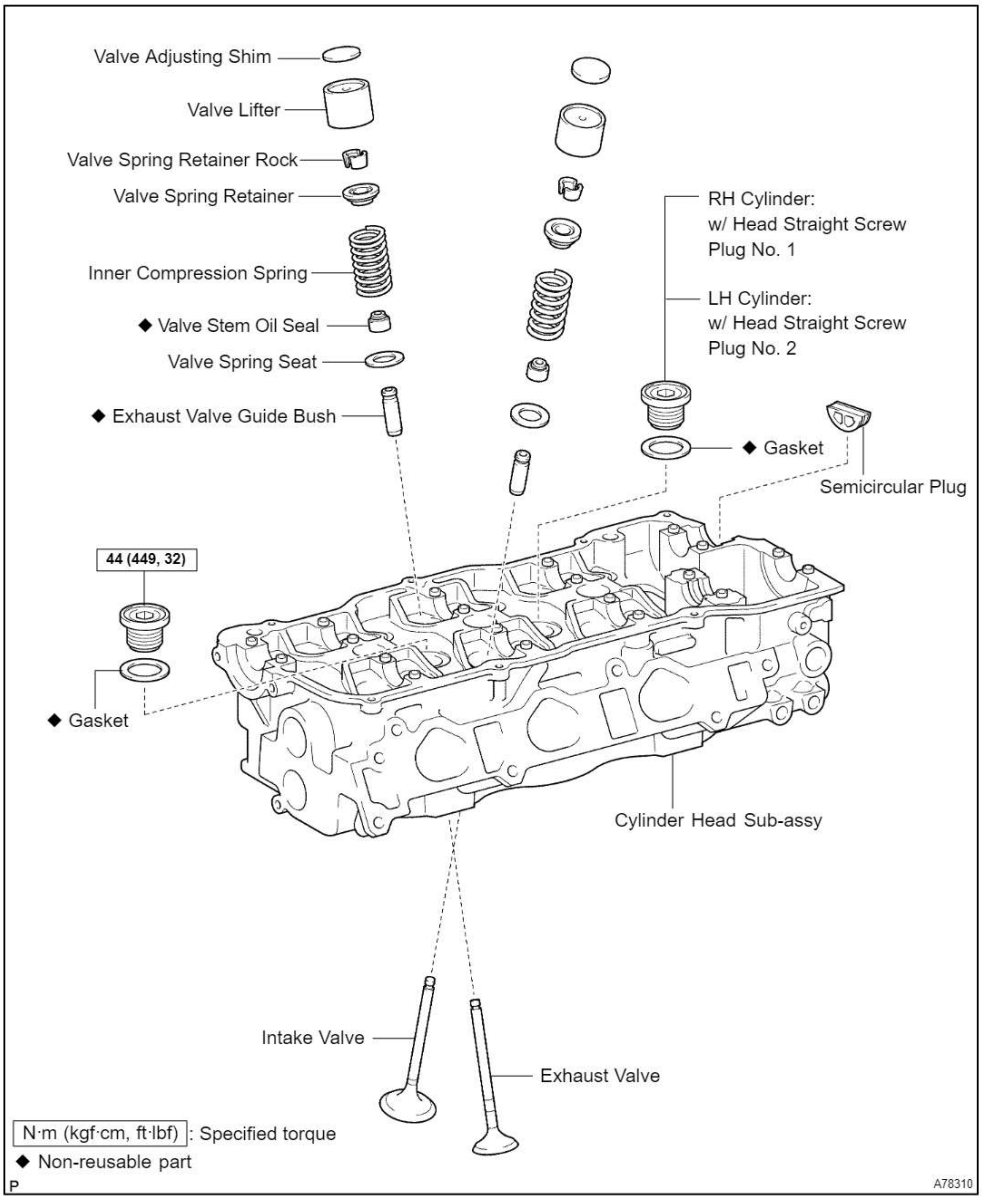

LH Bank
Camshaft Bearing Cap No. 2
Camshaft Bearing Cap No. 3
Camshaft Bearing Cap No. 6
Camshaft Bearing Cap No. 5
16 (163, 12)
10
Camshaft Timing Gear Assy
Camshaft Sub Gear Wave Washer
150 (1,530, 110)
Camshaft Bearing Cap No. 2
Camshaft Bearing Cap No. 4
Camshaft Sub Gear Shaft Snap Ring
Camshaft Bearing Cap No. 2
Camshaft Sub Gear
No. 3 Camshaft Sub-assy
16 (163, 12)
10
Oil Control Valve Filter
Camshaft Bearing Cap No. 1
◆ Gasket
Camshaft Timing Gear Bolt Washer
No. 4 Camshaft Sub-assy
45 (459, 33)
See page 14-240
1st: 54 (551, 40)
2nd: Turn 90◆
8
19 (194, 14)
10 (102, 7)
Cylinder Head LH
◆ Gasket
◆ Camshaft Setting Oil Seal
Cylinder Head Cover Rear
Engine Hanger No. 2
20 (204, 15)
◆ Cylinder Head Gasket No. 2
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
A78308


8.0 (82, 71 in.·lbf)
Water Inlet Housing
Cylinder Block Sub-assy
Engine Rear Oil Seal Retainer
20 (204, 15)
Oil Pump Assy
43 (438, 32)
6
8.0 (82, 71 in.·lbf)
Engine Rear Oil Seal Retainer
◆ O-Ring
30 (306, 22)
Oil Filter Union
8.0 (82, 71 in.·lbf)
Oil Pan Baffle Plate
◆ Oil Filter Sub-assy
◆ Oil Pump Seal
Oil Pan Sub-assy
8.0 (82, 71 in.·lbf)
20 (204, 15)
8.0 (82, 71 in.·lbf)
20 (204, 15)
◆ Gasket
Oil Strainer Sub-assy
8.0 (82, 71 in.·lbf)
8.0 (82, 71 in.·lbf)
Oil Pan Sub-assy No. 2
Oil Pan Drain Plug
45 (459, 33)
◆ Gasket
8.0 (82, 71 in.·lbf)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
P
A78309

CYLINDER HEAD ASSY (3MZ-FE)

COMPONENTS

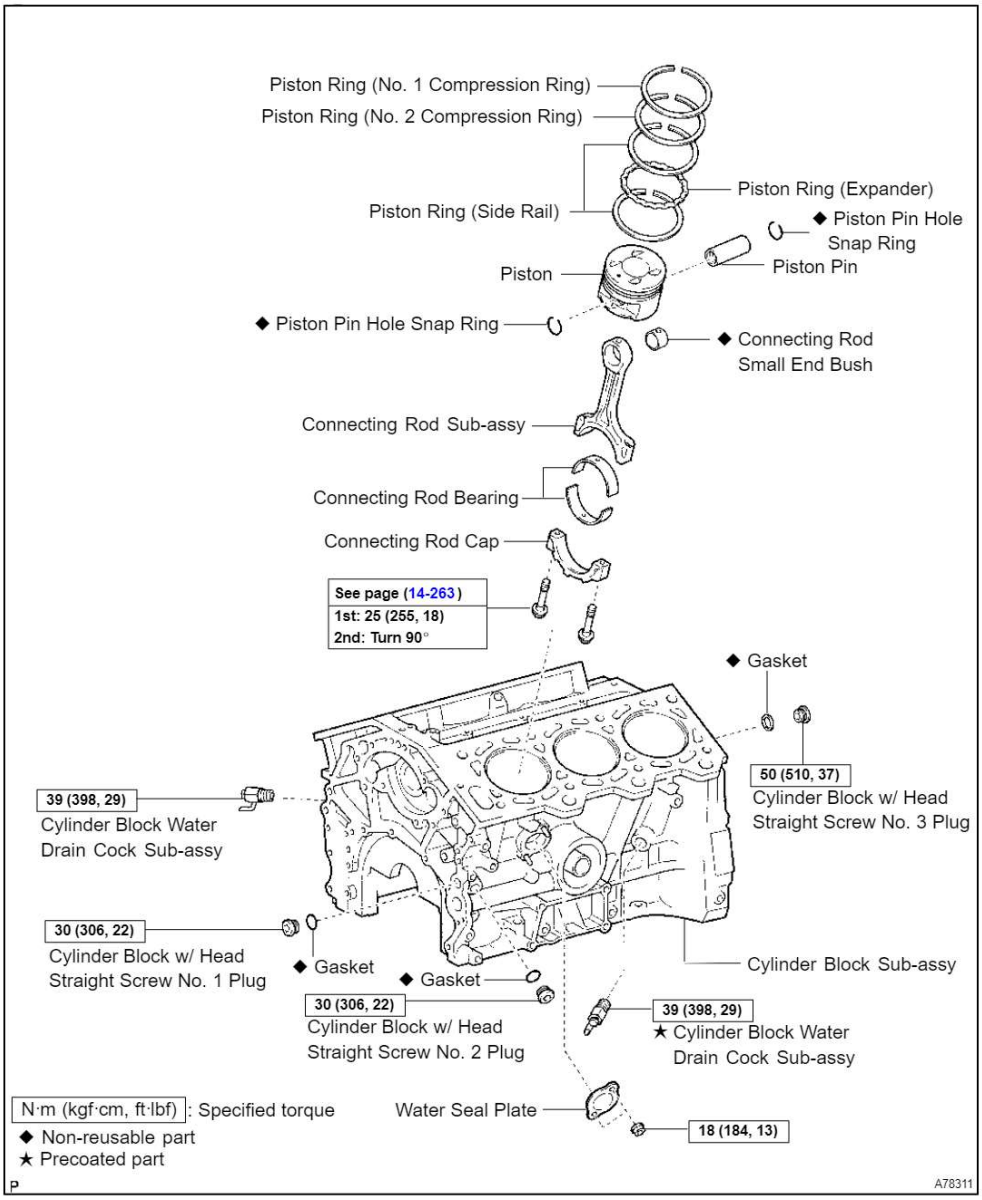
141PS-01

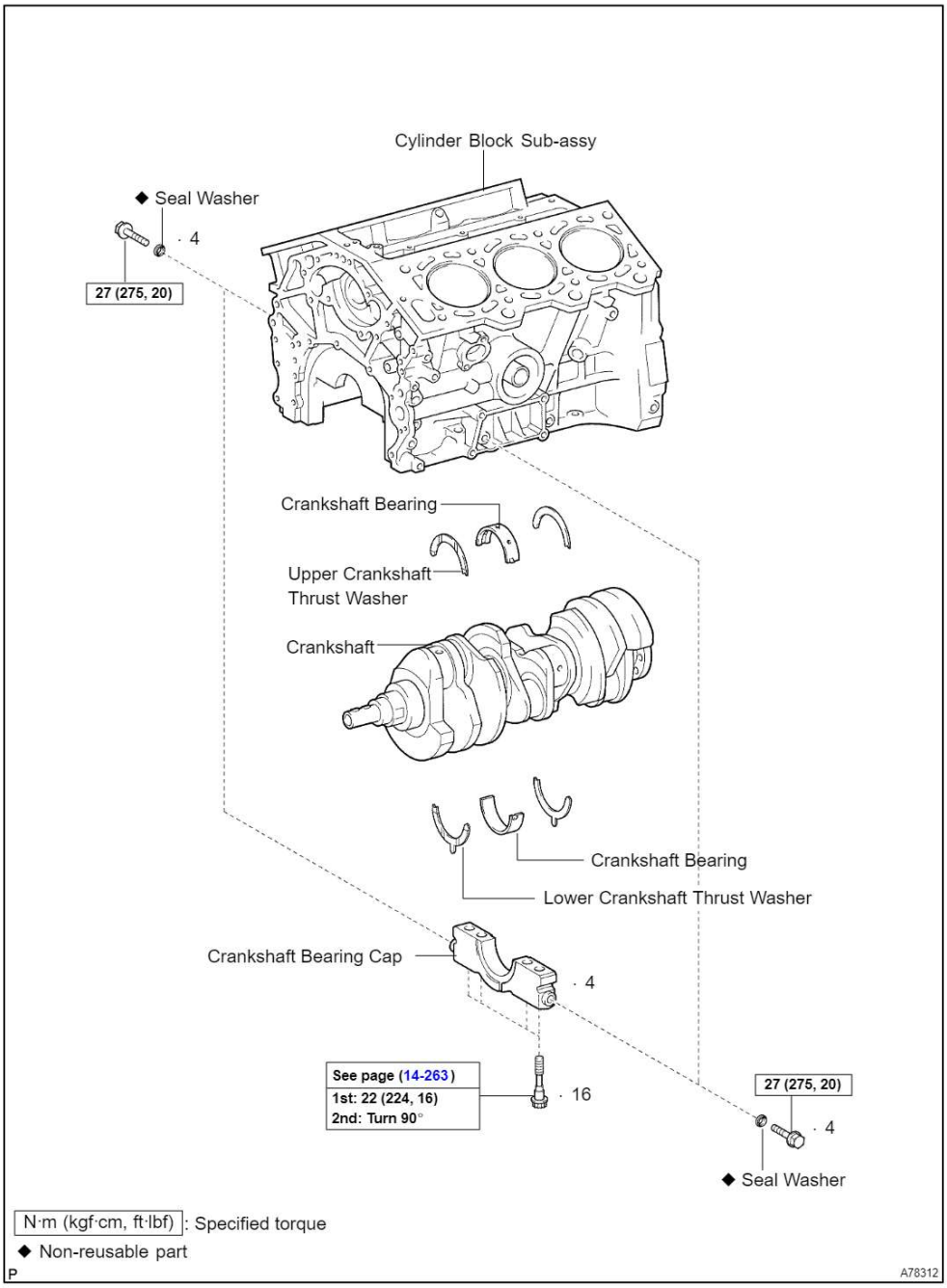


CYLINDER BLOCK ASSY (3MZ-FE)

COMPONENTS

141PU-01





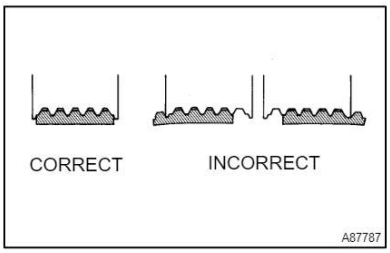
Author : Date : 2755

ENGINE (2AZ-FE)

141P0-02

INSPECTION

1. **INSPECT ENGINE COOLANT (See page 16-6)**
2. **INSPECT ENGINE OIL**
3. **INSPECT BATTERY**
4. **INSPECT AIR CLEANER FILTER ELEMENT SUB-ASSY**
5. **INSPECT SPARK PLUG (See page 18-3)**



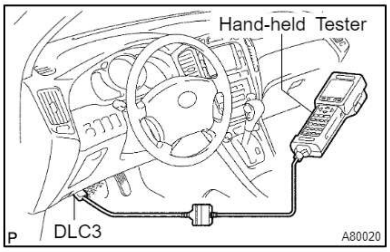
6. INSPECT V-RIBBED BELT

HINT:

- After installing the drive belt, check that it fits properly in the ribbed grooves. Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the crank pulley.
- "New belt" is a belt which has been used less than 5 minutes on a running engine.
- "Used belt" is a belt which has been used on a running engine for 5 minutes or more.
- After installing a new belt, run the engine for approximately 5 minutes and then recheck the tension.

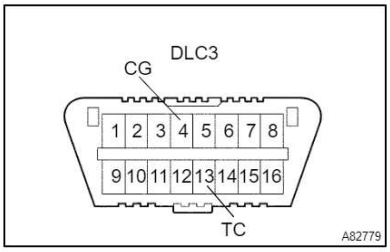
7. INSPECT IGNITION TIMING

(a) Warm up the engine.



(b) When using the hand-held tester:
Check the ignition timing.
(1) Connect the hand-held tester to the DLC3.
(2) Enter DATA LIST MODE on the hand-held tester.
Ignition timing: 8 to 12° BTDC @ idle

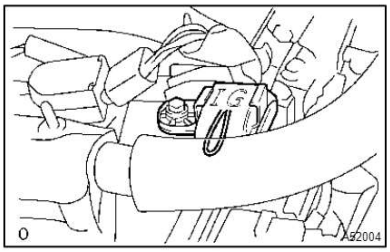
HINT:
Please refer to the hand-held tester operator's manual for help on selecting the DATA LIST.



(c) When not using the hand-held tester:
Check the ignition timing.
(1) Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.
SST 09843-18040

NOTICE:

- **Confirm the terminal numbers before connecting them. Connection with a wrong terminal can damage the engine.**
- **Turn off all electrical systems before connecting the terminals.**
- **Perform this inspection after the cooling fan motor is turned off.**



(2) Remove the cylinder head cover No. 2.
(3) Pull out the wire harness as shown in the illustration. Connect the clip of the timing light to the engine.

NOTICE:

- **Use a timing light which can detect the first signal.**
- **After checking, be sure to tape the wire harness.**

(4) Check the ignition timing at idle.
Ignition timing: 8 to 12° BTDC @ idle

NOTICE:

When checking the ignition timing, the transmission should be in the neutral position.

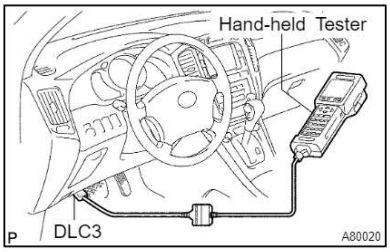
HINT:

After engine rpm is kept at 1,000 to 1,300 rpm for 5 seconds, check that it returns to idle speed.

(5) Remove the SST from the DLC3.
SST 09843-18040
(6) Check the ignition timing at idle.
Ignition timing: 5 to 15° BTDC @ idle
(7) Confirm that ignition timing moves to the advanced angle side when the engine rpm is increased.
(8) Remove the timing light.

8. INSPECT ENGINE IDLE SPEED

(a) Warm up the engine.



(b) When using the hand-held tester:
Check the idle speed.
(1) Connect the hand-held tester to the DLC3.

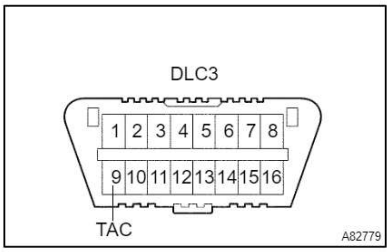
HINT:

Please refer to the hand-held tester operator's manual for further details.

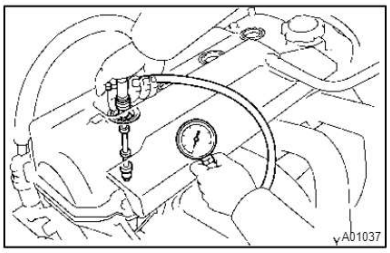
(2) Enter DATA LIST MODE on the hand-held tester.
Idle speed: 610 to 710 rpm

NOTICE:

- **When checking the idle speed, the transmission should be in the neutral position.**
- **Check idle speed with the cooling fan off.**
- **Switch off all accessories and air conditioning before connecting the hand-held tester.**



(c) When not using the hand-held tester:
Check the idle speed.
(1) Using SST, connect tachometer tester probe to terminal 9 (TAC) of the DLC3.
(2) Check the idle speed.
Idle speed: 610 to 710 rpm
SST 09843-18030



9. INSPECT COMPRESSION

(a) Warm up and stop the engine.
(b) Disconnect the injector connectors.
(c) Remove the ignition coils.
(d) Remove the spark plugs.
(e) Check the cylinder compression pressure.
  (1) Insert a compression gauge into the spark plug hole.
  (2) Fully open the throttle.
  (3) While cranking the engine, measure the compression pressure.

Compression pressure:
1,360 kPa (13.9 kgf/cm^2, 198 psi)
Minimum pressure: 0.98 MPa (10 kgf/cm^2, 142 psi)
Difference between each cylinder:
100 kPa (1.0 kgf/cm^2, 14 psi)

NOTICE:

- **Always use a fully charged battery to obtain engine speed of 250 rpm or more.**
- **Check other cylinder's compression pressure in the same way.**
- **This measurement must be done as quickly as possible.**
  (4) If the cylinder compression is low, pour a small amount of engine oil into the cylinder through the spark plug hole and inspect again.

HINT:

- If adding oil increases the compression, the piston rings and/or cylinder bore may be worn or damaged.
- If pressure stays low, a valve may be stuck or seated improperly, or there may be leakage in the gasket.

10. INSPECT CO/HC

(a) Start the engine.
(b) Rev the engine at 2,500 rpm for approximately 180 seconds.
(c) Insert CO/HC meter testing probe at least 40 cm (1.3 ft) into the tailpipe during idling.
(d) Immediately check CO/HC concentration at idle and/or 2,500 rpm.

HINT:

- Complete the measuring within 3 minutes.
- Check regulations and restrictions in your area when performing 2 mode CO/HC concentration testing (engine check at both idle speed and at 2,500 rpm).

(e) If the CO/HC concentration does not comply with regulations, troubleshoot in the order given below.
  (1) Check A/F sensor operation (see page 12-3).
  (2) See the table below for possible causes, and then inspect and repair.

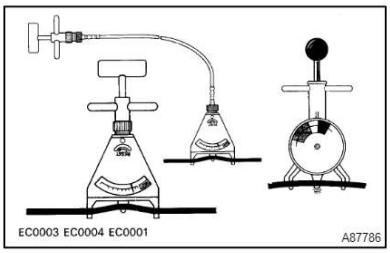
CO	HC	Problems	Causes
Normal	High	Rough idle	1. Faulty ignitions: • Incorrect timing • Fouled, shorted or improperly gapped plugs 2. Incorrect valve clearance 3. Leaky intake and exhaust valves 4. Leaky cylinders
Low	High	Rough idle (fluctuating HC reading)	1. Vacuum leaks: • PCV hoses • Intake manifold • 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 pressure regulator • Defective ECT • Defective MAF meter • Faulty ECM • Faulty injectors • Faulty throttle position sensor

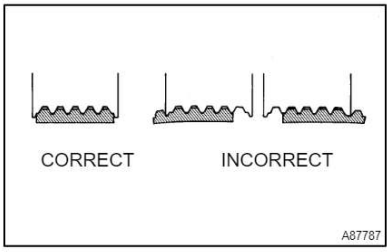
ENGINE (3MZ-FE)

141PF-02

INSPECTION

1. **INSPECT ENGINE COOLANT (See page 16-20)**
2. **INSPECT ENGINE OIL**
3. **INSPECT BATTERY (See page 19-36)**
4. **INSPECT AIR CLEANER FILTER ELEMENT SUB-ASSY**
5. **INSPECT SPARK PLUG (See page 18-9)**





6. INSPECT V-RIBBED BELT

(a) Using a belt tension gauge, check the belt tension.
Belt tension gauge:
DENSO BTG-20 (95506-00020)
Borroughs No. BT-33-73F
Drive belt tension:

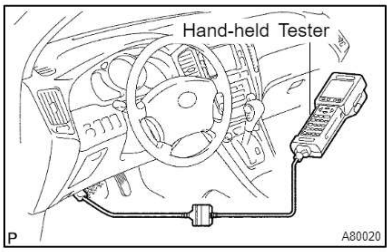
Item	Specified Condition
Cooler compressor to crankshaft pulley New belt	143 to 165 lbf
Cooler compressor to crankshaft pulley Used belt	80 to 132 lbf
Vane pump New belt	132 to 154 lbf
Vane pump Used belt	55 to 88 lbf

HINT:

- After installing the drive belt, check that it fits properly in the ribbed grooves. Check that the belt has not slipped out of the groove on the bottom of the crank pulley with your hand.
- "New belt" is a belt which has been used for less than 5 minutes on a running engine.
- "Used belt" is a belt which has been used on a running engine for 5 minutes or more.
- After installing a new belt, run the engine for approximately 5 minutes and then recheck the tension.

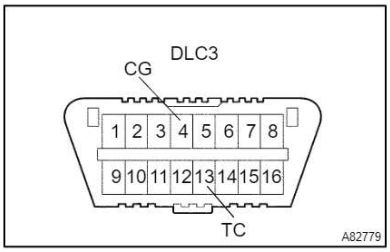
7. INSPECT IGNITION TIMING

(a) Warm up the engine.



(b) When using the hand-held tester:
Check the ignition timing.
(1) Connect the hand-held tester to the DLC3.
(2) Enter DATA LIST MODE on the hand-held tester.
Ignition timing: 8 to 12° BTDC @ idle

HINT:
Please refer to the hand-held tester operator's manual for further details.

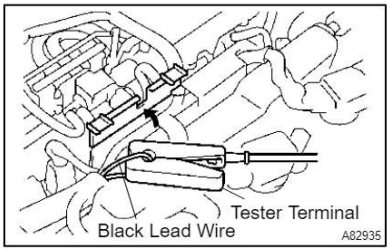


(c) When not using the hand-held tester:
Check the ignition timing.
(1) Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.
SST 09843-18040

NOTICE:

- **Confirm the terminal numbers before connecting them. Connection with a wrong terminal can damage the engine.**
- **Turn off all electrical systems before connecting the terminals.**
- **Perform this inspection after the cooling fan motor is turned off.**

(2) Remove the V-bank cover (see page 14-149).



(3) Pull out the black lead wire harness as shown in the illustration.
(4) Connect the tester terminal of the timing light to the engine.

NOTICE:

Use a timing light which detects the first signal.

(5) Check the ignition timing at idle.
Ignition timing: 8 to 12° BTDC @ idle

NOTICE:

When checking the ignition timing, the transmission should be in the neutral position.

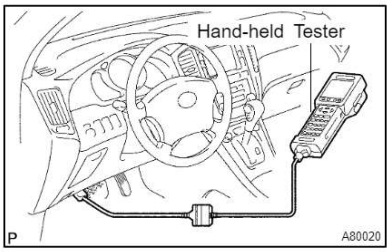
HINT:

Run the engine at 1,000 to 1,300 rpm for 5 seconds, and then check that the engine rpm returns to idle speed.

(6) Remove the SST from the DLC3.
(7) Check the ignition timing at idle.
Ignition timing: 7 to 24° BTDC @ idle
(8) Confirm that the ignition timing moves to the advanced angle side when the engine rpm is increased.
(9) Remove the timing light.

8. INSPECT ENGINE IDLE SPEED

(a) Warm up the engine.



(b) When using the hand-held tester:
Check the idle speed.
(1) Connect the hand-held tester to the DLC3.
(2) Enter DATA LIST MODE on the hand-held tester.
Idle speed: 650 to 750 rpm

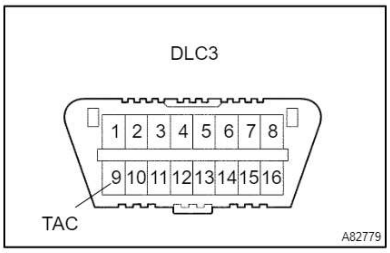
NOTICE:

- **When checking the idle speed, the transmission should be in the neutral position.**
- **Check the idle speed with the cooling fan off.**

- **Switch off all accessories and air conditioning before connecting the hand-held tester.**

HINT:

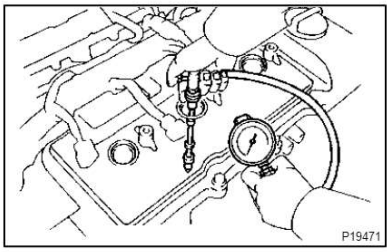
Please refer to the hand-held tester operator's manual for further details.



(c) When not using the hand-held tester:
Check the idle speed.
(1) Using SST, connect tachometer tester probe to terminal 9 (TAC) of the DLC3.
SST 09843-18030
(2) Check the idle speed.
Idle speed: 650 to 750 rpm

9. INSPECT COMPRESSION

(a) Warm up and stop the engine.
(b) Disconnect the injector connectors.
(c) Remove the intake air surge tank (see page 10-20).
(d) Remove the 6 ignition coils.
(e) Remove the 6 spark plugs.



(f) Check the cylinder compression pressure.
SST 09992-00500
(1) Insert a compression gauge into the spark plug hole.
(2) Fully open the throttle.
(3) While cranking the engine, measure the compression pressure.
Compression pressure:
1.5 MPa (15.3 kgf/cm^2, 218 psi)
Minimum pressure: 1.0 MPa (10.2 kgf/cm^2, 145 psi)
Difference between each cylinder:
100 kPa (1.0 kgf/cm^2, 15 psi)

NOTICE:

- **Always use a fully charged battery to obtain engine speed of 250 rpm or more.**
- **Check other cylinder's compression pressure in the same way.**
- **This measurement must be done as quickly as possible.**
(4) If the cylinder compression is low, pour a small amount of engine oil into the cylinder through the spark plug hole and inspect again.

HINT:

- If adding oil increases the compression, the piston rings and/or cylinder bore may be worn or damaged.

- If pressure stays low, a valve may be stuck or seated improperly, or there may be leakage in the gasket.

10. INSPECT CO/HC

(a) Start the engine.
(b) Rev the engine at 2,500 rpm for approximately 180 seconds.
(c) Insert CO/HC meter testing probe at least 40 cm (1.3 ft) into the tailpipe during idling.
(d) Check CO/HC concentration at idle and/or 2,500 rpm.

HINT:

Check regulations and restrictions in your area when performing 2 mode CO/CH concentration testing (engine check at both idle speed and at 2,500 rpm).

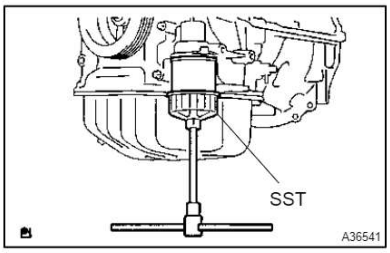
If the CO/HC concentration does not comply with regulations, troubleshoot in the order given below.

(1) Check A/F sensor operation (see page 05-649).
(2) See the table below for possible causes, and then inspect and repair.

CO	HC	Problems	Causes
Normal	High	Rough idle	1. Faulty ignitions: • Incorrect timing • Fouled, shorted or improperly gapped plugs 2. Incorrect valve clearance 3. Leaks in intake and exhaust valves 4. Leaks in cylinders
Low	High	Rough idle (fluctuating HC reading)	1. Vacuum leaks: • PCV hoses • Intake manifold • 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 • Defective ECT sensor • Defective MAF meter • Faulty ECM • Faulty injectors • Faulty throttle position sensor

141P5-01

OVERHAUL



1. REMOVE OIL FILTER SUB-ASSY

(a) Using SST, remove the oil filter.
SST 09228-06501

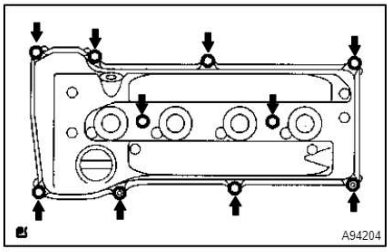
2. REMOVE OIL FILTER UNION

(a) Using a 12 mm hexagon wrench, remove the union.

3. REMOVE OIL FILLER CAP SUB-ASSY

4. REMOVE VENTILATION VALVE SUB-ASSY

5. REMOVE SPARK PLUG

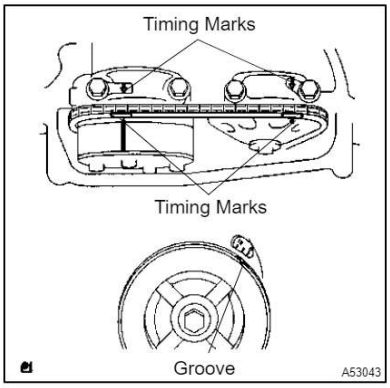


6. REMOVE CYLINDER HEAD COVER SUB-ASSY

(a) Remove the 8 bolts, 2 nuts, and cylinder head cover.

7. REMOVE CYLINDER HEAD COVER GASKET

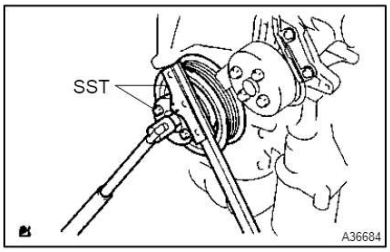
8. REMOVE CRANKSHAFT POSITION SENSOR



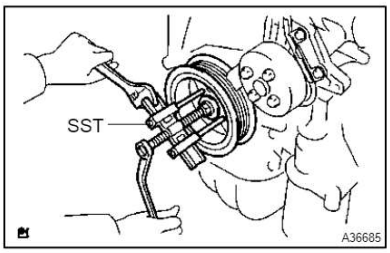
9. REMOVE CRANKSHAFT PULLEY

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

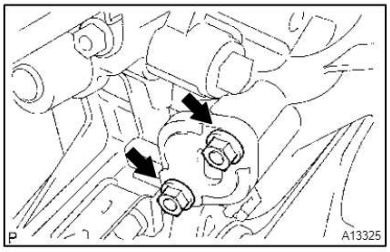
(b) Check that the timing marks of the camshaft timing sprockets are aligned with the timing marks of the No. 1 bearing cap, as shown in the illustration.



(c) Remove the crankshaft pulley.
(1) Using SST, fix the pulley and loosen the bolt.
SST 09213-54015 (91651-60855), 09330-00021



(2) Using SST, remove the bolt and pulley.
SST 09950- 50013 (09951- 05010, 09952- 05010, 09953-05020, 09954-05021)

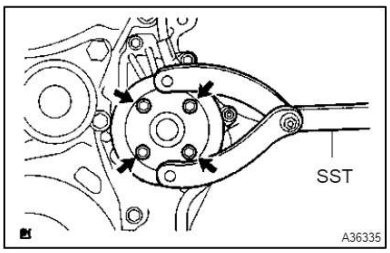


10. REMOVE CHAIN TENSIONER ASSY NO.1

(a) Remove the 2 nuts, chain tensioner and gasket.

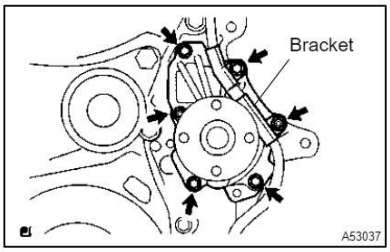
NOTICE:

Do not turn the crankshaft without the chain tensioner.



11. REMOVE WATER PUMP PULLEY

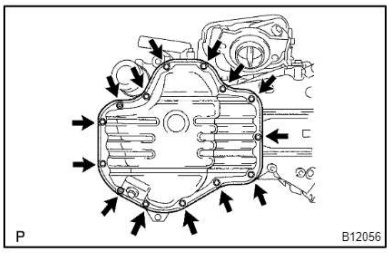
(a) Using SST, remove the water pump pulley.
SST 09960-10010 (09962-01000, 09963-00700)



12. REMOVE WATER PUMP ASSY

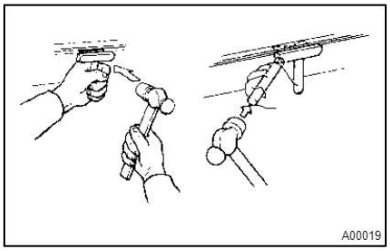
(a) Remove the 4 bolts, 2 nuts, bracket and water pump.

13. REMOVE OIL PAN DRAIN PLUG



14. REMOVE OIL PAN SUB-ASSY

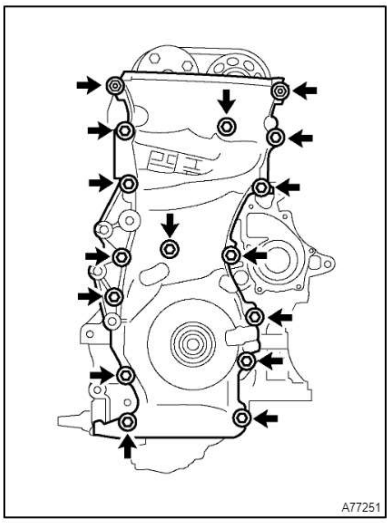
(a) Remove the 12 bolts and 2 nuts.



(b) Insert the blade of SST between the crankcase and oil pan. Cut off the applied sealer and remove the oil pan.
SST 09032-00100

NOTICE:

Be careful not to damage the contact surface of the cylinder block and oil pan.



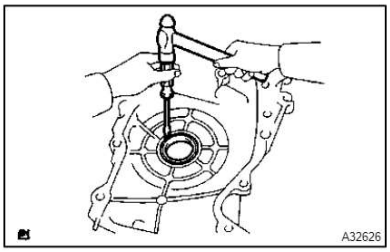
15. REMOVE TIMING CHAIN OR BELT COVER SUB-ASSY

(a) Remove the 14 bolts and 2 nuts.

(b) Remove the timing chain cover by prying between the timing chain cover and cylinder head or cylinder block with a screwdriver.

NOTICE:

Be careful not to damage the contact surfaces of the timing chain cover, cylinder block and cylinder head.



16. REMOVE ENGINE REAR OIL SEAL

(a) Using a screwdriver and hammer, remove the oil seal.

17. REMOVE CRANKSHAFT POSITION SENSOR PLATE NO.1

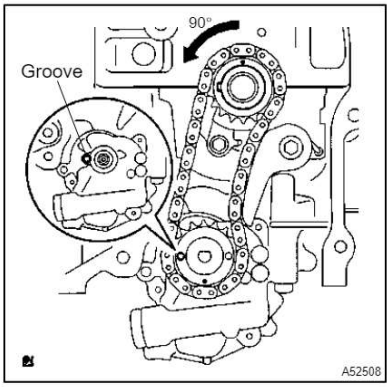
18. REMOVE TIMING CHAIN GUIDE

19. REMOVE CHAIN TENSIONER SLIPPER

20. REMOVE CHAIN VIBRATION DAMPER NO.1

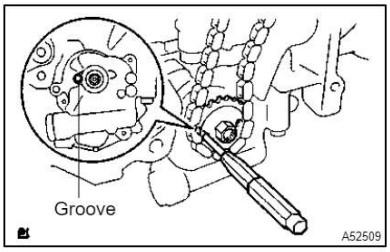
21. REMOVE CHAIN SUB-ASSY

22. REMOVE CRANKSHAFT TIMING GEAR OR SPROCKET

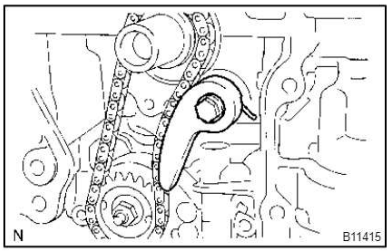


23. REMOVE NO.2 CHAIN SUB-ASSY

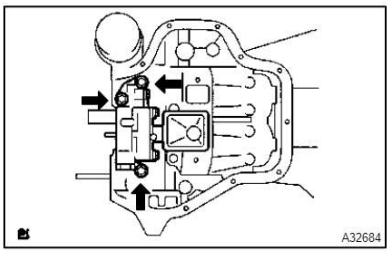
(a) Turn the crankshaft counterclockwise 90°, and align the adjusting hole of the oil pump driven sprocket with the groove of the oil pump.



(b) Put a bar (φ 4 mm (0.16 in.)) in the adjusting hole of the oil pump driven sprocket to temporarily lock the sprocket in position. then remove the nut.

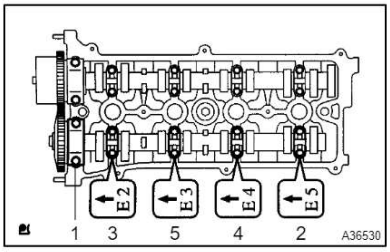


(c) Remove the bolt, chain tensioner plate and spring.
(d) Remove the oil pump sprocket gear,driven sprocket and chain.



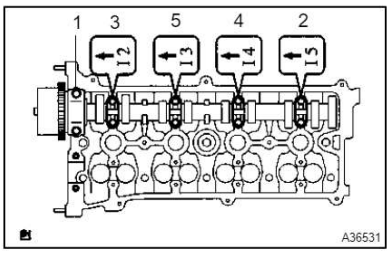
24. REMOVE OIL PUMP ASSY

(a) Remove the 3 bolts, oil pump and gasket.



25. REMOVE NO.2 CAMSHAFT (EXHAUST)

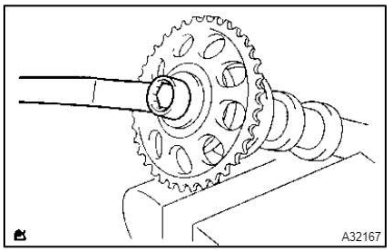
(a) Uniformly loosen and remove the No. 2 camshaft (exhaust)'s 10 bearing cap bolts in the sequence shown in the illustration. Then remove the 5 bearings.
(b) Remove the camshaft.



26. REMOVE CAMSHAFT (INTAKE)

(a) Uniformly loosen and remove the camshaft (intake)'s 10 bearing cap bolts in the sequence shown in the illustration. Then remove the 5 bearings.
(b) Remove the camshaft.

27. REMOVE CAMSHAFT BEARING NO.1

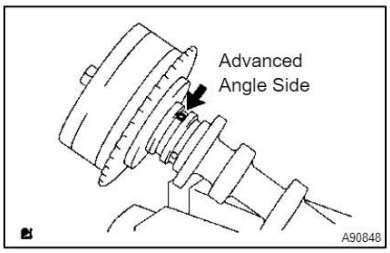


28. REMOVE CAMSHAFT TIMING GEAR OR SPROCKET

(a) Fix the camshaft with a vise and remove the camshaft timing sprocket.

NOTICE:

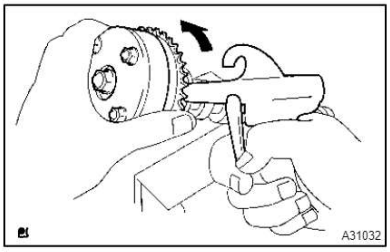
Be careful not to damage the camshaft.



29. REMOVE CAMSHAFT TIMING GEAR ASSY

(a) Fix the camshaft with a vise, and make sure that the camshaft timing gear does not move.

(b) Cover all the oil ports with vinyl tape except the advanced angle side, as shown in the illustration.



(c) Using an air gun, apply about 150 kPa (1.5 kgf/cm^2, 21 psi) of air pressure to the port on the advanced angle side.

CAUTION:

Some oil spraying will occur. Contain the spray with a shop rag.

HINT:

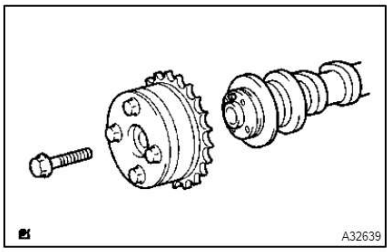
This operation releases the lock pin for the extreme retarded angle lock.

(d) Under the condition above, check that the camshaft timing gear can be turned by hand to the advanced angle side (counterclockwise), the direction of the arrow shown in the illustration.

Standard: Must turn

HINT:

The camshaft timing gear will turn to the advanced angle side without applying force by hand depending on the force of the air pressure applied. Also, if applying pressure to the oil path is difficult as a result of air leakage from the port, the lock-pin may be difficult to release.



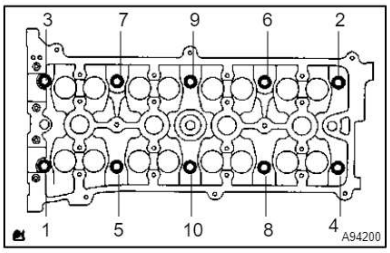
(e) Remove the fringe bolt from the camshaft timing gear.

NOTICE:

- **Be sure not to remove the other 4 bolts.**
- **If planning to reuse the camshaft timing gear, release the straight pin lock first, and then install the gear.**

30. REMOVE CAMSHAFT BEARING NO.2

31. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSY



32. REMOVE CYLINDER HEAD SUB-ASSY

(a) Using a 10 mm bi-hexagon wrench, uniformly loosen the 10 bolts in the sequence shown in the illustration. Remove the 10 cylinder head bolts and plate washers.

NOTICE:

- **Be careful not to drop the washers into the cylinder head.**
- **Head warpage or cracking could result from removing bolts in an incorrect order.**

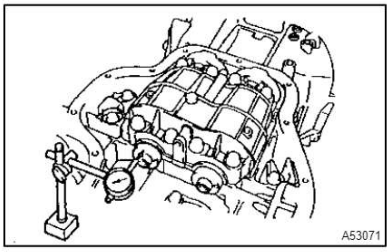
33. REMOVE CYLINDER HEAD GASKET

34. REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB-ASSY

35. REMOVE OIL CONTROL VALVE FILTER

(a) Using a 6 mm socket hexagon wrench, remove the plug and filter.

36. REMOVE W/HEAD TAPER SCREW PLUG NO.1

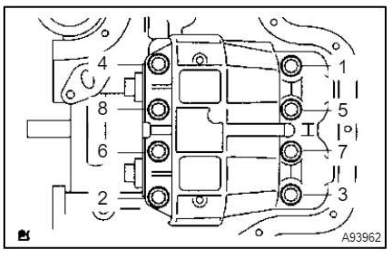


37. INSPECT BALANCESHAFT THRUST CLEARANCE

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

Standard thrust clearance:
0.050 to 0.090 mm (0.0020 to 0.0035 in.)
Maximum thrust clearance: 0.090 mm (0.0035 in.)

If the thrust clearance is greater than the maximum, replace the balanceshaft housing and bearings. If necessary, replace the balance shaft.



38. INSPECT BALANCESHAFT OIL CLEARANCE

(a) Uniformly loosen and remove the 8 bolts in the sequence shown in the illustration.

NOTICE:

Be careful not to damage the contact surfaces of the balanceshaft housing and crankcase.

HINT:

Keep the lower bearing and balanceshaft housing together.

(b) Lift out the No. 1 and No. 2 balanceshafts.

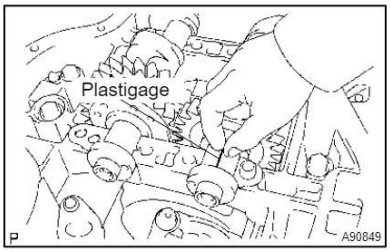
HINT:

Keep the upper bearing with the crankcase.

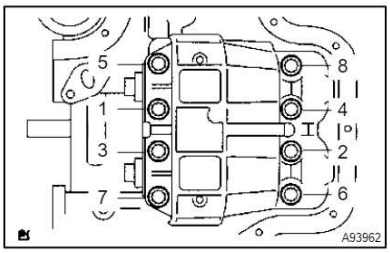
(c) Clean each bearing and journal.

(d) Check each bearing and journal for pitting and scratches. If a bearing or journal is damaged, replace the bearings. If necessary, replace the balance shaft.

(e) Place the No. 1 and No. 2 balanceshafts on the crankcase.

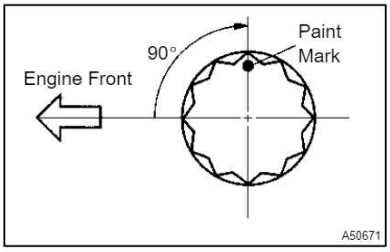


(f) Lay a strip of Plastigage across each journal, and install the balanceshaft housing.
(g) Apply a light coat of engine oil on the threads and under the heads of the balanceshaft housing bolts.

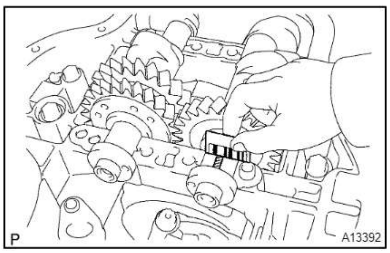


(h) Uniformly tighten the 8 bolts in the sequence shown in the illustration.
Torque: 22 N·m (220 kgf·cm, 16 ft·lbf)

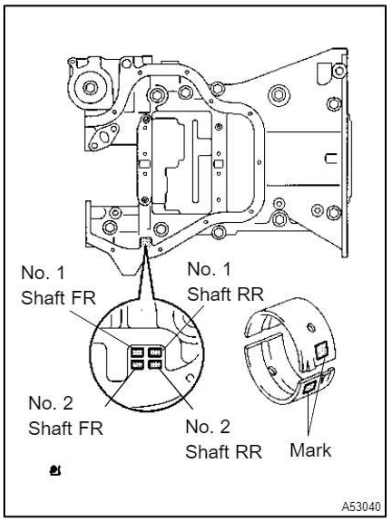
HINT:
The balanceshaft housing bolts are tightened in 2 progressive steps.



(i) Mark the front side of each balanceshaft housing bolt head with paint.
(j) Retighten the bolts 90° as shown in the illustration.
(k) Check that the paint marks are now at a 90° angle to the front.



(l) Remove the balanceshaft housing, and measure the Plastigage at its widest point.
Standard oil clearance:
0.004 to 0.031 mm (0.0002 to 0.0012 in.)
Maximum oil clearance: 0.031 mm (0.0012 in.)
(m) Completely remove the Plastigage after the inspection.



If the clearance is greater than the maximum, replace the bearing. If necessary, replace the balanceshaft.
If using a standard bearing, replace it with one of the same number.

Balanceshaft housing journal bore diameter:

Mark 1	26.000 to 26.006 mm (1.0236 to 1.0239 in.)
Mark 2	26.007 to 26.012 mm (1.0239 to 1.0241 in.)
Mark 3	26.013 to 26.018 mm (1.0241 to 1.0243 in.)

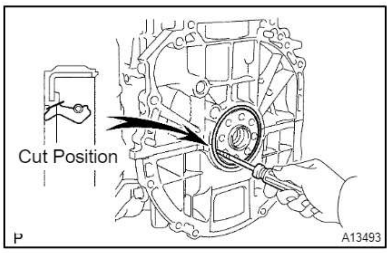
Balanceshaft journal diameter:
22.985 to 23.000 mm (0.9049 to 0.9055 in.)
Standard bearing center wall thickness:

Mark 1	1.486 to 1.489 mm (0.0585 to 0.0586 in.)
Mark 2	1.489 to 1.492 mm (0.0586 to 0.0587 in.)
Mark 3	1.492 to 1.495 mm (0.0587 to 0.0589 in.)

(n) Completely remove the Plastigage after the inspection.

39. REMOVE BALANCESHAFT

40. REMOVE BALANCESHAFT BEARING NO. 1



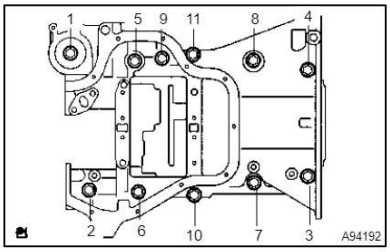
41. REMOVE ENGINE REAR OIL SEAL

(a) Using a knife, cut off the oil seal lip.

(b) Using a screwdriver with its tip taped, pry out the oil seal.

NOTICE:

After the removal, check the crankshaft for damage. If it is damaged, smooth the surface with 400-grit sandpaper.



42. REMOVE STIFFENING CRANKCASE ASSY

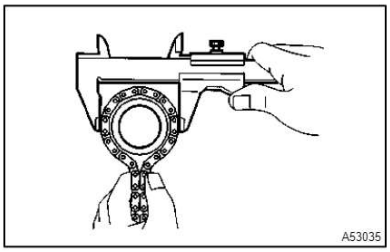
(a) Uniformly loosen and remove the 11 bolts in the sequence shown in the illustration.

(b) Using a screwdriver, remove the crankcase by prying the portions between the crankcase and cylinder block.

NOTICE:

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

(c) Remove the O-ring from the cylinder block.



43. INSPECT OIL PUMP DRIVE SPROCKET

(a) Wrap the chain around the drive gear.

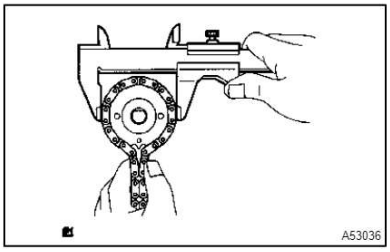
(b) Using a vernier caliper, measure the sprocket diameter with the chain.

Minimum sprocket diameter (w/chain): 48.2 mm (1.898 in.)

NOTICE:

The vernier caliper must contact the chain rollers for the measurement.

If the diameter is less than the minimum, replace the chain and sprocket.



44. INSPECT OIL PUMP DRIVEN SPROCKET

(a) Wrap the chain around the drive shaft gear.

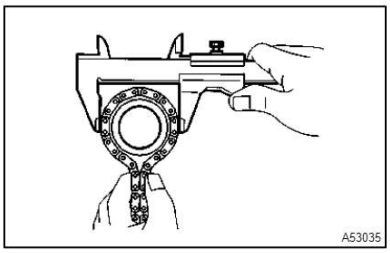
(b) Using a vernier caliper, measure the sprocket diameter with the chain.

Minimum gear diameter (w/chain): 48.2 mm (1.898 in.)

NOTICE:

The vernier caliper must contact the chain rollers for the measurement.

If the diameter is less than the minimum, replace the chain and sprocket.



45. INSPECT CRANKSHAFT TIMING GEAR OR SPROCKET

(a) Wrap the chain around the timing gear.

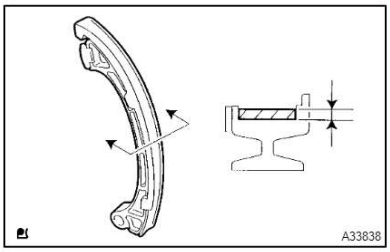
(b) Using a vernier caliper, measure the timing gear diameter with the chain.

Minimum gear diameter (w/ chain): 51.6 mm (2.031 in.)

NOTICE:

The vernier caliper must contact the chain rollers for the measurement.

If the diameter is less than the minimum, replace the chain and timing gear.

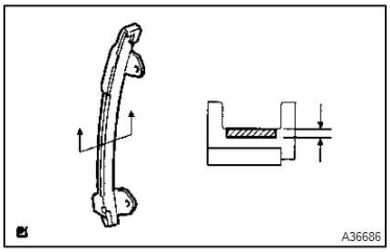


46. INSPECT CHAIN TENSIONER SLIPPER

(a) Measure the tensioner slipper wear.

Maximum wear: 1.0 mm (0.039 in.)

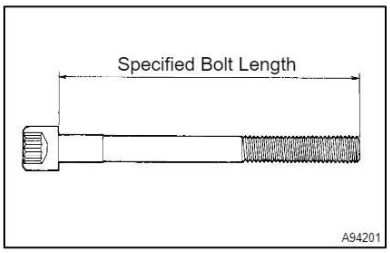
If the wear is greater than the maximum, replace the tensioner slipper.



47. INSPECT CHAIN VIBRATION DAMPER NO.1

(a) Measure the vibration damper wear.
Maximum wear: 1.0 mm (0.039 in.)

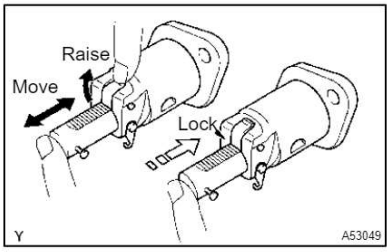
If the wear is greater than the maximum, replace the vibration damper.



48. INSPECT CYLINDER HEAD SET BOLT

(a) Using a vernier caliper, measure the length of the head bolts from the seat to the end.
Standard bolt length:
161.3 to 162.7 mm (6.3503 to 6.4055 in.)
Maximum bolt length: 164.2 mm (6.4646 in.)

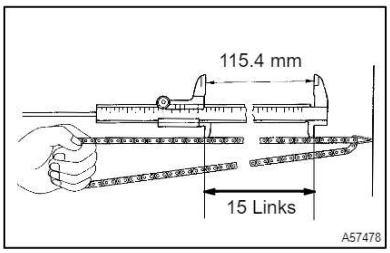
If the length is greater than the maximum, replace the bolt.



49. INSPECT CHAIN TENSIONER ASSY NO.1

(a) Check that the plunger moves smoothly when the ratchet pawl is raised.

(b) Release the ratchet pawl and check that the plunger is locked in place by the ratchet pawl and does not move when pushed with your finger.

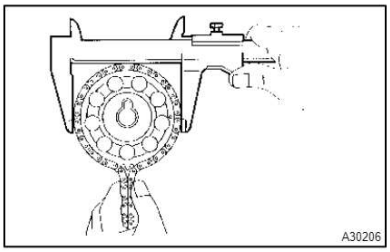


50. INSPECT CHAIN SUB-ASSY

(a) Using a vernier caliper, measure the length of 15 links with the chain fully stretched.
Maximum chain elongation: 115.4 mm (4.543 in.)

NOTICE:
Make the same measurements pulling at 3 or more places selected at random. Average the measurements.

If the elongation is greater than the maximum, replace the chain.



51. INSPECT CAMSHAFT TIMING GEAR OR SPROCKET

(a) Wrap the chain around the timing sprocket.

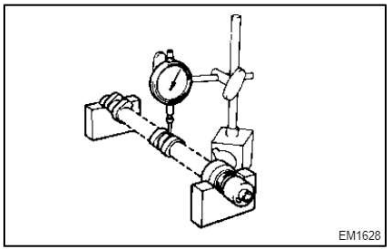
(b) Using a vernier caliper, measure the timing sprocket diameter with the chain.

Minimum sprocket diameter (w/chain):
97.3 mm (3.831 in.)

NOTICE:

The vernier caliper must contact the chain rollers for the measurement.

If the diameter is less than the minimum, replace the chain and timing gear.



52. INSPECT CAMSHAFT (INTAKE)

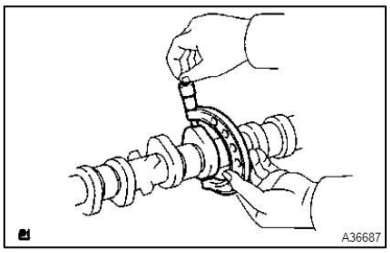
(a) Check the camshaft for runout.

(1) Place the camshaft on V-blocks.

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

Maximum circle runout: 0.03 mm (0.0012 in.)

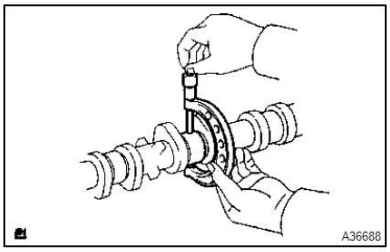
If the circle runout is greater than the maximum, replace the camshaft.



(b) Using a micrometer, measure the cam lobe height.

Standard cam lobe height:
46.495 to 46.595 mm (1.8305 to 1.8344 in.)
Minimum cam lobe height: 46.385 mm (1.8262 in.)

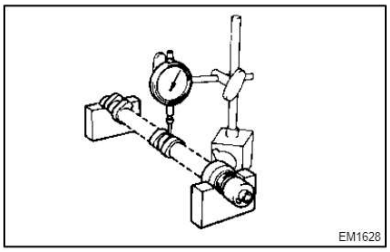
If the cam lobe height is less than the minimum, replace the camshaft.



(c) Using a micrometer, measure the journal diameter.

No. 1 journal diameter:
35.971 to 35.985 mm (1.4162 to 1.4167 in.)
Other journal diameter:
22.959 to 22.975 mm (0.9039 to 0.9045 in.)

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

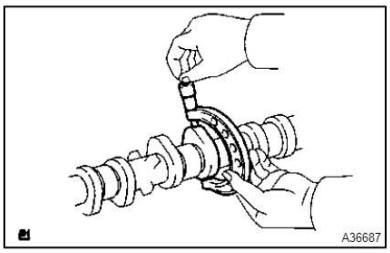


53. INSPECT NO.2 CAMSHAFT (EXHAUST)

(a) Check the camshaft for runout.
  (1) Place the camshaft on V-blocks.
  (2) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.03 mm (0.0012 in.)

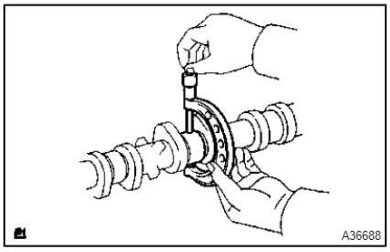
If the circle runout is greater than the maximum, replace the camshaft.



(b) Using a micrometer, measure the cam lobe height.

Standard cam lobe height:
45.983 to 46.083 mm (1.8104 to 1.8143 in.)
Minimum cam lobe height: 45.873 mm (1.8060 in.)

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



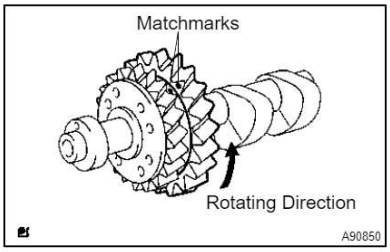
(c) Using a micrometer, measure the journal diameter.

No. 1 journal diameter:
35.971 to 35.985 mm (1.4162 to 1.4167 in.)
Other journal diameter:
22.959 to 22.975 mm (0.9039 to 0.9045 in.)

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

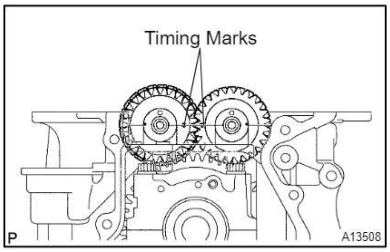
54. INSTALL BALANCESHAFT BEARING NO.1

(a) Install the bearings in the crankcase and balanceshaft housing.
(b) Apply a light coat of engine oil on the bearings.

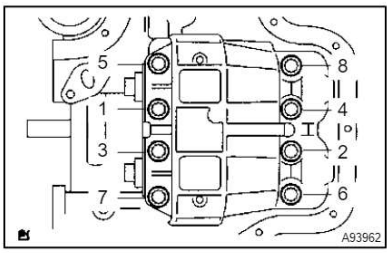


55. INSTALL BALANCESHAFT NO. 1 AND NO. 2

(a) Rotate the driven gear No. 1 of balanceshaft No. 1 for the rotating direction until it hits the stopper.
(b) Confirm that the matchmarks on driven gear No. 1 and No. 2 are matched.

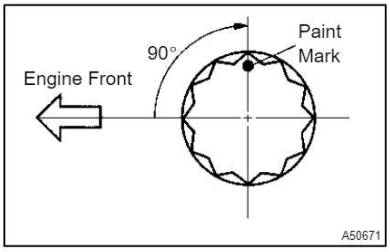


(c) Align the timing marks of the No. 1 and No. 2 balance-shafts as shown in the illustration.
(d) Place the No. 1 and No. 2 balance shafts on the crank case.
(e) Apply a light coat of engine oil under the heads of the balance shaft housing bolts.

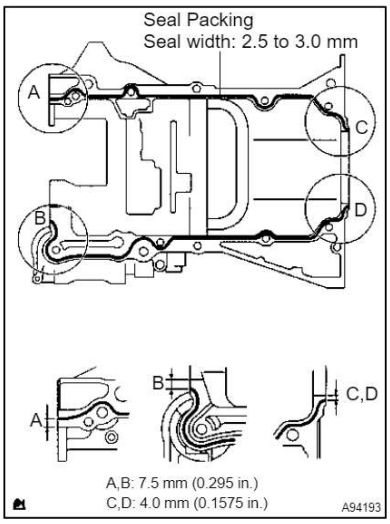


(f) Uniformly tighten the 8 bolts in the sequence shown in the illustration.
Torque: 22 N·m (224 kgf·cm, 16 ft·lbf)

HINT:
The balanceshaft housing bolts are tightened in 2 progressive steps.



(g) Mark the front side of each balance shaft housing bolt head with paint.
(h) Retighten the bolts by 90° as shown in the illustration.
(i) Check that the painted marks are now at a 90° angle to the front.

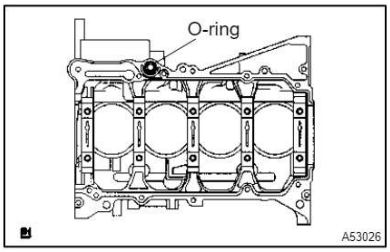


56. INSTALL STIFFENING CRANKCASE ASSY

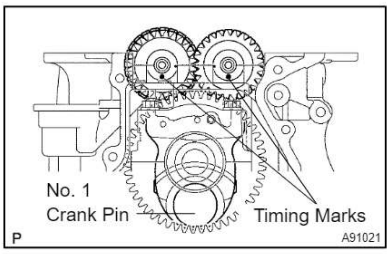
(a) Apply seal packing in a continuous bead (seal width: 2.5 to 3.0 mm (0.098 to 0.118 in.)) to the places shown in the illustration.
Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

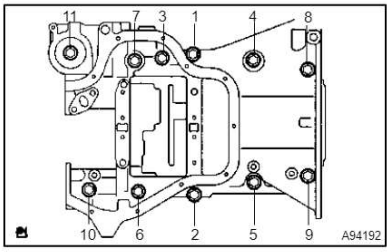
- **Remove any oil from the contact surface.**
- **Install the crankcase within 3 minutes after applying seal packing.**
- **Do not start the engine for at least 2 hours after installing.**



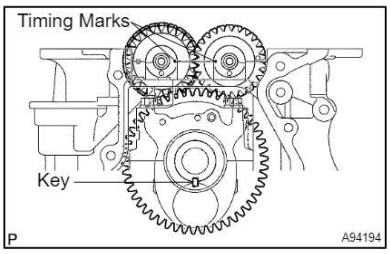
(b) Place a new O-ring on the cylinder block, as shown in the illustration.



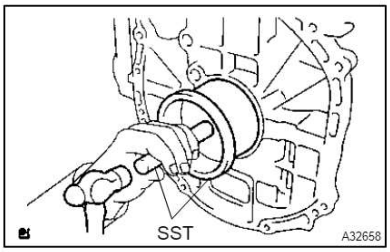
(c) With the No. 1 crank pin of the crankshaft placed at 6 o'clock, install the No. 1 and No. 2 balanceshaft and the adjusting hole as shown in the illustration.



(d) Uniformly tighten the 11 bolts in the sequence shown in the illustration.
Torque: 33 N·m (337 kgf·cm, 24 ft·lbf)



(e) Confirm that the timing marks of the balanceshafts are matched when the key groove is placed at 6 o'clock, as shown in the illustration.



57. INSTALL ENGINE REAR OIL SEAL

(a) Apply MP grease to a new oil seal lip.

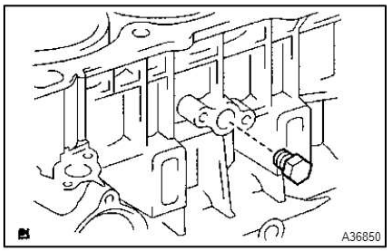
NOTICE:

Keep the lip off the foreign materials.

(b) Using SST and a hammer, evenly tap the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223-15030, 09950-70010 (09951-07100)

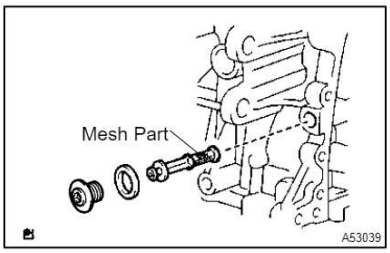
NOTICE:

Wipe off extra grease on the crankshaft.



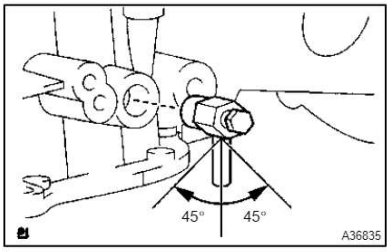
58. INSTALL W/HEAD TAPER SCREW PLUG NO.1

(a) Apply adhesive to the threads of the plug and install it.
Adhesive:
Part No. 08833-00070, THREE BOND 1324 or equivalent
Torque: 26 N·m (265 kgf·cm, 19 ft·lbf)



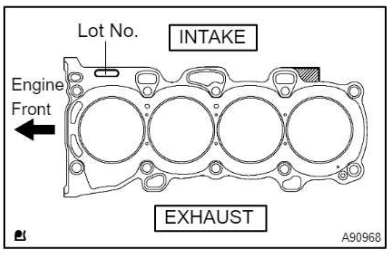
59. INSTALL OIL CONTROL VALVE FILTER FOR CAMSHAFT TIMING

(a) Check that no foreign substance is on the mesh part of the filter.
(b) Using a 6 mm socket hexagon wrench, install a new gasket and the oil control valve filter with the screw plug.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)



60. INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB-ASSY

(a) Install the water drain cock within the range shown in the illustration.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)



61. INSTALL CYLINDER HEAD GASKET

(a) Place a new gasket on the cylinder block surface with the Lot No. stamp upward.

NOTICE:

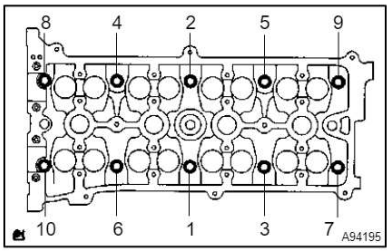
- **Remove any oil from contact surface.**
- **Be careful of the installation direction.**
- **To avoid damage to the gasket, place the cylinder head on the gasket carefully.**

62. INSTALL CYLINDER HEAD SUB-ASSY

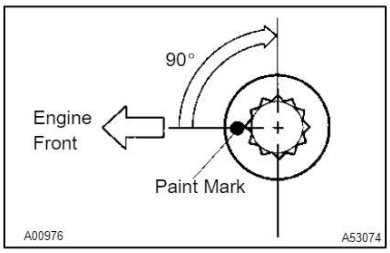
HINT:
The cylinder head bolts are tightened in 2 progressive steps.

(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
(b) Install the 10 bolts and plate washers to the cylinder head.

NOTICE:
Do not drop the washers into the cylinder head.

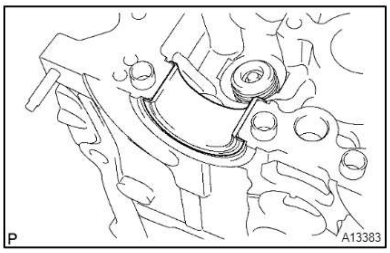


(c) Using a 10 mm bi-hexagon wrench, uniformly tighten the 10 bolts in the sequence shown in the illustration.
Torque: 79 N·m (806 kgf·cm, 58 ft·lbf)

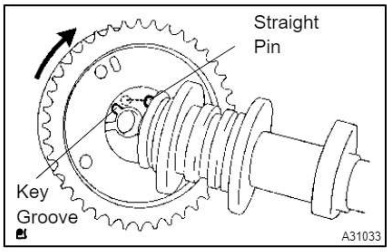


(d) Mark the front side of each cylinder head bolt with paint.
(e) Retighten the cylinder head bolts by 90° in the sequence shown in the illustration.
(f) Check that the painted marks are now at a 90° angle to the front.

63. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSY
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



64. INSTALL CAMSHAFT BEARING NO.2
(a) Install the bearing to the camshaft.
NOTICE:
Clean the contact surfaces of the bearing and the cylinder head. the surfaces should be free of dust and oils.

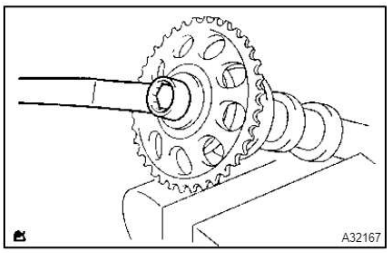


65. INSTALL CAMSHAFT TIMING GEAR ASSY
(a) Put the camshaft timing gear and the camshaft together with the straight pin and key groove.
(b) Turn the camshaft timing gear (as shown in the illustration) while pushing it lightly against the camshaft. Push further at the position where the pin enters the groove.
CAUTION:
Be sure not to turn the camshaft timing gear to the retarded angle side (to the right angle).
(c) Check that there is no clearance between the gear's fringe and the camshaft.
(d) Tighten the fringe bolt with the camshaft timing gear fixed.
Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)

(e) Check that the camshaft timing gear can move to the retarded angle side (the right direction) and is locked at the extreme retarded angle position.

HINT:

- Apply a light coat of engine oil on the threads and under the heads of the bolt.
- Length of sprocket bolt excluding bolt head: 40 mm (1.57 in.)



66. INSTALL CAMSHAFT TIMING GEAR OR SPROCKET

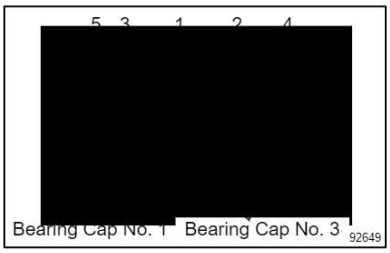
(a) Fix the camshaft with a vise, and install the camshaft No. 2 timing gear.

Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)

HINT:

- Apply a light coat of engine oil on the threads and under the heads of the bolt.
- Length of sprocket bolt excluding bolt head: 25 mm (0.98 in.)

67. INSTALL CAMSHAFT BEARING NO.1



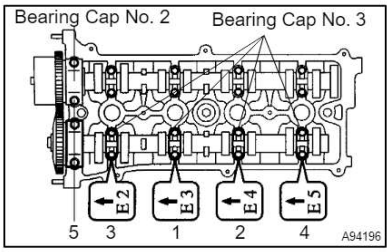
68. INSTALL CAMSHAFT (INTAKE)

(a) Examine the front marks and numbers of the 5 bearing caps and install them. Then install the 10 bearing cap bolts. Uniformly tighten the bolts in the sequence shown in the illustration.

Torque:
30 N·m (306 kgf·cm, 22 ft·lbf) for bearing cap No. 1
9.0 N·m (92 kgf·cm, 80 in.·lbf) for bearing cap No. 3

NOTICE:

- **Tighten the bolts after deciding the position for the thrust direction of the camshaft by the bearing cap No. 1.**
- **Install the camshaft with its timing mark of the camshaft timing gear on top.**



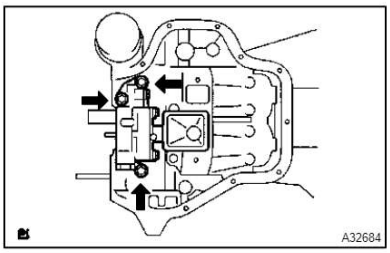
69. INSTALL NO.2 CAMSHAFT (EXHAUST)

(a) Examine the front marks and numbers of the 5 bearing caps and install them. Then install the 10 bearing cap bolts. Uniformly tighten the bolts in the sequence shown in the illustration.

Torque:
30 N·m (306 kgf·cm, 22 ft·lbf) for bearing cap No. 2
9.0 N·m (92 kgf·cm, 80 in.·lbf) for bearing cap No. 3

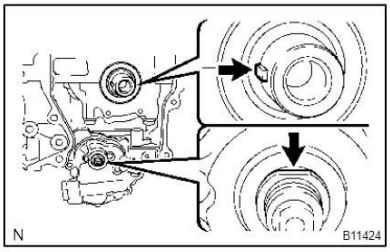
NOTICE:

- **Tighten the bolts after deciding the position for the thrust direction of the camshaft by the bearing cap No. 2.**
- **Install the camshaft with its timing mark of the camshaft timing gear on top.**



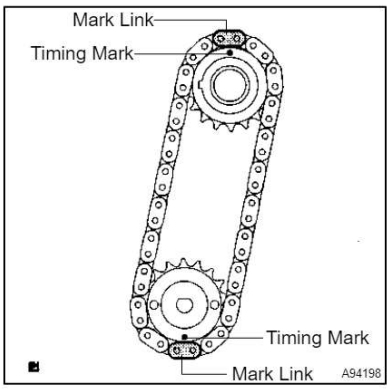
70. INSTALL OIL PUMP ASSY

(a) Install a new gasket and oil pump with the 3 bolts.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

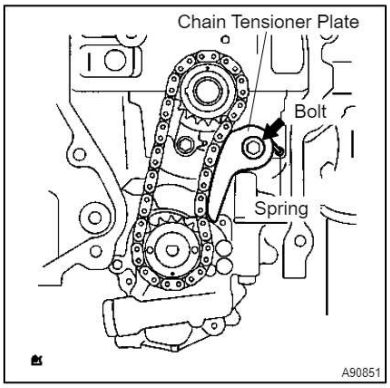


71. INSTALL NO.2 CHAIN SUB-ASSY

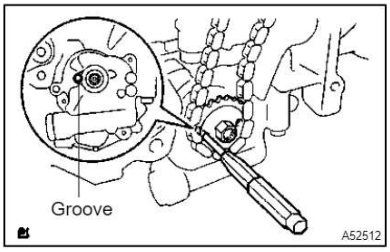
(a) Set the crankshaft key into the left horizontal position.
(b) Turn the cutout of the drive shaft to the top.



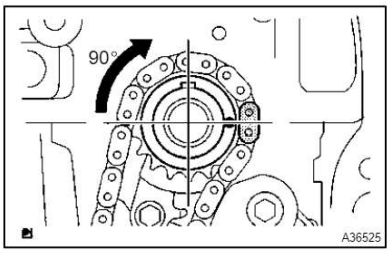
(c) Align the mark links (yellow colored links) with the timing marks of the sprocket as shown in the illustration.
(d) Insert the sprocket with chain to the crankshaft and oil pump shaft.
(e) Temporarily tighten the oil pump driven sprocket with the nut.



(f) Insert the damper spring into the adjusting hole, and install the chain tensioner plate by the bolt.
Torque: 12 N·m (122 kgf·cm, 9.0 ft·lbf)



(g) Align the adjusting hole of the sprocket with the groove of the oil pump.
(h) Put a bar (φ 4 mm (0.16 in.)) into the adjusting hole of the sprocket to temporarily lock the sprocket in position. Install the nut.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)

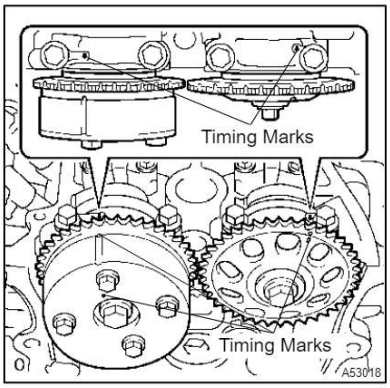


(i) Rotate the crankshaft clockwise 90°, and align the crankshaft key with the top.

72. INSTALL CRANKSHAFT TIMING GEAR OR SPROCKET

73. INSTALL CHAIN VIBRATION DAMPER NO.1

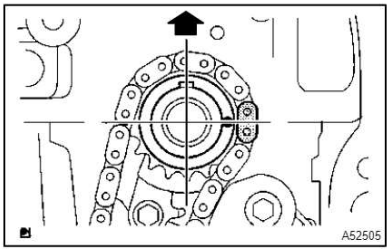
(a) Install the chain vibration damper with the 2 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



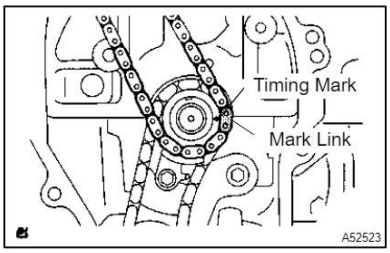
74. INSTALL CHAIN SUB-ASSY

(a) Set the No. 1 cylinder to TDC/compression.

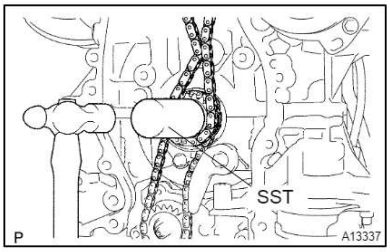
(1) Align the timing marks of the camshaft timing gear/sprocket and bearing caps (No. 1 and No. 2).



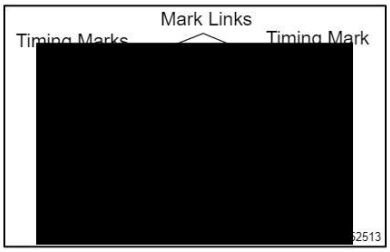
(2) Using the crankshaft pulley bolt, turn the crankshaft and set the set key on the crankshaft upward.



(b) Align the mark link (blue or orange colored link) with the timing mark of the crankshaft timing sprocket.



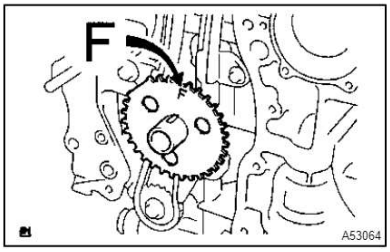
(c) Using SST, tap in the sprocket.
SST 09309-37010



(d) Align the mark links (gold or yellow colored links) with the timing marks of the camshaft timing gear and camshaft timing sprocket. Then install the chain.

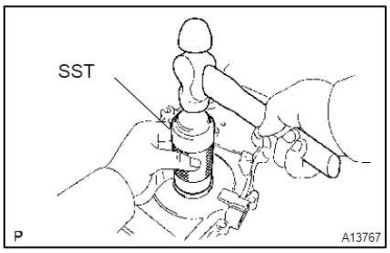
75. INSTALL CHAIN TENSIONER SLIPPER
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

76. INSTALL TIMING CHAIN GUIDE
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



77. INSTALL CRANKSHAFT POSITION SENSOR PLATE NO.1

(a) Install the sensor plate with the F mark facing forward.

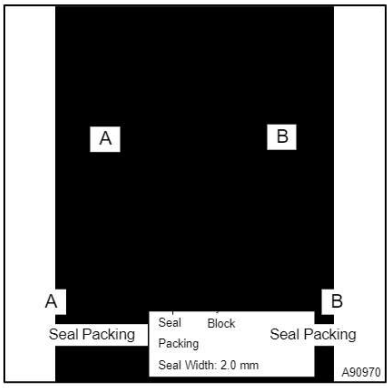


78. INSTALL TIMING GEAR CASE OR TIMING CHAIN CASE OIL SEAL

(a) Using SST, tap in a new oil seal until its surface is flush with the timing chain cover edge.
SST 09223-22010

(b) Apply a light coat of MP grease to the lip of the oil seal.

NOTICE:
Keep the gap between the timing chain cover edge and the oil seal free of foreign matter.

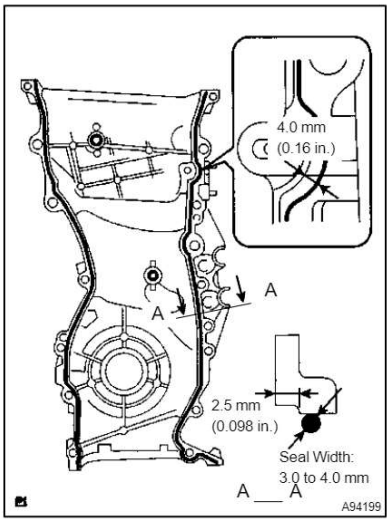


79. INSTALL TIMING CHAIN OR BELT COVER SUB-ASSY

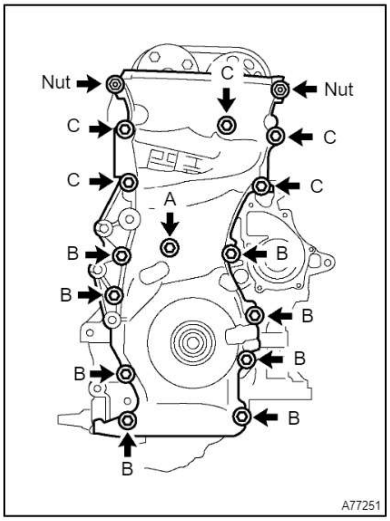
NOTICE:
- **Remove any oil from the contact surface.**
- **Install the chain cover within 3 minutes after applying seal packing.**
- **Do not start the engine for at least 2 hours after installing.**

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

(b) Apply seal packing in a continuous bead (seal width: 2.0 mm (0.079 in.)) as shown in the illustration.
Seal packing: Part No. 08826-00080 or equivalent

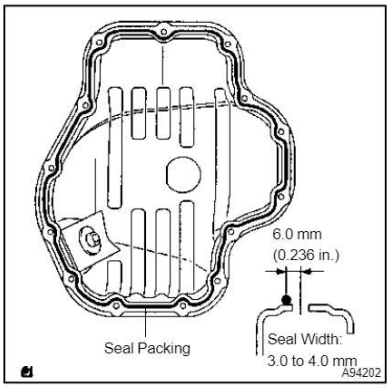


(c) Apply seal packing in a continuous bead (seal width: 3.0 to 4.0 mm (0.12 to 0.16 in.)) as shown in the illustration.
Seal packing: Part No. 08826-00080 or equivalent



(d) Install the timing chain cover with the 14 bolts and 2 nuts.
Torque:
9.0 N·m (92 kgf·cm, 80 in.·lbf) for bolt A
21 N·m (214 kgf·cm, 15 ft·lbf) for bolt B
43N·m (438 kgf·cm, 32 ft·lbf) for bolt C
9.0 N·m (92 kgf·cm, 80 in.·lbf) for nut

(e) Install the stud bolt to the drive belt tensioner.
Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)



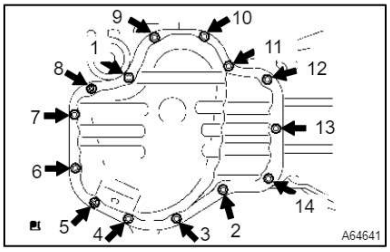
80. INSTALL OIL PAN SUB-ASSY

NOTICE:

- **Remove any oil from the contact surface.**
- **Install the oil pan within 3 minutes after applying seal packing.**
- **Do not start the engine for at least 2 hours after installing.**

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

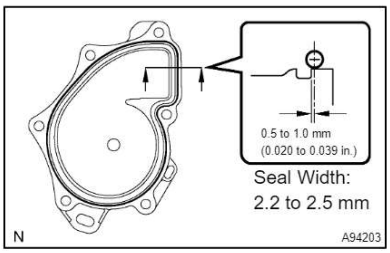
(b) Apply seal packing in a continuous bead (seal width: 3.0 to 4.0 mm (0.12 to 0.16 in.)) as shown in the illustration, and install the oil pan.
Seal packing: Part No. 08826-00080 or equivalent



(c) Uniformly tighten the 12 bolts and 2 nuts in the sequence shown in the illustration.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

81. INSTALL OIL PAN DRAIN PLUG

(a) Install a new gasket and the drain plug.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)



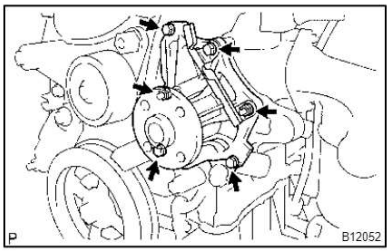
82. INSTALL WATER PUMP ASSY

(a) Clean the contact surface of the cylinder block.

(b) Apply seal packing in a continuous bead (seal width: 2.2 to 2.5 mm (0.087 to 0.098 in.)) to the outside edge of the water pump.
Seal packing: Part No. 08826-00100 or equivalent

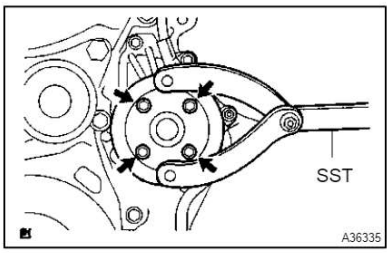
NOTICE:

- **Remove any oil from the contact surface.**
- **Install the water pump within 5 minutes after applying seal packing.**
- **Do not start the engine for at least 2 hours after installing.**



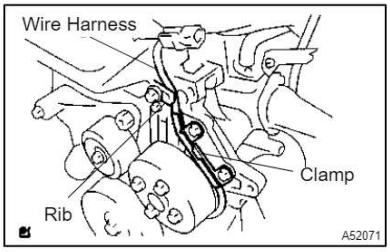
(c) Install the water pump with the 4 bolts and 2 nuts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

NOTICE:
Tighten the outside bolts and nuts with the clamp.



83. INSTALL WATER PUMP PULLEY

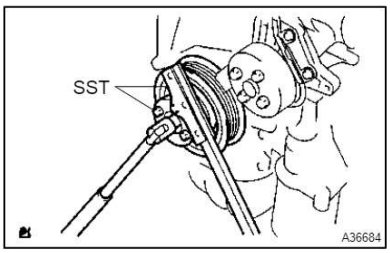
(a) Using SST, install the water pump pulley with the 4 bolts.
SST 09960-10010 (09962-01000, 09963-00700)
Torque: 26 N·m (265 kgf·cm, 19 ft·lbf)



84. INSTALL CRANKSHAFT POSITION SENSOR

(a) Install the sensor with the 2 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

(b) Confirm that the wire harness of the sensor is placed as shown in the illustration.

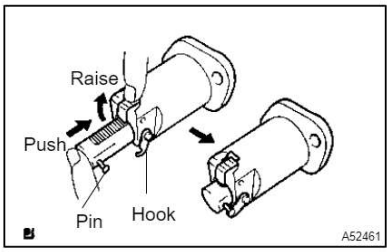


85. INSTALL CRANKSHAFT PULLEY

(a) Install the pulley.

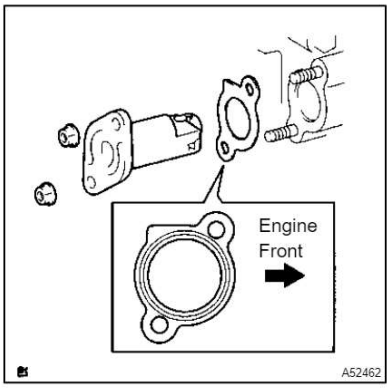
(b) Using SST,tighten the bolt.
SST 09213-54015 (91651-60855), 09330-00021
Torque: 180 N·m (1,835 kgf·cm, 133 ft·lbf)

HINT:
Apply a light coat of engine oil to the bolt threads and the area beneath the bolt head that come in contact with the washer.



86. INSTALL CHAIN TENSIONER ASSY NO.1

(a) Release the ratchet pawl, fully push in the plunger and apply the hook to the pin so that the plunger cannot spring out.

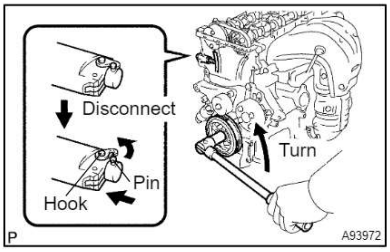


(b) Install a new gasket and the chain tensioner with the 2 nuts.

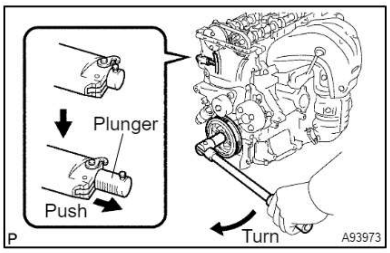
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

NOTICE:

If the hook is released while inserting, apply the hook again, and insert the chain tensioner.



(c) Turn the crankshaft counterclockwise and check that the plunger knock pin is disconnected from the hook.



(d) Turn the crankshaft clockwise and check that the slipper is pushed by the plunger.

87. INSPECT VALVE CLEARANCE (See page 14-6)

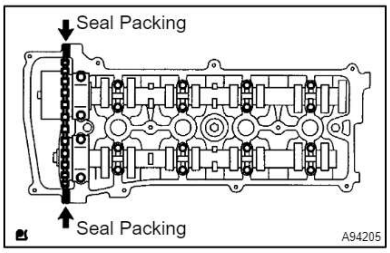
88. ADJUST VALVE CLEARANCE (See page 14-6)

89. INSTALL CYLINDER HEAD COVER GASKET

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

90. INSTALL CYLINDER HEAD COVER SUB-ASSY

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

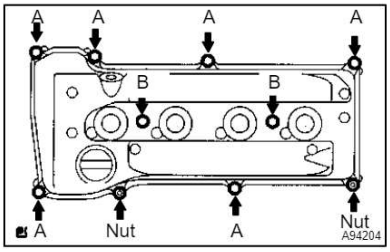


(b) Apply seal packing to the 2 locations shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

- **Remove any oil from the contact surface.**
- **Install the cylinder head cover within 5 minutes after applying seal packing.**
- **Do not apply engine oil for at least 2 hours after installing.**



(c) Install the cylinder head cover with the 8 bolts and 2 nuts.

Torque:
11 N·m (112 kgf·cm, 8 ft·lbf) for nut
11 N·m (112 kgf·cm, 8 ft·lbf) for bolt A
14 N·m (143 kgf·cm, 10 ft·lbf) for bolt B

91. INSTALL SPARK PLUG

Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

92. INSTALL VENTILATION VALVE SUB-ASSY

(a) Apply adhesive on the threads of the ventilation valve.

Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

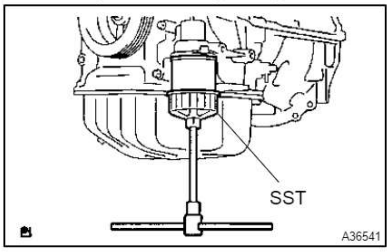
Adhesive: Part No. 08833-00070 THREE BOND 1324 or equivalent

93. INSTALL OIL FILLER CAP SUB-ASSY

94. INSTALL OIL FILTER UNION

(a) Using a 12 mm hexagon wrench, install the oil filter union.

Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)



95. INSTALL OIL FILTER SUB-ASSY

(a) Check and clean the oil filter installation surface.

(b) Apply clean engine oil to the gasket of a new oil filter.

(c) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.

(d) Using SST, tighten it an additional 3/4 turn.

SST 09228-06501

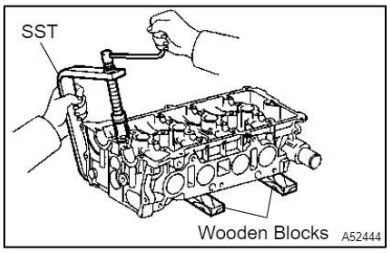
141P7-02

OVERHAUL

1. REMOVE VALVE LIFTER

HINT:

Arrange the valve lifters in the correct order.



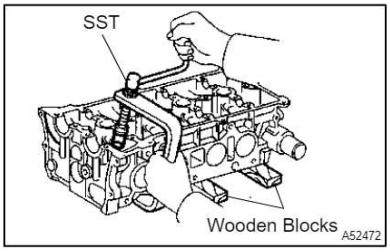
2. REMOVE INTAKE VALVE

(a) Using SST and wooden blocks, compress and remove the 8 valve spring retainer locks.
SST 09202-70020 (09202-00010)

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

HINT:

Arrange the removed parts in the correct order.



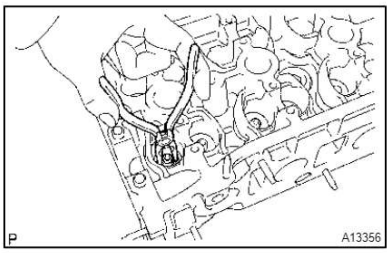
3. REMOVE EXHAUST VALVE

(a) Using SST and wooden blocks, compress and remove the 8 valve spring retainer locks.
SST 09202-70020 (09202-00010)

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

HINT:

Arrange the removed parts in the correct order.

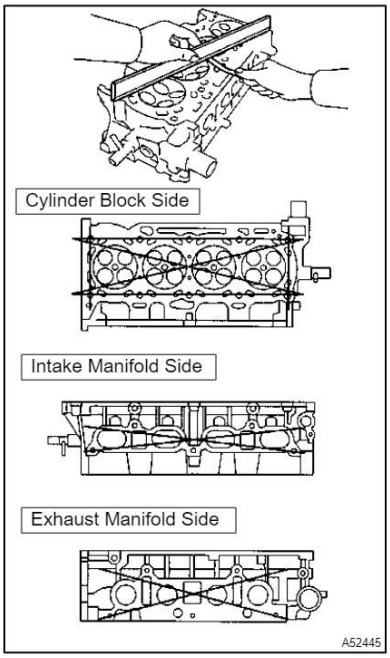


4. REMOVE VALVE STEM OIL O SEAL OR RING

(a) Using needle-nose pliers, remove the oil seals.

5. REMOVE VALVE SPRING SEAT

6. REMOVE STUD BOLT



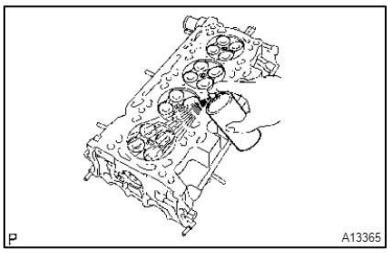
7. INSPECT CYLINDER HEAD FOR FLATNESS

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

Maximum warpage:

Item	Specified Condition
Cylinder block side	0.05 mm (0.0020 in.)
Intake manifold side	0.08 mm (0.0031 in.)
Exhaust manifold side	0.08 mm (0.0031 in.)

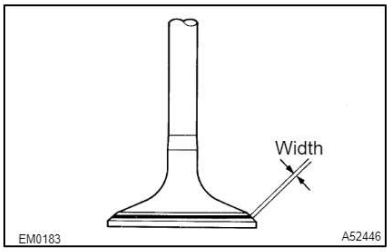
If the warpage is greater than the maximum, replace the cylinder head.



8. INSPECT CYLINDER HEAD FOR CRACKS

(a) Using a dye penetrate, check the intake ports, exhaust ports and cylinder surface for cracks.

If cracked, replace the cylinder head.



9. INSPECT VALVE SEATS

(a) Apply a light coat of prussian blue (or white lead) to the valve face.

(b) Lightly press the valve face against the valve seat.

(c) Check the valve face and valve seat according to the following procedure.

(1) If blue appears 360◆around the valve face, the valve face is concentric. If not, replace the valve.

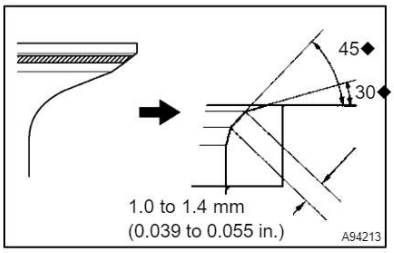
(2) If blue appears 360◆around the valve seat, the guide and valve face are concentric. If not, resurface the valve seat.

(3) Check that the valve seat contact is in the middle of the valve face with the width between 1.0 to 1.4 mm (0.039 to 0.055 in.).

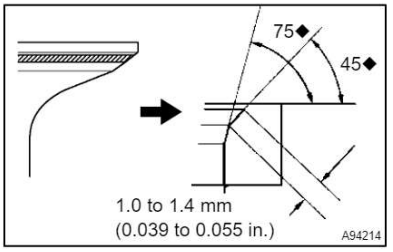
10. REPAIR VALVE SEATS

NOTICE:

Keep the lip free from a foreign matter.



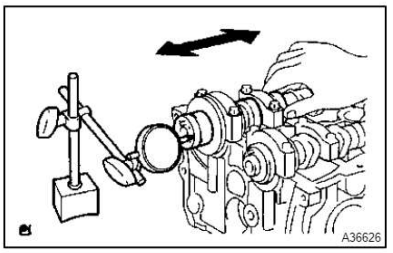
(a) If the seating is too high on the valve face, use 30◆and 45◆cutters to correct the seat.



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

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

(d) Check the valve seating position.



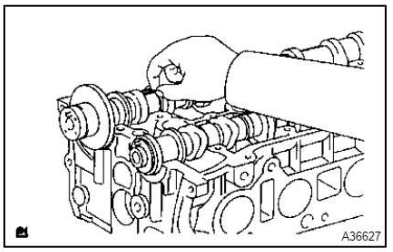
11. INSPECT CAMSHAFT THRUST CLEARANCE

(a) Install the camshafts.

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

Standard thrust clearance:
Intake 0.040 to 0.095 mm (0.0016 to 0.0037 in.)
Exhaust 0.080 to 0.135 mm (0.0032 to 0.0053 in.)
Maximum thrust clearance:
Intake 0.11mm (0.0043 in.)
Exhaust 0.15 mm (0.0059 in.)

If the thrust clearance is greater than the maximum, replace the cylinder head. If the thrust surface is damaged, replace the camshaft.

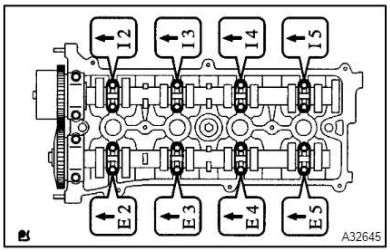


12. INSPECT CAMSHAFT OIL CLEARANCE

(a) Clean the bearing caps and camshaft journals.

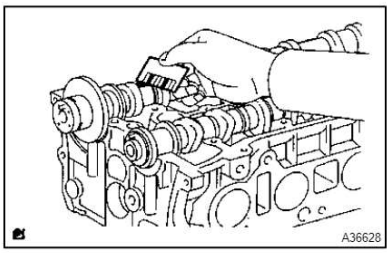
(b) Place the camshafts on the cylinder head.

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



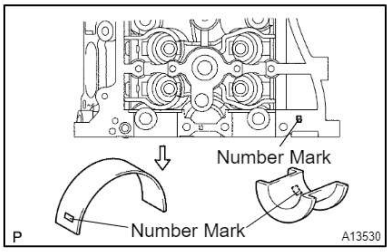
(d) Install the bearing caps.
Torque:
30 N·m (306 kgf·cm, 22 ft·lbf) for No. 1 bearing cap
30 N·m (306 kgf·cm, 22 ft·lbf) for No. 2 bearing cap
9.0 N·m (92 kgf·cm, 80 in.·lbf) for No. 3 bearing cap

NOTICE:
Do not turn the camshaft.



(e) Remove the bearing cap, and measure the Plastigage at its widest point.
Standard oil clearance:
Intake No. 1 journal bearing mark 1
0.007 to 0.038 mm (0.0028 to 0.00150 in.)
Intake No. 1 journal bearing mark 2
0.008 to 0.038 mm (0.0031 to 0.00150 in.)
Intake No. 1 journal bearing mark 3
0.008 to 0.038 mm (0.0031 to 0.00150 in.)
Other journals
0.025 to 0.062 mm (0.00098 to 0.00244 in.)
Exhaust No. 1 journal
0.040 to 0.079 mm (0.00157 to 0.00311 in.)
Other journals
0.025 to 0.062 mm (0.00098 to 0.00244 in.)
Maximum oil clearance:
Intake No. 1 journal 0.07 mm (0.0028 in.)
Other journals 0.10 mm (0.0039 in.)

NOTICE:
Completely remove the Plastigage after the inspection.
If the oil clearance is greater than the maximum, replace the camshaft. If necessary, replace the cylinder head.



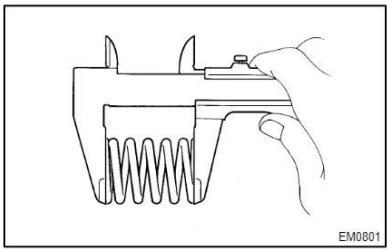
If the oil clearance on the No.1 journal is greater than the maximum, choose a new bearing and install it.
HINT:
Cylinder head journal bore diameter

Mark 1	40.000 to 40.008 mm (1.57480 to 1.57511 in.)
Mark 2	40.009 to 40.017 mm (1.57515 to 1.57547 in.)
Mark 3	40.018 to 40.025 mm (1.57551 to 1.57578 in.)

Standard bearing center wall thickness

Mark 1	2.000 to 2.004 mm (0.07874 to 0.07890 in.)
Mark 2	2.005 to 2.008 mm (0.07894 to 0.07905 in.)
Mark 3	2.009 to 2.012 mm (0.07909 to 0.07921 in.)

Camshaft journal diameter:
35.971 to 35.985 mm (1.41618 to 1.41673 in.)

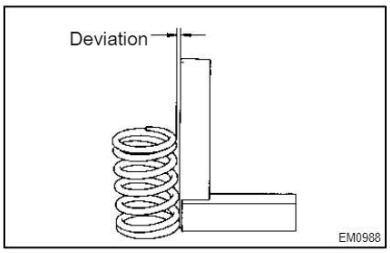


13. INSPECT INNER COMPRESSION SPRING

(a) Using a vernier caliper, measure the free length of the valve spring.

Free length: 45.7 mm (1.799 in.)

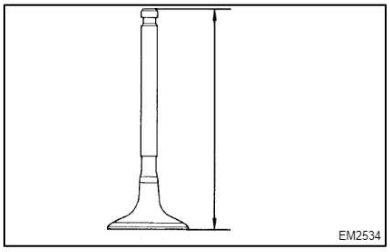
If the free length is not as specified, replace the valve spring.



(b) Using steel squares, measure the deviation of the valve spring.

Maximum deviation: 1.6 mm (0.063 in.)

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



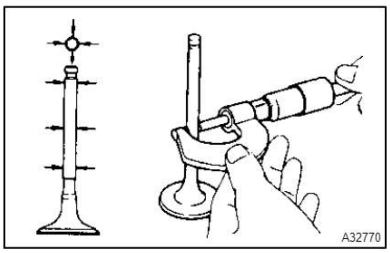
14. INSPECT INTAKE VALVE

(a) Using a vernier caliper, measure the valve overall length.

Standard overall length: 101.71 mm (4.0043 in.)

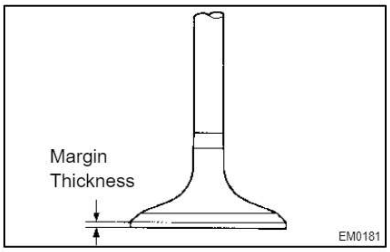
Minimum overall length: 101.21 mm (3.9846 in.)

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



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

Valve stem diameter:
5.470 to 5.485 mm (0.2154 to 0.2159 in.)

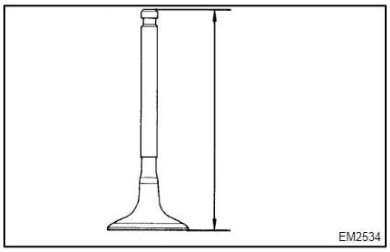


(c) Using a vernier caliper, measure the valve head margin thickness.

Standard margin thickness:
1.05 to 1.45 mm (0.0413 to 0.0571 in.)

Minimum margin thickness: 0.5 mm (0.0197 in.)

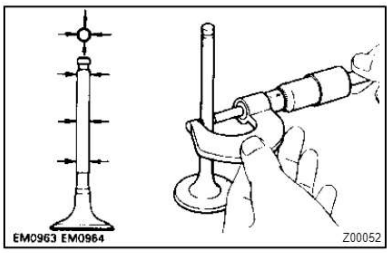
If the margin thickness is less than the minimum, replace the valve.



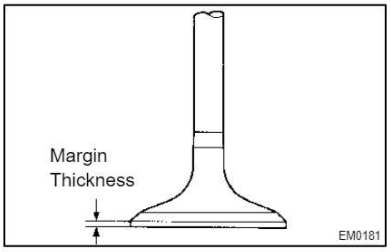
15. INSPECT EXHAUST VALVE

(a) Using a vernier caliper, measure the valve overall length.
Standard overall length: 101.15 mm (3.9823 in.)
Minimum overall length: 100.70 mm (3.9646 in.)

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

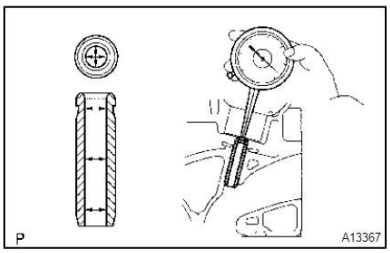


(b) Using a micrometer, measure the diameter of the valve stem.
Valve stem diameter:
5.465 to 5.480 mm (0.2152 to 0.2157 in.)



(c) Using a vernier caliper, measure the valve head margin thickness.
Standard margin thickness:
1.20 to 1.60 mm (0.0470 to 0.0630 in.)
Minimum margin thickness: 0.5 mm (0.020 in.)

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

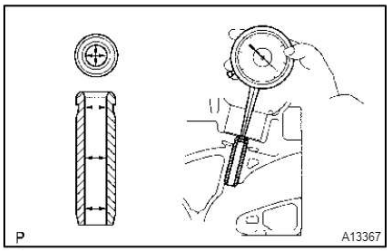


16. INSPECT INTAKE VALVE GUIDE BUSH

(a) Using a caliper gauge, measure the inside diameter of the guide bush.
Bush inside diameter:
5.510 to 5.530 mm (0.2169 to 0.2177 in.)

(b) Subtract the valve stem diameter measurement from the guide bush inside diameter measurement.
Standard oil clearance:
0.025 to 0.060 mm (0.0010 to 0.0024 in.)
Maximum oil clearance: 0.08 mm (0.0031 in.)

If the clearance is greater than the maximum, replace the valve and guide bush (see steps 18 and 20).

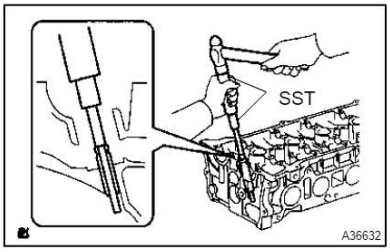


17. INSPECT EXHAUST VALVE GUIDE BUSH

(a) Using a caliper gauge, measure the inside diameter of the guide bush.
Bush inside diameter:
5.510 to 5.530 mm (0.2169 to 0.2177 in.)

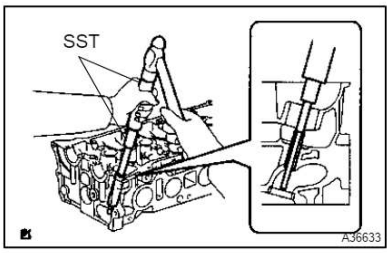
(b) Subtract the valve stem diameter measurement from the guide bush inside diameter measurement.
Standard oil clearance:
0.030 to 0.065 mm (0.0012 to 0.0026 in.)
Maximum oil clearance: 0.10 mm (0.0039 in.)

If the clearance is greater than the maximum, replace the valve and guide bush (see steps 19 and 21).



18. REMOVE INTAKE VALVE GUIDE BUSH

(a) Using SST and a hammer, tap out the guide bush.
SST 09201-10000 (09201-01050), 09950-70010 (09951-07100)



19. REMOVE EXHAUST VALVE GUIDE BUSH

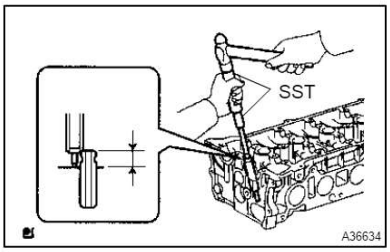
(a) Using SST and a hammer, tap out the guide bush.
SST 09201-10000 (09201-01050), 09950-70010 (09951-07100)

20. INSTALL INTAKE VALVE GUIDE BUSH

(a) Using a caliper gauge, measure the bush bore diameter of the cylinder head.
Diameter: 10.285 to 10.306 mm (0.4049 to 0.4057 in.)

(b) Install the STD bush if the diameter is within the specified diameter.
Standard diameter:
10.333 to 10.344 mm (0.4068 to 0.4072 in.)

If the diameter is not as specified, replace the STD bush.



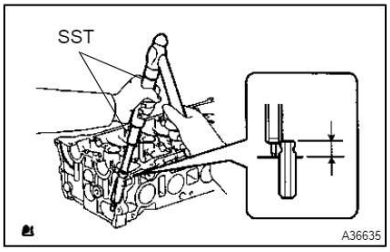
(c) Using SST and a hammer, tap in a new guide bush to the specified protrusion height.
Protrusion height:
9.6 to 10.0 mm (0.3780 to 0.3937 in.)
SST 09201-10000 (09201-01050), 09950-70010 (09951-07100)

(d) Using a sharp 5.5 mm reamer, ream the guide bush to obtain the standard specified clearance between the guide bush and valve stem.
Standard oil clearance:
0.025 to 0.060 mm (0.00098 to 0.00236 in.)

21. INSTALL EXHAUST VALVE GUIDE BUSH

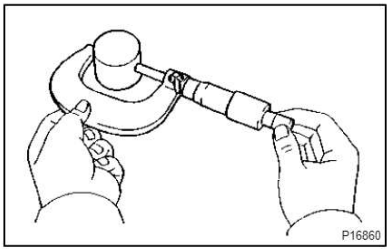
(a) Using a caliper gauge, measure the bush bore diameter of the cylinder head.
Diameter: 10.285 to 10.306 mm (0.4049 to 0.4057 in.)

(b) Install the STD bush if the diameter is within the specified diameter.
Standard diameter:
10.333 to 10.344 mm (0.4068 to 0.4072 in.)



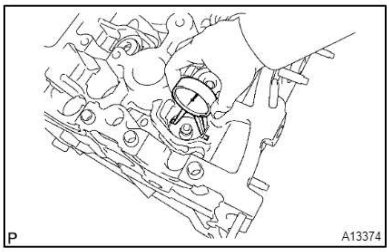
(c) Using SST and a hammer, tap in a new guide bush to the specified protrusion height.
Protrusion height:
9.6 to 10.0 mm (0.3780 to 0.3937 in.)

(d) Using a sharp 5.5 mm reamer, ream the guide bush to obtain the standard specified clearance between the guide bush and valve stem.
SST 09201- 10000 (09201- 01050), 09950- 70010 (09951-07100), 23801
Standard oil clearance:
0.030 to 0.065 mm (0.00118 to 0.00256 in.)



22. INSPECT VALVE LIFTER

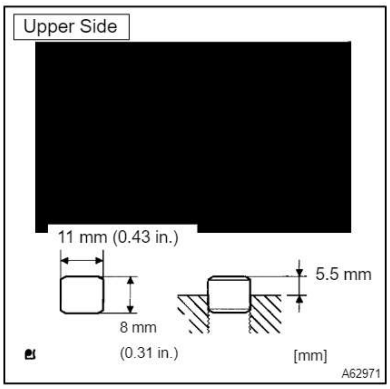
(a) Using a micrometer, measure the lifter diameter.
Lifter diameter:
30.966 to 30.976 mm (1.2191 to 1.2195 in.)



(b) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.
Lifter bore diameter:
31.009 to 31.025 mm (1.2208 to 1.2215 in.)

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.
Standard oil clearance:
0.033 to 0.059 mm (0.0013 to 0.0023 in.)
Maximum oil clearance: 0.07 mm (0.0028 in.)

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

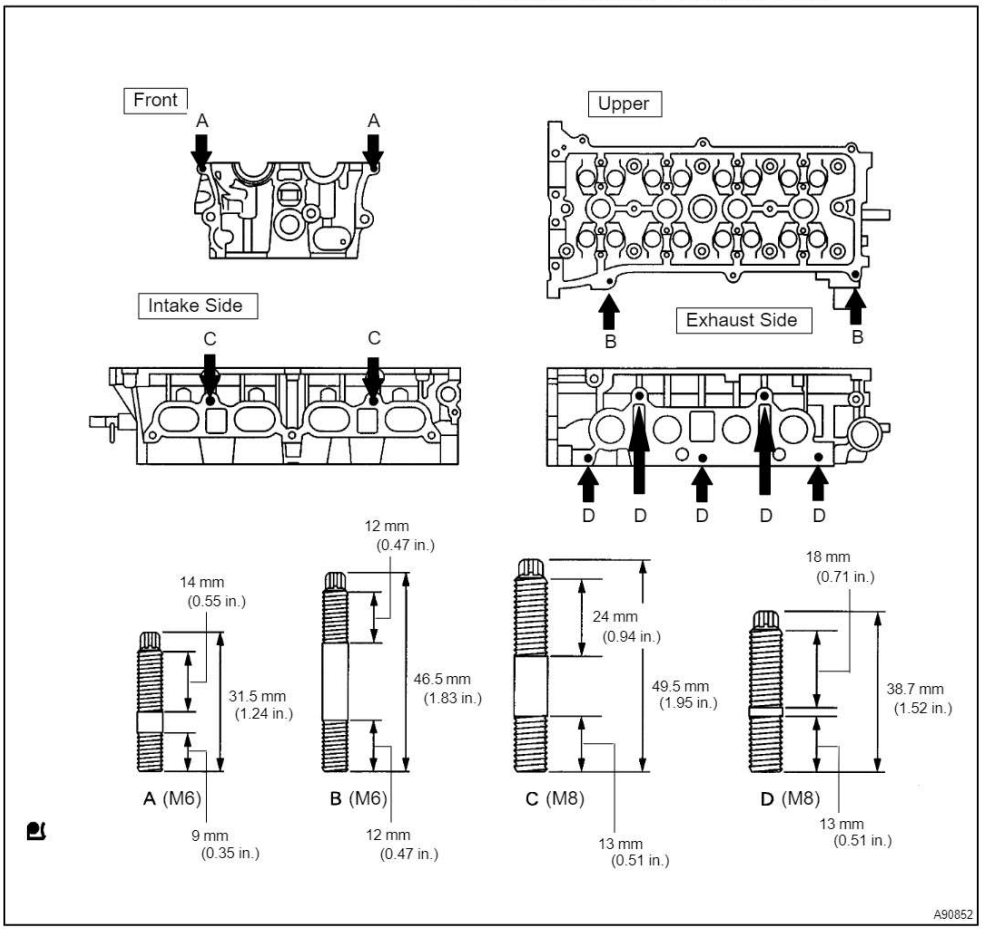


23. INSTALL RING W/HEAD PIN

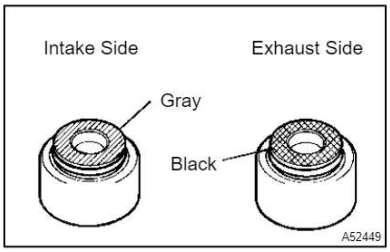
(a) Using a plastic-faced hammer, tap in a new ring pin to the specified protrusion height.
Protrusion height: 5.5 mm (0.22 in.)

24. INSTALL STUD BOLT

Torque:
5.0 N·m (51 kgf·cm, 44 in.·lbf) for bolt A
5.0 N·m (51 kgf·cm, 44 in.·lbf) for bolt B
10 N·m (102 kgf·cm, 7 ft·lbf) for bolt C
10 N·m (102 kgf·cm, 7 ft·lbf) for bolt D



25. INSTALL VALVE SPRING SEAT



26. INSTALL VALVE STEM OIL O SEAL OR RING

(a) Apply a light coat of engine oil on a new oil seal.

NOTICE:

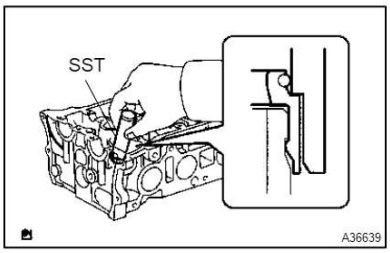
Pay close attention when installing the intake and exhaust oil seals. For example, installing the intake oil seal into the exhaust or installing the exhaust oil seal to the intake can cause installation problems later.

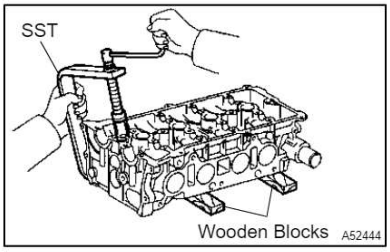
HINT:

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

(b) Using SST, push in the oil seal.

SST 09201-41020



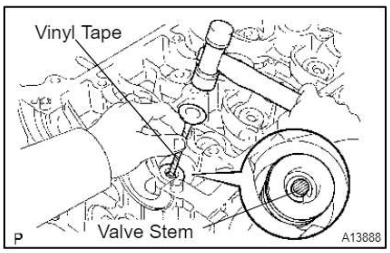


27. INSTALL INTAKE VALVE

(a) Install the valve, spring and retainer to the cylinder head.

(b) Using SST and wooden blocks, compress the spring and install the 2 retainer locks.

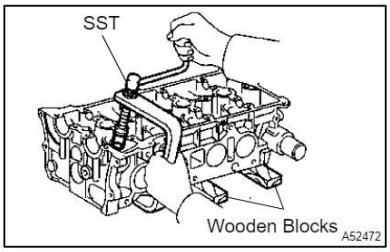
SST 09202-70020 (09202-00010)



(c) Using a plastic-faced hammer and a discarded valve with its tip wrapped in tape, lightly tap the installed valve to ensure that it is securely fit.

NOTICE:

Be careful not to damage the valve stem tip.

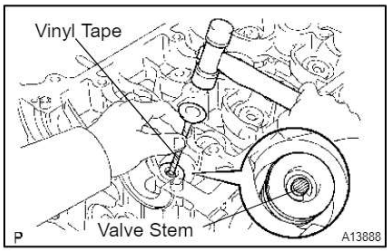


28. INSTALL EXHAUST VALVE

(a) Install the valve, spring and retainer to the cylinder head.

(b) Using SST and wooden blocks, compress the spring and install the 2 retainer locks.

SST 09202-70020 (09202-00010)



(c) Using a plastic-faced hammer and a discarded valve with its tip wrapped in vinyl tape, lightly tap the installed valve to ensure that it is securely fit.

NOTICE:

Be careful not to damage the valve stem tip.

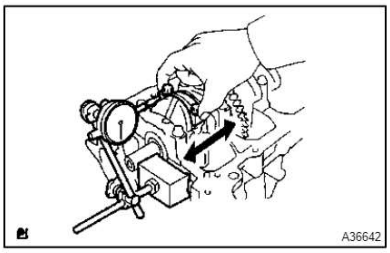
29. INSTALL VALVE LIFTER

(a) Assemble the valve lifter and the tip of the valve stem with a light coat of engine oil applied.

NOTICE:

Install the valve lifters in their original places.

OVERHAUL

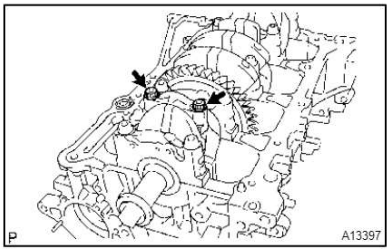


1. INSPECT CONNECTING ROD THRUST CLEARANCE

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

Standard thrust clearance:
0.160 to 0.362 mm (0.0063 to 0.0143 in.)
Maximum thrust clearance: 0.362 mm (0.0143 in.)

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



2. INSPECT CONNECTING ROD OIL CLEARANCE

HINT:
The connecting rod cap bolts are tightened in 2 progressive steps.

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

HINT:
The matchmarks on the connecting rods and caps are for ensuring the correct reassembly.

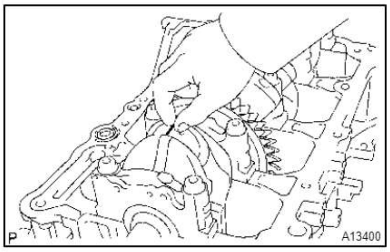
(b) Using a 12 mm socket wrench, remove the 2 connecting rod cap bolts.

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

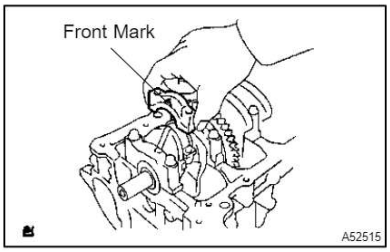
HINT:
Keep the lower bearing inserted to the connecting rod cap.

(d) Clean the crank pin and bearing.

(e) Check the crank pin and bearing for pitting and scratches.



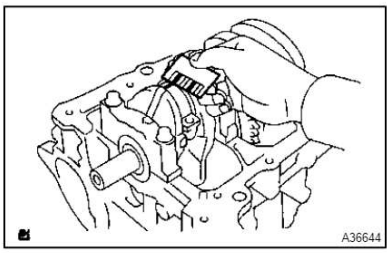
(f) Lay a strip of Plastigage on the crank pin.



(g) Check that the front mark of the connecting rod cap is facing in the correct direction.
(h) Apply a light coat of engine oil on the threads and under the heads of the connecting rod cap bolts.
(i) Install the connecting cap (see step 37).

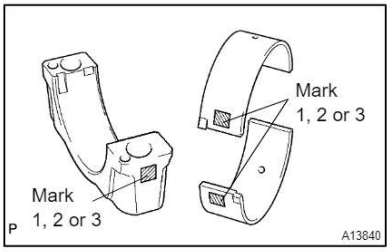
NOTICE:
Do not turn the crankshaft.

(j) Remove the 2 bolts and connecting rod cap.



(k) Measure the Plastigage at its widest point.
Standard oil clearance:
0.024 to 0.048 mm (0.0009 to 0.0019 in.)
Maximum oil clearance: 0.08 mm (0.0031 in.)

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

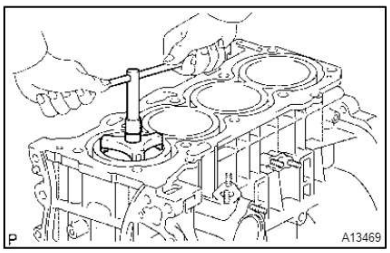


HINT:
If replacing a bearing, replace it with one that has the same number as the connecting rod. There are 3 sizes of standard bearings: 1, 2 and 3.

Standard bearing center wall thickness:

Mark 1	1.485 to 1.488 mm (0.05854 to 0.05858 in.)
Mark 2	1.489 to 1.491 mm (0.05862 to 0.05870 in.)
Mark 3	1.492 to 1.494 mm (0.05874 to 0.05881 in.)

(l) Completely remove the Plastigage.

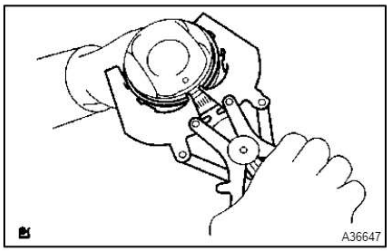


3. REMOVE PISTON SUB-ASSY W/CONNECTING ROD

(a) Using a ridge reamer, remove all the carbon from the top of the cylinder.
(b) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

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

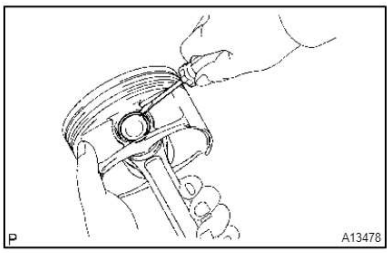
4. REMOVE CONNECTING ROD BEARING



5. REMOVE PISTON RING SET

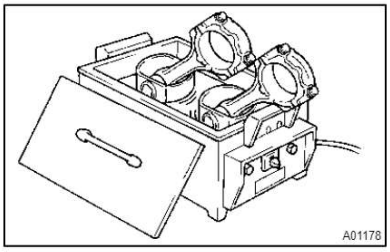
(a) Using a piston ring expander, remove the 2 compression rings.

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



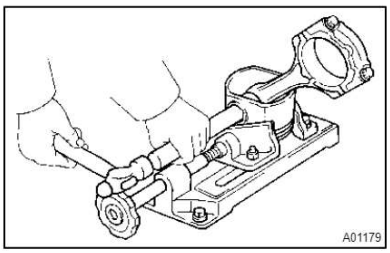
6. REMOVE PISTON PIN HOLE SNAP RING

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



7. REMOVE PISTON

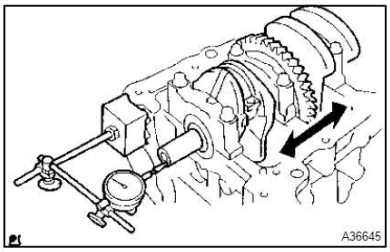
(a) Gradually heat the piston to approximately 80 to 90°C (176 to 194°F).



(b) 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.



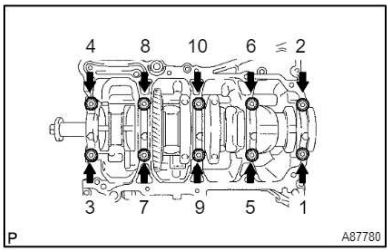
8. INSPECT CRANKSHAFT THRUST CLEARANCE

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

Standard thrust clearance:
0.040 to 0.240 mm (0.0016 to 0.0094 in.)
Maximum thrust clearance: 0.30 mm (0.0118 in.)

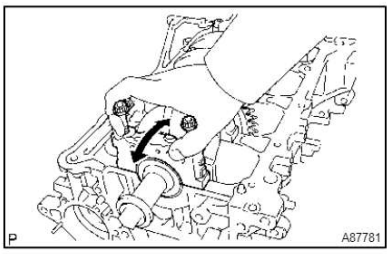
If the thrust clearance is greater than the maximum, replace the thrust washers as a set.

Thrust washer thickness:
1.930 to 1.980 mm (0.0760 to 0.0780 in.)



9. INSPECT CRANKSHAFT OIL CLEARANCE

(a) Uniformly loosen and remove the 10 main bearing cap bolts, in the sequence shown in the illustration.



(b) Use 2 removed main bearing cap bolts to remove the 5 main bearing caps and 5 lower bearings.

NOTICE:

Insert the bolts into one of the caps. Ease the cap out by gently pulling up and applying force toward the front and back side of the cylinder block, as shown in the illustration. Take care not to damage the contact surfaces of the cap and cylinder block.

HINT:

- Keep the lower bearing and main bearing cap together.
- Arrange the main bearing caps in correct order.

(c) Lift out the crankshaft.

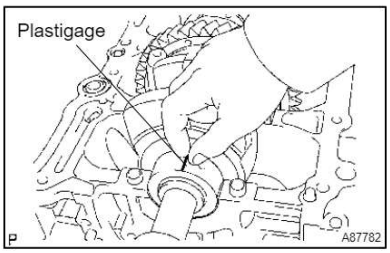
HINT:

Keep the upper bearings 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, replace the crankshaft.



(f) Place the crankshaft on the cylinder block.

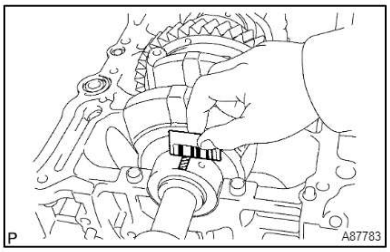
(g) Lay a strip of Plastigage across each journal.

(h) Install the main bearing caps (see step 36).

NOTICE:

Do not turn the crankshaft.

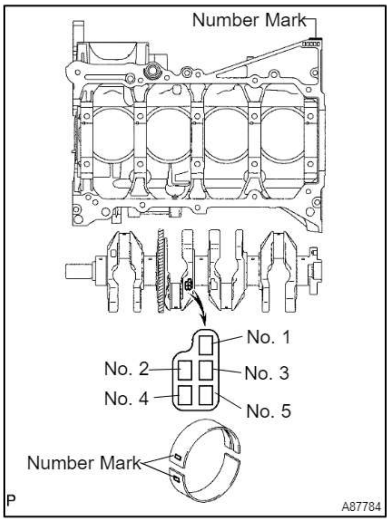
(i) Remove the main bearing cap (see steps (a) to (b) above).



(j) Measure the Plastigage at its widest point.

Standard oil clearance:
0.024 to 0.048 mm (0.00094 to 0.00189 in.)

If the oil clearance is greater than the maximum, replace the bearings. If necessary, replace the crankshaft.



(k) If using a standard bearing, replace it 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, and then select the bearing according to the chart below. There are 4 sizes of standard bearings: 1, 2, 3, and 4.

Cylinder block (A) + Crankshaft (B)	0 to 2	3 to 5	6 to 8	9 to 11
Use bearing	1	2	3	4

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

Reference:

Item	Mark	Specified Condition
Cylinder block main journal bore diameter (A)	0	59.000 to 59.002 mm (2.32283 to 2.32291 in.)
	1	59.003 to 59.004 mm (2.32294 to 2.32299 in.)
	2	59.005 to 59.006 mm (2.32303 to 2.32307 in.)
	3	59.007 to 59.009 mm (2.32311 to 2.32318 in.)
	4	59.010 to 59.011 mm (2.32322 to 2.32326 in.)
	5	59.012 to 59.013 mm (2.32330 to 2.32334 in.)
	6	59.014 to 59.016 mm (2.32338 to 2.32346 in.)
Crankshaft main journal diameter (B)	0	54.999 to 55.000 mm (2.16531 to 2.16535 in.)
	1	54.997 to 54.998 mm (2.16523 to 2.16527 in.)
	2	54.995 to 54.996 mm (2.16515 to 2.16519 in.)
	3	54.993 to 54.994 mm (2.16507 to 2.16511 in.)
	4	54.991 to 54.992 mm (2.16500 to 2.16504 in.)
	5	54.989 to 54.990 mm (2.16489 to 2.16496 in.)
Standard bearing center wall thickness	1	1.993 to 1.996 mm (0.07846 to 0.07858 in.)
	2	1.997 to 1.999 mm (0.07862 to 0.07870 in.)
	3	2.000 to 2.002 mm (0.07874 to 0.07882 in.)
	4	2.003 to 2.005 mm (0.07886 to 0.07894 in.)

(l) Completely remove the Plastigage.

10. REMOVE CRANKSHAFT

(a) Lift out the crankshaft.

(b) Remove the 5 upper main bearings and 2 thrust washers from the cylinder block.

HINT:
Arrange the main bearings and thrust washers in the correct order.

11. REMOVE CRANKSHAFT THRUST WASHER UPPER

12. REMOVE CRANKSHAFT BEARING

HINT:
Arrange the bearings in the correct order.

13. REMOVE CRANKSHAFT BEARING NO.2

HINT:

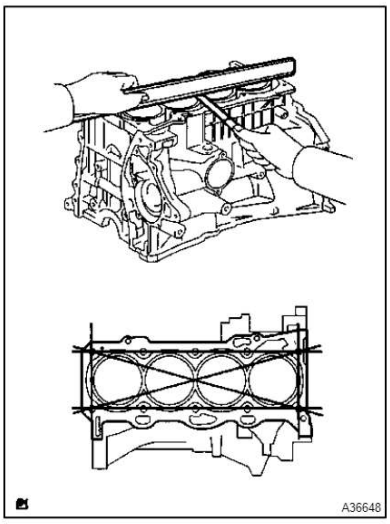
Arrange the main bearings and thrust washers in the correct order.

14. REMOVE STUD BOLT

15. CLEAN CYLINDER BLOCK

NOTICE:

If the cylinder is washed at high temperatures, the cylinder liner sticks out beyond the cylinder block. Always wash the cylinder block at a temperature of 45°C (113°F) or less.

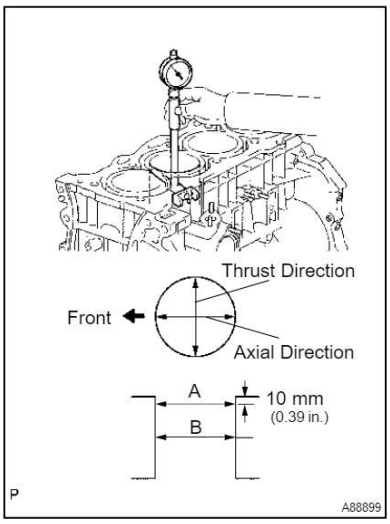


16. INSPECT CYLINDER BLOCK FOR FLATNESS

(a) Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head gasket for warpage.

Maximum warpage: 0.05 mm (0.0020 in.)

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



17. INSPECT CYLINDER BORE

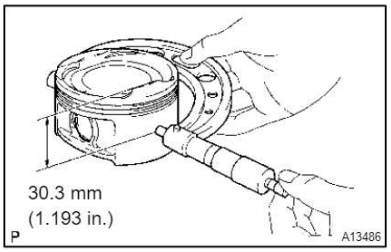
(a) Using a cylinder gauge, measure the cylinder bore diameter at positions A and B in the thrust and axial directions.

Standard diameter:

88.500 to 88.513 mm (3.4842 to 3.4848 in.)

Maximum diameter: 88.633 mm (3.4895 in.)

If the measured diameters is greater than the standard, replace the cylinder block.



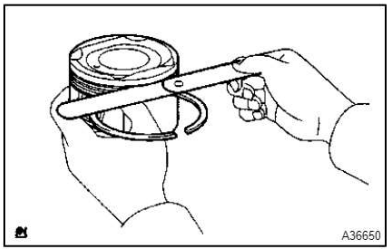
18. INSPECT PISTON DIAMETER

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 30.3 mm (1.193 in.) from the piston head.
Piston diameter:
88.439 to 88.449 mm (3.4818 to 3.4822 in.)

19. INSPECT PISTON CLEARANCE

(a) Subtract the piston diameter measurement from the cylinder bore diameter measurement.
Specified oil clearance: 0.051 to 0.100 mm (0.0020 to 0.0039 in.)

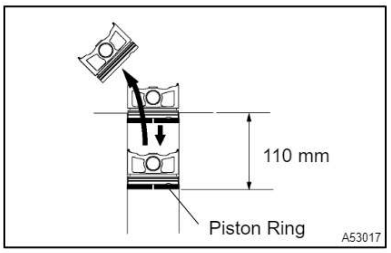
If the clearance is greater than the maximum, replace all the 4 pistons. If necessary, replace the cylinder block.



20. INSPECT RING GROOVE CLEARANCE

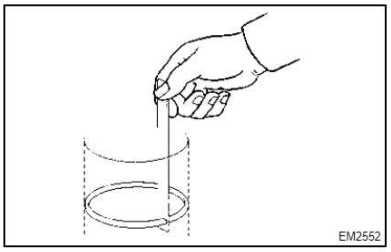
(a) Using a feeler gauge, measure the clearance between the piston ring and the wall of the ring groove.
Ring groove clearance:
0.030 to 0.070 mm (0.0012 to 0.0028 in.)

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



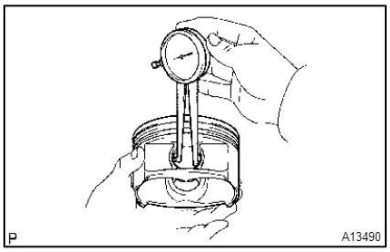
21. INSPECT PISTON RING END GAP

(a) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block.



(b) Using a feeler gauge, measure the end gap.
Standard end gap:
No. 1 0.22 to 0.32 mm (0.0087 to 0.0126 in.)
No. 2 0.50 to 0.60 mm (0.0197 to 0.0236 in.)
Oil (side rail) 0.10 to 0.35 mm (0.0039 to 0.0138 in.)
Maximum end gap:
No. 1 0.89 mm (0.0350 in.)
No. 2 1.35 mm (0.0531 in.)
Oil (side rail) 0.73 mm (0.0287 in.)

If the end gap is greater than the maximum, replace the piston ring. If the end gap is greater than the maximum even with a new piston ring, replace the cylinder block.

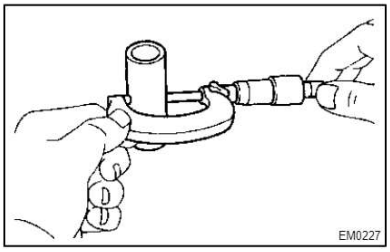


22. INSPECT PISTON PIN OIL CLEARANCE

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

Pin hole bush diameter:
22.001 to 22.010 mm (0.8662 to 0.8665 in.)
Pin hole bush diameter (Reference):

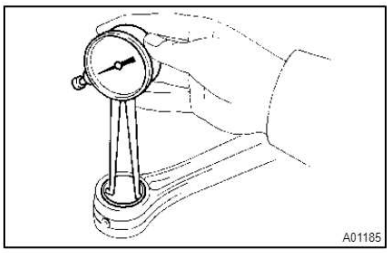
Mark	Specified Condition
A	22.001 to 22.004 mm (0.86618 to 0.86630 in.)
B	22.005 to 22.007 mm (0.86634 to 0.86612 in.)
C	22.008 to 22.010 mm (0.86645 to 0.86653 in.)



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

Piston pin diameter:
21.997 to 22.009 mm (0.8660 to 0.8665 in.)
Piston pin diameter (Reference):

Mark	Specified Condition
A	21.997 to 22.000 mm (0.86602 to 0.86614 in.)
B	22.001 to 22.003 mm (0.86618 to 0.86626 in.)
C	22.004 to 22.006 mm (0.86630 to 0.86638 in.)



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

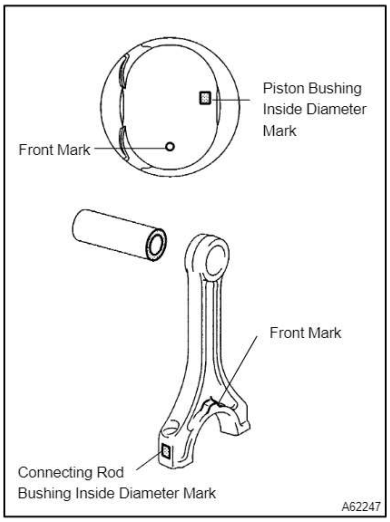
Bush inside diameter:
22.005 to 22.014 mm (0.8663 to 0.8667 in.)
Bush inside diameter:

Mark	Specified Condition
A	22.005 to 22.008 mm (0.8663 to 0.8665 in.)
B	22.008 to 22.011 mm (0.8665 to 0.8666 in.)
C	22.011 to 22.014 mm (0.8666 to 0.8667 in.)

(d) Subtract the piston pin diameter measurement from the piton pin bush hole diameter measurement.

Standard oil clearance:
0.001 to 0.007 mm (0.00004 to 0.00028 in.)
Maximum oil clearance: 0.010 mm (0.0020 in.)

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

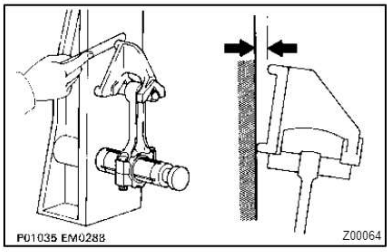


If the oil clearance is greater than the maximum, replace the connecting rod. If necessary, replace the piston and piston pin as a set.

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

Standard oil clearance:
0.005 to 0.011 mm (0.0002 to 0.0004 in.)
Maximum oil clearance: 0.010 mm (0.0020 in.)

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



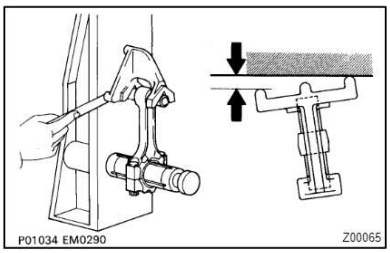
23. INSPECT CONNECTING ROD SUB-ASSY

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

(1) Check for out-of-alignment.

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

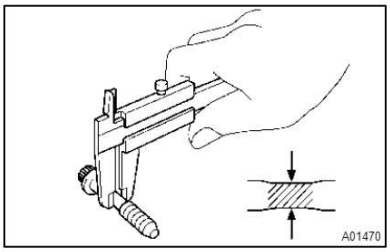
If the out-of-alignment is greater than the maximum, replace the connecting rod assembly.



(2) Check for twist.

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

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

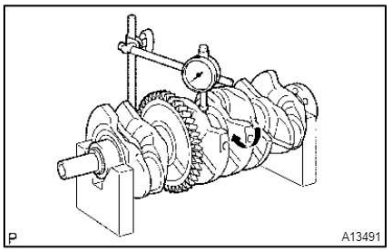


24. INSPECT CONNECTING ROD BOLT

(a) Using a vernier caliper, measure the tension portion diameter of the bolt.

Standard diameter: 7.2 to 7.3 mm (0.283 to 0.287 in.)
Maximum diameter: 7.0 mm (0.276 in.)

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

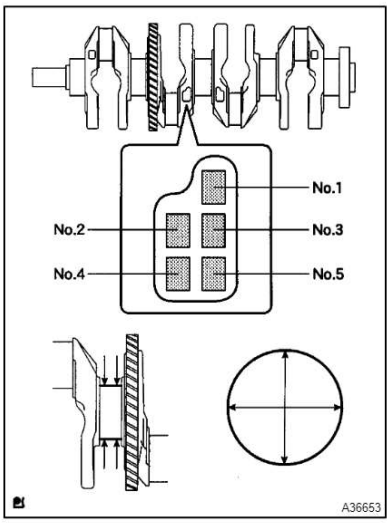


25. INSPECT CRANKSHAFT

(a) Using a dial indicator and V-blocks, measure the circle runout, as shown in the illustration.

Maximum circle runout: 0.03 mm (0.0012 in.)

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



(b) Using a micrometer, measure the diameter of each main journal.

Diameter:

54.988 to 55.000 mm (2.16488 to 2.16535 in.)

If the diameter is not as specified, check the oil clearance (see step 26). If necessary, replace the crankshaft.

(c) Check each main journal for taper and out-of-round as shown in the illustration.

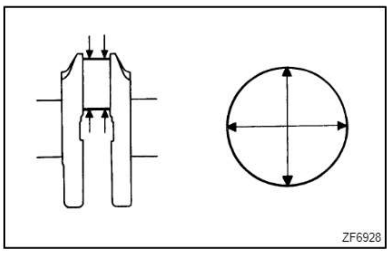
Maximum taper and out-of-round:

0.003 mm (0.0001 in.)

If the taper and out-of-round is greater than the maximum, replace the crankshaft.

Diameter (Reference):

Mark	Specified Condition
0	54.999 to 55.000 mm (2.16531 to 2.16535 in.)
1	54.997 to 54.998 mm (2.16523 to 2.16527 in.)
2	54.995 to 54.996 mm (2.16515 to 2.16519 in.)
3	54.993 to 54.994 mm (2.16507 to 2.16511 in.)
4	54.991 to 54.992 mm (2.16499 to 2.16504 in.)
5	54.989 to 54.990 mm (2.16491 to 2.16495 in.)



(d) Using a micrometer, measure the diameter of each crank pin.

Diameter: 47.990 to 48.000 mm (1.8894 to 1.8898 in.)

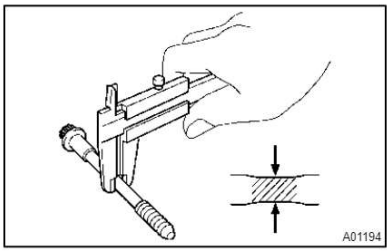
If the diameter is not as specified, check the oil clearance (see step 2). If necessary, replace the crankshaft.

(e) Check each crank pin for taper and out-of-round as shown in the illustration.

Maximum taper and out-of-round:

0.003 mm (0.0001 in.)

If the taper and out-of-round is greater than the maximum, replace the crankshaft.



26. INSPECT CRANKSHAFT BEARING CAP SET BOLT

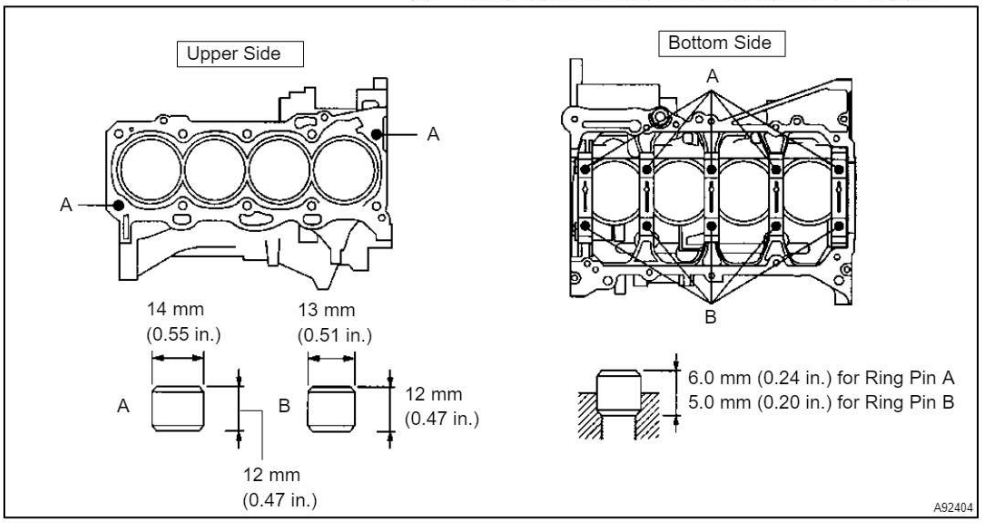
(a) Using a vernier caliper, measure the tension portion diameter of the bolt.

Standard diameter: 7.3 to 7.6 mm (0.287 to 0.299 in.)
Minimum diameter: 7.2 mm (0.283 in.)

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

27. INSTALL RING PIN

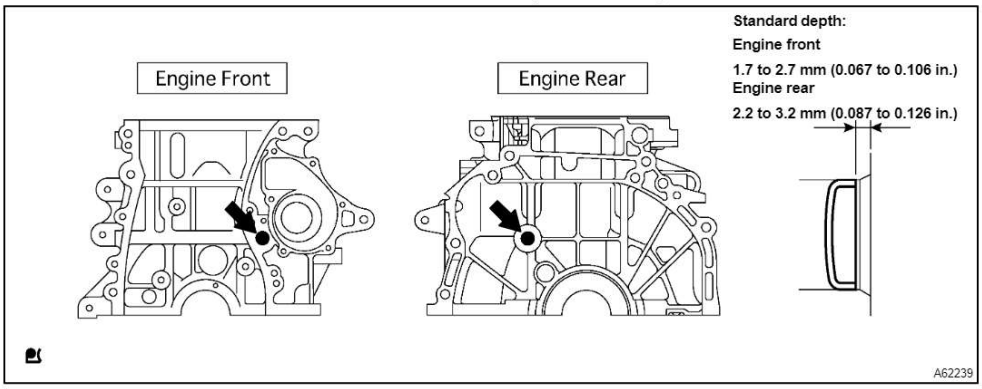
(a) Using a plastic-faced hammer, tap into the ring pin.



28. INSTALL TIGHT PLUG

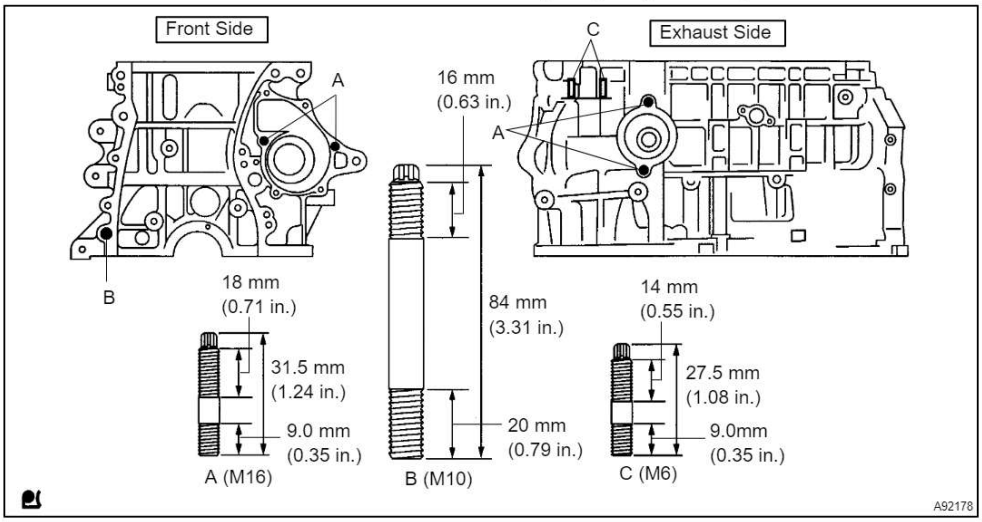
(a) Apply adhesive around the tight plugs.
Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent.

(b) Using SST, install new tight plugs as shown in the illustration.
SST 09950- 60010 (09951- 00200), 09950- 70010 (09951-07100)



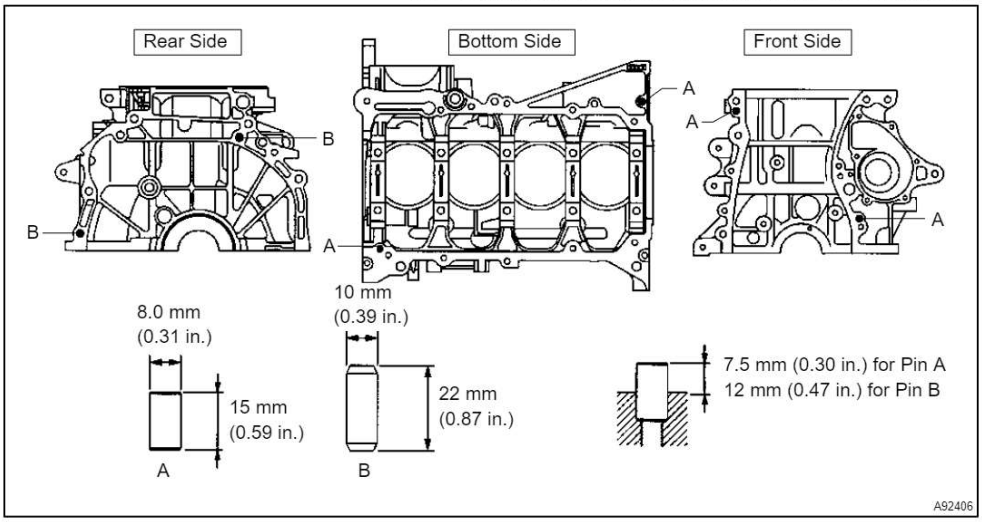
29. INSTALL STUD BOLT

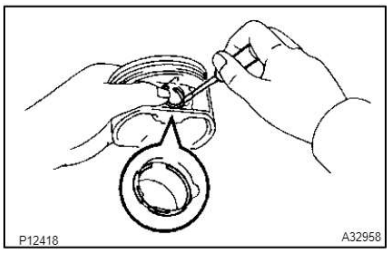
(a) Install the stud bolts as shown in the illustration.
Torque:
5.0 N·m (51 kgf·cm, 44 in.·lbf) for stud bolt A
10 N·m (102 kgf·cm, 7 ft.lbf) for stud bolt B
5.0 N·m (51 kgf·cm, 44 in.·lbf) for stud bolt C



30. INSTALL STRAIGHT PIN

(a) Using a plastic-faced hammer, tap into the straight pin.

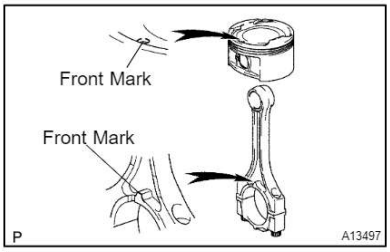




31. INSTALL PISTON

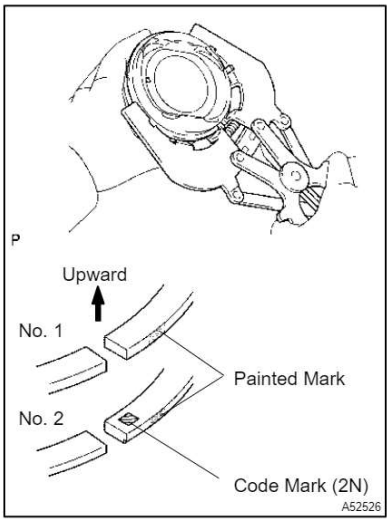
(a) Using a small screwdriver, install a new snap ring at one end of the piston pin hole.

(b) Gradually heat the piston to approximately 80 to 90°C (176 to 194°F).



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

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



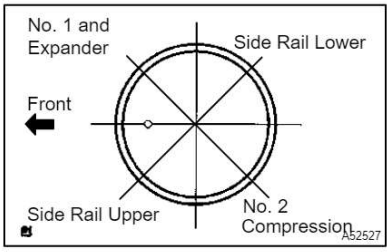
32. INSTALL PISTON RING SET

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

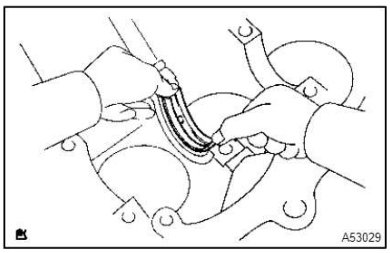
(b) Using a piston ring expander, install the 2 compression rings with the painted mark as shown in the illustration.

NOTICE:

Install the compression ring No. 2 with the code mark (2N) facing upward.



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

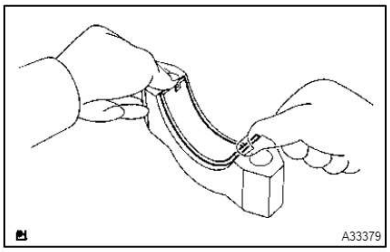


33. INSTALL CRANKSHAFT BEARING

(a) Install the upper bearing with an oil groove on the cylinder block.

NOTICE:

Clean the contact surfaces of the bearing and the cylinder block. The surfaces should be free of dust and oils.

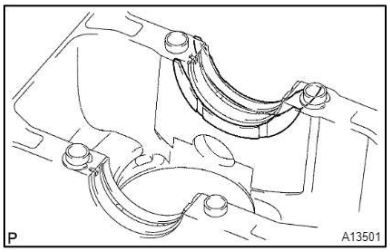


34. INSTALL CRANKSHAFT BEARING NO.2

(a) Install the lower bearing on bearing cap.

NOTICE:

Clean the contact surfaces of the bearing and the bearing cap. The surfaces should be free of dust and oils.



35. INSTALL CRANKSHAFT THRUST WASHER UPPER

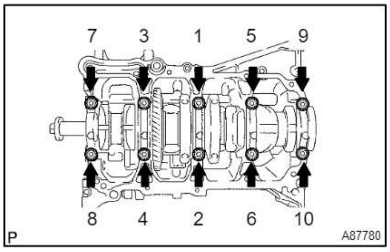
(a) Install the 2 thrust washers under the No. 3 journal position of the cylinder block with the oil grooves facing outward.

36. INSTALL CRANKSHAFT

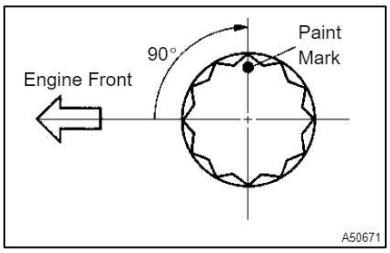
(a) Apply engine oil to upper bearing and install the crankshaft on the cylinder block.

(b) Examine the front marks and numbers and install the bearing caps on the cylinder block.

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



(d) Install and uniformly tighten 10 main bearing cap bolts in several passes,in the sequence shown.
Torque: 40 N·m (408 kgf·cm, 30 ft·lbf)

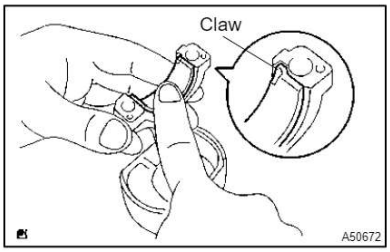


(e) Mark the front side of the bearing cap bolts with paint.

(f) Retighten the bearing cap bolts 90° in the sequence shown.

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

(h) Check that the crankshaft turns smoothly.



37. INSTALL CONNECTING ROD BEARING

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

NOTICE:

Clean the backside of the bearing and the bearing surface of the connecting rod. The surface should be free of dust and oil.

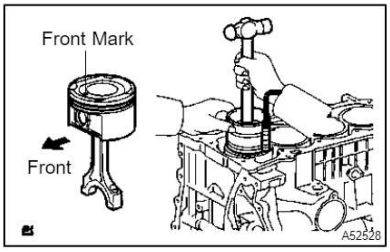
38. INSTALL PISTON

NOTICE:

The connecting rod cap bolts are tightened in 2 progressive steps.

(a) Apply engine oil to the cylinder walls, the pistons, and the surfaces of connecting rod bearings.

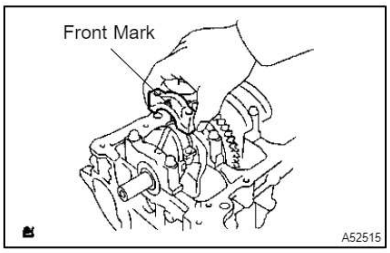
(b) Check the position of the piston ring ends.



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

NOTICE:

Match the numbered connecting rod cap with the connecting rod.



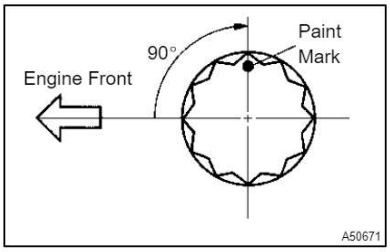
(d) Check that the protrusion of the connecting rod cap is facing in the correct direction.

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

(f) Using a 12 mm socket wrench, uniformly tighten the 2 bolts.

Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

(g) Mark the front of the connecting cap bolts with paint.



(h) Retighten the cap bolts 90° as shown in the illustration.

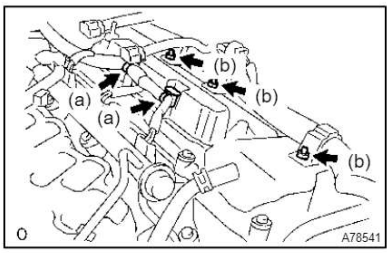
(i) Check that the crankshaft turns smoothly.

SST 09011-38121

141PK-02

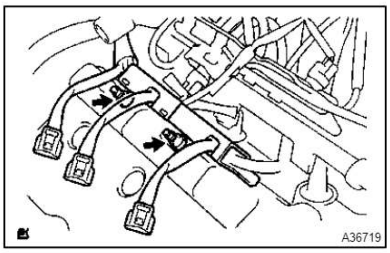
OVERHAUL

1. DRAIN ENGINE OIL
2. REMOVE SPARK PLUG
3. REMOVE VENTILATION VALVE SUB-ASSY
4. REMOVE OIL FILLER CAP SUB-ASSY
5. REMOVE OIL FILLER CAP GASKET



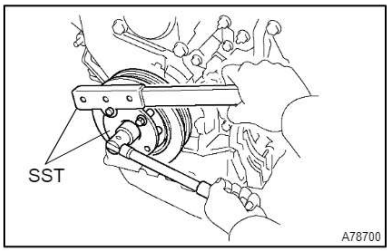
6. REMOVE CYLINDER HEAD COVER SUB-ASSY
(a) Remove the 2 engine wire harness clamps.
(b) Remove the 3 nuts and disconnect the engine wire harness.
(c) Remove the 9 bolts and cylinder head cover.

7. REMOVE CYLINDER HEAD COVER GASKET



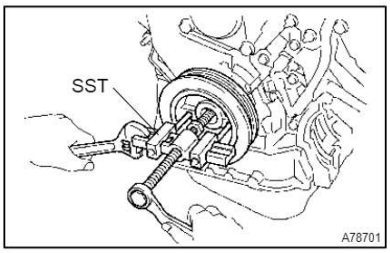
8. REMOVE CYLINDER HEAD COVER SUB-ASSY LH
(a) Using an E6 torx→ socket wrench, remove the 2 bolts and disconnect the engine wire harness protector.
(b) Remove the 9 bolts and cylinder head cover.

9. REMOVE CYLINDER HEAD COVER GASKET NO.2
10. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSY
11. REMOVE VVT SENSOR
(a) Remove the sensor.
(b) Remove the O-ring from the sensor.
12. REMOVE OIL LEVEL GAGE SUB-ASSY
13. REMOVE OIL LEVEL GAGE GUIDE



14. REMOVE CRANKSHAFT PULLEY

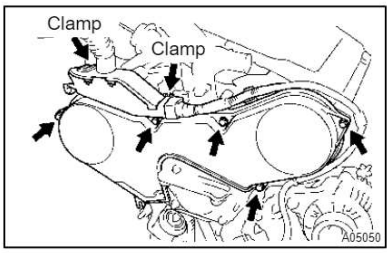
(a) Using SST, loosen the pulley bolt.
SST 09213-54015 (91651-60855), 09330-00021



(b) Using SST and the pulley bolt, remove the pulley.
SST 09950- 50013 (09951- 05010, 09952- 05010, 09953-05020, 09954-05031)

NOTICE:
Before using SST, apply lubricating oil to the threads and tip of the center bolt 150.

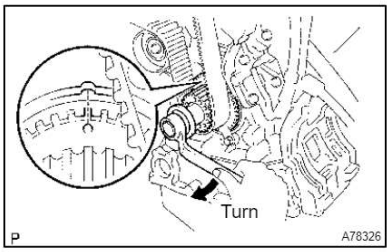
15. REMOVE TIMING BELT NO.1 COVER



16. REMOVE TIMING BELT NO.2 COVER

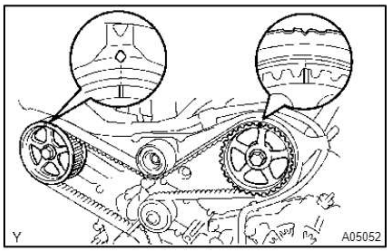
(a) Disconnect the engine wire protector clamps from the timing belt No. 3 cover.
(b) Remove the 5 bolts and timing belt cover.

17. REMOVE ENGINE MOUNTING BRACKET RH
18. REMOVE TIMING BELT GUIDE NO.2



19. REMOVE TIMING BELT

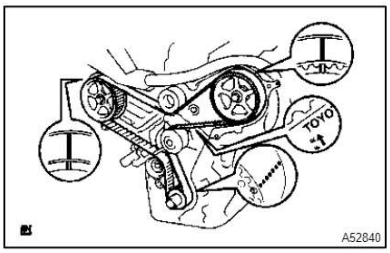
(a) Set the No. 1 cylinder to TDC/compression.
(1) Temporarily install the crankshaft pulley bolt and washer to the crankshaft.
(2) Turn the crankshaft clockwise, and align the timing mark of the crankshaft timing pulley with the oil pump body.



(3) Check that timing marks of the camshaft timing pulleys and No. 3 timing belt cover are aligned.

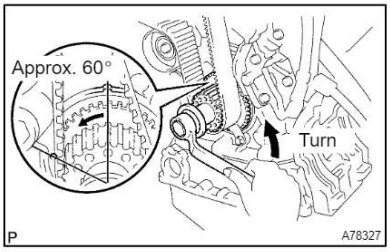
If not, turn the crankshaft 1 revolution (360°).

(4) Remove the crankshaft pulley bolt.



(b) If planning to reuse the timing belt, check that there are 4 installation marks on the timing belt, as shown in the illustration.

(1) If the installation marks have disappeared, put new installation marks on the timing belt before removing.



(c) Set the No. 1 cylinder to approximately 60° BTDC/ compression.

(1) Turn the crankshaft counterclockwise by approximately 60°.

NOTICE:

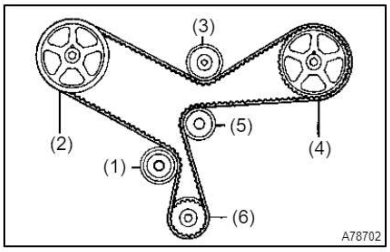
With the timing belt removed:

The crankshaft pulley must be at the correct angle to avoid damage in later steps. If the crankshaft pulley is at the wrong angle and the camshaft timing pulley and the camshaft are removed, the piston head and valve head may come in contact and damaged.

(d) Remove the timing belt tensioner.

NOTICE:

Do not reinstall the tensioner with its plunger extended.



(e) Remove the timing belt in this order.

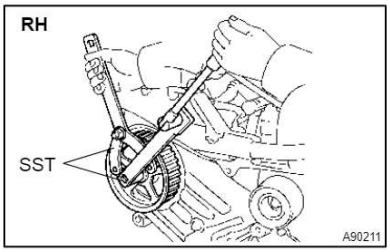
1st	No. 1 idler pulley
2nd	RH camshaft timing pulley
3rd	No. 2 idler pulley
4th	LH camshaft timing pulley
5th	Water pump pulley
6th	Crankshaft timing pulley

20. REMOVE TIMING BELT IDLER SUB-ASSY NO.1

(a) Using a socket hexagon wrench 10, remove the pivot bolt, timing belt idler No. 1 and plate washer.

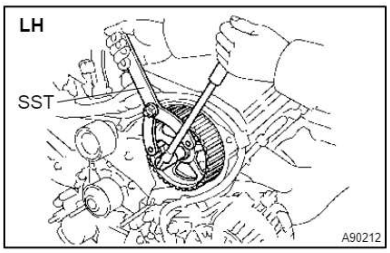
21. REMOVE TIMING BELT IDLER SUB-ASSY NO.2

22. REMOVE CRANKSHAFT POSITION SENSOR



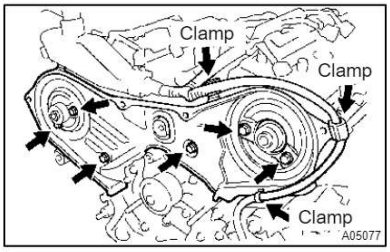
23. REMOVE CAMSHAFT TIMING PULLEY

(a) Using SST, remove the bolt and RH timing pulley.
SST 09960- 10010 (09962- 01000, 09963- 01000), 09249-63010



(b) Using SST, remove the bolt and LH timing pulley.
SST 09960-10010 (09962-01000, 09963-01000)

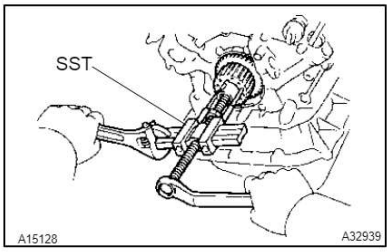
HINT:
Arrange the camshaft timing pulleys (RH and LH sides) so that they can be returned to the original locations when reassembling.



24. REMOVE TIMING BELT NO.3 COVER

(a) Disconnect the 3 engine wire harness clamps from the timing belt No. 3 cover.
(b) Remove the 6 bolts and the timing belt cover.

25. REMOVE TIMING BELT IDLER BRACKET

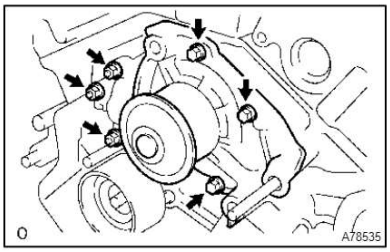


26. REMOVE CRANKSHAFT TIMING PULLEY

(a) Remove the bolt and the timing belt plate.
(b) Install the pulley bolt to the crankshaft.
(c) Using SST, remove the crankshaft timing pulley.
SST 09950- 50013 (09951- 05010, 09952- 05010, 09953-05020, 09954-05011)

NOTICE:

- **Do not scratch the sensor part of the crankshaft timing pulley.**
- **Before using SST, apply lubricating oil to the threads and tip of the center bolt 150.**



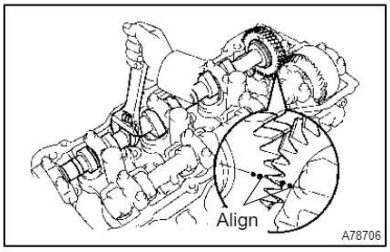
27. REMOVE WATER PUMP ASSY

(a) Remove the 3 bolts and 3 nuts, then remove the water pump and the gasket.

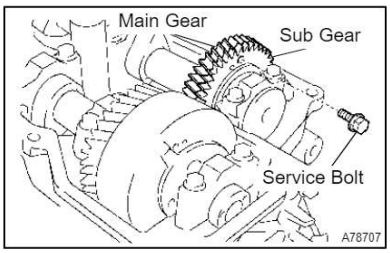
28. REMOVE CAMSHAFT

NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps must be carried out.



(a) Align the camshaft drive and driven gear's timing marks (2 dot marks each) by turning the camshaft with a wrench.



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

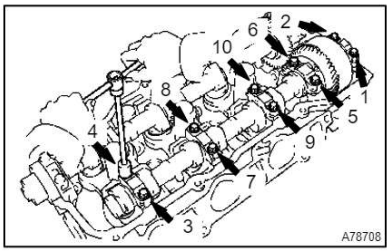
Recommended service bolt:

Thread diameter	6 mm
Thread pitch	1.0 mm
Bolt length	16 to 20 mm

Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

HINT:

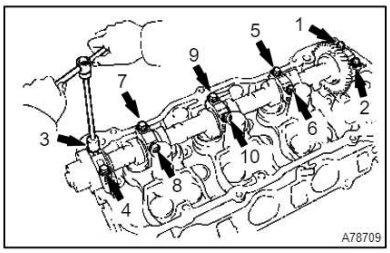
When removing the camshaft, make certain that the torsional spring force of the sub gear has been eliminated by installation of the service bolt.



(c) Uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration. Remove the 5 bearing caps and the camshaft.

NOTICE:

- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**



29. REMOVE NO.2 CAMSHAFT

(a) Uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 2 camshaft.

NOTICE:

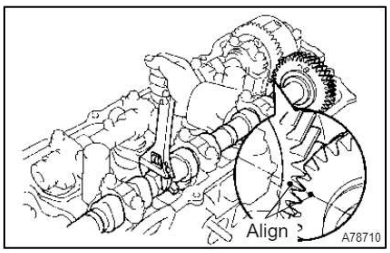
- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**

(b) Remove the oil seal from the No. 2 camshaft.

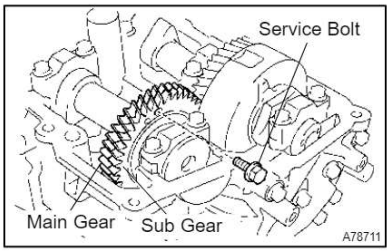
30. REMOVE NO.3 CAMSHAFT SUB-ASSY

NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.



(a) Align the camshaft drive and driven gear's timing marks (1 dot mark each) by turning the camshaft with a wrench.

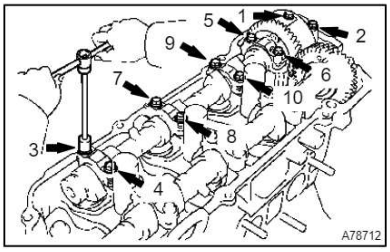


(b) Secure the exhaust camshaft sub gear to the main gear with a service bolt.
Recommended service bolt:

Thread diameter	6 mm
Thread pitch	1.0 mm
Bolt length	16 to 20 mm

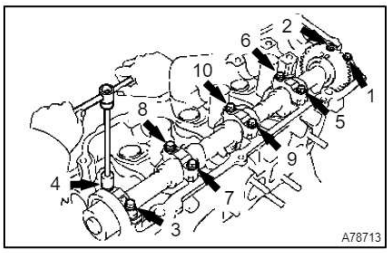
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

HINT:
When removing the camshaft, make certain that the torsional spring force of the sub gear has been eliminated by installation of the service bolt.



(c) Uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 3 camshaft.

NOTICE:
- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**

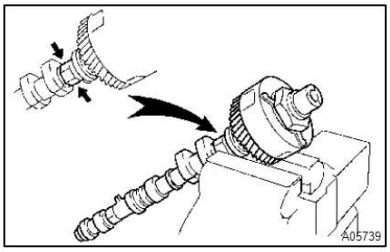


31. REMOVE NO.4 CAMSHAFT SUB-ASSY

(a) Uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 4 camshaft.

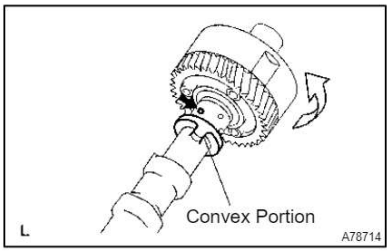
NOTICE:
- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**

(b) Remove the oil seal from the No. 4 camshaft.



32. INSPECT CAMSHAFT TIMING GEAR ASSY

(a) Clamp the camshaft in a vise on the hexagonal lobe.
(b) Check that the VVT-i does not turn.



(c) Cover all the oil ports with vinyl tape except the port on the advanced angle side (nearest to the convex portion) shown in the illustration.

(d) Using an air gun, apply about 100 kPa (1 kgf/cm^2, 14 psi) of air pressure to the port on the advanced angle side.

NOTICE:

Some oil will spill out. Contain the oil with a shop rag.

HINT:

This operation releases the lock pin for the extreme retarded angle lock.

(e) Under the condition above, check that the VVT-i can be turned by hand to the advanced angle side, the direction of the white arrow in the illustration.

Standard: Must turn

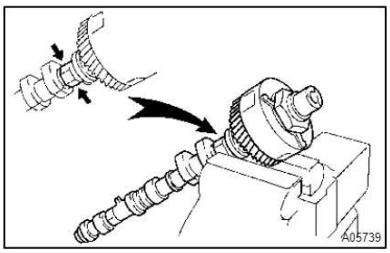
HINT:

The VVT-i will turn to the advanced angle side without applying force by hand depending on the force of the air pressure applied. Also, if applying pressure to the oil path is difficult as a result of air leakage from the port, the lock-pin may be difficult to release.

(f) Check that the VVT-i moves freely within a 30° range. Avoid moving the VVT-i unit to the extreme retarded angle position as the lock-pin will re-engage.

Standard: Smooth movable range is about 30°

(g) Turn the VVT-i by hand and lock it at the extreme retarded angle position.



33. REMOVE CAMSHAFT TIMING GEAR ASSY

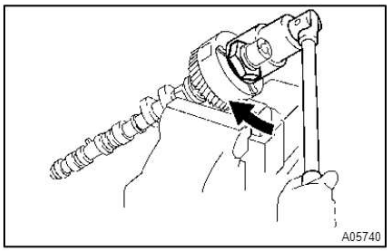
NOTICE:

Do not remove or install the timing gear (VVT-i) unless you are replacing the VVT-i or the camshaft.

(a) Clamp the camshaft in a vise on the hexagonal lobe.

NOTICE:

Do not damage the camshaft.



(b) Using a 46 mm socket wrench, remove the lock nut by turning it clockwise.

NOTICE:

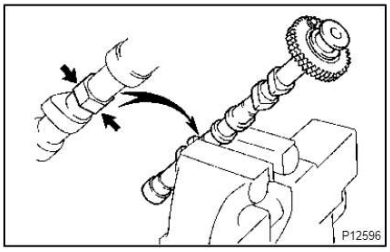
- **Remove it with the lock-pin engaged and locked at the extreme retarded angle position.**
- **The lock nut has LH threads.**
- **Only use the socket wrench. Other tools will deform the cam angle rotor.**

(c) Remove the timing gear (VVT-i).

NOTICE:

Never remove the 3 bolts on the gear.

If it is difficult to remove the VVT-i, tap it lightly using a plastic-faced hammer and then remove it.

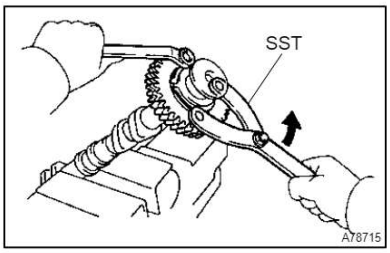


34. REMOVE CAMSHAFT SUB GEAR

(a) Clamp the camshaft in a vise on the hexagonal lobe.

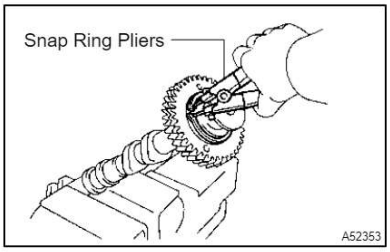
NOTICE:

Be careful not to damage the camshaft.



(b) Using SST, turn the sub gear counterclockwise and remove the service bolt.

SST 09960-10010 (09962-01000, 09963-00500)



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

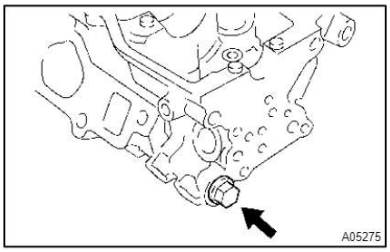
(d) Remove the wave washer, camshaft sub gear and camshaft gear bolt washer.

HINT:

Arrange the camshaft sub gears and gear bolt washers (RH and LH sides) so that they can be returned to their original location when reassembled.

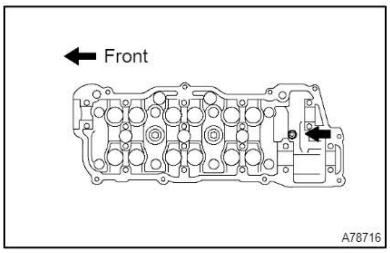
35. REMOVE ENGINE HANGER NO.2

36. REMOVE CYLINDER HEAD COVER REAR



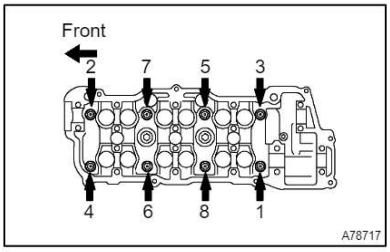
37. REMOVE OIL CONTROL VALVE FILTER

(a) Remove the plug, gasket and valve filter.



38. REMOVE CYLINDER HEAD SUB-ASSY

(a) Using a socket hexagon wrench 8, remove the hexagon bolt.

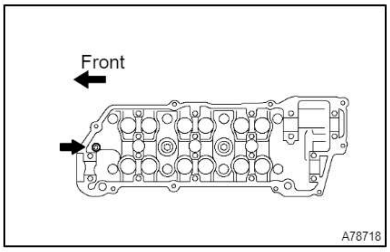


(b) Uniformly loosen the 8 cylinder head bolts in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.

NOTICE:

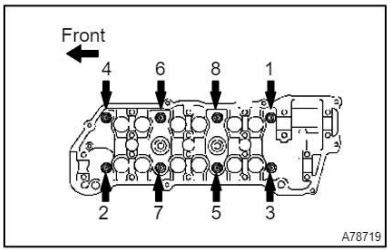
- **Be careful not to drop washers into the cylinder head.**
- **Head warpage or cracking could result from removing bolts in an incorrect order.**

39. REMOVE CYLINDER HEAD GASKET



40. REMOVE CYLINDER HEAD LH

(a) Using a socket hexagon wrench 8, remove the hexagon bolt.

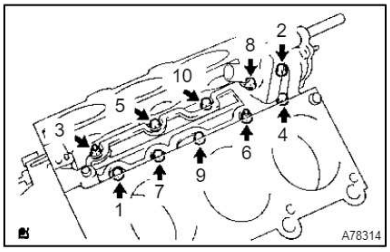


(b) Uniformly loosen the 8 cylinder head bolts in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.

NOTICE:

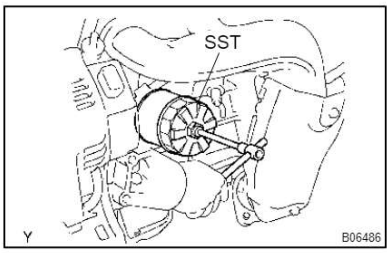
- **Be careful not to drop washers into the cylinder head.**
- **Head warpage or cracking could result from removing bolts in an incorrect order.**

41. REMOVE CYLINDER HEAD GASKET NO.2



42. REMOVE WATER INLET HOUSING

(a) Uniformly loosen and remove the 8 bolts and 2 nuts in the sequence shown in the illustration. Remove the water inlet housing.

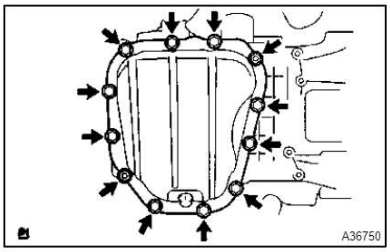


43. REMOVE OIL FILTER SUB-ASSY

(a) Using SST, remove the oil filter.
SST 09228-07501

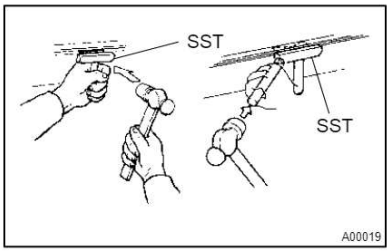
(b) Using a socket hexagon wrench 12, remove the oil filter union.

44. REMOVE OIL PAN DRAIN PLUG



45. REMOVE OIL PAN SUB-ASSY NO.2

(a) Remove the 10 bolts and 2 nuts.



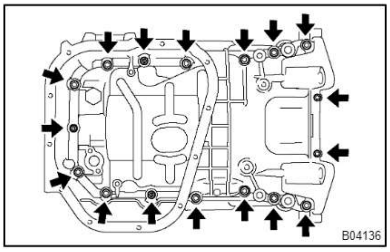
(b) Insert the blade of SST between the oil pan No. 1 and oil pan No. 2. Cut through the sealer and remove the oil pan No. 2.
SST 09032-00100

NOTICE:

- **Do not damage the contact surface of oil pan No. 1 and oil pan No. 2.**
- **Do not damage the flange portion of the oil pan No. 2 during removal.**

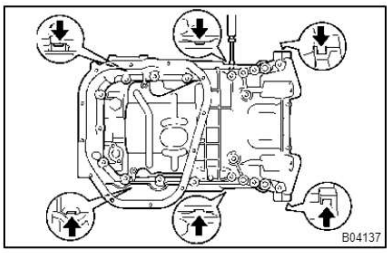
46. REMOVE OIL STRAINER SUB-ASSY

(a) Remove the bolt and 2 nuts. Then remove the oil strainer and the gasket.



47. REMOVE OIL PAN SUB-ASSY

(a) Uniformly loosen and remove the 15 bolts and 2 nuts, as shown in the illustration.

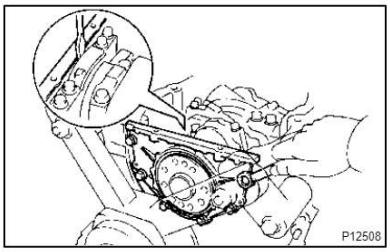


(b) Using a screwdriver, remove the oil pan by prying between the cylinder block and the oil pan.

NOTICE:

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

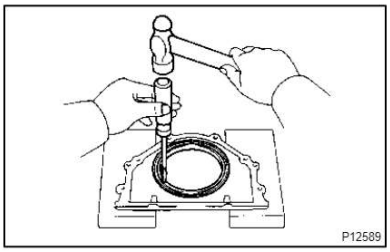
48. REMOVE OIL PAN BAFFLE PLATE



49. REMOVE ENGINE REAR OIL SEAL RETAINER

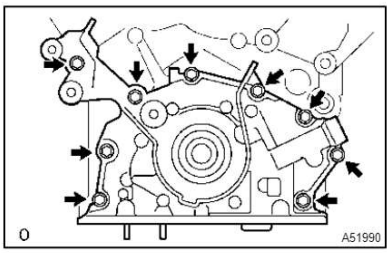
(a) Uniformly loosen and remove the 6 bolts.

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



50. REMOVE ENGINE REAR OIL SEAL

(a) Using a screwdriver and a hammer, tap out the oil seal.

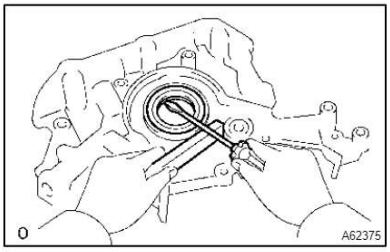


51. REMOVE OIL PUMP ASSY

(a) Remove the 9 bolts.

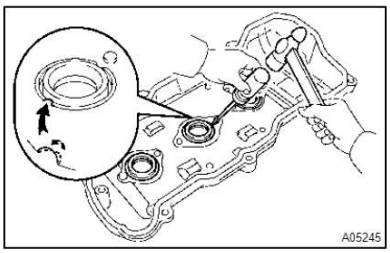
(b) Using a screwdriver, remove the oil pump by prying between the oil pump and the main bearing cap.

(c) Remove the O-ring.



52. REMOVE OIL PUMP SEAL

(a) Using a screwdriver, pry out the oil seal.



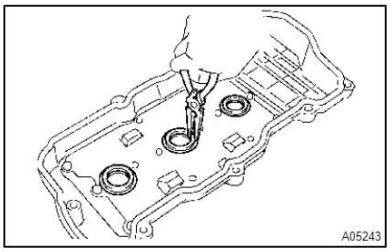
53. REMOVE SPARK PLUG TUBE GASKET

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

NOTICE:

Be careful not to damage the baffle plate of the cylinder head cover.

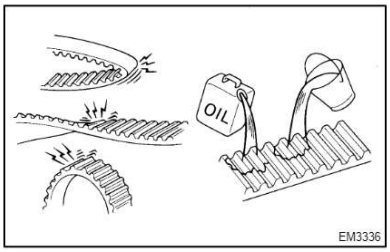
(b) Using a screwdriver and a hammer, tap out the gasket.



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

NOTICE:

Be careful not to damage the cylinder head cover.



54. 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 mounting bolt of the camshaft timing pulley.**

Check the belt for any defects, as shown in the illustrations. Also, check these points below.

(a) If there is premature parting:
- Check for proper installation.
- Check the timing cover gasket for no damage and proper installation.

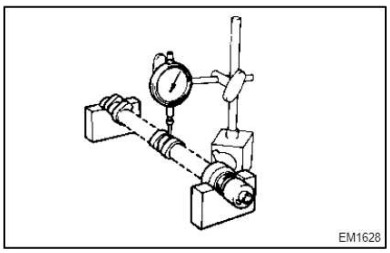
(b) If the belt teeth are cracked or damaged, check to see if either camshaft is locked.

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

(e) If there is noticeable wear on the belt teeth:
- Check the timing cover for damage.
- Check that the gasket has been installed correctly.
- Check for foreign objects on the pulley teeth.

If there is any doubt about the belt condition, replace the timing belt.

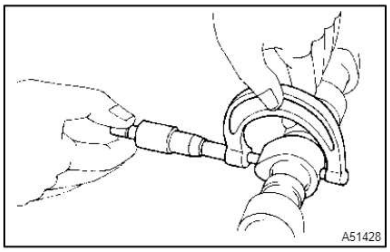


55. INSPECT CAMSHAFT

(a) Inspect the camshaft for runout.
(1) Place the camshaft on V-blocks.
(2) Using a dial indicator, measure the runout at the center journal.

Maximum circle runout: 0.06 mm (0.0024 in.)

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



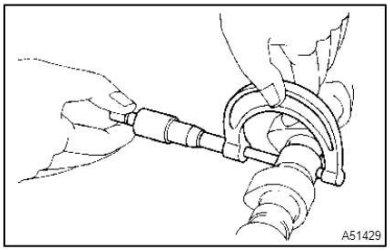
(b) Inspect the cam lobes.
(1) Using a micrometer, measure the cam lobe height.
Standard cam lobe height:

Item	Specified Condition
Intake	43.132 to 43.232 mm (1.6981 to 1.7020 in.)
Exhaust	43.010 to 43.110 mm (1.6933 to 1.6972 in.)

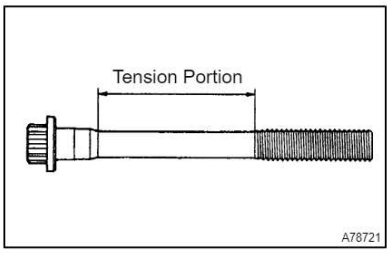
Minimum cam lobe height:

Item	Specified Condition
Intake	42.98 mm (1.6921 in.)
Exhaust	42.86 mm (1.6874 in.)

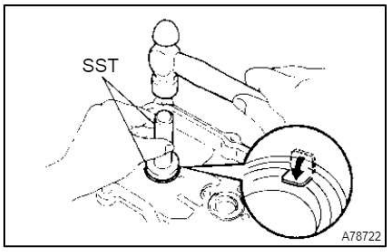
If the cam lobe height is less than the minimum, replace the camshaft.



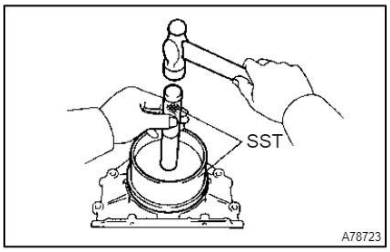
(c) Inspect the camshaft journals.
(1) Using a micrometer, measure the journal diameter.
Journal diameter:
26.959 to 26.975 mm (1.0614 to 1.0620 in.)
If the journal diameter is not as specified, check the oil clearance.



56. INSPECT CYLINDER HEAD SET BOLT
(a) Using a vernier caliper, measure the tension portion diameter of the bolt.
Standard outside diameter:
8.95 to 9.05 mm (0.3524 to 0.3563 in.)
Minimum outside diameter: 8.75 mm (0.3445 in.)
If the diameter is less than the minimum, replace the bolt.



57. INSTALL SPARK PLUG TUBE GASKET
(a) Using SST and a hammer, tap in a new gasket until its surface is flush with the upper edge of the cylinder head cover.
SST 09950-60010 (09951-00430), 09950-70010 (09951-07100)
(b) Return the ventilation plate tab to its original position.
(c) Apply a light coat of MP grease to the gasket lip.



58. INSTALL ENGINE REAR OIL SEAL

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

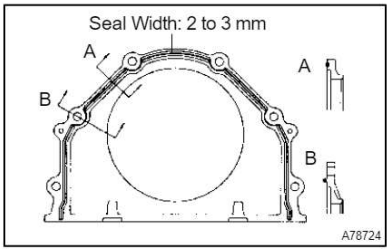
NOTICE:

- **Be careful not to tap the oil seal at an angle.**
- **Keep the gap between the rear oil seal retainer edge and the oil seal free of foreign matter.**

(b) Apply MP grease to the oil seal lip.

59. INSTALL ENGINE REAR OIL SEAL RETAINER

(a) Remove any old packing material from the contact surface.

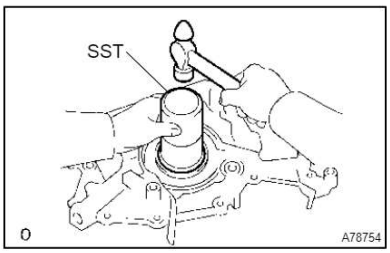


(b) Apply a continuous bead of seal packing (seal width: 2 to 3 mm (0.08 to 0.12 in.)), as shown in the illustration.
Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

- **Remove any oil from the contact surface.**
- **Install the oil seal retainer within 3 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing.**

(c) Install the oil seal retainer. Tighten the 6 bolts uniformly.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



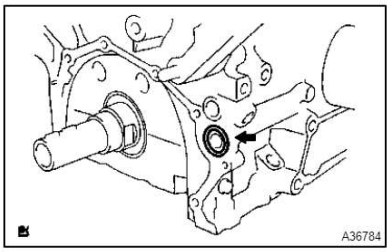
60. INSTALL OIL PUMP SEAL

(a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump body edge.
SST 09223-00010

NOTICE:

- **Be careful not to tap the oil seal at an angle.**
- **Keep the gap between the oil pump body edge and the oil seal free of foreign matter.**

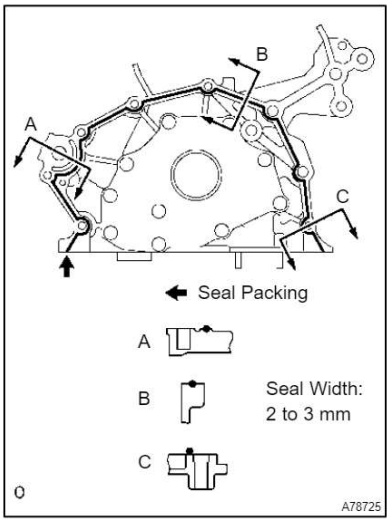
(b) Apply MP grease to the oil seal lip.



61. INSTALL OIL PUMP ASSY

(a) Remove any old packing material from the contact surface.

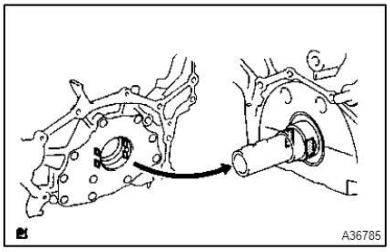
(b) Apply a light coat of engine oil to a new O-ring and place it on the cylinder block.



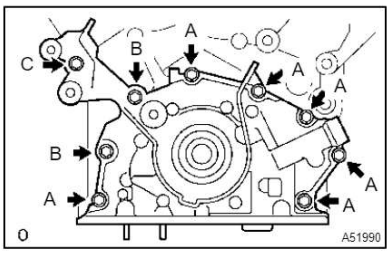
(c) Apply a continuous bead of seal packing (seal width: 2 to 3 mm (0.08 to 0.12 in.)), as shown in the illustration.
Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

- **Remove any oil from the contact surface.**
- **Apply seal packing to the inner side of the bolt holes.**
- **Install the oil pump within 3 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing the oil pump.**

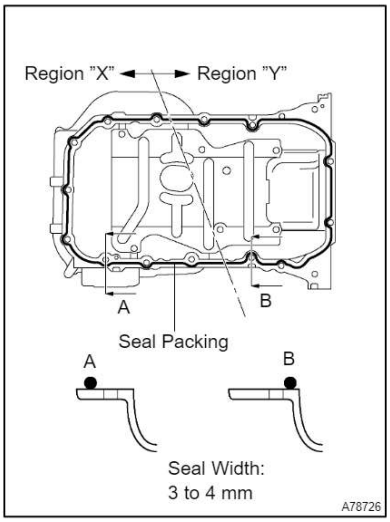


(d) Align the key of the oil pump drive gear with the keyway located on the crankshaft, and slide the oil pump into place.



(e) Install the oil pump with the 9 bolts. Tighten the bolts uniformly in several steps.
Torque:
8.0 N·m (82 kgf·cm, 71 in.·lbf) for bolt A
20 N·m (204 kgf·cm, 15 ft·lbf) for bolt B
43 N·m (438 kgf·cm, 32 ft·lbf) for bolt C

62. INSTALL OIL PAN BAFFLE PLATE
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



63. INSTALL OIL PAN SUB-ASSY

(a) Remove any old seal packing from the contact surface.

(b) Apply a continuous bead of seal packing (seal width: 3 to 4 mm (0.12 to 0.16 in.)), as shown in the illustration.
Seal packing: Part No. 08826-00080 or equivalent

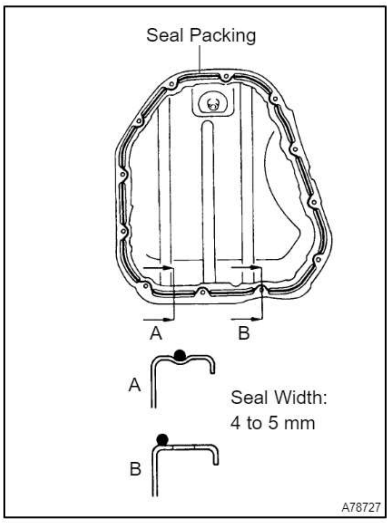
NOTICE:

- **Remove any oil from the contact surface.**
- **Apply seal packing to the outer side of the bolt holes in region "X".**
- **Apply seal packing to the inner side of the bolt holes in region "Y".**
- **Install the oil pan within 3 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing.**

(c) Install the oil pan No. 1 with the 15 bolts and 2 nuts. Tighten the bolts uniformly in several steps.
Torque:
8.0 N·m (82 kgf·cm, 71 in.·lbf) for 10 mm head
20 N·m (204 kgf·cm, 15 ft·lbf) for 12 mm head

64. INSTALL OIL STRAINER SUB-ASSY

(a) Install a new gasket and the oil strainer with the bolt and 2 nuts.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



65. INSTALL OIL PAN SUB-ASSY NO.2

(a) Remove any old seal packing from the contact surface.

(b) Apply a continuous bead of seal packing (seal width: 4 to 5 mm (0.16 to 0.20 in.)), as shown in the illustration.
Seal packing: Part No. 08826-00080 or equivalent

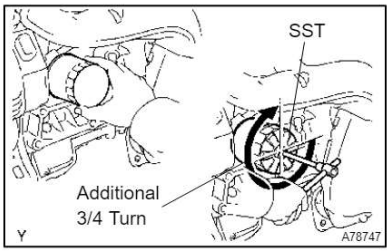
NOTICE:

- **Remove any oil from the contact surface.**
- **Apply seal packing to the inner side of the bolt holes.**
- **Install the oil pan within 3 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing.**

(c) Install the oil pan No. 2 with the 10 bolts and 2 nuts.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

66. INSTALL OIL PAN DRAIN PLUG

(a) Install the drain plug with a new gasket.
Torque: 45 N·m (459 kgf·cm, 33 ft·lbf)



67. INSTALL OIL FILTER SUB-ASSY

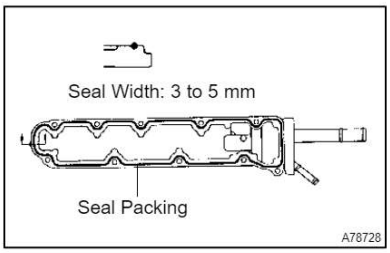
(a) Using a socket hexagon wrench 12, install the oil filter union.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)

(b) Check and clean the oil filter installation surface.

(c) Apply clean engine oil to the gasket of a new oil filter.

(d) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.

(e) Using SST, tighten it an additional 3/4 turn.
SST 09228-07501



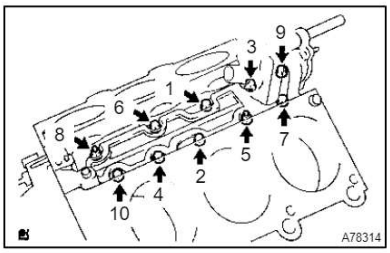
68. INSTALL WATER INLET HOUSING

(a) Remove any old packing material from the contact surface.

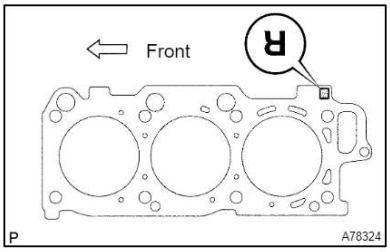
(b) Apply a continuous bead of seal packing (seal width: 3 to 5 mm (0.12 to 0.20 in.)) as shown in the illustration.
Seal packing: Part No. 08826-00100 or equivalent

NOTICE:

- **Remove any oil from the contact surface.**
- **Install the water inlet housing within 3 minutes after applying seal packing.**
- **Do not expose the seal to coolant for at least 2 hours after installing.**



(c) Install the water inlet housing with the 8 bolts and 2 nuts. Uniformly tighten the bolts and nuts in the sequence shown in the illustration.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



69. INSTALL CYLINDER HEAD GASKET

(a) Place a new cylinder head gasket on the cylinder block with the R mark upside down, as shown in the illustration.

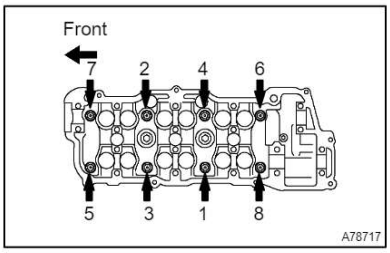
NOTICE:

- **Remove any oil from the contact surface.**
- **Make sure the cylinder head gasket is facing in the correct direction.**
- **Place the cylinder head on the gasket carefully in order not to damage the gasket at the bottom part of the head.**

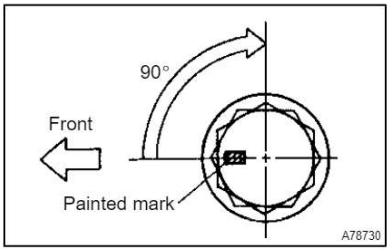
70. INSTALL CYLINDER HEAD SUB-ASSY

NOTICE:

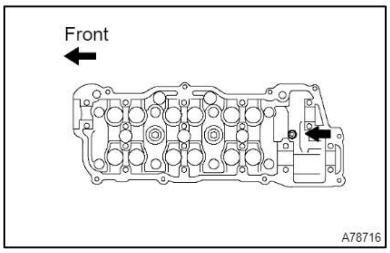
The cylinder head bolts are tightened in 2 successive steps.



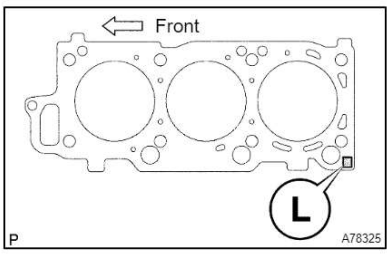
(a) Apply a light coat of engine oil on the threads of the cylinder head bolts.
(b) Install the plate washers to the cylinder head bolts.
(c) Uniformly install and tighten the 8 cylinder head bolts in the sequence shown in the illustration.
Torque: 54 N·m (550 kgf·cm, 40 ft·lbf)



(d) Mark the front side of each cylinder head bolt head with paint, as shown in the illustration.
(e) Retighten the cylinder head bolts by 90° in the same sequence as step (c).
(f) Check that each painted mark is now at a 90° angle to the front.



(g) Using a socket hexagon wrench 8, install the hexagon bolt.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)



71. INSTALL CYLINDER HEAD GASKET NO.2

(a) Place a new cylinder head gasket on the cylinder block with the L mark, as shown in the illustration.

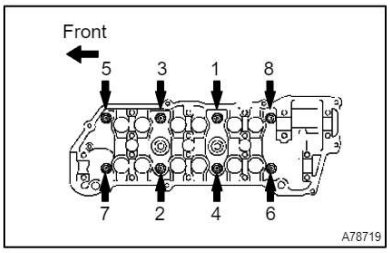
NOTICE:

- **Remove any oil from the contact surface.**
- **Make sure the cylinder head gasket is facing in the correct direction.**
- **Place the cylinder head on the gasket carefully in order not to damage the gasket at the bottom part of the head.**

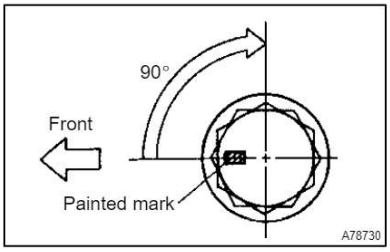
72. INSTALL CYLINDER HEAD LH

NOTICE:

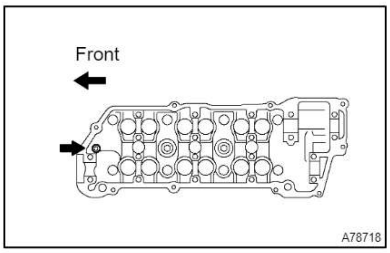
The cylinder head bolts are tightened in 2 successive steps.



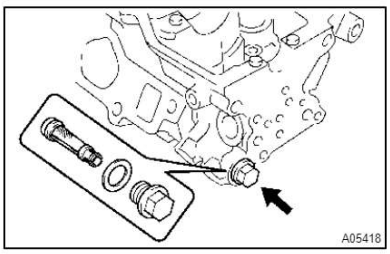
(a) Apply a light coat of engine oil to the threads of the cylinder head bolts.
(b) Install the plate washers to the cylinder head bolts.
(c) Uniformly install and tighten the 8 cylinder head bolts in the sequence shown in the illustration.
Torque: 54 N·m (550 kgf·cm, 40 ft·lbf)



(d) Mark the front side of each cylinder head bolt head with paint, as shown in the illustration.
(e) Retighten the cylinder head bolts by 90° in the same sequence as step (c).
(f) Check that each painted mark is now at a 90° angle to the front.



(g) Using a socket hexagon wrench 8, install the hexagon bolt.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)



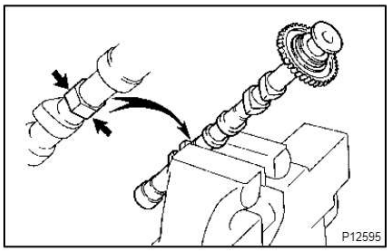
73. INSTALL OIL CONTROL VALVE FILTER

(a) Check that no foreign matter is on the mesh part of the filter.
(b) Assemble the valve filter and the plug.
(c) Install a new gasket and the plug.
Torque: 45 N·m (459 kgf·cm, 33 ft·lbf)

74. INSTALL CYLINDER HEAD COVER REAR

(a) Install a new gasket and the rear cover with the 4 bolts.
Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)

75. INSTALL ENGINE HANGER NO.2
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

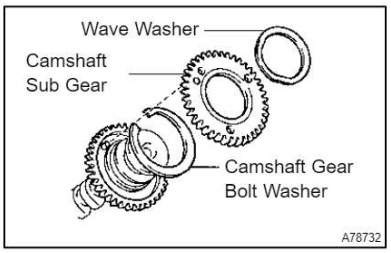


76. INSTALL CAMSHAFT SUB GEAR

(a) Clamp the camshaft in a vise on the hexagonal lobe.

NOTICE:

Be careful not to damage the camshaft.

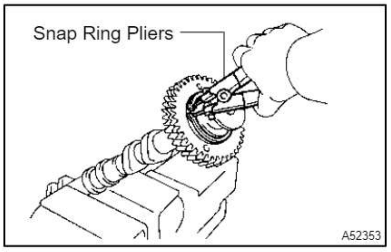


(b) Install the camshaft gear bolt washer and the camshaft sub gear.

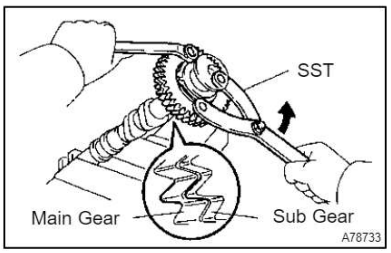
HINT:

Attach the pins on the gears to the gear bolt washer ends.

(c) Install the wave washer.



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



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

SST 09960-10010 (09962-01000, 09963-00500)

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

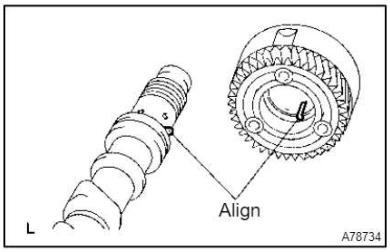
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

NOTICE:

Be careful not to damage the camshaft journals.

HINT:

When installing the camshaft, make certain that the torsional spring force of the sub gear has been eliminated by installation of the service bolt.



77. INSTALL CAMSHAFT TIMING GEAR ASSY

(a) Align the alignment pin with the alignment pin groove and install the VVT-i on the camshaft.

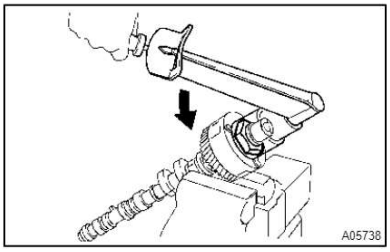
NOTICE:

Install the VVT-i with the lock-pin engaged and locked at the extreme retarded angle position.

(b) Apply engine oil to the nut, the mounting surface of the VVT-i and the screw threads.

NOTICE:

- **Be sure to apply the oil, otherwise the specified torque cannot be obtained.**
- **New nuts must be used when replacing the VVT-i unit.**



(c) Using a 46 mm socket wrench, install and tighten a lock nut by turning it counterclockwise.

Torque: 150 N·m (1,530 kgf·cm, 111 ft·lbf)

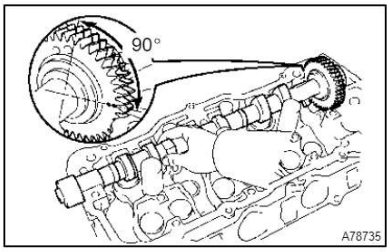
NOTICE:

- **The lock nut has LH threads.**
- **Never use any tools other than the socket wrench. Other tools will deform the cam angle rotor.**

78. INSTALL NO.2 CAMSHAFT

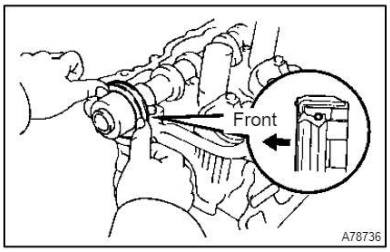
NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps must be carried out.



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

(b) Place the No. 2 camshaft at a 90° angle of the timing mark (2 dot marks) on the cylinder head.



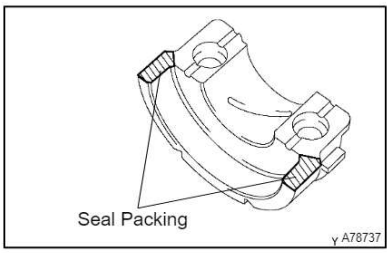
(c) Install the oil seal to the camshaft.

NOTICE:

- **Do not turn over the oil seal lip.**
- **Insert the oil seal until it stops.**

(d) Apply MP grease to a new oil seal lip.

(e) Remove any old packing material from the contact surface.

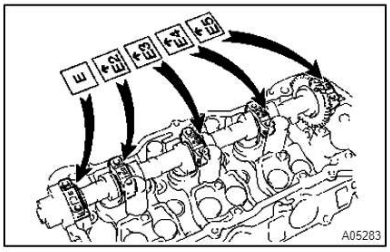


(f) Apply seal packing to the No. 1 bearing cap, as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

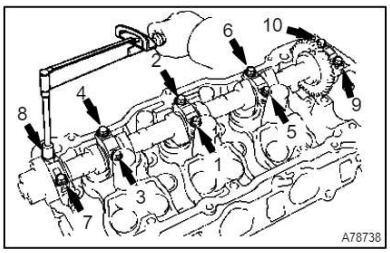
NOTICE:

- **Install the No. 1 bearing cap within 5 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing.**



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

(h) Apply a light coat of engine oil on the threads of the bearing cap bolts.



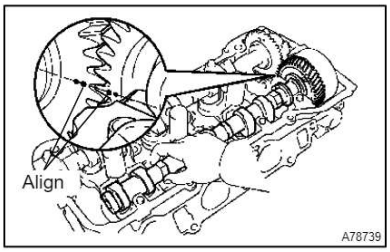
(i) Uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.

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

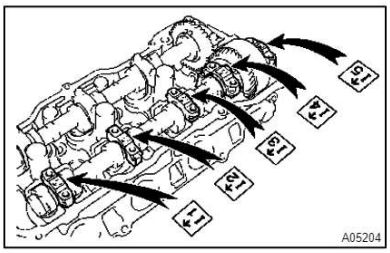
79. INSTALL CAMSHAFT

NOTICE:

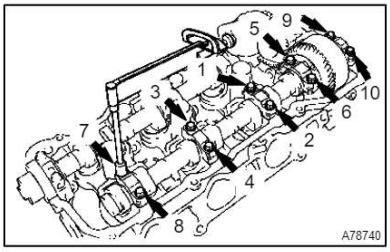
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps must be carried out.



(a) Apply new engine oil to the thrust portion and journal of the camshaft.
(b) Align the camshaft drive and driven gear's timing marks (2 dot mark each).
(c) Place the camshaft on the cylinder head.



(d) Install the 5 bearing caps in their proper locations.
(e) Apply a light coat of engine oil on the threads of the bearing cap bolts.

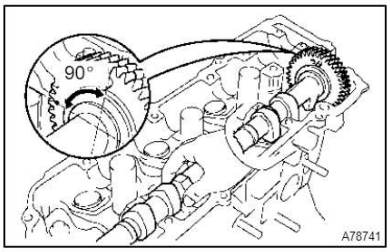


(f) Uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.
Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)
(g) Remove the service bolt.

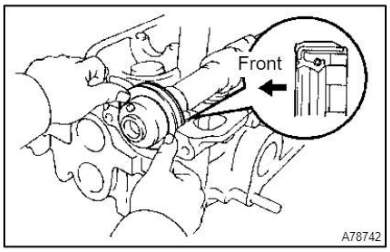
80. INSTALL NO.4 CAMSHAFT SUB-ASSY

NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps must be carried out.



(a) Apply new engine oil to the thrust portion and journal of the camshaft.
(b) Place the No. 4 camshaft at a 90° angle of the timing mark (1 dot mark) on the cylinder head.
(c) Apply MP grease to a new oil seal lip.

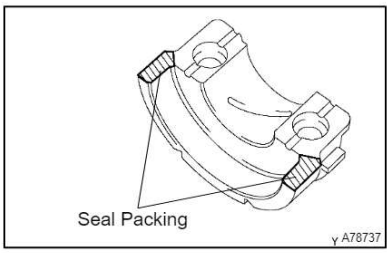


(d) Install the oil seal to the camshaft.

NOTICE:

- **Do not turn over the oil seal lip.**
- **Insert the oil seal until it stops.**

(e) Remove any old packing material from the contact surface.

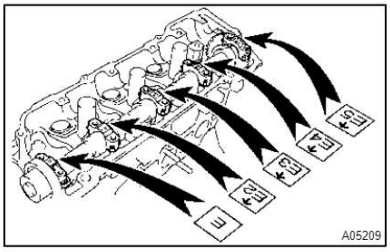


(f) Apply seal packing to the No. 1 bearing cap, as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

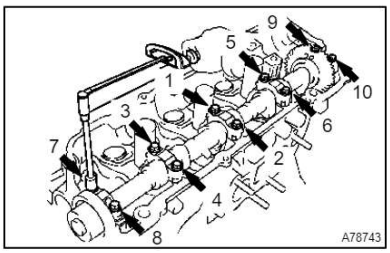
NOTICE:

- **Install the No. 1 bearing cap within 5 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing.**



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

(h) Apply a light coat of engine oil on the threads of the bearing cap bolts.



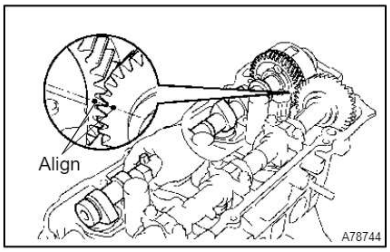
(i) Uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.

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

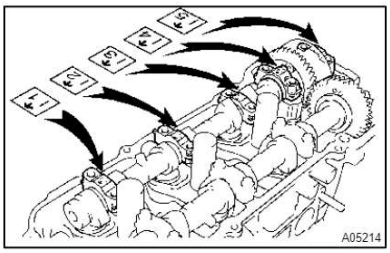
81. INSTALL NO.3 CAMSHAFT SUB-ASSY

NOTICE:

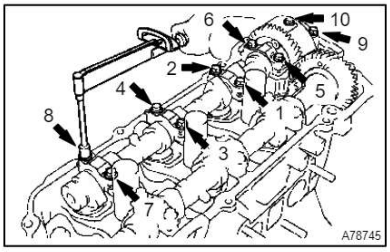
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps must be carried out.



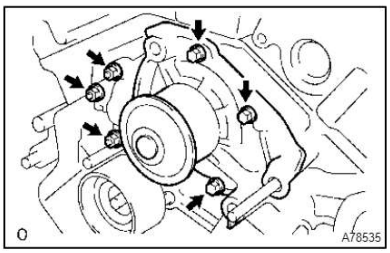
(a) Apply new engine oil to the thrust portion and journal of the camshaft.
(b) Align the camshaft drive and driven gear's timing marks (1 dot mark each).
(c) Place the camshaft on the cylinder head.



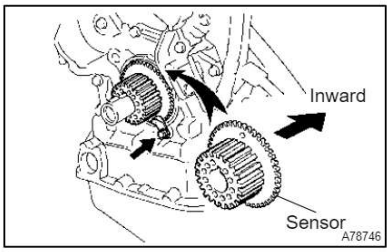
(d) Install the 5 bearing caps in their proper locations.
(e) Apply a light coat of engine oil on the threads of the bearing cap bolts.



(f) Uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.
Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)
(g) Remove the service bolt.

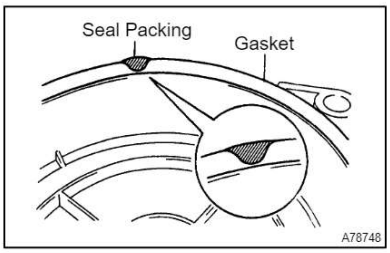


82. INSTALL WATER PUMP ASSY
(a) Install a new gasket and the water pump with the 3 bolts and 3 nuts.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



83. INSTALL CRANKSHAFT TIMING PULLEY
(a) Align the keyway of the timing pulley with the key located on the crankshaft and slide the timing pulley into place.
NOTICE:
Do not scratch the sensor area of the crankshaft timing pulley.
(b) Install the timing belt plate with the bolt.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

84. INSTALL TIMING BELT IDLER BRACKET
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)



85. INSTALL TIMING BELT NO.3 COVER

(a) Visually check for cracks and breaks on the gasket of the timing belt cover.

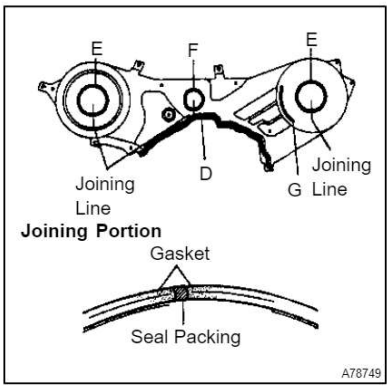
HINT:
If water is entering through cracks or breaks in the gasket, repair according to these guidelines: 1) if the crack length is within 2 to 3 cm (0.79 to 1.18 in.), repair with seal packing; or 2) if the crack length is over 3 cm (1.18 in.), replace the gasket.

(b) If the timing belt cover gasket needs to be repaired, follow the procedure below.
  (1) Repair the cracks and breaks by applying the seal packing to the damaged area.
  Seal packing: Part No. 08826-00080 or equivalent

NOTICE:
When applying the seal packing, apply it as wide and high as the gasket.

(c) If the timing belt cover gasket needs to be replaced, follow the procedure below.
  (1) Using a screwdriver and gasket scraper, remove the remaining gasket.

NOTICE:
Be careful not to damage the timing belt cover.



  (2) Remove the backing paper from a new gasket, and affix the gasket along the groove of the timing belt cover, as shown in the illustration.

NOTICE:
- **Affix the gasket in the center of the groove.**
- **At the corners, try to keep the gasket thickness uniform.**

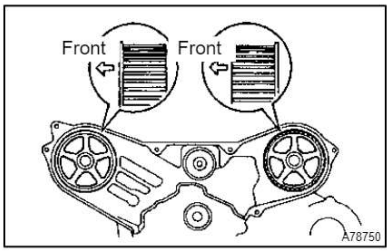
Length:

Gasket	D	E	F	G
Specified Condition	335 mm (13.19 in.)	180 mm (7.09 in.)	133 mm (5.24 in.)	72 mm (2.83 in.)

  (3) If there is a gap on the joint of the gasket, apply seal packing to close the gap.
  Seal packing: Part No. 08826-00080 or equivalent

NOTICE:
When applying the seal packing, apply it as wide and high as the gasket.

(d) Install the timing belt cover with the 6 bolts.
  Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

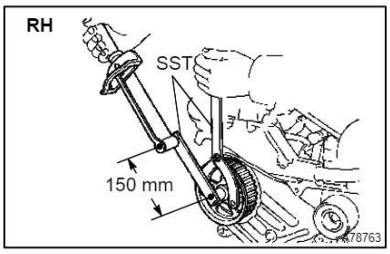


86. INSTALL CAMSHAFT TIMING PULLEY

(a) Install the camshaft timing pulley with the belt guide properly oriented and tighten the bolt temporarily.

HINT:

- Face the belt guide of the RH timing pulley towards the front of the engine.
- Face the belt guide of the LH timing pulley towards the rear of the engine.

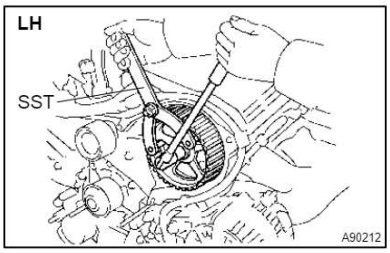


(b) Using SST, tighten the RH pulley bolt.
Torque: 125 N·m (1,275 kgf·cm, 92 ft·lbf)
SST 09960-10010 (09962-01000, 09963-01000), 09249-63010

NOTICE:

The torque specification above is the SST without extension tool specification. Use the special formula to calculate the SST with extension tool torque specification (see page 01-5).

Extended length of SST (09249-63010):
150 mm (5.91 in.)



(c) Using SST, tighten the LH pulley bolt.
Torque: 125 N·m (1,275 kgf·cm, 92 ft·lbf)
SST 09960-10010 (09962-01000, 09963-01000)

87. INSTALL CRANKSHAFT POSITION SENSOR

88. INSTALL TIMING BELT IDLER SUB-ASSY NO.2
Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)

89. INSTALL TIMING BELT IDLER SUB-ASSY NO.1

(a) Using a socket hexagon wrench 10, install the plate washer and timing belt idler No. 1 with the pivot bolt.
Torque: 34 N·m (348 kgf·cm, 25 ft·lbf)

90. INSTALL TIMING BELT

(a) Remove any oil or water on the pulleys, and keep them clean.

NOTICE:

- **If there is a trace of water and/or oil on the timing belt, repair the leakage and install a new timing belt.**
- **Do not use cleaning agents on the pulleys when cleaning them.**

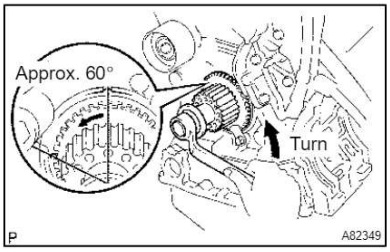
(b) Inspect the idler pulleys.
  (1) Check that the idler pulley turns smoothly.
  (2) Visually check the sealed portion of the idler pulley for oil leakage.

If there is any doubt about the idller pulleys condition, replace the idller pulleys.

(c) Inspect the water pump.
  (1) Turn the pulley, and check that the water pump bearing moves smoothly without any noise.
  (2) Visually check the drain hole for coolant leakage.

If there is any doubt about the water pump condition, replace the water pump.

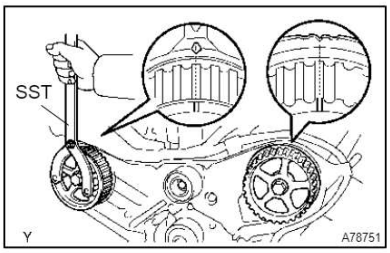
(d) Temporarily install the crankshaft pulley bolt and washer to the crankshaft.



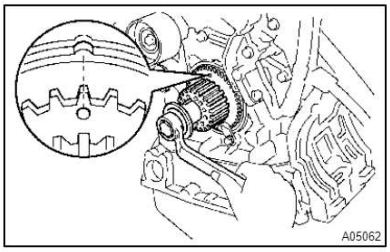
(e) Turn the crankshaft counterclockwise by approximately 60°.

NOTICE:

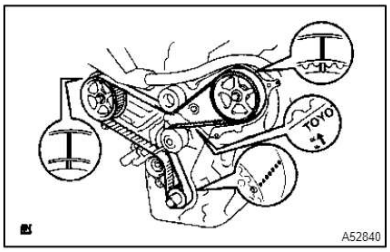
To prevent contacting the piston head and the valve head from colliding, set the crankshaft pulley at approximately 60° BTDC/compression position.



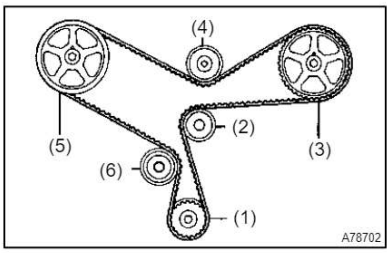
(f) Using SST, turn the crankshaft pulley, and align the timing marks of the timing pulley with the No. 3 timing belt cover.
SST 09960-10010 (09962-01000, 09963-01000)



(g) Turn the crankshaft, and align the timing mark of the crankshaft timing pulley with the oil pump body.

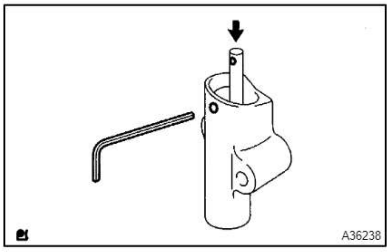


(h) Face the front mark on the timing belt forward.
(i) Align the installation mark on the timing belt with the timing mark of the crankshaft timing pulley.
(j) Align the installation marks on the timing belt with the timing marks of the camshaft timing pulleys.



(k) Install the timing belt in this order.

1st	Crankshaft timing pulley
2nd	Water pump pulley
3rd	LH camshaft timing pulley
4th	No. 2 idler pulley
5th	RH camshaft timing pulley
6th	No. 1 idler pulley



91. INSTALL TIMING BELT TENSIONER

(a) Set the timing belt tensioner uprightly on the press.
(b) Slowly press in the push rod.

NOTICE:

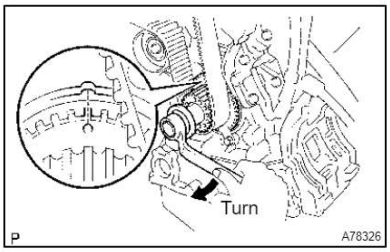
Do not apply pressure of more than 9.8 kN (1,000 kgf, 2,205 lbf) to the rod.

(c) 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.
(d) Release the press.
(e) Temporarily install the tensioner with the 2 bolts.
Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)

NOTICE:

Install the tensioner's bolts uniformly and evenly. Installing the tensioner at an angle may cause it to malfunction.

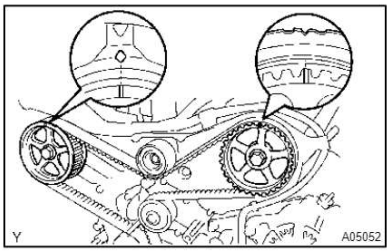
(f) Remove the 1.5 mm hexagon wrench from the tensioner.



(g) Turn the crankshaft 2 revolutions slowly, and align the timing mark of the crankshaft timing pulley with the oil pump body.

NOTICE:

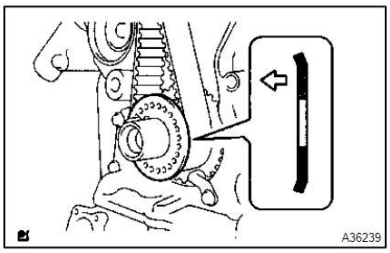
Always turn the crankshaft clockwise.



(h) Check that the timing marks of the RH and LH timing pulleys are aligned with the timing marks of the No. 3 timing belt cover, as shown in the illustration.

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

(i) Remove the crankshaft pulley bolt.



92. INSTALL TIMING BELT GUIDE NO.2

(a) Install the timing belt guide, facing the cup side toward the engine front.

93. INSTALL ENGINE MOUNTING BRACKET RH

Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)

94. INSTALL TIMING BELT NO.2 COVER

(a) Visually check for cracks and breaks on the gasket of the timing belt cover.

If there is a trace that water is entering at the visual check, replace the timing belt cover.

(b) Install the timing belt cover.

Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

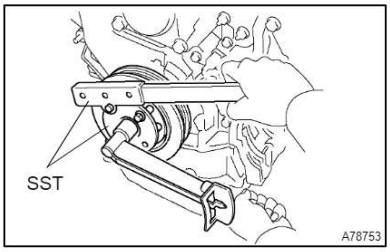
95. INSTALL TIMING BELT NO.1 COVER

(a) Visually check for cracks and breaks on the gasket of the timing belt cover.

If there is a trace that water is entering at the visual check, replace the timing belt cover.

(b) Install the timing belt cover.

Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



96. INSTALL CRANKSHAFT PULLEY

(a) Align the keyway of the pulley with the key located on the crankshaft and slide the pulley into place.

(b) Using SST, install the pulley bolt.

SST 09213-54015 (91651-60855), 09330-00021

Torque: 220 N·m (2,243 kgf·cm, 162 ft·lbf)

97. INSTALL OIL LEVEL GAGE GUIDE

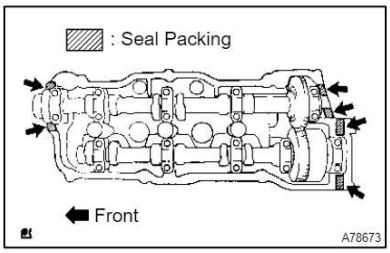
(a) Apply a light coat of engine oil to a new O-ring and install it to the level gage guide.

(b) Install the level gage guide.

Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

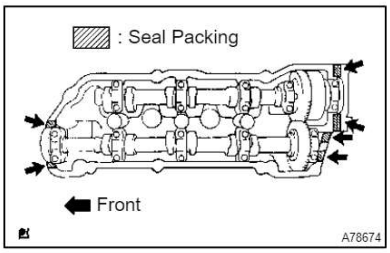
98. INSTALL OIL LEVEL GAGE SUB-ASSY

99. INSTALL VVT SENSOR
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
100. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSY
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
101. INSPECT VALVE CLEARANCE (See page 14-127)
102. ADJUST VALVE CLEARANCE (See page 14-127)



103. INSTALL CYLINDER HEAD COVER SUB-ASSY
(a) Install the gasket to the cylinder head cover.
(b) Apply seal packing to the cylinder head, as shown in the illustration.
Seal packing: Part No. 08826-00080 or equivalent
NOTICE:
- **Remove any oil from the contact surface.**
- **Install the cylinder head cover within 3 minutes after applying seal packing.**
- **Do not start the engine for at least 2 hours after installing.**

(c) Install the cylinder head cover with the 9 bolts. Tighten the bolts uniformly in several steps.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



104. INSTALL CYLINDER HEAD COVER SUB-ASSY LH
(a) Install the gasket to the cylinder head cover.
(b) Apply seal packing to the cylinder head, as shown in the illustration.
Seal packing: Part No. 08826-00080 or equivalent
NOTICE:
- **Remove any oil from the contact surface.**
- **Install the cylinder head cover within 3 minutes after applying seal packing.**
- **Do not start the engine for at least 2 hours after installing.**

(c) Install the cylinder head cover with the 9 bolts. Tighten the bolts uniformly in several steps.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

105. INSTALL OIL FILLER CAP SUB-ASSY
106. INSTALL VENTILATION VALVE SUB-ASSY
(a) Apply adhesive to 2 or 3 threads.
Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent
(b) Install the ventilation valve.
Torque: 19 N·m (193 kgf·cm, 14 ft·lbf)
107. INSTALL SPARK PLUG
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)
108. ADD ENGINE OIL

141PT-01

OVERHAUL

1. REMOVE W/HEAD STRAIGHT SCREW PLUG NO.1 (RH CYLINDER)

(a) Using a straight hexagon wrench 14, remove the 2 screw plugs.

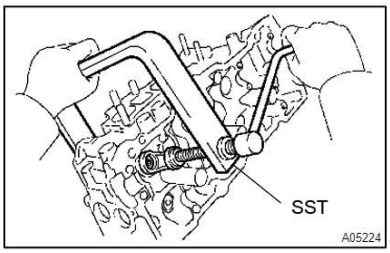
2. REMOVE W/HEAD STRAIGHT SCREW PLUG NO.2 (LH CYLINDER)

(a) Using a straight hexagon wrench 14, remove the 2 screw plugs.

3. REMOVE VALVE LIFTER

HINT:

Store the lifters in the correct order so that they can be returned to their original locations when reassembled.

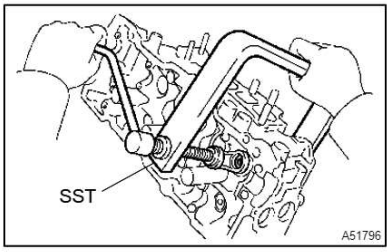


4. REMOVE INTAKE VALVE

(a) Using SST, compress the valve spring and remove the 2 retainer rocks, retainer, spring, spring seat and valve.
SST 09202-70020 (09202-00010)

HINT:

Store the valves, valve springs, spring seat, retainer rock and spring retainers in the correct order so that they can be returned to their original locations when reassembled.



5. REMOVE EXHAUST VALVE

(a) Using SST, compress the valve spring and remove the 2 retainer rocks, retainer, spring, spring seat and valve.
SST 09202-70020 (09202-00010)

HINT:

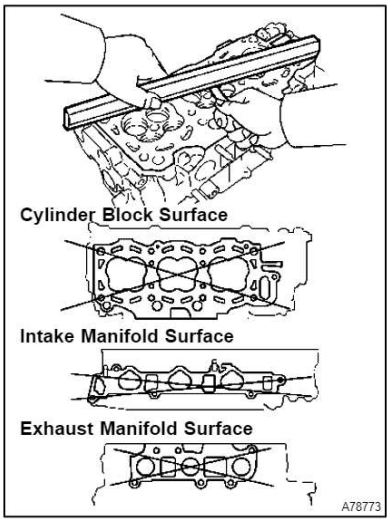
Store the valves, valve springs, spring seat, retainer rock and spring retainers in the correct order so that they can be returned to their original locations when reassembled.

6. REMOVE VALVE STEM OIL O SEAL OR RING

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

7. REMOVE VALVE SPRING SEAT

8. REMOVE SEMICIRCULAR PLUG



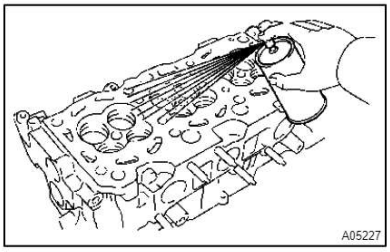
9. INSPECT CYLINDER HEAD FOR FLATNESS

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

Maximum warpage:

Item	Specified Condition
Cylinder block surface	0.05 mm (0.0020 in.)
Intake manifold surface	0.10 mm (0.0039 in.)
Exhaust manifold surface	0.10 mm (0.0039 in.)

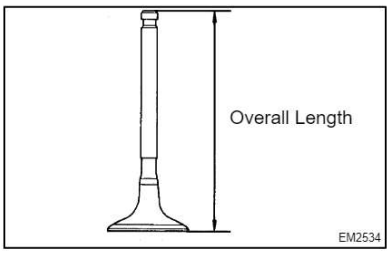
If the warpage is greater than the maximum, replace the cylinder head.



10. INSPECT CYLINDER HEAD FOR CRACKS

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

If cracked, replace the cylinder head.

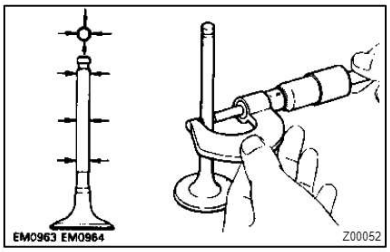


11. INSPECT INTAKE VALVE

(a) Check the valve overall length.

Standard overall length: 95.45 mm (3.7579 in.)
Minimum overall length: 94.95 mm (3.7382 in.)

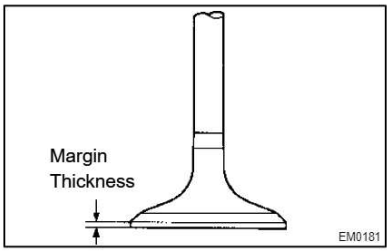
If the overall length is less than the minimum, replace the valve.



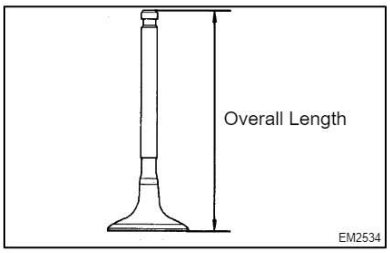
(b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:
5.470 to 5.485 mm (0.2154 to 0.2159 in.)

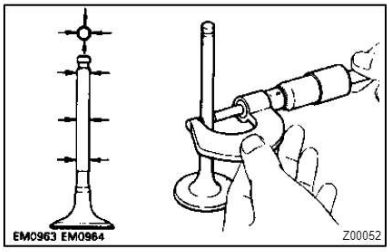
If the diameter is less than the minimum, replace the intake valve.



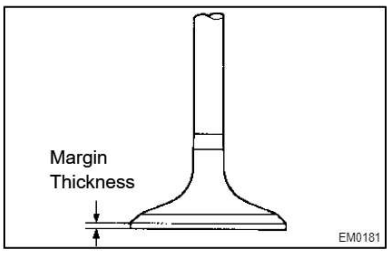
(c) Check the valve head margin thickness.
Standard margin thickness: 1.0 mm (0.039 in.)
Minimum margin thickness: 0.5 mm (0.020 in.)
If the margin thickness is less than the minimum, replace the valve.



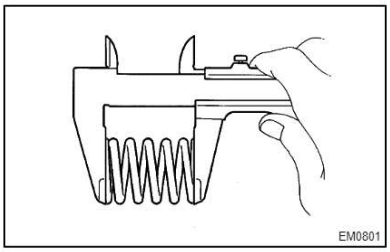
12. INSPECT EXHAUST VALVE
(a) Check the valve overall length.
Standard overall length: 95.40 mm (3.7559 in.)
Minimum overall length: 94.90 mm (3.7362 in.)
If the overall length is less than the minimum, replace the valve.



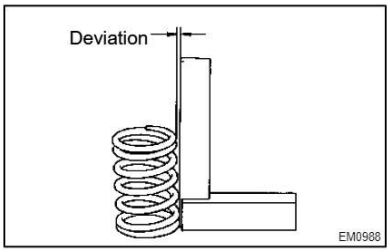
(b) Using a micrometer, measure the diameter of the valve stem.
Valve stem diameter:
5.465 to 5.480 mm (0.2152 to 0.2157 in.)
If the diameter is less than the minimum, replace the exhaust valve.



(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 the minimum, replace the valve.

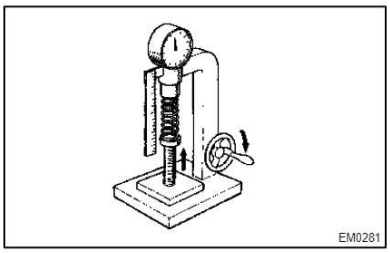


13. INSPECT INNER COMPRESSION SPRING
(a) Using a vernier caliper, measure the free length of the valve spring.
Free length: 45.50 mm (1.7913 in.)
If the free length is not as specified, replace the valve spring.



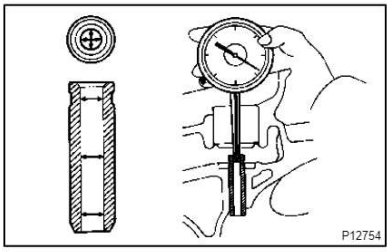
(b) Using steel squares, measure the deviation of the valve spring.
Maximum deviation: 2.0 mm (0.079 in.)

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



(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.
Installed tension:
186 to 206 N (19.0 to 21.0 kgf, 41.9 to 46.3 lbf)
at 33.8 mm (1.331 in.)

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



14. INSPECT VALVE GUIDE BUSH OIL CLEARANCE

(a) Using a caliper gauge, measure the inside diameter of the guide bush.
Bush inside diameter:
5.510 to 5.530 mm (0.2169 to 0.2177 in.)

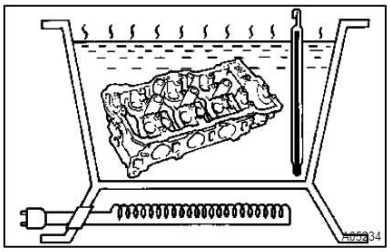
(b) Subtract the valve stem diameter measurement from the guide bush inside diameter measurement.
Standard oil clearance:

Item	Specified Condition
Intake	0.025 to 0.060 mm (0.0010 to 0.0024 in.)
Exhaust	0.030 to 0.065 mm (0.0012 to 0.0026 in.)

Maximum oil clearance:

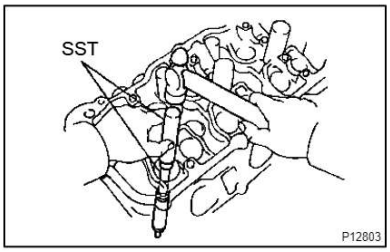
Item	Specified Condition
Intake	0.080 mm (0.0031 in.)
Exhaust	0.100 mm (0.0039 in.)

If the clearance is greater than the maximum, replace the valve and guide bush.

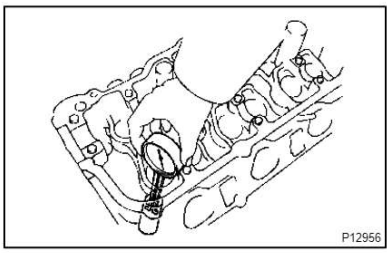


15. REMOVE VALVE GUIDE BUSH

(a) Heat the cylinder head to approximately 80 to 100°C (176 to 212°F).



(b) Using SST and a hammer, tap out the guide bush.
SST 09201- 10000, 09201- 01055, 09950- 70010 (09951-07100)



16. INSTALL VALVE GUIDE BUSH

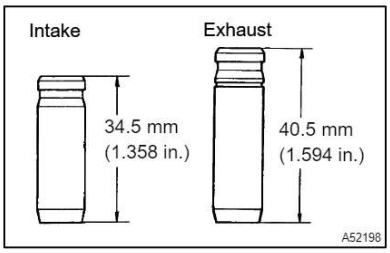
(a) Using a caliper gauge, measure the bush bore diameter of the cylinder head.

Diameter: 10.295 to 10.313 mm (0.4053 to 0.4060 in.)

If the bush bore diameter of the cylinder head is greater than 10.313 mm (0.4060 in.), machine the bush bore to the dimension of 10.345 to 10.363 mm (0.4073 to 0.4080 in.).

Bush diameter:

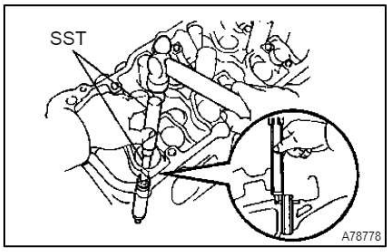
STD	10.333 to 10.344 mm (0.4068 to 0.4072 in.)
O/S	10.383 to 10.394 mm (0.4088 to 0.4092 in.)



HINT:
Use different bushes on the intake and exhaust.

Bush length:

Intake	34.5 mm (1.358 in.)
Exhaust	40.5 mm (1.594 in.)

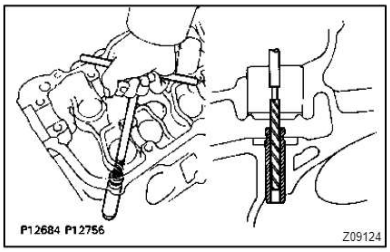


(b) Heat the cylinder head to approximately 80 to 100°C (176 to 212°F)

(c) Using SST and a hammer, tap in a new guide bush to the specified protrusion height.
SST 09201- 10000, 09201- 01055, 09950- 70010 (09951-07100)

Protrusion height:

Item	Specified Condition
Intake	11.1 to 11.5 mm (0.437 to 0.453 in.)
Exhaust	8.9 to 9.3 mm (0.350 to 0.336 in.)



(d) Using a sharp 5.5 mm reamer, ream the guide bush to obtain the standard specified clearance between the guide bush and the valve stem.

Standard oil clearance:

Item	Specified Condition
Intake	0.025 to 0.060 mm (0.0010 to 0.0024 in.)
Exhaust	0.030 to 0.065 mm (0.0012 to 0.0026 in.)

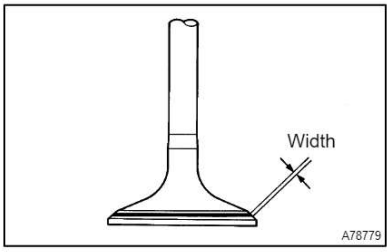
17. INSPECT VALVE SEATS

(a) Apply a light coat of prussian blue (or white lead) to the valve face.

(b) Lightly press the valve against the seat.

NOTICE:

Do not rotate the valve.

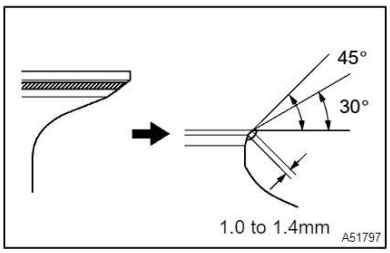


(c) Check the valve face and valve seat according to the following procedure.

(1) If blue appears 360° around the valve face, the valve face is concentric. If not, replace the valve.

(2) If blue appears 360° around the valve seat, the guide and valve face are concentric. If not, resurface the valve seat.

(3) Check that the valve seat contact is in the middle of the valve face with the width between 1.0 to 1.4 mm (0.039 to 0.055 in.).

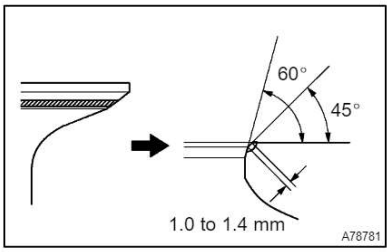


18. REPAIR VALVE SEATS

NOTICE:

Releasing the seat-cutter pressure gradually helps to make smoother valve seat faces.

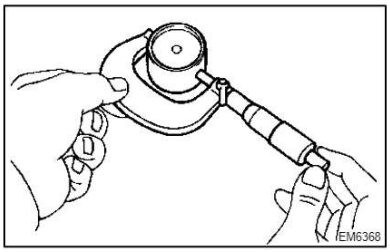
(a) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.



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

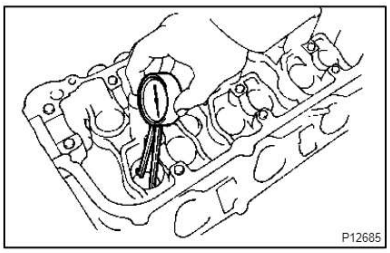
(c) Handrub the valve and valve seat with an abrasive compound.

(d) Recheck the valve seating position.



19. INSPECT VALVE LIFTER

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



20. INSPECT VALVE LIFTER OIL CLEARANCE

(a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.
Lifter bore diameter:
31.009 to 31.025 mm (1.2208 to 1.2215 in.)

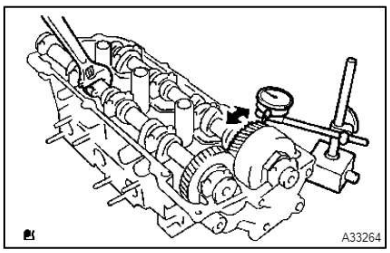
(b) Subtract the lifter diameter measurement from the lifter bore diameter measurement.
Standard oil clearance:
0.033 to 0.059 mm (0.0013 to 0.0023 in.)
Maximum oil clearance: 0.070 mm (0.0028 in.)

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

21. INSPECT CAMSHAFT GEAR BACKLASH

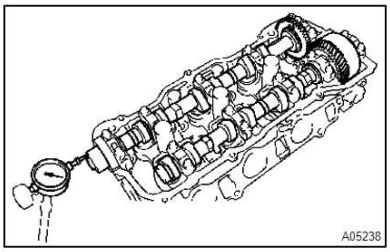
(a) Install the camshaft timing gear assembly.
(b) Install the camshafts to the cylinder head.

NOTICE:
- **Install without valves and sub gear.**
- **Install with its timing mark matched.**



(c) Set the dial indicator to the teeth of the intake camshaft at a right angle (90°).
(d) Measure the backlash of the camshaft timing gear at least 4 positions.
Standard backlash:
0.020 to 0.200 mm (0.0008 to 0.0079 in.)
Maximum backlash: 0.300 mm (0.0118 in.)

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



22. INSPECT CAMSHAFT THRUST CLEARANCE

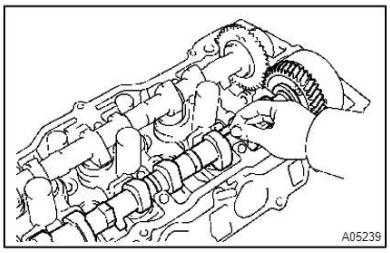
(a) Install the camshafts.
(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.
Standard thrust clearance:
0.040 to 0.090 mm (0.0016 to 0.035 in.)
Maximum thrust clearance: 0.120 mm (0.0047 in.)

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

23. INSPECT CAMSHAFT 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 journal.

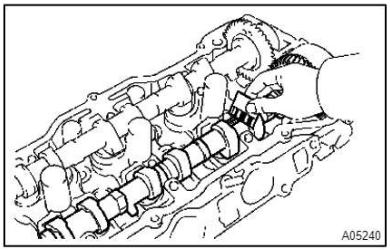
(d) Install the bearing caps.

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

NOTICE:

Do not turn the camshaft.

(e) Remove the bearing caps.



(f) Measure the plastigage at its widest point.

Standard oil clearance:

Intake #4, #5 journals

0.025 to 0.057 mm (0.0010 to 0.0022 in.)

Other journals

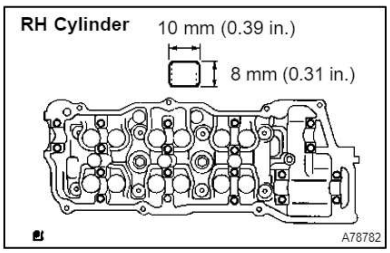
0.025 to 0.062 mm (0.0010 to 0.0024 in.)

Maximum oil clearance: 0.100 mm (0.0039 in.)

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

NOTICE:

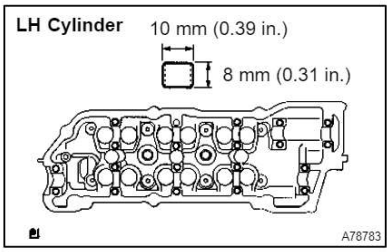
Completely remove the plastigage.



24. INSTALL RING W/HEAD PIN (RH CYLINDER)

(a) Using a plastic-faced hammer, tap in a new ring pin to the specified protrusion height.

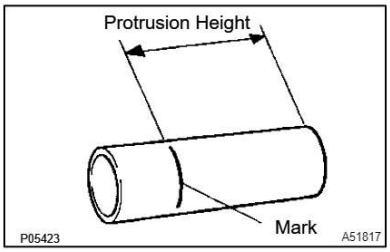
Protrusion height: 3 mm (0.12 in.)



25. INSTALL RING PIN (LH CYLINDER)

(a) Using a plastic-faced hammer, tap in a new ring pin to the specified protrusion height.

Protrusion height: 3 mm (0.12 in.)



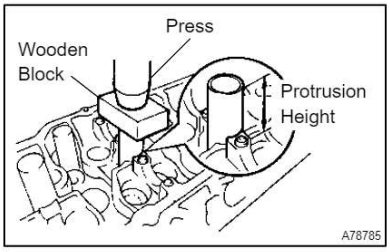
26. INSTALL SPARK PLUG TUBE

(a) Using paint, mark the standard position from the edge.
Standard protrusion height:
42.4 to 43.4 mm (1.669 to 1.709 in.)

HINT:
Use either end of the spark plug tube.

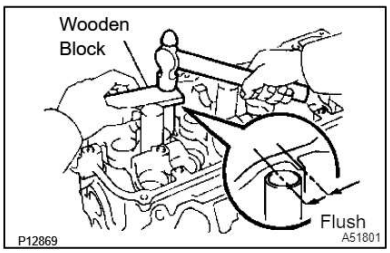
(b) Apply adhesive to the spark plug tube where it will be pressed into the cylinder head.
Adhesive: Part No. 08833-00070 THREE BOND 1324 or equivalent

NOTICE:
- **Install the spark plug tube within 3 minutes after applying adhesive.**
- **Do not deform the spark plug tube.**
- **Do not expose the seal to coolant for at least 1 hour after installing.**



(c) Using a press and wooden block, install the spark plug tube to the required protrusion height.

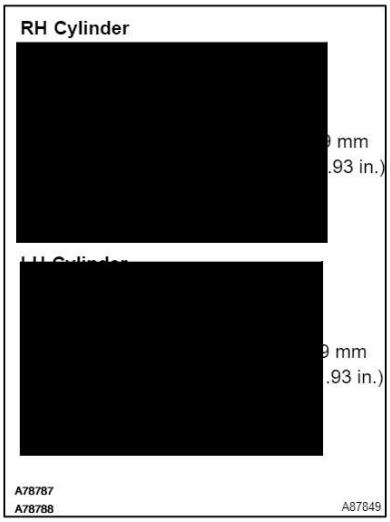
NOTICE:
Be careful not to drip the adhesive.



27. INSTALL PCV PIPE (RH CYLINDER)

(a) Using a wooden block and hammer, tap in 2 new PCV pipes until its top edge is flush with the cylinder head edge.

NOTICE:
Be careful not to damage the cylinder head edge.

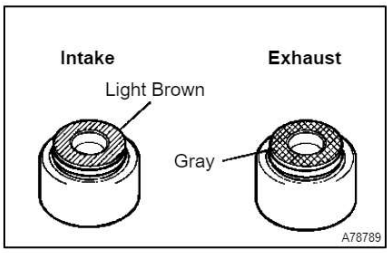


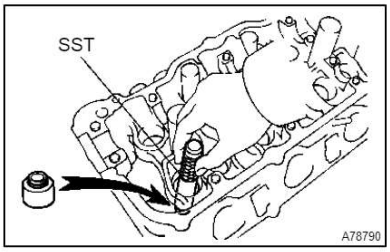
28. INSTALL STUD BOLT

(a) Install the stud bolts on the intake side.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

29. INSTALL STUD BOLT

(a) Install the stud bolts on the exhaust side.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)





30. INSTALL VALVE STEM OIL O SEAL OR RING

(a) Apply a light coat of engine oil on the valve stem.

NOTICE:

Pay close attention when installing the intake and exhaust oil seals. For example, installing the intake oil seal into the exhaust or installing the exhaust oil seal to the intake can cause installation problems later.

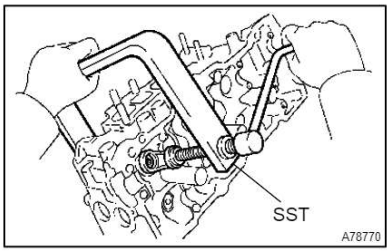
HINT:

The intake valve oil seal is light brown and the exhaust valve oil seal is gray.

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

NOTICE:

Failure to use SST will cause the seal to be damaged or improperly seated.



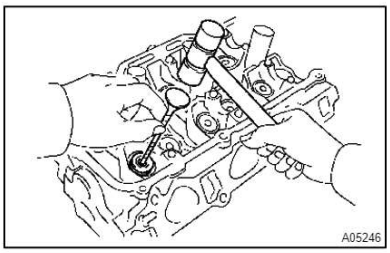
31. INSTALL INTAKE VALVE

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

NOTICE:

Install the same part in the same combination to the original locations.

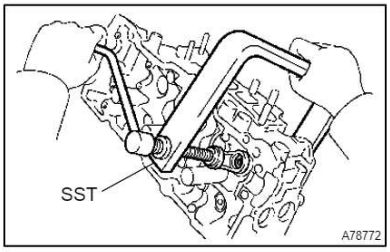
(b) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
SST 09202-70020 (09202-00010)



(c) Using a plastic-faced hammer and a discarded valve with its tip wrapped in tape, lightly tap the installed valve to ensure that it is securely fit.

NOTICE:

Be careful not to damage the installed valve stem tip.



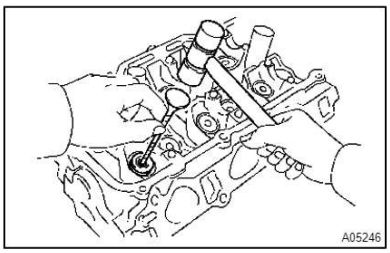
32. INSTALL EXHAUST VALVE

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

NOTICE:

Install the same parts in the same combination to the original locations.

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



(c) Using a plastic-faced hammer and a discarded valve with its tip wrapped in tape, lightly tap the installed valve to ensure that it is securely fit.

NOTICE:

Be careful not to damage the installed valve stem tip.

33. INSTALL VALVE LIFTER

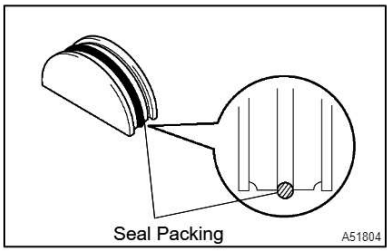
(a) Apply a light coat of engine oil to the valve lifter.

NOTICE:

Install the same part in the same combination to the original locations.

(b) Install the valve lifter.

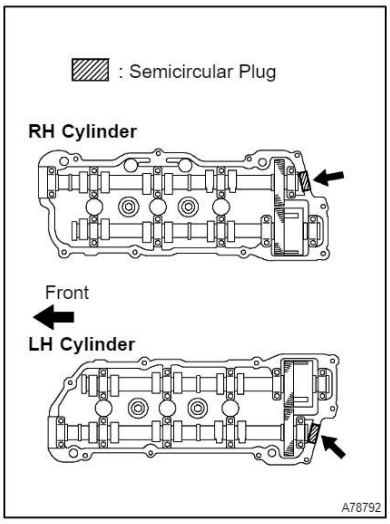
(c) Check that the valve lifter rotates smoothly by hand.



34. INSTALL SEMICIRCULAR PLUG

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

(b) Apply seal packing to the semicircular plug grooves.
Seal packing: Part No. 08826-00080 or equivalent



(c) Install the 2 semicircular plugs to the cylinder heads.

NOTICE:

- **Install the plugs so that they are flush with the top of the cylinder head.**
- **Install the semicircular plugs within 3 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing.**

35. INSTALL W/HEAD STRAIGHT SCREW PLUG NO.1 (RH CYLINDER)

(a) Using a straight hexagon wrench 14, install 2 new gaskets and the 2 screw plugs.
Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)

36. INSTALL W/HEAD STRAIGHT SCREW PLUG NO.2 (LH CYLINDER)

(a) Using a straight hexagon wrench 14, install 2 new gaskets and the 2 screw plugs.
Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)

141PV-02

OVERHAUL

1. REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB-ASSY

2. REMOVE WATER SEAL PLATE

3. REMOVE CYLINDER BLOCK W/HEAD STRAIGHT SCREW NO.1 PLUG

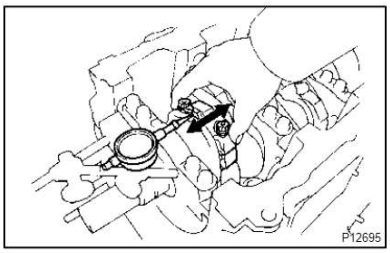
(a) Using a socket hexagon wrench 10, remove the screw plug.

4. REMOVE CYLINDER BLOCK W/HEAD STRAIGHT SCREW NO.2 PLUG

(a) Using a socket hexagon wrench 10, remove the screw plug.

5. REMOVE CYLINDER BLOCK W/HEAD STRAIGHT SCREW NO.3 PLUG

(a) Using a socket hexagon wrench 10, remove the screw plug.



6. INSPECT CONNECTING ROD THRUST CLEARANCE

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

Standard thrust clearance:
0.150 to 0.300 mm (0.0059 to 0.0118 in.)
Maximum thrust clearance: 0.350 mm (0.0138 in.)

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

Connecting rod thickness:
20.80 to 20.85 mm (0.8189 to 0.8209 in.)

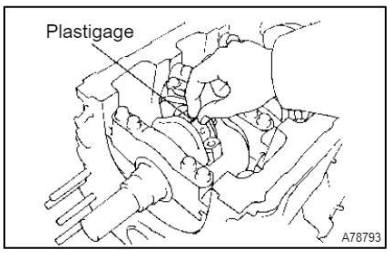
7. INSPECT CONNECTING ROD OIL CLEARANCE

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

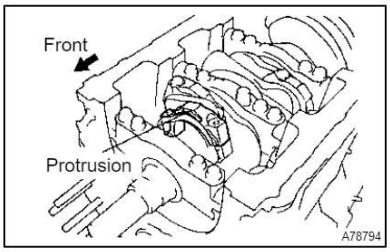
(b) Remove the 2 connecting rod cap bolts.

(c) Clean the crank pin, the bearing and the connecting rod.

(d) Check the crank pin and bearing for pitting and scratches.

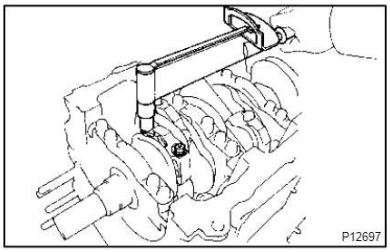


(e) Lay a strip of plastigage across the crank pin.

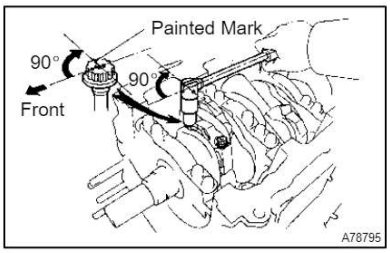


(f) Check that the protrusion of the connecting rod cap is facing the correct direction.

(g) Apply a light coat of engine oil to the threads of the connecting rod cap bolts.



(h) Tighten the bolts in several steps by the specified torque.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

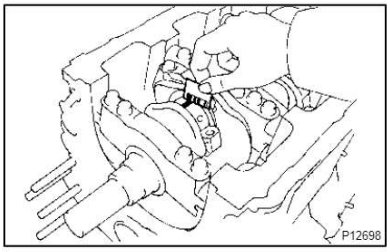


(i) Mark the front side of each connecting cap bolt with paint.
(j) Retighten the cap bolts by 90° as shown in the illustration.

NOTICE:

Do not turn the crankshaft.

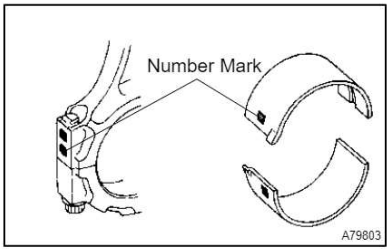
(k) Remove the 2 bolts, the connecting rod cap and the lower bearing.



(l) Measure the plastigage at its widest point.
Standard oil clearance:
0.038 to 0.066 mm (0.0015 to 0.0026 in.)
Maximum oil clearance: 0.080 mm (0.0031 in.)

If the oil clearance is greater than the maximum, replace the bearings. If necessary, grind or replace the crankshaft.

(m) Completely remove the plastigage.

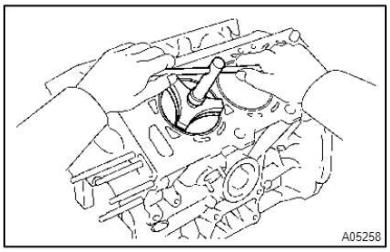


HINT:

If replacing the bearing, replace it with one that has the same number as the connecting rod. There are 4 sizes of standard bearings: 1, 2, 3 and 4.

Standard bearing center wall thickness:

Mark	Center Wall Thickness mm (in.)
1	1.484 to 1.486 (0.05843 to 0.05850)
2	1.487 to 1.489 (0.05854 to 0.05862)
3	1.490 to 1.492 (0.05866 to 0.05874)
4	1.493 to 1.495 (0.05878 to 0.05886)



8. REMOVE PISTON SUB-ASSY W/CONNECTING ROD

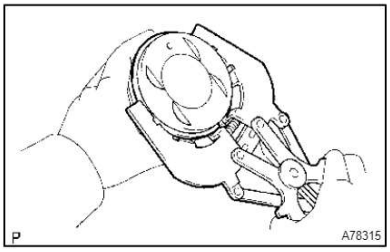
(a) Using a ridge reamer, remove all the carbon from the top of the cylinder.

(b) Push out the piston and the connecting rod assembly from the top of the cylinder block.

HINT:

- Keep the bearings, the connecting rod and the cap together.
- Arrange the piston and the connecting rod assemblies in the correct order so they can be returned to their original locations when reassembled.

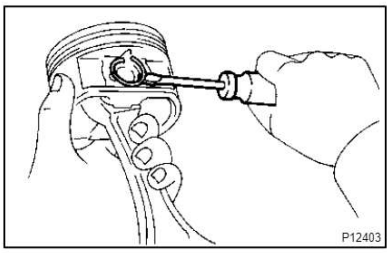
9. REMOVE CONNECTING ROD BEARING



10. REMOVE PISTON RING SET

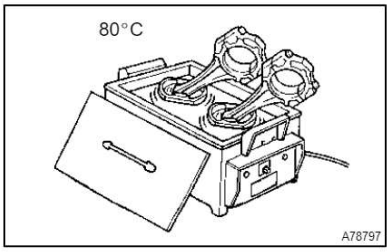
(a) Using a piston ring expander, remove the 2 compression rings.

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



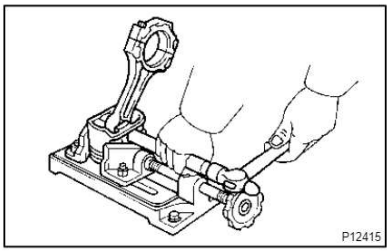
11. REMOVE PISTON PIN HOLE SNAP RING

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



12. REMOVE W/PIN PISTON SUB-ASSY

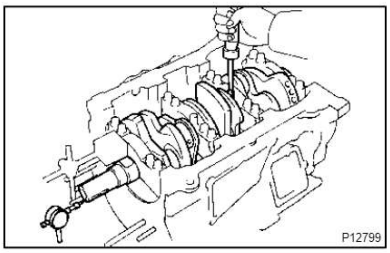
(a) Gradually heat the piston to approximately 80°C (176°F).



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

HINT:

- The piston and pin are a matched set.
- Store the pistons, the pins, the rings, the connecting rods and the bearings in the correct order so that they can be returned to their original locations when reassembled.



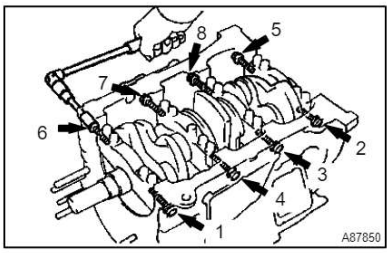
13. INSPECT CRANKSHAFT THRUST CLEARANCE

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

Standard thrust clearance:
0.04 to 0.24 mm (0.0016 to 0.0094 in.)
Maximum thrust clearance: 0.30 mm (0.0118 in.)

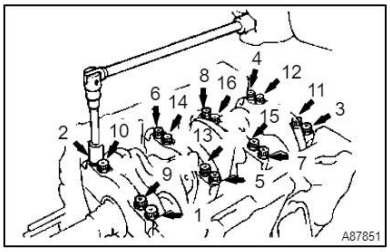
If the thrust clearance is greater than the maximum, replace the thrust washers as a set. Check the crankshaft for wear, repair or replace if necessary.

Thrust washer thickness:
1.93 to 1.98 mm (0.0760 to 0.0780 in.)

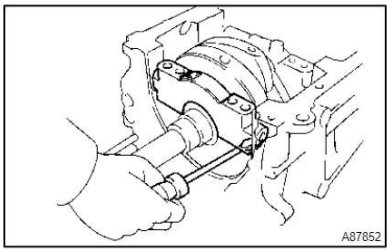


14. INSPECT CRANKSHAFT OIL CLEARANCE

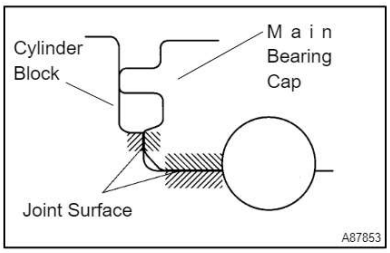
(a) Uniformly loosen and remove the 8 main bearing cap bolts and seal washers in the sequence shown in the illustration.



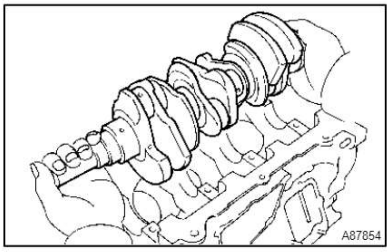
(b) Uniformly loosen and remove the 16 main bearing cap bolts in the sequence shown in the illustration.



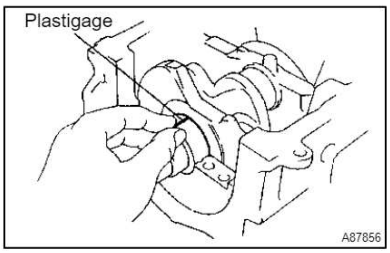
(c) Remove the 4 main bearing caps and 4 lower bearings. Also remove the 2 lower thrust washers, located under the No. 2 main bearing cap.



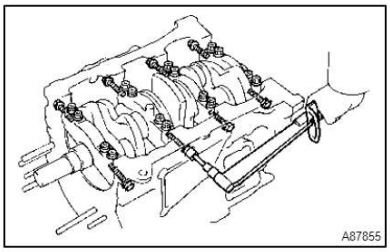
NOTICE:
Using a screwdriver, push up on the cap little by little, alternating from the right and left side until the cap is free. Take care not to damage the contact surfaces of the cap and cylinder block.
HINT:
- Keep the lower bearing and main bearing cap together.
- Arrange the main bearing caps and lower thrust washers in the correct order.



(d) Lift out the crankshaft.
HINT:
Keep the upper bearings together with the cylinder block.
(e) Clean each main journal and bearing.
(f) Check each main journal and bearing for pitting and scratches.
If the journal or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.



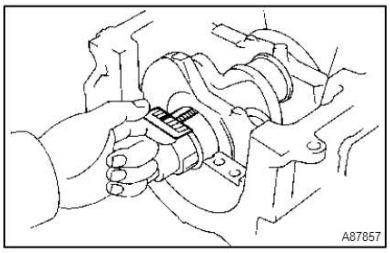
(g) Place the crankshaft on the cylinder block.
(h) Lay a strip of plastigage across each journal.



(i) Install the 4 main bearing caps.

NOTICE:
Do not turn the crankshaft.

(j) Remove the main bearing caps (see steps (a) to (c)).



(k) Measure the plastigage at its widest point.

Standard oil clearance:

No. 1 and No. 4 journals	0.014 to 0.034 mm (0.0006 to 0.0013 in.)
No. 2 and No. 3 journals	0.026 to 0.046 mm (0.0010 to 0.0018 in.)

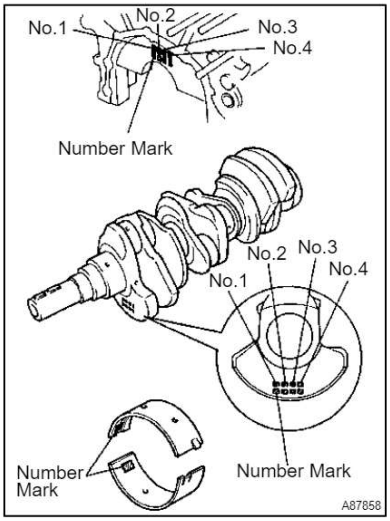
Maximum oil clearance:

No. 1 and No. 4 journals	0.050 mm (0.0020 in.)
No. 2 and No. 3 journals	0.060 mm (0.0024 in.)

If the oil clearance is greater than the maximum, replace the bearings. If necessary, replace the crankshaft.

HINT:

If using a bearing, replace it with one that has the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then refer to the table on the next page for the appropriate bearing number. The No. 1 and No. 4 journal bearings have 5 standard bearing sizes, marked 3, 4, 5, 6 and 7 accordingly. The No. 2 and No. 3 journal bearings have 5 standard bearing sizes, marked 1, 2, 3, 4 and 5 accordingly.



No. 1 and No. 4 journal bearings

Cylinder block + Crankshaft =	0 to 5	6 to 11	12 to 17	18 to 23	24 to 28
Replace-ment Bearing	3	4	5	6	7

HINT:
EXAMPLE
Cylinder block imprinted number mark is 06
Crankshaft imprinted number mark is 08
6 + 8 = 14
Select the bearing marked "5"

No. 1 and No. 4 journal standard bearings selection chart

Crankshaft number mark	Cylinder block number mark																
	00	01	02	03	04	05	**06**	07	08	09	10	11	12	13	14	15	16
00	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5
01	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5
02	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6
03	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6	6
04	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6	6	6
05	3	4	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6
06	4	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6
07	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6	6
08	4	4	4	4	5	5	**5**	5	5	5	6	6	6	6	6	6	7
09	4	4	4	5	5	5	5	5	5	6	6	6	6	6	6	7	7
10	4	4	5	5	5	5	5	5	6	6	6	6	6	6	7	7	7
11	4	5	5	5	5	5	5	6	6	6	6	6	6	7	7	7	7
12	5	5	5	5	5	5	6	6	6	6	6	6	7	7	7	7	7

EXAMPLE:
Cylinder block "**06**", Crankshaft "**08**" = Use bearing "**5**"

No. 2 and No. 3 journal bearings

Cylinder block + Crankshaft =	0 to 5	6 to 11	12 to 17	18 to 23	24 to 28
Replace-ment Bearing	3	4	5	6	7

HINT:
EXAMPLE
Cylinder block imprinted number mark is 06
Crankshaft imprinted number mark is 08
6 + 8 = 14
Select the bearing marked "3"

No.2 and No.3 journal standard bearings selection chart

Crankshaft number mark	Cylinder block number mark																
	00	01	02	03	04	05	**06**	07	08	09	10	11	12	13	14	15	16
00	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3
01	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3
02	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4
03	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4
04	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4
05	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4
06	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4
07	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4
08	2	2	2	2	3	3	**3**	3	3	3	4	4	4	4	4	4	5
09	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5
10	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5
11	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5
12	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5

EXAMPLE:
Cylinder block "**06**", Crankshaft "**08**" = Use bearing "**3**"

Reference

Item	Mark	Specified Condition
Cylinder block main journal bore diameter (A)	00	66.000 mm (2.5984 in.)
	01	66.001 mm (2.5985 in.)
	02	66.002 mm (2.5985 in.)
	03	66.003 mm (2.5985 in.)
	04	66.004 mm (2.5986 in.)
	05	66.005 mm(2.5986 in.)
	06	66.006 mm (2.5987 in.)
	07	66.007 mm (2.5987 in.)
	08	66.008 mm (2.5987 in.)
	09	66.009 mm (2.5988 in.)
	10	66.010 mm (2.5988 in.)
	11	66.011 mm (2.5989 in.)
	12	66.012 mm (2.5989 in.)
	13	66.013 mm (2.5989 in.)
	14	66.014 mm (2.5990 in.)
	15	66.015 mm (2.5990 in.)
	16	66.016 mm (2.5990 in.)
Crankshaft main journal diameter (B)	00	61.000 mm (2.4016 in.)
	01	60.999 mm (2.4015 in.)
	02	60.998 mm (2.4015 in.)
	03	60.997 mm (2.4015 in.)
	04	60.996 mm (2.4014 in.)
	05	60.995 mm (2.4014 in.)
	06	60.994 mm (2.4013 in.)
	07	60.993 mm (2.4012 in.)
	08	60.992 mm (2.4012 in.)
	09	60.991 mm (2.4012 in.)
	10	60.990 mm (2.4012 in.)
	11	60.989 mm (2.4011 in.)
	12	60.988 mm (2.4011 in.)
Standard bearing center wall thickness	1	2.486 to 2.489 mm (0.0979 to 0.0980 in.)
	2	2.489 to 2.492 mm (0.0980 to 0.0981 in.)
	3	2.492 to 2.495 mm (0.0981 to 0.0982 in.)
	4	2.495 to 2.498 mm (0.0982 to 0.0983 in.)
	5	2.498 to 2.501 mm (0.0983 to 0.0985 in.)
	6	2.501 to 2.504 mm (0.0985 to 0.0986 in.)
	7	2.504 to 2.507 mm (0.0986 to 0.0987 in.)

(l) Completely remove the plastigage.

15. REMOVE CRANKSHAFT

(a) Lift the crankshaft.

(b) Remove the 4 upper main bearings and 2 upper thrust washers from the cylinder block.

HINT:

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

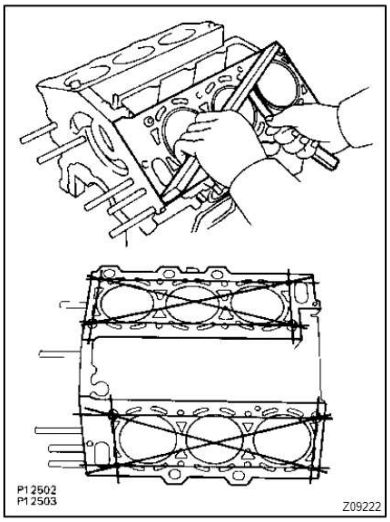
16. REMOVE CRANKSHAFT THRUST WASHER SET

17. REMOVE CRANKSHAFT BEARING

18. CLEAN CYLINDER BLOCK

NOTICE:

If the cylinder is washed at high temperatures, the cylinder liner sticks out beyond the cylinder block. Always wash the cylinder block at a temperature of 45°C (113°F) or less.

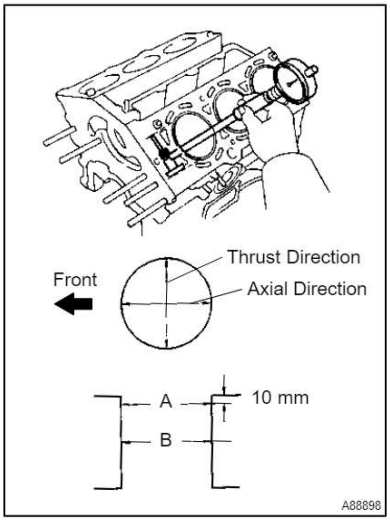


19. INSPECT CYLINDER BLOCK FOR FLATNESS

(a) Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head gasket for warpage.

Maximum warpage: 0.05 mm (0.0020 in.)

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



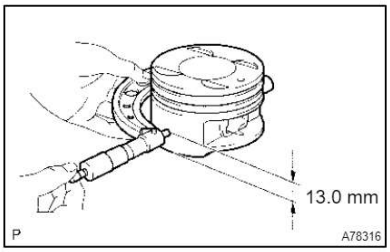
20. INSPECT CYLINDER BORE

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

Specified diameter:

92.000 to 92.132 mm (3.6220 to 3.6272 in.)

If the measured diameters is greater than the maximum, replace the cylinder block.



21. INSPECT W/PIN PISTON SUB-ASSY

(a) Using a micrometer, measure the diameter of the piston. When you measure the diameter, attach the micrometer to a location where 13.0 mm (0.512 in.) above from the piston bottom and meets at the right angles to the piston pin hole.

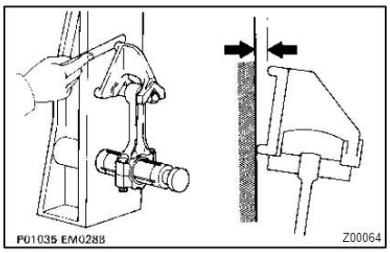
Piston diameter:

91.953 to 91.967 mm (3.6202 to 3.6207 in.)

22. INSPECT PISTON OIL CLEARANCE

(a) Subtract the piston diameter measurement from the cylinder bore diameter measurement.
Standard oil clearance: 0.033 to 0.059 mm (0.0013 to 0.0023 in.)
Maximum oil clearance: 0.130 mm (0.0051 in.)

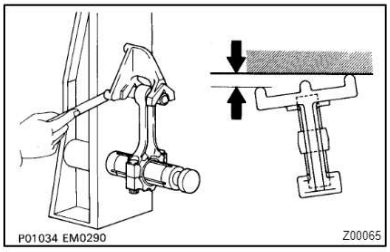
If the oil clearance is greater than the maximum, replace all the 6 pistons. If necessary, replace the cylinder block.



23. INSPECT CONNECTING ROD SUB-ASSY

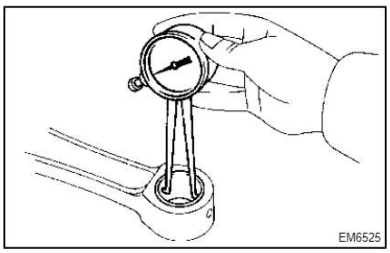
(a) Using a rod aligner and feeler gauge, check the connecting rod alignment.
(1) Check for misalignment.
Maximum misalignment:
0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

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



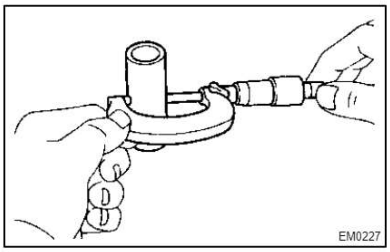
(2) Check for twist.
Maximum twist:
0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

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



24. INSPECT PISTON PIN OIL CLEARANCE

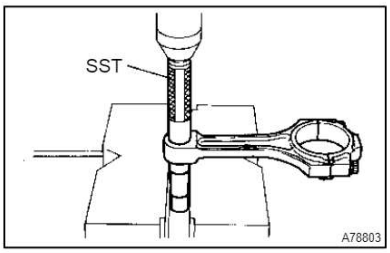
(a) Using a caliper gauge, measure the inside diameter of the connecting rod bush.
Bush inside diameter:
22.005 to 22.014 mm (0.8663 to 0.8667 in.)



(b) Using a micrometer, measure the piston pin diameter.
Piston pin diameter:
21.997 to 22.006 mm (0.8660 to 0.8664 in.)

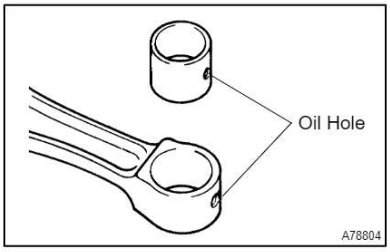
(c) Subtract the piston pin diameter measurement from the bush inside diameter measurement.
Standard oil clearance:
0.005 to 0.011 mm (0.0002 to 0.0004 in.)
Maximum oil clearance: 0.050 mm (0.0020 in.)

If the oil clearance is greater than the maximum, replace the bush. If necessary, replace the piston and the piston pin together.



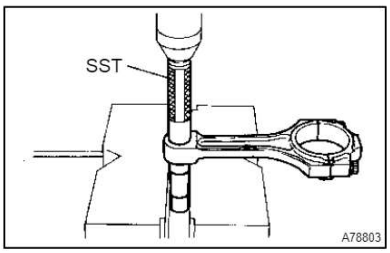
25. REMOVE CONNECTING ROD SMALL END BUSH

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

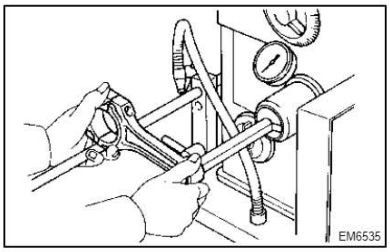


26. INSTALL CONNECTING ROD SMALL END BUSH

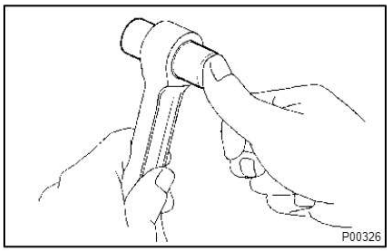
(a) Align the oil holes of a new bush and the connecting rod.



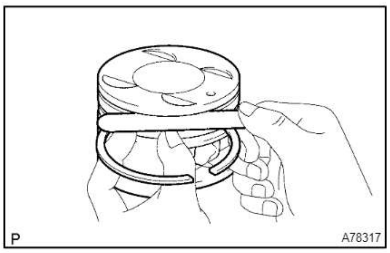
(b) Using SST and a press, press in the bush.
SST 09222-30010



(c) Using a pin hole grinder, hone the bushing to obtain the standard clearance between the bush and piston pin.
Standard oil clearance:
0.005 to 0.011 mm (0.0002 to 0.0004 in.)



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



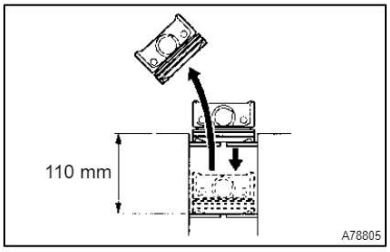
27. INSPECT RING GROOVE CLEARANCE

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

Ring groove clearance:

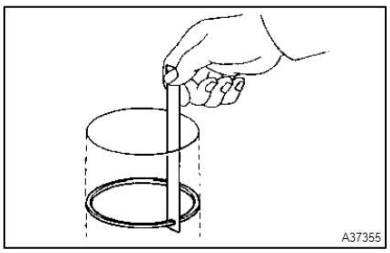
Item	Specified Condition
No. 1	0.03 to 0.08 mm (0.0012 to 0.0031 in.)
No. 2	0.02 to 0.06 mm (0.0008 to 0.0024 in.)
Oil	0.03 to 0.11 mm (0.0012 to 0.0043 in.)

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



28. INSPECT PISTON RING END GAP

(a) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block.



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

Standard end gap:

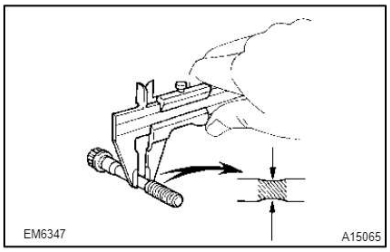
Item	Specified Condition
No. 1	0.30 to 0.40 mm (0.0118 to 0.0157 in.)
No. 2	0.50 to 0.60 mm (0.0197 to 0.0236 in.)
Oil (Side rail)	0.15 to 0.40 mm (0.0059 to 0.0157 in.)

Maximum end gap:

Item	Specified Condition
No. 1	0.95 mm (0.0374 in.)
No. 2	1.05 mm (0.0413 in.)
Oil (Side rail)	1.00 mm (0.0394 in.)

If the end gap is greater than the maximum, replace the piston ring.

If the end gap is greater than the maximum even with a new piston ring, replace the cylinder block.

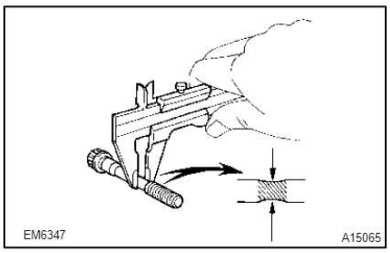


29. INSPECT CONNECTING ROD BOLT

(a) Using a vernier caliper, measure the tension portion diameter of the bolt.

Standard diameter:
7.20 to 7.30 mm (0.2830 to 0.2870 in.)
Minimum diameter: 7.0 mm (0.2760 in.)

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

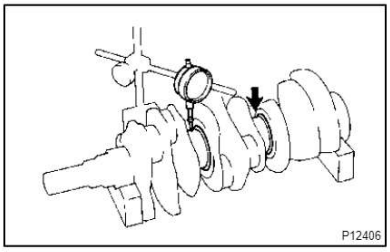


30. INSPECT CRANKSHAFT BEARING CAP SET BOLT

(a) Using a vernier caliper, measure the tension portion diameter of the bolt.

Standard diameter:
7.50 to 7.60 mm (0.2950 to 0.2990 in.)
Minimum diameter: 7.20 mm (0.2830 in.)

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

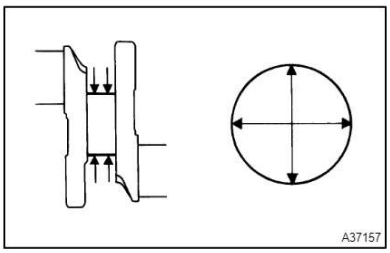


31. INSPECT CRANKSHAFT

(a) Using a dial indicator and V-blocks, measure the runout as shown in the illustration.

Maximum circle runout: 0.06 mm (0.0024 in.)

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



(b) Using a micrometer, measure the diameter of each main journal.

Diameter: 60.988 to 61.000 mm (2.4011 to 2.4016 in.)

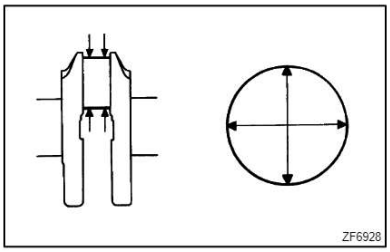
If the diameter is not as specified, check the oil clearance (see step 7).

If necessary, replace the crankshaft.

(c) Check each main journal for taper and out-of-round, as shown in the illustration.

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

If the taper and out-of-round is greater than the maximum, replace the crankshaft.



(d) Using a micrometer, measure the diameter of each crank pin.

Diameter: 52.992 to 53.000 mm (2.0863 to 2.0866 in.)

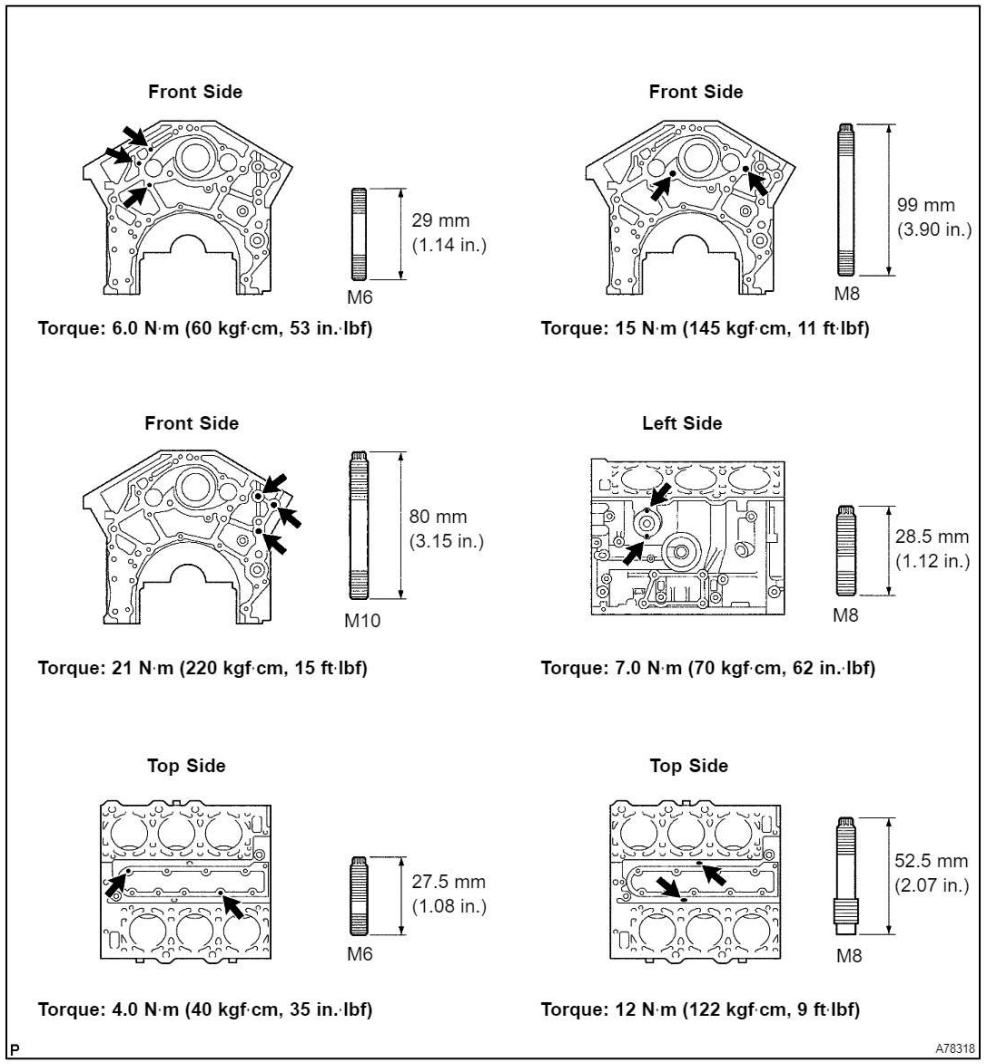
If the diameter is not as specified, check the oil clearance (see step 7).

(e) Check each crank pin for taper and out-of-round, as shown in the illustration.

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

If the taper and out-of-round is greater than the maximum, replace the crankshaft.

32. INSTALL STUD BOLT



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

Torque: 15 N·m (145 kgf·cm, 11 ft·lbf)

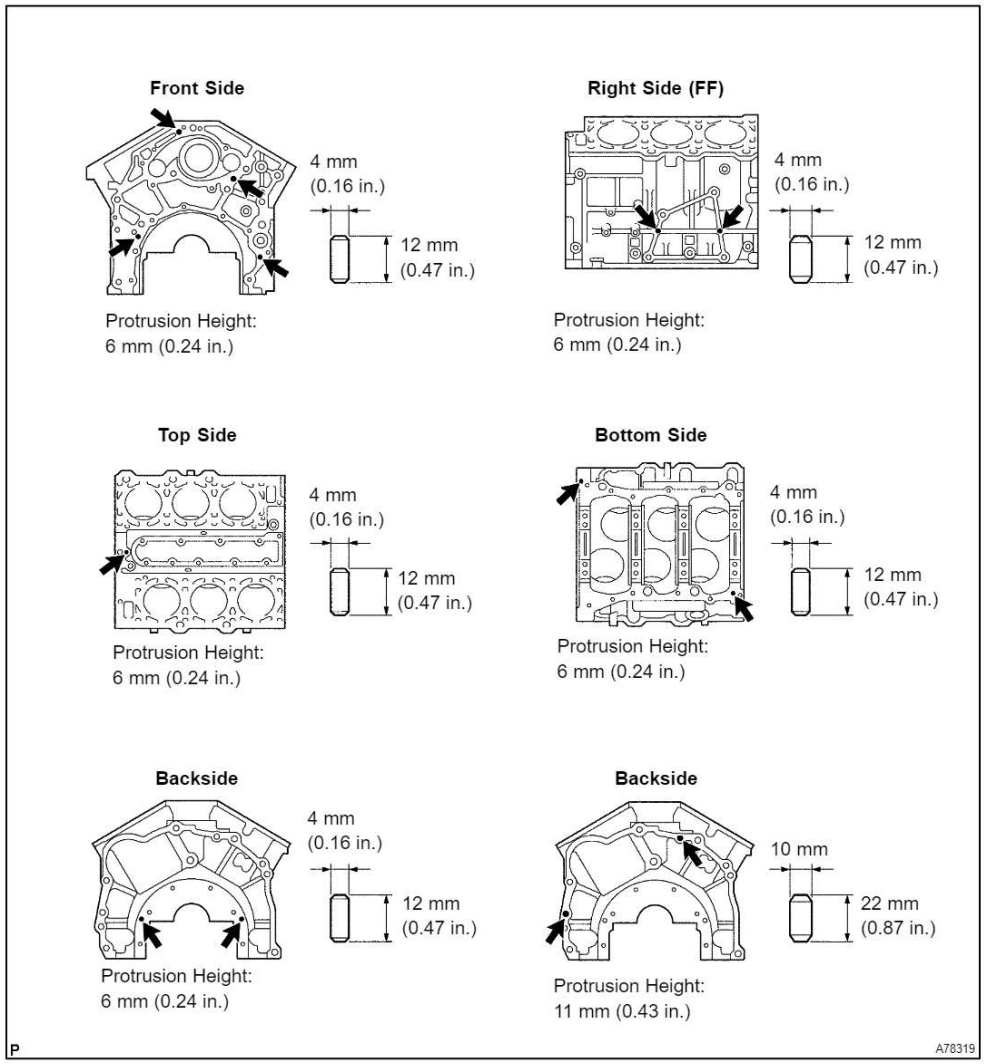
Torque: 21 N·m (220 kgf·cm, 15 ft·lbf)

Torque: 7.0 N·m (70 kgf·cm, 62 in.·lbf)

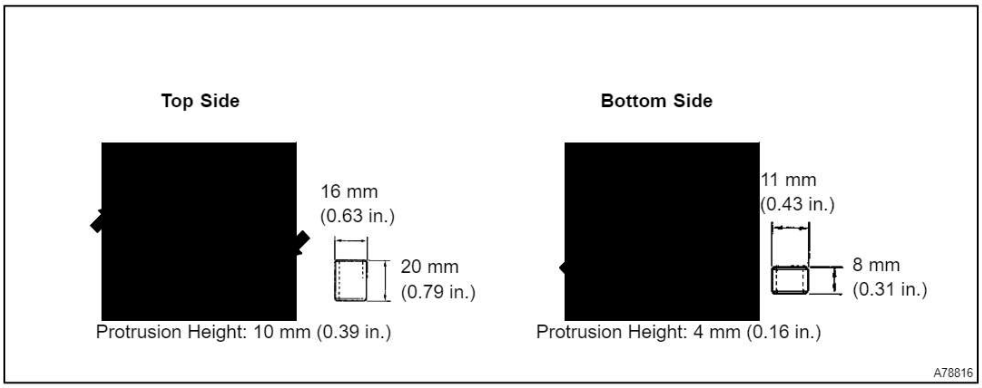
Torque: 4.0 N·m (40 kgf·cm, 35 in.·lbf)

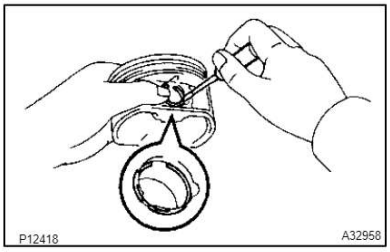
Torque: 12 N·m (122 kgf·cm, 9 ft·lbf)

33. INSTALL STRAIGHT PIN



34. INSTALL RING PIN



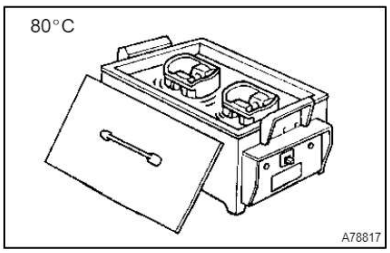


35. INSTALL PISTON PIN HOLE SNAP RING

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

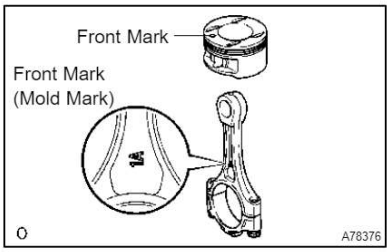
HINT:

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



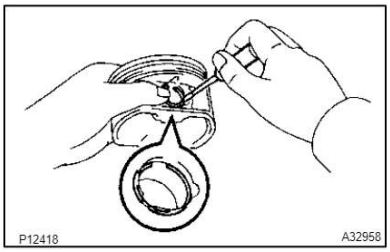
36. INSTALL W/PIN PISTON SUB-ASSY

(a) Gradually heat the piston to about 80°C (176°F).



(b) Coat the piston pin with engine oil.

(c) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb until the pin contacts the snap ring.

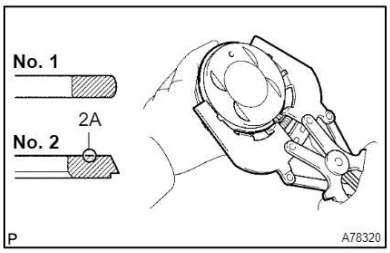


37. INSTALL PISTON PIN HOLE SNAP RING

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

HINT:

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



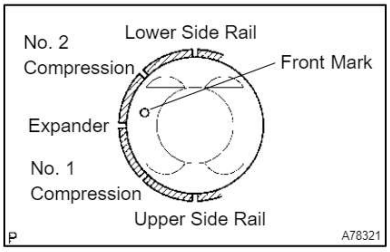
38. INSTALL PISTON RING SET

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

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

HINT:

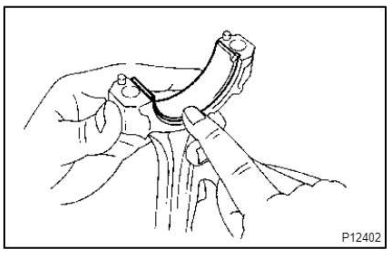
The compression ring No. 2 is installed with code mark "2A" faced upward, as shown in the illustration.



(c) Position the piston rings so that the ring ends are arranged, as shown in the illustration.

NOTICE:

Do not align the ring ends.

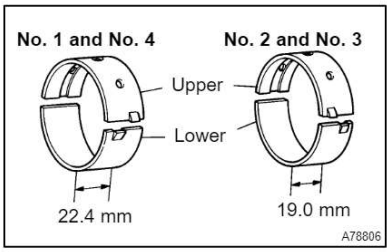


39. INSTALL CONNECTING ROD BEARING

(a) Align the key of the bearing with the keyway of the connecting rod or connecting cap.

NOTICE:

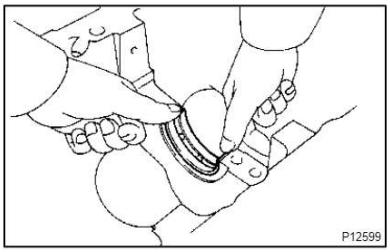
Clean the backside of the bearing and the bearing surface of the connecting rod. The surface should be free of dust and oils.



40. INSTALL CRANKSHAFT BEARING

HINT:

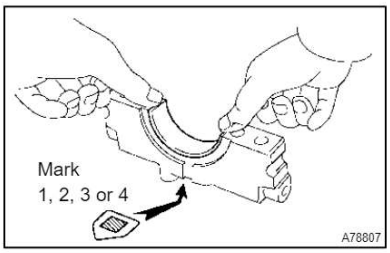
Main bearings come in width of 22.4 mm (0.882 in.) and 19.0 mm (0.748 in.). Install the 22.4mm (0.882 in.) bearings in the No. 1 and No. 4 cylinder block journal positions with the main bearing cap. Install the 19.0 mm (0.748 in.) bearings in the No. 2 and No. 3 positions.



(a) Align the key of the bearing with the keyway of the cylinder block, and push in the 4 upper bearings.

NOTICE:

Do not apply engine oil to the bearing and its contact surface.



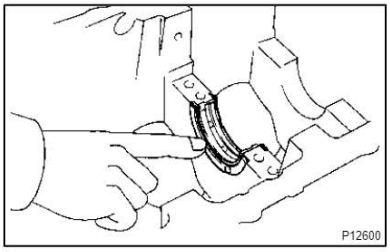
(b) Align the key of the bearing with the keyway of the main bearing cap, and push in the 4 lower bearings.

NOTICE:

Do not apply engine oil to the bearing and its contact surface.

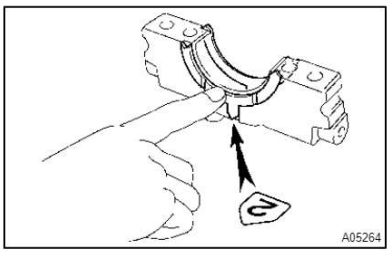
HINT:

A number is marked on each main bearing cap to indicate the installation position.



41. INSTALL CRANKSHAFT THRUST WASHER SET

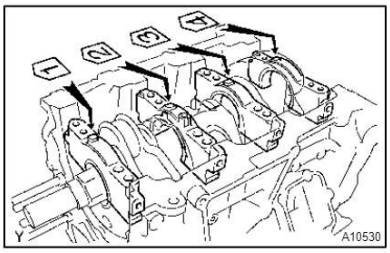
(a) Install the 2 thrust washers under the No. 2 journal position of the cylinder block with the oil grooves facing outward.



(b) Install the 2 thrust washers on the No. 2 bearing cap with the grooves facing outward.

42. INSTALL CRANKSHAFT

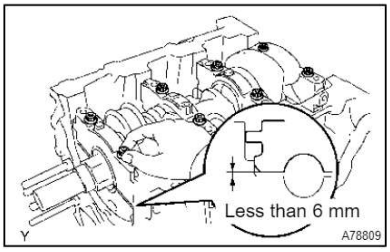
(a) Apply engine oil to the upper bearing and install the crankshaft on the cylinder block.



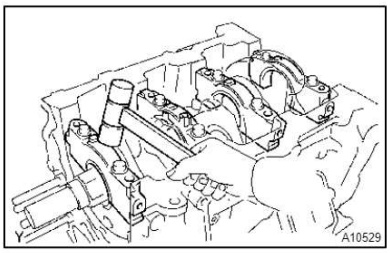
(b) Examine the front marks and numbers. Install the bearing caps on the cylinder block.

(c) Apply a light coat of engine oil on the threads of the bearing cap bolts.

(d) Temporarily install the 8 main bearing cap bolts to the inside positions.

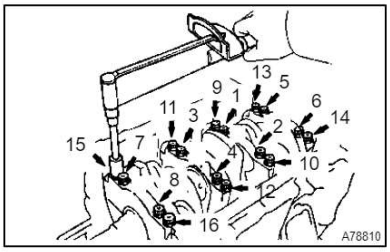


(e) Install the main bearing cap by hand using the inner bolt as a guide. Stop the main bearing cap about 6 mm (0.23 in.) away from contacting with the block.

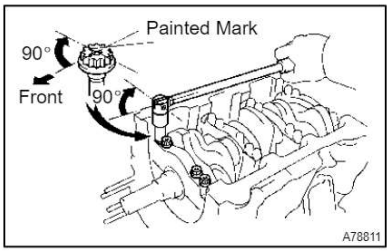


(f) Using a plastic-faced hammer, lightly tap the bearing cap to ensure a proper fit.

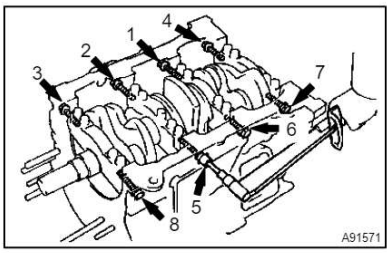
(g) Apply a light coat of engine oil on the threads of the main bearing cap bolts.



(h) Uniformly install and tighten the 16 main bearing cap bolts in the sequence shown in the illustration.
Torque: 22 N·m (224 kgf·cm, 16 ft·lbf)

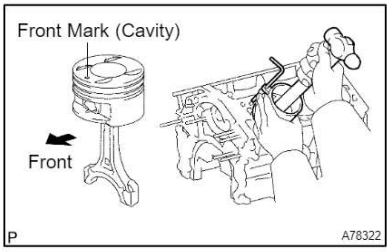


(i) Mark the front side of the bearing cap bolts with paint.
(j) Retighten the bearing cap bolts by 90° in the same sequence as step (h).
(k) Check that each painted mark is now at a 90° angle to the front.
(l) Check that the crankshaft turns smoothly.



(m) Uniformly install and tighten the 8 main bearing cap bolts in the sequence shown in the illustration.
Torque: 27 N·m (275 kgf·cm, 20 ft·lbf)

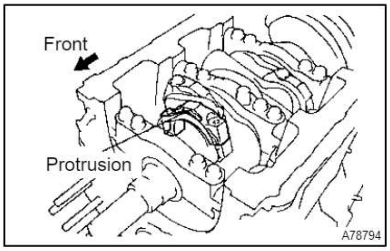
HINT:
Use the short bolt for the marked positions (arrow).



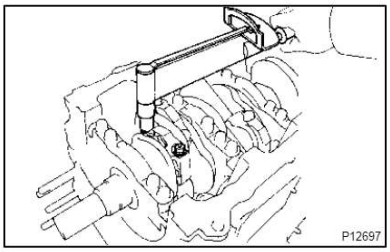
43. INSTALL PISTON SUB-ASSY W/CONNECTING ROD

(a) Apply engine oil to the cylinder walls, the pistons, and the surfaces of connecting rod bearings.
(b) Check the position of the piston ring ends.
(c) Using a piston ring compressor, push the piston that numbered correctly and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.

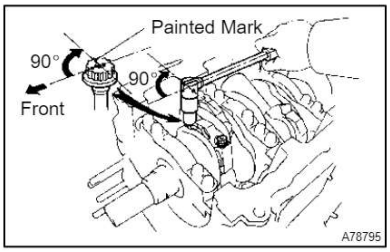
NOTICE:
Match the numbered connecting rod cap with the connecting rod.



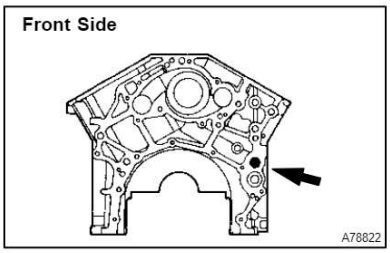
(d) Check that the protrusion of the connecting rod cap is facing the correct direction.
(e) Apply a light coat of engine oil on the threads of the connecting rod cap bolts.



(f) Tighten the bolts in several steps by the specified torque.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

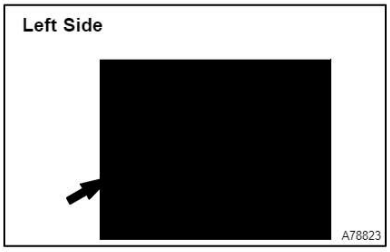


(g) Mark the front side of each connecting cap bolt with paint.
(h) Retighten the cap bolts by 90° as shown in the illustration.
(i) Check that the crankshaft turns smoothly.



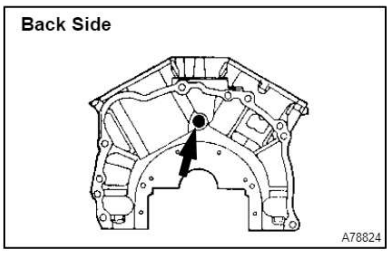
44. INSTALL CYLINDER BLOCK W/HEAD STRAIGHT SCREW NO.1 PLUG

(a) Using a socket hexagon wrench 10, install a new gasket and the screw plug.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)



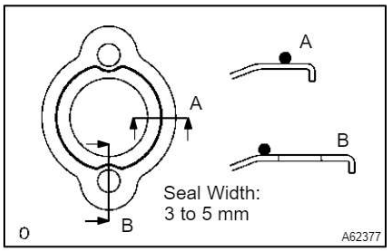
45. INSTALL CYLINDER BLOCK W/HEAD STRAIGHT SCREW NO.2 PLUG

(a) Using a socket hexagon wrench 10, install a new gasket and the screw plug.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)



46. INSTALL CYLINDER BLOCK W/HEAD STRAIGHT SCREW NO.3 PLUG

(a) Using a socket hexagon wrench 10, install a new gasket and the screw plug.
Torque: 50 N·m (510 kgf·cm, 37 ft·lbf)



47. INSTALL WATER SEAL PLATE

(a) Remove any old seal packing from the contact surface.

(b) Apply a continuous bead of seal packing (seal width: 3 to 5 mm (0.12 to 0.20 in.)), as shown in the illustration.
Seal packing: Part No. 08826-00100 or equivalent

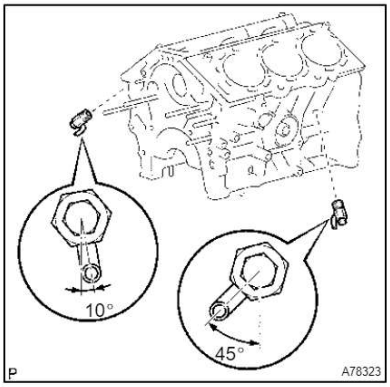
NOTICE:

- **Remove any oil from the contact surface.**
- **Install the seal plate within 3 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing.**

(c) Install the seal plate with the 2 nuts.
Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)

48. INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB-ASSY

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



(b) After applying the specified torque, rotate the drain cock clockwise, as shown in the illustration.
Torque: 39 N·m (398 kgf·cm, 29 ft·lbf)

NOTICE:

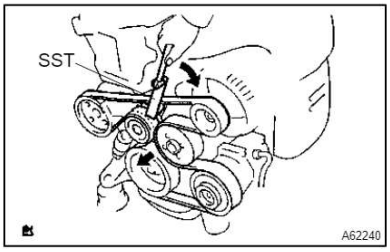
- **Install the drain cock within 3 minutes after applying adhesive.**
- **Do not expose the seal to coolant for at least 1 hour after installing.**
- **Do not rotate the drain cock more than 1 revolution (360°) after tightening the drain cock with the specified torque.**
- **Do not loosen the drain cock after setting it correctly.**

FAN AND GENERATOR V BELT (2AZ-FE)

141P1-02

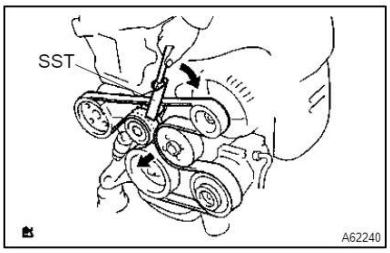
REPLACEMENT

1. REMOVE FRONT WHEEL RH
2. REMOVE FRONT FENDER SPLASH SHIELD FRONT RH
3. REMOVE FRONT FENDER APRON SEAL RH
4. REMOVE ENGINE MOUNTING STAY NO.2 RH
5. REMOVE ENGINE COVER SUB-ASSY NO.1
6. REMOVE ENGINE MOVING CONTROL ROD W/BRACKET (See page 14-24)
7. REMOVE ENGINE MOUNTING BRACKET NO.2 RH



8. REMOVE FAN AND GENERATOR V BELT

(a) Slowly turn the belt tensioner clockwise for more than 3 seconds, and remove the drive belt by using SST.
SST 09843-18030



9. INSTALL FAN AND GENERATOR V BELT

(a) Slowly turn the belt tensioner clockwise for more than 3 seconds, and install the drive belt by using SST.
SST 09249-63010

10. INSTALL ENGINE MOUNTING BRACKET NO.2 RH
Torque: 52 N·m (531 kgf·cm, 38 ft·lbf)
11. INSTALL ENGINE MOVING CONTROL ROD W/BRACKET (See page 14-24)
12. INSTALL ENGINE MOUNTING STAY NO.2 RH
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)
13. INSTALL FRONT WHEEL RH

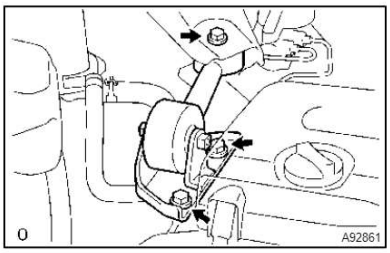
141P4-03

REPLACEMENT

1. **WORK FOR PREVENTING GASOLINE FROM SPILLING OUT (See page 11-1)**
2. **REMOVE FRONT WHEEL**
3. **REMOVE ENGINE UNDER COVER NO.1**
4. **REMOVE FRONT FENDER SPLASH SHIELD FRONT RH**
5. **REMOVE FRONT FENDER SPLASH SHIELD FRONTR LH**
6. **REMOVE FRONT FENDER APRON SEAL RH**
7. **DRAIN COOLANT (See page 16-6)**
8. **DRAIN AUTOMATIC TRANSAXLE FLUID**

(a) Using a 10 mm hexagon wrench, remove the drain plug and gasket. Drain automatic transaxle fluid.
(b) Install a new gasket and the drain plug.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

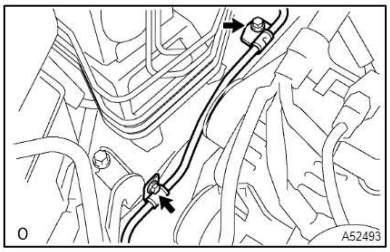
9. **DRAIN TRANSFER OIL (4WD TYPE)**
10. **REMOVE BATTERY**
11. **REMOVE AIR CLEANER ASSY**
12. **DISCONNECT RADIATOR HOSE INLET**
13. **DISCONNECT RADIATOR HOSE OUTLET**
14. **DISCONNECT OIL COOLER INLET HOSE**
15. **DISCONNECT OIL COOLER OUTLET HOSE**
16. **REMOVE ENGINE MOUNTING STAY NO.2 RH**



17. **REMOVE ENGINE MOVING CONTROL ROD W/BRACKET**

(a) Remove the 3 bolts and engine moving control rod.

18. **REMOVE ENGINE MOUNTING BRACKET NO.2 RH**
19. **REMOVE FAN AND GENERATOR V BELT (See page 14-5)**
20. **DISCONNECT VANE PUMP OIL RESERVOIR ASSY**



21. **DISCONNECT RETURN TUBE SUB-ASSY**

(a) Remove the 2 bolts and disconnect the return tube.

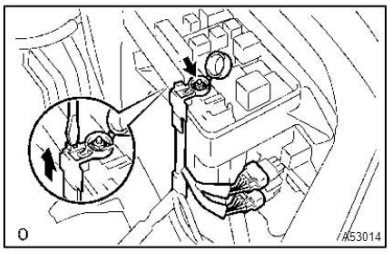
22. DISCONNECT UNION TO CHECK VALVE HOSE

23. DISCONNECT TRANSMISSION CONTROL CABLE ASSY (See page 40-34)

24. DISCONNECT HEATER INLET WATER HOSE

25. DISCONNECT HEATER OUTLET WATER HOSE

26. DISCONNECT FUEL TUBE SUB-ASSY (See page 11-1)



27. DISCONNECT ENGINE ROOM MAIN WIRE

(a) Disconnect the engine wire from the ECM and J/B.

(b) Disconnect the engine wire from the engine room J/B.

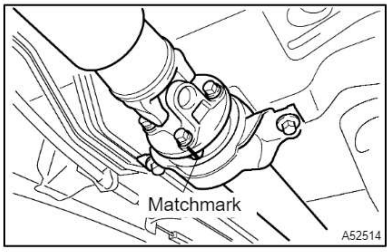
(1) Remove the nut fixing the wire harness.

(2) Using a screwdriver, unlock the engine room J/B. Disconnect the engine wire by pulling it upward.

(3) Disconnect the connectors.

(4) Remove the body ground.

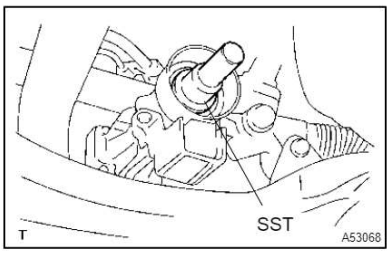
28. REMOVE EXHAUST PIPE ASSY FRONT (See page 15-2)



29. REMOVE PROPELLER SHAFT (4WD TYPE)

(a) Place the matchmarks on both of the flanges.

(b) Remove the 4 nuts, 4 bolts and 4 washers.



(c) Insert SST after removing the propeller shaft.
SST 09325-20010

30. REMOVE FRONT STABILIZER LINK ASSY LH

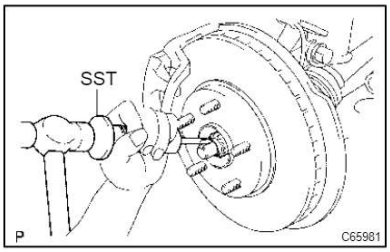
(a) Using a 6 mm socket hexagon wrench, fix the stud bolt.

(b) Remove the nut and disconnect the stabilizer link.

31. REMOVE FRONT STABILIZER LINK ASSY RH

HINT:

Use the same procedures described for the LH side.



32. REMOVE FRONT AXLE HUB RH NUT

(a) Using SST and a hammer, strike the lock nut covering to remove it.
SST 09930-00010

NOTICE:

- **Set the drive shaft's groove so that it faces up. Then use the SST and a hammer.**
- **Remove the covering from the lock nut completely or the screw of the drive shaft may be damaged.**
- **Do not sharpen the tip of the SST.**

(b) Using a 30 mm socket wrench, remove the lock nut.

33. REMOVE FRONT AXLE HUB LH NUT

HINT:
Use the same procedures described for the LH side.

34. DISCONNECT SPEED SENSOR FRONT LH

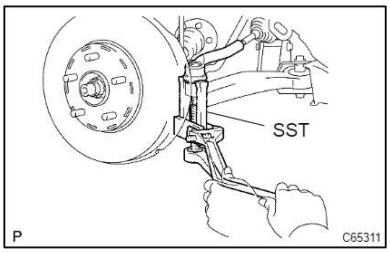
(a) Remove the bolt and disconnect the speed sensor from the steering knuckle.

NOTICE:

Keep the speed sensor tip and connection free from a foreign matter.

35. DISCONNECT SPEED SENSOR FRONT RH

HINT:
Use the same procedures described for the LH side.



36. DISCONNECT TIE ROD ASSY LH

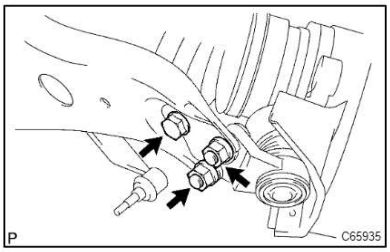
(a) Remove the cotter pin and castle nut.
(b) Using SST, disconnect the tie rod end from the steering knuckle.
SST 09628-6201 1

NOTICE:

Be careful not to damage the cover of the ball joint.

37. DISCONNECT TIE ROD ASSY RH

HINT:
Use the same procedures described for the LH side.



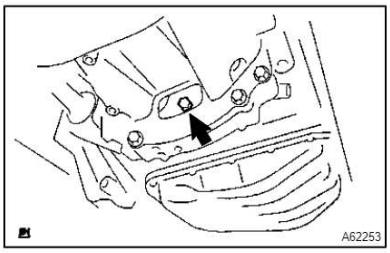
38. DISCONNECT FRONT SUSPENSION ARM SUB-ASSY LOWER NO.1 LH

(a) Fix the crankshaft and remove the 6 setting bolts.

39. DISCONNECT FRONT SUSPENSION ARM SUB-ASSY LOWER NO.1 RH

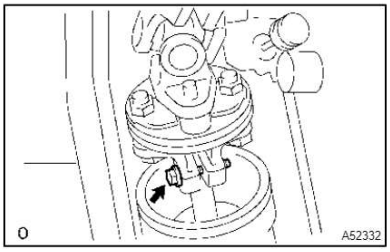
HINT:

Use the same procedures described for the LH side.



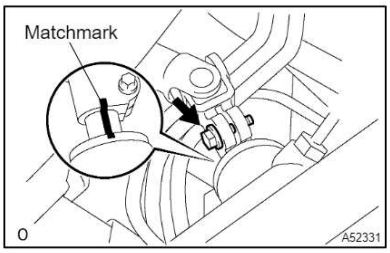
40. REMOVE DRIVE PLATE & TORQUE CONVERTER CLUTCH SETTING BOLT

(a) Fix the crankshaft and remove the 6 setting bolts.



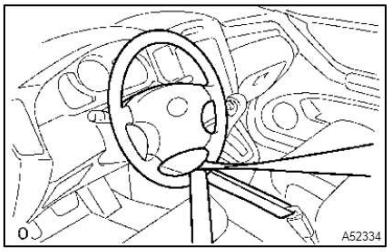
41. DISCONNECT STEERING INTERMEDIATE SHAFT SUB-ASSY

(a) Loosen the sliding yoke bolt.



(b) Place matchmarks on the intermediate shaft and control valve shaft.

(c) Remove the bolt and the steering intermediate shaft.



(d) To prevent the steering wheel from rotating, fix the wheel with the seat belt.

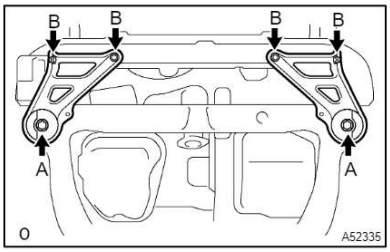
NOTICE:

If the steering wheel is not fixed, the spiral cable will be damaged.

42. DISCONNECT COMPRESSOR AND MAGNETIC CLUTCH

HINT:

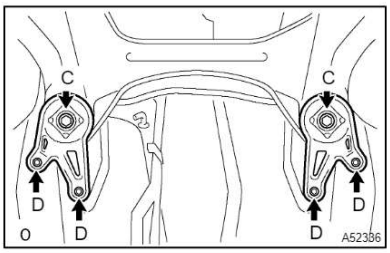
Hung up the hoses instead of detaching.



43. REMOVE ENGINE ASSEMBLY WITH TRANSAXLE

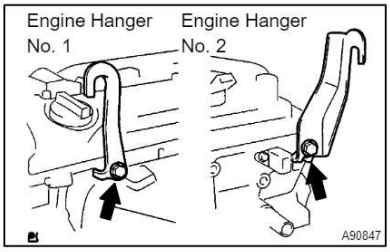
(a) Set the engine lifter.

(b) Remove the 6 bolts and frame side rail plate RH and LH.



(c) Remove the 6 bolts and front suspension member brace rear RH and LH.

(d) Carefully remove the engine assembly from the vehicle.

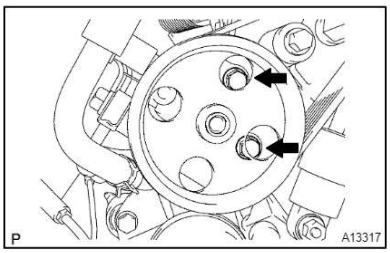


(e) Install the 2 engine hangers as shown in the illustration.
Parts No.:

Engine hanger No. 1	12281-28010
Engine hanger No. 2	12282-28010
Bolt	91512-61020

Torque: 38 N·m (387 kgf·cm, 28 ft lbf)

(f) Using a chain block and an engine sling device, hang the engine assembly.



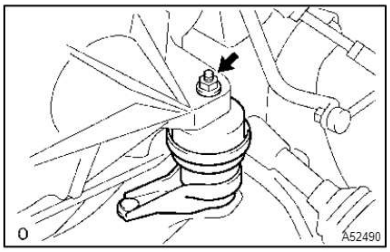
44. REMOVE VANE PUMP ASSY

(a) Disconnect the PS oil pressure switch connector.

(b) Remove the 2 bolts and vane pump from the engine.

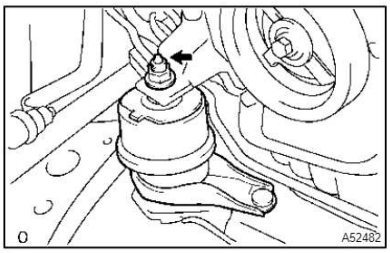
45. REMOVE STABILIZER BAR FRONT (4WD TYPE)

46. REMOVE RACK & PINION POWER STEERING GEAR ASSY (4WD TYPE)

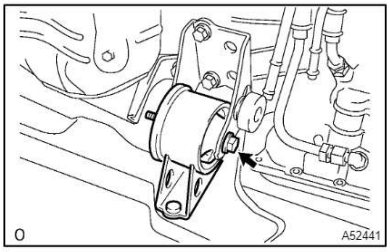


47. REMOVE FRONT FRAME ASSY

(a) Remove the nut installing the engine mounting insulator LH.

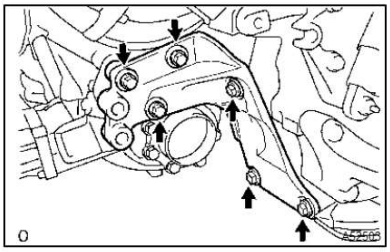


(b) Remove the nut installing the engine mounting insulator RH.



(c) Remove the nut installing the engine mounting insulator FR.

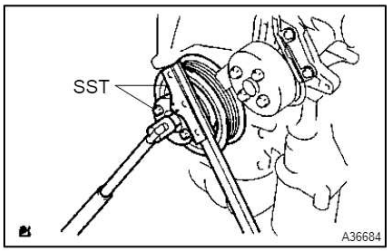
48. REMOVE FRONT DRIVE SHAFT ASSY RH (4WD TYPE) (See page 30-21)



49. REMOVE ENGINE MOUNTING BRACKET RR (4WD TYPE)

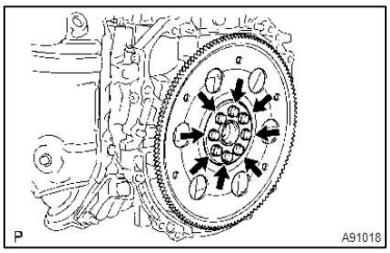
(a) Remove the 6 bolts and engine mounting bracket RR.

50. REMOVE TRANSFER ASSY (4WD TYPE) (See page 31-9)
51. REMOVE FRONT DRIVE SHAFT ASSY LH (See page 30-21)
52. REMOVE FRONT DRIVE SHAFT ASSY RH (2WD TYPE) (See page 30-21)
53. REMOVE STARTER ASSY (See page 19-4)
54. REMOVE AUTOMATIC TRANSAXLE ASSY (See page 40-12)



55. REMOVE DRIVE PLATE & RING GEAR SUB-ASSY

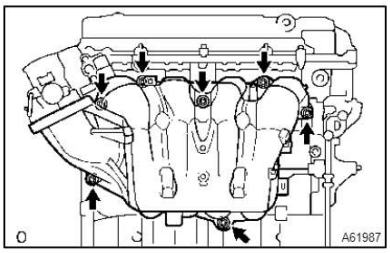
(a) Using SST, fix the crankshaft.
SST 09213-54015 (91651-60855), 09330-00021



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

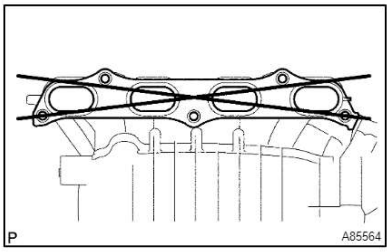
56. INSTALL ENGINE STAND

57. REMOVE ENGINE COVER SUB-ASSY NO.1



58. REMOVE INTAKE MANIFOLD

(a) Remove the 5 bolts, 2 nuts, intake manifold and gasket.



59. INSPECT INTAKE MANIFOLD

(a) Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.
Maximum warpage: 2.0 mm (0.079 in.)

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

60. REMOVE VENTILATION HOSE No.1

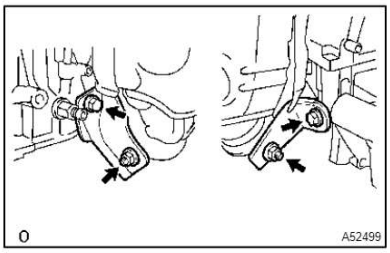
61. REMOVE VENTILATION HOSE NO.2

62. REMOVE ENGINE WIRE

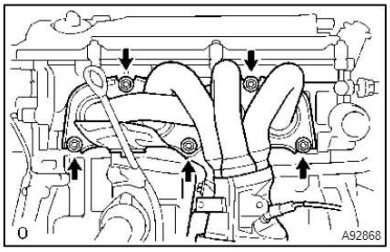
63. REMOVE INTAKE MANIFOLD INSULATOR NO.1

64. REMOVE GENERATOR ASSY

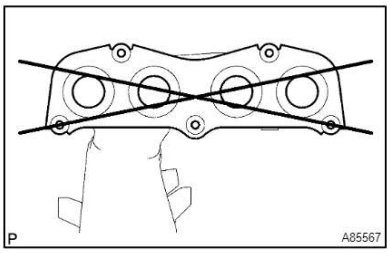
65. REMOVE OIL LEVEL GAGE SUB-ASSY
66. REMOVE OIL LEVEL GAGE GUIDE
67. REMOVE MANIFOLD CONVERTER INSULATOR NO.1



68. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSY
(a) Remove the 3 bolts, 2 nuts, and the No. 1 and No. 2 exhaust manifold stays.

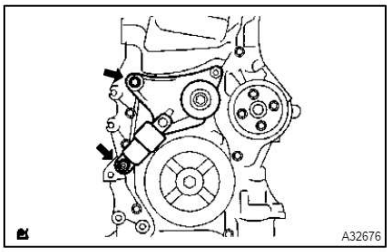


(b) Remove the 5 nuts, exhaust manifold converter and gasket.



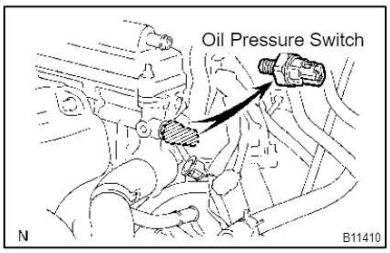
69. INSPECT EXHAUST MANIFOLD CONVERTER SUB-ASSY
(a) Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.
Maximum warpage: 0.70 mm (0.0276 in.)
If the warpage is greater than the maximum, replace the manifold.

70. REMOVE WATER INLET
71. REMOVE THERMOSTAT
72. REMOVE IGNITION COIL ASSY
73. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSY

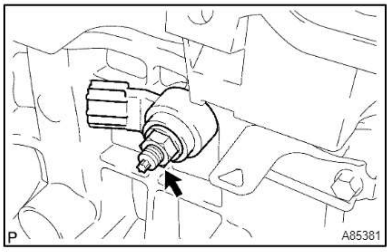


74. REMOVE V-RIBBED BELT TENSIONER ASSY
(a) Remove the bolt, nut and belt tensioner.

75. REMOVE DRIVE SHAFT BEARING BRACKET (2WD TYPE)
76. REMOVE ENGINE MOUNTING BRACKET RH
77. REMOVE FUEL DELIVERY PIPE W/INJECTOR (See page 11-10)
78. REMOVE WATER BY-PASS PIPE NO.1
79. REMOVE OIL COOLER PIPE (W/ OIL COOLER)
80. REMOVE OIL COOLER HOSE (W/ OIL COOLER)

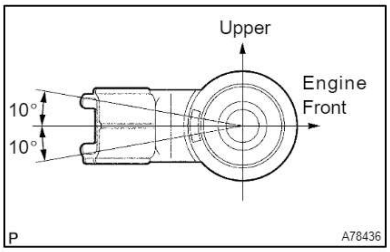


81. REMOVE ENGINE OIL PRESSURE SWITCH ASSY
(a) Remove the oil pressure switch.



82. REMOVE KNOCK SENSOR
(a) Remove the nut and the sensor.

83. REMOVE ENGINE COOLANT TEMPERATURE SENSOR
84. REPLACE PARTIAL ENGINE ASSY
85. INSTALL ENGINE COOLANT TEMPERATURE SENSOR
(a) Install a new gasket to the sensor.
(b) Install the sensor.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)



86. INSTALL KNOCK SENSOR
(a) Install the sensor with the nut.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)
HINT:
Angling the knock sensor below the horizontal (below 0°) is recommended.

87. INSTALL ENGINE OIL PRESSURE SWITCH ASSY

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

(b) Install the oil pressure switch.
Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)

88. INSTALL OIL COOLER PIPE (W/ OIL COOLER)

(a) Install a new gasket and the oil cooler pipe with the bolt and 2 nuts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

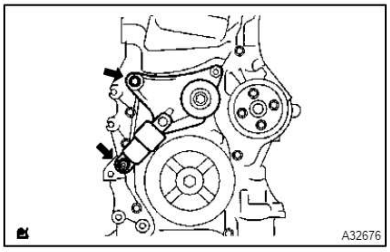
89. INSTALL WATER BY-PASS PIPE NO.1

(a) Install a new gasket and the by-pass pipe with the bolt and 2 nuts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

90. INSTALL FUEL DELIVERY PIPE W/INJECTOR (See page 11-10)

91. INSTALL ENGINE MOUNTING BRACKET RH
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)

92. INSTALL DRIVE SHAFT BEARING BRACKET (2WD TYPE)
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)



93. INSTALL V-RIBBED BELT TENSIONER ASSY

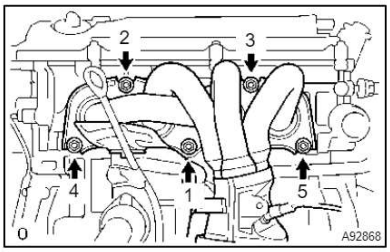
(a) Install the belt tensioner with the bolt and nut.
Torque: 60 N·m (612 kgf·cm, 44 ft·lbf)

94. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSY
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

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

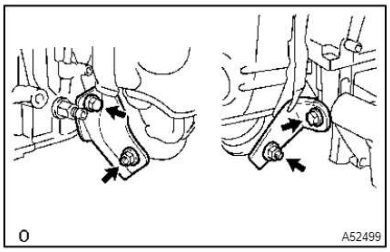
96. INSTALL THERMOSTAT (See page 16-1 1)

97. INSTALL WATER INLET
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



98. INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSY

(a) Install a new gasket and the exhaust manifold converter. Uniformly tighten the 5 nuts in the sequence shown in the illustration.
Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)



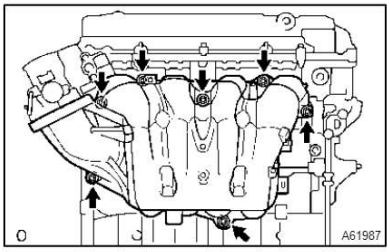
(b) Install the No. 1 and No. 2 exhaust manifold stays with the 2 bolts and 2 nuts.
Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)

99. INSTALL MANIFOLD CONVERTER INSULATOR NO.1

100. INSTALL OIL LEVEL GAGE GUIDE

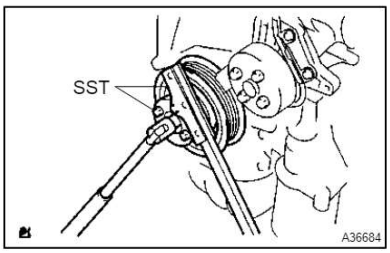
(a) Apply a light coat of the engine oil to the O-ring and install it to the guide.
(b) Install the oil level gage and guide with the bolt.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

101. INSTALL GENERATOR ASSY (See page 19-40)



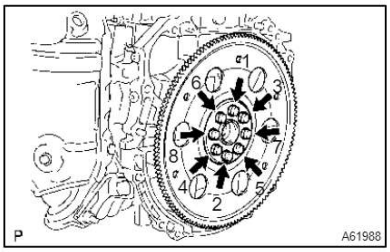
102. INSTALL INTAKE MANIFOLD

(a) Install a new gasket and the intake manifold with the 5 bolts and 2 nuts. Uniformly tighten the bolts in several passes.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)



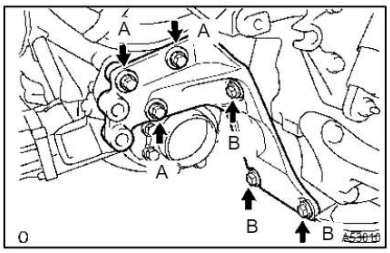
103. INSTALL DRIVE PLATE & RING GEAR SUB-ASSY

(a) Using SST, fix the crankshaft.
SST 09213-54015 (91651-60855), 09330-00021
(b) Apply adhesive to 2 or 3 threads of the bolt end.
Adhesive:
Part No. 08833-00070, THREE BOND or equivalent.



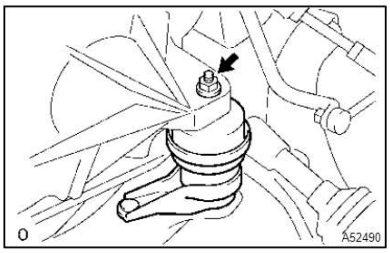
(c) Install the front spacer, drive plate and rear spacer with 8 bolts. Uniformly tighten the 8 bolts in the sequence shown in the illustration.
Torque: 98 N·m (1,000 kgf·cm, 72 ft·lbf)

104. **INSTALL AUTOMATIC TRANSAXLE ASSY (See page 40-12)**
105. **INSTALL STARTER ASSY (See page 19-4)**
Torque: 39 N·m (398 kgf·cm, 29 ft·lbf)
106. **INSTALL FRONT DRIVE SHAFT ASSY RH (2WD TYPE) (See page 30-21)**
107. **INSTALL FRONT DRIVE SHAFT ASSY LH (See page 30-21)**
108. **INSTALL TRANSFER ASSY (4WD TYPE) (See page 31-9)**

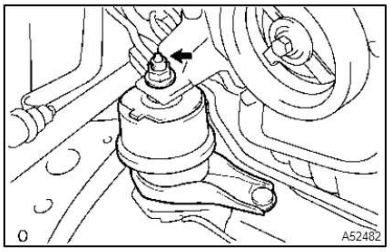


109. **INSTALL ENGINE MOUNTING BRACKET RR (4WD TYPE)**
(a) Install the mounting bracket with the 6 bolts.
Torque:
34 N·m (347 kgf·cm, 25 ft·lbf) for bolt A
64 N·m (653 kgf·cm, 47 ft·lbf) for bolt B

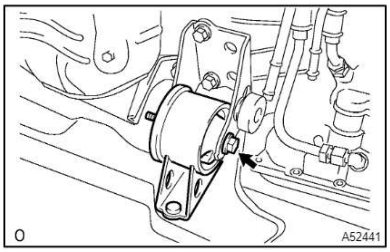
110. **INSTALL FRONT DRIVE SHAFT ASSY RH (4WD TYPE) (See page 30-21)**



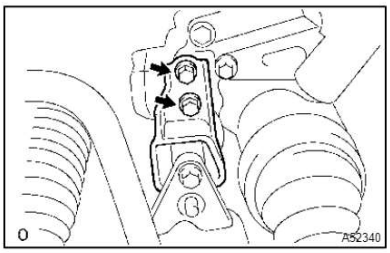
111. **INSTALL FRONT FRAME ASSY**
(a) Install the engine mounting insulator LH with the nut.
Torque: 95 N·m (969 kgf·cm, 70 ft·lbf)



(b) Install the engine mounting insulator RH with the nut.
Torque: 95 N·m (969 kgf·cm, 70 ft·lbf)



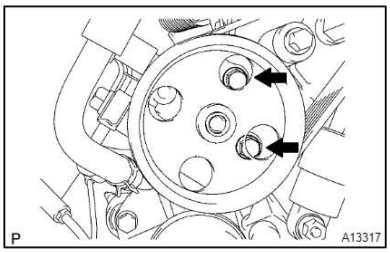
(c) Install the engine mounting insulator FR with the nut.
Torque: 87 N·m (887 kgf·cm, 64 ft·lbf)



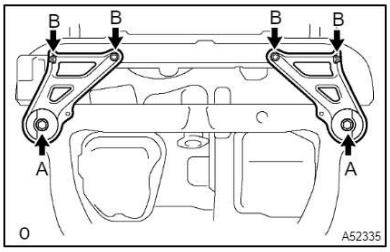
(d) 4WD type:
Install the engine mounting insulator RR with 2 nuts.
Torque: 75 N·m (765 kgf·cm, 55 ft·lbf)

112. INSTALL RACK & PINION POWER STEERING GEAR ASSY (4WD TYPE)
Torque: 70 N·m (714 kgf·cm, 52 ft·lbf)

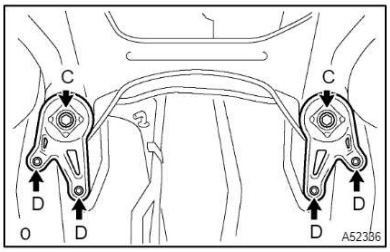
113. INSTALL STABILIZER BAR FRONT (4WD TYPE)
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)



114. INSTALL VANE PUMP ASSY
(a) Install the vane pump to the engine with the 2 bolts.
(b) Connect the PS oil pressure switch connector.
Torque: 43 N·m (438 kgf·cm, 31 ft·lbf)

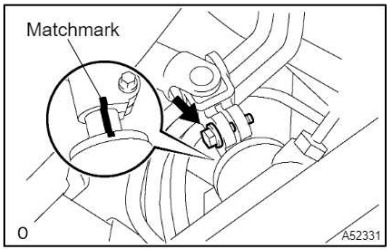


115. INSTALL ENGINE ASSEMBLY WITH TRANSAXLE
(a) Set the engine assembly with transaxle on the engine lifter.
(b) Install the engine assembly to the vehicle.
(c) Install the frame side plate LH and RH with the 6 bolts.
Torque:
86 N·m (877 kgf·cm, 63 ft·lbf) for bolt A
32 N·m (326 kgf·cm, 24 ft·lbf) for bolt B and nut



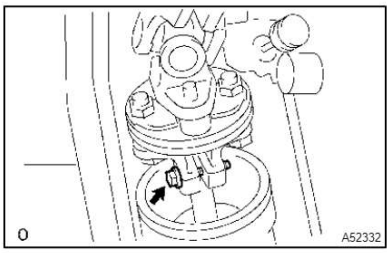
(d) Install the front suspension member brace rear RH and LH with the 6 bolts.
Torque:
86 N·m (877 kgf·cm, 63 ft·lbf) for bolt C
32 N·m (326 kgf·cm, 24 ft·lbf) for bolt D and nut

116. INSTALL COMPRESSOR AND MAGNETIC CLUTCH (See page 55-45)

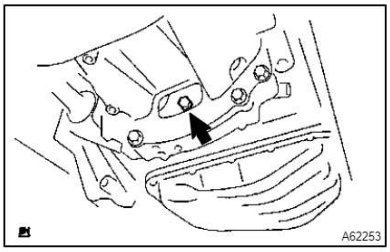


117. INSTALL STEERING INTERMEDIATE SHAFT SUB-ASSY

(a) Align the matchmarks on the intermediate shaft and control valve shaft.
Torque: 35 N·m (357 kgf·cm, 26 ft·lbf)

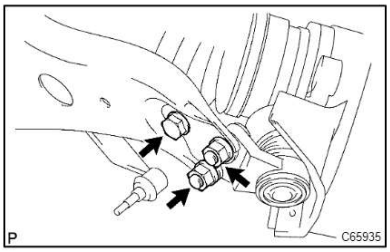


(b) Tighten the bolt.
Torque: 35 N·m (357 kgf·cm, 26 ft·lbf)



118. INSTALL BOLT, W/WASHER

(a) Fix the crankshaft, and install the 6 setting bolts.
Torque: 41 N·m (418 kgf·cm, 30 ft·lbf)



119. INSTALL FRONT SUSPENSION ARM SUB- ASSY LOWER NO.1 LH

(a) Install the drive shaft to the steering knuckle.

(b) Install the suspension lower arm with the bolt and the 2 nuts.

Torque: 127 N·m (1,295 kgf·cm, 94 ft·lbf)

120. INSTALL FRONT SUSPENSION ARM SUB-ASSY LOWER NO.1 RH

HINT:

Use the same procedures described for the LH side.

121. INSTALL TIE ROD ASSY LH

(a) Connect the tie rod end to the steering knuckle and install a new castle nut.

Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

NOTICE:

- **Prevent any lubricant from contacting the thread and the taper portions.**
- **After tightening the castle nut, tighten it to the additional direction within 60° to put into a cotter pin.**

(b) Insert a new cotter pin.

122. INSTALL TIE ROD ASSY RH

HINT:

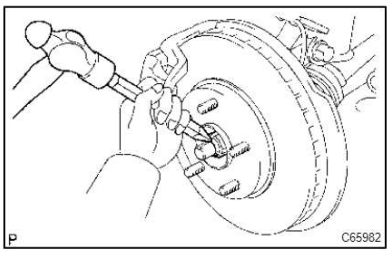
Use the same procedures described for the LH side.

123. INSTALL SPEED SENSOR FRONT LH

Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

124. INSTALL SPEED SENSOR FRONT RH

Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



125. INSTALL FRONT AXLE HUB LH NUT

(a) Using a 30 mm socket wrench, install a new hub nut.

Torque: 294 N·m (3,000 kgf·cm, 217 ft·lbf)

(b) Using a chisel and hammer, tapped the front axle hub LH nut.

126. INSTALL FRONT AXLE HUB RH NUT

HINT:

Use the same procedures described for the LH side.

127. INSTALL FRONT STABILIZER LINK ASSY LH

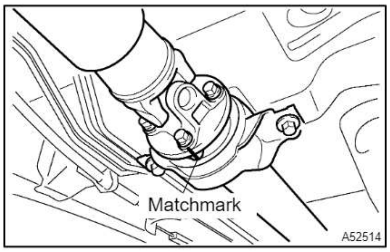
(a) Using a 5 mm socket hexagon wrench, fix the stud bolt and install the nut.

Torque: 74 N·m (755 kgf·cm, 55 ft·lbf)

128. INSTALL FRONT STABILIZER LINK ASSY RH

HINT:

Use the same procedures described for the LH side.

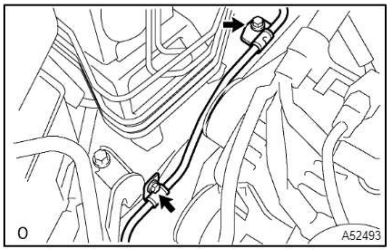


129. INSTALL PROPELLER SHAFT (4WD TYPE)

(a) Align the matchmarks on both the flanges of the front propeller shaft and intermediate shaft, then install and tighten the 4 bolts, 4 washers and 4 nuts.
Torque: 74 N·m (755 kgf·cm, 55 ft·lbf)

130. INSTALL EXHAUST PIPE ASSY FRONT (See page 15-2)

131. CONNECT FUEL TUBE SUB-ASSY (See page 11-1)

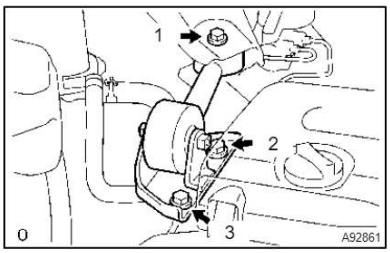


132. INSTALL RETURN TUBE SUB-ASSY

(a) Install the return tube with 2 bolts.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

133. INSTALL FAN AND GENERATOR V BELT (See page 14-5)

134. INSTALL ENGINE MOUNTING BRACKET NO.2 RH
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)



135. INSTALL ENGINE MOVING CONTROL ROD W/BRACKET

(a) Install the engine mounting control rod with the 3 bolts.
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)

HINT:
First, loosely install bolts (1) and (2) with your hand. Then use a wench to install bolt (3). Finally, tighten bolt (2) and (1), in that order.

136. INSTALL ENGINE MOUNTING STAY NO.2 RH
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)

137. INSTALL AIR CLEANER ASSY
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

138. ADD TRANSFER OIL

(a) Install a new gasket and the filler plug.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

139. ADD AUTOMATIC TRANSAXLE FLUID

140. ADD ENGINE OIL

141. ADD COOLANT (See page 16-6)

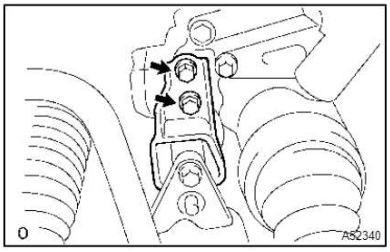
142. CHECK FOR ENGINE OIL LEAKS
143. CHECK FOR ENGINE COOLANT LEAKS (See page 16-6)
144. INSPECT FOR FUEL LEAKS (See page 11-1)
145. INSTALL FRONT WHEEL
146. ADJUST FRONT WHEEL ALIGNMENT (See page 26-7)
147. CHECK IDLE SPEED AND IGNITION TIMING (See page 14-1)
148. INSPECT CO/HC (See page 14-1)
149. CHECK ABS SPEED SENSOR SIGNAL (See page 05-765)

CYLINDER HEAD GASKET (2AZ-FE)

141PA-02

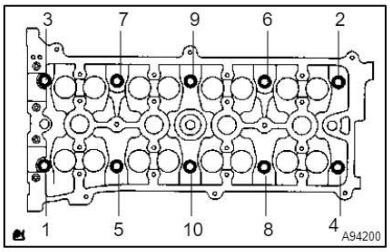
REPLACEMENT

1. WORK FOR PREVENTING GASOLINE FROM SPILLING OUT (See page 11-1)
2. REMOVE FRONT SUSPENSION BRACE SUB-ASSY UPPER CENTER (W/ FRONT SUSPENSION BRACE UPPER CENTER)
3. DRAIN COOLANT (See page 16-6)
4. DRAIN TRANSFER OIL (4WD TYPE)
5. DISCONNECT RADIATOR HOSE OUTLET
6. DISCONNECT UNION TO CONNECTOR TUBE HOSE
7. DISCONNECT HEATOR INLET WATER HOSE
8. DISCONNECT FUEL TUBE SUB-ASSY (See page 11-10)
9. SEPARATE FRONT DRIVE SHAFT ASSY RH (4WD TYPE) (See page 30-21)



10. SEPARATE ENGINE MOUNTING INSULATOR ASSY RR (4WD TYPE)
(a) Remove the 2 bolts and disconnect the engine mounting insulator.

11. REMOVE ENGINE MOUNTING BRACKET RR (4WD TYPE) (See page 14-24)
12. REMOVE INTAKE MANIFOLD (See page 14-24)
13. DISCONNECT ENGINE WIRE
14. REMOVE INTAKE MANIFOLD INSULATOR NO.1
15. REMOVE EXHAUST MANIFOLD HEAT INSULATOR NO.1
16. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSY (See page 14-24)
17. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSY
18. REMOVE CHAIN SUB-ASSY (See page 14-68)
19. REMOVE NO.2 CAMSHAFT (See page 14-41)
20. REMOVE CAMSHAFT (See page 14-41)
21. REMOVE CAMSHAFT BEARING NO.2
22. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSY



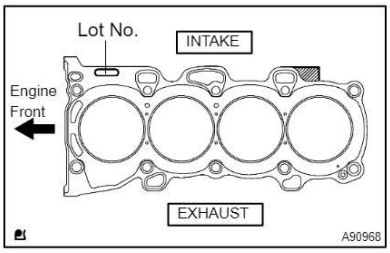
23. REMOVE CYLINDER HEAD SUB-ASSY
(a) Using a 10 mm Bi-hexagon wrench, uniformly loosen the 10 bolts in the sequence shown in the illustration. Remove the 10 cylinder head bolts and plate washers.

NOTICE:

- **Be careful not to drop washers into the cylinder head.**
- **Head warpage or cracking could result from removing bolts in an incorrect order.**

24. REMOVE CYLINDER HEAD GASKET

25. INSPECT CYLINDER HEAD SET BOLT (See page 14-41)



26. INSTALL CYLINDER HEAD GASKET

(a) Place a new gasket on the cylinder block surface with the Lot No. stamp upward.

NOTICE:

- **Remove any oil from contact surface.**
- **Be careful of the installation direction.**
- **To avoid damage to the gasket, place the cylinder head on the gasket carefully.**

27. INSTALL CYLINDER HEAD SUB-ASSY

HINT:

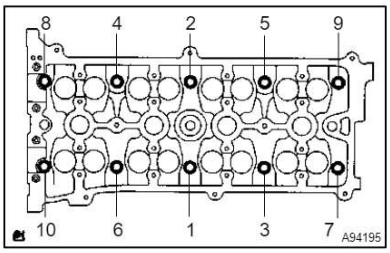
The cylinder head bolts are tightened in 2 progressive steps.

(a) Apply a light coat of engine oil to the bolt threads and the area beneath the bolt heads that come in contact with the washers.

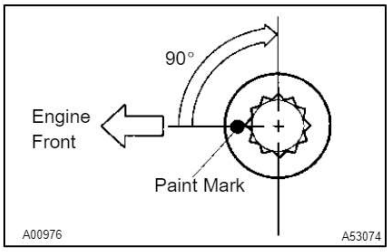
(b) Install the bolts and plate washers to the cylinder head.

NOTICE:

Do not drop the washers into the cylinder head.



(c) Using a 10 mm bi-hexagon wrench, uniformly tighten the 10 bolts in the sequence shown in the illustration.
Torque: 79 N·m (806 kgf·cm, 58 ft·lbf)



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

(e) Retighten the cylinder head bolts 90° in the sequence shown in the illustration.

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

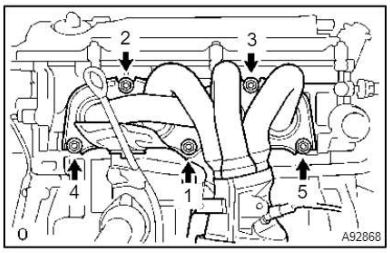
28. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSY
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

29. INSTALL CAMSHAFT BEARING NO.2

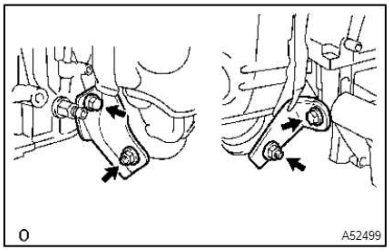
30. INSTALL CAMSHAFT (See page 14-41)

31. INSTALL NO.2 CAMSHAFT (See page 14-41)

32. **INSTALL CHAIN SUB-ASSY (See page 14-68)**
33. **INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSY**

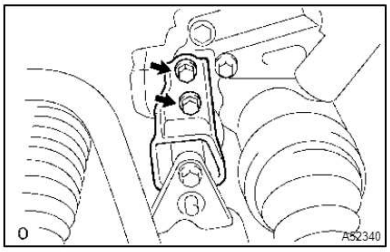


34. **INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSY**
(a) Install a new gasket and the exhaust manifold convert with the 5 nuts. Uniformly tighten the nuts in the sequence shown in the illustration.
Torque: 37 N·m (337 kgf·cm, 27 ft·lbf)



(b) Install the No. 1 and No. 2 exhaust manifold stays with the 2 bolts and 2 nuts.
Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)

35. **INSTALL EXHAUST MANIFOLD HEAT INSULATOR NO.1**
Torque: 12 N·m (122 kgf·cm, 9 ft·lbf)
36. **INSTALL INTAKE MANIFOLD INSULATOR NO.1**
37. **INSTALL ENGINE WIRE**
38. **INSTALL INTAKE MANIFOLD (See page 14-24)**
39. **INSTALL ENGINE MOUNTING BRACKET RR (4WD TYPE) (See page 14-24)**



40. **INSTALL ENGINE MOUNTING INSULATOR ASSY RR (4WD TYPE)**
(a) Install the mounting insulator with bolts.
Torque: 75 N·m (765 kgf·cm, 55 ft·lbf)

41. **INSTALL FRONT DRIVE SHAFT ASSY RH (4WD TYPE) (See page 30-21)**
42. **INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSY**
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)
43. **CONNECT FUEL TUBE SUB-ASSY (See page 11-10)**

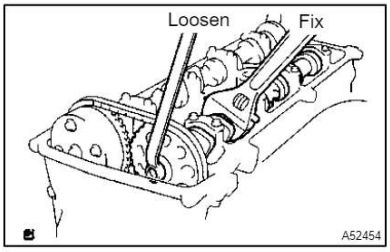
44. INSTALL FRONT SUSPENSION BRACE SUB-ASSY UPPER CENTER
Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)
45. ADD ENGINE OIL
46. ADD COOLANT (see page 16-6)
47. ADD TRANSFER OIL (4WD TYPE)
(a) Install a new gasket and the filler plug.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)
48. CHECK FOR OIL LEAKS
49. CHECK FOR ENGINE COOLANT LEAKS (See page 16-6)
50. INSPECT FOR FUEL LEAKS (See page 11-4)
51. CHECK IDLE SPEED AND IGNITION TIMING (See page 14-1)
52. INSPECT CO/HC (See page 14-1)
53. CHECK ABS SPEED SENSOR SIGNAL
54. INSPECT FRONT WHEEL ALIGNMENT (See page 26-7)

CAMSHAFT (2AZ-FE)

141PC-02

REPLACEMENT

1. REMOVE FRONT WHEEL RH
2. REMOVE FRONT FENDER SPLASH SHIELD FRONT RH
3. REMOVE FRONT FENDER APRON SEAL RH
4. REMOVE ENGINE COVER SUB-ASSY NO.1
5. REMOVE IGNITION COIL ASSY
6. REMOVE SPARK PLUG
7. DISCONNECT VENTILATION HOSE
8. DISCONNECT VENTILATION HOSE NO.2
9. DISCONNECT ENGINE WIRE
10. REMOVE CYLINDER HEAD COVER SUB-ASSY (See page 14-41)
11. SET NO. 1 CYLINDER TO TDC/COMPRESSION (See page 14-6)
12. REMOVE CHAIN TENSIONER ASSY NO.1 (See page 14-41)

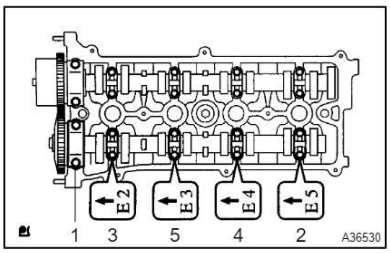


13. REMOVE NO.2 CAMSHAFT (EXHAUST)

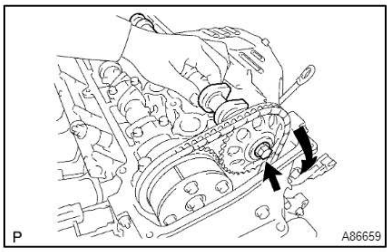
(a) Fix the camshaft with a wrench, and then loosen the sprocket bolt.

NOTICE:

Be careful not to damage the valve lifter.



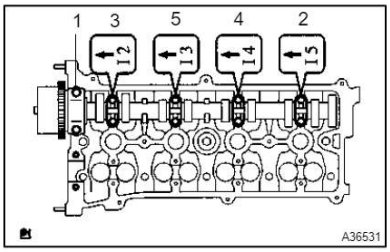
(b) Loosen and remove the bearing cap bolts on No. 2 camshaft (exhaust) in the sequence shown in the illustration in several passes, and remove the 5 bearing caps.



(c) Raise the No. 2 camshaft (exhaust) and remove it. Then remove the sprocket bolt.

(d) Disconnect the camshaft timing sprocket (with the timing chain) from the No. 2 camshaft (exhaust).

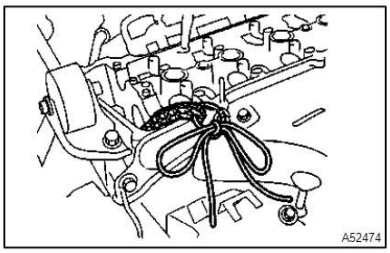
(e) Remove the camshaft timing sprocket from the timing chain.



14. REMOVE CAMSHAFT (INTAKE)

(a) Loosen the bearing cap bolts on camshaft (intake) in the sequence shown in the illustration in several passes, and remove the caps.

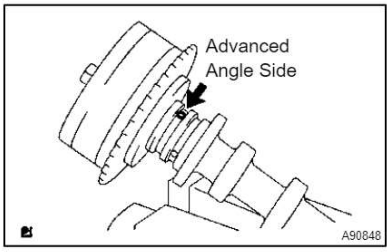
(b) Remove the camshaft.



(c) Tie the timing chain with a string.

NOTICE:

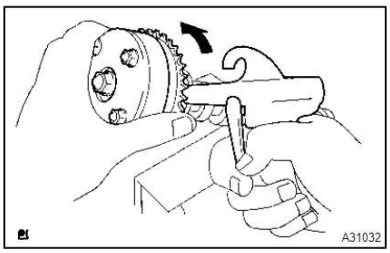
Do not drop anything inside the timing chain cover.



15. REMOVE CAMSHAFT TIMING GEAR ASSY

(a) Fix the camshaft (intake) with a vise, and make sure that the camshaft timing gear does not rotate.

(b) Cover all the paths with vinyl tape except the advanced side path shown in the illustration.



(c) Using an air gun, apply about 150 kPa (1.5 kgf/cm^2, 21 psi) of air pressure to the port on the advanced angle side.

CAUTION:

Some oil spraying will occur. Contain the spray with a shop rag.

HINT:

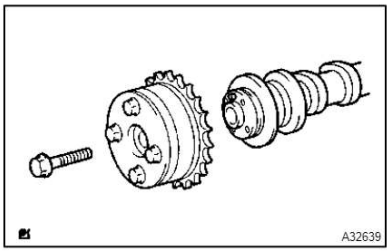
This operation releases the lock pin for the extreme retarded angle lock.

(d) Under the condition above, check that the camshaft timing gear can be turned by hand to the advanced angle side (counterclockwise), the direction of the arrow in the illustration.

Standard: Must turn

HINT:

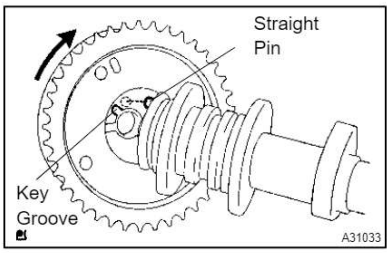
The camshaft timing gear will turn to the advanced angle side without applying force by hand depending on the force of the air pressure applied. Also, if applying pressure to the oil path is difficult as a result of air leakage from the port, the lock pin may be difficult to be released.



(e) Remove the fringe bolt from the camshaft timing gear.

NOTICE:

- **Be sure not to remove the other 4 bolts.**
- **If planning to reuse the camshaft timing gear assembly, release the straight pin lock first, and then install the gear.**



16. INSTALL CAMSHAFT TIMING GEAR ASSY

(a) Put the camshaft timing gear and the camshaft (intake) together with the straight pin and key groove.

(b) Turn the camshaft timing gear (as shown in the illustration) while pushing it lightly against the camshaft (intake).Push further at the position where the pin gets into the groove.

NOTICE:

Be sure not to turn the camshaft timing gear to the retarded angle side (to the right direction).

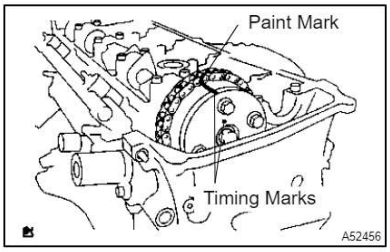
(c) Check that there is no clearance between the gear's fringe and the camshaft (intake).

(d) Tighten the fringe bolt with the camshaft timing gear fixed.
Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)

HINT:

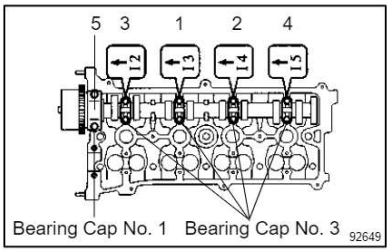
- Apply a light coat of engine oil on the threads and under the head of the bolt.
- Length of sprocket bolt excluding bolt head: 40 mm (1.57 in.)

(e) Check that the camshaft timing gear can move to the retarded angle side (to the right direction) and is locked at the extreme retarded angle.



17. INSTALL CAMSHAFT (INTAKE)

(a) Install the timing chain on the camshaft timing gear, with the painted mark of the link aligned with the timing marks of the camshaft timing sprocket.

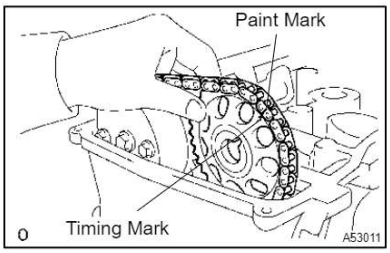


(b) Examine the front marks and numbers of the 5 bearing caps and install them. Then install the 10 bearing cap bolts. Uniformly tighten the bolts in the sequence shown in the illustration.

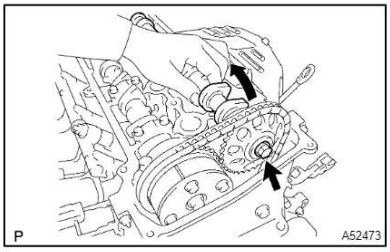
Torque:
30 N·m (306 kgf·cm, 22 ft·lbf) for bearing cap No. 1
9.0 N·m (92 kgf·cm, 80 in.·lbf) for bearing cap No. 3

HINT:
Apply a light coat of engine oil on the threads and under the heads of the bolts.

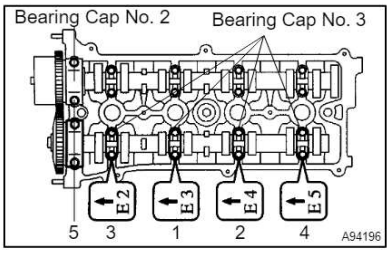
18. INSTALL NO.2 CAMSHAFT (EXHAUST)



(a) Put the camshaft on the cylinder head with the painted mark of the link of chain aligned with the timing mark of the camshaft timing sprocket.



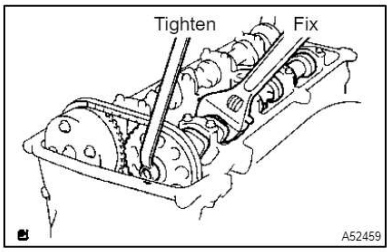
(b) Raising the camshaft, temporarily tighten the sprocket bolt.



(c) Examine the front marks and numbers of the 5 bearing caps and install them. Then install the 10 bearing cap bolts. Uniformly tighten the bolts in the sequence shown in the illustration.

Torque:
30 N·m (306 kgf·cm, 22 ft·lbf) for bearing cap No. 2
9.0 N·m (92 kgf·cm, 80 in.·lbf) for bearing cap No. 3

HINT:
Apply a light coat of engine oil on the threads and under the heads of the bolts.

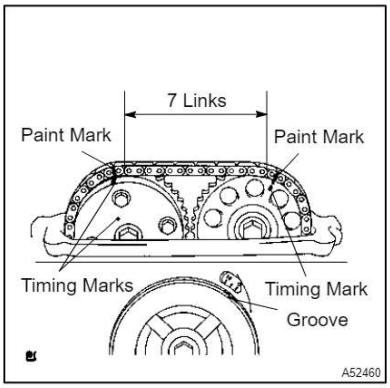


(d) Fix the camshaft with a wrench, and then tighten the sprocket bolt.

Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)

HINT:
- Apply a light coat of engine oil on the threads and under the head of the bolt.
- Length of sprocket bolt excluding bolt head: 25 mm (0.98 in.)

NOTICE:
Be careful not to damage the valve lifter.



(e) As shown in the illustration, check the paint marks of the timing chain, camshaft timing gear and camshaft timing sprocket and the alignment of the pulley groove with timing mark of the chain cover.

19. **INSTALL CHAIN TENSIONER ASSY NO.1 (See page 14-68)**
20. **INSTALL CYLINDER HEAD COVER SUB-ASSY (See page 14-41)**
21. **CONNECT ENGINE WIRE**
22. **INSTALL IGNITION COIL ASSY**
    Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)
23. **INSTALL SPARK PLUG**
    Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)
24. **INSTALL FRONT WHEEL RH**
25. **CHECK FOR ENGINE OIL LEAKS**

ENGINE REAR OIL SEAL (2AZ-FE)

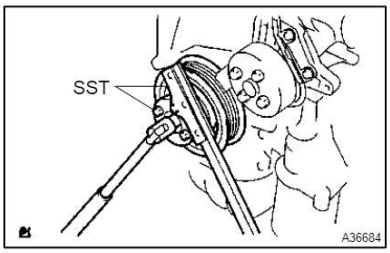
141PE-03

REPLACEMENT

1. REMOVE AUTOMATIC TRANSAXLE ASSY (See page 40-12)

HINT:

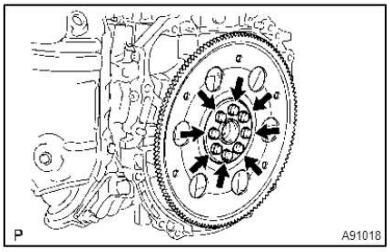
Remove and install the transaxle after removing the engine assy w/ transaxle.



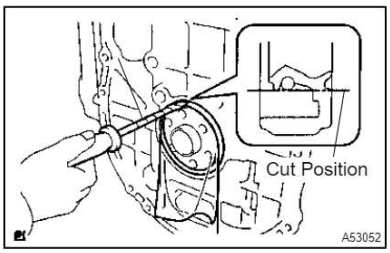
2. REMOVE DRIVE PLATE & RING GEAR SUB-ASSY

(a) Using SST, fix the crankshaft.

SST 09213-54015 (91651-60855), 09330-00021



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



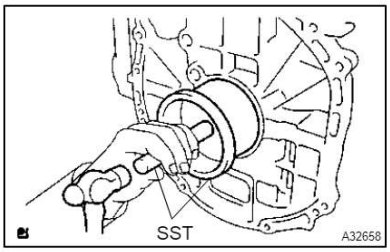
3. REMOVE ENGINE REAR OIL SEAL

(a) Using a knife, cut through the oil seal lip.

(b) Using a screwdriver with its tip taped, pry out the oil seal.

NOTICE:

After the removal, check the crankshaft for damage. If it is damaged, smooth the surface with 400-grit sandpaper.



4. INSTALL ENGINE REAR OIL SEAL

(a) Apply MP grease to a new oil seal lip.

NOTICE:

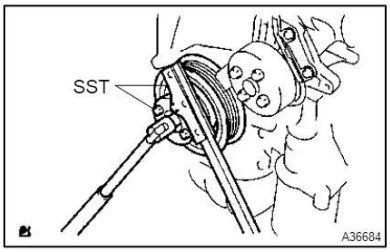
Keep the lip free from foreign matter.

(b) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.

SST 09223-15030, 09950-70010 (09951-07100)

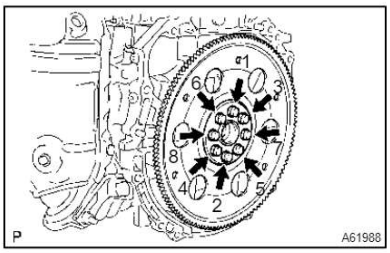
NOTICE:

Wipe off extra grease from the crankshaft.



5. INSTALL DRIVE PLATE & RING GEAR SUB-ASSY

(a) Using SST, fix the crankshaft.
SST 09213-54015 (91651-60855), 09330-00021



(b) Clean the bolt and the bolt hole.

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

(d) Install the front spacer, drive plate and rear spacer with the 8 bolts. Uniformly tighten the bolts in the sequence shown in the illustration.
Torque: 98 N·m (1,000 kgf·cm, 72 ft·lbf)

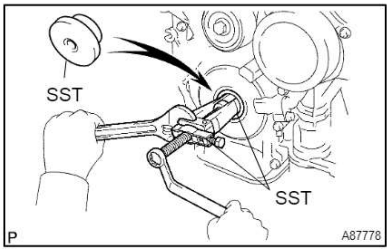
6. INSTALL AUTOMATIC TRANSAXLE ASSY (See page 40-12)

TIMING GEAR CASE OR TIMING CHAIN CASE OIL SEAL (2AZ-FE)

141PD-02

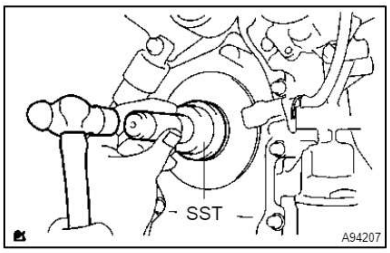
REPLACEMENT

1. REMOVE FRONT WHEEL RH
2. REMOVE FRONT FENDER SPLASH SHIELD FRONT RH
3. REMOVE FRONT FENDER APRON SEAL RH
4. REMOVE ENGINE COVER SUB-ASSY NO.1
5. REMOVE ENGINE MOUNTING STAY NO.2 RH
6. REMOVE ENGINE MOVING CONTROL ROD W/BRACKET (See page 14-24)
7. REMOVE ENGINE MOUNTING STAY NO.2 RH
8. REMOVE ENGINE MOUNTING BRACKET NO.2 RH
9. REMOVE FAN AND GENERATOR V BELT (See page 14-5)
10. REMOVE CRANKSHAFT PULLEY (See page 14-41)



11. REMOVE TIMING GEAR CASE OR TIMING CHAIN CASE OIL SEAL

(a) Using SST, remove the oil seal.
SST 09308-10010, 09950-60010 (09951-00200)



12. INSTALL TIMING GEAR CASE OR TIMING CHAIN CASE OIL SEAL

(a) Apply MP grease to a new oil seal lip.

NOTICE:

Keep the lip free from a foreign matter.

(b) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223-22010

NOTICE:

Wipe off extra grease from the crankshaft.

13. INSTALL CRANKSHAFT PULLEY (See page 14-41)
14. INSTALL FAN AND GENERATOR V BELT (See page 14-5)
Torque: 52 N·m (531 kgf·cm, 38 ft·lbf)
15. INSTALL ENGINE MOUNTING BRACKET NO.2 RH
Torque: 52 N·m (531 kgf·cm, 38 ft·lbf)
16. INSTALL ENGINE MOUNTING STAY NO.2 RH
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)
17. INSTALL ENGINE MOVING CONTROL ROD W/BRACKET (See page 14-24)
18. INSTALL FRONT WHEEL RH
19. CHECK FOR ENGINE OIL LEAKS

CHAIN (2AZ-FE)

141PB-01

REPLACEMENT

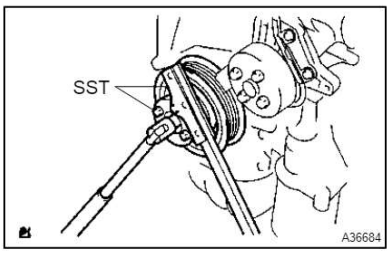
1. REMOVE HOOD SUB-ASSY
2. REMOVE FRONT WHEEL RH
3. REMOVE ENGINE UNDER COVER NO.1
4. REMOVE FRONT FENDER SPLASH SHIELD FRONT RH
5. REMOVE FRONT FENDER APRON SEAL RH
6. DRAIN ENGINE OIL

(a) Install a new gasket and the drain plug after draining engine oil.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

7. REMOVE EXHAUST PIPE ASSY FRONT
8. REMOVE ENGINE MOVING CONTROL ROD W/BRACKET (See page 14-24)
9. REMOVE ENGINE MOUNTING STAY NO.2 RH
10. REMOVE ENGINE MOUNTING BRACKET NO.2 RH
11. REMOVE FAN AND GENERATOR V BELT (See page 14-5)
12. REMOVE ENGINE COVER SUB-ASSY NO.1
13. DISCONNECT ENGINE WIRE
14. REMOVE GENERATOR ASSY
15. REMOVE VANE PUMP ASSY (See page 51-8)

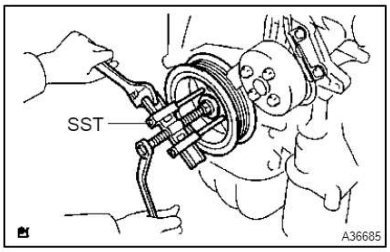
NOTICE:
Do not disconnect the hose.

16. REMOVE IGNITION COIL ASSY
17. DISCONNECT VENTILATION HOSE No.1
18. DISCONNECT VENTILATION HOSE NO.2
19. REMOVE ENGINE COVER SUB-ASSY NO.1
20. REMOVE CYLINDER HEAD COVER SUB-ASSY (Seepage 14-41)
21. SET NO. 1 CYLINDER TO TDC/COMPRESSION (See page 14-6)



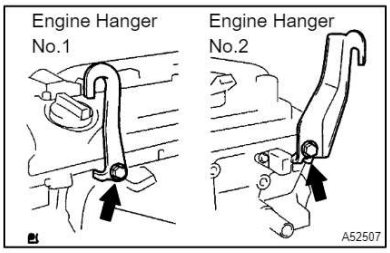
22. REMOVE CRANKSHAFT PULLEY

(1) Using SST, fix the pulley and loosen the bolt.
SST 09213-54015 (91651-60855), 09330-00021



(2) Using SST, remove the bolt and pulley.
SST 09950- 50013 (09951- 05010, 09952- 05010, 09953-05020, 09954-05021)

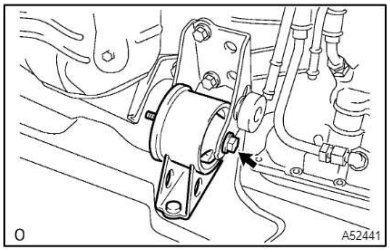
23. REMOVE CRANKSHAFT POSITION SENSOR
24. REMOVE OIL PAN SUB-ASSY (Seepage 14-41)
25. REMOVE CHAIN TENSIONER ASSY NO.1 (See page 14-41)
26. REMOVE V-RIBBED BELT TENSIONER ASSY (See page 14-24)



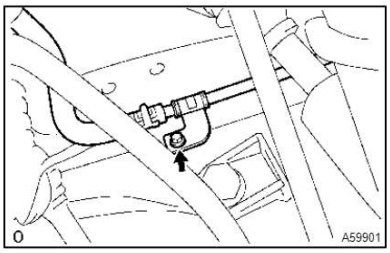
27. INSTALL ENGINE HANGER NO.1
(a) Install the engine hanger No. 1 and No. 2 with the bolts as shown in the illustration.
Parts No.:

Engine hanger No. 1	12281-28010
Engine hanger No. 2	12282-28010
Bolt	91512-61020

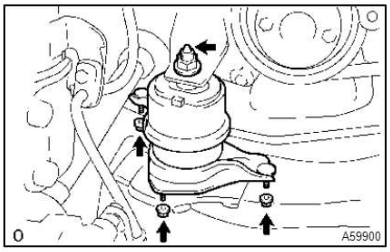
Torque: 38 N·m (387 kgf·cm, 30 ft·lbf)



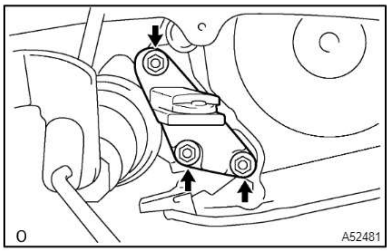
28. REMOVE ENGINE MOUNTING INSULATOR
(a) Attach the engine chain hoist to the engine hangers.
CAUTION:
Do not attempt to hang the engine by hooking the chain to any other part.
(b) Remove the bolt and disconnect the engine mounting insulator FR.



(c) Remove the bolt and disconnect the steering gear return hose clamp from the frame.

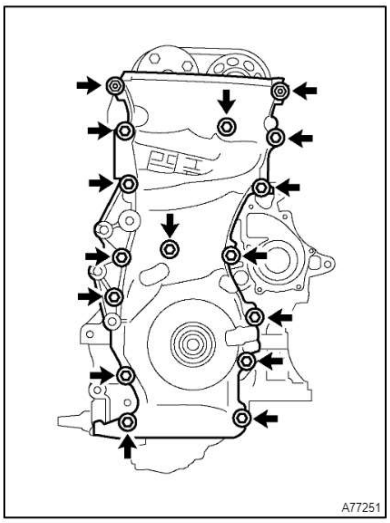


(d) Remove the 4 nuts from the engine mounting insulator RH.
(e) Raise the engine and remove the engine mounting insulator RH.



29. REMOVE ENGINE MOUNTING BRACKET RH

(a) Remove the 3 bolts and engine mounting bracket.



30. REMOVE TIMING CHAIN OR BELT COVER SUB-ASSSY

(a) Remove the stud bolt for the drive belt tensioner from the cylinder block.

(b) Remove the 14 bolts and 2 nuts.

(c) Pry out the timing chain cover with a screwdriver.

NOTICE:

Be careful not to damage the contact surfaces of the timing chain cover, cylinder block and cylinder head.

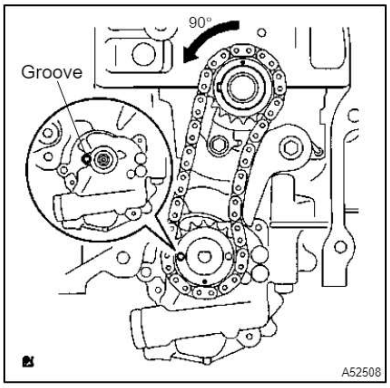
31. REMOVE CRANKSHAFT POSITION SENSOR PLATE NO.1

32. REMOVE CHAIN TENSIONER SLIPPER

33. REMOVE CHAIN VIBRATION DAMPER NO.1

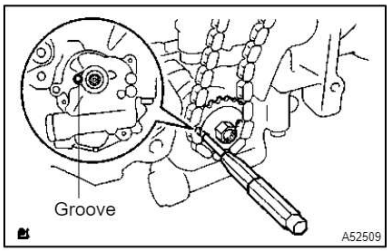
34. REMOVE CHAIN SUB-ASSY

35. REMOVE CRANKSHAFT TIMING GEAR OR SPROCKET

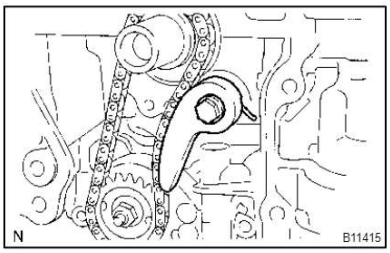


36. REMOVE NO.2 CHAIN SUB-ASSY

(a) Turn the crankshaft counterclockwise 90°, and align an adjusting hole of the oil pump driven sprocket with the groove of the oil pump.

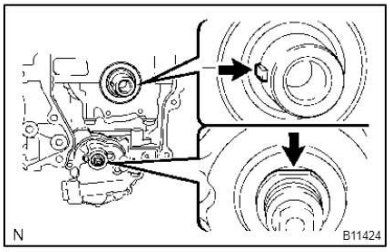


(b) Put a bar (φ 4.0 mm (0.16 in.)) in the adjusting hole of the oil pump driven sprocket to temporarily lock the sprocket in position. Remove the nut.

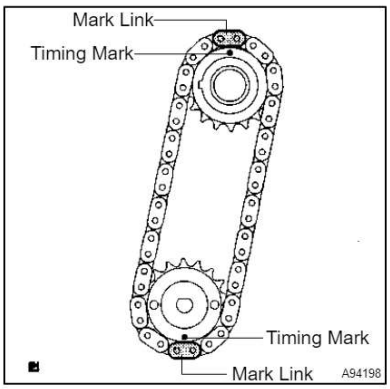


(c) Remove the bolt, chain tensioner plate and spring.
(d) Remove the chain tensioner, oil pump driven sprocket and chain.

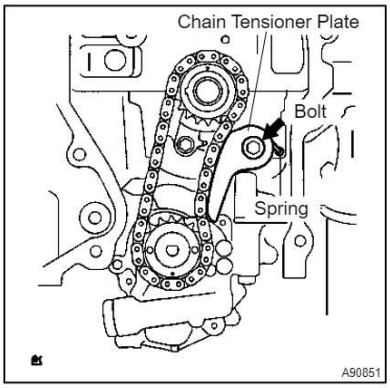
37. INSTALL NO.2 CHAIN SUB-ASSY



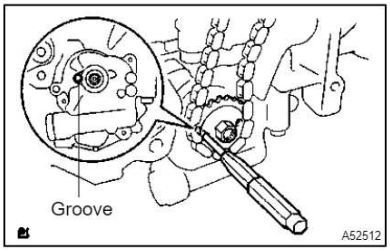
(a) Set the crankshaft key into the left horizontal position.
(b) Turn the cutout of the drive shaft to the top.



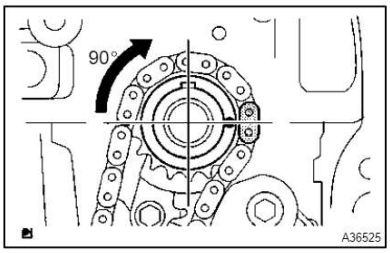
(c) Align the mark links (yellow colored links) with the timing marks of the sprocket as shown in the illustration.
(d) Insert the sprockets with chain to the crankshaft and oil pump shaft.
(e) Temporarily tighten the oil pump driven sprocket with the nut.



(f) Insert the damper spring into the adjusting hole, and install the chain tensioner plate with the nut.
Torque: 12 N·m (122 kgf·cm, 9.0 ft·lbf)

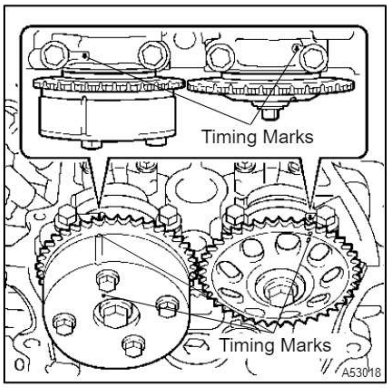


(g) Align the adjusting hole of the oil pump driven sprocket with the groove of the oil pump.
(h) Put a bar (φ 4 mm (0.16 in.)) in the adjusting hole of the oil pump driven sprocket to temporarily lock the sprocket in position. Install the nut.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)



(i) Rotate the crankshaft counterclockwise 90°, and align the crankshaft key to the top.

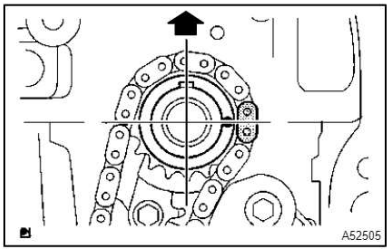
38. INSTALL CHAIN VIBRATION DAMPER NO.1
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



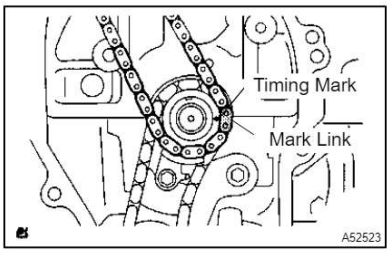
39. INSTALL CHAIN SUB-ASSY

(a) Set the No.1 cylinder to TDC/compression.

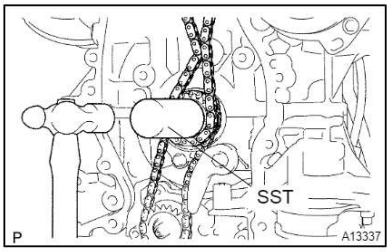
(1) Align the timing marks of the camshaft timing sprockets and bearing caps (No. 1 and No. 2).



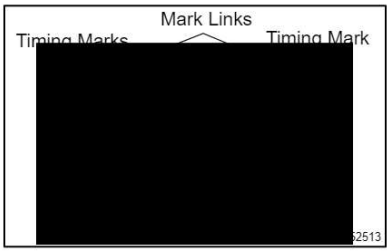
(2) Using the crankshaft pulley bolt, turn the crankshaft and set the set key on the crankshaft upward.



(b) Align the mark link (gold or orange colored link) with the timing mark of the crankshaft timing sprocket.



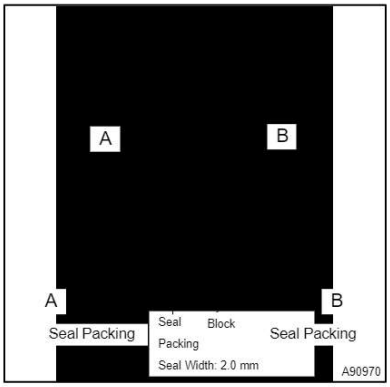
(c) Using SST, tap in the sprocket.
SST 09309-37010



(d) Align the mark links (gold or yellow colored links) with the timing marks of the camshaft timing gear and camshaft timing sprocket. Install the chain.

40. INSTALL CHAIN TENSIONER SLIPPER
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

41. INSTALL CRANKSHAFT POSITION SENSOR PLATE NO.1 (See page 14-41)



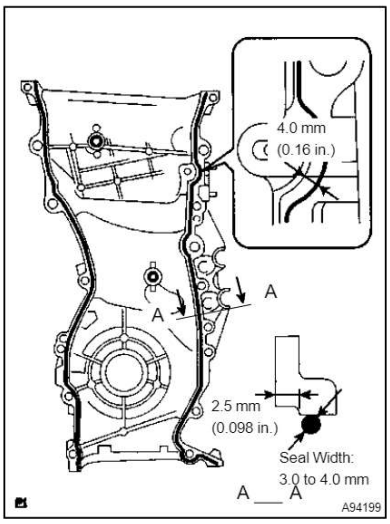
42. INSTALL TIMING CHAIN OR BELT COVER SUB-ASSSY

NOTICE:

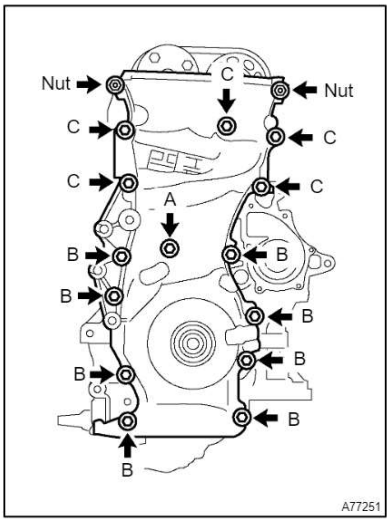
- **Remove any oil from the contact surface.**
- **Install the chain cover within 3 minutes after applying seal packing.**
- **Do not start the engine for at least 2 hours after installing.**

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

(b) Apply seal packing in a continuous bead (seal width: 2.0 mm (0.079 in.)) as shown in the illustration.
Seal packing: Part No. 08826-00080 or equivalent



(c) Apply seal packing in a continuous bead (seal width: 3.0 to 4.0 mm (0.12 to 0.16 in.)) as shown in the illustration.
Seal packing: Part No. 08826-00080 or equivalent

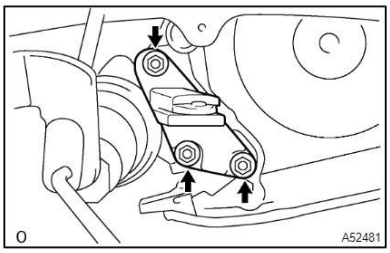


(d) Install the timing chain cover with the 14 bolts and 2 nuts.
Torque:
9.0 N·m (92 kgf·cm, 80 in.·lbf) for bolt A
21 N·m (214 kgf·cm, 15 ft·lbf) for bolt B
43 N·m (438 kgf·cm, 32 ft·lbf) for bolt C
9.0 N·m (92 kgf·cm, 80 in.·lbf) for nut

(e) Install the stud bolt to the drive belt tensioner.
Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)

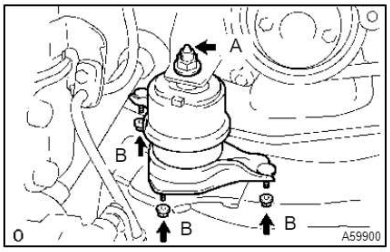
43. INSTALL CHAIN TENSIONER ASSY NO.1

44. INSTALL V-RIBBED BELT TENSIONER ASSY (See page 14-24)



45. INSTALL ENGINE MOUNTING BRACKET RH

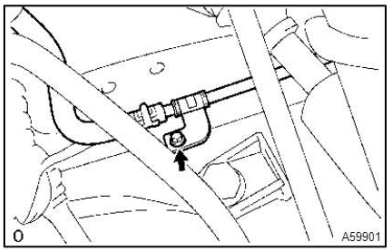
(a) Install the engine mounting bracket with the 3 bolts.
Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)



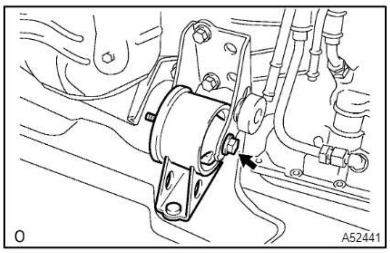
46. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING INSULATOR

(a) Raise the engine and install the engine mounting insulator RH.

(b) Install the engine mounting insulator RH with the 4 nuts.
Torque:
95 N·m (969 kgf·cm, 70 ft·lbf) for bolt A
87 N·m (887 kgf·cm, 64 ft·lbf) for bolt B

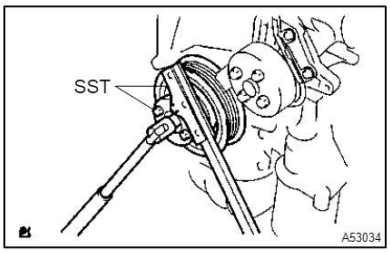


(c) Install the steering gear return hose clamp to the frame with the bolt.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



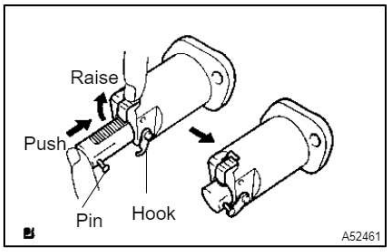
(d) Install the engine mounting insulator FR with the bolt.
Torque: 87 N·m (887 kgf·cm, 64 in.·lbf)

47. INSTALL OIL PAN SUB-ASSY (See page 14-41)
48. INSTALL CRANKSHAFT POSITION SENSOR (See page 14-41)

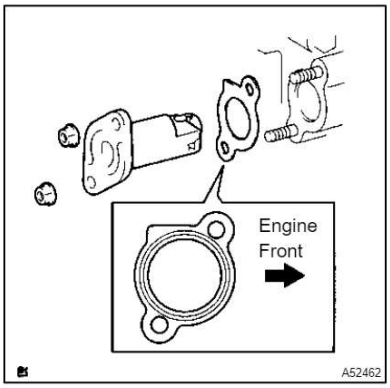


49. INSTALL CRANKSHAFT PULLEY
(a) Install the crankshaft pulley.
(1) Align the pulley set key with the key groove of the pulley, and side on the pulley.
(2) Using SST, install the pulley bolt.
SST 09213-54015 (91651-60855), 09330-00021
Torque: 180 N·m (1,835 kgf·cm, 133 ft lbf)

HINT:
Apply a light coat of engine oil to the bolt threads and the area beneath the bolt heads that come in contact with the washers.

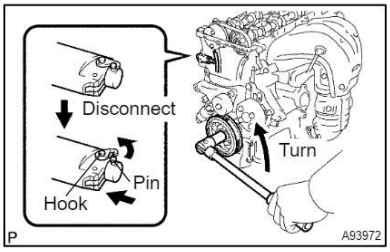


50. INSTALL CHAIN TENSIONER ASSY NO.1
(a) Release the ratchet pawl, fully push in the plunger and apply the hook to the pin so that the plunger cannot spring out.

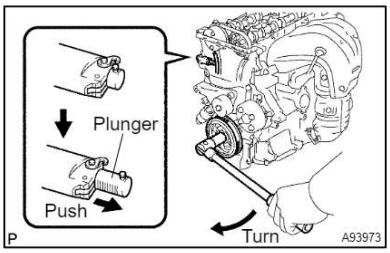


(b) Install a new gasket and the chain tensioner with the 2 nuts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

NOTICE:
If the hook is released while inserting, apply the hook again, and insert the chain tensioner.



(c) Turn the crankshaft counterclockwise and check that the plunger knock pin is disconnected from the hook.



(d) Turn the crankshaft clockwise and check that the slipper is pushed by the plunger.

51. **INSTALL CYLINDER HEAD COVER SUB-ASSY (See page 14-79)**
52. **INSTALL IGNITION COIL ASSY**
    Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)
53. **INSTALL VANE PUMP ASSY (See page 51-8)**
54. **INSTALL GENERATOR ASSY (See page 19-16)**
55. **INSTALL ENGINE WIRE**
56. **INSTALL FAN AND GENERATOR V BELT (See page 14-5)**
57. **INSTALL ENGINE MOUNTING BRACKET NO.2 RH**
    Torque: 52 N·m (531 kgf·cm, 38 ft·lbf)
58. **INSTALL ENGINE MOUNTING STAY NO.2 RH**
    Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)
59. **INSTALL ENGINE MOVING CONTROL ROD W/BRACKET (See page 14-24)**
60. **INSTALL EXHAUST PIPE ASSY FRONT (See page 15-2)**
61. **INSTALL FRONT WHEEL RH**

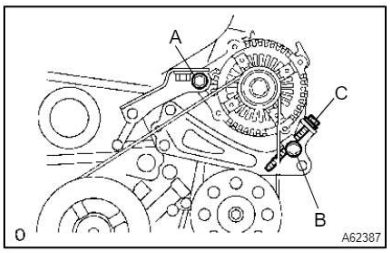
62. INSTALL HOOD SUB-ASSY
    Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)
63. ADD ENGINE OIL
64. CHECK FOR ENGINE OIL LEAKS

DRIVE BELT (3MZ-FE)

141PG-01

REPLACEMENT

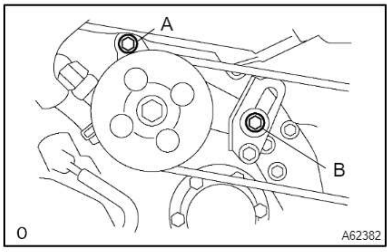
1. **REMOVE FRONT WHEEL RH**
2. **REMOVE ENGINE UNDER COVER NO.1**
3. **REMOVE FRONT FENDER APRON SEAL RH**



4. **REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1**

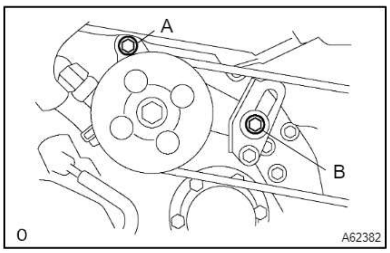
(a) Loosen bolts A and B.

(b) Loosen adjusting bolt C and remove the belt.



5. **REMOVE VANE PUMP V BELT**

(a) Loosen bolts A and B, and remove the belt.

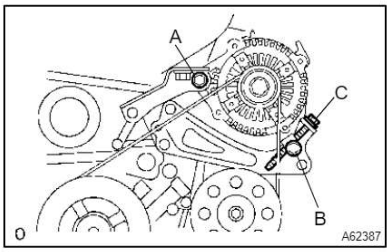


6. **INSTALL VANE PUMP V BELT**

(a) Install the belt on each pulley.

(b) Using a bar, adjust the belt tension and tighten bolt B.
Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)

(c) Tighten bolt A.
Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)



7. **INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1**

(a) Install the belt on each pulley.

(b) Tighten adjusting bolt C, and adjust the belt tension.

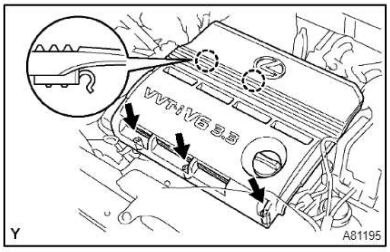
(c) First tighten bolt A, and then B.
Torque:
58 N·m (591 kgf·cm, 43 ft·lbf) for bolt A
18 N·m (184 kgf·cm, 13 ft·lbf) for bolt B

8. **INSPECT DRIVE BELT TENSION (See page 14-121)**
9. **INSTALL FRONT WHEEL RH**

141PJ-02

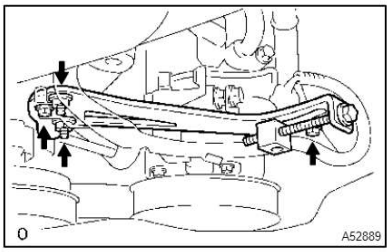
REPLACEMENT

1. WORK FOR PREVENTING GASOLINE FROM SPILLING OUT (See page 11-35)
2. REMOVE FRONT WHEELS
3. REMOVE ENGINE UNDER COVER NO.1
4. REMOVE FRONT FENDER SPLASH SHIELD SUB-ASSY LH
5. REMOVE FRONT FENDER SPLASH SHIELD SUB-ASSY RH
6. REMOVE FRONT FENDER APRON SEAL LH
7. REMOVE FRONT FENDER APRON SEAL RH
8. DRAIN ENGINE OIL
9. DRAIN ENGINE COOLANT (See page 16-26)
10. DRAIN AUTOMATIC TRANSAXLE FLUID
11. DRAIN TRANSFER OIL (4WD TYPE)
12. REMOVE FR WIPER ARM LH (See page 66-7)
13. REMOVE FR WIPER ARM RH (See page 66-7)
14. REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSY (See page 66-7)
15. REMOVE WINDSHIELD WIPER LINK ASSY (See page 66-7)
16. REMOVE COWL PANEL SUB-ASSY
17. REMOVE FRONT SUSPENSION BRACE SUB-ASSY UPPER CENTER

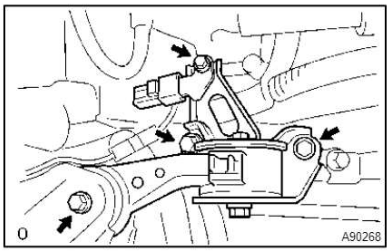


18. REMOVE V-BANK COVER SUB-ASSY
(a) Using a 5 mm hexagon wrench, remove the 3 nuts.
(b) Disconnect the 2 clips, and remove the cover.

19. REMOVE BATTERY
20. REMOVE AIR CLEANER CAP SUB-ASSY
21. REMOVE AIR CLEANER FILTER ELEMENT SUB-ASSY
22. REMOVE AIR CLEANER CASE
23. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-125)
24. REMOVE VANE PUMP V BELT (See page 14-125)
25. REMOVE GENERATOR ASSY (See page 19-40)
26. REMOVE GENERATOR BRACKET NO.2

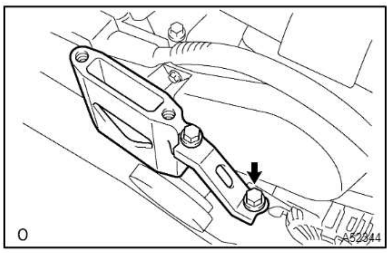


27. REMOVE GENERATOR BELT ADJUSTING BAR
(a) Remove the 2 bolts, 2 nuts and adjusting bar.



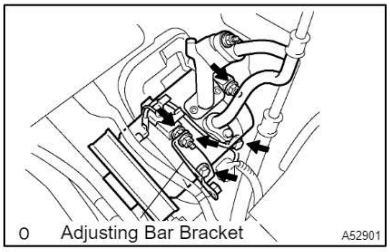
28. REMOVE ENGINE MOVING CONTROL ROD

(a) Remove the 4 bolts and control rod.



29. REMOVE ENGINE MOUNTING STAY NO.2 RH

(a) Remove the bolt, mounting stay No. 2 RH and mounting bracket No. 2 RH.



30. SEPARATE COMPRESSOR AND MAGNETIC CLUTCH

(a) Remove the bolt, nut and adjusting bar bracket.

(b) Remove the 3 bolts and disconnect the compressor.

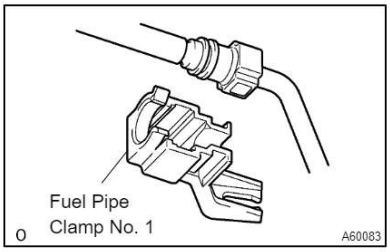
HINT:

Hang up the hoses instead of detaching them.

31. SEPARATE TRANSMISSION CONTROL CABLE ASSY (See page 40-73)

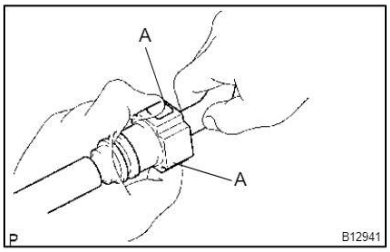
32. DISCONNECT UNION TO CHECK VALVE HOSE

(a) Remove the vacuum hose for the brake booster.



33. DISCONNECT FUEL PIPE SUB-ASSY NO.1

(a) Remove the fuel pipe clamp.



(b) Disconnect the connector from the tube while pinching part A with fingers as shown in the illustration.

NOTICE:

- **Check for contamination in the pipe and around the connector. Clean if necessary and then disconnect the connector.**
- **Disconnect the connector with your hands.**
- **Do not bend, fold or rotate the nylon tube.**
- **If the pipe and connector are stuck together, push and pull the connector until it comes free.**
- **Put the pipe and connector ends in vinyl bags to prevent damage and contamination.**

34. DISCONNECT HEATER INLET WATER HOSE

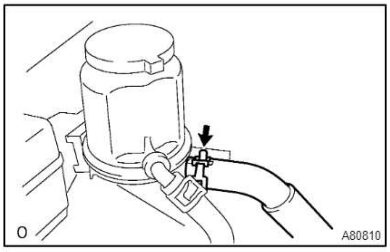
35. DISCONNECT HEATER OUTLET WATER HOSE

36. DISCONNECT RADIATOR HOSE INLET

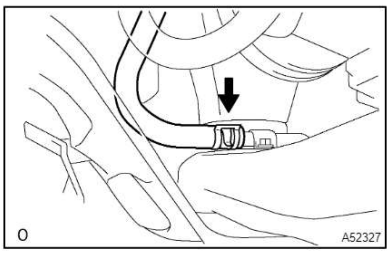
37. DISCONNECT RADIATOR HOSE OUTLET

38. DISCONNECT OIL COOLER INLET TUBE NO.1

39. DISCONNECT OIL COOLER OUTLET TUBE NO.1

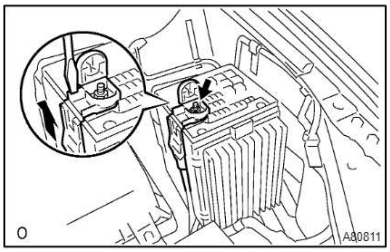


40. DISCONNECT OIL RESERVOIR TO PUMP HOSE NO.1



41. DISCONNECT STEERING GEAR OUTLET RETURN TUBE

42. REMOVE GLOVE COMPARTMENT DOOR ASSY



43. SEPARATE ENGINE WIRE

(a) Disconnect the engine wire from the ECM and junction block.

(b) Disconnect the engine wire from the engine room junction block.

(1) Remove the nut and separate the wire harness.

(2) Using a screwdriver, release the engine room junction block. Disconnect the engine wire by pulling it upward.

(c) Remove the 2 nuts and pull out the engine wire.

(d) Remove the body ground.

44. REMOVE PROPELLER SHAFT ASSY (4WD TYPE) (See page 30-12)

45. DISCONNECT EXHAUST PIPE SUB-ASSY FRONT NO.3 (See page 15-5)

46. DISCONNECT EXHAUST PIPE ASSY FRONT (See page 15-5)

47. REMOVE EXHAUST PIPE SUPPORT BRACKET NO.1 (See page 15-5)

48. DISCONNECT FRONT STABILIZER LINK ASSY LH

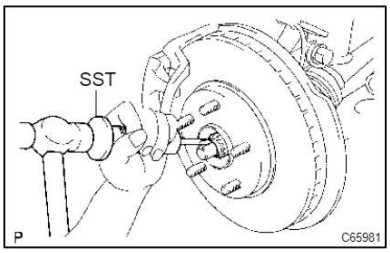
(a) Using a 6 mm socket hexagon wrench, hold the ball stud.

(b) Remove the nut and disconnect the stabilizer link.

49. DISCONNECT FRONT STABILIZER LINK ASSY RH

HINT:

Use the same procedures described for the LH side.



50. REMOVE FRONT AXLE HUB LH NUT

(a) Using SST and a hammer, strike the lock nut covering to remove it.

SST 09930-00010

NOTICE:

- **Set the drive shaft's groove so that it faces up. Then use the SST and hammer.**
- **Remove the covering from the lock nut completely or the screw of the drive shaft may be damaged.**
- **Do not sharpen the tip of the SST.**

(b) Using a 30 mm socket wrench, remove the lock nut.

51. REMOVE FRONT AXLE HUB RH NUT

HINT:

Use the same procedures described for the LH side.

52. DISCONNECT SPEED SENSOR FRONT LH

(a) Remove the bolt and disconnect the speed sensor from the steering knuckle.

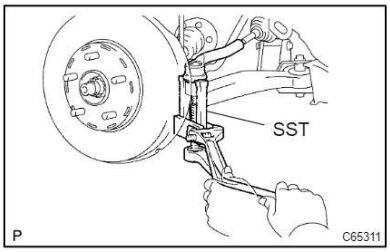
NOTICE:

Keep the speed sensor tip and connection free from foreign matter.

53. DISCONNECT SPEED SENSOR FRONT RH

HINT:

Use the same procedures described for the LH side.



54. SEPARATE TIE ROD END SUB-ASSY LH

(a) Remove the cotter pin and nut.

(b) Using SST, disconnect the tie rod end from the steering knuckle.

SST 09628-6201 1

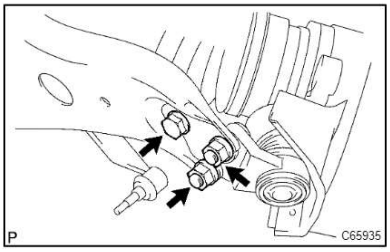
NOTICE:

Do not damage the dust cover of the ball joint.

55. SEPARATE TIE ROD END SUB-ASSY RH

HINT:

Use the same procedures described for the LH side.



56. SEPARATE FRONT SUSPENSION ARM SUB-ASSY LOWER NO.1 LH

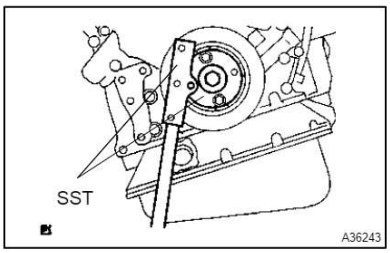
(a) Remove the bolt and 2 nuts, and separate the front suspension arm from the lower ball joint.

(b) Using a plastic hammer, disconnect the drive shaft from the axle hub.

57. SEPARATE FRONT SUSPENSION ARM SUB-ASSY LOWER NO.1 RH

HINT:

Use the same procedures described for the LH side.

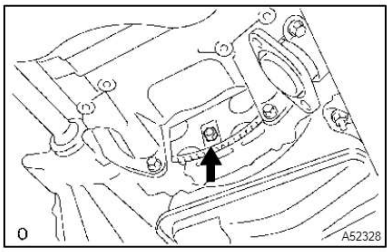


58. REMOVE DRIVE PLATE & TORQUE CONVERTER CLUTCH SETTING BOLT

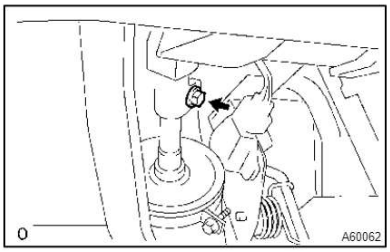
(a) Using SST, hold the crankshaft.

SST 09213-54015 (91651-60855), 09330-00021

(b) Remove the 2 bolts and flywheel housing under cover.

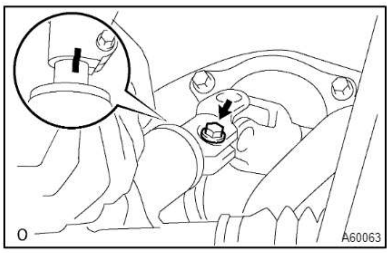


(c) Remove the 6 torque converter setting bolts.



59. SEPARATE STEERING INTERMEDIATE SHAFT SUB-ASSY

(a) Loosen the sliding yoke bolt.



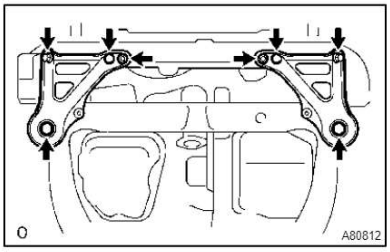
(b) Place matchmarks on the steering intermediate shaft and control valve shaft.

(c) Remove the bolt and disconnect the steering intermediate shaft.

(d) To prevent the steering wheel from rotating, fix the wheel with the seat belt.

NOTICE:

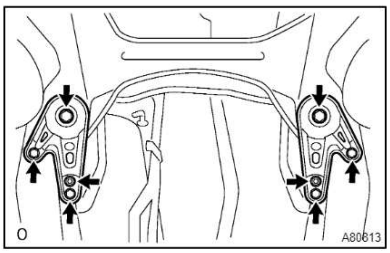
If the steering wheel is not fixed, the spiral cable will be damaged.



60. REMOVE ENGINE ASSEMBLY WITH TRANSAXLE

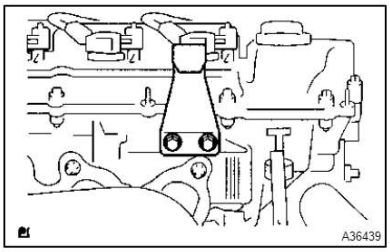
(a) Set the engine lifter.

(b) Remove the 6 bolts, 2 nuts, and frame side rail plate sub-assembly LH and RH.



(c) Remove the 6 bolts, 2 nuts, and front suspension member brace rear LH and RH.

(d) Carefully, remove the engine assembly from the vehicle.

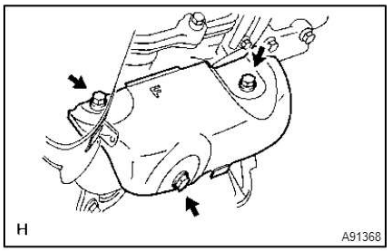


(e) Install the engine hanger as shown in the illustration.
Part No.:

No. 2 engine hanger	12282-20020
Bolt	91621-60822

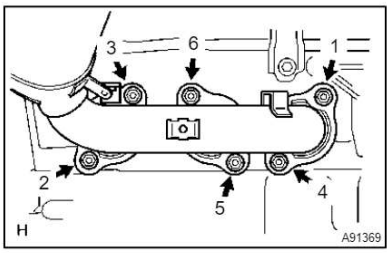
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

(f) Using a chain block and an engine sling device, hang the engine assembly.

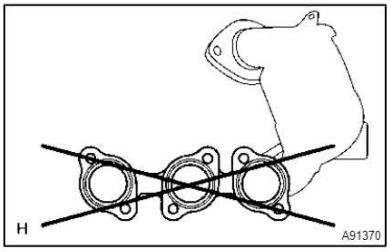


61. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSY

(a) Disconnect the A/F sensor connector.
(b) Remove the 3 bolts and insulator.



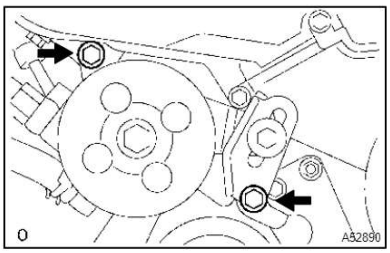
(c) Uniformly loosen and remove the 6 nuts in the sequence shown in the illustration.
(d) Remove the manifold and gasket.



62. INSPECT EXHAUST MANIFOLD CONVERTER SUB-ASSY

(a) Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.
Maximum warpage: 0.50 mm (0.0196 in.)

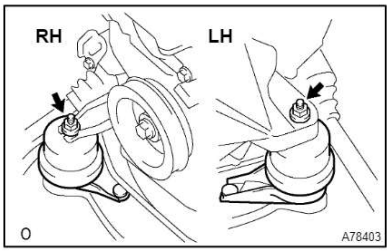
If the warpage is greater than the maximum, replace the manifold.



63. REMOVE VANE PUMP ASSY

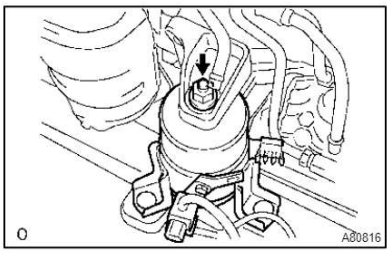
(a) Remove the power steering oil pressure sensor harness.
(b) Remove the pressure feed tube clamp.
(c) Remove the 2 bolts and vane pump.

64. REMOVE STABILIZER BAR FRONT (See page 26-22)
65. REMOVE POWER STEERING LINK ASSY (See page 51-28)

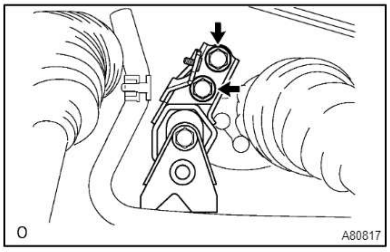


66. REMOVE FRONT FRAME ASSY

(a) Remove the 2 nuts and disconnect the engine mounting insulator RH and LH.

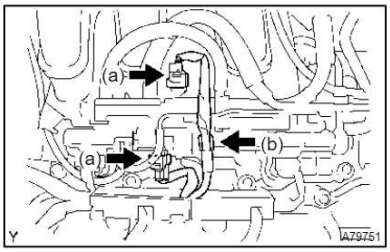


(b) Remove the nut and disconnect the engine mounting insulator FR.



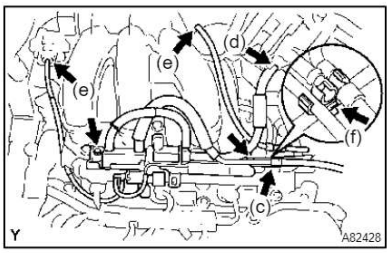
(c) Remove the 2 bolts and disconnect the engine mounting insulator RR.

67. REMOVE FRONT DRIVE SHAFT ASSY LH (See page 30-21)
68. REMOVE FRONT DRIVE SHAFT ASSY RH (2WD TYPE) (See page 30-21)
69. REMOVE FRONT DRIVE SHAFT ASSY RH (4WD TYPE) (See page 30-21)
70. REMOVE STARTER ASSY (See page 19-28)
71. REMOVE ENGINE MOUNTING BRACKET FR
72. REMOVE AUTOMATIC TRANSAXLE ASSY (2WD TYPE) (See page 40-20)
73. REMOVE TRANSFER STIFFENER PLATE RH (4WD TYPE)
74. REMOVE AUTOMATIC TRANSAXLE W/TRANSFER (4WD TYPE) (See page 40-20)
75. REMOVE ENGINE MOUNTING BRACKET RR
76. REMOVE DRIVE PLATE & RING GEAR SUB-ASSY (See page 14-246)
77. INSTALL ENGINE STAND
78. REMOVE ENGINE HANGER NO.2

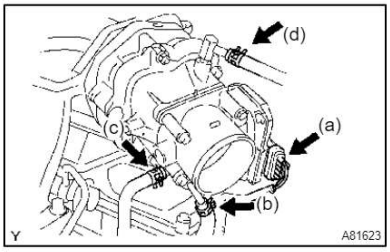


79. REMOVE EMISSION CONTROL VALVE SET

(a) Disconnect the 2 VSV connectors.
(b) Remove the wire harness clamp.

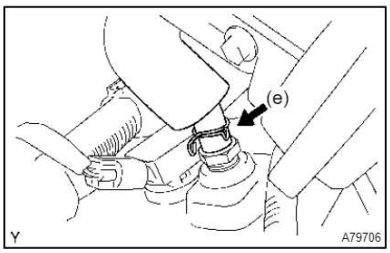


(c) Disconnect the fuel vapor feed hose No. 1.
(d) Disconnect the fuel vapor feed hose No. 2.
(e) Disconnect the 2 vacuum hoses.
(f) Remove the clamp.
(g) Remove the 2 nuts and the emission control valve set.

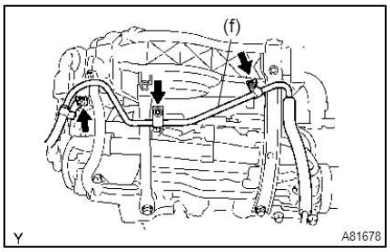


80. REMOVE INTAKE AIR SURGE TANK

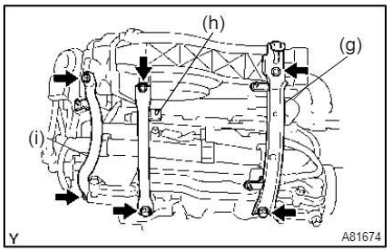
(a) Disconnect the throttle motor connector.
(b) Disconnect the water bypass hose No. 3.
(c) Disconnect the water bypass hose No. 2.
(d) Disconnect the union to check valve hose.



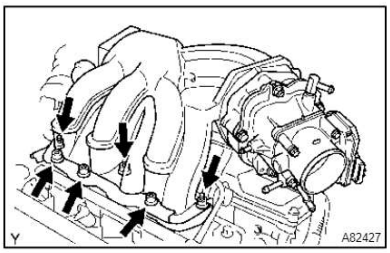
(e) Disconnect the ventilation hose.



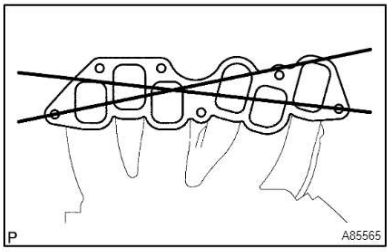
(f) Remove the 3 nuts and disconnect the pressure feed tube.



(g) Remove the 2 bolts and engine hanger No. 1.
(h) Remove the 2 bolts and surge tank stay No. 1.
(i) Remove the 2 bolts and surge tank stay No. 2.



(j) Using a socket hexagon wrench 8, remove the 4 bolts.
(k) Remove the 2 nuts, emission control valve bracket and intake air surge tank.
(l) Remove the gasket from the intake air surge tank.

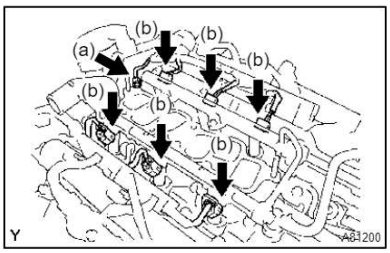


81. INSPECT INTAKE AIR SURGE TANK

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

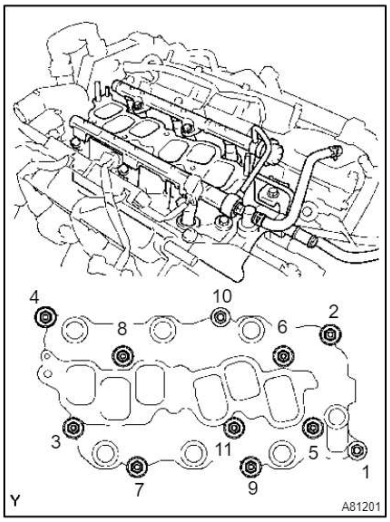
Maximum warpage: 0.10 mm (0.0039 in.)

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

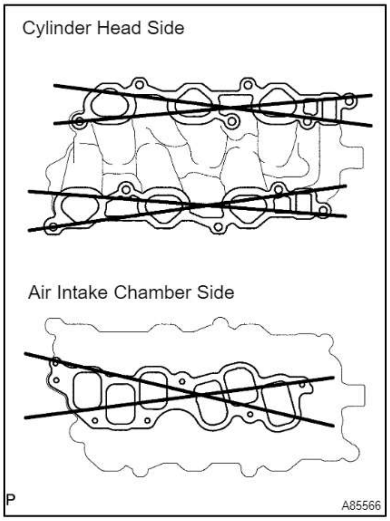


82. REMOVE INTAKE MANIFOLD

(a) Remove the nut and disconnect the ground cable.
(b) Disconnect the 6 fuel injector connectors.



(c) Uniformly loosen and remove the 9 bolts and 2 nuts in the sequence shown in the illustration. Remove the intake manifold.



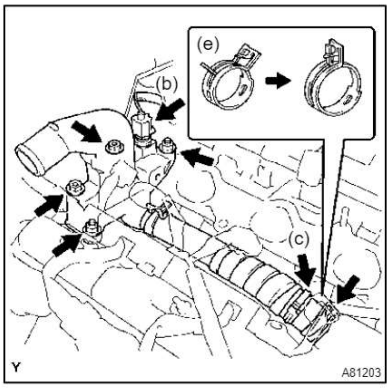
83. INSPECT INTAKE MANIFOLD

(a) Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head and intake air surge tank for warpage.

Maximum warpage:

Item	Specified Condition
Intake air surge tank side	0.15 mm (0.0059 in.)
Cylinder head side	0.08 mm (0.0031 in.)

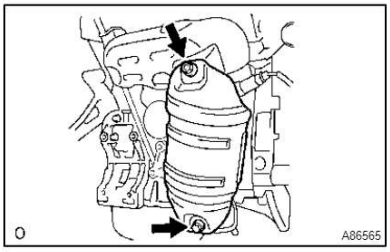
If warpage is greater than the maximum, replace the manifold.



84. REMOVE WATER OUTLET

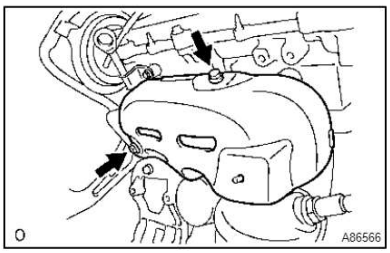
(a) Disconnect the radiator hose inlet.
(b) Disconnect the engine coolant temperature sensor connector.
(c) Remove the clamp.
(d) Remove the 2 bolts, 2 nuts and 2 washers.
(e) Lock the hose clamp as shown in the illustration and remove the water outlet together with the water bypass hose No. 1.
(f) Remove the 2 gaskets from the 2 cylinder heads.

85. REMOVE IGNITION COIL ASSY

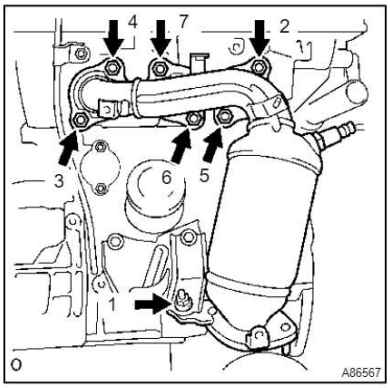


86. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSY NO.2

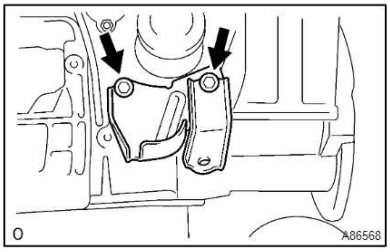
(a) Disconnect the A/F sensor connector.
(b) Remove the bolt, nut and insulator No. 3.



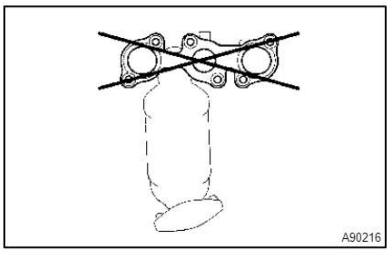
(c) Remove the 2 bolts and insulator No. 2.



(d) Uniformly loosen and remove the 7 nuts in the sequence shown in the illustration.
(e) Remove the converter and gasket.



(f) Remove the 2 bolts and manifold stay.

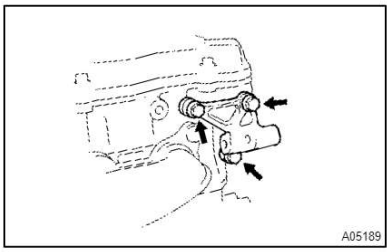


87. INSPECT EXHAUST MANIFOLD CONVERTER SUB-ASSY NO.2

(a) Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.
Maximum warpage: 0.50 mm (0.0196 in.)

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

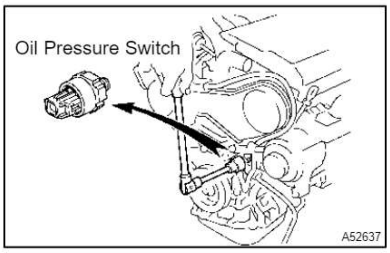
88. REMOVE ENGINE MOUNTING BRACKET RH



89. REMOVE PUMP BRACKET

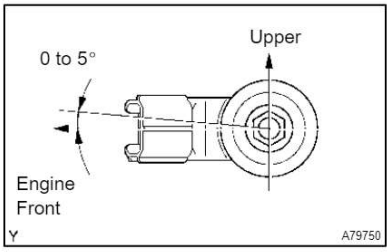
(a) Remove the 3 bolts and pump bracket.

90. REMOVE GENERATOR BRACKET NO.1
91. REMOVE COMPRESSOR MOUNTING BRACKET NO.1
92. REMOVE WATER INLET PIPE (See page 16-31)
93. REMOVE WATER INLET (See page 16-31)
94. REMOVE THERMOSTAT (See page 16-31)



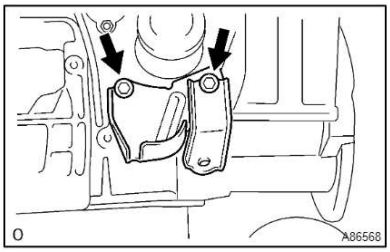
95. REMOVE ENGINE OIL PRESSURE SWITCH ASSY
(a) Remove the oil pressure switch.

96. REMOVE KNOCK SENSOR
(a) Remove the 2 nuts and 2 sensors.
97. REPLACE PARTIAL ENGINE ASSY



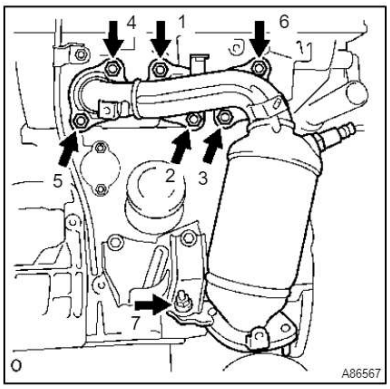
98. INSTALL KNOCK SENSOR
(a) Install the 2 knock sensors with the 2 nuts, as shown in the illustration.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

99. INSTALL ENGINE OIL PRESSURE SWITCH ASSY
(a) Clean the threads of the oil pressure switch. 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) Install the oil pressure switch.
Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)
100. INSTALL THERMOSTAT (See page 16-31)
101. INSTALL WATER INLET (See page 16-31)
102. INSTALL WATER INLET PIPE (See page 16-31)
103. INSTALL COMPRESSOR MOUNTING BRACKET NO.1
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)
104. INSTALL GENERATOR BRACKET NO.1
Torque: 58 N·m (591 kgf·cm, 43 ft·lbf)
105. INSTALL PUMP BRACKET
Torque: 32 N·m (326 kgf·cm, 24 ft·lbf)
106. INSTALL ENGINE MOUNTING BRACKET RH
Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)



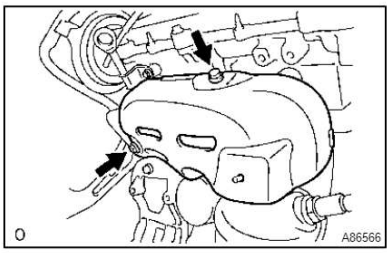
107. INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSY NO.2

(a) Install the manifold stay with the 2 bolts, as shown in the illustration.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

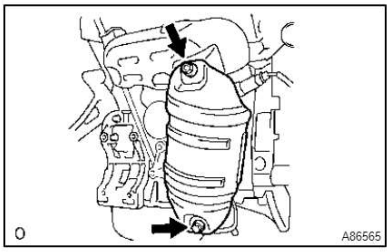


(b) Install a new gasket and the converter sub-assy No. 2 with the 7 nuts. Uniformly, tighten the 7 nuts in the sequence shown in the illustration.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

(c) Retighten nuts 1 and 2 as shown in the illustration.



(d) Install the insulator No. 2 with the bolt and nut, as shown in the illustration.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



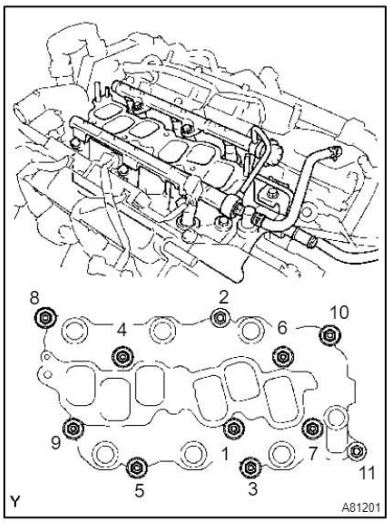
(e) Install the insulator No. 3 with the bolt and nut, as shown in the illustration.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

(f) Connect the A/F sensor connector.

108. INSTALL IGNITION COIL ASSY
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

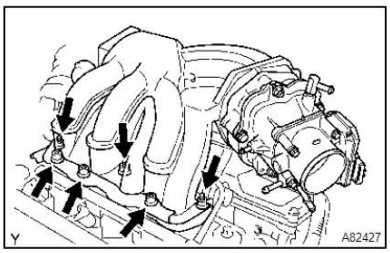
109. INSTALL WATER OUTLET

(a) Install 2 new gaskets to the 2 cylinder heads.
(b) Install the water outlet together with the water bypass hose No. 1 and unlock the hose clamp.
(c) Tighten the 2 bolts, 2 nuts and 2 washers.
Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)
(d) Install the clamp.
(e) Connect the engine coolant temperature sensor connector.
(f) Connect the radiator hose inlet.



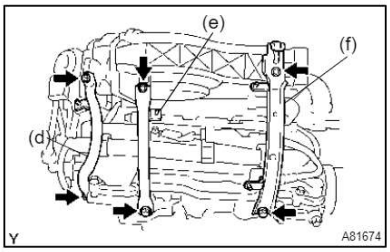
110. INSTALL INTAKE MANIFOLD

(a) Install the intake manifold with the 9 bolts, 2 nuts and 2 washers. Uniformly tighten the bolts and nuts in the sequence shown in the illustration.
Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)
(b) Retighten the water outlet mounting bolts and nuts.
Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)
(c) Install the ground cable with the nut.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
(d) Connect the heater inlet water hose.

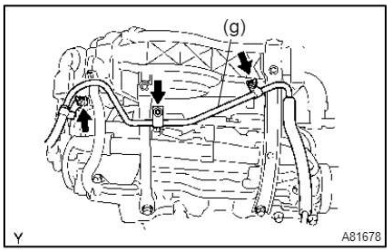


111. INSTALL INTAKE AIR SURGE TANK

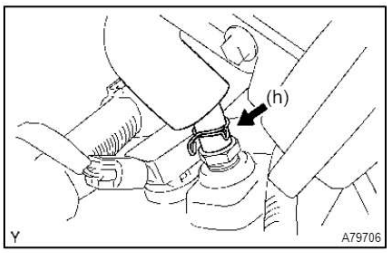
(a) Install a new gasket to the intake air surge tank.
(b) Install the intake air surge tank and emission control valve bracket with the 2 nuts.
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
(c) Using a socket hexagon wrench 8, tighten the 4 bolts.
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)



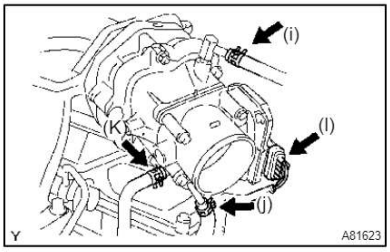
(d) Install the surge tank stay No. 2 with the 2 bolts.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)
(e) Install the surge tank stay No. 1 with the 2 bolts.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)
(f) Install the engine hanger No. 1 with the 2 bolts.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)



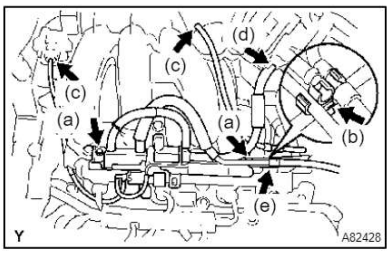
(g) Install the pressure feed tube with the 3 nuts.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



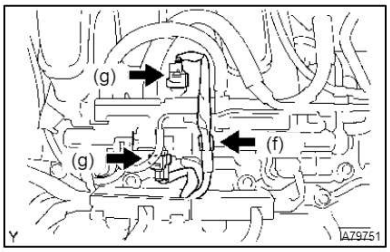
(h) Connect the ventilation hose.



(i) Connect the union to the check valve hose.
(j) Connect the water bypass hose No. 2.
(k) Connect the water bypass hose No. 3.
(l) Connect the throttle motor connector.

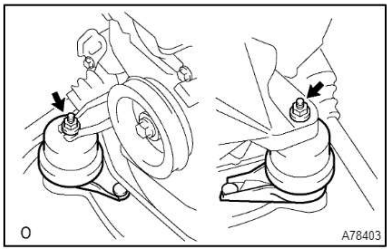


112. INSTALL EMISSION CONTROL VALVE SET
(a) Install the emission control valve set with the 2 nuts.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
(b) Install the clamp.
(c) Connect the 2 vacuum hoses.
(d) Connect the fuel vapor feed hose No. 2.
(e) Connect the fuel vapor feed hose No. 1.

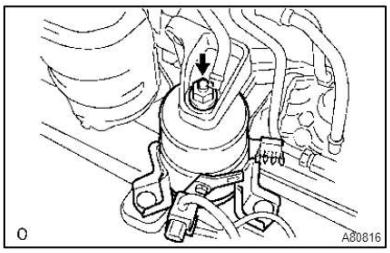


(f) Install the wire harness clamp.
(g) Connect the 2 VSV connectors.

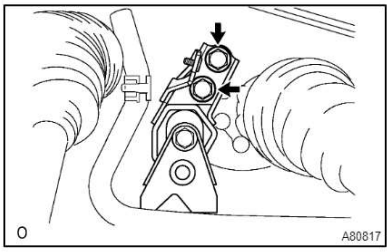
113. INSTALL ENGINE HANGER NO.2
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)
114. REMOVE ENGINE STAND
115. INSTALL DRIVE PLATE & RING GEAR SUB-ASSY (See page 14-246)
116. INSTALL ENGINE MOUNTING BRACKET RR
117. INSTALL AUTOMATIC TRANSAXLE W/TRANSFER (4WD TYPE) (See page 40-20)
118. INSTALL TRANSFER STIFFENER PLATE RH (4WD TYPE)
119. INSTALL AUTOMATIC TRANSAXLE ASSY (2WD TYPE) (See page 40-18)
120. INSTALL ENGINE MOUNTING BRACKET FR
121. INSTALL STARTER ASSY (See page 19-28)
122. INSTALL FRONT DRIVE SHAFT ASSY LH (See page 30-21)
123. INSTALL FRONT DRIVE SHAFT ASSY RH (2WD TYPE) (See page 30-21)
124. INSTALL FRONT DRIVE SHAFT ASSY RH (4WD TYPE) (See page 30-21)



125. INSTALL FRONT FRAME ASSY
(a) Install the engine mounting insulator RH and LH with the 2 nuts.
Torque: 95 N·m (969 kgf·cm, 70 ft·lbf)

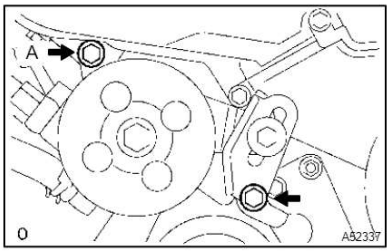


(b) Install the engine mounting insulator FR with the nut.
Torque: 87 N·m (887 kgf·cm, 64 ft·lbf)



(c) Install the engine mounting insulator RR with the 2 bolts.
Torque: 75 N·m (765 kgf·cm, 55 ft·lbf)

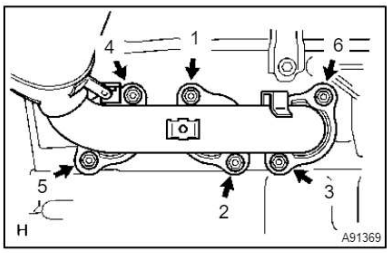
126. INSTALL POWER STEERING LINK ASSY (See page 51-28)
127. INSTALL STABILIZER BAR FRONT (See page 26-22)



128. INSTALL VANE PUMP ASSY

(a) Install the vane pump with the 2 bolts.
Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)

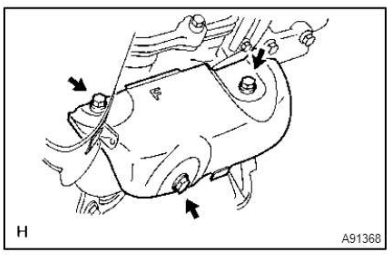
HINT:
After adjusting the V-ribbed belt, tighten bolt A.



129. INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSY

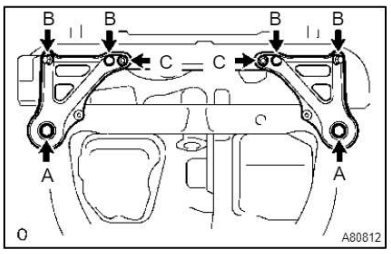
(a) Install a new gasket and the exhaust manifold RH. Uniformly tighten the 6 nuts in the sequence shown in the illustration.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

(b) Retighten nuts 1 and 2 shown in the illustration.



(c) Install the insulator with the 3 bolts, as shown in the illustration.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

(d) Connect the A/F sensor connector.

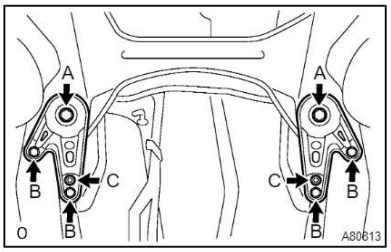


130. INSTALL ENGINE ASSEMBLY WITH TRANSAXLE

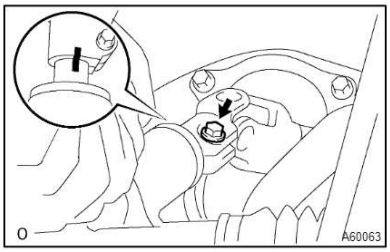
(a) Set the engine assembly with transaxle on the engine lifter.

(b) Install the engine assembly to the vehicle.

(c) Install the frame side rail plate RH and LH with the 6 bolts and 2 nuts.
Torque:
85 N·m (867 kgf·cm, 63 ft·lbf) for bolt A
32 N·m (326 kgf·cm, 24 ft·lbf) for bolt B and nut C

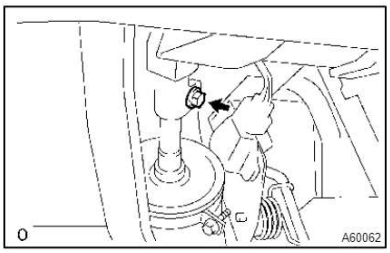


(d) Install the front suspension member brace rear RH and LH with the 6 bolts and 2 nuts.
Torque:
85 N·m (867 kgf·cm, 63 ft·lbf) for bolt A
32 N·m (326 kgf·cm, 24 ft·lbf) for bolt B and nut C

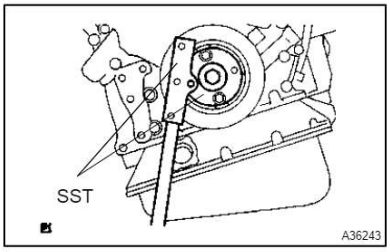


131. CONNECT STEERING INTERMEDIATE SHAFT SUB-ASSY

(a) Align the matchmarks on the intermediate shaft and the control valve shaft, and install the bolt.
Torque: 35 N·m (357 kgf·cm, 26 ft·lbf)

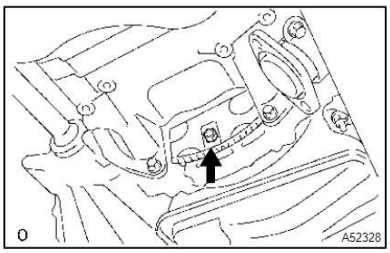


(b) Tighten the sliding yoke bolt.
Torque: 35 N·m (357 kgf·cm, 26 ft·lbf)



132. INSTALL DRIVE PLATE & TORQUE CONVERTER CLUTCH SETTING BOLT

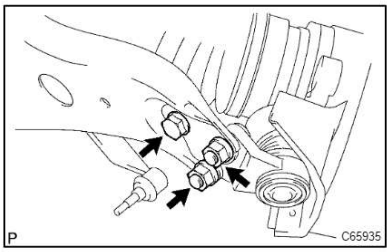
(a) Using SST, hold the crankshaft.
SST 09213-54015 (91651-60855), 09330-00021
(b) Using kerosene or gasoline, clean the bolts thoroughly.
(c) Apply adhesive to 2 or 3 threads of the bolt end.
Adhesive:
Part No. 08833-00070, THREE BOND 1324 or equivalent



(d) Install the 6 torque converter set bolts.
Torque: 41 N·m (418 kgf·cm, 30 ft·lbf)

NOTICE:
First tighten the green colored bolt and then tighten the 5 bolts.

(e) Install the flywheel housing under cover with the 2 bolts.
Torque: 8.0 N·m (82 kgf·cm, 70 in.·lbf)



133. INSTALL FRONT SUSPENSION ARM SUB- ASSY LOWER NO.1 LH

(a) Install the drive shaft to the steering knuckle.
(b) Install the suspension lower arm with the bolt and 2 nuts.
Torque: 127 N·m (1,295 kgf·cm, 94 ft·lbf)

134. INSTALL FRONT SUSPENSION ARM SUB-ASSY LOWER NO.1 RH

HINT:

Use the same procedures described for the LH side.

135. INSTALL TIE ROD END SUB-ASSY LH

(a) Connect the tie rod end to the steering knuckle and install a new castle nut.

Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

NOTICE:

- **Prevent any lubricant from contacting the thread and the taper portions.**
- **After tightening the castle nut, tighten it to the additional direction within 60° to put into a cotter pin.**

(b) Insert a new cotter pin.

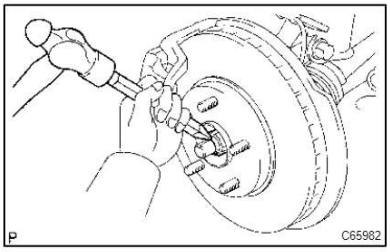
136. INSTALL TIE ROD END SUB-ASSY RH

HINT:

Use the same procedures described for the LH side.

137. INSTALL SPEED SENSOR FRONT LH (See page 32-40)

138. INSTALL SPEED SENSOR FRONT RH (See page 32-40)



139. INSTALL FRONT AXLE HUB LH NUT

(a) Using a 30 mm socket wrench, install a new hub nut.

Torque: 294 N·m (2,998 kgf·cm, 217 ft·lbf)

(b) Using a chisel and hammer, tap the front axle hub LH nut.

140. INSTALL FRONT AXLE HUB RH NUT

HINT:

Use the same procedures described for the LH side.

141. INSTALL FRONT STABILIZER LINK ASSY LH

(a) Using a 6 mm socket hexagon wrench, hold the ball stud and install the nut.

Torque: 74 N·m (755 kgf·cm, 55 ft·lbf)

142. INSTALL FRONT STABILIZER LINK ASSY RH

HINT:

Use the same procedures described for the LH side.

143. INSTALL EXHAUST PIPE SUPPORT BRACKET NO.1 (See page 15-5)

144. CONNECT EXHAUST PIPE ASSY FRONT (See page 15-5)

145. CONNECT EXHAUST PIPE SUB-ASSY FRONT NO.3 (See page 15-5)

146. INSTALL PROPELLER SHAFT (4WD TYPE) (See page 30-12)

147. CONNECT ENGINE WIRE

148. INSTALL GLOVE COMPARTMENT DOOR ASSY

149. CONNECT STEERING GEAR OUTLET RETURN TUBE

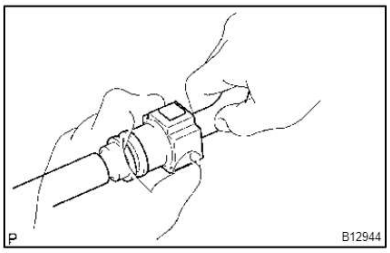
150. CONNECT OIL RESERVOIR TO PUMP HOSE NO.1

151. CONNECT OIL COOLER OUTLET TUBE NO.1

152. CONNECT OIL COOLER INLET TUBE NO.1

153. CONNECT RADIATOR HOSE OUTLET

154. CONNECT RADIATOR HOSE INLET
155. CONNECT HEATER OUTLET WATER HOSE
156. CONNECT HEATER INLET WATER HOSE

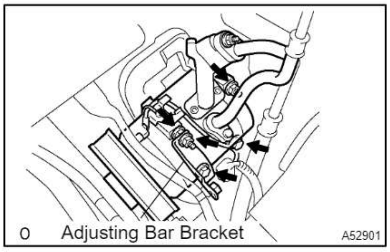


157. CONNECT FUEL PIPE SUB-ASSY NO.1
(a) Push in the fuel tube connector to the fuel pipe until connector makes a "click" sound.

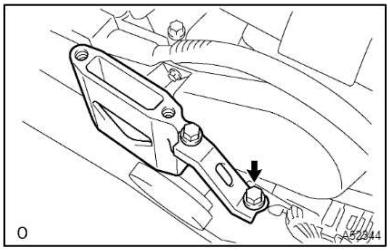
NOTICE:
- **Check for damage or contamination on the connected part of the pipe.**
- **After having finished the connection, check if the pipe and the connector are securely connected by trying to pull them apart.**

(b) Install the fuel pipe clamp.

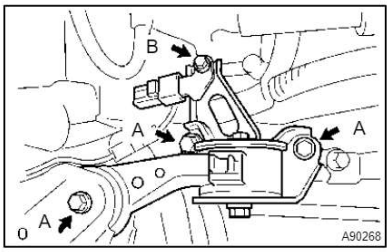
158. CONNECT UNION TO CHECK VALVE HOSE
159. INSTALL TRANSMISSION CONTROL CABLE ASSY (See page 40-20)



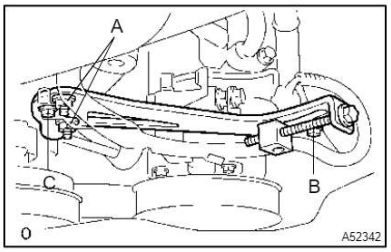
160. INSTALL COMPRESSOR AND MAGNETIC CLUTCH
(a) Install the compressor with the 3 bolts.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)
(b) Install the adjusting bar bracket with the bolt and nut.
Torque:
25 N·m (255 kgf·cm, 18 ft·lbf) for bolt
26 N·m (265 kgf·cm, 19 ft·lbf) for nut



161. INSTALL ENGINE MOUNTING STAY NO.2 RH
(a) Install the mounting stay and mounting bracket with the bolt.
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)



162. INSTALL ENGINE MOVING CONTROL ROD
(a) Install the control rod and bracket with the 4 bolts.
Torque:
64 N·m (653 kgf·cm, 47 ft·lbf) for bolt A
23 N·m (235 kgf·cm, 17 ft·lbf) for bolt B



163. INSTALL GENERATOR BELT ADJUSTING BAR

(a) Install the adjusting bar with the 2 bolts and 2 nuts.

Torque:
43 N·m (438 kgf·cm, 32 ft·lbf) for nut A
18 N·m (184 kgf·cm, 13 ft·lbf) for bolt B
8.0 N·m (82 kgf·cm, 71 in.·lbf) for bolt C

164. INSTALL GENERATOR BRACKET NO.2
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)

165. INSTALL GENERATOR ASSY (See page 19-40)

166. INSTALL VANE PUMP V BELT (See page 14-125)

167. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-125)

168. INSPECT DRIVE BELT TENSION (See page 14-121)

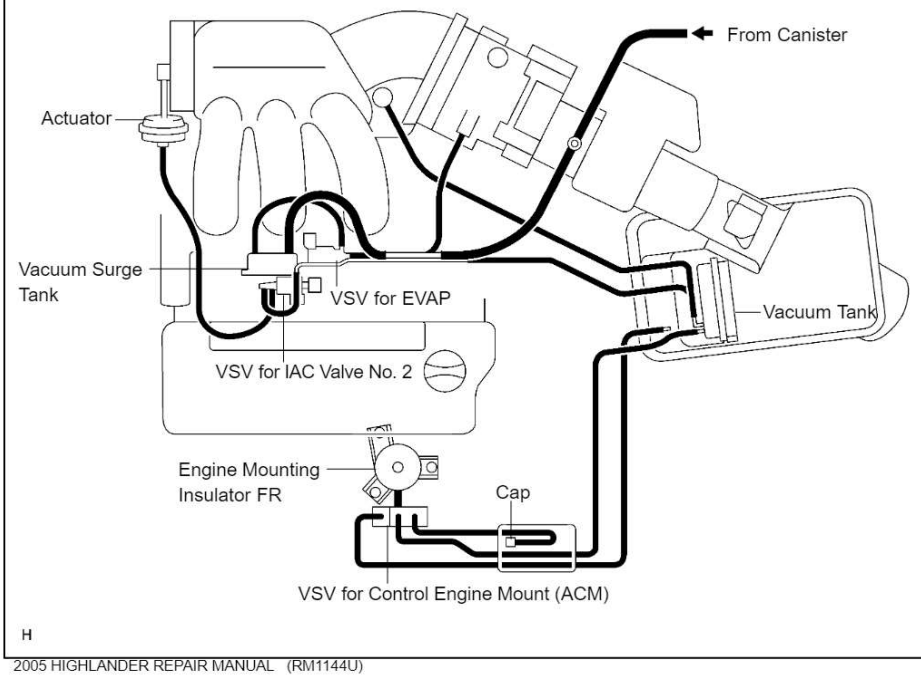
169. INSTALL AIR CLEANER CASE

170. INSTALL AIR CLEANER FILTER ELEMENT SUB-ASSY

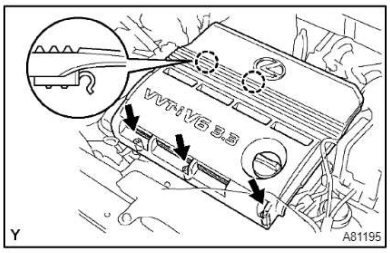
171. INSTALL AIR CLEANER CAP SUB-ASSY

172. CONNECT VACUUM HOSES

Vacuum Hose Routing Diagram



173. INSTALL BATTERY



174. INSTALL V-BANK COVER SUB-ASSY

(a) Fit the 2 retainers and install the V-bank cover.

(b) Using a socket hexagon wrench 5, tighten the 3 nuts.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

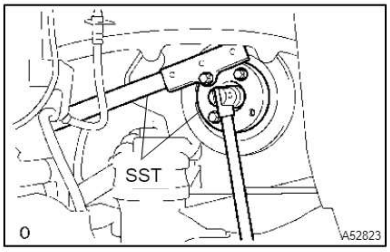
175. INSTALL FRONT SUSPENSION BRACE SUB-ASSY UPPER CENTER
Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)
176. INSTALL COWL PANEL SUB-ASSY
177. INSTALL WINDSHIELD WIPER LINK ASSY (See page 66-7)
178. INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSY (See page 66-7)
179. INSTALL FR WIPER ARM LH (See page 66-7)
180. INSTALL FR WIPER ARM RH (See page 66-7)
181. INSTALL FRONT WHEELS
182. ADD TRANSFER OIL (4WD TYPE)
183. INSPECT TRANSFER OIL (4WD TYPE)
184. ADD AUTOMATIC TRANSAXLE FLUID
185. ADD ENGINE OIL
186. ADD ENGINE COOLANT (See page 16-26)
187. ADD POWER STEERING FLUID
188. BLEED POWER STEERING FLUID (See page 51-3)
189. INSPECT AUTOMATIC TRANSAXLE FLUID
190. CHECK FOR ENGINE OIL LEAKS
191. CHECK FOR ENGINE COOLANT LEAKS (See page 16-20)
192. CHECK POWER STEERING FLUID LEAKAGE
193. INSPECT FOR FUEL LEAKS
194. CHECK FOR EXHAUST GAS LEAKS
195. INSPECT AND ADJUST FRONT WHEEL ALIGNMENT (See page 26-7)
196. INSPECT IGNITION TIMING (See page 14-121)
197. INSPECT ENGINE IDLE SPEED (See page 14-121)
198. INSPECT CO/HC (See page 14-121)
199. CHECK ABS SPEED SENSOR SIGNAL (See page 05-765)

TIMING BELT (3MZ-FE)

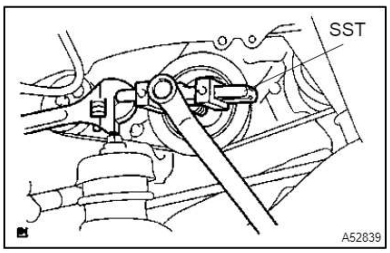
141PL-01

REPLACEMENT

1. REMOVE FRONT WHEEL RH
2. REMOVE FR WIPER ARM LH (See page 66-7)
3. REMOVE FR WIPER ARM RH (See page 66-7)
4. REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSY (See page 66-7)
5. REMOVE WINDSHIELD WIPER LINK ASSY (See page 66-7)
6. REMOVE COWL PANEL SUB-ASSY
7. REMOVE ENGINE UNDER COVER NO.1
8. REMOVE FRONT FENDER APRON SEAL RH
9. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-125)
10. REMOVE VANE PUMP V BELT (See page 14-125)
11. REMOVE ENGINE MOVING CONTROL ROD (See page 14-149)
12. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14-149)
13. REMOVE GENERATOR BRACKET NO.2



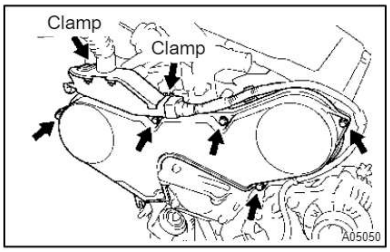
14. REMOVE CRANKSHAFT PULLEY
(a) Using SST, loosen the pulley bolt.
SST 09213-54015 (91651-60855), 09330-00021



(b) Using SST and the pulley bolt, remove the pulley.
SST 09950- 50013 (09951- 05010, 09952- 05010, 09953-05020, 09954-05031)

NOTICE:
Before using SST, apply lubricating oil to the threads and tip of the center bolt 100.

15. REMOVE TIMING BELT NO.1 COVER



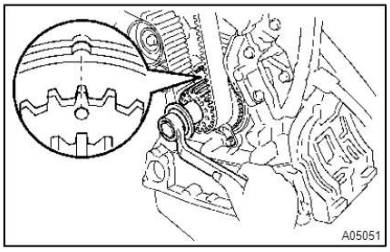
16. REMOVE TIMING BELT NO.2 COVER

(a) Disconnect the engine wire protector clamps from the timing belt No. 3 cover.

(b) Remove the 5 bolts and timing belt cover.

17. REMOVE ENGINE MOUNTING BRACKET RH

18. REMOVE TIMING BELT GUIDE NO.2

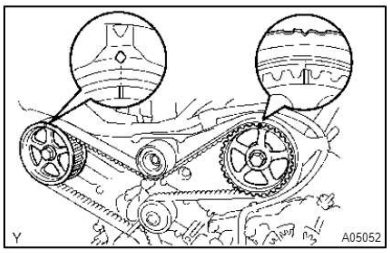


19. REMOVE TIMING BELT

(a) Set the No. 1 cylinder to TDC/compression.

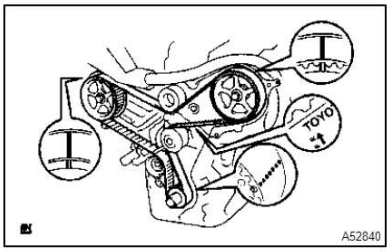
(1) Temporarily install the crankshaft pulley bolt with the washer to the crankshaft.

(2) Turn the crankshaft clockwise, and align the timing marks of the crankshaft timing pulley and oil pump body.



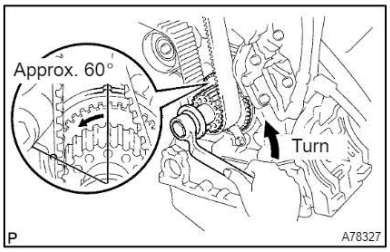
(3) Check that the timing marks of the camshaft timing pulleys and No. 3 timing belt cover are aligned. If not, turn the crankshaft 1 revolution (360°).

(4) Remove the crankshaft pulley bolt.



(b) If planning to reuse the timing belt, check that there are 4 installation marks on the timing belt, as shown in the illustration.

(1) If the installation marks have disappeared, put new installation marks on the timing belt before removing.

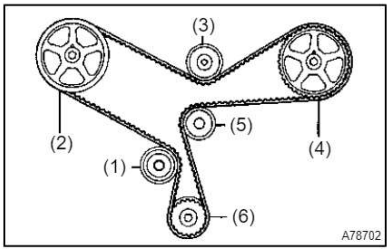


(c) Set the No. 1 cylinder to approximately 60° BTDC/compression.
  (1) Turn the crankshaft counterclockwise by approximately 60°.

NOTICE:
With the timing belt removed:
The crankshaft pulley must be at the correct angle to avoid damage in later steps. If the crankshaft pulley is at the wrong angle and then the camshaft timing pulley and the camshaft are removed, the piston head and valve head may come in contact and be damaged.

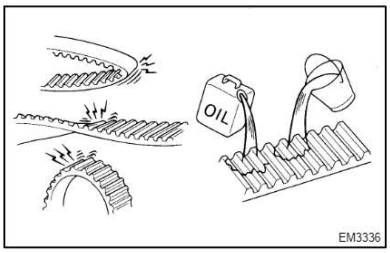
(d) Remove the timing belt tensioner.

NOTICE:
Do not reinstall the tensioner with its plunger extended.



(e) Remove the timing belt in this order.

1st	No. 1 idler pulley
2nd	RH camshaft timing pulley
3rd	No. 2 idler pulley
4th	LH camshaft timing pulley
5th	Water pump pulley
6th	Crankshaft timing pulley



20. 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 instaling the mounting bolt of the camshaft timing pulley.**

Check the belt for any defects, as shown in the installation. Also, check these points below.

(a) If there is premature parting:
  - Check for proper installation.
  - Check the timing cover gasket for no 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 only one side of the belt, check the belt guide and the alignment of each pulley.

(e) If there is noticeable wear on the belt teeth:
- Check the timing cover for damage.
- Check that the gasket has been installed correctly.
- Check for foreign object on the pulley teeth.

If there is any doubt about the belt condition, replace the timing belt.

21. INSTALL TIMING BELT

(a) Remove any oil or water on the pulleys, and keep them clean.

NOTICE:
- **If there is a trace of water and/or oil on the timing belt, repair the leakage and install a new timing belt.**
- **Do not use cleaning agents on the pulleys when cleaning them.**

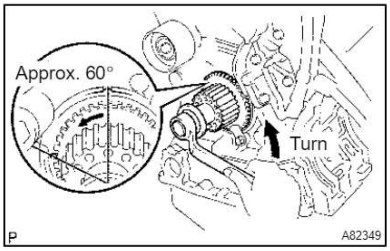
(b) Inspect the idler pulleys.
(1) Check that the idler pulleys turn smoothly.
(2) Visually check the sealed portion of the idler pulleys for oil leakage.

If there is any doubt about the idler pulleys condition, replace the idler pulleys.

(c) Inspect the water pump.
(1) Turn the pulley, and check that the water pump bearing moves smoothly without any noise.
(2) Visually check the drain hole for coolant leakage.

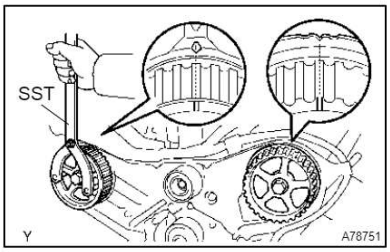
If there is any doubt about the water pump condition, replace the water pump.

(d) Temporarily install the crankshaft pulley bolt and washer to the crankshaft.

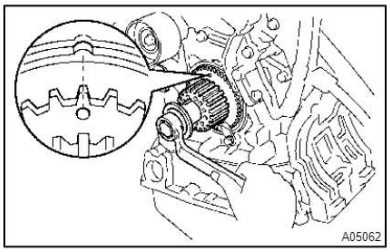


(e) Turn the crankshaft counterclockwise by approximately 60°.

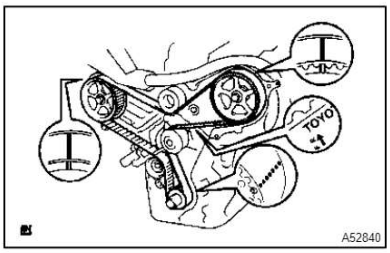
NOTICE:
To prevent the piston head and the valve head from colliding, set the crankshaft pulley at approximately 60° BTDC/ compression position.



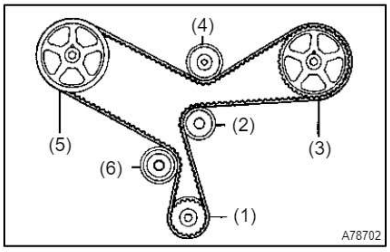
(f) Using SST, turn the timing pulleys, and align the timing marks of the timing pulleys with the No. 3 timing belt cover.
SST 09960-10010 (09962-01000, 09963-01000)



(g) Turn the crankshaft, and align the timing mark of the crankshaft timing pulley with the oil pump body.

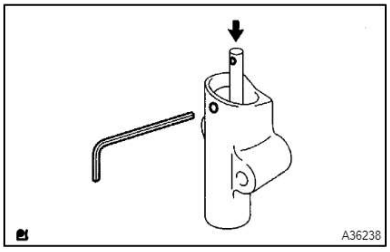


(h) Face the front mark on the timing belt forward.
(i) Align the installation mark on the timing belt with the timing mark of the crankshaft timing pulley.
(j) Align the installation marks on the timing belt with the timing marks of the camshaft timing pulleys.



(k) Install the timing belt in this order.

1st	Crankshaft timing pulley
2nd	Water pump pulley
3rd	LH camshaft timing pulley
4th	No. 2 idler pulley
5th	RH camshaft timing pulley
6th	No. 1 idler pulley



22. INSTALL TIMING BELT TENSIONER ASSY

(a) Set the timing belt tensioner uprightly on the press.
(b) Slowly press in the push rod.

NOTICE:

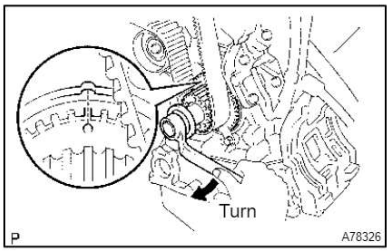
Do not apply pressure of more than 9.8 kN (1,000 kgf, 2,205 lbf) to the rod.

(c) 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.
(d) Release the push rod.
(e) Temporarily install the tensioner with the 2 bolts.
Torque: 27 N·m (275 kgf·cm, 20 ft·lbf)

NOTICE:

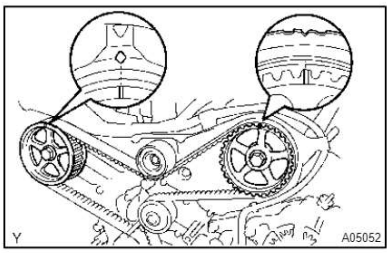
Install the tensioner's bolts uniformly and evenly. Installing the tensioner at an angle may cause it to malfunction.

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



(g) Turn the crankshaft 2 revolutions slowly and align the timing mark of the crankshaft timing pulley with the oil pump body.

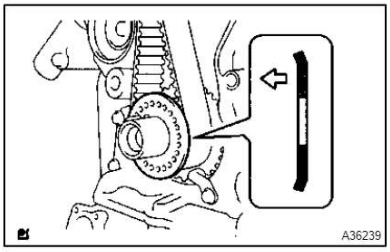
NOTICE:
Always turn the crankshaft clockwise.



(h) Check that the timing marks of the RH and LH timing pulleys are aligned with the timing marks of the No. 3 timing belt cover, as shown in the illustration.

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

(i) Remove the crankshaft pulley bolt.



23. INSTALL TIMING BELT GUIDE NO.2

(a) Install the timing belt guide, facing the cup side toward the engine front.

24. INSTALL ENGINE MOUNTING BRACKET RH
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)

25. INSTALL TIMING BELT NO.2 COVER

(a) Visually check for cracks and breaks on the gasket of the timing belt cover.

HINT:

If it is judged that water is entering at the visual check, replace the timing belt cover.

(b) Install the timing belt cover.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

26. INSTALL TIMING BELT NO.1 COVER

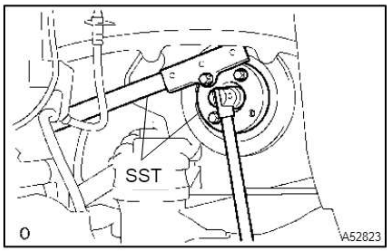
(a) Visually check for cracks and breaks on the gasket of the timing belt cover.

HINT:

If there is a trace that water is entering at the visual check, replace the timing belt cover.

(b) Install the timing belt cover.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

(c) Install the engine wire protector cover to the timing belt No. 3 cover.



27. INSTALL CRANKSHAFT PULLEY

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

(b) Using SST, install the pulley bolt.
SST 09213-54015 (91651-60855), 09330-00021
Torque: 220 N·m (2,243 kgf·cm, 162 ft·lbf)

28. INSTALL GENERATOR BRACKET NO.2
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)

29. INSTALL ENGINE MOUNTING STAY NO.2 RH (See page 14-149)

30. INSTALL ENGINE MOVING CONTROL ROD (See page 14-149)

31. INSTALL VANE PUMP V BELT (See page 14-125)

32. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-125)

33. INSPECT DRIVE BELT TENSION (See page 14-121)

34. INSTALL FRONT FENDER APRON SEAL RH

35. INSTALL ENGINE UNDER COVER NO.1

36. INSTALL COWL PANEL SUB-ASSY

37. INSTALL WINDSHIELD WIPER LINK ASSY(See page 66-7)

38. INSTALL FR WIPER ARM LH (See page 66-7)

39. INSTALL FR WIPER ARM RH (See page 66-7)

40. INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSY (See page 66-7)

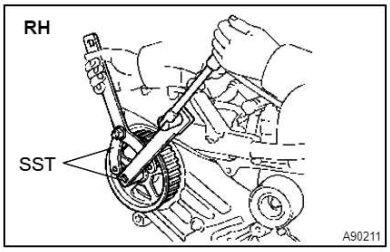
41. INSTALL FRONT WHEEL RH

CAMSHAFT (RH BANK) (3MZ-FE)

141PM-01

REPLACEMENT

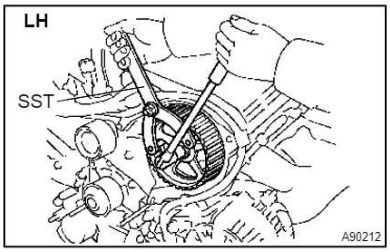
1. DRAIN ENGINE COOLANT (See page 16-26)
2. REMOVE FR WIPER ARM LH (See page 66-7)
3. REMOVE FR WIPER ARM RH (See page 66-7)
4. REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSY (See page 66-7)
5. REMOVE WINDSHIELD WIPER LINK ASSY (See page 66-7)
6. REMOVE COWL PANEL SUB-ASSY
7. REMOVE FRONT SUSPENSION BRACE SUB-ASSY UPPER CENTER
8. REMOVE V-BANK COVER SUB-ASSY (See page 14-149)
9. REMOVE AIR CLEANER CAP SUB-ASSY
10. REMOVE EMISSION CONTROL VALVE SET (See page 14-149)
11. REMOVE INTAKE AIR SURGE TANK (See page 14-149)
12. REMOVE IGNITION COIL ASSY
13. REMOVE CYLINDER HEAD COVER SUB-ASSY (See page 14-173)
14. REMOVE FRONT WHEEL RH
15. REMOVE ENGINE UNDER COVER NO.1
16. REMOVE FRONT FENDER APRON SEAL RH
17. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-125)
18. REMOVE VANE PUMP V BELT (See page 14-125)
19. REMOVE ENGINE MOVING CONTROL ROD (See page 14-149)
20. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14-149)
21. REMOVE GENERATOR BRACKET NO.2
22. REMOVE CRANKSHAFT PULLEY (See page 14-173)
23. REMOVE TIMING BELT NO.1 COVER
24. REMOVE TIMING BELT NO.2 COVER (See page 14-206)
25. REMOVE ENGINE MOUNTING BRACKET RH
26. REMOVE TIMING BELT GUIDE NO.2
27. REMOVE TIMING BELT (See page 14-206)
28. REMOVE TIMING BELT IDLER SUB-ASSY NO.2



29. REMOVE CAMSHAFT TIMING PULLEY

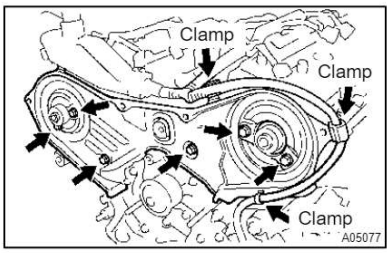
(a) Using SST, remove the bolt and RH timing pulley.

SST 09960-10010 (09962-01000, 09963-01000), 09249-63010



(b) Using SST, remove the bolt and LH timing pulley.
SST 09960-10010 (09962-01000, 09963-01000)

HINT:
Arrange the camshaft timing pulleys (RH and LH sides) so that they can be returned to their original locations when reassembled.

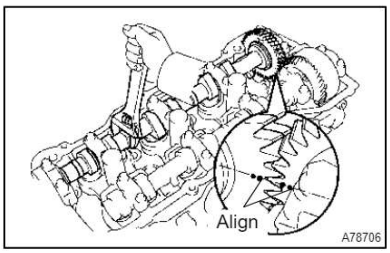


30. REMOVE TIMING BELT NO.3 COVER

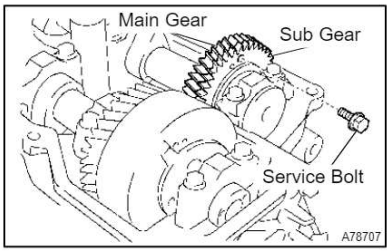
(a) Disconnect the 3 engine wire harness clamps from the timing belt No. 3 cover.
(b) Remove the 6 bolts and the timing belt cover.

31. REMOVE CAMSHAFT

NOTICE:
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps must be carried out.



(a) Align the camshaft drive and driven gear's timing marks (2 dot marks each) by turning the camshaft with a wrench.

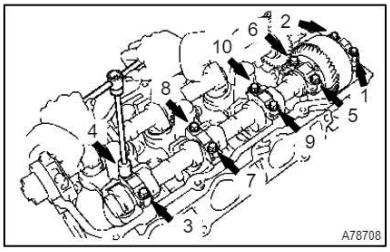


(b) Secure the exhaust camshaft sub gear to the main gear with a service bolt.
Recommended service bolt:

Thread diameter	6 mm
Thread pitch	1.0 mm
Bolt length	16 to 20 mm

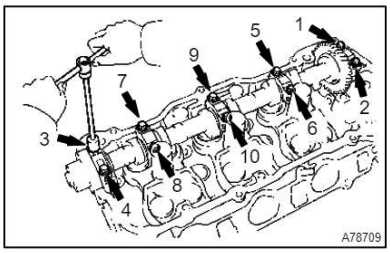
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

HINT:
When removing the camshaft, make certain that the torsional spring force of the sub gear has been eliminated by installation of the service bolt.



(c) Uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration. Remove the 5 bearing caps and the camshaft.

NOTICE:
- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**

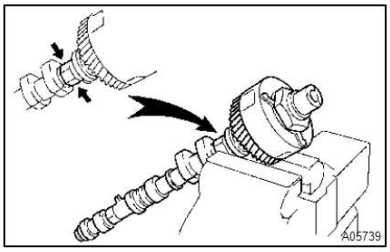


32. REMOVE NO.2 CAMSHAFT

(a) Uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 2 camshaft.

NOTICE:
- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**

(b) Remove the oil seal from the No. 2 camshaft.

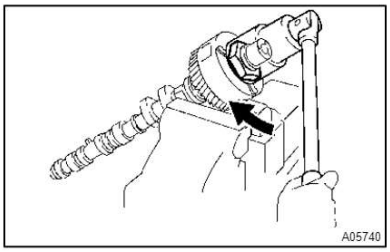


33. REMOVE CAMSHAFT TIMING GEAR ASSY

NOTICE:
Do not remove or install the camshaft timing gear (VVT-i) unless you are replacing the VVT-i or the camshaft.

(a) Clamp the camshaft in a vise on the hexagonal lobe.

NOTICE:
Do not damage the camshaft.



(b) Using a 46 mm socket wrench, remove the lock nut by turning it clockwise.

NOTICE:

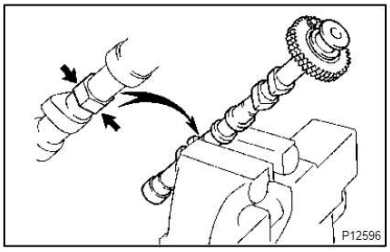
- **Remove the lock nut with the lock-pin engaged and locked at the extreme retarded angle position.**
- **The lock nut has LH threads.**
- **Only use the socket wrench. Other tools will deform the cam angle rotor.**

(c) Remove the timing gear (VVT-i).

NOTICE:

Never remove the 3 bolts on the gear.

If it is difficult to remove the VVT-i, tap it lightly using a plastic-faced hammer and then remove it.

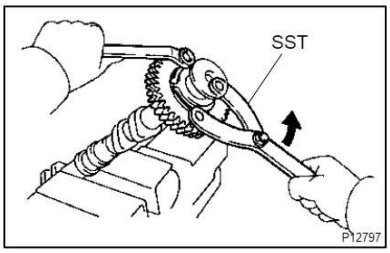


34. REMOVE CAMSHAFT SUB GEAR

(a) Clamp the camshaft in a vise on the hexagonal lobe.

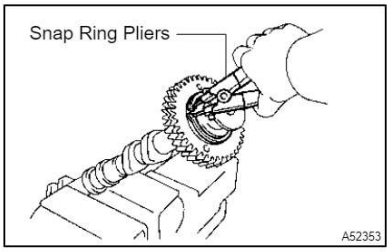
NOTICE:

Do not damage the camshaft.



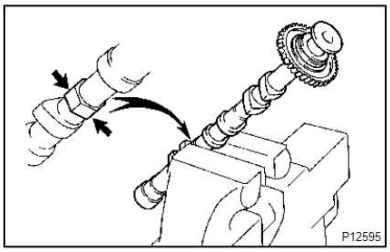
(b) Using SST, turn the sub gear counterclockwise, and remove the service bolt.

SST 09960-10010 (09962-01000, 09963-00500)



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

(d) Remove the wave washer, camshaft sub gear and camshaft gear spring.

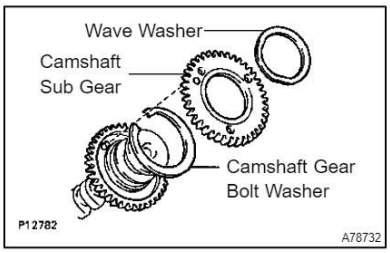


35. INSTALL CAMSHAFT SUB GEAR

(a) Clamp the camshaft in a vise on the hexagonal lobe.

NOTICE:

Do not damage the camshaft.

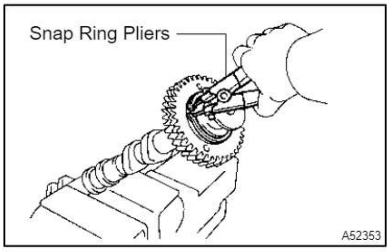


(b) Install the camshaft gear bolt washer and the camshaft sub gear.

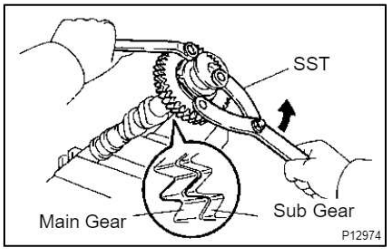
HINT:

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

(c) Install the wave washer.



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



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

SST 09960-10010 (09962-01000, 09963-00500)

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

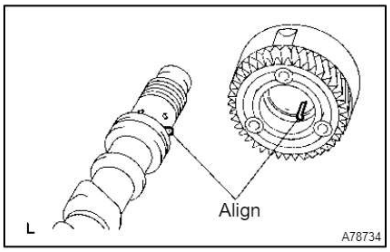
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

NOTICE:

Do not damage the camshaft journals.

HINT:

When installing the camshaft, make certain that the torsional spring force of the sub gear has been eliminated by installation of the service bolt.



36. INSTALL CAMSHAFT TIMING GEAR ASSY

(a) Align the alignment pin with the alignment pin groove and install the VVT-i on the camshaft.

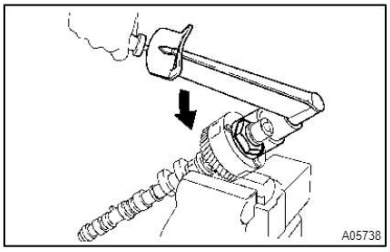
NOTICE:

Install the VVT-i with the lock-pin engaged and locked at the most retarded angle position.

(b) Apply engine oil to the nut, the mounting surface of the VVT-i and the screw threads.

NOTICE:

- **Be sure to apply the oil, otherwise the specified torque cannot be obtained.**
- **A new nut must be used when replacing the VVT-i unit.**



(c) Using a 46 mm socket wrench, install and tighten the lock nut by turning it counterclockwise.

Torque: 150 N·m (1,530 kgf·cm, 111 ft·lbf)

NOTICE:

- **The lock nut has LH threads.**
- **Only use the socket wrench. Other tools will deform the cam angle rotor.**

37. INSTALL NO.2 CAMSHAFT

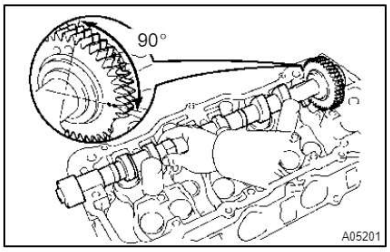
NOTICE:

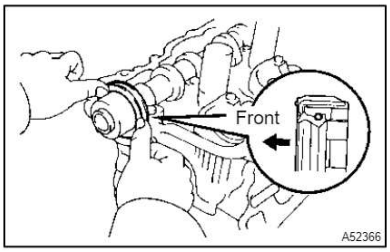
Since the thrust clearance of the camshaft is small, the camshaft must be held level while it is being installed. If the camshaft is not level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps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

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

(b) Place the No. 2 camshaft at a 90° angle of the timing mark (2 dot marks) on the cylinder head.

(c) Apply MP grease to a new oil seal lip.

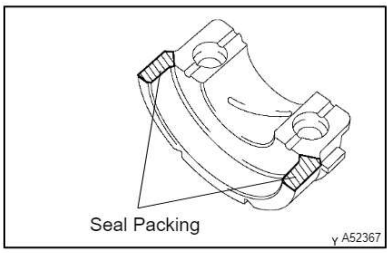




(d) Install the oil seal to the camshaft.

NOTICE:

- **Do not turn over the oil seal lip.**
- **Insert the oil seal until it stops.**



(e) Remove any old packing material from the contact surface.

(f) Apply seal packing to the No. 1 bearing cap, as shown in the illustration.

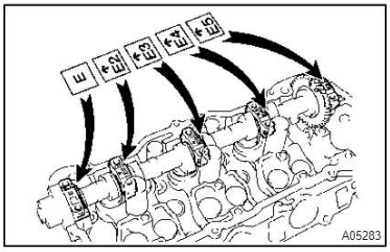
Seal packing: Part No. 08826-00080 or equivalent

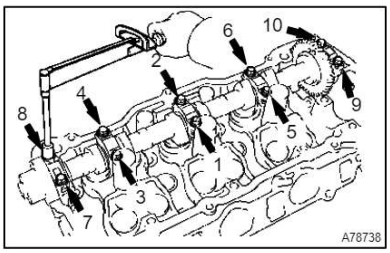
NOTICE:

- **Install the No. 1 bearing cap within 5 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing.**

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

(h) Apply a light coat of engine oil on the threads of the bearing cap bolts.





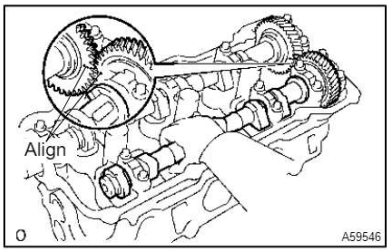
(i) Uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.

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

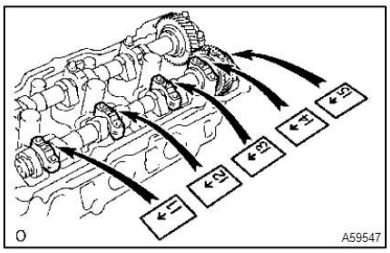
38. INSTALL CAMSHAFT

NOTICE:

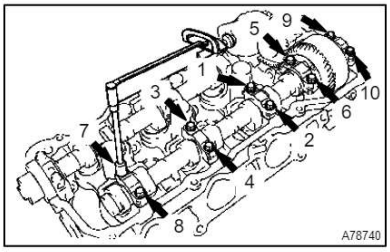
Since the thrust clearance of the camshaft is small, the camshaft must be held level while it is being installed. If the camshaft is not level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps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



(a) Apply new engine oil to the thrust portion and journal of the camshaft.
(b) Align the camshaft drive and driven gear's timing marks (2 dot marks each).
(c) Place the camshaft on the cylinder head.



(d) Install the 5 bearing caps in their proper locations.
(e) Apply a light coat of engine oil to the threads of the bearing cap bolts.

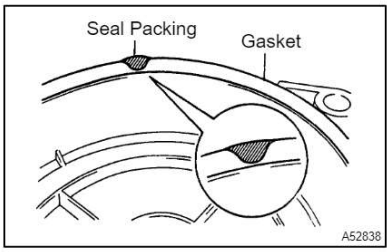


(f) Uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.
Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)
(g) Remove the service bolt.

39. INSTALL TIMING BELT NO.3 COVER

(a) Visually check for cracks and breaks in the gasket of the timing belt cover.

HINT:
If water is entering through cracks or breaks in the gasket, repair according to these guidelines: 1) if the crack length is within 2 to 3 cm (0.79 to 1.18 in.), repair with seal packing; or 2) if the crack length is over 3 cm (1.18 in.), replace the gasket.



(b) When repairing the timing belt cover gasket, follow the procedure below.
(1) Repair the cracks and breaks by applying the seal packing to the damaged area.
Seal packing: Part No. 08826-00080 or equivalent

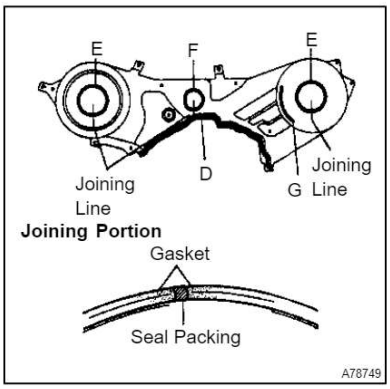
NOTICE:
When applying the seal packing, apply it as wide and high as the gasket.

(c) If the timing belt cover gasket needs to be replaced, follow the procedure below.

(1) Using a screwdriver and gasket scraper, remove the remaining gasket.

NOTICE:

Be careful not to damage the timing belt cover.



(2) Remove the backing paper from a new gasket, and affix the gasket along the groove of the timing belt cover, as shown in the illustration.

NOTICE:

- **Affix the gasket in the center of the groove.**
- **At the corners, try to keep the gasket thickness uniform.**

Length:

Gasket	D	E	F	G
Specified Condition	335 mm (13.19 in.)	180 mm (7.09 in.)	133 mm (5.24 in.)	72 mm (2.83 in.)

(3) If there is a gap on the joint of the gasket, apply seal packing to close the gap.

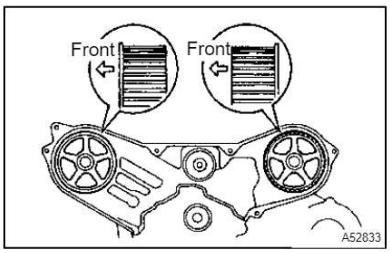
Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

When applying the seal packing, apply it as wide and high as the gasket.

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

Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

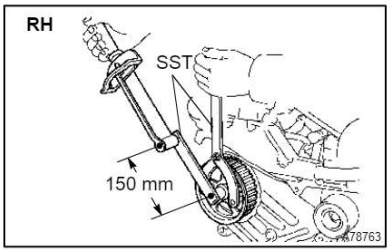


40. INSTALL CAMSHAFT TIMING PULLEY

(a) Install the camshaft timing pulley with the belt guide properly oriented and tighten the bolt temporarily.

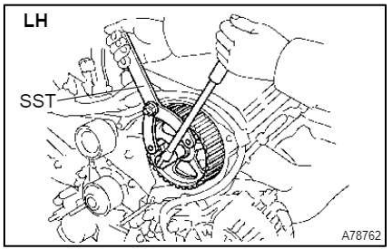
HINT:

- Face the belt guide of the RH timing pulley towards the front of the engine.
- Face the belt guide of the LH timing pulley towards the rear of the engine.



(b) Using SST, tighten the RH pulley bolt.
SST 09960- 10010 (09962- 01000, 09963- 01000), 09249-63010
Torque: 125 N·m (1,275 kgf·cm, 92 ft·lbf)

NOTICE:
The torque specification above is for the SST without extension tool specification. Use the special formula to calculate the SST with extension tool torque specification (see page 01-5).
Extended length of SST (09249-63010):
150 mm (5.91 in.)



(c) Using SST, tighten the LH pulley bolt.
SST 09960-10010 (09962-01000, 09963-01000)
Torque: 125 N·m (1,275 kgf·cm, 92 ft·lbf)

41. **INSTALL TIMING BELT IDLER SUB-ASSY NO.2**
Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)
42. **INSPECT TIMING BELT (See page 14-206)**
43. **INSTALL TIMING BELT (See page 14-206)**
44. **INSTALL TIMING BELT TENSIONER ASSY (See page 14-206)**
45. **INSTALL TIMING BELT GUIDE NO.2 (See page 14-206)**
46. **INSTALL ENGINE MOUNTING BRACKET RH**
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
47. **INSTALL TIMING BELT NO.2 COVER (See page 14-206)**
48. **INSTALL TIMING BELT NO.1 COVER (See page 14-206)**
49. **INSTALL CRANKSHAFT PULLEY (See page 14-173)**
50. **INSTALL GENERATOR BRACKET NO.2**
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
51. **INSTALL ENGINE MOUNTING STAY NO.2 RH (See page 14-149)**
52. **INSTALL ENGINE MOVING CONTROL ROD (See page 14-149)**
53. **INSPECT VALVE CLEARANCE (See page 14-127)**
54. **ADJUST VALVE CLEARANCE (See page 14-127)**
55. **INSTALL VANE PUMP V BELT (See page 14-125)**
56. **INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-125)**
57. **INSPECT DRIVE BELT TENSION (See page 14-121)**
58. **INSTALL CYLINDER HEAD COVER SUB-ASSY (See page 14-173)**
59. **INSTALL IGNITION COIL ASSY**
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
60. **INSTALL INTAKE AIR SURGE TANK (See page 14-149)**

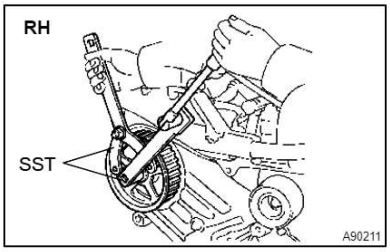
61. INSTALL EMISSION CONTROL VALVE SET (See page 14-149)
62. INSTALL AIR CLEANER CAP SUB-ASSY
63. CONNECT VACUUM HOSES (See page 14-149)
64. INSTALL V-BANK COVER SUB-ASSY (See page 14-149)
65. INSTALL FRONT SUSPENSION BRACE SUB-ASSY UPPER CENTER
    Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)
66. INSTALL COWL PANEL SUB-ASSY
67. INSTALL WINDSHIELD WIPER LINK ASSY (See page 66-7)
68. INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSY (See page 66-7)
69. INSTALL FR WIPER ARM LH (See page 66-7)
70. INSTALL FR WIPER ARM RH (See page 66-7)
71. INSTALL FRONT WHEEL RH
72. ADD ENGINE COOLANT (See page 16-26)
73. CHECK FOR ENGINE COOLANT LEAKS (See page 16-20)

CAMSHAFT (LH BANK) (3MZ-FE)

141PN-01

REPLACEMENT

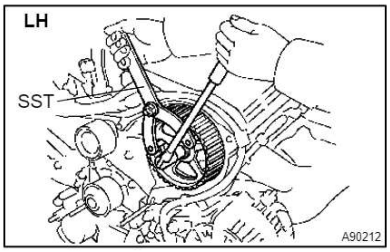
1. DRAIN ENGINE COOLANT (See page 16-26)
2. REMOVE FR WIPER ARM LH (See page 66-7)
3. REMOVE FR WIPER ARM RH (See page 66-7)
4. REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSY (See page 66-7)
5. REMOVE WINDSHIELD WIPER LINK ASSY (See page 66-7)
6. REMOVE COWL PANEL SUB-ASSY
7. REMOVE FRONT SUSPENSION BRACE SUB-ASSY UPPER CENTER
8. REMOVE V-BANK COVER SUB-ASSY (See page 14-149)
9. REMOVE RADIATOR HOSE INLET
10. REMOVE IGNITION COIL ASSY
11. REMOVE CYLINDER HEAD COVER SUB-ASSY LH (See page 14-173)
12. REMOVE FRONT WHEEL RH
13. REMOVE ENGINE UNDER COVER NO.1
14. REMOVE FRONT FENDER APRON SEAL RH
15. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-125)
16. REMOVE VANE PUMP V BELT (See page 14-125)
17. REMOVE ENGINE MOVING CONTROL ROD (See page 14-149)
18. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14-149)
19. REMOVE GENERATOR BRACKET NO.2
20. REMOVE CRANKSHAFT PULLEY (See page 14-173)
21. REMOVE TIMING BELT NO.1 COVER
22. REMOVE TIMING BELT NO.2 COVER (See page 14-206)
23. REMOVE ENGINE MOUNTING BRACKET RH
24. REMOVE TIMING BELT GUIDE NO.2
25. REMOVE TIMING BELT (See page 14-206)
26. REMOVE TIMING BELT IDLER SUB-ASSY NO.2



27. REMOVE CAMSHAFT TIMING PULLEY

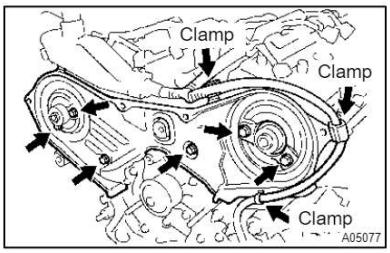
(a) Using SST, remove the bolt and RH timing pulley.

SST 09960- 10010 (09962- 01000, 09963- 01000), 09249-63010



(b) Using SST, remove the bolt and LH timing pulley.
SST 09960-10010 (09962-01000, 09963-01000)

HINT:
Arrange the camshaft timing pulleys (RH and LH sides) so that they can be returned to their original locations when reassembled.



28. REMOVE TIMING BELT NO.3 COVER

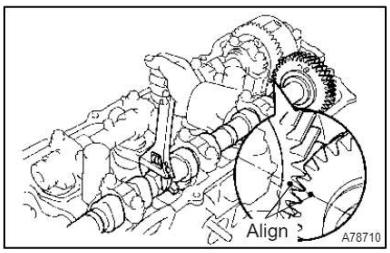
(a) Disconnect the 3 engine wire harness clamps from the timing belt No. 3 cover.

(b) Remove the 6 bolts and the timing belt cover.

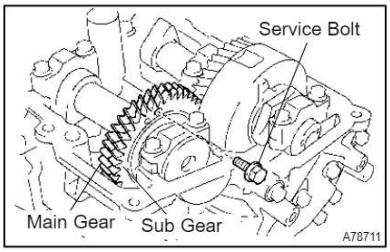
29. REMOVE NO.3 CAMSHAFT SUB-ASSY

NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps must be carried out.



(a) Align the camshaft drive and driven gear's timing marks (1 dot mark each) by turning the camshaft with a wrench.

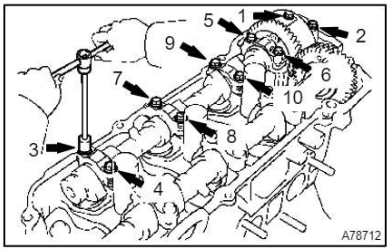


(b) Secure the exhaust camshaft sub gear to the main gear with a service bolt.
Recommended service bolt:

Thread diameter	6 mm
Thread pitch	1.0 mm
Bolt length	16 to 20 mm

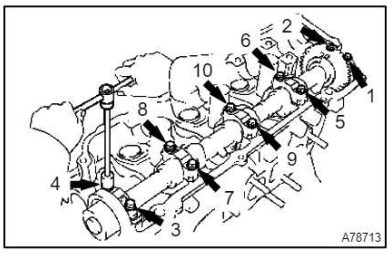
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

HINT:
When removing the camshaft, make certain that the torsional spring force of the sub gear has been eliminated by installation of the service bolt.



(c) Uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 3 camshaft.

NOTICE:
- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**

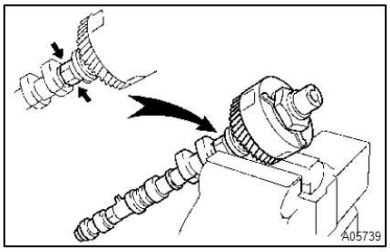


30. REMOVE NO.4 CAMSHAFT SUB-ASSY

(a) Uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 4 camshaft.

NOTICE:
- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**

(b) Remove the oil seal from the No. 4 camshaft.

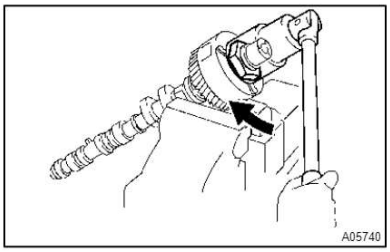


31. REMOVE CAMSHAFT TIMING GEAR ASSY

NOTICE:
Do not remove or install the timing gear (VVT-i) unless you are replacing the VVT-i or the camshaft.

(a) Clamp the camshaft in a vise on the hexagonal lobe.

NOTICE:
Do not damage the camshaft.



(b) Using a 46 mm socket wrench, remove the lock nut by turning it clockwise.

NOTICE:

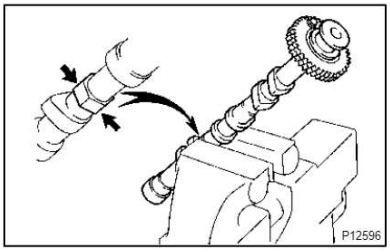
- **Remove it with the lock-pin engaged and locked at the extreme retarded angle position.**
- **The lock nut has LH threads.**
- **Only use the socket wrench. Other tools will deform the cam angle rotor.**

(c) Remove the timing gear (VVT-i).

NOTICE:

Never remove the 3 bolts on the gear.

If it is difficult to remove the VVT-i, tap it lightly using a plastic-faced hammer and then remove it.

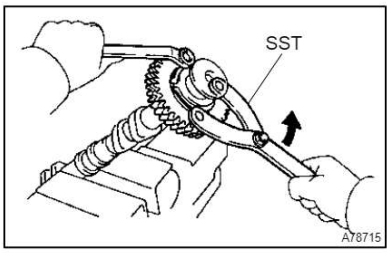


32. REMOVE CAMSHAFT SUB GEAR NO.3

(a) Clamp the camshaft in a vise on the hexagonal lobe.

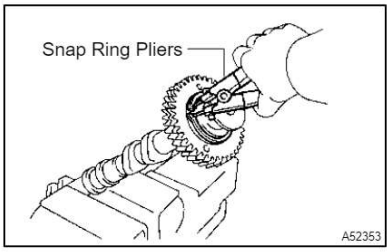
NOTICE:

Be careful not to damage the camshaft.



(b) Using SST, turn the sub gear counterclockwise, and remove the service bolt.

SST 09960-10010 (09962-01000, 09963-00500)

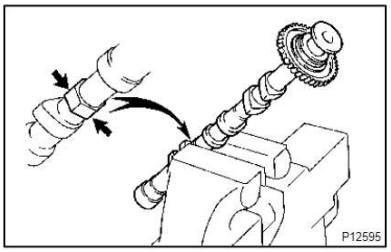


(c) Using snap ring pliers, remove the snap ring.

(d) Remove the wave washer, camshaft sub gear and camshaft gear bolt washer.

HINT:

Arrange the camshaft sub gears and gear bolt washers (RH and LH sides) so that they can be returned to their original location when reassembled.

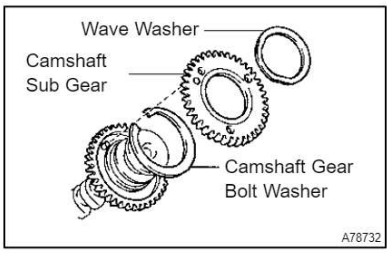


33. INSTALL CAMSHAFT SUB GEAR NO.3

(a) Clamp the camshaft in a vise on the hexagonal lobe.

NOTICE:

Be careful not to damage the camshaft.

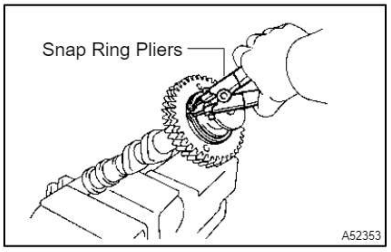


(b) Install the camshaft gear bolt washer and the camshaft sub gear.

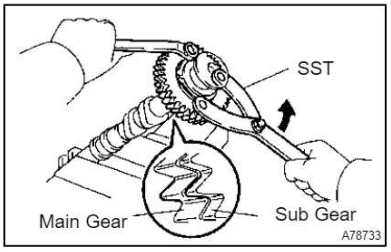
HINT:

Attach the pins on the gears to the gear bolt washer ends.

(c) Install the wave washer.



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



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

SST 09960-10010 (09962-01000, 09963-00500)

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

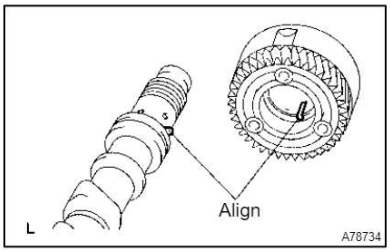
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

NOTICE:

Be careful not to damage the camshaft journals.

HINT:

When installing the camshaft, make certain that the torsional spring force of the sub gear has been eliminated by installation of the service bolt.



34. INSTALL CAMSHAFT TIMING GEAR ASSY

(a) Align the alignment pin with the alignment pin groove and install the VVT-i on the camshaft.

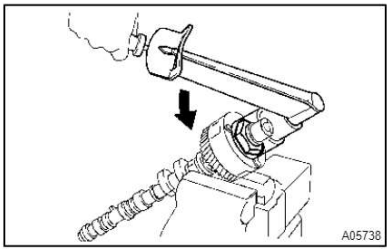
NOTICE:

Install the VVT-i with the lock-pin engaged and locked at the extreme retarded angle position.

(b) Apply engine oil on the nut, the mounting surface of the VVT-i and the screw threads.

NOTICE:

- **Be sure to apply the oil, otherwise the specified torque cannot be obtained.**
- **New nuts must be used when replacing the VVT-i unit.**



(c) Using a 46 mm socket wrench, install and tighten a lock nut by turning it counterclockwise.

Torque: 150 N·m (1,530 kgf·cm, 111 ft·lbf)

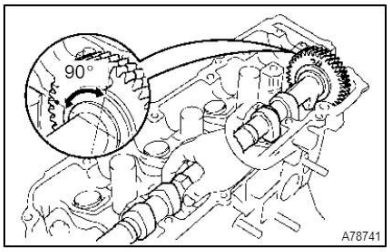
NOTICE:

- **The lock nut has LH threads.**
- **Never use any tools other than the socket wrench. Other tools will deform the cam angle rotor.**

35. INSTALL NO.4 CAMSHAFT SUB-ASSY

NOTICE:

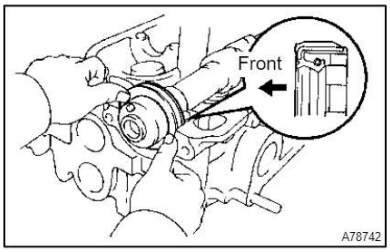
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps must be carried out.



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

(b) Place the No. 4 camshaft at a 90° angle of the timing mark (1 dot mark) on the cylinder head.

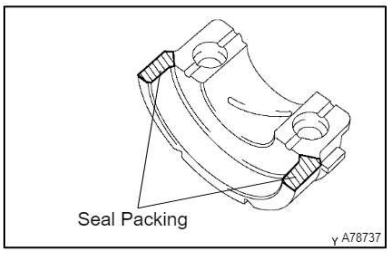
(c) Apply MP grease to a new oil seal lip.



(d) Install the oil seal to the camshaft.

NOTICE:

- **Do not turn over the oil seal lip.**
- **Insert the oil seal until it stops.**



(e) Remove any old packing material from the contact surface.

(f) Apply seal packing to the No. 1 bearing cap, as shown in the illustration.

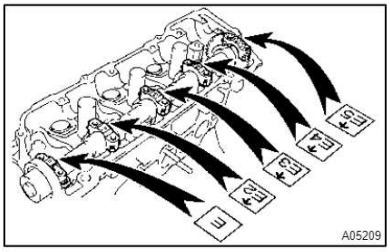
Seal packing: Part No. 08826-00080 or equivalent

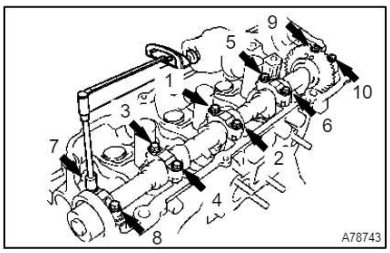
NOTICE:

- **Install the No. 1 bearing cap within 5 minutes after applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installing.**

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

(h) Apply a light coat of engine oil to the threads of the bearing cap bolts.





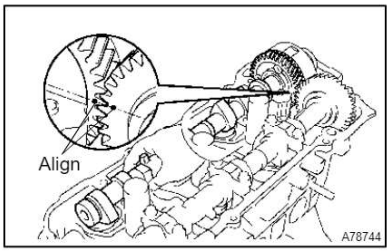
(i) Uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.

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

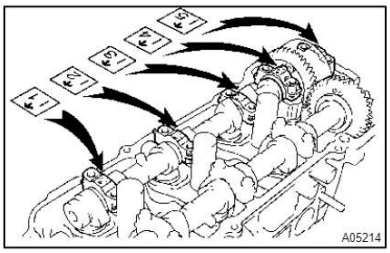
36. INSTALL NO.3 CAMSHAFT SUB-ASSY

NOTICE:

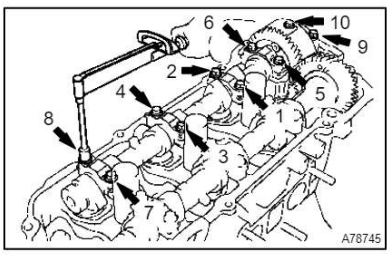
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps must be carried out.



(a) Apply new engine oil to the thrust portion and journal of the camshaft.
(b) Align the camshaft drive and driven gear's timing marks (1 dot mark each).
(c) Place the camshaft on the cylinder head.



(d) Install the 5 bearing caps in their proper locations.
(e) Apply a light coat of engine oil to the threads of the bearing cap bolts.

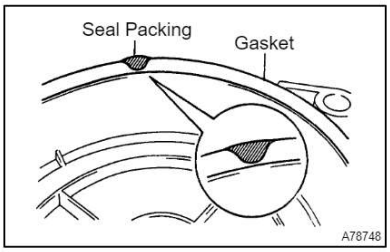


(f) Uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.
Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)
(g) Remove the service bolt.

37. INSTALL TIMING BELT NO.3 COVER

(a) Visually check for cracks and breaks on the gasket of the timing belt cover.

HINT:
If water is entering through cracks or breaks in the gasket, repair according to these guidelines: 1) if the crack length is within 2 to 3 cm (0.79 to 1.18 in.), repair with seal packing; or 2) if the crack length is over 3 cm (1.18 in.), replace the gasket.



(b) If the timing belt cover gasket needs to be repaired, follow the procedure below.
(1) Repair the cracks and breaks by applying the seal packing to the damaged area.
Seal packing: Part No. 08826-00080 or equivalent

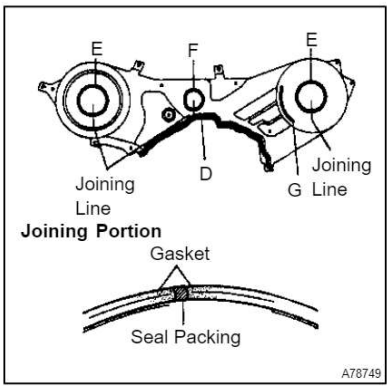
NOTICE:
When applying the seal packing, apply it as wide and high as the gasket.

(c) If the timing belt cover gasket needs to be replaced, follow the procedure below.

(1) Using a screwdriver and gasket scraper, remove the remaining gasket.

NOTICE:

Be careful not to damage the timing belt cover.



(2) Remove the backing paper from a new gasket, and affix the gasket along the groove of the timing belt cover, as shown in the illustration.

NOTICE:

- **Affix the gasket in the center of the groove.**
- **At the corners, try to keep the gasket thickness uniform.**

Length:

Gasket	D	E	F	G
Specified Condition	335 mm (13.19 in.)	180 mm (7.09 in.)	133 mm (5.24 in.)	72 mm (2.83 in.)

(3) If there is a gap on the joint of the gasket, apply seal packing to close the gap.

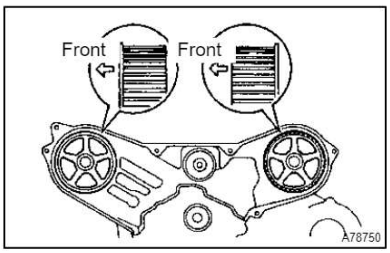
Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

When applying the seal packing, apply it as wide and high as the gasket.

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

Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

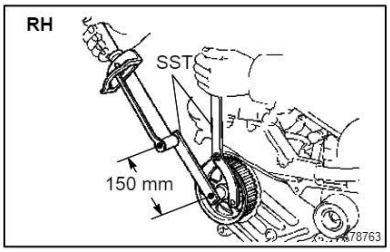


38. INSTALL CAMSHAFT TIMING PULLEY

(a) Install the camshaft timing pulley with the belt guide properly oriented and tighten the bolt temporarily.

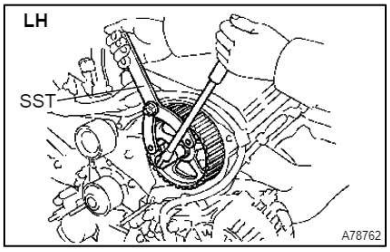
HINT:

- Face the belt guide of the RH timing pulley towards the front of the engine.
- Face the belt guide of the LH timing pulley towards the rear of the engine.



(b) Using SST, tighten the RH pulley bolt.
SST 09960- 10010 (09962- 01000, 09963- 01000), 09249-63010
Torque: 125 N·m (1,275 kgf·cm, 92 ft·lbf)

NOTICE:
The torque specification above is for the SST without extension tool specification. Use the special formula to calculate the SST with extension tool torque specification (see page 01-5).
Extended length of SST (09249-63010):
150 mm (5.91 in.)



(c) Using SST, tighten the LH pulley bolt.
SST 09960-10010 (09962-01000, 09963-01000)
Torque: 125 N·m (1,275 kgf·cm, 92 ft·lbf)

39. **INSTALL TIMING BELT IDLER SUB-ASSY NO.2**
Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)
40. **INSPECT TIMING BELT (See page 14-206)**
41. **INSTALL TIMING BELT (See page 14-206)**
42. **INSTALL TIMING BELT TENSIONER ASSY (See page 14-206)**
43. **INSTALL TIMING BELT GUIDE NO.2 (See page 14-206)**
44. **INSTALL ENGINE MOUNTING BRACKET RH**
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
45. **INSTALL TIMING BELT NO.2 COVER (See page 14-206)**
46. **INSTALL TIMING BELT NO.1 COVER (See page 14-206)**
47. **INSTALL CRANKSHAFT PULLEY (See page 14-173)**
48. **INSTALL GENERATOR BRACKET NO.2**
Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
49. **INSTALL ENGINE MOUNTING STAY NO.2 RH (See page 14-149)**
50. **INSTALL ENGINE MOVING CONTROL ROD (See page 14-149)**
51. **INSPECT VALVE CLEARANCE (See page 14-127)**
52. **ADJUST VALVE CLEARANCE (See page 14-127)**
53. **INSTALL VANE PUMP V BELT (See page 14-125)**
54. **INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-125)**
55. **INSPECT DRIVE BELT TENSION (See page 14-121)**
56. **INSTALL CYLINDER HEAD COVER SUB-ASSY LH (See page 14-173)**
57. **INSTALL IGNITION COIL ASSY**
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
58. **INSTALL RADIATOR HOSE INLET**

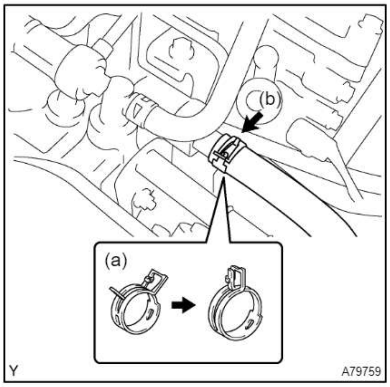
59. INSTALL V-BANK COVER SUB-ASSY (See page 14-149)
60. INSTALL FRONT SUSPENSION BRACE SUB-ASSY UPPER CENTER
    Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)
61. INSTALL COWL PANEL SUB-ASSY
62. INSTALL WINDSHIELD WIPER LINK ASSY (See page 66-7)
63. INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSY (See page 66-7)
64. INSTALL FR WIPER ARM LH (See page 66-7)
65. INSTALL FR WIPER ARM RH (See page 66-7)
66. INSTALL FRONT WHEEL RH
67. ADD ENGINE COOLANT (See page 16-26)
68. CHECK FOR ENGINE COOLANT LEAKS (See page 16-20)

CYLINDER HEAD GASKET (3MZ-FE)

141PO-02

REPLACEMENT

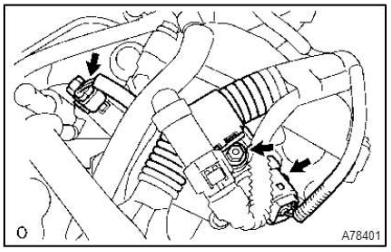
1. WORK FOR PREVENTING GASOLINE FROM SPILLING OUT (See page 11-35)
2. DRAIN ENGINE COOLANT (See page 16-26)
3. DRAIN ENGINE OIL
4. REMOVE FR WIPER ARM LH (See page 66-7)
5. REMOVE FR WIPER ARM RH (See page 66-7)
6. REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSY (See page 66-7)
7. REMOVE WINDSHIELD WIPER LINK ASSY (See page 66-7)
8. REMOVE COWL PANEL SUB-ASSY
9. REMOVE FRONT SUSPENSION BRACE SUB-ASSY UPPER CENTER
10. REMOVE V-BANK COVER SUB-ASSY (See page 14-149)
11. REMOVE AIR CLEANER CAP SUB-ASSY
12. REMOVE EMISSION CONTROL VALVE SET (See page 14-149)
13. REMOVE INTAKE AIR SURGE TANK (See page 14-149)
14. DISCONNECT FUEL PIPE SUB-ASSY NO.1 (See page 14-149)



15. DISCONNECT HEATER INLET WATER HOSE
(a) Lock the hose clamp, as shown in the illustration.
(b) Disconnect the heater inlet water hose.

16. REMOVE INTAKE MANIFOLD (See page 14-149)
17. DISCONNECT RADIATOR HOSE INLET
18. REMOVE WATER OUTLET (See page 14-149)
19. REMOVE FRONT WHEEL RH
20. REMOVE ENGINE UNDER COVER NO.1
21. REMOVE FRONT FENDER APRON SEAL RH
22. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-125)
23. REMOVE VANE PUMP V BELT (See page 14-125)
24. REMOVE ENGINE MOVING CONTROL ROD (See page 14-149)
25. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14-149)
26. REMOVE GENERATOR BRACKET NO.2
27. REMOVE CRANKSHAFT PULLEY (See page 14-173)
28. REMOVE TIMING BELT NO.1 COVER
29. REMOVE TIMING BELT NO.2 COVER (See page 14-206)

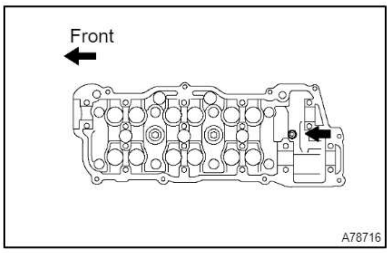
30. REMOVE ENGINE MOUNTING BRACKET RH
31. REMOVE TIMING BELT GUIDE NO.2
32. REMOVE TIMING BELT (See page 14-206)
33. REMOVE TIMING BELT IDLER SUB-ASSY NO.2
34. REMOVE CAMSHAFT TIMING PULLEY (See page 14-213)
35. REMOVE TIMING BELT NO.3 COVER (See page 14-213)
36. SEPARATE VANE PUMP ASSY (See page 14-149)
37. REMOVE PROPELLER SHAFT (4WD TYPE) (See page 30-12)
38. DISCONNECT EXHAUST PIPE SUB-ASSY FRONT NO.3 (See page 15-5)
39. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSY (See page 14-149)
40. REMOVE IGNITION COIL ASSY
41. REMOVE CYLINDER HEAD COVER SUB-ASSY (See page 14-173)
42. REMOVE CAMSHAFT (See page 14-213)
43. REMOVE NO.2 CAMSHAFT (See page 14-213)



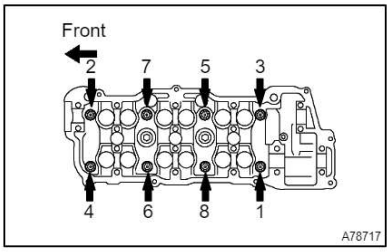
44. REMOVE CYLINDER HEAD SUB-ASSY

(a) Disconnect the camshaft timing oil control valve connector.

(b) Remove the nut and disconnect the engine wire harness clamp.



(c) Using a socket hexagon wrench 8, remove the hexagon bolt.

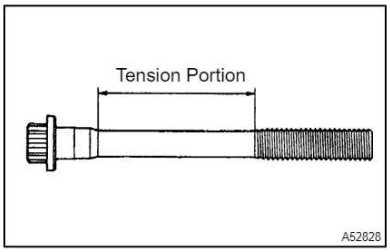


(d) Uniformly loosen the 8 cylinder head bolts in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.

NOTICE:

- **Be careful not to drop the washers into the cylinder head.**
- **Head warpage or cracking could result from removing bolts in an incorrect order.**

45. REMOVE CYLINDER HEAD GASKET

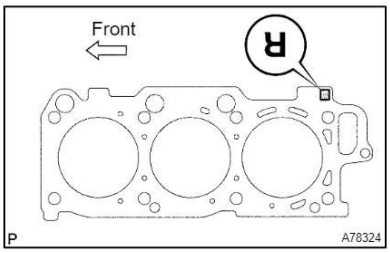


46. INSPECT CYLINDER HEAD SET BOLT

(a) Using a vernier caliper, measure the tension portion diameter of the bolt.

Standard outside diameter:
8.95 to 9.05 mm (0.3524 to 0.3563 in.)
Minimum outside diameter: 8.75 mm (0.3445 in.)

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



47. INSTALL CYLINDER HEAD GASKET

(a) Place a new cylinder head gasket on the cylinder block with the R mark upside down, as shown in the illustration.

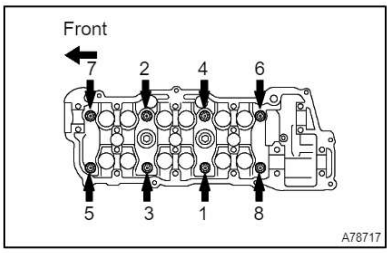
NOTICE:

- **Remove any oil from the contact surface.**
- **Be careful of the installation direction.**
- **To avoid damage to the gasket, place the cylinder head on the gasket carefully.**

48. INSTALL CYLINDER HEAD SUB-ASSY

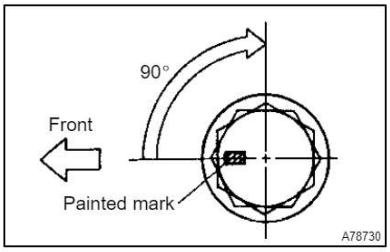
NOTICE:

The cylinder head bolts are tightened in 2 successive steps.

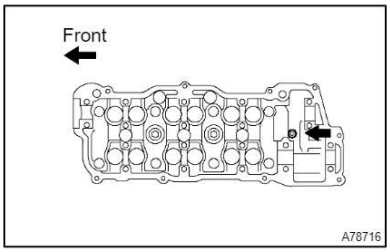


(a) Apply a light coat of engine oil on the threads of the cylinder head bolts.
(b) Install the plate washers to the cylinder head bolts.
(c) Uniformly install and tighten the 8 cylinder head bolts in the sequence shown in the illustration.

Torque: 54 N·m (550 kgf·cm, 40 ft·lbf)



(d) Mark the front side of each cylinder head bolt head with paint, as shown in the illustration.
(e) Retighten the cylinder head bolts by 90° in the same sequence as step (c).
(f) Check that each painted mark is now at a 90° angle to the front.



(g) Using a socket hexagon wrench 8, install the hexagon bolt.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

(h) Connect the engine wire harness clamp with the nut.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

49. **INSTALL NO.2 CAMSHAFT (See page 14-213)**
50. **INSTALL CAMSHAFT (See page 14-213)**
51. **INSTALL CYLINDER HEAD COVER SUB-ASSY (See page 14-213)**
52. **INSTALL IGNITION COIL ASSY**
    Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
53. **INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSY (See page 14-149)**
54. **CONNECT EXHAUST PIPE SUB-ASSY FRONT NO.3 (See page 15-5)**
55. **INSTALL PROPELLER SHAFT (4WD TYPE) (See page 30-12)**
56. **INSTALL VANE PUMP ASSY (See page 14-149)**
57. **INSTALL TIMING BELT NO.3 COVER (See page 14-213)**
58. **INSTALL CAMSHAFT TIMING PULLEY (See page 14-213)**
59. **INSTALL TIMING BELT IDLER SUB-ASSY NO.2**
    Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)
60. **INSPECT TIMING BELT (See page 14-206)**
61. **INSTALL TIMING BELT (See page 14-206)**
62. **INSTALL TIMING BELT TENSIONER ASSY (See page 14-206)**
63. **INSTALL TIMING BELT GUIDE NO.2 (See page 14-206)**
64. **INSTALL ENGINE MOUNTING BRACKET RH**
    Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
65. **INSTALL TIMING BELT NO.2 COVER (See page 14-206)**
66. **INSTALL TIMING BELT NO.1 COVER (See page 14-206)**
67. **INSTALL CRANKSHAFT PULLEY (See page 14-173)**
68. **INSTALL GENERATOR BRACKET NO.2**
    Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
69. **INSTALL ENGINE MOUNTING STAY NO.2 RH (See page 14-149)**
70. **INSTALL ENGINE MOVING CONTROL ROD (See page 14-149)**
71. **INSTALL VANE PUMP V BELT (See page 14-125)**
72. **INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-125)**
73. **INSPECT DRIVE BELT TENSION (See page 14-121)**
74. **INSTALL WATER OUTLET (See page 14-149)**
75. **CONNECT RADIATOR HOSE INLET**
76. **INSTALL INTAKE MANIFOLD (See page 14-149)**
77. **CONNECT HEATER INLET WATER HOSE**
78. **CONNECT FUEL PIPE SUB-ASSY NO.1 (See page 14-149)**
79. **INSTALL INTAKE AIR SURGE TANK (See page 14-149)**
80. **INSTALL EMISSION CONTROL VALVE SET (See page 14-149)**
81. **INSTALL AIR CLEANER CAP SUB-ASSY**
82. **CONNECT VACUUM HOSES (See page 14-149)**
83. **INSTALL V-BANK COVER SUB-ASSY (See page 14-149)**

84. INSTALL FRONT SUSPENSION BRACE SUB-ASSY UPPER CENTER
    Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)
85. INSTALL COWL PANEL SUB-ASSY
86. INSTALL WINDSHIELD WIPER LINK ASSY (See page 66-7)
87. INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSY (See page 66-7)
88. INSTALL FR WIPER ARM LH (See page 66-7)
89. INSTALL FR WIPER ARM RH (See page 66-7)
90. INSTALL FRONT WHEEL RH
91. ADD ENGINE OIL
92. ADD ENGINE COOLANT (See page 16-26)
93. CHECK FOR ENGINE OIL LEAKS
94. CHECK FOR ENGINE COOLANT LEAKS (See page 16-20)
95. INSPECT FOR FUEL LEAKS
96. CHECK FOR EXHAUST GAS LEAKS
97. INSPECT IGNITION TIMING (See page 14-121)
98. INSPECT ENGINE IDLE SPEED (See page 14-121)
99. INSPECT COMPRESSION (See page 14-121)
100. INSPECT CO/HC (See page 14-121)

CYLINDER HEAD GASKET NO.2 (3MZ-FE)

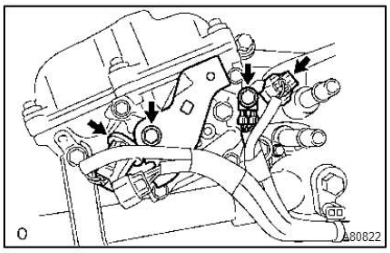
141PP-01

REPLACEMENT

1. WORK FOR PREVENTING GASOLINE FROM SPILLING OUT (See page 11-35)
2. DRAIN ENGINE COOLANT (See page 16-26)
3. DRAIN ENGINE OIL
4. REMOVE FR WIPER ARM LH (See page 66-7)
5. REMOVE FR WIPER ARM RH (See page 66-7)
6. REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSY (See page 66-7)
7. REMOVE WINDSHIELD WIPER LINK ASSY (See page 66-7)
8. REMOVE COWL PANEL SUB-ASSY
9. REMOVE FRONT SUSPENSION BRACE SUB-ASSY UPPER CENTER
10. REMOVE V-BANK COVER SUB-ASSY (See page 14-149)
11. REMOVE AIR CLEANER CAP SUB-ASSY
12. REMOVE AIR CLEANER FILTER ELEMENT SUB-ASSY
13. REMOVE AIR CLEANER CASE
14. REMOVE EMISSION CONTROL VALVE SET (See page 14-149)
15. REMOVE INTAKE AIR SURGE TANK (See page 14-149)
16. DISCONNECT FUEL PIPE SUB-ASSY NO.1 (See page 14-149)
17. DISCONNECT HEATER INLET WATER HOSE (See page 14-235)
18. REMOVE INTAKE MANIFOLD (See page 14-149)
19. REMOVE RADIATOR HOSE INLET
20. REMOVE WATER OUTLET (See page 14-149)
21. REMOVE RADIATOR HOSE OUTLET
22. REMOVE WATER INLET PIPE
23. REMOVE OIL LEVEL GAGE SUB-ASSY
24. REMOVE OIL LEVEL GAGE GUIDE
25. REMOVE FRONT WHEEL RH
26. REMOVE ENGINE UNDER COVER NO.1
27. REMOVE FRONT FENDER APRON SEAL RH
28. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-125)
29. REMOVE VANE PUMP V BELT (See page 14-125)
30. REMOVE ENGINE MOVING CONTROL ROD (See page 14-149)
31. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14-149)
32. REMOVE GENERATOR BRACKET NO.2
33. REMOVE CRANKSHAFT PULLEY (See page 14-173)
34. REMOVE TIMING BELT NO.1 COVER
35. REMOVE TIMING BELT NO.2 COVER (See page 14-206)
36. REMOVE ENGINE MOUNTING BRACKET RH
37. REMOVE TIMING BELT GUIDE NO.2
38. REMOVE TIMING BELT (See page 14-206)
39. REMOVE TIMING BELT IDLER SUB-ASSY NO.2
40. REMOVE CAMSHAFT TIMING PULLEY (See page 14-224)
41. REMOVE TIMING BELT NO.3 COVER (See page 14-224)
42. DISCONNECT EXHAUST PIPE ASSY FRONT (See page 15-5)
43. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSY NO.2 (See page 14-149)
44. REMOVE IGNITION COIL ASSY
45. REMOVE CYLINDER HEAD COVER SUB-ASSY LH (See page 14-173)

46. REMOVE NO.3 CAMSHAFT SUB-ASSY (See page 14-224)

47. REMOVE NO.4 CAMSHAFT SUB-ASSY (See page 14-224)



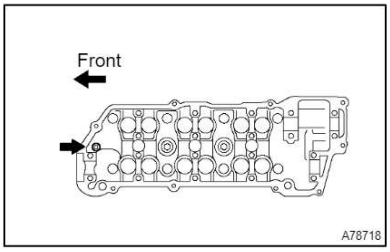
48. REMOVE CYLINDER HEAD LH

(a) Disconnect the VVT sensor connector.

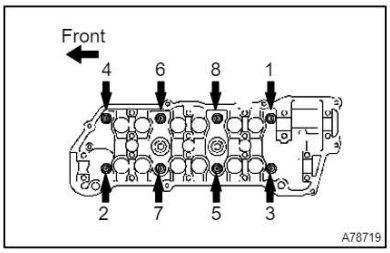
(b) Disconnect the camshaft timing oil control valve connector.

(c) Remove the bolt and disconnect the ground cable.

(d) Remove the bolt and the wire harness clamp bracket.



(e) Using a socket hexagon wrench 8, remove the hexagon bolt.



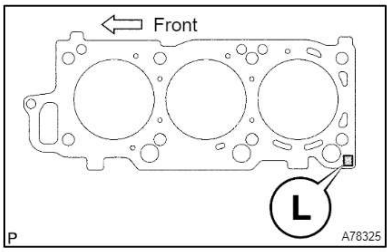
(f) Uniformly loosen the 8 cylinder head bolts in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.

NOTICE:

- **Be careful not to drop the washers into the cylinder head.**
- **Head warpage or cracking could result from removing bolts in an incorrect order.**

49. REMOVE CYLINDER HEAD GASKET NO.2

50. INSPECT CYLINDER HEAD SET BOLT (See page 14-235)



51. INSTALL CYLINDER HEAD GASKET NO.2

(a) Place a new cylinder head gasket on the cylinder block with the L mark, as shown in the illustration.

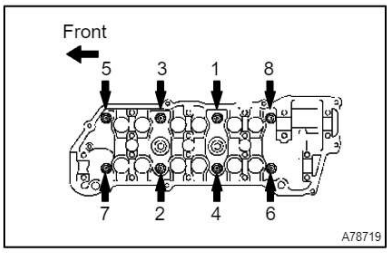
NOTICE:

- **Remove any oil from the contact surface.**
- **Be careful of the installation direction.**
- **To avoid damage to the gasket, place the cylinder head on the gasket carefully.**

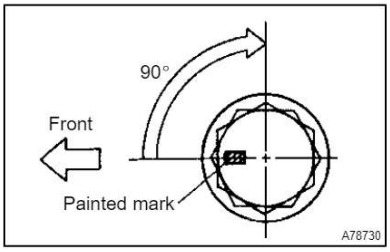
52. INSTALL CYLINDER HEAD LH

NOTICE:

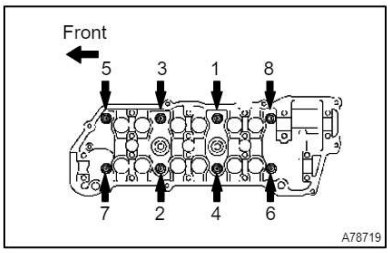
The cylinder head bolts are tightened in 2 successive steps.



(a) Apply a light coat of engine oil on the threads of the cylinder head bolts.
(b) Install the plate washer to the cylinder head bolt.
(c) Uniformly install and tighten the 8 cylinder head bolts in the sequence shown in the illustration.
Torque: 54 N·m (550 kgf·cm, 40 ft·lbf)



(d) Mark the front side of each cylinder head bolt head with paint, as shown in the illustration.
(e) Retighten the cylinder head bolts by 90° in the same sequence as step (c).
(f) Check that each painted mark is now at a 90° angle to the front.



(g) Using a socket hexagon wrench 8, install the hexagon bolt.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)
(h) Install the wire harness clamp bracket with the bolt.
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)
(i) Connect the ground cable with the bolt.
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

53. INSTALL NO.4 CAMSHAFT SUB-ASSY (See page 14-224)
54. INSTALL NO.3 CAMSHAFT SUB-ASSY (See page 14-224)
55. INSTALL CYLINDER HEAD COVER SUB-ASSY LH (See page 14-173)
56. INSTALL IGNITION COIL ASSY
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
57. INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSY NO.2 (See page 14-149)
58. CONNECT EXHAUST PIPE ASSY FRONT (See page 15-5)
59. INSTALL TIMING BELT NO.3 COVER (See page 14-224)
60. INSTALL CAMSHAFT TIMING PULLEY (See page 14-224)
61. INSTALL TIMING BELT IDLER SUB-ASSY NO.2
62. INSPECT TIMING BELT (See page 14-206)
63. INSTALL TIMING BELT (See page 14-206)
64. INSTALL TIMING BELT TENSIONER ASSY (See page 14-206)
65. INSTALL TIMING BELT GUIDE NO.2 (See page 14-206)

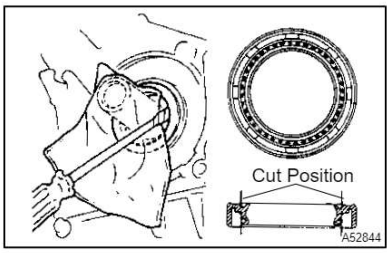
66. INSTALL ENGINE MOUNTING BRACKET RH
    Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
67. INSTALL TIMING BELT NO.2 COVER (See page 14-206)
68. INSTALL TIMING BELT NO.1 COVER (See page 14-206)
69. INSTALL CRANKSHAFT PULLEY (See page 14-173)
70. INSTALL GENERATOR BRACKET NO.2
    Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
71. INSTALL ENGINE MOUNTING STAY NO.2 RH (See page 14-149)
72. INSTALL ENGINE MOVING CONTROL ROD (See page 14-149)
73. INSTALL VANE PUMP V BELT (See page 14-125)
74. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1
    (See page 14-125)
75. INSPECT DRIVE BELT TENSION (See page 14-121)
76. INSTALL OIL LEVEL GAGE GUIDE (See page 14-173)
77. INSTALL OIL LEVEL GAGE SUB-ASSY
78. INSTALL WATER INLET PIPE
79. CONNECT RADIATOR HOSE OUTLET
80. INSTALL WATER OUTLET (See page 14-149)
81. CONNECT RADIATOR HOSE INLET
82. INSTALL INTAKE MANIFOLD (See page 14-149)
83. CONNECT HEATER INLET WATER HOSE
84. CONNECT FUEL PIPE SUB-ASSY NO.1 (See page 14-149)
85. INSTALL INTAKE AIR SURGE TANK (See page 14-149)
86. INSTALL EMISSION CONTROL VALVE SET (See page 14-149)
87. INSTALL AIR CLEANER CASE
88. INSTALL AIR CLEANER CAP SUB-ASSY
89. CONNECT VACUUM HOSES (See page 14-149)
90. INSTALL V-BANK COVER SUB-ASSY (See page 14-149)
91. INSTALL FRONT SUSPENSION BRACE SUB-ASSY UPPER CENTER
    Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)
92. INSTALL COWL PANEL SUB-ASSY
93. INSTALL WINDSHIELD WIPER LINK ASSY (See page 66-7)
94. INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSY (See page 66-7)
95. INSTALL FR WIPER ARM LH (See page 66-7)
96. INSTALL FR WIPER ARM RH (See page 66-7)
97. INSTALL FRONT WHEEL RH
98. ADD ENGINE OIL
99. ADD ENGINE COOLANT (See page 16-26)
100. CHECK FOR ENGINE OIL LEAKS
101. CHECK FOR ENGINE COOLANT LEAKS (See page 16-20)
102. INSPECT FOR FUEL LEAKS
103. CHECK FOR EXHAUST GAS LEAKS
104. INSPECT IGNITION TIMING (See page 14-121)
105. INSPECT ENGINE IDLE SPEED (See page 14-121)
106. INSPECT COMPRESSION (See page 14-121)
107. INSPECT CO/HC (See page 14-121)

OIL PUMP SEAL (3MZ-FE)

141PQ-01

REPLACEMENT

1. REMOVE FR WIPER ARM LH (See page 66-7)
2. REMOVE FR WIPER ARM RH (See page 66-7)
3. REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSY (See page 66-7)
4. REMOVE WINDSHIELD WIPER LINK ASSY (See page 66-7)
5. REMOVE COWL PANEL SUB-ASSY
6. REMOVE FRONT WHEEL RH
7. REMOVE ENGINE UNDER COVER NO.1
8. REMOVE FRONT FENDER APRON SEAL RH
9. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-125)
10. REMOVE VANE PUMP V BELT (See page 14-125)
11. REMOVE ENGINE MOVING CONTROL ROD (See page 14-149)
12. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14-149)
13. REMOVE GENERATOR BRACKET NO.2
14. REMOVE CRANKSHAFT PULLEY (See page 14-173)
15. REMOVE TIMING BELT NO.1 COVER
16. REMOVE TIMING BELT NO.2 COVER (See page 14-206)
17. REMOVE ENGINE MOUNTING BRACKET RH
18. REMOVE TIMING BELT GUIDE NO.2
19. REMOVE TIMING BELT (See page 14-206)
20. REMOVE CRANKSHAFT TIMING PULLEY (See page 14-173)

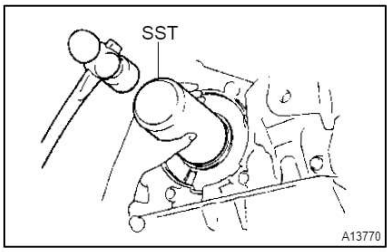


21. **REMOVE OIL PUMP SEAL**
(a) Using a knife, cut through the oil seal lip.
(b) Using a screwdriver with its tip wrapped in tape, pry out the oil seal.

NOTICE:
After the removal, check the crankshaft for damage. If it is damaged, smooth the surface with 400-grit sandpaper.

22. **INSTALL OIL PUMP SEAL**
(a) Apply MP grease to a new oil seal lip.

NOTICE:
Keep the lip free of foreign matter.



(b) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump edge.
SST 09223-00010

NOTICE:
- **Be careful not to tap the oil seal slantingly.**
- **Wipe off extra grease on the crankshaft.**

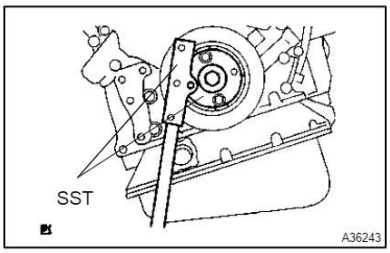
23. INSTALL CRANKSHAFT TIMING PULLEY (See page 14-173)
24. INSPECT TIMING BELT (See page 14-206)
25. INSTALL TIMING BELT (See page 14-206)
26. INSTALL TIMING BELT TENSIONER ASSY (See page 14-206)
27. INSTALL TIMING BELT GUIDE NO.2 (See page 14-206)
28. INSTALL ENGINE MOUNTING BRACKET RH
    Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
29. INSTALL TIMING BELT NO.2 COVER (See page 14-206)
30. INSTALL TIMING BELT NO.1 COVER (See page 14-206)
31. INSTALL CRANKSHAFT PULLEY (See page 14-173)
32. INSTALL GENERATOR BRACKET NO.2
    Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)
33. INSTALL ENGINE MOUNTING STAY NO.2 RH (See page 14-149)
34. INSTALL ENGINE MOVING CONTROL ROD (See page 14-149)
35. INSTALL VANE PUMP V BELT (See page 14-125)
36. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1
    (See page 14-125)
37. INSPECT DRIVE BELT TENSION (See page 14-121)
38. INSTALL COWL PANEL SUB-ASSY
39. INSTALL WINDSHIELD WIPER LINK ASSY (See page 66-7)
40. INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSY (See page 66-7)
41. INSTALL FR WIPER ARM LH (See page 66-7)
42. INSTALL FR WIPER ARM RH (See page 66-7)
43. INSTALL FRONT WHEEL RH
44. CHECK FOR ENGINE OIL LEAKS

ENGINE REAR OIL SEAL (3MZ-FE)

141PR-02

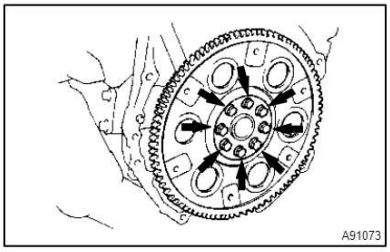
REPLACEMENT

1. **REMOVE AUTOMATIC TRANSAXLE ASSY (2WD TYPE) (See page 40-20)**
2. **REMOVE AUTOMATIC TRANSAXLE W/TRANSFER (4WD TYPE) (See page 40-20)**

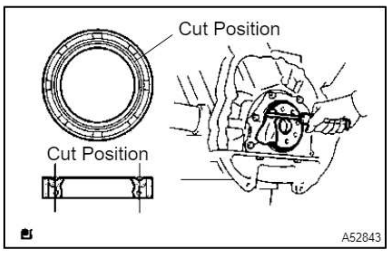


3. REMOVE DRIVE PLATE & RING GEAR SUB-ASSY

(a) Using SST, hold the crankshaft.
SST 09213-54015 (91651-60855), 09330-00021



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

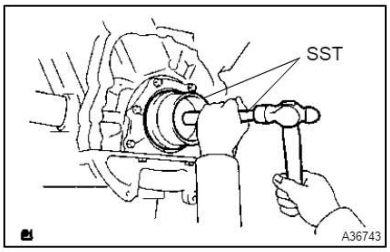


4. REMOVE ENGINE REAR OIL SEAL

(a) Using a knife, cut off the oil seal lip.
(b) Using a screwdriver with its tip wrapped in tape, pry out the oil seal.

NOTICE:

After the removal, check if the crankshaft is not damaged. If it is damaged, smooth the surface with 400-grit sandpaper.



5. INSTALL ENGINE REAR OIL SEAL

(a) Apply MP grease to a new oil seal lip.

NOTICE:

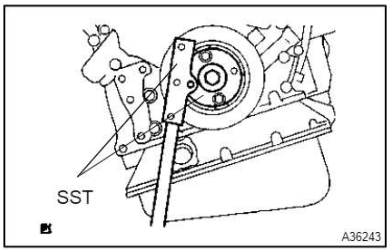
Keep the lip off foreign materials.

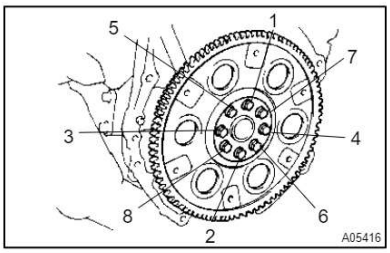
(b) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223-15030, 09950-70010 (09951-07100)

NOTICE:

- **Be careful not to tap the oil seal at an angle.**
- **Wipe off extra grease from the crankshaft.**

Author : **Date :** **2739**





6. INSTALL DRIVE PLATE & RING GEAR SUB-ASSY

(a) Using SST, hold the crankshaft.
SST 09213-54015 (91651-60855), 09330-00021

(b) Clean the bolts and bolt holes.

(c) Apply adhesive to 2 or 3 threads of the bolts.
Adhesive:
Part No. 08833-00070, THREE BOND 1324 or equivalent

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

(e) Uniformly install and tighten the 8 bolts in the sequence shown in the illustration.
Torque: 83 N·m (846 kgf·cm, 61 ft·lbf)

NOTICE:
Do not start the engine for at least an hour after installing.

7. INSTALL AUTOMATIC TRANSAXLE W/TRANSFER (4WD TYPE) (See page 40-20)

8. INSTALL AUTOMATIC TRANSAXLE ASSY (2WD TYPE) (See page 40-20)