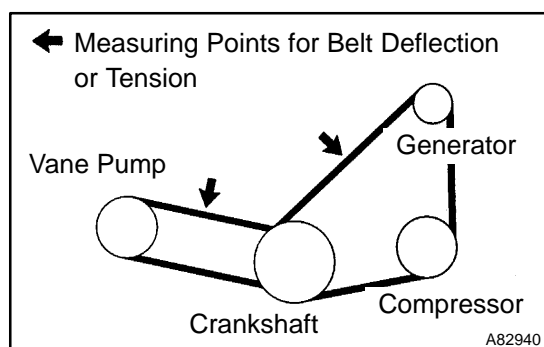


# ENGINE (3MZ-FE)

## INSPECTION

141C0-02

1. INSPECT ENGINE COOLANT (See page 16-1 )
2. INSPECT ENGINE OIL
3. INSPECT BATTERY  
Standard specific gravity: 1.25 to 1.29 at 20°C (68°F)
4. INSPECT AIR CLEANER FILTER ELEMENT SUB-ASSY
5. INSPECT SPARK PLUG (See page 18-3 )



### 6. INSPECT V-RIBBED BELT

#### (a) Belt deflection:

Pressing force: 98 N (10 kgf, 22 lbf)

	New Belt mm (in.)	Used Belt mm (in.)
V-ribbed Belt (For fan and generator)	9.1 to 10.5 (0.358 to 0.413)	11 to 13.5 (0.433 to 0.531)
V-ribbed Belt (For vane pump)	8 to 10 (0.315 to 0.394)	11 to 14 (0.433 to 0.551)

#### (b) Belt tension:

	New Belt N (kg , lb)	Used Belt N (kg , lb)
V-ribbed Belt (For fan and generator)	637 to 735 (65 to 75 , 143 to 165)	392 to 588 (40 to 60 , 88 to 132)
V-ribbed Belt (For vane pump)	588 to 686 (60 to 70 , 132 to 154)	245 to 392 (25 to 40 , 55 to 88)

### NOTICE:

- Check the drive belt deflection at the specified point.
- When installing a new belt, set its tension value as specified.
- When inspecting a belt which is used for over 5 minutes, apply the specification of "Used belt".
- When reinstalling a belt which is used for over 5 minutes, adjust its belt deflection and tension to the intermediate value of each specification in "Used belt".
- The V-ribbed belt tension and deflection value should be checked after 2 revolutions of engine cranking.
- When using a belt tension gauge, confirm the accuracy first by using a master gauge.

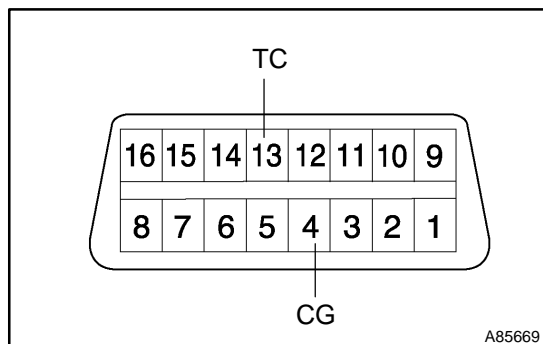
### 7. INSPECT IGNITION TIMING

- (a) Warm up engine.
- (b) When using the hand-held tester or OBD II scan tool:
  - (1) Connect the hand-held tester or OBD II scan tool to the DLC3.
  - (2) Enter DATA LIST MODE on the hand-held tester or OBD II scan tool.

Ignition timing: 8 to 12° BTDC

### HINT:

Refer to the hand-held tester or OBD II scan tool operator's manual if you need help to select DATA LIST.

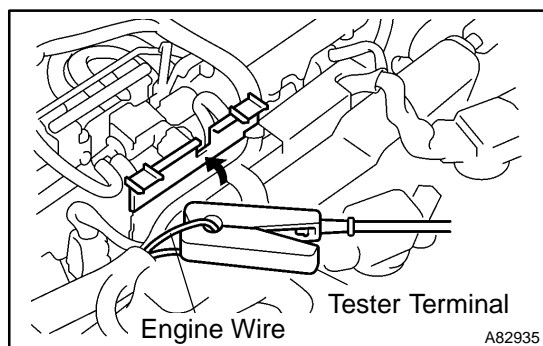


- (c) When not using the hand-held tester or OBD II scan tool:
- (1) Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.

SST 09843-18040

**NOTICE:**

- **Make sure of the terminal numbers before connecting them. Connecting wrong terminals 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.



- (3) Pull out the engine wire colored by black and red 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) Inspect the ignition timing at idle.

**Ignition timing: 8 to 12° BTDC**

**NOTICE:**

**When checking the ignition timing, the transmission is in the neutral position.**

**HINT:**

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

- (6) Disconnect terminals 13 (TC) and 4 (CG) of the DLC3.
  - (7) Inspect the ignition timing at idle.
- Ignition timing: 7 to 24° BTDC**
- (8) Confirm that the ignition timing advances when the engine speed is increased.
  - (9) Remove the timing light.

## 8. INSPECT ENGINE IDLE SPEED

- (a) Warm up the engine.
- (b) When using the hand-held tester or OBD II scan tool:
  - (1) Connect the hand-held tester or OBD II scan tool to the DLC3.
  - (2) Enter DATA LIST MODE on the hand-held tester or OBD II scan tool.

**Idle speed: 630 to 730 rpm**

**NOTICE:**

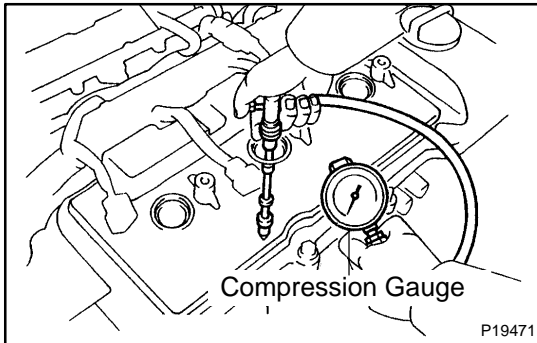
- **When checking the idle speed, the transmission is in the neutral position.**
- **Check the idle speed with the cooling fan OFF.**
- **Switch OFF all accessories and air conditioning before connecting the hand-held tester or OBD II scan tool.**

**HINT:**

Refer to the hand-held tester or OBD II scan tool operator's manual for further details.

**9. INSPECT COMPRESSION**

- (a) Warm up and stop the engine.
- (b) Remove the intake air surge tank (see page 11-13 ).
- (c) Disconnect the injector connectors.
- (d) Remove the ignition coils.
- (e) Remove the spark plugs.



- (f) Inspect the cylinder compression pressure.
  - (1) Insert a compression gauge into the spark plug hole.

SST 09992-00500

- (2) Fully open the throttle.
- (3) While cranking the engine, measure the compression pressure.

**Compression pressure:**

**1.5 MPa (15.3 kgf/cm<sup>2</sup>, 218 psi)**

**Minimum pressure:**

**1.0 MPa (10.2 kgf/cm<sup>2</sup>, 145 psi)**

**Difference between each cylinder:**

**100 kPa (1.0 kgf/cm<sup>2</sup>, 15 psi)**

**NOTICE:**

- Always use a fully-charged battery to obtain engine speed of 250 rpm or more.
  - Check the 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, then 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, the valve may be sticking or seated improperly, or there may be leakage past the gasket.

**10. INSPECT CO/HC****HINT:**

The ECM properly controls the CO/HC concentration in the emission gas.

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

**HINT:**

When doing the 2 mode (with the engine is at idle and at 2,500 rpm) tests, these measuring order are prescribed by the applicable local regulations.

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

- (1) Check the heated oxygen sensor operation (see page 05-126 ).

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

CO	HC	Problems	Causes
Normal	High	Rough idle	5. Faulty ignitions: <ul style="list-style-type: none"> <li>• Incorrect timing</li> <li>• Fouled, shorted or improperly gapped plugs</li> </ul> 6. Incorrect valve clearance 7. Leaks in intake and exhaust valves 8. Leaks in cylinders
Low	High	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: <ul style="list-style-type: none"> <li>• PCV hoses</li> <li>• Intake manifold</li> <li>• Throttle body</li> <li>• Brake booster line</li> </ul> 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Plugged PCV valve 3. Faulty SFI systems: <ul style="list-style-type: none"> <li>• Faulty pressure regulator</li> <li>• Defective engine coolant temperature sensor</li> <li>• Defective mass air flow meter</li> <li>• Faulty ECM</li> <li>• Faulty injectors</li> <li>• Faulty throttle body</li> </ul>

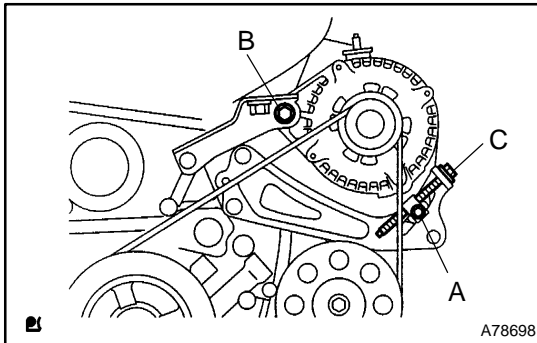


## DRIVE BELT (3MZ-FE)

### REPLACEMENT

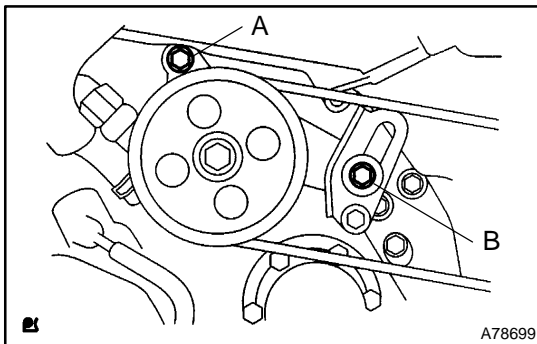
14193-03

1. REMOVE FRONT WHEEL RH
2. REMOVE FRONT FENDER APRON SEAL RH



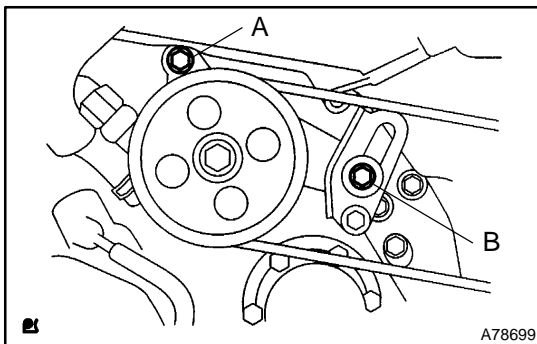
#### 3. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1

- (a) Loosen bolts A and B.
- (b) Loosen the adjusting bolt C, then remove the V-ribbed belt.



#### 4. REMOVE VANE PUMP V BELT

- (a) Loosen bolts A and B, then remove the V-ribbed belt.



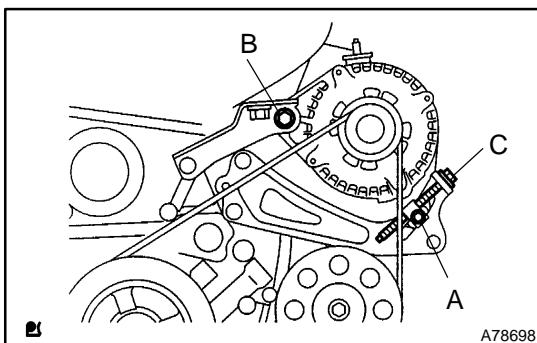
#### 5. INSTALL VANE PUMP V BELT

- (a) Install the V-ribbed belt on each pulley.
- (b) Using a bar, adjust the V-ribbed belt tension, then tighten bolt B.

**Torque: 43 N·m (439 kgf·cm, 32 ft·lbf)**

- (c) Tighten bolt A.

**Torque: 43 N·m (439 kgf·cm, 32 ft·lbf)**



#### 6. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1

- (a) Install the V-ribbed belt on each pulley.
- (b) Tighten the adjusting bolt C, then adjust the V-ribbed belt tension.
- (c) First tighten bolt A, then tighten bolt B.

**Torque:**

**18 N·m (178 kgf·cm, 13 ft·lbf) for bolt A**

**58 N·m (591 kgf·cm, 43 ft·lbf) for bolt B**

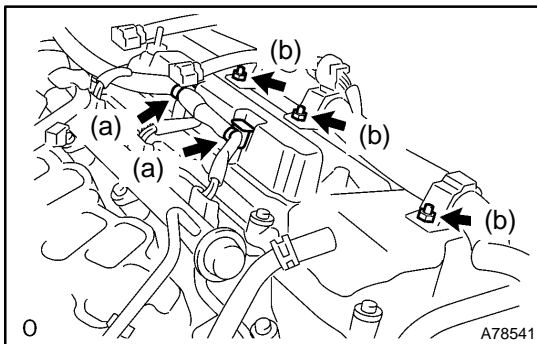
7. INSPECT DRIVE BELT DEFLECTION AND TENSION (See page [14-1](#) )
8. INSTALL FRONT WHEEL RH  
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

# VALVE CLEARANCE (3MZ-FE)

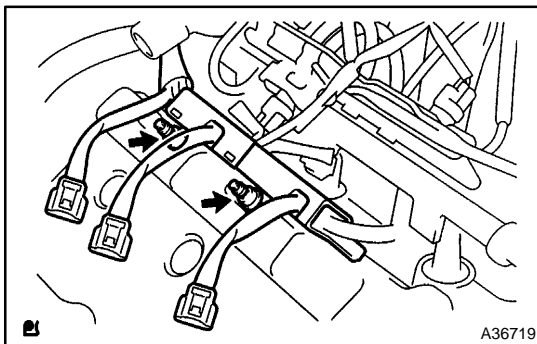
141J7-02

## ADJUSTMENT

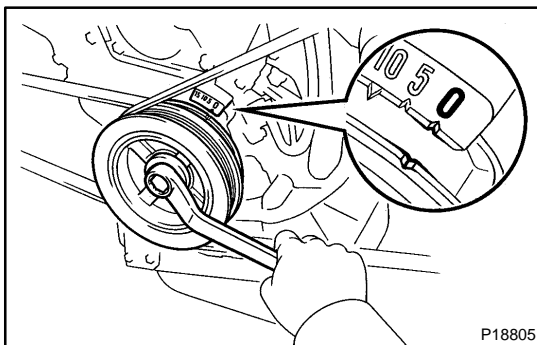
1. DISCONNECT BATTERY NEGATIVE TERMINAL
2. DRAIN ENGINE COOLANT (See page 16-9 )
3. REMOVE FRONT FENDER APRON SEAL RH
4. REMOVE FRONT SUSPENSION UPPER BRACE CENTER (W/O TEMS) (See page 10-1 1)
5. REMOVE V-BANK COVER SUB-ASSY (See page 10-1 1)
6. REMOVE AIR CLEANER CAP SUB-ASSY (See page 10-1 1)
7. REMOVE EMISSION CONTROL VALVE SET (See page 11-13 )
8. REMOVE INTAKE AIR SURGE TANK (See page 11-13 )
9. REMOVE RADIATOR HOSE INLET
10. REMOVE IGNITION COIL ASSY



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

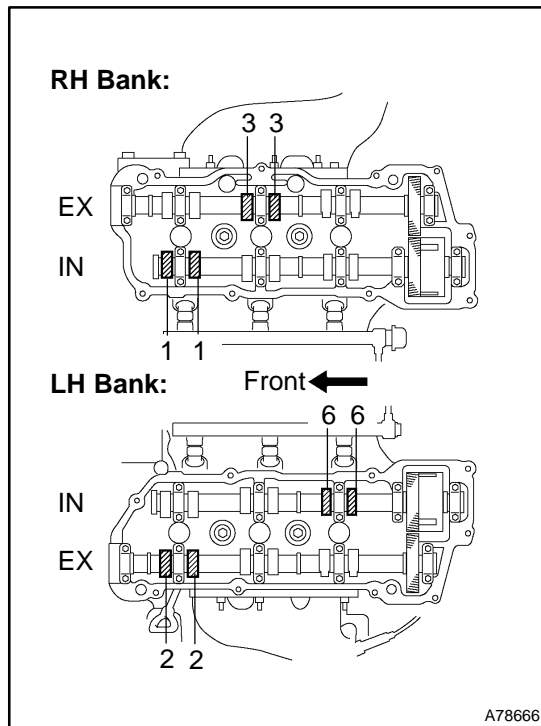


12. REMOVE CYLINDER HEAD COVER SUB-ASSY LH
  - (a) Using an E6 Torx® socket wrench, remove the 2 bolts and disconnect the engine wire harness protector.
  - (b) Remove the 9 bolts and cylinder head cover.



13. INSPECT VALVE CLEARANCE
  - (a) Turn the crankshaft pulley, then align the timing notch with the timing mark "0" of the timing belt No. 1 cover.
  - (b) Check that the valve lifters on the intake side of the No. 1 cylinder are not pushed by the cam.

If the valve lifters are pushed, turn the crankshaft by 1 revolution (360°) and align the marks as above.



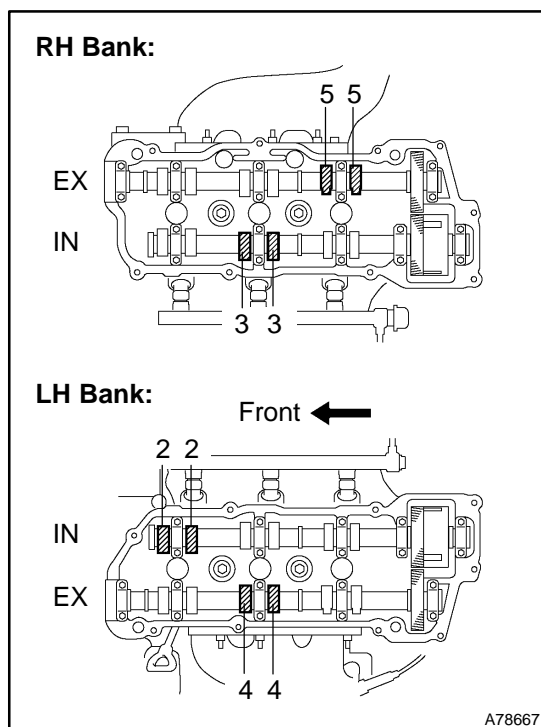
- (c) Inspect the valves indicated in the illustration on the left.
- (1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

**Valve clearance (Cold):**

**0.15 to 0.25 mm (0.0059 to 0.0098 in.) for intake**

**0.25 to 0.35 mm (0.0098 to 0.0138 in.) for exhaust**

- (2) Record the out-of-specification valve clearance measurements. They will be used later to select an adjusting shim to replace.



- (d) Turn the crankshaft by 2/3 of a revolution (240°), then inspect the valves indicated in the illustration on the left.

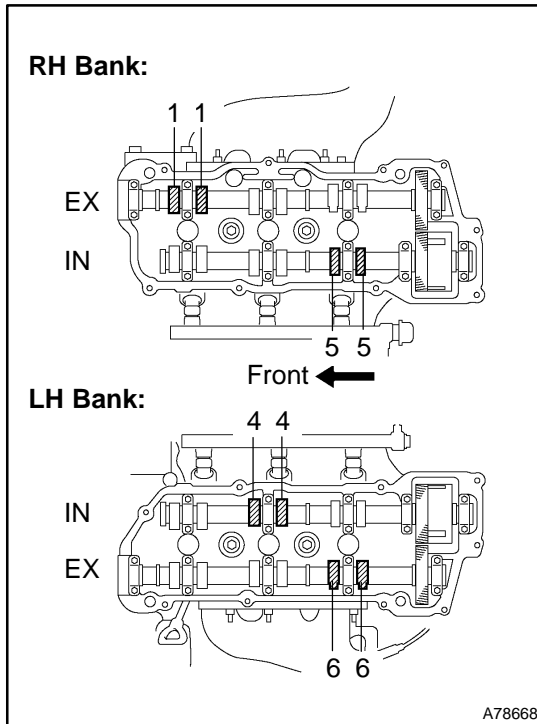
- (1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

**Valve clearance (Cold):**

**0.15 to 0.25 mm (0.0059 to 0.0098 in.) for intake**

**0.25 to 0.35 mm (0.0098 to 0.0138 in.) for exhaust**

- (2) Record the out-of-specification valve clearance measurements. They will be used later to select an adjusting shim to replace.



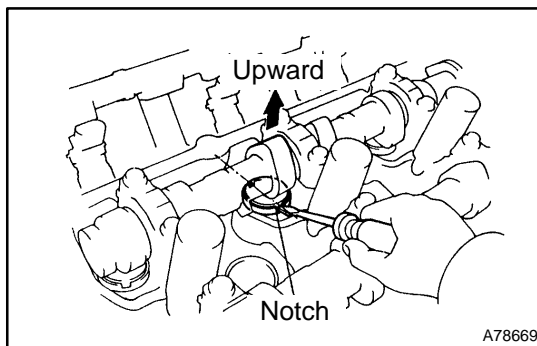
- (e) Turn the crankshaft by  $\frac{2}{3}$  of a revolution ( $240^\circ$ ), then inspect the valves indicated in the illustration on the left.
- (1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

**Valve clearance (Cold):**

**0.15 to 0.25 mm (0.0059 to 0.0098 in.) for intake**

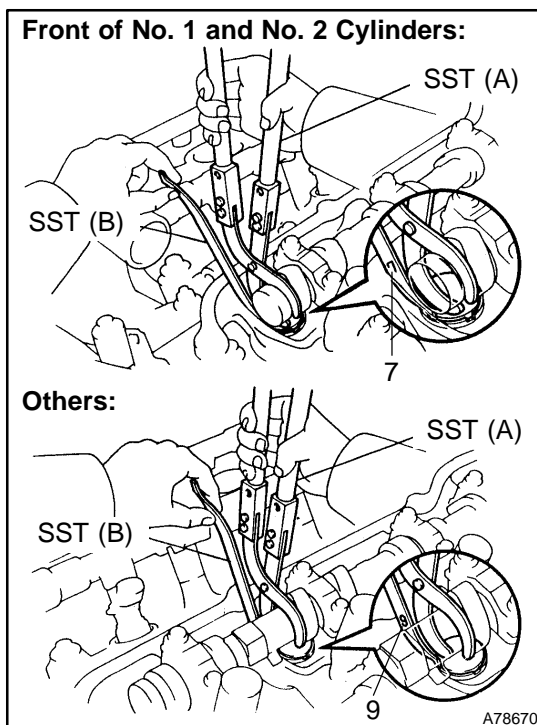
**0.25 to 0.35 mm (0.0098 to 0.0138 in.) for exhaust**

- (2) Record the out-of-specification valve clearance measurements. They will be used later to select an adjusting shim to replace.



**14. 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.



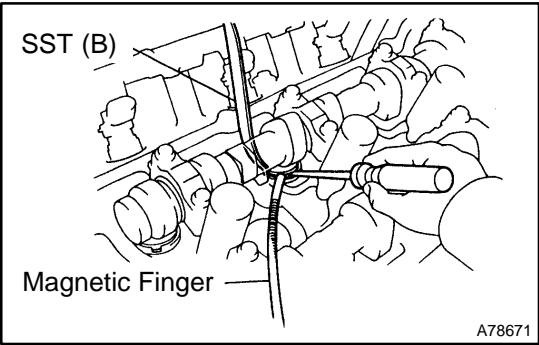
- (c) Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

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

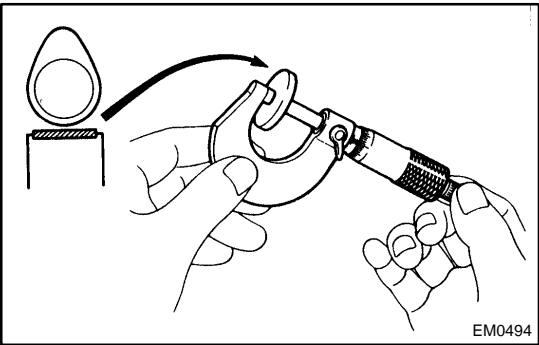
**HINT:**

- 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 SST (B) from getting stuck, insert it gently from the intake side at a slight angle.

SST (A)	09248-05410
SST (B)	09248-05420



(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  $A = B + (C - 0.20 \text{ mm (0.0079 in.)})$**

**Exhaust  $A = B + (C - 0.30 \text{ mm (0.0118 in.)})$**

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

**EXAMPLE (Intake):**

Measured valve clearance = 0.45 mm (0.0177 in.)  
 $0.45 \text{ mm (0.0177 in.)} - 0.20 \text{ mm (0.0079 in.)} = 0.25 \text{ mm (0.0098 in.)}$   
(Measured - Specification = Excess clearance)  
Used shim measurement = 2.80 mm (0.1102 in.)  
 $0.25 \text{ mm (0.0098 in.)} + 2.80 \text{ mm (0.1102 in.)} = 3.05 \text{ mm (0.1201 in.)}$   
(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 New Shim Thickness table on the next 2 pages.

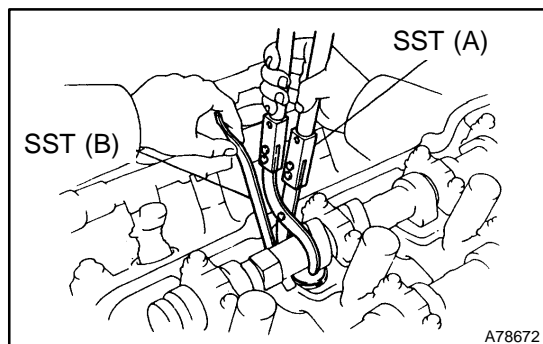
### Adjusting Shim Selection Chart (Intake)

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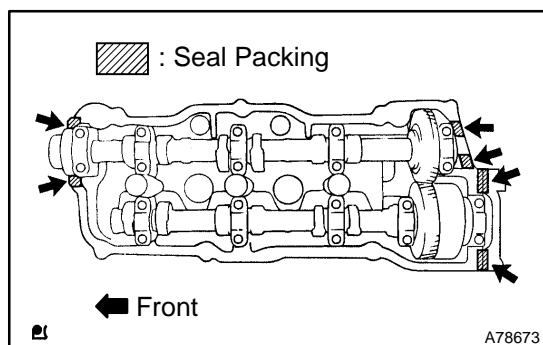
## Adjusting Shim Selection Chart (Exhaust)

Installed Shim Thickness mm (in.)	2.500 (0.0984)	2.520 (0.0992)	2.540 (0.1000)	2.560 (0.1004)	2.580 (0.1008)	2.600 (0.1012)	2.620 (0.1016)	2.640 (0.1039)	2.660 (0.1043)	2.680 (0.1047)	2.670 (0.1051)	2.690 (0.1055)	2.700 (0.1063)	2.710 (0.1067)	2.720 (0.1071)	2.730 (0.1075)	2.740 (0.1079)	2.750 (0.1083)	2.760 (0.1087)	2.770 (0.1091)	2.780 (0.1094)	2.790 (0.1098)	2.800 (0.1102)	2.810 (0.1106)	2.820 (0.1110)	2.830 (0.1114)	2.840 (0.1118)	2.850 (0.1122)	2.860 (0.1126)	2.870 (0.1130)	2.880 (0.1134)	2.890 (0.1138)	2.900 (0.1142)	2.910 (0.1146)	2.920 (0.1150)	2.930 (0.1154)	2.940 (0.1157)	2.950 (0.1161)	2.960 (0.1165)	2.970 (0.1169)	2.980 (0.1173)	2.990 (0.1177)	3.000 (0.1181)	3.010 (0.1185)	3.020 (0.1189)	3.030 (0.1193)	3.040 (0.1197)	3.050 (0.1201)	3.060 (0.1205)	3.070 (0.1209)	3.080 (0.1213)	3.090 (0.1217)	3.100 (0.1221)	3.110 (0.1225)	3.120 (0.1229)	3.130 (0.1233)	3.140 (0.1237)	3.150 (0.1241)	3.160 (0.1245)	3.180 (0.1252)	3.190 (0.1256)	3.200 (0.1260)	3.220 (0.1268)	3.240 (0.1276)	3.260 (0.1284)	3.280 (0.1292)	3.300 (0.1299)	3.320 (0.1307)	3.340 (0.1315)	3.360 (0.1323)	3.380 (0.1331)	3.400 (0.1339)	3.420 (0.1347)	3.440 (0.1355)	3.460 (0.1363)	3.480 (0.1371)	3.500 (0.1379)	3.520 (0.1387)	3.540 (0.1395)	3.560 (0.1403)	3.580 (0.1411)	3.600 (0.1419)	3.620 (0.1427)	3.640 (0.1435)	3.660 (0.1443)	3.680 (0.1451)	3.700 (0.1459)	3.720 (0.1467)	3.740 (0.1475)	3.760 (0.1483)	3.780 (0.1491)	3.800 (0.1499)	3.820 (0.1507)	3.840 (0.1515)	3.860 (0.1523)	3.880 (0.1531)	3.900 (0.1539)	3.920 (0.1547)	3.940 (0.1555)	3.960 (0.1563)	3.980 (0.1571)	4.000 (0.1579)	4.020 (0.1587)	4.040 (0.1595)	4.060 (0.1603)	4.080 (0.1611)	4.100 (0.1619)	4.120 (0.1627)	4.140 (0.1635)	4.160 (0.1643)	4.180 (0.1651)	4.200 (0.1659)	4.220 (0.1667)	4.240 (0.1675)	4.260 (0.1683)	4.280 (0.1691)	4.300 (0.1699)	4.320 (0.1707)	4.340 (0.1715)	4.360 (0.1723)	4.380 (0.1731)	4.400 (0.1739)	4.420 (0.1747)	4.440 (0.1755)	4.460 (0.1763)	4.480 (0.1771)	4.500 (0.1779)	4.520 (0.1787)	4.540 (0.1795)	4.560 (0.1803)	4.580 (0.1811)	4.600 (0.1819)	4.620 (0.1827)	4.640 (0.1835)	4.660 (0.1843)	4.680 (0.1851)	4.700 (0.1859)	4.720 (0.1867)	4.740 (0.1875)	4.760 (0.1883)	4.780 (0.1891)	4.800 (0.1899)	4.820 (0.1907)	4.840 (0.1915)	4.860 (0.1923)	4.880 (0.1931)	4.900 (0.1939)	4.920 (0.1947)	4.940 (0.1955)	4.960 (0.1963)	4.980 (0.1971)	5.000 (0.1979)	5.020 (0.1987)	5.040 (0.1995)	5.060 (0.2003)	5.080 (0.2011)	5.100 (0.2019)	5.120 (0.2027)	5.140 (0.2035)	5.160 (0.2043)	5.180 (0.2051)	5.200 (0.2059)	5.220 (0.2067)	5.240 (0.2075)	5.260 (0.2083)	5.280 (0.2091)	5.300 (0.2099)	5.320 (0.2107)	5.340 (0.2115)	5.360 (0.2123)	5.380 (0.2131)	5.400 (0.2139)	5.420 (0.2147)	5.440 (0.2155)	5.460 (0.2163)	5.480 (0.2171)	5.500 (0.2179)	5.520 (0.2187)	5.540 (0.2195)	5.560 (0.2203)	5.580 (0.2211)	5.600 (0.2219)	5.620 (0.2227)	5.640 (0.2235)	5.660 (0.2243)	5.680 (0.2251)	5.700 (0.2259)	5.720 (0.2267)	5.740 (0.2275)	5.760 (0.2283)	5.780 (0.2291)	5.800 (0.2299)	5.820 (0.2307)	5.840 (0.2315)	5.860 (0.2323)	5.880 (0.2331)	5.900 (0.2339)	5.920 (0.2347)	5.940 (0.2355)	5.960 (0.2363)	5.980 (0.2371)	6.000 (0.2379)	6.020 (0.2387)	6.040 (0.2395)	6.060 (0.2403)	6.080 (0.2411)	6.100 (0.2419)	6.120 (0.2427)	6.140 (0.2435)	6.160 (0.2443)	6.180 (0.2451)	6.200 (0.2459)	6.220 (0.2467)	6.240 (0.2475)	6.260 (0.2483)	6.280 (0.2491)	6.300 (0.2499)	6.320 (0.2507)	6.340 (0.2515)	6.360 (0.2523)	6.380 (0.2531)	6.400 (0.2539)	6.420 (0.2547)	6.440 (0.2555)	6.460 (0.2563)	6.480 (0.2571)	6.500 (0.2579)	6.520 (0.2587)	6.540 (0.2595)	6.560 (0.2603)	6.580 (0.2611)	6.600 (0.2619)	6.620 (0.2627)	6.640 (0.2635)	6.660 (0.2643)	6.680 (0.2651)	6.700 (0.2659)	6.720 (0.2667)	6.740 (0.2675)	6.760 (0.2683)	6.780 (0.2691)	6.800 (0.2699)	6.820 (0.2707)	6.840 (0.2715)	6.860 (0.2723)	6.880 (0.2731)	6.900 (0.2739)	6.920 (0.2747)	6.940 (0.2755)	6.960 (0.2763)	6.980 (0.2771)	7.000 (0.2779)	7.020 (0.2787)	7.040 (0.2795)	7.060 (0.2803)	7.080 (0.2811)	7.100 (0.2819)	7.120 (0.2827)	7.140 (0.2835)	7.160 (0.2843)	7.180 (0.2851)	7.200 (0.2859)	7.220 (0.2867)	7.240 (0.2875)	7.260 (0.2883)	7.280 (0.2891)	7.300 (0.2899)	7.320 (0.2907)	7.340 (0.2915)	7.360 (0.2923)	7.380 (0.2931)	7.400 (0.2939)	7.420 (0.2947)	7.440 (0.2955)	7.460 (0.2963)	7.480 (0.2971)	7.500 (0.2979)	7.520 (0.2987)	7.540 (0.2995)	7.560 (0.3003)	7.580 (0.3011)	7.600 (0.3019)	7.620 (0.3027)	7.640 (0.3035)	7.660 (0.3043)	7.680 (0.3051)	7.700 (0.3059)	7.720 (0.3067)	7.740 (0.3075)	7.760 (0.3083)	7.780 (0.3091)	7.800 (0.3099)	7.820 (0.3107)	7.840 (0.3115)	7.860 (0.3123)	7.880 (0.3131)	7.900 (0.3139)	7.920 (0.3147)	7.940 (0.3155)	7.960 (0.3163)	7.980 (0.3171)	8.000 (0.3179)	8.020 (0.3187)	8.040 (0.3195)	8.060 (0.3203)	8.080 (0.3211)	8.100 (0.3219)	8.120 (0.3227)	8.140 (0.3235)	8.160 (0.3243)	8.180 (0.3251)	8.200 (0.3259)	8.220 (0.3267)	8.240 (0.3275)	8.260 (0.3283)	8.280 (0.3291)	8.300 (0.3299)	8.320 (0.3307)	8.340 (0.3315)	8.360 (0.3323)	8.380 (0.3331)	8.400 (0.3339)	8.420 (0.3347)	8.440 (0.3355)	8.460 (0.3363)	8.480 (0.3371)	8.500 (0.3379)	8.520 (0.3387)	8.540 (0.3395)	8.560 (0.3403)	8.580 (0.3411)	8.600 (0.3419)	8.620 (0.3427)	8.640 (0.3435)	8.660 (0.3443)	8.680 (0.3451)	8.700 (0.3459)	8.720 (0.3467)	8.740 (0.3475)	8.760 (0.3483)	8.780 (0.3491)	8.800 (0.3499)	8.820 (0.3507)	8.840 (0.3515)	8.860 (0.3523)	8.880 (0.3531)	8.900 (0.3539)	8.920 (0.3547)	8.940 (0.3555)	8.960 (0.3563)	8.980 (0.3571)	9.000 (0.3579)	9.020 (0.3587)	9.040 (0.3595)	9.060 (0.3603)	9.080 (0.3611)	9.100 (0.3619)	9.120 (0.3627)	9.140 (0.3635)	9.160 (0.3643)	9.180 (0.3651)	9.200 (0.3659)	9.220 (0.3667)	9.240 (0.3675)	9.260 (0.3683)	9.280 (0.3691)	9.300 (0.3699)	9.320 (0.3707)	9.340 (0.3715)	9.360 (0.3723)	9.380 (0.3731)	9.400 (0.3739)	9.420 (0.3747)	9.440 (0.3755)	9.460 (0.3763)	9.480 (0.3771)	9.500 (0.3779)	9.520 (0.3787)	9.540 (0.3795)	9.560 (0.3803)	9.580 (0.3811)	9.600 (0.3819)	9.620 (0.3827)	9.640 (0.3835)	9.660 (0.3843)	9.680 (0.3851)	9.700 (0.3859)	9.720 (0.3867)	9.740 (0.3875)	9.760 (0.3883)	9.780 (0.3891)	9.800 (0.3899)	9.820 (0.3907)	9.840 (0.3915)	9.860 (0.3923)	9.880 (0.3931)	9.900 (0.3939)	9.920 (0.3947)	9.940 (0.3955)	9.960 (0.3963)	9.980 (0.3971)	10.000 (0.3979)	10.020 (0.3987)	10.040 (0.3995)	10.060 (0.4003)	10.080 (0.4011)	10.100 (0.4019)	10.120 (0.4027)	10.140 (0.4035)	10.160 (0.4043)	10.180 (0.4051)	10.200 (0.4059)	10.220 (0.4067)	10.240 (0.4075)	10.260 (0.4083)	10.280 (0.4091)	10.300 (0.4099)	10.320 (0.4107)	10.340 (0.4115)	10.360 (0.4123)	10.380 (0.4131)	10.400 (0.4139)	10.420 (0.4147)	10.440 (0.4155)	10.460 (0.4163)	10.480 (0.4171)	10.500 (0.4179)	10.520 (0.4187)	10.540 (0.4195)	10.560 (0.4203)	10.580 (0.4211)	10.600 (0.4219)	10.620 (0.4227)	10.640 (0.4235)	10.660 (0.4243)	10.680 (0.4251)	10.700 (0.4259)	10.720 (0.4267)	10.740 (0.4275)	10.760 (0.4283)	10.780 (0.4291)	10.800 (0.4299)	10.820 (0.4307)	10.840 (0.4315)	10.860 (0.4323)	10.880 (0.4331)	10.900 (0.4339)	10.920 (0.4347)	10.940 (0.4355)	10.960 (0.4363)	10.980 (0.4371)	11.000 (0.4379)	11.020 (0.4387)	11.040 (0.4395)	11.060 (0.4403)	11.080 (0.4411)	11.100 (0.4419)	11.120 (0.4427)	11.140 (0.4435)	11.160 (0.4443)	11.180 (0.4451)	11.200 (0.4459)	11.220 (0.4467)	11.240 (0.4475)	11.260 (0.4483)	11.280 (0.4491)	11.300 (0.4499)	11.320 (0.4507)	11.340 (0.4515)	11.360 (0.4523)	11.380 (0.4531)	11.400 (0.4539)	11.420 (0.4547)	11.440 (0.4555)	11.460 (0.4563)	11.480 (0.4571)	11.500 (0.4579)	11.520 (0.4587)	11.540 (0.4595)	11.560 (0.4603)	11.580 (0.4611)	11.600 (0.4619)	11.620 (0.4627)	11.640 (0.4635)	11.660 (0.4643)	11.680 (0.4651)	11.700 (0.4659)	11.720 (0.4667)	11.740 (0.4675)	11.760 (0.4683)	11.780 (0.4691)	11.800 (0.4699)	11.820 (0.4707)	11.840 (0.4715)	11.860 (0.4723)	11.880 (0.4731)	11.900 (0.4739)	11.920 (0.4747)	11.940 (0.4755)	11.960 (0.4763)	11.980 (0.4771)	12.000 (0.4779)	12.020 (0.4787)	12.040 (0.4795)	12.060 (0.4803)	12.080 (0.4811)	12.100 (0.4819)	12.120 (0.4827)	12.140 (0.4835)	12.160 (0.4843)	12.180 (0.4851)	12.200 (0.4859)	12.220 (0.4867)	12.240 (0.4875)	12.260 (0.4883)	12.280 (0.4891)	12.300 (0.4899)	12.320 (0.4907)	12.340 (0.4915)	12.360 (0.4923)	12.380 (0.4931)	12.400 (0.4939)	12.420 (0.4947)	12.440 (0.4955)	12.460 (0.4963)	12.480 (0.4971)	12.500 (0.4979)	12.520 (0.4987)	12.540 (0.4995)	12.560 (0.5003)	12.580 (0.5011)	12.600 (0.5019)	12.620 (0.5027)	12.640 (0.5035)	12.660 (0.5043)	12.680 (0.5051)	12.700 (0.5059)	12.720 (0.5067)	12.740 (0.5075)	12.760 (0.5083)	12.780 (0.5091)	12.800 (0.5099)	12.820 (0.5107)	12.840 (0.5115)	12.860 (0.5123)	12.880 (0.5131)	12.900 (0.5139)	12.920 (0.5147)	12.940 (0.5155)	12.960 (0.5163)	12.980 (0.5171)	13.000 (0.5179)	13.020 (0.5187)	13.040 (0.5195)	13.060 (0.5203)	13.080 (0.5211)	13.100 (0.5219)	13.120 (0.5227)	13.140 (0.5235)	13.160 (0.5243)	13.180 (0.5251)	13.200 (0.5259)	13.220 (0.5267)	13.240 (0.5275)	13.260 (0.5283)	13.280 (0.5291)	13.300 (0.5299)	13.320 (0.5307)	13.340 (0.5315)	13.360 (0.5323)	13.380 (0.5331)	13.400 (0.5339)	13.420 (0.5347)	13.440 (0.5355)	13.460 (0.5363)	13.480 (0.5371)	13.500 (0.5379)	13.520 (0.5387)	13.540 (0.5395)	13.560 (0.5403)	13.580 (0.5411)	13.600 (0.5419)	13.620 (0.5427)	13.640 (0.5435)	13.660 (0.5443)	13.680 (0.5451)	13.700 (0.5459)	13.720 (0.5467)	13.740 (0.5475)	13.760 (0.5483)	13.780 (0.5491)	13.800 (0.5499)	13.820 (0.5507)	13.840 (0.5515)	13.860 (0.5523)	13.880 (0.5531)	13.900 (0.5539)	13.920 (0.5547)	13.940 (0.5555)	13.960 (0.5563)	13.980 (0.5571)	14.000 (0.5579)	14.020 (0.5587)	14.040 (0.5595)	14.060 (0.5603)	14.080 (0.5611)	14.100 (0.5619)	14.120 (0.5627)	14.140 (0.5635)	14.160 (0.5643)	14.180 (0.5651)	14.200 (0.5659)	14.220 (0.5667)	14.240 (0.5675)	14.260 (0.5683)	14.280 (0.5691)	14.300 (0.5699)	14.320 (0.5707)	14.340 (0.5715)	14.360 (0.5723)	14.380 (0.5731)	14.400 (0.5739)	14.420 (0.5747)	14.440 (0.5755)	14.460 (0.5763)	14.480 (0.5771)	14.500 (0.5779)	14.520 (0.5787)	14.540 (0.5795)	14.560 (0.5803)	14.580 (0.5811)	14.600 (0.5819)	14.620 (0.5827)	14.640 (0.5835)	14.660 (0.5843)	14.680 (0.5851)	14.700 (0.5859)	14.720 (0.5867)	14.740 (0.5875)	14.760 (0.5883)	14.780 (0.5891)	14.800 (0.5899)	14.820 (0.5907)	14.840 (0.5915)	14.860 (0.5923)	14.880 (0.5931)	14.900 (0.5939)	14.920 (0.5947)	14.940 (0.5955)	14.960 (0.5963)	14.980 (0.5971)	15.000 (0.5979)	15.020 (0.5987)	15.040 (0.5995)	15.060 (0.6003)	15.080 (0.6011)	15.100 (0.6019)	15.120 (0.6027)	15.140 (0.6035)	15.160 (0.6043)	15.180 (0.6051)	15.200 (0.6059)	15.220 (0.6067)	15.240 (0.6075)	15.260 (0.6083)	15.280 (0.6091)	15.300 (0.6099)	15.320 (0.6107)	15.340 (0.6115)	15.360 (0.6123)	15.380 (0.6131)	15.400 (0.6139)	15.420 (0.6147)	15.440 (0.6155)	15.460 (0.6163)	15.480 (0.6171)	15.500 (0.6179)	15.520 (0.6187)	15.540 (0.6195)	15.560 (0.6203)	15.580 (0.6211)	15.600 (0.6219)	15.620 (0.6227)	15.640 (0.6235)	15.660 (0.6243)	15.680 (0.6251)	15.700 (0.6259)	15.720 (0.6267)	15.740 (0.6275)	15.760 (0.6283)	15.780 (0.6291)	15.800 (0.6299)	15.820 (0.6307)	15.840 (0.6315)	15.860 (0.6323)	15.880 (0.6331)	15.900 (0.6339)	15.920 (0.6347)	15.940 (0.6355)	15.960 (0.6363)	15.980 (0.6371)
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- (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), then remove SST (B).  
SST 09248-55040 (09248-05410, 09248-05420)
- (j) Recheck the valve clearance.



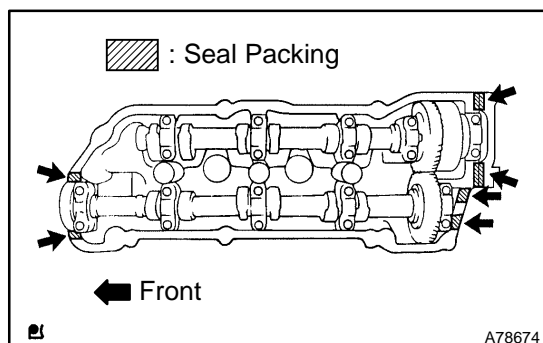
#### 15. INSTALL CYLINDER HEAD COVER SUB-ASSY

- (a) 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 within 2 hours after installing.
- (b) Install the cylinder head cover with the 9 bolts. Tighten the bolts uniformly in several steps.  
**Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)**
  - (c) Install the engine wire harness with the 3 nuts.  
**Torque: 8.4 N·m (85 kgf·cm, 74 in.·lbf)**



#### 16. INSTALL CYLINDER HEAD COVER SUB-ASSY LH

- (a) 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 within 2 hours after installing.
- (b) Install the cylinder head cover with the 9 bolts. Tighten the bolts uniformly in several steps.  
**Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)**
  - (c) Using an E6 Torx® socket wrench, install the engine wire harness protector with the 2 bolts.  
**Torque: 8.4 N·m (85 kgf·cm, 74 in.·lbf)**

#### 17. INSTALL IGNITION COIL ASSY

**Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)**

#### 18. INSTALL INTAKE AIR SURGE TANK (See page 11-13 )

#### 19. INSTALL EMISSION CONTROL VALVE SET (See page 11-13 )

#### 20. INSTALL AIR CLEANER CAP SUB-ASSY (See page 10-1 1)

#### 21. CHECK CONNECTION OF VACUUM HOSE (See page 14-29 )

#### 22. INSTALL V-BANK COVER SUB-ASSY (See page 10-1 1)

#### 23. INSTALL FRONT SUSPENSION UPPER BRACE CENTER (W/O TEMS) (See page 10-1 1)

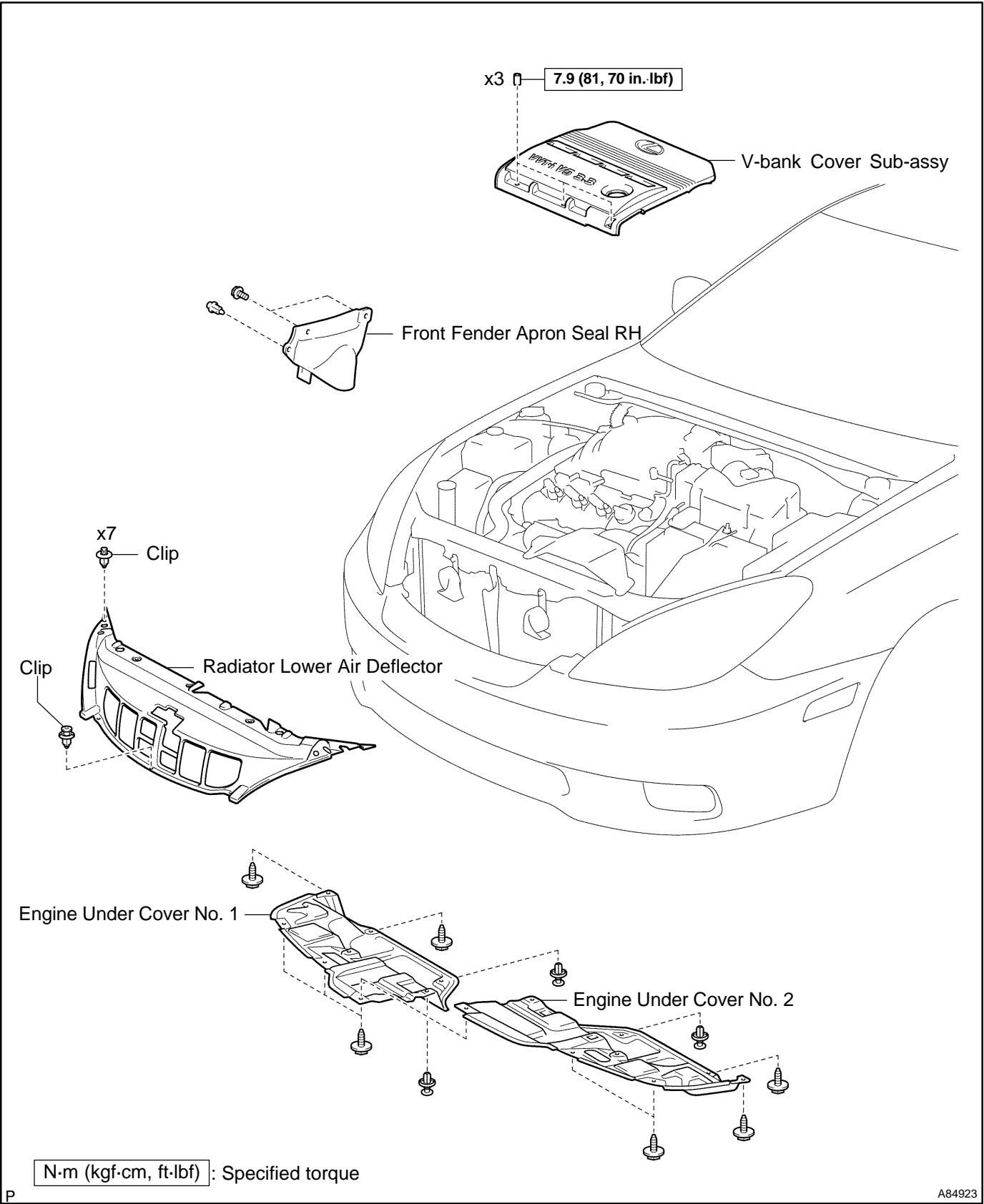
#### 24. ADD ENGINE COOLANT (See page 16-9 )

#### 25. CHECK FOR ENGINE COOLANT LEAKS (See page 16-1 )

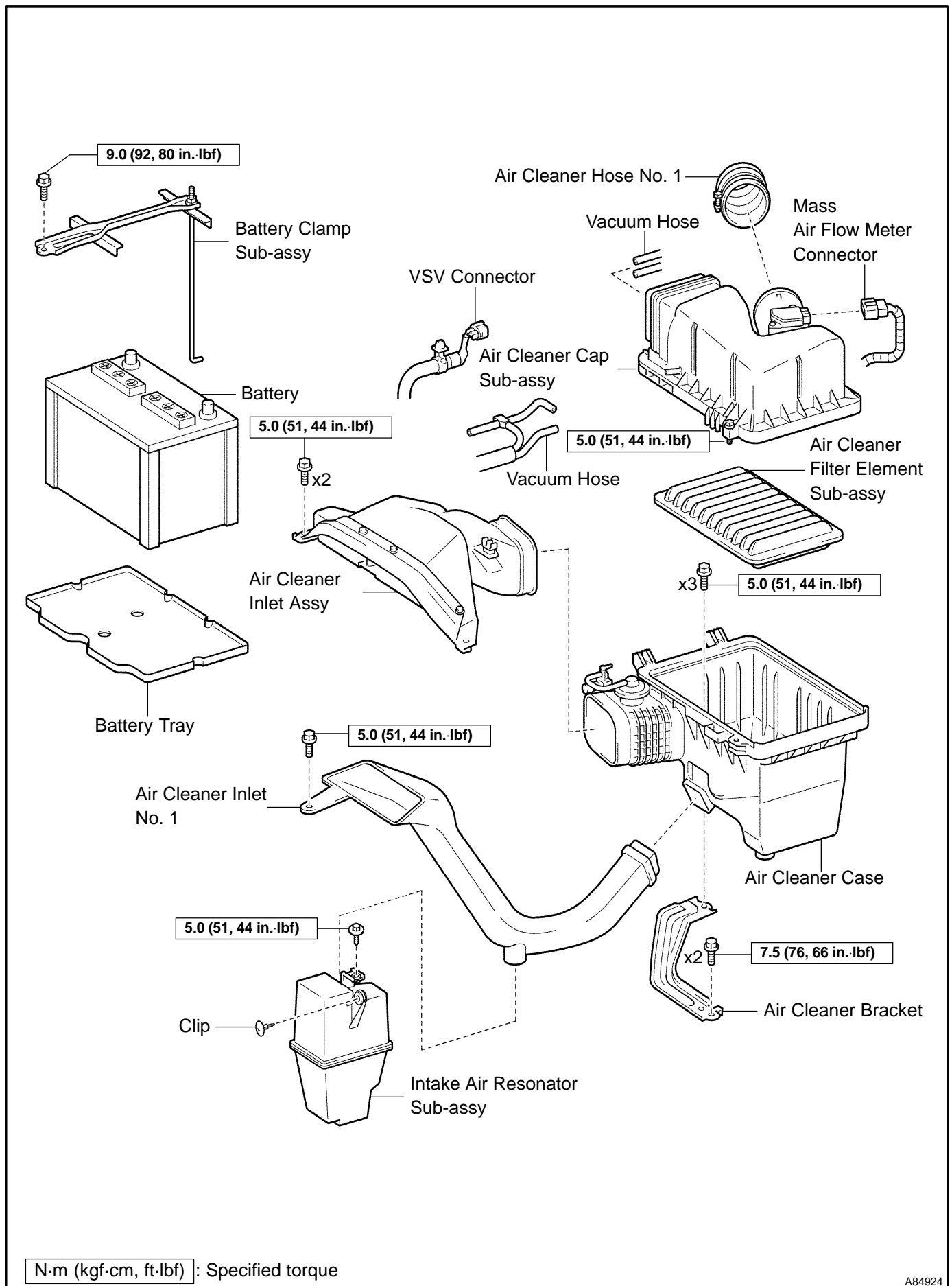
**26. SYSTEM INITIALIZATION (See page [19-15](#) )**

# PARTIAL ENGINE ASSY (3MZ-FE) COMPONENTS

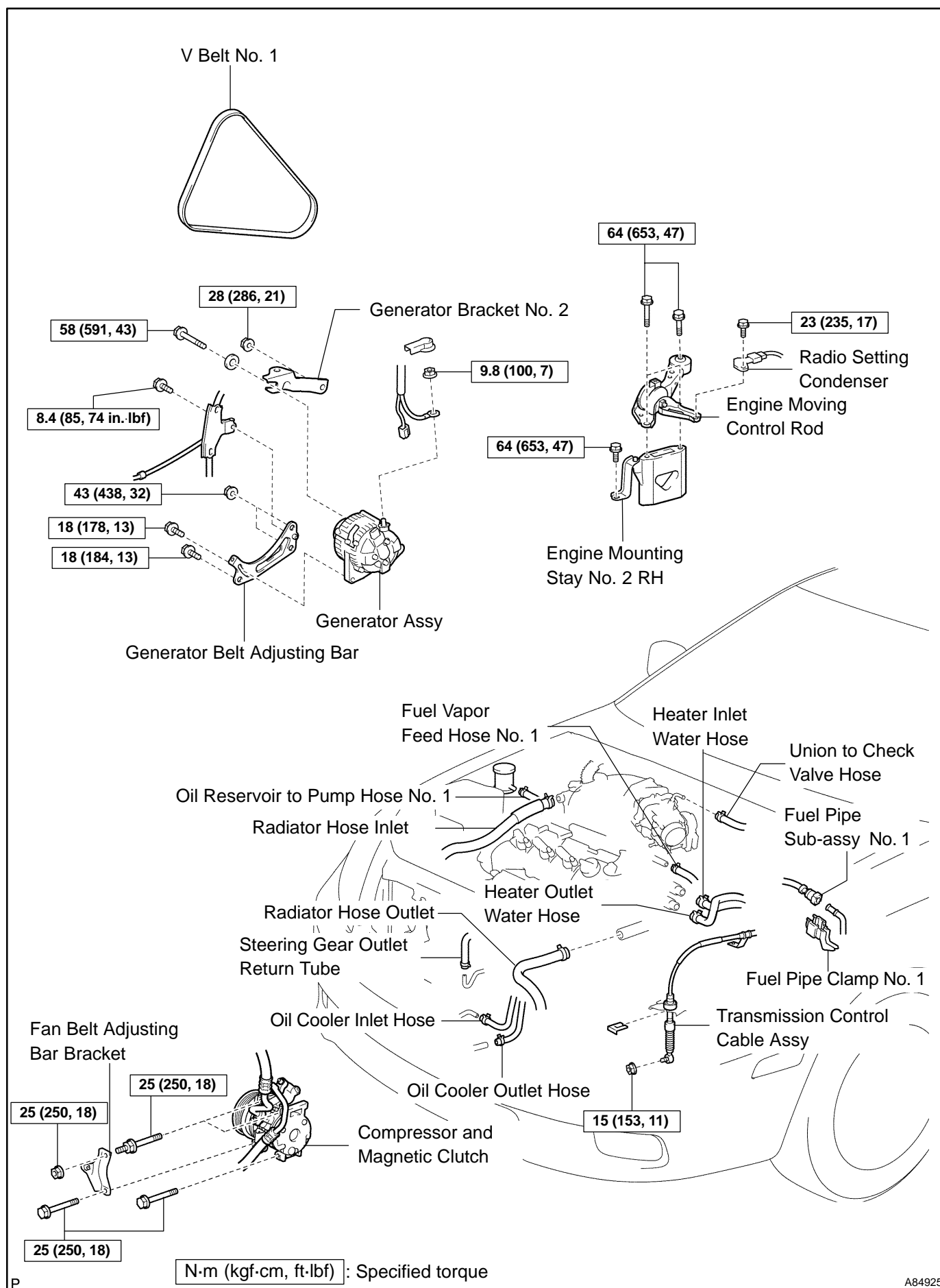
141JB-01

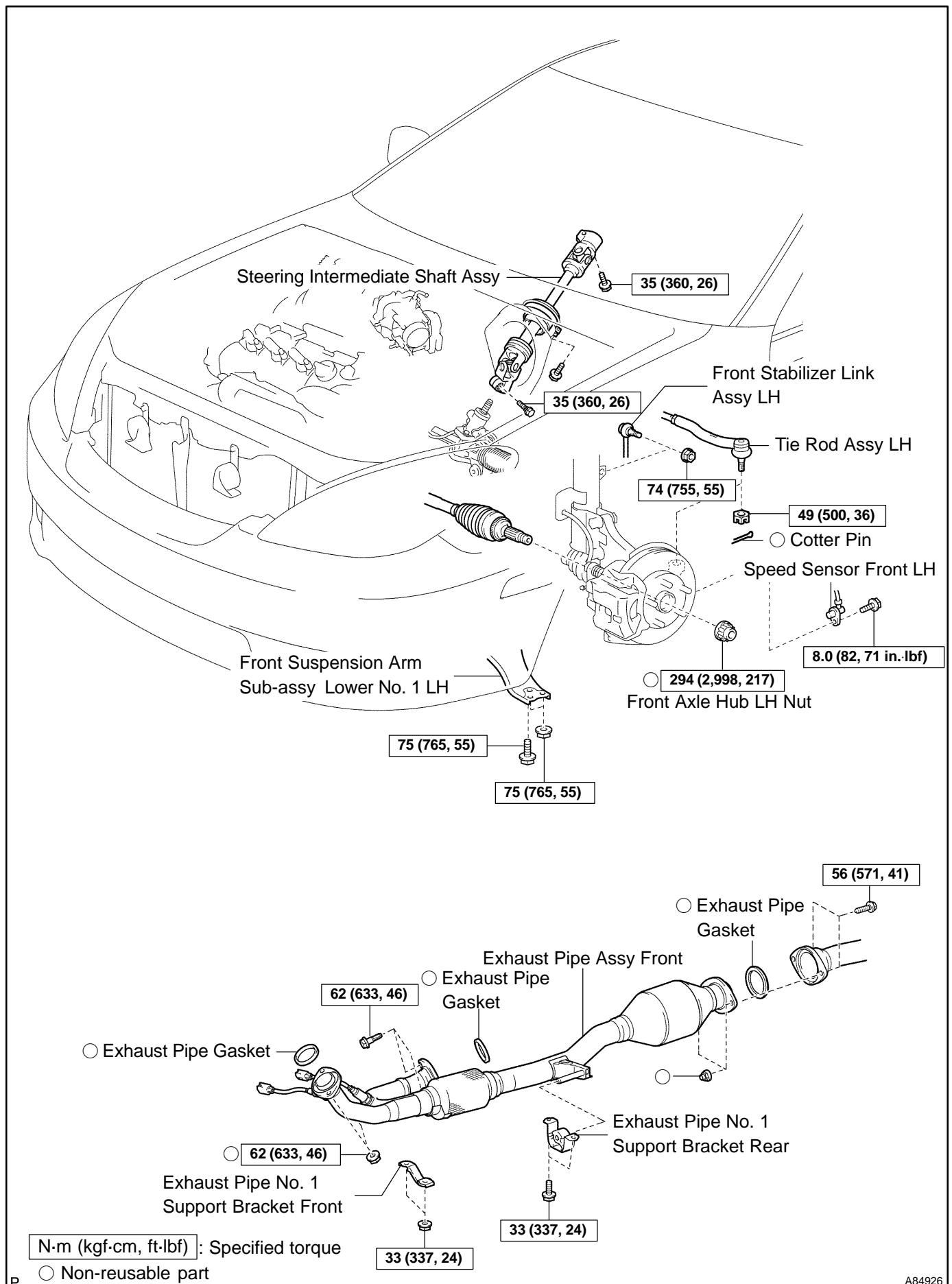


A84923

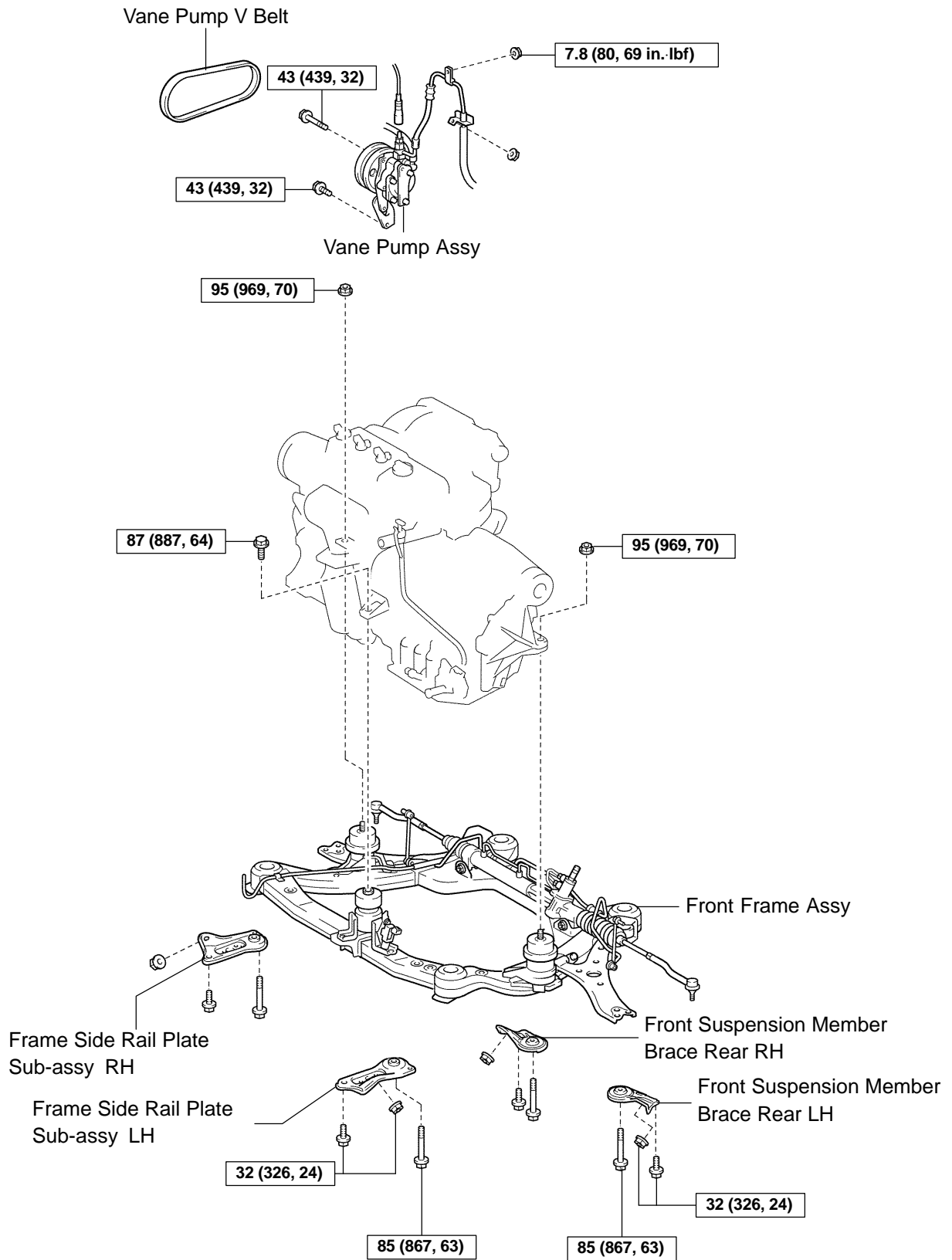


A84924



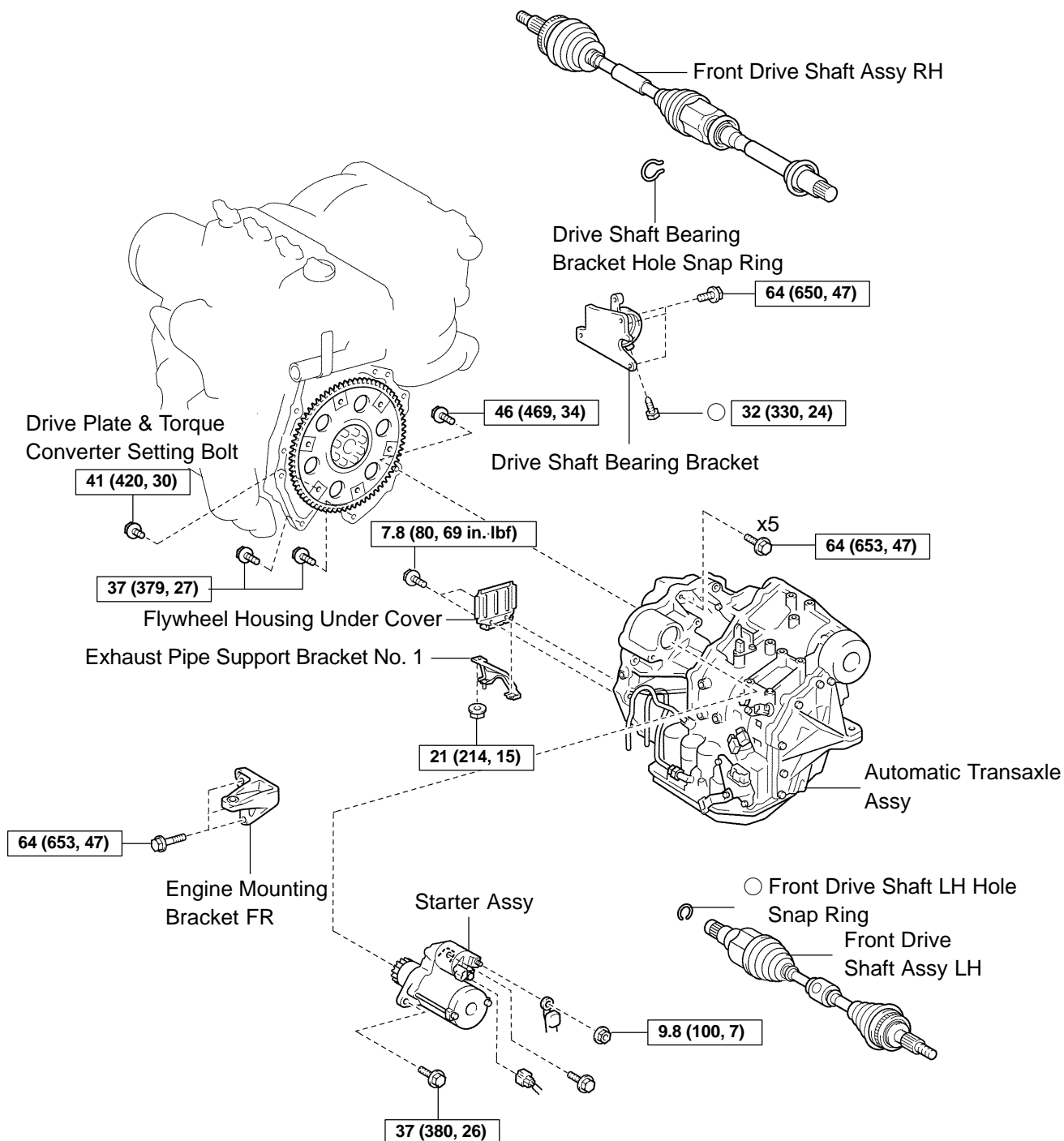


A84926



N·m (kgf·cm, ft·lbf) : Specified torque

A84927



N·m (kgf·cm, ft·lbf) : Specified torque

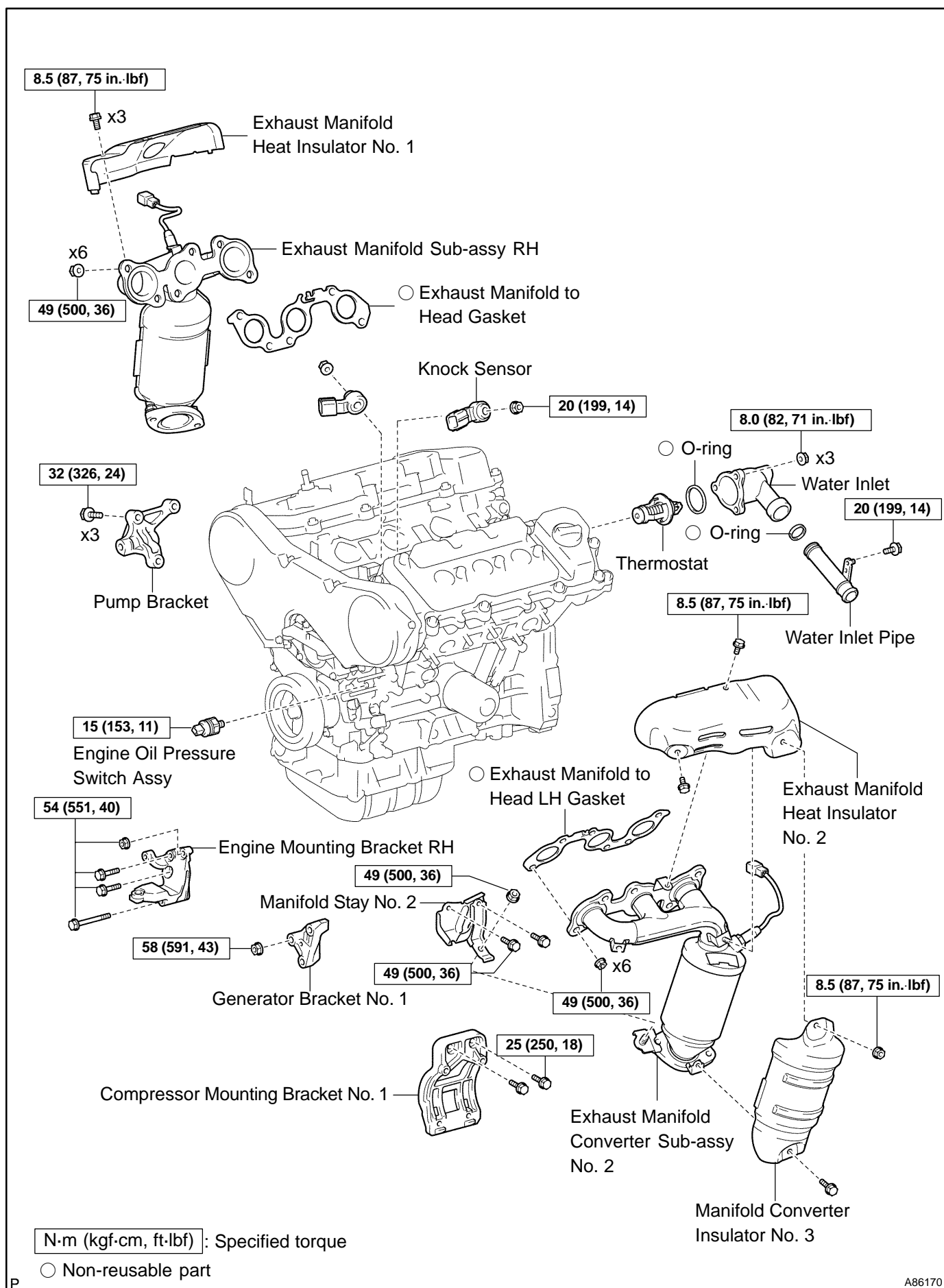
○ Non-reusable part

P

A84928

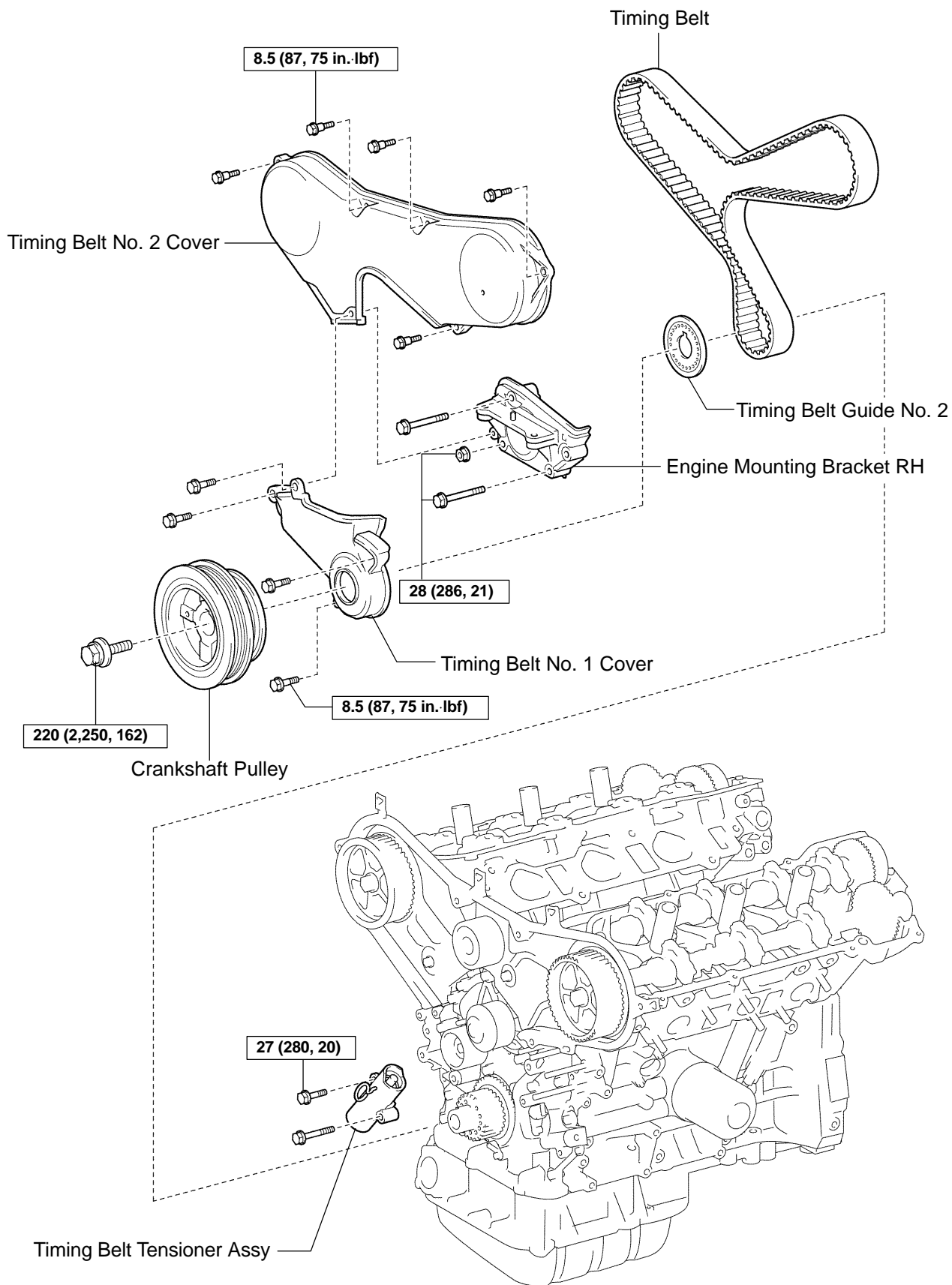






A86170

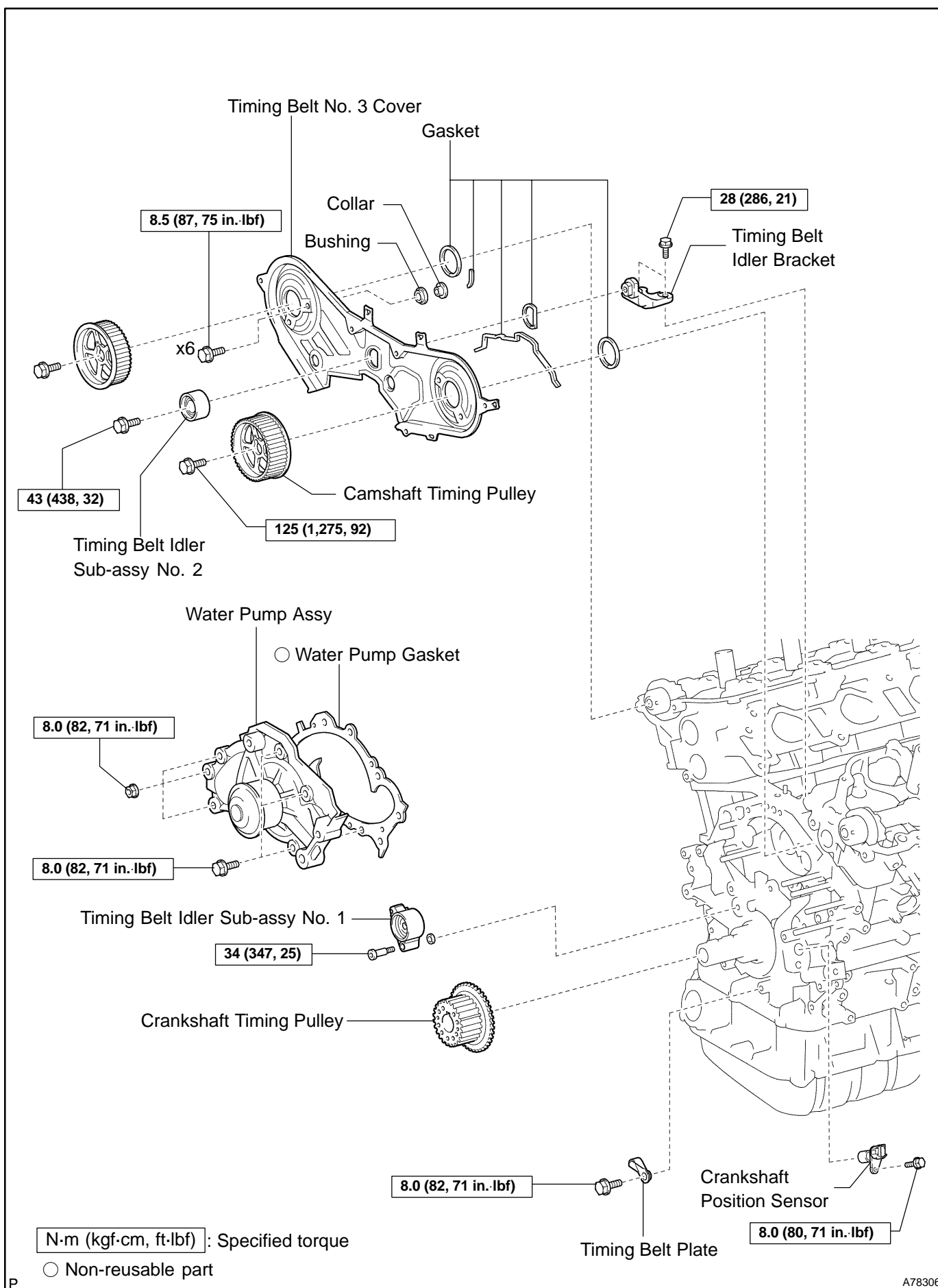




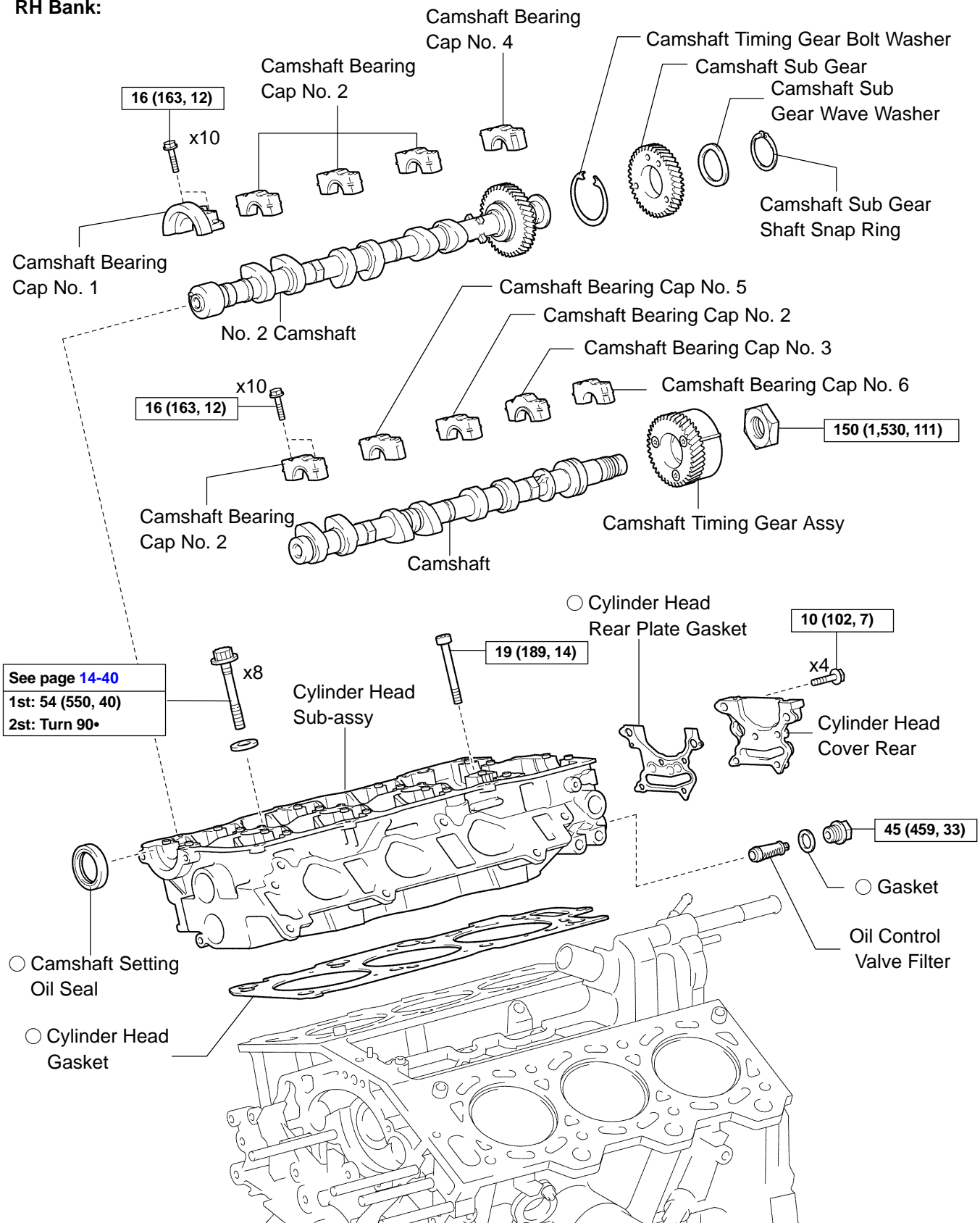
N·m (kgf·cm, ft·lbf) : Specified torque

P

A78305

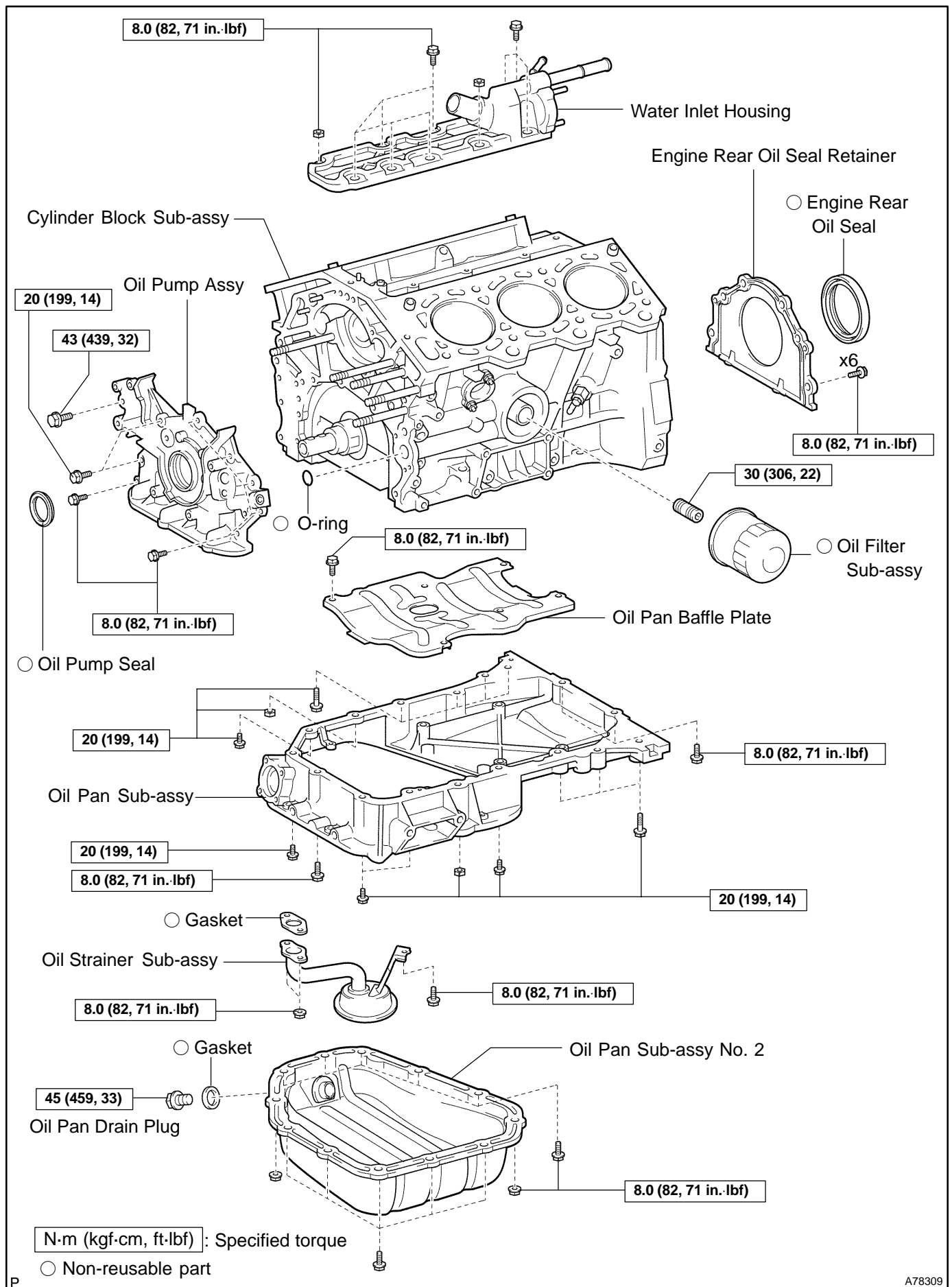


A78306

**RH Bank:**

A78307



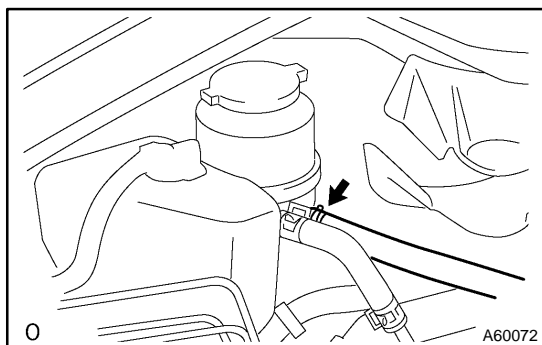


A78309

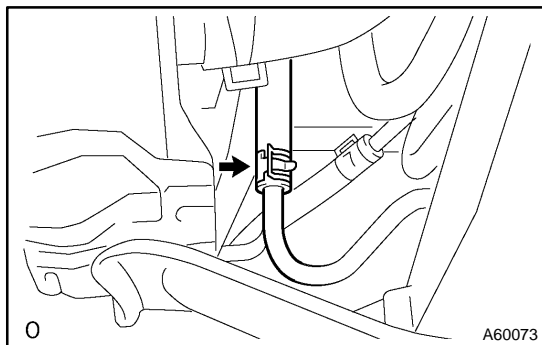


## REPLACEMENT

1. DISCHARGE FUEL SYSTEM PRESSURE (See page 11-1 )
2. DISCONNECT BATTERY NEGATIVE TERMINAL
3. REMOVE FRONT WHEELS
4. REMOVE ENGINE UNDER COVER NO.1
5. REMOVE ENGINE UNDER COVER NO.2
6. REMOVE FRONT FENDER APRON SEAL RH
7. DRAIN ENGINE COOLANT (See page 16-9 )
8. DRAIN ENGINE OIL (See page 17-20 )
9. DRAIN AUTOMATIC TRANSAXLE FLUID (See page 30-8 )
10. REMOVE V-BANK COVER SUB-ASSY (See page 10-1 1)
11. REMOVE RADIATOR LOWER AIR DEFLECTOR (See page 19-5 )
12. REMOVE BATTERY
13. REMOVE BATTERY TRAY
14. REMOVE AIR CLEANER INLET ASSY (See page 19-5 )
15. REMOVE AIR CLEANER ASSY (See page 19-5 )
16. REMOVE AIR CLEANER BRACKET (See page 19-5 )
17. REMOVE AIR CLEANER INLET NO.1 (See page 19-5 )
18. REMOVE INTAKE AIR RESONATOR SUB-ASSY
  - (a) Remove the clip and bolt, then remove the intake air resonator.
19. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-5 )
20. REMOVE GENERATOR ASSY (See page 19-21 )
21. REMOVE ENGINE MOVING CONTROL ROD (See page 14-79 )
22. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14-79 )
23. REMOVE GENERATOR BRACKET NO.2 (See page 14-79 )
24. REMOVE GENERATOR BELT ADJUSTING BAR (See page 17-9 )
25. SEPARATE COMPRESSOR AND MAGNETIC CLUTCH (See page 17-9 )
26. SEPARATE TRANSMISSION CONTROL CABLE ASSY (See page 40-44 )
27. DISCONNECT UNION TO CHECK VALVE HOSE
28. DISCONNECT FUEL VAPOR FEED HOSE NO.1
29. DISCONNECT FUEL PIPE SUB-ASSY NO.1 (See page 11-1 )
30. DISCONNECT HEATER INLET WATER HOSE
31. DISCONNECT HEATER OUTLET WATER HOSE
32. DISCONNECT RADIATOR HOSE INLET
33. DISCONNECT RADIATOR HOSE OUTLET
34. DISCONNECT OIL COOLER INLET HOSE
35. DISCONNECT OIL COOLER OUTLET HOSE



36. DISCONNECT OIL RESERVOIR TO PUMP HOSE NO.1

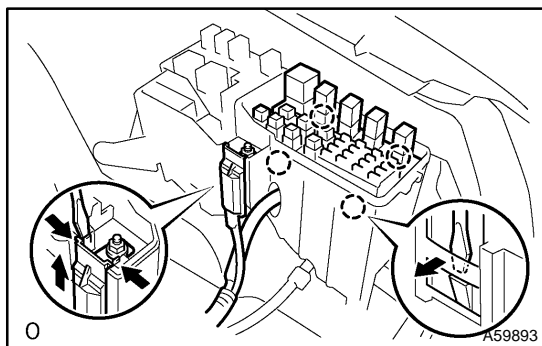


### 37. DISCONNECT STEERING GEAR OUTLET RETURN TUBE

### 38. REMOVE GLOVE COMPARTMENT DOOR ASSY (See page 10-22 )

### 39. SEPARATE ENGINE WIRE

- (a) Disconnect the engine wire harness from the ECM and junction block.



- (b) Disconnect the engine wire harness from the engine room junction block.
- (1) Remove the nut, then separate the engine wire harness.
  - (2) Using a screwdriver, release the engine room junction block. Separate the engine wire harness by pulling it upward.
- (c) Remove the 2 nuts, then pull out the engine wire harness.
- (d) Remove the body ground.

### 40. REMOVE EXHAUST PIPE NO.1 SUPPORT BRACKET FRONT (See page 15-2 )

### 41. REMOVE EXHAUST PIPE NO.1 SUPPORT BRACKET REAR (See page 15-2 )

### 42. REMOVE EXHAUST PIPE ASSY FRONT (See page 15-2 )

### 43. DISCONNECT FRONT STABILIZER LINK ASSY LH (See page 30-8 )

### 44. DISCONNECT FRONT STABILIZER LINK ASSY RH

HINT:

Perform the same procedure as above on the opposite side.

### 45. REMOVE FRONT AXLE HUB LH NUT (See page 30-8 )

SST 09930-00010

### 46. REMOVE FRONT AXLE HUB RH NUT

SST 09930-00010

HINT:

Perform the same procedure as above on the opposite side.

### 47. SEPARATE SPEED SENSOR FRONT LH (See page 30-8 )

### 48. SEPARATE SPEED SENSOR FRONT RH

HINT:

Perform the same procedure as above on the opposite side.

### 49. SEPARATE TIE ROD ASSY LH (See page 30-8 )

SST 09628-6201 1

### 50. SEPARATE TIE ROD ASSY RH

SST 09628-6201 1

HINT:

Perform the same procedure as above on the opposite side.

**51. SEPARATE FRONT SUSPENSION ARM SUB-ASSY LOWER NO.1 LH (See page 30-8 )****52. SEPARATE FRONT SUSPENSION ARM SUB-ASSY LOWER NO.1 RH**

HINT:

Perform the same procedure as above on the opposite side.

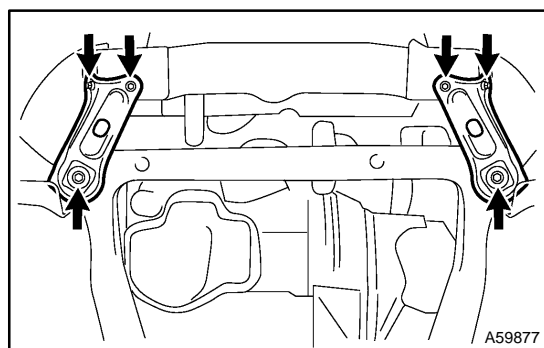
**53. SEPARATE FRONT AXLE ASSY LH (See page 30-8 )****54. SEPARATE FRONT AXLE ASSY RH**

HINT:

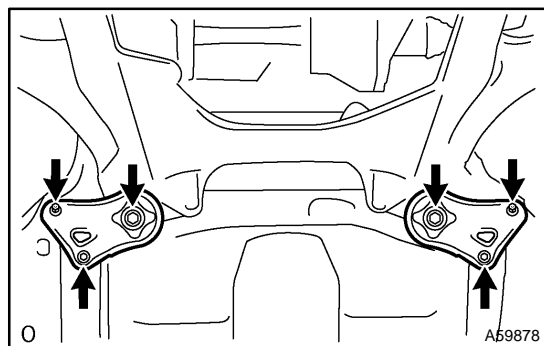
Perform the same procedure as above on the opposite side.

**55. SEPARATE STEERING INTERMEDIATE SHAFT ASSY (See page 51-21 )****56. REMOVE ENGINE ASSEMBLY WITH TRANSAXLE**

- (a) Set the engine lifter.

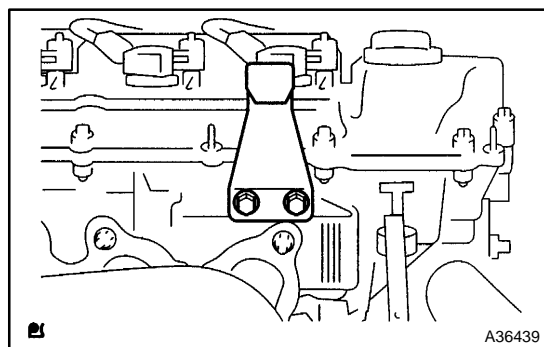


- (b) Remove the 4 bolts and 2 nuts, then remove the frame side rail plate RH and LH.



- (c) Remove the 4 bolts and 2 nuts, then remove the front suspension member brace rear RH and LH.

- (d) Carefully remove the engine assembly from the vehicle.



- (e) Install the engine hanger No. 2 in the correct direction as shown in the illustration.

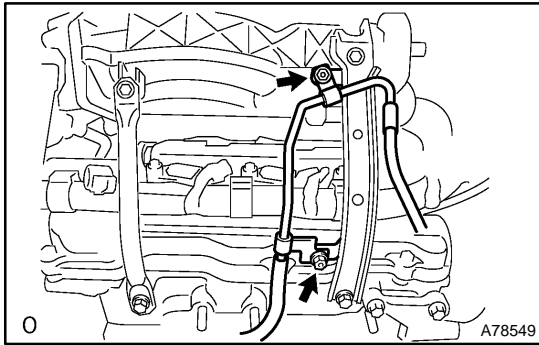
**Torque: 20 N·m (199 kgf·cm, 14 ft·lbf)**

HINT:

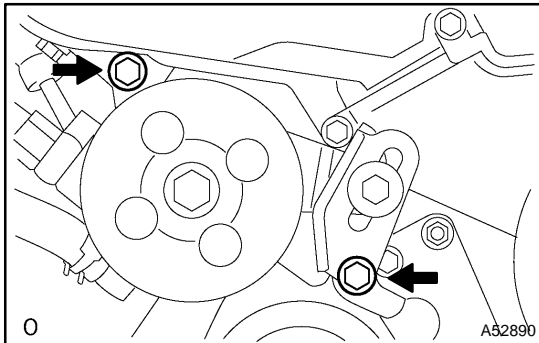
Engine hanger No. 2	12282-20020
Bolt	91621-60822

- (f) Attach the engine sling and hang the engine assembly with the chain block.

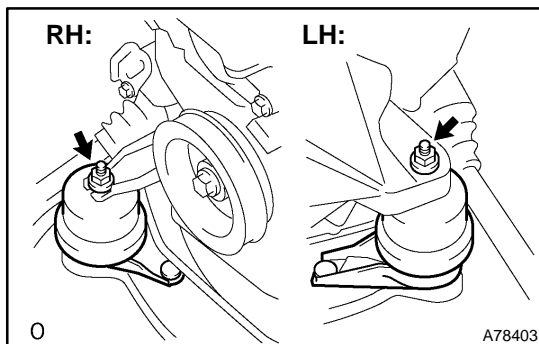
**57. REMOVE VANE PUMP V BELT (See page 14-5 )**

**58. REMOVE VANE PUMP ASSY**

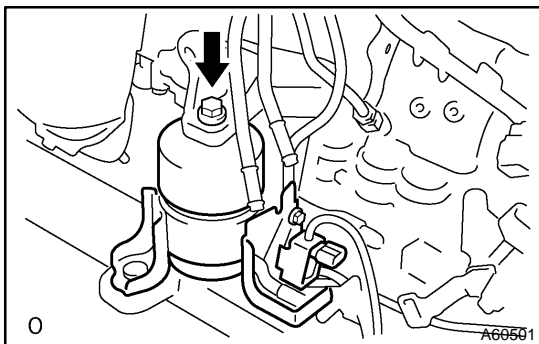
- (a) Remove the 2 nuts, then disconnect the power steering pressure tube.



- (b) Remove the 2 bolts and vane pump.

**59. REMOVE FRONT FRAME ASSY**

- (a) Remove the 2 nuts, then separate the engine mounting insulator RH and LH.



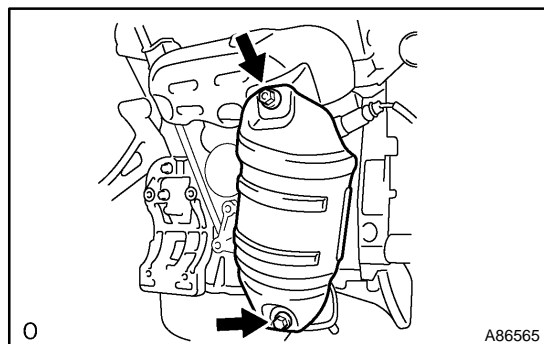
- (b) Remove the bolt, then separate the engine mounting insulator FR.

**60. REMOVE FRONT DRIVE SHAFT ASSY LH (See page 30-8 )**

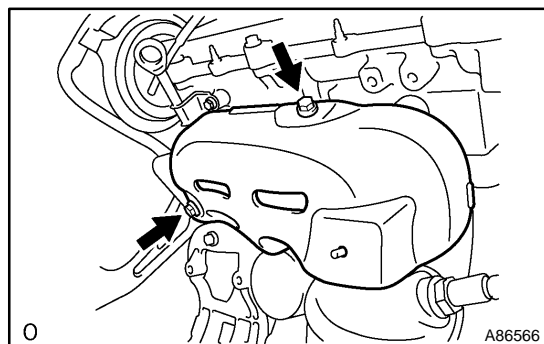
SST 09520-01010, 09520-24010 (09520-32040)

**61. REMOVE FRONT DRIVE SHAFT ASSY RH (See page 30-8 )****62. REMOVE STARTER ASSY (See page 19-5 )****63. REMOVE ENGINE MOUNTING BRACKET FR (See page 40-9 )****64. REMOVE EXHAUST PIPE SUPPORT BRACKET NO.1 (See page 40-9 )****65. REMOVE AUTOMATIC TRANSAXLE ASSY (See page 40-9 )****66. REMOVE DRIVE SHAFT BEARING BRACKET**

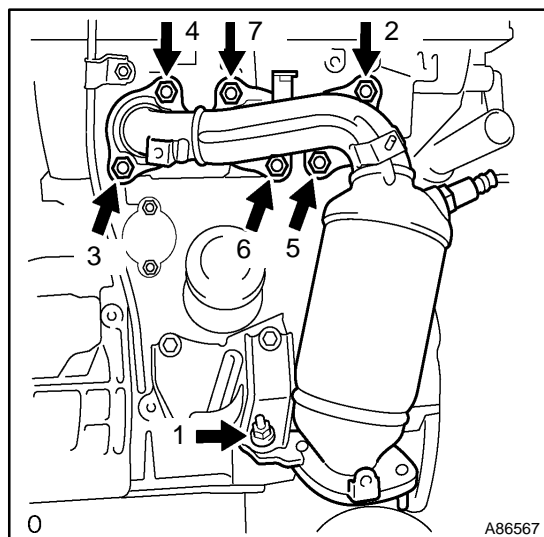
67. REMOVE DRIVE PLATE & RING GEAR SUB-ASSY (See page 14-140 )  
SST 09213-54015 (91651-60855), 09330-00021
68. INSTALL ENGINE STAND
69. REMOVE ENGINE HANGER NO.2
70. REMOVE EMISSION CONTROL VALVE SET (See page 11-13 )
71. REMOVE INTAKE AIR SURGE TANK (See page 11-13 )
72. REMOVE INTAKE MANIFOLD (See page 10-16 )
73. REMOVE WATER OUTLET (See page 10-16 )
74. REMOVE IGNITION COIL ASSY
75. REMOVE EXHAUST MANIFOLD HEAT INSULATOR NO.1 (See page 14-120 )
76. REMOVE EXHAUST MANIFOLD SUB-ASSY RH (See page 14-120 )



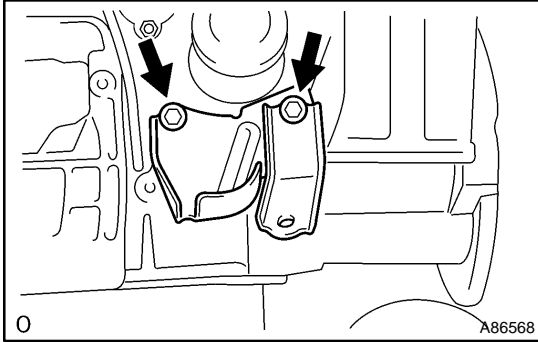
77. REMOVE MANIFOLD CONVERTER INSULATOR NO.3  
(a) Remove the bolt and nut, then remove the insulator.



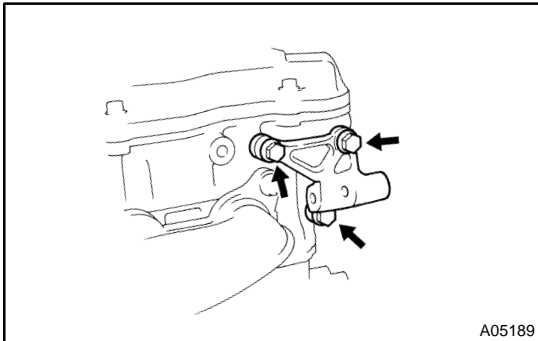
78. REMOVE EXHAUST MANIFOLD HEAT INSULATOR NO.2  
(a) Remove the 2 bolts and insulator.



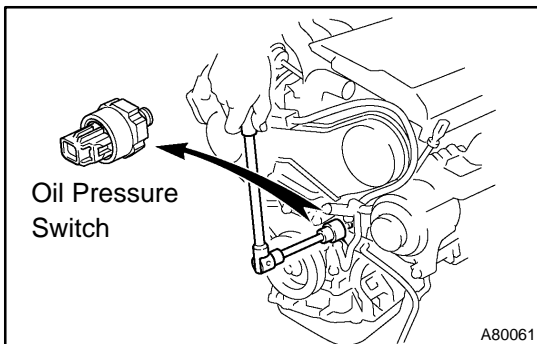
79. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSY NO.2  
(a) Using several steps, loosen and remove the 7 nuts in the sequence shown in the illustration.  
(b) Remove the exhaust manifold converter No. 2 and gasket from the cylinder head LH.

**80. REMOVE MANIFOLD STAY NO.2**

- (a) Remove the 2 bolts and manifold stay.

**81. REMOVE ENGINE MOUNTING BRACKET RH (See page 17-9 )****82. REMOVE PUMP BRACKET**

- (a) Remove the 3 bolts and pump bracket.

**83. REMOVE GENERATOR BRACKET NO.1****84. REMOVE COMPRESSOR MOUNTING BRACKET NO.1 (See page 17-9 )****85. REMOVE WATER INLET PIPE (See page 16-16 )****86. REMOVE WATER INLET (See page 16-16 )****87. REMOVE THERMOSTAT****88. REMOVE ENGINE OIL PRESSURE SWITCH ASSY**

- (a) Using a deep socket wrench 24 mm, remove the oil pressure switch.

**89. REMOVE KNOCK SENSOR (See page 10-16 )****90. REPLACE PARTIAL ENGINE ASSY****91. INSTALL KNOCK SENSOR (See page 10-16 )****92. INSTALL ENGINE OIL PRESSURE SWITCH ASSY**

- (a) Apply adhesive to 2 or 3 threads of the oil pressure switch.

**Adhesive:**

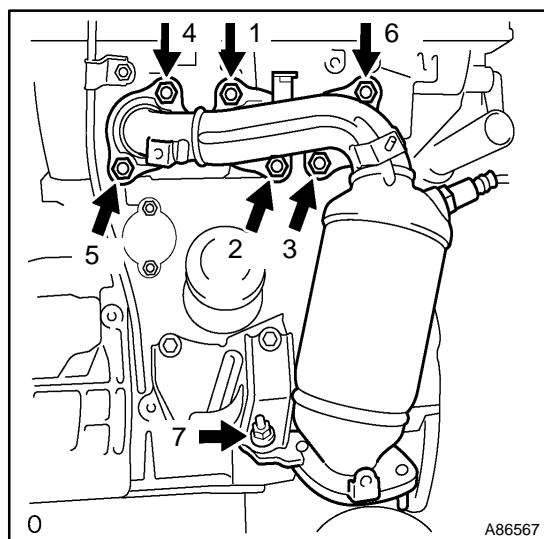
**Part No. 08833-00080 THREE BOND 1344,**

**LOCTITE 242 or equivalent**

- (b) Using a deep socket wrench 24 mm, install the oil pressure switch.

**Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)**

93. INSTALL THERMOSTAT (See page 16-16 )
94. INSTALL WATER INLET (See page 16-16 )
95. INSTALL WATER INLET PIPE (See page 16-16 )
96. INSTALL COMPRESSOR MOUNTING BRACKET NO.1 (See page 17-9 )
97. INSTALL GENERATOR BRACKET NO.1  
Torque: 58 N·m (591 kgf·cm, 43 ft·lbf)
98. INSTALL PUMP BRACKET  
Torque: 32 N·m (326 kgf·cm, 24 ft·lbf)
99. INSTALL ENGINE MOUNTING BRACKET RH (See page 17-9 )
100. INSTALL MANIFOLD STAY NO.2  
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)



#### 101. INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSY NO.2

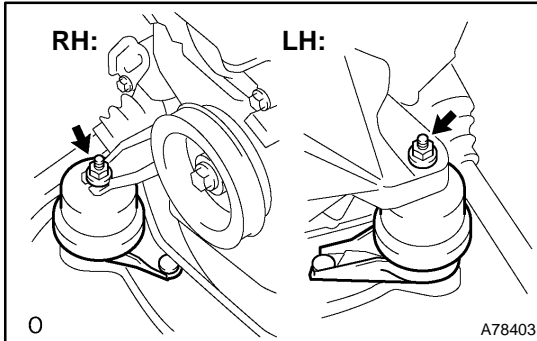
- (a) Install a new gasket and the exhaust manifold converter No. 2 with the 7 nuts. Using several steps, tighten the nuts uniformly in the sequence shown in the illustration.  
**Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)**
- (b) Retighten nuts 1 and 2 as shown in the illustration.

102. INSTALL EXHAUST MANIFOLD HEAT INSULATOR NO.2  
Torque: 8.5 N·m (87 kgf·cm, 75 in·lbf)
103. INSTALL MANIFOLD CONVERTER INSULATOR NO.3  
Torque: 8.5 N·m (87 kgf·cm, 75 in·lbf)
104. INSTALL EXHAUST MANIFOLD SUB-ASSY RH (See page 14-120 )
105. INSTALL EXHAUST MANIFOLD HEAT INSULATOR NO.1 (See page 14-120 )
106. INSTALL IGNITION COIL ASSY (See page 14-7 )
107. INSTALL WATER OUTLET (See page 10-16 )
108. INSTALL INTAKE MANIFOLD (See page 10-16 )
109. INSTALL INTAKE AIR SURGE TANK (See page 11-13 )
110. INSTALL EMISSION CONTROL VALVE SET (See page 11-13 )
111. INSTALL DRIVE PLATE & RING GEAR SUB-ASSY (See page 14-140 )  
SST 09213-54015 (91651-60855), 09330-00021
112. INSTALL DRIVE SHAFT BEARING BRACKET  
Torque: 64 N·m (650 kgf·cm, 47 in·lbf)
113. INSTALL AUTOMATIC TRANSAXLE ASSY (See page 40-9 )
114. INSTALL EXHAUST PIPE SUPPORT BRACKET NO.1 (See page 40-9 )
115. INSTALL ENGINE MOUNTING BRACKET FR (See page 40-9 )
116. INSTALL STARTER ASSY (See page 19-5 )



117. INSTALL FRONT DRIVE SHAFT ASSY LH (See page 30-8 )

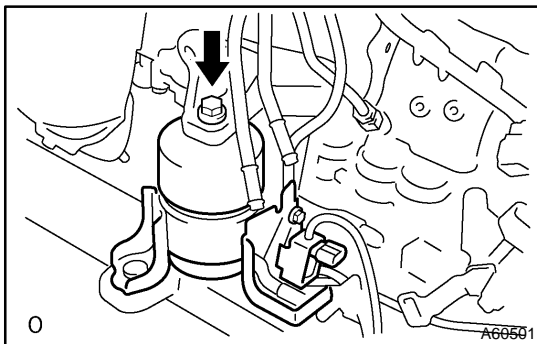
118. INSTALL FRONT DRIVE SHAFT ASSY RH (See page 30-8 )



### 119. INSTALL FRONT FRAME ASSY

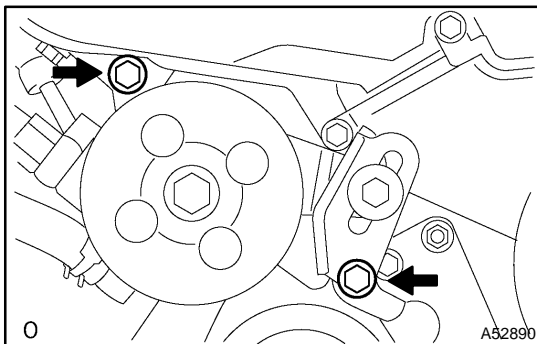
- (a) Install the engine mounting insulator RH and LH with the 2 nuts.

**Torque: 95 N·m (969 kgf·cm, 70 ft·lbf)**



- (b) Install the engine mounting insulator FR with the bolt.

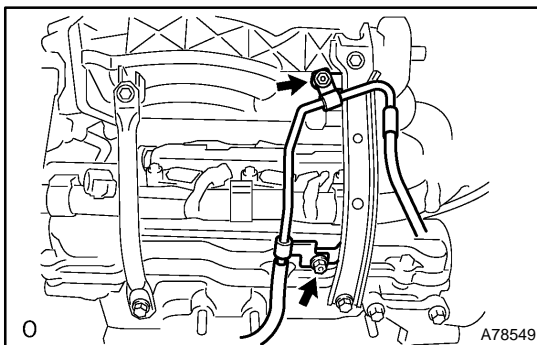
**Torque: 87 N·m (887 kgf·cm, 64 ft·lbf)**



### 120. INSTALL VANE PUMP ASSY

- (a) Temporarily tighten the bolt.  
(b) Install the adjusting strut to the engine mounting bracket RH with the bolt.

**Torque: 43 N·m (439 kgf·cm, 32 ft·lbf)**

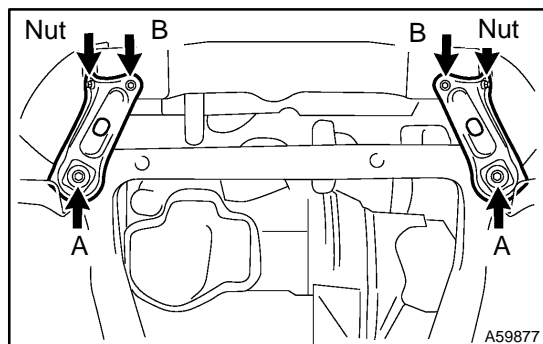


- (c) Connect the power steering pressure tube with the 2 nuts.

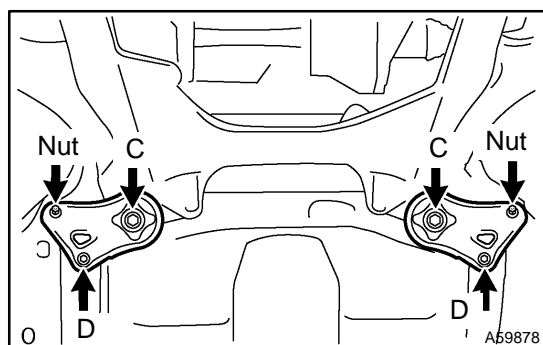
**Torque: 7.8 N·m (80 kgf·cm, 69 in·lbf)**

121. INSTALL VANE PUMP V BELT (See page 14-5 )



**122. INSTALL ENGINE ASSEMBLY WITH TRANSAXLE**

- (a) Set the engine assembly with the 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 4 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**

- (d) Install the front suspension member brace rear RH and LH with the 4 bolts and 2 nuts.

**Torque:****85 N·m (867 kgf·cm, 63 ft·lbf) for bolt C****32 N·m (326 kgf·cm, 24 ft·lbf) for bolt D and nut****123. CONNECT STEERING INTERMEDIATE SHAFT ASSY (See page 51-21 )****124. INSTALL FRONT AXLE ASSY LH (See page 30-8 )****125. INSTALL FRONT AXLE ASSY RH****HINT:**

Perform the same procedure as above on the opposite side.

**126. INSTALL FRONT SUSPENSION ARM SUB-ASSY LOWER NO.1 LH (See page 30-8 )****127. INSTALL FRONT SUSPENSION ARM SUB-ASSY LOWER NO.1 RH****HINT:**

Perform the same procedure as above on the opposite side.

**128. INSTALL TIE ROD ASSY LH (See page 30-8 )****129. INSTALL TIE ROD ASSY RH****HINT:**

Perform the same procedure as above on the opposite side.

**130. INSTALL SPEED SENSOR FRONT LH (See page 30-8 )****131. INSTALL SPEED SENSOR FRONT RH****HINT:**

Perform the same procedure as above on the opposite side.

**132. INSTALL FRONT AXLE HUB LH NUT (See page 30-8 )****133. INSTALL FRONT AXLE HUB RH NUT****HINT:**

Perform the same procedure as above on the opposite side.

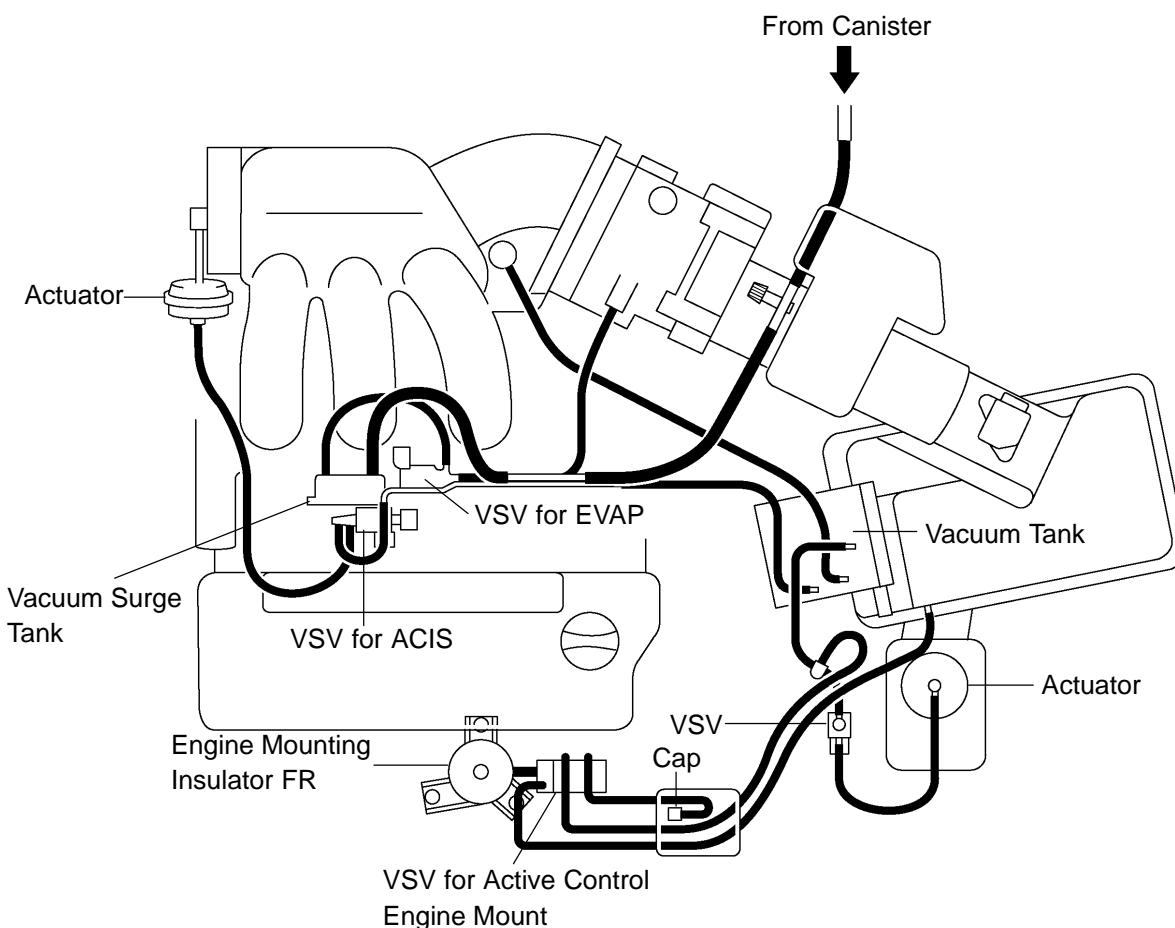
**134. INSTALL FRONT STABILIZER LINK ASSY LH (See page 30-8 )****135. INSTALL FRONT STABILIZER LINK ASSY RH****HINT:**

Perform the same procedure as above on the opposite side.

**136. INSTALL EXHAUST PIPE ASSY FRONT (See page 15-2 )****137. INSTALL EXHAUST PIPE NO.1 SUPPORT BRACKET REAR (See page 15-2 )****138. INSTALL EXHAUST PIPE NO.1 SUPPORT BRACKET FRONT (See page 15-2 )****139. CONNECT FUEL PIPE SUB-ASSY NO.1 (See page 11-1 )**

140. CONNECT TRANSMISSION CONTROL CABLE ASSY (See page 40-44 )
141. INSTALL COMPRESSOR AND MAGNETIC CLUTCH (See page 17-9 )
142. INSTALL GENERATOR BELT ADJUSTING BAR (See page 17-9 )
143. INSTALL GENERATOR BRACKET NO.2 (See page 14-79 )
144. INSTALL ENGINE MOUNTING STAY NO.2 RH (See page 14-79 )
145. INSTALL ENGINE MOVING CONTROL ROD (See page 14-79 )
146. INSTALL GENERATOR ASSY (See page 19-21 )
147. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-5 )
148. INSPECT DRIVE BELT DEFLECTION AND TENSION (See page 14-1 )
149. INSTALL INTAKE AIR RESONATOR SUB-ASSY  
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)
150. INSTALL AIR CLEANER INLET NO.1 (See page 19-5 )
151. INSTALL AIR CLEANER BRACKET (See page 19-5 )
152. INSTALL AIR CLEANER ASSY (See page 19-5 )
153. INSTALL AIR CLEANER INLET ASSY (See page 19-5 )
154. CHECK CONNECTION OF VACUUM HOSE

Vacuum Hose Routing Diagram:



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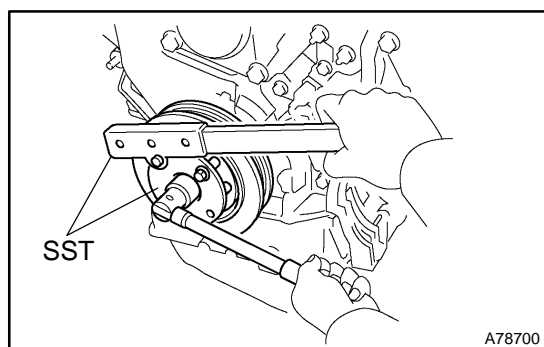
A86570

155. INSTALL V-BANK COVER SUB-ASSY (See page 10-1 1)
156. INSTALL FRONT WHEELS (See page 14-5 )

- 157. ADD AUTOMATIC TRANSAXLE FLUID
- 158. ADD ENGINE OIL (See page 17-20 )
- 159. ADD COOLANT (See page 16-9 )
- 160. ADD POWER STEERING FLUID
- 161. BLEED POWER STEERING FLUID
- 162. INSPECT AUTOMATIC TRANSAXLE FLUID (See page 40-1 )
- 163. CHECK FOR ENGINE OIL LEAKS
- 164. CHECK FOR ENGINE COOLANT LEAKS (See page 16-1 )
- 165. CHECK POWER STEERING FLUID LEAKAGE
- 166. INSPECT FOR FUEL LEAKS
- 167. CHECK FOR EXHAUST GAS LEAKS
- 168. INSPECT AND ADJUST FRONT WHEEL ALIGNMENT (See page 26-5 )
- 169. INSPECT STEERING WHEEL CENTER POINT
- 170. INSPECT IGNITION TIMING (See page 14-1 )
  - SST 09843-18040
- 171. INSPECT ENGINE IDLE SPEED (See page 14-1 )
- 172. INSPECT CO/HC (See page 14-1 )
- 173. CHECK ABS SPEED SENSOR SIGNAL (See page 05-420 , 05-471 )
- 174. SYSTEM INITIALIZATION (See page 19-15 )

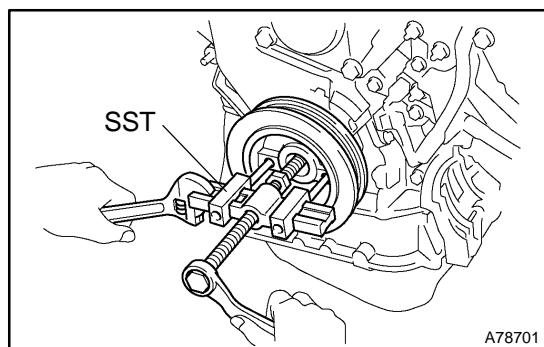
## OVERHAUL

1. REMOVE SPARK PLUG
2. REMOVE OIL FILLER CAP SUB-ASSY
3. REMOVE OIL FILLER CAP GASKET
4. REMOVE CYLINDER HEAD COVER SUB-ASSY LH
5. REMOVE CYLINDER HEAD COVER GASKET NO.2
6. REMOVE CYLINDER HEAD COVER SUB-ASSY
7. REMOVE CYLINDER HEAD COVER GASKET
8. REMOVE VENTILATION VALVE SUB-ASSY
9. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSY
10. REMOVE VVT SENSOR
  - (a) Remove both the camshaft oil control valves.
  - (b) Remove the O-ring from each camshaft oil control valve.
11. REMOVE OIL LEVEL GAGE SUB-ASSY
12. REMOVE OIL LEVEL GAGE GUIDE



### 13. REMOVE CRANKSHAFT PULLEY

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

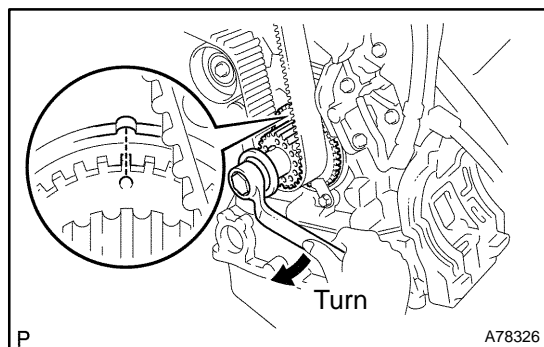


- (b) Using SST and the pulley bolt, remove the pulley.  
SST 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)

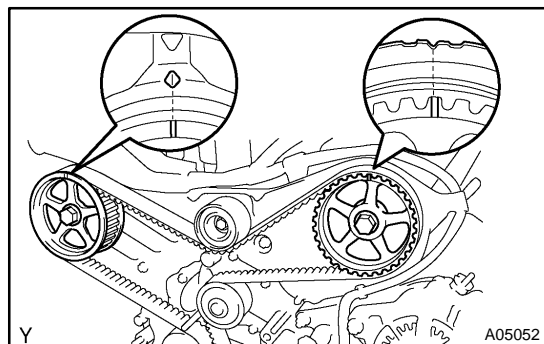
#### NOTICE:

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

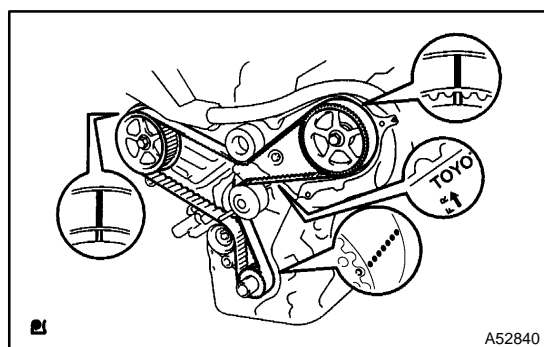
14. REMOVE TIMING BELT NO.1 COVER
15. REMOVE TIMING BELT NO.2 COVER
16. REMOVE ENGINE MOUNTING BRACKET RH
17. REMOVE TIMING BELT GUIDE NO.2

**18. REMOVE TIMING BELT**

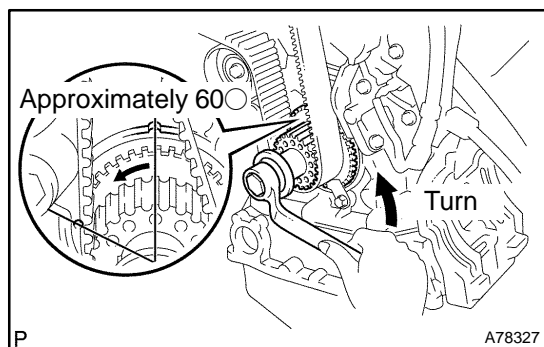
- (a) Set the No. 1 cylinder to the TDC/compression.
- (1) Temporarily install the crankshaft pulley bolt and washer to the crankshaft.
  - (2) Turn the crankshaft clockwise, then align the timing mark of the crankshaft timing pulley with the oil pump body.



- (3) Check that the timing marks of the camshaft timing pulleys and the timing belt No. 3 cover are aligned. If not, turn the crankshaft by 1 revolution (360°).
- (4) Remove the crankshaft pulley bolt.



- (b) If reusing the timing belt, check that there are 3 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°

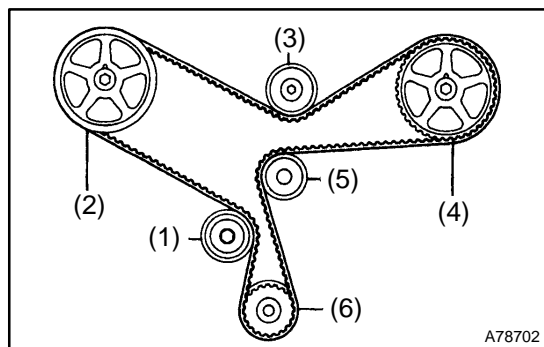
**NOTICE:**

If the timing belt is disengaged, having the crankshaft pulley set at the wrong angle can cause contact of the piston head with the valve head when removing the camshaft timing pulley and camshaft, which causes damage. So always set the crankshaft pulley at the correct angle.

- (d) Remove the timing belt tensioner.

**NOTICE:**

Do not reinstall the tensioner with its plunger extended.



(e) Remove the timing belt in this order.

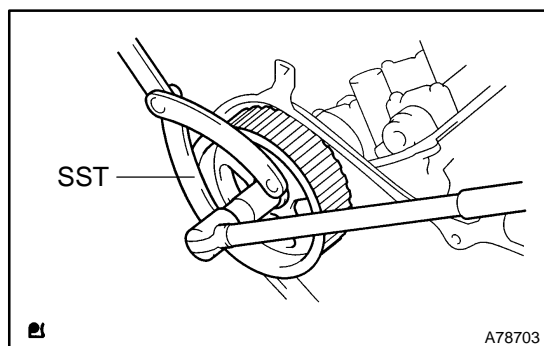
1st	No. 1 idler pulley
2nd	RH camshaft timing pulley
3rd	No. 2 idler pulley
4th	LH camshaft timing pulley
5th	Water pump pulley
6th	Crankshaft timing pulley

## 19. 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.

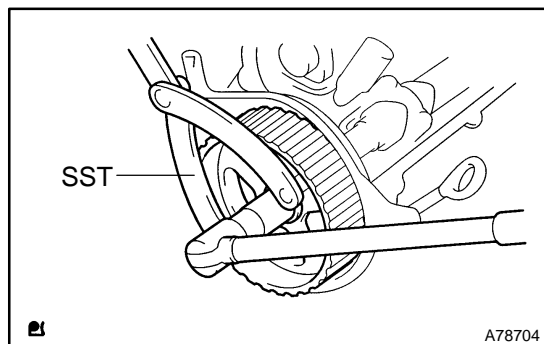
## 20. REMOVE TIMING BELT IDLER SUB-ASSY NO.2

## 21. REMOVE CRANKSHAFT POSITION SENSOR



## 22. REMOVE CAMSHAFT TIMING PULLEY

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



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

### HINT:

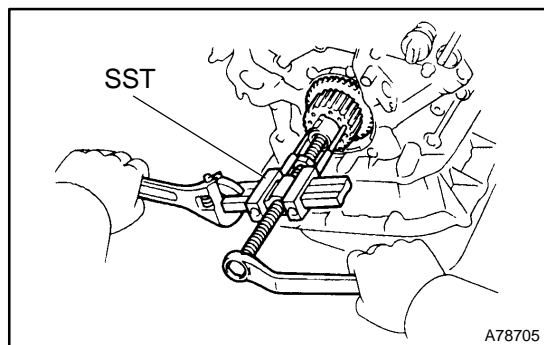
Arrange the camshaft timing pulleys (RH and LH sides) so that they can be returned to the original locations when reassembling.

## 23. REMOVE TIMING BELT NO.3 COVER

## 24. REMOVE TIMING BELT IDLER BRACKET

## 25. REMOVE CRANKSHAFT TIMING PULLEY

(a) Remove the bolt and timing belt plate.

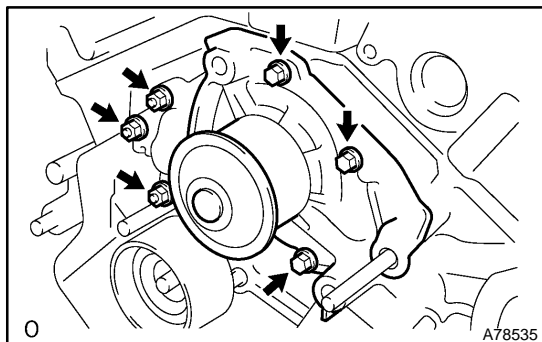


(b) Install the pulley bolt to the crankshaft.

(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.



## 26. REMOVE WATER PUMP ASSY

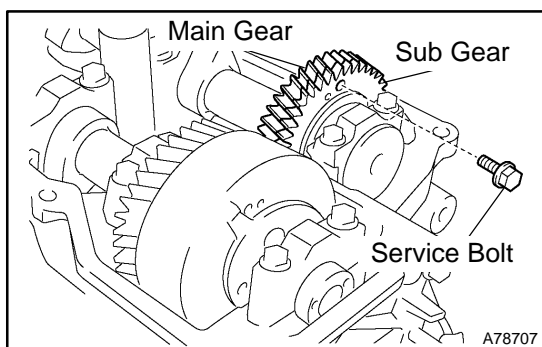
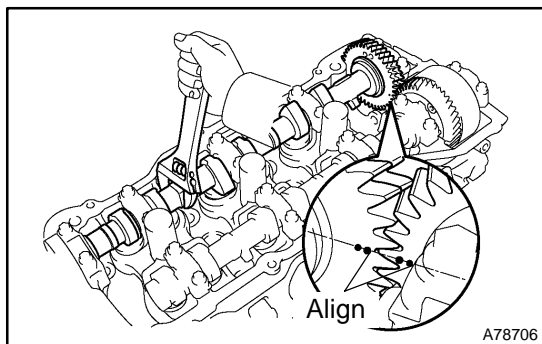
- (a) Remove the 3 bolts and 3 nuts, then remove the water pump and gasket.

## 27. REMOVE CAMSHAFT

### NOTICE:

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

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



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

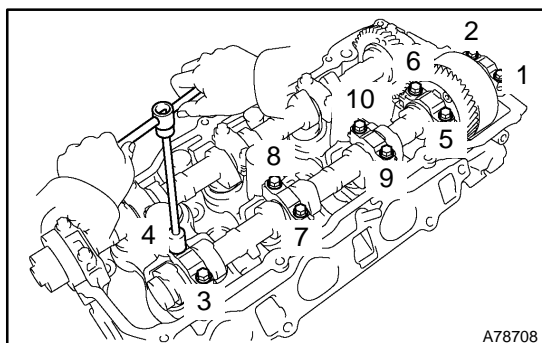
**Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)**

### Recommended service bolt

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

### HINT:

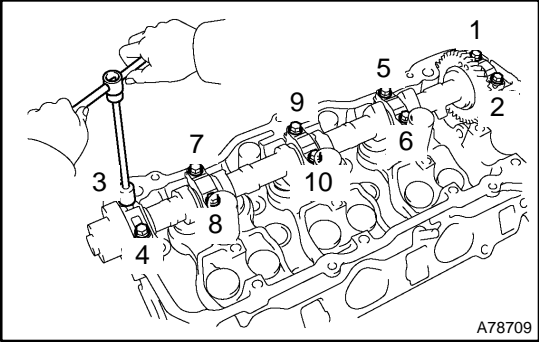
When removing the camshaft, make certain that the torsional spring force of the sub gear has been eliminated by installation of the service bolt.



- (c) Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and camshaft.

### NOTICE:

- Do not pry out the camshaft.
- Be careful not to damage the contact surface of the cylinder head that receives the shaft thrust.



**28. REMOVE NO.2 CAMSHAFT**

- (a) Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and No. 2 camshaft.

**NOTICE:**

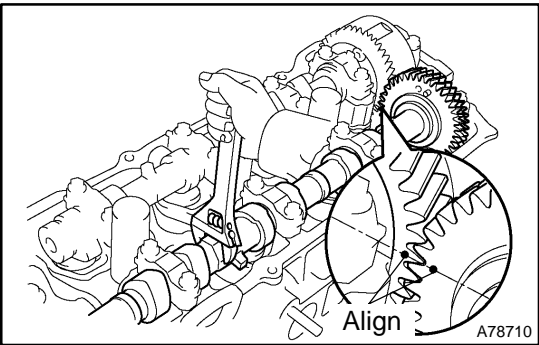
- Do not pry out the camshaft.
- Be careful not to damage the contact surface of the cylinder head that receives the shaft thrust.

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

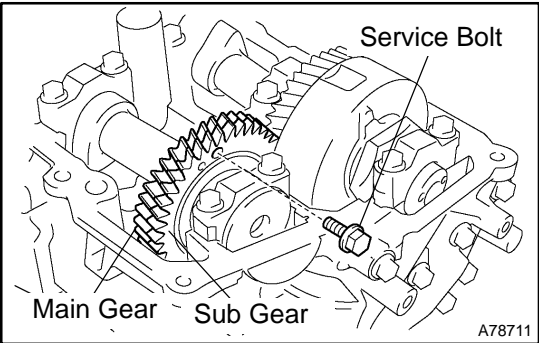
**29. REMOVE NO.3 CAMSHAFT SUB-ASSY**

**NOTICE:**

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



- (a) Align the timing marks (1 dot marks) of the camshaft drive and driven gears by turning the camshaft with a wrench.



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

**Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**

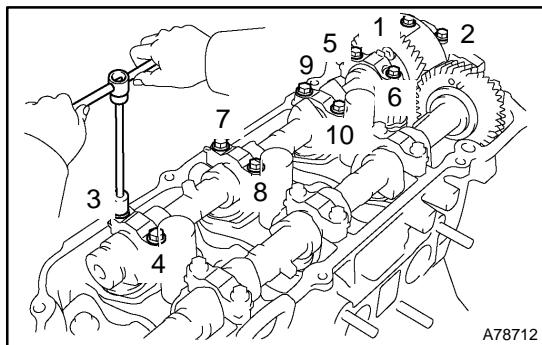
**Recommended service bolt**

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

**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.

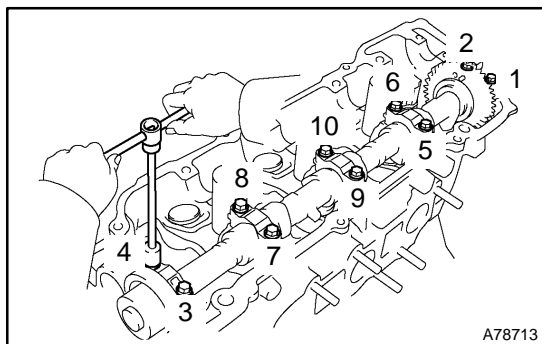




- (c) Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and No. 3 camshaft.

**NOTICE:**

- **Do not pry out the camshaft.**
- **Be careful not to damage the contact surface of the cylinder head that receives the shaft thrust.**

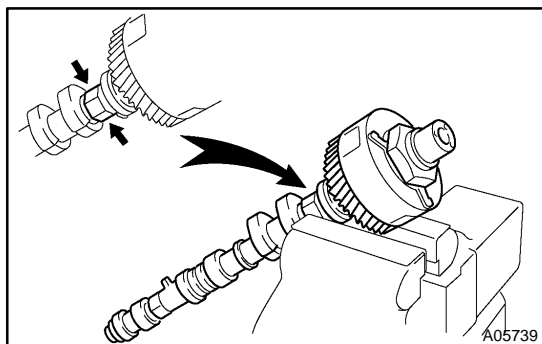
**30. REMOVE NO.4 CAMSHAFT SUB-ASSY**

- (a) Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and No. 4 camshaft.

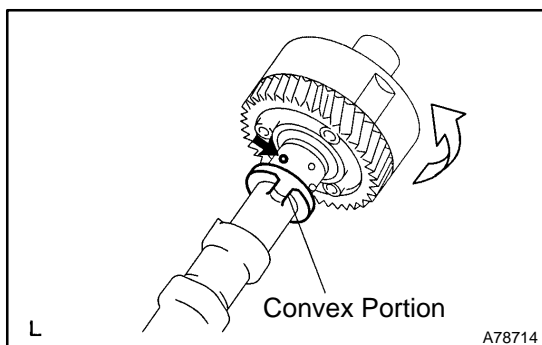
**NOTICE:**

- **Do not pry out the camshaft.**
- **Be careful not to damage the contact surface of the cylinder head that receives the shaft thrust.**

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

**31. INSPECT CAMSHAFT TIMING GEAR ASSY**

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



- (c) Cover all the oil ports with vinyl tape except the port on the advance angle side (nearest to the convex portion) shown in the illustration.  
(d) Using the air gun, apply about 100 kPa (1 kgf/cm<sup>2</sup>, 14 psi) of air pressure to the port on the advance angle side.

**NOTICE:**

**Some oil spraying will occur. Be prepared to catch the spray with a shop rag.**

**HINT:**

This operation releases the lock pin for the most retard angle lock.

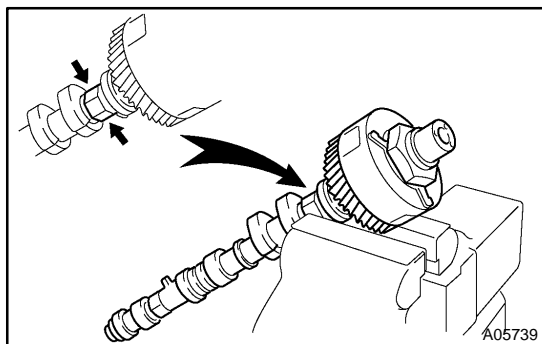
- (e) Under the condition above, turn the VVT-i to the advance angle side (the direction of the white arrow in the illustration) by hand.

**Standard: Must turn**

**HINT:**

Depending on the air pressure, the VVT-i will turn to the advance angle side without applying force by hand. Also, if the pressure can be hardly applied because of the air leakage from the port, the lock pin might not be released easily.

- (f) Check that the VVT-i moves freely within about 30° range. Avoid moving the VVT-i unit to the most retard angle position as the lock pin will engage again.  
**Standard: Smooth movable range is about 30°**
- (g) Turn the VVT-i by hand, then lock it at the most retard angle position.



### 32. REMOVE CAMSHAFT TIMING GEAR ASSY

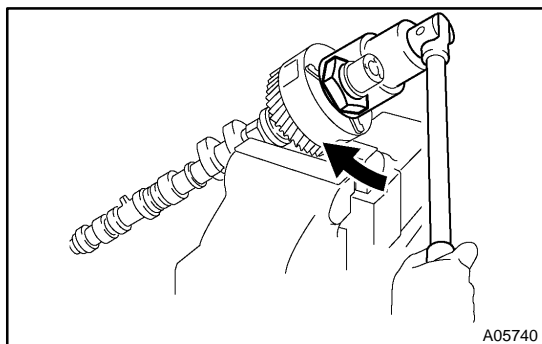
#### NOTICE:

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

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

#### NOTICE:

**Be careful not to damage the camshaft.**



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

#### NOTICE:

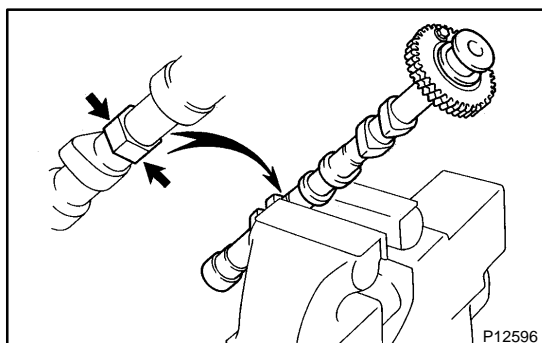
- **Remove it with the lock pin engaged and locked at the most retard angle position.**
- **The lock nut has LH threads.**
- **Never use any tools other than the socket wrench. Other tools will deform the cam angle rotor.**

- (c) Remove the camshaft VVT-i.

#### NOTICE:

**Never remove the 3 bolts on the gear.**

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

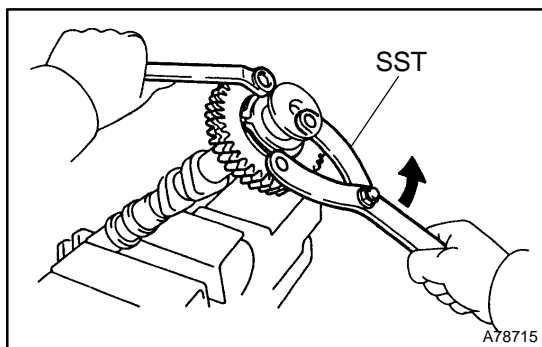


### 33. REMOVE CAMSHAFT SUB GEAR

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

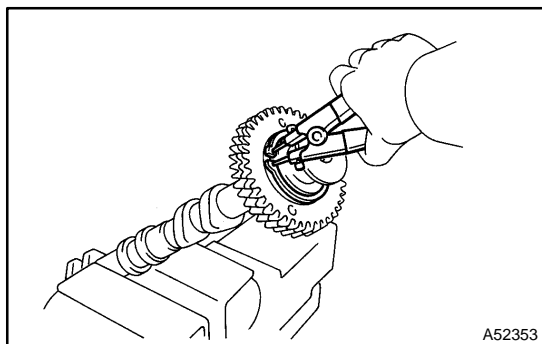
#### NOTICE:

**Be careful not to damage the camshaft.**



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

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



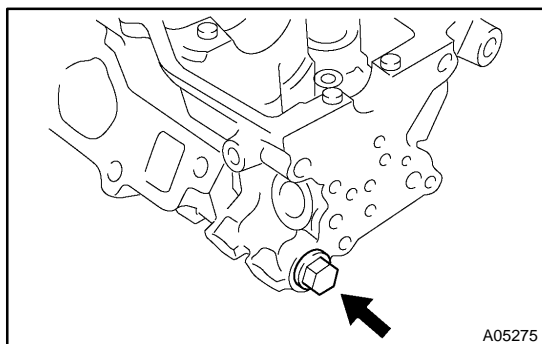
- (c) Using snap ring pliers, remove the snap ring.  
 (d) Remove the wave washer, camshaft sub gear and camshaft gear bolt washer.

**HINT:**

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

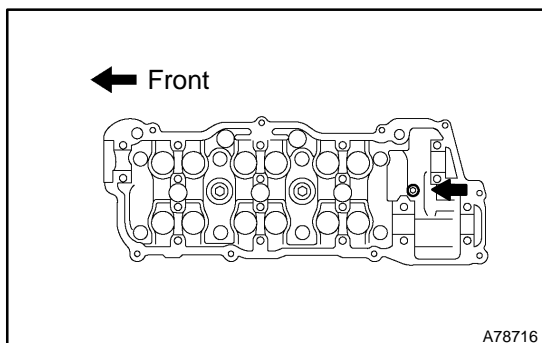
**34. REMOVE ENGINE HANGER NO.2**

**35. REMOVE CYLINDER HEAD COVER REAR**



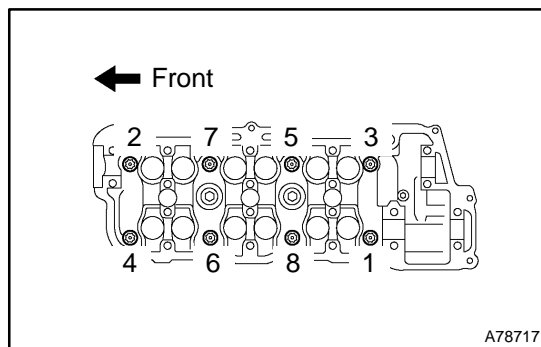
**36. REMOVE OIL CONTROL VALVE FILTER**

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



**37. REMOVE CYLINDER HEAD SUB-ASSY**

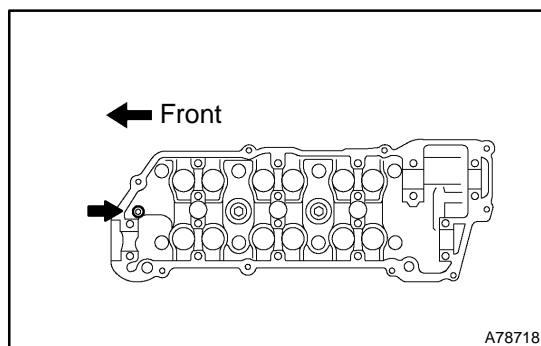
- (a) Using a socket hexagon wrench 8, remove the hexagon bolt.



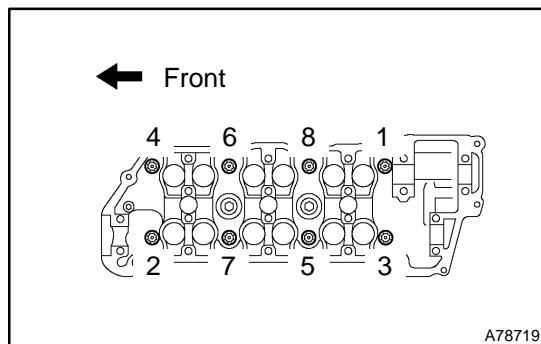
- (b) Using several steps, loosen the 8 cylinder head bolts uniformly in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.

**NOTICE:**

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

**38. REMOVE CYLINDER HEAD GASKET****39. REMOVE CYLINDER HEAD LH**

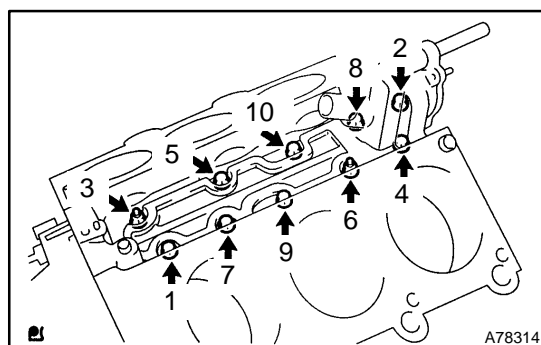
- (a) Using a socket hexagon wrench 8, remove the hexagon bolt.



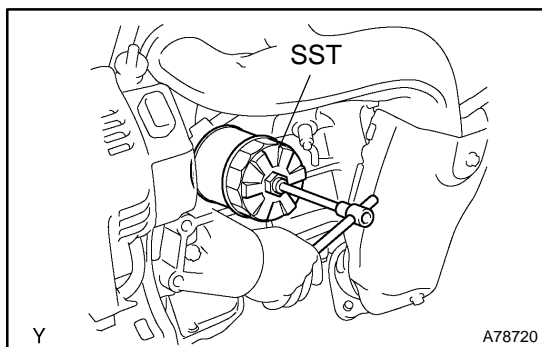
- (b) Using several steps, loosen the 8 cylinder head bolts uniformly in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.

**NOTICE:**

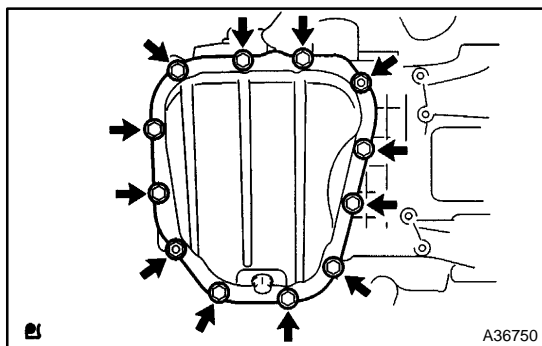
- Be careful not to drop the washers into the cylinder head.
- Head warpage or cracking could result from removing the bolts in an incorrect order.

**40. REMOVE CYLINDER HEAD GASKET NO.2****41. REMOVE WATER INLET HOUSING**

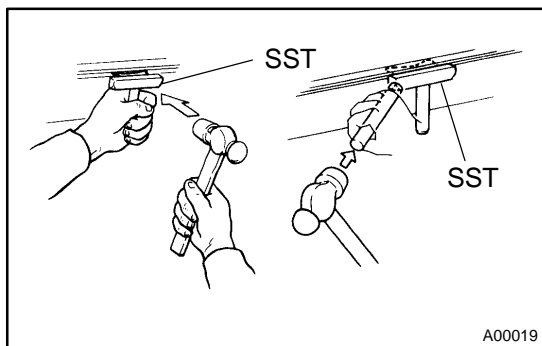
- (a) Remove the 8 bolts and 2 nuts, then remove the water inlet housing.

**42. 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.

**43. REMOVE OIL PAN DRAIN PLUG****44. 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, then cut off the sealer and remove the oil pan No. 2.

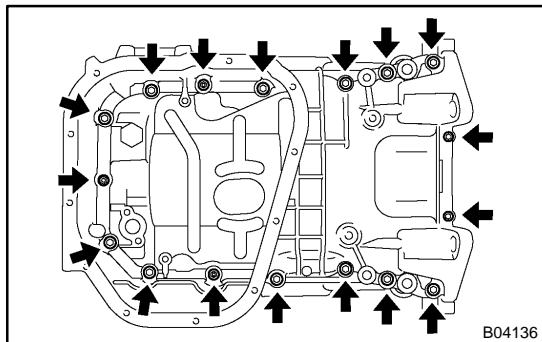
SST 09032-00100

**NOTICE:**

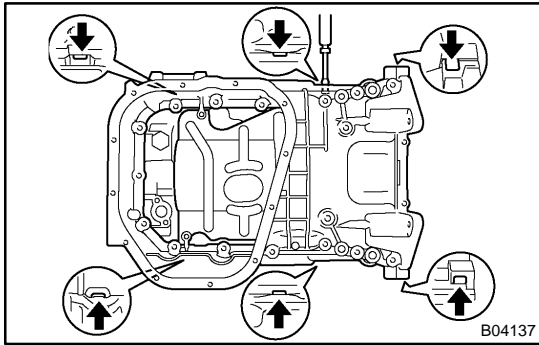
- Be careful not to damage the contact surface of the oil pan No. 1 where the oil pan No. 2 is mounted.
- Do not damage the flange portion of the oil pan No. 2 when removing.

**45. REMOVE OIL STRAINER SUB-ASSY**

- (a) Remove the bolt and 2 nuts, then remove the oil strainer and gasket.

**46. REMOVE OIL PAN SUB-ASSY**

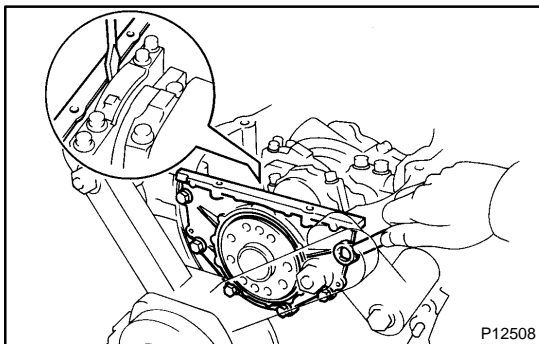
- (a) Loosen and remove the 15 bolts and 2 nuts uniformly.



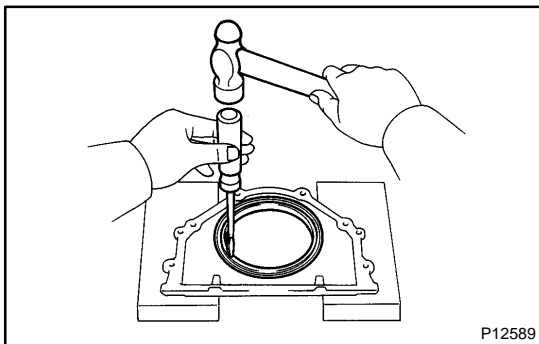
- (b) Using a screwdriver, remove the oil pan by prying between the cylinder block and oil pan.

**NOTICE:**

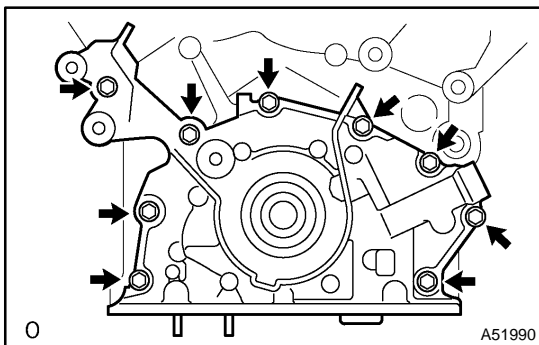
Be careful not to damage the contact surfaces of the oil pan and cylinder block.

**47. REMOVE OIL PAN BAFFLE PLATE****48. REMOVE ENGINE REAR OIL SEAL RETAINER**

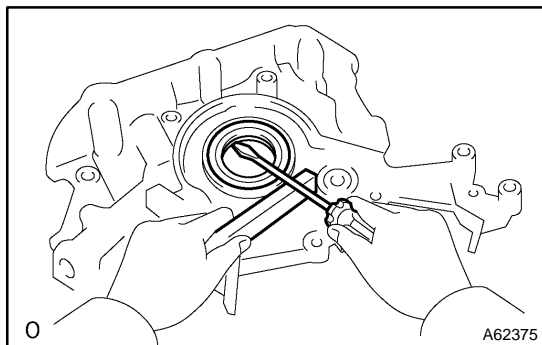
- (a) Remove the 6 bolts.  
 (b) Using a screwdriver, remove the oil seal retainer by prying between the oil seal retainer and bearing cap.

**49. REMOVE ENGINE REAR OIL SEAL**

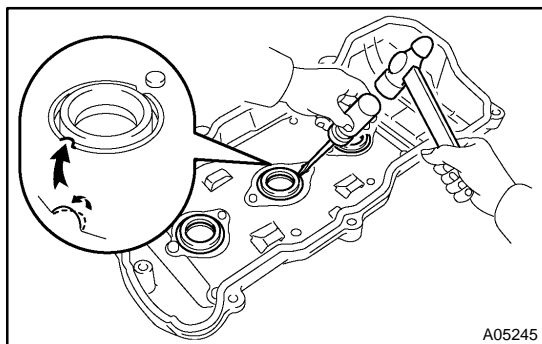
- (a) Using a screwdriver and hammer, tap out the oil seal.

**50. REMOVE OIL PUMP ASSY**

- (a) Remove the 9 bolts.  
 (b) Using a screwdriver, remove the oil pump by prying between the oil pump and bearing cap.  
 (c) Remove the O-ring.

**51. REMOVE OIL PUMP SEAL**

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

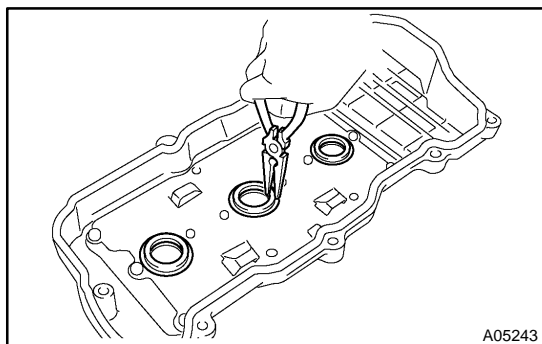
**52. REMOVE SPARK PLUG TUBE GASKET**

- (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.**

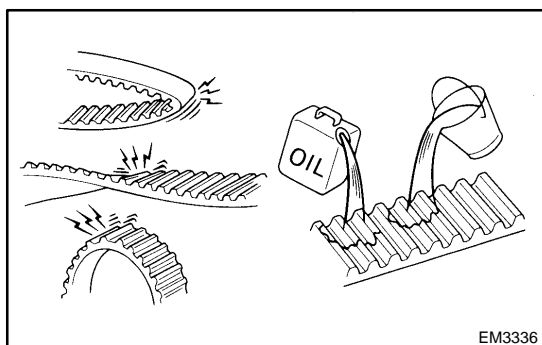
- (b) Using a screwdriver and hammer, tap out the gasket.



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

**NOTICE:**

**Be careful not to damage the cylinder head cover.**

**53. INSPECT TIMING BELT****NOTICE:**

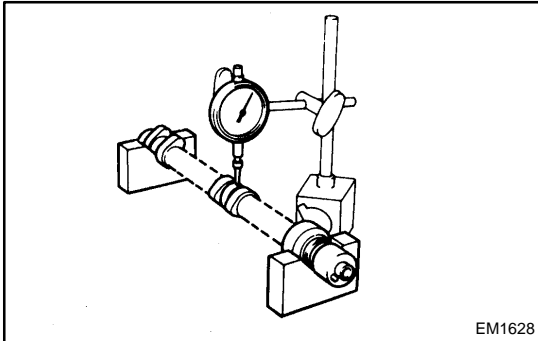
- Do not bend, twist or turn the timing belt inside out.
- Do not allow contact of the timing belt with oil, water or steam.
- Do not use the timing belt tension when installing or removing the mounting bolt of the camshaft timing pulley.

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

- (a) If the belt tears in a short time:
- Check if the belt is installed properly.
  - Check if the timing cover gasket is damaged and if it is installed properly.
- (b) If the belt teeth are cracked or damaged, check if either camshaft is locked.
- (c) If there is noticeable wear or cracks on the belt face, check 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 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.



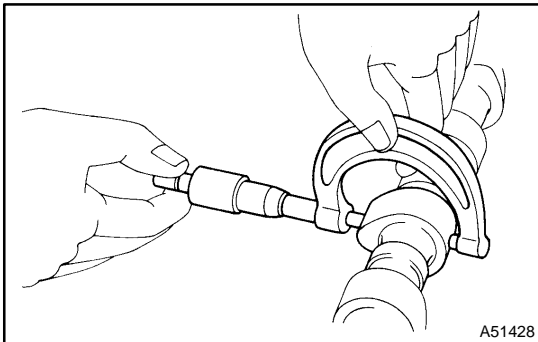
EM1628

#### 54. 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 maximum, replace the camshaft.



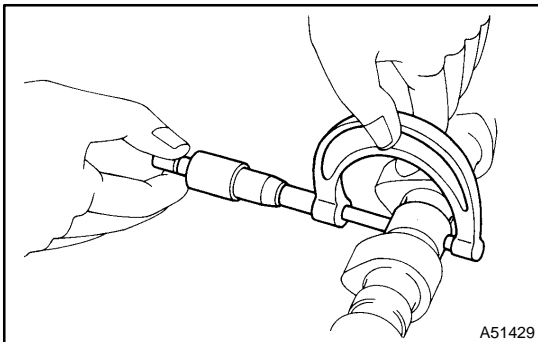
A51428

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

**Standard cam lobe height:**  
**43.132 to 43.232 mm (1.6981 to 1.7020 in.) for intake**  
**43.010 to 43.110 mm (1.6933 to 1.6972 in.) for exhaust**

**Minimum cam lobe height:**  
**42.98 mm (1.6921 in.) for intake**  
**42.86 mm (1.6874 in.) for exhaust**

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

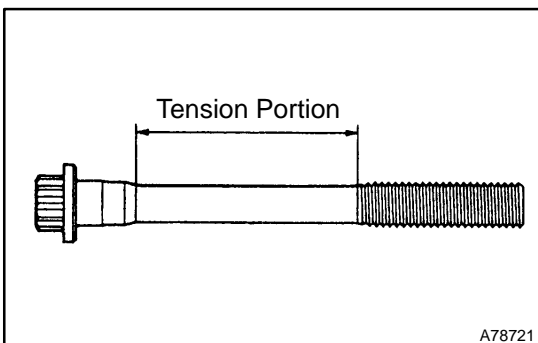


A51429

- (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.



A78721

#### 55. INSPECT CYLINDER HEAD SET BOLT

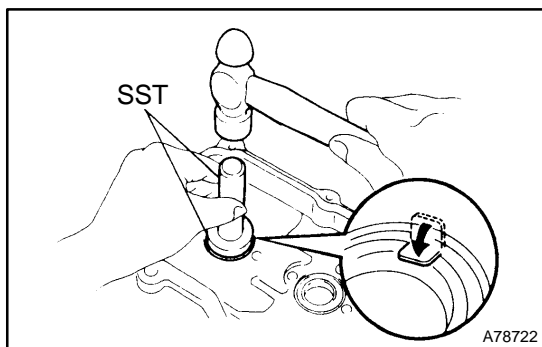
- (a) Using vernier calipers, measure the tension portion diameter of the bolt.
 

**Standard outside diameter:**  
**8.95 to 9.05 mm (0.3524 to 0.3563 in.)**

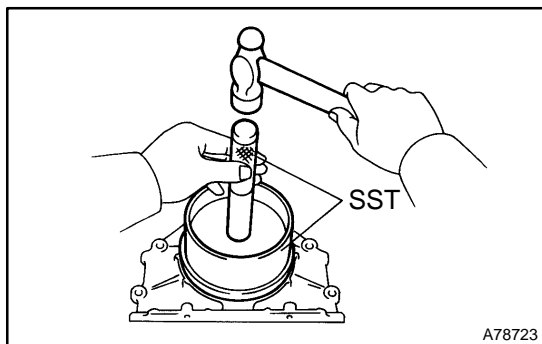
**Minimum outside diameter: 8.75 mm (0.3445 in.)**

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



**56. INSTALL SPARK PLUG TUBE GASKET**

- (a) Using SST and a hammer, tap in the 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 multi-purpose grease to the gasket lip.

**57. INSTALL ENGINE REAR OIL SEAL**

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

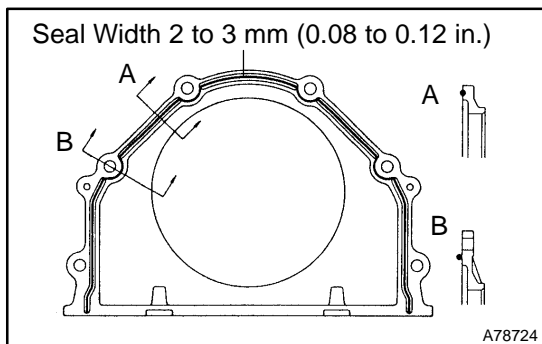
**NOTICE:**

- Be careful not to tap the oil seal at an angle.
- Keep the lip free of foreign objects.

- (b) Apply multi-purpose grease to the oil seal lip.

**58. INSTALL ENGINE REAR OIL SEAL RETAINER**

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



- (b) Apply a continuous bead of seal packing (Diameter 2 to 3 mm (0.08 to 0.12 in.)) as shown in the illustration.

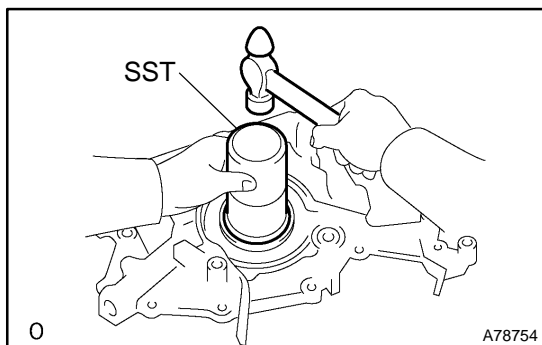
**Seal packing: Part No. 08826-00080 or equivalent**

**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 packing to engine oil within 2 hours after installing.

- (c) Install the oil seal retainer with the 6 bolts. Tighten the bolts uniformly in several steps.

**Torque: 8.0 N·m (82 kgf·cm, 71 in·lbf)**

**59. INSTALL OIL PUMP SEAL**

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

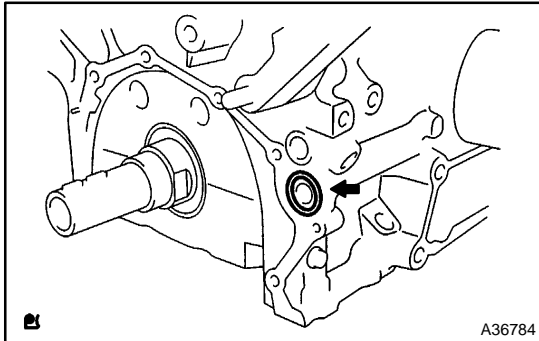
**NOTICE:**

- Be careful not to tap the oil seal at an angle.
- Keep the lip free of foreign objects.

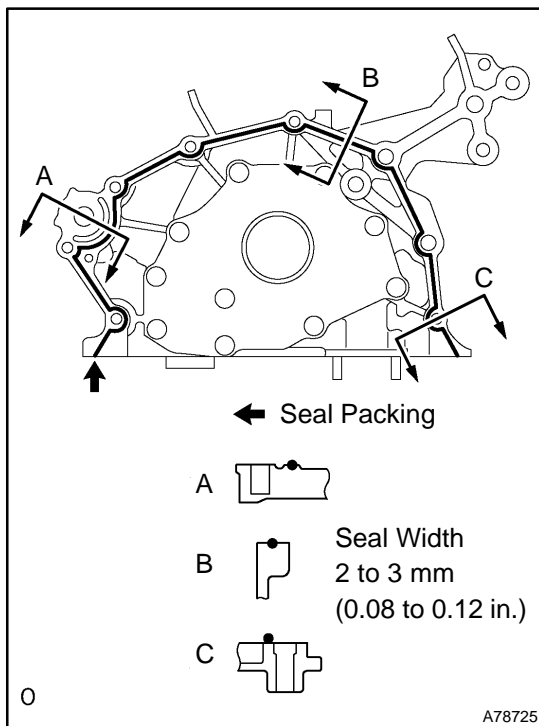
- (b) Apply multi-purpose grease to the oil seal lip.

**60. 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, then place it on the cylinder block.



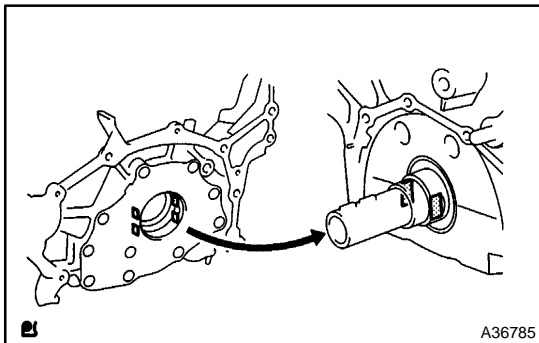
- (c) Apply a continuous bead of seal packing (Diameter 2 to 3 mm (0.08 to 0.12 in.)) as shown in the illustration.

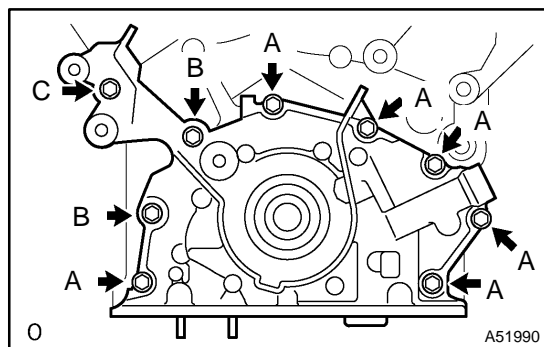
**Seal packing: Part No. 08826-00080 or equivalent**

**NOTICE:**

- Remove any oil from 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 packing to engine oil within 2 hours after installing.

- (d) Align the key of the oil pump drive gear with the keyway located on the crankshaft, then 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 (199 kgf·cm, 14 ft·lbf) for bolt B**

**43 N·m (439 kgf·cm, 32 ft·lbf) for bolt C**

**61. INSTALL CRANKSHAFT POSITION SENSOR**

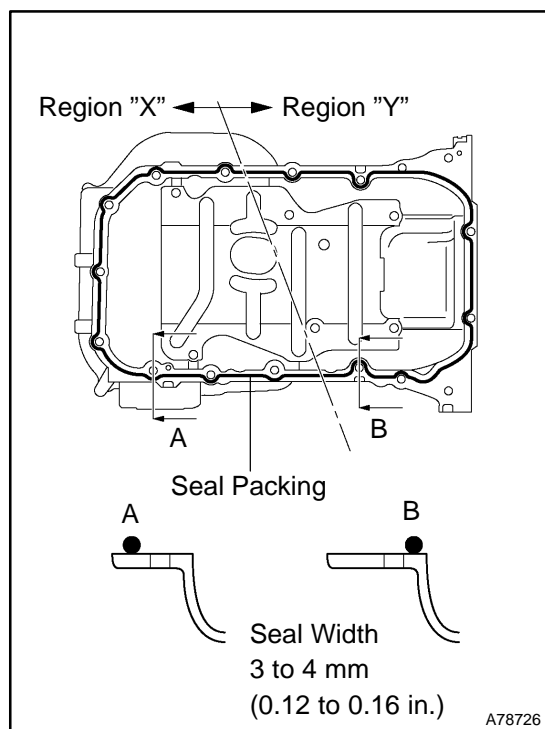
**Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)**

**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 (Diameter 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 the region "X".
  - Apply seal packing to the inner side of the bolt holes in the region "Y".
  - Install the oil pan within 3 minutes after applying seal packing.
  - Do not expose the seal packing to engine oil within 2 hours after installing.
- (c) Install the oil pan 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 (199 kgf·cm, 14 ft·lbf) for 12 mm head**

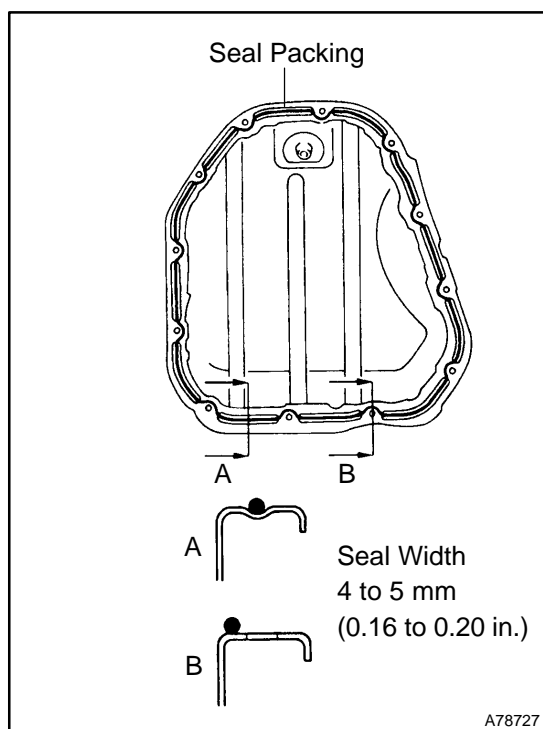
**64. INSTALL OIL STRAINER SUB-ASSY**

- (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 (Diameter 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 packing to engine oil within 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)**

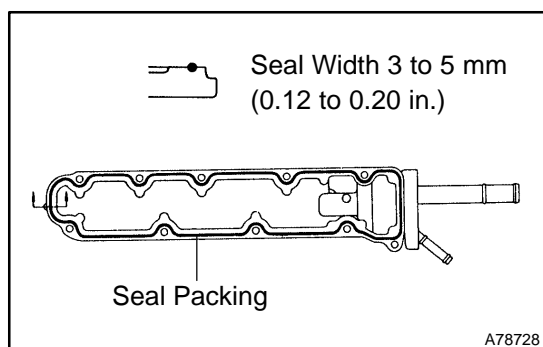
## 66. INSTALL OIL PAN DRAIN PLUG

- (a) Install the drain plug with a new gasket.

**Torque: 45 N·m (459 kgf·cm, 33 ft·lbf)**

## 67. INSTALL WATER INLET HOUSING

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

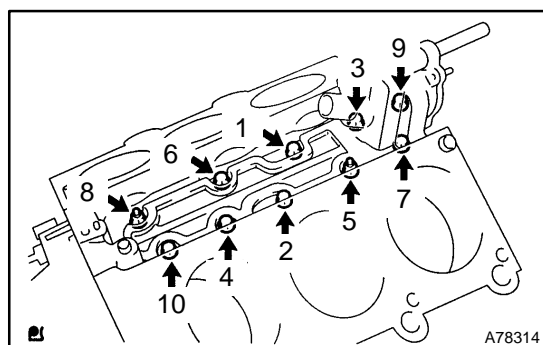


- (b) Apply a continuous bead of seal packing (Diameter 3 to 5 mm (0.12 to 0.20 in.)) as shown in the illustration.

**Seal packing: Part No. 08826-00100 or equivalent**

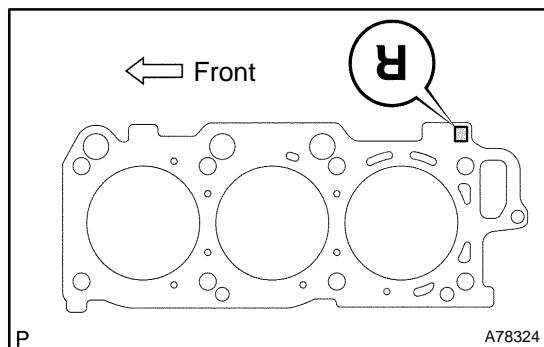
**NOTICE:**

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



- (c) Install the water inlet housing with the 8 bolts and 2 nuts. Using several steps, tighten the bolts and nuts uniformly in the sequence shown in the illustration.

**Torque: 8.0 N·m (82 kgf·cm, 71 in·lbf)**

**68. INSTALL CYLINDER HEAD GASKET**

- (a) Place a new cylinder head gasket on the cylinder block with the R mark upward.

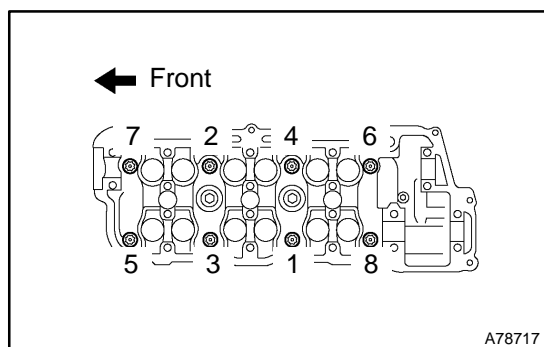
**NOTICE:**

- Remove any oil from the contact surface.
- Be careful of the installing orientation.
- Place the cylinder head on the gasket carefully in order not to damage the gasket at the bottom part of the head.

**69. INSTALL CYLINDER HEAD SUB-ASSY****NOTICE:**

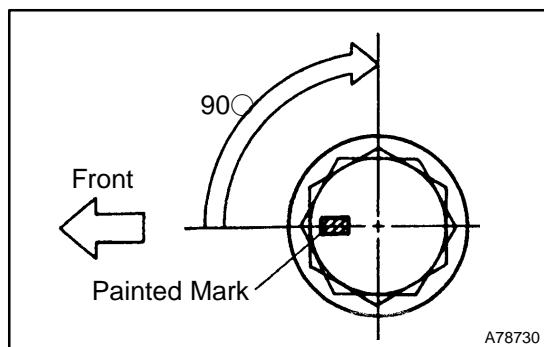
The cylinder head bolts are tightened in 2 successive steps.

- (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.

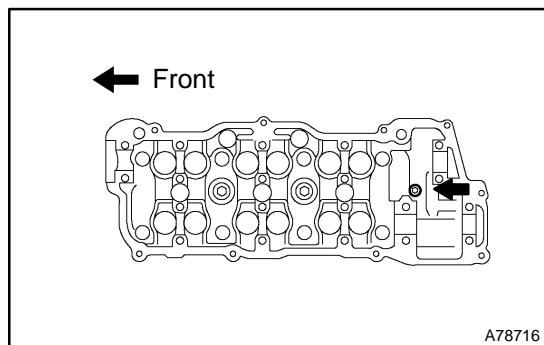


- (c) Using several steps, install and tighten the 8 cylinder head bolts uniformly in the sequence shown in the illustration.

**Torque: 54 N·m (550 kgf·cm, 40 ft·lbf)**

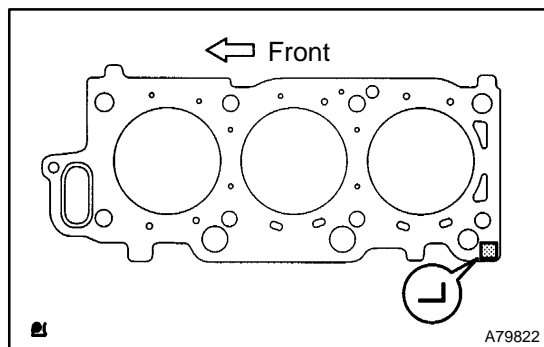


- (d) Mark the front side of each cylinder head bolt head with paint as shown in the illustration.
- (e) Retighten the cylinder head bolts by 90° in the same sequence as step (c).
- (f) Check that each painted mark is now at a 90° angle to the front.



- (g) Using a socket hexagon wrench 8, install the hexagon bolt.

**Torque: 19 N·m (189 kgf·cm, 14 ft·lbf)**

**70. INSTALL CYLINDER HEAD GASKET NO.2**

- (a) Place a new cylinder head gasket on the cylinder block with the L mark upward.

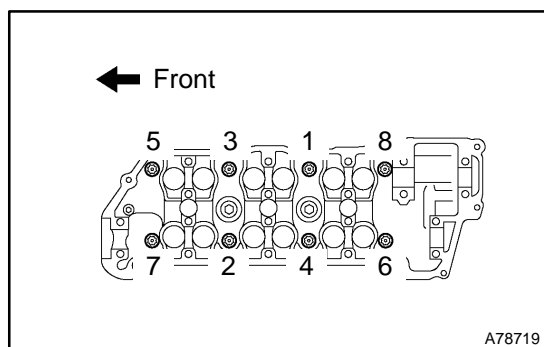
**NOTICE:**

- Remove any oil from the contact surface.
- Be careful of the installing orientation.
- Place the cylinder head on the gasket carefully in order not to damage the gasket at the bottom part of the head.

**71. INSTALL CYLINDER HEAD LH****NOTICE:**

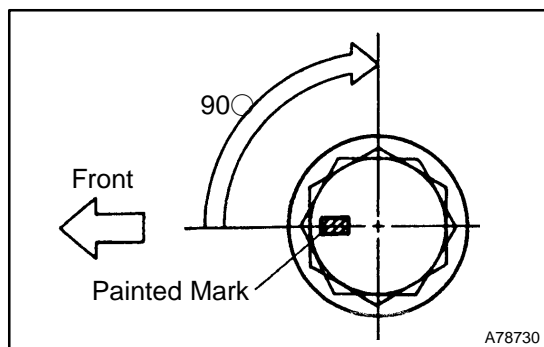
The cylinder head bolts are tightened in 2 successive steps.

- (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.

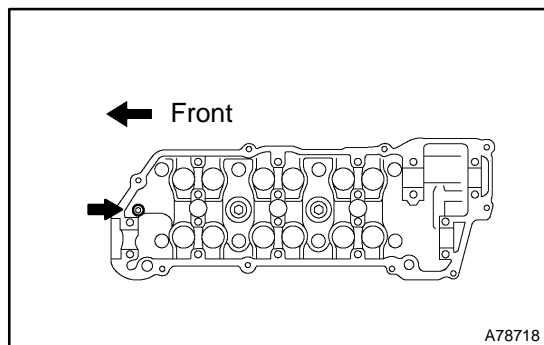


- (c) Using several steps, install and tighten the 8 cylinder head bolts uniformly in the sequence shown in the illustration.

**Torque: 54 N·m (550 kgf·cm, 40 ft·lbf)**

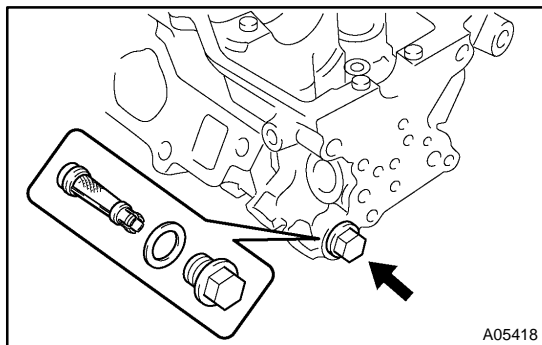


- (d) Mark the front side of each cylinder head bolt head with paint as shown in the illustration.
- (e) Retighten the cylinder head bolts by 90° in the same sequence as step (c).
- (f) Check that each painted mark is now at a 90° angle to the front.



- (g) Using a socket hexagon wrench 8, install the hexagon bolt.

**Torque: 19 N·m (189 kgf·cm, 14 ft·lbf)**

**72. INSTALL OIL CONTROL VALVE FILTER**

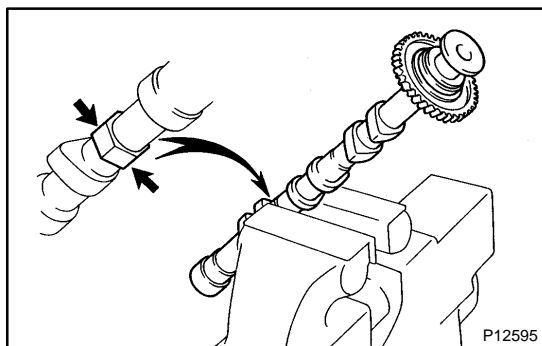
- (a) Check that no foreign object is on the mesh part of the filter.
- (b) Assemble the valve filter and plug.
- (c) Install the plug with a new gasket.

**Torque: 45 N·m (459 kgf·cm, 33 ft·lbf)**

**73. INSTALL CYLINDER HEAD COVER REAR**

- (a) Install the rear cover and a new gasket.

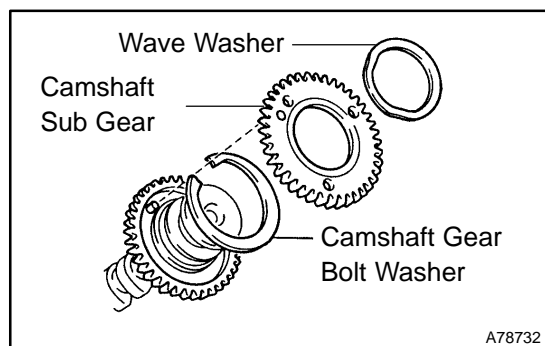
**Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)**

**74. INSTALL CAMSHAFT SUB GEAR**

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

**NOTICE:**

**Be careful not to damage the camshaft.**

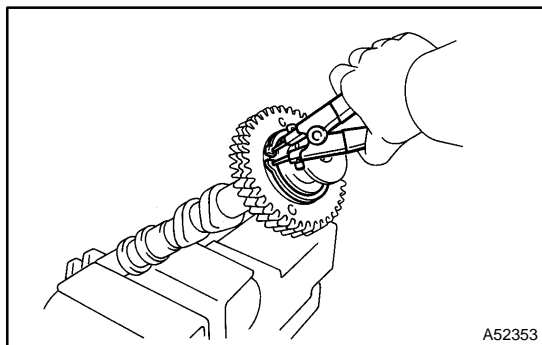


- (b) Install the camshaft gear bolt washer and camshaft sub gear.

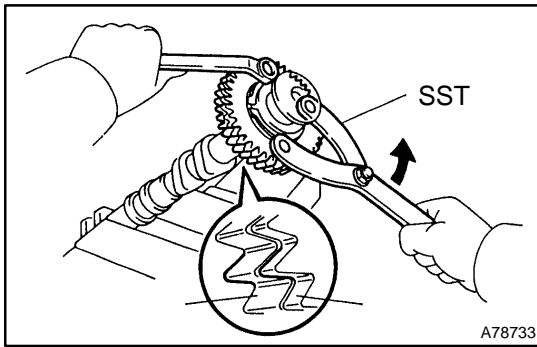
**HINT:**

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, then temporarily install a service bolt.

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

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

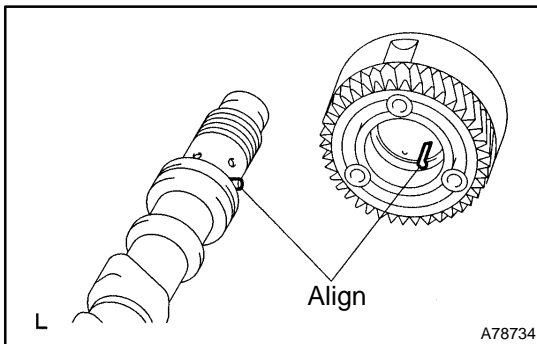
**Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)**

**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.



**75. INSTALL CAMSHAFT TIMING GEAR ASSY**

- (a) Align the alignment pin with the alignment pin groove, then install the VVT-i into the camshaft.

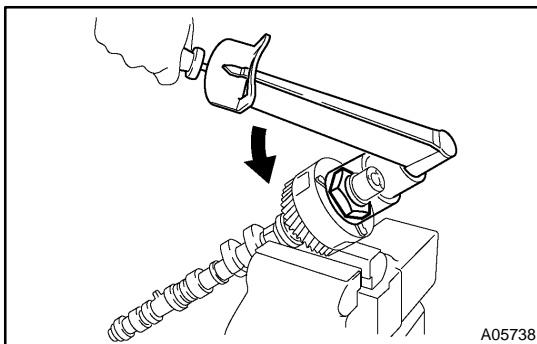
**NOTICE:**

**Install it with the lock pin engaged and locked at the most retard angle position.**

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

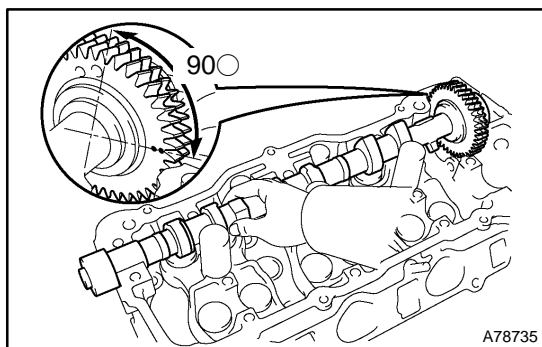
**76. INSTALL NO.2 CAMSHAFT**

**NOTICE:**

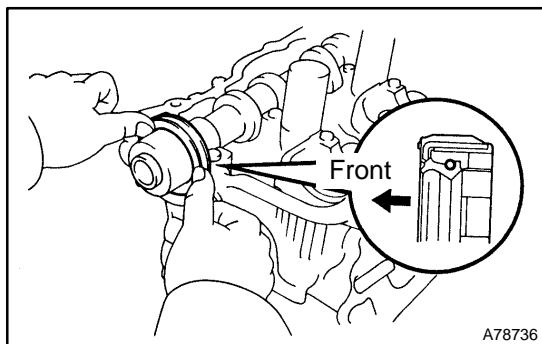
**Since the thrust clearance of the camshaft is small, the camshaft must be kept level while being installed. If the camshaft is not kept level, the cylinder head or camshaft may be damaged. To avoid this, the following steps must be carried out.**

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





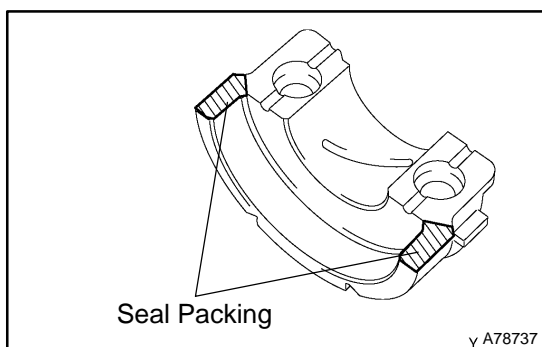
- (b) Place the No. 2 camshaft at a 90° angle of the timing mark (2 dot marks) on the cylinder head.
- (c) Apply multi-purpose grease to a new oil seal lip.



- (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.

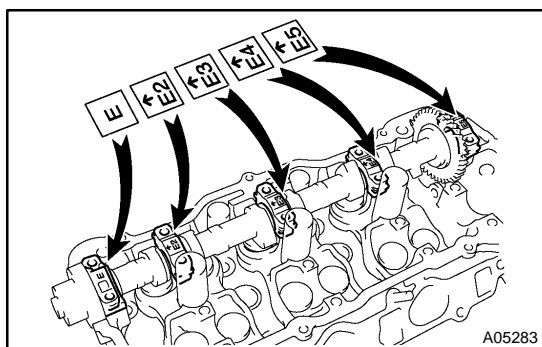


- (f) Apply seal packing to the bearing cap No. 1 as shown in the illustration.

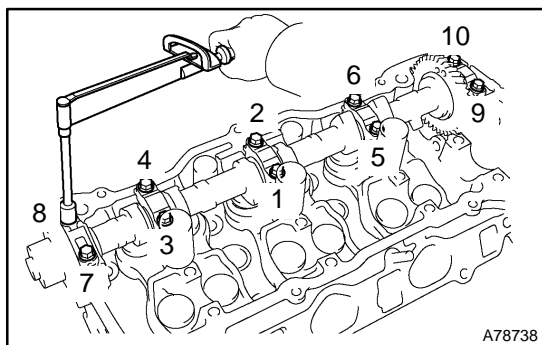
**Seal packing: Part No. 08826-00080 or equivalent**

**NOTICE:**

- Install the bearing cap No. 1 within 5 minutes after applying seal packing.
- Do not expose the seal packing to engine oil within 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.

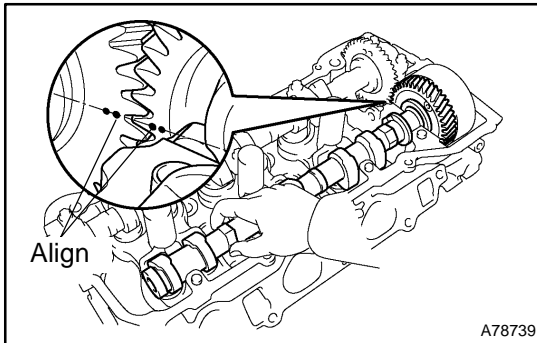


- (i) Using several steps, tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.  
**Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)**

**77. INSTALL CAMSHAFT****NOTICE:**

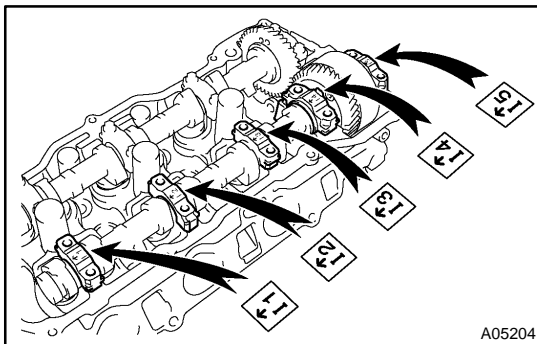
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while being installed. If the camshaft is not kept level, the cylinder head or camshaft may be damaged. To avoid this, the following steps must be carried out.

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



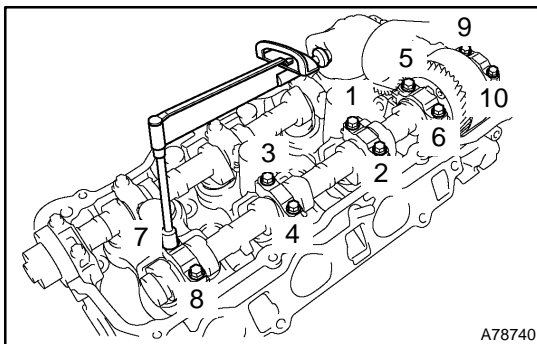
- (b) Align the timing marks (2 dot marks) of the camshaft drive and driven gears.

- (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) Using several steps, tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.

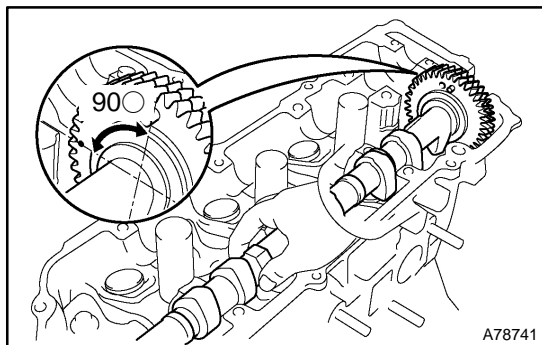
**Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)**

- (g) Remove the service bolt.

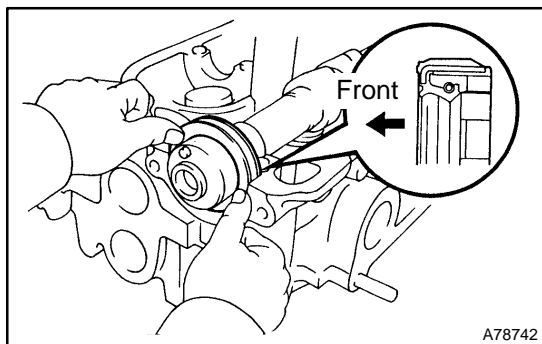
**78. INSTALL NO.4 CAMSHAFT SUB-ASSY****NOTICE:**

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

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



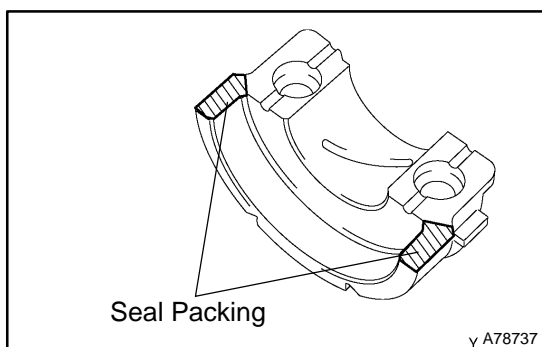
- (b) Place the No. 4 camshaft at a 90° angle of the timing mark (1 dot marks) on the cylinder head.
- (c) Apply multi-purpose grease to a new oil seal lip.



- (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.

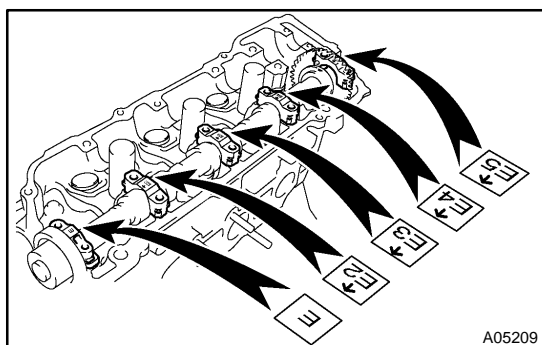


- (f) Apply seal packing to the bearing cap No. 1 as shown in the illustration.

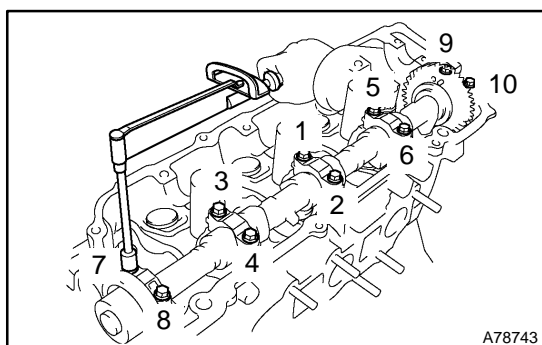
**Seal packing: Part No. 08826-00080 or equivalent**

**NOTICE:**

- Install the bearing cap No. 1 within 5 minutes after applying seal packing.
- Do not expose the seal packing to engine oil within 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.



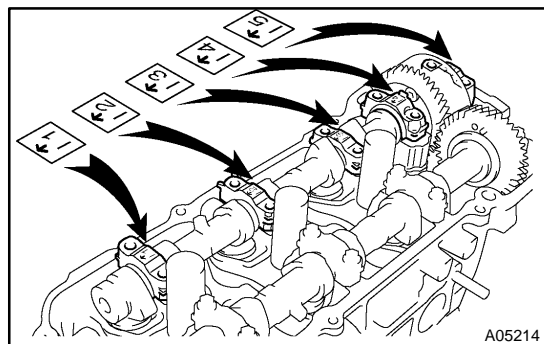
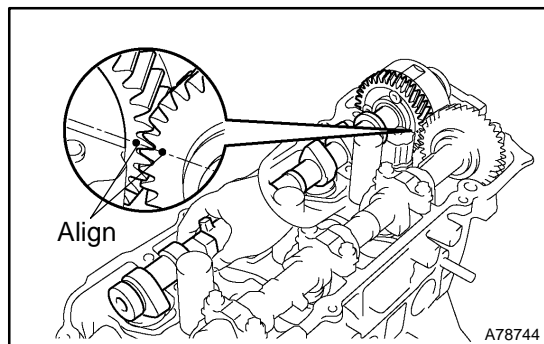
- (i) Using several steps, tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.

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

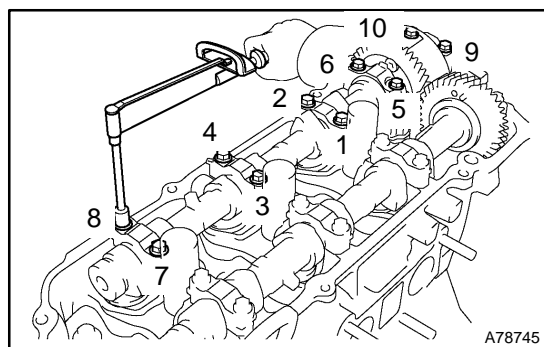
**79. INSTALL NO.3 CAMSHAFT SUB-ASSY****NOTICE:**

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

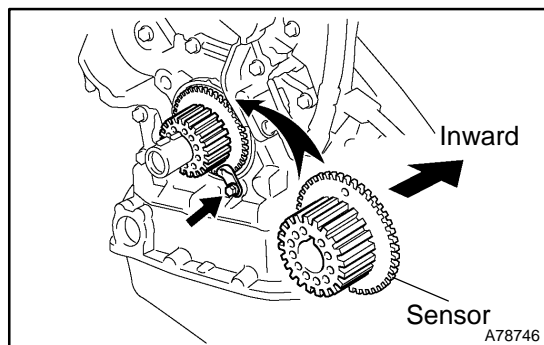
- (a) Apply new engine oil to the thrust portion and journal of the camshaft.
- (b) Align the timing marks (1 dot marks) of the camshaft drive and driven gears.
- (c) Place the camshaft on the cylinder head.



- (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) Using several steps, tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.  
**Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)**
- (g) Remove the service bolt.

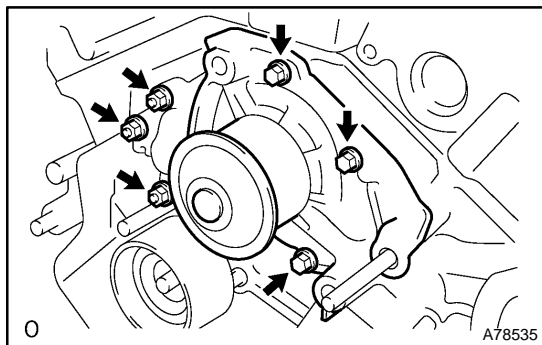
**80. INSTALL CRANKSHAFT TIMING PULLEY**

- (a) Align the keyway of the timing pulley with the key located on the crankshaft, then 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)**

**81. 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)**

**82. INSTALL OIL LEVEL GAGE GUIDE**

- (a) Apply a light coat of engine oil to a new O-ring, then install it to the level gage guide.  
 (b) Install the level gage guide.

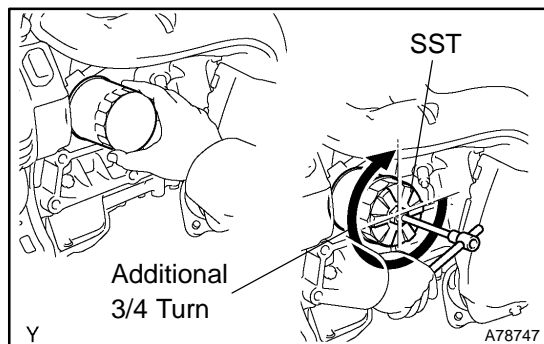
**Torque: 8.0 N·m (82 kgf·cm, 71 in.-lbf)**

**83. 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, then tighten it until the gasket contacts the seat.



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

**84. INSTALL TIMING BELT IDLER BRACKET**

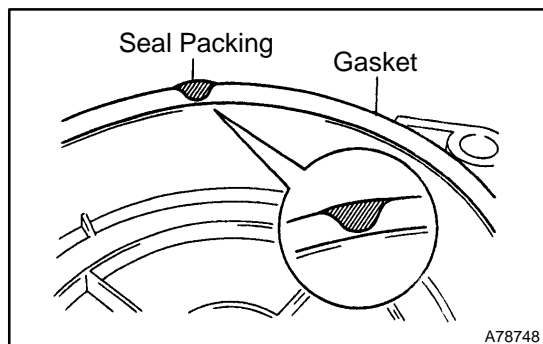
**Torque: 28 N·m (286 kgf·cm, 21 ft.-lbf)**

**85. INSTALL TIMING BELT NO.3 COVER**

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

**HINT:**

If there is a trace of water intrusion when checking visually, repair the gasket with seal packing when the crack length is within 2 to 3 cm (0.79 to 1.18 in.). Replace the gasket when the crack length is 3 to 4 cm (1.18 to 1.57 in.) or longer.



(b) If the timing belt cover gasket is needed to repair, follow the procedure below.

- (1) Repair the cracks and breaks by applying seal packing to the damaged area.

**Seal packing: Part No. 08826-00080 or equivalent**

**NOTICE:**

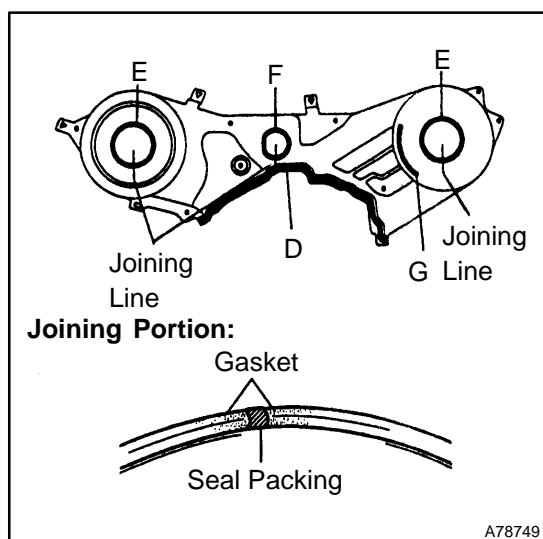
**When applying the seal packing, apply it as wide and high as the gasket.**

(c) If the timing belt cover gasket is needed to replace, 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, then 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.**

**HINT:**

Gasket	D	E	F	G
Length	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 between the ends of the gasket, apply seal packing to close the gap.

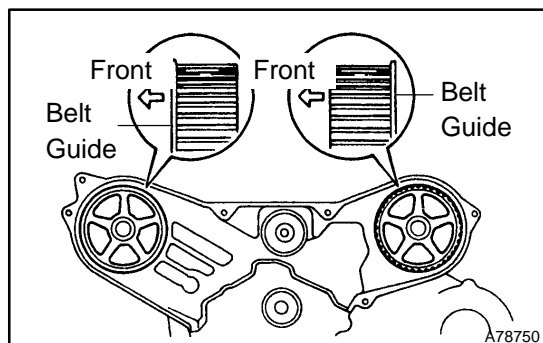
**Seal packing: Part No. 08826-00080 or equivalent**

**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: 8.5 N·m (87 kgf·cm, 75 in.-lbf)**

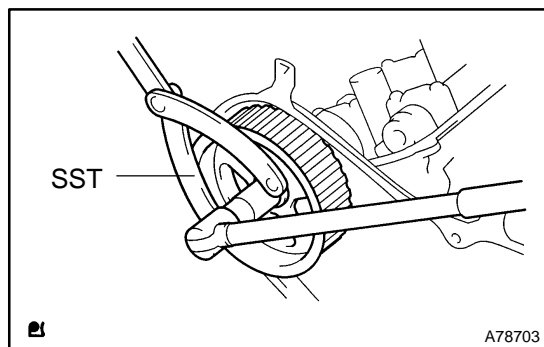


## 86. INSTALL CAMSHAFT TIMING PULLEY

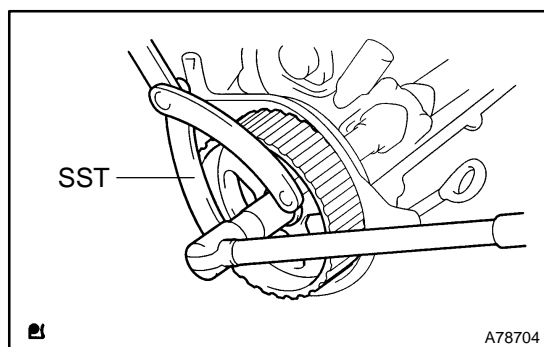
- (a) Pay attention to the orientation of the belt guide. Install the camshaft timing pulley with the belt guide properly oriented, then tighten the bolt temporarily.

**HINT:**

- Align the belt guide of the RH timing pulley so it faces the front of the engine as illustrated.
- Align the belt guide of the LH timing pulley so it faces the rear of the engine as illustrated.



- (b) Using SST, tighten the RH pulley bolt.  
 SST 09960-10010 (09962-01000, 09963-01000)  
**Torque: 125 N·m (1,275 kgf·cm, 92 ft·lbf)**



- (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)**

#### 87. INSTALL TIMING BELT IDLER SUB-ASSY NO.2

**Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)**

#### 88. 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.

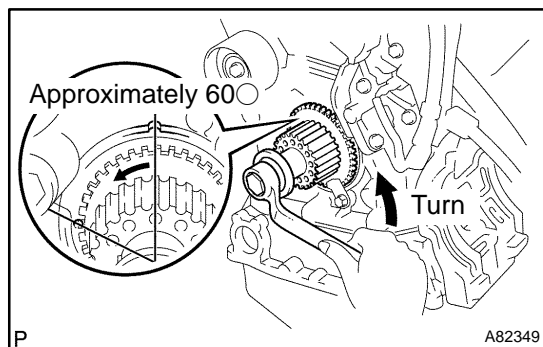
**Torque: 34 N·m (347 kgf·cm, 25 ft·lbf)**

#### 89. INSTALL TIMING BELT

- (a) Remove any oil or water on the pulleys, then keep them clean.

##### NOTICE:

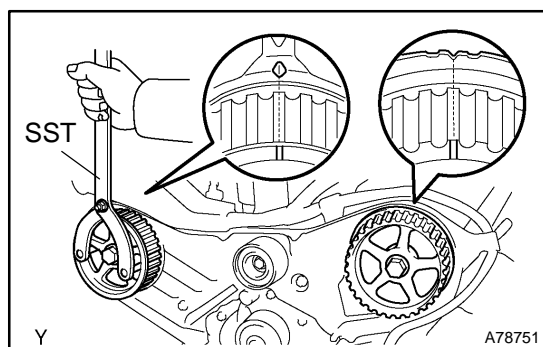
- **If there is a trace of water and/or oil on the timing belt, repair the leakage and install a new timing belt.**
  - **Only wipe the pulleys; do not use any cleaning agent.**
- (b) Check the idler pulleys.
- (1) Check that the idler pulley turns smoothly.
  - (2) Visually check the seal portion of the idler pulley for oil leakage.
- (c) Check the water pump.
- (1) Turn the pulley, then check that water pump bearing moves smoothly and does not make a noise.
  - (2) Visually check the drain hole for coolant leakage.
- (d) Temporarily install the crankshaft pulley bolt and washer to the crankshaft.



- (e) Turn the crankshaft counterclockwise by approximately 60°

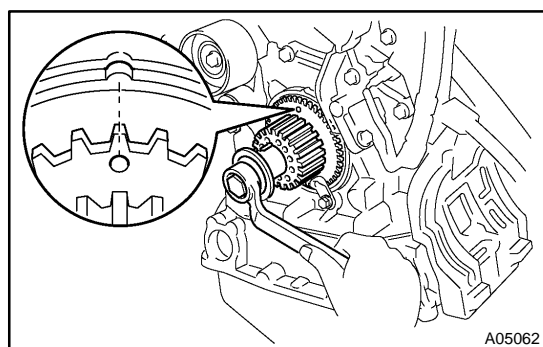
**NOTICE:**

To prevent contact of the piston head with the valve head, set the crankshaft pulley at the 60° BTDC/compression position.

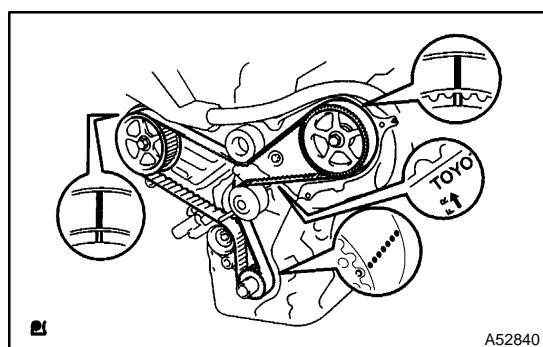


- (f) Using SST, turn the crankshaft pulley, then align the timing marks of the timing pulley with the timing belt No. 3 cover.

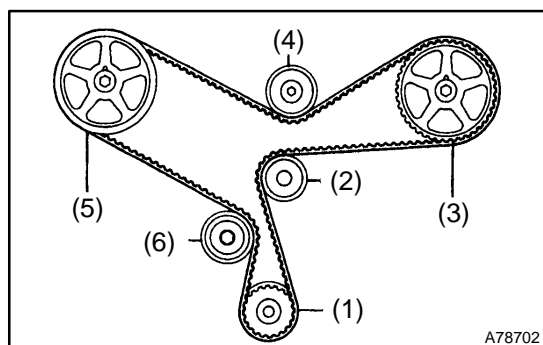
SST 09960-10010 (09962-01000, 09963-01000)



- (g) Turn the crankshaft, then align the timing mark of the crankshaft timing pulley with the oil pump body.



- (h) Align the front mark on the timing belt so it faces 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.



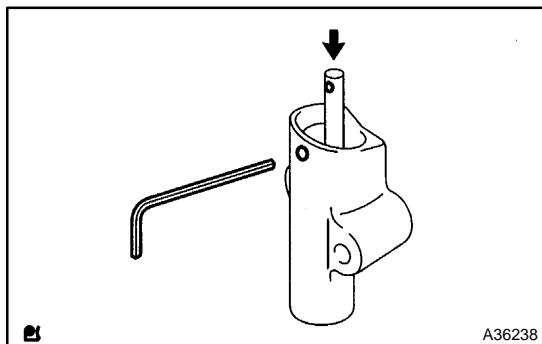
- (k) Install the timing belt in this order.

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



**90. INSTALL TIMING BELT TENSIONER ASSY**

- (a) Set the timing belt tensioner upright on the press.



- (b) Slowly press in the push rod.

**NOTICE:**

**Do not apply pressure more than 9.8 kN (1,000 kgf, 2,205 lbf) to the rod.**

- (c) Align the holes of the push rod and housing, then 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. Alternately tighten the 2 bolts.

**Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)**

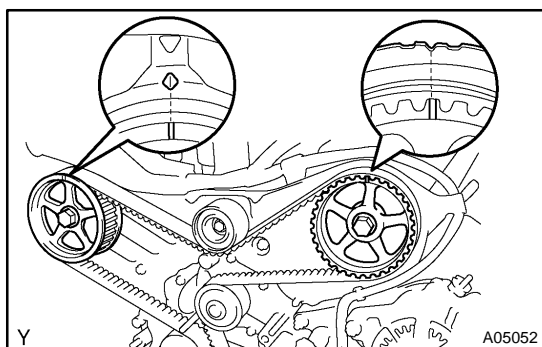
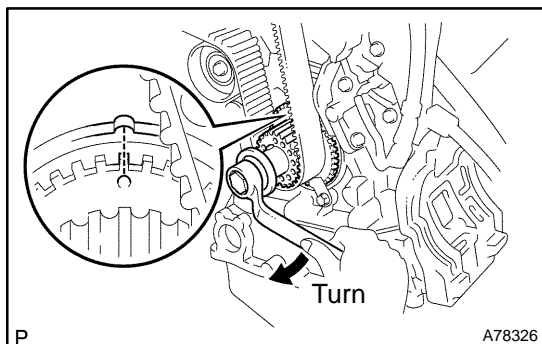
**NOTICE:**

**Be sure to tighten the bolts uniformly. Installing the tensioner at an angle may cause failure of its proper operation.**

- (f) Remove the 1.5 mm hexagon wrench from the tensioner.  
 (g) Turn the crankshaft 2 revolutions slowly, then align the timing mark of the crankshaft timing pulley with the oil pump body.

**NOTICE:**

**Always turn the crankshaft clockwise.**



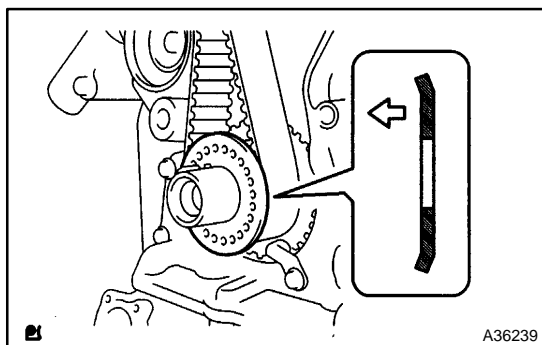
- (h) Check that the timing marks of the RH and LH timing pulleys are aligned with the timing marks of the timing belt No. 3 cover as shown in the illustration.

If the marks are not aligned, remove the timing belt and reinstall it.

- (i) Remove the crankshaft pulley bolt.

**91. INSTALL TIMING BELT GUIDE NO.2**

- (a) Install the timing belt guide with the cup side facing the engine front.



**92. INSTALL ENGINE MOUNTING BRACKET RH**

**Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)**

**93. 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 of water intrusion when checking visually, replace the timing belt cover.

(b) Install the timing belt cover.

**Torque: 8.5 N·m (87 kgf·cm, 75 in·lbf)**

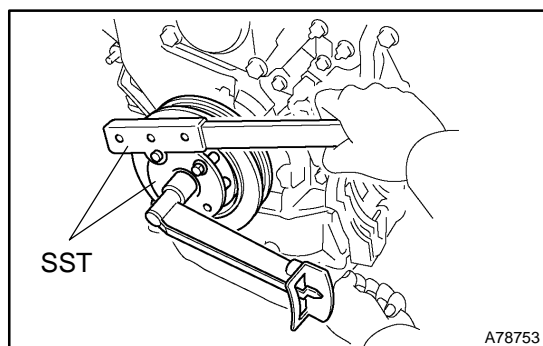
**94. INSTALL TIMING BELT NO.1 COVER**

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

If there is a trace of water intrusion when checking visually, replace the timing belt cover.

(b) Install the timing belt cover.

**Torque: 8.5 N·m (87 kgf·cm, 75 in·lbf)**

**95. INSTALL CRANKSHAFT PULLEY**

(a) Align the keyway of the pulley with the key located on the crankshaft, then slide the pulley into place.

(b) Using SST, install the pulley bolt.

SST 09213-54015 (91651-60855), 09330-00021

**Torque: 220 N·m (2,250 kgf·cm, 162 ft·lbf)**

**96. INSTALL VVT SENSOR**

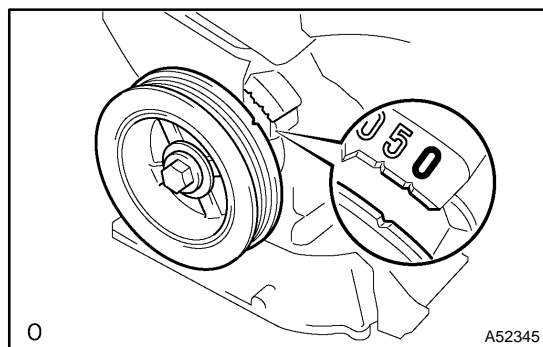
**Torque: 8.0 N·m (82 kgf·cm, 71 in·lbf)**

**97. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSY**

**Torque: 8.0 N·m (82 kgf·cm, 71 in·lbf)**

**98. INSTALL ENGINE HANGER NO.2**

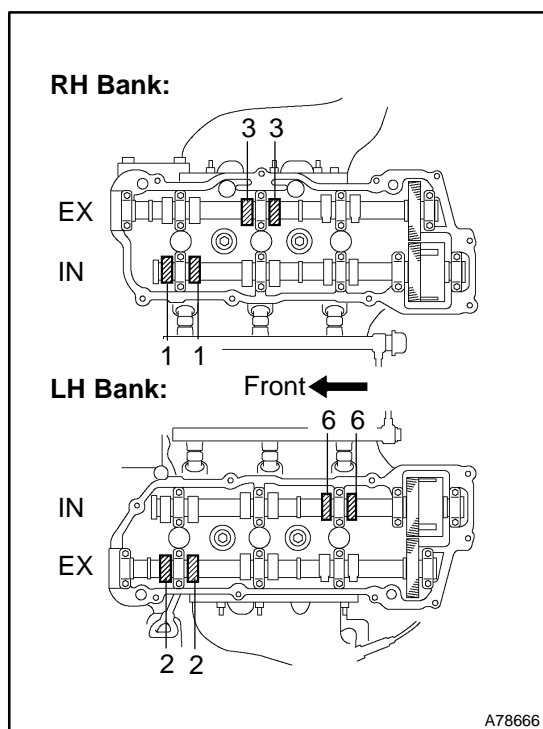
**Torque: 20 N·m (199 kgf·cm, 14 ft·lbf)**

**99. INSPECT VALVE CLEARANCE**

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

(b) Check that the valve lifters on the intake side of the No. 1 cylinder are not pushed by the cam.

If the valve lifters are pushed, turn the crankshaft 1 revolution (360°) and align the marks as above.



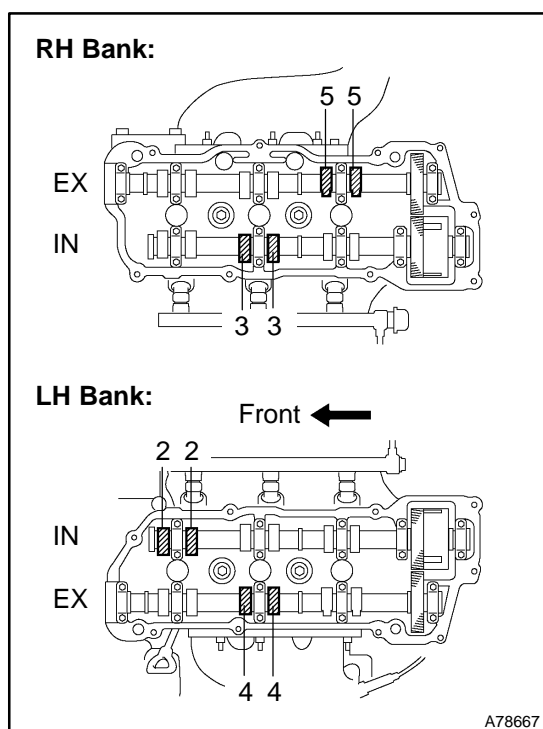
- (c) Inspect the valves indicated in the illustration on the left.
- (1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

**Valve clearance (Cold):**

**0.15 to 0.25 mm (0.0059 to 0.0098 in.) for intake**

**0.25 to 0.35 mm (0.0098 to 0.0138 in.) for exhaust**

- (2) Record the out-of-specification valve clearance measurements. They will be used later to select an adjusting shim to replace.



- (d) Turn the crankshaft by 2/3 of a revolution (240°), then inspect the valves indicated in the illustration on the left.

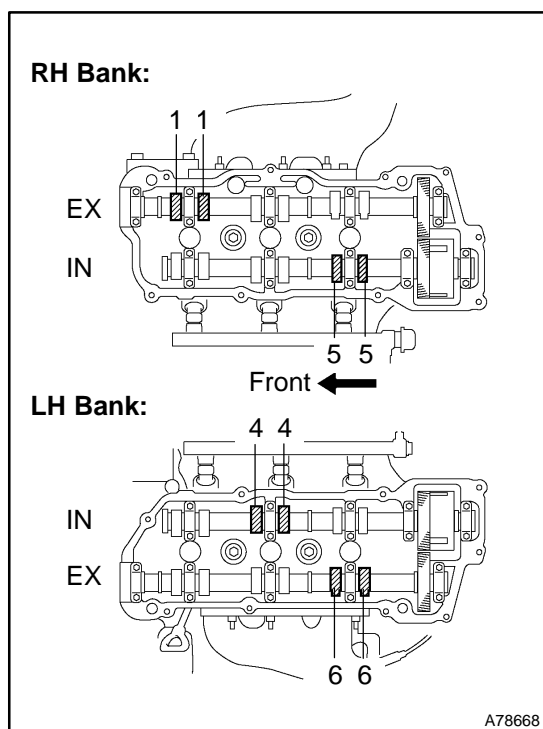
- (1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

**Valve clearance (Cold):**

**0.15 to 0.25 mm (0.0059 to 0.0098 in.) for intake**

**0.25 to 0.35 mm (0.0098 to 0.0138 in.) for exhaust**

- (2) Record the out-of-specification valve clearance measurements. They will be used later to select an adjusting shim to replace.



- (e) Turn the crankshaft by  $\frac{2}{3}$  of a revolution ( $240^\circ$ ), then inspect the valves indicated in the illustration on the left.

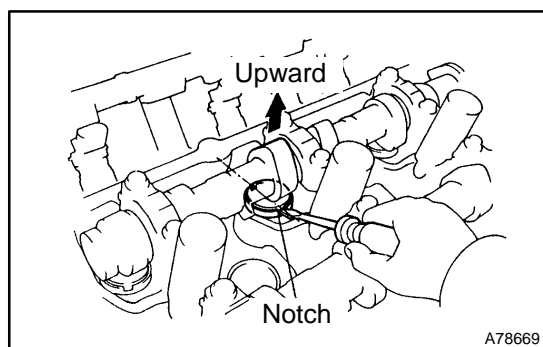
- (1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

**Valve clearance (Cold):**

**0.15 to 0.25 mm (0.0059 to 0.0098 in.) for intake**

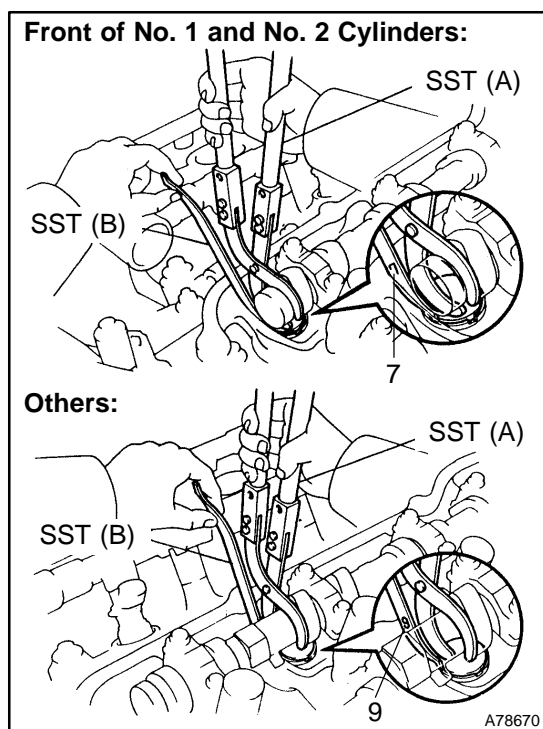
**0.25 to 0.35 mm (0.0098 to 0.0138 in.) for exhaust**

- (2) Record the out-of-specification valve clearance measurements. They will be used later to select an adjusting shim to replace.



**100. 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.



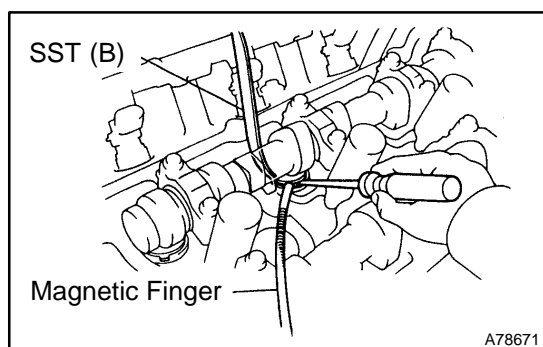
- (c) Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

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

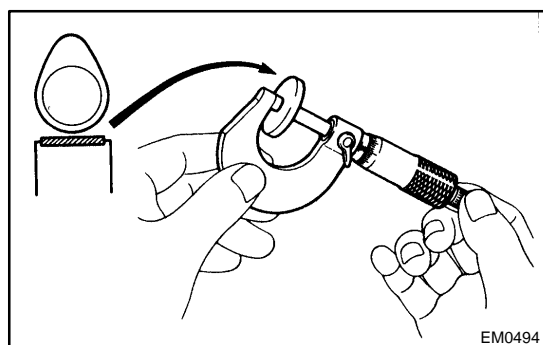
**HINT:**

- 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 SST(B) from getting stuck, insert it gently from the intake side at a slight angle.

SST (A)	09248-05410
SST (B)	09248-05420



- (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  $A = B + (C - 0.20 \text{ mm (0.0079 in.)})$**

**Exhaust  $A = B + (C - 0.30 \text{ mm (0.0118 in.)})$**

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

**EXAMPLE (Intake):**

Measured valve clearance = 0.45 mm (0.0177 in.)

$0.45 \text{ mm (0.0177 in.)} - 0.20 \text{ mm (0.0079 in.)} = 0.25 \text{ mm (0.0098 in.)}$

(Measured - Specification = Excess clearance)

Used shim measurement = 2.80 mm (0.1102 in.)

$0.25 \text{ mm (0.0098 in.)} + 2.80 \text{ mm (0.1102 in.)} = 3.05 \text{ mm (0.1201 in.)}$

(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 New Shim Thickness table on the next 2 pages.

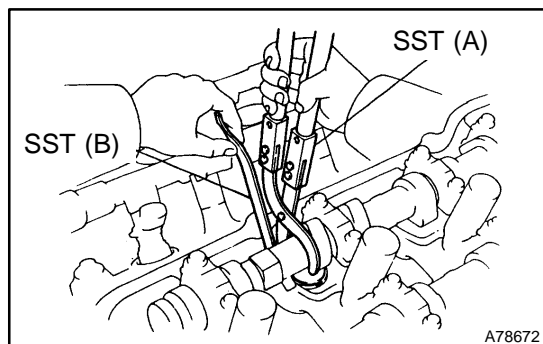
## 2005 LEXUS ES330 REPAIR MANUAL (RM1124U)

2166

**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.

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

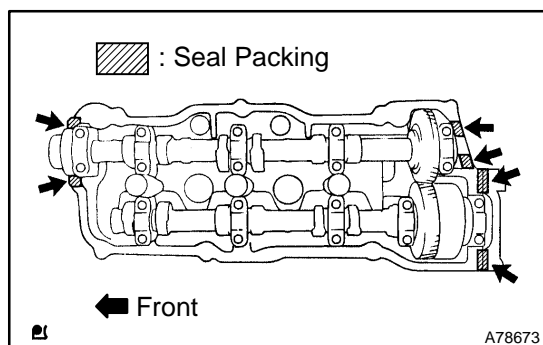
HINT: New shims have the thickness in millimeters imprinted on the face.



- (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), then remove SST (B).  
SST 09248-55040 (09248-05410, 09248-05420)
- (j) Recheck the valve clearance.

#### 101. 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**

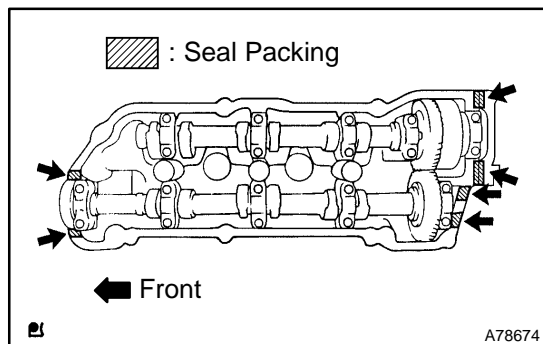
#### NOTICE:

- Remove any oil from the contact surface.
  - Install the cylinder head cover within 3 minutes after applying seal packing.
  - Do not start the engine within 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 (80 kgf·cm, 71 in.-lbf)**

#### 102. 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 within 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 (80 kgf·cm, 71 in.-lbf)**

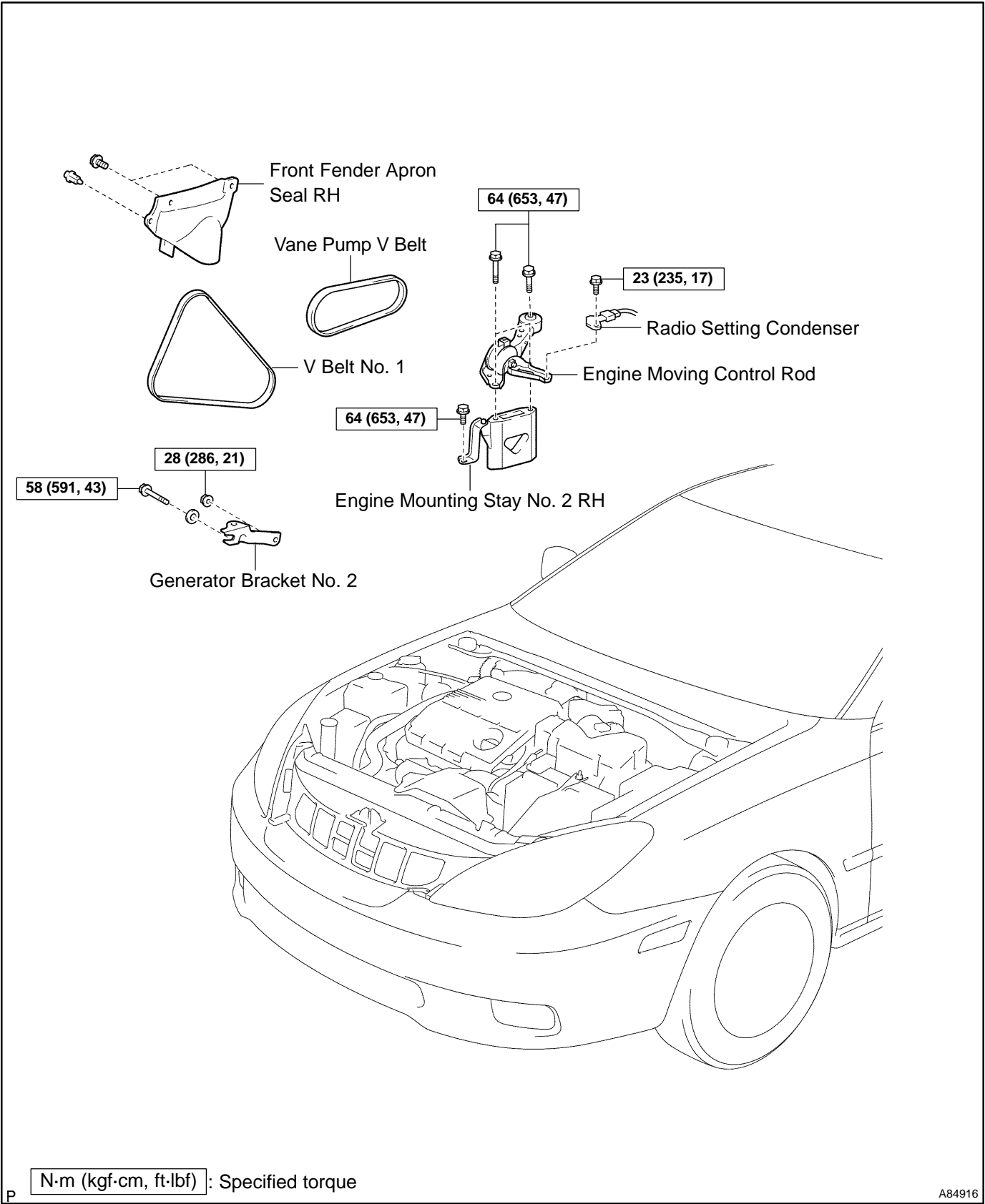
#### 103. INSTALL SPARK PLUG

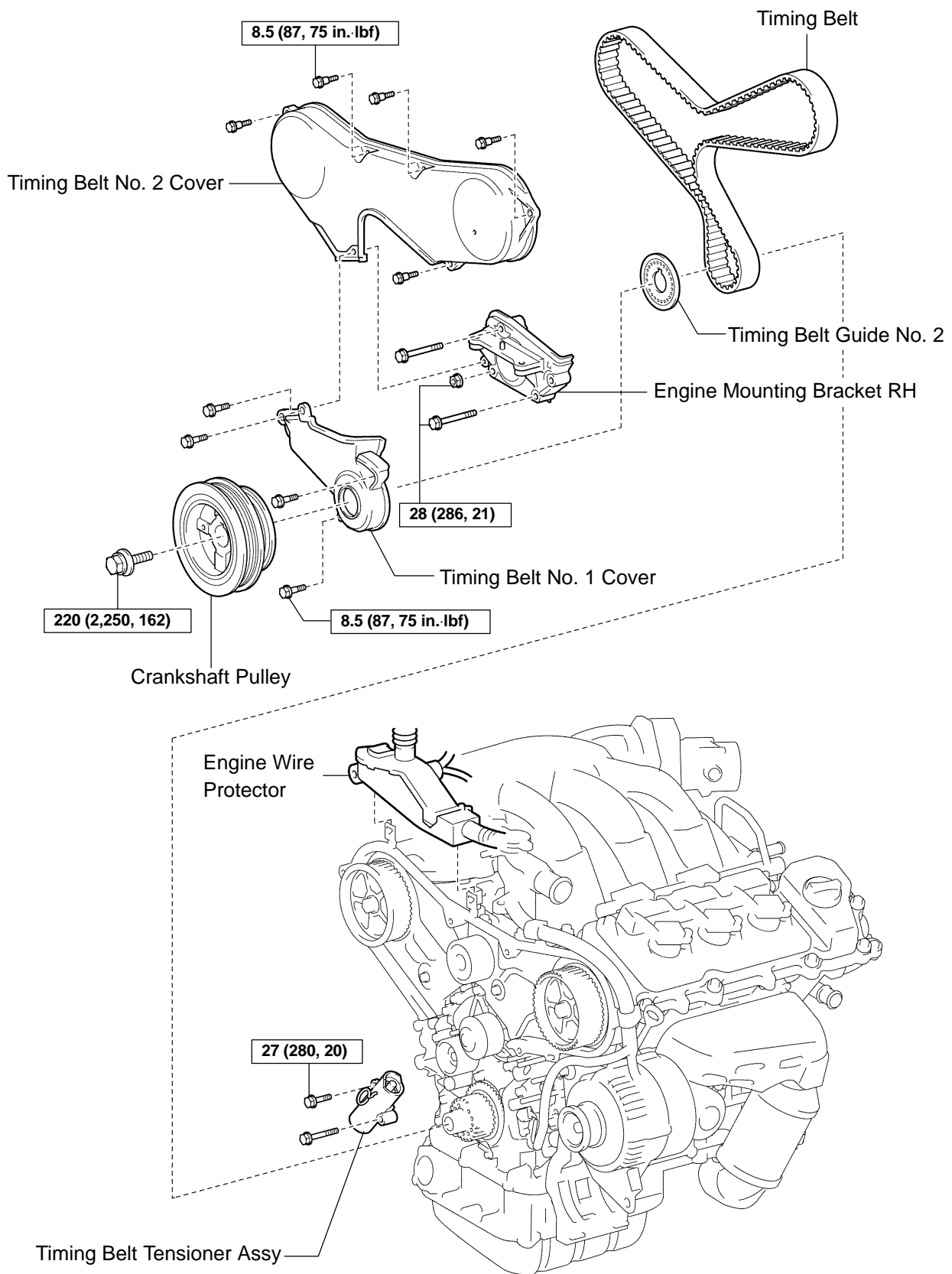
**Torque: 25 N·m (250 kgf·cm, 18 ft.-lbf)**



# TIMING BELT (3MZ-FE) COMPONENTS

141JA-01





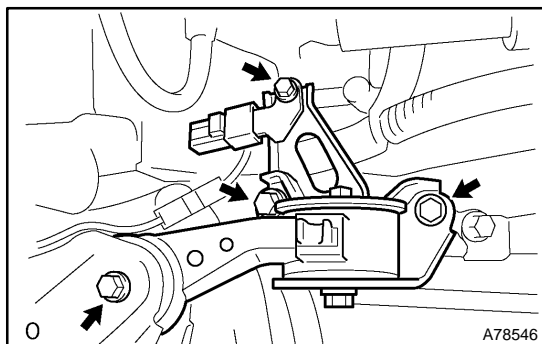
N·m (kgf·cm, ft·lbf) : Specified torque

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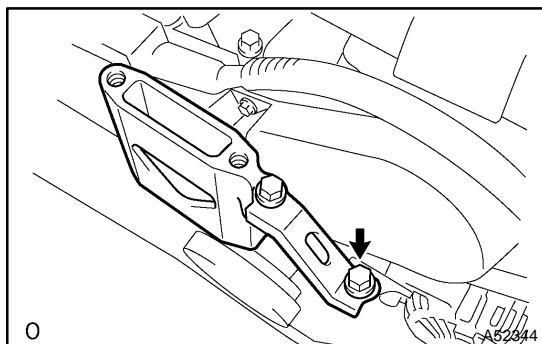
## REPLACEMENT

1. REMOVE FRONT WHEEL RH
2. REMOVE FRONT FENDER APRON SEAL RH
3. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1  
(See page 14-5)
4. REMOVE VANE PUMP V BELT (See page 14-5)



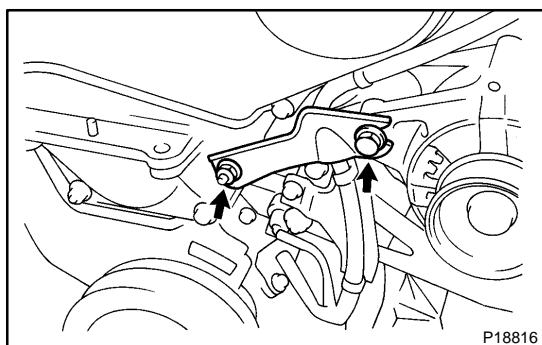
### 5. REMOVE ENGINE MOVING CONTROL ROD

- (a) Remove the reserve tank cap.
- (b) Remove the 4 bolts, engine moving control rod and bracket.



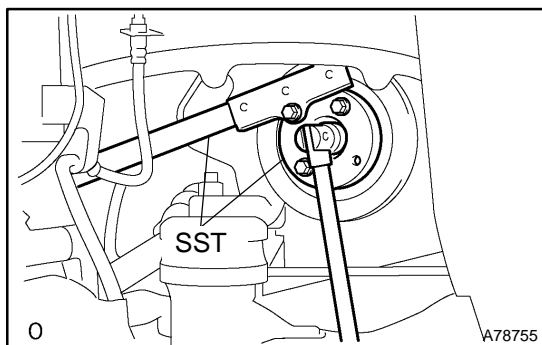
### 6. REMOVE ENGINE MOUNTING STAY NO.2 RH

- (a) Remove the bolt, engine mounting stay No. 2 and engine mounting bracket No. 2.



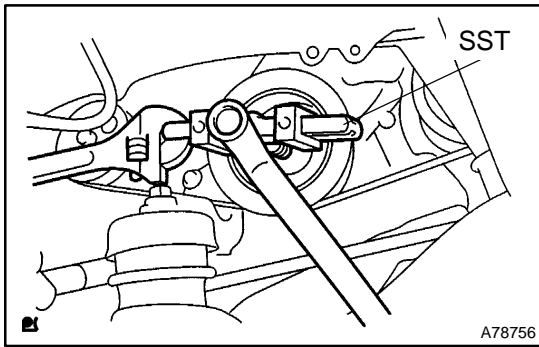
### 7. REMOVE GENERATOR BRACKET NO.2

- (a) Remove the nut and generator bracket.



### 8. REMOVE CRANKSHAFT PULLEY

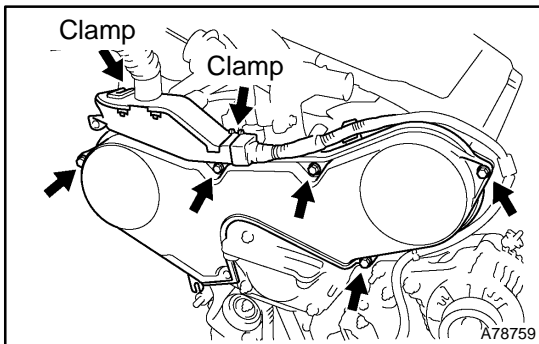
- (a) Using SST, loosen the pulley bolt.  
SST 09213-54015 (91651-60855), 09330-00021



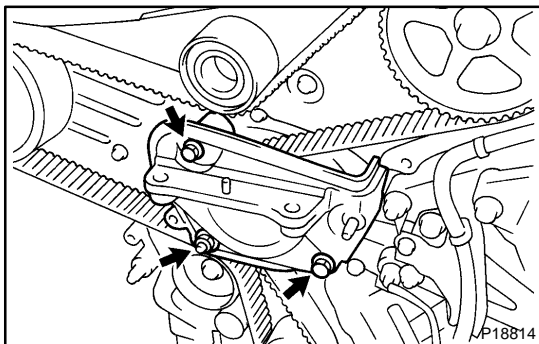
- (b) Using SST and the pulley bolt, remove the pulley.  
 SST 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)

**NOTICE:**

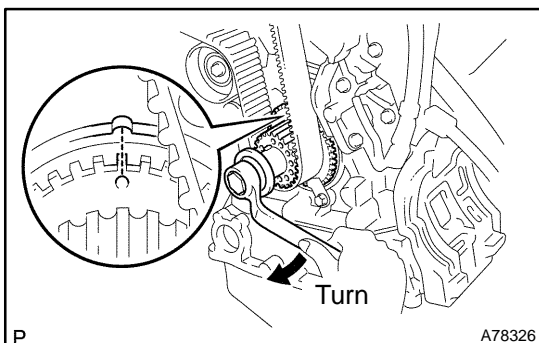
**Before using SST, apply lubricating oil to the threads and tip of the center bolt 150.**

**9. REMOVE TIMING BELT NO.1 COVER****10. REMOVE TIMING BELT NO.2 COVER**

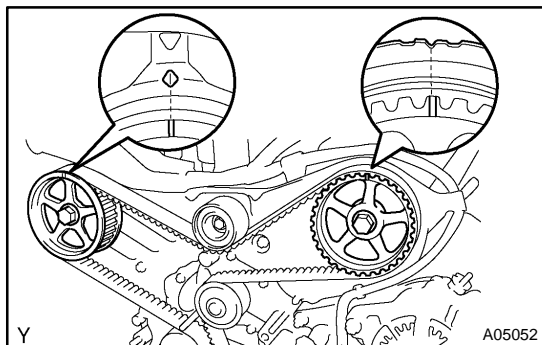
- (a) Disconnect the 2 engine wire protector clamps from the timing belt No. 3 cover.  
 (b) Remove the 5 bolts and timing belt cover.

**11. REMOVE ENGINE MOUNTING BRACKET RH**

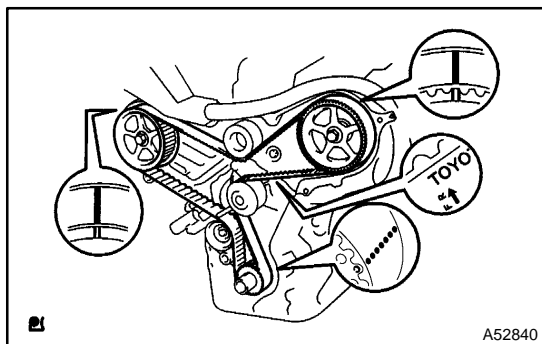
- (a) Remove the 2 bolts, nut and engine mounting bracket RH.

**12. REMOVE TIMING BELT GUIDE NO.2****13. REMOVE TIMING BELT**

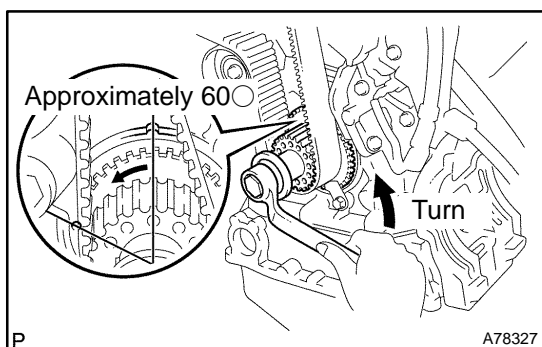
- (a) Set the No. 1 cylinder to the TDC/compression.  
 (1) Temporarily install the crankshaft pulley bolt and washer to the crankshaft.  
 (2) Turn the crankshaft clockwise, then align the timing mark of the crankshaft timing pulley with the oil pump body.



- (3) Check that the timing marks of the camshaft timing pulleys and the timing belt No. 3 cover are aligned. If not, turn the crankshaft by 1 revolution (360°).
- (4) Remove the crankshaft pulley bolt.



- (b) If reusing the timing belt, check that there are 3 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°

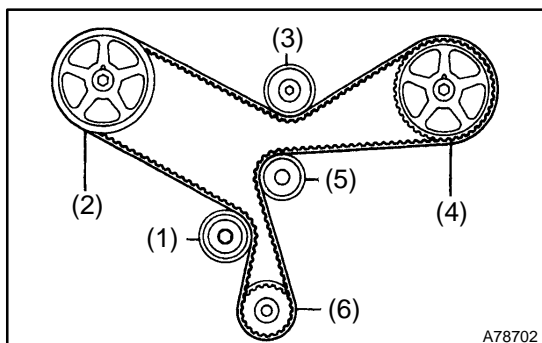
**NOTICE:**

If the timing belt is disengaged, having the crankshaft pulley set at the wrong angle can cause contact of the piston head with the valve head when removing the camshaft timing pulley and camshaft, which causes damage. So always set the crankshaft pulley at the correct angle.

- (d) Remove the timing belt tensioner.

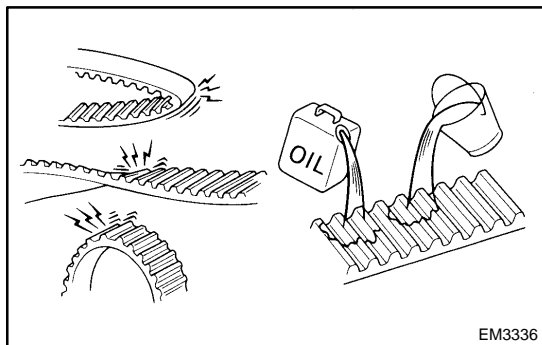
**NOTICE:**

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



#### 14. INSPECT TIMING BELT

##### NOTICE:

- **Do not bend, twist or turn the timing belt inside out.**
- **Do not allow contact of the timing belt with oil, water or steam.**
- **Do not use the 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 the belt tears in a short time:
  - Check if the belt is installed properly.
  - Check if the timing cover gasket is damaged and if it is installed properly.
- (b) If the belt teeth are cracked or damaged, check if either camshaft is locked.
- (c) If there is noticeable wear or cracks on the belt face, check 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 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.

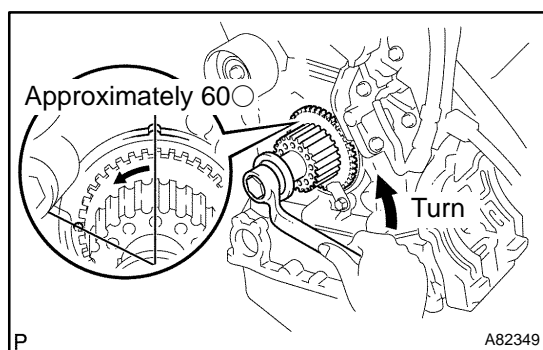
If there is any doubt about the belt condition, replace the timing belt.

#### 15. INSTALL TIMING BELT

- (a) Remove any oil or water on the pulleys, then keep them clean.

##### NOTICE:

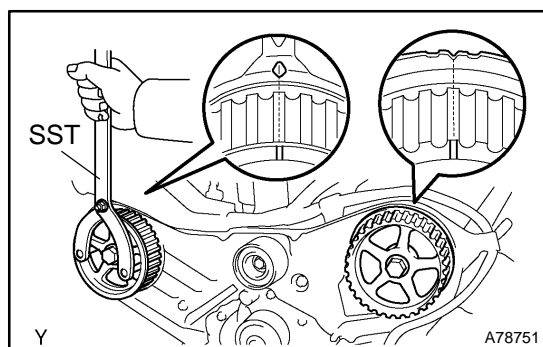
- **If there is a trace of water and/or oil on the timing belt, repair the leakage and install a new timing belt.**
  - **Only wipe the pulleys; do not use any cleaning agent.**
- (b) Check the idler pulleys.
    - (1) Check that the idler pulley turns smoothly.
    - (2) Visually check the seal portion of the idler pulley for oil leakage.
  - (c) Check the water pump.
    - (1) Turn the pulley, then check that water pump bearing moves smoothly and does not make a noise.
    - (2) Visually check the drain hole for coolant leakage.
  - (d) Temporarily install the crankshaft pulley bolt and washer to the crankshaft.



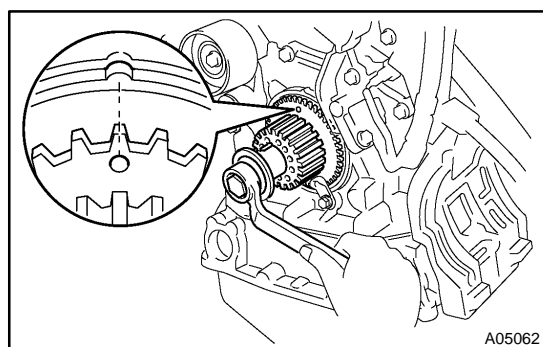
- (e) Turn the crankshaft counterclockwise by approximately 60°

**NOTICE:**

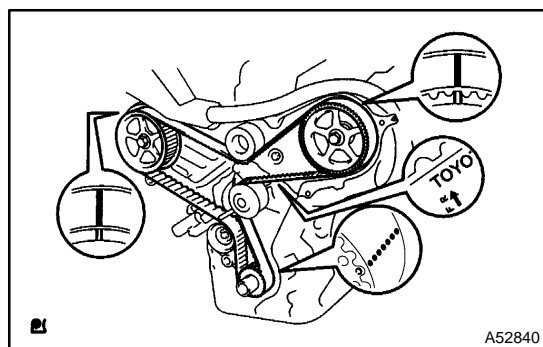
To prevent contact of the piston head with the valve head, set the crankshaft pulley at the 60° BTDC/compression position.



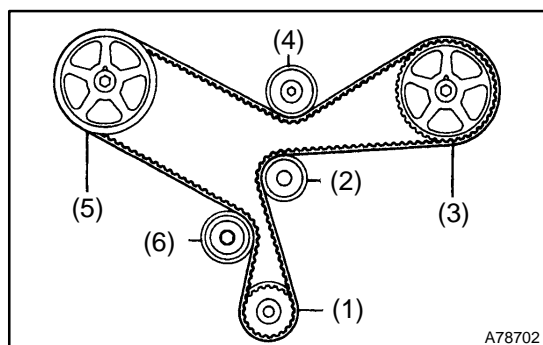
- (f) Using SST, turn the timing pulleys, then align the timing marks of the timing pulleys with the timing belt No. 3 cover. SST 09960-10010 (09962-01000, 09963-01000)



- (g) Turn the crankshaft, then align the timing mark of the crankshaft timing pulley with the oil pump body.



- (h) Align the front mark on the timing belt so it faces 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.

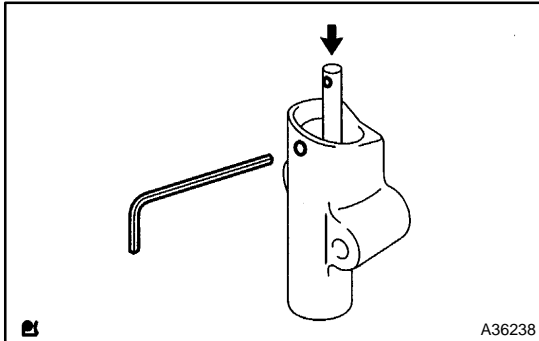


- (k) Install the timing belt in this order.

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

**16. INSTALL TIMING BELT TENSIONER ASSY**

- (a) Set the timing belt tensioner upright on the press.



- (b) Slowly press in the push rod.

**NOTICE:**

**Do not apply pressure more than 9.8 kN (1,000 kgf, 2,205 lbf) to the rod.**

- (c) Align the holes of the push rod and housing, then 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. Alternately tighten the 2 bolts.

**Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)**

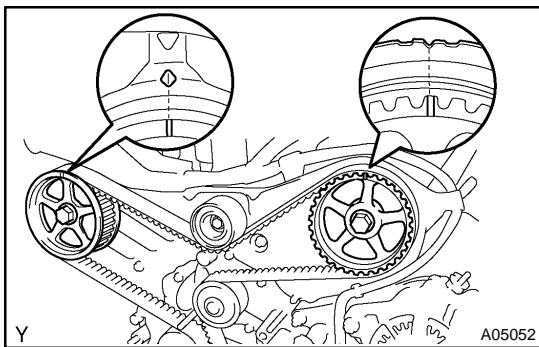
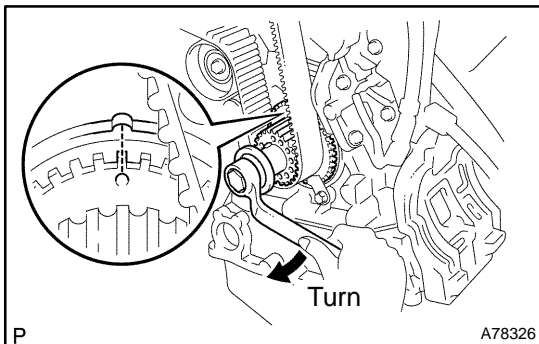
**NOTICE:**

**Be sure to tighten the bolts uniformly. Installing the tensioner at an angle may cause failure of its proper operation.**

- (f) Remove the 1.5 mm hexagon wrench from the tensioner.  
 (g) Turn the crankshaft 2 revolutions slowly, then align the timing mark of the crankshaft timing pulley with the oil pump body.

**NOTICE:**

**Always turn the crankshaft clockwise.**



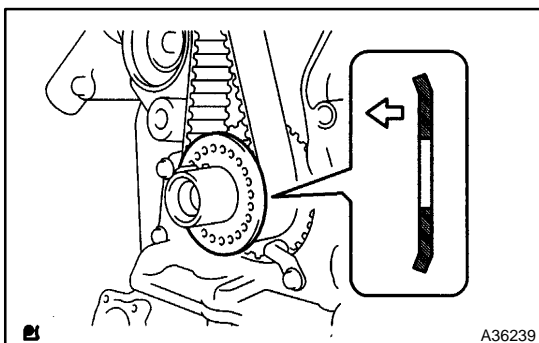
- (h) Check that the timing marks of the RH and LH timing pulleys are aligned with the timing marks of the timing belt No. 3 cover as shown in the illustration.

If the marks are not aligned, remove the timing belt and reinstall it.

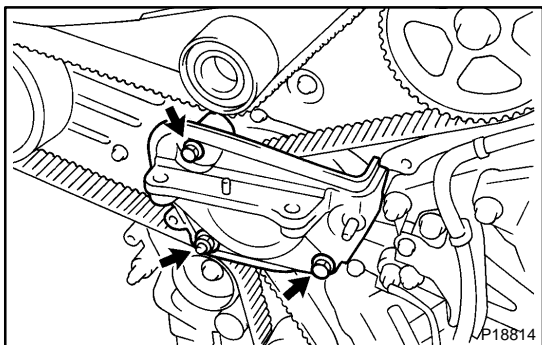
- (i) Remove the crankshaft pulley bolt.

**17. INSTALL TIMING BELT GUIDE NO.2**

- (a) Install the timing belt guide with the cup side facing the engine front.





**18. INSTALL ENGINE MOUNTING BRACKET RH**

- (a) Install the engine mounting bracket RH with the 2 bolts and nut.

**Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)**

**19. 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 of water intrusion when checking visually, replace the timing belt cover.
- (b) Install the timing belt cover.

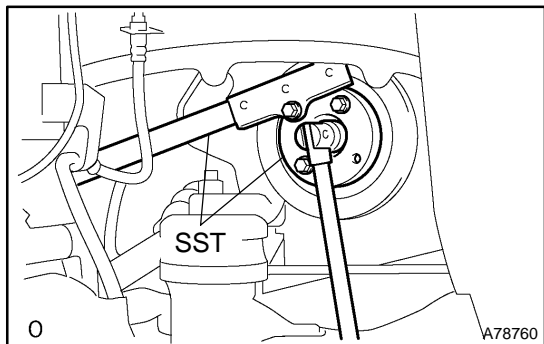
**Torque: 8.5 N·m (87 kgf·cm, 75 in·lbf)**

**20. 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 of water intrusion when checking visually, replace the timing belt cover.
- (b) Install the timing belt cover.

**Torque: 8.5 N·m (87 kgf·cm, 75 in·lbf)**

- (c) Install the 2 engine wire protector clamps to the timing belt No. 3 cover.

**21. INSTALL CRANKSHAFT PULLEY**

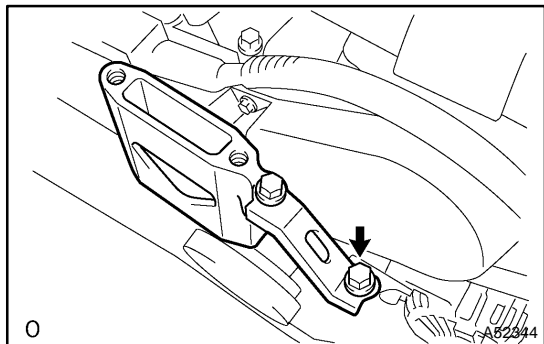
- (a) Align the keyway of the pulley with the key located on the crankshaft, then slide the pulley into place.
- (b) Using SST, install the pulley bolt.

SST 09213-54015 (91651-60855), 09330-00021

**Torque: 220 N·m (2250 kgf·cm, 162 ft·lbf)**

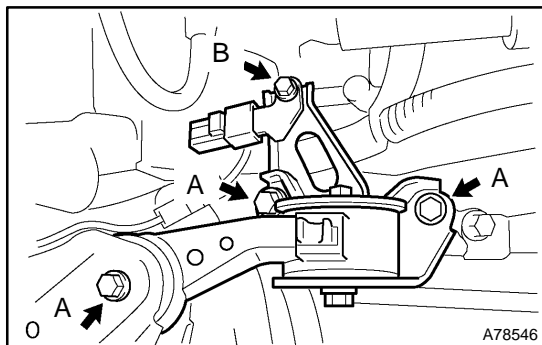
**22. INSTALL GENERATOR BRACKET NO.2**

**Torque: 28 N·m (286 kgf·cm, 21 ft·lbf)**

**23. INSTALL ENGINE MOUNTING STAY NO.2 RH**

- (a) Install the engine mounting stay No. 2 and engine mounting bracket No. 2 with the bolt.

**Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)**

**24. INSTALL ENGINE MOVING CONTROL ROD**

- (a) Install the engine moving 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**

**25. INSTALL VANE PUMP V BELT (See page 14-5 )**

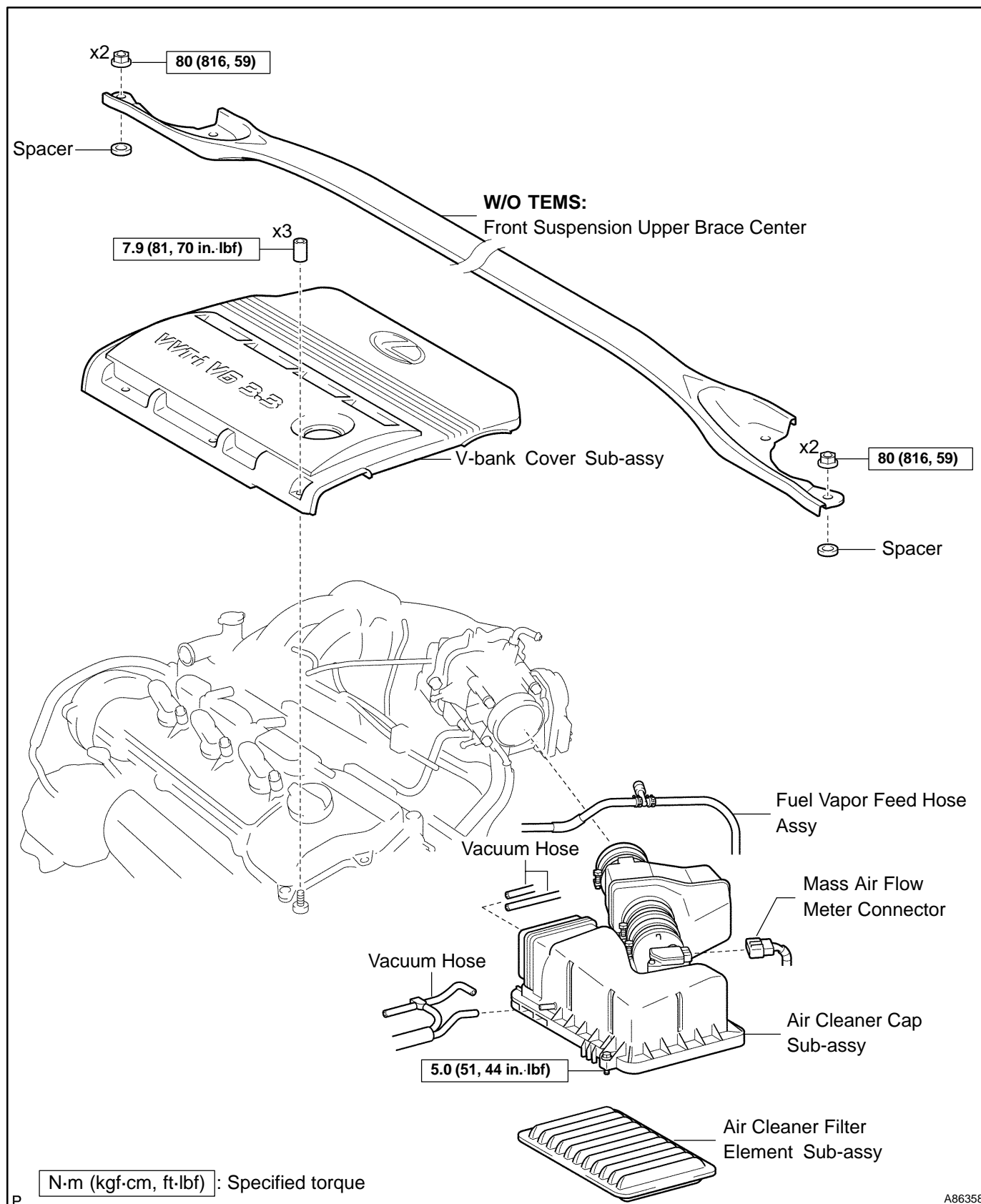
**26. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1  
(See page 14-5 )**

**27. INSPECT DRIVE BELT DEFLECTION AND TENSION (See page 14-1 )**

**28. INSTALL FRONT WHEEL RH (See page 14-5 )**

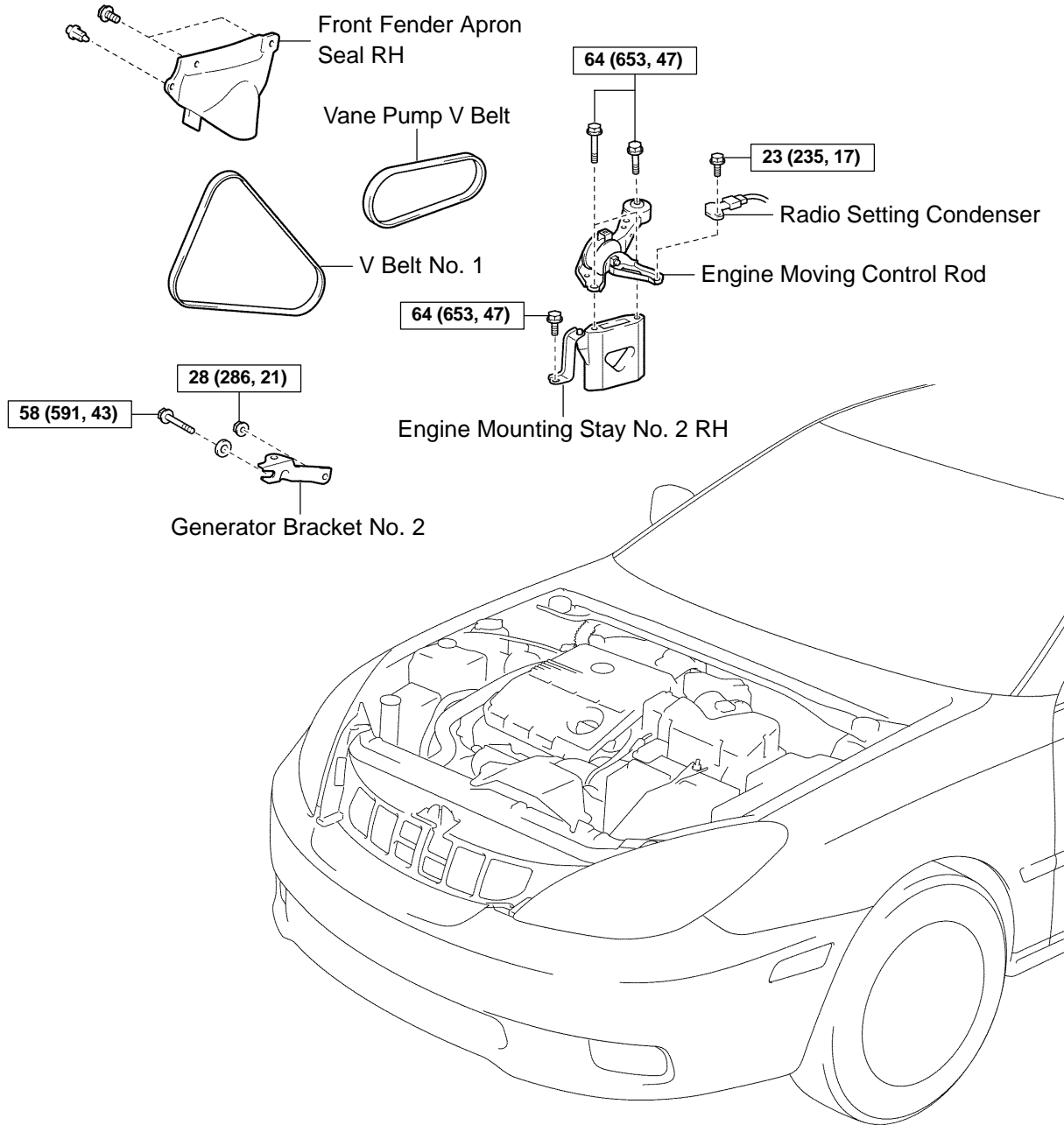
# CAMSHAFT (RH BANK) (3MZ-FE) COMPONENTS

141JC-01



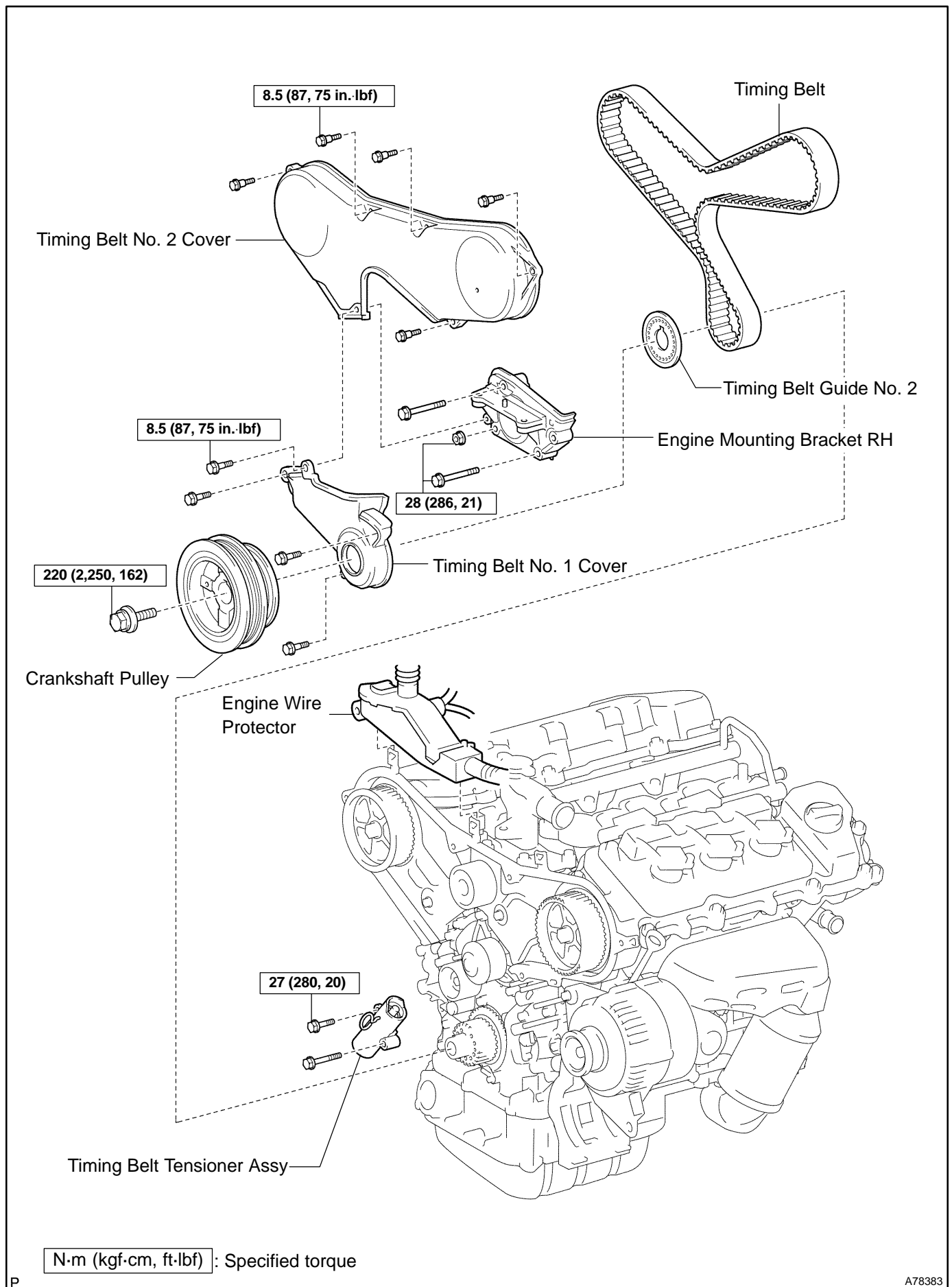
A86358





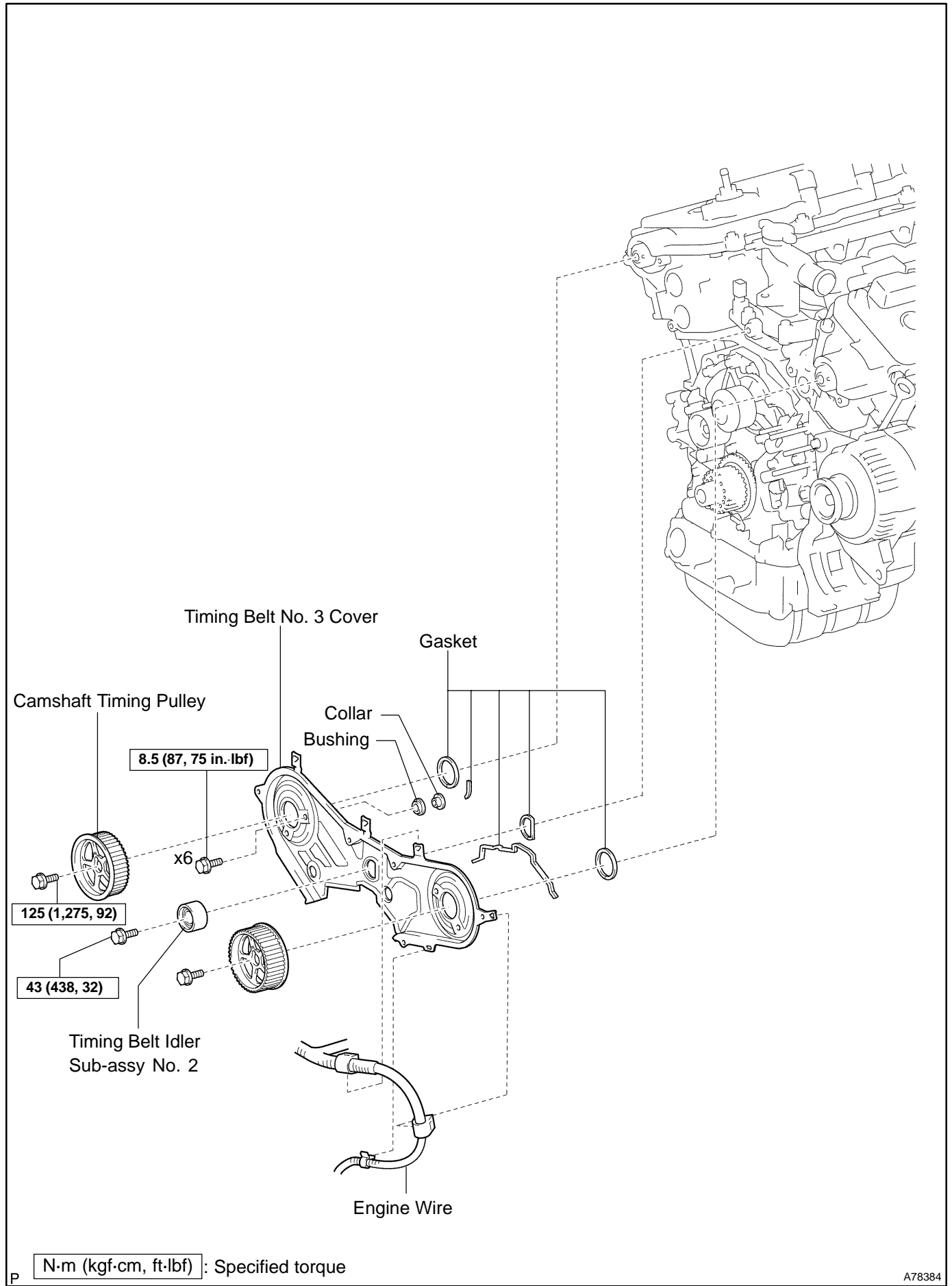
**N·m (kgf·cm, ft·lbf) : Specified torque**

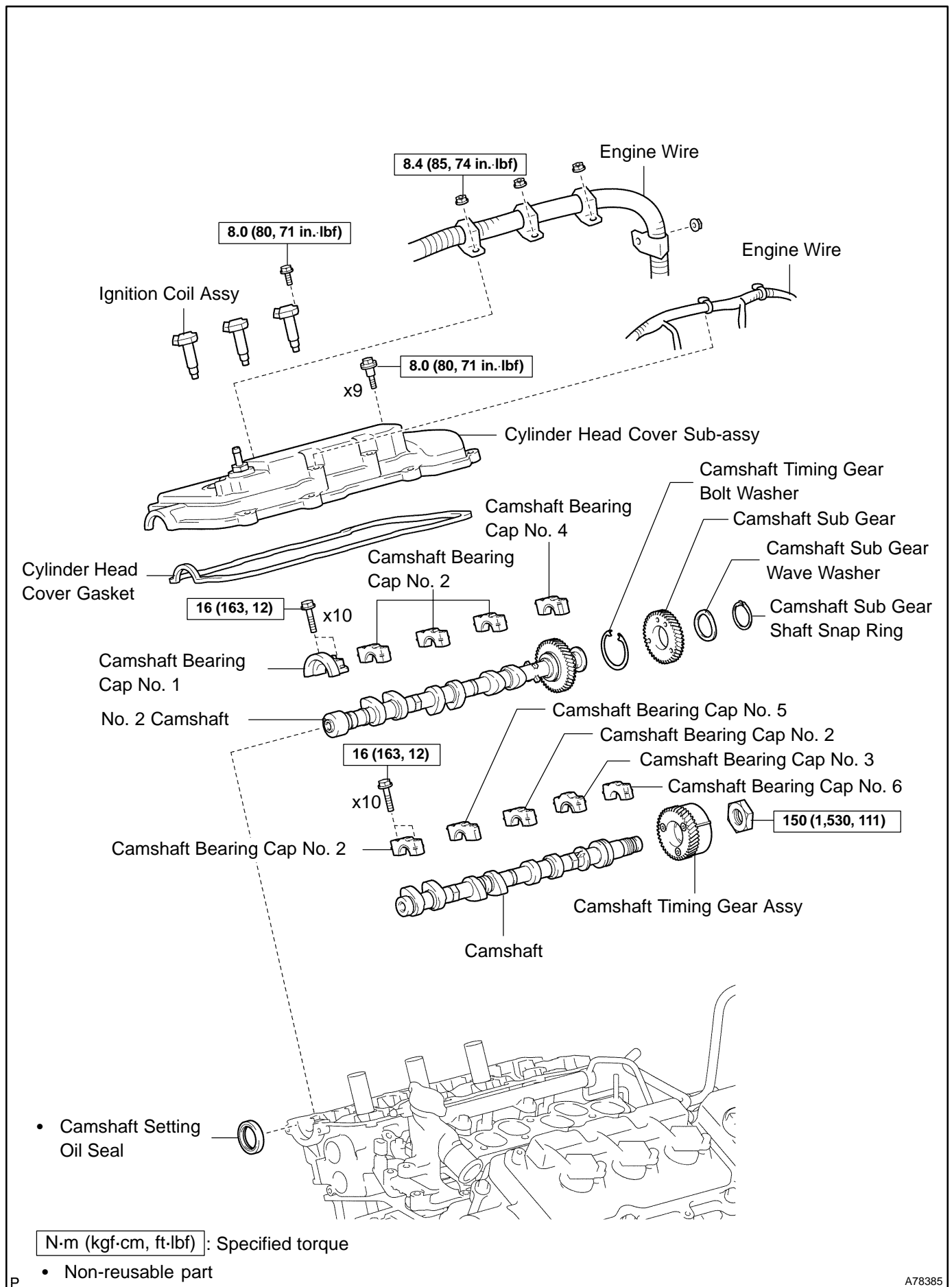
A84916



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A78383



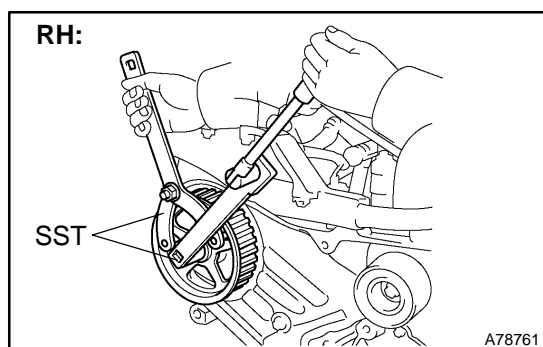


A78385



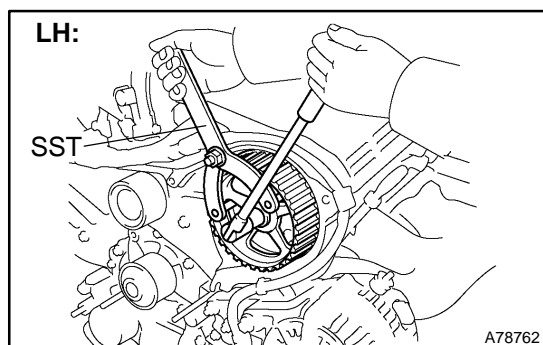
## REPLACEMENT

1. DISCONNECT BATTERY NEGATIVE TERMINAL
2. DRAIN ENGINE COOLANT (See page 16-9 )
3. REMOVE FRONT WHEEL RH
4. REMOVE FRONT SUSPENSION UPPER BRACE CENTER (W/O TEMS) (See page 10-1 1)
5. REMOVE V-BANK COVER SUB-ASSY (See page 10-1 1)
6. REMOVE AIR CLEANER CAP SUB-ASSY (See page 10-1 1)
7. REMOVE EMISSION CONTROL VALVE SET (See page 11-13 )
8. REMOVE INTAKE AIR SURGE TANK (See page 11-13 )
9. REMOVE IGNITION COIL ASSY
10. REMOVE CYLINDER HEAD COVER SUB-ASSY (See page 14-7 )
11. REMOVE FRONT FENDER APRON SEAL RH
12. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-5 )
13. REMOVE VANE PUMP V BELT (See page 14-5 )
14. REMOVE ENGINE MOVING CONTROL ROD (See page 14-79 )
15. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14-79 )
16. REMOVE GENERATOR BRACKET NO.2 (See page 14-79 )
17. REMOVE CRANKSHAFT PULLEY (See page 14-79 )  
SST 09213-54015 (91651-60855), 09330-00021, 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)
18. REMOVE TIMING BELT NO.1 COVER
19. REMOVE TIMING BELT NO.2 COVER (See page 14-79 )
20. REMOVE ENGINE MOUNTING BRACKET RH (See page 14-79 )
21. REMOVE TIMING BELT GUIDE NO.2
22. REMOVE TIMING BELT (See page 14-79 )
23. REMOVE TIMING BELT IDLER SUB-ASSY NO.2



### 24. REMOVE CAMSHAFT TIMING PULLEY

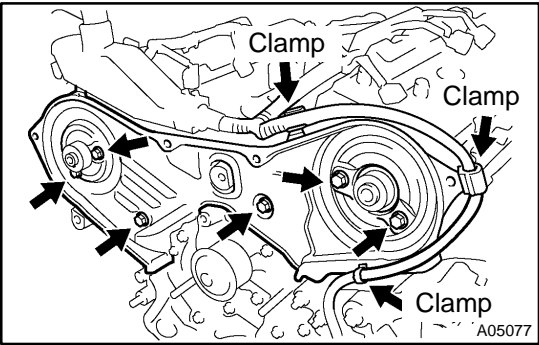
- (a) Using SST, remove the bolt and RH timing pulley.  
SST 09960-10010 (09962-01000, 09963-01000), 09249-63010



- (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.



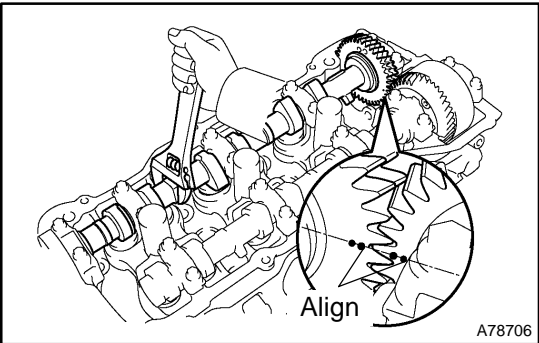
**25. REMOVE TIMING BELT NO.3 COVER**

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

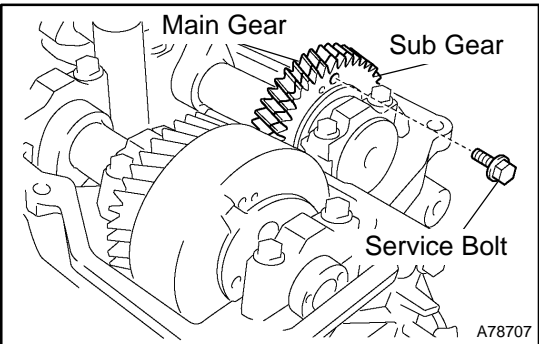
**26. REMOVE CAMSHAFT**

**NOTICE:**

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



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



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

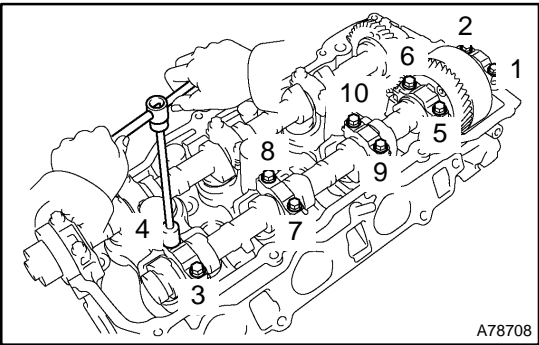
**Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)**

**Recommended service bolt**

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

**HINT:**

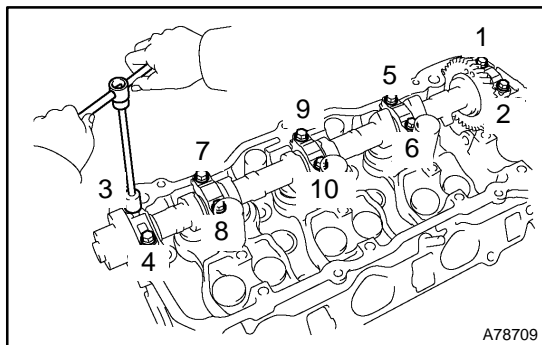
When removing the camshaft, make certain that the torsional spring force of the sub gear has been eliminated by installation of the service bolt.



- (c) Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and camshaft.

**NOTICE:**

- Do not pry out the camshaft.
- Be careful not to damage the contact surface of the cylinder head that receives the shaft thrust.

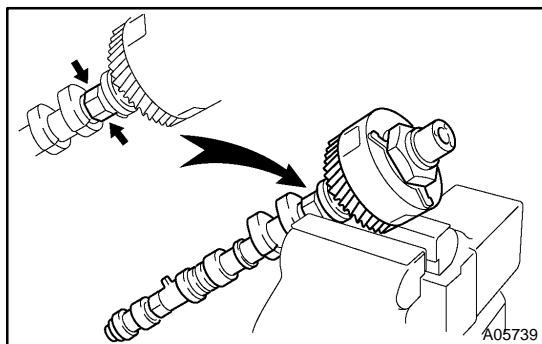
**27. REMOVE NO.2 CAMSHAFT**

- (a) Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and No. 2 camshaft.

**NOTICE:**

- Do not pry out the camshaft.
- Be careful not to damage the contact surface of the cylinder head that receives the shaft thrust.

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

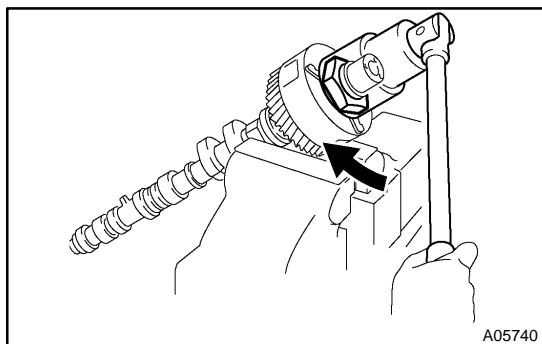
**28. REMOVE CAMSHAFT TIMING GEAR ASSY****NOTICE:**

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

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

**NOTICE:**

Be careful not to damage the camshaft.



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

**NOTICE:**

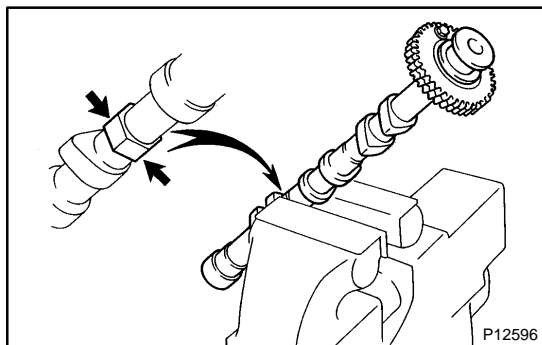
- Remove it with the lock pin engaged and locked at the most retard angle position.
- The lock nut has LH threads.
- Never use any tools other than the socket wrench. Other tools will deform the cam angle rotor.

- (c) Remove the camshaft VVT-i.

**NOTICE:**

Never remove the 3 bolts on the gear.

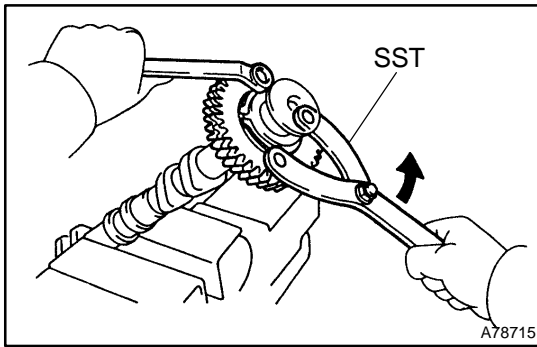
If it is difficult to remove VVT-i, tap it lightly using a plastic-faced hammer, then remove it.

**29. REMOVE CAMSHAFT SUB GEAR**

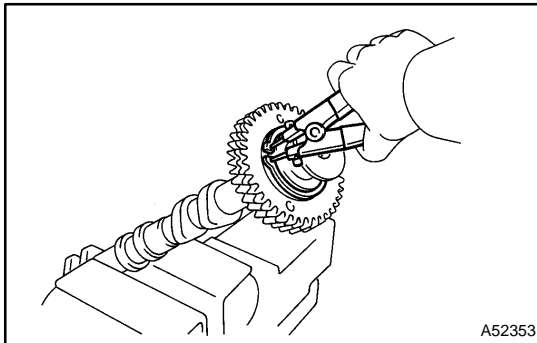
- (a) Clamp the camshaft in a vise on the hexagonal lobe.

**NOTICE:**

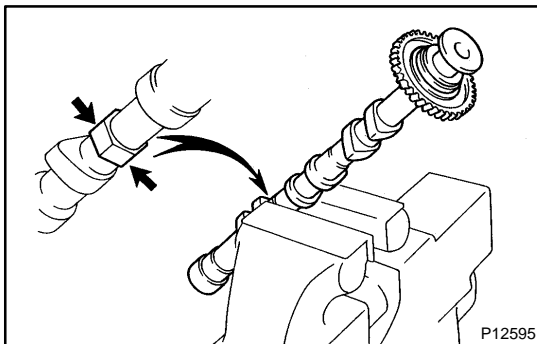
Be careful not to damage the camshaft.



- (b) Using SST, turn the sub gear counterclockwise, then 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.

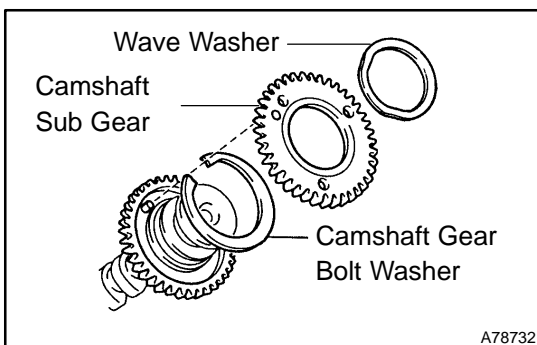


### 30. INSTALL CAMSHAFT SUB GEAR

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

#### NOTICE:

Be careful not to damage the camshaft.

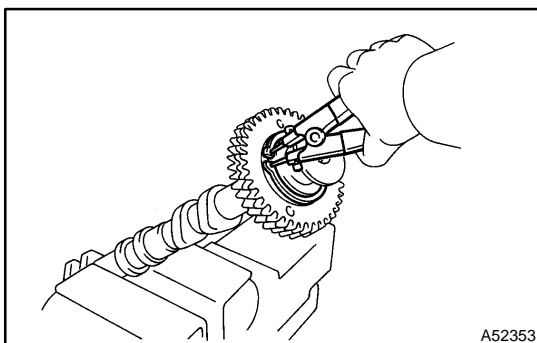


- (b) Install the camshaft gear bolt washer and camshaft sub gear.

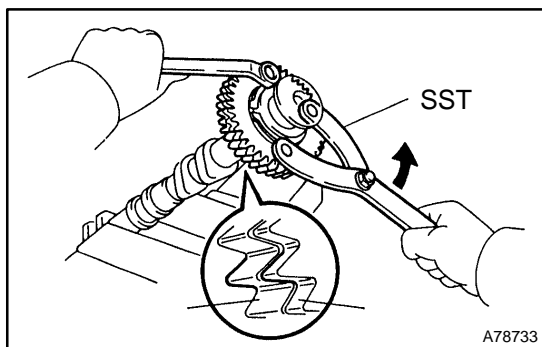
#### HINT:

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, then temporarily install a service bolt.

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

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

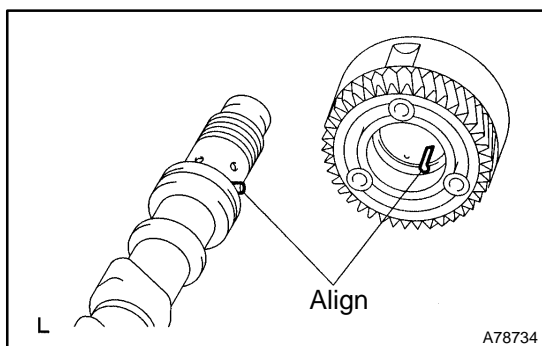
**Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)**

**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.



**31. INSTALL CAMSHAFT TIMING GEAR ASSY**

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

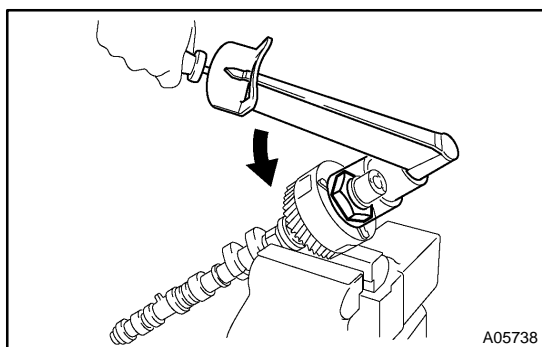
**NOTICE:**

**Install it with the lock pin engaged and locked at the most retard angle position.**

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

**NOTICE:**

- **Be sure to apply the oil, otherwise the specified torque cannot be obtained.**
- **New nut 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:**

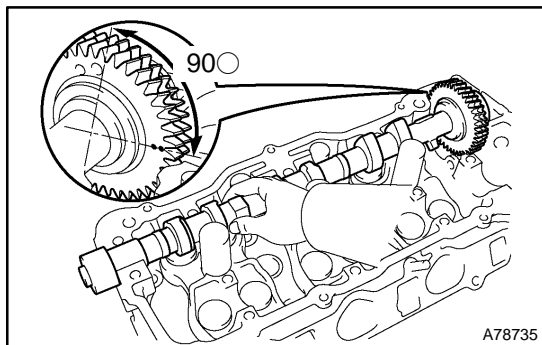
- **The lock nut has LH threads.**
- **Never use any tools other than the socket wrench. Other tools will deform the cam angle rotor.**

**32. INSTALL NO.2 CAMSHAFT**

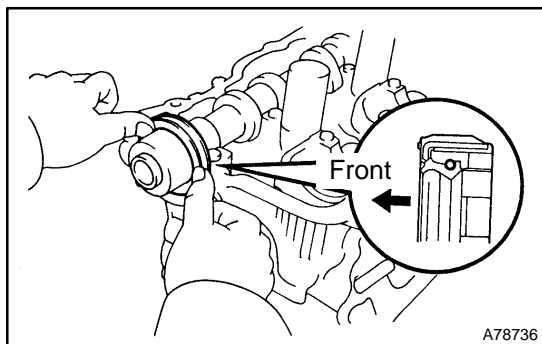
**NOTICE:**

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

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



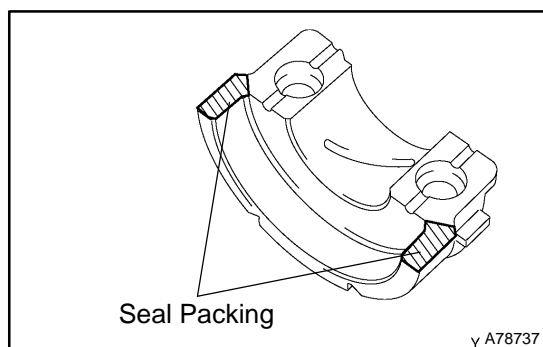
- (b) Place the No. 2 camshaft at a 90° angle of the timing mark (2 dot marks) on the cylinder head.
- (c) Apply multi-purpose grease to a new oil seal lip.



- (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.

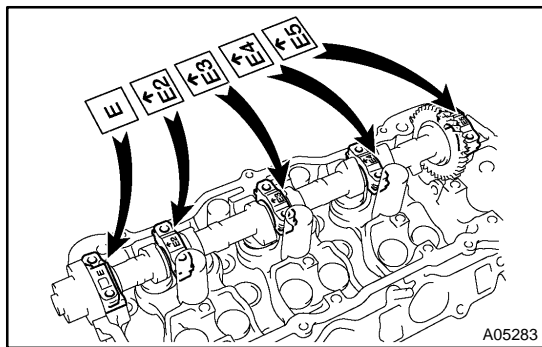


- (f) Apply seal packing to the bearing cap No. 1 as shown in the illustration.

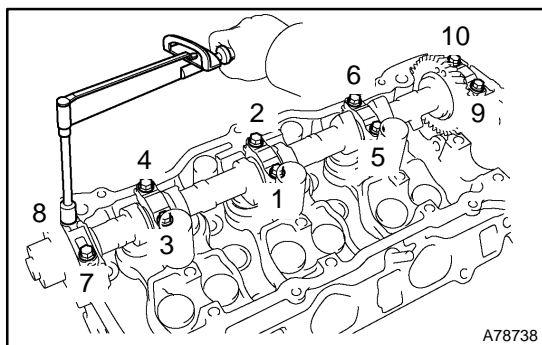
**Seal packing: Part No. 08826-00080 or equivalent**

**NOTICE:**

- Install the bearing cap No. 1 within 5 minutes after applying seal packing.
- Do not expose the seal packing to engine oil within 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.



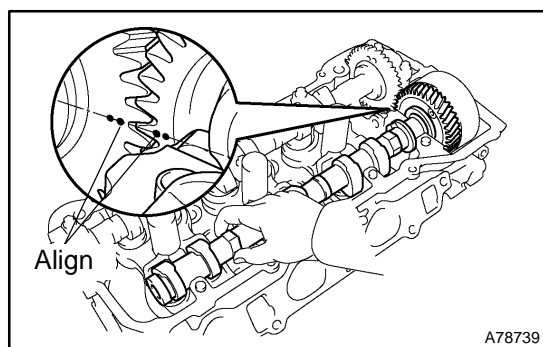
- (i) Using several steps, tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.

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

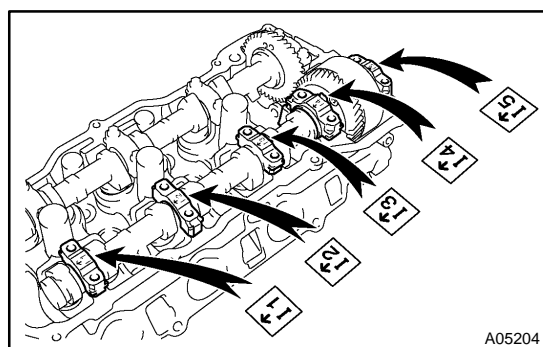
**33. INSTALL CAMSHAFT****NOTICE:**

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

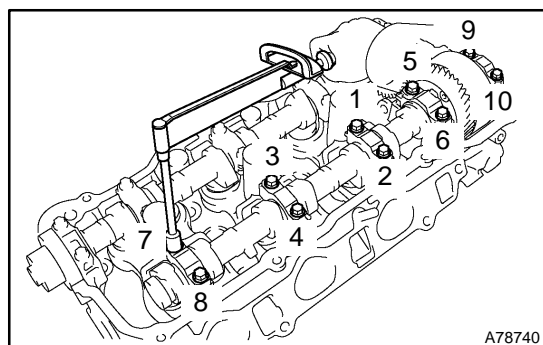
- (a) Apply new engine oil to the thrust portion and journal of the camshaft.



- (b) Align the timing marks (2 dot marks) of the camshaft drive and driven gears.  
(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) Using several steps, tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.

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

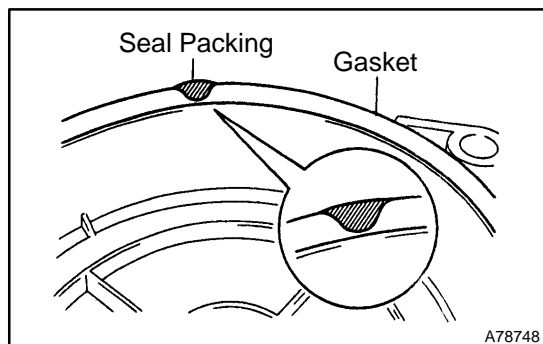
- (g) Remove the service bolt.

**34. INSTALL TIMING BELT NO.3 COVER**

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

**HINT:**

If there is a trace of water intrusion when checking visually, repair the gasket with seal packing when the crack length is within 2 to 3 cm (0.79 to 1.18 in.). Replace the gasket when the crack length is 3 to 4 cm (1.18 to 1.57 in.) or longer.



- (b) If the timing belt cover gasket is needed to repair, follow the procedure below.

- (1) Repair the cracks and breaks by applying seal packing to the damaged area.

**Seal packing: Part No. 08826-00080 or equivalent**

**NOTICE:**

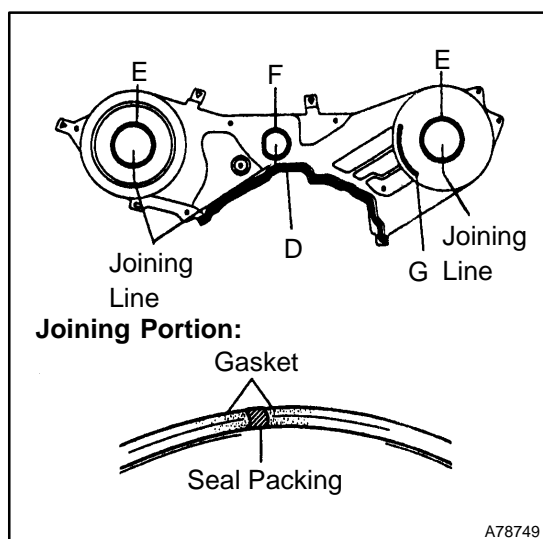
**When applying the seal packing, apply it as wide and high as the gasket.**

- (c) If the timing belt cover gasket is needed to replace, 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, then 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.**

**HINT:**

Gasket	D	E	F	G
Length	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 between the ends of the gasket, apply seal packing to close the gap.

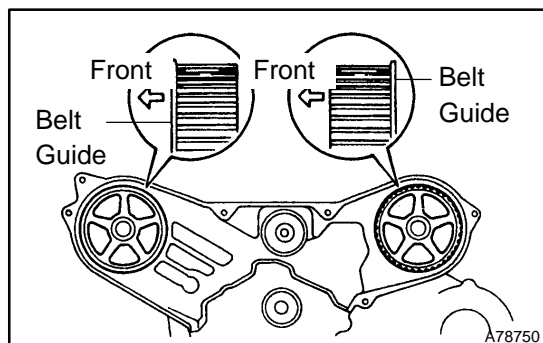
**Seal packing: Part No. 08826-00080 or equivalent**

**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: 8.5 N·m (87 kgf·cm, 75 in.-lbf)**



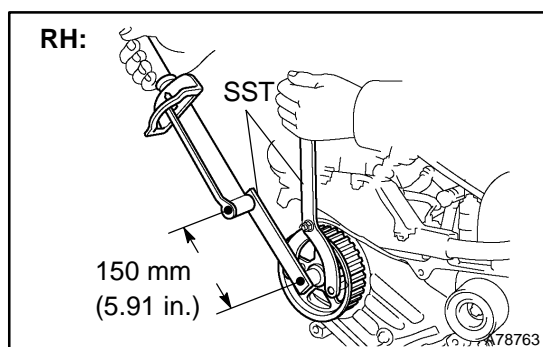
### 35. INSTALL CAMSHAFT TIMING PULLEY

- (a) Pay attention to the orientation of the belt guide. Install the camshaft timing pulley with the belt guide properly oriented, then tighten the bolt temporarily.

**HINT:**

- Align the belt guide of the RH timing pulley so it faces the front of the engine as illustrated.
- Align the belt guide of the LH timing pulley so it faces the rear of the engine as illustrated.





- (b) Using SST, tighten the RH pulley bolt.  
SST 09960-10010 (09962-01000, 09963-01000),  
09249-63010

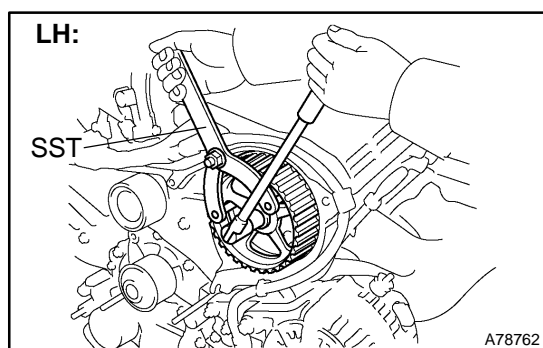
**Torque: 125 N·m (1,275 kgf·cm, 92 ft·lbf)**

**NOTICE:**

The torque indicated above is used without SST on the extension tool. If you are using the extension tool, find the reading of the torque wrench by the formula (see page 01-5).

**Extended length:**

**SST (09249-63010) 150mm (5.91 in.)**



- (c) Using SST, tighten the LH pulley bolt.  
SST 09960-10010 (09962-01000, 09963-01000)  
**Torque: 125 N·m (1275 kgf·cm, 92 ft·lbf)**

**36. INSTALL TIMING BELT IDLER SUB-ASSY NO.2**

**Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)**

**37. INSPECT TIMING BELT (See page 14-79 )**

**38. INSTALL TIMING BELT (See page 14-79 )**

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

**39. INSTALL TIMING BELT TENSIONER ASSY (See page 14-79 )**

**40. INSTALL TIMING BELT GUIDE NO.2 (See page 14-79 )**

**41. INSTALL ENGINE MOUNTING BRACKET RH (See page 14-79 )**

**42. INSTALL TIMING BELT NO.2 COVER (See page 14-79 )**

**43. INSTALL TIMING BELT NO.1 COVER (See page 14-79 )**

**44. INSTALL CRANKSHAFT PULLEY (See page 14-79 )**

SST 09213-54015 (91651-60855), 09330-00021

**45. INSTALL GENERATOR BRACKET NO.2 (See page 14-79 )**

**46. INSTALL ENGINE MOUNTING STAY NO.2 RH (See page 14-79 )**

**47. INSTALL ENGINE MOVING CONTROL ROD (See page 14-79 )**

**48. INSPECT VALVE CLEARANCE (See page 14-7 )**

**49. ADJUST VALVE CLEARANCE (See page 14-7 )**

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

**50. INSTALL VANE PUMP V BELT (See page 14-5 )**

**51. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-5 )**

**52. INSPECT DRIVE BELT DEFLECTION AND TENSION (See page 14-1 )**

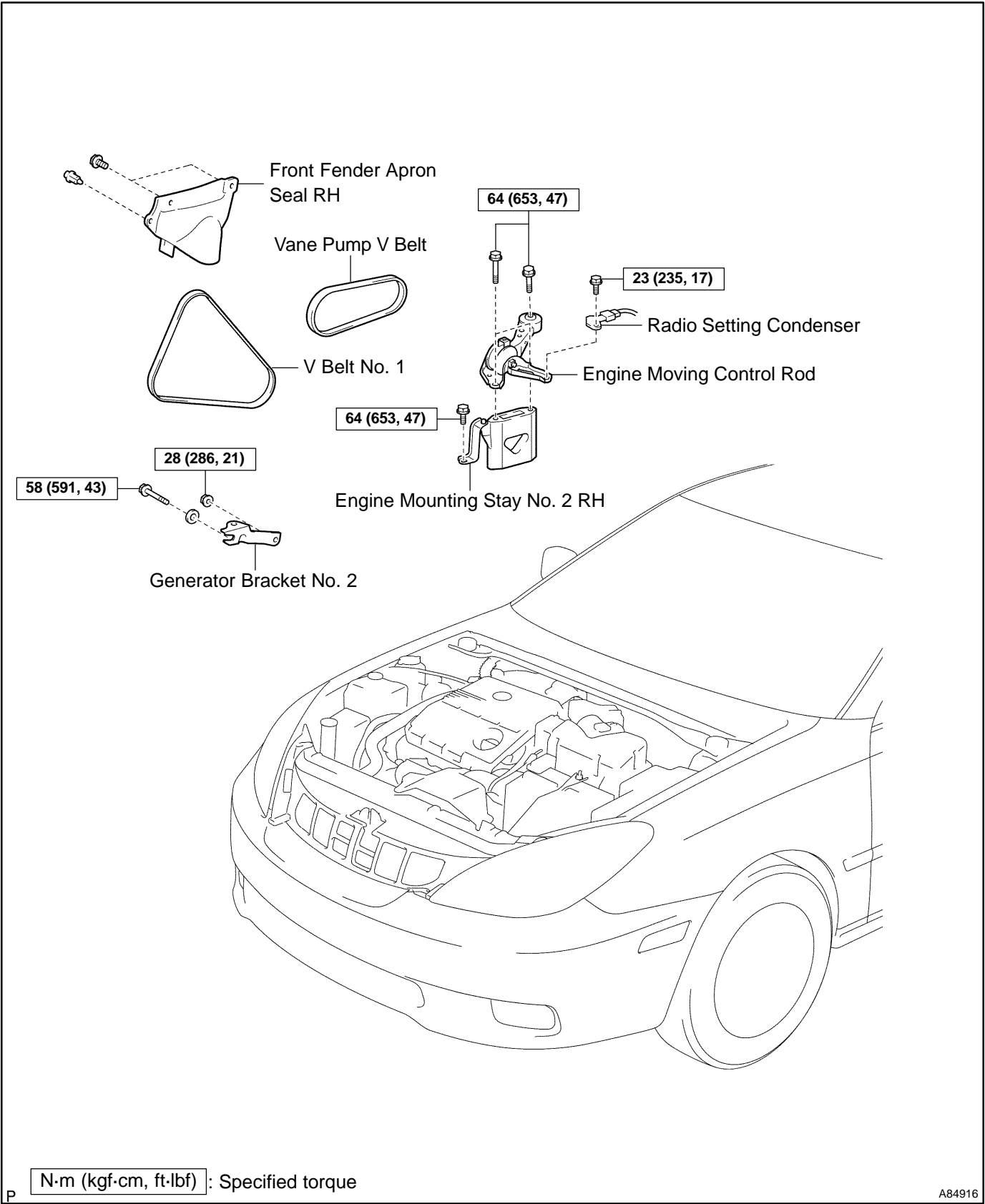
**53. INSTALL CYLINDER HEAD COVER SUB-ASSY (See page 14-7 )**

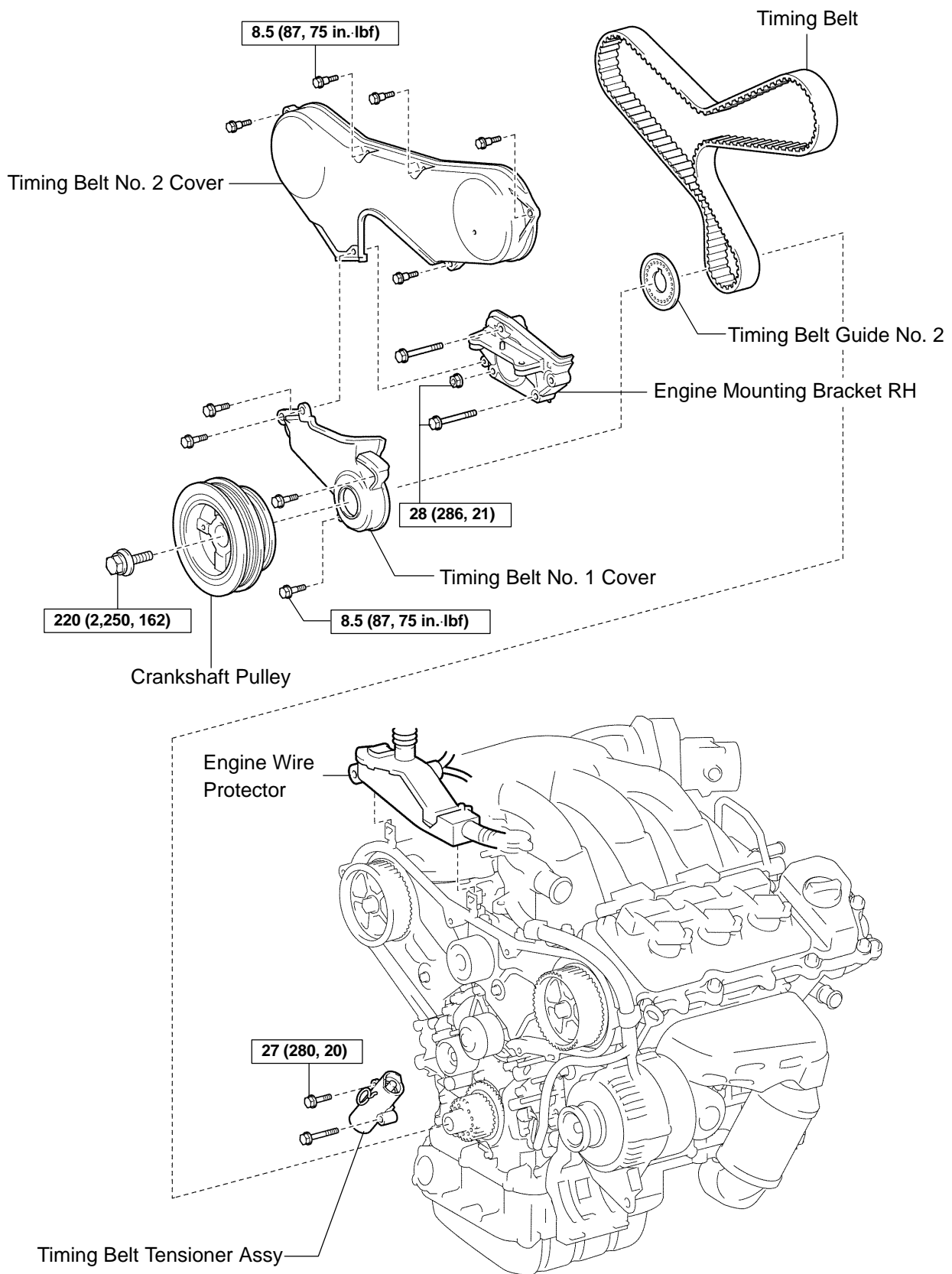
**54. INSTALL IGNITION COIL ASSY (See page 14-7 )**

- 55. INSTALL INTAKE AIR SURGE TANK (See page [11-13](#) )
- 56. INSTALL EMISSION CONTROL VALVE SET (See page [11-13](#) )
- 57. INSTALL AIR CLEANER CAP SUB-ASSY (See page [10-1 1](#) )
- 58. CHECK CONNECTION OF VACUUM HOSE (See page [14-29](#) )
- 59. INSTALL V-BANK COVER SUB-ASSY (See page [10-1 1](#) )
- 60. INSTALL FRONT SUSPENSION UPPER BRACE CENTER (W/O TEMS) (See page [10-1 1](#) )
- 61. INSTALL FRONT WHEEL RH (See page [14-5](#) )
- 62. ADD ENGINE COOLANT (See page [16-9](#) )
- 63. CHECK FOR ENGINE COOLANT LEAKS (See page [16-1](#) )
- 64. SYSTEM INITIALIZATION (See page [19-15](#) )

# CAMSHAFT (LH BANK) (3MZ-FE) COMPONENTS

141JE-01

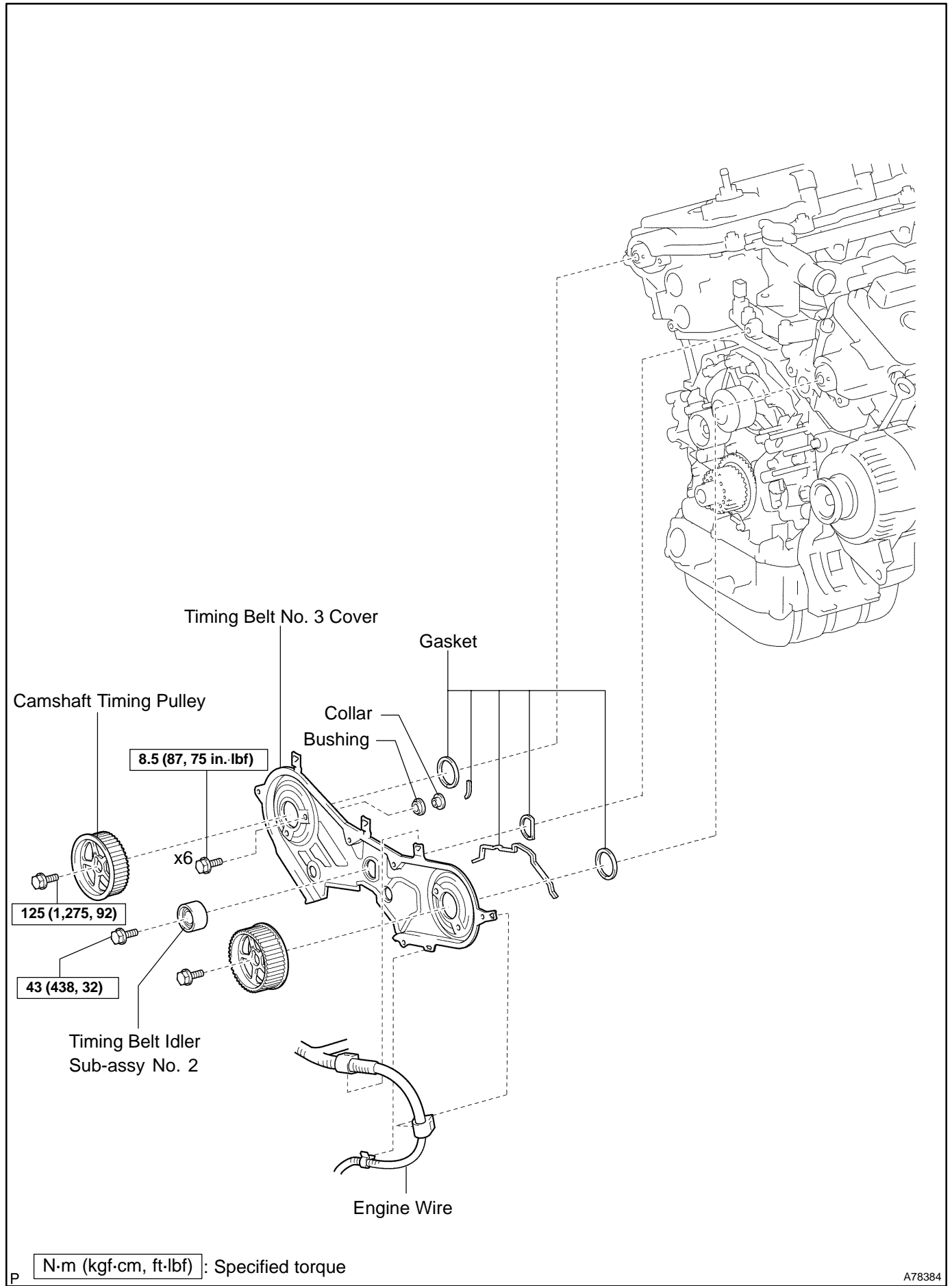


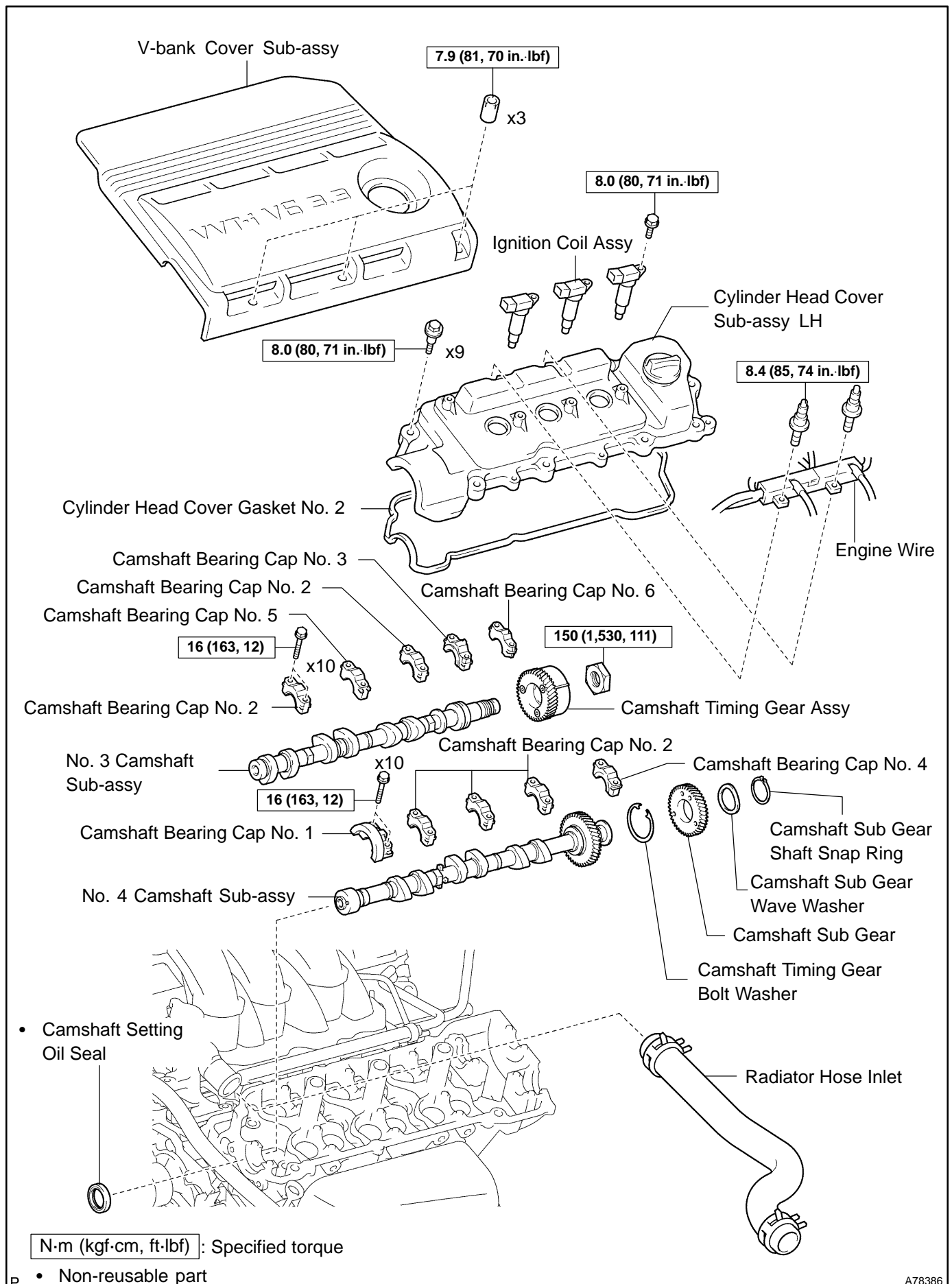


N·m (kgf·cm, ft·lbf) : Specified torque

P

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A78386

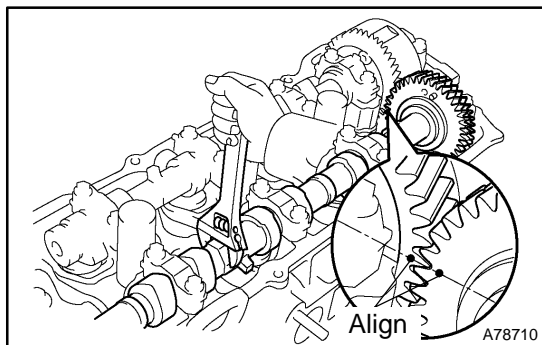
## REPLACEMENT

1. DISCONNECT BATTERY NEGATIVE TERMINAL
2. DRAIN ENGINE COOLANT (See page 16-9 )
3. REMOVE FRONT WHEEL RH
4. REMOVE V-BANK COVER SUB-ASSY (See page 10-1 1)
5. REMOVE RADIATOR HOSE INLET
6. REMOVE IGNITION COIL ASSY
7. REMOVE CYLINDER HEAD COVER SUB-ASSY LH (See page 14-7 )
8. REMOVE FRONT FENDER APRON SEAL RH
9. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1  
(See page 14-5 )
10. REMOVE VANE PUMP V BELT (See page 14-5 )
11. REMOVE ENGINE MOVING CONTROL ROD (See page 14-79 )
12. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14-79 )
13. REMOVE GENERATOR BRACKET NO.2 (See page 14-79 )
14. REMOVE CRANKSHAFT PULLEY (See page 14-79 )  
SST 09213-54015 (91651-60855), 09330-00021, 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)
15. REMOVE TIMING BELT NO.1 COVER
16. REMOVE TIMING BELT NO.2 COVER (See page 14-79 )
17. REMOVE ENGINE MOUNTING BRACKET RH (See page 14-79 )
18. REMOVE TIMING BELT GUIDE NO.2
19. REMOVE TIMING BELT (See page 14-79 )
20. REMOVE TIMING BELT IDLER SUB-ASSY NO.2
21. REMOVE CAMSHAFT TIMING PULLEY (See page 14-93 )  
SST 09960-10010 (09962-01000, 09963-01000), 09249-63010
22. REMOVE TIMING BELT NO.3 COVER (See page 14-93 )

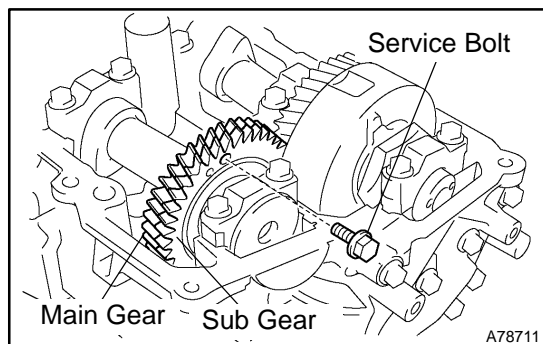
### 23. REMOVE NO.3 CAMSHAFT SUB-ASSY

#### NOTICE:

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



- (a) Align the timing marks (1 dot marks) of the camshaft drive and driven gears by turning the camshaft with a wrench.



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

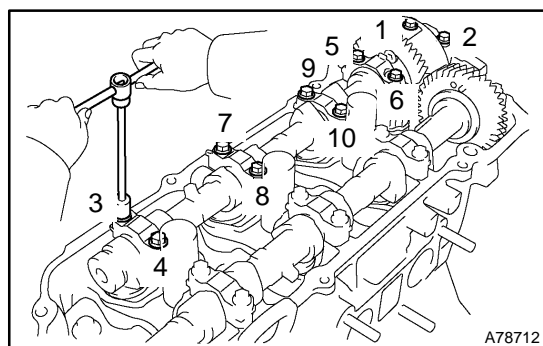
**Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)**

#### Recommended service bolt

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

#### HINT:

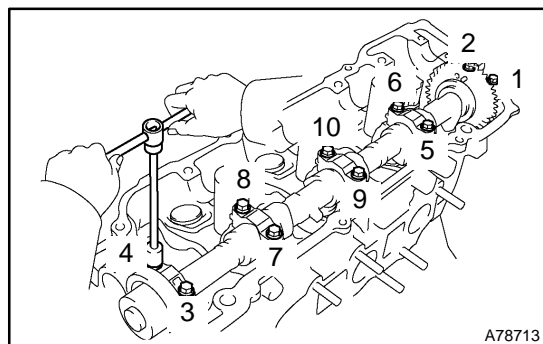
When removing the camshaft, make certain that the torsional spring force of the sub gear has been eliminated by installation of the service bolt.



- (c) Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and No. 3 camshaft.

#### NOTICE:

- Do not pry out the camshaft.
- Be careful not to damage the contact surface of the cylinder head that receives the shaft thrust.



#### 24. REMOVE NO.4 CAMSHAFT SUB-ASSY

- (a) Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and No. 4 camshaft.

#### NOTICE:

- Do not pry out the camshaft.
  - Be careful not to damage the contact surface of the cylinder head that receives the shaft thrust.
- (b) Remove the oil seal from the No. 4 camshaft.

#### 25. REMOVE CAMSHAFT TIMING GEAR ASSY (See page 14-93 )

#### 26. REMOVE CAMSHAFT SUB GEAR NO.3 (See page 14-93 )

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

#### 27. INSTALL CAMSHAFT SUB GEAR NO.3 (See page 14-93 )

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

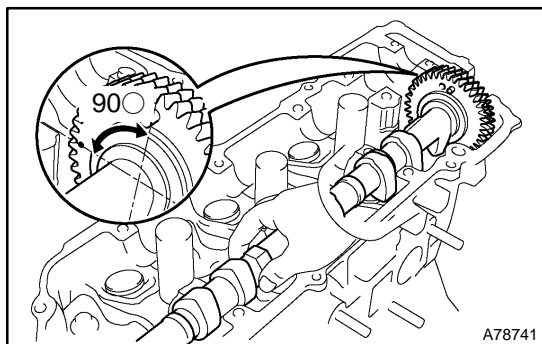
#### 28. INSTALL CAMSHAFT TIMING GEAR ASSY (See page 14-93 )



**29. INSTALL NO.4 CAMSHAFT SUB-ASSY****NOTICE:**

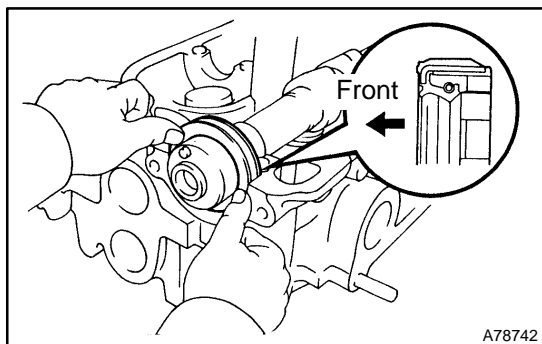
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while being installed. If the camshaft is not kept level, the cylinder head or camshaft may be damaged. To avoid this, the following steps must be carried out.

- (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 marks) on the cylinder head.

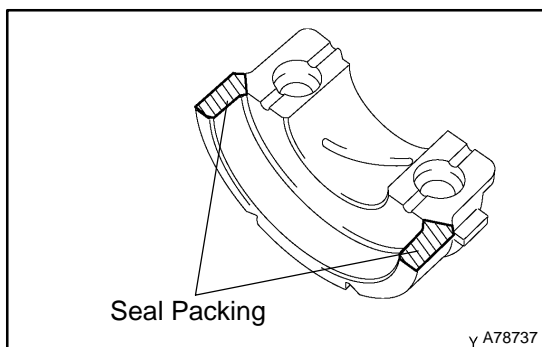
- (c) Apply multi-purpose grease to a new oil seal lip.



- (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.

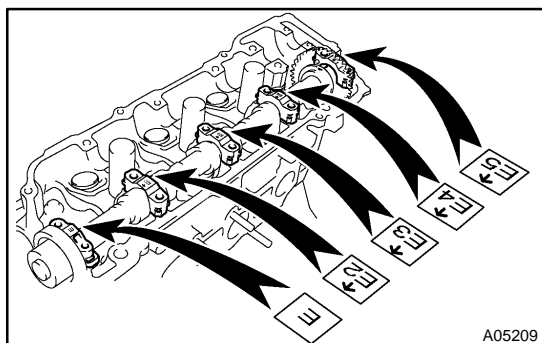


- (f) Apply seal packing to the bearing cap No. 1 as shown in the illustration.

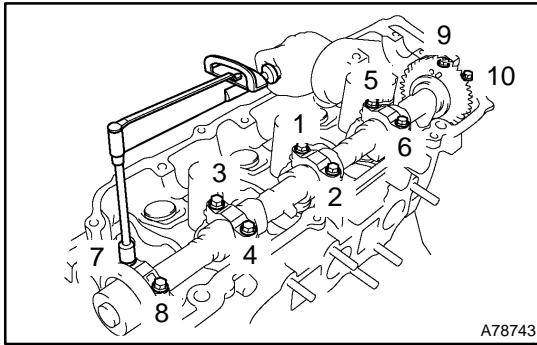
**Seal packing: Part No. 08826-00080 or equivalent**

**NOTICE:**

- Install the bearing cap No. 1 within 5 minutes after applying seal packing.
- Do not expose the seal packing to engine oil within 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.



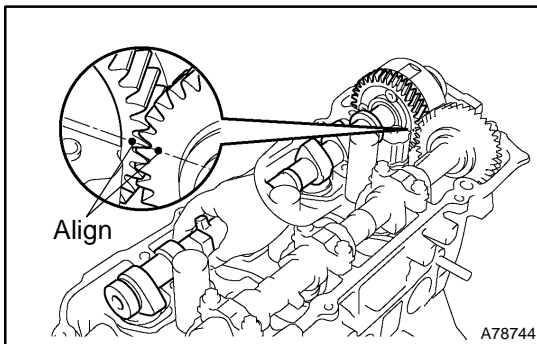
- (i) Using several steps, install and tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.  
**Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)**

### 30. INSTALL NO.3 CAMSHAFT SUB-ASSY

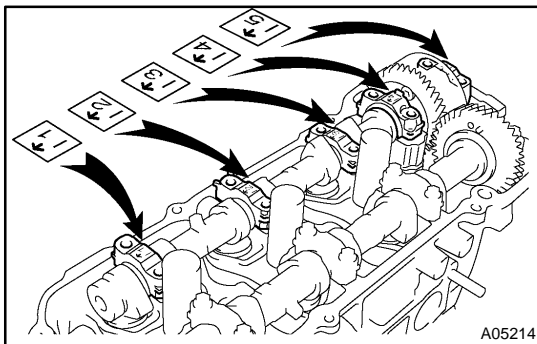
#### NOTICE:

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

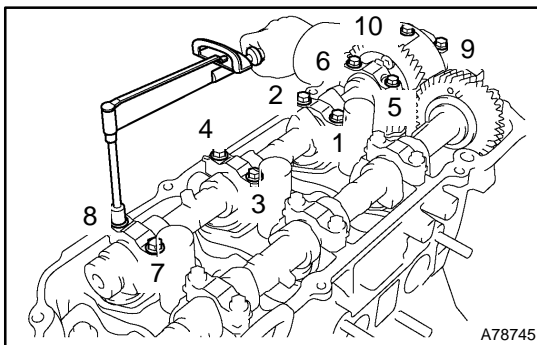
- (a) Apply new engine oil to the thrust portion and journal of the camshaft.



- (b) Align the timing marks (1 dot marks) of the camshaft drive and driven gears.  
(c) Place the camshaft to 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) Using several steps, install and tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.  
**Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)**  
(g) Remove the service bolt.

### 31. INSTALL TIMING BELT NO.3 COVER (See page 14-93 )

### 32. INSTALL CAMSHAFT TIMING PULLEY (See page 14-93 )

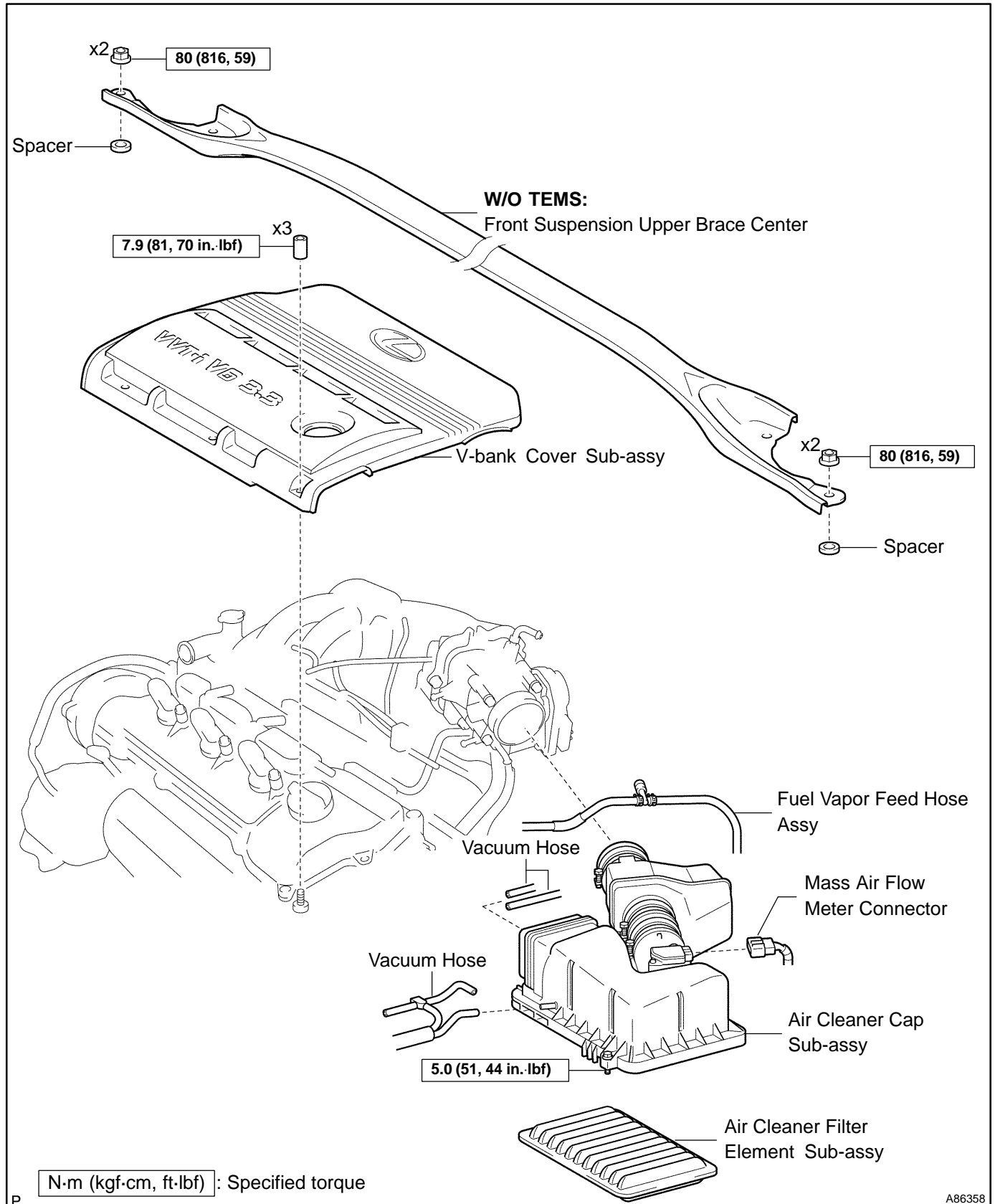
SST 09960-10010 (09962-01000, 09963-01000), 09249-63010

### 33. INSTALL TIMING BELT IDLER SUB-ASSY NO.2 (See page 14-93 )

34. INSPECT TIMING BELT (See page 14-79 )
35. INSTALL TIMING BELT (See page 14-79 )  
SST 09960-10010 (09962-01000, 09963-01000)
36. INSTALL TIMING BELT TENSIONER ASSY (See page 14-79 )
37. INSTALL TIMING BELT GUIDE NO.2 (See page 14-79 )
38. INSTALL ENGINE MOUNTING BRACKET RH (See page 14-79 )
39. INSTALL TIMING BELT NO.2 COVER (See page 14-79 )
40. INSTALL TIMING BELT NO.1 COVER (See page 14-79 )
41. INSTALL CRANKSHAFT PULLEY (See page 14-79 )  
SST 09213-54015 (91651-60855), 09330-00021
42. INSTALL GENERATOR BRACKET NO.2 (See page 14-79 )
43. INSTALL ENGINE MOUNTING STAY NO.2 RH (See page 14-79 )
44. INSTALL ENGINE MOVING CONTROL ROD (See page 14-79 )
45. INSPECT VALVE CLEARANCE (See page 14-7 )
46. ADJUST VALVE CLEARANCE (See page 14-7 )  
SST 09248-55040 (09248-05410, 09248-05420)
47. INSTALL VANE PUMP V BELT (See page 14-5 )
48. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1  
(See page 14-5 )
49. INSPECT DRIVE BELT DEFLECTION AND TENSION (See page 14-1 )
50. INSTALL CYLINDER HEAD COVER SUB-ASSY LH (See page 14-7 )
51. INSTALL IGNITION COIL ASSY (See page 14-7 )
52. INSTALL V-BANK COVER SUB-ASSY (See page 10-1 1)
53. INSTALL FRONT WHEEL RH (See page 14-5 )
54. ADD ENGINE COOLANT (See page 16-9 )
55. CHECK FOR ENGINE COOLANT LEAKS (See page 16-1 )
56. SYSTEM INITIALIZATION (See page 19-15 )

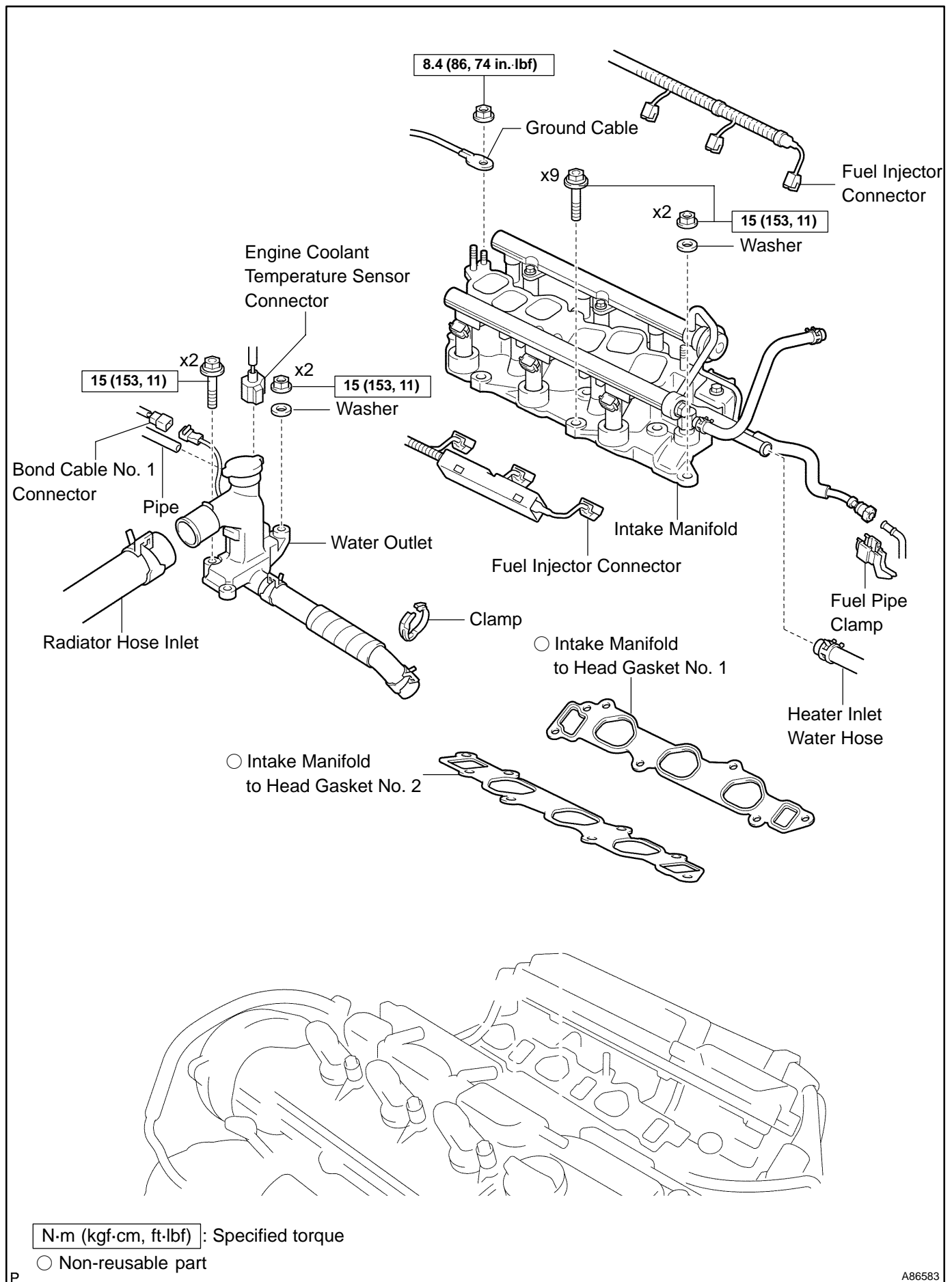
# CYLINDER HEAD GASKET (3MZ-FE) COMPONENTS

141JG-01

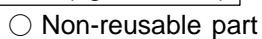


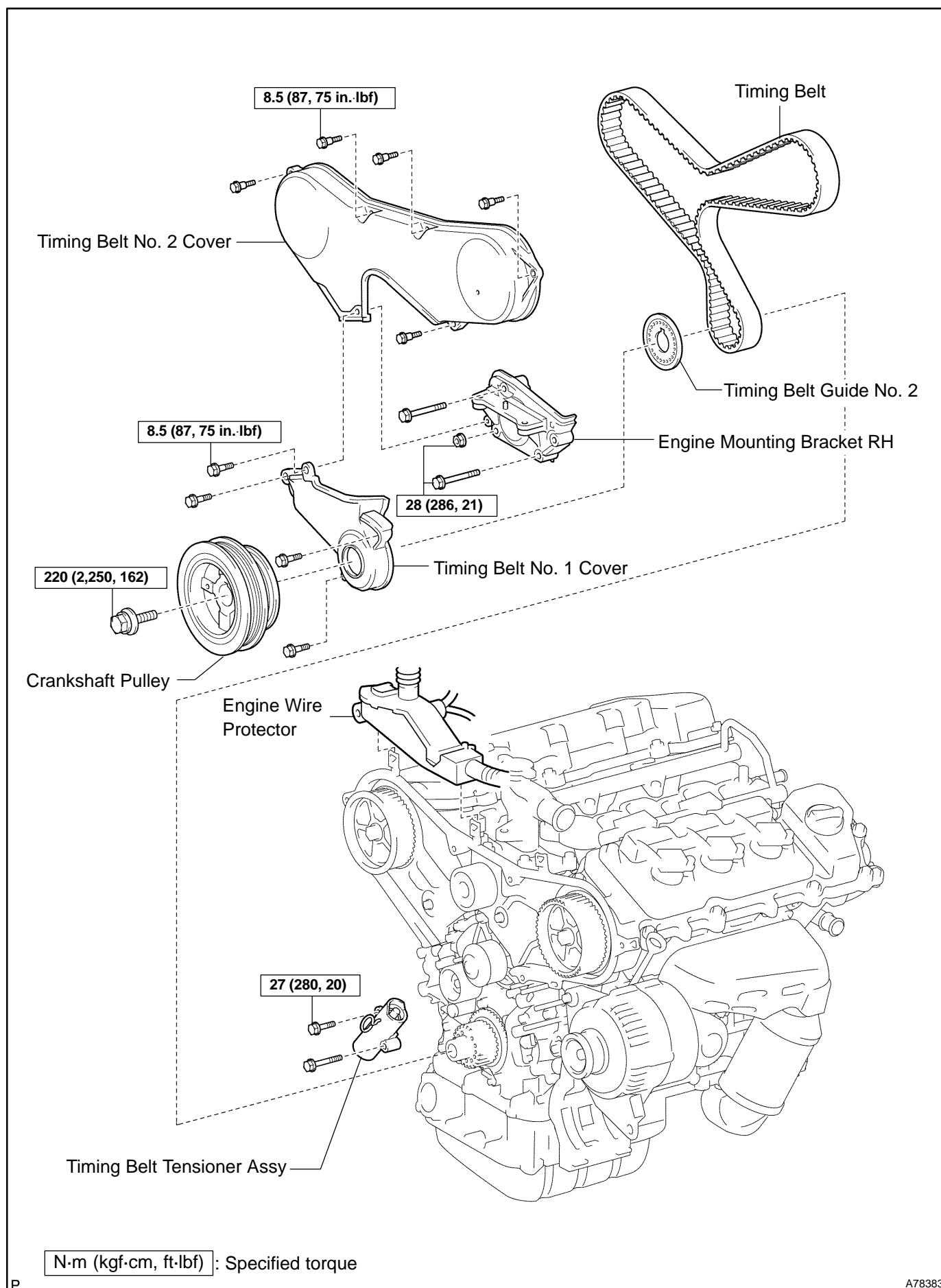
A86358



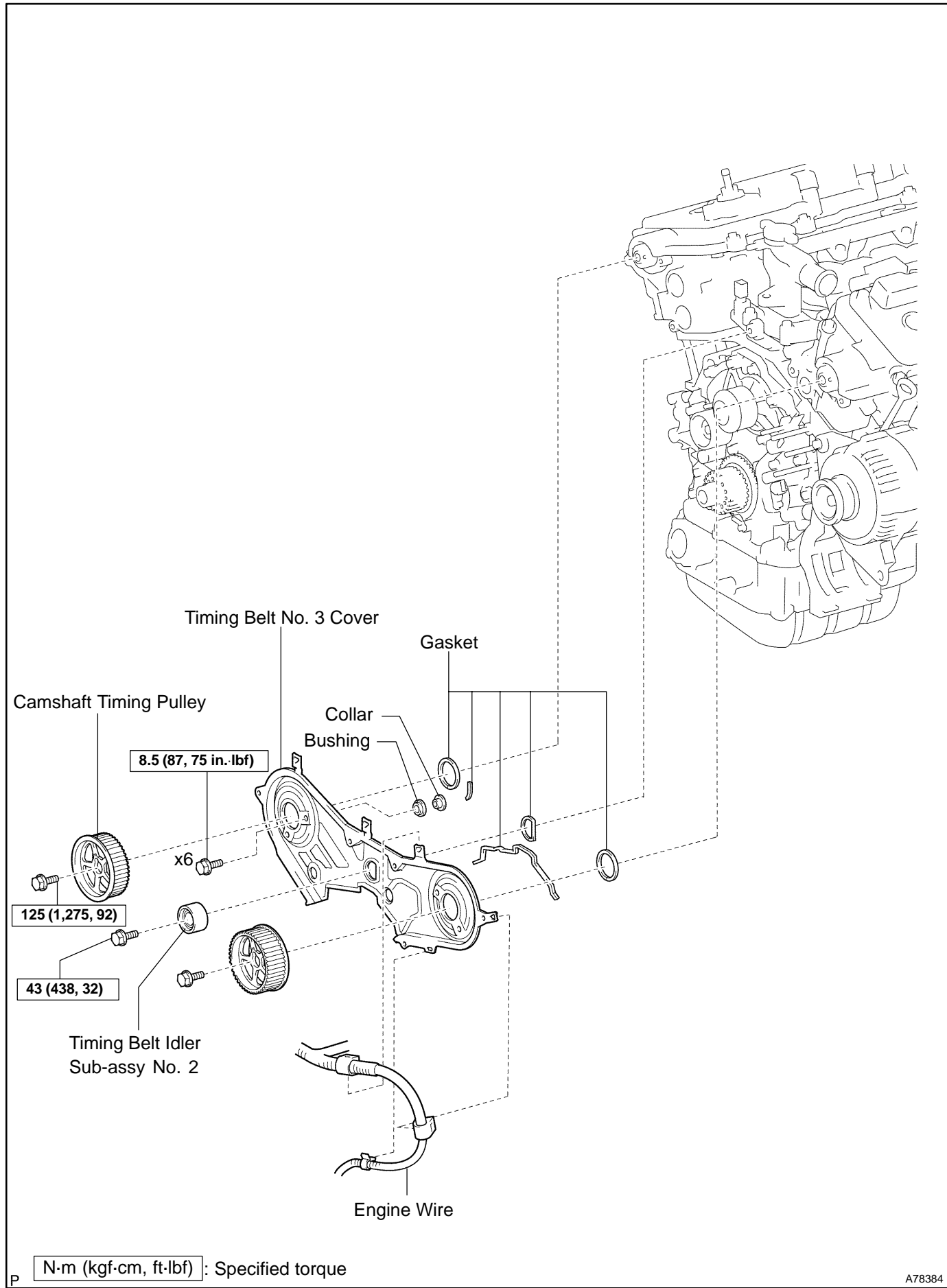


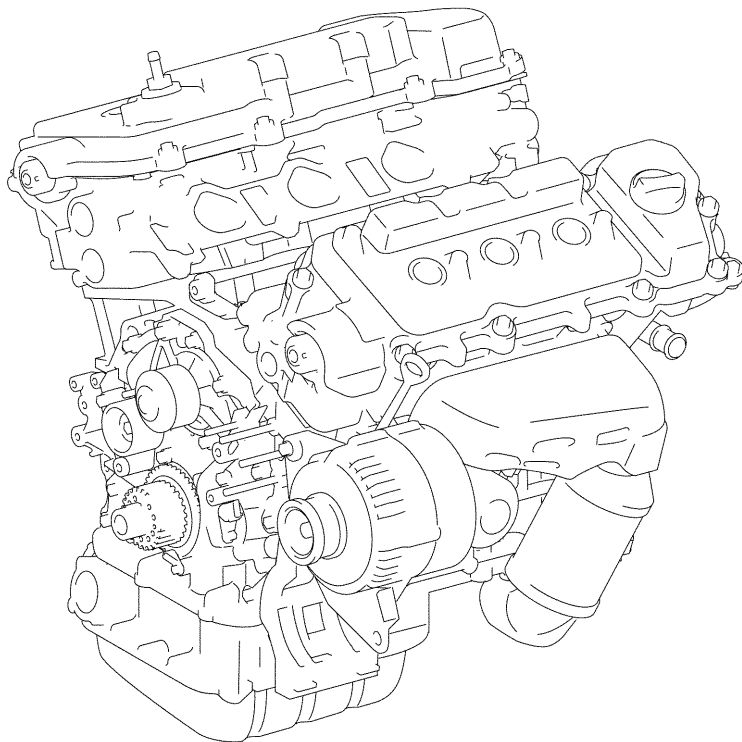
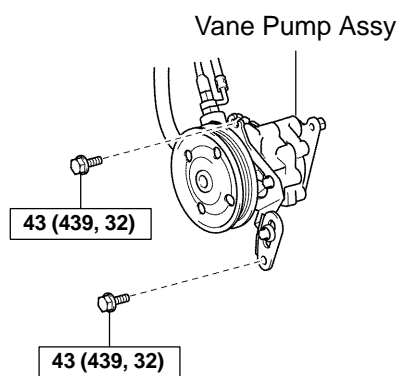
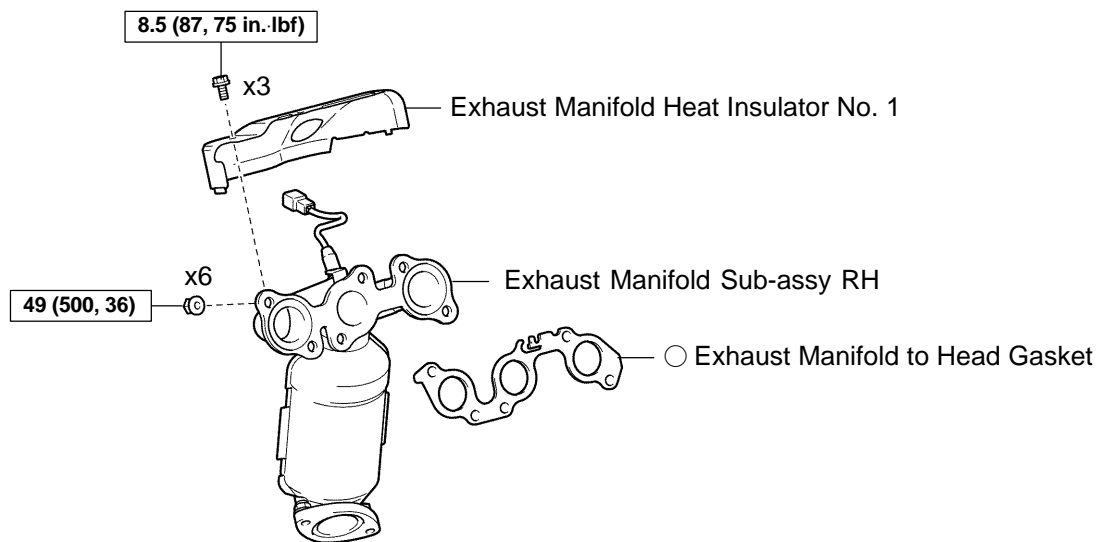
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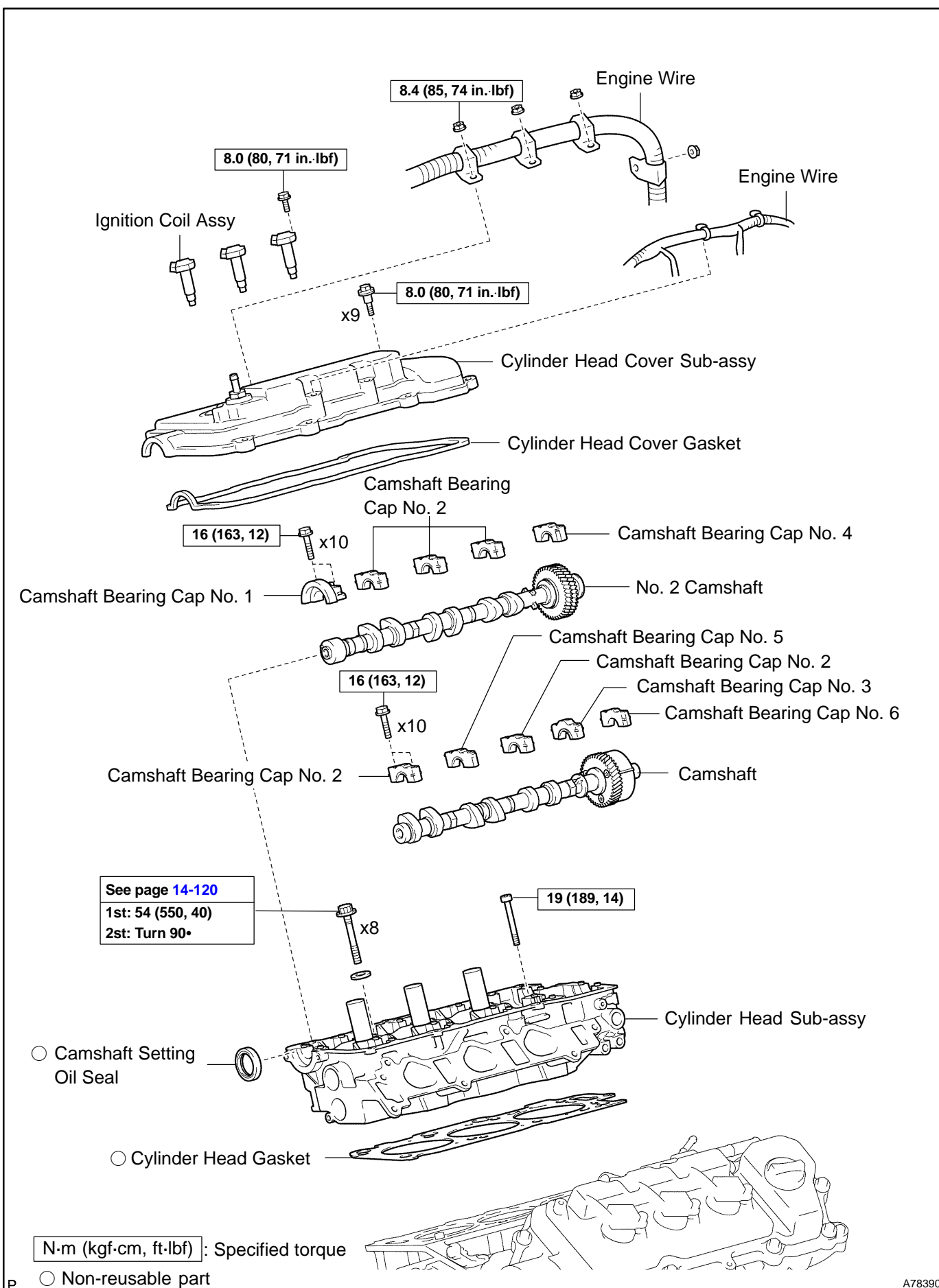




N·m (kgf·cm, ft·lbf) : Specified torque

○ Non-reusable part

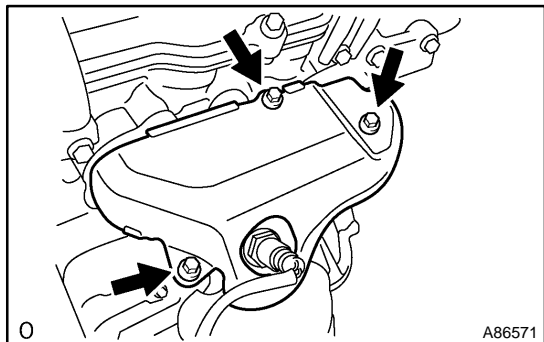
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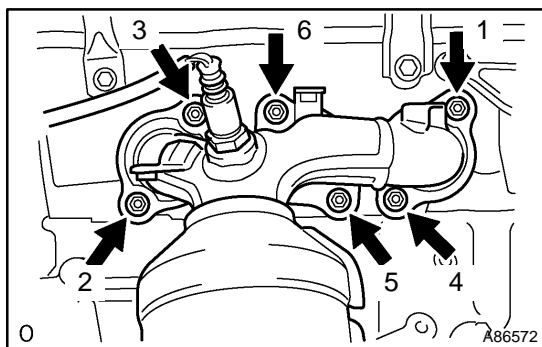


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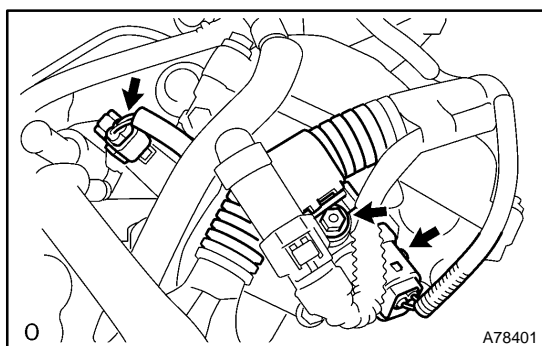
## REPLACEMENT

1. DISCHARGE FUEL SYSTEM PRESSURE (See page 11-1 )
2. DISCONNECT BATTERY NEGATIVE TERMINAL
3. DRAIN ENGINE COOLANT (See page 16-9 )
4. DRAIN ENGINE OIL (See page 17-20 )
5. REMOVE FRONT WHEEL RH
6. REMOVE FRONT SUSPENSION UPPER BRACE CENTER (W/O TEMS) (See page 10-1 1)
7. REMOVE V-BANK COVER SUB-ASSY (See page 10-1 1)
8. REMOVE AIR CLEANER CAP SUB-ASSY (See page 10-1 1)
9. REMOVE EMISSION CONTROL VALVE SET (See page 11-13 )
10. REMOVE INTAKE AIR SURGE TANK (See page 11-13 )
11. REMOVE INTAKE MANIFOLD (See page 10-16 )
12. REMOVE WATER OUTLET (See page 10-16 )
13. REMOVE FRONT FENDER APRON SEAL RH
14. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-5 )
15. REMOVE VANE PUMP V BELT (See page 14-5 )
16. REMOVE ENGINE MOVING CONTROL ROD (See page 14-79 )
17. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14-79 )
18. REMOVE GENERATOR BRACKET NO.2 (See page 14-79 )
19. REMOVE CRANKSHAFT PULLEY (See page 14-79 )  
SST 09213-54015 (91651-60855), 09330-00021, 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)
20. REMOVE TIMING BELT NO.1 COVER
21. REMOVE TIMING BELT NO.2 COVER (See page 14-79 )
22. REMOVE ENGINE MOUNTING BRACKET RH (See page 14-79 )
23. REMOVE TIMING BELT GUIDE NO.2
24. REMOVE TIMING BELT (See page 14-79 )
25. REMOVE TIMING BELT IDLER SUB-ASSY NO.2
26. REMOVE CAMSHAFT TIMING PULLEY (See page 14-93 )  
SST 09960-10010 (09962-01000, 09963-01000), 09249-63010
27. REMOVE TIMING BELT NO.3 COVER (See page 14-93 )
28. SEPARATE VANE PUMP ASSY
29. REMOVE EXHAUST PIPE NO.1 SUPPORT BRACKET FRONT (See page 15-2 )
30. REMOVE EXHAUST PIPE NO.1 SUPPORT BRACKET REAR (See page 15-2 )
31. REMOVE EXHAUST PIPE ASSY FRONT (See page 15-2 )
32. REMOVE EXHAUST MANIFOLD HEAT INSULATOR NO.1
  - (a) Disconnect the air fuel ratio sensor connector.
  - (b) Remove the 3 bolts and exhaust manifold heat insulator.



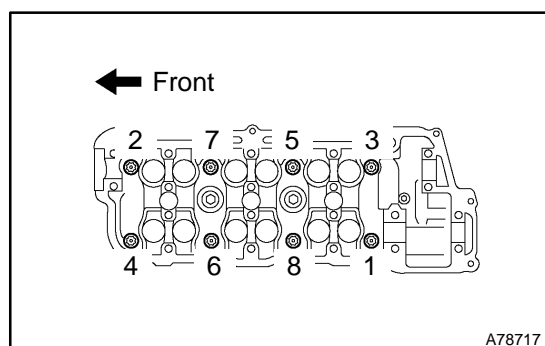
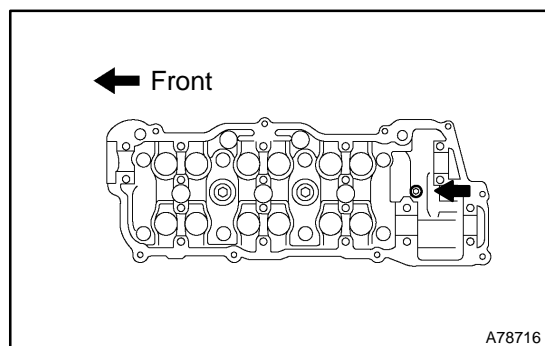
**33. REMOVE EXHAUST MANIFOLD SUB-ASSY RH**

- Using several steps, loosen and remove the 6 nuts in the sequence shown in the illustration.
- Remove the exhaust manifold RH and gasket from the cylinder head RH.

**34. REMOVE IGNITION COIL ASSY****35. REMOVE CYLINDER HEAD COVER SUB-ASSY (See page 14-7 )****36. REMOVE CAMSHAFT (See page 14-93 )****37. REMOVE NO.2 CAMSHAFT (See page 14-93 )****38. REMOVE CYLINDER HEAD SUB-ASSY**

- Disconnect the VVT sensor connector.
- Disconnect the camshaft timing oil control valve connector.
- Remove the nut, then disconnect the engine wire harness clamp.

- Using a socket hexagon wrench 8, remove the hexagon bolt.

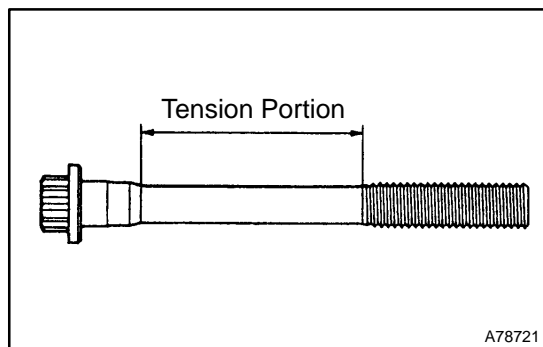


- Using several steps, loosen the 8 cylinder head bolts uniformly in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.

**NOTICE:**

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

**39. REMOVE CYLINDER HEAD GASKET**

**40. INSPECT CYLINDER HEAD SET BOLT**

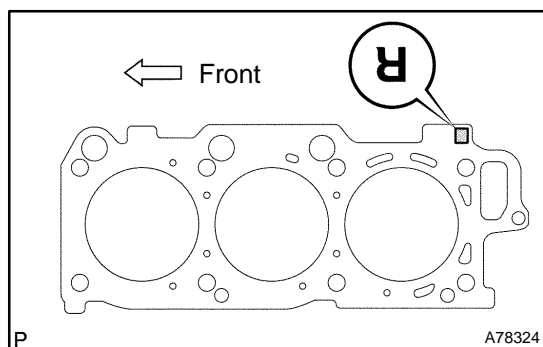
- (a) Using vernier calipers, measure the tension portion diameter of the bolt.

**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 minimum, replace the bolt.

**41. INSTALL CYLINDER HEAD GASKET**

- (a) Place a new cylinder head gasket on the cylinder block with the R mark upward.

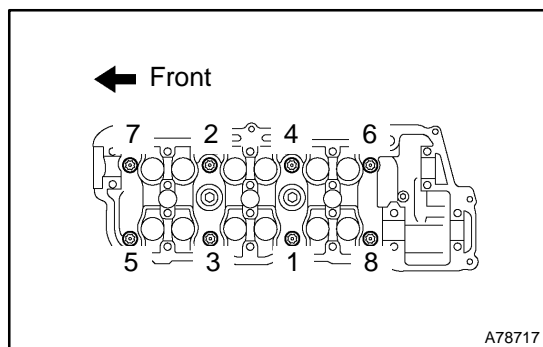
**NOTICE:**

- **Remove any oil from the contact surface.**
- **Be careful of the installing orientation.**
- **Place the cylinder head on the gasket carefully in order not to damage the gasket at the bottom part of the head.**

**42. INSTALL CYLINDER HEAD SUB-ASSY****NOTICE:**

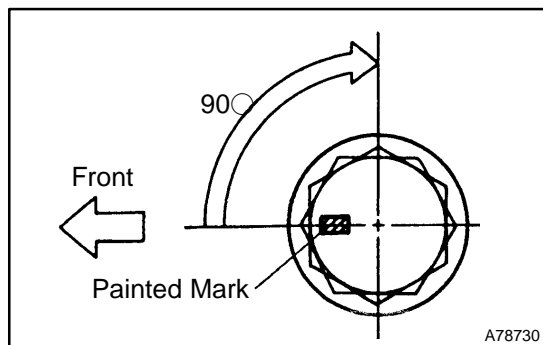
**The cylinder head bolts are tightened in 2 successive steps.**

- (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.

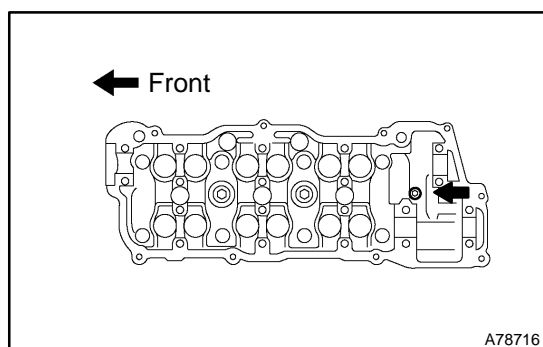


- (c) Using several steps, install and tighten the 8 cylinder head bolts uniformly in the sequence shown in the illustration.

**Torque: 54 N·m (550 kgf·cm, 40 ft·lbf)**

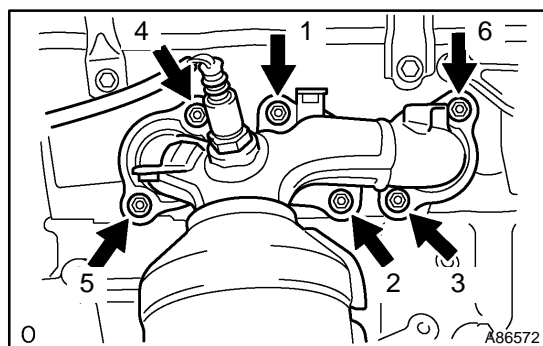


- (d) Mark the front side of each cylinder head bolt head with paint as shown in the illustration.
- (e) Retighten the cylinder head bolts by 90° in the same sequence as step (c).
- (f) Check that each painted mark is now at a 90° angle to the front.



- (g) Using a socket hexagon wrench 8, install the hexagon bolt.  
**Torque: 19 N·m (189 kgf·cm, 14 ft·lbf)**
- (h) Connect the engine wire harness clamp with the nut.  
**Torque: 8.4 N·m (85 kgf·cm, 74 in·lbf)**

- 43. **INSTALL NO.2 CAMSHAFT** (See page 14-93 )
- 44. **INSTALL CAMSHAFT** (See page 14-93 )
- 45. **INSTALL CYLINDER HEAD COVER SUB-ASSY** (See page 14-7 )
- 46. **INSTALL IGNITION COIL ASSY** (See page 14-7 )



- 47. **INSTALL EXHAUST MANIFOLD SUB-ASSY RH**
  - (a) Install a new gasket and the exhaust manifold RH with the 6 nuts. Using several steps, tighten the nuts uniformly 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.

- 48. **INSTALL EXHAUST MANIFOLD HEAT INSULATOR NO.1**  
**Torque: 8.5 N·m (87 kgf·cm, 75 ft·lbf)**
- 49. **INSTALL EXHAUST PIPE ASSY FRONT** (See page 15-2 )
- 50. **INSTALL EXHAUST PIPE NO.1 SUPPORT BRACKET REAR** (See page 15-2 )
- 51. **INSTALL EXHAUST PIPE NO.1 SUPPORT BRACKET FRONT** (See page 15-2 )
- 52. **INSTALL VANE PUMP ASSY** (See page 14-29 )
- 53. **INSTALL TIMING BELT NO.3 COVER** (See page 14-93 )
- 54. **INSTALL CAMSHAFT TIMING PULLEY** (See page 14-93 )  
SST 09960-10010 (09962-01000, 09963-01000), 09249-63010
- 55. **INSTALL TIMING BELT IDLER SUB-ASSY NO.2** (See page 14-93 )
- 56. **INSPECT TIMING BELT** (See page 14-79 )
- 57. **INSTALL TIMING BELT** (See page 14-79 )  
SST 09960-10010 (09962-01000, 09963-01000)
- 58. **INSTALL TIMING BELT TENSIONER ASSY** (See page 14-79 )
- 59. **INSTALL TIMING BELT GUIDE NO.2** (See page 14-79 )
- 60. **INSTALL ENGINE MOUNTING BRACKET RH** (See page 14-79 )
- 61. **INSTALL TIMING BELT NO.2 COVER** (See page 14-79 )
- 62. **INSTALL TIMING BELT NO.1 COVER** (See page 14-79 )
- 63. **INSTALL CRANKSHAFT PULLEY** (See page 14-79 )  
SST 09213-54015 (91651-60855), 09330-00021
- 64. **INSTALL GENERATOR BRACKET NO.2** (See page 14-79 )
- 65. **INSTALL ENGINE MOUNTING STAY NO.2 RH** (See page 14-79 )
- 66. **INSTALL ENGINE MOVING CONTROL ROD** (See page 14-79 )
- 67. **INSTALL VANE PUMP V BELT** (See page 14-5 )

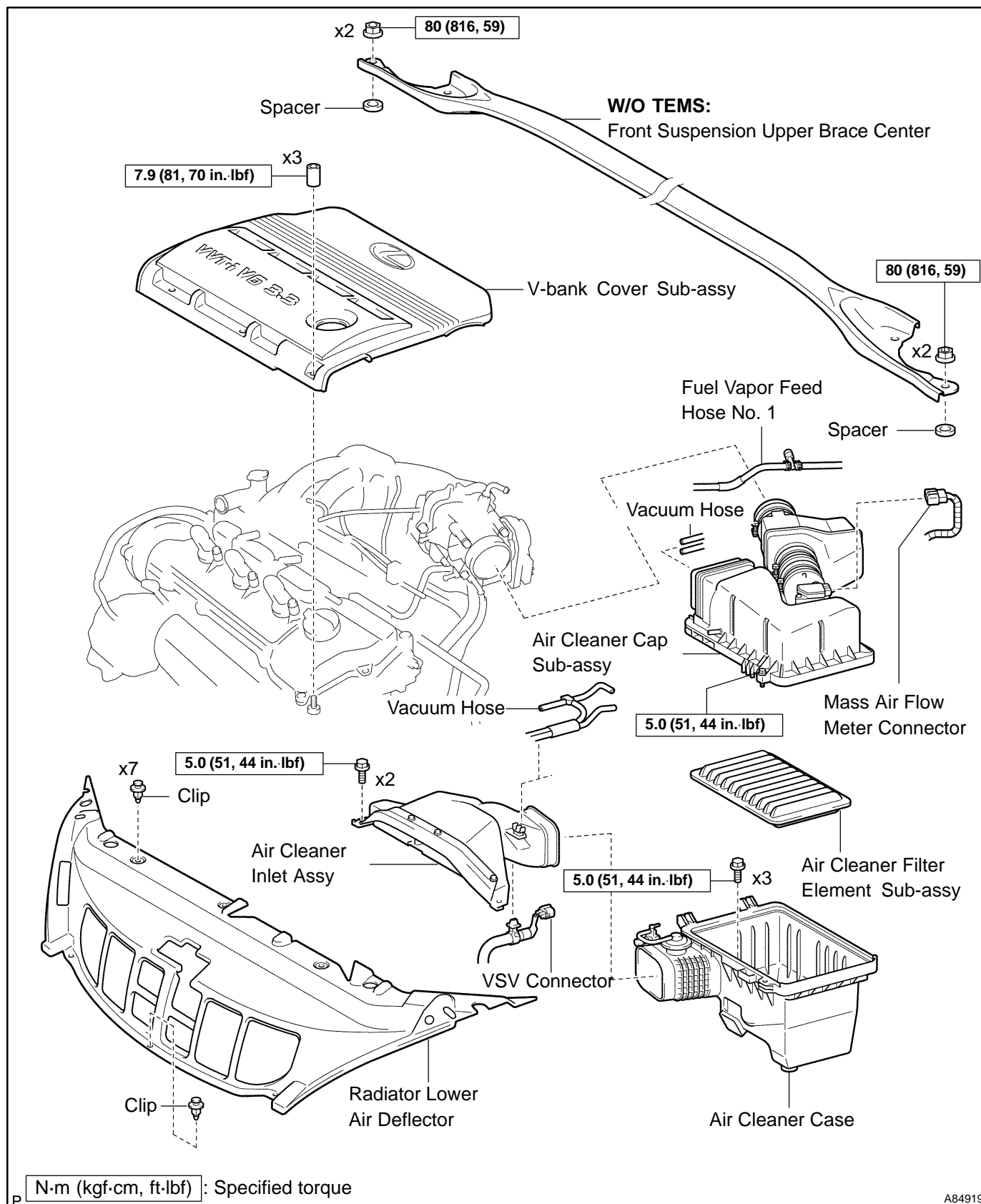
68. **INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1**  
(See page [14-5](#))
69. **INSPECT DRIVE BELT DEFLECTION AND TENSION** (See page [14-1](#))
70. **INSTALL WATER OUTLET** (See page [10-16](#))
71. **INSTALL INTAKE MANIFOLD** (See page [10-16](#))
72. **INSTALL INTAKE AIR SURGE TANK** (See page [11-13](#))
73. **INSTALL EMISSION CONTROL VALVE SET** (See page [11-13](#))
74. **INSTALL AIR CLEANER CAP SUB-ASSY** (See page [10-11](#))
75. **CHECK CONNECTION OF VACUUM HOSE** (See page [14-29](#))
76. **INSTALL V-BANK COVER SUB-ASSY** (See page [10-11](#))
77. **INSTALL FRONT SUSPENSION UPPER BRACE CENTER (W/O TEMS)** (See page [10-11](#))
78. **INSTALL FRONT WHEEL RH** (See page [14-5](#))
79. **ADD ENGINE OIL** (See page [17-20](#))
80. **ADD ENGINE COOLANT** (See page [16-9](#))
81. **CHECK FOR ENGINE OIL LEAKS**
82. **CHECK FOR ENGINE COOLANT LEAKS** (See page [16-1](#))
83. **INSPECT FOR FUEL LEAKS**
84. **CHECK FOR EXHAUST GAS LEAKS**
85. **INSPECT IGNITION TIMING** (See page [14-1](#))  
SST 09843-18040
86. **INSPECT ENGINE IDLE SPEED** (See page [14-1](#))
87. **INSPECT COMPRESSION** (See page [14-1](#))  
SST 09992-00500
88. **INSPECT CO/HC** (See page [14-1](#))
89. **SYSTEM INITIALIZATION** (See page [19-15](#))

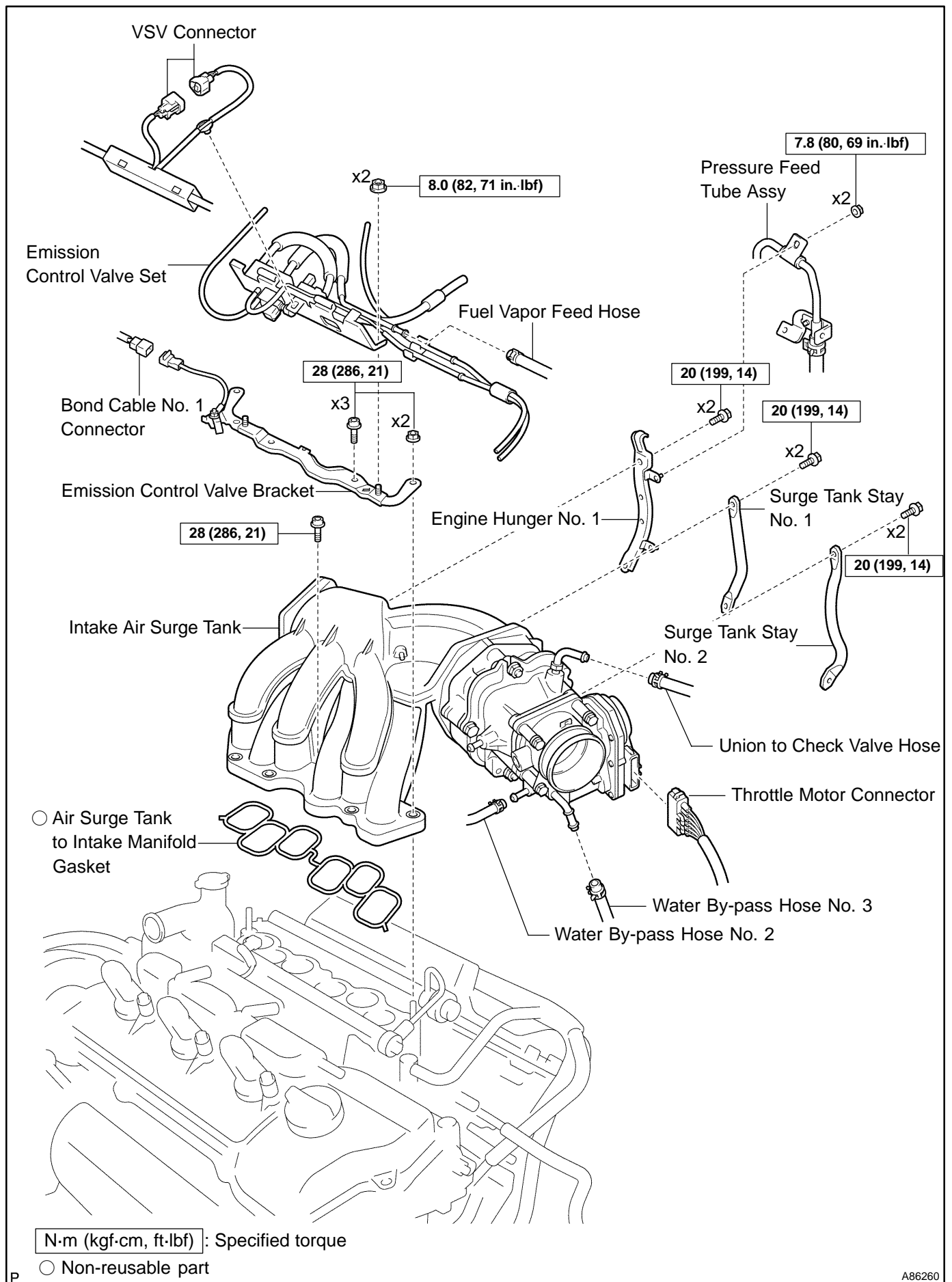


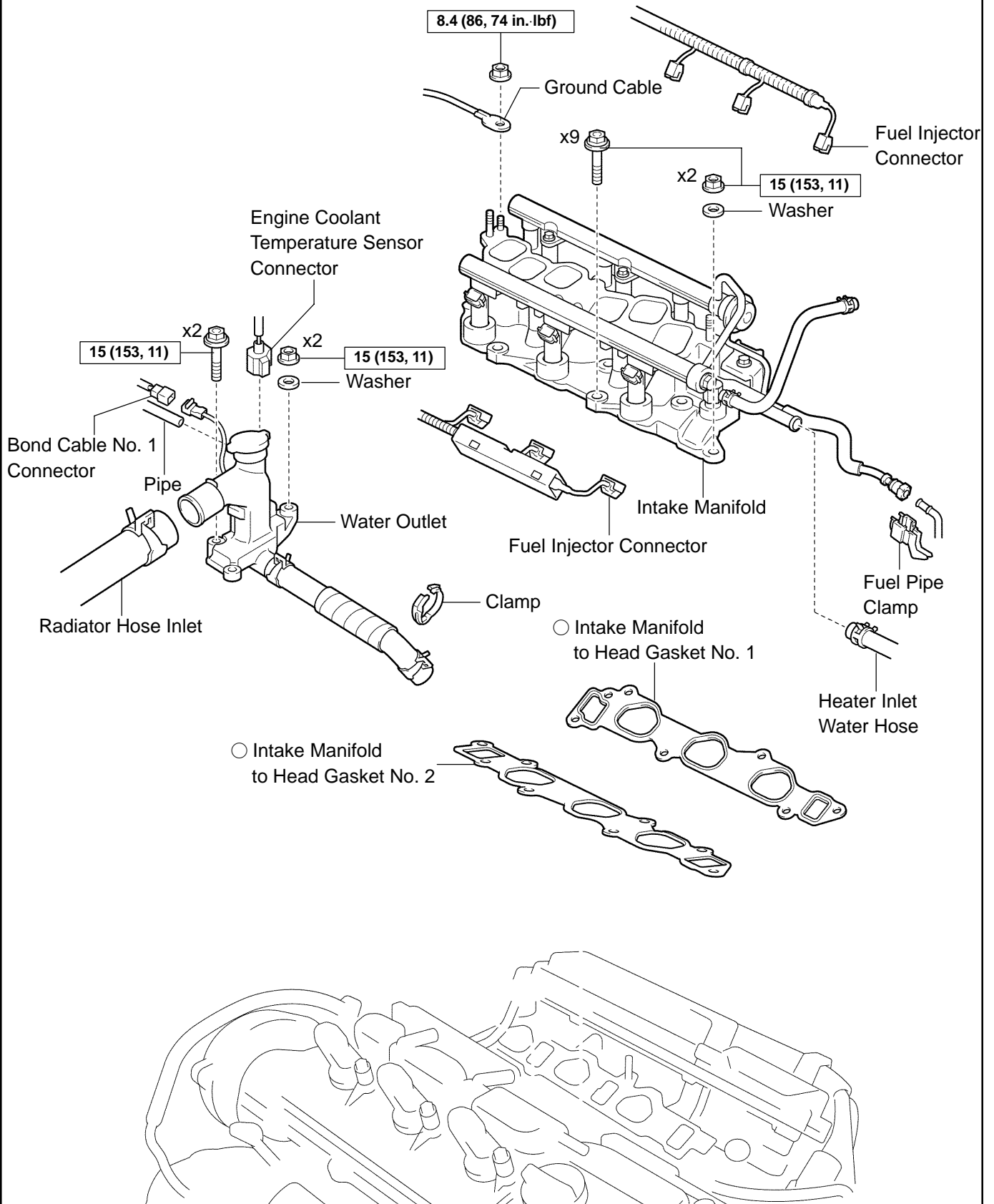
# CYLINDER HEAD GASKET NO.2 (3MZ-FE)

## COMPONENTS

141JL-01





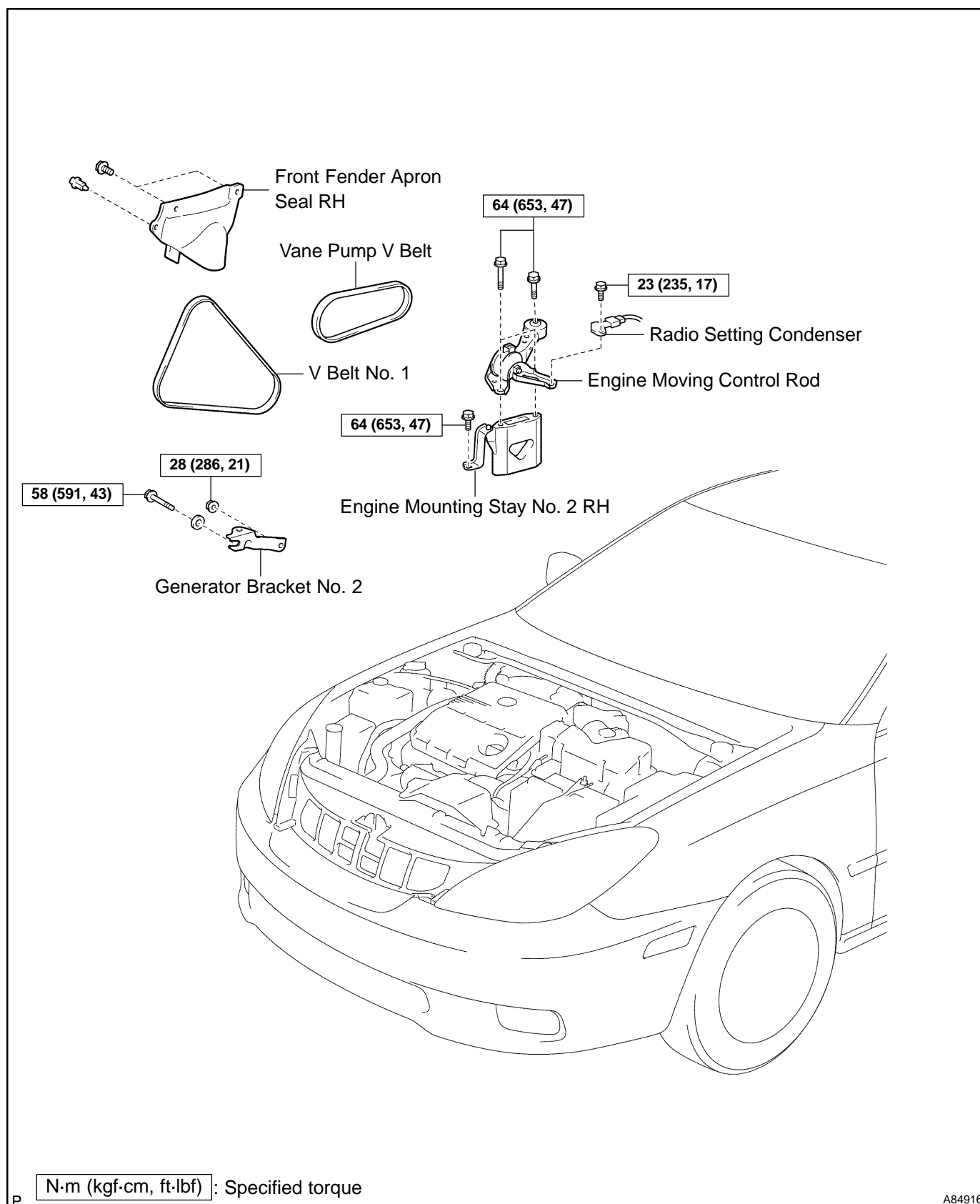


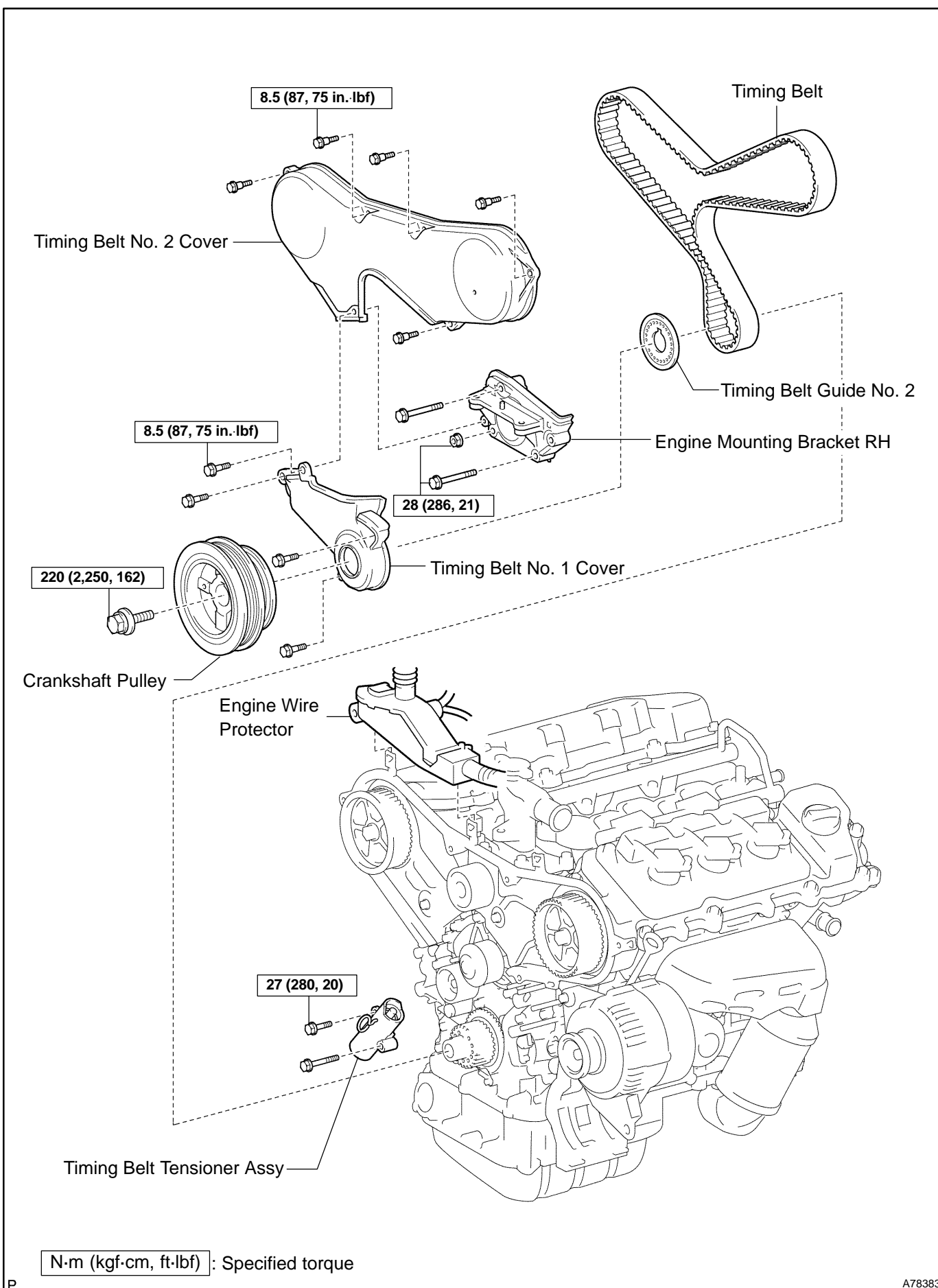
N·m (kgf·cm, ft·lbf) : Specified torque

○ Non-reusable part

P

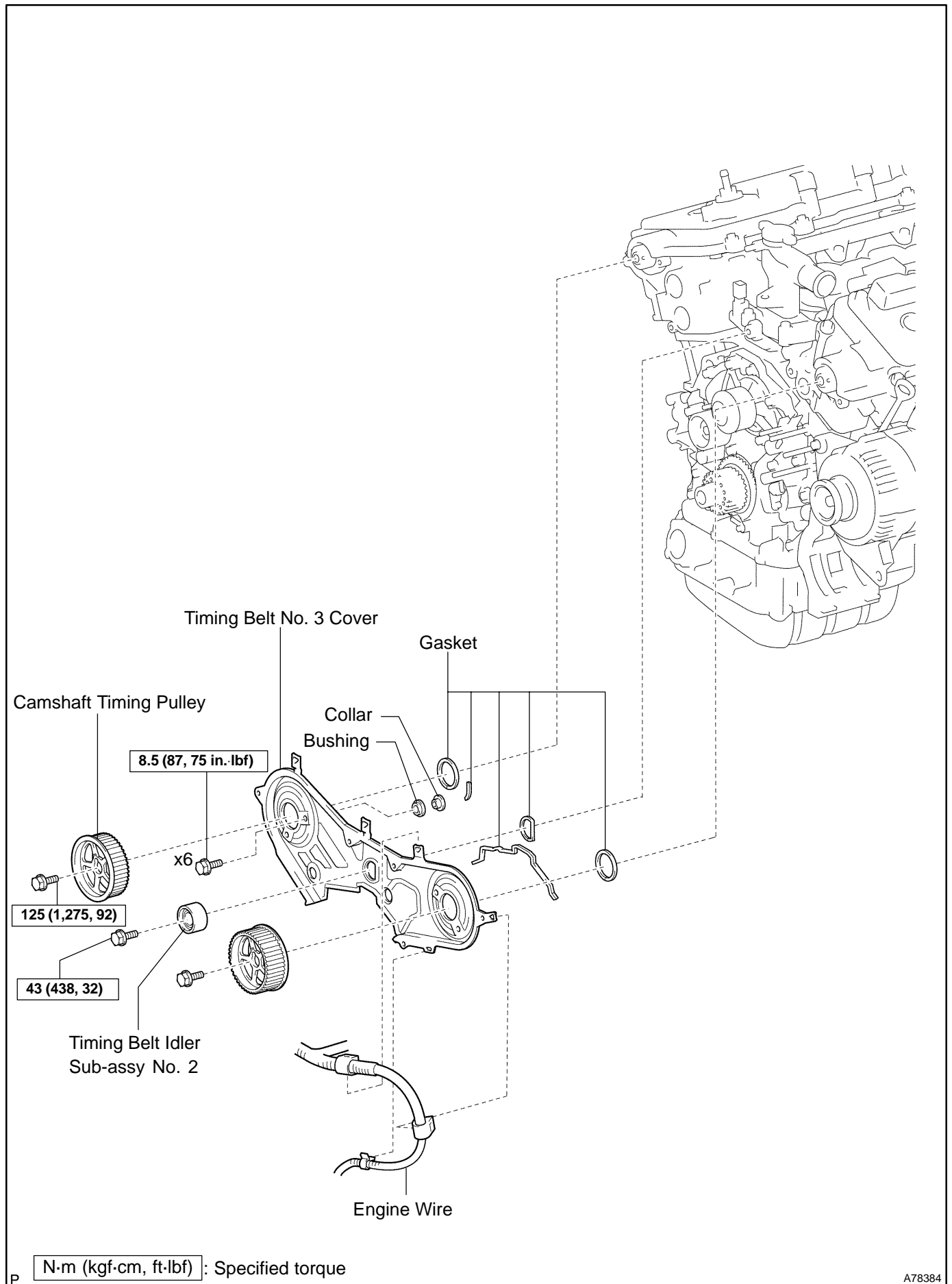
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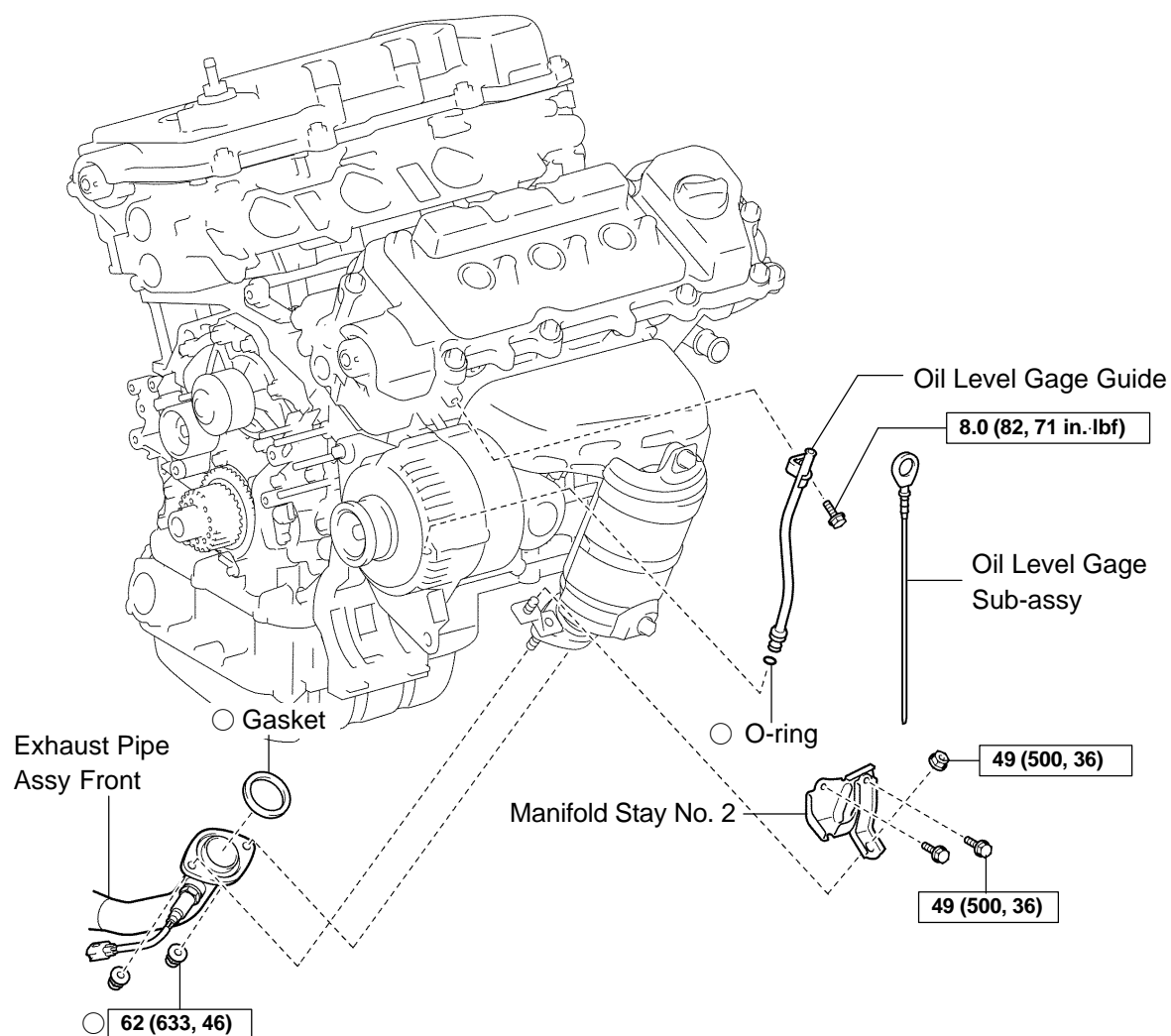




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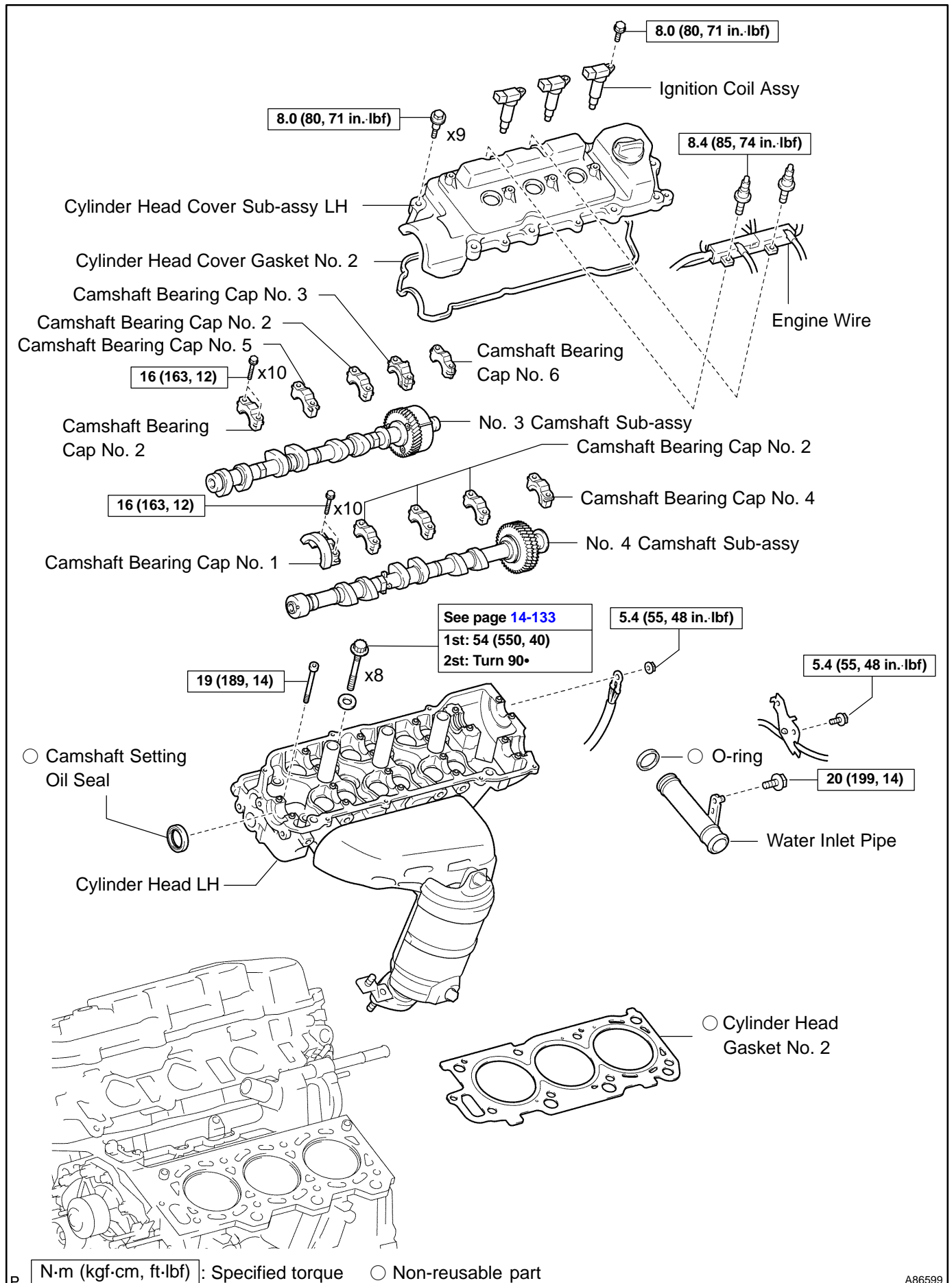




N·m (kgf·cm, ft·lbf) : Specified torque

○ Non-reusable part

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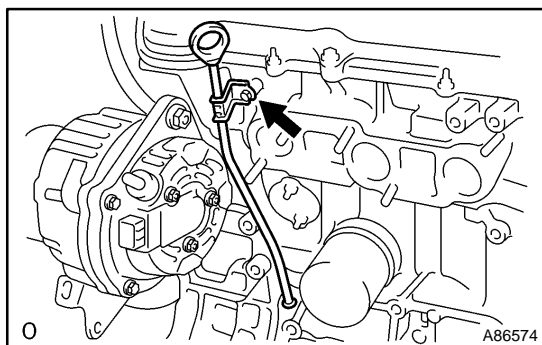


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## REPLACEMENT

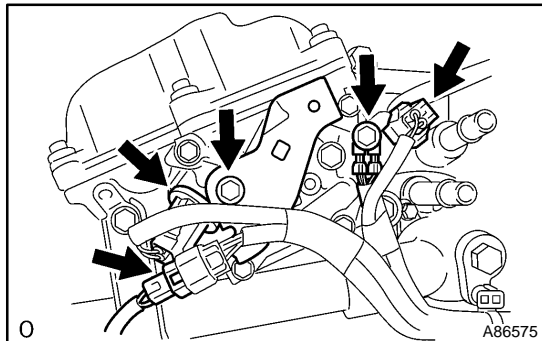
1. DISCHARGE FUEL SYSTEM PRESSURE (See page 11-1 )
2. DISCONNECT BATTERY NEGATIVE TERMINAL
3. DRAIN ENGINE COOLANT (See page 16-9 )
4. DRAIN ENGINE OIL (See page 17-20 )
5. REMOVE FRONT WHEEL RH
6. REMOVE RADIATOR LOWER AIR DEFLECTOR (See page 19-5 )
7. REMOVE FRONT SUSPENSION UPPER BRACE CENTER (W/O TEMS) (See page 10-1 1)
8. REMOVE V-BANK COVER SUB-ASSY (See page 10-1 1)
9. REMOVE AIR CLEANER INLET ASSY (See page 19-5 )
10. REMOVE AIR CLEANER CAP SUB-ASSY (See page 10-1 1)
11. REMOVE AIR CLEANER CASE (See page 19-5 )
12. REMOVE EMISSION CONTROL VALVE SET (See page 11-13 )
13. REMOVE INTAKE AIR SURGE TANK (See page 11-13 )
14. REMOVE INTAKE MANIFOLD (See page 10-16 )
15. REMOVE WATER OUTLET (See page 10-16 )
16. REMOVE FRONT FENDER APRON SEAL RH
17. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-5 )
18. REMOVE VANE PUMP V BELT (See page 14-5 )
19. REMOVE ENGINE MOVING CONTROL ROD (See page 14-79 )
20. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14-79 )
21. REMOVE GENERATOR BRACKET NO.2 (See page 14-79 )
22. REMOVE CRANKSHAFT PULLEY (See page 14-79 )  
SST 09213-54015 (91651-60855), 09330-00021, 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)
23. REMOVE TIMING BELT NO.1 COVER
24. REMOVE TIMING BELT NO.2 COVER (See page 14-79 )
25. REMOVE ENGINE MOUNTING BRACKET RH (See page 14-79 )
26. REMOVE TIMING BELT GUIDE NO.2
27. REMOVE TIMING BELT (See page 14-79 )
28. REMOVE TIMING BELT IDLER SUB-ASSY NO.2
29. REMOVE CAMSHAFT TIMING PULLEY (See page 14-93 )  
SST 09960-10010 (09962-01000, 09963-01000), 09249-63010
30. REMOVE TIMING BELT NO.3 COVER (See page 14-93 )
31. REMOVE MANIFOLD STAY NO.2 (See page 14-29 )
32. SEPARATE EXHAUST PIPE ASSY FRONT (See page 15-2 )



### 33. REMOVE OIL LEVEL GAGE GUIDE

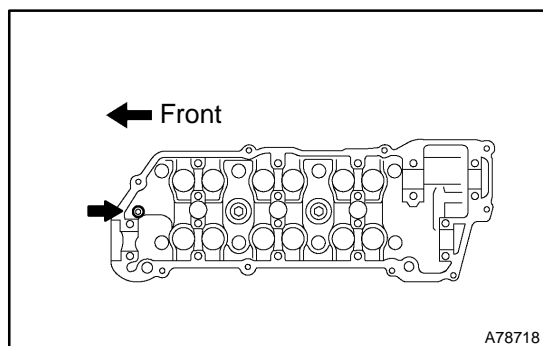
- (a) Remove the bolt which secures the oil level gage guide from the cylinder head LH.
- (b) Pull out the oil level gage guide and oil level gage together from the cylinder block.
- (c) Remove the O-ring from the oil level gage guide.

34. REMOVE WATER INLET PIPE (See page 16-16 )
35. REMOVE IGNITION COIL ASSY
36. REMOVE CYLINDER HEAD COVER SUB-ASSY LH (See page 14-7 )
37. REMOVE NO.3 CAMSHAFT SUB-ASSY (See page 14-107 )
38. REMOVE NO.4 CAMSHAFT SUB-ASSY (See page 14-107 )

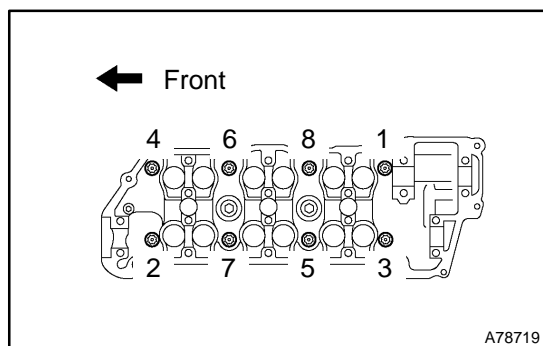


### 39. REMOVE CYLINDER HEAD LH

- (a) Disconnect the VVT sensor connector.
- (b) Disconnect the camshaft timing oil control valve connector.
- (c) Disconnect the air fuel ratio sensor connector.
- (d) Remove the bolt, then disconnect the ground cable.
- (e) Remove the bolt and wire harness clamp bracket.



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



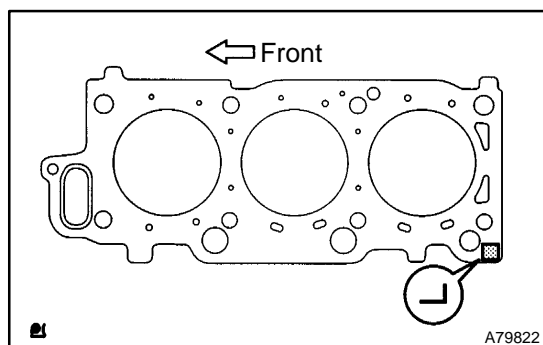
- (g) Using several steps, loosen the 8 cylinder head bolts uniformly in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.

### NOTICE:

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

### 40. REMOVE CYLINDER HEAD GASKET NO.2

### 41. INSPECT CYLINDER HEAD SET BOLT (See page 14-120 )



### 42. INSTALL CYLINDER HEAD GASKET NO.2

- (a) Place a new cylinder head gasket on the cylinder block with the L mark upward.

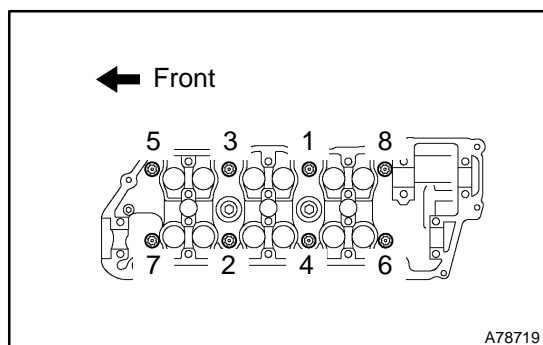
### NOTICE:

- Remove any oil from the contact surface.
- Be careful of the installing orientation.
- Place the cylinder head on the gasket carefully in order not to damage the gasket at the bottom part of the head.

**43. INSTALL CYLINDER HEAD LH****NOTICE:**

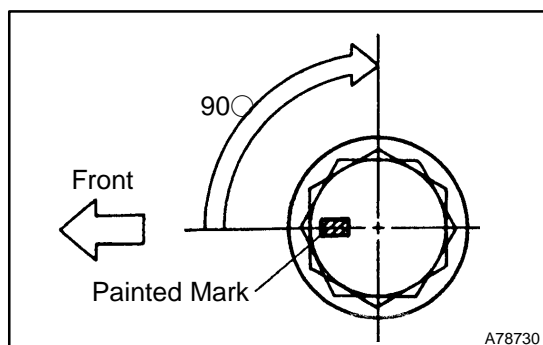
The cylinder head bolts are tightened in 2 successive steps.

- (a) Apply a light coat of engine oil to the threads of the cylinder head bolts.
- (b) Install the plate washer to the cylinder head bolt.

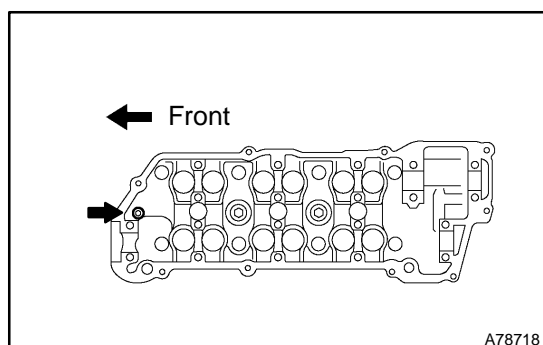


- (c) Using several steps, install and tighten the 8 cylinder head bolts uniformly in the sequence shown in the illustration.

**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 (189 kgf·cm, 14 ft·lbf)**

- (h) Install the wire harness clamp bracket with the bolt.

**Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)**

- (i) Connect the ground cable with the bolt.

**Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)**

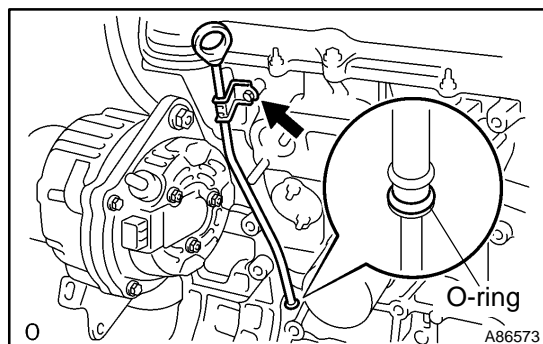
**44. INSTALL NO.4 CAMSHAFT SUB-ASSY (See page 14-107 )**

**45. INSTALL NO.3 CAMSHAFT SUB-ASSY (See page 14-107 )**

**46. INSTALL CYLINDER HEAD COVER SUB-ASSY LH (See page 14-7 )**

**47. INSTALL IGNITION COIL ASSY (See page 14-7 )**

**48. INSTALL WATER INLET PIPE (See page 16-16 )**

**49. INSTALL OIL LEVEL GAGE GUIDE**

- (a) Install a new O-ring to the oil level gage guide.
  - (b) Apply soapy water to the O-ring.
  - (c) Push in the oil level gage guide end into the guide hole of the cylinder block.
  - (d) Install the oil level gage guide with the bolt.
- Torque: 8.0 N·m (82 kgf·cm, 71 in.-lbf)**
- (e) Install the oil level gage.

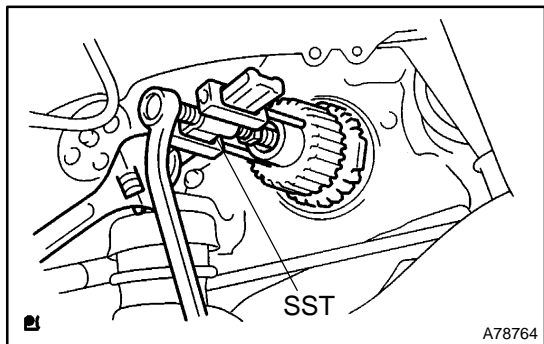
50. **INSTALL EXHAUST PIPE ASSY FRONT (See page 15-2 )**
51. **INSTALL MANIFOLD STAY NO.2 (See page 14-29 )**
52. **INSTALL TIMING BELT NO.3 COVER (See page 14-93 )**
53. **INSTALL CAMSHAFT TIMING PULLEY (See page 14-93 )**  
SST 09960-10010 (09962-01000, 09963-01000), 09249-63010
54. **INSTALL TIMING BELT IDLER SUB-ASSY NO.2 (See page 14-93 )**
55. **INSPECT TIMING BELT (See page 14-79 )**
56. **INSTALL TIMING BELT (See page 14-79 )**  
SST 09960-10010 (09962-01000, 09963-01000)
57. **INSTALL TIMING BELT TENSIONER ASSY (See page 14-79 )**
58. **INSTALL TIMING BELT GUIDE NO.2 (See page 14-79 )**
59. **INSTALL ENGINE MOUNTING BRACKET RH (See page 14-79 )**
60. **INSTALL TIMING BELT NO.2 COVER (See page 14-79 )**
61. **INSTALL TIMING BELT NO.1 COVER (See page 14-79 )**
62. **INSTALL CRANKSHAFT PULLEY (See page 14-79 )**  
SST 09213-54015 (91651-60855), 09330-00021
63. **INSTALL GENERATOR BRACKET NO.2 (See page 14-79 )**
64. **INSTALL ENGINE MOUNTING STAY NO.2 RH (See page 14-79 )**
65. **INSTALL ENGINE MOVING CONTROL ROD (See page 14-79 )**
66. **INSTALL VANE PUMP V BELT (See page 14-5 )**
67. **INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-5 )**
68. **INSPECT DRIVE BELT DEFLECTION AND TENSION (See page 14-1 )**
69. **INSTALL WATER OUTLET (See page 10-16 )**
70. **INSTALL INTAKE MANIFOLD (See page 10-16 )**
71. **INSTALL INTAKE AIR SURGE TANK (See page 11-13 )**
72. **INSTALL EMISSION CONTROL VALVE SET (See page 11-13 )**
73. **INSTALL AIR CLEANER CASE (See page 19-5 )**
74. **INSTALL AIR CLEANER CAP SUB-ASSY (See page 10-1 1)**
75. **INSTALL AIR CLEANER INLET ASSY (See page 19-5 )**
76. **CHECK CONNECTION OF VACUUM HOSE (See page 14-29 )**
77. **INSTALL V-BANK COVER SUB-ASSY (See page 10-1 1)**
78. **INSTALL FRONT SUSPENSION UPPER BRACE CENTER (W/O TEMS) (See page 10-1 1)**
79. **INSTALL FRONT WHEEL RH (See page 14-5 )**
80. **ADD ENGINE OIL (See page 17-20 )**
81. **ADD ENGINE COOLANT (See page 16-9 )**
82. **CHECK FOR ENGINE OIL LEAKS**
83. **CHECK FOR ENGINE COOLANT LEAKS (See page 16-1 )**
84. **INSPECT FOR FUEL LEAKS**

- 85. CHECK FOR EXHAUST GAS LEAKS
- 86. INSPECT IGNITION TIMING (See page 14-1 )  
SST 09843-18040
- 87. INSPECT ENGINE IDLE SPEED (See page 14-1 )
- 88. INSPECT COMPRESSION (See page 14-1 )  
SST 09992-00500
- 89. INSPECT CO/HC (See page 14-1 )
- 90. SYSTEM INITIALIZATION (See page 19-15 )

# OIL PUMP SEAL (3MZ-FE)

## REPLACEMENT

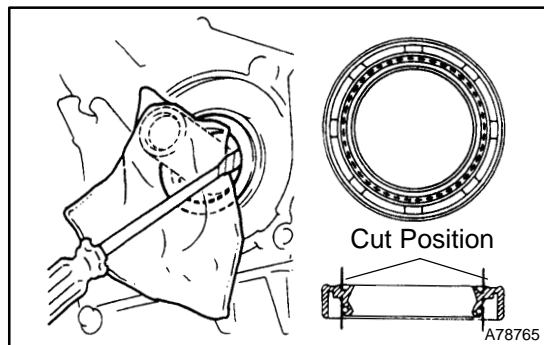
1. REMOVE FRONT WHEEL RH
2. REMOVE FRONT FENDER APRON SEAL RH
3. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1  
(See page 14-5 )
4. REMOVE VANE PUMP V BELT (See page 14-5 )
5. REMOVE ENGINE MOVING CONTROL ROD (See page 14-79 )
6. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14-79 )
7. REMOVE GENERATOR BRACKET NO.2 (See page 14-79 )
8. REMOVE CRANKSHAFT PULLEY (See page 14-79 )  
SST 09213-54015 (91651-60855), 09330-00021, 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)
9. REMOVE TIMING BELT NO.1 COVER
10. REMOVE TIMING BELT NO.2 COVER (See page 14-79 )
11. REMOVE ENGINE MOUNTING BRACKET RH (See page 14-79 )
12. REMOVE TIMING BELT GUIDE NO.2
13. REMOVE TIMING BELT (See page 14-79 )
14. REMOVE CRANKSHAFT TIMING PULLEY
  - (a) Remove the bolt and 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.



### 15. REMOVE OIL PUMP SEAL

- (a) Using a knife, cut off the oil seal lip.
- (b) Using a screwdriver with the tip wrapped in tape, pry out the oil seal.

### NOTICE:

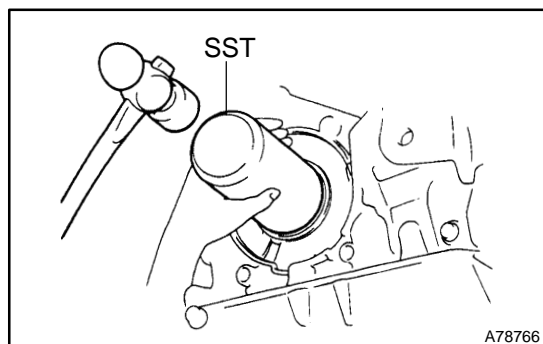
After removing, check the crankshaft for damage. If damaged, smooth the surface with 400-grit sandpaper.

**16. INSTALL OIL PUMP SEAL**

- (a) Apply multi-purpose grease to a new oil seal lip.

**NOTICE:**

**Keep the lip free of foreign objects.**

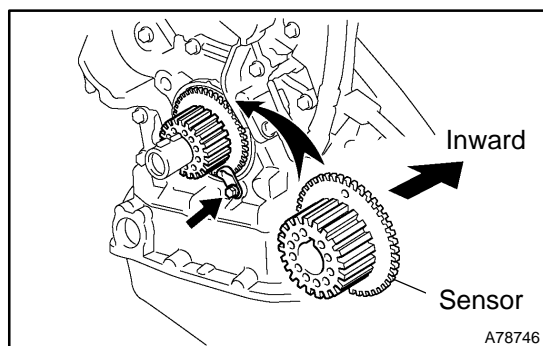


- (b) Using SST and a hammer, tap in the new oil seal until its surface is flush with the oil pump edge.

SST 09223-00010

**NOTICE:**

- **Be careful not to tap the oil seal at an angle.**
- **Wipe off extra grease on the crankshaft.**

**17. INSTALL CRANKSHAFT TIMING PULLEY**

- (a) Align the keyway of the pulley with the key located on the crankshaft, then slide the 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)**

**18. INSPECT TIMING BELT (See page 14-79 )****19. INSTALL TIMING BELT (See page 14-79 )**

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

**20. INSTALL TIMING BELT TENSIONER ASSY (See page 14-79 )****21. INSTALL TIMING BELT GUIDE NO.2 (See page 14-79 )****22. INSTALL ENGINE MOUNTING BRACKET RH (See page 14-79 )****23. INSTALL TIMING BELT NO.2 COVER (See page 14-79 )****24. INSTALL TIMING BELT NO.1 COVER (See page 14-79 )****25. INSTALL CRANKSHAFT PULLEY (See page 14-79 )**

SST 09213-54015 (91651-60855), 09330-00021

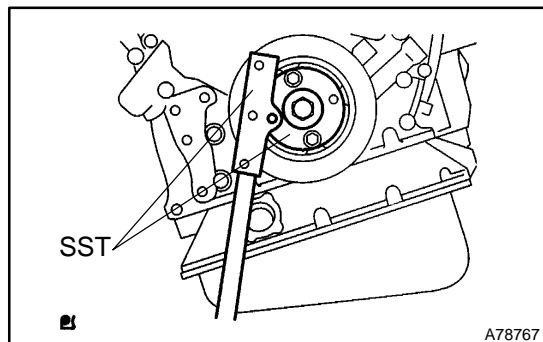
**26. INSTALL GENERATOR BRACKET NO.2 (See page 14-79 )****27. INSTALL ENGINE MOUNTING STAY NO.2 RH (See page 14-79 )****28. INSTALL ENGINE MOVING CONTROL ROD (See page 14-79 )****29. INSTALL VANE PUMP V BELT (See page 14-5 )****30. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-5 )****31. INSPECT DRIVE BELT DEFLECTION AND TENSION (See page 14-1 )****32. INSTALL FRONT WHEEL RH (See page 14-5 )****33. CHECK FOR ENGINE OIL LEAKS**



# ENGINE REAR OIL SEAL (3MZ-FE)

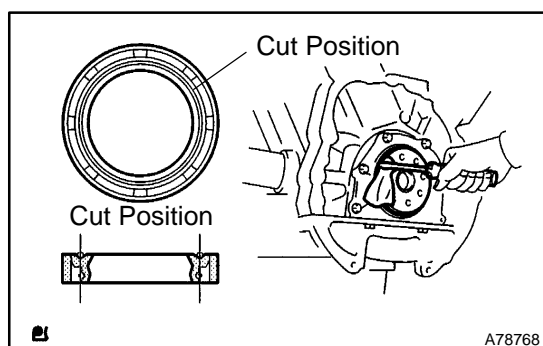
## REPLACEMENT

### 1. REMOVE AUTOMATIC TRANSAXLE ASSY (See page 40-9 )



### 2. 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, rear spacer, drive plate and front spacer.

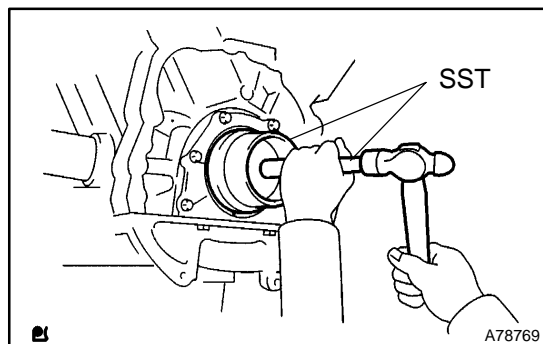


### 3. REMOVE ENGINE REAR OIL SEAL

- (a) Using a knife, cut off the oil seal lip.
- (b) Using a screwdriver with the tip wrapped in tape, pry out the oil seal.

#### NOTICE:

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



### 4. INSTALL ENGINE REAR OIL SEAL

- (a) Apply multi-purpose grease to a new oil seal lip.

#### NOTICE:

Keep the lip free of 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.

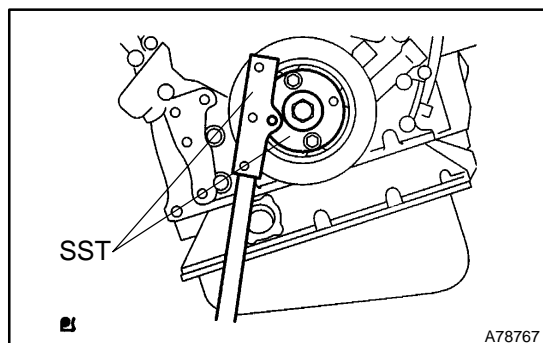
SST 09223-15030, 09950-70010 (09951-07100)

#### NOTICE:

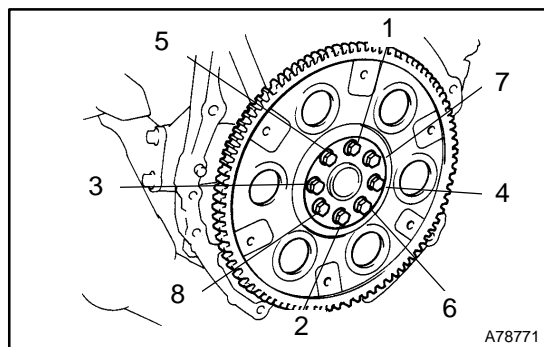
- Be careful not to tap the oil seal at an angle.
- Wipe off extra grease on the crankshaft.

### 5. INSTALL DRIVE PLATE & RING GEAR SUB-ASSY

- (a) Using SST, hold the crankshaft.  
SST 09213-54015 (91651-60855), 09330-00021
- (b) Clean the 8 bolts and 8 bolt holes.
- (c) Apply adhesive to 2 or 3 threads of the 8 bolts.  
**Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent**
- (d) Install the front spacer, drive plate and rear spacer on the crankshaft.







- (e) Using several steps, install and tighten the 8 bolts uniformly in the sequence shown in the illustration.

**Torque: 83 N·m (846 kgf·cm, 61 ft·lbf)**

**NOTICE:**

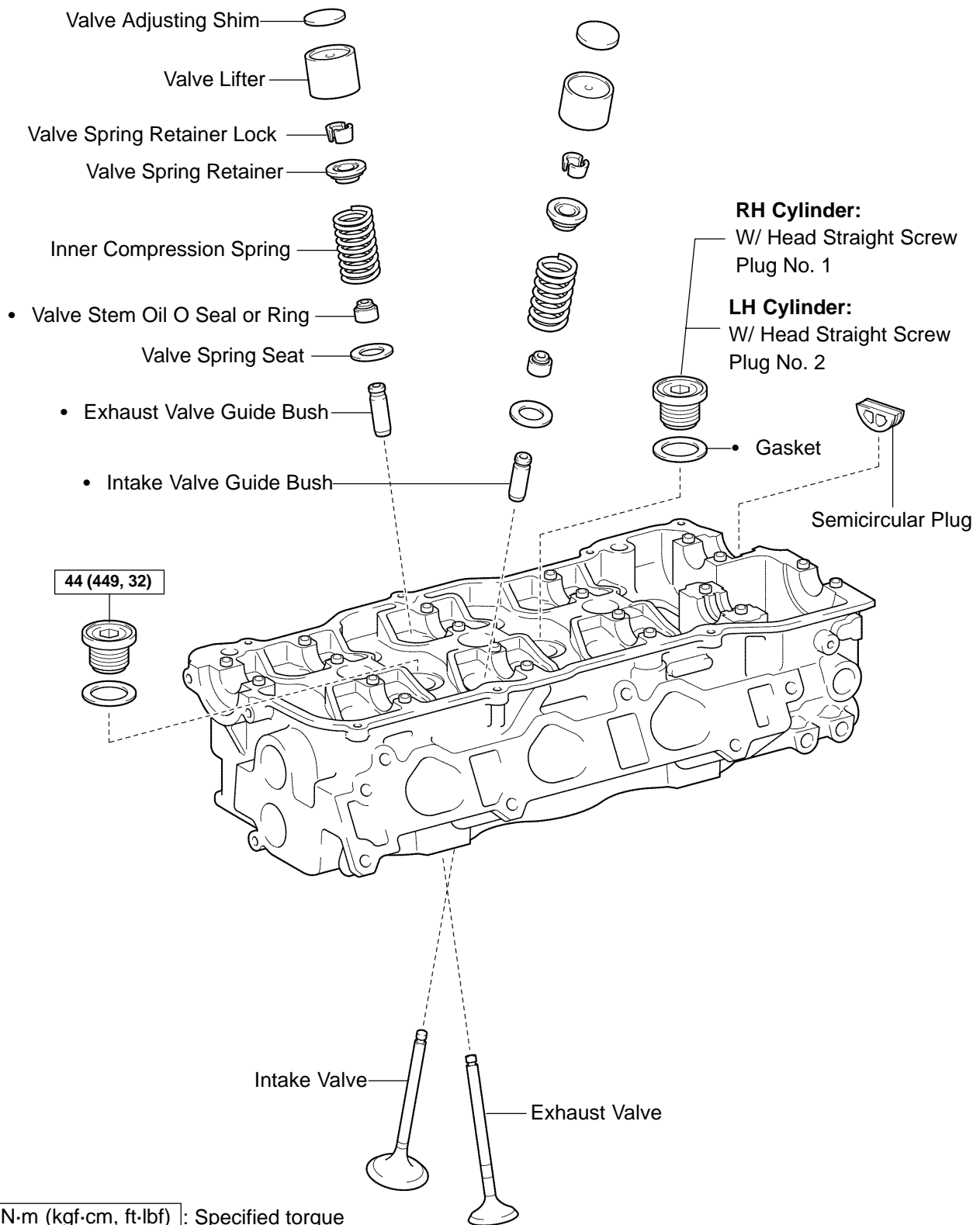
**Do not start the engine within 1 hour after installing.**

**6. INSTALL AUTOMATIC TRANSAXLE ASSY (See page 40-9 )**

# CYLINDER HEAD ASSY (3MZ-FE)

## COMPONENTS

1419J-03



P

A78310

## OVERHAUL

### 1. REMOVE W/HEAD STRAIGHT SCREW PLUG NO.1 (RH CYLINDER)

- (a) Using a straight hexagon wrench 14, remove the 2 screw plugs.

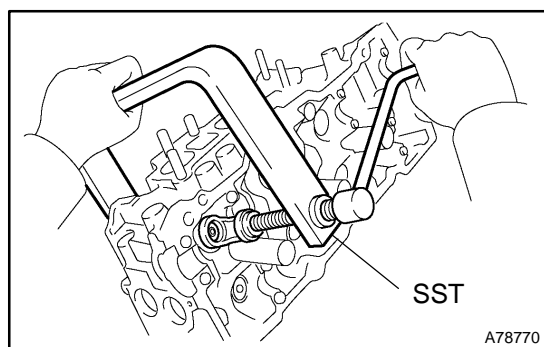
### 2. REMOVE W/HEAD STRAIGHT SCREW PLUG NO.2 (LH CYLINDER)

- (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 the original locations when reassembling.



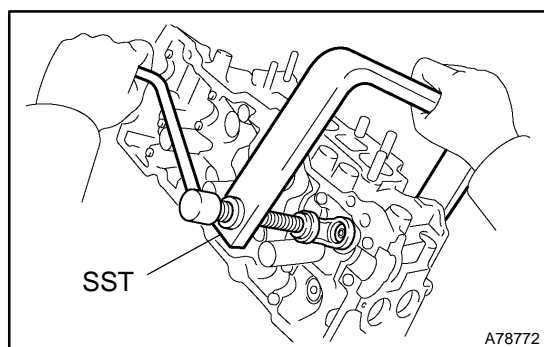
### 4. REMOVE INTAKE VALVE

- (a) Using SST, compress the spring, then remove the 2 retainer locks, retainer, spring and valve.

SST 09202-70020 (09202-00010)

HINT:

Store the valves, springs, seats and retainers in the correct order so that they can be returned to the original locations when reassembling.



### 5. REMOVE EXHAUST VALVE

- (a) Using SST, compress the spring, then remove the 2 retainer locks, retainer, spring and valve.

SST 09202-70020 (09202-00010)

HINT:

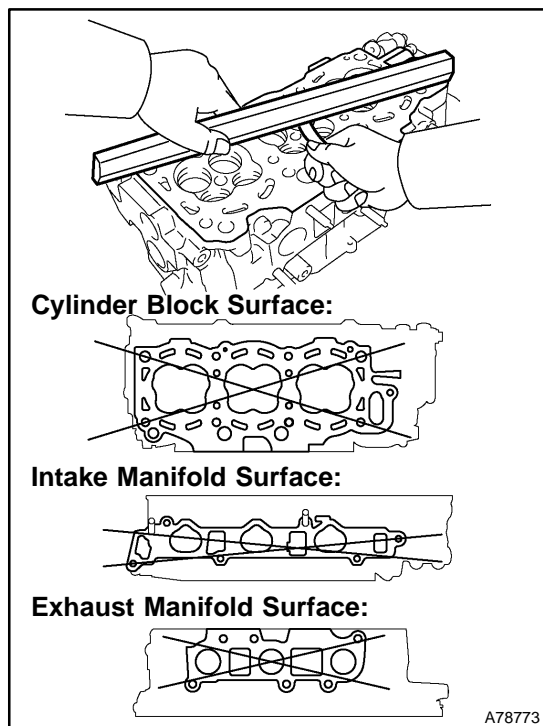
Store the valves, springs, seats and retainers in the correct order so that they can be returned to the original locations when reassembling.

### 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 feeler gauge, measure the warpage on the surfaces which contacts the cylinder block and manifolds.

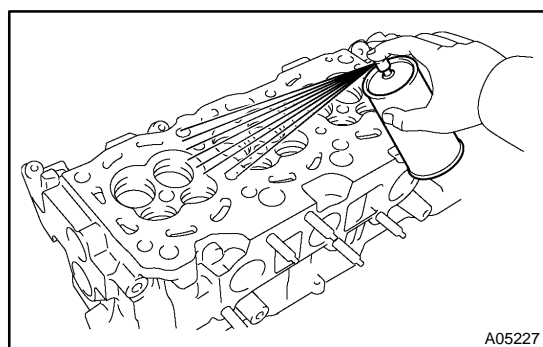
**Maximum warpage:**

**0.05 mm (0.0020 in.) for cylinder block surface**

**0.10 mm (0.0039 in.) for intake manifold surface**

**0.10 mm (0.0039 in.) for exhaust manifold surface**

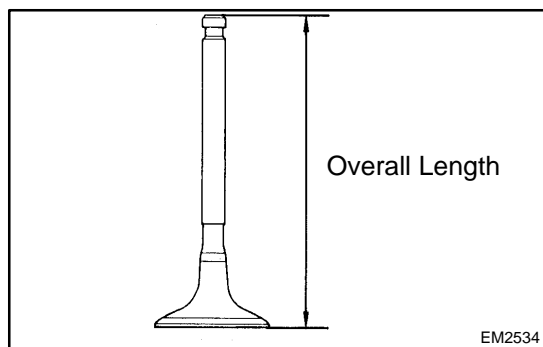
If the warpage is greater than maximum, replace the cylinder head.



## 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.



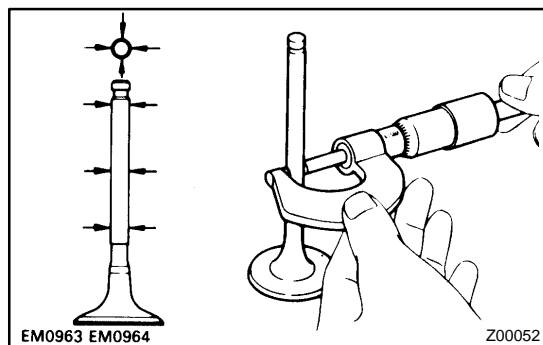
## 11. INSPECT INTAKE VALVE

- (a) Inspect the valve overall length.

**Standard overall length: 95.45 mm (3.7579 in.)**

**Minimum overall length: 94.95 mm (3.7382 in.)**

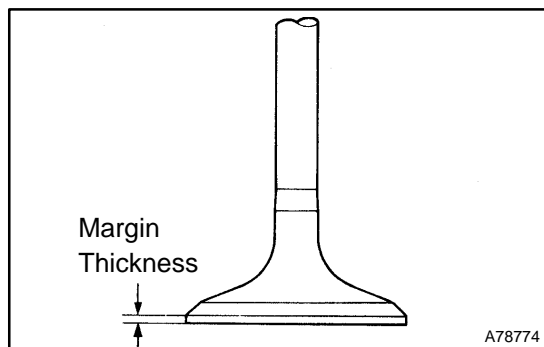
If the overall length is less than minimum, replace the valve.



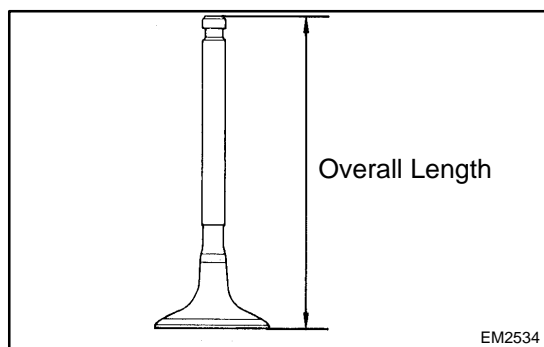
- (b) Using a micrometer, measure the diameter of the valve stem.

**Valve stem diameter:**

**5.470 to 5.485 mm (0.2154 to 0.2159 in.)**

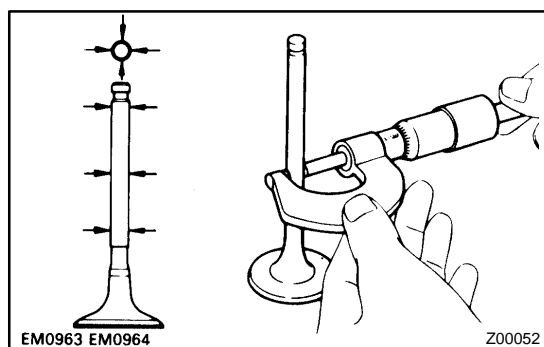


- (c) Inspect the valve head margin thickness.  
**Standard margin thickness: 1.0 mm (0.039 in.)**  
**Minimum margin thickness: 0.5 mm (0.020 in.)**  
 If the margin thickness is less than minimum, replace the valve.

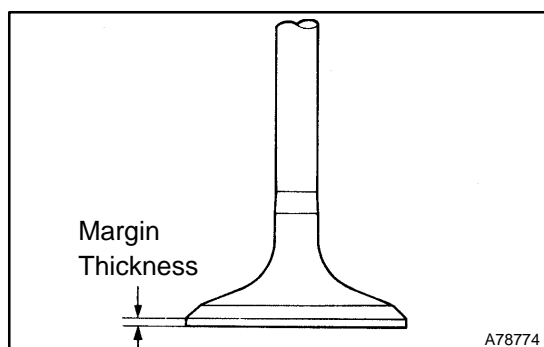


## 12. INSPECT EXHAUST VALVE

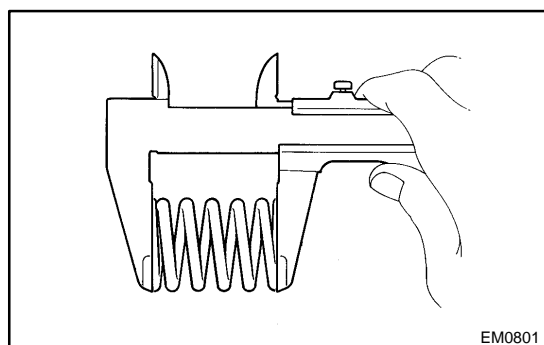
- (a) Inspect the valve overall length.  
**Standard overall length: 95.40 mm (3.7559 in.)**  
**Minimum overall length: 94.90 mm (3.7362 in.)**  
 If the overall length is less than minimum, replace the valve.



- (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.)**

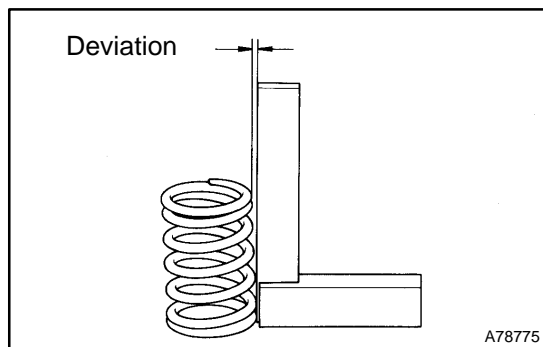


- (c) Inspect the valve head margin thickness.  
**Standard margin thickness: 1.0 mm (0.039 in.)**  
**Minimum margin thickness: 0.5 mm (0.020 in.)**  
 If the margin thickness is less than minimum, replace the valve.

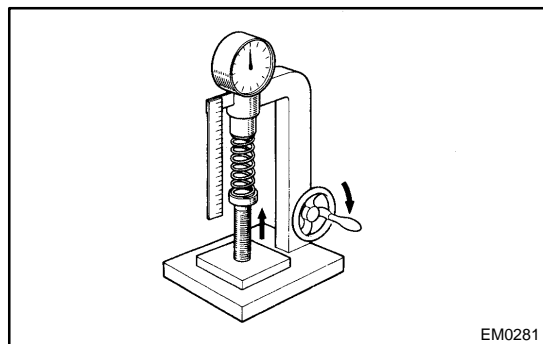


## 13. INSPECT INNER COMPRESSION SPRING

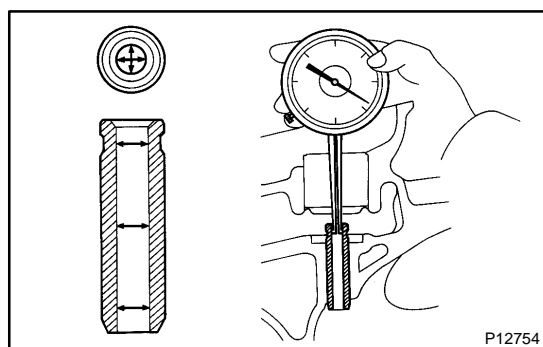
- (a) Using vernier calipers, measure the free length of the spring.  
**Free length: 45.50 mm (1.7913 in.)**  
 If the free length is not as specified, replace the spring.



- (b) Using a steel square, measure the deviation of the spring.  
**Maximum deviation: 2.0 mm (0.079 in.)**  
 If the deviation is greater than maximum, replace the spring.



- (c) Using a spring tester, measure the tension of the spring when the spring is 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 spring.



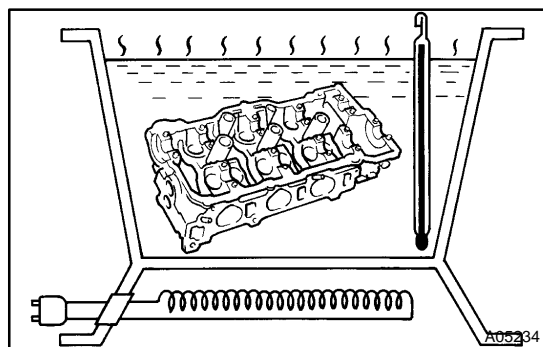
#### 14. INSPECT VALVE GUIDE BUSH OIL CLEARANCE

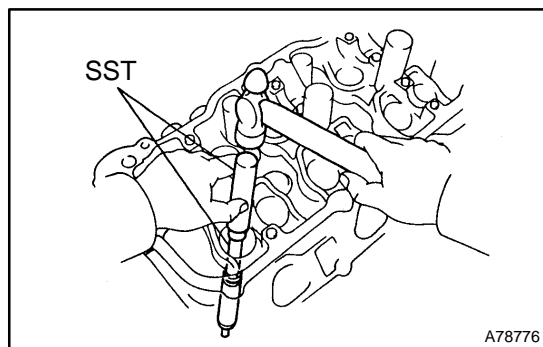
- (a) Using a caliper gauge, measure the inside diameter of the valve guide bush.  
**Bush inside diameter:**  
**5.510 to 5.530 mm (0.2169 to 0.2177 in.)**
- (b) Subtract the valve stem diameter measurement from the valve guide bush inside diameter measurement.  
**Standard oil clearance:**  
**0.025 to 0.060 mm (0.0010 to 0.0024 in.) for intake**  
**0.030 to 0.065 mm (0.0012 to 0.0026 in.) for exhaust**  
**Maximum oil clearance:**  
**0.08 mm (0.0031 in.) for intake**  
**0.10 mm (0.0039 in.) for exhaust**

If the clearance is greater than maximum, replace the valve and valve guide bush.

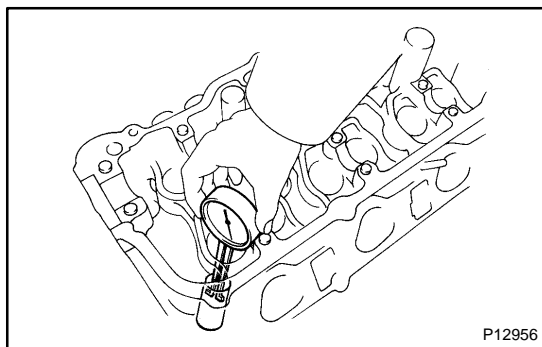
#### 15. REMOVE VALVE GUIDE BUSH

- (a) Heat the cylinder head up to 80 to 100 °C (176 to 212 °F).





- (b) Using SST and a hammer, tap out the valve 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.).

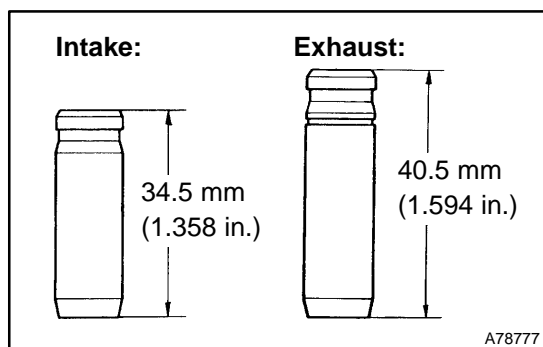
**HINT:**

**Bush diameter:**

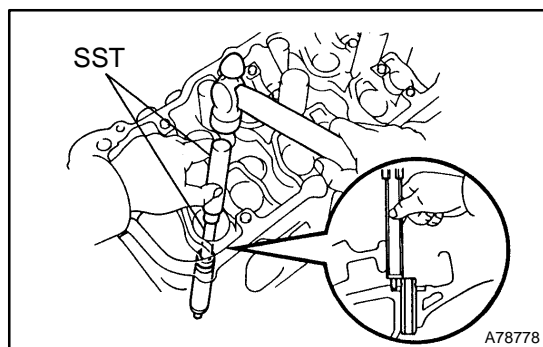
STD	10.333 to 10.344 mm (0.4068 to 0.4072 in.)
O/S	10.383 to 10.394 mm (0.4088 to 0.4092 in.)

**Bush length:**

Intake	34.5 mm (1.358 in.)
Exhaust	40.5 mm (1.594 in.)



- (b) Heat the cylinder head up to 80 to 100 °C (176 to 212 °F).



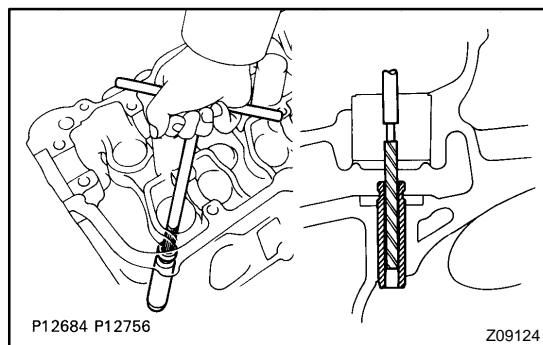
- (c) Using SST and a hammer, tap in a new valve guide bush to the specified protrusion height.

SST 09201-10000, 09201-01055, 09950-70010  
 (09951-07100)

**Protrusion height:**

**11.1 to 11.5 mm (0.437 to 0.453 in.) for intake**

**8.9 to 9.3 mm (0.350 to 0.366 in.) for exhaust**



- (d) Using a sharp 5.5 mm reamer, ream the valve guide bush to obtain the standard specified clearance between the valve guide bush and valve stem.

**Standard oil clearance:**

**0.025 to 0.060 mm (0.0010 to 0.0024 in.) for intake**

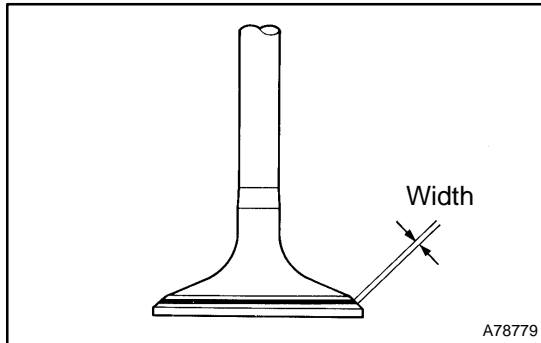
**0.030 to 0.065 mm (0.0012 to 0.0026 in.) for exhaust**

**17. INSPECT VALVE SEATS**

- Apply a light coat of prussian blue (or white lead) to the valve face.
- Lightly press the valve against the seat.

**NOTICE:**

**Do not rotate the valve.**

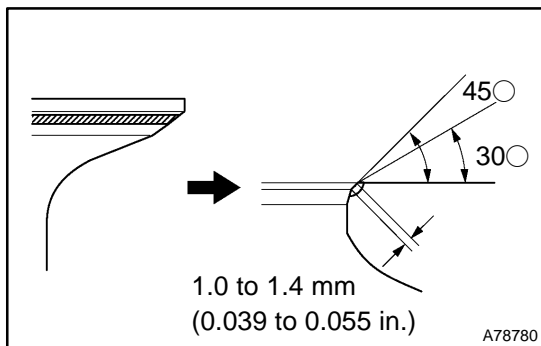


- Check the valve face and seat according to the following procedure.

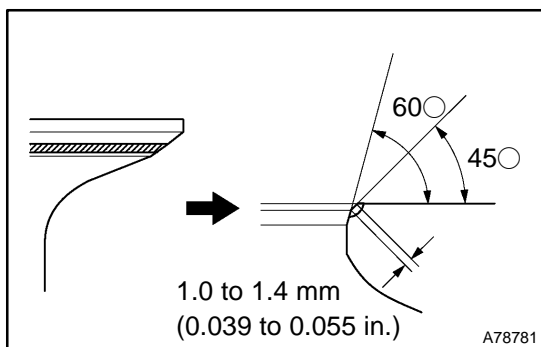
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with the width between 1.0 and 1.4 mm (0.039 to 0.055 in.).

**18. REPAIR VALVE SEATS****NOTICE:**

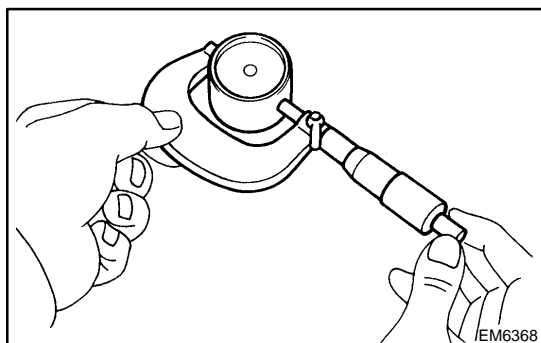
**Releasing the seat cutter pressure gradually helps to make smoother valve seat faces.**



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



- If the seating is too low on the valve face, use the 60° and 45° cutters to correct the seat.
- Lap the valve and valve seat by hand with an abrasive compound.
- Recheck the valve seating position.

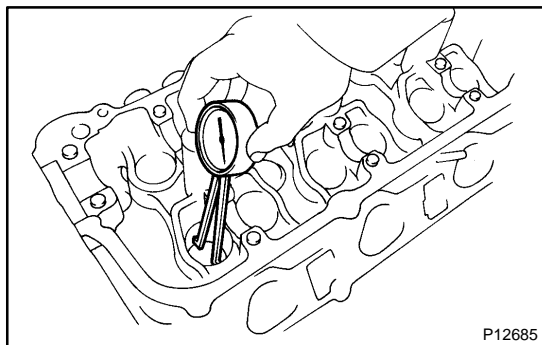
**19. INSPECT VALVE LIFTER**

- 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: 0.07 mm (0.0028 in.)**

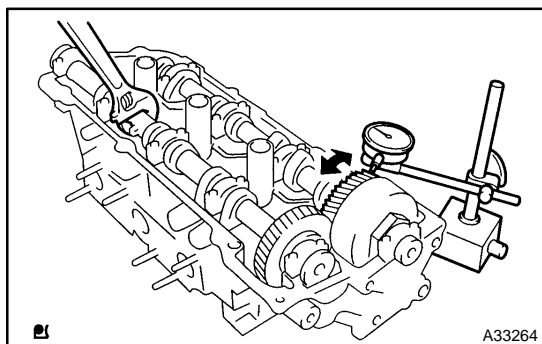
- If the oil clearance is greater than maximum, replace the valve lifter.
- If necessary, replace the cylinder head.

**21. INSPECT CAMSHAFT GEAR BACKLASH**

- (a) Install the camshaft timing gear.  
(b) Install the camshafts to the cylinder head.

**NOTICE:**

- **Install the camshafts with the valves and sub gear removed.**
- **Install the camshafts with their timing marks 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: 0.30 mm (0.0118 in.)**

**22. INSPECT CAMSHAFT THRUST CLEARANCE**

- (a) Install the camshafts.

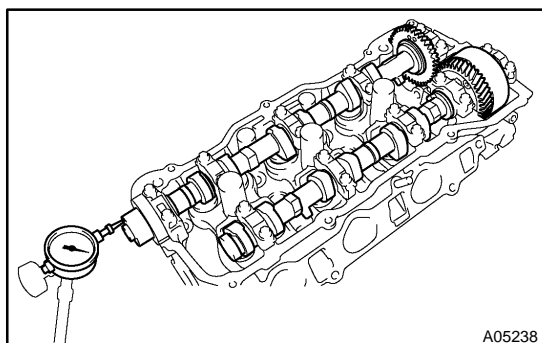
- (b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

**Standard thrust clearance:**

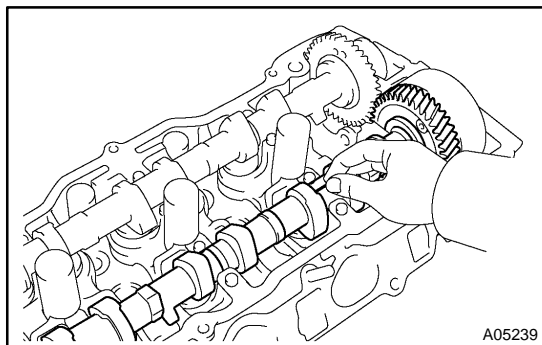
**0.040 to 0.090 mm (0.0016 to 0.0035 in.)**

**Maximum thrust clearance: 0.12 mm (0.0047 in.)**

- If the thrust clearance is greater than maximum, replace the camshaft.
- If necessary, replace the bearing caps and cylinder head together.

**23. INSPECT CAMSHAFT OIL CLEARANCE**

- (a) Clean the bearing caps and camshaft journals.  
(b) Clean the camshafts.  
(c) Place the camshafts on the cylinder head.



(d) Lay a strip of Plastigage across each of the camshaft journals.

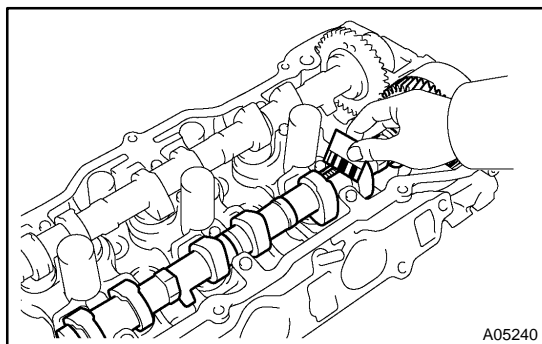
(e) Install the bearing caps.

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

**NOTICE:**

**Do not turn the camshaft.**

(f) Remove the bearing caps.



(g) 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.)**

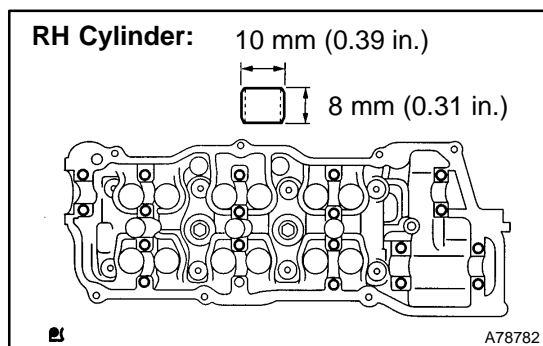
**Other journals 0.025 to 0.062 mm (0.0010 to 0.0024 in.)**

**Maximum oil clearance 0.10 mm (0.0039 in.)**

- If the oil clearance is greater than maximum, replace the camshaft.
- If necessary, replace the bearing caps and cylinder head together.

**NOTICE:**

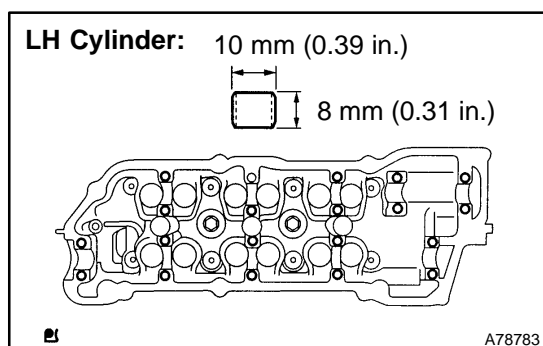
**Completely remove the Plastigage.**



**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.

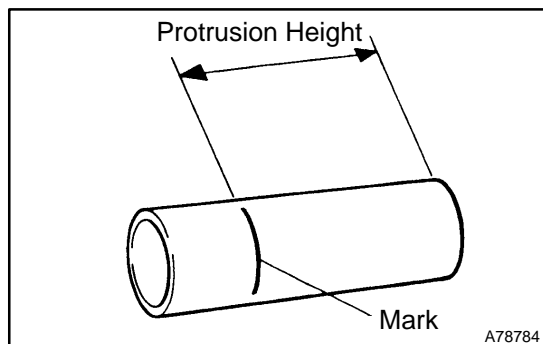
**Protrusion height: 3 mm (0.12 in.)**



**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 height from the edge.

**Standard protrusion height:**

**42.4 to 43.4 mm (1.669 to 1.709 in.)**

### HINT:

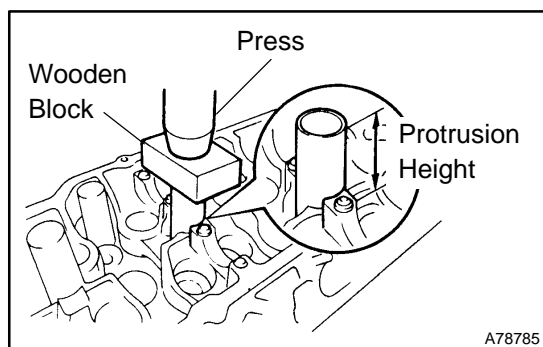
Use either end of the spark plug tube.

- (b) Apply adhesive to the end of the spark plug tube which will be pressed into the cylinder head.

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

### NOTICE:

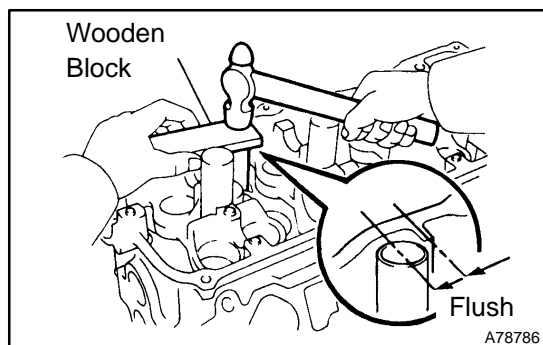
- Install the spark plug tube within 3 minutes after applying adhesive.
- Do not deform the spark plug tube.
- Do not expose the spark plug tube to coolant within 1 hour after installing.



- (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.**

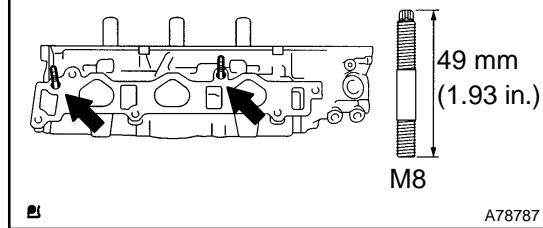


## 27. INSTALL PCV PIPE (RH CYLINDER)

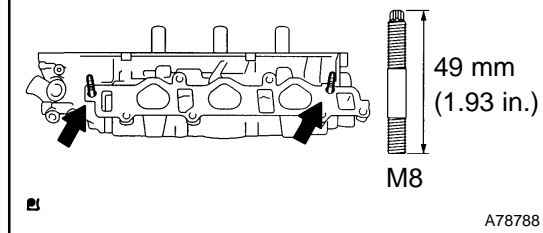
- (a) Using a wooden block and hammer, tap in 2 new PCV pipes until their top edges are flush with the cylinder head edge.

### NOTICE:

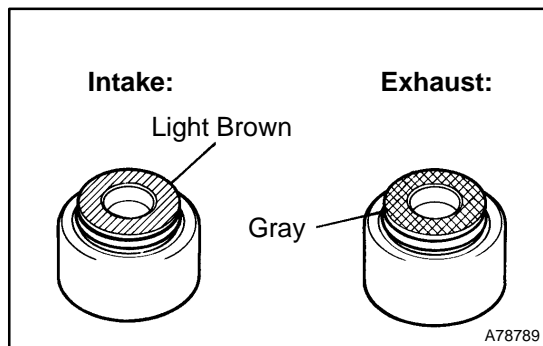
**Be careful not to damage the cylinder head edge.**

**RH Cylinder:****28. INSTALL STUD BOLT**

- (a) Install the stud bolts on the intake side.  
**Torque: 7.5 N·m (76 kgf·cm, 66 in·lbf)**

**LH Cylinder:****29. INSTALL STUD BOLT**

- (a) Install the stud bolts on the exhaust side.  
**Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)**

**30. INSTALL VALVE STEM OIL O SEAL OR RING**

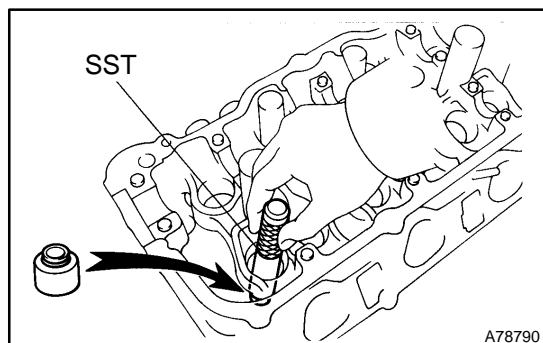
- (a) Apply a light coat of engine oil to the valve stem.

**NOTICE:**

**Installing the oil seals for intake and exhaust to the opposite valve guide bush may cause an improper installation.**

**HINT:**

The intake valve oil seal is light brown and the exhaust valve oil seal is gray.

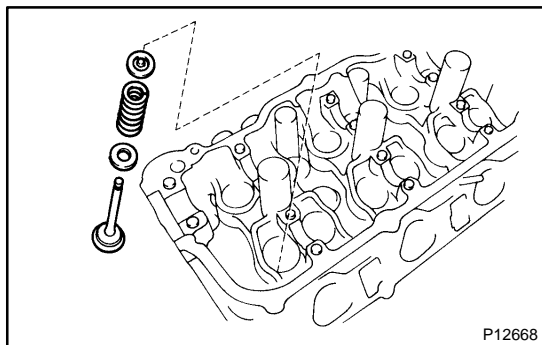


- (b) Using SST, push in a new oil seal.

SST 09201-41020

**NOTICE:**

**Failure to use SST will cause the seal to be damaged or improperly seated.**

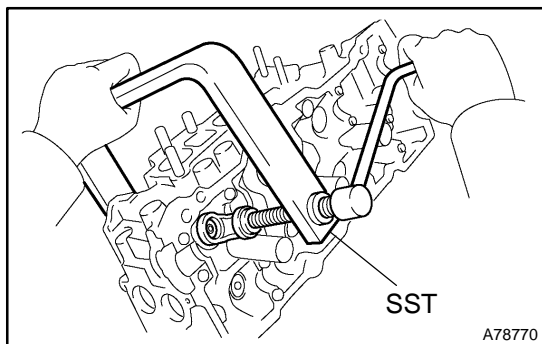


### 31. INSTALL INTAKE VALVE

- (a) Install the valve, seat, spring, and retainer.

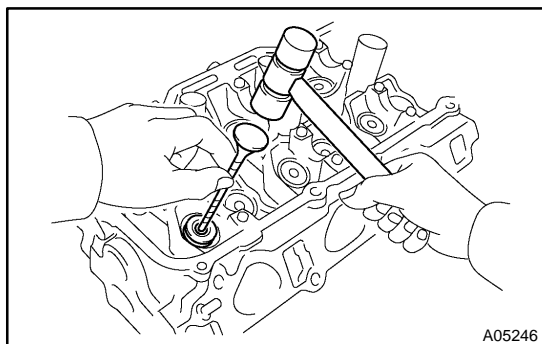
**NOTICE:**

Install the same parts in the same combination to the original locations.



- (b) Using SST, compress the spring and place the 2 retainer locks around the valve stem.

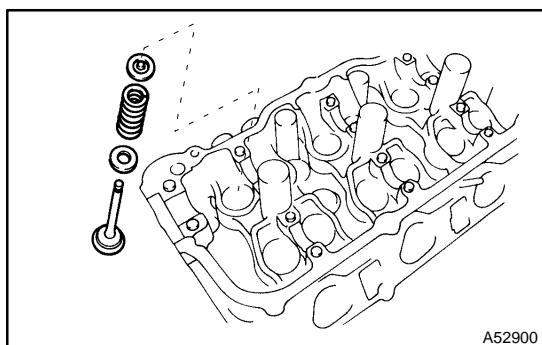
SST 09202-70020 (09202-00010)



- (c) Using a plastic-faced hammer and discarded valve (the tip is wrapped with tape), lightly tap the installed valve to fit into place.

**NOTICE:**

Be careful not to damage the installed valve stem tip.

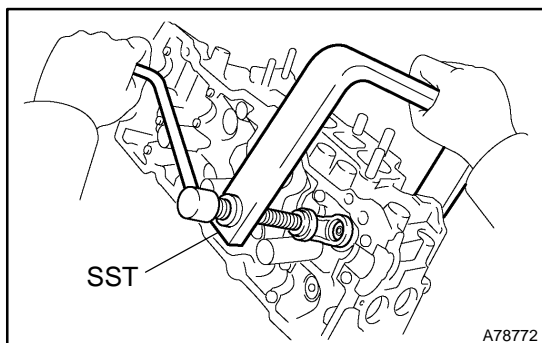


### 32. INSTALL EXHAUST VALVE

- (a) Install the valve, seat, spring, and retainer.

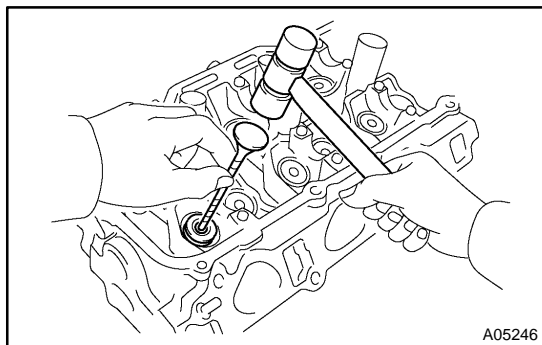
**NOTICE:**

Install the same parts in the same combination to the original locations.



- (b) Using SST, compress the spring and place the 2 retainer locks around the valve stem.

SST 09202-70020 (09202-00010)



- (c) Using a plastic-faced hammer and discarded valve (the tip is wrapped with tape), lightly tap the installed valve to fit into place.

**NOTICE:**

**Be careful not to damage the installed valve stem tip.**

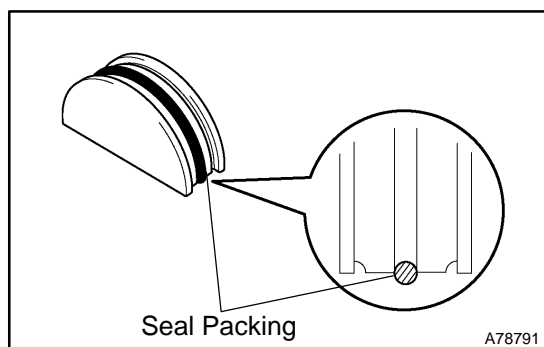
**33. INSTALL VALVE LIFTER**

- (a) Apply a light coat of engine oil to the valve lifter.

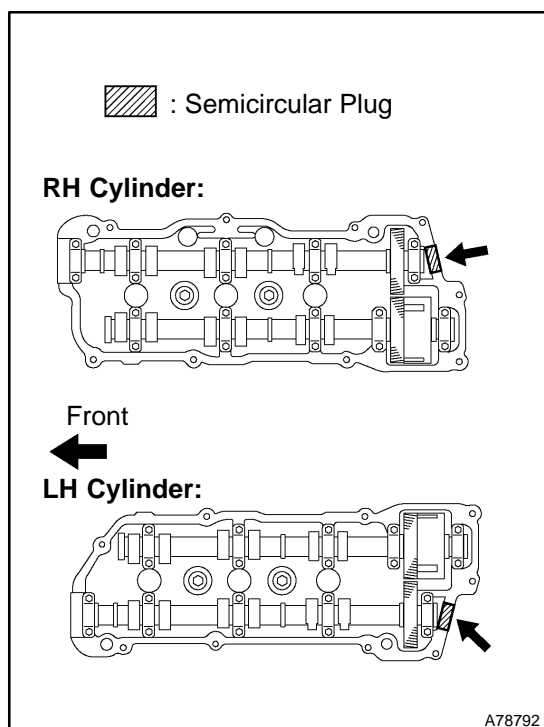
**NOTICE:**

**Install the same parts in the same combination to the original locations.**

- (b) Install the valve lifter.  
(c) Check that the valve lifter is rotated smoothly by hand.

**34. INSTALL SEMICIRCULAR PLUG**

- (a) Remove any old seal packing material.  
(b) Apply seal packing to the plug grooves.  
**Seal packing: Part No. 08826-00080 or equivalent**



- (c) Install the 2 plugs to the cylinder heads.

**NOTICE:**

- Install the plugs so that they are flush with the top of the cylinder head.
- Install the plugs within 3 minutes after applying seal packing.
- Do not expose the seal packing to engine oil within 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)**

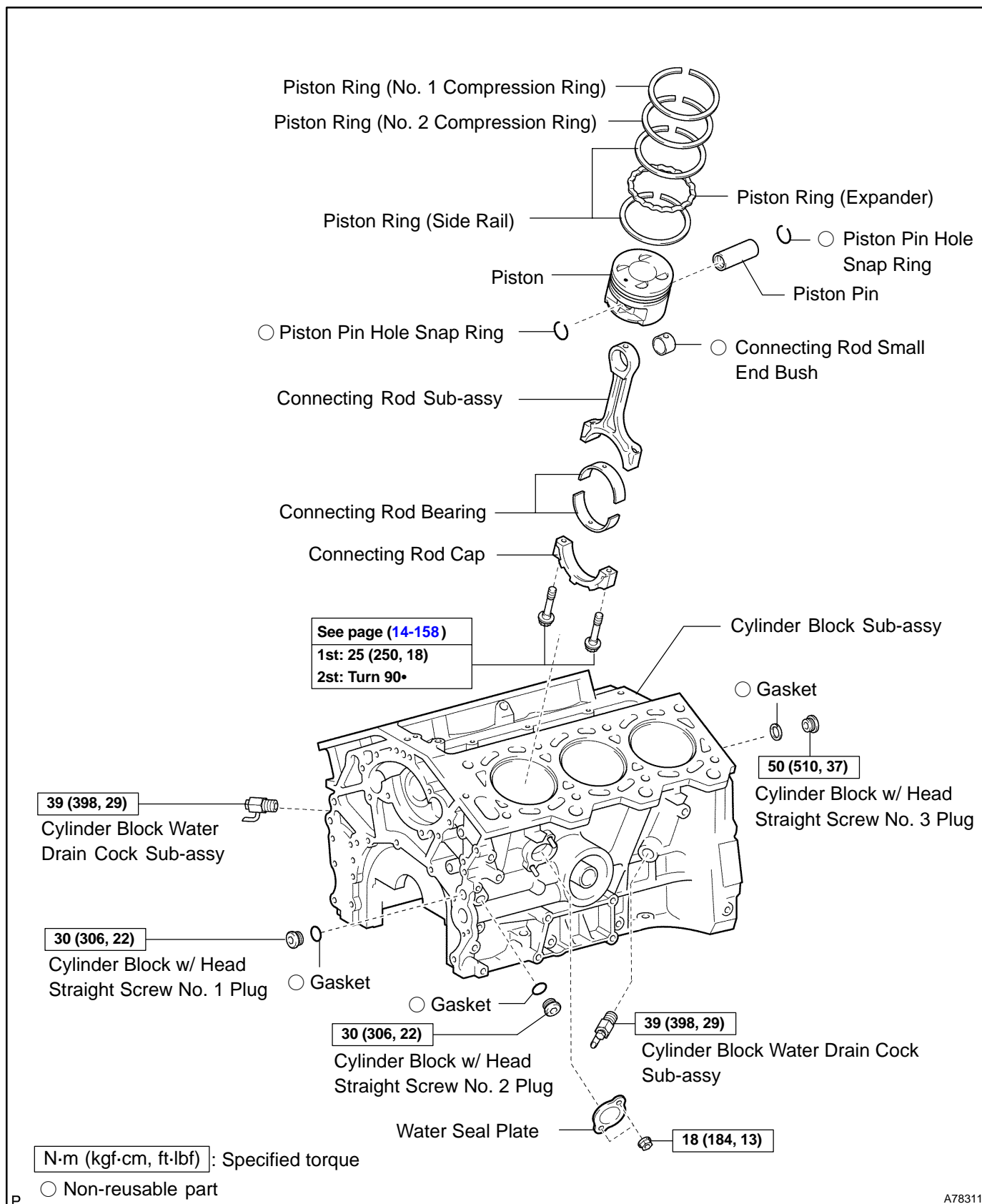
- (a) Using a straight hexagon wrench 14, install 2 new gaskets and the 2 screw plugs.

**Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)**

# CYLINDER BLOCK ASSY (3MZ-FE)

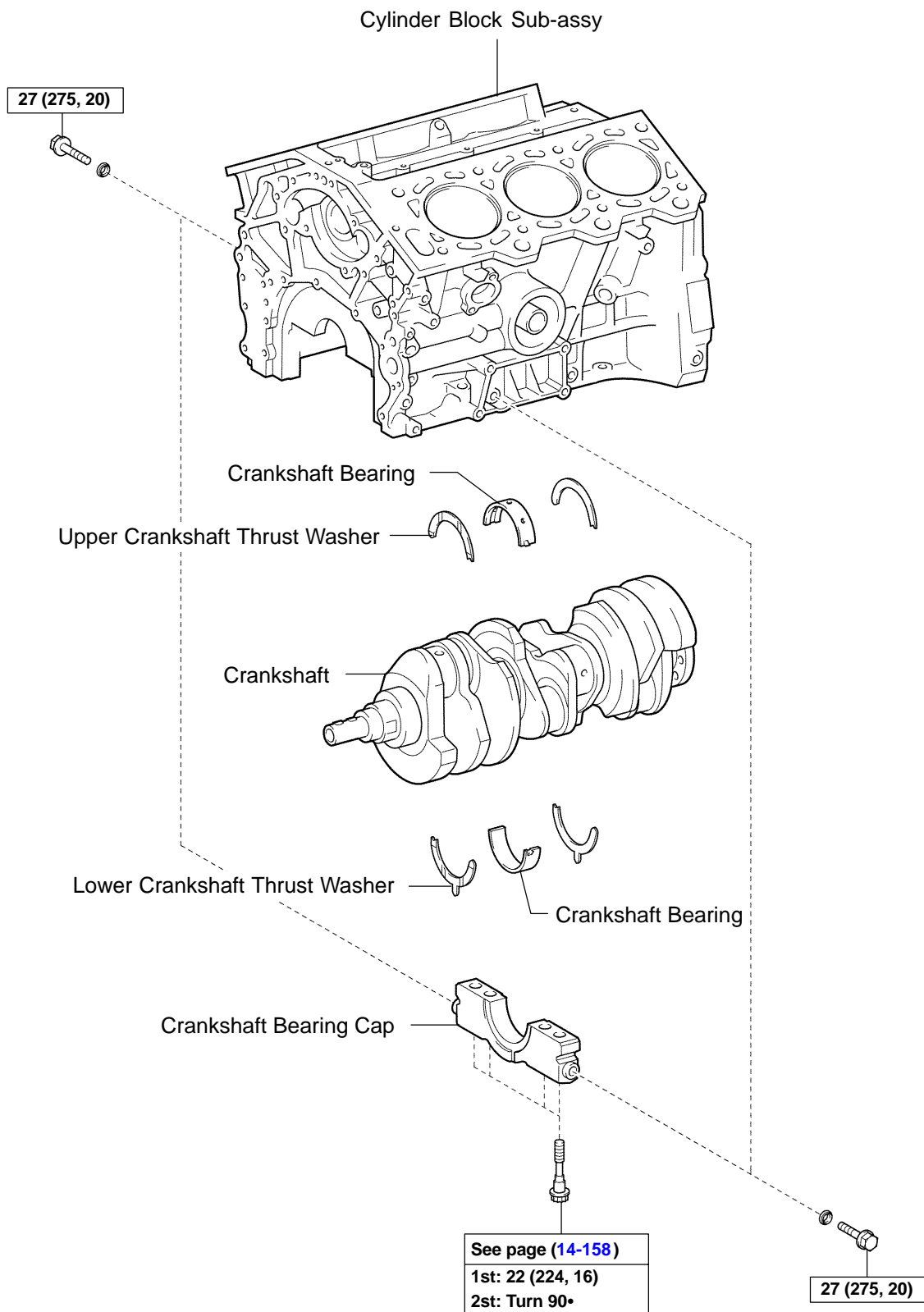
## COMPONENTS

1419L-03



A78311





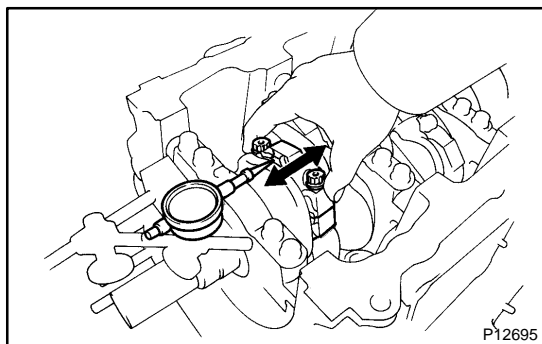
P

N·m (kgf·cm, ft·lbf): Specified torque

A78312

## 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:**

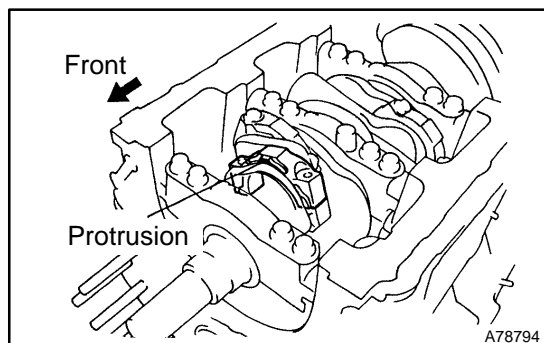
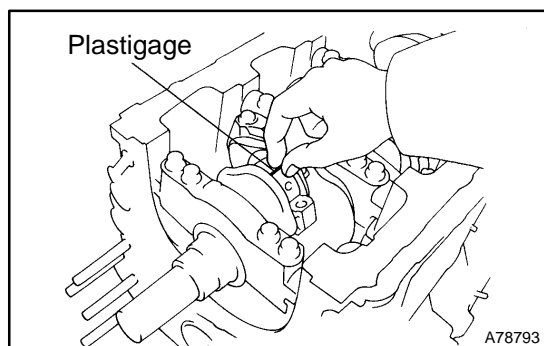
**0.15 to 0.30 mm (0.0059 to 0.0118 in.)**

**Maximum thrust clearance: 0.35 mm (0.0138 in.)**

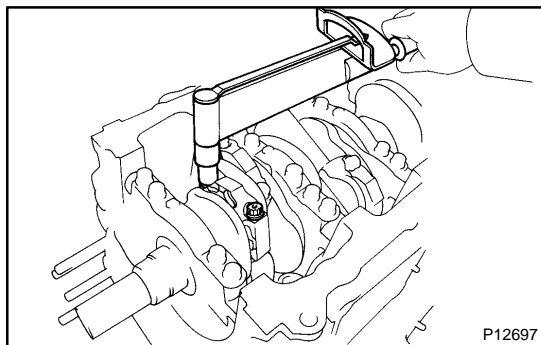
- If the thrust clearance is greater than maximum, replace the connecting rod.
- If necessary, replace the crankshaft.

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 cap bolts.
- (c) Clean the crank pin, bearing and connecting rod.
- (d) Check the crank pin and bearing for pitting and scratches.
- (e) Lay a strip of Plastigage across the crank pin.

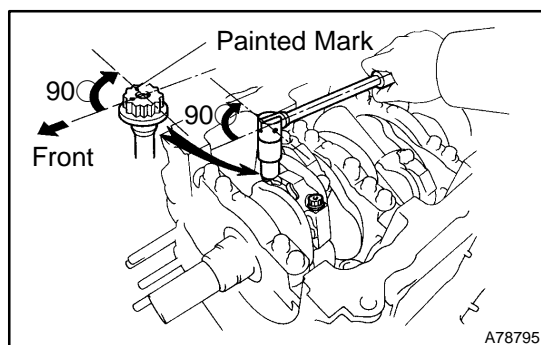


- (f) Check that the protrusion of the cap is facing the correct direction.
- (g) Apply a light coat of engine oil to the threads of the cap bolts.



- (h) Tighten the cap bolts in several steps by the specified torque.

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

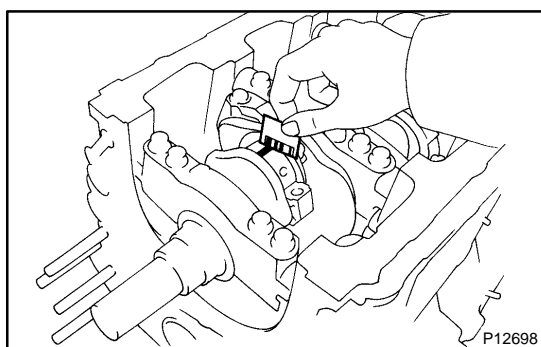


- (i) Mark the front side of each cap bolt with paint.  
 (j) Retighten the cap bolts by 90° as shown in the illustration.

**NOTICE:**

**Do not turn the crankshaft.**

- (k) Remove the cap bolts, cap and 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: 0.08 mm (0.0031 in.)**

**NOTICE:**

**Completely remove the Plastigage.**

- If the oil clearance is greater than maximum, replace the bearing.
- If necessary, grind or replace the crankshaft.

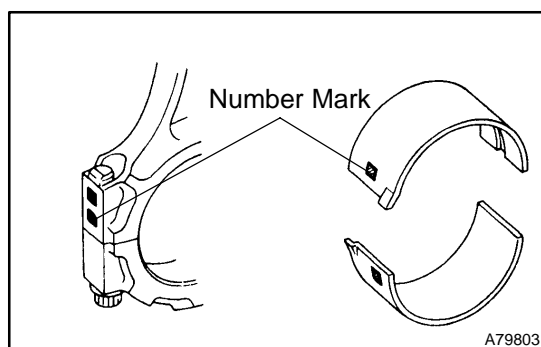
**HINT:**

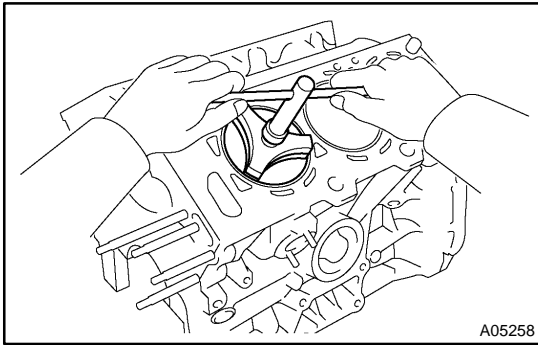
If replacing the bearing, replace it with one having the same number as marked on the connecting rod. There are 4 sizes of standard bearings, marked "1", "2", "3" and "4" accordingly.

**Reference:**

**Standard bearing center wall thickness:**

Mark	mm (in.)
"1"	1.484 to 1.487 (0.0584 to 0.0585)
"2"	1.487 to 1.490 (0.0585 to 0.0587)
"3"	1.490 to 1.493 (0.0587 to 0.0588)
"4"	1.493 to 1.496 (0.0588 to 0.0589)

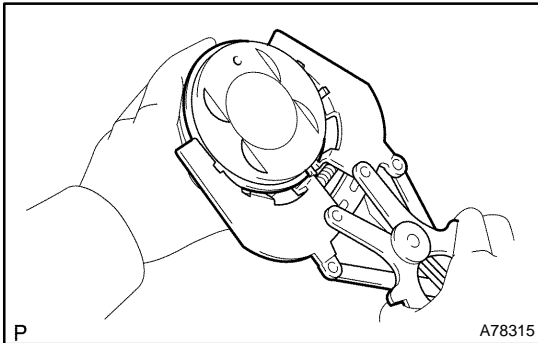


**8. REMOVE PISTON SUB-ASSY W/CONNECTING ROD**

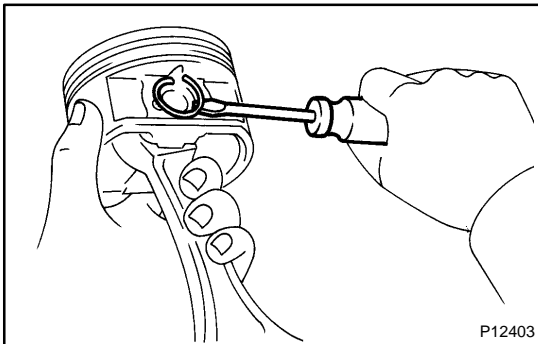
- (a) Using a ridge reamer, remove all the carbon from the top of the cylinder.
- (b) Push out the piston and connecting rod assembly from the top of the cylinder block.

**HINT:**

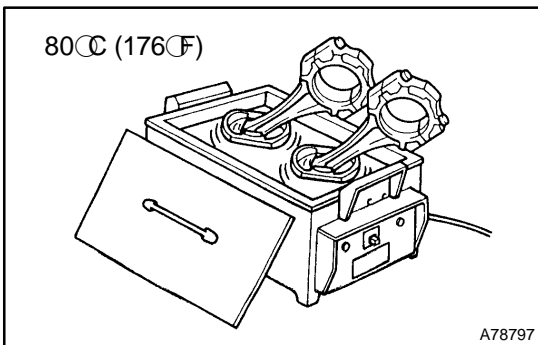
- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in the correct order so they can be returned to the original locations when reassembling.

**9. REMOVE CONNECTING ROD BEARING****10. REMOVE PISTON RING SET**

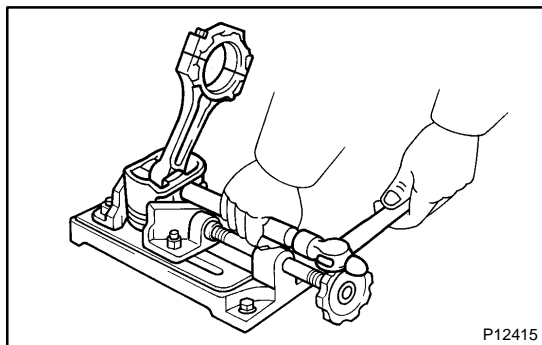
- (a) Using a piston ring expander, remove the 2 compression rings.
- (b) Remove the 2 side rails and expander by hand.

**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**

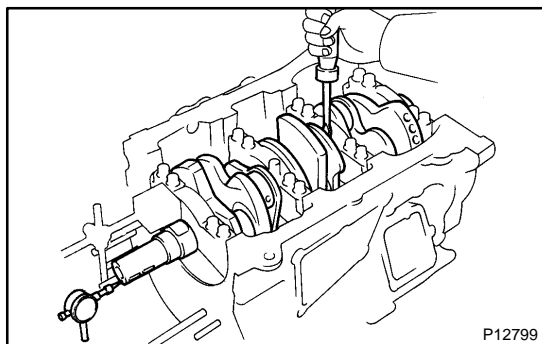
- (a) Gradually heat the piston up to approximately 80°C (176°F).



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

**HINT:**

- The piston and piston pin are a matched set.
- Store the pistons, piston pins, rings, connecting rods and bearings in the correct order so that they can be returned to the original locations when reassembling.



**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:**

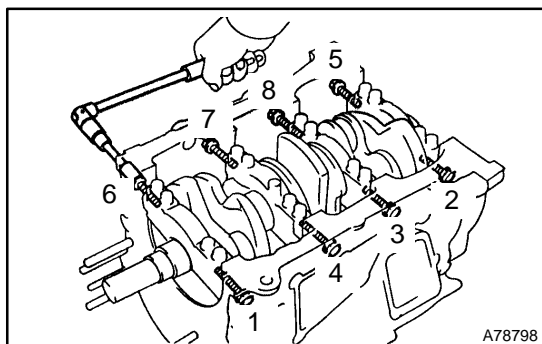
**0.04 to 0.24 mm (0.0016 to 0.0094 in.)**

**Maximum thrust clearance: 0.30 mm (0.0118 in.)**

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

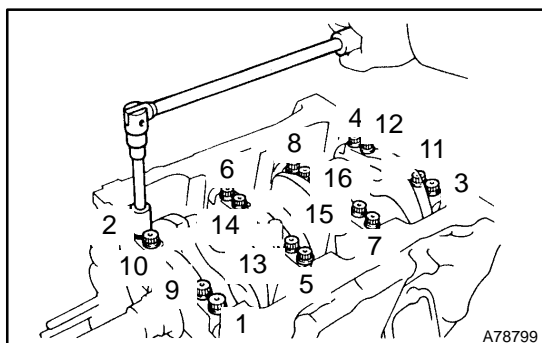
**HINT:**

The thrust washer thickness is 1.93 to 1.98 mm (0.0760 to 0.0780 in.).

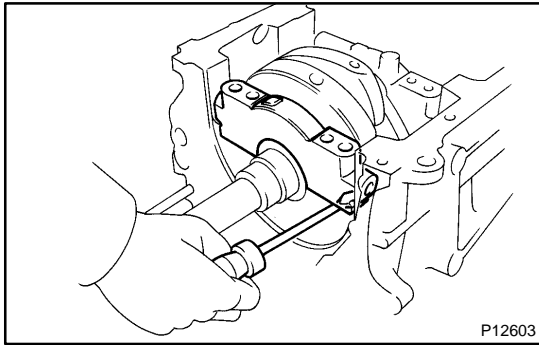


**14. REMOVE CRANKSHAFT**

- (a) Using several steps, loosen and remove the 8 bearing cap bolts and 8 seal washers uniformly in the sequence shown in the illustration.



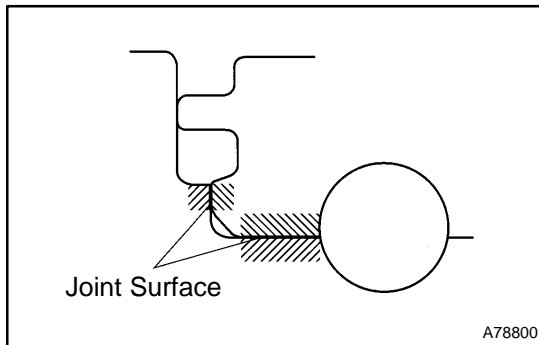
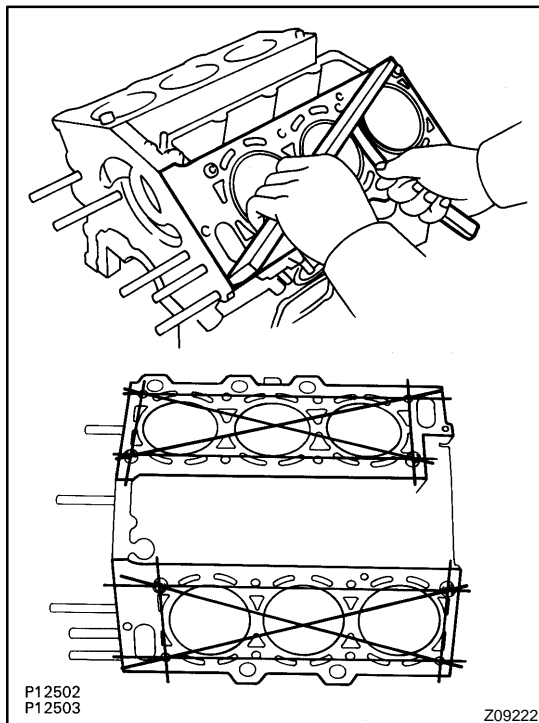
- (b) Using several steps, loosen and remove the 16 bearing cap bolts uniformly in the sequence shown in the illustration.



- (c) Using a screwdriver, pry out the bearing caps. Remove the 4 bearing caps and 4 lower bearings.

**NOTICE:**

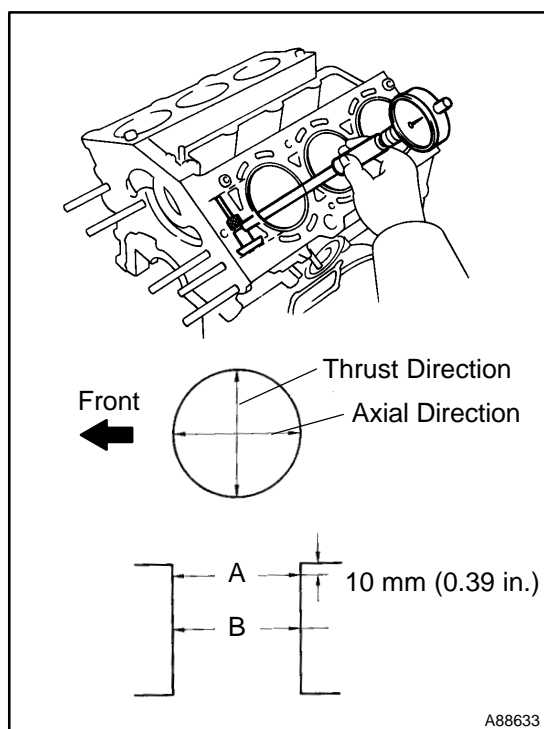
- **Carefully pry out the main bearing cap by alternately lifting each end of the bearing cap little by little.**
- **Be careful not to damage the joint surface of the cylinder block and bearing cap.**

**15. REMOVE CRANKSHAFT THRUST WASHER SET****16. REMOVE CRANKSHAFT BEARING****17. INSPECT CYLINDER BLOCK FOR FLATNESS**

- (a) Using a precision straight edge and feeler gauge, measure the warpage on the surface which contacts the cylinder head gasket.

**Maximum warpage: 0.05 mm (0.0020 in.)**

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

**18. INSPECT CYLINDER BORE**

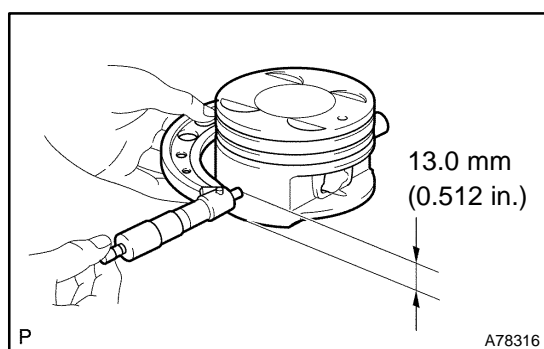
- (a) Using a cylinder gauge, measure the cylinder bore diameter at positions A and B in the thrust and axial directions.

**Standard diameter:**

**92.000 to 92.012 mm (3.6220 to 3.6225 in.)**

**Maximum diameter: 92.132 mm (3.6272 in.)**

If the average diameter of 4 positions is greater than maximum, replace the cylinder block.

**19. INSPECT W/PIN PISTON SUB-ASSY**

- (a) Using a micrometer, measure the diameter of the piston. Align the micrometer so it is 13.0 mm (0.512 in.) from the bottom of the piston and at a right angle (90°) to the piston pin holes as illustrated.

**Piston diameter:**

**91.953 to 91.967 mm (3.6202 to 3.6207 in.)**

**20. INSPECT PISTON OIL CLEARANCE**

- (a) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

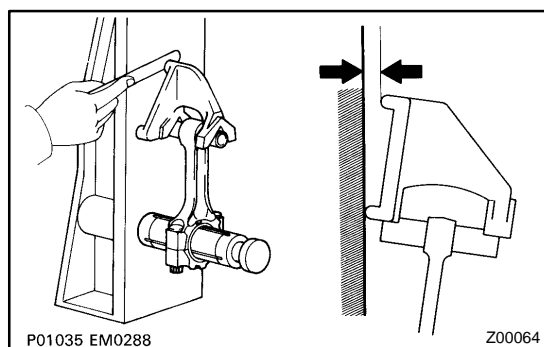
**Standard oil clearance: 0.033 to 0.059 mm (0.0013 to 0.0023 in.)**

**Maximum oil clearance: 0.13 mm (0.0051 in.)**

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

**21. INSPECT CONNECTING ROD SUB-ASSY**

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

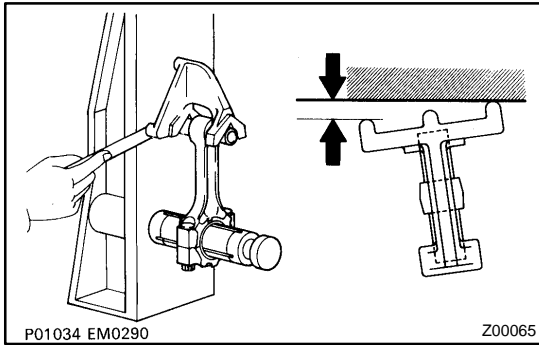


- (1) Inspect for misalignment.

**Maximum misalignment:**

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

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

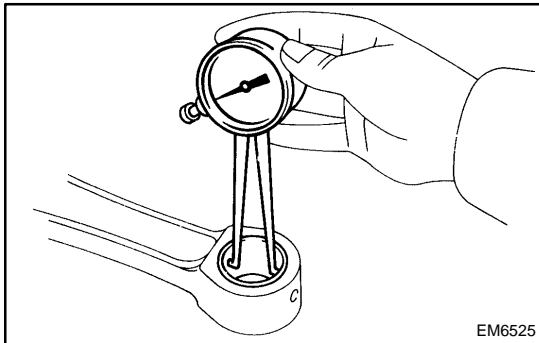


(2) Inspect for twist.

**Maximum twist:**

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

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

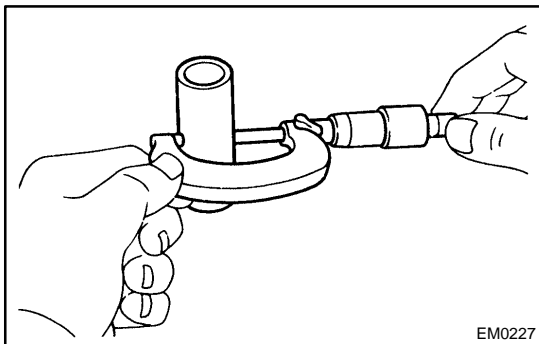


## 22. INSPECT PISTON PIN OIL CLEARANCE

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

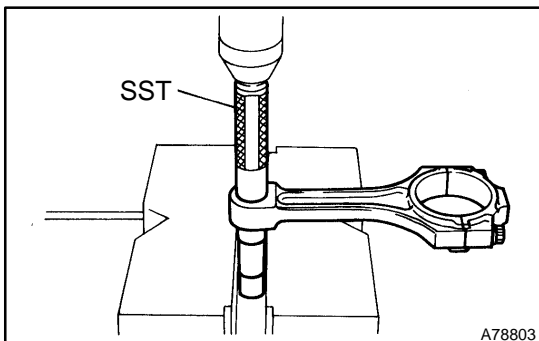
(c) Subtract the piston pin diameter measurement from the bush inside diameter measurement.

**Standard oil clearance:**

**0.005 to 0.011 mm (0.0002 to 0.0004 in.)**

**Maximum oil clearance: 0.05 mm (0.0020 in.)**

- If the oil clearance is greater than maximum, replace the bush.
- If necessary, replace the piston and piston pin together.

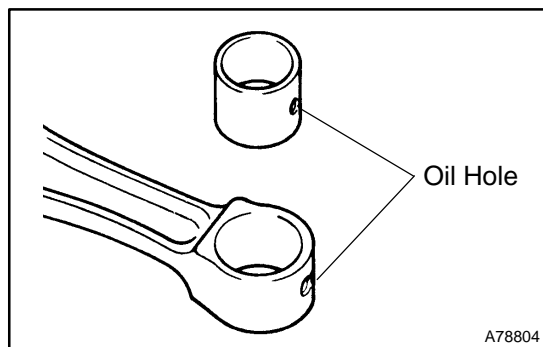


## 23. REMOVE CONNECTING ROD SMALL END BUSH

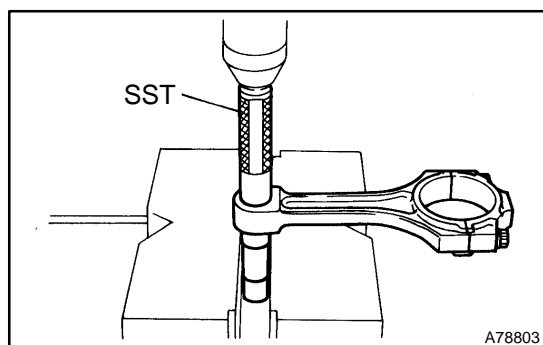
(a) Using SST and a press, press out the bush.

SST 09222-30010

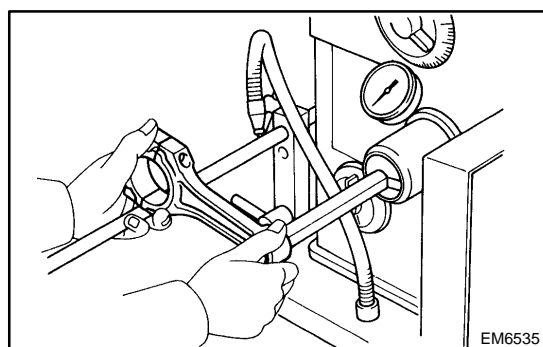


**24. INSTALL CONNECTING ROD SMALL END BUSH**

- (a) Align the oil holes of a new bush and the connecting rod.



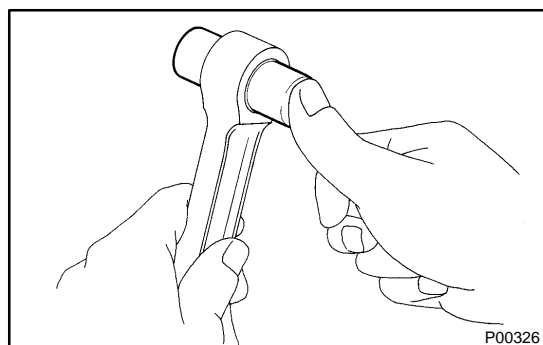
- (b) Using SST and a press, press in the bushing.  
SST 09222-30010



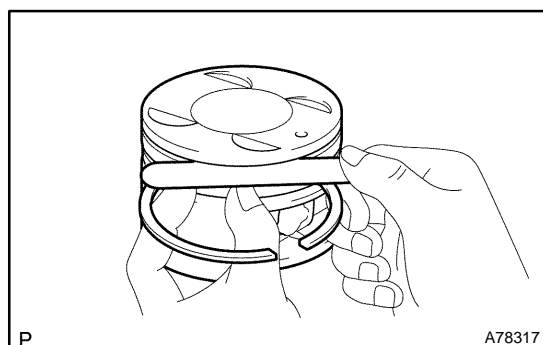
- (c) Using a pin hole grinder, hone the bush to obtain the standard specified clearance between the bush and piston pin.

**Standard oil clearance:**

**0.005 to 0.011 mm (0.0002 to 0.0004 in.)**



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

**25. INSPECT RING GROOVE CLEARANCE**

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

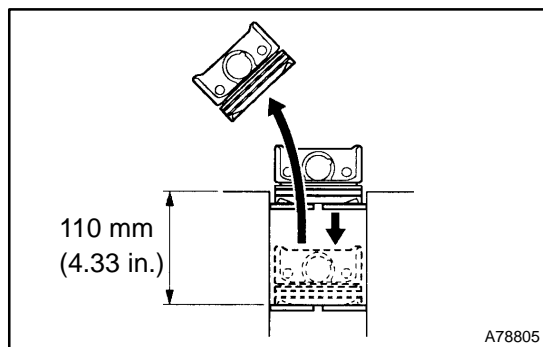
**Ring groove clearance:**

**0.03 to 0.08 mm (0.0012 to 0.0031 in.) for No. 1 ring**

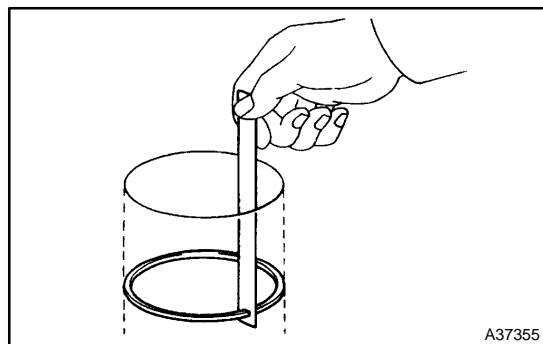
**0.02 to 0.06 mm (0.0008 to 0.0024 in.) for No. 2 ring**

**0.03 to 0.11 mm (0.0012 to 0.0043 in.) for oil ring**

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

**26. INSPECT PISTON RING END GAP**

- (a) Using a piston, push the piston ring which it is a little below the bottom of the ring travel, where is 110 mm (4.33 in.) from the top of the cylinder block.



- (b) Using a feeler gauge, measure the end gap.

**Standard end gap:**

**0.30 to 0.40 mm (0.0118 to 0.0157 in.) for No. 1 ring**

**0.50 to 0.60 mm (0.0197 to 0.0236 in.) for No. 2 ring**

**0.15 to 0.40 mm (0.0059 to 0.0157 in.) for oil (side rail) ring**

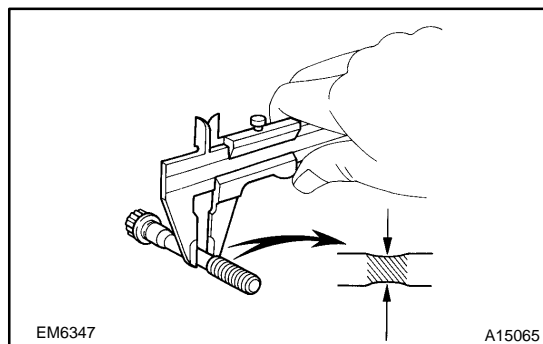
**Maximum end gap:**

**0.95 mm (0.0374 in.) for No. 1 ring**

**1.05 mm (0.0413 in.) for No. 2 ring**

**1.00 mm (0.0394 in.) for oil (side rail) ring**

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

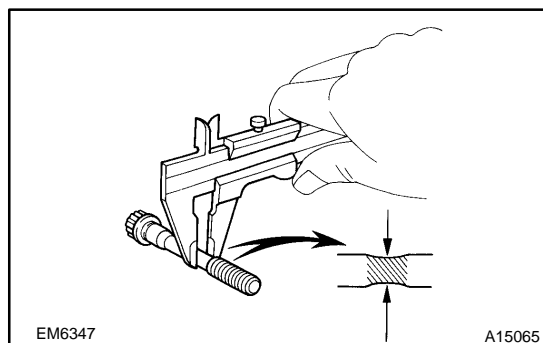
**27. INSPECT CONNECTING ROD BOLT**

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

**Standard diameter: 7.2 to 7.3 mm (0.283 to 0.287 in.)**

**Minimum diameter: 7.0 mm (0.276 in.)**

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

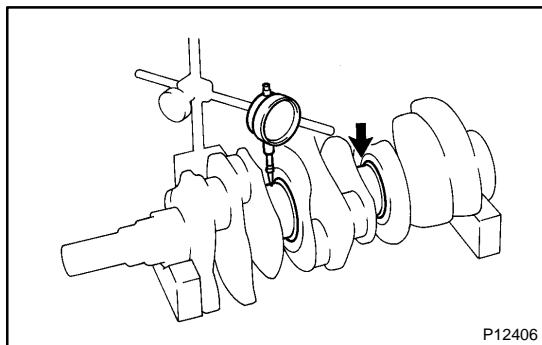
**28. INSPECT CRANKSHAFT BEARING CAP SET BOLT**

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

**Standard diameter: 7.5 to 7.6 mm (0.295 to 0.299 in.)**

**Minimum diameter: 7.2 mm (0.283 in.)**

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

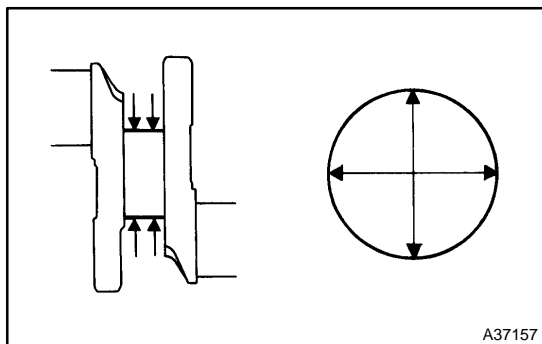


## 29. INSPECT CRANKSHAFT

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

**Maximum circle runout: 0.06 mm (0.0024 in.)**

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



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

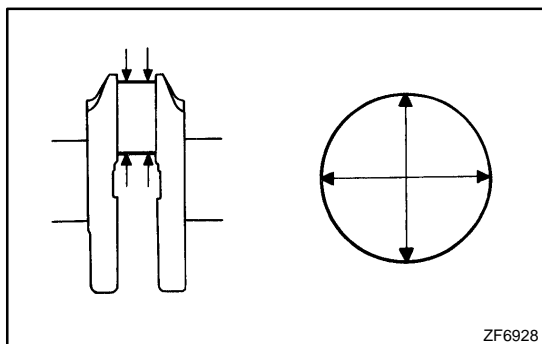
**Diameter: 60.988 to 61.000 mm (2.4011 to 2.4016 in.)**

If the diameter is not as specified, check the crankshaft oil clearance

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

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

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



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

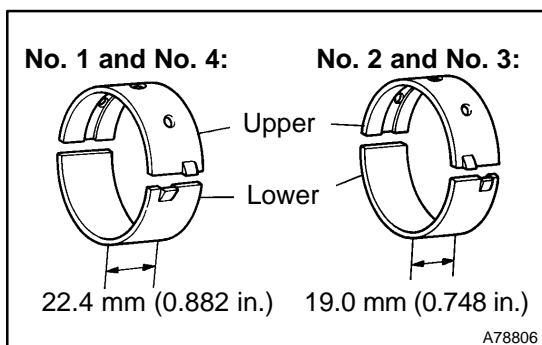
**Diameter: 52.992 to 53.000 mm (2.0863 to 2.0866 in.)**

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

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

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

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

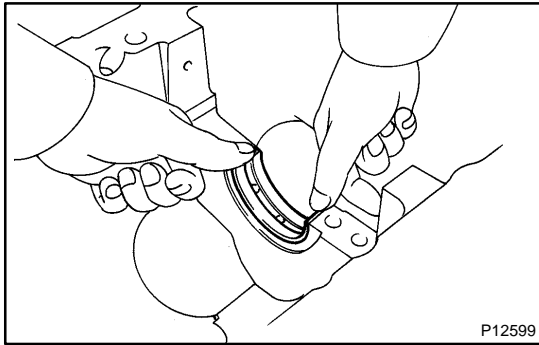


## 30. INSPECT CRANKSHAFT OIL CLEARANCE

HINT:

Crankshaft bearings come in widths of 22.4 mm (0.882 in.) and 19.0 mm (0.748 in.). Install the 22.4 mm (0.882 in.) bearings in the No. 1 and No. 4 cylinder block journal positions with the bearing caps. Install the 19.0 mm (0.748 in.) bearings in the No. 2 and No. 3 positions.

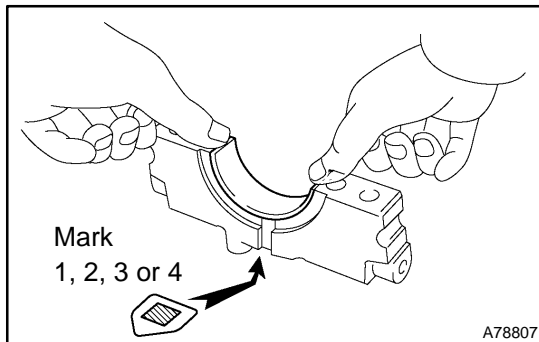
- (a) Clean each main journal and bearing.



- (b) Align the key of the bearing with the keyway of the cylinder block, then push in the 4 upper bearings.

**NOTICE:**

**Do not apply engine oil to the bearing and its contact surface.**



- (c) Align the key of the bearing with the keyway of the bearing cap, then push in the 4 lower bearings.

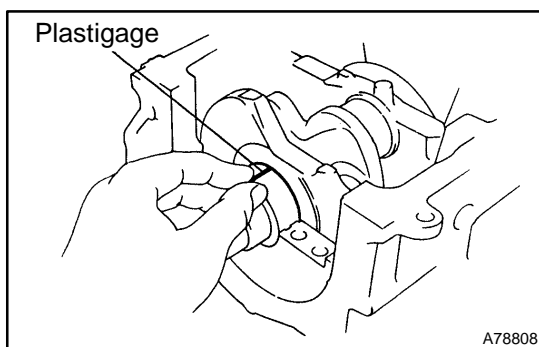
**NOTICE:**

**Do not apply engine oil to the bearing and its contact surface.**

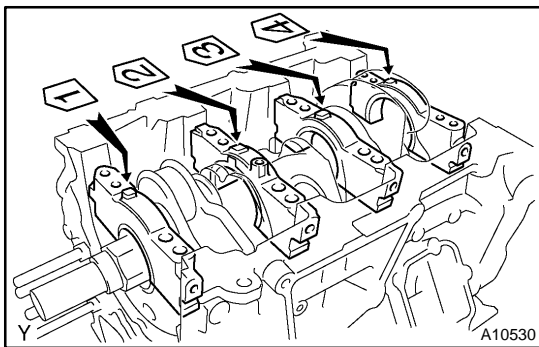
**HINT:**

A number is marked on each bearing cap to indicate the installation position.

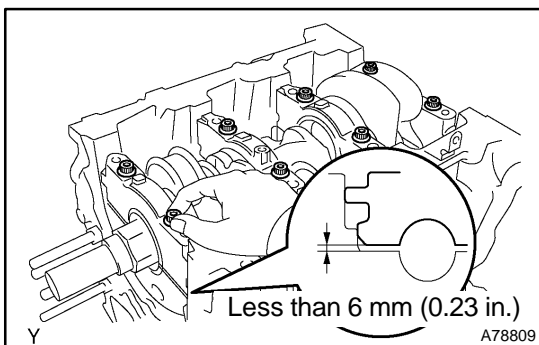
- (d) Place the crankshaft on the cylinder block.



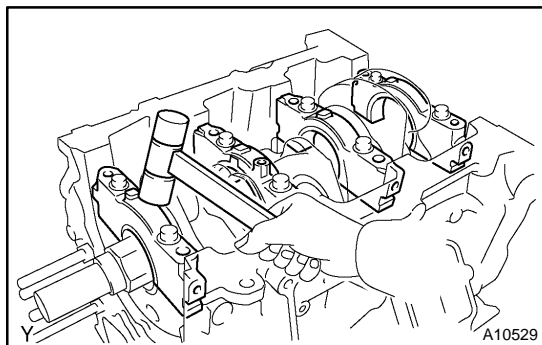
- (e) Lay a strip of Plastigage across each journal.



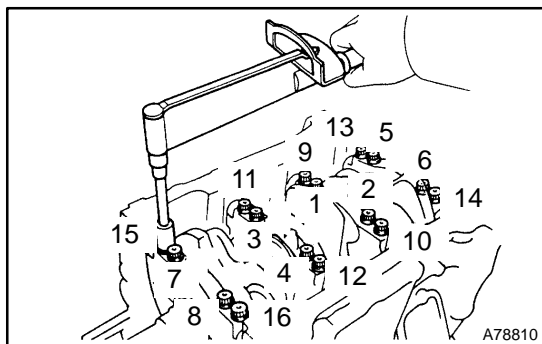
- (f) Examine the front marks and numbers, then install the bearing caps on the cylinder block.
- (g) Apply a light coat of engine oil to the threads of the bearing cap bolts.



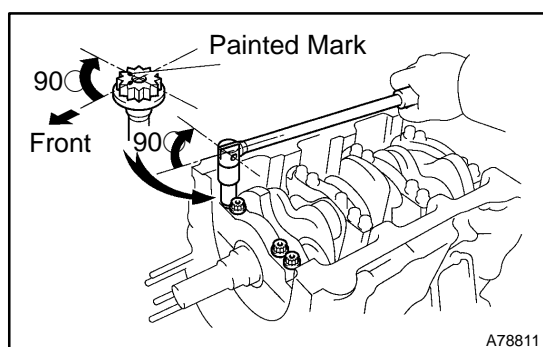
- (h) Temporarily install the 8 bearing cap bolts to the inside positions.
- (i) Install the bearing cap by hand using the inner bolt as a guide. Stop when the bearing cap is about 6 mm (0.23 in.) away from contact with the cylinder block.



- (j) Using a plastic-faced hammer, lightly tap the bearing cap to ensure proper fit.
- (k) Apply a light coat of engine oil to the threads of the bearing cap bolts.



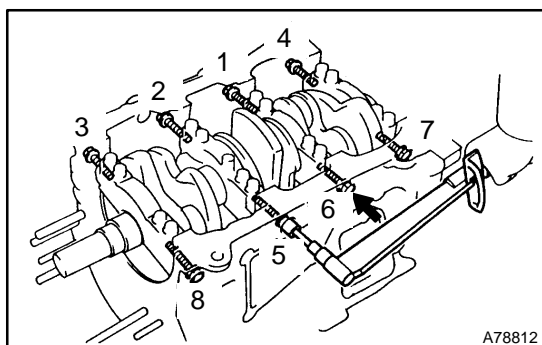
- (l) Using several steps, install and tighten the 16 bearing cap bolts uniformly in the sequence shown in the illustration.  
**Torque: 22 N·m (224 kgf·cm, 16 ft·lbf)**



- (m) Mark the front side of the bearing cap bolts with paint.
- (n) Retighten the bearing cap bolts by 90° in the same sequence as step (l).
- (o) Check that each painted mark is now at a 90° angle to the front.

**NOTICE:**

**Do not turn the crankshaft.**

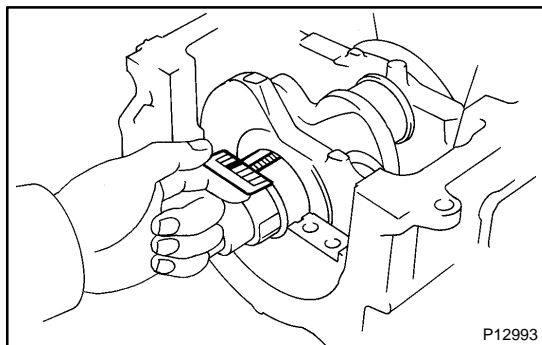


- (p) Using several steps, install and tighten the 8 bearing cap bolts uniformly in the sequence shown in the illustration.  
**Torque: 27 N·m (275 kgf·cm, 20 ft·lbf)**

**HINT:**

Use the short bolt for the position marked with the arrow.

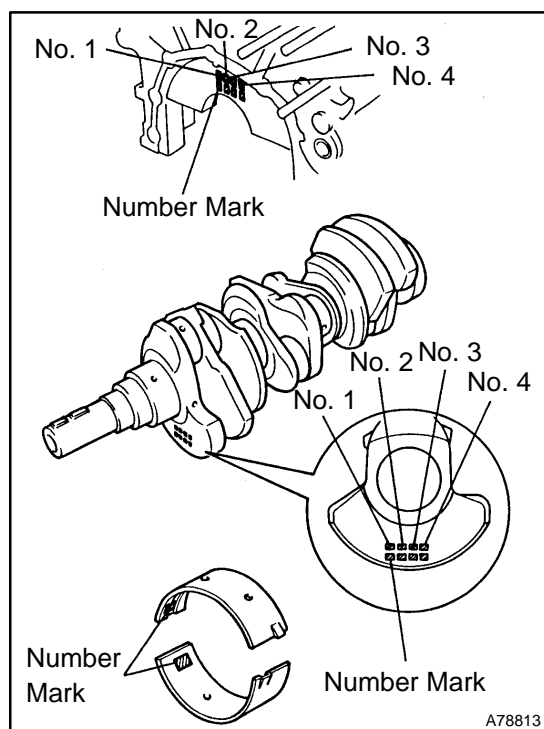
- (q) Remove the bearing caps.



- (r) Measure the Plastigage at its widest point.
- Standard oil clearance:**  
**0.014 to 0.034 mm (0.0006 to 0.0013 in.) for No. 1 and No. 2 journals**  
**0.026 to 0.046 mm (0.0010 to 0.0018 in.) for No. 3 and No. 4 journals**
- Maximum clearance:**  
**0.05 mm (0.0020 in.) for No. 1 and No. 2 journals**  
**0.06 mm (0.0024 in.) for No. 3 and No. 4 journals**
- If the oil clearance is greater than maximum, replace the bearings.
  - If necessary, replace the crankshaft.

**NOTICE:**

**Completely remove the Plastigage.**



- (s) If replacing a 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, then refer to the table below for the appropriate bearing number. The No. 1 and No. 2 journal bearing come in 5 sizes, marked "3", "4", "5", "6" and "7". The No. 3 and No. 4 journal bearings come in 5 standard bearing sizes, marked "1", "2", "3", "4" and "5".

#### No. 1 and No. 2 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

Imprinted number on the cylinder block is 06

Imprinted number on the crankshaft is 08

$$6 + 8 = 14$$

Select the bearing marked "5"

#### No. 3 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	"1"	"2"	"3"	"4"	"5"

#### HINT:

#### EXAMPLE

Imprinted number on the cylinder block is 06

Imprinted number on the crankshaft is 08

$$6 + 8 = 14$$

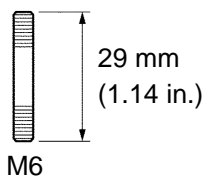
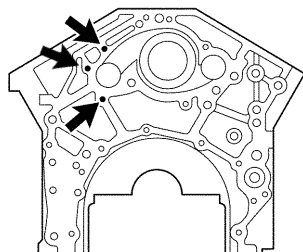
Select the bearing marked "3"

Item	Mark	mm (in.)
Cylinder block main journal bore diameter (A)	"00"	66.000 (2.5984)
	"01"	66.001 (2.5985)
	"02"	66.002 (2.5985)
	"03"	66.003 (2.5985)
	"04"	66.004 (2.5986)
	"05"	66.005 (2.5986)
	"06"	66.006 (2.5987)
	"07"	66.007 (2.5987)
	"08"	66.008 (2.5987)
	"09"	66.009 (2.5988)
	"10"	66.010 (2.5988)
	"11"	66.011 (2.5989)
	"12"	66.012 (2.5989)
	"13"	66.013 (2.5989)
	"14"	66.014 (2.5990)
	"15"	66.015 (2.5990)
	"16"	66.016 (2.5990)
Crankshaft main journal diameter (B)	"00"	61.000 (2.4016)
	"01"	60.999 (2.4015)
	"02"	60.998 (2.4015)
	"03"	60.997 (2.4015)
	"04"	60.996 (2.4014)
	"05"	60.995 (2.4014)
	"06"	60.994 (2.4013)
	"07"	60.993 (2.4012)
	"08"	60.992 (2.4012)
	"09"	60.991 (2.4012)
	"10"	60.990 (2.4012)
	"11"	60.989 (2.4011)
	"12"	60.988 (2.4011)
Standard bearing center wall thickness	"1"	2.486 to 2.489 (0.0979 to 0.0980)
	"2"	2.489 to 2.492 (0.0980 to 0.0981)
	"3"	2.492 to 2.495 (0.0981 to 0.0982)
	"4"	2.495 to 2.498 (0.0982 to 0.0983)
	"5"	2.498 to 2.501 (0.0983 to 0.0985)
	"6"	2.501 to 2.504 (0.0985 to 0.0986)
	"7"	2.504 to 2.507 (0.0986 to 0.0987)



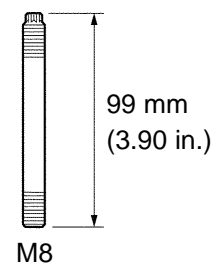
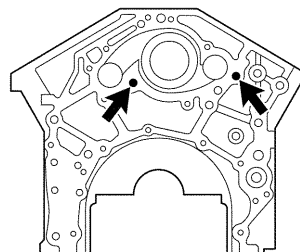
## 31. INSTALL STUD BOLT

Front Side:



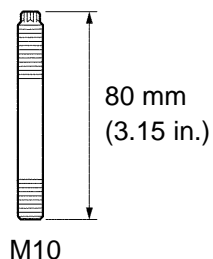
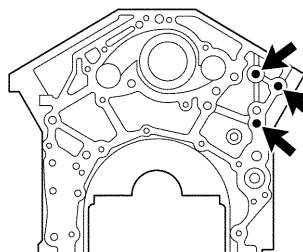
Torque: 6.0 N·m (60 kgf·cm, 53 in.-lbf)

Front Side:



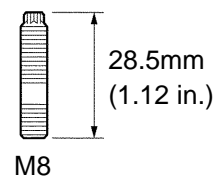
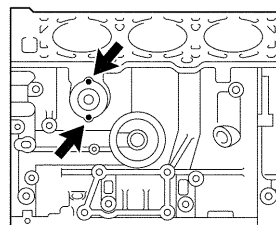
Torque: 15 N·m (145 kgf·cm, 11 ft.-lbf)

Front Side:



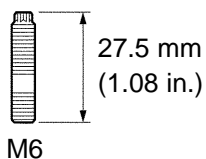
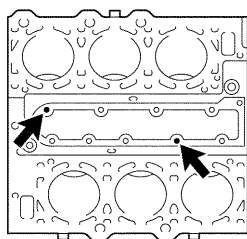
Torque: 21 N·m (220 kgf·cm, 15 ft.-lbf)

Left Side:



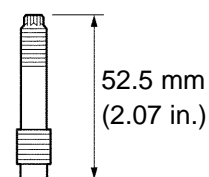
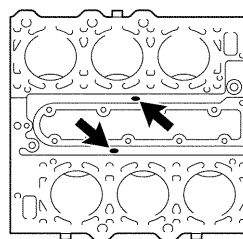
Torque: 7.0 N·m (70 kgf·cm, 62 in.-lbf)

Upper Side:



Torque: 4.0 N·m (40 kgf·cm, 35 in.-lbf)

Upper Side:



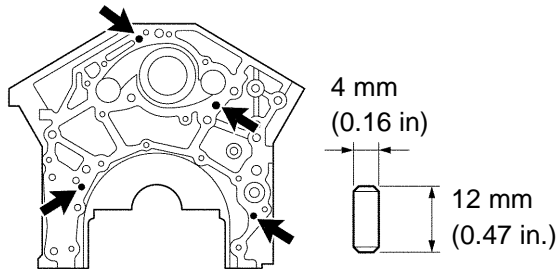
Torque: 12 N·m (122 kgf·cm, 9 ft.-lbf)

P

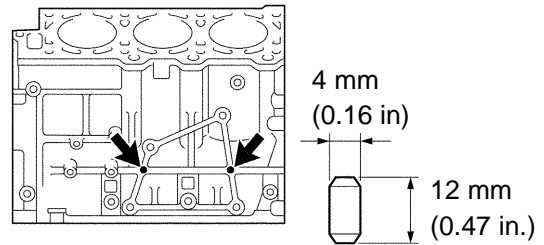
A78318

## 32. INSTALL STRAIGHT PIN

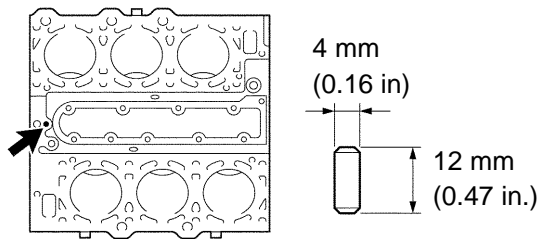
Front Side:



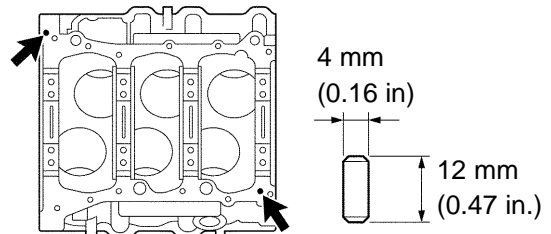
Right Side:



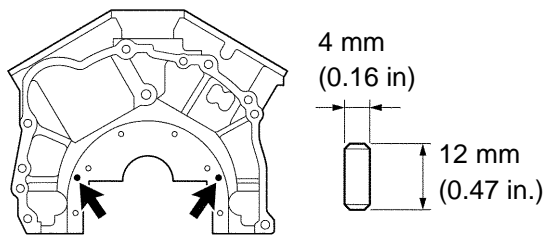
Upper Side:



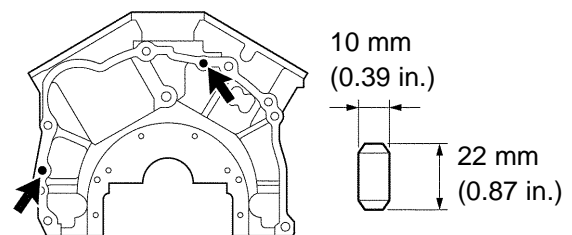
Lower Side:



Back Side:

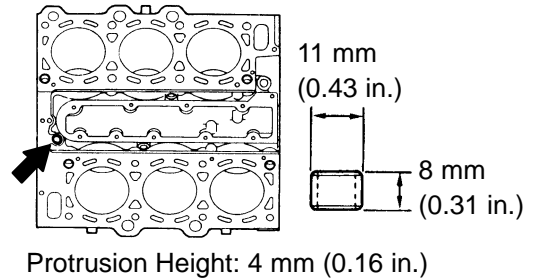
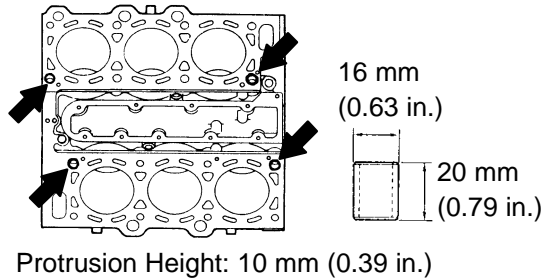


Back Side:

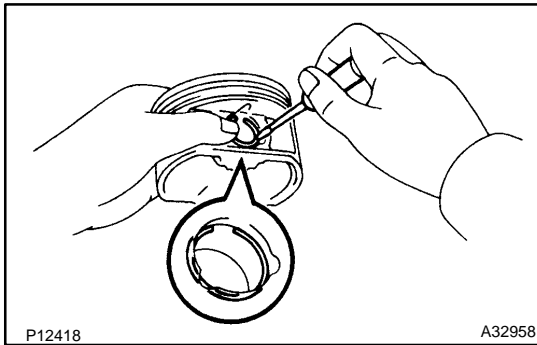


P

A78319

**33. INSTALL RING PIN****Upper Side:**

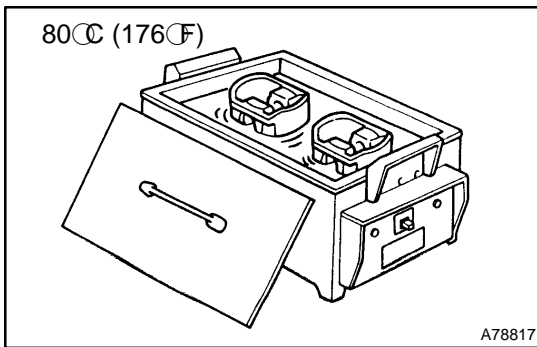
A78816

**34. INSTALL PISTON PIN HOLE SNAP RING**

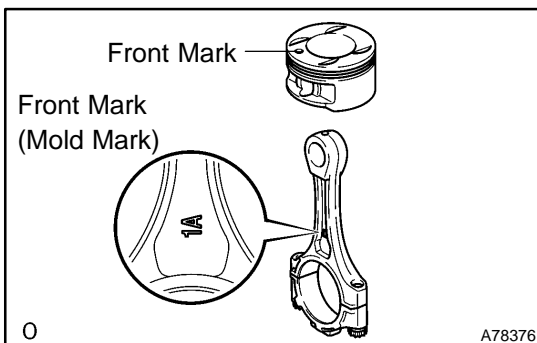
- (a) Using a small screwdriver, install a new snap ring at one end of the piston pin hole.

**HINT:**

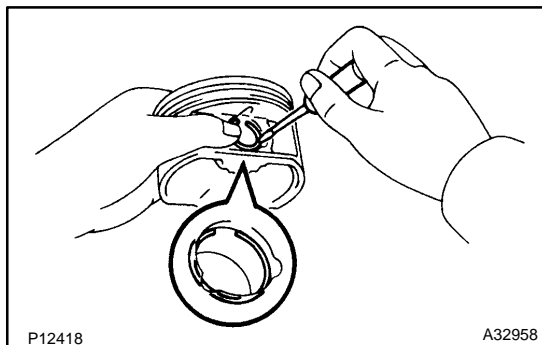
Be sure that the end gap of the snap ring is not aligned with the pin hole cutout of the piston.

**35. INSTALL W/PIN PISTON SUB-ASSY**

- (a) Gradually heat the piston up to approximately 80°C (176°F).



- (b) Coat the piston pin with engine oil.
- (c) Align the front marks of the piston and connecting rod, then push in the piston pin with your thumb until the pin contacts the snap ring.

**36. INSTALL PISTON PIN HOLE SNAP RING**

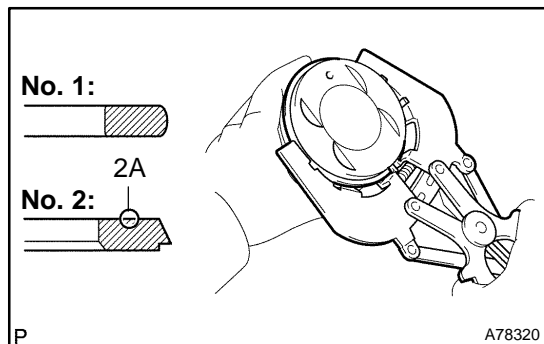
- (a) Using a small screwdriver, install a new snap ring on the other end of the piston pin hole.

**HINT:**

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

**37. INSTALL PISTON RING SET**

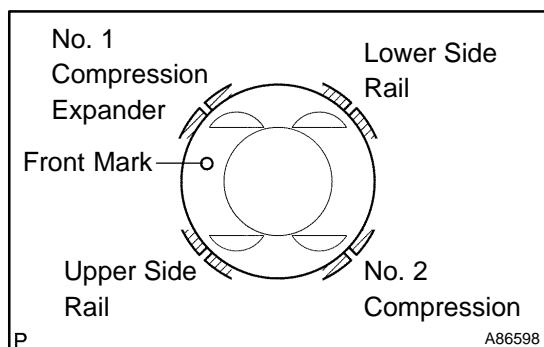
- (a) Install the expander and 2 side rails by hand.



- (b) Using a piston ring expander, install the 2 compression rings.

**HINT:**

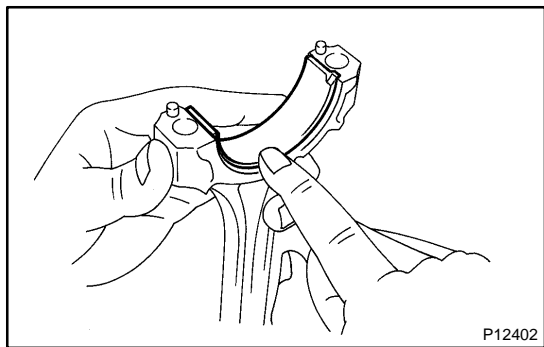
The No. 2 compression ring is installed with the code mark "2A" facing upward as shown in the illustration.



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

**NOTICE:**

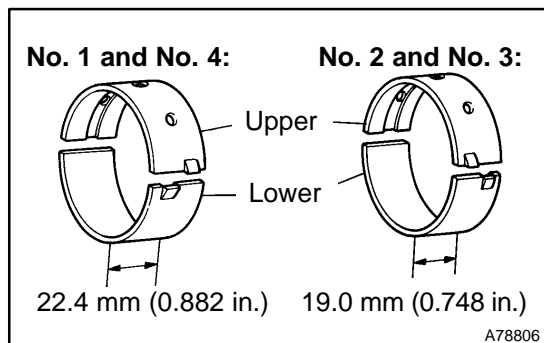
**Do not align the ring ends.**

**38. INSTALL CONNECTING ROD BEARING**

- (a) Align the key of the bearing with the keyway of the connecting rod or cap.

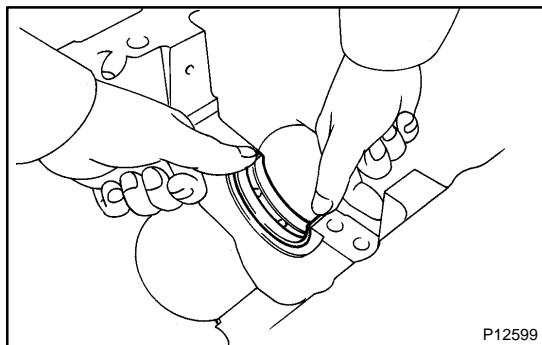
**NOTICE:**

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

**39. INSTALL CRANKSHAFT BEARING****HINT:**

Crankshaft bearings come in widths of 22.4 mm (0.882 in.) and 19.0 mm (0.748 in.). Install the 22.4 mm (0.882 in.) bearings in the No. 1 and No. 4 cylinder block journal positions with the main bearing caps. Install the 19.0 mm (0.748 in.) bearings in the No. 2 and No. 3 positions.

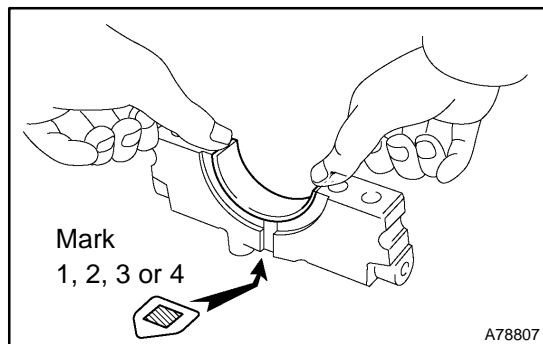
- (a) Clean each main journal and the bearing.



- (b) Align the key of the bearing with the keyway of the cylinder block, then push in the 4 upper bearings.

**NOTICE:**

**Do not apply engine oil to the bearing and its contact surface.**



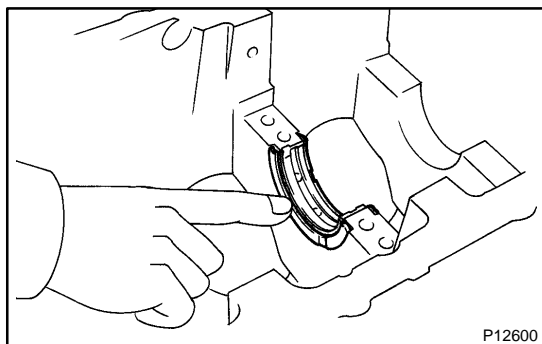
- (c) Align the key of the bearing with the keyway of the bearing cap, then push in the 4 lower bearings.

**NOTICE:**

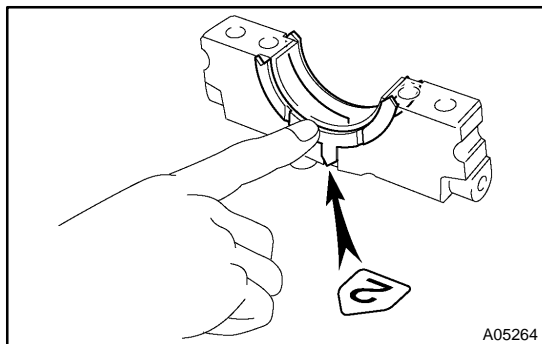
**Do not apply engine oil to the bearing and its contact surface.**

**HINT:**

A number is marked on each bearing cap to indicate the installation position.

**40. INSTALL CRANKSHAFT THRUST WASHER SET**

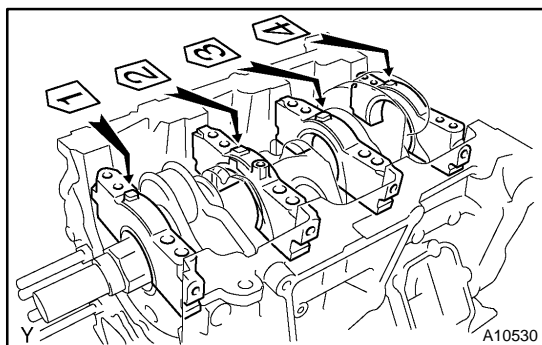
- (a) Install the 2 thrust washers under the No. 2 journal position of the cylinder block with the oil grooves facing outward.



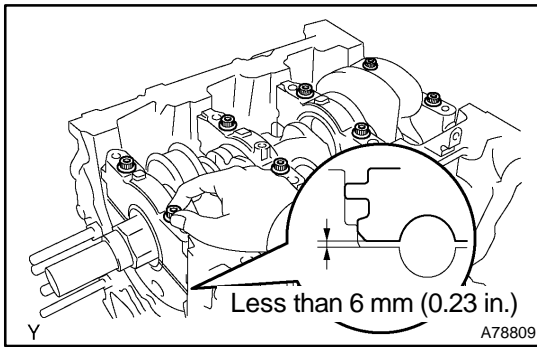
- (b) Install the 2 thrust washers on the No. 2 bearing cap with the grooves facing outward.

**41. INSTALL CRANKSHAFT**

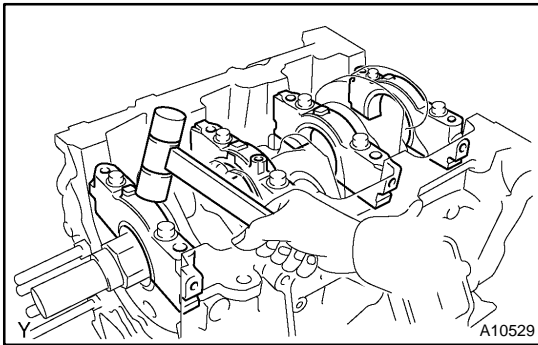
- (a) Apply engine oil to the upper bearing, then install the crankshaft on the cylinder block.



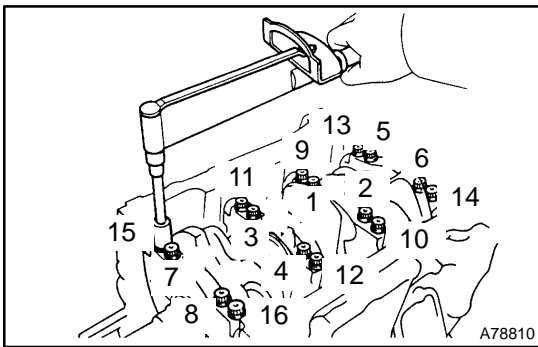
- (b) Examine the front marks and numbers, then install the bearing caps on the cylinder block.
- (c) Apply a light coat of engine oil to the threads of the bearing cap bolts.



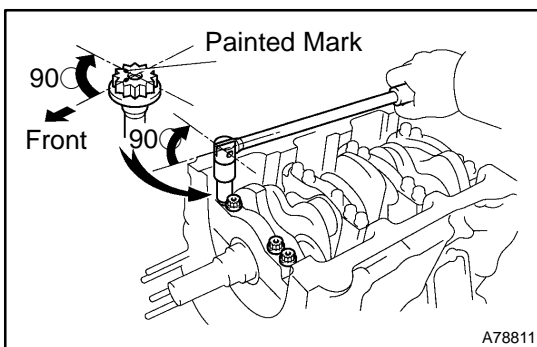
- (d) Temporarily install the 8 bearing cap bolts to the inside positions.
- (e) Install the bearing cap by hand using the inner bolt as a guide. Stop when the bearing cap is about 6 mm (0.23 in.) away from contact with the cylinder block.



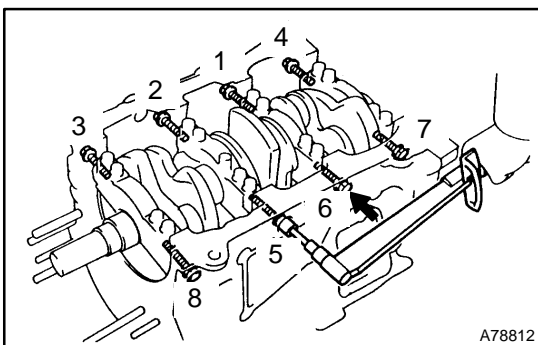
- (f) Using a plastic-faced hammer, lightly tap the bearing cap to ensure proper fit.
- (g) Apply a light coat of engine oil to the threads of the bearing cap bolts.



- (h) Using several steps, install and tighten the 16 bearing cap bolts uniformly in the sequence shown in the illustration.  
**Torque: 22 N·m (224 kgf·cm, 16 ft·lbf)**



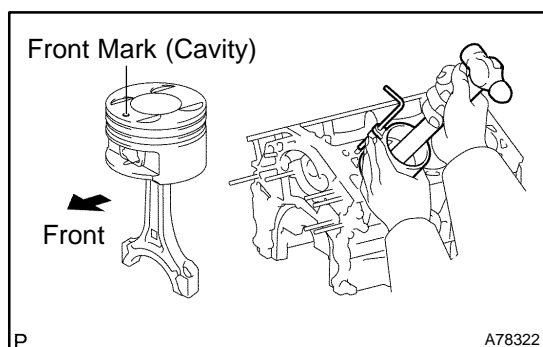
- (i) Mark the front side of the bearing cap bolts with paint.
- (j) Retighten the bearing cap bolts by 90° in the same sequence as step (h).
- (k) Check that each painted mark is now at a 90° angle to the front.
- (l) Check that the crankshaft turns smoothly.



- (m) Using several steps, install and tighten the 8 bearing cap bolts uniformly in the sequence shown in the illustration.  
**Torque: 27 N·m (275 kgf·cm, 20 ft·lbf)**

**HINT:**

Use the short bolt for the position marked with the arrow.

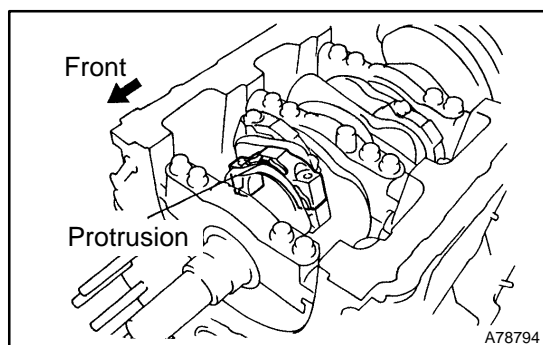


#### 42. INSTALL PISTON SUB-ASSY W/CONNECTING ROD

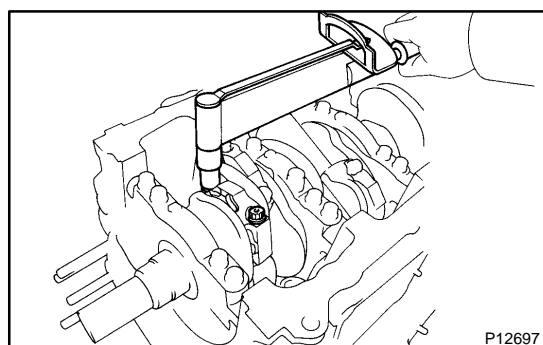
- Apply engine oil to the cylinder walls, pistons, and surfaces of the connecting rod bearings.
- Check the position of the piston ring ends.
- Using a piston ring compressor, push the numbered piston and connecting rod assemblies correctly into each cylinder with the front mark of the piston facing forward.

#### NOTICE:

**Match the numbered connecting rod cap with the connecting rod.**

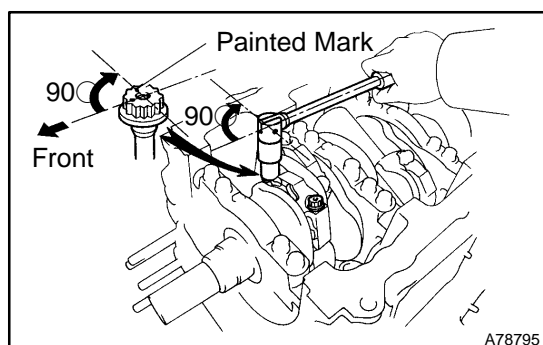


- Check that the protrusion of the cap is facing the correct direction.
- Apply a light coat of engine oil to the threads of the cap bolts.

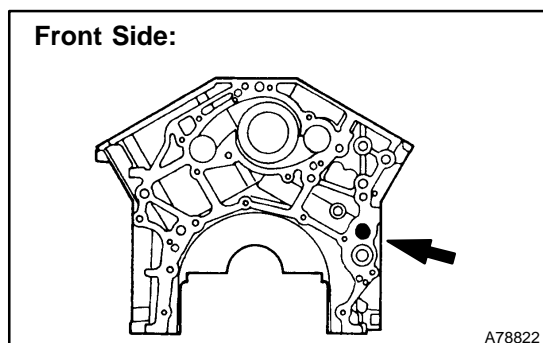


- Tighten the cap bolts in several steps by the specified torque.

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



- Mark the front side of each cap bolt with paint.
- Retighten the cap bolts by 90° as shown in the illustration.
- Check that the crankshaft turns smoothly.

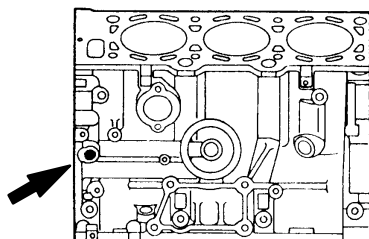


#### 43. INSTALL CYLINDER BLOCK W/HEAD STRAIGHT SCREW NO.1 PLUG

- Using a socket hexagon wrench 10, install a new gasket and the screw plug.

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

Left Side:



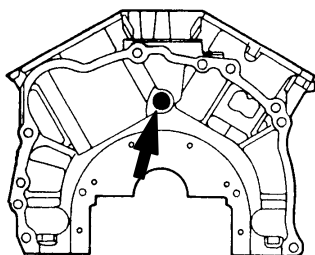
A78823

#### 44. 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)**

Back Side :



A78824

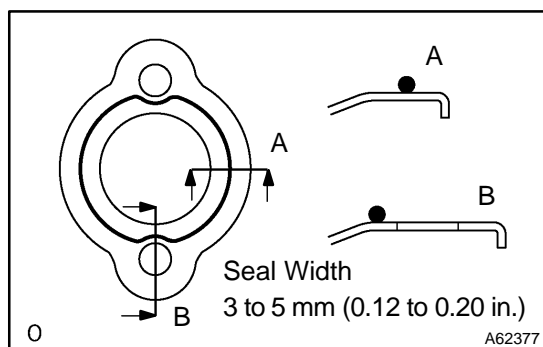
#### 45. INSTALL CYLINDER BLOCK W/HEAD STRAIGHT SCREW NO.3 PLUG

- (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)**

#### 46. INSTALL WATER SEAL PLATE

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



A62377

- (b) Apply a continuous bead of seal packing (Diameter 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 packing to engine oil within 2 hours after installing.

- (c) Install the seal plate with the 2 nuts.

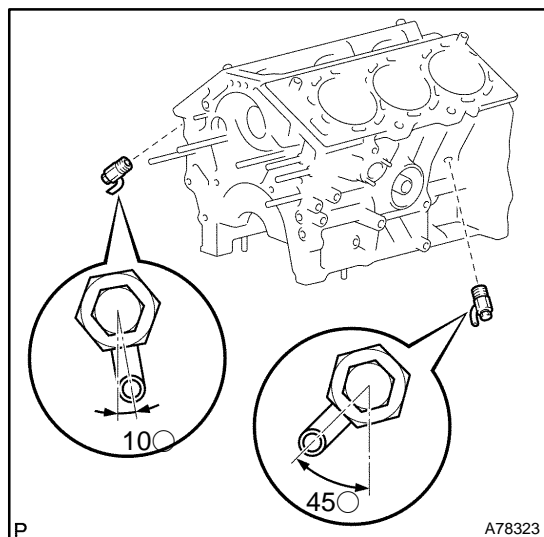
**Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)**

#### 47. 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)**

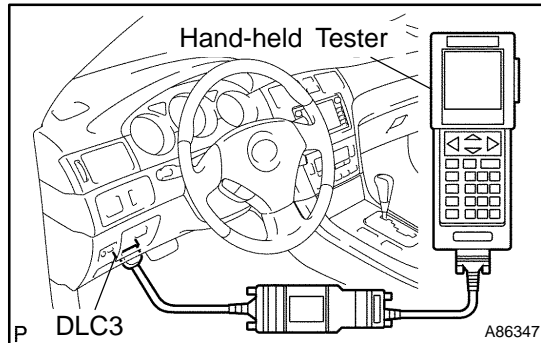
**NOTICE:**

- Install the drain cock within 3 minutes after applying adhesive.
- Do not expose the drain cock to coolant within 1 hour after installing.
- Do not rotate the drain cock by more than 1 revolution (360°) after tightening the drain cock with the specified torque.
- Do not loosen the drain cock after setting it correctly.

# SFI SYSTEM (3MZ-FE)

## ON-VEHICLE INSPECTION

100IZ-01



### 1. INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY

- (a) Check the operation.
- (1) Connect the hand-held tester to the DLC3.
  - (2) Turn the ignition switch ON.
  - (3) Start the engine and allow it to warm up.
  - (4) Connect the hand-held tester, then select VVT from the ACTIVE TEST menu.
  - (5) Check the engine speed when the OCV is operated with the hand-held tester.

#### Standard:

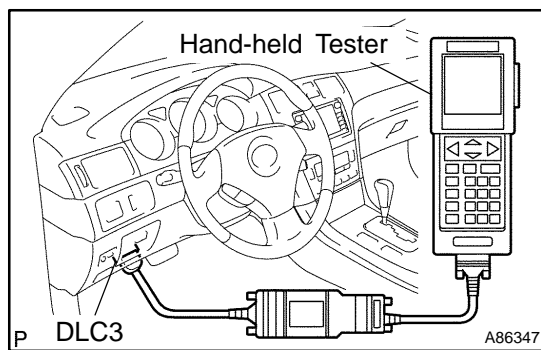
Tester Operation	Specified Condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

If the operation is not as specified, inspect the camshaft timing oil control valve (see page 10-2 ).

### 2. INSPECT THROTTLE BODY ASSY

- (a) Check the operation (throttle control motor).
- (1) Turn the ignition switch ON.
  - (2) When turning the accelerator pedal position sensor lever, check the running sound of the motor. Also, check that there is no friction sound.

If the operation is not as specified, inspect the throttle body (see page 10-2 ).



- (b) Check the operation (throttle position sensor).
- (1) Connect the hand-held tester to the DLC3.
  - (2) Turn the ignition switch ON.
  - (3) Check that the check engine warning light does not light up.
  - (4) Check that the throttle valve opening percentage (THROTTLE POS) of CURRENT DATA shows the standard value.

**Standard throttle valve opening percentage:**  
60 % or more

#### NOTICE:

When checking the standard throttle valve opening percentage, the transmission is in the neutral position.

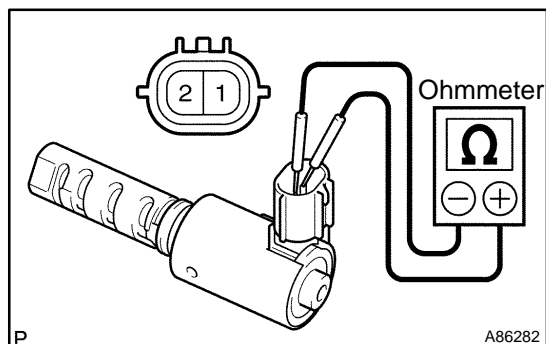
### 3. INSPECT ACCELERATOR PEDAL POSITION SENSOR

- (a) Inspect the voltage.
- (1) After turning the ignition switch ON, check CURRENT DATA, then verify that the throttle position sensor voltage is within the standard value.

**Standard voltage: 0.6 to 1.0 V**

If the voltage is not as specified, inspect the accelerator pedal (see page 10-2 ).

# INSPECTION



## 1. INSPECT CAMSHAFT TIMING OIL CONTROL VALVE ASSY

(a) Inspect the resistance.

- (1) Using an ohmmeter, measure the resistance between the terminals.

**Standard:**

Tester Connection	Specified Condition
1 (-) - 2 (+)	6.9 to 7.9 $\Omega$ at 20°C (68°F)

If the resistance is not as specified, replace the camshaft timing oil control valve.

(b) Check the operation.

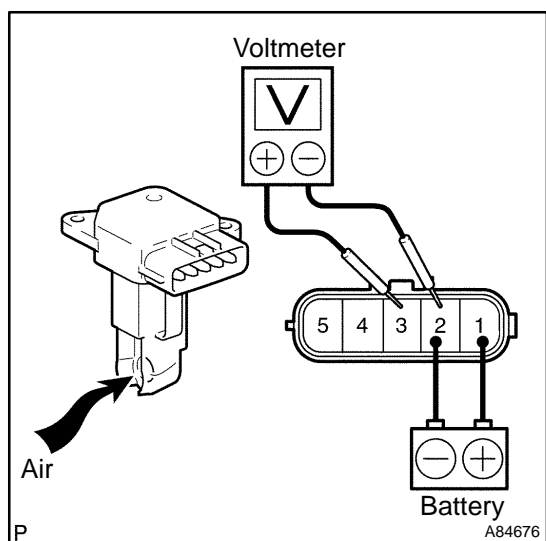
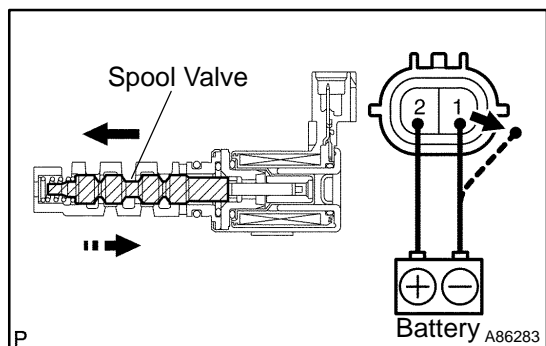
- (1) Connect the positive (+) lead from the battery to terminal 2 (+) and negative (-) lead to terminal 1 (-), then check the movement of the spool valve.

**NOTICE:**

**Confirm that the spool valve moves freely and does not get stuck in any position.**

**HINT:**

Bad returning of the spool valve resulted from catching foreign objects causes subtle pressure leak to the advanced direction. In that case, DTC can be detected.

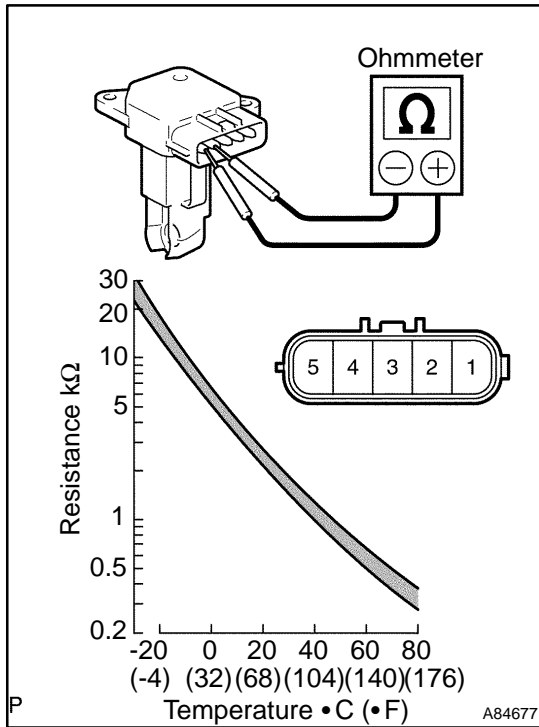


## 2. INSPECT MASS AIR FLOW METER

(a) Check the operation.

- (1) Apply battery voltage across terminals 1 (+B) and 2 (E2G).
- (2) Using voltmeter, connect the positive (+) tester probe to terminal 3 (VC), and negative (-) tester probe to terminal 2 (E2G).
- (3) Blow air into the mass air flow sensor, then check that the voltage fluctuates.

If the operation is not as specified, replace the mass air flow sensor.



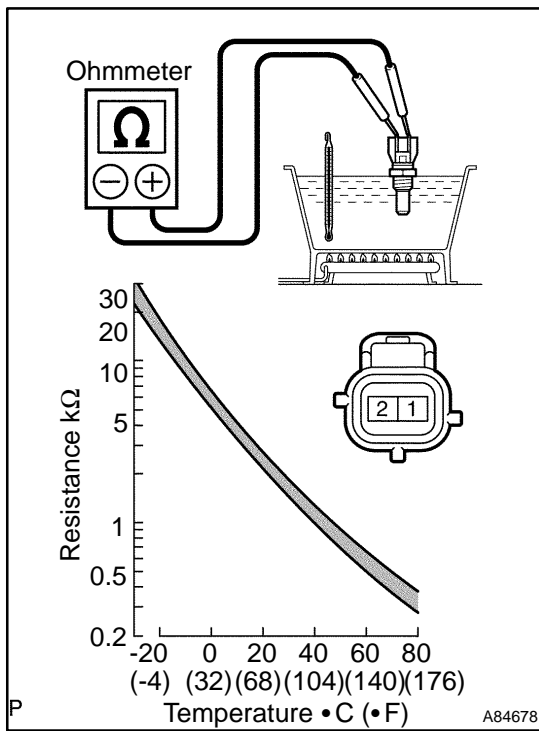
(b) Inspect the resistance.

- (1) Using an ohmmeter, measure the resistance between the terminals.

**Standard:**

Tester Connection	Specified Condition
4 (THA) - 5 (E2)	13.6 to 18.4 kΩ at -20°C (-4°F)
4 (THA) - 5 (E2)	2.21 to 2.69 kΩ at 20°C (68°F)
4 (THA) - 5 (E2)	0.493 to 0.667 kΩ at 60°C (140°F)

If the resistance is not as specified, replace the mass air flow sensor.



### 3. INSPECT ENGINE COOLANT TEMPERATURE SENSOR

(a) Inspect the resistance.

- (1) Using an ohmmeter, measure the resistance between the terminals.

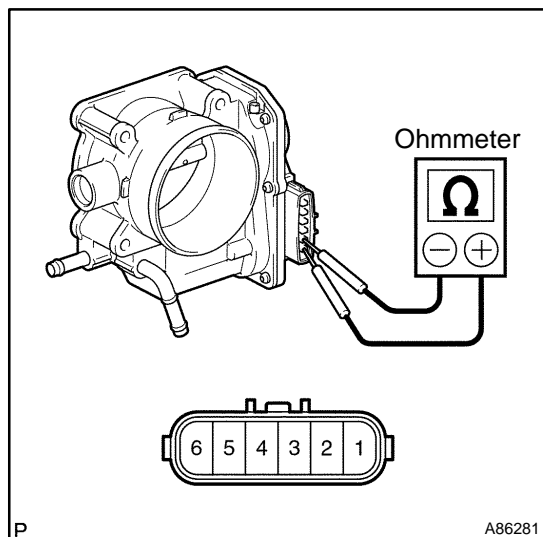
**Standard:**

Tester Connection	Specified Condition
1 (E2) - 2 (THW)	2.32 to 2.59 kΩ at 20°C (68°F)
1 (E2) - 2 (THW)	0.310 to 0.326 kΩ at 80°C (176°F)

**NOTICE:**

**When checking the engine coolant temperature sensor in water, be careful not to allow water to intrude into the terminals. Then dry the engine coolant temperature sensor after checking.**

If the resistance is not as specified, replace the engine coolant temperature sensor.



#### 4. INSPECT THROTTLE BODY ASSY

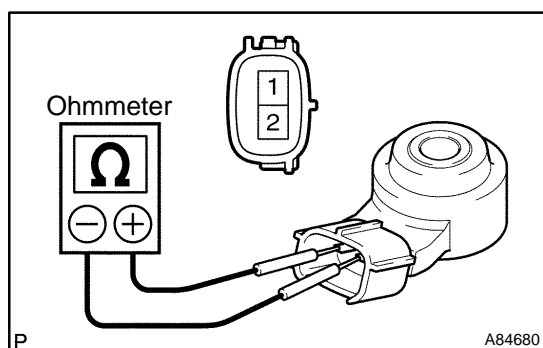
(a) Inspect the resistance.

- (1) Using an ohmmeter, measure the resistance between the terminals.

**Standard:**

Tester Connection	Specified Condition
1 (M-) - 2 (M+)	0.3 to 100 $\Omega$ at 20°C (68°F)
3 (E2) - 5 (VC)	1.2 to 3.2 k $\Omega$ at 20°C (68°F)

If the resistance is not as specified, replace the throttle body.



#### 5. INSPECT KNOCK SENSOR

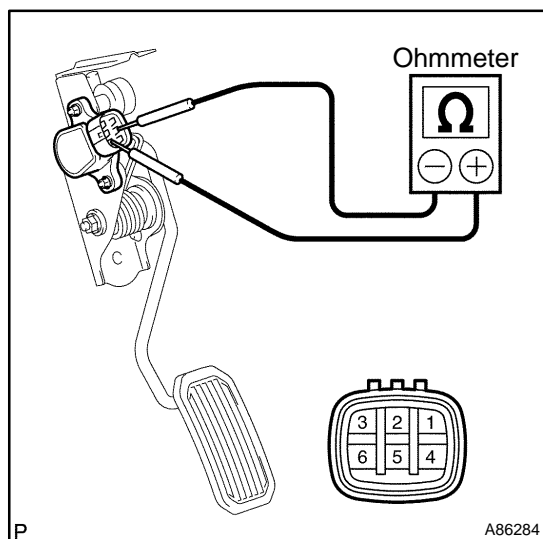
(a) Inspect the resistance.

- (1) Using an ohmmeter, measure the resistance between the terminals.

**Standard:**

Tester Connection	Specified Condition
1 (Output) - 2 (Ground)	120 to 280 $\Omega$ at 20°C (68°F)

If the resistance is not specified, replace the knock sensor.



#### 6. INSPECT ACCELERATOR PEDAL ASSY (NORMAL PEDAL)

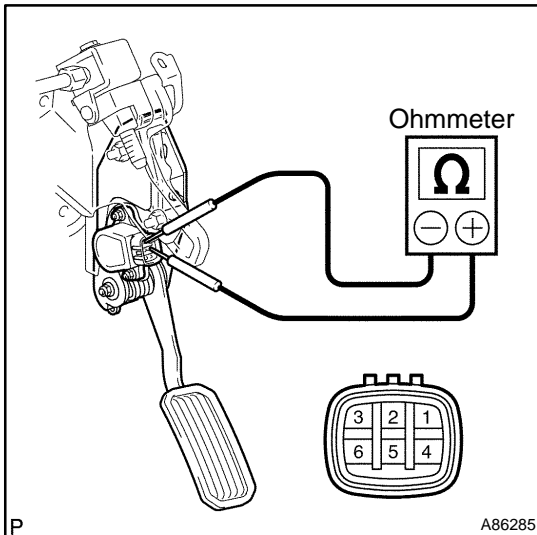
(a) Inspect the resistance.

- (1) Using an ohmmeter, measure the resistance between the terminals.

**Standard:**

Tester Connection	Specified Condition
2 (VPA2) - 3 (EP1)	5.0 k $\Omega$ or less
1 (EP2) - 5 (VPA1)	5.0 k $\Omega$ or less
3 (EP1) - 6 (VCP1)	2.25 to 4.75 k $\Omega$
1 (EP2) - 4 (VCP2)	2.25 to 4.75 k $\Omega$

If the resistance is not specified, replace the accelerator pedal.



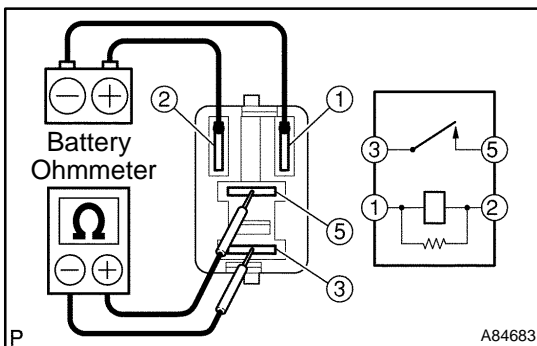
## 7. INSPECT ACCELERATOR & BRAKE PEDAL ASSY (POWER PEDAL)

- (a) Inspect the resistance.  
 (1) Using an ohmmeter, measure the resistance between the terminals.

### Standard:

Tester Connection	Specified Condition
3 (EP1) - 5 (VPA1)	5.0 kΩ or less
1 (EP2) - 2 (VPA2)	5.0 kΩ or less
3 (EP1) - 6 (VCP1)	2.25 to 4.75 kΩ
1 (EP2) - 4 (VCP2)	2.25 to 4.75 kΩ

If the resistance is not specified, replace the accelerator & brake pedal.



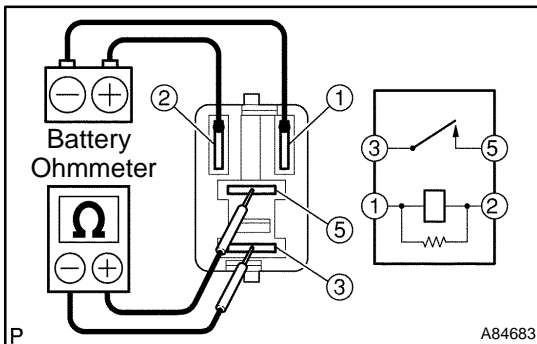
## 8. INSPECT MAIN RELAY

- (a) Inspect the resistance.  
 (1) Using an ohmmeter, measure the resistance between the terminals.

### Standard:

Tester Connection	Specified Condition
3 - 5	10 kΩ or higher
3 - 5	Below 1Ω (Apply battery voltage to terminals 1 and 2)

If the result is not as specified, replace the main relay.



## 9. INSPECT CIRCUIT OPENING RELAY

- (a) Inspect the resistance.  
 (1) Using an ohmmeter, measure the resistance between the terminals.

### Standard:

Tester Connection	Specified Condition
3 - 5	10 kΩ or higher
3 - 5	Below 1Ω (Apply battery voltage to terminals 1 and 2)

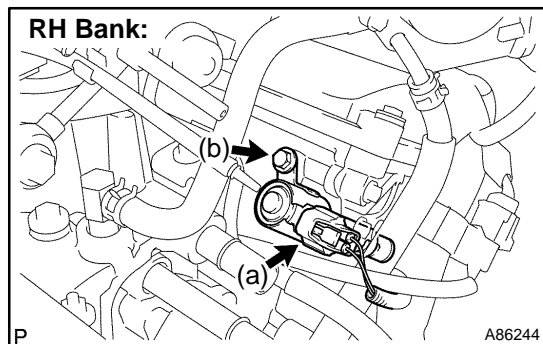
If the result is not as specified, replace the circuit opening relay.

# CAMSHAFT TIMING OIL CONTROL VALVE ASSY (3MZ-FE)

## REPLACEMENT

100J1-01

1. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)
2. REMOVE V-BANK COVER SUB-ASSY (See page 10-1 1)

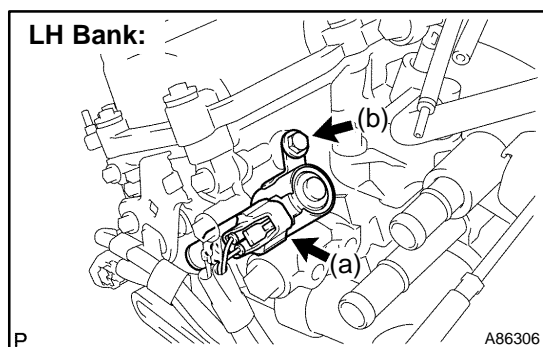


### 3. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSY

- (a) Disconnect the 2 camshaft timing oil control valve connectors.
- (b) Remove the 2 bolts, then remove the 2 camshaft timing oil control valves.

#### HINT:

The camshaft timing oil control valve is installed with the bolt.



### 4. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSY

- (a) Apply a light coat of engine oil to the O-ring on each camshaft timing oil control valve.
- (b) Install the 2 camshaft timing oil control valves with the 2 bolts.

**Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)**

#### NOTICE:

**Be careful not to twist the O-ring.**

- (c) Connect the 2 camshaft timing oil control valve connectors.

### 5. INSTALL V-BANK COVER SUB-ASSY (See page 10-1 1)

### 6. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)

**Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**

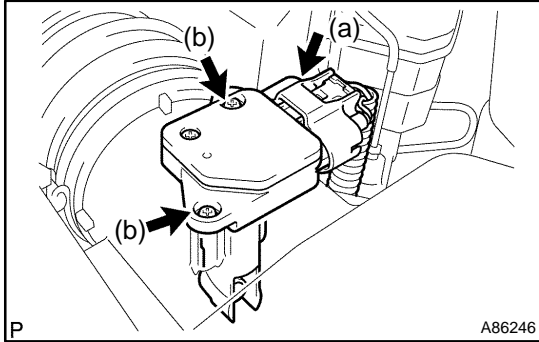
### 7. CHECK FOR ENGINE OIL LEAKS

### 8. SYSTEM INITIALIZATION (See page 19-15 )

## MASS AIR FLOW METER (3MZ-FE) REPLACEMENT

100J2-02

### 1. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)



### 2. REMOVE MASS AIR FLOW METER

- (a) Disconnect the mass air flow meter connector.
- (b) Remove the 2 screws, then remove the mass air flow meter.

### 3. INSTALL MASS AIR FLOW METER

### 4. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)

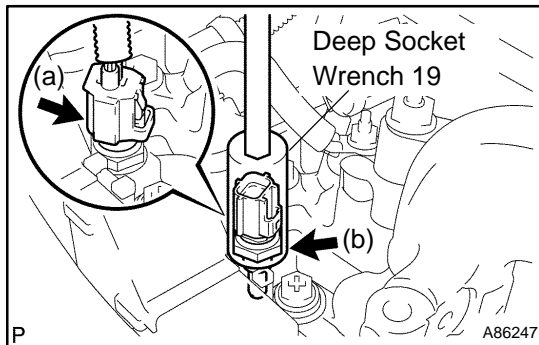
Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)

### 5. SYSTEM INITIALIZATION (See page [19-15](#) )



## ENGINE COOLANT TEMPERATURE SENSOR (3MZ-FE) REPLACEMENT

1. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)
2. REMOVE RADIATOR LOWER AIR DEFLECTOR (See page 19-5 )
3. DRAIN ENGINE COOLANT (See page 16-9 )



### 4. REMOVE ENGINE COOLANT TEMPERATURE SENSOR

- (a) Disconnect the engine coolant temperature sensor connector.
- (b) Using a deep socket wrench 19, remove the engine coolant temperature sensor and gasket.

### 5. INSTALL ENGINE COOLANT TEMPERATURE SENSOR

- (a) Using a deep socket wrench 19, install a new gasket and the engine coolant temperature sensor.  
**Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)**

- (b) Connect the engine coolant temperature sensor connector.

### 6. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)

**Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)**

### 7. ADD ENGINE COOLANT (See page 16-9 )

### 8. CHECK FOR ENGINE COOLANT LEAKS (See page 16-1 )

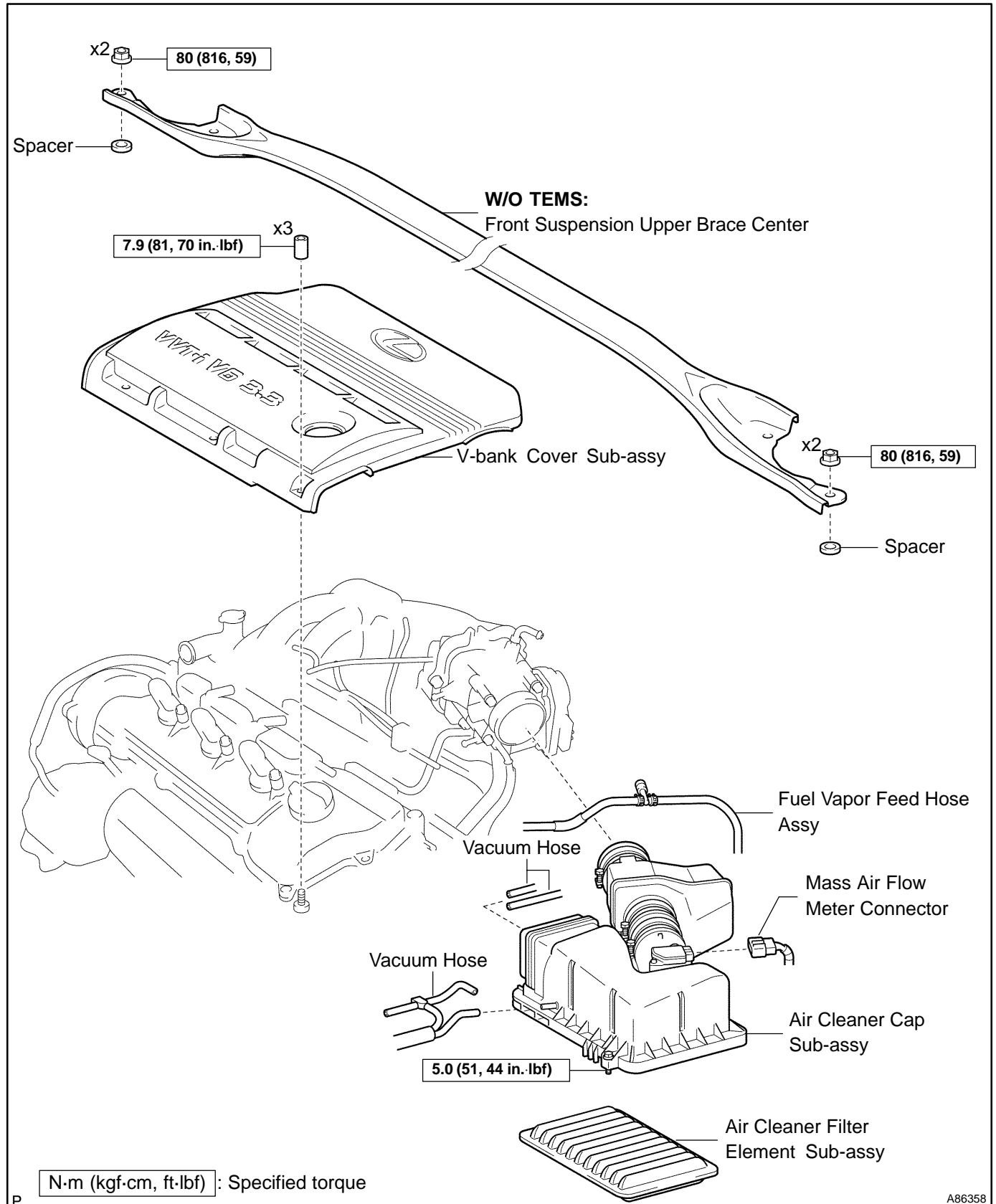
### 9. INSTALL RADIATOR LOWER AIR DEFLECTOR

### 10. SYSTEM INITIALIZATION (See page 19-15 )

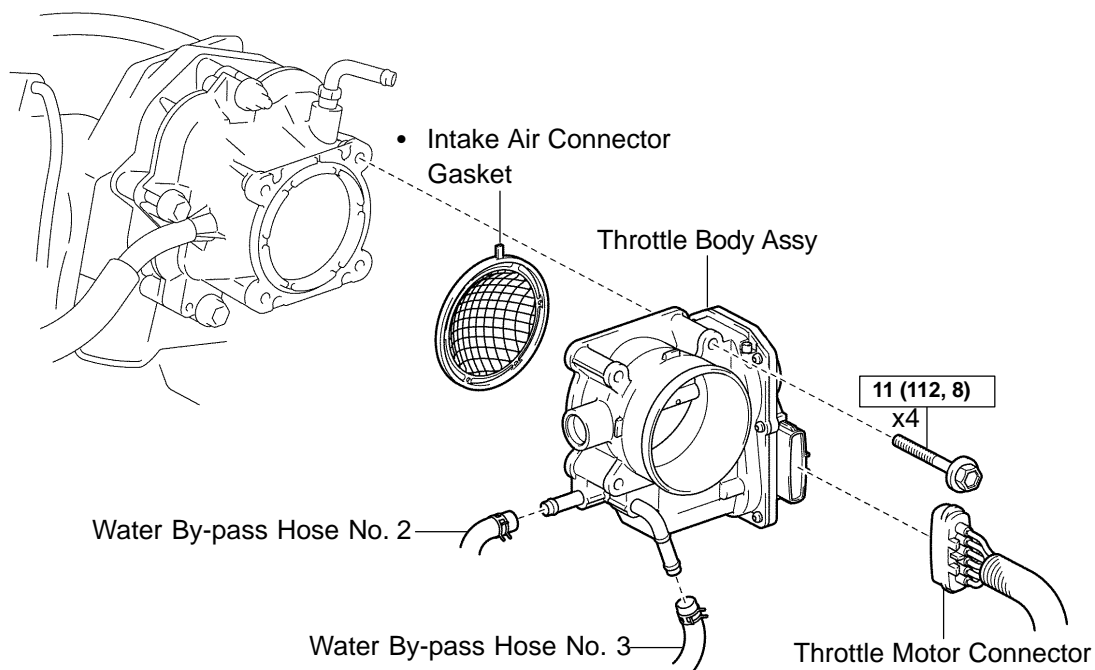
# THROTTLE BODY ASSY (3MZ-FE)

## COMPONENTS

100J4-01



A86358



N·m (kgf·cm, ft·lbf) : Specified torque

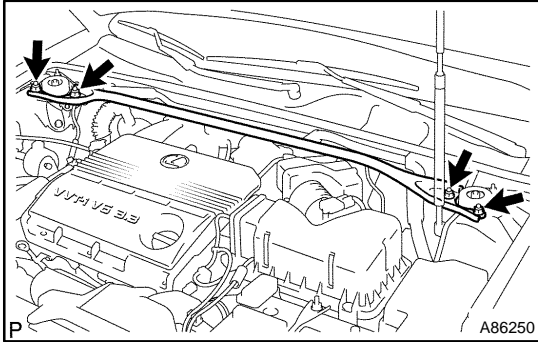
- Non-reusable part

P

A86249

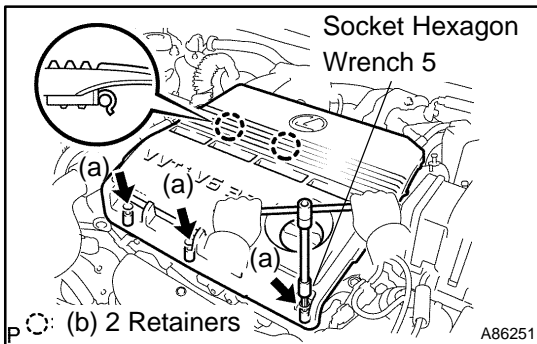
## REPLACEMENT

1. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)
2. REMOVE RADIATOR LOWER AIR DEFLECTOR (See page 19-5 )
3. DRAIN ENGINE COOLANT (See page 19-5 )



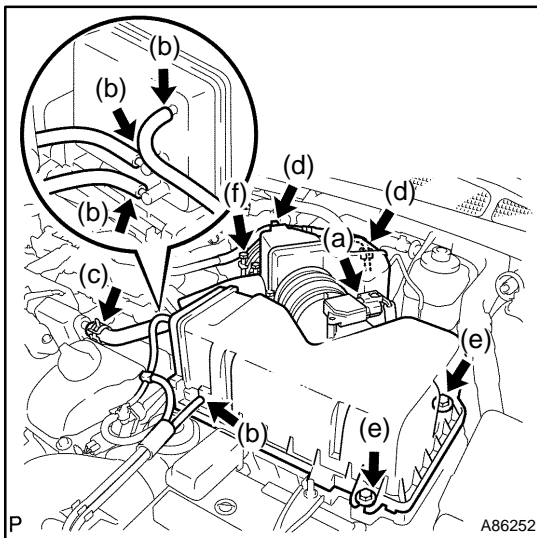
### 4. REMOVE FRONT SUSPENSION UPPER BRACE CENTER (W/O TEMS)

- (a) Remove the 4 nuts, then remove the front suspension upper brace center and 4 spacers.
- (b) Temporarily tighten the 4 nuts.



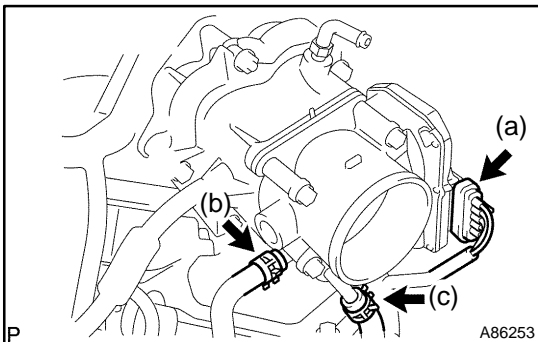
### 5. REMOVE V-BANK COVER SUB-ASSY

- (a) Using a socket hexagon wrench 5, remove the 3 nuts.
- (b) Unfasten the 2 retainers, then remove the V-bank cover.



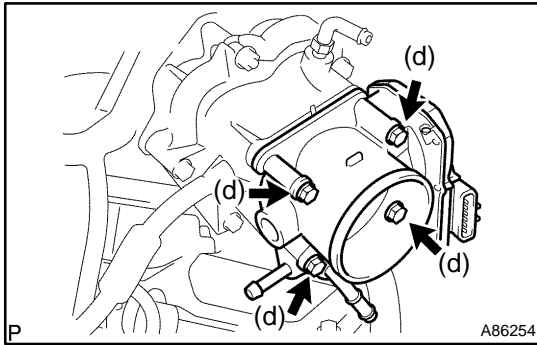
### 6. REMOVE AIR CLEANER CAP SUB-ASSY

- (a) Disconnect the mass air flow meter connector.
- (b) Disconnect the 4 vacuum hoses.
- (c) Disconnect the ventilation hose No. 2.
- (d) Disconnect the fuel vapor feed hose from the 2 hose clamps.
- (e) Loosen the 2 air cleaner cap bolts.
- (f) Loosen the air cleaner hose clamp bolt, then remove the air cleaner cap.
- (g) Remove the air cleaner filter element.



### 7. REMOVE THROTTLE BODY ASSY

- (a) Disconnect the throttle motor connector.
- (b) Disconnect the water by-pass hose No. 2.
- (c) Disconnect the water by-pass hose No. 3.



- (d) Remove the 4 bolts, then remove the throttle body.
- (e) Remove the gasket from the intake air connector.

## 8. INSTALL THROTTLE BODY ASSY

- (a) Install a new gasket to the intake air connector.
- (b) Install the throttle body with the 4 bolts.  
**Torque: 11 N·m (112 kgf·cm, 8 ft·lbf)**
- (c) Connect the water by-pass hose No. 3.
- (d) Connect the water by-pass hose No. 2.
- (e) Connect the throttle motor connector.

## 9. INSTALL AIR CLEANER CAP SUB-ASSY

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

## 10. CHECK CONNECTION OF VACUUM HOSE (See page 14-29 )

## 11. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)

**Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)**

## 12. ADD ENGINE COOLANT (See page 16-9 )

## 13. CHECK FOR ENGINE COOLANT LEAKS (See page 16-1 )

## 14. INSTALL V-BANK COVER SUB-ASSY

- (a) Fit the 2 retainers, then install the V-bank cover.
- (b) Using a socket hexagon wrench 5, tighten the 3 nuts.

**Torque: 7.9 N·m (81 kgf·cm, 70 in·lbf)**

## 15. INSTALL FRONT SUSPENSION UPPER BRACE CENTER (W/O TEMS)

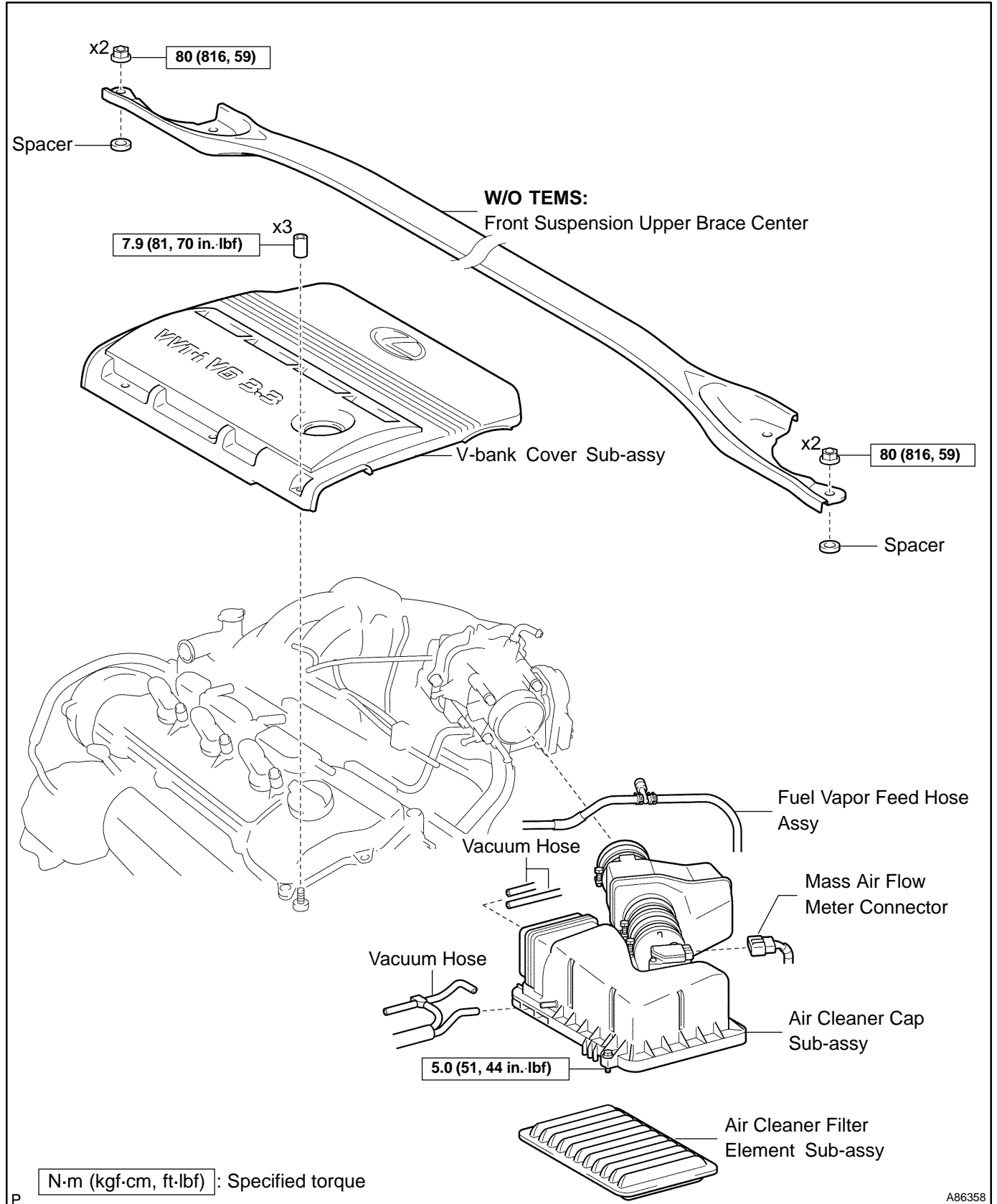
**Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)**

## 16. INSTALL RADIATOR LOWER AIR DEFLECTOR

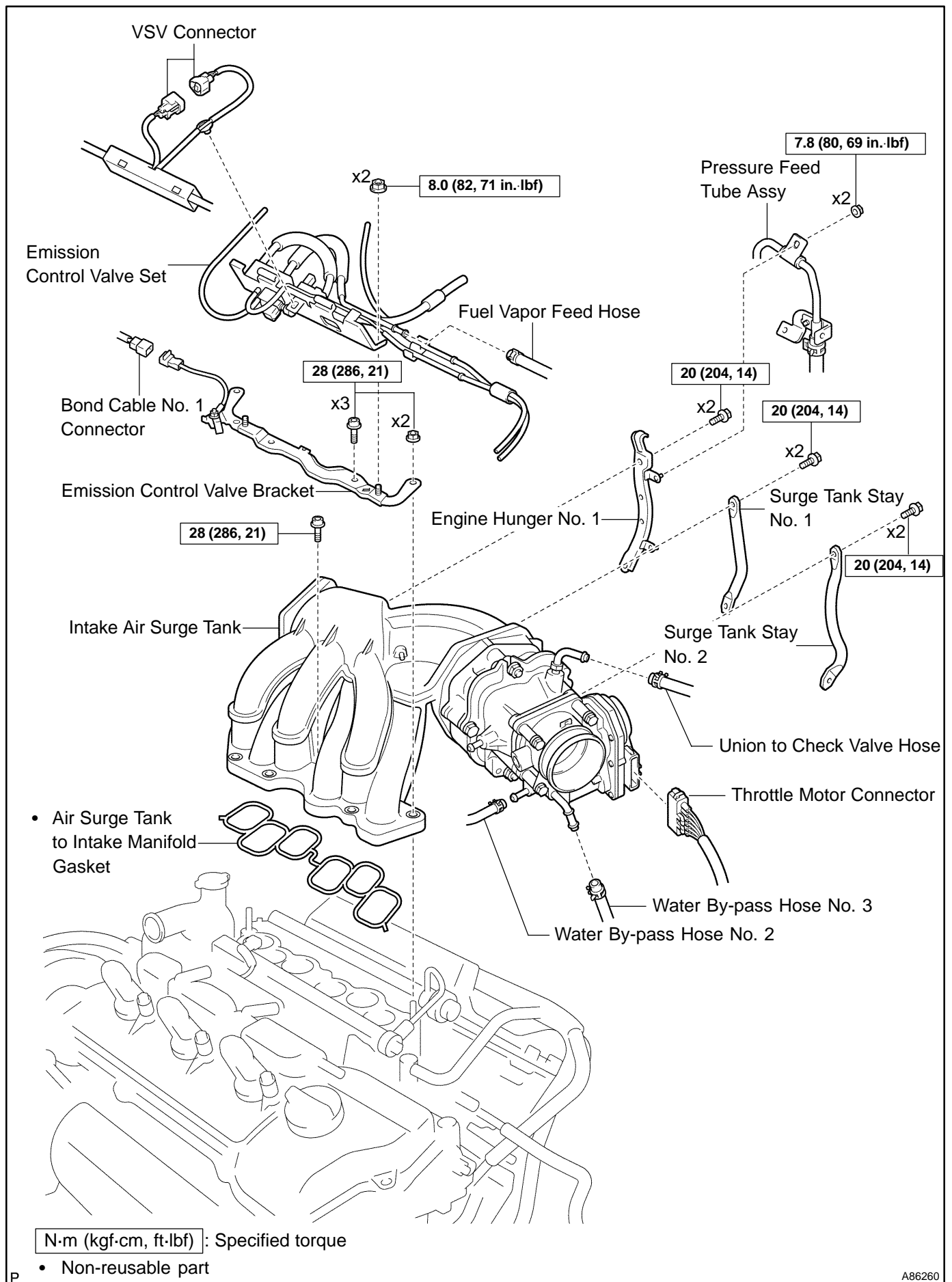
## 17. SYSTEM INITIALIZATION (See page 19-15 )

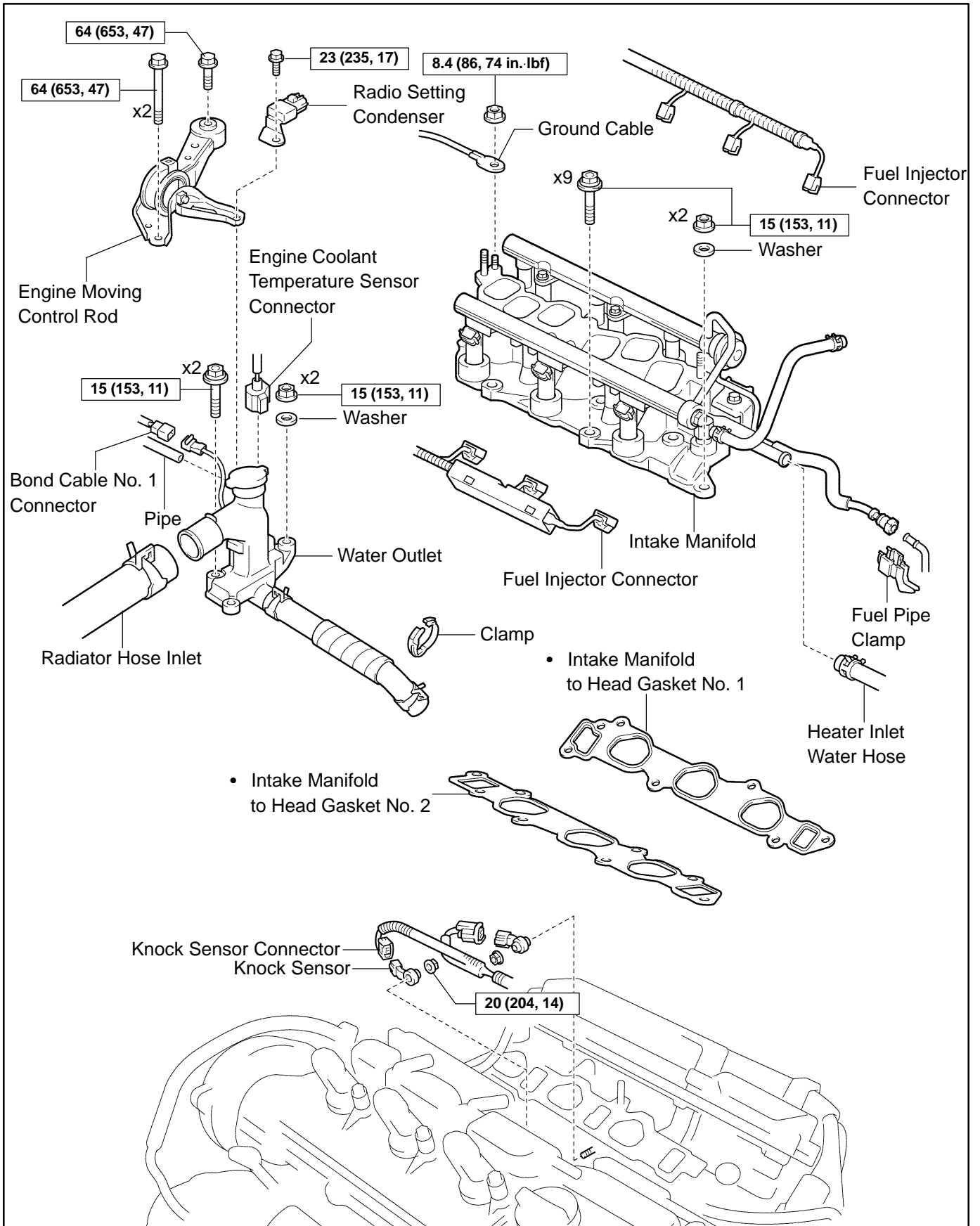
# KNOCK SENSOR (3MZ-FE) COMPONENTS

100J6-02



A86358





N·m (kgf·cm, ft·lbf) : Specified torque

- Non-reusable part

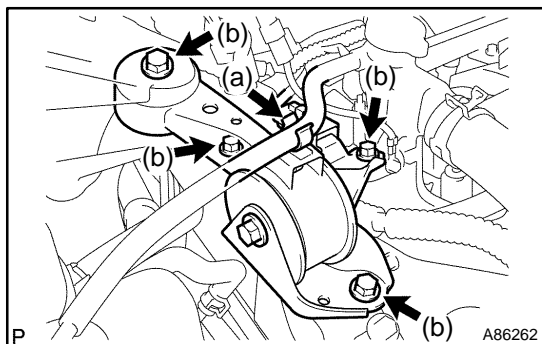
P

A86261



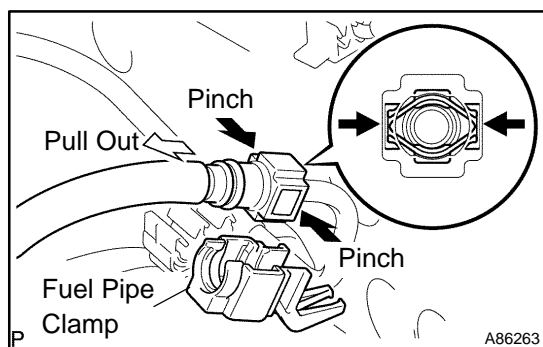
## REPLACEMENT

1. DISCHARGE FUEL SYSTEM PRESSURE (See page 11-1 )
2. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)
3. DRAIN ENGINE COOLANT (See page 16-9 )
4. REMOVE FRONT SUSPENSION UPPER BRACE CENTER (W/O TEMS) (See page 10-1 1)
5. REMOVE V-BANK COVER SUB-ASSY (See page 10-1 1)
6. REMOVE AIR CLEANER CAP SUB-ASSY (See page 10-1 1)
7. REMOVE EMISSION CONTROL VALVE SET (See page 11-13 )
8. REMOVE INTAKE AIR SURGE TANK (See page 11-13 )



### 9. REMOVE ENGINE MOVING CONTROL ROD

- (a) Remove the pipe from the clamp.
- (b) Remove the 4 bolts, then remove the engine moving control rod and radio setting condenser.

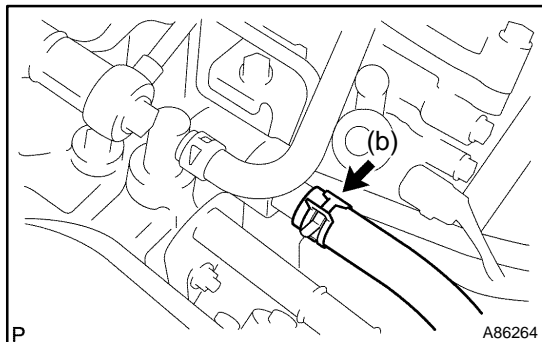
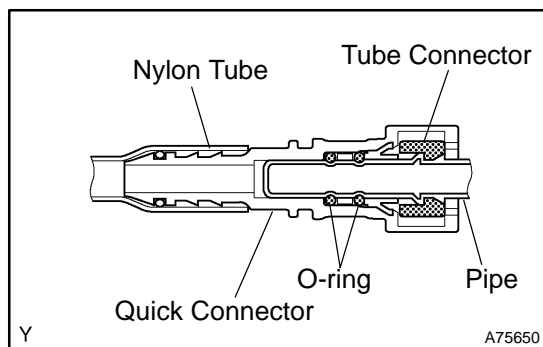


### 10. REMOVE INTAKE MANIFOLD

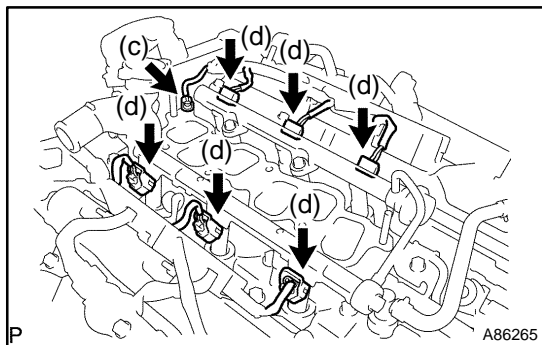
- (a) Disconnect the fuel pipe No. 1.
  - (1) Remove the fuel pipe clamp.
  - (2) Pinch the tube connector, then pull out the fuel pipe No. 1.

#### NOTICE:

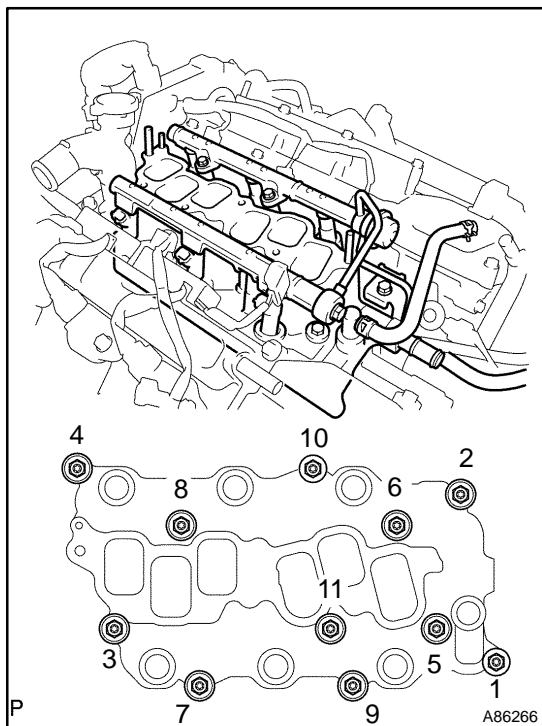
- Check around the quick connector for dirt or mud before this operation. Remove the dirt if necessary.
- Be careful of mud because the quick connector has an O-ring which seals the pipe and quick connector that can be contaminated.
- Do not use any tools in this operation.
- Do not bend or twist the nylon tube. Protect the quick connector by covering it with a vinyl or plastic bag.
- When the pipe and quick connector are stuck, push and pull the quick connector to release and pull the quick connector out carefully.



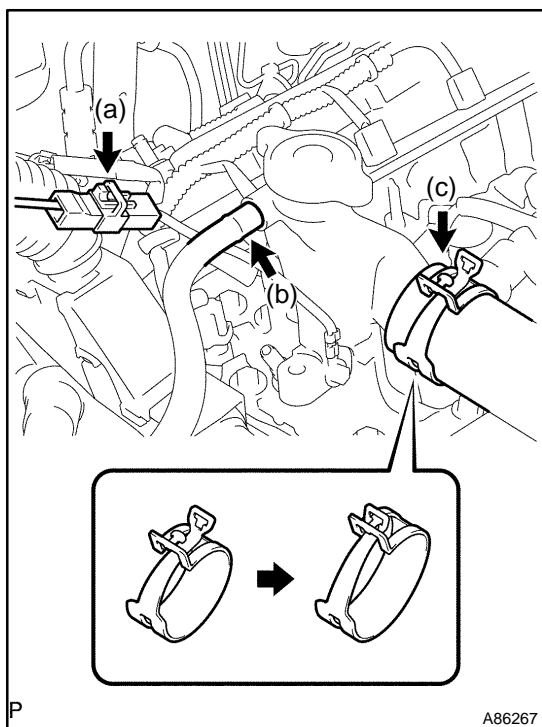
- (b) Disconnect the heater inlet water hose.



- (c) Remove the nut, then disconnect the ground cable.
- (d) Disconnect the 6 fuel injector connectors.

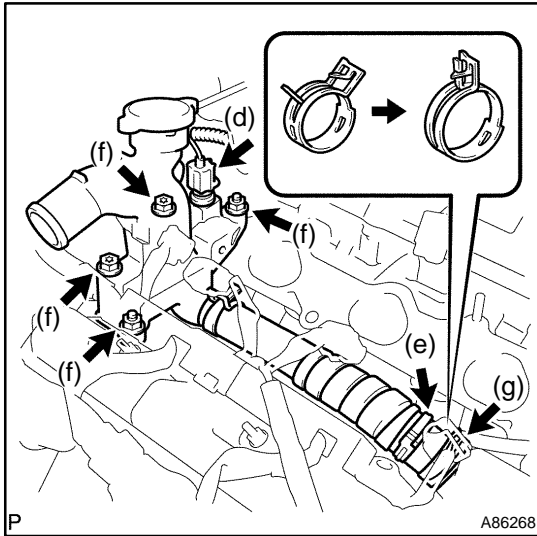


- (e) In order to remove the intake manifold, using several steps, remove the 9 bolts and 2 nuts in the sequence shown in the illustration.

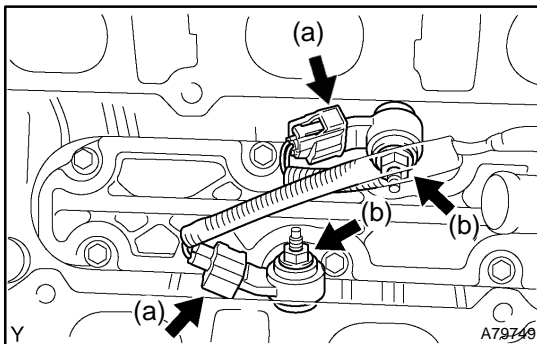


#### 11. REMOVE WATER OUTLET

- (a) Disconnect the bond cable No. 1 connector.
- (b) Disconnect the pipe of the radiator reserve tank.
- (c) Lock the hose clamp as shown in the illustration, then disconnect the radiator hose inlet.

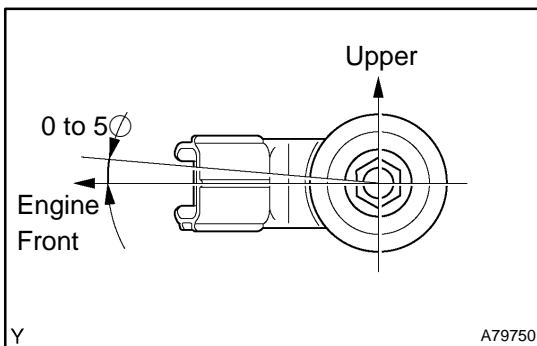


- (d) Disconnect the engine coolant temperature sensor connector.
- (e) Remove the clamp.
- (f) Remove the 2 bolts, 2 nuts and 2 washers.
- (g) Lock the hose clamp as shown in the illustration. Then remove the water outlet together with water by-pass hose No. 1.
- (h) Remove the 2 gaskets from the 2 cylinder heads.



## 12. REMOVE KNOCK SENSOR

- (a) Disconnect the 2 knock sensor connectors.
- (b) Remove the 2 nuts, then remove the 2 knock sensors.

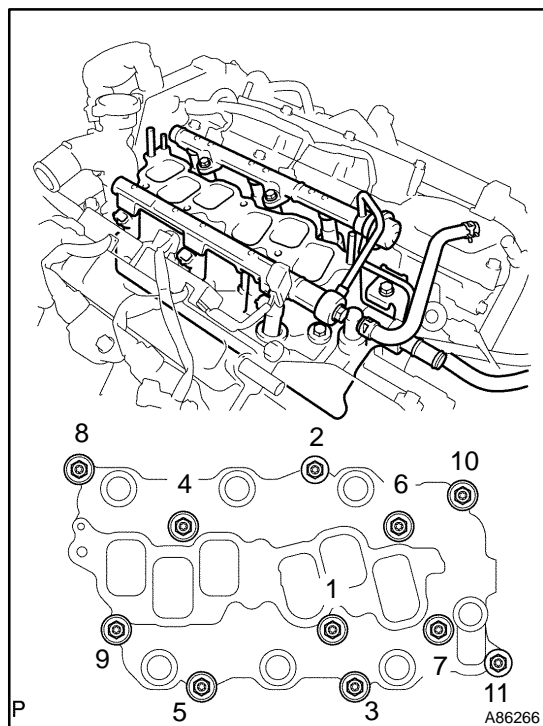


## 13. INSTALL KNOCK SENSOR

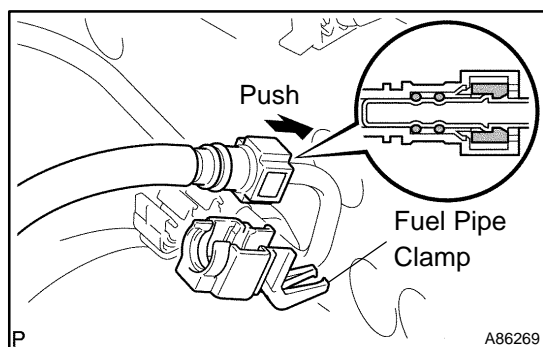
- (a) Install the 2 knock sensors with the 2 nuts as shown in the illustration.  
**Torque: 20 N·m (204 kgf·cm, 14 ft·lbf)**
- (b) Connect the 2 knock sensor connectors.

## 14. INSTALL WATER OUTLET

- (a) Install 2 new gaskets to the 2 cylinder heads.
- (b) Install the water outlet together with water by-pass hose No. 1, then 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 bond cable No. 3 connector.
- (g) Connect the pipe of the radiator reserve tank.
- (h) Connect the radiator hose inlet, then unlock the hose clamp.

**15. INSTALL INTAKE MANIFOLD**

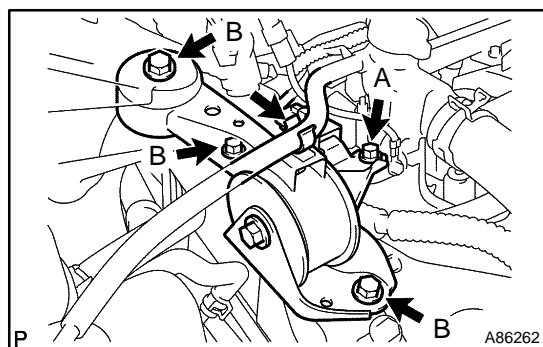
- (a) Install the intake manifold with the 9 bolts, 2 nuts and 2 washers. Using several steps, tighten the 9 bolts and 2 nuts uniformly in the sequence shown in the illustration.  
**Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)**
- (b) Retighten the 9 water outlet mounting bolts and 2 nuts.  
**Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)**
- (c) Install the ground cable with the nut.  
**Torque: 8.4 N·m (86 kgf·cm, 74 in·lbf)**
- (d) Connect the heater inlet water hose.



- (e) Connect the fuel pipe No. 1.
  - (1) Push in the quick connector to the pipe until it makes a "click" sound.

**NOTICE:**

- Check the connected part for damage or foreign objects.
  - After connecting, check if the quick connector and pipe are securely connected by pulling them.
- (2) Install the fuel pipe clamp.

**16. INSTALL ENGINE MOVING CONTROL ROD****Torque:**

**23 N·m (235 kgf·cm, 17 ft·lbf) for bolt A**  
**64 N·m (653 kgf·cm, 47 ft·lbf) for bolt B**

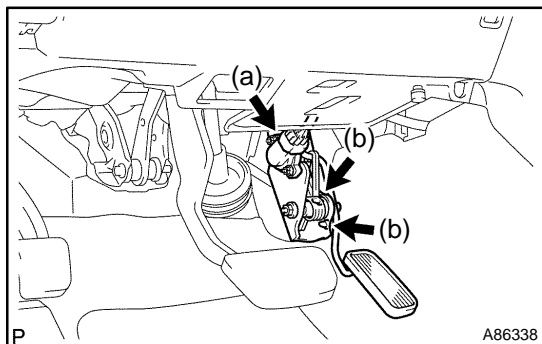
- 17. INSTALL INTAKE AIR SURGE TANK (See page 11-13 )**
- 18. INSTALL EMISSION CONTROL VALVE SET (See page 11-13 )**
- 19. INSTALL AIR CLEANER CAP SUB-ASSY (See page 10-1 1)**
- 20. CHECK CONNECTION OF VACUUM HOSE (See page 14-29 )**
- 21. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)**  
**Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)**
- 22. ADD ENGINE COOLANT (See page 16-9 )**
- 23. CHECK FOR ENGINE COOLANT LEAKS (See page 16-1 )**
- 24. CHECK FOR FUEL LEAKS (See page 11-5 )**
- 25. INSTALL V-BANK COVER SUB-ASSY (See page 10-1 1)**

- 26. INSTALL FRONT SUSPENSION UPPER BRACE CENTER (W/O TEMS) (See page [10-11](#))
- 27. SYSTEM INITIALIZATION (See page [19-15](#))

# ACCELERATOR PEDAL ASSY (3MZ-FE (NORMAL PEDAL)) REPLACEMENT

100J8-01

## 1. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)



## 2. REMOVE ACCELERATOR PEDAL ASSY

- (a) Disconnect the accelerator position sensor connector.
- (b) Remove the 2 bolts, then remove the accelerator pedal rod.

## 3. INSTALL ACCELERATOR PEDAL ASSY

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

## 4. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

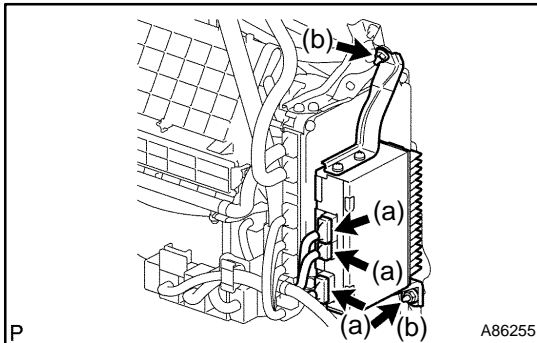
## 5. SYSTEM INITIALIZATION (See page 19-15 )

## ECM (3MZ-FE)

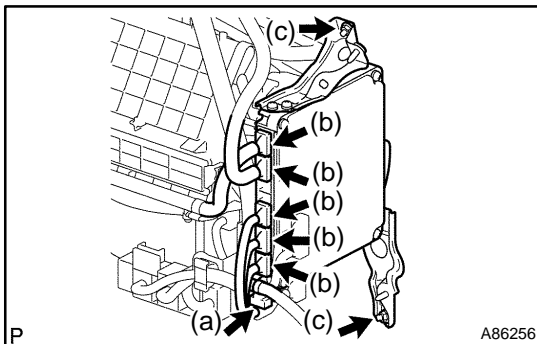
### REPLACEMENT

100J9-02

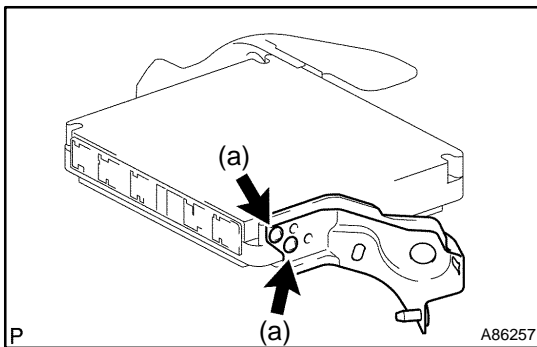
1. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)
2. REMOVE FRONT DOOR SCUFF PLATE RH (See page 71-1 1)
3. REMOVE INSTRUMENT PANEL UNDER COVER SUB-ASSY NO.1 (See page 71-1 1)
4. REMOVE INSTRUMENT PANEL SUB-ASSY LOWER (See page 71-1 1)



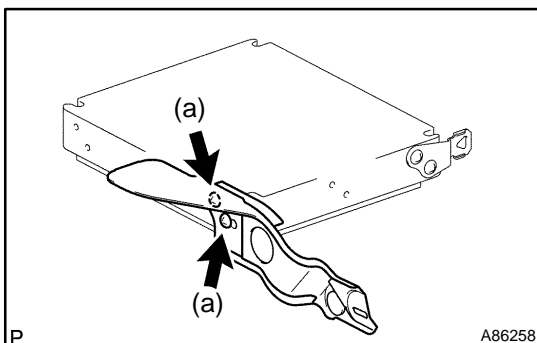
5. **REMOVE STEREO COMPONENT AMPLIFIER ASSY**
  - (a) Disconnect the 3 stereo component amplifier connectors.
  - (b) Remove the 2 nuts, then remove the stereo component amplifier.



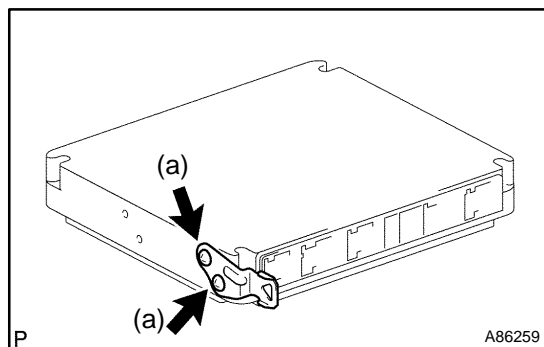
6. **REMOVE ECM**
  - (a) Remove the wire harness clamp.
  - (b) Disconnect the 5 ECM connectors.
  - (c) Remove the 2 nuts, then remove the ECM.



7. **REMOVE ECM BRACKET**
  - (a) Remove the 2 screws, then remove the ECM bracket.



8. **REMOVE ECM BRACKET NO.2**
  - (a) Remove the 2 screws, then remove the ECM bracket No. 2.

**9. REMOVE ECM BRACKET NO.3**

- (a) Remove the 2 screws, then remove the ECM bracket No 3.

**10. INSTALL ECM BRACKET NO.3****11. INSTALL ECM BRACKET NO.2****12. INSTALL ECM BRACKET****13. INSTALL ECM**

Torque: 5.5 N·m (56 kgf·cm, 49 in.·lbf)

**14. INSTALL STEREO COMPONENT AMPLIFIER ASSY**

Torque: 5.5 N·m (56 kgf·cm, 49 in.·lbf)

**15. INSTALL INSTRUMENT PANEL SUB-ASSY LOWER****16. INSTALL INSTRUMENT PANEL UNDER COVER SUB-ASSY NO.1****17. INSTALL FRONT DOOR SCUFF PLATE RH****18. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)**

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

**19. RESET MEMORY (See page [05-604](#) )****20. SYSTEM INITIALIZATION (See page [19-15](#) )**



# FUEL SYSTEM (3MZ-FE)

110XR-01

## PRECAUTION

### 1. PRECAUTION

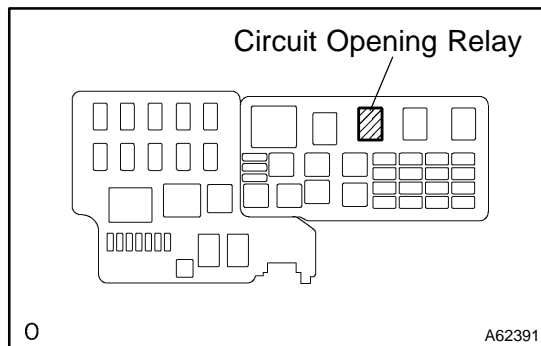
- (a) Before working on the fuel system, disconnect the engine wire No. 3 (battery negative terminal) from battery.
- (b) Do not smoke or work near open flame when working on the fuel system.
- (c) Keep gasoline away from the rubber or leather parts.

### 2. DISCHARGE FUEL SYSTEM PRESSURE

#### CAUTION:

- Do not disconnect any parts of the fuel system pressure until you have discharging the fuel system pressure.
- Even after discharge the fuel pressure, place a shop rag over fittings as you separate them in order to reduce risk of fuel spray on yourself or in the engine compartment.

- (a) Disconnect the engine wire No. 3 (battery negative terminal).



- (b) Remove the circuit opening relay from the engine room relay block.
- (c) Connect the engine wire No. 3 (battery negative terminal). **Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**
- (d) Start the engine. After the engine has stopped on its own, turn the ignition switch OFF.

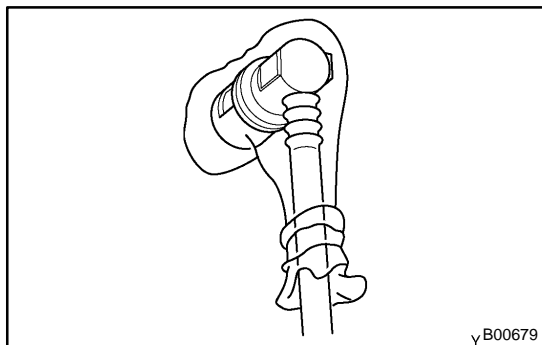
#### HINT:

There is a case that DTC P0171 (system too lean) is output.

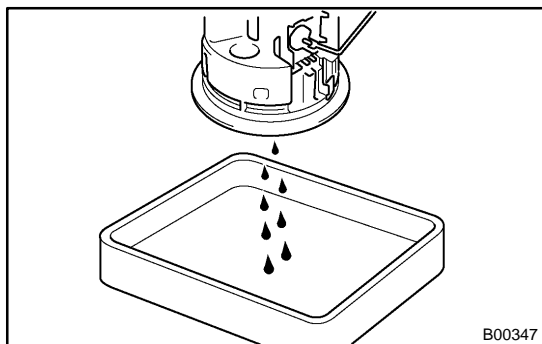
- (e) Check that the engine does not start.
- (f) Remove the fuel tank cap, then let the air out of the fuel tank.
- (g) Disconnect battery negative terminal.
- (h) Reinstall the circuit opening relay.

### 3. FUEL SYSTEM

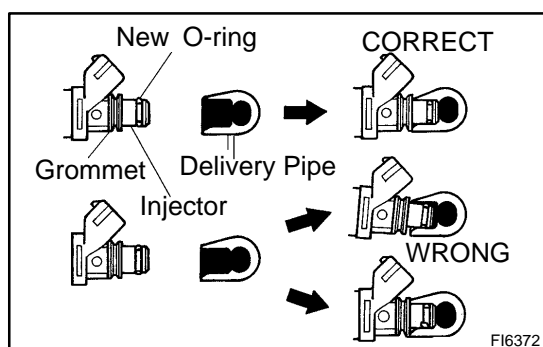
- (a) When disconnecting the high fuel pressure line, a large amount of gasoline will spill out. So observe these procedures.
  - (1) Work in order to prevent gasoline from spilling out.
  - (2) Disconnect the fuel pump tube (see page 11-20).
  - (3) Drain the fuel remaining inside the fuel pump tube.



- (4) In order to prevent the disconnected fuel pump tube from being damaged and foreign objects from being introduced, cover the disconnected fuel pump tube with a vinyl or plastic bag.
- (5) Place a tray under the vehicle or point of disconnection to catch any fuel that may spill.



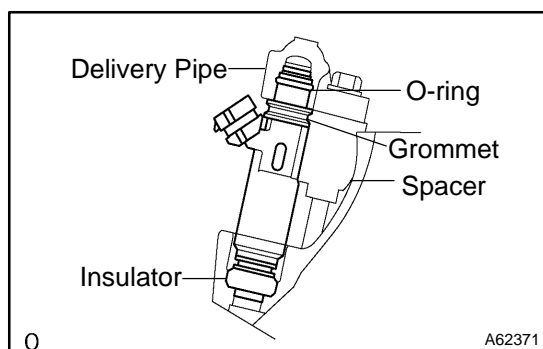
- (6) Put a container under the connection.



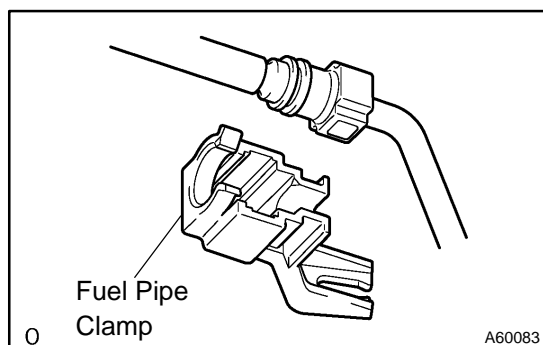
- (b) Take the following precautions when removing and installing the fuel injectors.

**NOTICE:****Never reuse the O-ring.**

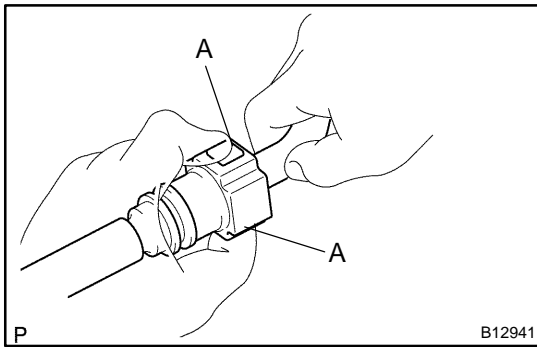
- (1) When installing a new O-ring on the fuel injector, be careful not to damage it.
- (2) Coat a new O-ring with spindle oil or gasoline before installing. Never use engine oil, gear oil or brake oil.



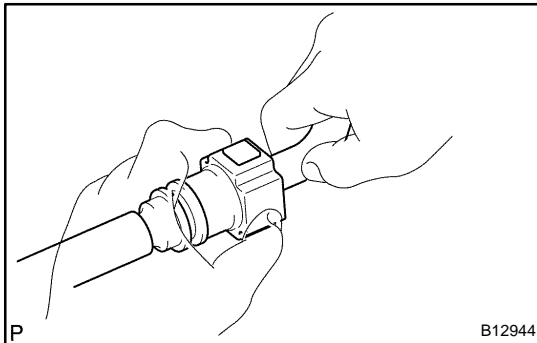
- (c) Install the fuel injector to the fuel delivery pipe and intake manifold as shown in the illustration. Before installing the fuel injector, be sure to apply spindle oil or gasoline to the place where the fuel delivery pipe or intake manifold touches the O-ring of the fuel injector.



- (d) Take the following precautions when disconnecting the quick connector.
  - (1) Remove the fuel pipe clamp.
  - (2) Check the pipe and around the quick connector for dirt or mud before disconnecting them. Remove the dirt if necessary.



- (3) Disconnect the quick connector from the pipe while pinching portion A with your fingers as shown in the illustration.

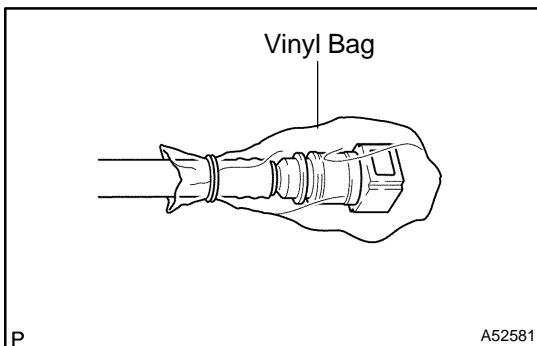


- (4) If the quick connector and pipe are stuck, pinch the pipe, then push and pull the quick connector to release and pull it out.

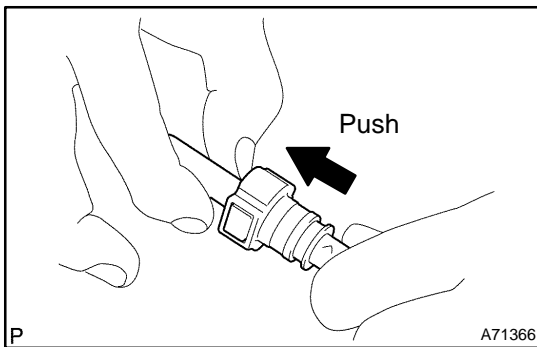
**NOTICE:**

**Do not use any tools.**

- (5) If there is dirt or any other substances on the sealing surface that might interfere with the seal, clean the area thoroughly before assembling.

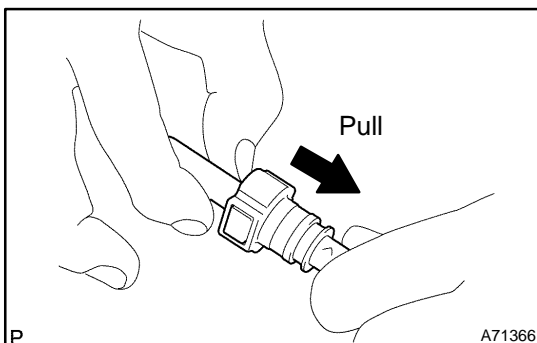


- (6) In order to prevent the disconnected pipe and quick connector from damage or dirt, cover them with a vinyl or plastic bag.



- (e) Take the following precautions when connecting the quick connector.

- (1) Check the connected part of the pipe for damage or foreign objects.
- (2) Align the axis of the quick connector with the axis of the pipe, then push into the quick connector until the quick connector makes a "click" sound. In case that the connection is tight, apply a little amount of fresh engine oil to the tip of the pipe.

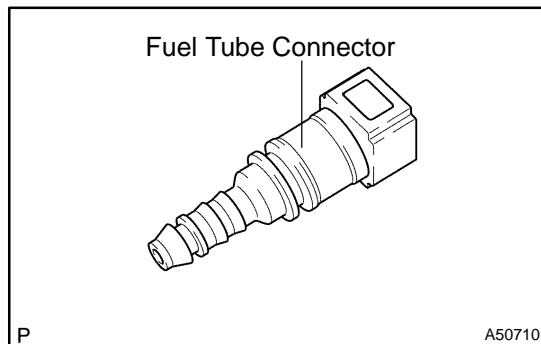


- (3) After connecting, check if the pipe and quick connector are securely connected by pulling on them.
- (4) Install the fuel pipe clamp.
- (5) Check if there is any leakage.

**4. CHECK FOR FUEL LEAKS**

- (a) Check that there are no fuel leaks after doing maintenance anywhere on the fuel system (see page [11-5](#) ).

## ON-VEHICLE INSPECTION

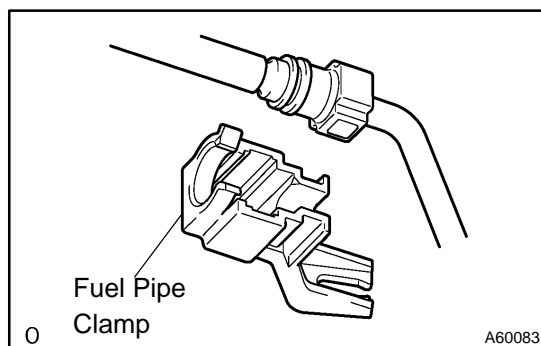


### 1. CHECK FUEL PRESSURE

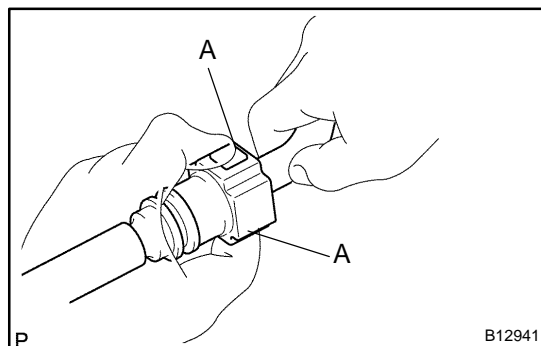
- Discharge the fuel pressure and take precautions against possible fuel spillage (see page 11-1).
- Check that the battery voltage is above 12 V.
- Disconnect the engine wire No. 3 (battery negative terminal).
- Pull out the fuel tube connector from a new fuel tube.

HINT:

Part No. 23801-20190



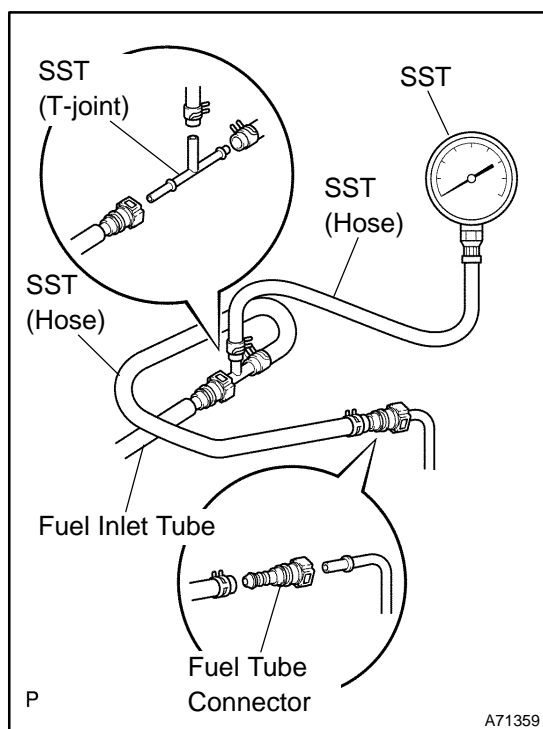
- Remove the fuel pipe clamp.



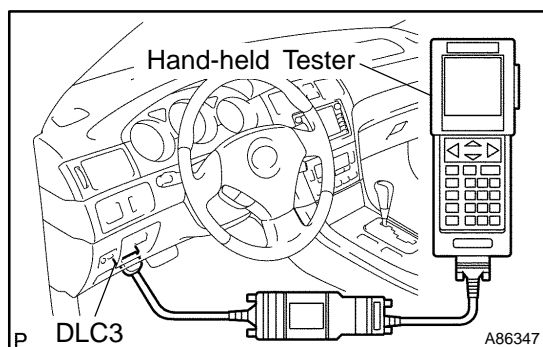
- Disconnect the quick connector from the fuel pipe by pinching portion A with your fingers as shown in the illustration.

### CAUTION:

- After taking the precautions, disconnect the quick connector.
- As pressure remains in the fuel line, prevent it from splashing inside the engine compartment.



- (g) Install SST (a pressure gauge) and fuel tube connector using SST as shown in the illustration.  
SST 09268-41047 (95336-08070), 09268-45014 (09268-41250, 09268-41200, 09268-41220)
- (h) Wipe up any gasoline.
- (i) Reconnect the engine wire No. 3 (battery negative terminal).



- (j) Connect the hand-held tester to the DLC3.
- (k) Measure the fuel pressure.

**Fuel pressure:**

**304 to 343 kPa (3.1 to 3.5 kgf/cm<sup>2</sup>, 44 to 50 psi)**

If the pressure is high, replace the fuel pressure regulator.

If the pressure is low, check the fuel hose connections, fuel pump, fuel filter and fuel pressure regulator.

- (l) Disconnect the hand-held tester from the DLC3.
- (m) Start the engine.
- (n) Measure the fuel pressure at idle.

**Fuel pressure:**

**304 to 343 kPa (3.1 to 3.5 kgf/cm<sup>2</sup>, 44 to 50 psi)**

- (o) Stop the engine.
- (p) Check that the fuel pressure remains as specified for 5 minutes after the engine has stopped.

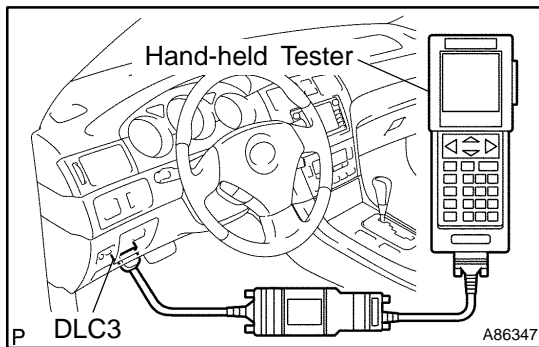
**Fuel pressure: 147 kPa (1.5 kgf/cm<sup>2</sup>, 21 psi) or more**

If the pressure is not as specified, check the fuel pump, pressure regulator and/or fuel injectors.

- (q) After checking the fuel pressure, disconnect the battery negative terminal and carefully remove SST and the fuel tube connector to prevent gasoline splash.
- (r) Reconnect the No. 1 fuel pipe (the fuel tube connector).

**CAUTION:**

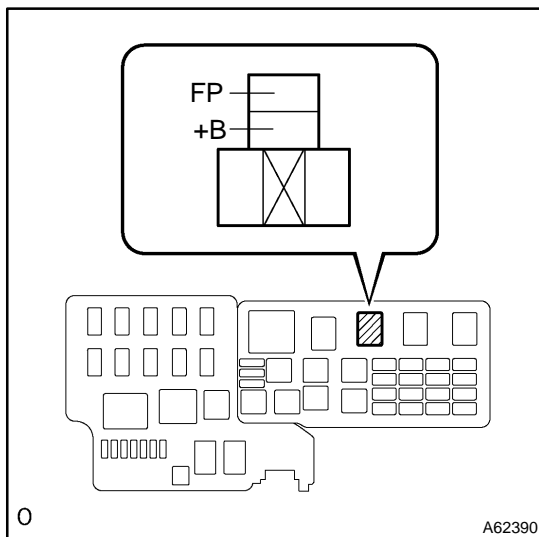
**After taking the precautions, connect the quick connector.**



- 2. CHECK FUEL PUMP OPERATION AND FUEL LEAK**
- (a) When using the hand-held tester.
- (1) Connect the hand-held tester to the DLC3.
  - (2) Turn the ignition switch ON and the hand-held tester ON.

**NOTICE:****Do not start the engine.**

- (3) Select the ACTIVE TEST mode on the hand-held tester.
- (4) If you need help to select the ACTIVE TEST mode on the hand-held tester, refer to the hand-held tester operator's manual.



- (b) When not using the hand-held tester.
- (1) Remove the circuit opening relay.
  - (2) Using a service wire, connect terminals FP and +B of the engine room relay block.

**NOTICE:****Pay due attention to the terminal connecting position to avoid a malfunction.**

- (3) Turn the ignition switch ON, and check that the fuel pump operates.

**NOTICE:****Do not start the engine.**

- (c) Check that there are no fuel leaks after doing maintenance anywhere on the fuel system.

INSPECTION

1. INSPECT FUEL INJECTOR ASSY

- (a) Inspect the resistance.
  - (1) Using an ohmmeter, measure the resistance between the terminals.

Standard:

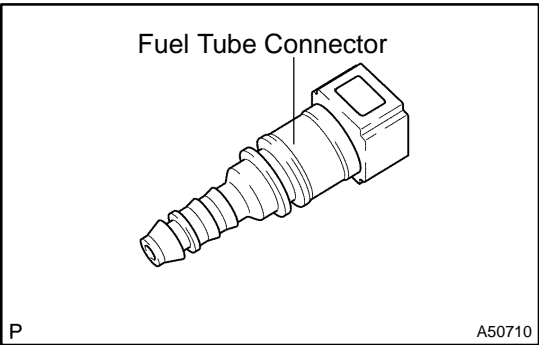
Tester Connection	Specified Condition
1 - 2	13.4 to 14.2 Ω at 20℃ (68℉)

If the resistance is not as specified, replace the fuel injector.

- (b) Check the operation.

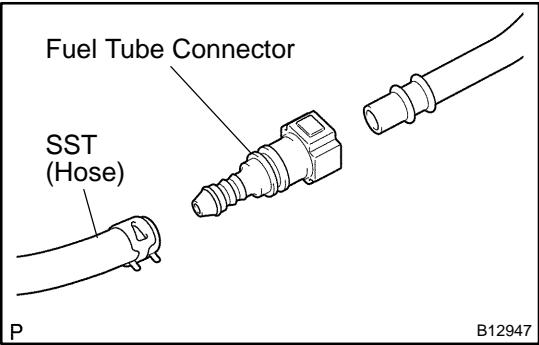
CAUTION:

- This test involves high-pressure fuel and electricity. Keep the injector free of sparks during the test.
- Take every precaution regarding safe handling of both the fuel and electricity.
- Perform this test in a safe area, and avoid any sparks or flame.
- Do not smoke.



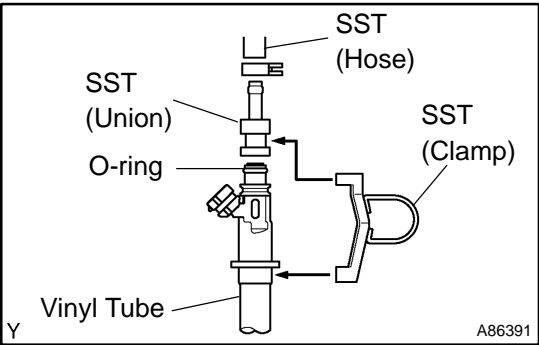
- (1) Pull out the fuel tube connector from a new fuel tube.

HINT:  
Part No. 23801 - 20190



- (2) Connect SST and the fuel tube connector to the fuel pipe.  
SST 09268-41047 (95336-08070)

CAUTION:  
After taking the precautions, connect the quick connector.

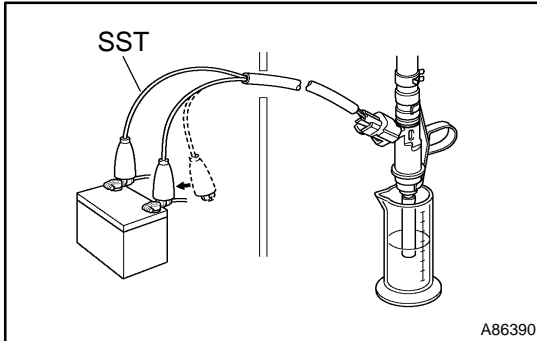


- (3) Install the grommet and O-ring to the fuel injector.
- (4) Connect SST (a union and hose) to the fuel injector, then hold the fuel injector and union with SST (a clamp).  
SST 09268- 41047 (09268- 41110, 09268- 41300, 95336-08070)
- (5) Put the fuel injector into a graduated cylinder.

HINT:  
Install a suitable vinyl tube to the fuel injector to contain the gasoline spray.



(6) Operate the fuel pump (see page 11-5).



(7) Connect SST (a wire) to the fuel injector and battery for 15 seconds, then measure the injection volume with the graduated cylinder. Test each fuel injector 2 or 3 times.

SST 09842-30070

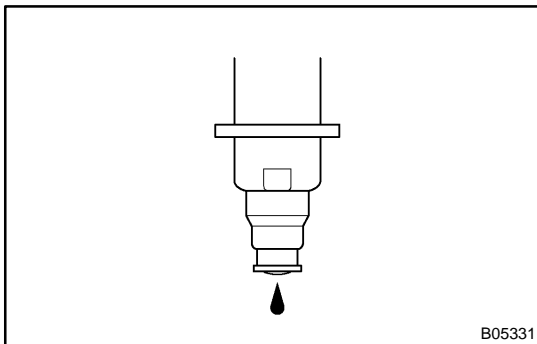
**Standard:**

Injection Volume	Difference between Cylinders
60 to 73 cm <sup>3</sup> (3.7 to 4.5 cu in.) per 15 seconds	13 cm <sup>3</sup> (0.8 cu in.) or less

**NOTICE:**

**Always do the switching at the battery side.**

If the injection volume is not as specified, replace the fuel injector.

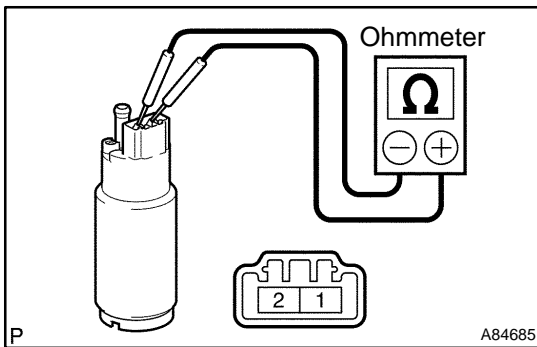


(c) Inspect the leakage.

(1) In the condition of step (7), disconnect the test probes of SST (a wire) from the battery, then check the fuel leakage from the fuel injector.

**Fuel drop: 1 drop or less per 12 minutes**

If the fuel drop is not as specified, replace the fuel injector.



## 2. INSPECT FUEL PUMP

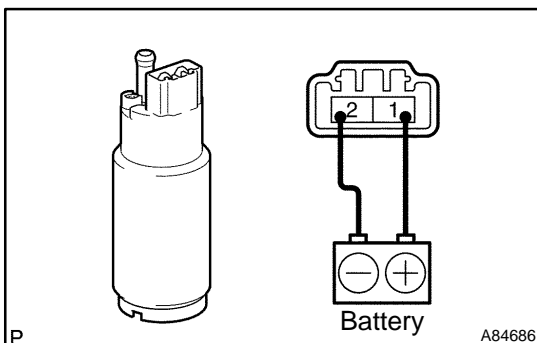
(a) Inspect the resistance.

(1) Using an ohmmeter, measure the resistance between the terminals.

**Standard:**

Tester Connection	Specified Condition
1 - 2	0.2 to 3.0 Ω at 20°C (68°F)

If the resistance is not as specified, replace the fuel pump.



(b) Check the operation.

(1) Apply battery positive voltage across the terminals.  
(2) Check that the fuel pump operates.

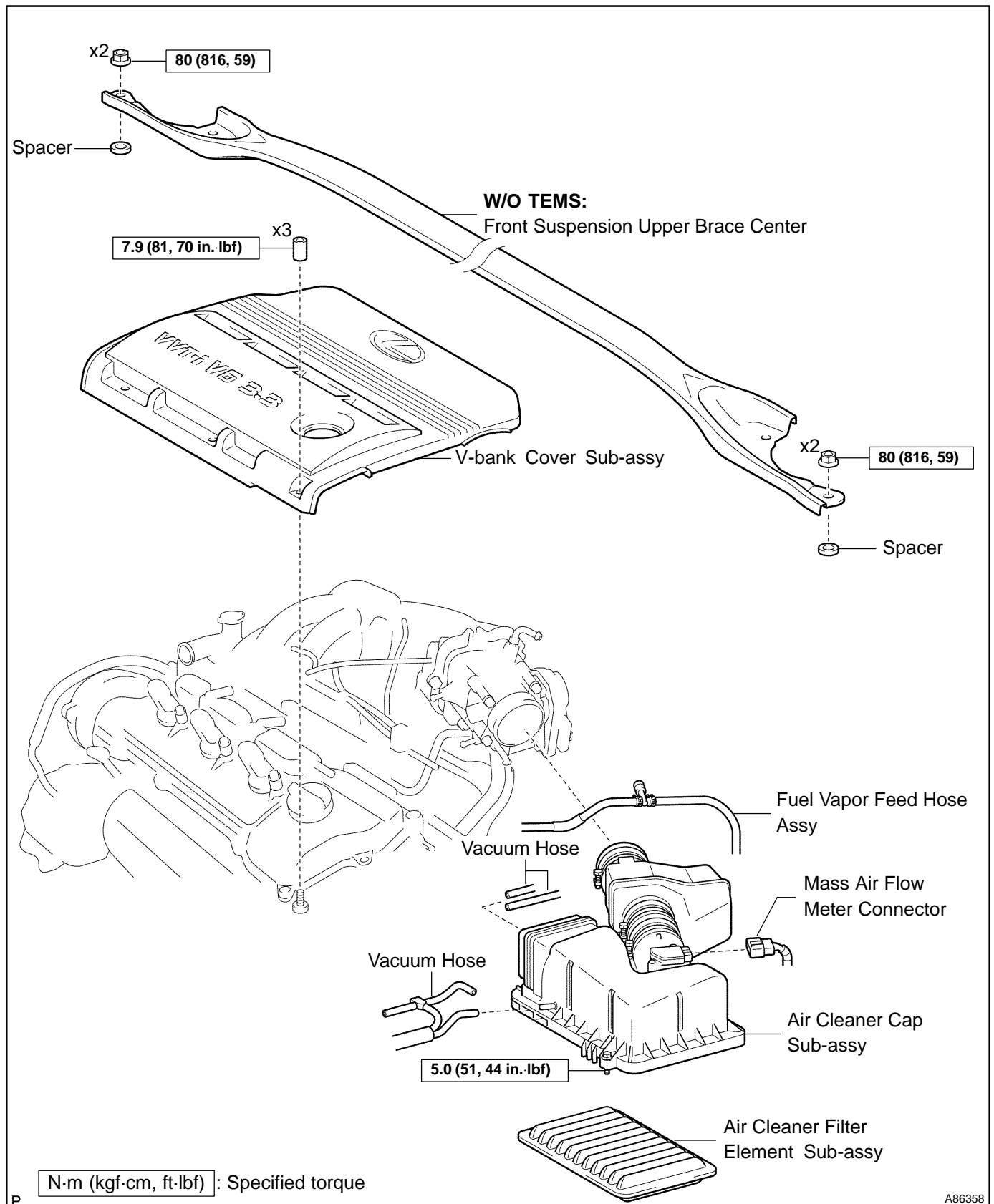
**NOTICE:**

- These tests must be performed quickly (within 10 seconds) to prevent burnout of the coil.
- Keep the fuel pump as far away from the battery as possible.
- Always do the switching at the battery side.

If the operation is not as specified, replace the fuel pump.

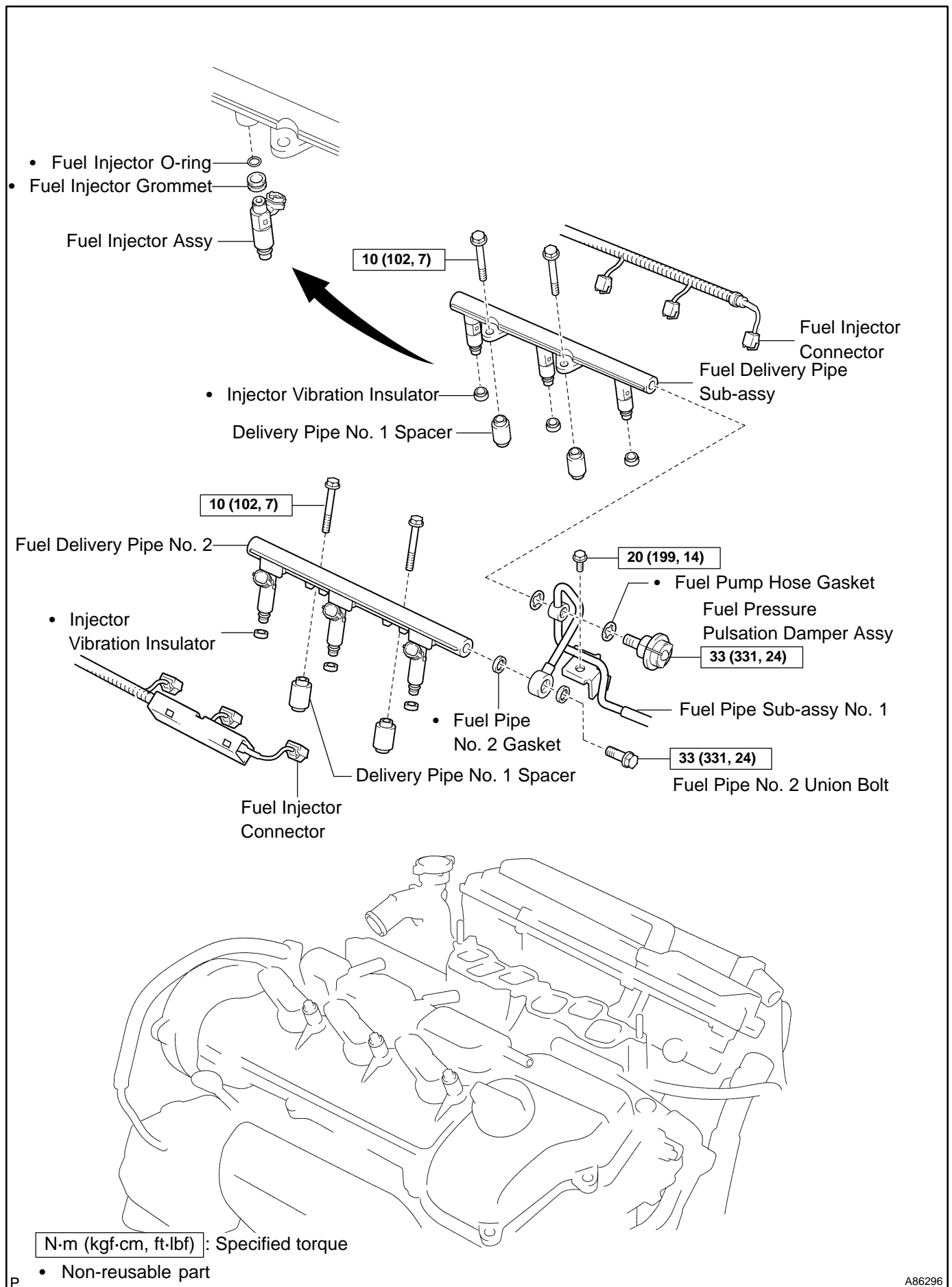
# FUEL INJECTOR ASSY (3MZ-FE) COMPONENTS

110XU-01



A86358

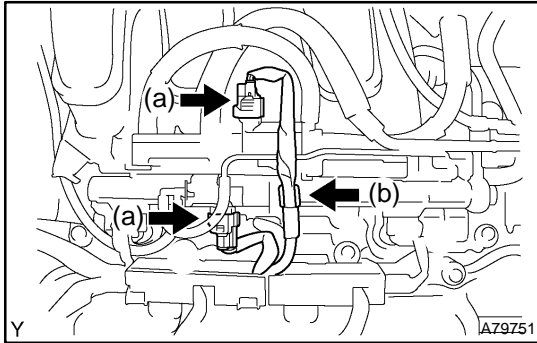




A86296

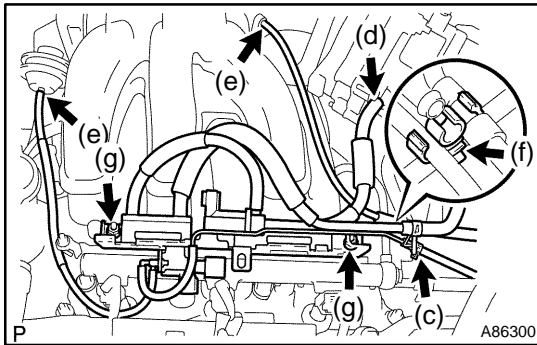
## REPLACEMENT

1. DISCHARGE FUEL SYSTEM PRESSURE (See page 11-1 )
2. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)
3. DRAIN ENGINE COOLANT (See page 16-9 )
4. REMOVE FRONT SUSPENSION UPPER BRACE CENTER (W/O TEMS) (See page 10-1 1)
5. REMOVE V-BANK COVER SUB-ASSY (See page 10-1 1)
6. REMOVE AIR CLEANER CAP SUB-ASSY (See page 10-1 1)

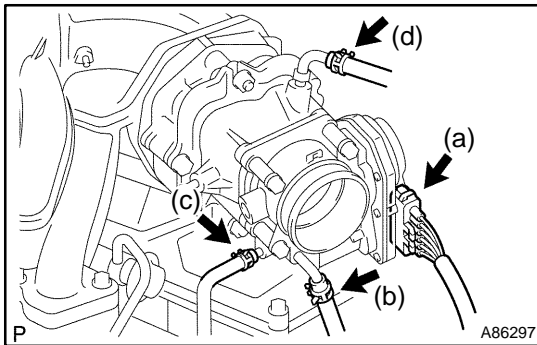


### 7. REMOVE EMISSION CONTROL VALVE SET

- (a) Disconnect the 2 VSV connectors.
- (b) Remove the wire harness clamp.

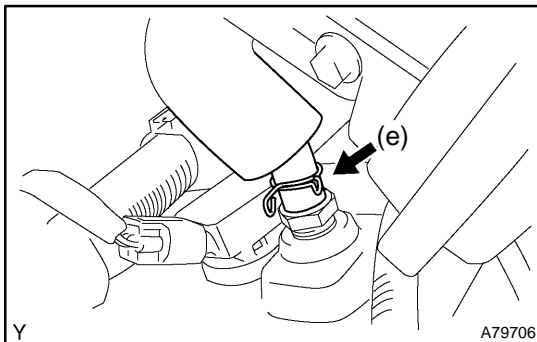


- (c) Disconnect the fuel vapor feed hose No. 1.
- (d) Disconnect the fuel vapor feed hose No. 2.
- (e) Disconnect the 2 vacuum hoses.
- (f) Remove the clamp.
- (g) Remove the 2 nuts, then remove the emission control valve set.

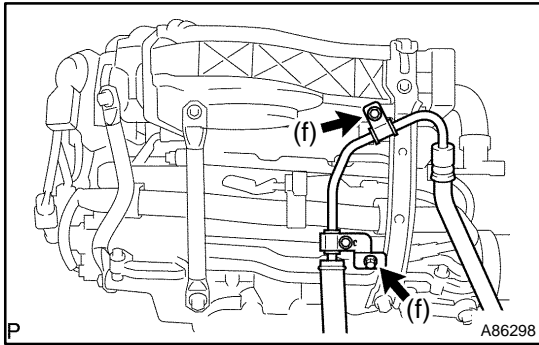


### 8. REMOVE INTAKE AIR SURGE TANK

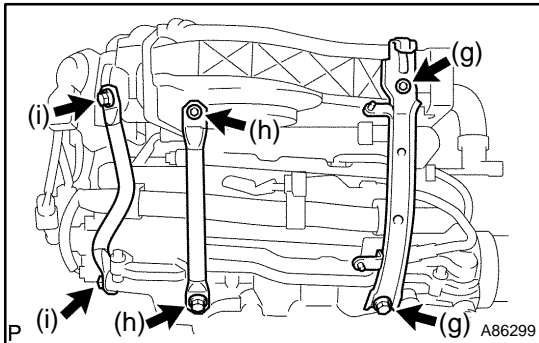
- (a) Disconnect the throttle motor connector.
- (b) Disconnect the water by-pass hose No. 3.
- (c) Disconnect the water by-pass hose No. 2.
- (d) Disconnect the union to check valve hose.



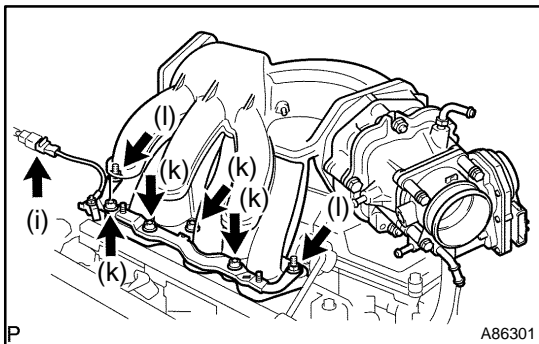
- (e) Disconnect the ventilation hose.



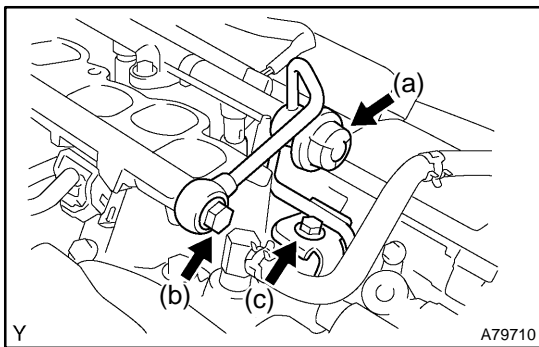
- (f) Remove the 2 nuts, then remove the pressure feed tube.



- (g) Remove the 2 bolts, then remove the engine hanger No. 1.  
 (h) Remove the 2 bolts, then remove the surge tank stay No. 1.  
 (i) Remove the 2 bolts, then remove the surge tank stay No. 2.

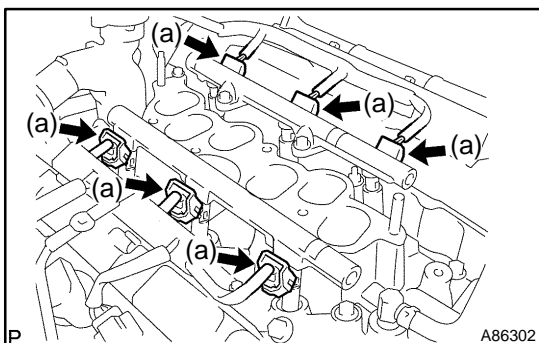


- (j) Disconnect the bond cable No. 1 connector.  
 (k) Using a socket hexagon wrench 8, remove the 4 bolts.  
 (l) Remove the 2 nuts, then remove the emission control valve bracket and intake air surge tank.  
 (m) Remove the gasket from the intake air surge tank.



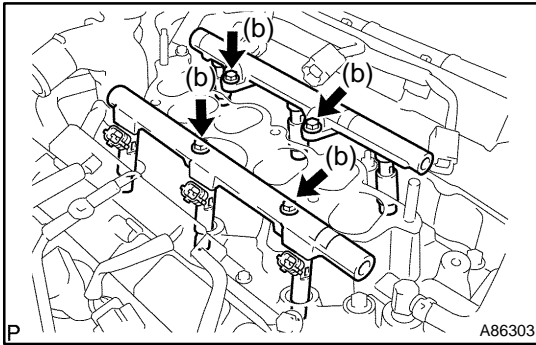
#### 9. SEPARATE FUEL PIPE SUB-ASSY NO.1

- (a) Remove the fuel pressure pulsation damper and 2 gaskets.  
 (b) Remove the fuel pipe No. 2 union bolt and 2 gaskets.  
 (c) Remove the bolt, then separate the fuel pipe No. 1.



#### 10. REMOVE FUEL INJECTOR ASSY

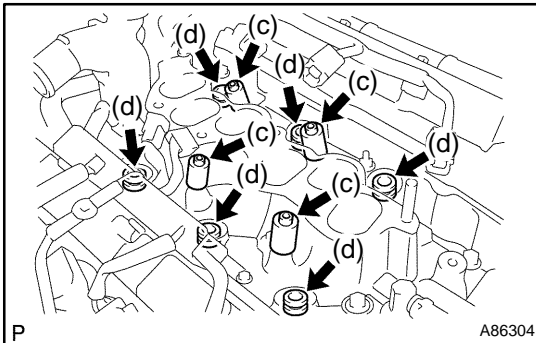
- (a) Disconnect the 6 fuel injector connectors.



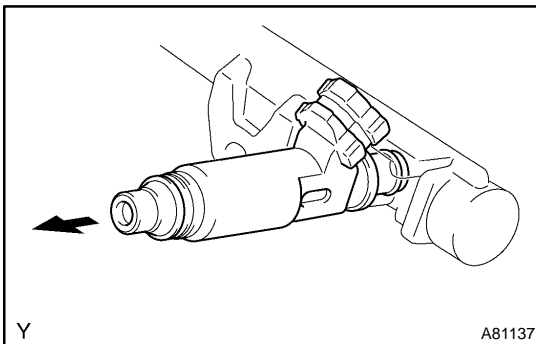
- (b) Remove the 4 bolts, then remove the 2 fuel delivery pipes together with the 6 fuel injectors.

**NOTICE:**

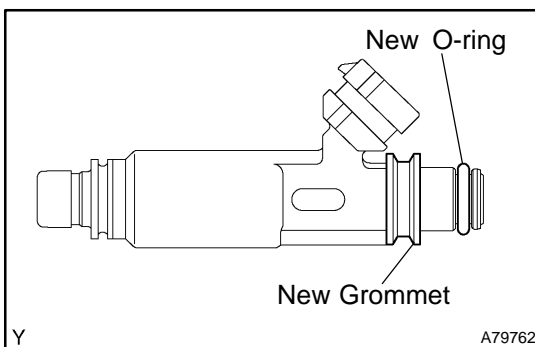
**Be careful not to drop the fuel injectors when removing the fuel delivery pipe.**



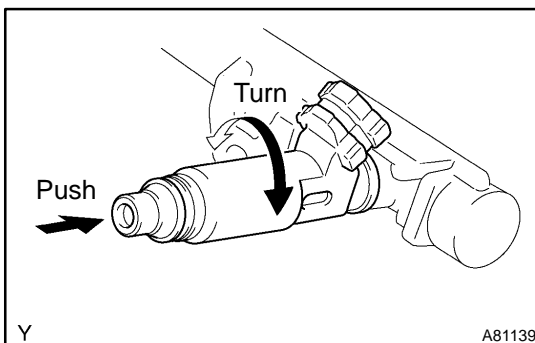
- (c) Remove the 4 delivery pipe No. 1 spacers from the intake manifold.  
(d) Remove the 6 insulators from the intake manifold.



- (e) Pull out the fuel injector from the fuel delivery pipe.

**11. INSTALL FUEL INJECTOR ASSY**

- (a) Install new grommets to each fuel injector.  
(b) Apply a light coat of spindle oil or gasoline to new O-rings, then install them to each fuel injector.

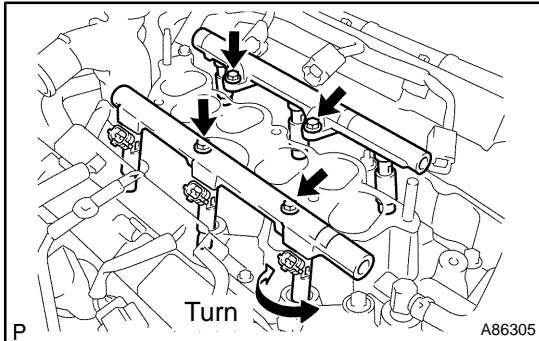


- (c) Apply a light coat of spindle oil or gasoline to the place where the fuel delivery pipe contacts the O-ring.  
(d) Push the fuel injector while twisting it back and forth to install it in the fuel delivery pipe.

**NOTICE:**

- **Be careful not to twist the O-ring.**
- **After installing the fuel injectors, check that they turn smoothly. If not, replace O-ring with a new O-ring.**

- (e) Install 6 new insulators and the 4 delivery pipe No. 1 spacers to the intake manifold.



- (f) Place the 2 fuel delivery pipes together with the 6 fuel injectors to the intake manifold.

**NOTICE:**

**Be careful not to drop the fuel injectors when installing the fuel delivery pipe.**

- (g) Temporarily install the 4 bolts which attach the fuel delivery pipe to the intake manifold.
- (h) Check that the fuel injectors rotate smoothly.  
If the fuel injectors do not rotate smoothly, the probable cause is incorrect installation of the O-ring. Replace it with a new one.
- (i) Tighten the 4 bolts.

**Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)**

- (j) Connect the 6 fuel injector connectors.

## 12. INSTALL FUEL PIPE SUB-ASSY NO.1

- (a) Install 2 new gaskets and fuel pipe No. 2 union bolt.  
**Torque: 33 N·m (331 kgf·cm, 24 ft·lbf)**
- (b) Install 2 new gaskets and fuel pressure pulsation damper.  
**Torque: 33 N·m (331 kgf·cm, 24 ft·lbf)**
- (c) Install the fuel pipe No. 1 with the bolt.  
**Torque: 20 N·m (199 kgf·cm, 14 ft·lbf)**

## 13. 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 (199 kgf·cm, 14 ft·lbf)**
- (e) Install the surge tank stay No. 1 with the 2 bolts.  
**Torque: 20 N·m (199 kgf·cm, 14 ft·lbf)**
- (f) Install the engine hanger No. 1 with the 2 bolts.  
**Torque: 20 N·m (199 kgf·cm, 14 ft·lbf)**
- (g) Install the pressure feed tube with the 2 nuts.  
**Torque: 7.8 N·m (80 kgf·cm, 69 in·lbf)**
- (h) Connect the ventilation hose.
- (i) Connect the union to check valve hose.
- (j) Connect the water by-pass hose No. 2.
- (k) Connect the water by-pass hose No. 3.
- (l) Connect the throttle motor connector.

## 14. INSTALL EMISSION CONTROL VALVE SET

**Torque: 8.0 N·m (82 kgf·cm, 71 in·lbf)**

## 15. INSTALL AIR CLEANER CAP SUB-ASSY (See page 10-11)

## 16. CHECK CONNECTION OF VACUUM HOSE (See page 14-29)

## 17. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)

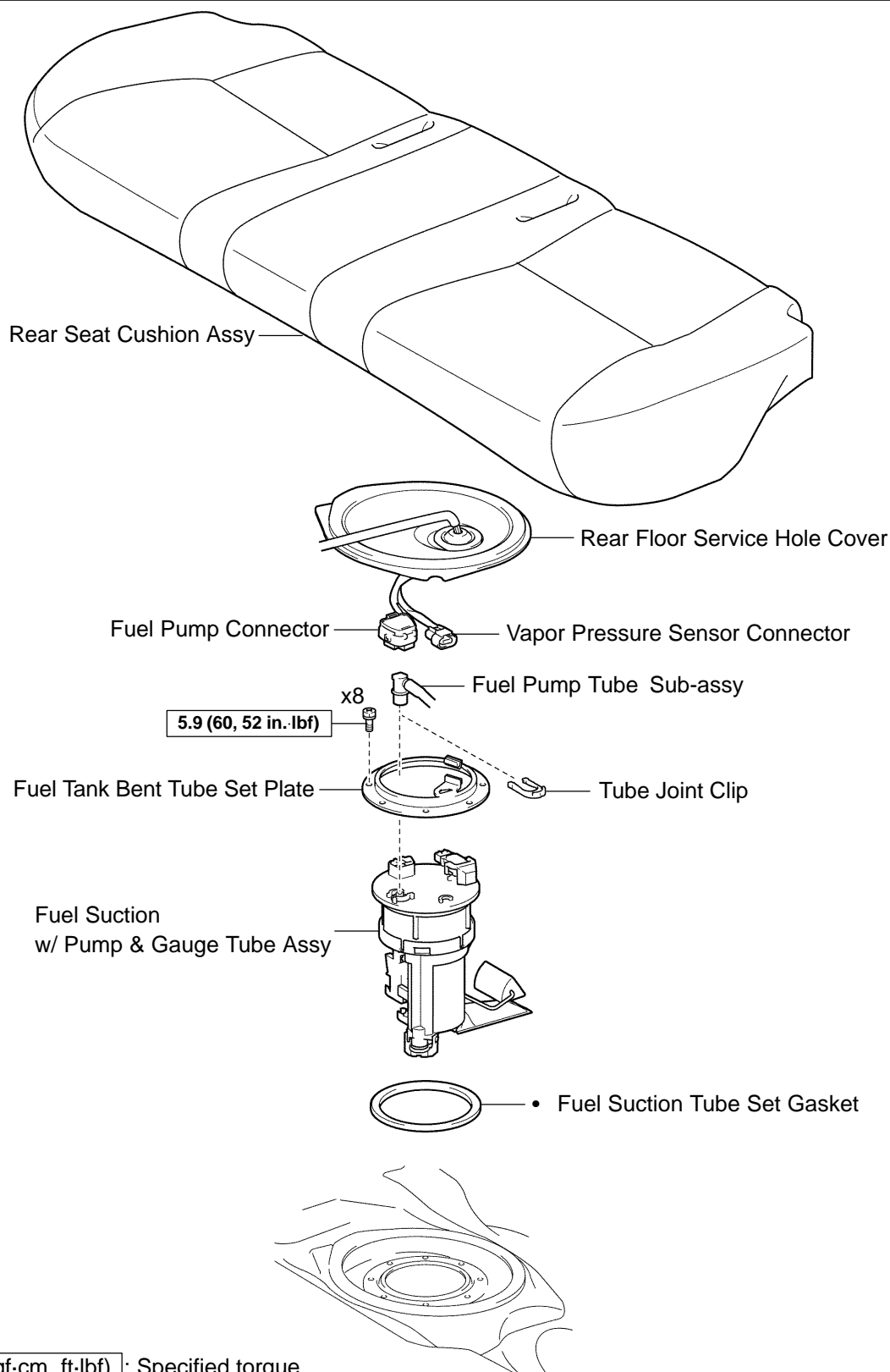
**Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)**



18. ADD ENGINE COOLANT (See page [16-9](#) )
19. CHECK FOR ENGINE COOLANT LEAKS (See page [16-1](#) )
20. CHECK FOR FUEL LEAKS (See page [11-5](#) )
21. INSTALL V-BANK COVER SUB-ASSY (See page [10-1 1](#))
22. INSTALL FRONT SUSPENSION UPPER BRACE CENTER (W/O TEMS) (See page [10-1 1](#))
23. SYSTEM INITIALIZATION (See page [19-15](#) )

# FUEL SUCTION W/ PUMP & GAUGE TUBE ASSY (3MZ-FE) COMPONENTS

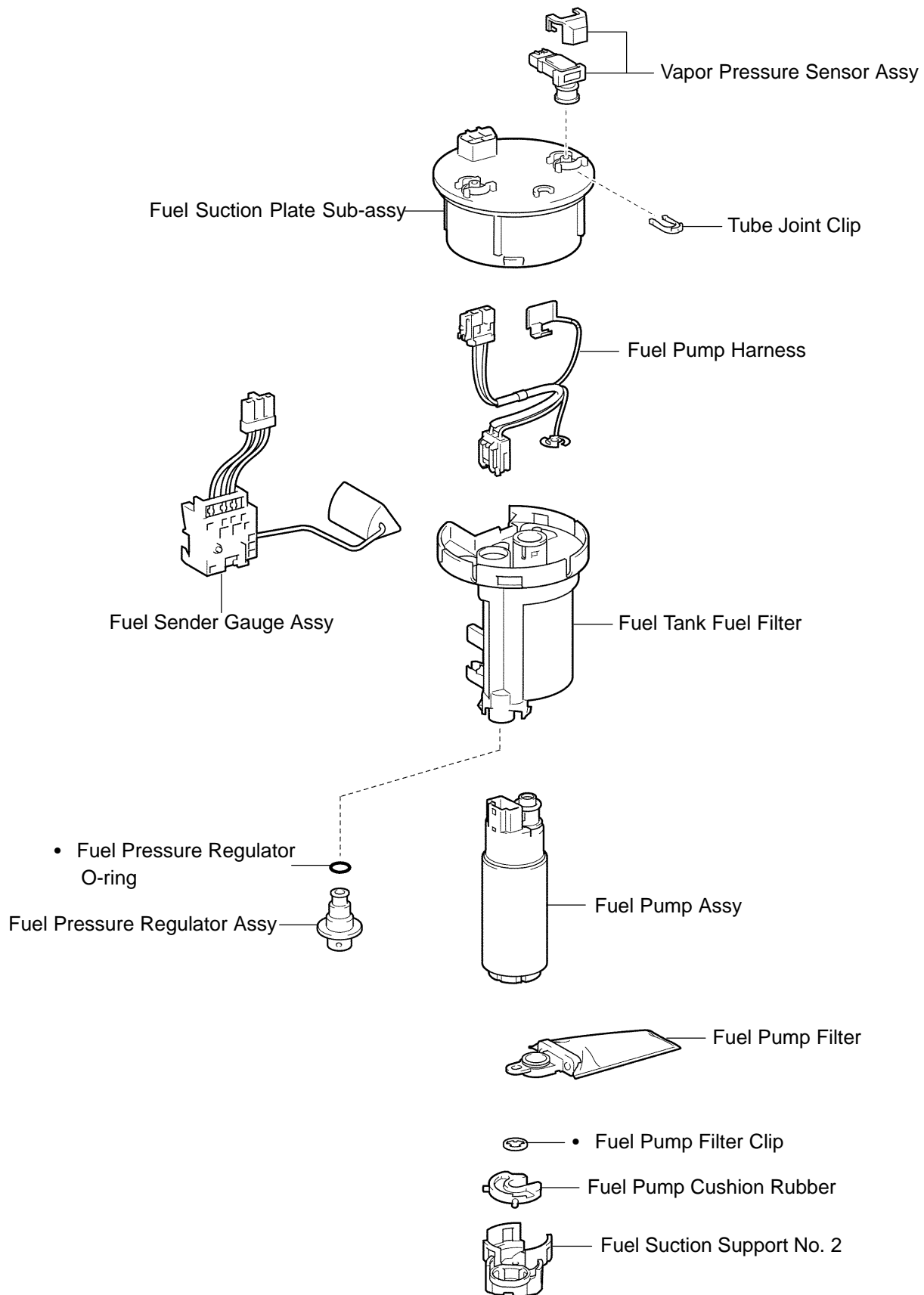
110XW-02



N·m (kgf·cm, ft·lbf) : Specified torque

P • Non-reusable part

A79485

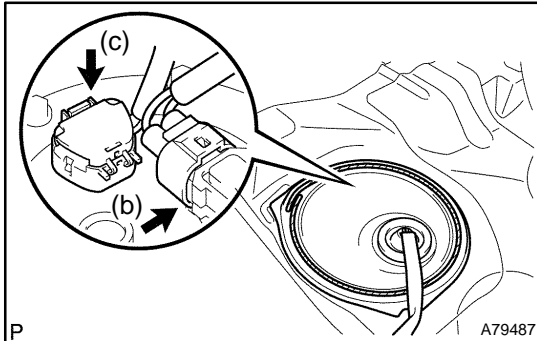


P • Non-reusable part

A79486

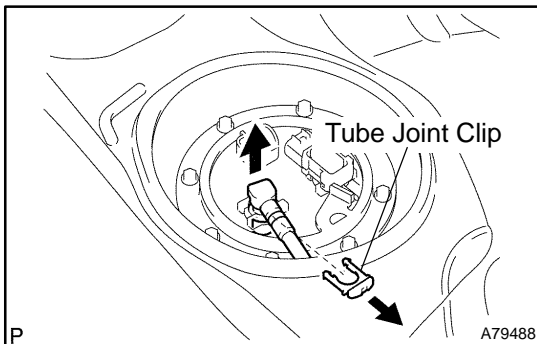
## Removal & Installation and Disassembly & Reassembly

1. DISCHARGE FUEL SYSTEM PRESSURE (See page 11-1 )
2. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)
3. REMOVE REAR SEAT CUSHION ASSY (See page 72-39 )



### 4. REMOVE REAR FLOOR SERVICE HOLE COVER

- (a) Remove the rear floor service hole cover.
- (b) Disconnect the vapor pressure sensor connector.
- (c) Disconnect the fuel pump connector.

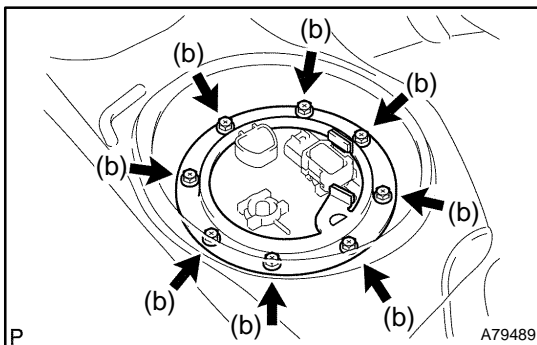
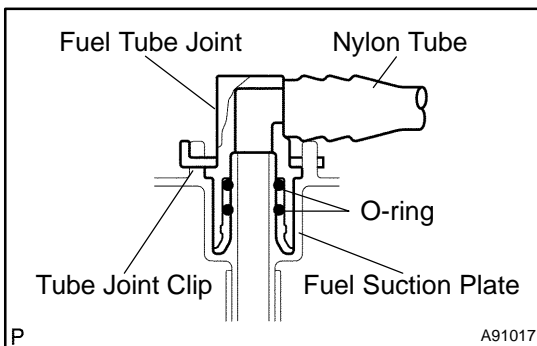


### 5. REMOVE FUEL SUCTION W/ PUMP & GAUGE TUBE ASSY

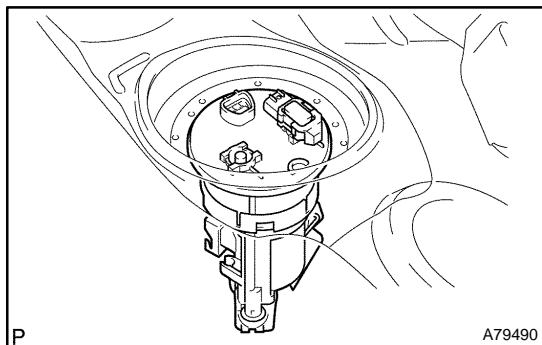
- (a) Remove the tube joint clip, then pull out the fuel pump tube.

#### NOTICE:

- Check around the connector for dirt or mud before this operation. Remove the dirt if necessary.
- Be careful of mud because the fuel tube joint has an O-ring which seals the pipe and connector that can be contaminated.
- Do not use any tools in this operation.
- Do not bend or twist the nylon tube. Protect the connector by covering it with a vinyl or plastic bag.
- When the pipe and connector are stuck, push and pull the connector to release. Pull the connector carefully.



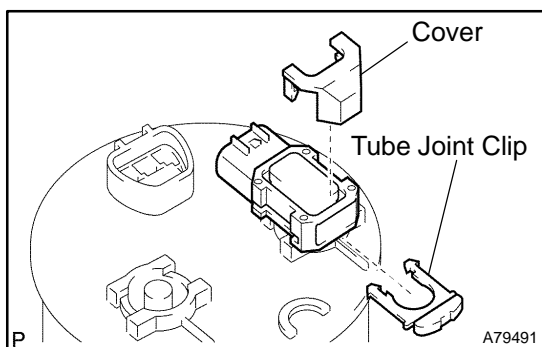
- (b) Remove the 8 bolts, then remove the fuel tank vent tube set plate.



- (c) Remove the fuel suction tube w/ pump & gauge from the fuel tank.

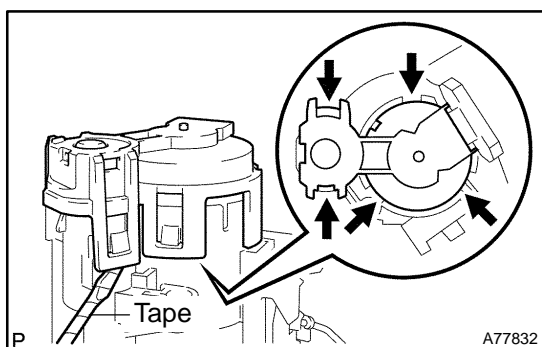
**NOTICE:**

- **Do not damage the fuel pump filter.**
  - **Do not bend the arm of the fuel sender gauge.**
- (d) Remove the gasket from the fuel suction tube w/ pump & gauge.



**6. REMOVE VAPOR PRESSURE SENSOR ASSY**

- (a) Remove the cover.
- (b) Remove the tube joint clip, then pull out the vapor pressure sensor.

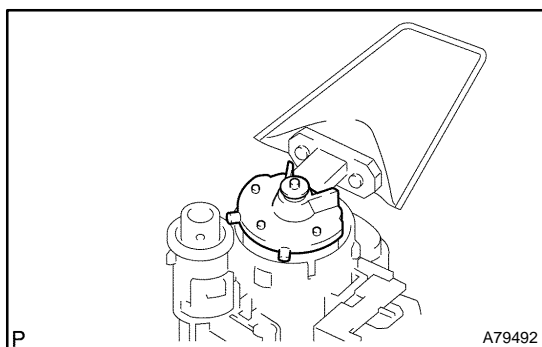


**7. REMOVE FUEL SUCTION SUPPORT NO.2**

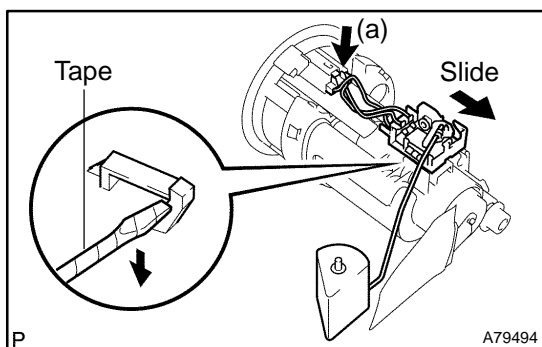
- (a) Using a screwdriver with the tip wrapped in tape, unfasten the 5 claws. Then remove the fuel suction support No. 2.

**NOTICE:**

**Do not damage the fuel suction support No. 2.**

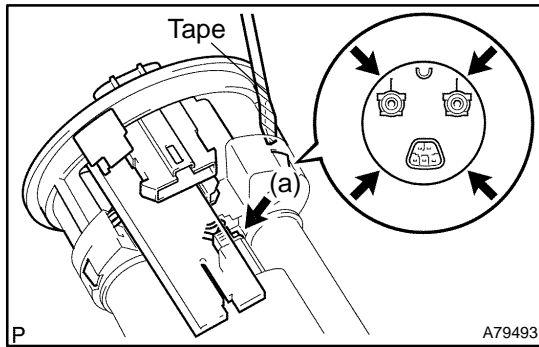


**8. REMOVE FUEL PUMP CUSHION RUBBER**



**9. REMOVE FUEL SENDER GAUGE ASSY**

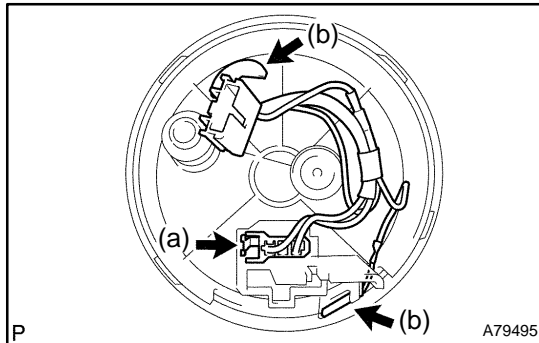
- (a) Disconnect the fuel sender gauge connector.
- (b) Using a screwdriver with the tip wrapped in tape, unfasten the clamp to release the fuel sender gauge. Then slide the fuel sender gauge to remove it from the fuel pump.

**10. REMOVE FUEL SUCTION PLATE SUB-ASSY**

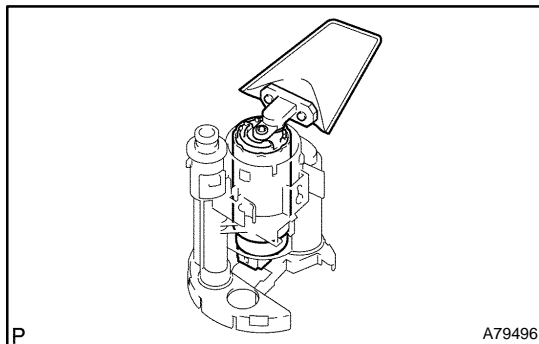
- (a) Disconnect the fuel pump connector.
- (b) Using a screwdriver with the tip wrapped in tape, unfasten the 4 claws. Then pull out the fuel suction plate.

**NOTICE:**

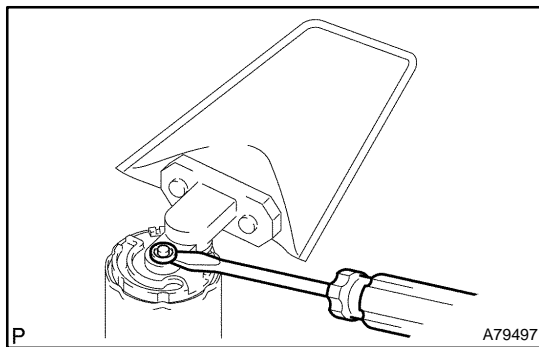
**Do not damage the fuel suction plate.**

**11. REMOVE FUEL PUMP HARNESS**

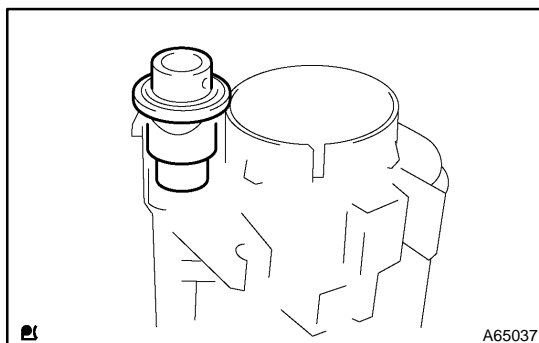
- (a) Disconnect the connector.
- (b) Using a small screwdriver, pry out the fuel pump harness.

**12. REMOVE FUEL PUMP**

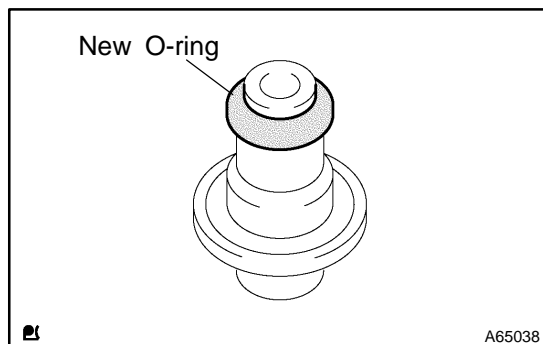
- (a) Pull out the fuel pump from the fuel tank fuel filter.

**13. REMOVE FUEL PUMP FILTER**

- (a) Using a small screwdriver, pry out the clip.
- (b) Pull out the fuel pump filter from the fuel pump.

**14. REMOVE FUEL PRESSURE REGULATOR ASSY**

- (a) Pull out the fuel pressure regulator from the fuel tank fuel filter.
- (b) Remove the O-ring from the fuel pressure regulator.

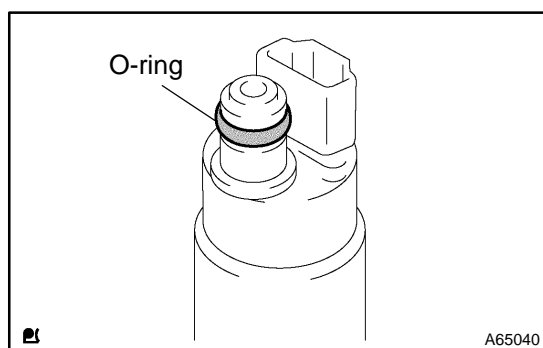


### 15. INSTALL FUEL PRESSURE REGULATOR ASSY

- (a) Apply a light coat of spindle oil or gasoline to a new O-ring, then install it to the fuel pressure regulator.
- (b) Push in the fuel pressure regulator to the fuel tank fuel filter.

### 16. INSTALL FUEL PUMP FILTER

- (a) Install the fuel pump filter with a new clip.



### 17. INSTALL FUEL PUMP

- (a) Apply a light coat of gasoline or spindle oil to the O-ring on the fuel pump.
- (b) Push in the fuel pump to the fuel tank fuel filter.

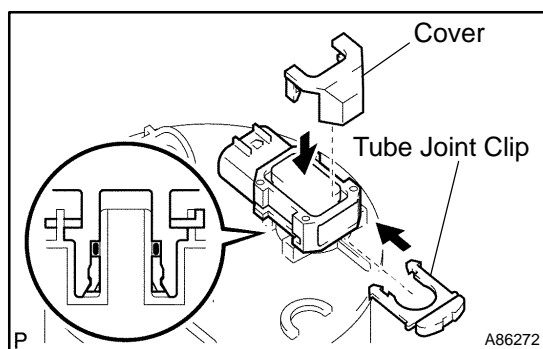
### 18. INSTALL FUEL PUMP HARNESS

### 19. INSTALL FUEL SUCTION PLATE SUB-ASSY

### 20. INSTALL FUEL SENDER GAUGE ASSY

### 21. INSTALL FUEL PUMP CUSHION RUBBER

### 22. INSTALL FUEL SUCTION SUPPORT NO.2



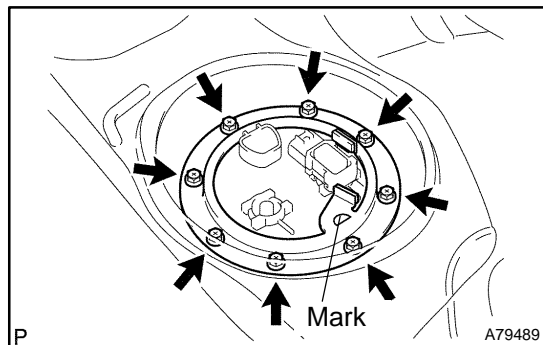
### 23. INSTALL VAPOR PRESSURE SENSOR ASSY

- (a) Install the vapor pressure sensor with the tube joint clip.

#### NOTICE:

- Check the connected part for scratch or foreign objects.
- Check that the vapor pressure sensor is inserted securely.
- Check that the tube joint clip is on the collar of the vapor pressure sensor.
- After installing the tube joint clip, check that the vapor pressure sensor has not been pulled off.

- (b) Install the cover.

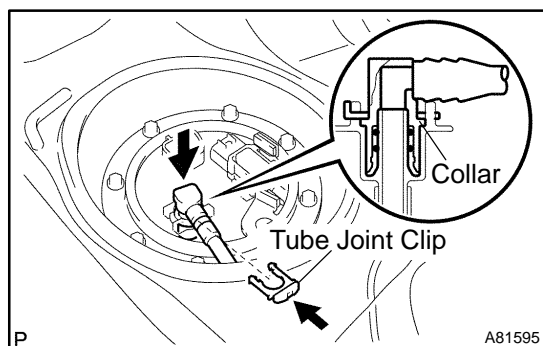


## 24. INSTALL FUEL SUCTION W/ PUMP & GAUGE TUBE ASSY

- Install a new gasket to the fuel suction tube w/ pump & gauge.
- Install the fuel suction tube w/ pump & gauge to the fuel tank.

### NOTICE:

- Do not damage the fuel pump filter.
  - Do not bend the arm of the fuel sender gauge.
- Align the mark of the fuel tank vent tube set plate with the fuel suction tube w/ pump & gauge.
  - Install the fuel tank bent tube set plate with the 8 bolts.  
**Torque: 5.9 N·m (60 kgf·cm, 52 in·lbf)**



- Install the fuel pump tube with the tube joint clip.

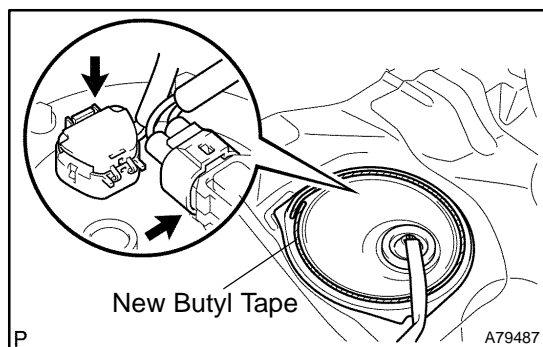
### NOTICE:

- Check the connected part for scratch or foreign objects.
- Check that the fuel tube joint is inserted securely.
- Check that the tube joint clip is on the collar of the fuel tube joint.
- After installing the tube joint clip, check that the fuel tube joint has not been pulled off.

## 25. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)

**Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)**

## 26. CHECK FOR FUEL LEAKS (See page 11-5 )



## 27. INSTALL REAR FLOOR SERVICE HOLE COVER

- Connect the fuel pump connector.
- Connect the vapor pressure sensor connector.
- Using new butyl tape, install the rear floor service hole cover.

## 28. INSTALL REAR SEAT CUSHION ASSY

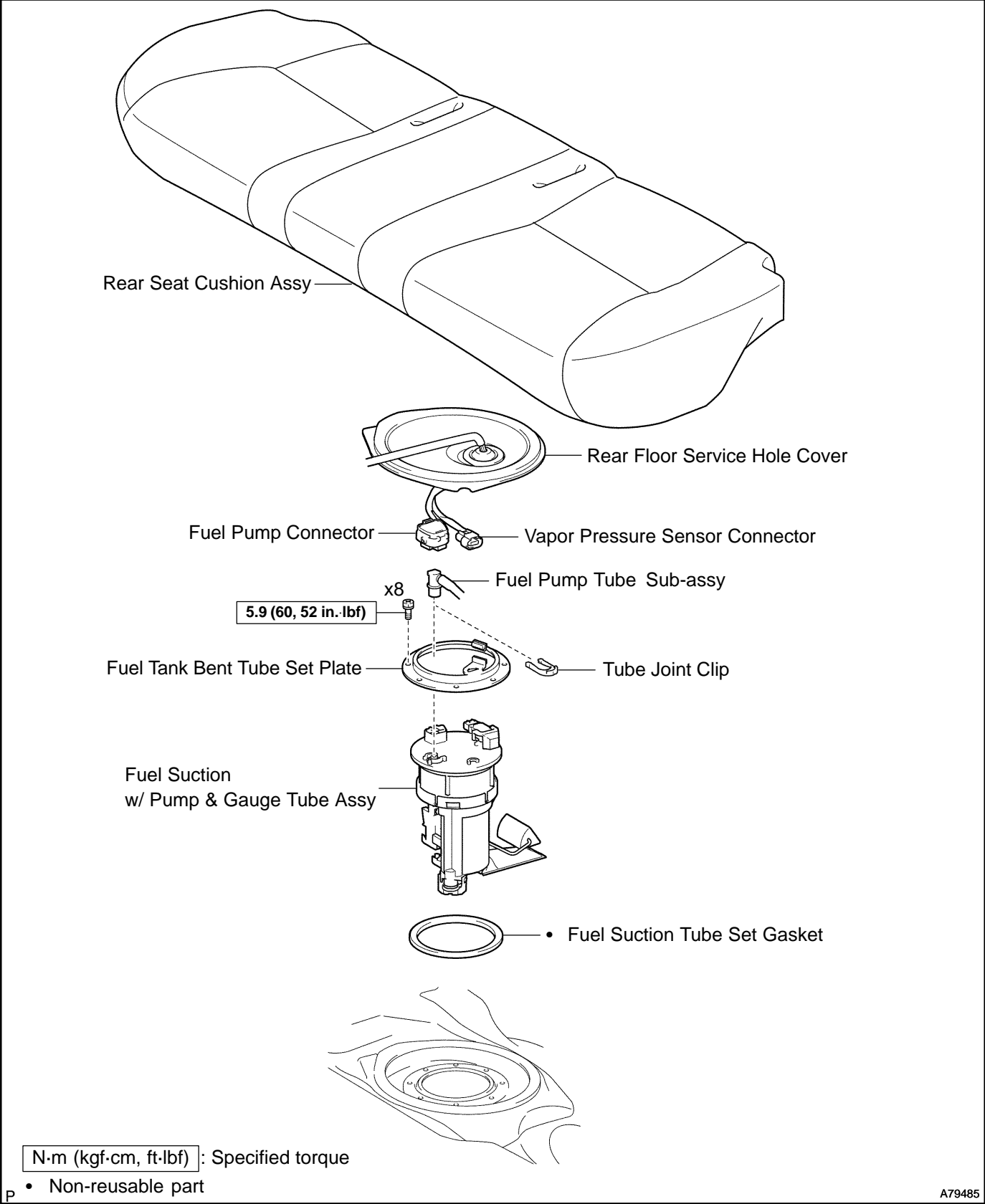
## 29. SYSTEM INITIALIZATION (See page 19-15 )



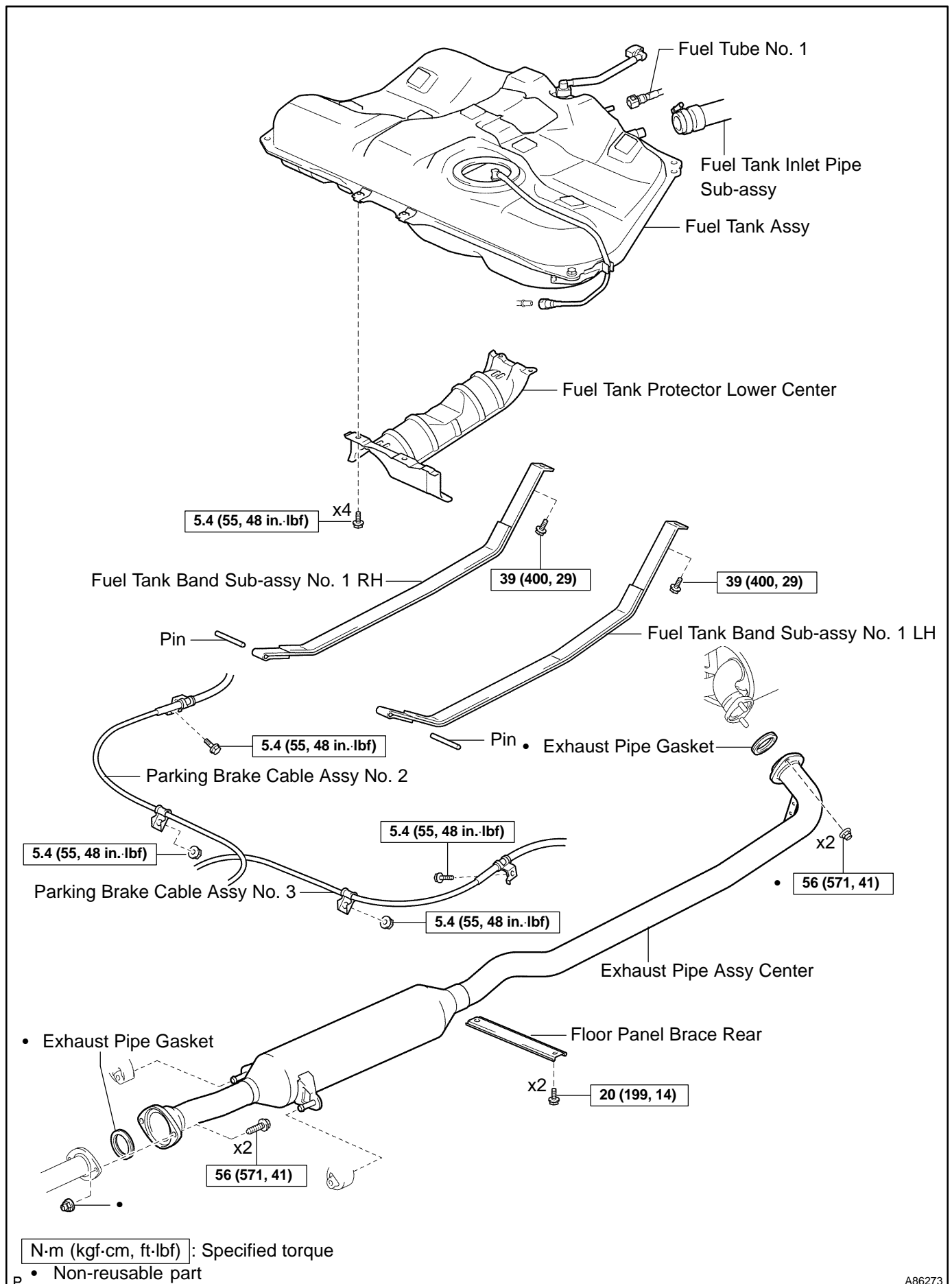
# FUEL TANK ASSY (3MZ-FE)

## COMPONENTS

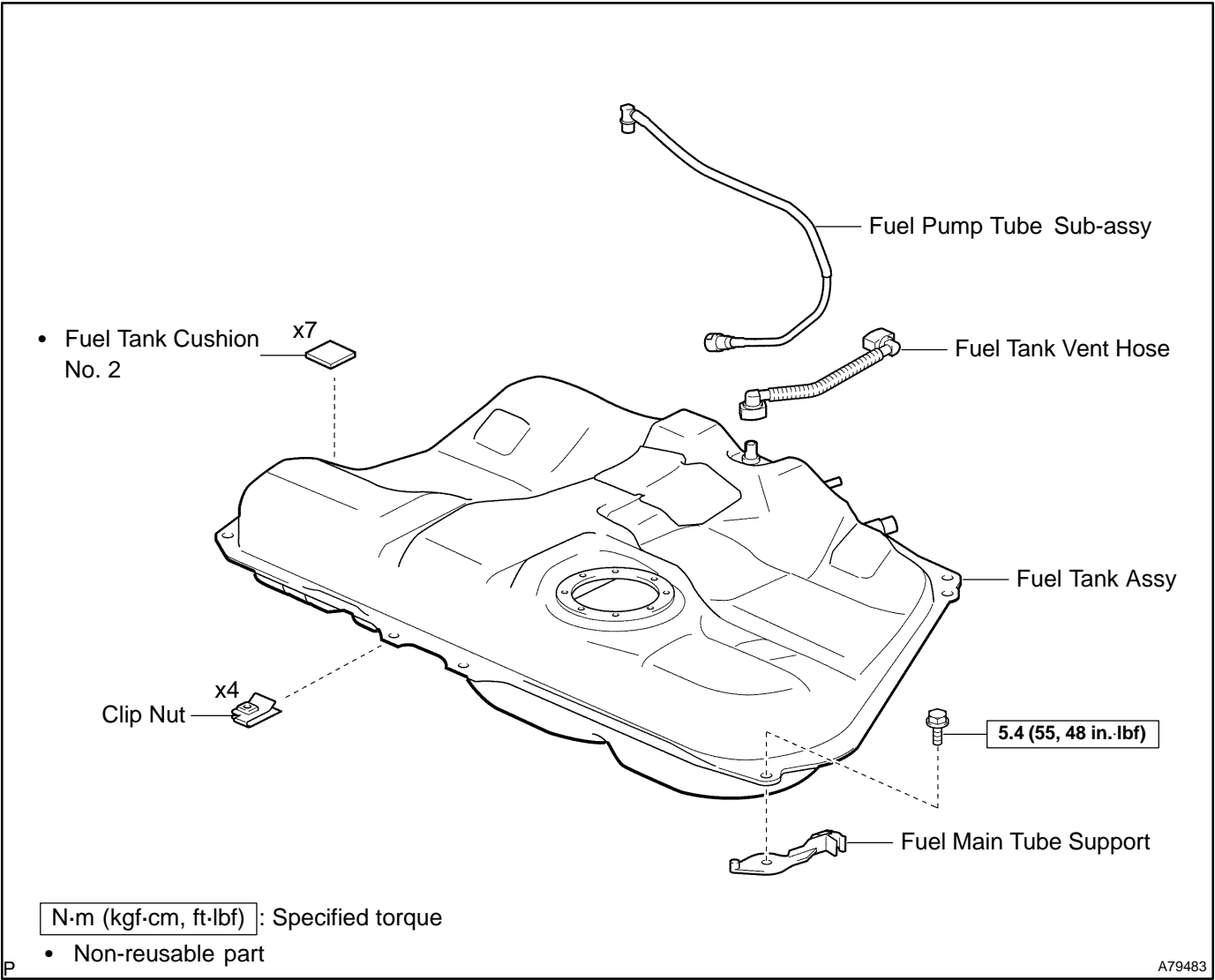
110XY-01



A79485

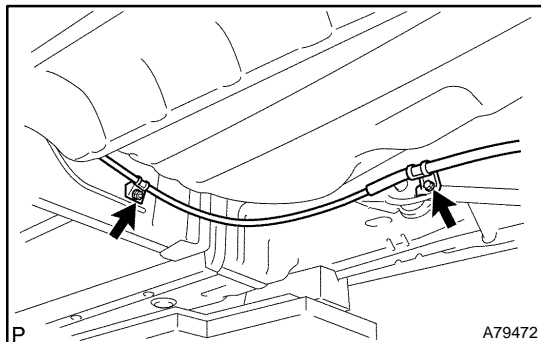
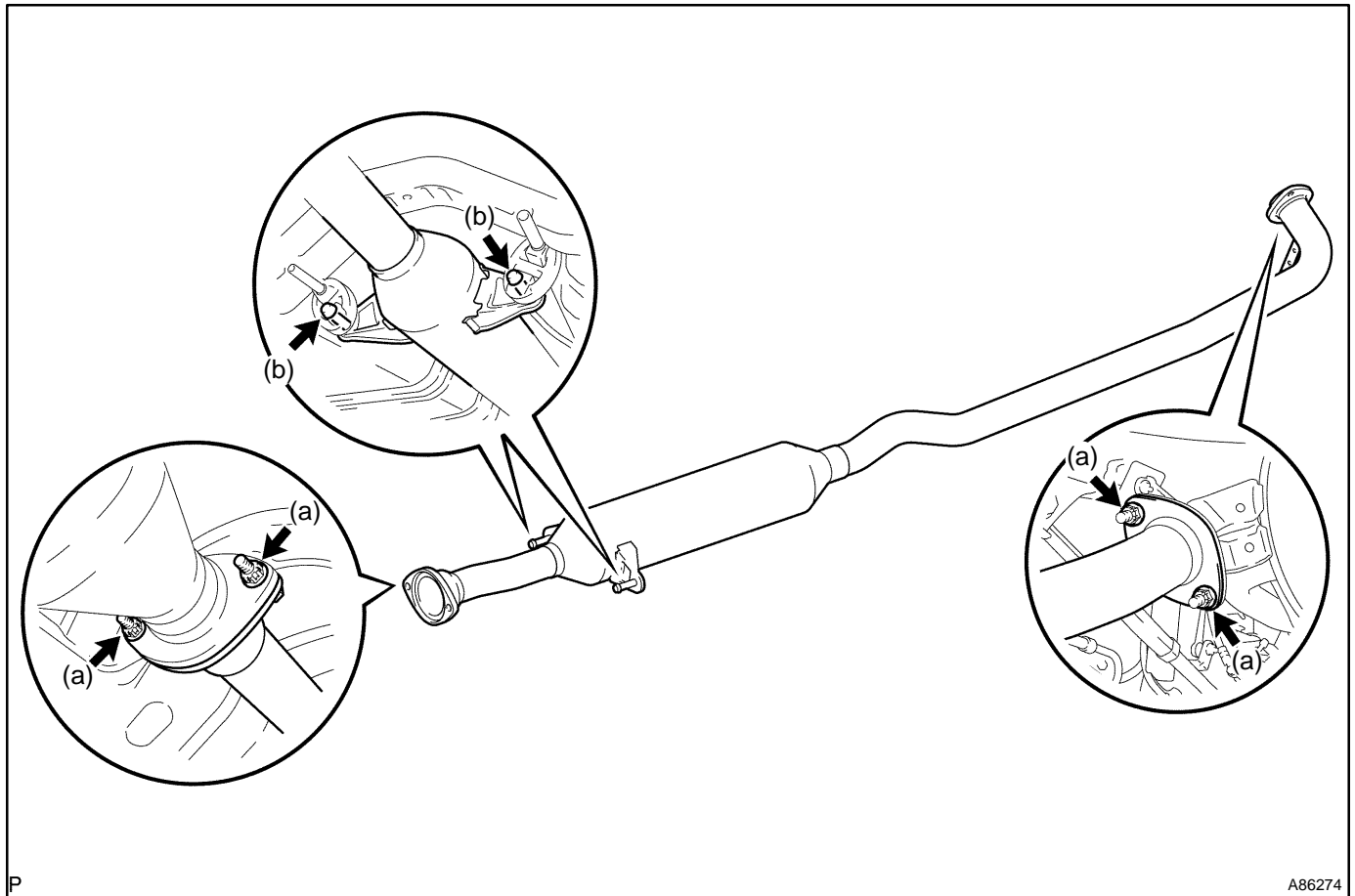


A86273

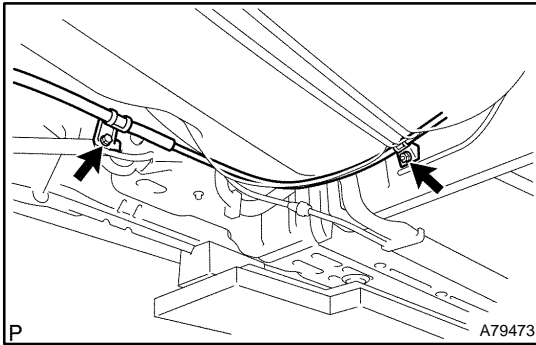


## Removal & Installation and Disassembly & Reassembly

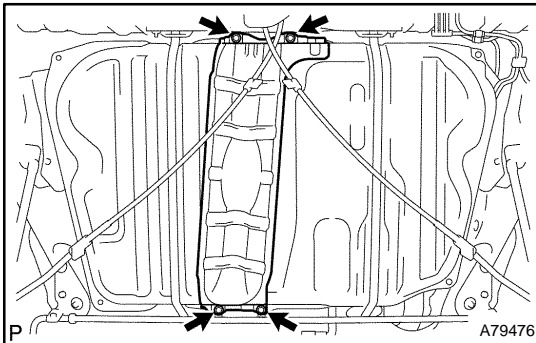
1. DISCHARGE FUEL SYSTEM PRESSURE (See page 11-1 )
2. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)
3. REMOVE REAR SEAT CUSHION ASSY (See page 72-39 )
4. REMOVE REAR FLOOR SERVICE HOLE COVER (See page 11-20 )
5. REMOVE FUEL SUCTION W/ PUMP & GAUGE TUBE ASSY (See page 11-20 )
6. DRAIN FUEL
7. REMOVE FLOOR PANEL BRACE REAR (See page 15-2 )
8. REMOVE EXHAUST PIPE ASSY CENTER
  - (a) Remove the 2 bolts and 4 nuts.
  - (b) Remove the exhaust pipe center and 2 gaskets from the 2 exhaust pipe supports.



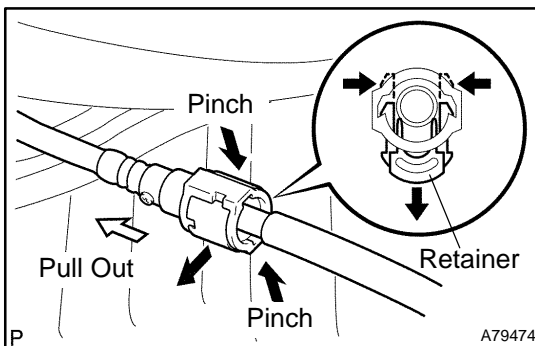
9. DISCONNECT PARKING BRAKE CABLE ASSY NO.2
  - (a) Remove the bolt and nut, then disconnect the parking brake cable No. 2.



- 10. DISCONNECT PARKING BRAKE CABLE ASSY NO.3**  
 (a) Remove the bolt and nut, then disconnect the parking brake cable No. 3.



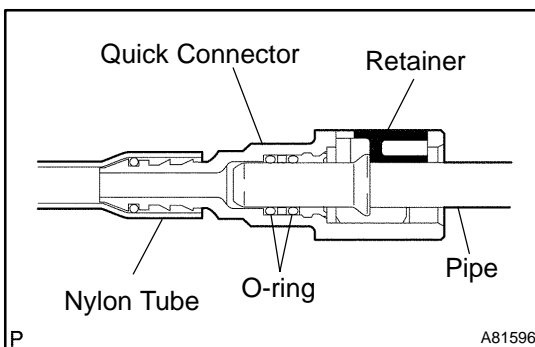
- 11. REMOVE FUEL TANK PROTECTOR LOWER CENTER**  
 (a) Remove the 4 bolts, then remove the fuel tank protector lower center.

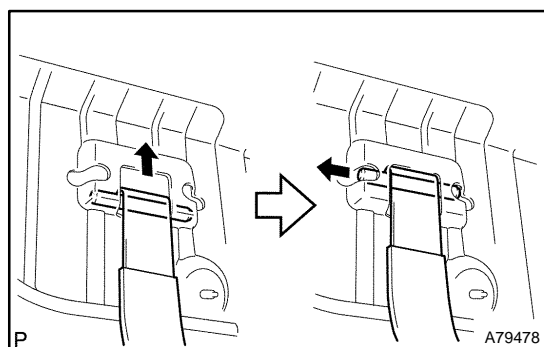
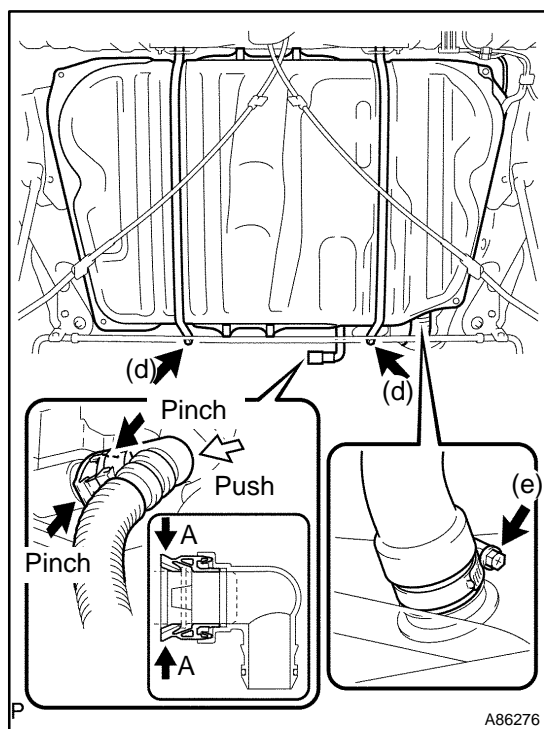
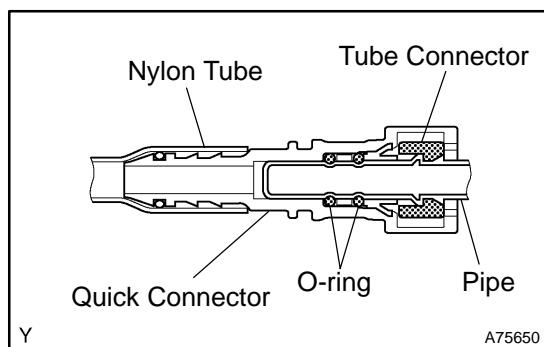
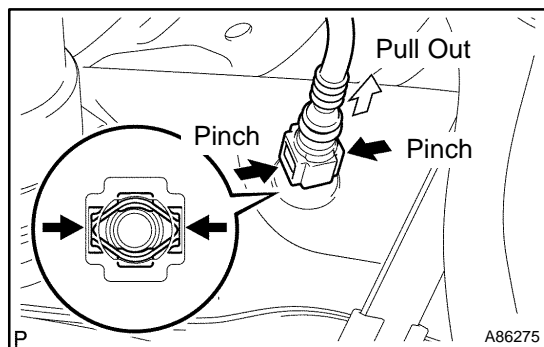


- 12. REMOVE FUEL TANK ASSY**  
 (a) Disconnect the fuel pump tube.  
 (1) Pinch the projection of the retainer to remove the lock claws, then pull it down as shown in the illustration.  
 (2) Pull out the fuel pump tube.

**NOTICE:**

- Check around the quick connector for dirt or mud before this operation. Remove the dirt if necessary.
- Be careful of mud because the quick connector has an O-ring which seals the pipe and quick connector that can be contaminated.
- Do not use any tools in this operation.
- Do not bend or twist the nylon tube. Protect the quick connector by covering it with a vinyl or plastic bag.
- When the pipe and quick connector are stuck, push and pull the quick connector to release. Pull out the quick connector from the pipe.





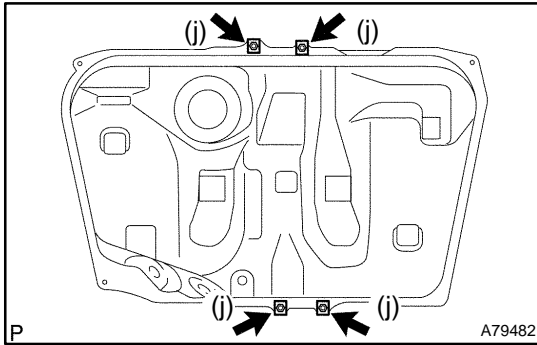
- (b) Disconnect the fuel tube No. 1.
- (1) Pinch the tube connector, then pull out the fuel tube No. 1.

**NOTICE:**

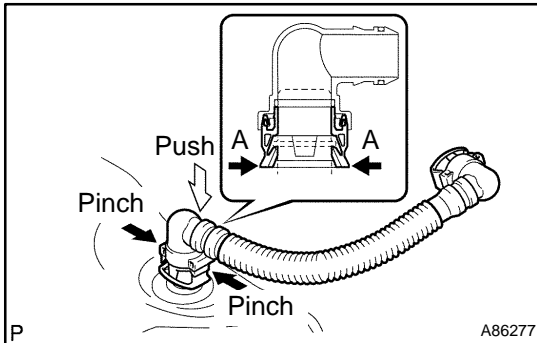
- Check around the quick connector for dirt or mud before this operation. Remove the dirt if necessary.
- Be careful of mud because the quick connector has an O-ring which seals the pipe and quick connector that can be contaminated.
- Do not use any tools in this operation.
- Do not bend or twist the nylon tube. Protect the quick connector by covering it with a vinyl or plastic bag.
- When the pipe and quick connector are stuck, push and pull the quick connector to release. Pull out the quick connector carefully.

- (c) Set up a transmission jack underneath the fuel tank.
- (d) Remove the 2 bolts which hold the fuel tank bands.
- (e) Loosen the clamp bolt.
- (f) Operate the transmission jack, then disconnect the fuel tank inlet pipe.
- (g) Disconnect the fuel tank vent hose from the charcoal canister.
- (1) Deeply push the quick connector to release the lock pin.
- (2) Pinch portion A.
- (3) Pull out the fuel tank vent hose.
- (h) Operate the transmission jack, then remove the fuel tank.

- (i) Remove the 2 pins, then remove the 2 fuel tank bands as shown in the illustration.

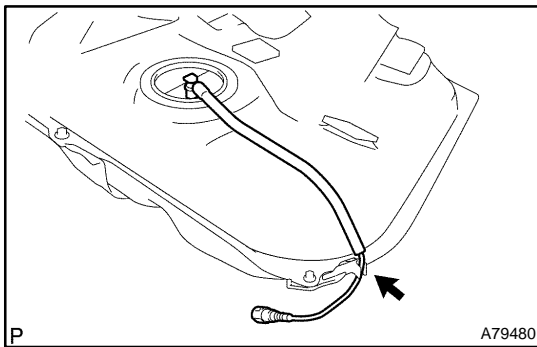


- (j) Remove the 4 clip nuts.



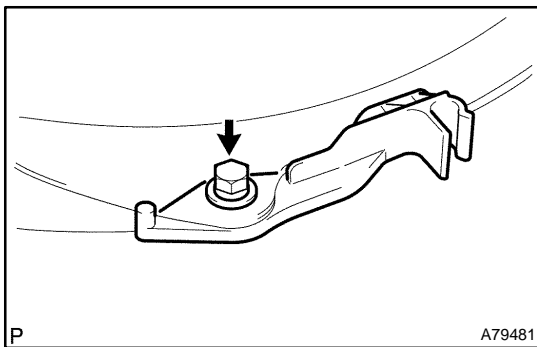
### 13. REMOVE FUEL TANK VENT HOSE

- Deeply push the quick connector to release the lock pin.
- Pinch portion A.
- Pull out the fuel tank vent hose.



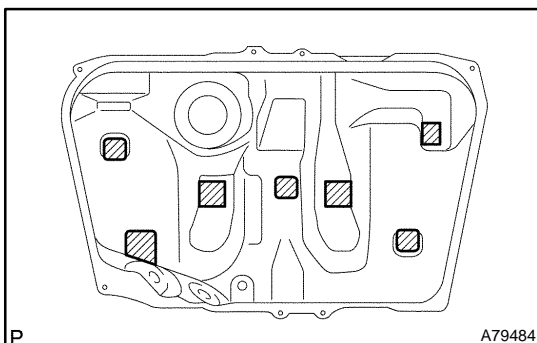
### 14. REMOVE FUEL PUMP TUBE SUB-ASSY

- Remove the fuel pump tube from the fuel main tube support.



### 15. REMOVE FUEL MAIN TUBE SUPPORT

- Remove the bolt, then remove the fuel main tube support.



### 16. REMOVE FUEL TANK CUSHION NO.2

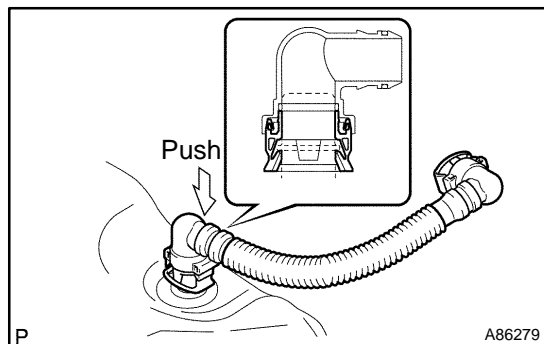
- Remove the 7 fuel tank cushions from the fuel tank.

**17. INSTALL FUEL TANK CUSHION NO.2**

- (a) Install 7 new fuel tank cushions to the fuel tank.

**18. INSTALL FUEL MAIN TUBE SUPPORT**

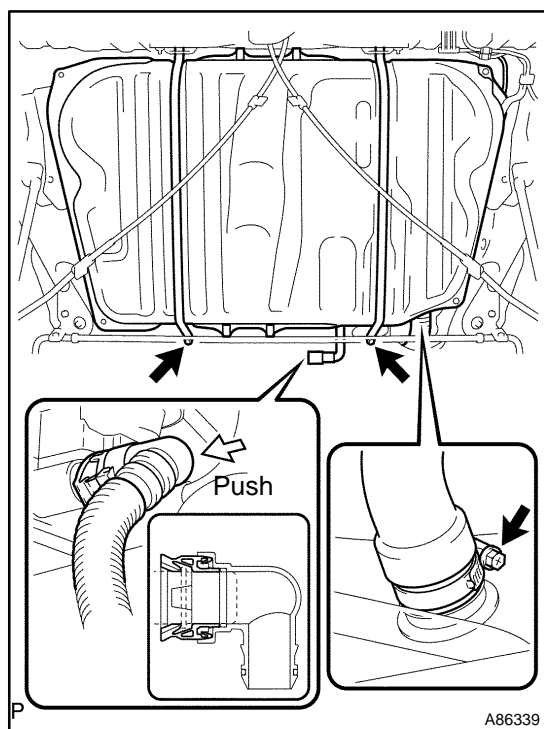
**Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)**

**19. INSTALL FUEL PUMP TUBE SUB-ASSY****20. INSTALL FUEL TANK VENT HOSE**

- (a) Push in the quick connector to the pipe until the quick connector makes a "click" sound.

**NOTICE:**

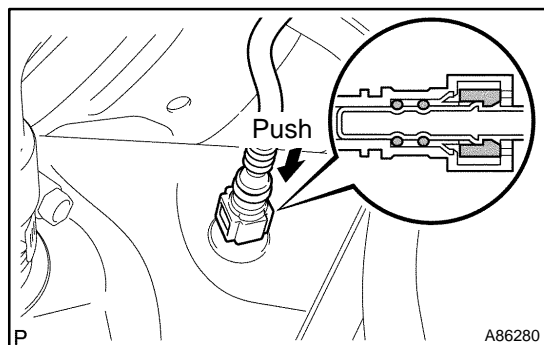
- Check the connected part for damage or foreign objects.
- After connecting, check if the quick connector and pipe are securely connected by pulling on them.

**21. INSTALL FUEL TANK ASSY**

- (a) Install the 4 clip nuts.  
 (b) Install the 2 fuel tank bands with the 2 pins.  
 (c) Set up the fuel tank to the transmission jack.  
 (d) Connect the fuel tank vent hose to the charcoal canister.  
 (1) Push in the quick connector to the pipe until the quick connector makes a "click" sound.

**NOTICE:**

- Check the connected part for damage or foreign objects.
  - After connecting, check if the connector and pipe are securely connected by pulling on them.
- (e) Operate the transmission jack, then connect the fuel tank filler pipe.  
 (f) Tighten the clamp bolt.  
 (g) Tighten the 2 bolts which hold the fuel tank bands.  
**Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)**

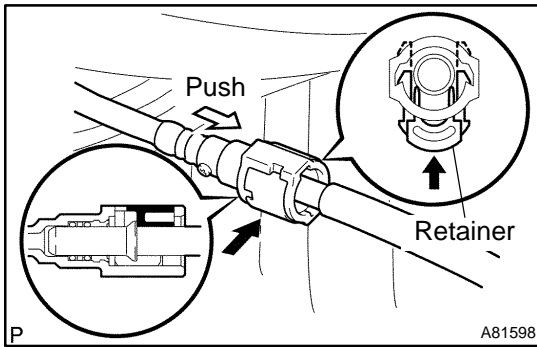


- (h) Connect the fuel tube No. 1.  
 (1) Push in the quick connector to the pipe until the quick connector makes a "click" sound.

**NOTICE:**

- Check the connected part for damage or foreign objects.
- After connecting, check if the quick connector and pipe are securely connected by pulling on them.





- (i) Connect the fuel pump tube.
- (1) Push in the quick connector to the pipe until the quick connector makes a "click" sound, then push up the retainer until the claws lock.

**NOTICE:**

- Check the connected part for damage or foreign objects.
- After connecting, check if the connector and pipe are securely connected by pulling on them.

**22. INSTALL FUEL TANK PROTECTOR LOWER CENTER**

Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)

**23. INSTALL PARKING BRAKE CABLE ASSY NO.3**

Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)

**24. INSTALL PARKING BRAKE CABLE ASSY NO.2**

Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)

**25. INSTALL EXHAUST PIPE ASSY CENTER**

- (a) Install 2 new gaskets and the exhaust pipe center to the 2 exhaust pipe supports.
- (b) Tighten the 2 bolts and 4 new nuts.

Torque: 56 N·m (571 kgf·cm, 41 ft·lbf)

**26. INSTALL FUEL SUCTION W/ PUMP & GAUGE TUBE ASSY (See page 11-20 )****27. ADD FUEL****28. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)**

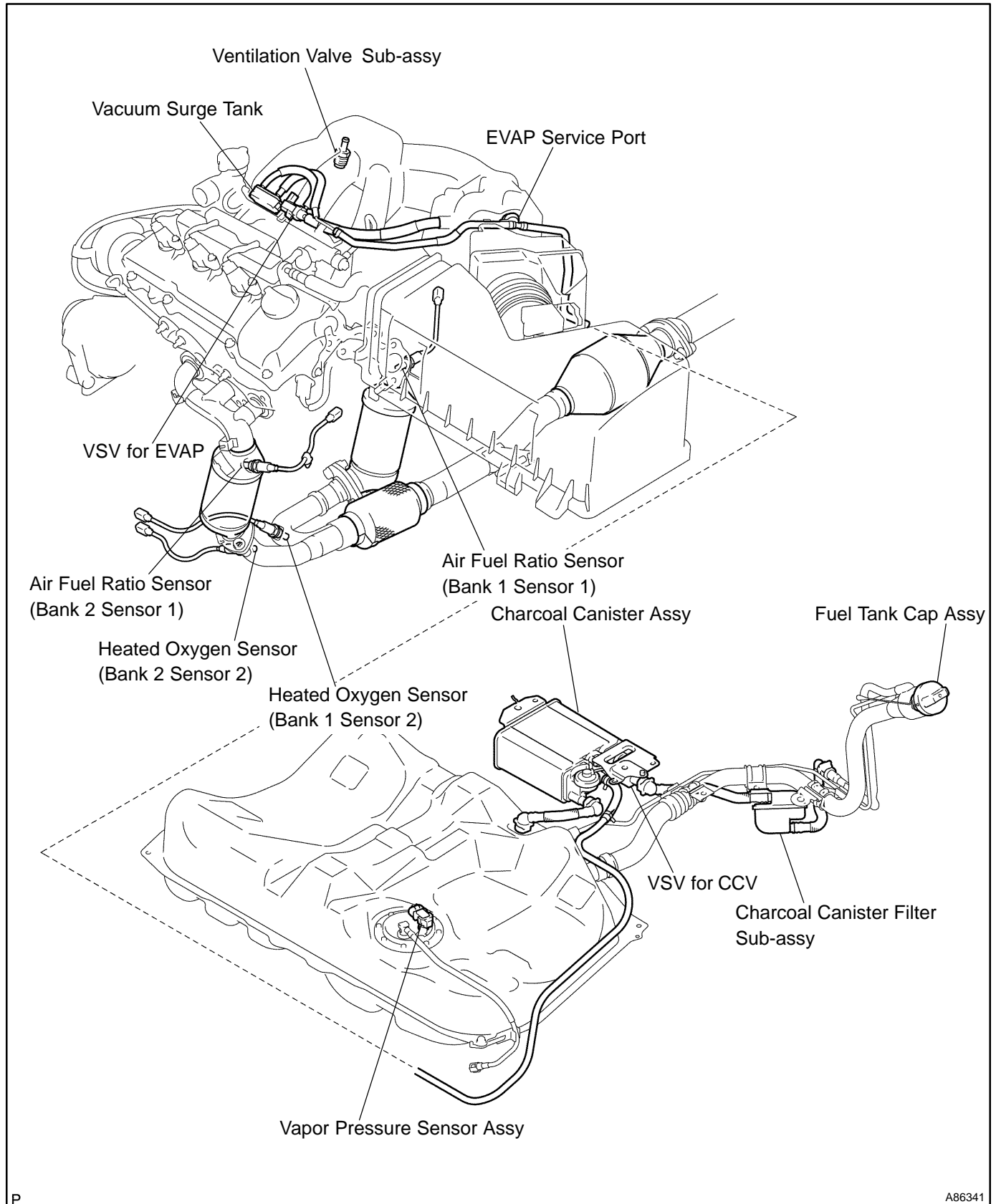
Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)

**29. CHECK FOR FUEL LEAKS (See page 11-5 )****30. CHECK FOR EXHAUST GAS LEAKS****31. INSTALL REAR FLOOR SERVICE HOLE COVER (See page 11-20 )****32. INSTALL REAR SEAT CUSHION ASSY****33. INSTALL FLOOR PANEL BRACE REAR (See page 15-2 )****34. SYSTEM INITIALIZATION (See page 19-15 )**

# EMISSION CONTROL SYSTEM (3MZ-FE)

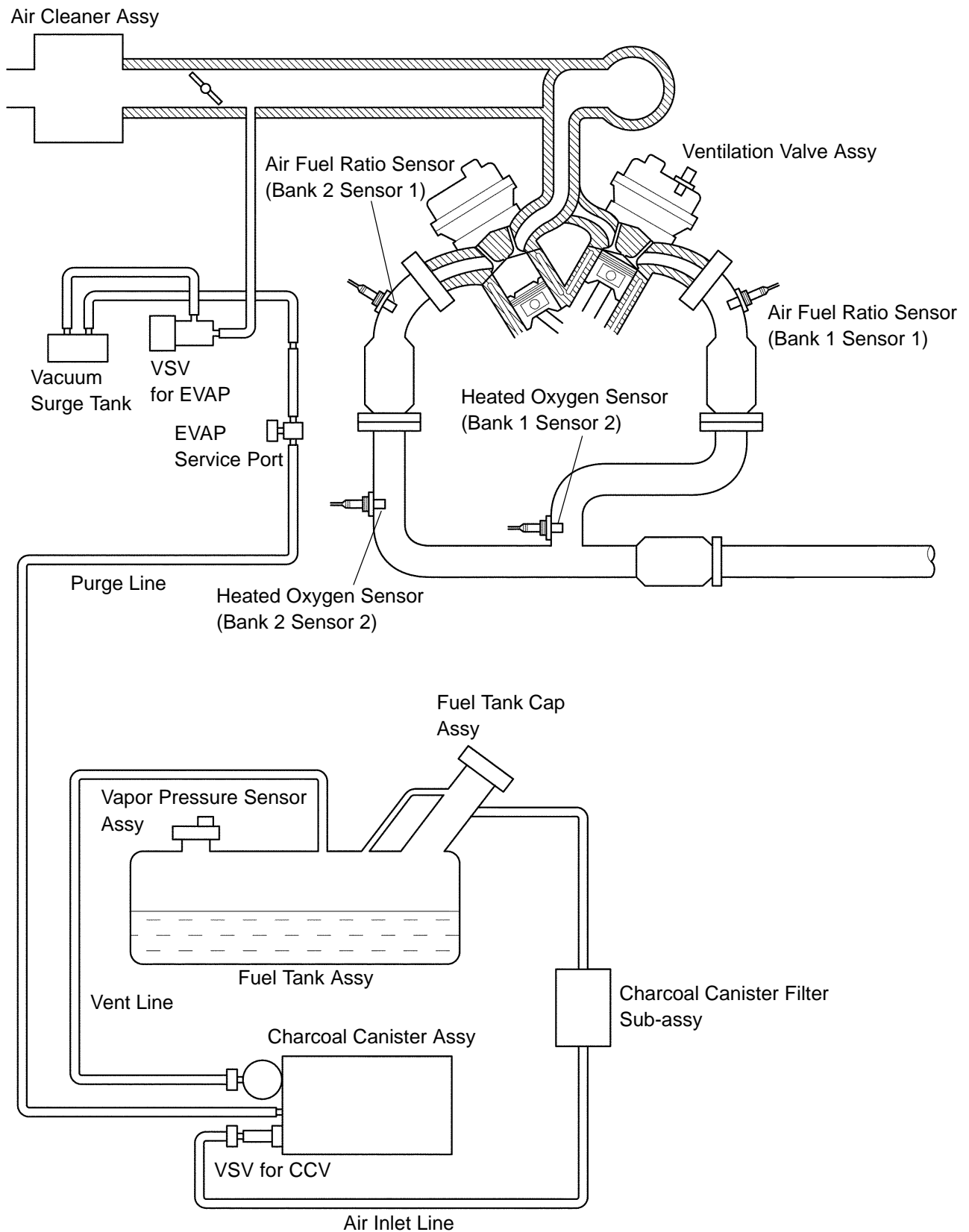
## LOCATION

120C0-01

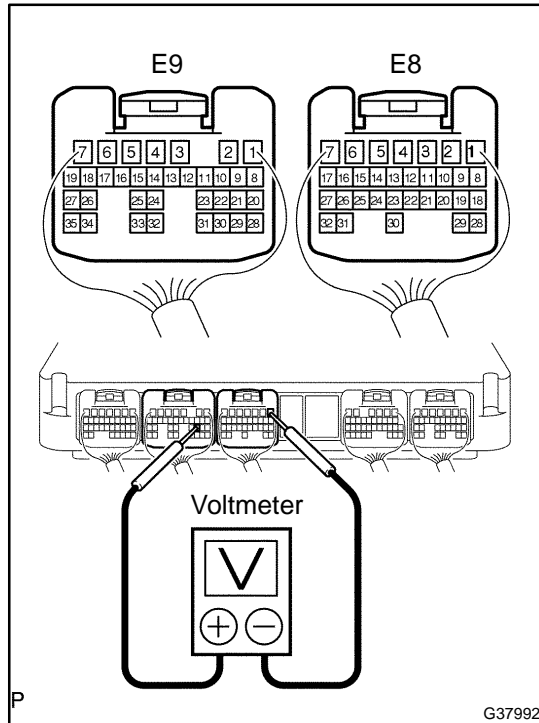


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## ON-VEHICLE INSPECTION



### 1. INSPECT AIR FUEL RATIO COMPENSATION SYSTEM

#### (a) Inspect the voltage.

- (1) Turn the ignition switch ON.
- (2) Using a voltmeter, measure the voltage between the terminals of the ECM.

#### Standard:

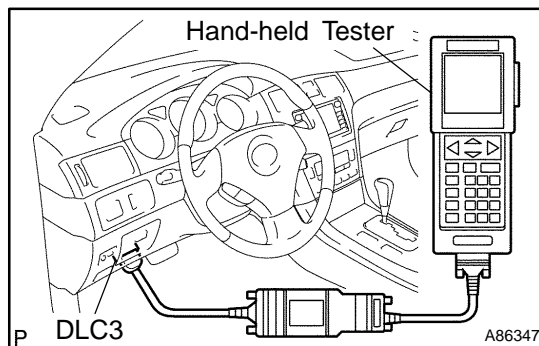
Tester Connection	Specified Condition
A1A+ (E9-22) - E1 (E8-1)	3.3 V
A1A- (E9-30) - E1 (E8-1)	3.0 V
A2A+ (E9-23) - E1 (E8-1)	3.3 V
A2A- (E9-31) - E1 (E8-1)	3.0 V

#### CAUTION:

Connect the test leads from the back side of the ECM connector to the terminals.

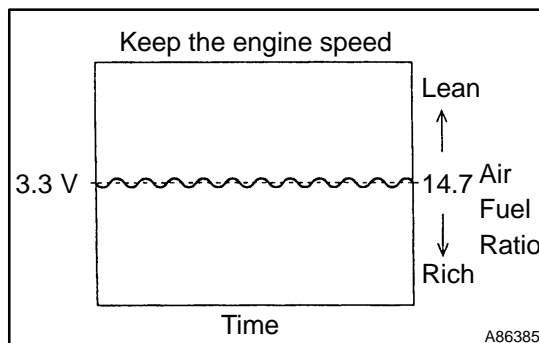
#### HINT:

The voltage between the terminals of the ECM is constant regardless of the voltage output from the air fuel ratio sensor (A/F sensor).



#### (b) Check the operation.

- (1) Connect the hand-held tester to the DLC3.
- (2) Enter "DIAGNOSIS/ENHANCED OBD II/DATA LIST", then select "AFS B1 S1" and "AFS B2 S1" to display the monitor.
- (3) Warm up the A/F sensor with the engine speed at 2,500 rpm for approximately 2 minutes.



- (4) Keep the engine speed at 2,500 rpm, then confirm that the waveform of "AFS B1 S1" and "AFS B2 S1" are similar as shown in the illustration.

#### HINT:

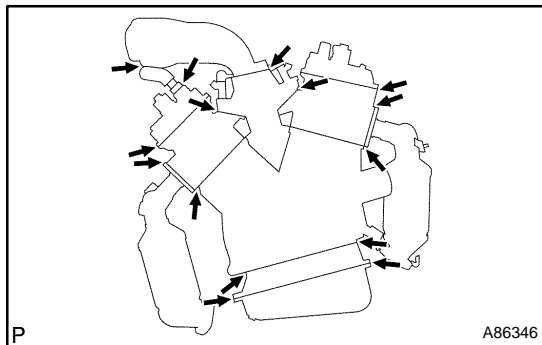
- The waveform in the illustration is a sample.
  - Only the hand-held tester displays the waveform of the A/F sensor.
- (c) Confirm that the display of "DATA LIST" - "O2S B1 S2" and "O2S B2 S2" fluctuates up and down between 0 V and 1 V with the engine speed at 2,500 rpm.

## 2. INSPECT FUEL CUT OFF RPM

- (a) Check the operation.
- (1) Increase the engine speed to at least 3,500 rpm.
  - (2) Use a sound scope to check the fuel injector operating noise.
  - (3) Check that when the throttle lever is released, the fuel injector operation noise stops momentarily at 2,500 rpm and then resumes at 1,200 rpm.

**2,500 rpm: Fuel cut off rpm**

**1,200 rpm: Fuel return rpm**



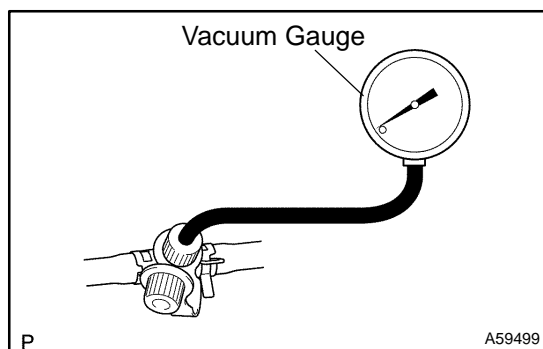
## 3. VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS

- (a) Check the appearance.
- (1) Check the engine assembly to see if the indicated portions by the arrows have cracks, leaks or damage.

### HINT:

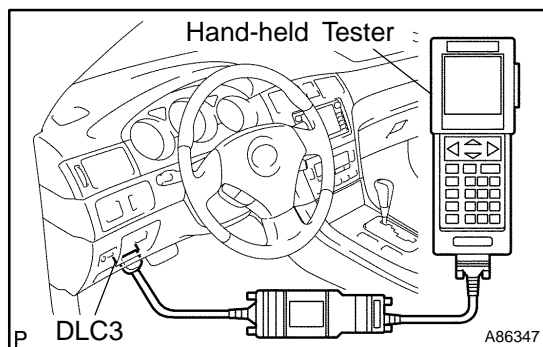
Separation of the engine oil level gauge, oil filler cap, PCV hose, etc. may cause the engine to run improperly. Disconnection, looseness or cracks in the parts of the air induction system between the throttle body and cylinder head will allow air suction and cause the engine to run improperly.

If necessary, repair the engine assembly.

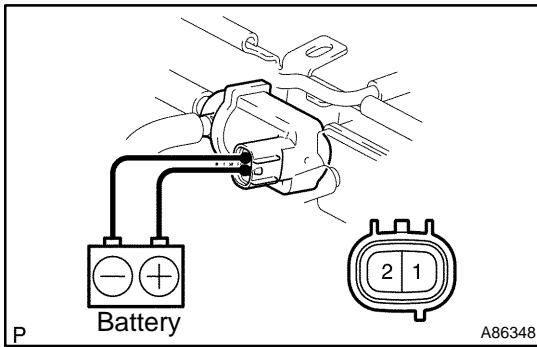


## 4. INSPECT EVAP SYSTEM LINE

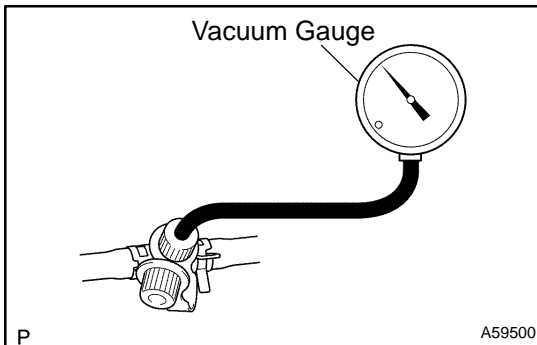
- (a) Warm up the engine to the normal operating temperature.
- (b) Connect the vacuum gauge (EVAP control system test equipment vacuum gauge) to the EVAP service port on the purge line. Then stop the engine.



- (c) If you have the hand-held tester:  
Force the VSV for EVAP to operate.
- (1) Connect the hand-held tester to the DLC3.
  - (2) Start the engine.
  - (3) Turn the hand-held tester ON.
  - (4) Use the ACTIVE TEST mode on the hand-held tester to operate the VSV for EVAP.



- (d) If you have no hand-held tester:  
Force the VSV for EVAP to operate.
- (1) Disconnect the VSV for EVAP connector.
  - (2) Connect the positive (+) and negative (-) leads of the battery to the VSV for EVAP terminals.
  - (3) Start the engine.

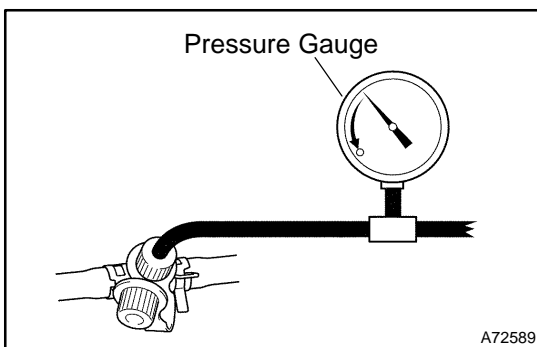


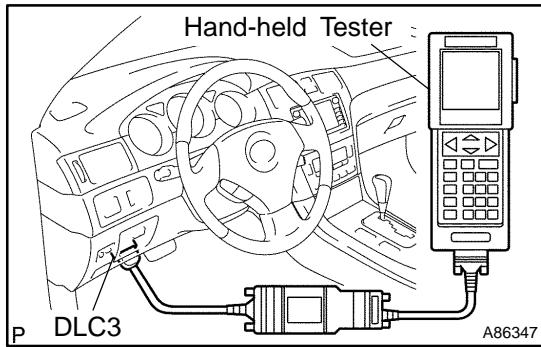
- (e) Check the vacuum at idle.  
**Vacuum:**  
**Maintain at 0.368 to 19.713 in.Hg (5 to 268 in.Aq) for over 5 seconds.**

**HINT:**

If the vacuum does not change, it can be concluded that the hose which connects the VSV to the service port is loose or blocked, or the VSV is malfunctioning.

- (f) If you have the hand-held tester:  
Return to the normal VSV for EVAP.
- (1) Stop the engine.
  - (2) Disconnect the hand-held tester from the DLC3.
- (g) If you have no hand-held tester:  
Return to the normal VSV for EVAP.
- (1) Stop the engine.
  - (2) Disconnect the positive (+) and negative (-) leads of the battery from the VSV for EVAP terminals.
  - (3) Reconnect the VSV for EVAP connector.
- (h) Disconnect the vacuum gauge from the EVAP service port on the purge line.
- (i) Connect a pressure gauge to the EVAP service port on the purge line.





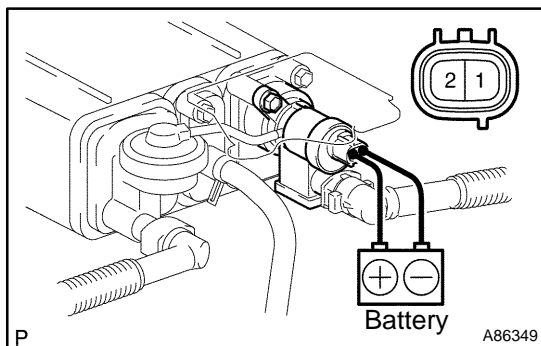
- (j) If you have the hand-held tester:  
Force the VSV for CCV to operate.
- (1) Connect the hand-held tester to the DLC3.
  - (2) Turn the ignition switch ON.
  - (3) Turn the hand-held tester ON.
  - (4) Use the ACTIVE TEST mode on the hand-held tester to operate the VSV for CCV.

**NOTICE:**

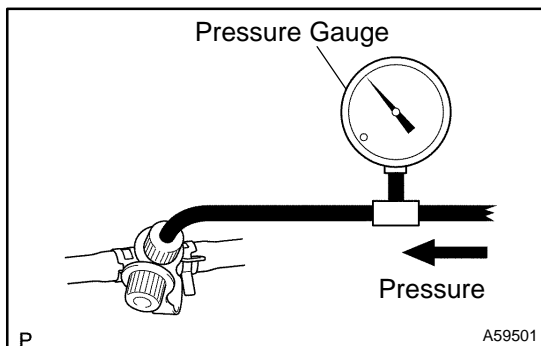
**Do not start the engine during this operation.**

**HINT:**

If the check is not completed within 10 minutes, the forced close of the VSV for CCV will be tested.



- (k) If you have no hand-held tester:  
Force the VSV for CCV to operate.
- (1) Disconnect the VSV for CCV connector.
  - (2) Connect the positive (+) and negative (-) leads of the battery to the VSV for CCV terminals.



- (l) Check the pressure.
- (1) Add the pressure (13.5 to 15.5 in.Aq) from the EVAP service port.

**Pressure:**

**2 minutes after the pressure is added, the gauge should be over 7.7 to 8.8 in.Aq.**

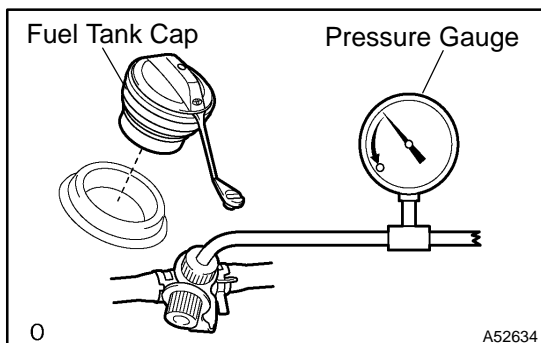
**HINT:**

If you cannot add the pressure, it can be concluded that the hose which connects the VSV for EVAP canister fuel tank is slipped off or the VSV is open.

- (2) Check if the pressure decreases when the fuel tank cap is removed while adding the pressure.

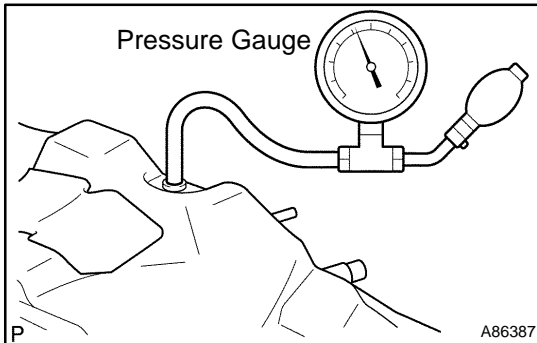
**HINT:**

If the pressure does not decrease when the filler cap is removed, it can be concluded that the hose which connects the service port to the fuel tank is blocked, etc.



- (m) If you have the hand-held tester:  
Return to the normal VSV for CCV operation.
- (1) Turn the ignition switch ON.
  - (2) Disconnect the hand-held tester from the DLC3.
- (n) If you have no hand-held tester:  
Return to the normal VSV for CCV operation.
- (1) Disconnect the positive (+) and negative (-) leads of the battery to the VSV for CCV terminals.
  - (2) Reconnect the VSV for CCV connector.

- (o) Disconnect the pressure gauge from the EVAP service port on the purge line.

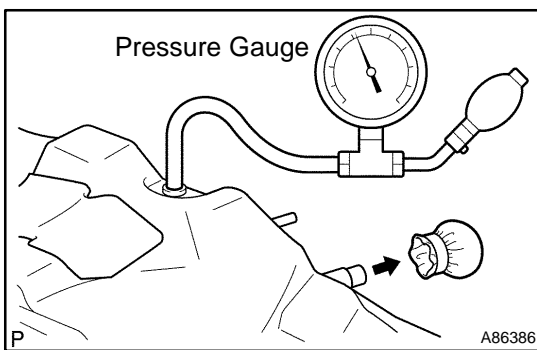


## 5. CHECK AIR TIGHTNESS IN FUEL TANK AND FILLER PIPE

- (a) Check the operation.
  - (1) Remove the fuel tank (see page 11-28 ).
  - (2) Remove the fuel tank vent hose from the fuel tank (see page 11-28 ).
  - (3) Connect the pressure gauge to the fuel tank vent hose port of the fuel tank.
  - (4) Apply pressure to the fuel tank, so that the internal pressure of the fuel tank is 4 kPa (41 gf/cm<sup>2</sup>, 0.58 psi).
  - (5) Check that the internal fuel tank pressure is maintained for 1 minute.
  - (6) Check the connected portions of each hose and pipe.
  - (7) Check the installed parts on the fuel tank.

If there is no abnormality, replace the fuel tank and fuel tank filler pipe.

- (8) Reinstall the fuel tank vent hose to the fuel tank (see page 11-28 ).
- (9) Reinstall fuel tank (see page 11-28 ).



## 6. INSPECT FUEL CUT OFF VALVE AND FILL CHECK VALVE

- (a) Check the operation.
  - (1) Remove the fuel tank (see page 11-28 ).
  - (2) Remove the fuel tank vent hose from the fuel tank (see page 11-28 ).
  - (3) Connect the pressure gauge to the fuel tank vent hose port of the fuel tank.
  - (4) Fully fill the fuel tank with fuel.

### HINT:

In the condition that the fuel is full, there is no ventilation as the float valve of the fill check valve is closed.

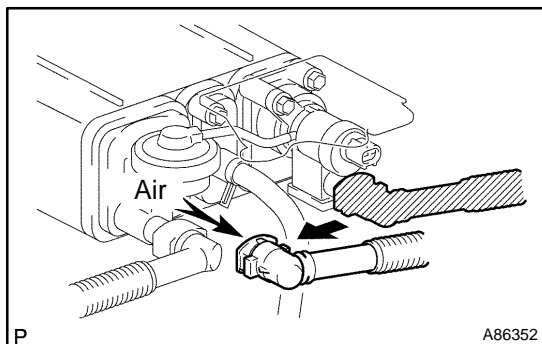
- (5) Install the fuel suction w/ pump & gauge tube (see page 11-20 ).
- (6) Securely cover the fuel pump tube, fuel tube No. 1 port and fuel tank to filler pipe port with vinyl or plastic bags to perform the accurate pressure test.
- (7) Apply 4 kPa (41 gf/cm<sup>2</sup>, 0.58 psi) of pressure to the fuel tank vent hose port of the fuel tank.



- (8) Remove the vinyl or plastic bag from the fuel tank to filler pipe port, then check that the pressure drops.

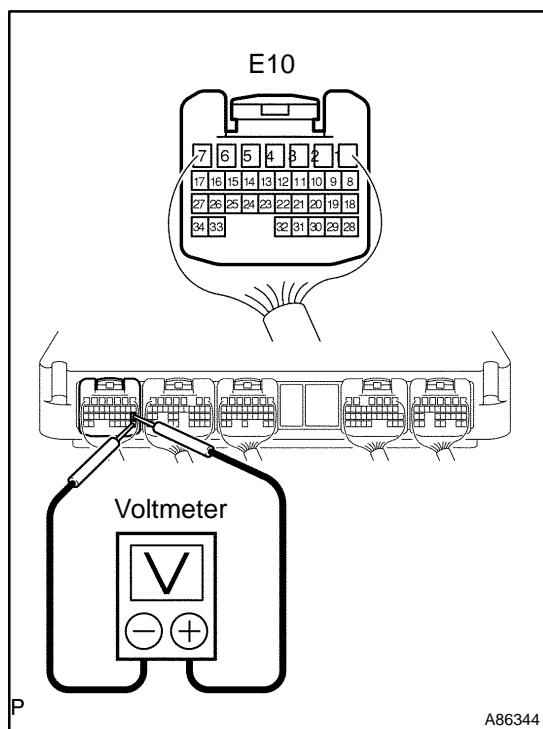
If the pressure does not drop, replace the fuel tank.

- (9) Drain fuel from the fuel tank.
- (10) Reinstall the fuel tank vent hose to the fuel tank (see page 11-28).
- (11) Reinstall the fuel tank (see page 11-28).



## 7. CHECK AIR INLET LINE

- (a) Disconnect the fuel tank vent hose (see page 12-18).
- (b) Check that there is ventilation in fuel tank vent hose. If necessary, replace the charcoal canister filter.
- (c) Reconnect the fuel tank vent hose (see page 12-18).



## 8. INSPECT VAPOR PRESSURE SENSOR

- (a) Inspect the voltage (power source).
  - (1) Turn the ignition switch ON.
  - (2) Using a voltmeter, measure the voltage between the terminals of the ECM.

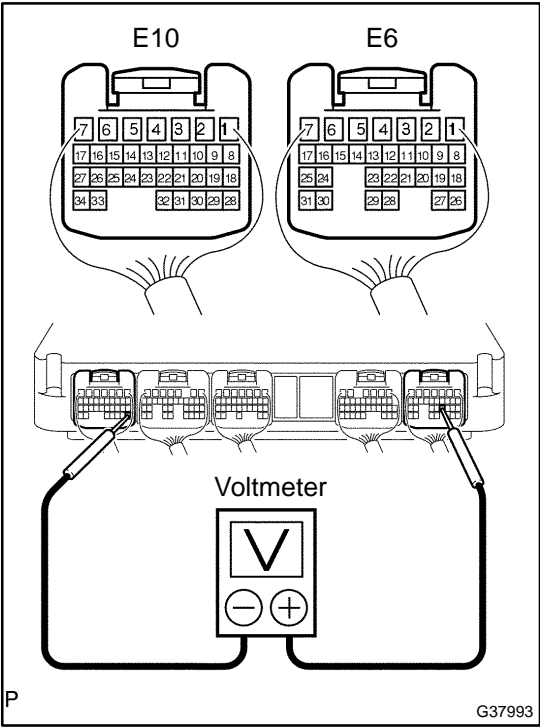
### Voltage:

Tester Connection	Specified Condition
VC (E10-18) - E2 (E10-28)	4.5 to 5.5 V

### CAUTION:

Connect the test leads from the back side of the ECM connector to the terminals.

- (3) Turn the ignition switch OFF.



- (b) Inspect the voltage (power output).
- (1) Turn the ignition switch ON.
  - (2) Remove the fuel tank cap.
  - (3) Using a voltmeter, measure the voltage between the terminals of the ECM.

**Voltage:**

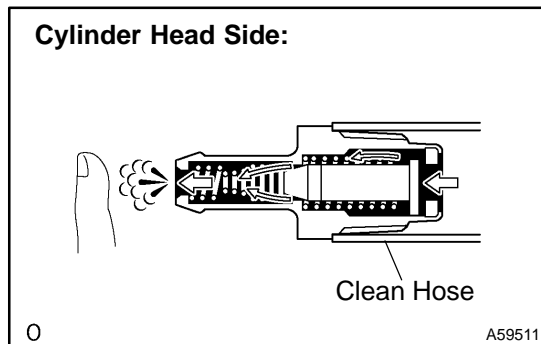
Tester Connection	Specified Condition
PTNK (E6-21) - E2 (E10-28)	3.0 to 3.6 V

**CAUTION:**

**Connect the test leads from the back side of the ECM connector to the terminals.**

- (4) Reinstall the fuel tank cap.
- (5) Turn the ignition switch OFF.

## INSPECTION

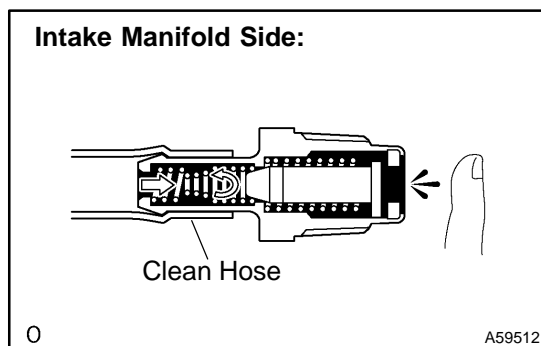


### 1. INSPECT VENTILATION VALVE SUB-ASSY

- (a) Check the operation.
- (1) Install a clean hose as shown in the illustration.
  - (2) Blow air into the cylinder head side, then check that air passes through easily.

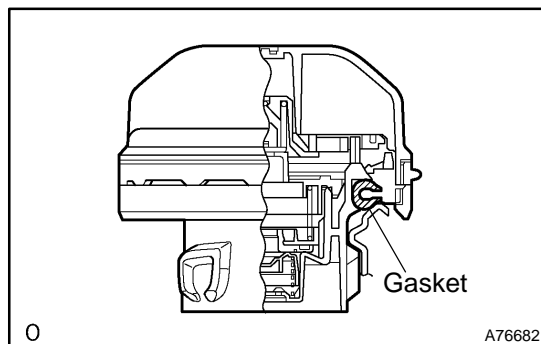
**CAUTION:**

**Do not suck air through the ventilation valve. Petroleum substances inside the ventilation valve are harmful.**



- (3) Blow air into the intake manifold side, then check that air passes through with difficulty.

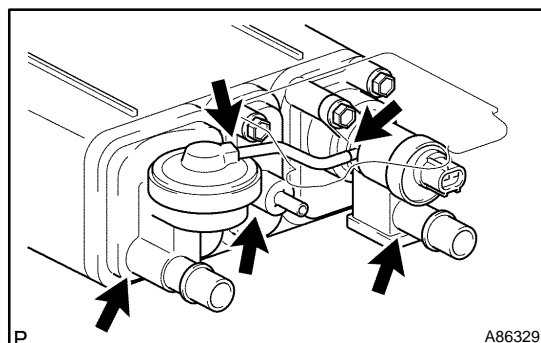
If the operation is not as specified, replace the ventilation valve.



### 2. INSPECT FUEL TANK CAP ASSY

- (a) Check the appearance.
- (1) Visually check if the fuel tank cap and gasket are deformed or damaged.

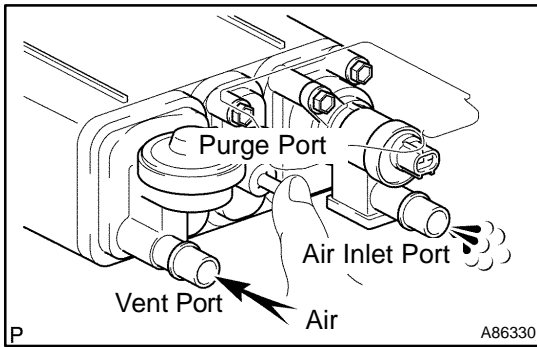
If necessary, replace the fuel tank cap.



### 3. INSPECT CHARCOAL CANISTER ASSY

- (a) Check the appearance.
- (1) Visually check the charcoal canister to see if the indicated portions by the arrows are cracked or damaged.

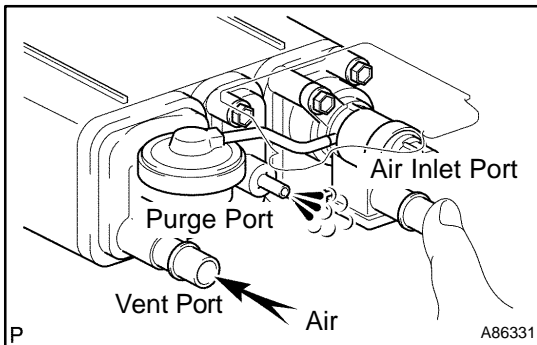
If necessary, replace the charcoal canister.



(b) Check the operation.

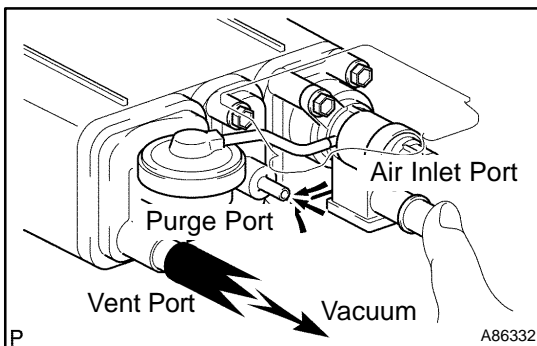
- (1) While holding the purge port closed, blow air (0.39 kPa (4.0 gf/cm<sup>2</sup>, 0.06 psi)) into the vent port, then check that the air flows from the air inlet port.

If the operation is not as specified, replace the charcoal canister.



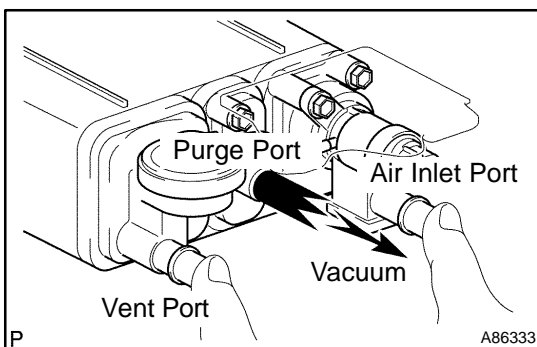
- (2) While holding the air inlet port closed, blow air (0.39 kPa (4.0 gf/cm<sup>2</sup>, 0.06 psi)) into the vent port, then check that the air flows from the purge port.

If the operation is not as specified, replace the charcoal canister.



- (3) While holding the air inlet port closed, apply vacuum (3.43 kPa (25.7 mm/Hg, 1.01 in.Hg)) to the vent port, then check that the air is sucked from the purge port.

If the operation is not as specified, replace the charcoal canister.



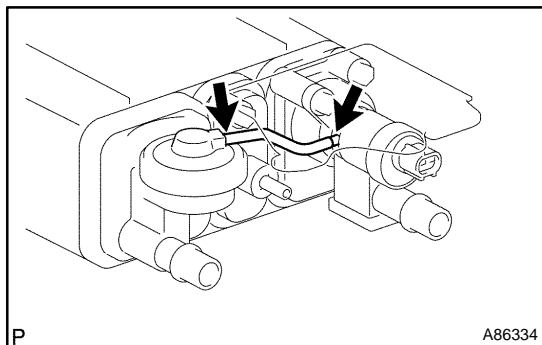
(c) Check the air tightness.

- (1) While holding the vent and air inlet ports closed, apply vacuum (3.43 kPa (25.7 mmHg, 1.01 in.Hg)) to the purge port, then check that the vacuum is maintained for 1 minute.

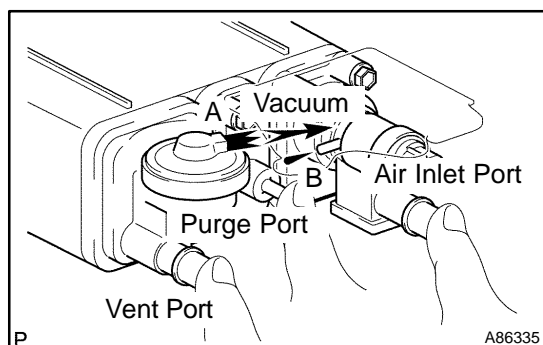
**HINT:**

In order to maintain air tightness, the check should be performed with the VSV (for CCV) terminal port held closed by your finger.

If the operation is not as specified, replace the charcoal canister.

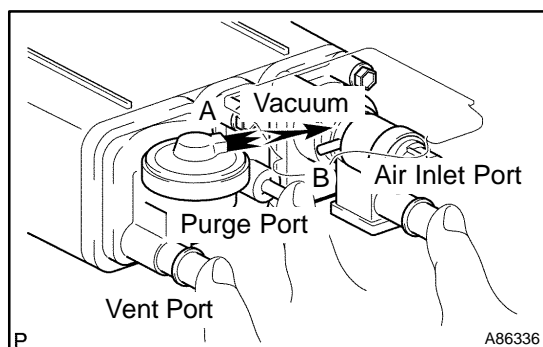


- (d) Inspect the diaphragm.  
(1) Remove the air hose.



- (2) While holding the vent, purge and air inlet ports closed, apply vacuum (1.42 kPa (11 mmHg, 0.42 in.Hg)) into port A, then check that the air is sucked from port B.

If the operation is not as specified, replace the charcoal canister.

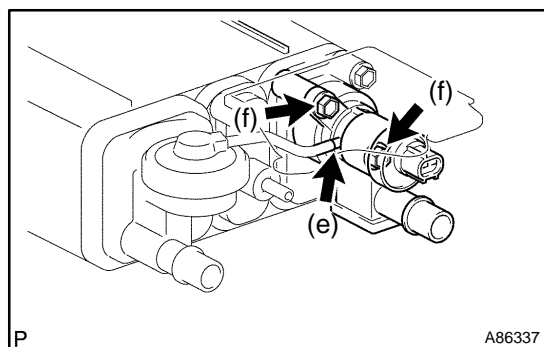


- (3) While holding the vent, purge and air inlet ports closed, apply vacuum (1.42 kPa (11 mmHg, 0.42 in.Hg)) into port A, then measure how long it takes for vacuum to drop.

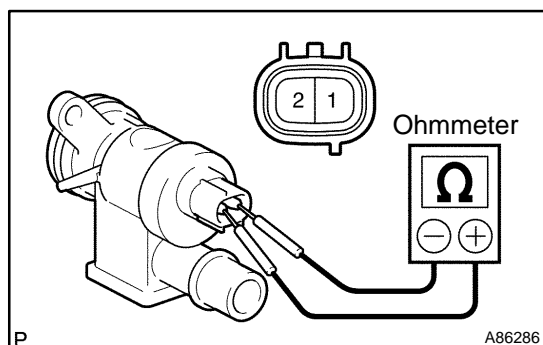
**Vacuum drop time: 10 seconds or longer**

If the operation is not as specified, replace the charcoal canister.

- (4) Reinstall the air hose.



- (e) Disconnect the air hose.  
(f) Remove the 2 bolts, then remove the VSV.

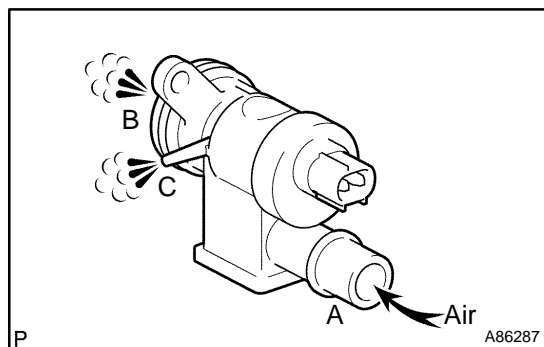


- (g) Inspect the resistance.  
(1) Using an ohmmeter, measure the resistance between the terminals.

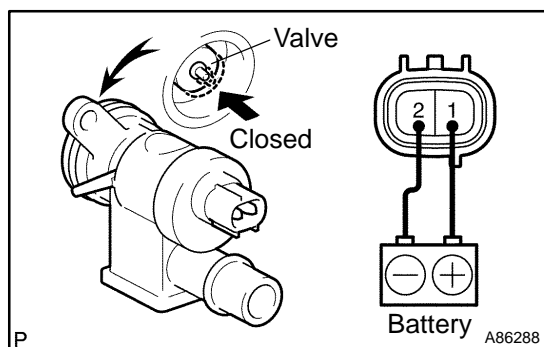
**Standard:**

Tester Connection	Specified Condition
1 - 2	25 to 30 $\Omega$ at 20°C (68°F)
1 - 2	32 to 40 $\Omega$ at 100°C (212°F)

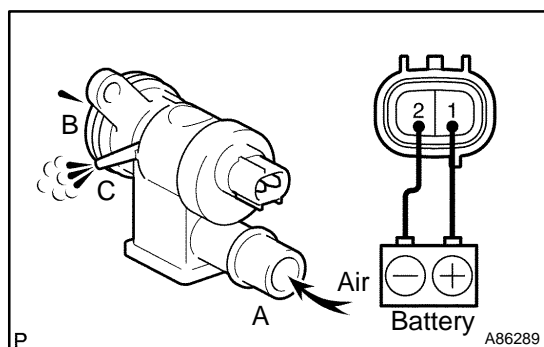
If the resistance is not as specified, replace the charcoal canister.



- (h) Check the operation.
- (1) Check that air flows from port A to B and C.



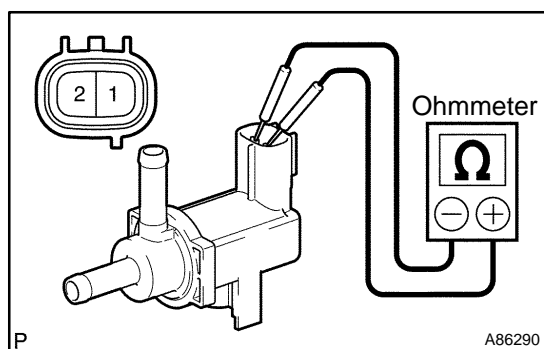
- (2) Apply battery voltage across the terminals.
- (3) Check that the valve is closed.



- (4) Check that air does not flow from port A to B.
- (5) Check that air flows from port A to C.

If the operation is not as specified, replace the charcoal canister.

- (i) Install the VSV with the 2 bolts.
- (j) Connect the air hose.



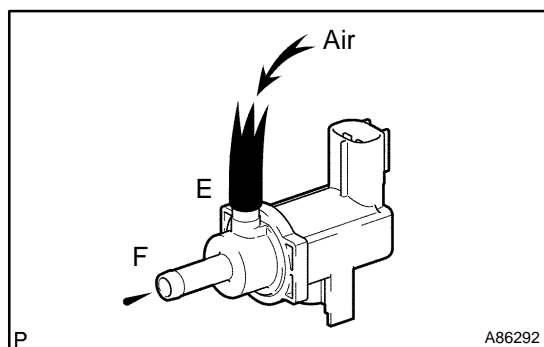
#### 4. INSPECT VACUUM SWITCHING VALVE ASSY NO.1

- (a) Inspect the resistance.
- (1) Using an ohmmeter, measure the resistance between the terminals.

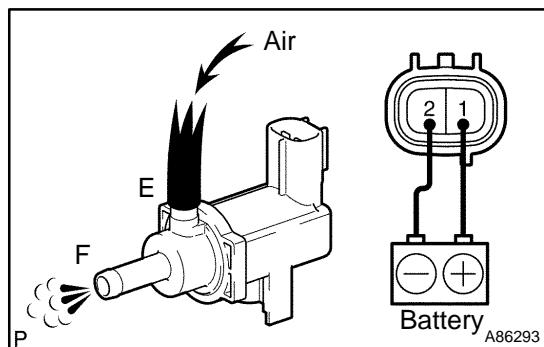
##### Standard:

Tester Connection	Specified Condition
1 - 2	26 to 30 $\Omega$ at 20°C (68°F)

If the resistance is not as specified, replace the vacuum switching valve No. 1.

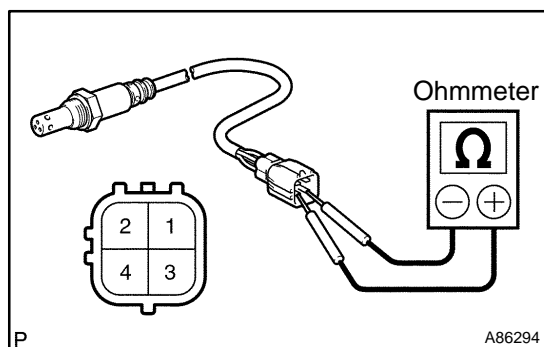


- (b) Check the operation.
- (1) Check that air does not flow from port E to F.



- (2) Apply battery voltage across the terminals.
- (3) Check that air flows from port E to F.

If the operation is not as specified, replace the vacuum switching valve No. 1.



## 5. INSPECT AIR FUEL RATIO SENSOR

- (a) Inspect the resistance.

- (1) Using an ohmmeter, measure the resistance between the terminals.

### Standard:

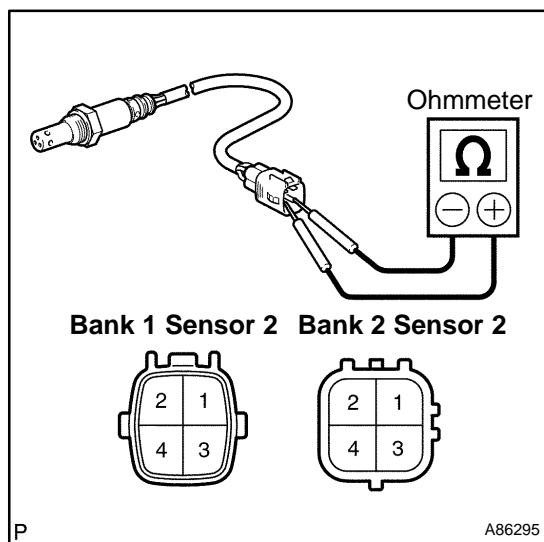
Tester Connection	Specified Condition
1 (HT) - 2 (+B)	1.8 to 3.4 $\Omega$ at 20°C (68°F)

If the resistance is not as specified, replace the air fuel ratio sensor.

- (b) Check the continuity.

- (1) Using an ohmmeter, check that there is no continuity between terminals 2 (+B) and 4 (AF-).

If there is continuity, replace the air fuel ratio sensor.



## 6. INSPECT HEATED OXYGEN SENSOR

- (a) Inspect the resistance.

- (1) Using an ohmmeter, measure the resistance between the terminals.

### Standard:

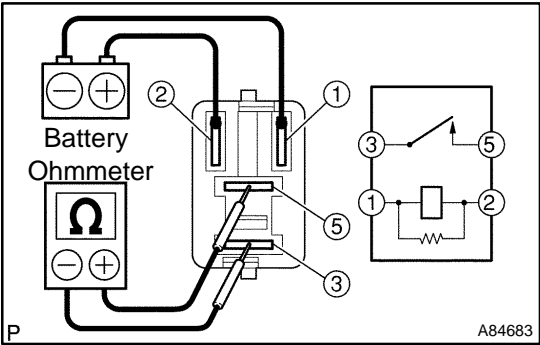
Tester Connection	Specified Condition
1 (HT) - 2 (+B)	11 to 16 $\Omega$ at 20°C (68°F)

If the resistance is not as specified, replace the heated oxygen sensor.

- (b) Check the continuity.

- (1) Using an ohmmeter, check that there is no continuity between terminals 1 (HT) and 4 (E).

If there is continuity, replace the heated oxygen sensor.



**7. INSPECT AIR FUEL RATIO SENSOR HEATER RELAY**

- (a) Inspect the resistance.
- (1) Using an ohmmeter, measure the resistance between the terminals.

**Standard:**

Tester Connection	Specified Condition
3 - 5	10 kΩ or higher
3 - 5	Below 1Ω (Apply battery voltage to terminals 1 and 2)

If the result is not as specified, replace the air fuel ratio sensor heater relay.

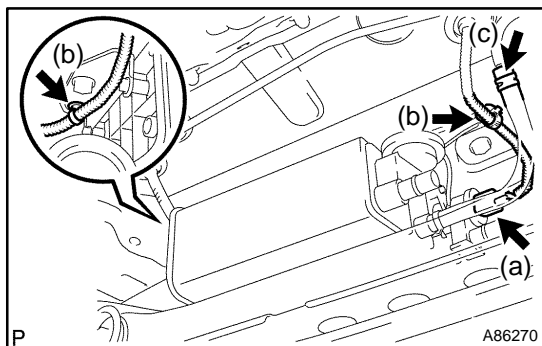


# CHARCOAL CANISTER ASSY (3MZ-FE)

120BT-01

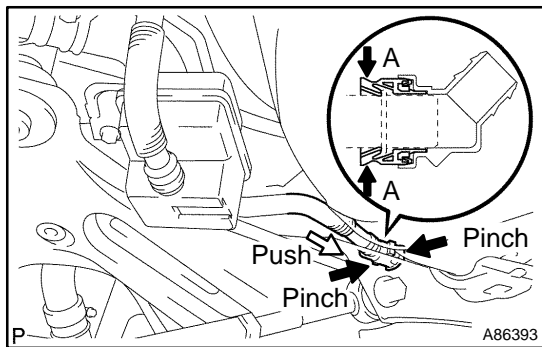
## REPLACEMENT

1. DISCHARGE FUEL SYSTEM PRESSURE (See page 11-1 )
2. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)
3. REMOVE REAR SEAT CUSHION ASSY (See page 72-39 )
4. REMOVE REAR FLOOR SERVICE HOLE COVER (See page 11-20 )
5. REMOVE FUEL SUCTION W/ PUMP & GAUGE TUBE ASSY (See page 11-20 )
6. DRAIN FUEL
7. REMOVE FLOOR PANEL BRACE REAR (See page 15-2 )
8. REMOVE EXHAUST PIPE ASSY CENTER (See page 11-28 )
9. DISCONNECT PARKING BRAKE CABLE ASSY NO.2 (See page 11-28 )
10. DISCONNECT PARKING BRAKE CABLE ASSY NO.3 (See page 11-28 )
11. REMOVE FUEL TANK PROTECTOR LOWER CENTER (See page 11-28 )
12. REMOVE FUEL TANK ASSY (See page 11-28 )

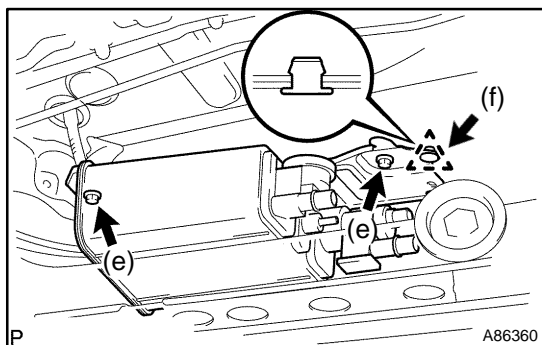


### 13. REMOVE CHARCOAL CANISTER ASSY

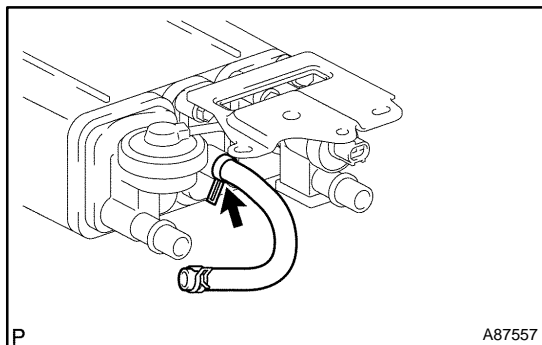
- (a) Disconnect the VSV connector.
- (b) Remove the 2 wire harness clamps.
- (c) Disconnect the fuel hose No. 1.



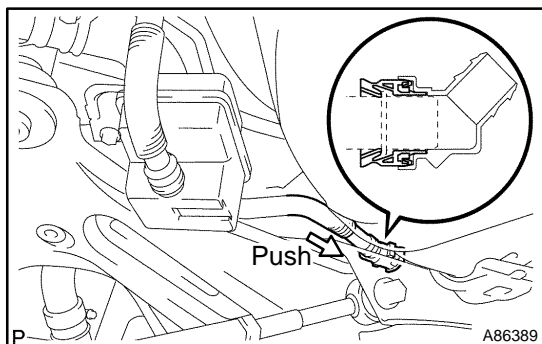
- (d) Disconnect the fuel tank vent hose.
  - (1) Deeply push the quick connector to release the lock pin.
  - (2) Pinch portion A.
  - (3) Pull out the fuel tank vent hose.



- (e) Remove the 2 bolts.
- (f) Unfasten the claw, then remove the charcoal canister.

**14. REMOVE FUEL EMISSION TUBE FUEL HOSE**

- (a) Remove the fuel emission tube fuel hose.

**15. INSTALL FUEL EMISSION TUBE FUEL HOSE****16. INSTALL CHARCOAL CANISTER ASSY**

- (a) Install the charcoal canister with the 2 bolts.  
**Torque: 40 N·m (400 kgf·cm, 29 ft·lbf)**
- (b) Connect the fuel tank vent hose.  
 (1) Push in the quick connector to the pipe until the quick connector makes a "click" sound.

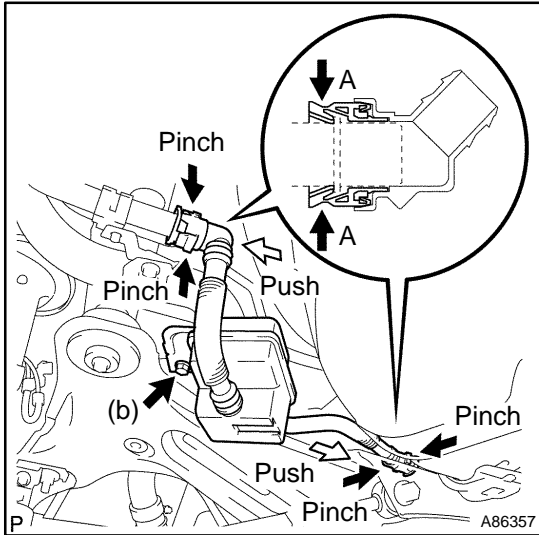
**NOTICE:**

- Check the connected part for damage or foreign objects.
  - After connecting, check if the quick connector and pipe are securely connected by pulling on them.
- (c) Connect the fuel hose No. 1.  
 (d) Install the 3 wire harness clamps.  
 (e) Connect the VSV connector.

- 17. INSTALL FUEL TANK ASSY (See page 11-28 )**
- 18. INSTALL FUEL TANK PROTECTOR LOWER CENTER (See page 11-28 )**
- 19. INSTALL PARKING BRAKE CABLE ASSY NO.3 (See page 11-28 )**
- 20. INSTALL PARKING BRAKE CABLE ASSY NO.2 (See page 11-28 )**
- 21. INSTALL EXHAUST PIPE ASSY CENTER (See page 11-28 )**
- 22. INSTALL FUEL SUCTION W/ PUMP & GAUGE TUBE ASSY (See page 11-20 )**
- 23. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)**  
**Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)**
- 24. ADD FUEL**
- 25. CHECK FOR FUEL LEAKS (See page 11-5 )**
- 26. CHECK FOR EXHAUST GAS LEAKS**
- 27. INSTALL REAR FLOOR SERVICE HOLE COVER (See page 11-20 )**
- 28. INSTALL REAR SEAT CUSHION ASSY**
- 29. INSTALL FLOOR PANEL BRACE REAR (See page 15-2 )**
- 30. SYSTEM INITIALIZATION (See page 19-15 )**

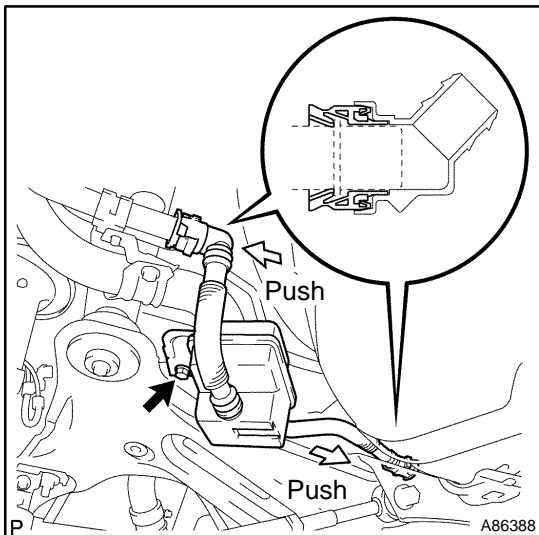
# CHARCOAL CANISTER FILTER SUB-ASSY (3MZ-FE) REPLACEMENT

120BW-01



## 1. REMOVE CHARCOAL CANISTER FILTER SUB-ASSY

- (a) Disconnect the 2 fuel tank vent hoses.
  - (1) Deeply push the quick connector to release the lock pin.
  - (2) Pinch portion A.
  - (3) Pull out the 2 fuel tank vent hoses.
- (b) Remove the bolt, then remove the charcoal canister filter.



## 2. INSTALL CHARCOAL CANISTER FILTER SUB-ASSY

- (a) Install the charcoal canister filter with the bolt.  
**Torque: 7.5 N·m (76 kgf·cm, 66 in.-lbf)**
- (b) Connect the 2 fuel tank vent hoses.
  - (1) Push in the quick connector to the pipe until the quick connector makes a "click" sound.

### NOTICE:

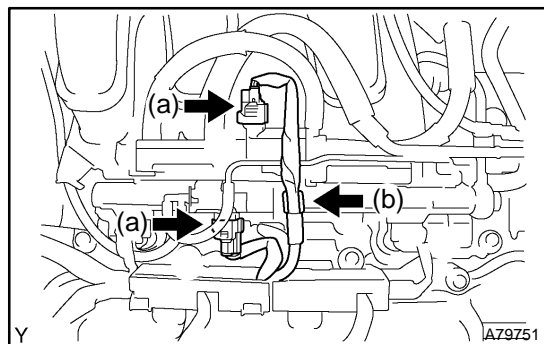
- Check the connected part for damage or foreign objects.
- After connecting, check if the quick connector and pipe are securely connected by pulling on them.

# DUTY VACUUM SWITCHING VALVE (3MZ-FE)

## REPLACEMENT

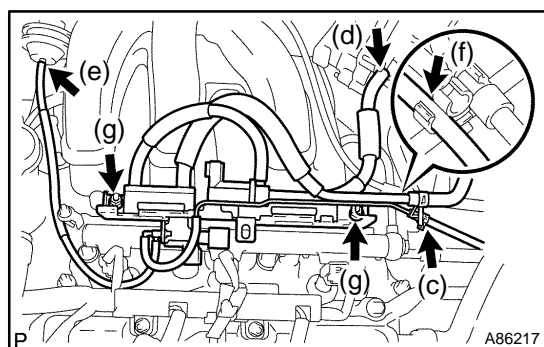
120BU-01

1. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)
2. REMOVE V-BANK COVER SUB-ASSY (See page 10-11)

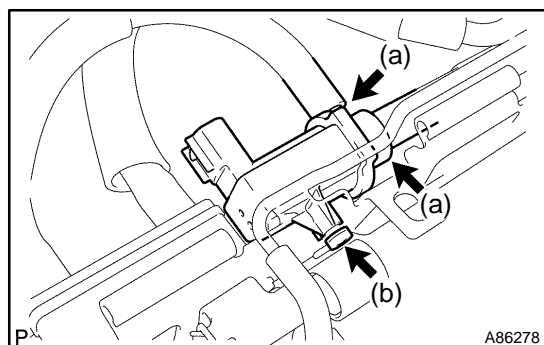


### 3. REMOVE EMISSION CONTROL VALVE SET

- (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 vacuum hose.
- (f) Remove the vacuum hose from the clamp.
- (g) Remove the 2 nuts, then remove the emission control valve set.



### 4. REMOVE DUTY VACUUM SWITCHING VALVE

- (a) Disconnect the 2 vacuum hoses.
- (b) Remove the screw, then remove the duty vacuum switching valve.

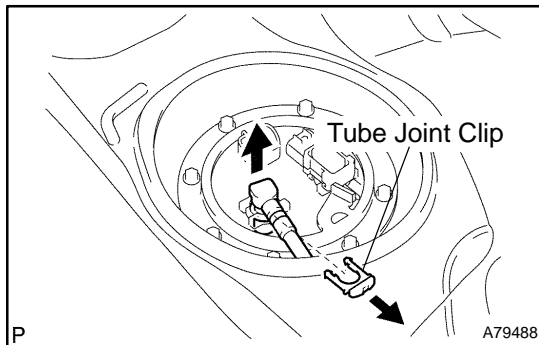
5. INSTALL DUTY VACUUM SWITCHING VALVE
6. INSTALL EMISSION CONTROL VALVE SET  
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
7. CHECK CONNECTION OF VACUUM HOSE (See page 14-29)
8. INSTALL V-BANK COVER SUB-ASSY (See page 10-11)
9. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)  
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)
10. SYSTEM INITIALIZATION (See page 19-15)

# VAPOR PRESSURE SENSOR ASSY (3MZ-FE)

## REPLACEMENT

120BV-02

1. DISCHARGE FUEL SYSTEM PRESSURE (See page 11-1 )
2. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)
3. REMOVE REAR SEAT CUSHION ASSY (See page 72-39 )
4. REMOVE REAR FLOOR SERVICE HOLE COVER (See page 11-20 )

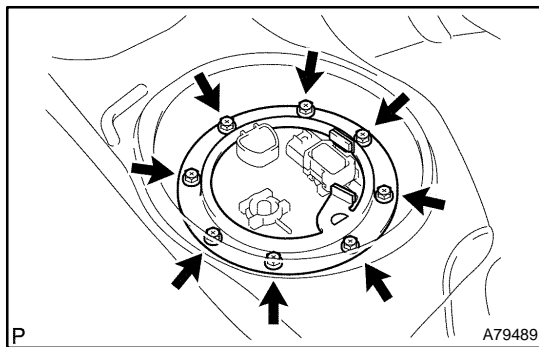
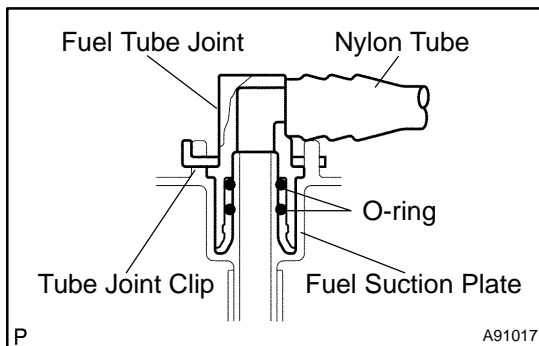


### 5. DISCONNECT FUEL PUMP TUBE SUB-ASSY

- (a) Remove the tube joint clip, then pull out the fuel pump tube.

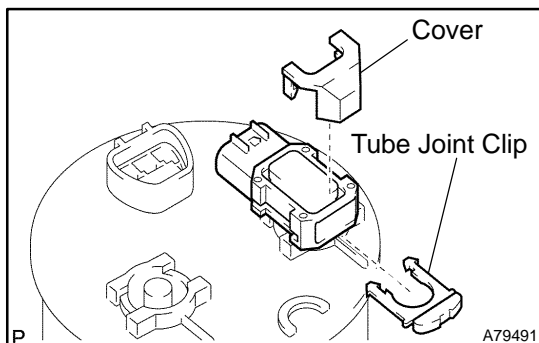
#### NOTICE:

- Check around the quick connector for dirt or mud before this operation. Remove the dirt if necessary.
- Be careful of mud because the quick connector has an O-ring which seals the pipe and quick connector that can be contaminated.
- Do not use any tools in this operation.
- Do not bend or twist the nylon tube. Protect the quick connector by covering it with a vinyl or plastic bag.
- When the pipe and quick connector are stuck, push and pull the quick connector to release. Pull the quick connector carefully.



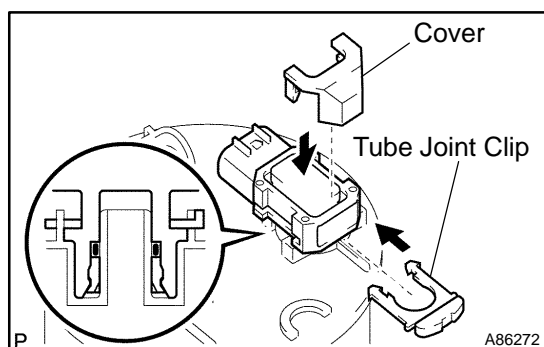
### 6. REMOVE FUEL TANK VENT TUBE SET PLATE

- (a) Remove the 8 bolts, then remove the fuel tank vent tube set plate.



### 7. REMOVE VAPOR PRESSURE SENSOR ASSY

- (a) Remove the cover.
- (b) Remove the tube joint clip, then pull out the vapor pressure sensor.

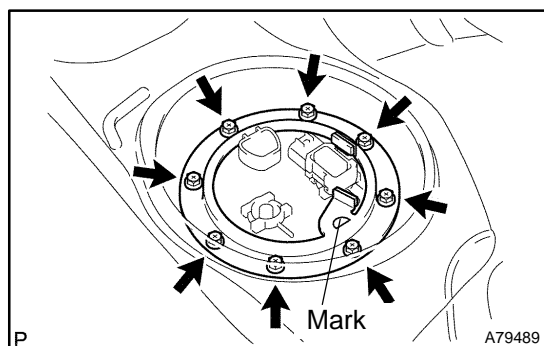


## 8. INSTALL VAPOR PRESSURE SENSOR ASSY

- (a) Install the vapor pressure sensor with the tube joint clip.

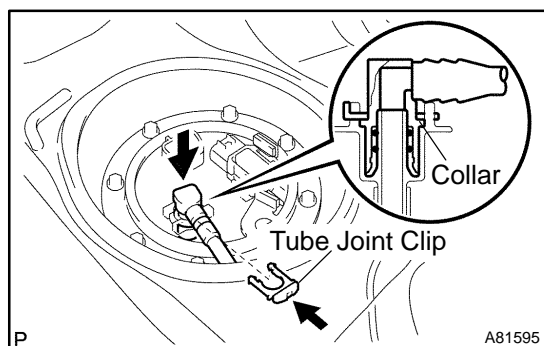
### NOTICE:

- Check the connected part for scratch or foreign objects.
  - Check that the vapor pressure sensor is inserted securely.
  - Check that the tube joint clip is on the collar of the vapor pressure sensor.
  - After installing the tube joint clip, check that the vapor pressure sensor has not been pulled off.
- (b) Install the cover.



## 9. INSTALL FUEL TANK VENT TUBE SET PLATE

- (a) Align the mark of the fuel tank vent tube set plate with the fuel suction tube w/ pump & gauge.
- (b) Install the fuel tank vent tube set plate with the 8 bolts.  
**Torque: 5.9 N·m (60 kgf·cm, 52 in·lbf)**



## 10. CONNECT FUEL PUMP TUBE SUB-ASSY

- (a) Install the fuel pump tube with the tube joint clip.

### NOTICE:

- Check the connected part for scratch or foreign objects.
- Check that the fuel tube joint is inserted securely.
- Check that the tube joint clip is on the collar of the fuel tube joint.
- After installing the tube joint clip, check that the fuel tube joint has not been pulled off.

## 11. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)

**Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)**

## 12. CHECK FOR FUEL LEAKS (See page 11-5 )

## 13. INSTALL REAR FLOOR SERVICE HOLE COVER (See page 11-20 )

## 14. INSTALL REAR SEAT CUSHION ASSY

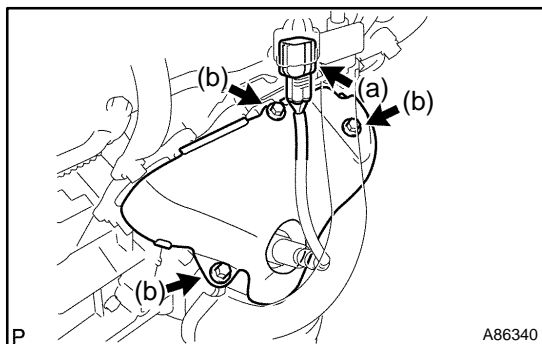
## 15. SYSTEM INITIALIZATION (See page 19-15 )

# AIR FUEL RATIO SENSOR (3MZ-FE (RH BANK))

## REPLACEMENT

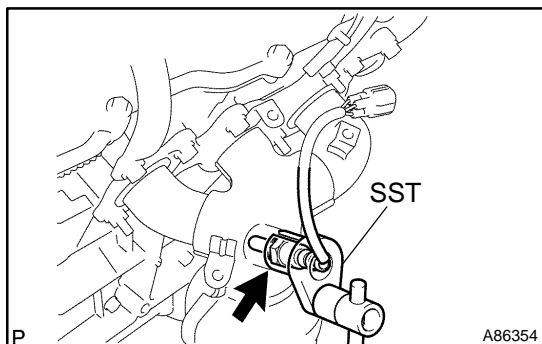
120BY-01

1. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)
2. REMOVE EXHAUST PIPE NO.1 SUPPORT BRACKET FRONT (See page 15-2 )
3. REMOVE EXHAUST PIPE NO.1 SUPPORT BRACKET REAR (See page 15-2 )
4. REMOVE EXHAUST PIPE ASSY FRONT (See page 15-2 )



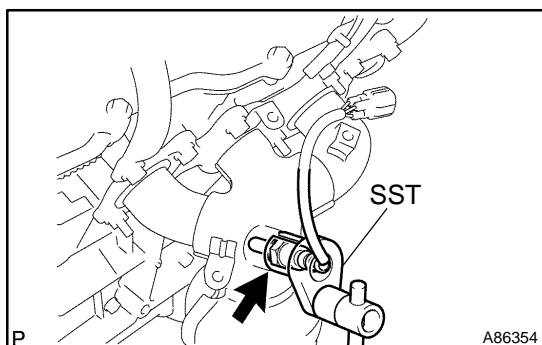
### 5. REMOVE EXHAUST MANIFOLD HEAT INSULATOR NO.1

- (a) Disconnect the air fuel ratio sensor connector.
- (b) Remove the 3 bolts, then remove the exhaust manifold heat insulator No. 1.



### 6. REMOVE AIR FUEL RATIO SENSOR

- (a) Using SST, remove the air fuel ratio sensor.  
SST 09224-00010



### 7. INSTALL AIR FUEL RATIO SENSOR

- (a) Using SST, install the air fuel ratio sensor.  
SST 09224-00010  
Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)

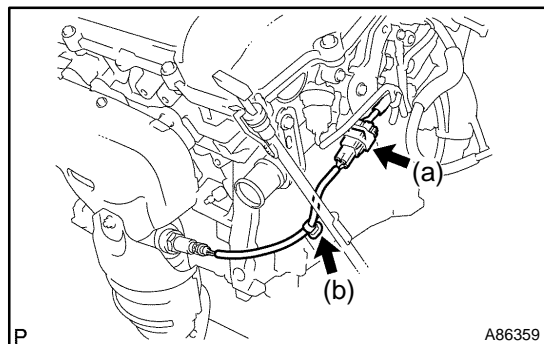
8. INSTALL EXHAUST MANIFOLD HEAT INSULATOR NO.1  
Torque: 8.5 N·m (87 kgf·cm, 75 in·lbf)
9. INSTALL EXHAUST PIPE ASSY FRONT (See page 15-2 )
10. INSTALL EXHAUST PIPE NO.1 SUPPORT BRACKET REAR (See page 15-2 )
11. INSTALL EXHAUST PIPE NO.1 SUPPORT BRACKET FRONT (See page 15-2 )
12. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)  
Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)
13. CHECK FOR EXHAUST GAS LEAKS
14. SYSTEM INITIALIZATION (See page 19-15 )



# AIR FUEL RATIO SENSOR (3MZ-FE (LH BANK)) REPLACEMENT

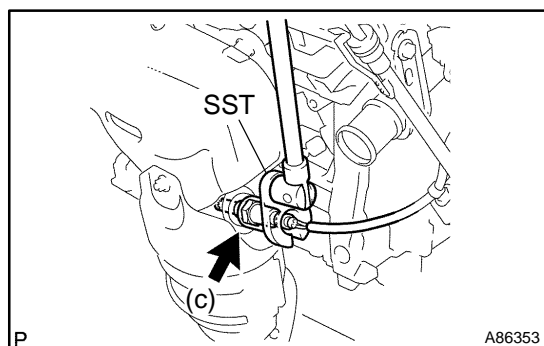
120BZ-01

## 1. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)

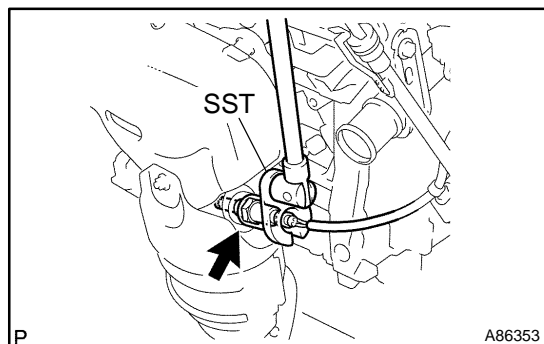


## 2. REMOVE AIR FUEL RATIO SENSOR

- (a) Disconnect the air fuel ratio sensor connector.
- (b) Remove the wire harness clamp.



- (c) Using SST, remove the air fuel ratio sensor.  
SST 09224-00010



## 3. INSTALL AIR FUEL RATIO SENSOR

- (a) Using SST, install the air fuel ratio sensor.  
SST 09224-00010  
**Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)**
- (b) Install the wire harness clamp.
- (c) Connect the air fuel ratio sensor connector.

## 4. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)

**Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)**

## 5. CHECK FOR EXHAUST GAS LEAKS

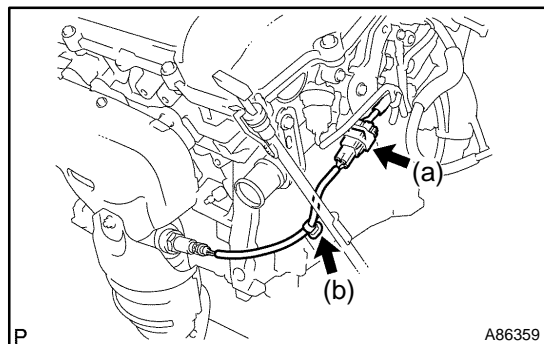
## 6. SYSTEM INITIALIZATION (See page 19-15 )



# AIR FUEL RATIO SENSOR (3MZ-FE (LH BANK)) REPLACEMENT

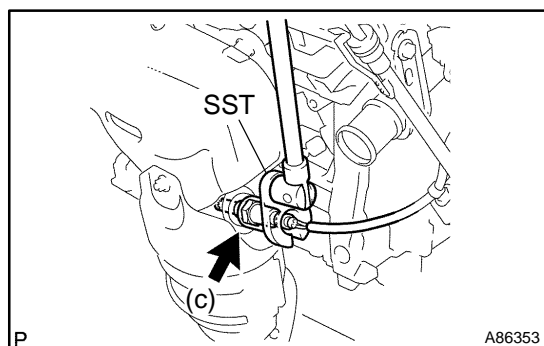
120BZ-01

## 1. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)

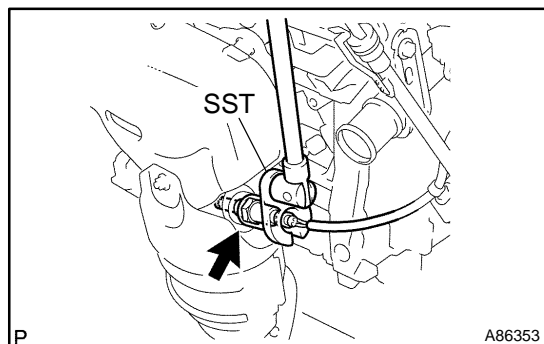


## 2. REMOVE AIR FUEL RATIO SENSOR

- (a) Disconnect the air fuel ratio sensor connector.
- (b) Remove the wire harness clamp.



- (c) Using SST, remove the air fuel ratio sensor.  
SST 09224-00010



## 3. INSTALL AIR FUEL RATIO SENSOR

- (a) Using SST, install the air fuel ratio sensor.  
SST 09224-00010  
**Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)**
- (b) Install the wire harness clamp.
- (c) Connect the air fuel ratio sensor connector.

## 4. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)

**Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)**

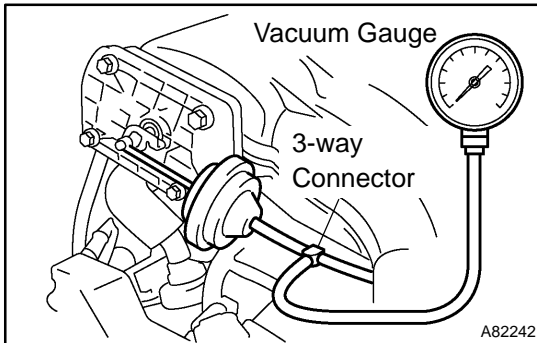
## 5. CHECK FOR EXHAUST GAS LEAKS

## 6. SYSTEM INITIALIZATION (See page 19-15 )

# INTAKE AIR CONTROL SYSTEM (3MZ-FE)

## ON-VEHICLE INSPECTION

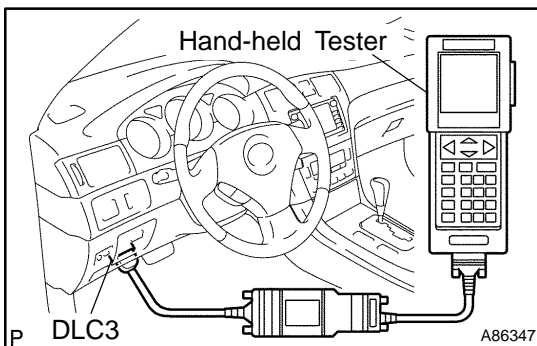
1307V-01



### 1. INSPECT INTAKE CONTROL VALVE ASSY NO. 2

#### (a) Check the operation.

- (1) Using a 3-way connector, connect the vacuum gauge to the actuator hose as shown in the illustration.



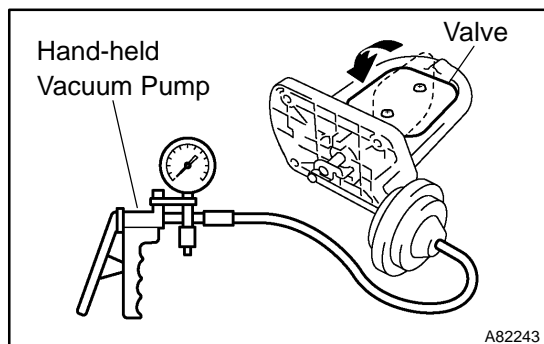
- (2) Connect the hand-held tester to the DLC3.
- (3) Start the engine.
- (4) Turn the hand-held tester switch ON.
- (5) Select the item "DIAGNOSIS/ENHANCED OBD II/ ACTIVE TEST/INTAKE CTL VSV1" and operate the VSV for AICS.

#### Vacuum:

Tester Operation	Specified Condition
VSV is ON	Approximately 27.6 kPa (200 mmHg, 7.9 in.Hg)
VSV is OFF	0 kPa (0 mmHg, 0 in.Hg)

If the operation is not as specified, replace the intake air control valve No. 2.

## INSPECTION



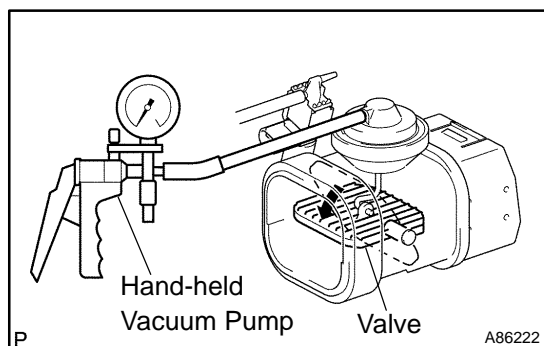
### 1. INSPECT INTAKE AIR CONTROL VALVE ASSY NO.2

- (a) Check the operation.
- (1) With vacuum of 26.7 kPa (200 mmHg, 7.9 in.Hg) applied to the actuator, check that the valve closes.
  - (2) 1 minute after applying the vacuum, check that the valve remains closed.

#### NOTICE:

**Do not adjust the adjust screw.**

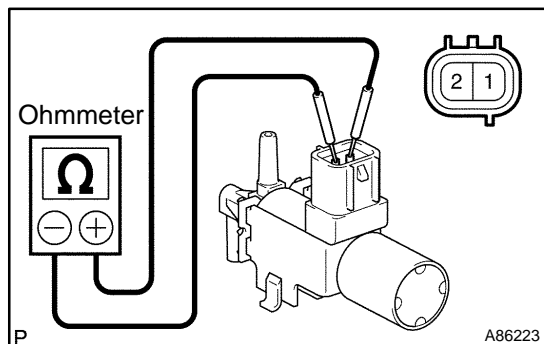
If the operation is not as specified, replace the intake air control valve No. 2.



### 2. INSPECT INTAKE AIR CONTROL VALVE ASSY NO.3

- (a) Check the operation.
- (1) With vacuum of 26.7 kPa (200 mmHg, 7.9 in.Hg) applied to the actuator, check that the valve opens.
  - (2) 1 minute after applying the vacuum, check that the valve remains opened.

If the operation is not as specified, replace the intake air control valve No. 3.

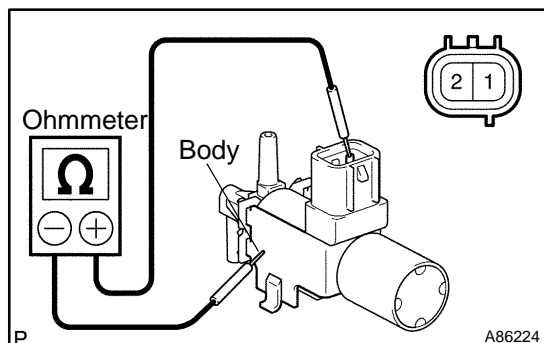


- (b) Inspect the resistance.
- (1) Using an ohmmeter, measure the resistance between the terminals.

#### Resistance:

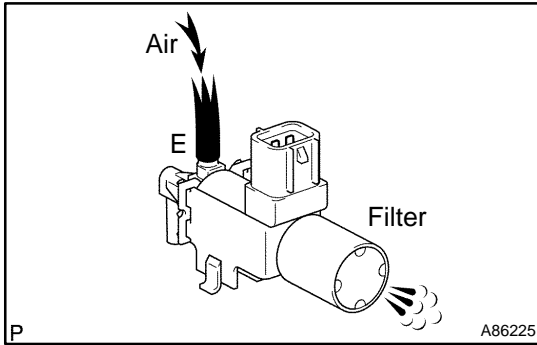
Tester Connection	Specified Condition
1 - 2	37 to 44Ω at 20°C (68°F)

If the resistance is not as specified, replace the intake air control valve No. 3.

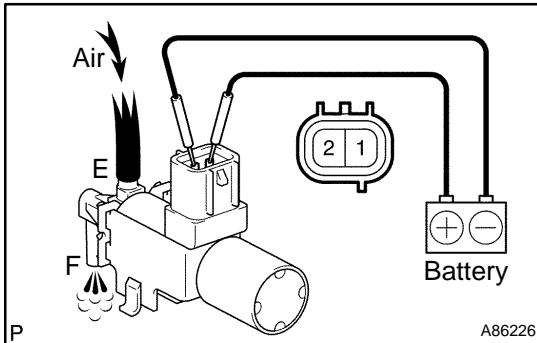


- (c) Check the continuity.
- (1) Using an ohmmeter, check that there is no continuity between each terminal and the body.

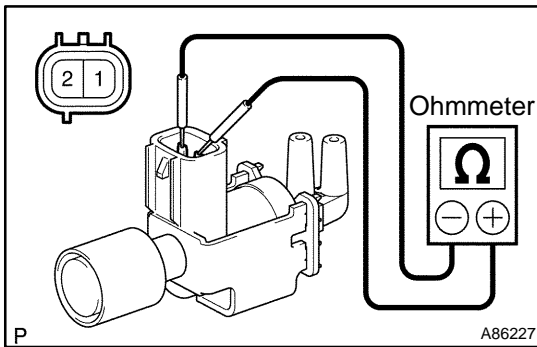
If there is continuity, replace the intake air control valve No. 3.



- (d) Check the operation.  
(1) Check that air flows from port E to the filter.



- (2) Apply battery voltage across the terminals.  
(3) Check that air flows from port E to F.  
If the operation is not as specified, replace the intake air control valve No. 3.



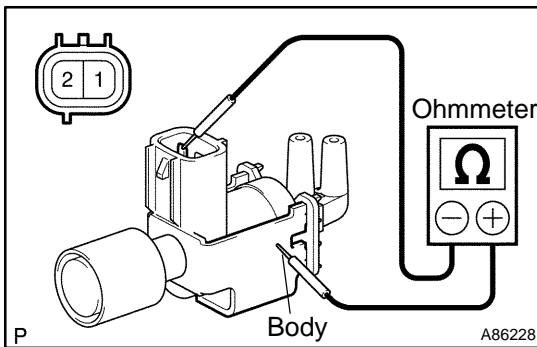
### 3. INSPECT VACUUM SWITCHING VALVE ASSY NO.1

- (a) Inspect the resistance.  
(1) Using an ohmmeter, measure the resistance between the terminals.

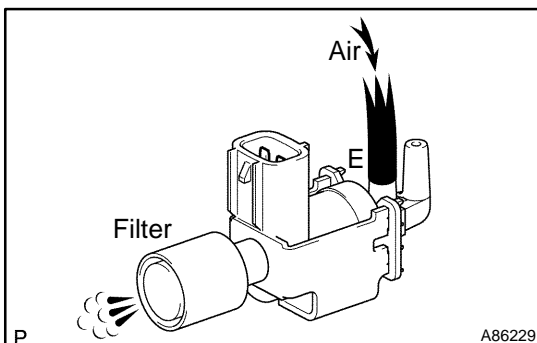
#### Resistance:

Tester Connection	Specified Condition
1 - 2	33 to 39Ω at 20°C (68°F)

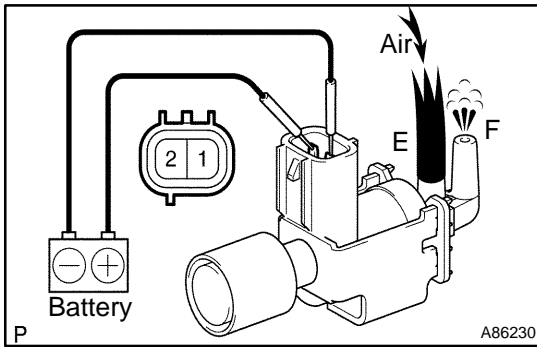
If the resistance is not as specified, replace the vacuum switching valve No. 1.



- (b) Check the continuity.  
(1) Using an ohmmeter, check that there is no continuity between each terminal and the body.  
If there is continuity, replace the vacuum switching valve No. 1.



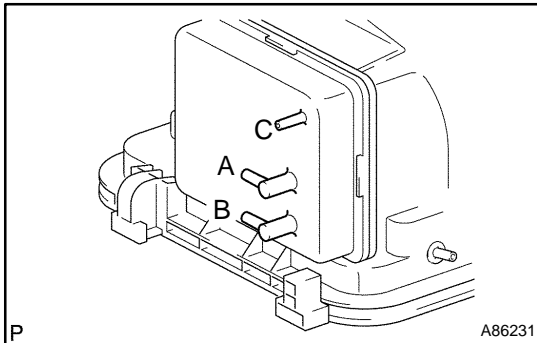
- (c) Check the operation.  
(1) Check that air flows from port E to the filter.



(2) Apply battery voltage across the terminals.

(3) Check that air flows from port E to F.

If the operation is not as specified, replace the vacuum switching valve No. 1.



#### 4. INSPECT AIR CLEANER CAP SUB-ASSY

(a) Check the operation.

(1) Cover port C with your finger, then check that the air flow from port B to A.

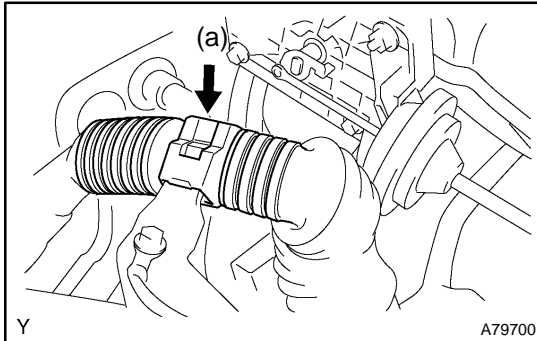
(2) Cover port C with your finger, then check that the air does not flow from port A to B.

(3) Cover ports A and C with your fingers, then apply 60 kPa (450 mmHg, 18 in.Hg) of vacuum to port B. Check that there is no vacuum change after 1 minute.

If the operation is not as specified, replace the air cleaner cap.

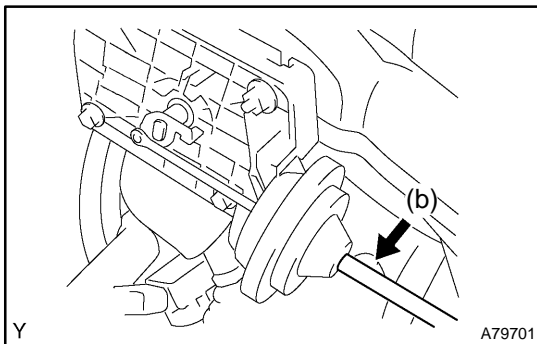
# INTAKE AIR CONTROL VALVE ASSY NO.2 (3MZ-FE) REPLACEMENT

1307X-01

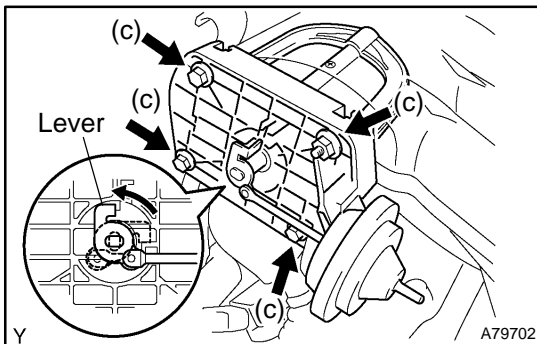


## 1. REMOVE INTAKE AIR CONTROL VALVE ASSY NO.2

- (a) Remove the wire harness clamp.



- (b) Disconnect the vacuum hose.



- (c) Remove the 3 bolts and nut.  
(d) Rotate the lever to the closed position as shown in the illustration, then pull out the intake air control valve No. 2.  
(e) Remove the gasket from the intake air surge tank.

## 2. INSTALL INTAKE AIR CONTROL VALVE ASSY NO.2

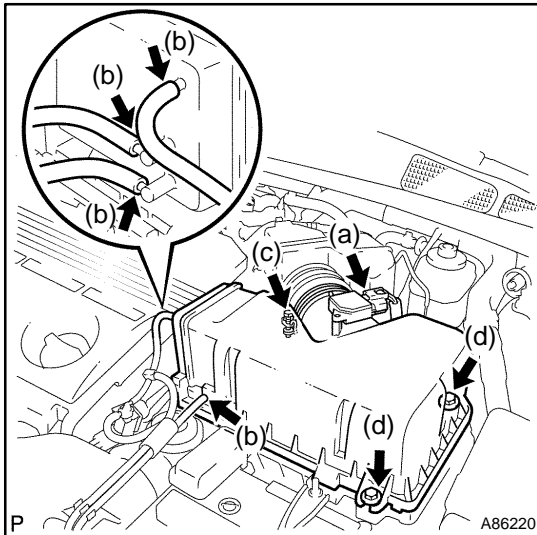
- (a) Install a new gasket to the intake air surge tank.  
(b) Install the intake air control valve No. 2 with the 3 bolts and nut.  
**Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)**  
(c) Connect the vacuum hose.  
(d) Install the wire harness clamp.

# INTAKE AIR CONTROL VALVE ASSY NO.3 (3MZ-FE)

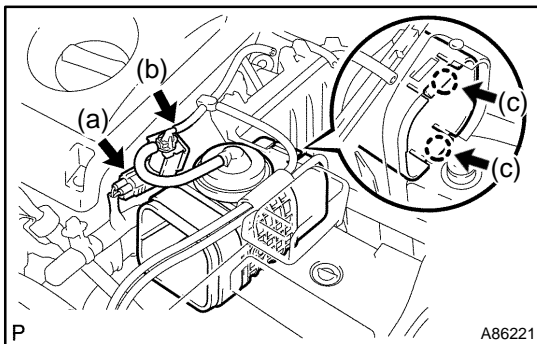
## REPLACEMENT

1307Y-01

1. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)
2. REMOVE RADIATOR LOWER AIR DEFLECTOR (See page 19-5 )
3. REMOVE AIR CLEANER INLET ASSY (See page 19-5 )



4. REMOVE AIR CLEANER CAP SUB-ASSY
  - (a) Disconnect the mass air flow meter connector.
  - (b) Disconnect the 4 vacuum hoses.
  - (c) Loosen the hose clamp bolt.
  - (d) Loosen the 2 bolts, then remove the air cleaner cap.
  - (e) Remove the air cleaner filter element.



5. REMOVE INTAKE AIR CONTROL VALVE ASSY NO.3
  - (a) Disconnect the VSV connector.
  - (b) Disconnect the vacuum hose.
  - (c) Unfasten the 2 claws, then remove the intake air control valve No. 3.

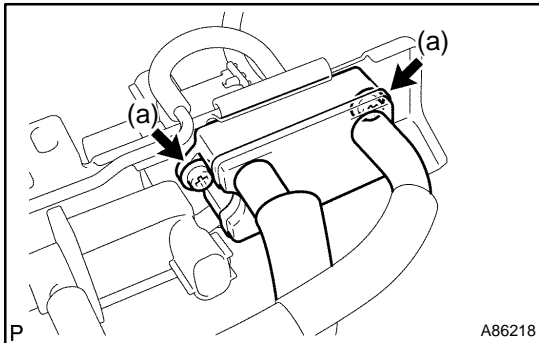
6. INSTALL INTAKE AIR CONTROL VALVE ASSY NO.3
7. INSTALL AIR CLEANER CAP SUB-ASSY  
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)
8. INSTALL AIR CLEANER INLET ASSY (See page 19-5 )
9. CHECK CONNECTION OF VACUUM HOSE (See page 14-29 )
10. INSTALL RADIATOR LOWER AIR DEFLECTOR
11. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)  
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)
12. SYSTEM INITIALIZATION (See page 19-15 )

## VACUUM SWITCHING VALVE ASSY NO.1 (3MZ-FE)

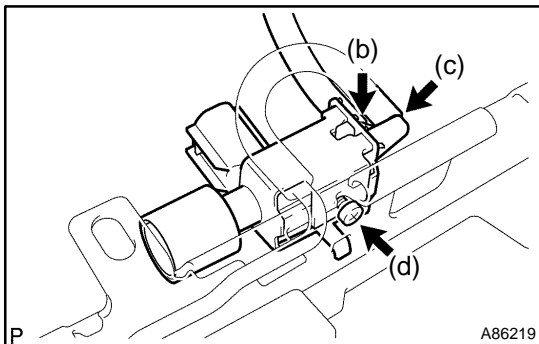
### REPLACEMENT

1307Z-01

1. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)
2. REMOVE V-BANK COVER SUB-ASSY (See page 10-11)
3. REMOVE EMISSION CONTROL VALVE SET (See page 12-19)



4. REMOVE VACUUM SWITCHING VALVE ASSY NO.1
- (a) Remove the 2 screws, then remove the vacuum surge tank.



- (b) Disconnect the vacuum hose.
- (c) Remove the vacuum hose.
- (d) Remove the screw, then remove the vacuum switching valve No. 1.

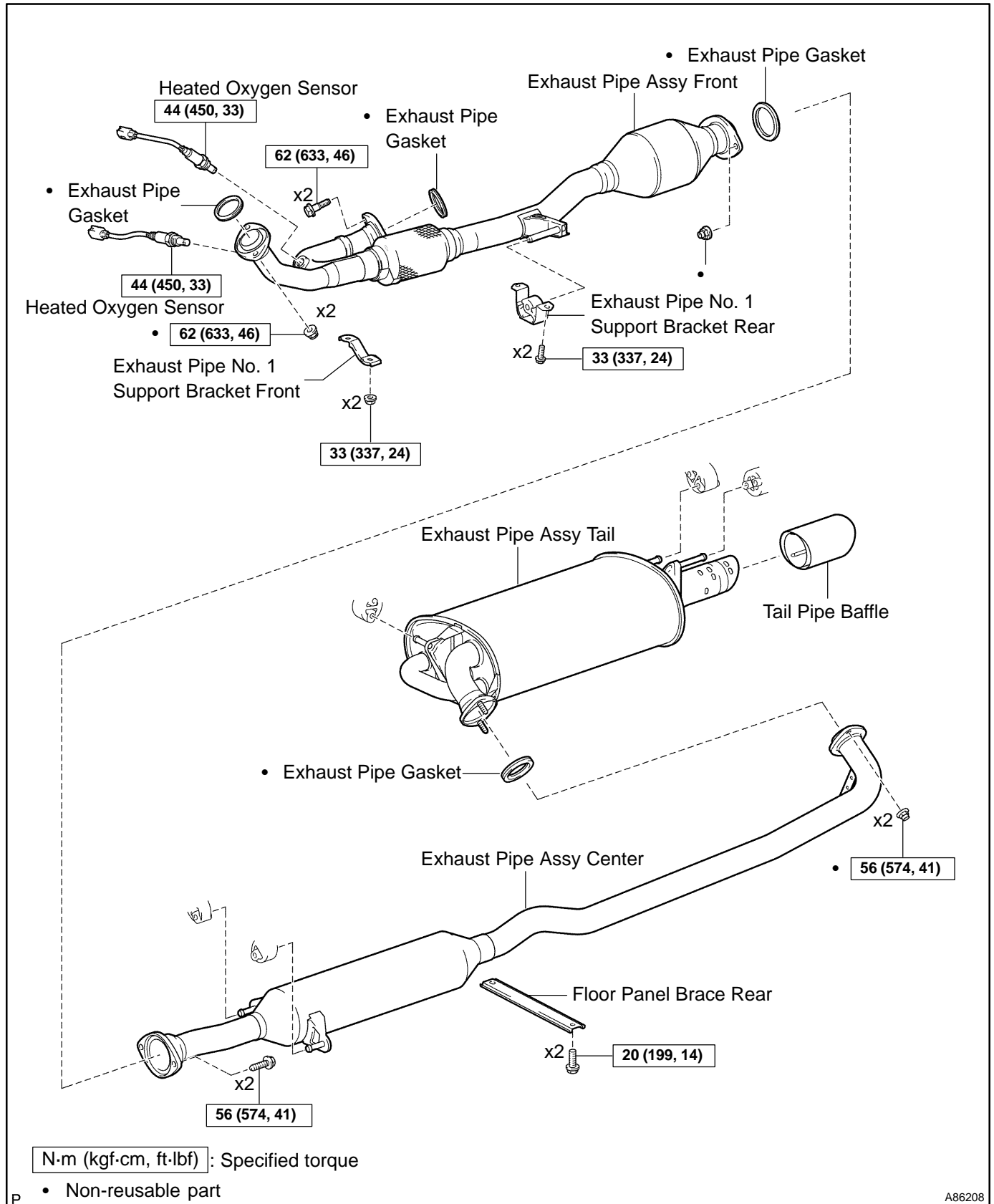
5. INSTALL VACUUM SWITCHING VALVE ASSY NO.1
6. INSTALL EMISSION CONTROL VALVE SET (See page 12-19)
7. CHECK CONNECTION OF VACUUM HOSE (See page 14-29)
8. INSTALL V-BANK COVER SUB-ASSY (See page 10-11)
9. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)  
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)
10. SYSTEM INITIALIZATION (See page 19-15)



# EXHAUST PIPE ASSY (3MZ-FE)

## COMPONENTS

150B7-01

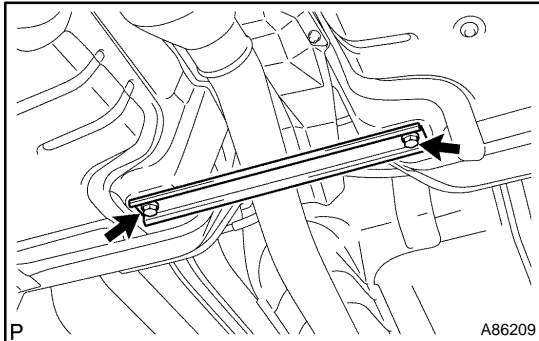


A86208

## Removal & Installation and Disassembly & Reassembly

1. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)
2. REMOVE HEATED OXYGEN SENSOR (See page 12-24 )

SST 09224-00010

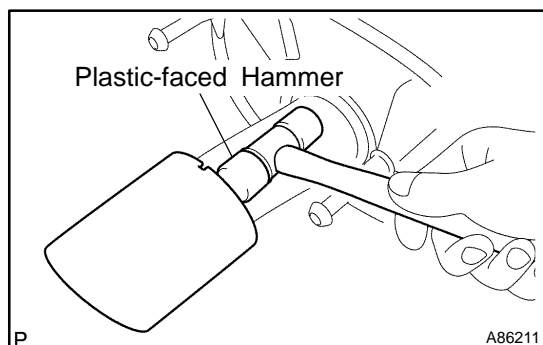
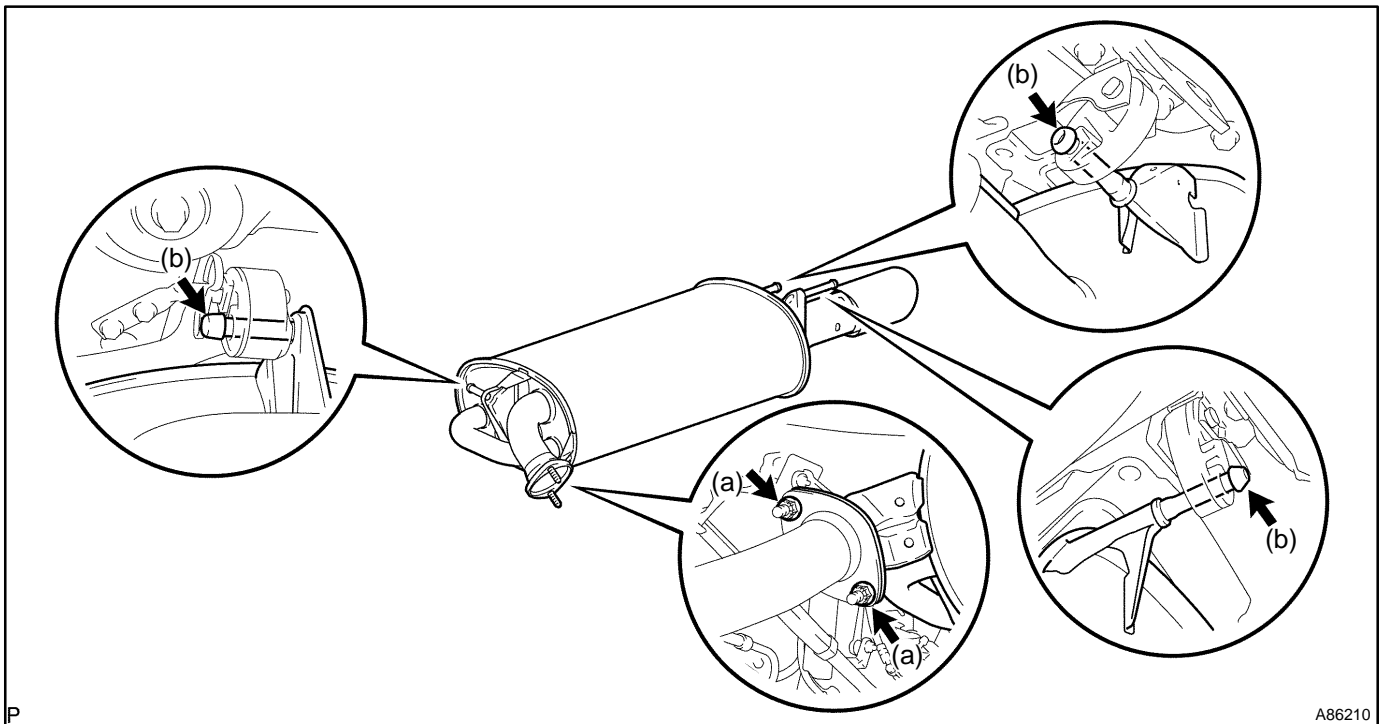


### 3. REMOVE FLOOR PANEL BRACE REAR

- (a) Remove the 2 bolts, then remove the floor panel brace rear.

### 4. REMOVE EXHAUST PIPE ASSY TAIL

- (a) Remove the 2 nuts.
- (b) Remove the exhaust pipe tail and gasket from the 3 exhaust pipe supports.

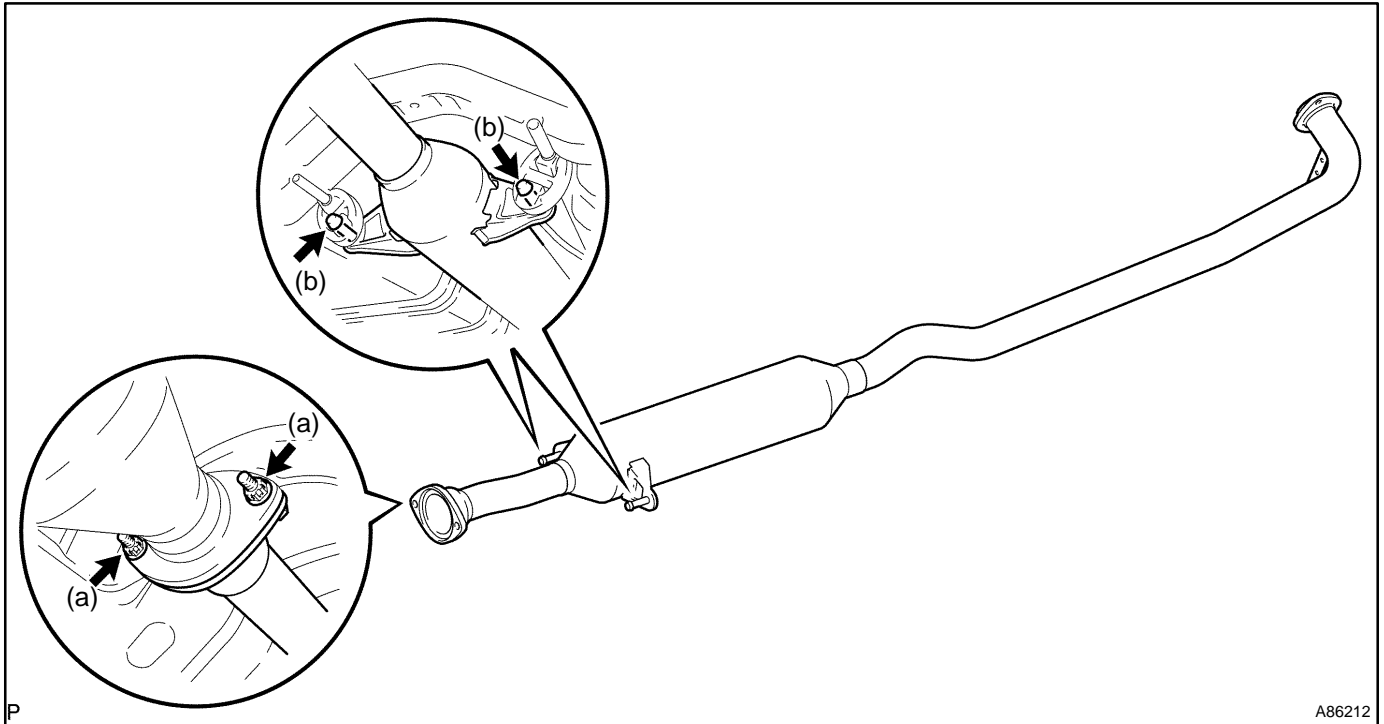


### 5. REMOVE TAIL PIPE BAFFLE

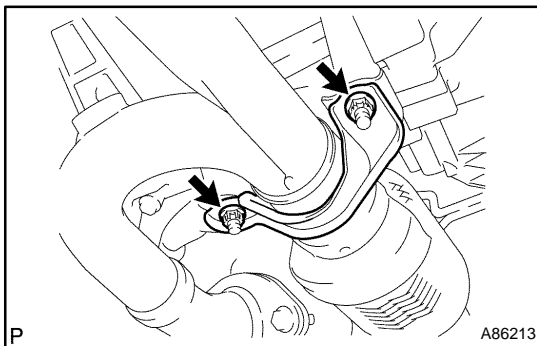
- (a) Using a plastic-faced hammer, uniformly tap the tail pipe baffle to remove.

**6. REMOVE EXHAUST PIPE ASSY CENTER**

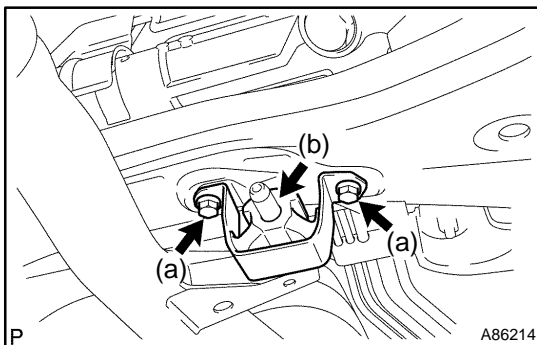
- (a) Remove the 2 bolts and 2 nuts.
- (b) Remove the exhaust pipe center and gasket from the 2 exhaust pipe supports.

**7. REMOVE EXHAUST PIPE NO.1 SUPPORT BRACKET FRONT**

- (a) Remove the 2 nuts, then remove the exhaust pipe No. 1 support bracket front.

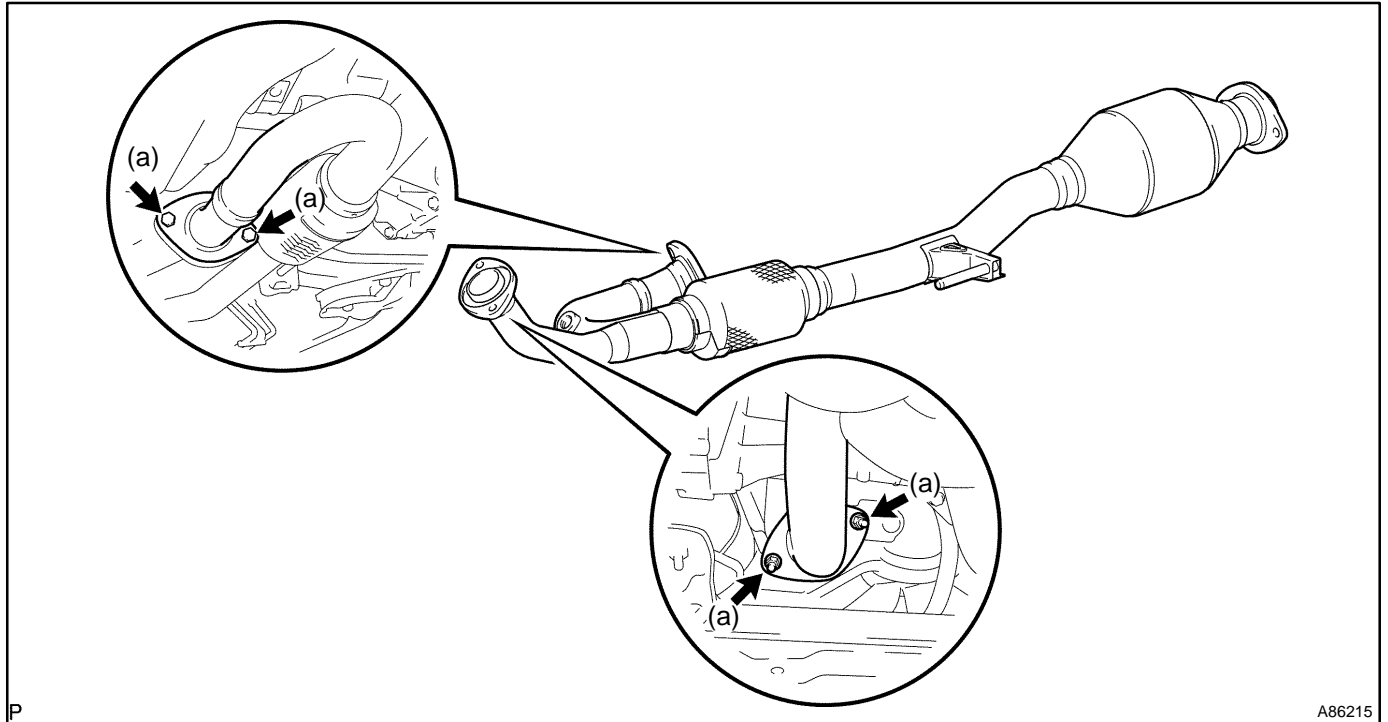
**8. REMOVE EXHAUST PIPE NO.1 SUPPORT BRACKET REAR**

- (a) Remove the 2 bolts.
- (b) Remove the exhaust pipe No. 1 support bracket rear from the exhaust pipe front.

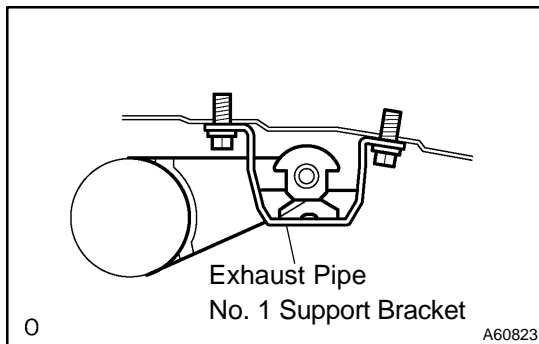


**9. REMOVE EXHAUST PIPE ASSY FRONT**

- (a) Remove the 2 bolts and 2 nuts, then remove the exhaust pipe front and 2 gaskets.

**10. INSTALL EXHAUST PIPE ASSY FRONT**

- (a) Install 2 new gaskets and the exhaust pipe front with the 2 bolts.  
**Torque: 62 N·m (633 kgf·cm, 46 ft·lbf)**
- (b) Tighten 2 new nuts.  
**Torque: 62 N·m (633 kgf·cm, 46 ft·lbf)**

**11. INSTALL EXHAUST PIPE NO.1 SUPPORT BRACKET REAR**

**Torque: 33 N·m (337 kgf·cm, 24 ft·lbf)**

**HINT:**

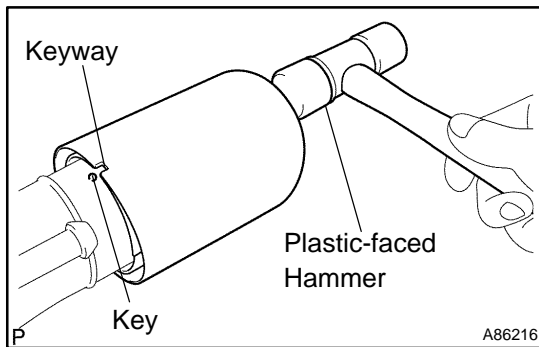
Be careful not to install the exhaust pipe No. 1 support bracket rear in the wrong direction.

**12. INSTALL EXHAUST PIPE NO.1 SUPPORT BRACKET FRONT**

**Torque: 33 N·m (337 kgf·cm, 24 ft·lbf)**

**13. INSTALL EXHAUST PIPE ASSY CENTER**

- (a) Install a new gasket and the exhaust pipe center to the 2 exhaust pipe supports.
- (b) Tighten the 2 bolts and 2 new nuts.  
**Torque: 56 N·m (574 kgf·cm, 41 ft·lbf)**

**14. INSTALL TAIL PIPE BAFFLE**

- (a) Align the keyway of the tail pipe baffle with the key on the exhaust pipe tail.
- (b) Using a plastic-faced hammer, tap the tail pipe baffle to install.

**15. INSTALL EXHAUST PIPE ASSY TAIL**

- (a) Install a new gasket and the exhaust pipe tail to the 3 exhaust pipe supports.
- (b) Tighten the 2 new nuts.

**Torque: 56 N·m (574 kgf·cm, 41 ft·lbf)**

**16. INSTALL HEATED OXYGEN SENSOR (See page 12-24 )**

SST 09224-00010

**17. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)**

**Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)**

**18. CHECK FOR EXHAUST GAS LEAKS****19. INSTALL FLOOR PANEL BRACE REAR**

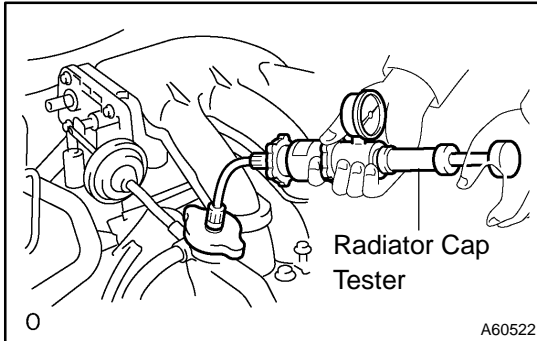
**Torque: 20 N·m (199 kgf·cm, 14 ft·lbf)**

**20. SYSTEM INITIALIZATION (See page 19-15 )**

# COOLING SYSTEM (3MZ-FE)

## ON-VEHICLE INSPECTION

160QB-01



### 1. INSPECT COOLING SYSTEM FOR LEAKS

- (a) Remove the water outlet cap.

#### CAUTION:

**To avoid the danger of being burned, do not remove the water outlet cap while the engine and radiator are still hot. Thermal expansion will cause hot engine coolant and steam to blow out from the radiator.**

- (b) Fill the radiator with coolant, then attach a radiator cap tester.
- (c) Warm up the engine.
- (d) Pump it to 118 kPa (1.2 kgf/cm<sup>2</sup>, 17.1 psi), then check that the pressure does not drop.

If the pressure drops, check the hoses, radiator and water pump for leaks. If there are no signs or traces of external coolant leaks, check the heater core, cylinder block and head.

- (e) Reinstall the water outlet cap.

### 2. CHECK ENGINE COOLANT LEVEL AT RESERVOIR

- (a) The engine coolant should be between the "LOW" and "FULL" lines when the engine is cold. If low, check for leaks and add "Toyota Super Long Life Coolant" or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology up to the "FULL" line.

### 3. CHECK ENGINE COOLANT QUALITY

- (a) Remove the water outlet cap.

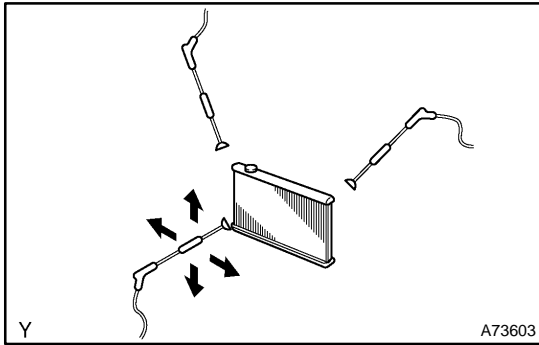
#### CAUTION:

**To avoid the danger of being burned, do not remove the water outlet cap while the engine and radiator are still hot. Thermal expansion will cause hot engine coolant and steam to blow out from the radiator.**

- (b) Check if there are any excessive deposits of rust or scale around the water outlet cap and water outlet filler hole; the coolant should be free of oil.

If excessively dirty, replace the coolant.

- (c) Reinstall the water outlet cap.

**4. INSPECT FIN BLOCKAGE**

- (a) If the fins are clogged, wash them with water or a steam cleaner, then dry with compressed air.

**NOTICE:**

- If the distance between the steam cleaner and core is too close, there is a possibility of damaging the fins, so keep the following injection distance.

Injection Pressure kPa (kgf/cm <sup>2</sup> , psi)	Injection Distance mm (in.)
2,942 to 4,903 (30 to 50, 427 to 711)	300 (11.811)
4,903 to 7,845 (50 to 80, 711 to 1,138)	500 (19.685)

- If the fins are bent, straighten them with a screwdriver or pliers.
- Be careful not to expose electronic components to water.

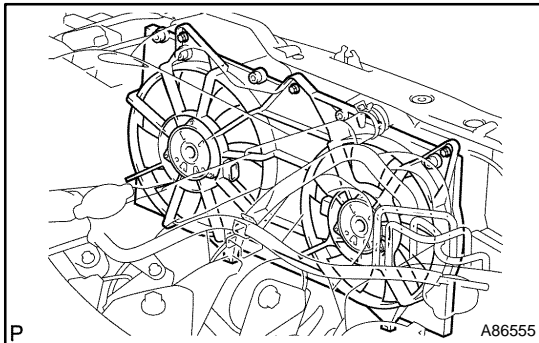
# COOLING FAN SYSTEM (3MZ-FE)

## ON-VEHICLE INSPECTION

160QD-01

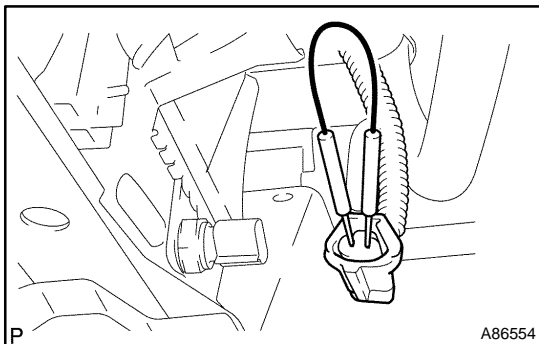
### 1. CHECK COOLING FAN OPERATION AT LOW TEMPERATURE (Below 83°C (181°F))

(a) Turn the ignition switch ON.

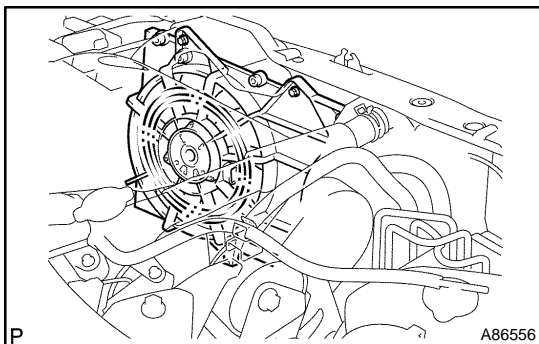


(b) Check that the fan and fan No. 2 stops.  
If not, check the cooling fan relays and temperature detect switches.

(c) Disconnect the temperature detect switch connector.



(d) Connect the terminals of the temperature detect switch wire connector.

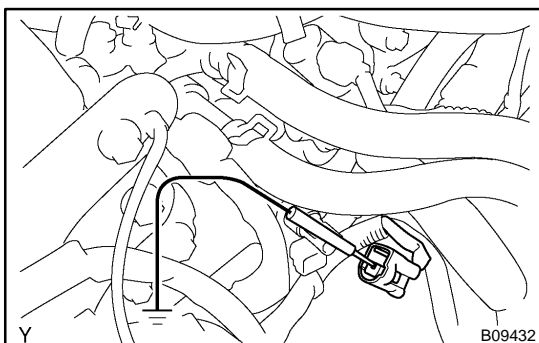


(e) Check that the fan rotates at high speed.

If not, check the cooling fan relay and fan.

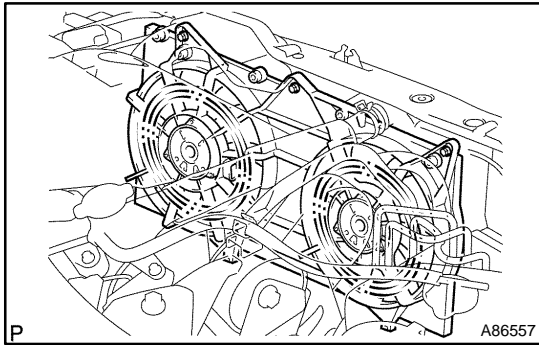
(f) Reconnect the temperature detect switch connector.

(g) Disconnect the temperature detect switch No. 2 connector.

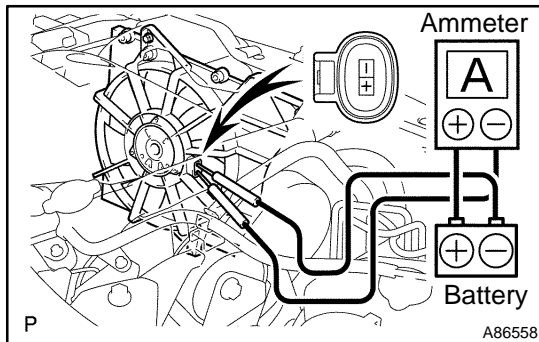


(h) Ground the terminal on the temperature detect switch No. 2 wire harness side connector.



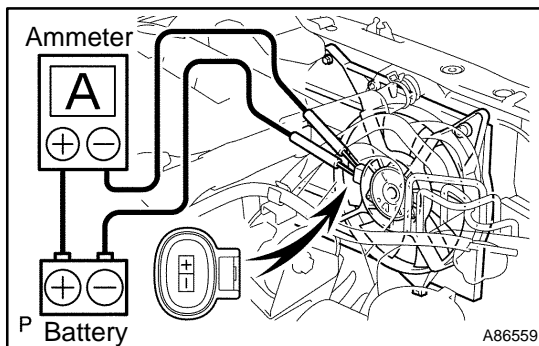


- (i) Check that the fan and fan No. 2 rotates at low speed. If not, check the cooling fan relay No. 2, cooling fan relay No. 3 and No. 2 fan.
- (j) Reconnect the temperature detect switch No. 2 connector.



## 2. INSPECT FAN

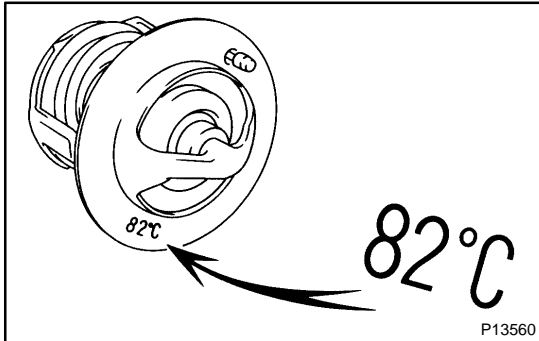
- (a) Disconnect the fan connector.
- (b) Connect battery and ammeter to the fan connector.
- (c) Check that the fan rotates smoothly, then check the reading on the ammeter.  
**Standard amperage: 10.2 to 16.2 A at 20°C (68°F)**
- (d) Reconnect the fan connector.



## 3. INSPECT NO. 2 FAN

- (a) Disconnect the No. 2 fan connector.
- (b) Connect the battery and ammeter to the No. 2 fan connector.
- (c) Check that the No. 2 fan rotates smoothly, then check the reading on the ammeter.  
**Standard amperage: 10.2 to 16.2 A at 20°C (68°F)**
- (d) Reconnect the No. 2 fan connector.

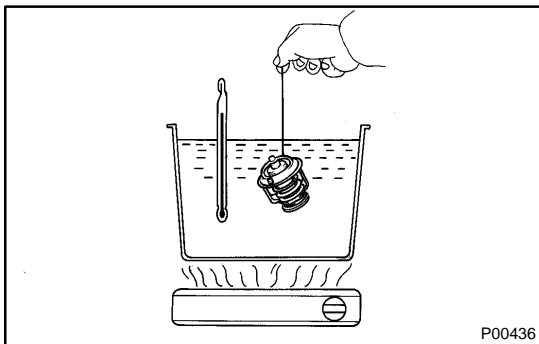
# INSPECTION



## 1. INSPECT THERMOSTAT

### HINT:

The thermostat is inscribed with the valve opening temperature.



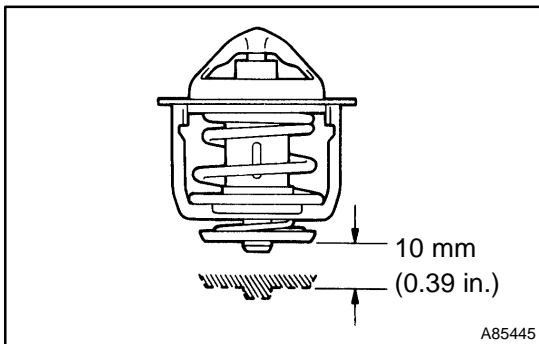
(a) Immerse the thermostat in water, then gradually heat the water.

(b) Inspect the valve opening temperature of the thermostat.

### Valve opening temperature:

**80 to 84°C (176 to 183°F)**

If the valve opening temperature is not as specified, replace the thermostat.



(c) Inspect the valve lift.

**Valve lift: 10 mm (0.39 in.) or more at 95°C (203°F)**

If the valve lift is not as specified, replace the thermostat.

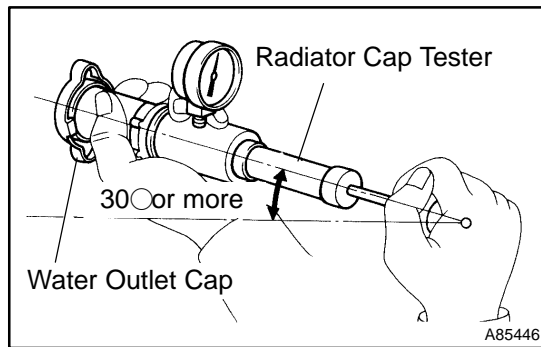
(d) Check that the valve is fully closed when the thermostat is at low temperature (below 77°C (171°F)).

If not fully closed, replace the thermostat.

## 2. INSPECT WATER OUTLET CAP SUB-ASSY

### NOTICE:

- If the water outlet cap is contaminated, rinse it with water.
- Before using a radiator cap tester, wet the relief valve and pressure valve with engine coolant or water.
- When performing the following steps (a) and (b), keep the tester at an angle of over 30° above horizontal.



- (a) Using a radiator cap tester, slowly pump the tester and check that air is coming from the vacuum valve.

**Pump speed: 1 push / 3 seconds or more**

**NOTICE:**

**Push the pump at a constant speed.**

If air is not coming from the vacuum valve, replace the water outlet cap.

- (b) Pump the tester, then measure the relief valve opening pressure.

**Pump speed: 1 push within 1 second**

**NOTICE:**

**The above pump speed is for the first pump only (in order to close the vacuum valve). After the first pump, the pump speed can be reduced.**

**Standard opening pressure:**

**83 to 113 kPa (0.85 to 1.15 kgf/cm<sup>2</sup>, 12.1 to 16.4 psi)**

**Minimum opening pressure:**

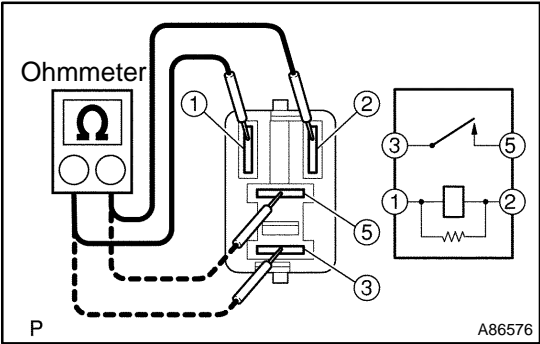
**69 kPa (0.7 kgf/cm<sup>2</sup>, 10.0 psi)**

**HINT:**

Use the tester's maximum reading as the opening pressure.

If the opening pressure is less than minimum, replace the water outlet cap.

INSPECTION



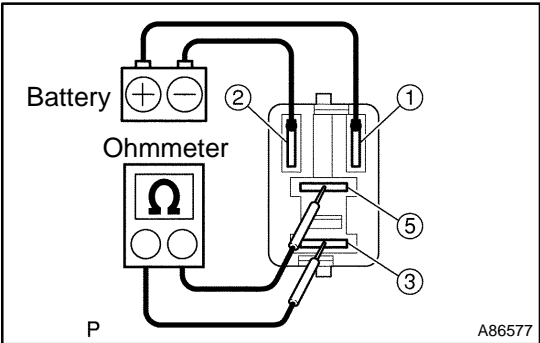
1. INSPECT COOLING FAN RELAY

- (a) Check the continuity.
- (1) Using an ohmmeter, check for continuity between the terminals.

Standard:

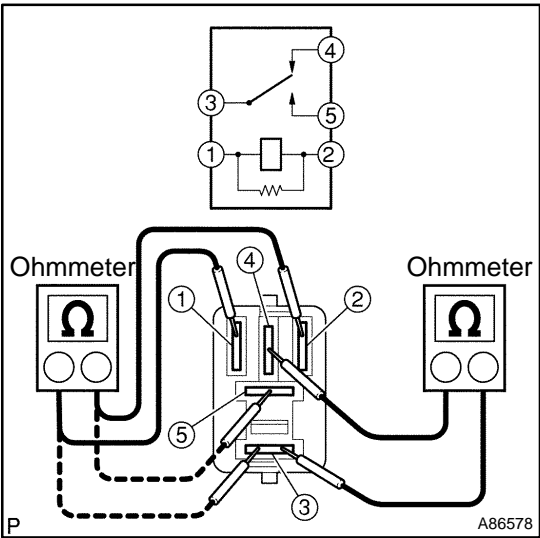
Tester Connection	Specified Condition
1 - 2	Continuity
3 - 5	No continuity

If the result is not as specified, replace the cooling fan relay.



- (b) Check the operation.
- (1) Apply battery positive voltage across terminals 1 and 2.
- (2) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the cooling fan relay.



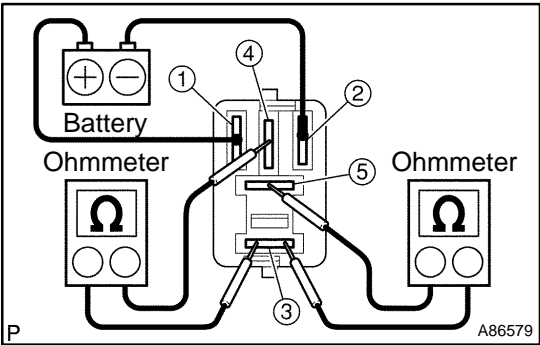
2. INSPECT COOLING FAN RELAY NO.2

- (a) Check the continuity.
- (1) Using an ohmmeter, check for continuity between the terminals.

Standard:

Tester Connection	Specified Condition
1 - 2	Continuity
3 - 4	Continuity
3 - 5	No continuity

If the result is not as specified, replace the cooling fan relay.

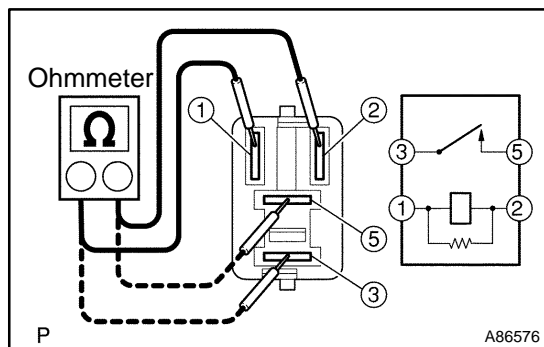


- (b) Check the operation.
- (1) Apply battery positive voltage across terminals 1 and 2.
- (2) Using an ohmmeter, check that there is no continuity between terminals 3 and 4.

If there is continuity, replace the cooling fan relay.

- (3) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the cooling fan relay.



### 3. INSPECT COOLING FAN RELAY NO.3

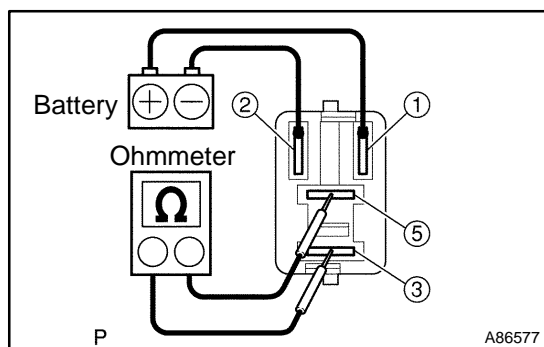
(a) Check the continuity.

- (1) Using an ohmmeter, check for continuity between the terminals.

**Standard:**

Tester Connection	Specified Condition
1 - 2	Continuity
3 - 5	No continuity

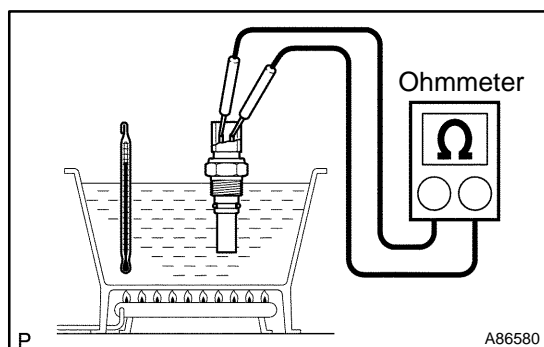
If the result is not as specified, replace the cooling fan relay.



(b) Check the operation.

- (1) Apply battery positive voltage across terminals 1 and 2.  
 (2) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the cooling fan relay.



### 4. INSPECT TEMPERATURE DETECT SWITCH

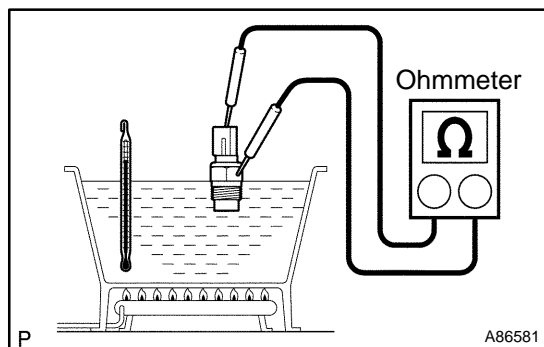
(a) Check the continuity.

- (1) Using an ohmmeter, check for continuity between the terminals.

**Standard:**

Coolant Temperature	Specified Condition
Above 98°C (208°F)	Continuity
Below 88°C (190°F)	No continuity

If the result is not as specified, replace the temperature detect switch.



### 5. INSPECT TEMPERATURE DETECT SWITCH NO.2

(a) Check the continuity.

- (1) Using an ohmmeter, check for continuity between the terminals.

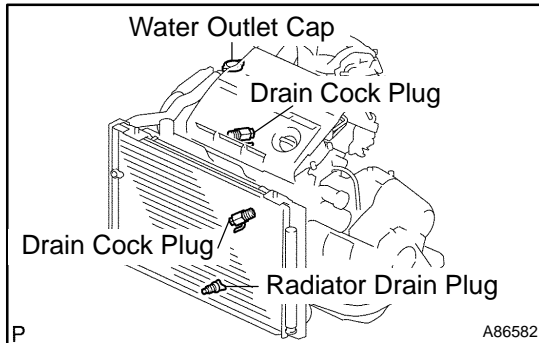
**Standard:**

Coolant Temperature	Specified Condition
Above 93°C (199°F)	Continuity
Below 83°C (181°F)	No continuity

If the result is not as specified, replace the temperature detect switch.

# ENGINE COOLANT (3MZ-FE) REPLACEMENT

160QF-01



## 1. DRAIN ENGINE COOLANT

- (a) Remove the water outlet cap from the water outlet.

### CAUTION:

**To avoid the danger of being burned, do not remove the water outlet cap while the engine and radiator are still hot. Thermal expansion will cause hot engine coolant and steam to blow out from the radiator.**

- (b) Loosen the radiator drain plug and 2 drain cock plugs, then drain the coolant.  
 (c) Close the radiator drain plug.  
 (d) Tighten the 2 drain cock plugs.

**Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)**

## 2. ADD ENGINE COOLANT

- (a) Slowly fill the cooling system with coolant.

**Capacity: 9.2 liters (9.7 US qts, 8.1 Imp. qts)**

### HINT:

- Use of improper coolants may damage the engine cooling system.
- Use "Toyota Super Long Life Coolant" or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology.
- New Toyota vehicles are filled with Toyota Super Long Life Coolant (color is pink, premixed ethylene-glycol concentration is approximately 50% and freezing temperature is -35°C (-31°F)). When replacing the coolant, Toyota Super Long Life Coolant is recommended.
- Observe the coolant level inside the radiator by pressing the inlet and outlet radiator hoses several times by hand. If the coolant level goes down, add the coolant.

### NOTICE:

**Do not use plain water alone.**

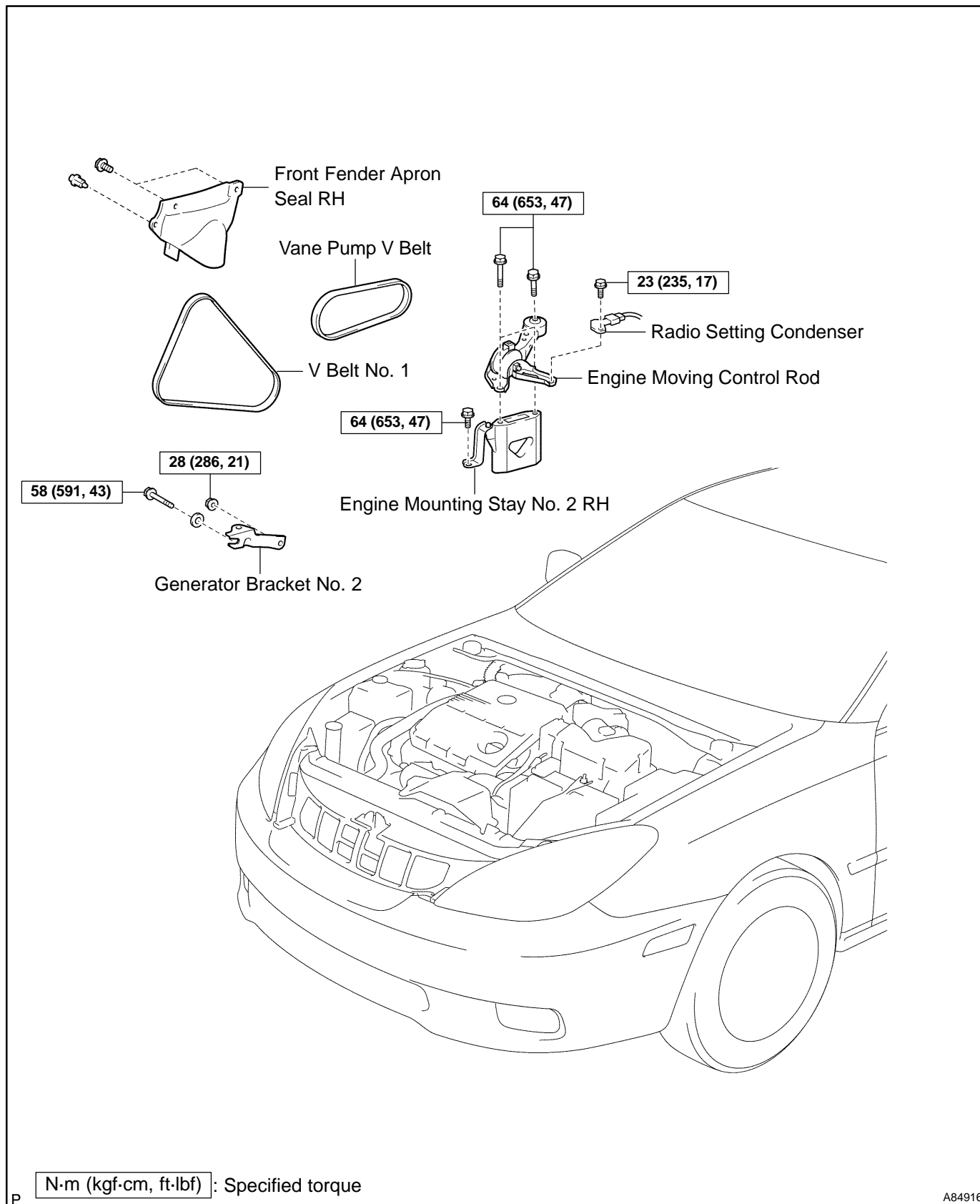
## 3. CHECK FOR ENGINE COOLANT LEAKS

- (a) Fill the radiator with coolant, then attach a radiator cap tester.  
 (b) Pump it to 118 kPa (1.2 kgf/cm<sup>2</sup> 17.1 psi), then check for leakage.

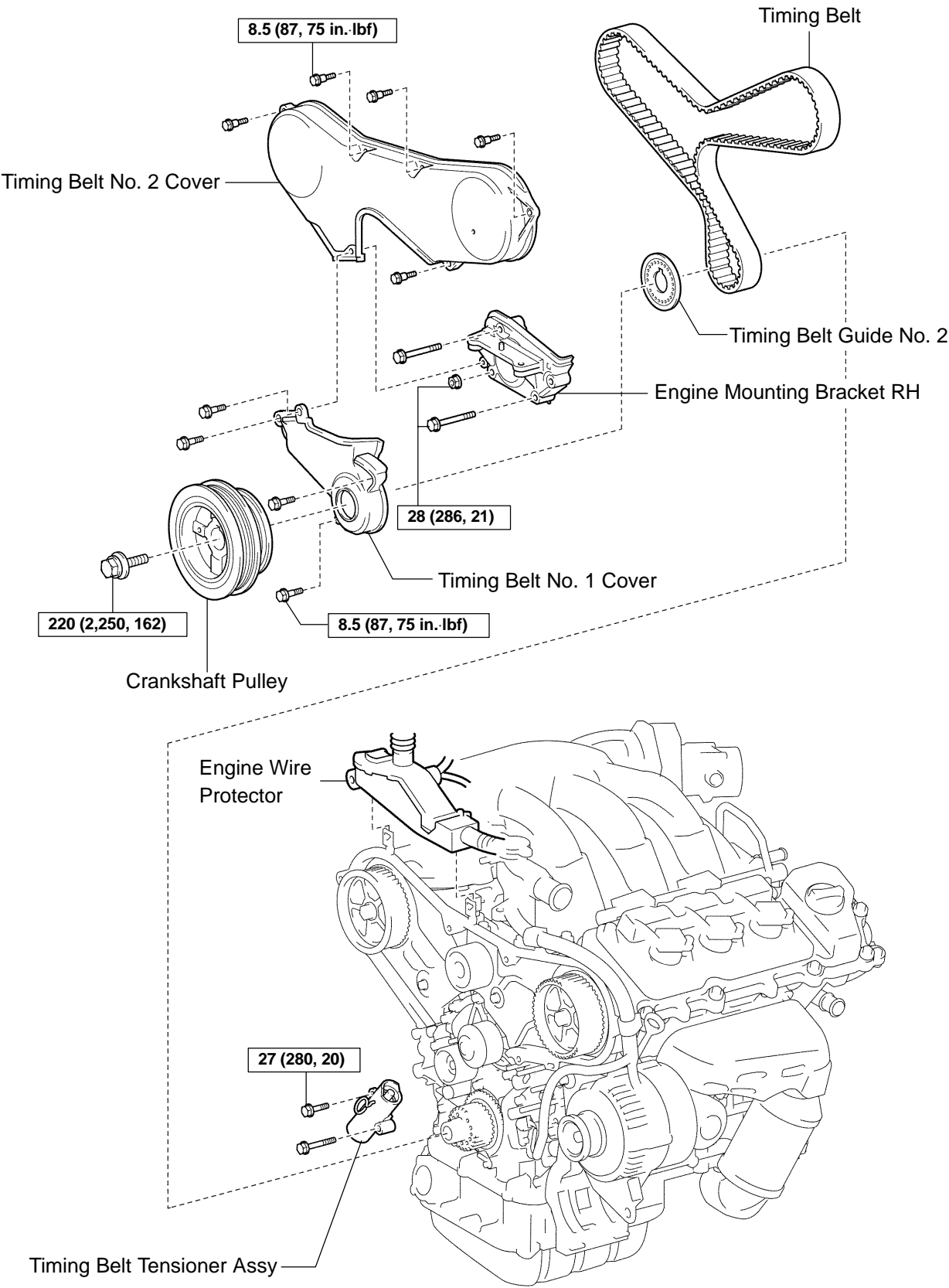
# WATER PUMP ASSY (3MZ-FE)

## COMPONENTS

160QG-01



A84916

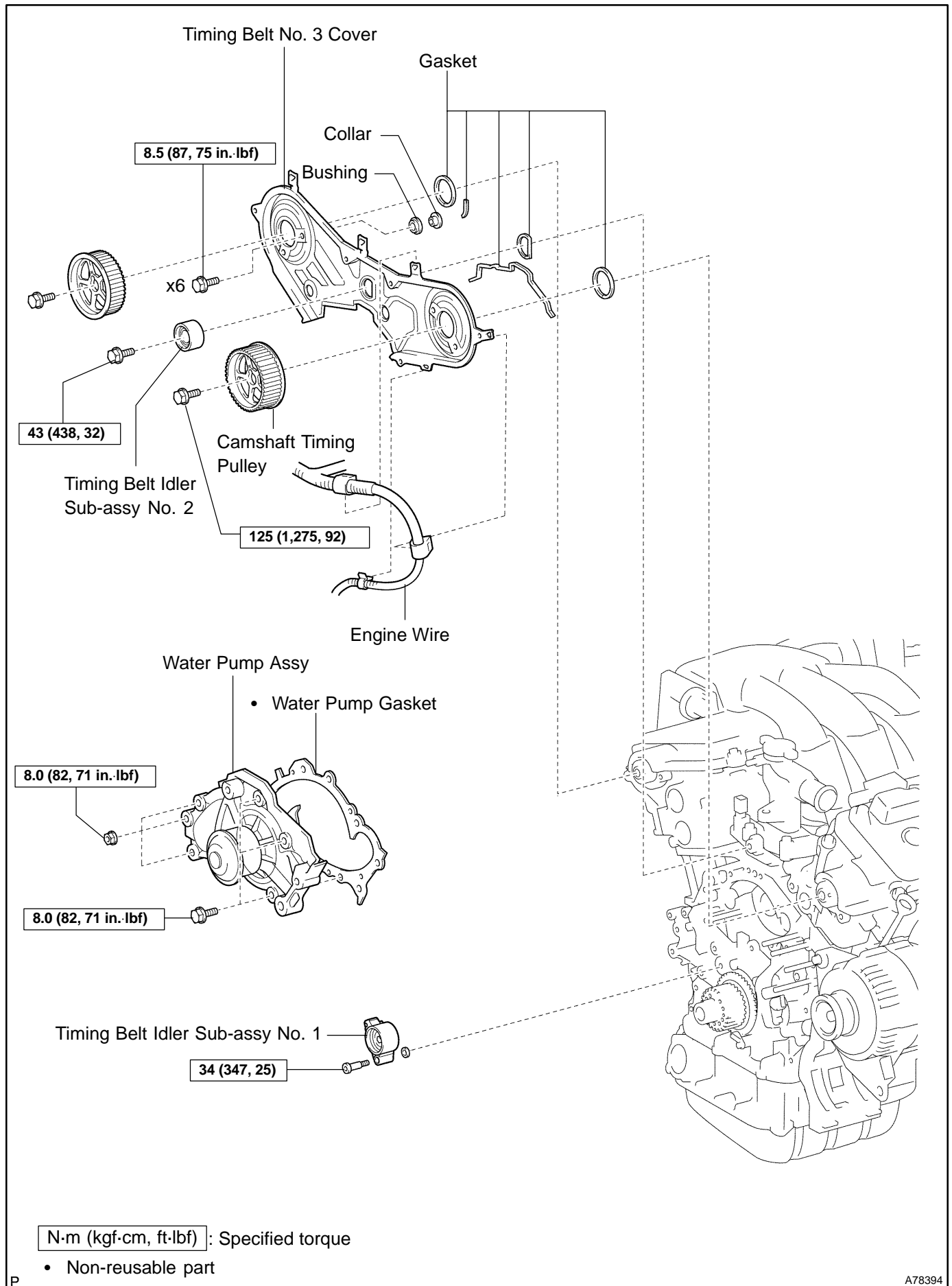


N·m (kgf·cm, ft·lbf) : Specified torque

P

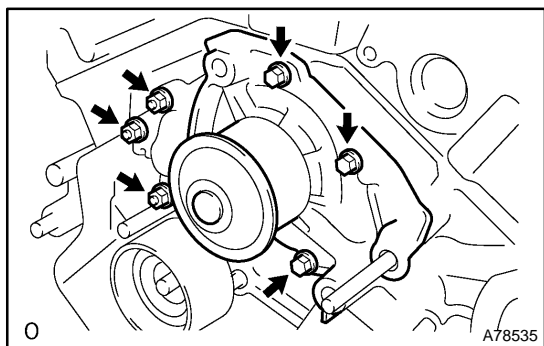
A78353





## REPLACEMENT

1. DRAIN ENGINE COOLANT (See page 16-9 )
2. REMOVE FRONT WHEEL RH
3. REMOVE FRONT FENDER APRON SEAL RH
4. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1  
(See page 14-5 )
5. REMOVE VANE PUMP V BELT (See page 14-5 )
6. REMOVE ENGINE MOVING CONTROL ROD (See page 14-79 )
7. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14-79 )
8. REMOVE GENERATOR BRACKET NO.2 (See page 14-79 )
9. REMOVE CRANKSHAFT PULLEY (See page 14-79 )  
SST 09213-54015 (91651-60855), 09330-00021, 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)
10. REMOVE TIMING BELT NO.1 COVER
11. REMOVE TIMING BELT NO.2 COVER (See page 14-79 )
12. REMOVE ENGINE MOUNTING BRACKET RH (See page 14-79 )
13. REMOVE TIMING BELT GUIDE NO.2
14. REMOVE TIMING BELT (See page 14-79 )
15. REMOVE TIMING BELT IDLER SUB-ASSY NO.2
16. REMOVE CAMSHAFT TIMING PULLEY (See page 14-93 )  
SST 09960-10010 (09962-01000, 09963-01000), 09249-63010
17. REMOVE TIMING BELT NO.3 COVER (See page 14-93 )
18. 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.



### 19. REMOVE WATER PUMP ASSY

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

### 20. 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)**

### 21. 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 (347 kgf·cm, 25 ft·lbf)**

### 22. INSTALL TIMING BELT NO.3 COVER (See page 14-93 )

### 23. INSTALL CAMSHAFT TIMING PULLEY (See page 14-93 )

SST 09960-10010 (09962-01000, 09963-01000), 09249-63010

### 24. INSTALL TIMING BELT IDLER SUB-ASSY NO.2 (See page 14-93 )

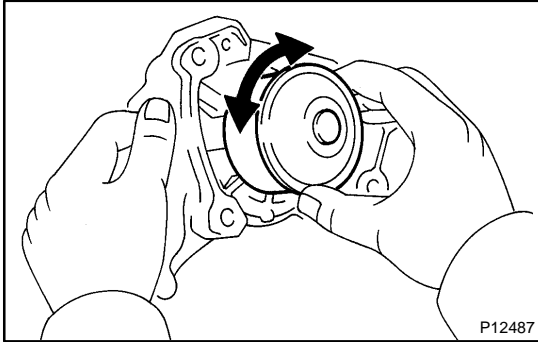
### 25. INSPECT TIMING BELT (See page 14-79 )

### 26. INSTALL TIMING BELT (See page 14-79 )

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

27. INSTALL TIMING BELT TENSIONER ASSY (See page 14-79 )
28. INSTALL TIMING BELT GUIDE NO.2 (See page 14-79 )
29. INSTALL ENGINE MOUNTING BRACKET RH (See page 14-79 )
30. INSTALL TIMING BELT NO.2 COVER (See page 14-79 )
31. INSTALL TIMING BELT NO.1 COVER (See page 14-79 )
32. INSTALL CRANKSHAFT PULLEY (See page 14-79 )  
SST 09213-54015 (91651-60855), 09330-00021
33. INSTALL GENERATOR BRACKET NO.2 (See page 14-79 )
34. INSTALL ENGINE MOUNTING STAY NO.2 RH (See page 14-79 )
35. INSTALL ENGINE MOVING CONTROL ROD (See page 14-79 )
36. INSTALL VANE PUMP V BELT (See page 14-5 )
37. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1  
(See page 14-5 )
38. INSPECT DRIVE BELT DEFLECTION AND TENSION (See page 14-1 )
39. INSTALL FRONT WHEEL RH (See page 14-5 )
40. ADD ENGINE COOLANT (See page 16-9 )
41. CHECK FOR ENGINE COOLANT LEAKS (See page 16-1 )

## INSPECTION



### 1. INSPECT WATER PUMP ASSY

- (a) Visually check the drain hole for coolant leakage.
- (b) Turn the pulley, then check that the water pump bearing moves smoothly without making a noise.

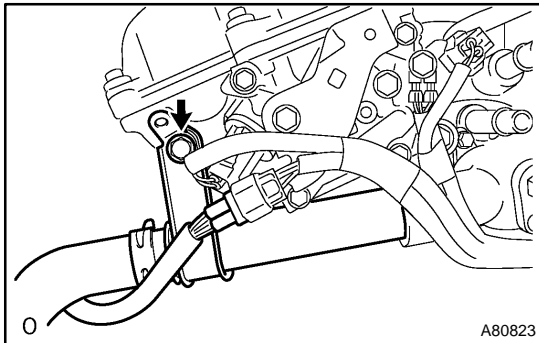
If not, replace the water pump.

# THERMOSTAT (3MZ-FE)

## REPLACEMENT

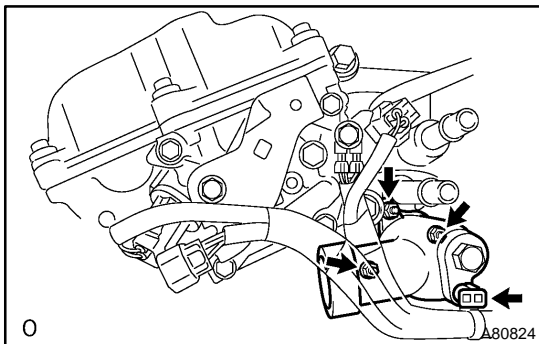
160QI-01

1. DISCONNECT BATTERY NEGATIVE TERMINAL
2. DRAIN ENGINE COOLANT (See page 16-9 )
3. REMOVE RADIATOR LOWER AIR DEFLECTOR (See page 19-5 )
4. REMOVE AIR CLEANER INLET ASSY (See page 19-5 )
5. REMOVE AIR CLEANER ASSY (See page 19-5 )



### 6. REMOVE WATER INLET PIPE

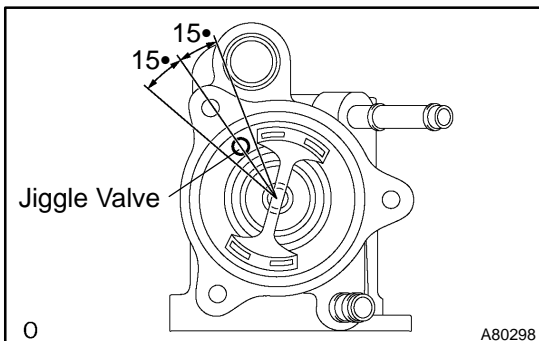
- (a) Remove the bolt and water inlet pipe.
- (b) Remove the O-ring from the water inlet pipe.



### 7. REMOVE WATER INLET

- (a) Disconnect the wire harness clamp.
- (b) Remove the 3 nuts and water inlet.

### 8. REMOVE THERMOSTAT



### 9. INSTALL THERMOSTAT

- (a) Install a new gasket to the thermostat.
- (b) Align the thermostat jiggle valve with the upper stud bolt, then insert the thermostat in the water inlet housing.

#### HINT:

The jiggle valve may be set within 15 • of either side of the prescribed position.

### 10. INSTALL WATER INLET

**Torque: 8.0 N·m (82 kgf·cm, 71 in.-lbf)**

**11. INSTALL WATER INLET PIPE**

- (a) Install a new O-ring to the water inlet pipe.
- (b) Apply soapy water to the O-ring.
- (c) Connect the water inlet pipe to the water inlet.
- (d) Install the bolt which is used to fix the water inlet pipe to the cylinder head.

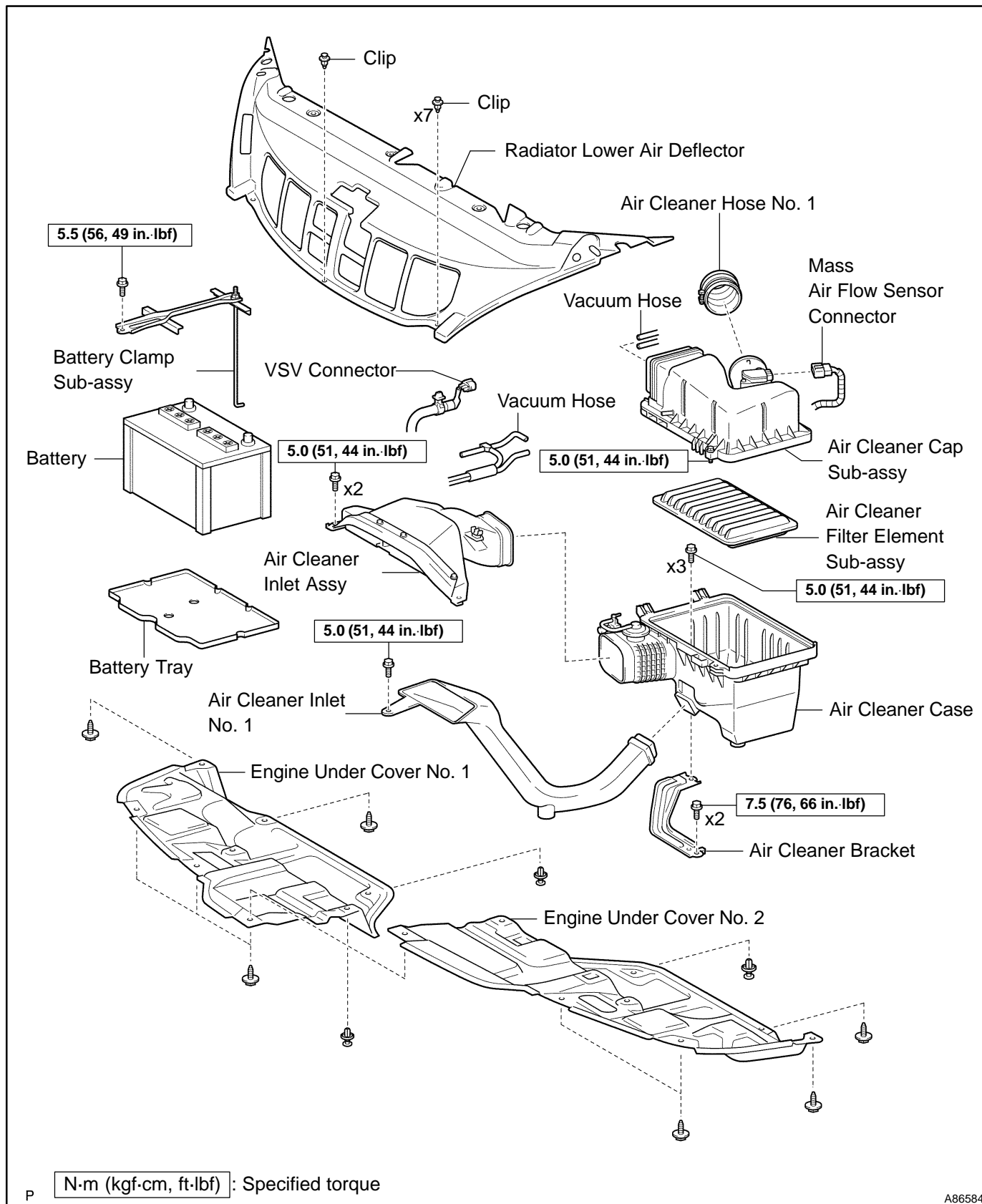
**Torque: 20 N·m (199 kgf·cm, 14 ft·lbf)**

**12. INSTALL AIR CLEANER ASSY (See page 19-5 )****13. INSTALL AIR CLEANER INLET ASSY (See page 19-5 )****14. CHECK CONNECTION OF VACUUM HOSE (See page 14-29 )****15. ADD ENGINE COOLANT (See page 16-9 )****16. CHECK FOR ENGINE COOLANT LEAKS (See page 16-1 )**

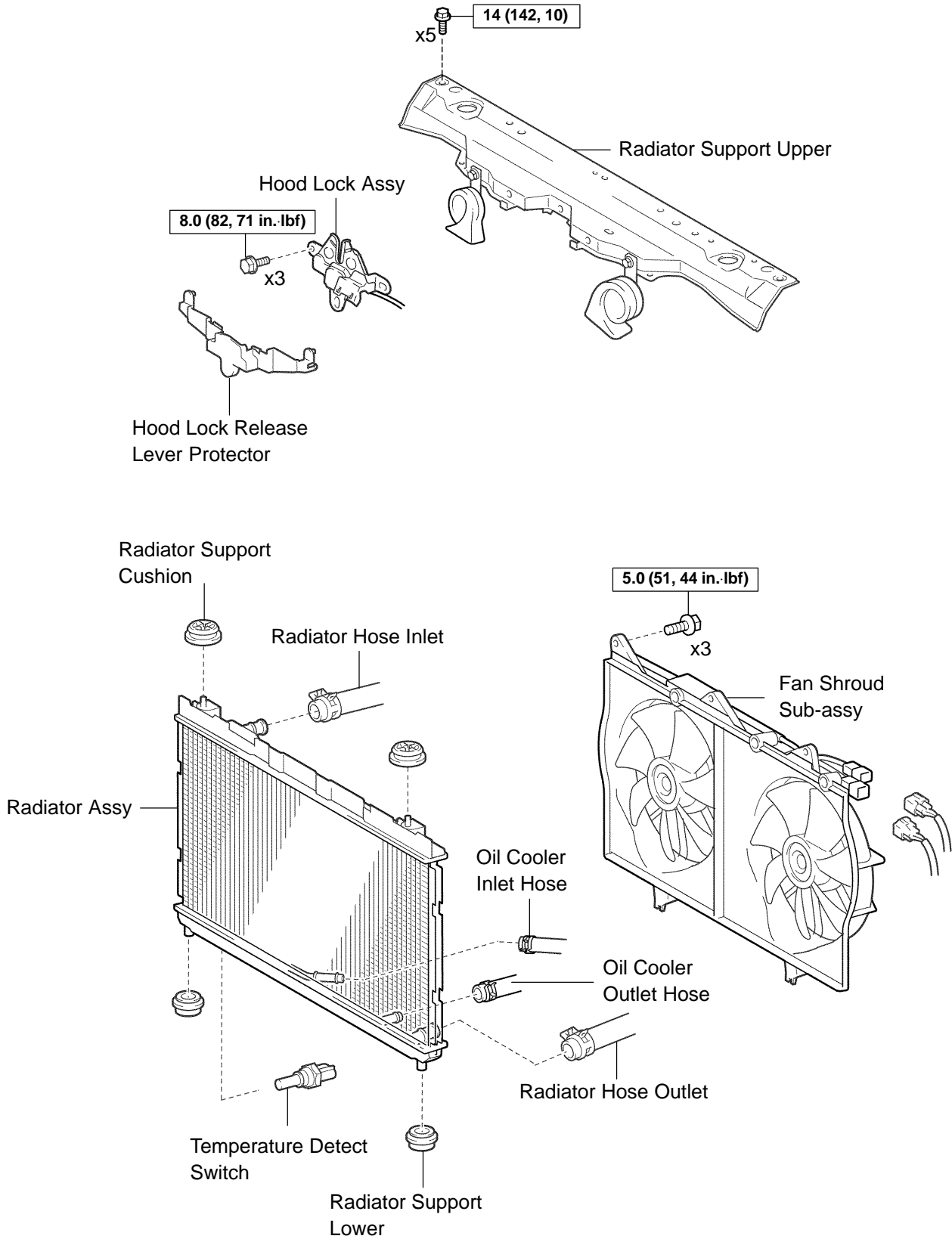
# RADIATOR ASSY (3MZ-FE)

## COMPONENTS

160QJ-01



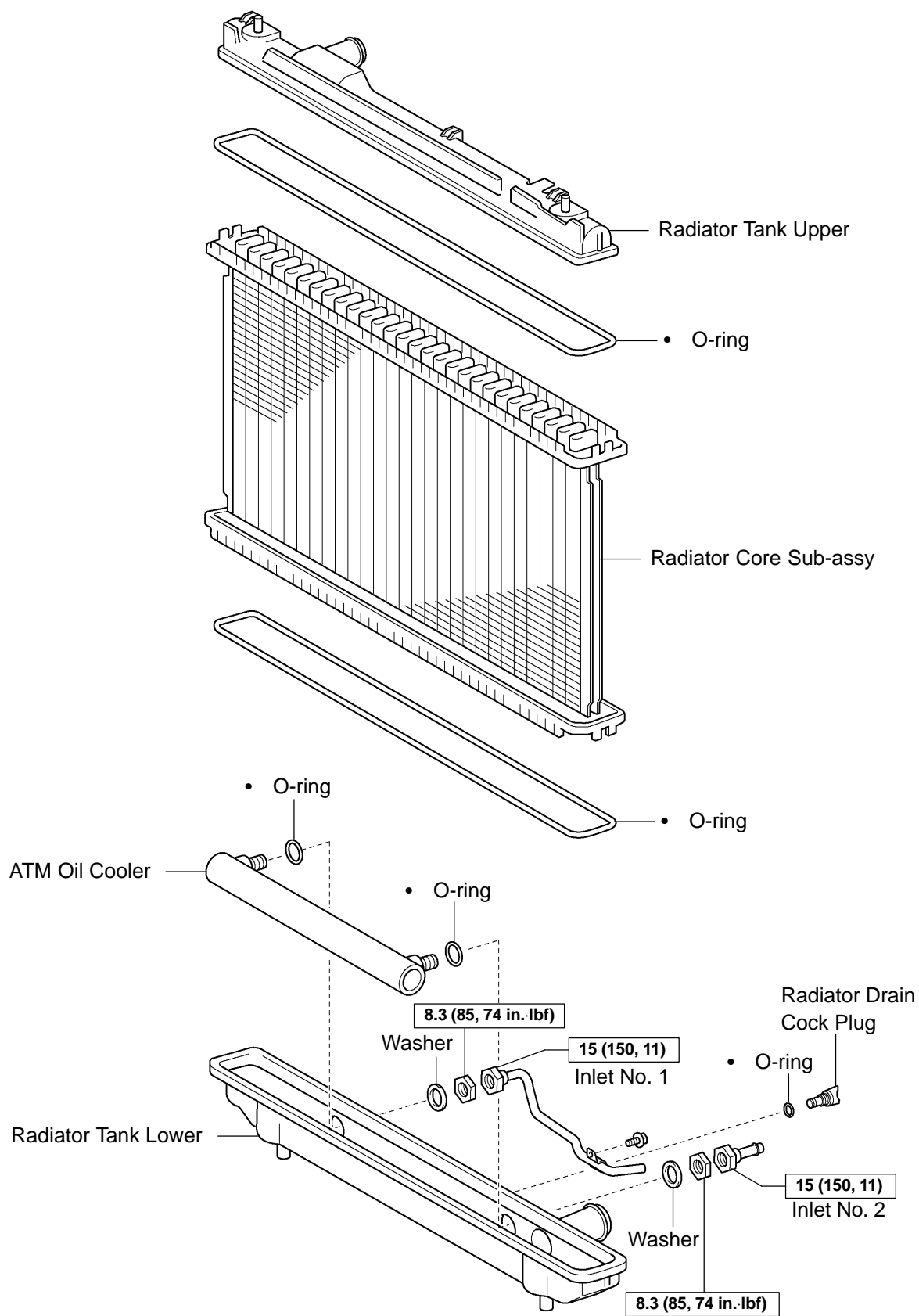
A86584



N·m (kgf·cm, ft·lbf) : Specified torque

A86585





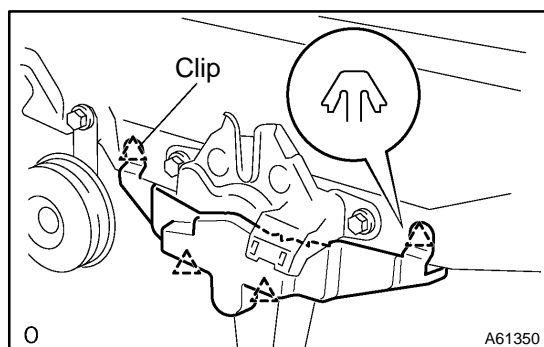
N·m (kgf·cm, ft·lbf) : Specified torque

γ • Non-reusable part

A86586

## REPLACEMENT

1. DISCONNECT BATTERY NEGATIVE TERMINAL
2. DRAIN ENGINE COOLANT (See page 16-9 )
3. REMOVE ENGINE UNDER COVER NO.1
4. REMOVE ENGINE UNDER COVER NO.2
5. REMOVE RADIATOR LOWER AIR DEFLECTOR (See page 19-5 )
6. REMOVE BATTERY
7. REMOVE BATTERY TRAY
8. REMOVE AIR CLEANER INLET ASSY (See page 19-5 )
9. REMOVE AIR CLEANER ASSY (See page 19-5 )
10. REMOVE AIR CLEANER BRACKET (See page 19-5 )
11. REMOVE AIR CLEANER INLET NO.1 (See page 19-5 )
12. DISCONNECT RADIATOR HOSE INLET
13. DISCONNECT RADIATOR HOSE OUTLET
14. DISCONNECT OIL COOLER INLET HOSE
15. DISCONNECT OIL COOLER OUTLET HOSE

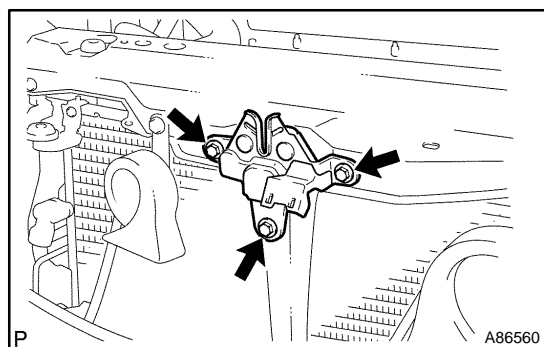


### 16. REMOVE HOOD LOCK RELEASE LEVER PROTECTOR

- (a) Using a screwdriver with the tip wrapped in tape, remove the protector.

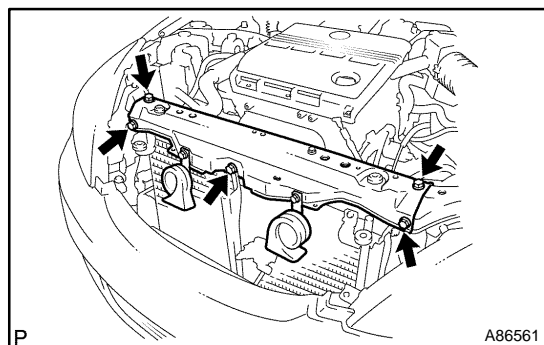
#### NOTICE:

Removing the protector damages the clips inside the protector, therefore it is necessary to use a new protector when installing.



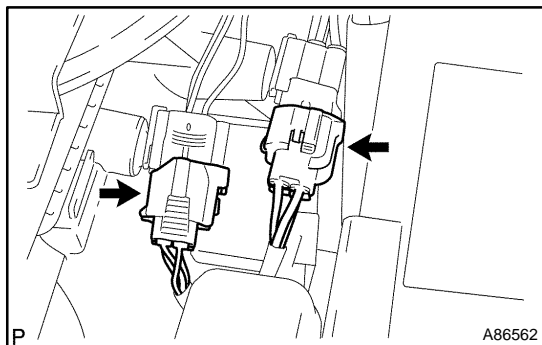
### 17. SEPARATE HOOD LOCK ASSY

- (a) Disconnect the hood switch connector.
- (b) Remove the 3 bolts, then separate the hood lock.



### 18. REMOVE RADIATOR SUPPORT UPPER

- (a) Disconnect the horn connectors.
- (b) Remove the 5 bolts, then remove the radiator support upper.

**19. REMOVE RADIATOR ASSY**

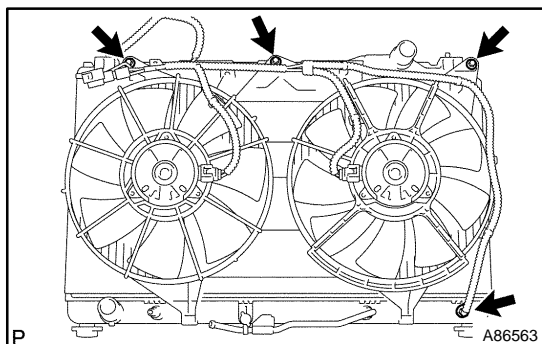
- (a) Disconnect the 2 wire harness connectors.
- (b) Remove the radiator from the vehicle.

**20. REMOVE RADIATOR SUPPORT CUSHION**

- (a) Remove the 2 radiator support cushions from the radiator.

**21. REMOVE RADIATOR SUPPORT LOWER**

- (a) Remove the 2 radiator support lowers from the radiator.

**22. REMOVE FAN SHROUD SUB-ASSY**

- (a) Disconnect the temperature detect switch connector.
- (b) Remove the 3 bolts, then remove the fan shroud with motor.

**23. REMOVE TEMPERATURE DETECT SWITCH****24. REPLACE RADIATOR ASSY****25. INSTALL FAN SHROUD SUB-ASSY**

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

**26. INSTALL RADIATOR SUPPORT UPPER**

Torque: 14 N·m (142 kgf·cm, 10 ft·lbf)

**27. INSTALL HOOD LOCK ASSY**

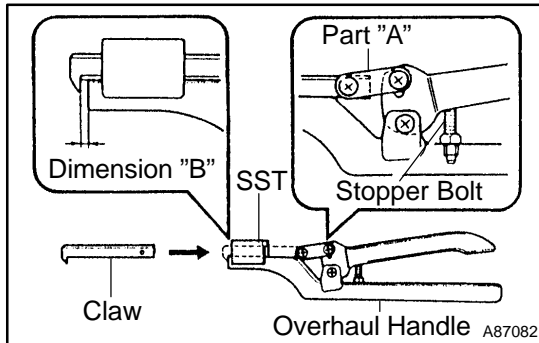
Torque: 8.0 N·m (82 kgf·cm, 71 in·lbf)

**28. INSTALL AIR CLEANER INLET NO.1 (See page 19-5 )****29. INSTALL AIR CLEANER BRACKET (See page 19-5 )****30. INSTALL AIR CLEANER ASSY (See page 19-5 )****31. INSTALL AIR CLEANER INLET ASSY (See page 19-5 )****32. CHECK CONNECTION OF VACUUM HOSE (See page 14-29 )****33. ADD ENGINE COOLANT (See page 16-9 )****34. CHECK FOR ENGINE COOLANT LEAKS (See page 16-1 )**

## OVERHAUL

### 1. REMOVE RADIATOR DRAIN COCK PLUG

- (a) Remove the drain cock plug.
- (b) Remove the O-ring from the drain cock plug.



### 2. ASSEMBLE SST

SST 09230-01010 (09231-01010, 09231-01030)

- (a) Install the claw to the overhaul handle by inserting it in the hole in part "A" as shown in the illustration.
- (b) While gripping the handle, adjust the stopper bolt so that dimension "B" is as shown in the illustration.

**Dimension "B": 0.2 to 0.3 mm (0.008 to 0.012 in)**

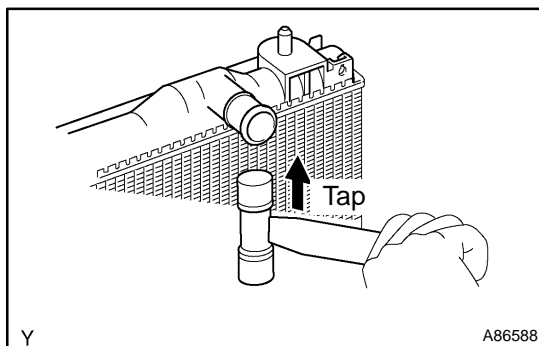
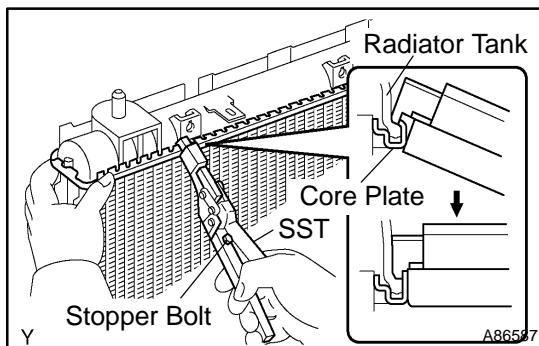
#### NOTICE:

**If the stopper bolt is not adjusted, the claw may be damaged.**

### 3. UNCAULK CORE PLATE

- (a) Using SST to release the core plate, grip the handle until stopped by the stopper bolt.

SST 09230-01010 (09231-01010, 09231-01030)



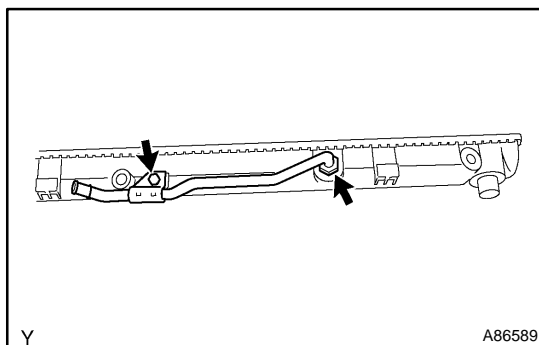
### 4. REMOVE RADIATOR TANK UPPER

- (a) Lightly tap the bracket of the radiator tank (or radiator tank pipe) with a soft-faced hammer, then remove the radiator tank.
- (b) Remove the O-ring.

### 5. REMOVE RADIATOR TANK LOWER

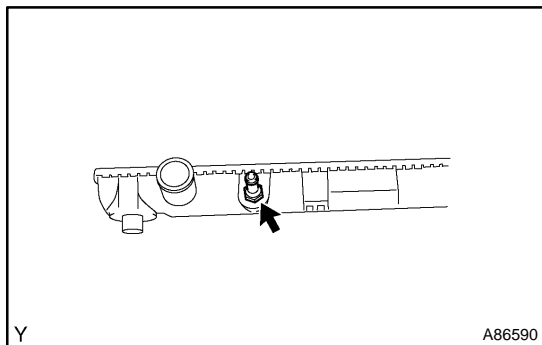
#### HINT:

Perform the same procedures as the radiator tank upper.

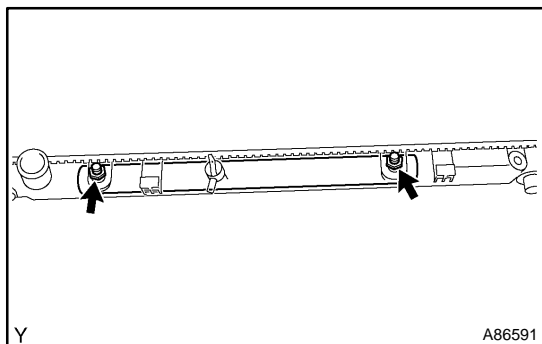


### 6. REMOVE INLET NO.1

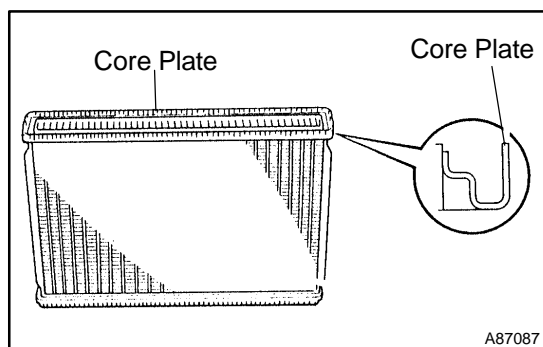
- (a) Remove the bolt.
- (b) Remove the nut and inlet No. 1.

**7. REMOVE INLET NO.2**

- (a) Remove the nut and inlet No. 2.

**8. REMOVE ATM OIL COOLER**

- (a) Remove the 2 nuts and 2 washers, then remove the oil cooler from the radiator tank.  
 (b) Remove the 2 O-rings from the oil cooler.

**9. INSPECT RADIATOR CORE SUB-ASSY**

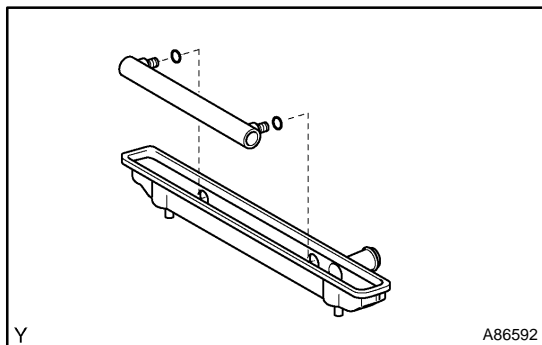
Check the core plate for damage.

**HINT:**

- If the sides of the core plate groove are deformed, it will be impossible to reassemble the radiator tank. Therefore, first correct any deformation with pliers or a similar tool.
- Water leakage will result if the bottom of the core plate groove is damaged or dented. Repair or replace if necessary.

**NOTICE:**

**The radiator can only be recaulked 2 times. After being recaulked 2 times, the radiator core must be replaced.**

**10. INSTALL ATM OIL COOLER**

- (a) Install the 2 new O-rings to the oil cooler.  
 (b) Install the oil cooler to the radiator tank.  
 (c) Install the 2 nuts and 2 washers.

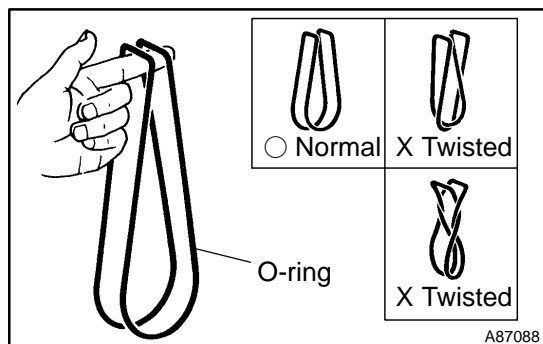
**Torque: 8.3 N·m (85 kgf·cm, 74 in.-lbf)**

**11. INSTALL INLET NO.2**

**Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)**

**12. INSTALL INLET NO.1**

**Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)**

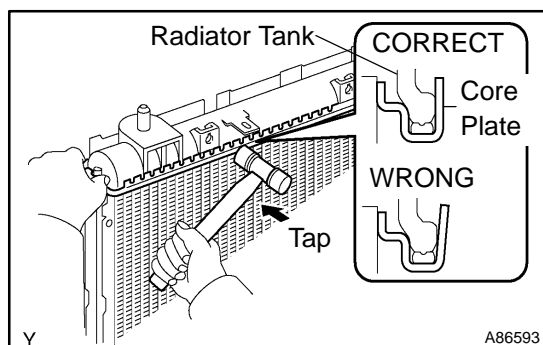


### 13. INSTALL RADIATOR TANK UPPER

- (a) After checking that there are no foreign objects in the core plate groove, install a new O-ring without twisting it.

HINT:

When cleaning the core plate groove, lightly rub it with sandpaper without scratching it.

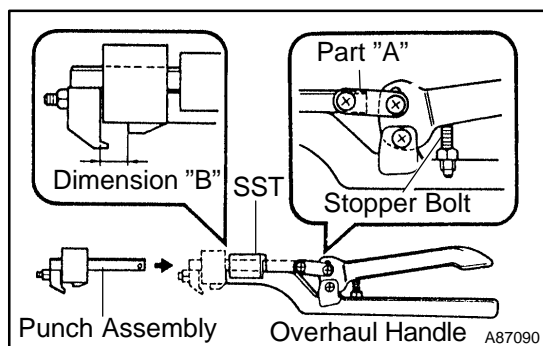


- (b) Install the radiator tank without damaging the O-ring.
- (c) Tap the core plate with a soft-faced hammer so that there is no gap between the core plate and radiator tank.

### 14. INSTALL RADIATOR TANK LOWER

HINT:

Perform the same procedures as the radiator tank upper.

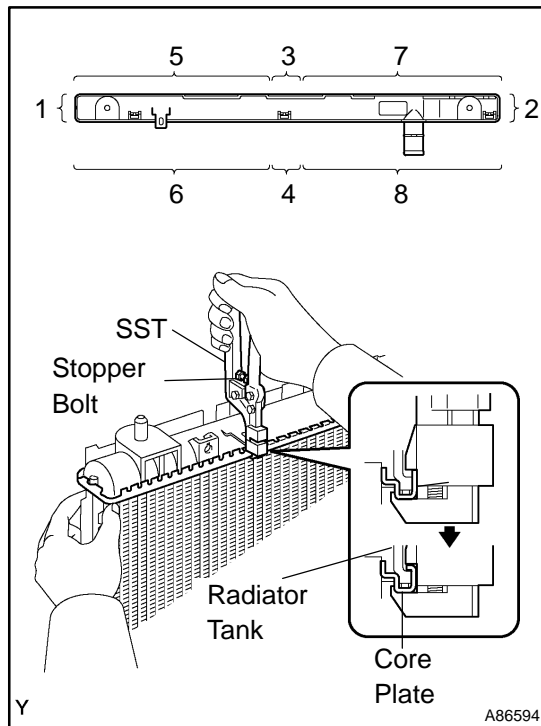


### 15. ASSEMBLE SST

SST 09230-01010 (09231-01010, 09231-01020)

- (a) Install the punch assembly to the overhaul handle by inserting it in the hole in part "A" as shown in the illustration.
- (b) While gripping the handle, adjust the stopper bolt so that dimension "B" is as shown in the illustration.

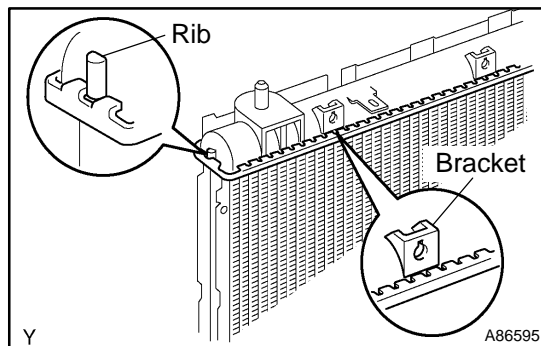
**Dimension "B": 8.4 mm (0.341 in.)**



## 16. CAULK CORE PLATE

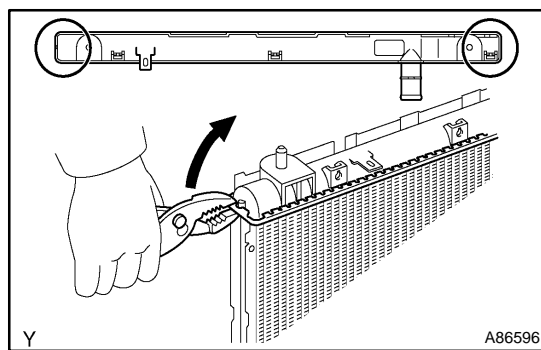
- (a) Lightly press SST against the core plate in the order shown in the illustration. After repeating this a few times, fully caulk the core plate by gripping the handle until stopped by the stopper bolt.

SST 09230-01010 (09231-01010, 09231-01020)

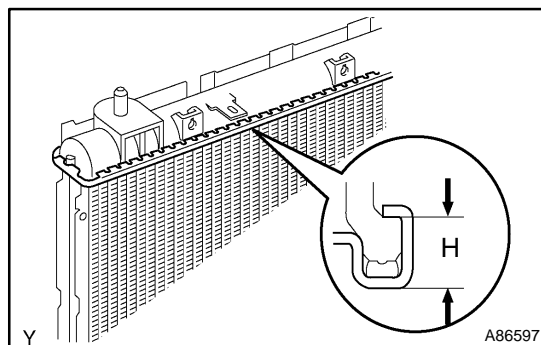


### HINT:

- Do not tap the areas protruding around the pipes, brackets or tank ribs.



- The points shown in the illustration and oil cooler near here cannot be tapped with the SST. Use pliers or a similar tool and be careful not to damage the core plate.



- (b) Check the core plate height (H) after completing the caulking.

**Plate height (H): 7.40 to 7.80 mm (0.2913 to 0.3071 in.)**

If the height is not as specified, adjust the stopper bolt of the handle again, then caulk again.

**17. INSTALL RADIATOR DRAIN COCK PLUG**

- (a) Install a new O-ring to the drain cock plug.
- (b) Install the drain cock plug.



# LUBRICATION SYSTEM (3MZ-FE)

170FZ-02

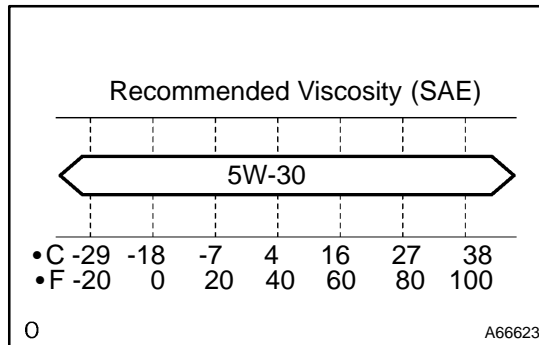
## ON-VEHICLE INSPECTION

### 1. CHECK ENGINE OIL LEVEL

- Warm up the engine, then stop the engine and wait for 5 minutes.
- Check that the engine oil level is between the low and full level marks on the level gage. If low, check for leakage and add oil up to the full level mark.

#### NOTICE:

Do not fill with engine oil above the full level mark.



### 2. CHECK ENGINE OIL QUALITY

- Check the oil for deterioration, water intrusion, discoloring or thinning.

If the quality is visibly poor, replace the oil.

#### Oil grade:

Use API grade SL "Energy-Conserving", or ILSAC multigrade engine oil.

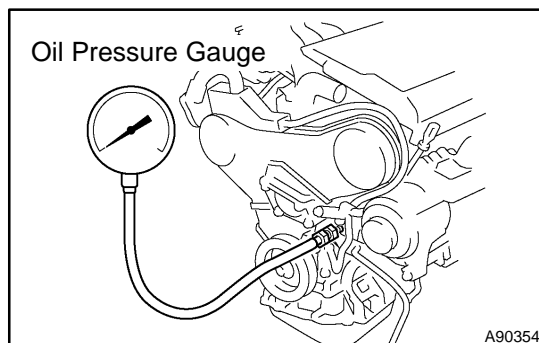
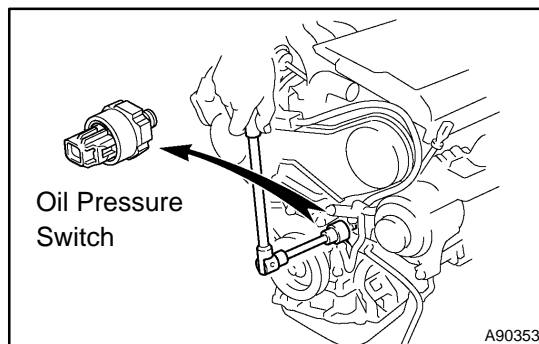
SAE 5W-30 is the best choice for good fuel economy, and good starting in cold weather.

If SAE 5W-30 is not available, SAE 10W-30 may be used.

However, it should be replaced with SAE 5W-30 at the next oil replacement.

### 3. INSPECT OIL PRESSURE

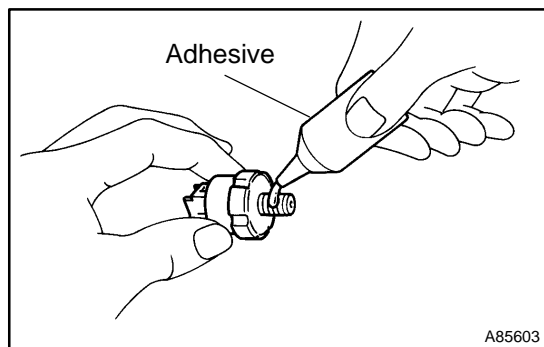
- Disconnect the oil pressure switch connector.
- Using a deep socket wrench 24 mm, remove the oil pressure switch.



- Install the oil pressure gauge.
- Warm up the engine.
- Inspect the oil pressure.

#### Oil pressure:

At idle	29 kPa (0.3 kgf/cm <sup>2</sup> , 4.3 psi) or more
At 3,000 rpm	245 to 539 kPa (2.5 to 5.5 kgf/cm <sup>2</sup> , 36 to 78 psi)



- (f) Apply adhesive to 2 or 3 threads of the oil pressure switch.

**Adhesive:**

**Part No. 08833-00080, THREE BOND 1344,  
LOCTITE 242 or equivalent**

- (g) Using a deep socket wrench 24 mm, install the oil pressure switch.

**Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)**

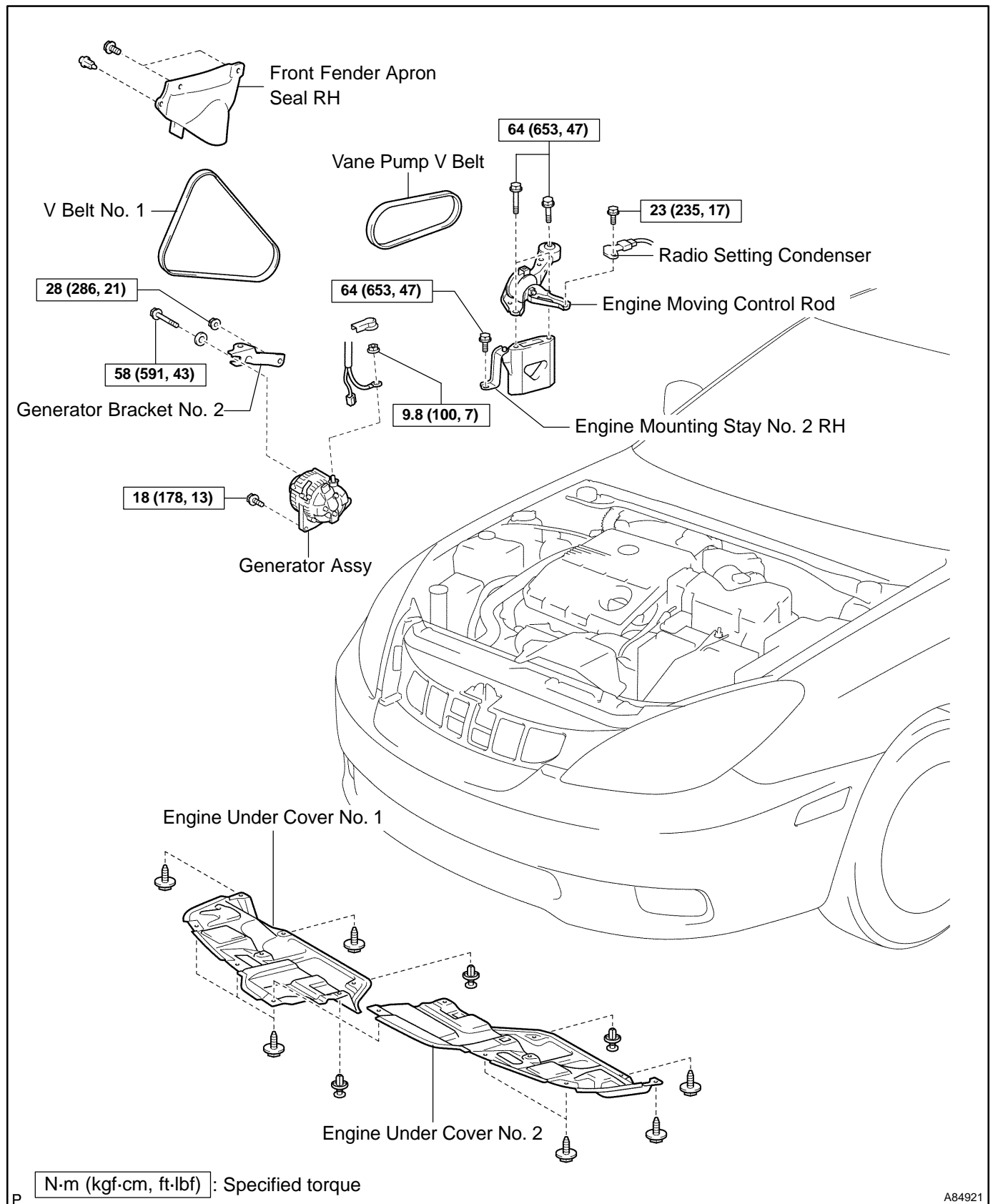
**NOTICE:**

**Do not start the engine within 1 hour of installation.**

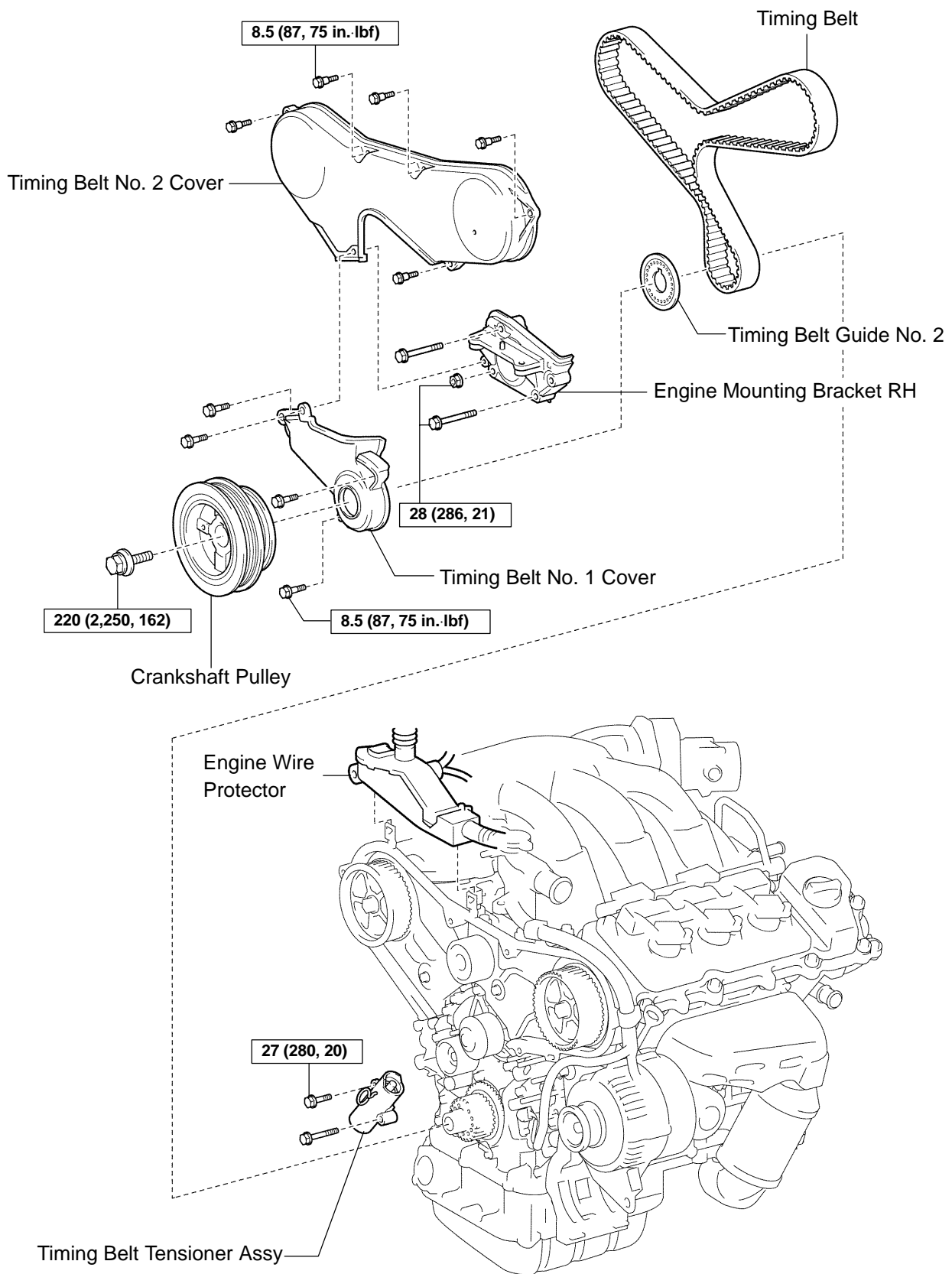
- (h) Connect the oil pressure switch connector.  
(i) Check for the engine oil leaks.

# OIL PUMP ASSY (3MZ-FE) COMPONENTS

170HM-01



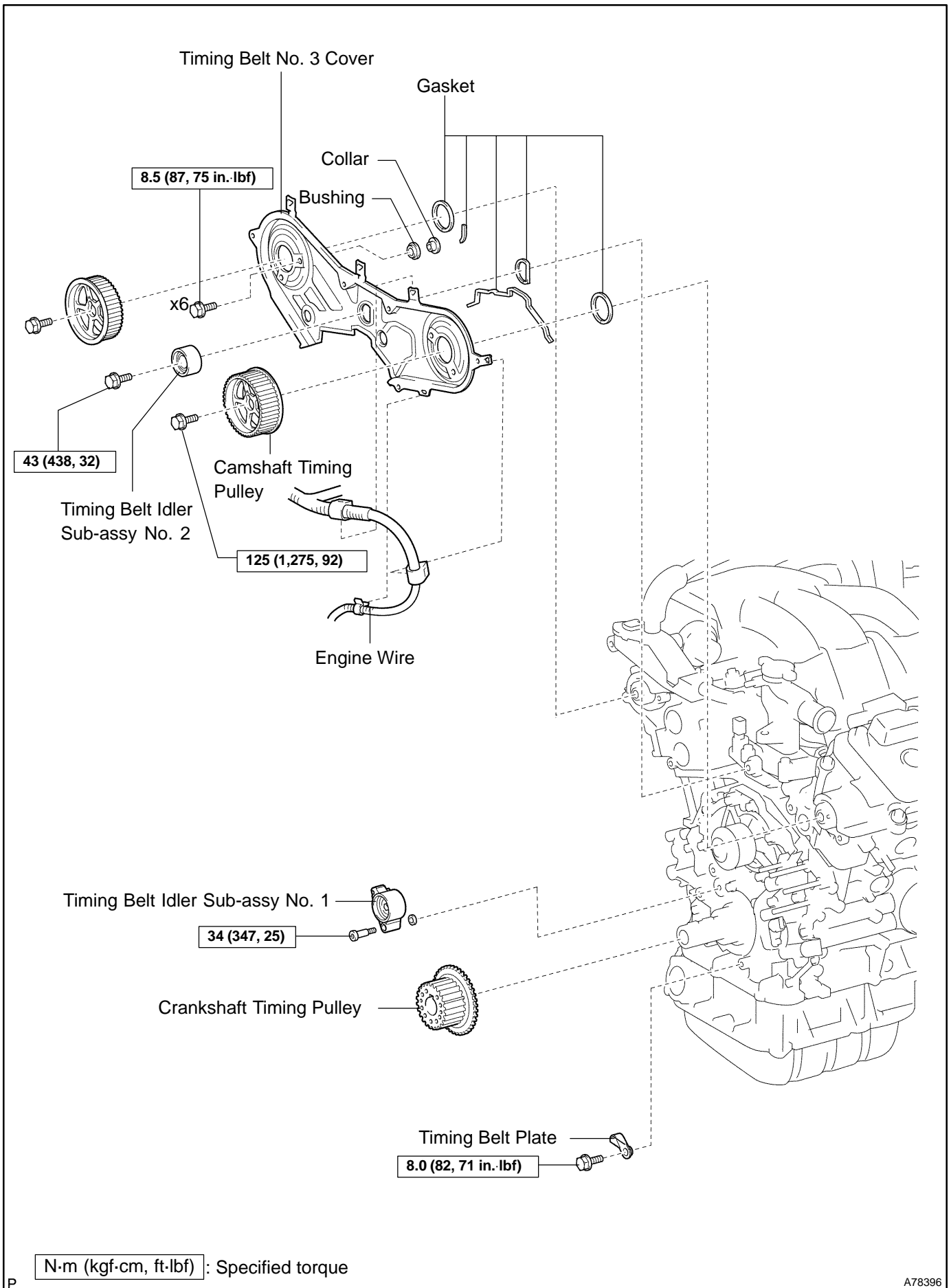
A84921

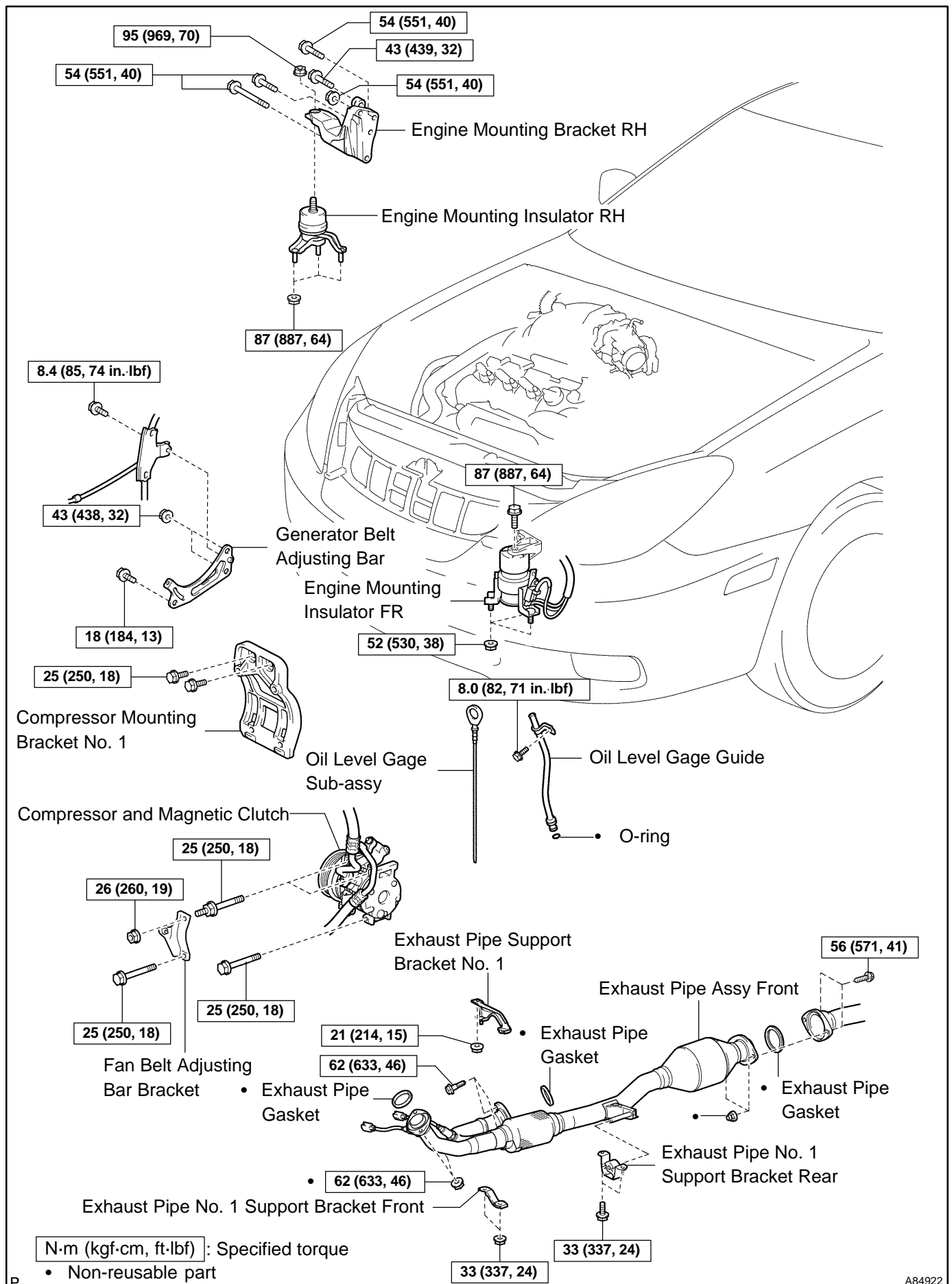


N·m (kgf·cm, ft·lbf) : Specified torque

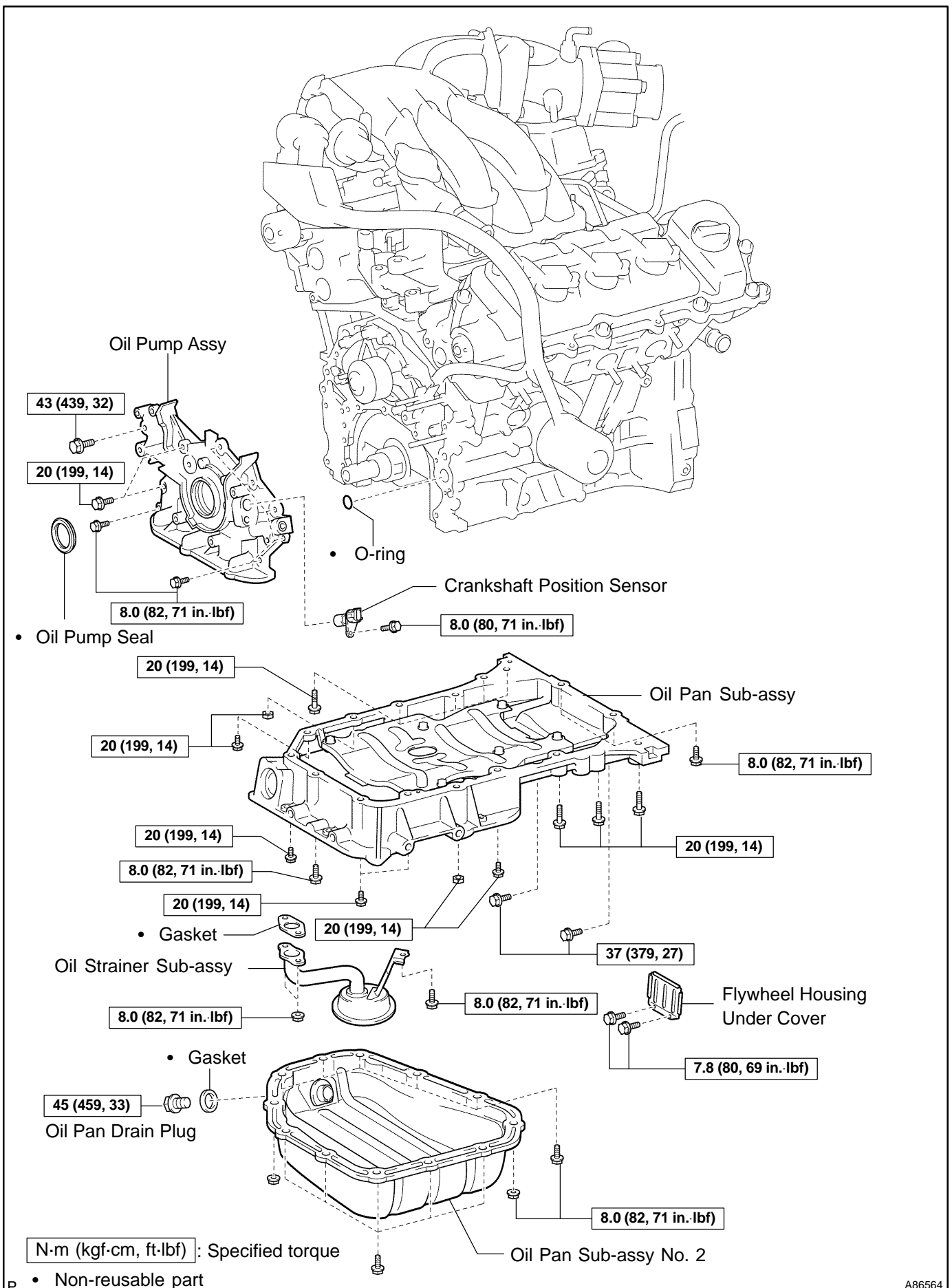
P

A78353

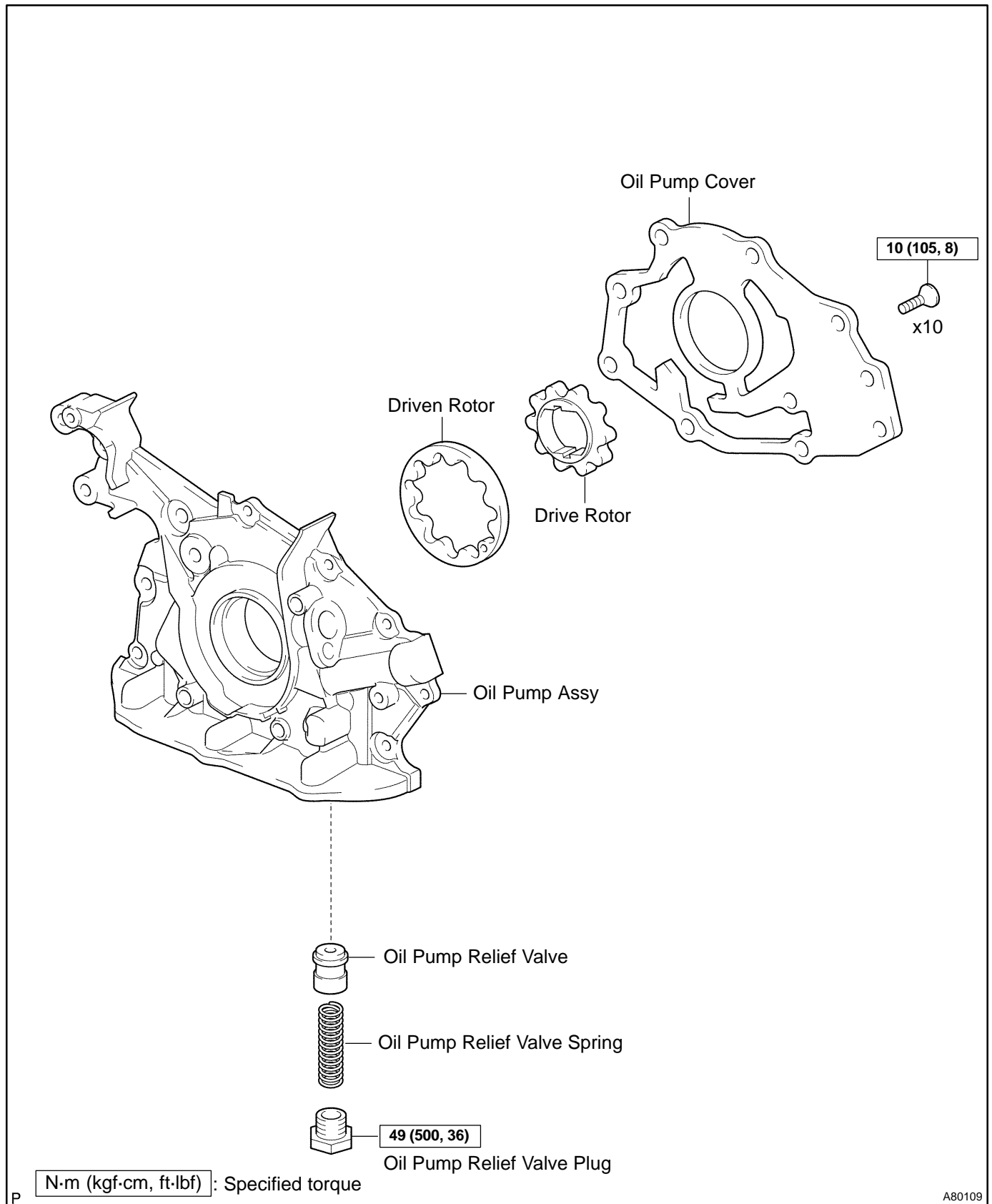




A84922



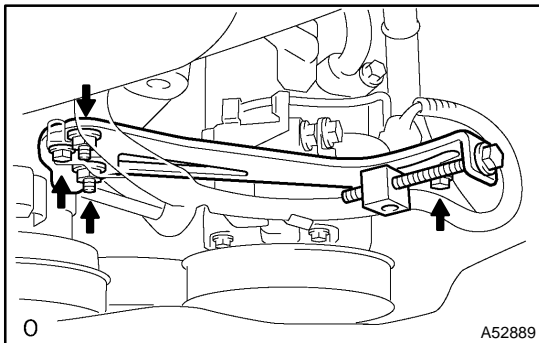
A86564



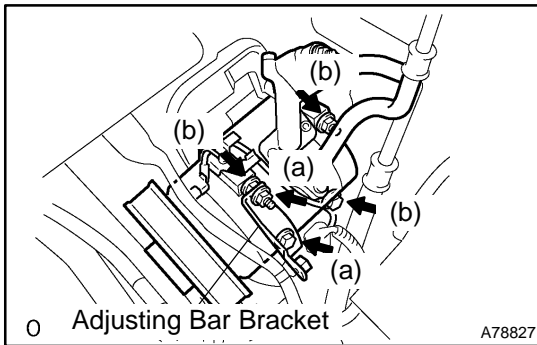


## REPLACEMENT

1. DISCONNECT BATTERY NEGATIVE TERMINAL
2. DRAIN ENGINE OIL (See page 17-20 )
3. REMOVE FRONT WHEEL RH
4. REMOVE ENGINE UNDER COVER NO.1
5. REMOVE ENGINE UNDER COVER NO.2
6. REMOVE FRONT FENDER APRON SEAL RH
7. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1  
(See page 14-5 )
8. REMOVE GENERATOR ASSY (See page 19-21 )
9. REMOVE VANE PUMP V BELT (See page 14-5 )
10. REMOVE ENGINE MOVING CONTROL ROD (See page 14-79 )
11. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14-79 )
12. REMOVE GENERATOR BRACKET NO.2 (See page 14-79 )
13. REMOVE CRANKSHAFT PULLEY (See page 14-79 )  
SST 09213-54015 (91651-60855), 09330-00021, 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)
14. REMOVE TIMING BELT NO.1 COVER
15. REMOVE TIMING BELT NO.2 COVER (See page 14-79 )
16. REMOVE ENGINE MOUNTING BRACKET RH (See page 14-79 )
17. REMOVE TIMING BELT GUIDE NO.2
18. REMOVE TIMING BELT (See page 14-79 )
19. REMOVE TIMING BELT IDLER SUB-ASSY NO.2
20. REMOVE CAMSHAFT TIMING PULLEY (See page 14-93 )  
SST 09960-10010 (09962-01000, 09963-01000), 09249-63010
21. REMOVE TIMING BELT NO.3 COVER (See page 14-93 )
22. REMOVE TIMING BELT IDLER SUB-ASSY NO.1 (See page 16-13 )
23. REMOVE CRANKSHAFT TIMING PULLEY (See page 14-138 )  
SST 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05011)
24. REMOVE EXHAUST PIPE NO.1 SUPPORT BRACKET FRONT (See page 15-2 )
25. REMOVE EXHAUST PIPE NO.1 SUPPORT BRACKET REAR (See page 15-2 )
26. REMOVE EXHAUST PIPE ASSY FRONT (See page 15-2 )
27. REMOVE EXHAUST PIPE SUPPORT BRACKET NO.1 (See page 40-9 )
28. REMOVE OIL LEVEL GAGE GUIDE (See page 14-133 )



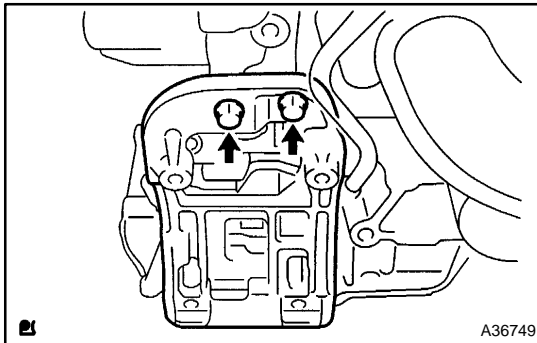
29. REMOVE GENERATOR BELT ADJUSTING BAR
  - (a) Remove the 2 bolts and 2 nuts, then remove the adjusting bar.

**30. SEPARATE COMPRESSOR AND MAGNETIC CLUTCH**

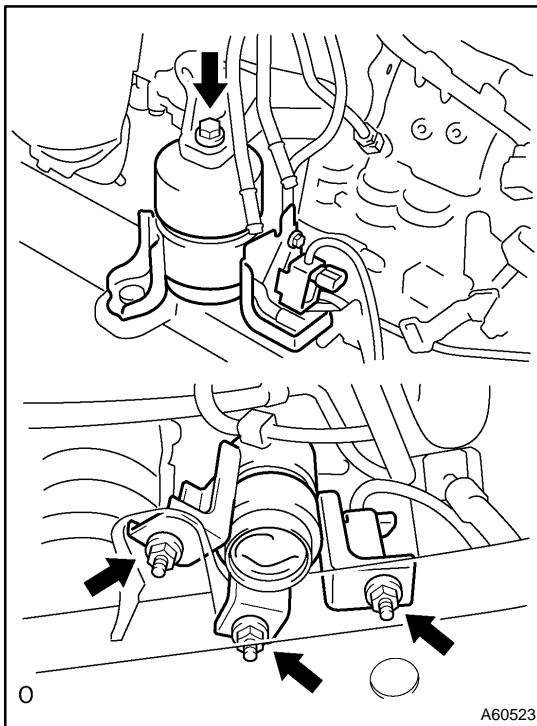
- (a) Remove the bolt and nut, then remove the adjusting bar bracket.
- (b) Remove the 3 bolts and compressor.

**HINT:**

Secure the hoses off to the side instead of detaching.

**31. REMOVE COMPRESSOR MOUNTING BRACKET NO.1**

- (a) Remove the 2 bolts and compressor mounting bracket.

**32. SEPARATE ENGINE MOUNTING INSULATOR FR**

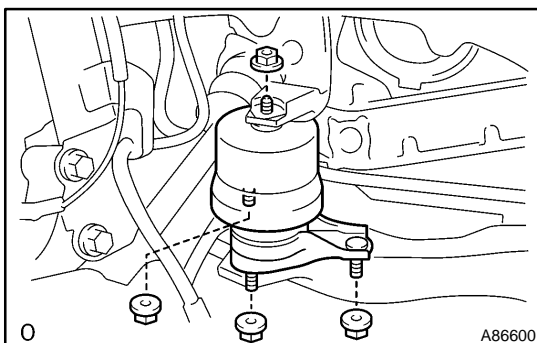
- (a) Remove the 3 nuts and bolt, then separate the engine mounting insulator FR.

**NOTICE:**

**Do not remove the engine mounting insulator FR.**

**33. REMOVE ENGINE MOUNTING INSULATOR RH**

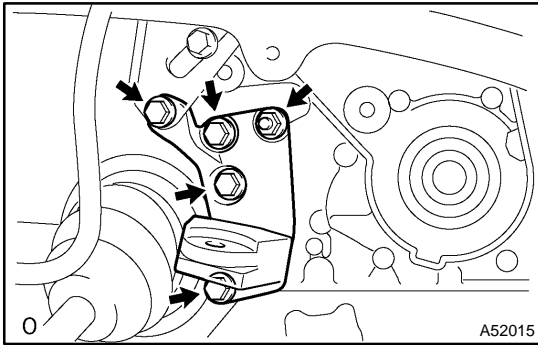
- (a) Remove the bolt, then disconnect the power steering return hose clamp from the frame.



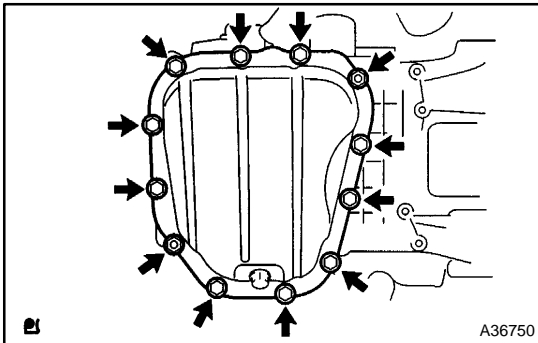
- (b) Remove the 4 nuts.
- (c) Place a wooden block on a jack underneath the engine.
- (d) Jack up the engine, then remove the engine mounting insulator RH.

**NOTICE:**

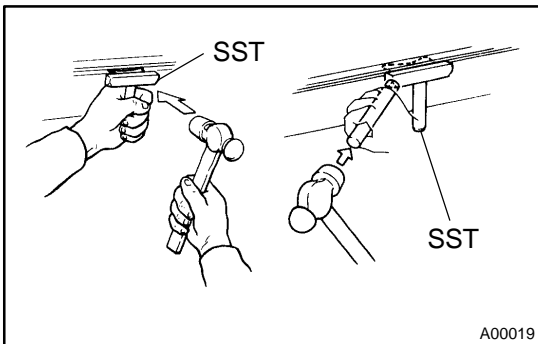
**Be careful not to damage the oil pan.**

**34. REMOVE ENGINE MOUNTING BRACKET RH**

- (a) Remove the 4 bolts and nut, then remove the bracket.

**35. 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, then cut off the sealer and remove the oil pan No. 2.

SST 09032-00100

**NOTICE:**

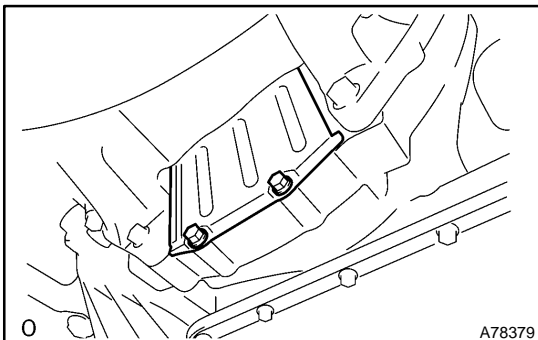
- Be careful not to damage the contact surface of the oil pan No. 1 where the oil pan No. 2 is mounted.
- Do not damage the flange portion of the oil pan No. 2 when removing.

**36. REMOVE OIL STRAINER SUB-ASSY**

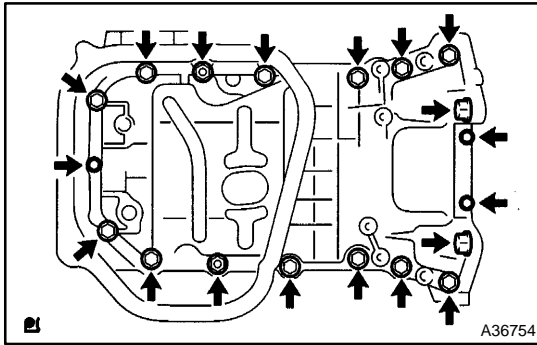
- (a) Remove the bolt and 2 nuts, then remove the oil strainer and gasket.

**37. REMOVE OIL PAN SUB-ASSY**

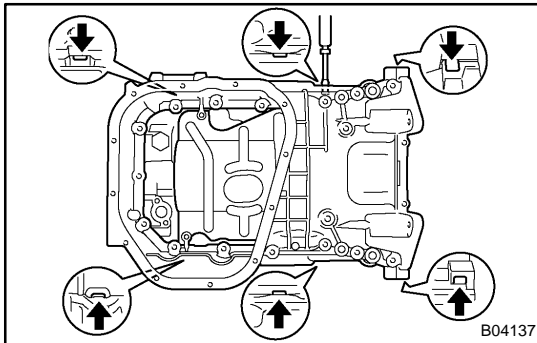
- (a) Remove the 2 bolts and nut, then disconnect the engine oil level sensor connector.



- (b) Remove the 2 bolts and flywheel housing under cover.



- (c) Loosen and remove the 17 bolts and 2 nuts uniformly.



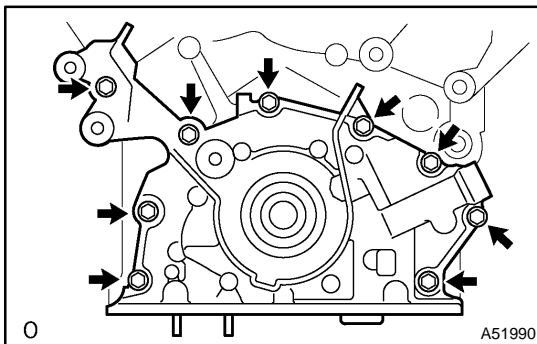
- (d) Using a screwdriver, remove the oil pan by prying between the cylinder block and oil pan.

**NOTICE:**

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

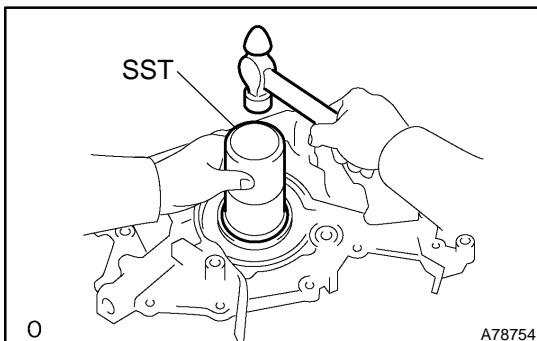
### 38. REMOVE CRANKSHAFT POSITION SENSOR

- Disconnect the crankshaft position sensor connector.
- Remove the bolt and crankshaft position sensor.



### 39. REMOVE OIL PUMP ASSY

- Remove the 9 bolts.
- Using a screwdriver, remove the oil pump by prying between the oil pump and bearing cap.
- Remove the O-ring.



### 40. INSTALL OIL PUMP SEAL

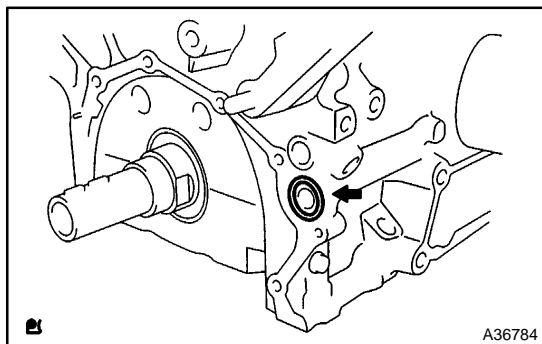
- Using SST and a hammer, tap in the new oil seal until its surface is flush with the oil pump body edge.  
SST 09223-00010

**NOTICE:**

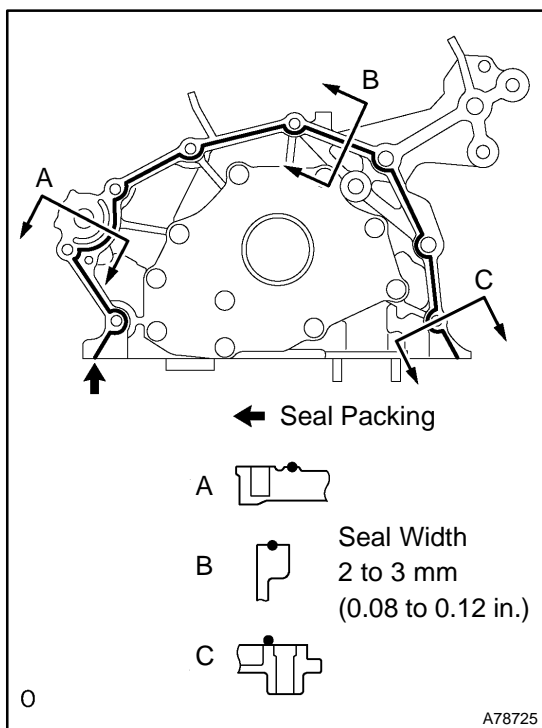
- Be careful not to tap the oil seal at an angle.
  - Keep the lip free of foreign objects.
- Apply multi-purpose grease to the oil seal lip.

**41. INSTALL OIL PUMP ASSY**

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



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



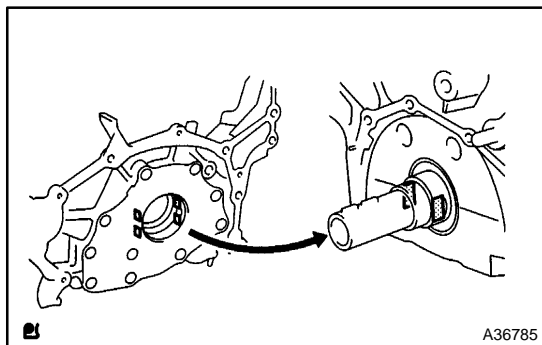
- (c) Apply a continuous bead of seal packing (Diameter 2 to 3 mm (0.08 to 0.12 in.)) as shown in the illustration.

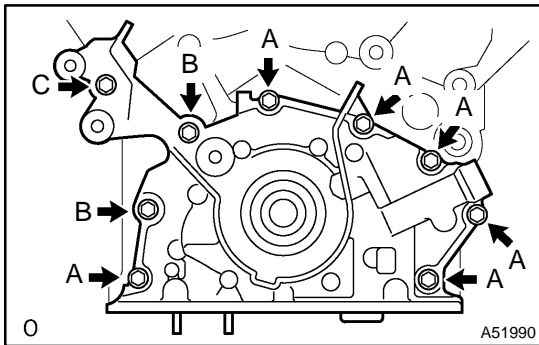
**Seal packing: Part No. 08826-00080 or equivalent**

**NOTICE:**

- Remove any oil from 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 packing to engine oil within 2 hours after installing.

- (d) Align the key of the oil pump drive gear with the keyway located on the crankshaft, then 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 (199 kgf·cm, 14 ft·lbf) for bolt B**

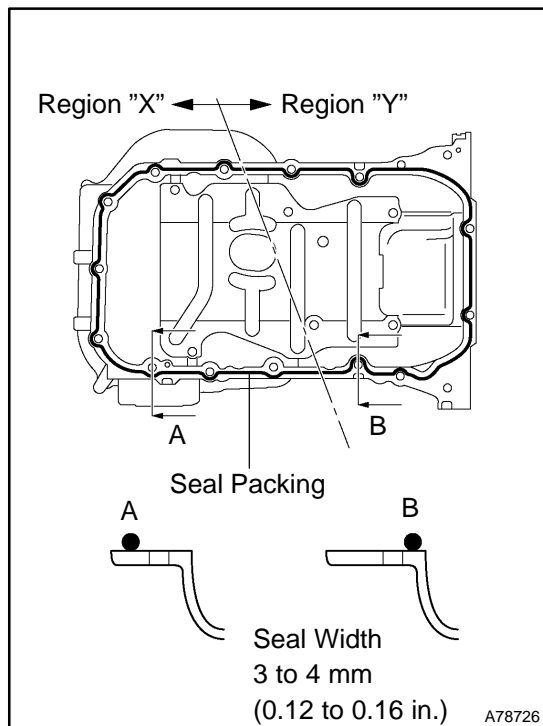
**43 N·m (439 kgf·cm, 32 ft·lbf) for bolt C**

#### 42. INSTALL CRANKSHAFT POSITION SENSOR

**Torque: 8.0 N·m (80 kgf·cm, 71 in·lbf)**

#### 43. INSTALL OIL PAN SUB-ASSY

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



- (b) Apply a continuous bead of seal packing (Diameter 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 the region "X".
  - Apply seal packing to the inner side of the bolt holes in the region "Y".
  - Install the oil pan within 3 minutes after applying seal packing.
  - Do not expose the seal packing to engine oil within 2 hours after installing.
- (c) Install the oil pan with the 17 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 (199 kgf·cm, 14 ft·lbf) for 12 mm head**

**37 N·m (379 kgf·cm, 27 ft·lbf) for 14 mm head**

- (d) Install the flywheel housing under cover with the 2 bolts.

**Torque: 7.8 N·m (80 kgf·cm, 69 in·lbf)**

- (e) Install the engine oil level sensor connector with the 2 bolts and nut.

**Torque: 8.4 N·m (85 kgf·cm, 74 in·lbf)**

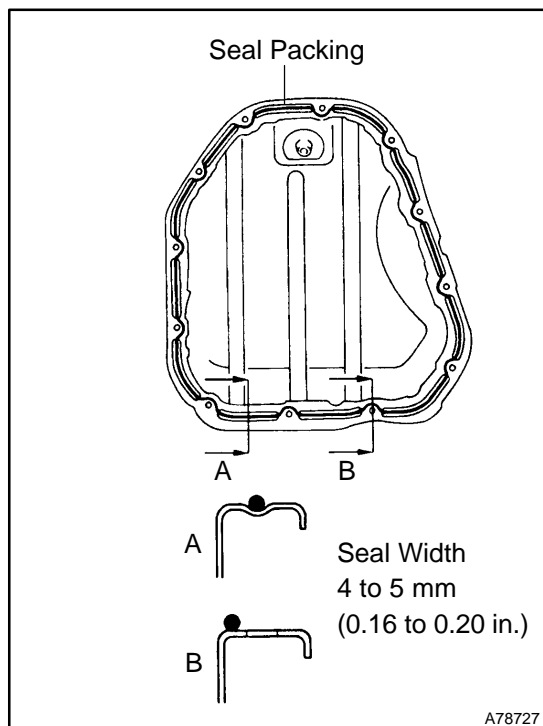
#### 44. INSTALL OIL STRAINER SUB-ASSY

- (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)**

**45. INSTALL OIL PAN SUB-ASSY NO.2**

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

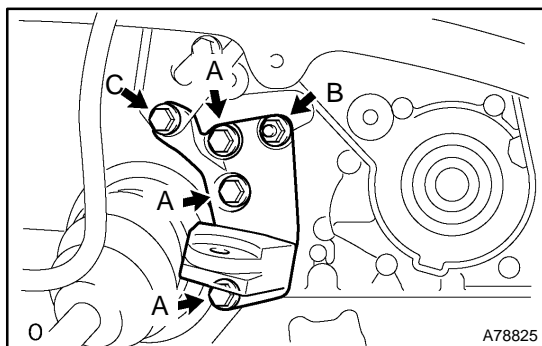


- (b) Apply a continuous bead of seal packing (Diameter 4 to 5 mm (0.16 to 0.20 in.)) as shown in the illustration.

**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 packing to engine oil within 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)**

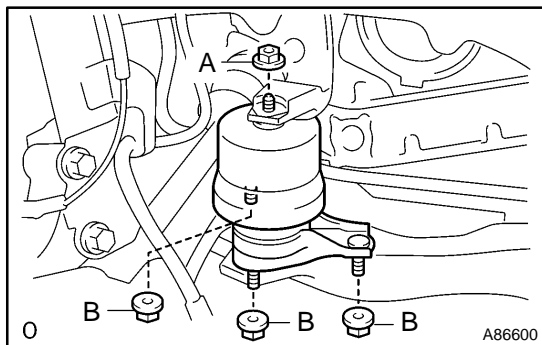
**46. INSTALL ENGINE MOUNTING BRACKET RH**

**Torque:**

**54 N·m (551 kgf·cm, 40 ft·lbf) for bolt A**

**54 N·m (551 kgf·cm, 40 ft·lbf) for nut B**

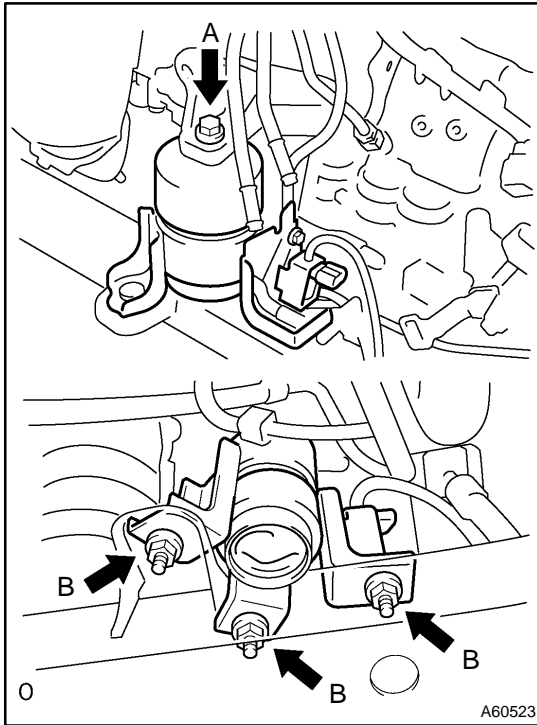
**43 N·m (439 kgf·cm, 32 ft·lbf) for bolt C**

**47. INSTALL ENGINE MOUNTING INSULATOR RH**

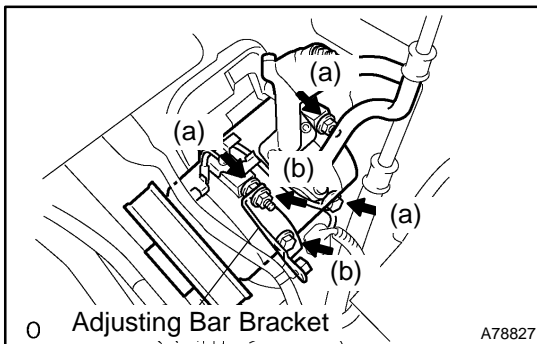
**Torque:**

**95 N·m (969 kgf·cm, 70 ft·lbf) for nut A**

**87 N·m (887 kgf·cm, 64 ft·lbf) for nut B**

**48. INSTALL ENGINE MOUNTING INSULATOR FR**

Torque:

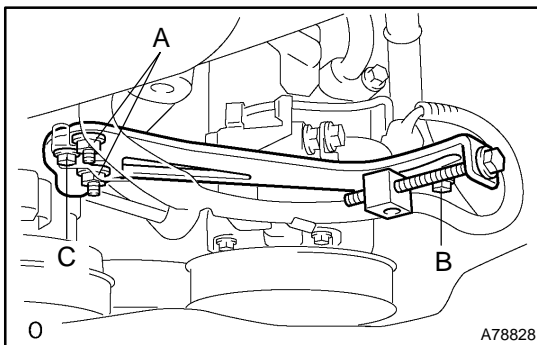
**87 N·m (887 kgf·cm, 64 ft·lbf) for bolt A****52 N·m (530 kgf·cm, 38 ft·lbf) for nut B****49. INSTALL COMPRESSOR MOUNTING BRACKET NO.1**Torque: **25 N·m (250 kgf·cm, 18 ft·lbf)****50. INSTALL COMPRESSOR AND MAGNETIC CLUTCH**

(a) Install the compressor with the 3 bolts.

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

(b) Install the adjusting bar bracket with the bolt and nut.

Torque:

**25 N·m (250 kgf·cm, 18 ft·lbf) for bolt****26 N·m (260 kgf·cm, 19 ft·lbf) for nut****51. 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****8.4 N·m (85 kgf·cm, 74 in·lbf) for bolt C****52. INSTALL OIL LEVEL GAGE GUIDE (See page 14-133 )****53. INSTALL EXHAUST PIPE SUPPORT BRACKET NO.1 (See page 40-9 )****54. INSTALL EXHAUST PIPE ASSY FRONT (See page 15-2 )****55. INSTALL EXHAUST PIPE NO.1 SUPPORT BRACKET REAR (See page 15-2 )**

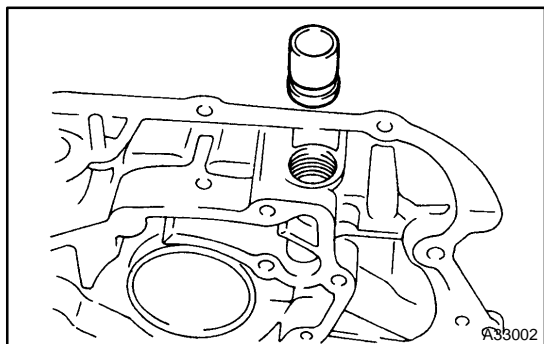


56. INSTALL EXHAUST PIPE NO.1 SUPPORT BRACKET FRONT (See page 15-2 )
57. INSTALL CRANKSHAFT TIMING PULLEY (See page 14-138 )
58. INSTALL TIMING BELT IDLER SUB-ASSY NO.1 (See page 16-13 )
59. INSTALL TIMING BELT NO.3 COVER (See page 14-93 )
60. INSTALL CAMSHAFT TIMING PULLEY (See page 14-93 )  
SST 09960-10010 (09962-01000, 09963-01000), 09249-63010
61. INSTALL TIMING BELT IDLER SUB-ASSY NO.2 (See page 14-93 )
62. INSPECT TIMING BELT (See page 14-79 )
63. INSTALL TIMING BELT (See page 14-79 )  
SST 09960-10010 (09962-01000, 09963-01000)
64. INSTALL TIMING BELT TENSIONER ASSY (See page 14-79 )
65. INSTALL TIMING BELT GUIDE NO.2 (See page 14-79 )
66. INSTALL ENGINE MOUNTING BRACKET RH (See page 14-79 )
67. INSTALL TIMING BELT NO.2 COVER (See page 14-79 )
68. INSTALL TIMING BELT NO.1 COVER (See page 14-79 )
69. INSTALL CRANKSHAFT PULLEY (See page 14-79 )  
SST 09213-54015 (91651-60855), 09330-00021
70. INSTALL GENERATOR BRACKET NO.2 (See page 14-79 )
71. INSTALL ENGINE MOUNTING STAY NO.2 RH (See page 14-79 )
72. INSTALL ENGINE MOVING CONTROL ROD (See page 14-79 )
73. INSTALL VANE PUMP V BELT (See page 14-5 )
74. INSTALL GENERATOR ASSY (See page 19-21 )
75. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1  
(See page 14-5 )
76. INSPECT DRIVE BELT DEFLECTION AND TENSION (See page 14-1 )
77. INSTALL FRONT WHEEL RH (See page 14-5 )
78. ADD ENGINE OIL (See page 17-20 )
79. CHECK FOR ENGINE OIL LEAKS
80. CHECK FOR EXHAUST GAS LEAKS
81. SYSTEM INITIALIZATION (See page 19-15 )

## OVERHAUL

### 1. REMOVE OIL PUMP RELIEF VALVE

- (a) Remove the plug, spring and relief valve.



### 2. INSPECT OIL PUMP RELIEF VALVE

- (a) Apply a light coat of engine oil to the relief valve.  
 (b) Check that the relief valve falls smoothly into the valve hole by its own weight.

### 3. INSPECT OIL PUMP ASSY

- (a) Remove the oil pump cover.  
 (1) Remove the 10 screws and oil pump cover.  
 (b) Remove the oil pump rotor set.

#### NOTICE:

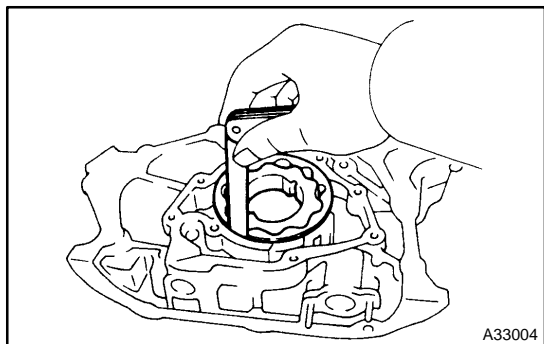
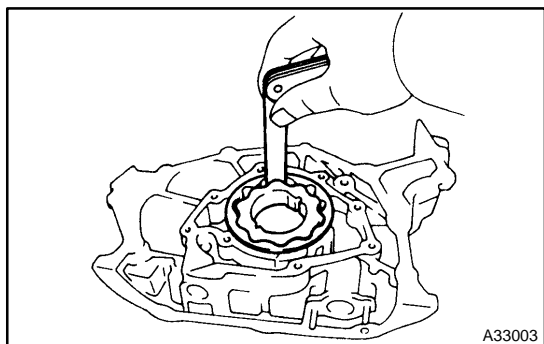
**Do not change the combination or turn over the 2 removed rotors.**

- (c) Inspect the oil pump rotor set.  
 (1) Apply a light coat of engine oil to the oil pump rotor set, then place them into the oil pump body. Check that the rotors revolve smoothly.  
 (d) Inspect the tip clearance.  
 (1) Using a feeler gauge, measure the clearance between the drive and driven rotor tips.

#### Standard tip clearance:

**0.06 to 0.18 mm (0.0024 to 0.0071 in.)**

**Maximum tip clearance: 0.35 mm (0.0138 in.)**

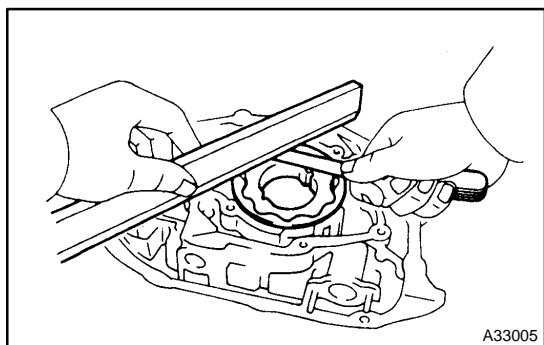


- (e) Inspect the body clearance.  
 (1) Using a feeler gauge, measure the clearance between the driven rotor and body.

#### Standard body clearance:

**0.250 to 0.325 mm (0.0098 to 0.0128 in.)**

**Maximum body clearance: 0.30 mm (0.0118 in.)**

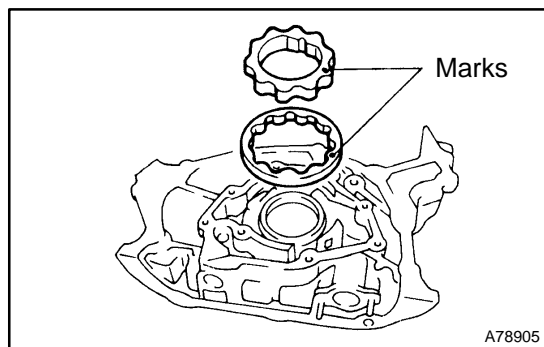


- (f) Inspect the side clearance.  
 (1) Using a feeler gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.

#### Standard side clearance:

**0.03 to 0.09 mm (0.0012 to 0.0035 in.)**

**Maximum side clearance: 0.15 mm (0.0059 in.)**



- (g) Install the oil pump rotor set.
  - (1) Apply a light coat of engine oil to the oil pump gear set, then place it into the pump body with the marks facing the pump body cover side.
- (h) Install the oil pump cover.
  - (1) Install the 10 screws and oil pump cover.

**Torque: 10 N·m (105 kgf·cm, 8 ft·lbf)**

#### 4. INSTALL OIL PUMP RELIEF VALVE

- (a) Apply a light coat of engine oil to the relief valve, then insert the relief valve and spring into the pump body hole.
- (b) Install the oil pump relief valve plug.

**Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)**

# OIL FILTER SUB-ASSY (3MZ-FE)

170F5-03

## REPLACEMENT

### CAUTION:

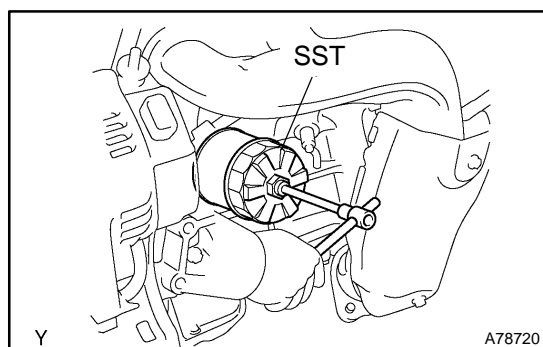
- Prolonged and repeated contact with engine oil will cause removal of natural oils from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.
- Precautions should be taken when replacing engine oil to minimize the risk of your skin making contact with used engine oil. Wear protective clothing and gloves. Wash your skin thoroughly with soap and water, or use water-less hand cleaner to remove any used engine oil. Do not use gasoline, thinners, or solvents.
- For environmental protection used oil and used oil filter must be disposed of at designated disposal sites.

### 1. REMOVE ENGINE UNDER COVER NO.1

### 2. DRAIN ENGINE OIL

- Remove the oil filler cap.
- Remove the oil drain plug, then drain the oil into a container.
- Clean and install the oil drain plug with a new gasket.

**Torque: 45 N·m (459 kgf·cm, 33 ft·lbf)**

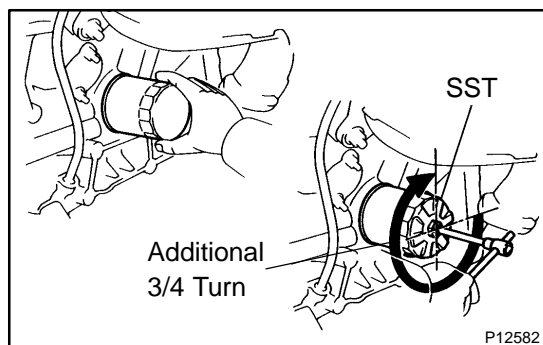


### 3. REMOVE OIL FILTER SUB-ASSY

- Using SST, remove the oil filter.  
SST 09228-07501

### 4. INSTALL OIL FILTER SUB-ASSY

- Check and clean the oil filter installation surface.
- Apply clean engine oil to the gasket of a new oil filter.
- Lightly screw the oil filter into place, then tighten it until the gasket contacts the seat.



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

### 5. ADD ENGINE OIL

- Fill with fresh engine oil.

#### Capacity:

Drain and refill with oil filter change	4.7 liters (5.0 US qts, 4.1 Imp. qts)
Drain and refill without oil filter change	4.5 liters (4.8 US qts, 4.0 Imp. qts)
Dry fill	5.5 liters (5.8 US qts, 4.8 Imp. qts)

### 6. CHECK FOR ENGINE OIL LEAKS

# IGNITION SYSTEM (3MZ-FE)

## ON-VEHICLE INSPECTION

1809A-01

### NOTICE:

"Cold" and "Hot" in this section mean temperature of the coils themselves. "Cold" is from -10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

### 1. INSPECT IGNITION COIL AND SPARK TEST

- (a) Check the DTCs.

### NOTICE:

If a DTC is present, perform troubleshooting in accordance with a procedure for that DTC.

- (b) Check that a spark occurs.

- (1) Remove the 6 ignition coils (see page 18-7).
- (2) Using a spark plug wrench 16 mm, remove the 6 spark plugs.

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

- (3) Install the spark plugs to each ignition coil, then connect the ignition coil connectors.
- (4) Disconnect the 6 fuel injector connectors.
- (5) Ground the spark plugs.
- (6) Check that the spark plug occurs at each spark plug while the engine is being cranked.

### NOTICE:

- Be sure to ground the spark plugs when checking.
- Replace the ignition coil if physical impact is felt.
- Do not crank the engine for more than 2 seconds.

If a spark does not occur, perform the following test.

<b>1</b>	<b>SPARK TEST</b>
----------	-------------------

**NG**

<b>2</b>	<b>CHECK CONNECTION OF IGNITION COIL CONNECTOR</b>
----------	--

**NG**
**CONNECT SECURELY**

**OK**

<b>3</b>	<b>REPLACE IT WITH NORMAL IGNITION COIL AND PERFORM SPARK TEST AGAIN</b>
----------	--

**OK**
**REPLACE IGNITION COIL ASSY  
(See page 18-7)**

**NG**

<b>4</b>	<b>CHECK POWER SUPPLY TO IGNITION COIL</b>
----------	--

- (a) Turn the ignition switch ON.
- (b) Check that there is battery voltage at the ignition coil positive (+) terminal.

**NG**
**CHECK WIRE HARNESS (BETWEEN IGNITION  
(START) SWITCH ASSY AND IGNITION COIL  
ASSY)**

**OK**

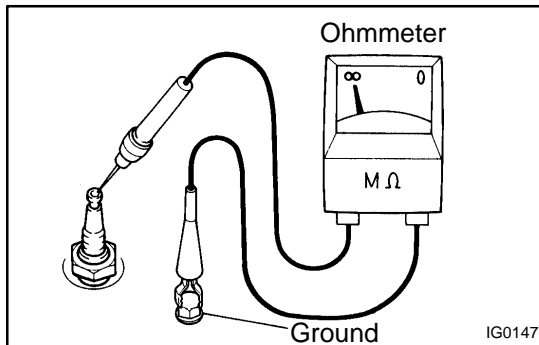
**5 INSPECT VVT SENSOR (See page 18-3 )****NG****REPLACE VVT SENSOR (See page 18-5 )****OK****6 INSPECT CRANKSHAFT POSITION SENSOR (See page 18-3 )****NG****REPLACE CRANKSHAFT POSITION SENSOR  
(See page 18-6 )****OK****7 INSPECT IGT SIGNAL FROM ECM (See page 05-34 )****NG****REPLACE ECM (See page 10-22 )****OK****REPAIR WIRE HARNESS (BETWEEN IGNI-  
TION COIL ASSY AND IGNITION (START)  
SWITCH ASSY)**

## INSPECTION

### 1. INSPECT SPARK PLUG

#### NOTICE:

- Do not use a wire brush to clean the spark plug.
- Do not try to adjust the electrode gap of a used spark plug.

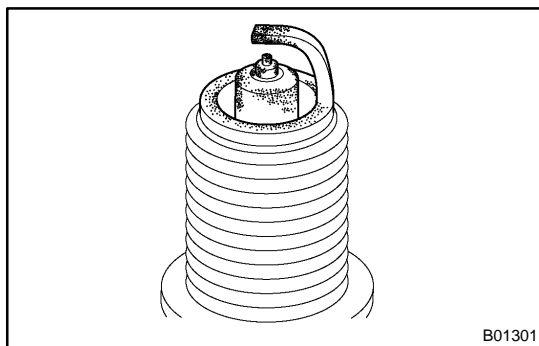


(a) Inspect the resistance.

- (1) Using an ohmmeter, measure the resistance between the insulation and body ground.

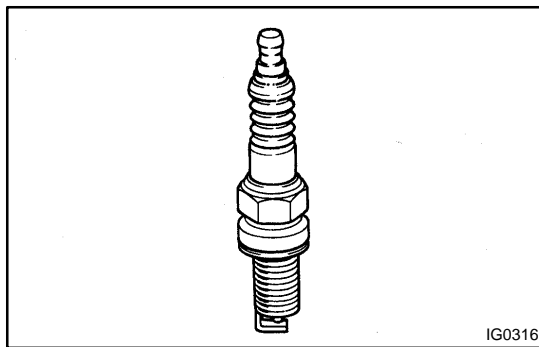
**Resistance: 10 MΩ or more**

If the resistance is not as specified, check the electrode gap.



(b) Alternative inspection method.

- (1) Quickly accelerate the engine speed to 4,000 rpm 5 times.  
 (2) Remove the spark plug.  
 (3) Visually check the spark plug.  
 (4) If the electrode is dry...OK.  
 (5) If the electrode is wet...Proceed to step (c).  
 (6) Reinstall the spark plug.



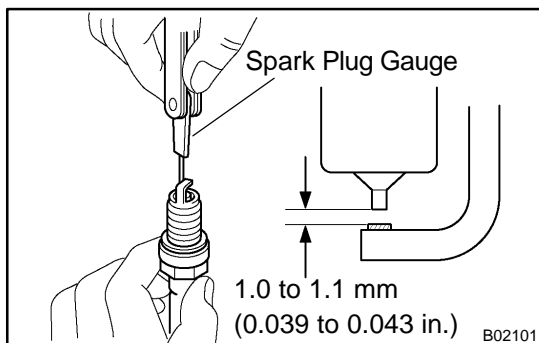
(c) Check the appearance.

- (1) Check the thread and insulator of the spark plug for damage.

If damaged, replace the spark plug.

#### Recommended spark plug:

Supplier	Type
DENSO	SK20R11
NGK	IFR6A11



(d) Inspect the electrode gap.

- (1) Using a spark plug gauge, measure the electrode gap.

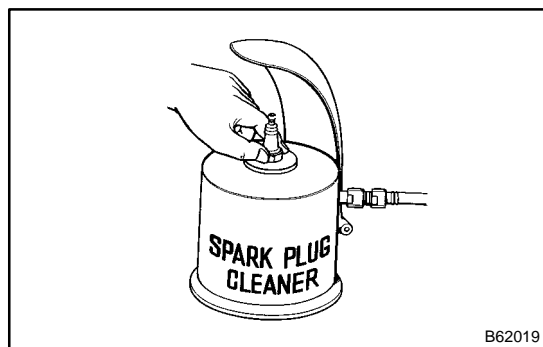
**Maximum electrode gap of used spark plug:**

**1.3 mm (0.051 in.)**

If the electrode gap is greater than maximum, replace the spark plug.

**Electrode gap of new spark plug:**

**1.0 to 1.1 mm (0.039 to 0.043 in.)**



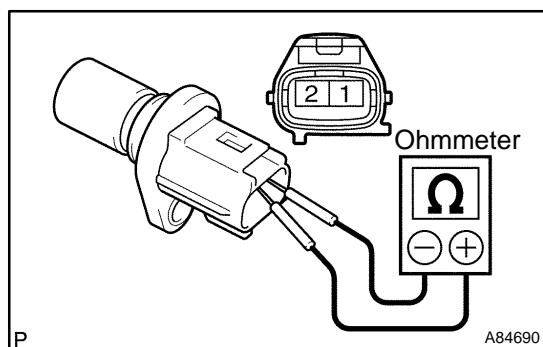
(e) Clean the spark plugs.

If the electrode has traces of wet carbon, clean the electrode with a spark plug cleaner, then dry it.

**Air pressure: Blow 588 kPa (6 kgf/cm<sup>2</sup>, 85 psi)**

**Duration: 20 seconds or shorter**

If there are traces of oil, remove it with gasoline before using the spark plug cleaner.



## 2. INSPECT VVT SENSOR

(a) Inspect the resistance.

(1) Using an ohmmeter, measure the resistance between the terminals.

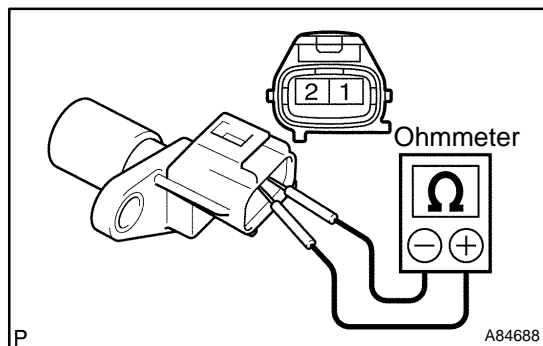
**Resistance:**

Tester Connection	Specified Condition
1 (G+) - 2 (G-)	835 to 1,400 $\Omega$ at cold
1 (G+) - 2 (G-)	1,060 to 1,645 $\Omega$ at hot

**NOTICE:**

"Cold" and "Hot" mean temperature of the coils themselves. "Cold" is from -10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

If the resistance is not as specified, replace the VVT sensor.



## 3. INSPECT CRANKSHAFT POSITION SENSOR

(a) Inspect the resistance.

(1) Using an ohmmeter, measure the resistance between the terminals.

**Resistance:**

Tester Connection	Specified Condition
1 (NE+) - 2 (NE-)	1,630 to 2,740 $\Omega$ at cold
1 (NE+) - 2 (NE-)	2,065 to 3,225 $\Omega$ at hot

**NOTICE:**

"Cold" and "Hot" mean temperature of the coils themselves. "Cold" is from -10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

If the resistance is not as specified, replace the crankshaft position sensor.

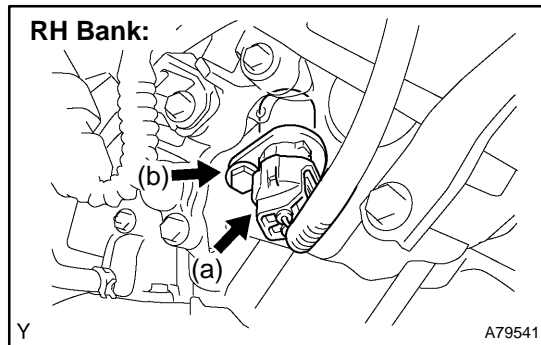


## VVT SENSOR (3MZ-FE)

### REPLACEMENT

1809C-01

1. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)
2. REMOVE RADIATOR LOWER AIR DEFLECTOR (See page 19-5 )
3. REMOVE AIR CLEANER INLET ASSY (See page 19-5 )
4. REMOVE AIR CLEANER ASSY (See page 19-5 )

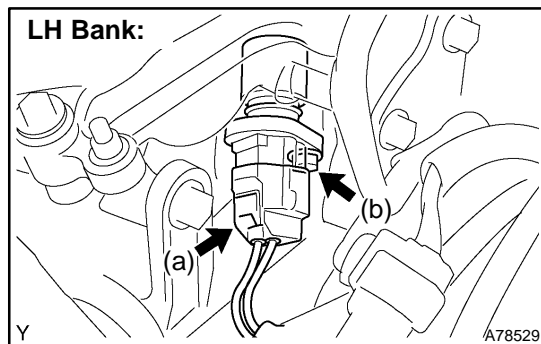


#### 5. REMOVE VVT SENSOR

- (a) Remove the 2 VVT sensor connectors.
- (b) Remove the 2 bolts, then remove the 2 VVT sensors.

**HINT:**

The VVT sensor is installed with the bolt.



#### 6. INSTALL VVT SENSOR

- (a) Apply a light coat of engine oil to the O-ring on each VVT sensor.
- (b) Install the 2 VVT sensors with the 2 bolts.

**Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)**

#### **NOTICE:**

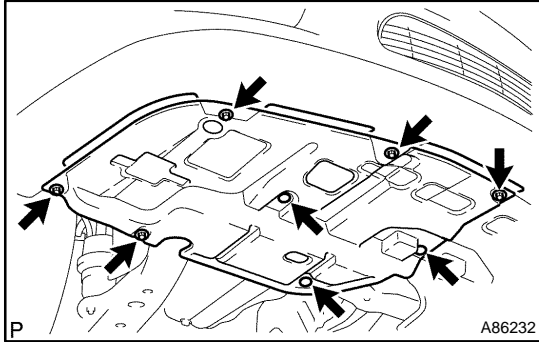
**Be careful not to twist the O-ring.**

- (c) Connect the 2 VVT sensor connectors.
7. INSTALL AIR CLEANER ASSY (See page 19-5 )
8. INSTALL AIR CLEANER INLET ASSY (See page 19-5 )
9. INSTALL RADIATOR LOWER AIR DEFLECTOR
10. CHECK CONNECTION OF VACUUM HOSE (See page 14-29 )
11. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)  
**Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**
12. CHECK FOR ENGINE OIL LEAKS
13. SYSTEM INITIALIZATION (See page 19-15 )

# CRANKSHAFT POSITION SENSOR (3MZ-FE)

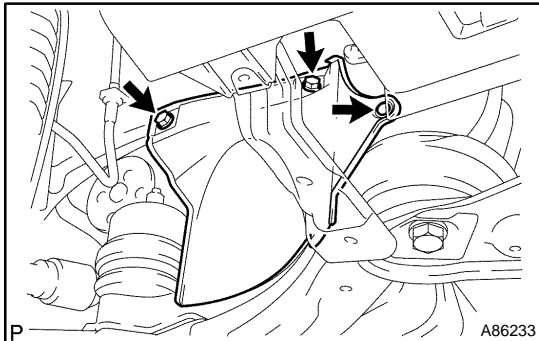
## REPLACEMENT

### 1. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)



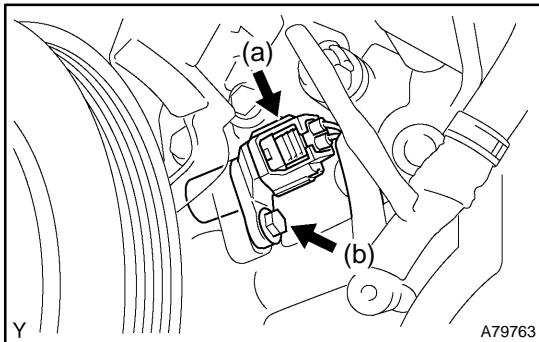
### 2. REMOVE ENGINE UNDER COVER NO.1

- (a) Remove the 3 clips and 5 screws, then remove the engine under cover No. 1.



### 3. REMOVE FRONT FENDER APRON SEAL RH

- (a) Remove the clip and 2 bolts, then remove the front fender apron seal.



### 4. REMOVE CRANKSHAFT POSITION SENSOR

- (a) Remove the crankshaft position sensor connector.  
(b) Remove the bolt, then remove the crankshaft position sensor.

### 5. INSTALL CRANKSHAFT POSITION SENSOR

Torque: 8.0 N·m (80 kgf·cm, 71 in·lbf)

### 6. INSTALL FRONT FENDER APRON SEAL RH

### 7. INSTALL ENGINE UNDER COVER NO.1

### 8. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)

Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)

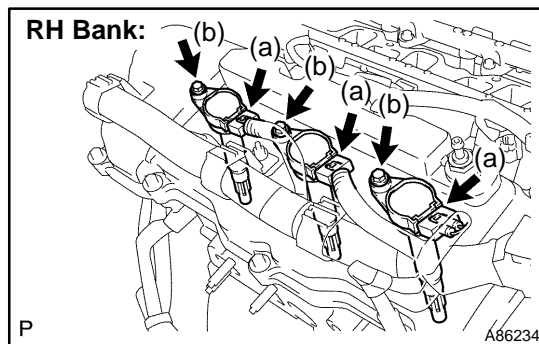
### 9. SYSTEM INITIALIZATION (See page 19-15 )

# IGNITION COIL ASSY (3MZ-FE)

## REPLACEMENT

1809E-02

1. DISCONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)
2. DRAIN ENGINE COOLANT (RH BANK) (See page 10-11)
3. REMOVE FRONT SUSPENSION UPPER BRACE CENTER (W/O TEMS, RH BANK) (See page 16-9)
4. REMOVE V-BANK COVER SUB-ASSY (See page 16-9)
5. REMOVE AIR CLEANER CAP SUB-ASSY (RH BANK) (See page 16-9)
6. REMOVE EMISSION CONTROL VALVE SET (RH BANK) (See page 11-13)
7. REMOVE INTAKE AIR SURGE TANK (RH BANK) (See page 11-13)

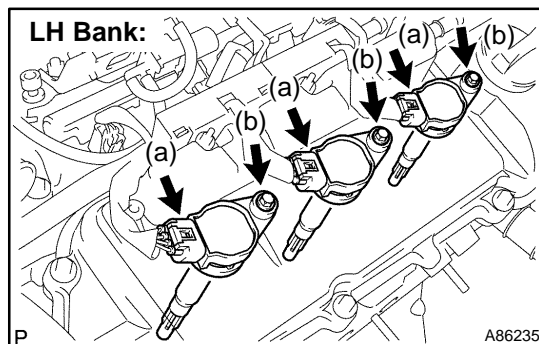


### 8. REMOVE IGNITION COIL ASSY

- (a) Disconnect the 6 connectors.
- (b) Remove the 6 bolts, then remove the 6 ignition coils.

HINT:

The ignition coil is installed with the bolt.



### 9. INSTALL IGNITION COIL ASSY

Torque: 8.0 N·m (80 kgf·cm, 71 in·lbf)

10. INSTALL INTAKE AIR SURGE TANK (RH BANK) (See page 11-13)
11. INSTALL EMISSION CONTROL VALVE SET (RH BANK) (See page 11-13)
12. INSTALL AIR CLEANER CAP SUB-ASSY (RH BANK) (See page 16-9)
13. CHECK CONNECTION OF VACUUM HOSE (RH BANK) (See page 14-29)
14. CONNECT ENGINE WIRE NO. 3 (BATTERY NEGATIVE TERMINAL)  
Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)
15. ADD ENGINE COOLANT (RH BANK) (See page 10-11)
16. CHECK FOR ENGINE COOLANT LEAKS (RH BANK) (See page 16-1)
17. INSTALL V-BANK COVER SUB-ASSY (See page 16-9)
18. INSTALL FRONT SUSPENSION UPPER BRACE CENTER (W/O TEMS, RH BANK) (See page 16-9)
19. SYSTEM INITIALIZATION (See page 19-15)