

2013 ENGINE**Engine Mechanical (Service Information) - xB****ENGINE****ON-VEHICLE INSPECTION****ON-VEHICLE INSPECTION****1. INSPECT ENGINE COOLANT**

Refer to **ON-VEHICLE INSPECTION** .

2. INSPECT ENGINE OIL

Refer to **ON-VEHICLE INSPECTION** .

3. INSPECT BATTERY

Refer to **ON-VEHICLE INSPECTION** .

4. INSPECT AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY

- a. Remove the air cleaner cap.
- b. Remove the air filter element.
- c. Visually check that the air filter is not excessively damaged or oily.

If necessary, replace the air filter.

5. INSPECT SPARK PLUG . Refer to **ON-VEHICLE INSPECTION - Step 2** .**6. INSPECT FAN AND GENERATOR V BELT** See step 1.**7. INSPECT IGNITION TIMING****NOTE:**

- **Turn all the electrical systems and the A/C OFF.**
- **When checking the ignition timing, shift the transmission to the neutral position.**

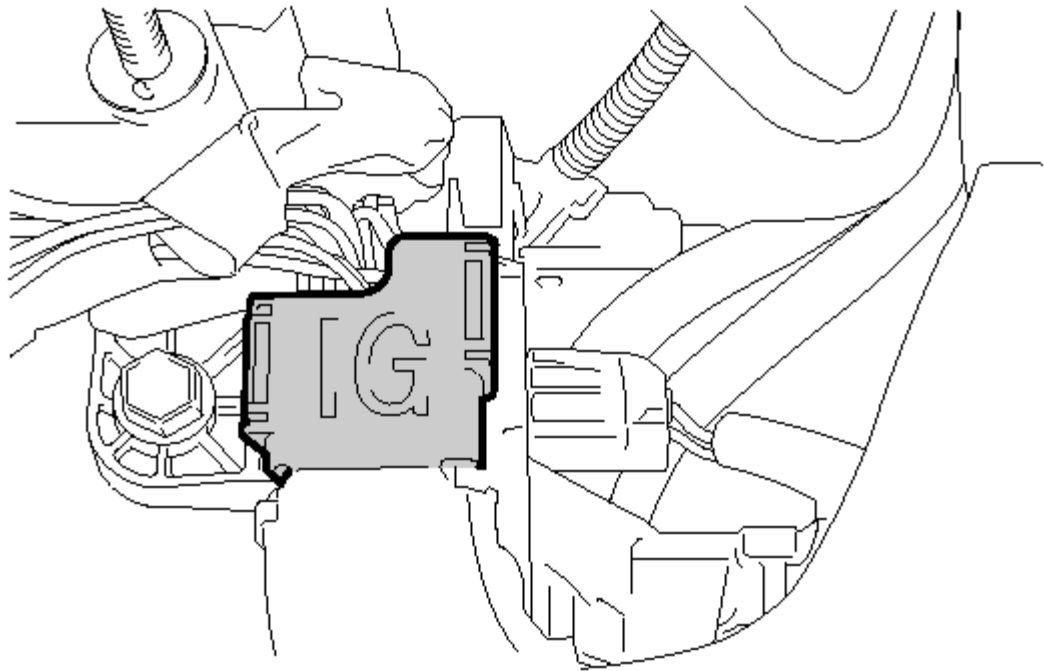
- a. Warm up and stop the engine.
- b. When using the Techstream:
 1. Connect the Techstream to the DLC3.
 2. Turn the ignition switch to ON.
 3. Turn the Techstream on.
 4. Enter the following menus: Power Train / Engine and ECT / Data List / IGN Advance

5. Start the engine.
6. According to the display on Techstream, read the Data List.

Standard ignition timing

BTDC 0 to 15° at idle

7. Check that the ignition timing advances immediately when the engine speed is increased.
 8. Turn the ignition switch to OFF.
 9. Disconnect the Techstream from the DLC3.
- c. When not using the Techstream:
1. Remove the No. 1 engine cover. Refer to **REMOVAL - Step 1**.



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Fig. 1: View Of Ignition Cover

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

2. Open the ignition cover located to the right of the No. 4 ignition coil.
3. Pull the wire harness out from the IG cover.
4. Connect a timing light to the wire harness.

NOTE: Use a timing light that detects the first signal.

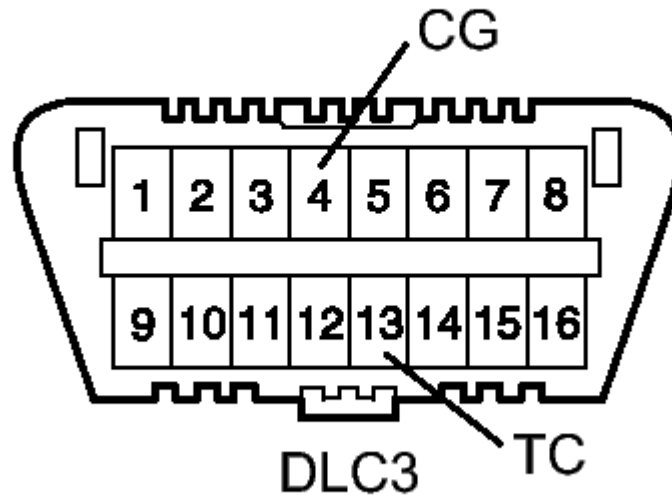
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Fig. 2: Identifying Terminals (TC) And (CG) Of DLC3
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.
 - SST: 09843-18040
6. Allow the engine to idle and check the ignition timing.

Standard ignition timing

BTDC 8 to 12° at idle

HINT:

Run the engine at 1000 to 1300 rpm for 5 seconds, then check that the engine speed returns to the idling speed.

7. Remove SST from the DLC3.
8. Allow the engine to idle and check the ignition timing.

Standard ignition timing

BTDC 5 to 15°

9. Check that the ignition timing advances immediately when the engine speed is increased.
10. Turn the ignition switch OFF.
11. Remove the timing light.

12. Close the IG cover.

13. Install the No. 1 engine cover. Refer to **INSTALLATION - Step 4** .

8. INSPECT ENGINE IDLING SPEED

NOTE:

- **Turn all the electrical systems and the A/C OFF.**
- **When checking the ignition timing, shift the transmission to the P or neutral position.**

a. When using the Techstream:

1. Warm up the engine.
2. Turn the ignition switch to OFF.
3. Connect the Techstream to the DLC3.
4. Turn the ignition switch to ON.
5. Turn the Techstream on.
6. Enter the following menus: Power Train / Engine and ECT / Data List / Engine Speed
7. Start the engine.
8. According to the display on Techstream, read the Data List.

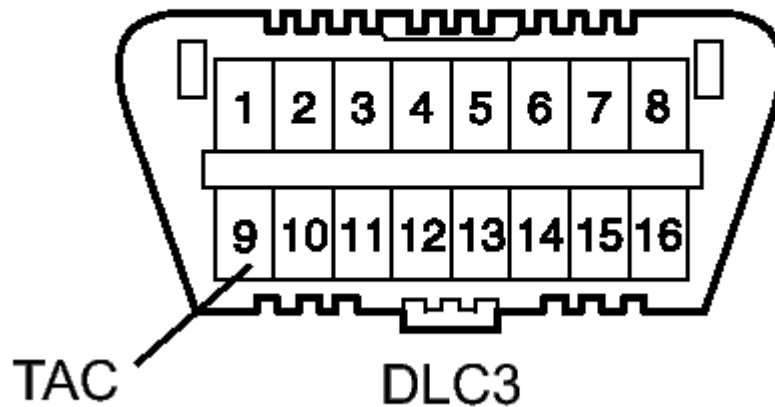
Standard idle speed

600 to 700 rpm

9. Turn the ignition switch to OFF.
10. Disconnect the Techstream from the DLC3.

b. When not using the Techstream:

1. Turn OFF all the accessories and air conditioning.
2. Move the shift lever to P or neutral.
3. Connect SST to 9 (TAC) of the DLC3 terminal, and then connect a tachometer to SST.

**T****Fig. 3: Identifying DLC3 TAC Terminal**

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

- SST: 09843-18030

4. Warm up the engine.
5. Check the idle speed while the radiator-cooling fan is not rotating.

Standard idle speed

600 to 700 rpm

6. Turn the ignition switch OFF.
7. Remove the tachometer and disconnect SST from the DLC3.

9. INSPECT COMPRESSION

- a. Warm up and then stop the engine.
- b. Remove the 4 ignition coils and spark plugs. Refer to **REMOVAL**.
- c. Disconnect the 4 fuel injector connectors.

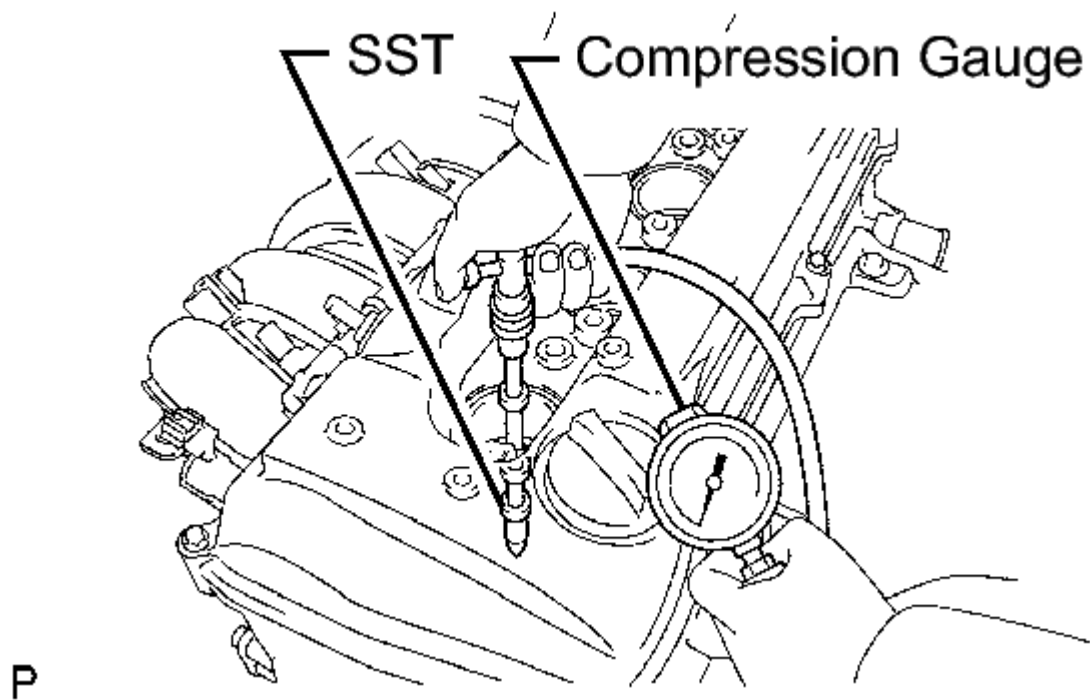


Fig. 4: Measuring Compression Pressure With SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Set SST and a compression gauge.
 - **SST: 09992-00500**
- e. Insert the compression gauge into the spark plug hole.
- f. While cranking the engine, measure the compression pressure.

Standard compression pressure

1300 kPa (13.3 kgf/cm² , 189 psi)

Minimum compression pressure

1000 kPa (10.0 kgf/cm² , 145 psi)

Standard difference between each cylinder

100 kPa (1.0 kgf/cm² , 15 psi)

NOTE:

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

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.

g. Connect the 4 fuel injector connectors.

h. Install the 4 spark plugs and ignition coils. Refer to **INSTALLATION** .

10. INSPECT CO/HC

HINT:

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

- a. Start and warm up the engine.
- b. Run the engine at 2500 rpm for approximately 180 seconds.
- c. Insert the CO/HC meter testing probe at least 40 cm (1.3 ft.) into the tailpipe while idling.
- d. Inspect the CO/HC concentration while idling and/or at 2500 rpm.

If the CO/HC concentration is not as specified, perform troubleshooting.

HINT:

See the table below for possible causes, and then inspect and repair the applicable causes if necessary.

CO	HC	Problems	Causes
Normal	High	Rough idle	1. Faulty ignition: - Incorrect timing - Plugs are contaminated, shorted, or gaps are defective 2. Incorrect valve clearance 3. Leaks in intake and exhaust valve 4. Leaks in cylinders
Low	High	Rough idle (Fluctuating HC reading)	1. Vacuum leakage: - Ventilation hoses - Intake manifold - Throttle body - Brake booster line

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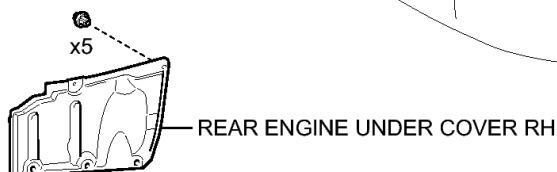
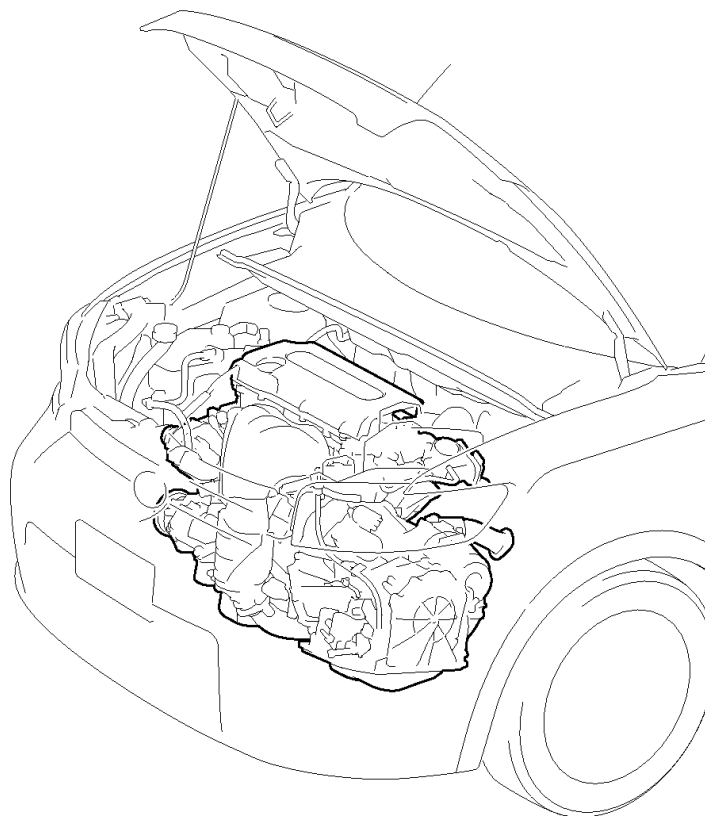
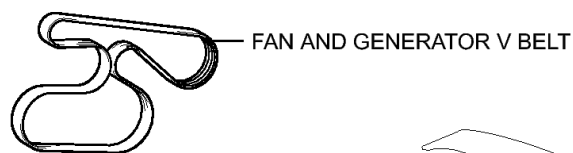
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			2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Plugged PCV valve 3. Faulty SFI system: - Faulty pressure regulator - Faulty engine coolant temperature sensor - Faulty mass air flow meter - Faulty ECM - Faulty injectors - Faulty throttle body

DRIVE BELT

COMPONENTS

ILLUSTRATION



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

ON-VEHICLE INSPECTION

ON-VEHICLE INSPECTION

1. CHECK FAN AND GENERATOR V BELT

INCORRECT

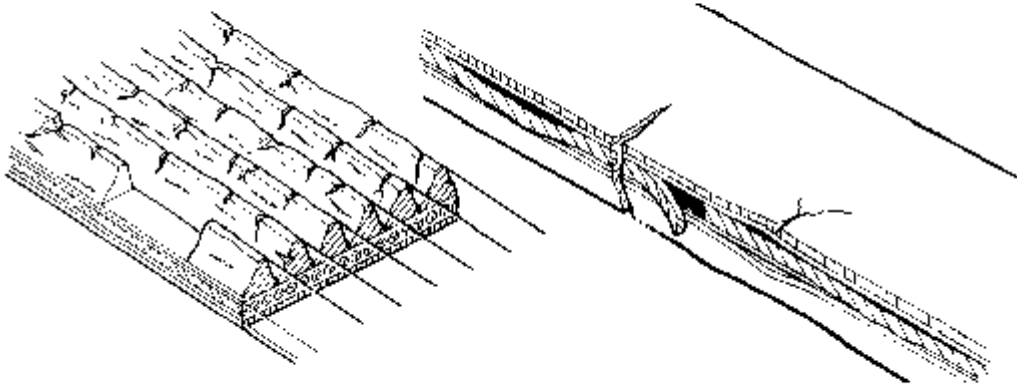


Fig. 6: Inspecting Drive Belt For Excessive Wear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Visually check the drive belt for excessive wear, frayed cords, etc.

If any defect has been found, replace the drive belt.

HINT:

Cracks on the rib side of a drive belt are considered acceptable.

If the drive belt has chunks missing from the ribs, it should be replaced.

- b. After installing the drive belt, check that it fits properly in the ribbed grooves.

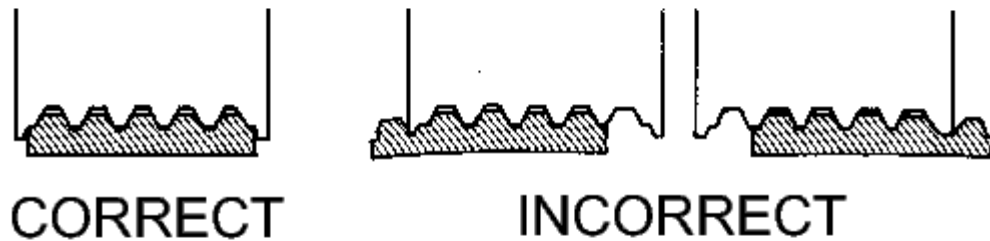


Fig. 7: Identifying Proper Position Of V-Ribbed Belt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Check with your hand to confirm that the belt has not slipped out of the grooves on the bottom of the crank pulley.

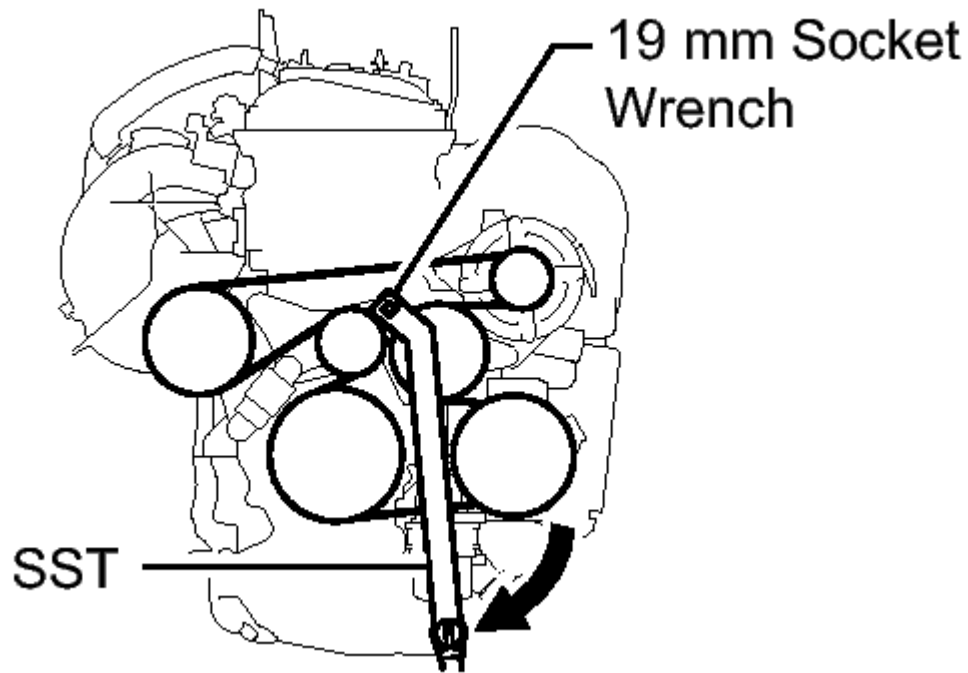
HINT:

- A "new belt" is a belt which has been used for less than 5 minutes on a running engine.
- A "used belt" is a belt which has been used on a running engine for 5 minutes or more.
- After installing a new belt, run the engine for approximately 5 minutes and then recheck the tension.

REMOVAL

REMOVAL

1. **REMOVE REAR ENGINE UNDER COVER RH**
2. **REMOVE FAN AND GENERATOR V BELT**

**P****Fig. 8: Remove/Install Fan And Generator V Belt With SST**

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

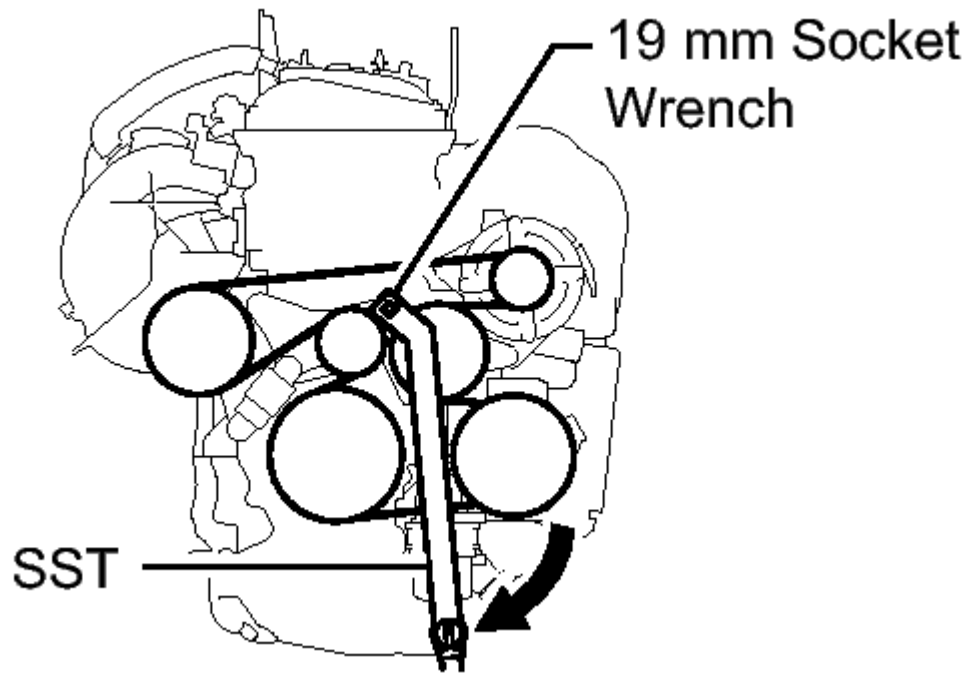
- a. Using SST and 19 mm socket wrench, loosen the V-ribbed belt tensioner arm clockwise, then remove the fan and generator V belt.

- SST: 09216-42010
09216-04010

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.

INSTALLATION**INSTALLATION****1. INSTALL FAN AND GENERATOR V BELT**

**P****Fig. 9: Remove/Install Fan And Generator V Belt With SST**

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

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

- SST: 09216-42010
09216-04010

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 any more force than is necessary.

2. INSTALL REAR ENGINE UNDER COVER RH**VALVE CLEARANCE****ON-VEHICLE INSPECTION****ON-VEHICLE INSPECTION****1. INSPECT VALVE CLEARANCE**

- a. Check for noise and vibration

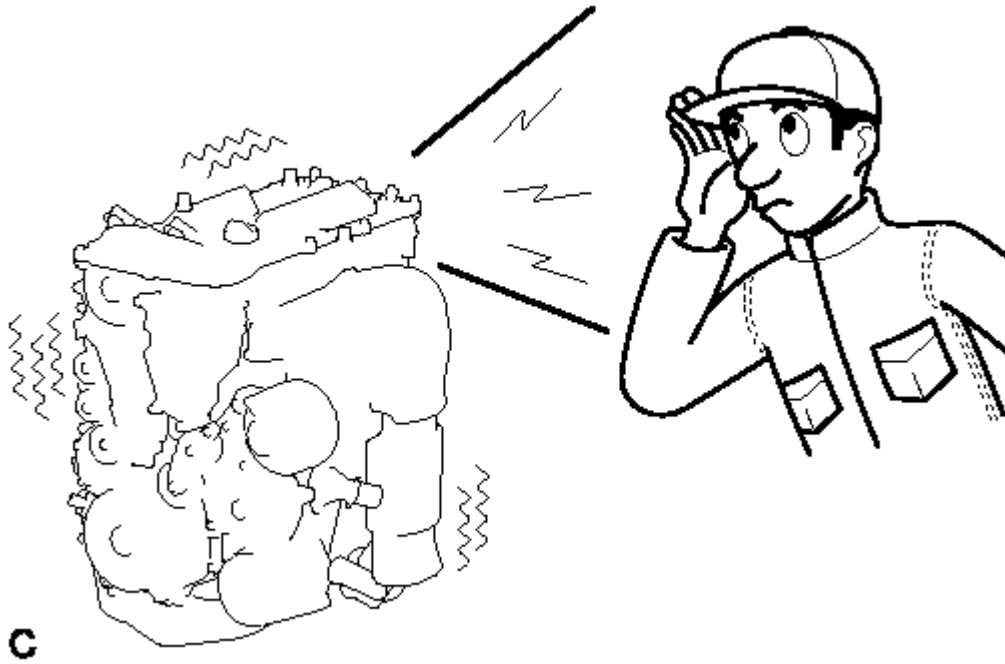


Fig. 10: Listening For Any Noise & Vibrations In Engine Assembly
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Check for valve noise or a rough idle.
2. Judge whether the valve clearance needs to be adjusted.

HINT:

If the valve noise is too loud or the idle is rough, inspect the valve clearance. Refer to **ADJUSTMENT**.

ADJUSTMENT

ADJUSTMENT

1. **REMOVE REAR ENGINE UNDER COVER RH**
2. **REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY** . Refer to **REMOVAL - Step 1** .
3. **REMOVE IGNITION COIL ASSEMBLY** . Refer to **REMOVAL - Step 2** .
4. **REMOVE SPARK PLUG** . Refer to **REMOVAL - Step 3** .
5. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY** See step 5.
6. **SET NO. 1 CYLINDER TO TDC / COMPRESSION** See step 6.
7. **CHECK VALVE CLEARANCE**

No. 1 Cylinder TDC/Compression

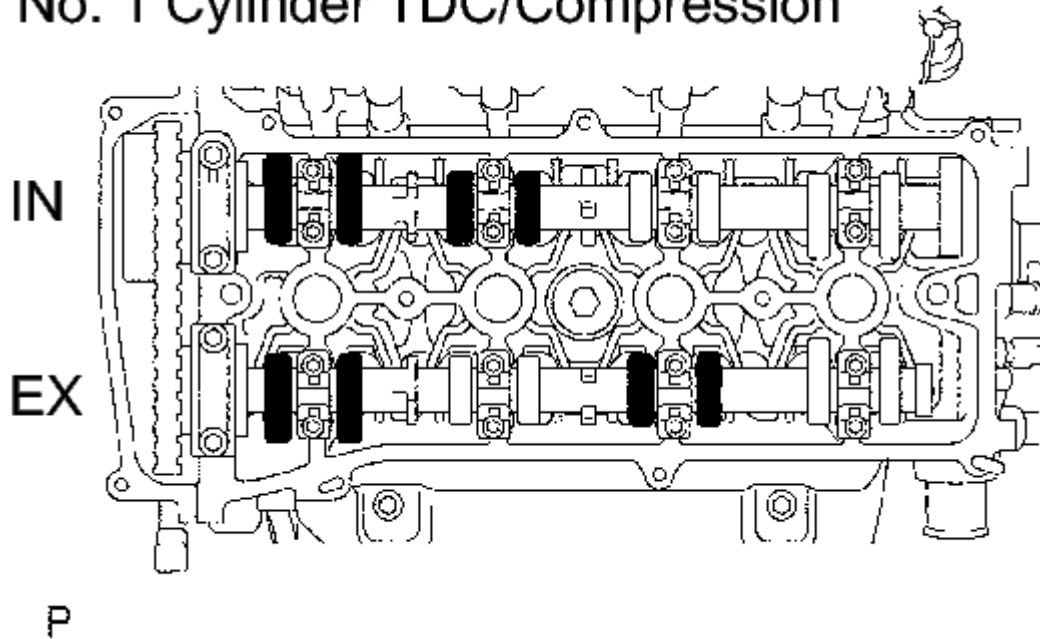


Fig. 11: Measuring Clearance Between Valve Lifter And Camshaft (1 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Standard valve clearance (cold)

Item	Specified 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 clearance lifters.
- b. Turn the crankshaft 1 revolution (360°) and set the No. 4 cylinder to the TDC/compression.

No. 4 Cylinder TDC/Compression

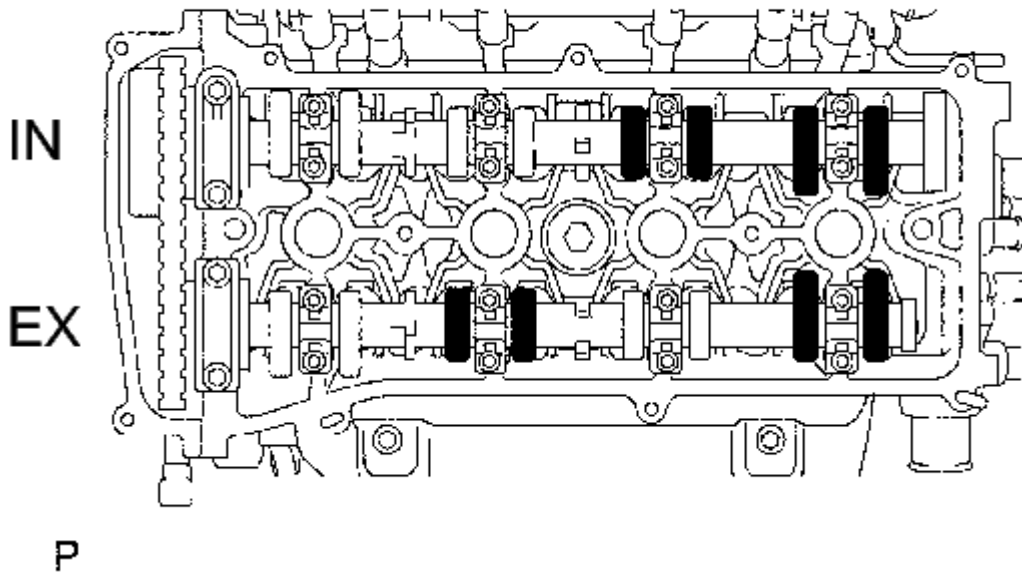


Fig. 12: Measuring Clearance Between Valve Lifter And Camshaft (2 Of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Standard valve clearance (cold)

Item	Specified 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.

8. ADJUST VALVE CLEARANCE

- a. Set No. 1 cylinder to TDC/compression See step 6.
- b. Remove the No. 1 chain tensioner See step 7.
- c. Loosen the camshaft timing sprocket See step 8.
- d. Remove the No. 2 camshaft See step 6.
- e. Remove the camshaft See step 10.
- f. Remove the valve lifters.

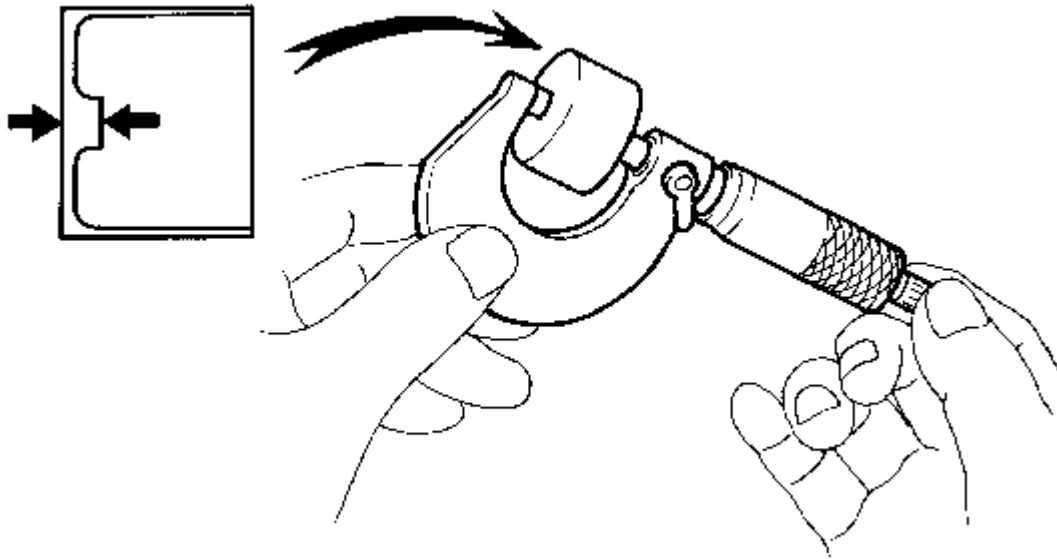


Fig. 13: Measuring Removed Lifter Thickness With Micrometer
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Using a micrometer, measure the thickness of the removed valve lifters.
- h. Calculate the thickness of a new lifter so that the valve clearance comes within the specified values.

New lifter thickness

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

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 thickness = 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. $0.16 \text{ mm (0.0063 in.)} + 5.250 \text{ mm (0.2067 in.)} = 5.410 \text{ mm (0.2130 in.)}$

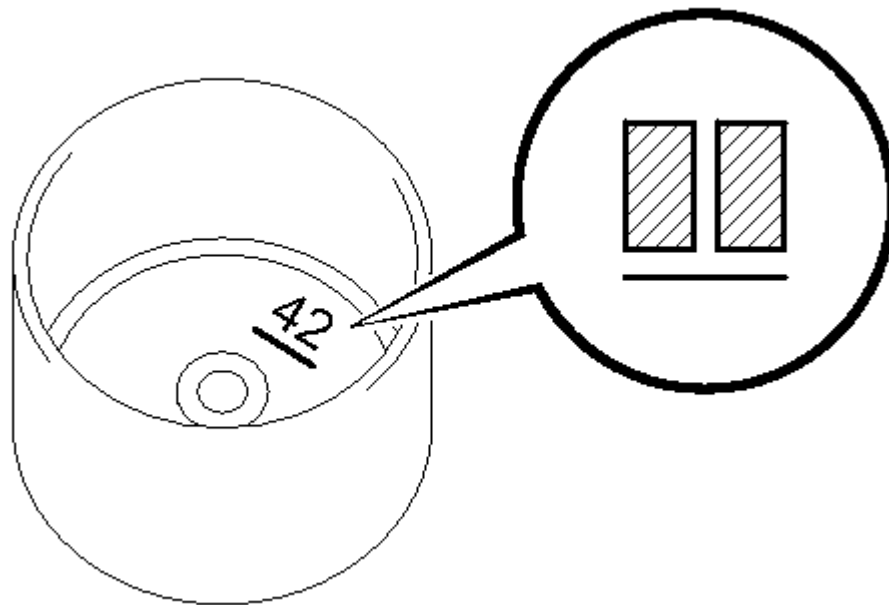
4. Closest new lifter = 5.420 mm (0.2134 in.)

- Select No. 42 lifter

i. 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.).



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Fig. 14: View Of Identification Number Inside Valve Lifters

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

- The identification number inside the valve lifters shows the value to 2 decimal places. (The illustration shows 5.420 mm (0.2134 in.)
- j. Valve lifter selection chart (intake).

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NEW LIFTER THICKNESS

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)
08	5.080 (0.2000)	32	5.320 (0.2094)	56	5.560 (0.2189)

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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.

- k. Valve lifter selection chart (exhaust).

Measured clearance mm (in.)	mm (in.)	
	mm (in.)	mm (in.)
5.060 (0.1992)	0.000 - 0.030 (0.0000 - 0.0012)	28.30 32.34 36.38 40.42 44.46 48.50 52.54 56.58 60.62 64.66 68.70 72.74 74.74
5.080 (0.2000)	0.031 - 0.050 (0.0012 - 0.0020)	06 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.100 (0.2008)	0.051 - 0.070 (0.0020 - 0.0028)	06 08 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.120 (0.2016)	0.071 - 0.090 (0.0028 - 0.0035)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.140 (0.2024)	0.091 - 0.110 (0.0036 - 0.0043)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.160 (0.2031)	0.111 - 0.130 (0.0044 - 0.0051)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.180 (0.2039)	0.131 - 0.150 (0.0052 - 0.0059)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.200 (0.2047)	0.151 - 0.170 (0.0059 - 0.0067)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.210 (0.2051)	0.171 - 0.190 (0.0067 - 0.0075)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.220 (0.2055)	0.191 - 0.210 (0.0075 - 0.0083)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.230 (0.2059)	0.211 - 0.230 (0.0083 - 0.0091)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.240 (0.2063)	0.231 - 0.250 (0.0091 - 0.0098)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.250 (0.2067)	0.251 - 0.270 (0.0099 - 0.0106)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.260 (0.2071)	0.271 - 0.290 (0.0107 - 0.0114)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.270 (0.2075)	0.291 - 0.300 (0.0115 - 0.0118)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.280 (0.2079)	0.300 - 0.400 (0.0118 - 0.0157)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.290 (0.2083)	0.401 - 0.420 (0.0158 - 0.0165)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.300 (0.2087)	0.421 - 0.440 (0.0166 - 0.0173)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.310 (0.2091)	0.441 - 0.460 (0.0174 - 0.0181)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.320 (0.2094)	0.461 - 0.480 (0.0181 - 0.0188)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.330 (0.2098)	0.481 - 0.500 (0.0189 - 0.0197)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.340 (0.2102)	0.501 - 0.520 (0.0197 - 0.0205)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.350 (0.2106)	0.521 - 0.540 (0.0205 - 0.0213)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.360 (0.2110)	0.541 - 0.560 (0.0213 - 0.0220)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.370 (0.2114)	0.561 - 0.580 (0.0221 - 0.0228)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.380 (0.2118)	0.581 - 0.600 (0.0229 - 0.0236)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.390 (0.2122)	0.601 - 0.620 (0.0237 - 0.0244)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.400 (0.2126)	0.621 - 0.640 (0.0244 - 0.0252)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.410 (0.2130)	0.641 - 0.660 (0.0252 - 0.0260)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.420 (0.2134)	0.661 - 0.680 (0.0260 - 0.0268)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.430 (0.2138)	0.681 - 0.700 (0.0268 - 0.0276)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.440 (0.2142)	0.701 - 0.720 (0.0276 - 0.0283)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.450 (0.2146)	0.721 - 0.740 (0.0284 - 0.0291)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.460 (0.2150)	0.741 - 0.760 (0.0292 - 0.0299)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.470 (0.2154)	0.761 - 0.780 (0.0300 - 0.0307)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.480 (0.2157)	0.781 - 0.800 (0.0307 - 0.0315)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.490 (0.2161)	0.801 - 0.820 (0.0315 - 0.0323)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.500 (0.2165)	0.821 - 0.840 (0.0323 - 0.0331)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.510 (0.2169)	0.841 - 0.860 (0.0331 - 0.0339)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.520 (0.2173)	0.861 - 0.880 (0.0339 - 0.0346)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.530 (0.2177)	0.881 - 0.900 (0.0347 - 0.0354)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.540 (0.2181)	0.901 - 0.920 (0.0355 - 0.0362)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.550 (0.2185)	0.921 - 0.940 (0.0363 - 0.0370)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.560 (0.2189)	0.941 - 0.960 (0.0370 - 0.0378)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.570 (0.2193)	0.961 - 0.980 (0.0378 - 0.0386)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.580 (0.2197)	0.981 - 1.000 (0.0386 - 0.0394)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.590 (0.2201)	1.001 - 1.020 (0.0394 - 0.0402)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.600 (0.2205)	1.021 - 1.040 (0.0402 - 0.0409)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.620 (0.2213)	1.041 - 1.060 (0.0410 - 0.0417)	06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.640 (0.2220)		06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.660 (0.2228)		06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.680 (0.2236)		06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.700 (0.2244)		06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.720 (0.2252)		06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74
5.740 (0.2260)		06 08 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 74.74

6

Fig. 16: Valve Lifter Selection Chart (Exhaust)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NEW LIFTER THICKNESS

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)
08	5.080 (0.2000)	32	5.320 (0.2094)	56	5.560 (0.2189)

2013 Scion xB

2013 ENGINE Engine Mechanical (Service Information) - xB

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:

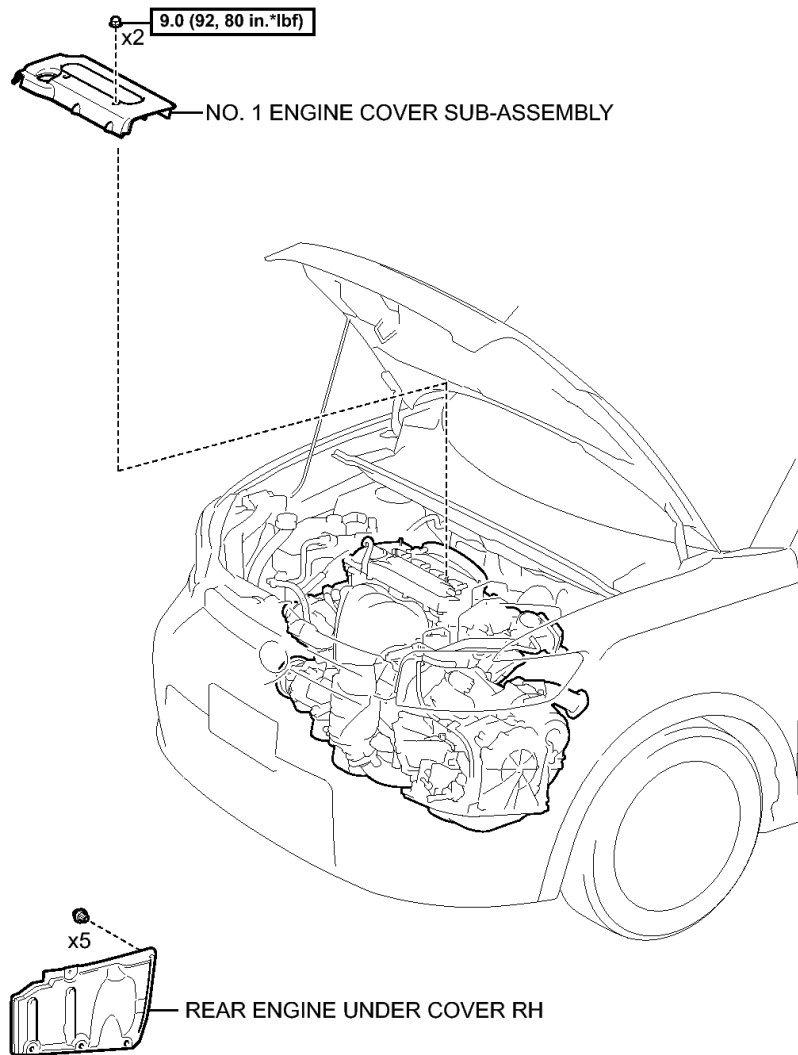
The 5.340 mm (0.2102 in.) lifter is installed, and the measured clearance is 0.510 mm (0.020 in.). Replace the 5.340 mm (0.2102 in.) lifter with a new No. 42 lifter.

- l. Install the selected valve lifter.
- m. Install the camshaft See step 2.
- n. Install the No. 2 camshaft See step 3.
- o. Install the No. 1 chain tensioner See step 4.
9. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY** See step 8.
10. **INSTALL SPARK PLUG** . Refer to **INSTALLATION - Step 1** .
11. **INSTALL IGNITION COIL ASSEMBLY** . Refer to **INSTALLATION - Step 2** .
12. **INSPECT FOR ENGINE OIL LEAK**
13. **INSPECT IGNITION TIMING** See step 7.
14. **INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 4** .
15. **INSTALL REAR ENGINE UNDER COVER RH**

CAMSHAFT

COMPONENTS

ILLUSTRATION

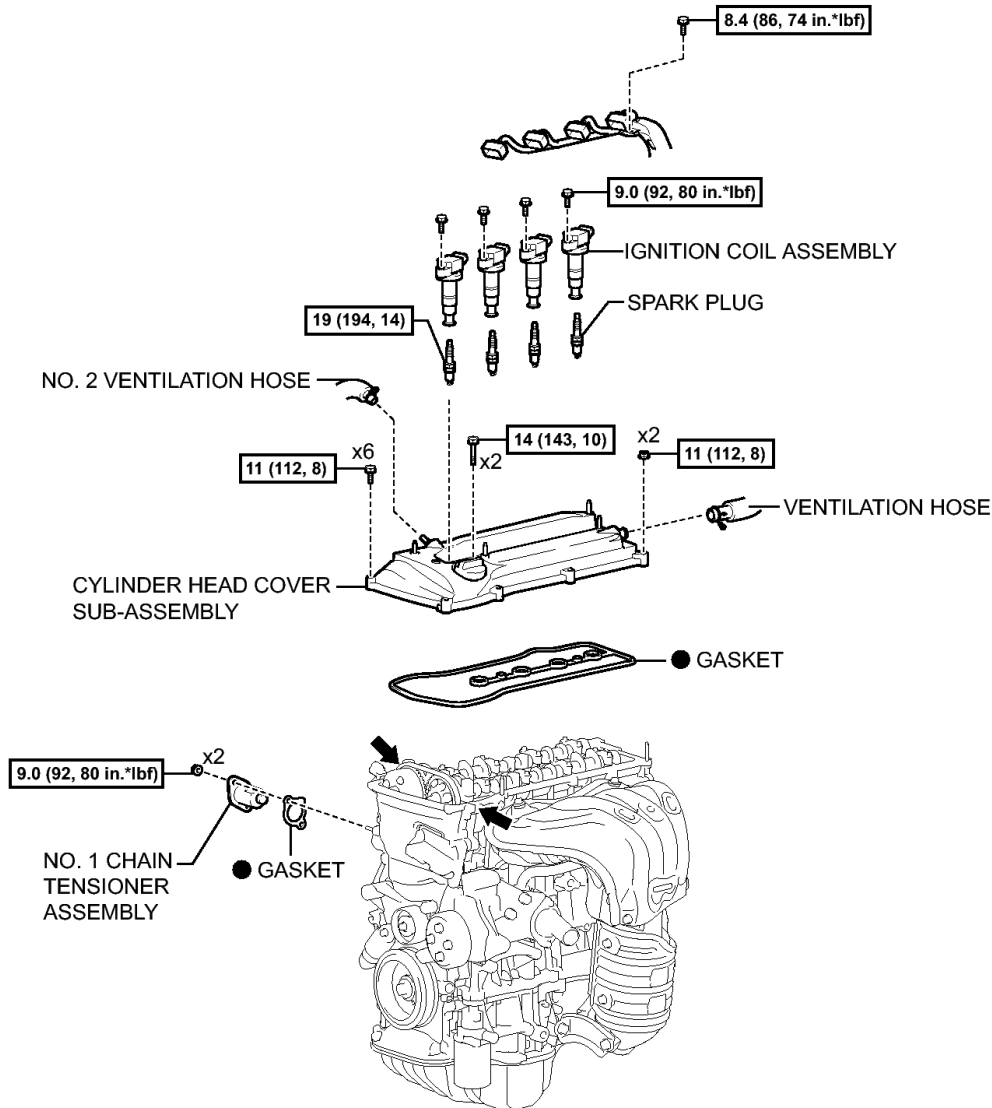


$\boxed{\text{N*m (kgf*cm, ft*lb)}} : \text{Specified torque}$

P

Fig. 17: Identifying Camshaft Replacement Components With Torque Specifications (1 Of 3)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

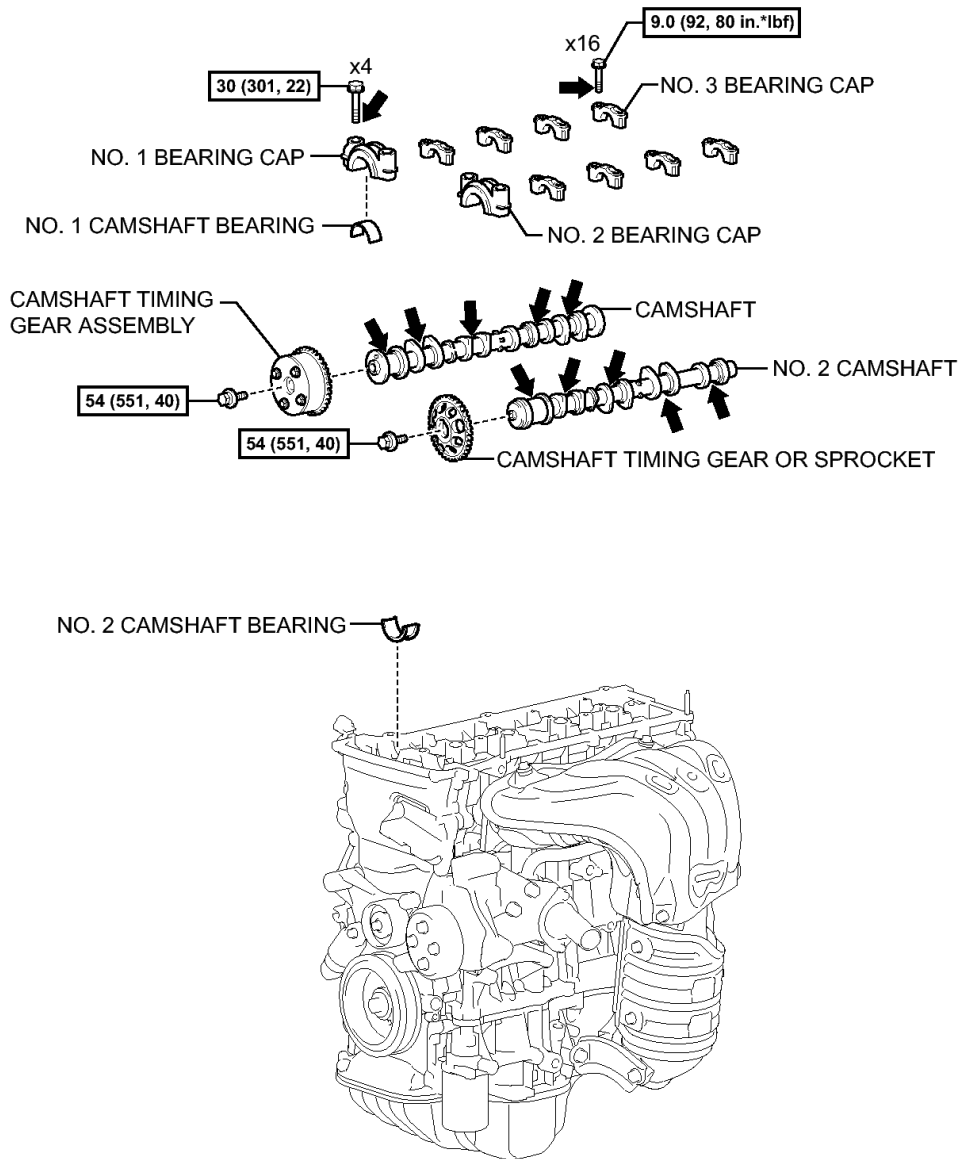


[N*m (kgf*cm, ft*lbf)] : Specified torque

● Non-reusable part ← Seal packing

Fig. 18: Identifying Camshaft Replacement Components With Torque Specifications (2 Of 3)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



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

← Engine oil

P

Fig. 19: Identifying Camshaft Replacement Components With Torque Specifications (3 Of 3)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

REMOVAL

1. REMOVE REAR ENGINE UNDER COVER RH

2. **REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY** . Refer to **REMOVAL - Step 1** .
3. **REMOVE IGNITION COIL ASSEMBLY** . Refer to **REMOVAL - Step 2** .
4. **REMOVE SPARK PLUG** . Refer to **REMOVAL - Step 3** .
5. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY**

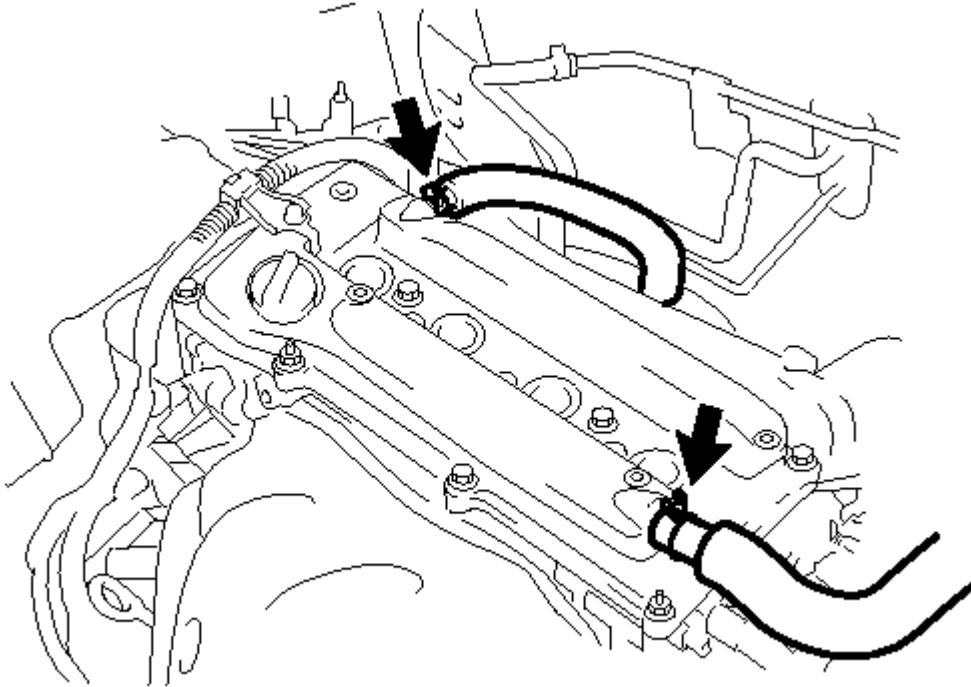
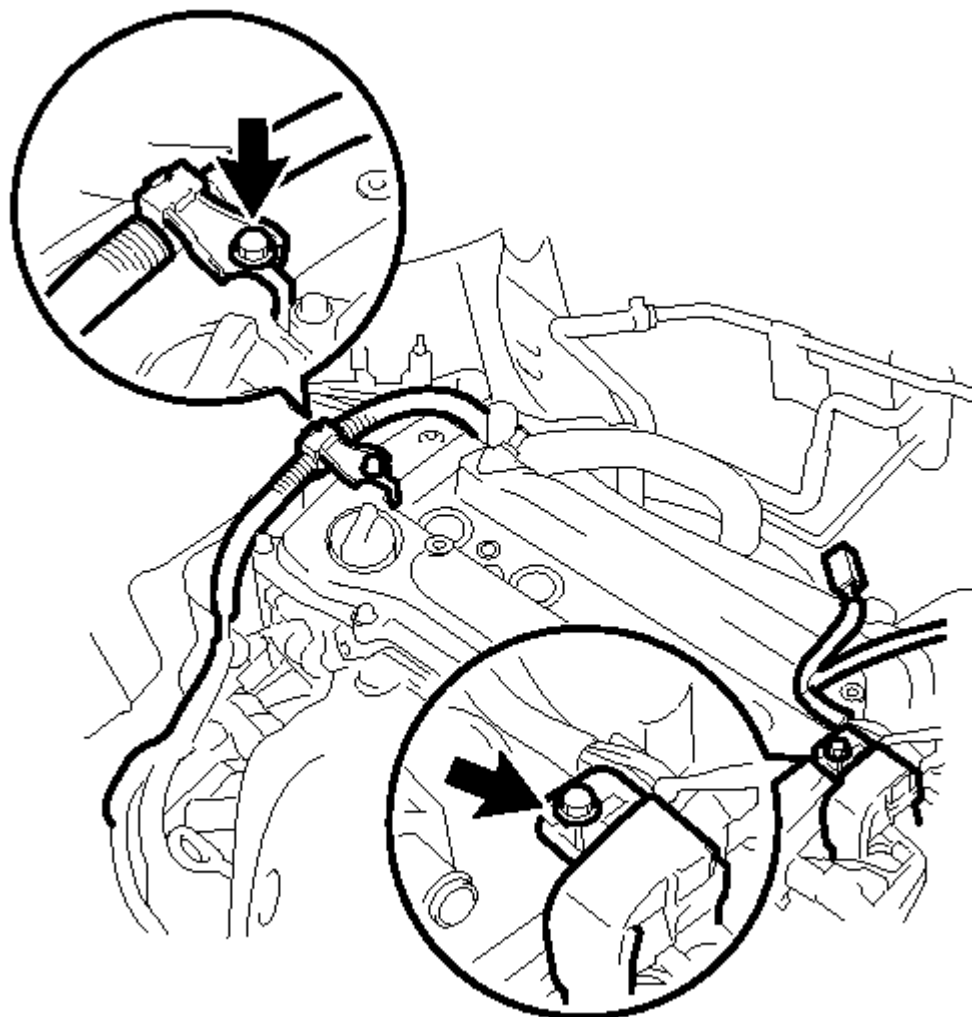
**T**

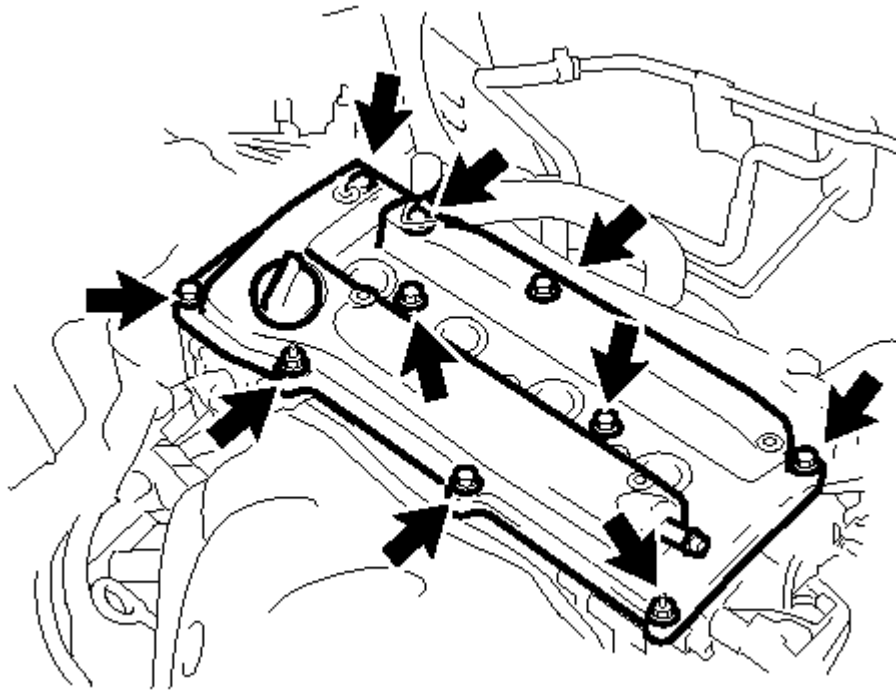
Fig. 20: Location of Ventilation Hoses

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

- a. Remove the 2 ventilation hoses from the cylinder head.
- b. Remove the 2 bolts and separate the 2 wire harness brackets.

**T****Fig. 21: Location of Engine Wires With Bolts****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- c. Remove the 8 bolts and 2nuts, and then remove the cylinder head cover and gasket.



T

Fig. 22: Location of Cylinder Head Cover Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. SET NO. 1 CYLINDER TO TDC / COMPRESSION

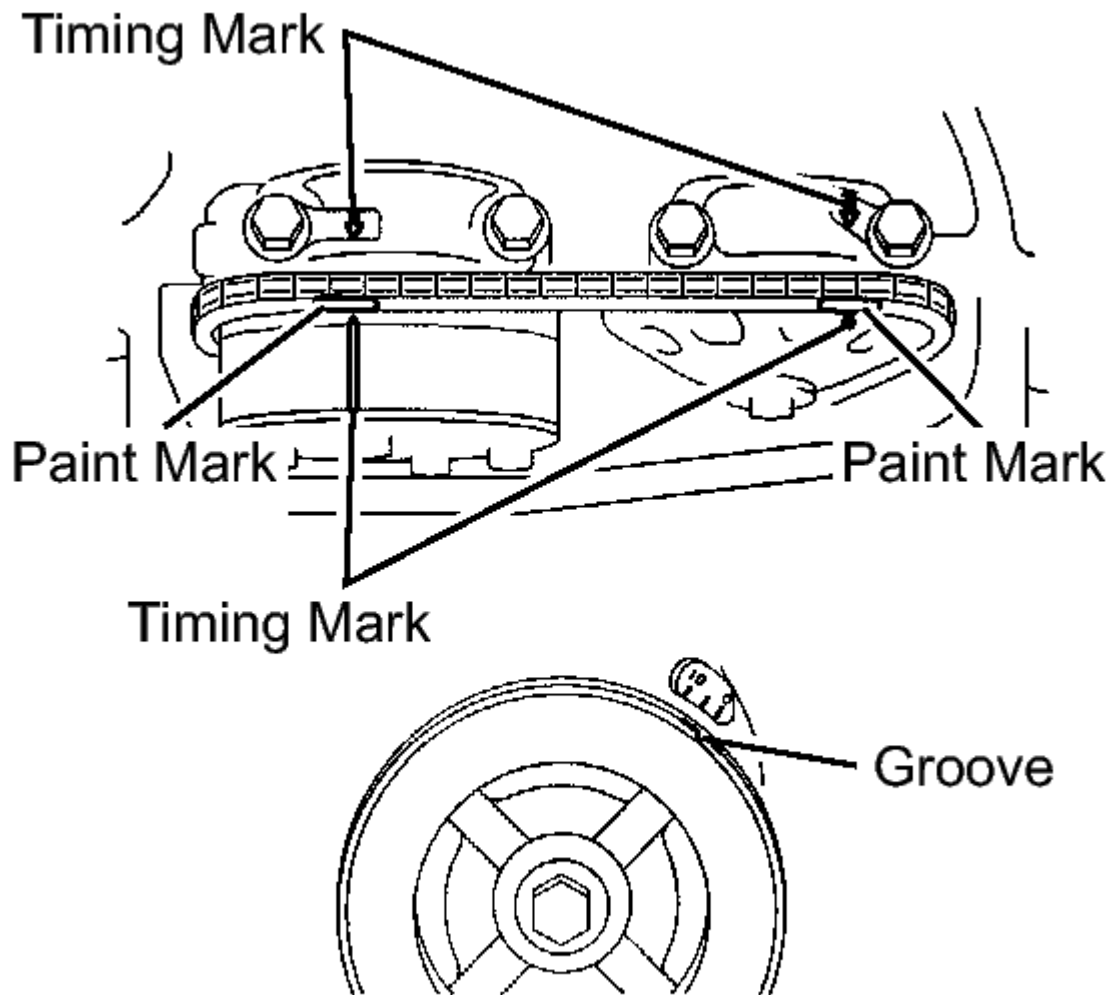


Fig. 23: Identifying Timing Mark On Camshaft Timing Gear And Sprocket
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Turn the crankshaft pulley until the groove and the timing mark "0" on the timing chain cover are aligned.
- b. Check that each timing mark on 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 pulley by 1 revolution (360°) to align the timing marks as above.

- c. Place paint marks on the chain in alignment with the timing marks on the camshaft timing gear and camshaft timing sprocket.

7. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY See step 46.

8. LOOSEN CAMSHAFT TIMING GEAR OR SPROCKET

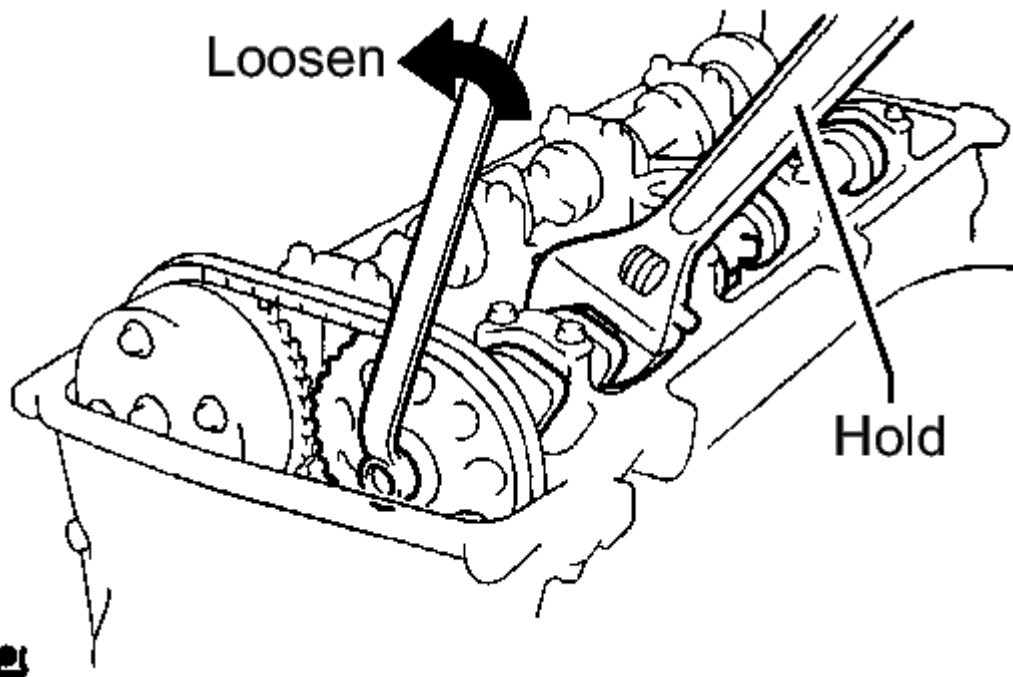


Fig. 24: Loosening Camshaft Timing Set Bolt
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. While holding the No. 2 camshaft with a wrench, loosen the No. 2 camshaft timing set bolt.

9. REMOVE NO. 2 CAMSHAFT

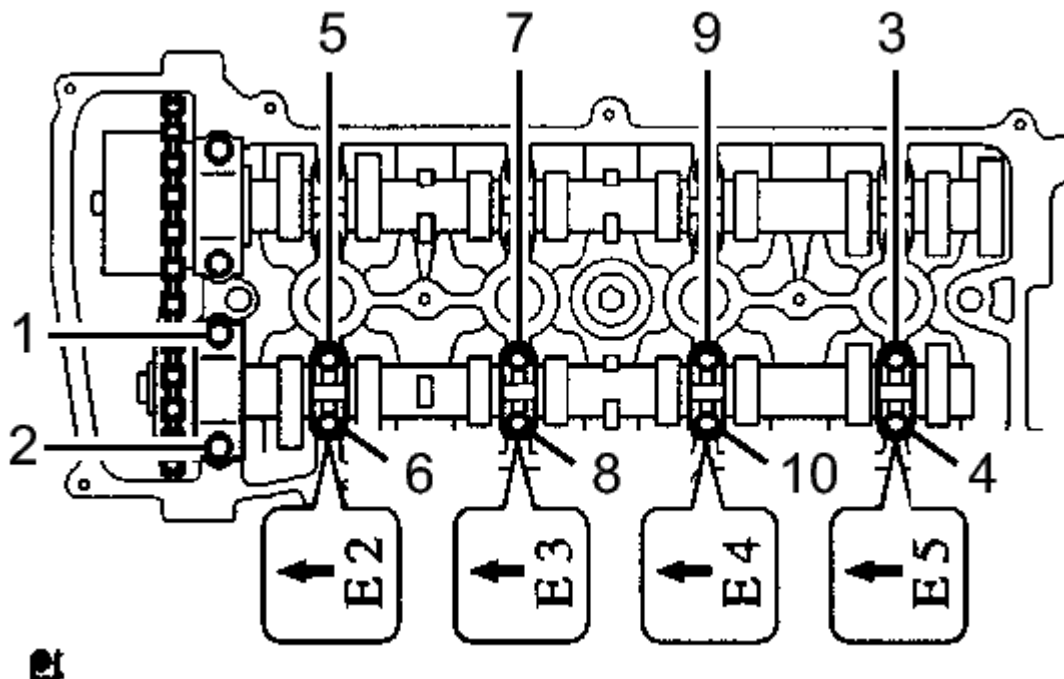


Fig. 25: Removing Bearing Cap Bolts In Sequence
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

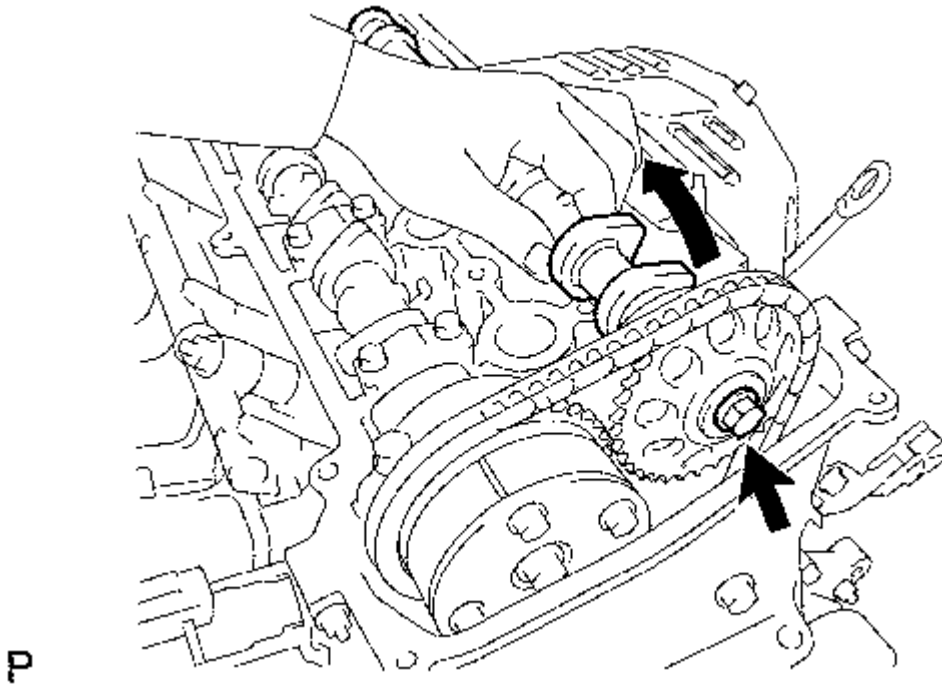


Fig. 26: Removing Camshaft Timing Sprocket Set Bolt
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Remove the camshaft timing sprocket from the No. 2 camshaft with the timing chain wrapped on the sprocket.
- e. Remove the camshaft timing sprocket from the timing chain.

10. REMOVE CAMSHAFT

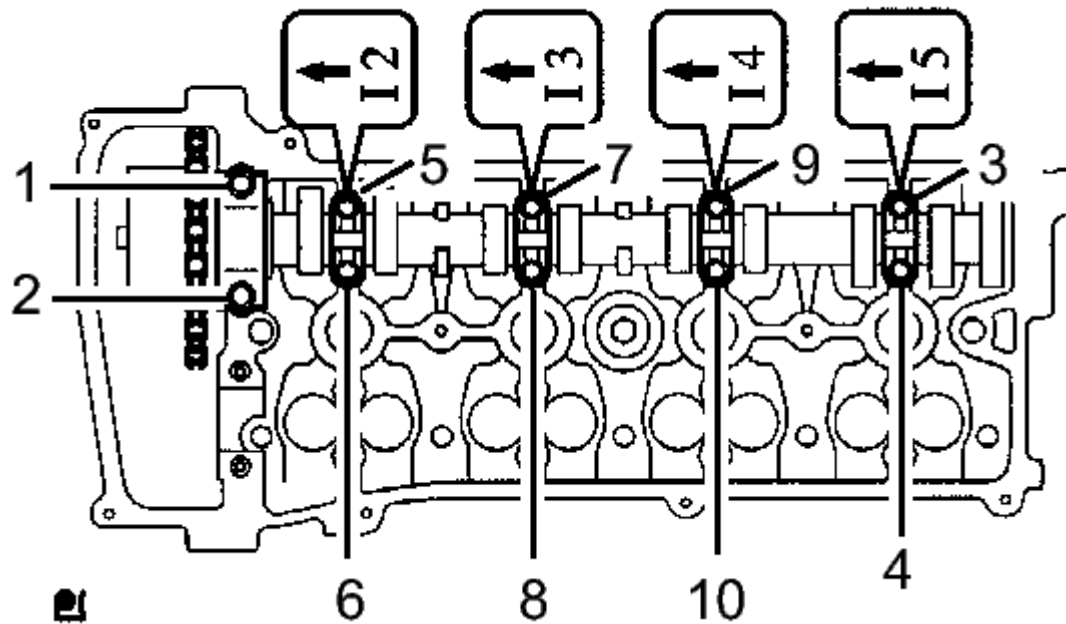


Fig. 27: Removing Bearing Cap Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- In several steps, uniformly loosen and remove the 10 bearing caps bolts in the sequence shown in the illustration.
- Remove the 5 bearing caps.
- Remove the camshaft and camshaft timing gear while holding the timing chain by hand.
- Tie the timing chain with a string as shown in the illustration.

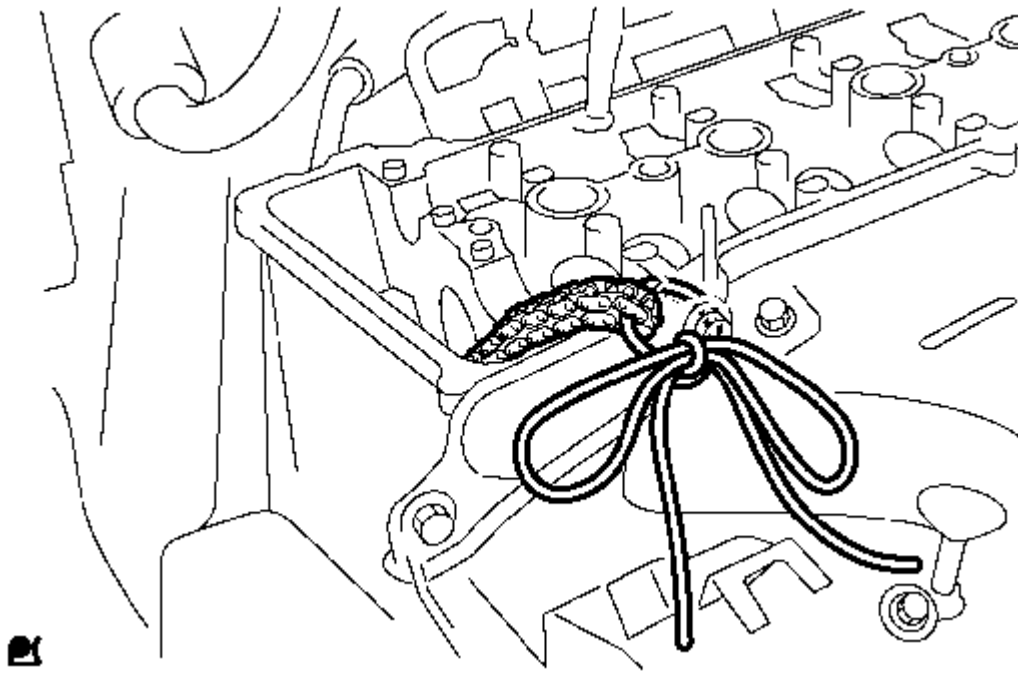
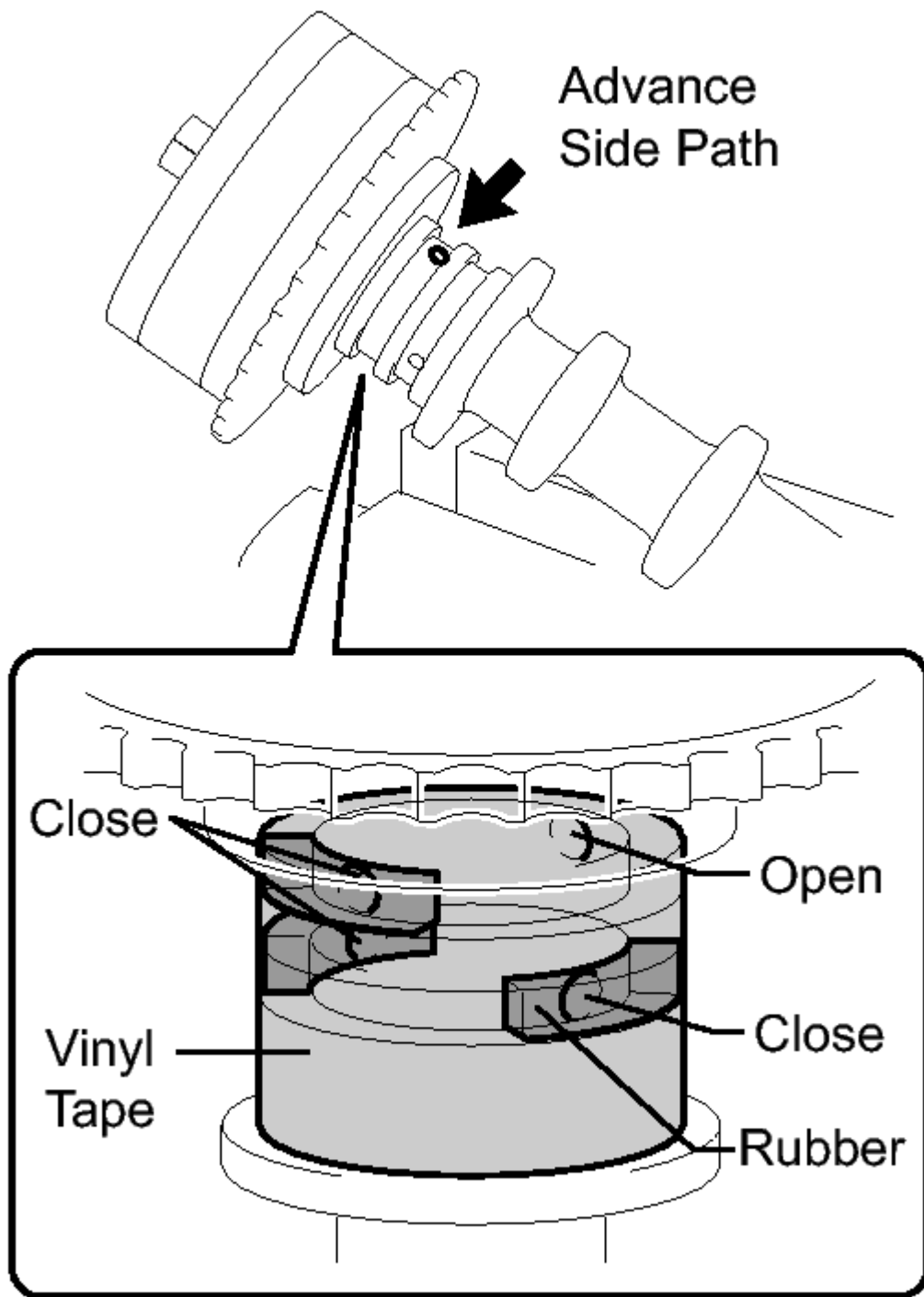


Fig. 28: Tying Timing Chain With String
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

11. REMOVE CAMSHAFT TIMING GEAR ASSEMBLY

**T****Fig. 29: Camshaft & Advance Side Port****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

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

- c. Apply air pressure of 150 kPa (1.5 kgf/cm², 22 psi) to the oil path, then turn the camshaft timing gear to the advance direction (counterclockwise) by hand.

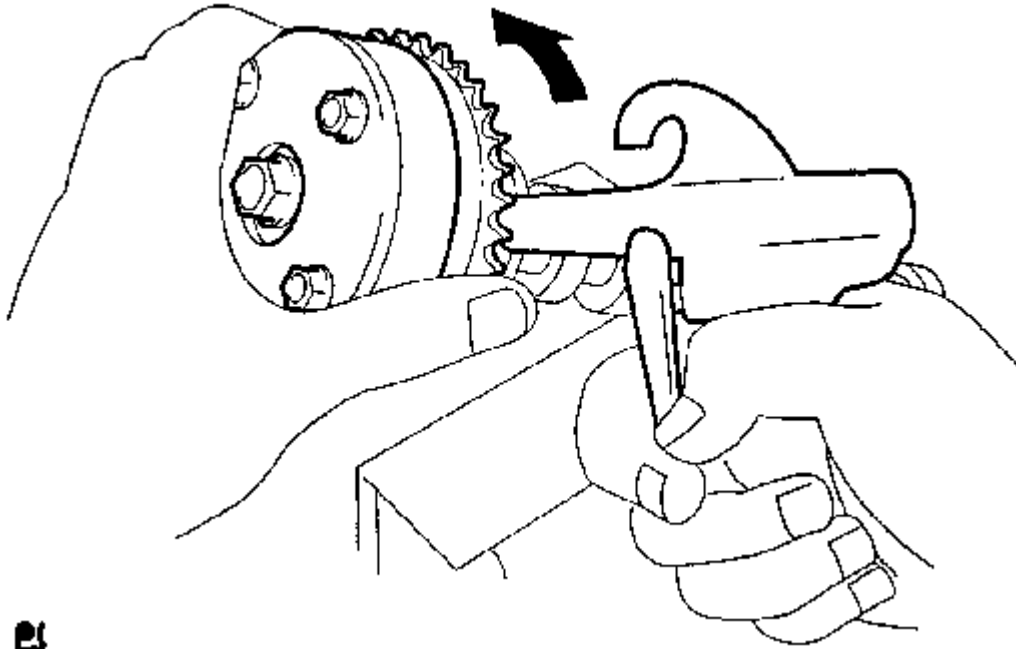


Fig. 30: Applying Compressed Air To Oil Path
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

WARNING: Cover the paths with a piece of cloth to avoid oil splashes.

HINT:

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

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

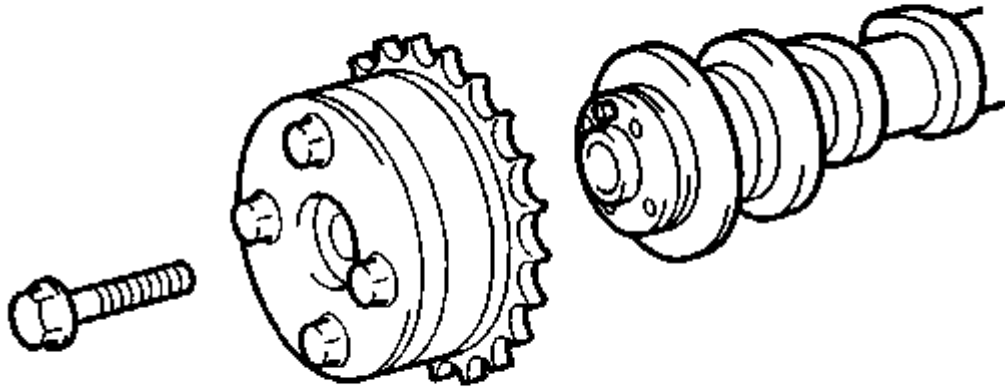


Fig. 31: View Of Flange Bolt Of Camshaft Timing Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

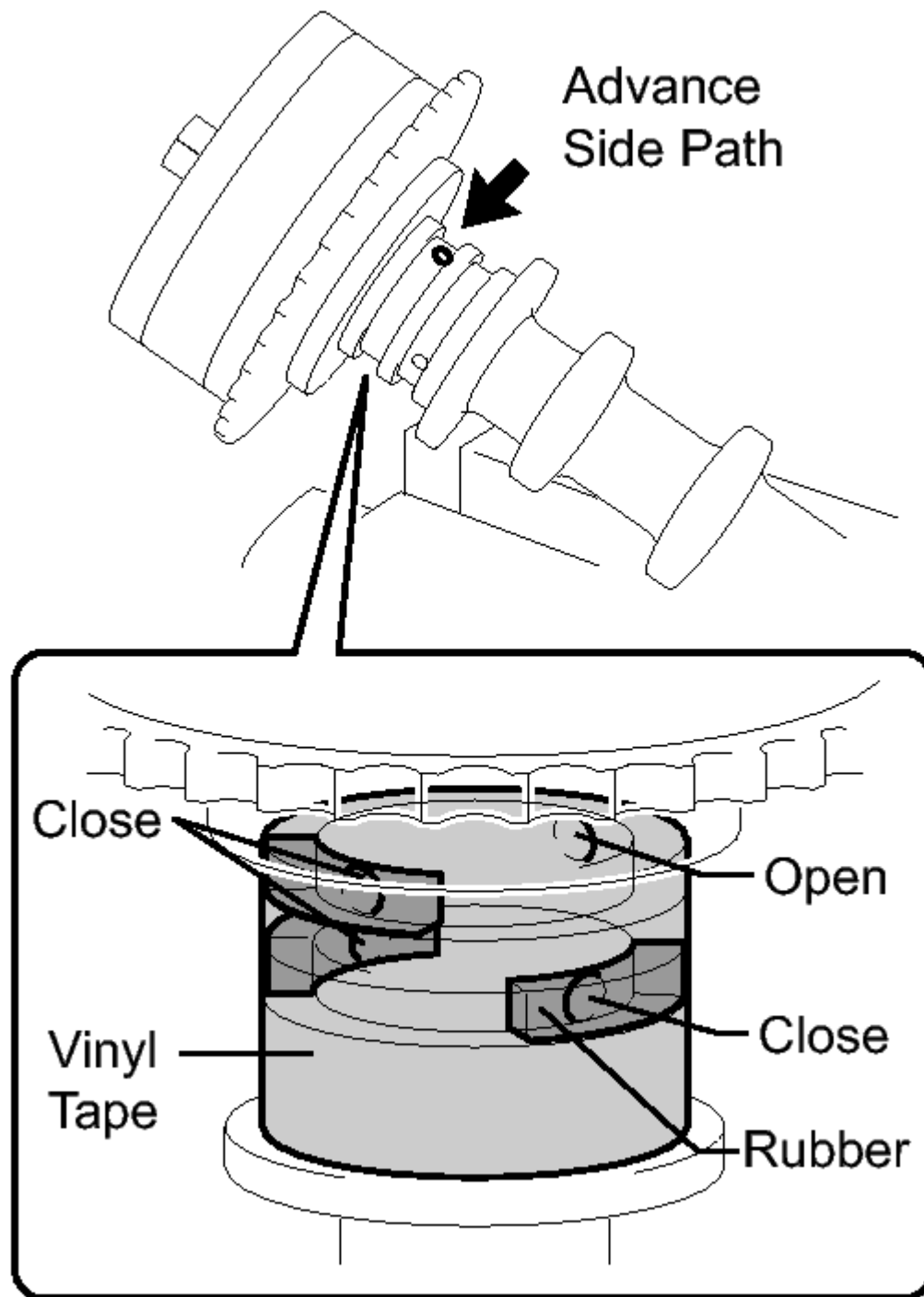
- Be sure not to remove the other 4 bolts.
- When reusing the camshaft timing gear, release the straight pin lock first, then install the gear.

INSPECTION

INSPECTION

1. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY

- a. Install the camshaft timing gear assembly. See step 1.
- b. Clamp the camshaft in a vise, and make sure that the camshaft timing gear does not rotate.

**T****Fig. 32: Camshaft & Advance Side Port****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- c. Cover all the oil ports with vinyl tape except the advance side port shown in the illustration.
- d. Apply air pressure of 150 kPa (1.5 kgf/cm² , 22 psi) to the oil path

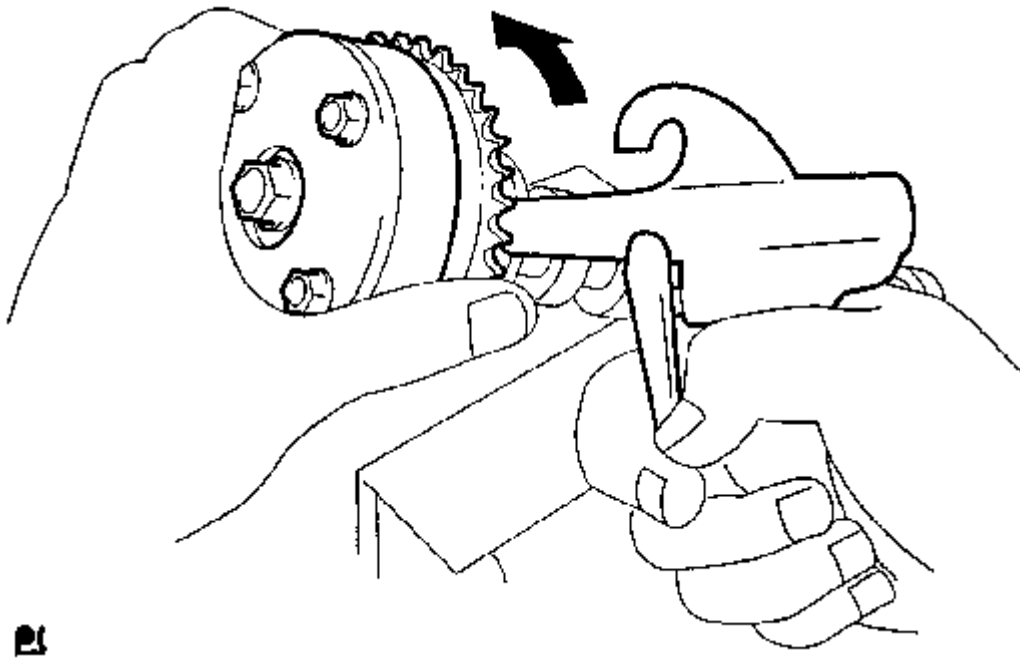


Fig. 33: Applying Compressed Air To Oil Path
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

WARNING: Cover the paths with a piece of cloth to avoid oil splashes.

- e. Check that the camshaft timing gear revolves in the advance direction (counterclockwise) by hand.

HINT:

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

- f. Check for smooth rotation.
 - 1. Turn the camshaft timing gear within its movable range (21°) 2 or 3 times, but do not turn it to the most retarded position. Make sure that the gear turns smoothly.

NOTE: Do not use air pressure to perform the smooth rotation check.

- g. Check the lock in the most retarded position.
 - 1. Confirm that the camshaft timing gear is locked at the most retarded position.
- h. Remove the camshaft timing gear assembly. See step 11.

INSTALLATION

INSTALLATION

1. INSTALL CAMSHAFT TIMING GEAR ASSEMBLY

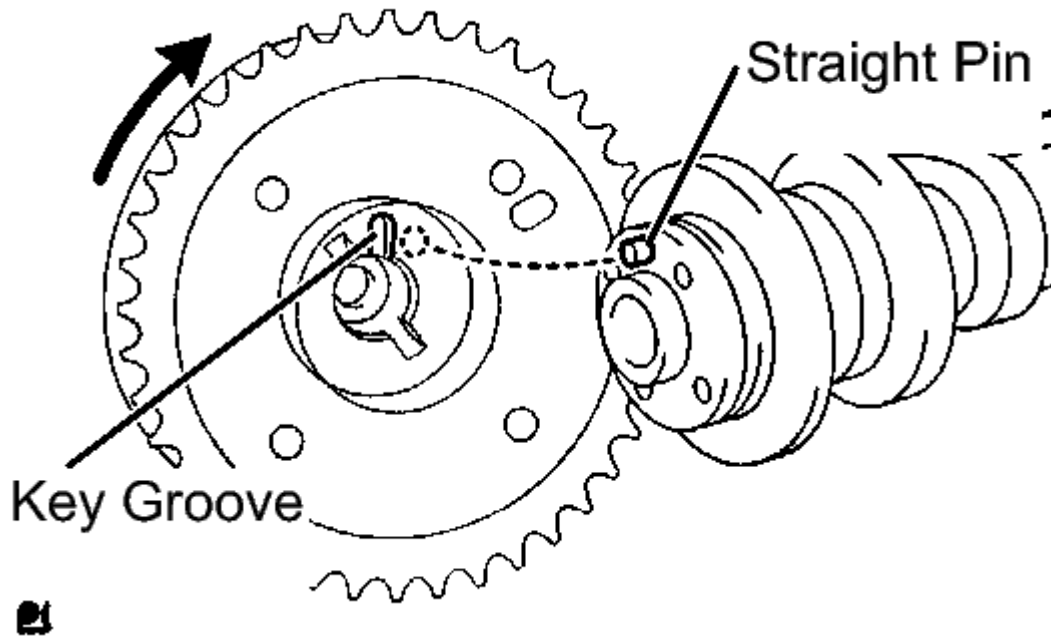


Fig. 34: Aligning Straight Pin And Key Groove

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

- 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.

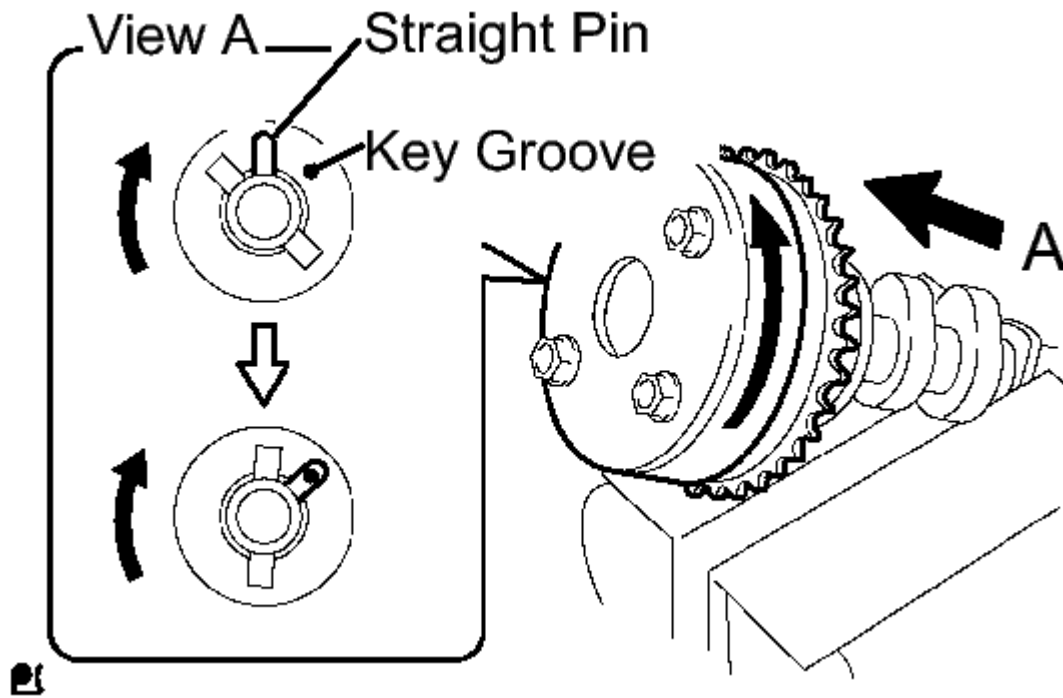


Fig. 35: Turning Camshaft Timing Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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 flange and camshaft.

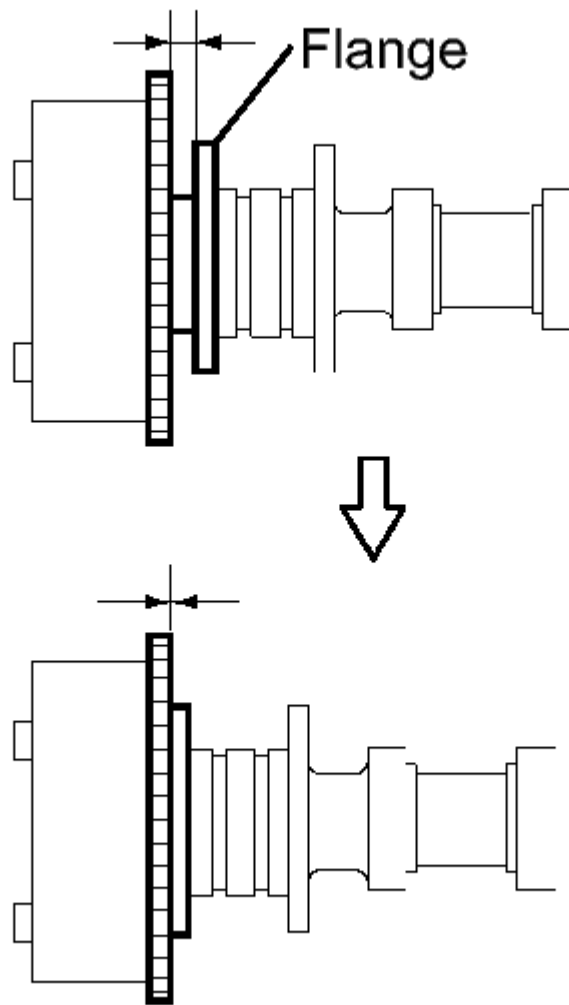
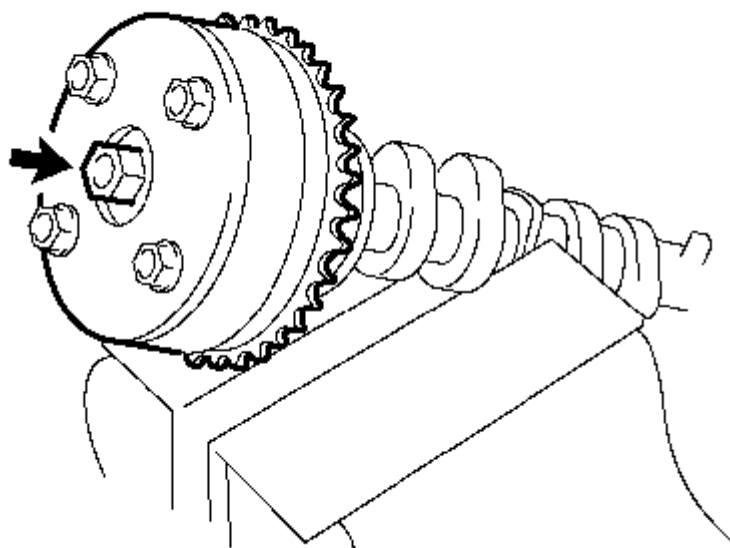


Fig. 36: Checking That There Is No Clearance Between Gear Flange And Camshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Tighten the flange bolt with the camshaft timing gear fixed in place.



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Fig. 37: Location of Flange Bolt

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

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.

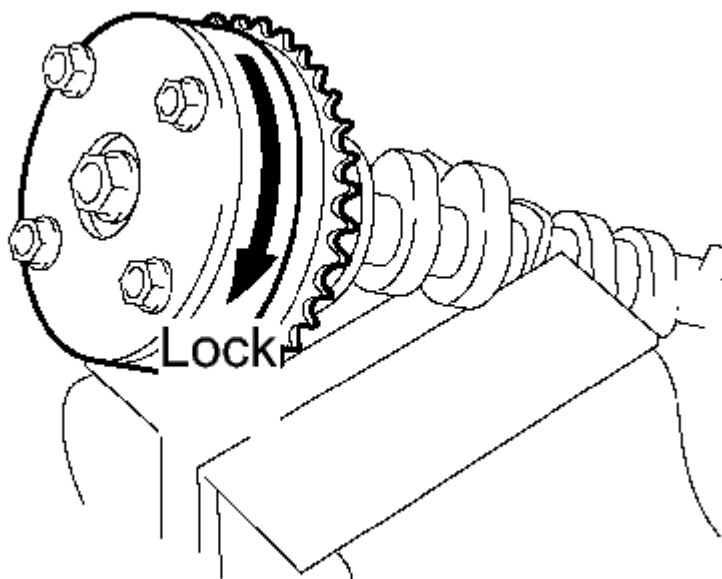


Fig. 38: Locking Camshaft Timing Gear To Retard Angle Side (The Right Direction)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL CAMSHAFT

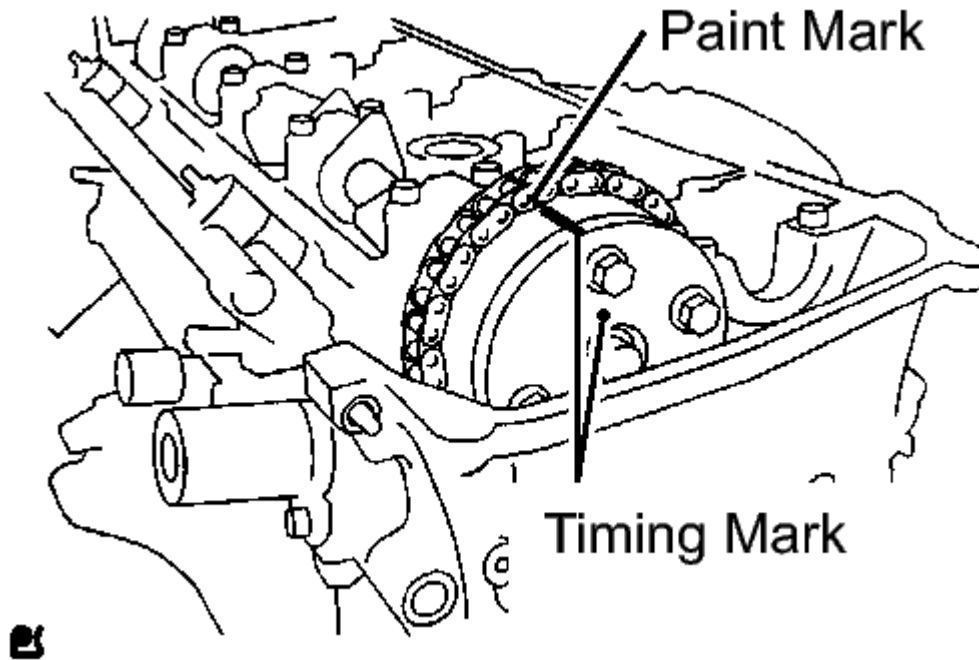


Fig. 39: Aligning Paint Mark With Timing Mark In Camshaft Timing Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- 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.
- 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.

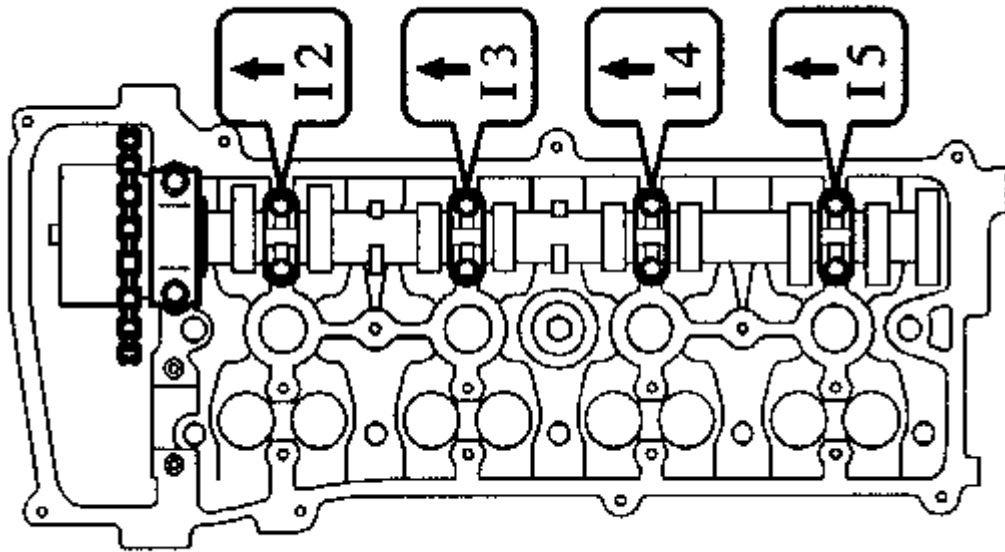


Fig. 40: Identifying Bearing Cap Numbers

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

- d. Apply a light coat of engine oil on 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.

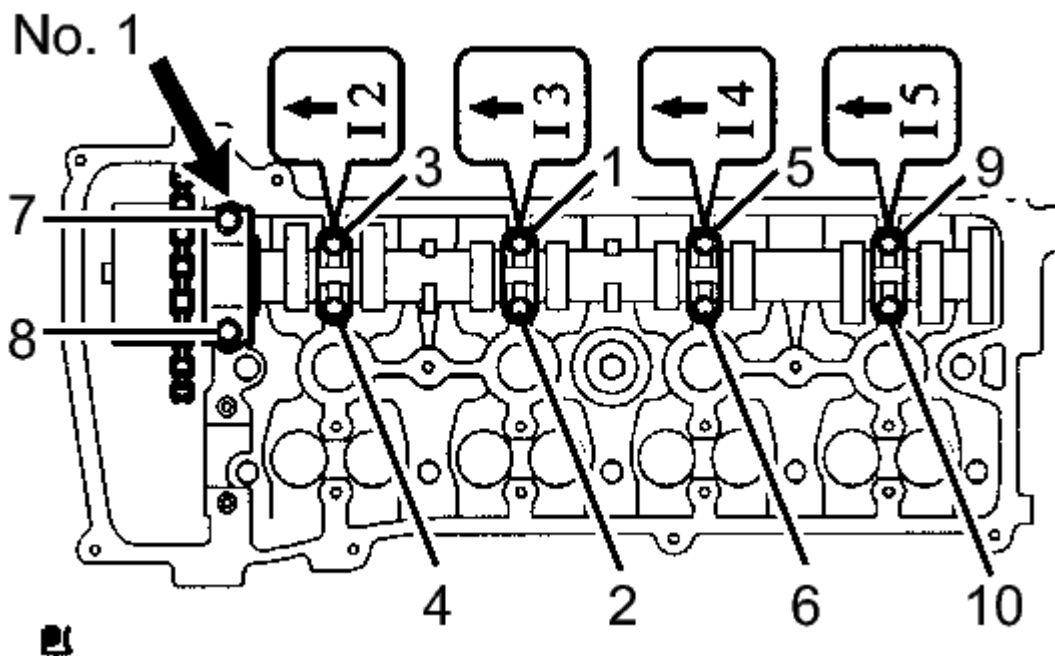


Fig. 41: Tightening Bearing Cap Bolts In Sequence

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

No. 1 bearing

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

No. 3 bearing

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

3. INSTALL NO. 2 CAMSHAFT

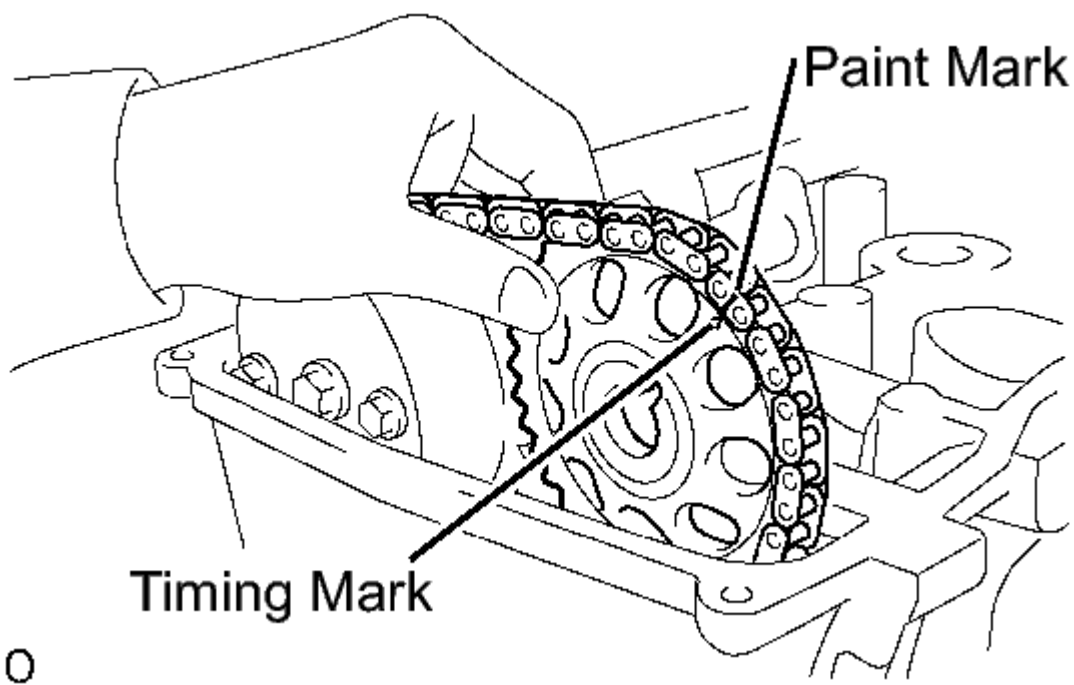


Fig. 42: Aligning Paint Mark On Chain With Timing Mark On Camshaft Timing Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Apply a light coat of engine oil to the journal portion of the No. 2 camshaft.
- Put the No. 2 camshaft on the cylinder head with the paint mark on the chain aligned with the timing mark on the camshaft timing sprocket.
- While holding the No. 2 camshaft by hand, temporarily tighten the camshaft timing sprocket set bolt.

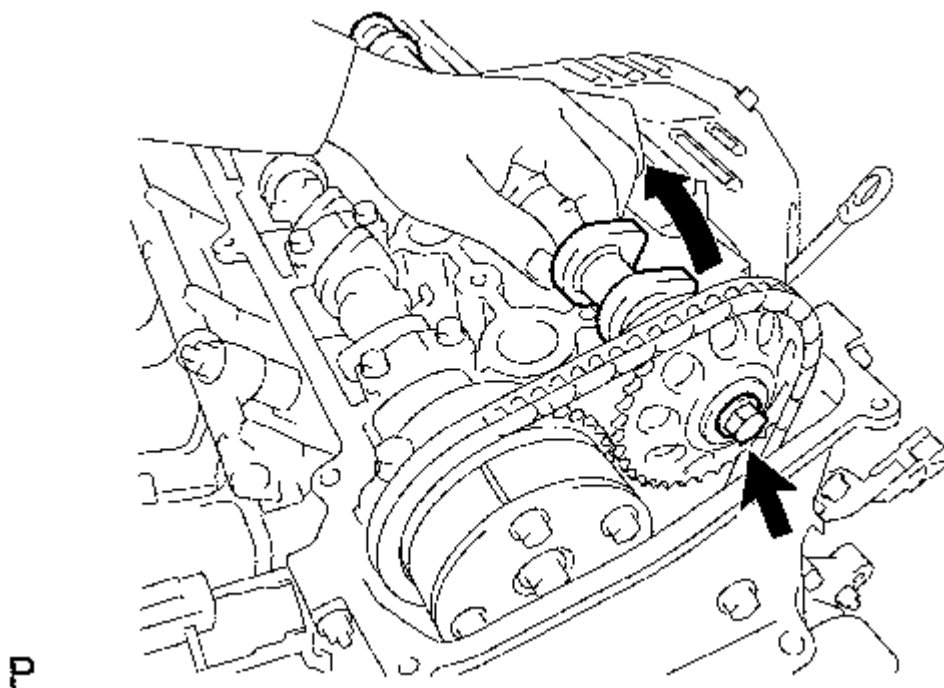


Fig. 43: Tightening Camshaft Timing Sprocket Set Bolt
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- 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.

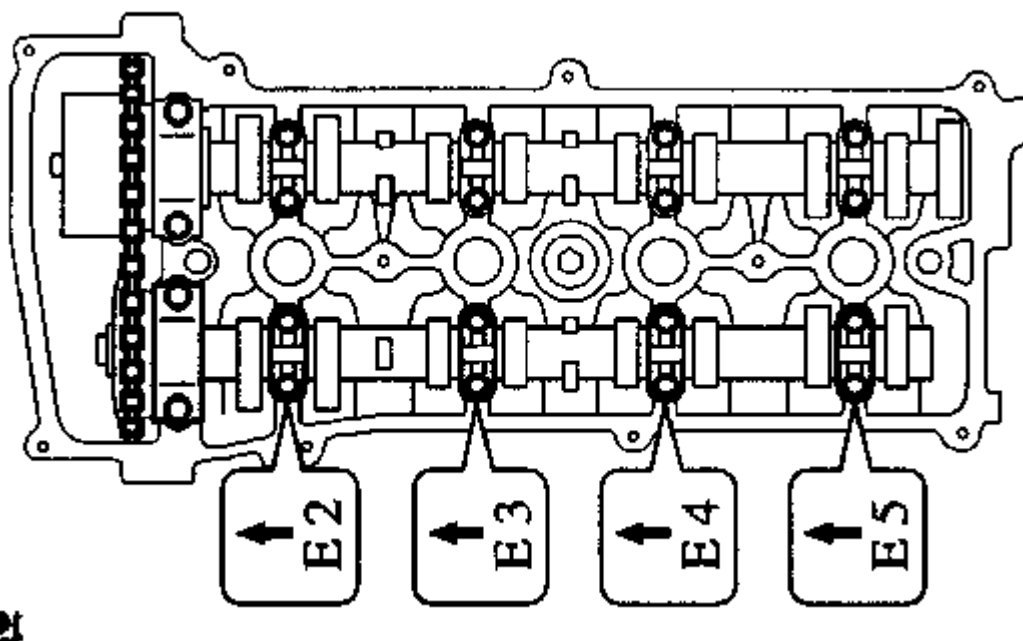


Fig. 44: Identifying Front Marks And Numbers Order
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- 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.

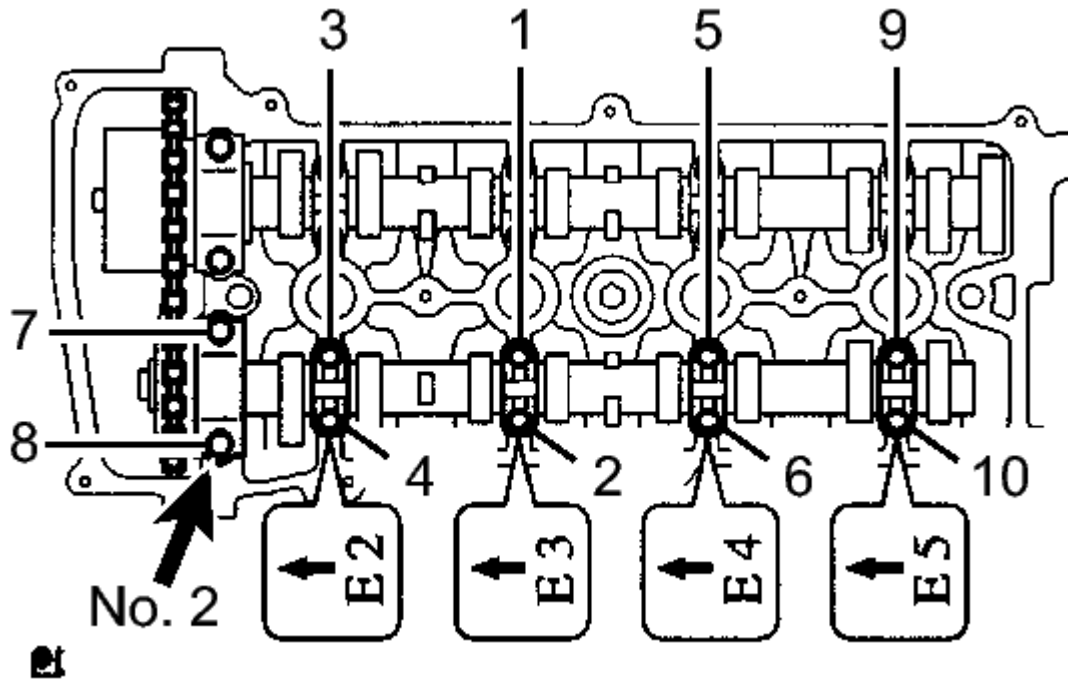


Fig. 45: Tightening Bearing Cap Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

No. 2 bearing

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

No. 3 bearing

Torque: 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.

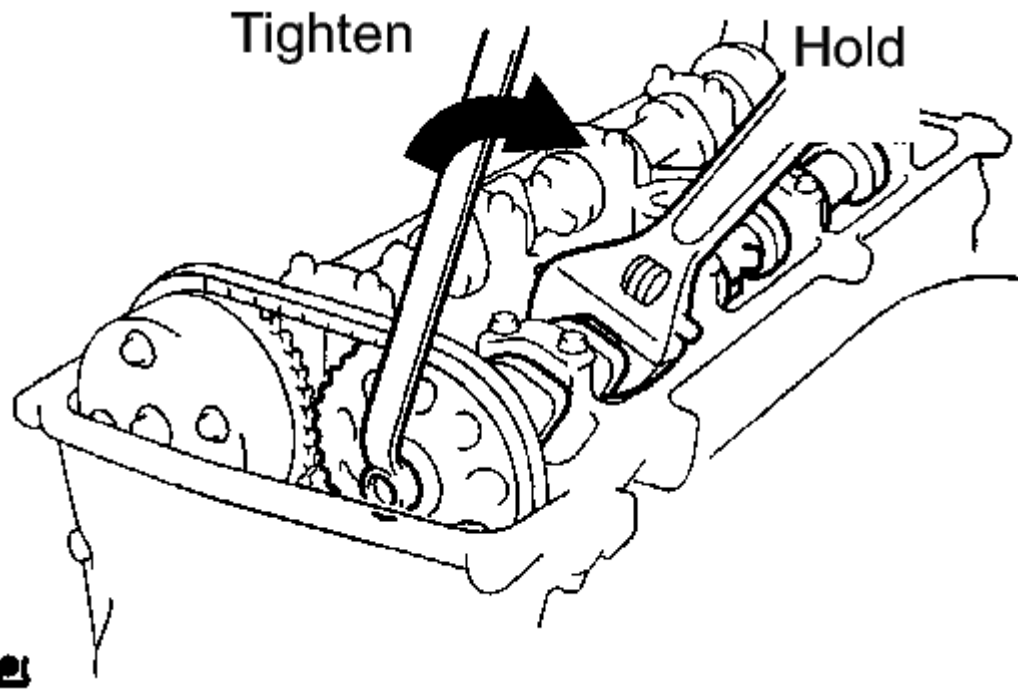


Fig. 46: Tightening Camshaft Timing Sprocket Set Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE: Be careful not to damage the valve lifter.

- 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" on the timing mark chain cover.

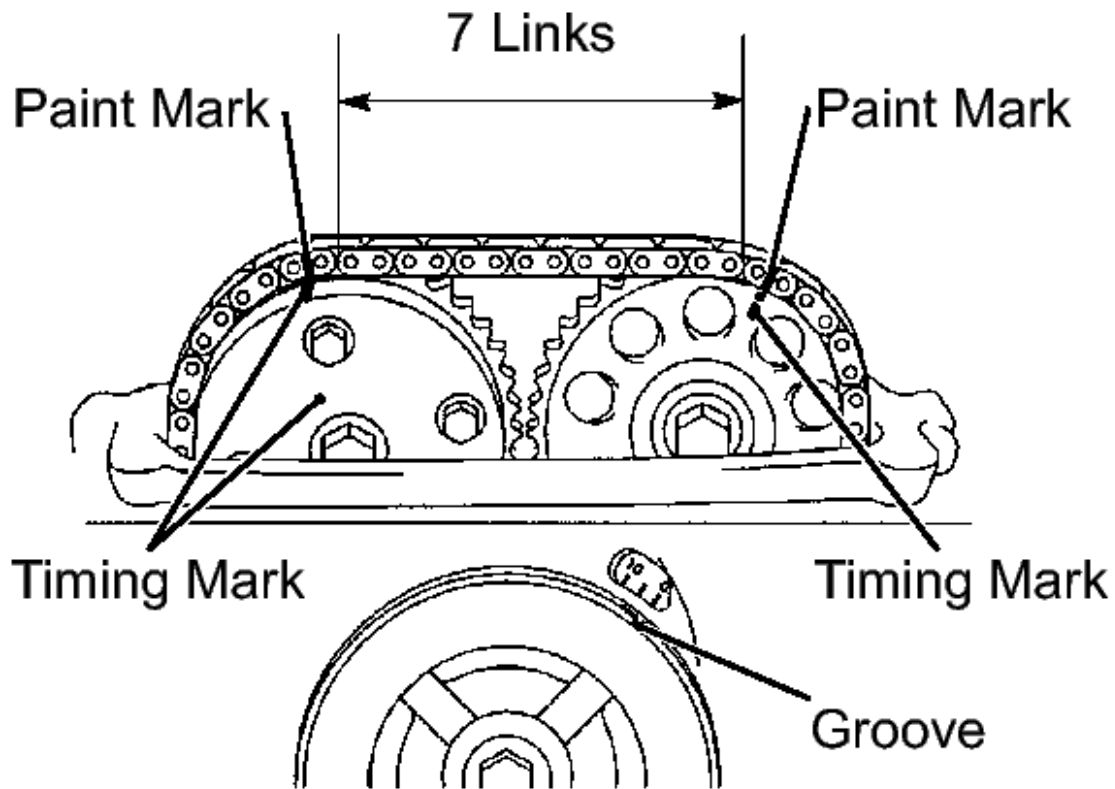


Fig. 47: Identifying Aligning With Timing Marks On Camshaft Timing Gear And Camshaft Timing Sprocket Components

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

4. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY

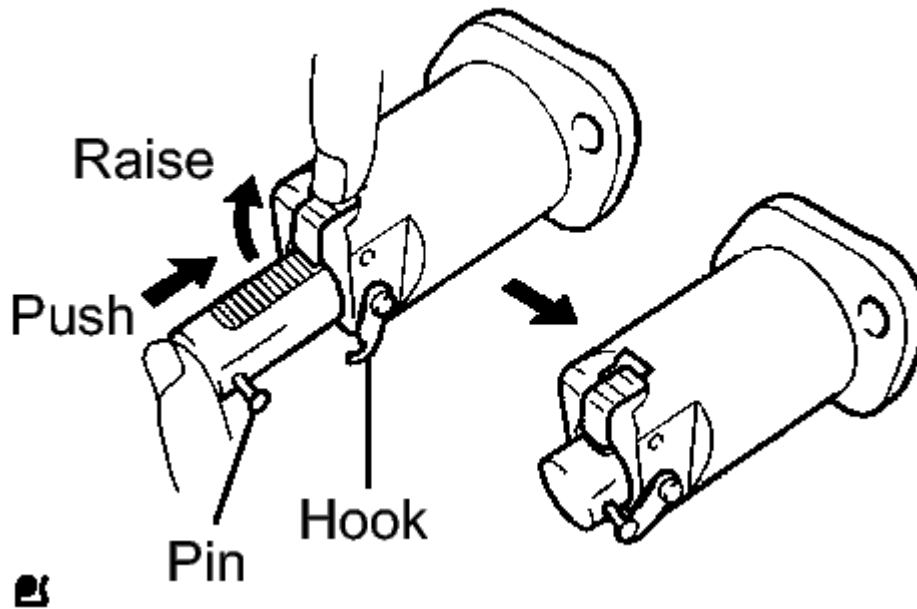


Fig. 48: Identifying Plunger Position

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

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

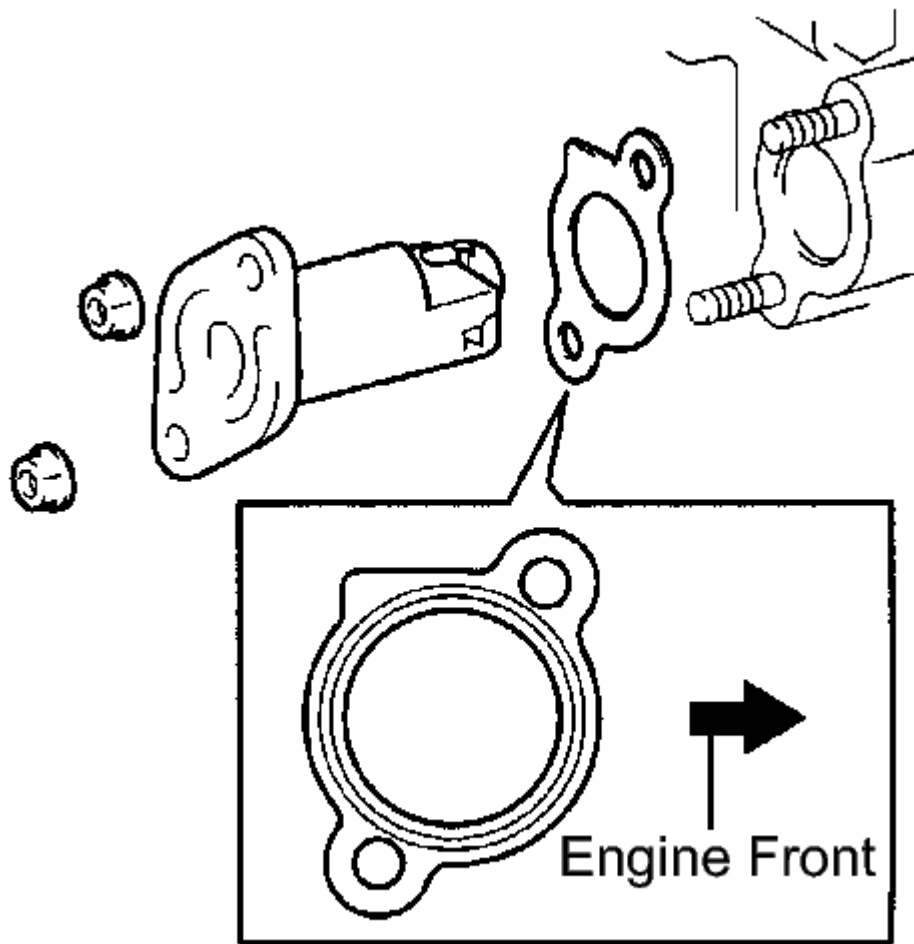


Fig. 49: View Of Gasket And Chain Tensioner With Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

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

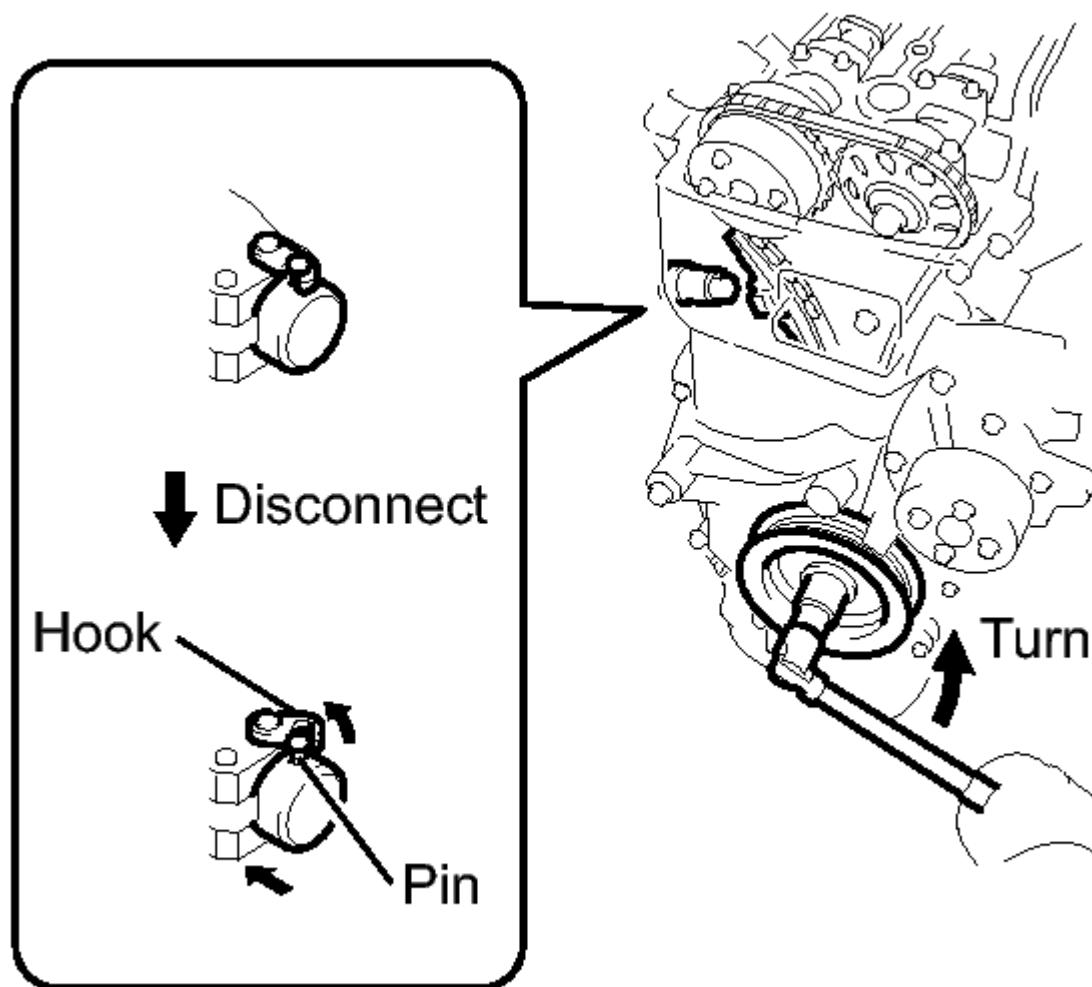
**T**

Fig. 50: 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.

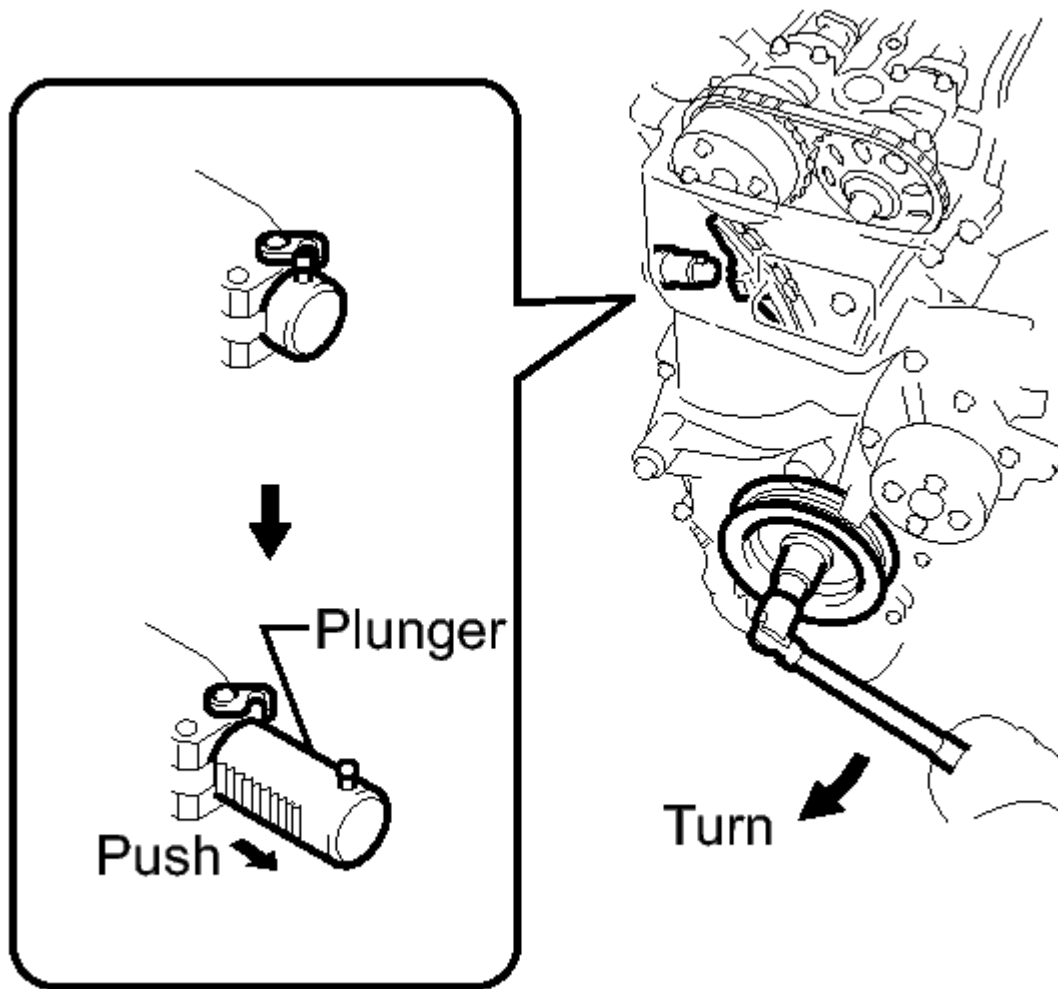
**T**

Fig. 51: Checking Plunger Extended

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

5. **SET NO. 1 CYLINDER TO TDC / COMPRESSION** See step 6.
6. **CHECK VALVE CLEARANCE** See step 7.
7. **ADJUST VALVE CLEARANCE** See step 8.
8. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY**
 - a. Install a new cylinder head cover gasket onto the cylinder head cover.
 - b. Remove any old packing material from the contact surface.

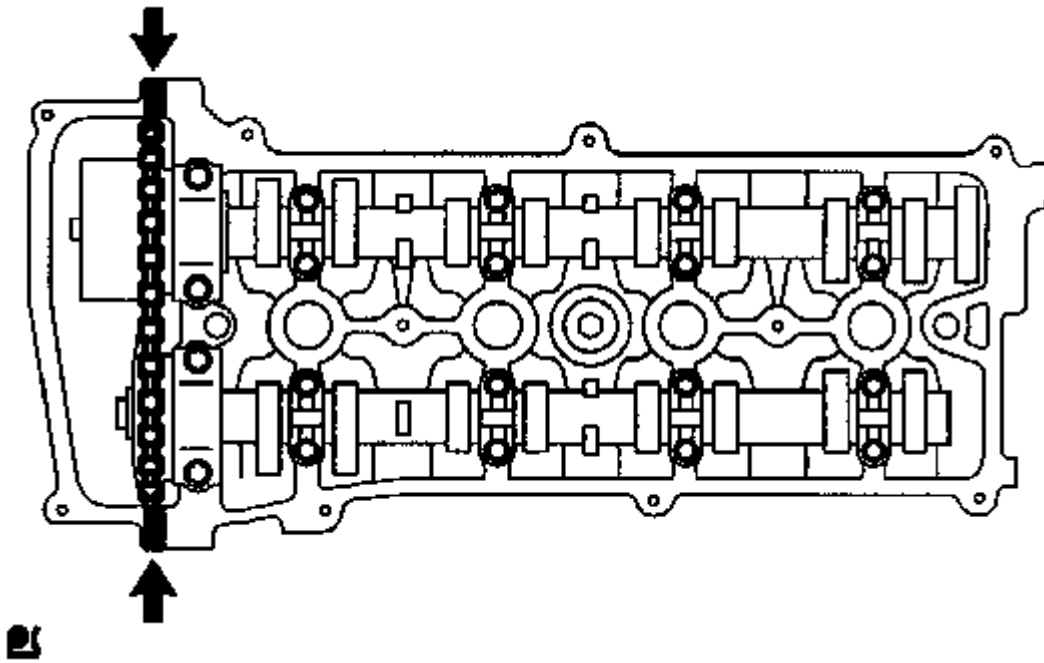


Fig. 52: View Of Seal Packing Locations

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

- c. Apply seal packing to the 2 locations shown in the illustration.

Seal packing

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

NOTE:

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

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

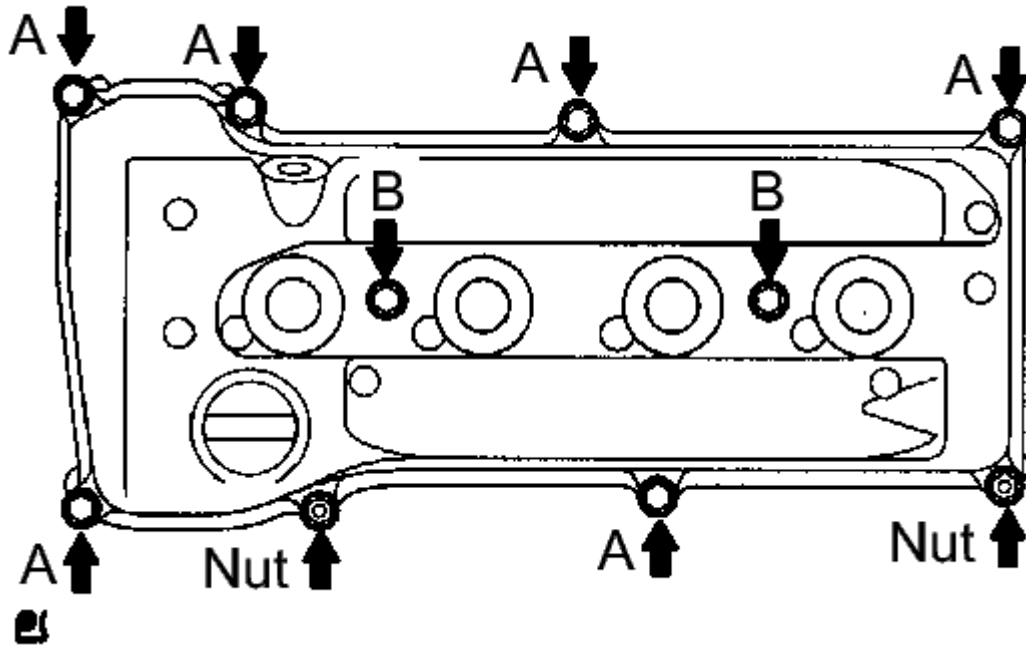


Fig. 53: Location Of Cylinder Head Cover Nuts And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Bolt A

Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)

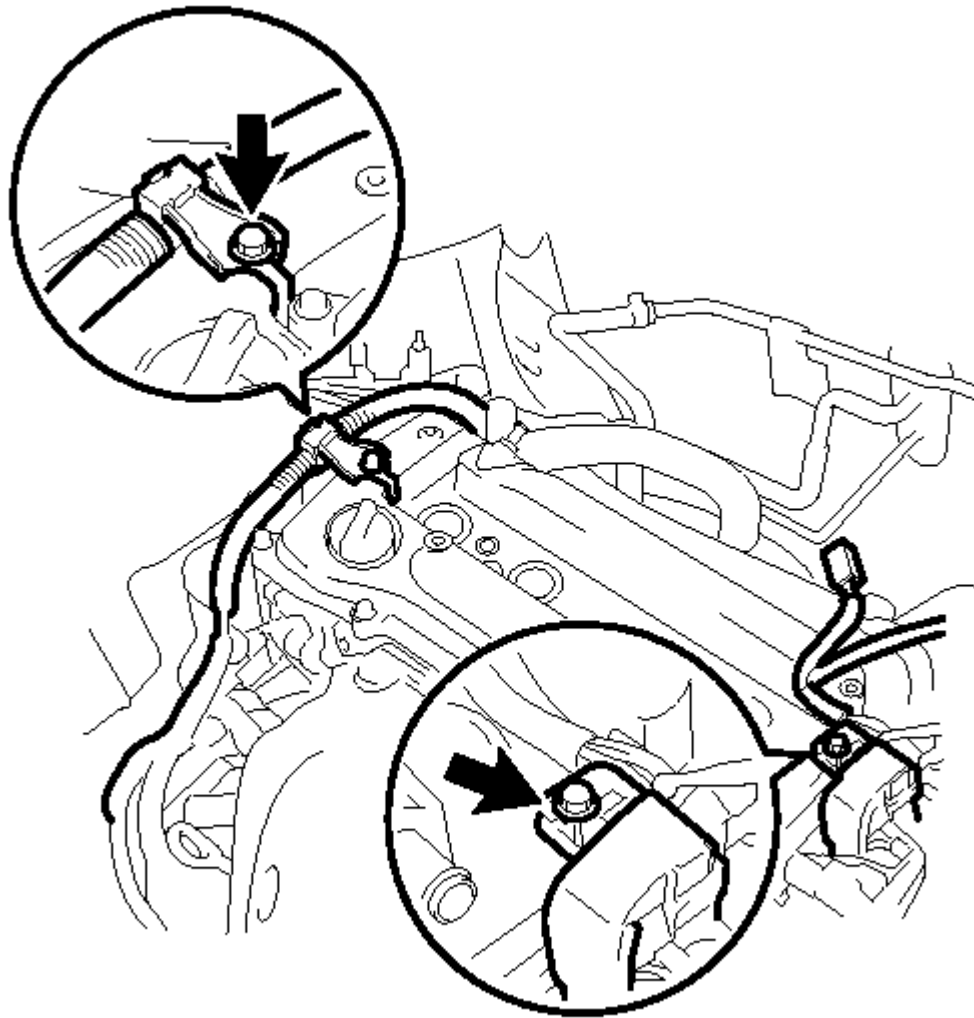
Bolt B

Torque: 14 N*m (143 kgf*cm, 10 ft.*lbf)

Nut

Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)

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

**T****Fig. 54: Location of Engine Wires With Bolts****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.****Torque: 8.4 N*m (86 kgf*cm, 74 in.*lbf)**

- f. Connect the 2 ventilation hoses to the cylinder head cover.

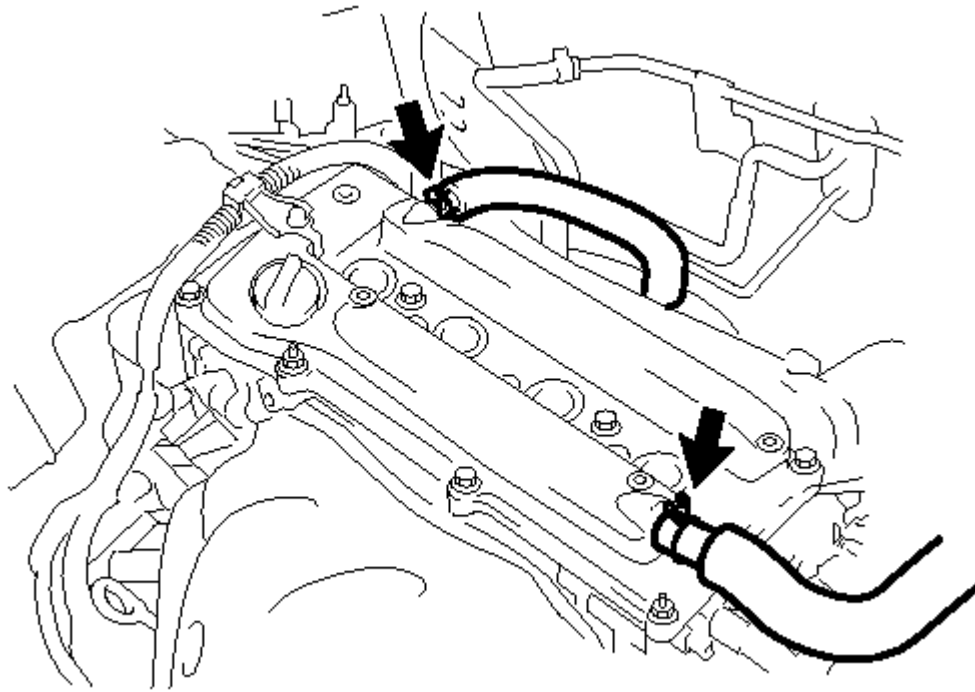
**T**

Fig. 55: Location of Ventilation Hoses

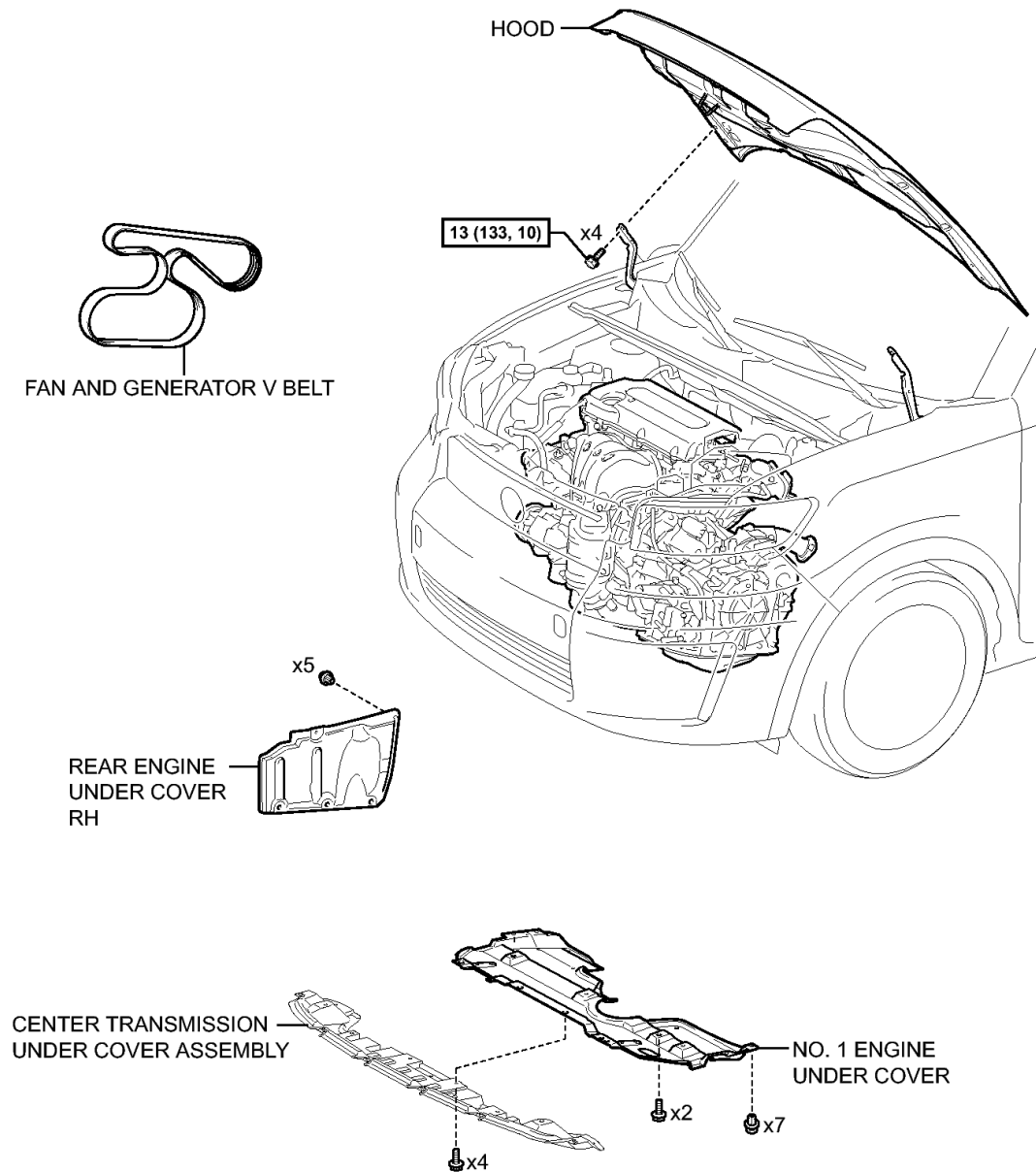
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. **INSTALL SPARK PLUG** . Refer to **INSTALLATION - Step 1** .
10. **INSTALL IGNITION COIL ASSEMBLY** . Refer to **INSTALLATION - Step 2** .
11. **INSPECT FOR ENGINE OIL LEAK**
12. **INSPECT IGNITION TIMING** See step 7.
13. **REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 4** .
14. **INSTALL REAR ENGINE UNDER COVER RH**

CYLINDER HEAD GASKET

COMPONENTS

ILLUSTRATION



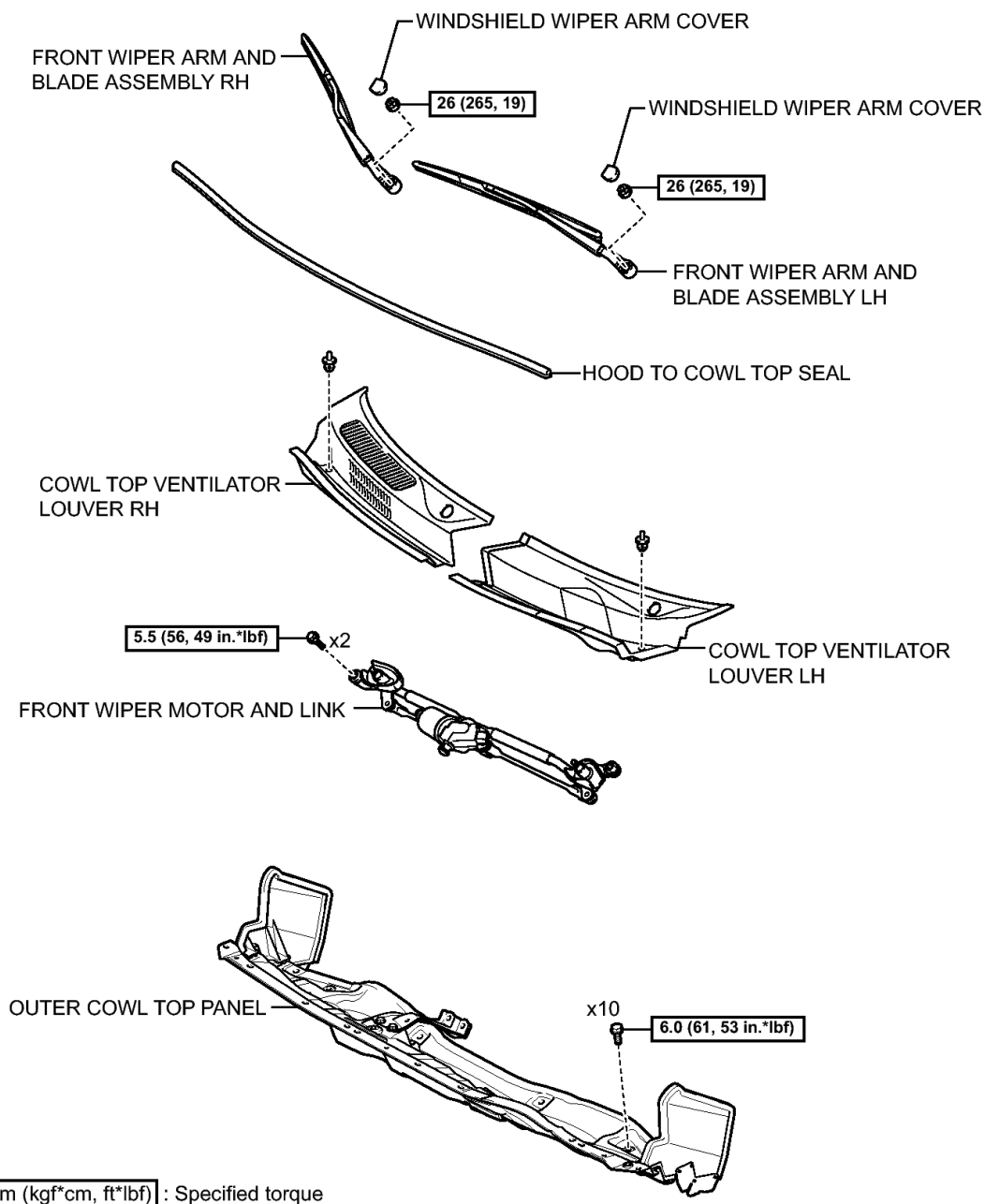
N*m (kgf*cm, ft*lb) : Specified torque

P

Fig. 56: Identifying Cylinder Head Gasket Replacement Components With Torque Specifications (1 Of 13)

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

ILLUSTRATION

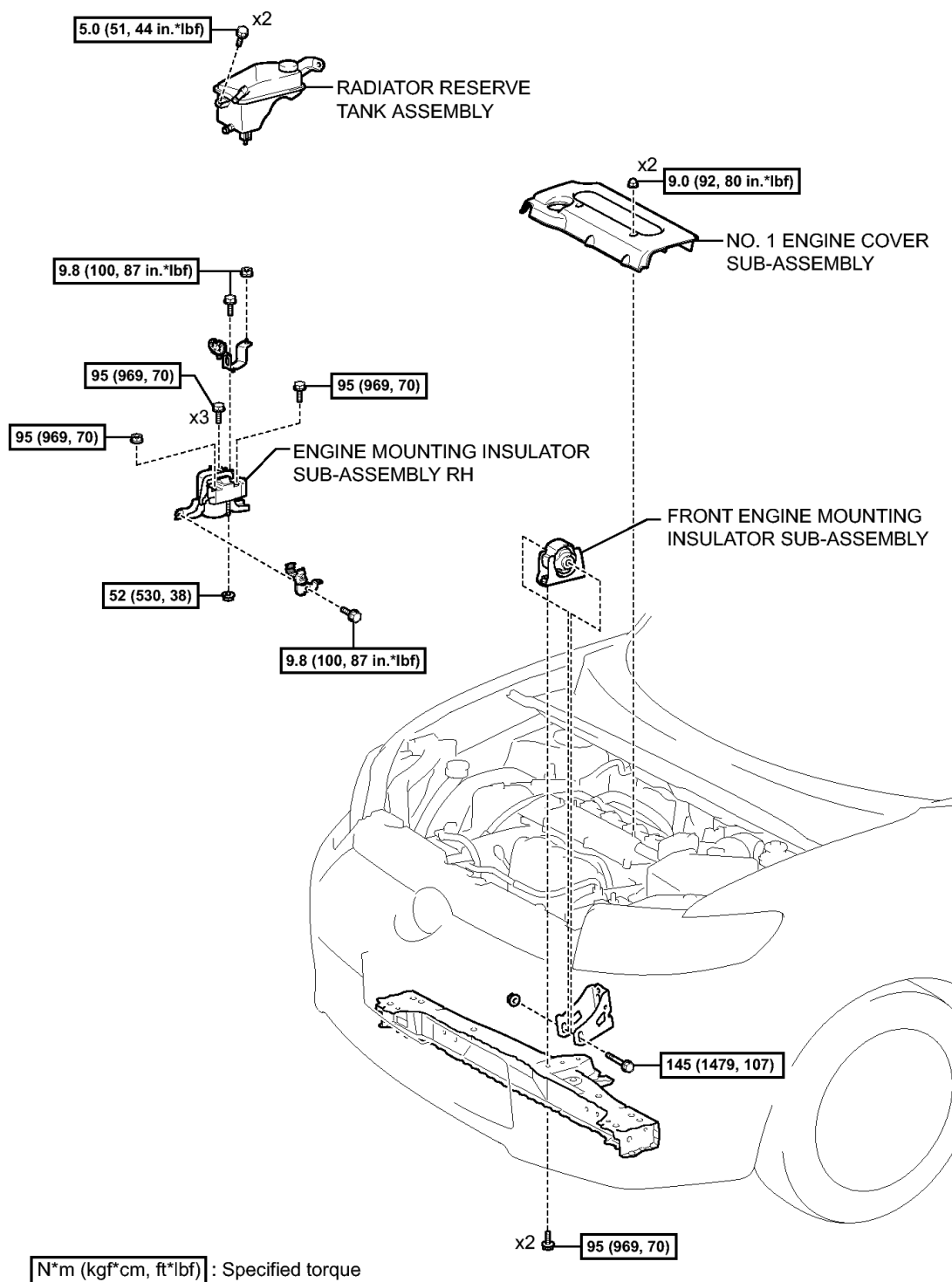


Y

Fig. 57: Identifying Cylinder Head Gasket Replacement Components With Torque Specifications (2 Of 13)

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

ILLUSTRATION

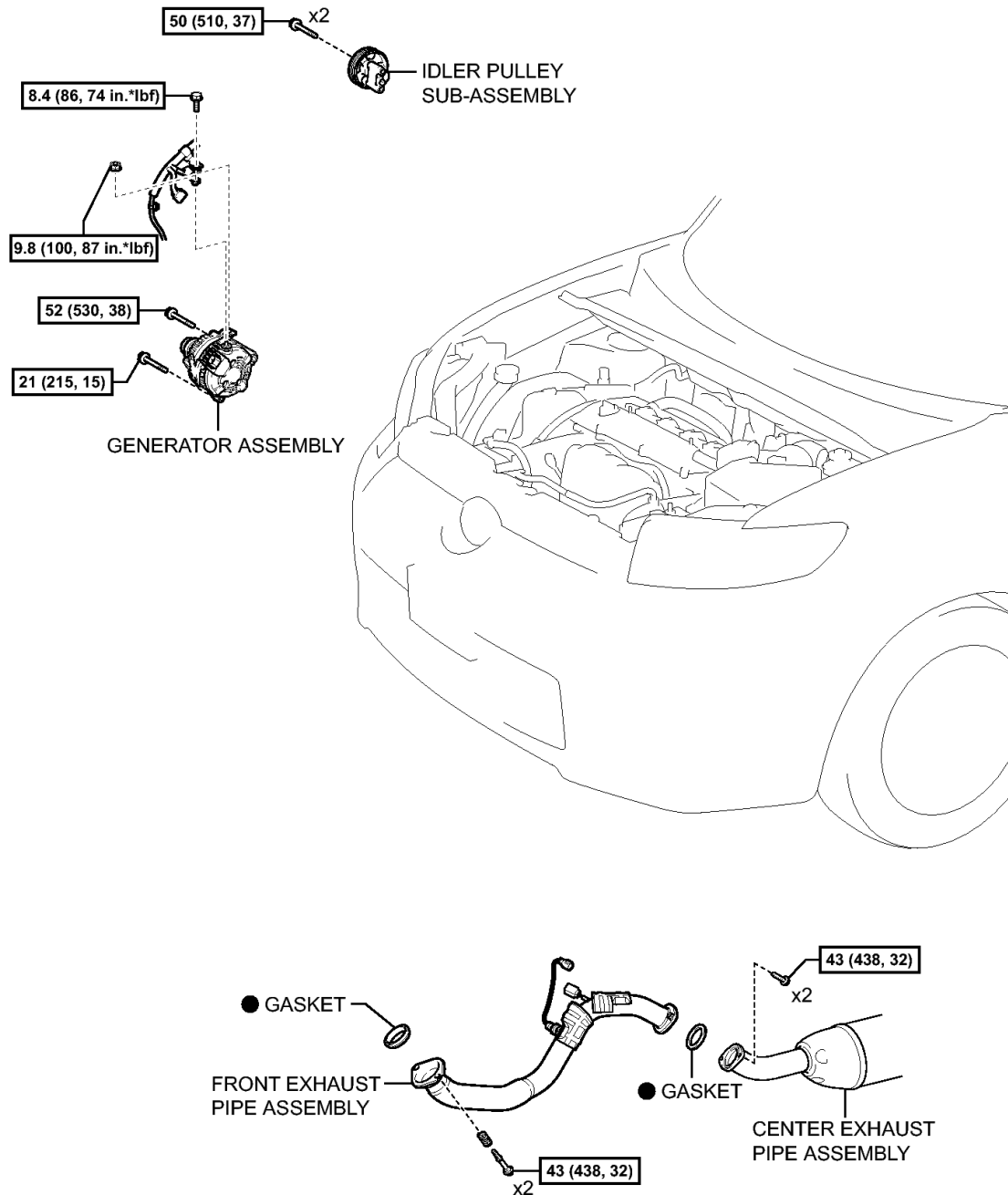


P

Fig. 58: Identifying Cylinder Head Gasket Replacement Components With Torque Specifications (3 Of 13)

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

ILLUSTRATION



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

● Non-reusable part

P

Fig. 59: Identifying Cylinder Head Gasket Replacement Components With Torque Specifications (4 Of 13)

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

ILLUSTRATION

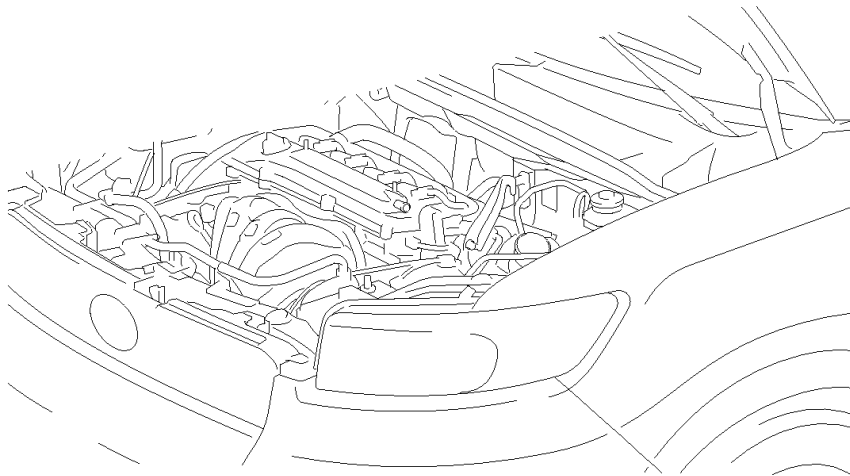
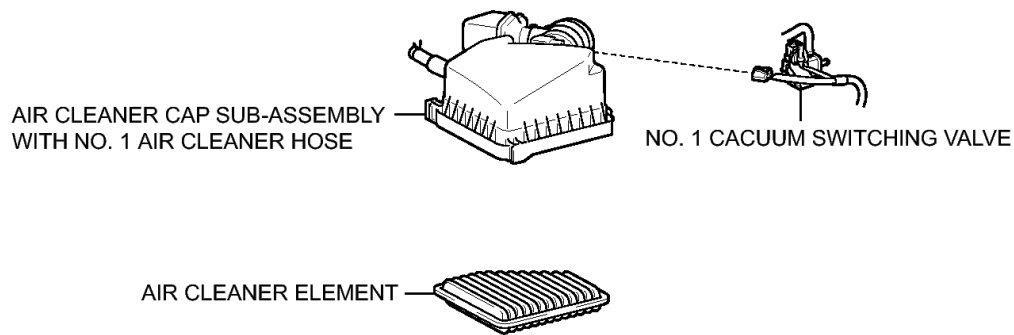
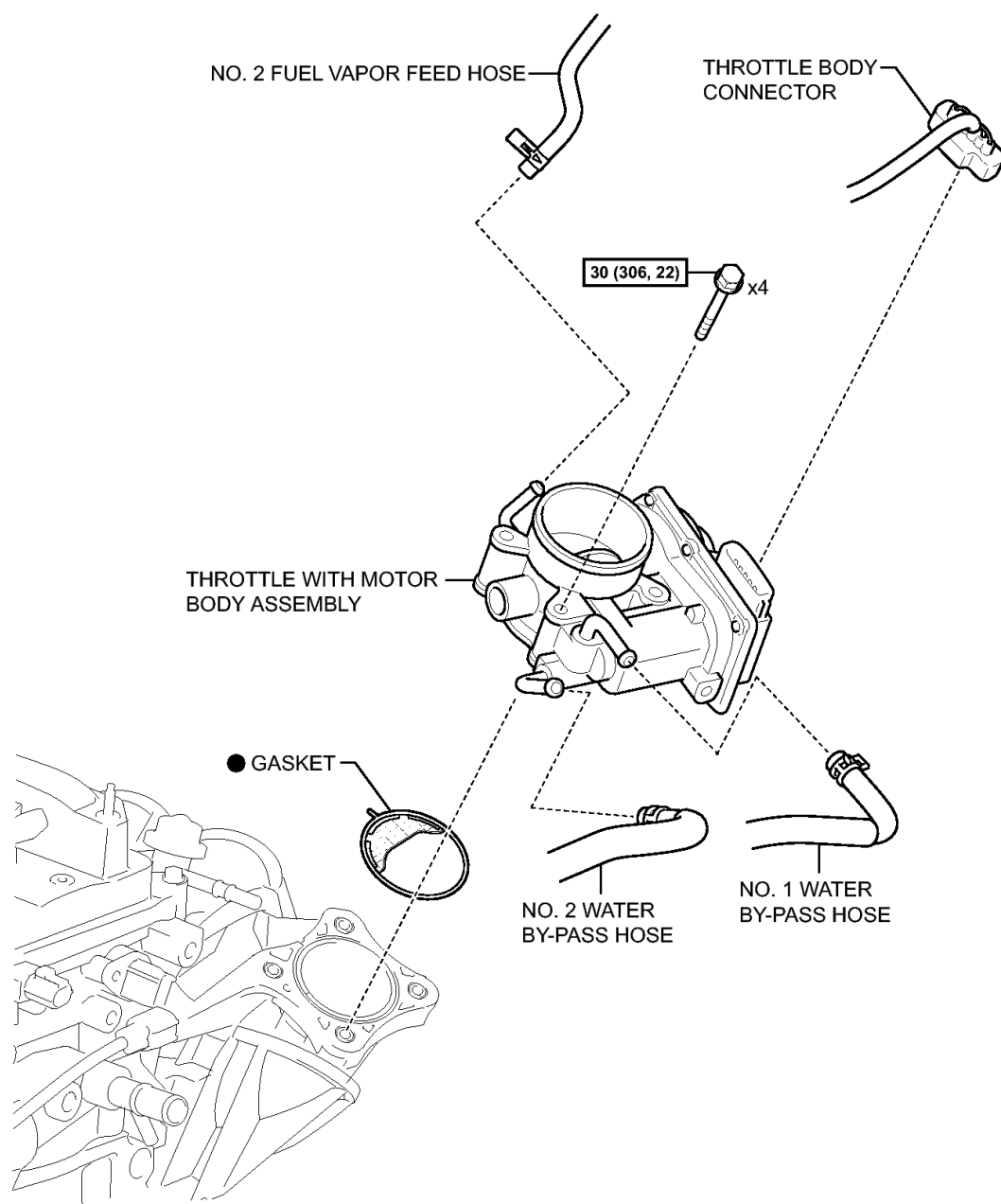


Fig. 60: Identifying Cylinder Head Gasket Replacement Components (5 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

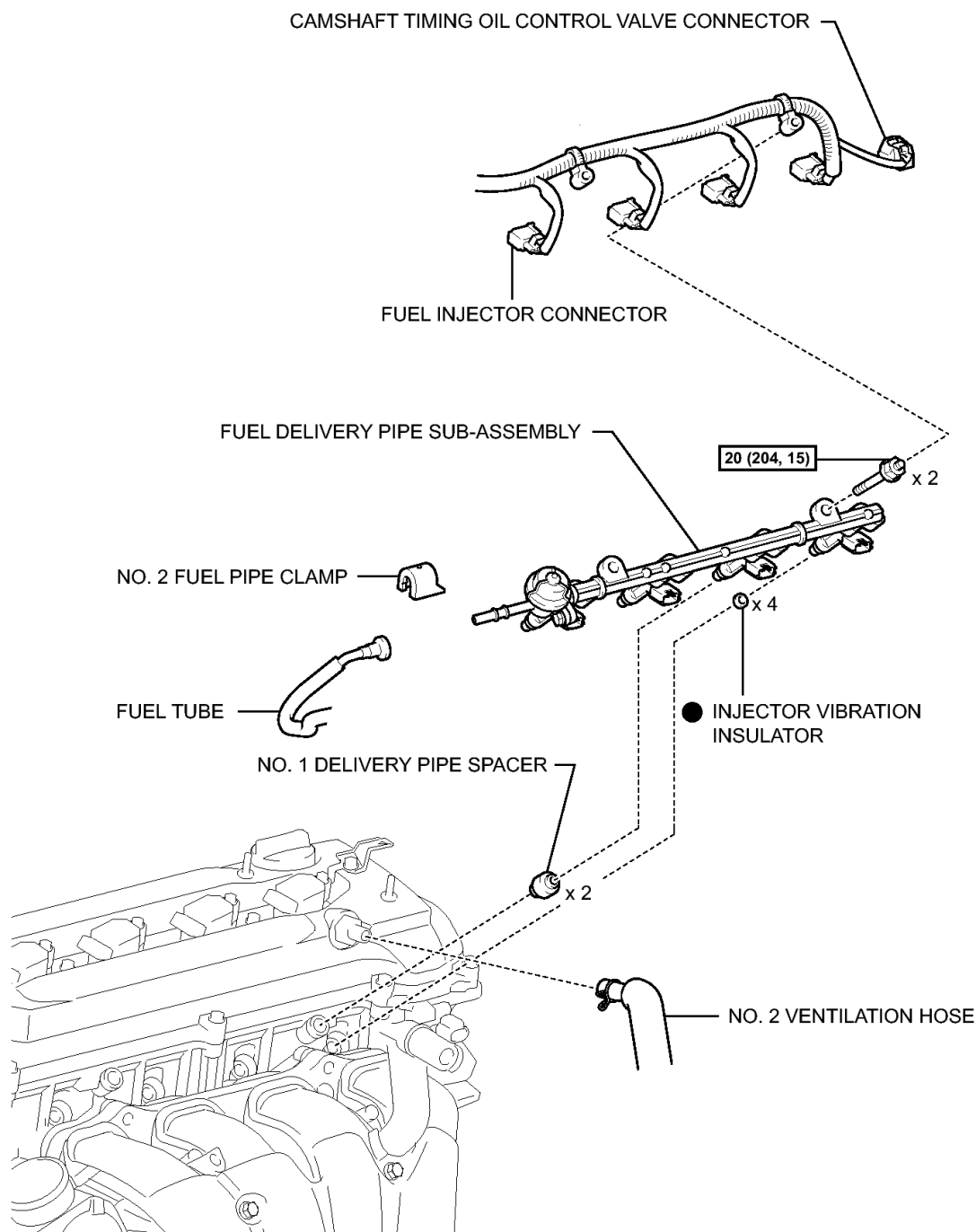


N*m (kgf*cm, ft.*lbf): Specified torque ● Non-reusable part

Fig. 61: Identifying Cylinder Head Gasket Replacement Components With Torque Specifications (6 Of 13)

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

ILLUSTRATION



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

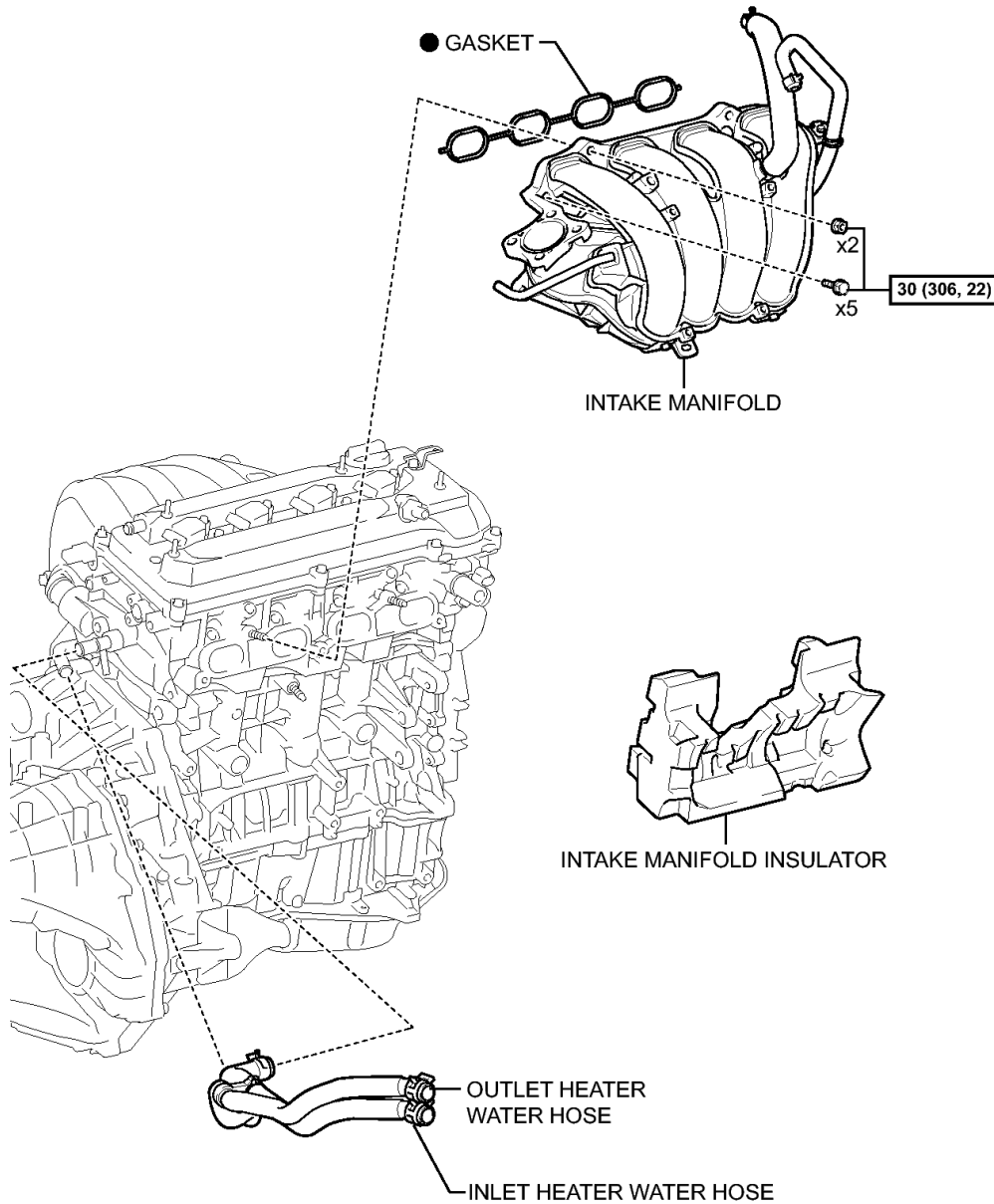
● Non-reusable part

P

Fig. 62: Identifying Cylinder Head Gasket Replacement Components With Torque Specifications (7 Of 13)

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

ILLUSTRATION



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

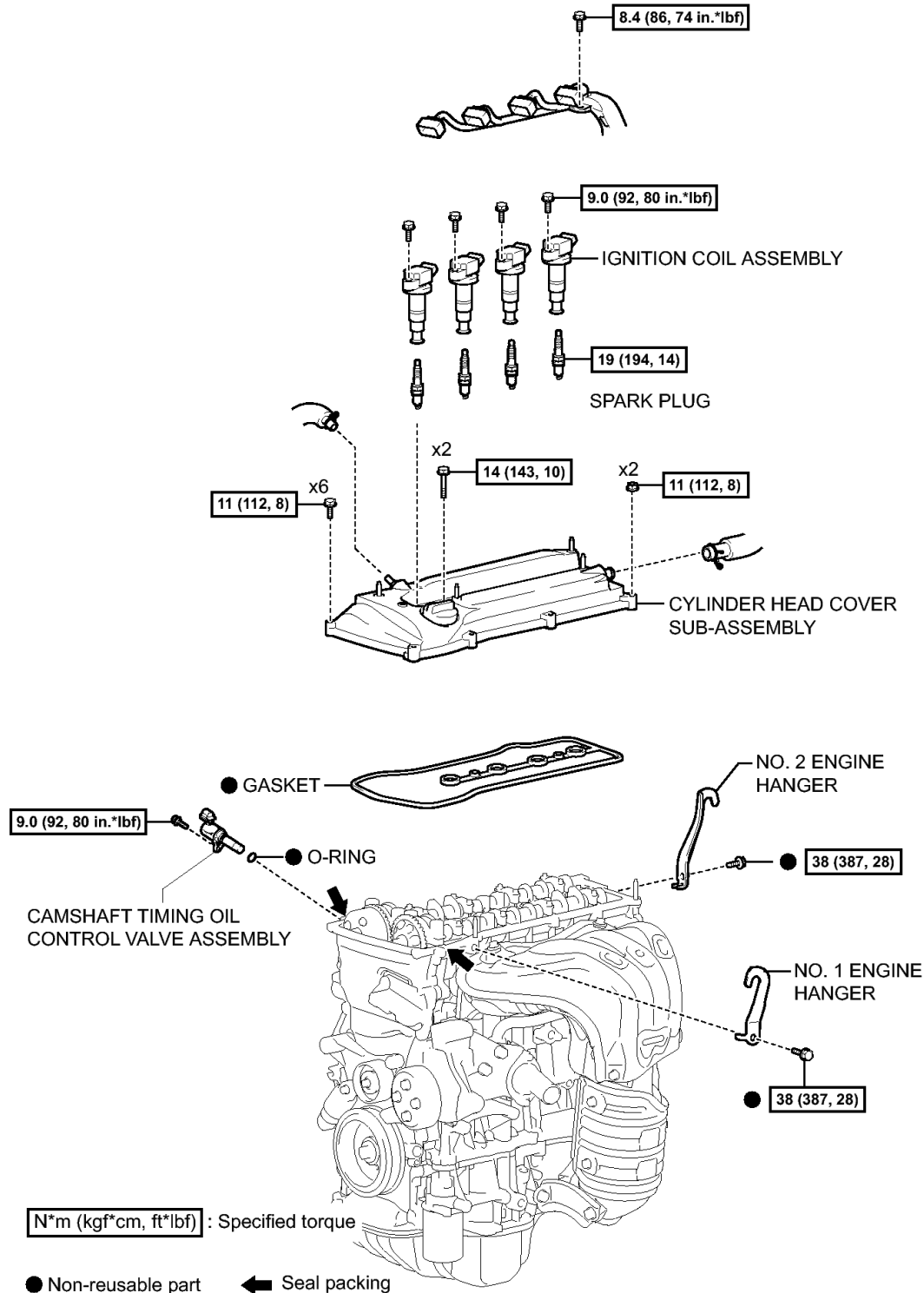
● Non-reusable part

P

Fig. 63: Identifying Cylinder Head Gasket Replacement Components With Torque Specifications (8 Of 13)

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

ILLUSTRATION

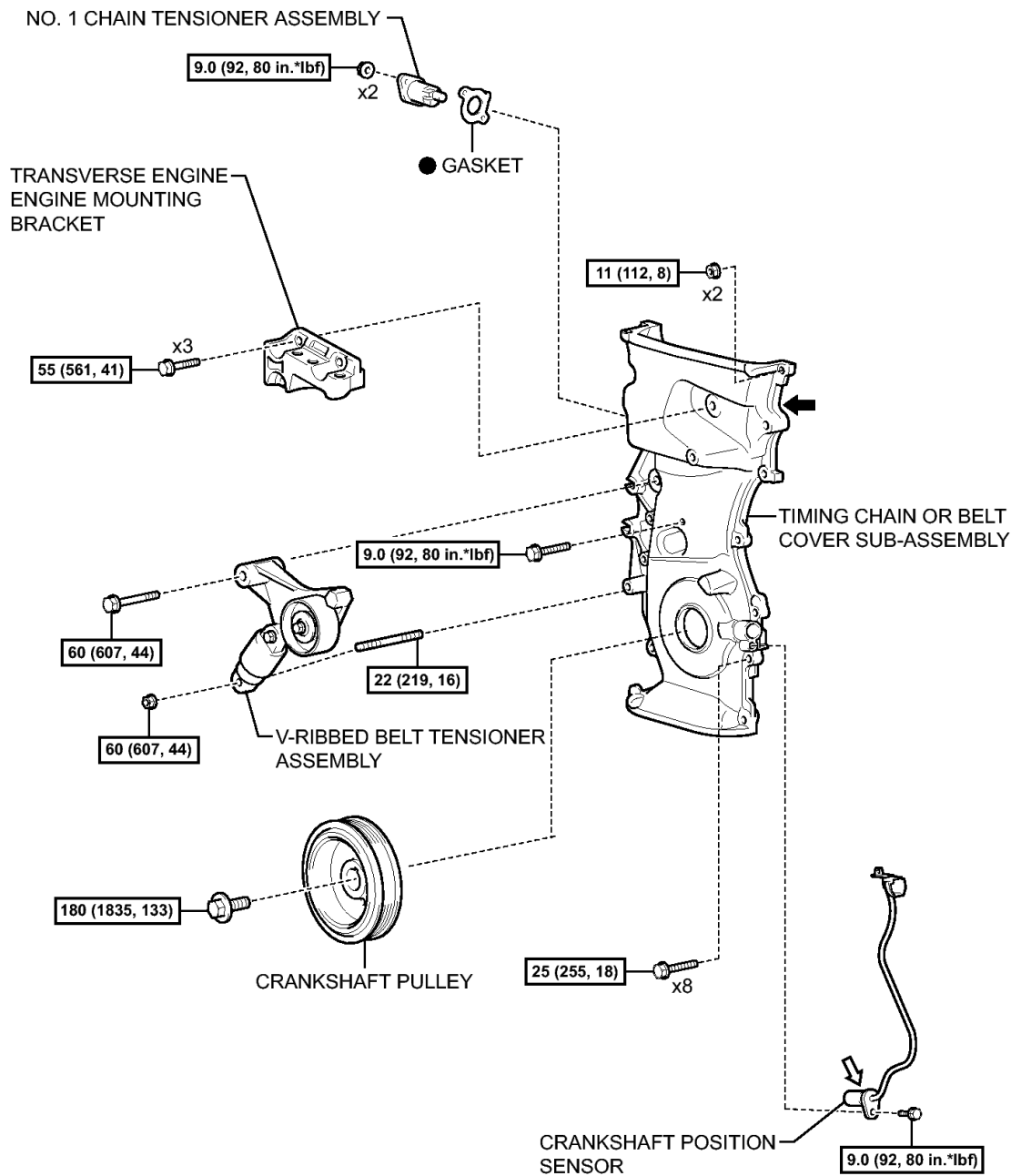


P

Fig. 64: Identifying Cylinder Head Gasket Replacement Components With Torque Specifications (9 Of 13)

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

ILLUSTRATION



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

● Non-reusable part

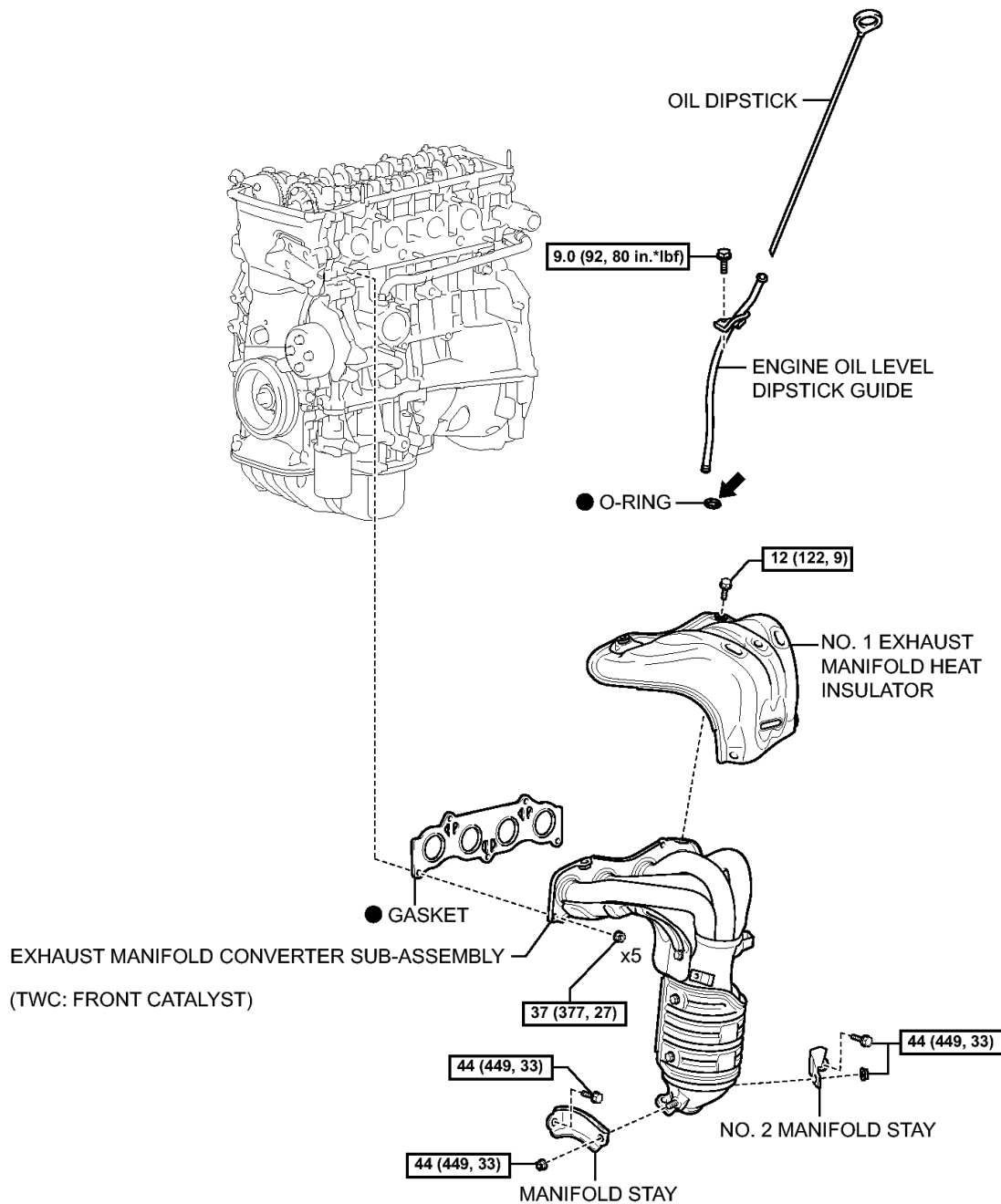
← Seal packing

← Engine oil

Fig. 65: Identifying Cylinder Head Gasket Replacement Components With Torque Specifications (10 Of 13)

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

ILLUSTRATION



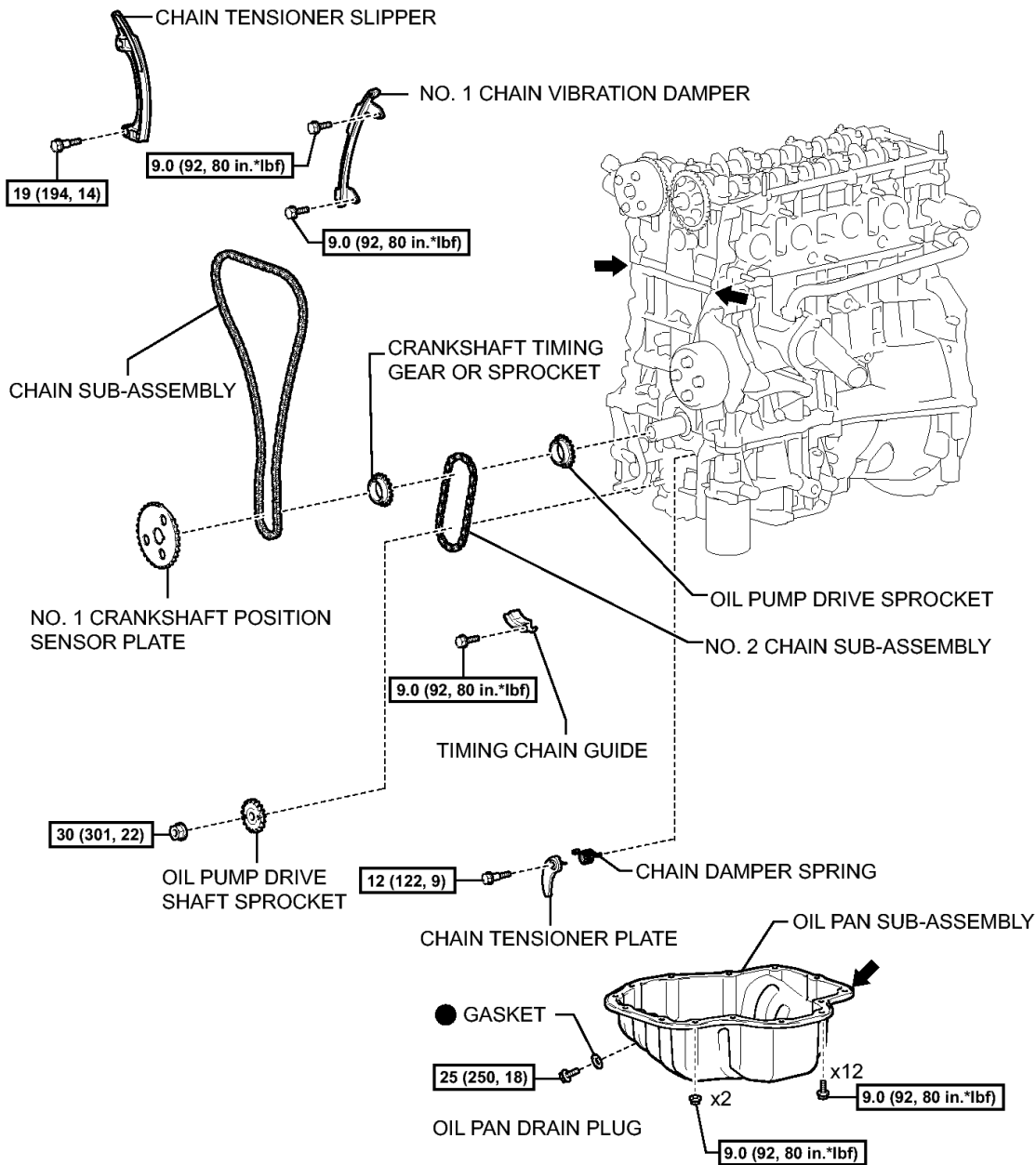
N*m (kgf*cm, ft*lbf) : Specified torque

● Non-reusable part ← Engine oil

Fig. 66: Identifying Cylinder Head Gasket Replacement Components With Torque Specifications (11 Of 13)

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

ILLUSTRATION



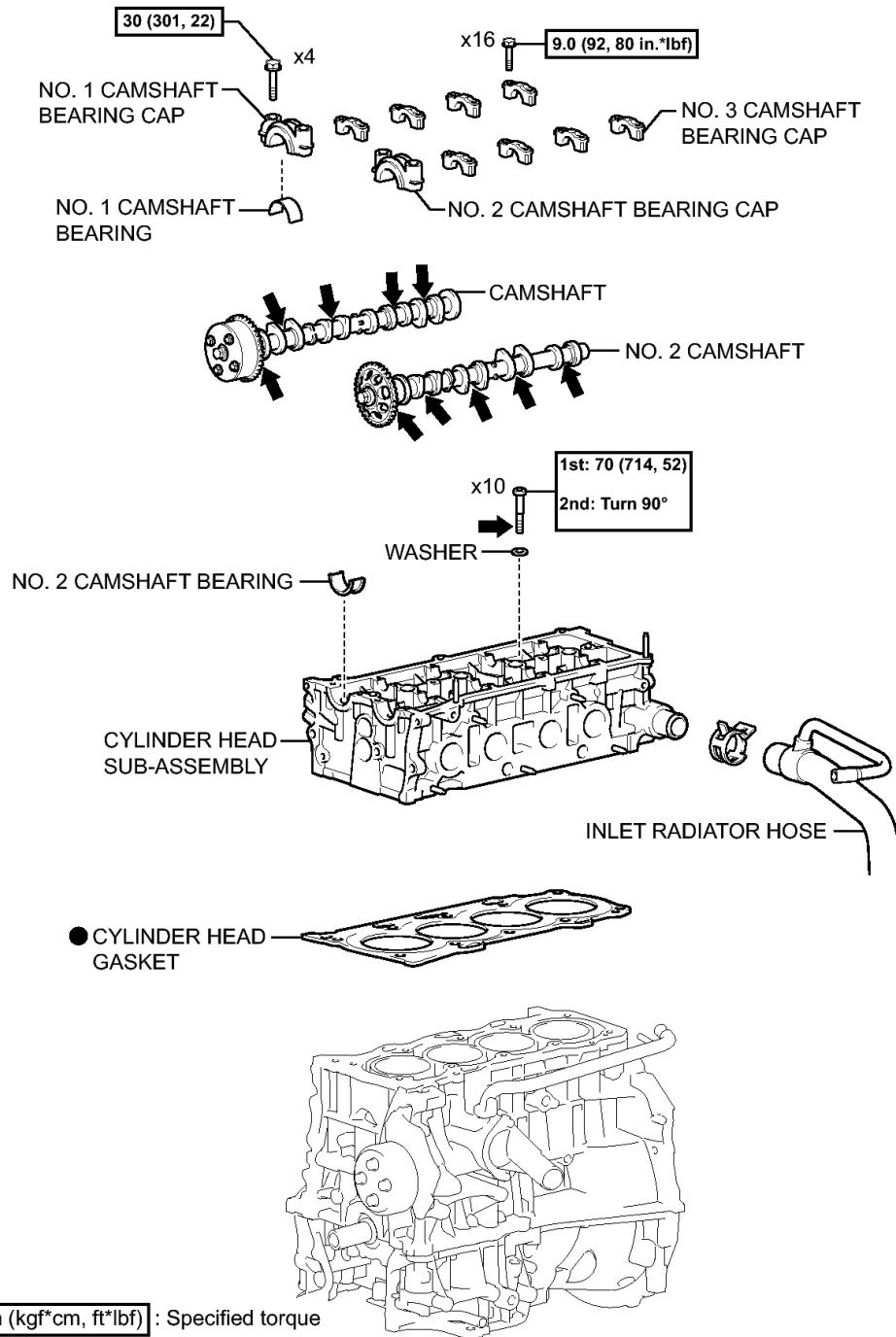
N*m (kgf*cm, ft.*lbf) : Specified torque

● Non-reusable part

➔ Seal packing

P

Fig. 67: Identifying Cylinder Head Gasket Replacement Components With Torque Specifications (12 Of 13)**Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.****ILLUSTRATION**



● Non-reusable part ← Engine oil

P

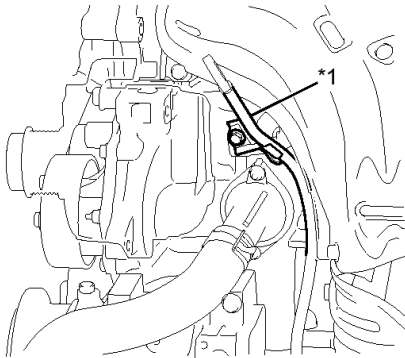
Fig. 68: Identifying Cylinder Head Gasket Replacement Components With Torque Specifications (13 Of 13)

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

REMOVAL**REMOVAL****HINT:**

Check whether the engine is TMC made or not by referring to the following illustration.

*A



*B

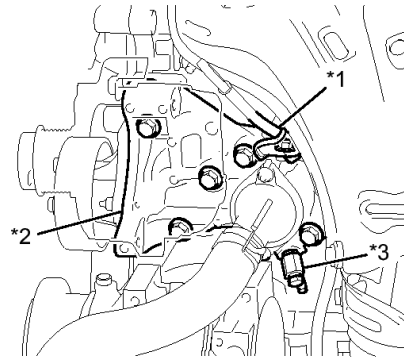


Fig. 69: Identifying Whether The Engine Is TMC Made
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*A	for TMC Made Engine	*B	except TMC Made Engine
*1	Engine Oil Level Dipstick Guide	*2	Water Inlet Housing
*3	Water Inlet Housing Drain Cock Assembly	-	-

REMOVAL**1. DISCHARGE FUEL SYSTEM PRESSURE**

Refer to **PRECAUTION** .

2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

WARNING: Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

3. REMOVE HOOD

- Disconnect the washer hose.
- Remove the 4 bolts and remove the hood.

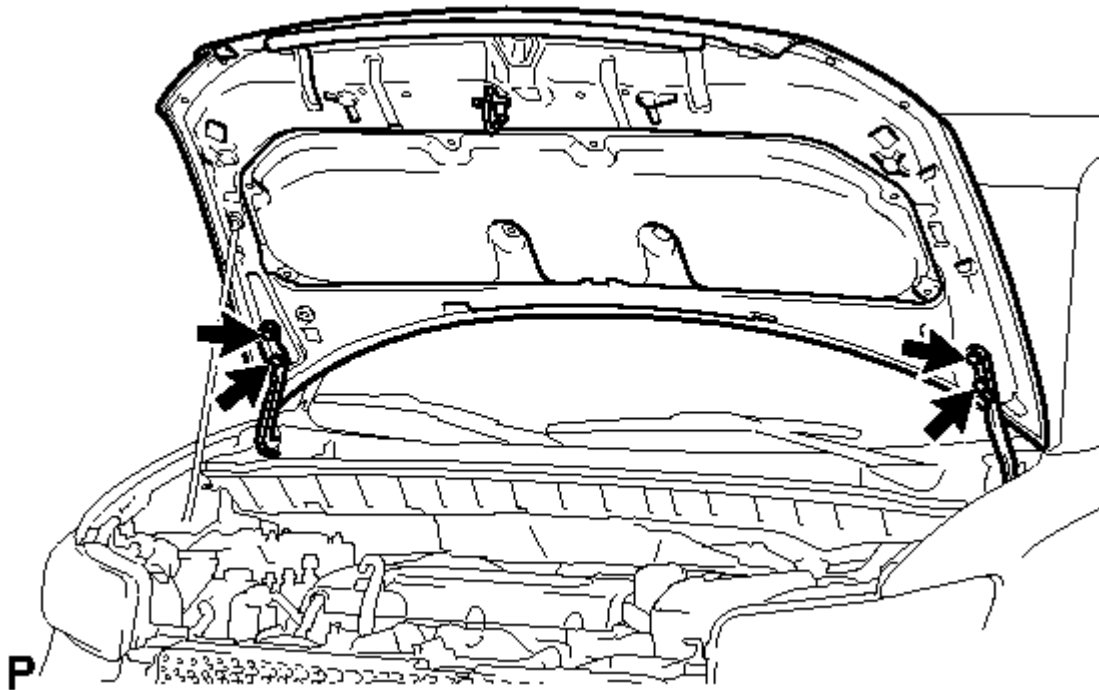
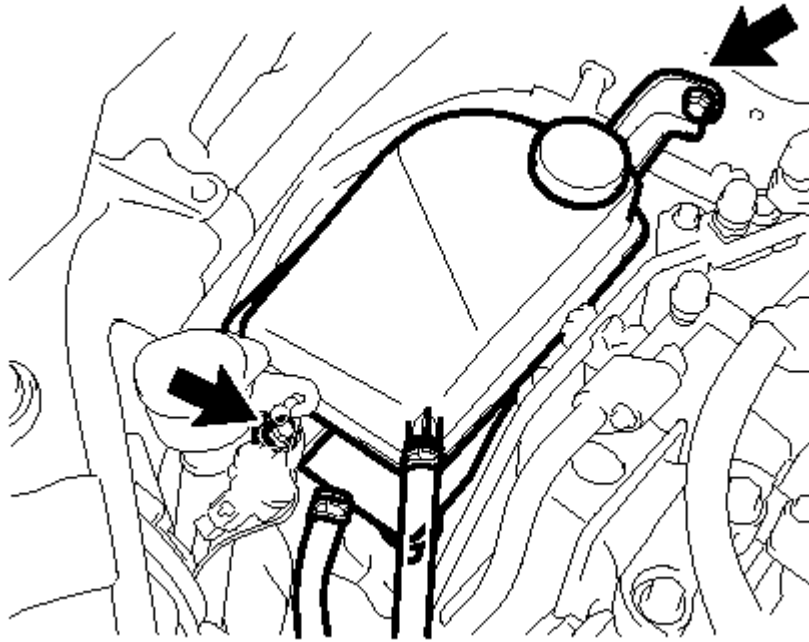


Fig. 70: Location of Hood Bolts

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

4. REMOVE FRONT WHEEL RH
5. REMOVE NO. 1 ENGINE UNDER COVER
6. REMOVE REAR ENGINE UNDER COVER RH
7. REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY . Refer to REMOVAL - Step 1 .
8. DRAIN ENGINE COOLANT . Refer to REPLACEMENT - Step 1 .
9. DRAIN ENGINE OIL . Refer to REPLACEMENT - Step 2 .
10. SEPARATE CENTER EXHAUST PIPE ASSEMBLY See step 13.
11. REMOVE FRONT EXHAUST PIPE ASSEMBLY See step 14.
12. REMOVE WINDSHIELD WIPER ARM COVER . Refer to REMOVAL - Step 1 .
13. REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH . Refer to REMOVAL - Step 2 .
14. REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH . Refer to REMOVAL - Step 3 .
15. REMOVE HOOD TO COWL TOP SEAL . Refer to REMOVAL - Step 4 .
16. REMOVE COWL TOP VENTILATOR LOUVER RH . Refer to REMOVAL - Step 5 .
17. REMOVE COWL TOP VENTILATOR LOUVER LH . Refer to REMOVAL - Step 6 .
18. REMOVE FRONT WIPER MOTOR AND LINK . Refer to REMOVAL - Step 7 .
19. REMOVE OUTER COWL TOP PANEL . Refer to REMOVAL - Step 8 .
20. REMOVE FAN AND GENERATOR V BELT See step 2.
21. REMOVE GENERATOR ASSEMBLY . Refer to REMOVAL - Step 4 .
22. SEPARATE RADIATOR RESERVE TANK ASSEMBLY



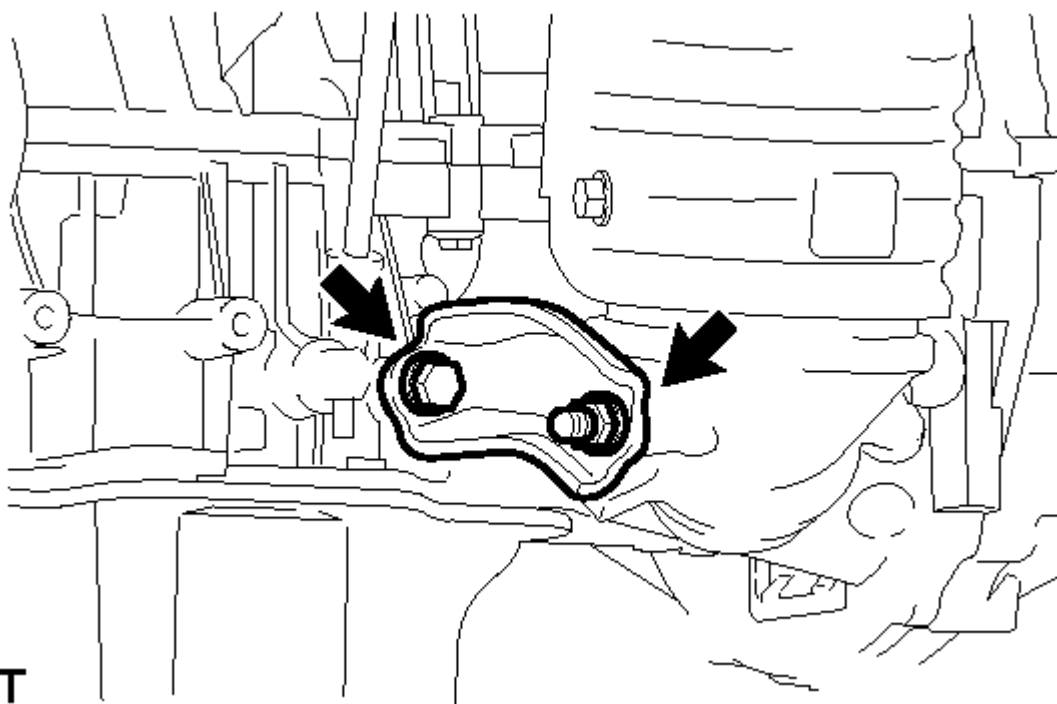
T

Fig. 71: Location of Radiator Reserve Tank Bolts

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

- a. Separate the 2 bolts and radiator reserve tank.

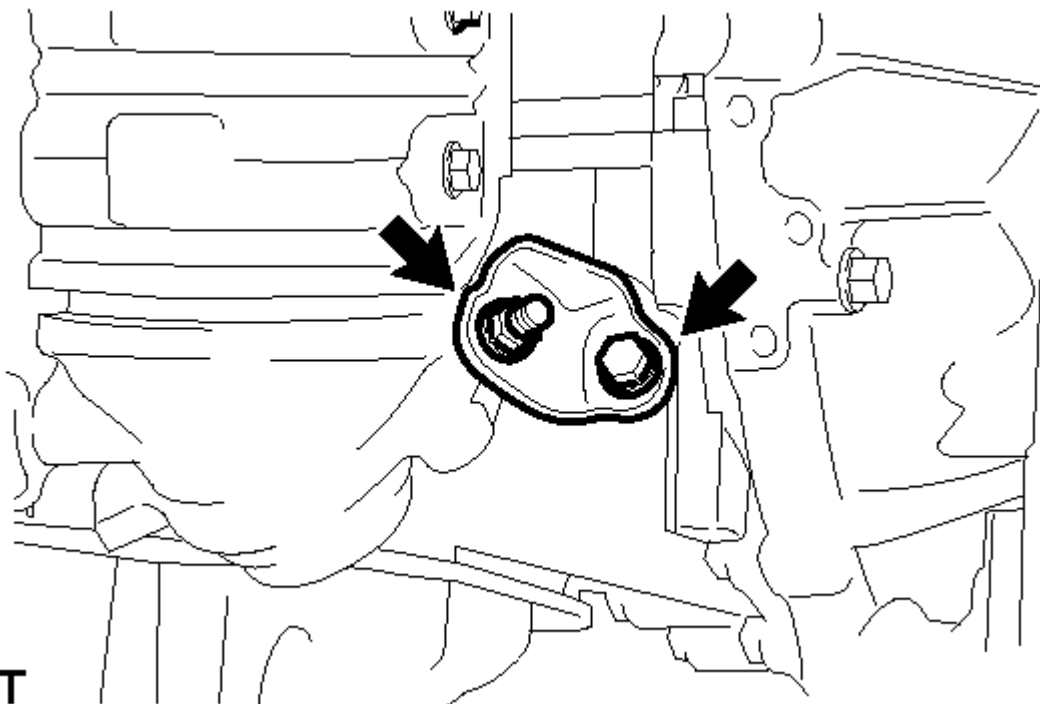
23. **REMOVE AIR CLEANER CAP SUB-ASSEMBLY WITH NO. 1 AIR CLEANER HOSE** . Refer to **REMOVAL - Step 3** .
24. **REMOVE THROTTLE WITH MOTOR BODY ASSEMBLY** . Refer to **REMOVAL - Step 4** .
25. **REMOVE IGNITION COIL ASSEMBLY** . Refer to **REMOVAL - Step 2** .
26. **REMOVE SPARK PLUG** . Refer to **REMOVAL - Step 3** .
27. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY** See step 5.
28. **REMOVE OIL DIPSTICK**
29. **REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE (for TMC Made Engine)** See step 15.
30. **REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE (except TMC Made Engine)** See step 16.
31. **DISCONNECT FUEL MAIN TUBE** . Refer to **REMOVAL - Step 4** .
32. **REMOVE FUEL DELIVERY PIPE SUB-ASSEMBLY** . Refer to **REMOVAL - Step 6** .
33. **REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY** . Refer to **REMOVAL - Step 10** .
34. **REMOVE INTAKE MANIFOLD** . Refer to **REMOVAL - Step 15** .
35. **REMOVE INTAKE MANIFOLD INSULATOR** . Refer to **REMOVAL - Step 16** .
36. **REMOVE MANIFOLD STAY**



T
Fig. 72: Remove/Install Manifold Stay With Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Remove the bolt, nut and stay.

37. REMOVE NO. 2 MANIFOLD STAY



T
Fig. 73: Remove/Install No. 2 Manifold Stay With Fasteners

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

- a. Remove the bolt, nut and stay.

38. REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

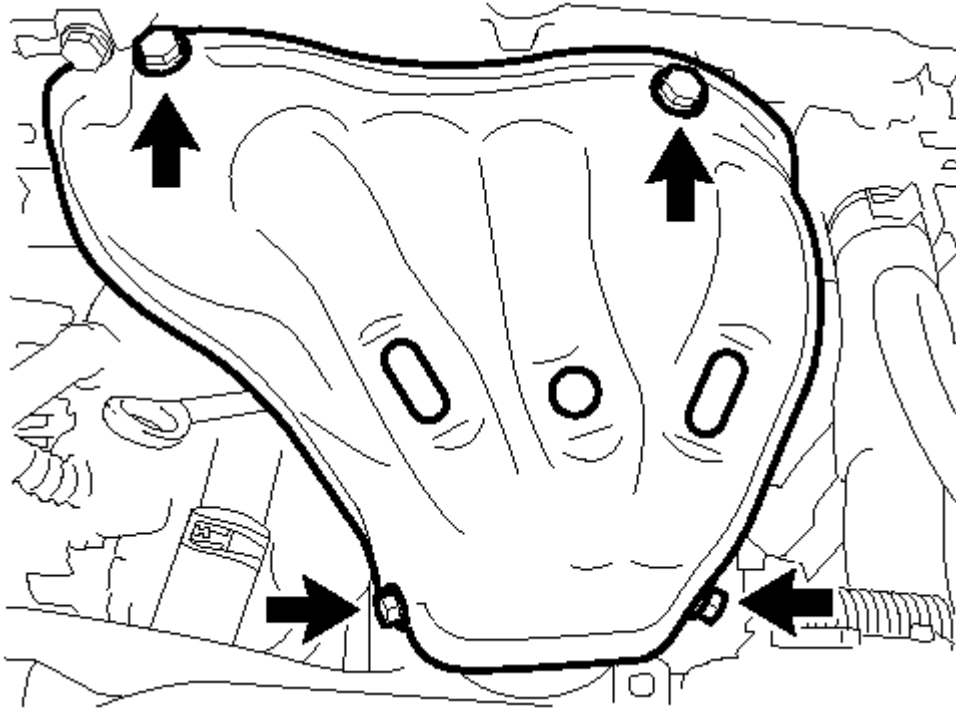


Fig. 74: Remove/Install No. 1 Exhaust Manifold Heat Insulator Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Remove the 4 bolts and heat insulator.

39. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY

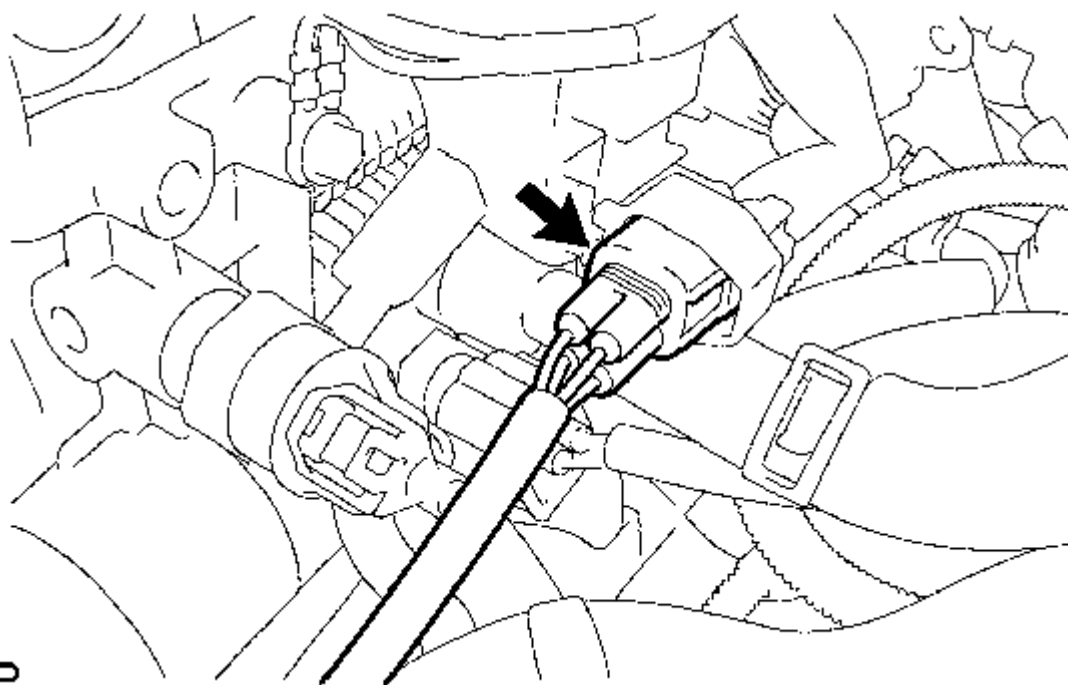


Fig. 75: Location of Air-Fuel Ratio Sensor Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Disconnect the air-fuel ratio sensor connector.

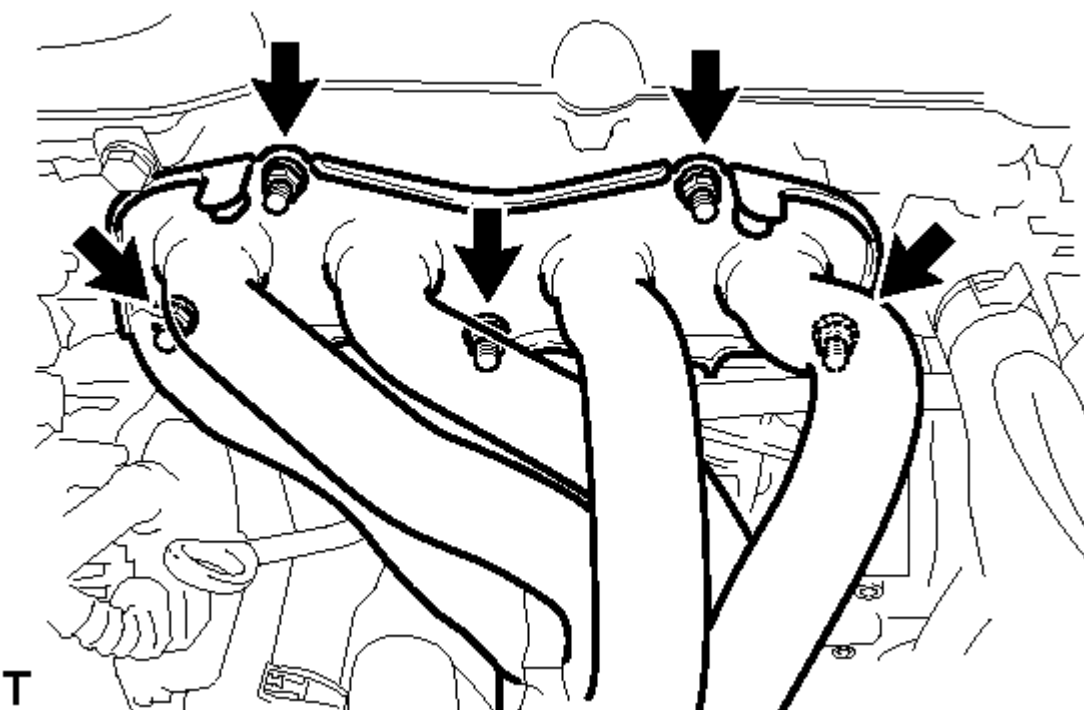


Fig. 76: View OF Exhaust Manifold And Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 5 nuts, manifold converter and gasket.
- 40. **REMOVE ENGINE MOUNTING INSULATOR SUB-ASSEMBLY RH**
 - a. Place a jack underneath the engine, then put a wooden block on the jack.
 - b. Remove the bolt and cooler bracket.

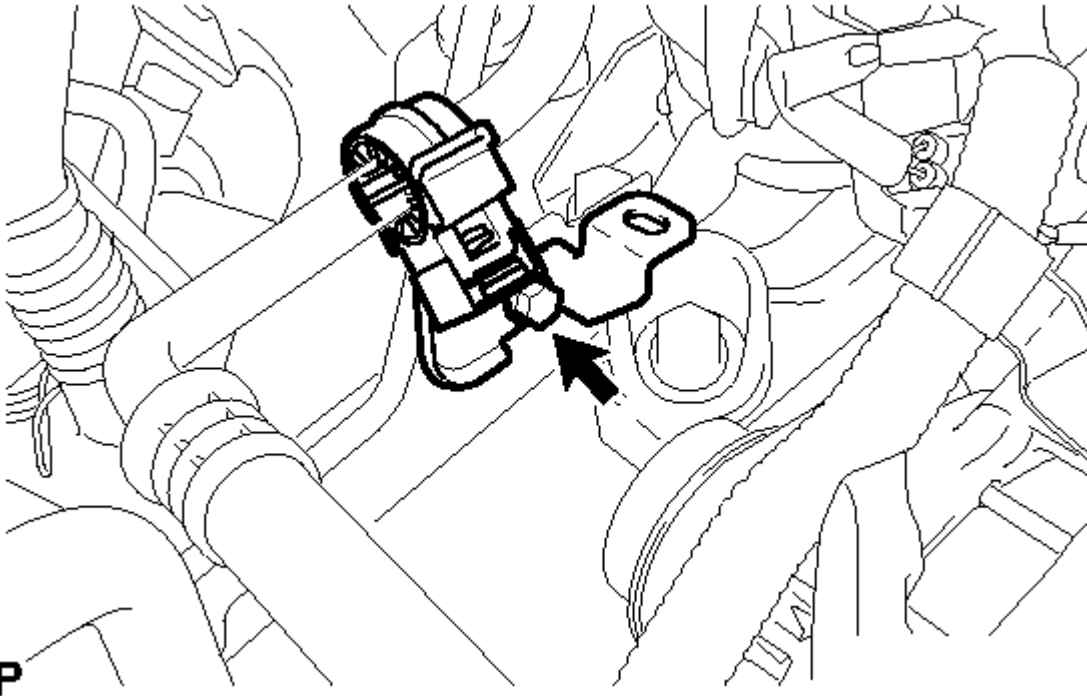


Fig. 77: Location of Cooler Bracket Bolt
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the bolt and nut, then remove the No. 2 air conditioning pipe bracket.

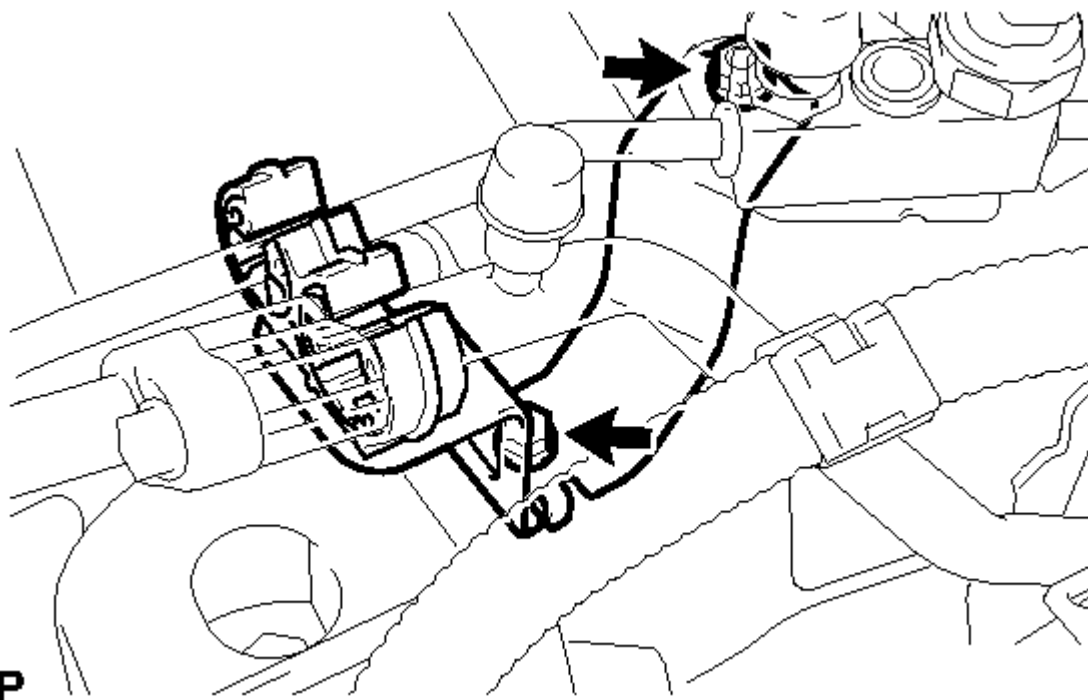


Fig. 78: Location of No. 2 Air Conditioning Pipe Bracket Bolt And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Remove the 4 bolts and 2 nuts, then remove the engine mounting insulator RH.

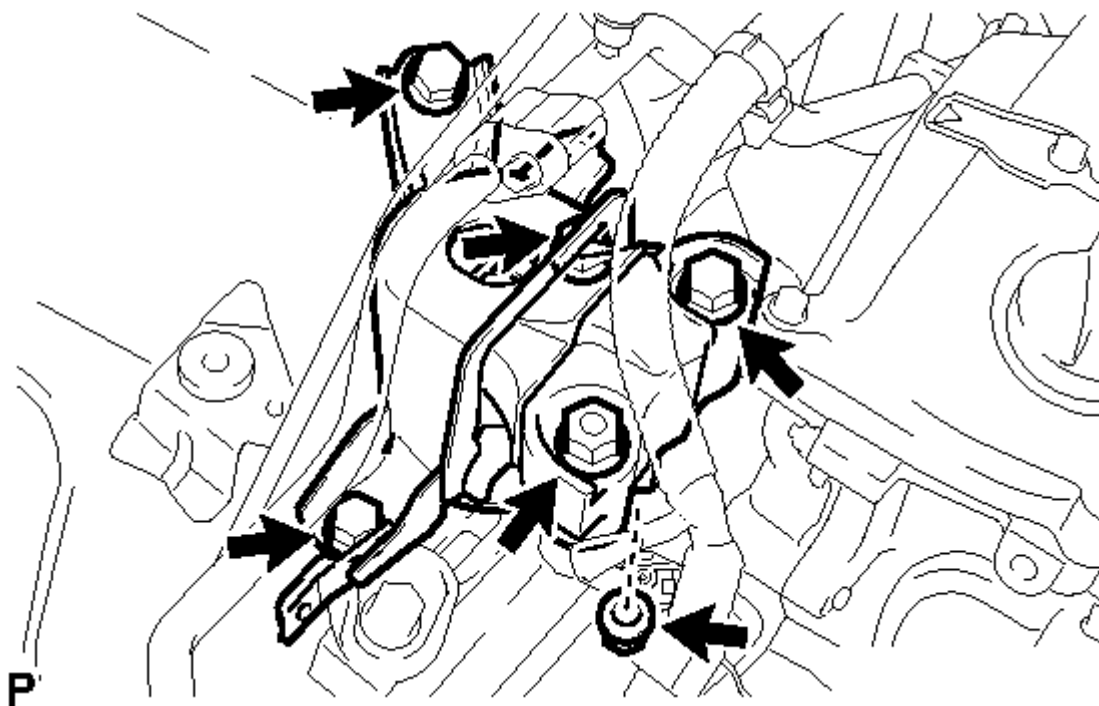


Fig. 79: Location of Engine Mounting Insulator RH Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

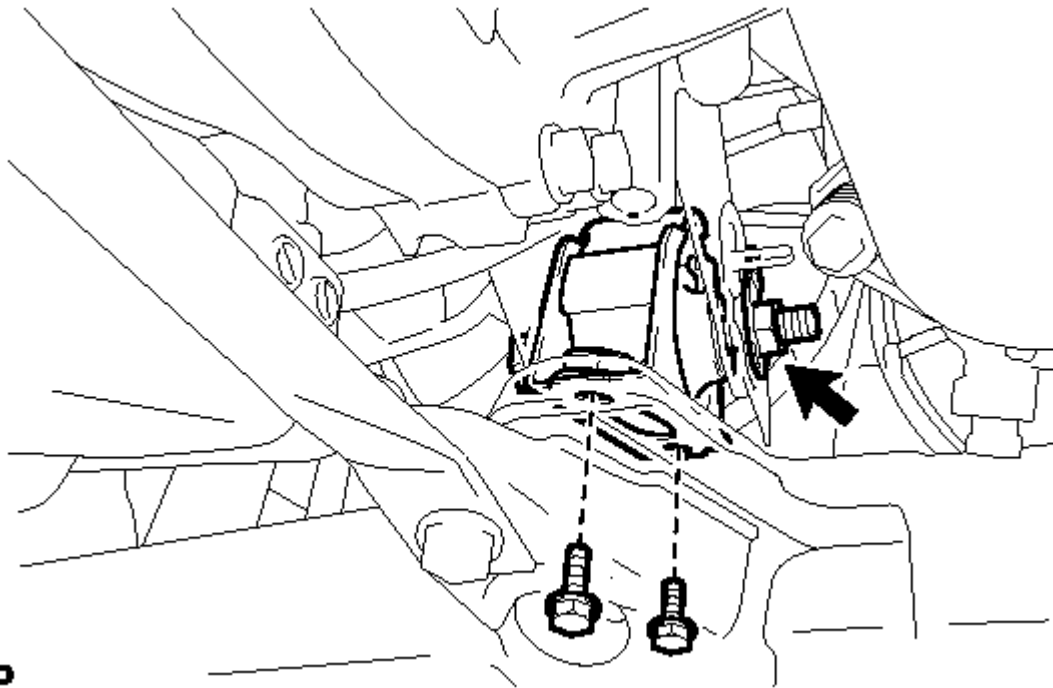
NOTE: Do not apply excessive force to the return tube when removing the engine mounting insulator RH.

HINT:

Keep clearance by lowering the engine using the transmission jack when removing the front engine mounting insulator.

41. REMOVE FRONT ENGINE MOUNTING INSULATOR SUB-ASSEMBLY

- a. Remove the through bolt and nut.



P

Fig. 80: Location of Front Engine Mounting Insulator Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 2 bolts and front engine mounting insulator.

HINT:

Keep clearance by lowering the engine using the transmission jack when removing the front engine mounting insulator.

42. REMOVE IDLER PULLEY SUB-ASSEMBLY

- a. Loosen the 2 bolts and remove the idler pulley with the 2 bolts.

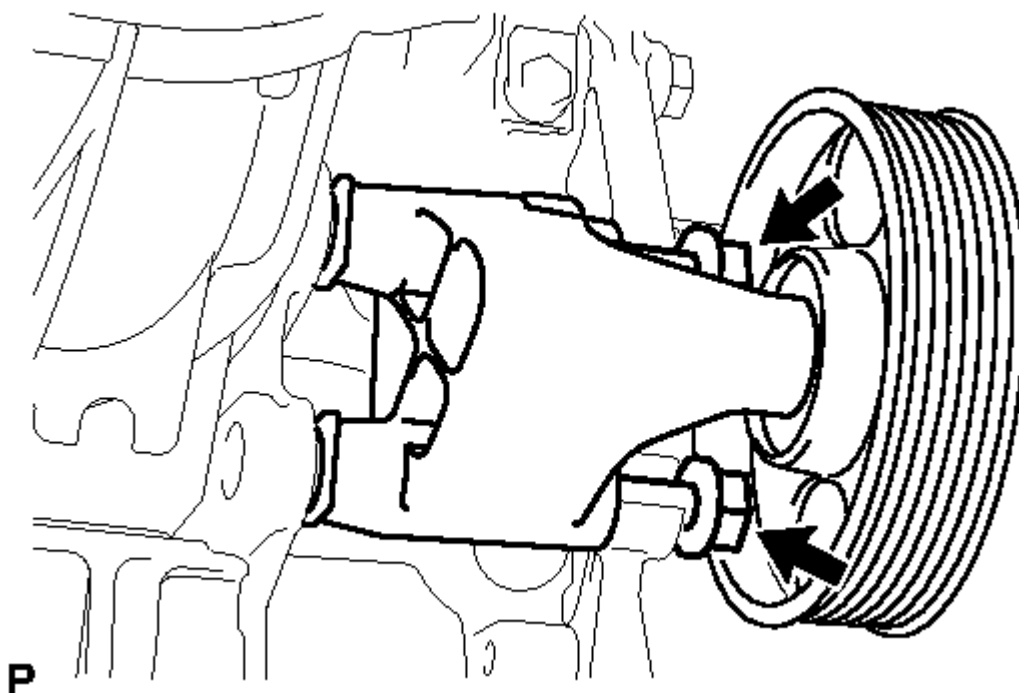
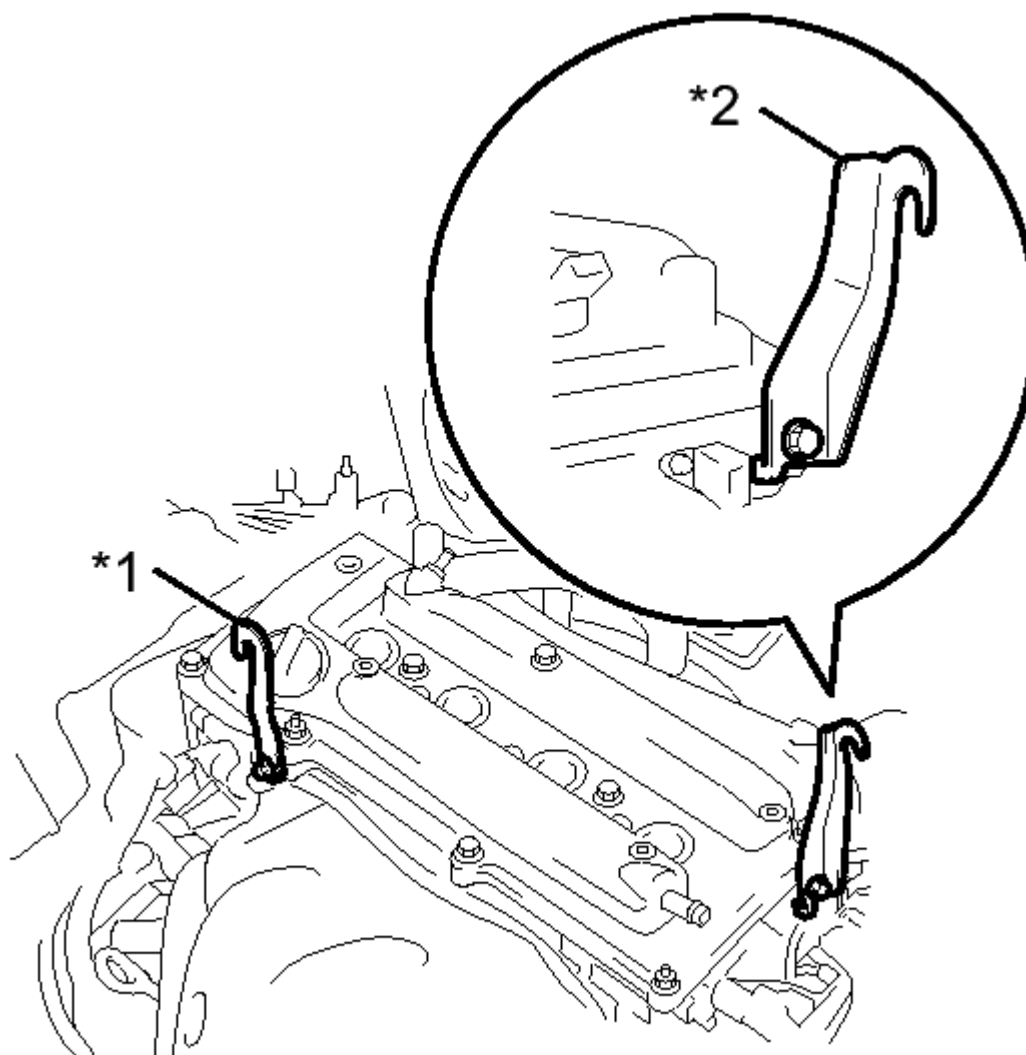
**P**

Fig. 81: Location of Idler Pulley Bolts

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

43. REMOVE OIL PAN SUB-ASSEMBLY

- a. Install the No. 1 and No. 2 engine hangers with the new bolts.



T

Fig. 82: Identifying No. 1 And No. 2 Engine Hangers
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

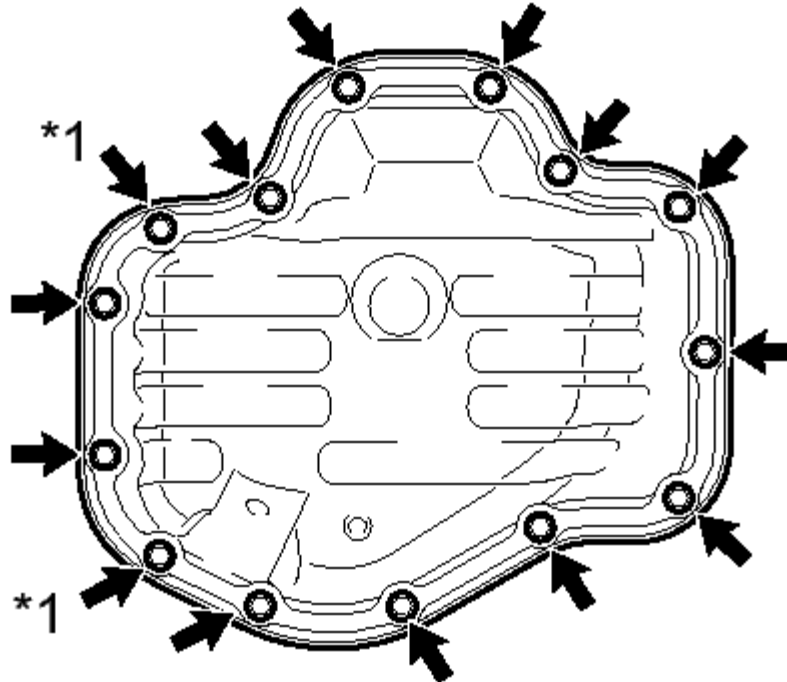
TEXT IN ILLUSTRATION

*1	No. 1 Engine Hanger
*2	No. 2 Engine Hanger

HINT:

Item	Part No.
No. 1 engine hanger	12281-28010
No. 2 engine hanger	12282-28010
Bolt	91512-61020

- b. Attach the sling device to the engine hangers and chain block.
- c. Remove the 12 bolts and 2 nuts.

**P****Fig. 83: Identifying Oil Pan Bolts**

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

TEXT IN ILLUSTRATION

*1	Nut
----	-----

- d. Insert the blade of oil pan seal cutter between the crankcase, chain cover and oil pan, then cut through the applied sealer and remove the oil pan.

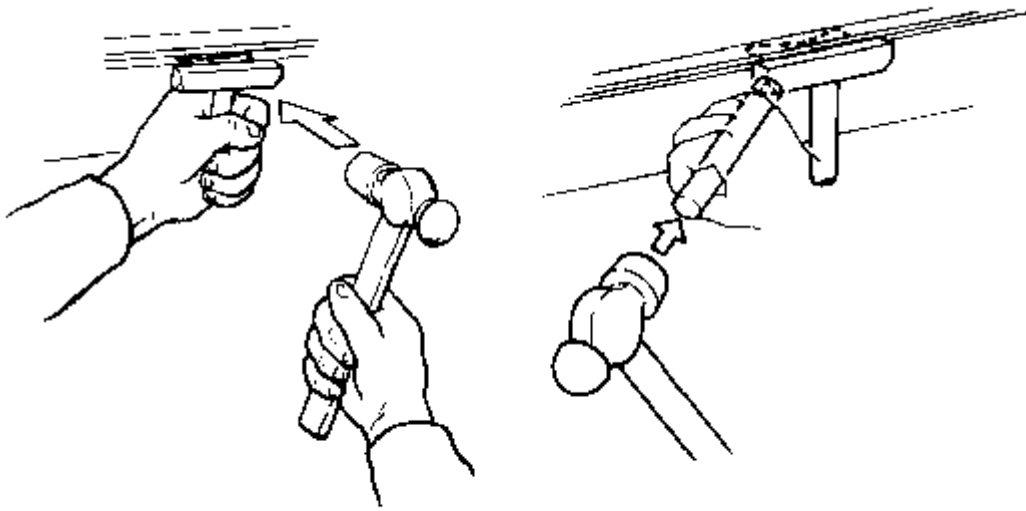


Fig. 84: Inserting Blade Of Oil Pan Seal Cutter Between Crankcase, Chain Cover And Oil Pan

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

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

44. SET NO. 1 CYLINDER TO TDC / COMPRESSION

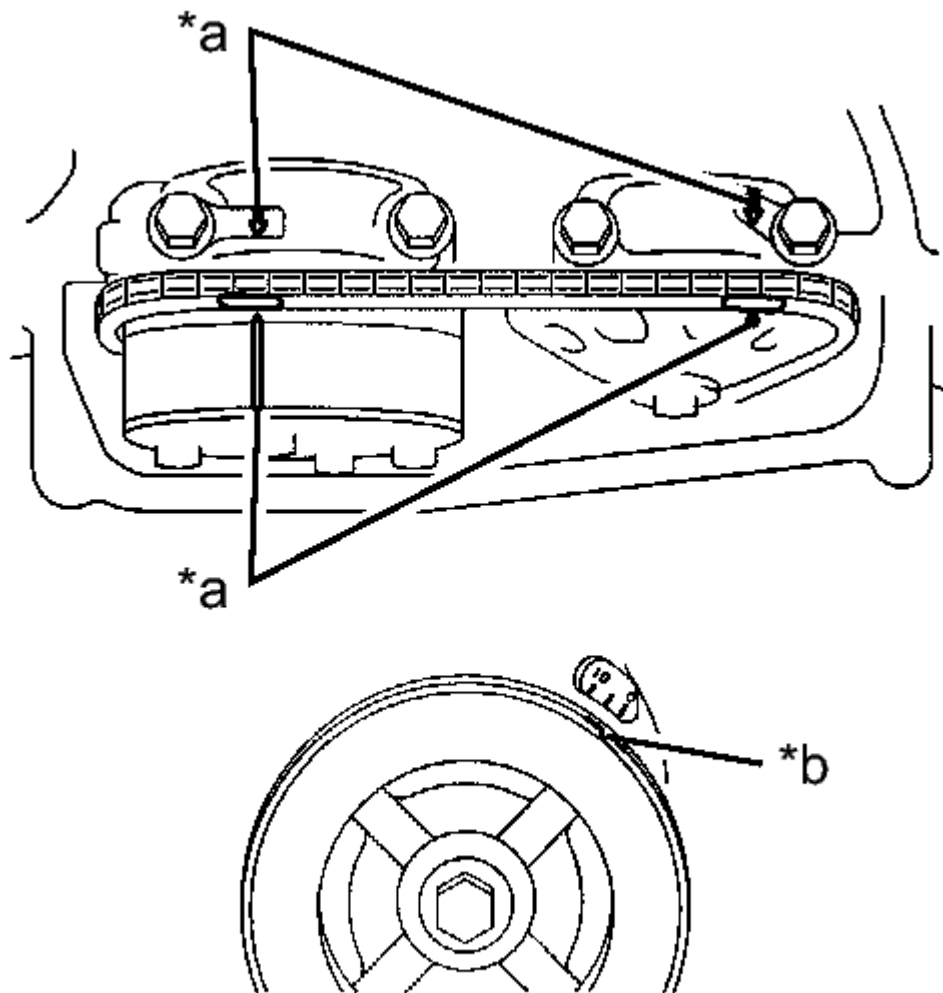


Fig. 85: Setting No. 1 Cylinder To TDC / Compression
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Turn the crankshaft pulley until the groove and the timing mark "0" on the timing chain cover are aligned.

TEXT IN ILLUSTRATION

*a	Timing Mark
*b	Groove

- b. Check that each timing mark on the camshaft timing gear and sprocket is aligned with the timing marks 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.

45. REMOVE CRANKSHAFT PULLEY See step 4.

46. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY

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

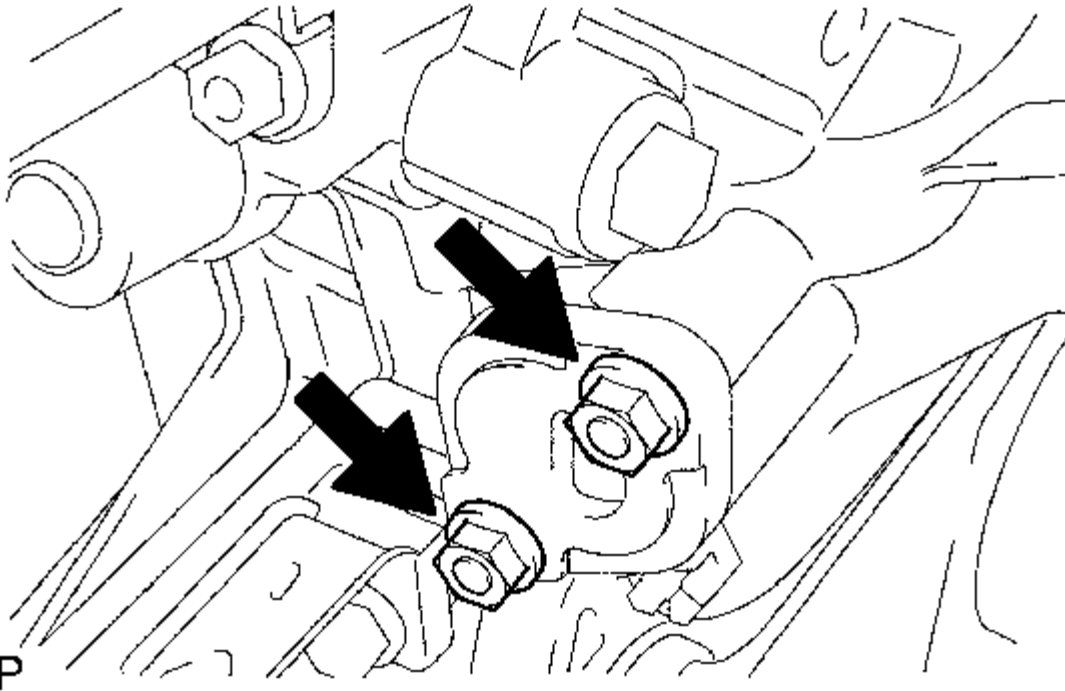


Fig. 86: Location of No. 1 Chain Tensioner Assembly Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Do not turn the crankshaft without the chain tensioner

47. REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

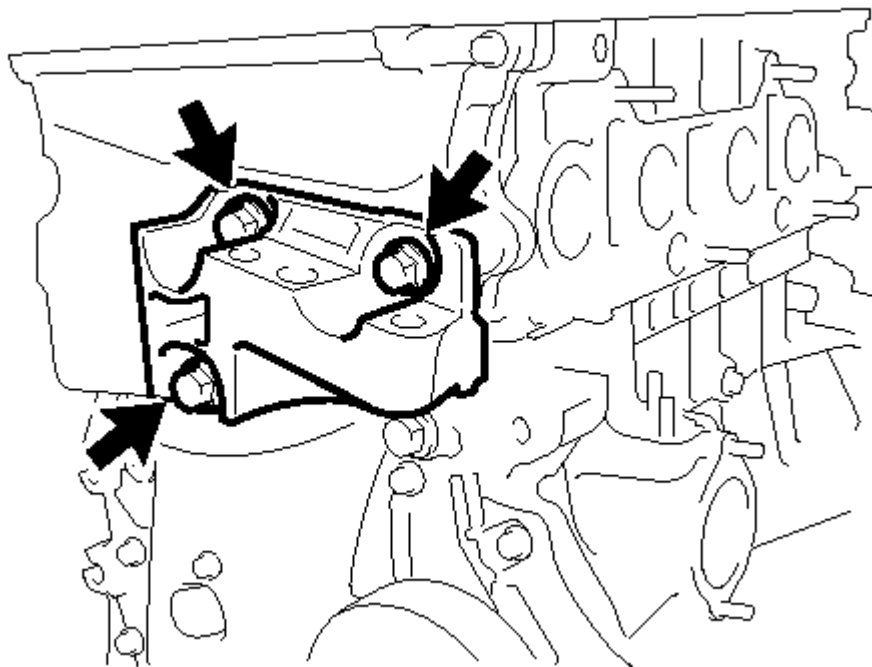
**T**

Fig. 87: Remove/Install Engine Mounting Bracket

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

- a. Remove the 3 bolts and transverse engine engine mounting bracket.
48. **REMOVE V-RIBBED BELT TENSIONER ASSEMBLY**
- a. Lift the engine upward.

NOTE: Do not lift the engine more than necessary.

- b. Remove the bolt, nut and V-ribbed belt tensioner.

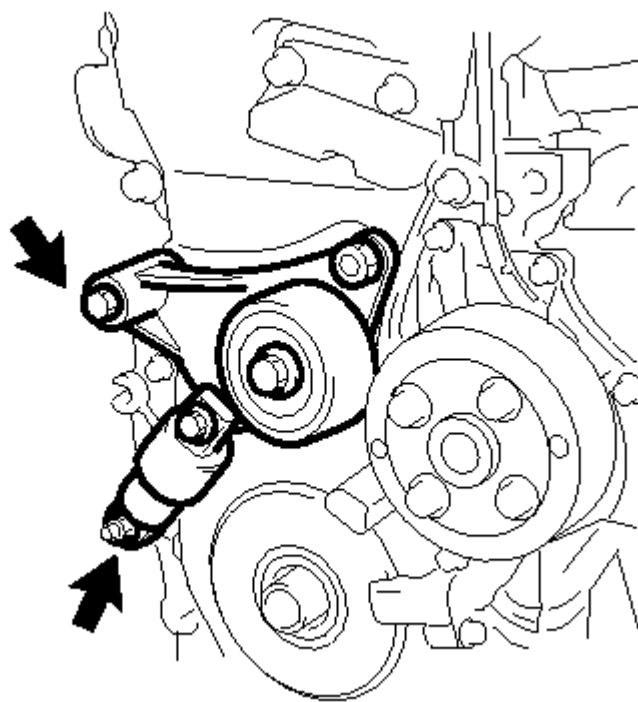
**T**

Fig. 88: Location of V-Ribbed Belt Tensioner Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

49. **REMOVE CRANKSHAFT POSITION SENSOR** . Refer to **REMOVAL - Step 2** .
50. **REMOVE TIMING CHAIN OR BELT COVER SUB-ASSEMBLY**
 - a. Using an E10 "TORX" socket, remove the stud bolt for the V-ribbed belt tensioner.

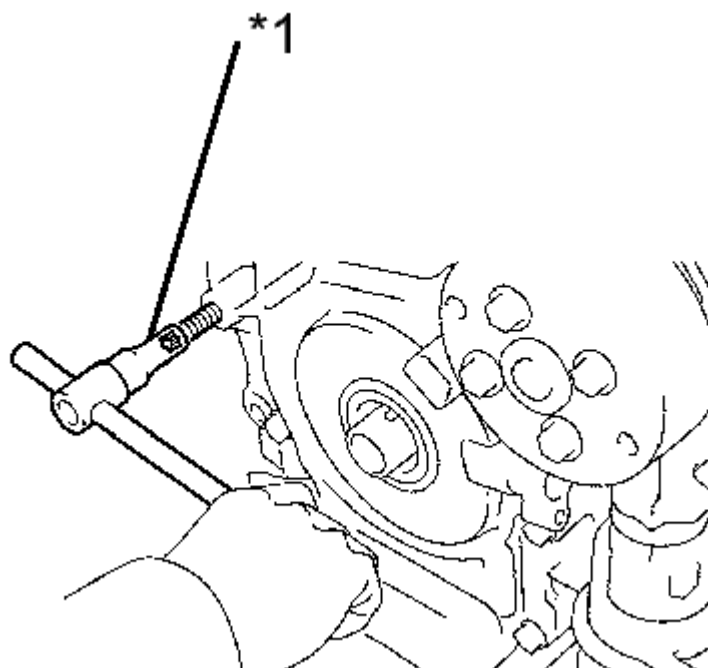
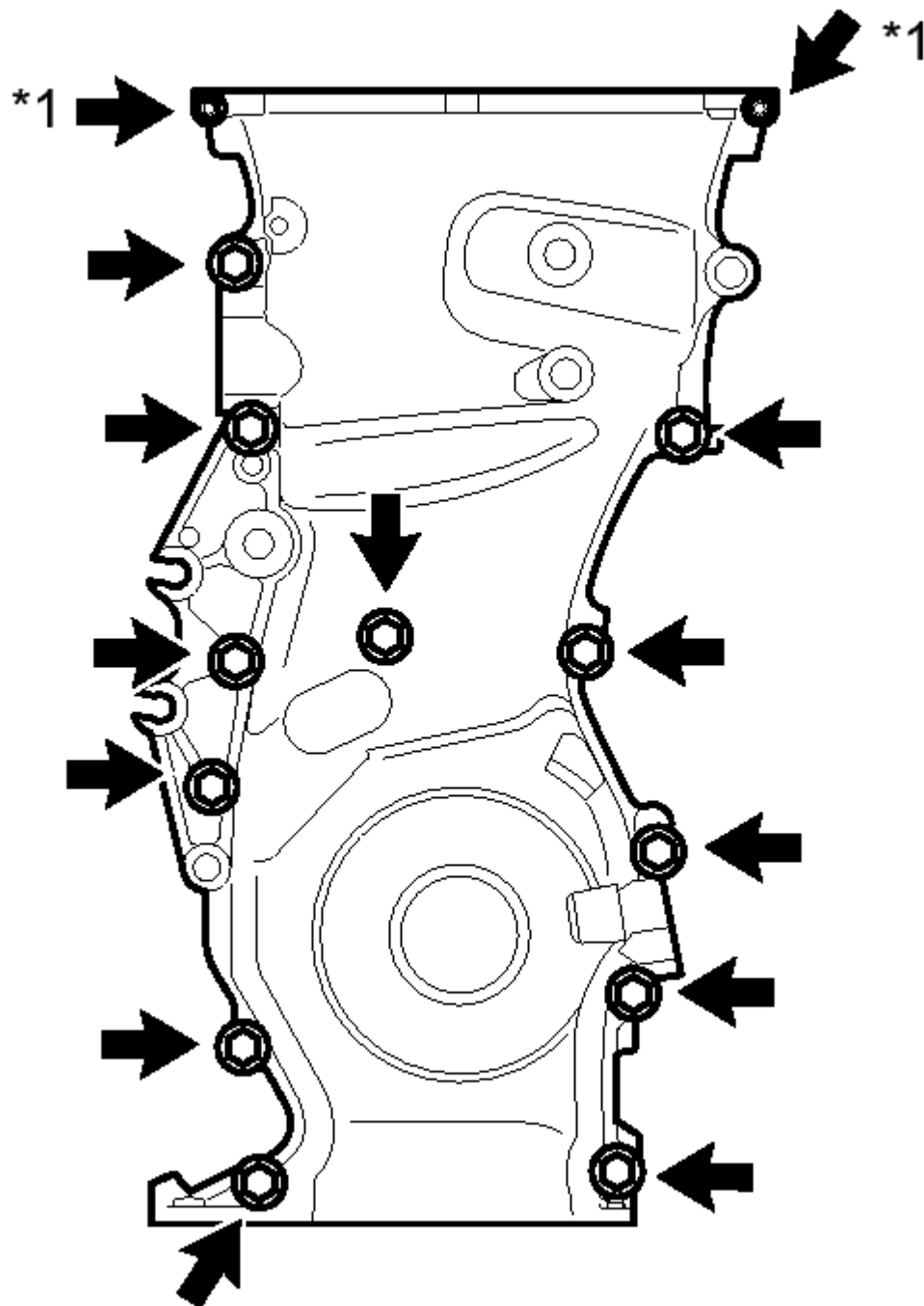
**P**

Fig. 89: Removing V-Ribbed Belt Tensioner Stud
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	"TORX" Socket Wrench
----	----------------------

- b. Remove the 12 bolts and 2 nuts.



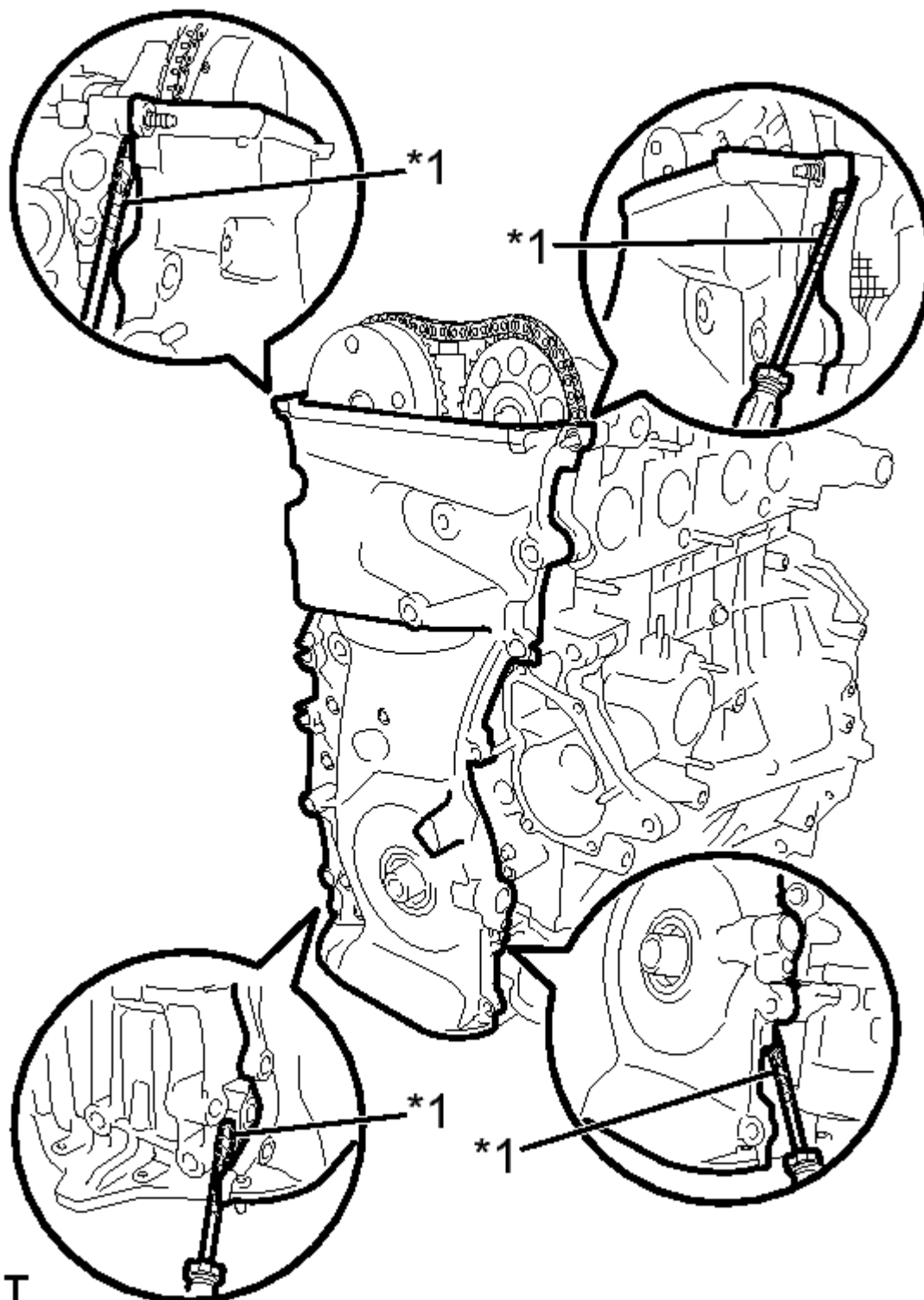
T

Fig. 90: Identifying Timing Chain Cover Bolts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Nut
----	-----

- c. Remove the timing chain cover by prying the portions between the timing chain cover, cylinder head and cylinder block with a screwdriver.



T

Fig. 91: Removing Timing Chain Cover Using A Screwdriver
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Protective Tape
----	-----------------

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

HINT:

Tape the screwdriver tip before use.

51. REMOVE NO. 1 CRANKSHAFT POSITION SENSOR PLATE

- a. Remove the No. 1 crankshaft position sensor plate.

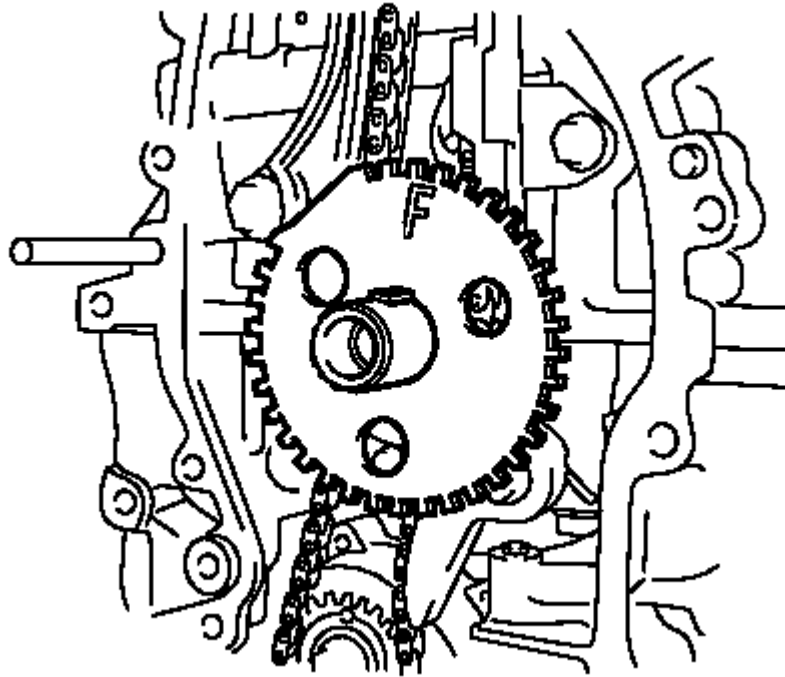
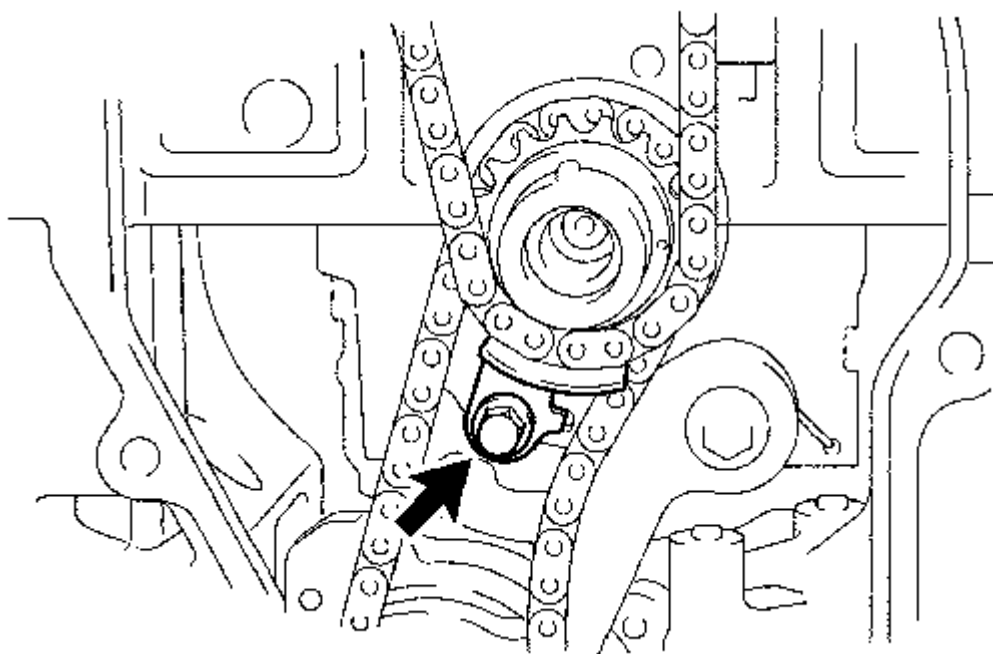


Fig. 92: View Of Crankshaft Position Sensor Plate
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

52. REMOVE TIMING CHAIN GUIDE

- a. Remove the bolt and timing chain guide.



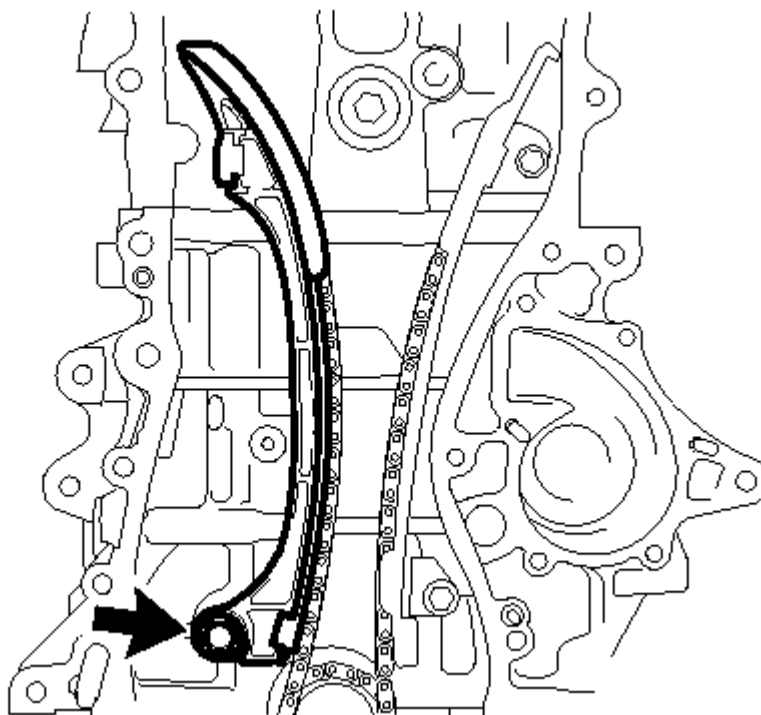
P

Fig. 93: Remove/Install Timing Chain Guide Bolt

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

53. REMOVE CHAIN TENSIONER SLIPPER

- a. Remove the bolt and chain tensioner slipper.



T

Fig. 94: Location of Chain Tensioner Slipper Bolt

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

54. REMOVE NO. 1 CHAIN VIBRATION DAMPER

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

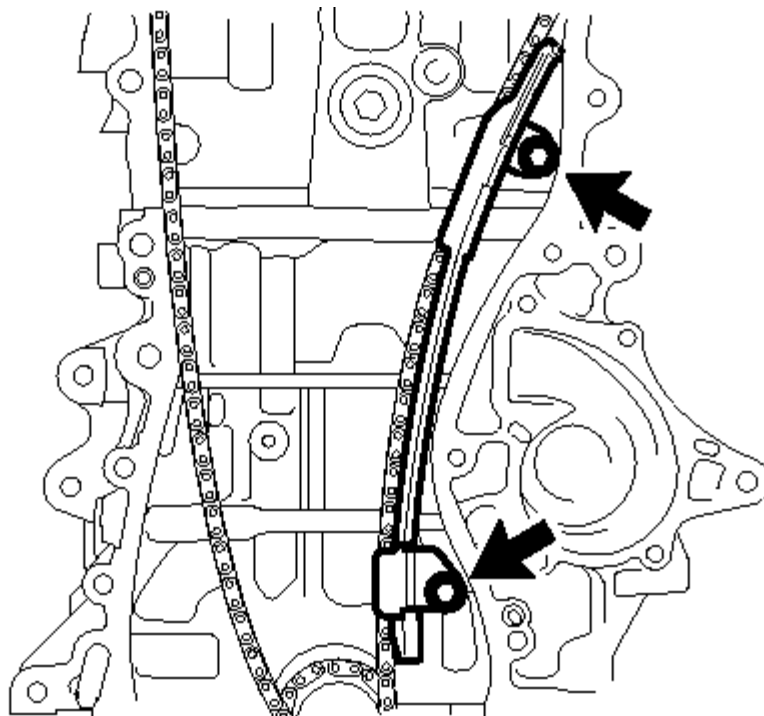
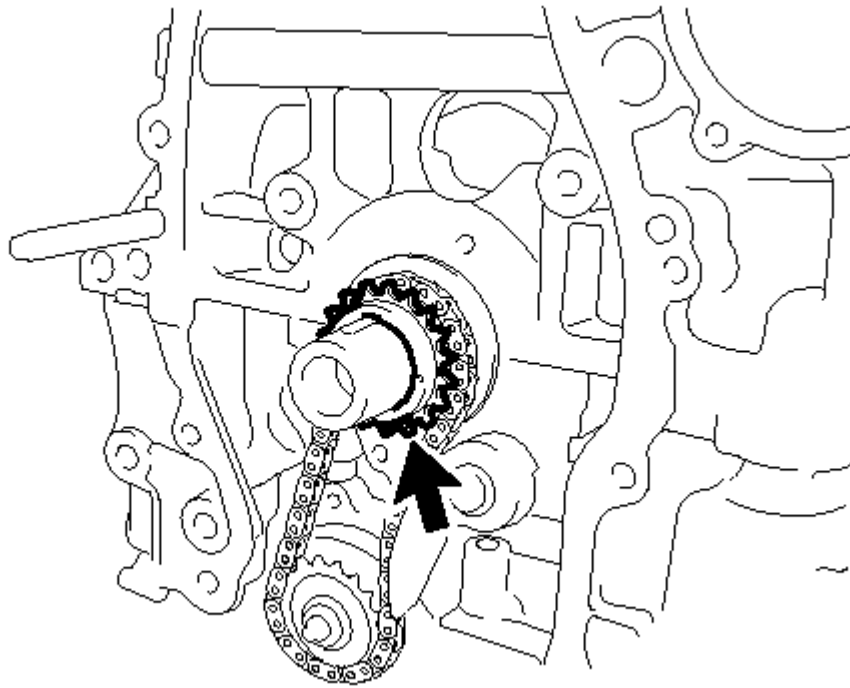
**T**

Fig. 95: Location of Chain Vibration Damper Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

55. REMOVE CHAIN SUB-ASSEMBLY**56. REMOVE CRANKSHAFT TIMING GEAR OR SPROCKET**

- a. Remove the crankshaft timing gear or sprocket from the crankshaft.



T

Fig. 96: Remove/Install Crankshaft Timing Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

57. REMOVE NO. 2 CHAIN SUB-ASSEMBLY

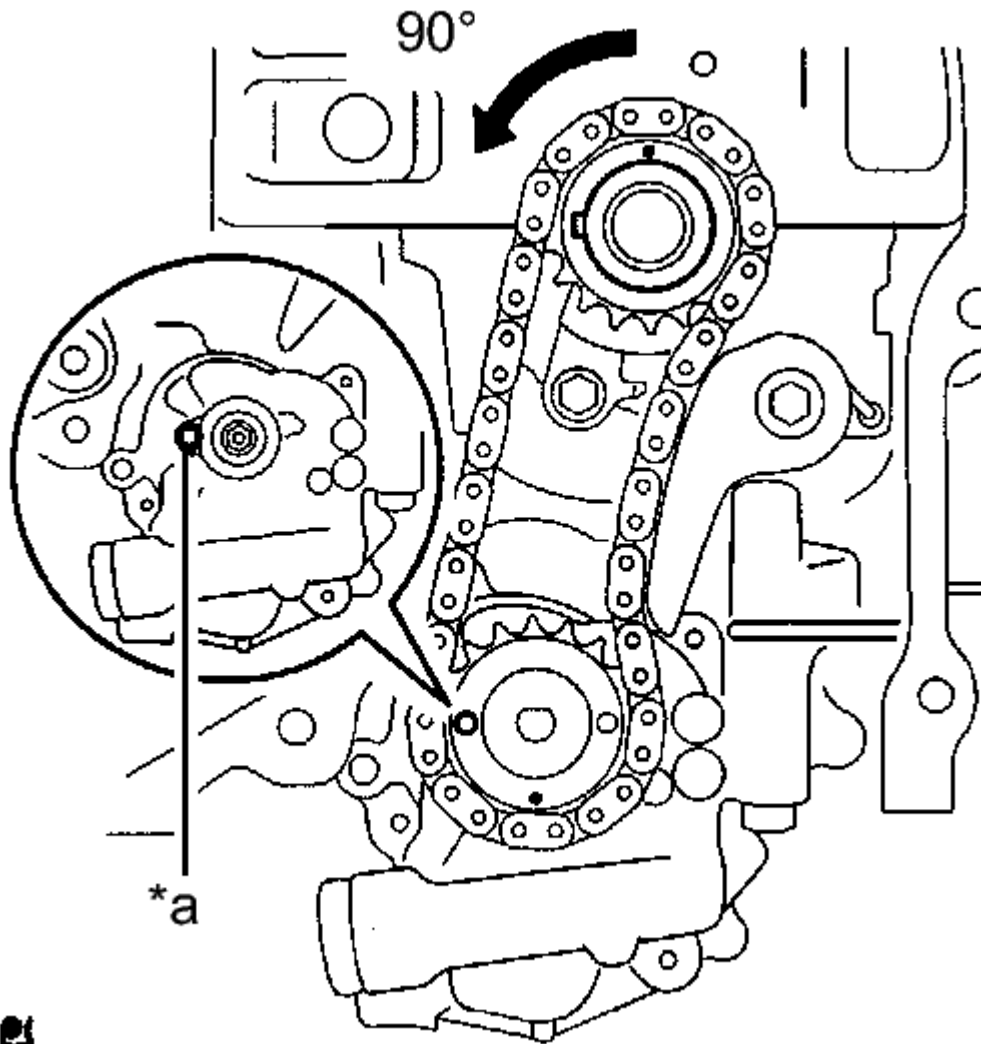


Fig. 97: Aligning Oil Pump Drive Sprocket With Oil Pump

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

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

TEXT IN ILLUSTRATION

*a	Groove
----	--------

- 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.

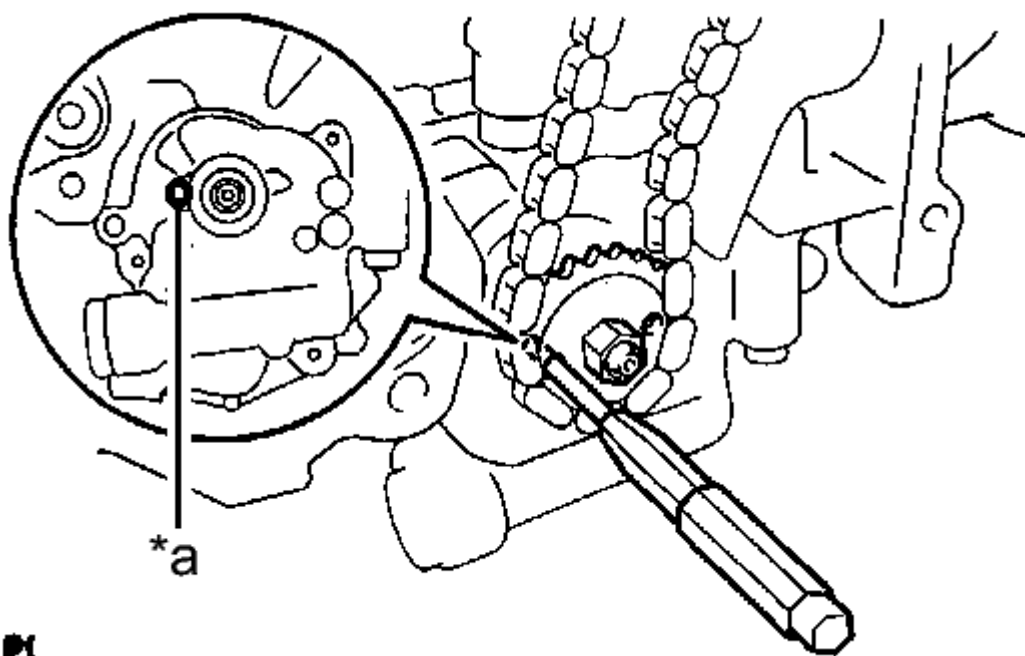


Fig. 98: Locking Oil Pump Drive Shaft Sprocket In Position
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Groove
----	--------

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

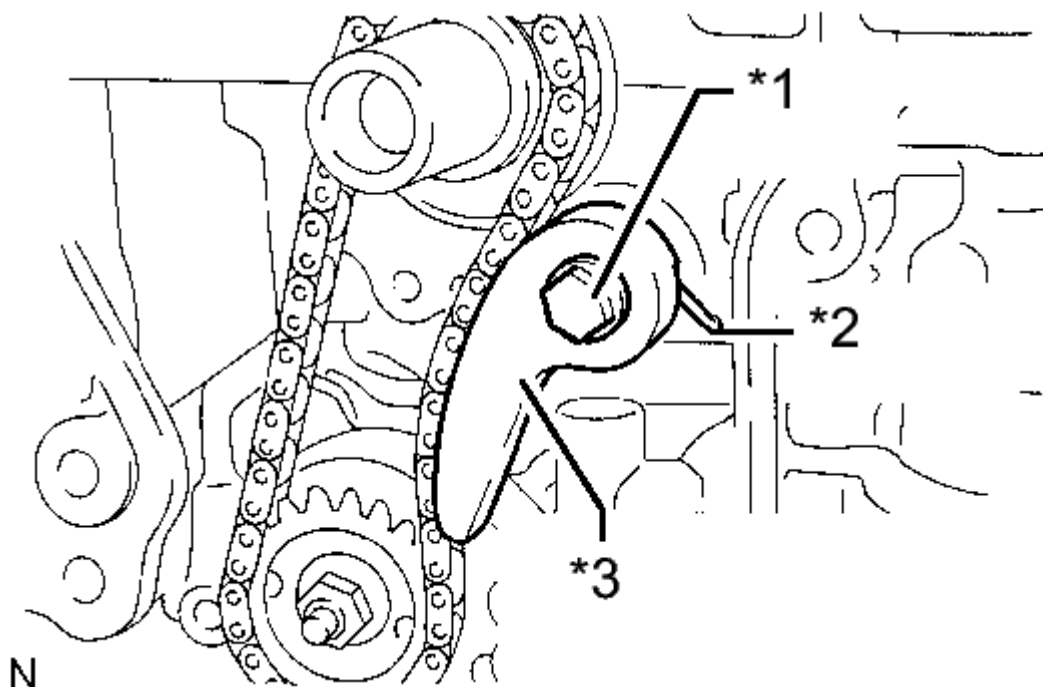


Fig. 99: Identifying Chain Tensioner Plate, Spring And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Bolt
*2	Spring
*3	Chain Tensioner Plate

- d. Remove the oil pump drive sprocket, oil pump drive shaft sprocket and No. 2 chain.
58. **DISCONNECT INLET RADIATOR HOSE** See step 30.
59. **DISCONNECT OUTLET HEATER WATER HOSE**
60. **DISCONNECT INLET HEATER WATER HOSE**
61. **DISCONNECT ENGINE WIRE**

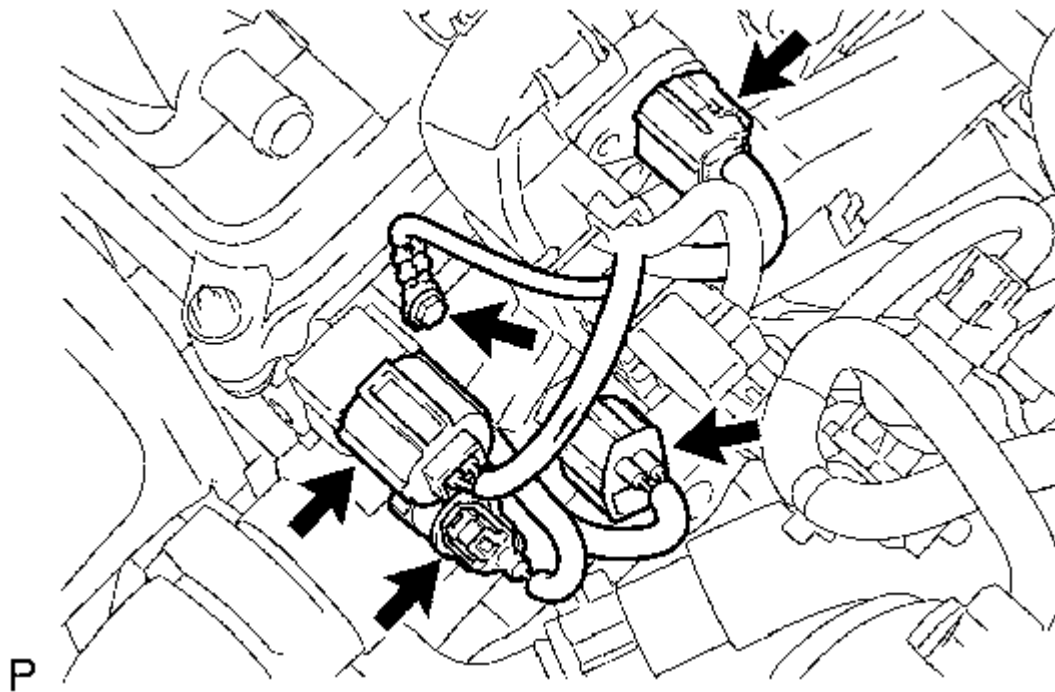


Fig. 100: Remove/Install Camshaft Position Sensor Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- 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.
62. **REMOVE NO. 2 CAMSHAFT** See step 31.
63. **REMOVE CAMSHAFT** See step 32.

64. **REMOVE NO. 1 CAMSHAFT BEARING** See step 33.
65. **REMOVE NO. 2 CAMSHAFT BEARING** See step 34.
66. **REMOVE CYLINDER HEAD SUB-ASSEMBLY**
 - a. In 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.

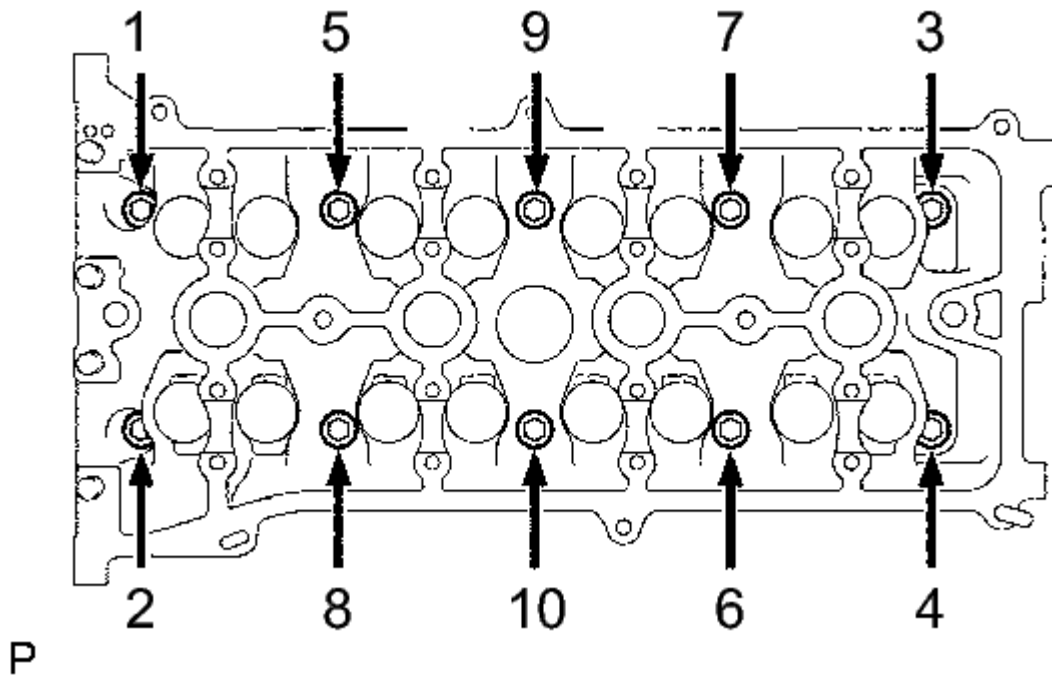
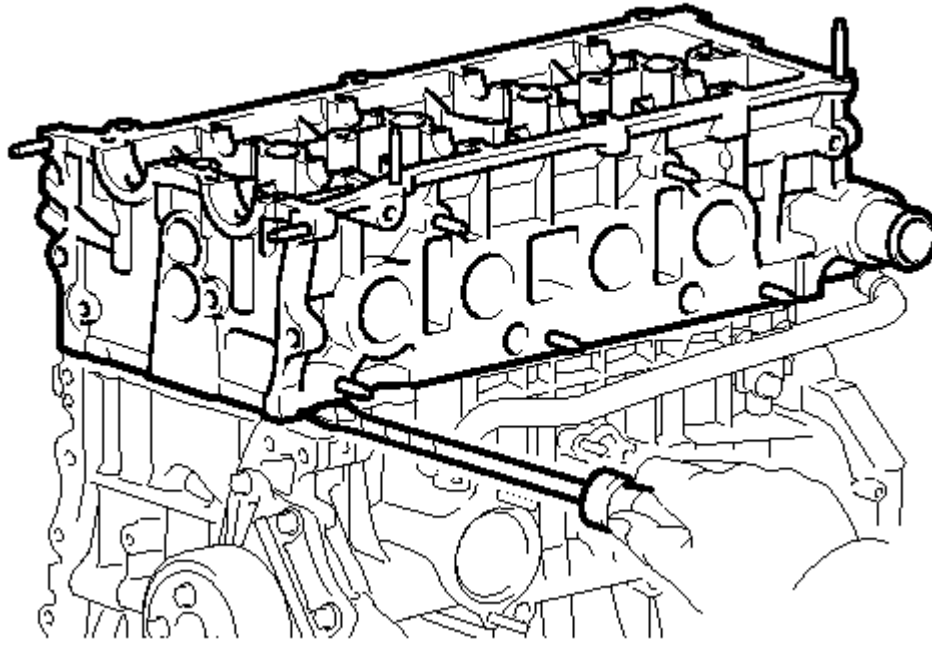


Fig. 101: Removing Cylinder Head Bolts In Sequence

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

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

**P****Fig. 102: Removing Cylinder Head**

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

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

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

67. REMOVE CYLINDER HEAD GASKET

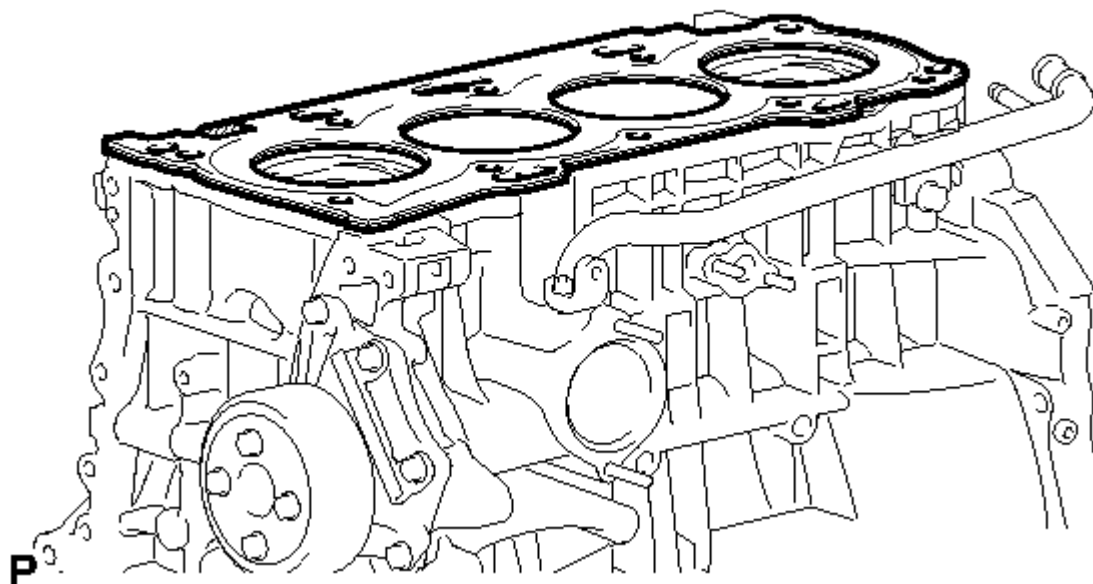


Fig. 103: View Of Cylinder Head Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

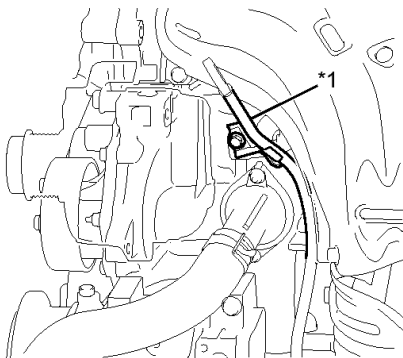
INSTALLATION

INSTALLATION

HINT:

Check whether the engine is TMC made or not by referring to the following illustration.

*A



*B

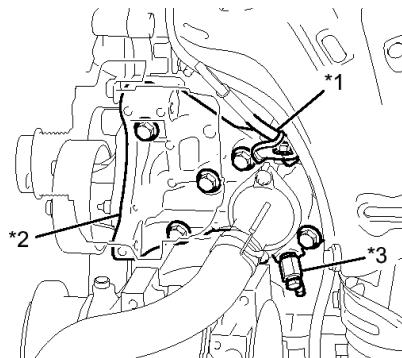


Fig. 104: Identifying Whether The Engine Is TMC Made
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*A	for TMC Made Engine	*B	except TMC Made Engine
*1	Engine Oil Level Dipstick Guide	*2	Water Inlet Housing
*3	Water Inlet Housing Drain Cock Assembly	-	-

INSTALLATION

1. INSTALL CYLINDER HEAD GASKET

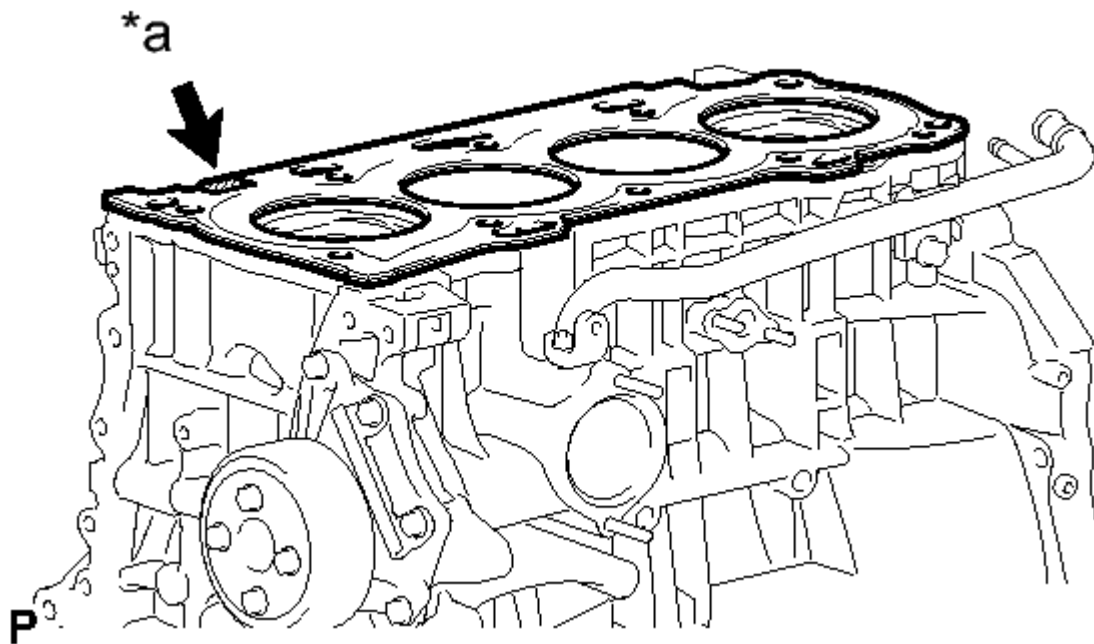


Fig. 105: Install Cylinder Head Gasket

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

NOTE:

- Remove any oil from contact surface.
 - Be careful of the installation direction.
- a. Place a new gasket on the cylinder block surface with the Lot No. stamp facing upward.

TEXT IN ILLUSTRATION

*a	Lot No.
----	---------

2. INSTALL CYLINDER HEAD SUB-ASSEMBLY

- a. Place the cylinder head on the head gasket.

NOTE:

Place the cylinder head gently in order to avoid damaging the gasket.

- b. Install the cylinder head bolts.

NOTE: The cylinder head bolts are tightened in 2 successive steps.

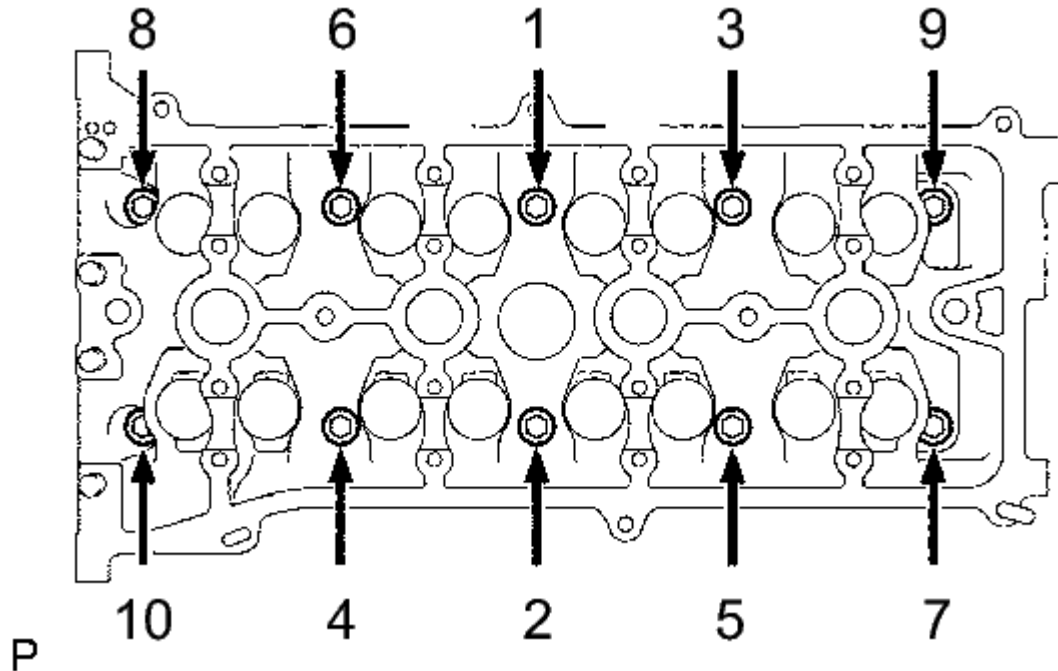


Fig. 106: Tightening Sequence of Cylinder Head Set Bolts And Plate Washer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Apply a light coat of engine oil to the threads and under the heads of the cylinder head set bolts.
2. 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)

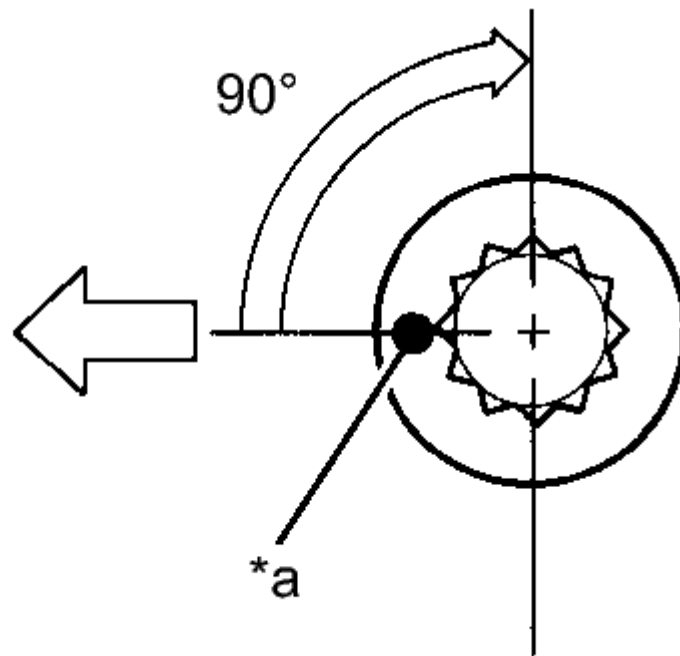
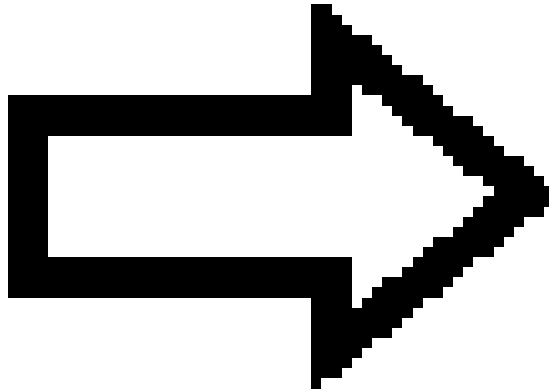


Fig. 107: Identifying Cylinder Head Bolts Final Torque Position
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Mark the front of the cylinder head bolts with paint.

TEXT IN ILLUSTRATION

*a	Paint Mark
	Engine Front



- d. Further tighten the cylinder head bolts by 90° as shown in the illustration.
 - e. Check that the paint mark is now at a 90° angle to the front.
- 3. **INSTALL NO. 1 CAMSHAFT BEARING** See step 17.
 - 4. **INSTALL NO. 2 CAMSHAFT BEARING** See step 18.
 - 5. **INSTALL CAMSHAFT** See step 19.
 - 6. **INSTALL NO. 2 CAMSHAFT** See step 20.
 - 7. **CONNECT INLET HEATER WATER HOSE**
 - 8. **CONNECT OUTLET HEATER WATER HOSE**
 - 9. **CONNECT INLET RADIATOR HOSE** See step 51.
 - 10. **CONNECT ENGINE WIRE**

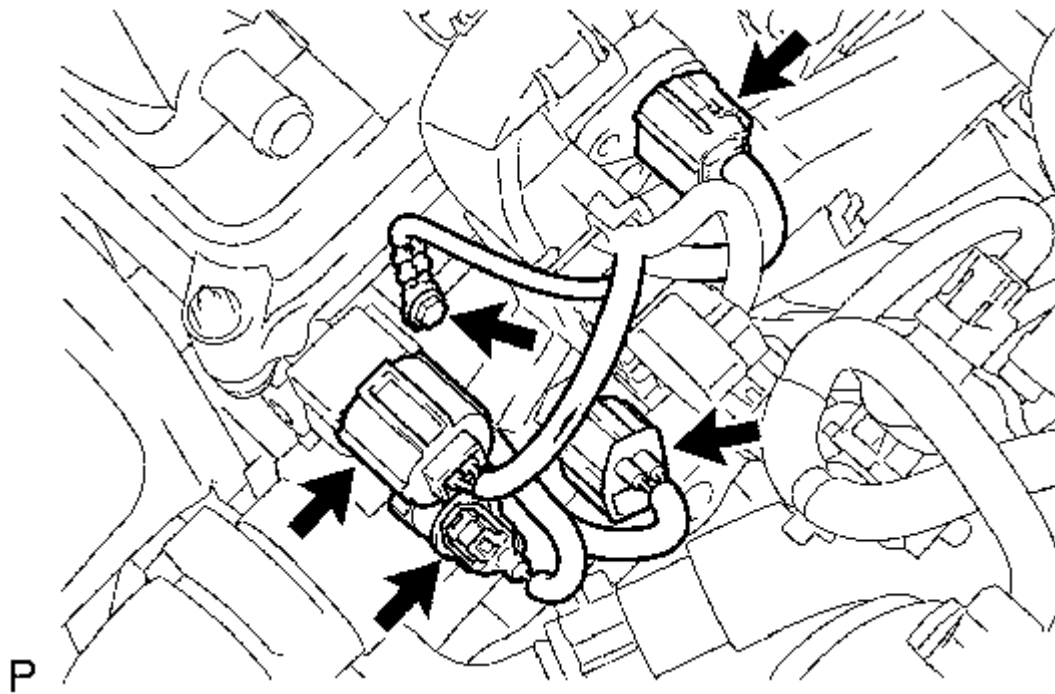


Fig. 108: Remove/Install Camshaft Position Sensor Connector
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

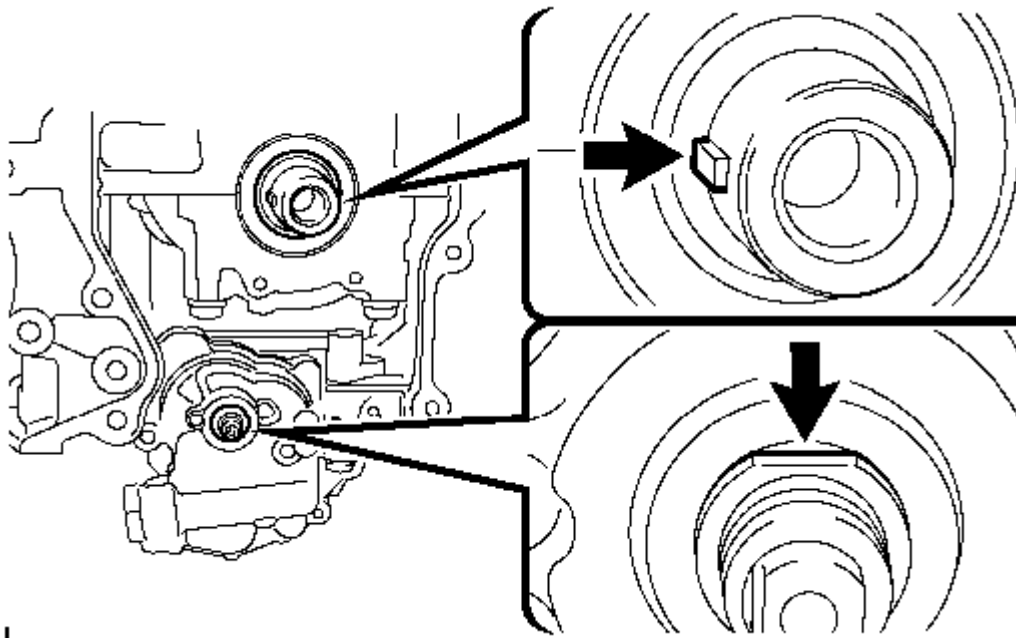
- a. Connect the ground cable with the bolt.

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.
- f. Connect the heater water inlet hose.

11. INSTALL NO. 2 CHAIN SUB-ASSEMBLY

- a. Set the crankshaft key in the left horizontal position.



N

Fig. 109: Setting Crankshaft Key In Left Horizontal Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Turn the cutout of the drive shaft so that it faces upward.

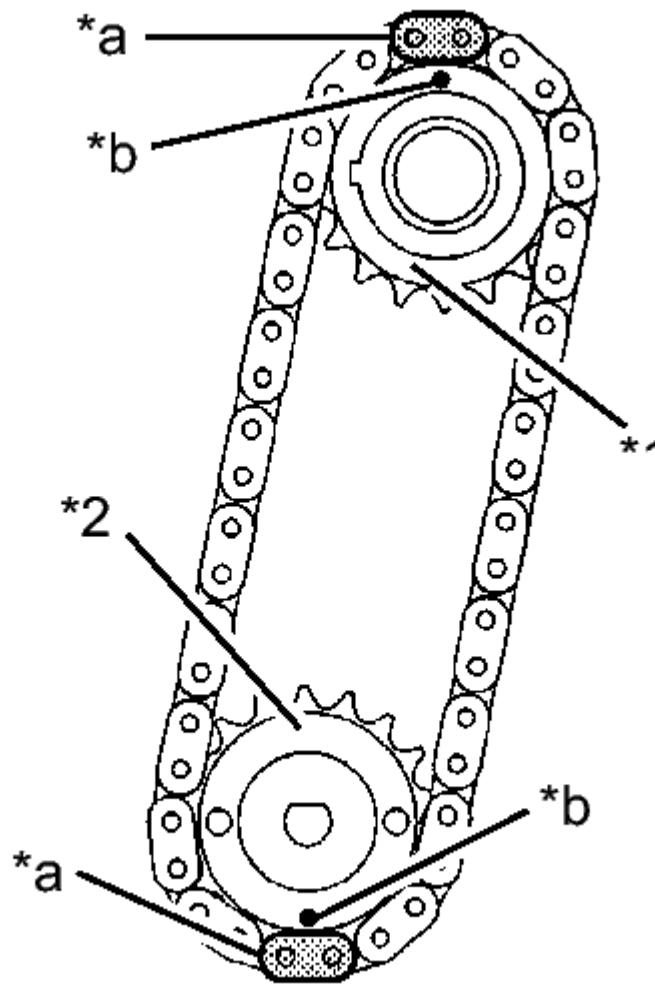


Fig. 110: Install Timing Chain and Gears

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

TEXT IN ILLUSTRATION

*1	Oil Pump Drive Sprocket
*2	Oil Pump Drive Shaft Sprocket
*a	Mark Link
*b	Timing Mark

- Align the yellow mark links with the timing marks of each gear as shown in the illustration.
- Install the sprockets onto the crankshaft and oil pump shaft with the chain wrapped on the gears.
- Temporarily tighten the oil pump drive shaft sprocket with the nut.
- Insert the damper spring into the adjusting hole, and then install the chain tensioner plate with the bolt.

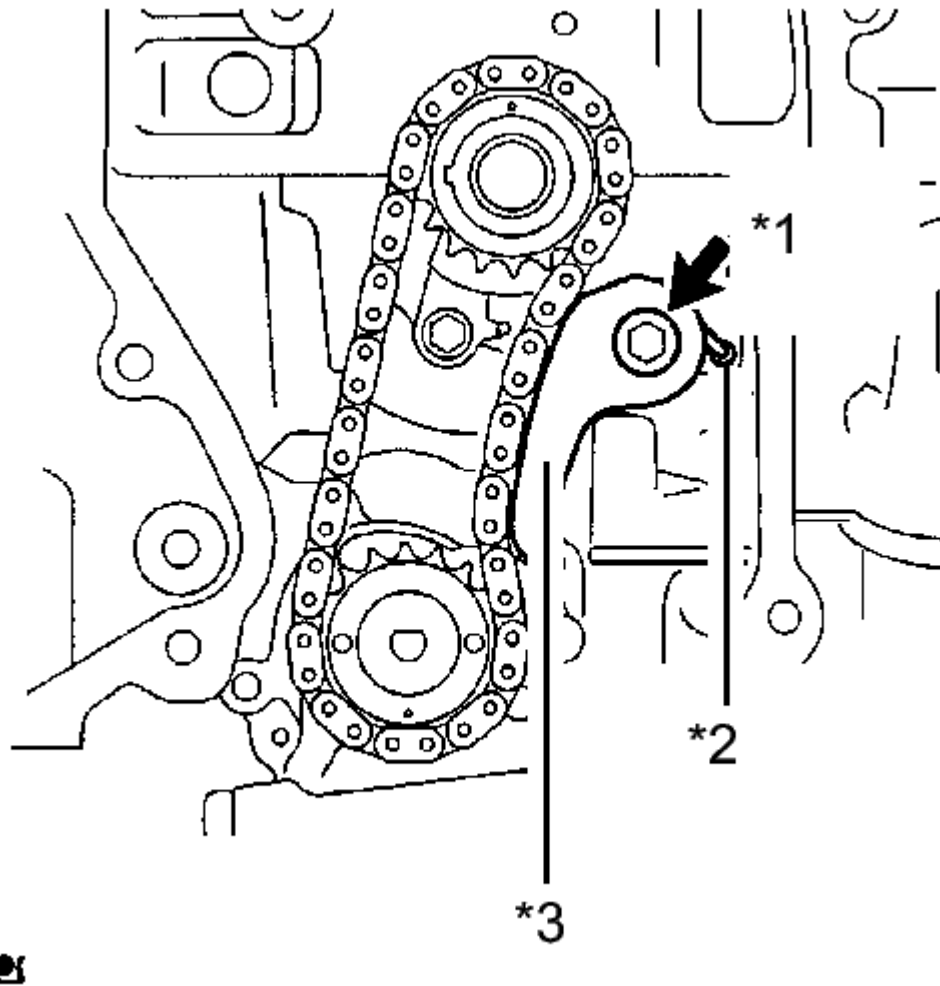


Fig. 111: Identifying Chain Tensioner Plate Components
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

TEXT IN ILLUSTRATION

*1	Bolt
*2	Spring
*3	Chain Tensioner Plate

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

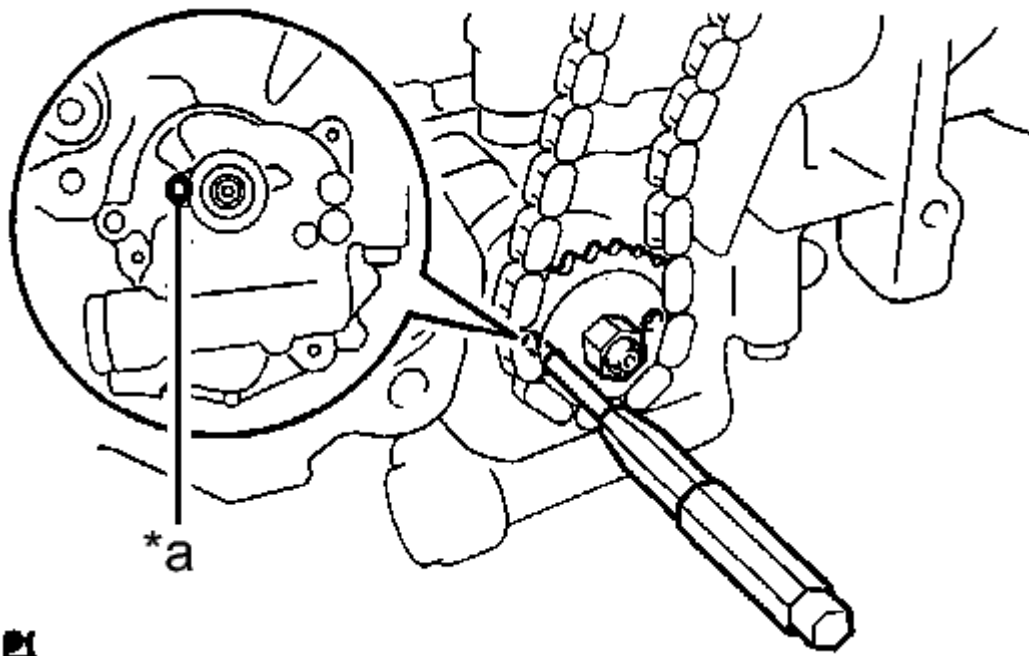


Fig. 112: Locking Oil Pump Drive Shaft Sprocket In Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Groove
----	--------

- h. Insert a 4 mm diameter bar into the adjusting hole on 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)

12. INSTALL CRANKSHAFT TIMING GEAR OR SPROCKET

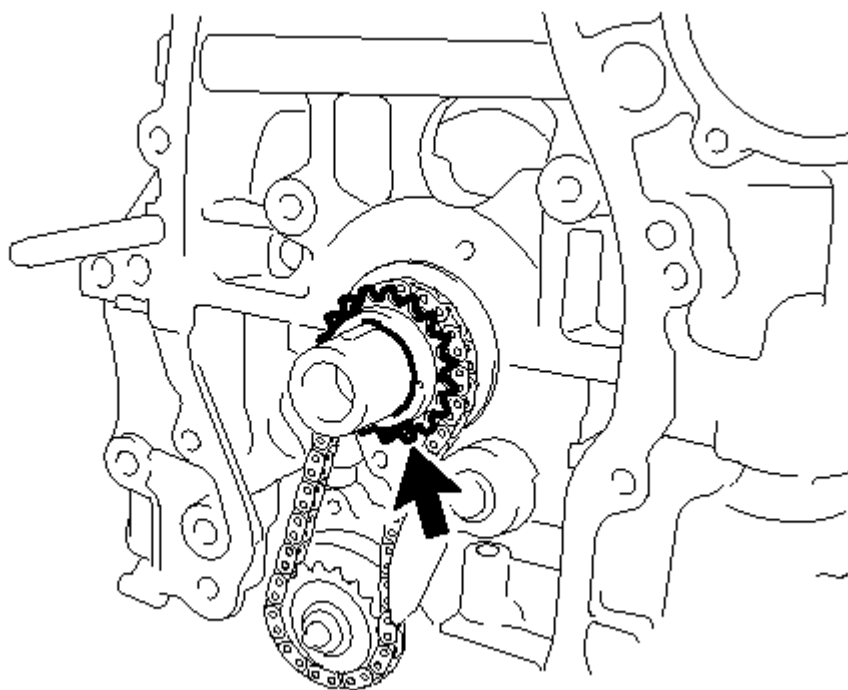
**T**

Fig. 113: Remove/Install Crankshaft Timing Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. INSTALL NO. 1 CHAIN VIBRATION DAMPER

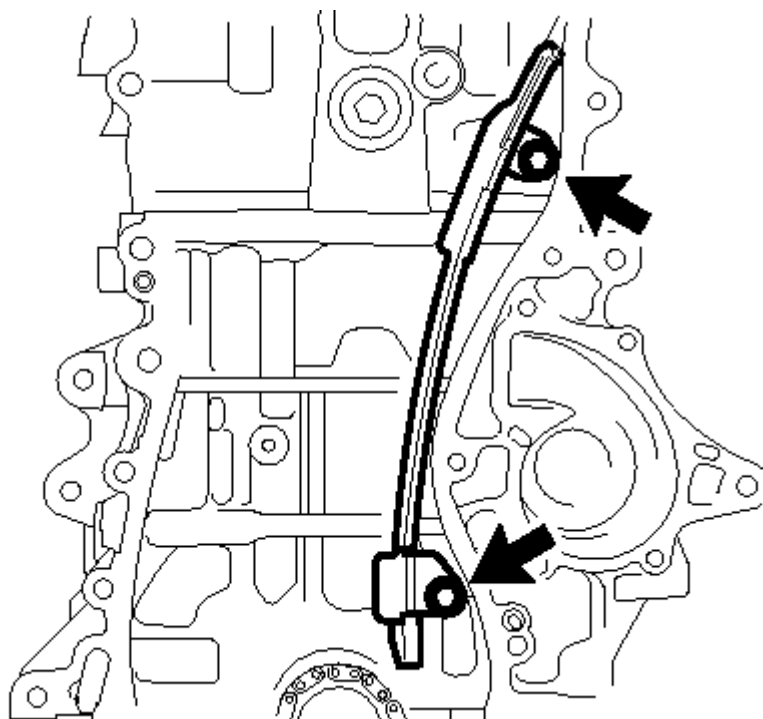
**T**

Fig. 114: Locating No. 1 Chain Vibration Damper And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

14. INSTALL CHAIN SUB-ASSEMBLY

- a. Set the No. 1 cylinder to TDC/compression.

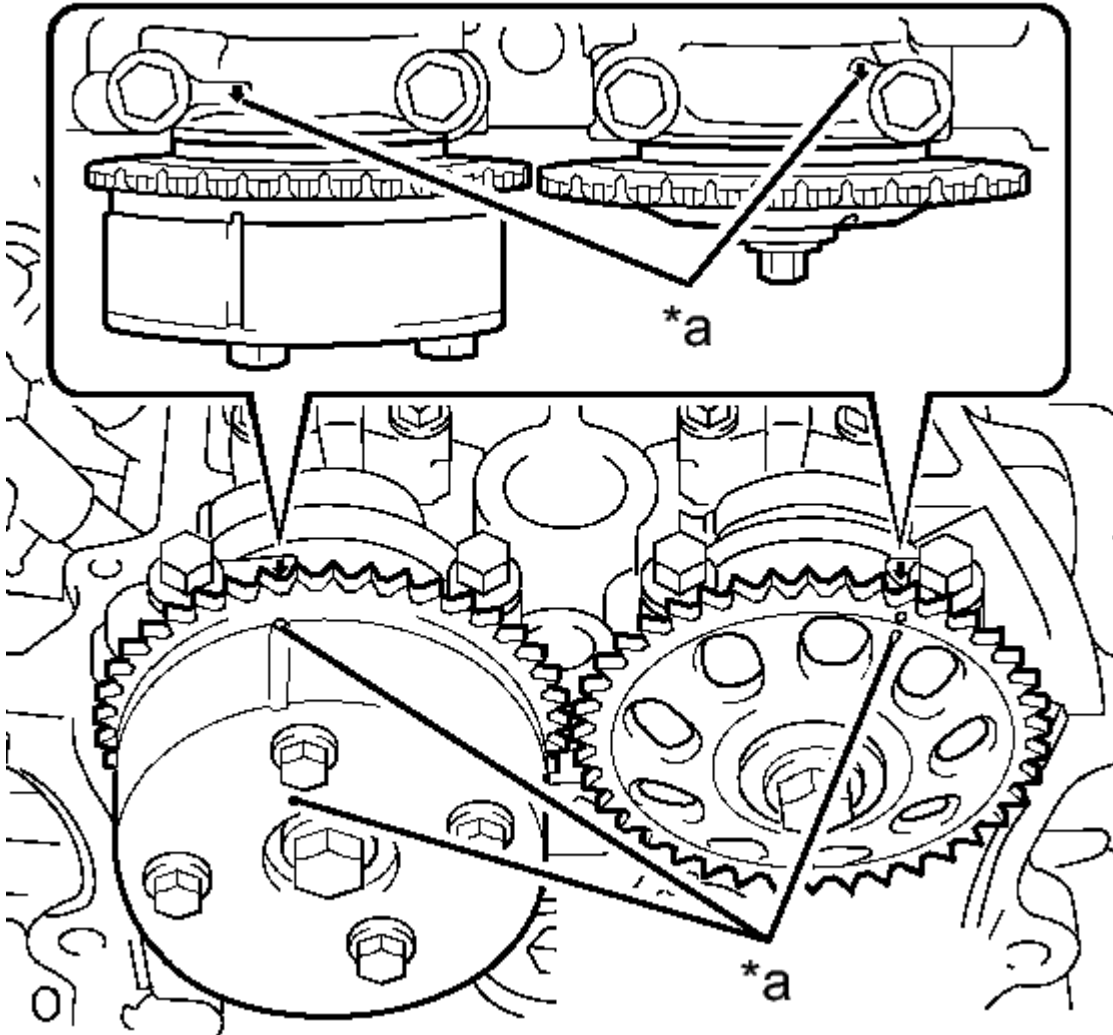


Fig. 115: Identifying No. 1 Cylinder To TDC/Compression Timing Marks
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Timing Mark
----	-------------

1. Turn the camshafts with a wrench (using the hexagonal lobe) to align the timing marks on the camshaft timing gear with the timing marks located on the No. 1 and No. 2 bearing caps as shown in the illustration.

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

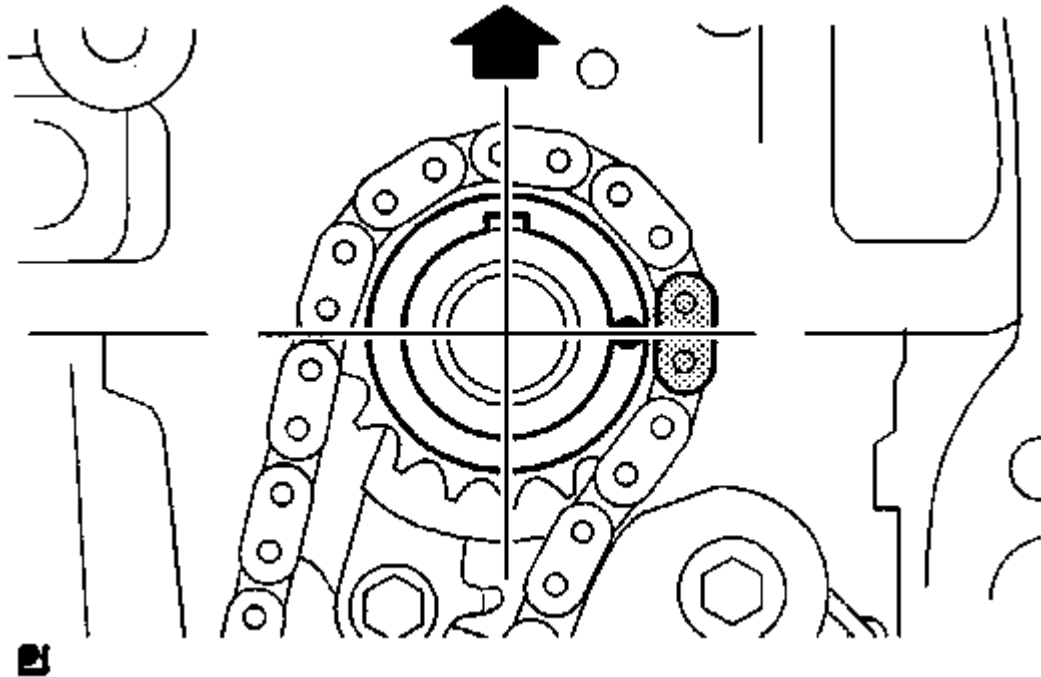


Fig. 116: Turning Crankshaft To Position Key On Crankshaft Upward
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

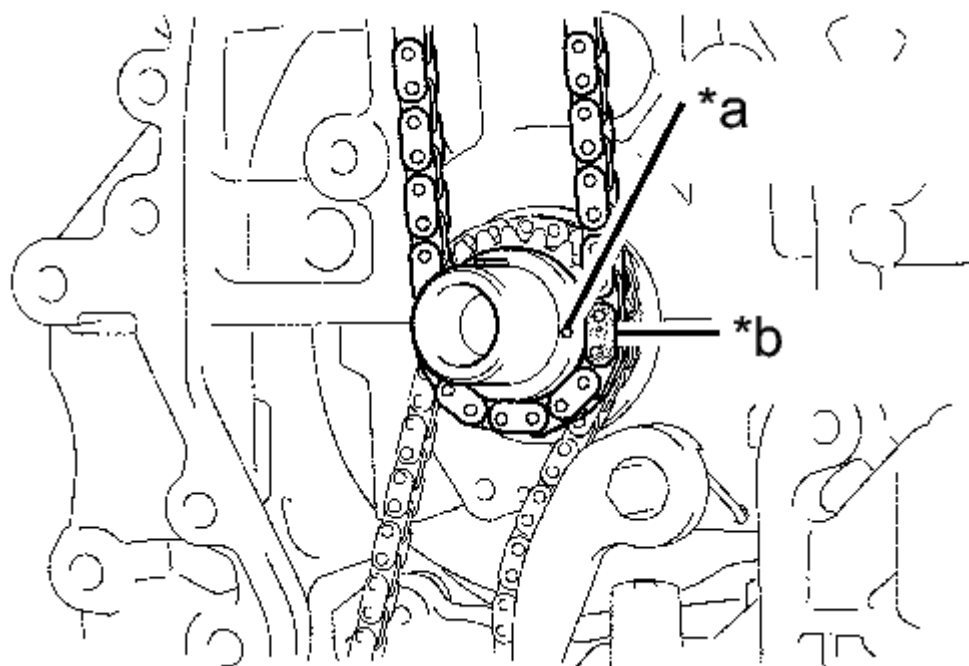


Fig. 117: Install Timing Chain Onto Crankshaft Timing Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Timing Mark
*b	Mark Link

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

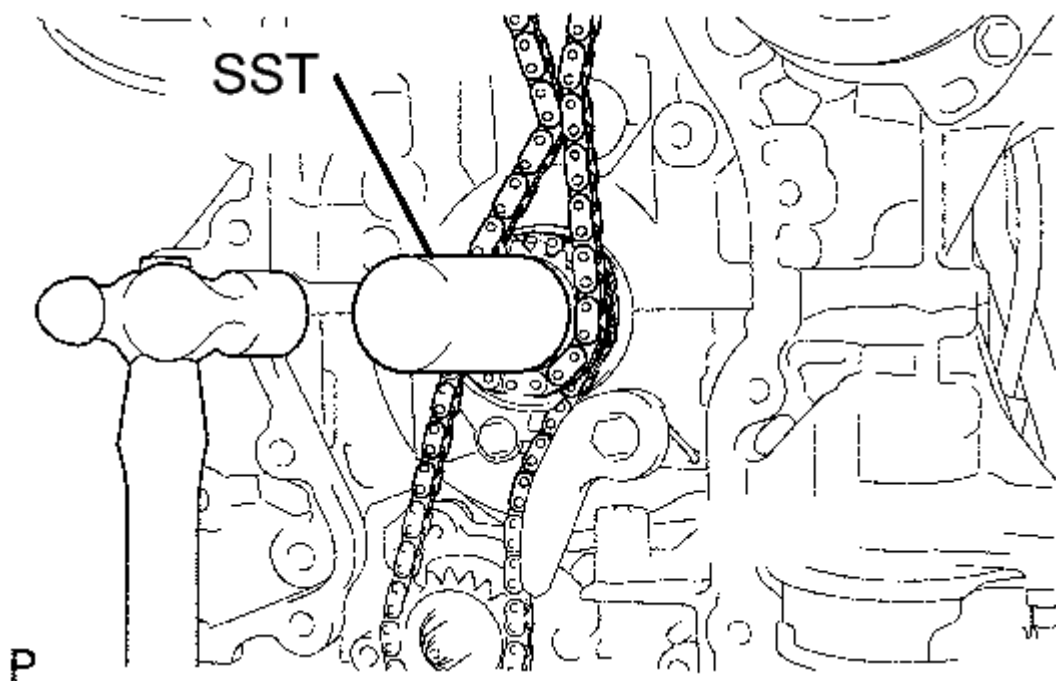


Fig. 118: Tapping In Crankshaft Timing Sprocket With SST
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09309-37010

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

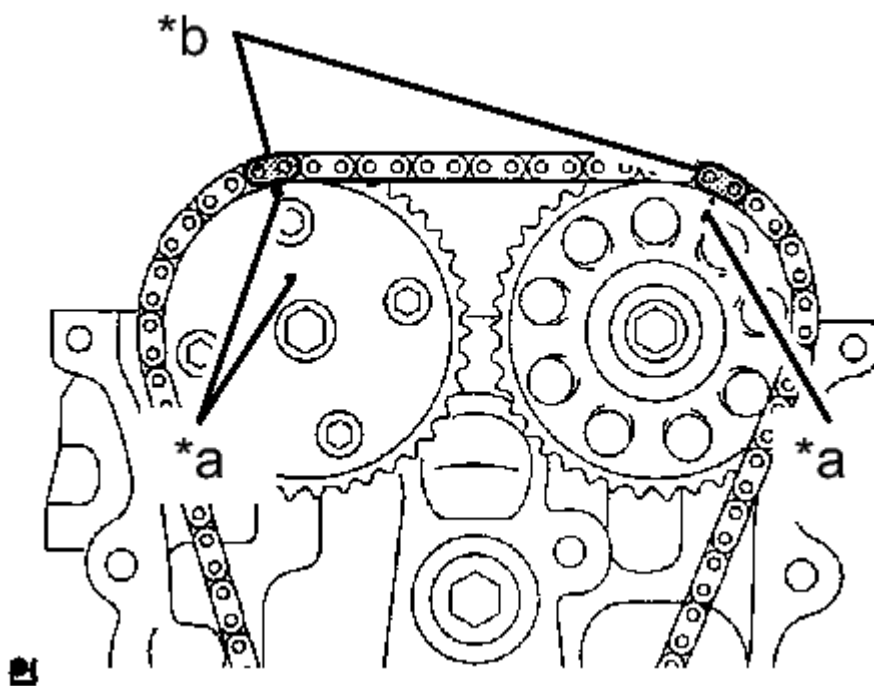


Fig. 119: Aligning Timing Marks On Camshaft Timing Gear And Sprocket

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

TEXT IN ILLUSTRATION

*a	Timing Mark
*b	Mark Link

15. INSTALL CHAIN TENSIONER SLIPPER

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

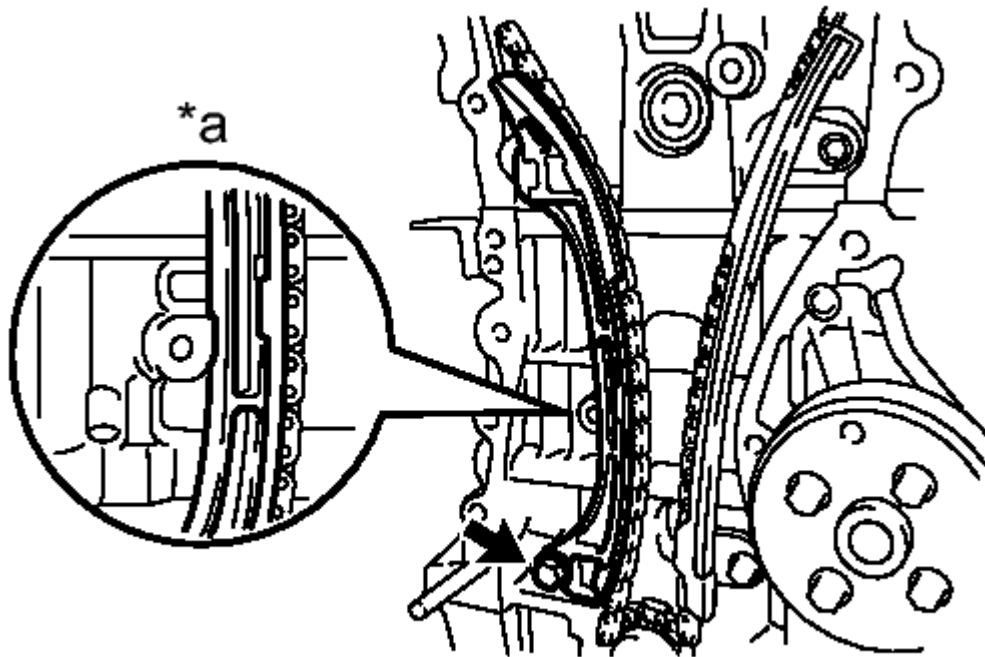
**H**

Fig. 120: Install Chain Tensioner Slipper

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

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

TEXT IN ILLUSTRATION

*a	Hold
----	------

16. INSTALL TIMING CHAIN GUIDE

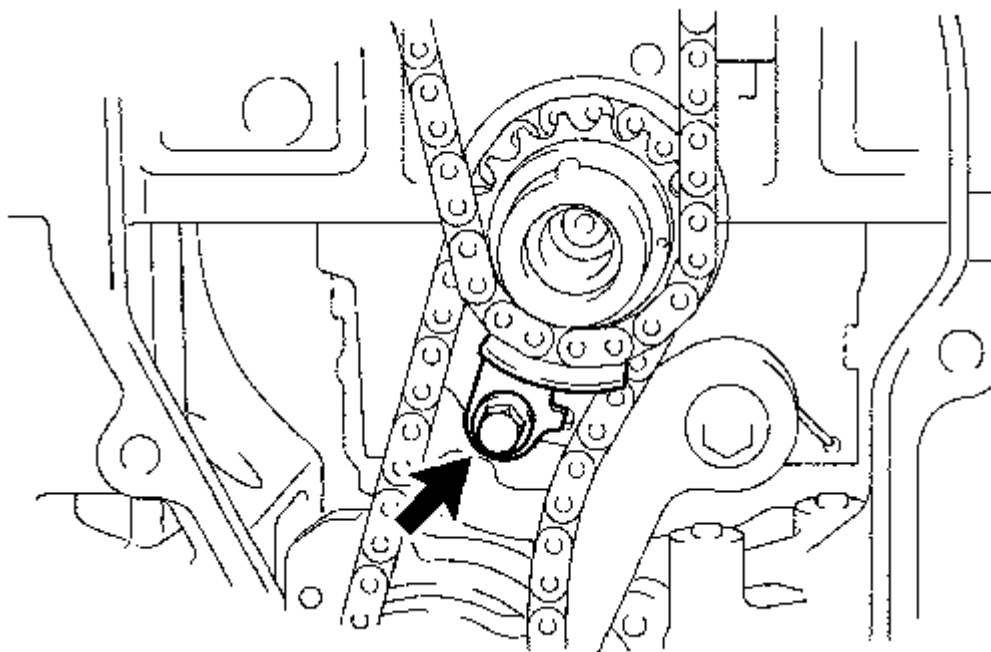
**P**

Fig. 121: Remove/Install Timing Chain Guide Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

17. INSTALL NO. 1 CRANKSHAFT POSITION SENSOR PLATE

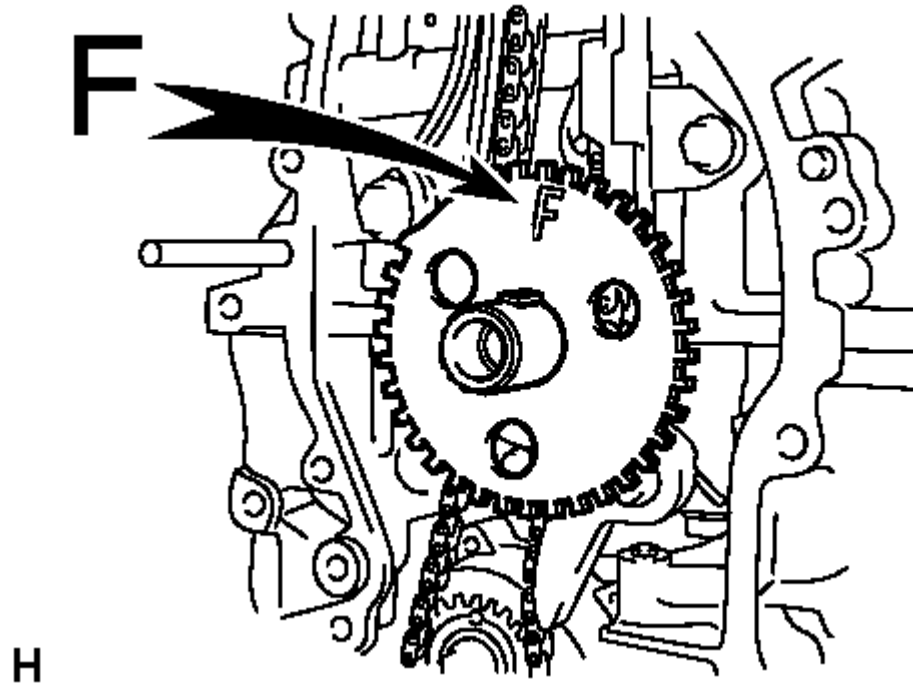


Fig. 122: Location of Crankshaft Position Sensor Plate
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Install the sensor plate with the "F" mark facing forward.
18. **INSTALL TIMING CHAIN OR BELT COVER SUB-ASSEMBLY**
- a. Remove any old packing material and be careful not to drop any oil on the contact surfaces of the timing chain cover, cylinder head and cylinder block.
 - b. Apply seal packing (Diameter 4.0 to 4.5 mm (0.157 to 0.177 in.)) as shown in the illustration.

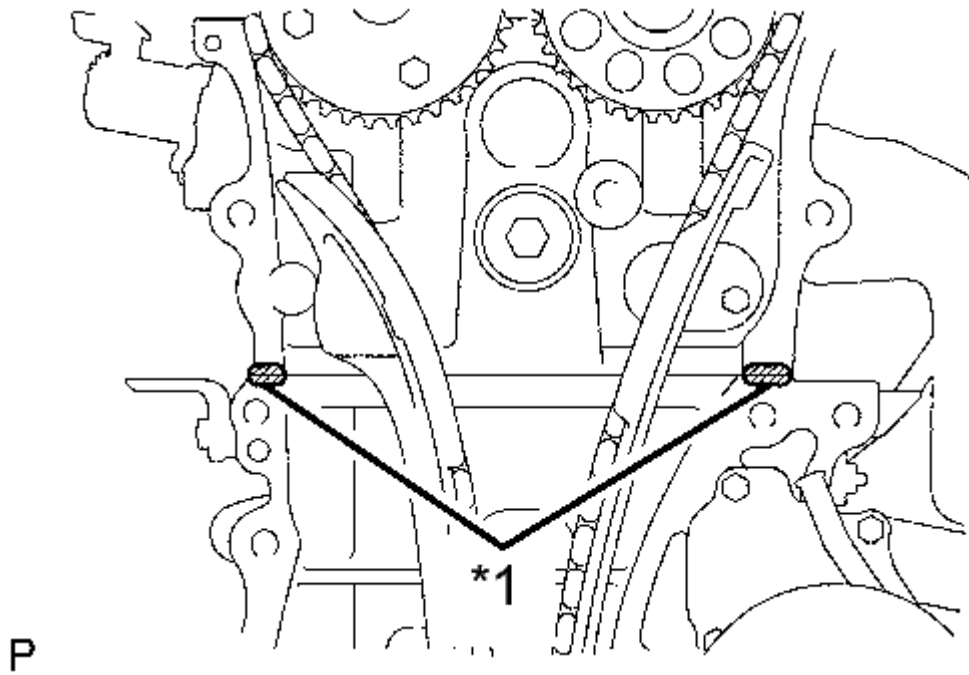


Fig. 123: Applying Seal Packing to Engine Block

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

Seal packing

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

NOTE:

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

TEXT IN ILLUSTRATION

*1	Seal Packing
----	--------------

- c. Apply a continuous bead of seal packing as shown in the illustration.

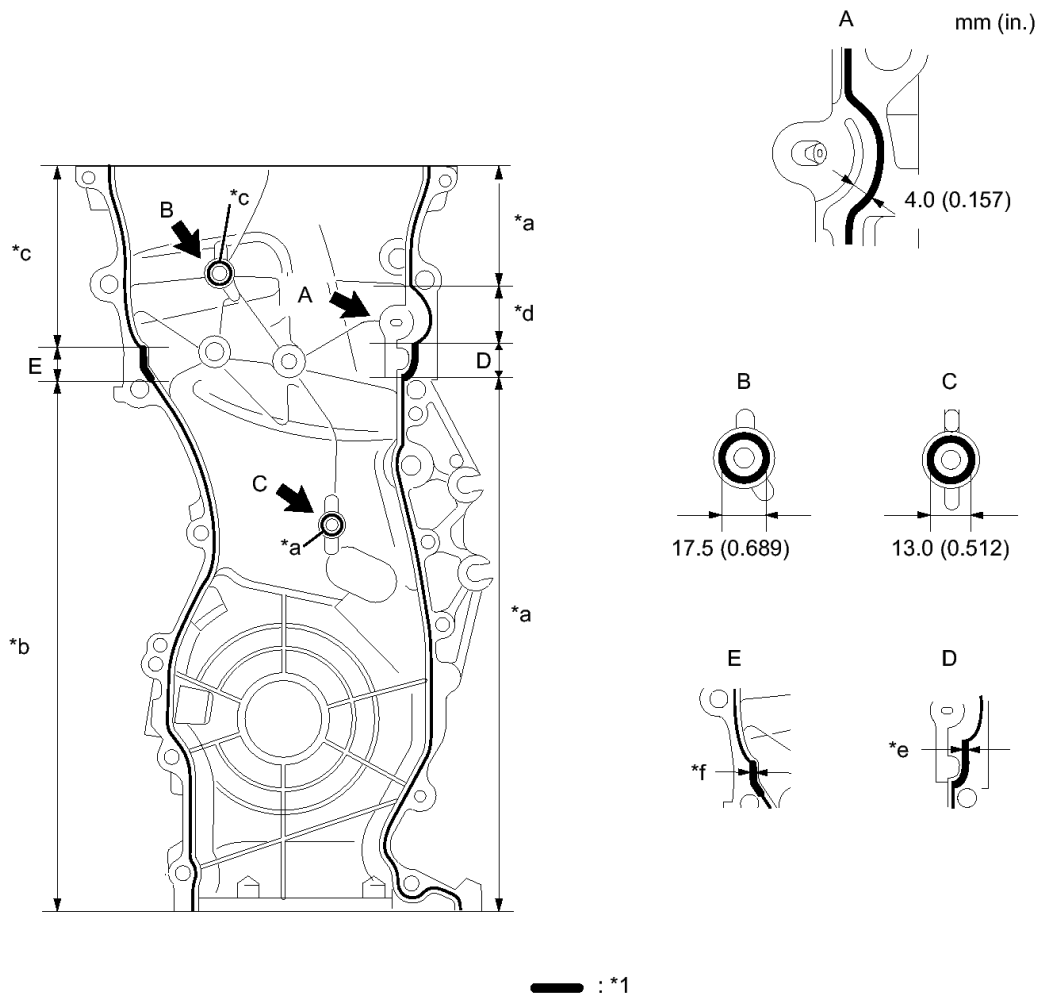


Fig. 124: Applying Seal Packing To Timing Cover
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Seal Packing	-	-
*a	Seal Diameter 2.5 to 3.0 mm (0.098 to 0.118 in.)	*b	Seal Diameter 3.0 mm (0.118 in.)
*c	Seal Diameter 4.0 mm (0.157 in.)	*d	Seal Diameter 4.0 to 4.5 mm (0.157 to 0.177 in.)
*e	Seal Diameter 4.5 to 5.0 mm (0.177 to 0.197 in.)	*f	Seal Diameter 5.5 to 6.0 mm (0.217 to 0.236 in.)

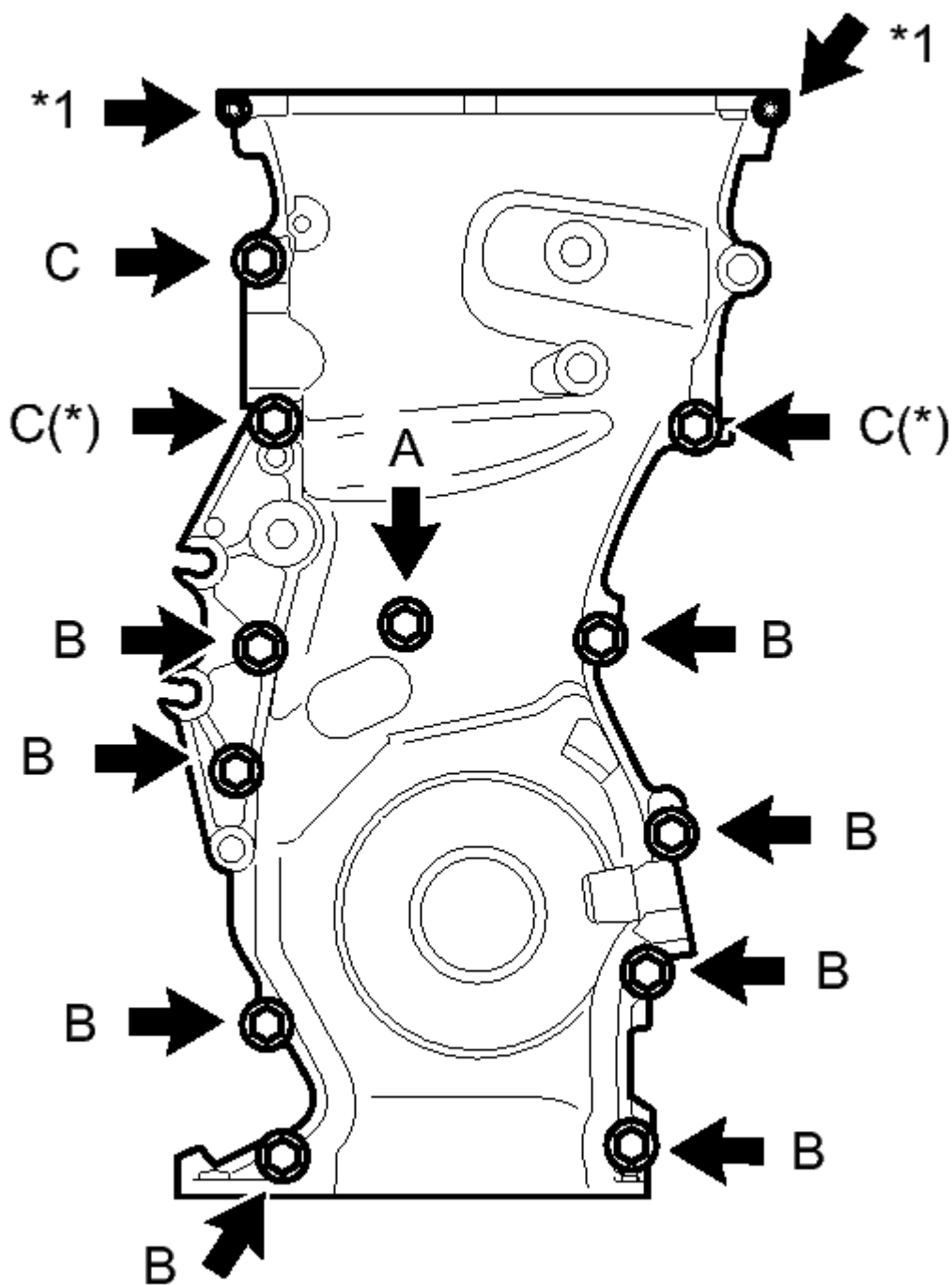
Seal packing

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

NOTE:

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

- d. Install the timing chain cover with the 12 bolts and 2 nuts.

**T****Fig. 125: Installing Timing Chain Cover**

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

Bolt A

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

Bolt B

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

Bolt C

Torque: 55 N*m (561 kgf*cm, 41 ft.*lbf)

Nut

Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)

TEXT IN ILLUSTRATION

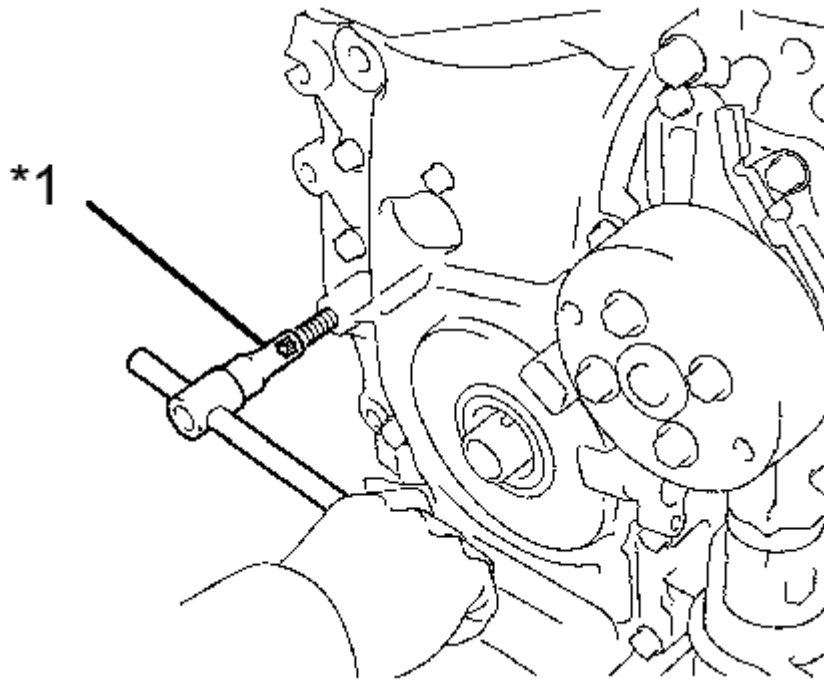
*1	Nut
----	-----

NOTE: Make sure there is no oil adhering to the bolts or threaded holes at the locations marked with C(*) in the illustration. If there is any oil adhering to the bolts or threaded holes, clean and degrease the parts.

BOLT LENGTH

Item	Specification
Bolt A	30 mm (1.18 in.) length for 10 mm head
Bolt B	30 mm (1.18 in.) length for 12 mm head
Bolt C	40 mm (1.57 in.) length for 14 mm head

- e. Using an E10 "TORX" socket, install the stud bolt for the V-ribbed belt tensioner.



P

Fig. 126: Installing Belt Tensioner Stud Bolt

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

Torque: 22 N*m (220 kgf*cm, 16 ft.*lbf)**TEXT IN ILLUSTRATION**

*1	"TORX" Socket Wrench
----	----------------------

19. 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.

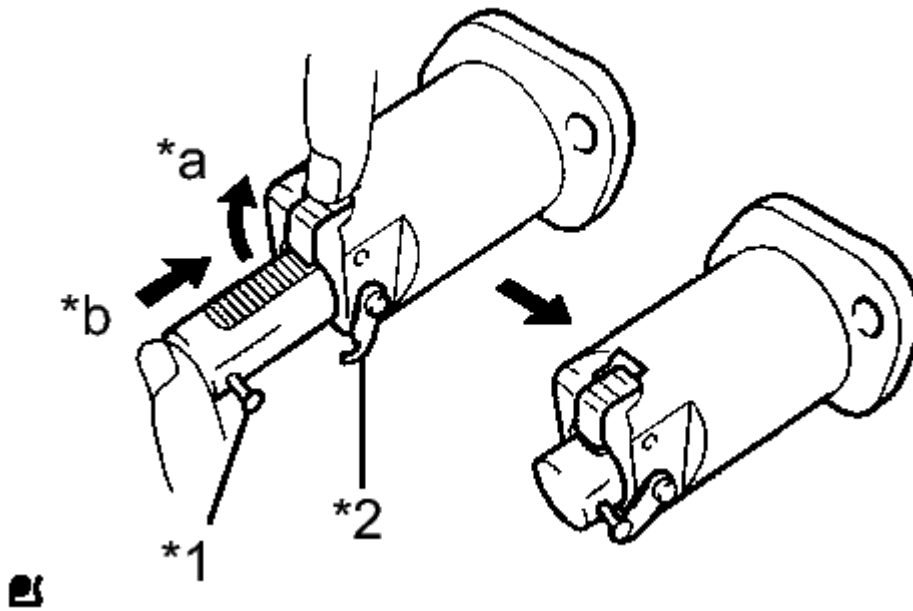
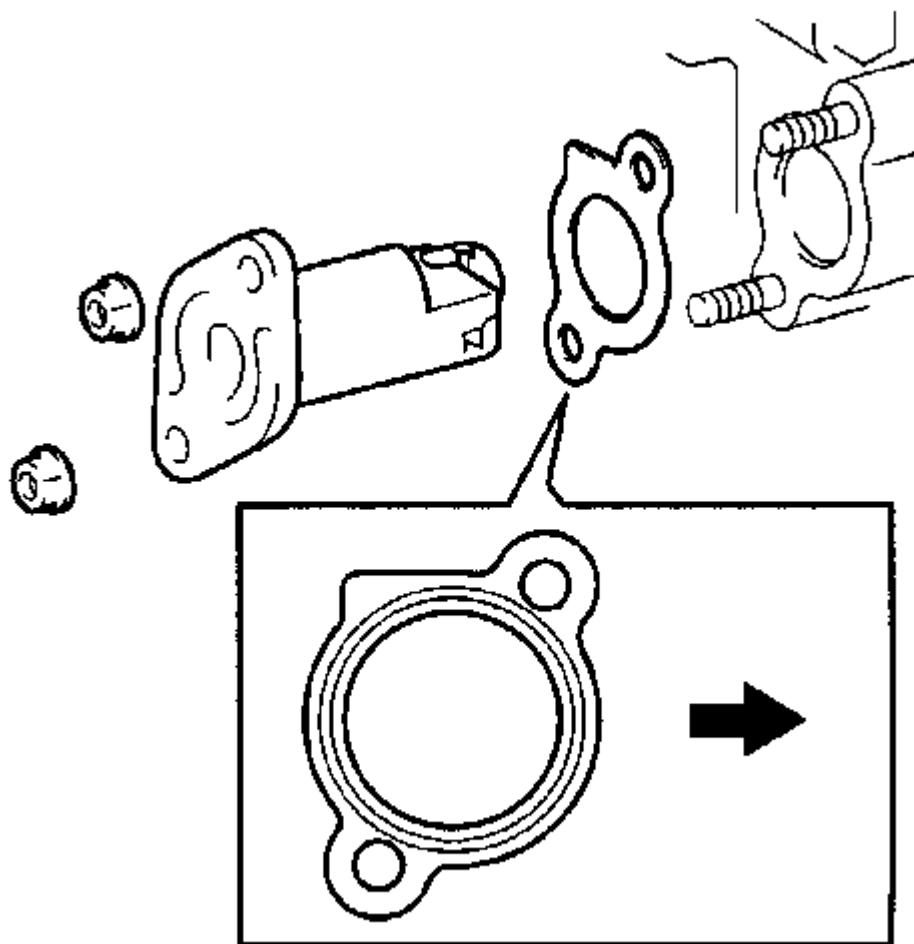


Fig. 127: Identifying No. 1 Chain Tensioner Plunger Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Pin
*2	Hook
*a	Raise
*b	Push

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



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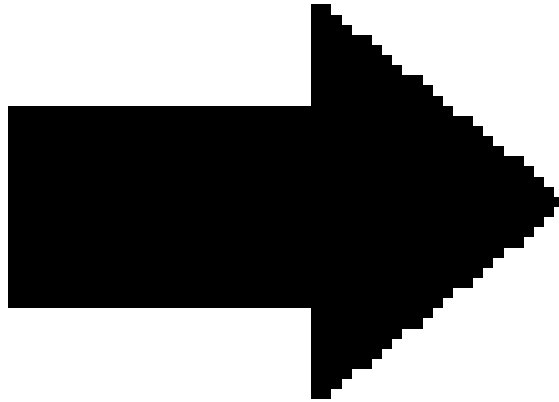
Fig. 128: Identifying Chain Tensioner, Gasket & Nuts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

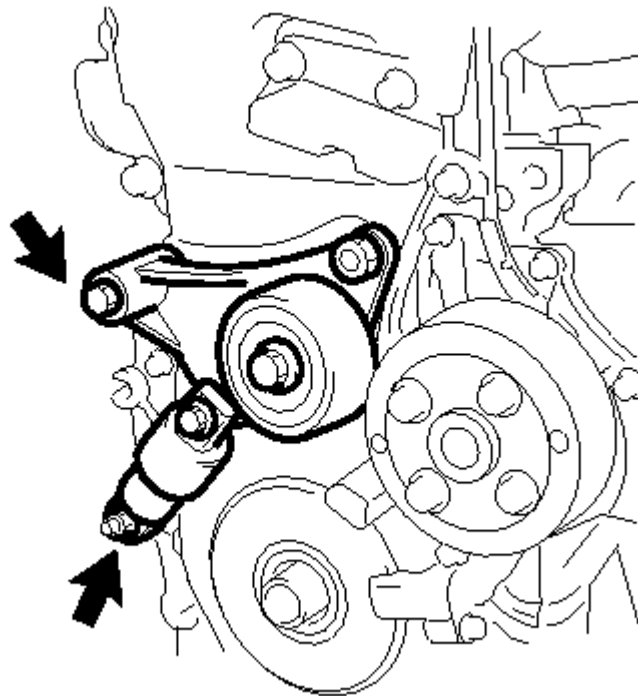
TEXT IN ILLUSTRATION

	Engine Front
--	--------------



20. INSTALL V-RIBBED BELT TENSIONER ASSEMBLY

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



T

Fig. 129: Location of V-Ribbed Belt Tensioner Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE: Do not lift the engine more than necessary.

21. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

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

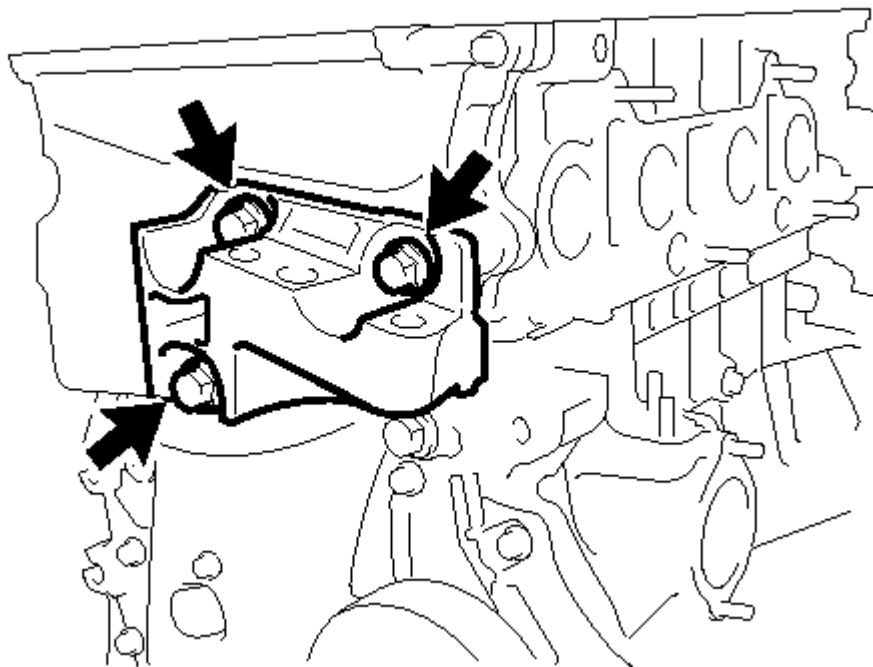
**T**

Fig. 130: Remove/Install Engine Mounting Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 55 N*m (561 kgf*cm, 41 ft.*lbf)

22. INSTALL CRANKSHAFT PULLEY

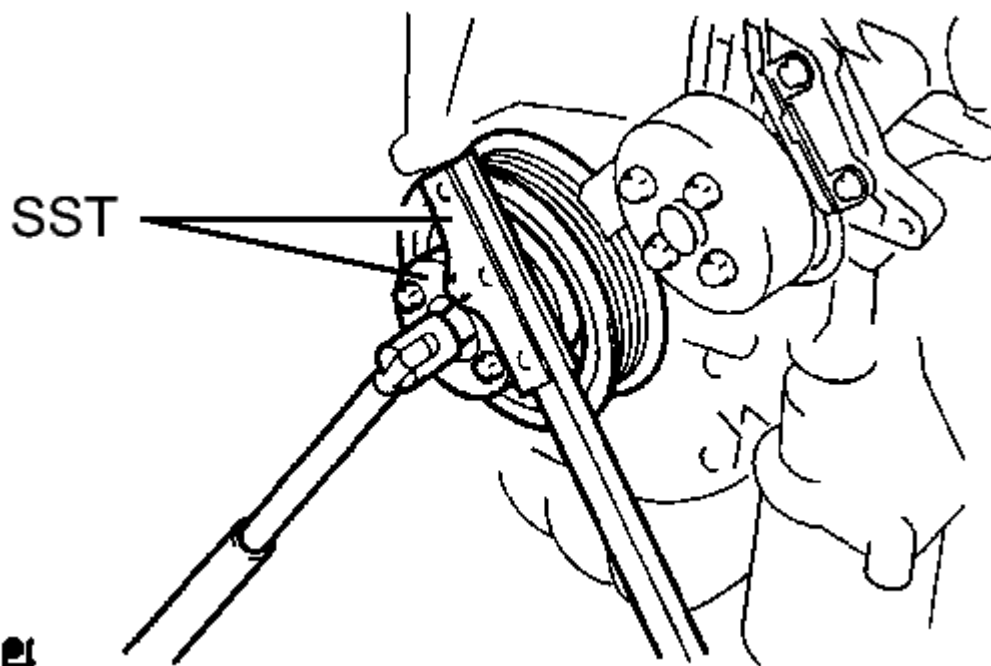


Fig. 131: Tightening Pulley Bolt

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

- a. Using SST, fix the pulley in place and tighten the bolt.

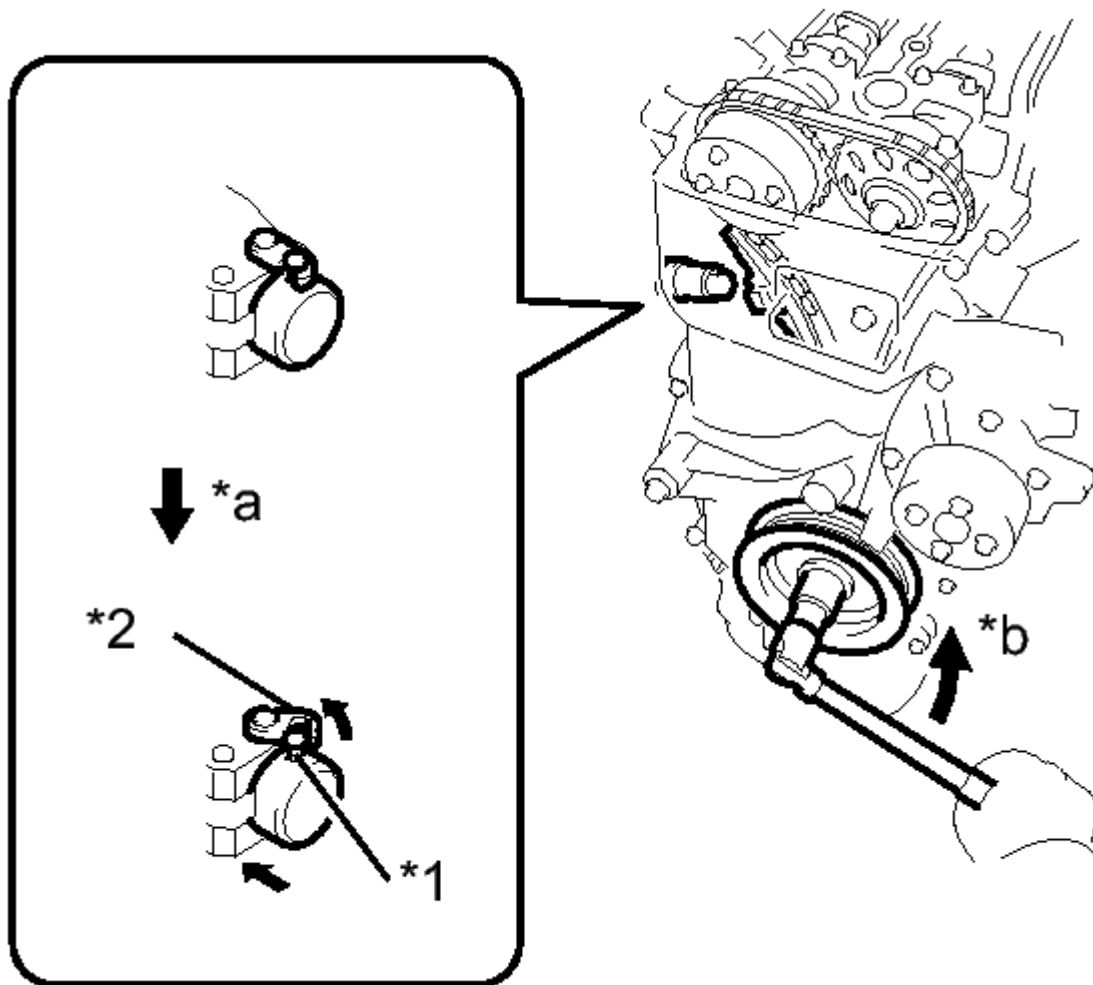
- SST: 09213-54015

91651-60855

- SST: 09330-00021

Torque: 180 N*m (1835 kgf*cm, 133 ft.*lbf)

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



T

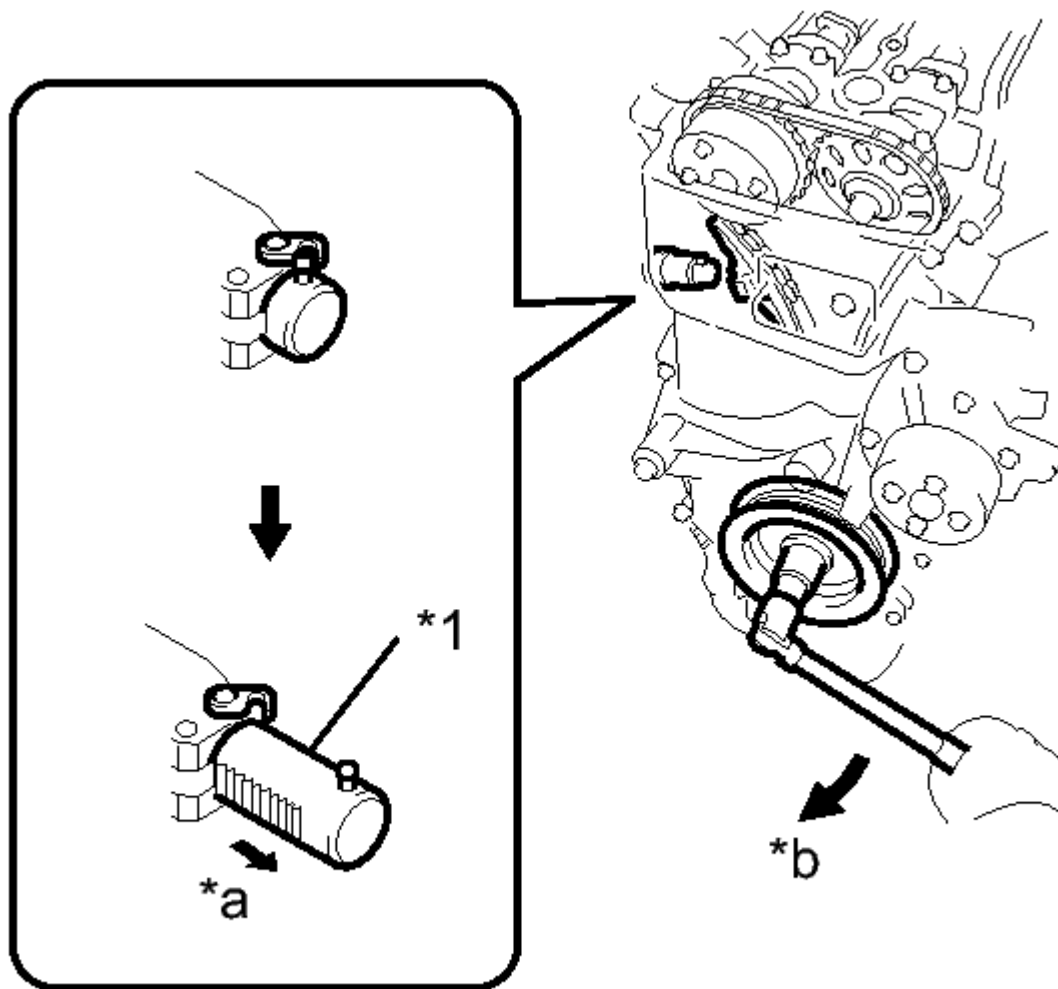
Fig. 132: Removing Chain Tensioner Plunger Knock Pin From Hook

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

TEXT IN ILLUSTRATION

*1	Pin
*2	Hook
*a	Disconnect
*b	Turn

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



T

Fig. 133: Checking Chain Tensioner Plunger Position
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Plunger
*a	Push
*b	Turn

23. INSTALL OIL PAN SUB-ASSEMBLY

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

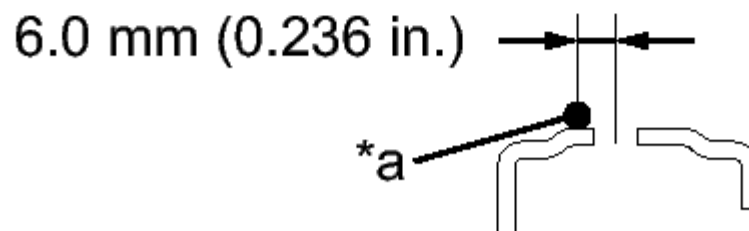
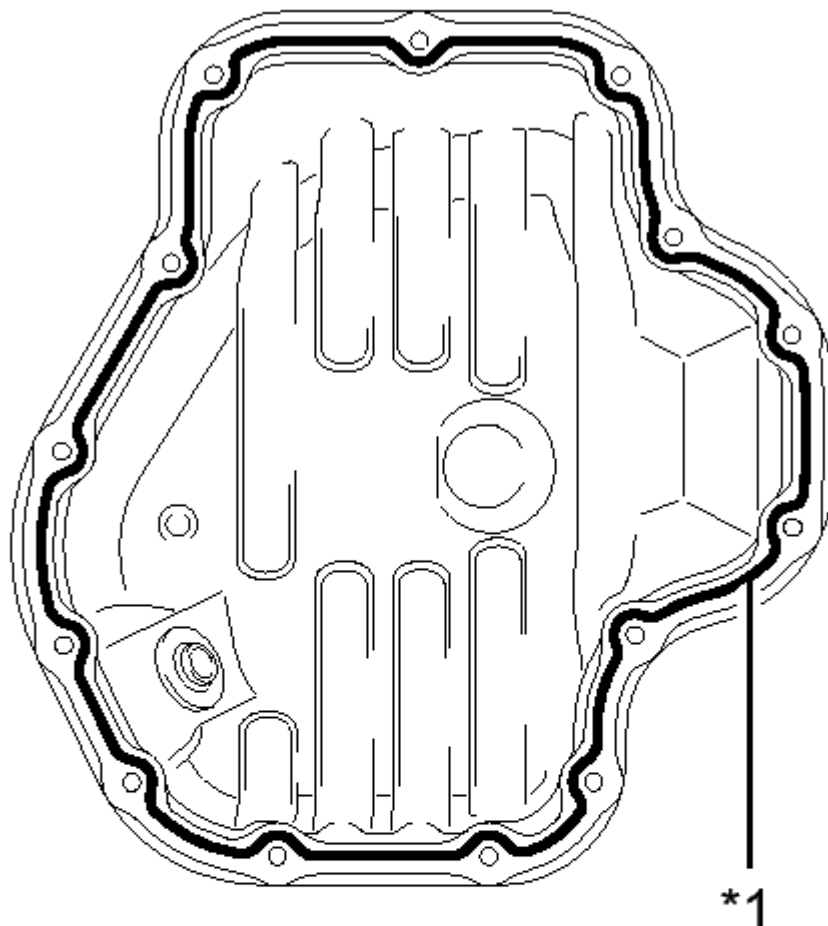
**P**

Fig. 134: Applying Oil Pan Seal Packing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Seal packing

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

NOTE:

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

TEXT IN ILLUSTRATION

*1	Seal Packing
*a	Seal Diameter 3.0 to 4.0 mm

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

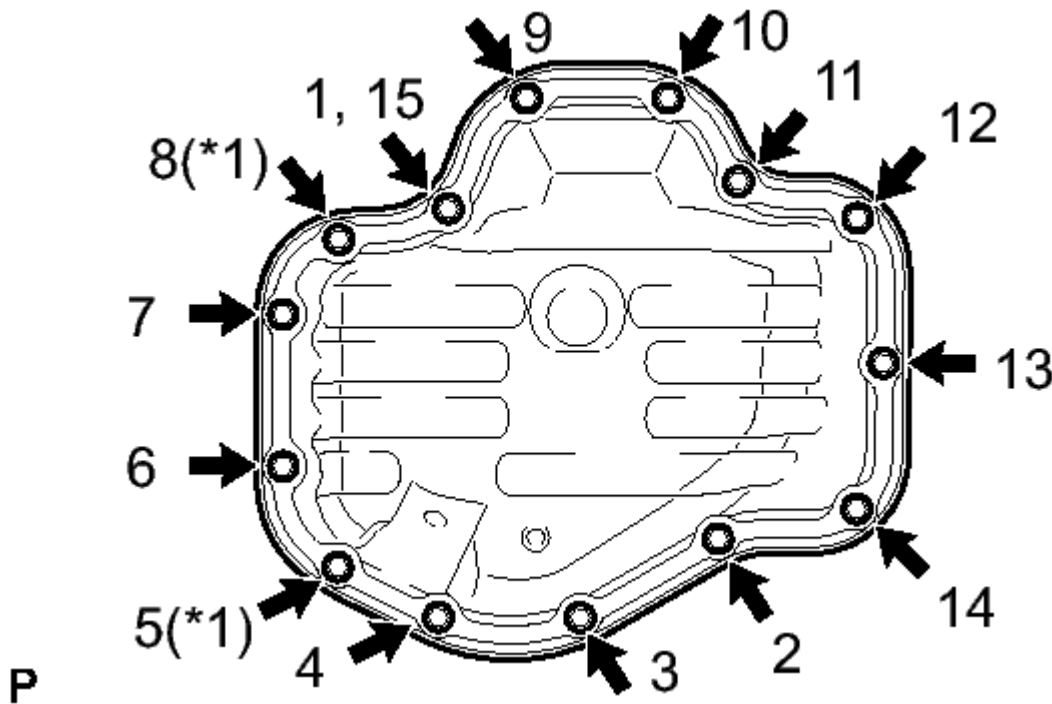


Fig. 135: Identifying Oil Pan With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

TEXT IN ILLUSTRATION

*1	Nut
----	-----

- Place a jack underneath the engine, then put a wooden block on the jack.
- Remove the chain block and sling device.
- Remove the No. 1 and No. 2 engine hangers.

24. **INSTALL CRANKSHAFT POSITION SENSOR (for TMC Made Engine)** See step 32.
25. **INSTALL CRANKSHAFT POSITION SENSOR (except TMC Made Engine)** . Refer to **INSTALLATION - Step 1** .
26. **INSTALL IDLER PULLEY SUB-ASSEMBLY**

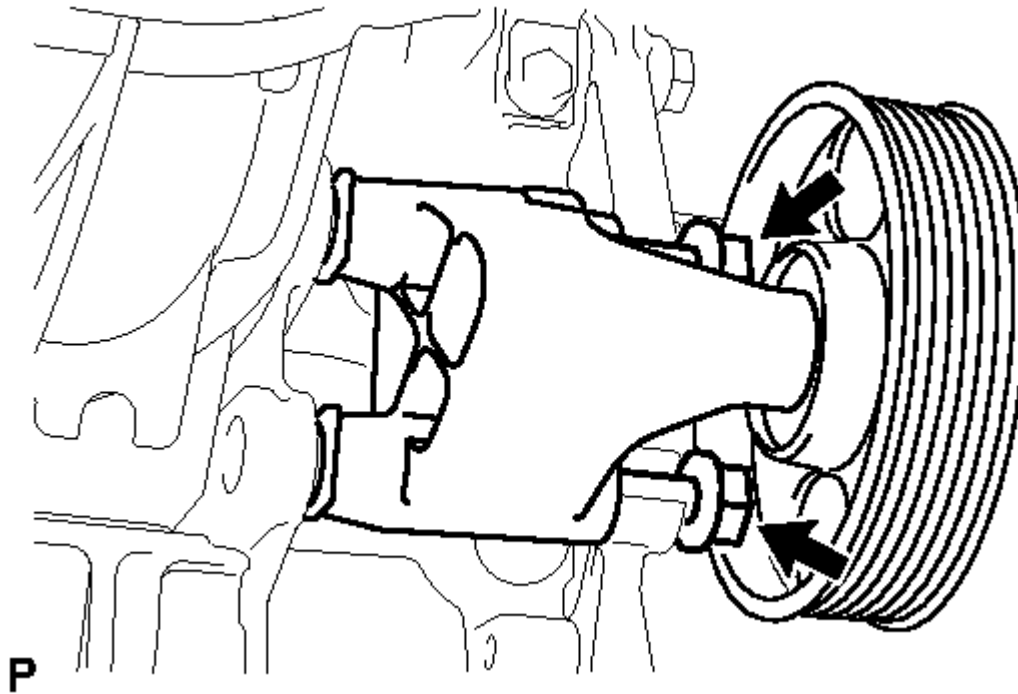
**P**

Fig. 136: Location of Idler Pulley Bolts

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

- a. Install the idler pulley with the 2 bolts.

Torque: 50 N*m (510 kgf*cm, 37 ft.*lbf)

27. **INSTALL ENGINE MOUNTING INSULATOR SUB-ASSEMBLY RH**

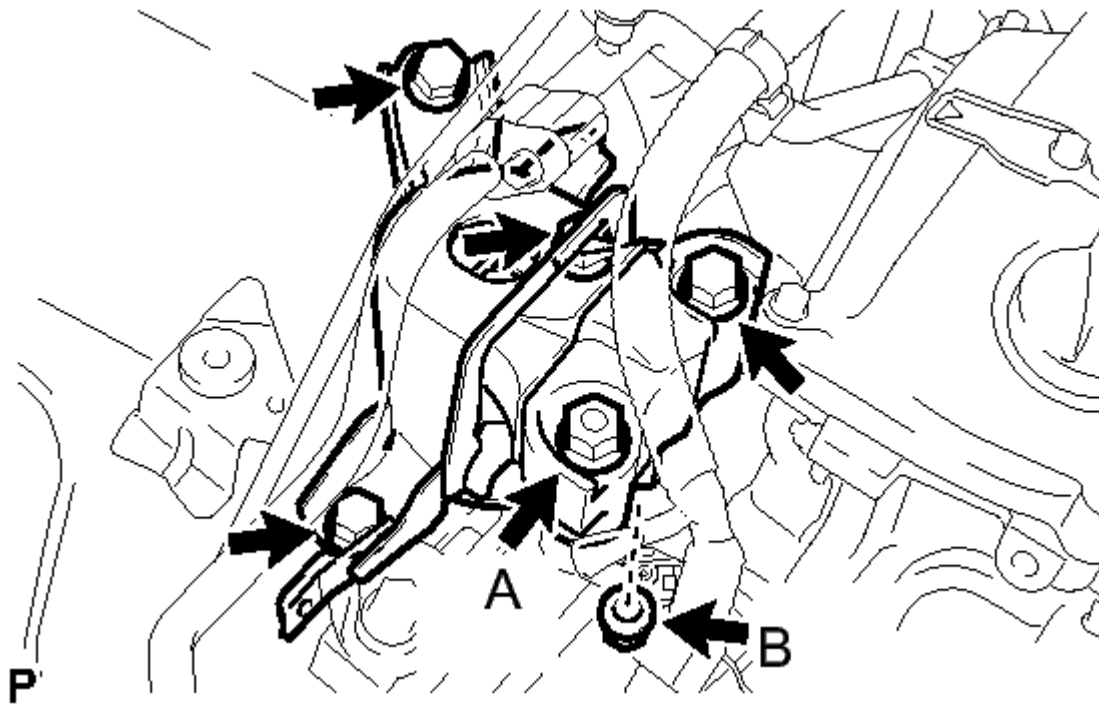


Fig. 137: Installing Engine Mounting Insulator Sub-Assembly RH

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

- a. Install the engine mounting insulator RH with the 4 bolts and 2 nuts.

Bolt

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

Nut A

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

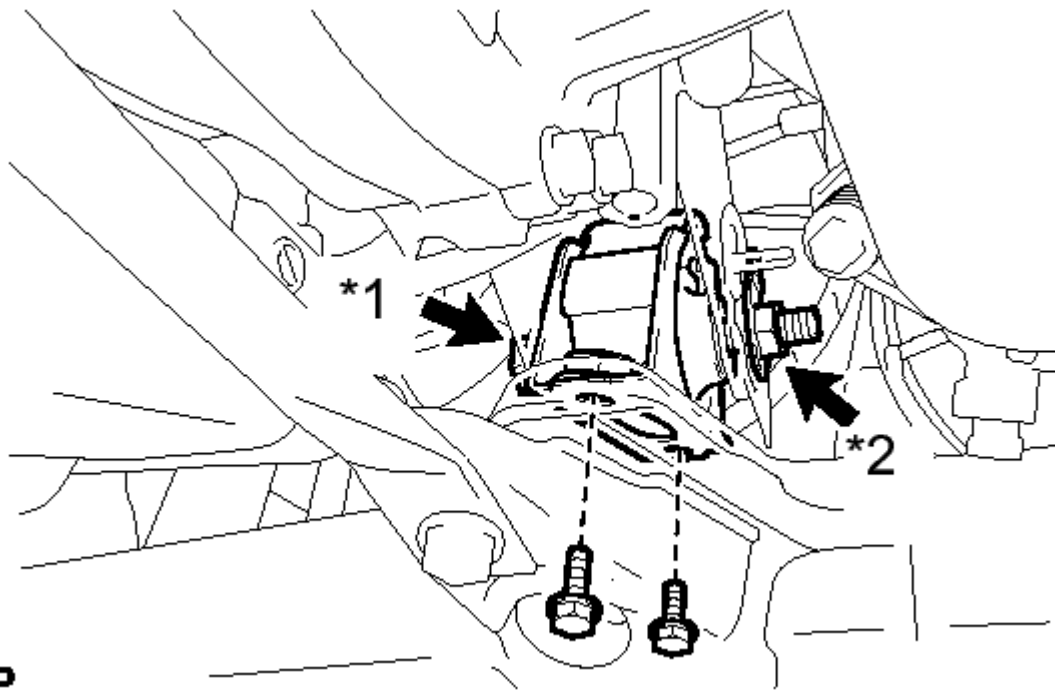
Nut B

Torque: 52 N*m (530 kgf*cm, 38 ft.*lbf)

- b. Install the 2 cooler brackets with the 2 bolts and nut.

Torque: 9.8 N*m (100 kgf*cm, 87 in.*lbf)

28. INSTALL FRONT ENGINE MOUNTING INSULATOR SUB-ASSEMBLY

**P****Fig. 138: Location of Front Engine Mounting Insulator Components**

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

- a. Install the front engine mounting insulator with the 2 bolts, through bolt and nut.

Bolt**Torque: 95 N*m (969 kgf*cm, 70 ft.*lbf)****Through bolt and Nut****Torque: 145 N*m (1479 kgf*cm, 107 ft.*lbf)****TEXT IN ILLUSTRATION**

*1	Through Bolt
*2	Nut

HINT:

Install the bolt which is used to secure the front engine mounting bracket.

29. INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY

- a. Install a new gasket onto the cylinder head.
- b. Temporarily tighten the exhaust manifold converter with the 5 nuts.

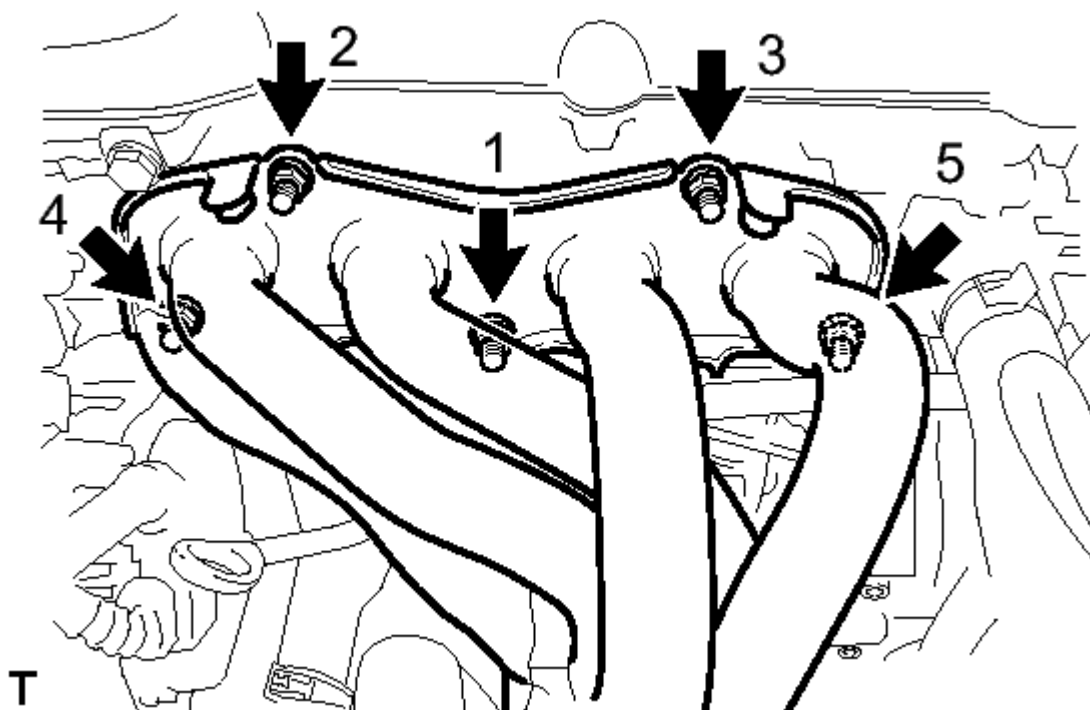


Fig. 139: View Of Exhaust Manifold Converter Nut Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Tighten the 5 nuts in the sequence shown in the illustration.

Torque: 37 N*m (377 kgf*cm, 27 ft.*lbf)

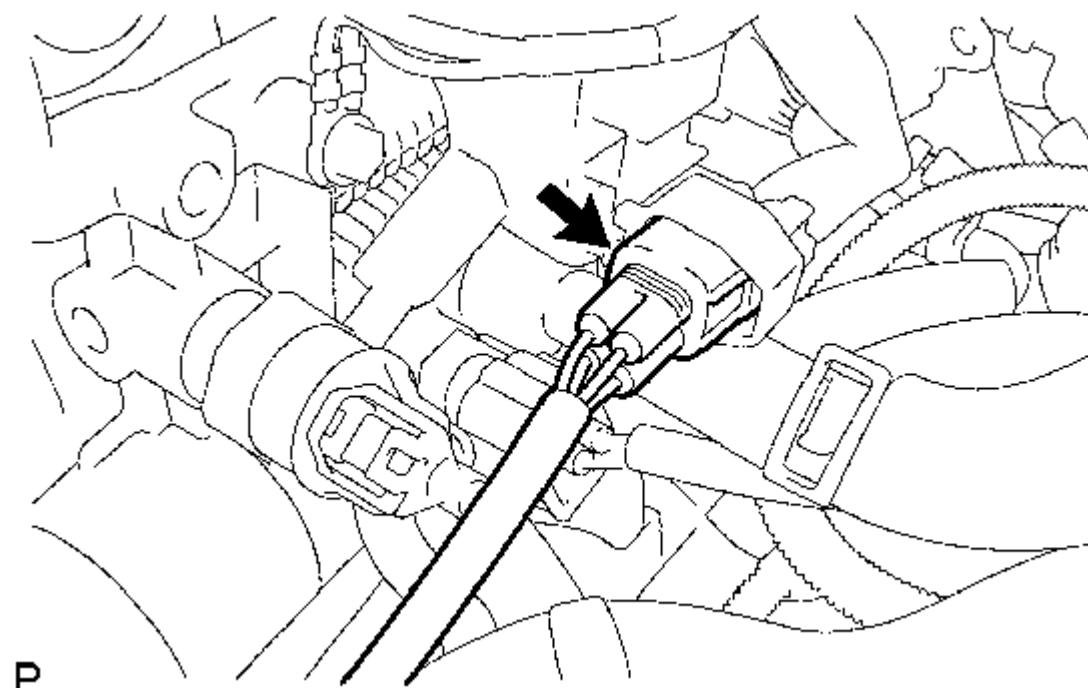


Fig. 140: Location of Air-Fuel Ratio Sensor Connector

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

- d. Connect the air-fuel ratio sensor connector.

30. INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

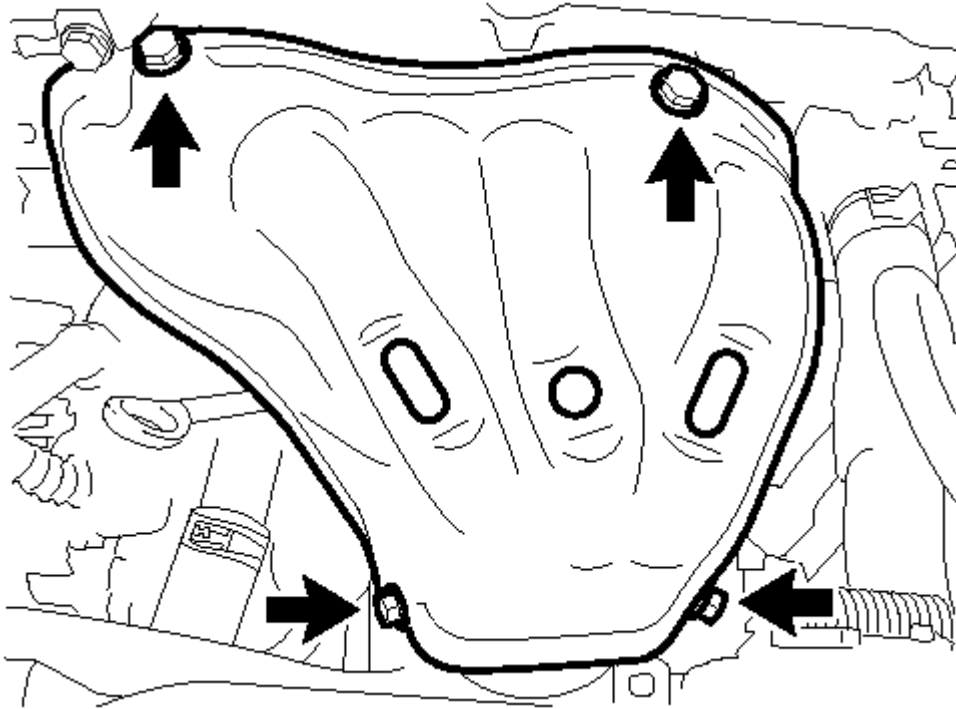


Fig. 141: Remove/Install No. 1 Exhaust Manifold Heat Insulator Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Install the exhaust manifold heat insulator with the 4 bolts.

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

31. INSTALL NO. 2 MANIFOLD STAY

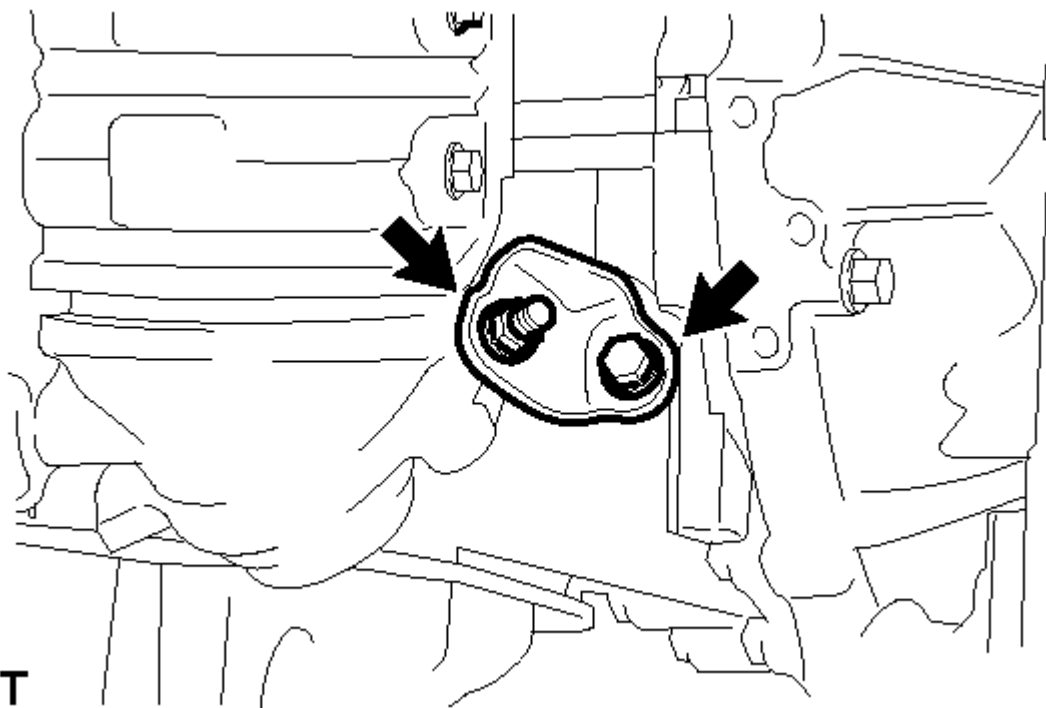
**T**

Fig. 142: Remove/Install No. 2 Manifold Stay With Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Install the stay with the bolt and nut.

Torque: 44 N*m (449 kgf*cm, 33 ft.*lbf)

32. INSTALL MANIFOLD STAY



Fig. 143: Remove/Install Manifold Stay With Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Install the stay with the bolt and nut.

Torque: 44 N*m (449 kgf*cm, 33 ft.*lbf)

33. **INSTALL INTAKE MANIFOLD INSULATOR**
34. **INSTALL INTAKE MANIFOLD** . Refer to INSTALLATION - Step 1 .
35. **INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY** . Refer to INSTALLATION - Step 1 .
36. **INSTALL FUEL DELIVERY PIPE SUB-ASSEMBLY** . Refer to INSTALLATION - Step 2 .
37. **CONNECT FUEL MAIN TUBE** . Refer to INSTALLATION - Step 4 .
38. **INSTALL ENGINE OIL LEVEL DIPSTICK GUIDE** See step 8.
39. **INSTALL OIL DIPSTICK**
40. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY** See step 8.
41. **INSTALL SPARK PLUG** . Refer to INSTALLATION - Step 1 .
42. **INSTALL IGNITION COIL ASSEMBLY** . Refer to INSTALLATION - Step 2 .
43. **INSTALL THROTTLE WITH MOTOR BODY ASSEMBLY** . Refer to INSTALLATION - Step 1 .
44. **INSTALL AIR CLEANER CAP SUB-ASSEMBLY WITH NO. 1 AIR CLEANER HOSE** . Refer to INSTALLATION - Step 2 .
45. **INSTALL RADIATOR RESERVE TANK ASSEMBLY**

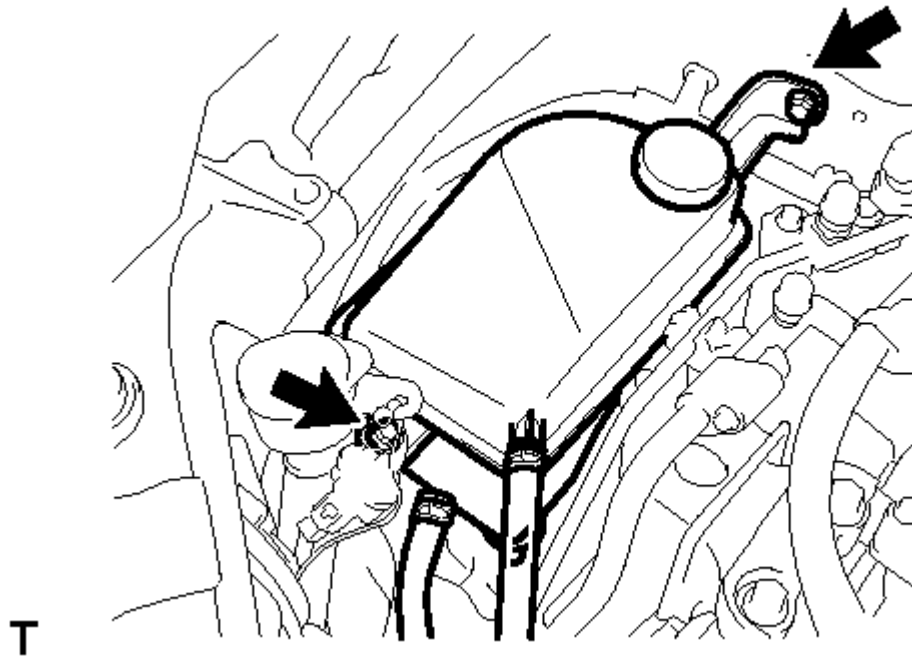


Fig. 144: Location of Radiator Reserve Tank Bolts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Install the radiator reservoir with the 2 bolts.

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

46. **INSTALL GENERATOR ASSEMBLY** . Refer to **INSTALLATION - Step 1** .
47. **INSTALL FAN AND GENERATOR V BELT** See step 1.
48. **INSTALL FRONT EXHAUST PIPE ASSEMBLY** See step 64.
49. **INSTALL CENTER EXHAUST PIPE ASSEMBLY** See step 65.
50. **INSTALL OUTER COWL TOP PANEL** . Refer to **INSTALLATION - Step 2** .
51. **INSTALL FRONT WIPER MOTOR AND LINK** . Refer to **INSTALLATION - Step 2** .
52. **INSTALL COWL TOP VENTILATOR LOUVER LH** . Refer to **INSTALLATION - Step 3** .
53. **INSTALL COWL TOP VENTILATOR LOUVER RH** . Refer to **INSTALLATION - Step 4** .
54. **INSTALL HOOD TO COWL TOP SEAL** . Refer to **INSTALLATION - Step 5** .
55. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY LH** . Refer to **INSTALLATION - Step 6** .
56. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY RH** . Refer to **INSTALLATION - Step 7** .
57. **INSTALL WINDSHIELD WIPER ARM COVER** . Refer to **INSTALLATION - Step 8** .
58. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

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

- 59. **ADD ENGINE OIL** . Refer to **REPLACEMENT - Step 5** .
- 60. **ADD ENGINE COOLANT** . Refer to **REPLACEMENT - Step 2** .
- 61. **INSPECT FOR FUEL LEAK**

Refer to **ON-VEHICLE INSPECTION** .

- 62. **INSPECT FOR ENGINE COOLANT LEAK** . Refer to **ON-VEHICLE INSPECTION - Step 1** .
- 63. **INSPECT FOR ENGINE OIL LEAK**
- 64. **INSPECT FOR EXHAUST GAS LEAK**
- 65. **INSPECT IGNITION TIMING** See step 7.
- 66. **INSPECT ENGINE IDLING SPEED** See step 8.
- 67. **INSPECT COMPRESSION** See step 9.
- 68. **INSPECT CO/HC** See step 10.
- 69. **INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 4** .
- 70. **INSTALL NO. 1 ENGINE UNDER COVER**
- 71. **INSTALL REAR ENGINE UNDER COVER RH**
- 72. **INSTALL FRONT WHEEL RH**

Torque: 103 N*m (1050 kgf*cm, 76 ft.*lbf)

- 73. **INSTALL HOOD**
 - a. Temporarily install the hood with the 4 bolts.

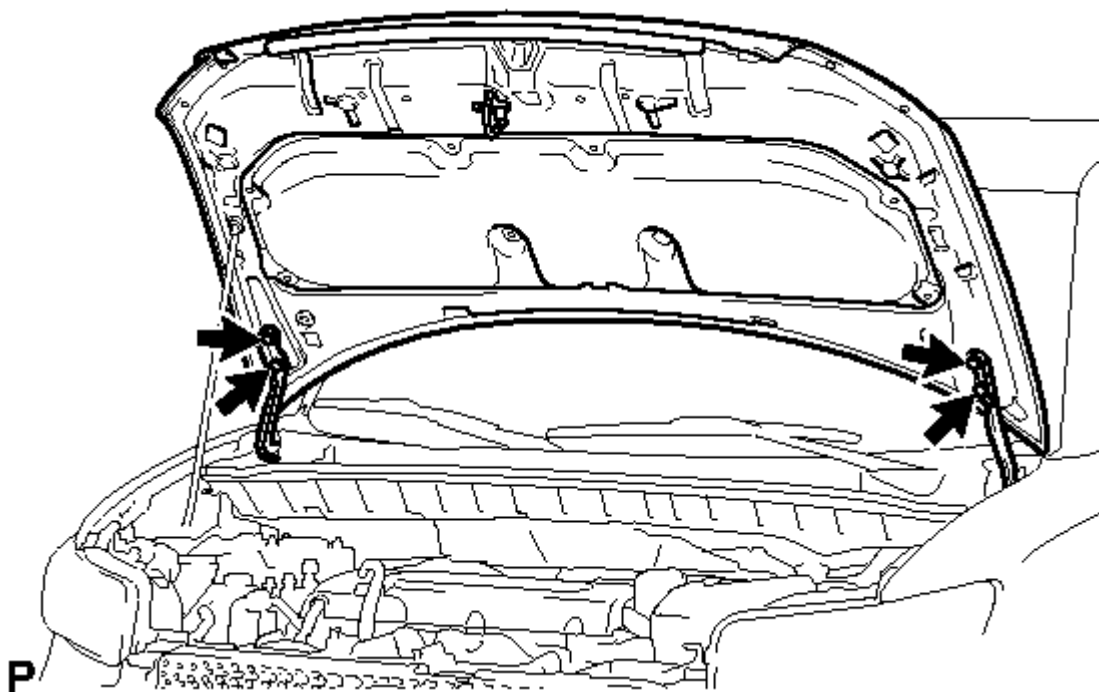


Fig. 145: Location of Hood Bolts

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

b. Connect the washer hose.

74. **INSPECT HOOD** . Refer to **ADJUSTMENT - Step 1** .

75. **ADJUST HOOD** . Refer to **ADJUSTMENT - Step 2** .

CYLINDER HEAD

COMPONENTS

ILLUSTRATION



1. REMOVE VALVE LIFTER

- a. Remove the 16 valve lifters from the cylinder head.

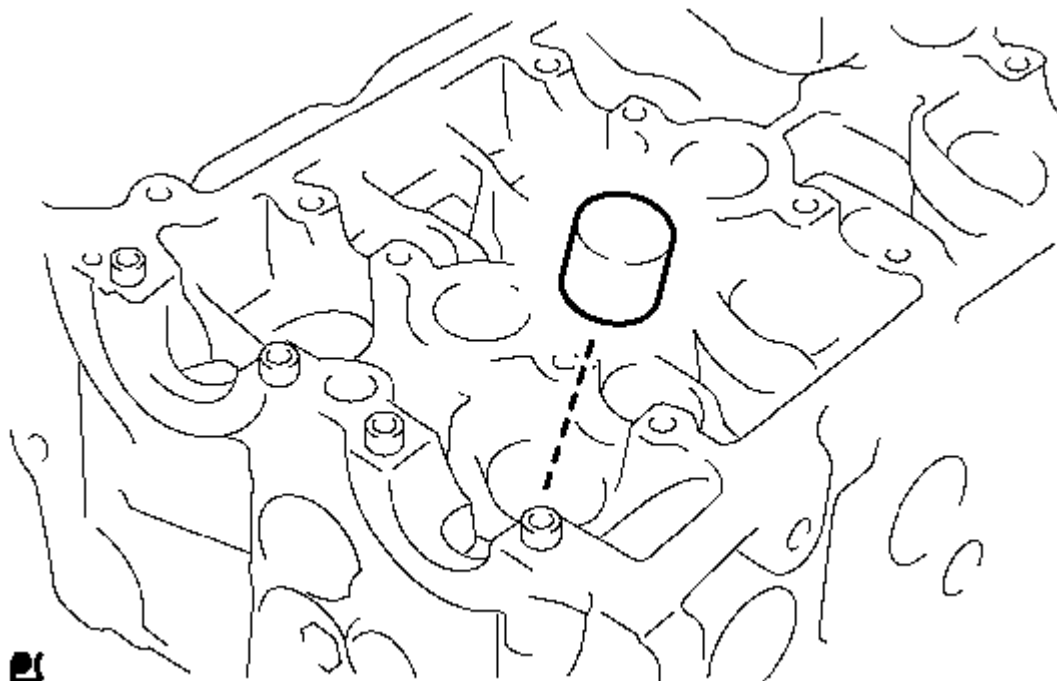


Fig. 147: Remove/Install Valve Lifters

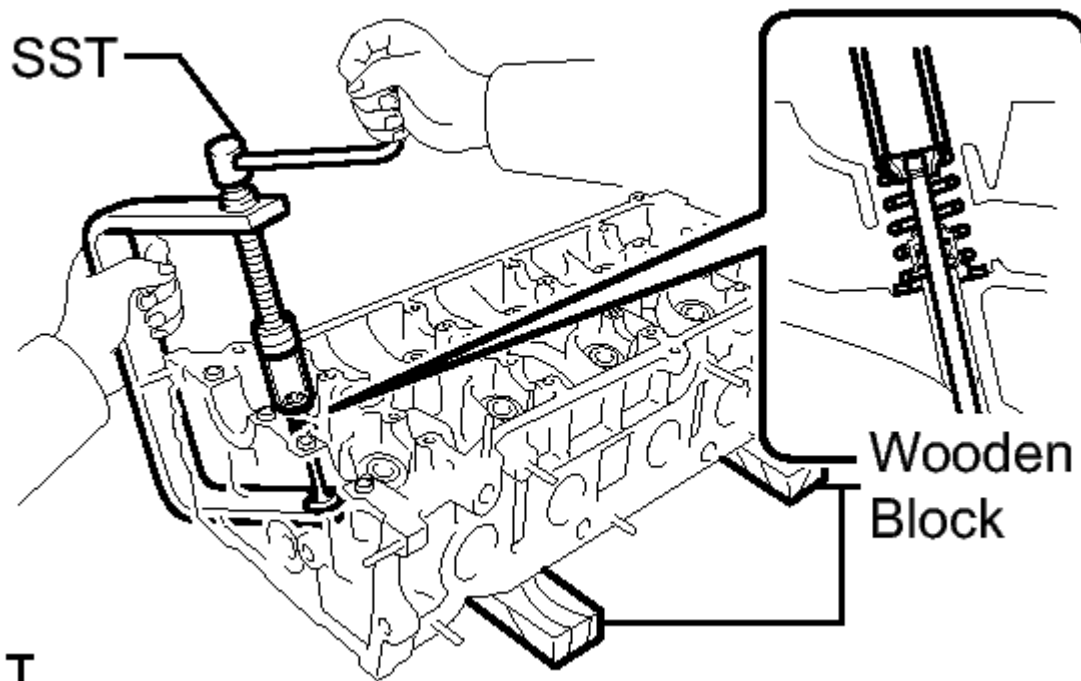
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Arrange the valve lifters in the correct order.

2. REMOVE INTAKE VALVE

- a. Using SST, remove the 16 retainer locks.

**T****Fig. 148: Identifying SST Compressing Spring Component**

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

- SST: 09202-70020
09202-00010

- b. Remove the 8 retainers, compression springs and intake valves.

HINT:

Arrange the removed parts in the correct order.

3. REMOVE EXHAUST VALVE

- a. Using SST, remove the 16 retainer locks.

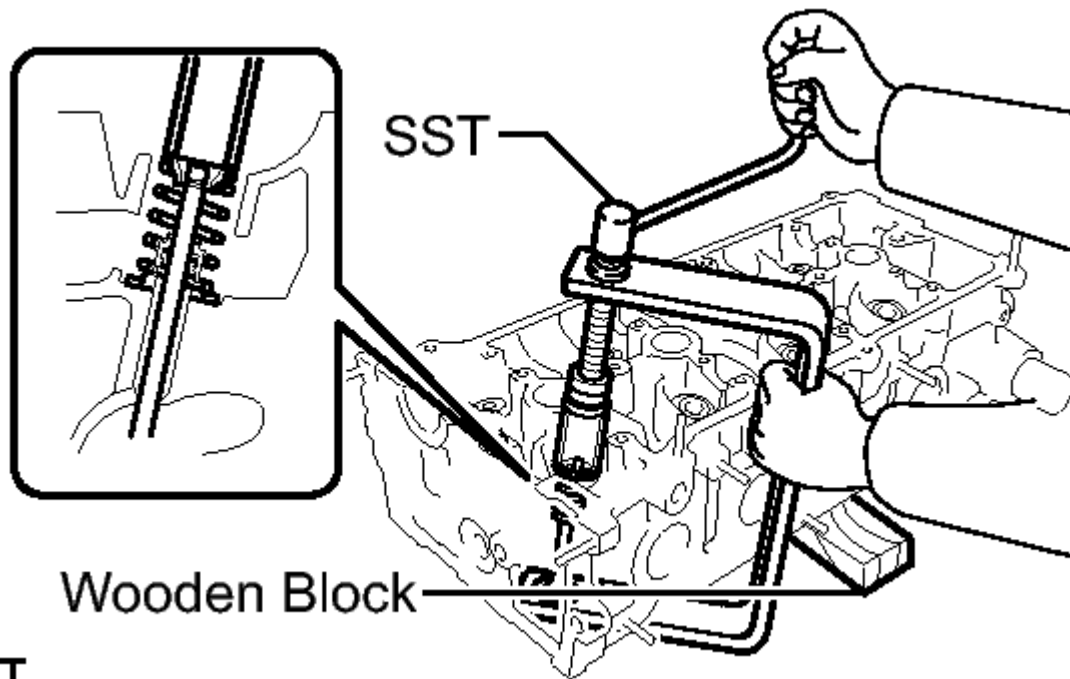
**T**

Fig. 149: Identifying SST Compressing Spring Component

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

- SST: 09202-70020
09202-00010

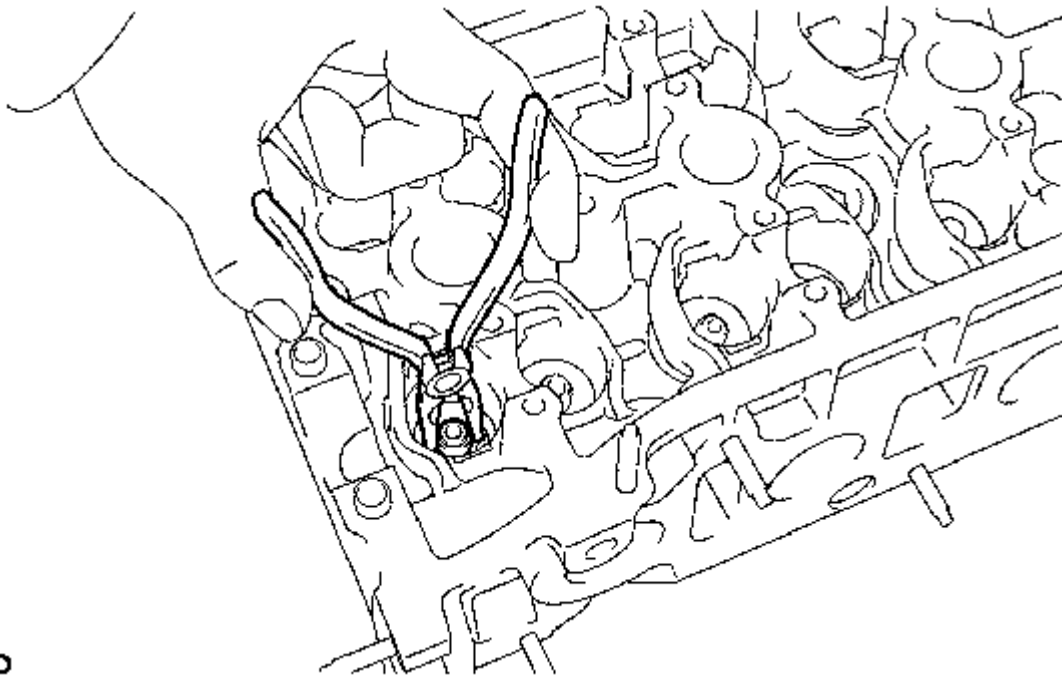
- b. Remove the 8 retainers, compression springs and exhaust valves.

HINT:

Arrange the removed parts in the correct order.

4. REMOVE VALVE STEM OIL O SEAL OR RING

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

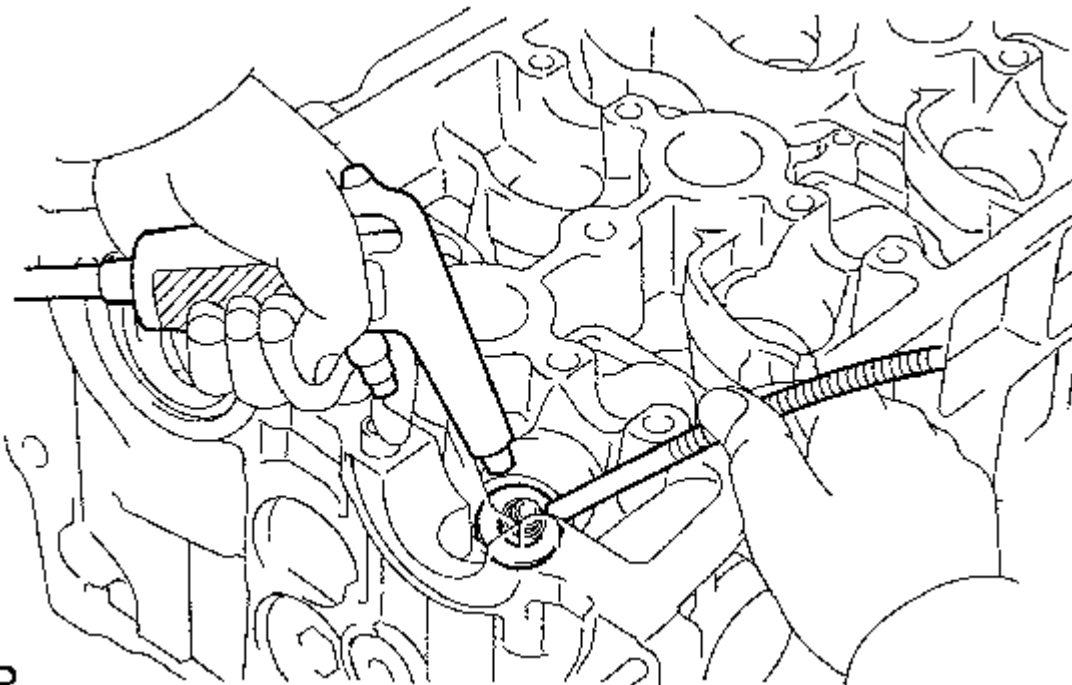


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Fig. 150: Removing Valve Stem Oil Seal Using Needle Nose Pliers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. REMOVE VALVE SPRING SEAT

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



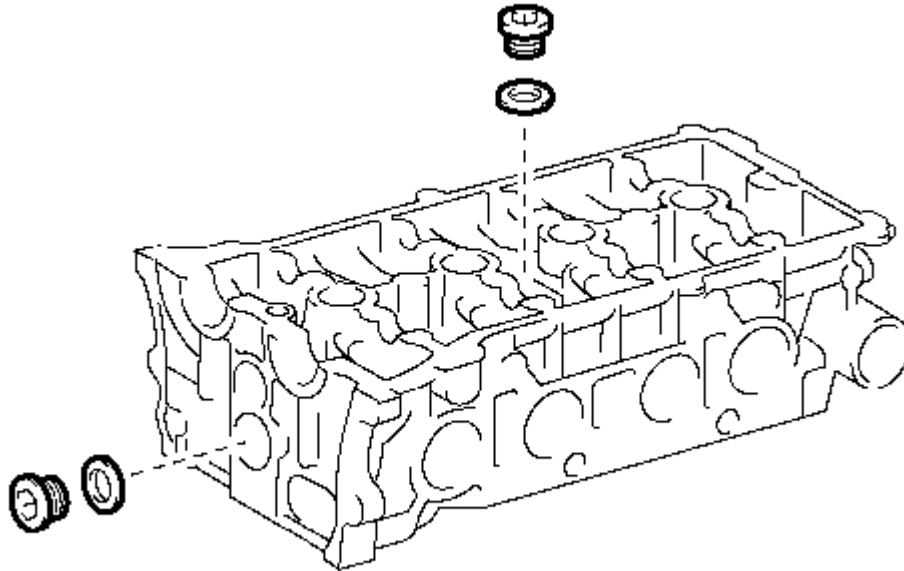
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Fig. 151: Removing Valve Spring Seat Using Compressed Air And Magnetic Finger

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

6. REMOVE NO. 1 STRAIGHT HEAD SCREW PLUG

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



A62841

Fig. 152: Remove/Install Screw Plugs And Gaskets

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

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

7. REMOVE STUD BOLT

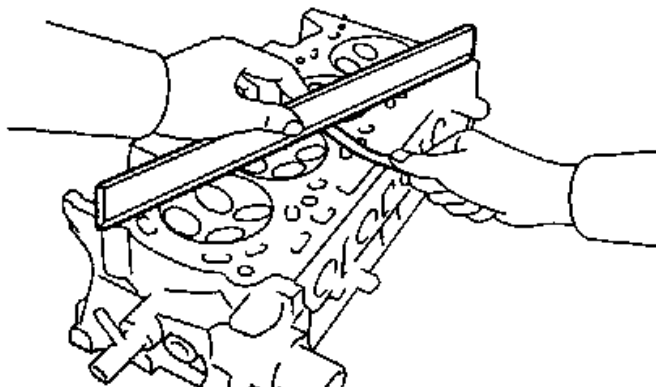
8. REMOVE RING PIN

INSPECTION

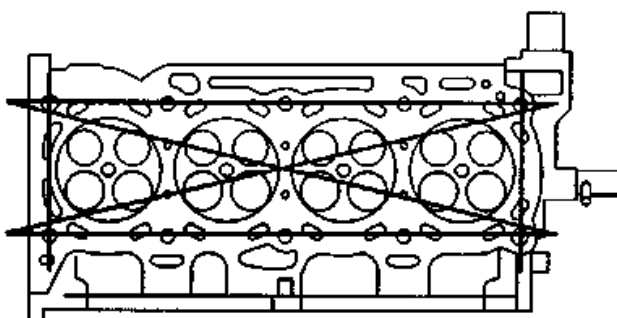
INSPECTION

1. INSPECT CYLINDER HEAD FOR FLATNESS

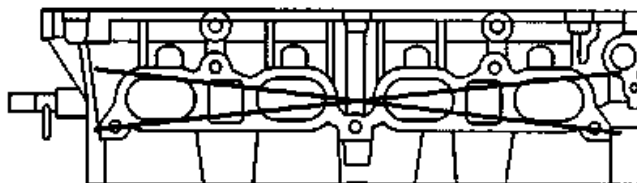
- a. Using a precision straightedge and a feeler gauge, measure the surface contacting the cylinder block and the manifolds for warpage.



Cylinder Block Side:



Intake Manifold Side:



Exhaust Manifold Side:

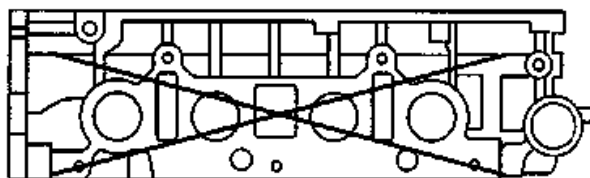


Fig. 153: Inspecting Cylinder Head For Warpage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

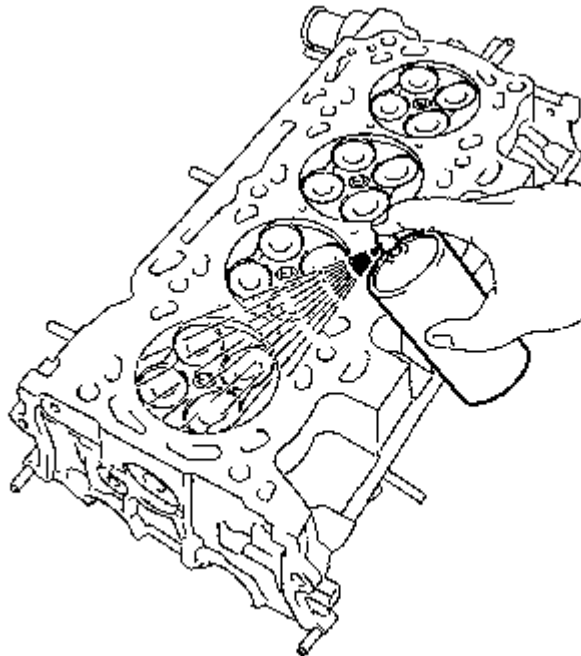
Maximum warpage

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.



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A13365

Fig. 154: Identifying Intake Ports, Exhaust Ports And Cylinder Surface Component For Cracks

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

If cracked, replace the cylinder head.

3. INSPECT CAMSHAFT THRUST CLEARANCE

- Install the camshafts. Refer to **REASSEMBLY**.
- Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

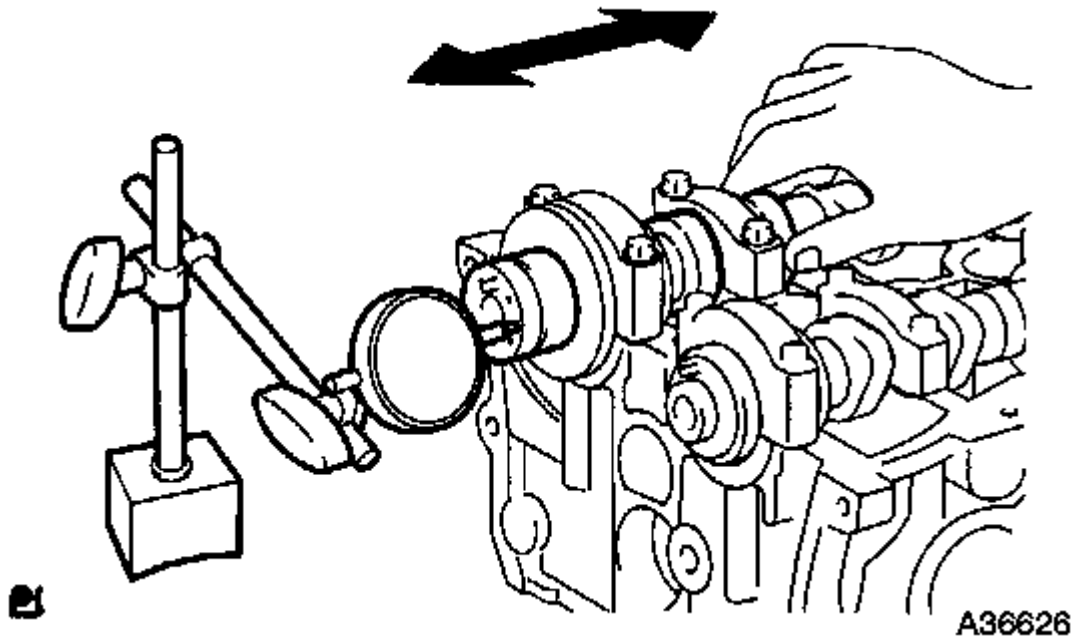


Fig. 155: Measuring Camshaft Thrust Clearance Using Dial Indicator
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard thrust clearance

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

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.

4. 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.

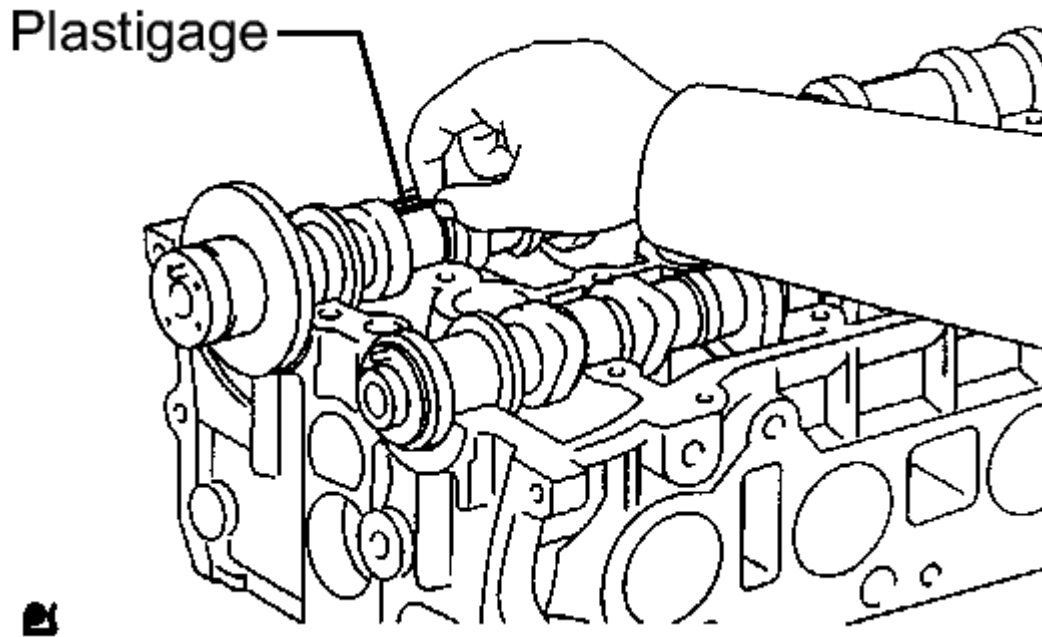


Fig. 156: Laying Strip Of Plastigage Across Each Of Camshaft Journals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the bearing caps. Refer to **REASSEMBLY**.

NOTE: **Do not turn the camshaft.**

- e. Remove the bearing caps. Refer to **REASSEMBLY**.
f. Measure the Plastigage at its widest point.

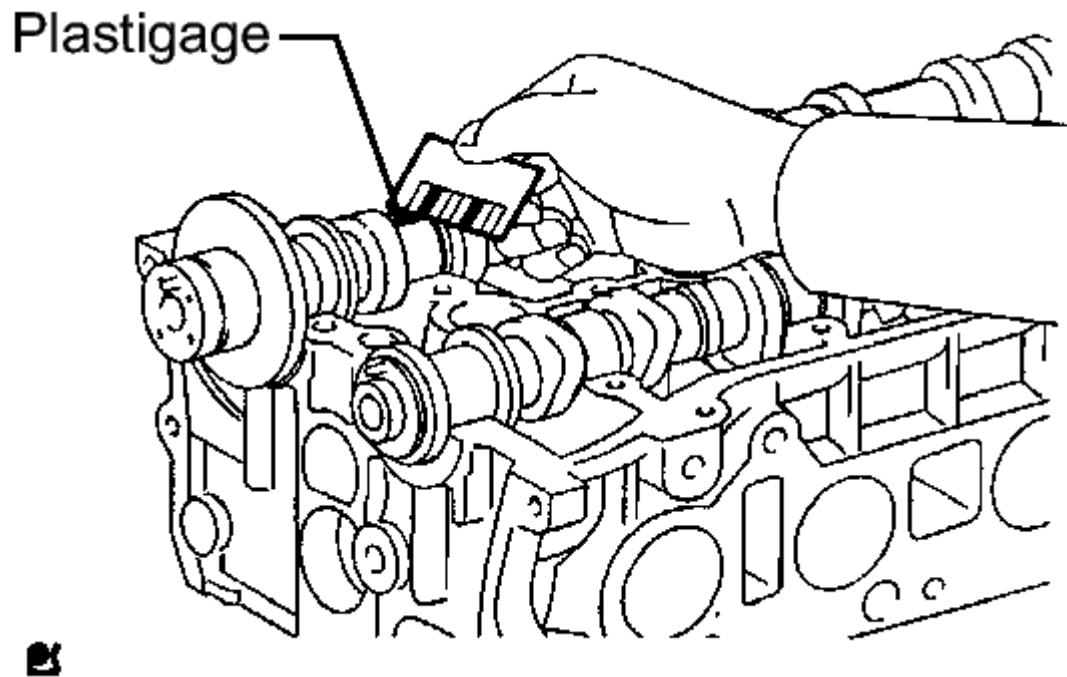


Fig. 157: Measuring Plastigage On Widest Point
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard oil clearance

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

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.

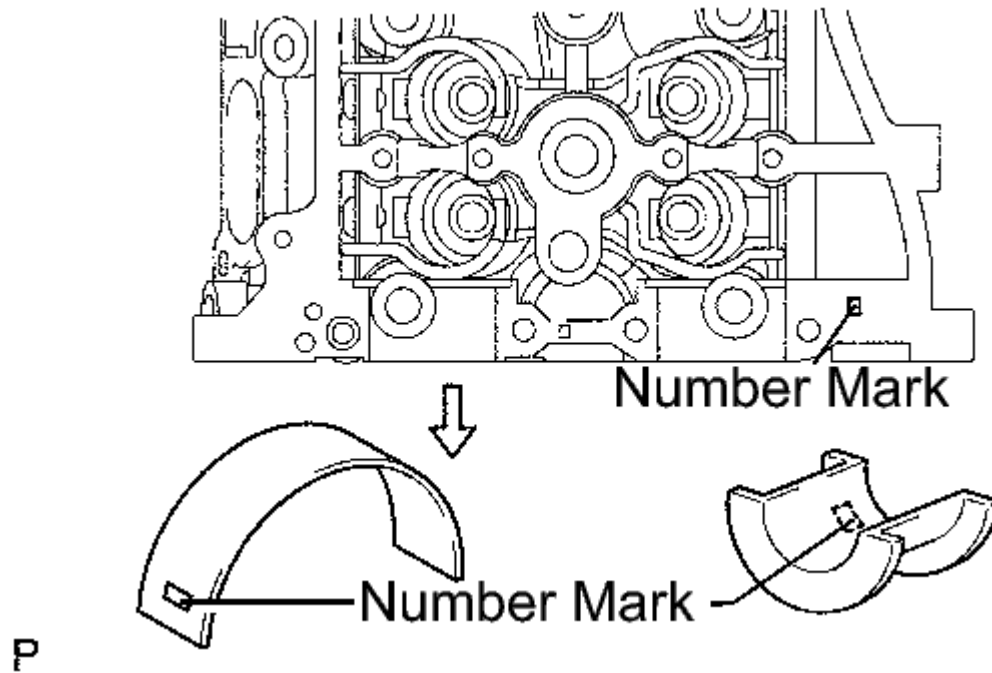


Fig. 158: Identifying Bearing Cap Number Mark
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Cylinder head journal bore diameter

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

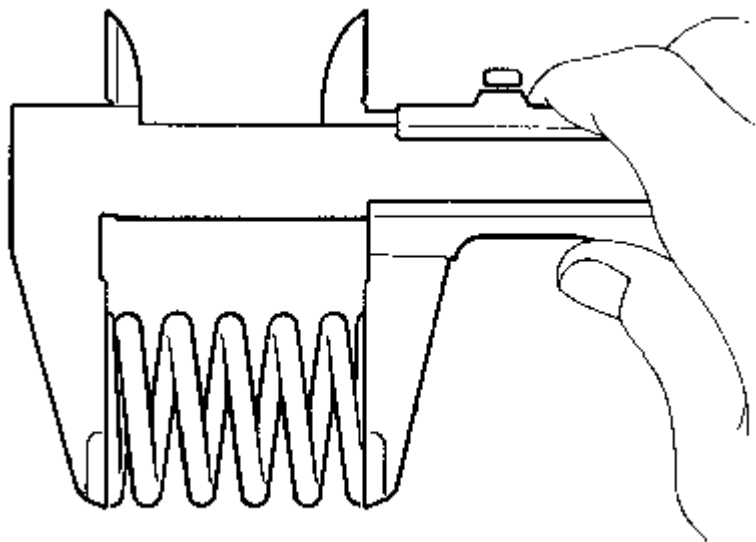
Mark 1	Mark 2	Mark 3
2.000 to 2.004 mm (0.0787 to 0.0789 in.)	2.005 to 2.008 mm (0.0789 to 0.0791 in.)	2.009 to 2.012 mm (0.0791 to 0.0792 in.)

Camshaft journal diameter

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.)

5. INSPECT INNER COMPRESSION SPRING

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



EM0801

Fig. 159: Measuring Free Length Of Valve Spring Using Vernier Clipper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Free length

47.43 mm (1.867 in.)

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

- b. Using a steel set square, measure the deviation of the valve spring.

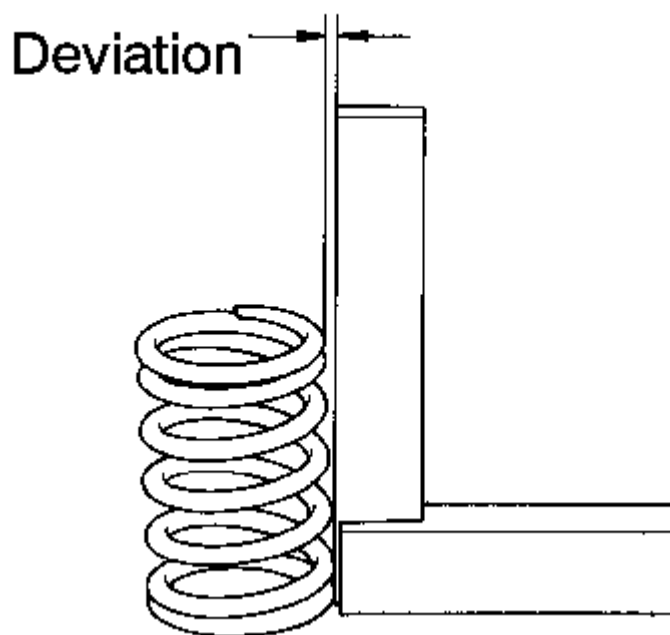


Fig. 160: Measuring Valve Spring Deviation
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

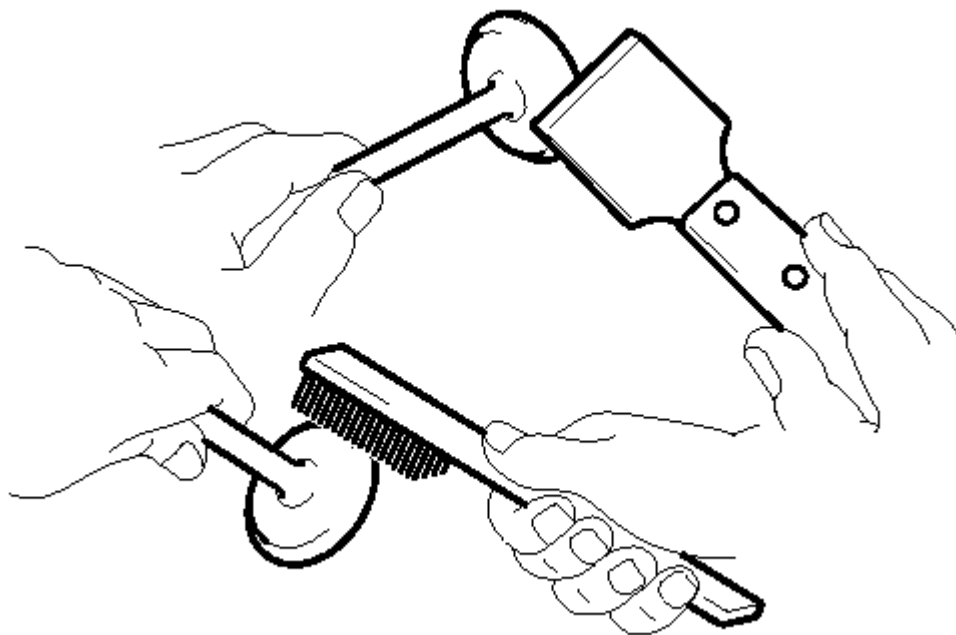
Maximum deviation

1.6 mm (0.063 in.)

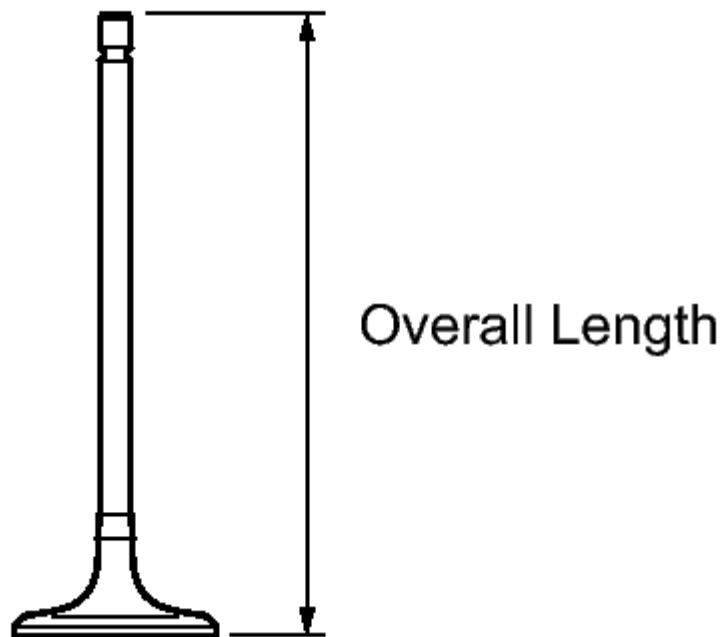
If the deviation is greater than the maximum, replace the valve spring.

6. INSPECT INTAKE VALVE

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

**P****Fig. 161: Cleaning Valve Head****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

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

**T****Fig. 162: Identifying Valve's Overall Length****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

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.

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

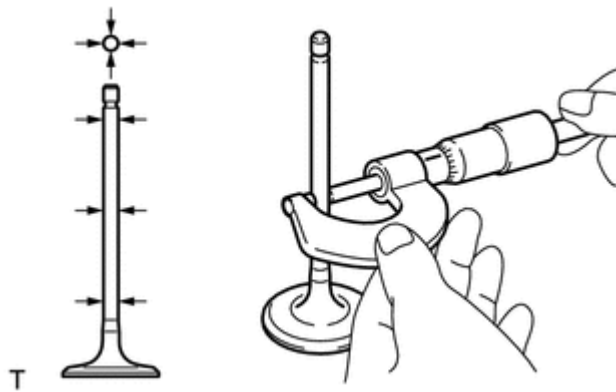


Fig. 163: Measuring Diameter Of Valve Stem Using Micrometer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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.

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

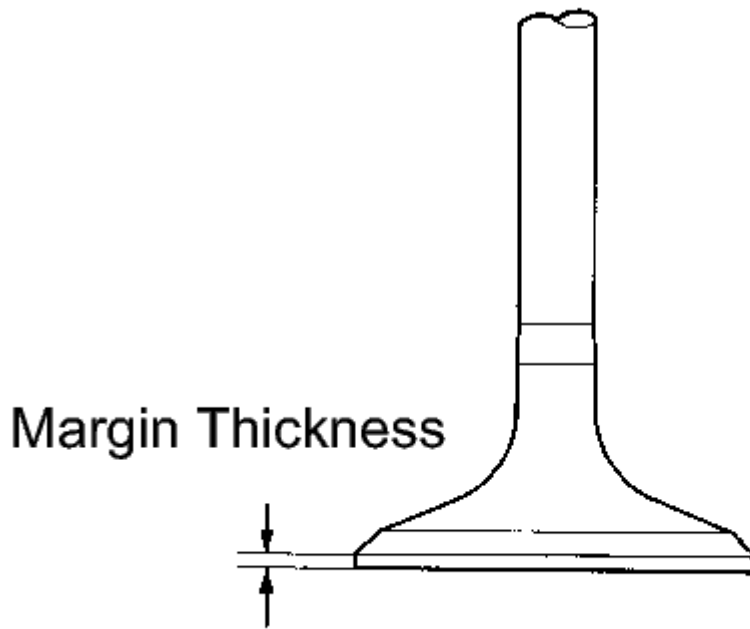


Fig. 164: Measuring Valve Head Margin Thickness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard margin thickness

1.05 to 1.45 mm (0.0413 to 0.0571 in.)

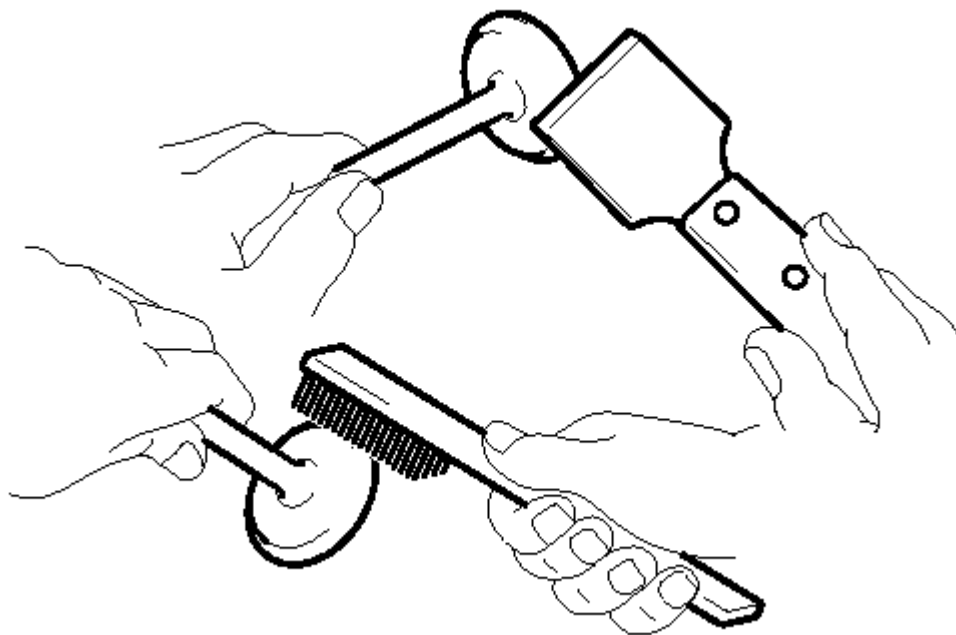
Minimum margin thickness

0.50 mm (0.0197 in.)

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

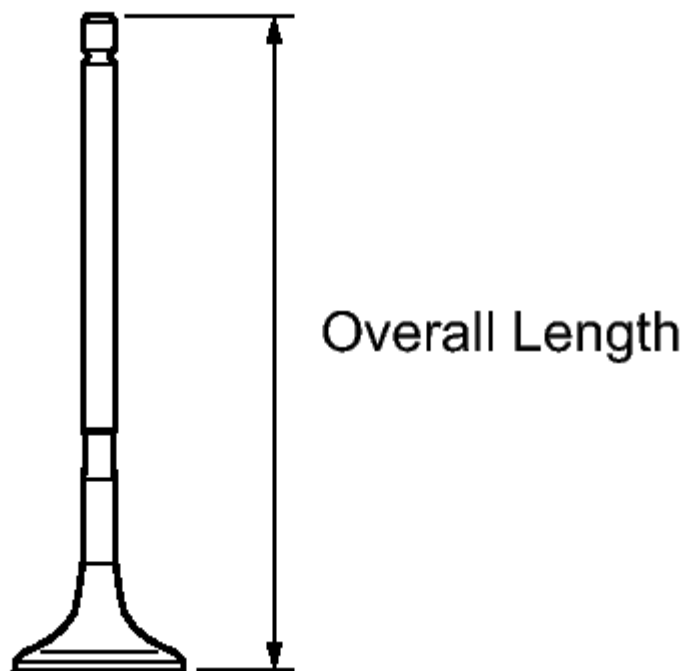
7. INSPECT EXHAUST VALVE

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

**P****Fig. 165: Cleaning Valve Head**

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

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

**T****Fig. 166: Identifying Valve Overall Length**

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

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.

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

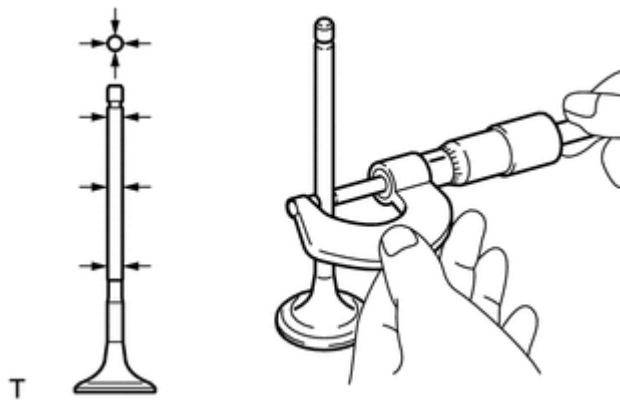


Fig. 167: Measuring Diameter Of Valve Stem

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

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.

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

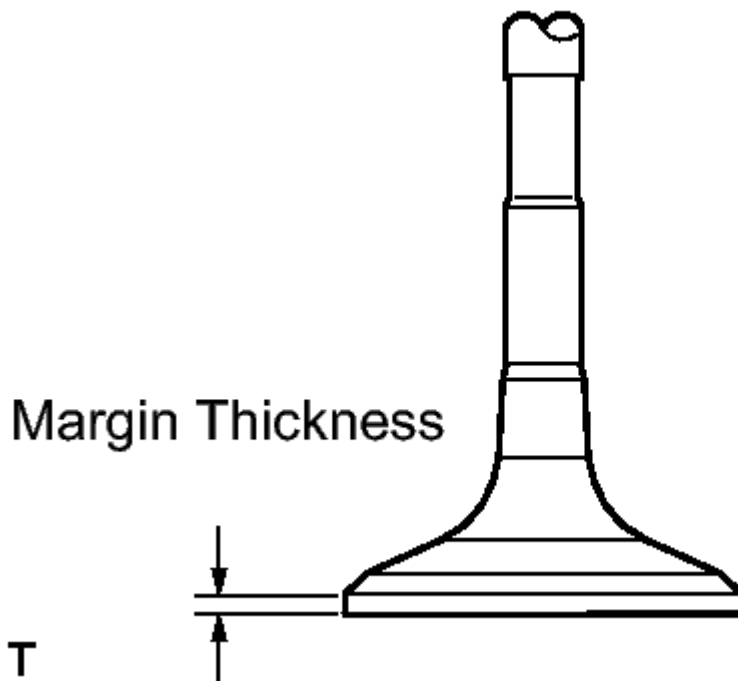


Fig. 168: Identifying Valve Head Margin Thickness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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.

8. INSPECT INTAKE VALVE GUIDE BUSH

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

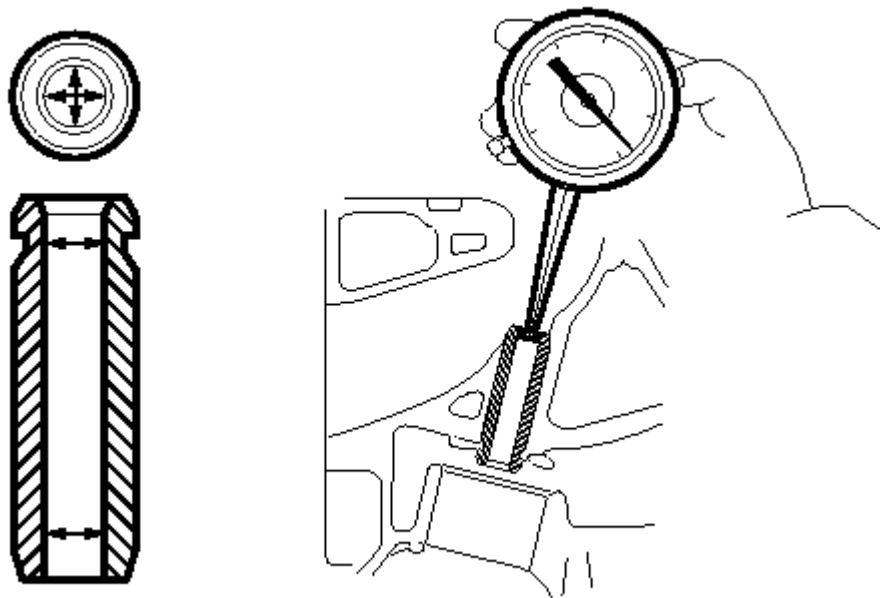
**T**

Fig. 169: Measuring Inside Diameter Of Guide Bush Using Caliper Gauge (Intake)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Bushing inside diameter

5.510 to 5.530 mm (0.2169 to 0.2177 in.)

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

Standard oil clearance

0.025 to 0.060 mm (0.0010 to 0.0024 in.)

Maximum oil clearance

0.080 mm (0.0031 in.)

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

9. INSPECT EXHAUST VALVE GUIDE BUSH

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

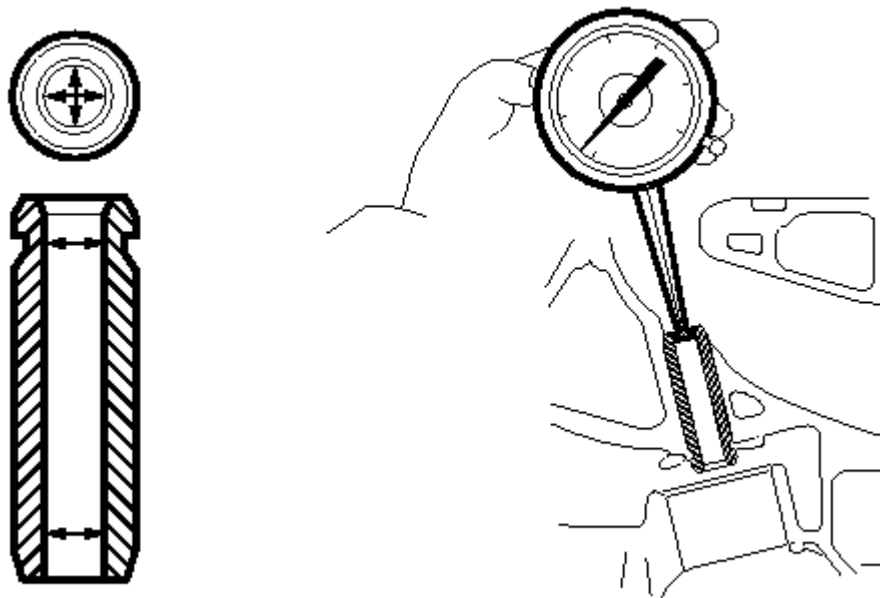
**T**

Fig. 170: Measuring Inside Diameter Of Guide Bush Using Caliper Gauge (Exhaust)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Bushing inside diameter

5.510 to 5.530 mm (0.2169 to 0.2177 in.)

- 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.

10. INSPECT VALVE LIFTER

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

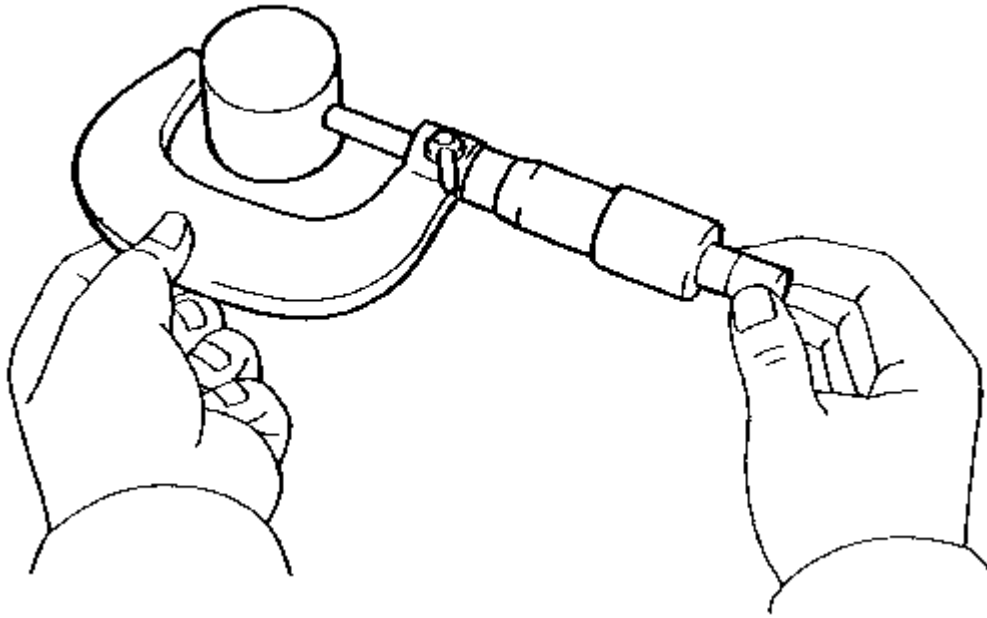


Fig. 171: Measuring Valve Lifter Diameter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Lifter diameter

30.966 to 30.976 mm (1.2191 to 1.2195 in.)

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

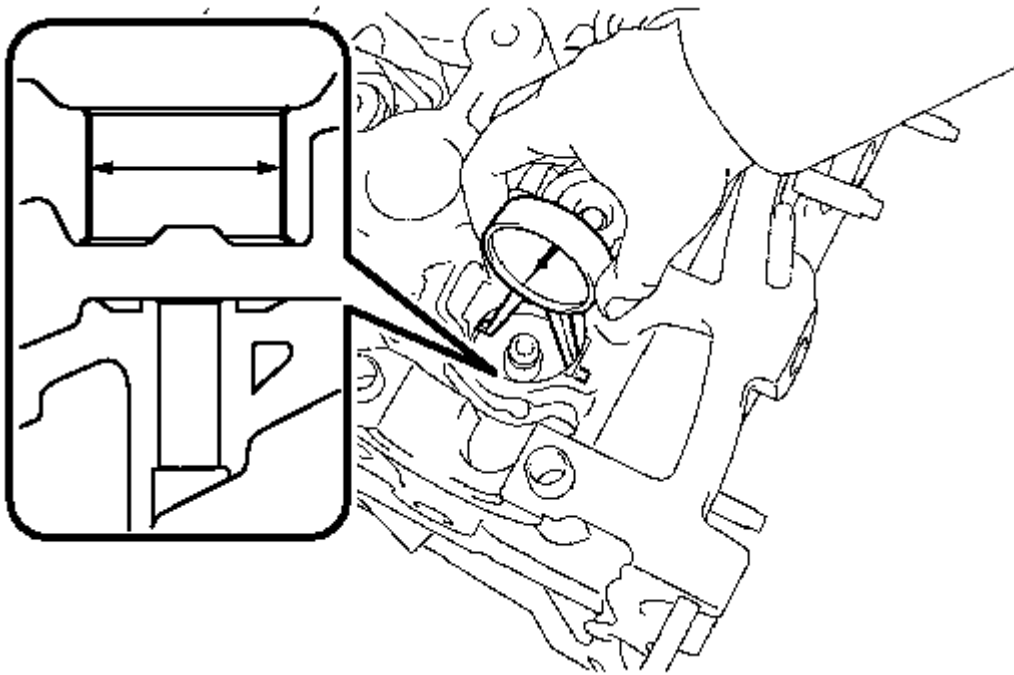


Fig. 172: Measuring Lifter Bore Diameter Of Cylinder Head Using Caliper Gauge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard lifter bore diameter

31.009 to 31.025 mm (1.2208 to 1.2215 in.)

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

Standard oil clearance

0.033 to 0.059 mm (0.0013 to 0.0023 in.)

Maximum oil clearance

0.070 mm (0.0028 in.)

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

11. INSPECT CYLINDER HEAD SET BOLT

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

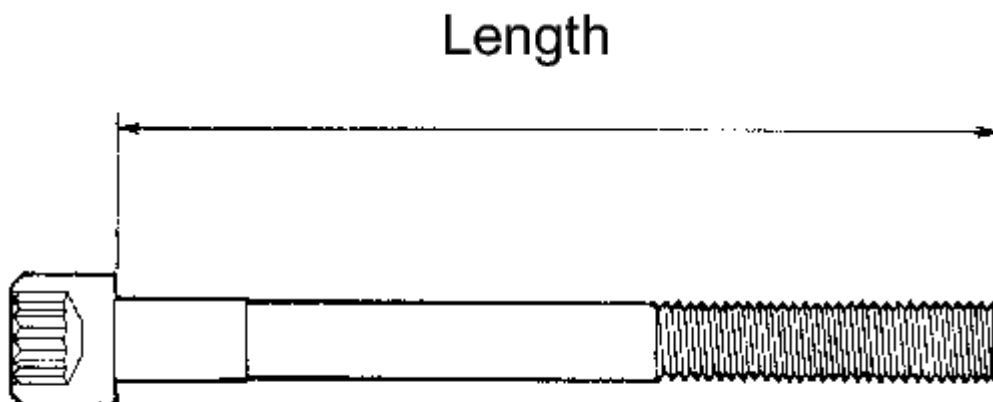


Fig. 173: Measuring Length Of Head Bolts From Seat To End
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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.

REPLACEMENT

REPLACEMENT

1. REMOVE INTAKE VALVE GUIDE BUSH

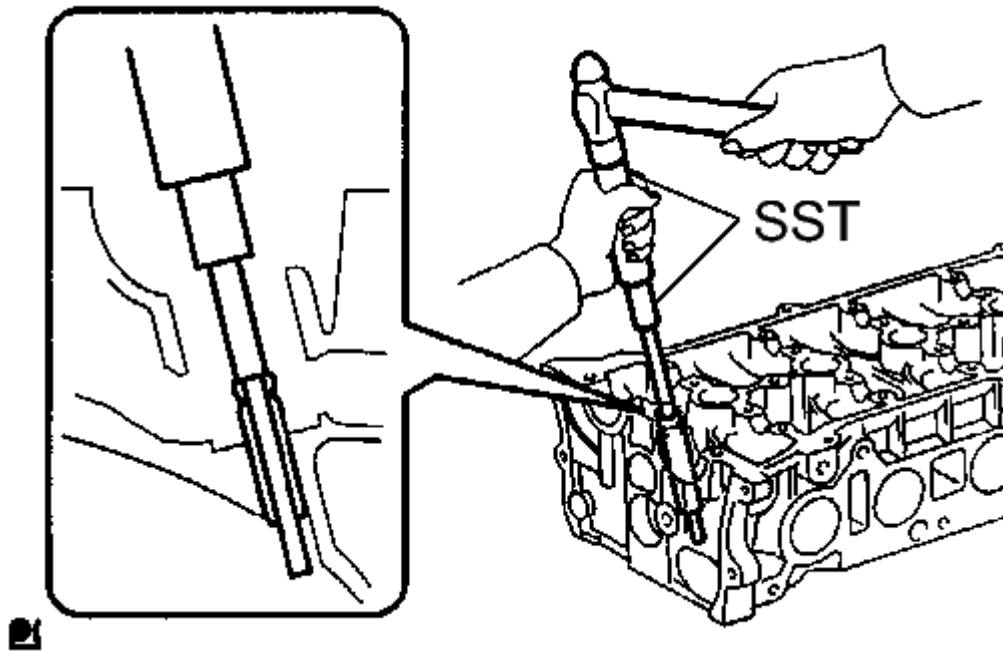


Fig. 174: Tapping Out Guide Bush Using SST (Intake)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- 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: 09202-70020
09202-00010

2. REMOVE EXHAUST VALVE GUIDE BUSH

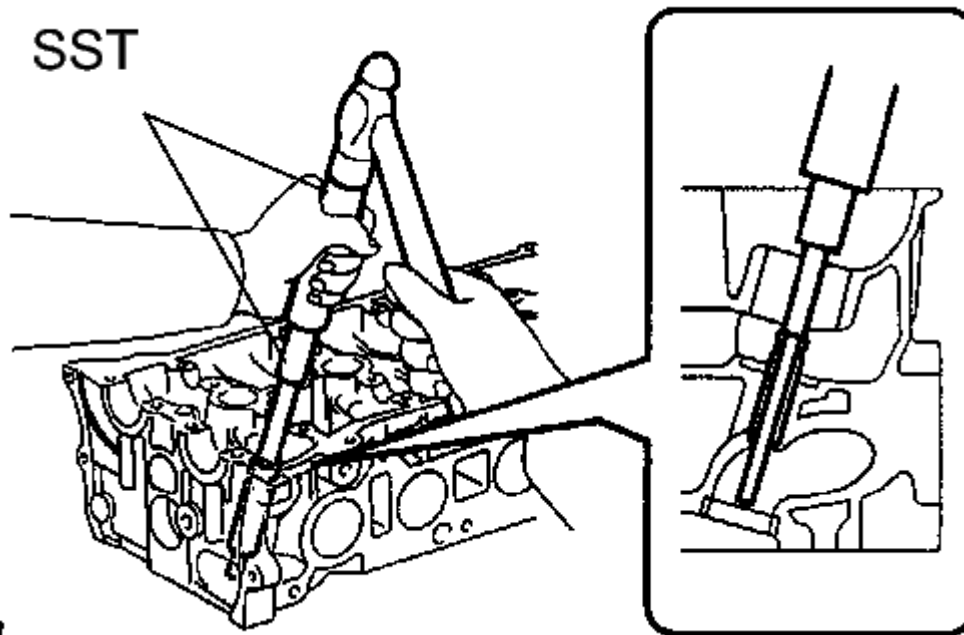
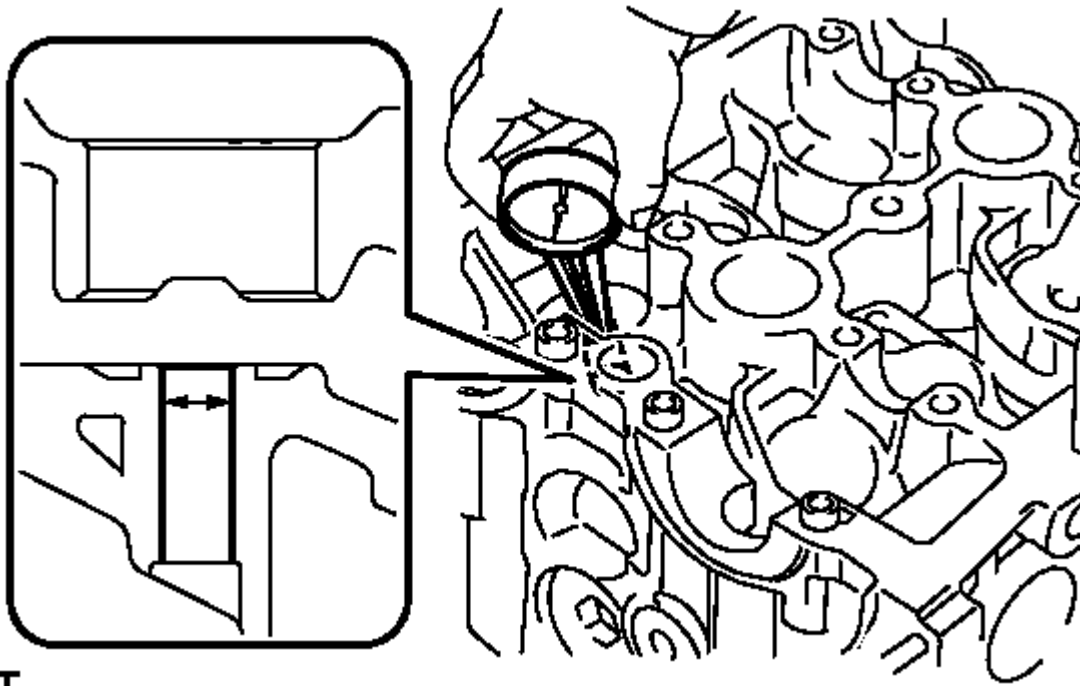


Fig. 175: Tapping Out Guide Bush Using SST (Exhaust)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- 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: 09202-70020
09202-00010

3. INSTALL INTAKE VALVE GUIDE BUSH



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Fig. 176: Measuring Bush Bore Diameter Of Cylinder Head Using Caliper Gauge
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. 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)

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 cylinder head bush bore diameter is greater than 10.306 mm (0.4057 in.), machine the bush bore to a dimension of 10.335 to 10.356 mm (0.4069 to 0.4077 in.) and install an 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.

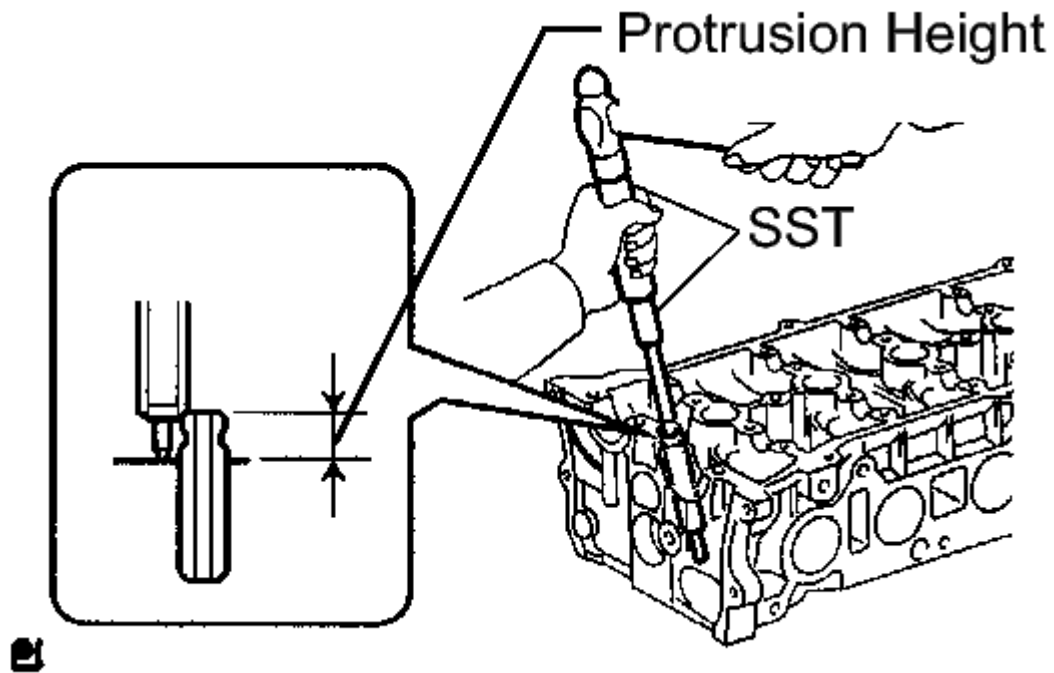


Fig. 177: Tapping In Guide Bush

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

- SST: 09201-10000
09201-01050
- SST: 09950-70010
09951-07100

Protrusion height

9.6 to 10.0 mm (0.3779 to 0.3937 in.)

- 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.

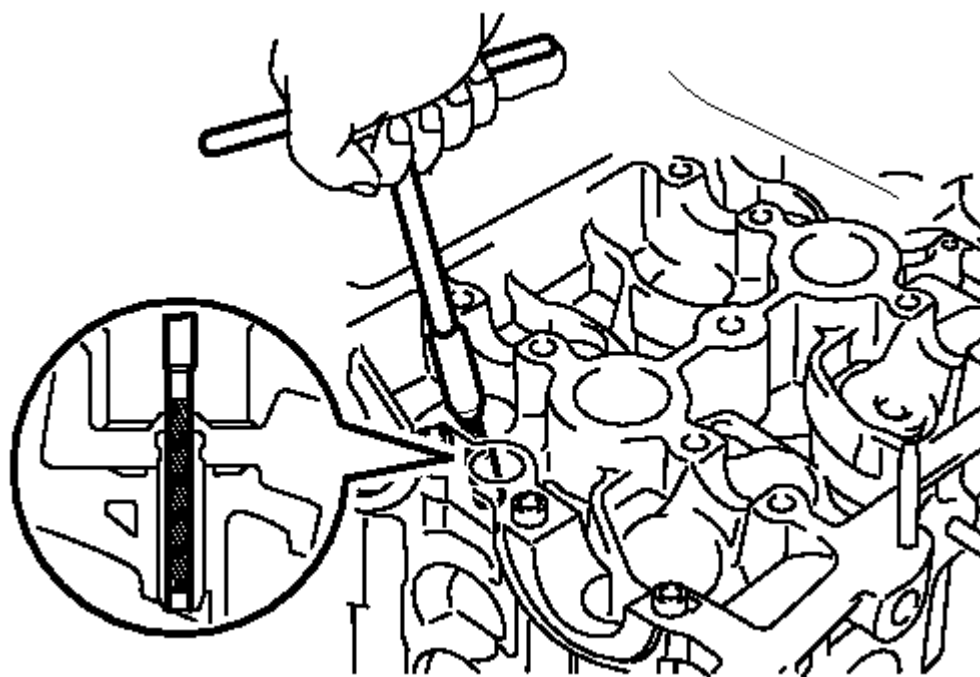


Fig. 178: Reaming Guide Bush

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

Standard oil clearance

0.025 to 0.060 mm (0.0010 to 0.0024 in.)

4. INSTALL EXHAUST VALVE GUIDE BUSH

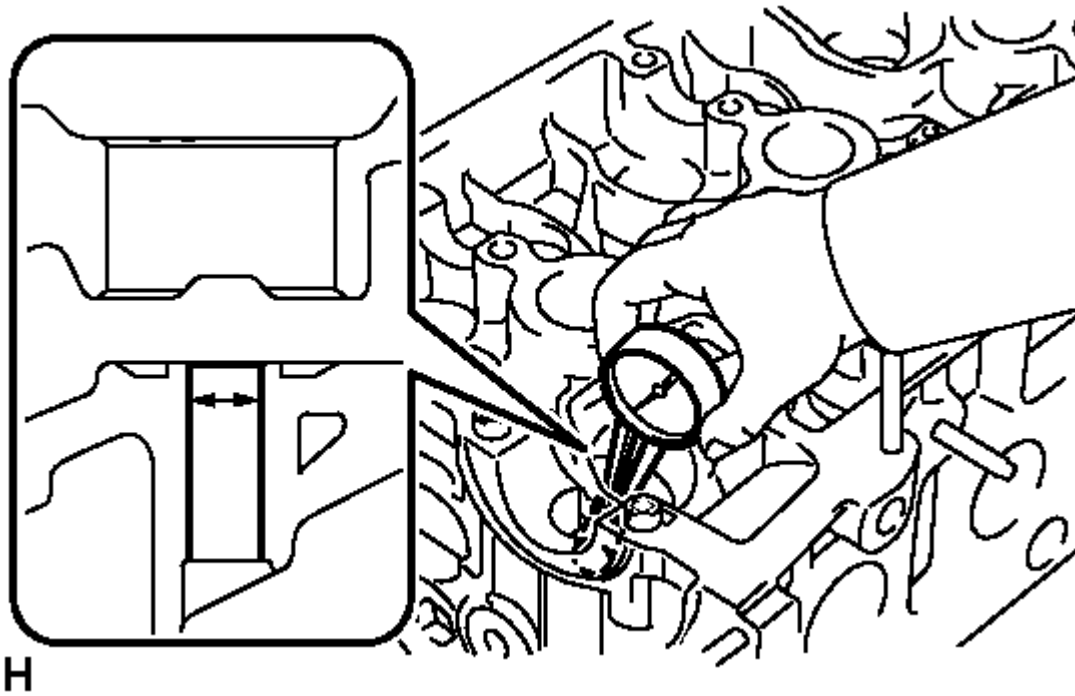


Fig. 179: Measuring Bush Bore Diameter Of Cylinder Head Using Caliper Gauge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. 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)

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 cylinder head bush bore diameter is greater than 10.306 mm (0.4057 in.), machine the bush bore to a dimension of 10.335 to 10.356 mm (0.4069 to 0.4077 in.) and install an 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.

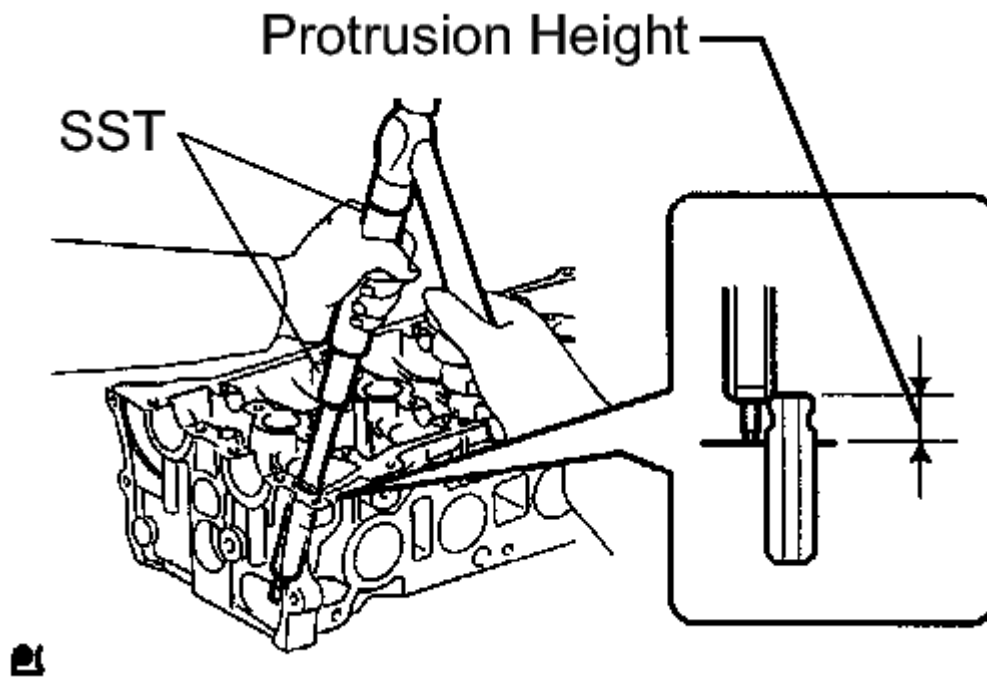


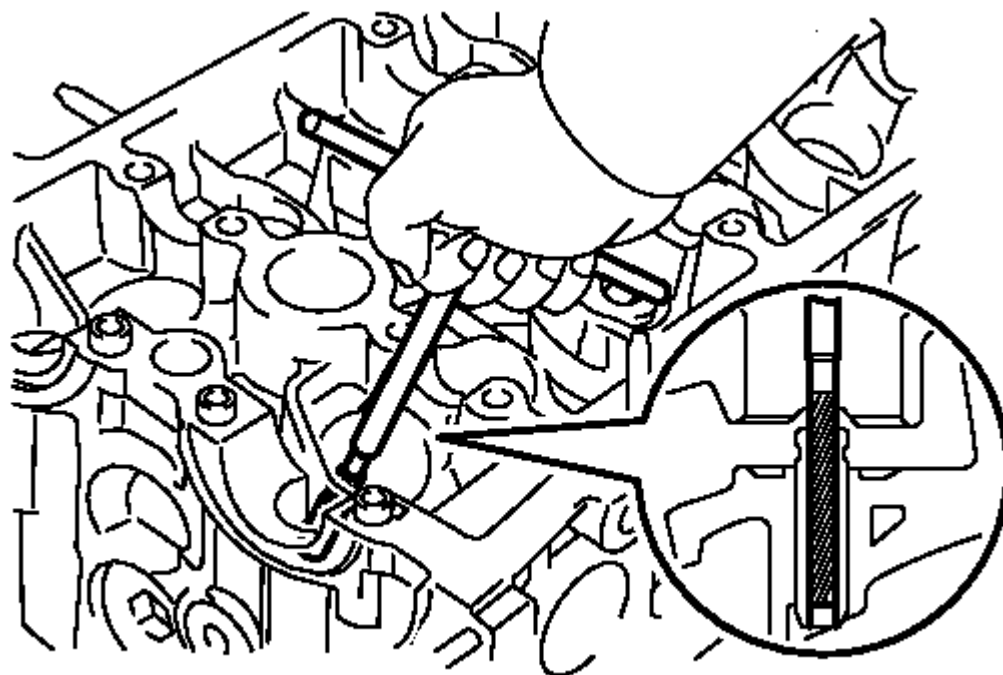
Fig. 180: Tapping In Guide Bush To Specified Protrusion Height Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09201-10000
09201-01050
- SST: 09950-70010
09951-07100

Protrusion height

9.6 to 10.0 mm (0.3779 to 0.3937 in.)

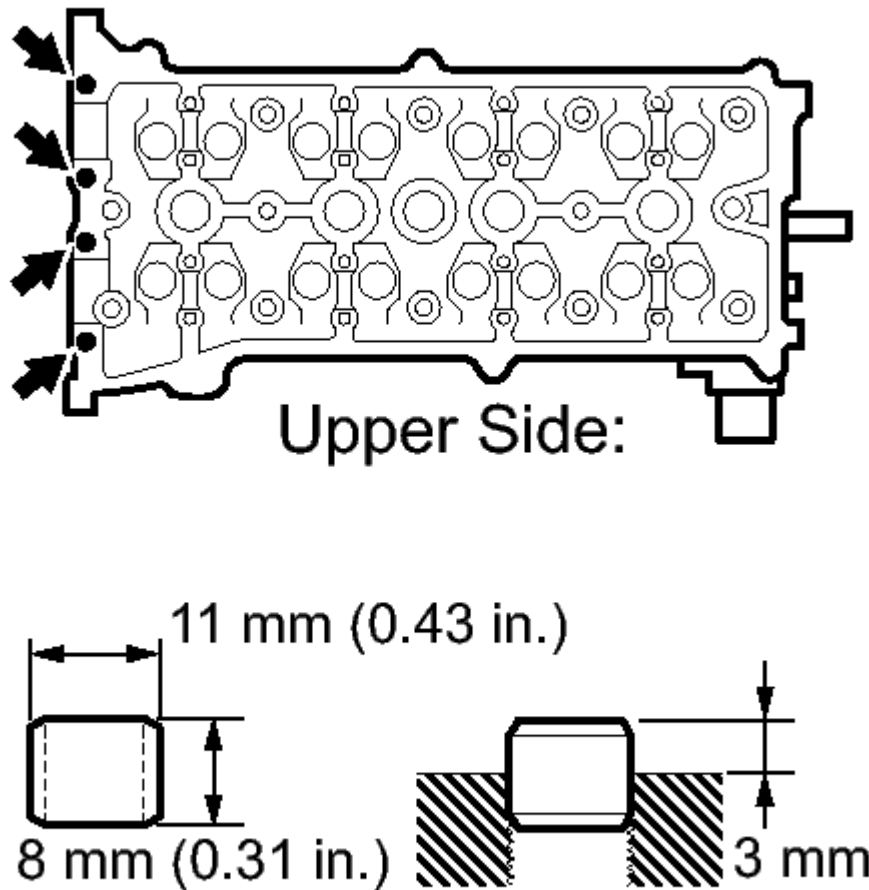
- e. Using a sharp 5.5 mm reamer, ream the guide bush to obtain the standard specified clearance between the guide bush and valve stem.

**H****Fig. 181: Reaming Valve Guide Bush****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

Standard oil clearance

0.025 to 0.060 mm (0.0010 to 0.0024 in.)

REASSEMBLY**REASSEMBLY****1. INSTALL RING PIN**



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Fig. 182: Identifying Ring Pin Protrusion Height

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

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

Protrusion height

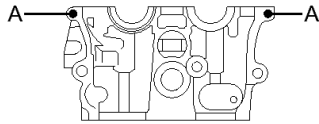
3 mm (0.12 in.)

2. INSTALL STUD BOLT

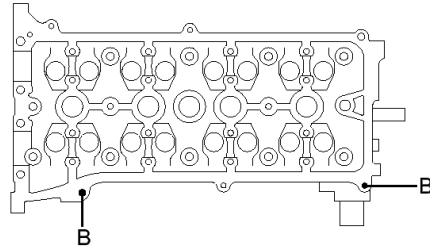
NOTE: If the stud bolt is deformed or the threads are damaged, replace it.

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

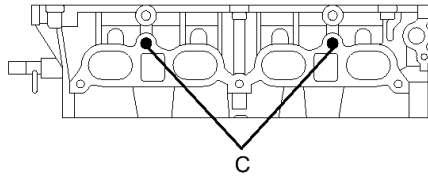
Front Side:



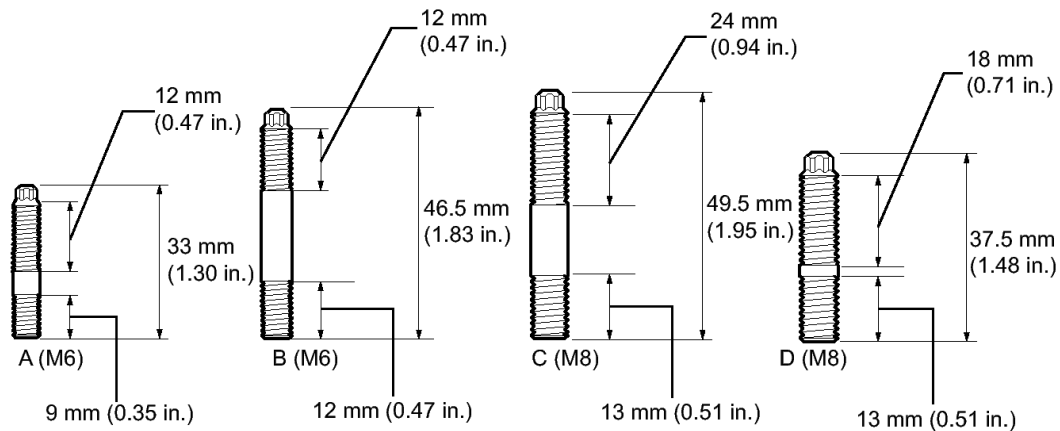
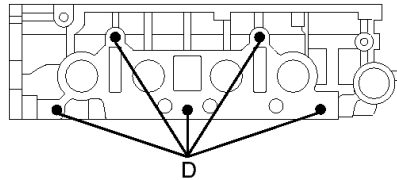
Upper Side:



Intake Side:



Exhaust Side:



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Fig. 183: Stud Bolts Specifications Chart

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

Bolt A

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

Bolt B

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

Bolt C

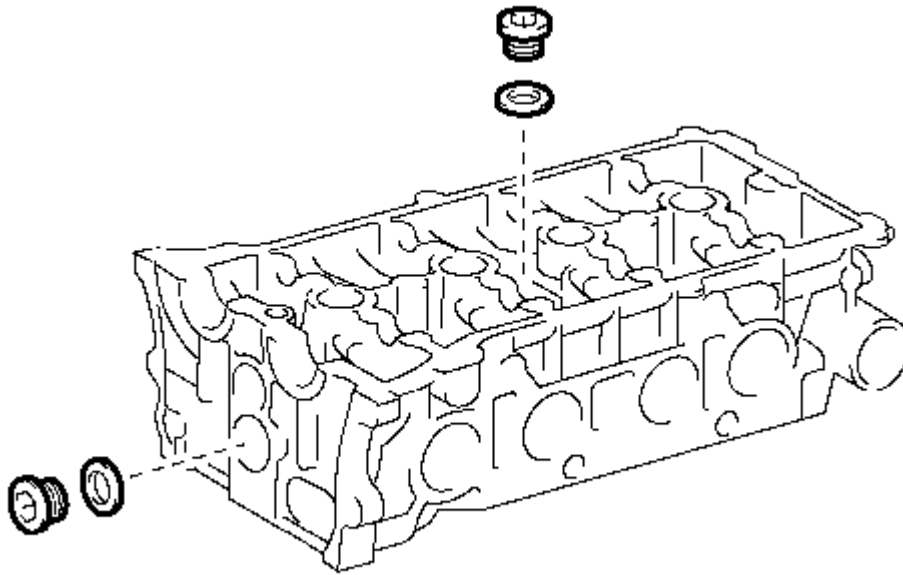
Torque: 9.5 N*m (97 kgf*cm, 84 in.*lbf)

Bolt D

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

3. INSTALL NO. 1 STRAIGHT HEAD SCREW PLUG

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



A62841

Fig. 184: Remove/Install Screw Plugs And Gaskets
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 86 N*m (877 kgf*cm, 64 ft.*lbf)

4. INSTALL VALVE SPRING SEAT

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

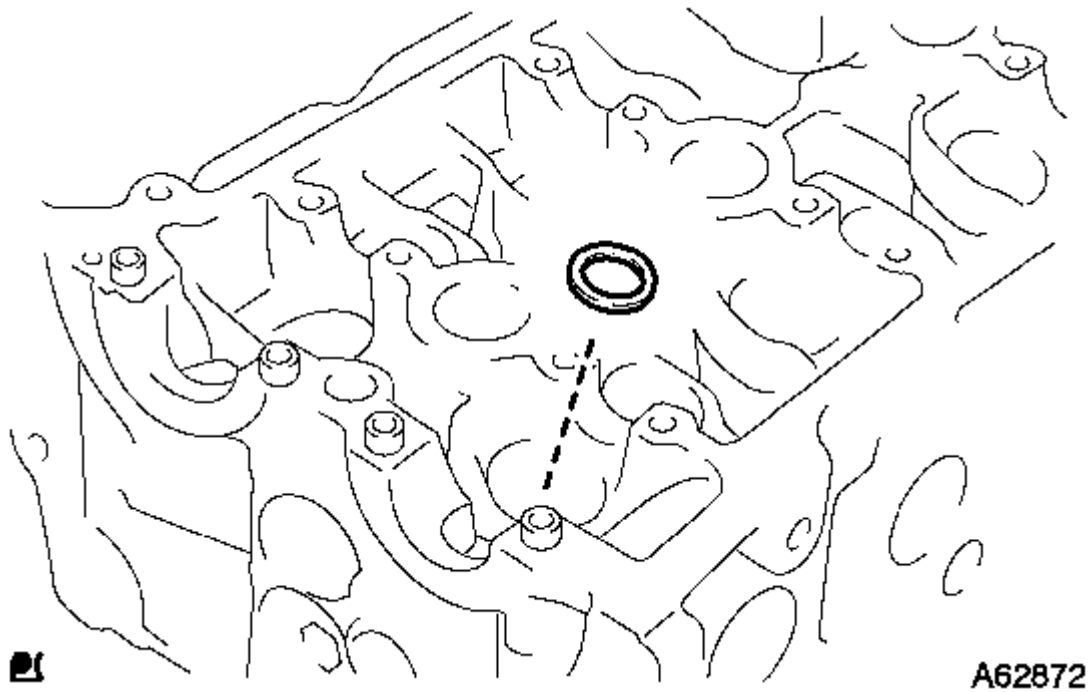


Fig. 185: View Of Valve Spring Seat

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

5. INSTALL VALVE STEM OIL O SEAL OR RING

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

Intake Side:

Exhaust Side:

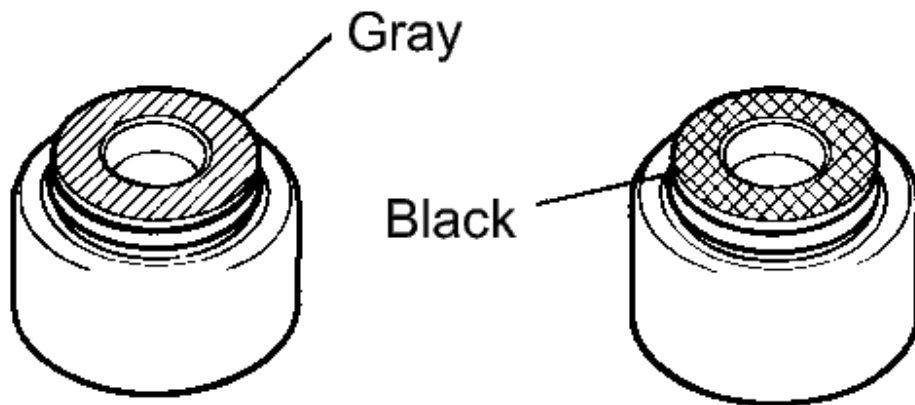


Fig. 186: View Of Intake And Exhaust Valve Oil Seal

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

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 into the intake side can cause installation problems later.

HINT:

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

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

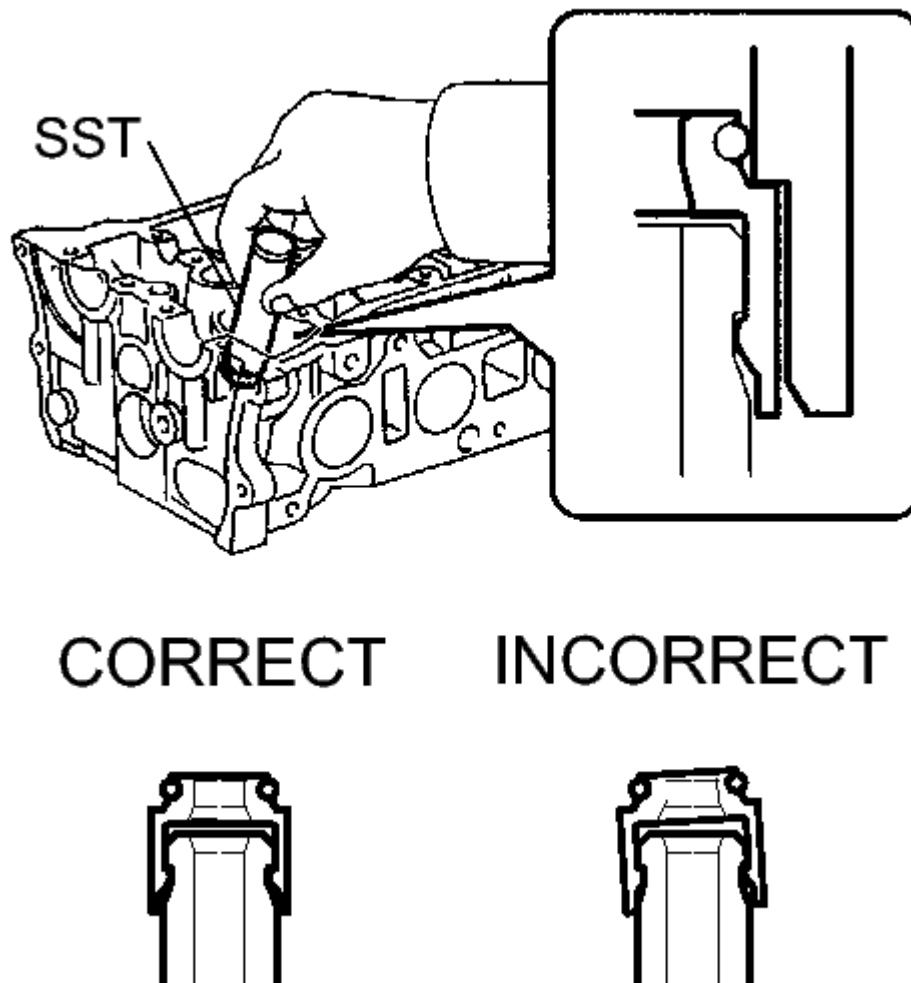


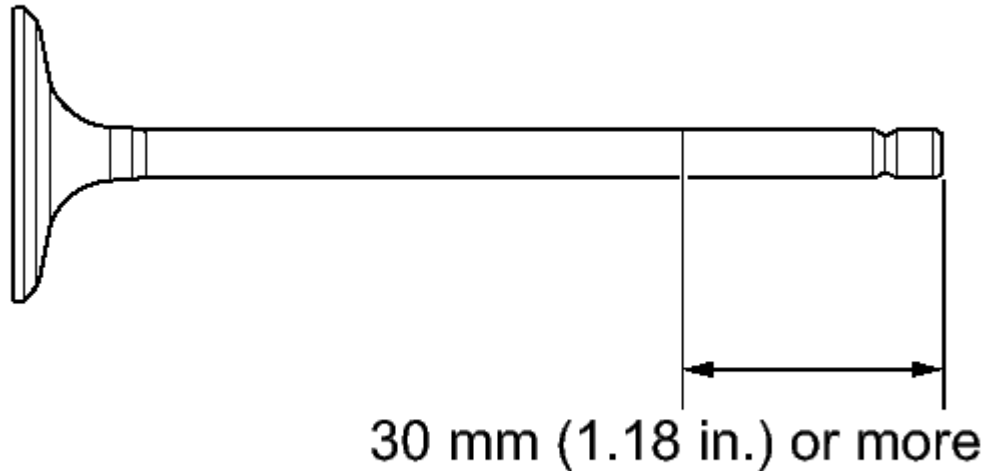
Fig. 187: Pushing In Oil Seal Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09201-41020

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

6. INSTALL INTAKE VALVE

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



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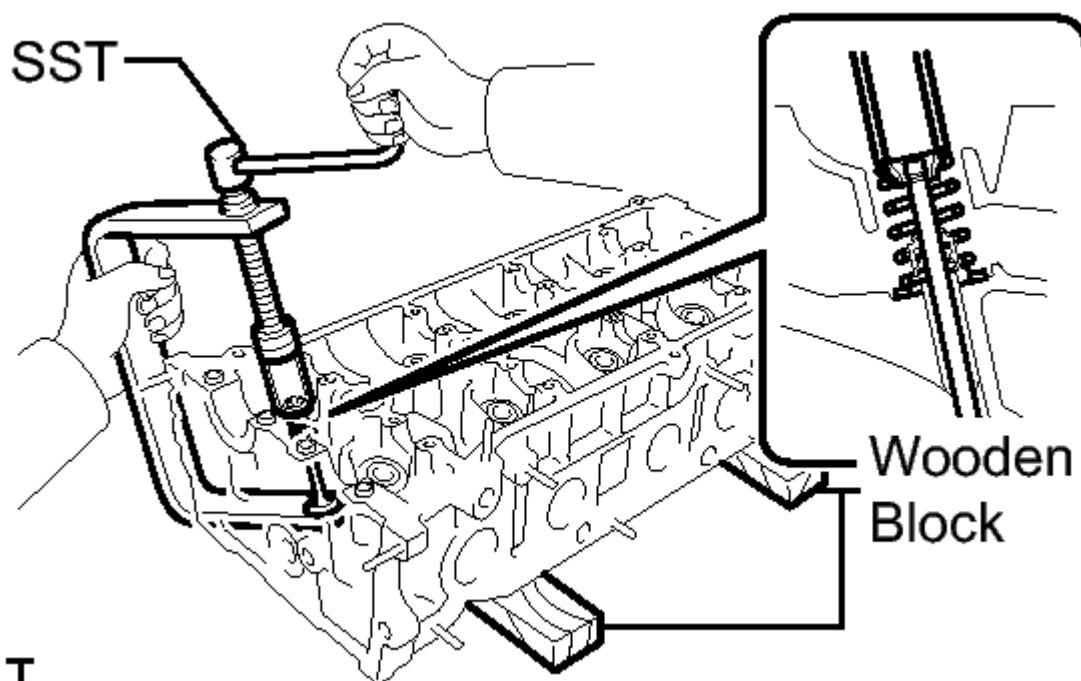
Fig. 188: Identifying Intake Valve Dimension

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.

**T****Fig. 189: Compressing Spring Using SST**

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

- SST: 09202-70020
09202-00010

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

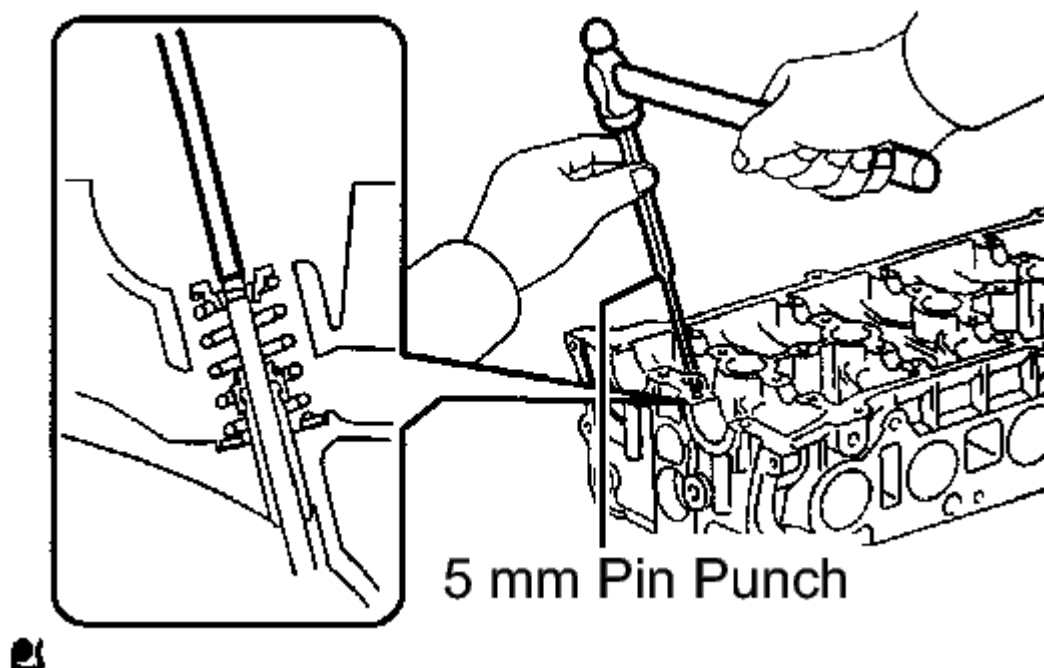
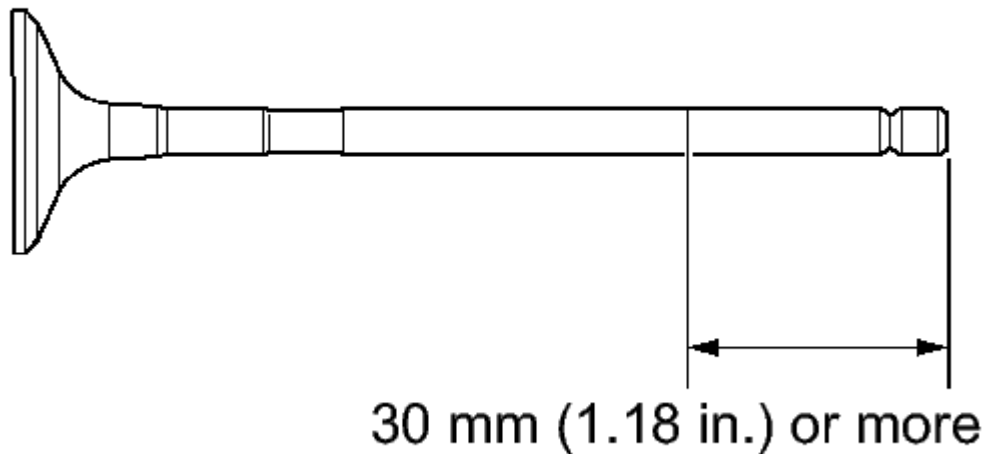


Fig. 190: Tapping Valve Step Tip

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

NOTE: Be careful not to damage the valve stem tip.**7. INSTALL EXHAUST VALVE**

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

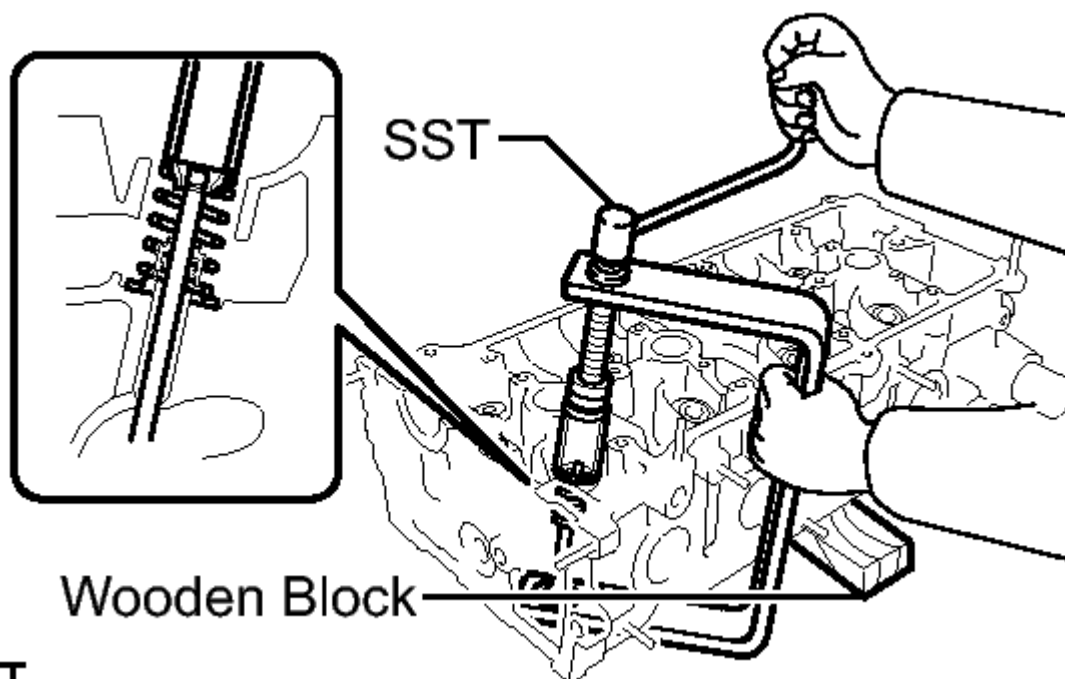
**T****Fig. 191: Identifying Valve Tip Area Length**

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.

**T****Fig. 192: Compressing Spring Using SST**

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

- SST: 09202-70020
09202-00010

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

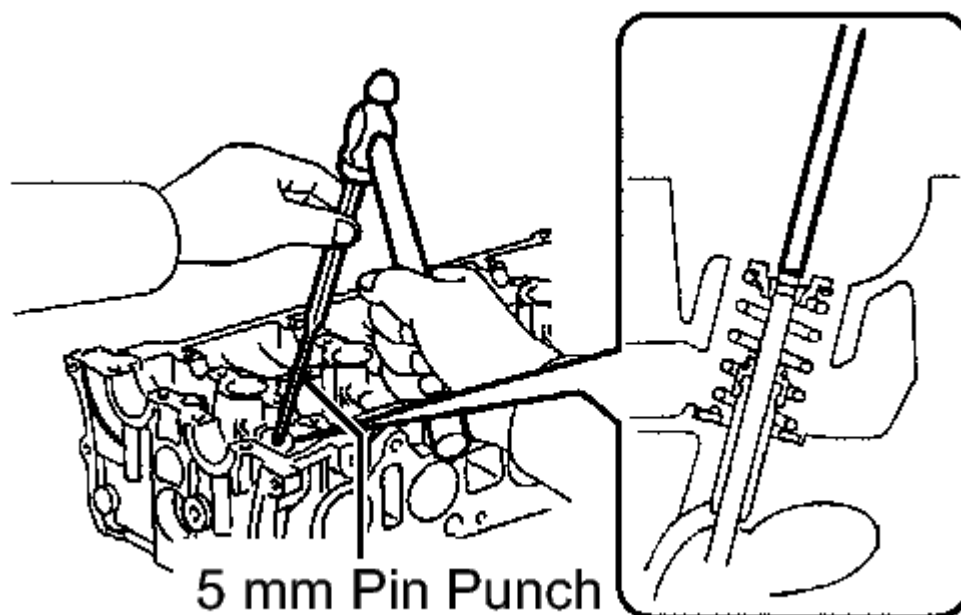
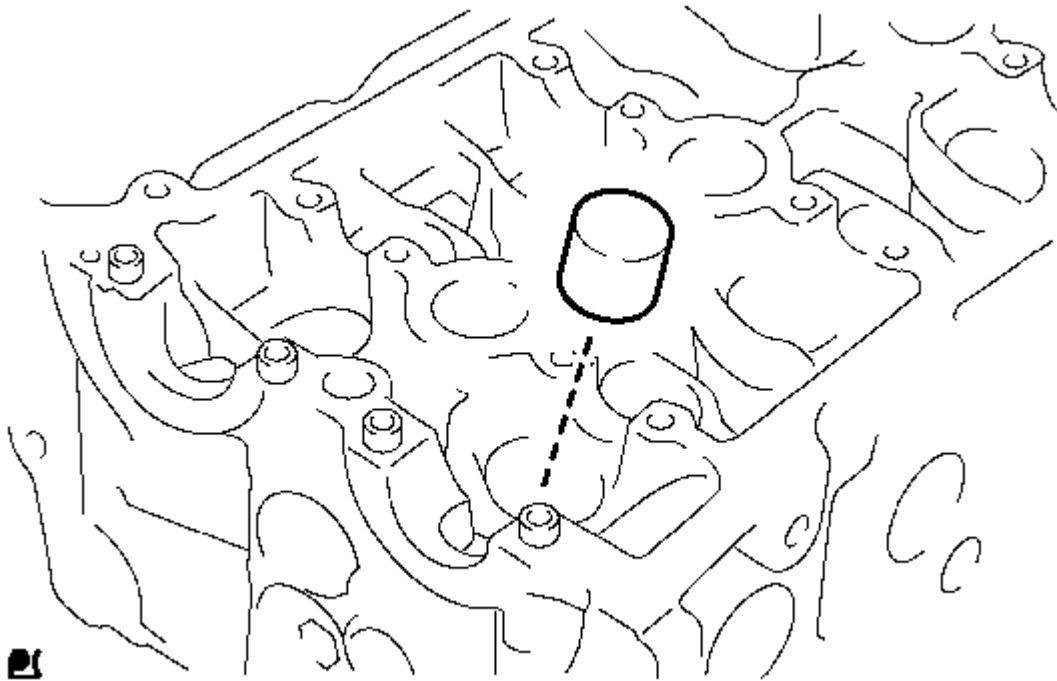


Fig. 193: Tapping Valve Stem Tip

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

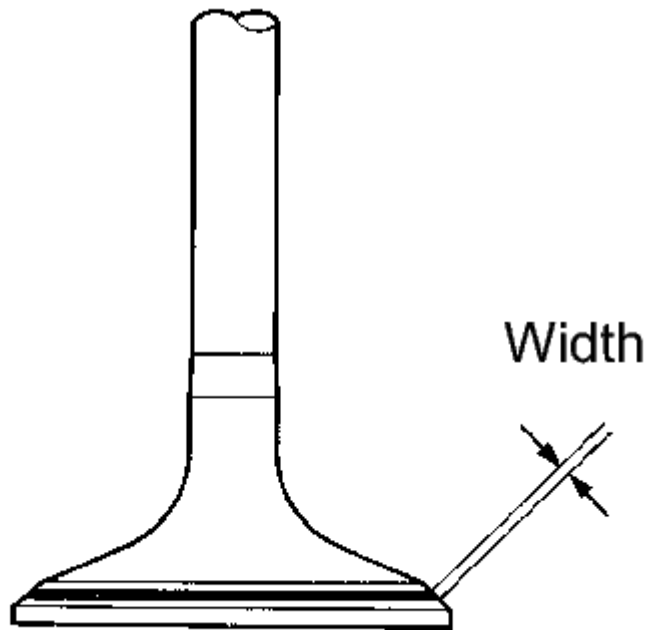
NOTE: Be careful not to damage the valve stem tip.**8. INSTALL VALVE LIFTER**

- a. Apply a light coat of engine oil.
- b. Assemble the valve lifter and the tip of the valve stem.

**Fig. 194: Remove/Install Valve Lifters**

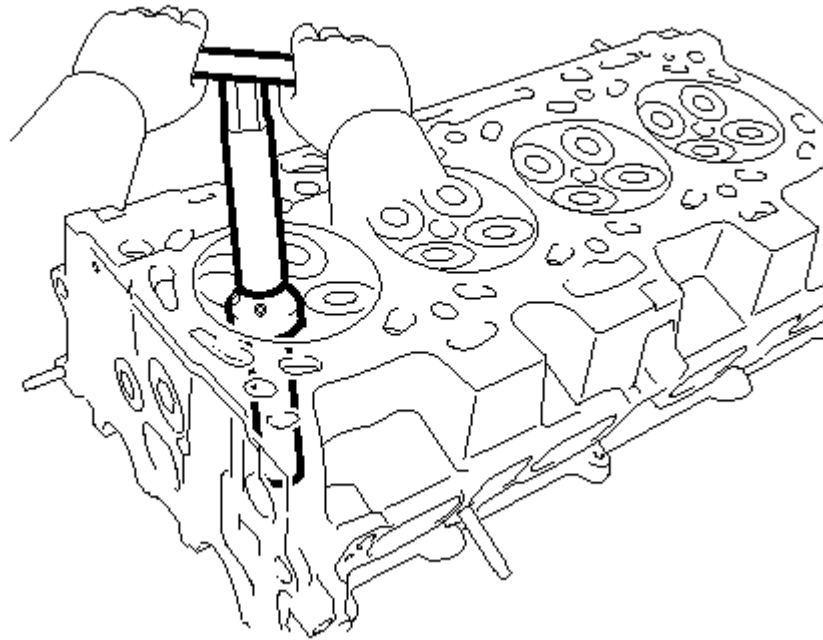
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Install the same parts in the same combination to the original locations.**REPAIR****REPAIR****1. INSPECT VALVE SEATS**

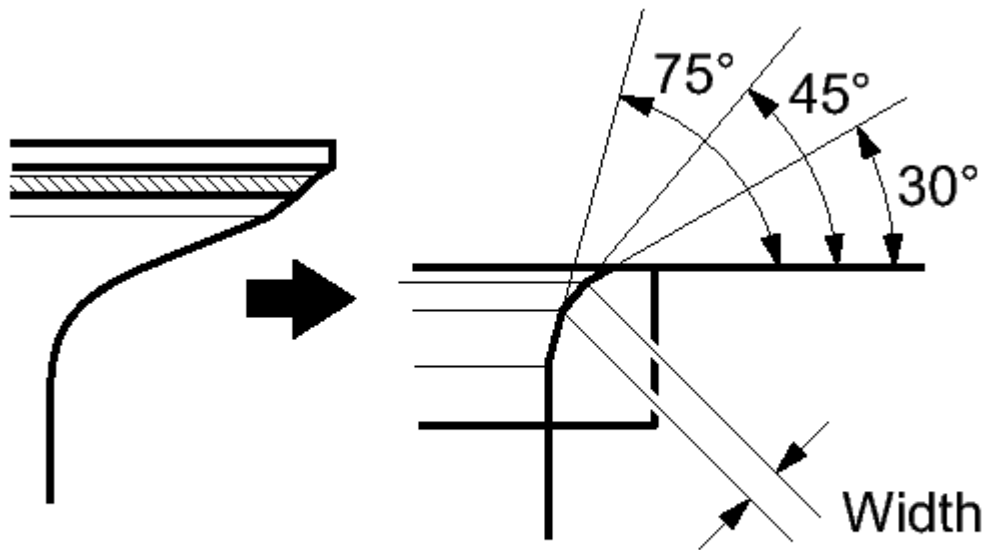
**EM0183****Fig. 195: Identifying Valve Seat****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- a. Apply a light coat of prussian blue to the valve face.
- b. Lightly press the valve face against the valve seat.
- c. Check the valve face and valve seat according to the following procedure:
 1. If prussian blue appears 360° around the valve face, the valve face is concentric. If not, replace 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 face with the width between 1.2 to 1.6 mm (Exhaust side (0.047 to 0.063 in.)).

2. REPAIR VALVE SEATS

**T****Fig. 196: Repairing Valve Seats****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.****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.
 - b. Using 30° to 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.

**T****Fig. 197: Identifying Valves Head Cutting Angles**

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

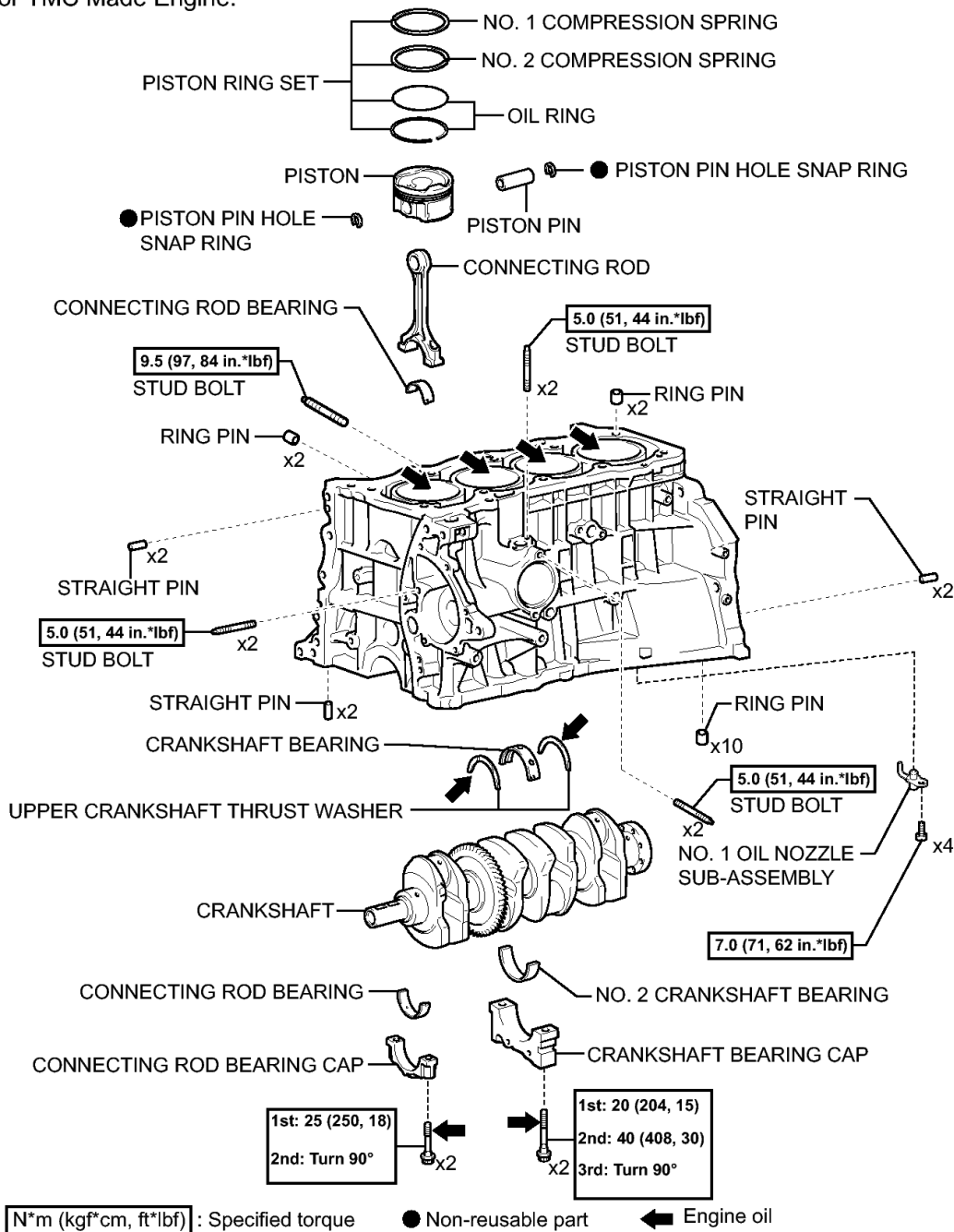
Valve Seat Width

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.)

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

CYLINDER BLOCK**COMPONENTS****ILLUSTRATION**

for TMC Made Engine:



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Fig. 198: Identifying Cylinder Block Replacement Components With Torque Specifications (1 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

Exploded view diagram of the TMC Made Engine assembly. The diagram shows the following components and their assembly sequence:

- Piston Ring Set:** NO. 1 COMPRESSION SPRING, NO. 2 COMPRESSION SPRING, OIL RING.
- Piston:** PISTON PIN HOLE SNAP RING, PISTON PIN.
- Connecting Rod:** CONNECTING ROD BEARING.
- Crankshaft:** CRANKSHAFT BEARING, UPPER CRANKSHAFT THRUST WASHER, CRANKSHAFT BEARING CAP, NO. 2 CRANKSHAFT BEARING.
- Other Components:** RING PIN, STRAIGHT PIN, NO. 1 OIL NOZZLE SUB-ASSEMBLY.

Torque Specifications:

- STUD BOLT: 9.5 (97, 84 in.*lbf)
- NO. 1 OIL NOZZLE SUB-ASSEMBLY: 7.0 (71, 62 in.*lbf)
- CRANKSHAFT BEARING CAP: 1st: 20 (204, 15), 2nd: 40 (408, 30), 3rd: Turn 90°
- CONNECTING ROD BEARING CAP: 1st: 25 (250, 18), 2nd: Turn 90°

Legend:

- Non-reusable part
- ← Engine oil

Fig. 199: Identifying Cylinder Block Replacement Components With Torque Specifications (2 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

DISASSEMBLY

- ### 1. INSPECT CONNECTING ROD THRUST CLEARANCE See step 1.

2. **INSPECT CONNECTING ROD OIL CLEARANCE** See step 2.
3. **REMOVE PISTON SUB-ASSEMBLY WITH CONNECTING ROD**

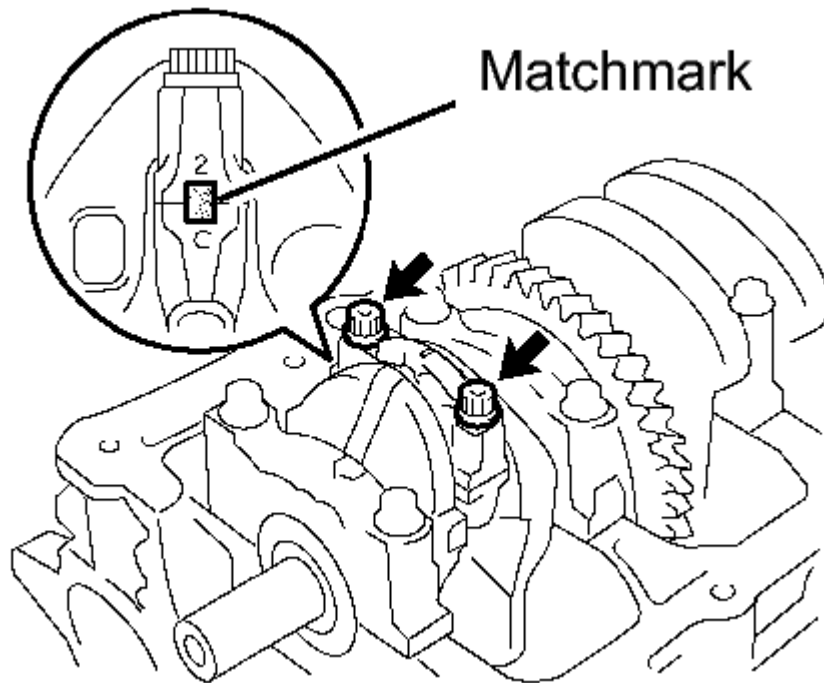


Fig. 200: Identifying Matchmarks On Connecting Rod And Cap Components
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

HINT:

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

- b. Using a 12 mm socket wrench, uniformly loosen the 2 bolts.

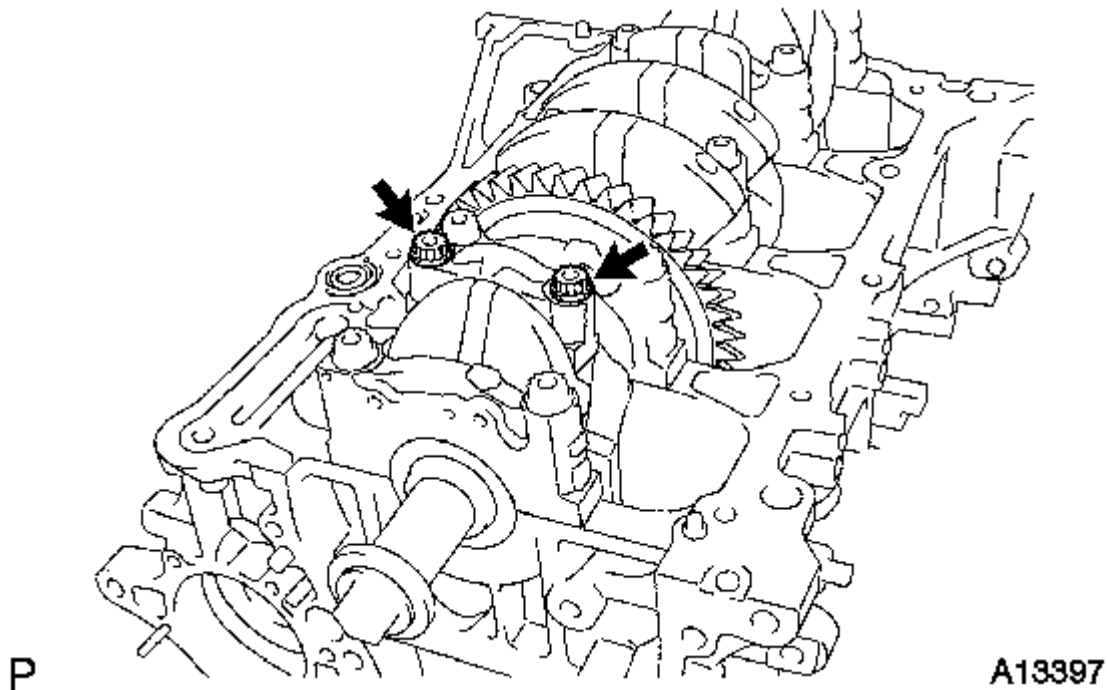


Fig. 201: Location of Connecting Rod Cap Bolts

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

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

HINT:

Keep the lower bearing inserted in the connecting rod cap.

- d. Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

HINT:

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

4. REMOVE CONNECTING ROD BEARING

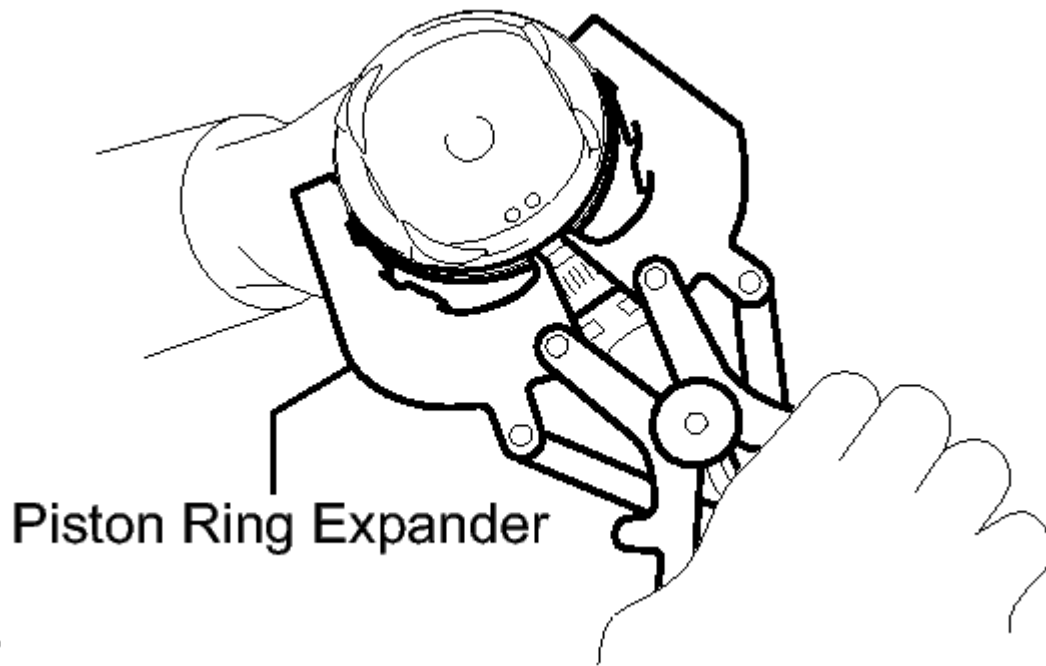
- a. Remove the connecting rod bearings.

HINT:

Arrange the removed parts in the correct order.

5. REMOVE PISTON RING SET

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

**T****Fig. 202: Removing Piston Rings****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

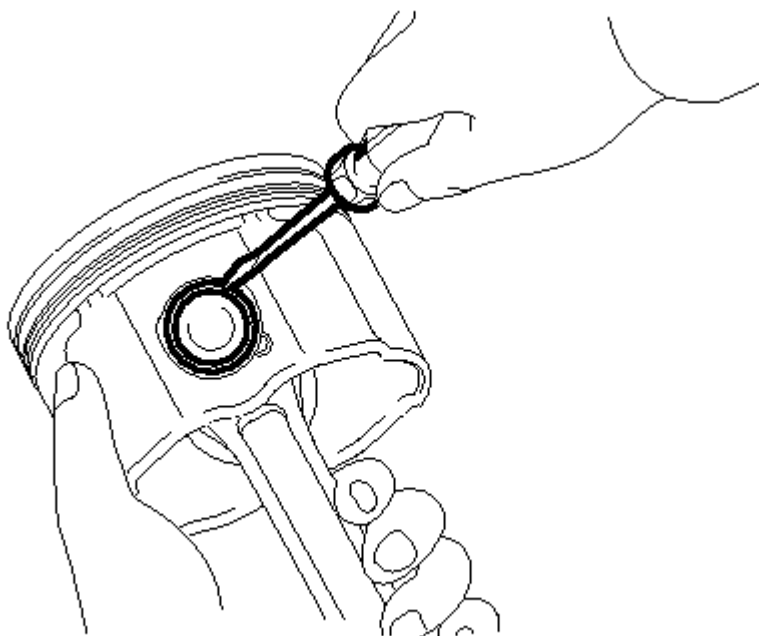
- b. Remove the oil ring rail and oil ring expander by hand

HINT:

Arrange the removed parts in the correct order.

6. REMOVE PISTON PIN HOLE SNAP RING

- a. Using a screwdriver, pry out the 2 snap rings.



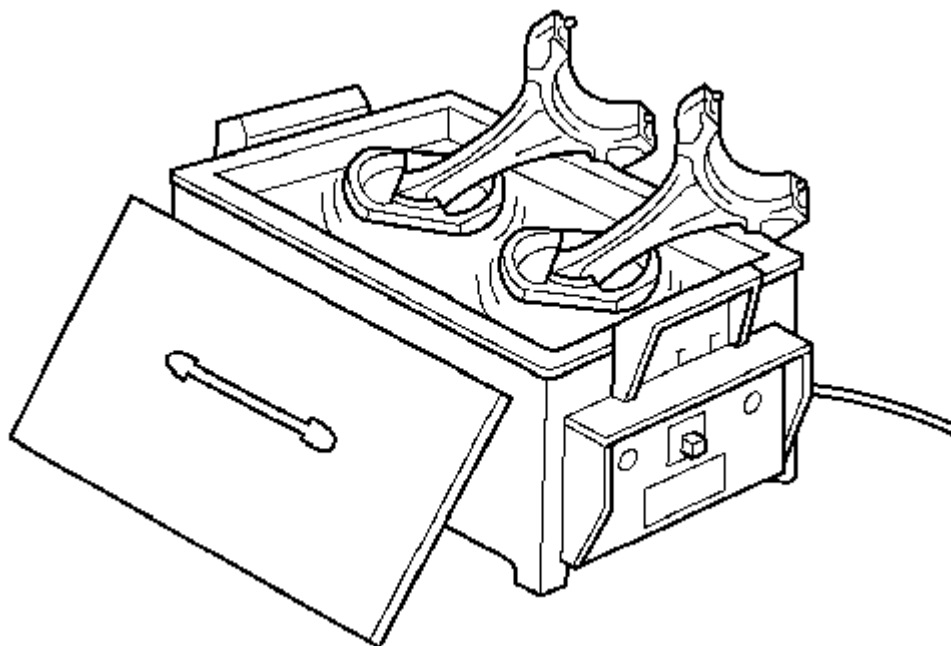
T

Fig. 203: Removing Piston Pin Hole Snap Ring

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

7. REMOVE PISTON

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

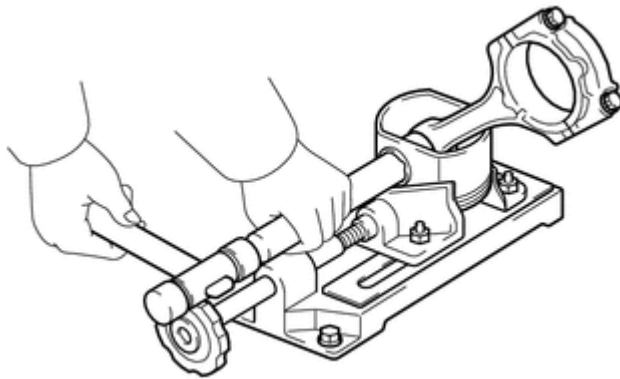


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Fig. 204: View Of Heating Piston

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.



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Fig. 205: View Of Connecting Rod Removal Procedure

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

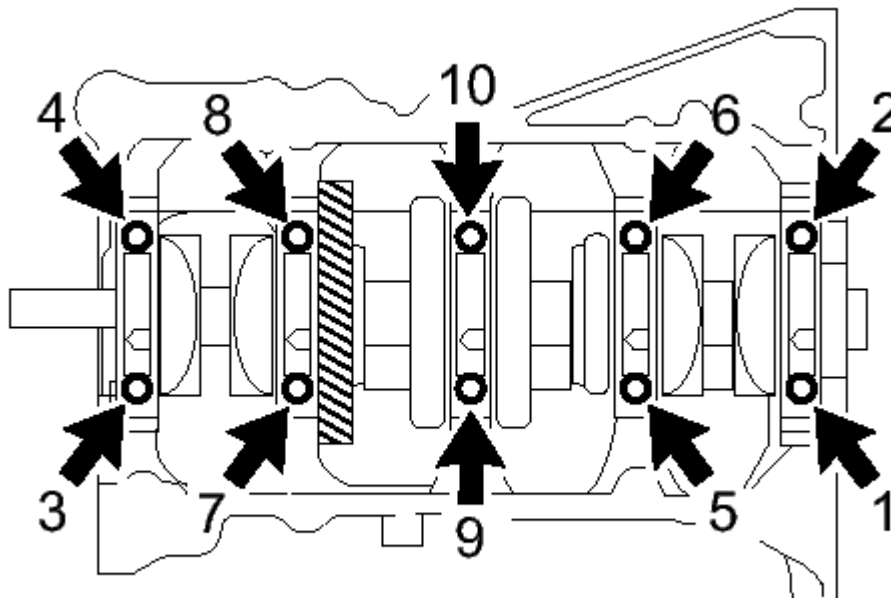
HINT:

- The piston and pin are a matched set.
- Arrange the pistons, pin, rings, connecting rods and bearings in the correct order.

8. INSPECT CRANKSHAFT THRUST CLEARANCE See step 13.

9. REMOVE CRANKSHAFT

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



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Fig. 206: Loosening Sequence Of Crankshaft Bearing Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

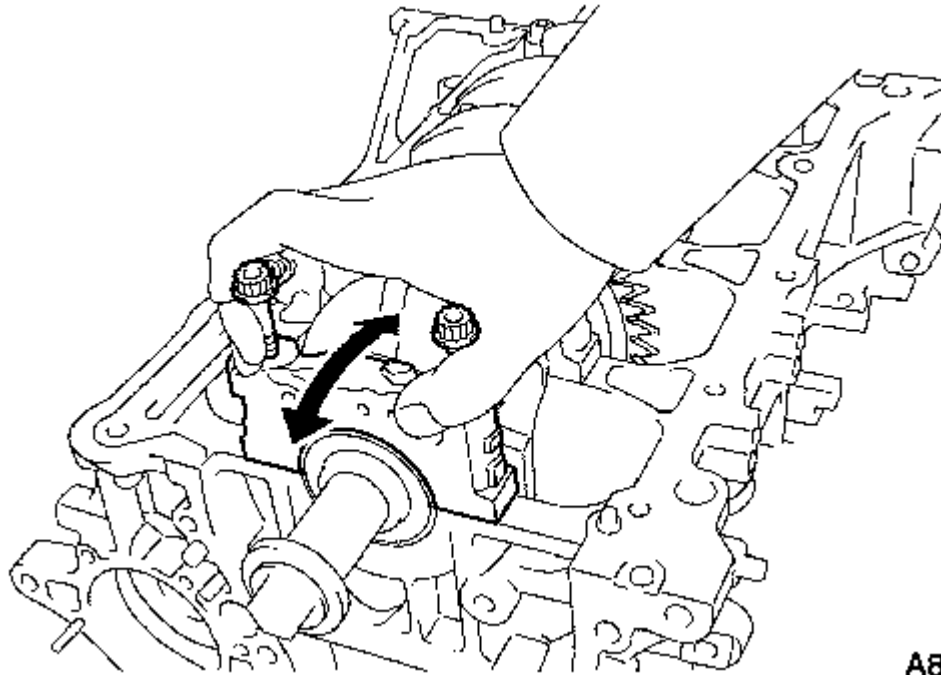


Fig. 207: Removing Main Bearing Caps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

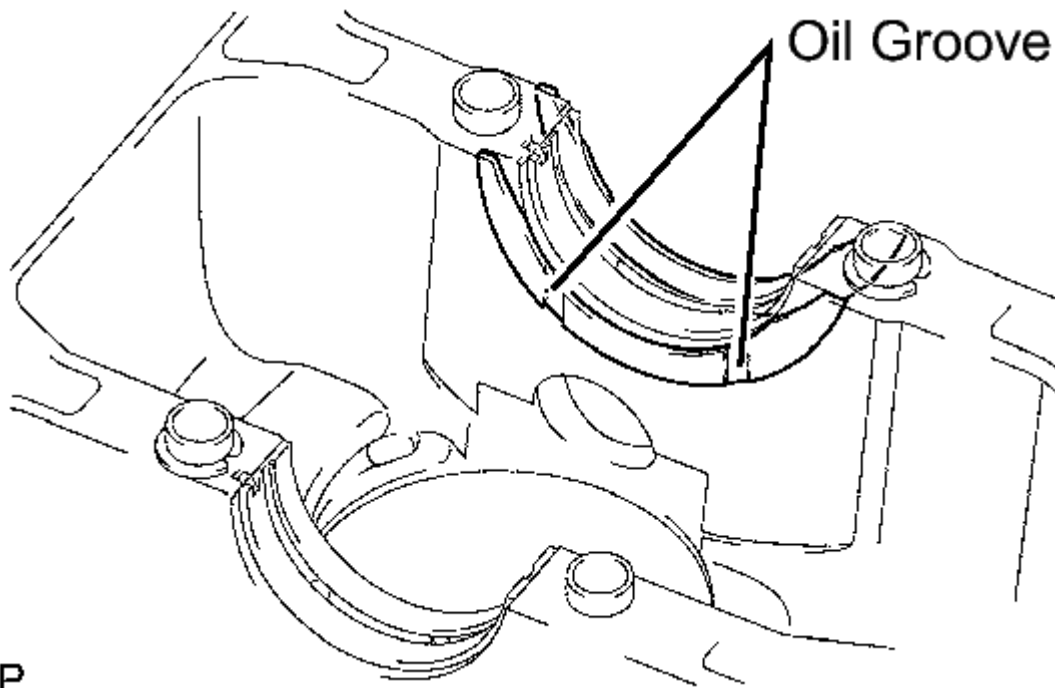
NOTE: Insert the bolts into one of the caps. Ease the cap out by gently pulling up and applying force toward the front and back side of the cylinder block, as shown in the illustration. Take care not to damage the contact surfaces of the cap and cylinder block.

HINT:

- Keep the lower bearing and main bearing cap.
 - Arrange the main bearing caps in the correct order.
- c. Lift out the crankshaft.

10. REMOVE UPPER CRANKSHAFT THRUST WASHER

- a. Remove the upper thrust washers from the cylinder block.



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Fig. 208: Identifying Cylinder Block With Oil Grooves Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. REMOVE CRANKSHAFT BEARING

- Remove the 5 crankshaft bearings from the cylinder block.

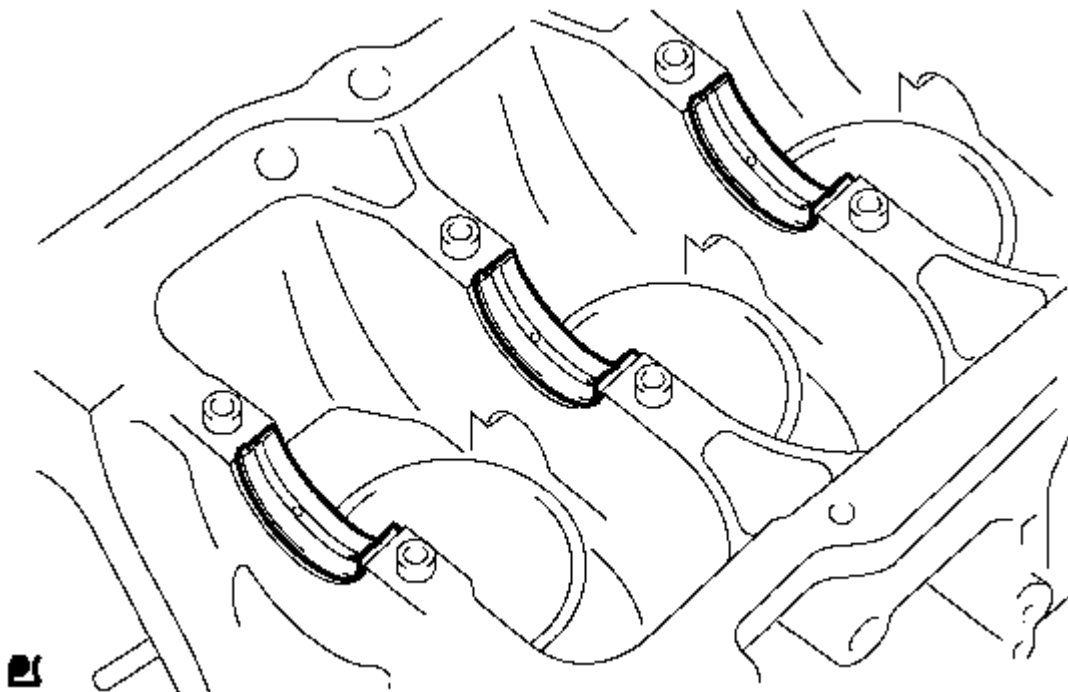


Fig. 209: View Of Crankshaft Bearings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Arrange the removed parts in the correct order.

12. REMOVE NO. 2 CRANKSHAFT BEARING

- a. Remove the 5 No. 2 crankshaft bearings from the 5 main bearing caps.

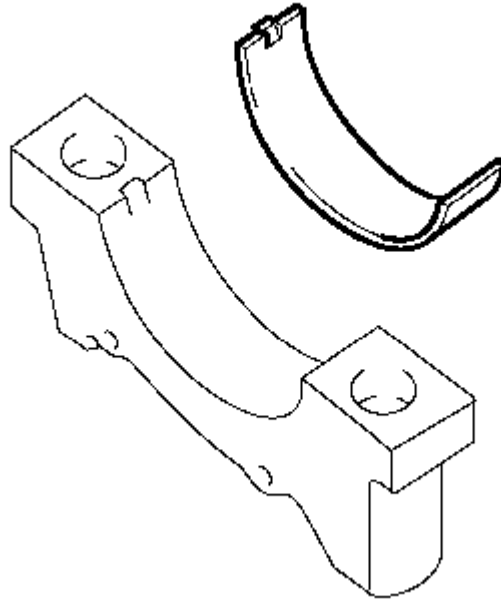


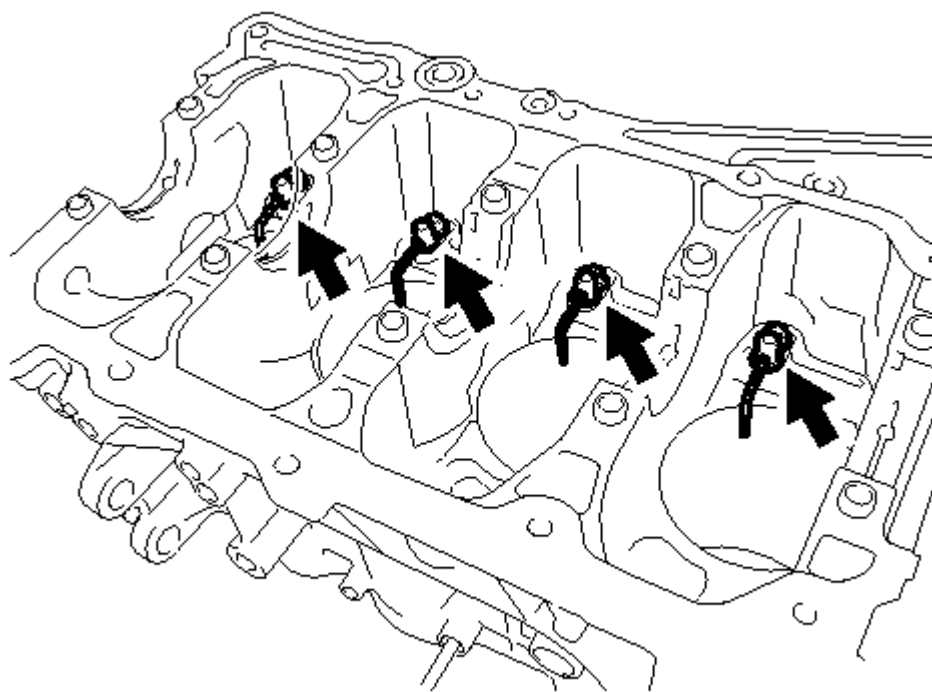
Fig. 210: Identifying No. 2 Crankshaft Bearings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Arrange the removed parts in the correct order.

13. REMOVE NO. 1 OIL NOZZLE SUB-ASSEMBLY

- a. Using a 5 mm hexagon wrench, remove the bolts and oil nozzles.



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Fig. 211: Location of Oil Nozzles And Bolts

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

14. REMOVE STUD BOLT
15. REMOVE RING PIN
16. REMOVE STRAIGHT PIN

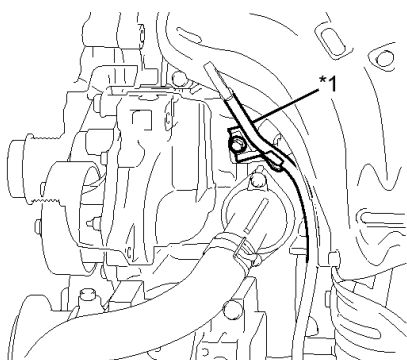
INSPECTION

INSPECTION

HINT:

Check whether the engine is TMC made or not by referring to the following illustration.

*A



*B

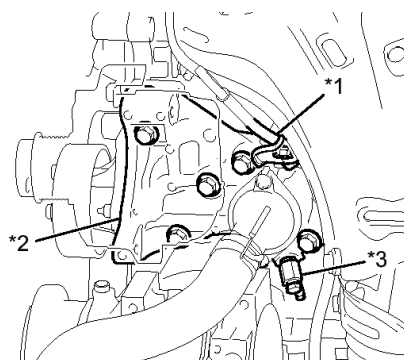


Fig. 212: Identifying Whether The Engine Is TMC Made
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*A	for TMC Made Engine	*B	except TMC Made Engine
*1	Engine Oil Level Dipstick Guide	*2	Water Inlet Housing
*3	Water Inlet Housing Drain Cock Assembly	-	-

INSPECTION

1. INSPECT CONNECTING ROD THRUST CLEARANCE

- a. Install the connecting rod cap. Refer to **REASSEMBLY**.
- b. Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

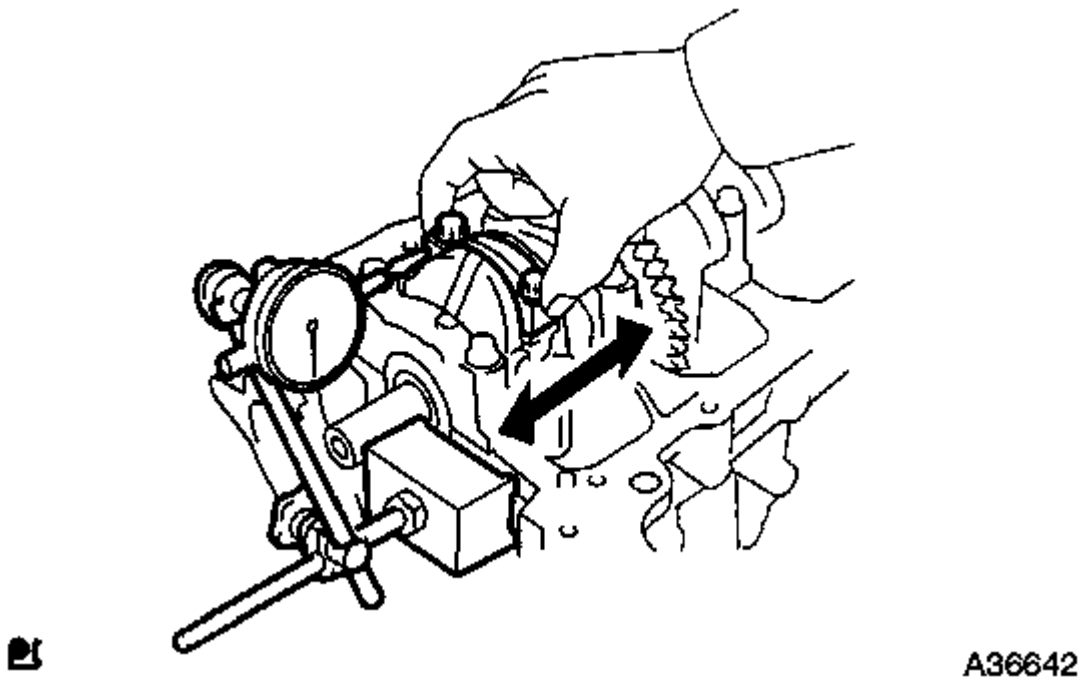


Fig. 213: Inspecting Connecting Rod Thrust Clearance Using Dial indicator
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard thrust clearance

0.160 to 0.362 mm (0.0063 to 0.0142 in.)

Maximum thrust clearance

0.362 mm (0.0142 in.)

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

2. INSPECT CONNECTING ROD OIL CLEARANCE

- a. Clean the crank pin and bearing.
- b. Check the crank pin and bearing for pitting and scratches.
- c. Lay a strip of Plastigage on the crank pin.

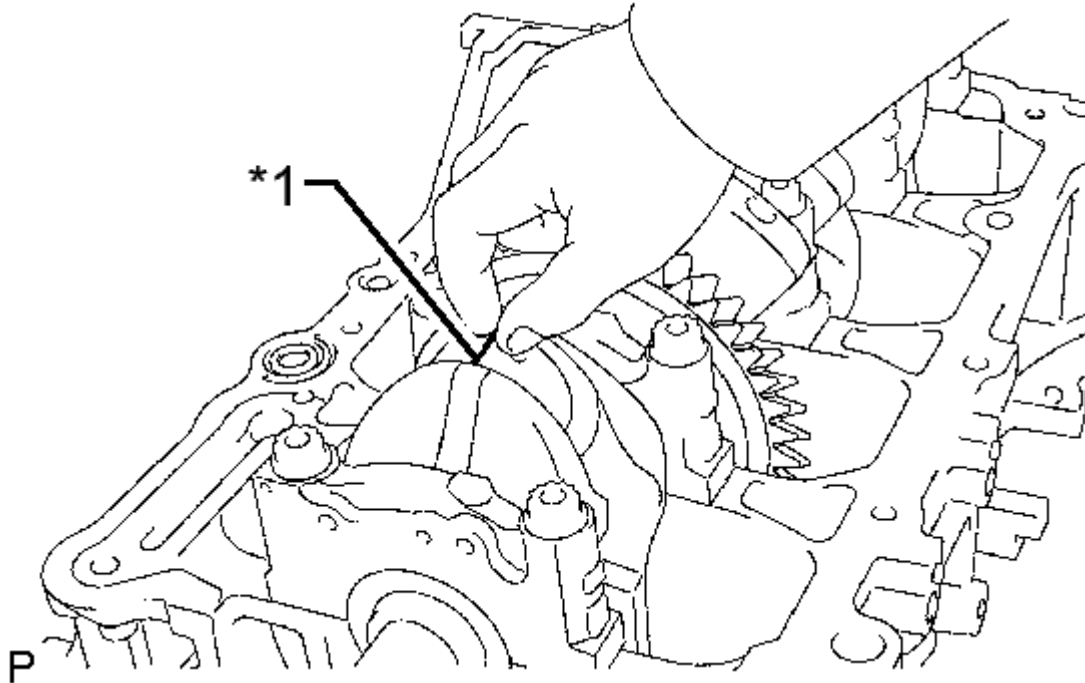


Fig. 214: Inspecting Connecting Rod Oil Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Plastigage
----	------------

- d. Check that the front mark of the connecting rod cap is facing forward.

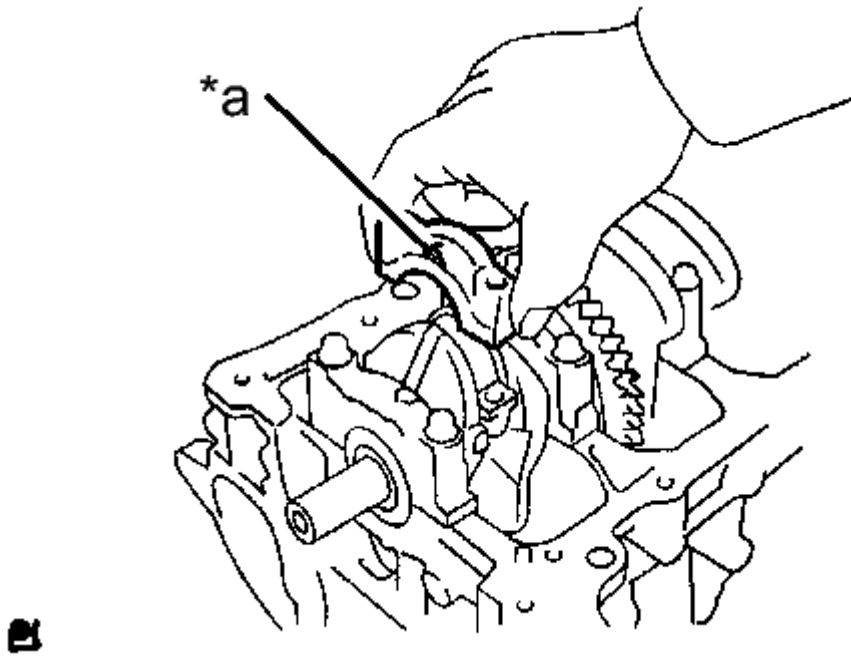


Fig. 215: Installing Connecting Rod Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front Mark
----	------------

- e. Install the connecting rod cap. Refer to **REASSEMBLY**.

NOTE: **Do not turn the crankshaft.**

- f. Remove the 2 bolts and connecting rod cap. Refer to **DISASSEMBLY**.
g. Measure the Plastigage at its widest point.

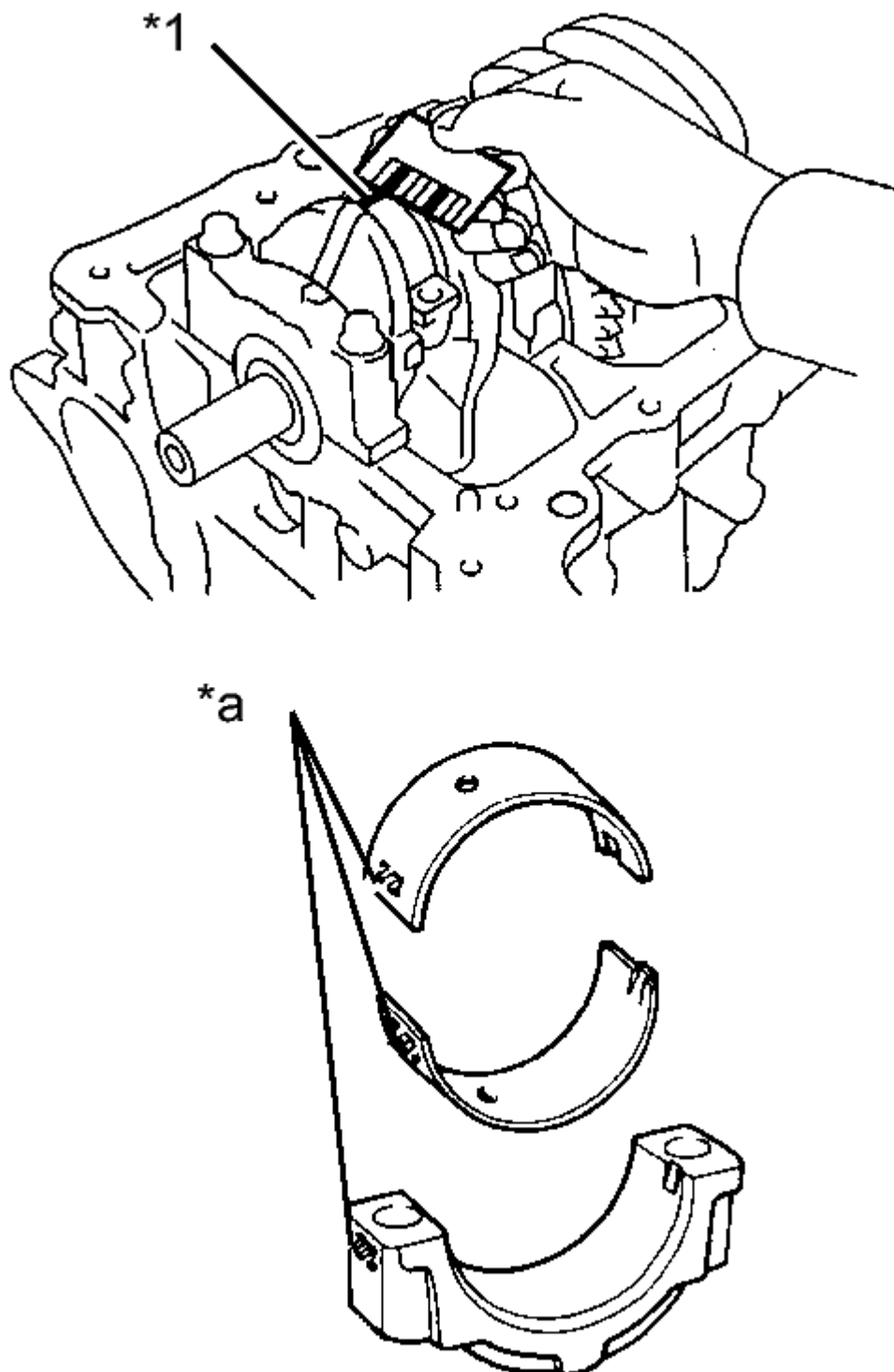


Fig. 216: Inspecting Connecting Rod Bearing Oil Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard oil clearance

0.024 to 0.048 mm (0.0009 to 0.0019 in.)

Maximum oil clearance

0.08 mm (0.0032 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.

TEXT IN ILLUSTRATION

*1	Plastigage
*a	1, 2 or 3 Mark

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.

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

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

Mark	Specified Condition
Mark 1	47.990 to 48.000 (1.8894 to 1.8898 in.)

3. 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.

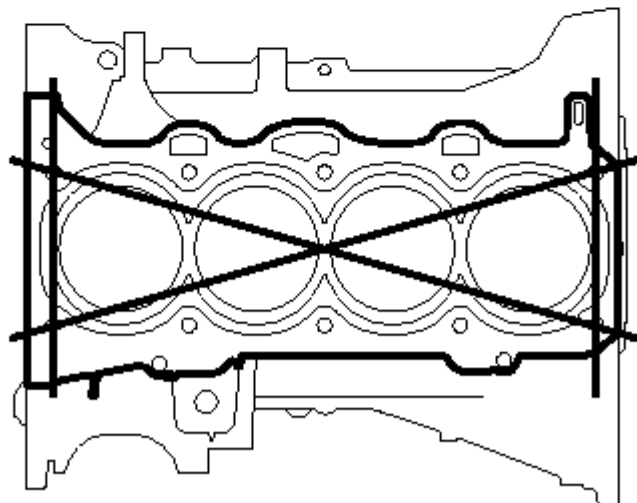
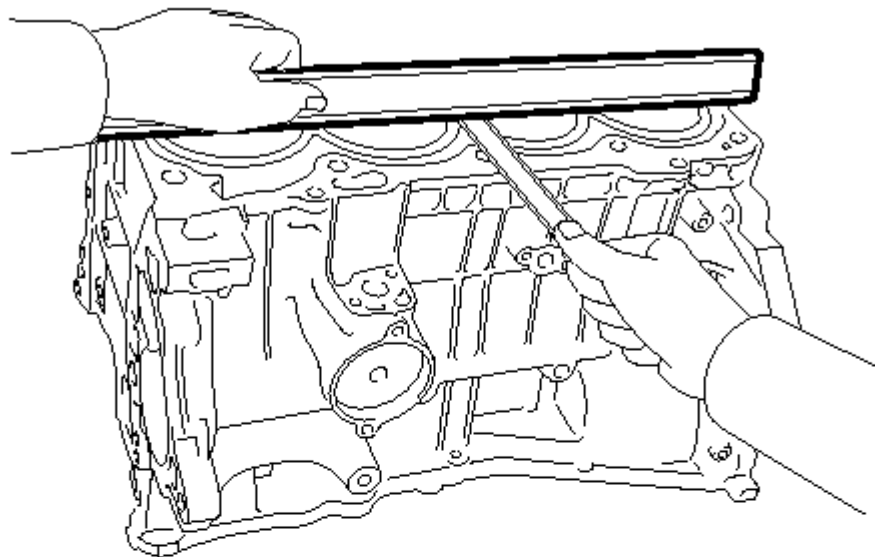
**T**

Fig. 217: Inspecting Cylinder Block For Warpage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

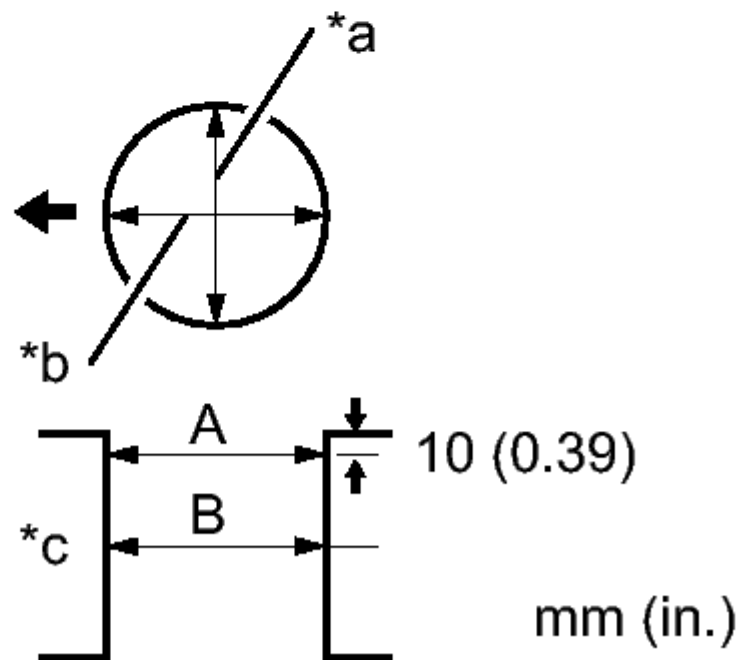
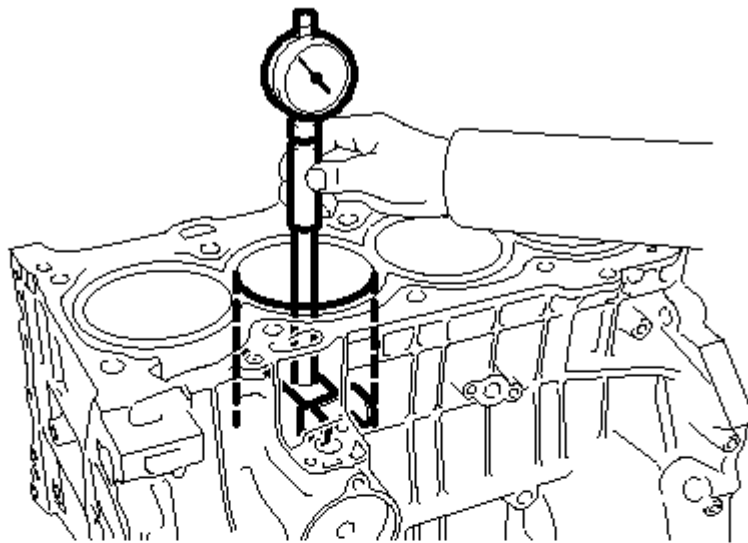
Maximum warpage

0.05 mm (0.0020 in.)

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

4. INSPECT CYLINDER BORE

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



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Fig. 218: Inspecting Cylinder Bore

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

Standard diameter

88.500 to 88.513 mm (3.4843 to 3.4847 in.)

Maximum diameter

88.633 mm (3.4894 in.)

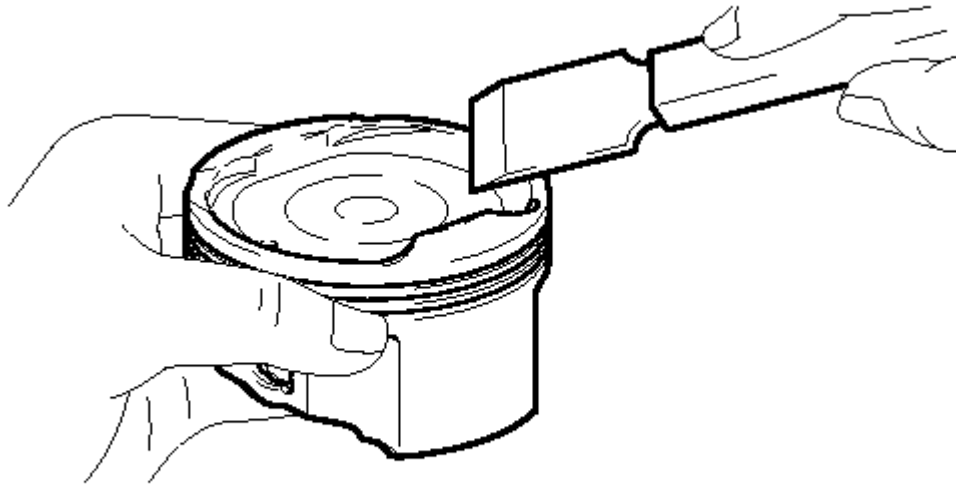
If the average diameter of the 4 positions is greater than the maximum, replace the cylinder block.

TEXT IN ILLUSTRATION

*a	Thrust Direction
*b	Axial Direction
*c	Center
	
Engine Front	

5. INSPECT PISTON

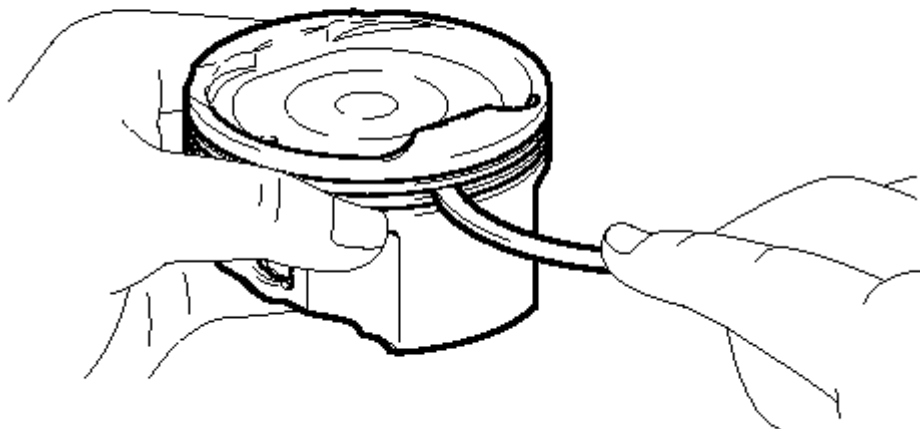
- Using a gasket scraper, remove the carbon from the piston top.



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Fig. 219: Removing Carbon From Piston Top Using A Gasket Scraper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

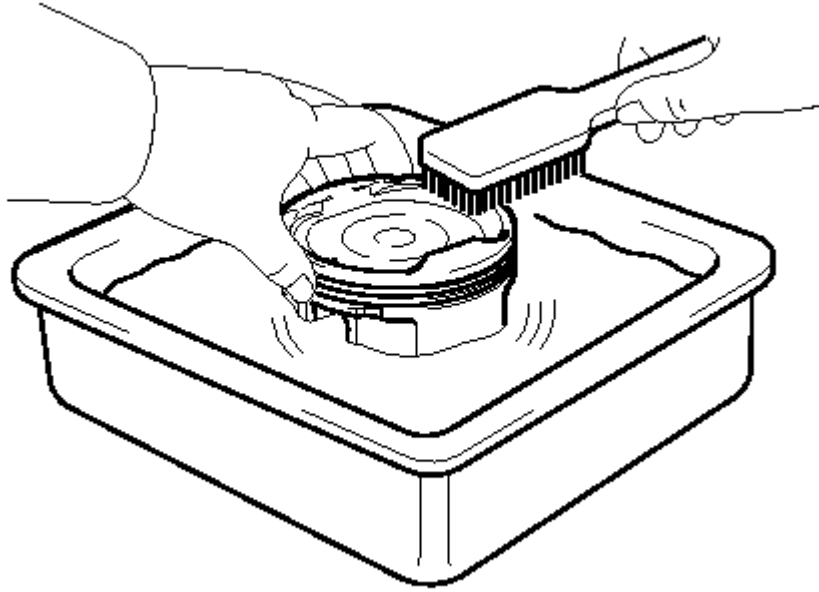
- b. Using a groove cleaning tool or a broken ring, clean the piston ring grooves.



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Fig. 220: Cleaning Piston Ring Grooves
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using a brush and solvent, thoroughly clean the piston.



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Fig. 221: View Of Cleaning Piston

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

NOTE: Do not use a wire brush.

- d. Using a micrometer, measure the piston diameter at right angles to the piston pin hole, and at the piston 44.3 mm (1.744 in.) from the piston head.

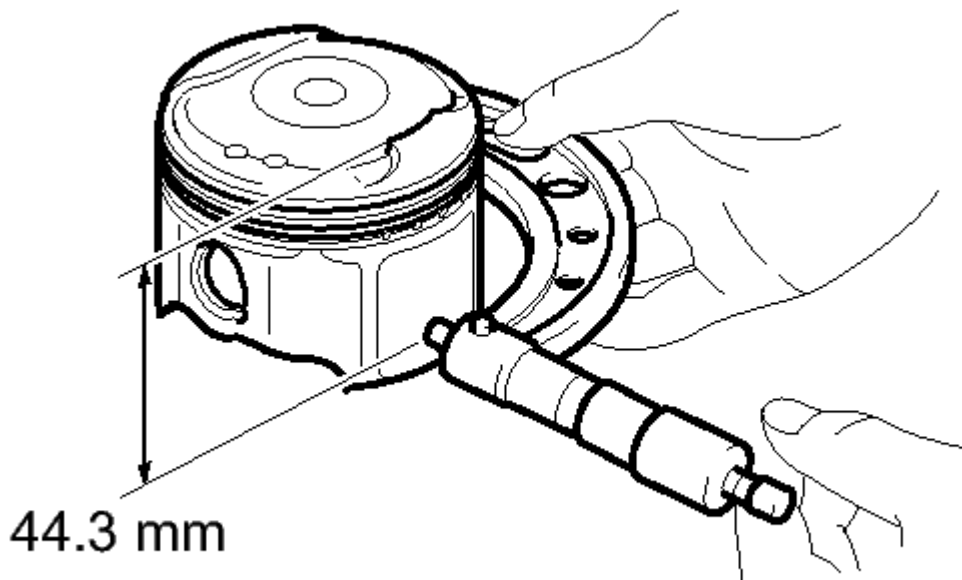


Fig. 222: Measuring Piston Diameter At Right Angles To Piston Pin Hole, And At Piston 44.3 mm (1.7441 in.) From Piston Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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.

6. 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.

7. INSPECT RING GROOVE CLEARANCE

- a. Using a feeler gauge, measure the clearance between a new piston ring and the wall of the ring groove.

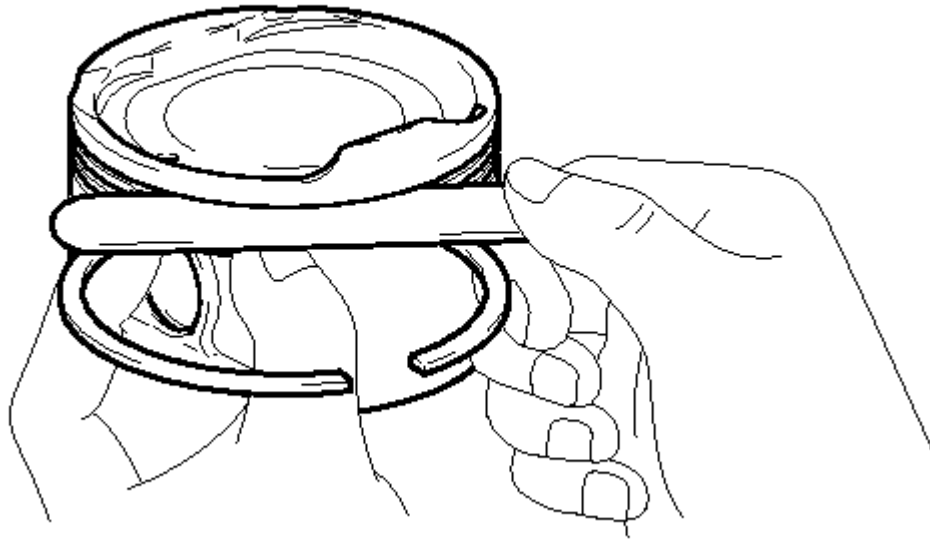
**P**

Fig. 223: Measuring Clearance Between Piston Ring And Wall Of Ring Groove Using Feeler Gauge

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

Standard ring groove clearance

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.

8. INSPECT PISTON RING END GAP

- Using a piston, push the piston ring a little beyond the bottom of the ring travel, 110 mm (4.331 in.) from the top of the cylinder block.

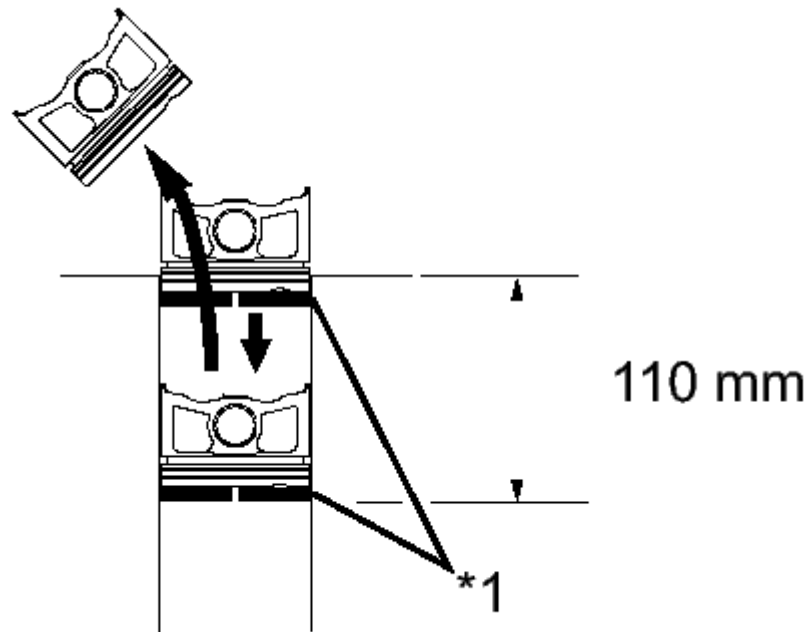


Fig. 224: Inspecting Piston Ring End Gap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Piston Ring
----	-------------

- b. Using a feeler gauge, measure the end gap.

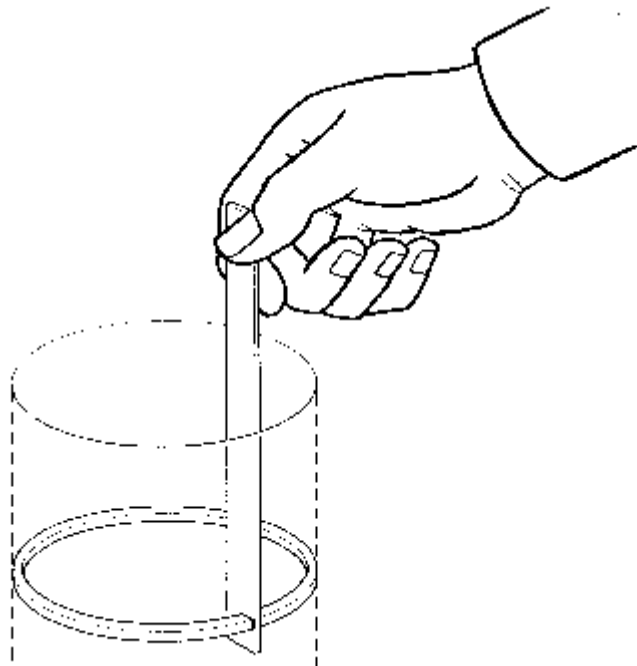


Fig. 225: Measuring Piston Ring End Gap

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

Standard end gap

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 0.20 mm (0.0040 to 0.0079 in.)

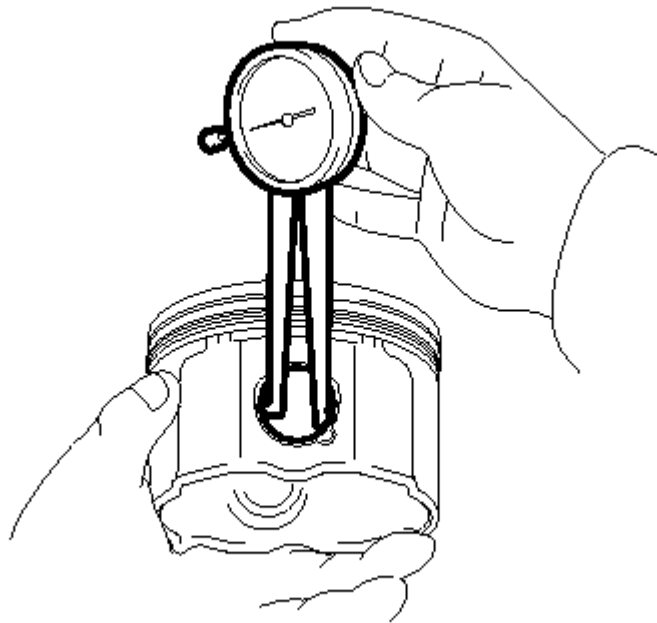
Maximum end gap

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 with a new piston ring, replace the cylinder block.

9. INSPECT PISTON PIN OIL CLEARANCE

- a. Using a caliper gauge, measure the piston pin bore diameter.

**T****Fig. 226: Measuring Piston Pin Bore Diameter Using Caliper Gauge**

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

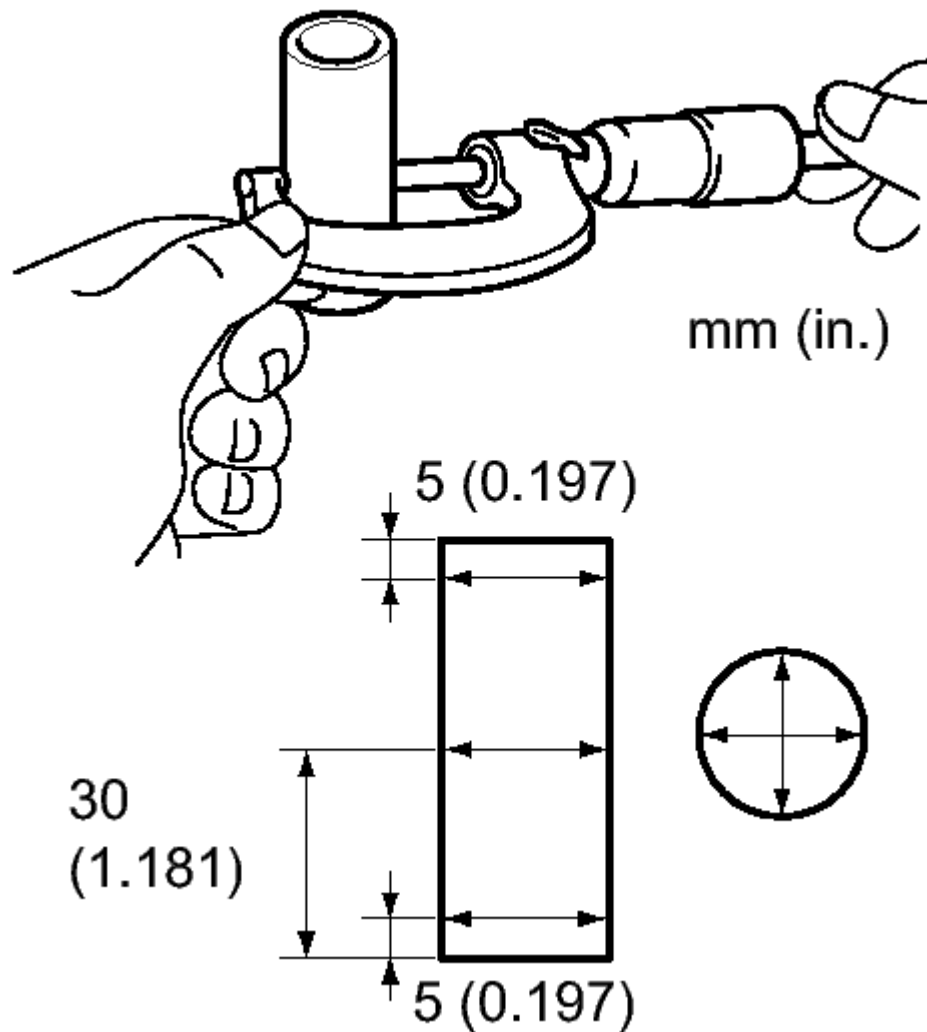
Standard piston pin bore diameter

22.001 to 22.010 mm (0.8662 to 0.8665 in.)

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.



T

Fig. 227: 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.)

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.

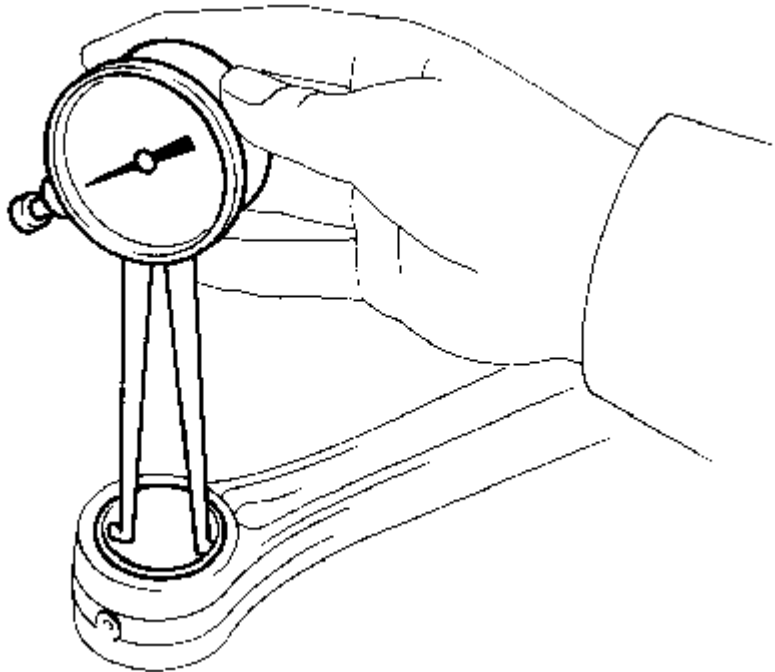


Fig. 228: Measuring Connecting Rod Small End Bore Diameter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard connecting rod small end bore diameter

22.005 to 22.014 mm (0.8663 to 0.8667 in.)

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.

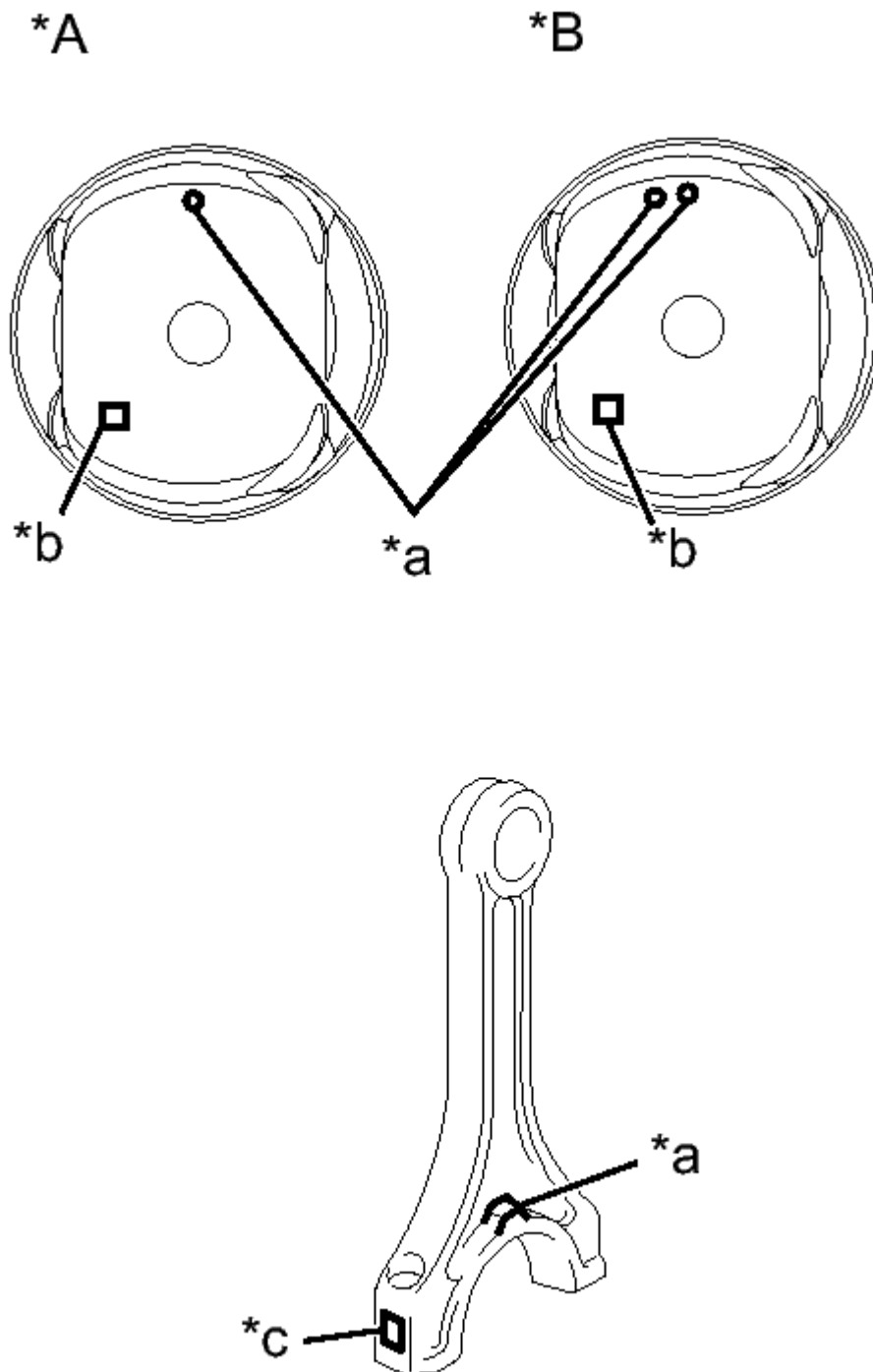


Fig. 229: Location Of Diameter Marks On Piston And Connecting Rod
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard oil clearance

0.001 to 0.007 mm (0.00004 to 0.0003 in.)

Maximum oil clearance

0.013 mm (0.0005 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.

TEXT IN ILLUSTRATION

*A	except TMC Made Engine
*B	for TMC Made Engine
*a	Front Mark
*b	Piston Pin Bore Diameter Mark
*c	Connecting Rod Small End Bore Diameter Mark

- 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

0.017 mm (0.0007 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.

10. INSPECT CONNECTING ROD BOLT

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

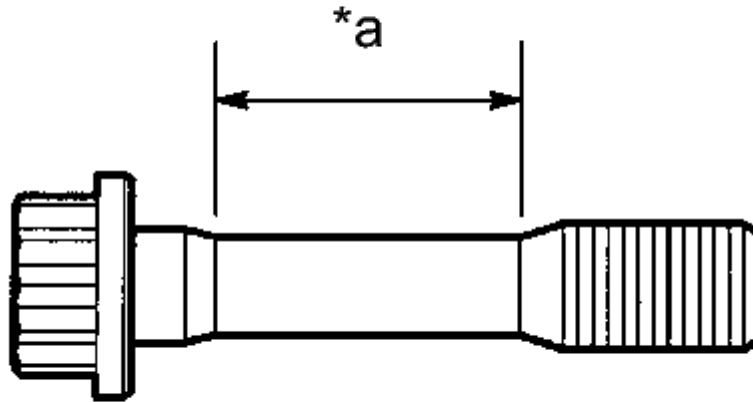


Fig. 230: Inspecting Connecting Rod Bolt

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

Standard diameter

7.2 to 7.3 mm (0.283 to 0.287 in.)

Minimum diameter

7.0 mm (0.276 in.)

TEXT IN ILLUSTRATION

*a	Measuring Area
----	----------------

HINT:

- Diameter measurements should be done at several points.
- If the diameter is less than the minimum, replace the bolt with a new one. Failure to do so may lead to engine damage.
- If there is any thread deformation, replace the bolt with a new one.

11. INSPECT CONNECTING ROD SUB-ASSEMBLY

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

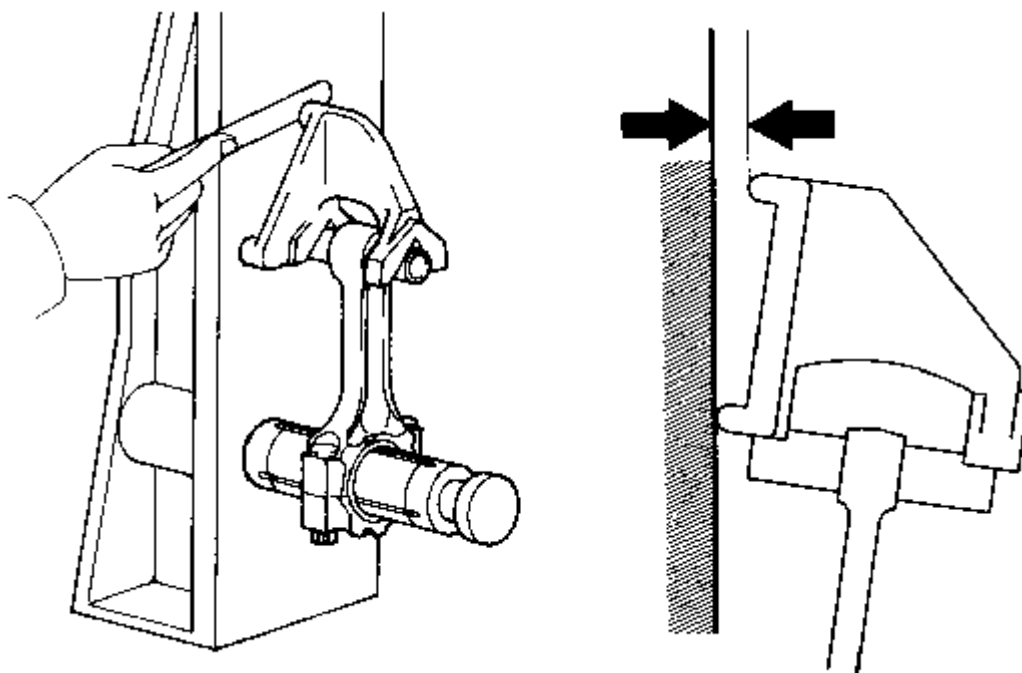


Fig. 231: Checking Misalignment Of Connecting Rod
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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.

2. Check for twist.

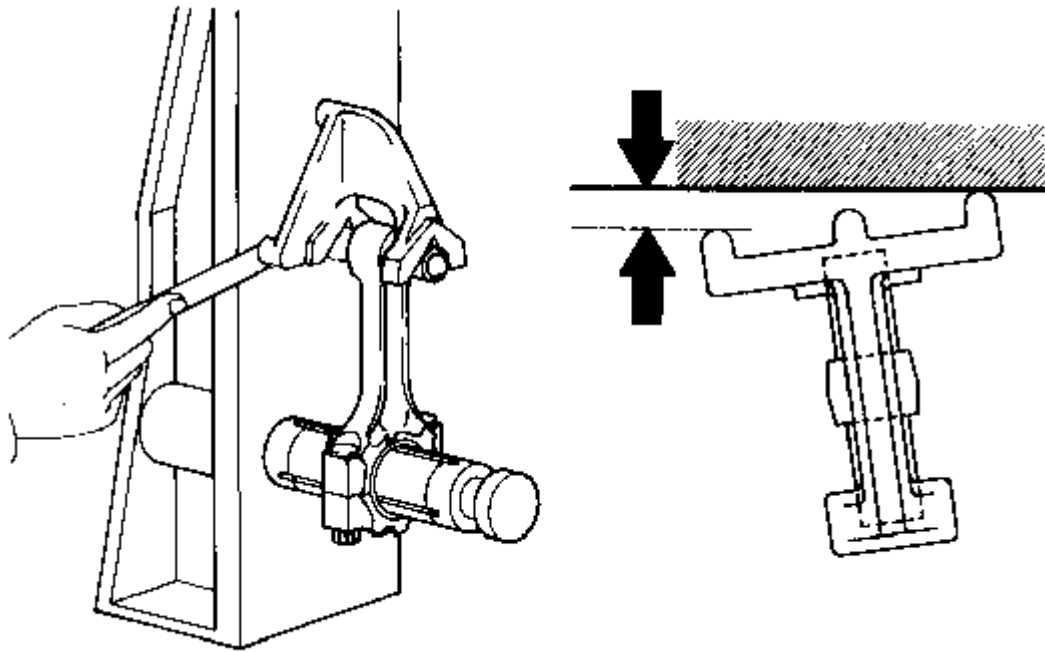


Fig. 232: Checking For Twist Of Connecting Rod
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum twist

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

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

12. INSPECT CRANKSHAFT

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

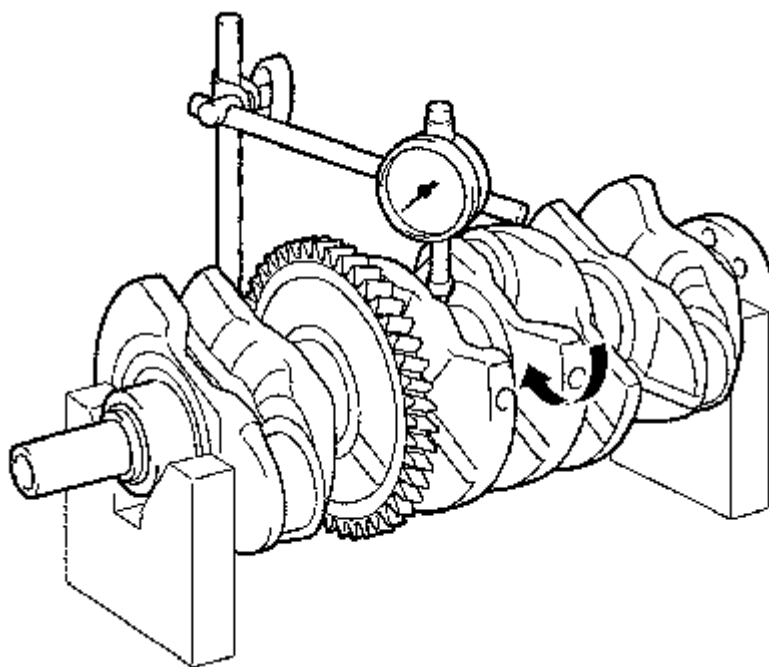
**P**

Fig. 233: Measuring Circle Runout Using Dial Indicator & V-Blocks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum circle runout

0.03 mm (0.0012 in.)

If the taper and distortion are greater than the maximum, replace the crankshaft.

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

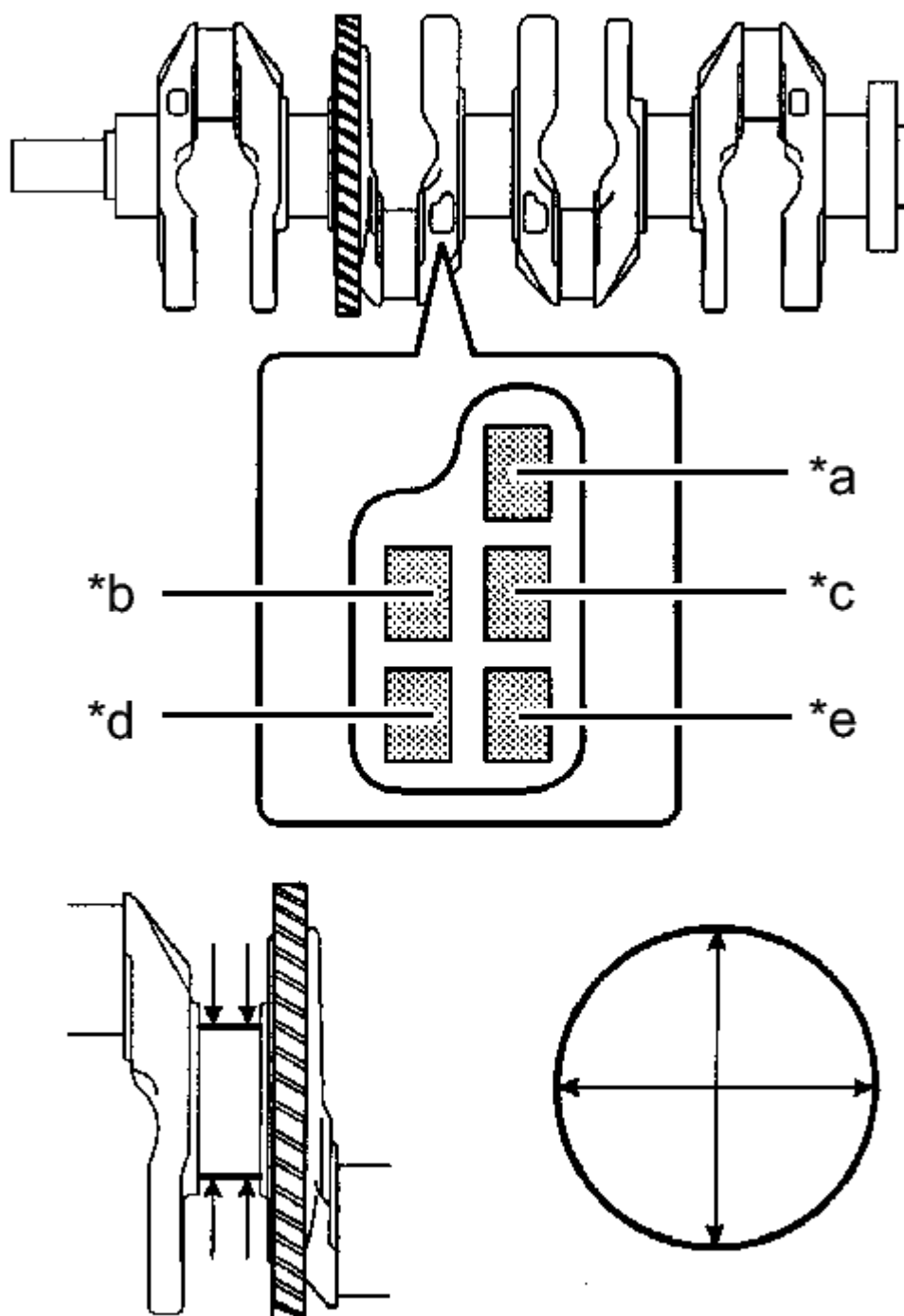


Fig. 234: Measure Diameter of Crankshaft Main Journal
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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.

TEXT IN ILLUSTRATION

*a	No. 1
*b	No. 2
*c	No. 3
*d	No. 4
*e	No. 5

- 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)

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.

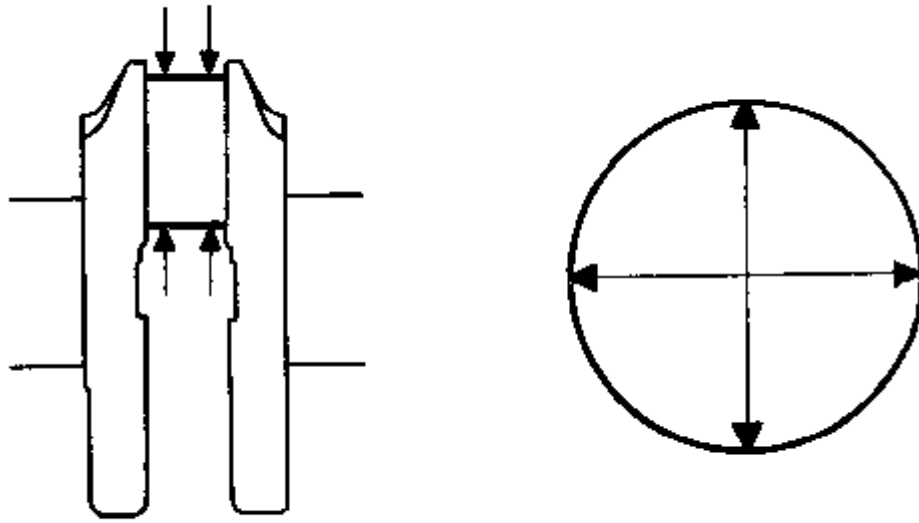


Fig. 235: Measuring Diameter Of Each Crank Pin Using A Micrometer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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.

- 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.

13. INSPECT CRANKSHAFT THRUST CLEARANCE

- a. Install the main bearing cap. Refer to **REASSEMBLY**.
- b. Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

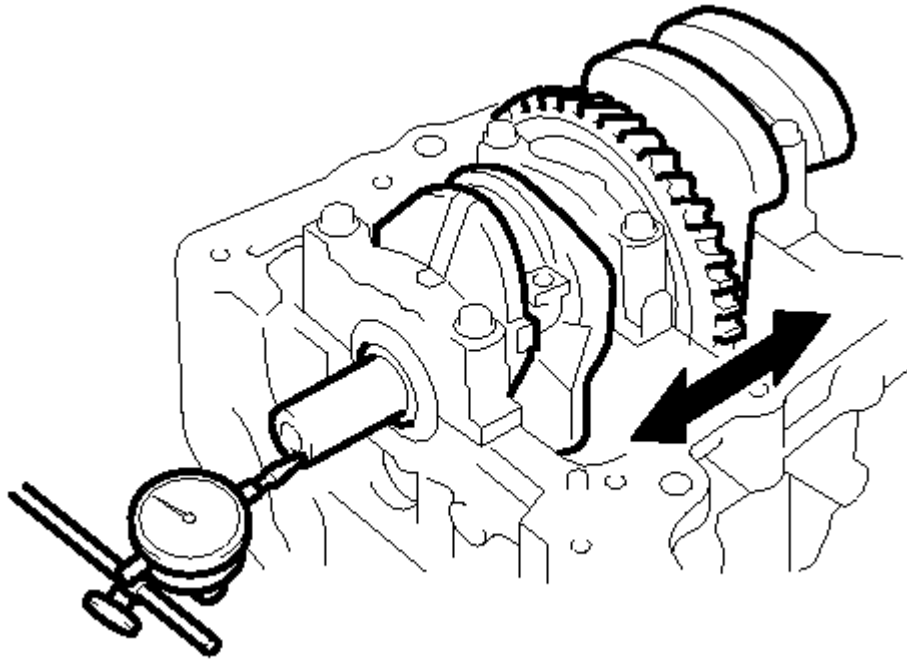
**T**

Fig. 236: Inspecting Crankshaft Thrust Clearance Using Dial Indicator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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.).

14. INSPECT CRANKSHAFT OIL CLEARANCE

- a. Check the crank journal and bearing for pitting and scratches.
- b. Install the crankshaft bearing. Refer to **REASSEMBLY**.
- c. Place the crankshaft on the cylinder block.
- d. Lay a strip of Plastigage across each journal.

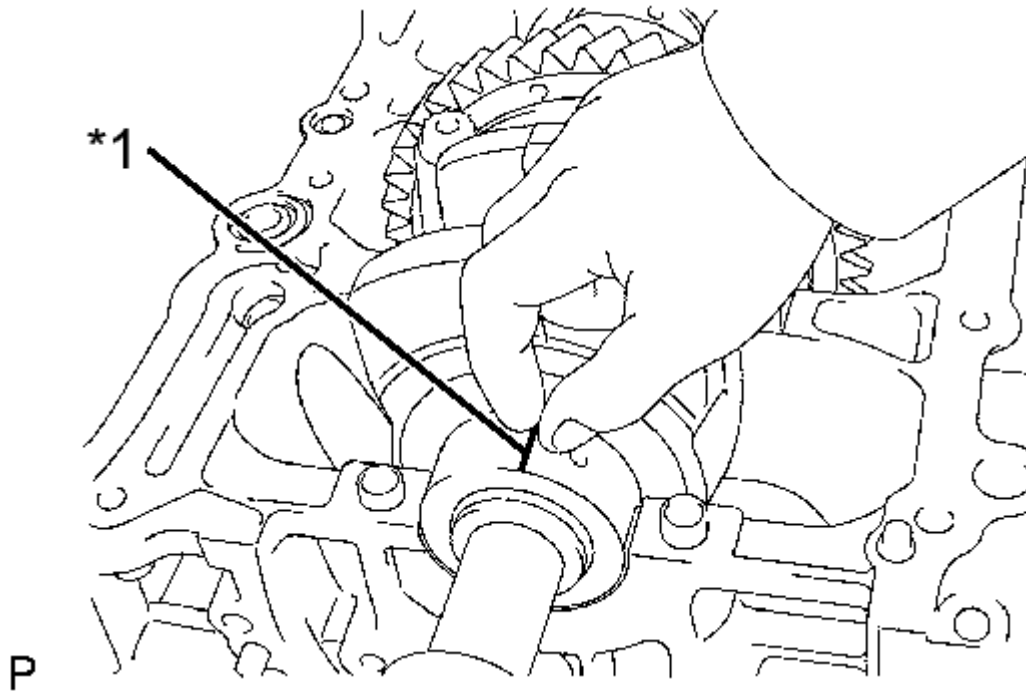


Fig. 237: Laying Strip of Plastigage Across Each Journal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Plastigage
----	------------

- e. 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.

- f. Install the main bearing cap. Refer to **REASSEMBLY**.

NOTE: **Do not turn the crankshaft.**

- g. Remove the main bearing caps See step 9.
h. Measure the Plastigage at its widest point.

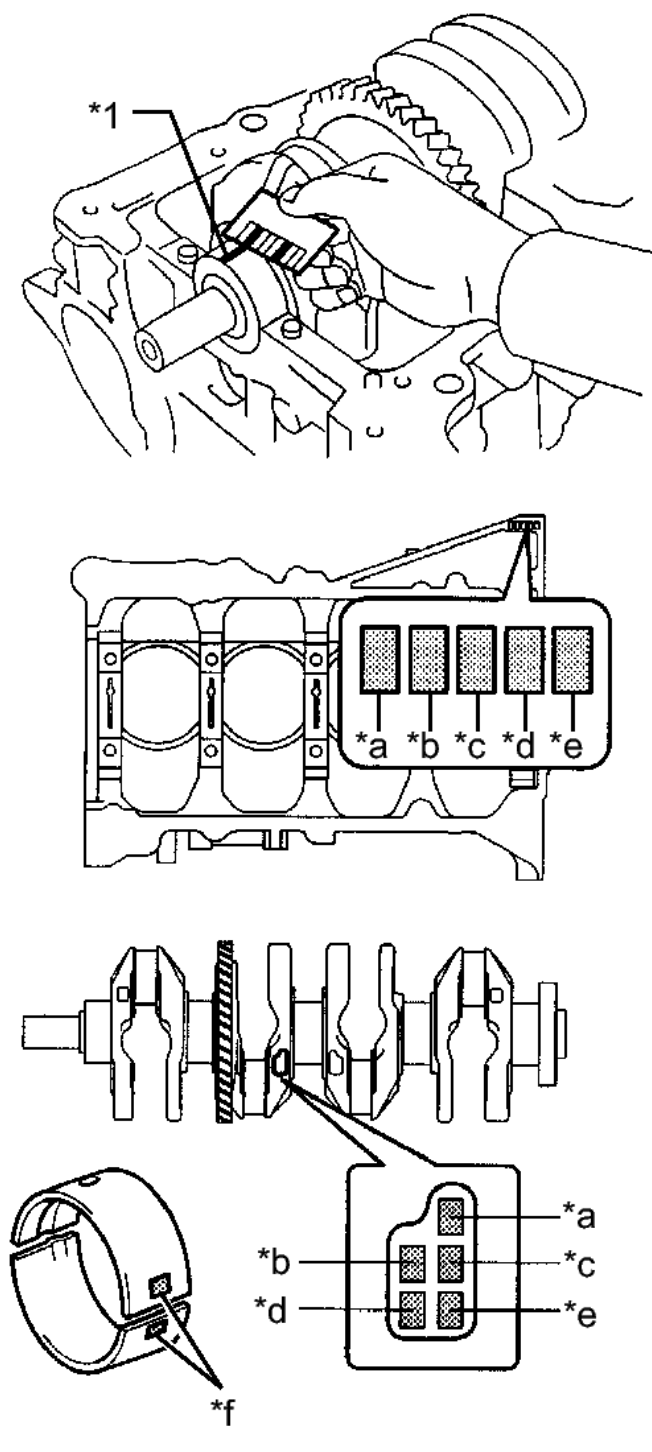


Fig. 238: Measuring Plastigage At Widest Point
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard oil clearance

0.017 to 0.040 mm (0.0007 to 0.0016 in.)

Maximum oil clearance

0.060 mm (0.0024 in.)

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.

TEXT IN ILLUSTRATION

*1	Plastigage
*a	No. 1
*b	No. 2
*c	No. 3
*d	No. 4
*e	No. 5
*f	Number mark

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 "5" = Total number 8 (Use bearing "3")

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

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

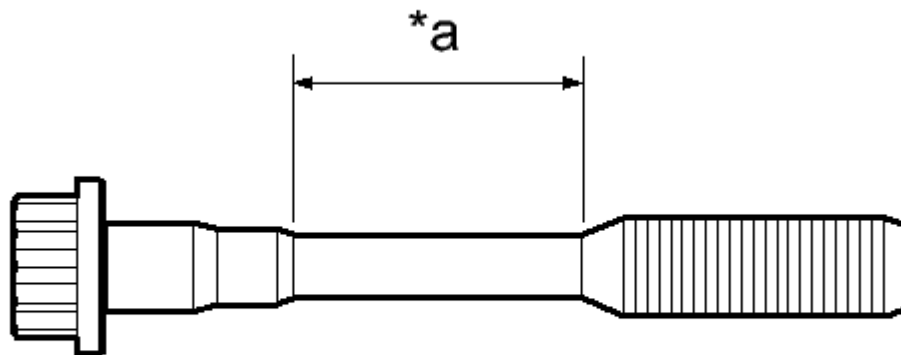
Mark	Specified Condition
0	54.999 to 55.000 mm (2.1653 to 2.1654 in.)
1	54.997 to 54.998 mm (2.1652 to 2.1653 in.)
2	54.995 to 54.996 mm (2.1652 to 2.1652 in.)
3	54.993 to 54.994 mm (2.1651 to 2.1651 in.)
4	54.991 to 54.992 mm (2.1650 to 2.1650 in.)
5	54.988 to 54.990 mm (2.1649 to 2.1650 in.)

Standard bearing center wall thickness

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.)

15. INSPECT CRANKSHAFT BEARING CAP SET BOLT

- Using vernier caliper, measure the tension portion diameter of the bolts.



A64458

Fig. 239: Inspecting Crankshaft Bearing Cap Set Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard diameter

7.5 to 7.6 mm (0.295 to 0.299 in.)

Minimum diameter

7.5 mm (0.295 in.)

TEXT IN ILLUSTRATION

*a	Measuring Area
----	----------------

HINT:

- Diameter measurements should be done at several points.
- If the diameter is less than the minimum, replace the bolt with a new one. Failure to do so may lead to engine damage.
- If there is any thread deformation, replace the bolt with a new one.

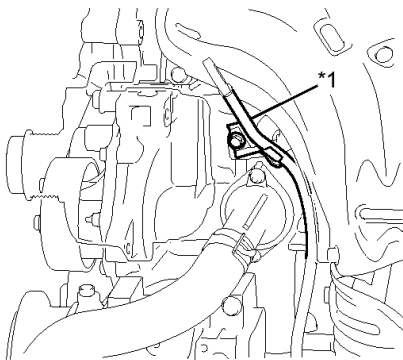
REASSEMBLY

REASSEMBLY

HINT:

Check whether the engine is TMC made or not by referring to the following illustration.

*A



*B

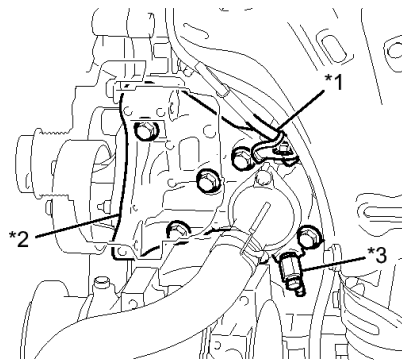


Fig. 240: Identifying Whether The Engine Is TMC Made
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

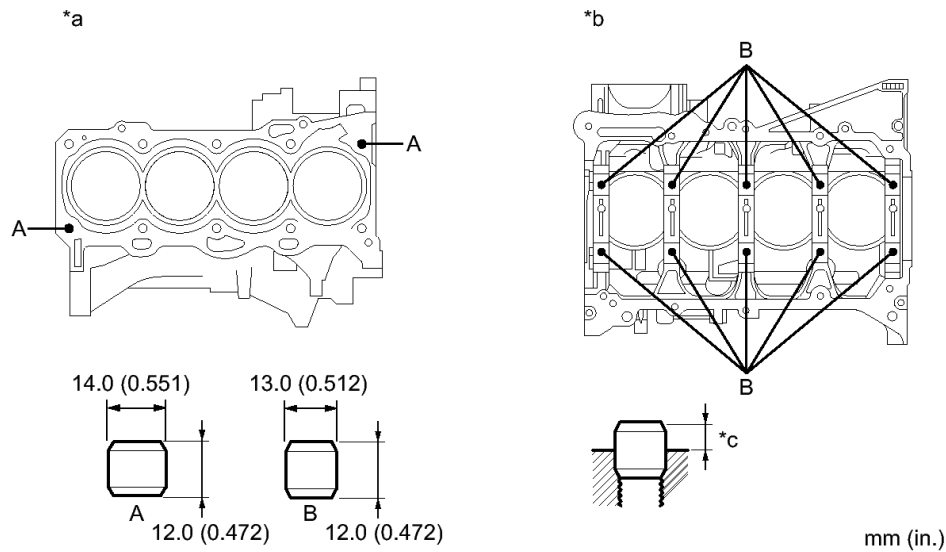
TEXT IN ILLUSTRATION

*A	for TMC Made Engine	*B	except TMC Made Engine
*1	Engine Oil Level Dipstick Guide	*2	Water Inlet Housing
*3	Water Inlet Housing Drain Cock Assembly	-	-

REASSEMBLY

1. INSTALL RING PIN

- a. Using a plastic hammer, tap in the ring pins.



T

Fig. 241: Identifying Ring Pins

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

TEXT IN ILLUSTRATION

*a	Upper Side	*b	Lower Side
*c	Protrusion Height	-	-

Standard Protrusion

Item	Protrusion
A	6 mm (0.236 in.)
B	5 mm (0.197 in.)

2. INSTALL STUD BOLT (for TMC Made Engine)

- a. Using an E5 or E7 "TORX" socket, install the stud bolts.

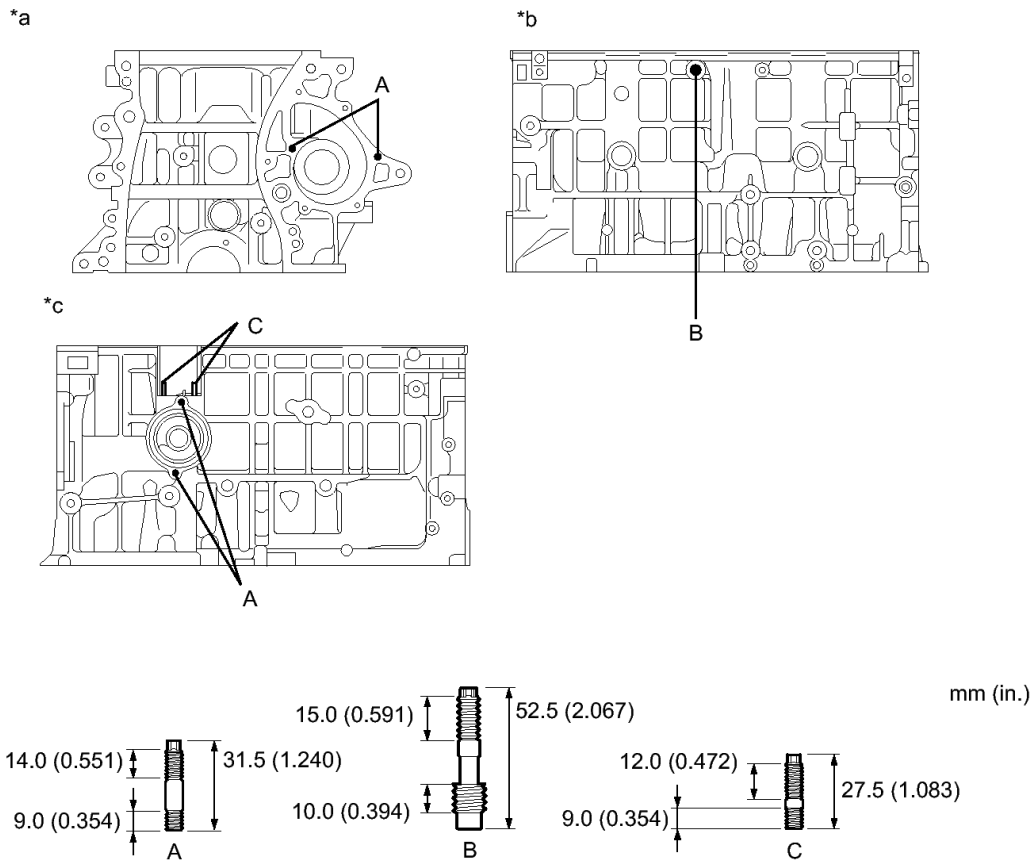


Fig. 242: Identifying Stud Bolts (For Tmc Made Engine)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front Side	*b	RH Side
*c	LH Side	-	-

Stud Bolt A, C

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

Stud Bolt B

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

3. INSTALL STUD BOLT (except TMC Made Engine)

- Using a E7 "TORX" socket wrench, install the stud bolt as shown in the illustration.

*a

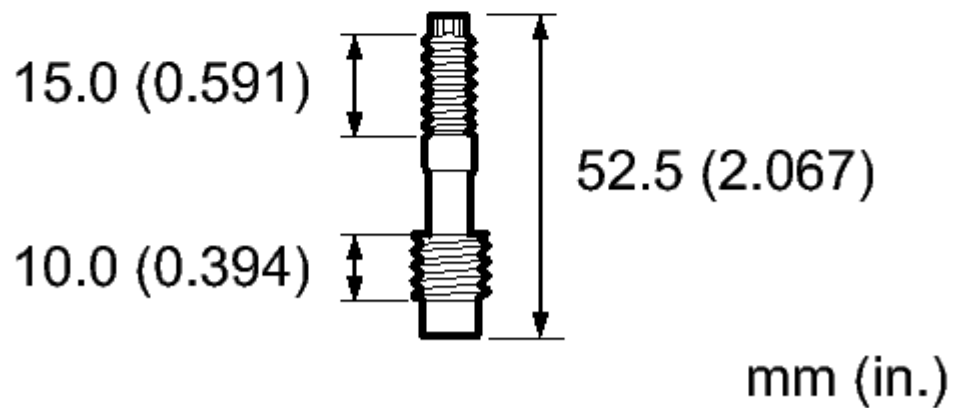
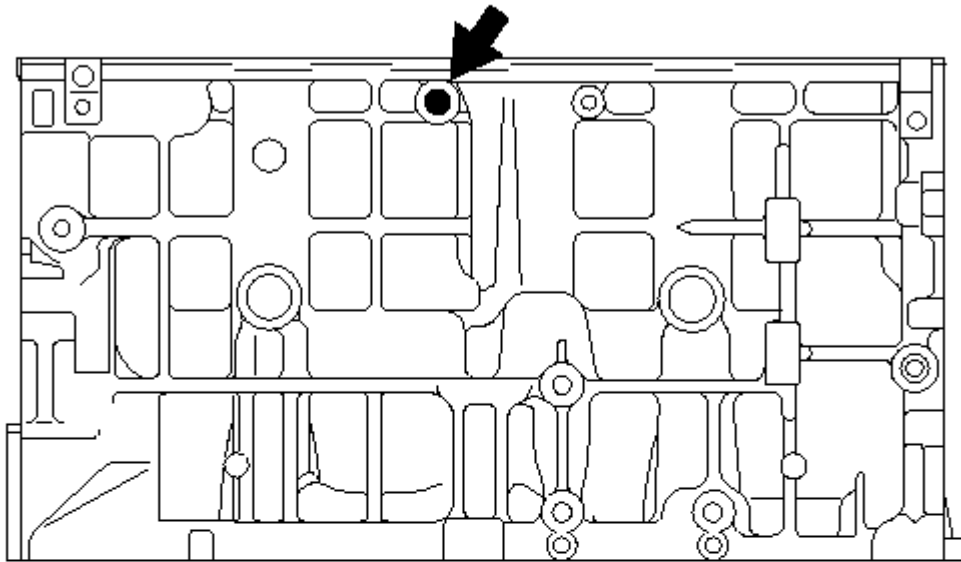


Fig. 243: Identifying Stud Bolts (Except Tmc Made Engine)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

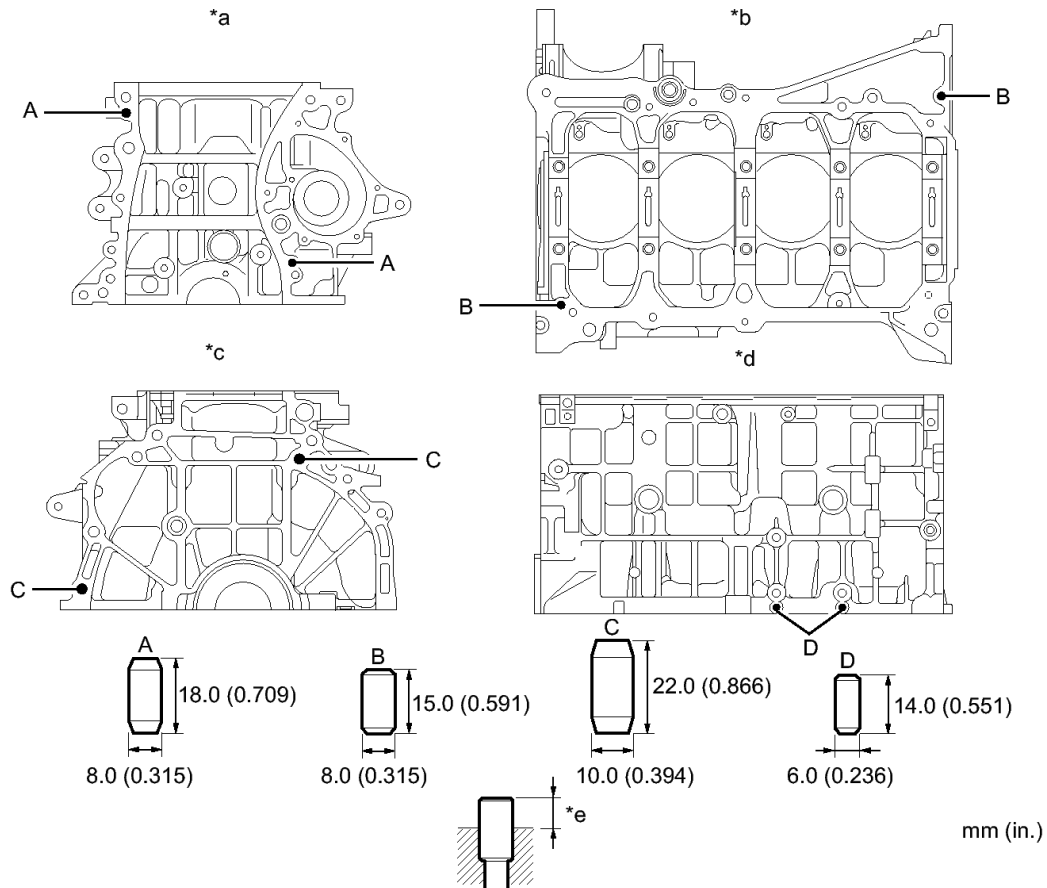
Torque: 9.5 N*m (97 kgf*cm, 84 in.*lbf)

TEXT IN ILLUSTRATION

*a RH Side

4. INSTALL STRAIGHT PIN (for TMC Made Engine)

- a. Using a plastic hammer, tap in the straight pins.



T

Fig. 244: Identifying Straight Pins (For Tmc Made Engine)

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

TEXT IN ILLUSTRATION

*a	Front Side	*b	Lower Side
*c	Rear Side	*d	RH Side
*e	Protrusion Height	-	-

Standard Protrusion

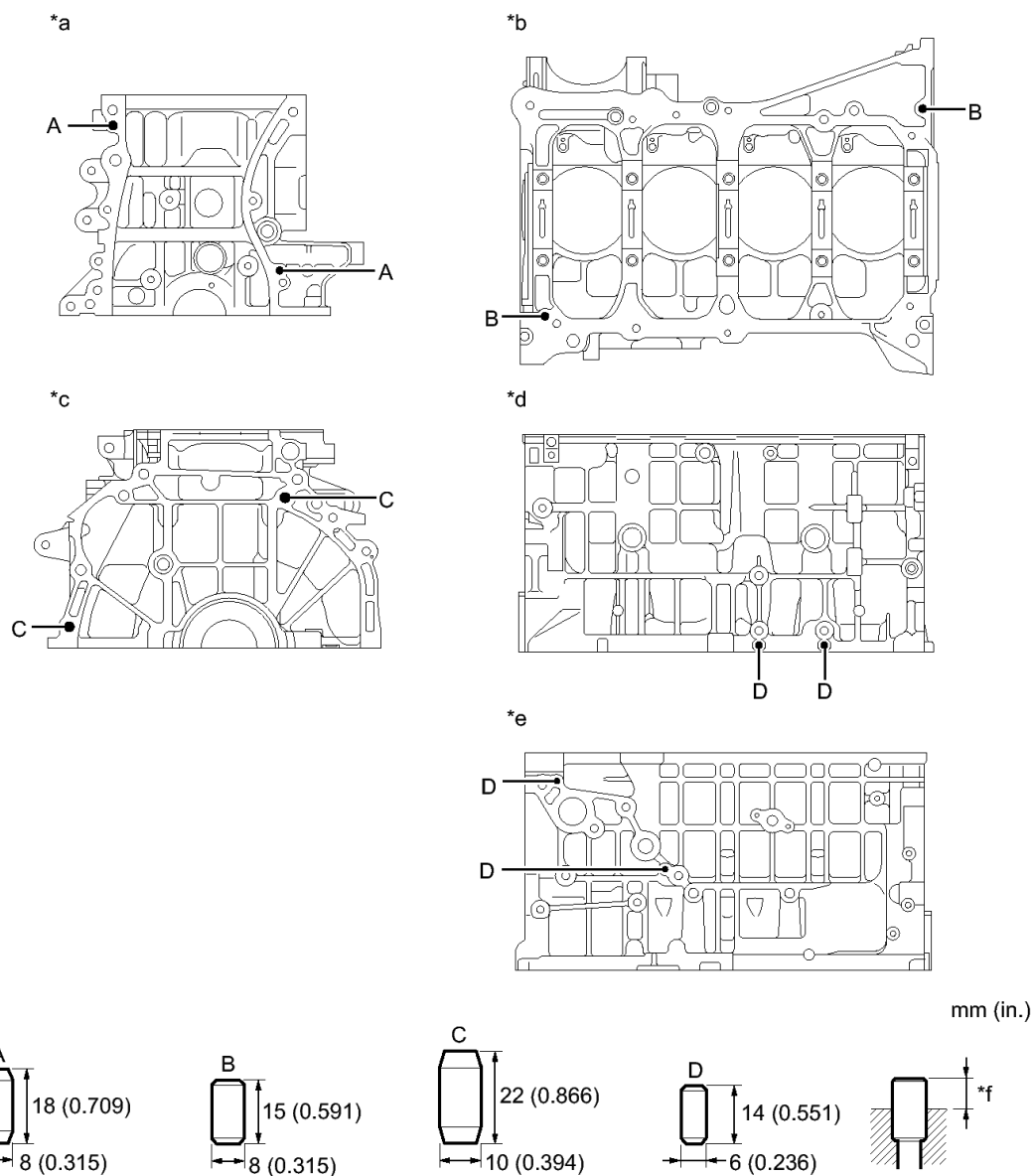
Item	Protrusion
A	8 mm (0.315 in.)
B	7.5 mm (0.295 in.)
C	12 mm (0.472 in.)

D

5 mm (0.197 in.)

5. INSTALL STRAIGHT PIN (except TMC Made Engine)

- Using a plastic hammer, tap in the straight pins.



T

Fig. 245: Identifying Straight Pins (Except Tmc Made Engine)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front Side	*b	Lower Side
*c	Rear Side	*d	RH Side
*e	LH Side	*f	Protrusion Height

Standard Protrusion

Item	Protrusion
A	8 mm (0.315 in.)
B	7.5 mm (0.295 in.)
C	12 mm (0.472 in.)
D	5 mm (0.197 in.)

6. **INSPECT CRANKSHAFT OIL CLEARANCE** See step 14.
7. **INSTALL NO. 1 OIL NOZZLE SUB-ASSEMBLY**
 - a. Using a 5 mm hexagon wrench, install the oil nozzles with the bolts.

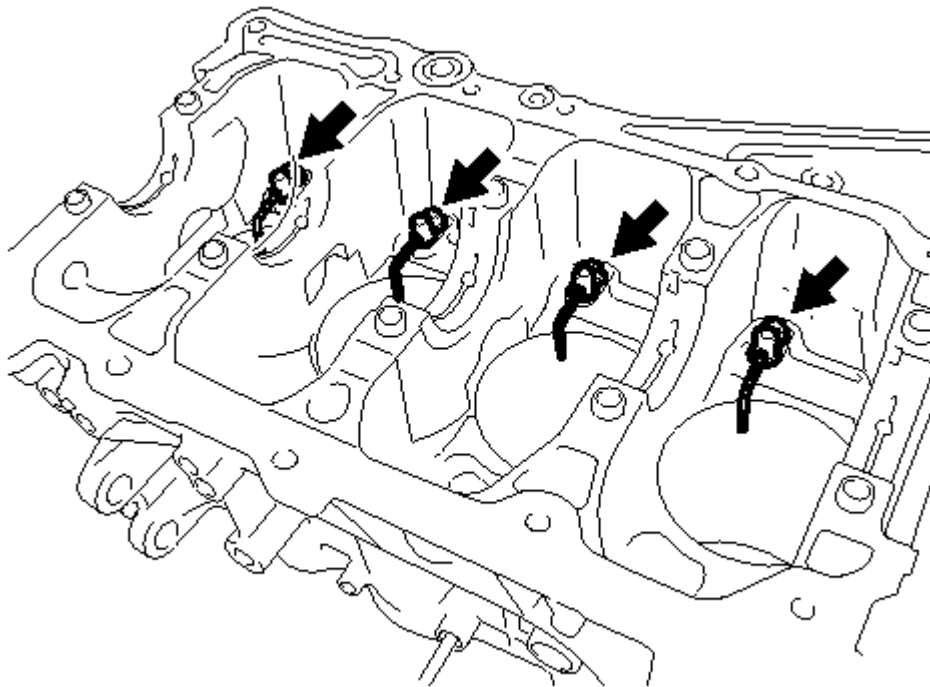
**T**

Fig. 246: Location of Oil Nozzles And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 7.0 N*m (71 kgf*cm, 62 in.*lbf)

8. **INSTALL PISTON**
 - a. Using a screwdriver, install a new snap ring at one end of the piston pin hole.

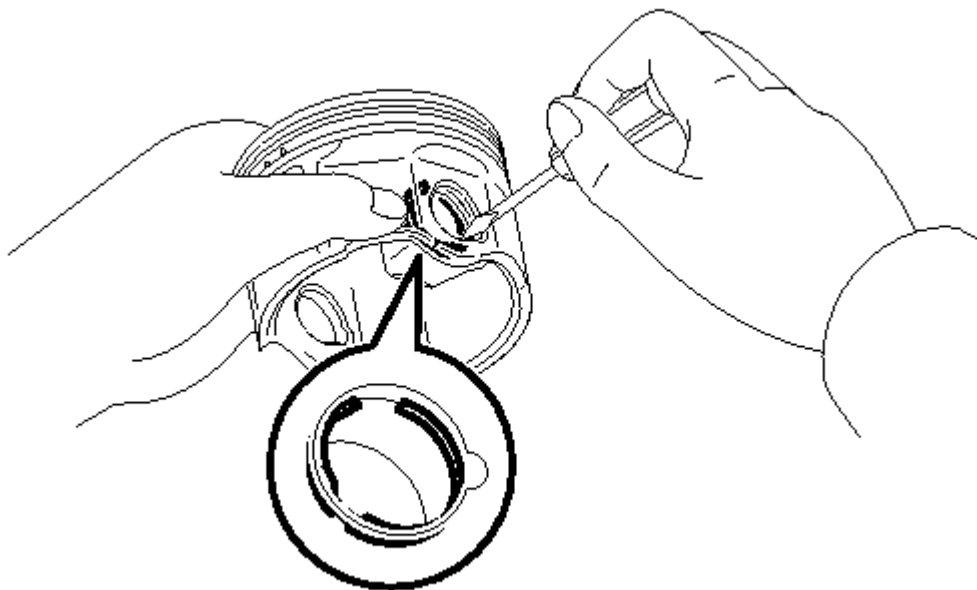
**T**

Fig. 247: Installing Snap Ring Using Screwdriver

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

HINT:

Make sure that the end gap on the snap ring is not aligned with the pin hole cutout portion of the piston.

- b. Gradually heat the piston to approximately 80 to 90 °C (176 to 194 °F).
- c. Align the front marks on the piston and connecting rod, and push in the piston with your thumb.

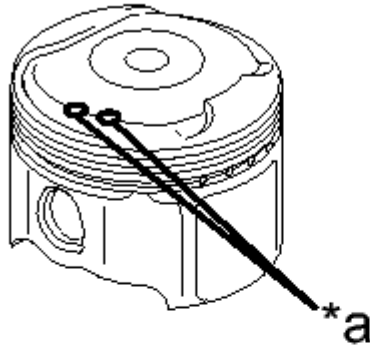
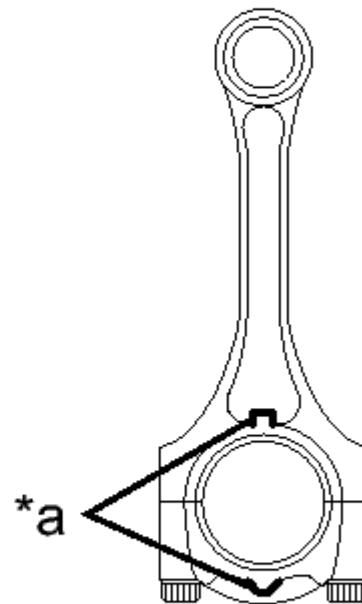
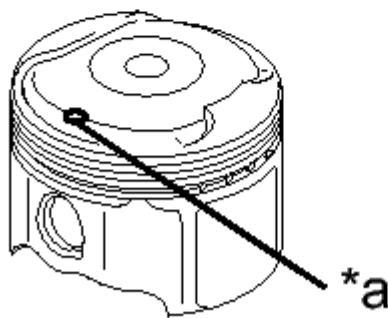
A**B**

Fig. 248: Aligning Front Marks On Piston And Connecting Rod
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*A	for TMC Made Engine
*B	except TMC Made Engine
*a	Front Mark

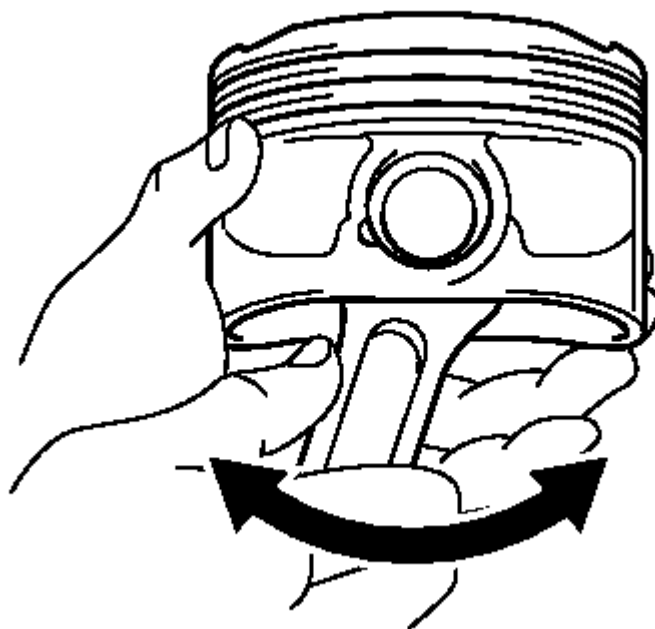
- d. Using a screwdriver, install a new snap ring on the other end of the piston pin hole.

HINT:

Make sure that the end gap on 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.



Y

Fig. 249: Checking Fitting Condition Between Piston And Piston Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. INSTALL PISTON RING SET

- a. Install the oil ring expander and oil ring rail by hand.

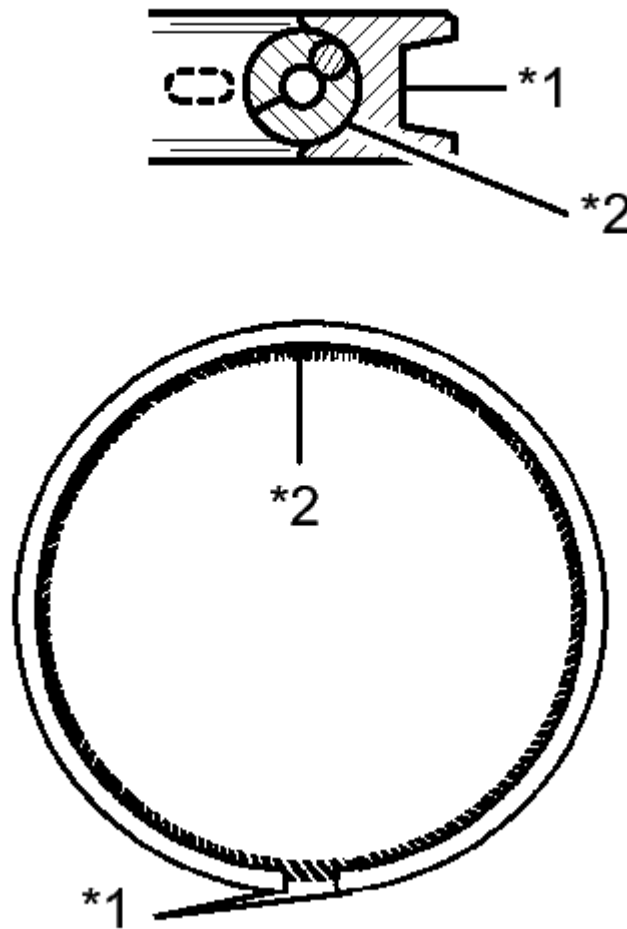


Fig. 250: Identifying Oil Ring Expander And Rail
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Install the expander and oil ring so that their ring ends are at opposite sides.
- Securely install the expander into the inner groove of the oil ring.

TEXT IN ILLUSTRATION

*1	Oil Ring
*2	Oil Ring (Expander)

- b. Using a piston ring expander, install the 2 compression rings so that the paint marks are positioned as shown in the illustration.

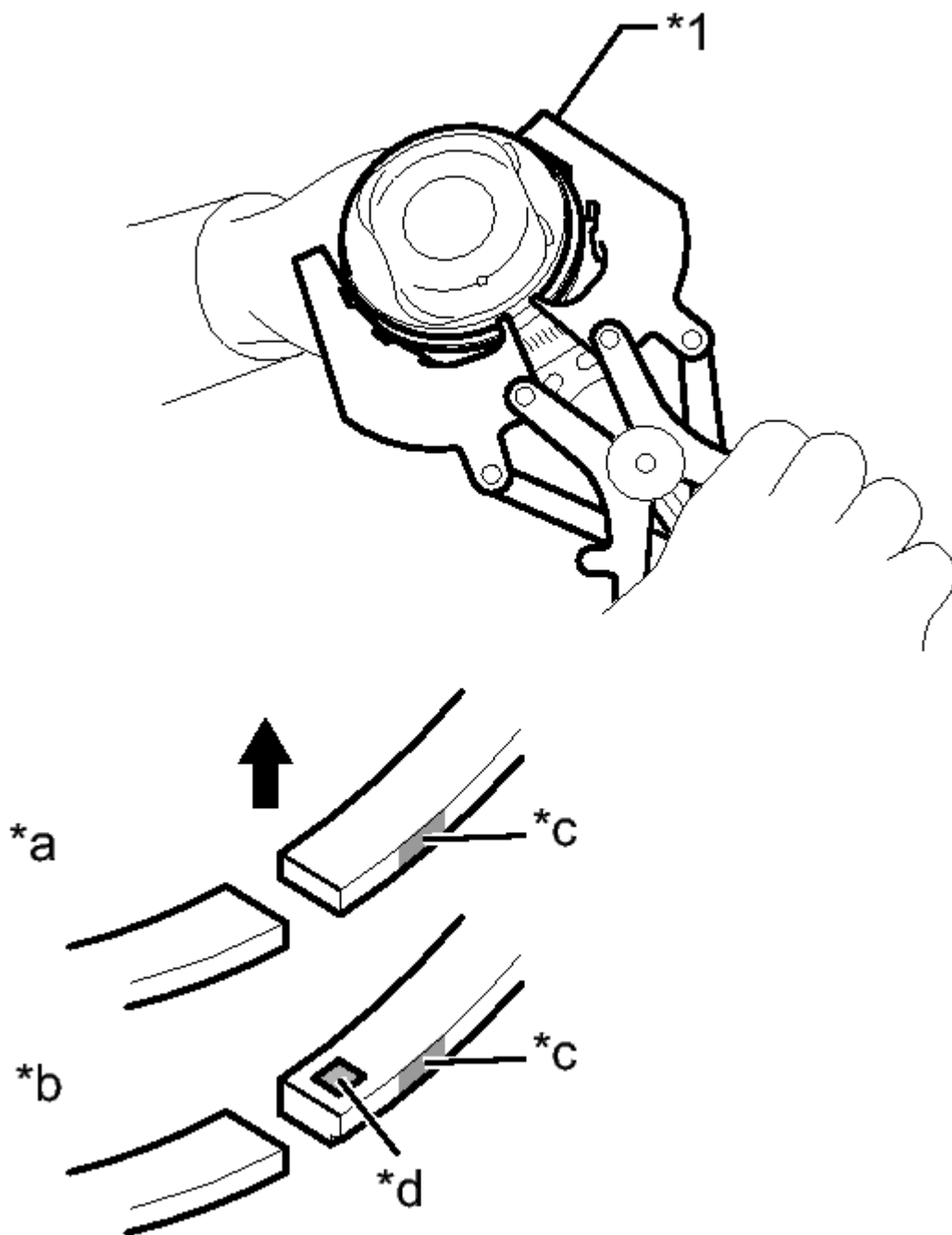


Fig. 251: Installing Compression Rings

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

NOTE:

- Compression ring No. 1 may be installed with either side facing upward.

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

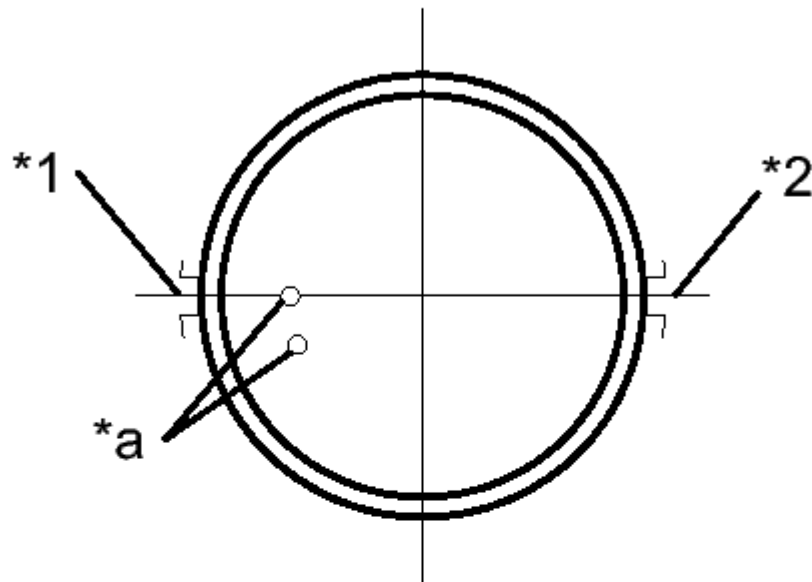
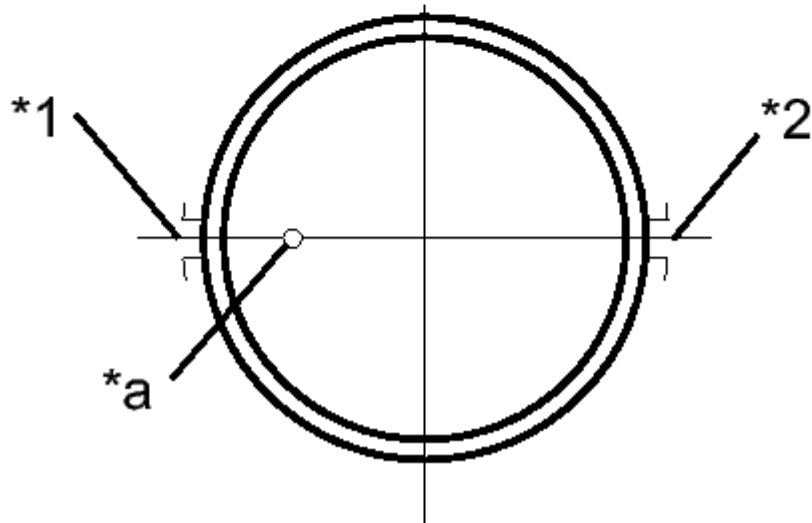
TEXT IN ILLUSTRATION

*1	Piston Ring Expander
*a	No. 1
*b	No. 2
*c	Paint Mark
*d	Code Mark (2N)
	
	Upward

HINT:

Supply part compression springs (No. 1 and No. 2) do not have paint marks.

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

A**B****Fig. 252: Identifying Piston Ring Position**

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

TEXT IN ILLUSTRATION

*A	for TMC Made Engine
----	---------------------

*B	except TMC Made Engine
*1	No. 1 and Oil Ring Rail
*2	No. 2 and Oil Ring Rail
*a	Front Mark

10. INSTALL CRANKSHAFT BEARING

- Install the upper bearing with an oil groove on the cylinder block.

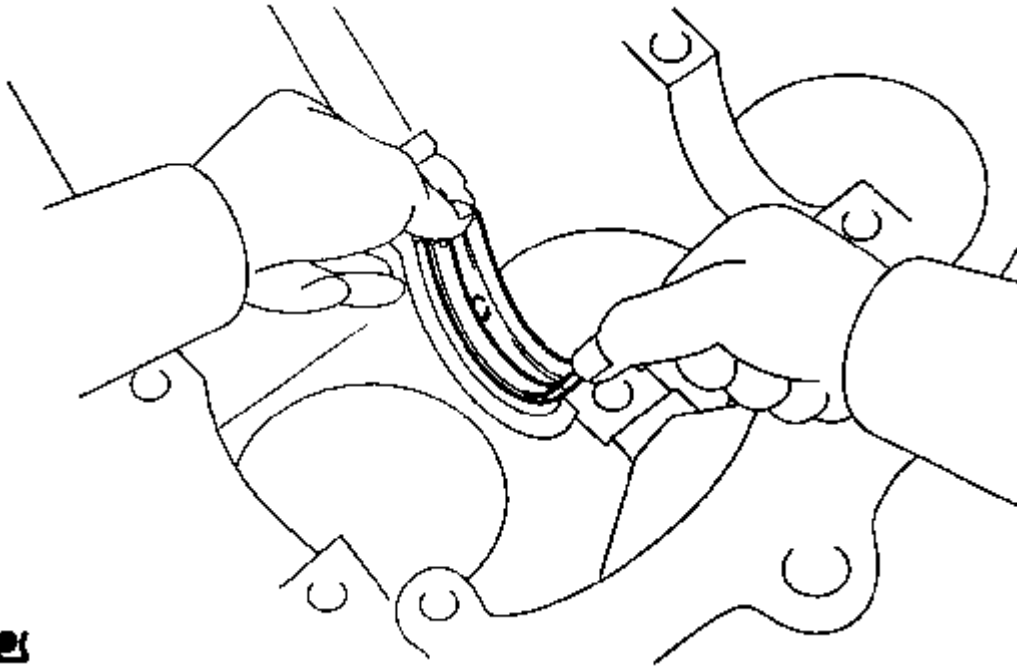
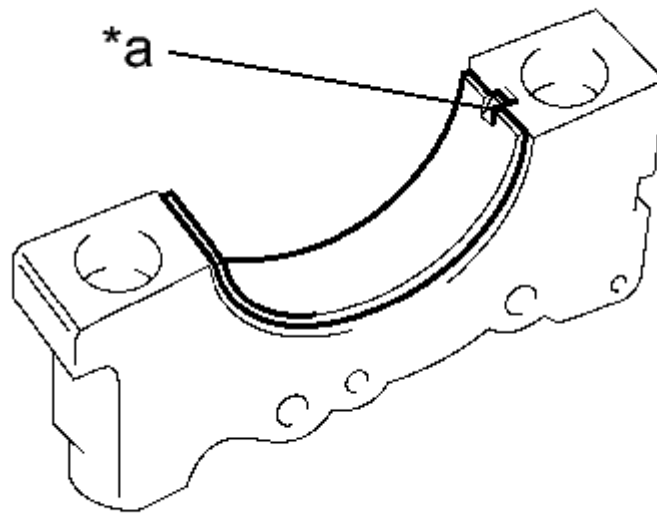


Fig. 253: Installing Upper Bearing With An Oil Groove On Cylinder Block
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Do not apply engine oil to the bearings or the contact surfaces.

11. INSTALL NO. 2 CRANKSHAFT BEARING

- Install the No. 2 crankshaft bearing on the bearing cap.



A63909

Fig. 254: Installing No. 2 Crankshaft Bearing

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

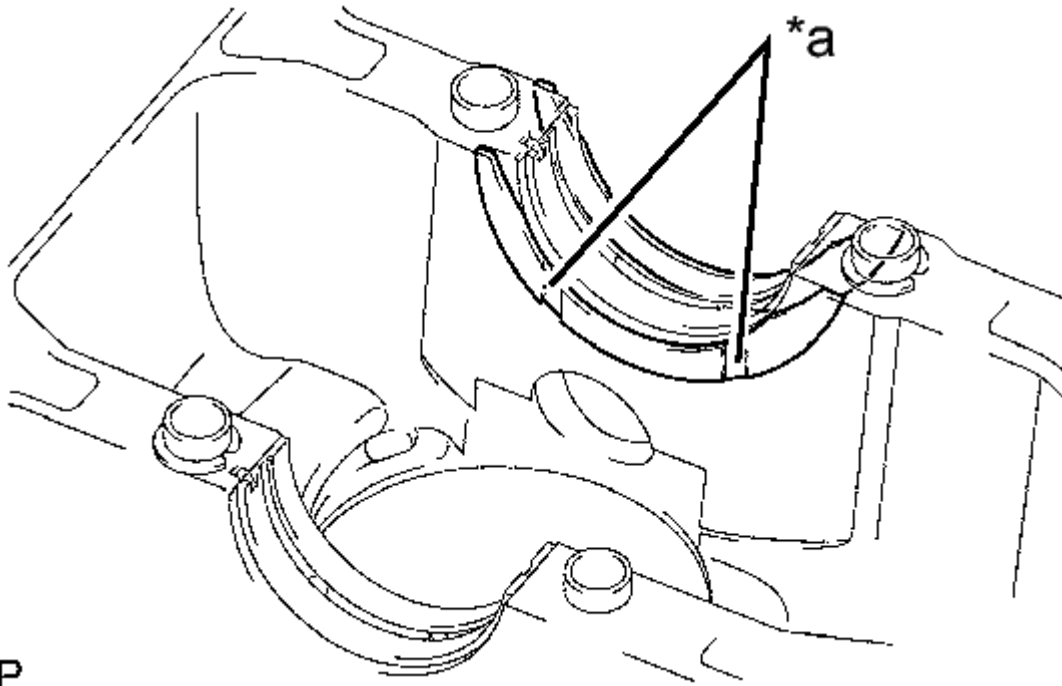
NOTE: Clean the backside of the bearing and the bearing surface of the connecting rod. The surface should be free of dust and oils.

TEXT IN ILLUSTRATION

*a	Claw
----	------

12. 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.



P
Fig. 255: Identifying Upper Crankshaft Thrust Washer Facing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: **Make sure to install the proper thrust washers.**

TEXT IN ILLUSTRATION

*a	Oil Groove
----	------------

- b. Apply engine oil to the crankshaft thrust washer.

13. INSTALL CRANKSHAFT

- a. Apply engine oil to the crankshaft bearing and install the crankshaft on the cylinder block.
- b. Apply engine oil to the No. 2 crankshaft bearing.
- c. Examine the front marks and install the bearing caps on the cylinder block.

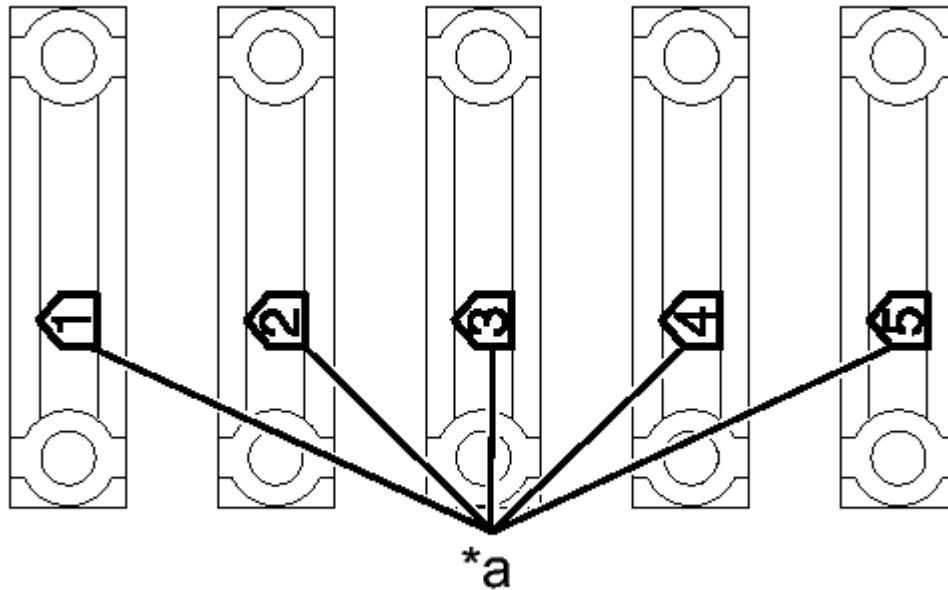
**T**

Fig. 256: Identifying Front Marks On Bearing Caps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

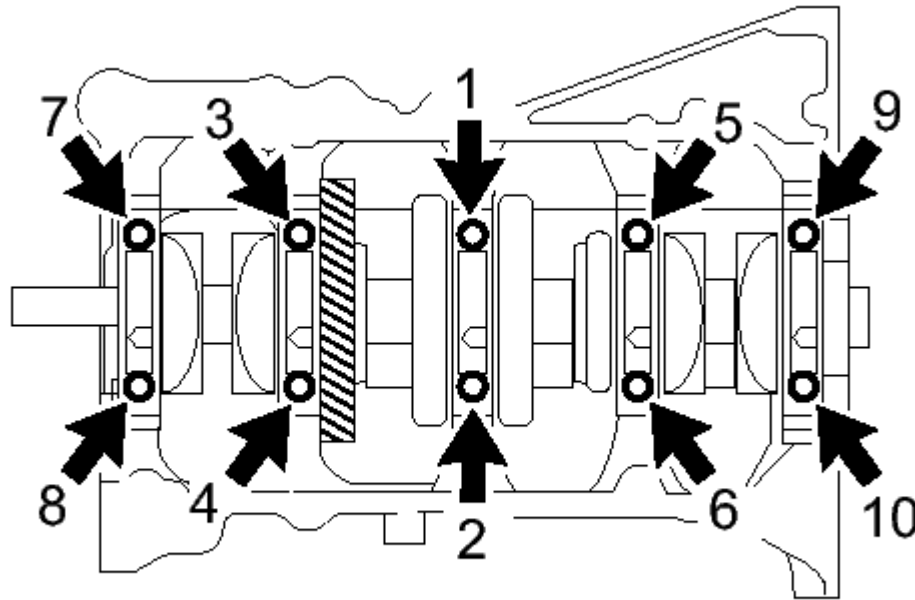
TEXT IN ILLUSTRATION

*a	Front Mark and Number
----	-----------------------

- d. Apply a light coat of engine oil to the threads and under the bearing cap bolts.
- e. Install the crankshaft bearing cap bolts.

NOTE: **The main bearing cap bolts should be tightened in 3 progressive steps.**

- f. Step 1:

**T****Fig. 257: Identifying Main Bearing Cap Bolts Tightening Sequence**

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

1. Install and uniformly tighten the 10 main bearing cap bolts in several steps in the sequence shown in the illustration.

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

g. Step 2:

1. Tighten the bearing cap bolts in several steps in the sequence shown in the illustration.

Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)

h. Step 3:

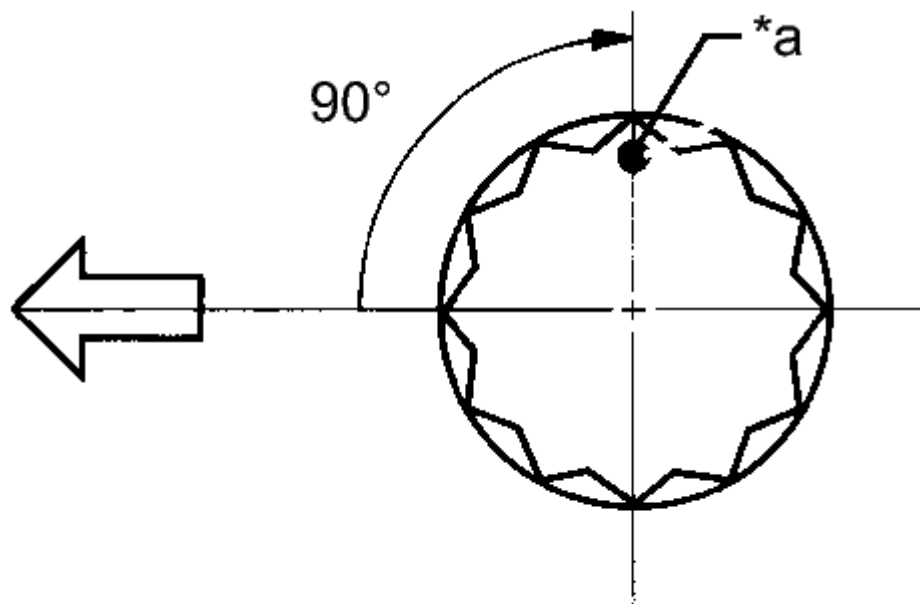
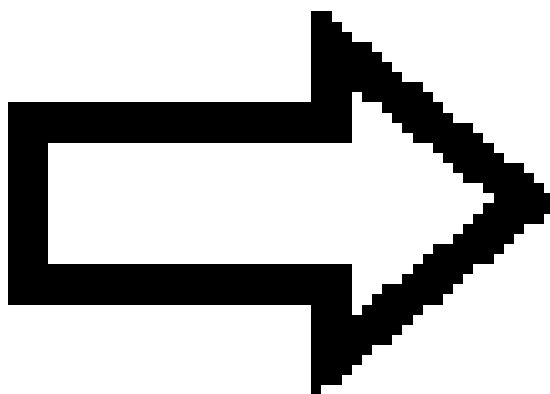


Fig. 258: Identifying Main Bearing Cap Bolts Final Torque Position
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Mark the front of the bearing cap bolts with paint.

TEXT IN ILLUSTRATION

*a	Paint Mark
	Engine Front

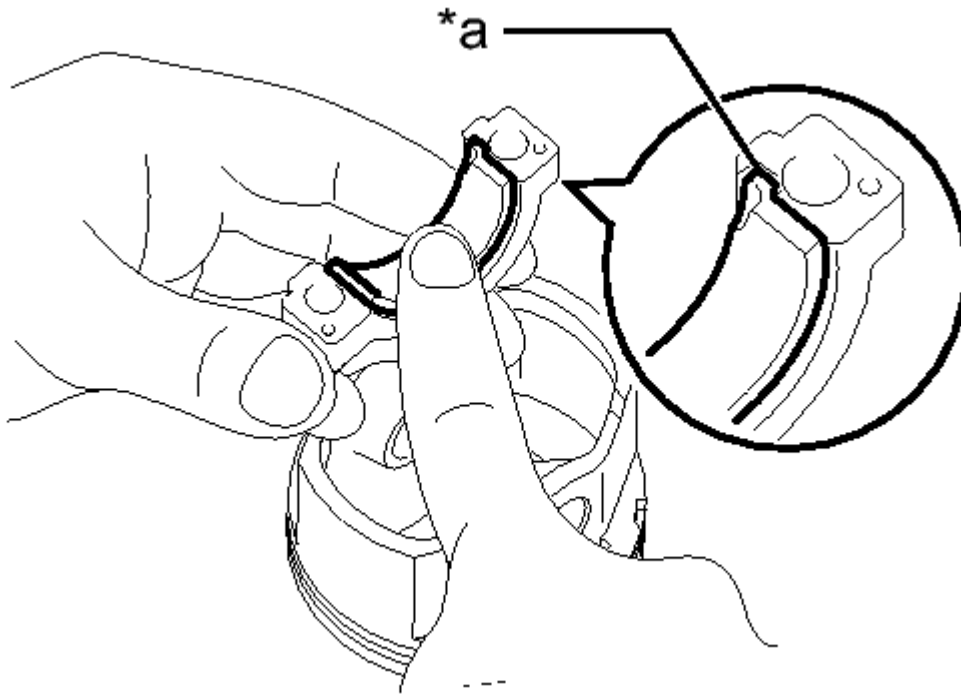


2. Further tighten the bearing cap bolts by 90° in the sequence shown in the previous illustration.

- i. Check that the paint mark is now at a 90° angle to the front.
- j. Check that the crankshaft turns smoothly.
- k. Check the crankshaft thrust clearance. See step 13.

14. **INSTALL CONNECTING ROD BEARING**

- a. Align the bearing claw with the groove on the connecting rod or connecting cap.

**T****Fig. 259: Installing Connecting Rod Bearing**

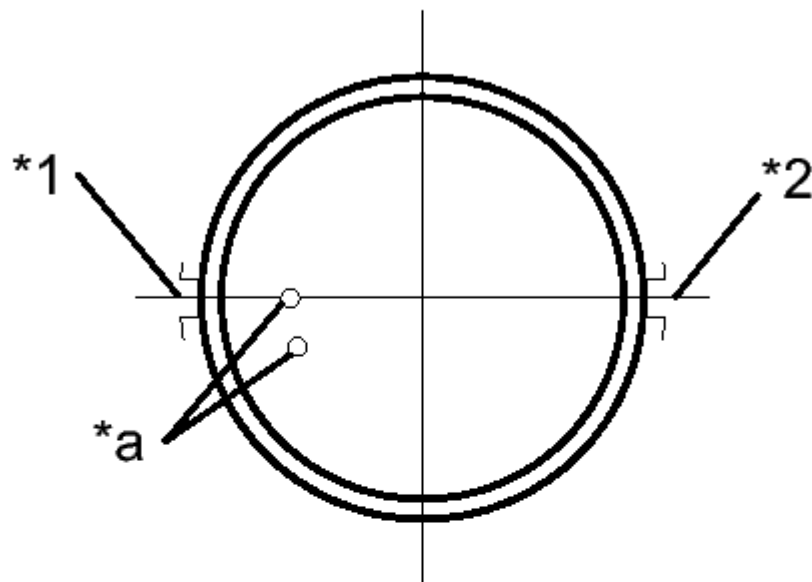
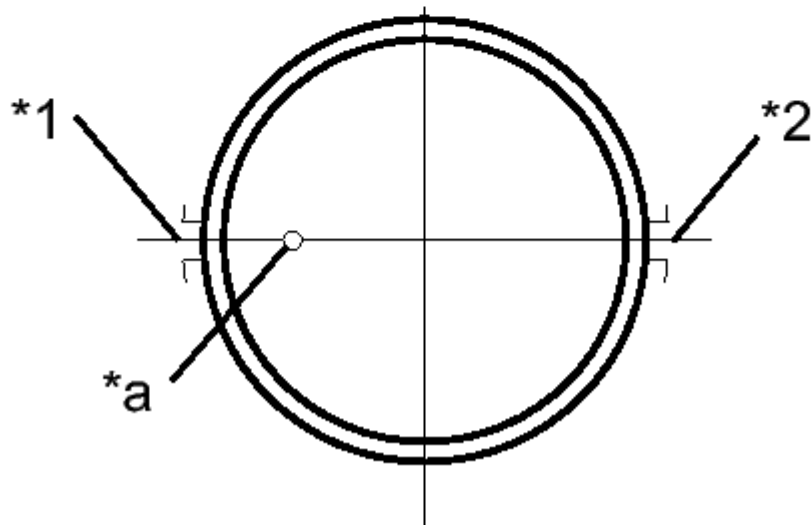
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Do not apply engine oil to the bearings and the contact surfaces.**TEXT IN ILLUSTRATION**

*a	Claw
----	------

15. INSTALL PISTON SUB-ASSEMBLY WITH CONNECTING ROD**NOTE:** The connecting rod cap bolts are tightened in 2 progressive steps.

- Apply engine oil to the cylinder walls, the pistons, and the surfaces of connecting rod bearings.
- Check the position of the piston ring ends.

A**B****Fig. 260: Identifying Piston Ring Position**

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

TEXT IN ILLUSTRATION

*A	for TMC Made Engine
----	---------------------

*B	except TMC Made Engine
*1	No. 1 and Oil Ring Rail
*2	No. 2 and Oil Ring Rail
*a	Front Mark

- 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.

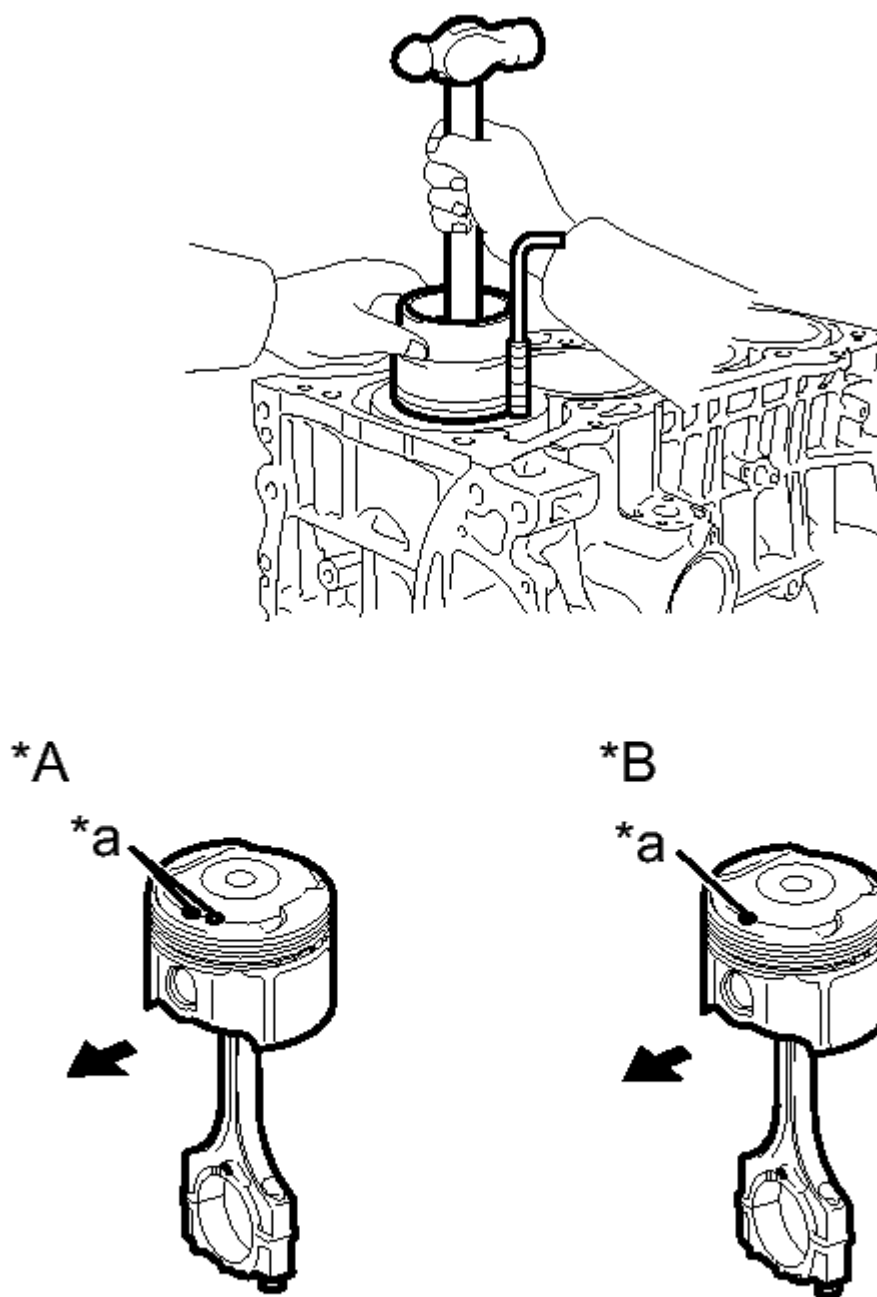


Fig. 261: Installing Piston Sub-Assembly With Connecting Rod
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Match the numbered connecting rod cap with the connecting rod.

TEXT IN ILLUSTRATION

*A	for TMC Made Engine
*B	except TMC Made Engine
*a	Front Mark
	
Engine Front	

- d. Check that the protrusion on the connecting rod cap is facing in the correct direction.

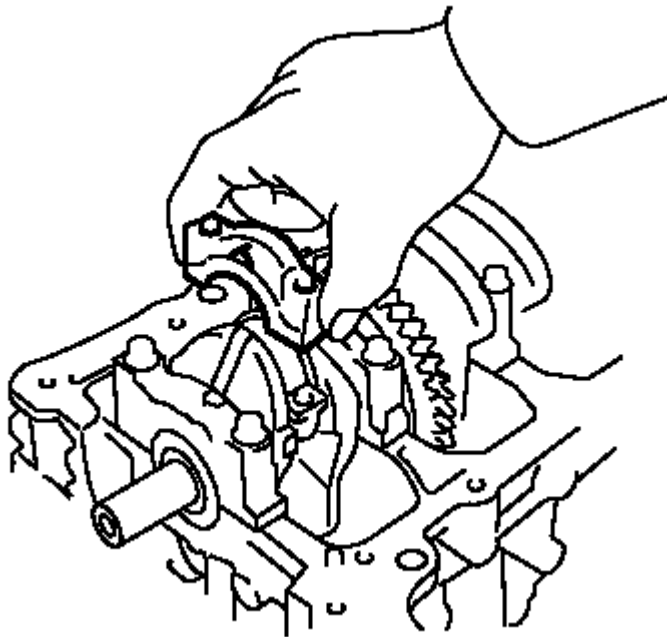


Fig. 262: Installing Connecting Rod Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Apply a light coat of engine oil to the threads and under the heads of the connecting rod cap bolts.

NOTE: The connecting cap bolts should be tightened in 2 progressive steps.

- f. Install and alternately tighten the bolts of the connecting rod cap in several steps.

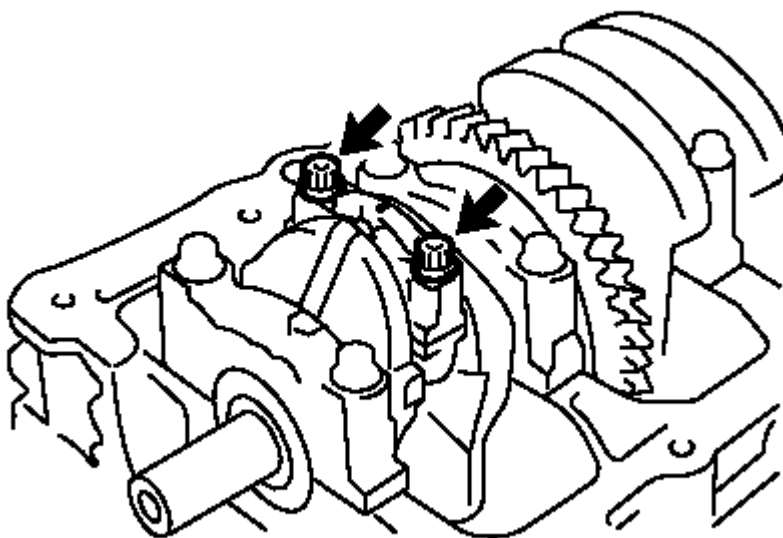


Fig. 263: Location of Connecting Rod Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- g. Mark the front of the connecting rod cap bolts with paint.

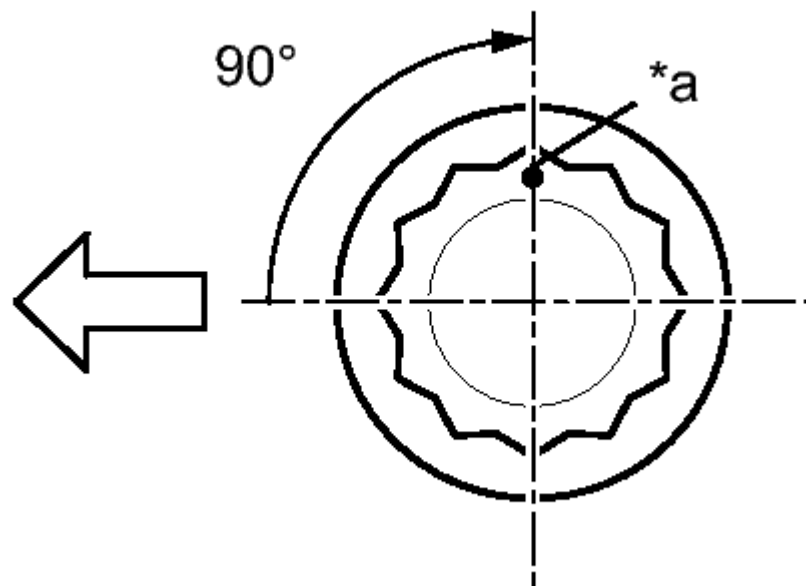
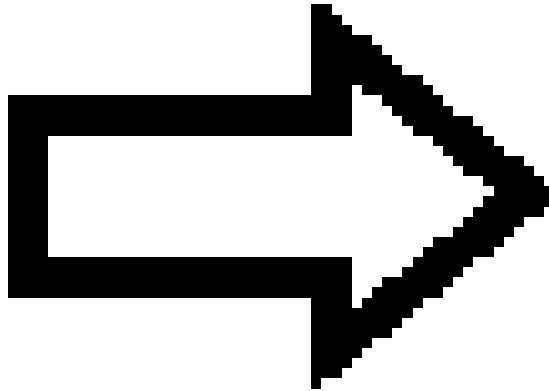
**P**

Fig. 264: Identifying Connecting Rod Cap Bolts Final Torque Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Paint Mark
	Engine Front

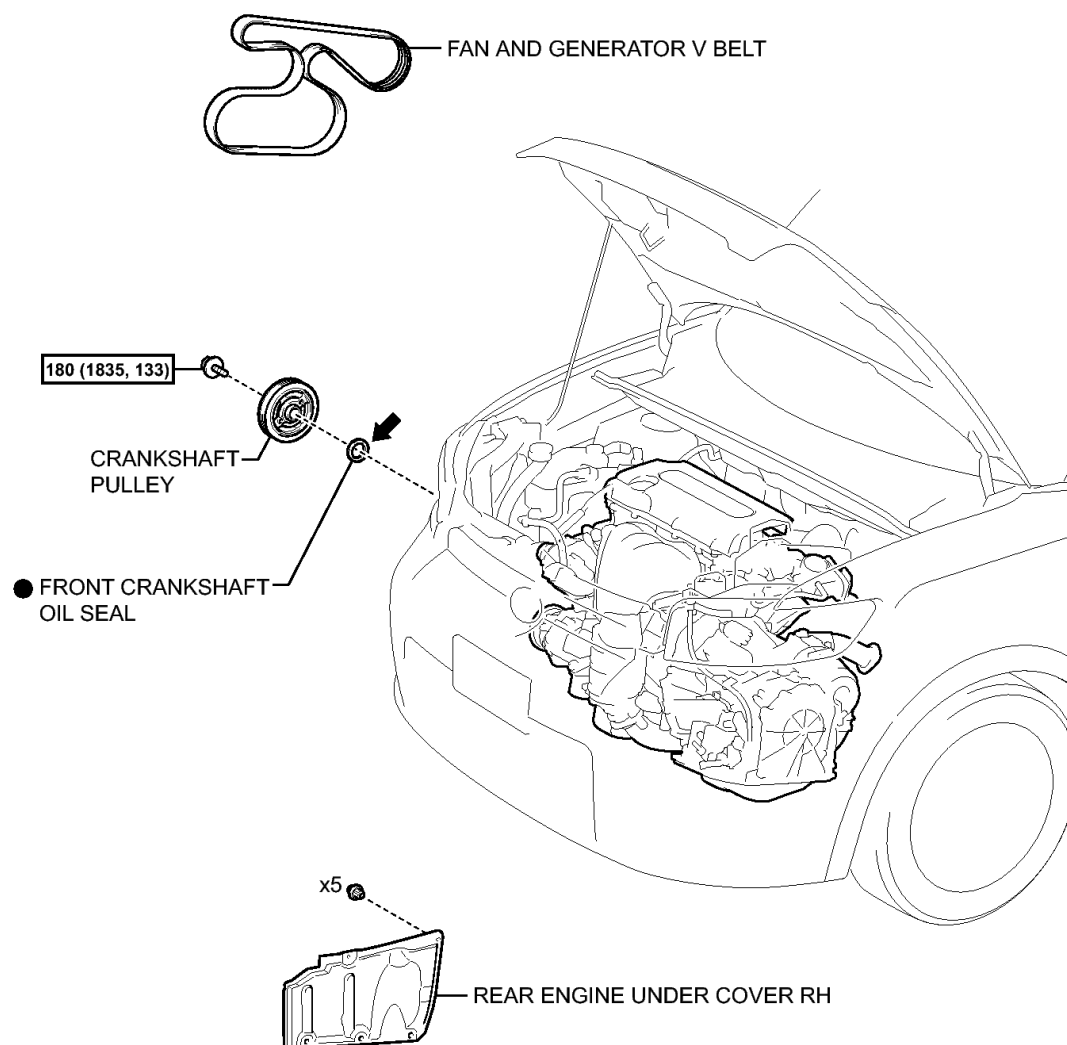


- h. Retighten the cap bolts by 90° as shown in the illustration.
- i. Check the crankshaft turns smoothly.
- j. Check the connecting rod thrust clearance. See step 1.

FRONT CRANKSHAFT OIL SEAL

COMPONENTS

ILLUSTRATION



180 (1835, 133) : Specified torque

● Non-reusable part ← MP Grease

P

Fig. 265: Identifying Front Crankshaft Oil Seal Replacement Components With Torque Specifications
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

REMOVAL

1. REMOVE FRONT WHEEL RH

2. REMOVE REAR ENGINE UNDER COVER RH**3. REMOVE FAN AND GENERATOR V BELT** See step 2.**4. REMOVE CRANKSHAFT PULLEY**

- a. Using SST, hold the pulley in place and loosen the pulley bolt.

- SST: 09213-54015
91651-60855
- SST: 09330-00021

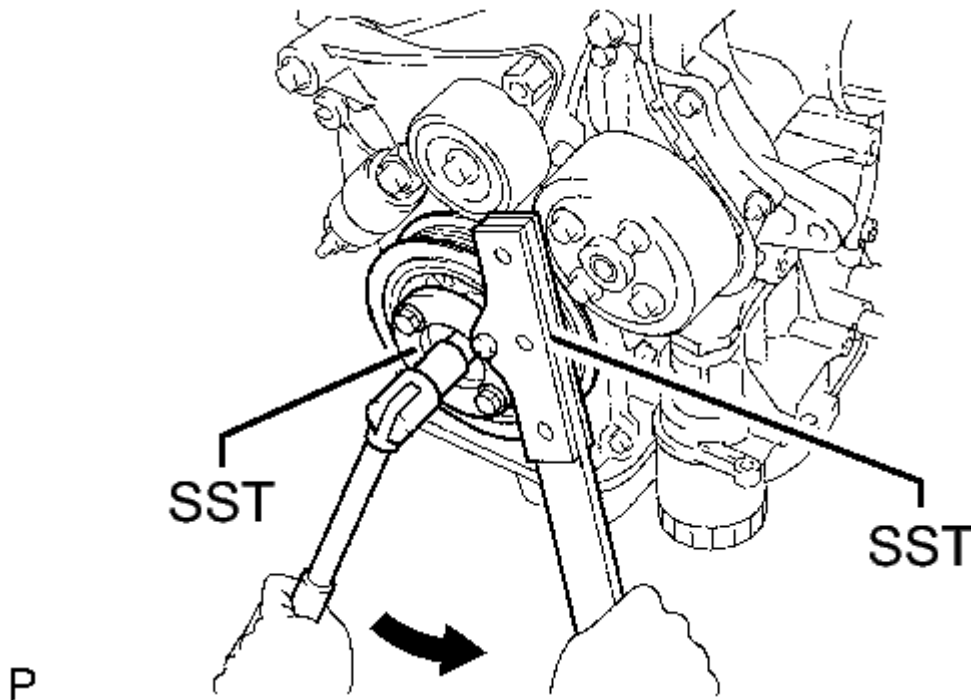
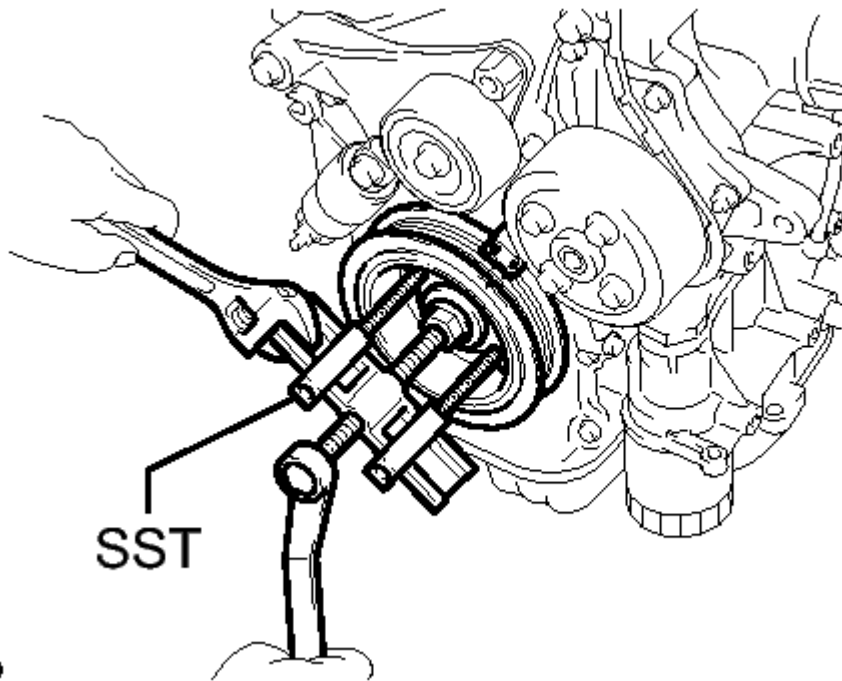


Fig. 266: Removing Crankshaft Pulley Bolt Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using SST, remove the crankshaft pulley.



P

Fig. 267: Removing Crankshaft Pulley With SST

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

- **SST: 09950-50013**
09951-05010
09952-05010
09953-05020
09954-05021
- **SST: 09950-40011**
09957-04010

HINT:

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

5. REMOVE FRONT CRANKSHAFT OIL SEAL

- a. Using a knife, cut off the lip of the oil seal.

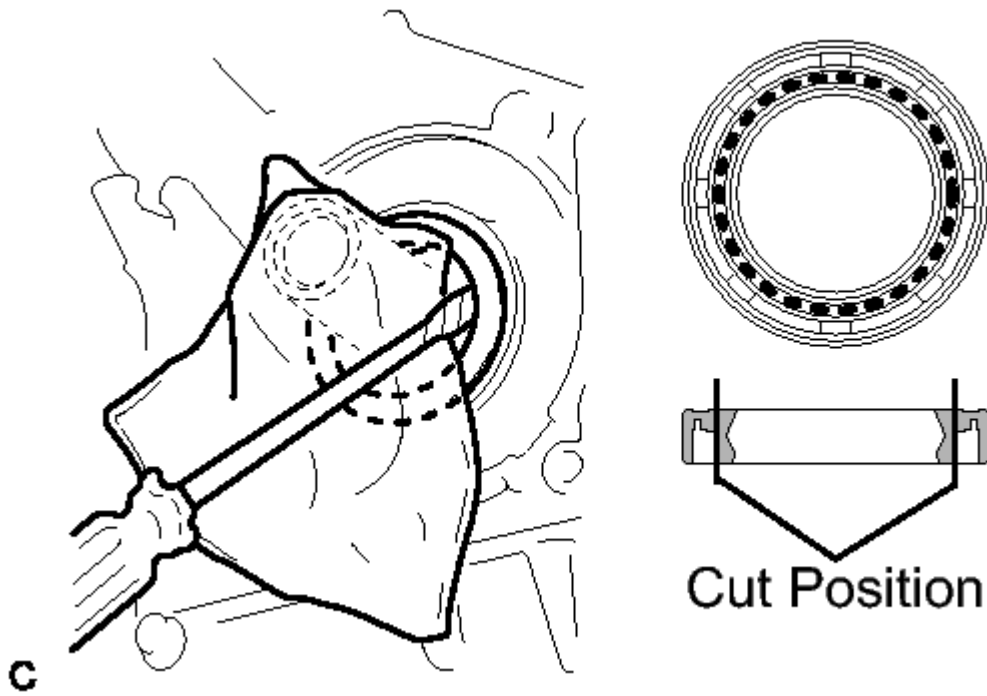


Fig. 268: Prying Out Oil Seal

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

- b. Using a screwdriver, pry out the oil seal.

NOTE: Do not damage the surface of the oil seal press fit hole and crankshaft.

HINT:

Tape the screwdriver tip before use.

INSTALLATION

INSTALLATION

1. INSTALL FRONT CRANKSHAFT OIL SEAL

- a. Apply MP grease to the lip of a new oil seal.
- b. Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.

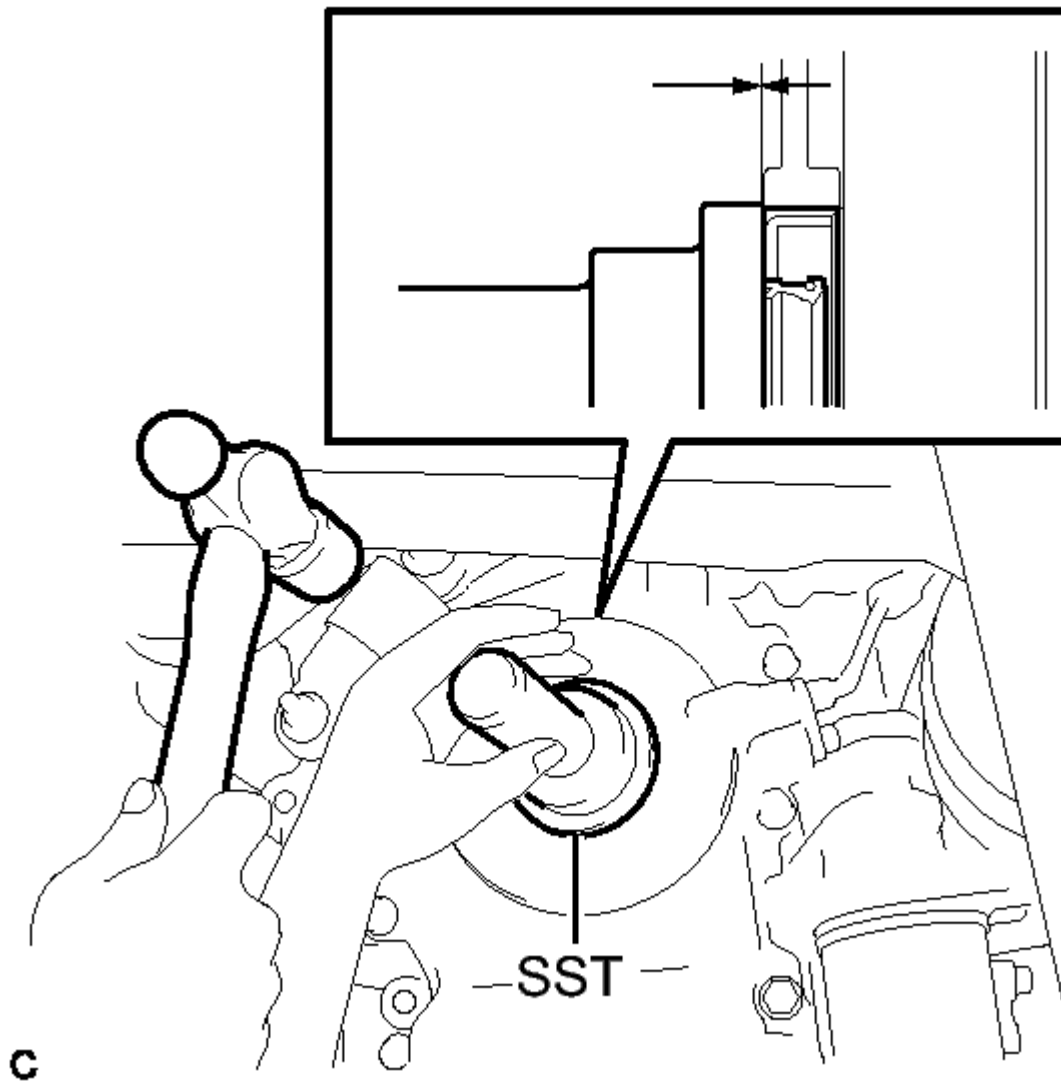


Fig. 269: Tapping In Oil Seal Until Its Surface Is Flush With Rear Oil Seal Retainer Edge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09223-22010

NOTE:

- Keep the lip free from foreign matter.
- Do not tap on the oil seal at an angle.

2. INSTALL CRANKSHAFT PULLEY

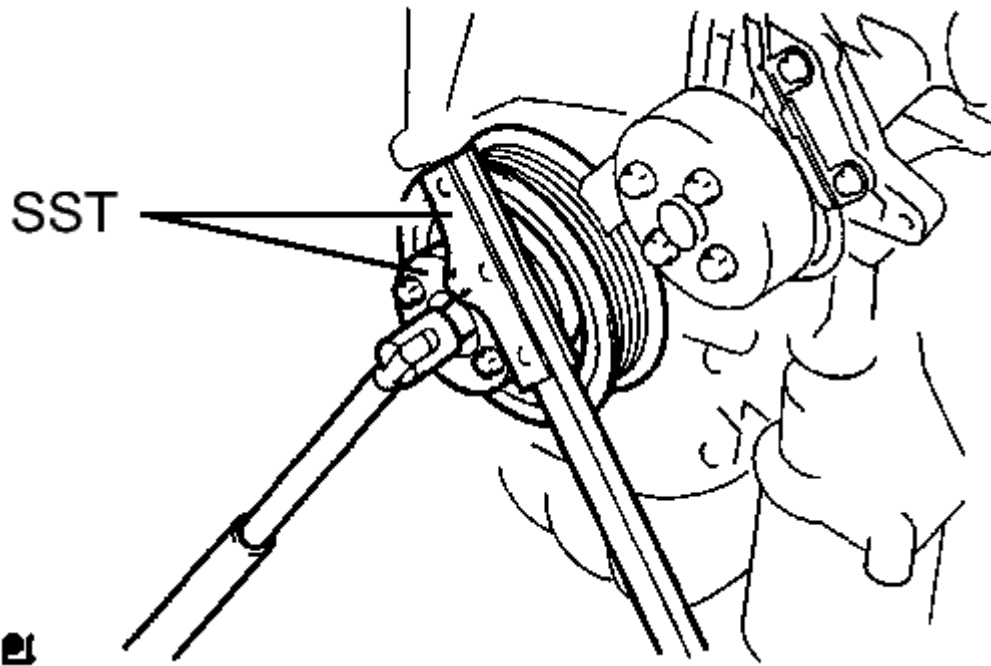


Fig. 270: Tightening Pulley Bolt

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

- a. Using SST, fix the pulley in place and tighten the bolt.

- SST: 09213-54015
91651-60855
- SST: 09330-00021

Torque: 180 N*m (1835 kgf*cm, 133 ft.*lbf)

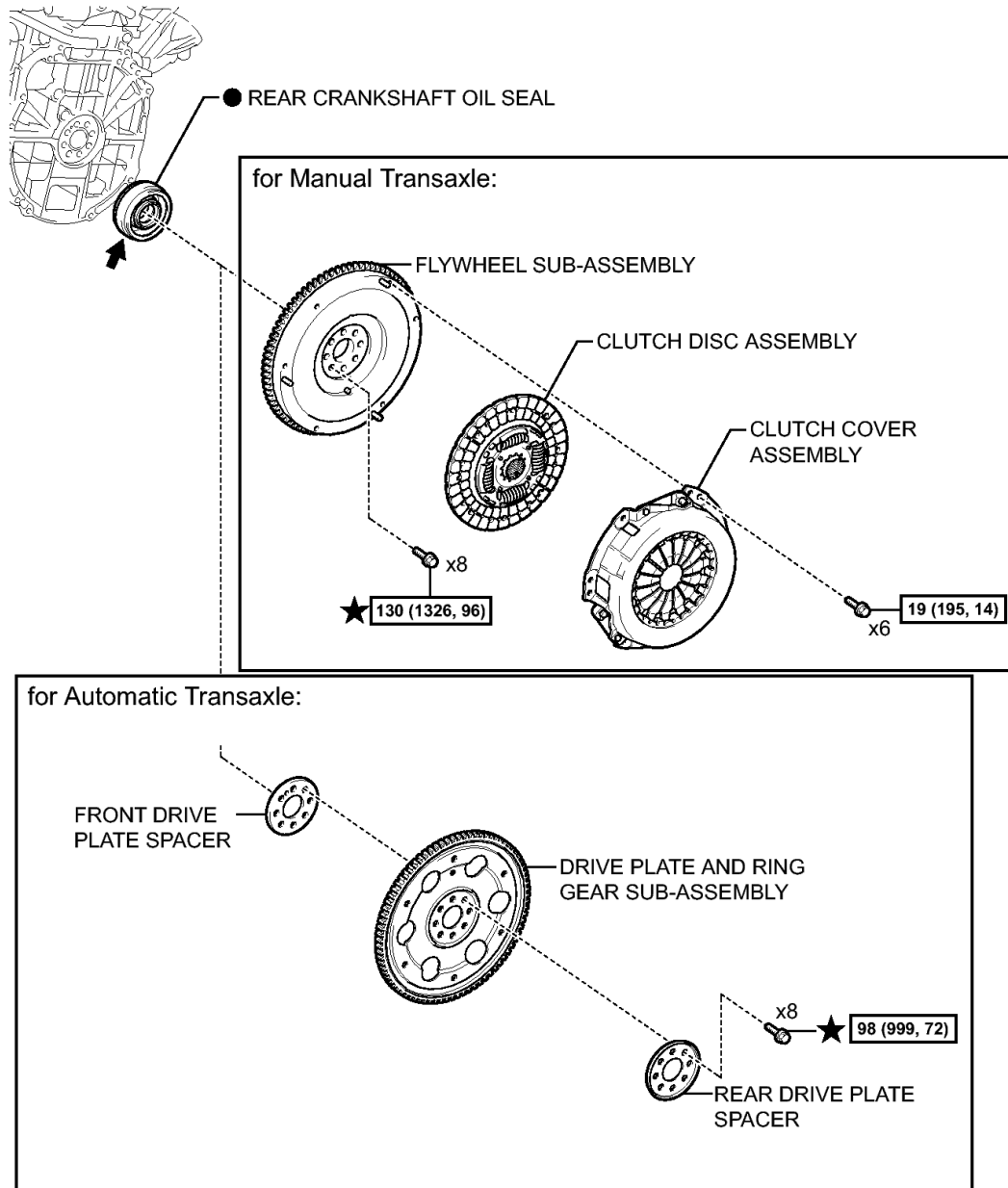
3. **INSTALL FAN AND GENERATOR V BELT** See step 1.
4. **INSPECT FOR ENGINE OIL LEAK**
5. **INSPECT ENGINE OIL LEVEL** . Refer to **ON-VEHICLE INSPECTION - Step 1** .
6. **INSTALL REAR ENGINE UNDER COVER RH**
7. **INSTALL FRONT WHEEL RH**

Torque: 103 N*m (1050 kgf*cm, 76 ft.*lbf)

REAR CRANKSHAFT OIL SEAL

COMPONENTS

ILLUSTRATION



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

● Non-reusable part

← MP Grease

★ Precoated part

P

Fig. 271: Identifying Rear Crankshaft Oil Seal Replacement Components With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

REMOVAL

1. REMOVE AUTOMATIC TRANSAXLE ASSEMBLY (for Automatic Transaxle)

Refer to the procedures under "REMOVE AUTOMATIC TRANSAXLE ASSEMBLY". Refer to **REMOVAL** .

2. **REMOVE MANUAL TRANSAXLE ASSEMBLY (for Manual Transaxle)**

Refer to the procedures under "REMOVE MANUAL TRANSAXLE ASSEMBLY". Refer to **REMOVAL** .

3. **REMOVE CLUTCH COVER ASSEMBLY (for Manual Transaxle)** . Refer to **REMOVAL - Step 7** .

4. **REMOVE CLUTCH DISC ASSEMBLY (for Manual Transaxle)**

5. **REMOVE DRIVE PLATE AND RING GEAR SUB-ASSEMBLY (for Automatic Transaxle)**

- a. Using SST, hold the crankshaft.

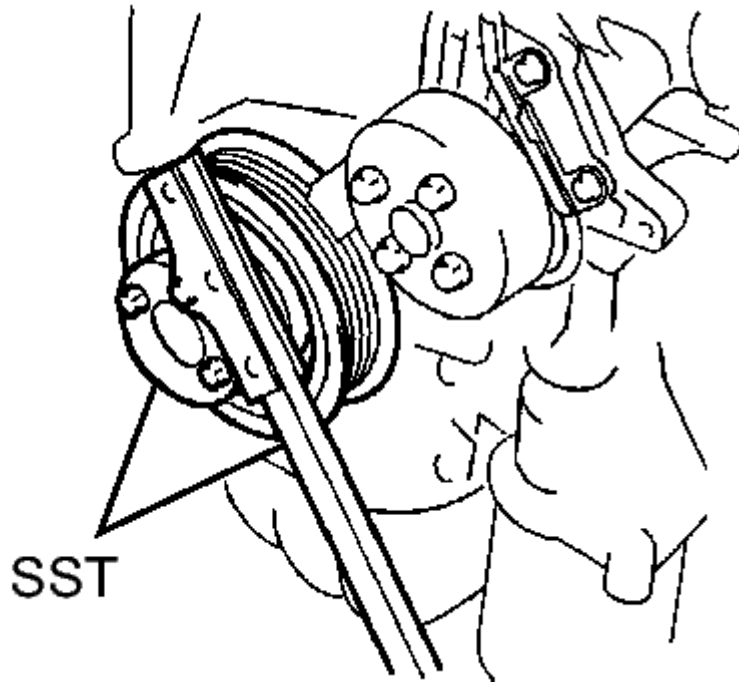
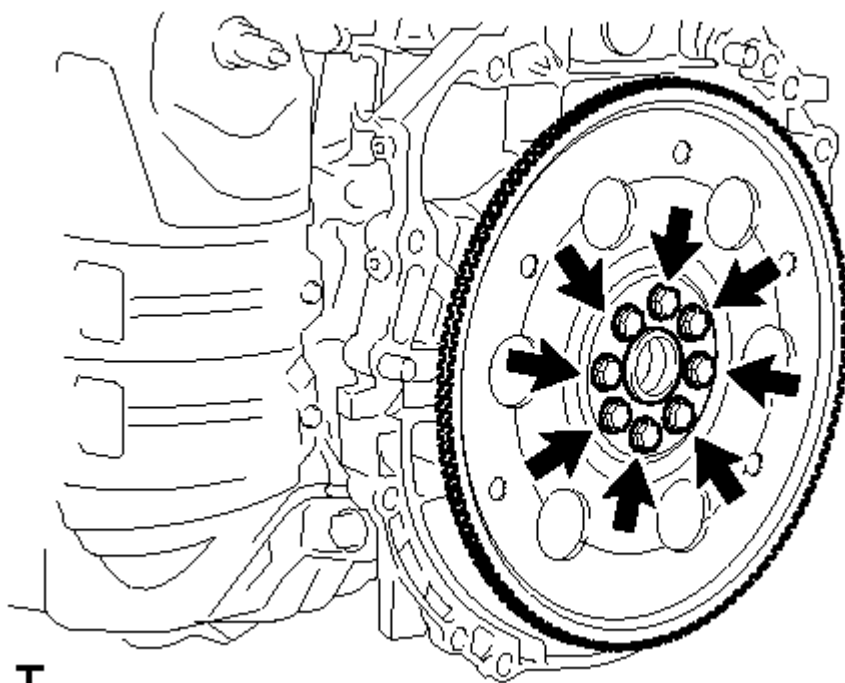


Fig. 272: Holding Crankshaft Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09213-54015
91651-60855
- SST: 09330-00021

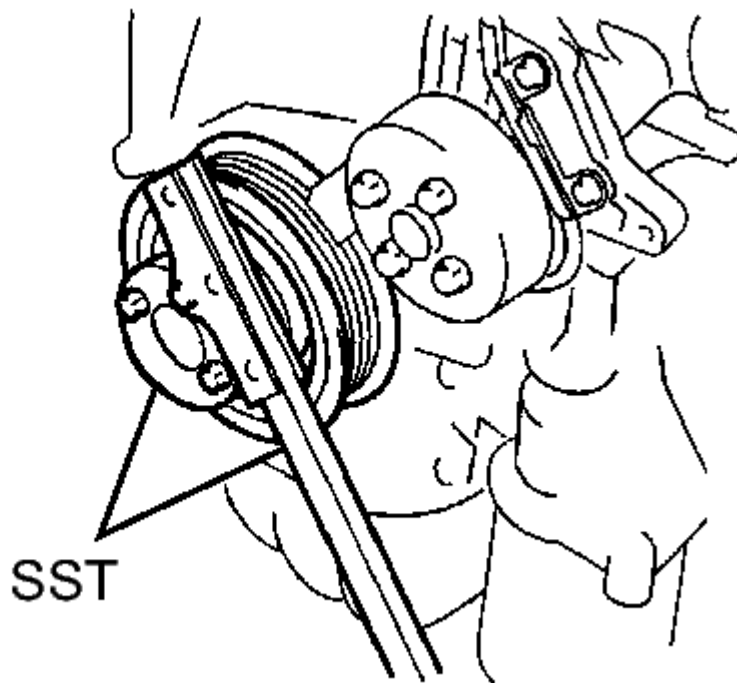
- b. Remove the 8 bolts, rear drive plate spacer, drive plate and front drive plate spacer.

**T****Fig. 273: Location of Drive Plate Bolts**

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

6. REMOVE FLYWHEEL SUB-ASSEMBLY (for Manual Transaxle)

- a. Using SST, hold the crankshaft.

**B****Fig. 274: Holding Crankshaft Using SST**

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

- SST: 09213-54015

91651-60855

- SST: 09330-00021

- b. Remove the 8 bolts and flywheel.

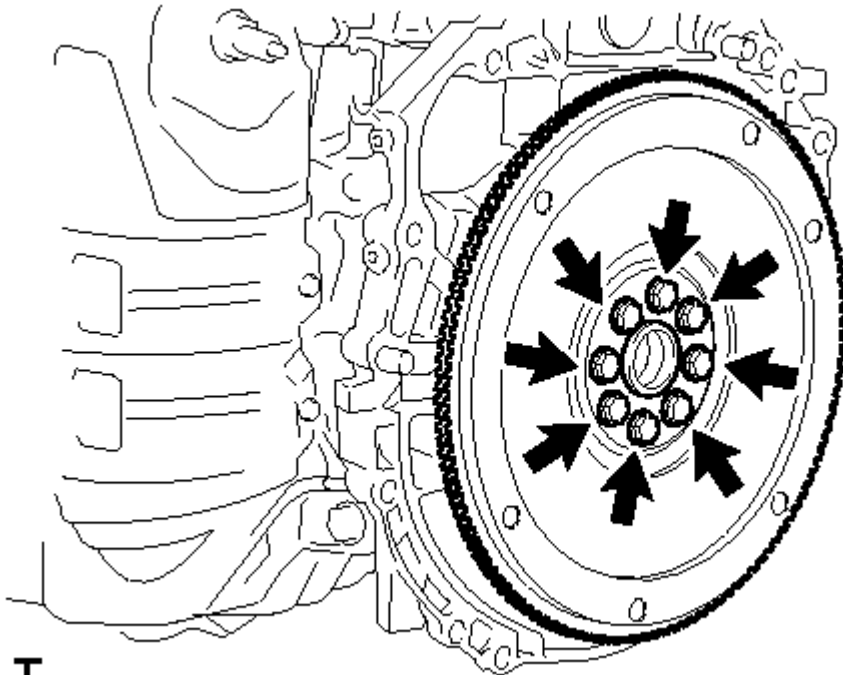


Fig. 275: Location of Flywheel Bolts

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

7. REMOVE REAR CRANKSHAFT OIL SEAL

- a. Using a knife, cut off the lip of the oil seal.

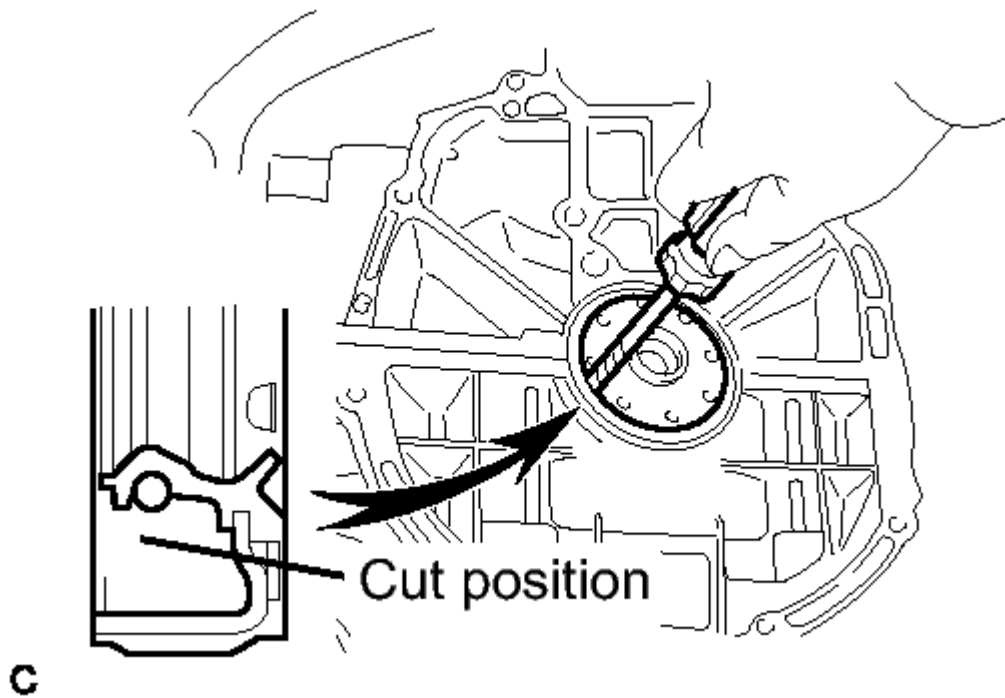


Fig. 276: Removing Rear Crankshaft Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a screwdriver, pry out the oil seal.

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

HINT:

Tape the screwdriver tip before use.

INSTALLATION

INSTALLATION

1. INSTALL REAR CRANKSHAFT OIL SEAL

- a. Apply MP grease to the lip of a new oil seal.
- b. Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.

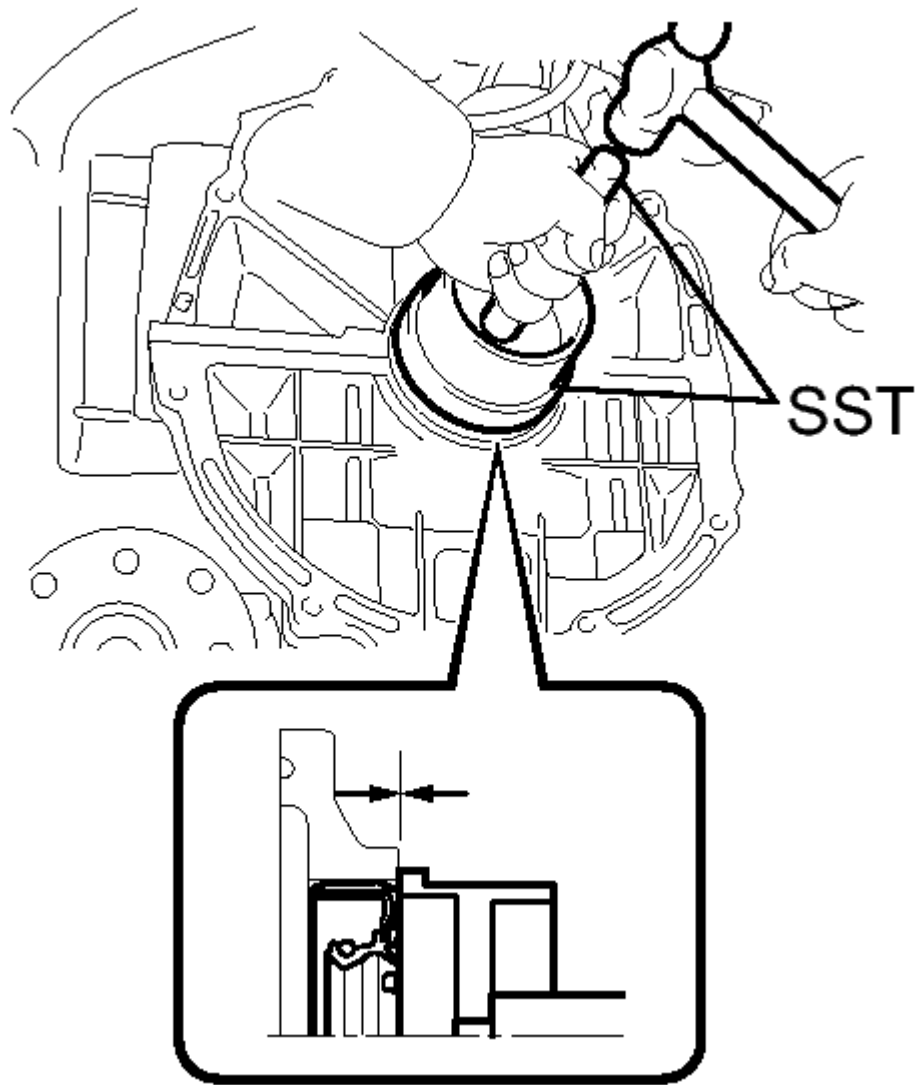
**C**

Fig. 277: Installing Rear Crankshaft Oil Seal With SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09223-15030
- SST: 09950-70010
09951-07100

NOTE:

- Keep the lip free from foreign matter.
- Do not tap on the oil seal at an angle.

2. INSTALL DRIVE PLATE AND RING GEAR SUB-ASSEMBLY (for Automatic Transaxle)

- a. Clean the 8 bolts and 8 bolt holes.
- b. Apply adhesive to 2 or 3 threads of the 8 bolts.

Adhesive

Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

- c. Using SST, hold the crankshaft.

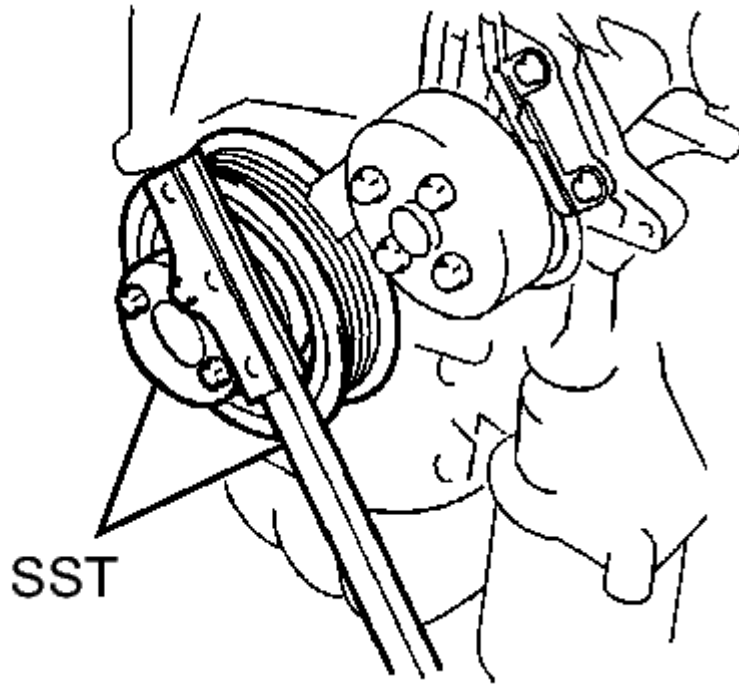


Fig. 278: Holding Crankshaft Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09213-54015
91651-60855
- SST: 09330-00021

- d. Install the front drive plate spacer.

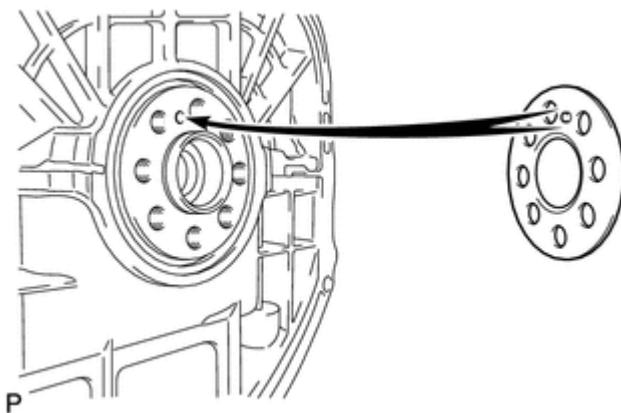


Fig. 279: Aligning Pin With Pin Hole

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

HINT:

Align the pin of the front spacer with the pin hole of the crankshaft.

- e. Install the drive plate and rear drive plate spacer onto the crankshaft.

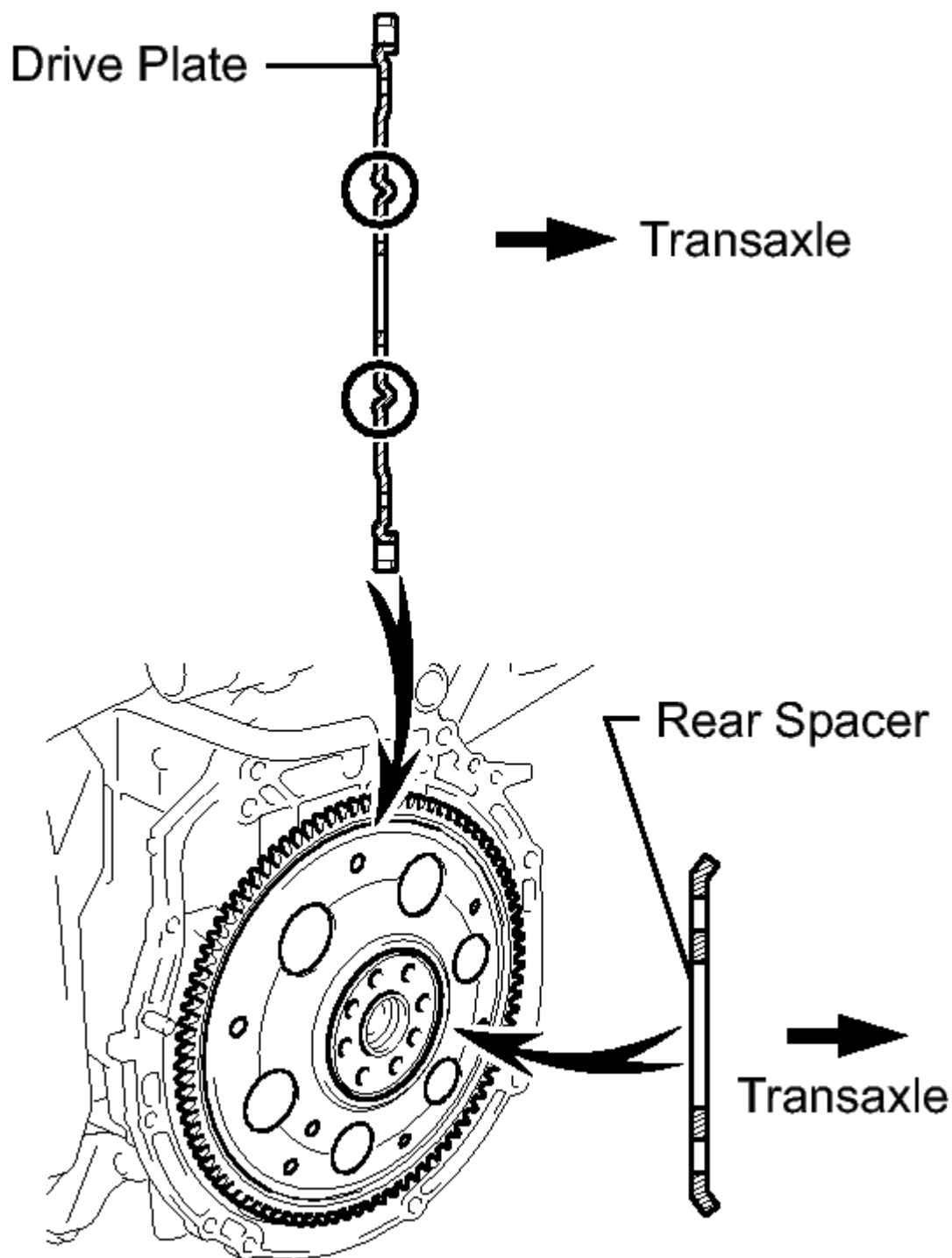
**P**

Fig. 280: Installing Drive Plate And Rear Drive Plate Spacer Onto Crankshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. In several steps, uniformly install and tighten the 8 bolts in the sequence shown in the illustration.

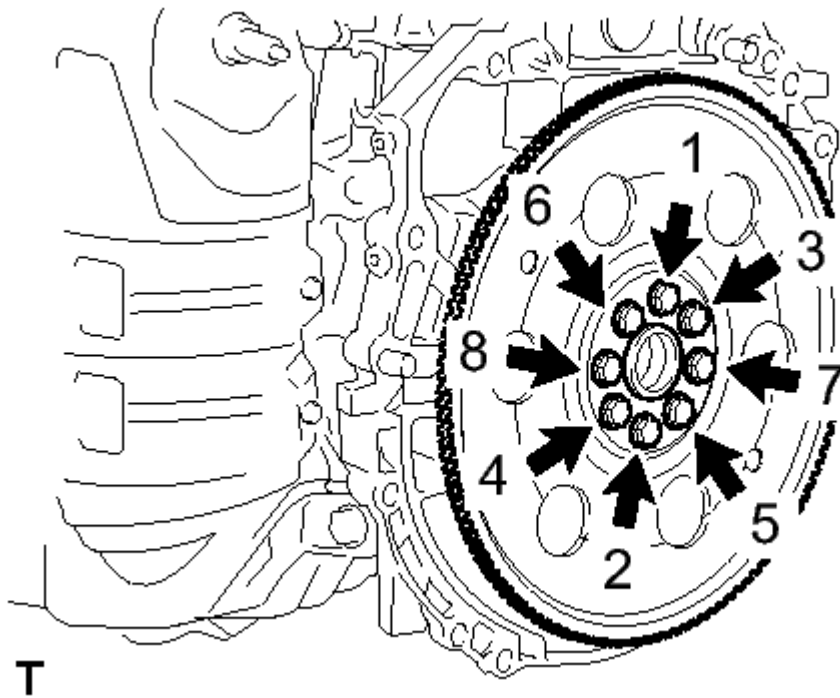


Fig. 281: Tightening Drive Plate And REar Spacer Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 98 N*m (999 kgf*cm, 72 ft.*lbf)

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

- a. Clean the 8 bolts and 8 bolt holes.
- b. Apply adhesive to 2 or 3 threads of the 8 bolts.

Adhesive

Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

- c. Using SST, hold the crankshaft.

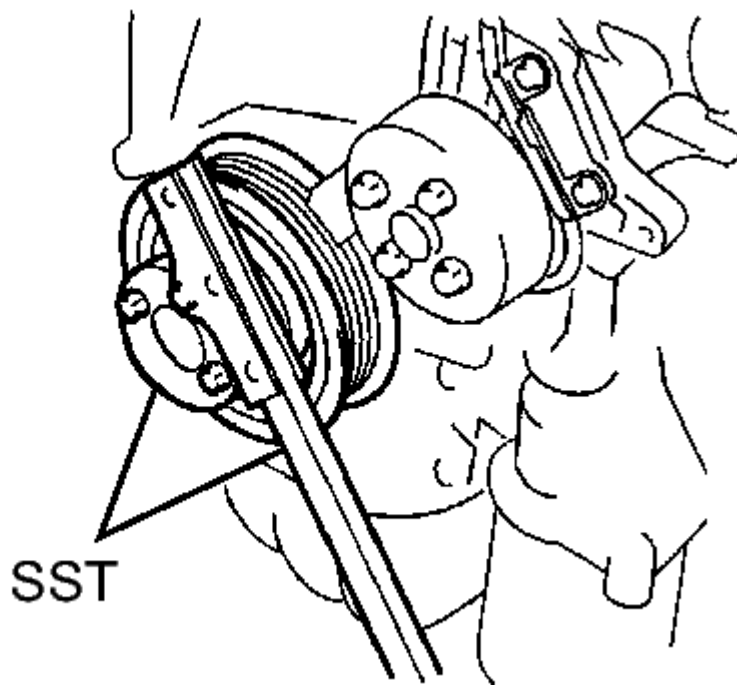


Fig. 282: Holding Crankshaft Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09213-54015
91651-60855
 - SST: 09330-00021
- d. In several steps, uniformly install and tighten the 8 bolts in the sequence shown in the illustration.

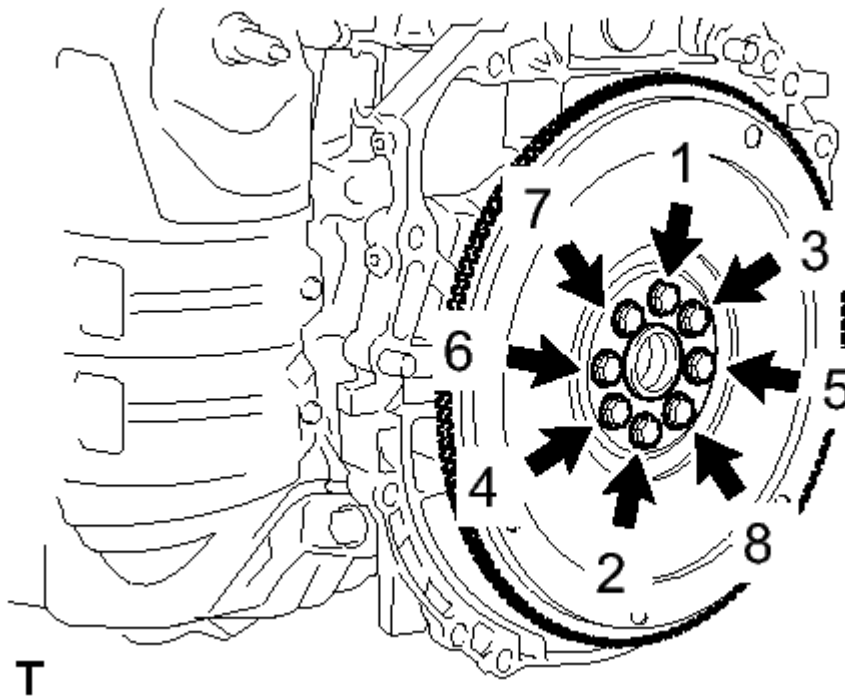


Fig. 283: Identifying Flywheel Bolts Tightening Sequence
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 130 N*m (1326 kgf*cm, 96 ft.*lbf)

4. **INSTALL CLUTCH DISC ASSEMBLY (for Manual Transaxle)** . Refer to **INSTALLATION - Step 1** .
5. **INSTALL CLUTCH COVER ASSEMBLY (for Manual Transaxle)** . Refer to **INSTALLATION - Step 2** .
6. **INSTALL AUTOMATIC TRANSAXLE ASSEMBLY (for Automatic Transaxle)**

Refer to the procedures under "INSTALL AUTOMATIC TRANSAXLE ASSEMBLY". Refer to **INSTALLATION** .

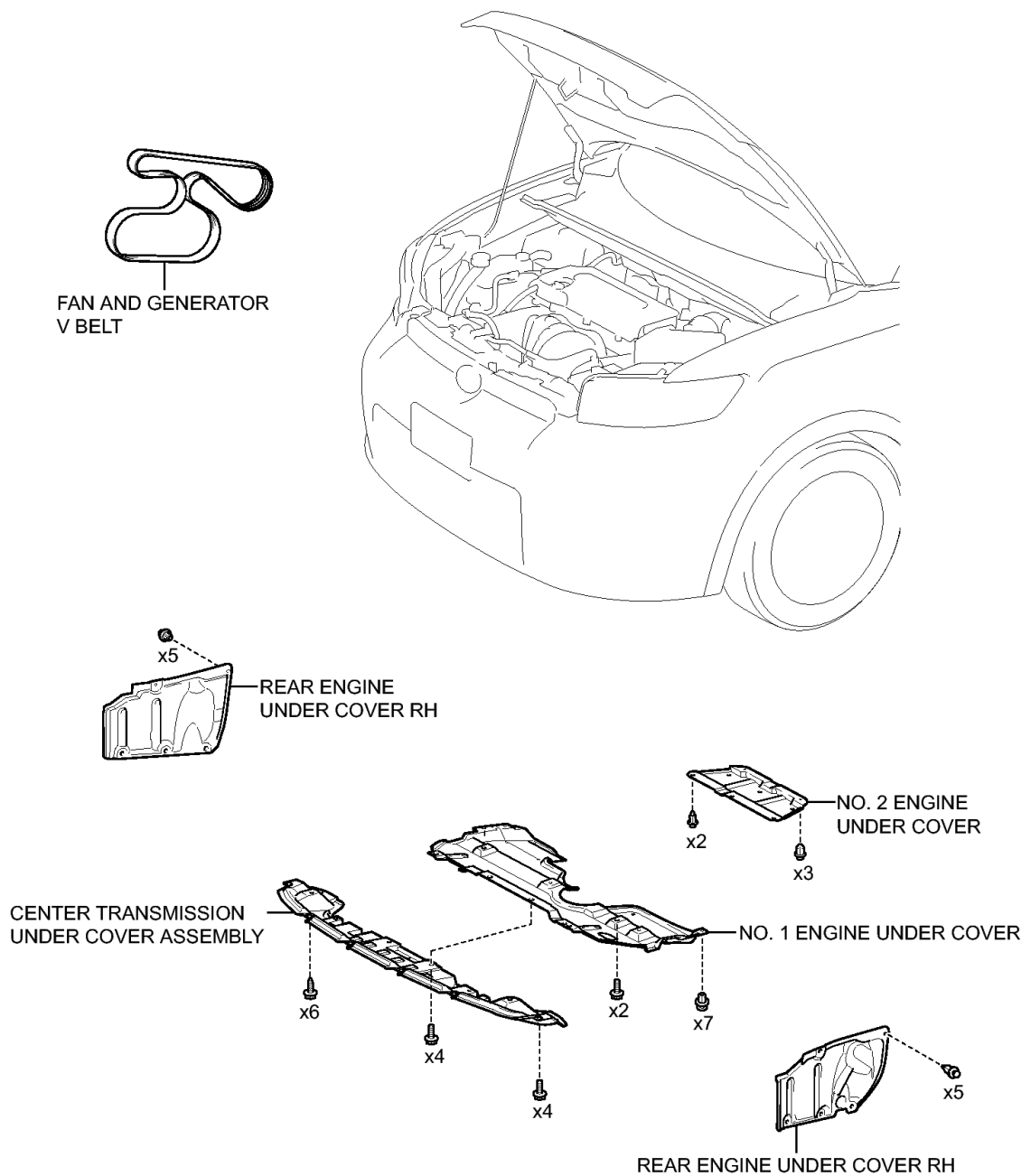
7. **INSTALL MANUAL TRANSAXLE ASSEMBLY (for Manual Transaxle)**

Refer to the procedures under "INSTALL MANUAL TRANSAXLE ASSEMBLY". Refer to **INSTALLATION** .

ENGINE ASSEMBLY

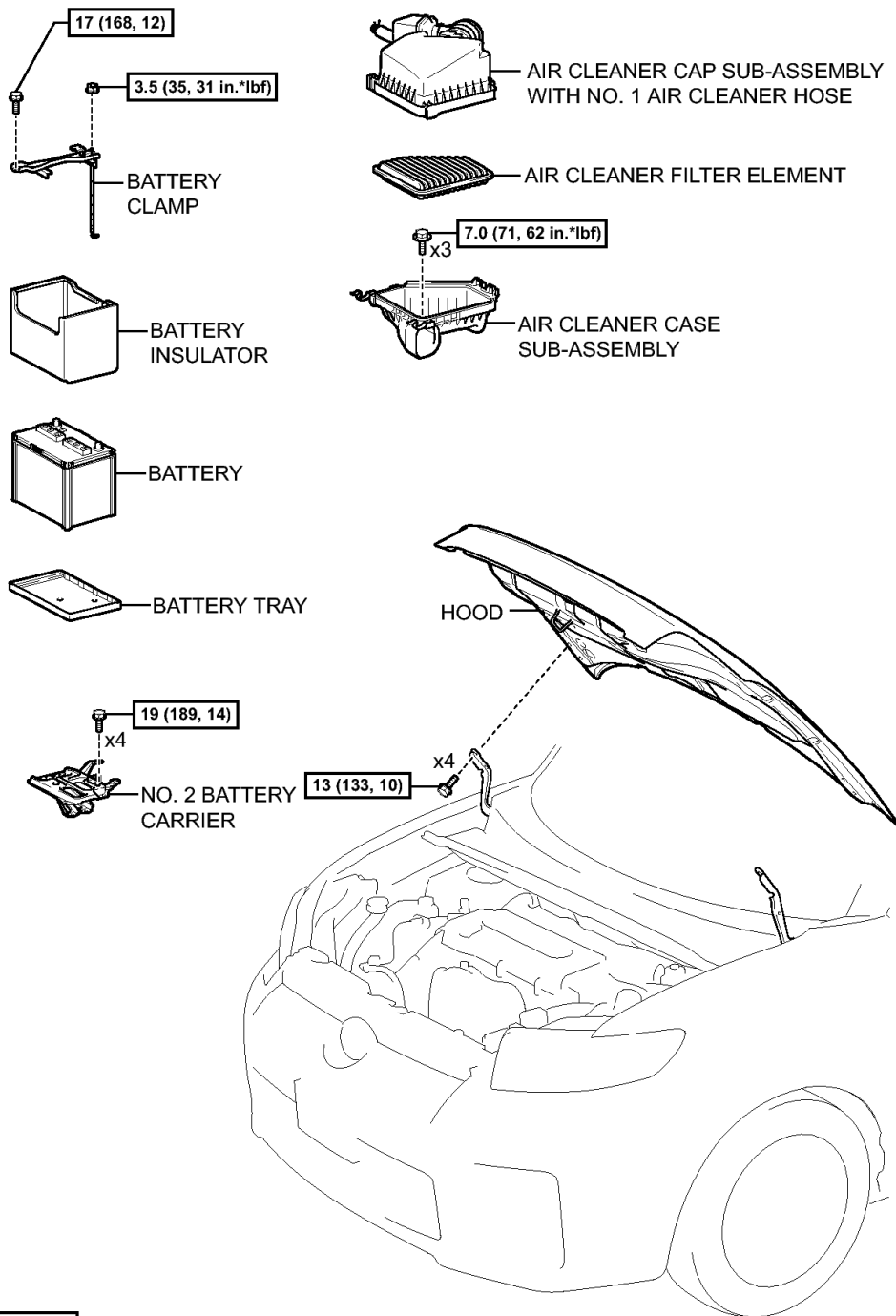
COMPONENTS

ILLUSTRATION



P
Fig. 284: Identifying Engine Assembly Replacement Components (1 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

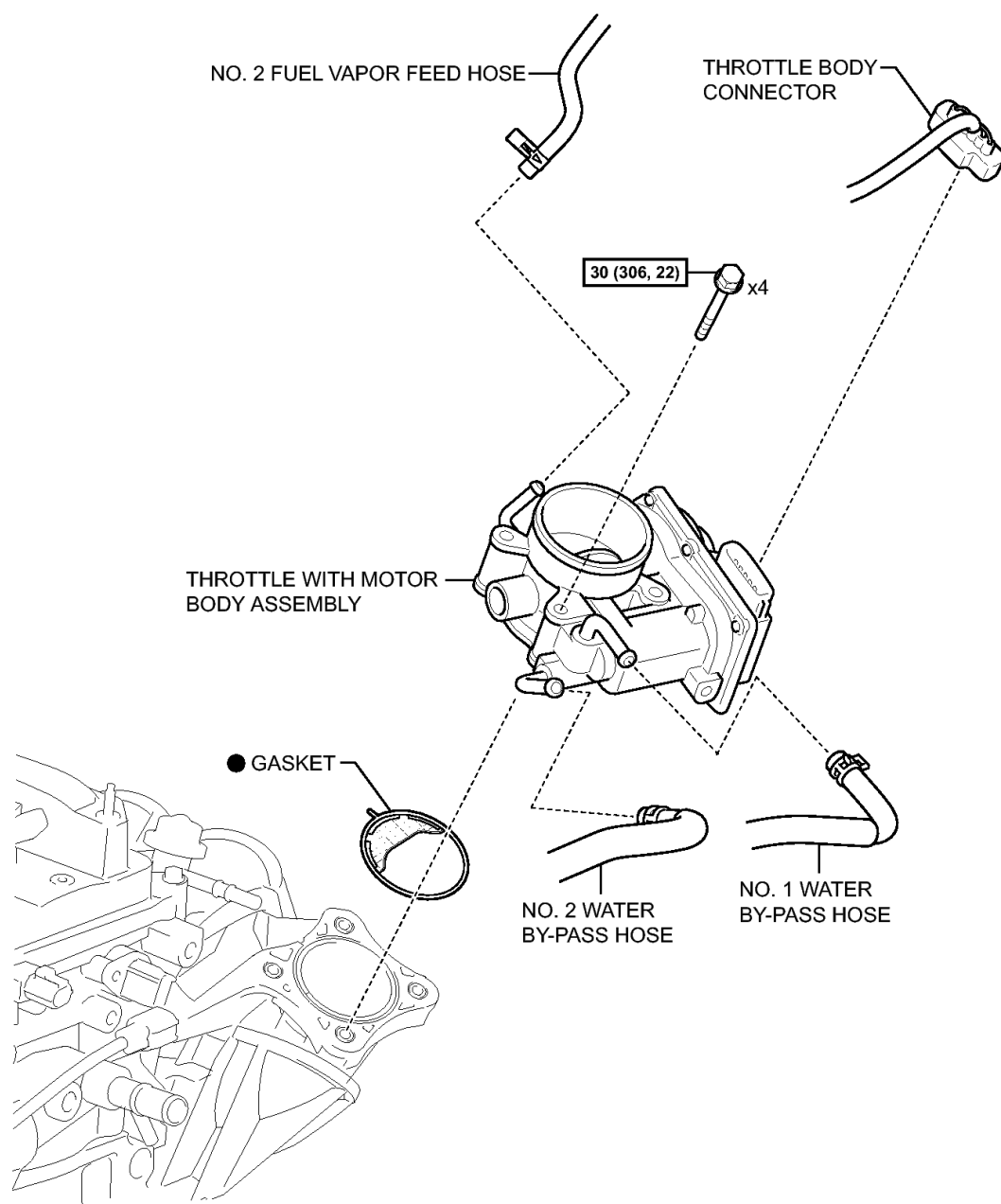


N*m (kgf*cm, ft*lbf) : Specified torque

P

Fig. 285: Identifying Engine Assembly Replacement Components With Torque Specifications (2 Of 13)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

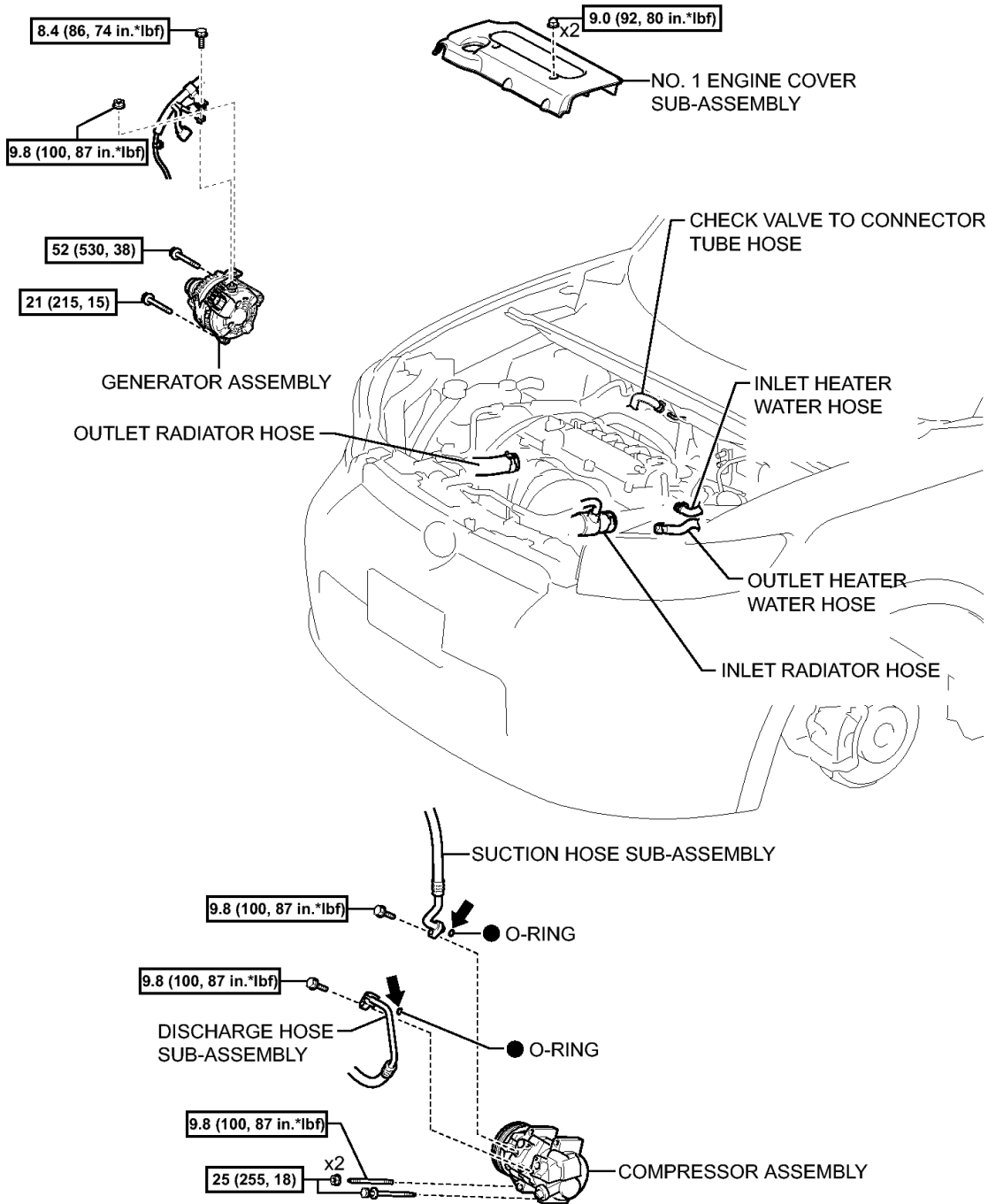
ILLUSTRATION



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

Fig. 286: Identifying Engine Assembly Replacement Components With Torque Specifications (3 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

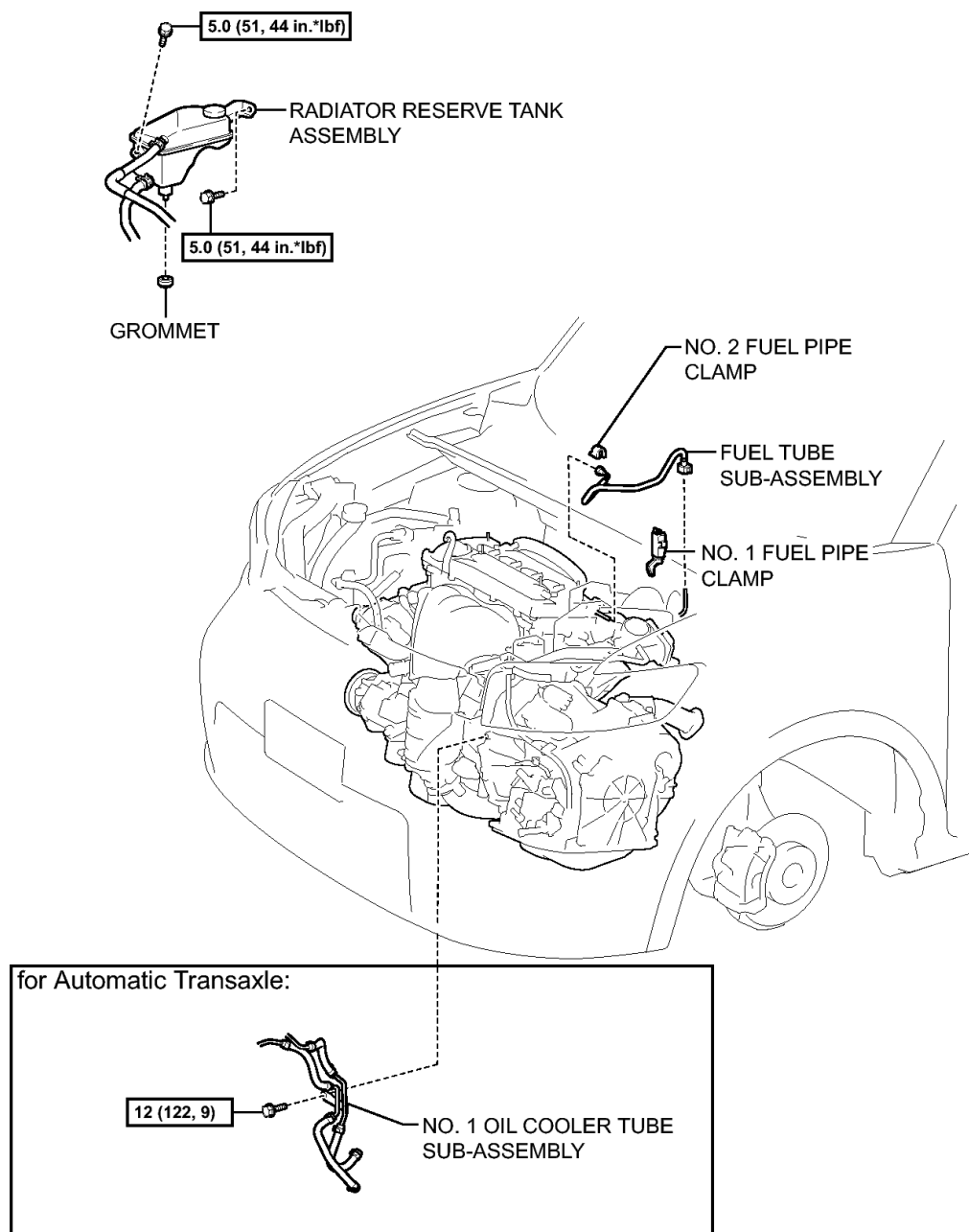


N*m (kgf*cm, ft*lbf) : Specified torque

● Non-reusable part ← Compressor Oil ND-OIL8 or equivalent

Fig. 287: Identifying Engine Assembly Replacement Components With Torque Specifications (4 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

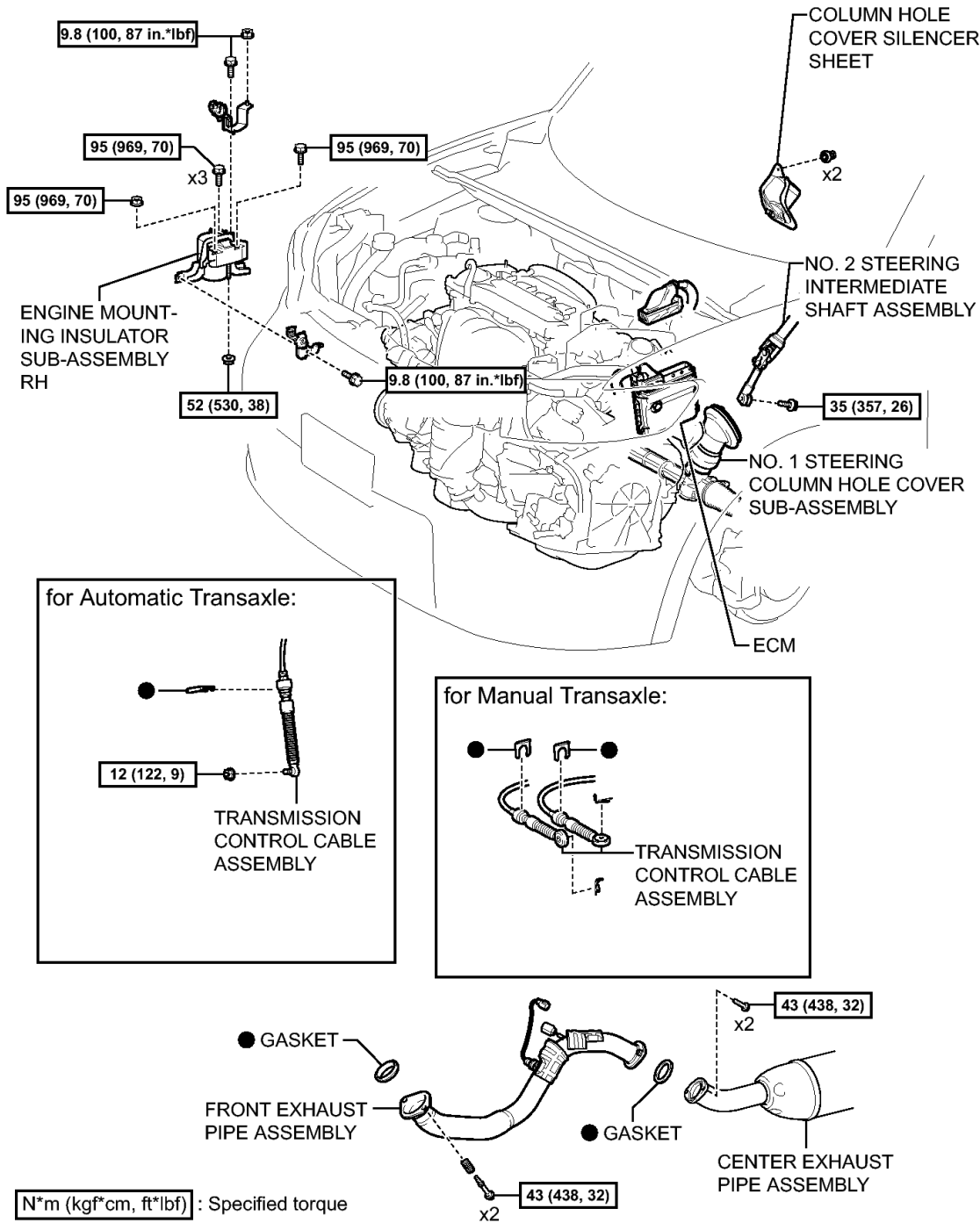


N*m (kgf*cm, ft*lbf) : Specified torque

P

Fig. 288: Identifying Engine Assembly Replacement Components With Torque Specifications (5 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

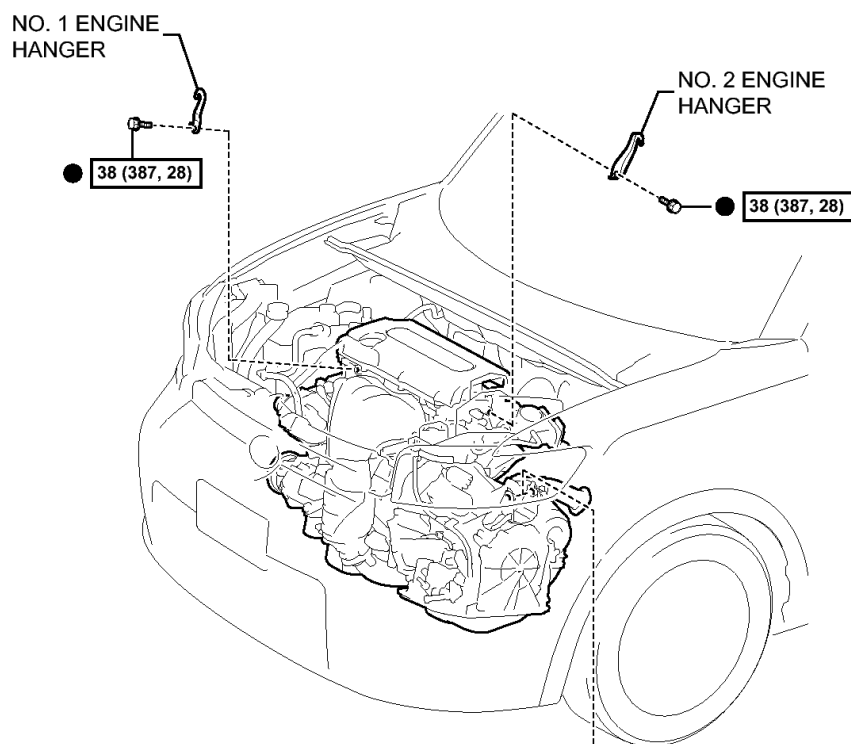
ILLUSTRATION



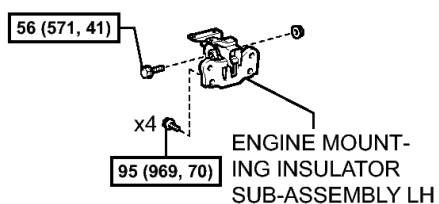
P

Fig. 289: Identifying Engine Assembly Replacement Components With Torque Specifications (6 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

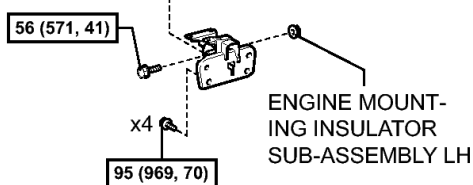
ILLUSTRATION



for Manual Transaxle:



for Automatic Transaxle:



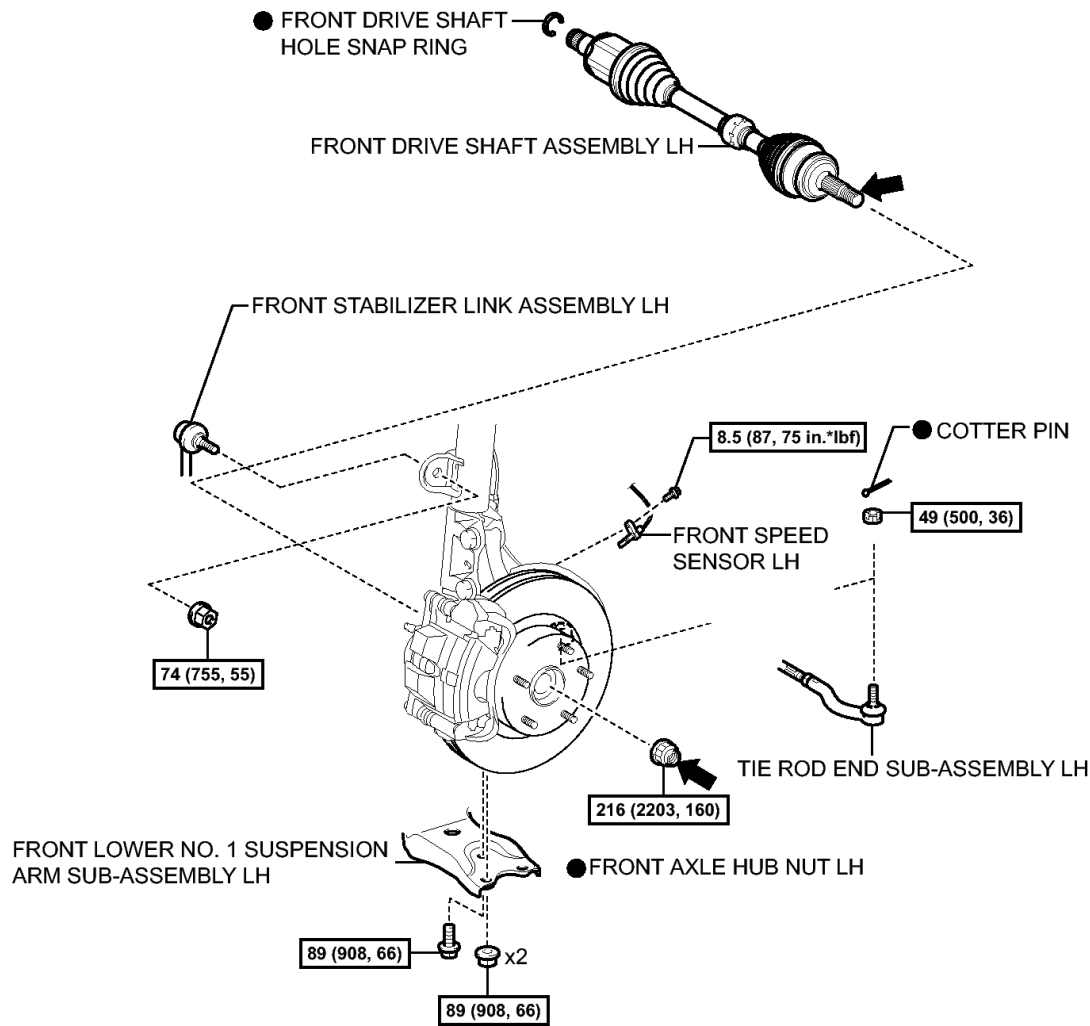
N*m (kgf*cm, ft*lb) : Specified torque

● Non-reusable part

P

Fig. 290: Identifying Engine Assembly Replacement Components With Torque Specifications (7 Of 13)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



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

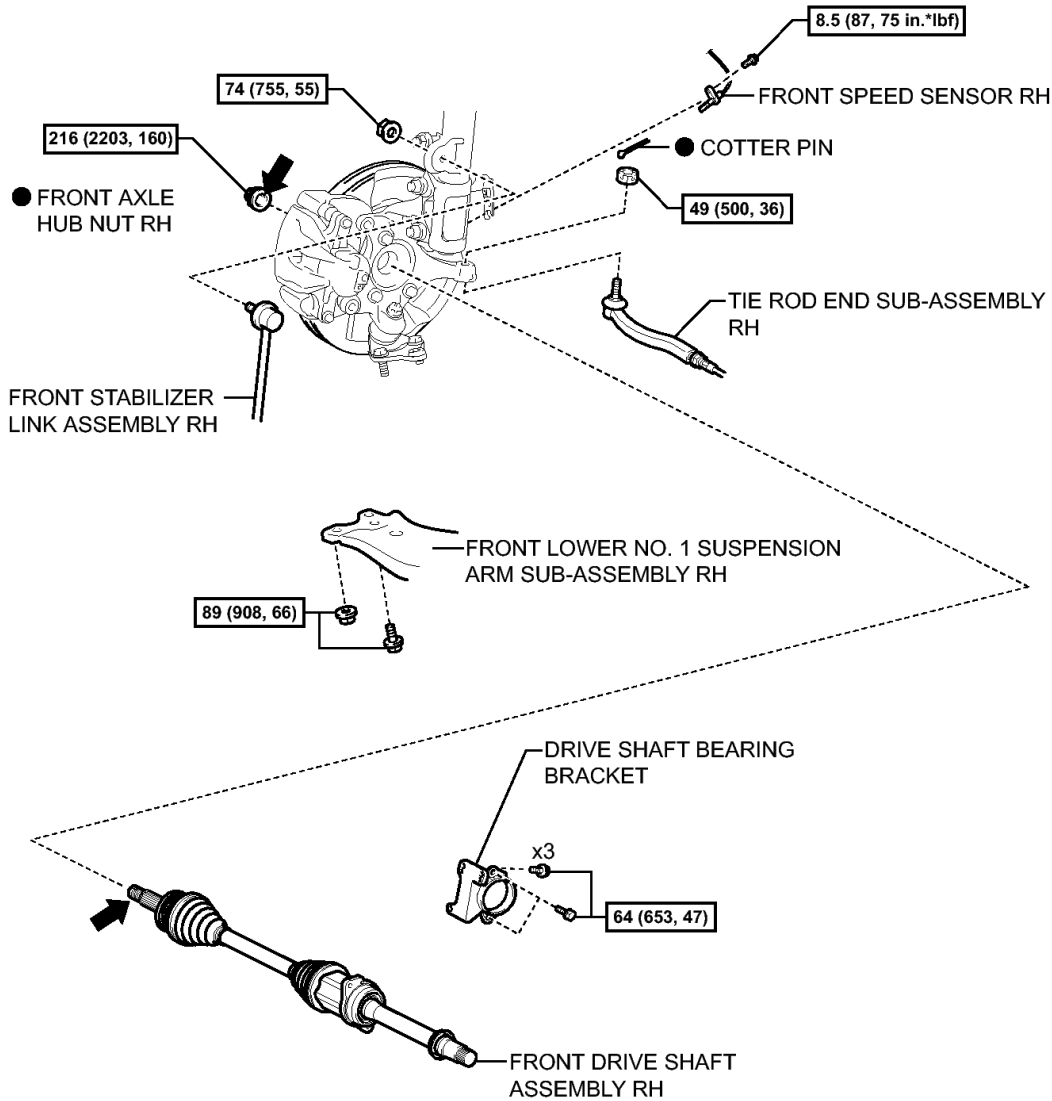
● Non-reusable part

➡ Do not apply lubricants to the threaded parts.

P

Fig. 291: Identifying Engine Assembly Replacement Components With Torque Specifications (8 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



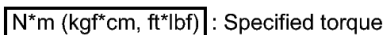
N*m (kgf*cm, ft*lbf) : Specified torque

● Non-reusable part ← Do not apply lubricants to the threaded parts.

P

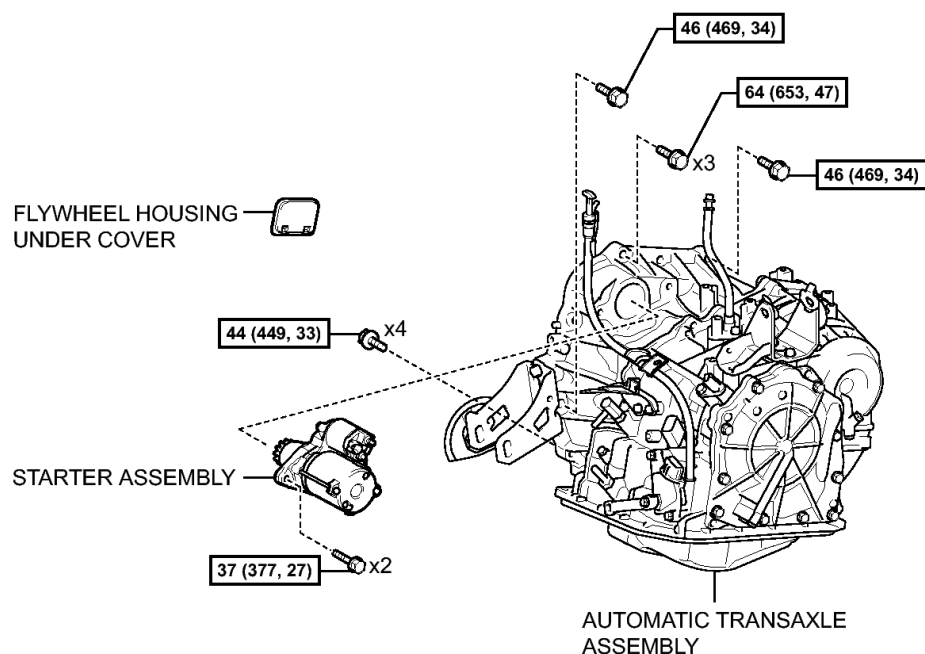
Fig. 292: Identifying Engine Assembly Replacement Components With Torque Specifications (9 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



ILLUSTRATION

for Automatic Transaxle:



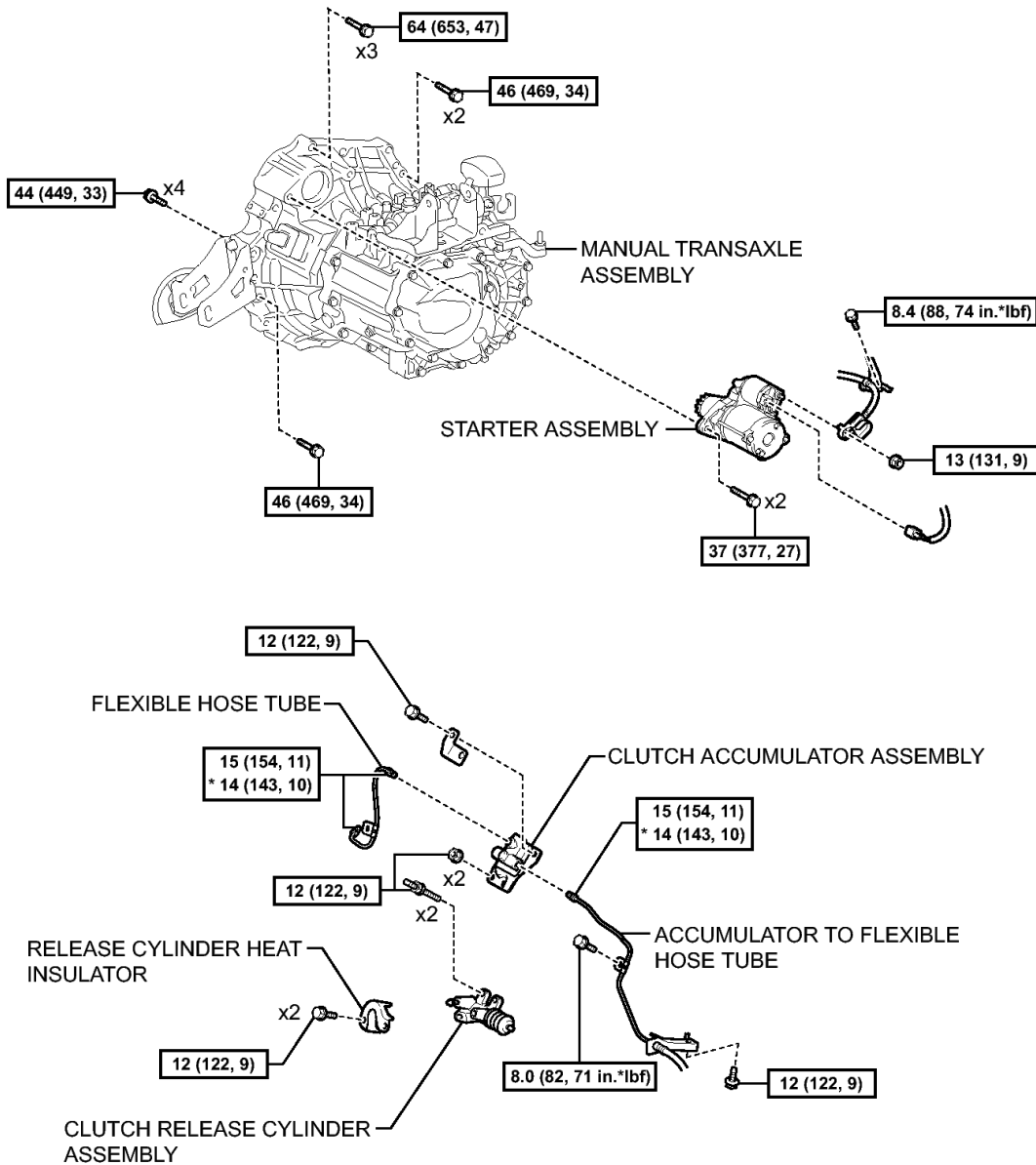
N*m (kgf*cm, ft*lb) : Specified torque

P

Fig. 294: Identifying Engine Assembly Replacement Components With Torque Specifications (11 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

for Manual Transaxle:



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

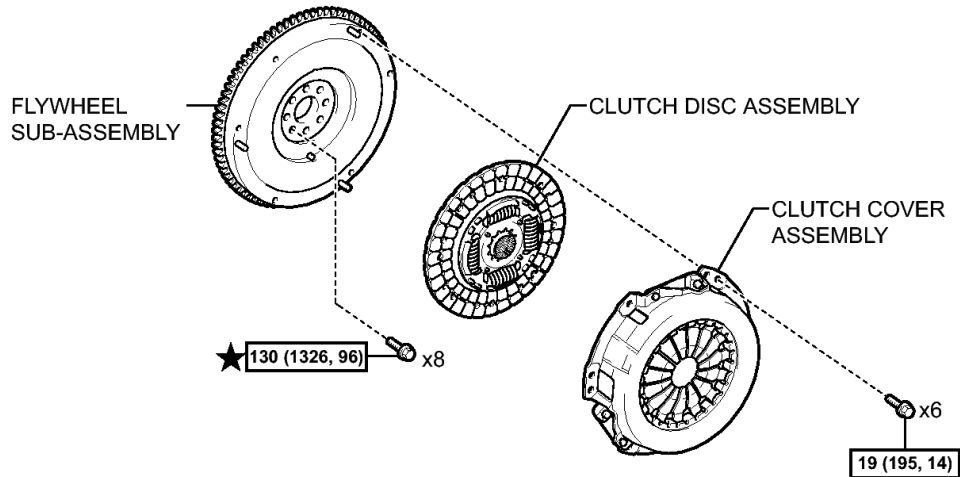
* For use with union nut wrench

P

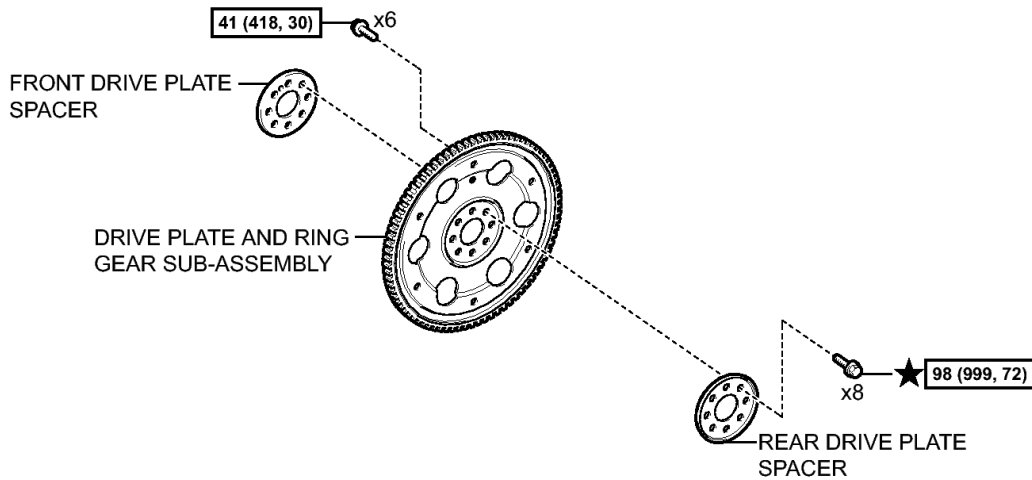
Fig. 295: Identifying Engine Assembly Replacement Components With Torque Specifications (12 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

for Manual Transaxle:



for Automatic Transaxle:



$\boxed{N \cdot m \text{ (kgf} \cdot \text{cm, ft} \cdot \text{lbf)}}$: Specified torque

$\star$ Precoated part

P

Fig. 296: Identifying Engine Assembly Replacement Components With Torque Specifications (13 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

REMOVAL

1. PLACE FRONT WHEELS FACING STRAIGHT AHEAD

2. **SECURE STEERING WHEEL** . Refer to **REMOVAL - Step 2** .
3. **REFRIGERANT FROM REFRIGERATION SYSTEM** . Refer to **REPLACEMENT - Step 1** .
4. **DISCHARGE FUEL SYSTEM PRESSURE** . Refer to **REMOVAL - Step 1** .
5. **REMOVE BATTERY** . Refer to **REMOVAL - Step 6** .
6. **REMOVE HOOD** See step 3.
7. **REMOVE FRONT WHEELS**
8. **REMOVE CENTER TRANSMISSION UNDER COVER ASSEMBLY**
9. **REMOVE NO. 1 ENGINE UNDER COVER**
10. **REMOVE NO. 2 ENGINE UNDER COVER**
11. **REMOVE REAR ENGINE UNDER COVER LH**
12. **REMOVE REAR ENGINE UNDER COVER RH**
13. **SEPARATE CENTER EXHAUST PIPE ASSEMBLY**
 - a. Remove the 2 bolts and separate the center exhaust pipe.
 - b. Remove the gasket.
14. **REMOVE FRONT EXHAUST PIPE ASSEMBLY**
 - a. Disconnect the heated oxygen sensor connector.
 - b. Remove the 2 bolts and 2 compression springs and remove the front exhaust pipe.
15. **REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY** . Refer to **REMOVAL - Step 1** .
16. **DRAIN ENGINE COOLANT** . Refer to **REPLACEMENT - Step 1** .
17. **DRAIN AUTOMATIC TRANSAXLE FLUID (for Automatic Transaxle)** . Refer to **REMOVAL - Step 9** .
18. **DRAIN MANUAL TRANSAXLE OIL (for Manual Transaxle)** . Refer to **REMOVAL - Step 9** .
19. **SEPARATE RADIATOR RESERVE TANK ASSEMBLY** See step 22.
20. **REMOVE AIR CLEANER CAP SUB-ASSEMBLY WITH NO. 1 AIR CLEANER HOSE** . Refer to **REMOVAL - Step 3** .
21. **REMOVE AIR CLEANER CASE SUB-ASSEMBLY** . Refer to **REMOVAL - Step 4** .
22. **REMOVE NO. 2 BATTERY CARRIER** . Refer to **REMOVAL - Step 24** .
23. **REMOVE THROTTLE WITH MOTOR BODY ASSEMBLY** . Refer to **REMOVAL - Step 4** .
24. **REMOVE FAN AND GENERATOR V BELT** See step 2.
25. **REMOVE GENERATOR ASSEMBLY** . Refer to **REMOVAL - Step 4** .
26. **SEPARATE SUCTION HOSE SUB-ASSEMBLY** . Refer to **REMOVAL - Step 5** .
27. **SEPARATE DISCHARGE HOSE SUB-ASSEMBLY** . Refer to **REMOVAL - Step 6** .
28. **REMOVE COMPRESSOR ASSEMBLY** . Refer to **REMOVAL - Step 7** .
29. **DISCONNECT OUTLET RADIATOR HOSE**

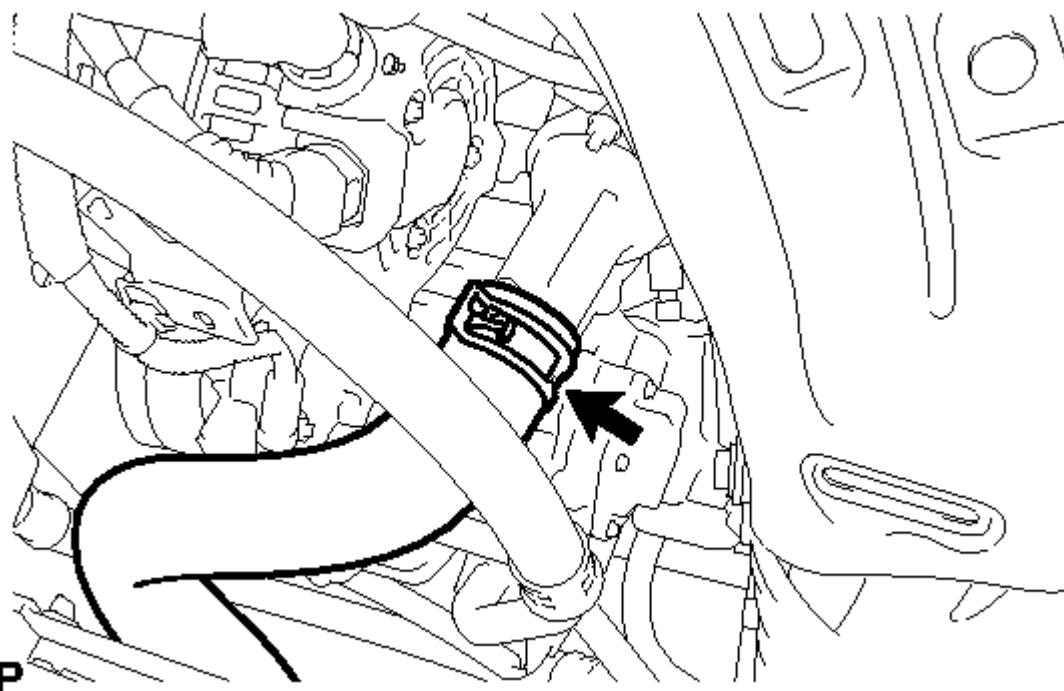


Fig. 297: Location of Outlet Radiator Hose

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

- a. Disconnect the outlet radiator hose.

30. DISCONNECT INLET RADIATOR HOSE

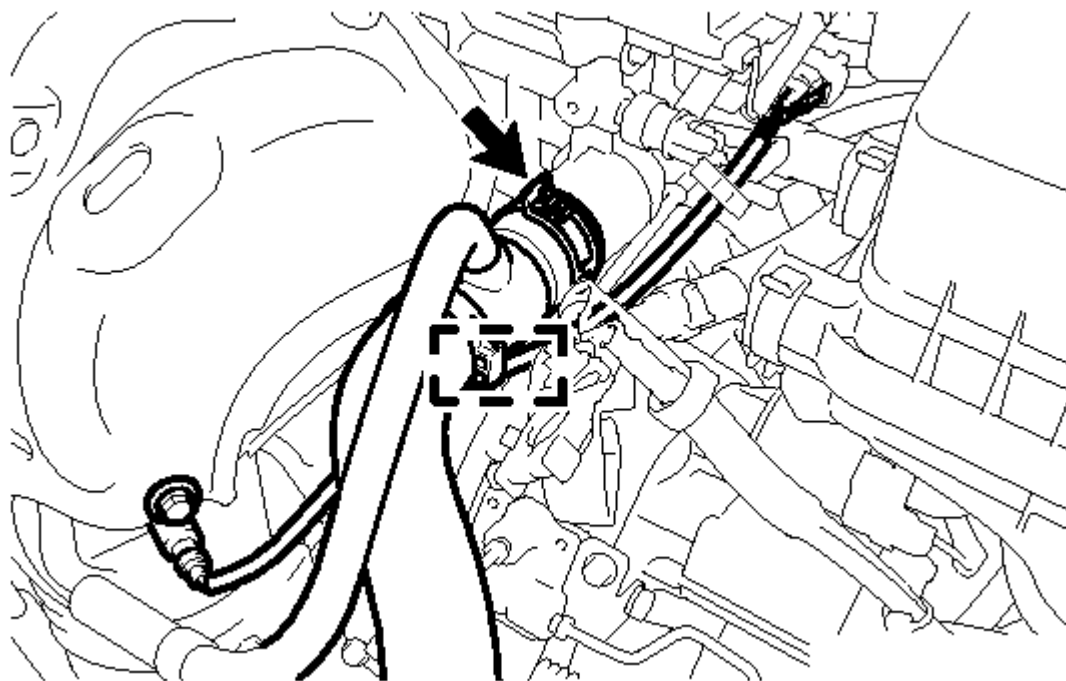
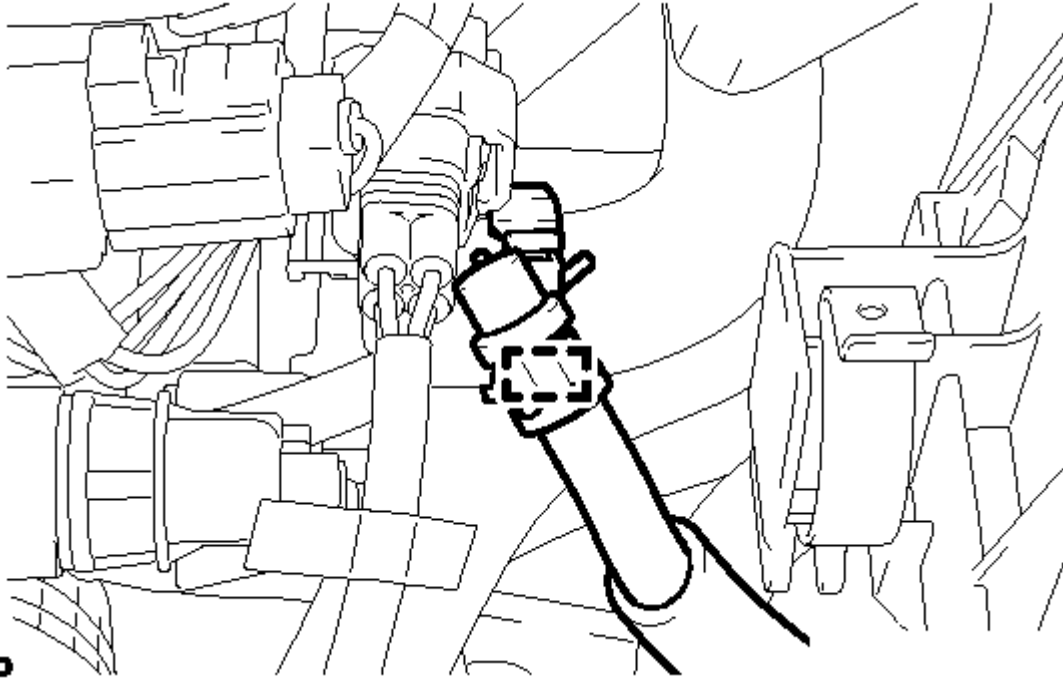


Fig. 298: Identifying Inlet Radiator Hose Clamps

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

- a. Disengage the heated oxygen sensor wire harness clamp.
 - b. Disconnect the inlet radiator hose.
31. **DISCONNECT NO. 1 OIL COOLER TUBE SUB-ASSEMBLY (for Automatic Transaxle)** . Refer to **REMOVAL - Step 36** .
32. **DISCONNECT BREATHER HOSE (for Automatic Transaxle)**

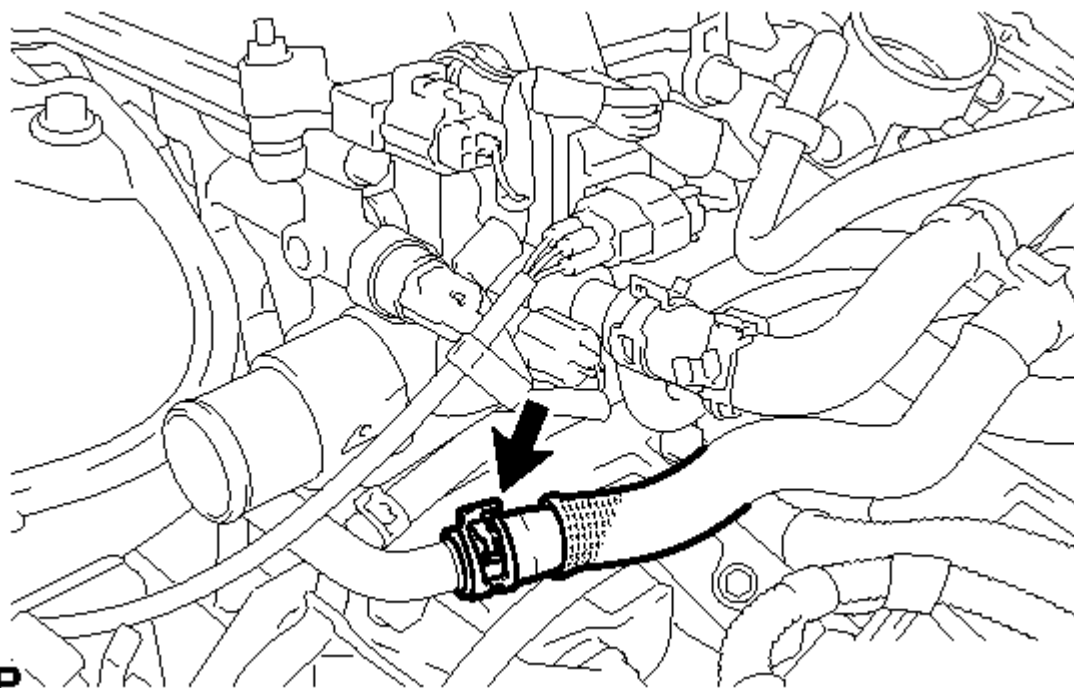


P

Fig. 299: Identifying Breather Plug Hose Clamp

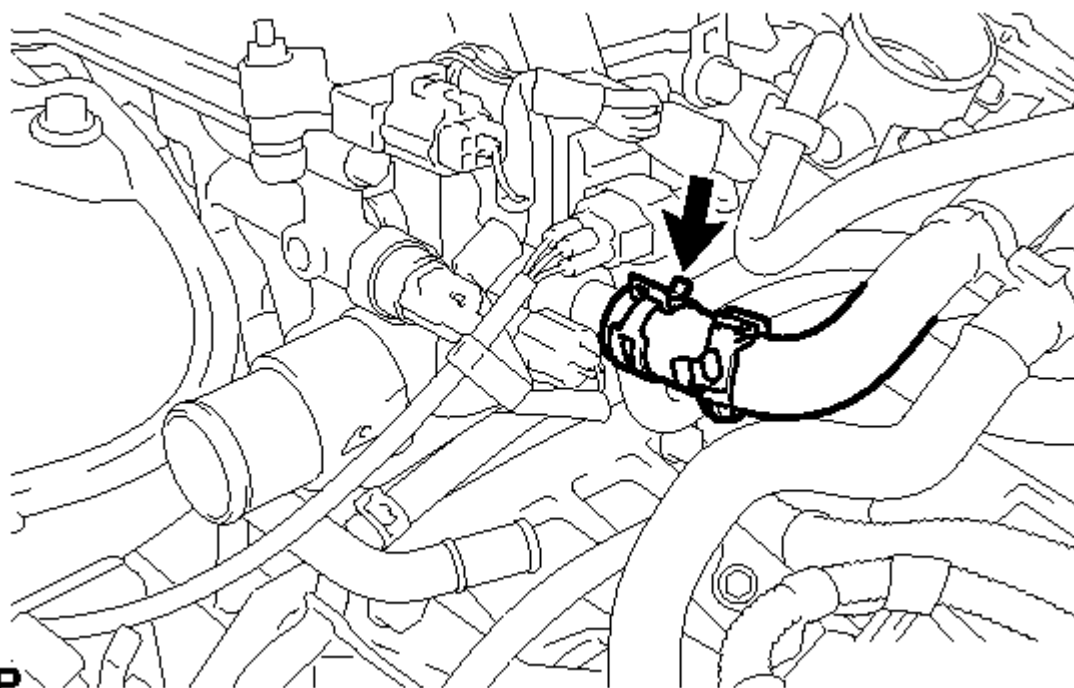
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Disengage the clamp and disconnect the breather hose.
33. **DISCONNECT OUTLET HEATER WATER HOSE**

**P****Fig. 300: Identifying Outlet Heater Water Hose**

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

- a. Disconnect the outlet heater water hose.

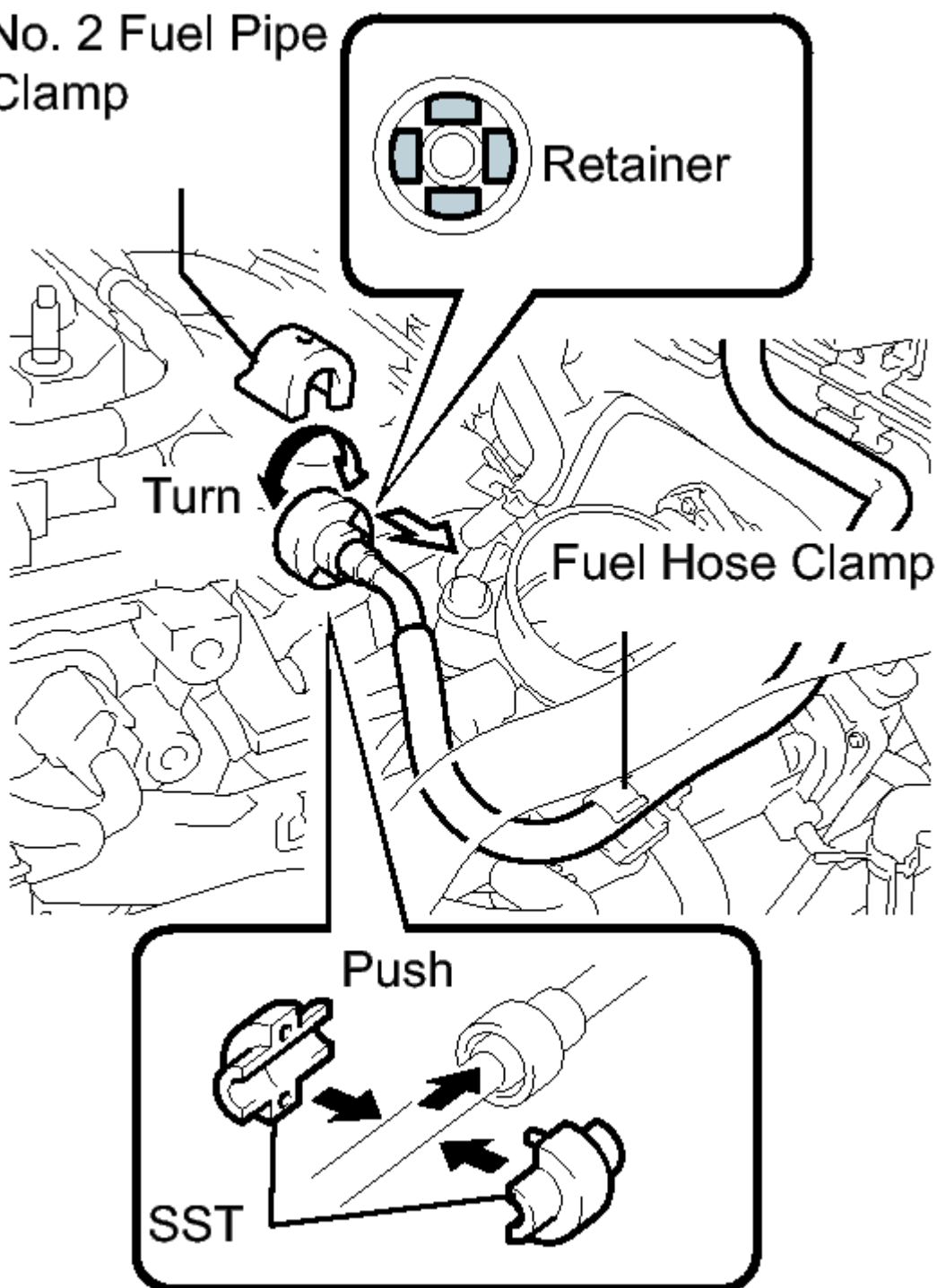
34. DISCONNECT INLET HEATER WATER HOSE**P****Fig. 301: Identifying INLET HEATER WATER HOSE**

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

- a. Disconnect the inlet heater water hose.

35. REMOVE FUEL TUBE SUB-ASSEMBLY

No. 2 Fuel Pipe
Clamp



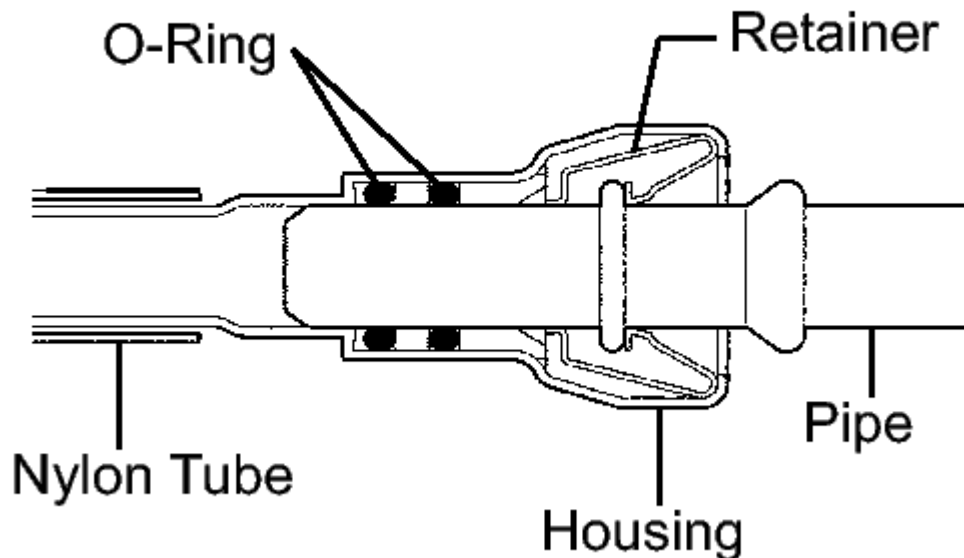
P

Fig. 302: Removing Fuel Tube Connector

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

NOTE: Do not forcibly bend, kink or twist the fuel main tube.

- a. Remove the fuel tube from the fuel hose clamp.
- b. Remove the No. 2 fuel pipe clamp.
- c. Wipe off any dirt on the fuel tube connector.
- d. Hold the fuel tube connector, and then install SST.
 - **SST: 09268-21010**
- e. Turn SST to align the retainer inside the fuel tube connector with the chamfered part of SST.
- f. Insert SST into the fuel tube and hold it. Then push the fuel tube connector toward SST.
- g. Mount the retainer of the fuel tube connector onto the chamfered part of SST.
- h. Slide SST and the fuel tube connector together towards the fuel tube until they make a "click" sound, and then disconnect the fuel tube.



A76220

Fig. 303: Identifying O-Ring, Retainer, Nylon Tube, Housing And Pipe

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

- i. Drain the fuel remaining inside the fuel tube.
- j. Cover the fuel tube and fuel pipe with a plastic bag to protect the disconnected part.
- k. Release the claw and remove the No. 1 fuel pipe clamp.

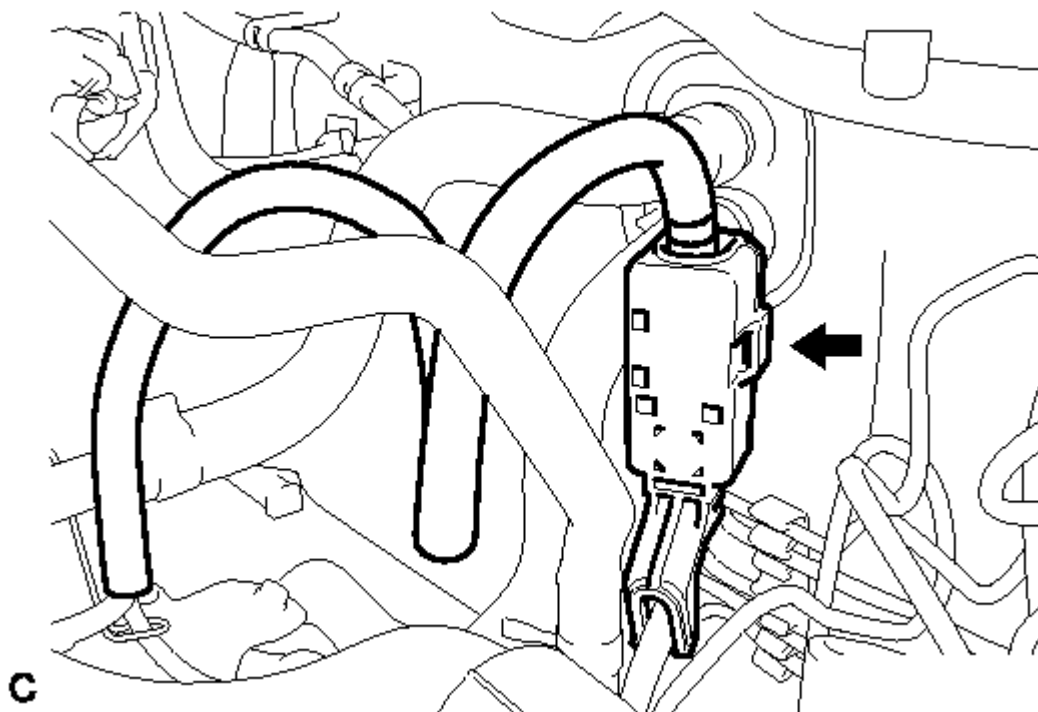


Fig. 304: Location Of No. 1 Fuel Pipe Clamp

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

1. Pinch the retainer as illustrated, then pull the fuel tube connector out of the pipe.

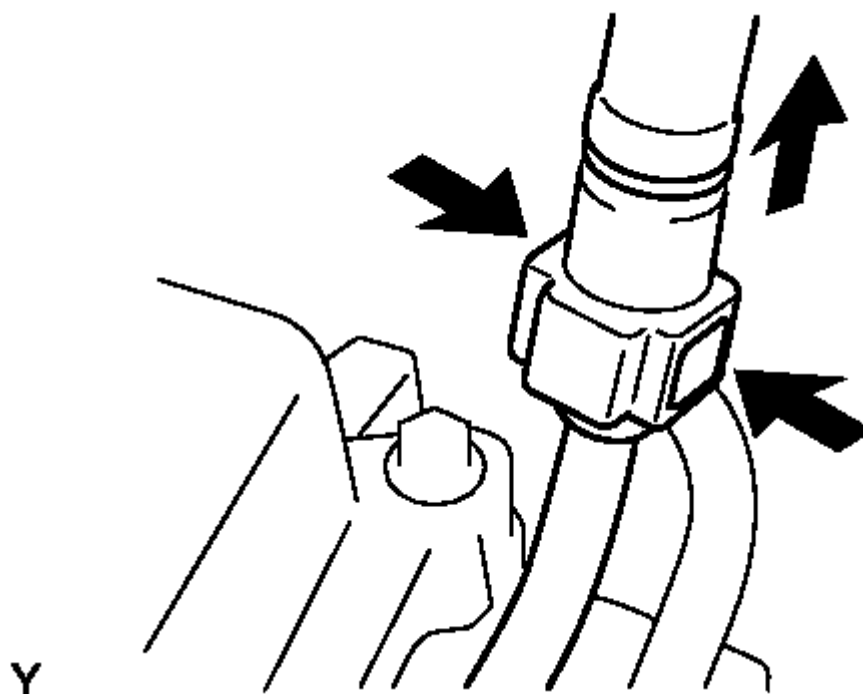


Fig. 305: Removing Fuel Tube Connector Retainer

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

NOTE:

- Remove any dirt and foreign matter from the fuel tube connector before performing this work.
- Do not allow any scratches or foreign matter on the parts when disconnecting, as the fuel tube connector has O-rings that seal the pipe.
- Perform this work by hand. Do not use any tools.
- Do not forcibly bend, kink or twist the nylon tube.
- Protect the disconnected parts by covering them with vinyl bags after disconnecting the fuel tube.
- If the fuel tube connector and pipe are stuck, push and pull to release them.

36. DISCONNECT CHECK VALVE TO CONNECTOR TUBE HOSE

- a. Disconnect the check valve to connector tube hose.

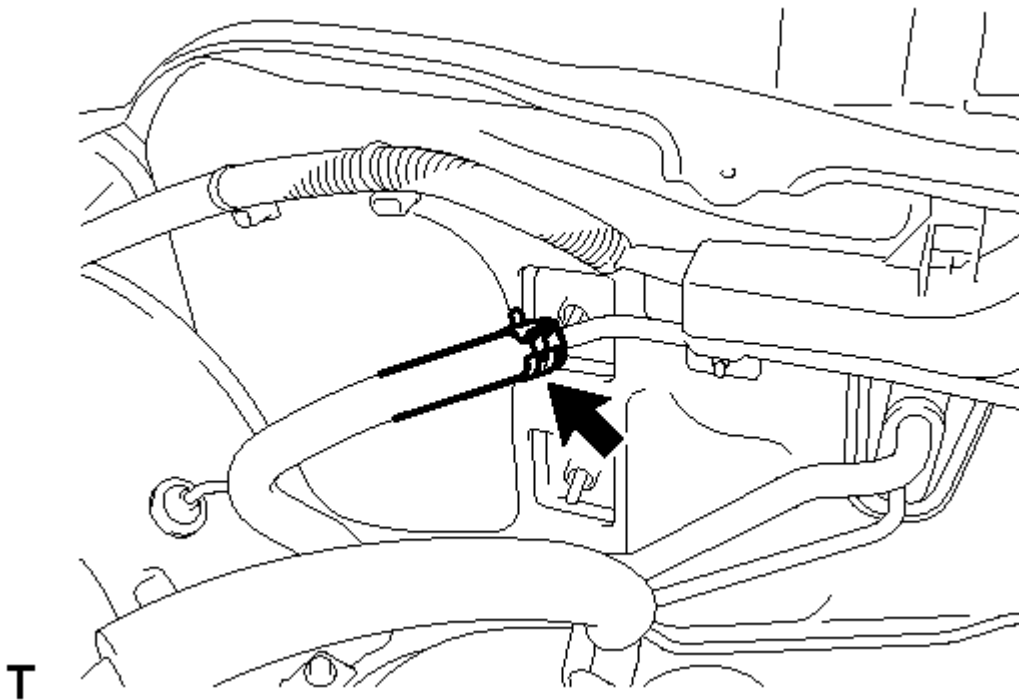


Fig. 306: View Of Check Valve To Connector Tube Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

37. REMOVE CLUTCH ACCUMULATOR ASSEMBLY (for Manual Transaxle)

Refer to the procedures under "REMOVE CLUTCH ACCUMULATOR ASSEMBLY". Refer to **REMOVAL**.

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

Refer to **REMOVAL** .

39. **SEPARATE ACCUMULATOR TO FLEXIBLE HOSE TUBE (for Manual Transaxle)** . Refer to **REMOVAL - Step 28** .
40. **SEPARATE TRANSMISSION CONTROL CABLE ASSEMBLY (for Automatic Transaxle)** . Refer to **REMOVAL - Step 32** .
41. **SEPARATE TRANSMISSION CONTROL CABLE ASSEMBLY (for Manual Transaxle)** . Refer to **REMOVAL - Step 29** .
42. **REMOVE STARTER ASSEMBLY (for Automatic Transaxle)** . Refer to **REMOVAL - Step 6** .
43. **REMOVE STARTER ASSEMBLY (for Manual Transaxle)** . Refer to **REMOVAL - Step 5** .
44. **REMOVE COLUMN HOLE COVER SILENCER SHEET** . Refer to **REMOVAL - Step 10** .
45. **SEPARATE NO. 2 STEERING INTERMEDIATE SHAFT ASSEMBLY** . Refer to **REMOVAL - Step 11** .
46. **REMOVE NO. 1 STEERING COLUMN HOLE COVER SUB-ASSEMBLY** . Refer to **REMOVAL - Step 5** .
47. **SEPARATE ECM**
 - a. Pull up the lever and disconnect the ECM connector.

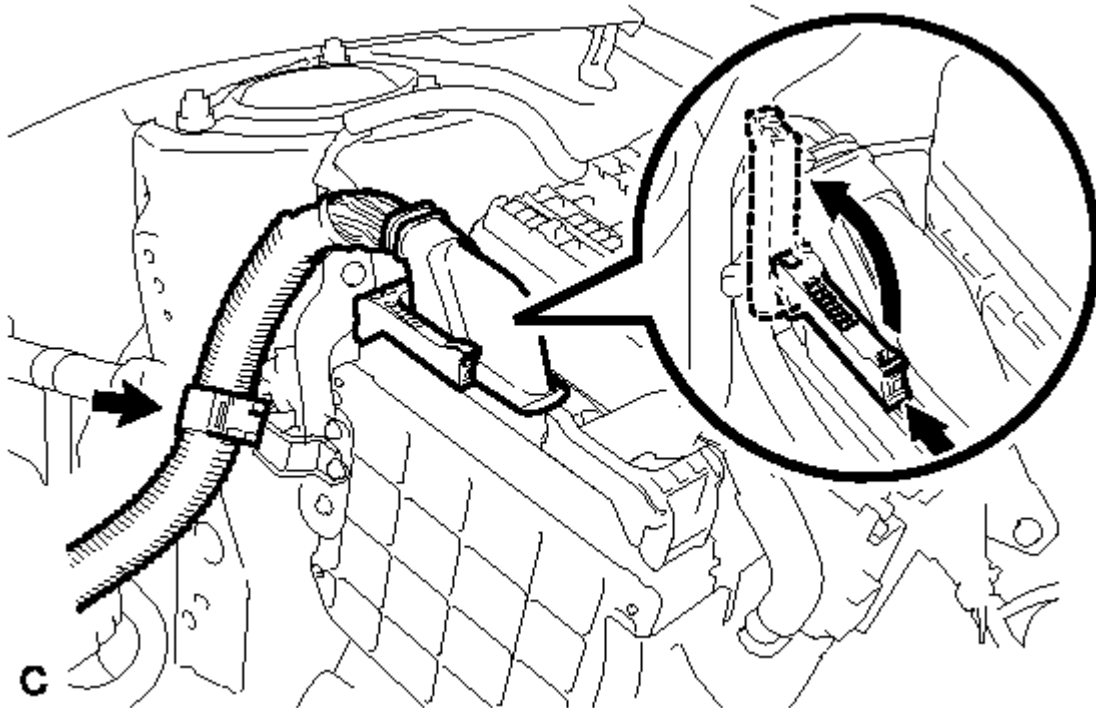


Fig. 307: Location of Engine Room Relay Block Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

48. **SEPARATE ENGINE WIRE**
 - a. Remove the engine room relay block cover.

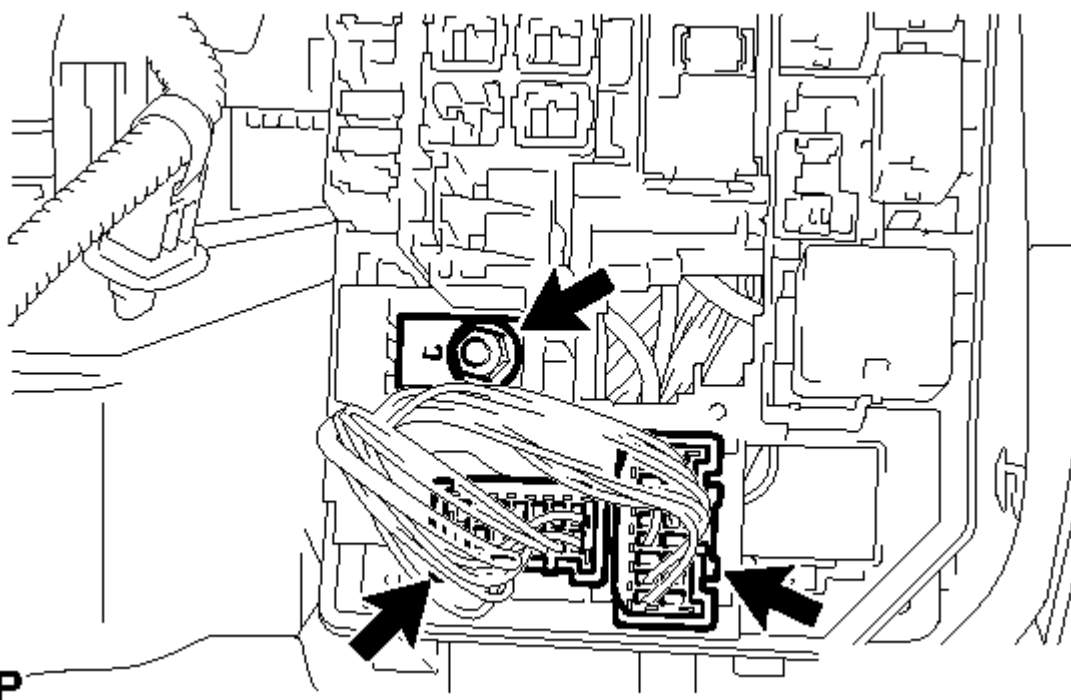


Fig. 308: Location of Engine Wire Connectors And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the nut and disconnect the 2 engine wire connectors.
- c. Remove the bolt and engine wire cover. Then disconnect the engine wire from the engine wire cover.

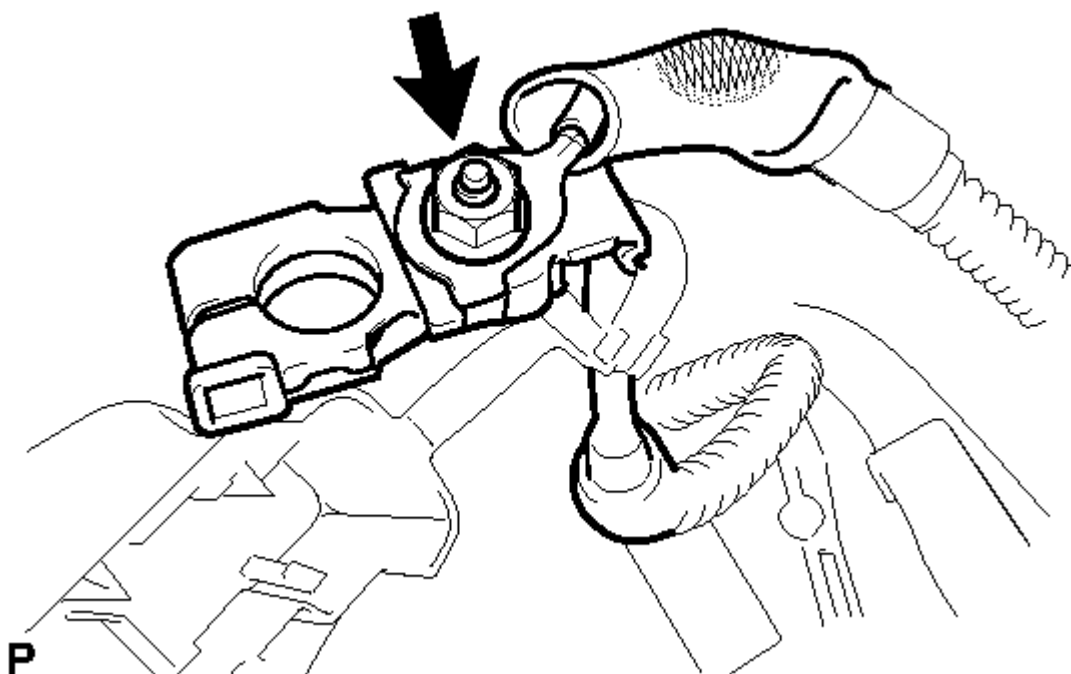


Fig. 309: Location of Positive Battery Terminal Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Remove the nut from the positive battery terminal to disconnect the engine wire.
 - e. Disconnect the ground cable connector.
 - f. Disconnect the ground cable from the clamp located near the starter.
 - g. Remove the bolt and ground cable located near the starter.
49. **REMOVE FRONT AXLE HUB NUT LH** . Refer to **REMOVAL - Step 2** .
50. **REMOVE FRONT AXLE HUB NUT RH**

HINT:

Perform the same procedure for the LH side.

51. **SEPARATE FRONT SPEED SENSOR LH** . Refer to **REMOVAL - Step 3** .
52. **SEPARATE FRONT SPEED SENSOR RH**

HINT:

Perform the same procedure for the LH side.

53. **SEPARATE FRONT LOWER NO. 1 SUSPENSION ARM SUB-ASSEMBLY LH** . Refer to **REMOVAL - Step 7** .
54. **SEPARATE FRONT LOWER NO. 1 SUSPENSION ARM SUB-ASSEMBLY RH**

HINT:

Perform the same procedure for the LH side.

55. **SEPARATE TIE ROD END SUB-ASSEMBLY LH** . Refer to **REMOVAL - Step 15** .
56. **SEPARATE TIE ROD END SUB-ASSEMBLY RH**

HINT:

Perform the same procedure for the LH side.

57. **SEPARATE FRONT STABILIZER LINK ASSEMBLY LH** . Refer to **REMOVAL - Step 11** .
58. **SEPARATE FRONT STABILIZER LINK ASSEMBLY RH**

HINT:

Perform the same procedure for the LH side.

59. **SEPARATE FRONT AXLE ASSEMBLY LH** . Refer to **REMOVAL - Step 17** .
60. **SEPARATE FRONT AXLE ASSEMBLY RH**

HINT:

Perform the same procedure for the LH side.

61. **REMOVE FRONT DRIVE SHAFT ASSEMBLY LH** . Refer to **REMOVAL - Step 19** .
62. **REMOVE FRONT DRIVE SHAFT ASSEMBLY RH** . Refer to **REMOVAL - Step 20** .
63. **REMOVE DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT (for Automatic Transaxle)** . Refer to **REMOVAL - Step 37** .
64. **SUSPEND ENGINE ASSEMBLY**
 - a. Install the No. 1 and No. 2 engine hangers with the new bolts as shown in the illustration.

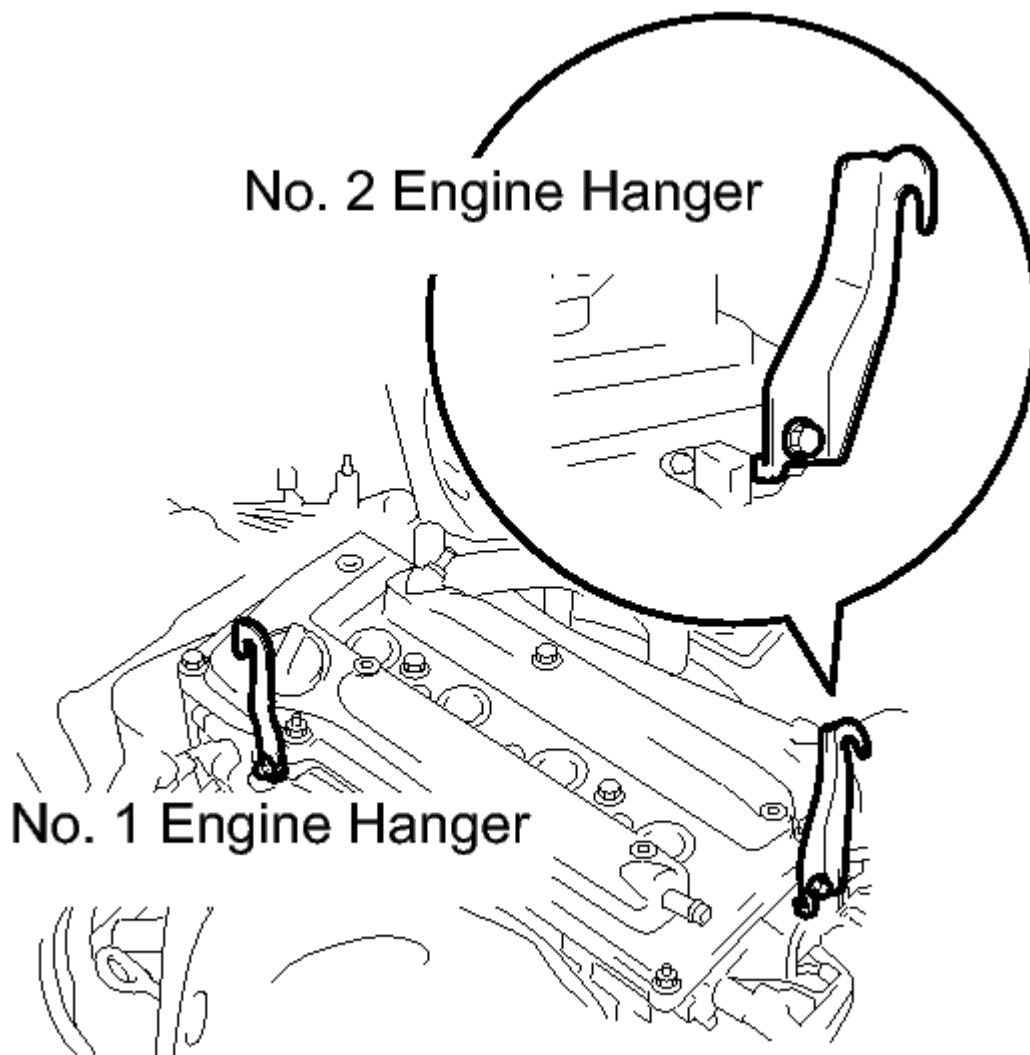
**T**

Fig. 310: Identifying No. 1 And No. 2 Engine Hangers With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

PART NO.

Item	Part No.
No. 1 engine hanger	12281-28010
No. 2 engine hanger	12282-28010
Bolt	91512-61020

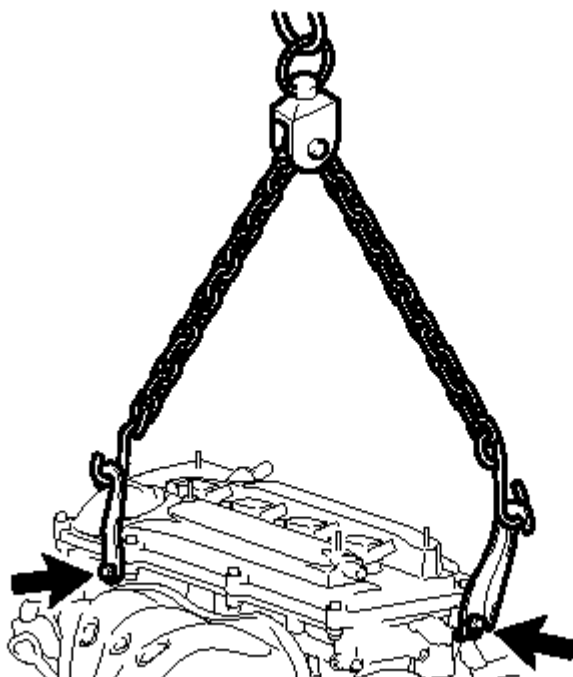
**P**

Fig. 311: Attaching Sling Device And Engine With Chain Block
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

65. REMOVE FRONT SUSPENSION MEMBER REINFORCEMENT LH

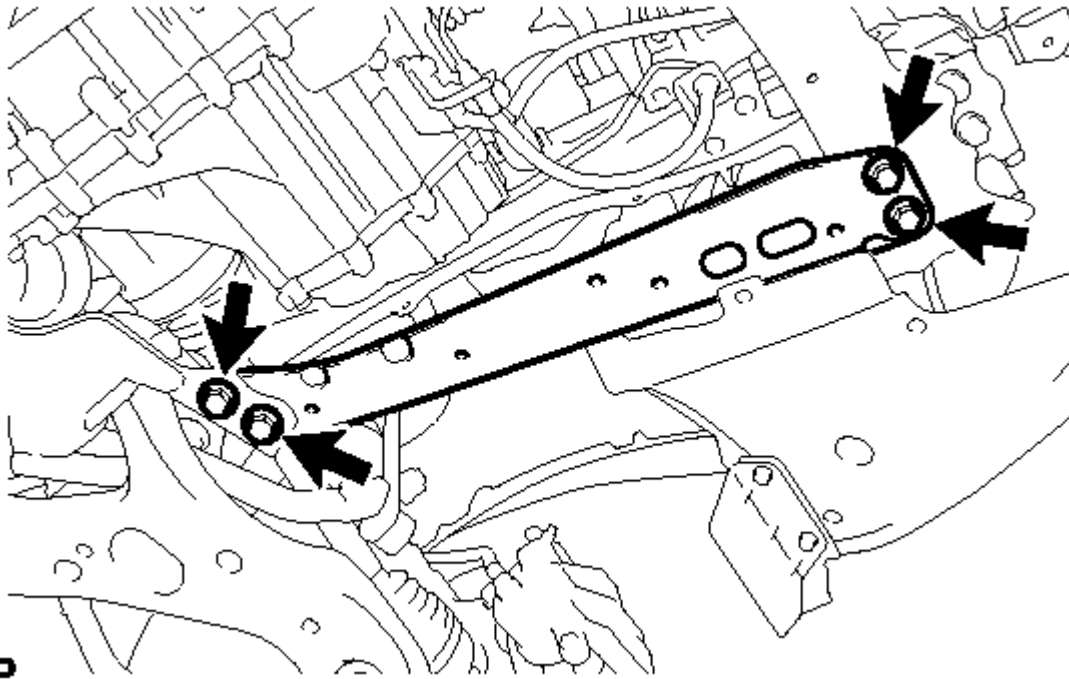


Fig. 312: Location of Front Suspension Member Reinforcement

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

- a. Remove the 4 bolts and front suspension member reinforcement LH.

66. REMOVE FRONT SUSPENSION MEMBER REINFORCEMENT RH

HINT:

Perform the same procedure for the LH side.

67. REMOVE FRONT SUSPENSION MEMBER BRACE REAR LH

- a. Remove the 3 bolts and front suspension member rear brace LH.

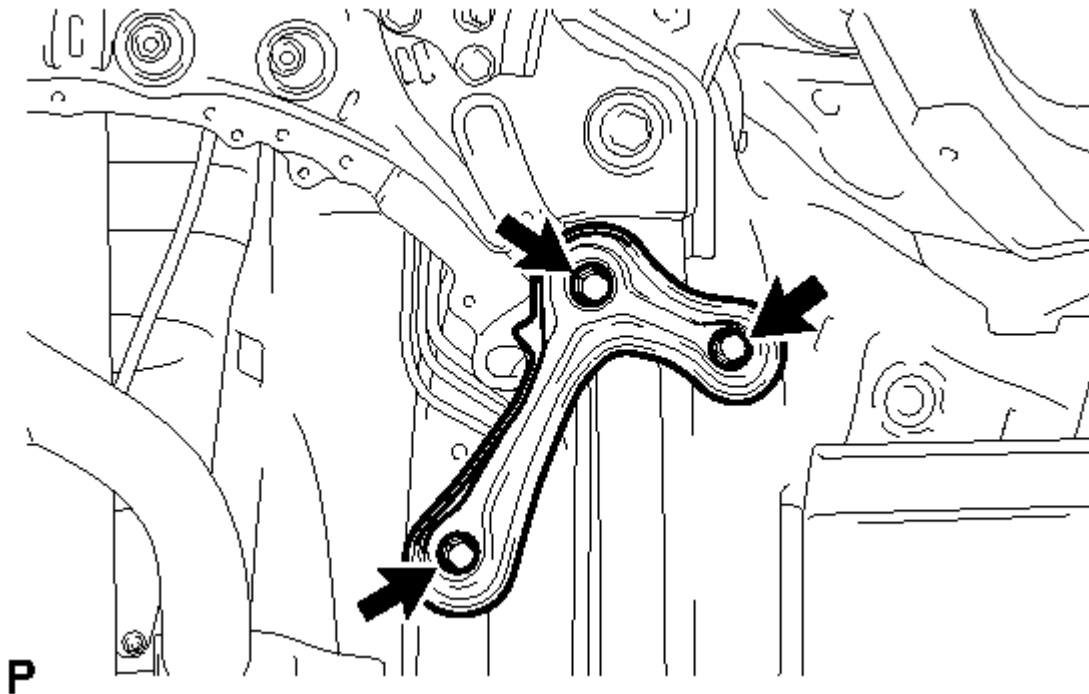


Fig. 313: Location of Bolts And Front Suspension Member Brace Rear LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

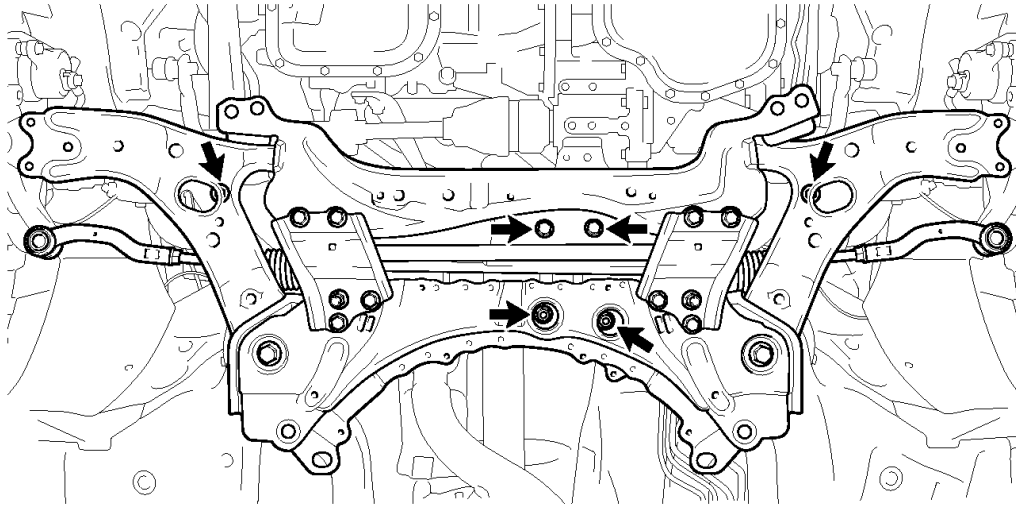
68. REMOVE FRONT SUSPENSION MEMBER BRACE REAR RH

HINT:

Perform the same procedure for the LH side.

69. REMOVE FRONT SUSPENSION CROSSMEMBER SUB-ASSEMBLY

- a. Support the front suspension crossmember with a transmission jack.
- b. Remove the 4 bolts, 2 nuts, and front suspension crossmember sub-assembly.

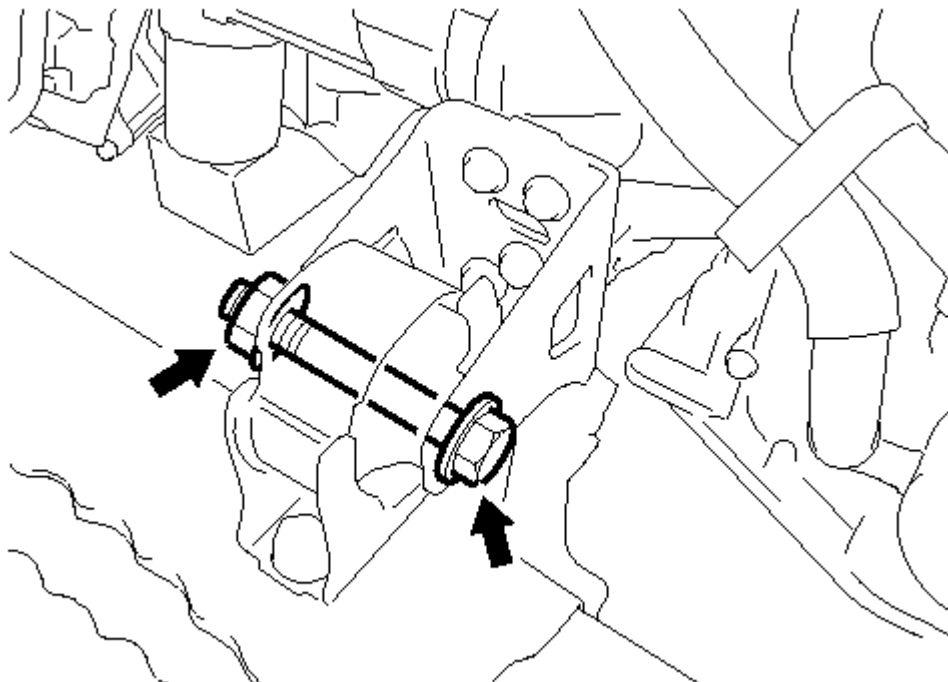


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Fig. 314: Location of Bolts, Nuts And Front Suspension Crossmember Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

70. REMOVE FRONT CROSS MEMBER SUB-ASSEMBLY

- a. Remove the bolt and nut.



C

Fig. 315: Location of Engine Mounting Insulator Bolt And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Separate the engine mounting insulator front from the engine mounting bracket front.

- c. Remove the 2 bolts and front engine mounting insulator.

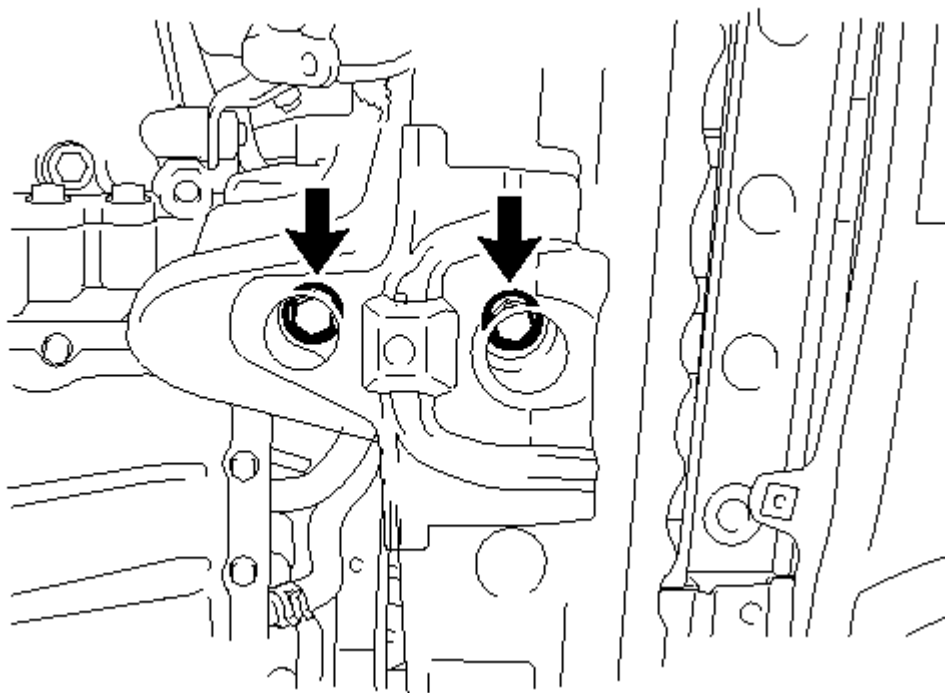
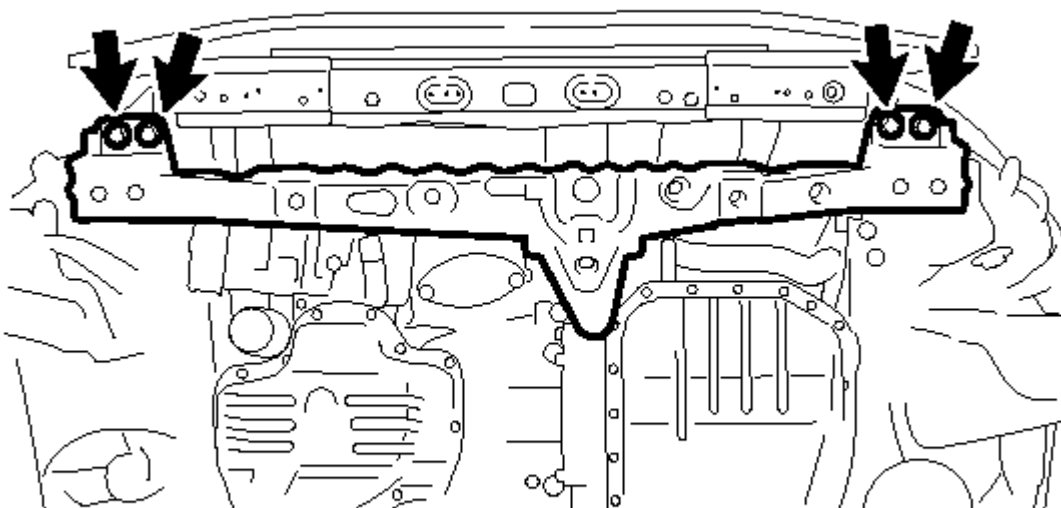


Fig. 316: Location of Front Engine Mounting Insulator Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

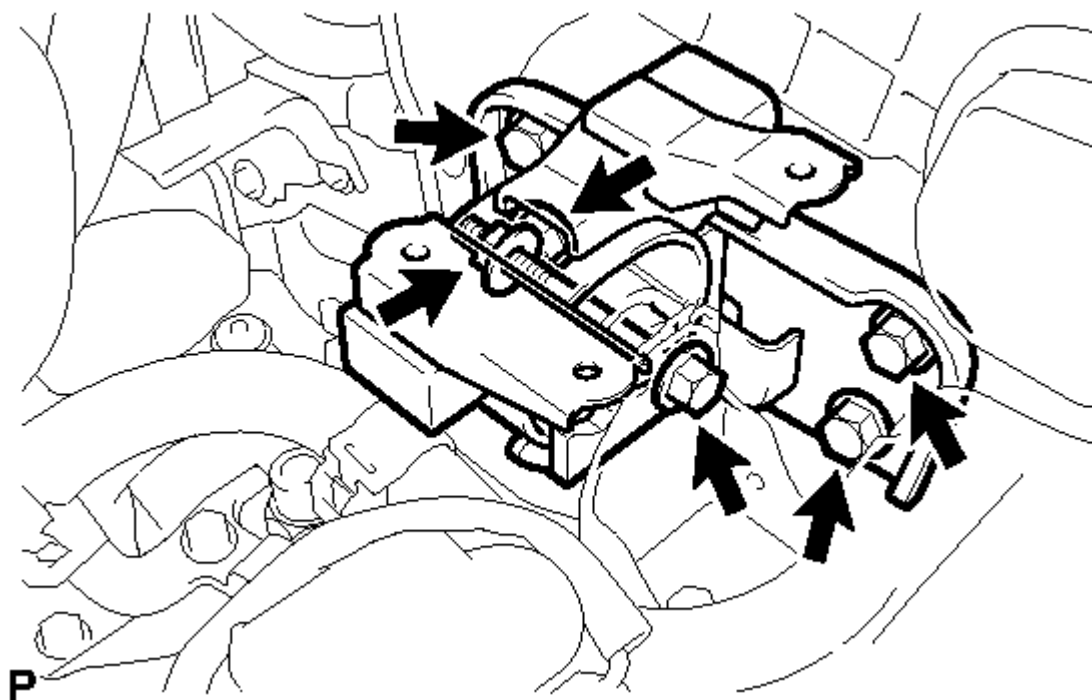
Only perform this procedure when replacement of the engine mounting insulator is necessary.

- d. Remove the 4 bolts and front crossmember.

**C****Fig. 317: Location of Front Crossmember Bolts**

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

- 71. REMOVE ENGINE MOUNTING INSULATOR SUB-ASSEMBLY RH See step 40.
- 72. REMOVE ENGINE MOUNTING INSULATOR SUB-ASSEMBLY LH

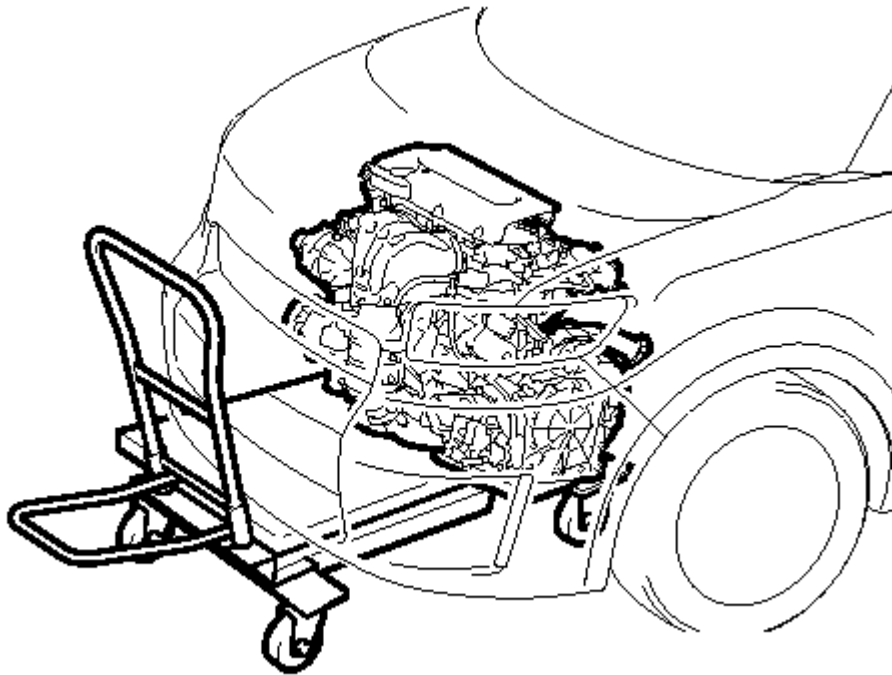
**Fig. 318: Identifying Engine Mounting Insulator Bolts And Nut**

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

- a. Remove the through bolt and nut.
- b. Remove the 4 bolts and engine mounting insulator LH.

73. REMOVE ENGINE ASSEMBLY WITH TRANSAXLE

- a. Set the engine lifter.



P

Fig. 319: Identifying Engine Lifter

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

NOTE: Place the engine on wooden blocks or equivalent so that the engine is level.

- b. Carefully remove the engine with transaxle from the vehicle.

74. REMOVE REAR ENGINE MOUNTING INSULATOR SUB-ASSEMBLY

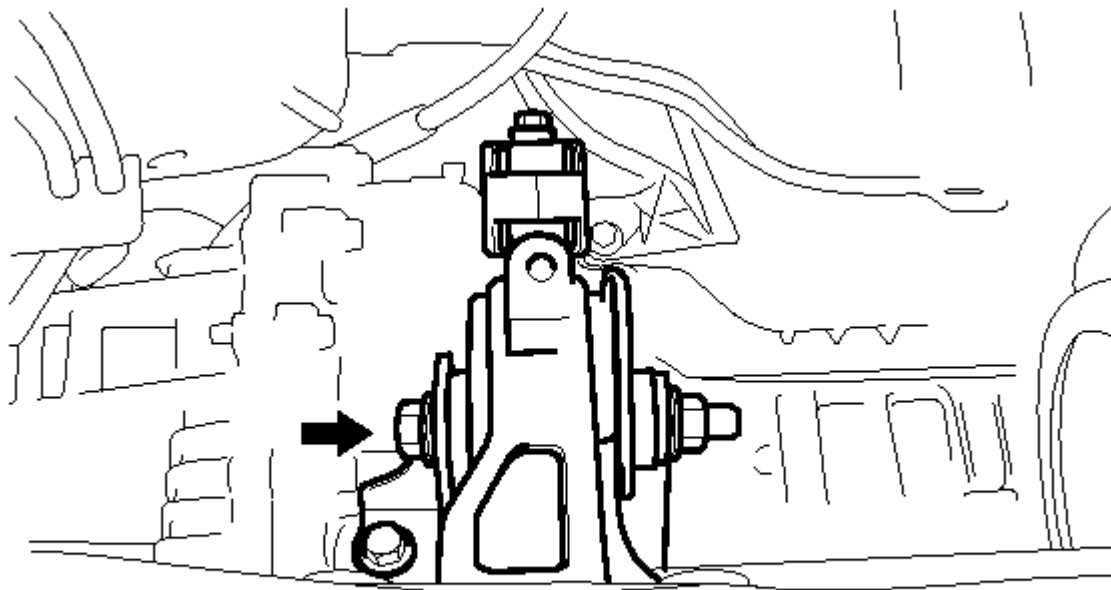
**C**

Fig. 320: Location of Rear Engine Mounting Insulator Bolt And Nut

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

- a. Remove the bolt and nut, and separate the rear engine mounting insulator.

75. REMOVE DRIVE SHAFT BEARING BRACKET

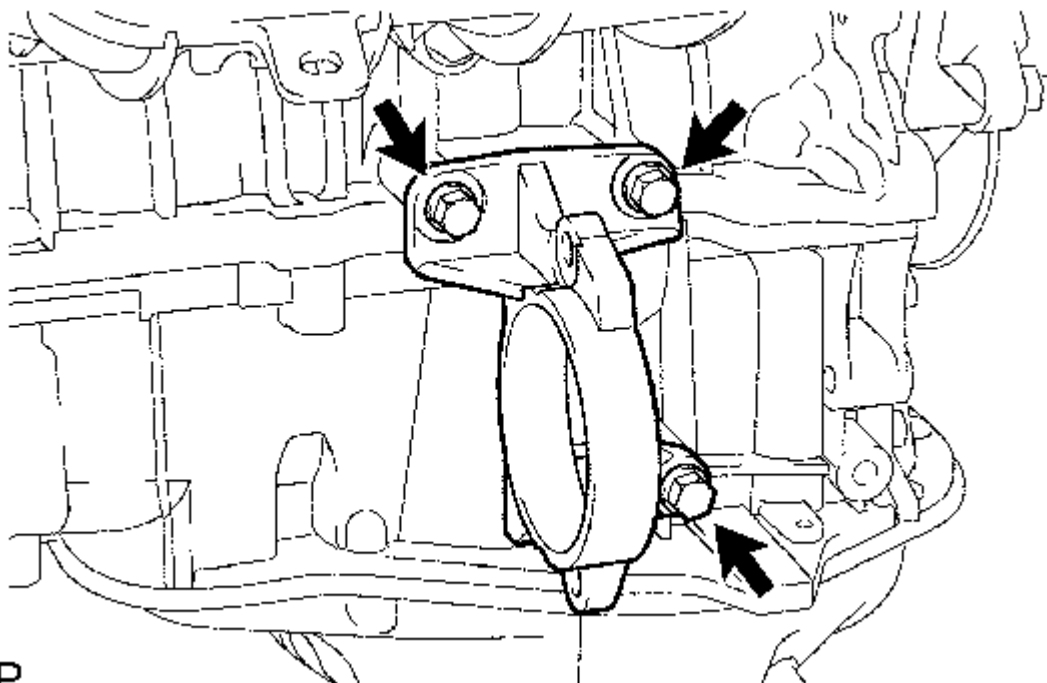
**P**

Fig. 321: Identifying Drive Shaft Bearing Bracket And Bolts

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

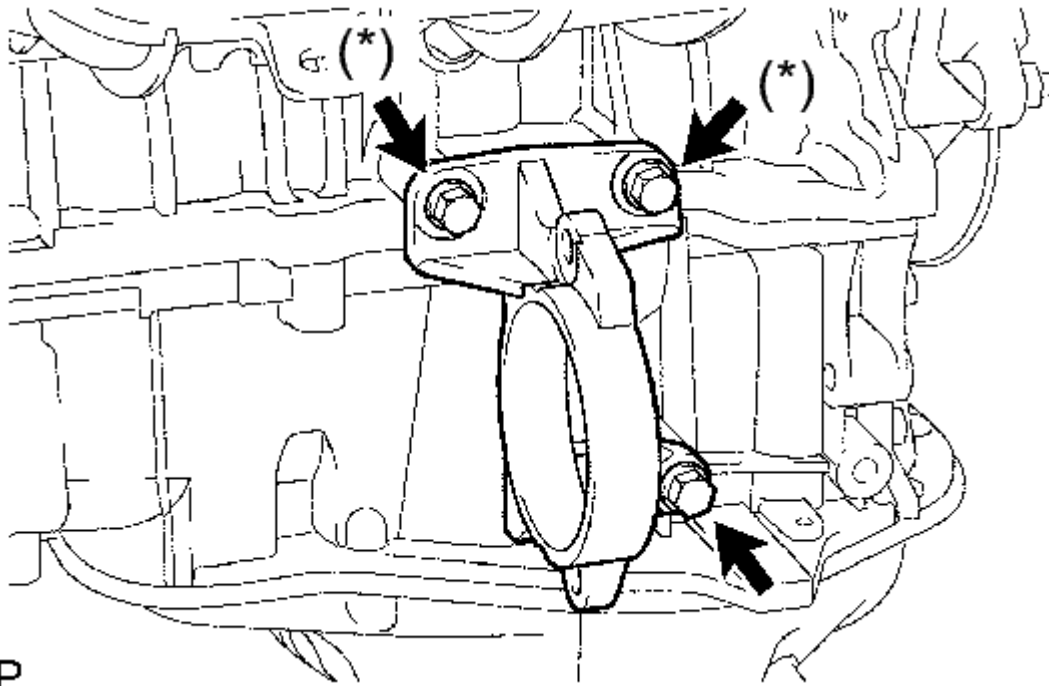
a. Remove the 3 bolts and bracket.

76. **REMOVE AUTOMATIC TRANSAXLE ASSEMBLY (for Automatic Transaxle)** . Refer to **REMOVAL - Step 47** .
77. **REMOVE MANUAL TRANSAXLE ASSEMBLY (for Manual Transaxle)** . Refer to **REMOVAL - Step 62** .
78. **REMOVE CLUTCH COVER ASSEMBLY (for Manual Transaxle)** . Refer to **REMOVAL - Step 7** .
79. **REMOVE CLUTCH DISC ASSEMBLY (for Manual Transaxle)**
80. **REMOVE DRIVE PLATE AND RING GEAR SUB-ASSEMBLY (for Automatic Transaxle)** See step 5.
81. **REMOVE FLYWHEEL SUB-ASSEMBLY (for Manual Transaxle)** See step 6.

INSTALLATION

INSTALLATION

1. **INSTALL DRIVE PLATE AND RING GEAR SUB-ASSEMBLY (for Automatic Transaxle)** See step 2.
2. **INSTALL FLYWHEEL SUB-ASSEMBLY (for Manual Transaxle)** See step 3.
3. **INSTALL CLUTCH DISC ASSEMBLY (for Manual Transaxle)** . Refer to **INSTALLATION - Step 1** .
4. **INSTALL CLUTCH COVER ASSEMBLY (for Manual Transaxle)** . Refer to **INSTALLATION - Step 2** .
5. **INSPECT AND ADJUST CLUTCH COVER ASSEMBLY (for Manual Transaxle)** . Refer to **INSTALLATION - Step 3** .
6. **INSTALL AUTOMATIC TRANSAXLE ASSEMBLY (for Automatic Transaxle)** . Refer to **INSTALLATION - Step 12** .
7. **INSTALL MANUAL TRANSAXLE ASSEMBLY (for Manual Transaxle)** . Refer to **INSTALLATION - Step 1** .
8. **INSTALL DRIVE SHAFT BEARING BRACKET**



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Fig. 322: Identifying Drive Shaft Bearing Bracket And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Install the bracket with the 3 bolts.

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

NOTE: Make sure there is no oil adhering to the bolts or threaded holes at the locations marked with (*) in the illustration. If there is any oil adhering to the bolts or threaded holes, clean and degrease the parts.

9. INSTALL REAR ENGINE MOUNTING INSULATOR SUB-ASSEMBLY

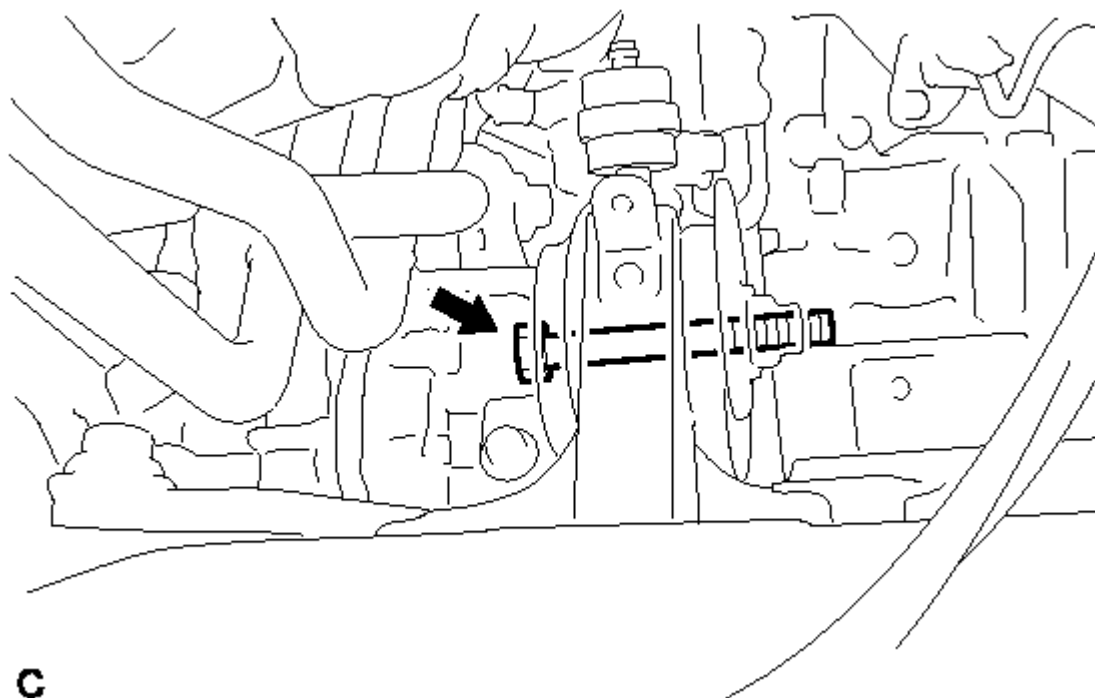
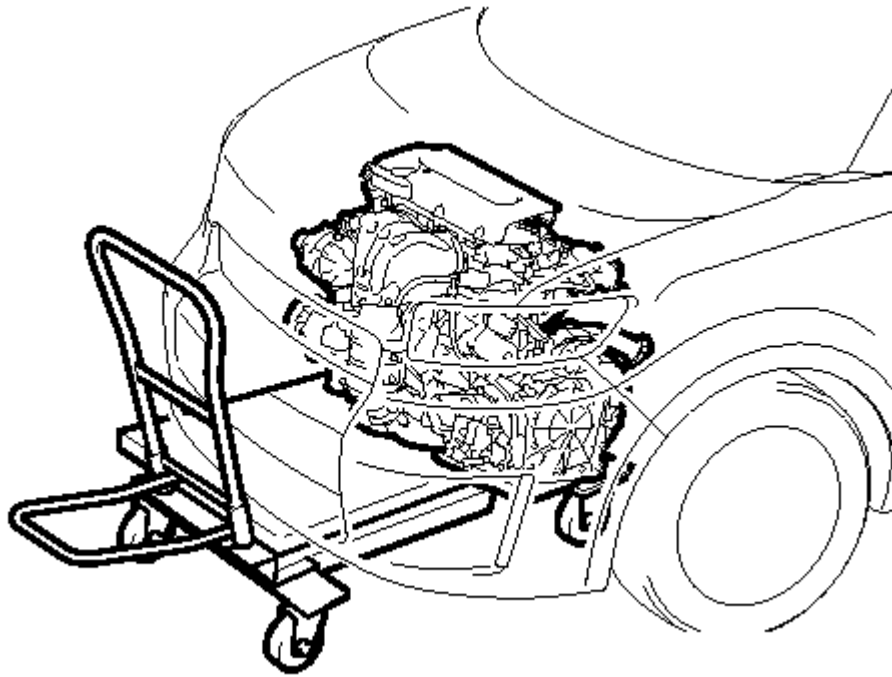


Fig. 323: Location of Rear Engine Mounting Insulator Bracket With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Install the rear engine mounting insulator to the engine mounting bracket with the through bolt.

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

10. INSTALL ENGINE ASSEMBLY WITH TRANSAXLE

**P****Fig. 324: Identifying Engine Lifter****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- a. Set the engine assembly with transaxle and front suspension crossmember on the engine lifter.
- b. Operate the engine lifter and lift the engine assembly with transaxle and front suspension crossmember to the position where the engine mounting insulator RH and LH can be installed.

WARNING: Do not raise the engine more than necessary. If the engine is raised excessively, the vehicle may also be lifted up.

NOTE:

- Make sure that the engine is clear of all wiring and hoses.
- While raising the engine into the vehicle, do not allow it to contact the vehicle.

11. INSTALL ENGINE MOUNTING INSULATOR SUB-ASSEMBLY LH

- a. Install the engine mounting insulator LH with the 4 bolts.

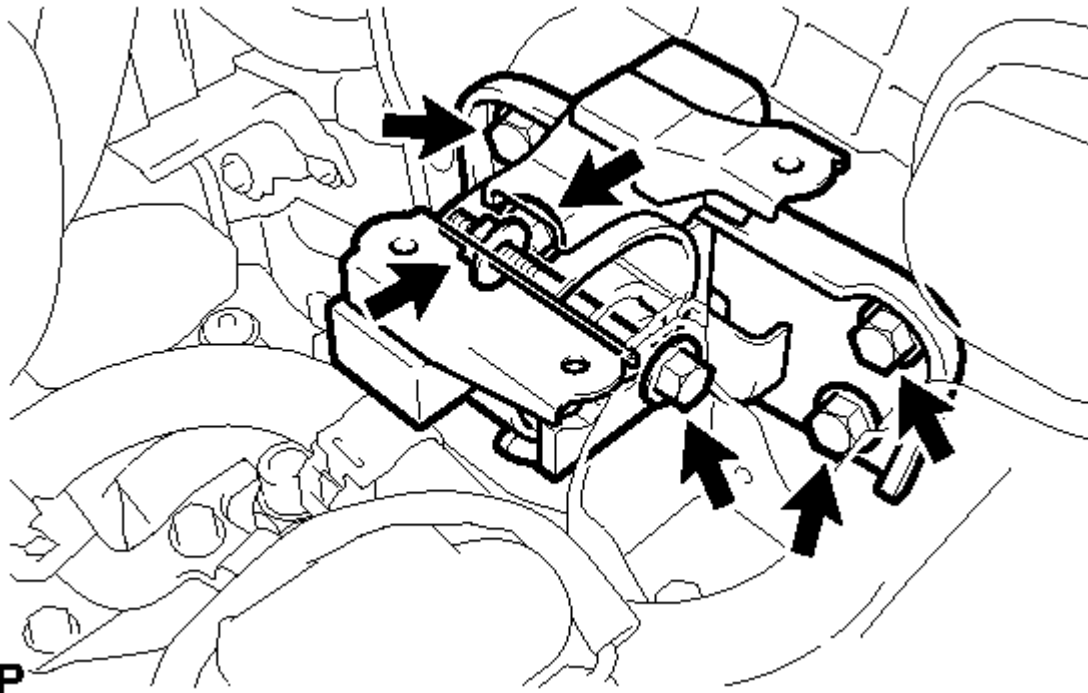


Fig. 325: Identifying Engine Mounting Insulator Bolts And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- b. Install the engine mounting insulator LH with the through bolt and nut.

Torque: 56 N*m (571 kgf*cm, 41 ft.*lbf)

HINT:

Install the through bolt by tightening the nut.

12. **INSTALL ENGINE MOUNTING INSULATOR SUB-ASSEMBLY RH** See step 27.
13. **INSTALL FRONT CROSS MEMBER SUB-ASSEMBLY**
 - a. Install the front crossmember with the 4 bolts.

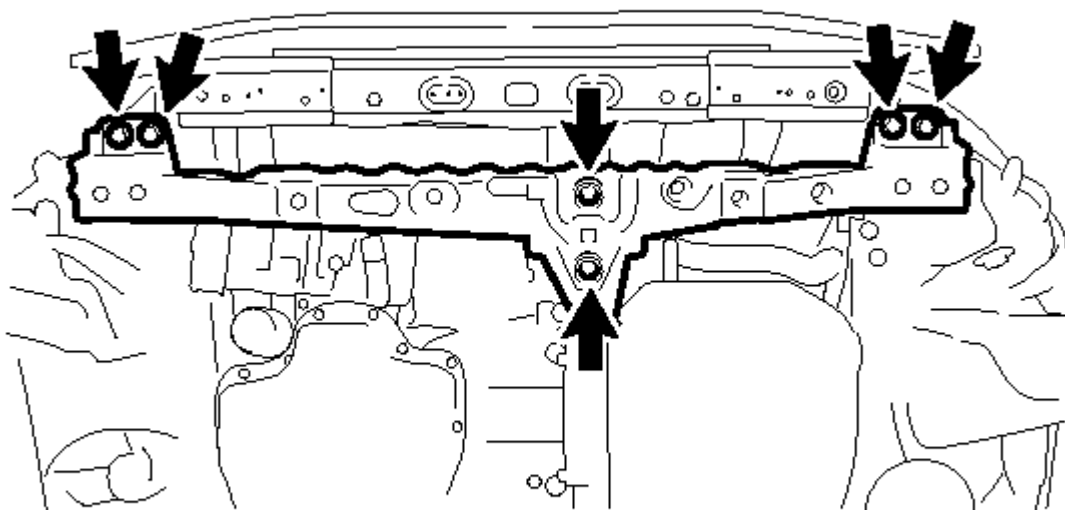
**C**

Fig. 326: Identifying Front Crossmember Bolts

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

Torque: 96 N*m (979 kgf*cm, 71 ft.*lbf)

- b. Install the front engine mounting insulator with the 2 bolts.

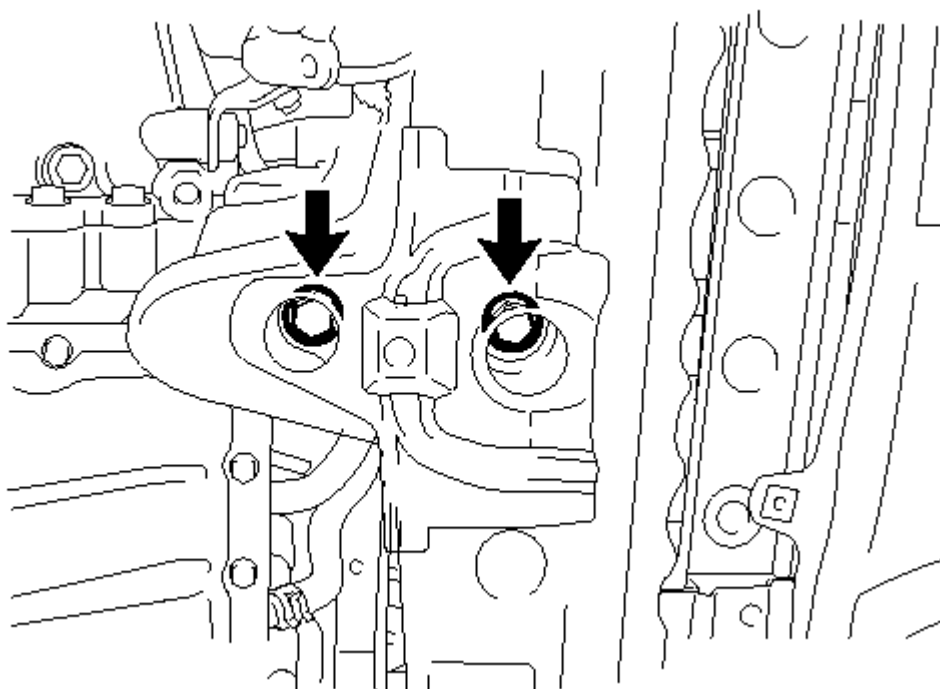
**C**

Fig. 327: Location of Front Engine Mounting Insulator Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

HINT:

Only perform this procedure when replacement of the engine mounting insulator is necessary.

- c. Install the engine mounting insulator front to the engine mounting bracket front with the bolt and nut.

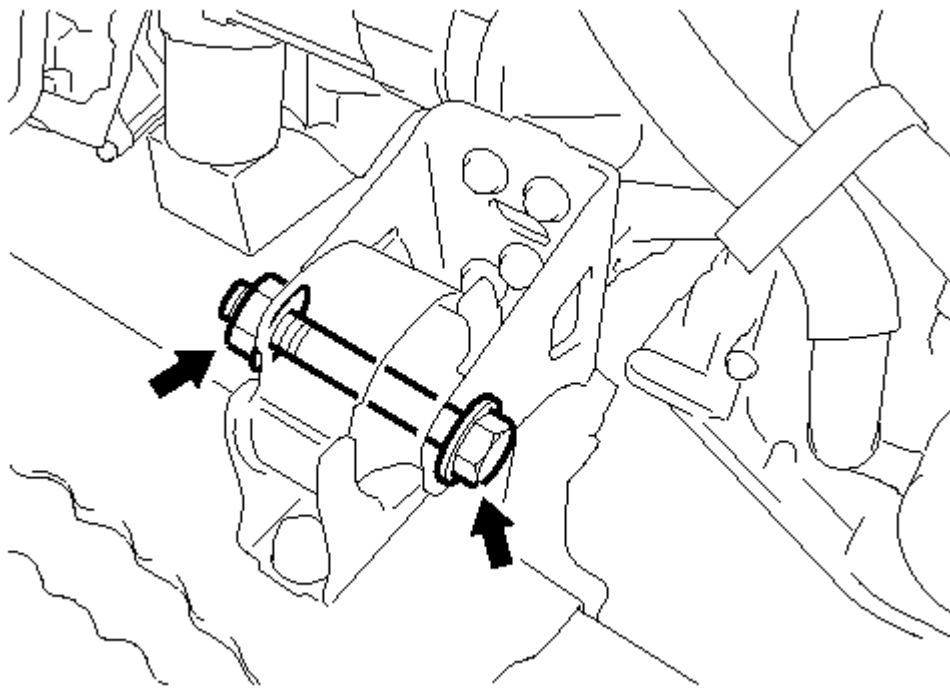
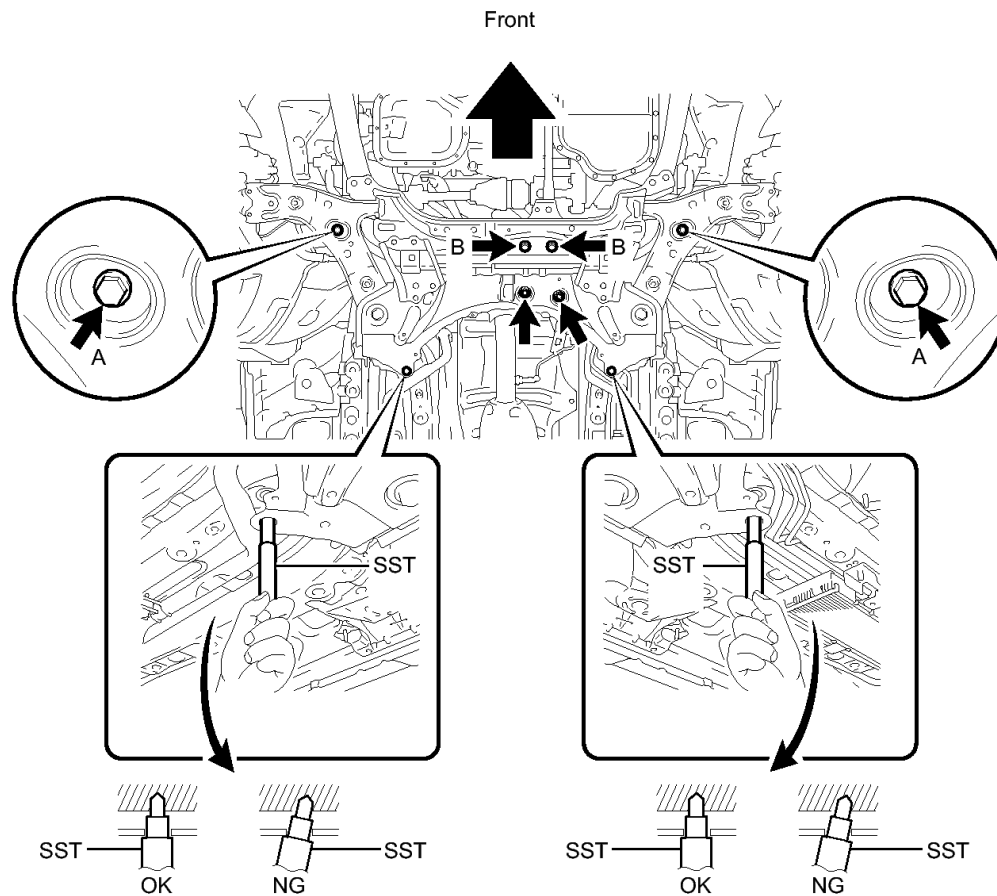


Fig. 328: Location of Engine Mounting Insulator Bolt And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 145 N*m (1479 kgf*cm, 107 ft.*lbf)

14. INSTALL FRONT SUSPENSION CROSSMEMBER SUB-ASSEMBLY

- a. Support the front suspension crossmember with a transmission jack.
- b. While inserting SST into the reference holes on the front suspension crossmember RH and LH alternately, tighten 2 bolts A, 2 bolts B, and 2 nuts on the RH and LH sides to the respective specified torque in several steps.



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Fig. 329: Location of Front Suspension Crossmember Bolts And Nuts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09670-00020

Bolt A

Torque: 145 N*m (1479 kgf*cm, 107 ft.*lbf)

Bolt B

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

Nut

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

15. INSTALL FRONT SUSPENSION MEMBER BRACE REAR LH

- Install the front suspension member rear brace LH with the 3 bolts.

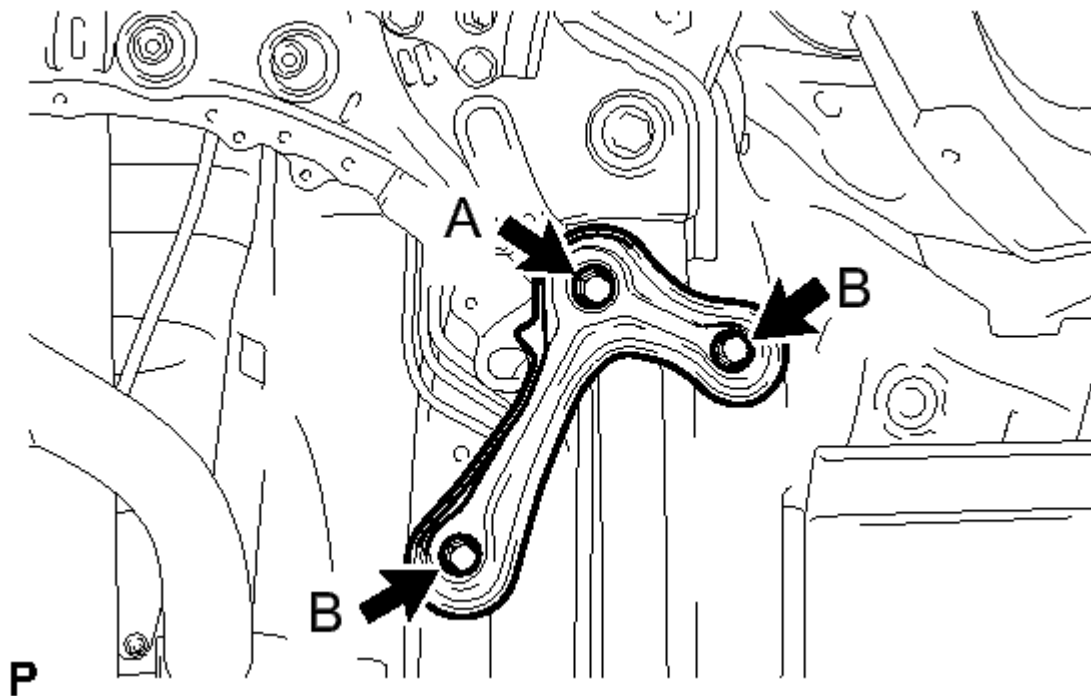


Fig. 330: Location of Front Suspension Member Brace Rear LH With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Bolt A

Torque: 145 N*m (1479 kgf*cm, 107 ft.*lbf)

Bolt B

Torque: 93 N*m (948 kgf*cm, 69 ft.*lbf)

16. INSTALL FRONT SUSPENSION MEMBER BRACE REAR RH

HINT:

Perform the same procedure for the LH side.

17. INSTALL FRONT SUSPENSION MEMBER REINFORCEMENT LH

- a. Install the front suspension member reinforcement LH with the 4 bolts.

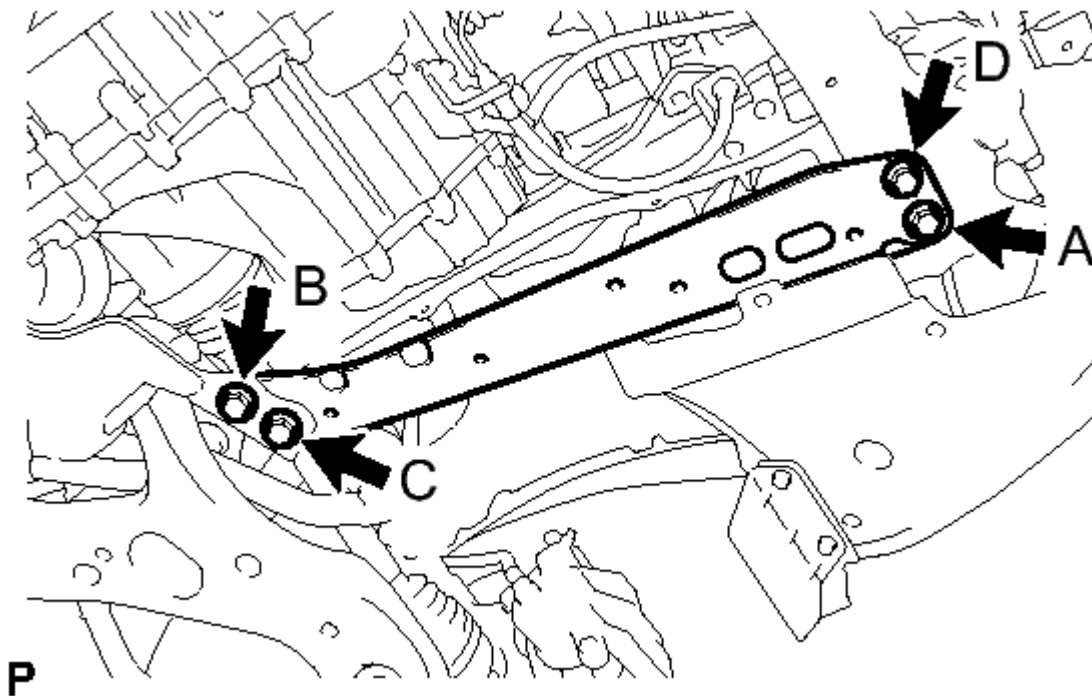


Fig. 331: Location of Front Suspension Member Reinforcement LH With Bolts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 96 N*m (979 kgf*cm, 71 ft.*lbf)

NOTE: Temporarily tighten bolts A and B, and then fully tighten the 4 bolts in the order of C, B, D, and A.

18. INSTALL FRONT SUSPENSION MEMBER REINFORCEMENT RH

HINT:

Perform the same procedure for the LH side.

19. **INSTALL DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT** (for Automatic Transaxle) . Refer to INSTALLATION - Step 23 .
20. **INSTALL FRONT DRIVE SHAFT ASSEMBLY LH** . Refer to INSTALLATION - Step 1 .
21. **INSTALL FRONT DRIVE SHAFT ASSEMBLY RH** . Refer to INSTALLATION - Step 2 .
22. **INSTALL FRONT AXLE ASSEMBLY LH** . Refer to INSTALLATION - Step 3 .
23. **INSTALL FRONT AXLE ASSEMBLY RH**

HINT:

Perform the same procedure for the LH side.

24. **INSTALL FRONT STABILIZER LINK ASSEMBLY LH** . Refer to INSTALLATION - Step 12 .

25. INSTALL FRONT STABILIZER LINK ASSEMBLY RH**HINT:**

Perform the same procedure for the LH side.

26. INSTALL TIE ROD END SUB-ASSEMBLY LH . Refer to INSTALLATION - Step 11 .**27. INSTALL TIE ROD END SUB-ASSEMBLY RH****HINT:**

Perform the same procedure for the LH side.

28. INSTALL FRONT LOWER NO. 1 SUSPENSION ARM SUB-ASSEMBLY LH . Refer to INSTALLATION - Step 3 .**29. INSTALL FRONT LOWER NO. 1 SUSPENSION ARM SUB-ASSEMBLY RH****HINT:**

Perform the same procedure for the LH side.

30. INSTALL FRONT SPEED SENSOR LH . Refer to INSTALLATION - Step 14 .**31. INSTALL FRONT SPEED SENSOR RH****HINT:**

Perform the same procedure for the LH side.

32. INSTALL FRONT AXLE HUB NUT LH . Refer to INSTALLATION - Step 7 .**33. INSTALL FRONT AXLE HUB NUT RH****HINT:**

Perform the same procedure for the LH side.

34. CONNECT ENGINE WIRE

- a. Install the ground cable with the bolt located near the starter.

Torque: 13 N*m (133 kgf*cm, 10 ft.*lbf)

- b. Connect the ground cable to the clamp located near the starter.
- c. Connect the ground cable connector.
- d. Connect the engine wire to the positive battery terminal with the nut.

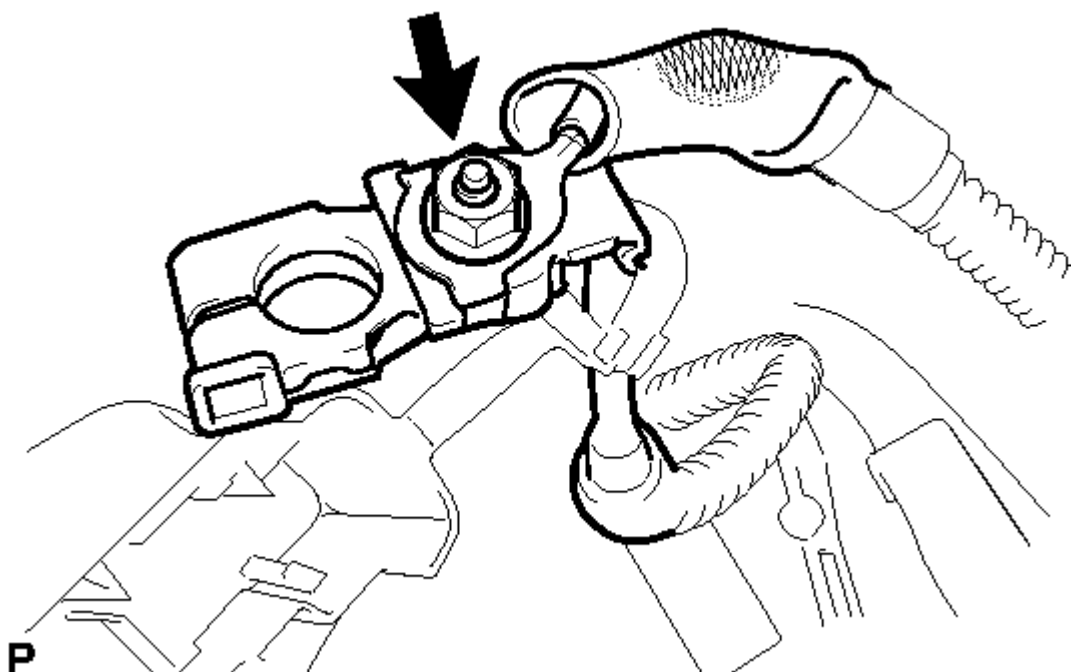


Fig. 332: Location of Positive Battery Terminal Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 13 N*m (133 kgf*cm, 10 ft.*lbf)

- e. Connect the 2 engine wire connectors and install the nut.

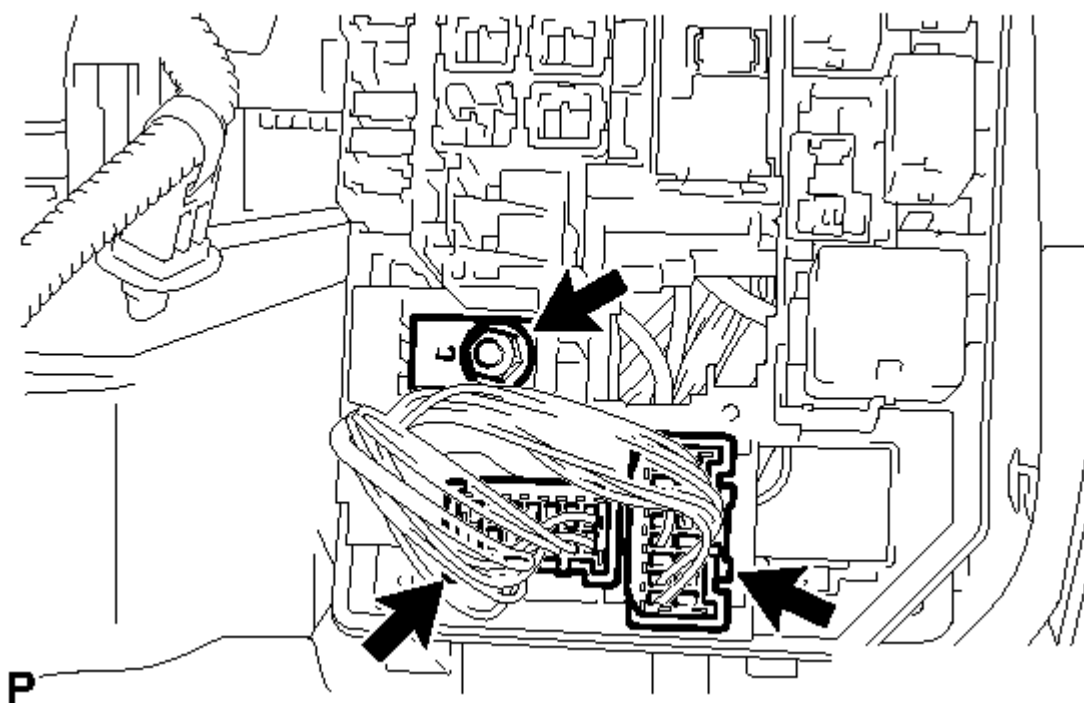


Fig. 333: Location of Engine Wire Connectors And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Install the engine room relay block cover.
- g. Attach the clamp of the engine wire cover.
- h. Install the engine wire cover to with the bolt.

35. CONNECT ECM

- a. Connect the connector to the engine control computer with the clamp and lock lever.

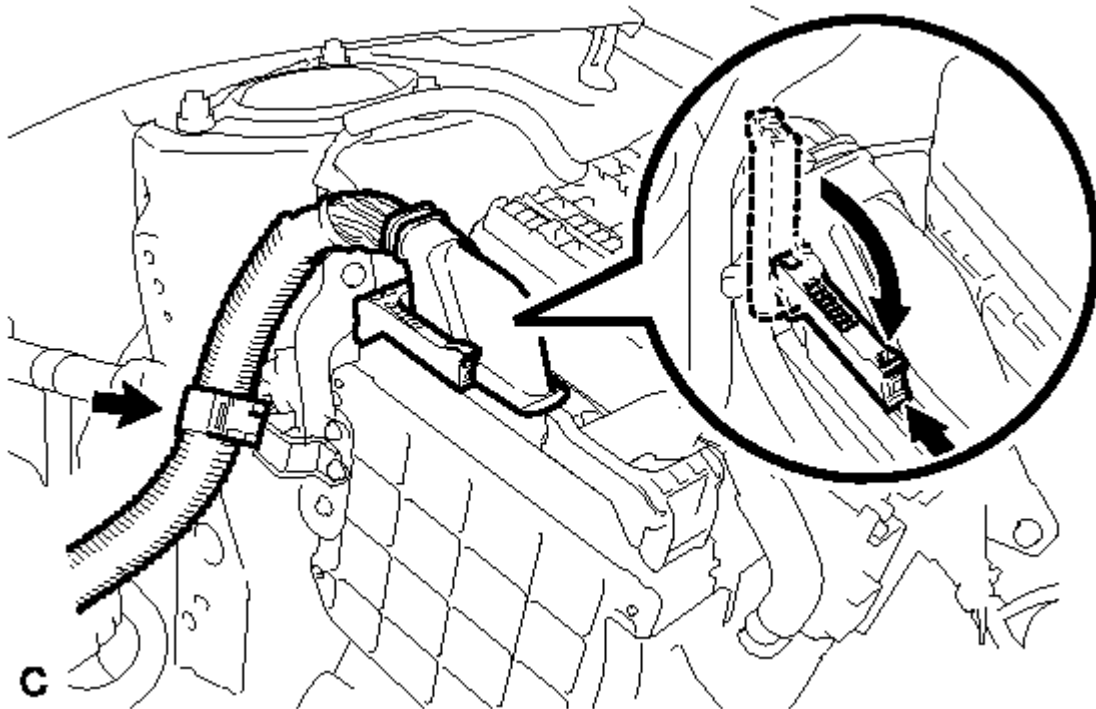


Fig. 334: Location of Engine Control Computer With Clamp And Lock Lever
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- 36. **INSTALL NO. 1 STEERING COLUMN HOLE COVER SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 21** .
- 37. **INSTALL NO. 2 STEERING INTERMEDIATE SHAFT ASSEMBLY** . Refer to **INSTALLATION - Step 4** .
- 38. **INSTALL COLUMN HOLE COVER SILENCER SHEET** . Refer to **INSTALLATION - Step 5** .
- 39. **INSTALL STARTER ASSEMBLY (for Automatic Transaxle)** . Refer to **INSTALLATION - Step 2** .
- 40. **INSTALL STARTER ASSEMBLY (for Manual Transaxle)** . Refer to **INSTALLATION - Step 1** .
- 41. **INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY (for Automatic Transaxle)** . Refer to **INSTALLATION - Step 4** .
- 42. **INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY (for Manual Transaxle)** . Refer to **INSTALLATION - Step 32** .
- 43. **INSTALL ACCUMULATOR TO FLEXIBLE HOSE TUBE (for Manual Transaxle)** . Refer to **INSTALLATION - Step 33** .

44. INSTALL CLUTCH RELEASE CYLINDER ASSEMBLY (for Manual Transaxle)

Refer to **INSTALLATION** .

45. INSTALL CLUTCH ACCUMULATOR ASSEMBLY (for Manual Transaxle)

Refer to the procedures under "INSTALL CLUTCH ACCUMULATOR ASSEMBLY". Refer to **INSTALLATION** .

46. CONNECT CHECK VALVE TO CONNECTOR TUBE HOSE

- a. Connect the check valve to connector tube hose.

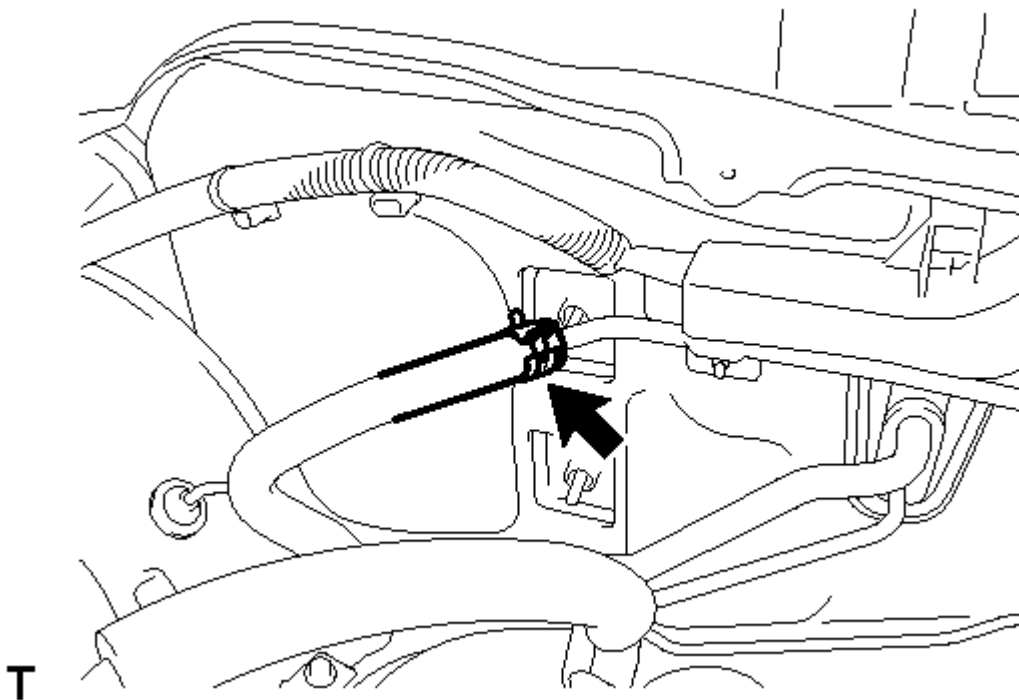


Fig. 335: View Of Check Valve To Connector Tube Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

47. INSTALL FUEL TUBE SUB-ASSEMBLY

- a. Connect the fuel tube connector and fuel pipe.

WARNING: Align the fuel tube connector with the pipe, then push the fuel tube connector in until the retainer makes a "click" sound. If the connection is tight, apply a small amount of engine oil to the tip of the pipe. After connecting, pull the pipe and connector to make sure that they are securely connected.

- b. Engage the claw and install the No. 1 fuel pipe clamp.

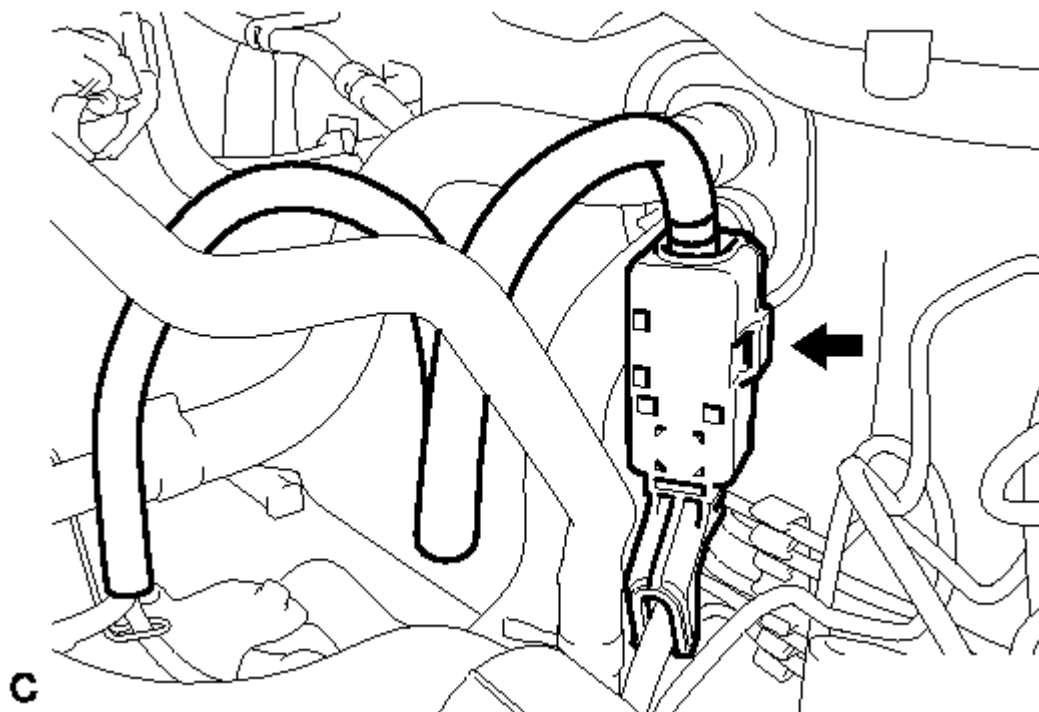


Fig. 336: Location of No. 1 Fuel Pipe Clamp

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

- c. Install the No. 2 fuel pipe clamp.

48. CONNECT INLET HEATER WATER HOSE

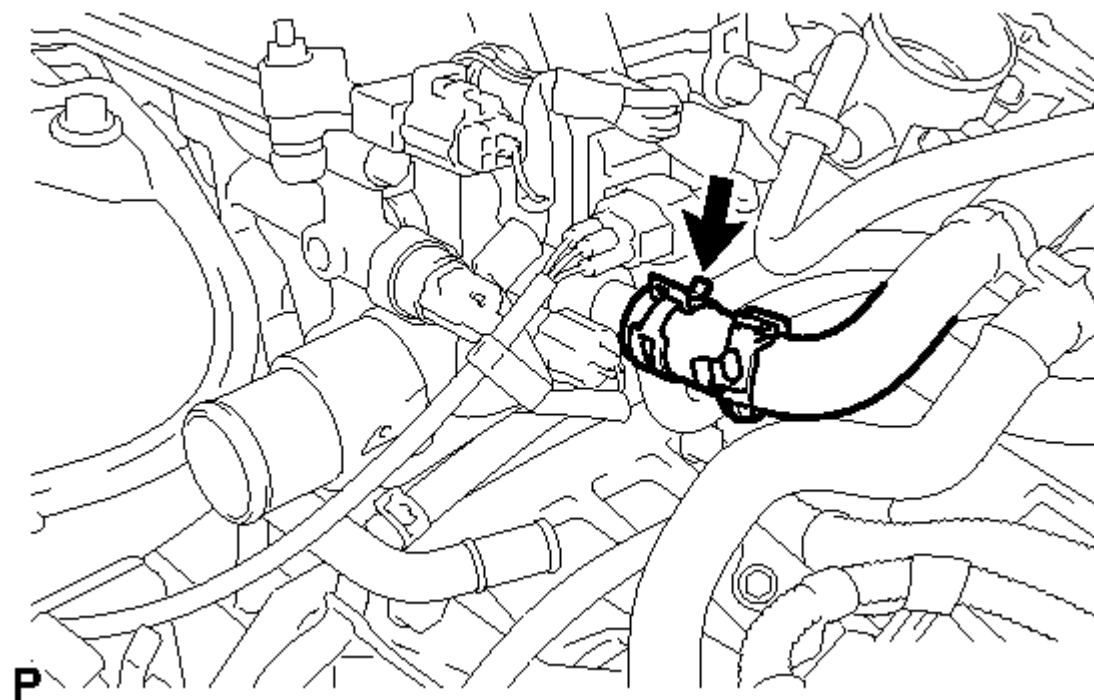
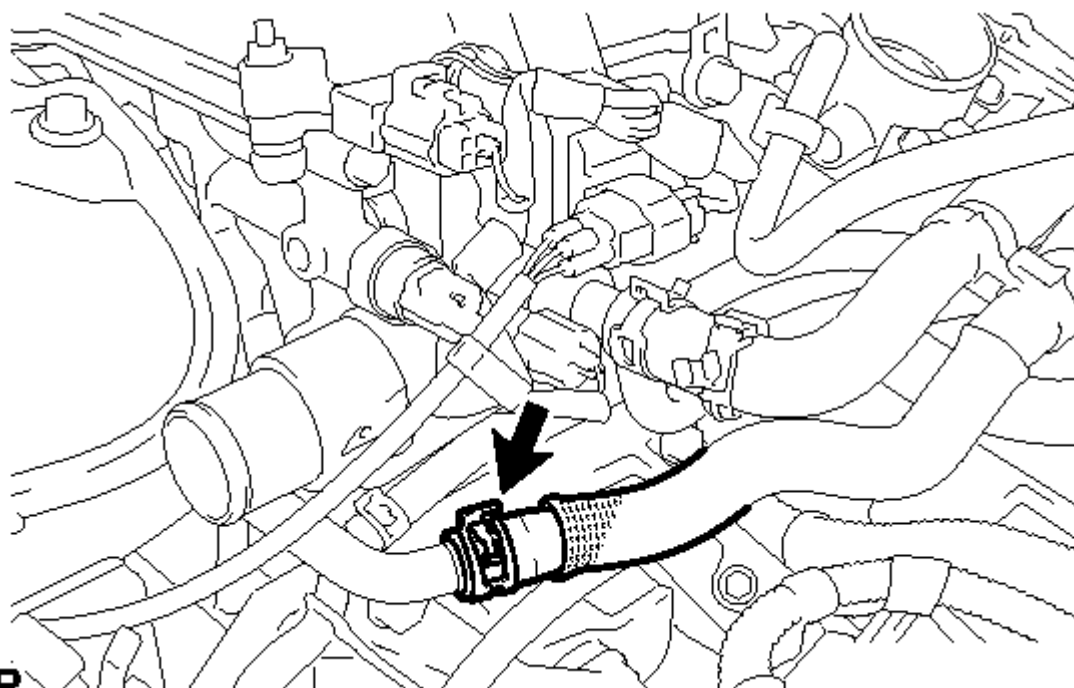


Fig. 337: Identifying INLET HEATER WATER HOSE

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

- a. Connect the inlet heater water hose.

49. **CONNECT OUTLET HEATER WATER HOSE**



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Fig. 338: Identifying Outlet Heater Water Hose

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

- a. Connect the outlet heater water hose.

50. **CONNECT OUTLET RADIATOR HOSE**

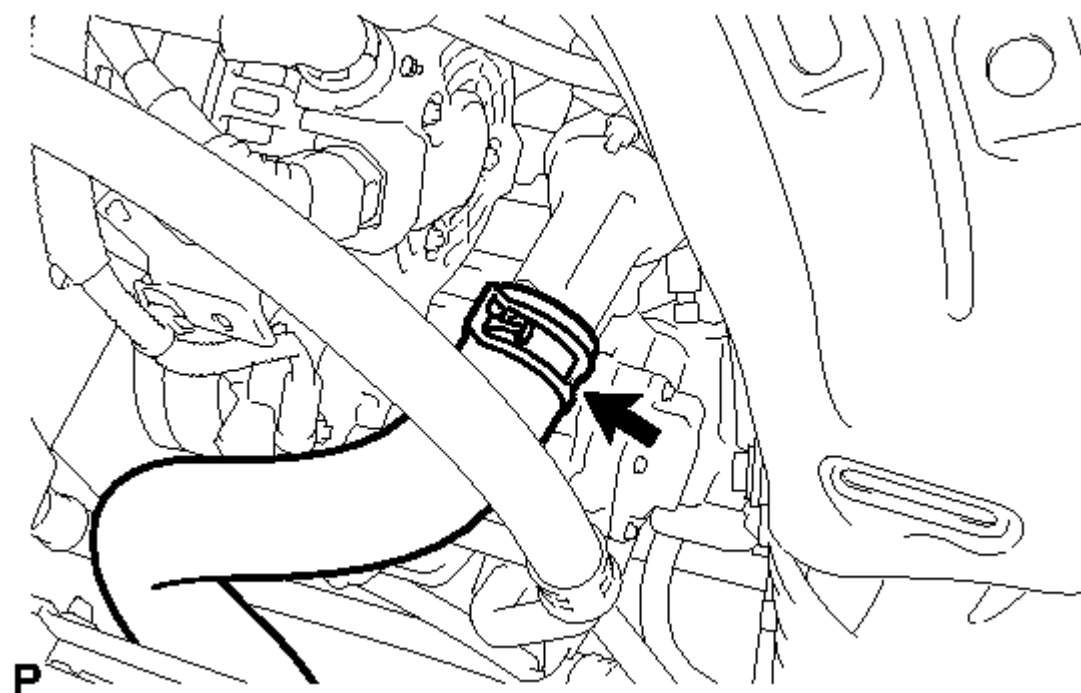


Fig. 339: Location of Outlet Radiator Hose

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

- a. Connect the outlet radiator hose.

51. CONNECT INLET RADIATOR HOSE

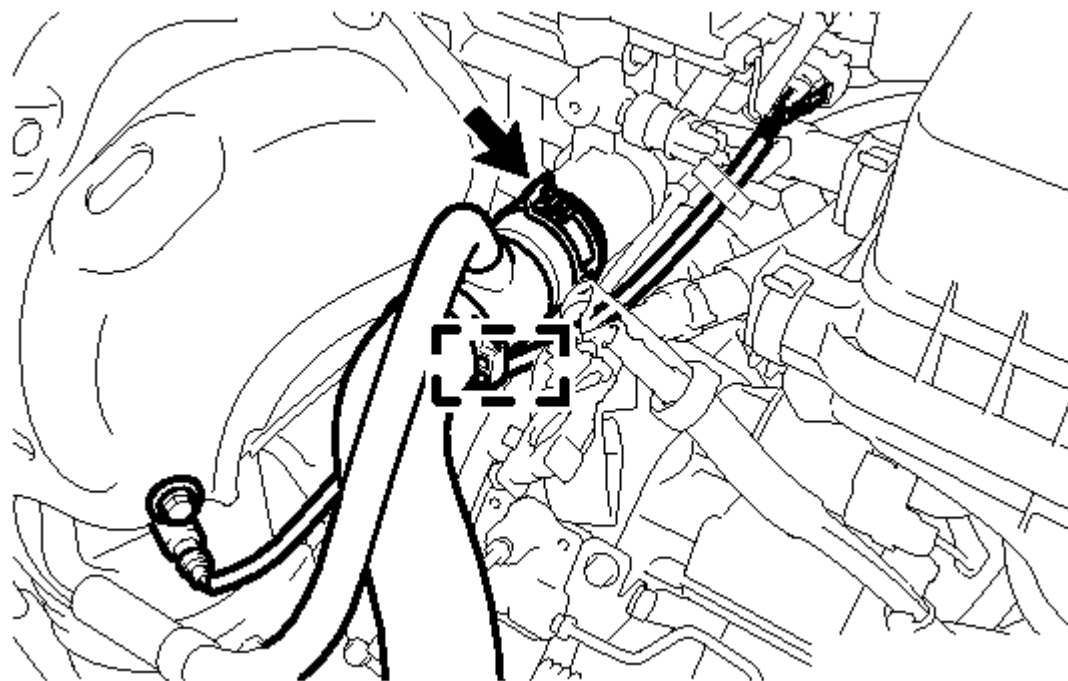
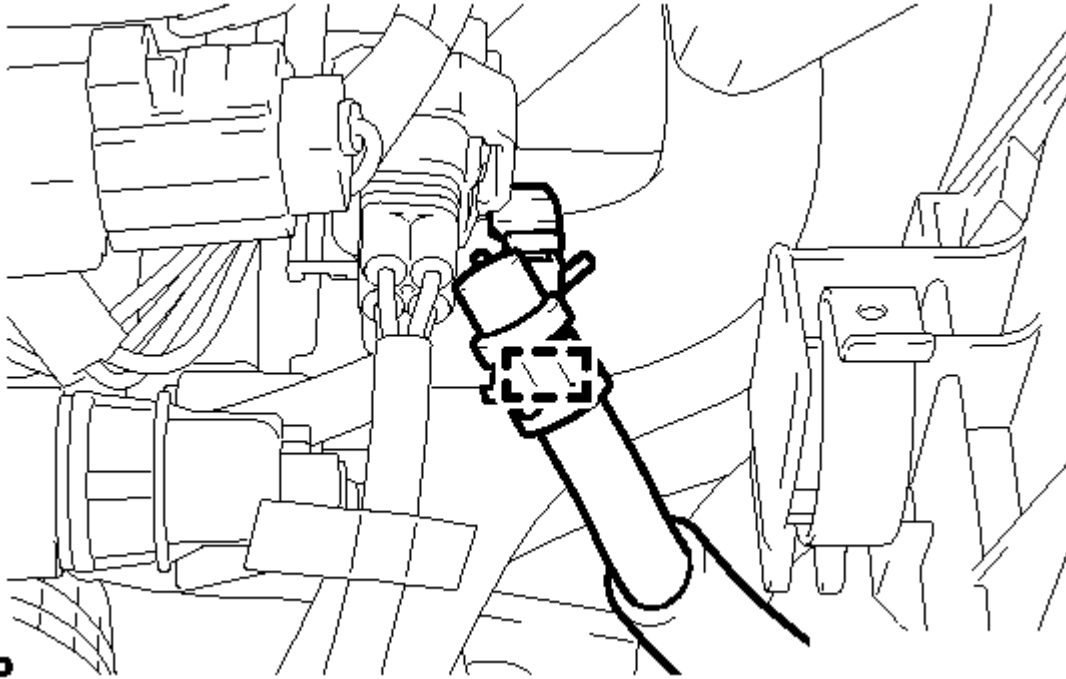


Fig. 340: Identifying Inlet Radiator Hose Clamps

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

- a. Connect the inlet radiator hose.
- b. Engage the heated oxygen sensor wire harness clamp.

52. **CONNECT BREATHER HOSE (for Automatic Transaxle)**



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Fig. 341: Identifying Breather Plug Hose Clamp

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

- a. Engage the clamp and connect the breather hose.

53. **CONNECT NO. 1 OIL COOLER TUBE SUB-ASSEMBLY (for Automatic Transaxle)** . Refer to INSTALLATION - Step 24 .
54. **INSTALL COMPRESSOR ASSEMBLY** . Refer to INSTALLATION - Step 2 .
55. **CONNECT DISCHARGE HOSE SUB-ASSEMBLY** . Refer to INSTALLATION - Step 3 .
56. **CONNECT SUCTION HOSE SUB-ASSEMBLY** . Refer to INSTALLATION - Step 4 .
57. **INSTALL GENERATOR ASSEMBLY** . Refer to INSTALLATION - Step 1 .
58. **INSTALL FAN AND GENERATOR V BELT** See step 1.
59. **INSTALL THROTTLE WITH MOTOR BODY ASSEMBLY** . Refer to INSTALLATION - Step 1 .
60. **INSTALL NO. 2 BATTERY CARRIER** . Refer to INSTALLATION - Step 36 .
61. **INSTALL AIR CLEANER CASE SUB-ASSEMBLY** . Refer to INSTALLATION - Step 3 .
62. **INSTALL AIR CLEANER CAP SUB-ASSEMBLY WITH NO. 1 AIR CLEANER HOSE** . Refer to INSTALLATION - Step 2 .
63. **INSTALL RADIATOR RESERVE TANK ASSEMBLY** See step 45.
64. **INSTALL FRONT EXHAUST PIPE ASSEMBLY**

- a. Using vernier caliper, measure the free length of the compression spring.

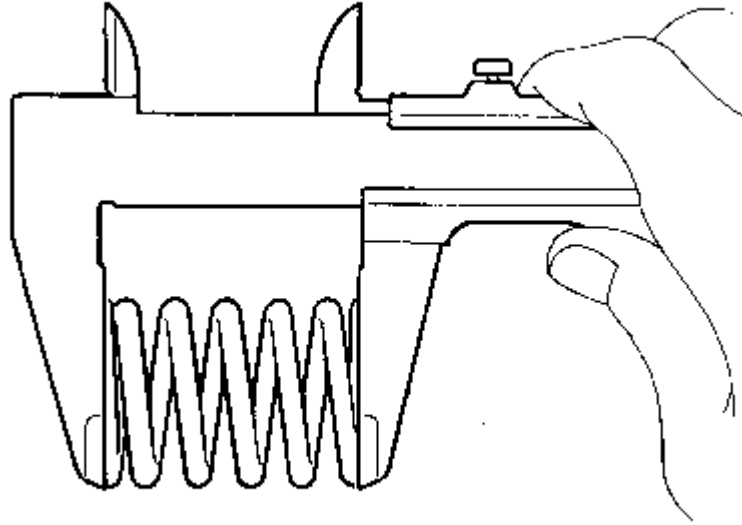


Fig. 342: Measuring Free Length Of Compression Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Minimum length

41.5 mm (1.634 in.)

If the length is not as specified, replace the compression spring.

- b. Install the new exhaust pipe gasket to the exhaust manifold converter.
- c. Install the front exhaust pipe with the 2 compression springs and 2 bolts.

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

65. INSTALL CENTER EXHAUST PIPE ASSEMBLY

- a. Install the new gasket onto the front exhaust pipe.
- b. Install the center exhaust pipe with the 2 bolts.

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

66. ADD AUTOMATIC TRANSAXLE FLUID (for Automatic Transaxle) . Refer to INSTALLATION - Step 54 .

67. INSPECT AUTOMATIC TRANSAXLE FLUID (for Automatic Transaxle) . Refer to ON-VEHICLE INSPECTION - Step 1 .

- 68. **ADD MANUAL TRANSAXLE OIL (for Manual Transaxle)**
- 69. **INSPECT AND ADJUST MANUAL TRANSAXLE OIL (for Manual Transaxle)** . Refer to **ON-VEHICLE INSPECTION - Step 1** .
- 70. **INSTALL BATTERY** . Refer to **INSTALLATION - Step 20** .
- 71. **ADD ENGINE COOLANT** . Refer to **REPLACEMENT - Step 2** .
- 72. **CHARGE REFRIGERANT** . Refer to **REPLACEMENT - Step 2** .
- 73. **WARM UP ENGINE** . Refer to **REPLACEMENT - Step 3** .
- 74. **ADD CLUTCH FLUID (for Manual Transaxle)**
- 75. **BLEED CLUTCH LINE (for Manual Transaxle)** . Refer to **BLEEDING - Step 2** .
- 76. **INSPECT FOR CLUTCH FLUID LEAK (for Manual Transaxle)**
- 77. **INSPECT CLUTCH FLUID LEVEL IN RESERVOIR (for Manual Transaxle)**
- 78. **INSPECT FOR FUEL LEAK**

Refer to **ON-VEHICLE INSPECTION** .

- 79. **INSPECT FOR ENGINE COOLANT LEAK** . Refer to **ON-VEHICLE INSPECTION - Step 1** .
- 80. **INSPECT REFRIGERANT LEAK** . Refer to **REPLACEMENT - Step 4** .
- 81. **INSPECT FOR AUTOMATIC TRANSAXLE FLUID LEAK (for Automatic Transaxle)**
- 82. **INSPECT SHIFT LEVER POSITION (for Automatic Transaxle)** . Refer to **ON-VEHICLE INSPECTION - Step 1** .
- 83. **ADJUST SHIFT LEVER POSITION (for Automatic Transaxle)** . Refer to **INSTALLATION - Step 4** .
- 84. **INSPECT EXHAUST GAS LEAK**
- 85. **INSTALL REAR ENGINE UNDER COVER LH**
- 86. **INSTALL REAR ENGINE UNDER COVER RH**
- 87. **INSTALL NO. 2 ENGINE UNDER COVER**
- 88. **INSTALL NO. 1 ENGINE UNDER COVER**
- 89. **INSTALL CENTER TRANSMISSION UNDER COVER ASSEMBLY**
- 90. **INSTALL FRONT WHEELS**

Torque: 103 N*m (1050 kgf*cm, 76 ft.*lbf)

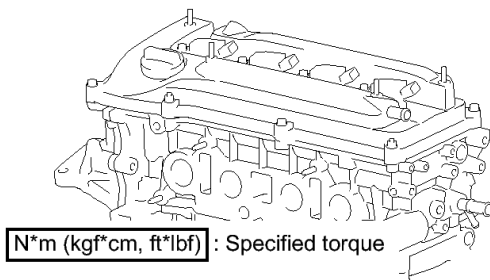
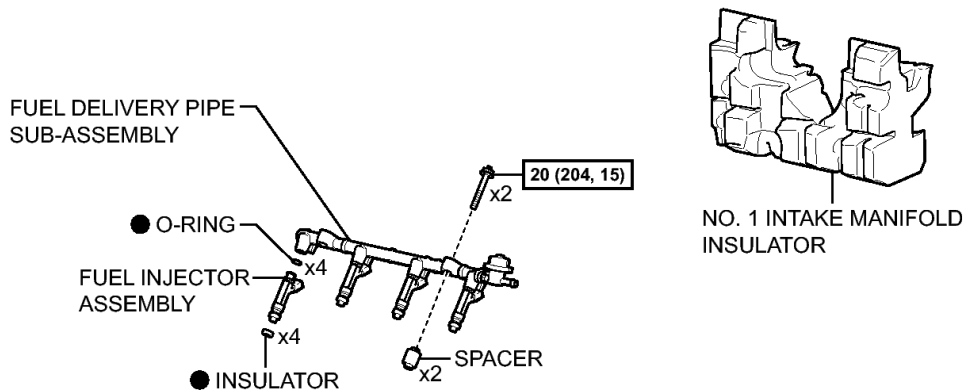
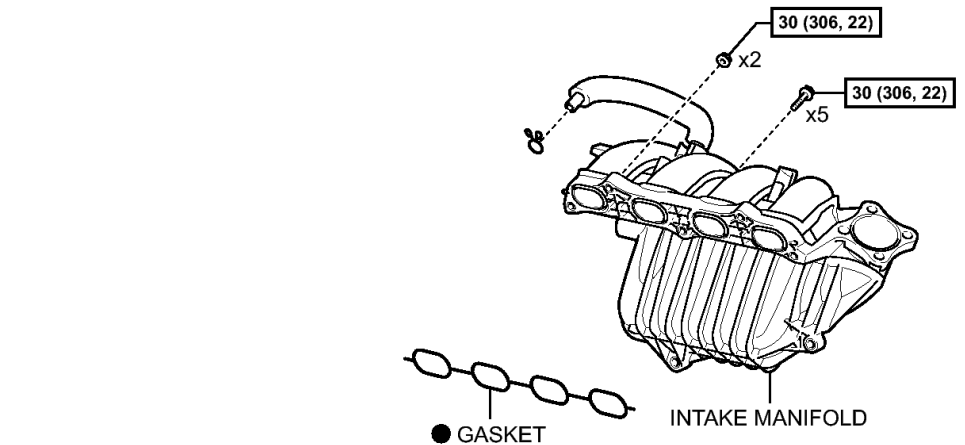
- 91. **INSTALL HOOD** See step 73.
- 92. **INSPECT HOOD** . Refer to **ADJUSTMENT - Step 1** .
- 93. **ADJUST HOOD** . Refer to **ADJUSTMENT - Step 2** .
- 94. **INSPECT ENGINE IDLING SPEED** See step 8.
- 95. **INSPECT CO/HC** See step 10.
- 96. **INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 4** .
- 97. **INSPECT AND ADJUST FRONT WHEEL ALIGNMENT**
 - a. Inspect and adjust the front wheel alignment. Refer to **ADJUSTMENT** .

98. INSPECT ABS SPEED SENSOR SIGNAL

ENGINE UNIT

COMPONENTS

ILLUSTRATION

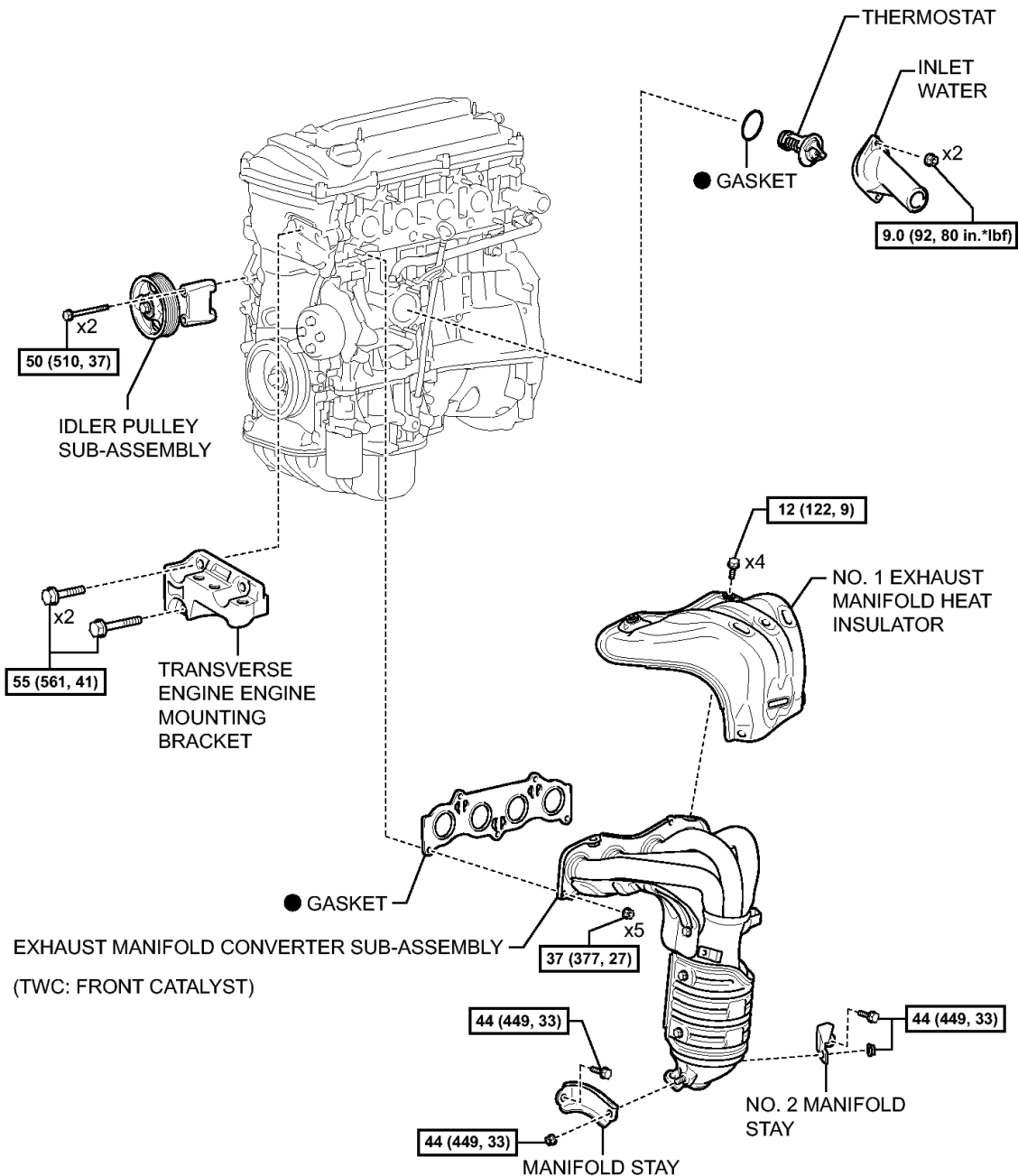


● Non-reusable part

P

Fig. 343: Identifying Engine Unit Replacement Components With Torque Specifications (1 of 14)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



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

● Non-reusable part

P

Fig. 344: Identifying Engine Unit Replacement Components With Torque Specifications (2 of 14)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

for TMC Made Engine:

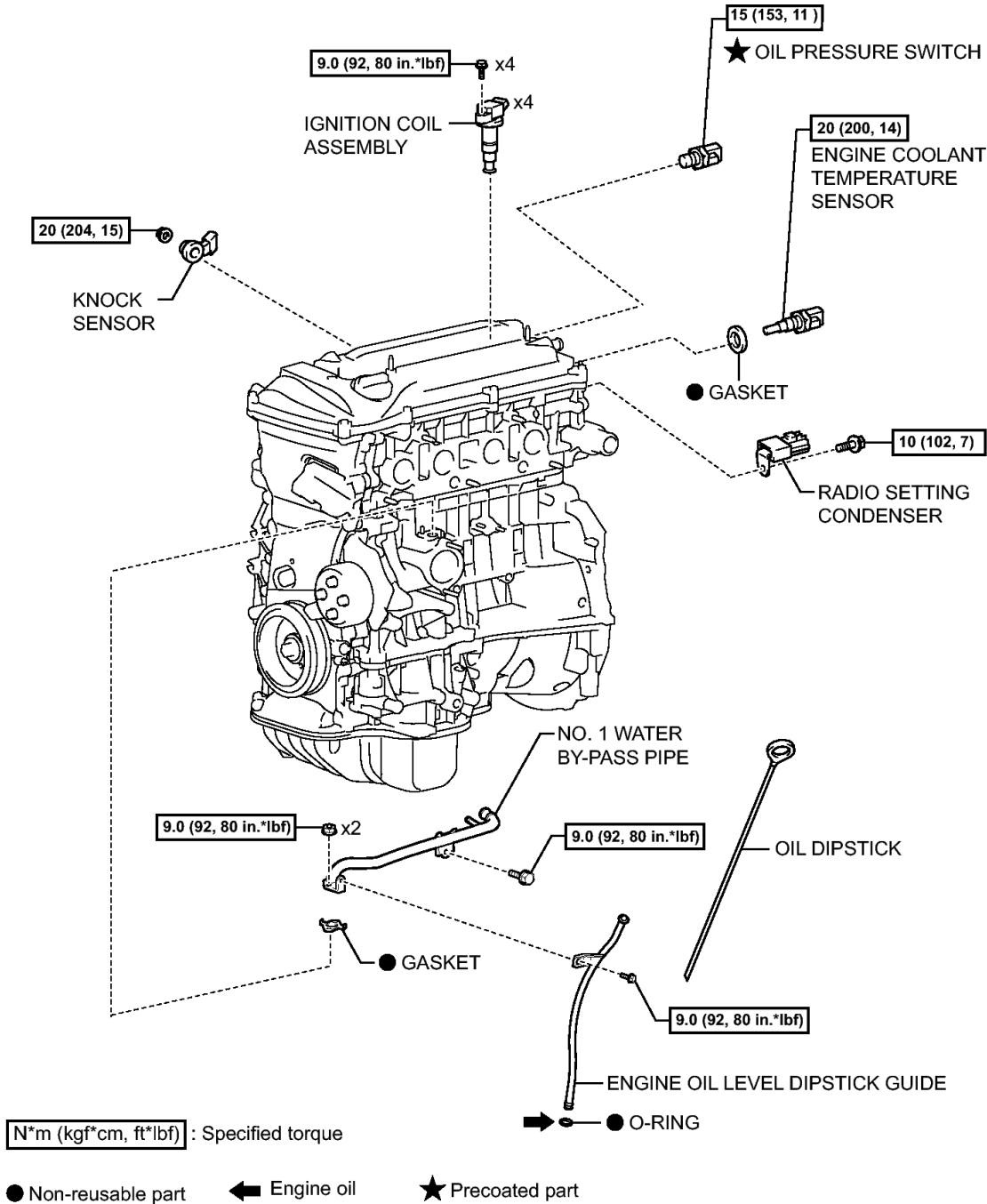


Fig. 345: Identifying Engine Unit Replacement Components With Torque Specifications (3 of 14)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

except TMC Made Engine:

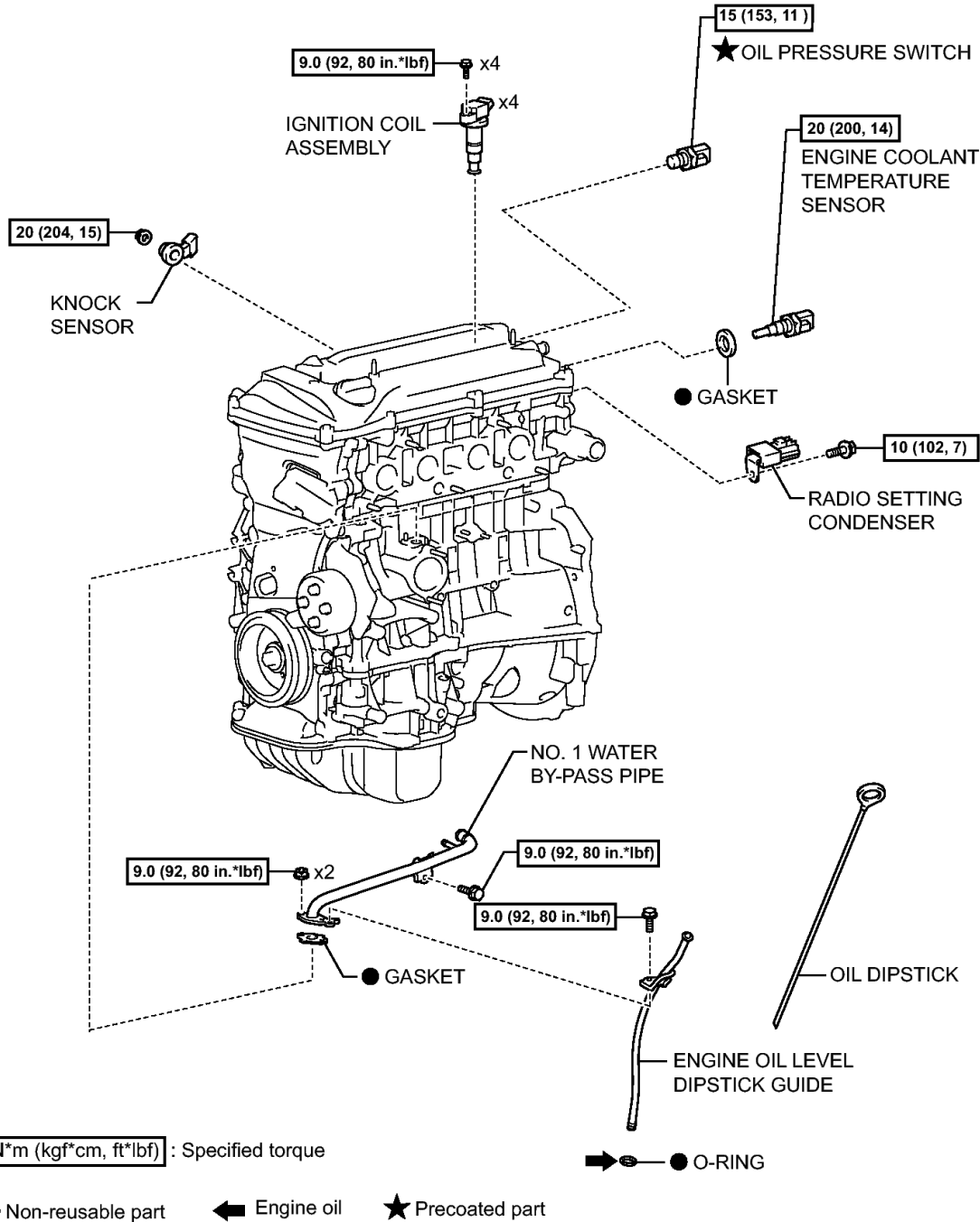
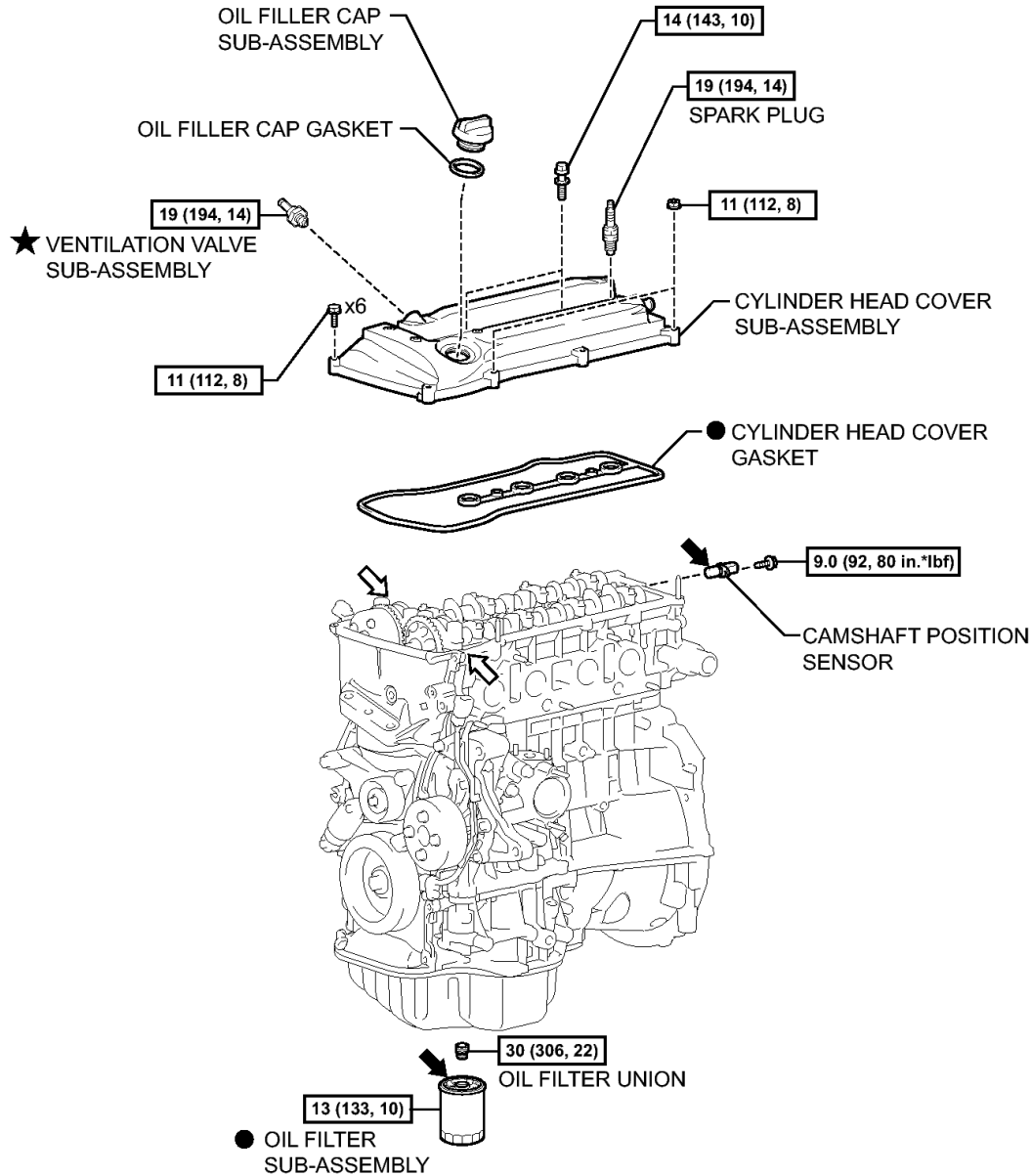


Fig. 346: Identifying Engine Unit Replacement Components With Torque Specifications (4 of 14)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



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

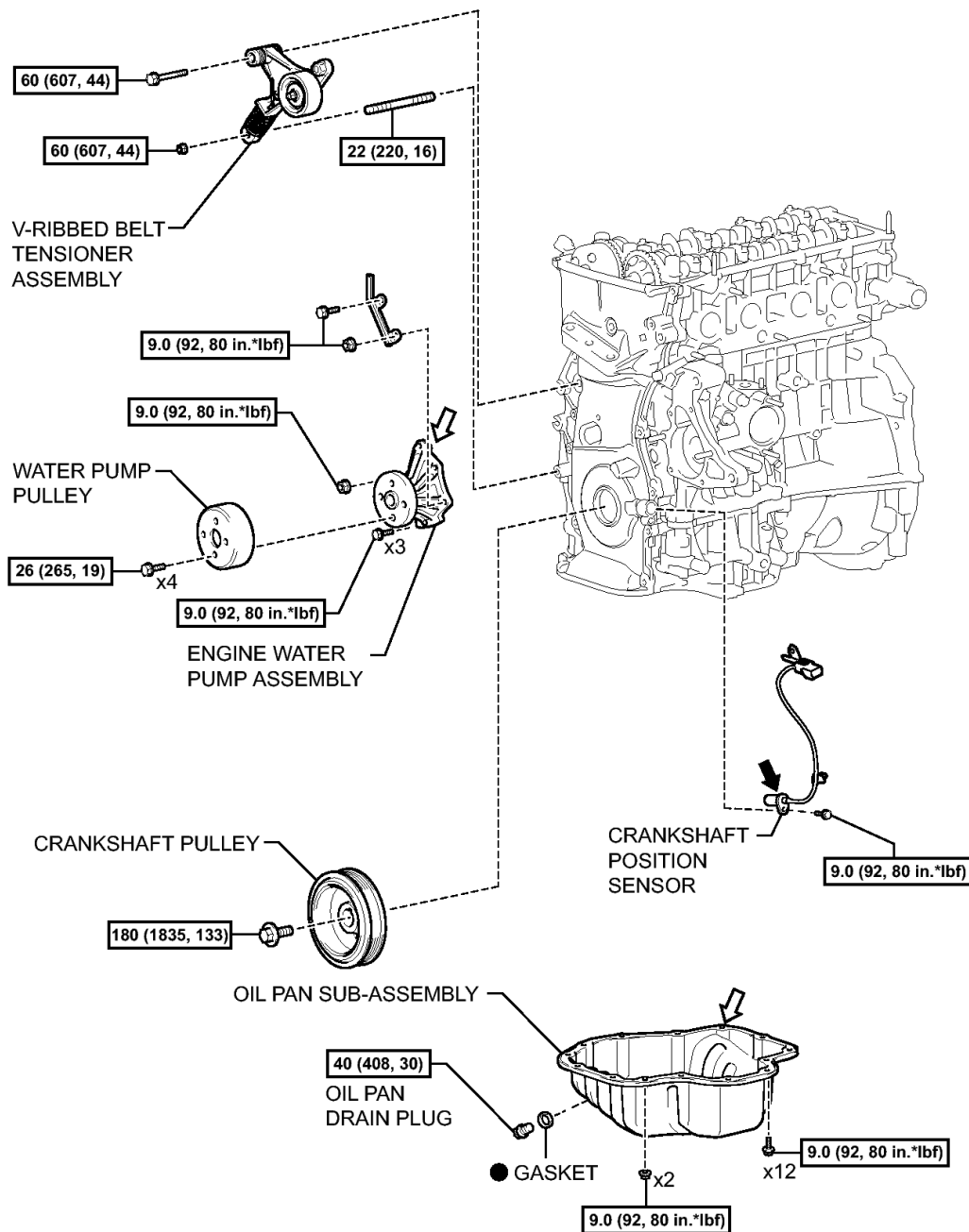
● Non-reusable part ← Engine oil ← Seal packing ★ Precoated part

P

Fig. 347: Identifying Engine Unit Replacement Components With Torque Specifications (5 of 14)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

for TMC Made Engine:



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

● Non-reusable part

← Engine oil

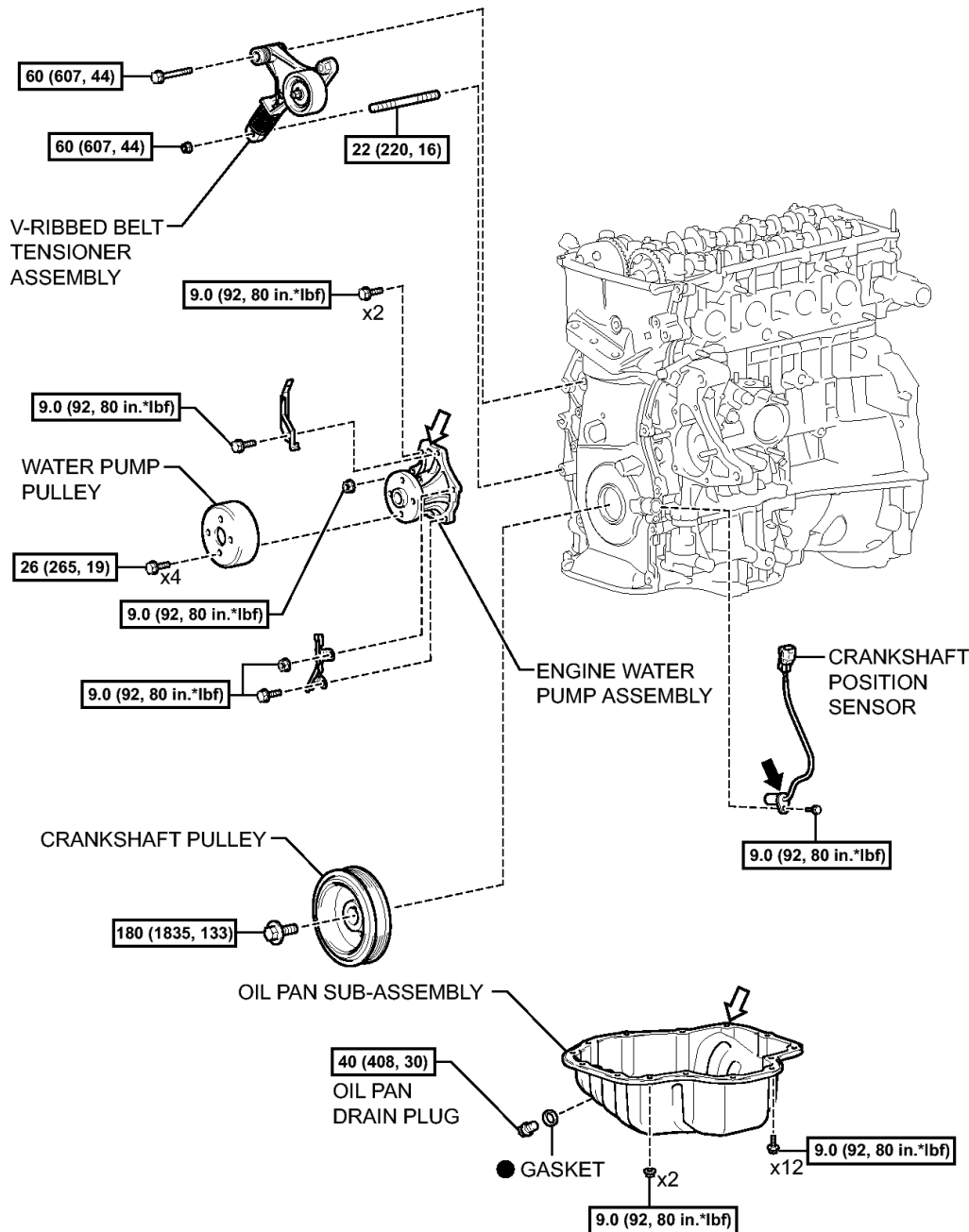
↩ Seal packing

H

Fig. 348: Identifying Engine Unit Replacement Components With Torque Specifications (6 of 14)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

except TMC Made Engine:



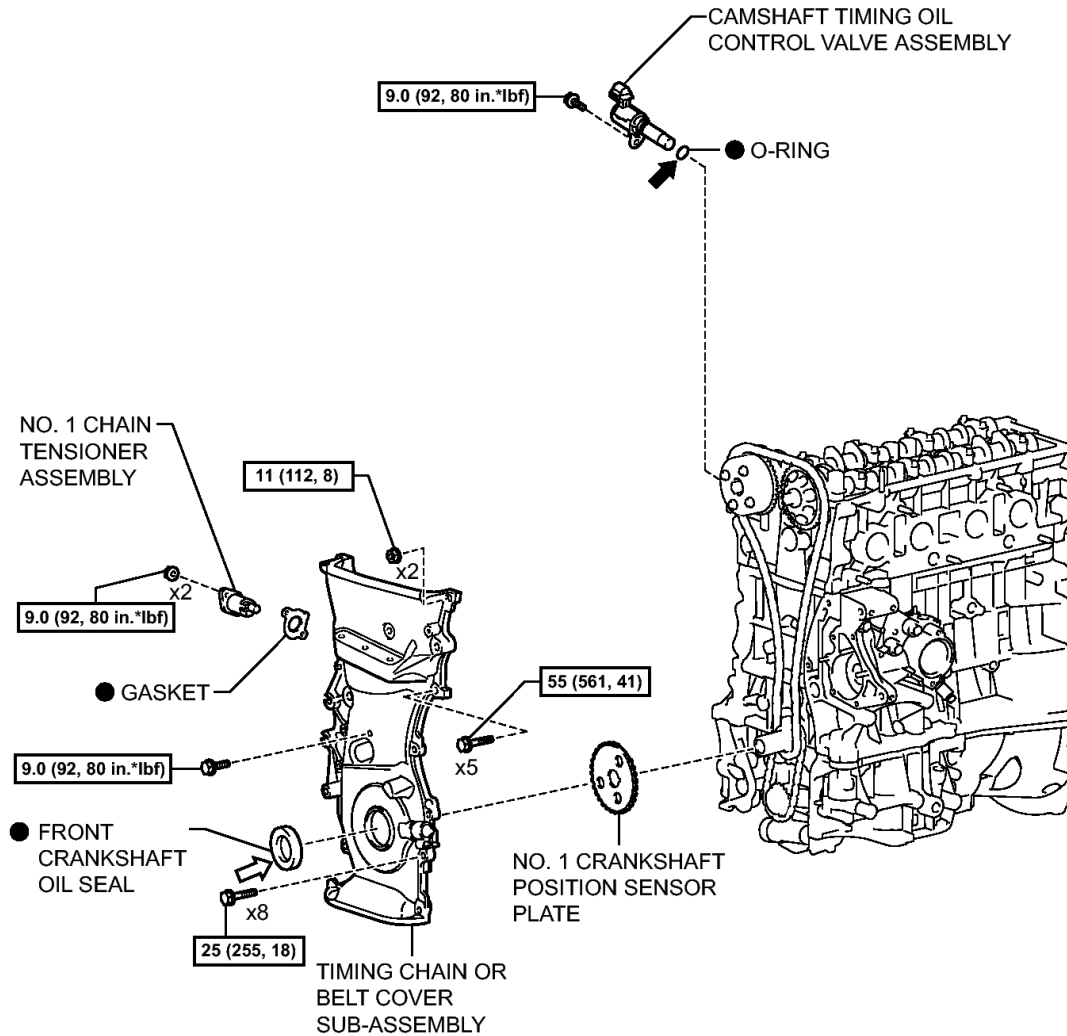
[N*m (kgf*cm, ft*lbf)] : Specified torque

● Non-reusable part ← Engine oil ← Seal packing

H

Fig. 349: Identifying Engine Unit Replacement Components With Torque Specifications (7 of 14)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



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

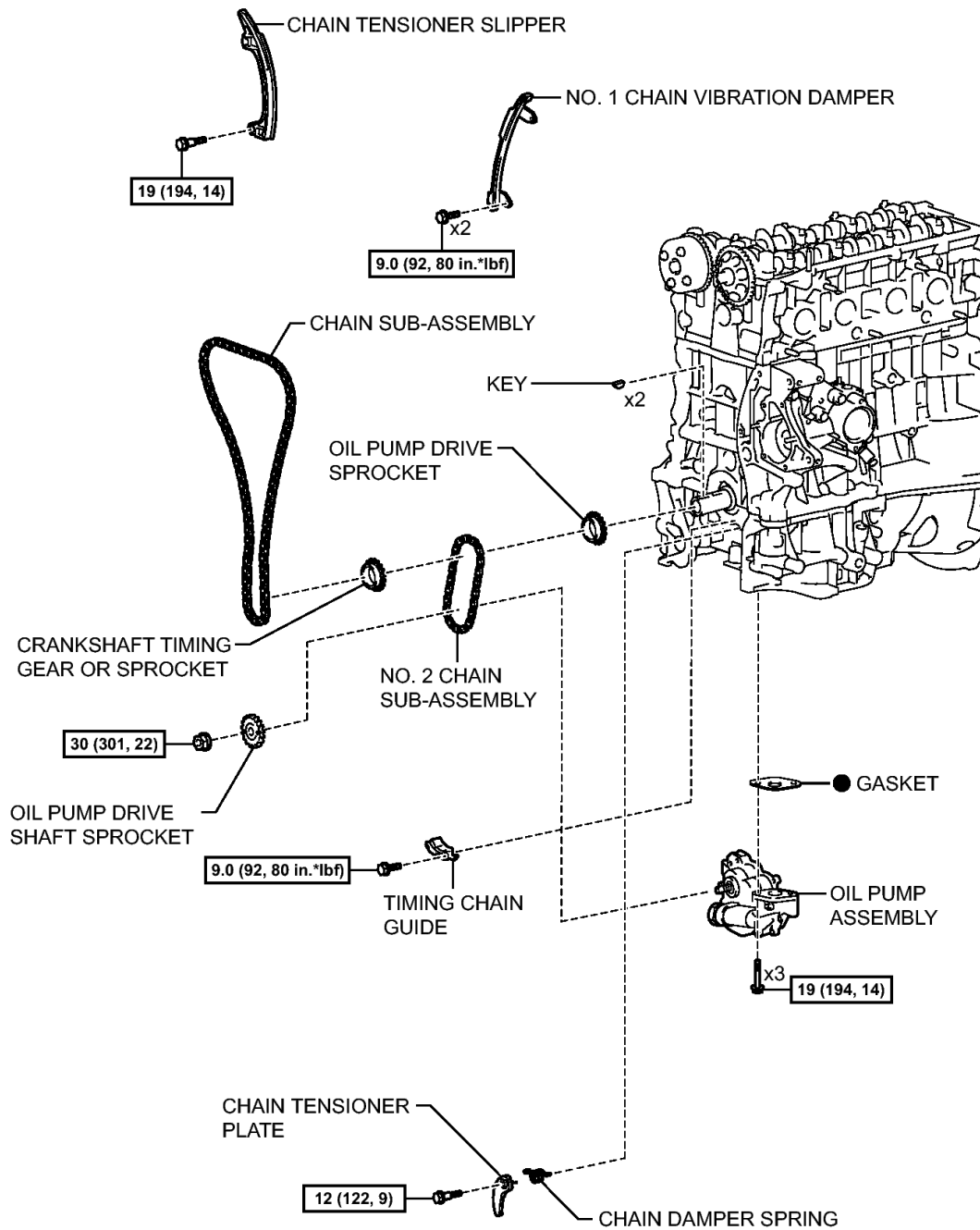
● Non-reusable part

← Engine oil

← MP grease

Fig. 350: Identifying Engine Unit Replacement Components With Torque Specifications (8 of 14)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



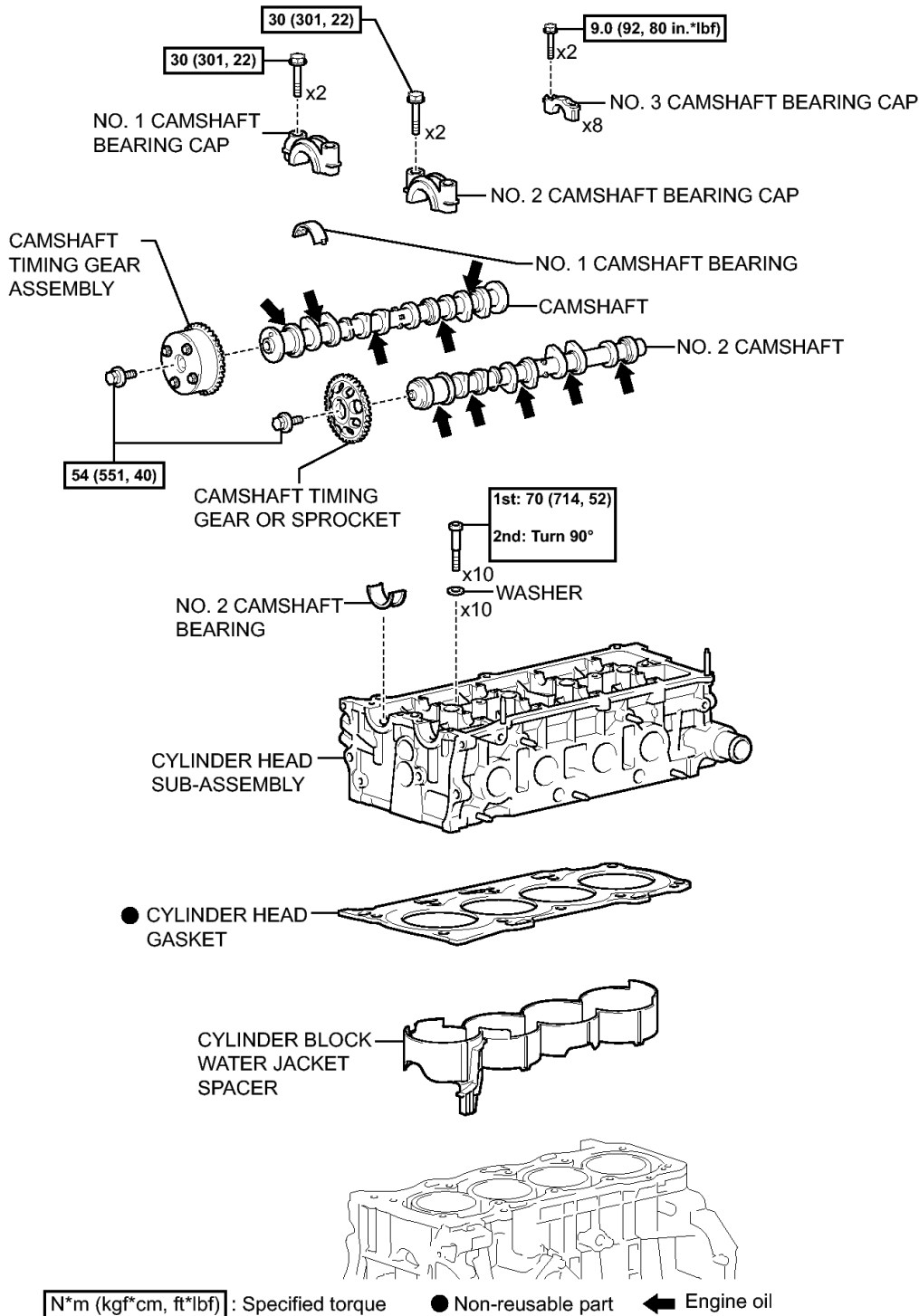
[N*m (kgf*cm, ft*lbf)] : Specified torque

● Non-reusable part

Fig. 351: Identifying Engine Unit Replacement Components With Torque Specifications (9 of 14)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

for TMC Made Engine:

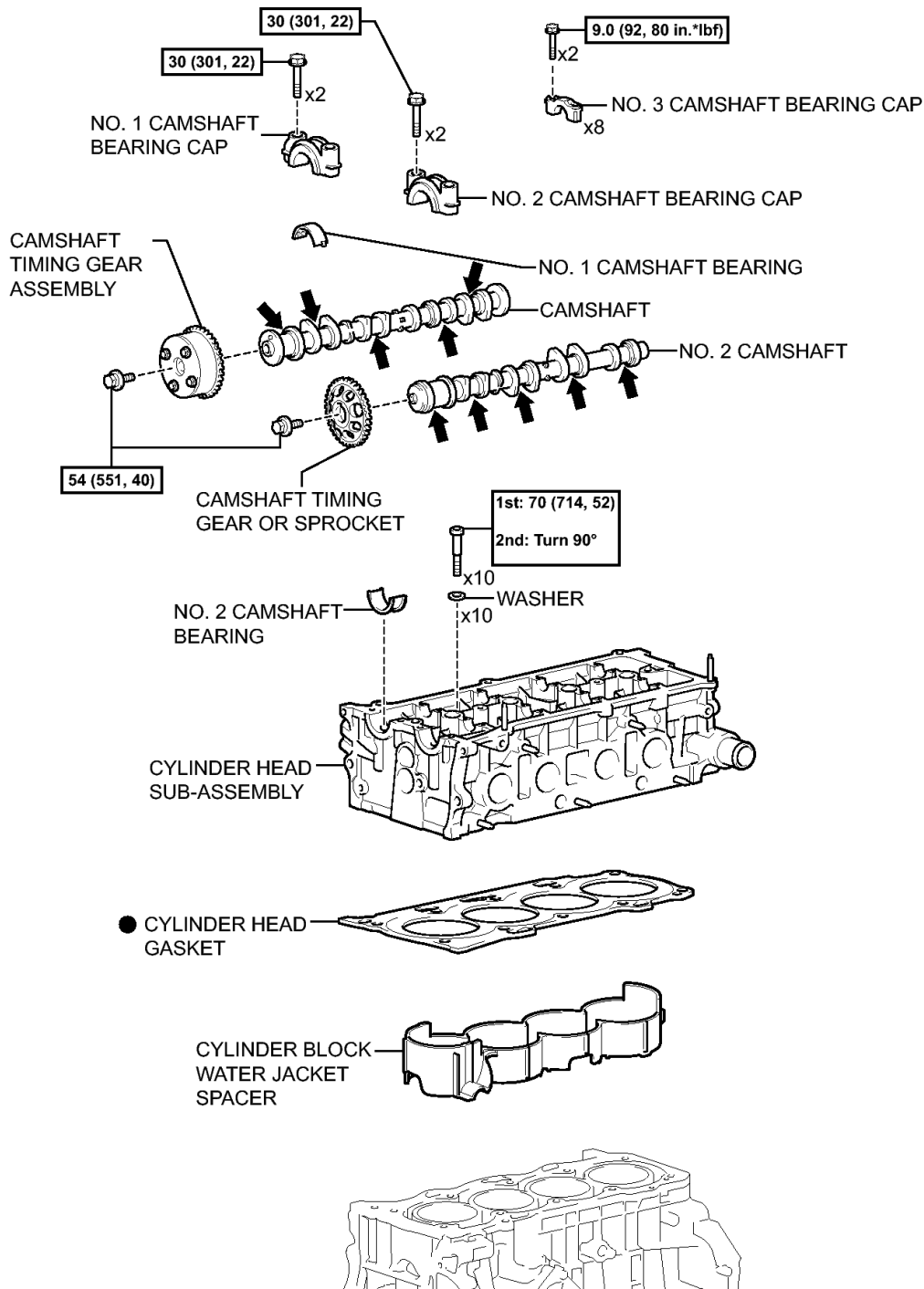


P

Fig. 352: Identifying Engine Unit Replacement Components With Torque Specifications (10 of 14)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

except TMC Made Engine:

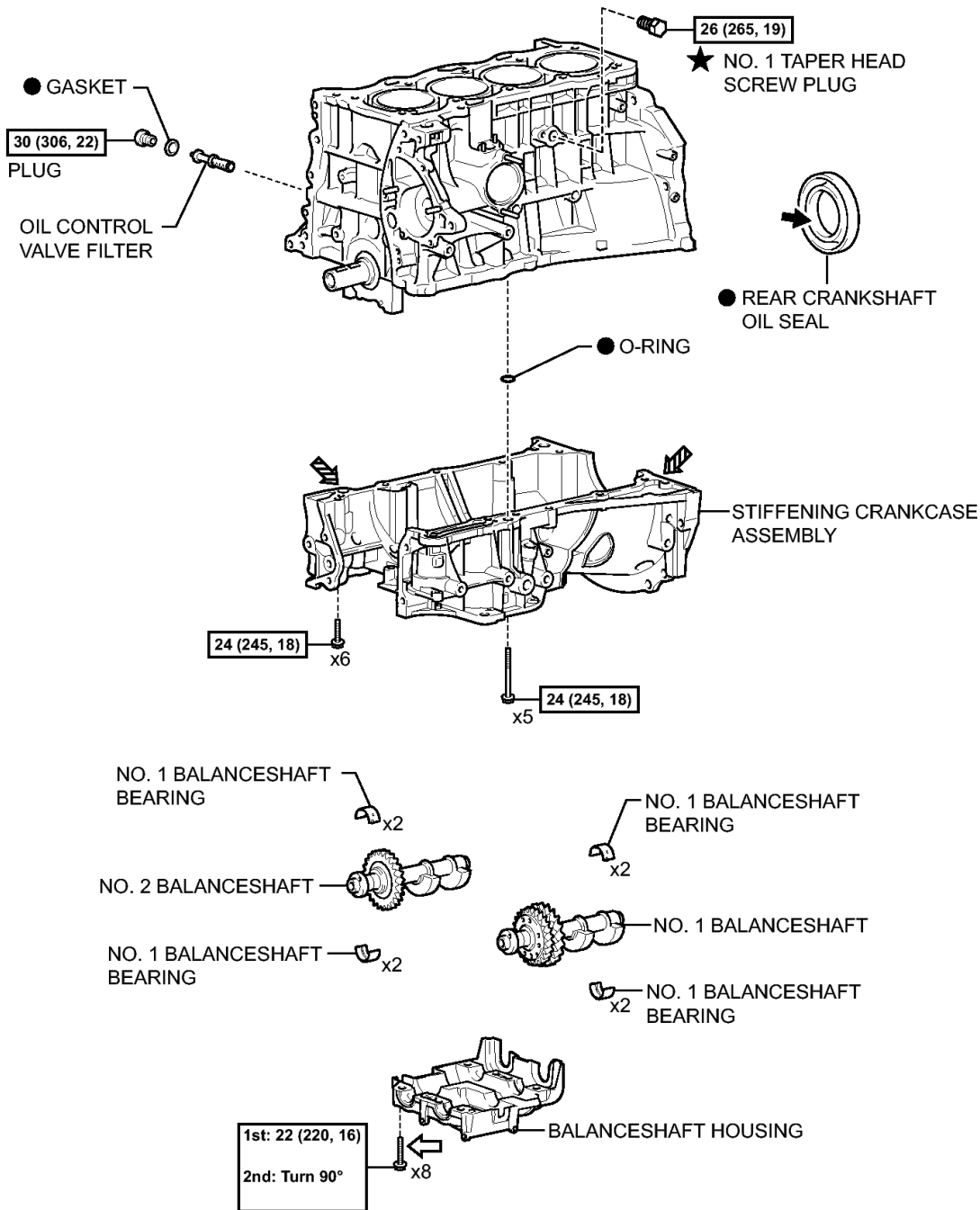


N*m (kgf*cm, ft*lbf) : Specified torque ● Non-reusable part ← Engine oil

Fig. 353: Identifying Engine Unit Replacement Components With Torque Specifications (11 of 14)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

for TMC Made Engine:



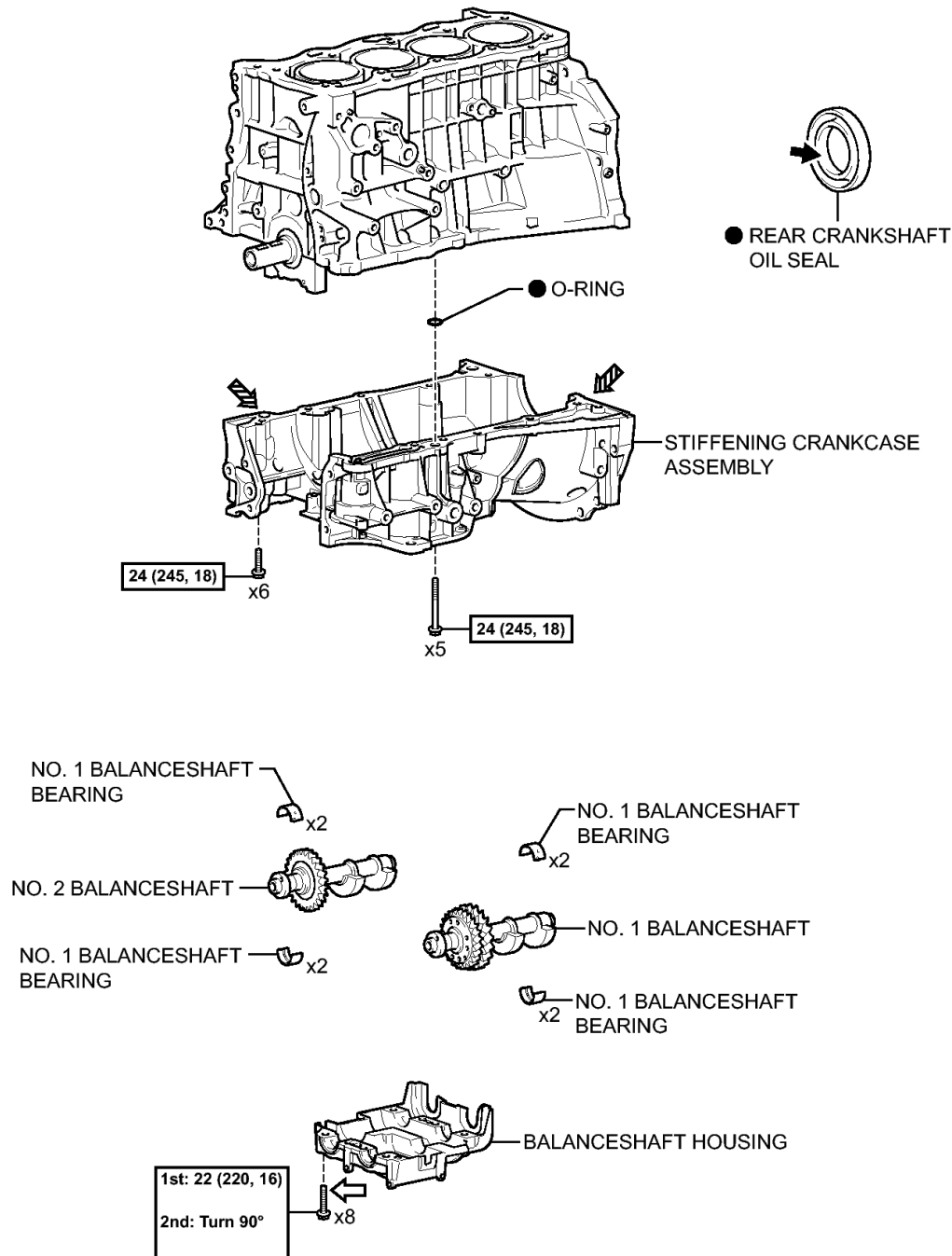
[N*m (kgf*cm, ft*lb)] : Specified torque

● Non-reusable part ← MP Grease ← Engine oil ← Seal packing ★ Precoated part

Fig. 354: Identifying Engine Unit Replacement Components With Torque Specifications (12 of 14)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

except TMC Made Engine:



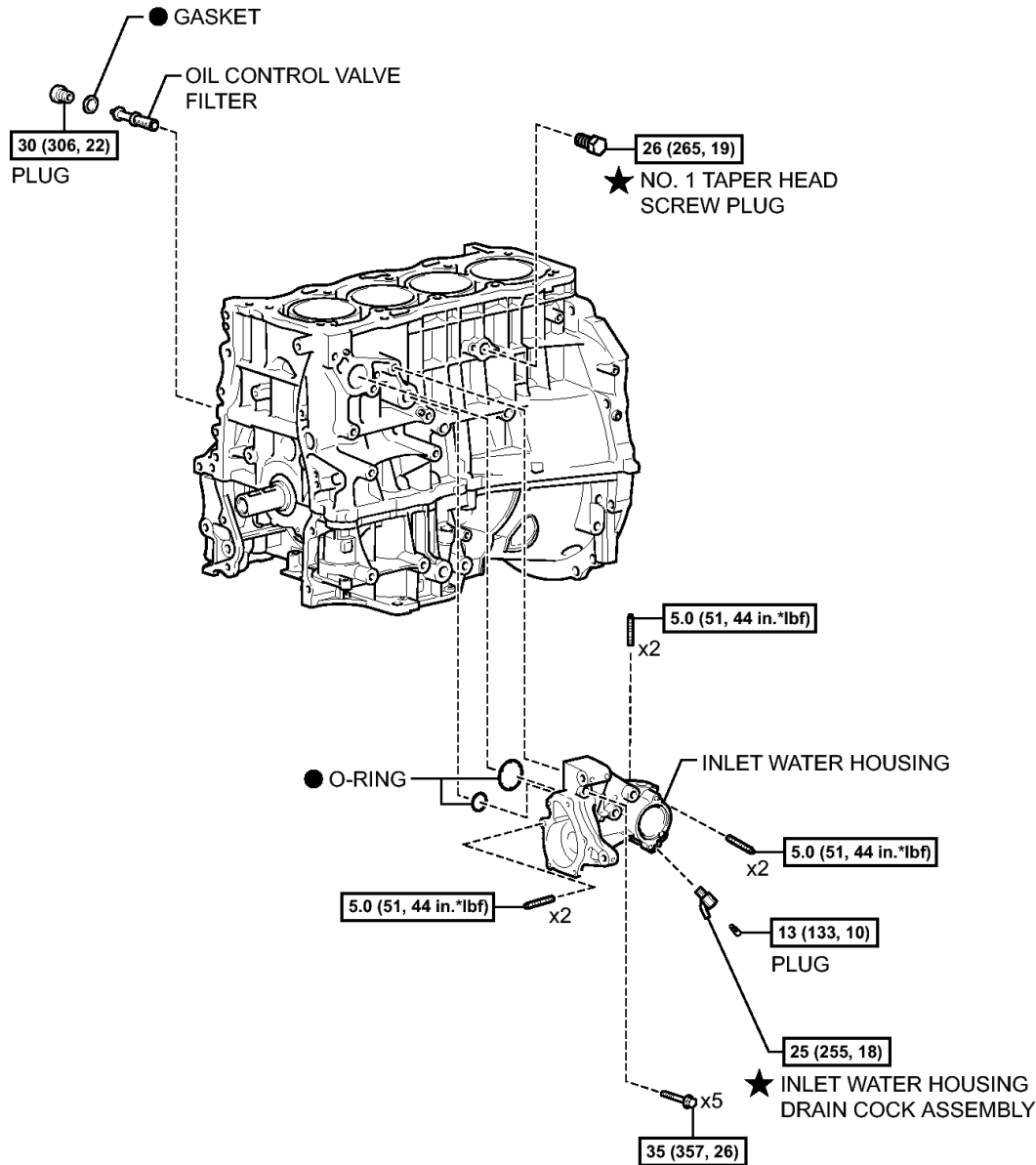
N*m (kgf*cm, ft*lb) : Specified torque

● Non-reusable part ← MP Grease ← Engine oil ← Seal packing

Fig. 355: Identifying Engine Unit Replacement Components With Torque Specifications (13 of 14)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

except TMC Made Engine:



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

● Non-reusable part ★ Precoated part

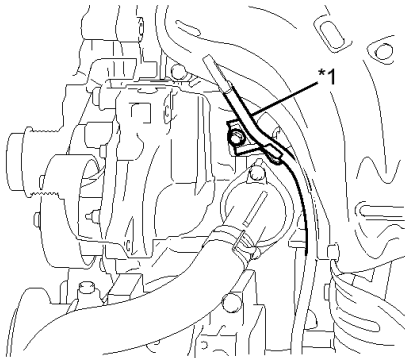
Fig. 356: Identifying Engine Unit Replacement Components With Torque Specifications (14 of 14)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

REMOVAL**HINT:**

Check whether the engine is TMC made or not by referring to the following illustration.

*A



*B

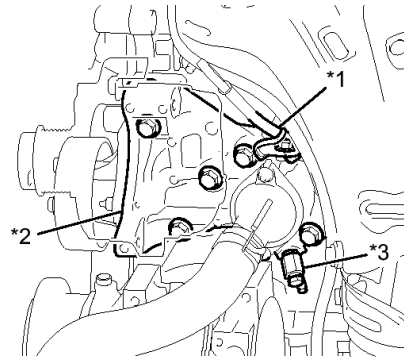


Fig. 357: Identifying Whether The Engine Is TMC Made
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*A	for TMC Made Engine	*B	except TMC Made Engine
*1	Engine Oil Level Dipstick Guide	*2	Water Inlet Housing
*3	Water Inlet Housing Drain Cock Assembly	-	-

REMOVAL

1. **REMOVE FUEL DELIVERY PIPE SUB-ASSEMBLY** . Refer to **REMOVAL - Step 6** .
2. **REMOVE FUEL INJECTOR ASSEMBLY** . Refer to **REMOVAL - Step 7** .
3. **DISCONNECT NO. 2 VENTILATION HOSE** . Refer to **REMOVAL - Step 5** .
4. **REMOVE INTAKE MANIFOLD**

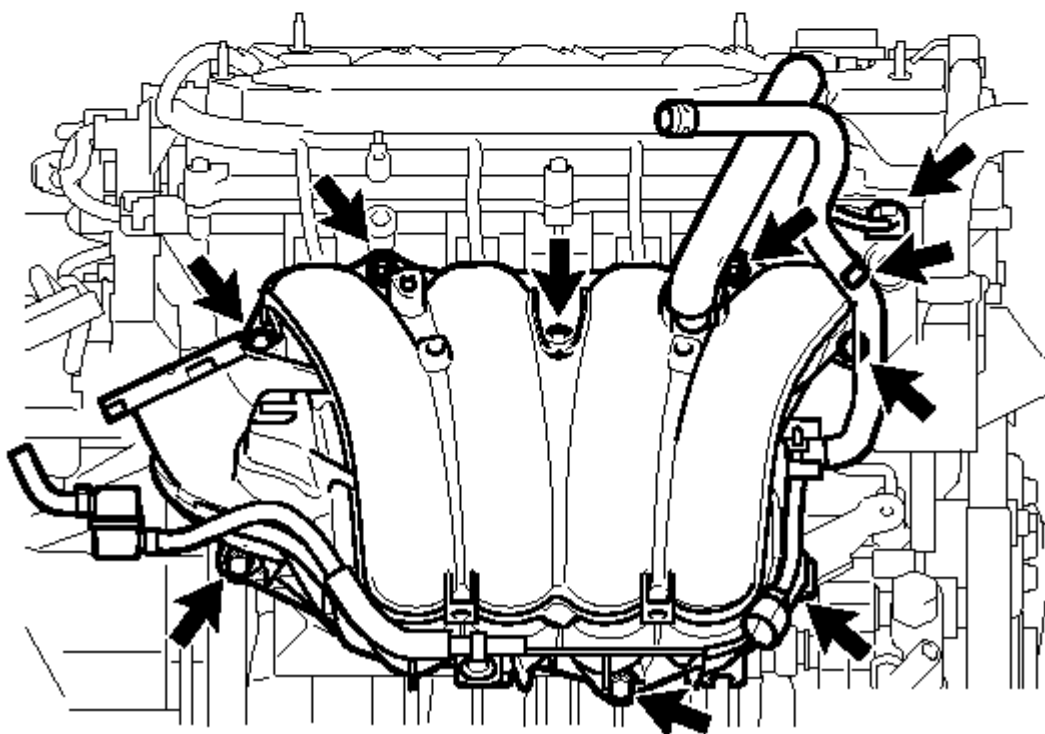
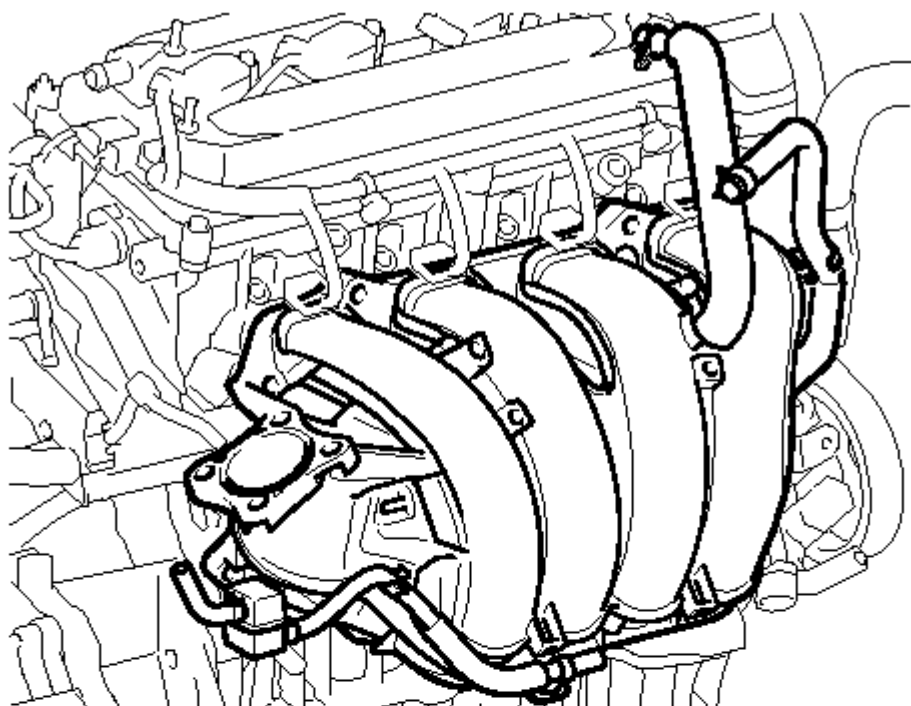
**P**

Fig. 358: Location of Intake Manifold Components
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Disconnect the camshaft timing oil control valve connector.
- b. Remove the wire harness clamp.

- c. Remove the 5 bolts, 2 nuts and intake manifold.
- d. Remove the gasket from the intake manifold.

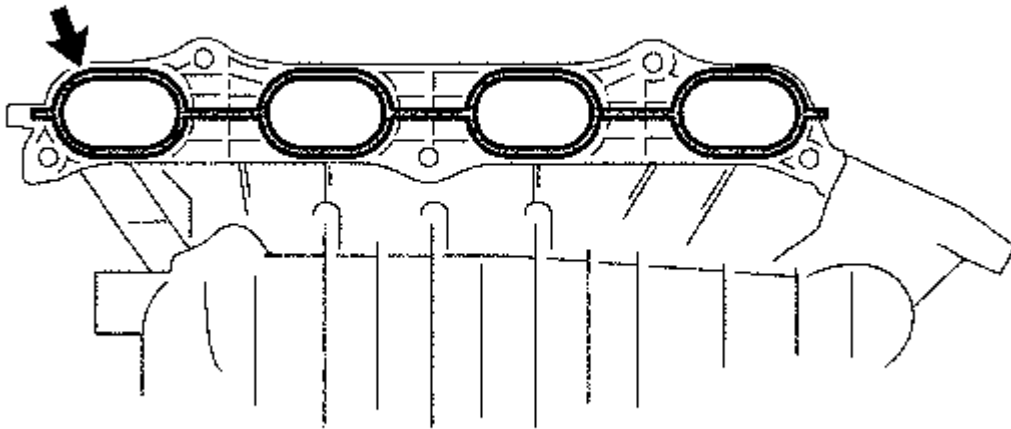
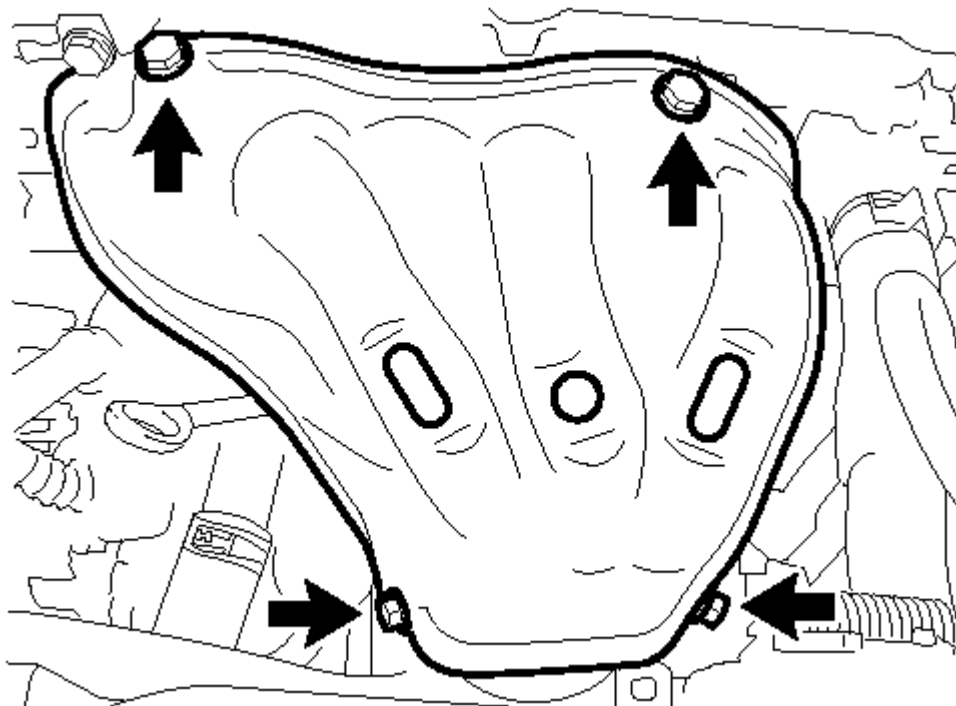



Fig. 359: View Of Intake Manifold Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

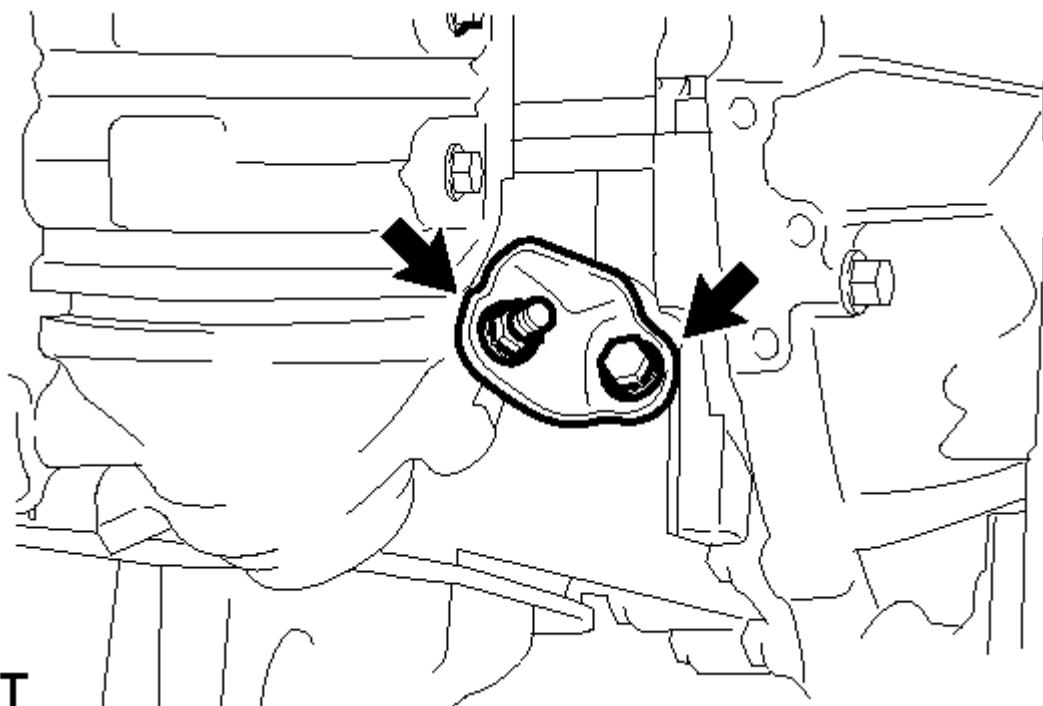
- 5. **REMOVE NO. 1 INTAKE MANIFOLD INSULATOR** . Refer to **REMOVAL - Step 17** .
- 6. **REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR**
 - a. Remove the 4 bolts and No. 1 exhaust manifold heat insulator.



T

Fig. 360: Remove/Install No. 1 Exhaust Manifold Heat Insulator Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. REMOVE MANIFOLD STAY



T

Fig. 361: Remove/Install No. 2 Manifold Stay With Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Remove the bolt and nut, then remove the manifold stay.

8. REMOVE NO. 2 MANIFOLD STAY

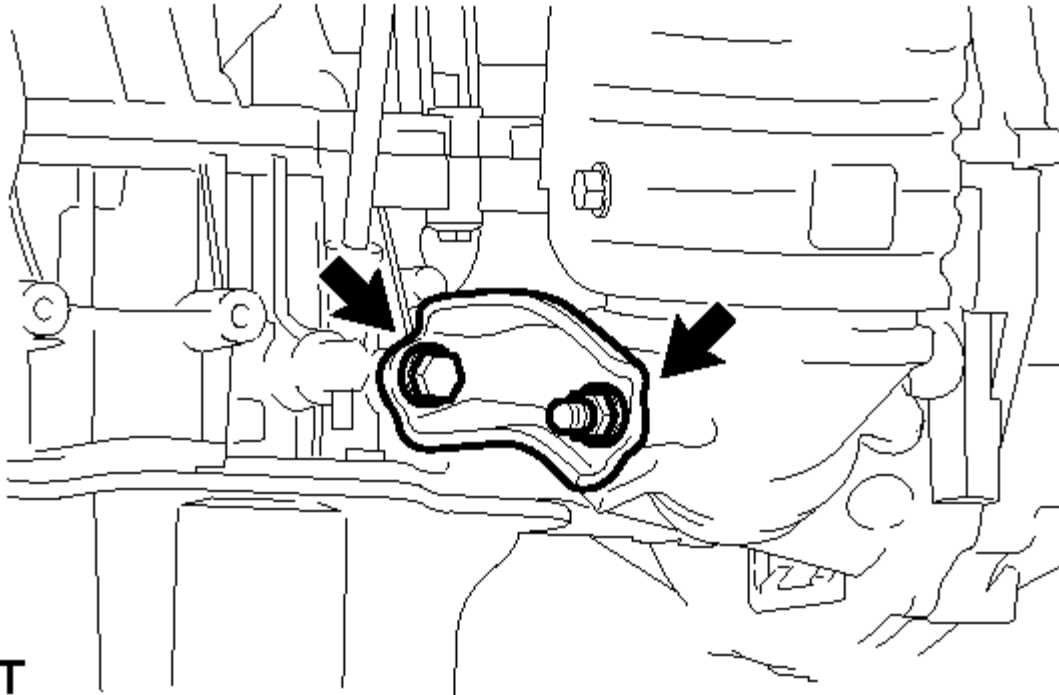


Fig. 362: Remove/Install Manifold Stay With Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Remove the bolt and nut, then remove the No. 2 manifold stay.

9. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY

- a. Remove the 5 nuts and exhaust manifold converter.

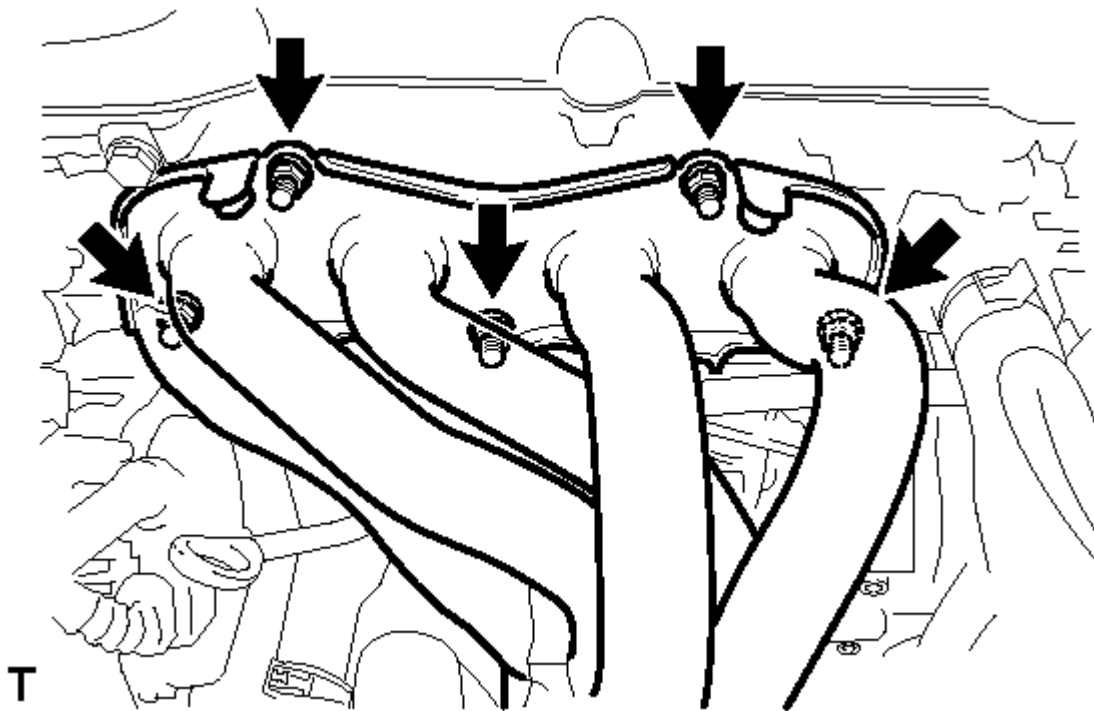
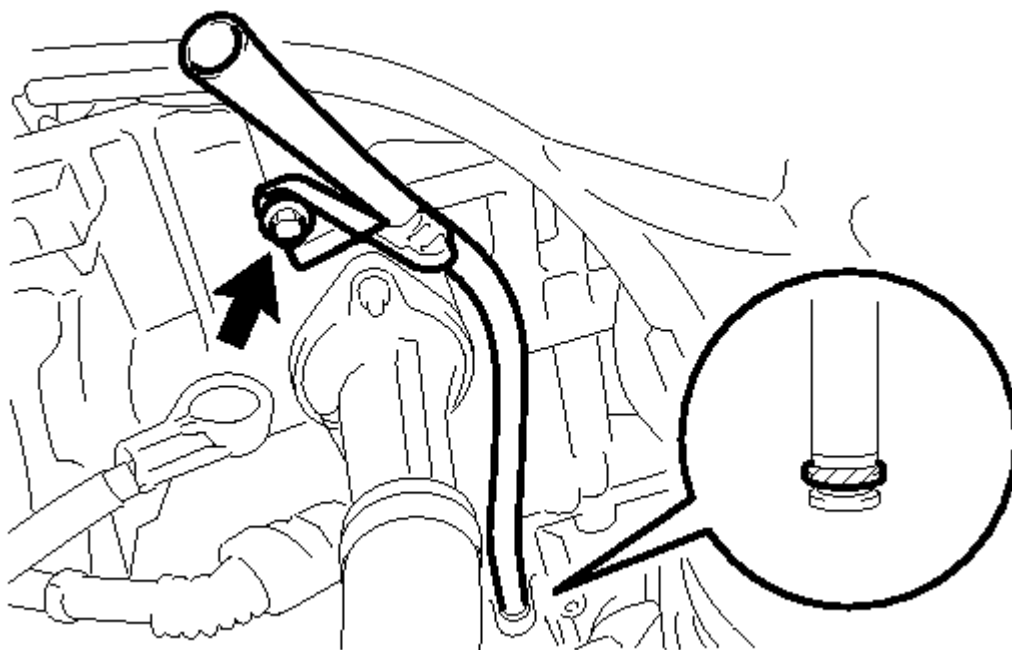


Fig. 363: View OF Exhaust Manifold And Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the gasket.
- 10. **REMOVE IDLER PULLEY SUB-ASSEMBLY** See step 42.
- 11. **REMOVE INLET WATER** . Refer to **REMOVAL - Step 4** .
- 12. **REMOVE THERMOSTAT**
- 13. **REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET** See step 47.
- 14. **REMOVE OIL DIPSTICK**
- 15. **REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE (for TMC Made Engine)**

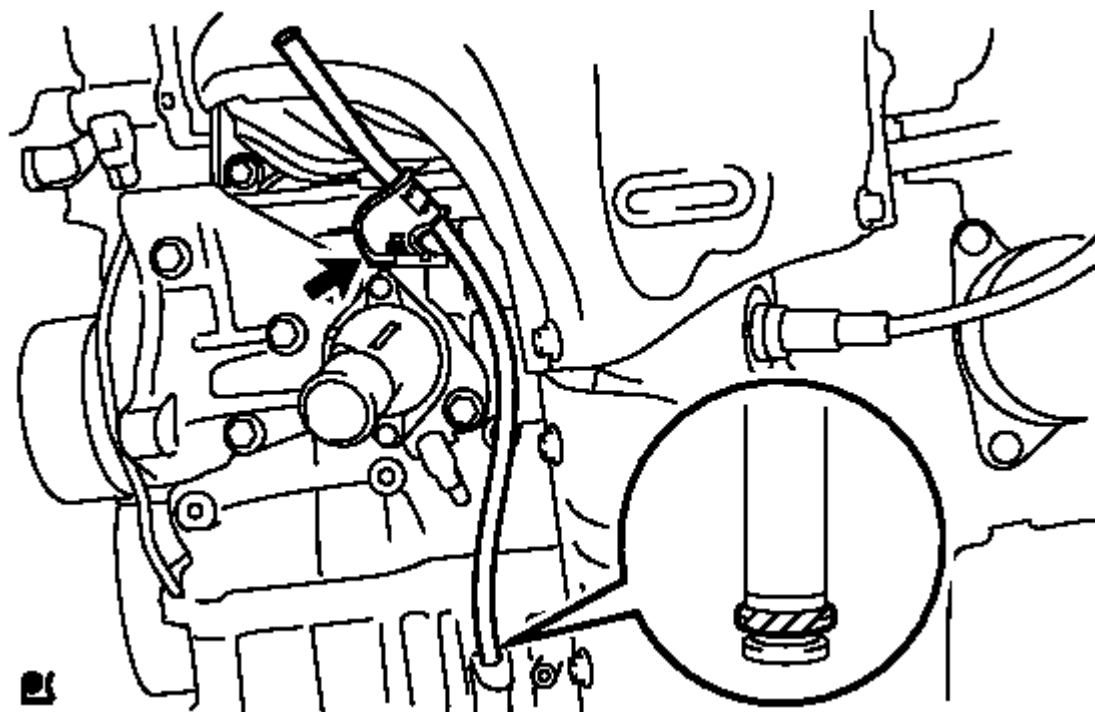


T

Fig. 364: Location of Oil Level Gauge Guide

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

- a. Remove the bolt and engine oil level dipstick guide.
- b. Remove the O-ring from the engine oil level dipstick guide.

16. REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE (except TMC Made Engine)

P

Fig. 365: Identifying Engine Oil Dipstick Guide (Except TMC Made Engine)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Remove the bolt and engine oil level dipstick guide.
 - b. Remove the O-ring from the engine oil level dipstick guide.
17. **REMOVE NO. 1 WATER BY-PASS PIPE (for TMC Made Engine)**
- a. Remove the bolt and 2 nuts, then remove the No. 1 water by-pass pipe.

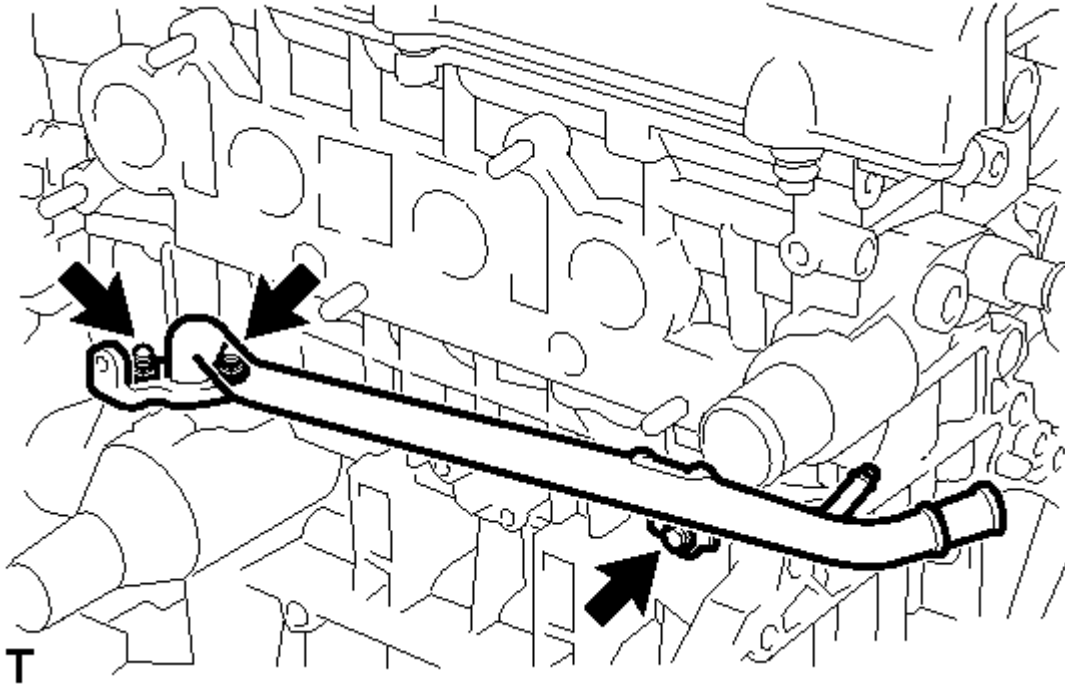


Fig. 366: Location of No. 1 Water By-Pass Pipe Bolt And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the gasket.
18. **REMOVE NO. 1 WATER BY-PASS PIPE (except TMC Made Engine)**
- a. Remove the bolt and 2 nuts, then remove the No. 1 water by-pass pipe.

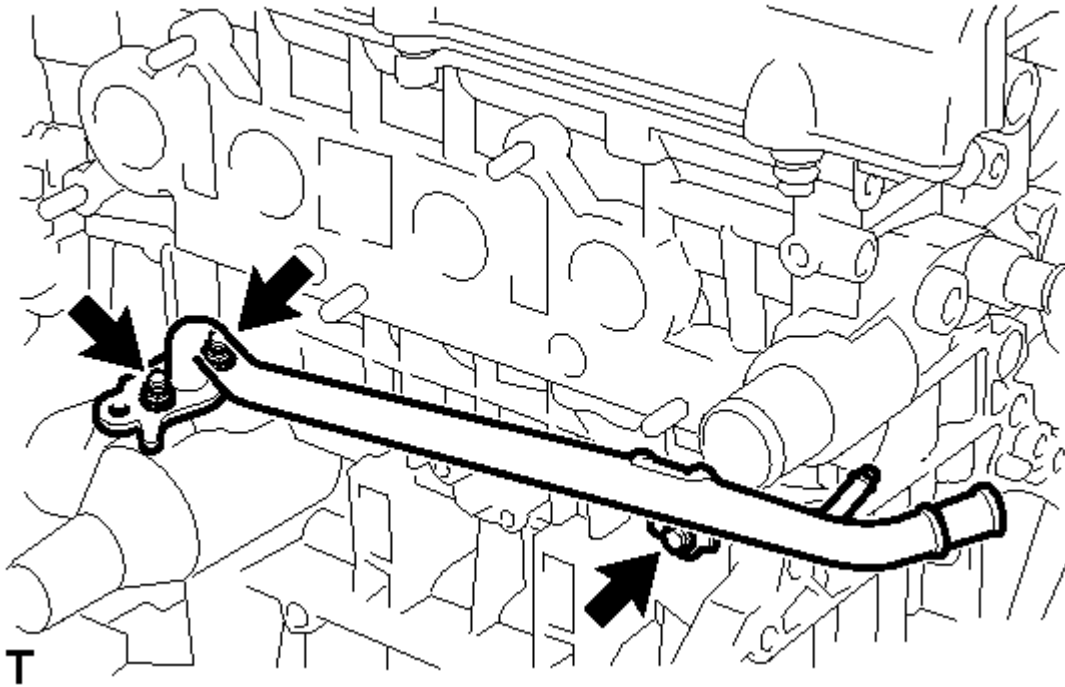


Fig. 367: Location of No. 1 Water By-Pass Pipe Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the gasket.
- 19. **REMOVE IGNITION COIL ASSEMBLY** . Refer to **REMOVAL - Step 2** .
- 20. **REMOVE KNOCK SENSOR** . Refer to **REMOVAL - Step 18** .
- 21. **REMOVE OIL PRESSURE SWITCH** . Refer to **REMOVAL - Step 1** .
- 22. **REMOVE ENGINE COOLANT TEMPERATURE SENSOR** . Refer to **REMOVAL - Step 3** .
- 23. **REMOVE RADIO SETTING CONDENSER**
 - a. Remove the bolt and radio setting condenser.

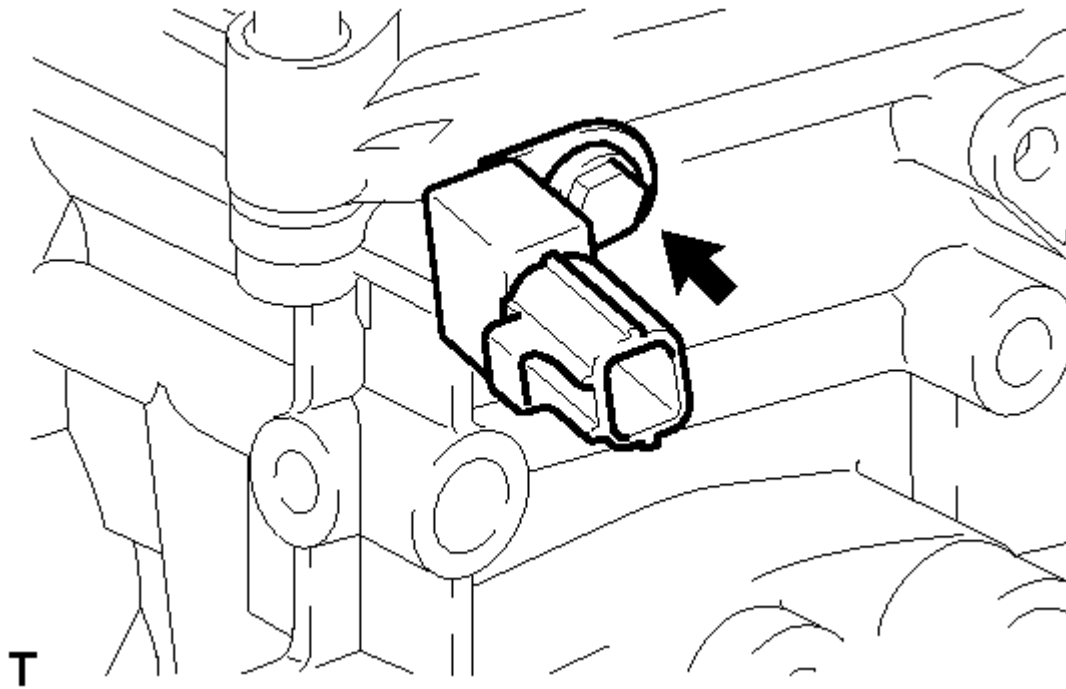


Fig. 368: Remove/Install Radio Setting Condenser And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

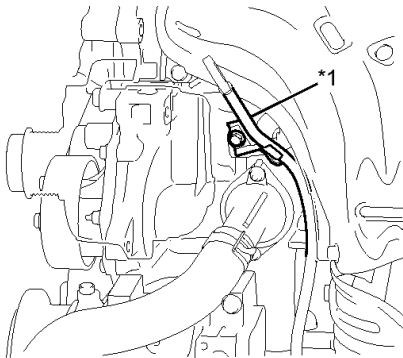
DISASSEMBLY

DISASSEMBLY

HINT:

Check whether the engine is TMC made or not by referring to the following illustration.

*A



*B

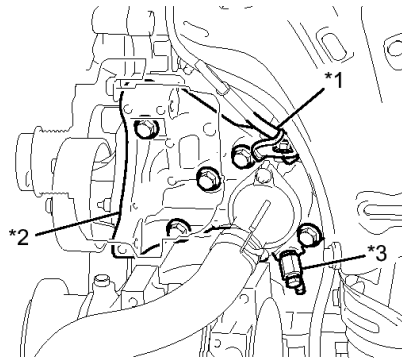


Fig. 369: Identifying Whether The Engine Is TMC Made
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

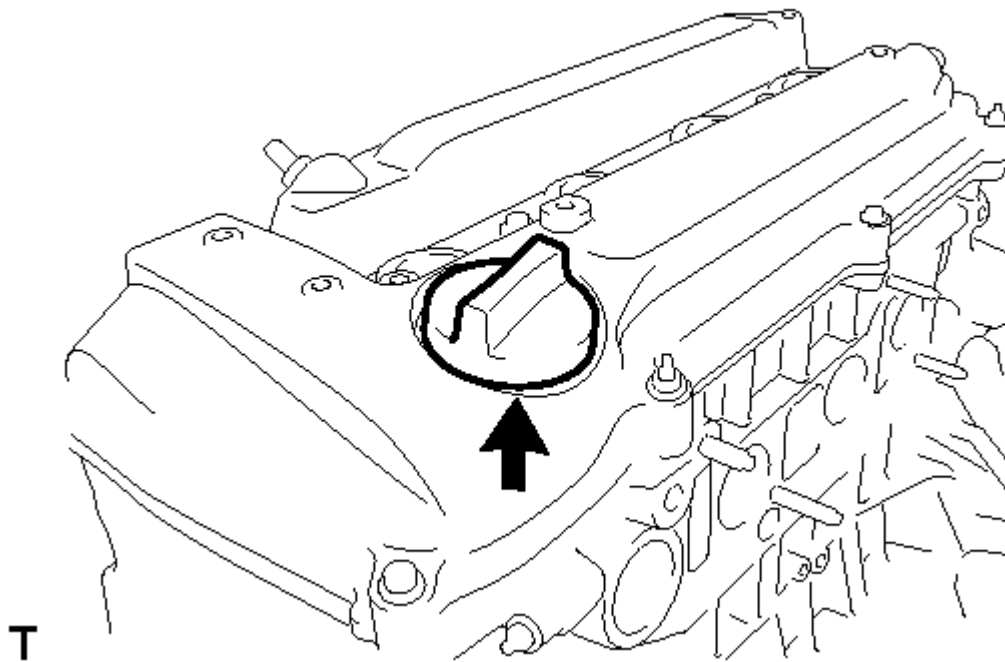
TEXT IN ILLUSTRATION

*A	for TMC Made Engine	*B	except TMC Made Engine
*1	Engine Oil Level Dipstick Guide	*2	Water Inlet Housing
*3	Water Inlet Housing Drain Cock Assembly	-	-

DISASSEMBLY

1. REMOVE OIL FILLER CAP SUB-ASSEMBLY

- Remove the oil filler cap from the cylinder head cover.



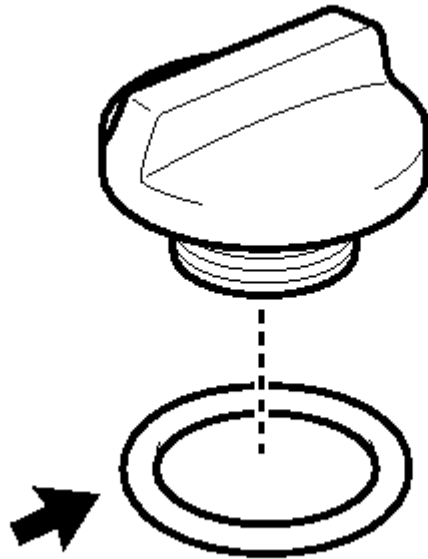
T

Fig. 370: Location of Oil Filler Cap

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

2. REMOVE OIL FILLER CAP GASKET

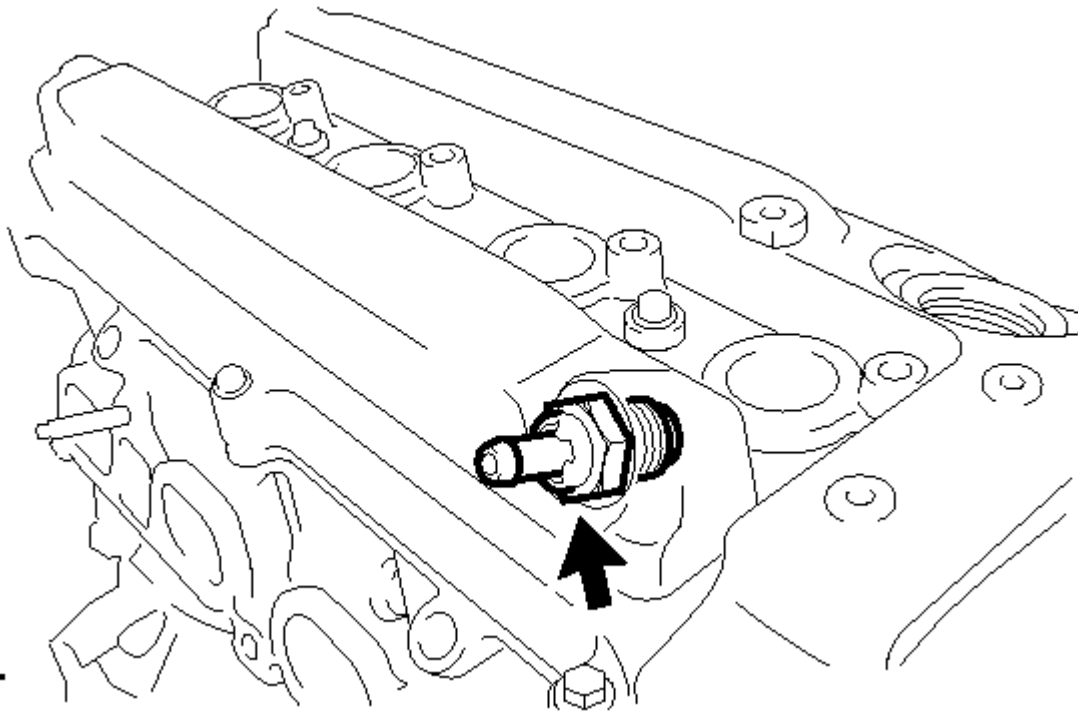
- Remove the oil filler cap gasket from the oil filler cap.

**T****Fig. 371: View Of Oil Filler Cap Gasket**

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

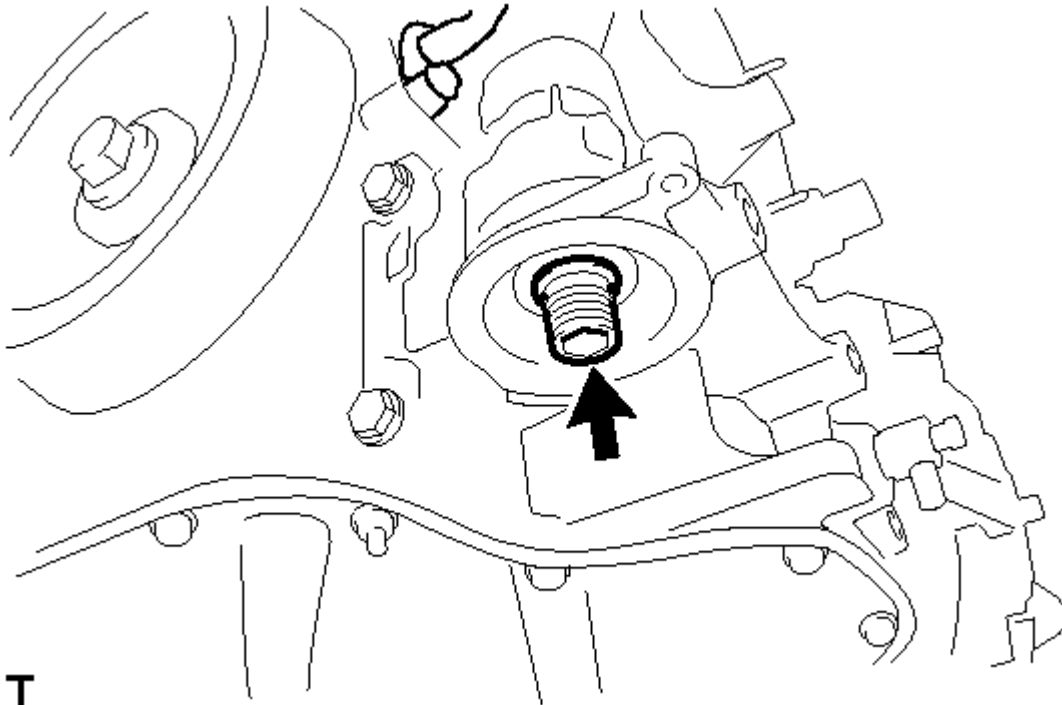
3. REMOVE VENTILATION VALVE SUB-ASSEMBLY

- a. Using a 22 mm deep socket wrench, remove the ventilation valve from the cylinder head cover.

**T****Fig. 372: Remove/Install Ventilation Valve**

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

4. **REMOVE SPARK PLUG** . Refer to **REMOVAL - Step 3** .
5. **REMOVE OIL FILTER SUB-ASSEMBLY** . Refer to **REPLACEMENT - Step 3** .
6. **REMOVE OIL FILTER UNION**
 - a. Using a 12 mm socket hexagon wrench, remove the oil filter union.



T

Fig. 373: Remove/Install Oil Filter Union

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

7. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY**
 - a. Remove the 8 bolts and 2 nuts, remove the cylinder head cover.

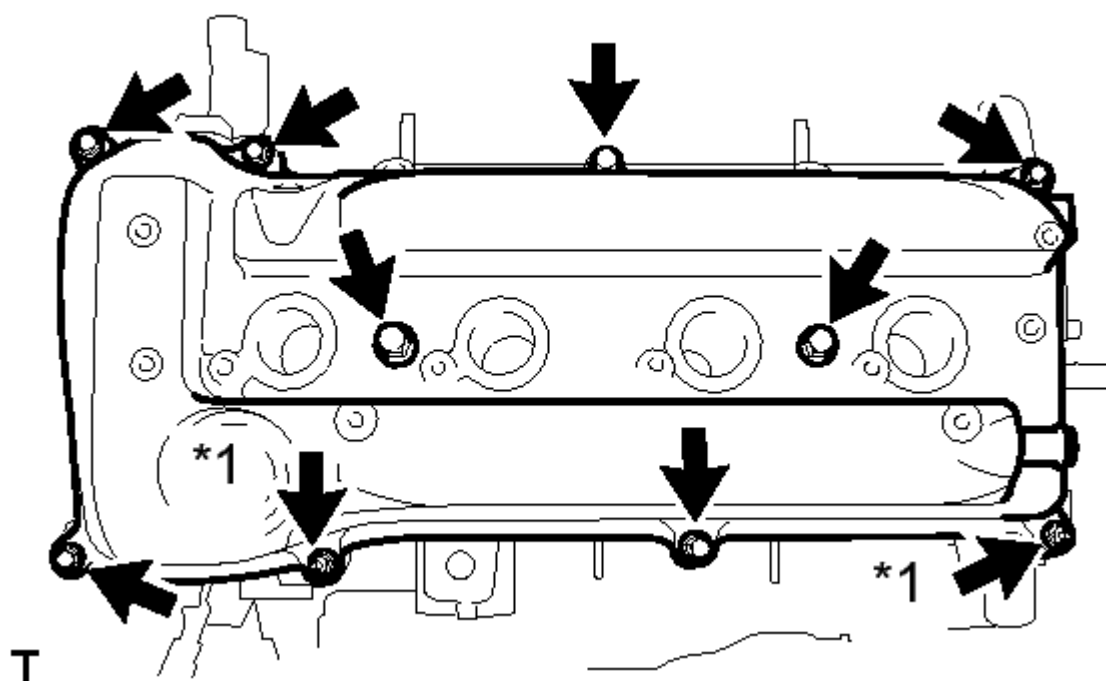


Fig. 374: Identifying Cylinder Head Cover Sub-Assembly

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

TEXT IN ILLUSTRATION

*1	Nut
----	-----

8. REMOVE CYLINDER HEAD COVER GASKET

- a. Remove cylinder head cover gasket from the cylinder head cover.

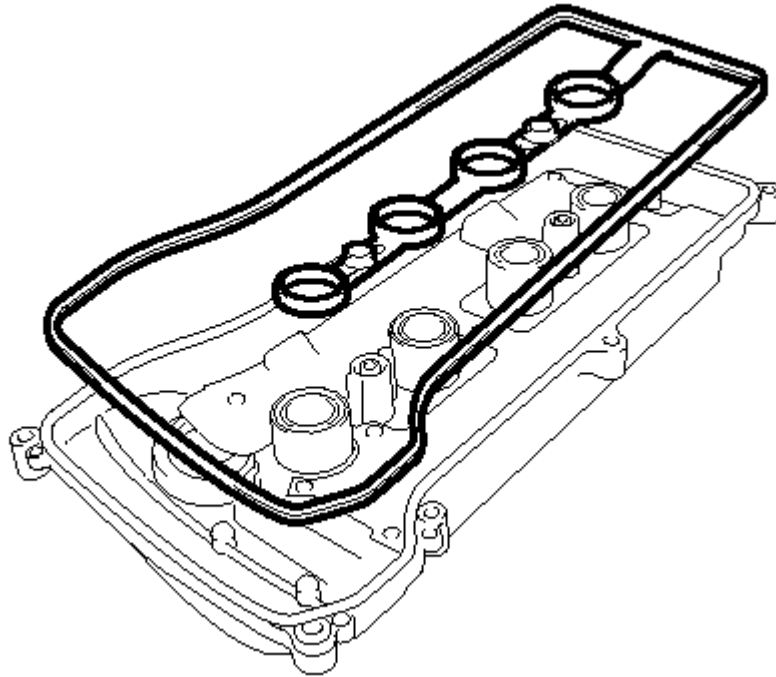
**T**

Fig. 375: View Of Cylinder Head Cover Gasket

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

9. **REMOVE V-RIBBED BELT TENSIONER ASSEMBLY** See step 48.
10. **REMOVE CRANKSHAFT POSITION SENSOR (for TMC Made Engine)**
 - a. Disconnect the crankshaft position sensor wire from the rib portion of the timing chain cover.

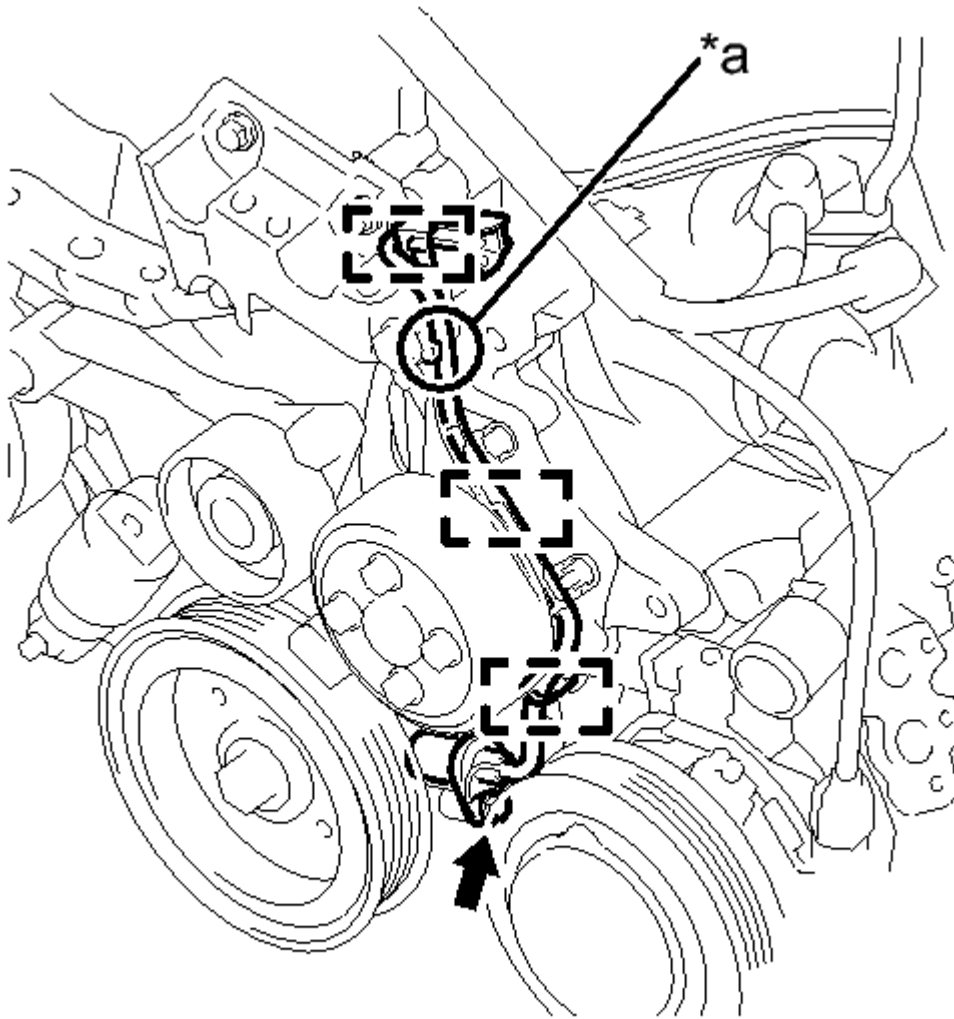


Fig. 376: Identifying Crankshaft Position Sensor Wire And Clamps (For TMC Made Engine)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Timing Chain Cover Rib Portion
----	--------------------------------

- b. Disengage the clamp and disconnect the crankshaft position sensor connector from the connector clamp bracket.
- c. Disconnect the crankshaft position sensor wire from the wire harness clamp bracket.
- d. Disengage the clamp and disconnect the crankshaft position sensor wire from the water pump.
- e. Remove the bolt and crankshaft position sensor.

11. REMOVE CRANKSHAFT POSITION SENSOR (except TMC Made Engine)

- a. Disengage the clamp and disconnect the crankshaft position sensor connector from the connector clamp bracket.

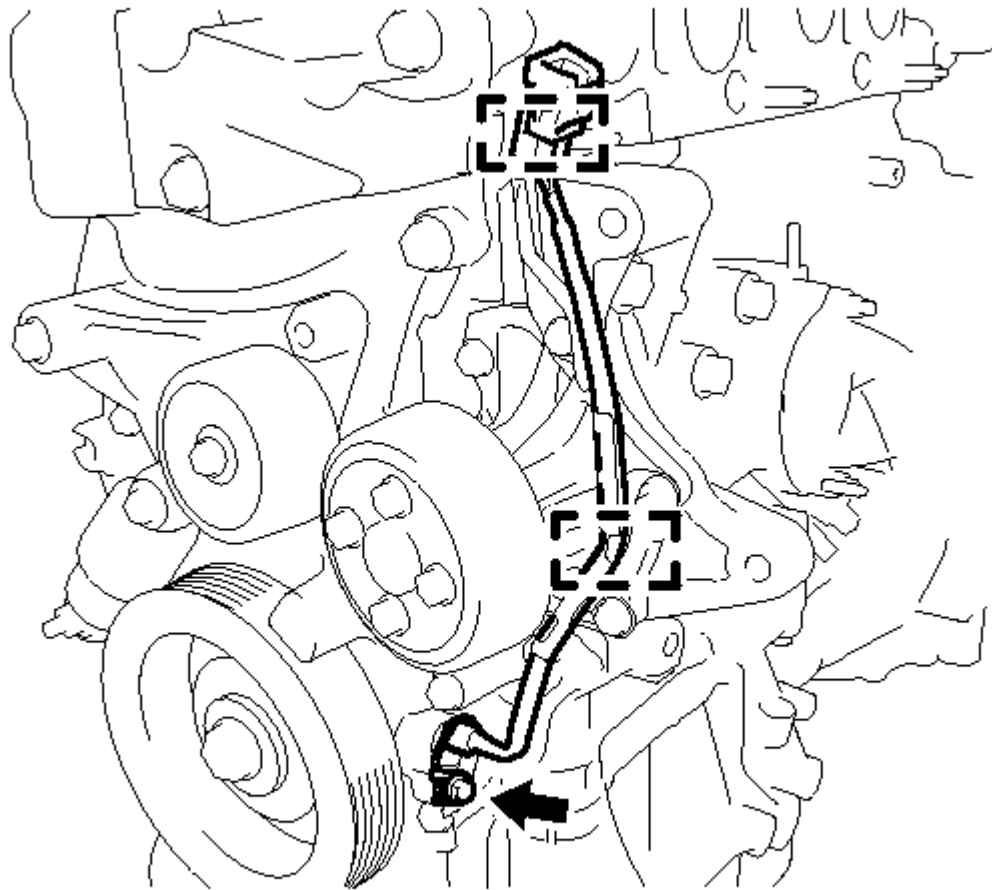


Fig. 377: Identifying Crankshaft Position Sensor Connector And Clamps (Except TMC Made Engine)

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

- b. Disconnect the crankshaft position sensor wire from the wire harness clamp bracket.
- c. Remove the bolt and crankshaft position sensor.

12. REMOVE CAMSHAFT POSITION SENSOR

- a. Remove the bolt and camshaft position sensor.

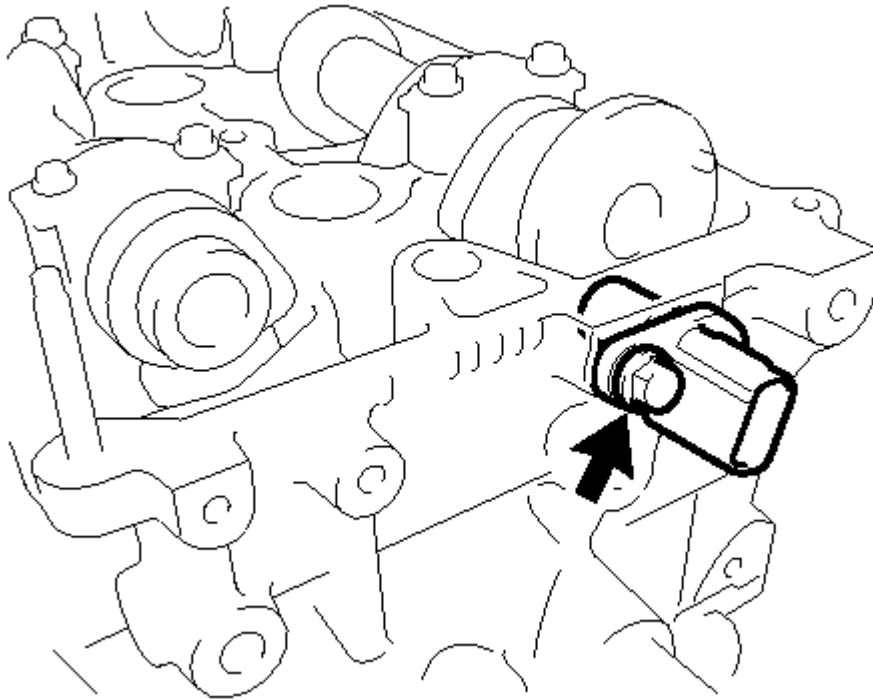
**T**

Fig. 378: Remove/Install Camshaft Position Sensor And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. **SET NO. 1 CYLINDER TO TDC / COMPRESSION** See step 44.
14. **REMOVE CRANKSHAFT PULLEY** See step 4.
15. **REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY**
 - a. Remove the bolt and camshaft timing oil control valve from the cylinder head.

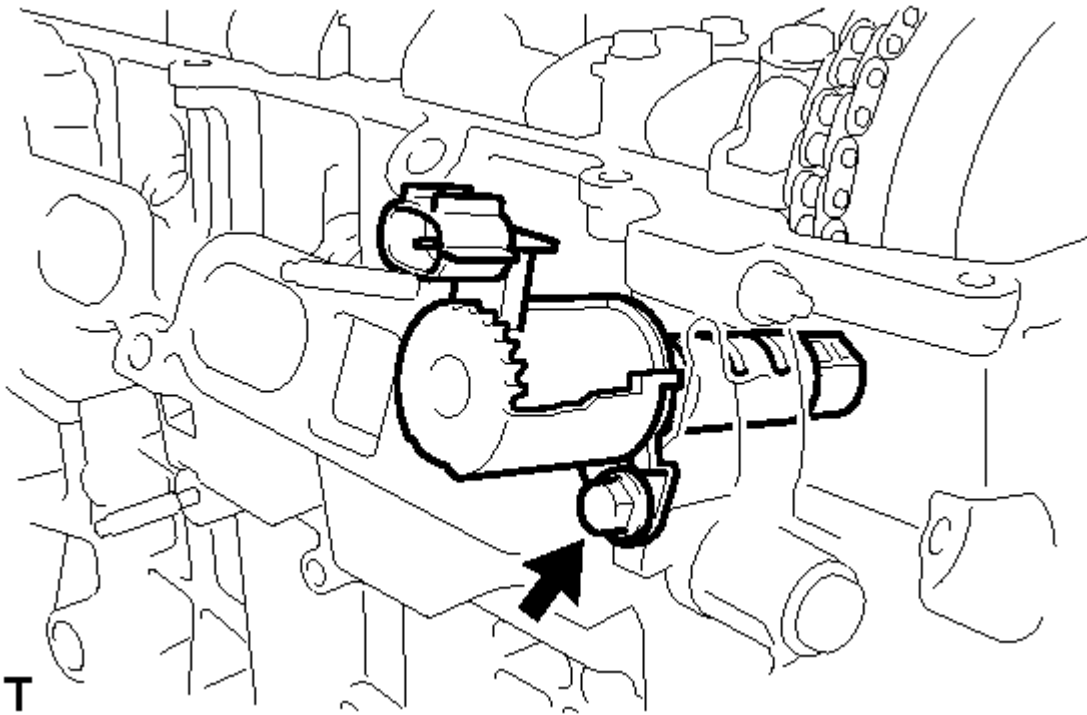
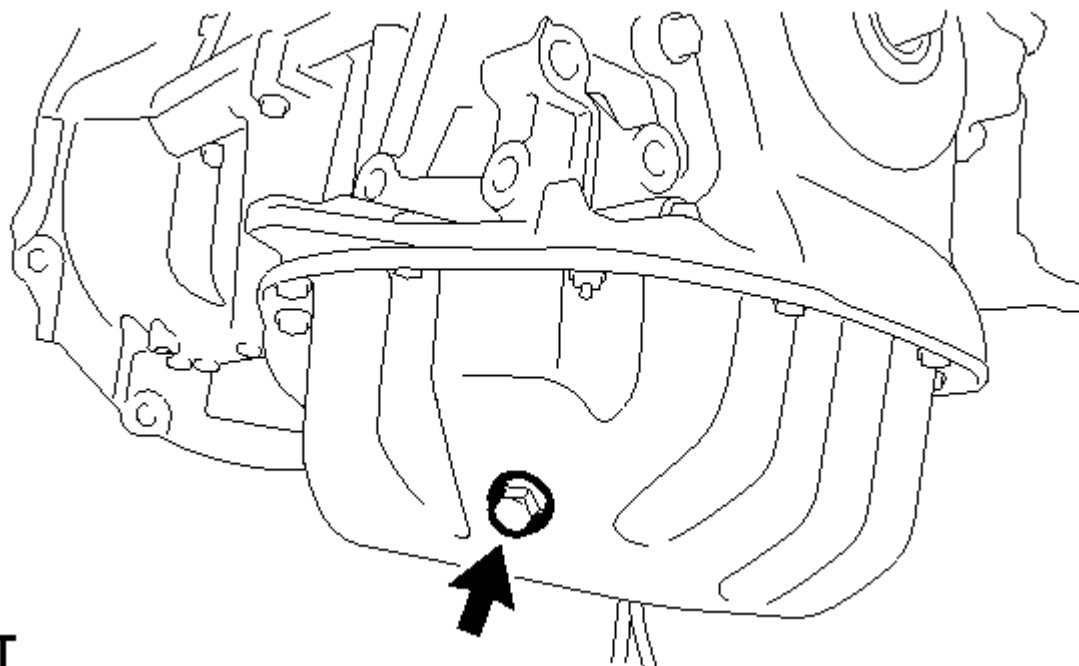


Fig. 379: Remove/Install Camshaft Timing Oil Control Valve And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: The camshaft timing oil control valve may be damaged when loosening the cylinder head bolt if the camshaft timing oil control valve is not removed.

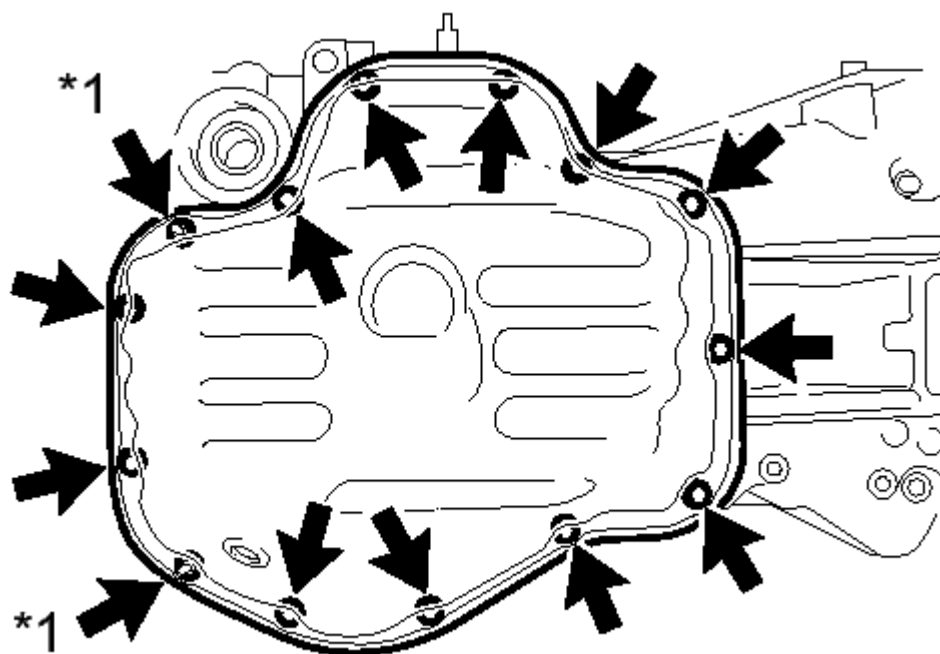
16. **REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY** See step 46.
17. **REMOVE WATER PUMP PULLEY** . Refer to **REMOVAL - Step 6** .
18. **REMOVE ENGINE WATER PUMP ASSEMBLY (for TMC Made Engine)** . Refer to **REMOVAL - Step 7** .
19. **REMOVE ENGINE WATER PUMP ASSEMBLY (except TMC Made Engine)** . Refer to **REMOVAL - Step 8** .
20. **REMOVE OIL PAN DRAIN PLUG**
 - a. Remove the oil pan drain plug from the oil pan.

**T****Fig. 380: Remove/Install Oil Pan Drain Plug**

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

21. REMOVE OIL PAN SUB-ASSEMBLY

- a. Remove the 12 bolts and 2 nuts.

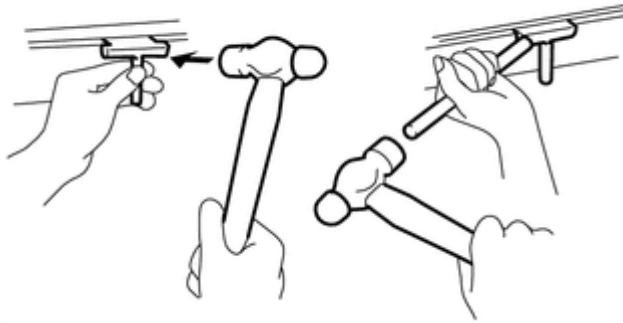
**T****Fig. 381: REMOVE OIL PAN SUB-ASSEMBLY**

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

TEXT IN ILLUSTRATION

*1	Nut
----	-----

- b. Insert the blade of oil pan seal cutter between the crankcase, chain cover and oil pan, then cut through the applied sealer and remove the oil pan.



T

Fig. 382: Removing Oil Pan Sealer

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

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

22. **REMOVE TIMING CHAIN OR BELT COVER SUB-ASSEMBLY** See step 50.
23. **REMOVE FRONT CRANKSHAFT OIL SEAL**
 - a. Using a screwdriver with its tip wrapped in protective tape, remove the oil seal.

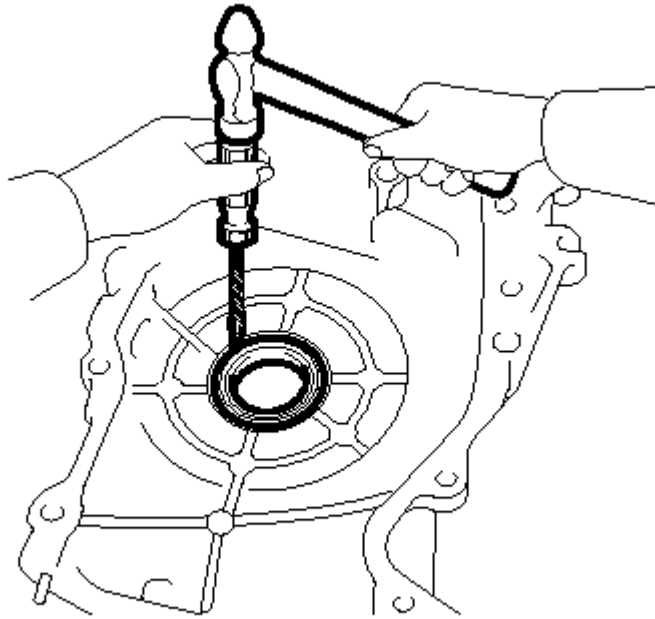
**T**

Fig. 383: Removing Timing Chain Cover Oil Seal

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

NOTE: Be careful not to damage the timing chain case oil seal.

24. **REMOVE NO. 1 CRANKSHAFT POSITION SENSOR PLATE** See step 51.
25. **REMOVE TIMING CHAIN GUIDE** See step 52.
26. **REMOVE CHAIN TENSIONER SLIPPER** See step 53.
27. **REMOVE NO. 1 CHAIN VIBRATION DAMPER** See step 54.
28. **REMOVE CHAIN SUB-ASSEMBLY**
29. **REMOVE CRANKSHAFT TIMING GEAR OR SPROCKET** See step 56.
30. **REMOVE NO. 2 CHAIN SUB-ASSEMBLY** See step 57.
31. **REMOVE NO. 2 CAMSHAFT**
 - a. Using several steps, uniformly loosen and remove the No. 2 and 4 No. 3 bearing caps in the sequence shown in the illustration.

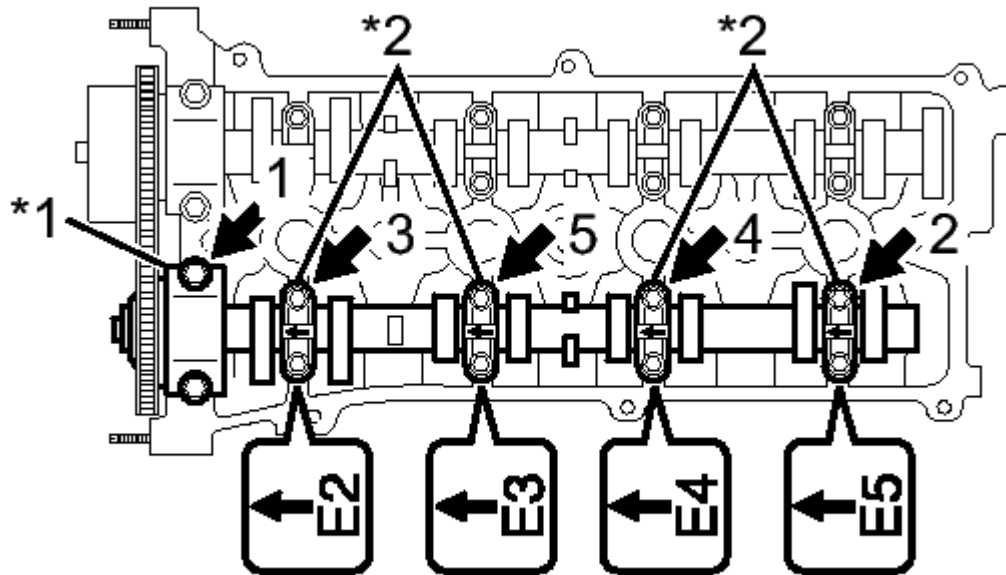


Fig. 384: No. 2 Camshaft Bearing Cap Removal Sequence
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Uniformly loosen the bolts while keeping the camshaft level.

HINT:

Arrange the removed parts in the correct order.

TEXT IN ILLUSTRATION

*1	No. 2 Bearing Cap
*2	No. 3 Bearing Cap

- b. Remove the No. 2 camshaft.

32. REMOVE CAMSHAFT

- a. Using several steps, uniformly loosen and remove the No. 1 and 4 No. 3 bearing caps in the sequence shown in the illustration.

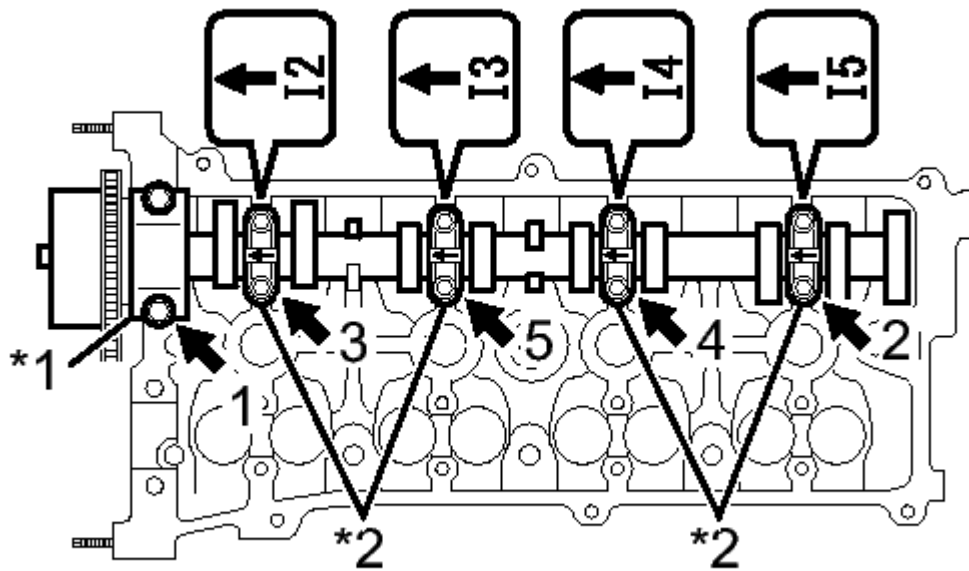


Fig. 385: Camshaft Bearing Cap Removal Sequence
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Uniformly loosen the bolts while keeping the camshaft level.

HINT:

Arrange the removed parts in the correct order.

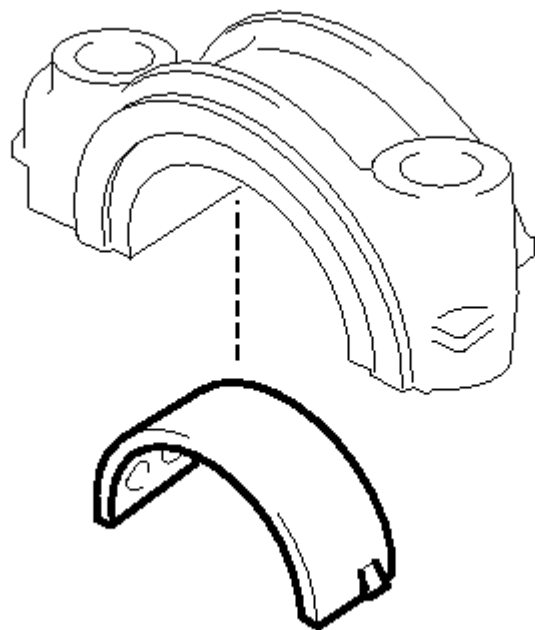
TEXT IN ILLUSTRATION

*1	No. 1 Bearing Cap
*2	No. 3 Bearing Cap

b. Remove the camshaft.

33. REMOVE NO. 1 CAMSHAFT BEARING

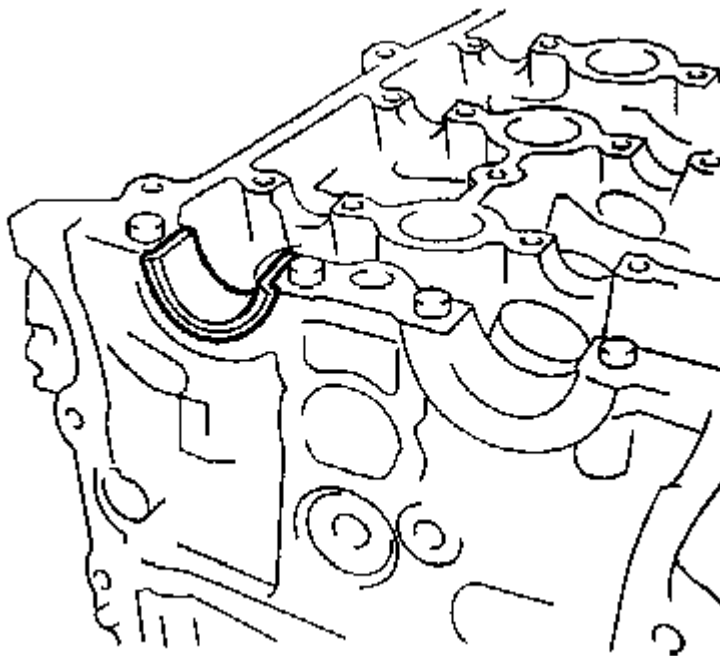
a. Remove the camshaft bearing from the No. 1 camshaft bearing cap.

**T****Fig. 386: Identifying No. 1 Camshaft Bearing**

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

34. REMOVE NO. 2 CAMSHAFT BEARING

- a. Remove the No. 2 camshaft bearing from the cylinder head.

**M****A32664****Fig. 387: Identifying No. 2 Camshaft Bearing**

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

35. REMOVE CAMSHAFT TIMING GEAR OR SPROCKET

- a. Clamp the camshaft in a vise, and make sure that the camshaft timing gear or sprocket does not rotate.

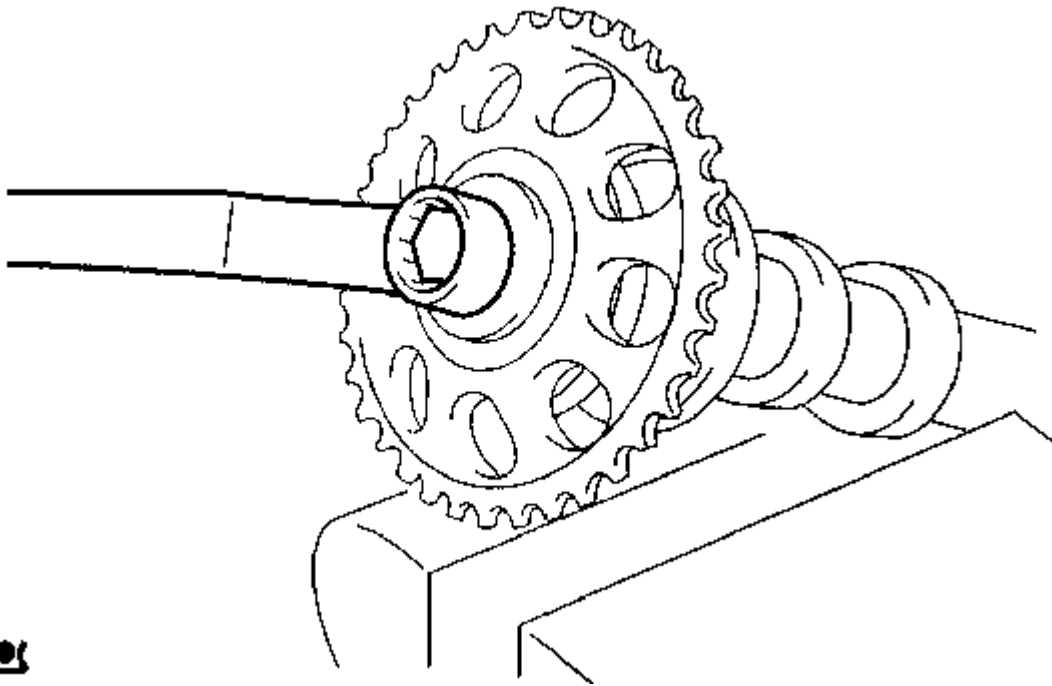


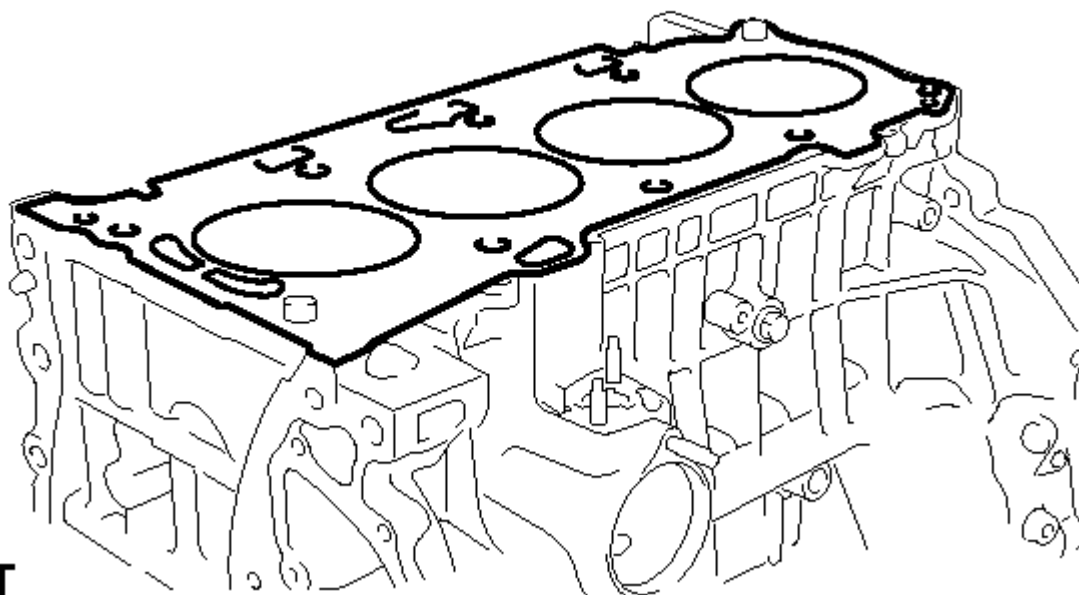
Fig. 388: Identifying Camshaft Timing Gear Or Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Do not overtighten the vise.
- Do not damage the camshaft.

- b. Remove the bolt and camshaft timing gear or sprocket.

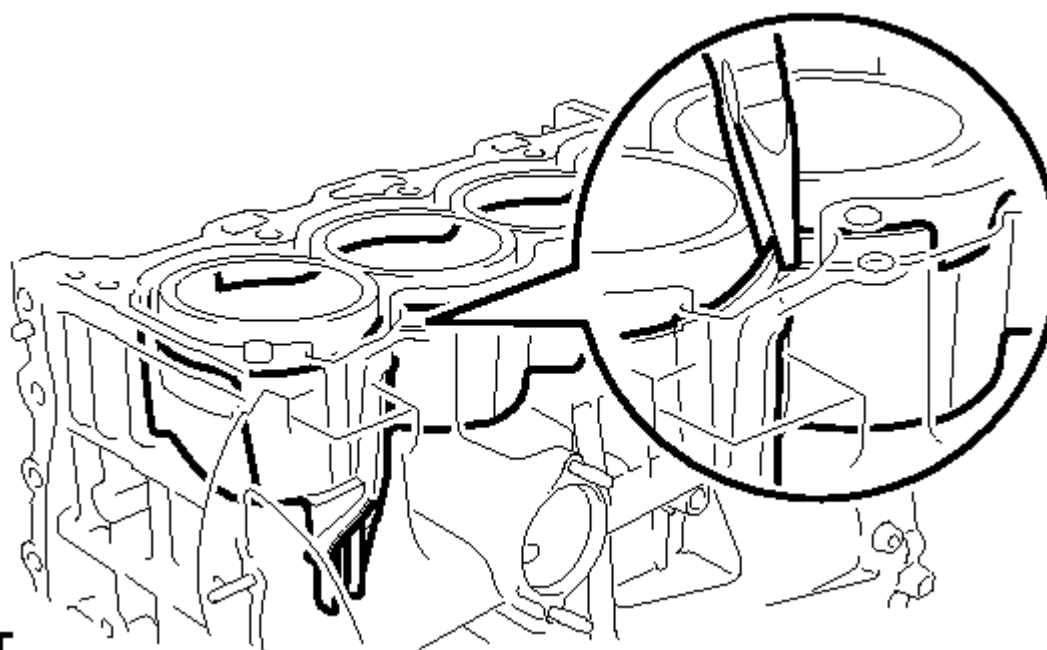
36. **REMOVE CAMSHAFT TIMING GEAR ASSEMBLY** See step 11.
37. **REMOVE CYLINDER HEAD SUB-ASSEMBLY** See step 66.
38. **REMOVE CYLINDER HEAD GASKET**

**T****Fig. 389: View Of Cylinder Head Gasket**

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

39. REMOVE CYLINDER BLOCK WATER JACKET SPACER (for TMC Made Engine)

- a. Using needle nose pliers, remove the cylinder block water jacket spacer from the water jacket.

**T****Fig. 390: Removing Cylinder Block Water Jacket Spacer**

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

NOTE: Before turning the cylinder block upside down, make sure that the water jacket spacer is removed, as it will fall out.

40. **REMOVE CYLINDER BLOCK WATER JACKET SPACER (except TMC Made Engine)**

- a. Using needle nose pliers, remove the cylinder block water jacket spacer from the water jacket.

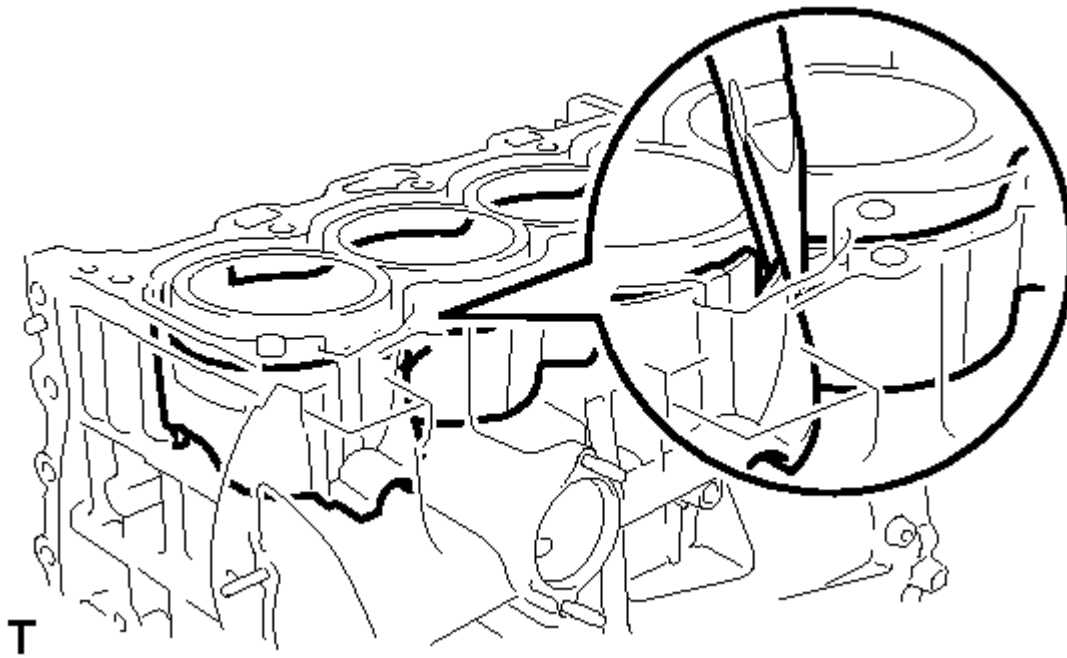


Fig. 391: Identifying Cylinder Block Water Jacket Spacer From Water Jacket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Before turning the cylinder block upside down, make sure that the water jacket spacer is removed, as it will fall out.

41. **REMOVE INLET WATER HOUSING DRAIN COCK ASSEMBLY (except TMC Made Engine)**

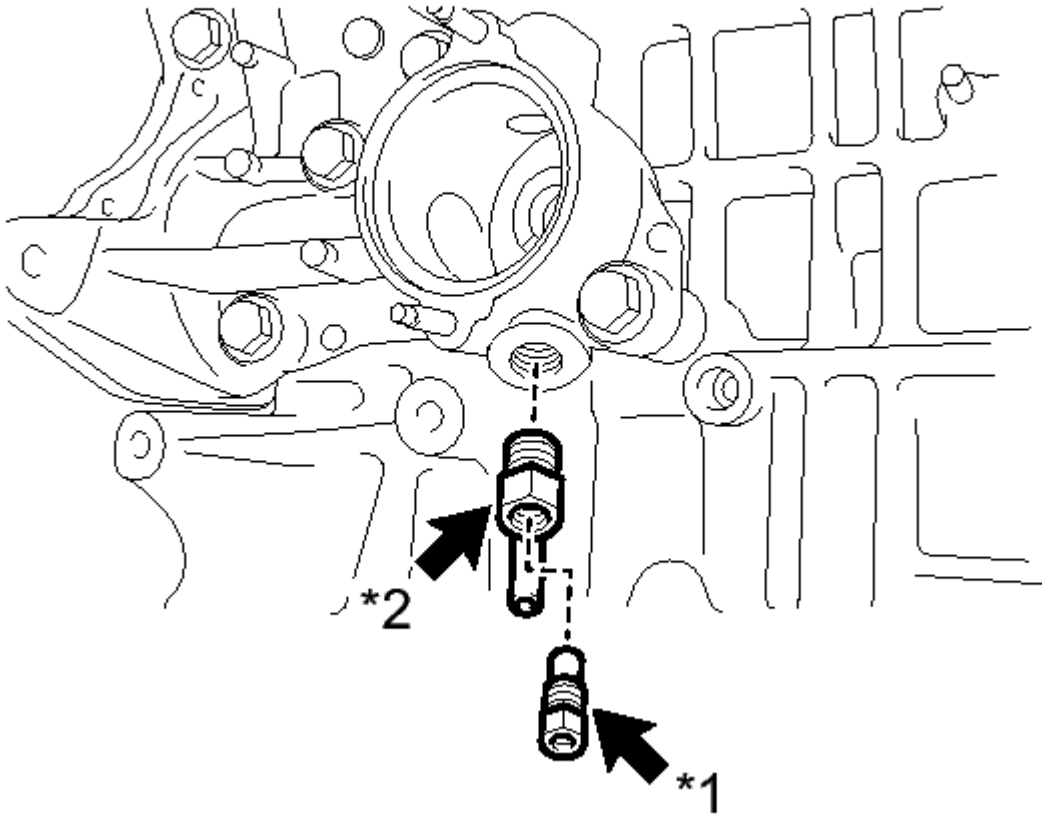


Fig. 392: Remove Inlet Water Housing Drain Cock Assembly (Except Tmc Made Engine)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Remove the plug from the drain cock.

TEXT IN ILLUSTRATION

*1	Plug
*2	Drain Cock

- b. Remove the drain cock from the inlet water housing.

42. REMOVE INLET WATER HOUSING (except TMC Made Engine)

- a. Using a E5 "TORX" socket wrench, remove the 6 stud bolts from the inlet water housing.
- b. Using several steps, uniformly loosen and remove the 5 bolts and inlet water housing in the sequence shown in the illustration.

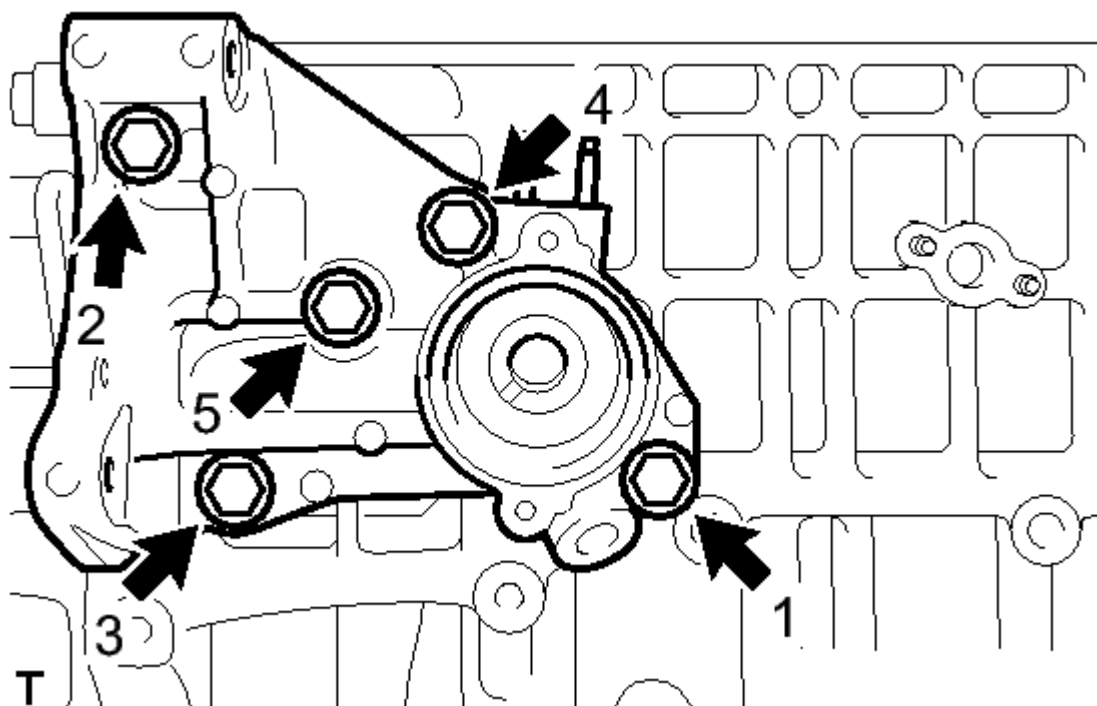
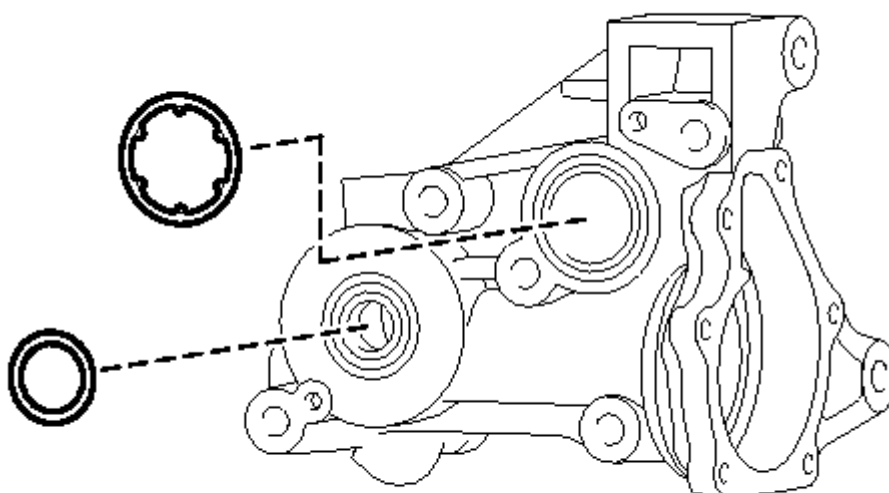


Fig. 393: Location of Inlet Water Housing Bolts & Loosening Sequence
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the 2 O-rings from the inlet water housing.



T

Fig. 394: Identifying Inlet Water Housing O-Rings
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

43. REMOVE OIL CONTROL VALVE FILTER

- a. Using a socket hexagon wrench 8, remove the plug, gasket and oil control valve filter.

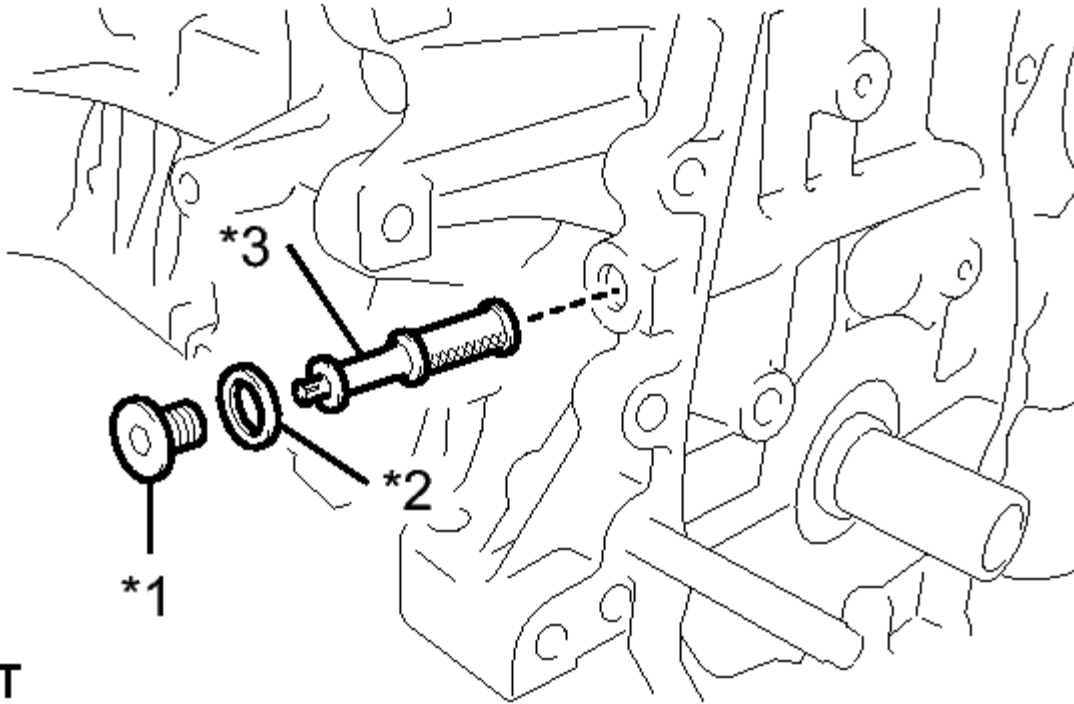
**T**

Fig. 395: Identifying Oil Control Valve Filter

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

TEXT IN ILLUSTRATION

*1	Plug
*2	Gasket
*3	Oil Filter Control Valve

44. REMOVE NO. 1 TAPER HEAD SCREW PLUG

- a. Remove the No. 1 taper head screw plug.

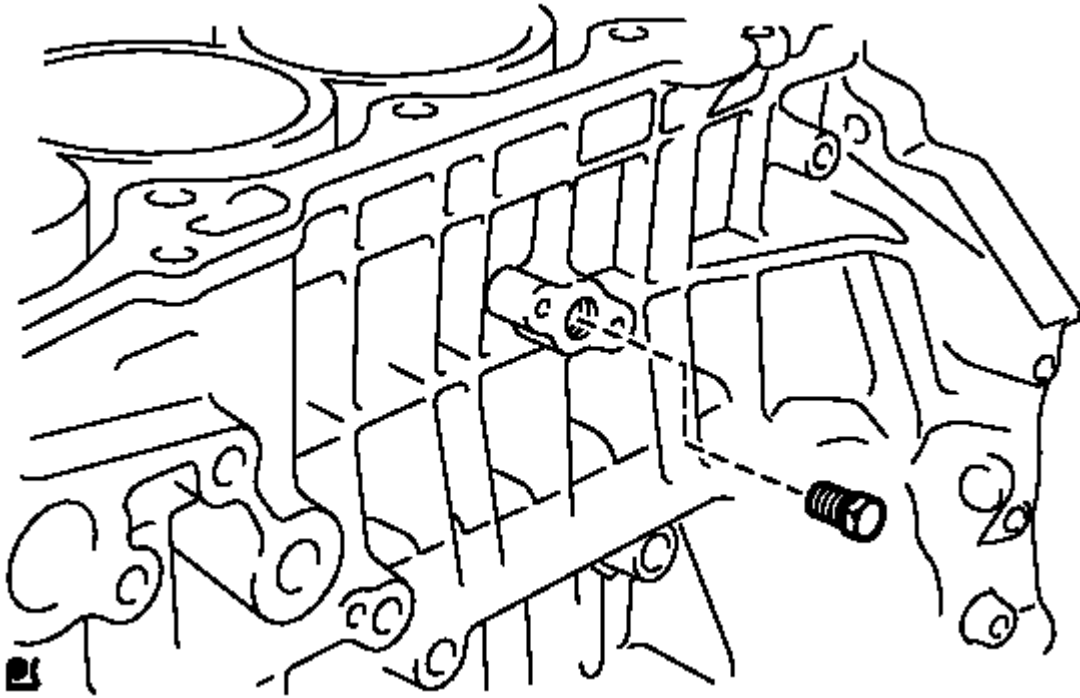
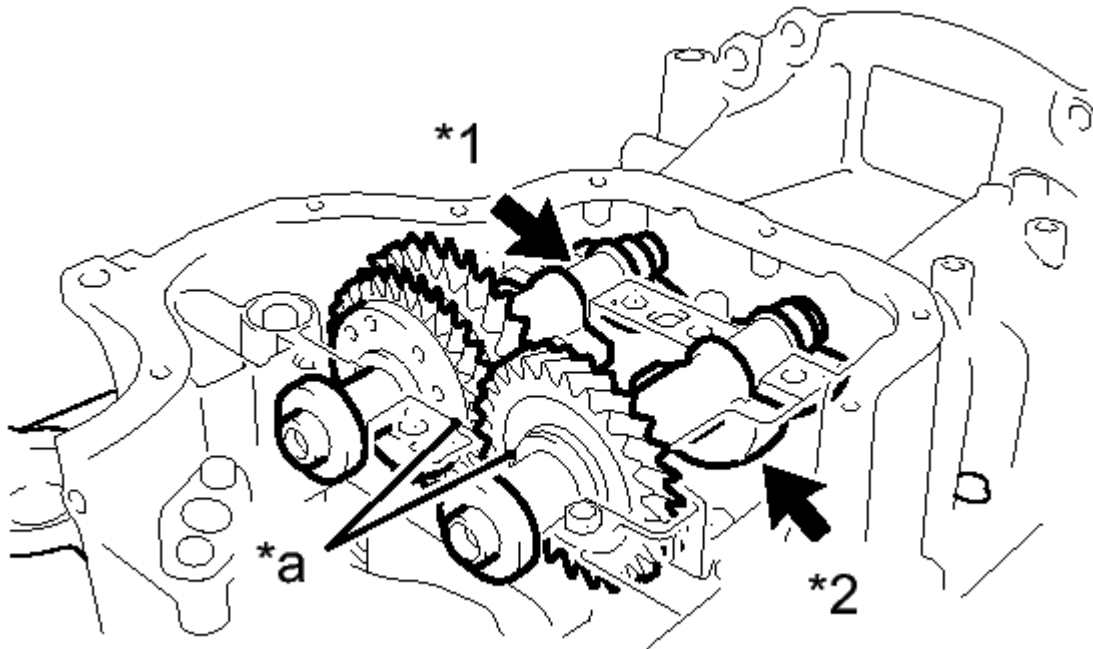


Fig. 396: Remove/Install No. 1 Taper Head Screw Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

45. **REMOVE OIL PUMP ASSEMBLY** . Refer to **REMOVAL - Step 36** .
46. **INSPECT BALANCESHAFT THRUST CLEARANCE** See step 1.
47. **INSPECT BALANCESHAFT OIL CLEARANCE** See step 2.
48. **REMOVE NO. 1 AND NO. 2 BALANCESHAFTS**
 - a. Remove the No. 1 and No. 2 balancershafts.

**T****Fig. 397: Remove No. 1 And No. 2 Balanceshafts**

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

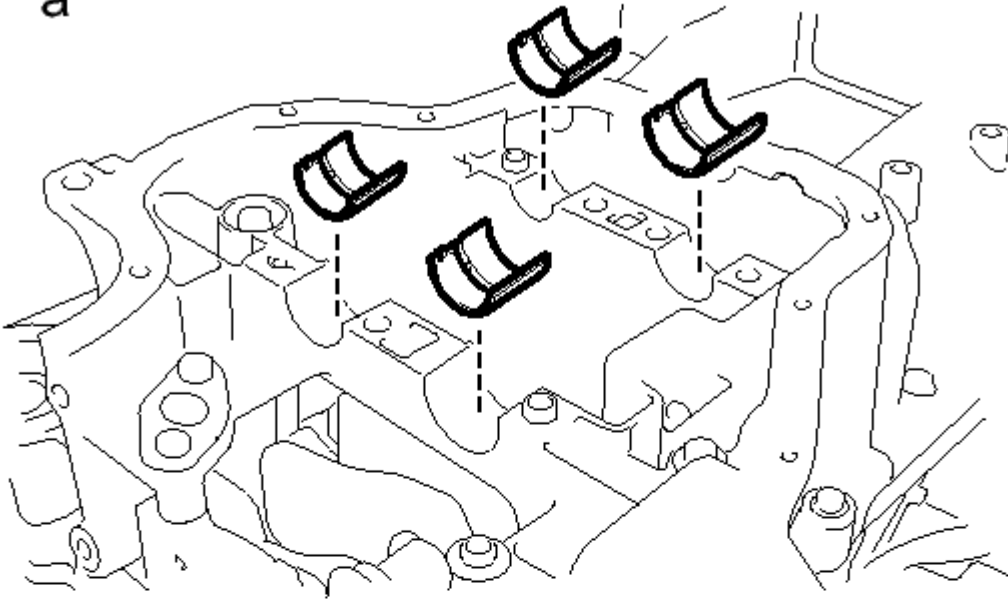
TEXT IN ILLUSTRATION

*1	No. 1 Balanceshaft
*2	No. 2 Balanceshaft
*a	Timing Mark

49. REMOVE NO. 1 BALANCESHAFT BEARING

- a. Remove the 8 No. 1 balancershaft bearings in the shown in the illustration.

*a



*b

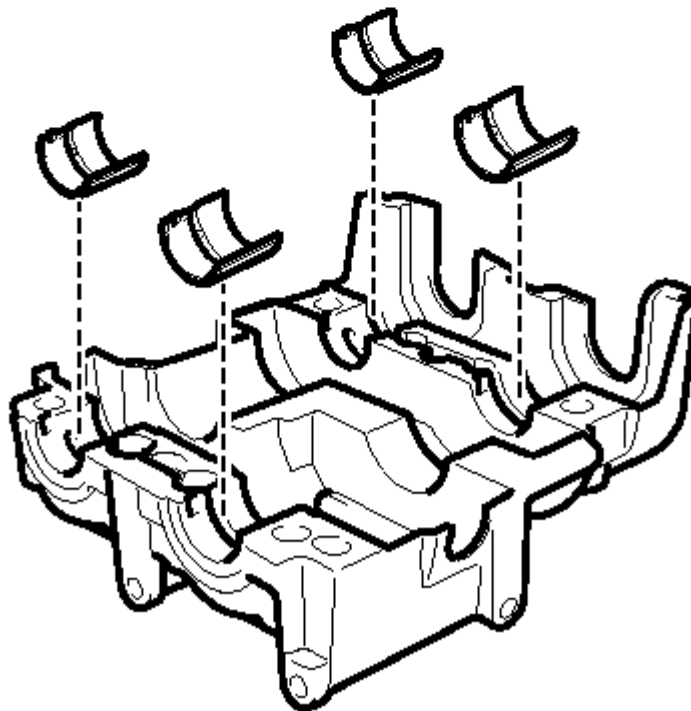
**T**

Fig. 398: Identifying No. 1 Balanceshaft Bearings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Stiffening Crankcase Side
----	---------------------------

*b	Balanceshaft Housing
----	----------------------

50. **REMOVE REAR CRANKSHAFT OIL SEAL** See step 7.

51. **REMOVE STIFFENING CRANKCASE ASSEMBLY**

- a. Using several steps, uniformly loosen and remove the 11 bolts and in the sequence shown in the illustration.

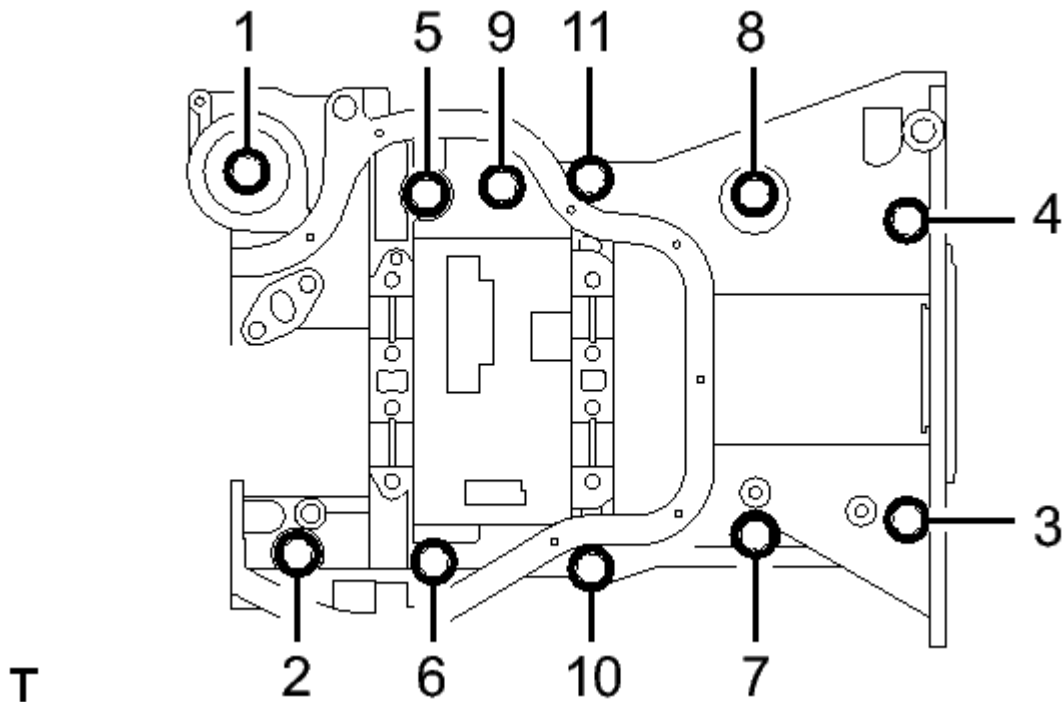


Fig. 399: Identifying Stiffening Crankcase Assembly Bolts Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the crankcase by prying the portions between the crankcase and cylinder block.

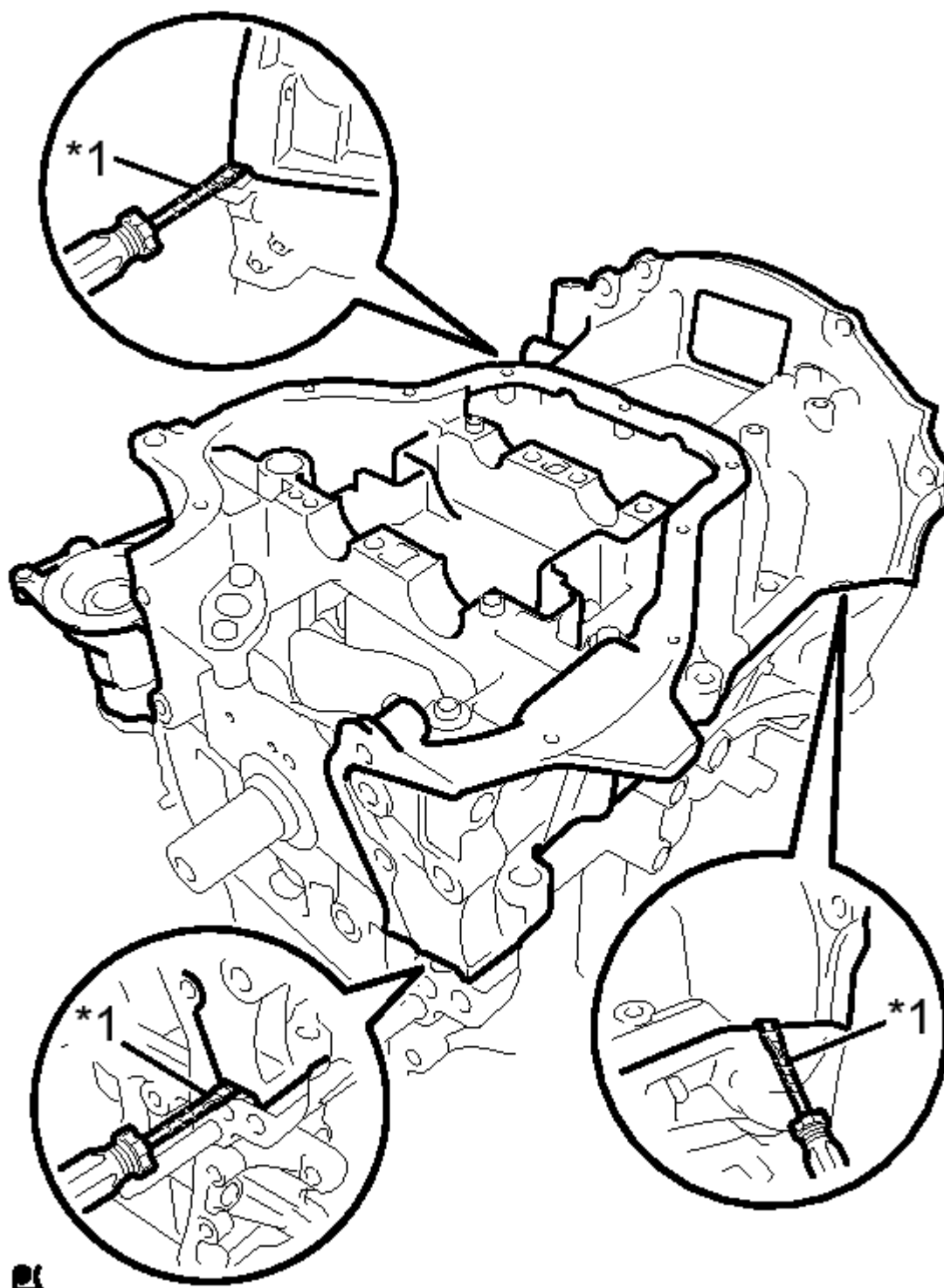


Fig. 400: Remove Crankcase From Cylinder Block
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

TEXT IN ILLUSTRATION

*1	Protective Tape
----	-----------------

HINT:

Tape the screwdriver tip before use.

- c. Remove the O-ring.

INSPECTION**INSPECTION****1. INSPECT BALANCESHAFT THRUST CLEARANCE**

- a. Install the balanceshafts. Refer to **REASSEMBLY**.
- b. Using a dial indicator, measure the thrust clearance while moving the balanceshaft back and forth.

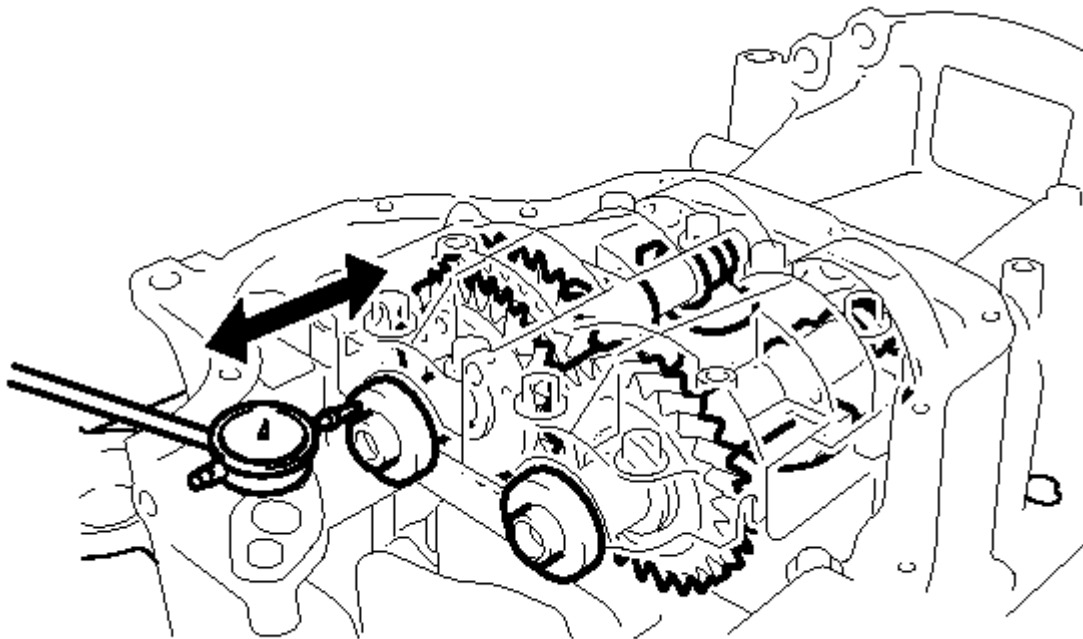
**T**

Fig. 401: Inspecting Balanceshaft Thrust Clearance Using Dial Indicator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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 balancershaft housing and bearings.
If necessary, replace the balancershaft.

2. INSPECT BALANCERSHAFT OIL CLEARANCE

- a. Clean each bearing and journal.
- b. Check each bearing and journal for pitting and scratches.

If a bearing or journal is damaged, replace the bearings. If necessary, replace the balancershaft.

- c. Place the No. 1 and No. 2 balancershafts onto the crankcase.
- d. Lay a strip of Plastigage across each journal.

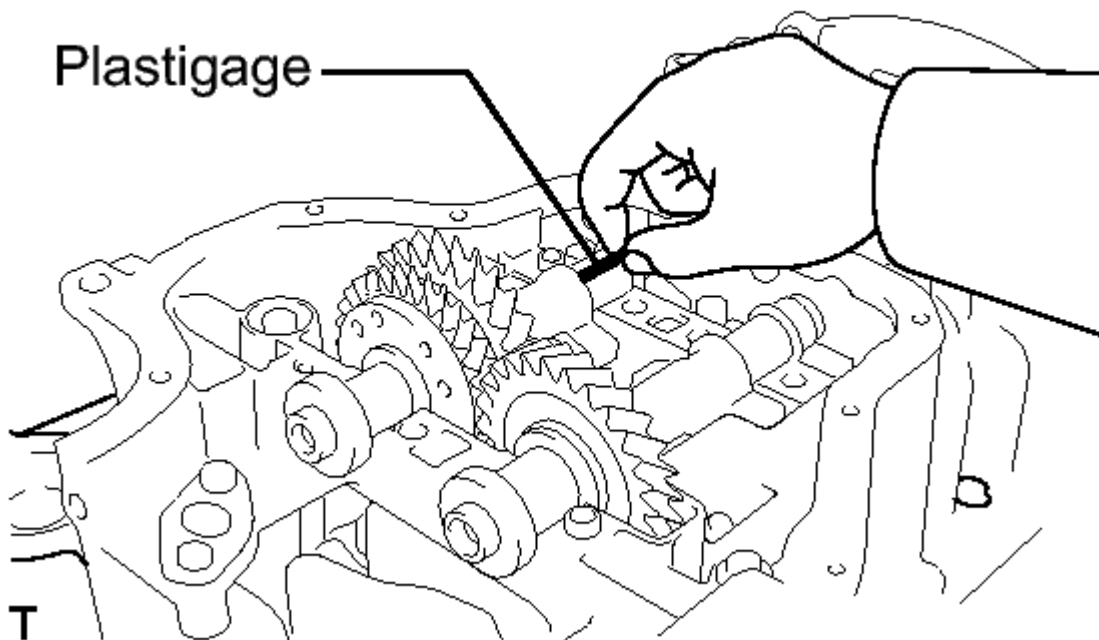


Fig. 402: Laying Strip Of Plastigage Across Journal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Install the balancershaft housing. Refer to **REASSEMBLY**.

NOTE: Do not turn the balancershafts.

- f. Remove the balancershafts. Refer to **DISASSEMBLY**.
- g. Measure the Plastigage at its widest point.

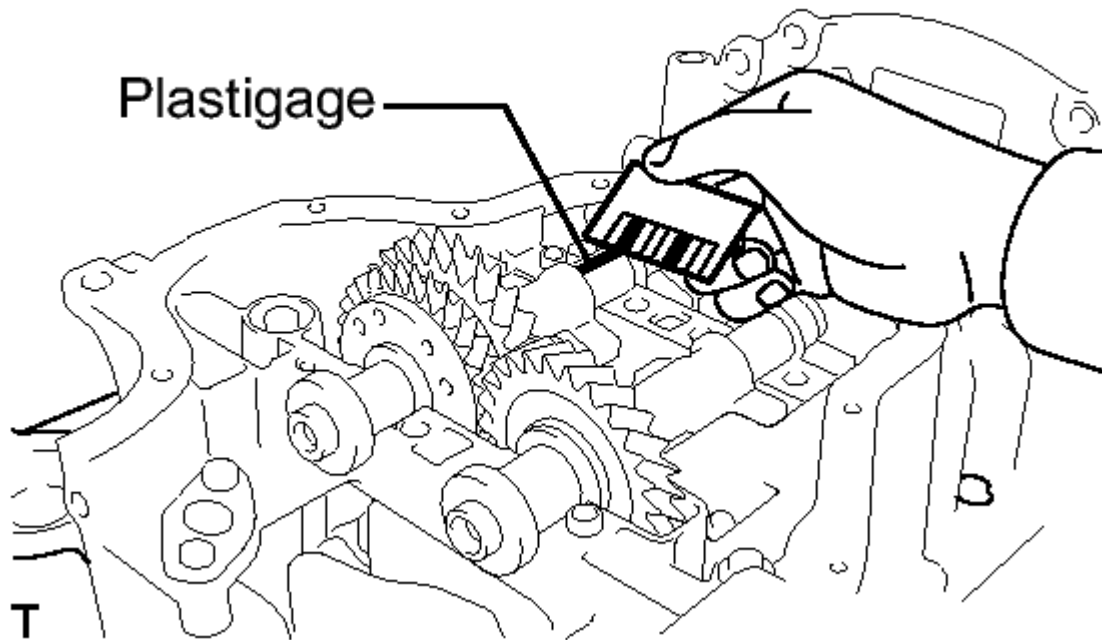


Fig. 403: Measuring Plastigage At Widest Point

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

Standard oil clearance

0.004 to 0.049 mm (0.0002 to 0.0019 in.)

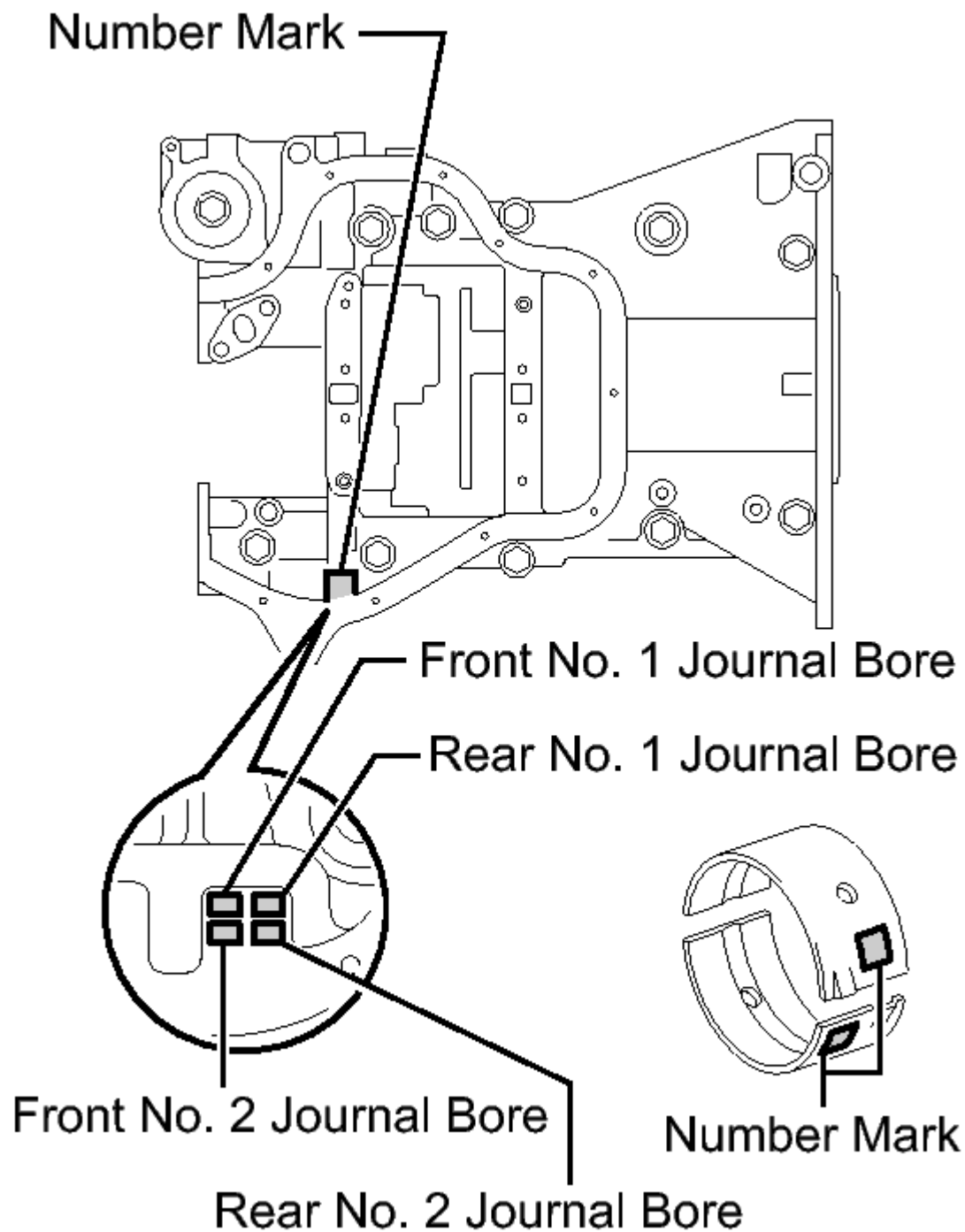
Maximum oil clearance

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.

- h. If replacing a bearing, select a new one with the same number.



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Fig. 404: Identifying Standard balance shaft Housing
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard balancershaft housing journal bore diameter

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

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 balanceshaft journal diameter

Item	Specified Condition
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 balanceshaft housing bolts.
 1. Using vernier caliper, measure the length of the bolts from the seat to the end.

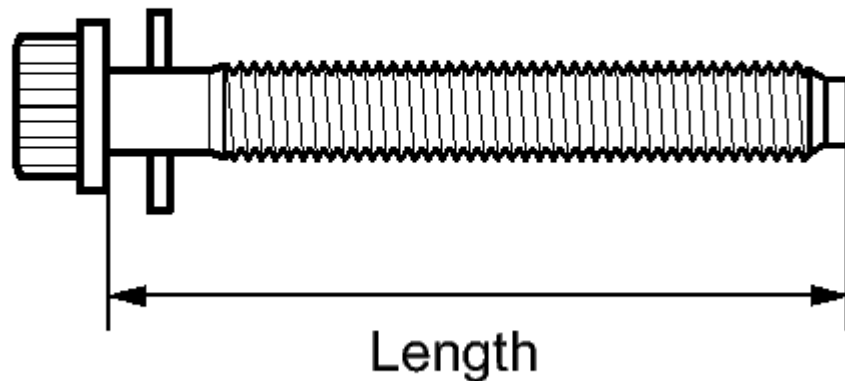


Fig. 405: Measuring Length Of Bolts From Seat To End
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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 balanceshaft housing bolt.

3. INSPECT CHAIN SUB-ASSEMBLY

- a. Pull the chain with a force of 140 N (14.3 kgf, 31.5 lbf) as shown in the illustration.

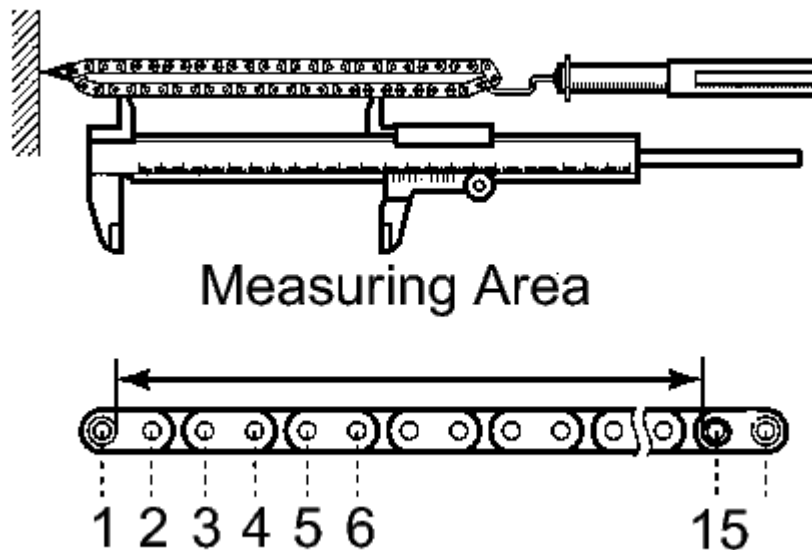


Fig. 406: Measuring Chain Sub-Assembly

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

- b. Using vernier caliper, 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.

4. INSPECT NO. 2 CHAIN SUB-ASSEMBLY

- a. Pull the chain with a force of 140 N (14.3 kgf, 31.5 lbf) as shown in the illustration.

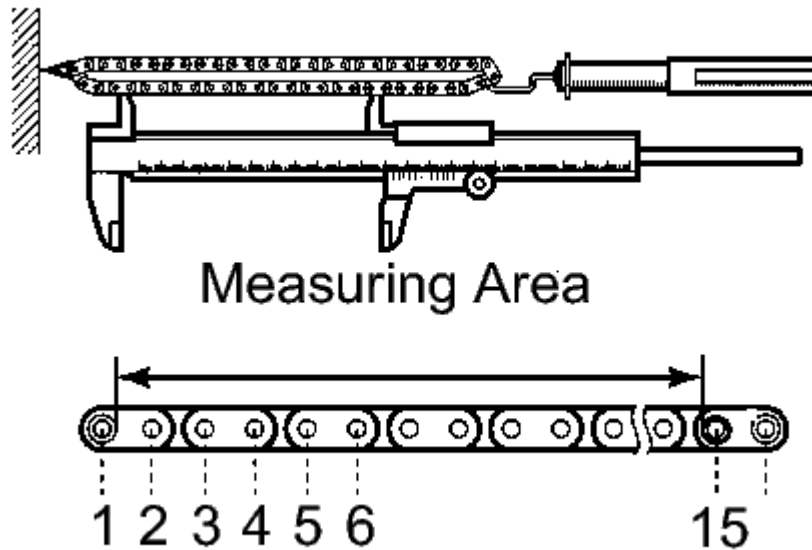


Fig. 407: Measuring Chain Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using vernier caliper, 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.

5. INSPECT OIL PUMP DRIVE GEAR

- a. Wrap the chain around the sprocket.

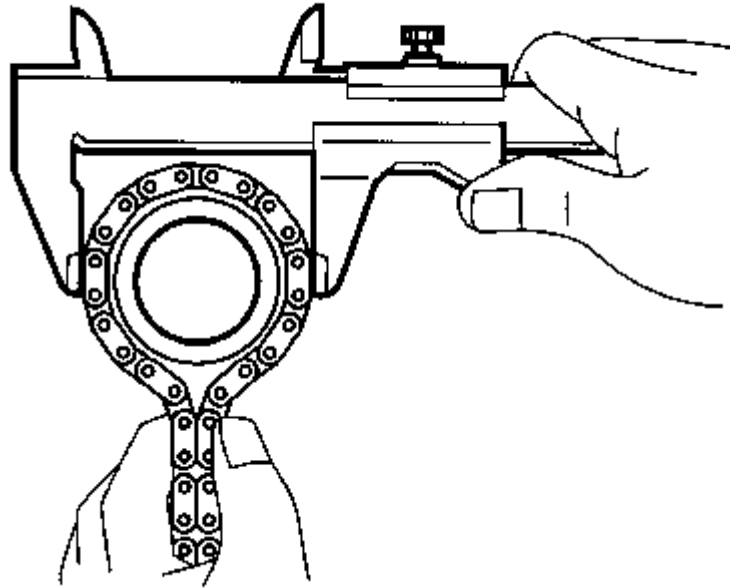


Fig. 408: Measuring Timing Gear Diameter With Chain Using Vernier Caliper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using vernier caliper, measure the sprocket diameter with the chain wrapped around.

Minimum gear diameter (with chain)

48.2 mm (1.898 in.)

NOTE: **The vernier caliper must be in contact with the chain rollers when measuring.**

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

6. INSPECT OIL PUMP DRIVE SHAFT GEAR

- a. Wrap the chain around the sprocket.

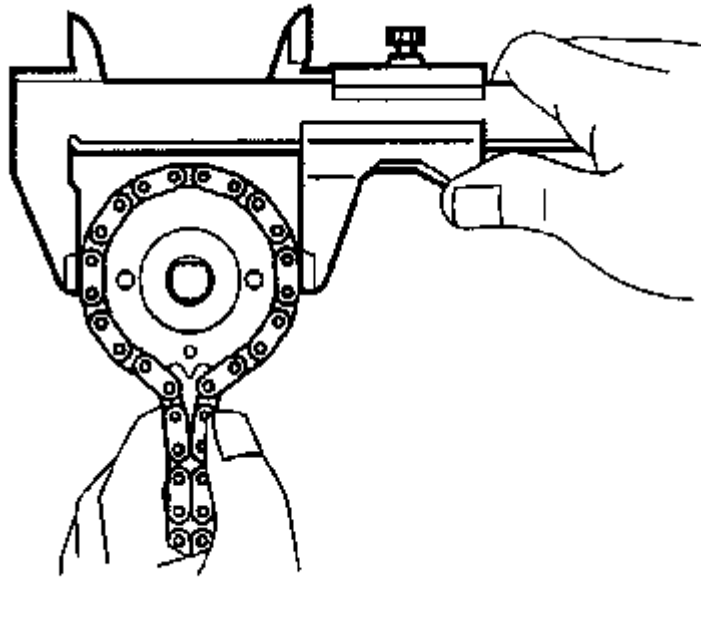


Fig. 409: Measuring Oil Pump Drive Shaft Gear & Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using vernier caliper, measure the sprocket diameter with the chain wrapped around.

Minimum gear diameter (with chain)

48.2 mm (1.898 in.)

NOTE: The vernier caliper must be in contact with the chain rollers when measuring.

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

7. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY

- a. Wrap the chain around the sprocket.

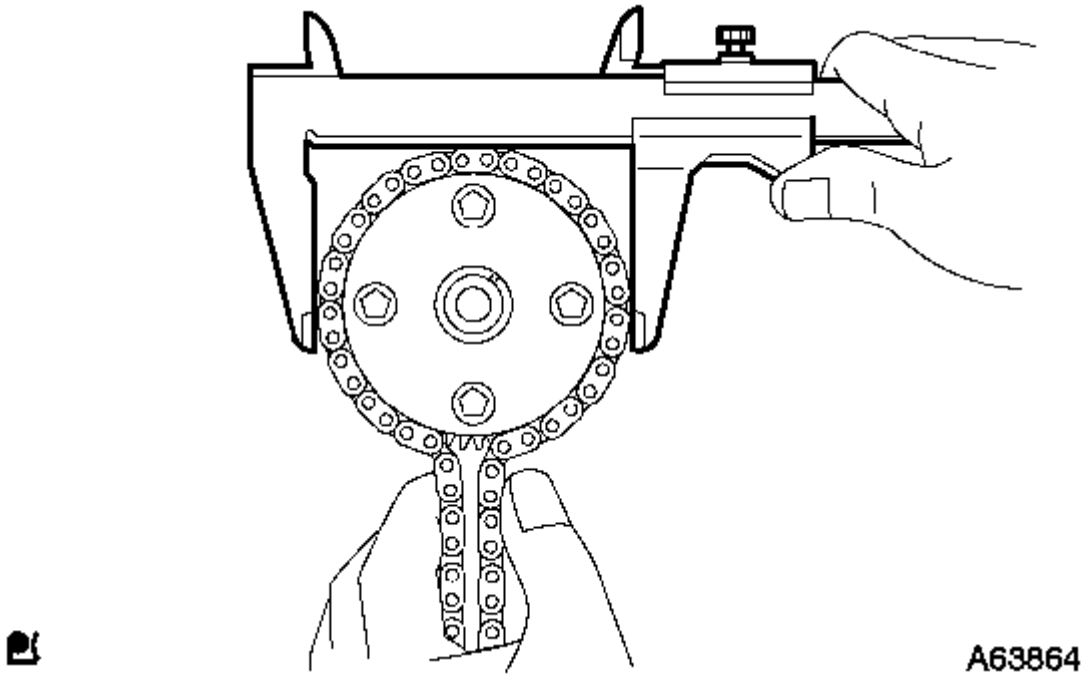


Fig. 410: Measuring Camshaft Timing Gear & Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using vernier caliper, measure the sprocket diameter with the chain wrapped around.

Minimum gear diameter (with chain)

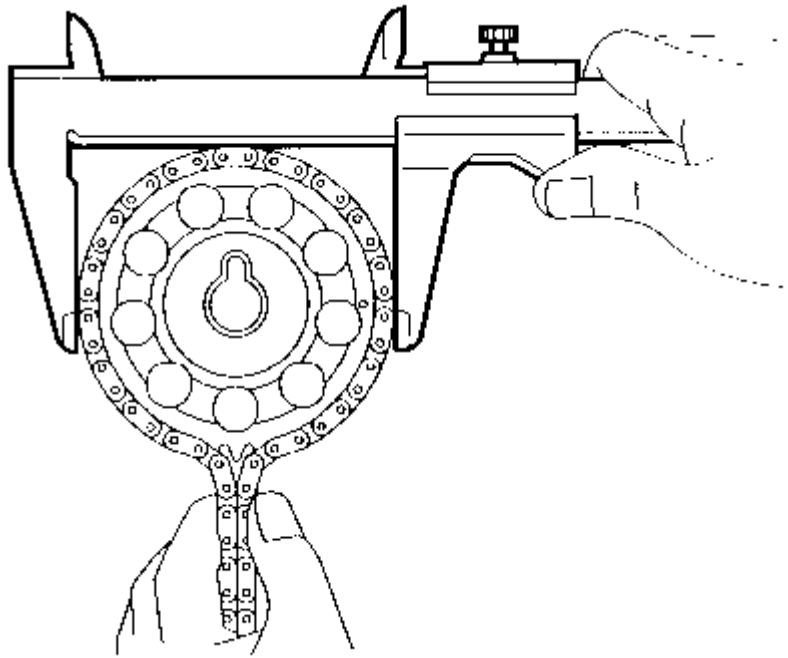
97.3 mm (3.831 in.)

NOTE: The vernier caliper must be in contact with the chain rollers when measuring.

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

8. INSPECT CAMSHAFT TIMING GEAR OR SPROCKET

- a. Wrap the chain around the sprocket.



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Fig. 411: Inspecting Camshaft Timing Sprocket Using Vernier Calipers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using vernier caliper, measure the sprocket diameter with the chain wrapped around.

Minimum gear diameter (with chain)

97.3 mm (3.831 in.)

NOTE: **The vernier caliper must be in contact with the chain rollers when measuring.**

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

9. INSPECT CRANKSHAFT TIMING GEAR OR SPROCKET

- a. Wrap the chain around the timing sprocket.

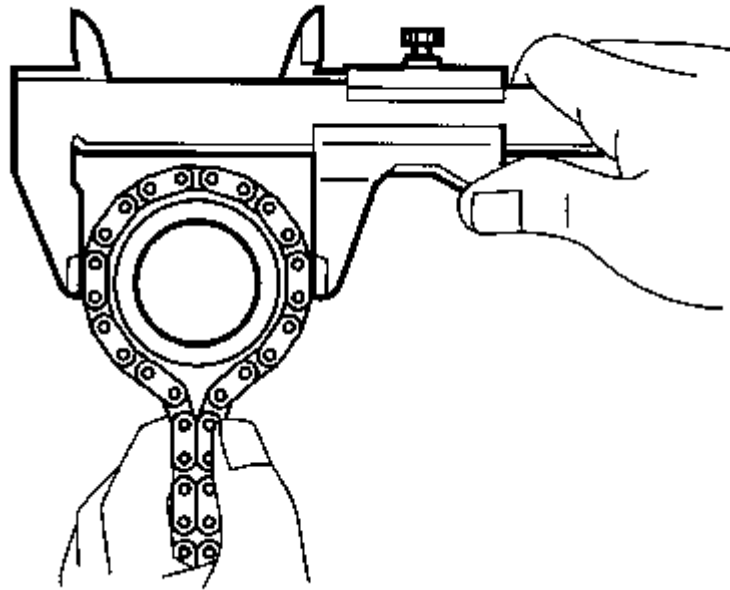


Fig. 412: Measuring Timing Gear Diameter With Chain Using Vernier Caliper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using vernier caliper, measure the timing gear diameter with the chain wrapped around.

Minimum gear diameter (with chain)

51.6 mm (2.031 in.)

NOTE: **The vernier caliper 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.

10. INSPECT CHAIN TENSIONER SLIPPER

- a. Using vernier caliper, measure the tensioner slipper wear.

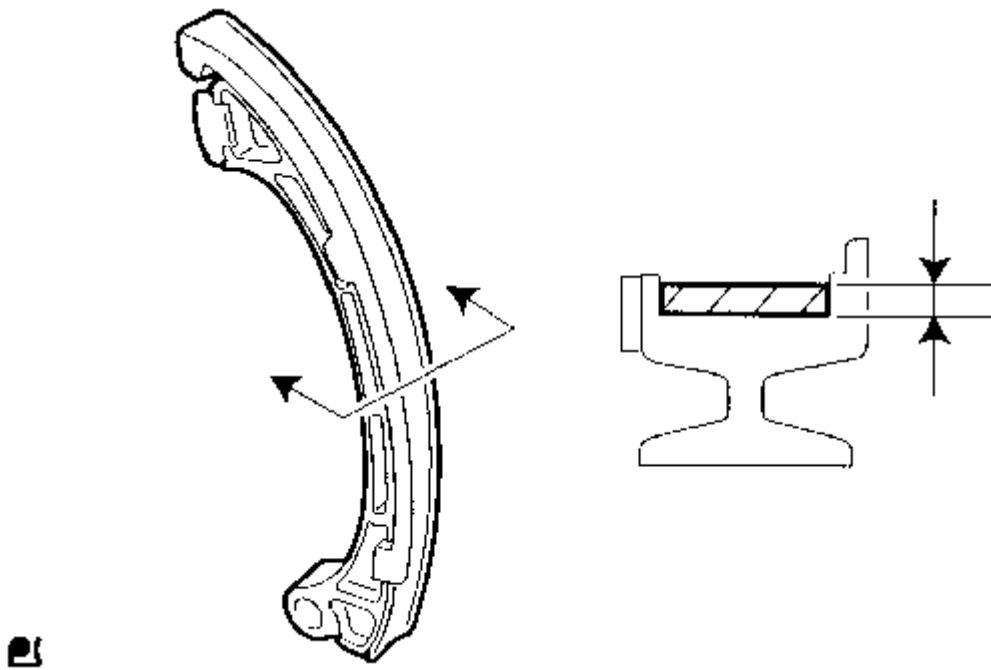


Fig. 413: Inspecting Chain Tensioner Slipper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum wear

1.0 mm (0.039 in.)

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

11. INSPECT NO. 1 CHAIN VIBRATION DAMPER

- a. Using vernier caliper, measure the vibration damper wear.

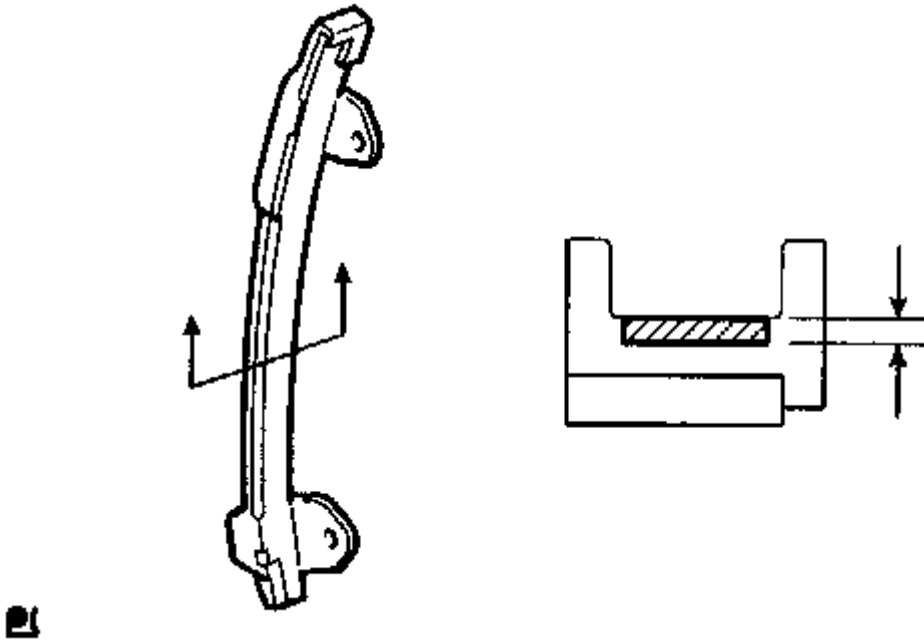


Fig. 414: Inspecting Chain Vibration Damper Using A Vernier Caliper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum wear

1.0 mm (0.039 in.)

If the wear is greater than the maximum, replace the No. 1 chain vibration damper.

12. INSPECT CHAIN TENSIONER PLATE

- a. Using vernier caliper, measure the vibration damper wear.

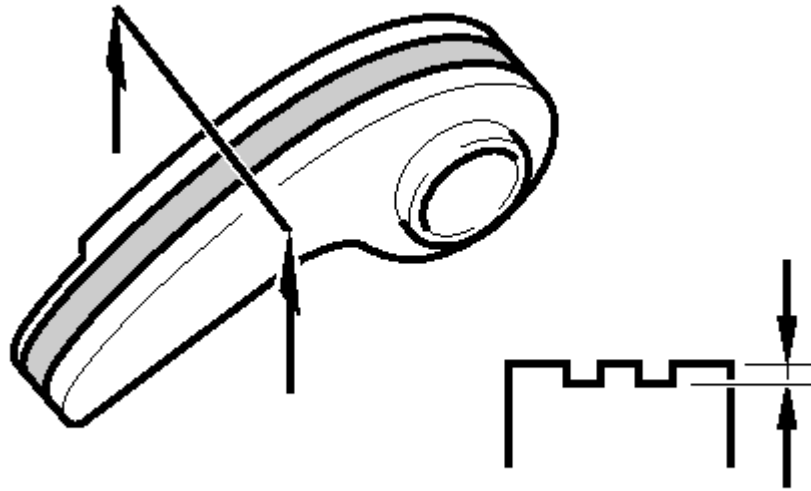
**T**

Fig. 415: Identifying Vibration Damper Wear Using A Vernier Caliper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum wear

0.5 mm (0.020 in.)

If the wear is greater than the maximum, replace the chain tensioner plate.

13. INSPECT NO. 1 CHAIN TENSIONER ASSEMBLY

- a. Check that the plunger moves smoothly when the ratchet pawl is raised with your finger.

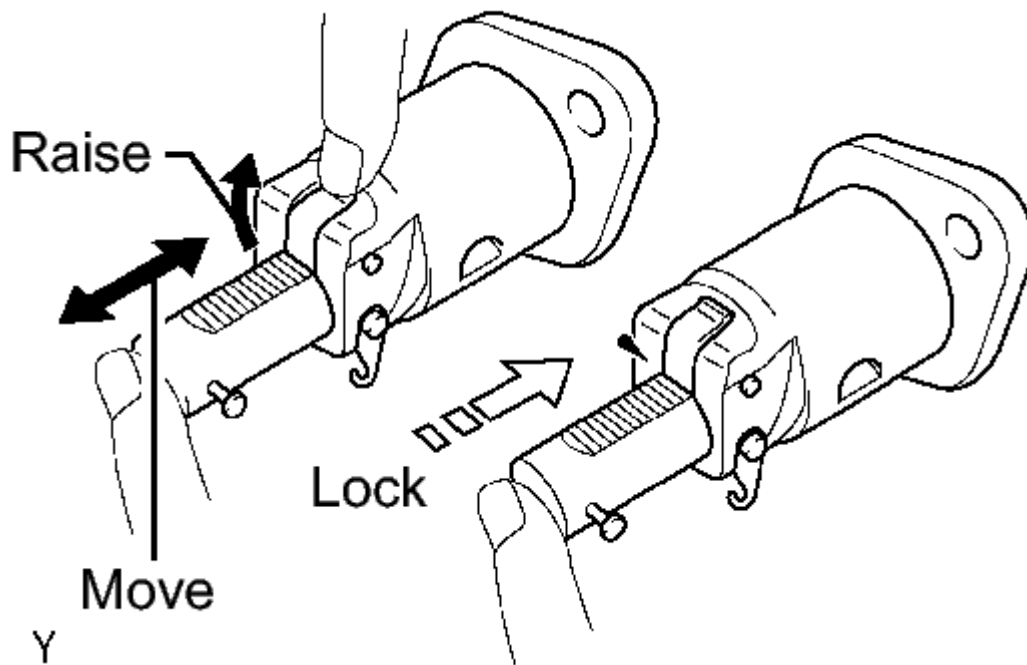


Fig. 416: Inspecting No. 1 Chain Tensioner
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- 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.

14. INSPECT CAMSHAFT

- a. Inspect the camshaft for runout.

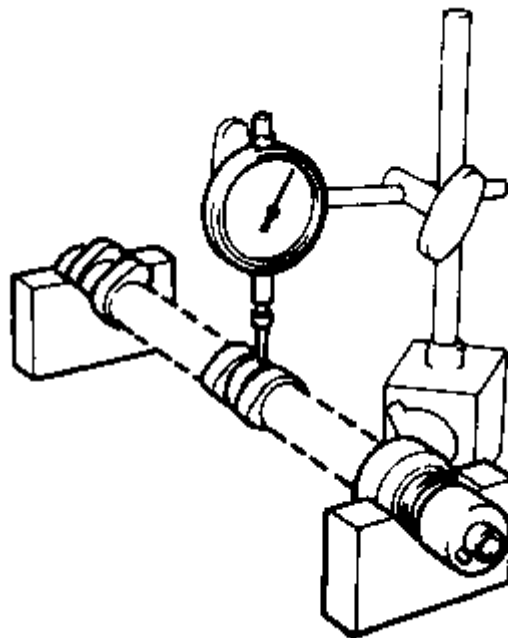


Fig. 417: Inspecting Camshaft For Runout Using A Dial Indicator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Maximum circle runout

0.03 mm (0.0012 in.)

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

- b. Inspect the cam lobes.

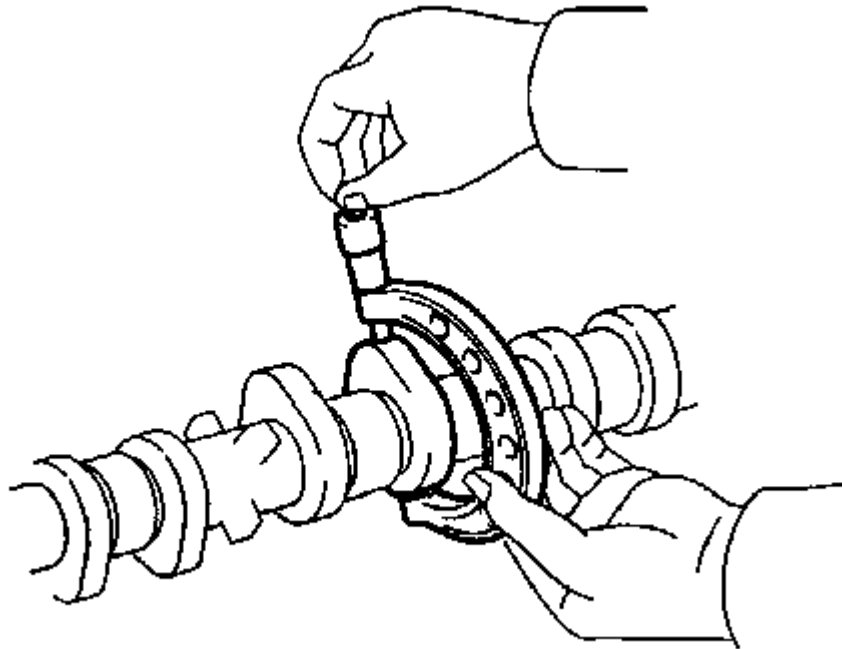


Fig. 418: Inspecting Cam Lobes Using Micrometer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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 any of the cam lobe heights are less than the minimum, replace the camshaft.

- c. Inspect the camshaft journals.

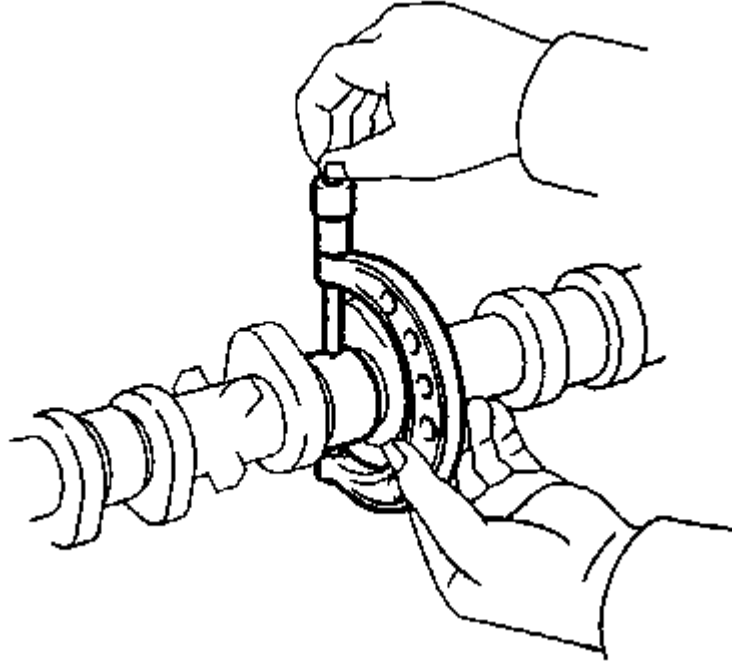


Fig. 419: Inspecting Camshaft Journals Using Micrometer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Using a micrometer, measure the journal diameter.

Standard journal diameter

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

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

15. INSPECT NO. 2 CAMSHAFT

- a. Inspect the camshaft for runout.

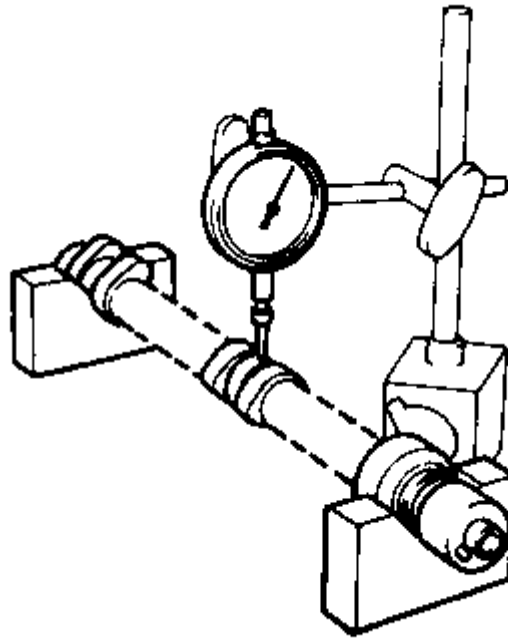


Fig. 420: Inspecting Camshaft For Runout Using A Dial Indicator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Maximum circle runout

0.03 mm (0.0012 in.)

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

- b. Inspect the cam lobes.

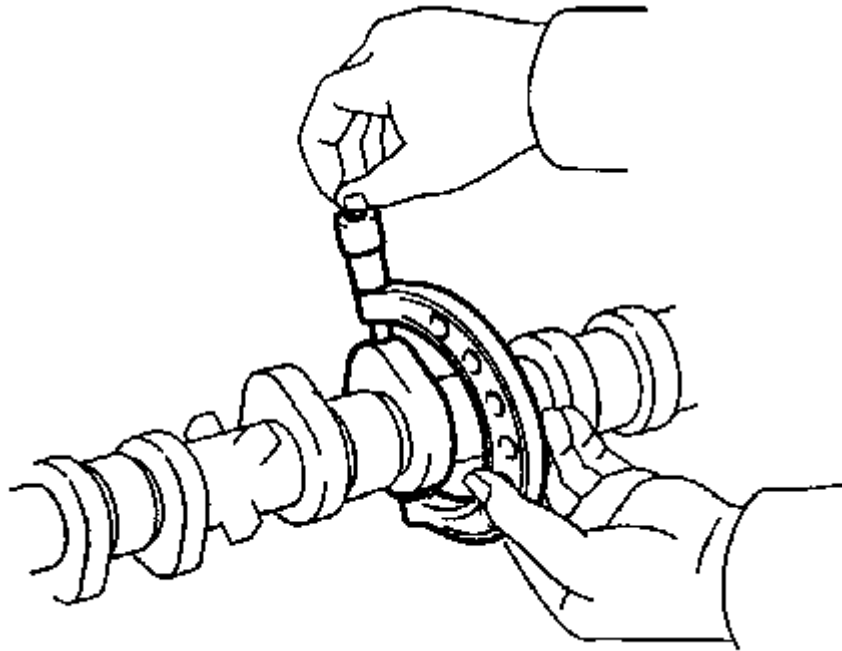


Fig. 421: Inspecting Cam Lobes Using Micrometer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Standard cam lobe height

45.983 to 46.083 mm (1.8104 to 1.8143 in.)

Minimum cam lobe height

45.873 mm (1.8060 in.)

If any of the cam lobe heights are less than the minimum, replace the camshaft.

- c. Inspect the camshaft journals.

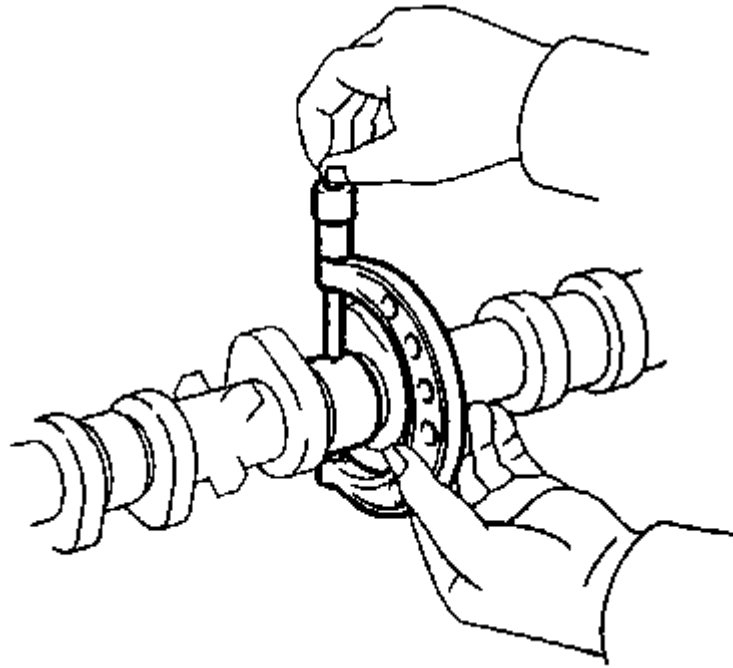


Fig. 422: Inspecting Camshaft Journals Using Micrometer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Using a micrometer, measure the journal diameter.

Standard journal diameter

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

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

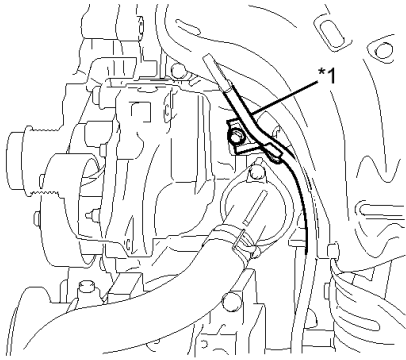
REASSEMBLY

REASSEMBLY

HINT:

Check whether the engine is TMC made or not by referring to the following illustration.

*A



*B

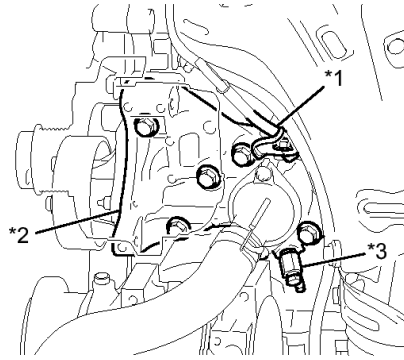


Fig. 423: Identifying Whether The Engine Is TMC Made
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

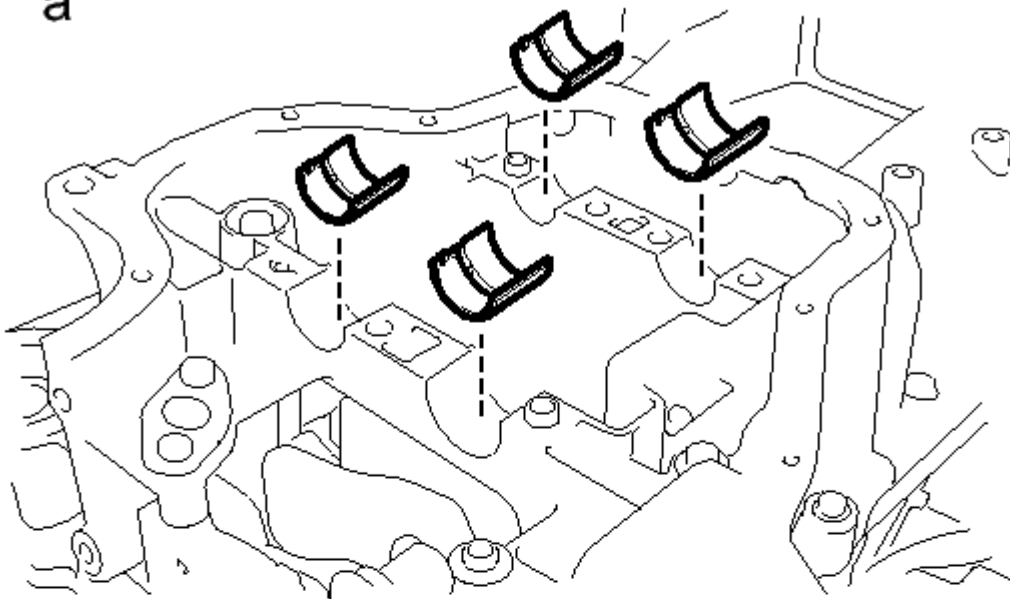
*A	for TMC Made Engine	*B	except TMC Made Engine
*1	Engine Oil Level Dipstick Guide	*2	Water Inlet Housing
*3	Water Inlet Housing Drain Cock Assembly	-	-

REASSEMBLY

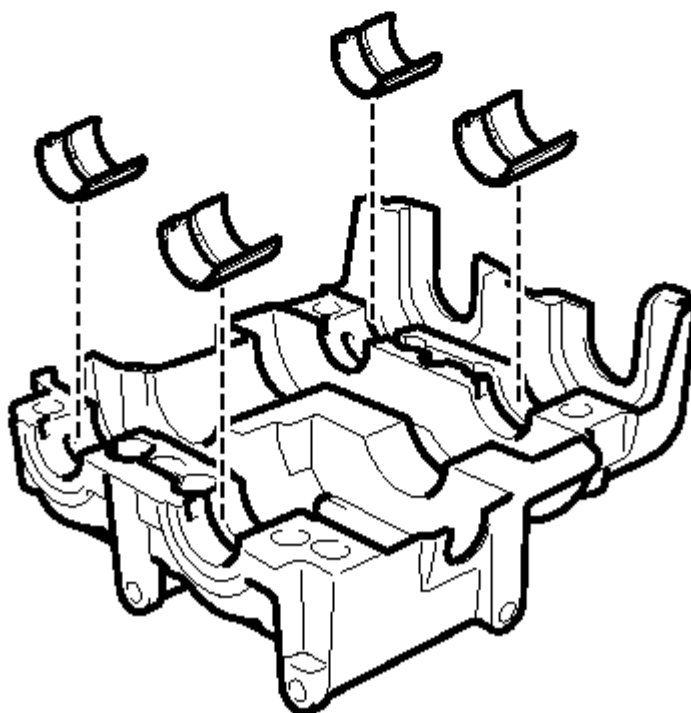
1. INSTALL NO. 1 BALANCESHAFT BEARING

- Align the bearing claw with the claw groove, and push in the 8 bearings.

*a



*b



T

Fig. 424: Identifying No. 1 Balanceshaft Bearings

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

NOTE: Do not apply engine oil to the contact surfaces of the balanceshaft bearing and balanceshaft housing.

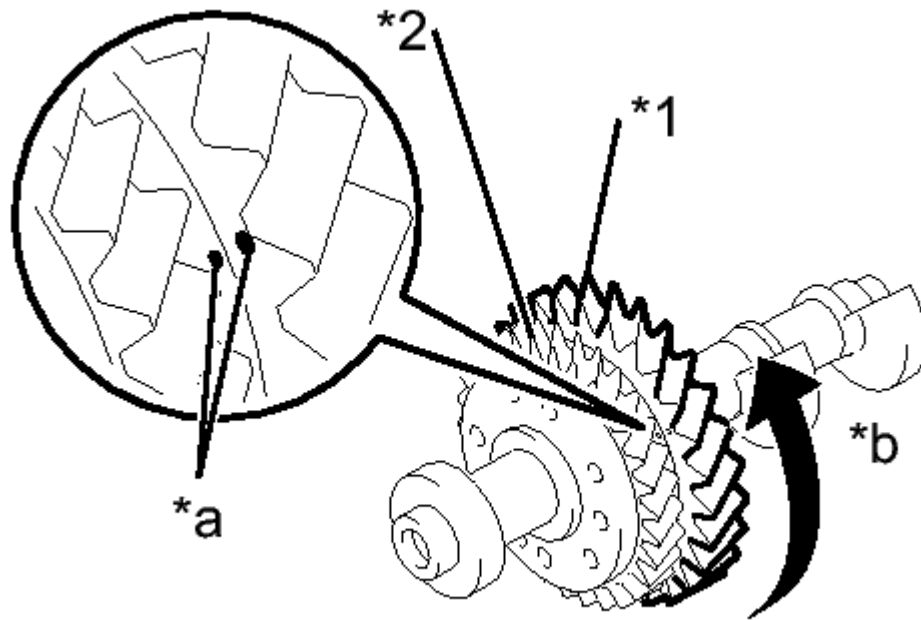
TEXT IN ILLUSTRATION

*a	Stiffening Crankcase Side
*b	Balanceshaft Housing Side

- b. Apply a light coat of the engine oil to the bearings.

2. INSTALL NO. 1 AND NO. 2 BALANCESHAFTS

- a. Rotate the No. 1 driven gear of the No. 1 balanceshaft in the rotating direction until it hits the stopper.

**T****Fig. 425: Rotating The No. 1 Driven Gear**

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

TEXT IN ILLUSTRATION

*1	No. 1 Driven Gear
*2	No. 2 Driven Gear
*a	Matchmark
*b	Rotating Direction

- b. Confirm that the matchmarks on the No. 1 and No. 2 driven gears are aligned.
- c. Confirm that the alignment marks on the No. 1 and No. 2 balanceshafts are aligned.

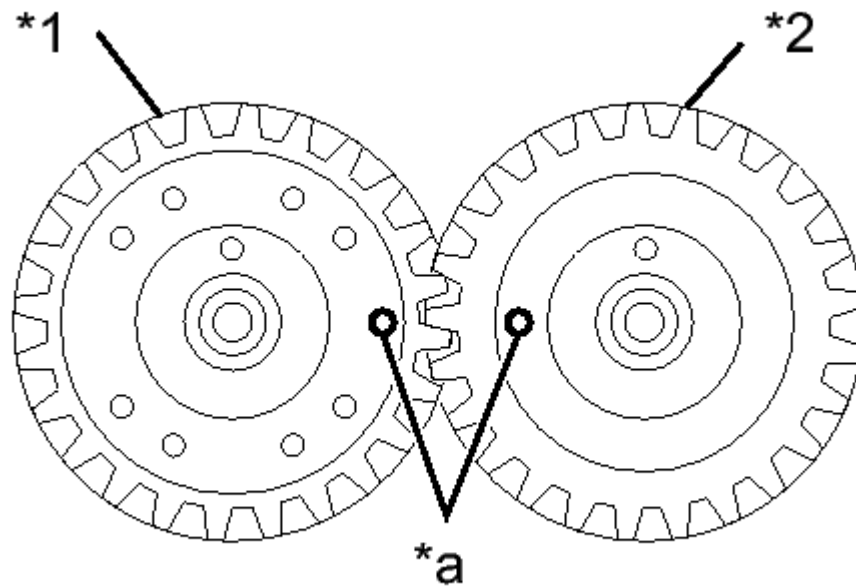
**T**

Fig. 426: Aligning Matchmarks On No. 1 And No. 2 Balanceshafts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	No. 1 Balanceshaft
*2	No. 2 Balanceshaft
*a	Alignment Mark

- d. Align the alignment marks on the No. 1 and No. 2 balancershafts as shown in the illustration.

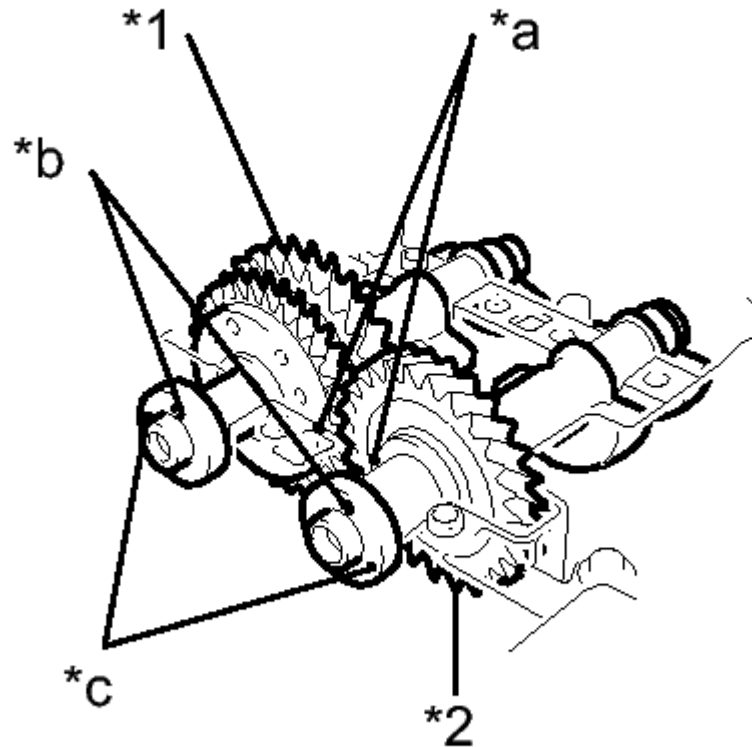
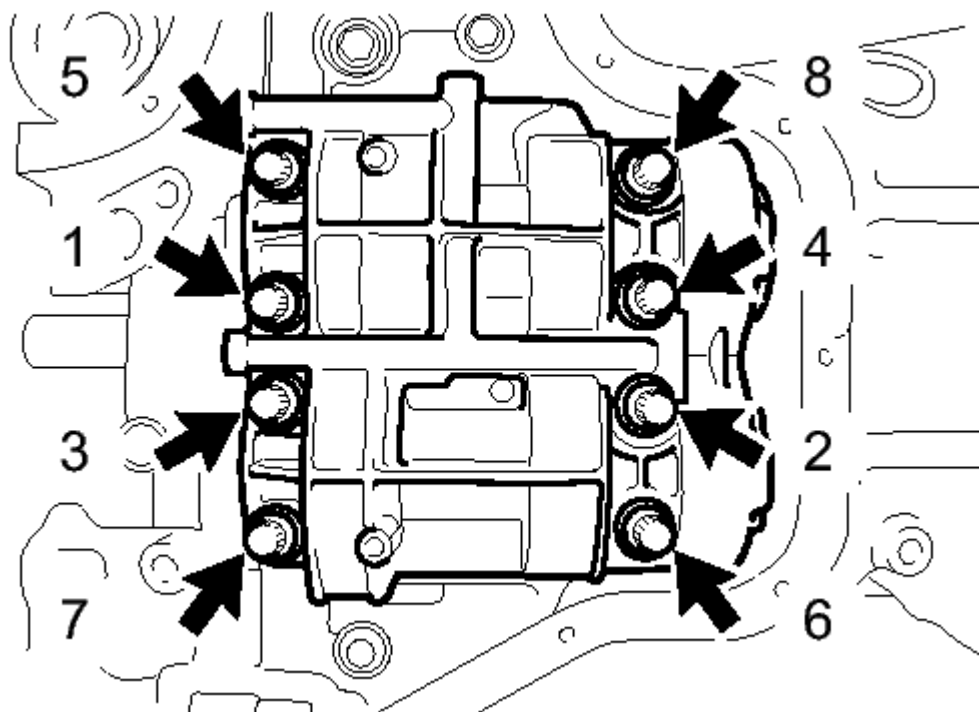


Fig. 427: Identifying Alignment Marks On No. 1 And No. 2 Balanceshafts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	No. 1 Balancershaft
*2	No. 2 Balancershaft
*a	Alignment Mark
*b	Adjusting Hole
*c	Timing Mark

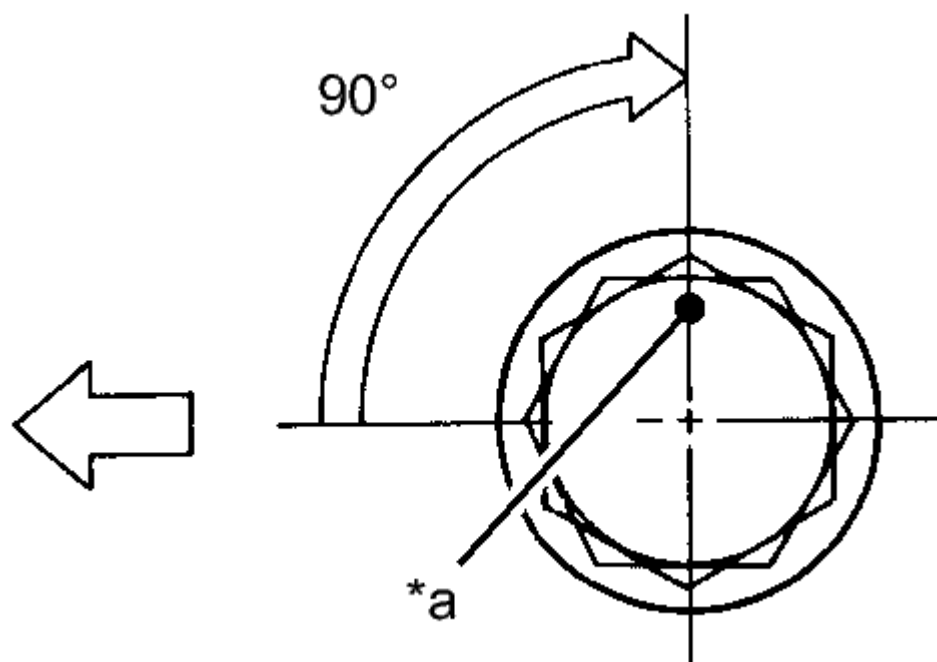
- e. Place the No. 1 and No. 2 balancershafts onto the crankcase.
- f. Apply a light coat of engine oil to the threads and under the heads of the bolts.
- g. Using several steps, uniformly install and tighten the 8 bolts in the sequence shown in the illustration.

**T****Fig. 428: Tightening Bolts In Sequence**

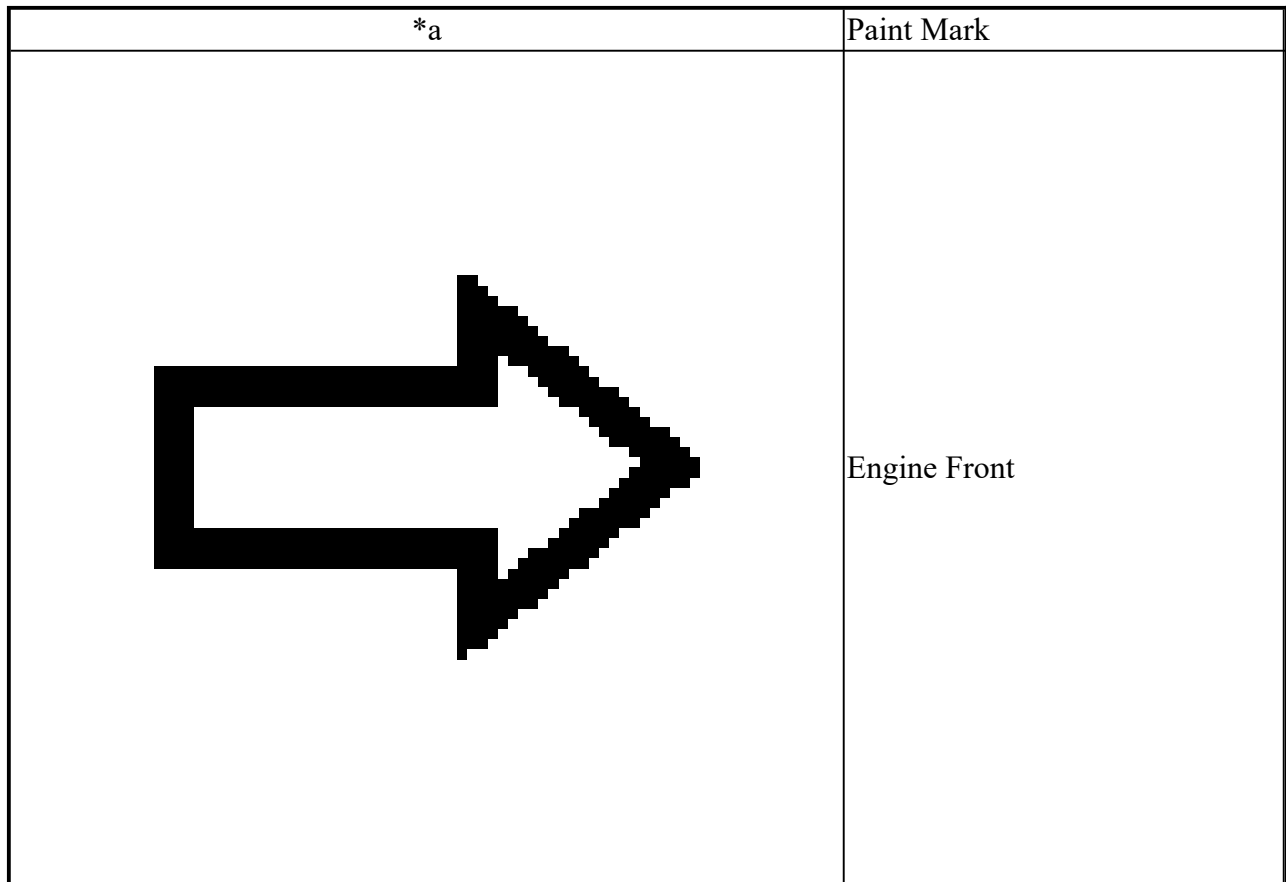
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 22 N*m (220 kgf*cm, 16 ft.*lbf)

- h. Mark the front of the bolts with paint.

**Fig. 429: Final Balancershaft Bolts Torque Position**

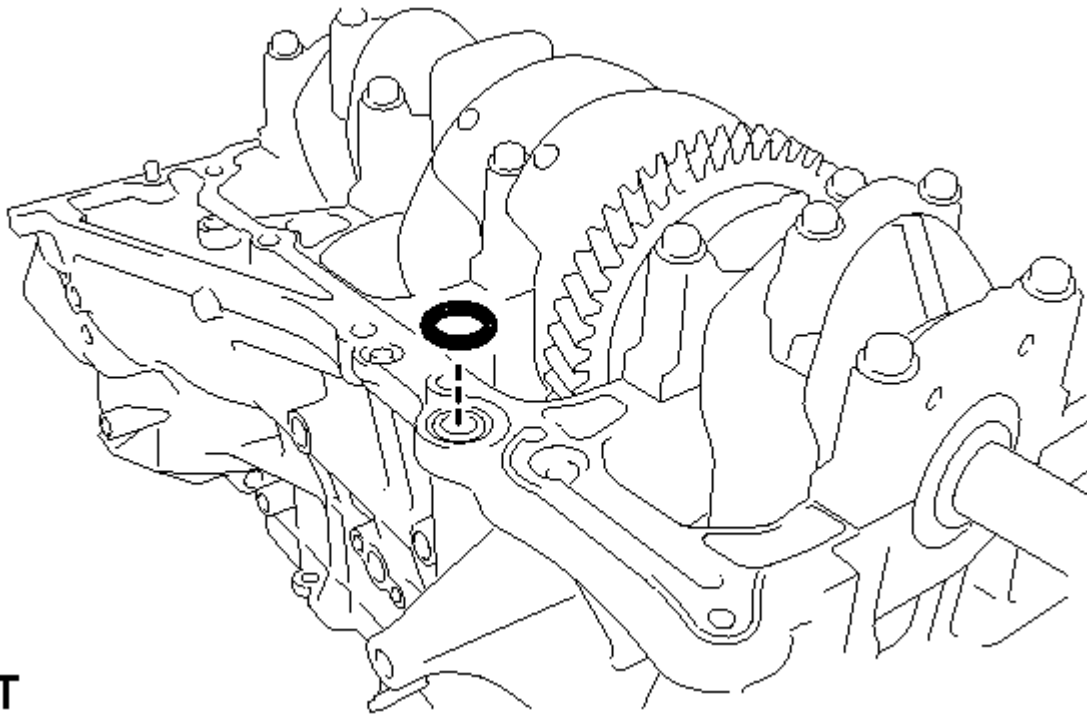
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

- i. Further tighten the bolts by 90° as shown in the illustration.
- j. Check that the paint mark is now at a 90° angle to the front.

3. INSTALL STIFFENING CRANKCASE ASSEMBLY

- a. Remove any old packing material and be careful not to drop any oil on the contact surfaces of the cylinder block and crankcase.
- b. Place a new O-ring on the cylinder block as shown in the illustration.

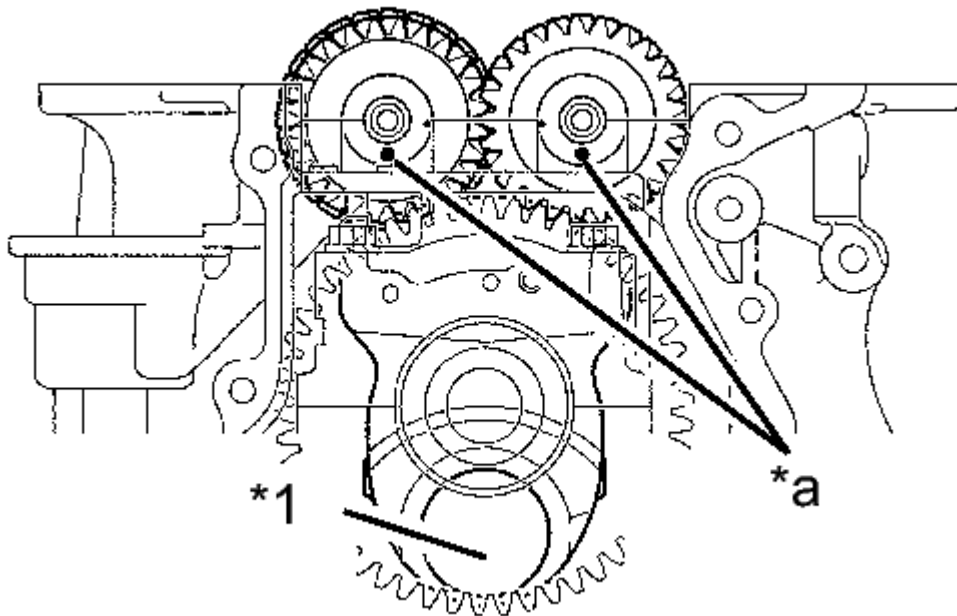


T

Fig. 430: Identifying O-Ring From Cylinder Block

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

- c. With the No. 1 crank pin of the crankshaft placed at the 6 o'clock position, install the No. 1 and No. 2 balancershafts and align the adjusting holes as shown in the illustration.



P

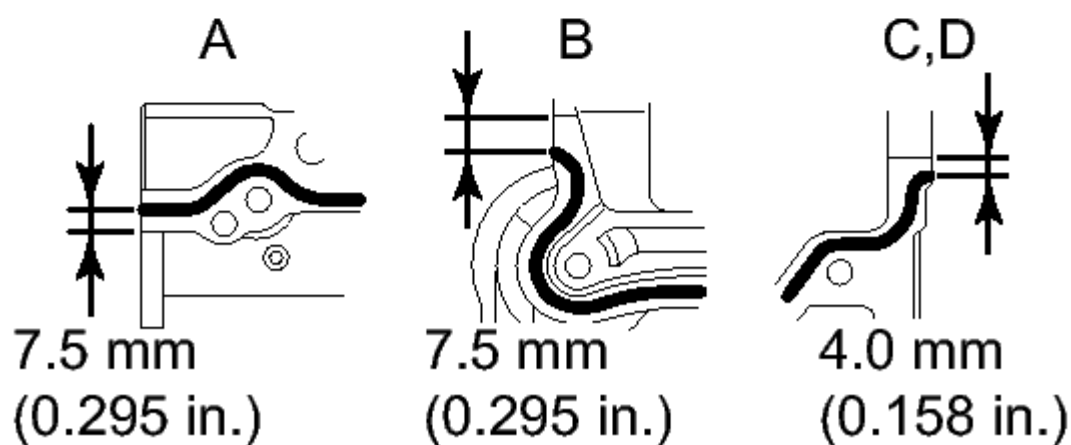
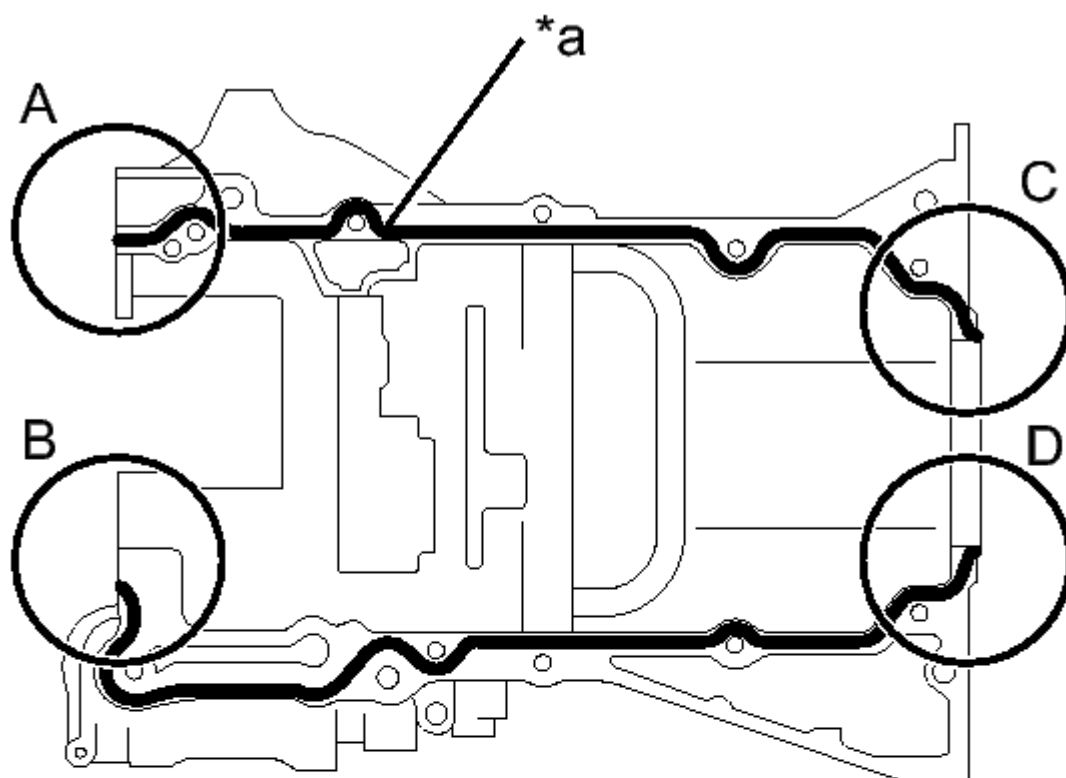
Fig. 431: Aligning No. 1 And No. 2 Balancershafts Adjusting Holes

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

TEXT IN ILLUSTRATION

*1	No. 1 Crank Pin
*a	Adjusting Hole

- d. Apply a continuous bead of seal packing (Diameter 2.5 to 3.0 mm (0.098 to 0.118 in.)) as shown in the illustration.



T

Fig. 432: Applying Seal Packing To Crankcase
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Seal Packing

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

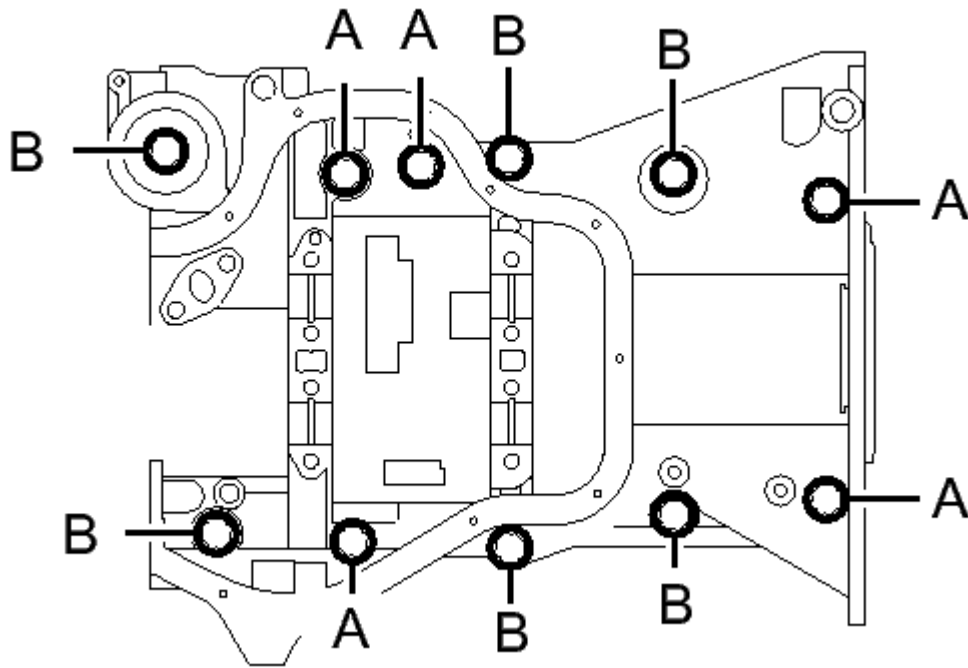
NOTE:

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

TEXT IN ILLUSTRATION

*a	Seal Diameter 2.5 to 3.0 mm (0.098 to 0.118 in.)
----	--

- e. Temporarily install the crankcase with the 11 bolts.



T

Fig. 433: Identifying Crankcase Bolts

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

Item	Bolt Length
A	122 mm (4.80 in.)
B	45 mm (1.77 in.)

- f. Uniformly tighten the bolts.

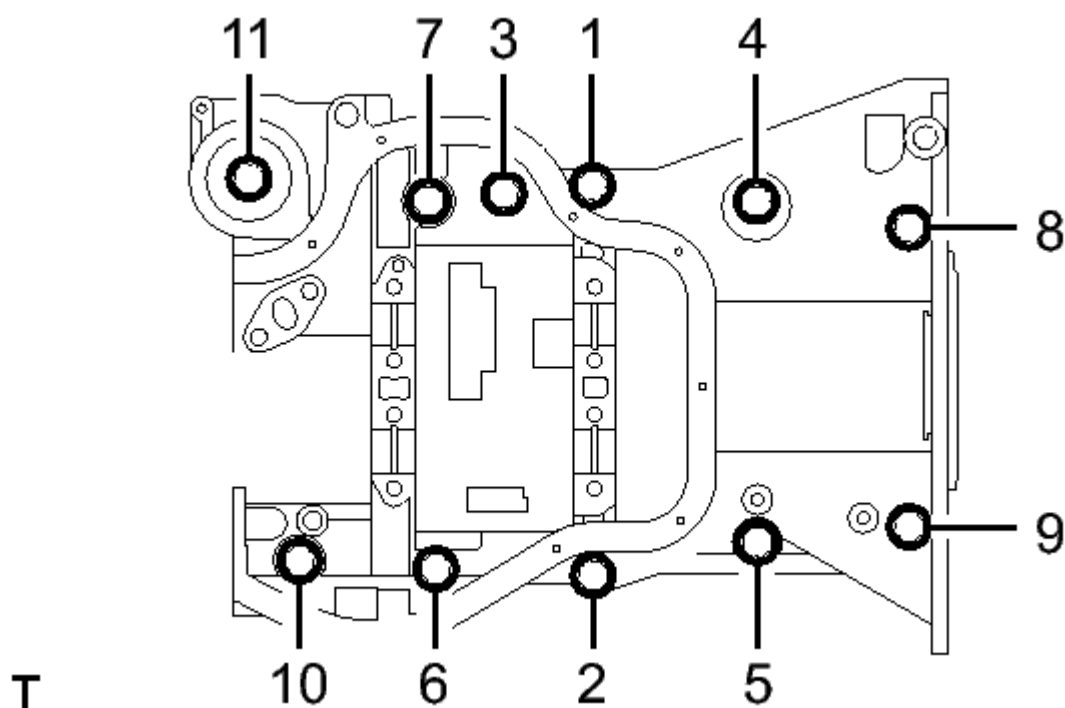


Fig. 434: Uniformly Tighten Bolts

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

Torque: 24 N*m (245 kgf*cm, 18 ft.*lbf)

- g. Confirm that the timing marks on the balancershafts are aligned when the key groove the is placed at the 6 o'clock position, as shown in the illustration.

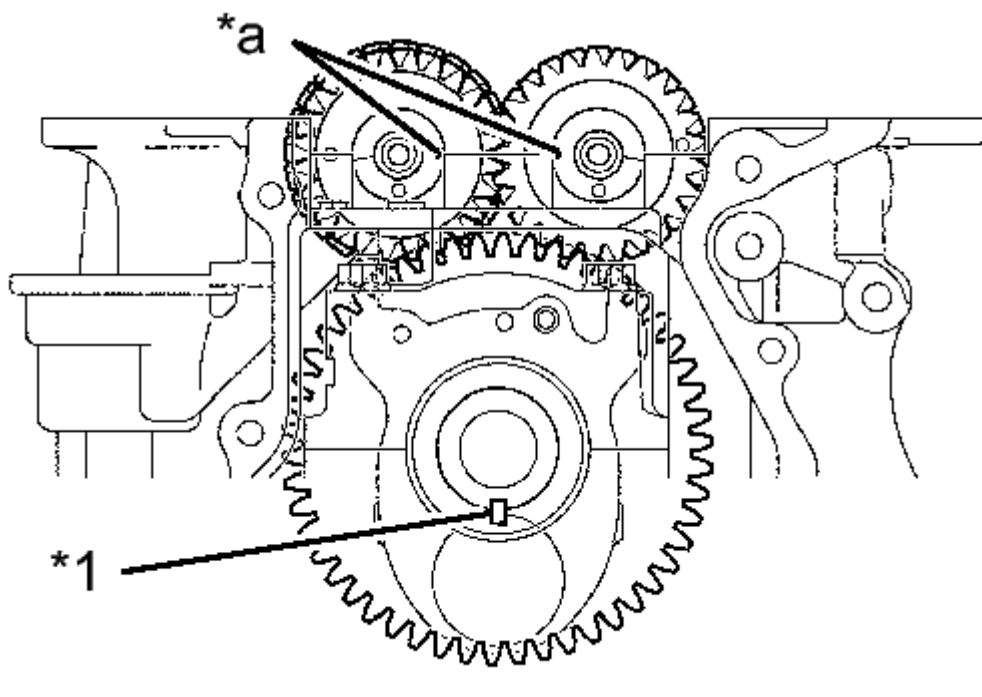


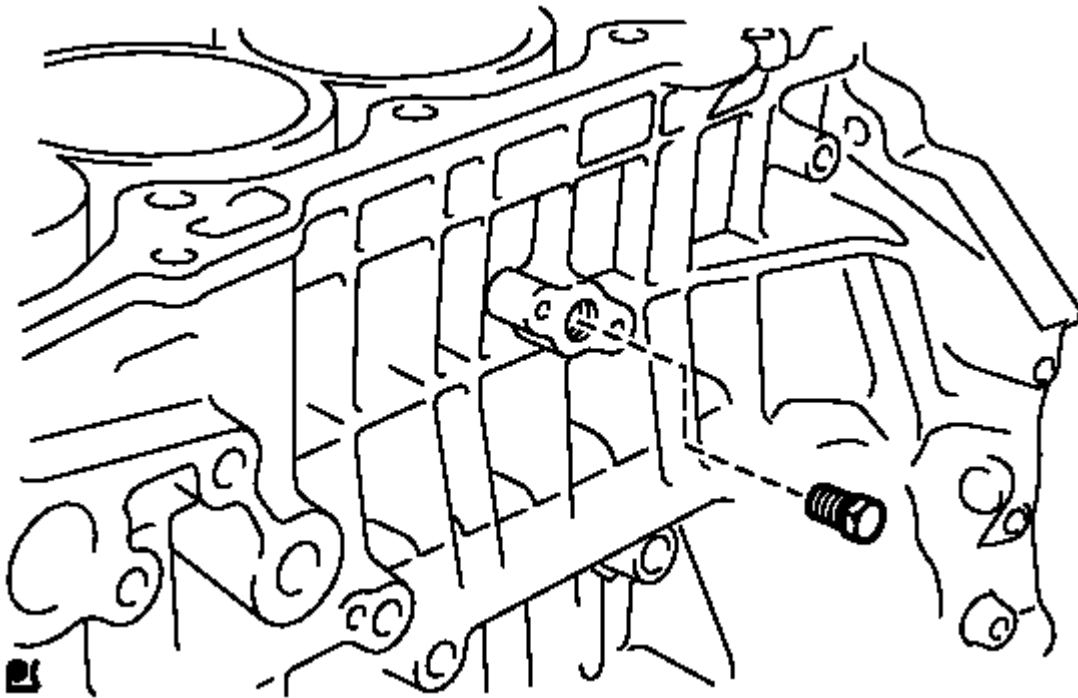
Fig. 435: Identifying Balanceshaft Timing Marks

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

TEXT IN ILLUSTRATION

*1	Key
*a	Timing Mark

4. **INSTALL OIL PUMP ASSEMBLY** . Refer to **INSTALLATION - Step 1** .
5. **INSTALL REAR CRANKSHAFT OIL SEAL** See step 1.
6. **INSTALL NO. 1 TAPER HEAD SCREW PLUG**
 - a. Apply adhesive to 2 or 3 threads of the plug, and install it.

**Fig. 436: Remove/Install No. 1 Taper Head Screw Plug**

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

Torque: 26 N*m (265 kgf*cm, 19 ft.*lbf)

Adhesive

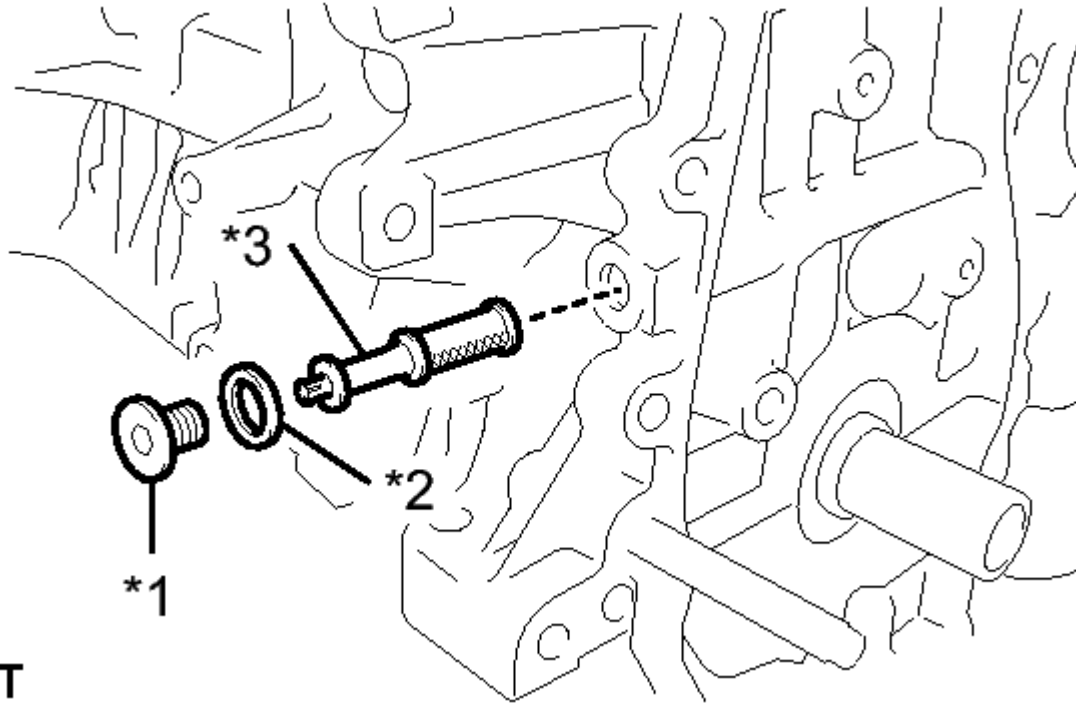
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

NOTE:

- Install the plug within 3 minutes of applying adhesive.
- Do not add coolant for at least an hour after installing the plug.

7. INSTALL OIL CONTROL VALVE FILTER

- a. Check that there are no foreign objects on the mesh part of the oil control valve filter.
- b. Using an 8 mm socket hexagon wrench, install a new gasket and the oil control valve filter with the plug.



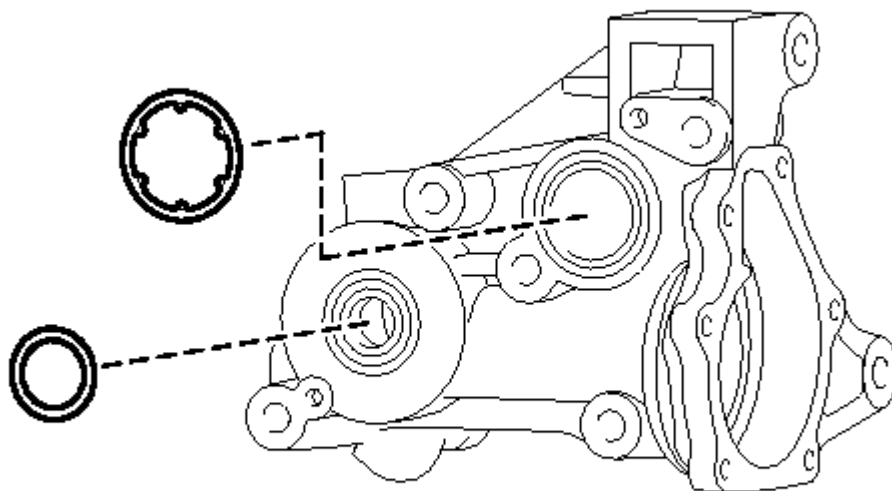
T
Fig. 437: Identifying Oil Control Valve Filter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

TEXT IN ILLUSTRATION

*1	Plug
*2	Gasket
*3	Oil Control Valve Filter

8. INSTALL INLET WATER HOUSING (except TMC Made Engine)



T

Fig. 438: Identifying Inlet Water Housing O-Rings

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

- a. Install the 2 new O-rings onto the inlet water housing.
- b. Using several steps, uniformly install and tighten the 5 bolts in the sequence shown in the illustration.

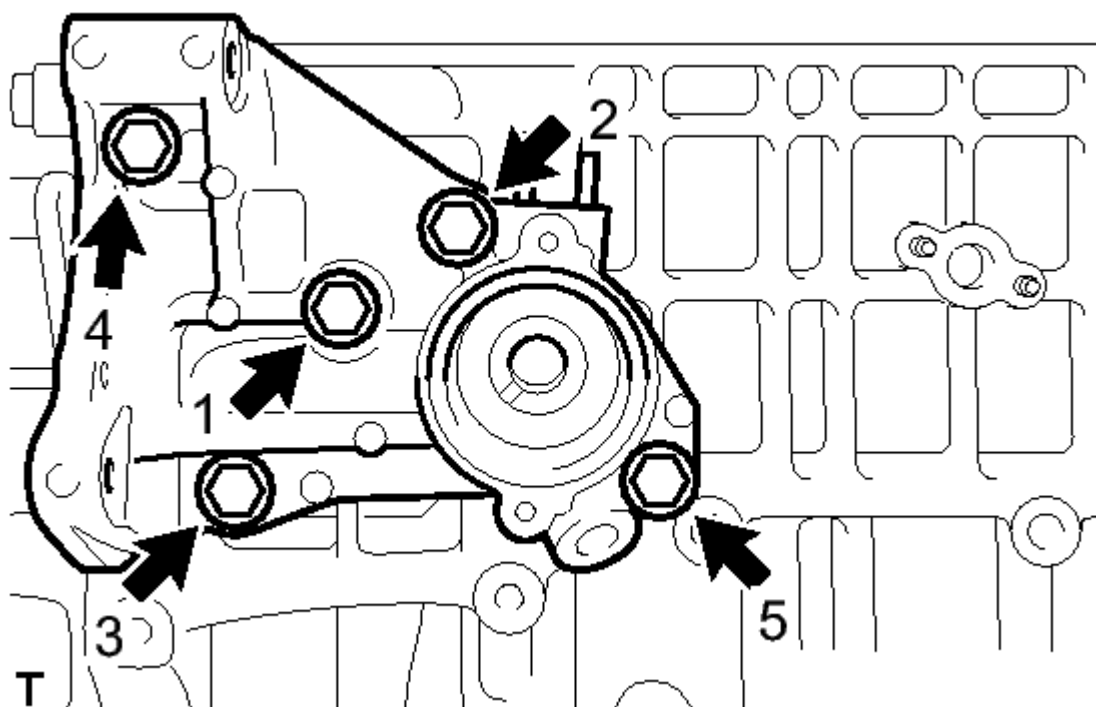
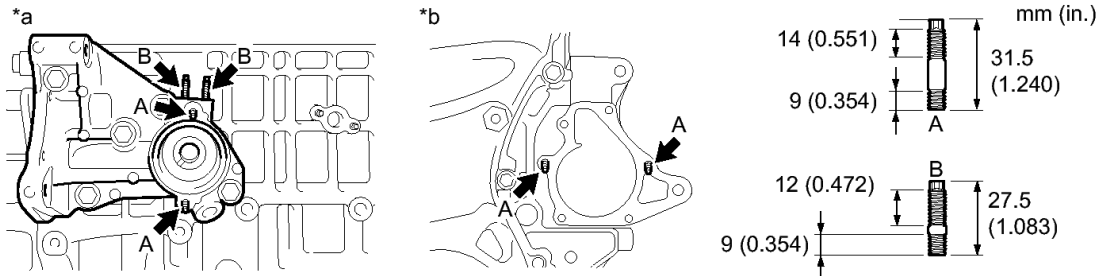


Fig. 439: Identifying Inlet Water Housing Bolts Tightening Sequence

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

Torque: 35 N*m (357 kgf*cm, 26 ft.*lbf)

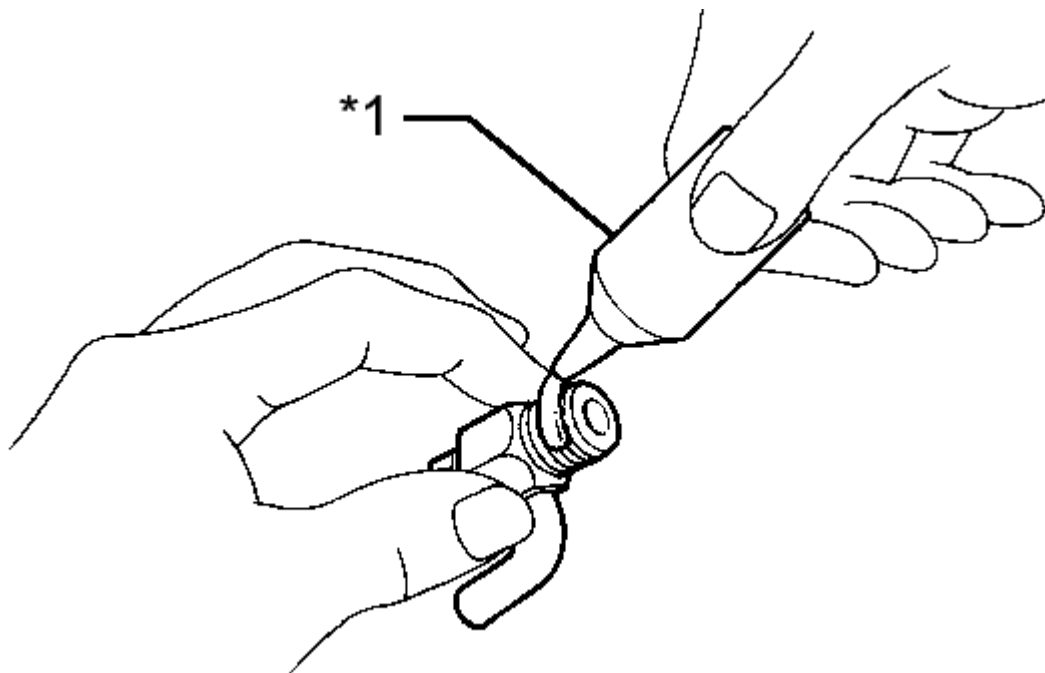
- c. Using E5 "TORX" socket wrench, remove the 6 stud bolts from the inlet water housing.

**Fig. 440: Identifying Inlet Water Housing Bolts**

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

TEXT IN ILLUSTRATION

*a	RH Side	*b	Front Side
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Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)**9. INSTALL INLET WATER HOUSING DRAIN COCK ASSEMBLY (except TMC Made Engine)****Fig. 441: Applying Adhesive To Drain Cock Assembly**

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

- a. Apply adhesive to 2 or 3 threads of the drain cock.

Adhesive

Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

TEXT IN ILLUSTRATION

*1	Adhesive
----	----------

- b. After tightening the drain cock to the specified torque, further tighten it one turn or less to set the drain cock pipe as specified in the illustration.

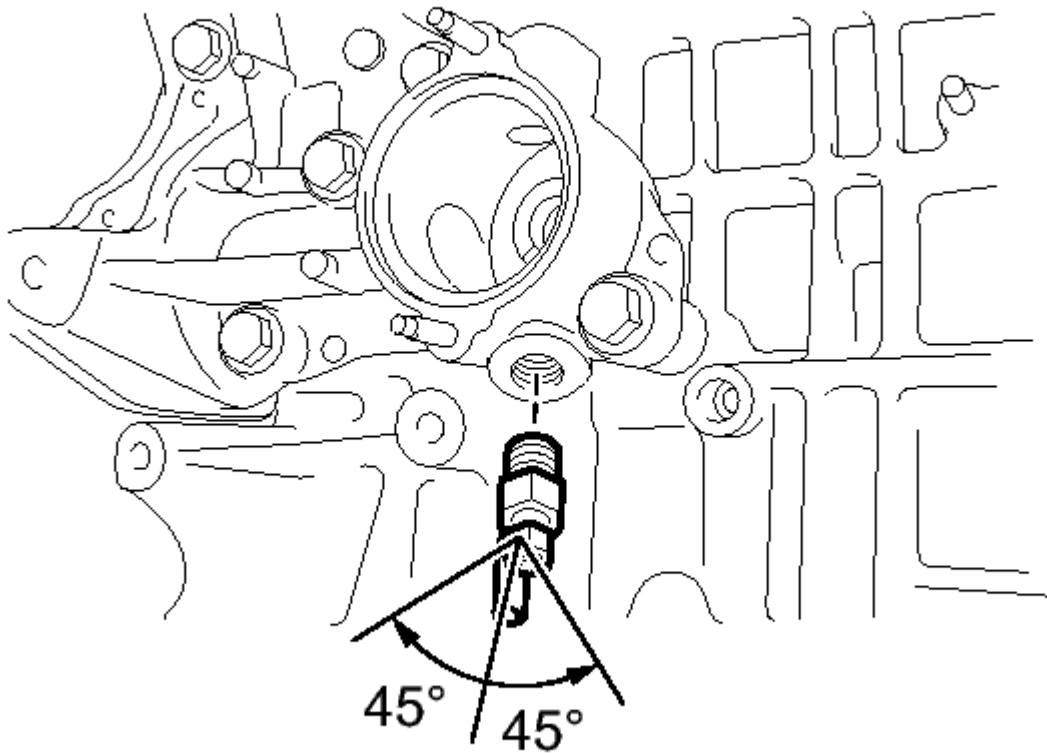


Fig. 442: Identifying Plug Onto Water Drain Cock
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE:

- Install the drain cock within 3 minutes of applying adhesive.
- Do not add coolant for at least an hour after installing the drain cock.
- Do not turn the drain cock by more than 1 revolution (360°) after tightening the drain cock to the specified torque.
- Do not loosen the drain cock after setting it correctly.

c. Install the plug onto the water drain cock.

Torque: 13 N*m (133 kgf*cm, 10 ft.*lbf)

10. INSTALL CYLINDER BLOCK WATER JACKET SPACER (for TMC Made Engine)

a. Install the cylinder block water jacket spacer into the cylinder block as shown in the illustration.

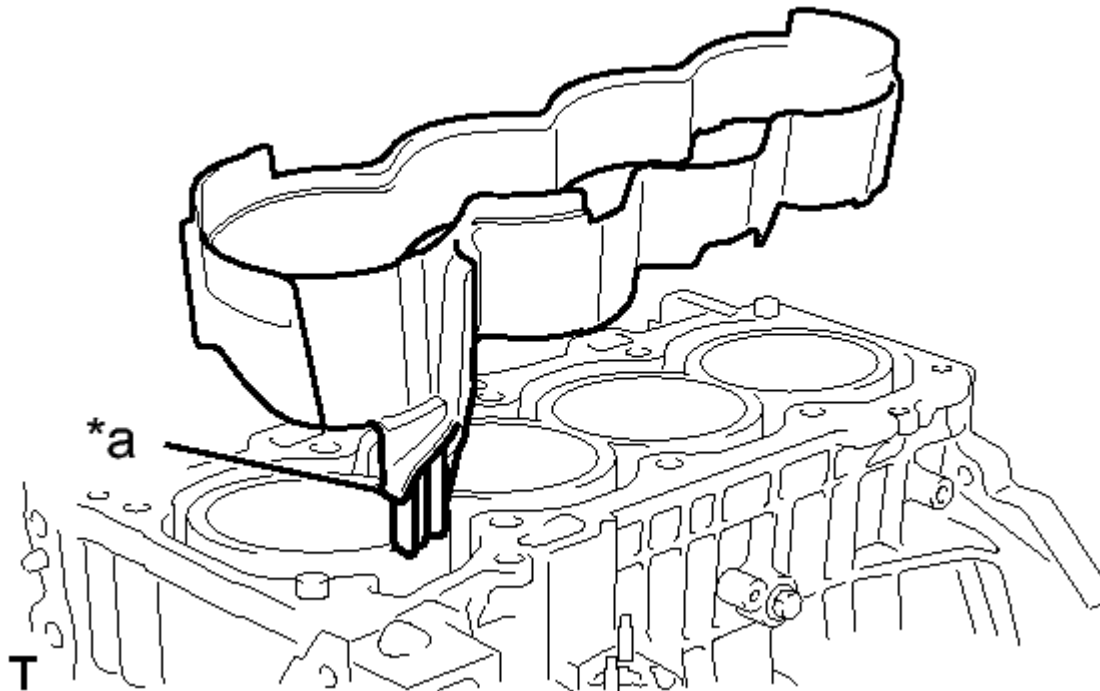


Fig. 443: Install Cylinder Block Water Jacket Spacer (For TMC Made Engine)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Be sure to face the slope to the front of the engine.

TEXT IN ILLUSTRATION

*a	Slope
----	-------

11. INSTALL CYLINDER BLOCK WATER JACKET SPACER (except TMC Made Engine)

- a. Install the cylinder block water jacket spacer into the cylinder block as shown in the illustration.

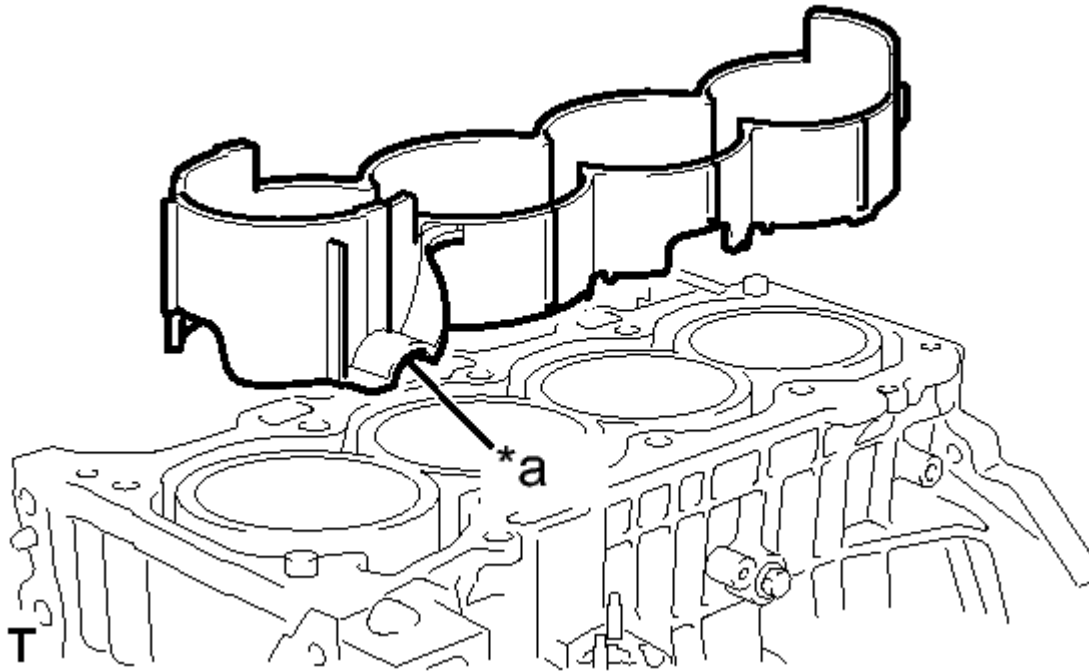


Fig. 444: Install Cylinder Block Water Jacket Spacer (Except TMC Made Engine)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Be sure to face the slope to the front of the engine.

TEXT IN ILLUSTRATION

*a	Slope
----	-------

12. **INSTALL CYLINDER HEAD GASKET** See step 1.
13. **INSTALL CYLINDER HEAD SUB-ASSEMBLY** See step 2.
14. **INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY**
 - a. Apply a light coat of engine oil onto the O-ring.

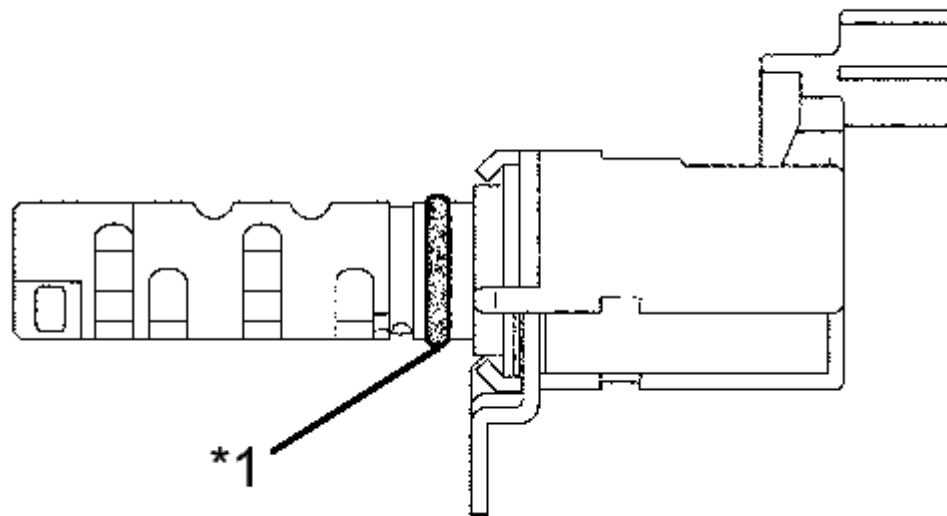


Fig. 445: Identifying Camshaft Timing Oil Control Valve Assembly O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	O-Ring
----	--------

- b. Install the camshaft timing oil control valve with the bolt.

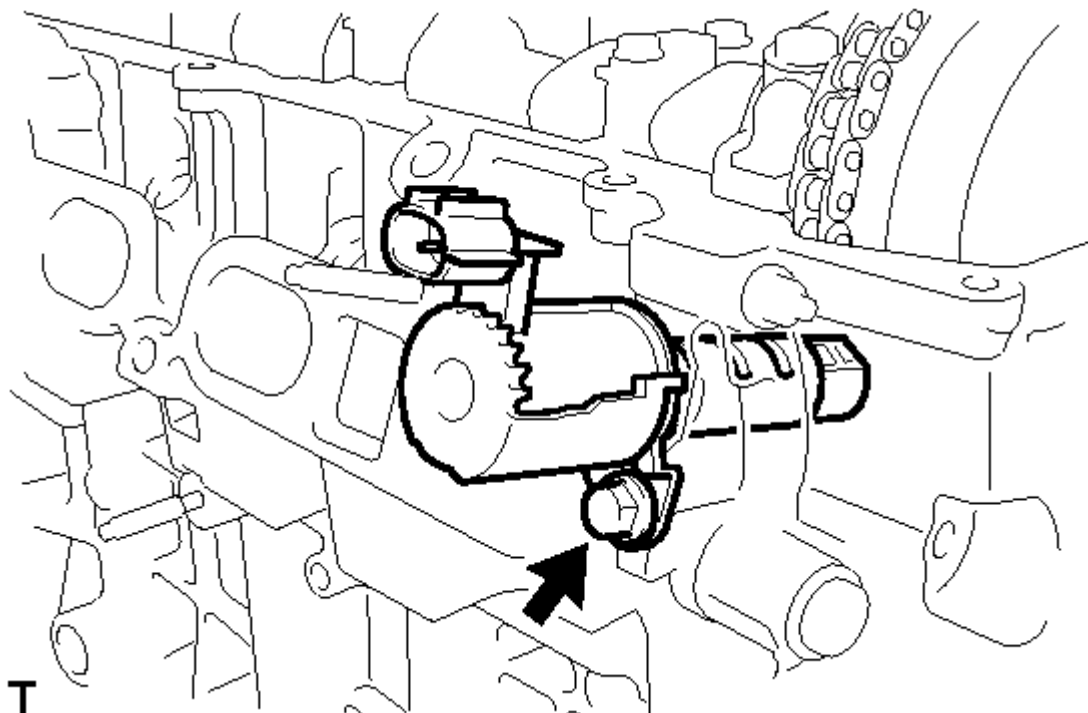


Fig. 446: Remove/Install Camshaft Timing Oil Control Valve And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

15. **INSTALL CAMSHAFT TIMING GEAR ASSEMBLY** See step 1.
16. **INSTALL CAMSHAFT TIMING GEAR OR SPROCKET**
 - a. Clamp the camshaft in a vise, then install the camshaft timing sprocket with the bolt.

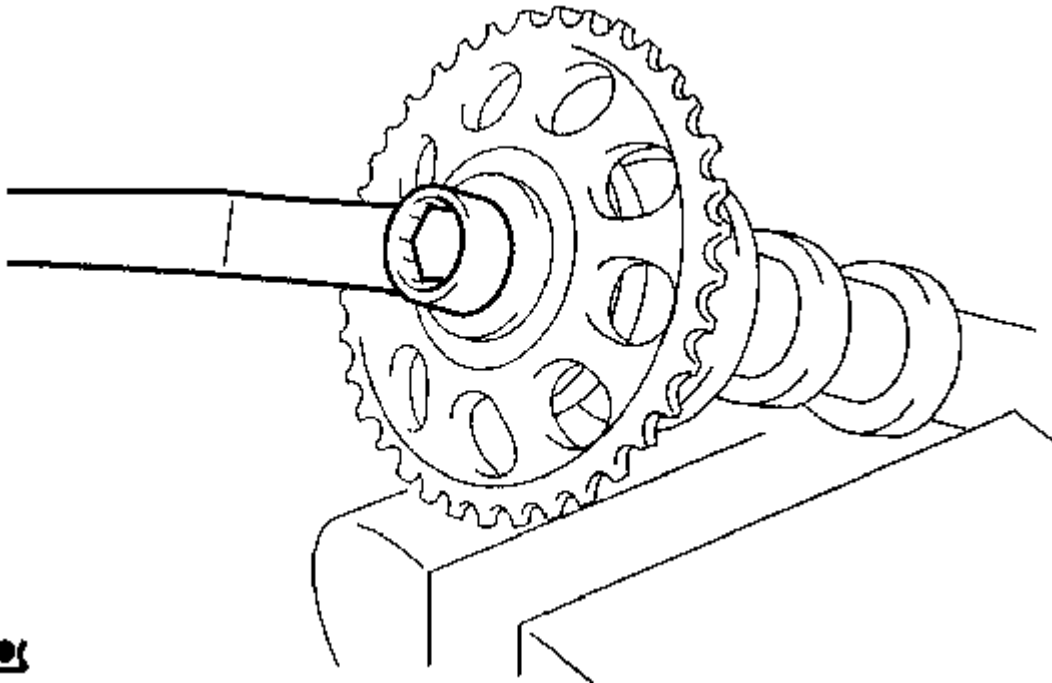
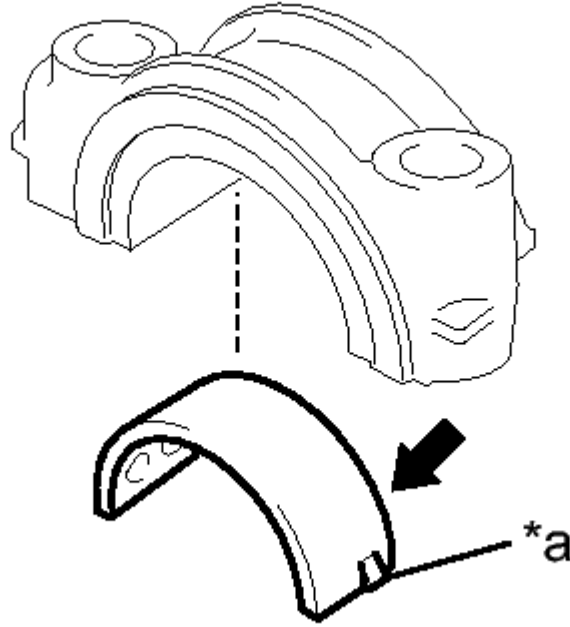


Fig. 447: Installing Camshaft Timing Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

17. **INSTALL NO. 1 CAMSHAFT BEARING**
 - a. Clean the installation surfaces and the inner and outer surfaces of the bearing.

NOTE: **Keep the installation surfaces and the back surfaces of the bearing free of engine oil.**
 - b. Align the claws and install No. 1 camshaft bearing onto No. 1 camshaft bearing cap.

**T****Fig. 448: Install No. 1 Camshaft Bearing**

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

TEXT IN ILLUSTRATION

*a	Claw
----	------

18. INSTALL NO. 2 CAMSHAFT BEARING

- Clean the installation surfaces and the inner and outer surfaces of the bearing.

NOTE: **Keep the installation surfaces and the back surfaces of the bearing free of engine oil.**

- Install the No. 2 camshaft bearing onto the cylinder head.

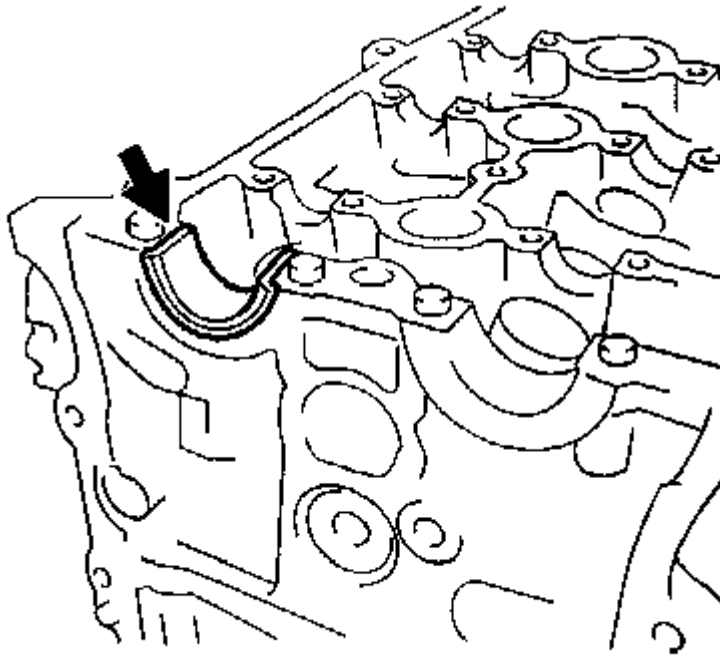


Fig. 449: Identifying No. 2 Camshaft Bearing Onto Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

19. INSTALL CAMSHAFT

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

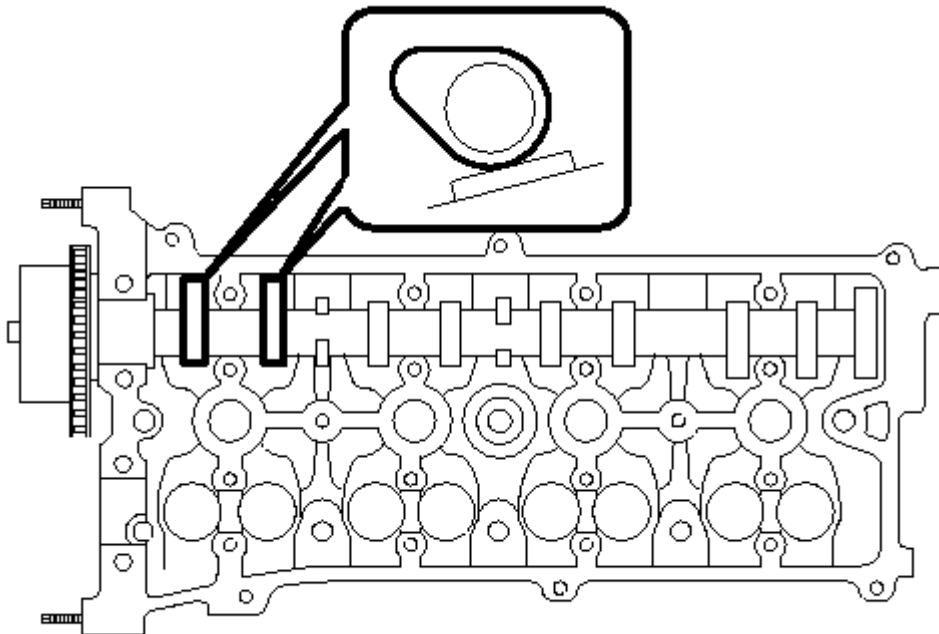
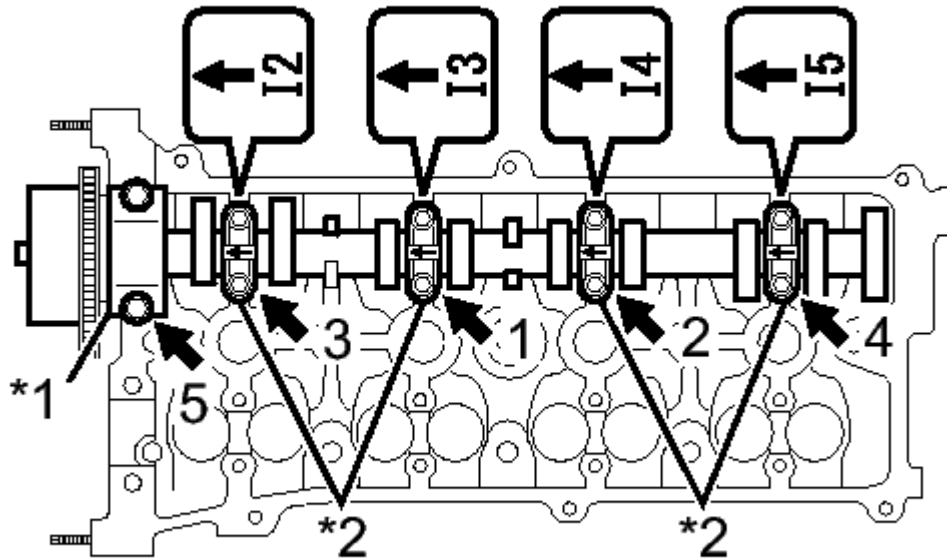


Fig. 450: Placing Camshaft On Cylinder Head

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. 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. 451: Camshaft Bolt Tightening Sequence**

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

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

- Determine the thrust direction of the camshaft by checking the location of the No. 1 bearing cap. Then tighten the bolts.
- Install the camshaft with the timing with the timing mark of the camshaft timing gear on top.

TEXT IN ILLUSTRATION

*1	No. 1 Bearing Cap
*2	No. 3 Bearing Cap

20. INSTALL NO. 2 CAMSHAFT

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

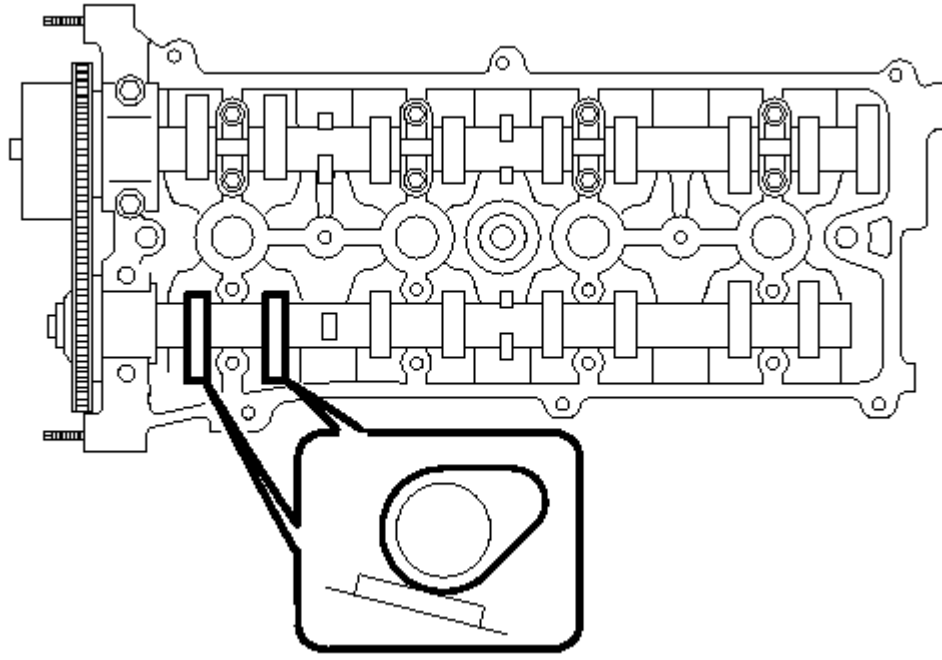


Fig. 452: Identifying No. 2 Cam Lobes Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.
- d. 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.

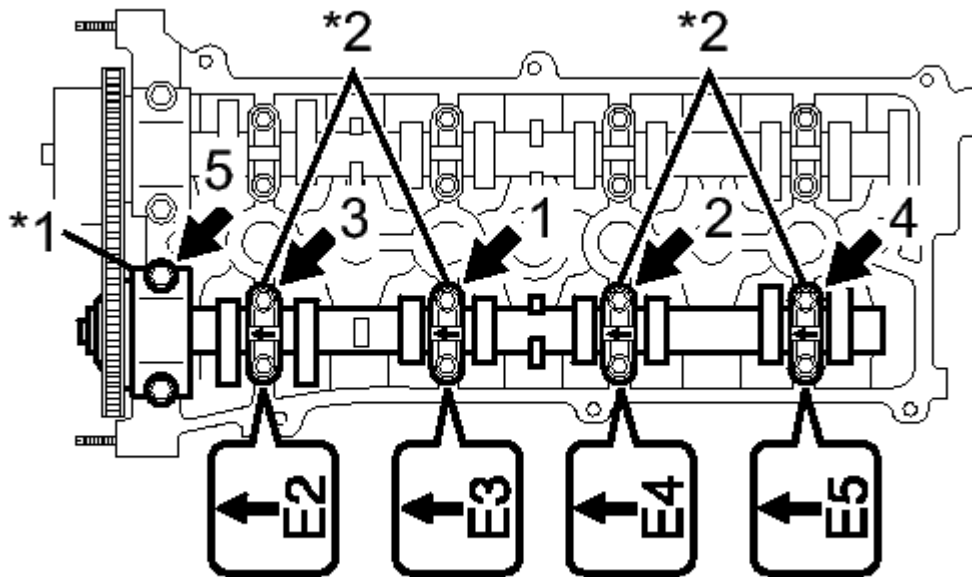


Fig. 453: No. 2 Camshaft Bolt Tightening Sequence
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

No. 2 bearing cap

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

No. 3 bearing cap

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

NOTE:

- Determine the thrust direction of the camshaft by checking the location of the No. 2 bearing cap. Then tighten the bolts.
- Install the camshaft with the timing with the timing mark of the camshaft timing gear on top.

TEXT IN ILLUSTRATION

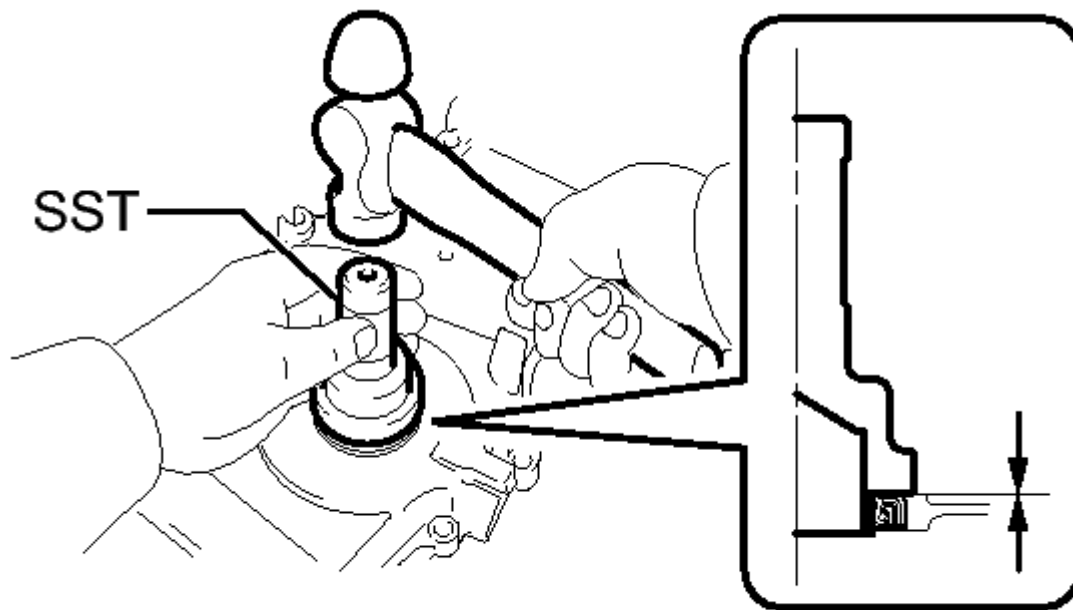
*1	No. 2 Bearing Cap
*2	No. 3 Bearing Cap

21. **INSTALL NO. 2 CHAIN SUB-ASSEMBLY** See step 11.
22. **INSTALL CRANKSHAFT TIMING GEAR OR SPROCKET** See step 12.
23. **INSTALL NO. 1 CHAIN VIBRATION DAMPER** See step 13.
24. **INSTALL CHAIN SUB-ASSEMBLY** See step 14.
25. **INSTALL CHAIN TENSIONER SLIPPER** See step 15.

26. **INSTALL TIMING CHAIN GUIDE** See step 16.
27. **INSTALL NO. 1 CRANKSHAFT POSITION SENSOR PLATE** See step 17.
28. **INSTALL FRONT CRANKSHAFT OIL SEAL**
 - a. Apply MP grease to the tip of a oil seal.

NOTE: Keep the lip free of foreign objects.

- b. Using SST and a hammer, tap in the new oil seal until its surface is flush with the timing chain cover edge.



T

Fig. 454: Tapping Timing Chain Case Oil Seal

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

- SST: 09223-22010

NOTE: Do not tap the oil seal at an angle.

29. **INSTALL TIMING CHAIN OR BELT COVER SUB-ASSEMBLY** See step 18.
30. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY** See step 19.
31. **INSTALL V-RIBBED BELT TENSIONER ASSEMBLY** See step 20.
32. **INSTALL CRANKSHAFT POSITION SENSOR (for TMC Made Engine)**

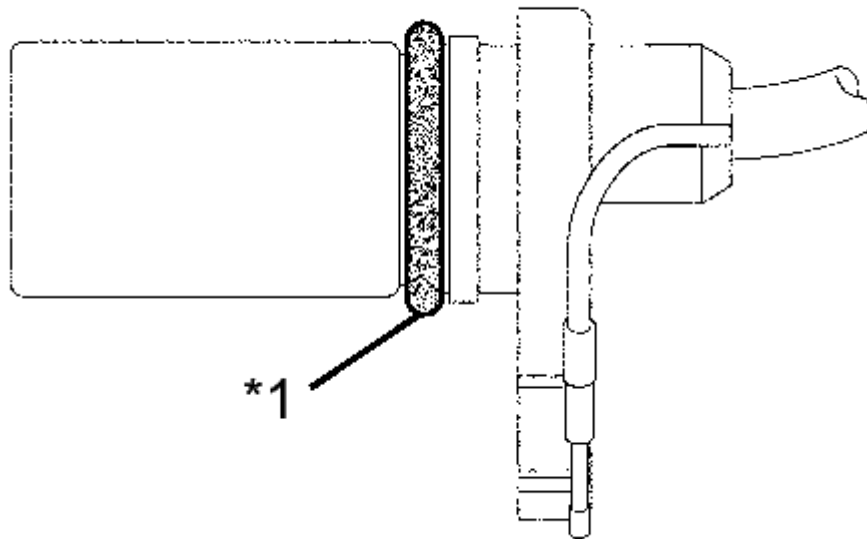
**P**

Fig. 455: Identifying Crankshaft Position Sensor O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Apply a light coat of engine oil onto the O-ring.

TEXT IN ILLUSTRATION

*1	O-Ring
----	--------

- b. Install the crankshaft position sensor with the bolt.

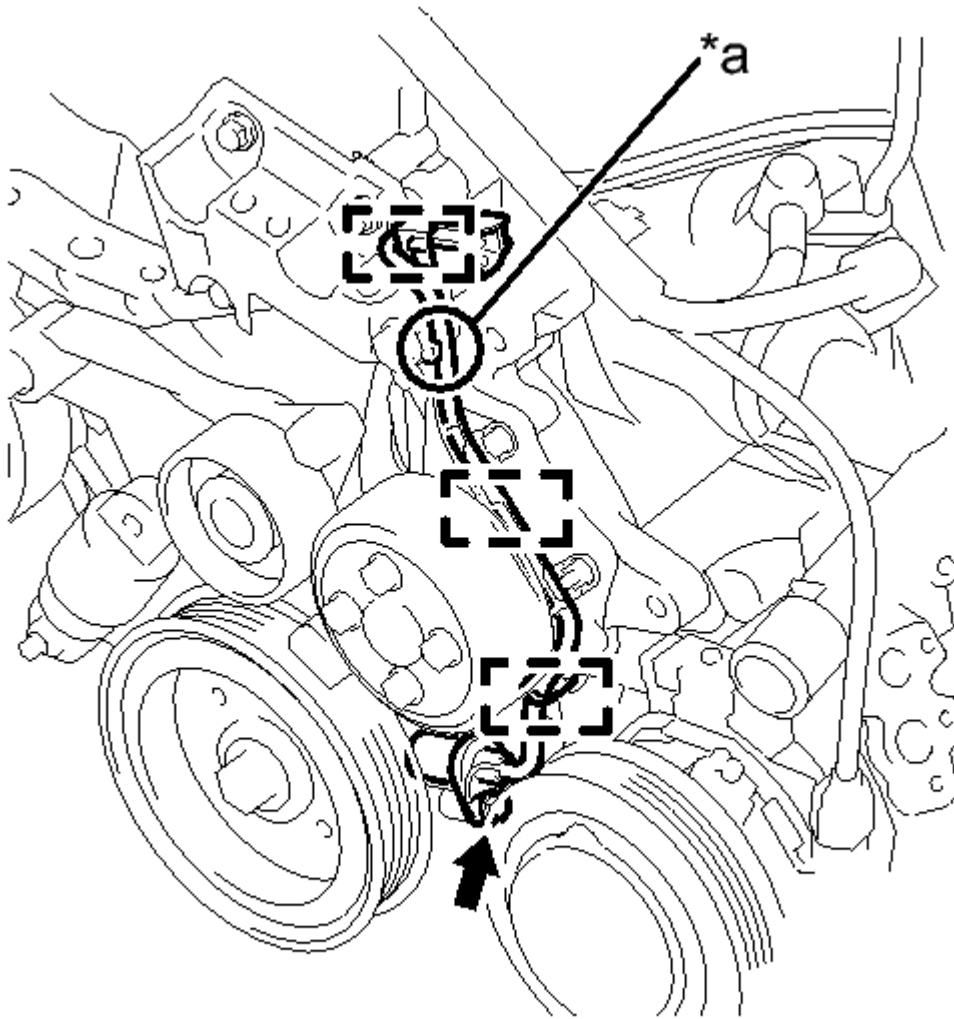


Fig. 456: Identifying Crankshaft Position Sensor Wire And Clamps (For TMC Made Engine)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

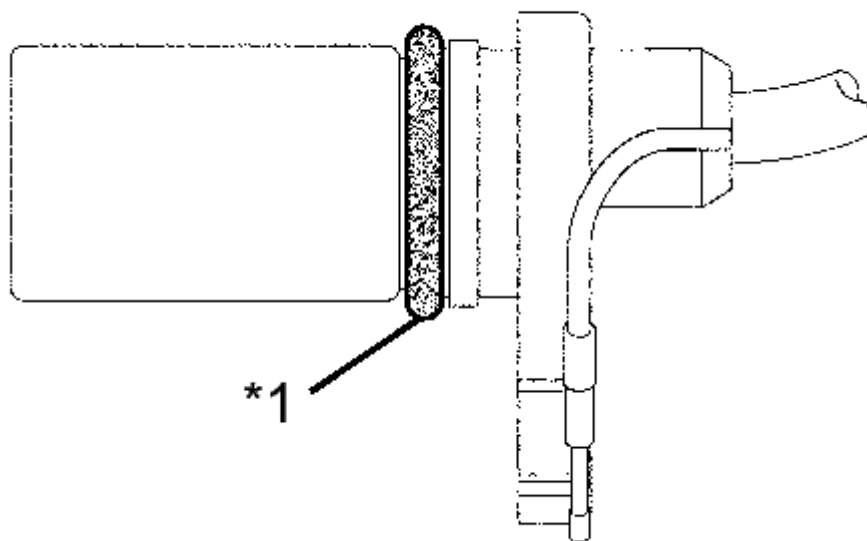
Torque: 9.0 N*m (92 kgf*cm, 80 in.*lbf)

- c. Engage the clamp and connect the crankshaft position sensor wire to the water pump.
- d. Connect the crankshaft position sensor wire to the wire harness clamp bracket.
- e. Engage the clamp and connect the crankshaft position sensor connector to the connector clamp bracket.
- f. Connect the crankshaft position sensor wire to the rib portion of the timing chain cover.

TEXT IN ILLUSTRATION

*a	Timing Chain Cover Rib Portion
----	--------------------------------

33. INSTALL CRANKSHAFT POSITION SENSOR (except TMC Made Engine)



P

Fig. 457: Identifying Crankshaft Position Sensor O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Apply a light coat of engine oil onto the O-ring.

TEXT IN ILLUSTRATION

*1	O-Ring
----	--------

- b. Install the crankshaft position sensor with the bolt.

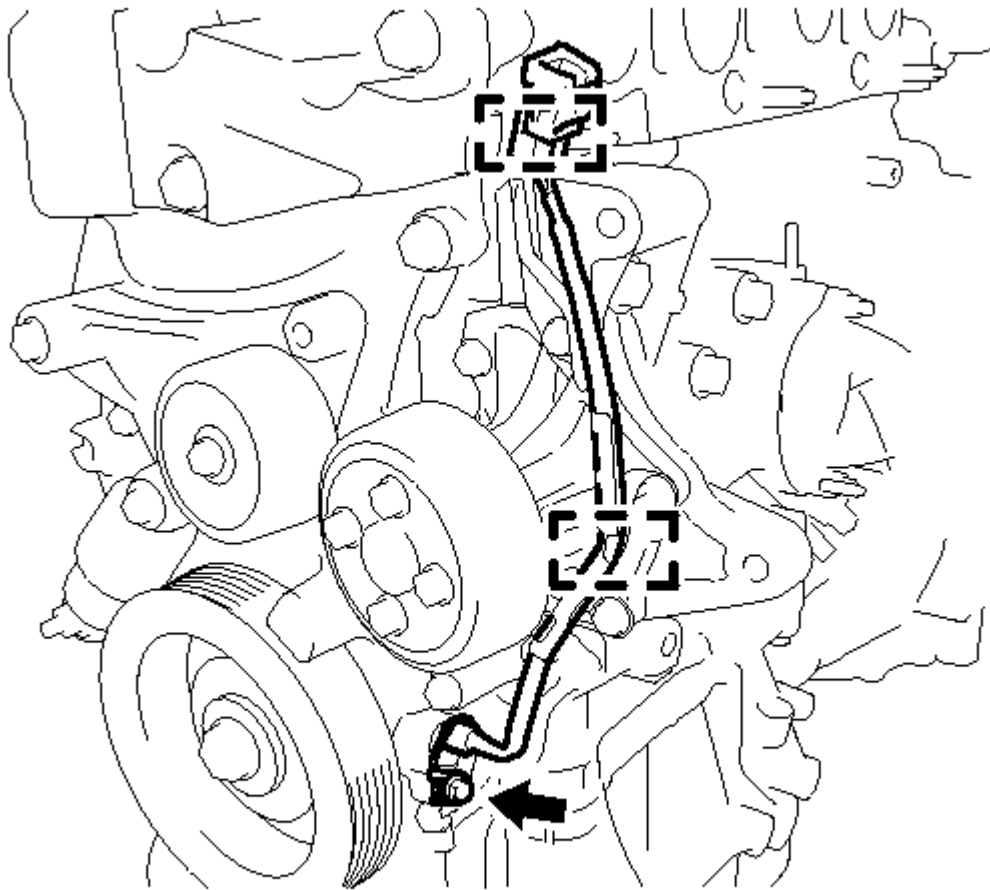


Fig. 458: Identifying Crankshaft Position Sensor Connector And Clamps (Except TMC Made Engine)

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

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

- c. Connect the crankshaft position sensor wire to the wire harness clamp bracket.
- d. Engage the clamp and connect the crankshaft position sensor connector to the connector clamp bracket.

34. INSTALL OIL PAN SUB-ASSEMBLY

- a. Remove any old packing material from the contact surface.
- b. Apply a continuous bead of seal packing (Diameter 4.0 to 4.5 mm (0.157 to 0.177 in.)) to the oil pan mating surface as shown in the illustration.

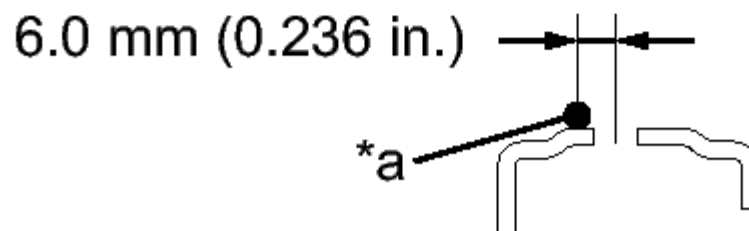
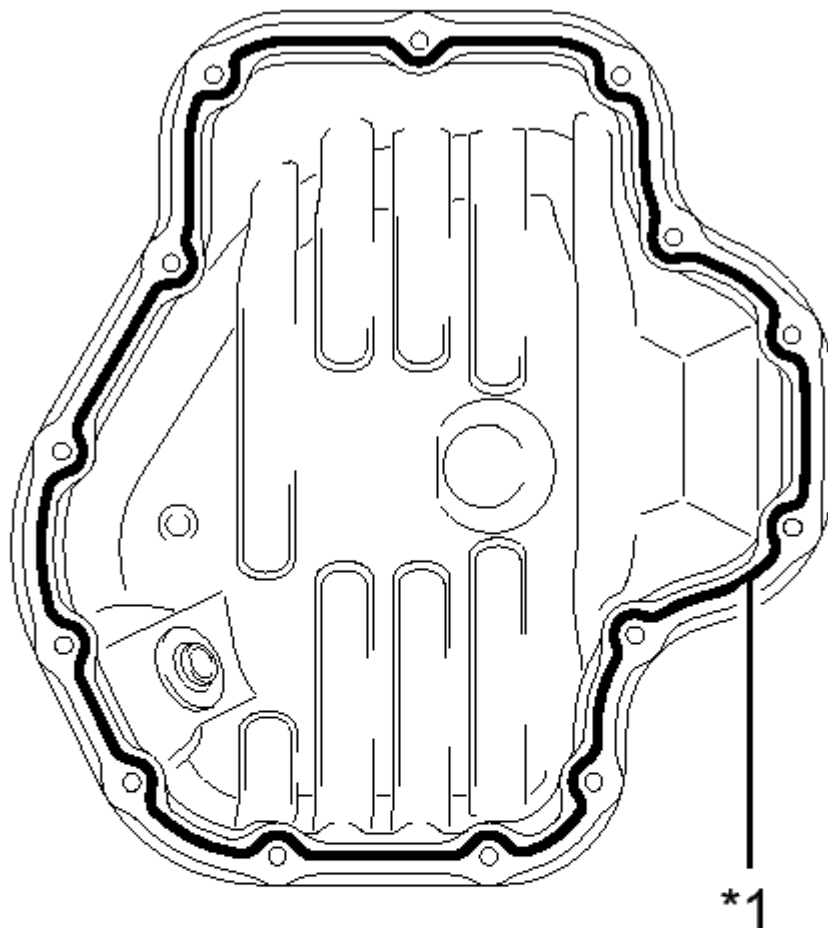
**P**

Fig. 459: Applying Oil Pan Seal Packing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Seal packing

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

NOTE:

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

TEXT IN ILLUSTRATION

*1	Seal Packing
*a	Seal Diameter 4.0 to 4.5 mm (0.157 to 0.177 in.)

- c. Uniformly tighten the 12 bolts and 2 nuts in the sequence shown in the illustration.

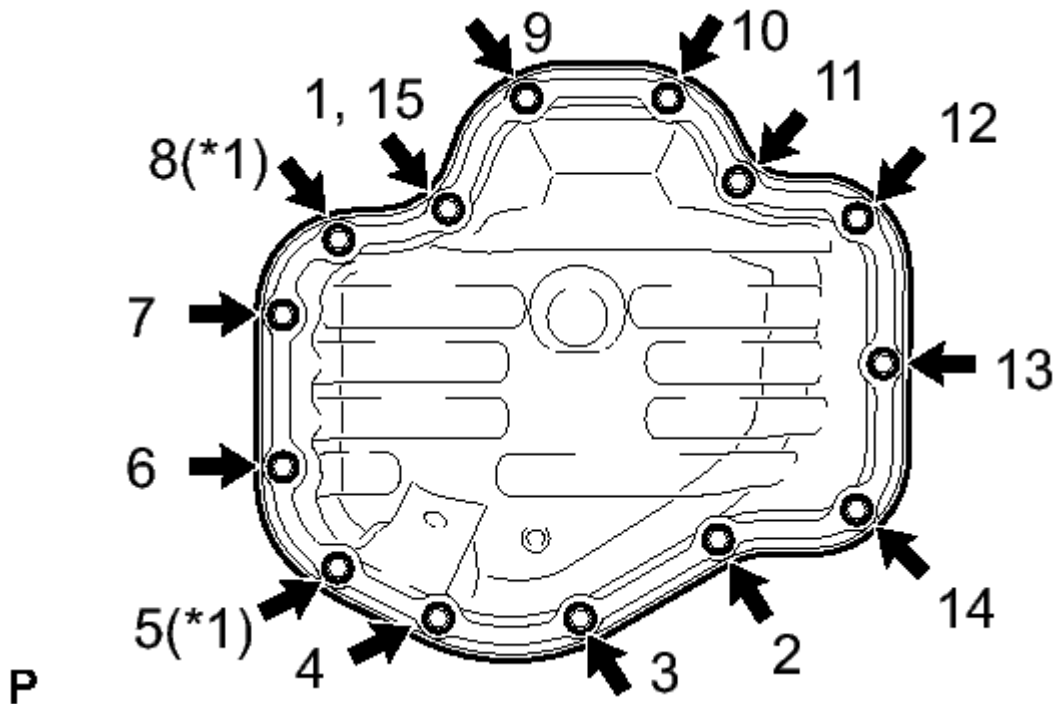


Fig. 460: Identifying Oil Pan With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

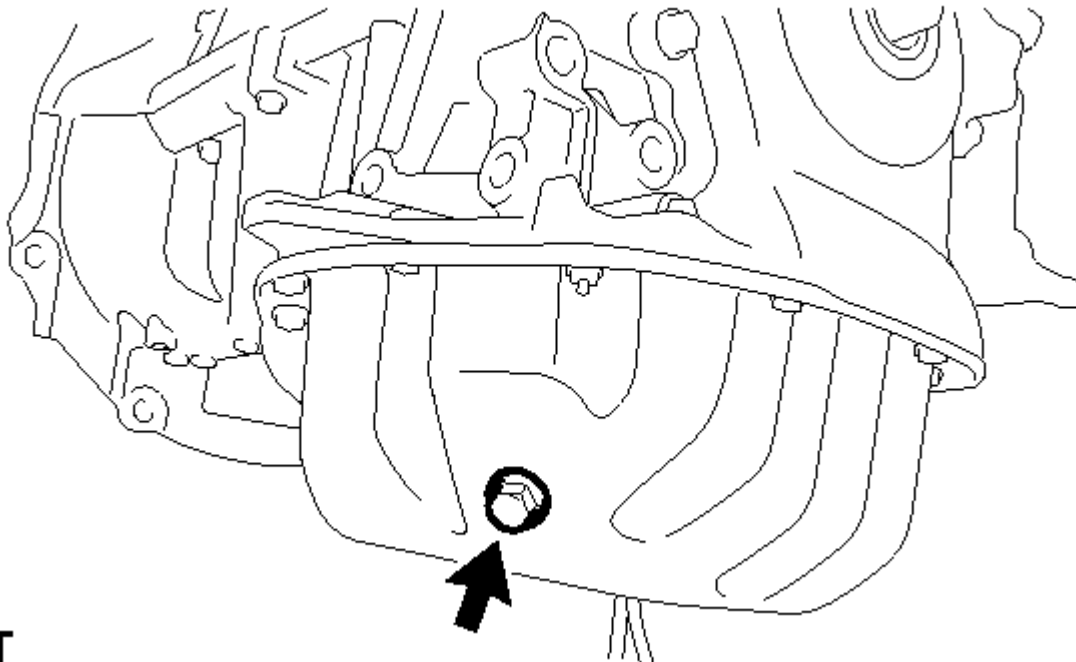
Torque: 9.0 N*m (92 kgf*cm, 80 in.*lbf)

TEXT IN ILLUSTRATION

*1	Nut
----	-----

35. INSTALL OIL PAN DRAIN PLUG

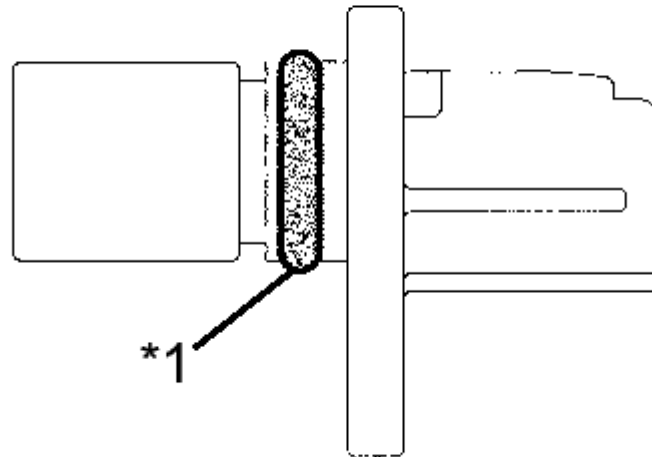
- a. Install the oil drain plug with a new gasket.

**T****Fig. 461: Remove/Install Oil Pan Drain Plug**

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

Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)

36. **INSTALL ENGINE WATER PUMP ASSEMBLY (for TMC Made Engine)** . Refer to **INSTALLATION - Step 1** .
37. **INSTALL ENGINE WATER PUMP ASSEMBLY (except TMC Made Engine)** . Refer to **INSTALLATION - Step 2** .
38. **INSTALL WATER PUMP PULLEY** . Refer to **INSTALLATION - Step 3** .
39. **INSTALL CRANKSHAFT PULLEY** See step 22.
40. **INSPECT VALVE CLEARANCE** See step 7.
41. **ADJUST VALVE CLEARANCE** See step 8.
42. **INSTALL CAMSHAFT POSITION SENSOR**
 - a. Apply a light coat of engine oil onto the O-ring.



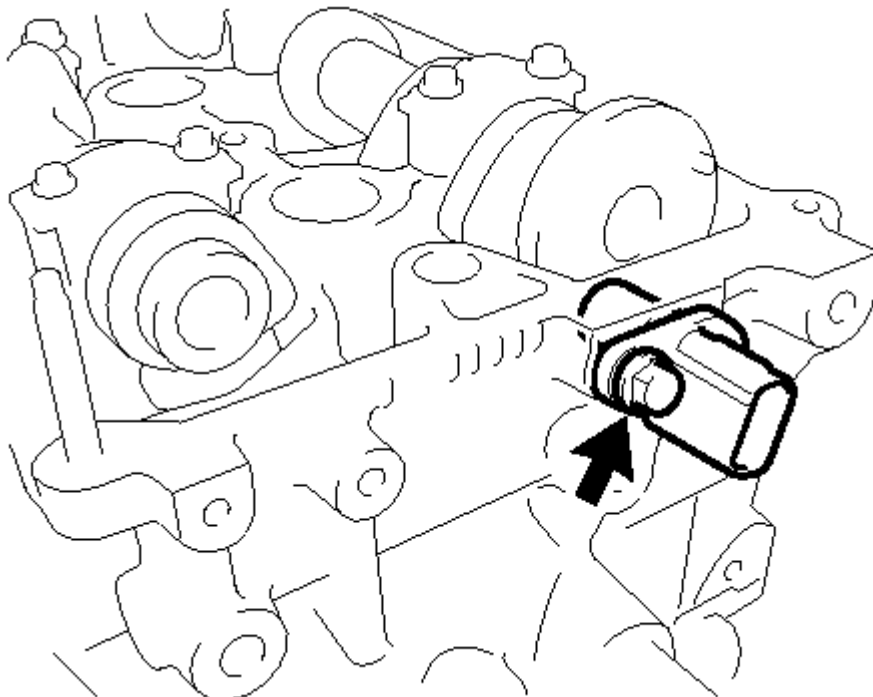
P

Fig. 462: Identifying Camshaft Position Sensor O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	O-Ring
----	--------

- b. Install the camshaft position sensor with the bolt.



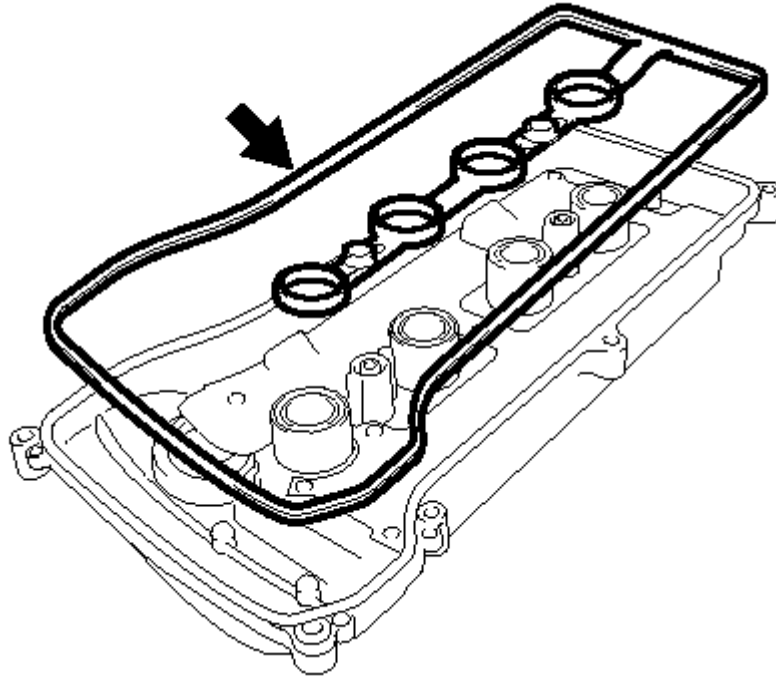
T

Fig. 463: Remove/Install Camshaft Position Sensor And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

43. INSTALL CYLINDER HEAD COVER GASKET

- a. Install a new cylinder head cover gasket onto the cylinder head cover.

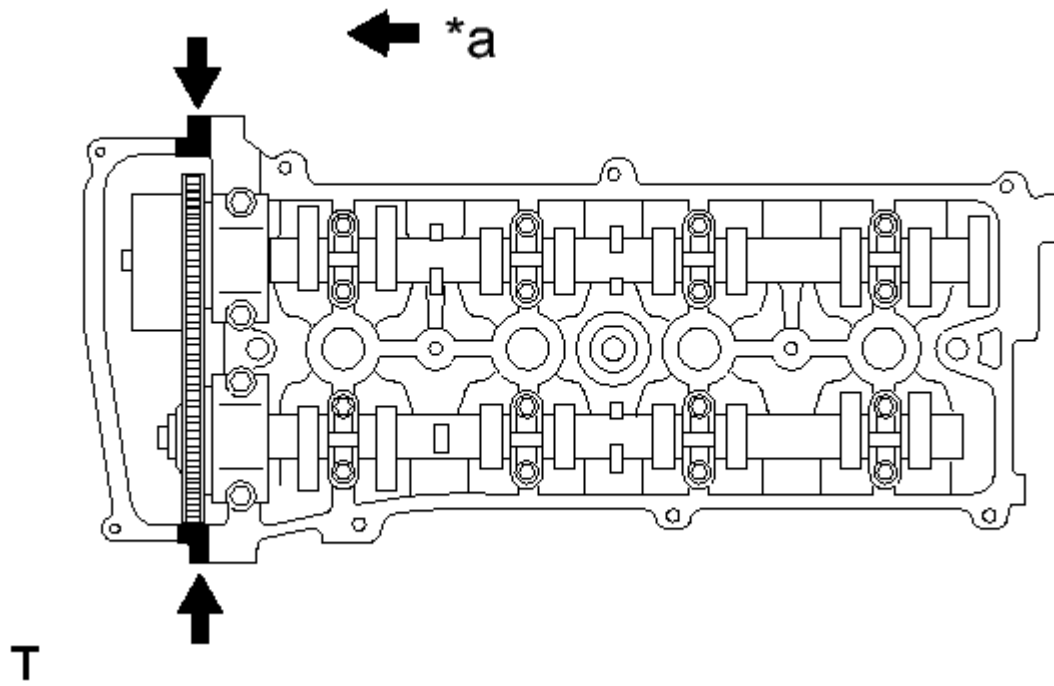


T

Fig. 464: Identifying Packing Material From Contact Surface
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

44. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY

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

**Fig. 465: Applying Seal Packing**

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

Seal Packing

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

NOTE:

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

TEXT IN ILLUSTRATION

*a	Seal Packing
----	--------------

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

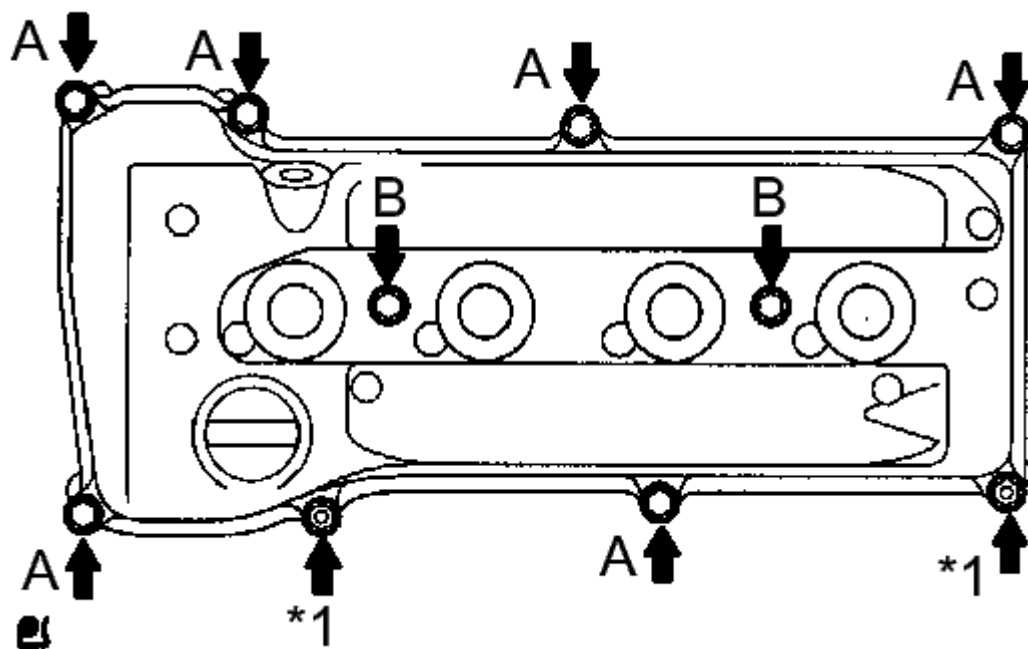


Fig. 466: Identifying Cylinder Head Cover Bolts

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

Bolt A

Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)

Bolt B

Torque: 14 N*m (143 kgf*cm, 10 ft.*lbf)

Nut

Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)

TEXT IN ILLUSTRATION

*1	Nut
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45. INSTALL OIL FILTER UNION

- Using a 12 mm socket hexagon wrench, install the oil filter union.

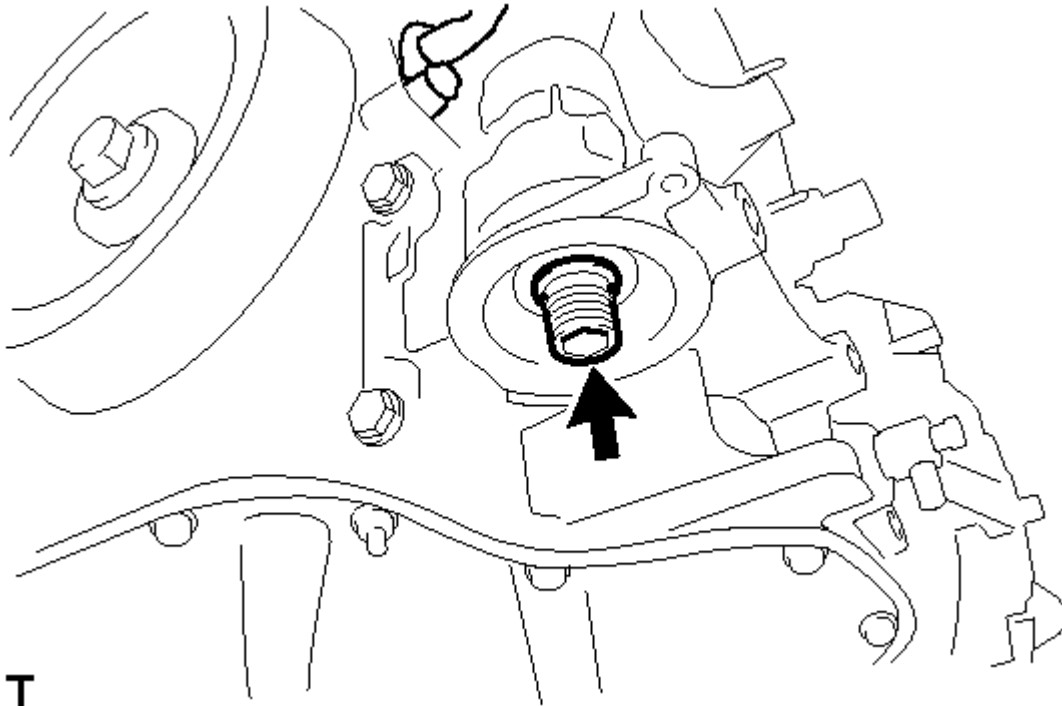
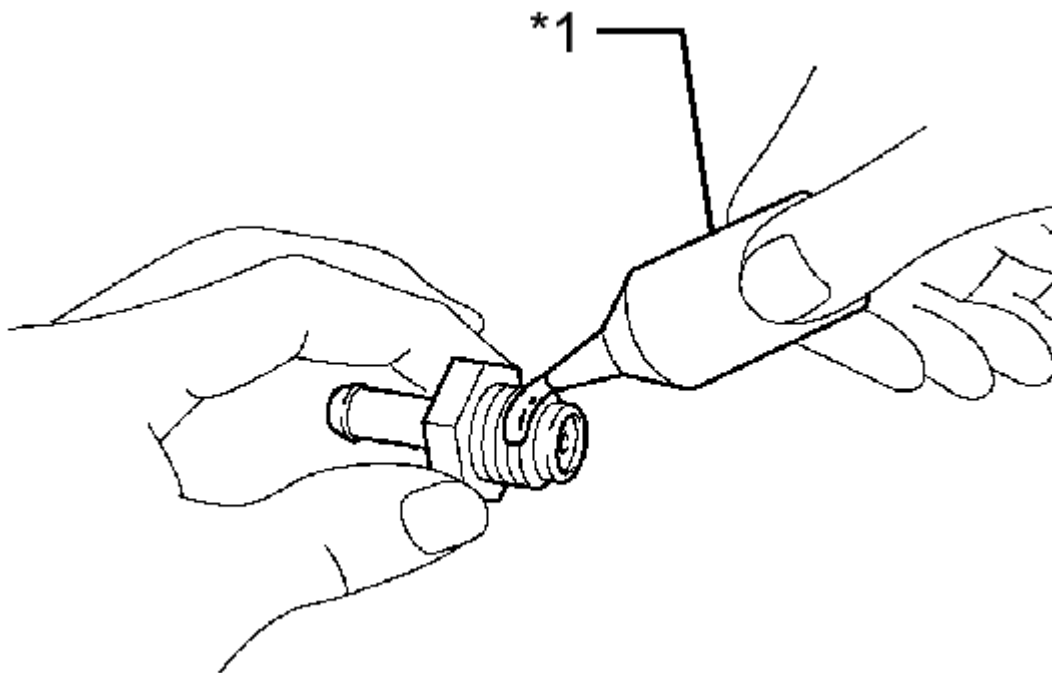
**T**

Fig. 467: Remove/Install Oil Filter Union

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

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

46. **INSTALL OIL FILTER SUB-ASSEMBLY** . Refer to **REPLACEMENT - Step 4** .
47. **INSTALL SPARK PLUG** . Refer to **INSTALLATION - Step 1** .
48. **INSTALL VENTILATION VALVE SUB-ASSEMBLY**
 - a. Apply adhesive to the threads of the ventilation valve.



N

Fig. 468: Apply Adhesive To Ventilation Valve

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

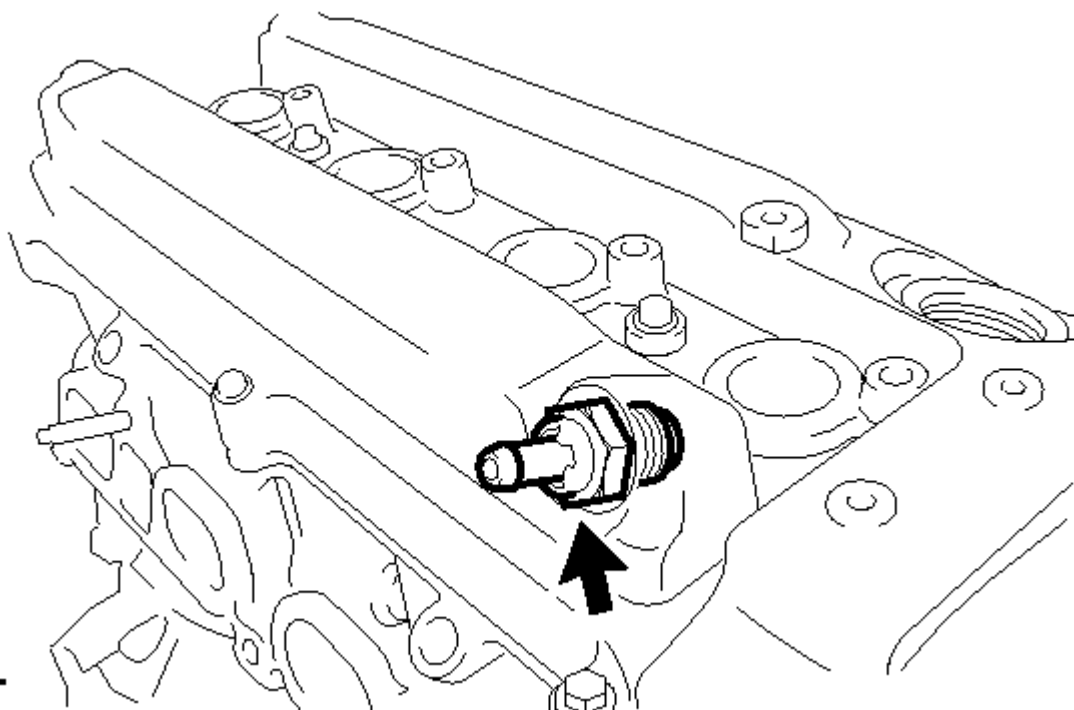
Adhesive

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

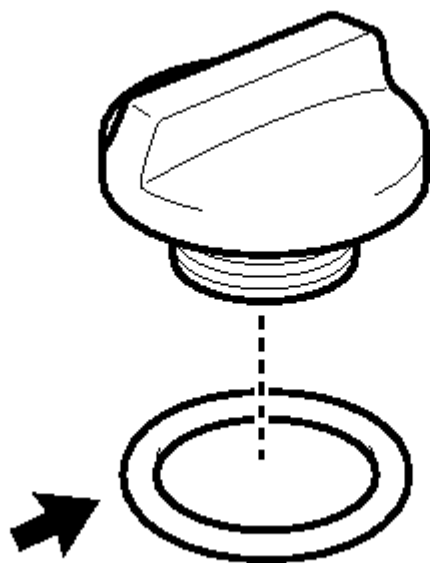
TEXT IN ILLUSTRATION

*1	Adhesive
----	----------

- b. Using a deep socket wrench 22 mm, install the ventilation valve onto the cylinder head cover.

**T****Fig. 469: Remove/Install Ventilation Valve****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.****Torque: 19 N*m (194 kgf*cm, 14 ft.*lbf)****49. INSTALL OIL FILLER CAP GASKET**

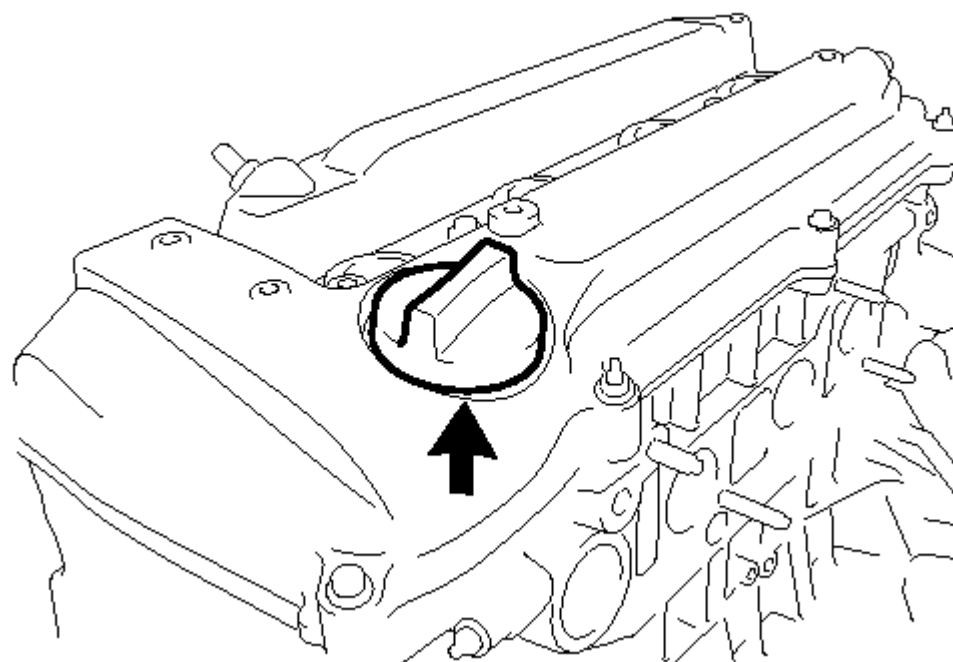
- a. Install the oil filler cap gasket onto the oil filler cap.

**T****Fig. 470: View Of Oil Filler Cap Gasket**

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

50. INSTALL OIL FILLER CAP SUB-ASSEMBLY

- a. Install the oil filler cap onto the cylinder head cover.

**T****Fig. 471: Location of Oil Filler Cap**

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

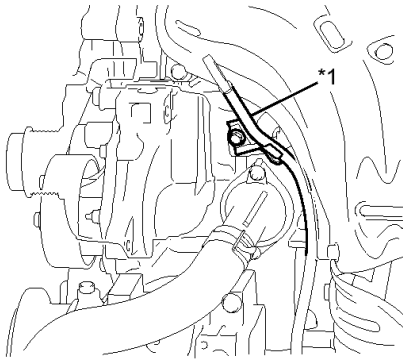
INSTALLATION

INSTALLATION

HINT:

Check whether the engine is TMC made or not by referring to the following illustration.

*A



*B

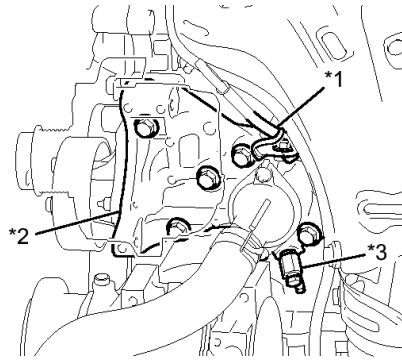


Fig. 472: Identifying Whether The Engine Is TMC Made
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*A	for TMC Made Engine	*B	except TMC Made Engine
*1	Engine Oil Level Dipstick Guide	*2	Water Inlet Housing
*3	Water Inlet Housing Drain Cock Assembly	-	-

INSTALLATION

1. INSTALL RADIO SETTING CONDENSER

- Install the condenser with the bolt.

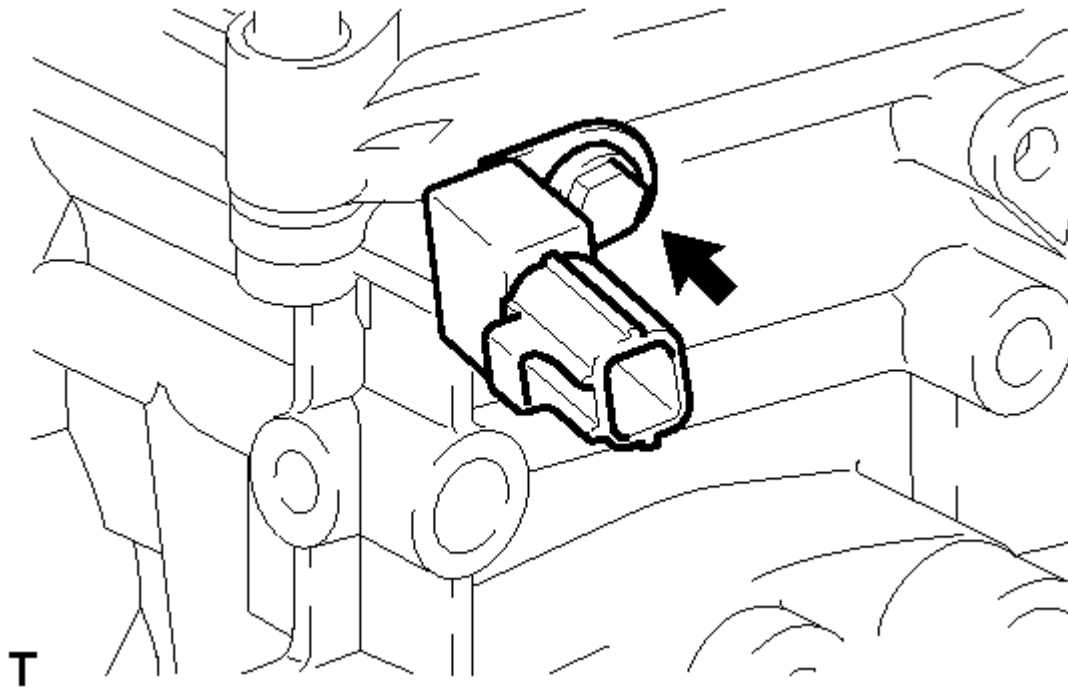


Fig. 473: Remove/Install Radio Setting Condenser And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

2. **INSTALL ENGINE COOLANT TEMPERATURE SENSOR** . Refer to **INSTALLATION - Step 1** .
3. **INSTALL OIL PRESSURE SWITCH** . Refer to **INSTALLATION - Step 1** .
4. **INSTALL KNOCK SENSOR** . Refer to **INSTALLATION - Step 1** .
5. **INSTALL IGNITION COIL ASSEMBLY** . Refer to **INSTALLATION - Step 2** .
6. **INSTALL NO. 1 WATER BY-PASS PIPE (for TMC Made Engine)**

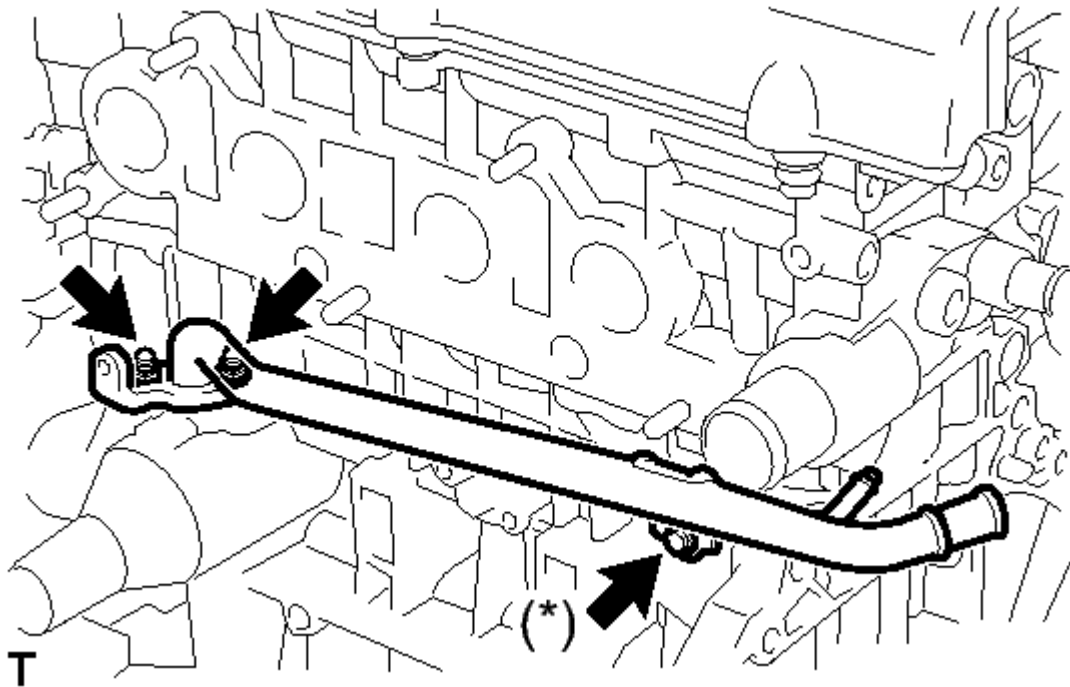


Fig. 474: Installing No. 1 Water By-Pass Pipe (For TMC Made Engine)

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

- 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)

NOTE: Make sure there is no oil adhering to the bolt or threaded hole at the location marked with (*) in the illustration. If there is any oil adhering to the bolt or threaded hole, clean and degrease the parts.

7. INSTALL NO. 1 WATER BY-PASS PIPE (except TMC Made Engine)

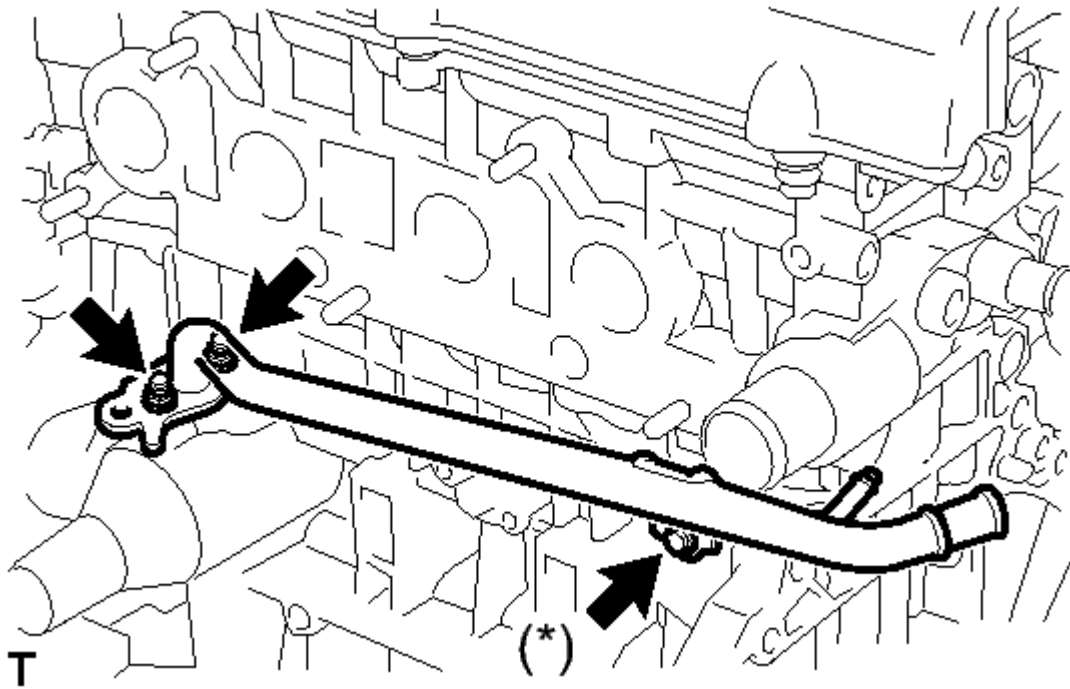


Fig. 475: Installing No. 1 Water By-Pass Pipe (Except TMC Made Engine)

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

- 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)

NOTE: Make sure there is no oil adhering to the bolt or threaded hole at the location marked with (*) in the illustration. If there is any oil adhering to the bolt or threaded hole, clean and degrease the parts.

8. INSTALL ENGINE OIL LEVEL DIPSTICK GUIDE

- a. Install a new O-ring and the engine oil level dipstick guide with the bolt.

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

9. INSTALL OIL DIPSTICK

10. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET See step 21.

11. INSTALL THERMOSTAT . Refer to INSTALLATION - Step 1 .

12. INSTALL INLET WATER . Refer to INSTALLATION - Step 2 .

13. INSTALL IDLER PULLEY SUB-ASSEMBLY See step 26.

14. INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY

- a. Install a new gasket onto the cylinder head.
- b. Temporarily tighten the exhaust manifold converter with the 5 nuts.

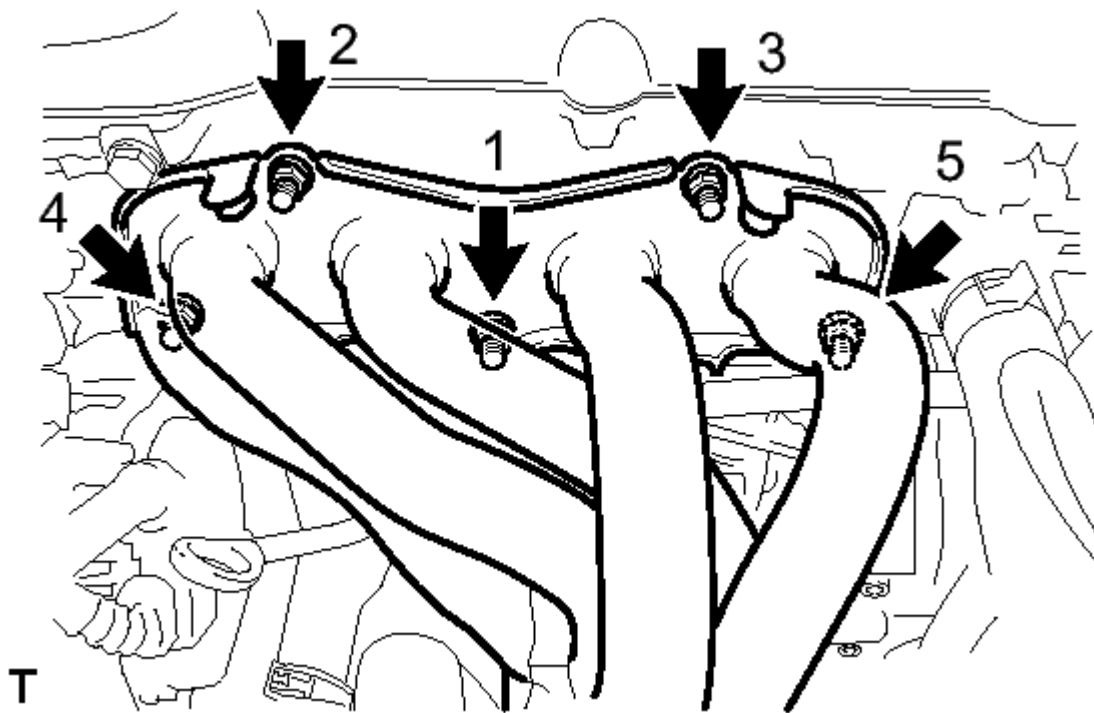


Fig. 476: View Of Exhaust Manifold Converter Nut Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Tighten the 5 nuts in the sequence shown in the illustration.

Torque: 37 N*m (377 kgf*cm, 27 ft.*lbf)

15. INSTALL NO. 2 MANIFOLD STAY

- a. Install the No. 2 manifold stay with the bolt and nut.

Torque: 44 N*m (449 kgf*cm, 33 ft.*lbf)

16. INSTALL MANIFOLD STAY

- a. Install the manifold stay with the bolt and nut.

Torque: 44 N*m (449 kgf*cm, 33 ft.*lbf)

17. INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

- a. Install the exhaust manifold heat insulator with the 4 bolts.

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

18. INSTALL NO. 1 INTAKE MANIFOLD INSULATOR . Refer to INSTALLATION - Step 2 .

19. INSTALL INTAKE MANIFOLD

- a. Install a new gasket onto the intake manifold.
- b. Install the intake manifold with the 5 bolts and 2 nuts.

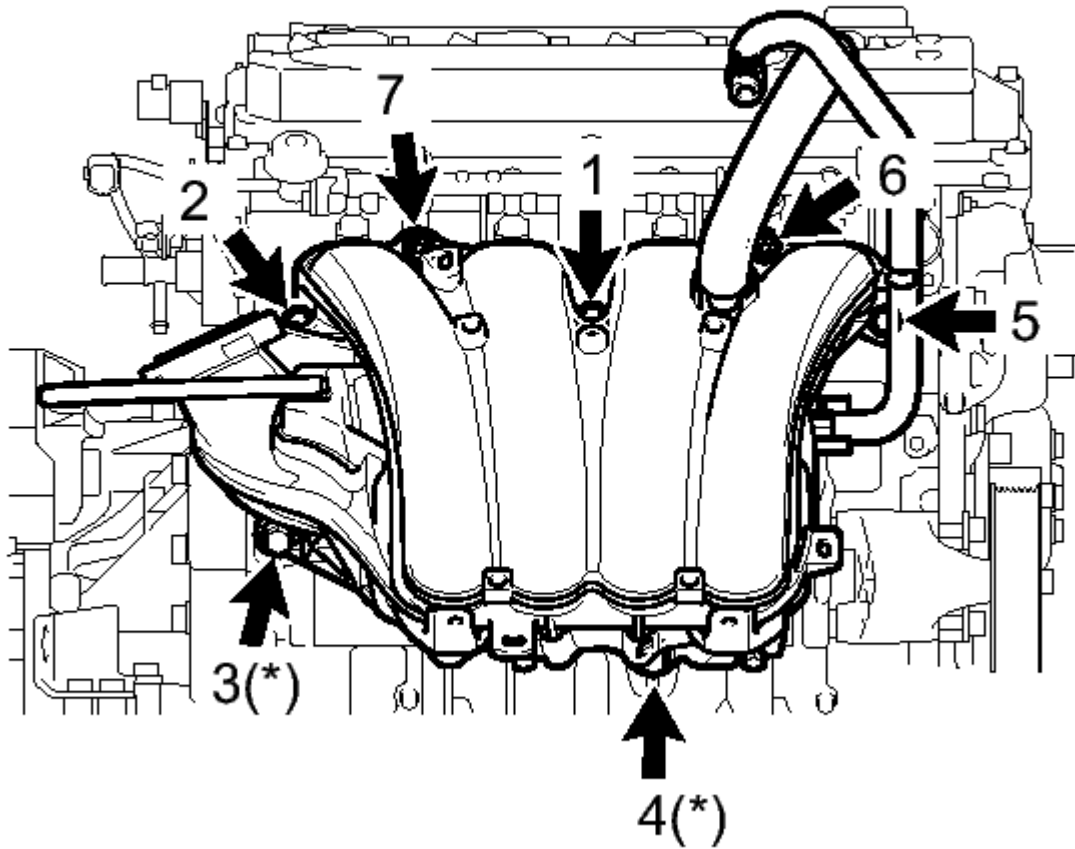
**P**

Fig. 477: Installing Intake Manifold And Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE: Make sure there is no oil adhering to the bolts or threaded holes at the locations marked with (*) in the illustration. If there is any oil adhering to the bolts or threaded holes, clean and degrease the parts.

20. **CONNECT NO. 2 VENTILATION HOSE** . Refer to INSTALLATION - Step 3 .
21. **INSTALL FUEL INJECTOR ASSEMBLY** . Refer to INSTALLATION - Step 1 .
22. **INSTALL FUEL DELIVERY PIPE SUB-ASSEMBLY** . Refer to INSTALLATION - Step 2 .