

2008 ENGINE**Engine Mechanical (2AZ-FE) - Camry****ENGINE****INSPECTION****1. INSPECT ENGINE COOLANT**

- a. Inspect the engine coolant (See ON-VEHICLE INSPECTION).

2. INSPECT ENGINE OIL

- a. Inspect the engine oil (See ON-VEHICLE INSPECTION).

3. INSPECT BATTERY

- a. Inspect the battery (See ON-VEHICLE INSPECTION).

4. INSPECT SPARK PLUGS

- a. Inspect the spark plugs (See ON-VEHICLE INSPECTION).

5. INSPECT AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY

- a. Remove the air cleaner filter element sub-assembly.
- b. Visually check that there is no dirt, blockage, and/or damage to the air cleaner filter element.

HINT:

- If there is any dirt or a blockage in the air cleaner filter element, clean it with compressed air.
- If any dirt or a blockage remains even after cleaning the air cleaner filter element with compressed air, replace it.

6. INSPECT IGNITION TIMING

- a. Warm up the engine.
- b. When using the Techstream:

Check the ignition timing.

1. Connect the Techstream to the DLC3.
2. Enter DATA LIST MODE on the Techstream.

Ignition timing:

8 to 12° BTDC at idle

HINT:

Refer to the Techstream operator's service information for help when selecting the DATA LIST.

c. When not using the Techstream:

Check the ignition timing.

1. Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.

SST 09843-18040

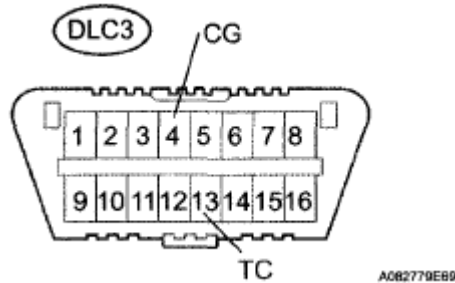


Fig. 1: Connecting Terminals 13 (TC) And 4 (CG) Of DLC3
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

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

2. Remove the No. 1 engine cover.

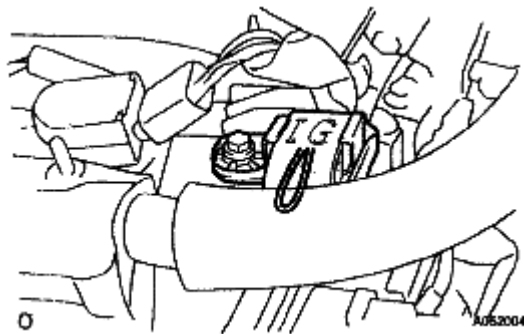


Fig. 2: Pulling Out Wire Harness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. Pull out the wire harness as shown in the illustration. Connect the clip of the timing light to the wire harness.

NOTE:

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

4. Check the ignition timing at idle.

Ignition timing:**8 to 12° BTDC at idle****NOTE:****When checking the ignition timing, the transmission should be in neutral.****HINT:**

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

5. Disconnect terminals 13 (TC) and 4 (CG) of the DLC3.
6. Check the ignition timing at idle.

Ignition timing:**5 to 15° BTDC at idle**

7. Confirm that the ignition timing moves to the advanced angle side when the engine rpm is increased.
8. Remove the timing light.

7. INSPECT ENGINE IDLE SPEED

- a. Warm up the engine.
- b. When using the Techstream:

Check the idle speed.

1. Connect the Techstream to the DLC3.

HINT:

Refer to the Techstream operator's service information for further details.

2. Enter DATA LIST MODE on the Techstream.

Idle speed**IDLE SPEED SPECIFICATION**

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Item	Specified Condition
M/T	650 to 750 rpm
A/T	610 to 710 rpm

NOTE:

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

c. When not using the Techstream:

Check the idle speed.

1. Using SST, connect the tachometer tester probe to terminal 9 (TAC) of the DLC3.

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2. Check the idle speed.

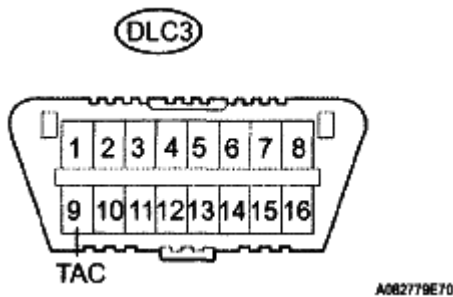


Fig. 3: Connecting Tachometer Tester Probe To Terminal 9 (TAC) Of DLC3
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Idle speed**IDLE SPEED SPECIFICATION**

Item	Specified Condition
M/T	650 to 750 rpm
A/T	610 to 710 rpm

8. INSPECT COMPRESSION

- a. Warm up and stop the engine.
- b. Disconnect the injector connectors.
- c. Remove the ignition coils.
- d. Remove the spark plugs.

e. Check the cylinder compression pressure.

1. Insert a compression gauge into the spark plug hole.
2. Fully open the throttle.
3. While cranking the engine, measure the compression pressure.

Compression pressure:

1.360 MPa (13.9 kgf/ cm² , 198 psi)

Minimum pressure:

0.98 MPa (10 kgf/ cm² , 142 psi)

Difference between each cylinder:

100 kPa (1.0 kgf/ cm² , 14 psi)

NOTE:

- Always use a fully charged battery to obtain an engine speed of 250 rpm or more.
- Check the other cylinders' compression pressure in the same way.
- This measurement must be done as quickly as possible.

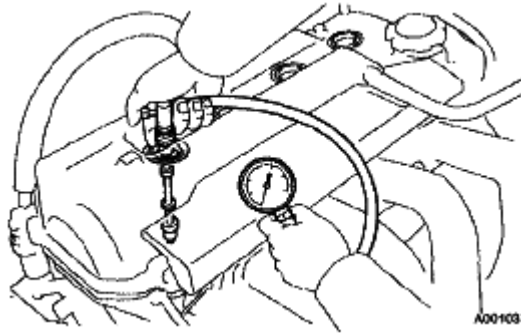


Fig. 4: Inspecting Cylinder Compression Pressure
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. If the cylinder compression is low, pour a small amount of engine oil into the cylinder through the spark plug hole and inspect again.

HINT:

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

leakage in the gasket.

9. INSPECT CO/HC

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

HINT:

- Complete the measuring within 3 minutes.
 - Check regulations and restrictions in your area when performing 2 mode CO/HC concentration testing (engine check at both idle speed and at 2,500 rpm).
- If the CO/HC concentration does not comply with regulations, troubleshoot in the order given below.
 - Check A/F sensor and heated oxygen sensor operation (See **INSPECTION**).
 - See the table below for possible causes, and then inspect and repair.

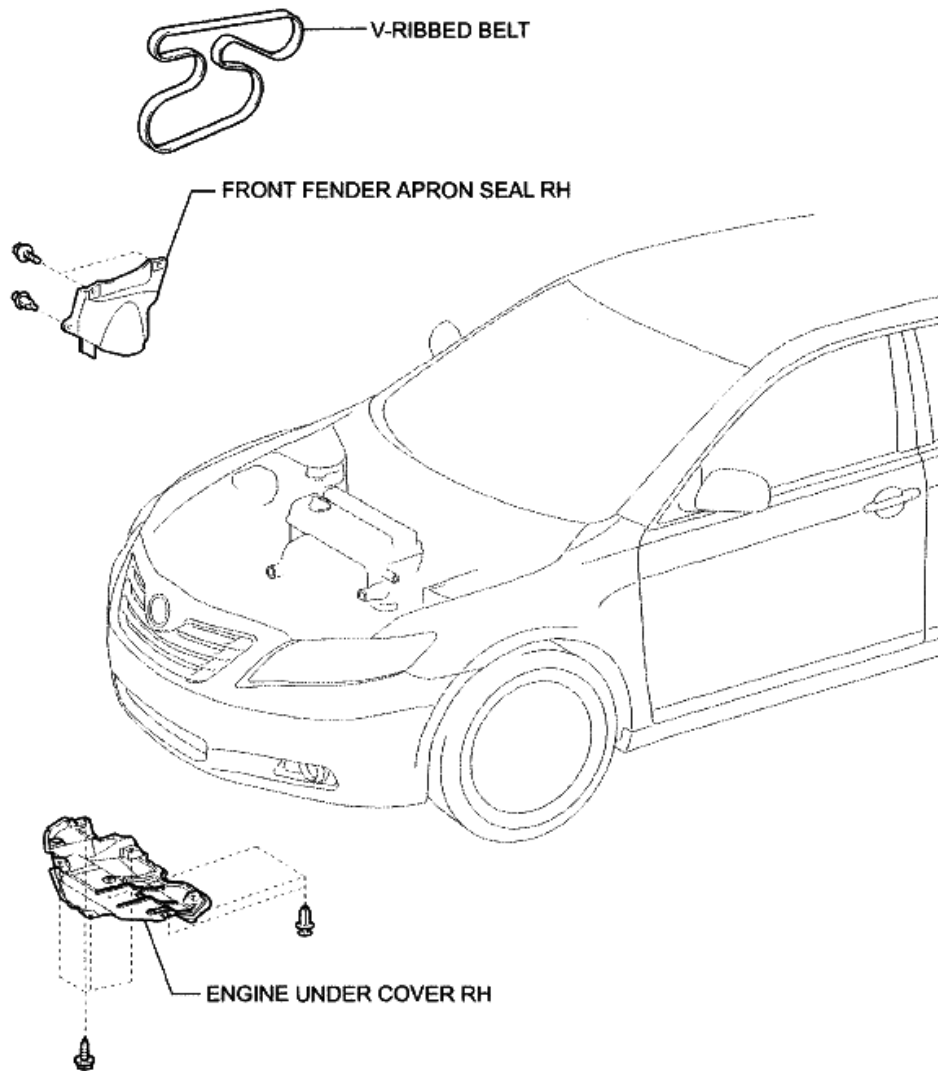
CO/HC PROBLEM CHART

CO	HC	Problems	Causes
Normal	High	Rough idle	- Faulty ignitions: - Incorrect timing - Fouled, shorted or improperly gapped plugs - Incorrect valve clearance - Leaky intake and exhaust valves - Leaky cylinders
Low	High	Rough idle (fluctuating HC reading)	- Vacuum leaks: - PCV hoses - Intake manifold - Throttle body - Brake booster line - Lean mixture causing misfire
High	High	Rough idle (black smoke from exhaust)	- Restricted air filter - Plugged PCV valve - Faulty SFI system: - Faulty pressure regulator - Defective ECT - Defective MAF meter - Faulty ECM

- Faulty injectors
- Faulty throttle position sensor

DRIVE BELT

COMPONENTS



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Fig. 5: Identifying Drive Belt Components
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. REMOVE FRONT WHEEL RH
2. REMOVE ENGINE UNDER COVER RH

3. REMOVE FRONT FENDER APRON SEAL RH**4. REMOVE V-RIBBED BELT**

- a. Using SST and 19 mm socket wrench, loosen the V-ribbed belt tensioner arm clockwise, then remove the V-ribbed belt.

SST 09216-42010**NOTE:**

- Be sure to connect SST and the tools so that they are in line during use.
- When retracting the tensioner, turn it clockwise slowly for 3 seconds or more. Do not apply force rapidly.
- After the tensioner is fully retracted, do not apply force any more than necessary.

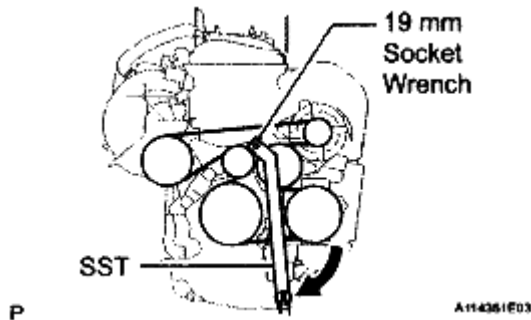


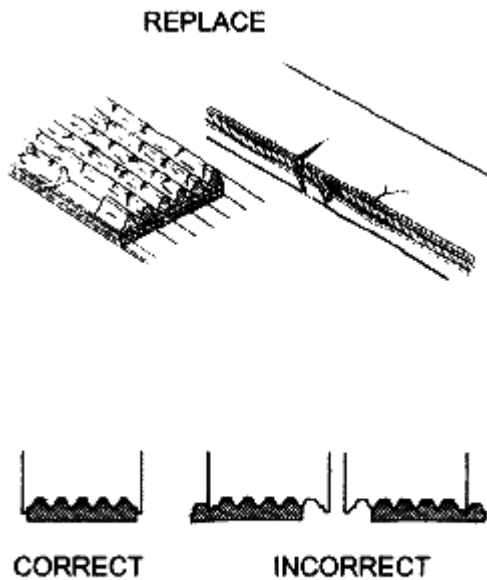
Fig. 6: Removing V-Ribbed Belt With SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION**1. INSPECT V-RIBBED BELT**

- a. Visually check the V-ribbed belt for excessive wear, frayed cords, etc. If any defect has been found, replace the V-ribbed belt.

HINT:

- Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.
- A "new belt" is a belt which has been used for less than 5 minutes with the engine running.
- A "used belt" is a belt which has been used for 5 minutes or more with the engine running.



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Fig. 7: Checking V-Ribbed Belt For Excessive Wear And Frayed Cords
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. INSTALL V-RIBBED BELT

- a. Using SST and 19 mm socket wrench, loosen the V-ribbed belt tensioner arm clockwise, then install the V-ribbed belt.

SST 09216-42010

NOTE:

- Be sure to connect SST and the tools so that they are in line during use.
 - When retracting the tensioner, turn it clockwise slowly for 3 seconds or more. Do not apply force rapidly.
 - After the tensioner is fully retracted, do not apply force any more than necessary.
- b. After installing the V-ribbed belt, check that it fits properly in the ribbed grooves. Check to confirm that the belt has not slipped out of the grooves on the bottom of the crank pulley by hand.

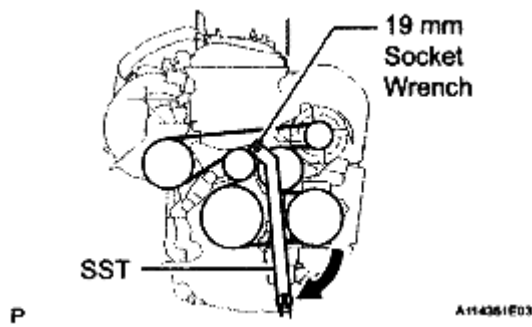


Fig. 8: Installing V-Ribbed Belt With SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSTALL FRONT FENDER APRON SEAL RH**
3. **INSTALL ENGINE UNDER COVER RH**
4. **INSTALL FRONT WHEEL RH**

Torque: 103 N*m (1,050 kgf*cm, 76 ft.*lbf)

VALVE CLEARANCE

ADJUSTMENT

1. **REMOVE FRONT WHEEL RH**
2. **REMOVE ENGINE UNDER COVER LH**
3. **REMOVE ENGINE UNDER COVER RH**
4. **REMOVE FRONT FENDER APRON SUB-ASSEMBLY RH**
5. **REMOVE NO. 1 ENGINE COVER** (See **REMOVAL**)
6. **REMOVE IGNITION COIL ASSEMBLY** (See **REMOVAL**)
7. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY** (See **REMOVAL**)
8. **SET NO. 1 CYLINDER TO TDC/COMPRESSION**
 - a. Turn the crankshaft pulley until its groove and the timing mark "0" of the timing chain cover are aligned.
 - b. Check that each timing mark of the camshaft timing gear and sprocket is aligned with each timing mark located on the No. 1 and No. 2 bearing caps as shown in the illustration. If not, turn the crankshaft by 1 revolution (360°) to align the timing marks as above.

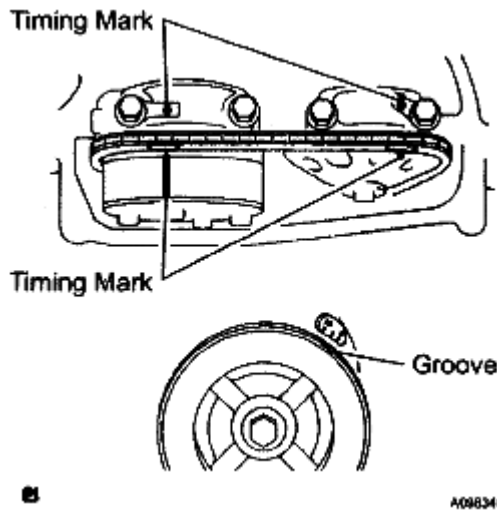


Fig. 9: Checking Timing Mark Of Camshaft Timing Gear And Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. CHECK VALVE CLEARANCE

- Check only the valves indicated.
 - Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

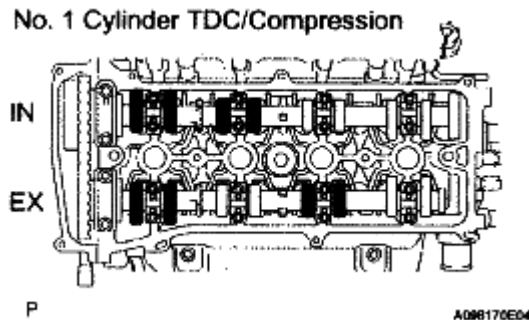


Fig. 10: Measuring Clearance Between Valve Lifter And Camshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard valve clearance (cold)

STANDARD VALVE CLEARANCE (COLD)

Item	Standard Condition
Intake	0.19 to 0.29 mm (0.0075 to 0.0114 in.)
Exhaust	0.38 to 0.48 mm (0.0150 to 0.0189 in.)

- Record any out-of-specification valve clearance measurements. They will be used later to determine the required replacement valve clearance lifters.
- Turn the crankshaft 1 revolution (360°) and set the No. 4 cylinder to the TDC/compression.
- Check only the valves indicated.

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

No. 4 Cylinder TDC/Compression

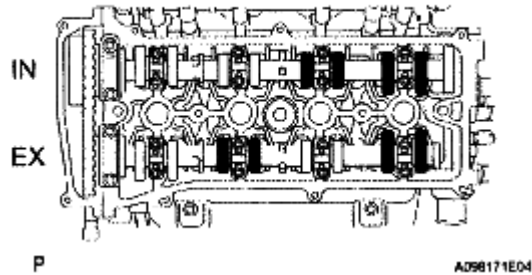


Fig. 11: Measuring Clearance Between Valve Lifter And Camshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard valve clearance (cold)

STANDARD VALVE CLEARANCE (COLD) (NO. 4 CYLINDER TO TDC/COMPRESSION)

Item	Standard Condition
Intake	0.19 to 0.29 mm (0.0075 to 0.0114 in.)
Exhaust	0.38 to 0.48 mm (0.0150 to 0.0189 in.)

2. Record any out-of-specification valve clearance measurements. They will be used later to determine the required replacement valve lifters.

10. ADJUST VALVE CLEARANCE

- a. Remove the No. 2 camshaft (see **REMOVAL**).
- b. Remove the camshaft (see **REMOVAL**).
- c. Remove the valve lifters.
- d. Using a micrometer, measure the thickness of the removed valve lifters.

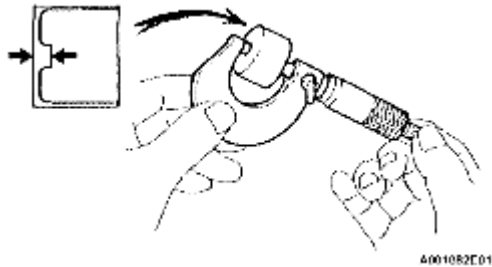


Fig. 12: Measuring Removed Lifter Thickness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Calculate the thickness of a new lifter so that the valve clearance comes within the specified values.

New lifter thickness

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ADJUST VALVE CLEARANCE

Item	Specification
Intake	$A = B + (C - 0.24 \text{ mm (0.0095 in.)})$
Exhaust	$A = B + (C - 0.43 \text{ mm (0.0169 in.)})$

NEW LIFTER THICKNESS

A	New lifter thickness
B	Used lifter thickness
C	Measured valve clearance

CALCULATION EXAMPLE (Intake):

1. Measured intake valve clearance = 0.40 mm (0.0158 in.)

(Measured - Specification = Excess clearance)
 - a. $0.40 \text{ mm (0.0158 in.)} - 0.24 \text{ mm (0.0095 in.)} = 0.16 \text{ mm (0.0063 in.)}$
2. Measured used lifter measurement = 5.250 mm (0.2067 in.)
3. New lifter thickness = 5.410 mm (0.2130 in.) (Excess clearance + Used lifter thickness = Ideal new lifter)
 - a. $0.16 \text{ mm (0.0063 in.)} + 5.250 \text{ mm (0.2067 in.)} = 5.410 \text{ mm (0.2130 in.)}$
4. Closest new lifter = 5.420 mm (0.2134 in.)
 - o Select No. 42 lifter
- f. Select a new lifter with a thickness as close as possible to the calculated values.

HINT:

- Lifters are available in 35 sizes in increments of 0.020 mm (0.0008 in.), from 5.060 to 5.740 mm (0.1992 to 0.2260 in.).
- The identification number inside the valve lifters shows the value to 2 decimal places. (The illustration shows 5.420 mm (0.2134 in.)

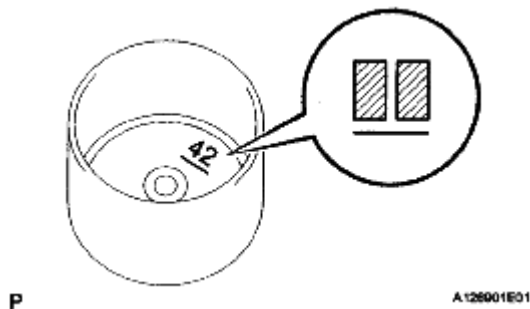


Fig. 13: Identifying Number Of Inside Valve Lifters
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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g. Valve lifter selection chart (intake).

Measured clearance mm (in.)	Installed lifter thickness mm (in.)	
	mm (in.)	mm (in.)
5.060 (0.1992)	0.000 (0.0000)	0.001 (0.0012)
5.080 (0.2000)	0.001 (0.0012)	0.002 (0.0020)
5.100 (0.2008)	0.002 (0.0020)	0.003 (0.0035)
5.120 (0.2016)	0.003 (0.0035)	0.004 (0.0043)
5.140 (0.2024)	0.004 (0.0043)	0.005 (0.0051)
5.160 (0.2031)	0.005 (0.0051)	0.006 (0.0061)
5.180 (0.2039)	0.006 (0.0061)	0.007 (0.0067)
5.200 (0.2047)	0.007 (0.0067)	0.008 (0.0074)
5.210 (0.2051)	0.008 (0.0074)	0.009 (0.0079)
5.220 (0.2055)	0.009 (0.0079)	0.010 (0.0084)
5.230 (0.2059)	0.010 (0.0084)	0.011 (0.0089)
5.240 (0.2063)	0.011 (0.0089)	0.012 (0.0094)
5.250 (0.2067)	0.012 (0.0094)	0.013 (0.0099)
5.260 (0.2071)	0.013 (0.0099)	0.014 (0.0104)
5.270 (0.2075)	0.014 (0.0104)	0.015 (0.0109)
5.280 (0.2079)	0.015 (0.0109)	0.016 (0.0114)
5.290 (0.2083)	0.016 (0.0114)	0.017 (0.0119)
5.300 (0.2087)	0.017 (0.0119)	0.018 (0.0124)
5.310 (0.2091)	0.018 (0.0124)	0.019 (0.0129)
5.320 (0.2094)	0.019 (0.0129)	0.020 (0.0134)
5.330 (0.2098)	0.020 (0.0134)	0.021 (0.0139)
5.340 (0.2102)	0.021 (0.0139)	0.022 (0.0144)
5.350 (0.2106)	0.022 (0.0144)	0.023 (0.0149)
5.360 (0.2110)	0.023 (0.0149)	0.024 (0.0154)
5.370 (0.2114)	0.024 (0.0154)	0.025 (0.0159)
5.380 (0.2118)	0.025 (0.0159)	0.026 (0.0164)
5.390 (0.2122)	0.026 (0.0164)	0.027 (0.0169)
5.400 (0.2126)	0.027 (0.0169)	0.028 (0.0174)
5.410 (0.2130)	0.028 (0.0174)	0.029 (0.0179)
5.420 (0.2134)	0.029 (0.0179)	0.030 (0.0184)
5.430 (0.2138)	0.030 (0.0184)	0.031 (0.0189)
5.440 (0.2142)	0.031 (0.0189)	0.032 (0.0194)
5.450 (0.2146)	0.032 (0.0194)	0.033 (0.0199)
5.460 (0.2150)	0.033 (0.0199)	0.034 (0.0204)
5.470 (0.2154)	0.034 (0.0204)	0.035 (0.0209)
5.480 (0.2157)	0.035 (0.0209)	0.036 (0.0214)
5.490 (0.2161)	0.036 (0.0214)	0.037 (0.0219)
5.500 (0.2165)	0.037 (0.0219)	0.038 (0.0224)
5.510 (0.2169)	0.038 (0.0224)	0.039 (0.0229)
5.520 (0.2173)	0.039 (0.0229)	0.040 (0.0234)
5.530 (0.2177)	0.040 (0.0234)	0.041 (0.0239)
5.540 (0.2181)	0.041 (0.0239)	0.042 (0.0244)
5.550 (0.2185)	0.042 (0.0244)	0.043 (0.0249)
5.560 (0.2189)	0.043 (0.0249)	0.044 (0.0254)
5.570 (0.2193)	0.044 (0.0254)	0.045 (0.0259)
5.580 (0.2197)	0.045 (0.0259)	0.046 (0.0264)
5.590 (0.2201)	0.046 (0.0264)	0.047 (0.0269)
5.600 (0.2205)	0.047 (0.0269)	0.048 (0.0274)
5.620 (0.2213)	0.048 (0.0274)	0.049 (0.0279)
5.640 (0.2220)	0.049 (0.0279)	0.050 (0.0284)
5.660 (0.2228)	0.050 (0.0284)	0.051 (0.0289)
5.680 (0.2236)	0.051 (0.0289)	0.052 (0.0294)
5.700 (0.2244)	0.052 (0.0294)	0.053 (0.0299)
5.720 (0.2252)	0.053 (0.0299)	0.054 (0.0304)
5.740 (0.2260)	0.054 (0.0304)	0.055 (0.0309)

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Fig. 14: Identifying Valve Lifter Selection Chart (Intake)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

New lifter thickness

NEW LIFTER THICKNESS SPECIFICATION

Lifter No.	Thickness mm (in.)	Lifter No.	Thickness mm (in.)	Lifter No.	Thickness mm (in.)
06	5.060 (0.1992)	30	5.300 (0.2087)	54	5.540 (0.2181)

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08	5.080 (0.2000)	32	5.320 (0.2094)	56	5.560 (0.2189)
10	5.100 (0.2008)	34	5.340 (0.2102)	58	5.580 (0.2197)
12	5.120 (0.2016)	36	5.360 (0.2110)	60	5.600 (0.2205)
14	5.140 (0.2024)	38	5.380 (0.2118)	62	5.620 (0.2213)
16	5.160 (0.2031)	40	5.400 (0.2126)	64	5.640 (0.2220)
18	5.180 (0.2039)	42	5.420 (0.2134)	66	5.660 (0.2228)
20	5.200 (0.2047)	44	5.440 (0.2142)	68	5.680 (0.2236)
22	5.220 (0.2055)	46	5.460 (0.2150)	70	5.700 (0.2244)
24	5.240 (0.2063)	48	5.480 (0.2157)	72	5.720 (0.2252)
26	5.260 (0.2071)	50	5.500 (0.2165)	74	5.740 (0.2260)
28	5.280 (0.2079)	52	5.520 (0.2173)	-	-

Standard intake valve clearance (cold):**0.19 to 0.29 mm (0.0075 to 0.0114 in.)****EXAMPLE:**

The 5.250 mm (0.2067 in.) lifter is installed, and the measured clearance is 0.400 mm (0.0157 in.).

Replace the 5.250 mm (0.2067 in.) lifter with a new No. 42 lifter.

- h. Valve lifter selection chart (exhaust).

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Measured clearance		mm (in.)		Installed lifter thickness		mm (in.)	
0.000 - 0.030 (0.0000 - 0.0012)	0.031 - 0.050 (0.0012 - 0.0020)	0.051 - 0.070 (0.0020 - 0.0028)	0.071 - 0.090 (0.0028 - 0.0035)	0.091 - 0.110 (0.0036 - 0.0043)	0.111 - 0.130 (0.0044 - 0.0051)	0.131 - 0.150 (0.0052 - 0.0059)	0.151 - 0.170 (0.0060 - 0.0067)
0.171 - 0.190 (0.0067 - 0.0075)	0.191 - 0.210 (0.0075 - 0.0083)	0.211 - 0.230 (0.0083 - 0.0091)	0.231 - 0.250 (0.0091 - 0.0098)	0.251 - 0.270 (0.0098 - 0.0106)	0.271 - 0.290 (0.0107 - 0.0114)	0.291 - 0.310 (0.0115 - 0.0122)	0.311 - 0.330 (0.0122 - 0.0130)
0.331 - 0.350 (0.0130 - 0.0138)	0.351 - 0.370 (0.0138 - 0.0146)	0.371 - 0.390 (0.0146 - 0.0154)	0.391 - 0.410 (0.0154 - 0.0162)	0.411 - 0.430 (0.0162 - 0.0170)	0.431 - 0.450 (0.0170 - 0.0178)	0.451 - 0.470 (0.0178 - 0.0186)	0.471 - 0.490 (0.0186 - 0.0194)
0.491 - 0.510 (0.0194 - 0.0202)	0.511 - 0.530 (0.0202 - 0.0210)	0.531 - 0.550 (0.0210 - 0.0218)	0.551 - 0.570 (0.0218 - 0.0226)	0.571 - 0.590 (0.0226 - 0.0234)	0.591 - 0.610 (0.0234 - 0.0242)	0.611 - 0.630 (0.0242 - 0.0250)	0.631 - 0.650 (0.0250 - 0.0258)
0.651 - 0.670 (0.0258 - 0.0266)	0.671 - 0.690 (0.0266 - 0.0274)	0.691 - 0.710 (0.0274 - 0.0282)	0.711 - 0.730 (0.0282 - 0.0290)	0.731 - 0.750 (0.0290 - 0.0298)	0.751 - 0.770 (0.0298 - 0.0306)	0.771 - 0.790 (0.0306 - 0.0314)	0.791 - 0.810 (0.0314 - 0.0322)
0.811 - 0.830 (0.0322 - 0.0330)	0.831 - 0.850 (0.0330 - 0.0338)	0.851 - 0.870 (0.0338 - 0.0346)	0.871 - 0.890 (0.0346 - 0.0354)	0.891 - 0.910 (0.0354 - 0.0362)	0.911 - 0.930 (0.0362 - 0.0370)	0.931 - 0.950 (0.0370 - 0.0378)	0.951 - 0.970 (0.0378 - 0.0386)
0.971 - 0.990 (0.0386 - 0.0394)	0.991 - 1.010 (0.0394 - 0.0402)	1.011 - 1.030 (0.0402 - 0.0410)	1.031 - 1.050 (0.0410 - 0.0418)	1.051 - 1.070 (0.0418 - 0.0426)	1.071 - 1.090 (0.0426 - 0.0434)	1.091 - 1.110 (0.0434 - 0.0442)	1.111 - 1.130 (0.0442 - 0.0450)
1.131 - 1.150 (0.0450 - 0.0458)	1.151 - 1.170 (0.0458 - 0.0466)	1.171 - 1.190 (0.0466 - 0.0474)	1.191 - 1.210 (0.0474 - 0.0482)	1.211 - 1.230 (0.0482 - 0.0490)	1.231 - 1.250 (0.0490 - 0.0498)	1.251 - 1.270 (0.0498 - 0.0506)	1.271 - 1.290 (0.0506 - 0.0514)
1.291 - 1.310 (0.0514 - 0.0522)	1.311 - 1.330 (0.0522 - 0.0530)	1.331 - 1.350 (0.0530 - 0.0538)	1.351 - 1.370 (0.0538 - 0.0546)	1.371 - 1.390 (0.0546 - 0.0554)	1.391 - 1.410 (0.0554 - 0.0562)	1.411 - 1.430 (0.0562 - 0.0570)	1.431 - 1.450 (0.0570 - 0.0578)
1.451 - 1.470 (0.0578 - 0.0586)	1.471 - 1.490 (0.0586 - 0.0594)	1.491 - 1.510 (0.0594 - 0.0602)	1.511 - 1.530 (0.0602 - 0.0610)	1.531 - 1.550 (0.0610 - 0.0618)	1.551 - 1.570 (0.0618 - 0.0626)	1.571 - 1.590 (0.0626 - 0.0634)	1.591 - 1.610 (0.0634 - 0.0642)
1.611 - 1.630 (0.0642 - 0.0650)	1.631 - 1.650 (0.0650 - 0.0658)	1.651 - 1.670 (0.0658 - 0.0666)	1.671 - 1.690 (0.0666 - 0.0674)	1.691 - 1.710 (0.0674 - 0.0682)	1.711 - 1.730 (0.0682 - 0.0690)	1.731 - 1.750 (0.0690 - 0.0698)	1.751 - 1.770 (0.0698 - 0.0706)
1.771 - 1.790 (0.0706 - 0.0714)	1.791 - 1.810 (0.0714 - 0.0722)	1.811 - 1.830 (0.0722 - 0.0730)	1.831 - 1.850 (0.0730 - 0.0738)	1.851 - 1.870 (0.0738 - 0.0746)	1.871 - 1.890 (0.0746 - 0.0754)	1.891 - 1.910 (0.0754 - 0.0762)	1.911 - 1.930 (0.0762 - 0.0770)
1.931 - 1.950 (0.0770 - 0.0778)	1.951 - 1.970 (0.0778 - 0.0786)	1.971 - 1.990 (0.0786 - 0.0794)	1.991 - 2.010 (0.0794 - 0.0802)	2.011 - 2.030 (0.0802 - 0.0810)	2.031 - 2.050 (0.0810 - 0.0818)	2.051 - 2.070 (0.0818 - 0.0826)	2.071 - 2.090 (0.0826 - 0.0834)
2.091 - 2.110 (0.0834 - 0.0842)	2.111 - 2.130 (0.0842 - 0.0850)	2.131 - 2.150 (0.0850 - 0.0858)	2.151 - 2.170 (0.0858 - 0.0866)	2.171 - 2.190 (0.0866 - 0.0874)	2.191 - 2.210 (0.0874 - 0.0882)	2.211 - 2.230 (0.0882 - 0.0890)	2.231 - 2.250 (0.0890 - 0.0898)
2.251 - 2.270 (0.0898 - 0.0906)	2.271 - 2.290 (0.0906 - 0.0914)	2.291 - 2.310 (0.0914 - 0.0922)	2.311 - 2.330 (0.0922 - 0.0930)	2.331 - 2.350 (0.0930 - 0.0938)	2.351 - 2.370 (0.0938 - 0.0946)	2.371 - 2.390 (0.0946 - 0.0954)	2.391 - 2.410 (0.0954 - 0.0962)
2.411 - 2.430 (0.0962 - 0.0970)	2.431 - 2.450 (0.0970 - 0.0978)	2.451 - 2.470 (0.0978 - 0.0986)	2.471 - 2.490 (0.0986 - 0.0994)	2.491 - 2.510 (0.0994 - 0.1002)	2.511 - 2.530 (0.1002 - 0.1010)	2.531 - 2.550 (0.1010 - 0.1018)	2.551 - 2.570 (0.1018 - 0.1026)
2.571 - 2.590 (0.1026 - 0.1034)	2.591 - 2.610 (0.1034 - 0.1042)	2.611 - 2.630 (0.1042 - 0.1050)	2.631 - 2.650 (0.1050 - 0.1058)	2.651 - 2.670 (0.1058 - 0.1066)	2.671 - 2.690 (0.1066 - 0.1074)	2.691 - 2.710 (0.1074 - 0.1082)	2.711 - 2.730 (0.1082 - 0.1090)
2.731 - 2.750 (0.1090 - 0.1098)	2.751 - 2.770 (0.1098 - 0.1106)	2.771 - 2.790 (0.1106 - 0.1114)	2.791 - 2.810 (0.1114 - 0.1122)	2.811 - 2.830 (0.1122 - 0.1130)	2.831 - 2.850 (0.1130 - 0.1138)	2.851 - 2.870 (0.1138 - 0.1146)	2.871 - 2.890 (0.1146 - 0.1154)
2.891 - 2.910 (0.1154 - 0.1162)	2.911 - 2.930 (0.1162 - 0.1170)	2.931 - 2.950 (0.1170 - 0.1178)	2.951 - 2.970 (0.1178 - 0.1186)	2.971 - 2.990 (0.1186 - 0.1194)	2.991 - 3.010 (0.1194 - 0.1202)	3.011 - 3.030 (0.1202 - 0.1210)	3.031 - 3.050 (0.1210 - 0.1218)
3.051 - 3.070 (0.1218 - 0.1226)	3.071 - 3.090 (0.1226 - 0.1234)	3.091 - 3.110 (0.1234 - 0.1242)	3.111 - 3.130 (0.1242 - 0.1250)	3.131 - 3.150 (0.1250 - 0.1258)	3.151 - 3.170 (0.1258 - 0.1266)	3.171 - 3.190 (0.1266 - 0.1274)	3.191 - 3.210 (0.1274 - 0.1282)
3.211 - 3.230 (0.1282 - 0.1290)	3.231 - 3.250 (0.1290 - 0.1298)	3.251 - 3.270 (0.1298 - 0.1306)	3.271 - 3.290 (0.1306 - 0.1314)	3.291 - 3.310 (0.1314 - 0.1322)	3.311 - 3.330 (0.1322 - 0.1330)	3.331 - 3.350 (0.1330 - 0.1338)	3.351 - 3.370 (0.1338 - 0.1346)
3.371 - 3.390 (0.1346 - 0.1354)	3.391 - 3.410 (0.1354 - 0.1362)	3.411 - 3.430 (0.1362 - 0.1370)	3.431 - 3.450 (0.1370 - 0.1378)	3.451 - 3.470 (0.1378 - 0.1386)	3.471 - 3.490 (0.1386 - 0.1394)	3.491 - 3.510 (0.1394 - 0.1402)	3.511 - 3.530 (0.1402 - 0.1410)
3.531 - 3.550 (0.1410 - 0.1418)	3.551 - 3.570 (0.1418 - 0.1426)	3.571 - 3.590 (0.1426 - 0.1434)	3.591 - 3.610 (0.1434 - 0.1442)	3.611 - 3.630 (0.1442 - 0.1450)	3.631 - 3.650 (0.1450 - 0.1458)	3.651 - 3.670 (0.1458 - 0.1466)	3.671 - 3.690 (0.1466 - 0.1474)
3.691 - 3.710 (0.1474 - 0.1482)	3.711 - 3.730 (0.1482 - 0.1490)	3.731 - 3.750 (0.1490 - 0.1498)	3.751 - 3.770 (0.1498 - 0.1506)	3.771 - 3.790 (0.1506 - 0.1514)	3.791 - 3.810 (0.1514 - 0.1522)	3.811 - 3.830 (0.1522 - 0.1530)	3.831 - 3.850 (0.1530 - 0.1538)
3.851 - 3.870 (0.1538 - 0.1546)	3.871 - 3.890 (0.1546 - 0.1554)	3.891 - 3.910 (0.1554 - 0.1562)	3.911 - 3.930 (0.1562 - 0.1570)	3.931 - 3.950 (0.1570 - 0.1578)	3.951 - 3.970 (0.1578 - 0.1586)	3.971 - 3.990 (0.1586 - 0.1594)	3.991 - 4.010 (0.1594 - 0.1602)
4.011 - 4.030 (0.1602 - 0.1610)	4.031 - 4.050 (0.1610 - 0.1618)	4.051 - 4.070 (0.1618 - 0.1626)	4.071 - 4.090 (0.1626 - 0.1634)	4.091 - 4.110 (0.1634 - 0.1642)	4.111 - 4.130 (0.1642 - 0.1650)	4.131 - 4.150 (0.1650 - 0.1658)	4.151 - 4.170 (0.1658 - 0.1666)
4.171 - 4.190 (0.1666 - 0.1674)	4.191 - 4.210 (0.1674 - 0.1682)	4.211 - 4.230 (0.1682 - 0.1690)	4.231 - 4.250 (0.1690 - 0.1698)	4.251 - 4.270 (0.1698 - 0.1706)	4.271 - 4.290 (0.1706 - 0.1714)	4.291 - 4.310 (0.1714 - 0.1722)	4.311 - 4.330 (0.1722 - 0.1730)
4.331 - 4.350 (0.1730 - 0.1738)	4.351 - 4.370 (0.1738 - 0.1746)	4.371 - 4.390 (0.1746 - 0.1754)	4.391 - 4.410 (0.1754 - 0.1762)	4.411 - 4.430 (0.1762 - 0.1770)	4.431 - 4.450 (0.1770 - 0.1778)	4.451 - 4.470 (0.1778 - 0.1786)	4.471 - 4.490 (0.1786 - 0.1794)
4.491 - 4.510 (0.1794 - 0.1802)	4.511 - 4.530 (0.1802 - 0.1810)	4.531 - 4.550 (0.1810 - 0.1818)	4.551 - 4.570 (0.1818 - 0.1826)	4.571 - 4.590 (0.1826 - 0.1834)	4.591 - 4.610 (0.1834 - 0.1842)	4.611 - 4.630 (0.1842 - 0.1850)	4.631 - 4.650 (0.1850 - 0.1858)
4.651 - 4.670 (0.1858 - 0.1866)	4.671 - 4.690 (0.1866 - 0.1874)	4.691 - 4.710 (0.1874 - 0.1882)	4.711 - 4.730 (0.1882 - 0.1890)	4.731 - 4.750 (0.1890 - 0.1898)	4.751 - 4.770 (0.1898 - 0.1906)	4.771 - 4.790 (0.1906 - 0.1914)	4.791 - 4.810 (0.1914 - 0.1922)
4.811 - 4.830 (0.1922 - 0.1930)	4.831 - 4.850 (0.1930 - 0.1938)	4.851 - 4.870 (0.1938 - 0.1946)	4.871 - 4.890 (0.1946 - 0.1954)	4.891 - 4.910 (0.1954 - 0.1962)	4.911 - 4.930 (0.1962 - 0.1970)	4.931 - 4.950 (0.1970 - 0.1978)	4.951 - 4.970 (0.1978 - 0.1986)
4.971 - 4.990 (0.1986 - 0.1994)	4.991 - 5.010 (0.1994 - 0.2002)	5.011 - 5.030 (0.2002 - 0.2010)	5.031 - 5.050 (0.2010 - 0.2018)	5.051 - 5.070 (0.2018 - 0.2026)	5.071 - 5.090 (0.2026 - 0.2034)	5.091 - 5.110 (0.2034 - 0.2042)	5.111 - 5.130 (0.2042 - 0.2050)
5.131 - 5.150 (0.2050 - 0.2058)	5.151 - 5.170 (0.2058 - 0.2066)	5.171 - 5.190 (0.2066 - 0.2074)	5.191 - 5.210 (0.2074 - 0.2082)	5.211 - 5.230 (0.2082 - 0.2090)	5.231 - 5.250 (0.2090 - 0.2098)	5.251 - 5.270 (0.2098 - 0.2106)	5.271 - 5.290 (0.2106 - 0.2114)
5.291 - 5.310 (0.2114 - 0.2122)	5.311 - 5.330 (0.2122 - 0.2130)	5.331 - 5.350 (0.2130 - 0.2138)	5.351 - 5.370 (0.2138 - 0.2146)	5.371 - 5.390 (0.2146 - 0.2154)	5.391 - 5.410 (0.2154 - 0.2162)	5.411 - 5.430 (0.2162 - 0.2170)	5.431 - 5.450 (0.2170 - 0.2178)
5.451 - 5.470 (0.2178 - 0.2186)	5.471 - 5.490 (0.2186 - 0.2194)	5.491 - 5.510 (0.2194 - 0.2202)	5.511 - 5.530 (0.2202 - 0.2210)	5.531 - 5.550 (0.2210 - 0.2218)	5.551 - 5.570 (0.2218 - 0.2226)	5.571 - 5.590 (0.2226 - 0.2234)	5.591 - 5.610 (0.2234 - 0.2242)
5.611 - 5.630 (0.2242 - 0.2250)	5.631 - 5.650 (0.2250 - 0.2258)	5.651 - 5.670 (0.2258 - 0.2266)	5.671 - 5.690 (0.2266 - 0.2274)	5.691 - 5.710 (0.2274 - 0.2282)	5.711 - 5.730 (0.2282 - 0.2290)	5.731 - 5.750 (0.2290 - 0.2298)	5.751 - 5.770 (0.2298 - 0.2306)
5.771 - 5.790 (0.2306 - 0.2314)	5.791 - 5.810 (0.2314 - 0.2322)	5.811 - 5.830 (0.2322 - 0.2330)	5.831 - 5.850 (0.2330 - 0.2338)	5.851 - 5.870 (0.2338 - 0.2346)	5.871 - 5.890 (0.2346 - 0.2354)	5.891 - 5.910 (0.2354 - 0.2362)	5.911 - 5.930 (0.2362 - 0.2370)
5.931 - 5.950 (0.2370 - 0.2378)	5.951 - 5.970 (0.2378 - 0.2386)	5.971 - 5.990 (0.2386 - 0.2394)	5.991 - 6.010 (0.2394 - 0.2402)	6.011 - 6.030 (0.2402 - 0.2410)	6.031 - 6.050 (0.2410 - 0.2418)	6.051 - 6.070 (0.2418 - 0.2426)	6.071 - 6.090 (0.2426 - 0.2434)
6.091 - 6.110 (0.2434 - 0.2442)	6.111 - 6.130 (0.2442 - 0.2450)	6.131 - 6.150 (0.2450 - 0.2458)	6.151 - 6.170 (0.2458 - 0.2466)	6.171 - 6.190 (0.2466 - 0.2474)	6.191 - 6.210 (0.2474 - 0.2482)	6.211 - 6.230 (0.2482 - 0.2490)	6.231 - 6.250 (0.2490 - 0.2498)
6.251 - 6.270 (0.2498 - 0.2506)	6.271 - 6.290 (0.2506 - 0.2514)	6.291 - 6.310 (0.2514 - 0.2522)	6.311 - 6.330 (0.2522 - 0.2530)	6.331 - 6.350 (0.2530 - 0.2538)	6.351 - 6.370 (0.2538 - 0.2546)	6.371 - 6.390 (0.2546 - 0.2554)	6.391 - 6.410 (0.2554 - 0.2562)
6.411 - 6.430 (0.2562 - 0.2570)	6.431 - 6.450 (0.2570 - 0.2578)	6.451 - 6.470 (0.2578 - 0.2586)	6.471 - 6.490 (0.2586 - 0.2594)	6.491 - 6.510 (0.2594 - 0.2602)	6.511 - 6.530 (0.2602 - 0.2610)	6.531 - 6.550 (0.2610 - 0.2618)	6.551 - 6.570 (0.2618 - 0.2626)
6.571 - 6.590 (0.2626 - 0.2634)	6.591 - 6.610 (0.2634 - 0.2642)	6.611 - 6.630 (0.2642 - 0.2650)	6.631 - 6.650 (0.2650 - 0.2658)	6.651 - 6.670 (0.2658 - 0.2666)	6.671 - 6.690 (0.2666 - 0.2674)	6.691 - 6.710 (0.2674 - 0.2682)	6.711 - 6.730 (0.2682 - 0.2690)
6.731 - 6.750 (0.2690 - 0.2698)	6.751 - 6.770 (0.2698 - 0.2706)	6.771 - 6.790 (0.2706 - 0.2714)	6.791 - 6.810 (0.2714 - 0.2722)	6.811 - 6.830 (0.2722 - 0.2730)	6.831 - 6.850 (0.2730 - 0.2738)	6.851 - 6.870 (0.2738 - 0.2746)	6.871 - 6.890 (0.2746 - 0.2754)
6.891 - 6.910 (0.2754 - 0.2762)	6.911 - 6.930 (0.2762 - 0.2770)	6.931 - 6.950 (0.2770 - 0.2778)	6.951 - 6.970 (0.2778 - 0.2786)	6.971 - 6.990 (0.2786 - 0.2794)	6.991 - 7.010 (0.2794 - 0.2802)	7.011 - 7.030 (0.2802 - 0.2810)	7.031 - 7.050 (0.2810 - 0.2818)
7.051 - 7.070 (0.2818 - 0.2826)	7.071 - 7.090 (0.2826 - 0.2834)	7.091 - 7.110 (0.2834 - 0.2842)	7.111 - 7.130 (0.2842 - 0.2850)	7.131 - 7.150 (0.2850 - 0.2858)	7.151 - 7.170 (0.2858 - 0.2866)	7.171 - 7.190 (0.2866 - 0.2874)	7.191 - 7.210 (0.2874 - 0.2882)
7.211 - 7.230 (0.2882 - 0.2890)	7.231 - 7.250 (0.2890 - 0.2898)	7.251 - 7.270 (0.2898 - 0.2906)	7.271 - 7.290 (0.2906 - 0.2914)	7.291 - 7.310 (0.2914 - 0.2922)	7.311 - 7.330 (0.2922 - 0.2930)	7.331 - 7.350 (0.2930 - 0.2938)	7.351 - 7.370 (0.2938 - 0.2946)
7.371 - 7.390 (0.2946 - 0.2954)	7.391 - 7.410 (0.2954 - 0.2962)	7.411 - 7.430 (0.2962					

2008 Toyota Camry LE

2008 ENGINE Engine Mechanical (2AZ-FE) - Camry

10	5.100 (0.2008)	34	5.340 (0.2102)	58	5.580 (0.2197)
12	5.120 (0.2016)	36	5.360 (0.2110)	60	5.600 (0.2205)
14	5.140 (0.2024)	38	5.380 (0.2118)	62	5.620 (0.2213)
16	5.160 (0.2031)	40	5.400 (0.2126)	64	5.640 (0.2220)
18	5.180 (0.2039)	42	5.420 (0.2134)	66	5.660 (0.2228)
20	5.200 (0.2047)	44	5.440 (0.2142)	68	5.680 (0.2236)
22	5.220 (0.2055)	46	5.460 (0.2150)	70	5.700 (0.2244)
24	5.240 (0.2063)	48	5.480 (0.2157)	72	5.720 (0.2252)
26	5.260 (0.2071)	50	5.500 (0.2165)	74	5.740 (0.2260)
28	5.280 (0.2079)	52	5.520 (0.2173)	-	-

Standard exhaust valve clearance (cold):

0.38 to 0.48 mm (0.0150 to 0.0189 in.)

EXAMPLE:

The 5.340 mm (0.2102 in.) lifter is installed, and the measured clearance is 0.430 mm (0.0169 in.).

Replace the 5.340 mm (0.2102 in.) lifter with a new No. 42 lifter.

- i. Install the selected valve lifter.

11. INSTALL CAMSHAFT

- a. Apply a light coat of engine oil to the journal portion of the camshaft.
- b. Install the timing chain onto the camshaft timing gear with the paint mark aligned with the timing mark on the camshaft timing gear as shown in the illustration.

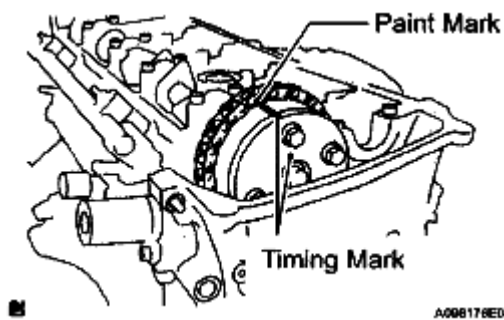


Fig. 16: Identifying Paint Mark, Timing Mark On Camshaft Timing Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Examine the front marks and numbers, and check that the order is as shown in the illustration. Then install the bearing caps into the cylinder head.

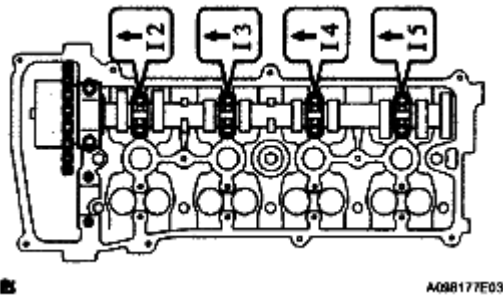


Fig. 17: Identifying Bearing Cap Numbers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.
- e. Using several steps, uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.

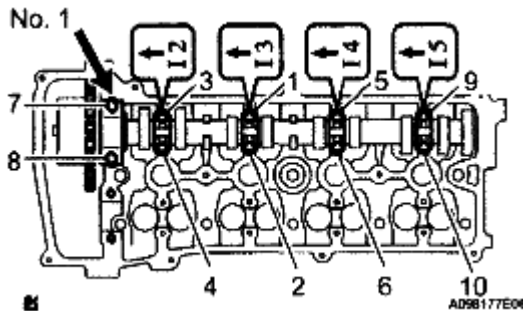


Fig. 18: Tightening Bearing Cap Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque:

No. 1 bearing cap

30 N*m (301 kgf*cm, 22 ft.*lbf)

No. 3 bearing cap

9.0 N*m (92 kgf*cm, 80 in.*lbf)

12. INSTALL NO. 2 CAMSHAFT

- a. Apply a light coat of engine oil to the journal portion of the No. 2 camshaft.
- b. Put the No. 2 camshaft on the cylinder head with the paint mark of the chain aligned with the timing mark on the camshaft timing sprocket.

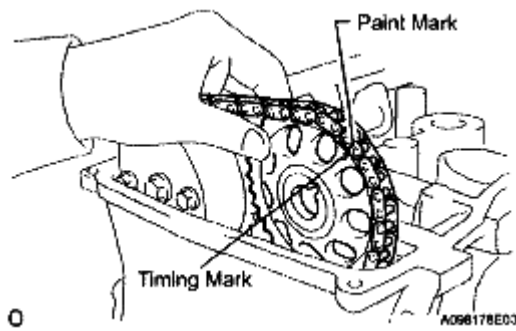


Fig. 19: Aligning With Timing Mark On Camshaft Timing Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. While holding the No. 2 camshaft by hand, temporarily tighten the camshaft timing sprocket set bolt.

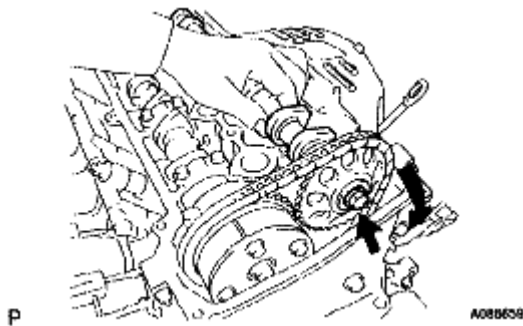


Fig. 20: Locating Camshaft Timing Sprocket Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Examine the front marks and numbers, and check that the order is as shown in the illustration. Then install the bearing caps onto the cylinder head.

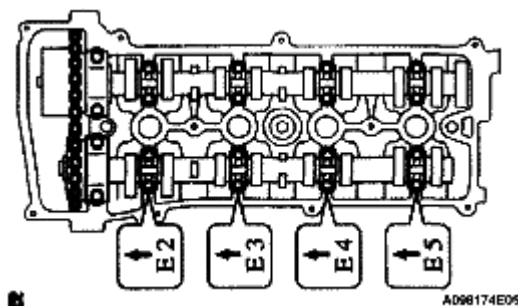


Fig. 21: Identifying Front Marks And Numbers Order
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.
- f. Using several steps, uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.

Torque:

No. 2 bearing cap

30 N*m (301 kgf*cm, 22 ft.*lbf)

No. 3 bearing cap

9.0 N*m (92 kgf*cm, 80 in.*lbf)

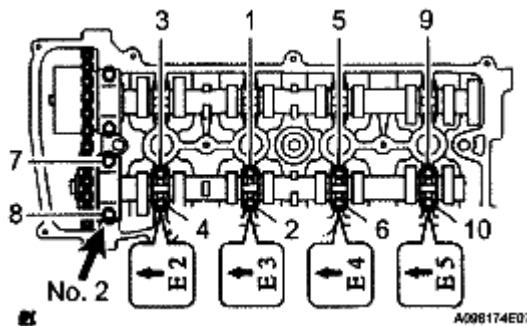


Fig. 22: Tightening Bearing Cap Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. While holding the camshaft with a wrench, tighten the camshaft timing sprocket set bolt.

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

NOTE: Be careful not to damage the valve lifter.

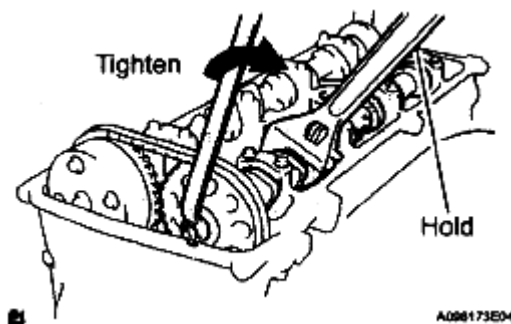


Fig. 23: Tightening Camshaft Timing Sprocket Set Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- h. Check that the paint marks on the chain are aligned with the timing marks on the camshaft timing gear and camshaft timing, sprocket. Also, check that the crankshaft pulley groove is aligned with the timing mark "0" of the timing chain cover.

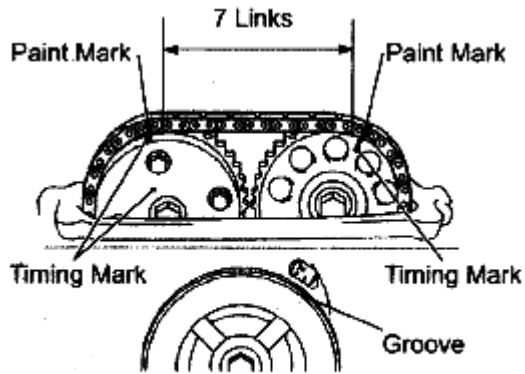


Fig. 24: Aligning With Timing Marks On Camshaft Timing Gear And Camshaft Timing Sprocket

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

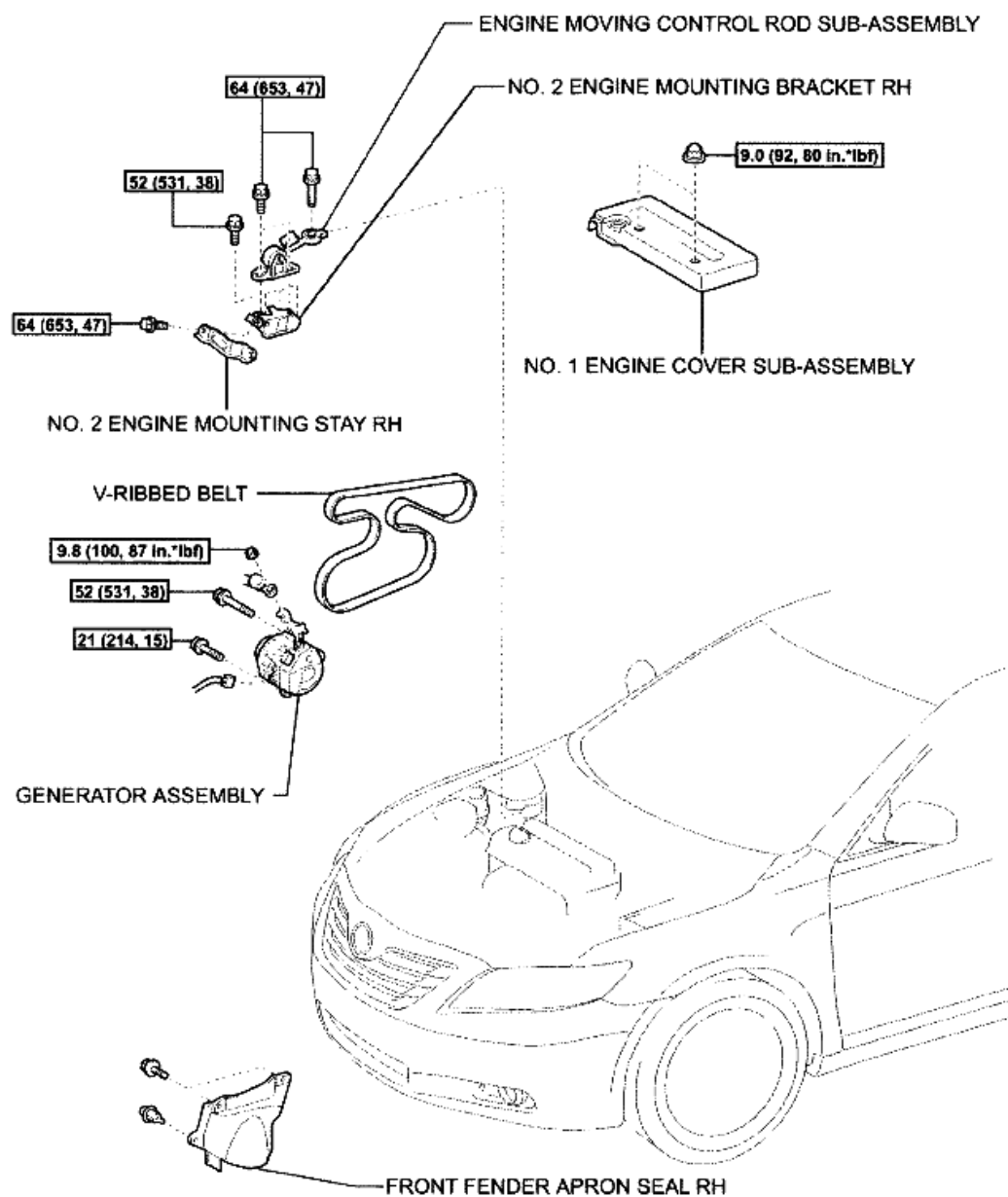
13. INSTALL NO. 1 CHAIN TENSIONER (See INSTALLATION)
14. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY (See INSTALLATION)
15. INSTALL IGNITION COIL ASSEMBLY (See INSTALLATION)
16. CHECK FOR ENGINE OIL LEAKS
17. INSTALL NO. 1 ENGINE COVER (See INSTALLATION)
18. INSTALL FRONT FENDER APRON RH
19. INSTALL ENGINE UNDER COVER LH
20. INSTALL ENGINE UNDER COVER RH
21. INSTALL FRONT WHEEL RH

TIMING CHAIN

COMPONENTS

2008 Toyota Camry LE

2008 ENGINE Engine Mechanical (2AZ-FE) - Camry



[N*m (kgf*cm, ft.*lbf)]: Specified torque

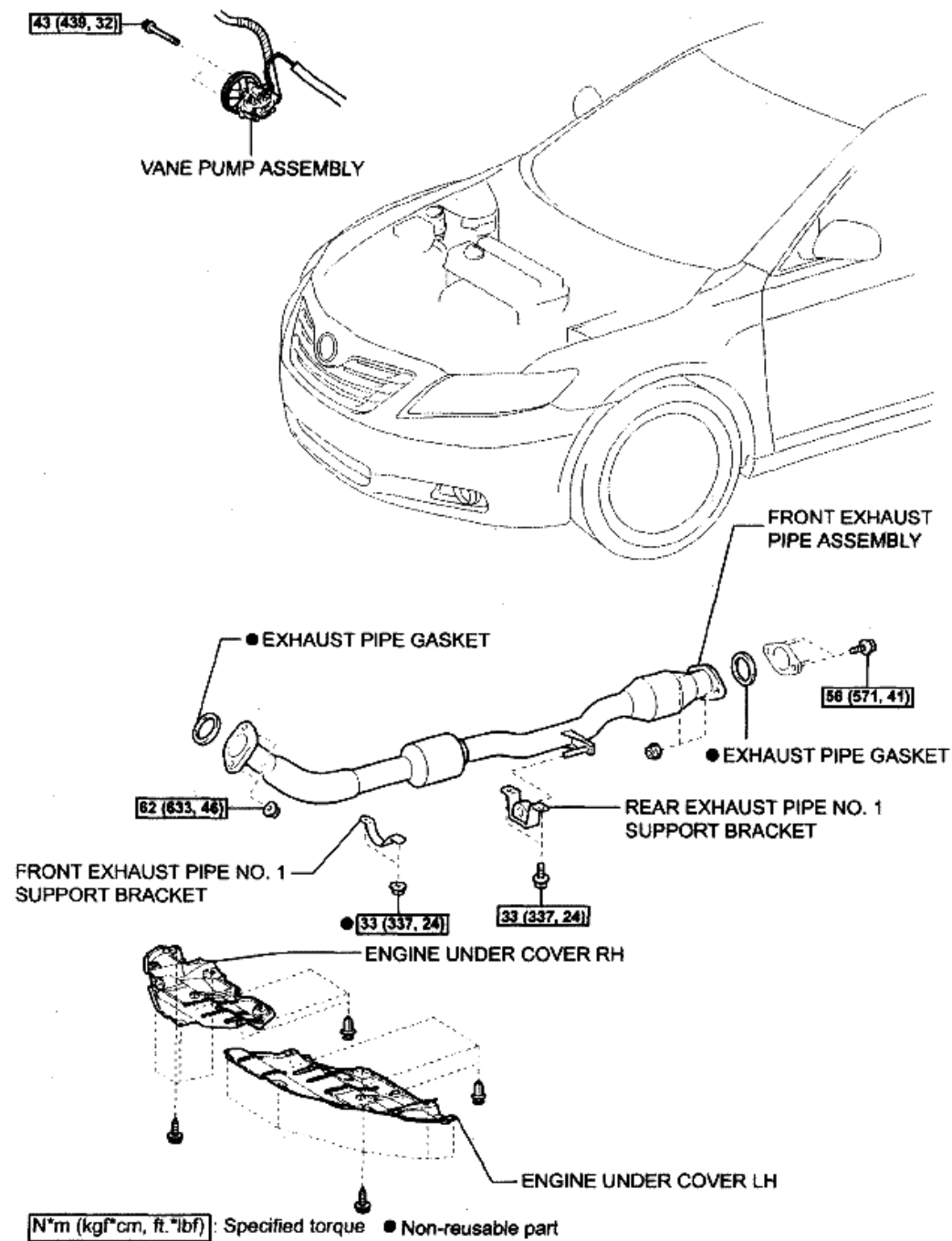
c

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Fig. 25: Identifying Timing Chain Components With Torque Specifications (1 Of 4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2008 Toyota Camry LE

2008 ENGINE Engine Mechanical (2AZ-FE) - Camry

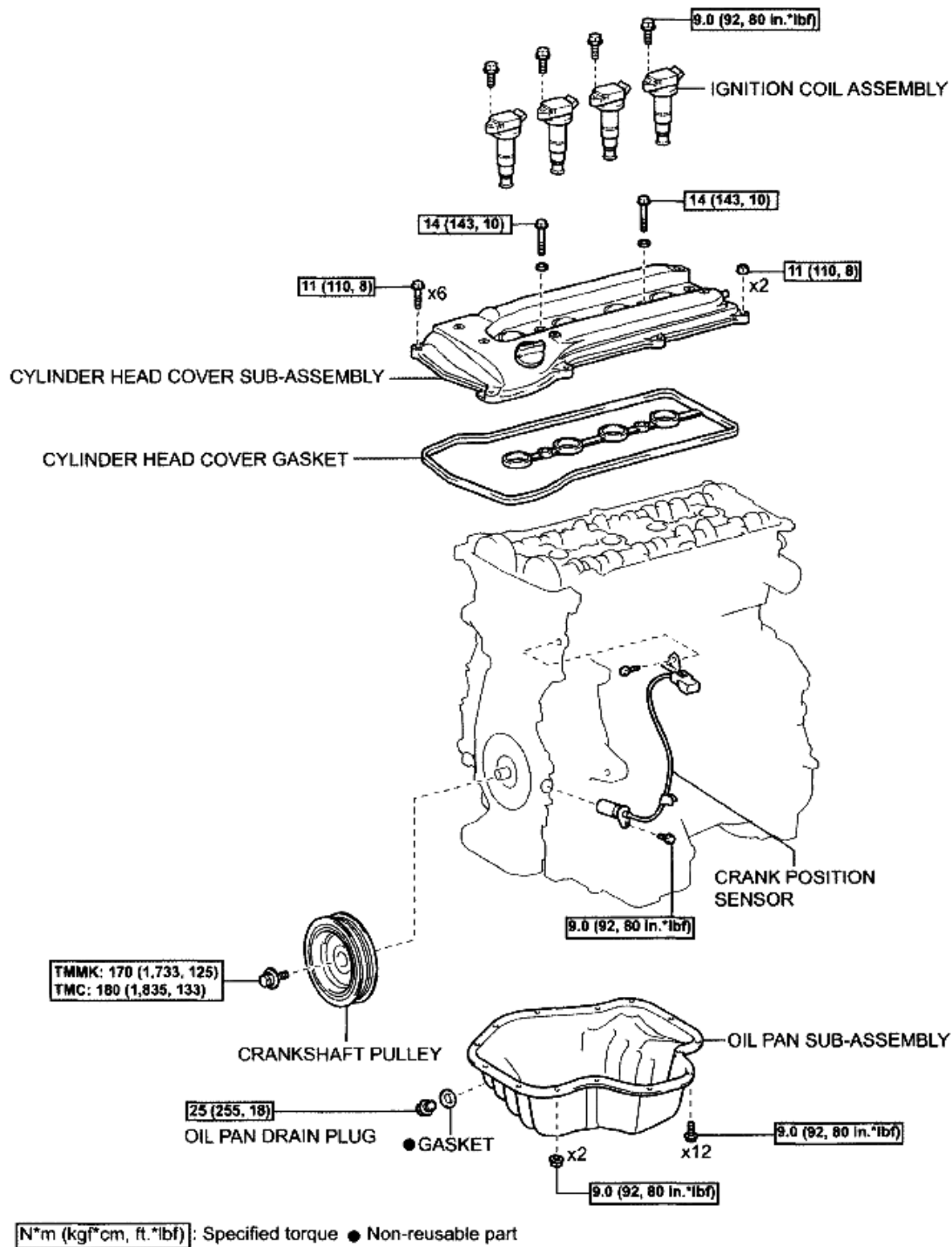


A134947E01

Fig. 26: Identifying Timing Chain Components With Torque Specifications (2 Of 4)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2008 Toyota Camry LE

2008 ENGINE Engine Mechanical (2AZ-FE) - Camry



A134922E01

Fig. 27: Identifying Timing Chain Components With Torque Specifications (3 Of 4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

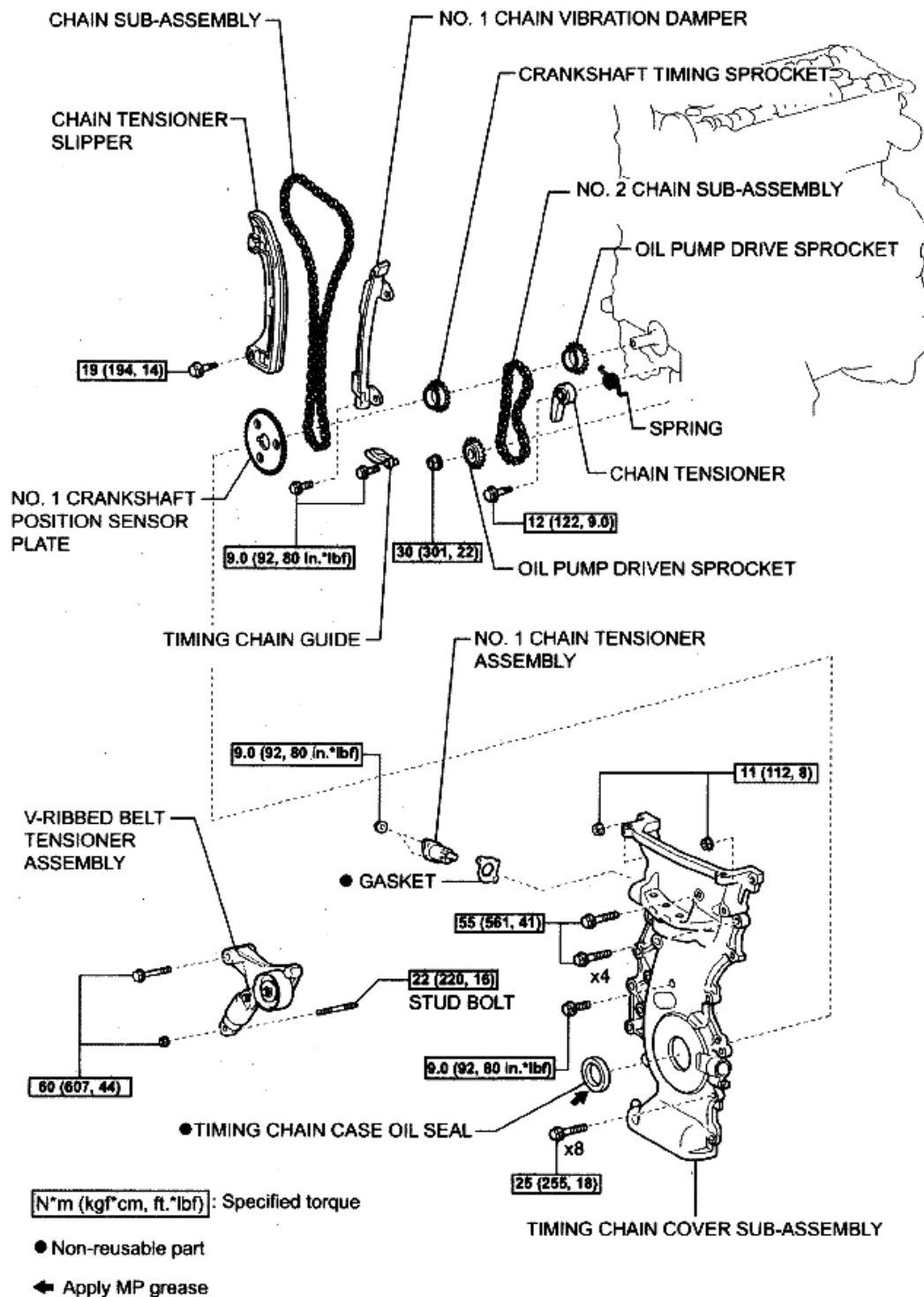


Fig. 28: Identifying Timing Chain Components With Torque Specifications (4 Of 4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

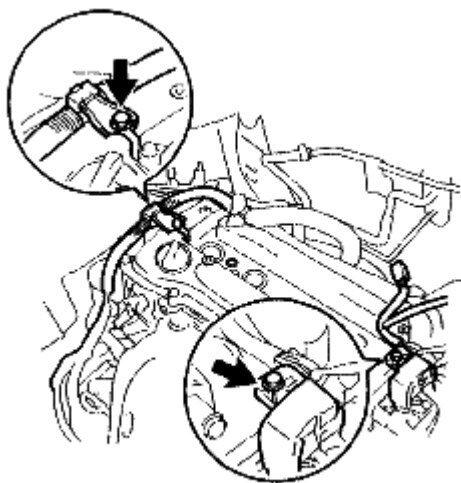
REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
2. **REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY** (See REMOVAL)
3. **REMOVE FRONT WHEEL RH**
4. **REMOVE ENGINE UNDER COVER LH**
5. **REMOVE ENGINE UNDER COVER RH**
6. **REMOVE FRONT FENDER APRON SEAL RH**
7. **DRAIN ENGINE OIL** (See REPLACEMENT)
8. **REMOVE FRONT EXHAUST PIPE ASSEMBLY**

HINT:

See REMOVAL .

9. **REMOVE NO. 2 ENGINE MOUNTING STAY RH** (See REMOVAL)
10. **REMOVE ENGINE MOVING CONTROL ROD SUB-ASSEMBLY** (See REMOVAL)
11. **REMOVE NO. 2 ENGINE MOUNTING BRACKET RH** (See REMOVAL)
12. **REMOVE V-RIBBED BELT** (See REMOVAL)
13. **REMOVE GENERATOR ASSEMBLY** (See REMOVAL)
14. **REMOVE VANE PUMP ASSEMBLY** (See REMOVAL)
15. **REMOVE IGNITION COIL ASSEMBLY** (See REMOVAL)
16. **DISCONNECT VENTILATION HOSE**
17. **DISCONNECT NO. 2 VENTILATION HOSE**
18. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY**
 - a. Remove the 2 bolts and disconnect the 2 engine wires.



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Fig. 29: Locating Engine Wires Bolt

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 8 bolts, 2 nuts, and the cylinder head cover.

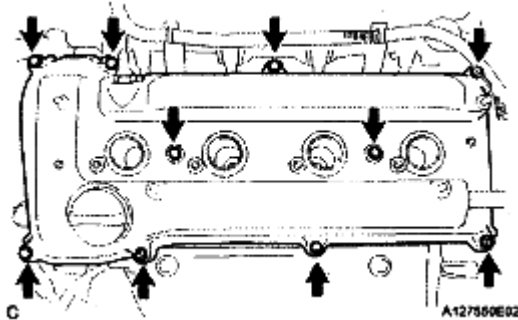


Fig. 30: Locating Cylinder Head Cover Bolts And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

19. SET NO. 1 CYLINDER TO TDC/COMPRESSION (See VALVE CLEARANCE)
20. REMOVE CRANKSHAFT PULLEY (See REMOVAL)
21. REMOVE CRANK POSITION SENSOR (See REMOVAL)
22. REMOVE OIL PAN SUB-ASSEMBLY
 - a. Remove the 12 bolts and 2 nuts.

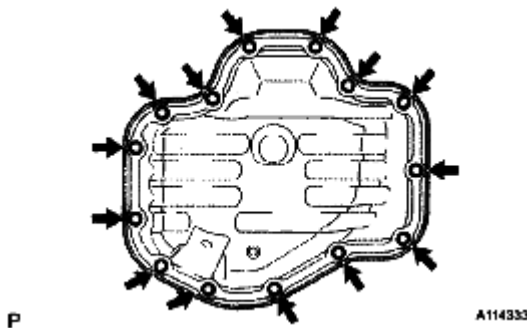
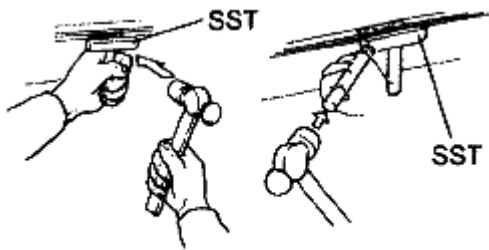


Fig. 31: Locating Oil Pan, Bolts And Nuts Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Insert the blade of SST between the crankcase and oil pan. Cut through the sealer and remove the oil pan.

SST 09032-00100

NOTE: Be careful not to damage the contact surfaces of the crankcase, chain cover and oil pan.



A000019E05

Fig. 32: Removing Oil Pan

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

23. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY

- a. Remove the 2 nuts, tensioner and gasket.

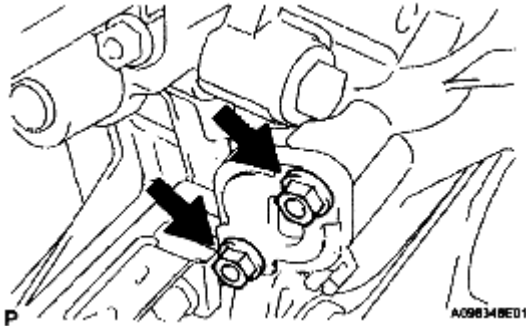


Fig. 33: Removing 2 Nuts, Chain Tensioner And Gasket

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Do not turn the crankshaft without the chain tensioner.

24. INSTALL ENGINE HANGERS

- a. Install the No. 1 engine hanger and No. 2 engine hanger with the bolts as shown in the illustration.
Parts No.:

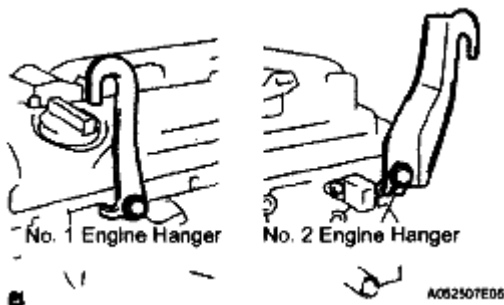


Fig. 34: Identifying Engine Hanger Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ENGINE HANGER SPECIFICATION

No. 1 Engine hanger	12281-28010
No. 2 Engine hanger	12282-28010
Bolt	91512-61020

Torque: 38 N*m (387 kgf*cm, 28 ft.*lbf)

- b. Attach the sling device to the engine hangers and chain block.

25. REMOVE V-RIBBED BELT TENSIONER ASSEMBLY

- a. Lift the engine upward using the chain block.

NOTE: Do not lift the engine more than necessary.

- b. Spring Type:

- (1) Remove the bolt, nut and tensioner.

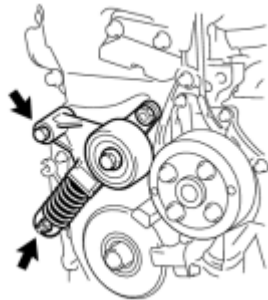


Fig. 35: Locating V-Ribbed Belt Tensioner Assembly (Spring Type)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Except Spring Type:

- (1) Remove the bolt, nut and tensioner.

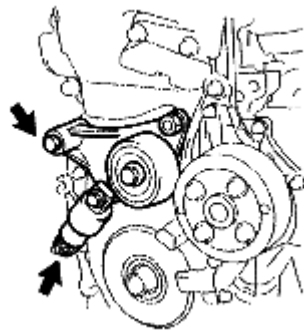


Fig. 36: Locating V-Ribbed Belt Tensioner Assembly (Except Spring Type)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

26. REMOVE ENGINE MOUNTING INSULATOR

- a. Attach the engine chain hoist to the engine hangers.

CAUTION: Do not attempt to hang the engine by hooking the chain to any other part.

- b. Remove the bolt and disconnect the engine mounting insulator FR.



Fig. 37: Locating Engine Mounting Insulator FR With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. M/T:

Remove the bolt and disconnect the engine lateral control rod.

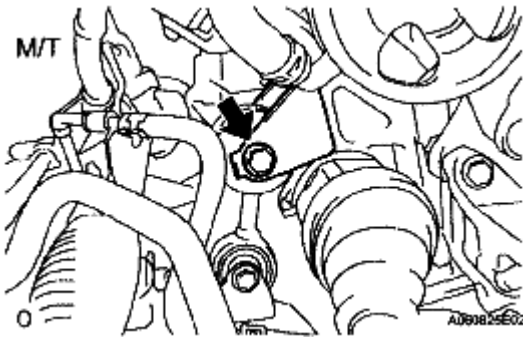


Fig. 38: Locating Engine Lateral Control Rod Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Remove the 2 bolts and disconnect the steering gear return tube clamps from the frame.

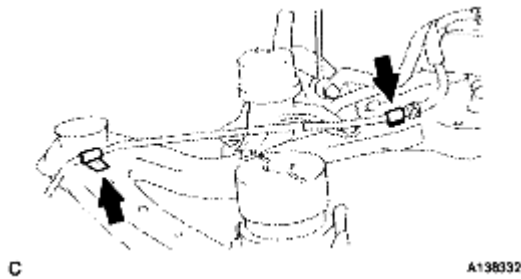


Fig. 39: Locating Steering Gear Return Tube Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Remove the 4 nuts from the engine mounting insulator RH.

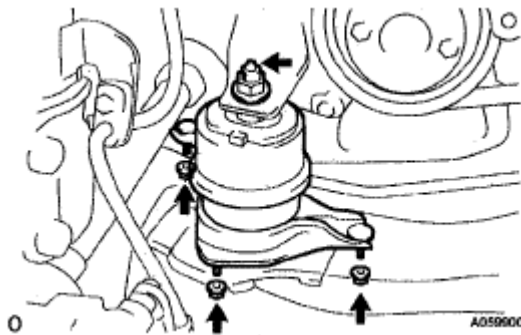


Fig. 40: Locating Engine Mounting Insulator RH Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Raise the engine and remove the engine mounting insulator RH.

27. REMOVE ENGINE MOUNTING BRACKET RH

- a. Remove the 3 bolts and engine mounting bracket.

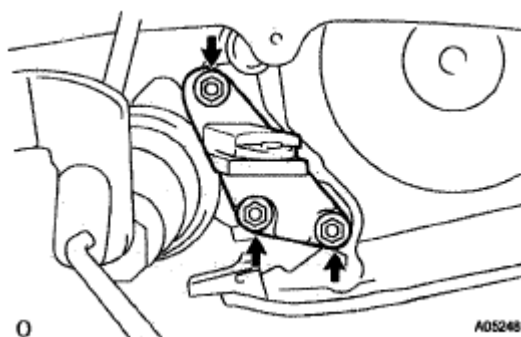


Fig. 41: Locating Engine Mounting Bracket With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

28. REMOVE TIMING CHAIN COVER SUB-ASSEMBLY (See REMOVAL)

29. REMOVE TIMING CHAIN CASE OIL SEAL (See REMOVAL)

30. REMOVE NO. 1 CRANKSHAFT POSITION SENSOR PLATE

- a. Remove the crankshaft position sensor plate.

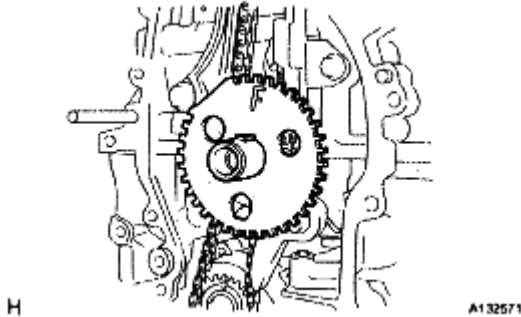


Fig. 42: Identifying Crankshaft Position Sensor Plate
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

31. REMOVE CHAIN TENSIONER SLIPPER

- a. Remove the bolt and chain tensioner slipper.

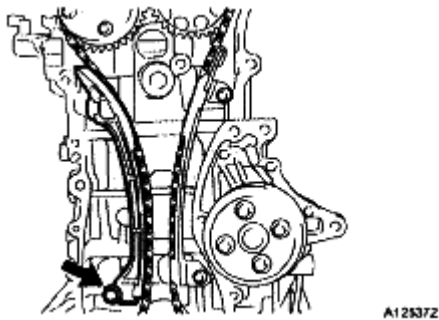


Fig. 43: Locating Chain Tensioner Slipper And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

32. REMOVE NO. 1 CHAIN VIBRATION DAMPER

- a. Remove the 2 bolts and chain vibration damper.

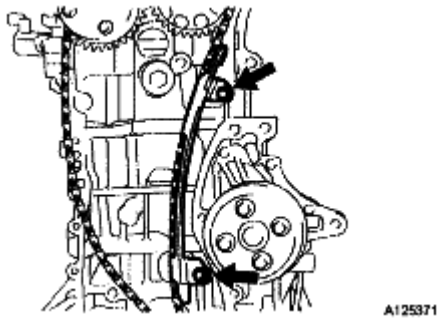


Fig. 44: Locating Chain Vibration Damper And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

33. REMOVE TIMING CHAIN GUIDE

- a. Remove the bolt and timing chain guide.

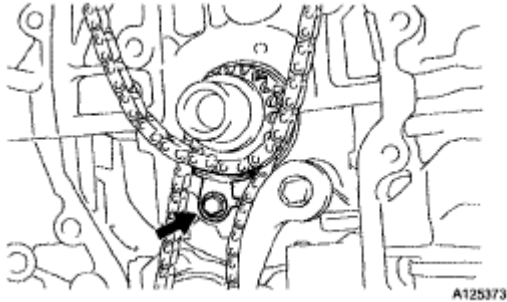


Fig. 45: Locating Timing Chain Guide And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

34. REMOVE CHAIN SUB-ASSEMBLY

- a. Remove the chain sub-assembly.

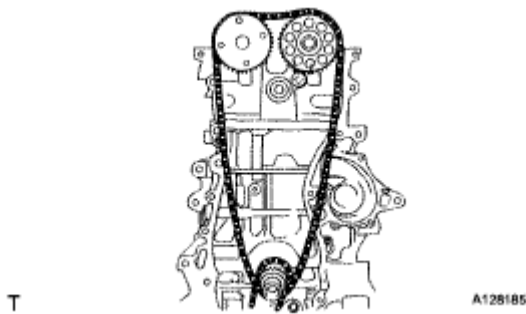


Fig. 46: Identifying Chain Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

35. REMOVE CRANKSHAFT TIMING SPROCKET

- a. Remove the crankshaft timing sprocket.

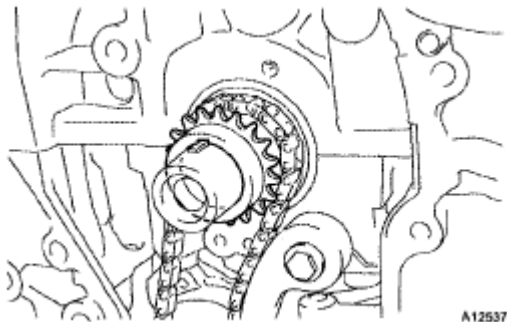


Fig. 47: Identifying Crankshaft Timing Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

36. REMOVE NO. 2 CHAIN SUB-ASSEMBLY

- a. Turn the crankshaft by 90° counterclockwise to align the adjusting hole of the oil pump drive shaft sprocket with the groove of the oil pump.

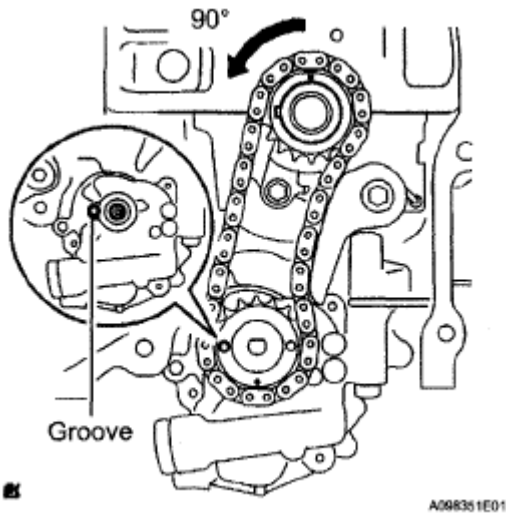


Fig. 48: Aligning Adjusting Hole With Oil Pump Groove
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Insert a 4 mm diameter bar into the adjusting hole of the oil pump drive shaft sprocket to lock the gear in position, and then remove the nut.

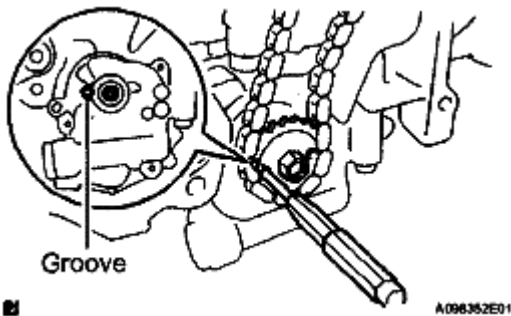


Fig. 49: Inserting 4 mm Diameter Bar Into Adjusting Hole To Lock Gear In Position
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the bolt, chain tensioner plate and spring.

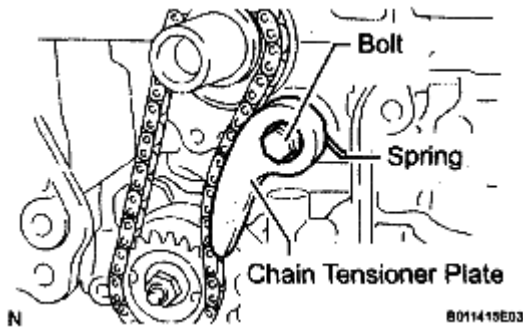


Fig. 50: Identifying Bolt, Chain Tensioner Plate And Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Remove the chain tensioner, oil pump driven sprocket and chain.

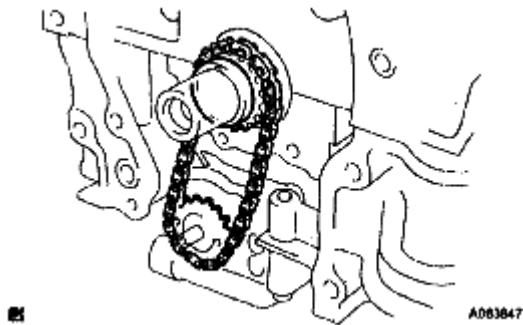


Fig. 51: Identifying Chain Tensioner, Oil Pump Driven Sprocket And Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. INSPECT CHAIN SUB-ASSEMBLY (See INSPECTION)
2. INSPECT NO. 2 CHAIN SUB-ASSEMBLY (See INSPECTION)
3. INSPECT OIL PUMP DRIVE SPROCKET (See INSPECTION)
4. INSPECT OIL PUMP DRIVE SHAFT SPROCKET (See INSPECTION)
5. INSPECT CHAIN TENSIONER SLIPPER (See INSPECTION)
6. INSPECT NO. 1 CHAIN VIBRATION DAMPER (See INSPECTION)
7. INSPECT CHAIN TENSIONER PLATE (See INSPECTION)
8. INSPECT NO. 1 CHAIN TENSIONER (See INSPECTION)

INSTALLATION

1. INSTALL NO. 2 CHAIN SUB-ASSEMBLY
 - a. Set the crankshaft key into the left horizontal position.
 - b. Turn the drive shaft so that the cutout faces upward.

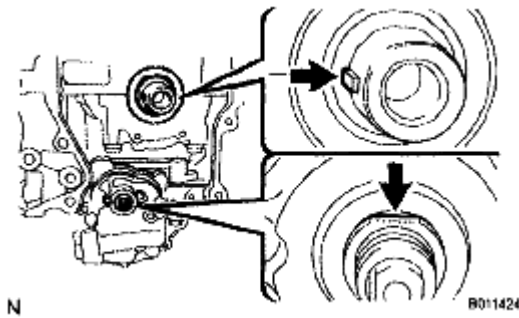


Fig. 52: Locating Crankshaft Key And Cutout Of Drive Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Align the yellow mark links with the timing marks of each gear as shown in the illustration.

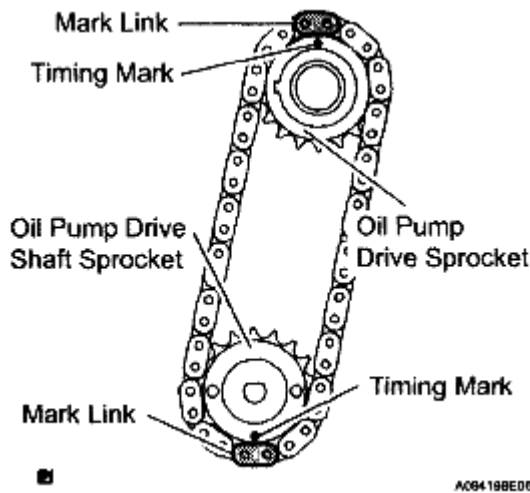


Fig. 53: Aligning Links With Timing Marks Of Each Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the sprockets onto the crankshaft and oil pump shaft with the chain wrapped on the gears.
e. Temporarily tighten the oil pump drive shaft sprocket with the nut.
f. Insert the damper spring into the adjusting hole, and then install the chain tensioner plate with the bolt.

Torque: 12 N*m (122 kgf*cm, 9 ft.*lbf)

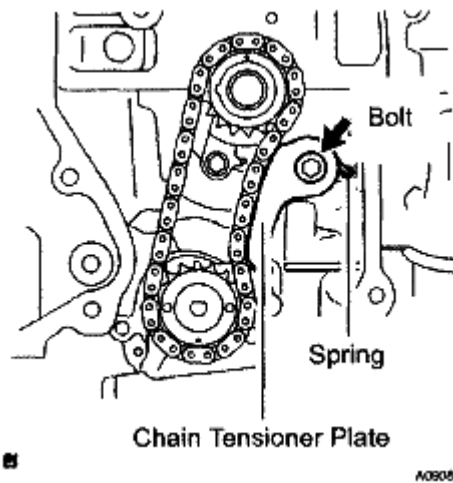


Fig. 54: Locating Damper Spring Into Adjusting Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Align the adjusting hole of the oil pump drive shaft sprocket with the groove of the oil pump.

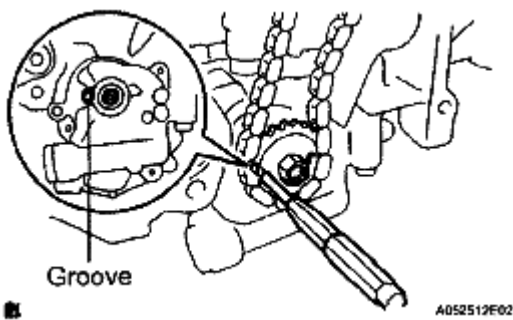


Fig. 55: Aligning Adjusting Hole Of Oil Pump Driven Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- h. Insert a 4 mm diameter bar into the adjusting hole of the oil pump drive shaft gear to lock the gear in position, and then tighten the nut.

Torque: 30 N*m (301 kgf*cm, 22 ft.*lbf)

- i. Rotate the crankshaft clockwise by 90°, and align the crankshaft key to the top.

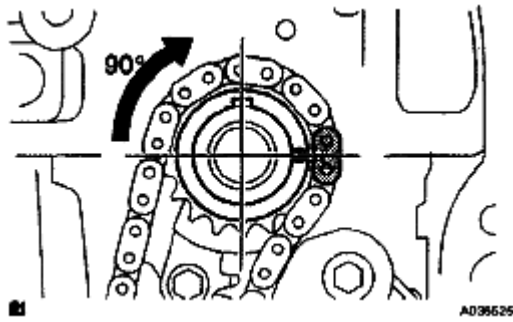


Fig. 56: Aligning Crankshaft Key To Top
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL CRANKSHAFT TIMING SPROCKET

- a. Install the crankshaft timing sprocket.

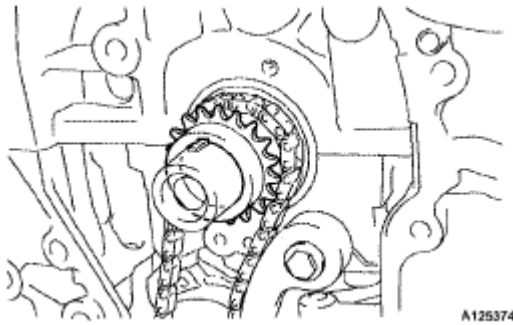


Fig. 57: Identifying Crankshaft Timing Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL NO. 1 CHAIN VIBRATION DAMPER

- a. Install the chain vibration damper with the 2 bolts.

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

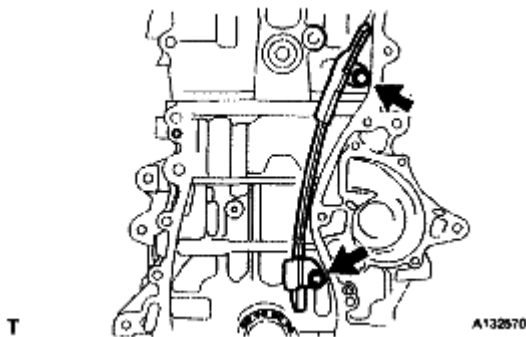


Fig. 58: Locating Chain Vibration Damper With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSTALL CHAIN SUB-ASSEMBLY

- a. Set the No. 1 cylinder to TDC/compression.
 1. Turn the camshafts with a wrench (using the hexagonal lobe) to align the timing marks of the camshaft timing gear with each timing mark located on the No. 1 and No. 2 bearing caps as shown in the illustration.

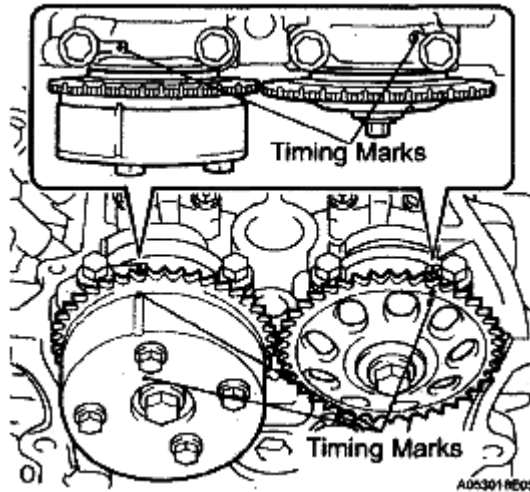


Fig. 59: Identifying Timing Mark On Camshaft Timing Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Using the crankshaft pulley bolt, turn the crankshaft to position with the key on the crankshaft upward.

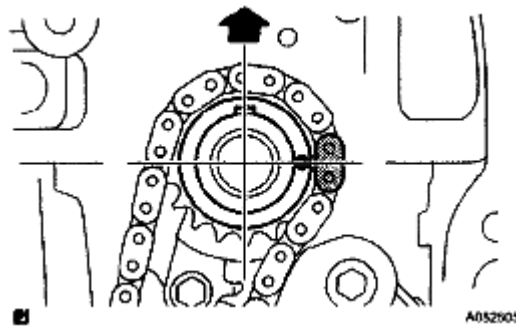


Fig. 60: Setting Key On Crankshaft Upward
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the chain onto the crankshaft timing sprocket with the gold or pink mark link aligned with the timing mark on the crankshaft.

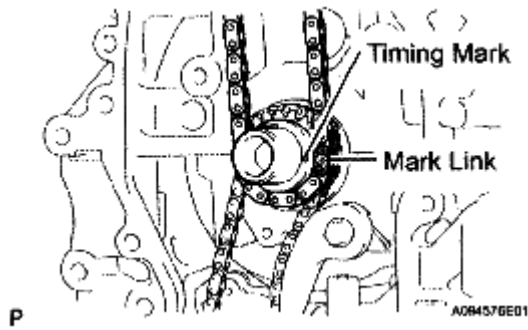


Fig. 61: Identifying Timing Mark With Mark Link
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using SST and a hammer, tap in the crankshaft timing sprocket.

SST 09309-37010

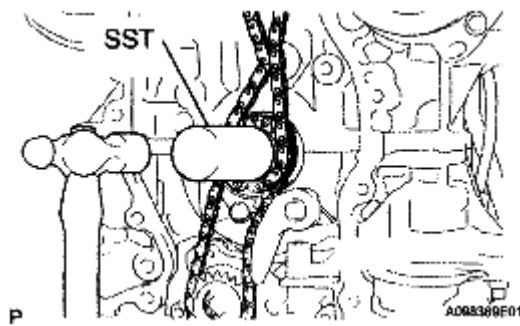


Fig. 62: Tapping In Crankshaft Timing Sprocket
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Align the gold or yellow link with each timing mark located on the camshaft timing gear and sprocket, then install the chain.

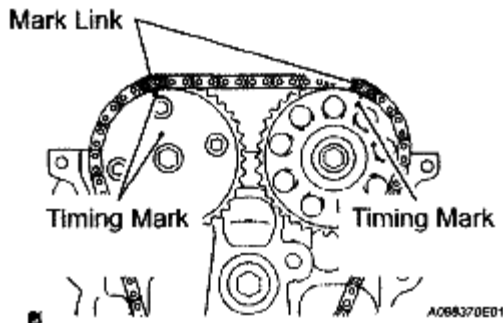


Fig. 63: Identifying Mark Link And Timing Mark
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSTALL CHAIN TENSIONER SLIPPER

- a. Install the chain tensioner slipper with the bolt.

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

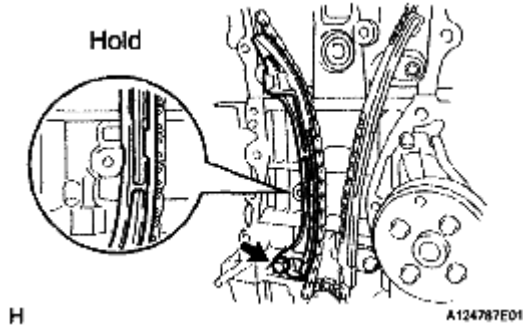


Fig. 64: Locating Chain Tensioner Slipper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSTALL TIMING CHAIN GUIDE

- a. Install the timing chain guide with the bolt.

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

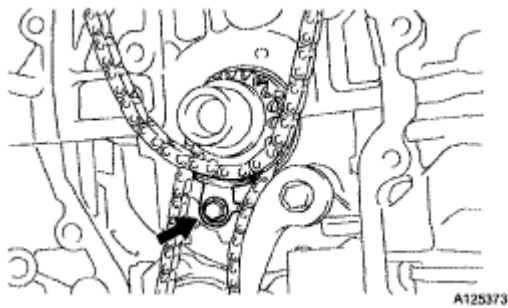


Fig. 65: Locating Timing Chain Guide And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. INSTALL NO. 1 CRANKSHAFT POSITION SENSOR PLATE

- a. Install the sensor plate with the "F" mark facing forward.

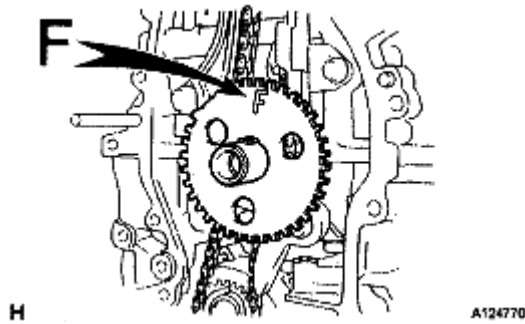


Fig. 66: Locating Crankshaft Position Sensor Plate
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **INSTALL TIMING CHAIN CASE OIL SEAL** (See INSTALLATION)
9. **INSTALL TIMING CHAIN COVER SUB-ASSEMBLY** (See INSTALLATION)
10. **INSTALL V-RIBBED BELT TENSIONER ASSEMBLY**
 - a. **Spring Type:**

(1) Install the V-ribbed belt tensioner with the bolt and nut.

Torque: 60 N*m (607 kgf*cm, 44 ft.*lbf)

NOTE: When replacing the V-ribbed belt tensioner with a new one, do not pull out the pin.

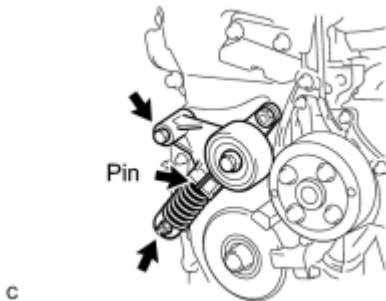


Fig. 67: Locating V-Ribbed Belt Tensioner Assembly (Spring Type)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. **Except Spring Type:**

(1) Install the V-ribbed belt tensioner with the bolt and nut.

Torque: 60 N*m (607 kgf*cm, 44 ft.*lbf)

NOTE: Do not lift the engine more than necessary.

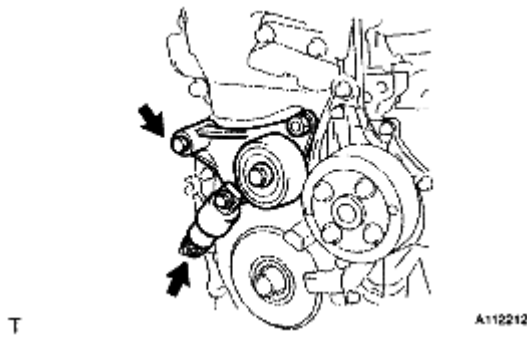


Fig. 68: Locating V-Ribbed Belt Tensioner Assembly (Except Spring Type)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. INSTALL ENGINE MOUNTING BRACKET RH

- a. Install the engine mounting bracket with the 3 bolts.

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

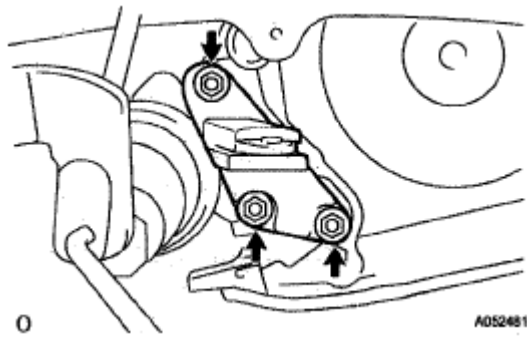


Fig. 69: Locating Engine Mounting Bracket With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. INSTALL ENGINE MOUNTING INSULATOR

- a. Raise the engine and install the engine mounting insulator RH.

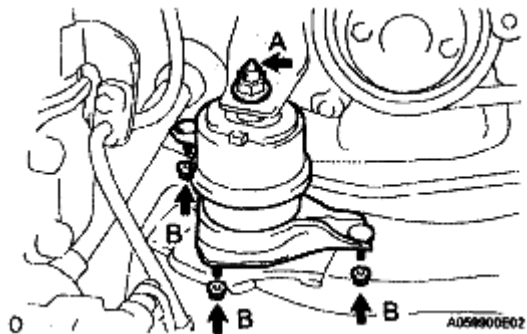


Fig. 70: Locating Engine Mounting Insulator RH With Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the engine mounting Insulator RH with the 4 nuts.

Torque:

Nut A

95 N*m (969 kgf*cm, 70 ft.*lbf)

Nut B

87 N*m (888 kgf*cm, 64 ft.*lbf)

- c. Install the steering gear return tube clamps to the frame with the 2 bolts.

Torque: 8.0 N*m (80 kgf*cm, 69 in.*lbf)

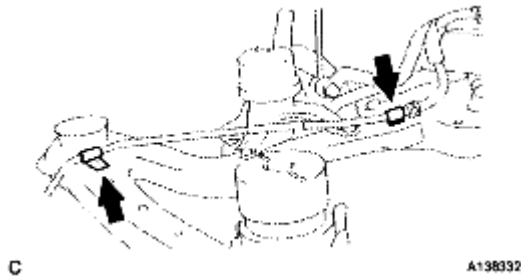


Fig. 71: Locating Steering Gear Return Tube Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the engine mounting insulator FR with the bolt.

Torque: 87 N*m (888 kgf*cm, 64 ft.*lbf)

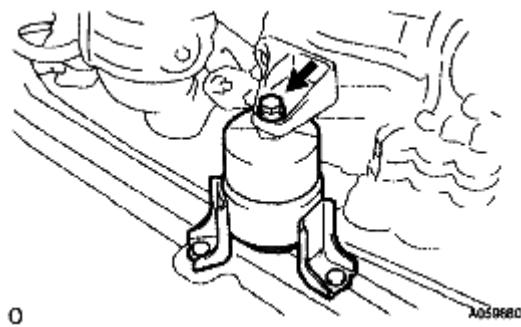


Fig. 72: Locating Engine Mounting Insulator FR With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. M/T:

Install the engine lateral control rod with the bolt.

Torque: 89 N*m (910 kgf*cm, 66 ft.*lbf)

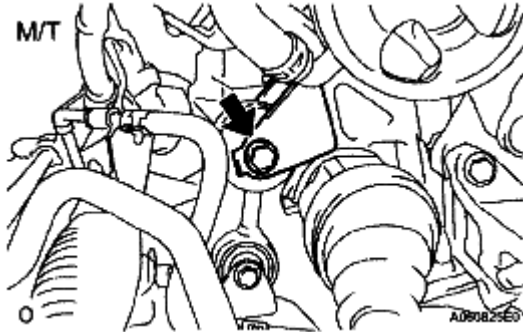


Fig. 73: Locating Engine Lateral Control Rod With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. INSTALL OIL PAN SUB-ASSEMBLY

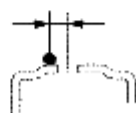
- Remove any old packing material and be careful not to drop any oil on the contact surfaces of the cylinder block and oil pan.
- Apply a continuous bead of seal packing (Diameter 3.0 to 4.0 mm (0.118 to 0.157 in.)) as shown in the illustration.

Seal packing:

Toyota Genuine Seal Packing Block, Three Bond 1207B or Equivalent



6.0 mm (0.236 in.)



Seal Diameter: 3.0 to 4.0 mm

P

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Fig. 74: Applying Continuous Bead Of Seal Packing
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

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

- c. Install the oil pan to the cylinder block.
- d. Uniformly tighten the 12 bolts and 2 nuts in the sequence shown in the illustration.

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

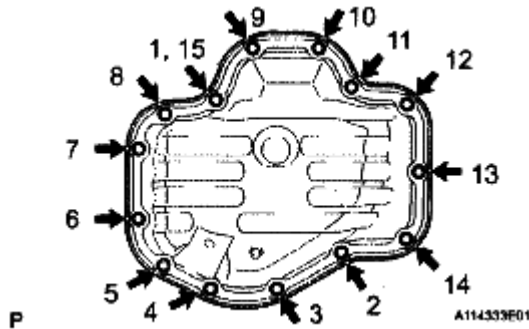


Fig. 75: Tightening Oil Pan Sub-Assembly Bolts And Nuts In Sequence
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. INSTALL CRANK POSITION SENSOR (See INSTALLATION)
15. INSTALL CRANKSHAFT PULLEY (See INSTALLATION)
16. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY
 - a. Release the ratchet pawl, then fully push in the plunger and hook the hook to the pin so that the plunger is in the position shown in the illustration.

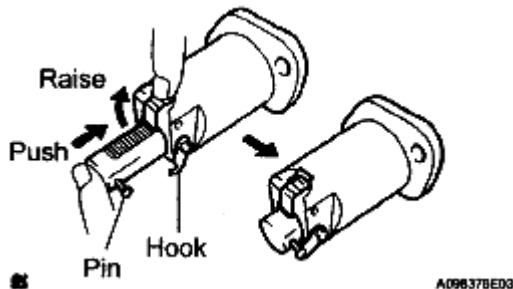


Fig. 76: Identifying Plunger Position
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

NOTE: If the hook releases the plunger while the chain tensioner is being installed, Set the hook again.

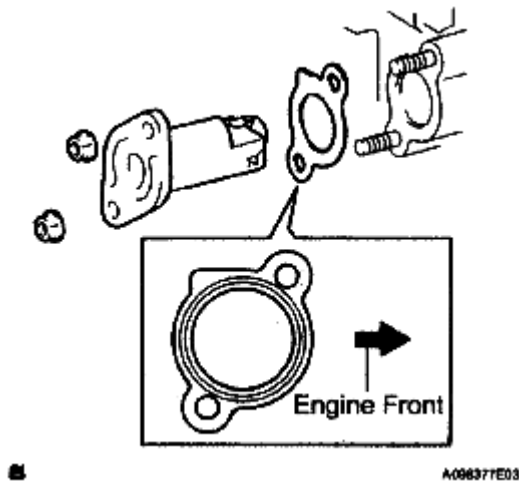


Fig. 77: Installing Gasket And Chain Tensioner Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Turn the crankshaft counterclockwise, then disconnect the plunger knock pin from the hook.

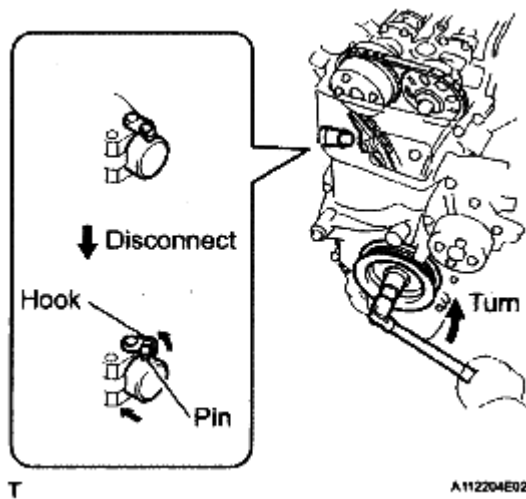


Fig. 78: Disconnecting Plunger Knock Pin From Hook
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Turn the crankshaft clockwise, then check that the plunger is extended.

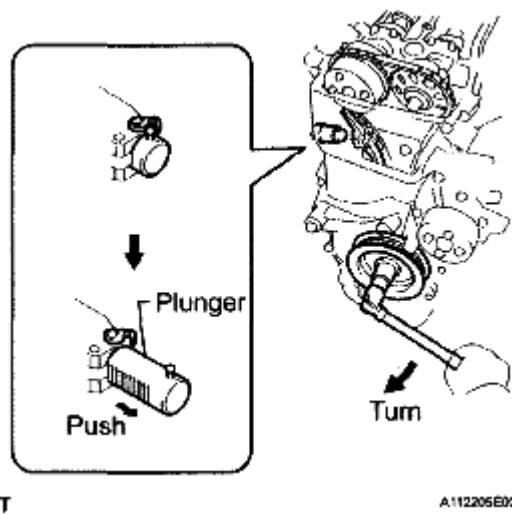


Fig. 79: Checking Plunger Is Extended
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY

- Remove any old packing material from the contact surface.
- Apply seal packing to the 2 locations shown in the illustration.

Seal packing:

Toyota Genuine Seal Packing Block, Three Bond 1207B or Equivalent

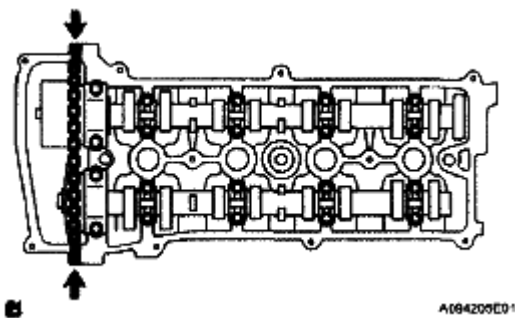


Fig. 80: Locating Seal Packing Locations
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Remove any oil from the contact surface.
- Install the cylinder head cover within 3 minutes of applying seal packing.
- Do not add engine oil for at least 2 hours after installing the cylinder head cover.

- Install the cylinder head cover with the 8 bolts and 2 nuts.

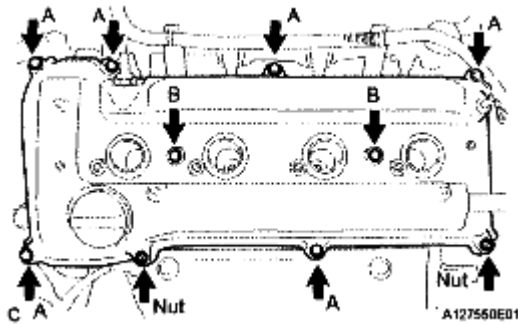
Torque:**Bolt A****11 N*m (112 kgf*cm, 8 ft.*lbf)****Bolt B****14 N*m (143 kgf*cm, 10 ft.*lbf)****Nut****11 N*m (112 kgf*cm, 8 ft.*lbf)**

Fig. 81: Locating Cylinder Head Cover With Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the 2 engine wires with the 2 bolts.

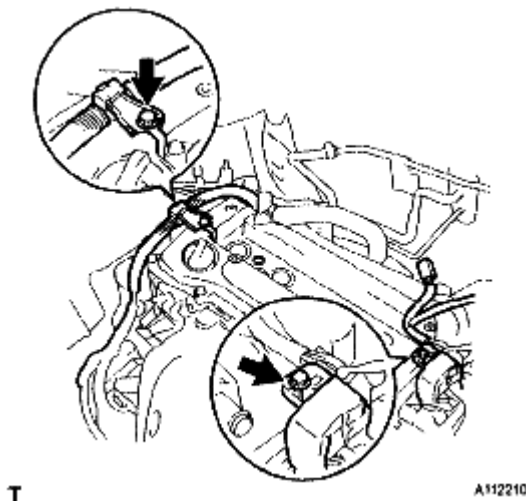
Torque: 8.4 N*m (86 kgf*cm, 74 in.*lbf)

Fig. 82: Locating Engine Wires With Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- 18. **INSTALL NO. 2 VENTILATION HOSE**
- 19. **INSTALL VENTILATION HOSE**
- 20. **INSTALL IGNITION COIL ASSEMBLY**
 - a. Install the 4 ignition coils with the 4 bolts.

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

- 21. **INSTALL VANE PUMP ASSEMBLY** (See INSTALLATION)
- 22. **INSTALL GENERATOR ASSEMBLY** (See INSTALLATION)
- 23. **INSTALL V-RIBBED BELT** (See INSTALLATION)
- 24. **INSTALL NO. 2 ENGINE MOUNTING BRACKET RH** (See INSTALLATION)
- 25. **INSTALL ENGINE MOVING CONTROL ROD SUB-ASSEMBLY** (See INSTALLATION)
- 26. **INSTALL NO. 2 ENGINE (MOUNTING STAY RH** (See INSTALLATION)
- 27. **INSTALL FRONT EXHAUST PIPE ASSEMBLY**

HINT:

See INSTALLATION .

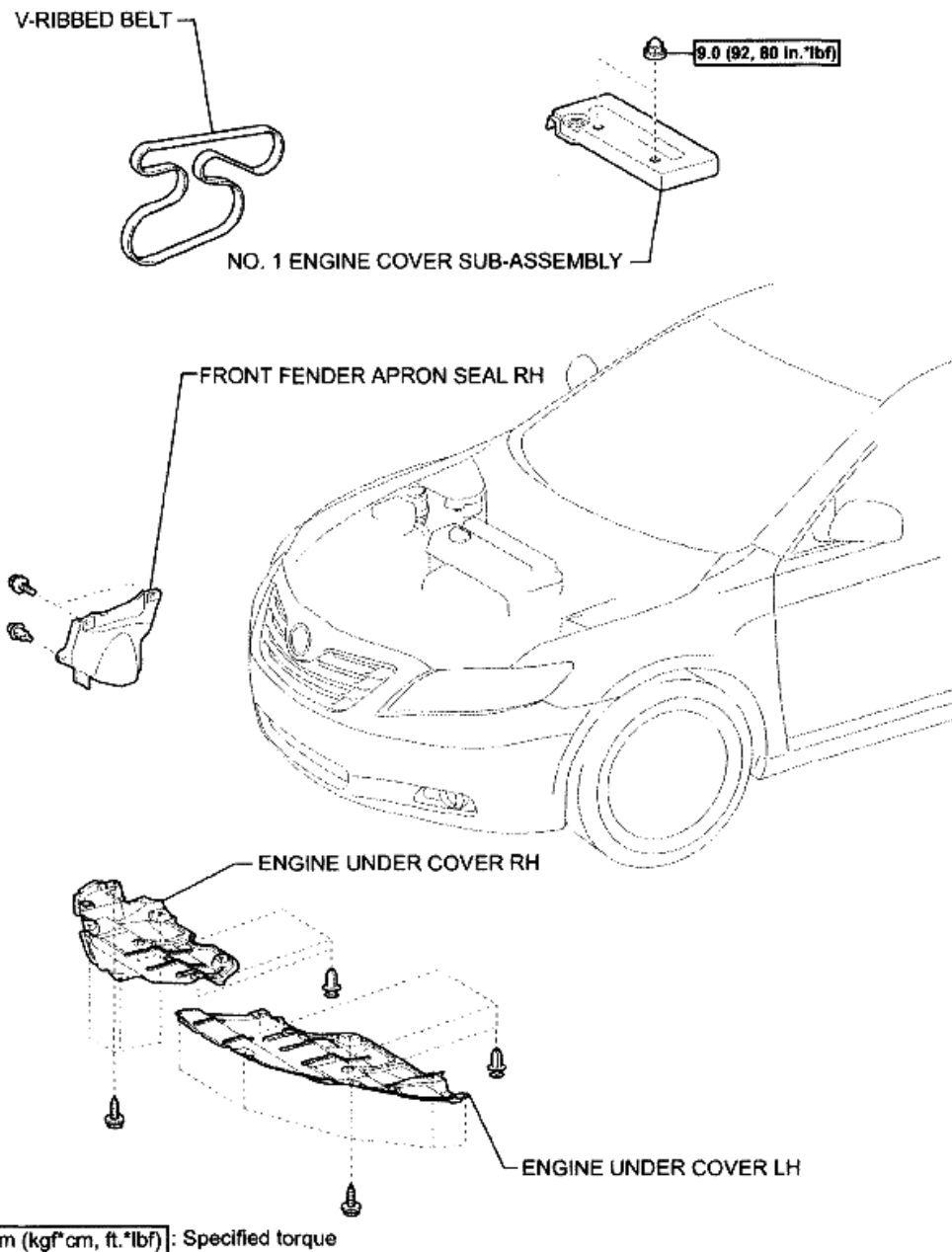
- 28. **ADD ENGINE OIL**
- 29. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL** (See INSTALLATION)
- 30. **CHECK FOR ENGINE OIL LEAKS**
- 31. **CHECK FOR EXHAUST GAS LEAKS**
- 32. **CHECK IGNITION TIMING** (See INSPECTION)
- 33. **INSTALL FRONT FENDER APRON SEAL RH**
- 34. **INSTALL ENGINE UNDER COVER LH**
- 35. **INSTALL ENGINE UNDER COVER RH**
- 36. **INSTALL FRONT WHEEL RH**
- 37. **INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY** (See INSTALLATION)

CAMSHAFT

COMPONENTS

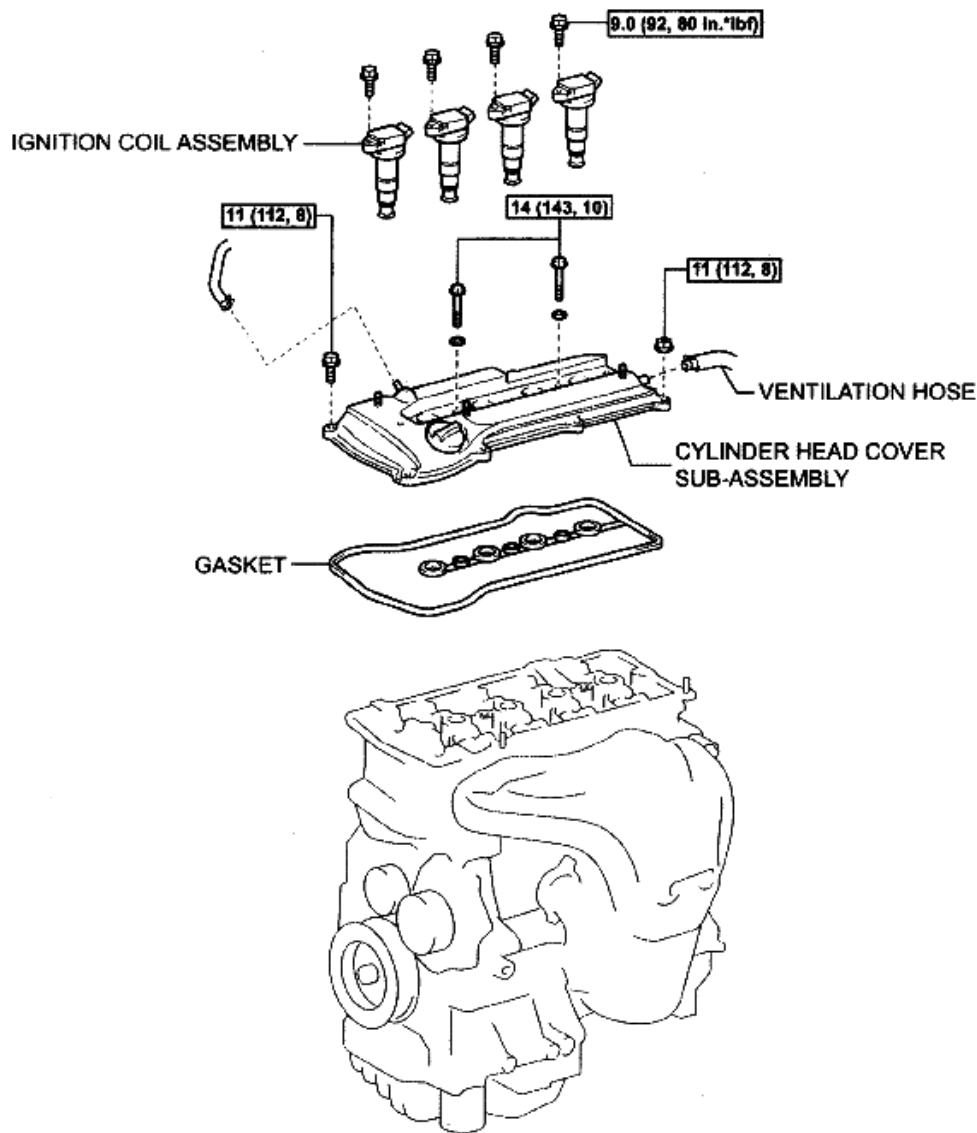
2008 Toyota Camry LE

2008 ENGINE Engine Mechanical (2AZ-FE) - Camry



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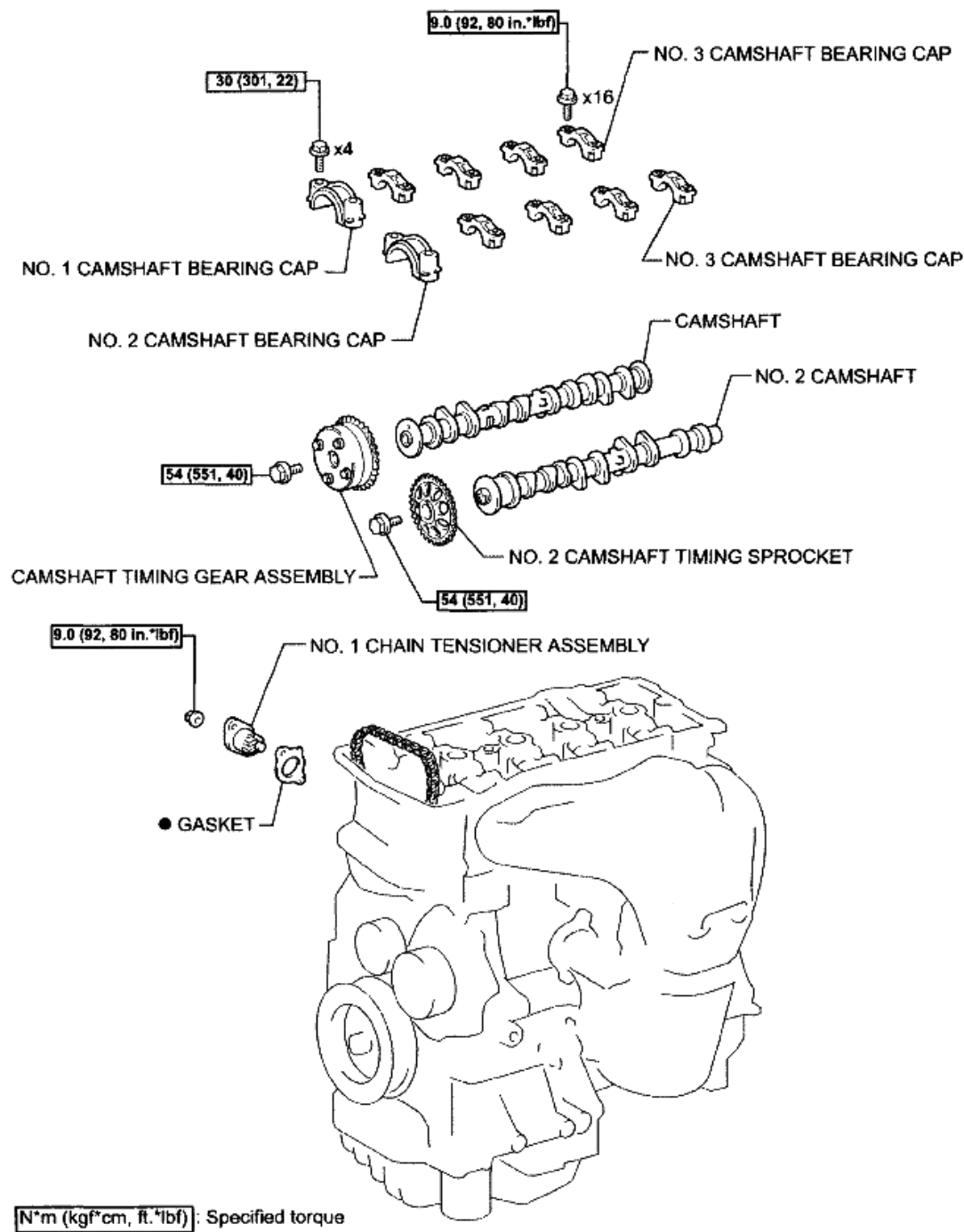
Fig. 83: Identifying Camshaft Components With Torque Specifications (1 Of 3)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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

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Fig. 84: Identifying Camshaft Components With Torque Specifications (2 Of 3)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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Fig. 85: Identifying Camshaft Components With Torque Specifications (3 Of 3)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. REMOVE FRONT WHEEL RH

2. REMOVE ENGINE UNDER COVER LH
3. REMOVE ENGINE UNDER COVER RH
4. REMOVE FRONT FENDER APRON SEAL RH
5. REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY (See REMOVAL)
6. REMOVE IGNITION COIL ASSEMBLY (See REMOVAL)
7. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY (See REMOVAL)
8. SET NO. 1 CYLINDER TO TDC/COMPRESSION (See VALVE CLEARANCE)
9. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY (See REMOVAL)
10. REMOVE NO. 2 CAMSHAFT
 - a. While holding the camshaft with a wrench, loosen the camshaft timing set bolt.

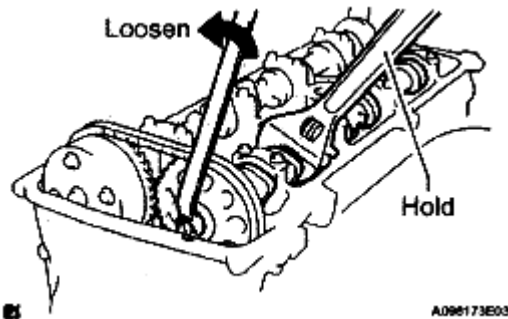


Fig. 86: Loosening Camshaft Timing Set Bolt

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

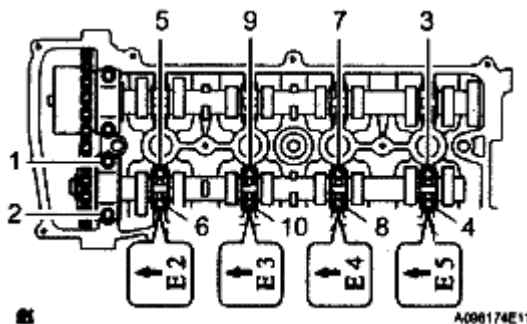


Fig. 87: Identifying Bearing Cap Bolts In Loosening Sequence

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. While holding the No. 2 camshaft by hand, remove the camshaft timing sprocket set bolt.
- e. Remove the camshaft timing sprocket from the No. 2 camshaft with the timing chain wrapped on the sprocket.

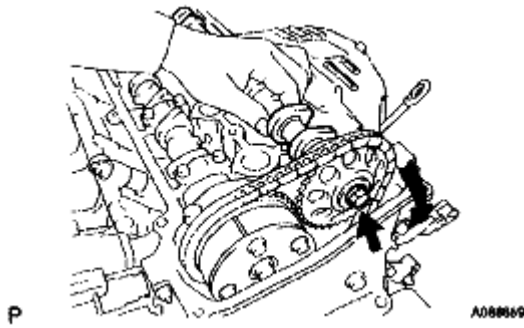


Fig. 88: Removing Camshaft Timing Sprocket And Timing Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Remove the camshaft timing sprocket from the timing chain.

11. REMOVE CAMSHAFT

- a. Using several steps, uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration.

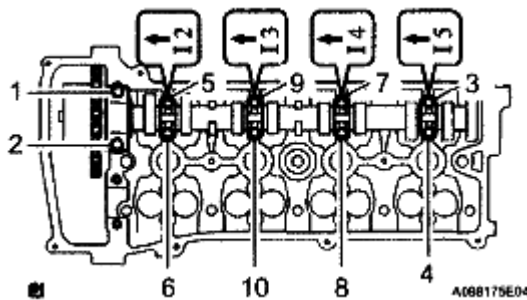


Fig. 89: Identifying Bearing Cap Bolts In Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 5 bearing caps.
- c. Remove the camshaft and camshaft timing gear while holding the timing chain by hand.
- d. Tie the timing chain with a string as shown in the illustration.

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



Fig. 90: Tying Timing Chain With String

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. REMOVE CAMSHAFT TIMING GEAR ASSEMBLY

- a. Clamp the camshaft in a vise, and make sure that the camshaft timing gear does not rotate.
- b. Cover all the oil ports except the advance side port shown in the illustration with vinyl tape.

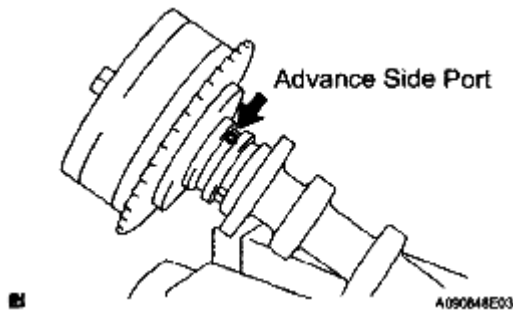


Fig. 91: Locating Advance Side Port

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Apply air pressure of 100 kPa (1.0 kgf/cm², 14 psi) to the oil path, then turn the camshaft timing gear in the advance direction (counterclockwise) by hand.

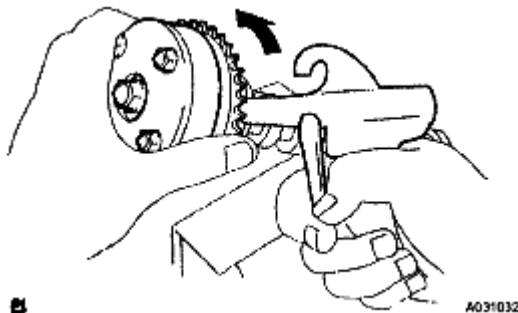


Fig. 92: Applying Air Pressure To Port On Advanced Angle Side

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

CAUTION: Cover the paths with a shop rag or piece of cloth to avoid oil splashes.

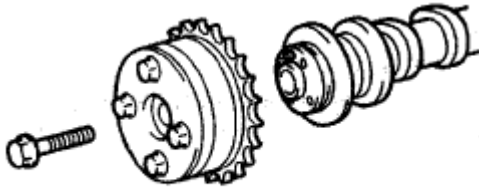
HINT:

Depending on the air pressure, the camshaft timing gear will turn to the advance angle side without applying force by hand. Also, if the pressure is difficult to apply because of air leakage from the port, the lock may be difficult to release.

- d. Remove the flange bolt of the camshaft timing gear.

NOTE:

- Be sure not to remove the other 4 bolts.
- If planning to reuse the gear, be sure to release the straight pin lock before installing the gear.



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Fig. 93: Identifying Fringe Bolt From Camshaft Timing Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION**1. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY**

- a. Check the lock of the camshaft timing gear.
 1. Clamp the camshaft in a vise, and confirm that the camshaft timing gear is locked.

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

- b. Release the lock pin.
 1. Cover the 4 oil paths of the cam journal with vinyl tape as shown in the illustration.

HINT:

The 2 advance side paths are provided in the groove of the camshaft. Plug one of the paths with a rubber piece.

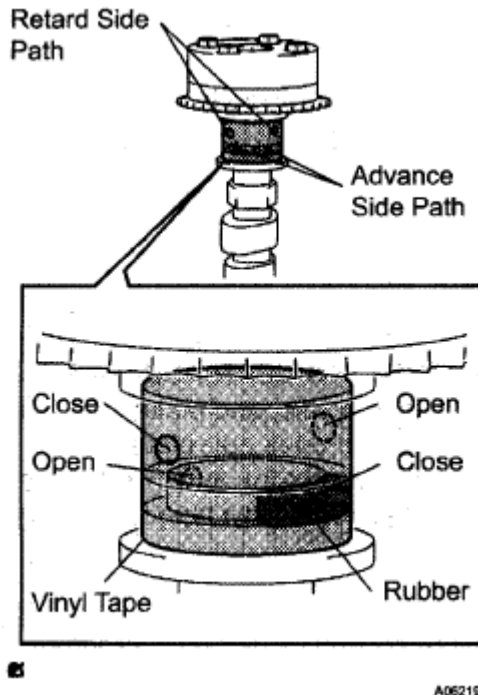


Fig. 94: Covering 4 Oil Paths Of Cam Journal With Vinyl Tape
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Break through the tape of the advance side path and the retard side path on the opposite side to the hole of the advance side path, as shown in the illustration.
3. Apply approximately 200 kPa (2.0 kgf/cm² , 28 psi) of air pressure to the two broken paths.

CAUTION: Cover the paths with a piece of cloth when applying pressure to keep oil from splashing.

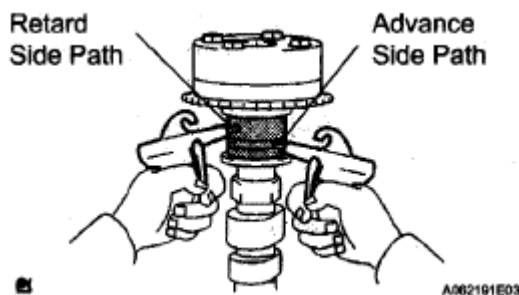


Fig. 95: Applying Air Pressure Retard And Advance Side Path
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. Check that the camshaft timing gear revolves in the advance direction when reducing the air pressure of the retard side path.

OK: Gear rotates in the advance direction.

HINT:

This operation releases the lock pin for the most retarded position.

5. When the camshaft timing gear reaches the most advanced position, remove the air gun from the retard side path and advance side path, in that order.

NOTE: Do not remove the air gun from the advance side path first. The gear may abruptly shift in the retard direction and break the lock pin.

- c. Check for smooth rotation.

1. Rotate the camshaft timing gear within its movable range several times, but do not turn it to the most retarded position. Check that the gear rotates smoothly.

OK: Gear rotates smoothly.

NOTE: Do not use an air gun to check for smooth operation.

- d. Check the lock in the most retarded position.

1. Confirm that the camshaft timing gear is locked at the most retarded position.

2. INSPECT CAMSHAFT

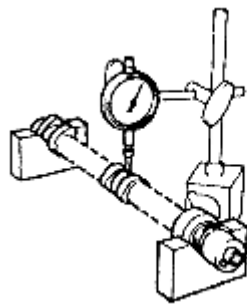
- a. Inspect the camshaft for runout.

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

Maximum circle runout:

0.03 mm (0.0012 in.)

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



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Fig. 96: Inspecting Camshaft For Runout

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Inspect the cam lobes.

1. Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

47.306 to 47.406 mm (1.8624 to 1.8664 in.)

Minimum cam lobe height:

47.196 mm (1.8581 in.)

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

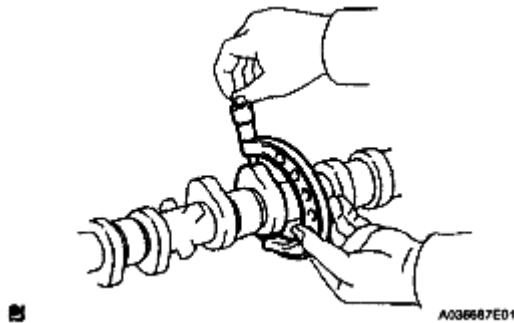


Fig. 97: Inspecting Cam Lobes

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Inspect the camshaft journals.

1. Using a micrometer, measure the journal diameter.

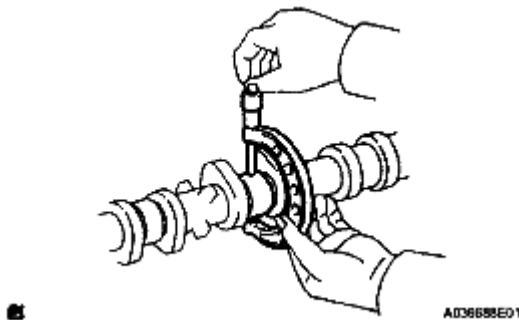


Fig. 98: Inspecting Camshaft Journals

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard journal diameter

STANDARD JOURNAL DIAMETER

Journal Position	Specified Condition

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

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

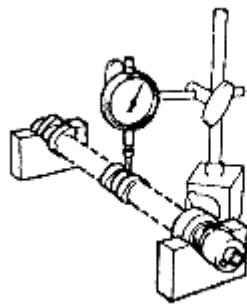
3. INSPECT NO. 2 CAMSHAFT

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

Maximum circle runout:

0.03 mm (0.0012 in.)

If the circle runout is greater than the maximum, replace the No. 2 camshaft.



EM01628001

Fig. 99: Inspecting Camshaft For Runout
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

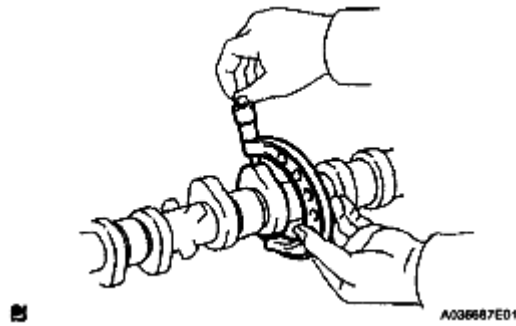
Standard cam lobe height:

46.063 to 46.163 mm (1.8135 to 1.8174 in.)

Minimum cam lobe height:

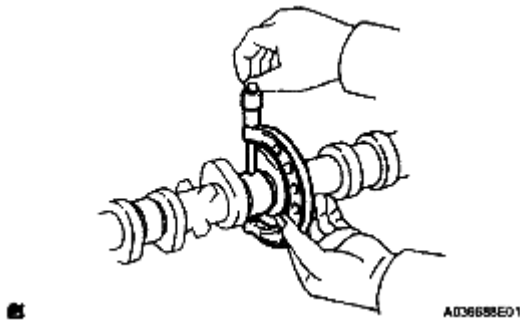
45.953 mm (1.8092 in.)

If the cam lobe height is less than the minimum, replace the No. 2 camshaft.

**Fig. 100: Inspecting Cam Lobes**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Inspect the camshaft journals.

**Fig. 101: Inspecting Camshaft Journals**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Using a micrometer, measure the journal diameter.

Standard journal diameter**STANDARD JOURNAL DIAMETER**

Journal Position	Specified Condition
No. 1	35.971 to 35.985 mm (1.4162 to 1.4167 in.)
Other	22.959 to 22.975 mm (0.9039 to 0.9045 in.)

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

INSTALLATION**1. INSTALL CAMSHAFT TIMING GEAR ASSEMBLY**

- a. Put the camshaft timing gear and camshaft together with the straight pin and key groove misaligned, as shown in the illustration.
- b. Turn the camshaft timing gear as shown in the illustration while pushing it gently against the camshaft. Push further at the position where the pin fits into the groove.

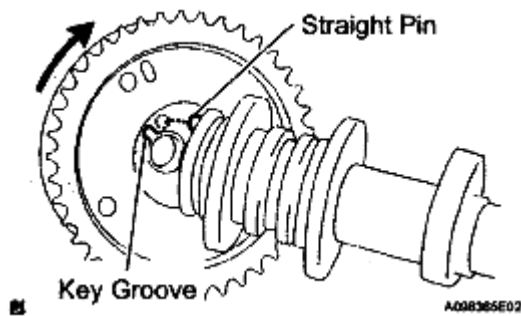


Fig. 102: Installing Camshaft Timing Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Be sure not to turn the camshaft timing gear to the retard angle side (the right angle).

- c. Check that there is no clearance between the gear and camshaft.
- d. Tighten the flange bolt with the camshaft timing gear fixed in place.

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

- e. Check that the camshaft timing gear can move to the retard angle side (the right direction) and is locked in the most retarded position.

2. INSTALL CAMSHAFT

- a. Apply a light coat of engine oil to the journal portion of the camshaft.
- b. Install the timing chain onto the camshaft timing gear with the paint mark aligned with the timing mark in the camshaft timing gear as shown in the illustration.

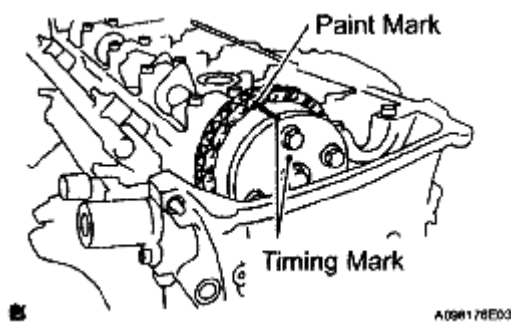


Fig. 103: Aligning Paint Mark With Timing Mark In Camshaft Timing Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Examine the front marks and numbers, and check that the order is as shown in the illustration. Then install the bearing caps into the cylinder head.

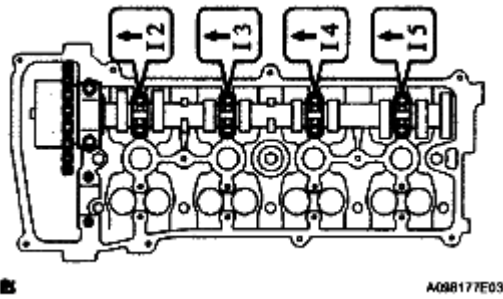


Fig. 104: Installing Bearing Caps Into Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.
- e. Using several steps, uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.

Torque:

No. 1 Bearing cap

30 N*m (301 kgf*cm, 22 ft.*lbf)

No. 3 Bearing cap

9.0 N*m (92 kgf*cm, 80 in.*lbf)

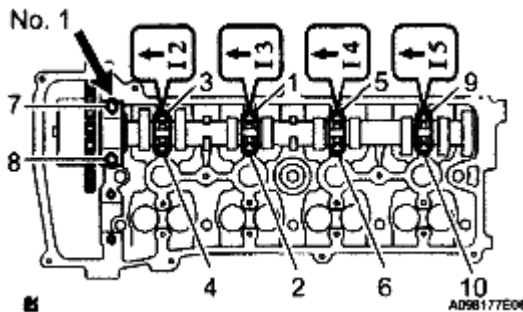


Fig. 105: Tightening Bearing Cap Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL NO. 2 CAMSHAFT

- a. Apply a light coat of engine oil to the journal portion of the No. 2 camshaft.
- b. Put the No. 2 camshaft on the cylinder head with the paint mark of the chain aligned with the timing mark on the camshaft timing sprocket.

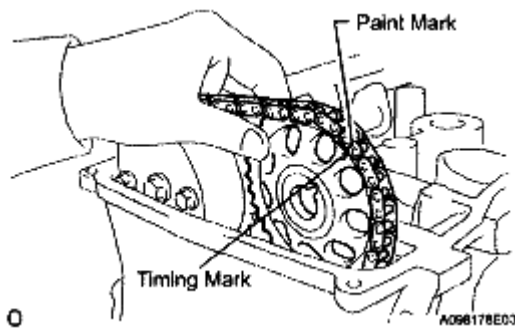


Fig. 106: Identifying Paint Mark And Timing Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. While holding the No. 2 camshaft by hand, temporarily tighten the camshaft timing sprocket set bolt.

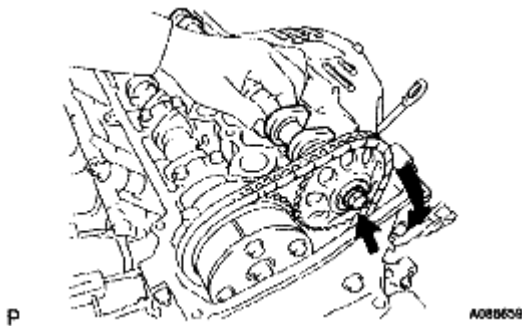


Fig. 107: Locating Camshaft Timing Sprocket Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Examine the front marks and numbers, and check that the order is as shown in the illustration. Then install the bearing caps onto the cylinder head.

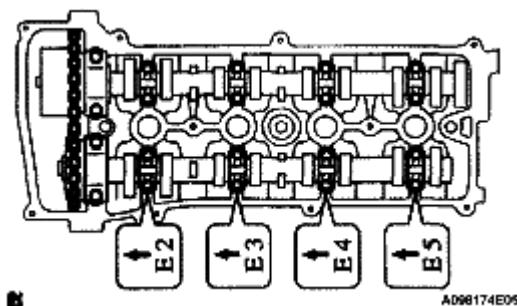


Fig. 108: Identifying Front Marks And Numbers Order
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.
- f. Using several steps, uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.

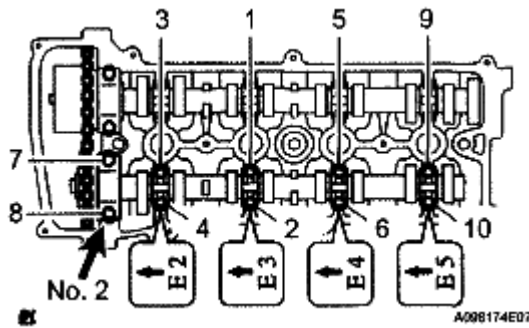


Fig. 109: Tightening Bearing Cap Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque:

No. 2 Bearing cap

30 N*m (301 kgf*cm, 22 ft.*lbf)

No. 3 Bearing cap

9.0 N*m (92 kgf*cm, 80 in.*lbf)

- g. While holding the camshaft with a wrench, tighten the camshaft timing sprocket set bolt.

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

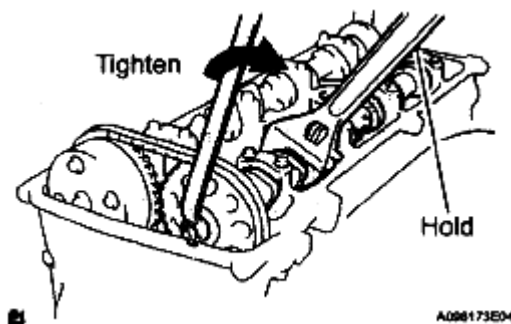
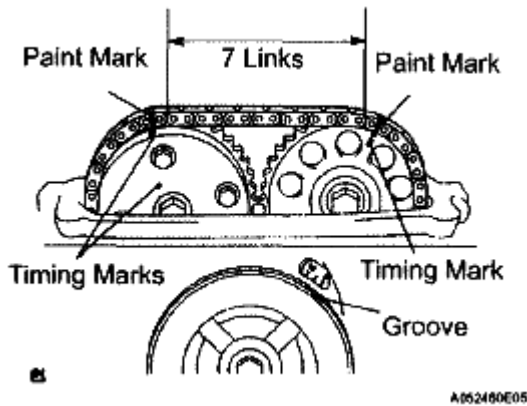


Fig. 110: Tightening Camshaft Timing Sprocket Set Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- h. Check that the paint marks on the chain are aligned with the timing marks on the camshaft timing gear and camshaft timing sprocket. Also, check that the crankshaft pulley groove is aligned with the timing mark "0" of the timing chain cover.



A052480E05

Fig. 111: Checking Crankshaft Pulley Grooved Is Aligned With Timing Mark
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

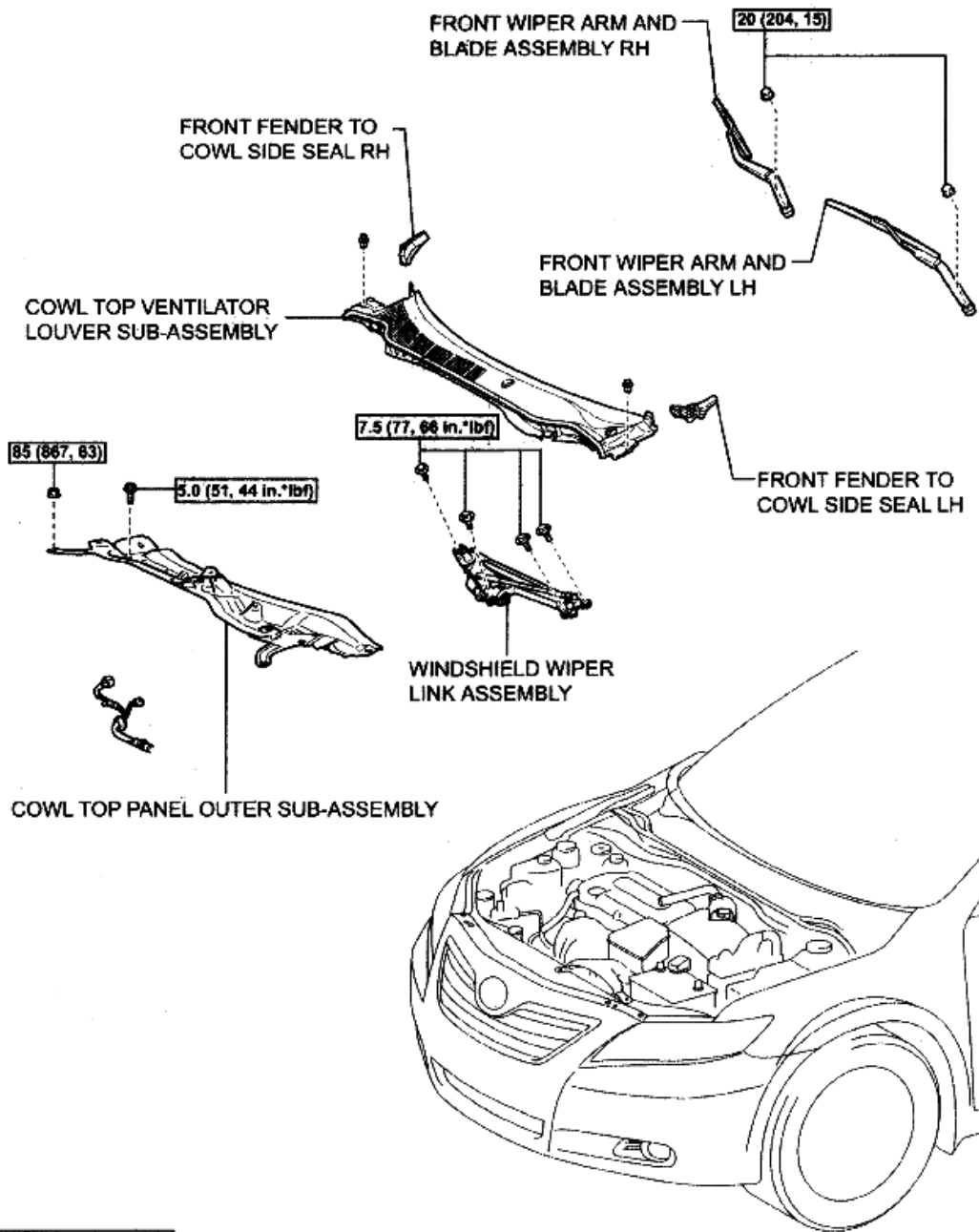
4. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY** (See INSTALLATION)
5. **CHECK VALVE CLEARANCE** (See VALVE CLEARANCE)
6. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY** (See INSTALLATION)
7. **INSTALL IGNITION COIL ASSEMBLY** (See INSTALLATION)
8. **INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY** (See INSTALLATION)
9. **INSTALL FRONT FENDER APRON SEAL RH**
10. **INSTALL ENGINE UNDER COVER LH**
11. **INSTALL ENGINE UNDER COVER RH**
12. **INSTALL FRONT WHEEL RH**
13. **CHECK FOR ENGINE OIL LEAKS**

CYLINDER HEAD

COMPONENTS

2008 Toyota Camry LE

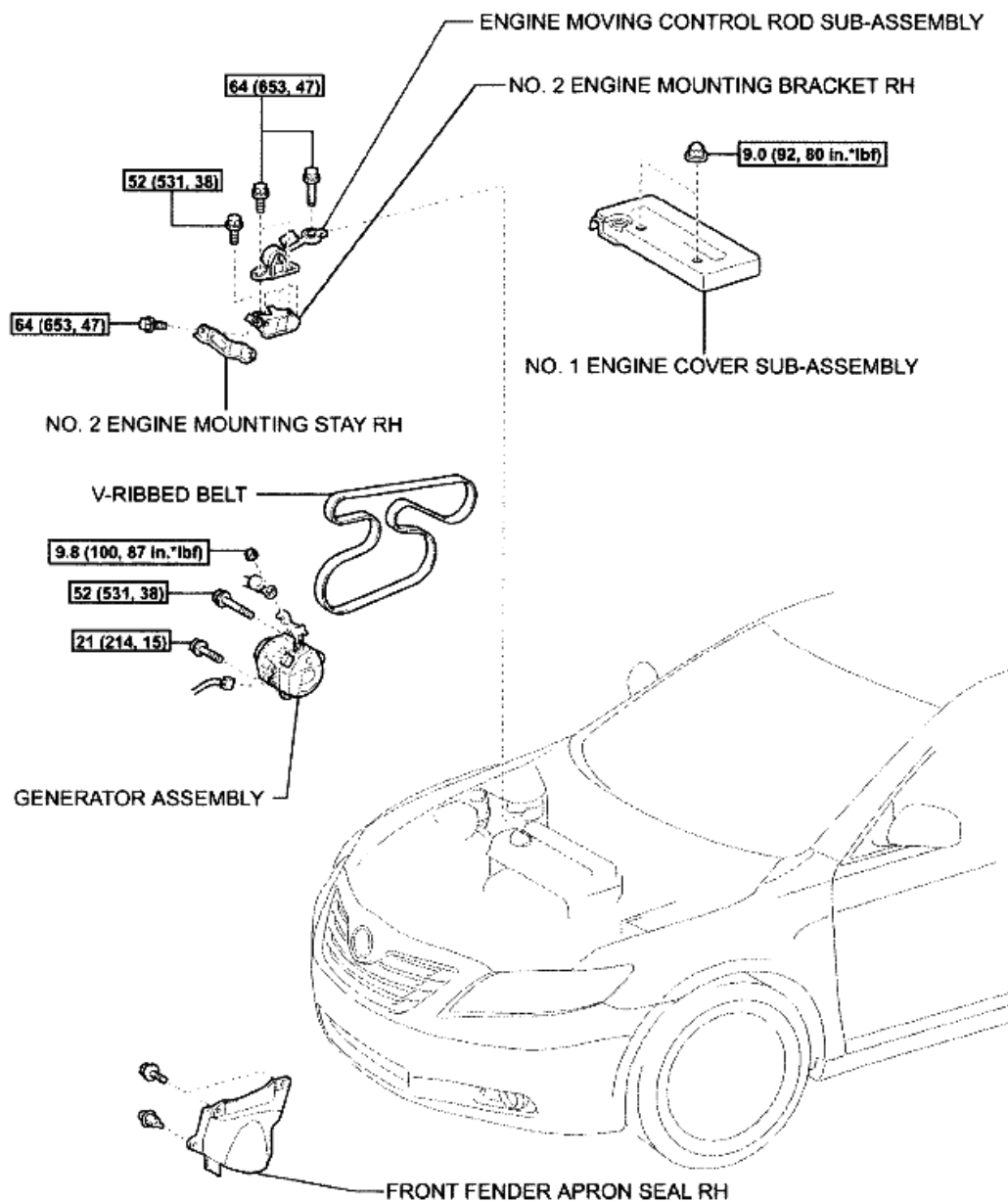
2008 ENGINE Engine Mechanical (2AZ-FE) - Camry



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

A136B12E01

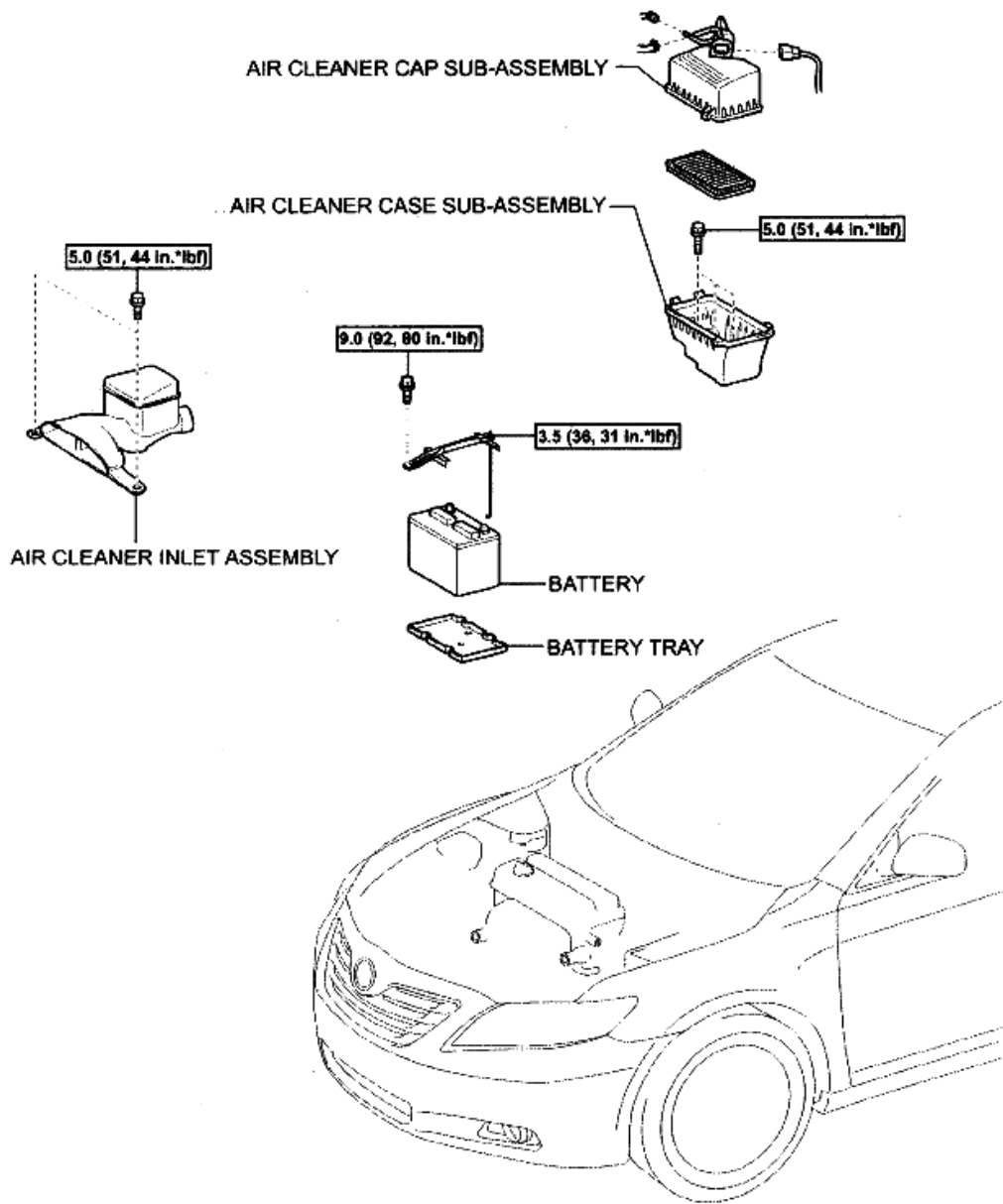
Fig. 112: Identifying Cylinder Head Components With Torque Specifications (1 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



[N*m (kgf*cm, ft.*lbf)]: Specified torque

A134948E01

Fig. 113: Identifying Cylinder Head Components With Torque Specifications (2 Of 7)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

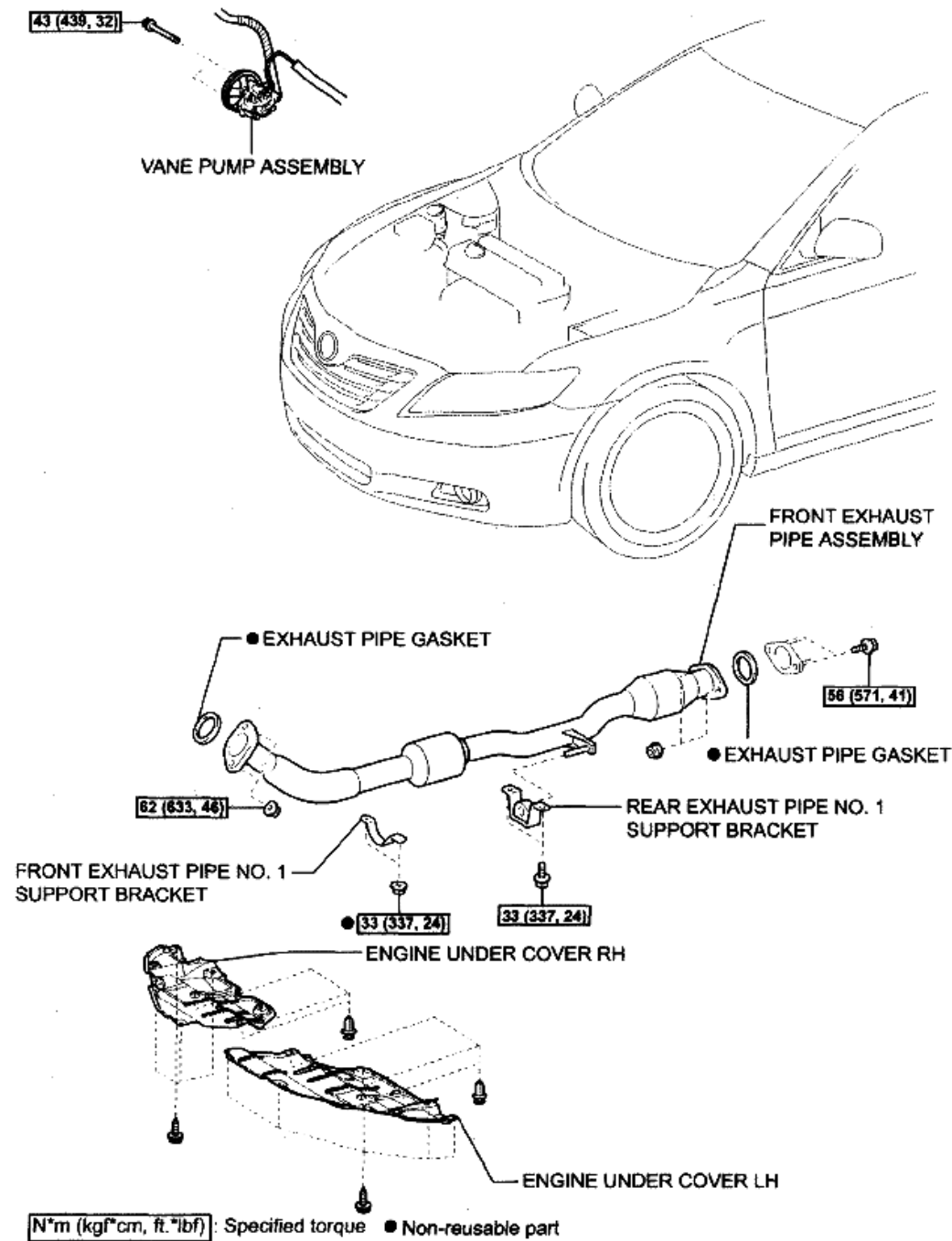


N*m (kgf*cm, ft.*lbf) : Specified torque

C

A134950E01

Fig. 114: Identifying Cylinder Head Components With Torque Specifications (3 Of 7)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



A134947E01

Fig. 115: Identifying Cylinder Head Components With Torque Specifications (4 Of 7)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2008 Toyota Camry LE

2008 ENGINE Engine Mechanical (2AZ-FE) - Camry

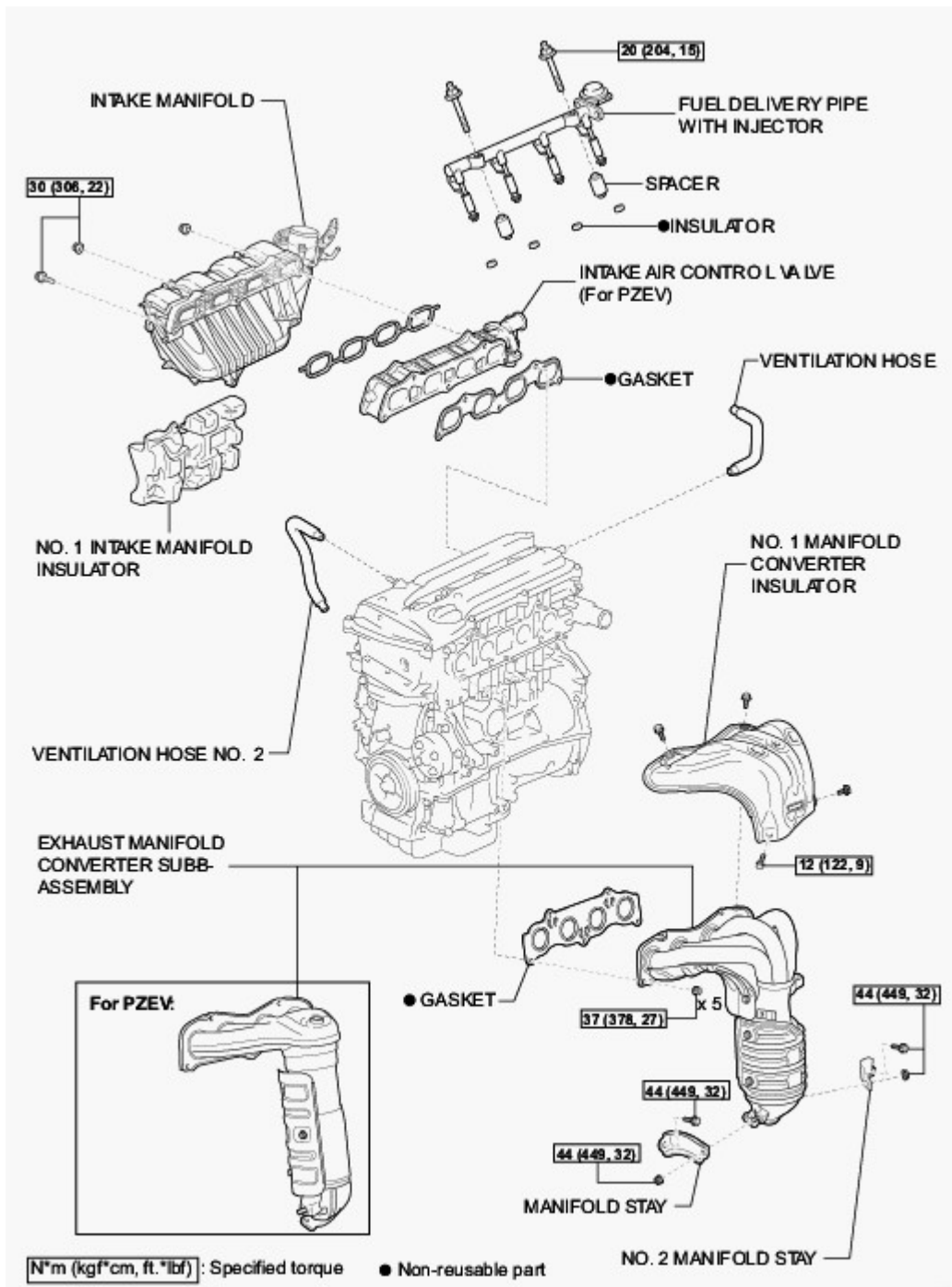


Fig. 116: Identifying Cylinder Head Components With Torque Specifications (5 Of 7)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

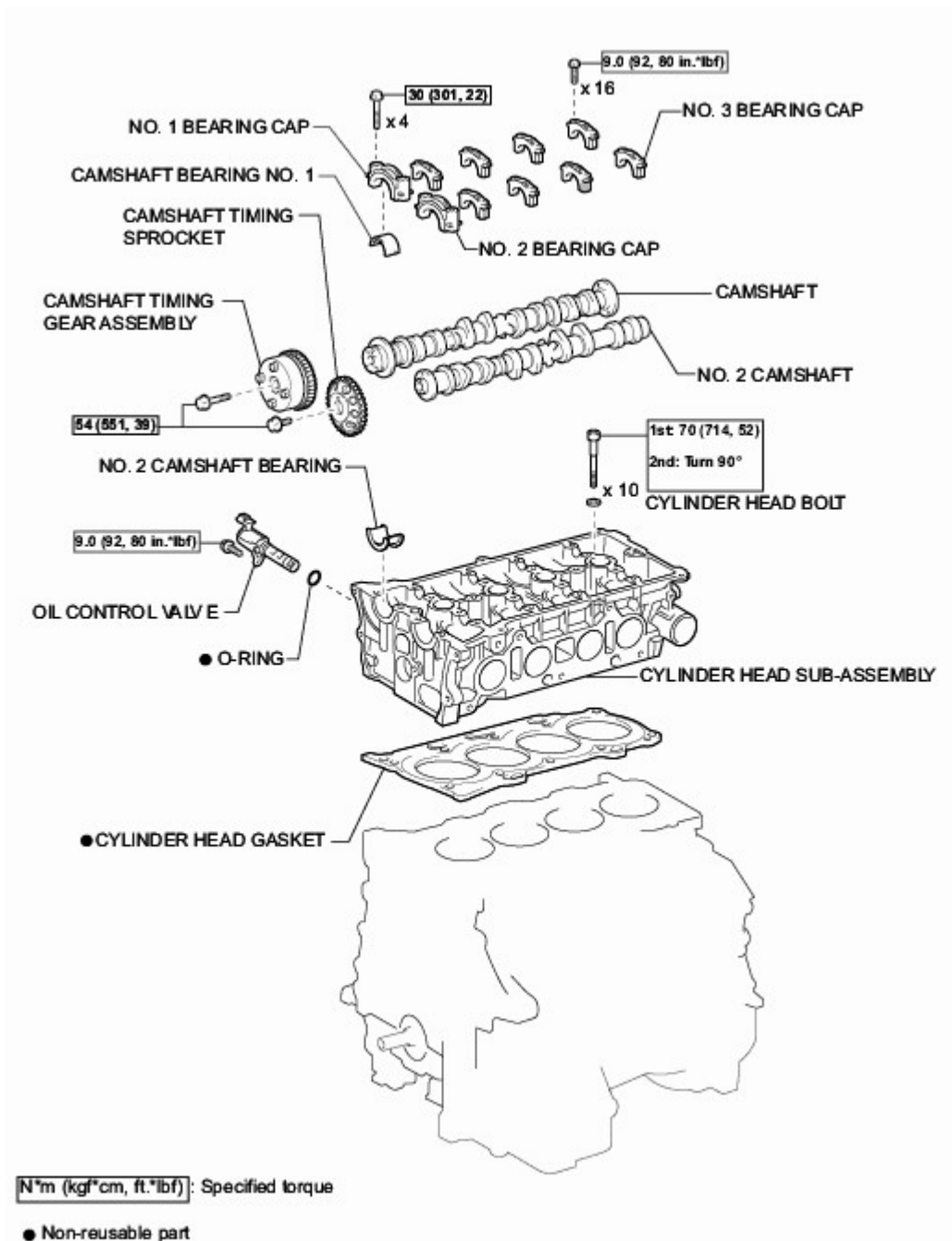
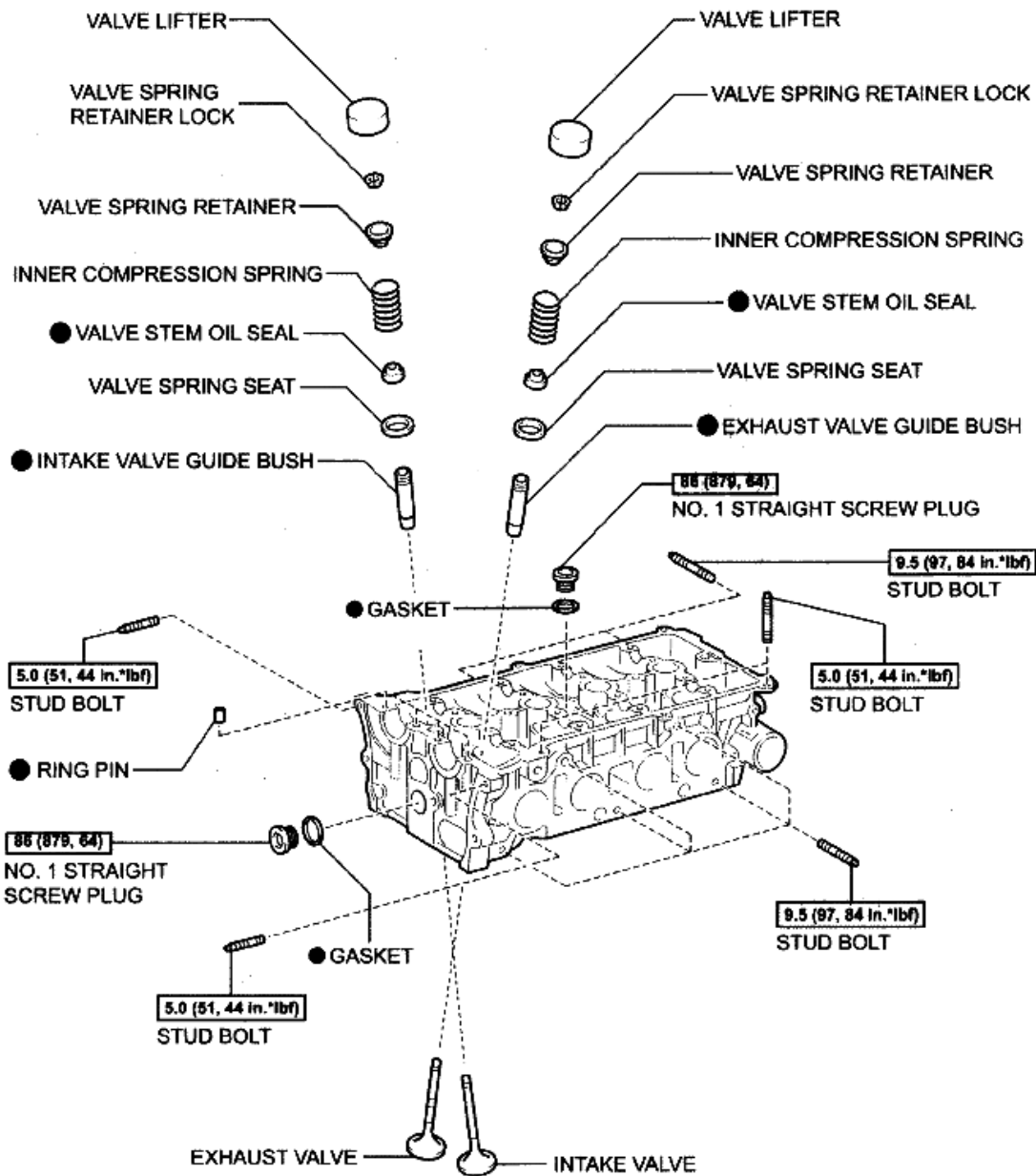


Fig. 117: Identifying Cylinder Head Components With Torque Specifications (6 Of 7)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



N*m (kgf*cm, ft.*lbf) : Specified torque ● Non-reusable part

A136083E01

Fig. 118: Identifying Cylinder Head Components With Torque Specifications (7 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. DISCHARGE FUEL SYSTEM PRESSURE

HINT:

See **PRECAUTION** .

2. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
3. **REMOVE ENGINE UNDER COVER LH**
4. **REMOVE ENGINE UNDER COVER RH**
5. **REMOVE FRONT FENDER APRON SEAL RH**
6. **REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY (See REMOVAL)**
7. **DRAIN ENGINE COOLANT (See ON-VEHICLE INSPECTION)**
8. **DRAIN ENGINE OIL (See REPLACEMENT)**
9. **REMOVE WINDSHIELD WIPER LINK ASSEMBLY**

HINT:

See **REMOVAL** .

10. **REMOVE COWL TOP PANEL OUTER SUB-ASSEMBLY (See REMOVAL)**
11. **REMOVE AIR CLEANER INLET ASSEMBLY (See REMOVAL)**
12. **REMOVE AIR CLEANER CAP SUB-ASSEMBLY (See REMOVAL)**
13. **REMOVE AIR CLEANER CASE SUB-ASSEMBLY (See REMOVAL)**
14. **REMOVE BATTERY (See REMOVAL)**
15. **REMOVE THROTTLE BODY ASSEMBLY (See REMOVAL)**
16. **DISCONNECT FUEL TUBE SUB-ASSEMBLY (See REMOVAL)**
17. **REMOVE FUEL DELIVERY PIPE WITH INJECTOR (See REMOVAL)**
18. **REMOVE INTAKE MANIFOLD (See REMOVAL)**
19. **REMOVE INTAKE AIR CONTROL VALVE (For PZEV) (See REMOVAL)**
20. **REMOVE NO. 1 INTAKE MANIFOLD INSULATOR (See REMOVAL)**
21. **REMOVE FRONT EXHAUST PIPE ASSEMBLY**

HINT:

See **REMOVAL** .

22. **REMOVE NO. 2 ENGINE MOUNTING STAY RH (See REMOVAL)**
23. **REMOVE ENGINE MOVING CONTROL ROD SUB-ASSEMBLY (See REMOVAL)**
24. **REMOVE NO. 2 ENGINE MOUNTING BRACKET RH (See REMOVAL)**
25. **REMOVE V-RIBBED BELT (See REMOVAL)**
26. **REMOVE GENERATOR ASSEMBLY (See REMOVAL)**
27. **REMOVE OIL LEVEL GAUGE SUB-ASSEMBLY**
28. **REMOVE OIL LEVEL GAUGE GUIDE (See REMOVAL)**

29. **REMOVE MANIFOLD STAY** (See REMOVAL)
30. **REMOVE NO. 2 MANIFOLD STAY** (See REMOVAL)
31. **REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY** (See REMOVAL)
32. **REMOVE CHAIN SUB-ASSEMBLY**

HINT:

See REMOVAL.

33. **REMOVE NO. 2 CAMSHAFT**
 - a. Using several steps, uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration.
 - b. Remove the 5 bearing caps and No. 2 camshaft.

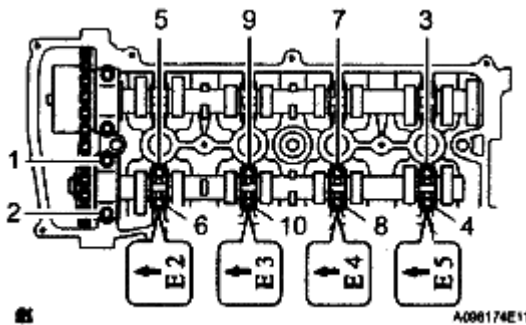


Fig. 119: Identifying Bearing Cap Bolts In Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

34. **REMOVE CAMSHAFT**
 - a. Using several steps, uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration.
 - b. Remove the 5 bearing caps and camshaft.

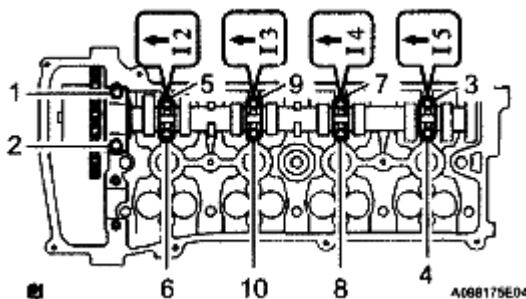
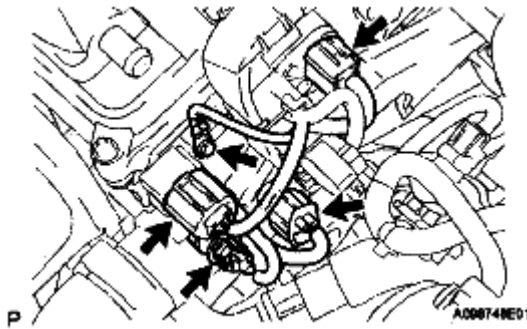


Fig. 120: Identifying Bearing Cap Bolts In Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

35. **REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY** (See REMOVAL)

36. DISCONNECT RADIATOR HOSE INLET (See REMOVAL)**37. DISCONNECT ENGINE WIRE**

- a. Disconnect the radio setting condenser connector.
- b. Disconnect the engine oil pressure switch connector.
- c. Disconnect the engine coolant temperature sensor connector.
- d. Disconnect the camshaft position sensor connector.
- e. Remove the bolt and ground cable.

**Fig. 121: Disconnecting Engine Wire**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

38. REMOVE NO. 2 CAMSHAFT BEARING

- a. Remove the No. 2 camshaft bearing.

**Fig. 122: Identifying Camshaft Bearing**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

39. REMOVE CYLINDER HEAD SUB-ASSEMBLY

- a. Using several steps, uniformly loosen and remove the 10 cylinder head bolts and 10 plate washers with a 10 mm bi-hexagon wrench in the sequence shown in the illustration.

NOTE: Head warpage or cracking could result from removing the bolts in the wrong order.

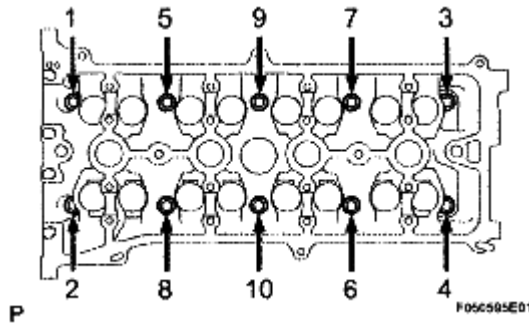


Fig. 123: Identifying Cylinder Head Bolts And Plate Washers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a screwdriver with its tip wrapped with tape, pry between the cylinder head and cylinder block, and remove the cylinder head.

NOTE: Be careful not to damage the contact surfaces of the cylinder head and cylinder block.

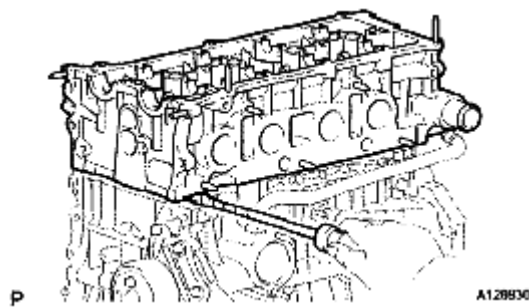


Fig. 124: Removing Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

40. REMOVE CYLINDER HEAD GASKET

- a. Remove the cylinder head gasket.

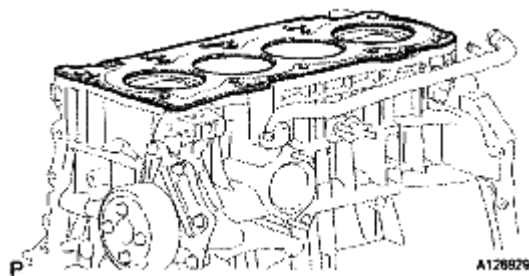


Fig. 125: Identifying Cylinder Head Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

1. REMOVE VALVE LIFTER

- a. Remove the valve lifters.

HINT:

Arrange the valve lifters in the correct order.

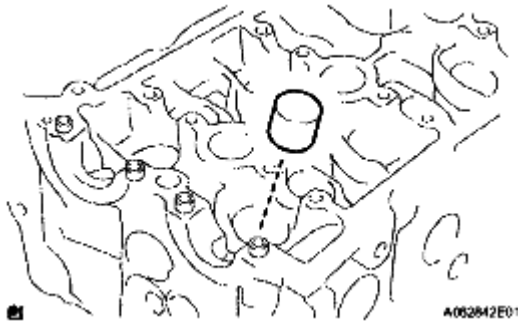


Fig. 126: Identifying Valve Lifters

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. REMOVE INTAKE VALVE

- a. Using SST and wooden blocks, compress and remove the valve retainer locks.

SST 09202-70020(09202-00010)

- b. Remove the retainer, valve spring and valve.

HINT:

Arrange the removed parts in the correct order.

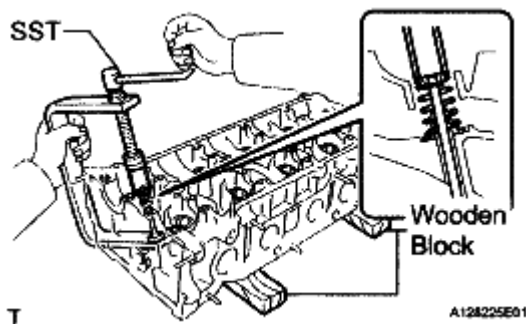


Fig. 127: Removing Intake Valve

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. REMOVE EXHAUST VALVE

- a. Using SST and wooden blocks, compress and remove the valve retainer locks.

SST 09202-70020(09202-00010)

- b. Remove the retainer, valve spring and valve.

HINT:

Arrange the removed parts in the correct order.

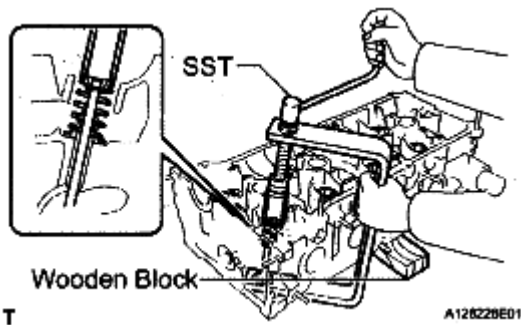


Fig. 128: Removing Exhaust Valve

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. REMOVE VALVE STEM OIL SEAL

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

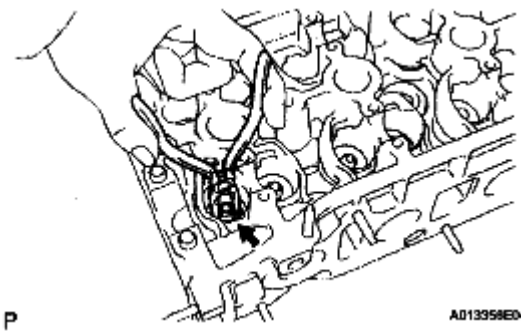


Fig. 129: Removing Valve Stem Oil Seal

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. REMOVE VALVE SPRING SEAT

- a. Using compressed air and a magnetic finger, remove the valve spring seats by blowing air onto them.

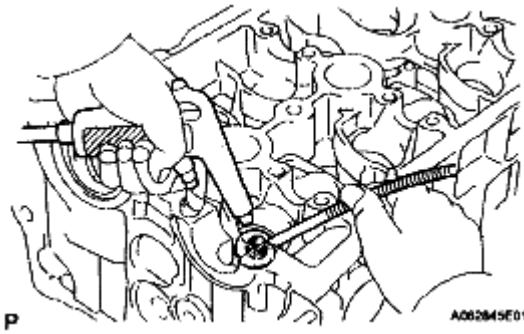


Fig. 130: Removing Valve Spring Seat
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. REMOVE NO. 1 STRAIGHT SCREW PLUG

- a. Using a 14 mm straight hexagon wrench, remove the 2 screw plugs and 2 gaskets.

NOTE: If water leaks from the straight screw plug or the plug corrodes, replace it.

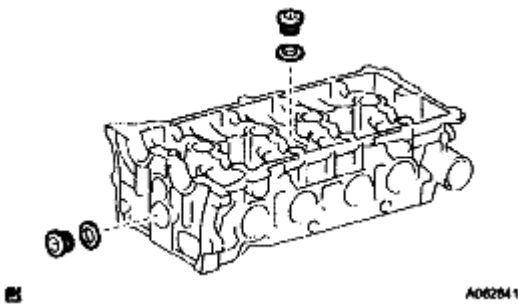


Fig. 131: Identifying Screw Plugs And Gaskets
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

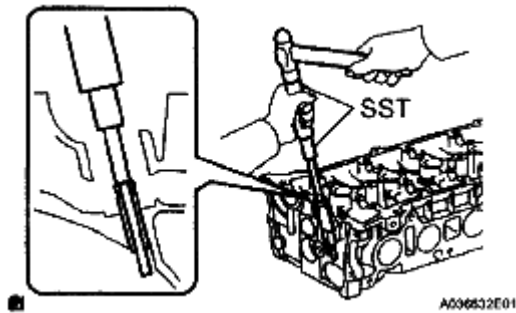
7. REMOVE STUD BOLT

8. REMOVE RING PIN

9. REMOVE INTAKE VALVE GUIDE BUSH

- a. Heat the cylinder head to 80 to 100°C (176 to 212°F).
- b. Place the cylinder head on wooden blocks.
- c. Using SST and a hammer, tap out the guide bush.

SST 09201-10000 (09201-01050), 09950-70010 (09951-07100)

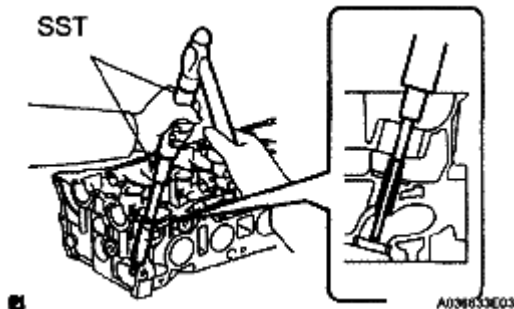
**Fig. 132: Tapping Out Guide Bush**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. REMOVE EXHAUST VALVE GUIDE BUSH

- a. Heat the cylinder head to 80 to 100°C (176 to 212°F).
- b. Place the cylinder head on wooden blocks.
- c. Using SST and a hammer, tap out the guide bush.

SST 09201 -10000 (09201 -01050), 09950-70010 (09951-07100)

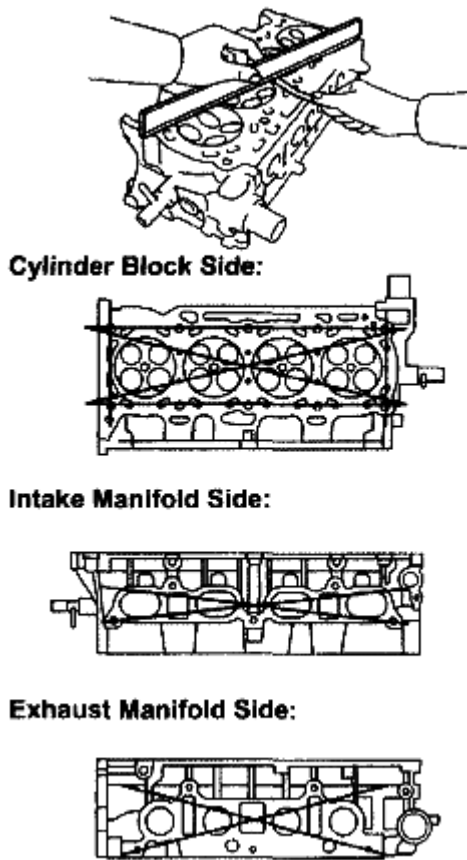
**Fig. 133: Tapping Guide Bush**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. INSPECT CYLINDER HEAD FOR FLATNESS

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



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Fig. 134: Measuring Surface Contacting Cylinder Block
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum warpage

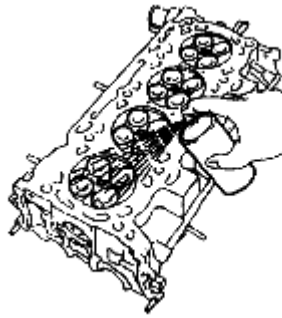
Maximum warpage

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

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

2. INSPECT CYLINDER HEAD FOR CRACKS

- Using a dye penetrant, check the intake ports, exhaust ports and cylinder surface for cracks. If cracked, replace the cylinder head.



P

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Fig. 135: Checking Intake Ports, Exhaust Ports And Cylinder Surface For Cracks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSPECT VALVE SEATS

- a. Apply a light coat of prussian blue to the valve face.

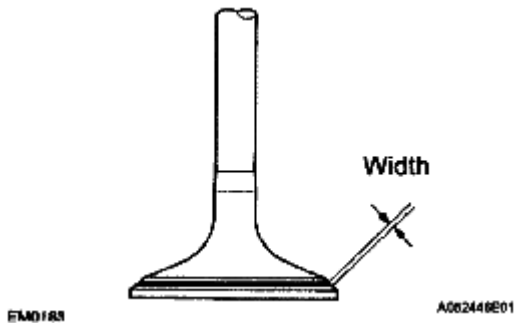


Fig. 136: Checking Valve Seats
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Lightly press the valve face against the valve seat.
- c. Check the valve face and valve seat according to the following procedure:
 1. If prussian blue appears 360° around the valve face, the valve face is concentric. If not, replace the valve.
 2. If prussian blue appears 360° around the valve seat, the guide and valve face are concentric. If not, resurface the valve seat.
 3. Check that the valve seat contact is in the middle of the valve face with the width between 1.0 to 1.4 mm (Intake side (0.039 to 0.055 in.)).
 4. Check that the valve seat contact is in the -middle of the valve face with the width between 1.2 to 1.6 mm (Exhaust side (0.047 to 0.063 in.)).

4. REPAIR VALVE SEATS

NOTE:

- Repair the seat while checking the seating position.
- Keep the lip free from foreign matter.

- a. Using a 45° cutter, resurface the valve seat so that the valve seat width is more than the

specification.

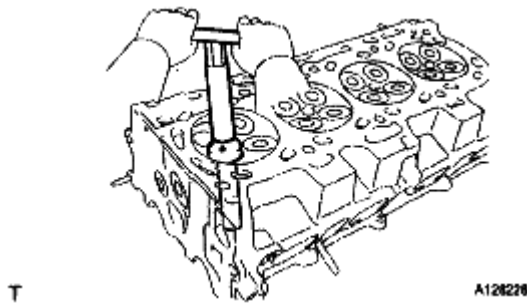


Fig. 137: Repairing Valve Seats

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using 30° and 75° cutters, correct the valve seat so that the valve contacts the entire circumference of the seat. The contact should be in the center of the valve seat, and the valve seat width should be maintained within the specified range around the entire circumference of the seat.

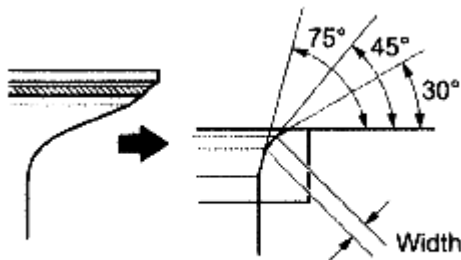


Fig. 138: Identifying Valves Seats Angle

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Valve Seat Width

VALVES SEATS WIDTH SPECIFICATION CHART

Item	Specified Condition
Intake Side	1.0 to 1.4 mm (0.039 to 0.055 in.)
Exhaust Side	1.2 to 1.6 mm (0.047 to 0.063 in.)

- c. Handrub the valve and valve seat with an abrasive compound.
- d. Check the valve seating position.

5. INSPECT CAMSHAFT THRUST CLEARANCE

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

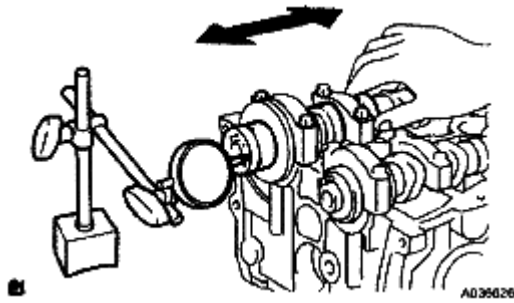


Fig. 139: Measuring Camshaft Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard thrust clearance

STANDARD THRUST CLEARANCE SPECIFICATION

Item	Specified Condition
Intake	0.040 to 0.095 mm (0.0016 to 0.0037 in.)
Exhaust	0.080 to 0.135 mm (0.0032 to 0.0053 in.)

Maximum thrust clearance

MAXIMUM THRUST CLEARANCE SPECIFICATION

Item	Specified Condition
Intake	0.110 mm (0.0043 in.)
Exhaust	0.150 mm (0.0059 in.)

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

6. INSPECT CAMSHAFT OIL CLEARANCE

- Clean the bearing caps and camshaft journals.
- Place the camshafts on the cylinder head.
- Lay a strip of Plastigage across each of the camshaft journals.

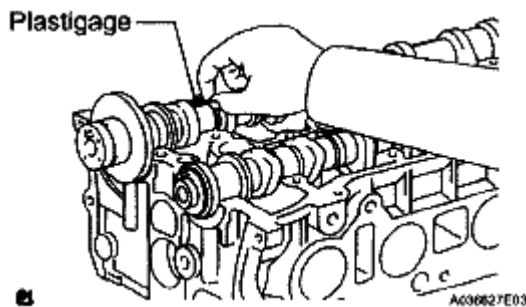


Fig. 140: Laying Strip Of Plastigage On Camshaft Journals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the bearing caps (See **INSTALLATION**).

NOTE: Do not turn the camshaft.

- e. Remove the bearing caps (See **REMOVAL**).
f. Measure the Plastigage at its widest point.

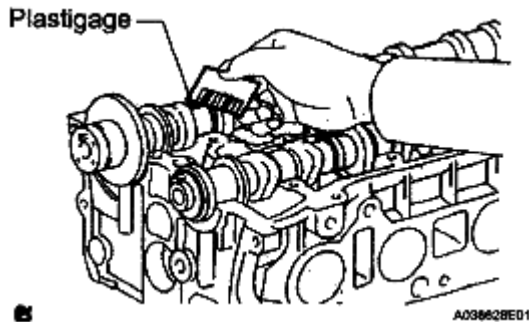


Fig. 141: Measuring Plastigage On Widest Point
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard oil clearance

STANDARD OIL CLEARANCE SPECIFICATION

Item	Specified Condition
Camshaft No. 1 journal bearing mark 1	0.007 to 0.038 mm (0.0003 to 0.0015 in.)
Camshaft No. 1 journal bearing mark 2	0.008 to 0.038 mm (0.0003 to 0.0015 in.)
Camshaft No. 1 journal bearing mark 3	0.008 to 0.038 mm (0.0003 to 0.0015 in.)
Camshaft other journals	0.025 to 0.062 mm (0.0010 to 0.0024 in.)
No. 2 camshaft No. 1 journal	0.015 to 0.054 mm (0.0006 to 0.0021 in.)
No. 2 camshaft other journals	0.025 to 0.062 mm (0.0010 to 0.0024 in.)

Maximum oil clearance

MAXIMUM OIL CLEARANCE SPECIFICATION

Item	Specified Condition
Intake	0.070 mm (0.0028 in.)
Exhaust	0.100 mm (0.0039 in.)

NOTE: Completely remove the Plastigage after the inspection.

- If the oil clearance is greater than the maximum, replace the camshaft. If necessary, replace the cylinder head.
- If the oil clearance on the camshaft No. 1 journal is greater than the maximum, choose a new bearing and install it.

1. Check the number mark shown in the illustration.

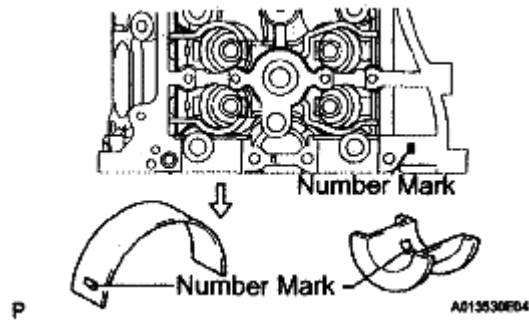


Fig. 142: Identifying Bearing Cap Number Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Cylinder head journal bore diameter

CYLINDER HEAD JOURNAL BORE SPECIFICATION

Mark 1	Mark 2	Mark 3
40.000 to 40.008 mm (1.5748 to 1.5752 in.)	40.009 to 40.017 mm (1.5752 to 1.5755 in.)	40.018 to 40.025 mm (1.5755 to 1.5758 in.)

Standard bearing center wall thickness

STANDARD BEARING CENTER WALL THICKNESS

Mark 1	Mark 2	Mark 3
2.000 to 2.004 mm (0.0787 to 0.0789 in.)	2.005 to 2.008 mm (0.0789 to 0.0791 in.)	2.009 to 2.012 mm (0.0791 to 0.0792 in.)

Camshaft journal diameter

CAMSHAFT JOURNAL DIAMETER SPECIFICATION

Mark 1	Mark 2	Mark 3
35.971 to 35.985 mm (1.4162 to 1.4167 in.)	35.971 to 35.985 mm (1.4162 to 1.4167 in.)	35.971 to 35.985 mm (1.4162 to 1.4167 in.)

7. INSPECT INNER COMPRESSION SPRING

- a. Using vernier calipers, measure the free length of the valve spring.

Free length:

47.43 mm (1.867 in.)

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

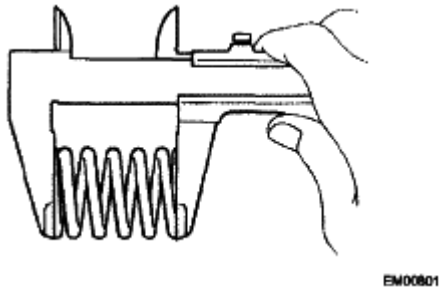


Fig. 143: Measuring Free Length Of Valve Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Maximum deviation:

1.6 mm (0.063 in.)

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

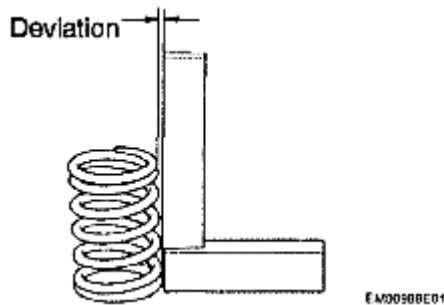


Fig. 144: Measuring Deviation Of Valve Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. INSPECT INTAKE VALVE

- a. Using a gasket scraper, scrape off any carbon on the valve head.

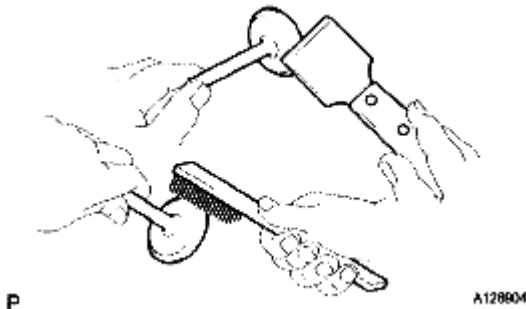


Fig. 145: Cleaning Valve Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using vernier calipers, measure the overall length of the valve.

Standard overall length:

101.71 mm (4.0043 in.)

Minimum overall length:

101.21 mm (3.9846 in.)

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

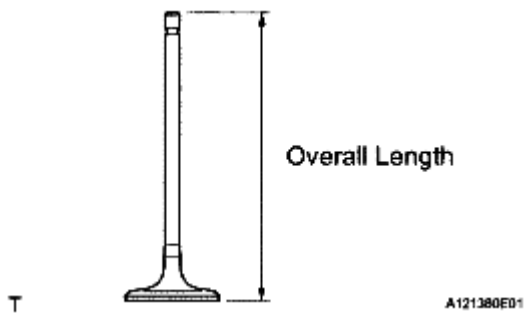


Fig. 146: Identifying Valve's Overall Length
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:

5.470 to 5.485 mm (0.2154 to 0.2159 in.)

If the valve stem is not as specified, check the oil clearance.

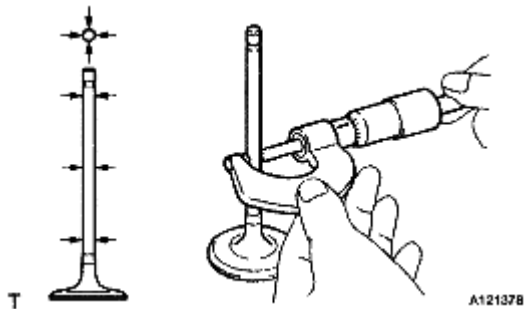


Fig. 147: Checking Diameter Of Valve Stem
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Using vernier calipers, measure the valve head margin thickness.

Standard margin thickness:

1.05 to 1.45 mm (0.0413 to 0.0571 in.)

Minimum margin thickness:

0.50 mm (0.0197 in.)

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

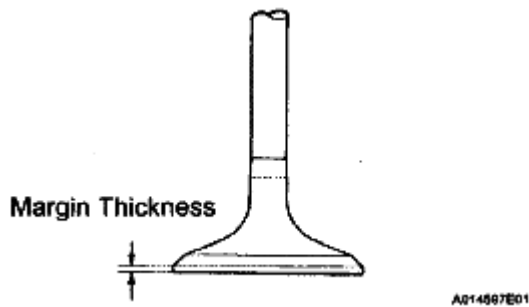


Fig. 148: Measuring Valve Head Margin Thickness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. INSPECT EXHAUST VALVE

- a. Using a gasket scraper, scrape off any carbon on the valve head.

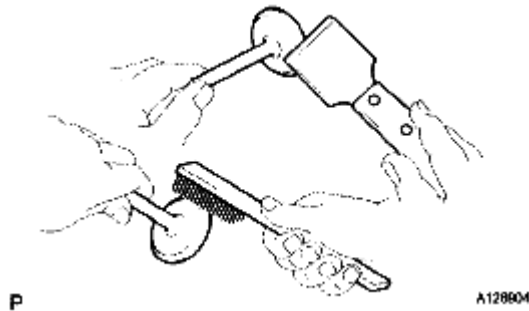


Fig. 149: Cleaning Valve Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using vernier calipers, measure the overall length of the valve.

Standard overall length:

101.15 mm (3.9823 in.)

Minimum overall length:

100.70 mm (3.9646 in.)

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

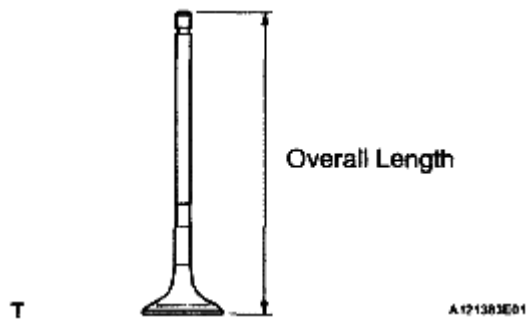


Fig. 150: Identifying Valve Overall Length

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:

5.465 to 5.480 mm (0.2152 to 0.2157 in.)

If the valve stem is not as specified, check the oil clearance.

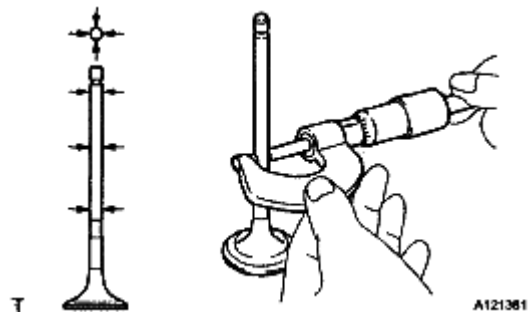


Fig. 151: Measuring Diameter Of Valve Stem

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Using vernier calipers, measure the valve head margin thickness.

Standard margin thickness:

1.20 to 1.60 mm (0.0472 to 0.0630 in.)

Minimum margin thickness:

0.50 mm (0.0197 in.)

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

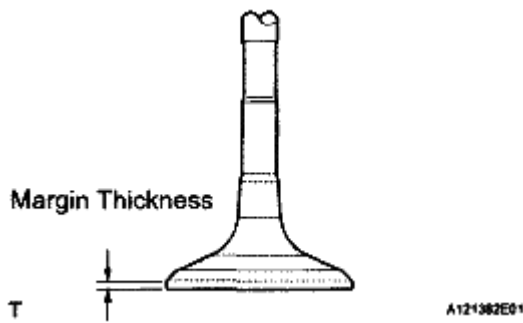


Fig. 152: Identifying Valve Head Margin Thickness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. INSPECT INTAKE VALVE GUIDE BUSH

- a. Using a caliper gauge, measure the inside diameter of the guide bush.

Bushing inside diameter:

5.510 to 5.530 mm (0.2169 to 0.2177 in.)

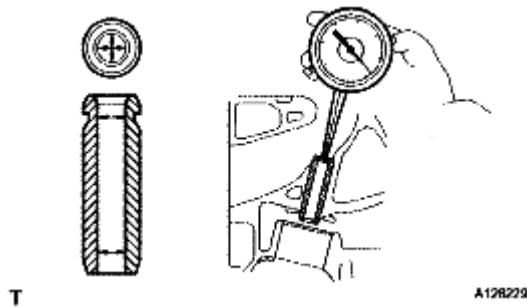


Fig. 153: Measuring Inside Diameter Of Guide Bush
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Subtract the valve stem diameter measurement from the guide bush inside diameter measurement.

Standard oil clearance:

0.025 to 0.060 mm (0.0010 to 0.0024 in.)

Maximum oil clearance:

0.080 mm (0.0031 in.)

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

11. INSPECT EXHAUST VALVE GUIDE BUSH

- a. Using a caliper gauge, measure the inside diameter of the guide bush.

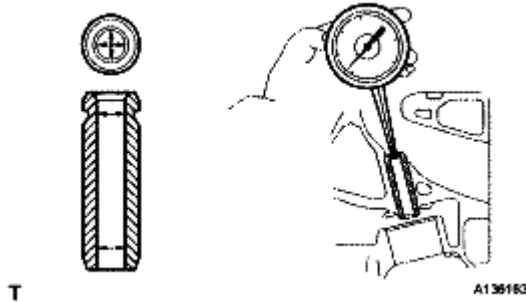
Bushing inside diameter:**5.510 to 5.530 mm (0.2169 to 0.2177 in.)**

Fig. 154: Measuring Inside Diameter Of Guide Bush
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

Standard oil clearance:**0.030 to 0.065 mm (0.0012 to 0.0026 in.)****Maximum oil clearance:****0.100 mm (0.0039 in.)**

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

12. INSPECT VALVE LIFTER

- a. Using a micrometer, measure the lifter diameter.

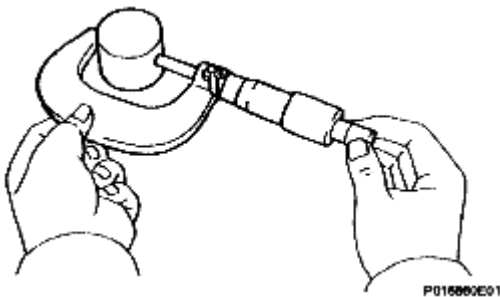
Lifter diameter:**30.966 to 30.976 mm (1.2191 to 1.2195 in.)**

Fig. 155: Measuring Lifter Diameter

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a caliper gauge, measure the lifter bore diameter of the cylinder head.

Standard lifter bore diameter:

31.009 to 31.025 mm (1.2208 to 1.2215 in.)

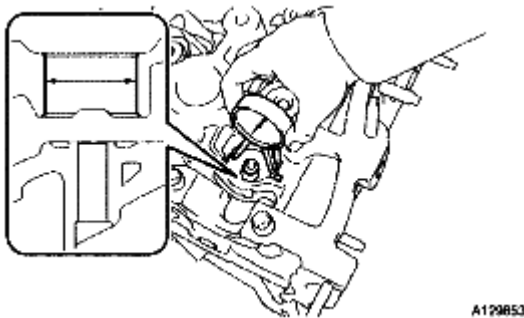


Fig. 156: Measuring Lifter Bore Diameter Of Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Subtract the lifter diameter measurement from the lifter bore diameter measurement.

Standard oil clearance:

0.033 to 0.059 mm (0.0013 to 0.0023 in.)

Maximum oil clearance:

0.070 mm (0.0028 in.)

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

13. INSPECT CYLINDER HEAD SET BOLT

- a. Using vernier calipers, measure the length of the head bolts from the seat to the end.

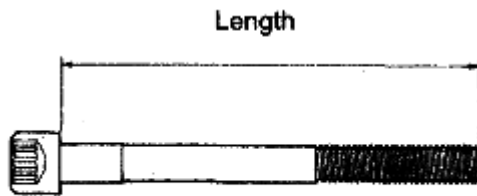
Standard bolt length:

141.3 to 142.7 mm (5.563 to 5.618 in.)

Maximum bolt length:

144.2 mm (5.677 in.)

If the bolt length is greater than the maximum, replace the cylinder head set bolt.



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Fig. 157: Identifying Length Of Cylinder Head Set Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REASSEMBLY

1. INSTALL INTAKE VALVE GUIDE BUSH

- Using a caliper gauge, measure the bush bore diameter of the cylinder head.

Cylinder bore diameter:

10.285 to 10.306 mm (0.4049 to 0.4057 in.)

Select a new guide bush (STD or O/S 0.05)

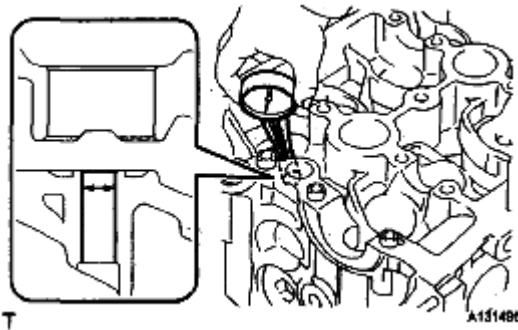


Fig. 158: Measuring Bush Bore Diameter Of Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INTAKE VALVE GUIDE BUSH SPECIFICATION

Bush size	Bush bore diameter
Use STD	10.285 to 10.306 mm (0.4049 to 0.4057 in.)
Use O/S 0.05	10.335 to 10.356 mm (0.4069 to 0.4077 in.)

If the bush bore diameter of the cylinder head is greater than 10.306 mm (0.4057 in.), machine the bush bore to the dimension of 10.335 to 10.356 mm (0.4069 to 0.4077 in.) to install a O/S 0.05 valve guide bush. If the bush bore diameter of the cylinder head is greater than 10.356 mm (0.4077 in.), replace the cylinder head.

- b. Heat the cylinder head to 80 to 100°C (176 to 212°F).
- c. Place the cylinder head on wooden blocks.
- d. Using SST and a hammer, tap in a new guide bush to the specified protrusion height.

SST 09201-10000 (09201-01050), 09950-70010 (09951-07100)

Protrusion height:

9.6 to 10.0 mm (0.3779 to 0.3937 in.)

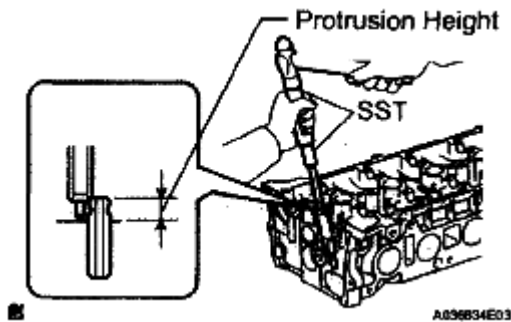


Fig. 159: Tapping Guide Bush To Specified Protrusion Height
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Standard oil clearance:

0.025 to 0.060 mm (0.0010 to 0.0024 in.)

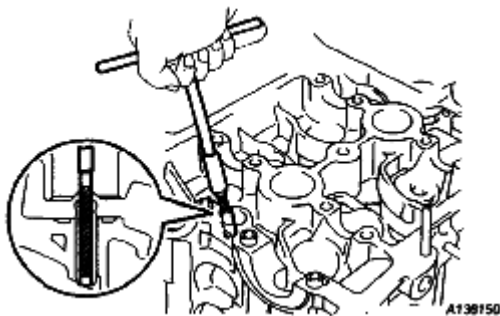


Fig. 160: Reaming Guide Bush
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL EXHAUST VALVE GUIDE BUSH

- a. Using a caliper gauge, measure the bush bore diameter of the cylinder head.

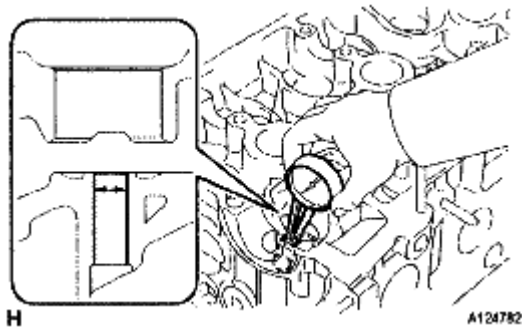


Fig. 161: Measuring Bush Bore Diameter Of Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Diameter:

10.285 to 10.306 mm (0.4049 to 0.4057 in.)

Select a new guide bush (STD or O/S 0.05)

EXHAUST VALVE GUIDE BUSH SPECIFICATION

Bush size	Bush bore diameter
Use STD	10.285 to 10.306 mm (0.4049 to 0.4057 in.)
Use O/S 0.05	10.335 to 10.356 mm (0.4069 to 0.4077 in.)

If the bush bore diameter of the cylinder head is greater than 10.306 mm (0.4057 in.), machine the bush bore to the dimension of 10.335 to 10.356 mm (0.4069 to 0.4077 in.) to install a O/S 0.05 valve guide bush. If the bush bore diameter of the cylinder head is greater than 10.356 mm (0.4077 in.), replace the cylinder head.

- Heat the cylinder head to 80 to 100°C (176 to 212°F).
- Place the cylinder head on wooden blocks.
- Using SST and a hammer, tap in a new guide bush to the specified protrusion height.

SST 09201 -10000 (09201 -01050), 09950-70010 (09951-07100)

Protrusion height:

9.6 to 10.0 mm (0.3779 to 0.3937 in.)

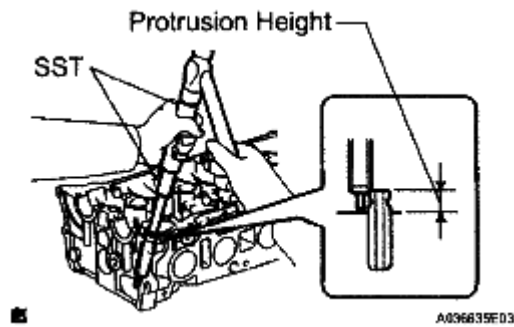


Fig. 162: Placing Cylinder Head On Wooden Blocks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Standard oil clearance:

0.030 to 0.065 mm (0.0012 to 0.0026 in.)

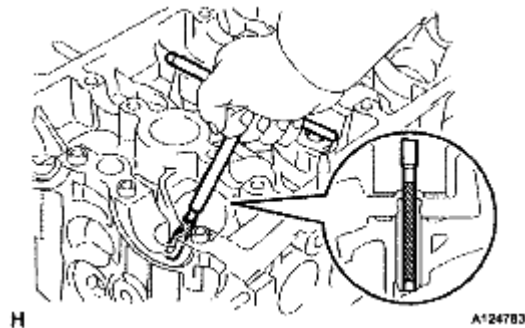


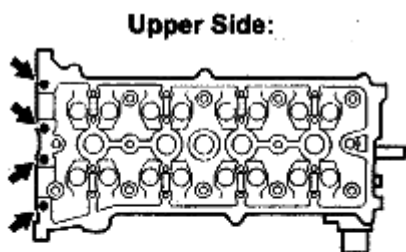
Fig. 163: Reaming Valve Guide Bush
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL RING W/HEAD PIN

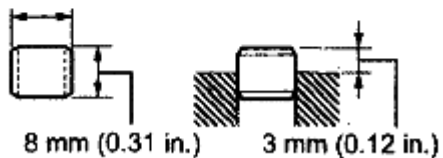
- a. Using a plastic-faced hammer, tap in a new ring pin to the specified protrusion height.

Protrusion height:

3 mm (0.12 in.)



11 mm (0.43 in.)



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Fig. 164: Identifying Ring Pin To Protrusion Height
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSTALL STUD BOLT

NOTE: If the stud bolt is deformed or the threads are damaged, replace it.

- Using E5 and E7 "torx" sockets, install the stud bolts.

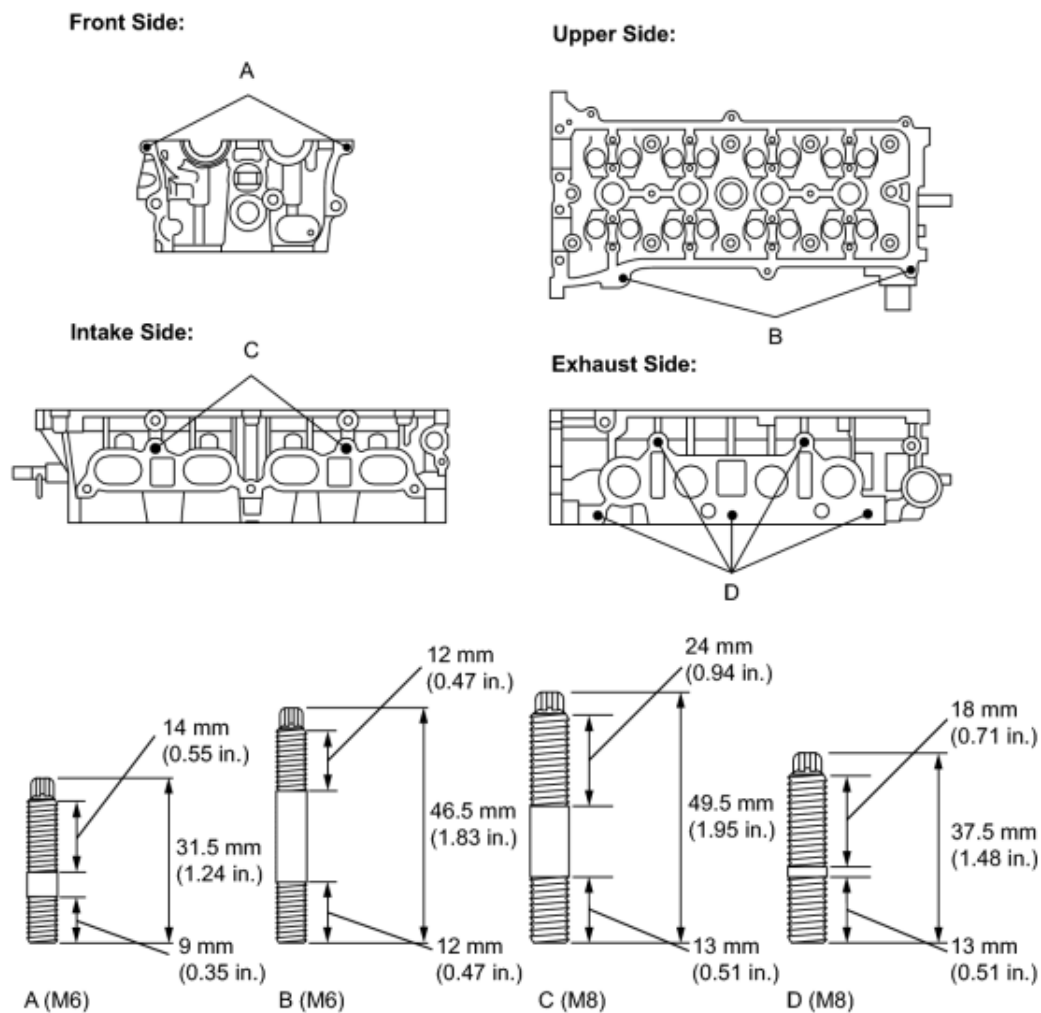


Fig. 165: Identifying Stud Bolt Thread Dimension

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque:

Bolt A

5.0 N*m (51 kgf*cm, 44 in.*lbf)

Bolt B

5.0 N*m (51 kgf*cm, 44 in.*lbf)

Bolt C

9.5 N*m (97 kgf*cm, 84 in.*lbf)

Bolt D

9.5 N*m (97 kgf*cm, 84 in.*lbf)

5. INSTALL NO. 1 STRAIGHT SCREW PLUG

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

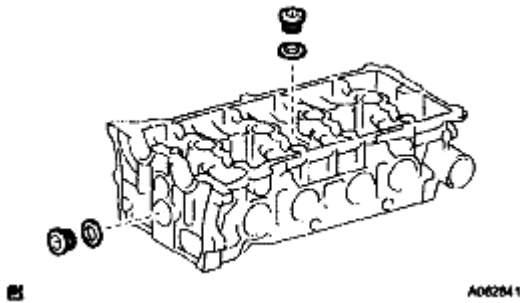


Fig. 166: Identifying Screw Plugs And Gaskets

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSTALL VALVE SPRING SEAT

- a. Install the valve spring seats to the cylinder head.



Fig. 167: Identifying Valve Spring Seat

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. INSTALL VALVE STEM OIL SEAL

- a. Apply a light coat of engine oil to a new oil seal.

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

HINT:

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

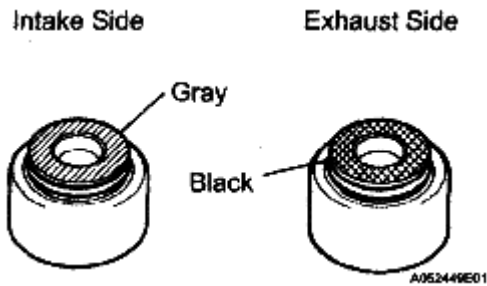


Fig. 168: Identifying Intake And Exhaust Valve Stem Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using SST, push in the oil seal.

SST 09201-41020

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

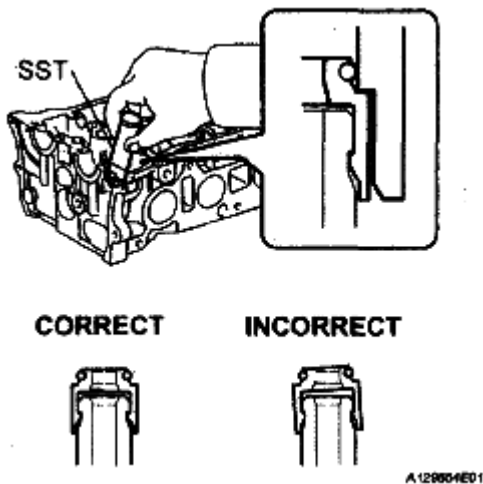


Fig. 169: Pushing Oil Seal With SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. INSTALL INTAKE VALVE

- a. Apply a sufficient coat of engine oil to the tip area of the intake valve shown in the illustration.

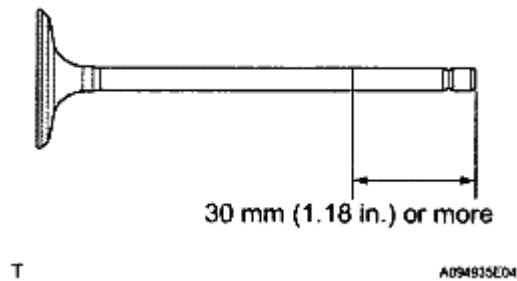


Fig. 170: Identifying Intake Valve Dimension

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the valve, compression spring and spring retainer to the cylinder head.

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

- c. Using SST and wooden blocks, compress the spring and install the 2 retainer locks.

SST 09202-70020(09202-00010)

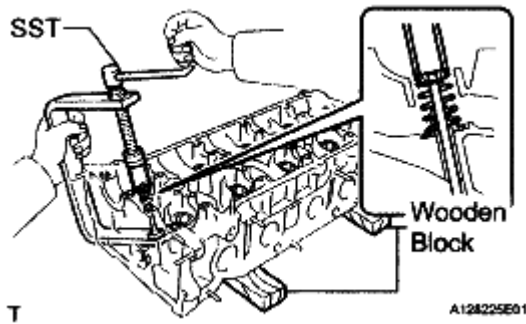


Fig. 171: Compressing Spring

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Using a 5 mm pin punch and plastic hammer, lightly tap the valve stem tip to ensure a proper fit.

NOTE: Be careful not to damage the valve stem tip.

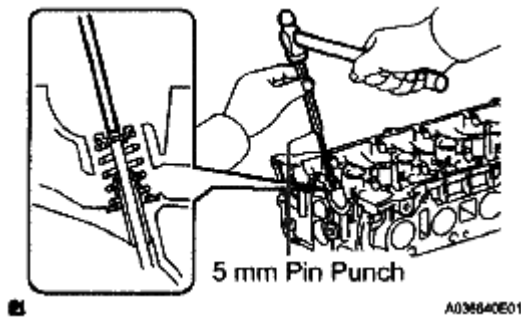


Fig. 172: Tapping Valve Step Tip

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. INSTALL EXHAUST VALVE

- Apply a sufficient coat of engine oil to the tip area of the exhaust valve shown in the illustration.

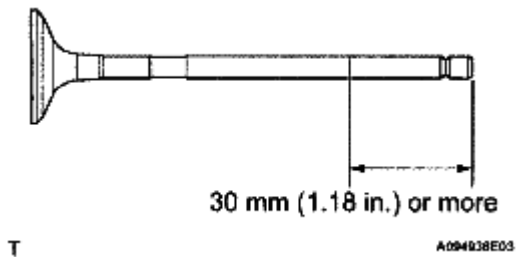


Fig. 173: Identifying Exhaust Valve Dimension

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Install the valve, compression spring and spring retainer to the cylinder head.

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

- Using SST and wooden blocks, compress the spring and install the 2 retainer locks.

SST 09202-70020 (09202-00010)

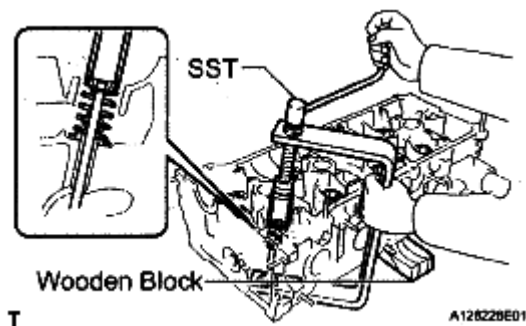


Fig. 174: Compressing Spring

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Using a 5 mm pin punch and plastic hammer, lightly tap the valve stem tip to ensure a proper fit.

NOTE: Be careful not to damage the valve stem tip.

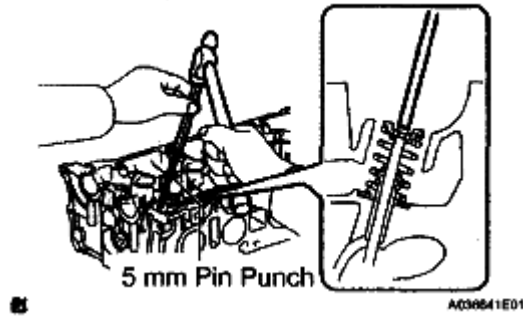


Fig. 175: Tapping Valve Stem Tip

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. INSTALL VALVE LIFTER

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

NOTE: Install the valve lifters in their original places.

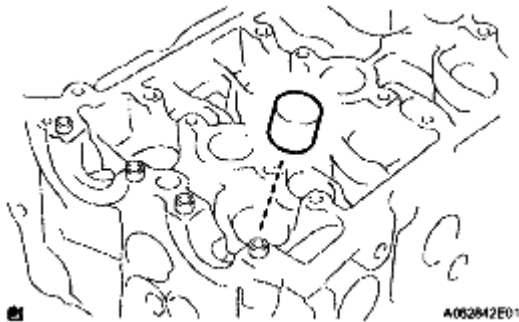


Fig. 176: Identifying Valve Lifter

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. INSTALL CYLINDER HEAD GASKET

- a. Place a new gasket on the cylinder block surface with the Lot No. stamp facing upward.

NOTE:

- Remove any oil from the contact surface.
- Make sure that the gasket is installed in the correct direction.

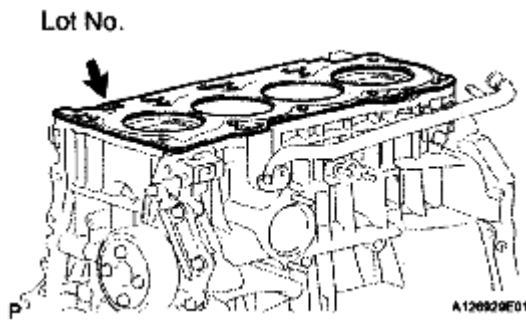


Fig. 177: Locating Cylinder Head Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL CYLINDER HEAD SUB-ASSEMBLY

HINT:

The cylinder head bolts are tightened in 2 progressive steps.

- Apply a light coat of engine oil to the bolt threads and the area beneath the bolt heads that come in contact with the washers.
- Install the bolts and plate washers to the cylinder head.

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

- Using several steps, uniformly install and tighten the 10 cylinder head set bolts and plate washers with a 10 mm bi-hexagon wrench in the order shown in the illustration.

Torque: 70 N*m (714 kgf*cm, 52 ft.*lbf)

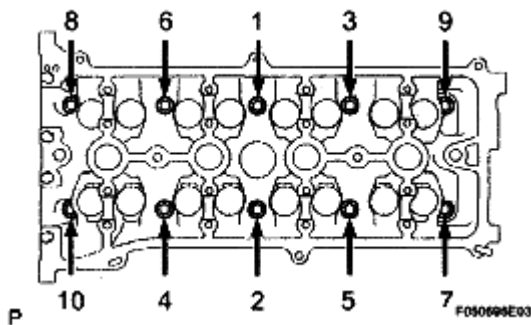


Fig. 178: Tightening Cylinder Head Set Bolts And Plate Washer In Several Steps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Mark the front side of the cylinder head bolt with paint.
- Retighten the cylinder head bolts 90° in the sequence shown in the illustration.

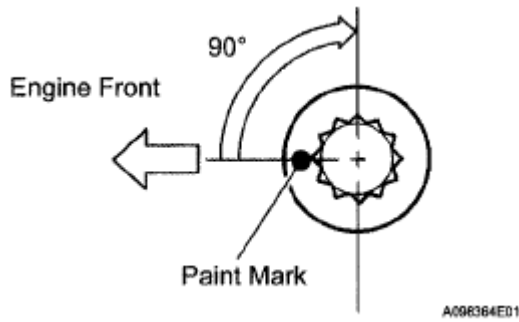


Fig. 179: Tightening Cylinder Head Bolts An Additional 90°
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Check that the paint mark is now at a 90° angle to the front.

3. CONNECT ENGINE WIRE

- a. Connect the ground cable with the bolt.

Torque: 8.4 N*m (86 kgf*cm, 74 in.*lbf)

- b. Connect the camshaft position sensor connector.
- c. Connect the engine coolant temperature sensor connector.
- d. Connect the engine oil pressure switch connector.
- e. Connect the radio setting condenser connector.

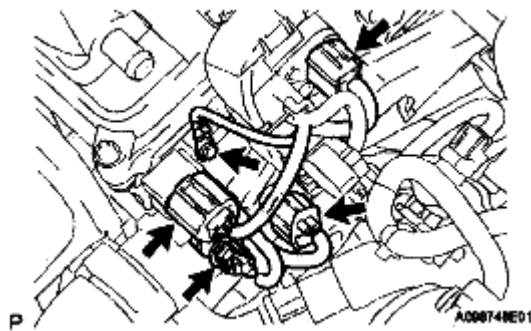


Fig. 180: Connecting Engine Wire
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. CONNECT RADIATOR HOSE INLET (See INSTALLATION)

5. INSTALL NO. 2 CAMSHAFT BEARING

- a. Install the No. 2 camshaft bearing.

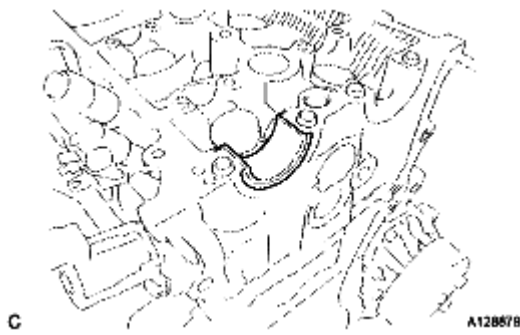


Fig. 181: Identifying Camshaft Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (See INSTALLATION)

7. INSTALL CAMSHAFTS

- a. Apply a light coat of engine oil to the journal portion of the camshaft.
- b. Place the 2 camshafts on the cylinder head with the No. 1 cam lobes facing the directions shown in the illustration.

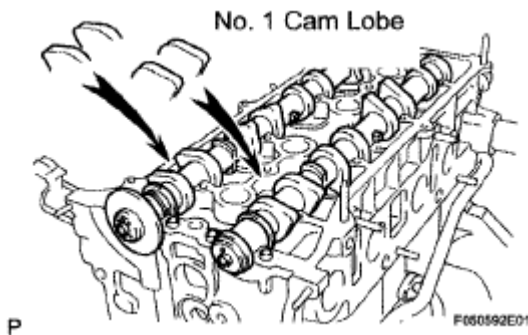


Fig. 182: Placing Camshafts On Cylinder Head With No. 1 Cam Lobes
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Examine the front marks and numbers, and check that the order is as shown in the illustration. Then install the bearing caps onto the cylinder head.
- d. Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.

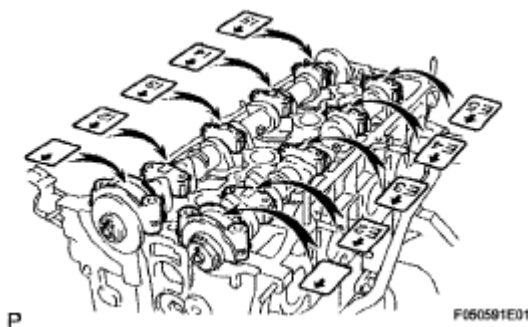


Fig. 183: Identifying Front Marks And Numbers Order
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Using several steps, uniformly tighten the 20 bearing cap bolts in the sequence shown in the illustration.

Torque:

No. 1 and No. 2 bearing cap

30 N*m (301 kgf*cm, 22 ft.*lbf)

No. 3 bearing cap

9.0 N*m (92 kgf*cm, 80 in.*lbf)

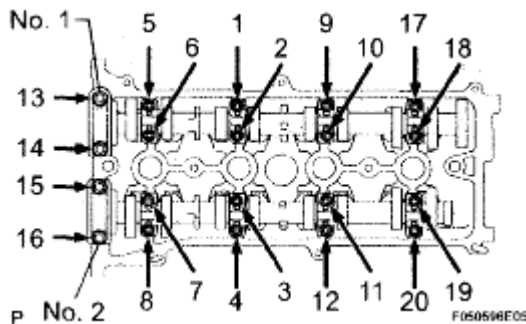


Fig. 184: Tightening Bearing Cap Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. INSTALL CHAIN SUB-ASSEMBLY

HINT:

See INSTALLATION.

9. INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY (See INSTALLATION)
10. INSTALL NO. 2 MANIFOLD STAY (See INSTALLATION)
11. INSTALL MANIFOLD STAY (See INSTALLATION)
12. INSTALL OIL LEVEL GAUGE GUIDE (See INSTALLATION)
13. INSTALL OIL LEVEL GAUGE SUB-ASSEMBLY
14. INSTALL GENERATOR ASSEMBLY (See INSTALLATION)
15. INSTALL V-RIBBED BELT (See INSTALLATION)
16. INSTALL NO. 2 ENGINE MOUNTING BRACKET RH (See INSTALLATION)
17. INSTALL ENGINE MOVING CONTROL ROD SUB-ASSEMBLY (See INSTALLATION)
18. INSTALL NO. 2 ENGINE MOUNTING STAY RH (See INSTALLATION)

19. INSTALL FRONT EXHAUST PIPE ASSEMBLY

HINT:

See INSTALLATION .

- 20. INSTALL NO. 1 INTAKE MANIFOLD INSULATOR (See INSTALLATION)**
- 21. INSTALL INTAKE AIR CONTROL VALVE (For PZEV) (See INSTALLATION)**
- 22. INSTALL INTAKE MANIFOLD (See INSTALLATION)**
- 23. INSTALL FUEL DELIVERY PIPE WITH INJECTOR (See INSTALLATION)**
- 24. CONNECT FUEL TUBE SUB-ASSEMBLY (See INSTALLATION)**
- 25. INSTALL THROTTLE BODY ASSEMBLY (See INSTALLATION)**
- 26. INSTALL BATTERY (See INSTALLATION)**
- 27. REMOVE AIR CLEANER CASE SUB-ASSEMBLY (See INSTALLATION)**
- 28. INSTALL AIR CLEANER CAP SUB-ASSEMBLY (See INSTALLATION)**
- 29. INSTALL AIR CLEANER INLET ASSEMBLY (See INSTALLATION)**
- 30. INSTALL COWL TOP PANEL OUTER SUB-ASSEMBLY (See INSTALLATION)**
- 31. INSTALL WINDSHIELD WIPER LINK ASSEMBLY**

HINT:

See INSTALLATION .

- 32. CONNECT CABLE FROM NEGATIVE BATTERY TERMINAL (See INSTALLATION)**
- 33. ADD ENGINE OIL**
- 34. CHECK FOR FUEL LEAKS (See ON-VEHICLE INSPECTION)**
- 35. ADD COOLANT (See ON-VEHICLE INSPECTION)**
- 36. CHECK FOR ENGINE COOLANT LEAKS (See ON-VEHICLE INSPECTION)**
- 37. CHECK FOR ENGINE OIL LEAKS**
- 38. CHECK FOR EXHAUST GAS LEAKS**
- 39. INSPECT IGNITION TIMING (See INSPECTION)**
- 40. INSPECT IDLE SPEED (See INSPECTION)**
- 41. INSPECT COMPRESSION (See INSPECTION)**
- 42. INSPECT CO/HC (See INSPECTION)**
- 43. INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY (See INSTALLATION)**
- 44. INSTALL FRONT FENDER APRON SEAL RH**
- 45. INSTALL ENGINE UNDER COVER LH**
- 46. INSTALL ENGINE UNDER COVER RH**
- 47. INSTALL FRONT WHEEL RH (See INSTALLATION)**

ENGINE FRONT OIL SEAL

COMPONENTS

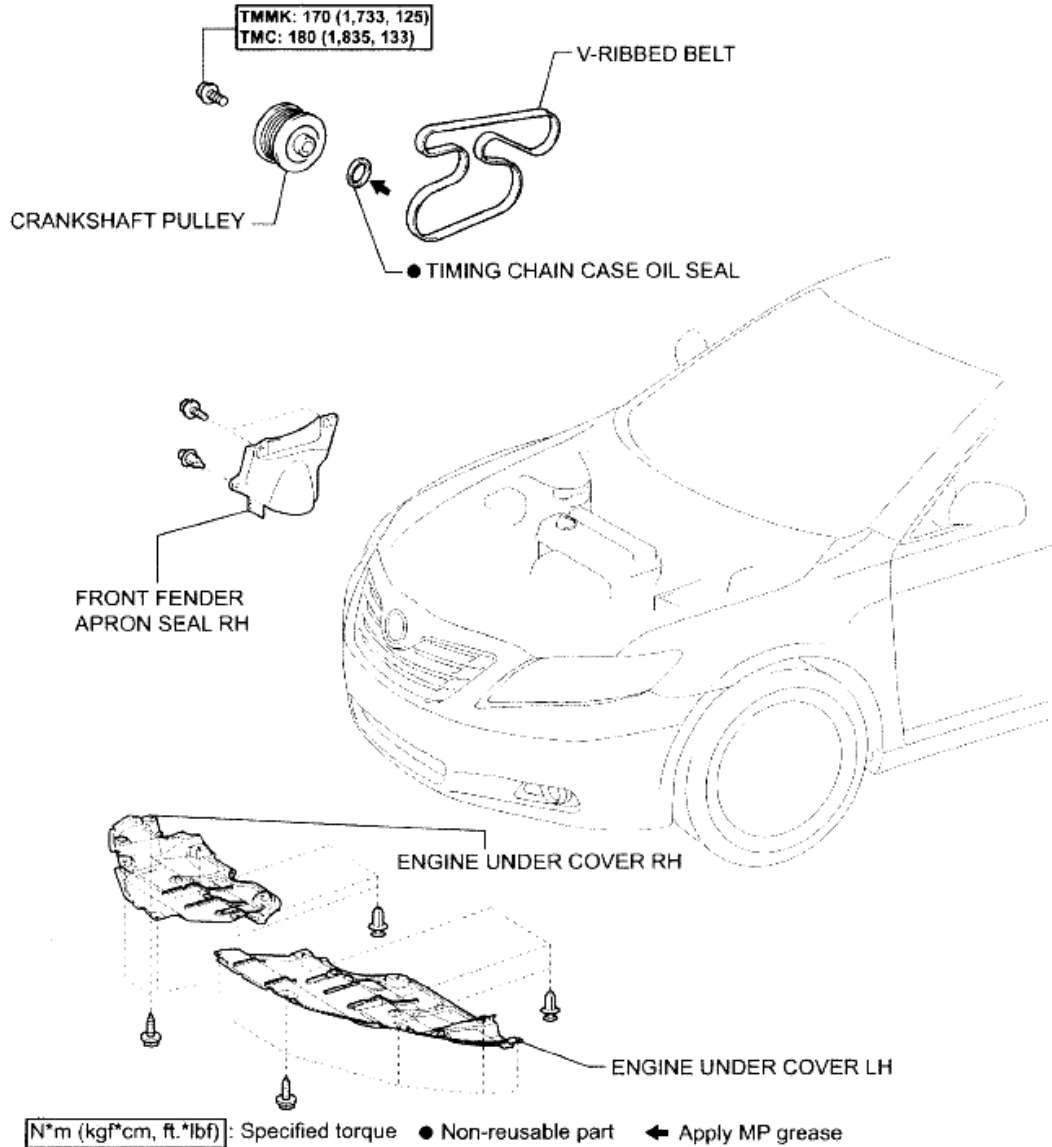


Fig. 185: Identifying Engine Front Oil Seal Components With Torque Specifications
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. REMOVE FRONT WHEEL RH
2. REMOVE FRONT FENDER APRON SEAL RH
3. REMOVE ENGINE UNDER COVER LH
4. REMOVE ENGINE UNDER COVER RH

5. REMOVE V-RIBBED BELT (See REMOVAL)**6. REMOVE CRANKSHAFT PULLEY****a. TMMK made:**

1. Using SST, fix the pulley in place and loosen the pulley bolt.

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

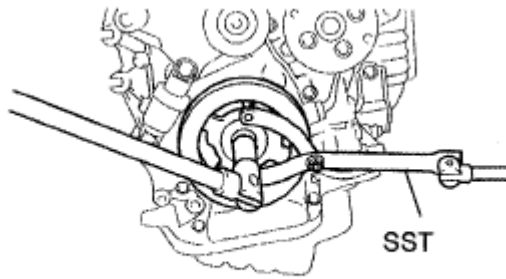


Fig. 186: Fixing Pulley And Loosening Bolt

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Using SST, remove the pulley bolt and pulley.

SST 09950-40011 (09951-04010, 09952-04010, 09953-04030, 09955-04041, 09957-04010, 09954-04010, 91111-51014)

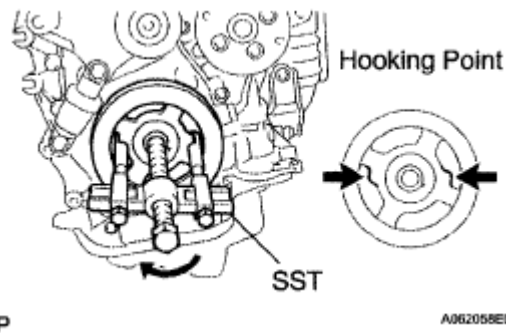


Fig. 187: Removing Pulley Bolt And Pulley

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. TMC made:

1. Using SST, fix the pulley in place and loosen the pulley bolt.

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

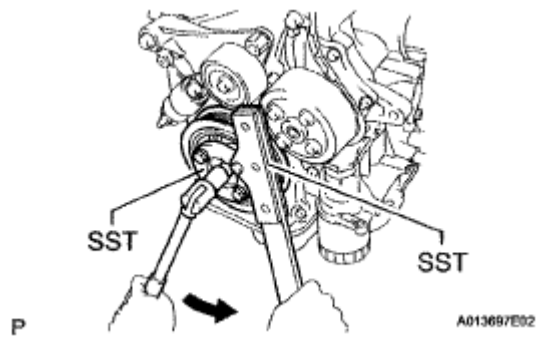


Fig. 188: Loosening Pulley Bolt

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Using SST, remove the pulley bolt and pulley.

SST 09950-50013 (09951 -05010, 09952-05010, 09953-05020, 09954-05021), 09950-40011 (09957-04010)

HINT:

If necessary, remove the pulley and pulley bolt using SST.

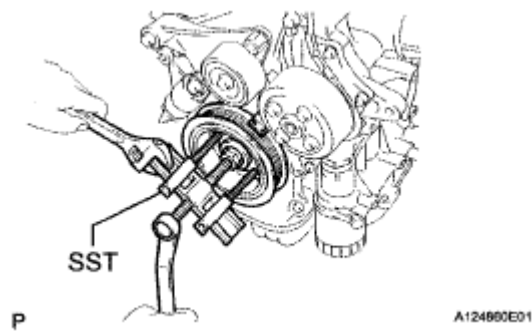


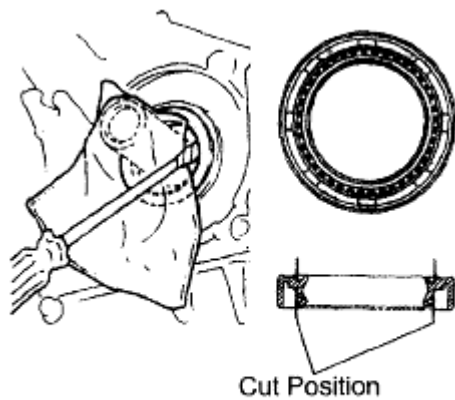
Fig. 189: Removing Pulley And Pulley Bolt

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. REMOVE TIMING CHAIN CASE OIL SEAL

- a. Using a knife, cut off the oil seal lip.
- b. Using a screwdriver with the tip taped, pry out the oil seal.

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



A112629E02

Fig. 190: Prying Out Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. INSTALL TIMING CHAIN CASE OIL SEAL

- Apply MP grease to a new oil seal lip.

NOTE: Keep the lip free from foreign matter.

- Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.

SST 09223-22010

NOTE: Wipe off extra grease from the crankshaft.

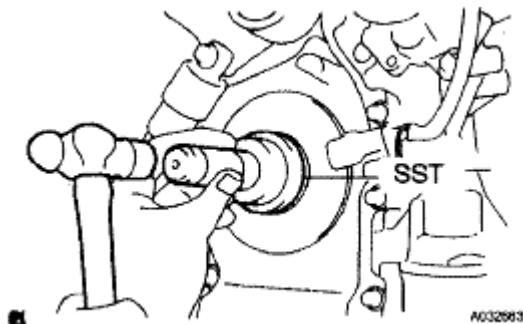


Fig. 191: Installing Timing Chain Case Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL CRANKSHAFT PULLEY

- TMMK made:

1. Align the pulley set key with the key groove of the pulley.
2. Using SST, fix the pulley in place and tighten the bolt.

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

Torque: 170 N*m (1,733 kgf*cm, 125 ft.*lbf)

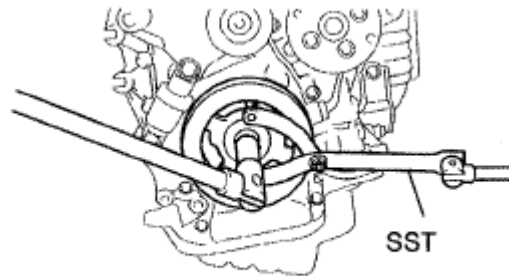


Fig. 192: Fixing Pulley And Tightening Bolt

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. TMC made:

1. Align the pulley set key with the key groove of the pulley.
2. Using SST, fix the pulley in place and tighten the bolt.

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

Torque: 180 N*m (1,835 kgf*cm, 133 ft.*lbf)

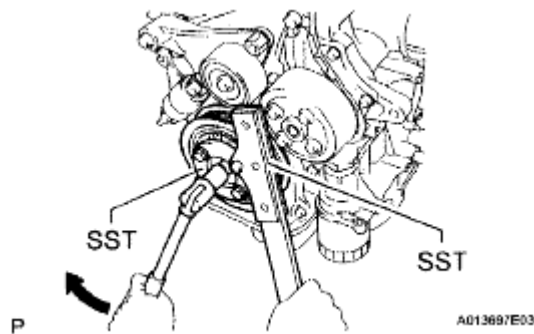


Fig. 193: Fixing Pulley And Tightening Bolt

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

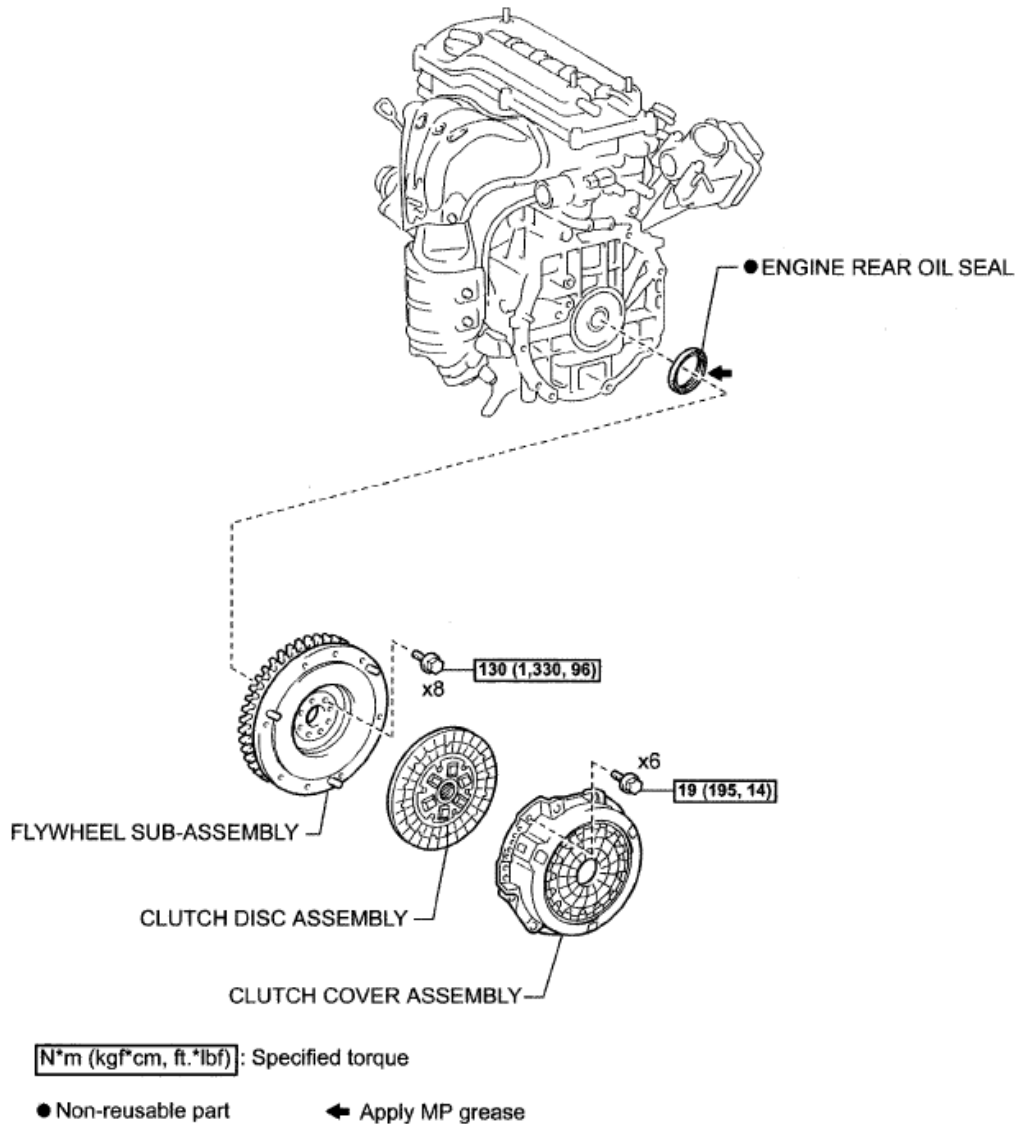
3. **INSTALL V-RIBBED BELT** (See **INSTALLATION**)
4. **INSTALL ENGINE UNDER COVER LH**
5. **INSTALL ENGINE UNDER COVER RH**
6. **INSTALL FRONT FENDER APRON SEAL RH**

7. INSTALL FRONT WHEEL RH
8. CHECK FOR ENGINE OIL LEAKS

ENGINE REAR OIL SEAL

COMPONENTS

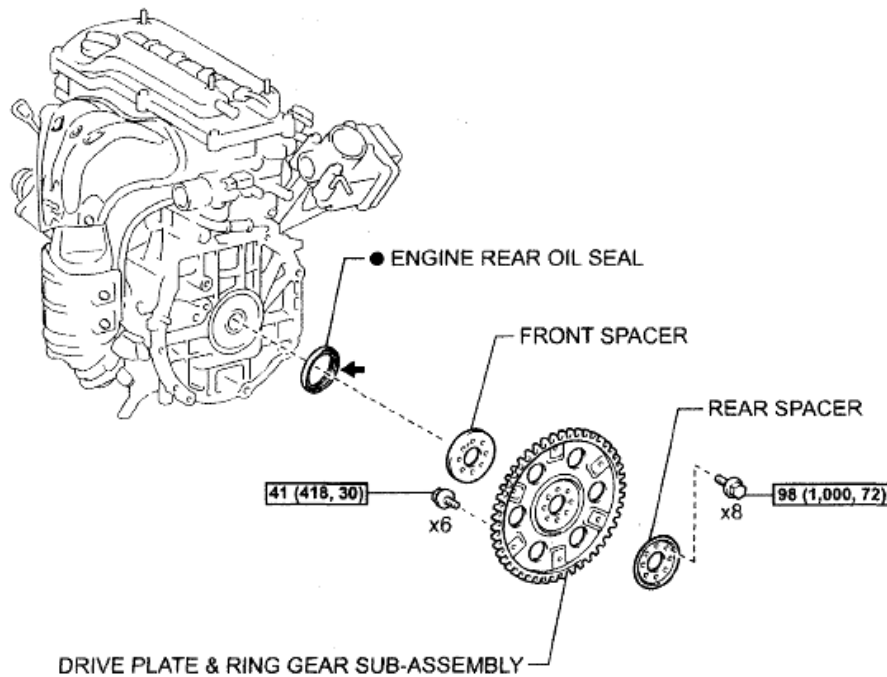
M/T:



A136909E01

Fig. 194: Identifying Engine Rear Oil Seal Components With Torque Specifications (1 Of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

A/T:



A136910E01

Fig. 195: Identifying Engine Rear Oil Seal Components With Torque Specifications (2 Of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. SEPARATE AUTOMATIC TRANSAXLE ASSEMBLY (for Automatic Transaxle)

HINT:

See **REMOVAL**

2. SEPARATE MANUAL TRANSAXLE ASSEMBLY (for Manual Transaxle)

HINT:

See **REMOVAL** .

3. REMOVE DRIVE PLATE & RING GEAR SUB-ASSEMBLY (for Automatic Transaxle)

a. TMMK made:

1. Using SST, hold the crankshaft.

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

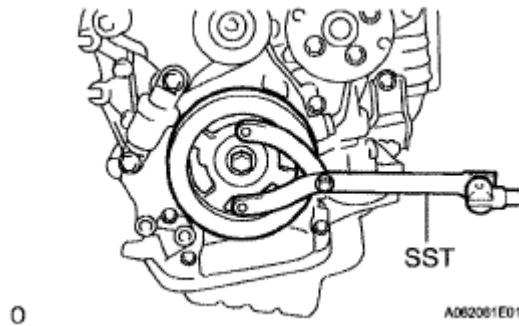


Fig. 196: Holding Crankshaft (TMMK)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. TMC made:

1. Using SST, hold the crankshaft.

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

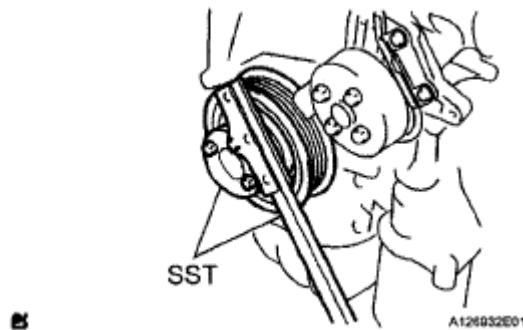


Fig. 197: Holding Crankshaft (TMC)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Remove the 8 bolts, rear spacer, drive plate and front spacer.

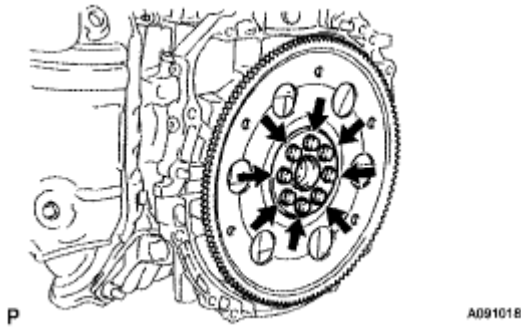


Fig. 198: Locating Drive Plate Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **REMOVE CLUTCH COVER ASSEMBLY** (for Manual Transaxle) (See DISASSEMBLY)
5. **REMOVE CLUTCH DISC ASSEMBLY** (for Manual Transaxle) (See DISASSEMBLY)
6. **REMOVE FLYWHEEL SUB-ASSEMBLY** (for Manual Transaxle)
 - a. TMMK made:
 1. Using SST, hold the crankshaft.

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

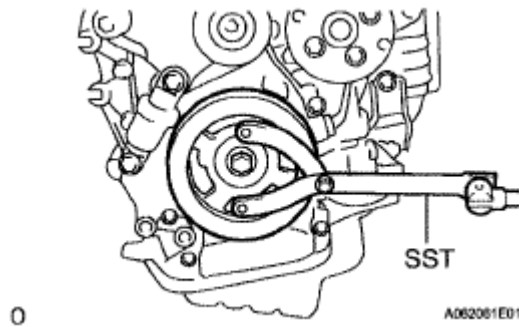


Fig. 199: Holding Crankshaft (TMMK)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. TMC made:
 1. Using SST, hold the crankshaft.

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

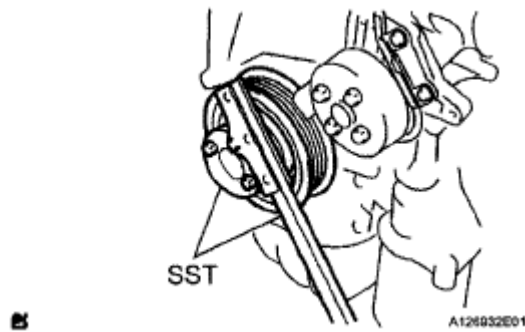


Fig. 200: Holding Crankshaft (TMC)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the 8 bolts and flywheel.

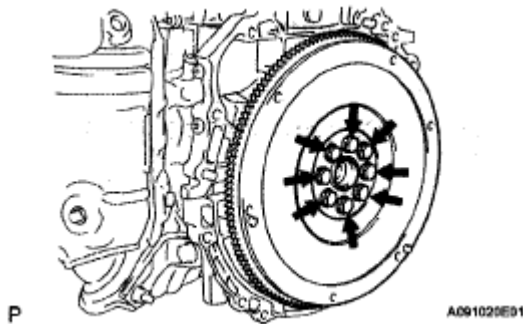


Fig. 201: Locating Flywheel With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. REMOVE ENGINE REAR OIL SEAL

- a. Using a knife, cut through the oil seal lip.
- b. Using a screwdriver with its tip taped, pry out the oil seal.

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

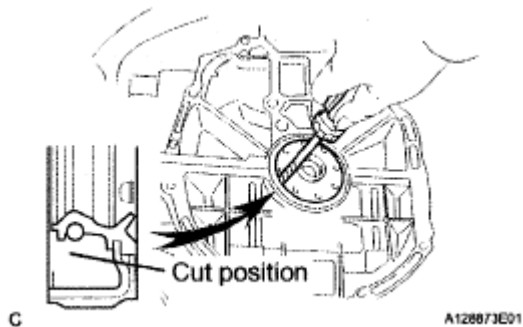


Fig. 202: Removing Engine Rear Oil Seal

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. INSTALL ENGINE REAR OIL SEAL

- a. Apply MP grease to a new oil seal lip.

NOTE: Keep the lip free from foreign matter.

- b. Using SST and a hammer tap in the oil seal until its Surface is flush with the rear oil seal retainer edge.

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

NOTE: Wipe off extra grease from the crankshaft.

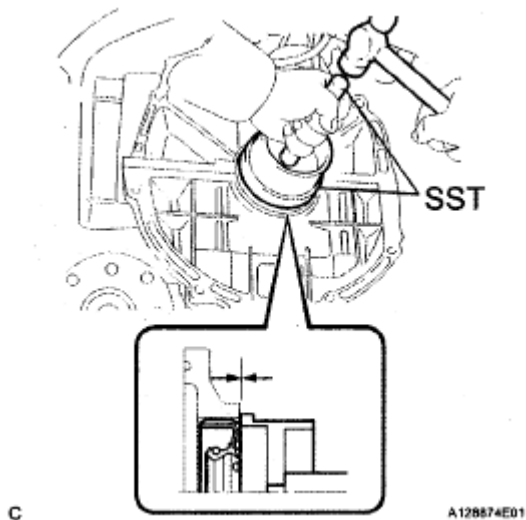


Fig. 203: Installing Engine Rear Oil Seal

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL FLYWHEEL SUB-ASSEMBLY (for Manual Transaxle)

- a. TMMK made:
 1. Using SST, hold the crankshaft.

SST 09960-10010 ({19962411000, 09963-01000)

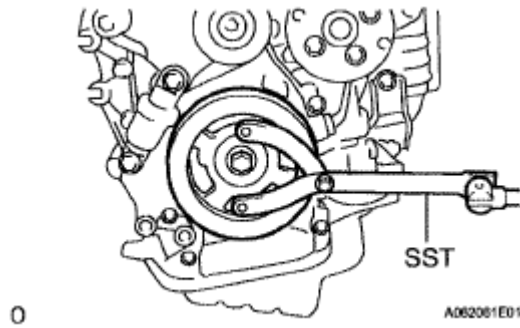


Fig. 204: Holding Crankshaft (TMMK)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. TMC made:
1. Using SST, hold the crankshaft.

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

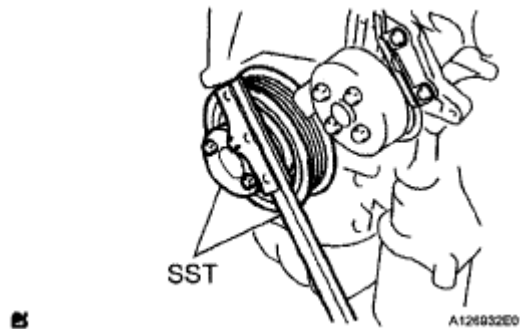


Fig. 205: Holding Crankshaft (TMC)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Clean the bolt and the bolt hole.
- d. Apply adhesive to 2 or 3 threads of the bolt end.

Adhesive:

Part No. 08833-00070, THREE BOND or equivalent

- e. Install the flywheel with the 8 bolts. Uniformly tighten the 8 bolts in the sequence shown in the illustration.

Torque: 130 N*m (1,330 kgf*cm, 96 ft.*lbf)

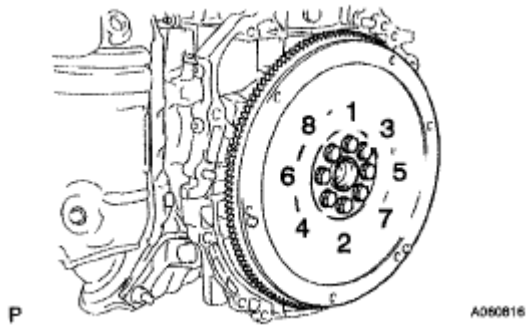


Fig. 206: Tightening Flywheel Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **INSTALL CLUTCH DISC ASSEMBLY (for Manual Transaxle) (See REASSEMBLY)**
4. **INSTALL CLUTCH COVER ASSEMBLY (for Manual Transaxle) (See REASSEMBLY)**
5. **INSTALL DRIVE PLATE & RING GEAR SUB-ASSEMBLY (for Automatic Transaxle)**
 - a. TMMK made:
 1. Using SST, hold the crankshaft.

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

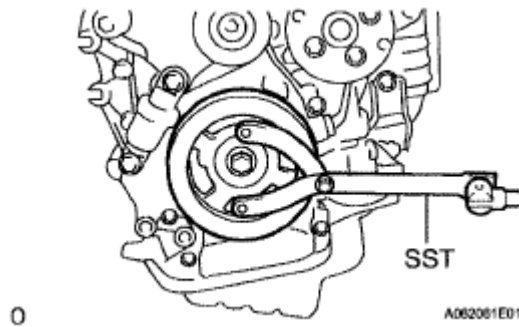


Fig. 207: Holding Crankshaft (TMMK)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. TMC made:
 1. Using SST, hold the crankshaft.

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

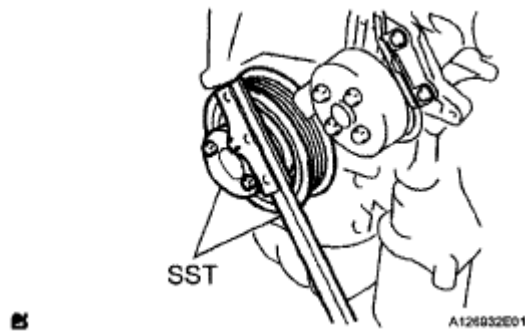


Fig. 208: Holding Crankshaft (TMC)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Clean the bolt and the bolt hole.
- d. Apply adhesive to 2 or 3 threads of the bolt end.

Adhesive:

Part No. 08833-00070, THREE BOND or equivalent

- e. Install the front spacer, drive plate and rear spacer with the 8 bolts. Uniformly tighten the 8 bolts in the sequence shown in the illustration.

Torque: 98 N*m (1,000 kgf*cm, 72 ft.*lbf)

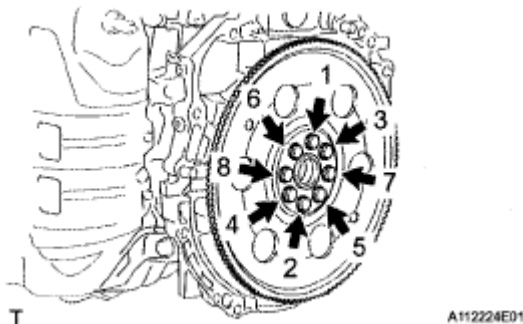


Fig. 209: Tightening Drive Plate And Rear Spacer Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSTALL MANUAL TRANSAXLE ASSEMBLY (for Manual Transaxle)

HINT:

See INSTALLATION .

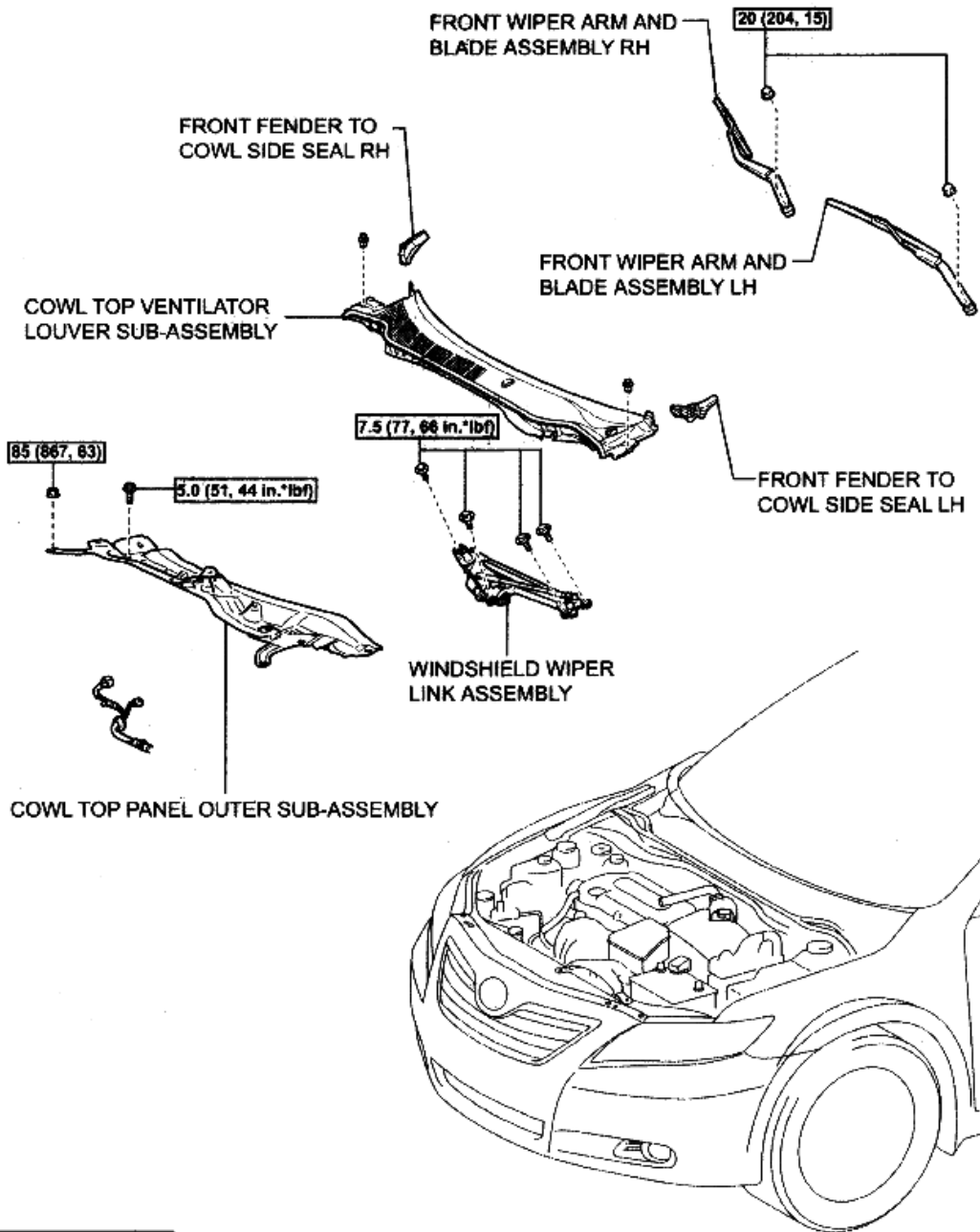
7. INSTALL AUTOMATIC TRANSAXLE ASSEMBLY (for Automatic Transaxle)

HINT:

See INSTALLATION.

ENGINE ASSEMBLY

COMPONENTS



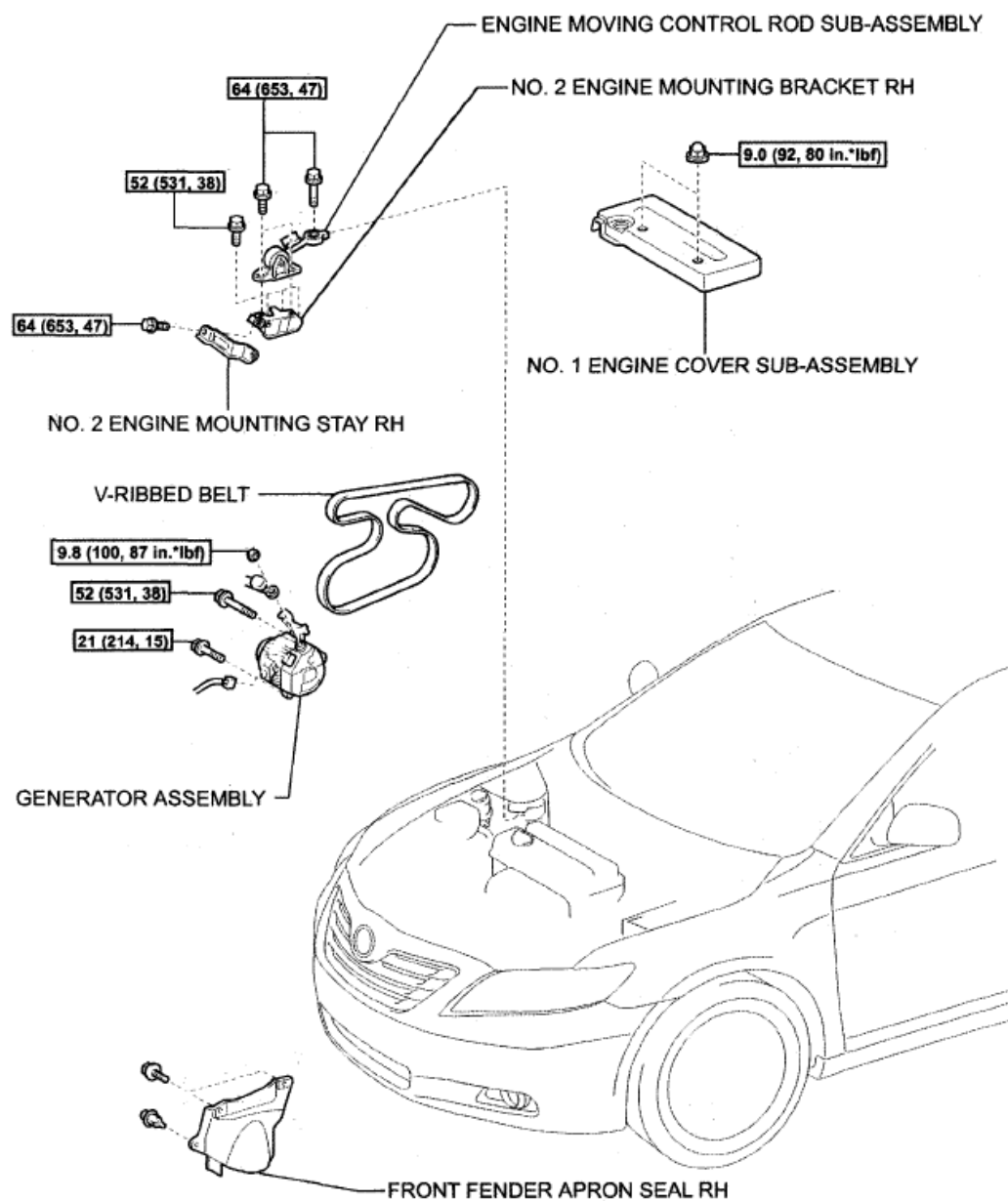
N*m (kgf*cm, ft.*lbf): Specified torque

A130812E01

Fig. 210: Identifying Engine Assembly Components With Torque Specifications (1 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2008 Toyota Camry LE

2008 ENGINE Engine Mechanical (2AZ-FE) - Camry



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

C

A134940E01

Fig. 211: Identifying Engine Assembly Components With Torque Specifications (2 Of 11)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2008 Toyota Camry LE

2008 ENGINE Engine Mechanical (2AZ-FE) - Camry

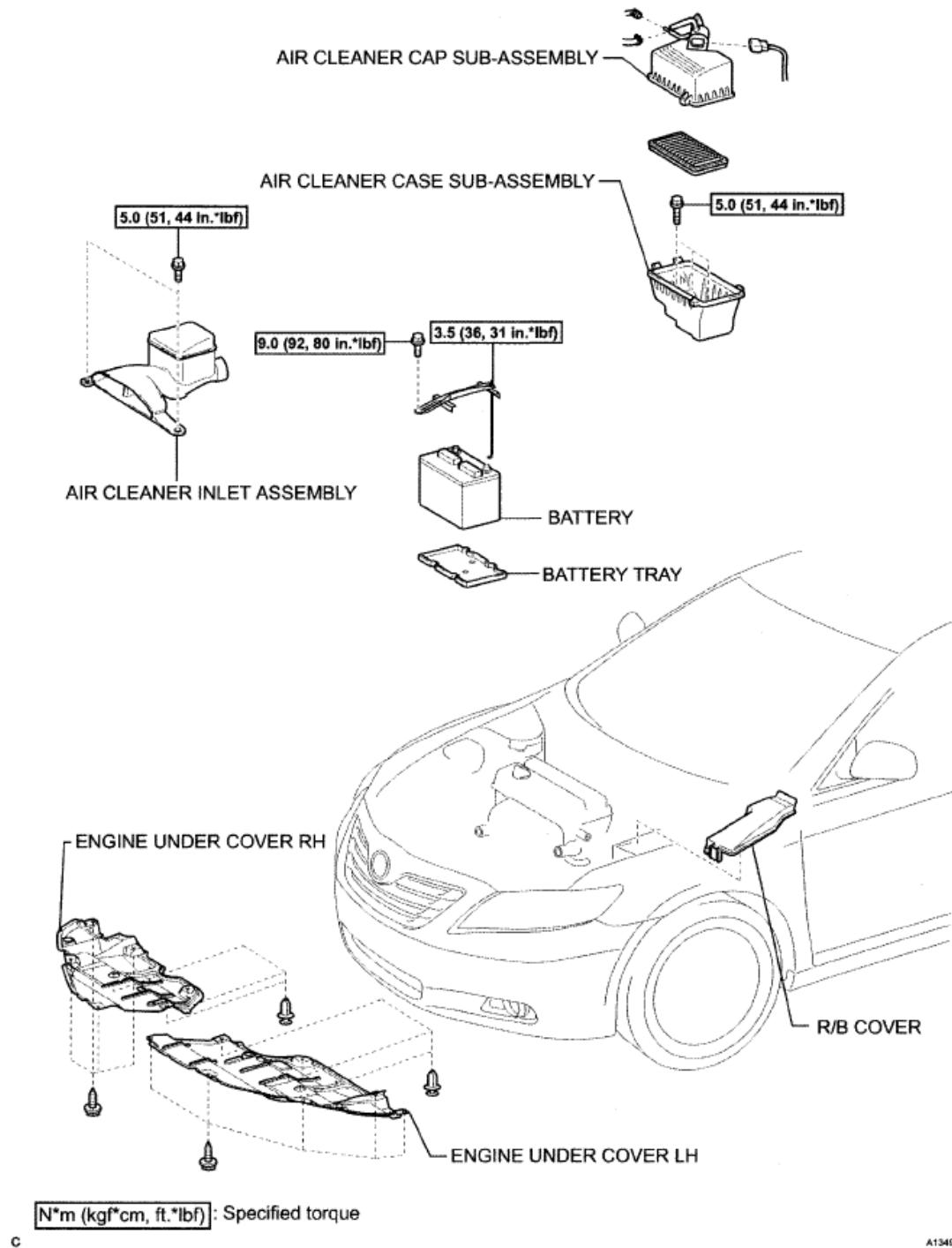
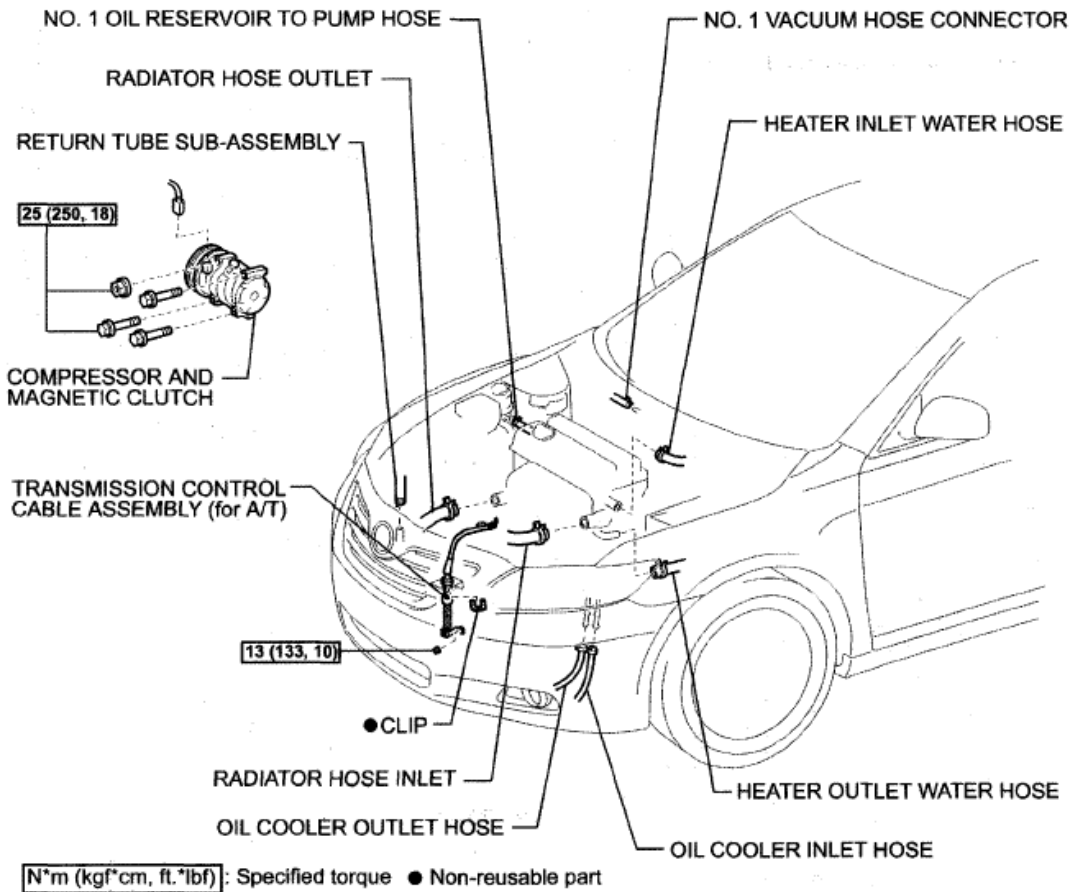
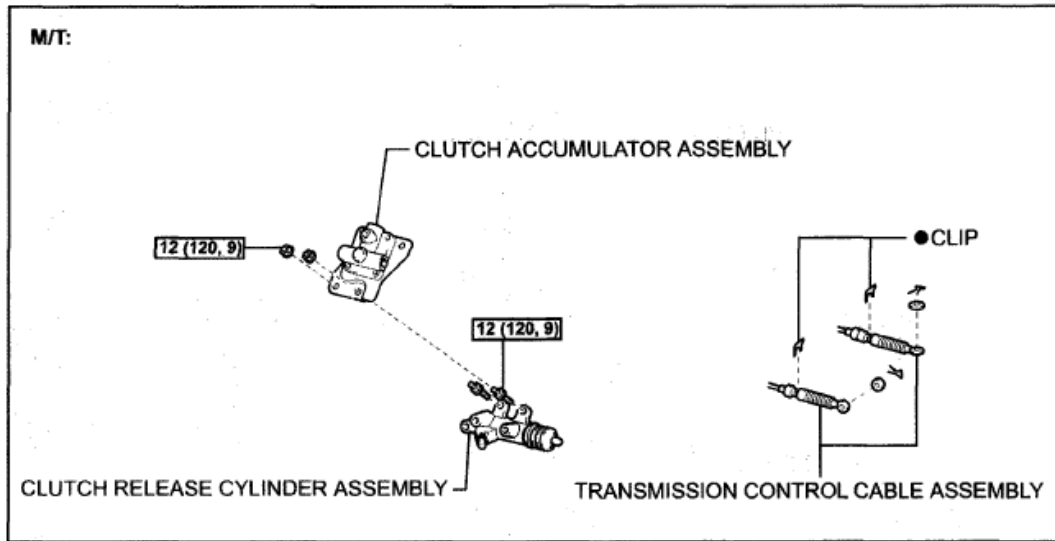


Fig. 212: Identifying Engine Assembly Components With Torque Specifications (3 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2008 Toyota Camry LE

2008 ENGINE Engine Mechanical (2AZ-FE) - Camry



A134910E01

Fig. 213: Identifying Engine Assembly Components With Torque Specifications (4 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

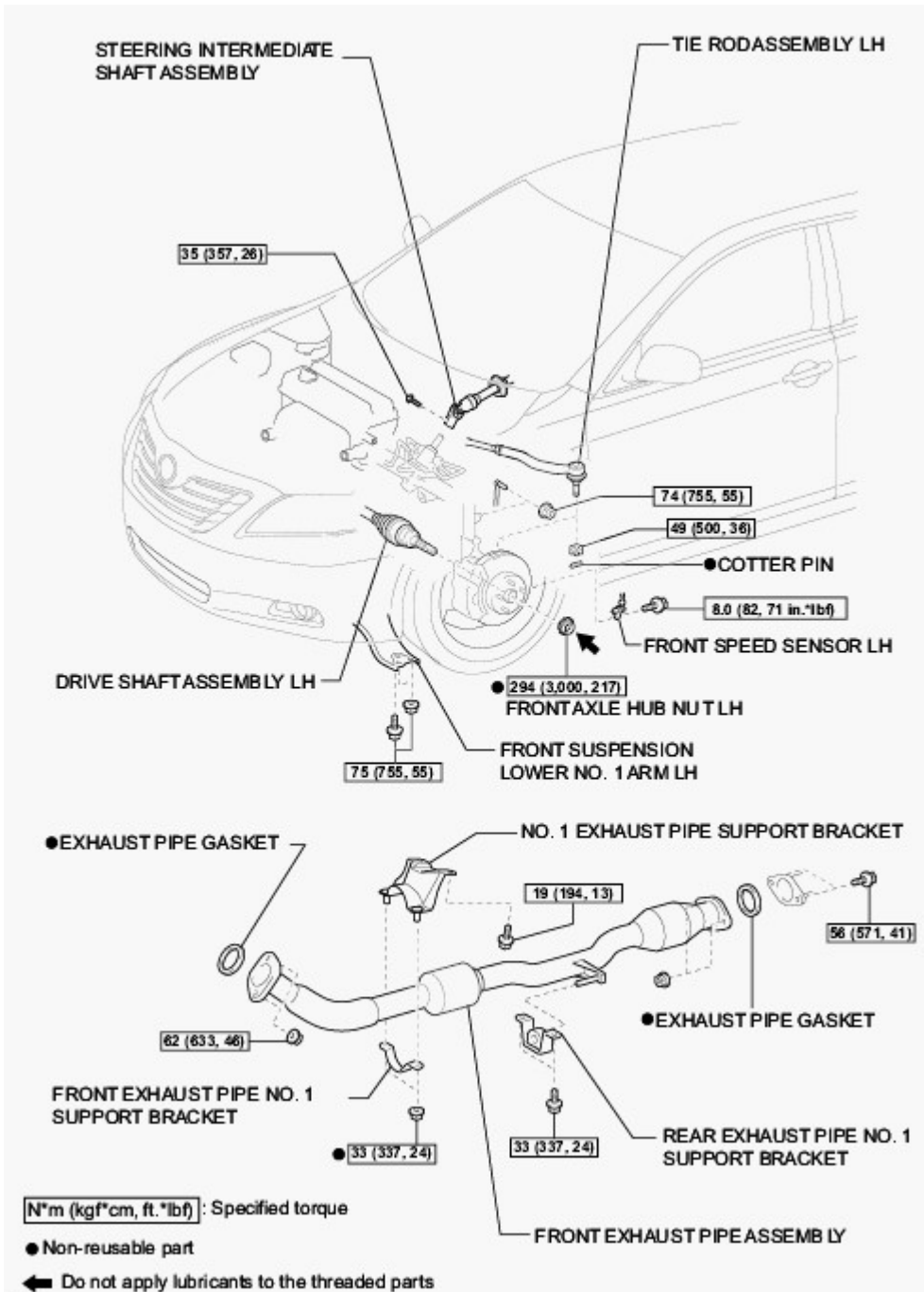


Fig. 214: Identifying Engine Assembly Components With Torque Specifications (5 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

A/T:

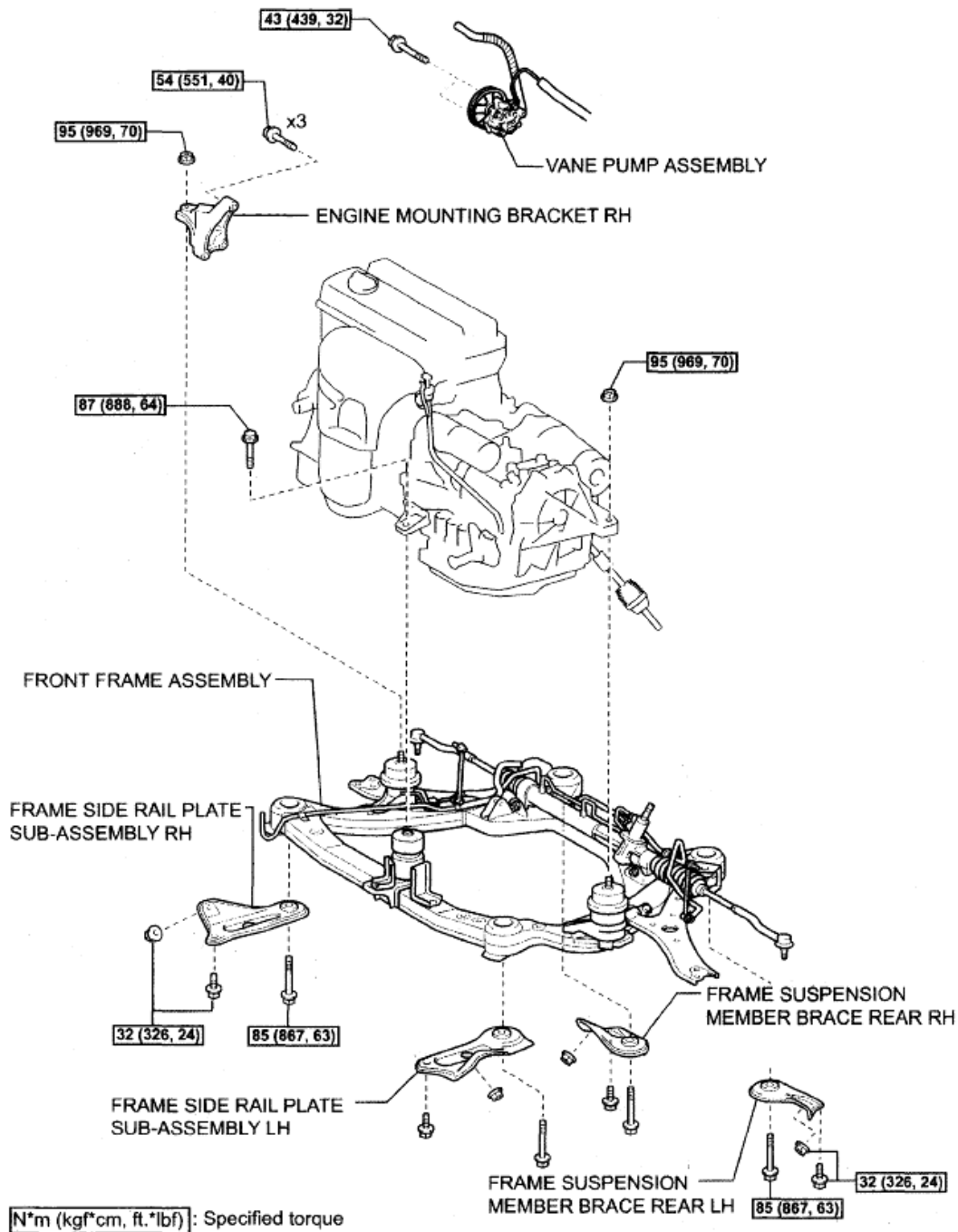


Fig. 215: Identifying Engine Assembly Components With Torque Specifications (6 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

M/T:

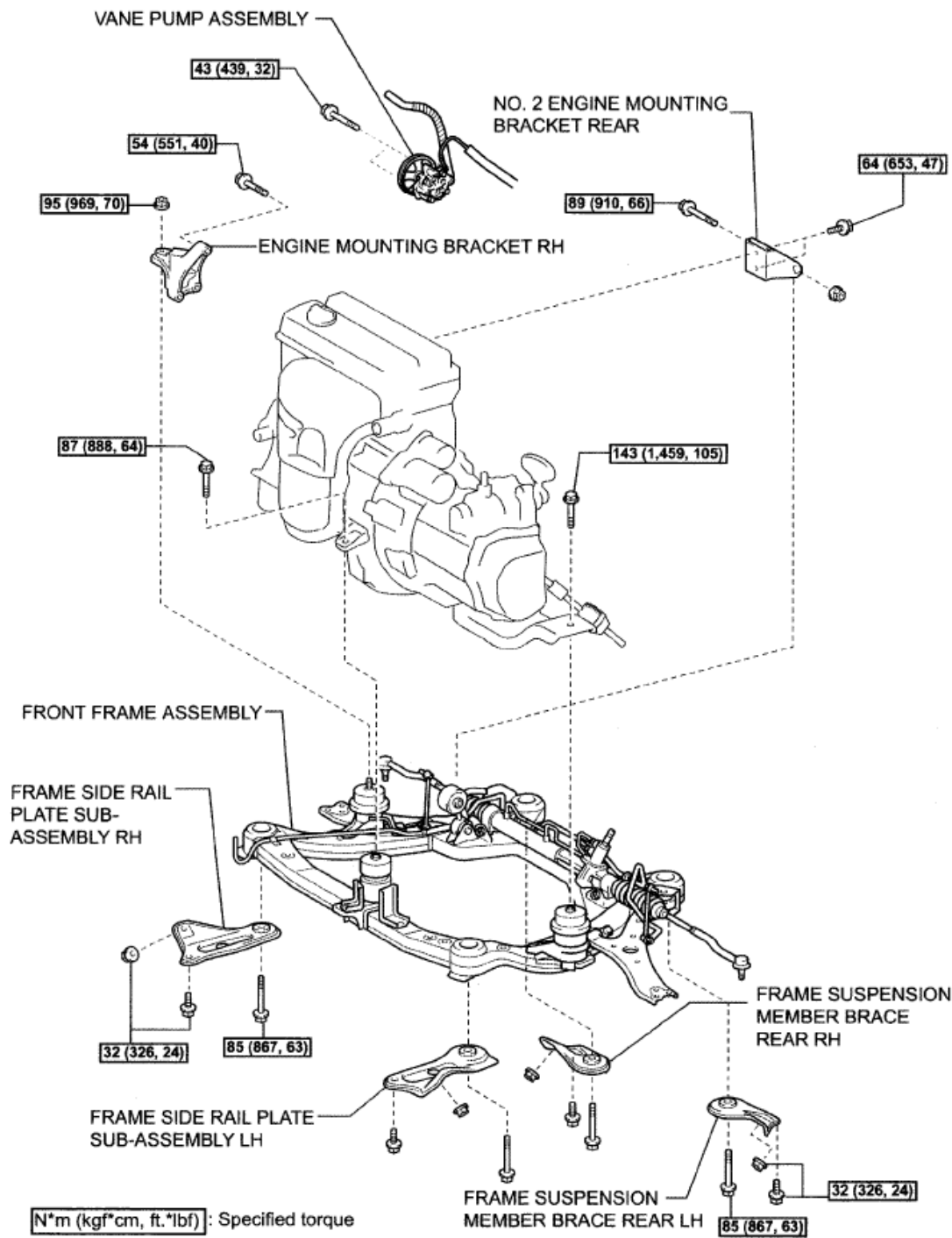


Fig. 216: Identifying Engine Assembly Components With Torque Specifications (7 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

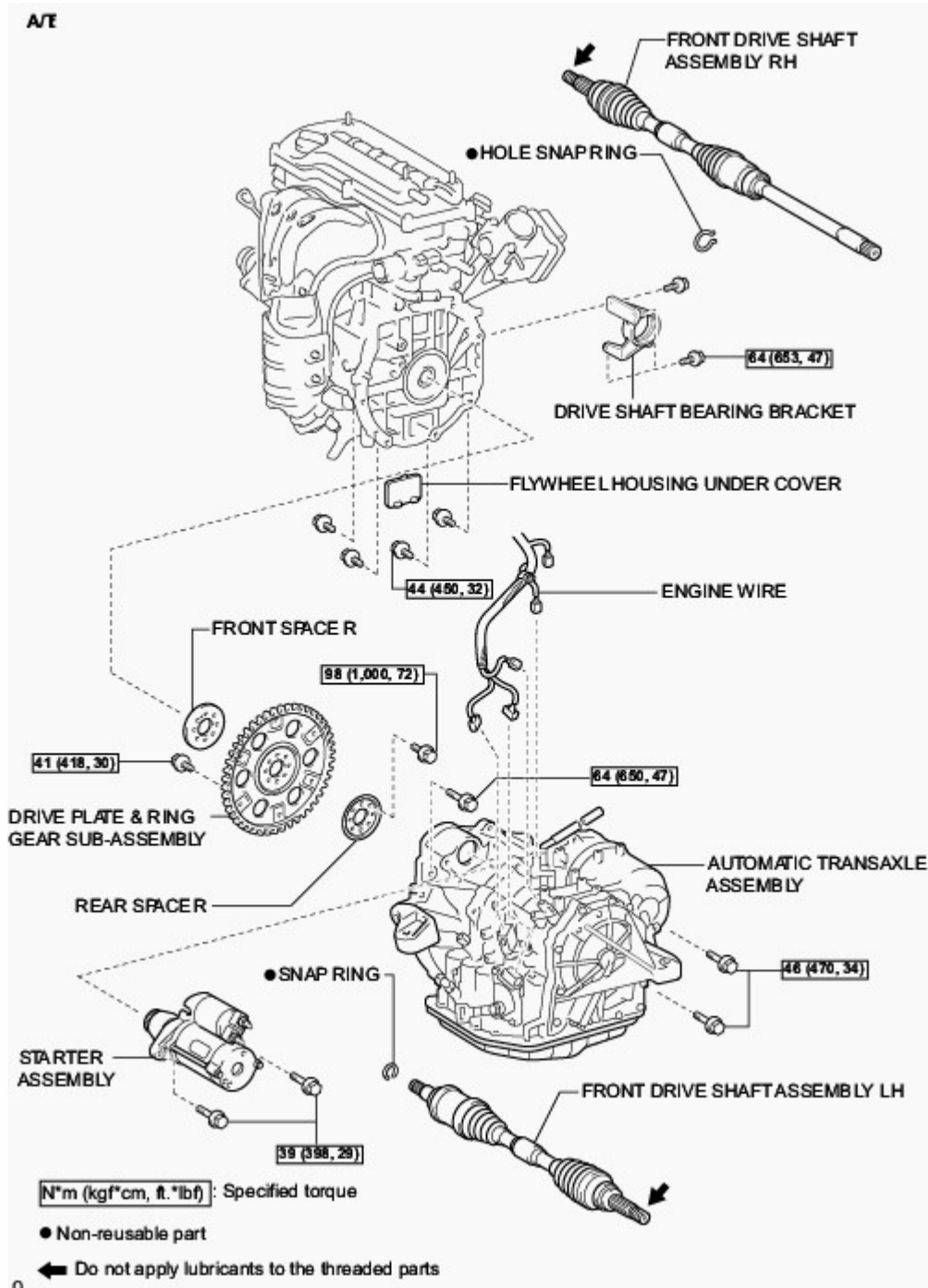


Fig. 217: Identifying Engine Assembly Components With Torque Specifications (8 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

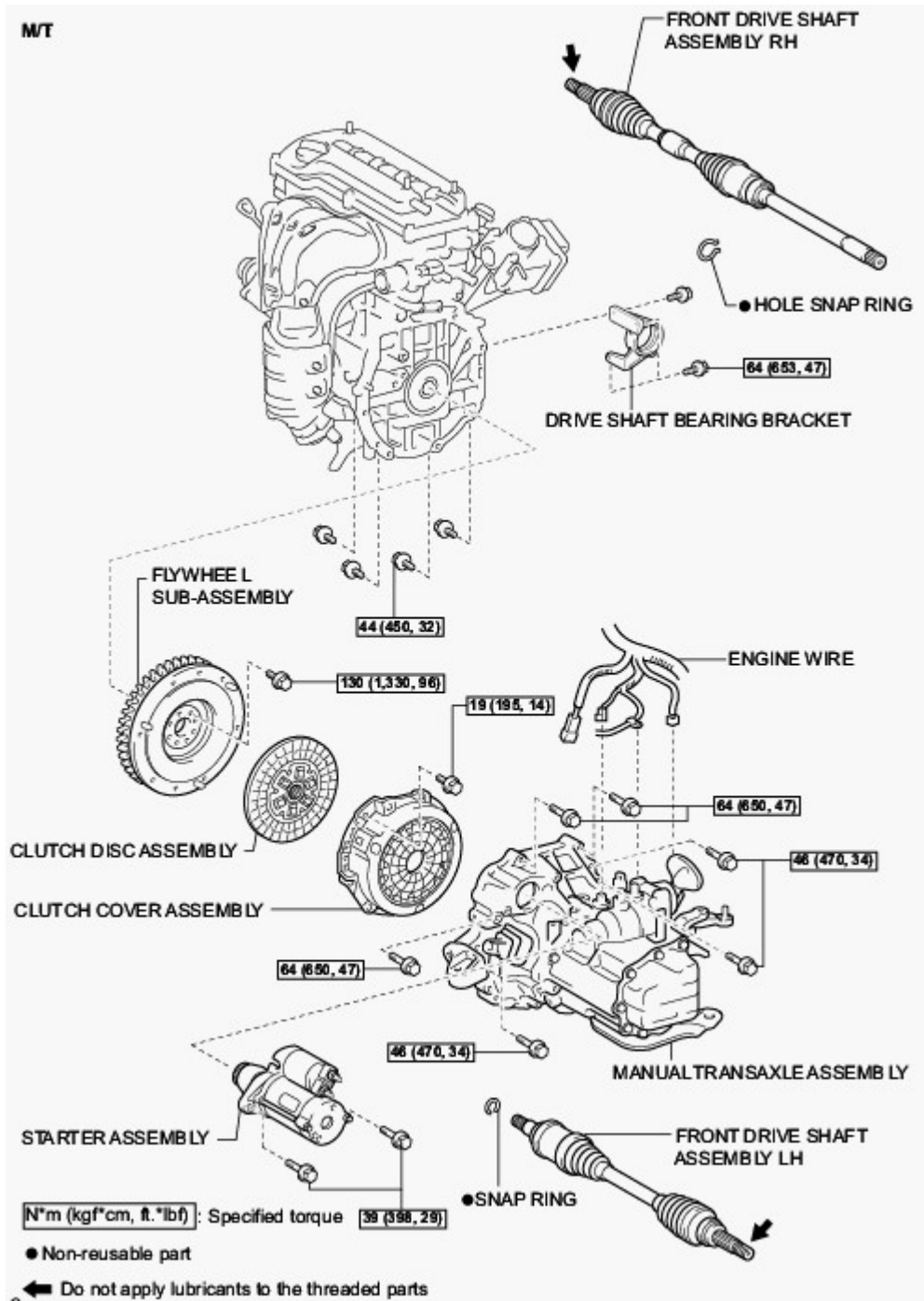


Fig. 218: Identifying Engine Assembly Components With Torque Specifications (9 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2008 Toyota Camry LE

2008 ENGINE Engine Mechanical (2AZ-FE) - Camry

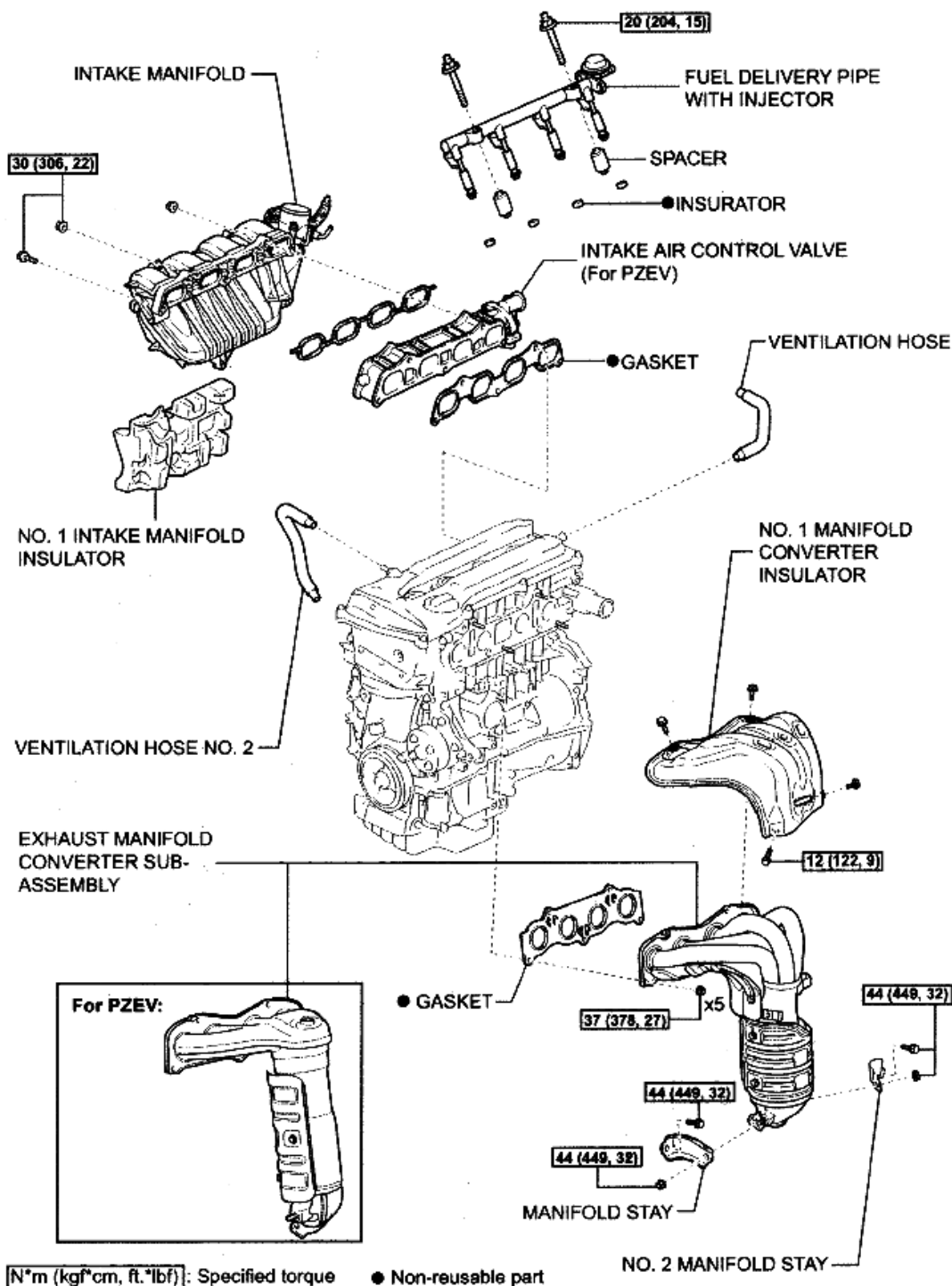


Fig. 219: Identifying Engine Assembly Components With Torque Specifications (10 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

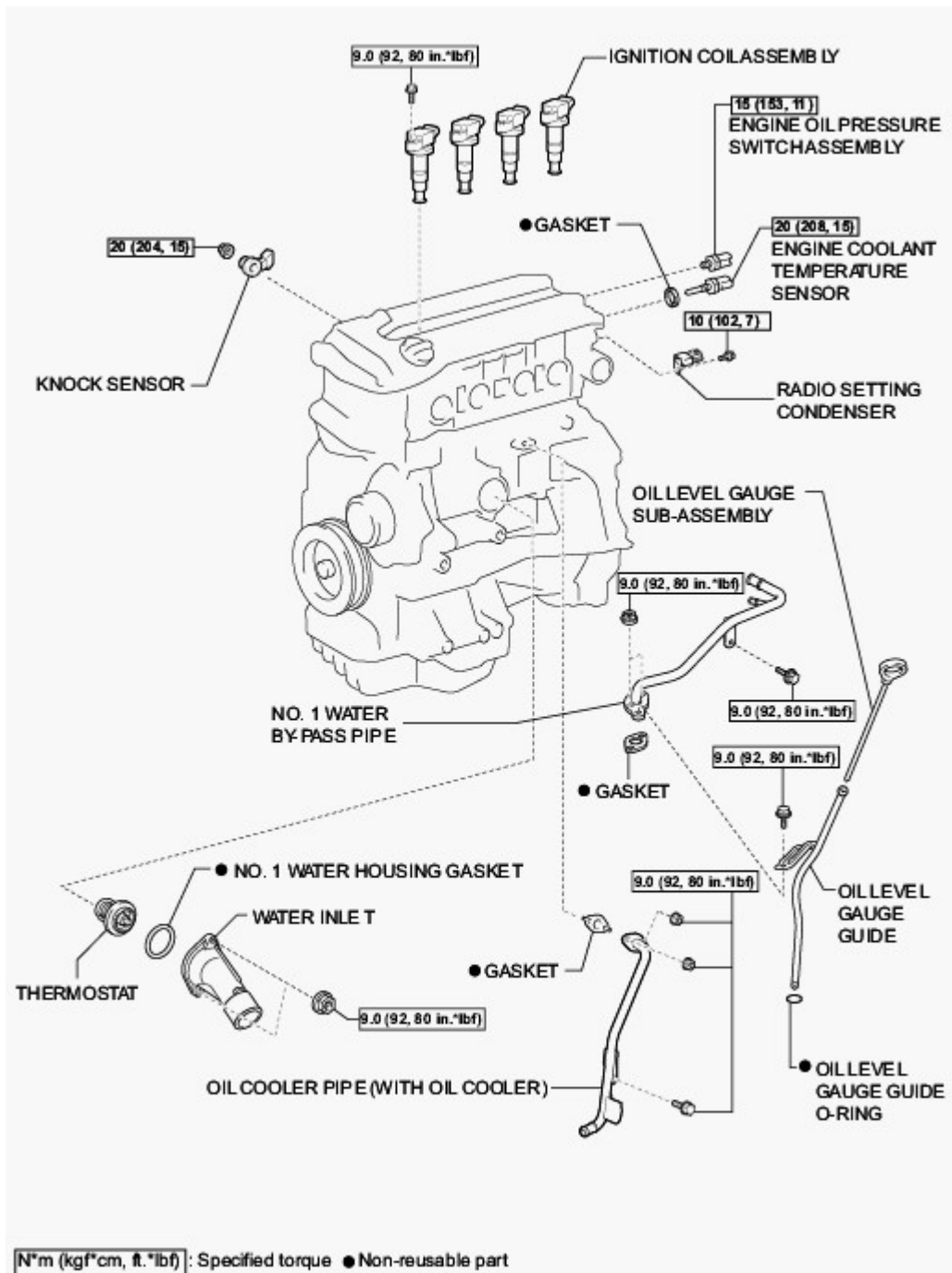


Fig. 220: Identifying Engine Assembly Components With Torque Specifications (11 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. DISCHARGE FUEL SYSTEM PRESSURE

HINT:

See **PRECAUTION** .

2. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
3. **PLACE FRONT WHEELS FACING STRAIGHT AHEAD**
4. **REMOVE FRONT WHEELS**
5. **REMOVE ENGINE UNDER COVER LH**
6. **REMOVE ENGINE UNDER COVER RH**
7. **REMOVE FRONT FENDER APRON SEAL RH**
8. **DRAIN ENGINE OIL** (See **REPLACEMENT**)
9. **DRAIN ENGINE COOLANT** (See **ON-VEHICLE INSPECTION**)
10. **DRAIN AUTOMATIC TRANSAXLE FLUID** (for Automatic Transaxle) (See **REMOVAL**)
11. **DRAIN MANUAL TRANSAXLE OIL** (for Manual Transaxle) (See **REMOVAL**)
12. **DRAIN BRAKE FLUID** (for Manual Transaxle) (See **REMOVAL**)
13. **REMOVE WINDSHIELD WIPER LINK ASSEMBLY**

HINT:

See **REMOVAL** .

14. **REMOVE COWL TOP PANEL OUTER SUB-ASSEMBLY** (See **REMOVAL**)
15. **REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY**
 - a. Remove the 2 nuts and cover.

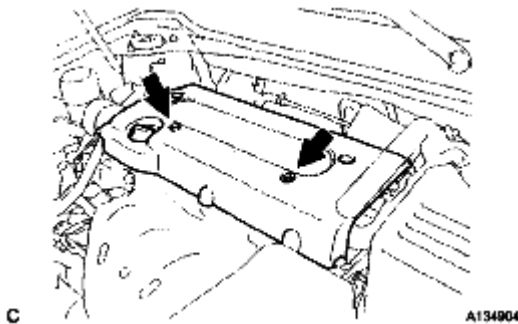


Fig. 221: Locating Engine Cover Sub-Assembly And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

16. **REMOVE V-RIBBED BELT** (See **REMOVAL**)
17. **REMOVE AIR CLEANER INLET ASSEMBLY**
 - a. Remove the 2 bolts, clamp and air cleaner inlet.

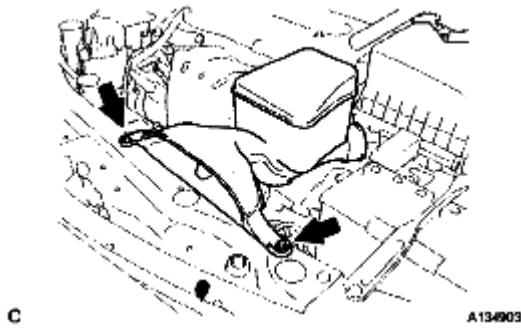


Fig. 222: Locating Clamp And Air Cleaner Inlet Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. **REMOVE AIR CLEANER CAP SUB-ASSEMBLY** (See **REMOVAL**)
19. **REMOVE AIR CLEANER CASE SUB-ASSEMBLY**
 - a. Disconnect the hose clamp.
 - b. Remove the 3 bolts and air cleaner case.

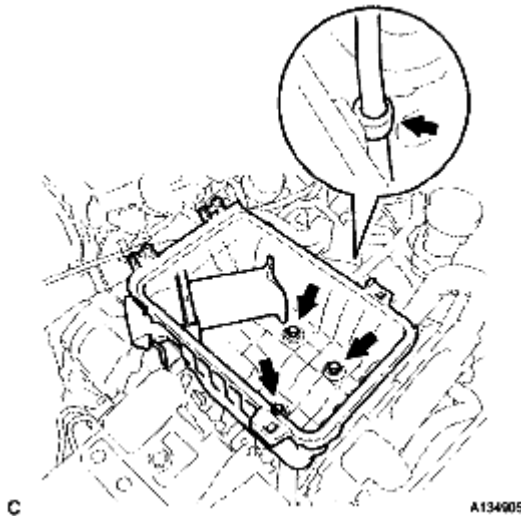


Fig. 223: Locating Air Cleaner Case And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

20. **REMOVE BATTERY**
 - a. Loosen the bolt and nut, and remove the battery clamp.
 - b. Remove the battery and battery tray.

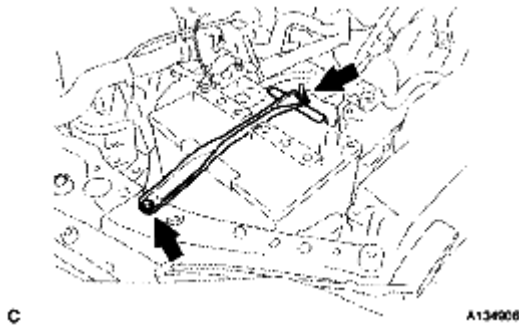


Fig. 224: Locating Battery Clamp Bolt And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

21. REMOVE NO. 2 ENGINE MOUNTING STAY RH

- a. Remove the 2 bolts and No. 2 mounting stay RH.

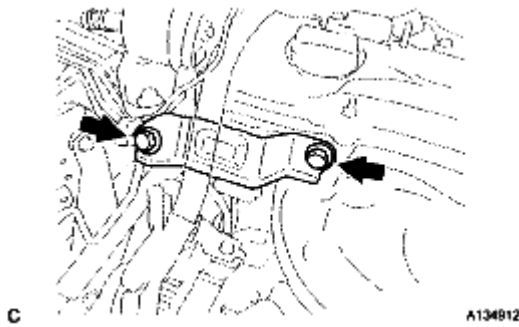


Fig. 225: Locating Mounting Stay And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

22. REMOVE ENGINE MOVING CONTROL ROD SUB-ASSEMBLY

- a. Remove the bolt and disconnect the ground cable.

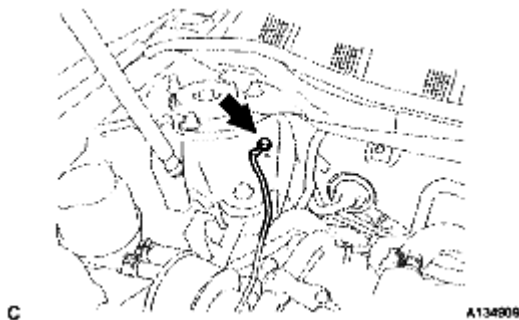


Fig. 226: Locating Ground Cable Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 3 bolts and the engine moving control rod with bracket.

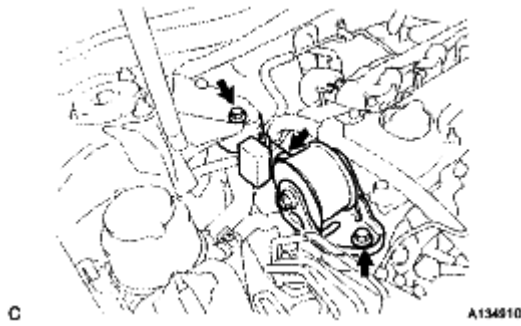


Fig. 227: Locating Engine Moving Control Rod, Bracket And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

23. REMOVE NO. 2 ENGINE MOUNTING BRACKET RH

- a. Remove the 3 bolts and No. 2 mounting bracket RH.

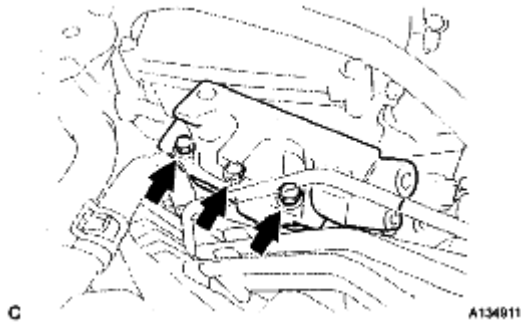


Fig. 228: Locating Mounting Bracket And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

24. DISCONNECT NO. 1 VACUUM HOSE CONNECTOR

- a. Remove the clamp and disconnect the vacuum hose connector.

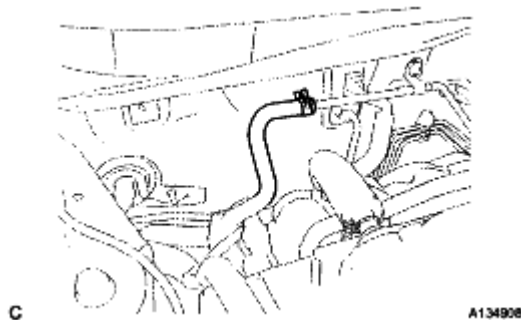


Fig. 229: Identifying Vacuum Hose Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

25. DISCONNECT RADIATOR HOSE INLET

- a. Remove the clamp and disconnect the radiator hose inlet.

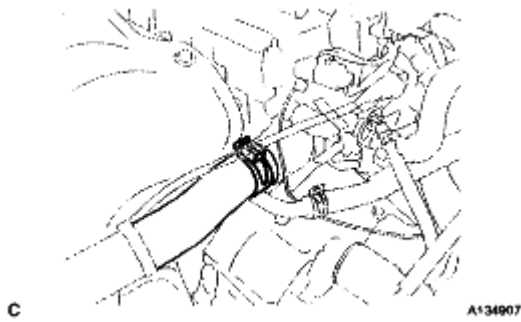


Fig. 230: Identifying Radiator Hose Inlet And Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

26. DISCONNECT RADIATOR HOSE OUTLET

- a. Remove the clamp and disconnect the radiator hose outlet.

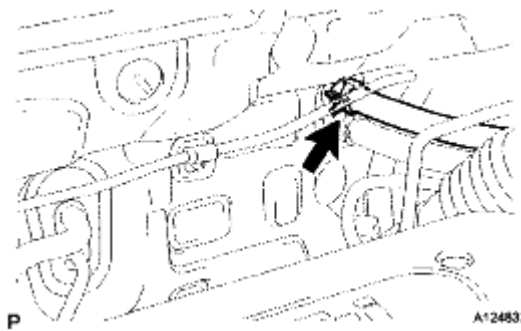


Fig. 231: Locating Heater Water Inlet Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

27. **DISCONNECT OIL COOLER INLET HOSE (for Automatic Transaxle)** (See **REMOVAL**)
28. **DISCONNECT OIL COOLER OUTLET HOSE (for Automatic Transaxle)** (See **REMOVAL**)
29. **DISCONNECT HEATER INLET WATER HOSE**
 - a. Disconnect the heater inlet water hose.



Fig. 232: Identifying Heater Inlet Water Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

30. DISCONNECT HEATER OUTLET WATER HOSE

- a. Disconnect the heater outlet water hose.

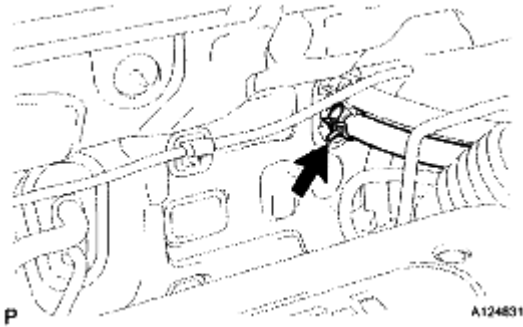


Fig. 233: Locating Heater Water Outlet Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

31. REMOVE ECM

HINT:

See **REMOVAL** .

32. DISCONNECT ENGINE WIRE

- a. Disconnect the engine wire from the engine room relay block.
 1. Remove the nut and separate the wire harness.
 2. Using a screwdriver, unlock the engine room R/B. Pull the engine room R/B upward.
 3. Disconnect the engine wire connectors.

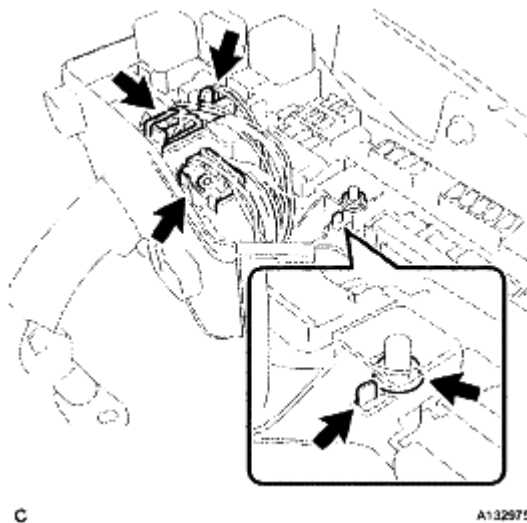


Fig. 234: Locating Engine Wire And Engine Room Relay Block
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the clamp from the bracket.

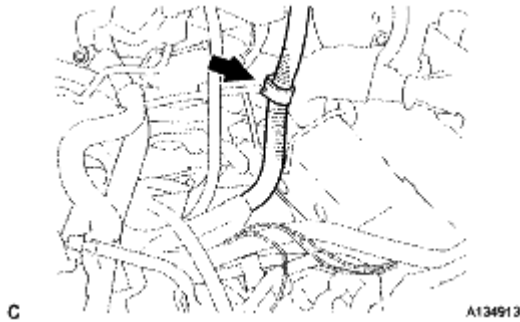


Fig. 235: Locating Clamp And Bracket

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the 2 bolts and clamp from the body.

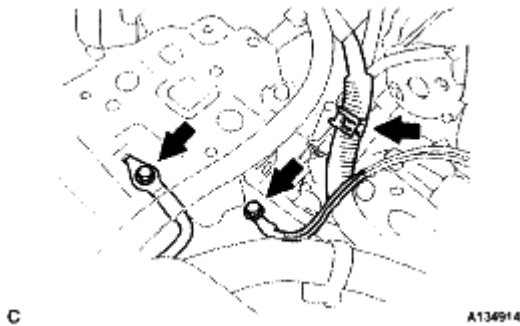


Fig. 236: Locating Clamp And Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

33. DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY (for Automatic Transaxle)

- a. Remove the clip and nut, and separate the control lever.
- b. Separate the clamp and separate the cable from the transaxle.

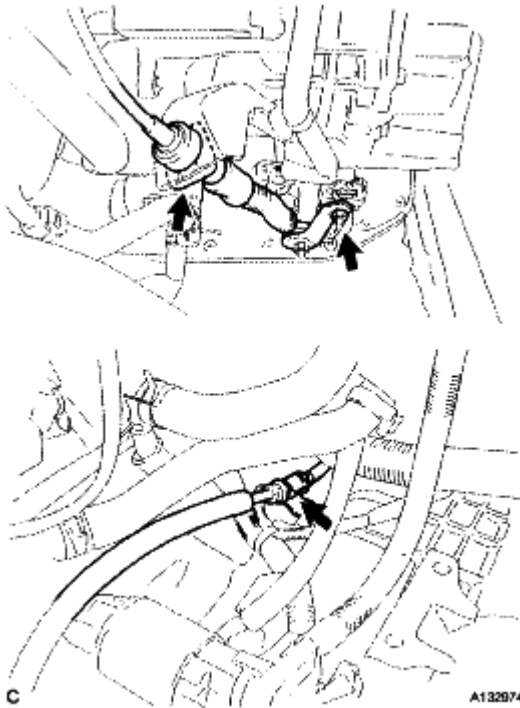


Fig. 237: Locating Transmission Control Cable Assembly (For Automatic Transaxle)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

34. DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY (for Manual Transaxle)

- a. Remove the 2 clips and 2 washers and disconnect the 2 cables from the transaxle.
- b. Remove the 2 clips and disconnect the 2 cables from the control cable bracket.

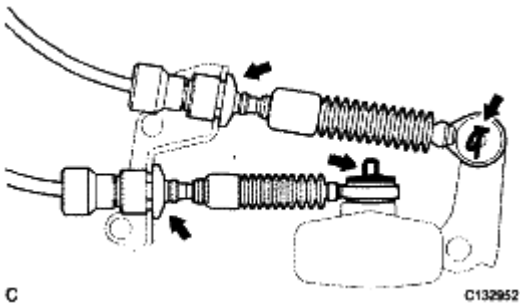


Fig. 238: Locating Transmission Control Cable Assembly (For Manual Transaxle)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

35. DISCONNECT NO. 1 OIL RESERVOIR TO PUMP HOSE

- a. Disconnect the No. 1 oil reservoir to pump hose.

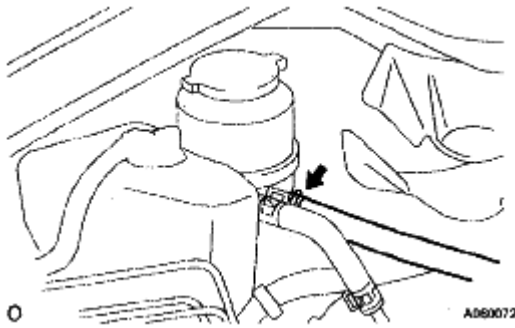


Fig. 239: Locating Oil Reservoir To Pump Hose No. 1
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

36. DISCONNECT RETURN TUBE SUB-ASSEMBLY

- a. Disconnect the return tube sub-assembly.

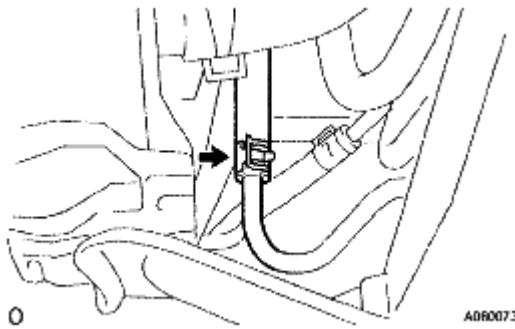


Fig. 240: Locating Return Tube Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

37. REMOVE CLUTCH ACCUMULATOR ASSEMBLY (for Manual Transaxle)

HINT:

See **REMOVAL** .

38. REMOVE CLUTCH RELEASE CYLINDER ASSEMBLY (for Manual Transaxle)

HINT:

See **DISASSEMBLY** .

39. DISCONNECT FUEL TUBE SUB-ASSEMBLY

- a. Remove the No. 1 fuel pipe clamp.

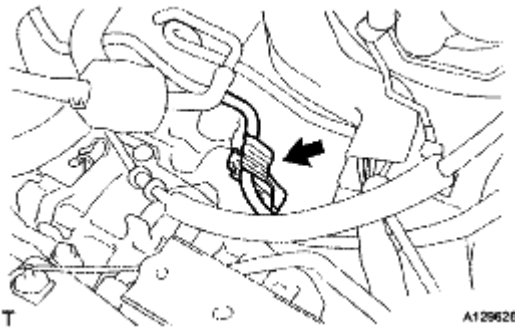


Fig. 241: Locating Fuel Pipe Clamp

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Disconnect the connector from the tube while pinching part A with your fingers as shown in the illustration.

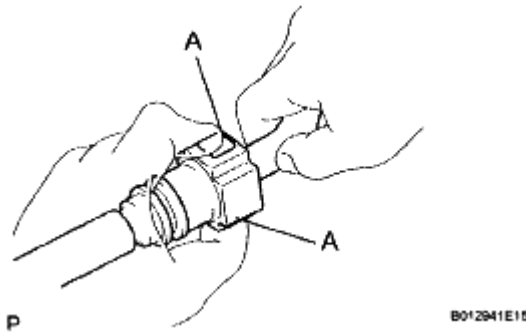


Fig. 242: Disconnecting Connector From Tube

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Check for contamination in the pipe and around the connector. Clean if necessary and then disconnect the connector.
- Disconnect the connector by hand.
- Do not bend, fold or rotate the nylon tube.
- If the pipe and connector are stuck together, push and pull the connector until it becomes free.
- Put the pipe and connector ends in vinyl bags to prevent damage and contamination.

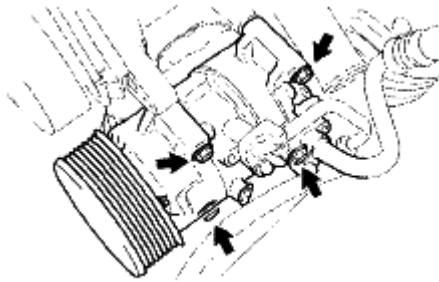
40. REMOVE GENERATOR ASSEMBLY (See REMOVAL)

41. SEPARATE COMPRESSOR AND MAGNETIC CLUTCH

- a. Disconnect the connector.
- b. Remove the 4 bolts and separate the compressor.

HINT:

Hang up the hoses instead of detaching them.



A134644

Fig. 243: Locating Compressor Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

42. REMOVE FRONT EXHAUST PIPE ASSEMBLY

HINT:

See **REMOVAL** .

43. REMOVE FRONT AXLE HUB NUT LH (See REMOVAL)

44. REMOVE FRONT AXLE HUB NUT RH

HINT:

Use the same procedures described for the LH side.

45. REMOVE FRONT STABILIZER LINK ASSEMBLY LH (See REMOVAL)

46. REMOVE FRONT STABILIZER LINK ASSEMBLY RH

HINT:

Use the same procedures described for the LH side.

47. REMOVE FRONT SPEED SENSOR LH (See REMOVAL)

48. REMOVE FRONT SPEED SENSOR RH

HINT:

Use the same procedures described for the LH side.

49. DISCONNECT TIE ROD ASSEMBLY LH (See REMOVAL)

50. DISCONNECT TIE ROD ASSEMBLY RH

HINT:

Use the same procedures described for the LH side.

- 51. **DISCONNECT FRONT SUSPENSION LOWER NO. 1 ARM LH** (See **REMOVAL**)
- 52. **DISCONNECT FRONT SUSPENSION LOWER NO. 1 ARM RH**

HINT:

Use the same procedures described for the LH side.

- 53. **SEPARATE FRONT AXLE ASSEMBLY LH** (See **REMOVAL**)
- 54. **SEPARATE FRONT AXLE ASSEMBLY RH**

HINT:

Use the same procedures described for the LH side.

- 55. **REMOVE DRIVE PLATE & TORQUE CONVERTER CLUTCH SETTING BOLT** (for Automatic Transaxle) (See **REMOVAL**)
- 56. **REMOVE NO. 1 EXHAUST PIPE SUPPORT BRACKET**
 - a. Remove the 2 bolts and exhaust pipe support bracket.
- 57. **SEPARATE STEERING SLIDING YOKE** (See **REMOVAL**)
- 58. **REMOVE ENGINE ASSEMBLY WITH TRANSAXLE**
 - a. Set the engine lifter.
 - b. Remove the 4 bolts, 2 nuts and frame side rail plate RH and LH.

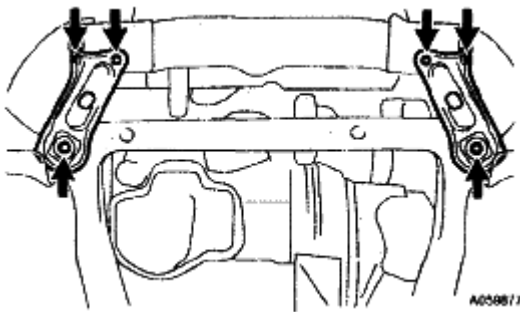


Fig. 244: Locating Bolts, Nuts And Frame Side Rail Plate RH And LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

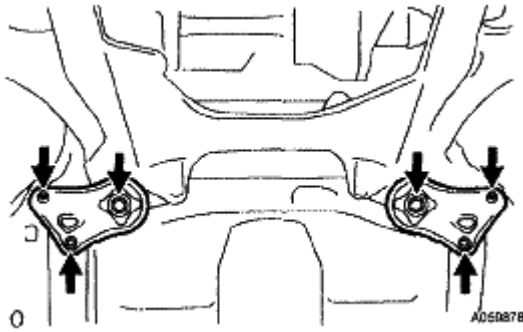


Fig. 245: Locating Bolts, Nuts And Front Suspension Member Brace Rear RH And LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Carefully remove the engine assembly from the vehicle.
- e. Install the 2 engine hangers as shown in the illustration.

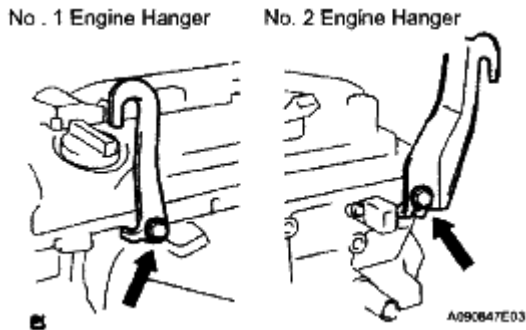


Fig. 246: Locating Engine Hangers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Parts No.:

ENGINE HANGERS SPECIFICATION

Parts	Parts No.
No. 1 Engine hanger	12281-28010
No. 2 Engine hanger	12282-28010
Bolt	91512-61020

Torque: 38 N*m (387 kgf*cm, 28 ft.*lbf)

- f. Using a chain block and an engine sling device, hang the engine assembly.

59. REMOVE VANE PUMP ASSEMBLY

- a. Disconnect the oil pressure switch connector.
- b. Loosen the 2 bolts and remove the vane pump from the engine.

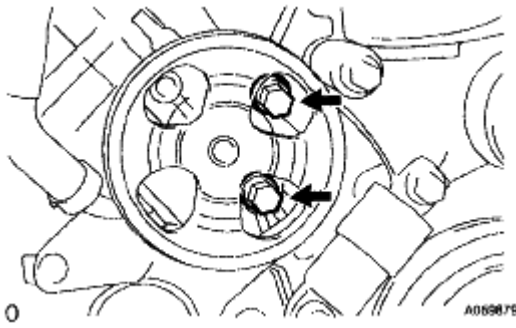


Fig. 247: Locating Vane Pump To Engine With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

60. REMOVE FRONT FRAME ASSEMBLY

a. A/T:

Remove the nut from the engine mounting insulator LH.

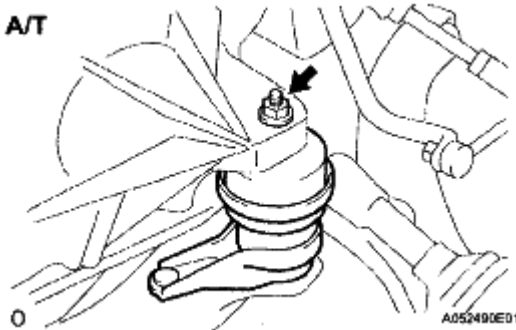


Fig. 248: Locating Engine Mounting Insulator LH With Nut (A/T)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. M/T:

Remove the bolt from the engine mounting insulator LH.

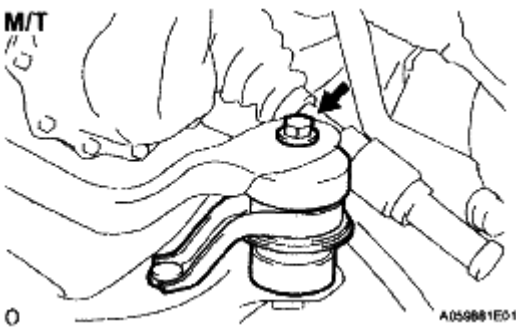


Fig. 249: Locating Engine Mounting Insulator LH With Bolt (M/T)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the nut from the engine mounting insulator RH.

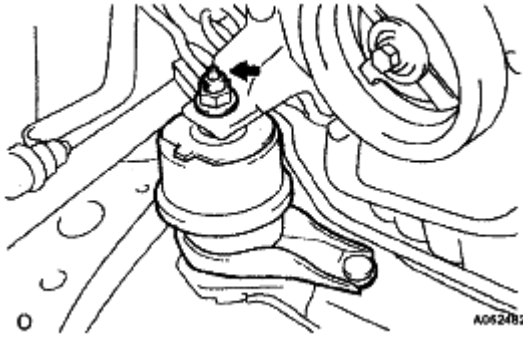


Fig. 250: Locating Engine Mounting Insulator RH With Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Remove the bolt from the engine mounting insulator FR.

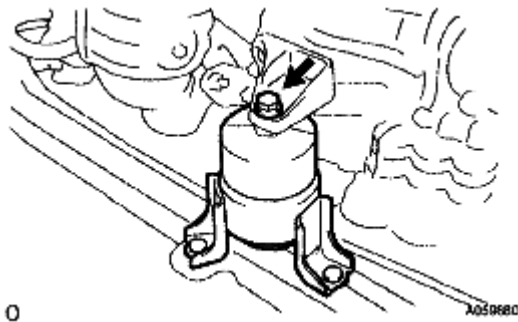


Fig. 251: Locating Engine Mounting Insulator FR With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. MIT.

Remove the bolt from the engine lateral control rod.

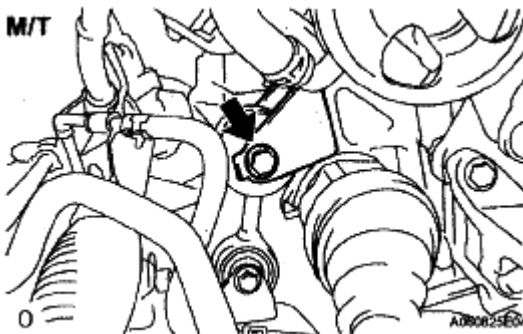


Fig. 252: Locating Bolt From Engine Lateral Control Rod
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Raise the engine assembly and separate the front frame.

- 61. **REMOVE FRONT DRIVE SHAFT ASSEMBLY LH** (See **DISASSEMBLY**)
- 62. **REMOVE FRONT DRIVE SHAFT ASSEMBLY RH** (See **DISASSEMBLY**)
- 63. **REMOVE ENGINE WIRE**
- 64. **REMOVE STARTER ASSEMBLY (for Manual transaxle)** (See **REMOVAL**)
- 65. **REMOVE STARTER ASSEMBLY (for Automatic Transaxle)** (See **REMOVAL**)
- 66. **SEPARATE AUTOMATIC TRANSAXLE ASSEMBLY (for Automatic Transaxle)**

HINT:

See **REMOVAL** .

- 67. **SEPARATE MANUAL TRANSAXLE ASSEMBLY (for Manual Transaxle)**

HINT:

See **REMOVAL** .

- 68. **REMOVE DRIVE PLATE & RING GEAR SUB-ASSEMBLY (for Automatic Transaxle)** (See **REMOVAL**)
- 69. **REMOVE CLUTCH COVER ASSEMBLY (for Manual Transaxle)** (See **DISASSEMBLY**)
- 70. **REMOVE CLUTCH DISC ASSEMBLY (for Manual Transaxle)** (See **DISASSEMBLY**)
- 71. **REMOVE FLYWHEEL SUB-ASSEMBLY (for Manual Transaxle)** (See **REMOVAL**)
- 72. **INSTALL ENGINE STAND**
 - a. Fix the engine onto a engine stand with the bolts.
- 73. **REMOVE FUEL DELIVERY PIPE WITH INJECTOR** (See **REMOVAL**)
- 74. **REMOVE INTAKE MANIFOLD**
 - a. Remove the 5 bolts, 2 nuts, and intake manifold.

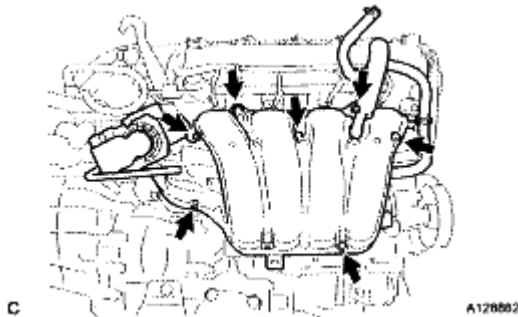
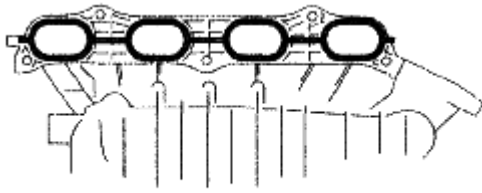


Fig. 253: Locating Intake Manifold, Bolts And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the gasket from the intake manifold.

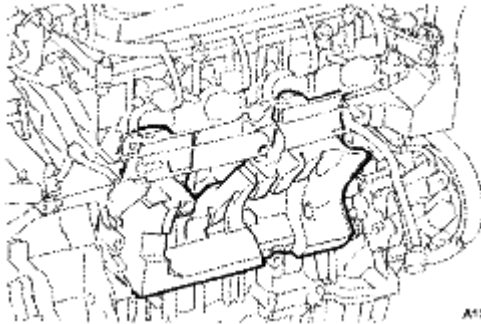


A134342

Fig. 254: Identifying Intake Manifold Gasket

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- 75. **REMOVE INTAKE AIR CONTROL VALVE (for PZEV) (See REMOVAL)**
- 76. **REMOVE NO. 2 VENTILATION HOSE**
- 77. **REMOVE NO. 1 INTAKE MANIFOLD INSULATOR**
 - a. Remove the intake manifold insulator from the cylinder block.

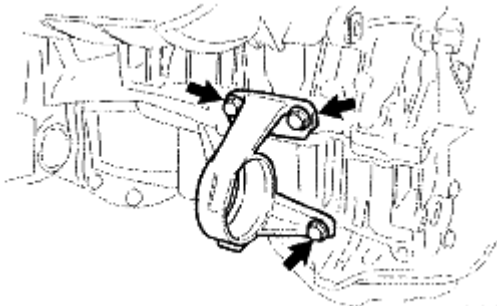


A134343

Fig. 255: Identifying Intake Manifold Insulator And Cylinder Block

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- 78. **REMOVE DRIVE SHAFT BEARING BRACKET**
 - a. Remove the 3 bolts and drive shaft bearing bracket.



A134945

Fig. 256: Locating Drive Shaft Bearing Bracket And Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- 79. **REMOVE OIL LEVEL GAUGE SUB-ASSEMBLY**

80. REMOVE OIL LEVEL GAUGE GUIDE

- a. Remove the bolt and oil level gauge guide.

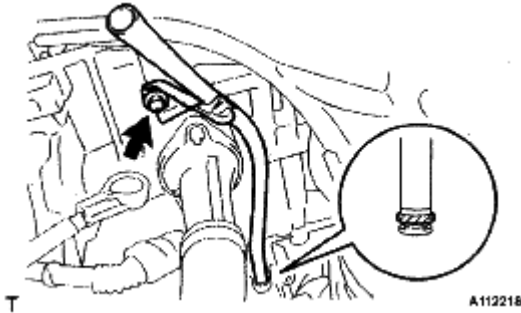


Fig. 257: Locating Oil Level Gauge Guide Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the O-ring from the oil level gauge guide.

81. REMOVE MANIFOLD STAY

- a. Remove the bolt, nut and stay.

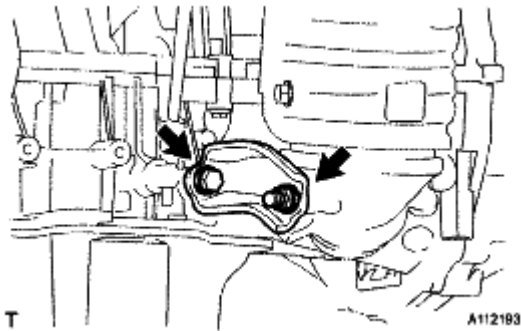


Fig. 258: Installing Stay With Bolt And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

82. REMOVE NO. 2 MANIFOLD STAY

- a. Remove the bolt, nut and stay.

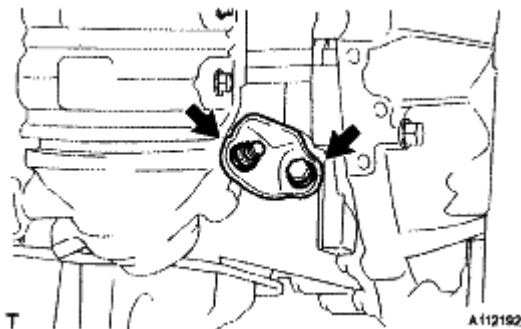
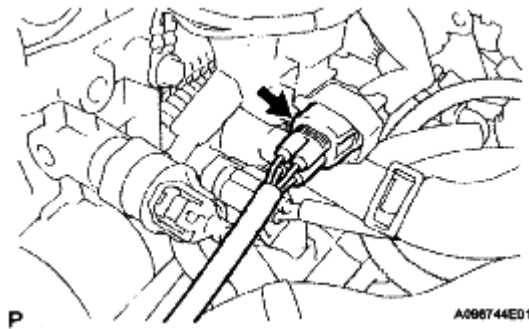


Fig. 259: Locating Stay With Bolt And Nut

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

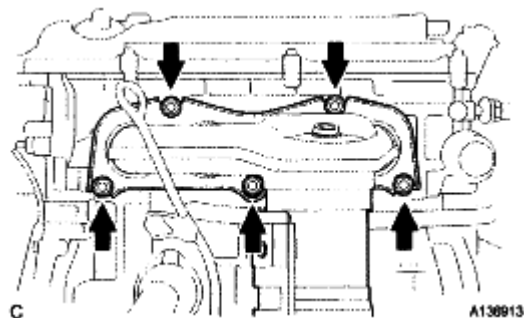
83. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY**a. For PZEV:**

1. Disconnect the air-fuel ratio sensor connector.

**Fig. 260: Locating Air-Fuel Ratio Sensor Connector**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Remove the 5 nuts, manifold converter and gasket.

**Fig. 261: Identifying Manifold Converter And Nuts**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Except for PZEV:

1. Remove the 4 bolts and No. 1 insulator.

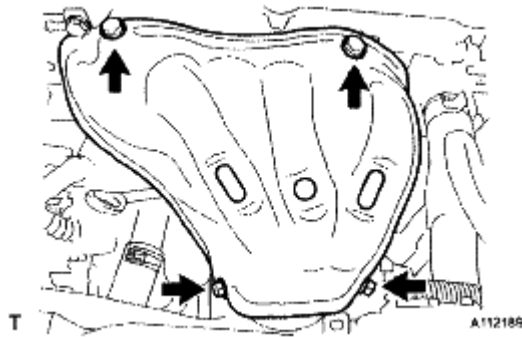


Fig. 262: Locating Exhaust Manifold Heat Insulator With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Disconnect the air-fuel ratio sensor connector.

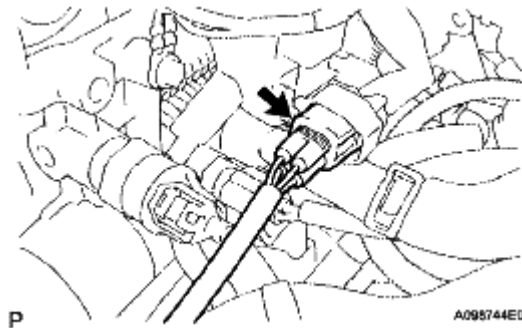


Fig. 263: Locating Air-Fuel Ratio Sensor Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. Remove the 5 nuts, manifold converter and gasket.

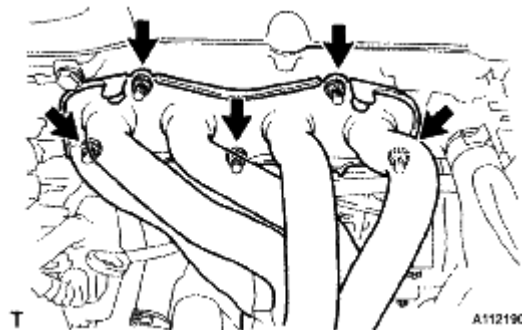


Fig. 264: Removing Nuts Manifold Converter And Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

84. **REMOVE WATER INLET** (See **REMOVAL**)
85. **REMOVE THERMOSTAT** (See **REMOVAL**)
86. **REMOVE NO. 1 WATER BY-PASS PIPE**

- a. Remove the bolt, 2 nuts and No. 1 water by-pass pipe with the gasket.

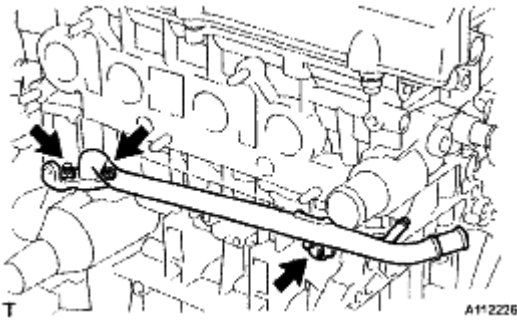


Fig. 265: Locating No. 1 Water By-Pass Pipe Bolt And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

87. REMOVE OIL COOLER PIPE (w/ Oil Cooler)

- a. Remove the bolt, 2 nuts and oil cooler pipe with the gasket.

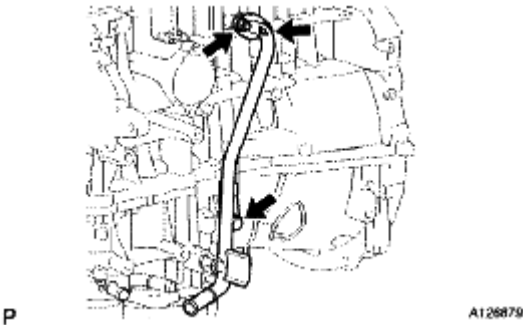


Fig. 266: Locating Oil Cooler Pipe, Nuts And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

88. REMOVE ENGINE MOUNTING BRACKET RH

- a. Remove the 3 bolts and engine mounting bracket RH.

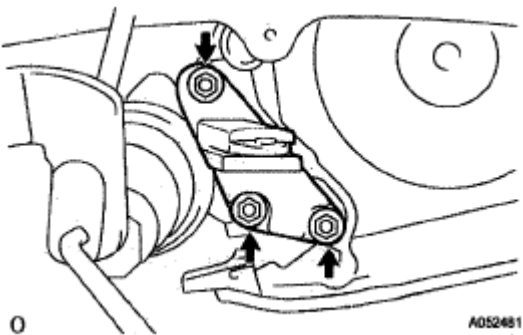


Fig. 267: Locating Engine Mounting Bracket With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

89. REMOVE V-RIBBED BELT TENSIONER ASSEMBLY

- a. Remove the bolt, nut and belt tensioner

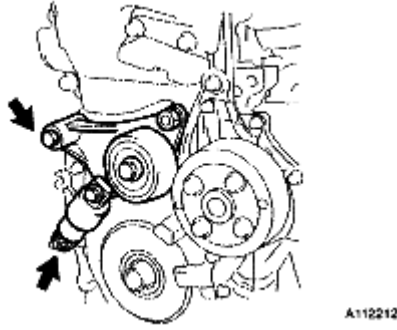


Fig. 268: Locating V-Ribbed Belt Tensioner Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

90. REMOVE IGNITION COIL ASSEMBLY

- a. Remove the 4 bolts and 4 ignition coils.

91. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (See REMOVAL)**92. REMOVE KNOCK SENSOR**

- a. Disconnect the sensor connector.
- b. Remove the nut and sensor.

93. REMOVE RADIO SETTING CONDENSER

- a. Remove the bolt and radio setting condenser.

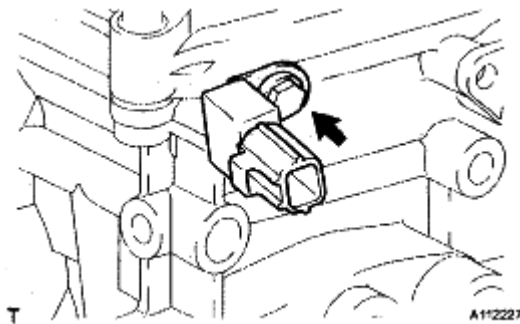


Fig. 269: Locating Radio Setting Condenser Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

94. REMOVE ENGINE OIL PRESSURE SWITCH ASSEMBLY

- a. Using a 24 mm deep socket wrench, remove the engine oil pressure switch assembly.

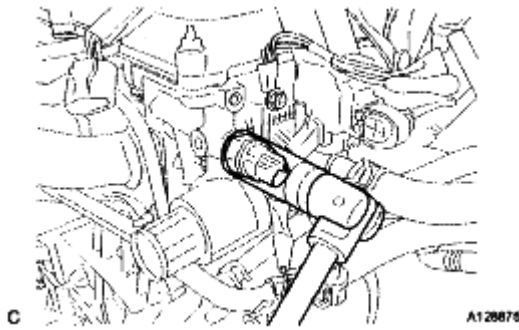


Fig. 270: Removing Engine Oil Pressure Switch Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

95. REMOVE ENGINE COOLANT TEMPERATURE SENSOR

- a. Using SST, remove the sensor and gasket.

SST 09817-33190

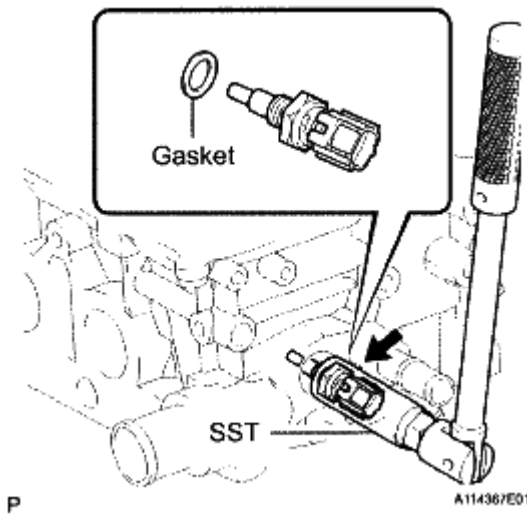


Fig. 271: Locating Gasket And ECT Sensor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. INSPECT INTAKE MANIFOLD

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

Maximum warpage:

0.20 mm (0.0079 in.)

If the warpage is greater than maximum, replace the manifold.

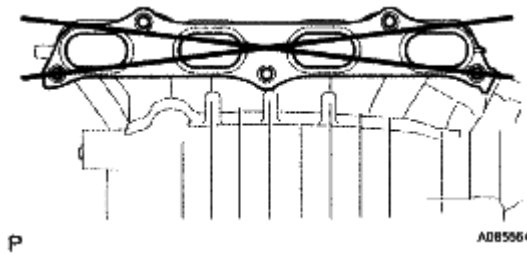


Fig. 272: Measuring Surface Contacting Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSPECT EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY

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

Maximum warpage:

0.70 mm (0.0276 in.)

If the warpage is greater than the maximum, replace the manifold.

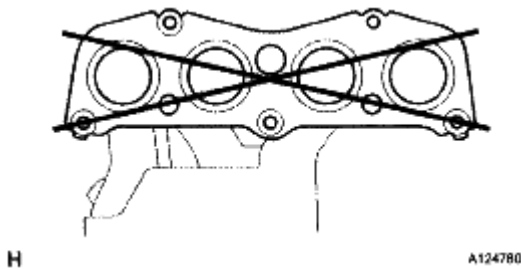


Fig. 273: Inspecting Exhaust Manifold
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. INSTALL ENGINE COOLANT TEMPERATURE SENSOR

- a. Using SST, install a new gasket and the ECT sensor.

SST 09817-33190

Torque: 20 N*m (208 kgf*cm, 15 ft.*lbf)

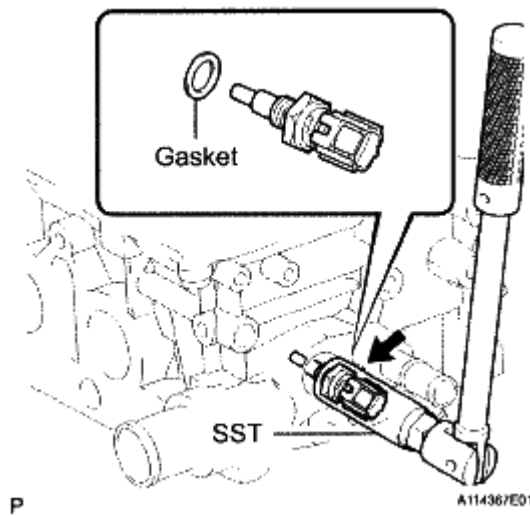


Fig. 274: Locating Gasket And ECT Sensor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL ENGINE OIL PRESSURE SWITCH ASSEMBLY

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

Adhesive:

Part No. 08833-00080 THREE BOND 1344 or equivalent

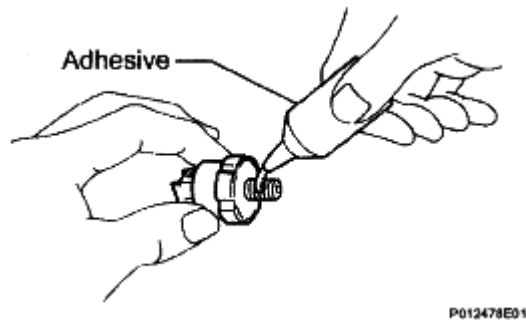


Fig. 275: Cleaning Threads Of Oil Pressure Switch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

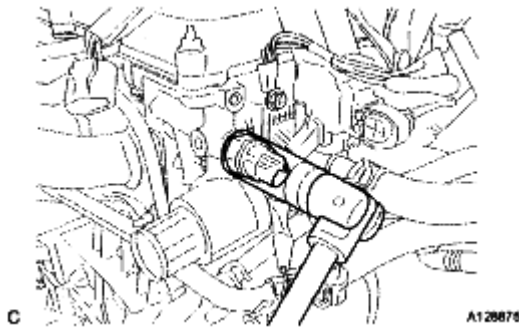


Fig. 276: Installing Engine Oil Pressure Switch Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL RADIO SETTING CONDENSER

- a. Install the condenser with the bolt.

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

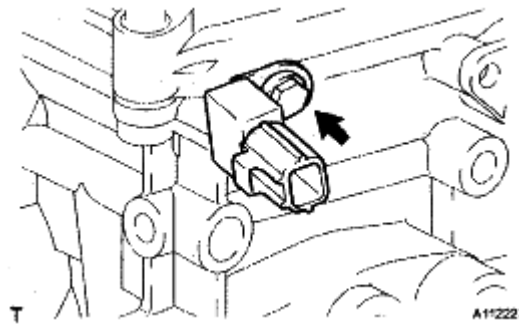


Fig. 277: Locating Radio Setting Condenser
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSTALL KNOCK SENSOR

- a. Install the sensor with the nut as shown in the illustration.

Torque: 20 N*m (204 kgf*cm, 15 ft.*lbf)

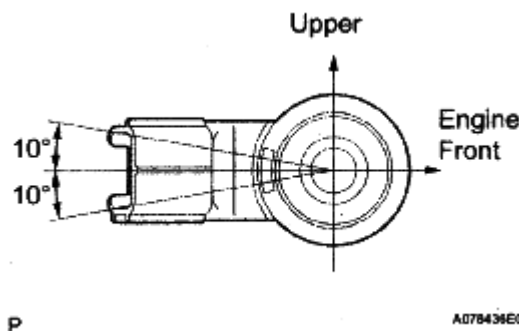


Fig. 278: Identifying Engine Knock Sensor Angle

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY** (See **INSTALLATION**)

6. **INSTALL IGNITION COIL ASSEMBLY**

- a. Install the 4 ignition coils with the 4 bolts.

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

7. **INSTALL ENGINE MOUNTING BRACKET RH**

- a. Remove the engine mounting bracket RH with the 3 bolts.

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

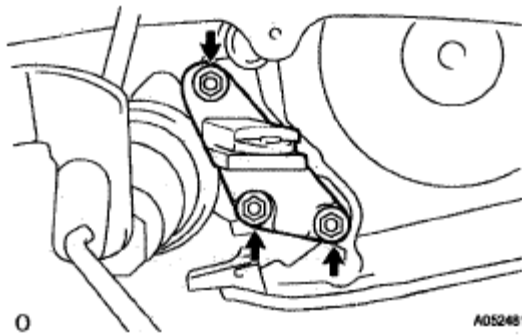


Fig. 279: Locating Engine Mounting Bracket With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **INSTALL OIL COOLER PIPE (w/ Oil Cooler)**

- a. Install a new gasket and the pipe with the bolt and 2 nuts.

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

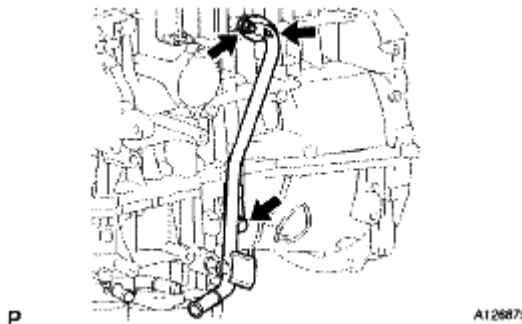


Fig. 280: Locating Oil Cooler Pipe, Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. **INSTALL NO. 1 WATER BY-PASS PIPE**

- a. Install a new gasket and the pipe with the bolt and 2 nuts.

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

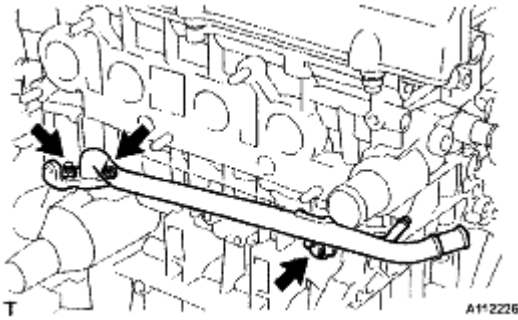


Fig. 281: Locating No. 1 Water By-Pass Pipe Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. **INSTALL THERMOSTAT** (See INSTALLATION)
11. **INSTALL WATER INLET** (See INSTALLATION)
12. **INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY**

a. Except for PZEV:

1. Install a new gasket onto the cylinder head.
2. Temporarily tighten the exhaust manifold converter with the 5 nuts.
3. Tighten the 5 nuts in the sequence shown in the illustration.

Torque: 37 N*m (378 kgf*cm, 27 ft.*lbf)

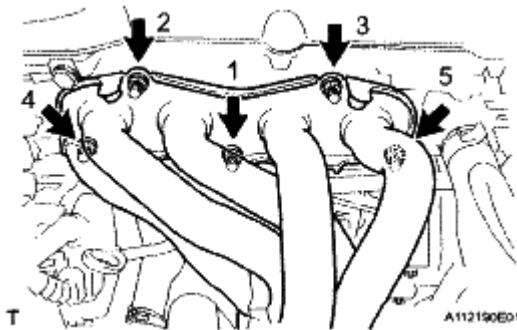


Fig. 282: Identifying Exhaust Manifold Converter Tighten Nuts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. Connect the air-fuel ratio sensor connector.

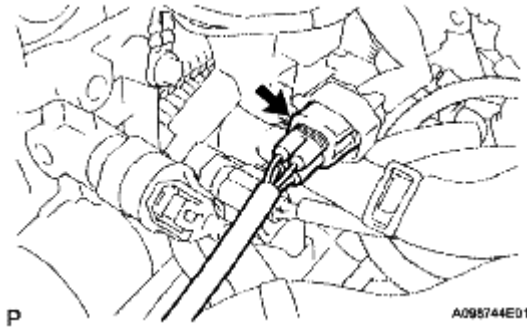


Fig. 283: Locating Air-Fuel Ratio Sensor Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. Install the exhaust manifold heat insulator with the 4 bolts.

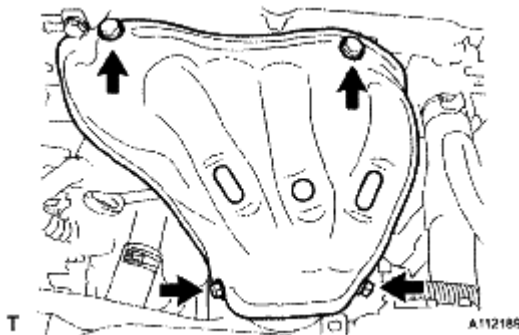


Fig. 284: Locating Exhaust Manifold Heat Insulator With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 12 N*m (122 kgf*cm, 9 ft.*lbf)

- b. For PZEV:

1. Install a new gasket onto the cylinder head.
2. Temporarily tighten the exhaust manifold converter with the 5 nuts.
3. Tighten the 5 nuts in the sequence shown in the illustration.

Torque: 37 N*m (378 kgf*cm, 27 ft.*lbf)

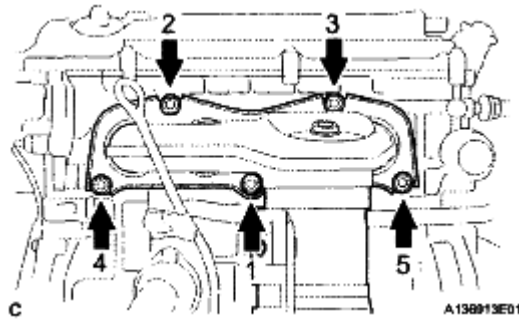


Fig. 285: Tightening Exhaust Manifold Converter Nuts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. Connect the air-fuel ratio sensor connector.

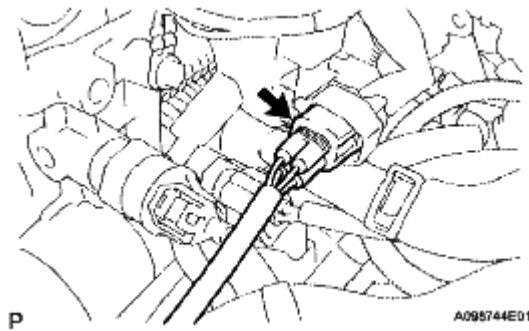


Fig. 286: Locating Air-Fuel Ratio Sensor Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. INSTALL NO. 2 MANIFOLD STAY

- a. Install the stay with the bolt and nut.

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

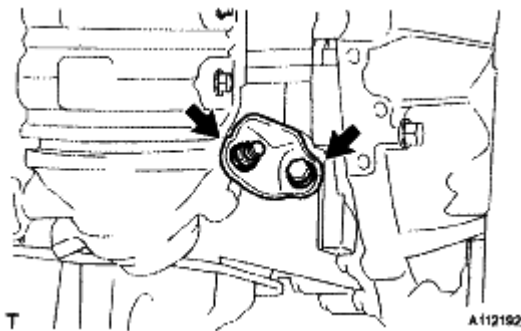


Fig. 287: Locating Stay With Bolt And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. INSTALL MANIFOLD STAY

- a. Install the stay with the bolt and nut.

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

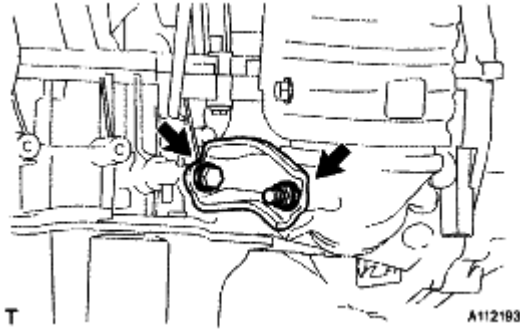


Fig. 288: Locating Stay With Bolt And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. INSTALL OIL LEVEL GAUGE GUIDE

- a. Apply a light coat of engine oil to a new O-ring and install it to the guide.
- b. Install the oil level gauge guide with the bolt.

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

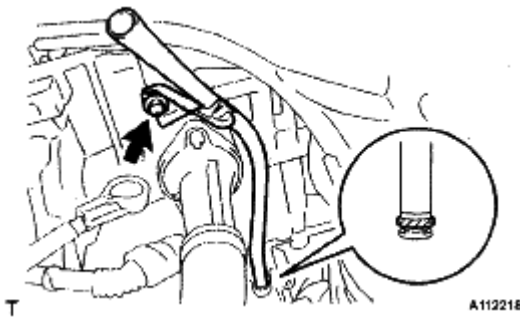


Fig. 289: Locating Oil Level Gauge Guide
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

16. INSTALL OIL LEVEL GAUGE SUB-ASSEMBLY

17. INSTALL DRIVE SHAFT BEARING BRACKET

- a. Install the bracket with the 3 bolts.

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

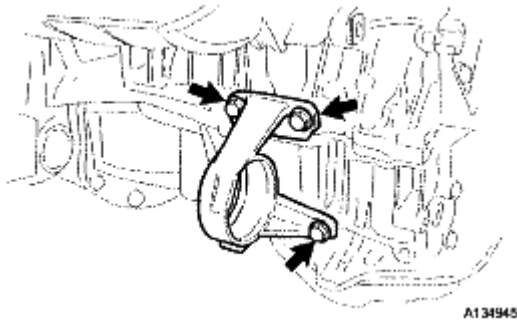


Fig. 290: Locating Drive Shaft Bearing Bracket And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. INSTALL NO. 1 INTAKE MANIFOLD INSULATOR

- a. Install the intake manifold insulator onto the cylinder block.

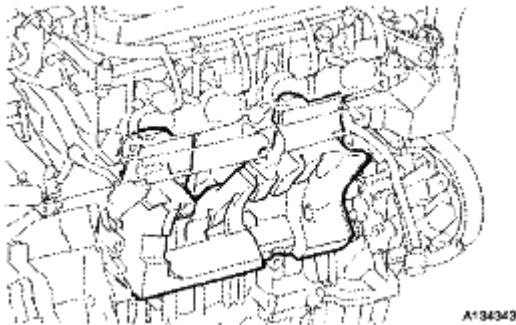


Fig. 291: Identifying Intake Manifold Insulator And Cylinder Block
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

19. INSTALL NO. 2 VENTILATION HOSE

20. INSTALL INTAKE AIR CONTROL VALVE (for PZEV) (See INSTALLATION)

21. INSTALL INTAKE MANIFOLD

- a. Install a new gasket into the intake manifold.

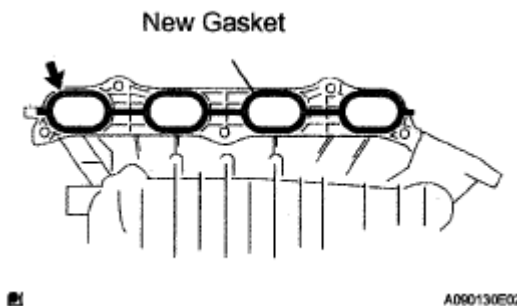


Fig. 292: Identifying Intake Manifold Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the intake manifold with the 5 bolts and 2 nuts.

Torque: 30 N*m (305 kgf*cm, 22 ft.*lbf)

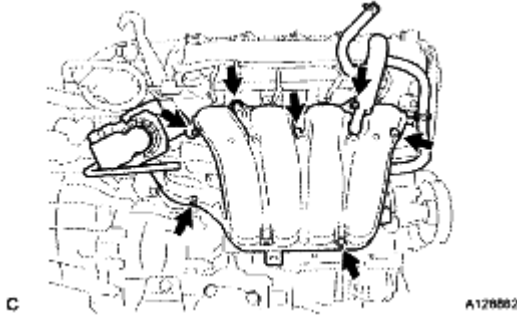


Fig. 293: Locating Intake Manifold Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

22. INSTALL FUEL DELIVERY PIPE WITH INJECTOR (See INSTALLATION)
23. REMOVE ENGINE STAND
24. INSTALL FLYWHEEL SUB-ASSEMBLY (for Manual Transaxle) (See INSTALLATION)
25. INSTALL CLUTCH DISC ASSEMBLY (for Manual Transaxle) (See REASSEMBLY)
26. INSTALL CLUTCH COVER ASSEMBLY (for Manual Transaxle) (See REASSEMBLY)
27. INSTALL DRIVE PLATE & RING GEAR SUB-ASSEMBLY (for Automatic Transaxle) (See INSTALLATION)
28. INSTALL MANUAL TRANSAXLE ASSEMBLY (for Manual Transaxle)

HINT:

See INSTALLATION .

29. INSTALL AUTOMATIC TRANSAXLE ASSEMBLY (for Automatic Transaxle)

HINT:

See INSTALLATION .

30. INSTALL STARTER ASSEMBLY (for Manual Transaxle) (See INSTALLATION)
31. INSTALL STARTER ASSEMBLY (for Automatic Transaxle) (See INSTALLATION)
32. INSTALL ENGINE WIRE
33. INSTALL FRONT DRIVE SHAFT ASSEMBLY LH (See INSTALLATION)
34. INSTALL FRONT DRIVE SHAFT ASSEMBLY RH (See INSTALLATION)
35. INSTALL FRONT FRAME ASSEMBLY

- a. A/T:

Install the engine mounting insulator LH with the nut.

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

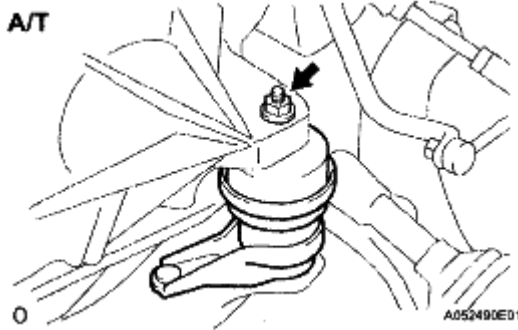


Fig. 294: Locating Engine Mounting Insulator LH With Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. M/T:

Install the engine mounting insulator LH with the bolt.

Torque: 143 N*m (1,459 kgf*cm, 105 ft.*lbf)

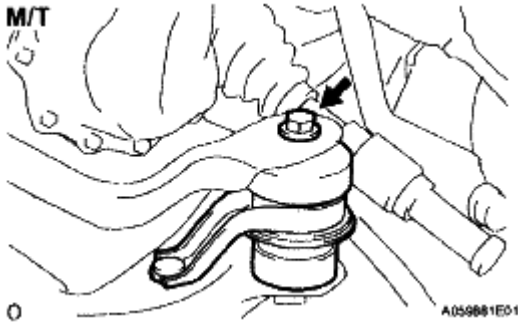


Fig. 295: Locating Engine Mounting Insulator LH With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Install the engine mounting insulator RH with the nut.

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

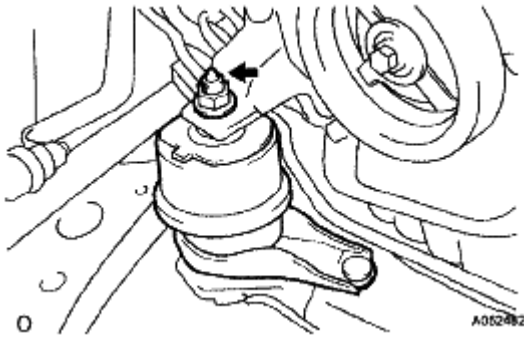


Fig. 296: Locating Engine Mounting Insulator RH With Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the engine mounting insulator FR with the bolt.

Torque: 87 N*m (888 kgf*cm, 64 ft.*lbf)

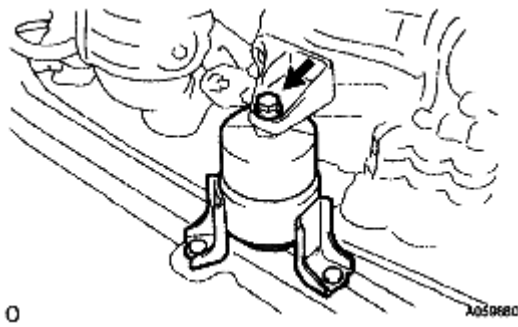


Fig. 297: Locating Engine Mounting Insulator FR With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. M/T:

Install the engine lateral control rod with the bolt.

Torque: 89 N*m (910 kgf*cm, 66 ft.*lbf)

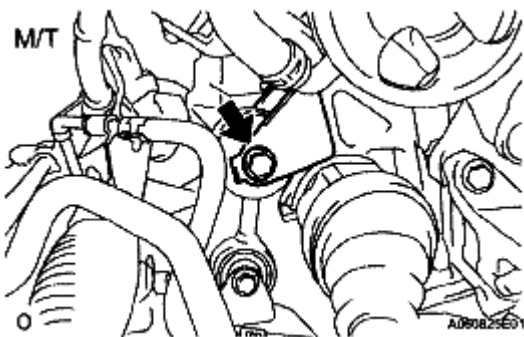


Fig. 298: Locating Engine Lateral Control Rod With Bolt

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

36. INSTALL VANE PUMP ASSEMBLY

- a. Install the vane pump to the engine with the 2 bolts.

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

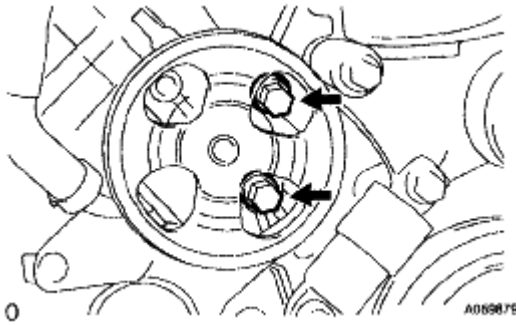


Fig. 299: Locating Vane Pump To Engine With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Connect the oil pressure switch connector.

37. INSTALL ENGINE ASSEMBLY WITH TRANSAXLE

- a. Set the engine assembly with transaxle on the engine lifter.
- b. Install the engine assembly to the vehicle.
- c. Install the frame side plate LH and RH with the 4 bolts and 2 nuts.

Torque:

Bolt A

85 N*m (867 kgf*cm, 63 ft.*lbf)

Bolt B and nut

32 N*m (326 kgf*cm, 24 ft.*lbf)

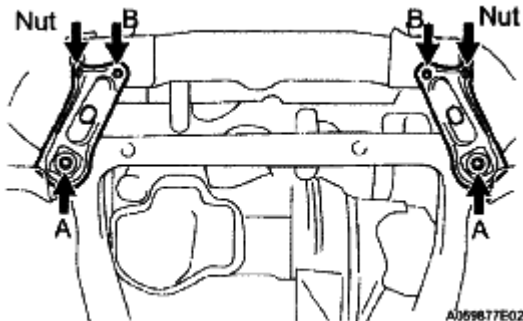


Fig. 300: Identifying Frame Side Plate Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Torque:

Bolt C

85 N*m (867 kgf*cm, 63 ft.*lbf)

Bolt D and nut

32 N*m (326 kgf*cm, 24 ft.*lbf)

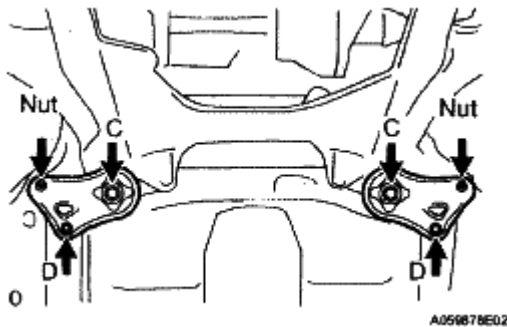


Fig. 301: Locating Front Suspension Member Brace Rear RH And LH With Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

38. **INSTALL STEERING SLIDING YOKE** (See INSTALLATION)
39. **INSTALL NO. 1 EXHAUST PIPE SUPPORT BRACKET**
 - a. Install the exhaust pipe support bracket with the 2 bolts.

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

40. **INSTALL DRIVE PLATE & TORQUE CONVERTER CLUTCH SETTING BOLT** (for Automatic Transaxle) (See INSTALLATION)
41. **INSTALL FRONT AXLE ASSEMBLY LH** (See INSTALLATION)
42. **INSTALL FRONT AXLE ASSEMBLY RH**

HINT:

Use the same procedures described for the LH side.

43. **INSTALL FRONT SUSPENSION LOWER NO. 1 ARM LH** (See INSTALLATION)
44. **INSTALL FRONT SUSPENSION LOWER NO. 1 ARM RH**

HINT:

Use the same procedures described for the LH side.

45. **INSTALL TIE ROD ASSEMBLY LH** (See INSTALLATION)

46. **INSTALL TIE ROD ASSEMBLY RH**

HINT;

Use the same procedures described for the LH side.

47. **INSTALL FRONT SPEED SENSOR LH** (See INSTALLATION)

48. **INSTALL FRONT SPEED SENSOR RH**

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

49. **INSTALL FRONT STABILIZER LINK ASSEMBLY LH** (See INSTALLATION)

50. **INSTALL FRONT STABILIZER LINK ASSEMBLY RH**

HINT:

Use the same procedures described for the LH side.

51. **INSTALL FRONT AXLE HUB NUT LH** (See INSTALLATION)

52. **INSTALL FRONT AXLE HUB NUT RH**

HINT:

Use the same procedures described for the LH side.

53. **INSTALL FRONT EXHAUST PIPE ASSEMBLY**

HINT:

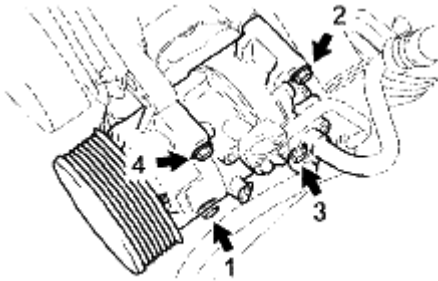
See INSTALLATION .

54. **INSTALL COMPRESSOR AND MAGNETIC CLUTCH**

- a. Install the cooler compressor with the 4 bolts.

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

NOTE: **Tighten the bolts in the order shown in the illustration to install the cooler compressor.**



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Fig. 302: Locating Cooler Compressor With Bolts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

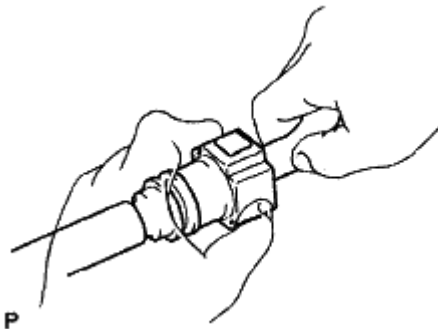
55. **INSTALL GENERATOR ASSEMBLY** (See INSTALLATION)

56. **CONNECT FUEL TUBE SUB-ASSEMBLY**

- a. Push in the fuel tube connector to the fuel pipe until the connector makes a "click" sound.

NOTE:

- Check for damage or contamination on the connected part of the pipe.
- Check if the pipe and the connector are securely connected by trying to pull them apart.



B012944

Fig. 303: Connecting Fuel Tube Connector
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the No. 1 fuel pipe clamp.

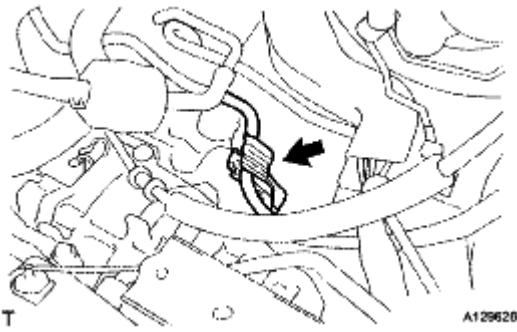


Fig. 304: Locating Fuel Pipe Clamp

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

57. INSTALL CLUTCH RELEASE CYLINDER ASSEMBLY (for Manual Transaxle)

HINT:

See **INSTALLATION** .

58. REMOVE CLUTCH ACCUMULATOR ASSEMBLY (for Manual Transaxle)

HINT:

See **REMOVAL** .

59. CONNECT RETURN TUBE SUB-ASSEMBLY

- a. Connect the return tube sub-assembly.

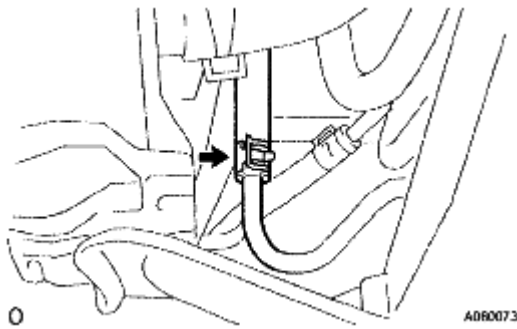


Fig. 305: Locating Return Tube Sub-Assembly

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

60. CONNECT NO. 1 OIL RESERVOIR TO PUMP HOSE

- a. Connect the No. 1 oil reservoir to pump hose.

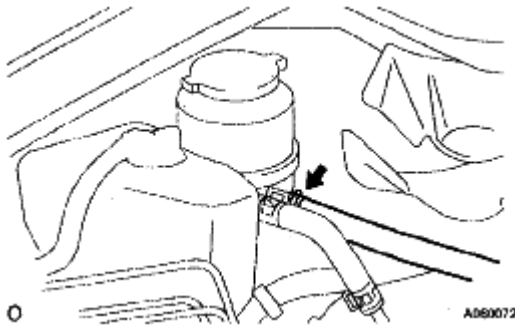


Fig. 306: Locating Oil Reservoir To Pump Hose No. 1
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

61. **INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY (for Manual Transaxle)**
- Connect the ends of the 2 cables and install the 2 washers and 2 clips.
 - Install 2 new clips to the control cable bracket.

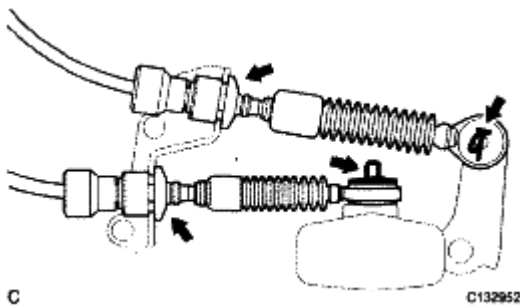


Fig. 307: Identifying Transmission Control Cable Assembly (For Manual Transaxle)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

62. **INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY (for Automatic Transaxle)**
- Install a new clip and nut, and connect the control lever.

Torque: 13 N*m (133 kgf*cm, 10 ft.*lbf)

- Connect the clamp with the cable to the transaxle.

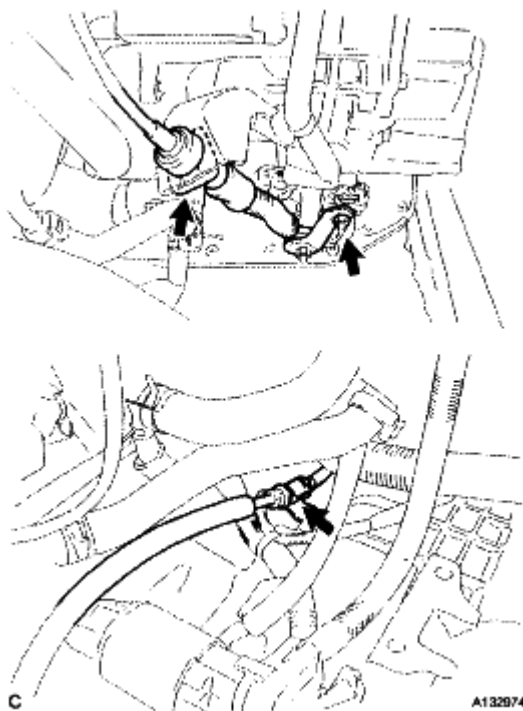


Fig. 308: Identifying Transmission Control Cable Assembly (For Automatic Transaxle)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

63. CONNECT ENGINE WIRE

- a. Install the 2 bolts and clamp to the body.

Torque:

Bolt A

8.4 N*m (85 kgf*cm, 74 in.*lbf)

Bolt B

12 N*m (123 kgf*cm, 9 ft.*lbf)

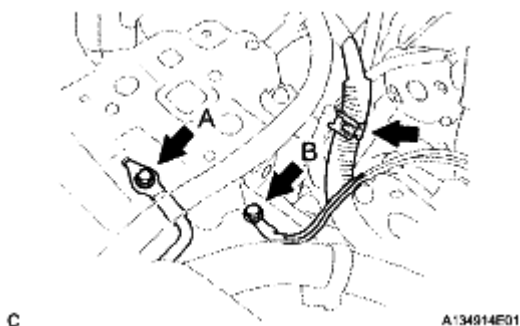


Fig. 309: Locating Engine Wire, Clamp And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Connect the clamp to the bracket.

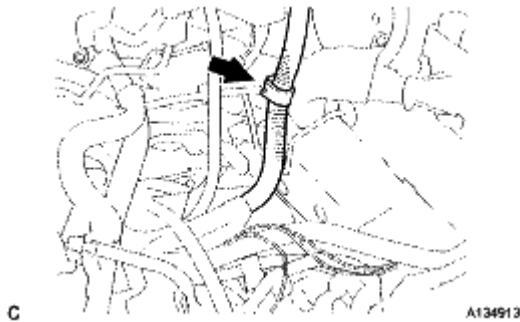


Fig. 310: Locating Clamp To Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Connect the wire to the engine room junction block. Then, install it with the nut and 3 connectors.

Torque: 8.4 N*m (85 kgf*cm, 74 in.*lbf)

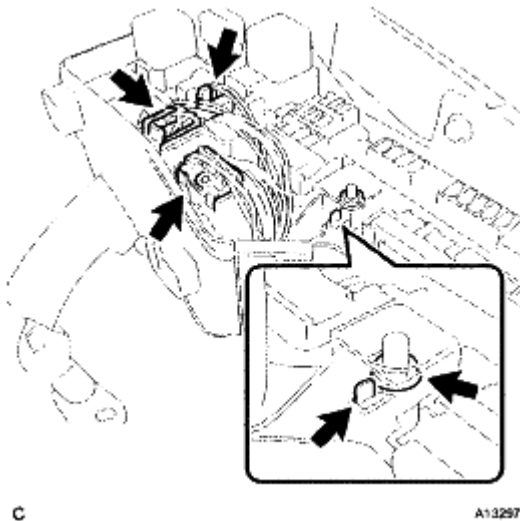


Fig. 311: Locating Engine Wire And Engine Room Relay Block
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

64. INSTALL ECM

HINT:

See **INSTALLATION** .

65. CONNECT HEATER INLET WATER HOSE

- a. Connect the heater inlet water hose.

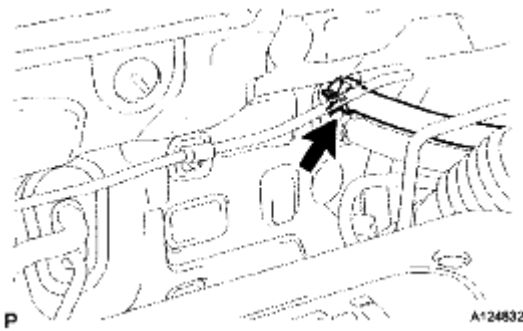


Fig. 312: Locating Heater Water Inlet Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

66. CONNECT HEATER OUTLET WATER HOSE

- a. Connect the heater outlet water hose.

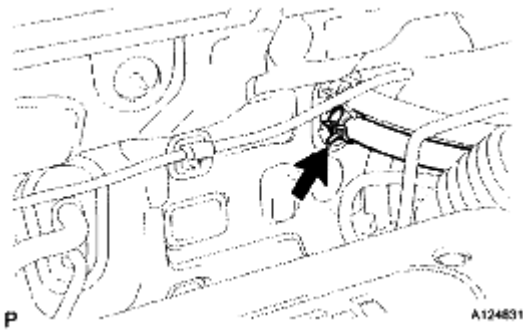


Fig. 313: Locating Heater Water Outlet Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

67. **CONNECT OIL COOLER INLET HOSE** (See INSTALLATION)
68. **CONNECT OIL COOLER OUTLET HOSE** (See INSTALLATION)
69. **CONNECT RADIATOR HOSE INLET**
 - a. Install the clamp and connect the radiator hose inlet.

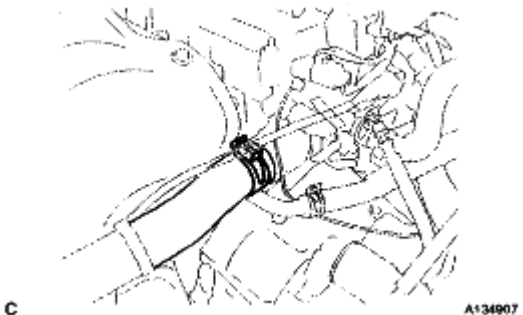


Fig. 314: Identifying Radiator Hose Inlet And Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

70. CONNECT RADIATOR HOSE OUTLET

- a. Install the clamp and connect the radiator hose outlet.



Fig. 315: Identifying Radiator Hose Outlet And Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

71. CONNECT NO. 1 VACUUM HOSE CONNECTOR

- a. Install the clamp and connect the vacuum hose connector.

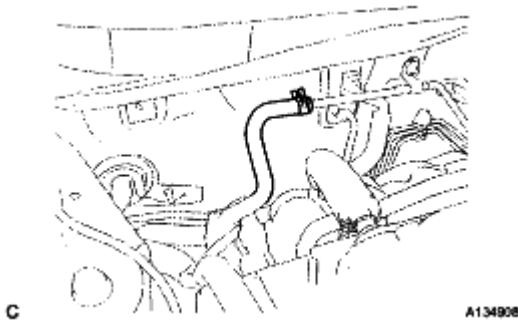


Fig. 316: Identifying Vacuum Hose Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

72. INSTALL NO. 2 ENGINE MOUNTING BRACKET RH

- a. Install the 3 bolts and No. 2 mounting bracket RH.

Torque: 52 N*m (531 kgf*cm, 38 ft.*lbf)

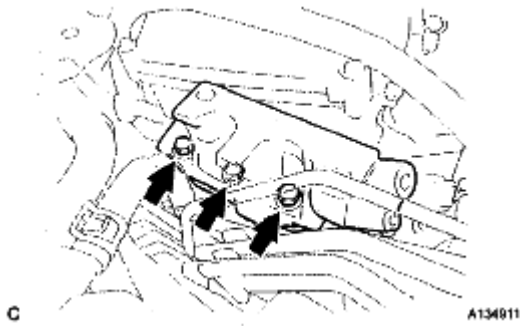


Fig. 317: Locating Mounting Bracket And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

73. INSTALL ENGINE MOVING CONTROL ROD SUB-ASSEMBLY

- a. Install the engine moving control rod with the 3 bolts.

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

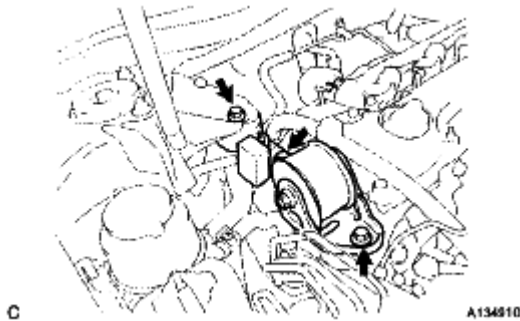


Fig. 318: Locating Engine Moving Control Rod, Bracket And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the ground cable with the bolt.

Torque: 8.4 N*m (85 kgf*cm, 74 in.*lbf)

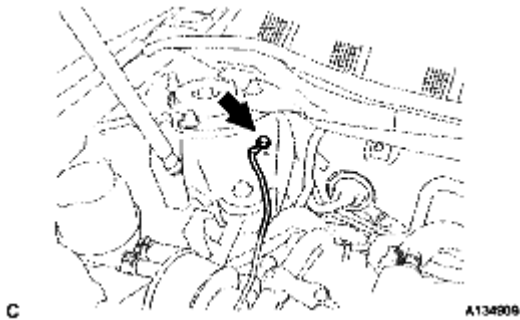


Fig. 319: Locating Ground Cable Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

74. INSTALL NO. 2 ENGINE MOUNTING STAY RH

- a. Install the No. 2 mounting stay RH with the 2 bolts.

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

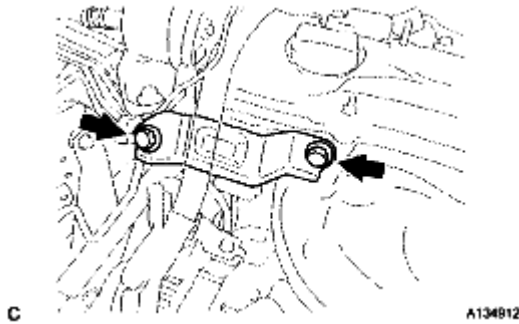


Fig. 320: Locating Mounting Stay And Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

75. INSTALL BATTERY

- a. Install the battery and battery tray.
- b. Install the battery clamp with the bolt and nut.

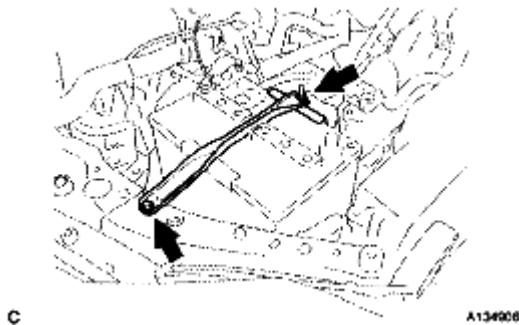


Fig. 321: Locating Battery Clamp

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque:

Bolt

9.0 N*m (92 kgf*cm, 80 in.*lbf)

Nut

3.5 N*m (36 kgf*cm, 31 in.*lbf)

76. INSTALL AIR CLEANER CASE SUB-ASSEMBLY

- a. Install the air cleaner case with the 3 bolts.

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

- b. Connect the hose clamp.

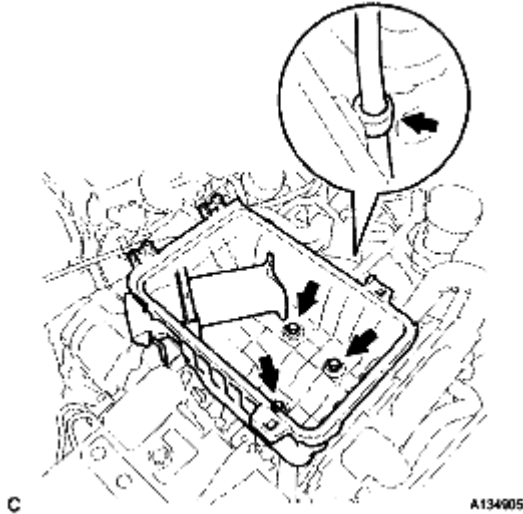


Fig. 322: Locating Air Cleaner Case And Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

77. INSTALL AIR CLEANER CAP SUB-ASSEMBLY (See INSTALLATION)

78. INSTALL AIR CLEANER INLET ASSEMBLY

- a. Install the air cleaner inlet with the 2 bolts.

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

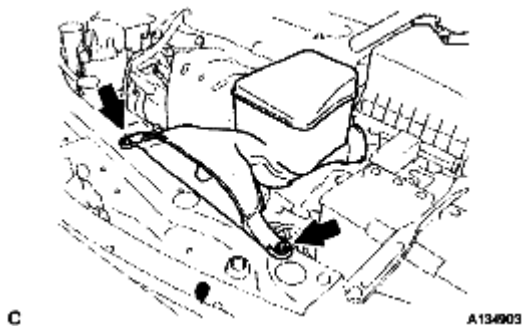


Fig. 323: Locating Clamp And Air Cleaner Inlet

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

79. INSTALL V-RIBBED BELT (See INSTALLATION)

80. INSTALL COWL TOP PANEL OUTER SUB-ASSEMBLY (See INSTALLATION)

81. INSTALL WINDSHIELD WIPER LINK ASSEMBLY

HINT:

See INSTALLATION .

82. INSTALL FRONT WHEEL

Torque: 103 N*m (1,050 kgf*cm, 76 ft.*lbf)

83. ADD ENGINE OIL

84. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

Torque: 6.9 N*m (70 kgf*cm, 61 in.*lbf)

85. BLEED CLUTCH LINE (for Manual Transaxle) (See INSTALLATION)

86. ADD ENGINE COOLANT (See ON-VEHICLE INSPECTION)

87. ADD MANUAL TRANSAXLE OIL (for Manual Transaxle) (See INSTALLATION)

88. ADD AUTOMATIC TRANSAXLE FLUID (for Automatic Transaxle) (See INSTALLATION)

89. ADD POWER STEERING FLUID

90. BLEED POWER STEERING FLUID (See BLEEDING)

91. CHECK FOR FUEL LEAKS (See ON-VEHICLE INSPECTION)

92. CHECK FOR ENGINE OIL LEAKS

93. CHECK FOR ENGINE COOLANT LEAKS (See ON-VEHICLE INSPECTION)

94. CHECK FOR EXHAUST GAS LEAKS

95. CHECK SHIFT LEVER POSITION (See ON-VEHICLE INSPECTION)

96. ADJUST FRONT WHEEL ALIGNMENT

HINT:

See ADJUSTMENT .

97. CHECK IGNITION TIMING (See INSPECTION)

98. CHECK ENGINE IDLE SPEED (See INSPECTION)

99. INSPECT CO/HC (See INSPECTION)

100. INSTALL FRONT FENDER APRON SEAL RH

101. INSTALL ENGINE UNDER COVER LH

102. INSTALL ENGINE UNDER COVER RH

103. INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY

- a. Install the engine cover with the 2 nuts.

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

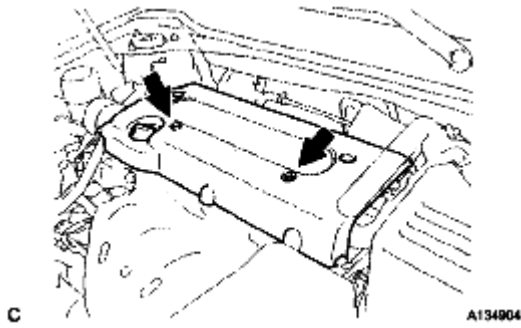


Fig. 324: Locating Engine Cover Sub-Assembly And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

104. CHECK ABS SPEED SENSOR SIGNAL

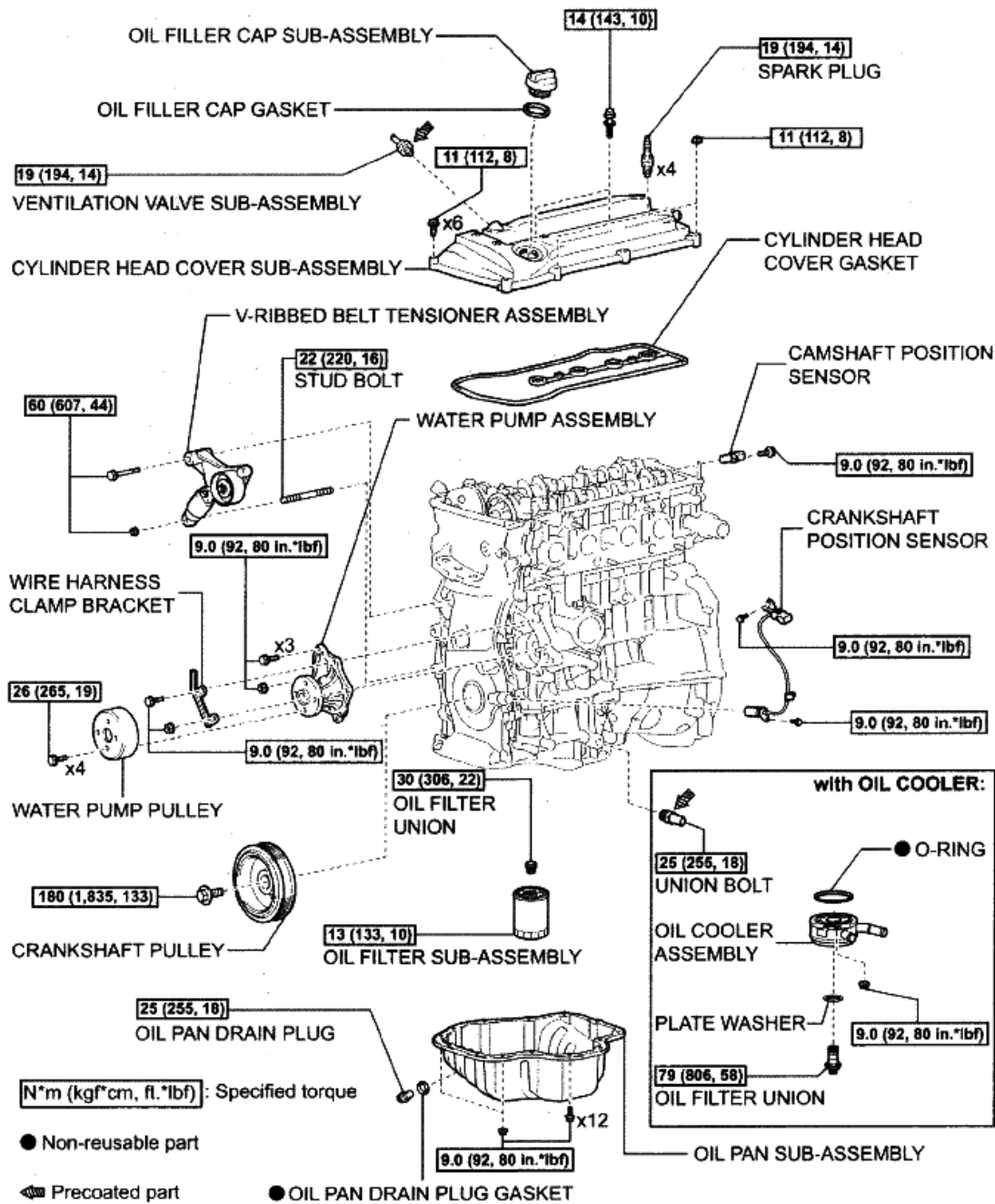
- a. ABS: See **TEST MODE PROCEDURE**
- b. VSC (for BOSCH): See **TEST MODE PROCEDURE**
- c. VSC (for ADVICS): See **TEST MODE PROCEDURE**

ENGINE UNIT

COMPONENTS

2008 Toyota Camry LE

2008 ENGINE Engine Mechanical (2AZ-FE) - Camry



A*35392E01

Fig. 325: Identifying Engine Unit Components With Torque Specifications (1 Of 5)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

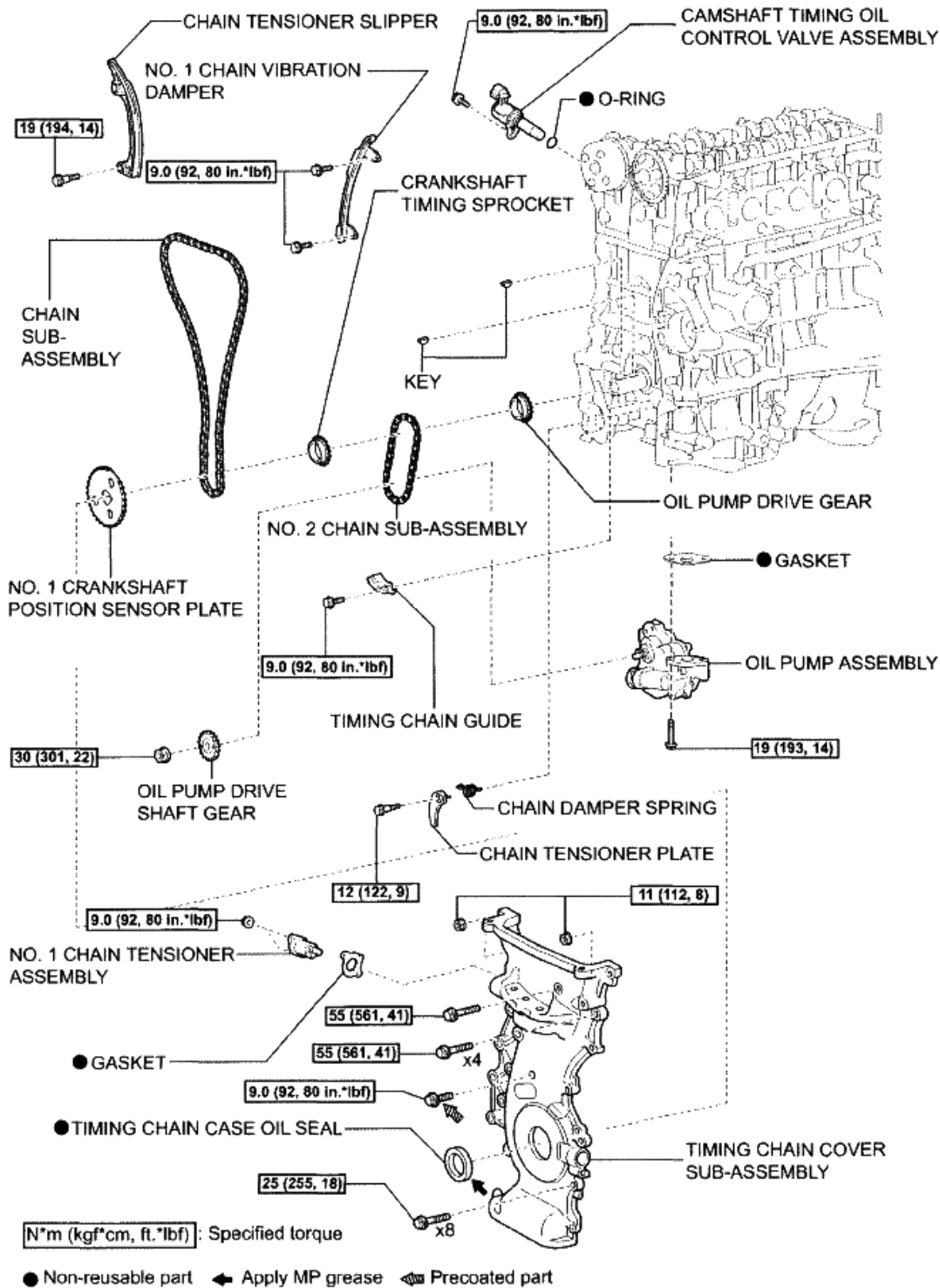
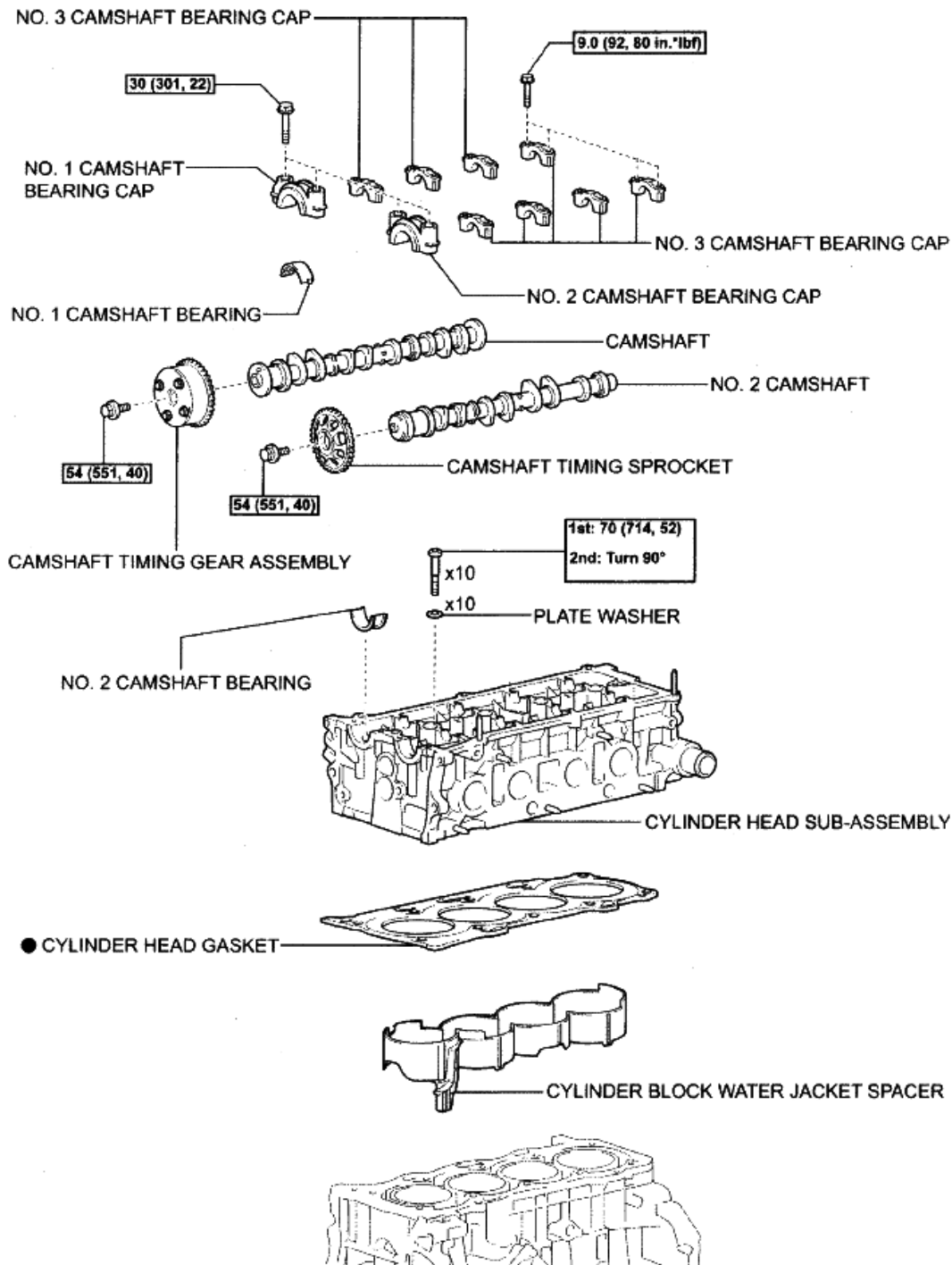


Fig. 326: Identifying Engine Unit Components With Torque Specifications (2 Of 5)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



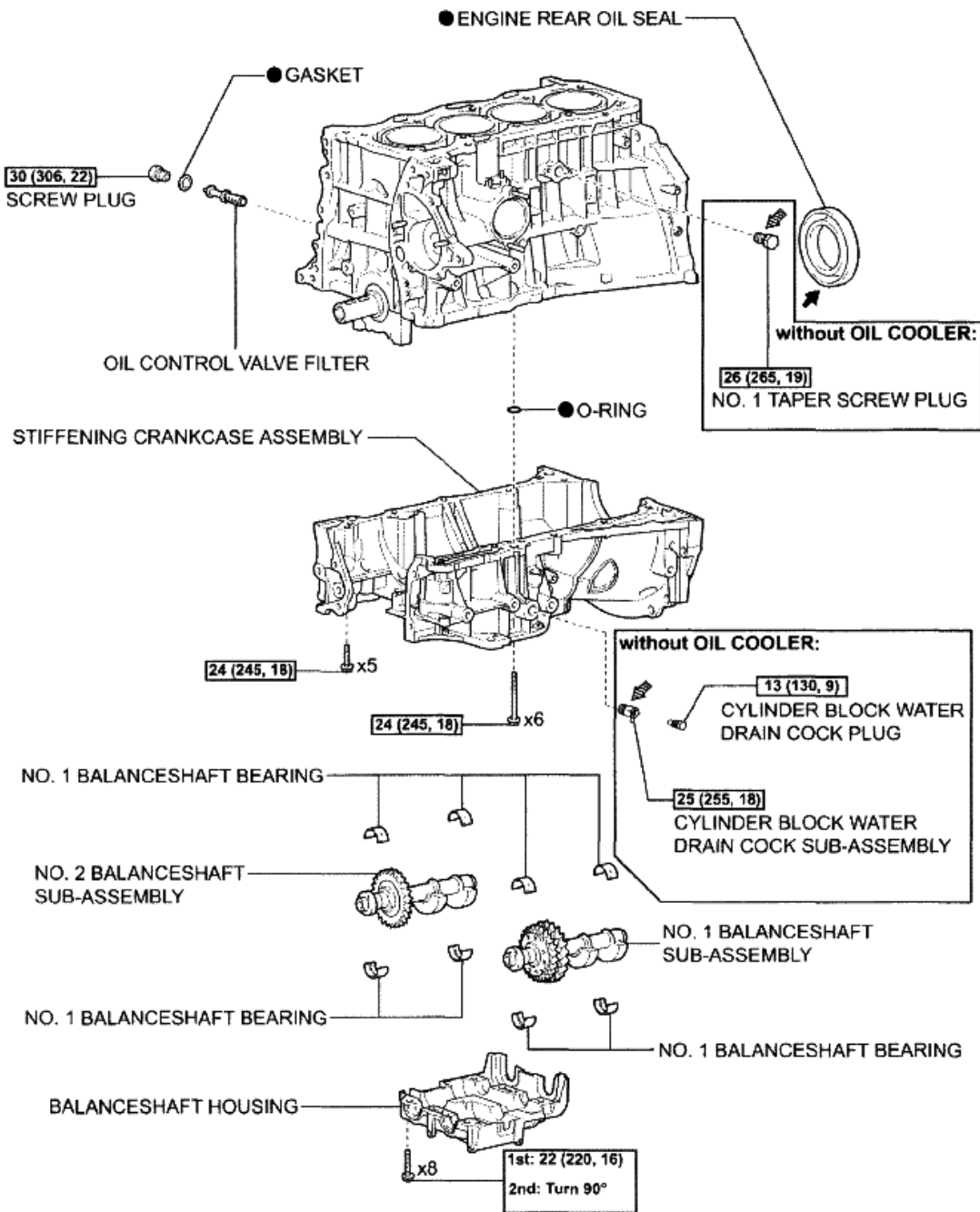
N*m (kgf*cm, ft.*lbf): Specified torque ● Non-reusable part

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Fig. 327: Identifying Engine Unit Components With Torque Specifications (3 Of 5)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2008 Toyota Camry LE

2008 ENGINE Engine Mechanical (2AZ-FE) - Camry

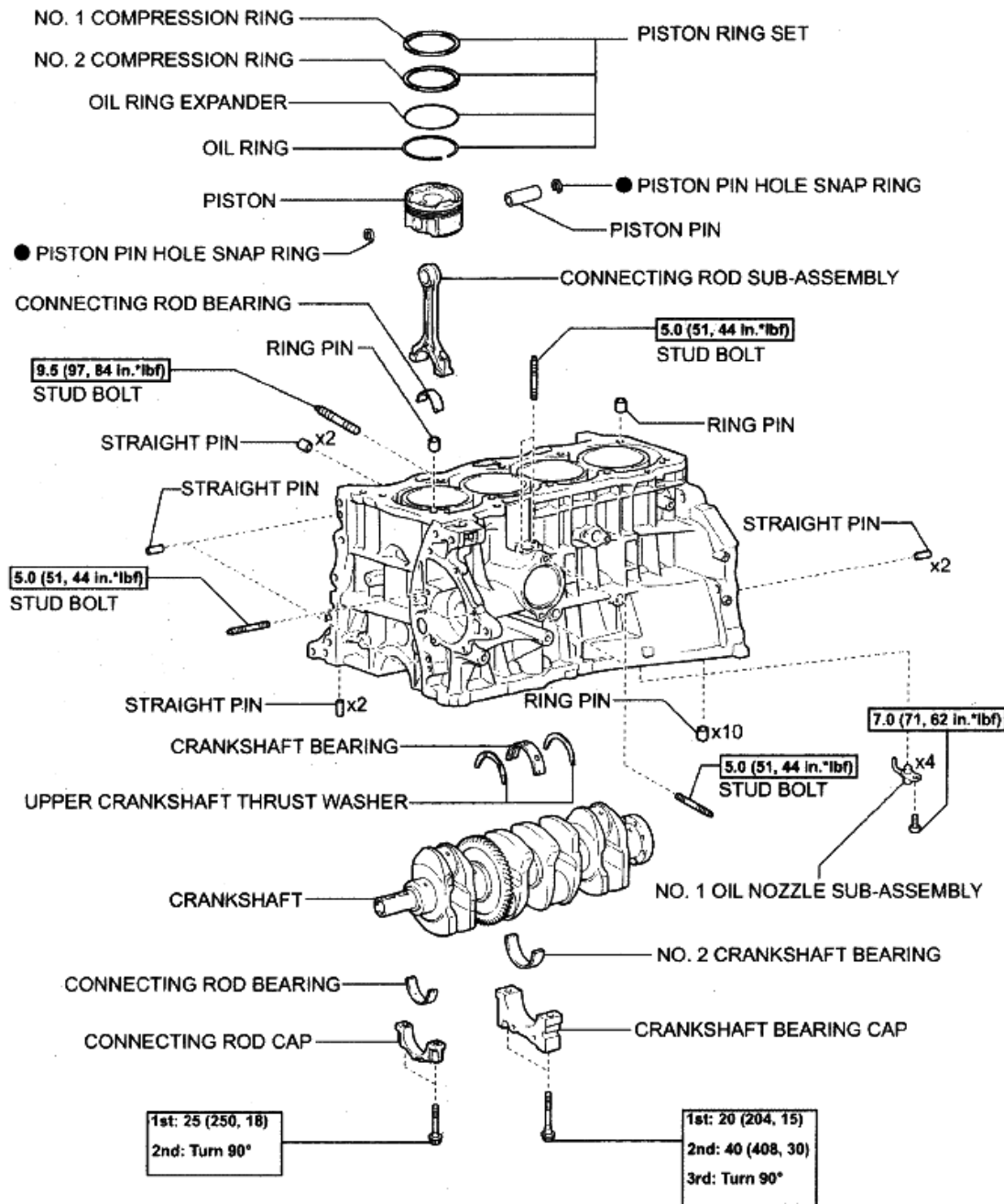


[N*m (kgf*cm, ft.*lbf)]: Specified torque

● Non-reusable part ← Apply MP grease ← Precoated part

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Fig. 328: Identifying Engine Unit Components With Torque Specifications (4 Of 5)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



[N*m (kgf*cm, ft.*lbf)]: Specified torque ● Non-reusable part

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Fig. 329: Identifying Engine Unit Components With Torque Specifications (5 Of 5)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

1. REMOVE OIL FILLER CAP SUB-ASSEMBLY

- Remove the oil filler cap.

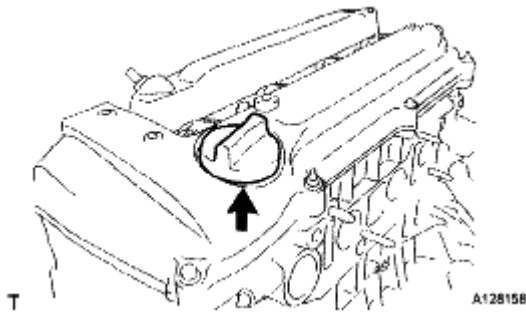


Fig. 330: Locating Oil Filler Cap

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. REMOVE OIL FILLER CAP GASKET

- a. Remove the oil filler cap gasket.

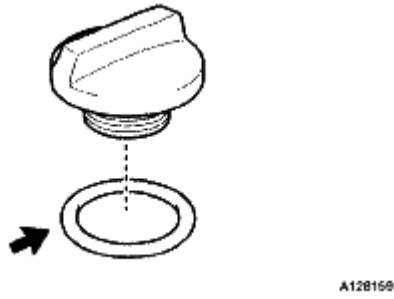


Fig. 331: Locating Gasket To Cap

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. REMOVE VENTILATION VALVE SUB-ASSEMBLY

- a. Remove the ventilation valve.

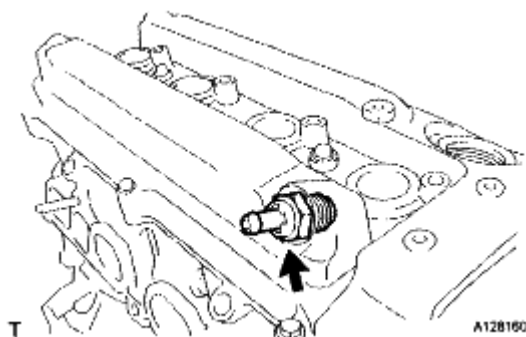


Fig. 332: Locating Ventilation Valve

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. REMOVE SPARK PLUG

- a. Remove the spark plugs.

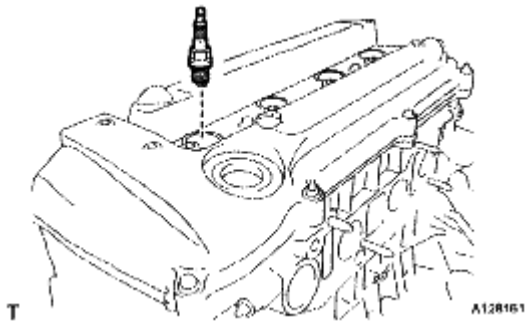


Fig. 333: Identifying Spark Plugs

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. REMOVE OIL FILTER SUB-ASSEMBLY

- a. Using SST, remove the oil filter.

SST 09228-06501

HINT:

Place a container for oil to be drained before removing the oil filter.

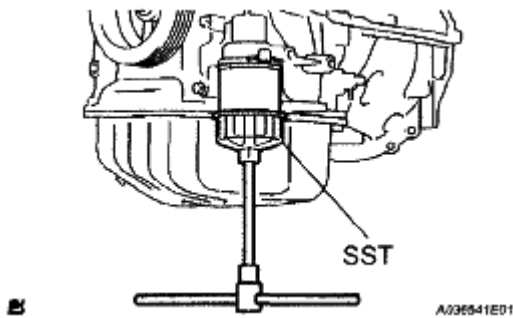


Fig. 334: Identifying Oil Filter With SST

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. REMOVE OIL FILTER UNION (w/o Oil Cooler)

- a. Using a 12 mm hexagon wrench, remove the union.

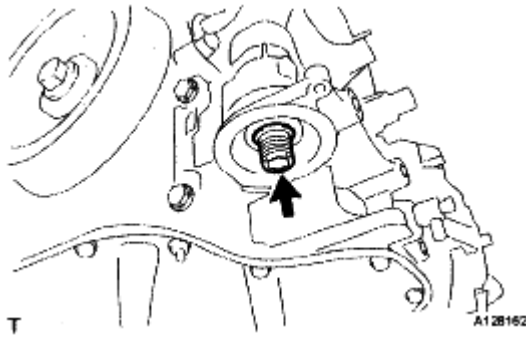


Fig. 335: Locating Oil Filter Union

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. REMOVE OIL COOLER ASSEMBLY (w/ Oil Cooler)

- a. Remove the oil filter union, plate washer, nut, oil cooler and O-ring.
- b. Remove the union bolt.

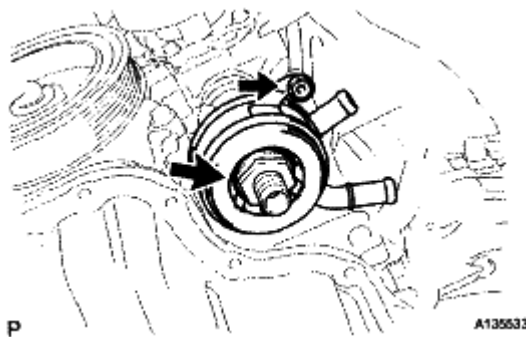


Fig. 336: Identifying Oil Cooler Assembly (W/Oil Cooler)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY (See REMOVAL)

9. REMOVE CYLINDER HEAD COVER GASKET

- a. Remove the cylinder head cover gasket.

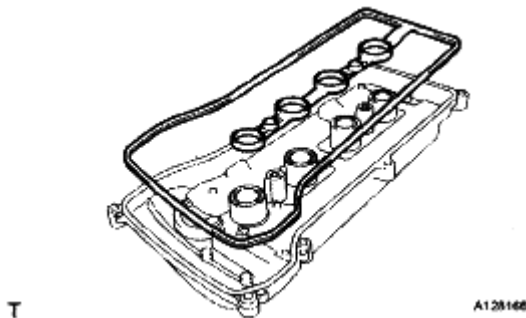
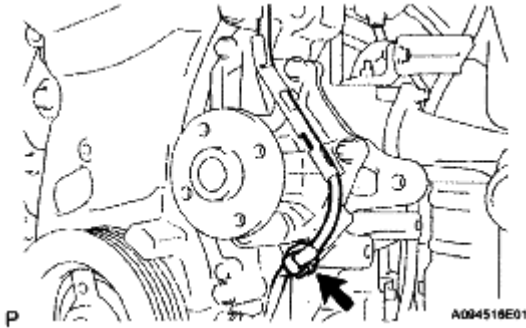


Fig. 337: Identifying Cylinder Head Cover Gasket

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

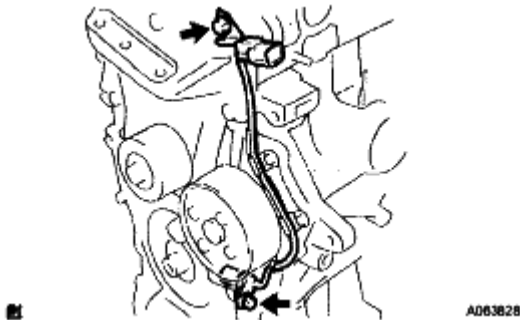
10. REMOVE V-RIBBED BELT TENSIONER ASSEMBLY (See REMOVAL)**11. REMOVE CRANKSHAFT POSITION SENSOR**

- a. Remove the wire harness clamp.

**Fig. 338: Locating Wire Harness Clamp**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Separate the wire harness from the wire harness clamp bracket.
- c. Remove the 2 bolts and sensor.

**Fig. 339: Locating Sensor And Bolts**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. REMOVE CAMSHAFT POSITION SENSOR

- a. Remove the bolt and sensor.

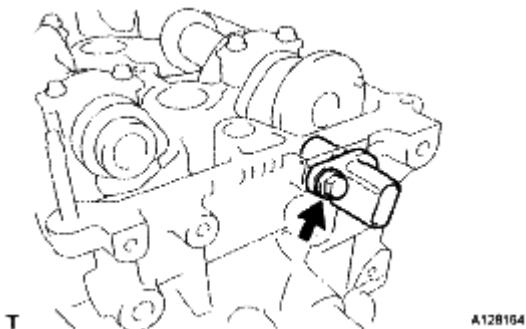


Fig. 340: Locating Camshaft Position Sensor Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. REMOVE CRANKSHAFT PULLEY (See REMOVAL)
14. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (See REMOVAL)
15. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY (See REMOVAL)
16. REMOVE WATER PUMP PULLEY (See REMOVAL)
17. REMOVE WATER PUMP ASSEMBLY (See REMOVAL)
18. REMOVE OIL PAN DRAIN PLUG
 - a. Remove the oil pan drain plug and gasket.

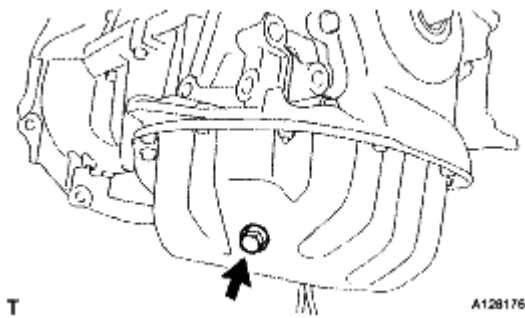


Fig. 341: Locating Oil Pan Drain Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

19. REMOVE OIL PAN SUB-ASSEMBLY (See REMOVAL)
20. REMOVE TIMING CHAIN COVER SUB-ASSEMBLY (See REMOVAL)
21. REMOVE TIMING CHAIN CASE OIL SEAL
 - a. Using a screwdriver and a hammer, remove the oil seal.

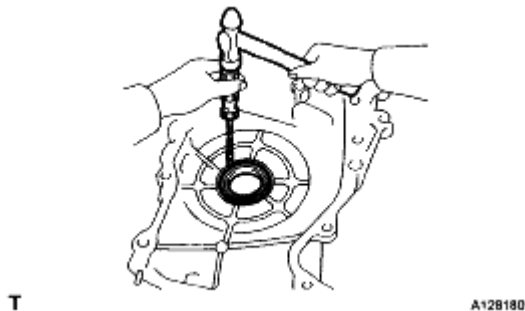


Fig. 342: Removing Timing Chain Case Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

22. REMOVE NO. 1 CRANKSHAFT POSITION SENSOR PLATE (See REMOVAL)
23. REMOVE TIMING CHAIN GUIDE (See REMOVAL)
24. REMOVE CHAIN TENSIONER SLIPPER (See REMOVAL)

25. **REMOVE NO. 1 CHAIN VIBRATION DAMPER** (See REMOVAL)
26. **REMOVE CHAIN SUB-ASSEMBLY** (See REMOVAL)
27. **REMOVE CRANKSHAFT TIMING SPROCKET** (See REMOVAL)
28. **REMOVE NO. 2 CHAIN SUB-ASSEMBLY** (See REMOVAL)
29. **REMOVE KEYS**
 - a. Remove the 2 pulley set keys from the crankshaft.

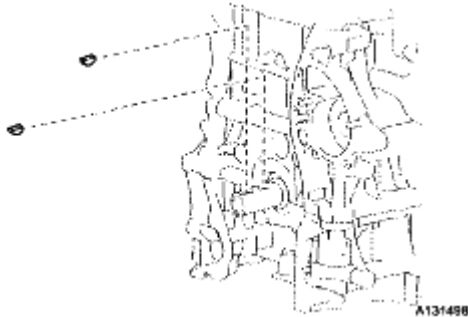


Fig. 343: Identifying Pulley Set Keys

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

30. REMOVE NO. 2 CAMSHAFT

- a. Using several steps, uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration.

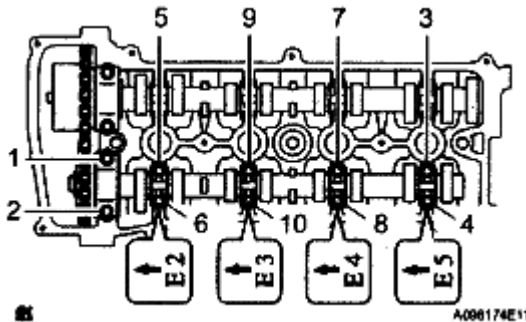


Fig. 344: Identifying Bearing Cap Bolts In Loosening Sequence

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 5 bearing caps.

31. REMOVE CAMSHAFT

- a. Using several steps, uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration.

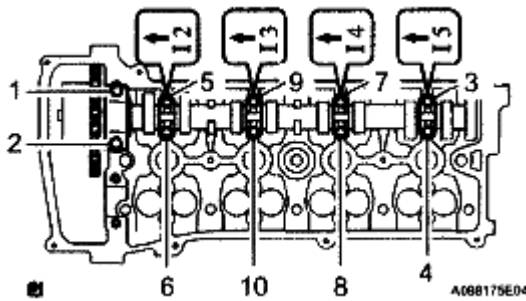


Fig. 345: Identifying Bearing Cap Bolts In Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the 5 bearing caps.

32. REMOVE NO. 1 CAMSHAFT BEARING

Remove the No. 1 camshaft bearing.

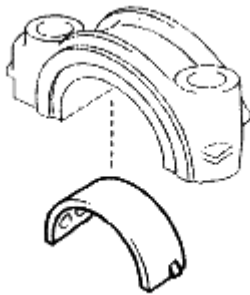


Fig. 346: Identifying Camshaft Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

33. REMOVE NO. 2 CAMSHAFT BEARING

a. Remove the No. 2 camshaft bearing.

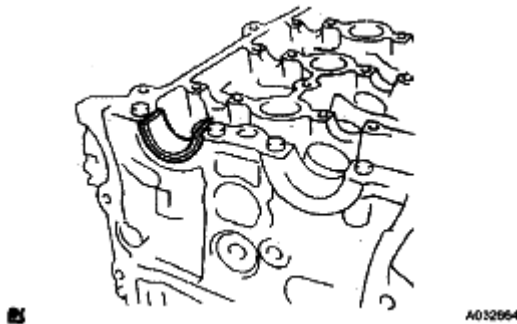


Fig. 347: Identifying Camshaft Bearing Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

34. REMOVE CAMSHAFT TIMING SPROCKET

- a. Clamp the camshaft in a vise.
- b. Remove the flange bolt of the camshaft timing sprocket.

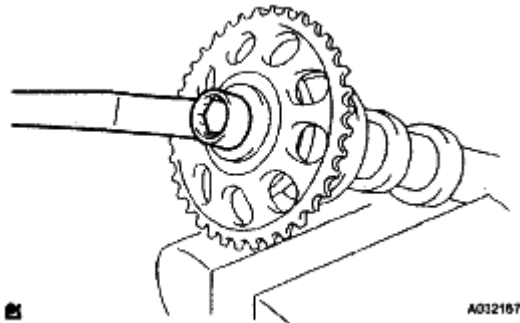


Fig. 348: Identifying Camshaft Timing Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

35. **REMOVE CAMSHAFT TIMING GEAR ASSEMBLY** (See **REMOVAL**)
36. **REMOVE CYLINDER HEAD SUB-ASSEMBLY** (See **REMOVAL**)
37. **REMOVE CYLINDER HEAD GASKET** (See **REMOVAL**)
38. **REMOVE CYLINDER BLOCK WATER JACKET SPACER**
 - a. Using needle-nose pliers, remove the cylinder block water jacket spacer.

NOTE: Be sure to remove the water jacket spacer if turning the cylinder block upside down.

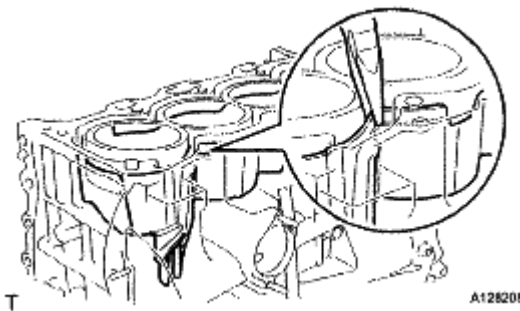
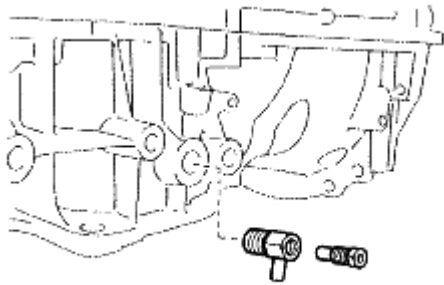


Fig. 349: Identifying Cylinder Block Water Jacket Spacer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

39. **REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY (w/o Oil Cooler)**
 - a. Remove the water drain cock from the stiffening crankcase.
 - b. Remove the water drain cock plug from the water drain cocks.



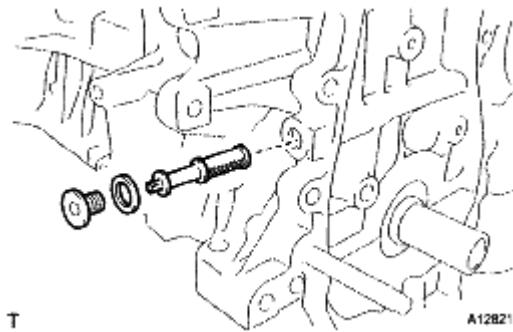
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Fig. 350: Identifying Cylinder Block Water Drain Cock Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

40. REMOVE OIL CONTROL VALVE FILTER

- a. Using an 8 mm socket hexagon wrench, remove the plug and filter.



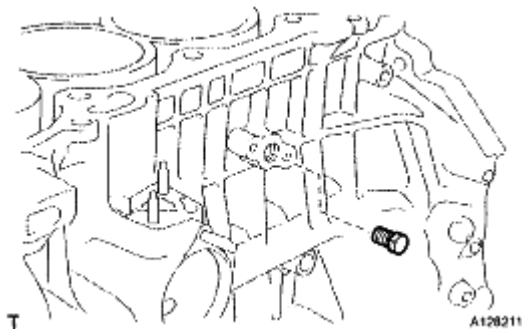
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Fig. 351: Identifying Oil Control Valve Filter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

41. REMOVE NO. 1 TAPER SCREW PLUG (w/o Oil Cooler)

- a. Remove the taper screw plug.



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Fig. 352: Identifying Taper Screw Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

42. REMOVE OIL PUMP ASSEMBLY

- a. Remove the 3 bolts, oil pump and gasket.

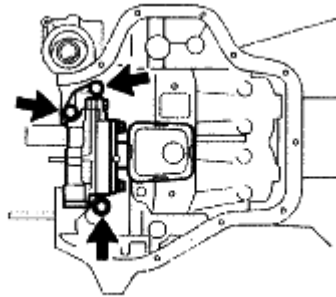


Fig. 353: Locating Oil Pump And Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

43. REMOVE NO. 1 AND NO. 2 BALANCESHAFT SUB-ASSEMBLY

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

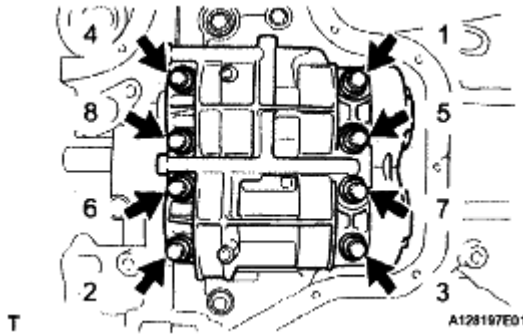


Fig. 354: Loosening Removal Sequence Of Balancershaft Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the No. 1 and No. 2 balancershafts.

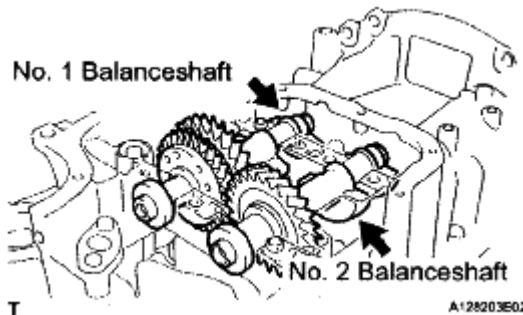


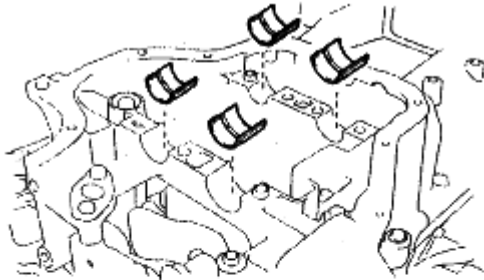
Fig. 355: Locating Balancershafts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

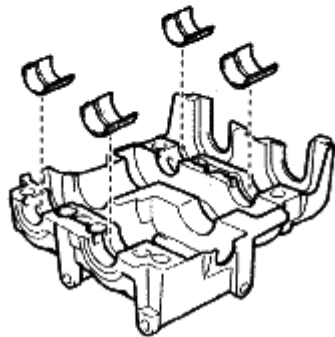
44. REMOVE NO. 1 BALANCESHAFT BEARING

- a. Remove the balancershaft bearings.

Stiffening Crankcase:



Balancershaft Housing:



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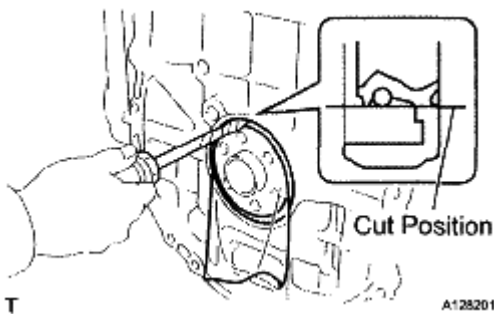
Fig. 356: Identifying Balancershaft Bearings

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

45. REMOVE ENGINE REAR OIL SEAL

- a. Using a knife, cut off the oil seal lip.
- b. Using a screwdriver with its tip taped, pry out the oil seal.

NOTE: After removing the oil seal, check the crankshaft for damage. If it is damaged, smooth the surface with 400-grit sandpaper.



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Fig. 357: Removing Engine Rear Oil Seal

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

46. REMOVE STIFFENING CRANKCASE ASSEMBLY

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

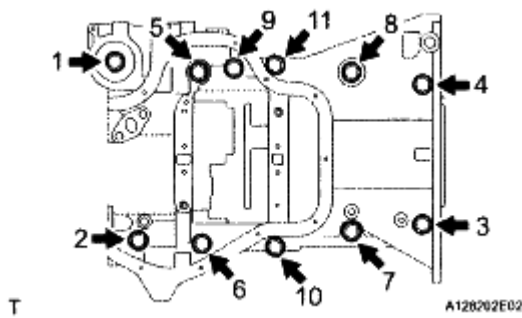


Fig. 358: Locating Stiffening Crankcase Bolt Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a screwdriver, remove the crankcase by prying between the crankcase and cylinder block.

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

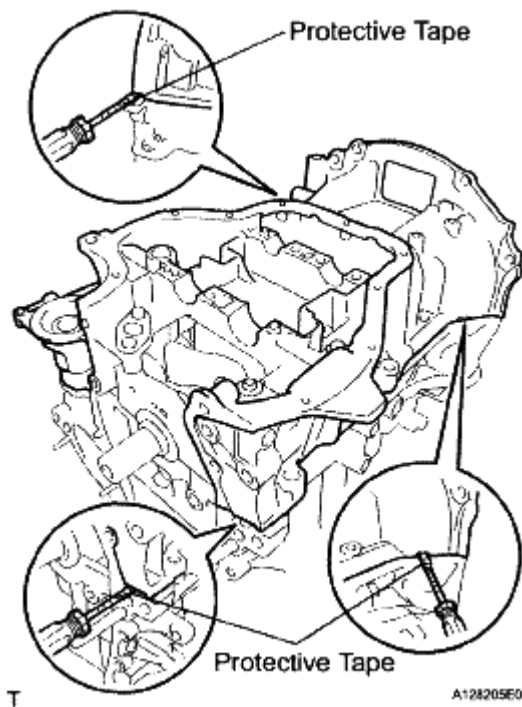


Fig. 359: Prying Between Crankcase And Cylinder Block
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

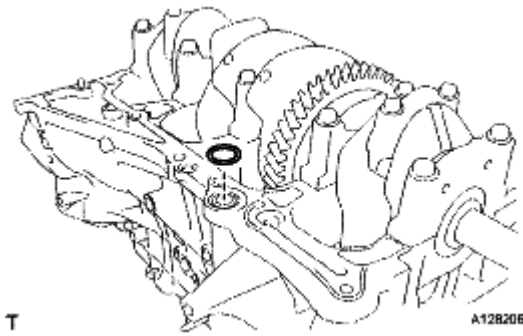


Fig. 360: Identifying O-Ring From Cylinder Block
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

47. REMOVE PISTON SUB-ASSEMBLY WITH CONNECTING ROD

- a. Using a ridge reamer, remove all the carbon from the top of the cylinder.

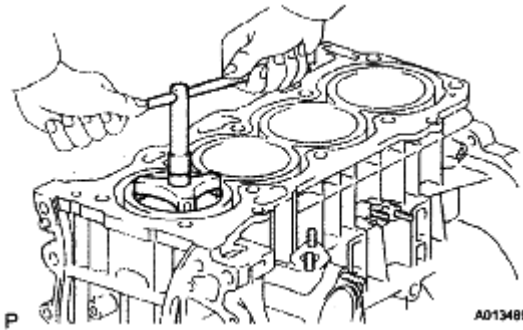


Fig. 361: Removing Carbon From Top Of Cylinder
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Check that the matchmarks on the connecting rod and cap are aligned to ensure the correct reassembly.

HINT:

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

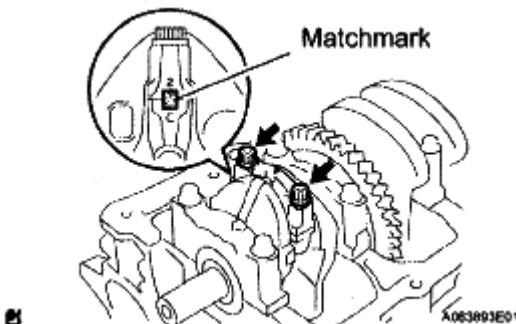


Fig. 362: Aligning Matchmarks On Connecting Rod And Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using a 12 mm socket wrench, uniformly loosen the 2 bolts.

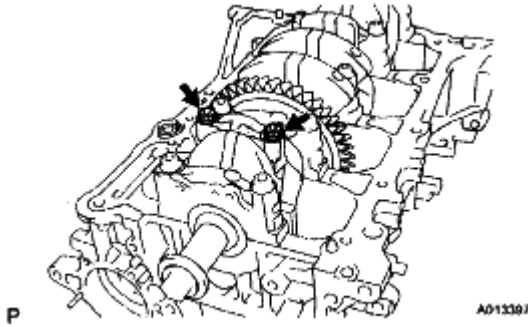


Fig. 363: Locating Connecting Rod Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Using the 2 removed connecting rod cap bolts, remove the connecting rod cap and lower bearing by wiggling the connecting rod cap right and left.

HINT:

Keep the lower bearing inserted in the connecting rod cap.

- e. Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

HINT:

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

48. REMOVE CONNECTING ROD BEARING

- a. Remove the connecting rod bearings.

HINT:

Arrange the removed parts in the correct order.

49. REMOVE PISTON RING SET

- a. Using a piston ring expander, remove the 2 compression rings.
b. Remove the oil ring rail and oil ring expander by hand.

HINT:

Arrange the removed parts in the correct order.

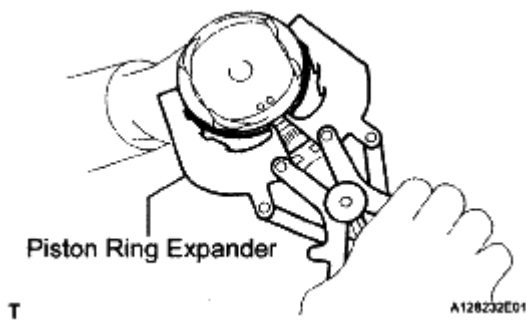


Fig. 364: Removing Piston Ring With Piston Ring Expander
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

50. REMOVE PISTON PIN HOLE SNAP RING

- a. Using a screwdriver, pry out the 2 snap rings.

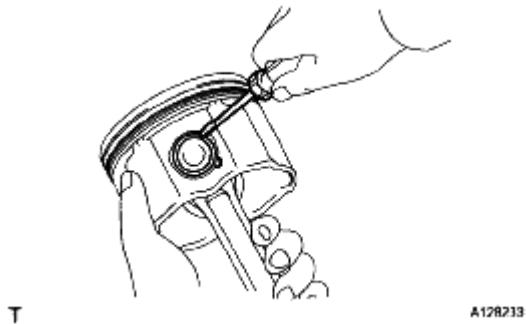


Fig. 365: Removing Piston Pin Hole Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

51. REMOVE PISTON

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

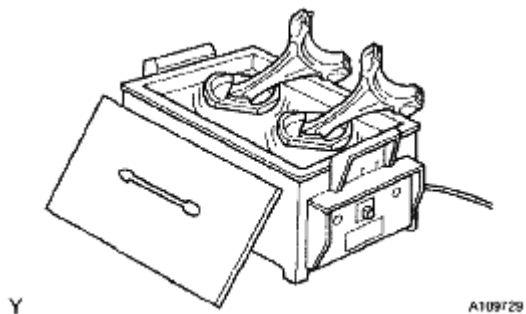


Fig. 366: Heating Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a plastic hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.

HINT:

- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in the correct order.

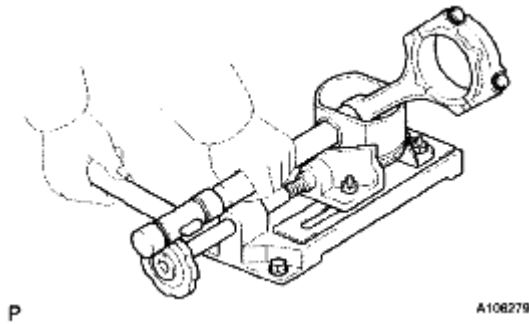


Fig. 367: Removing Connecting Rod
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

52. REMOVE CRANKSHAFT

- Uniformly loosen and remove the 10 main bearing cap bolts in the sequence shown in the illustration.

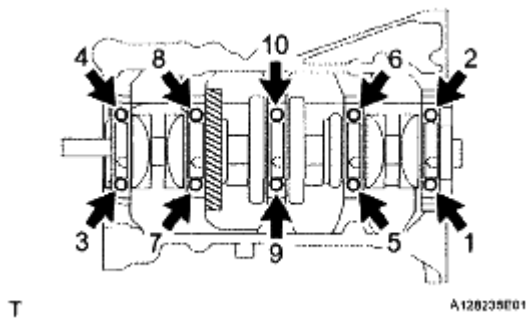


Fig. 368: Identifying Loosening Sequence Of Crankshaft Bearing Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

HINT:

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

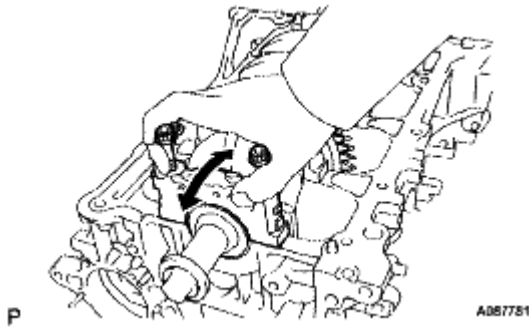


Fig. 369: Removing Main Bearing Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Lift out the crankshaft.

53. REMOVE UPPER CRANKSHAFT THRUST WASHER

a. Remove the upper thrust washers from the cylinder block.

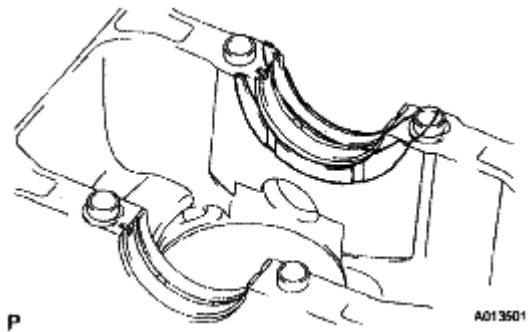


Fig. 370: Identifying Crankshaft Thrust Washer Upper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

54. REMOVE CRANKSHAFT BEARING

a. Remove the 5 upper main bearings from the cylinder block.

HINT:

Arrange the bearings in the correct order.

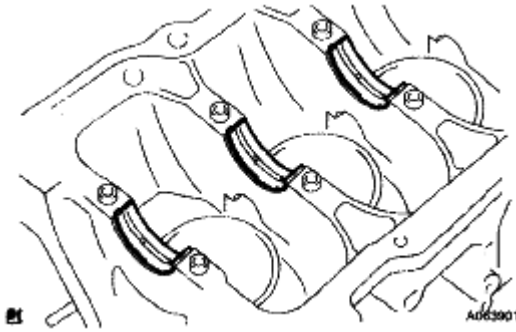


Fig. 371: Identifying Crankshaft Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

55. REMOVE NO. 2 CRANKSHAFT BEARING

- a. Remove the 5 lower main bearings from the 5 main bearing caps.

HINT:

Arrange the bearings in the correct order.

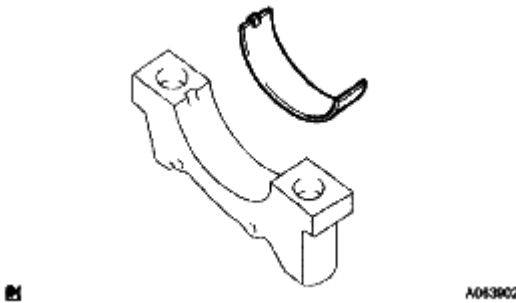


Fig. 372: Identifying Lower Main Bearings And Main Bearing Caps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

56. REMOVE STUD BOLT

57. REMOVE NO. 1 OIL NOZZLE SUB-ASSEMBLY

- a. Using a 5 mm hexagon wrench, remove the bolts and oil nozzles.

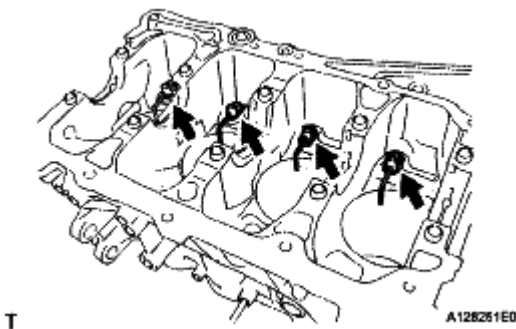


Fig. 373: Locating Oil Nozzles And Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

58. CLEAN CYLINDER BLOCK

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

INSPECTION**1. INSPECT BALANCESHAFT THRUST CLEARANCE**

- Install the balanceshafts (See **INSPECTION**).
- Using a dial indicator, measure the thrust clearance while moving the balanceshaft back and forth.

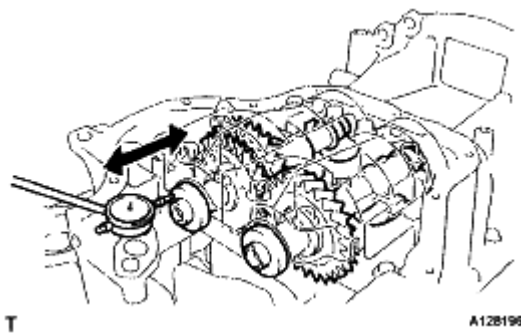
Standard thrust clearance:

0.05 to 0.09 mm (0.0020 to 0.0035 in.)

Maximum thrust clearance:

0.09 mm (0.0035 in.)

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

**Fig. 374: Inspecting Balance Shaft Thrust Clearance**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSPECT BALANCESHAFT OIL CLEARANCE

- Clean each bearing and journal.
- Check each bearing and journal for pitting and scratches.

If a bearing or journal is damaged, replace the bearings. If necessary, replace the balanceshaft.

- Place the No. 1 and No. 2 balanceshafts onto the crankcase.

- d. Lay a strip of Plastigage across each journal.

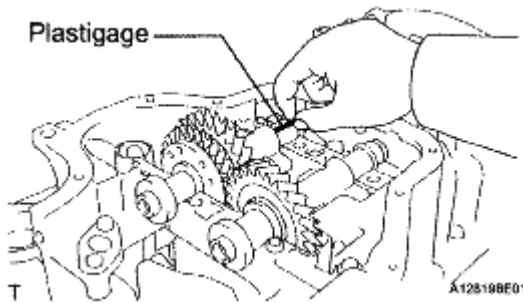


Fig. 375: Laying Strip Of Plastigage Across Journal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Install the balancshaft housing (See INSPECTION).

NOTE: Do not turn the balance shafts.

- f. Remove the balancshafts (See DISASSEMBLY).
g. Measure the Plastigage at its widest point.

Standard oil clearance:

0.004 to 0.049 mm (0.0002 to 0.0019 in.)

Maximum oil clearance:

0.049 mm (0.0019 in.)

NOTE: Remove the Plastigage completely after the measurement.

If the oil clearance is greater than the maximum, replace the bearing. If necessary, replace the balancshaft.

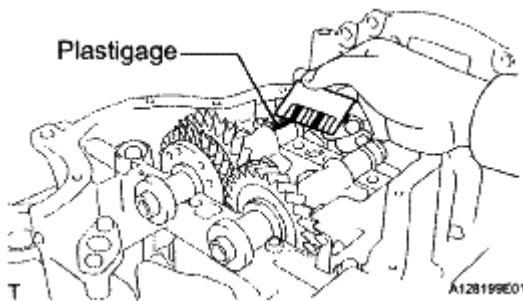


Fig. 376: Measuring Plastigage At Widest Point
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- h. If replacing a bearing, select a new one with the same number.

Standard balancershaft housing journal bore diameter**STANDARD BALANCESHAFT HOUSING JOURNAL BORE SPECIFICATION**

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

Standard bearing center wall thickness**STANDARD BEARING CENTER WALL THICKNESS**

Item	Specified Condition
Mark 1	1.486 to 1.489 mm (0.05850 to 0.05862 in.)
Mark 2	1.490 to 1.492 mm (0.05866 to 0.05874 in.)
Mark 3	1.493 to 1.495 mm (0.0588 to 0.0589 in.)

Standard balancershaft journal diameter**STANDARD BALANCESHAFT JOURNAL DIAMETER**

Item	Journal diameter
Mark 1	22.985 to 23.000 mm (0.9049 to 0.9055 in.)
Mark 2	22.985 to 23.000 mm (0.9049 to 0.9055 in.)
Mark 3	22.985 to 23.000 mm (0.9049 to 0.9055 in.)

- i. Inspect the balancershaft housing bolts.
1. Using vernier calipers, measure the length of the bolts from the seat to the end.

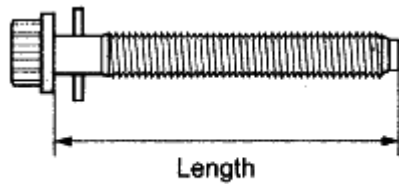
Standard bolt length:

58.3 to 59.7 mm (2.295 to 2.350 in.)

Maximum bolt length:

60.3 mm (2.374 in.)

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



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Fig. 377: Measuring Length Of Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSPECT CHAIN SUB-ASSEMBLY

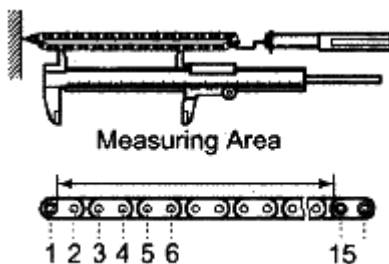
- Pull the chain with a force of 140 N (14.3 kgf, 31.5 lbf) as shown in the illustration.
- Using vernier calipers, measure the length of 15 links.

Maximum chain elongation:

114.5 mm (4.508 in.)

NOTE: Perform the measurement at 3 random places. Use the average of the measurements.

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



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Fig. 378: Measuring Chain Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSPECT NO. 2 CHAIN SUB-ASSEMBLY

- Pull the chain with a force of 140 N (14.3 kgf, 31.5 lbf) as shown in the illustration.
- Using vernier calipers, measure the length of 15 links.

Maximum chain elongation:

102.2 mm (4.024 in.)

NOTE: Perform the measurement at 3 random places. Use the average of the measurements.

If the elongation is greater than the maximum, replace the No. 2 chain.

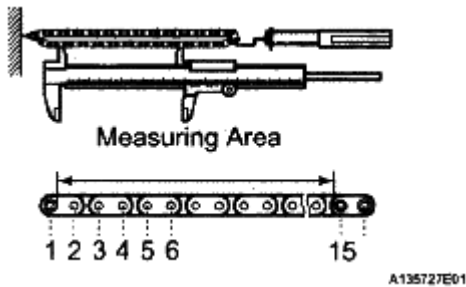


Fig. 379: Measuring Chain Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSPECT OIL PUMP DRIVE GEAR

- Wrap the chain around the sprocket.
- Using vernier calipers, measure the sprocket diameter with the chain wrapped around.

Minimum gear diameter (with chain):

48.2 mm (1.898 in.)

NOTE: The vernier calipers must be in contact with the chain rollers when measuring.

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

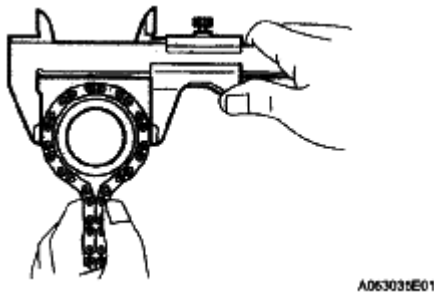


Fig. 380: Measuring Drive Gear Diameter With Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSPECT OIL PUMP DRIVE SHAFT GEAR

- Wrap the chain around the sprocket.
- Using vernier calipers, measure the sprocket diameter with the chain wrapped around.

Minimum gear diameter (with chain):

48.2 mm (1.898 in.)

NOTE: The vernier calipers must be in contact with the chain rollers when measuring.

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

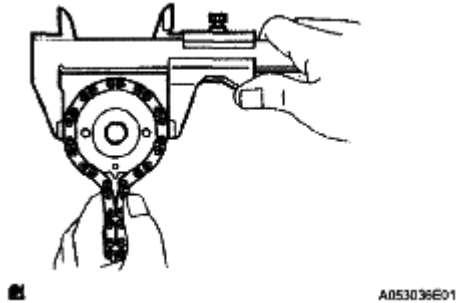


Fig. 381: Inspecting Oil Pump Drive Shaft Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY

- Wrap the chain around the sprocket.
- Using vernier calipers, measure the sprocket diameter with the chain wrapped around.

Minimum gear diameter (with chain):

97.3 mm (3.831 in.)

NOTE: The vernier calipers must be in contact with the chain rollers when measuring.

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

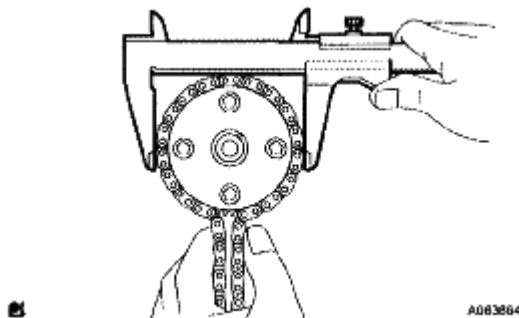


Fig. 382: Inspecting Camshaft Timing Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. INSPECT CAMSHAFT TIMING SPROCKET

- Wrap the chain around the sprocket.

- b. Using vernier calipers, measure the sprocket diameter with the chain wrapped around.

Minimum gear diameter (with chain):

97.3 mm (3.831 in.)

NOTE: **The vernier calipers must be in contact with the chain rollers when measuring.**

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

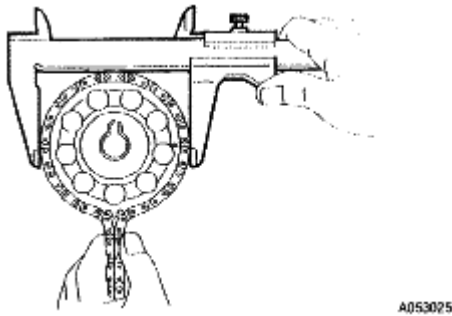


Fig. 383: Inspecting Camshaft Timing Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. INSPECT CRANKSHAFT TIMING GEAR

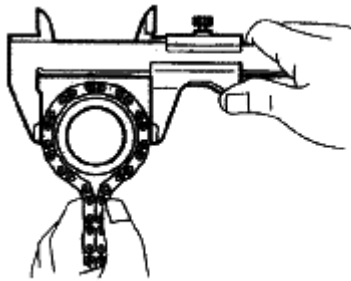
- a. Wrap the chain around the timing sprocket.
b. Using vernier calipers, measure the timing gear diameter with the chain wrapped around.

Minimum gear diameter (with chain):

51.6 mm (2.031 in.)

NOTE: **The vernier calipers must be in contact with the chain rollers when measuring.**

If the gear diameter is less than the minimum, replace the chain sub-assembly and crankshaft timing sprocket.



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Fig. 384: Inspecting Crankshaft Timing Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

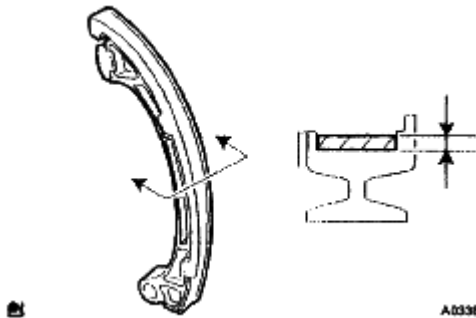
10. INSPECT CHAIN TENSIONER SLIPPER

- a. Using vernier calipers, measure the tensioner slipper wear.

Maximum wear:

1.0 mm (0.039 in.)

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



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Fig. 385: Inspecting Chain Tensioner Slipper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. INSPECT NO. 1 CHAIN VIBRATION DAMPER

- a. Using vernier calipers, measure the vibration damper wear.

Maximum wear:

1.0 mm (0.039 in.)

If the wear is greater than the maximum, replace the No. 1 chain vibration damper.

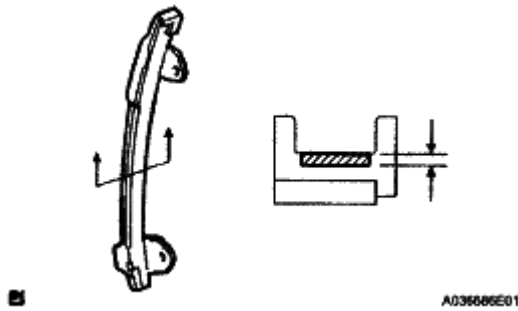


Fig. 386: Inspecting Chain Vibration Damper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. INSPECT CHAIN TENSIONER PLATE

- a. Using vernier calipers, measure the vibration damper wear.

Maximum wear:

0.5 mm (0.020 in.)

If the wear is greater than the maximum, replace the chain tensioner plate.

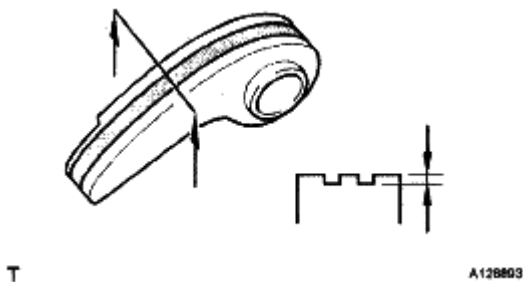


Fig. 387: Inspecting Chain Tensioner Plate
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. INSPECT NO. 1 CHAIN TENSIONER

- a. Check that the plunger moves smoothly when the ratchet pawl is raised with your finger.
- b. Release the ratchet pawl, then check that the plunger is locked in place by the ratchet pawl and does not move when pushed with your finger.

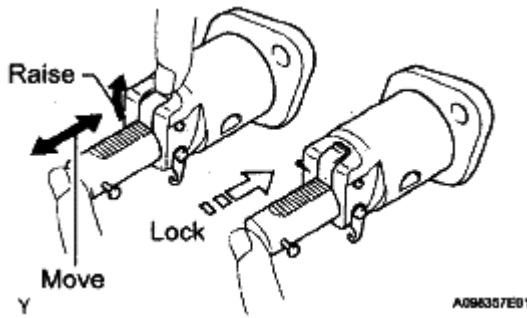


Fig. 388: Inspecting No. 1 Chain Tensioner
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. INSPECT CONNECTING ROD THRUST CLEARANCE

- Install the connecting rod cap (See **INSPECTION**).
- Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance:

0.160 to 0.362 mm (0.0063 to 0.0143 in.)

Maximum thrust clearance:

0.362 mm (0.0143 in.)

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

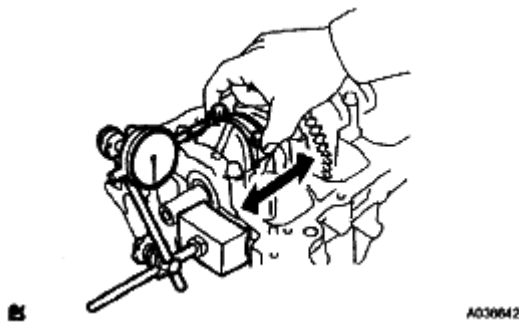


Fig. 389: Inspecting Connecting Rod Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. INSPECT CONNECTING ROD OIL CLEARANCE

- Clean the crank pin and bearing.
- Check the crank pin and bearing for pitting and scratches.
- Lay a strip of Plastigage on the crank pin.

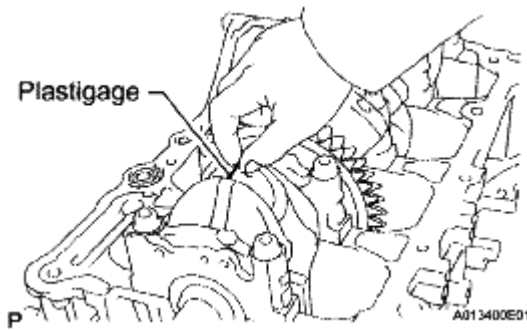


Fig. 390: Identifying Plastigage On Crank Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Check that the front mark of the connecting rod cap is facing forward.

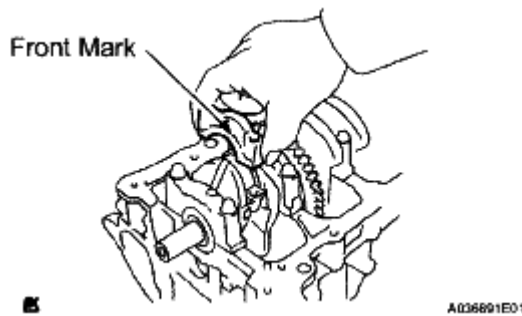


Fig. 391: Checking Front Mark Of Connecting Rod Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Install the connecting rod cap (See INSPECTION).

NOTE: Do not turn the crankshaft.

- f. Remove the 2 bolts and connecting rod cap (See DISASSEMBLY).
g. Measure the Plastigage at its widest point.

Standard oil clearance:

0.032 to 0.063 mm (0.0013 to 0.0025 in.)

Maximum oil clearance:

0.063 mm (0.0025 in.)

NOTE: Completely remove the Plastigage after the measurement.

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

HINT:

If replacing a bearing, replace it with one that has the same number as its respective connecting rod cap. Each bearing's standard thickness is indicated by a 1, 2, or 3 mark on its surface.

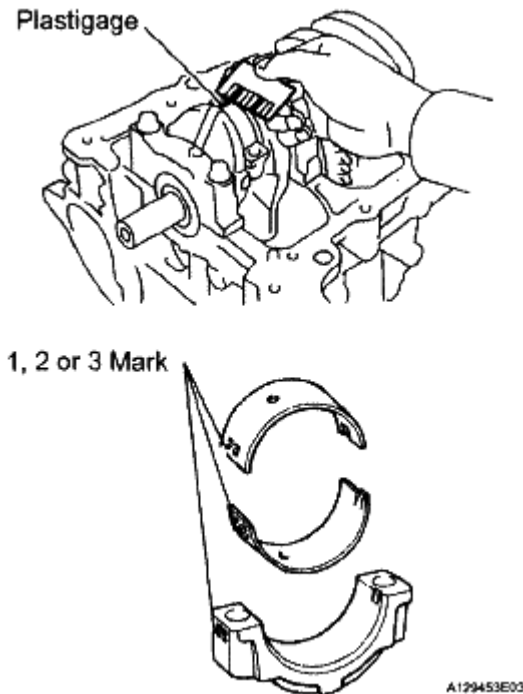


Fig. 392: Measuring Plastigage At Widest Point
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard connecting rod large end bore diameter

STANDARD CONNECTING ROD LARGE END BORE DIAMETER

Mark	Specified Condition
Mark 1	51.000 to 51.007 mm (2.0079 to 2.0082 in.)
Mark 2	51.008 to 51.013 mm (2.0082 to 2.0084 in.)
Mark 3	51.014 to 51.020 mm (2.0084 to 2.0087 in.)

Standard connecting rod bearing thickness

STANDARD CONNECTING ROD BEARING THICKNESS

Mark	Specified Condition
Mark 1	1.485 to 1.488 mm (0.0585 to 0.0586 in.)
Mark 2	1.489 to 1.491 mm (0.0586 to 0.0587 in.)
Mark 3	1.492 to 1.494 mm (0.0587 to 0.0588 in.)

Standard crankshaft pin diameter

STANDARD CRANKSHAFT PIN DIAMETER

Mark	Specified Condition
Mark 1	47.990 to 48.000 (1.8894 to 1.8898 in.)
Mark 2	47.990 to 48.000 (1.8894 to 1.8898 in.)
Mark 3	47.990 to 48.000 (1.8894 to 1.8898 in.)

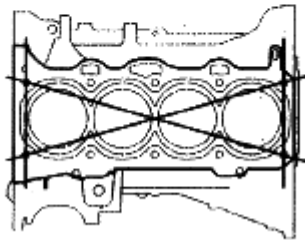
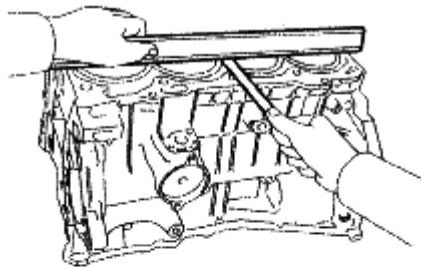
16. INSPECT CYLINDER BLOCK FOR WARPAGE

- a. Using a precision straightedge and feeler gauge, measure the warpage of the surface that is in contact with the cylinder head gasket.

Maximum warpage:

0.05 mm (0.0020 in.)

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



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Fig. 393: Inspecting Cylinder Block For Warpage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. INSPECT CYLINDER BORE

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

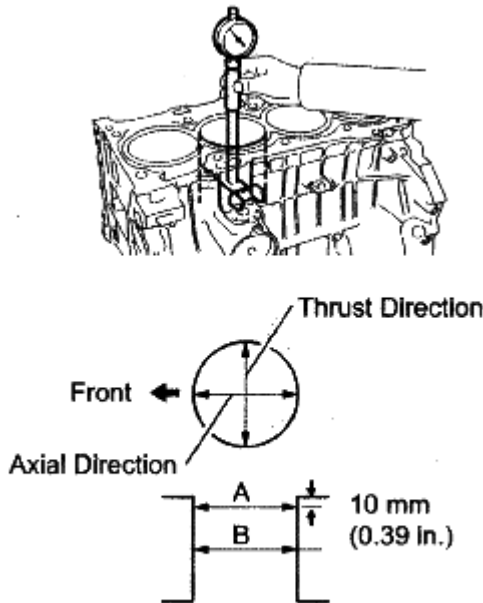
Standard diameter:

88.500 to 88.513 mm (3.4843 to 3.4847 in.)

Maximum diameter:

88.633 mm (3.4894 in.)

If the average diameter of the 4 positions is greater than the maximum, replace the cylinder block.



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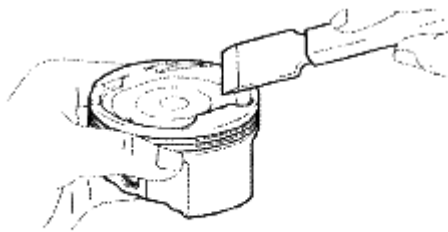
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Fig. 394: Measuring Cylinder Bore Diameter

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. INSPECT PISTON

- Using a gasket scraper, remove the carbon from the piston top.



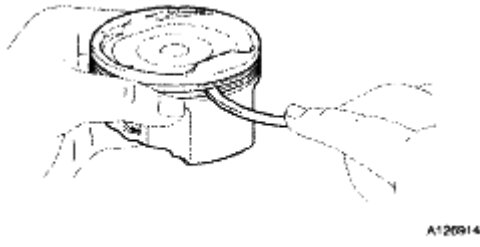
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Fig. 395: Removing Carbon From Piston Top

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

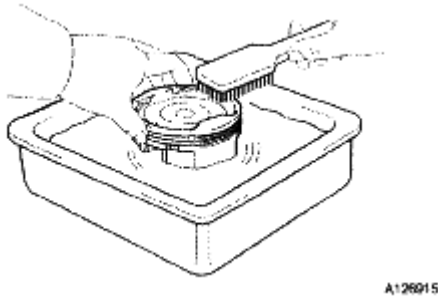
- Using a groove cleaning tool or a broken ring, clean the piston ring grooves.

**Fig. 396: Cleaning Piston Ring Grooves**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using a brush and solvent, thoroughly clean the piston.

NOTE: Do not use a wire brush.

**Fig. 397: Cleaning Piston**

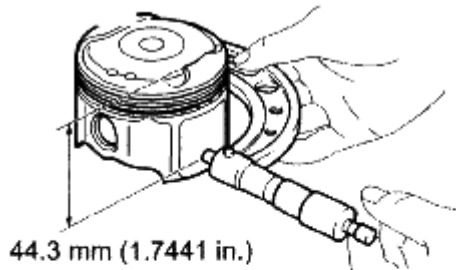
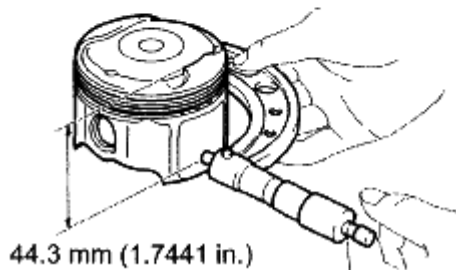
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Using a micrometer, measure the piston diameter at right angles to the piston pin hole, and at the piston 44.3 mm (1.7441 in.) from the piston head.

Standard piston diameter:

88.469 to 88.479 mm (3.4830 to 3.4834 in.)

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

TMC Made:**TMMK Made:**

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Fig. 398: Measuring Piston Diameter**Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.****19. INSPECT PISTON OIL CLEARANCE**

- a. Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:**0.021 to 0.044 mm (0.0008 to 0.0017 in.)****Maximum oil clearance:****0.10 mm (0.0039 in.)**

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

20. INSPECT RING GROOVE CLEARANCE

- a. Using a feeler gauge, measure the clearance between a new piston ring and wall of the ring groove.

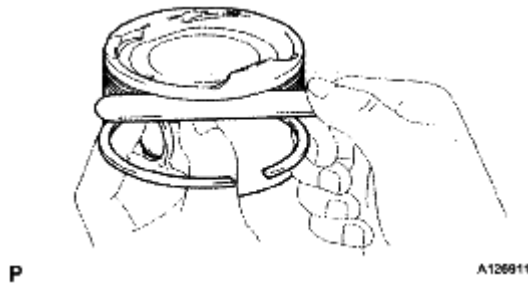


Fig. 399: Measuring Clearance Between Piston Ring And Ring Groove
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard ring groove clearance

RING GROOVE CLEARANCE SPECIFICATION

Item	Specified Condition
No. 1 Ring	0.020 to 0.070 mm (0.0008 to 0.0028 in.)
No. 2 Ring	0.020 to 0.060 mm (0.0008 to 0.0024 in.)
Oil Ring	0.020 to 0.070 mm (0.0008 to 0.0028 in.)

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

21. INSPECT PISTON RING END GAP

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

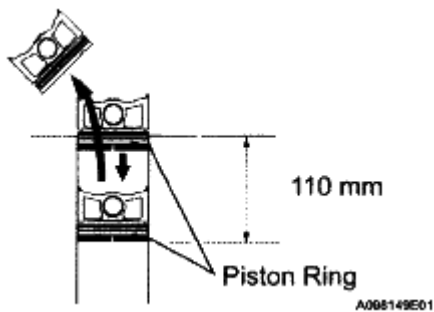
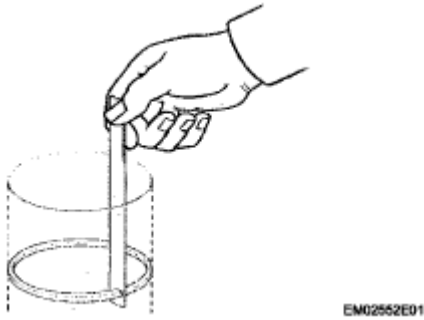


Fig. 400: Identifying Piston Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Using a feeler gauge, measure the end gap.

**Fig. 401: Measuring End Gap**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard end gap**STANDARD END GAP SPECIFICATION**

Item	Specified Condition
No. 1 Ring	0.24 to 0.31 mm (0.0094 to 0.0122 in.)
No. 2 Ring	0.33 to 0.43 mm (0.0130 to 0.0169 in.)
Oil Ring	0.10 to 0.30 mm (0.0040 to 0.0119 in.)

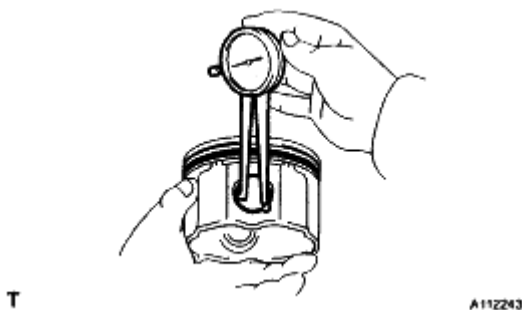
Maximum end gap**MAXIMUM END GAP SPECIFICATION**

Item	Specified Condition
No. 1 Ring	0.89 mm (0.0350 in.)
No. 2 Ring	1.37 mm (0.0539 in.)
Oil Ring	0.73 mm (0.0287 in.)

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

22. INSPECT PISTON PIN OIL CLEARANCE

- a. Using a caliper gauge, measure the piston pin bore diameter.

**Fig. 402: Measuring Piston Pin Bore Diameter**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard piston pin bore diameter:

22.001 to 22.010 mm (0.8662 to 0.8665 in.)

PISTON PIN OIL CLEARANCE SPECIFICATION

Item	Specified Condition
A	22.001 to 22.004 mm (0.8662 to 0.8663 in.)
B	22.005 to 22.007 mm (0.8663 to 0.8664 in.)
C	22.008 to 22.010 mm (0.8665 to 0.8665 in.)

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

- b. Using a micrometer, measure the piston pin diameter.

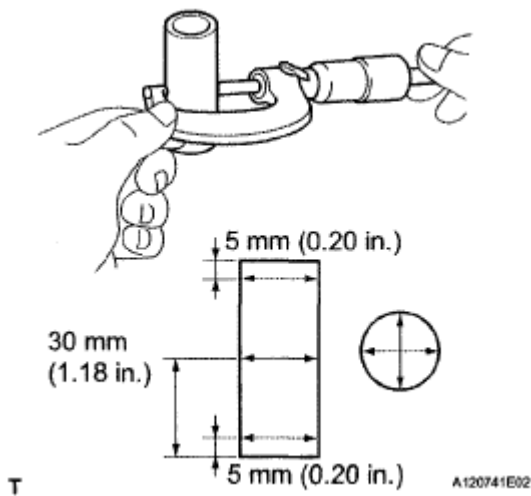


Fig. 403: Measuring Piston Pin Diameter

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard piston pin diameter:

21.997 to 22.006 mm (0.8660 to 0.8664 in.)

PISTON PIN SPECIFICATION

Item	Specified Condition
A	21.997 to 22.000 mm (0.8660 to 0.8661 in.)
B	22.001 to 22.003 mm (0.8662 to 0.8663 in.)
C	22.004 to 22.006 mm (0.8663 to 0.8664 in.)

If the diameter is not as specified, replace the piston pin.

- c. Using a caliper gauge, measure the connecting rod small end bore diameter.

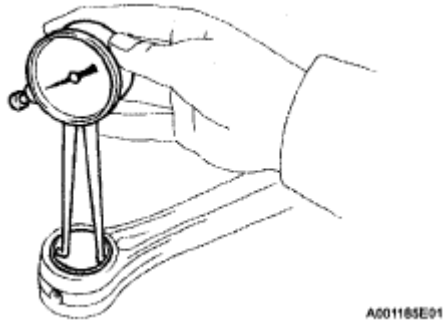


Fig. 404: Measuring Connecting Rod Small End Bore Diameter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard connecting rod small end bore diameter:

22.005 to 22.014 mm (0.8663 to 0.8667 in.)

STANDARD CONNECTING ROD SMALL END BORE DIAMETER

Item	Specified Condition
A	22.005 to 22.008 mm (0.8663 to 0.8665 in.)
B	22.009 to 22.011 mm (0.8665 to 0.8666 in.)
C	22.012 to 22.014 mm (0.8666 to 0.8667 in.)

If the diameter is not as specified, replace the connecting rod.

- d. Subtract the piston pin diameter measurement from the piston pin bore diameter measurement.

Standard oil clearance:

0.001 to 0.007 mm (0.00004 to 0.0003 in.)

Maximum oil clearance:

0.010 mm (0.0004 in.)

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

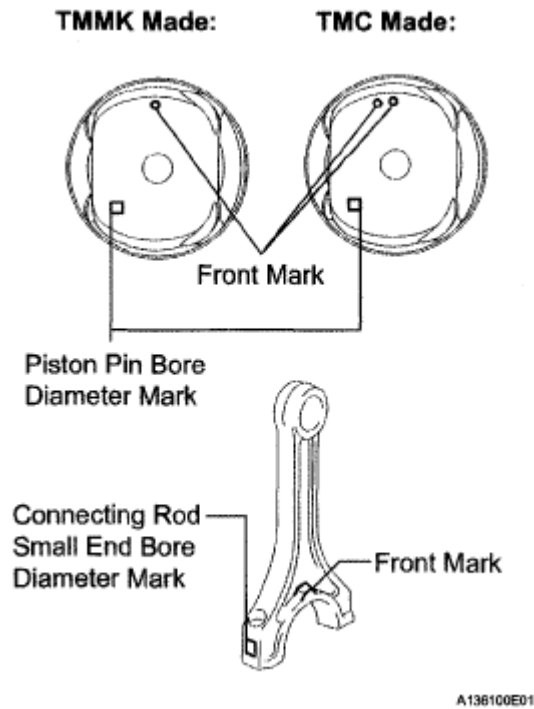


Fig. 405: Identifying Piston Pin Bore Mark And Connecting Rod Bore Mark Location
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Subtract the piston pin diameter measurement from the connecting rod small end bore diameter measurement.

Standard oil clearance:

0.005 to 0.011 mm (0.0002 to 0.0004 in.)

Maximum oil clearance:

0.011 mm (0.0004 in.)

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

23. INSPECT CONNECTING ROD BOLT

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

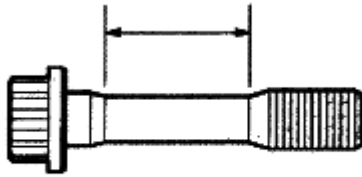
Standard diameter:

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 the minimum, replace the connecting rod bolt.



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Fig. 406: Identifying Connecting Rod Bolt Dimension

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

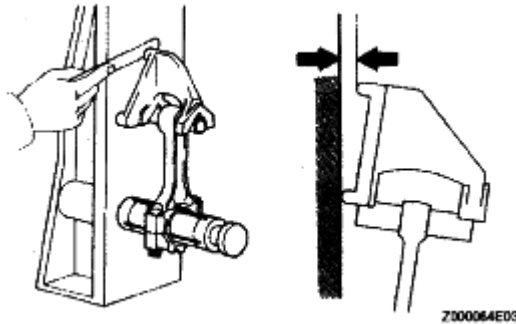
24. INSPECT CONNECTING ROD SUB-ASSEMBLY

- a. Using a connecting rod aligner and feeler gauge, check the connecting rod alignment.
 1. Check for misalignment

Maximum misalignment:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If the misalignment is greater than the maximum, replace the connecting rod.



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Fig. 407: Checking Connecting Rod Alignment

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Check for twist.

Maximum twist:

0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

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

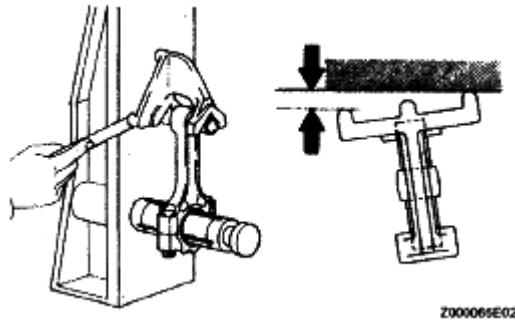


Fig. 408: Checking For Twist

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

25. INSPECT CRANKSHAFT

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

Maximum circle runout:

0.03 mm (0.0012 in.)

If the taper and distortion are greater than the maximum, replace the crankshaft.

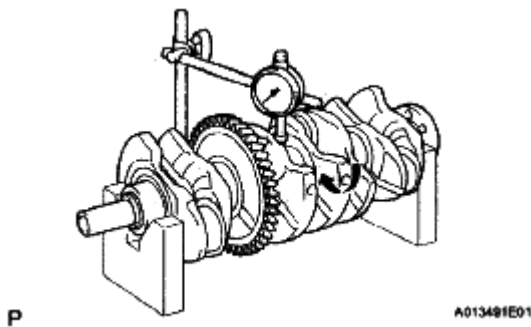


Fig. 409: Measuring Circle Runout

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Standard diameter:

54.988 to 55.000 mm (2.1649 to 2.1654 in.)

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

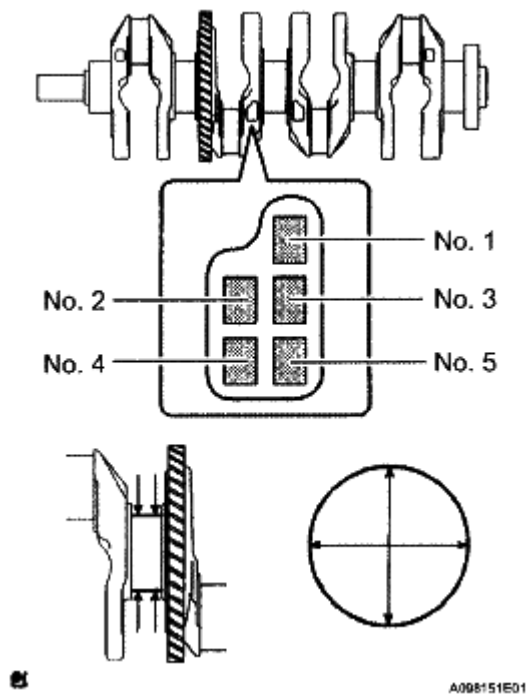


Fig. 410: Measuring Diameter Of Each Main Journal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Check each main journal for taper and distortion as shown in the illustration.

Maximum taper and distortion:

0.003 mm (0.0001 in.)

If the taper and distortion are greater than the maximum, replace the crankshaft.

Standard diameter (Reference)

STANDARD DIAMETER REFERENCE CHART

Mark	Specified Condition
0	54.999 to 55.000 mm (2.1653 to 2.1654 in.)
1	54.997 to 54.998 mm (2.1652 to 2.1653 in.)
2	54.995 to 54.996 mm (2.1652 to 2.1652 in.)
3	54.993 to 54.994 mm (2.1651 to 2.1651 in.)
4	54.991 to 54.992 mm (2.1650 to 2.1650 in.)
5	54.988 to 54.990 mm (2.1649 to 2.1650 in.)

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

Standard diameter:

47.990 to 48.000 mm (1.8894 to 1.8898 in.)

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

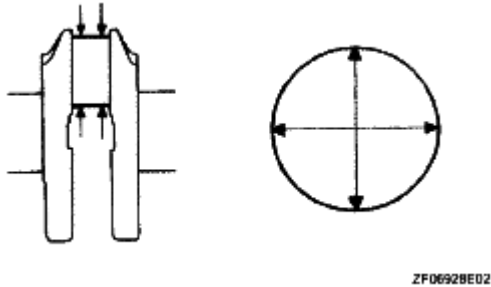


Fig. 411: Measuring Diameter Of Each Crank Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Inspect each crank pin for taper and distortion as shown in the illustration.

Maximum taper and distortion:

0.003 mm (0.0001 in.)

If the taper and distortion are greater than the maximum, replace the crankshaft.

26. INSPECT CRANKSHAFT THRUST CLEARANCE

- a. Install the main bearing cap (See **INSPECTION**).
- b. 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 0.0095 in.)

Maximum thrust clearance:

0.30 mm (0.0118 in.)

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

HINT:

The thrust washer thickness is 1.93 to 1.98 mm (0.0760 to 0.0780 in.).

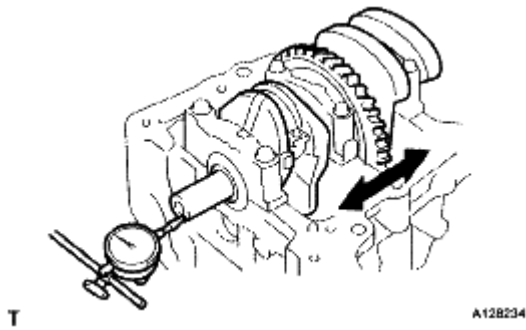


Fig. 412: Inspecting Crankshaft Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

27. INSPECT CRANKSHAFT OIL CLEARANCE

- Check the crank journal and bearing for pitting and scratches.
- Install the crankshaft bearing (See **INSPECTION**).
- Place the crankshaft on the cylinder block.
- Lay a strip of Plastigage across each journal.

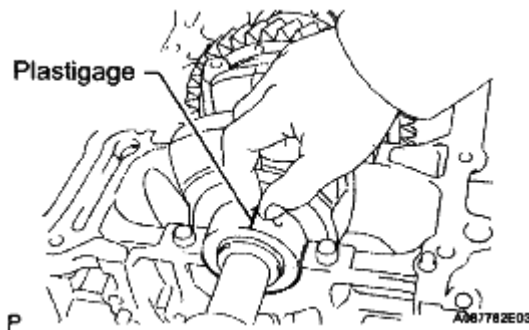


Fig. 413: Laying Strip Of Plastigage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Examine the front marks and numbers and install the bearing caps on the cylinder block.

HINT:

A number is marked on each main bearing cap to indicate the installation position.

- Install the main bearing cap (See **INSPECTION**).

NOTE: Do not turn the crankshaft.

- Remove the main bearing caps (See **DISASSEMBLY**).
- Measure the Plastigage at its widest point.

Standard oil clearance:

0.017 to 0.040 mm (0.0007 to 0.0016 in.)

Maximum oil clearance:

0.060 mm (0.0024 in.)

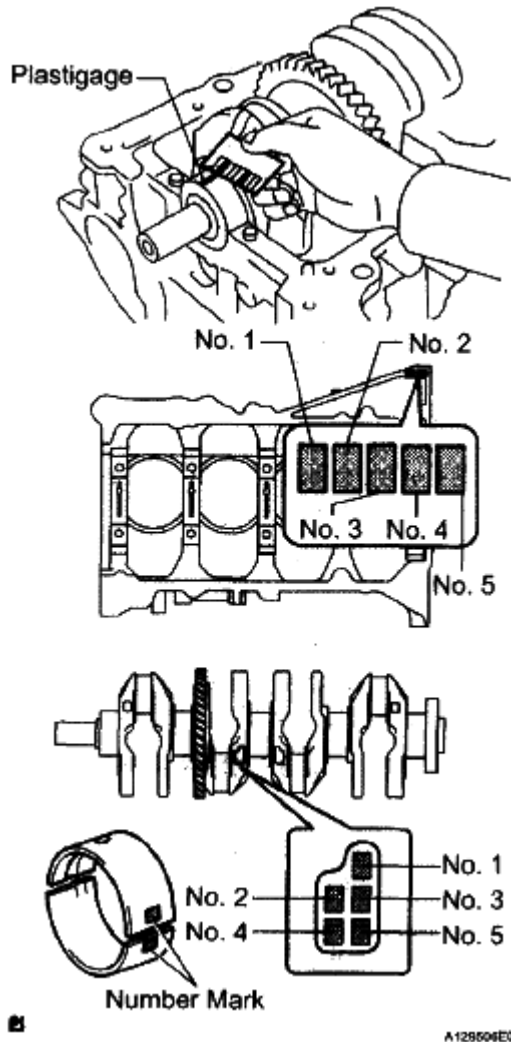


Fig. 414: Measuring Plastigage At Widest Point
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Remove the Plastigage completely after the measurement.

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

HINT:

- If replacing a bearing, select a new one with the same number. If the number of the bearing

cannot be determined, calculate the correct bearing number by adding together the numbers imprinted on the cylinder block and crankshaft. Then select a new bearing with the calculated number. There are 4 sizes of standard bearings, marked "1", "2", "3" and "4" accordingly.

- EXAMPLE: Cylinder block "3" + Crankshaft "511" = Total number 8 (Use bearing "3")

CYLINDER BLOCK JOURNAL SPECIFICATION

Cylinder block + Crankshaft	0 to 2	3 to 5	6 to 8	9 to 11
Bearing to be used	"1"	"2"	"3"	"4"

Standard cylinder block journal bore diameter

STANDARD CYLINDER BLOCK JOURNAL BORE DIAMETER

Mark	Specified Condition
0	59.000 to 59.002 mm (2.3228 to 2.3229 in.)
1	59.003 to 59.004 mm (2.3230 to 2.3230 in.)
2	59.005 to 59.006 mm (2.3230 to 2.3231 in.)
3	59.007 to 59.009 mm (2.3231 to 2.3232 in.)
4	59.010 to 59.011 mm (2.3232 to 2.3233 in.)
5	59.012 to 59.013 mm (2.3233 to 2.3234 in.)
6	59.014 to 59.016 mm (2.3234 to 2.3235 in.)

Standard crankshaft journal diameter

STANDARD CRANKSHAFT JOURNAL DIAMETER

Mark	Specified Condition
0	54.999 to 55.000 mm (2.1653 to 2.1654 in.)
1	54.997 to 54.998 mm (2.1652 to 2.1653 in.)
2	54.995 to 54.996 mm (2.1652 to 2.1652 in.)
3	54.993 to 54.994 mm (2.1651 to 2.1651 in.)
4	54.991 to 54.992 mm (2.1650 to 2.1650 in.)
5	54.988 to 54.990 mm (2.1649 to 2.1650 in.)

Standard bearing center wall thickness

STANDARD BEARING CENTER WALL THICKNESS

Mark	Specified Condition
1	1.993 to 1.996 mm (0.0785 to 0.0786 in.)
2	1.997 to 1.999 mm (0.0786 to 0.0787 in.)
3	2.000 to 2.002 mm (0.0787 to 0.0788 in.)
4	2.003 to 2.005 mm (0.0789 to 0.0789 in.)

28. INSPECT CRANKSHAFT BEARING CAP SET BOLT

- a. Using vernier calipers, measure the tension portion diameter of the bolts.

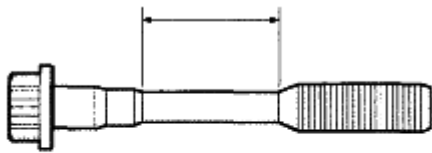
Standard diameter:

7.3 to 7.5 mm (0.287 to 0.295 in.)

Minimum diameter:

7.2 mm (0.284 in.)

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



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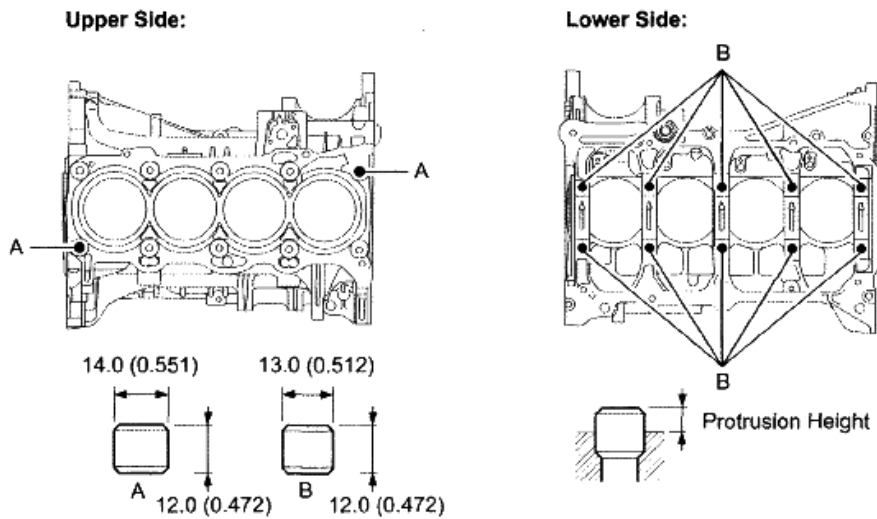
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Fig. 415: Identifying Bearing Cap Bolt Dimension
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REASSEMBLY

1. INSTALL RING PIN

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



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Fig. 416: Identifying Ring Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard protrusion

STANDARD PROTRUSION REFERENCE

Item	Protrusion
Pin A	6 mm (0.236 in.)
Pin B	5 mm (0.197 in.)

2. INSTALL STUD BOLT

- Install the stud bolts as shown in the illustration.

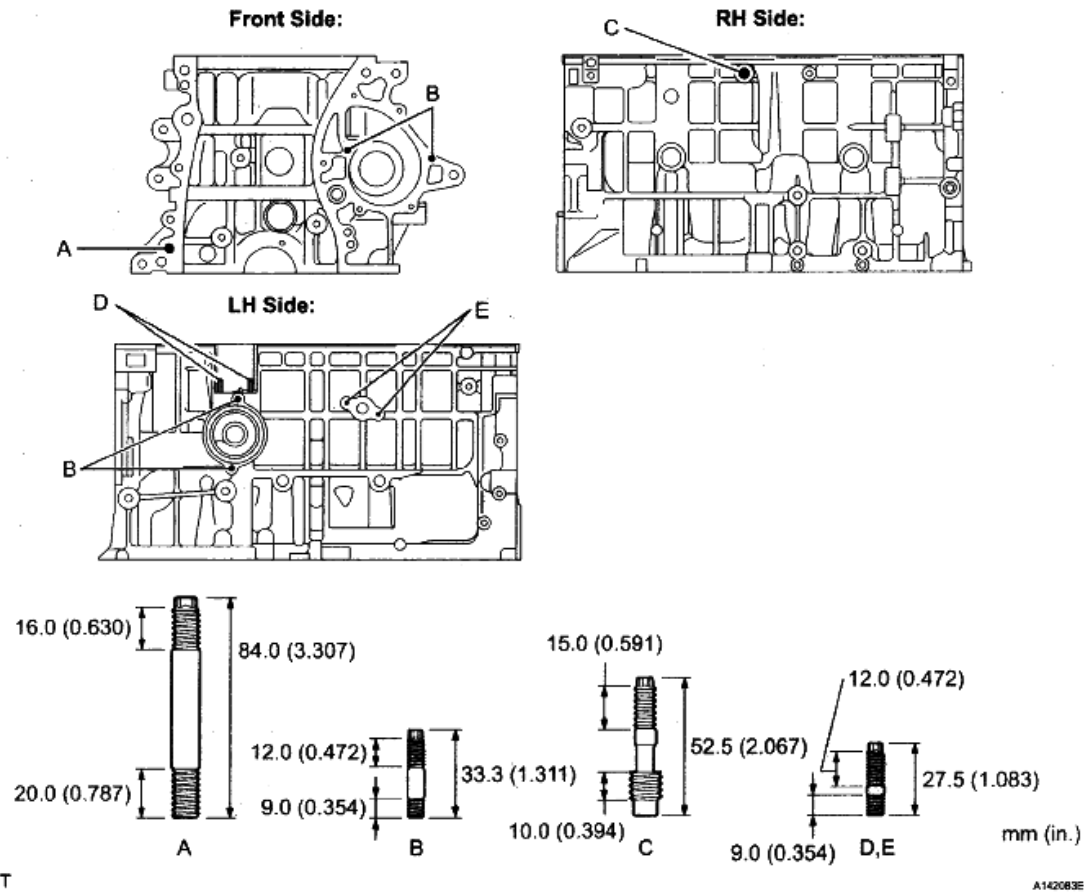


Fig. 417: Identifying Stud Bolt Dimension

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque:

Stud Bolt A

5.0 N*m (51 kgf*cm, 44 in.*lbf)

Stud Bolt B

22 N*m (220 kgf*cm, 16 ft.*lbf)

Stud Bolt C

9.5 N*m (97 kgf*cm, 84 in.*lbf)

Stud Bolt D

5.0 N*m (51 kgf*cm, 44 in.*lbf)

Stud Bolt E (with oil cooler)

5.0 N*m (51 kgf*cm, 44 in.*lbf)

3. INSTALL STRAIGHT PIN

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

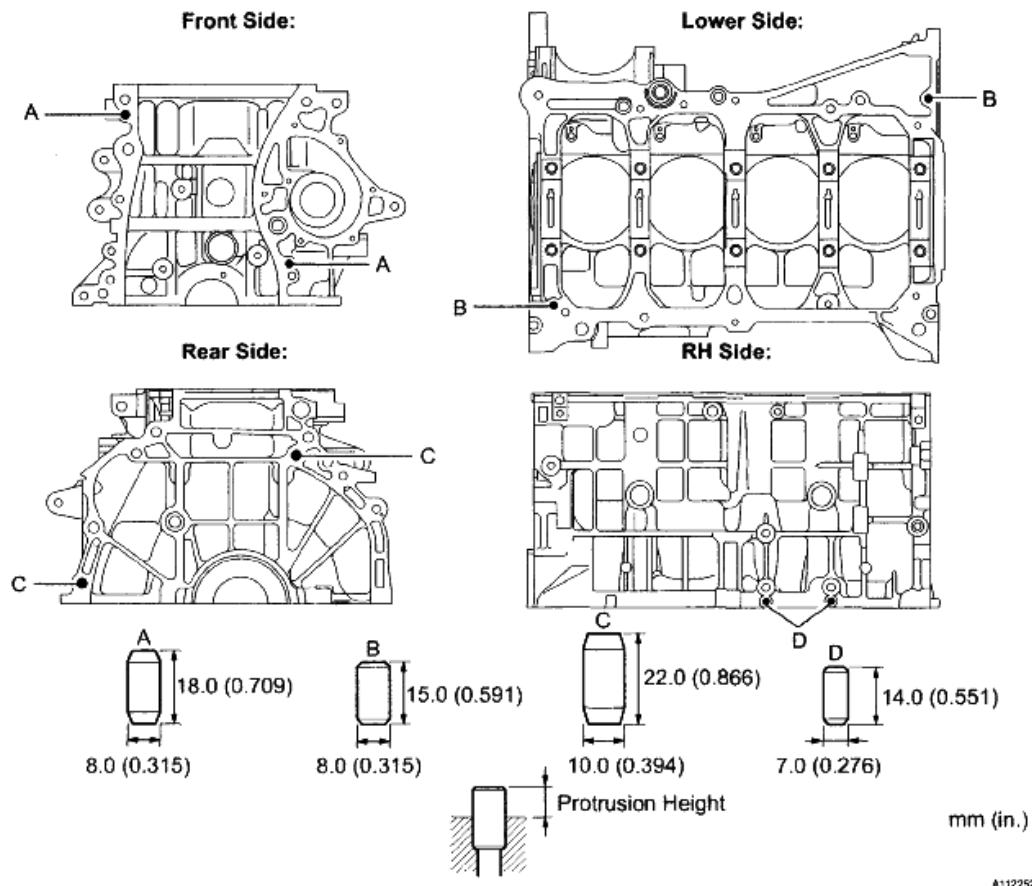


Fig. 418: Identifying Straight Pin Dimension
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard protrusion

STANDARD PROTRUSION REFERENCE

Item	Protrusion
Pin A	8 mm (0.315 in.)
Pin B	7.5 mm (0.295 in.)
Pin C	12 mm (0.472 in.)
Pin D	5 mm (0.197 in.)

4. INSTALL NO. 1 OIL NOZZLE SUB-ASSEMBLY

- Using a 5 mm hexagon wrench, install the oil nozzles with the bolts.

Torque: 7.0 N*m (71 kgf*cm, 62 in.*lbf)

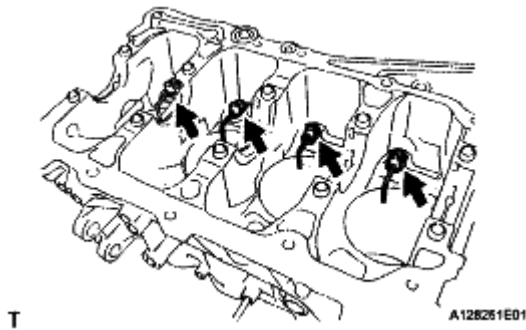


Fig. 419: Locating Oil Nozzles And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSTALL PISTON

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

HINT:

Make sure that the end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.

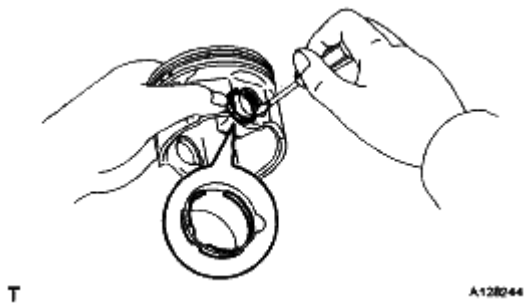


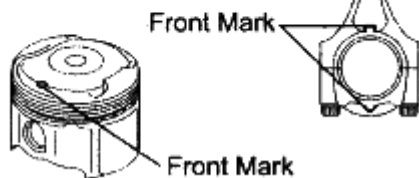
Fig. 420: Installing Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Gradually heat the piston to approximately 80 to 90°C (176 to 194°F).
- c. Align the front marks of the piston and connecting rod, and push in the piston with your thumb.

TMC Made:



TMMK Made:



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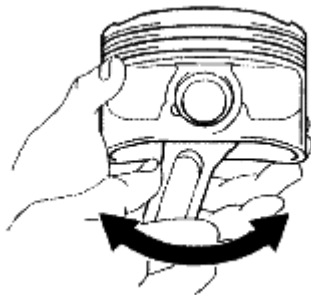
Fig. 421: Identifying Front Marks Of Piston And Connecting Rod
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

HINT:

Make sure that the end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.

- e. Check the fitting condition between the piston and piston pin by trying to move the piston back and forth on the piston pin.



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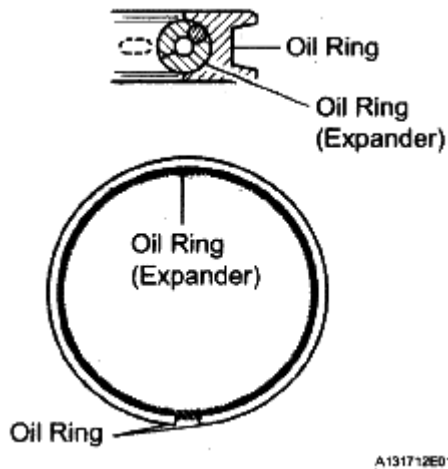
Fig. 422: Checking Fitting Condition Between Piston And Piston Pin
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSTALL PISTON RING SET

- a. Install the oil ring expander and oil ring rail by hand.

NOTE:

- Install the expander and oil ring so that their ring ends are at opposite sides.
- Securely install the expander to the inner groove of the oil ring.

**Fig. 423: Identifying Expander And Oil Ring**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a piston ring expander, install the 2 compression rings so that the paint marks are positioned as shown in the illustration.

NOTE:

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

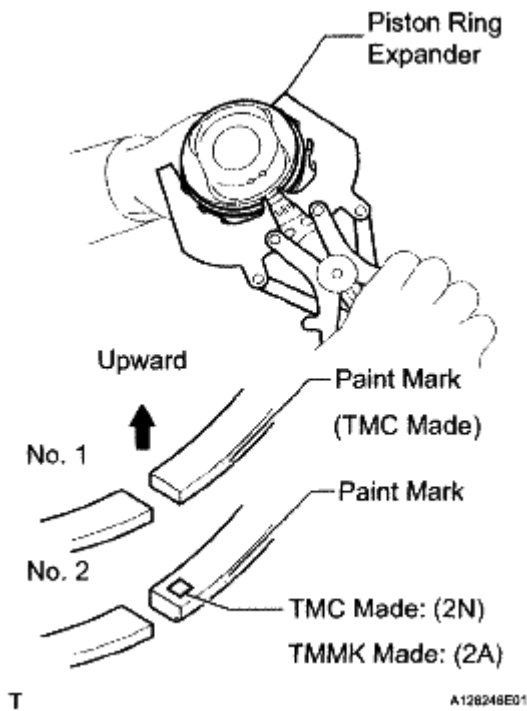


Fig. 424: Installing Compression Rings With Piston Ring Expander
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

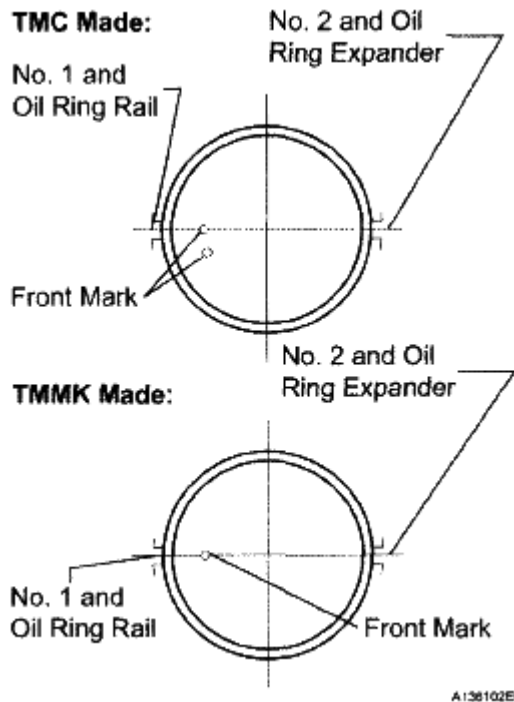


Fig. 425: Positioning Piston Rings And Ring Ends
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. INSTALL CRANKSHAFT BEARING

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

NOTE: Do not apply engine oil to the bearings and the contact surfaces.

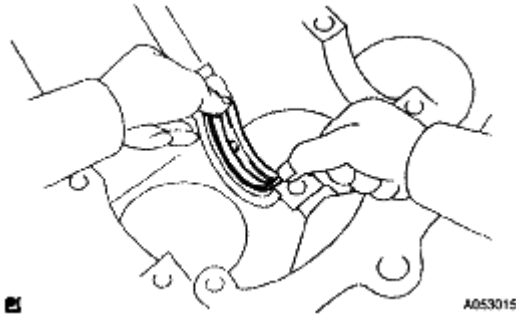


Fig. 426: Installing Crankshaft Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. INSTALL NO. 2 CRANKSHAFT BEARING

- a. Install the lower bearing on the bearing cap.

NOTE: Clean the backside of the bearing and the bearing surface of the connecting rod. The surface should be free of dust and oils.

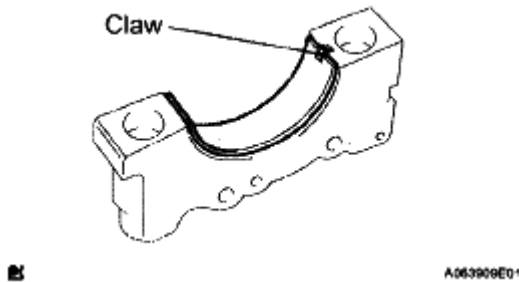


Fig. 427: Identifying Lower Bearing On Bearing Cap (Claw)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. INSTALL UPPER CRANKSHAFT THRUST WASHER

- a. Install the 2 thrust washers under the No. 3 journal of the cylinder block with the oil grooves facing outward.
- b. Apply engine oil to the crankshaft thrust washer.

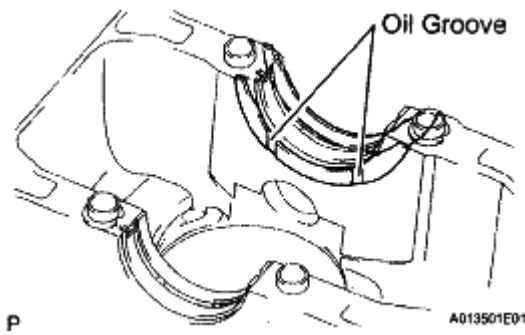


Fig. 428: Identifying Upper Crankshaft Thrust Washer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. INSTALL CRANKSHAFT

- Apply engine oil to the upper bearing and install the crankshaft on the cylinder block.
- Apply engine oil to the lower bearing.
- Examine the front marks and install the bearing caps on the cylinder block.

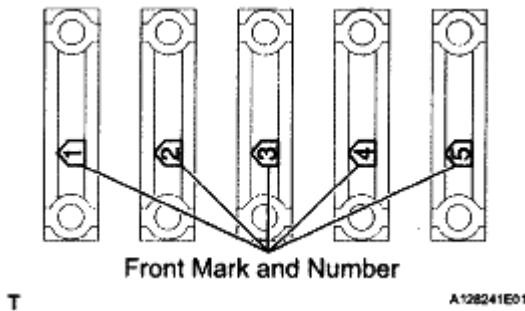


Fig. 429: Identifying Front Marks On Bearing Caps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Apply a light coat of engine oil to the threads and under the bearing cap bolts.
- Install the crankshaft bearing cap bolts.

NOTE: The main bearing cap bolts are tightened in 2 progressive steps.

- Step 1
 - Install and uniformly tighten the 10 main bearing cap bolts in the sequence shown in the illustration.

Torque: 20 N*m (204 kgf*cm, 15 ft.*lbf)

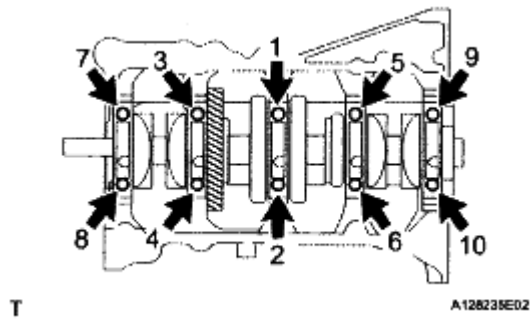


Fig. 430: Tightening Main Bearing Cap Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Retighten the 10 main bearing cap bolts in the sequence shown in the illustration.

Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)

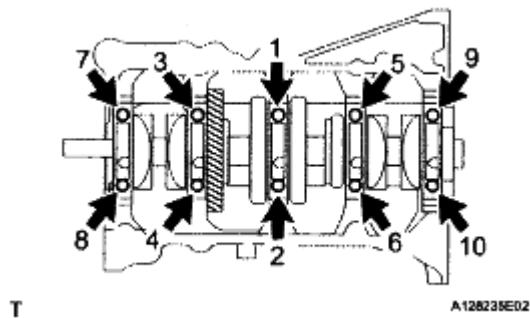


Fig. 431: Retighten Main Bearing Cap Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Step 2

1. Mark the front of the bearing cap bolts with paint.
2. Retighten the bearing cap bolts by 90° in the numerical order shown in the illustration.

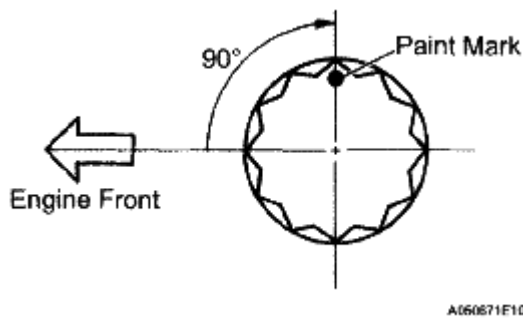


Fig. 432: Retightening Bearing Cap Bolts 90°
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- h. Check that the paint mark is now at a 90° angle to the front.

- i. Check that the crankshaft turns smoothly.
- j. Check the crankshaft thrust clearance (See **INSPECTION**).

11. INSTALL CONNECTING ROD BEARING

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

NOTE: Do not apply engine oil to the bearings and the contact surfaces.

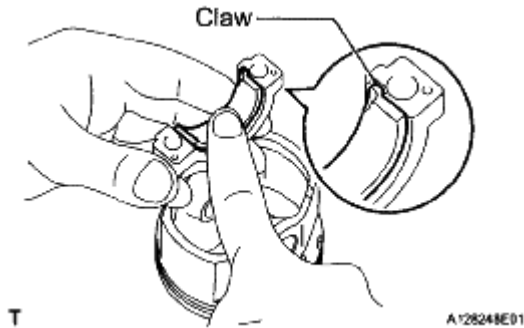


Fig. 433: Aligning Bearing Claw With Groove Of Connecting Rod Or Connecting Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. INSTALL PISTON SUB-ASSEMBLY WITH CONNECTING ROD

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

- a. Apply engine oil to the cylinder walls, the pistons, and the surfaces of connecting rod bearings.
- b. Check the position of the piston ring ends.

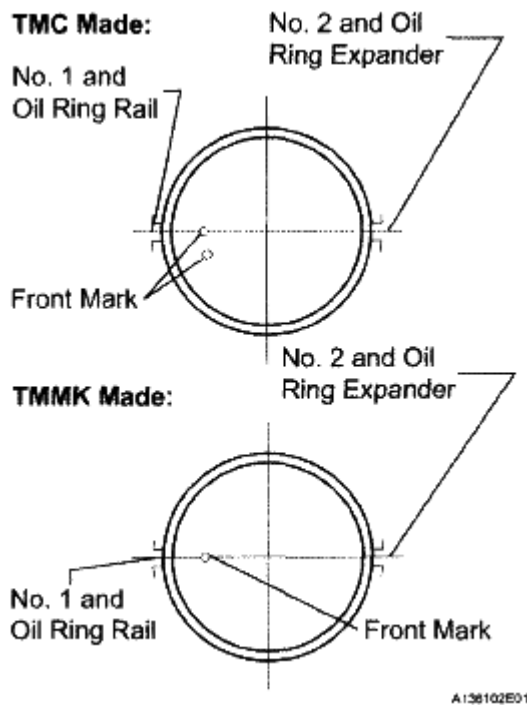


Fig. 434: Positioning Piston Rings And Ring Ends
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE: Match the numbered connecting rod cap with the connecting rod.

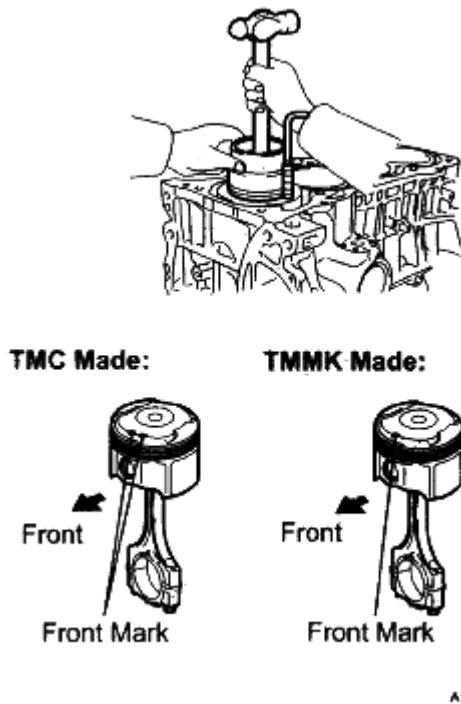


Fig. 435: Pushing Piston And Connecting Rod Assemblies
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

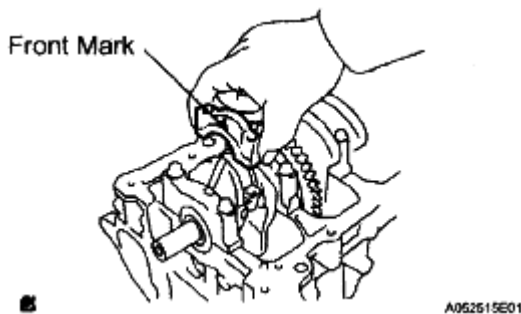


Fig. 436: Installing Connecting Rod Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Apply a light coat of engine oil to the threads and under the heads of the connecting rod cap bolts.
- f. Install the connecting cap bolts.

NOTE: The connecting cap bolts should be tightened in 2 progressive steps.

- g. Step 1
 - 1. Install and alternately tighten the bolts of the connecting rod cap in several steps.

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

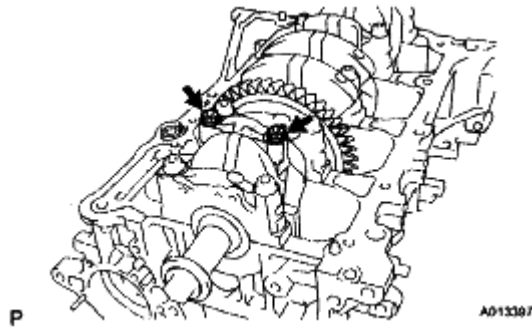


Fig. 437: Tightening Connecting Rod Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

h. Step 2

1. Mark the front of the connecting rod cap bolts with paint.
2. Retighten the cap bolts by 90° as shown in the illustration.

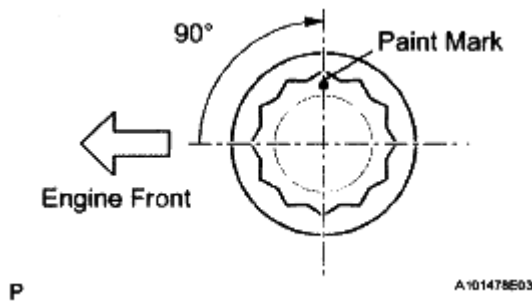


Fig. 438: Retightening Cap Bolts 90°
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- i. Check that the crankshaft turns smoothly.
- j. Check the connecting rod thrust clearance (See **INSPECTION**).

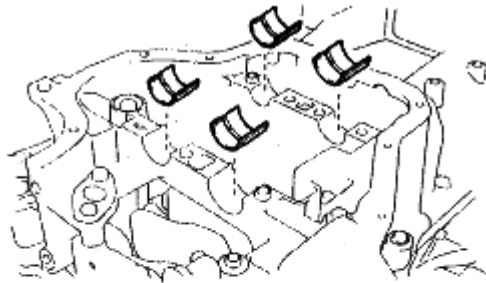
13. INSTALL NO. 1 BALANCESHAFT BEARING

- a. Install the bearings in the crankcase and balanceshaft housing.

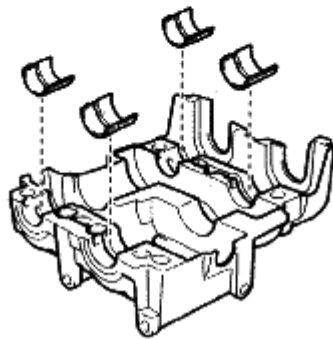
NOTE: Do not apply engine oil to the bearings and the contact surfaces.

- b. Apply a light coat of engine oil to the bearings.

Stiffening Crankcase:



Balanceshaft Housing:



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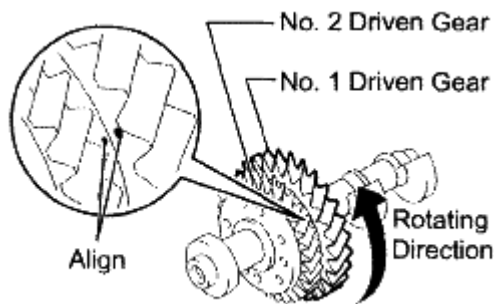
Fig. 439: Identifying Balanceshaft Bearings

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. INSTALL NO. 1 AND NO. 2 BALANCESHAFT SUB-ASSEMBLY

- a. Rotate the driven gear No. 1 of balanceshaft No. 1 in the rotating direction until it hits the stopper.

NOTE: Confirm that the matchmarks on driven gears No. 1 and No. 2 are matched.



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Fig. 440: Rotating Driven Gear Of Balanceshaft

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Align the timing marks of the No. 1 and No. 2 balanceshafts as shown in the illustration.

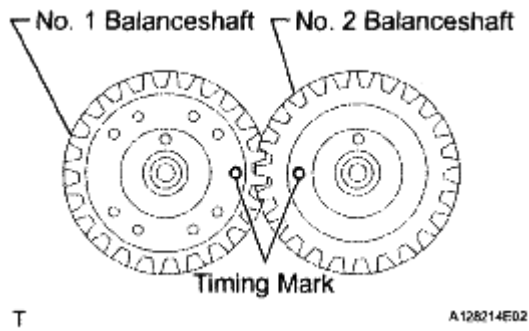


Fig. 441: Identifying Timing Marks Of Balancershafts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Place the No. 1 and No. 2 balancershafts on the crankcase.
- d. Apply a light coat of engine oil under the heads of the balancershaft housing bolts.
- e. Install the balancershaft housing bolts.

NOTE: The balance shaft housing bolts are tightened in 2 progressive steps.

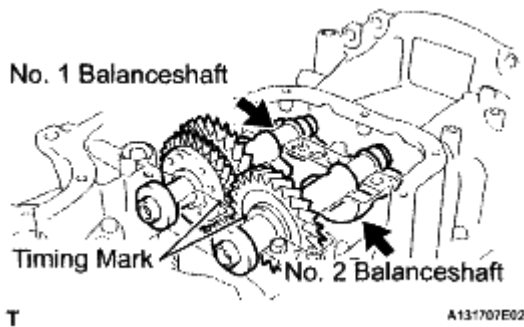


Fig. 442: Locating Timing Mark On Balancer Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Step 1
 1. Install and uniformly tighten the 8 bolts in the sequence shown in the illustration.

Torque: 22 N*m (220 kgf*cm, 16 ft.*lbf)

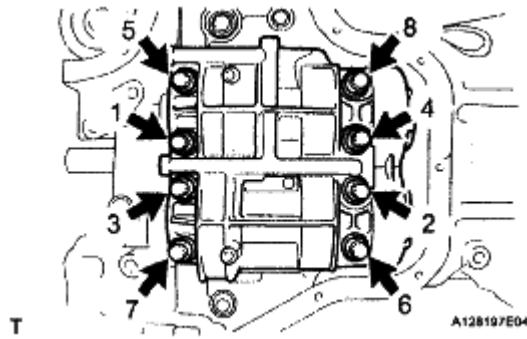


Fig. 443: Tightening Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Step 2
- a. Mark the front side of each balanceshaft housing bolt head with paint.

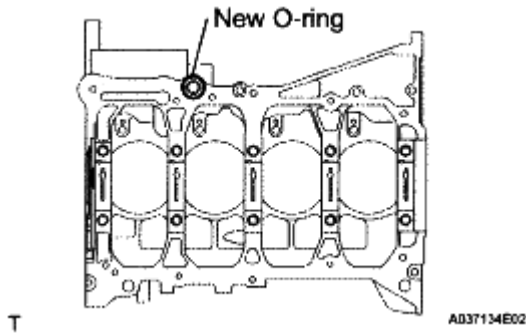


Fig. 444: Identifying O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Retighten the bolts by 90° as shown in the illustration.
 - c. Check that the paint marks are now at a 90° angle to the front.
15. **INSTALL STIFFENING CRANKCASE ASSEMBLY**
- a. Place a new O-ring on the cylinder block, as shown in the illustration.

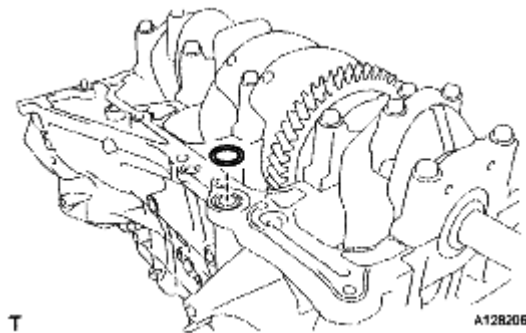


Fig. 445: Identifying O-Ring From Cylinder Block
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Temporarily tighten the pulley set bolt.
- c. Turn the crankshaft to set the crank pins of the No. 1 and No. 4 cylinders to the bottom.

HINT:

Make sure that the timing mark on the balancershaft drive gear is positioned as shown in the illustration.

Front View:

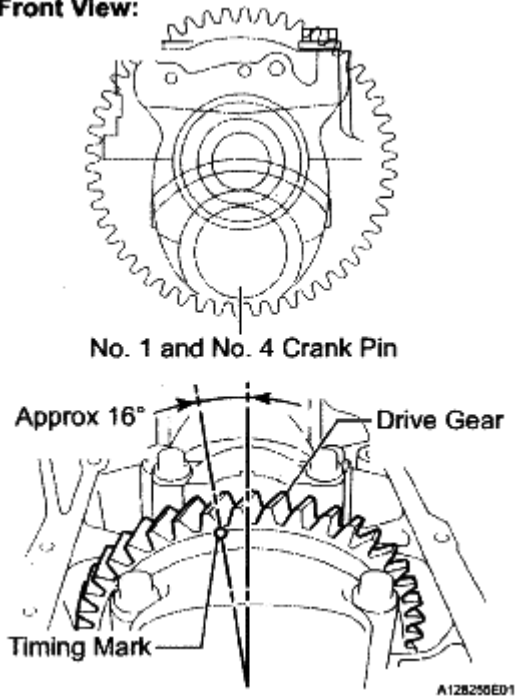


Fig. 446: Identifying Timing Mark On Balancershaft Drive Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Apply seal packing in a continuous bead (diameter: 2.5 to 3.0 mm (0.098 to 0.118 in.)) to the places shown in the illustration.

Seal packing:

Toyota Genuine Seal Packing Black, Three bond 1207B or Equivalent

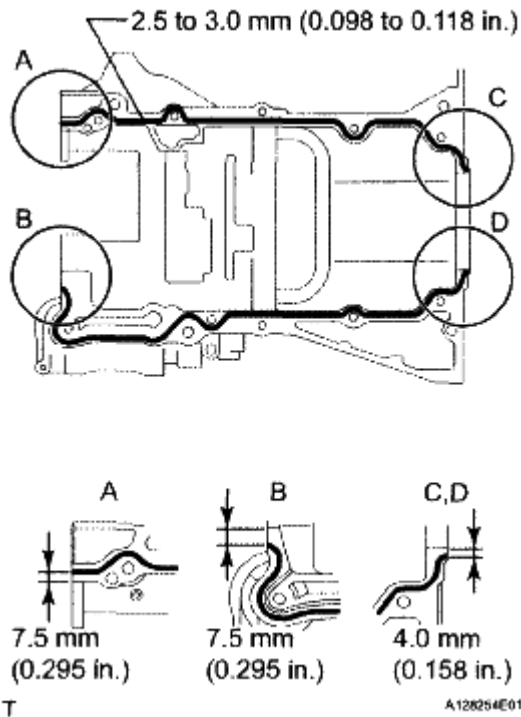


Fig. 447: Applying Seal Packing

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

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

- e. Install the stiffening crankcase so that the reference holes on the balancershafts are positioned as shown in the illustration.

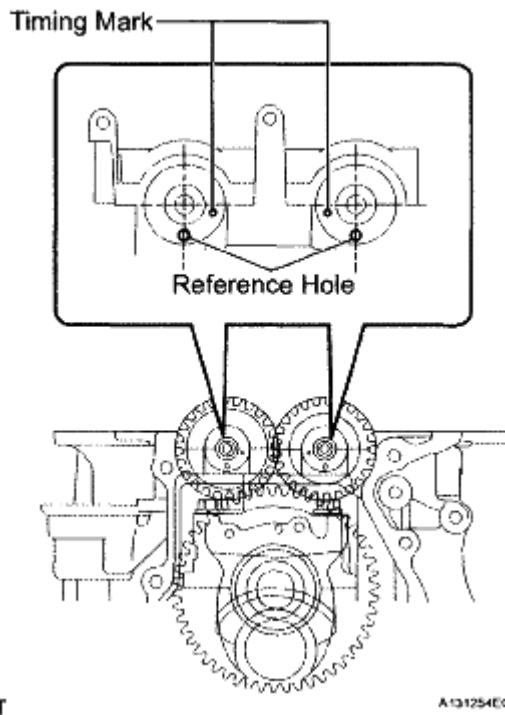


Fig. 448: Identifying Reference Holes On Balancershafts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Temporarily install the crankcase with the 11 bolts.

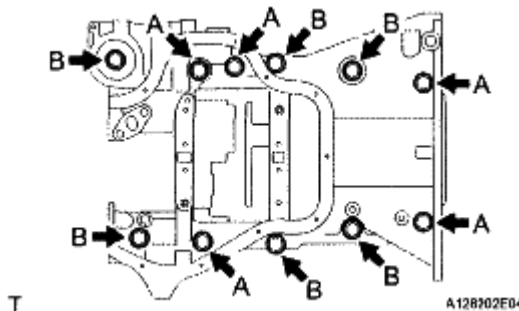


Fig. 449: Locating Crankcase With Bolts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Bolt length

BOLT LENGTH SPECIFICATION

Item	Length
Bolt A	122 mm (4.803 in.)
Bolt B	45 mm (1.772 in.)

- g. Uniformly tighten the 11 bolts in the sequence shown in the illustration.

Torque: 24 N*m (245 kgf*cm, 18 ft.*lbf)

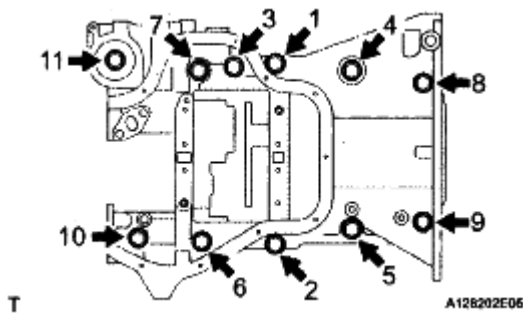


Fig. 450: Tightening Crankshaft Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- h. Wipe off the excess seal packing with a clean piece of cloth.
- i. Turn the crankshaft again to set the key groove to the bottom. Make sure that the timing marks are aligned as shown in the illustration.

HINT:

An 'O' is stamped as a timing mark.

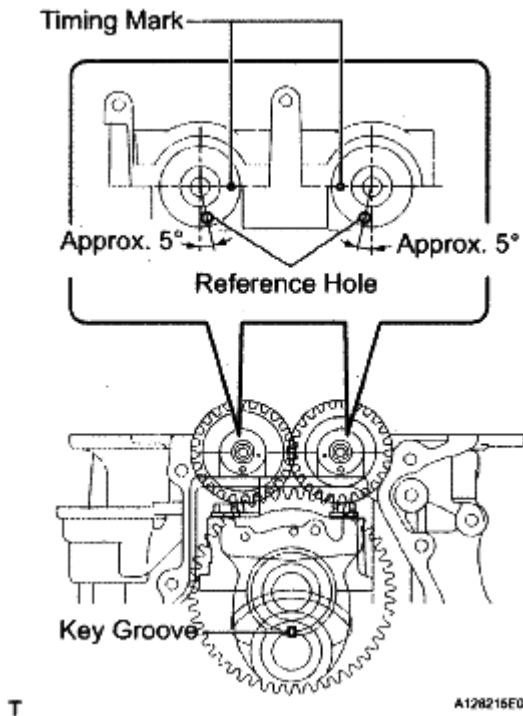


Fig. 451: Aligning Timing Marks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- j. Remove the pulley set bolt.

16. INSTALL OIL PUMP ASSEMBLY

- Install a new gasket and oil pump with the 3 bolts.

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

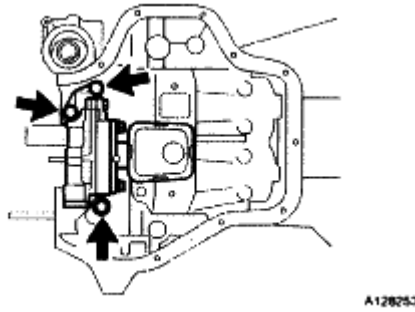


Fig. 452: Identifying Oil Pump With Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. INSTALL ENGINE REAR OIL SEAL

- Using SST and a hammer, evenly tap the oil seal until its surface is flush with the rear oil seal retainer edge.

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

NOTE: Keep the lip free from foreign materials.

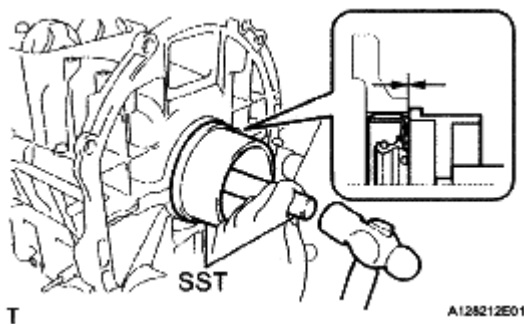


Fig. 453: Tapping Oil Seal

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Apply MP grease to a new oil seal lip.

NOTE: Wipe off extra grease on the crankshaft.

18. INSTALL NO. 1 TAPER SCREW PLUG (w/o Oil Cooler)

- Apply adhesive to 2 or 3 threads of the plug, and install the plug.

Torque: 26 N*m (265 kgf*cm, 19 ft.*lbf)

Adhesive:

Toyota Genuine Adhesive 1324, Three Bond 1324 or Equivalent

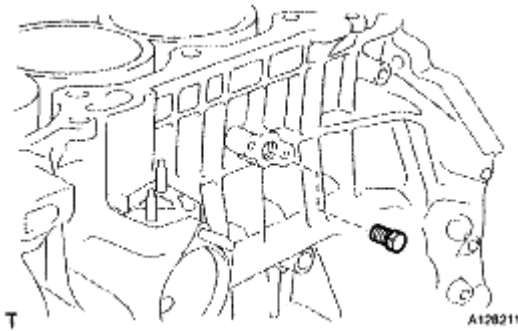


Fig. 454: Installing Taper Screw Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

19. INSTALL OIL CONTROL VALVE FILTER

- a. Check that no foreign matter is on the mesh part of the filter.
- b. Using an 8 mm socket hexagon wrench, install a new gasket and the oil control valve filter with the screw plug.

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

NOTE: Do not touch the mesh when installing the oil control valve filter.

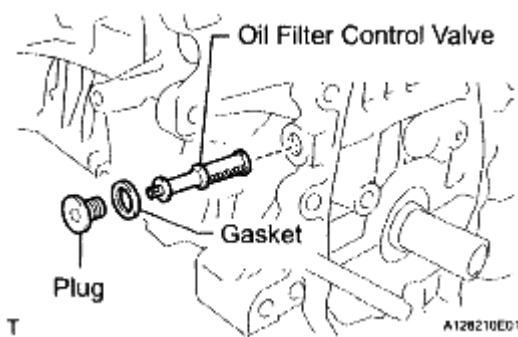


Fig. 455: Identifying Oil Control Valve Filter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

20. INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY (w/o Oil Cooler)

- a. Apply adhesive around the drain cock.

Adhesive:

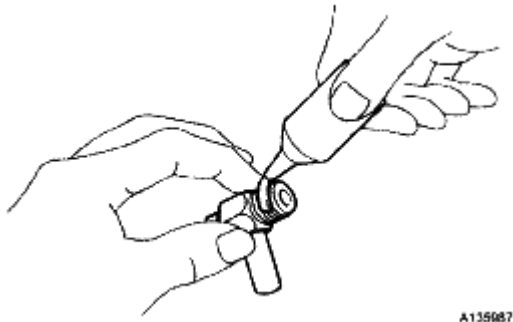
Toyota Genuine Adhesive 1344, Three Bond 1344 or Equivalent

Fig. 456: Applying Adhesive On Drain Cock
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the water drain cock within the range shown in the illustration.

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

NOTE: Do not rotate the drain cocks more than 1 revolution (360°) after tightening the drain cocks to the specified torque.

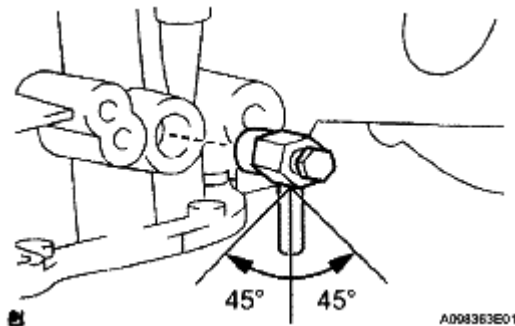


Fig. 457: Installing Drain Cock
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the water drain cock plugs to the water drain cocks

Torque: 13 N*m (130 kgf*cm, 9 ft.*lbf)

21. INSTALL CYLINDER BLOCK WATER JACKET SPACER

- a. Install the water jacket spacer as shown in the illustration.

HINT:

Be sure to face the slope to the front of the engine.

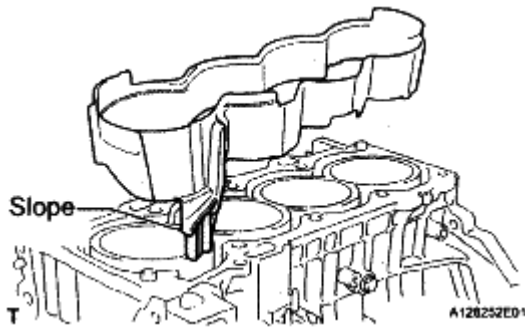


Fig. 458: Identifying Water Jacket Spacer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

22. INSTALL CYLINDER HEAD GASKET (See INSTALLATION)
23. INSTALL CYLINDER HEAD SUB-ASSEMBLY (See INSTALLATION)
24. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY
 - a. Apply a light coat of engine oil to a new O-ring, then install it onto the camshaft timing oil control valve.

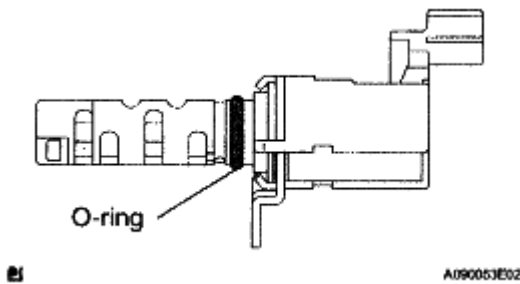


Fig. 459: Identifying O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the camshaft timing oil control valve with the bolt.

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

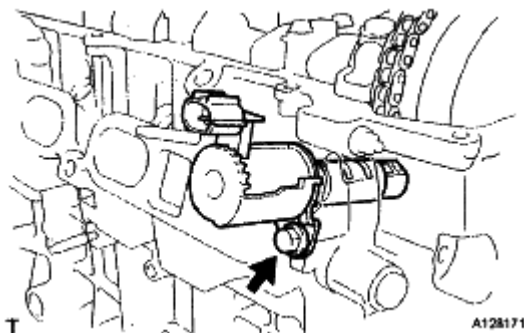


Fig. 460: Locating Camshaft Timing Oil Control Valve With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

25. **INSTALL CAMSHAFT TIMING GEAR ASSEMBLY** (See **INSTALLATION**)

26. **INSTALL CAMSHAFT TIMING SPROCKET**

- a. Clamp the camshaft in a vise.
- b. Tighten the flange bolt with the camshaft timing sprocket fixed.

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

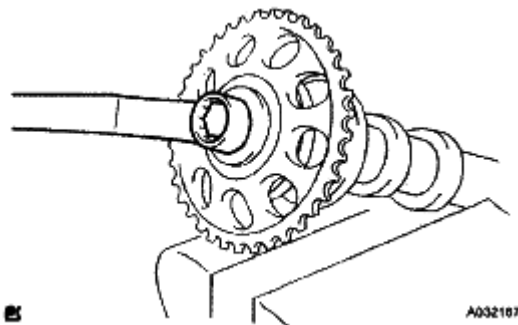


Fig. 461: Tightening Camshaft Timing Sprocket Flange Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

27. **INSTALL NO. 1 CAMSHAFT BEARING**

- a. Install the No. 1 camshaft bearing.

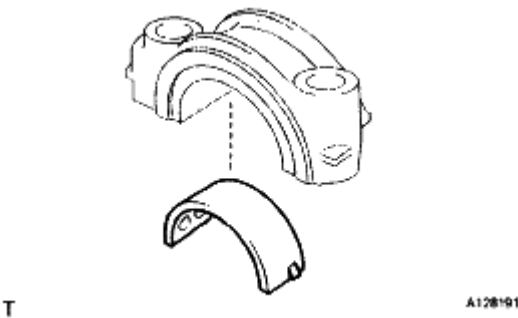


Fig. 462: Identifying Camshaft Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

28. **INSTALL NO. 2 CAMSHAFT BEARING** (See **INSTALLATION**)

29. **INSTALL CAMSHAFT**

- a. Apply a light coat of engine oil to the journal portion of the camshaft.
- b. Examine the front marks and numbers, and check that the order is as shown in the illustration. Then install the bearing caps into the cylinder head.

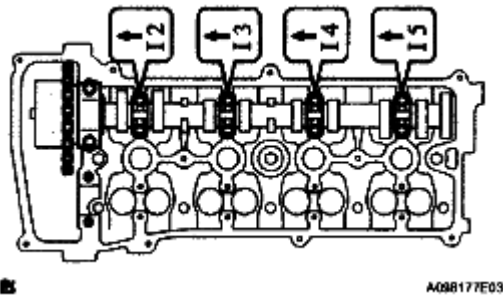


Fig. 463: Identifying Bearing Cap Marks And Numbers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.
- d. Using several steps, uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.

Torque:

No. 1 Bearing cap

30 N*m (301 kgf*cm, 22 ft.*lbf)

No. 3 Bearing cap

9.0 N*m (92 kgf*cm, 80 in.*lbf)

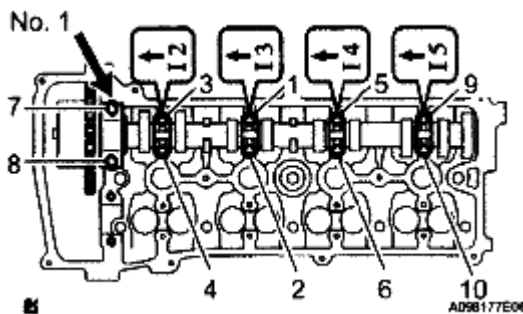


Fig. 464: Tightening Bearing Cap Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

30. INSTALL NO. 2 CAMSHAFT

- a. Apply a light coat of engine oil to the journal portion of the No. 2 camshaft.
- b. Examine the front marks and numbers, and check that the order is as shown in the illustration. Then install the bearing caps onto the cylinder head.

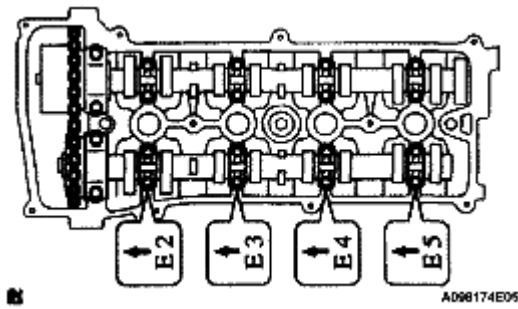


Fig. 465: Identifying Front Marks And Numbers Order
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.
- d. Using several steps, uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.

Torque:

No. 1 Bearing cap

30 N*m (301 kgf*cm, 22 ft.*lbf)

No. 3 Bearing cap

9.0 N*m (92 kgf*cm, 80 in.*lbf)

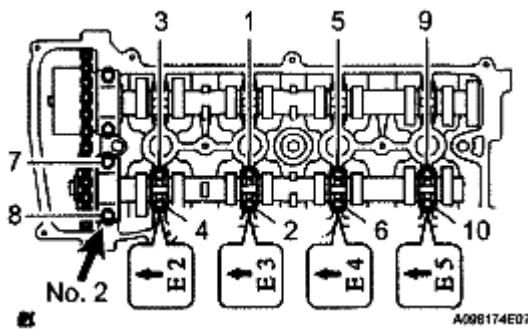


Fig. 466: Tightening Bearing Cap Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

31. INSTALL KEYS

- a. Install the 2 keys.

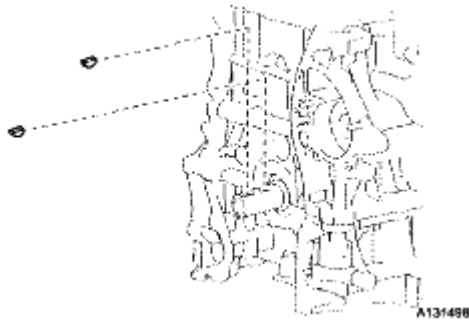


Fig. 467: Installing Keys

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

32. INSTALL NO. 2 CHAIN SUB-ASSEMBLY (See INSTALLATION)
33. INSTALL CRANKSHAFT TIMING SPROCKET (See INSTALLATION)
34. INSTALL NO. 1 CHAIN VIBRATION DAMPER (See INSTALLATION)
35. INSTALL CHAIN SUB-ASSEMBLY (See INSTALLATION)
36. INSTALL CHAIN TENSIONER SLIPPER (See INSTALLATION)
37. INSTALL TIMING CHAIN GUIDE (See INSTALLATION)
38. INSTALL NO. 1 CRANKSHAFT POSITION SENSOR PLATE (See INSTALLATION)
39. INSTALL TIMING CHAIN CASE OIL SEAL
 - a. Using SST, tap in a new oil seal until its surface is flush with the timing chain cover edge.

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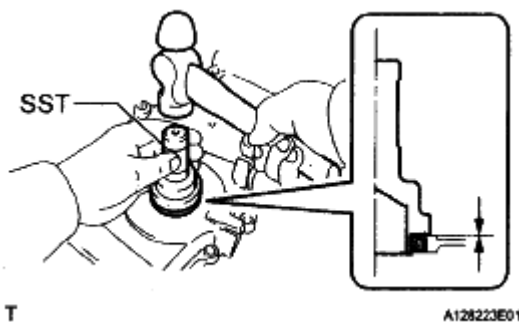


Fig. 468: Tapping Timing Chain Case Oil Seal

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

40. INSTALL TIMING CHAIN COVER SUB-ASSEMBLY (See INSTALLATION)
41. INSTALL V-RIBBED BELT TENSIONER ASSEMBLY (See INSTALLATION)

42. **INSTALL OIL PAN SUB-ASSEMBLY** (See INSTALLATION)
43. **INSTALL OIL PAN DRAIN PLUG**
 - a. Install a new gasket and oil pan drain plug with a new gasket.

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

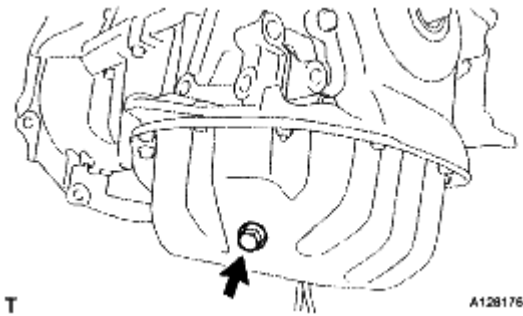


Fig. 469: Locating Oil Pan Drain Plug

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

44. **INSTALL WATER PUMP ASSEMBLY** (See INSTALLATION)
45. **INSTALL WATER PUMP PULLEY** (See INSTALLATION)
46. **INSTALL CRANKSHAFT POSITION SENSOR**
 - a. Apply a light coat of engine oil to the O-ring of the sensor.

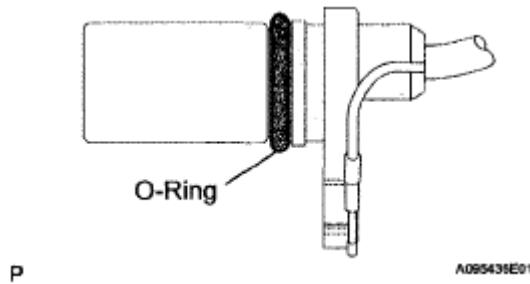


Fig. 470: Applying Light Coat Of Engine Oil To O-Ring Of Sensor

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

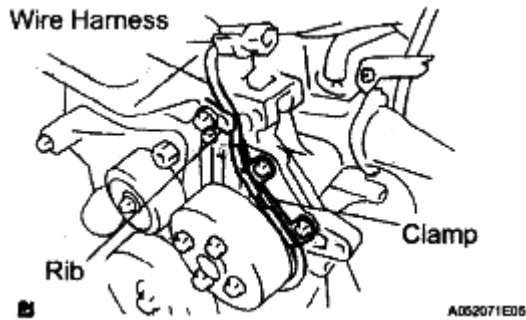


Fig. 471: Identifying Wire Harness

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the sensor with the 2 bolts.

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

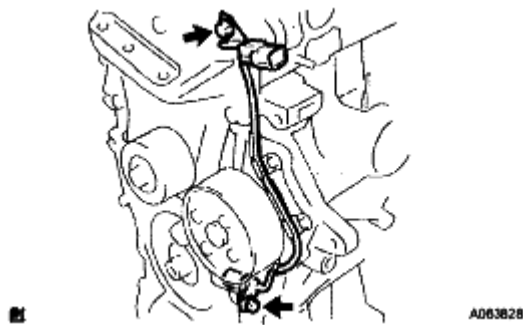


Fig. 472: Locating Sensor With Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the clamp of the crankshaft position sensor onto the water pump.

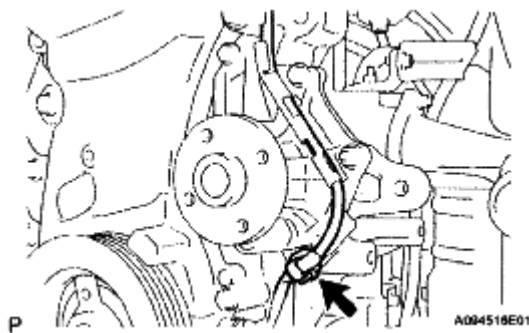


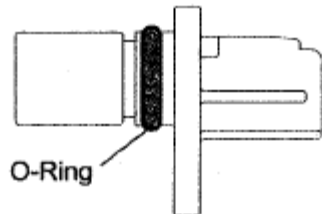
Fig. 473: Locating Clamp Of Crankshaft Position Sensor From Water Pump

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

47. **INSTALL CRANKSHAFT PULLEY** (See **INSTALLATION**)

48. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY** (See **INSTALLATION**)

49. **INSPECT VALVE CLEARANCE** (See VALVE CLEARANCE)
50. **ADJUST VALVE CLEARANCE** (See ADJUSTMENT)
51. **INSTALL CAMSHAFT POSITION SENSOR**
 - a. Apply a light coat of engine oil to the O-ring of the sensor.



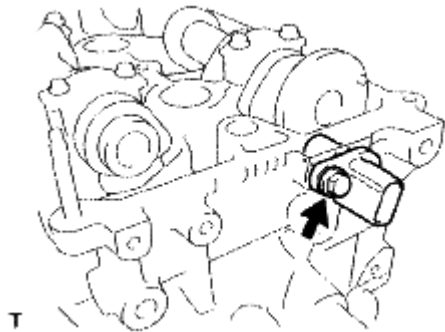
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Fig. 474: Applying Light Coat Of Engine Oil To O-Ring Of Sensor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the sensor with the bolt.

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



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Fig. 475: Locating Sensor And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

52. **INSTALL CYLINDER HEAD COVER GASKET**
 - a. Install the gasket to the cylinder head cover.

NOTE: Remove any oil from the contact surface.

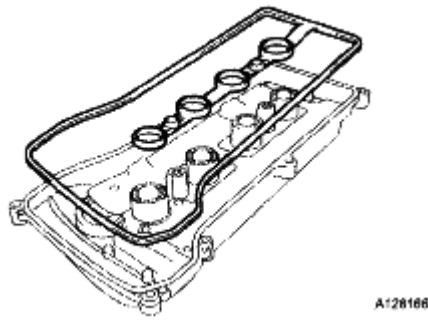


Fig. 476: Identifying Cylinder Head Cover Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

53. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY (See INSTALLATION)
54. INSTALL OIL FILTER UNION (w/o Oil Cooler)
 - a. Using a 12 mm hexagon wrench, install the oil filter union.

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

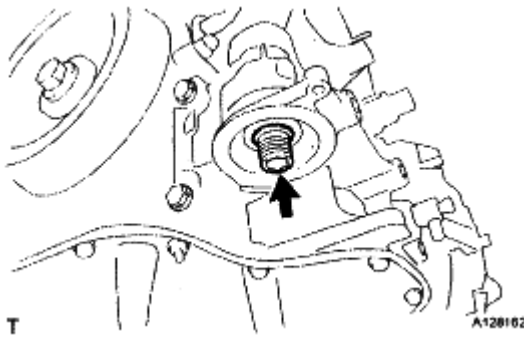


Fig. 477: Locating Oil Filter Union
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

55. INSTALL OIL COOLER ASSEMBLY (w/ Oil Cooler)
 - a. Clean the oil cooler contact surface on the cooler mounting.
 - b. Install a new O-ring to the oil cooler.

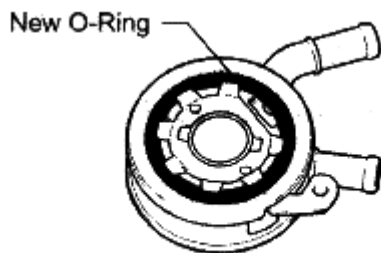


Fig. 478: Identifying O-Ring And Oil Cooler

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Apply a light coat of engine oil to the threads and under the head of the union bolt.
- d. Install the oil cooler with the plate washer, oil filter union and nut.

Torque:

Oil Filter Union

79 N*m (806 kgf*cm, 58 ft.*lbf)

Nut

9.0 N*m (92 kgf*cm, 80 in.*lbf)

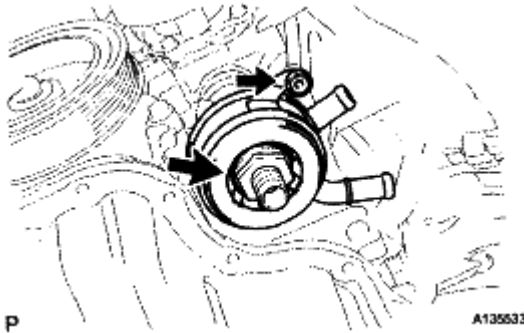


Fig. 479: Locating Oil Filter Union, Plate Washer, Nut, Oil Cooler And O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Apply adhesive to the threads of the oil filter union.

Adhesive:

Toyota Genuine Adhesive 1324, Three Bond 1324 or Equivalent

- f. Install the union bolt.

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

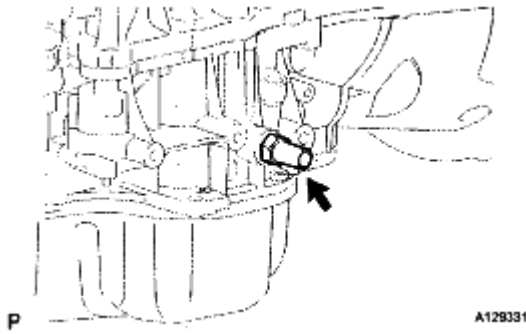


Fig. 480: Identifying Union Bolt

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

56. INSTALL OIL FILTER SUB-ASSEMBLY

- a. Check and clean the oil filter installation surface.
- b. Apply clean engine oil to the gasket of a new oil filter.
- c. Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.
- d. When using a torque wrench:
 1. Using SST, tighten the oil filter.

SST 09228-06501

Torque: 13 N*m (133 kgf*cm, 10 ft.*lbf)

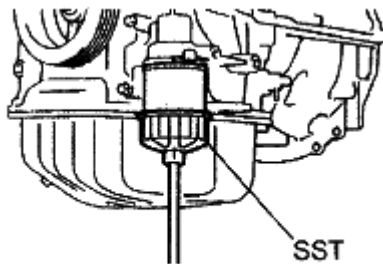


Fig. 481: Tightening Oil Filter With SST

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. When not using a torque wrench:
 1. Using SST, tighten it an additional 3/4 turn.

SST 09228-06501

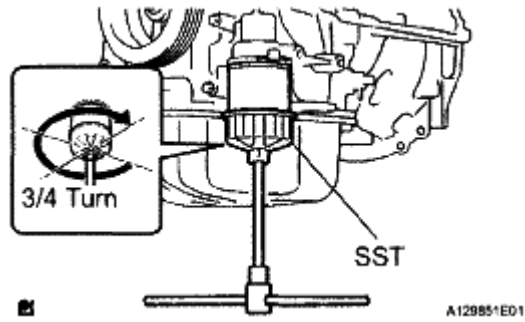


Fig. 482: Tightening Oil Filter An Additional 3/4 Turn
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

57. INSTALL SPARK PLUG

- Install the spark plugs.

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

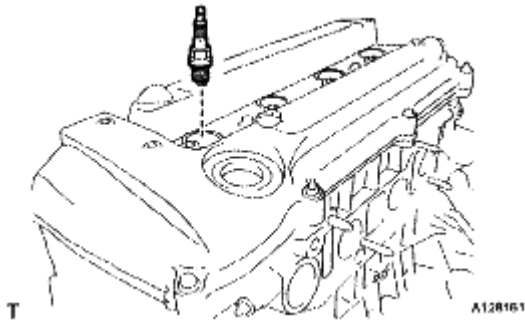


Fig. 483: Identifying Spark Plugs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

58. INSTALL VENTILATION VALVE SUB-ASSEMBLY

- Apply adhesive to the threads of the ventilation valve.

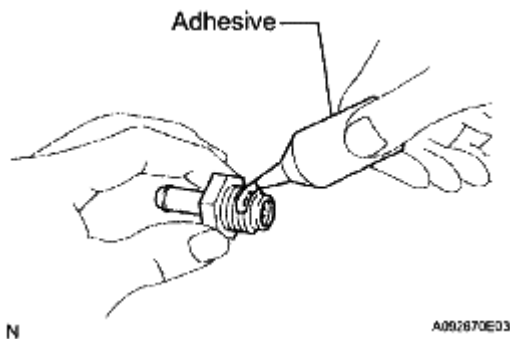


Fig. 484: Applying Adhesive To Threads Of Ventilation Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the ventilation valve.

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

Adhesive:

Toyota Genuine Adhesive 1324, Three Bond 1324 or Equivalent

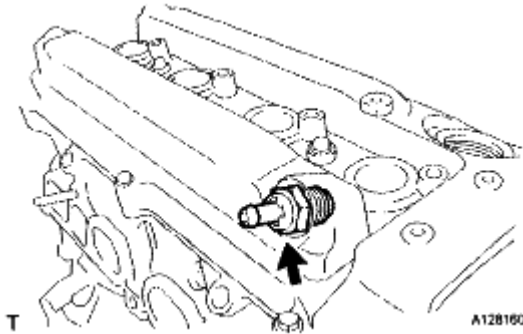


Fig. 485: Locating Ventilation Valve

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

59. INSTALL OIL FILLER CAP GASKET

- a. Install the gasket to the cap.

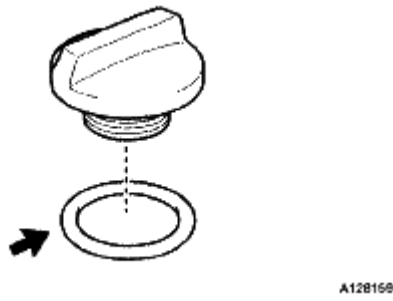


Fig. 486: Locating Gasket To Cap

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

60. INSTALL OIL FILLER CAP SUB-ASSEMBLY

- a. Install the oil filler cap.

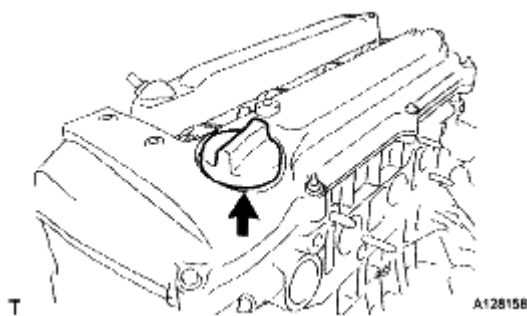


Fig. 487: Locating Oil Filler Cap

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.