

2012 ENGINE**Engine Mechanical (Service Information) - iQ****ENGINE****ON-VEHICLE INSPECTION****ON-VEHICLE INSPECTION**

1. **INSPECT ENGINE COOLANT** . Refer to **ON-VEHICLE INSPECTION - Step 3**
2. **INSPECT ENGINE OIL** . Refer to **ON-VEHICLE INSPECTION - Step 1**
3. **INSPECT BATTERY** . Refer to **ON-VEHICLE INSPECTION - Step 1**
4. **INSPECT AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY**
 - a. Remove the air cleaner and hose. Refer to **REMOVAL - Step 5** .
 - b. Remove the air cleaner filter element sub-assembly.
 - c. Visually check that the air cleaner filter is not excessively damaged or oily. If necessary, replace the air cleaner filter.

HINT:

- If there is any dirt or a blockage in the air cleaner filter element sub-assembly, clean it with compressed air.
 - If any dirt or a blockage remains even after cleaning the air cleaner filter element sub-assembly with compressed air, replace it.
- d. Install the air cleaner filter element sub-assembly.
 - e. Install the air cleaner and hose. Refer to **INSTALLATION - Step 11** .
 5. **INSPECT V-RIBBED BELT TENSIONER ASSEMBLY**
 - a. Remove the V-ribbed belt. Refer to **REMOVAL**.
 - b. Check that nothing is caught in the tensioner by turning it clockwise and counterclockwise. If a malfunction exists, replace the tensioner.
 - c. Install the V-ribbed belt. Refer to **INSTALLATION**.
 6. **INSPECT SPARK PLUG** . Refer to **ON-VEHICLE INSPECTION - Step 3**
 7. **INSPECT VALVE LASH ADJUSTER NOISE**
 - a. Rev up the engine several times. Check that the engine does not emit unusual noises. If unusual noises occur, warm up the engine and idle it for over 30 minutes. Then perform the preceding inspection.

HINT:

If any defects or problems are found during the preceding inspection, perform lash adjuster inspection See step 17.

8. INSPECT IGNITION TIMING

NOTE:

- Check the ignition timing with the cooling fans off.
- Turn off all electrical systems and the A/C.
- When checking the ignition timing, the transaxle should be in neutral or park.

- a. Warm up and stop the engine.
- b. When using the Techstream: Check the ignition timing.
 1. Connect the Techstream to the DLC3.
 2. Start the engine and run it at idle.
 3. Turn the Techstream on.
 4. Enter the following menus: Powertrain / Engine and ECT / Data List / IGN Advance.

Standard ignition timing

-5 to 5 degrees BTDC

HINT:

Refer to the Techstream operator's manual for further details.

5. Check that the ignition timing advances immediately when the engine speed is increased.
6. Enter the following menus: Powertrain / Engine and ECT / Active Test / Connect the TC and TE1 / ON.
7. Monitor IGN Advance of the Data List.

Standard ignition timing

8 to 12 degrees BTDC

NOTE: When checking the ignition timing, the transaxle should be in neutral or park.

HINT:

Refer to the Techstream operator's manual for further details.

8. Enter the following menus: Connect the TC and TE1 / OFF.
 9. Turn the ignition switch off.
 10. Disconnect the Techstream from the DLC3.
- c. When not using the Techstream:
 1. Remove the No. 3 engine under cover See step 12.

2. Remove the No. 1 engine cover See step 3.
3. Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.

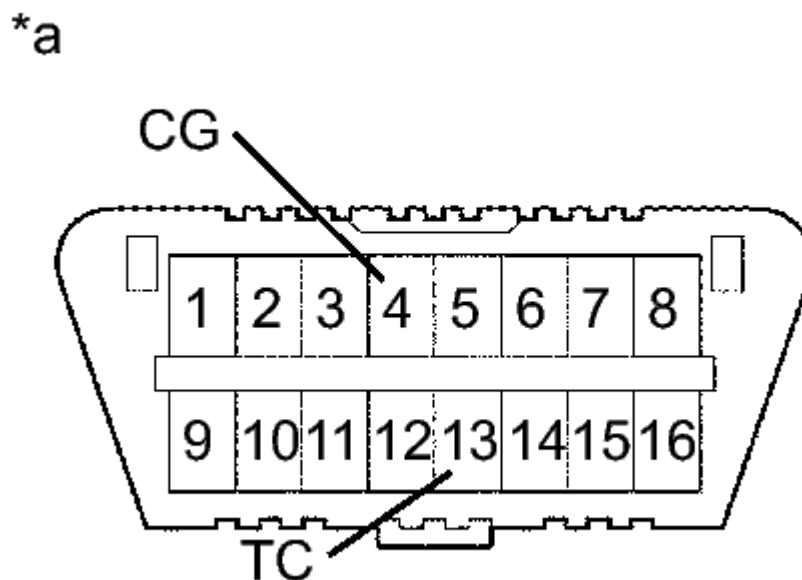


Fig. 1: Identifying DLC3 Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front view of DLC3
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- SST: 09843-18040

NOTE:

- Be sure to connect the terminals correctly. Failure to do this can damage the engine.

4. Connect the clip of the timing light to the wire harness.

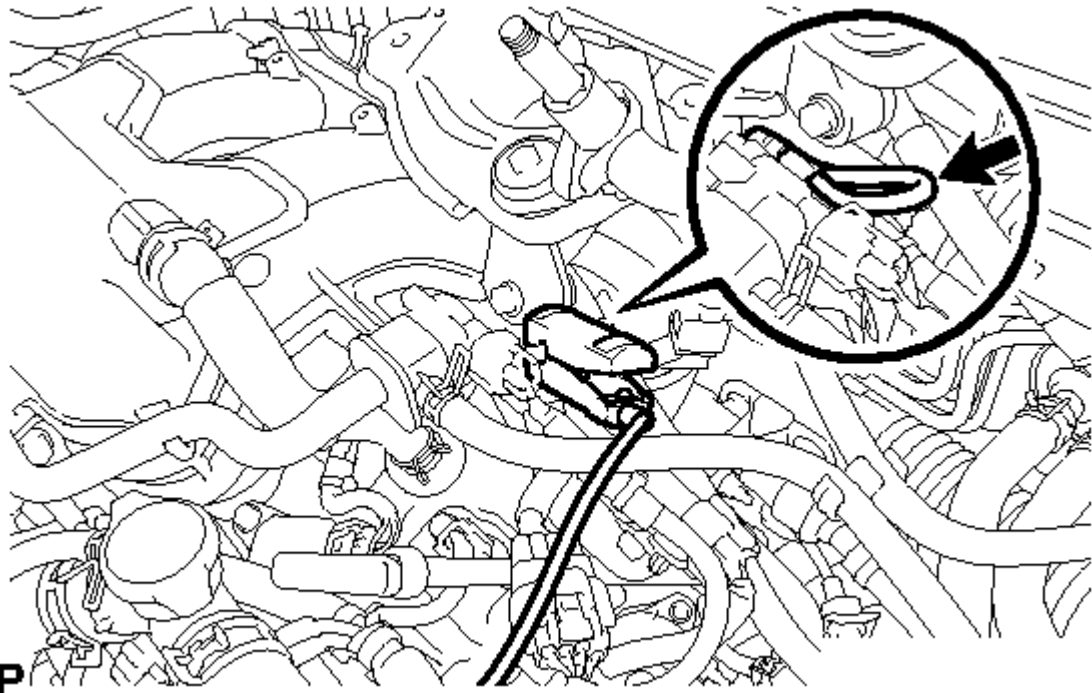


Fig. 2: Identifying Clip Of Timing Light On Wire Harness

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

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

5. Inspect the ignition timing at idle.

Standard ignition timing

8 to 12 degrees BTDC

NOTE: When checking the ignition timing, the transaxle should be in neutral or park.

HINT:

After running the engine at 1000 to 1300 RPM for 5 seconds, check that it returns to idle speed.

6. Disconnect SST from terminals 13 (TC) and 4 (CG) of the DLC3.
7. Inspect the ignition timing at idle.

Standard ignition timing

-5 to 5 degrees BTDC

8. Confirm that the ignition timing advances when the engine RPM is increased.
9. Remove the timing light.
10. Install the No. 1 engine cover See step 5.
11. Install the No. 3 engine under cover See step 79.

9. INSPECT ENGINE IDLE SPEED

NOTE:

- Turn all electrical systems and the A/C off.
- Inspect the idle speed with the cooling fans off.
- When checking the idle speed, the transaxle should be in neutral or park.

- a. Warm up and stop the engine.
- b. Connect the Techstream to the DLC3.
- c. Start the engine and run it at idle.
- d. Turn the Techstream on.
- e. Enter the following menus: Powertrain / Engine and ECT / Data List / Engine Speed.

HINT:

Refer to the Techstream operator's manual for further details.

- f. Inspect the engine idle speed.

Standard Idle Speed

600 to 700 RPM

- g. Turn the ignition switch off.
- h. Disconnect the Techstream from the DLC3.

10. INSPECT COMPRESSION

- a. Check for DTCs. Refer to **DTC CHECK / CLEAR** .

HINT:

If any DTC is present, perform troubleshooting in accordance with the procedure for that DTC.

- b. Warm up and stop the engine.
- c. Remove the 4 spark plugs. Refer to **REMOVAL** .

NOTE:

Take care to ensure that foreign objects do not enter the intake manifold.

- d. Disconnect the 4 fuel injector connectors.
- e. Inspect the cylinder compression pressure.

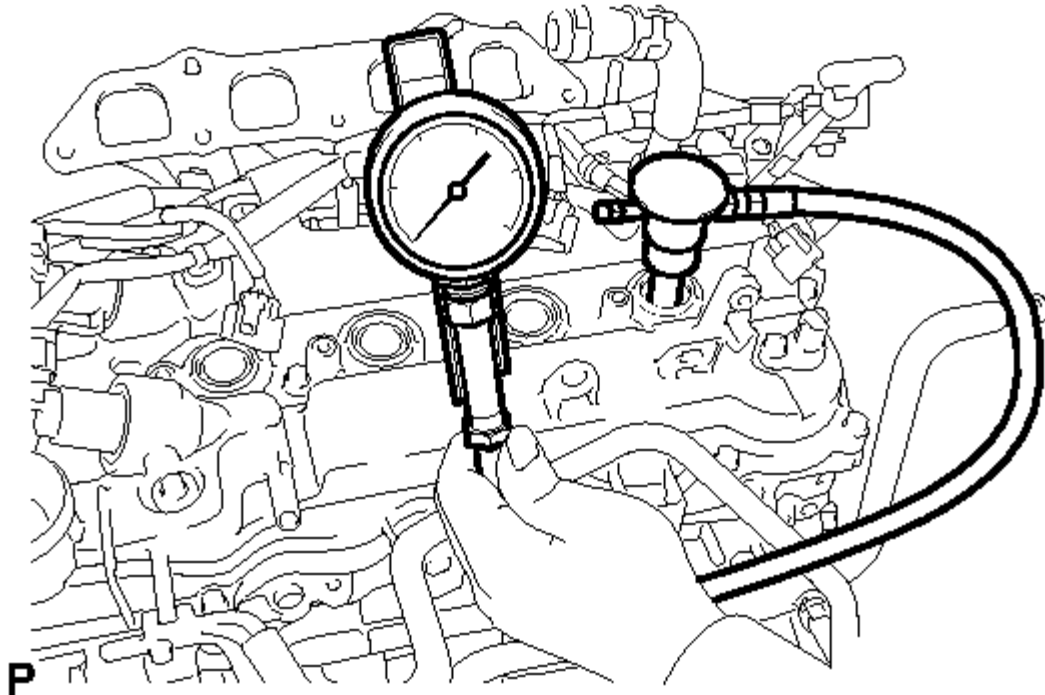


Fig. 3: Inspecting Cylinder Compression Pressure

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

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

Standard compression pressure

1200 kPa (12.2 kgf/cm² , 174 psi)

Minimum pressure

900 kPa (9.1 kgf/cm² , 131 psi)

Difference between each cylinder

98 kPa (1.0 kgf/cm² , 14.2 psi) or less

NOTE:

- Use a fully-charged battery so that the engine speed can be increased to 250 RPM or more.
- Inspect the other cylinders in the same way.
- Measure the compression in as a short time as possible.

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

HINT:

- If adding oil increases the compression, the piston rings and/or cylinder bore may be worn or damaged.
 - If the pressure stays low, the valve may be stuck or seated improperly, or there may be leakage from the gasket.
- f. Connect the 4 fuel injector connectors.
 - g. Install the 4 spark plugs. Refer to **INSTALLATION**.
 - h. Clear the DTC. Refer to **DTC CHECK / CLEAR**.
 - i. Check for DTCs. Refer to **DTC CHECK / CLEAR**.

HINT:

Reinstall the sensors, connectors, etc. and restore the previous vehicle conditions before rechecking for DTCs.

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

This check determines whether or not the idle CO/HC complies with local regulations.

- a. Start 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. Check the CO/HC concentration during idle and when the engine is running at 2500 RPM.

HINT:

When doing the 2 mode (with the engine idling/ running at 2500 RPM) test, the measurement procedures are determined by applicable local regulations.

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

1. Check the A/F sensor and heated oxygen sensor operation.
2. See the table below for possible causes, and then inspect the applicable parts and repair them if necessary.

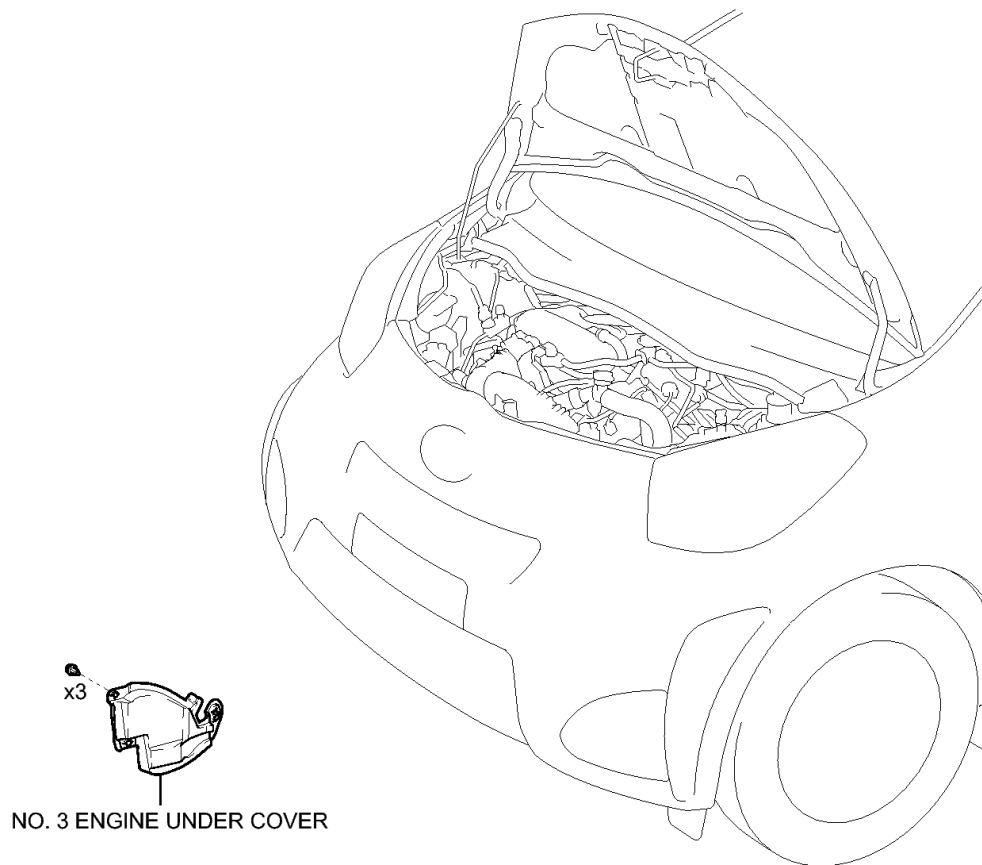
CO	HC	Problem	Possible Cause
			a. Faulty ignition:

Normal	High	Rough idle	• Incorrect timing • Fouled, shorted or improperly gapped plugs b. Incorrect valve clearance c. Leakage from intake and exhaust valves d. Leakage from cylinders
Low	High	Rough idle (Fluctuating HC reading)	a. Vacuum leaks: • PCV hoses • Intake manifold • Throttle body • Brake booster line b. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	a. Restricted air cleaner filter element b. Plugged PCV valve c. Faulty EFI system: • Faulty pressure regulator • Faulty engine coolant temperature sensor • Faulty mass air flow meter • Faulty ECM • Faulty injectors • Throttle body

DRIVE BELT

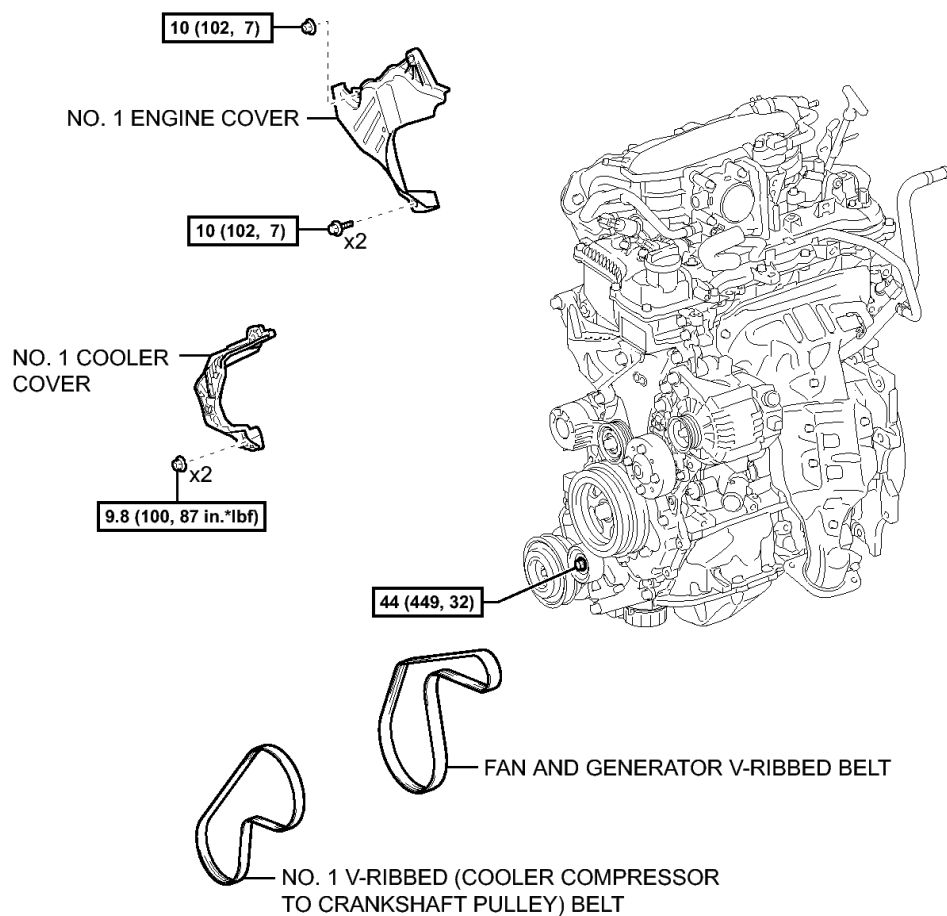
COMPONENTS

ILLUSTRATION



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Fig. 4: Identifying Drive Belt Replacement Components (1 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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

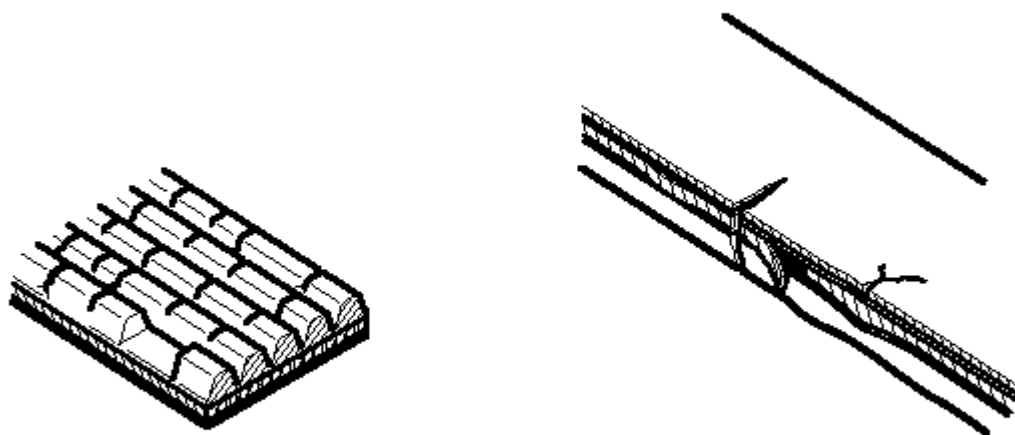
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Fig. 5: Identifying Drive Belt Replacement Components With Torque Specifications (2 Of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ON-VEHICLE INSPECTION

ON-VEHICLE INSPECTION

1. **REMOVE NO. 3 ENGINE UNDER COVER** See step 12
2. **REMOVE NO. 1 COOLER COVER** See step 2
3. **REMOVE NO. 1 ENGINE COVER** See step 3
4. **INSPECT FAN AND GENERATOR V-RIBBED BELT**

**P****Fig. 6: Inspecting Fan And Generator V Belt**

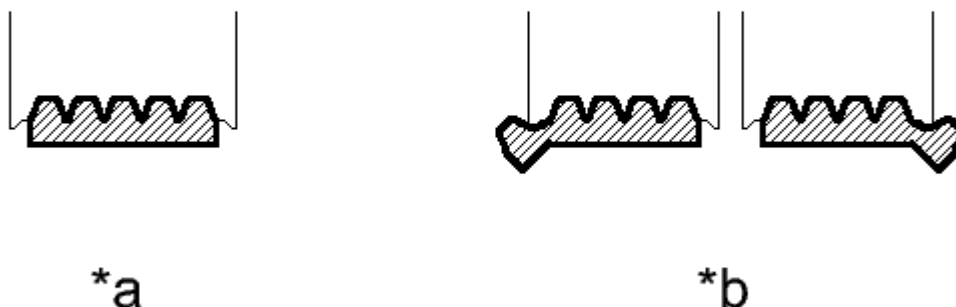
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Check the belt for wear, cracks or other signs of damage.

If any of the following defects is found, replace the V-ribbed belt.

HINT:

- The belt is cracked.
 - The belt is worn out to the extent that the cords are exposed.
 - The belt has chunks missing from the ribs.
- b. Check that the belt fits properly in the ribbed grooves.

**P****Fig. 7: Identifying Correct And Incorrect Ribbed Grooves**

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

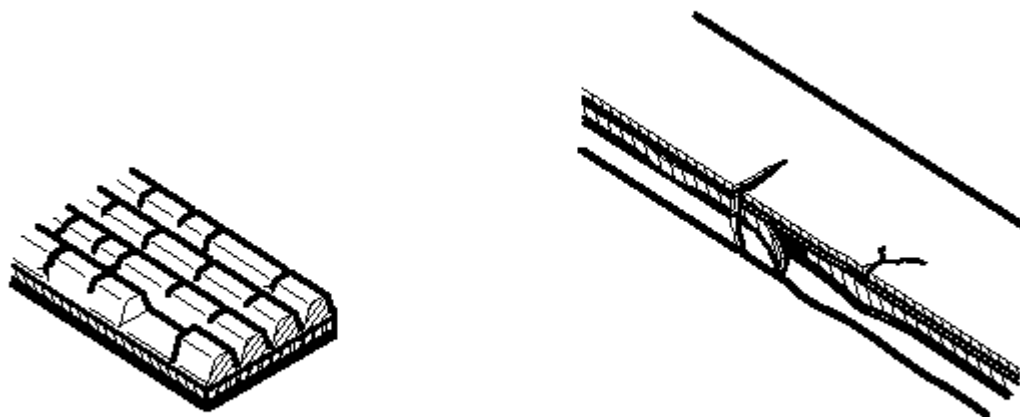
TEXT IN ILLUSTRATION

*a	Correct
*b	Incorrect

HINT:

Check with your hand to confirm that the belt has not slipped out of the grooves on the bottom of the pulley. If it has slipped out, replace the V-ribbed belt. Install a new V-ribbed belt correctly.

5. INSPECT NO. 1 V-RIBBED (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT

**P****Fig. 8: Checking Belt Condition**

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

- a. Check the belt for wear, cracks or other signs of damage.

If any of the following defects is found, replace the No. 1 V-ribbed belt.

HINT:

- The belt is cracked.
 - The belt is worn out to the extent that the cords are exposed.
 - The belt has chunks missing from the ribs.
- b. Check that the belt fits properly in the ribbed grooves.



*a



*b

P**Fig. 9: Identifying Correct And Incorrect Ribbed Grooves**

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

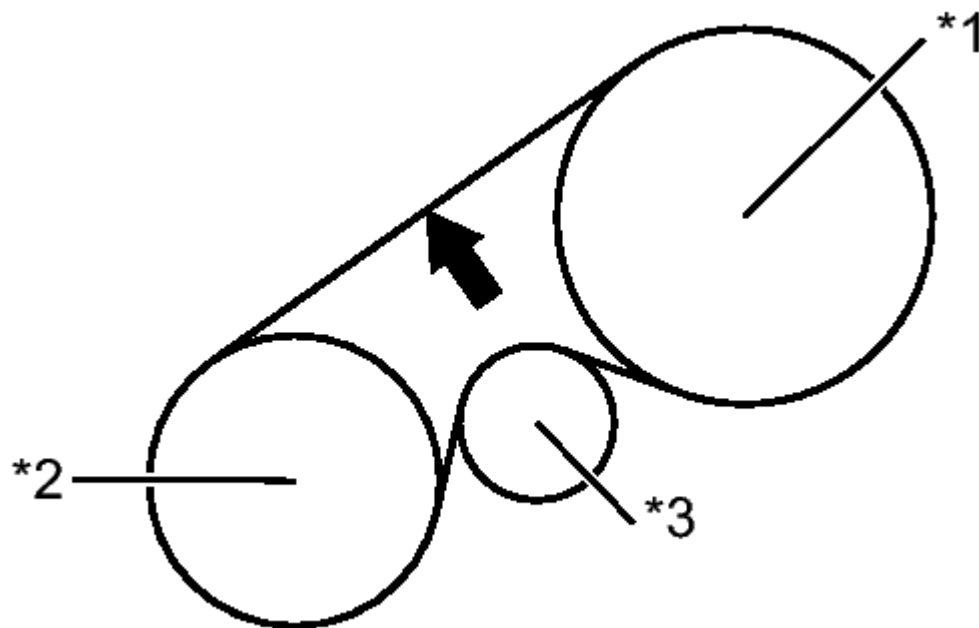
TEXT IN ILLUSTRATION

*a	Correct
*b	Incorrect

HINT:

Check with your hand to confirm that the belt has not slipped out of the grooves on the bottom to the pulley. If it has slipped out, replace the No. 1 V-ribbed belt. Install a new No. 1 V-ribbed belt correctly.

- c. Inspect the No. 1 V-ribbed belt deflection.



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Fig. 10: View Of Drive Belt Routing And Pulleys

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

TEXT IN ILLUSTRATION

*1	Crankshaft
*2	A/C Compressor
*3	Tensioner
	
	Specified Point

Deflection

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2012 ENGINE Engine Mechanical (Service Information) - iQ

Pressing Force N (kg, lb)	New Belt mm (in.)	Used Belt mm (in.)
10 (10, 22)	8.0 to 10.0 (0.315 to 0.394)	10.0 to 12.0 (0.394 to 0.472)

HINT:

No. 1 V-ribbed belt tension

New Belt N (kg, lb)	Used Belt N (kg, lb)
397 to 593 (40 to 60, 89 to 133)	300 to 398 (31 to 41, 67 to 89)

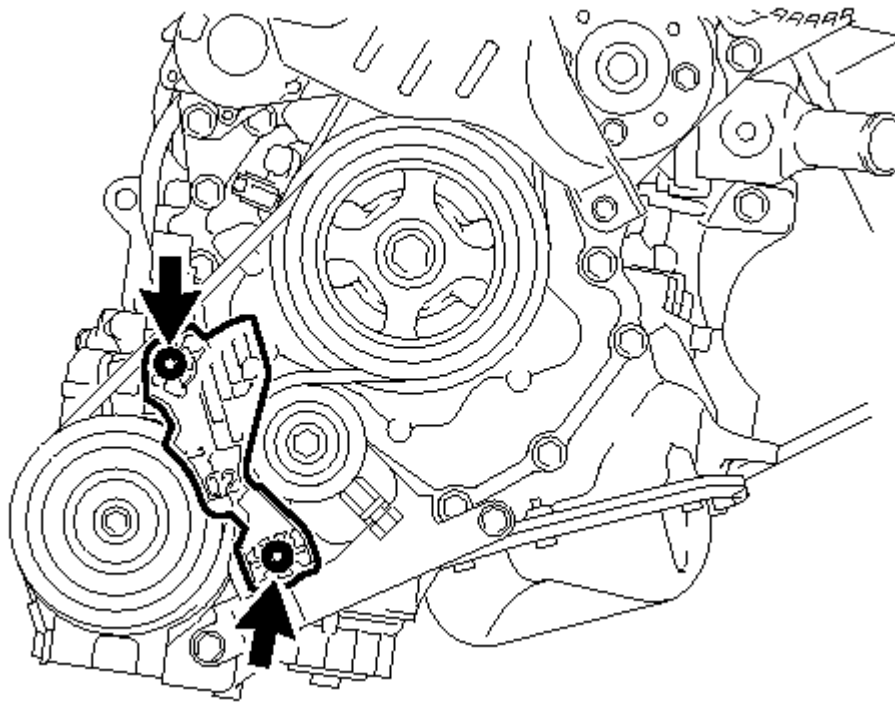
NOTE:

- Check the No. 1 V-ribbed belt deflection at the specified point.
- When installing a new belt, set its deflection value as specified.
- When checking a belt used for over 5 minutes, confirm that the deflection value is within the specified range for a used belt.
- When reinstalling a belt used for over 5 minutes, check whether its deflection value is within the specified range for a used belt.

6. **INSTALL NO. 1 ENGINE COVER** See step 5
7. **INSTALL NO. 1 COOLER COVER** See step 6
8. **INSTALL NO. 3 ENGINE UNDER COVER** See step 79

REMOVAL**REMOVAL**

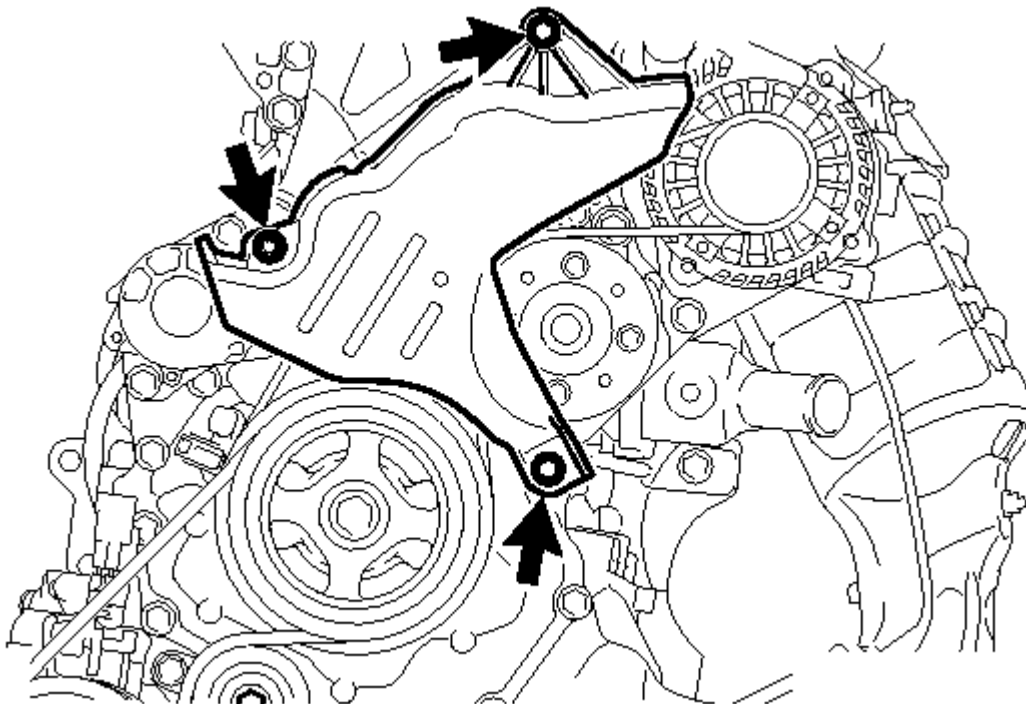
1. **REMOVE NO. 3 ENGINE UNDER COVER** See step 12
2. **REMOVE NO. 1 COOLER COVER**

**H****Fig. 11: Identifying Cooler Cover Nuts**

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

- a. Remove the 2 nuts and the No. 1 cooler cover.

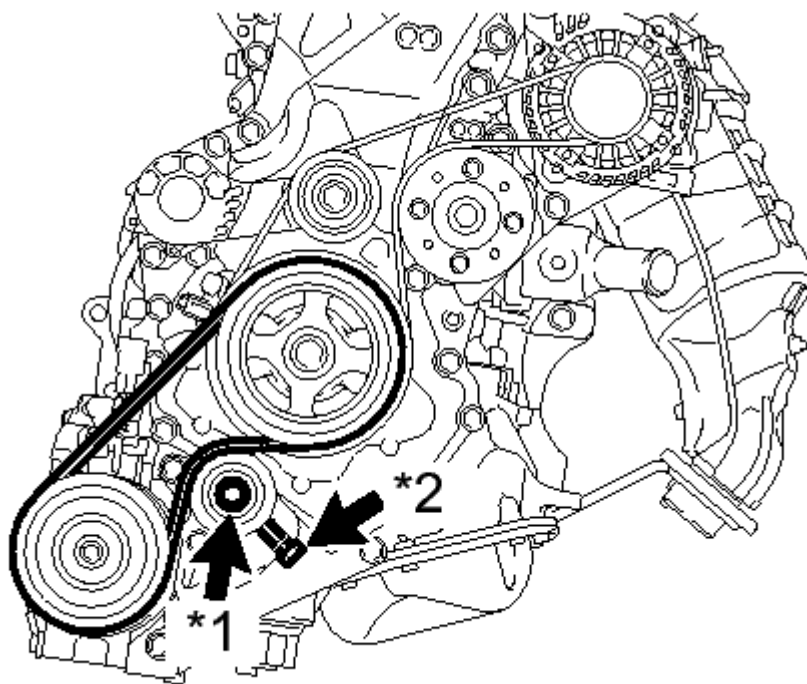
3. REMOVE NO. 1 ENGINE COVER

**Fig. 12: Identifying No. 1 Engine Cover Nut And Bolts**

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

- a. Remove the 2 bolts, nut and the No. 1 engine cover.

4. REMOVE NO. 1 V-RIBBED (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT



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Fig. 13: Identifying Adjusting Bolt B

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

- a. Loosen the bolt A.

TEXT IN ILLUSTRATION

*1	Bolt A
*2	Adjusting Bolt B

- b. Turn adjusting bolt B to release the tension and remove the No. 1 V-ribbed belt from the pulleys.

5. REMOVE FAN AND GENERATOR V-RIBBED BELT

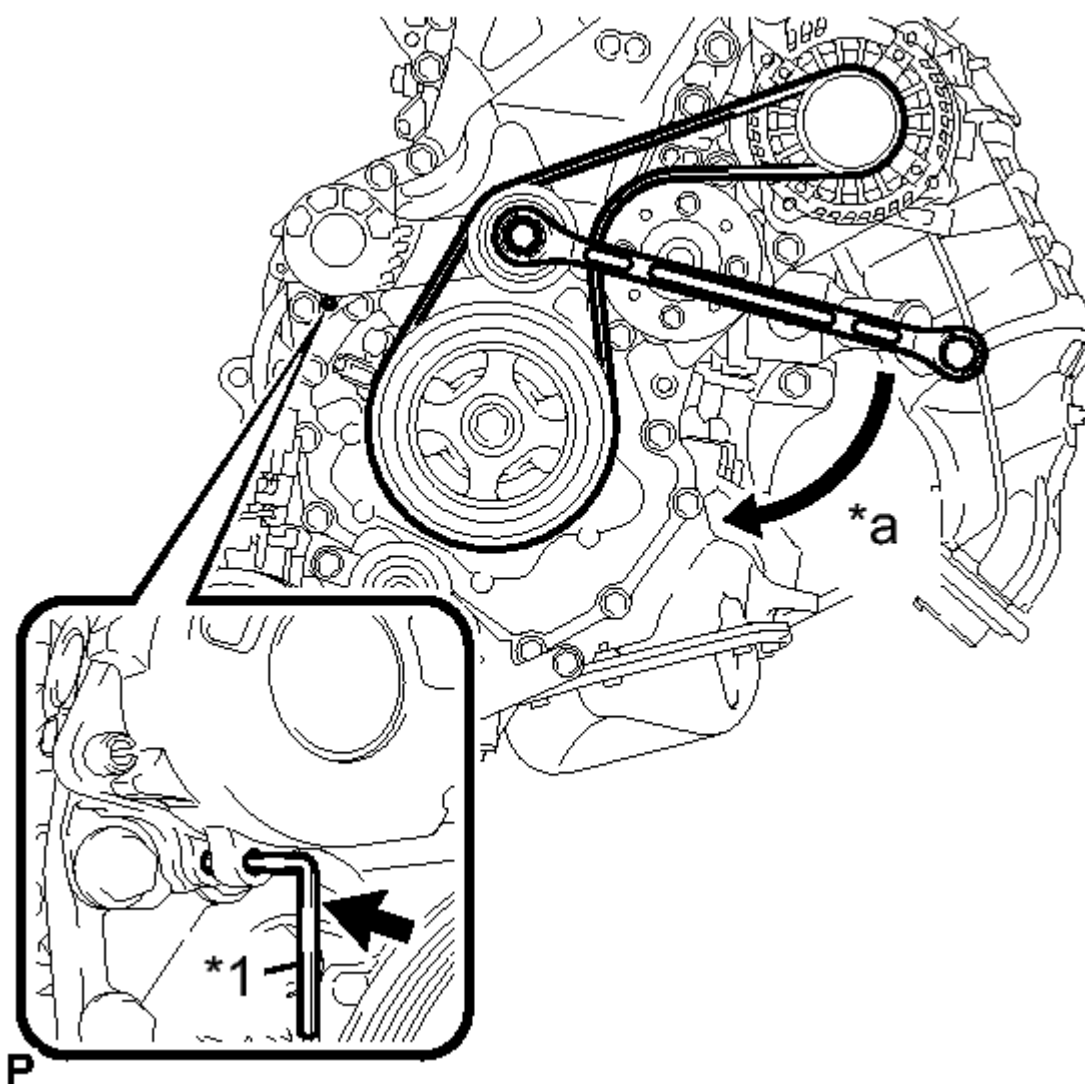


Fig. 14: Removing Fan And Generator V-Ribbed Belt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Release the V-ribbed belt tension by turning the V-ribbed belt tensioner counterclockwise, and remove the V-ribbed belt from the V-ribbed belt tensioner.

TEXT IN ILLUSTRATION

*1	4 mm Bi-hexagon Wrench
*a	Turn

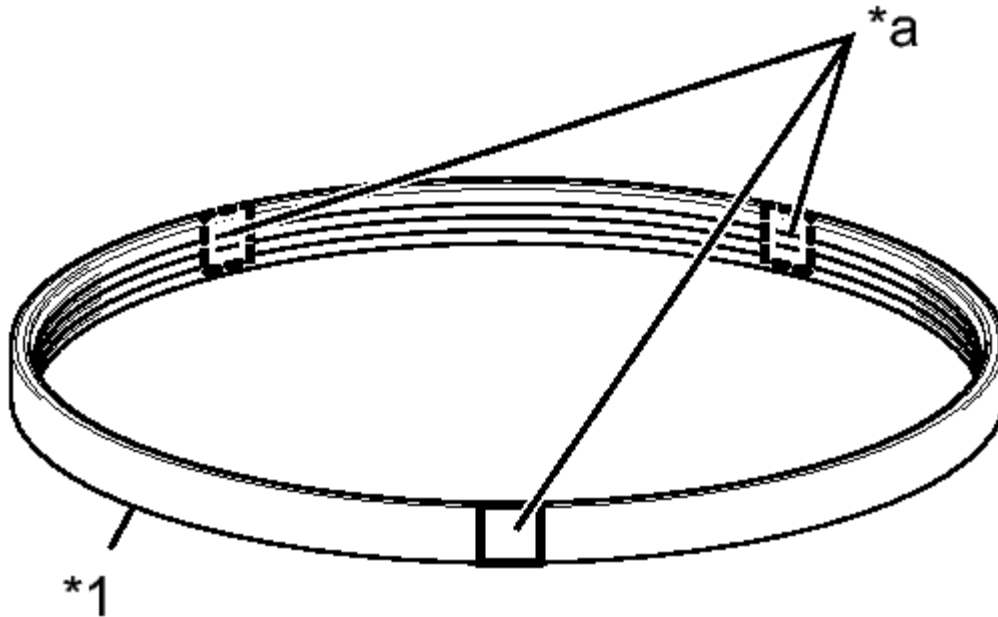
- b. While turning the V-ribbed belt tensioner counterclockwise, align the holes, and then insert a 4 mm bi-hexagon wrench into the holes to fix the V-ribbed belt tensioner in place.

INSTALLATION

INSTALLATION

1. INSTALL FAN AND GENERATOR V-RIBBED BELT

- a. Install the V-ribbed belt.



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Fig. 15: Identifying Paint Marks

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

TEXT IN ILLUSTRATION

*1	V-ribbed belt
*a	Paint Mark

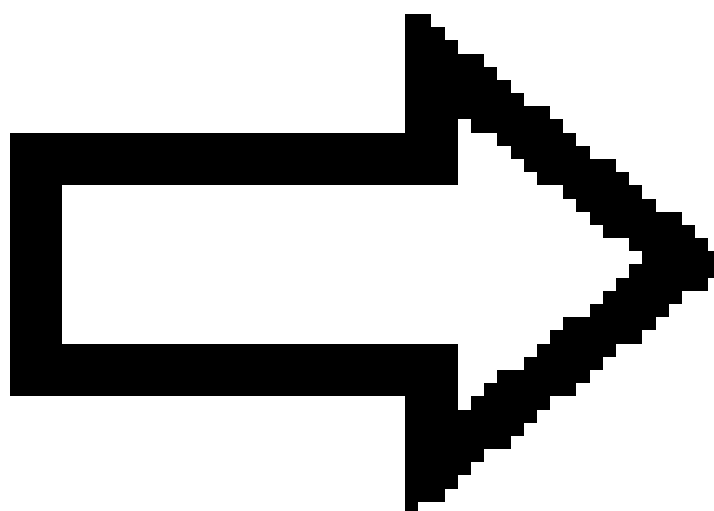
NOTE:

- There are 2 types of V-ribbed belt. The type to use depends on the type of generator, so be sure to confirm the belt type before installing.

Generator	Paint Mark
80 A	Blue
100 A	Red

- Before installing the V-ribbed belt, check each pulley for any liquid or chips.
- Check that the ribs of the V-ribbed belt are correctly fitted into the grooves of the pulleys.

- b. Turn the V-ribbed belt tensioner clockwise and remove the 4 mm bi-hexagon wrench.

Specified
Point

Deflection

Pressing Force N (kg, lb)	New Belt mm (in.)	Used Belt mm (in.)
10 (10, 22)	8.0 to 10.0 (0.315 to 0.394)	10.0 to 12.0 (0.394 to 0.472)

c. Tighten bolt A.

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

3. **INSPECT FAN AND GENERATOR V-RIBBED BELT** See step 4
4. **INSPECT NO. 1 V-RIBBED (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT**
See step 5
5. **INSTALL NO. 1 ENGINE COVER**

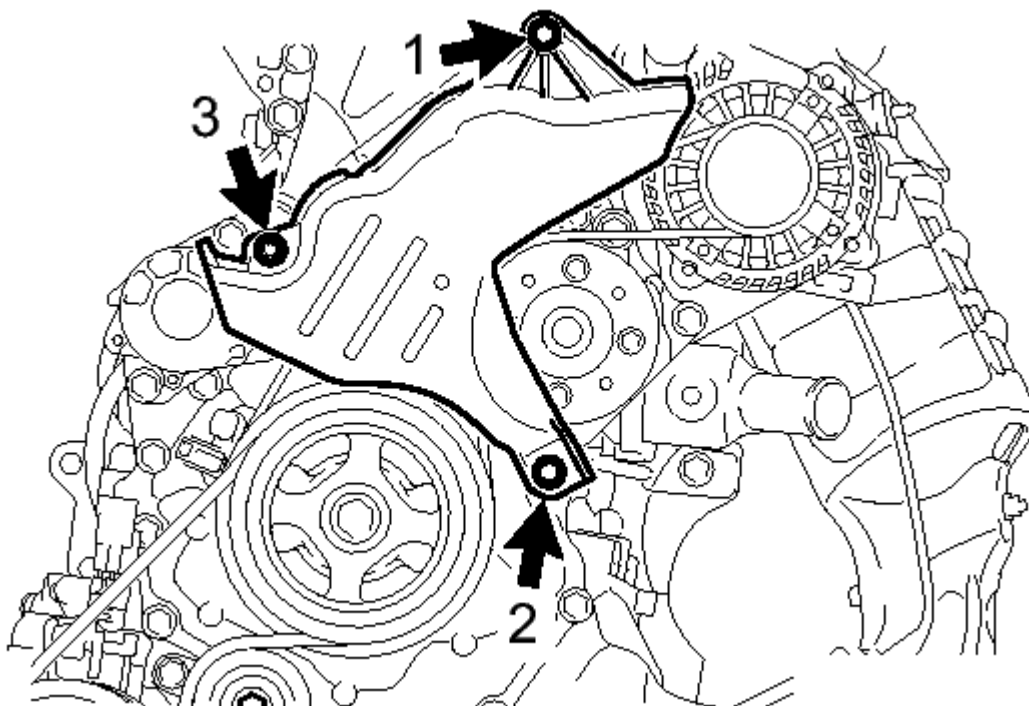


Fig. 17: Identifying No. 1 Engine Cover Nut And Bolts

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

- a. Temporarily install the No. 1 engine cover with the 2 bolts and nut.
- b. Fully tighten the 2 bolts and nut in the order shown in the illustration.

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

6. INSTALL NO. 1 COOLER COVER

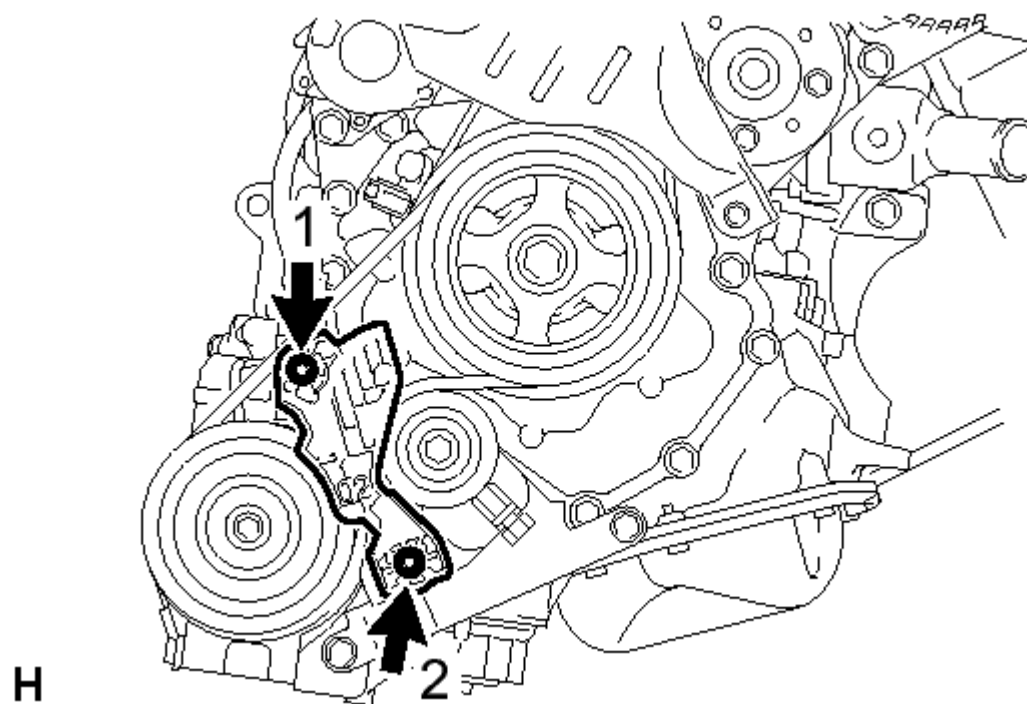


Fig. 18: Identifying Cooler Cover Nuts

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

- Temporarily install the No. 1 cooler cover with the 2 nuts.
- Fully tighten the 2 nuts in the order shown in the illustration.

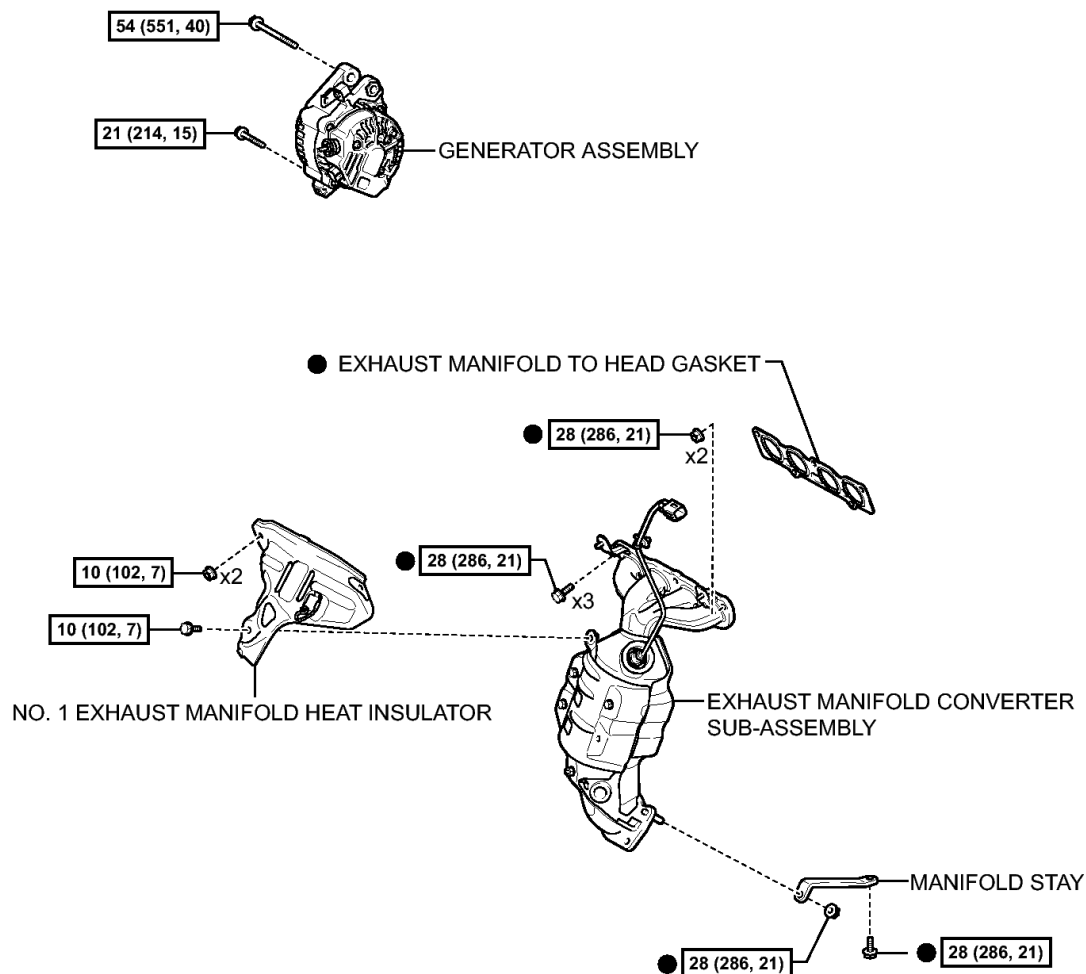
Torque: 9.8 N*m (100 kgf*cm, 87 in.*lbf)

7. INSTALL NO. 3 ENGINE UNDER COVER See step 79

CAMSHAFT

COMPONENTS

ILLUSTRATION

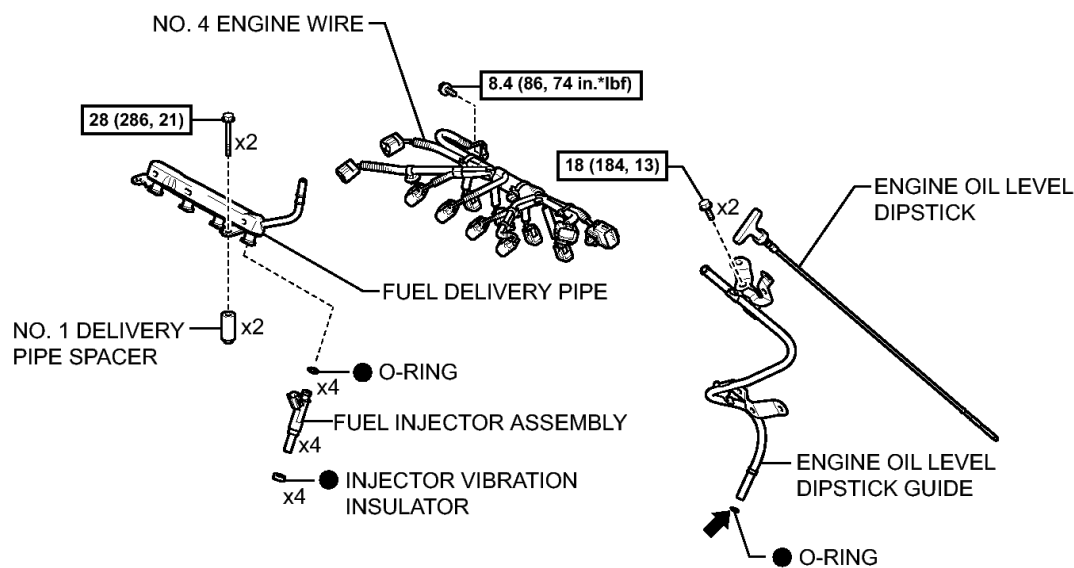
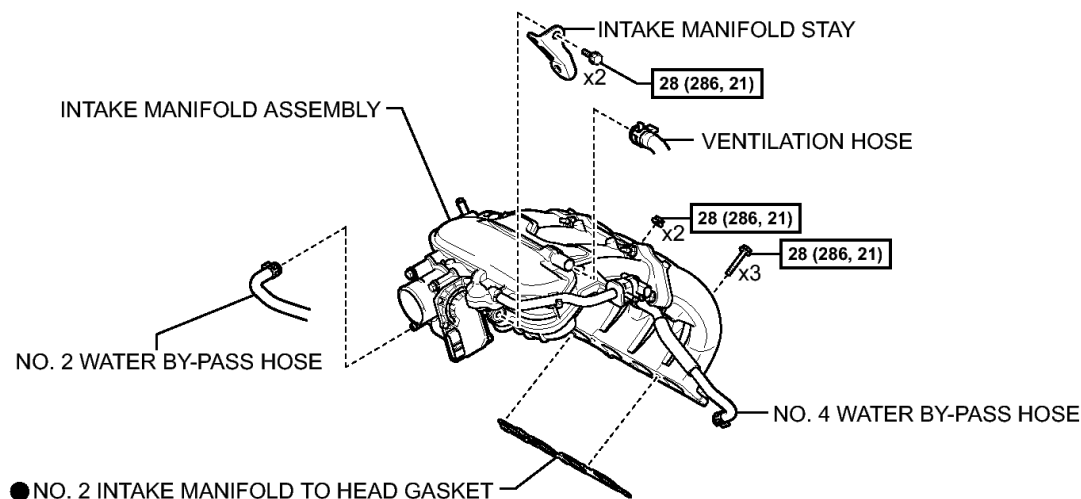


N*m (kgf*cm, ft.*lbf): Specified torque

● Non-reusable part

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Fig. 19: Identifying Camshaft Replacement Components With Torque Specifications (1 Of 7)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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

● Non-reusable part

← Engine oil

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Fig. 20: Identifying Camshaft Replacement Components With Torque Specifications (2 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

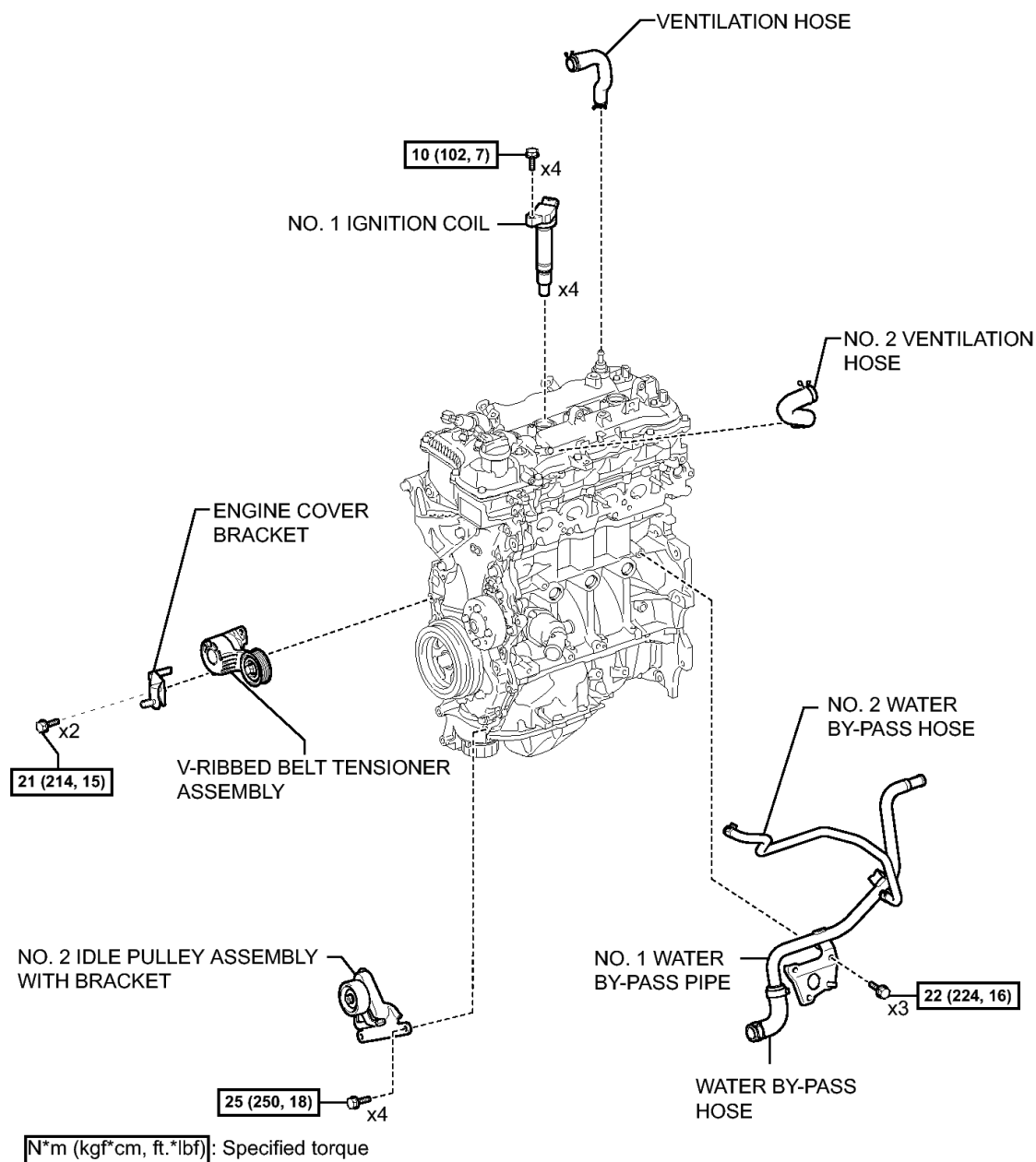


Fig. 21: Identifying Camshaft Replacement Components With Torque Specifications (3 Of 7)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

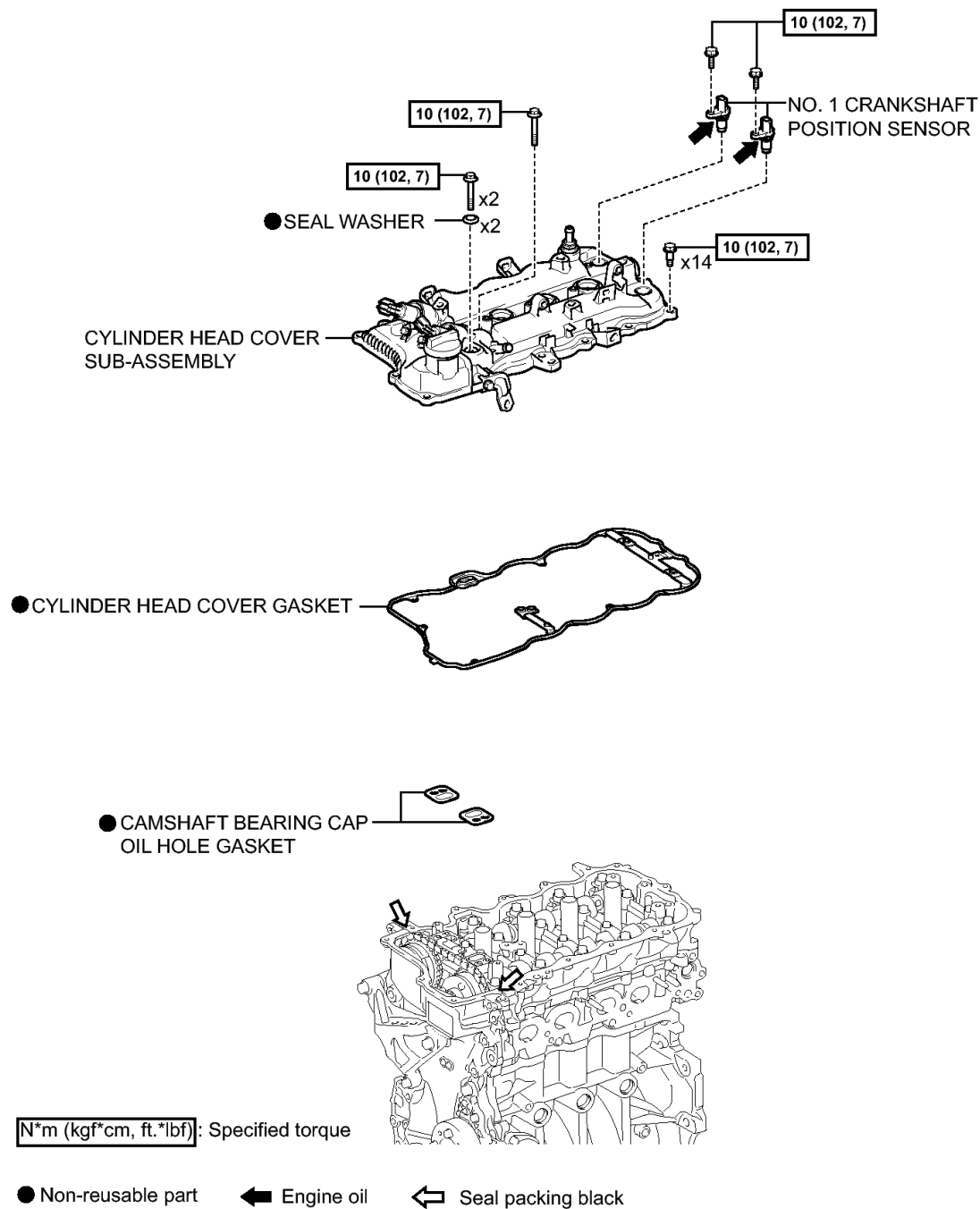


Fig. 22: Identifying Camshaft Replacement Components With Torque Specifications (4 Of 7)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

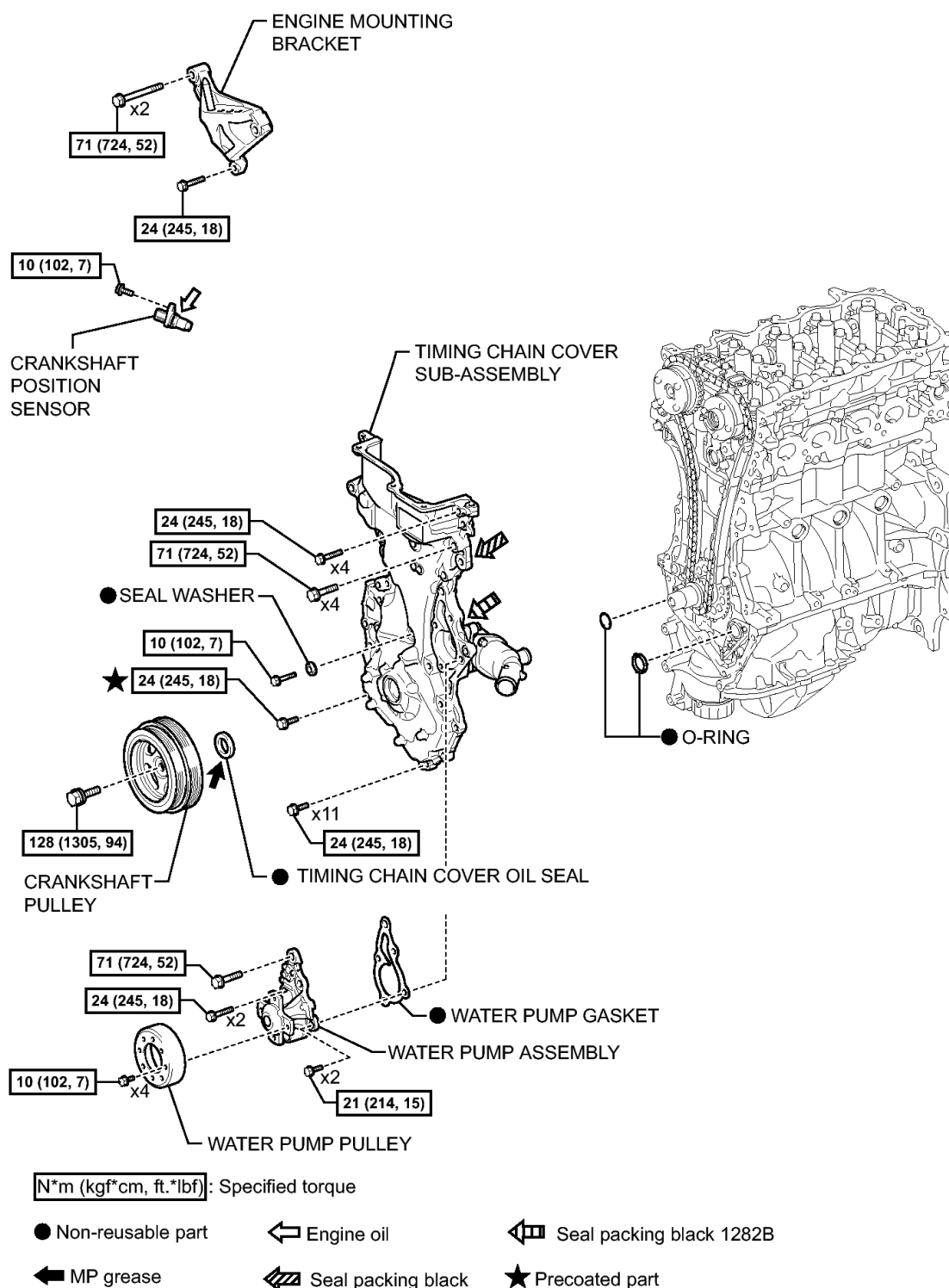
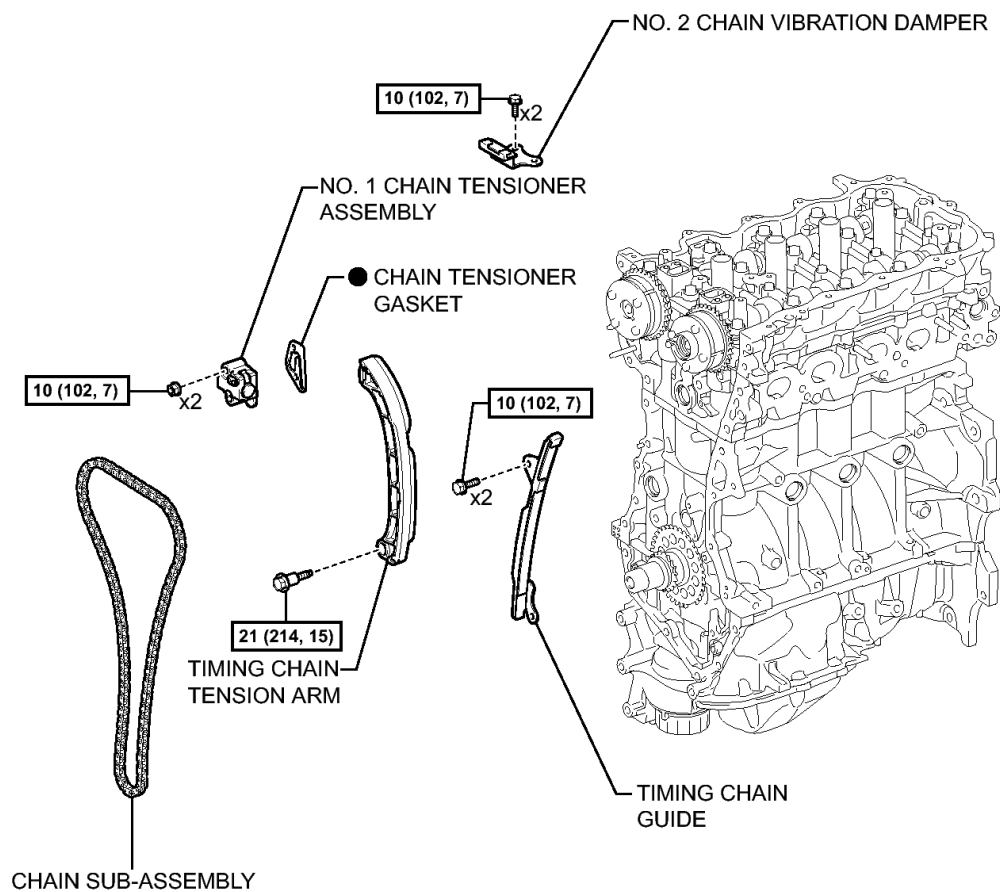


Fig. 23: Identifying Camshaft Replacement Components With Torque Specifications (5 Of 7)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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

● Non-reusable part

Fig. 24: Identifying Camshaft Replacement Components With Torque Specifications (6 Of 7)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



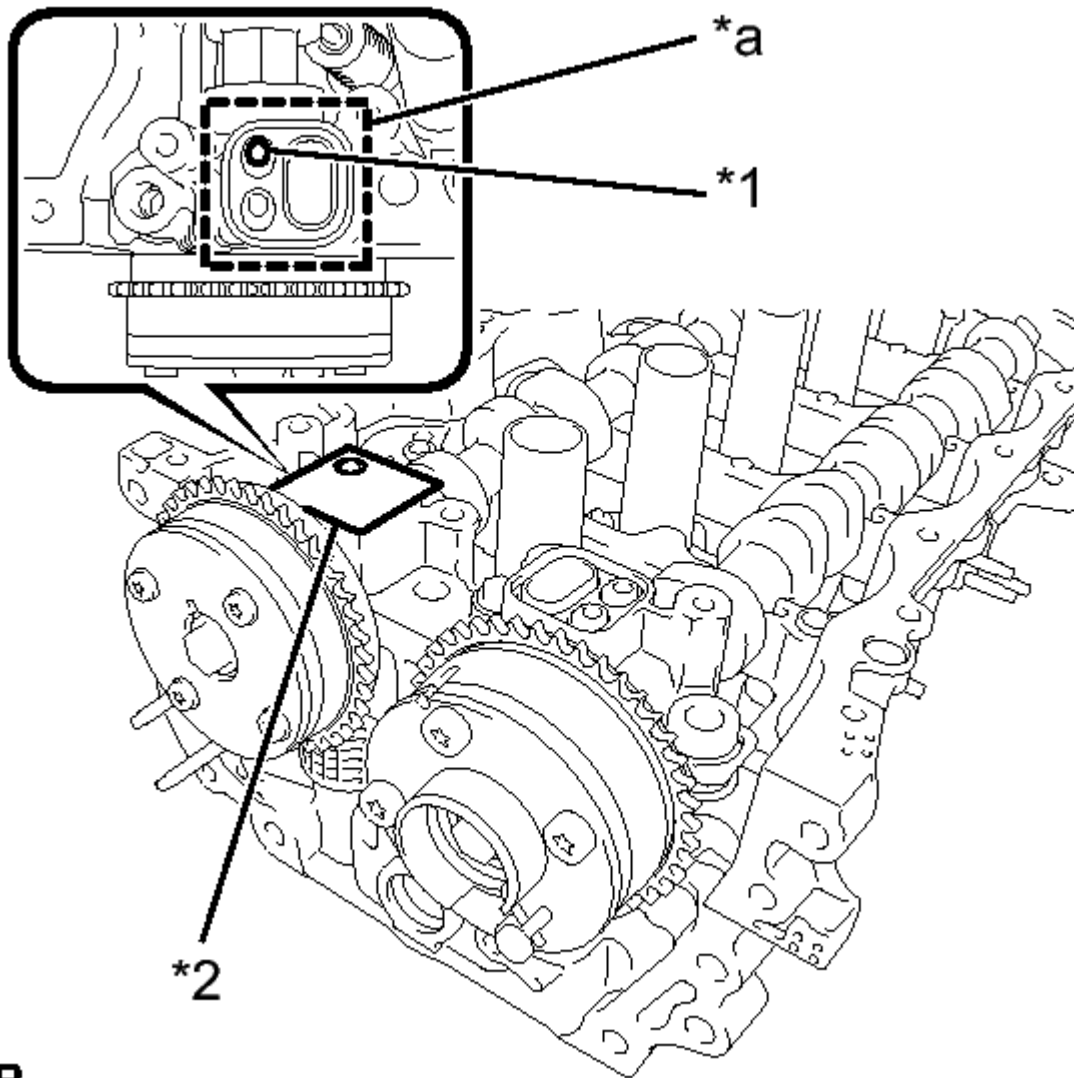
REMOVAL

REMOVAL**1. REMOVE ENGINE ASSEMBLY WITH TRANSAXLE**

Refer to **REMOVAL**

- 2. REMOVE GENERATOR ASSEMBLY** See step 1
- 3. REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR** See step 2
- 4. REMOVE MANIFOLD STAY** See step 3
- 5. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY** See step 4
- 6. DISCONNECT VENTILATION HOSE** See step 5
- 7. DISCONNECT NO. 2 WATER BY-PASS HOSE** See step 6
- 8. DISCONNECT NO. 4 WATER BY-PASS HOSE** See step 7
- 9. REMOVE INTAKE MANIFOLD STAY** See step 8
- 10. REMOVE INTAKE MANIFOLD ASSEMBLY** See step 9
- 11. REMOVE NO. 4 ENGINE WIRE** See step 10
- 12. REMOVE ENGINE OIL LEVEL DIPSTICK**
- 13. REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE** See step 12
- 14. REMOVE FUEL DELIVERY PIPE** . Refer to **REMOVAL - Step 5**
- 15. REMOVE FUEL INJECTOR ASSEMBLY** . Refer to **REMOVAL - Step 6**
- 16. REMOVE NO. 1 DELIVERY PIPE SPACER** . Refer to **REMOVAL - Step 7**
- 17. REMOVE INJECTOR VIBRATION INSULATOR** . Refer to **REMOVAL - Step 8**
- 18. REMOVE NO. 1 IGNITION COIL** See step 18
- 19. REMOVE VENTILATION HOSE** See step 19
- 20. REMOVE NO. 2 VENTILATION HOSE** See step 20
- 21. REMOVE NO. 1 WATER BY-PASS PIPE** See step 21
- 22. REMOVE NO. 2 IDLE PULLEY ASSEMBLY WITH BRACKET** See step 22
- 23. REMOVE V-RIBBED BELT TENSIONER ASSEMBLY** See step 23
- 24. REMOVE NO. 1 CRANKSHAFT POSITION SENSOR** See step 6
- 25. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY** See step 8
- 26. REMOVE CAMSHAFT BEARING CAP OIL HOLE GASKET** See step 9
- 27. REMOVE CRANKSHAFT POSITION SENSOR** See step 10
- 28. REMOVE WATER PUMP PULLEY** See step 15
- 29. REMOVE CRANKSHAFT PULLEY** See step 17
- 30. REMOVE TIMING CHAIN COVER SUB-ASSEMBLY** . Refer to **REMOVAL - Step 26**
- 31. REMOVE TIMING CHAIN COVER OIL SEAL** . Refer to **REMOVAL - Step 28**
- 32. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY** See step 25
- 33. REMOVE NO. 2 CHAIN VIBRATION DAMPER** See step 26
- 34. REMOVE TIMING CHAIN TENSION ARM** See step 27

35. **REMOVE CHAIN SUB-ASSEMBLY** See step 28
36. **REMOVE TIMING CHAIN GUIDE** See step 29
37. **INSPECT CAMSHAFT TIMING GEAR ASSEMBLY**
 - a. Inspect the lock of the camshaft timing gear.
 - b. After cleaning and degreasing the VVT oil hole on the intake side of the No. 1 camshaft bearing cap, completely seal the oil hole with adhesive tape or equivalent as shown in the illustration to prevent air from leaking.



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Fig. 26: Sealing The Oil Hole

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

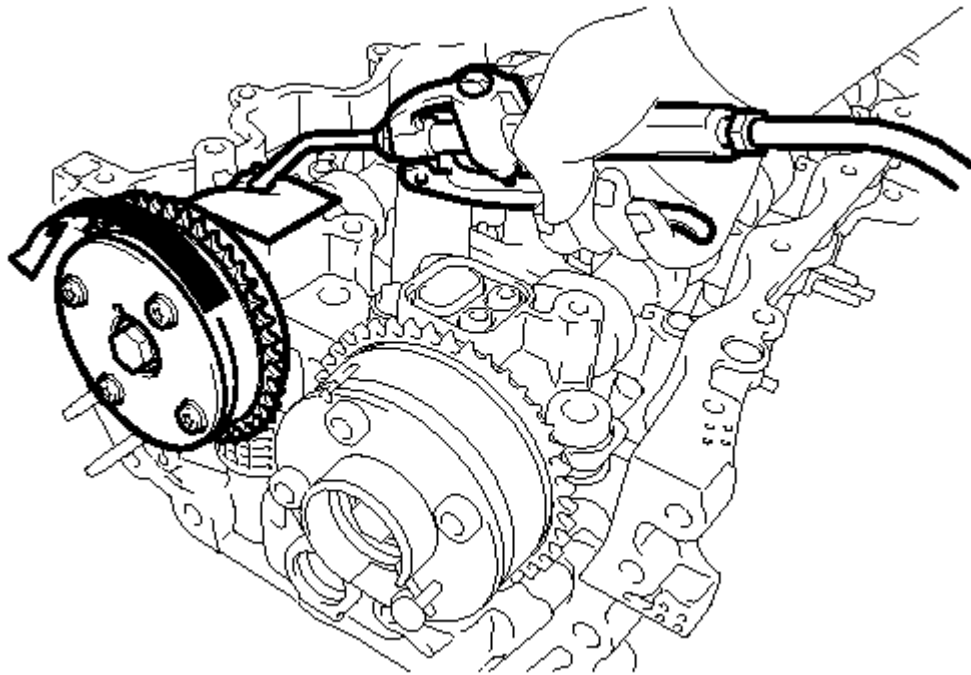
TEXT IN ILLUSTRATION

*1	Prick a Hole
*2	Adhesive Tape

*a	Adhesive Tape Sealing Area
----	----------------------------

NOTE: Be sure to seal the oil hole completely because air leaks due to insufficient sealing will prevent the lock pin from being released.

- c. Prick a hole in the tape covering the oil hole as shown in the illustration (Procedure A).
- d. Apply approximately 150 kPa (1.5 kgf/cm², 22 psi) of air pressure to the hole pricked in procedure A to release the lock pin.



P

Fig. 27: Applying Air Pressure To The Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- If air leaks out, reattach adhesive tape.
- Cover the oil hole with a piece of cloth when applying air pressure to prevent oil from spraying.

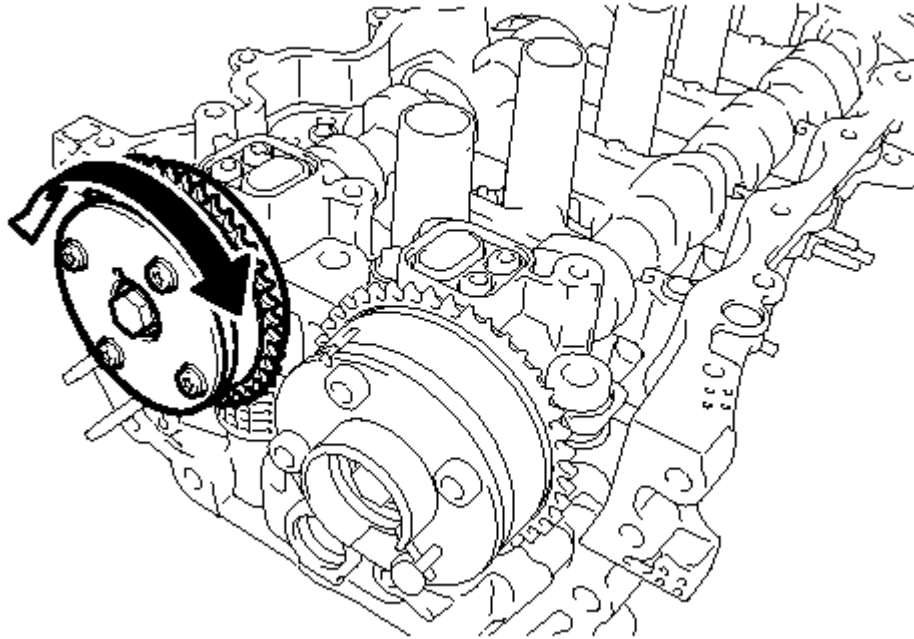
- e. Forcibly turn the camshaft timing gear assembly in the advance direction (counterclockwise).

HINT:

Depending on the air pressure applied, the camshaft timing gear assembly may turn in the advance direction without assistance by hand.

- f. Turn the camshaft timing gear assembly within its movable range (26.5 to 28.5°) 2 or 3 times without turning it to the most retarded position. Make sure that the camshaft timing gear assembly

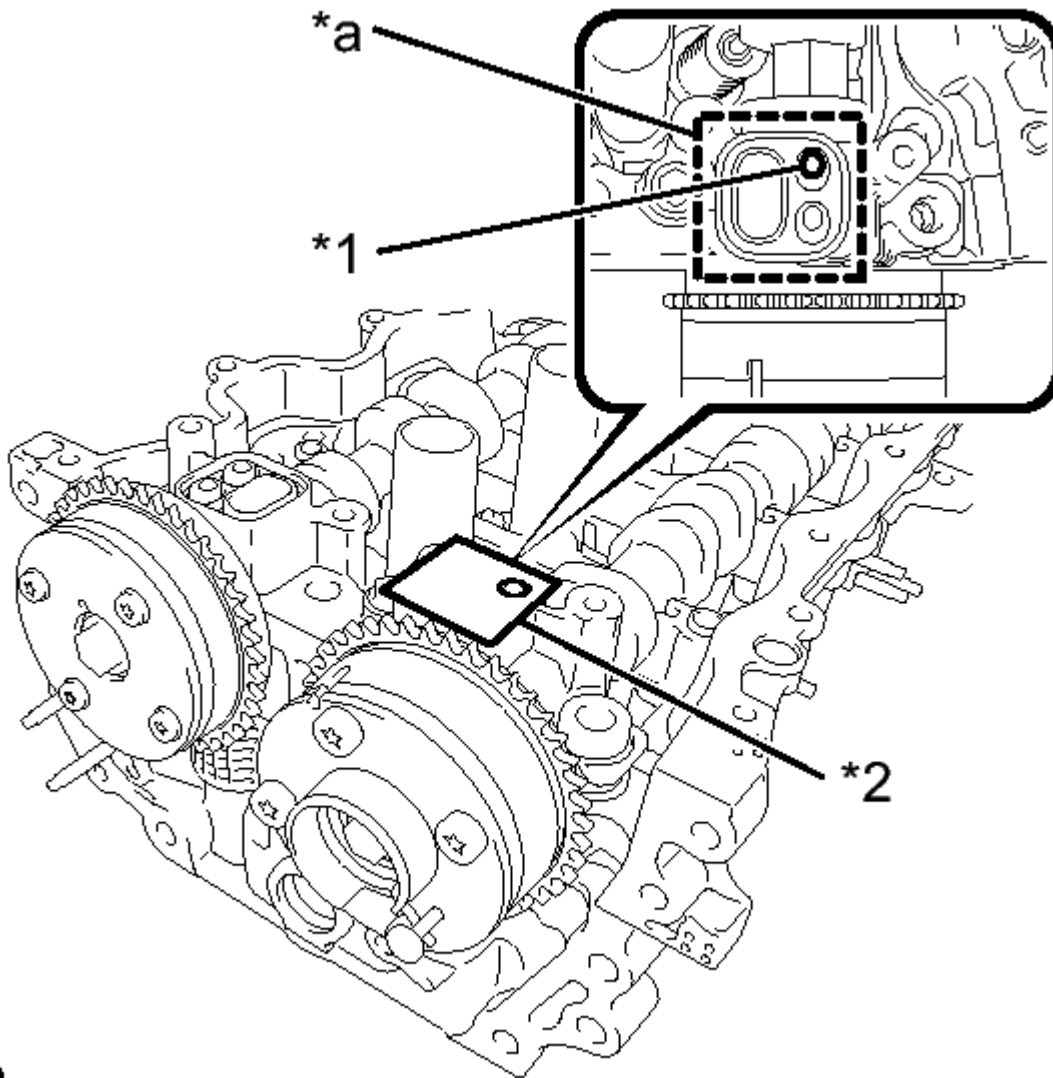
turns smoothly.



P

Fig. 28: Turning Camshaft Timing Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Remove the adhesive tape from the No. 1 camshaft bearing cap.
38. **INSPECT CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY**
- a. Check the lock of the camshaft timing exhaust gear.
 - b. After cleaning and degreasing the VVT oil hole on the exhaust side of the No. 1 camshaft bearing cap, completely seal the oil hole with adhesive tape or equivalent as shown in the illustration to prevent air from leaking.



P

Fig. 29: Sealing The Oil Hole

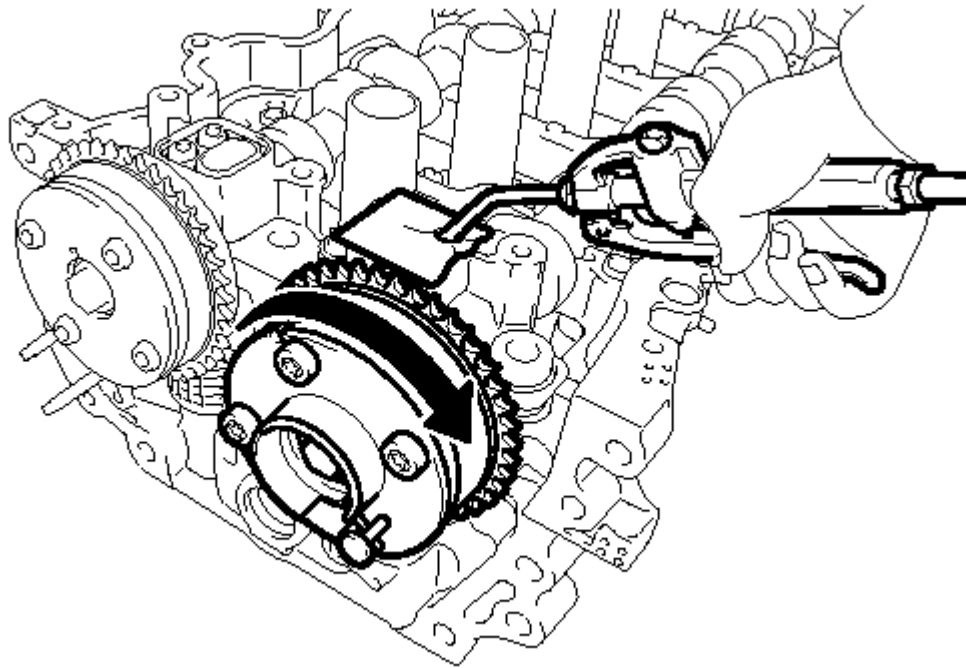
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Prick a Hole
*2	Adhesive Tape
*a	Adhesive Tape Sealing Area

NOTE: Be sure to seal the oil hole completely because air leaks due to insufficient sealing will prevent the lock pin from being released.

- c. Prick a hole in the tape covering the oil hole as shown in the illustration (Procedure B).
- d. Apply approximately 200 kPa (2.0 kgf/cm², 28 psi) of air pressure to the hole pricked in procedure B to release the lock pin.

**P****Fig. 30: Applying Air Pressure To The Hole**

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

NOTE:

- If air leaks out, reattach adhesive tape.
- Cover the oil hole with a piece of cloth when applying air pressure to prevent oil from spraying.

- e. Using a screwdriver with its tip wrapped with tape, forcibly turn the camshaft timing exhaust gear in the retard direction (clockwise).

NOTE:

- Be sure to keep the camshaft timing exhaust gear in the retard direction using a screwdriver. If the gear is released, it will return to the most advanced position automatically due to force from the spring.
- Do not damage the camshaft timing exhaust gear.

- f. Using a screwdriver with its tip wrapped with tape, turn the camshaft timing exhaust gear within its movable range (19 to 21°) 2 or 3 times without turning it to the most advanced position. Make sure that the camshaft timing exhaust gear turns smoothly.

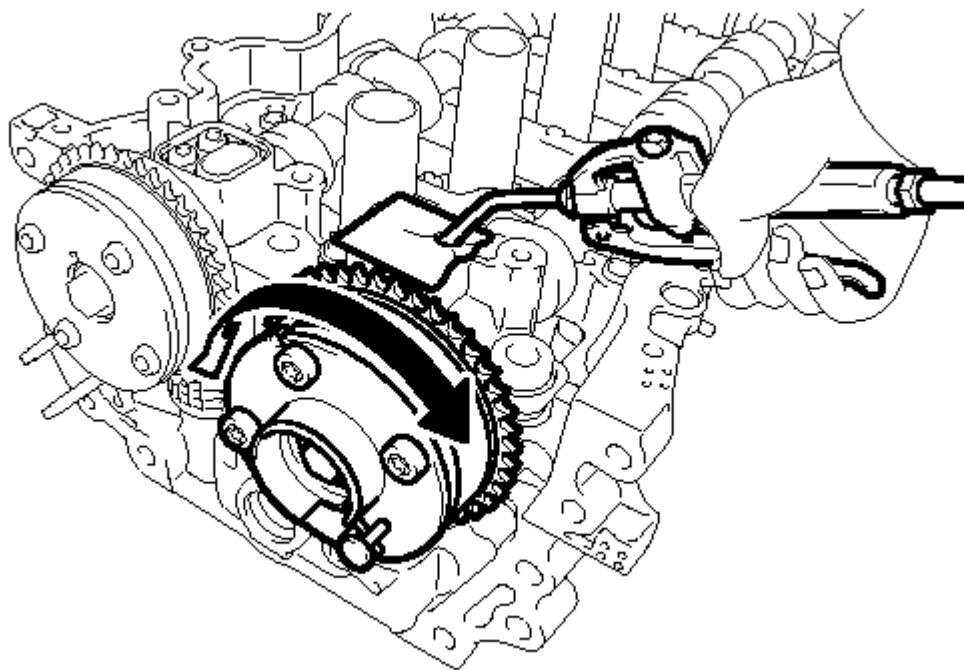
**P**

Fig. 31: Turning Camshaft Timing Exhaust Gear

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

- g. Remove the adhesive tape from the No. 1 camshaft bearing cap.

39. REMOVE CAMSHAFT TIMING GEAR ASSEMBLY

- a. Remove the flange bolt while holding the hexagonal portion of the camshaft, and then remove the camshaft timing gear assembly.

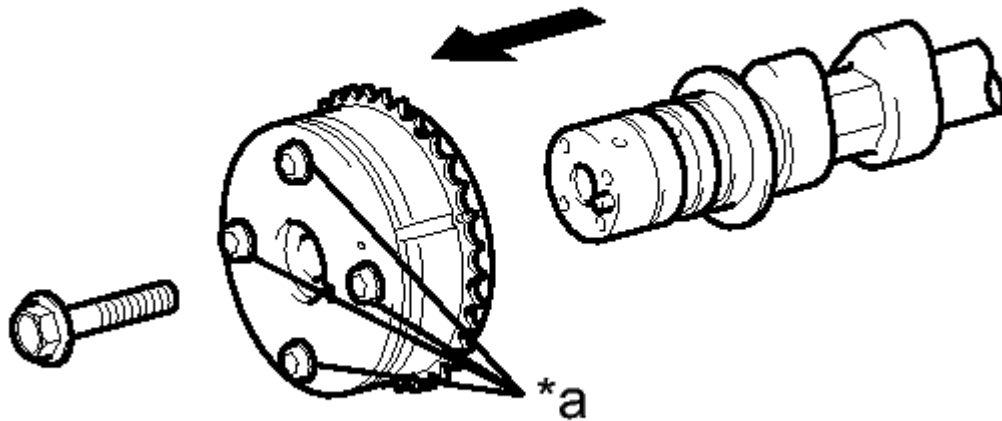
**C**

Fig. 32: Identifying Camshaft Timing Gear Flange Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Do Not Remove
----	---------------

NOTE:

- Before removing the camshaft timing gear, make sure that the lock pin has been released.
- Be sure not to remove the other 4 bolts.
- Keep the camshaft timing gear assembly horizontal while removing it from the camshaft.

40. REMOVE CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY

- a. Remove the flange bolt while holding the hexagonal portion of the camshaft, and then remove the camshaft timing exhaust gear assembly.

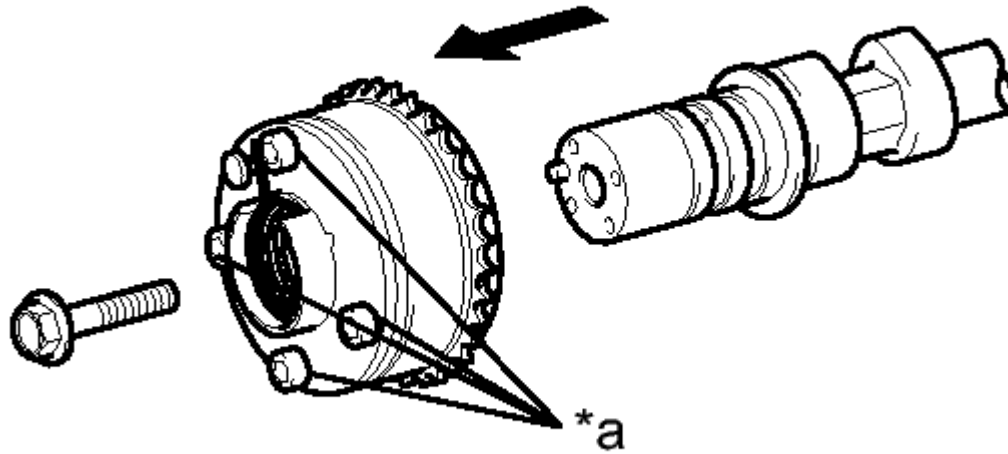
**C**

Fig. 33: Identifying Camshaft Timing Exhaust Gear Flange Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

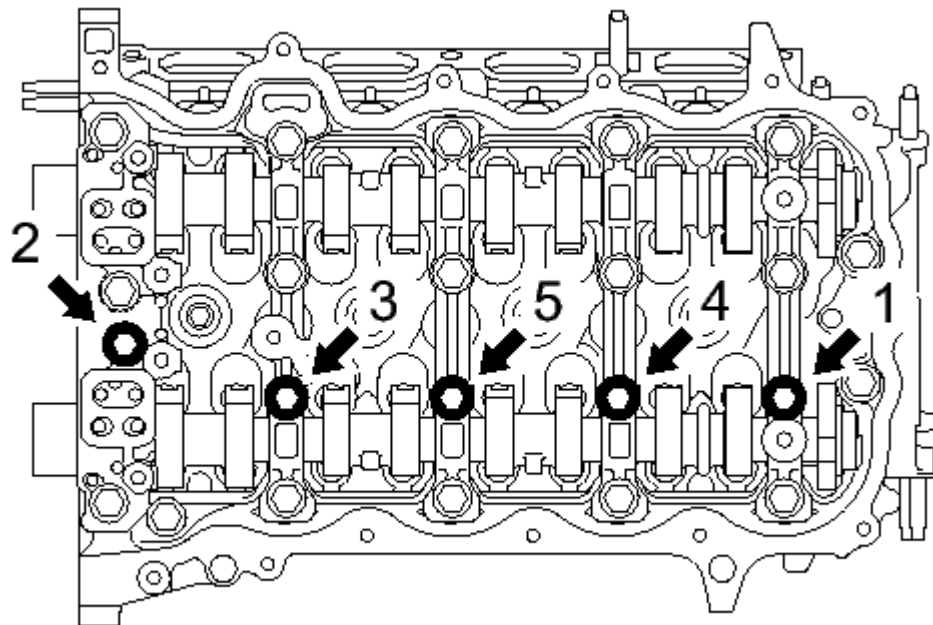
*a	Do Not Remove
----	---------------

NOTE:

- Be sure not to remove the other 4 bolts.
- Keep the camshaft timing exhaust gear assembly horizontal while removing it from the camshaft.

41. REMOVE CAMSHAFT BEARING CAP

- a. Uniformly loosen and remove the 5 bearing cap bolts in the sequence shown in the illustration.

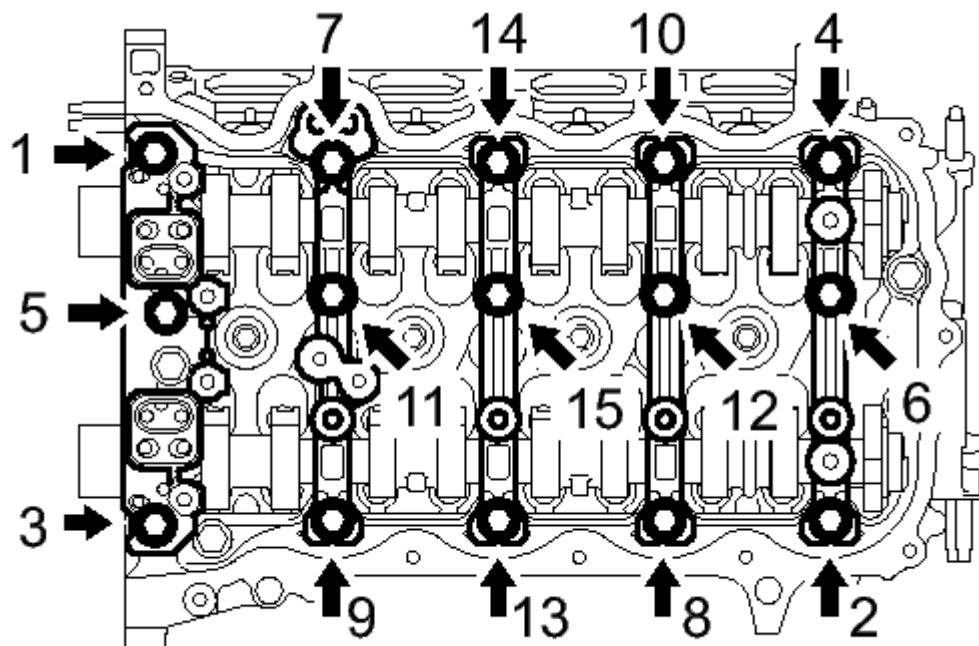


C

Fig. 34: Identifying Bearing Cap Bolts

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

- b. Uniformly loosen and remove the 15 bearing cap bolts in the sequence shown in the illustration.



C

Fig. 35: Identifying Bearing Cap Bolts

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

NOTE: Uniformly loosen the bolts while keeping the camshaft level.

- c. Remove the 5 bearing caps.

HINT:

Arrange the removed parts in the correct order.

42. REMOVE NO. 2 CAMSHAFT

- a. Remove the No. 2 camshaft.

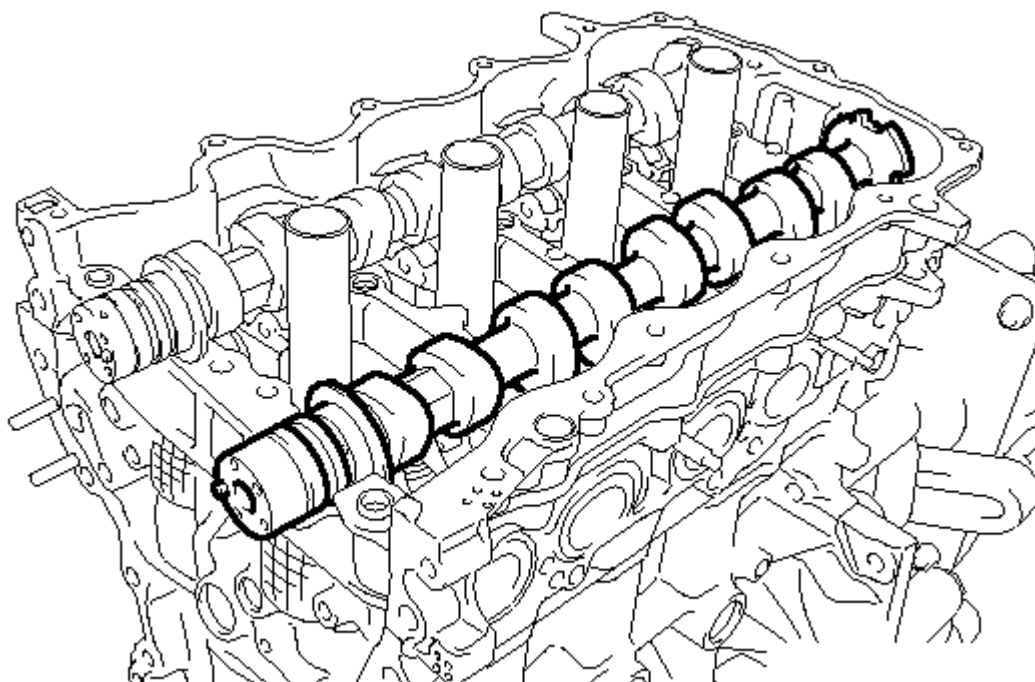


Fig. 36: Identifying No. 2 Camshaft

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

43. REMOVE CAMSHAFT

- a. Remove the camshaft.

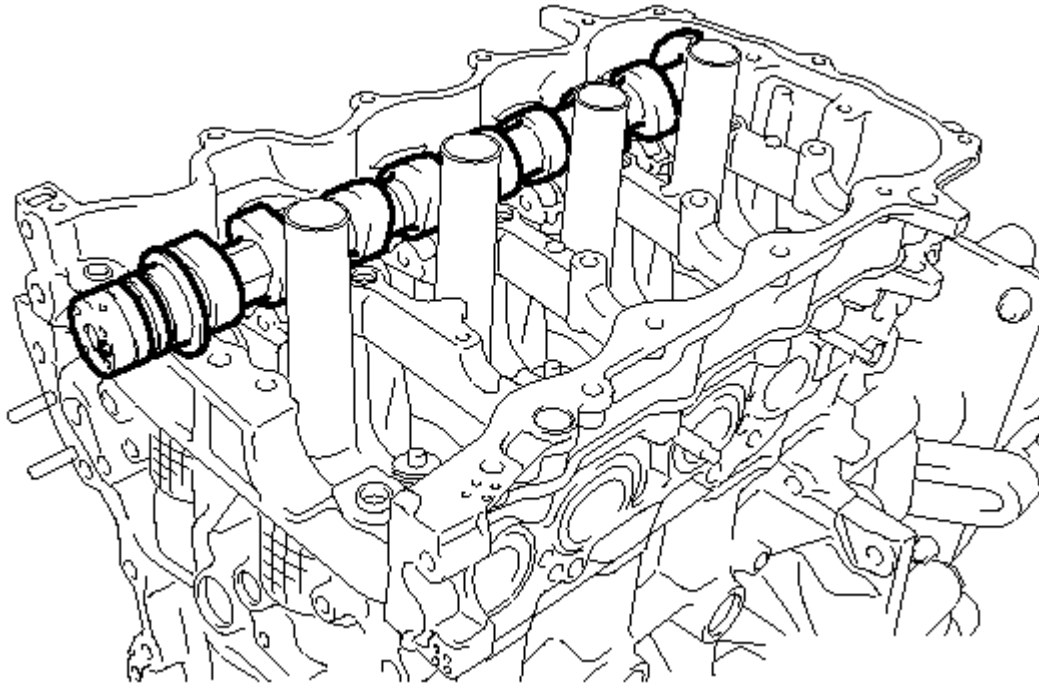


Fig. 37: Identifying Camshaft

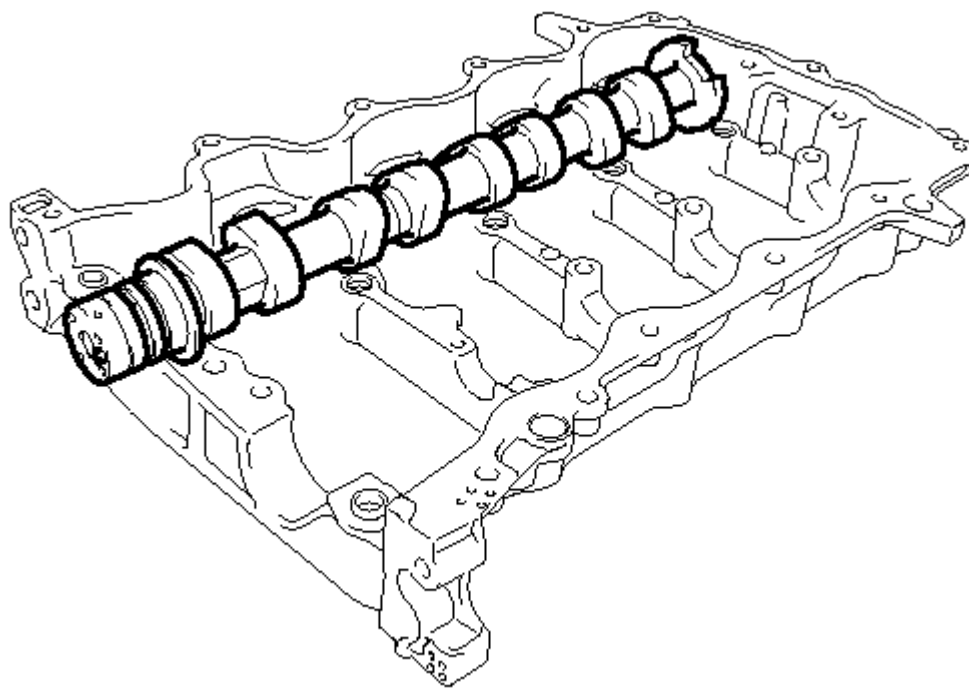
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- 44. **REMOVE NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY** See step 35
- 45. **REMOVE VALVE LASH ADJUSTER ASSEMBLY** See step 36
- 46. **REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY** See step 37
- 47. **INSPECT CAMSHAFT** See step 11
- 48. **INSPECT NO. 2 CAMSHAFT** See step 12
- 49. **INSPECT CAMSHAFT THRUST CLEARANCE** See step 13
- 50. **INSPECT CAMSHAFT OIL CLEARANCE** See step 14
- 51. **INSPECT NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY** See step 16
- 52. **INSPECT VALVE LASH ADJUSTER ASSEMBLY** See step 17

INSTALLATION

INSTALLATION

- 1. **INSTALL VALVE LASH ADJUSTER ASSEMBLY** See step 8
- 2. **INSTALL NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY** See step 9
- 3. **INSTALL CAMSHAFT**
 - a. Clean the camshaft journals.

**C****Fig. 38: Installing Camshaft To Camshaft Housing****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- b. Apply a light coat of engine oil to the camshaft journals and camshaft housing.
- c. Install the camshaft to the camshaft housing.

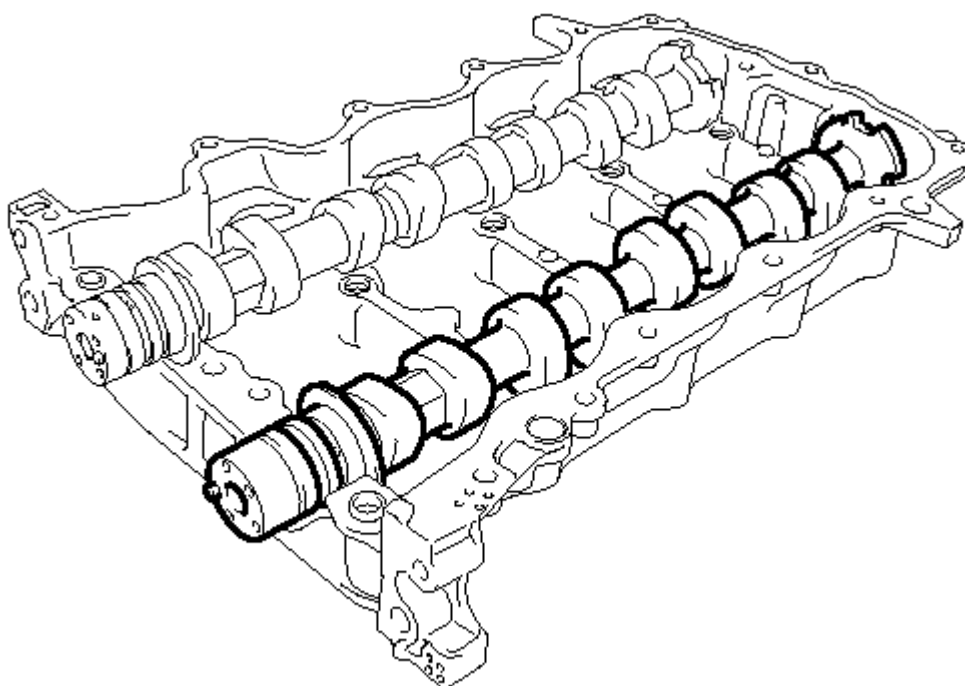
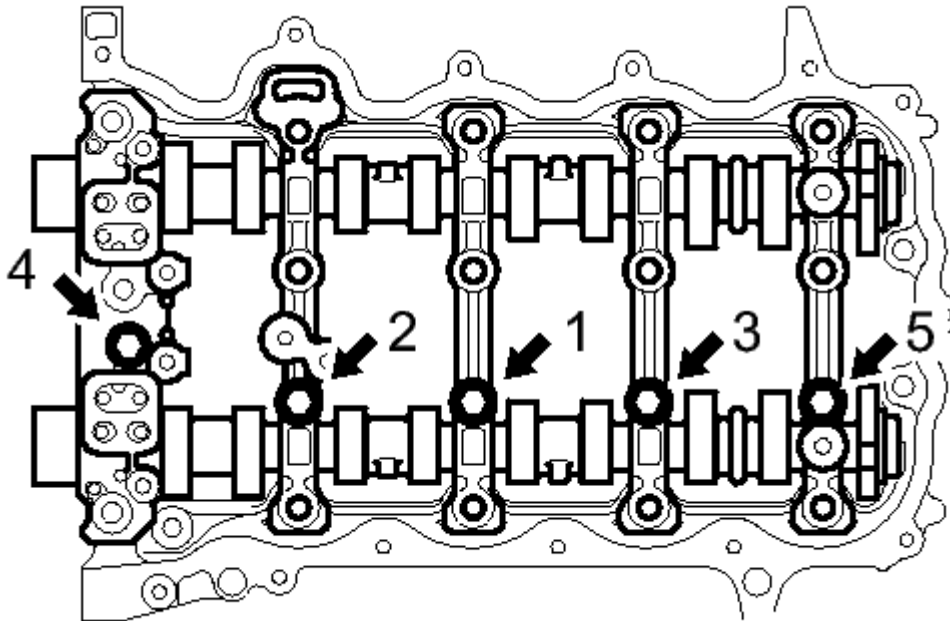
4. INSTALL NO. 2 CAMSHAFT**C**

Fig. 39: Installing No. 2 Camshaft To Camshaft Housing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Clean the camshaft journals.
- b. Apply a light coat of engine oil to the camshaft journals and camshaft housing.
- c. Install the No. 2 camshaft to the camshaft housing.

5. INSTALL CAMSHAFT BEARING CAP



C

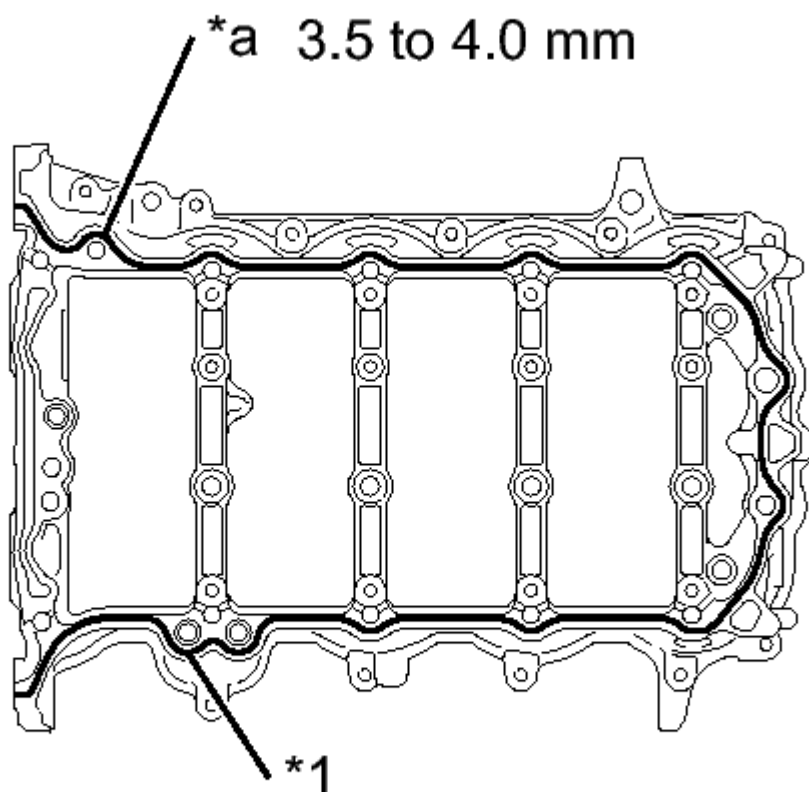
Fig. 40: Identifying Bearing Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Apply engine oil to the bearing caps.
- b. Install the 5 bearing caps to the camshaft housing.
- c. Tighten the 5 bolts in the order shown in the illustration.

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

6. INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY

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

**C****Fig. 41: Applying Seal Packing**

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

TEXT IN ILLUSTRATION

*1	Seal Packing
*a	Bead Diameter

Seal packing

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

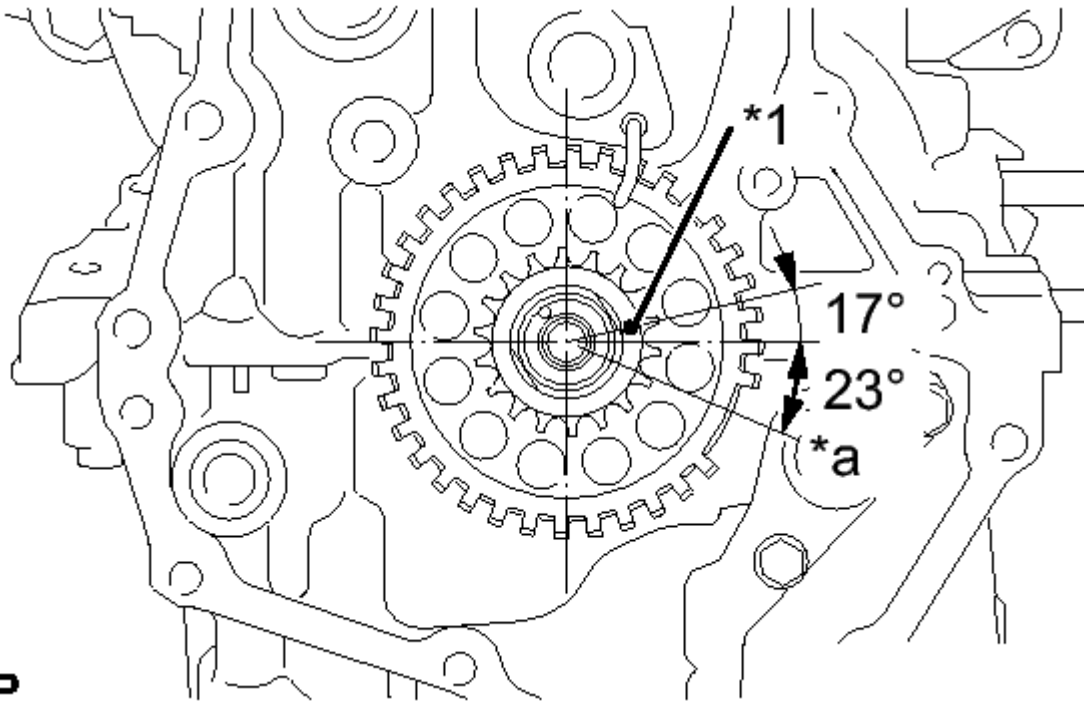
Bead diameter

3.5 to 4.0 mm (0.138 to 0.158 in.)

NOTE:

- Remove any oil from the contact surfaces.
- Install the camshaft housing sub-assembly within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.
- Do not start the engine for at least 2 hours after installing.

- b. Set the crankshaft in the position (40° BTDC) shown in the illustration.

**P****Fig. 42: Setting The Crankshaft**

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

TEXT IN ILLUSTRATION

*1	Timing Mark
*a	TDC

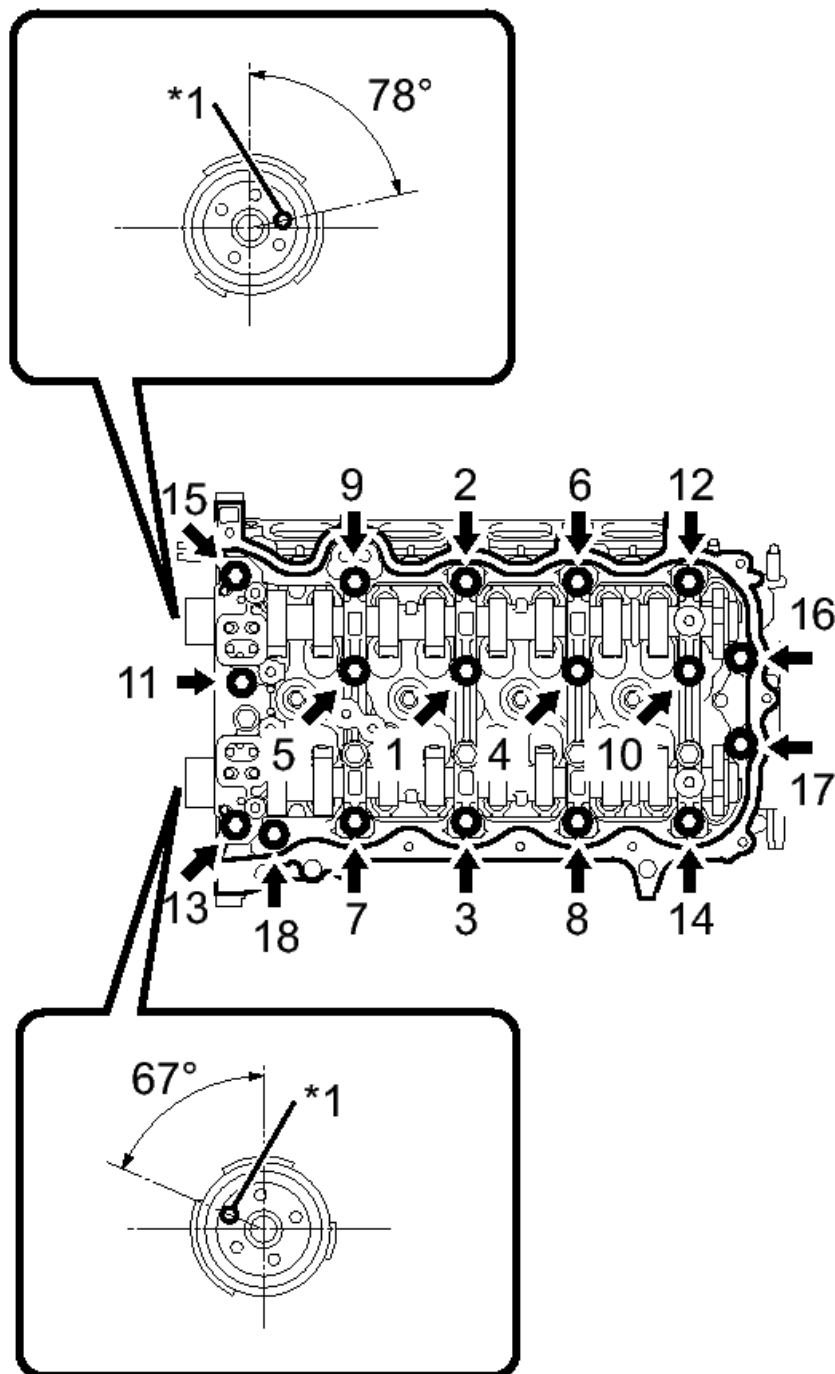
NOTE:

Turn the crankshaft clockwise when positioning the No. 1 cylinder after the camshaft housing sub-assembly is installed.

HINT:

Make sure that the timing mark of the crankshaft is positioned as shown in the illustration.

- c. Set the camshaft and No. 2 camshaft as shown in the illustration.



C

Fig. 43: Setting Camshaft And No. 2 Camshaft

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

TEXT IN ILLUSTRATION

*1	Straight Pin
----	--------------

HINT:

Make sure that the straight pin of the camshaft is positioned as shown in the illustration.

- d. Install the camshaft housing and tighten the 18 bolts in the order shown in the illustration.

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

NOTE:

- After installing the camshaft housing, make sure that the cam lobes are positioned as shown in the illustration.
- If any of the bolts are loosened during installation, remove the camshaft housing, clean the installation surfaces, and reapply seal packing.
- If the camshaft housing is removed because any of the bolts are loosened during installation, make sure that the previously applied seal packing does not enter any oil passages.
- After installing the camshaft housing, wipe off any seal packing that seeped out from between the housing and the cylinder head.

7. INSTALL CAMSHAFT TIMING GEAR ASSEMBLY

- a. Check that the straight pin is installed on the camshaft.

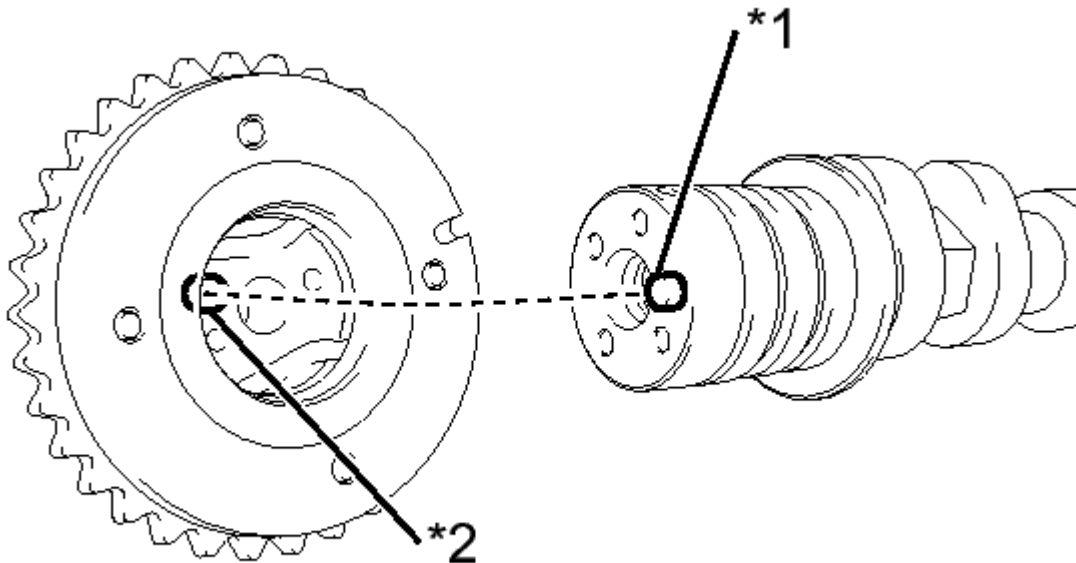
**P**

Fig. 44: Aligning Camshaft Timing Gear Straight Pin And Straight Pin Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Straight Pin
*2	Straight Pin Hole

- b. Put the camshaft timing gear and camshaft together by aligning the straight pin hole and straight pin.

NOTE:

- Do not forcefully push in the camshaft timing gear assembly. This may cause the camshaft straight pin tip to damage the installation surface of the camshaft timing gear assembly.
- Do not turn the camshaft timing gear in the retard direction (clockwise).

- c. Tighten the flange bolt with the camshaft timing gear secured in place.

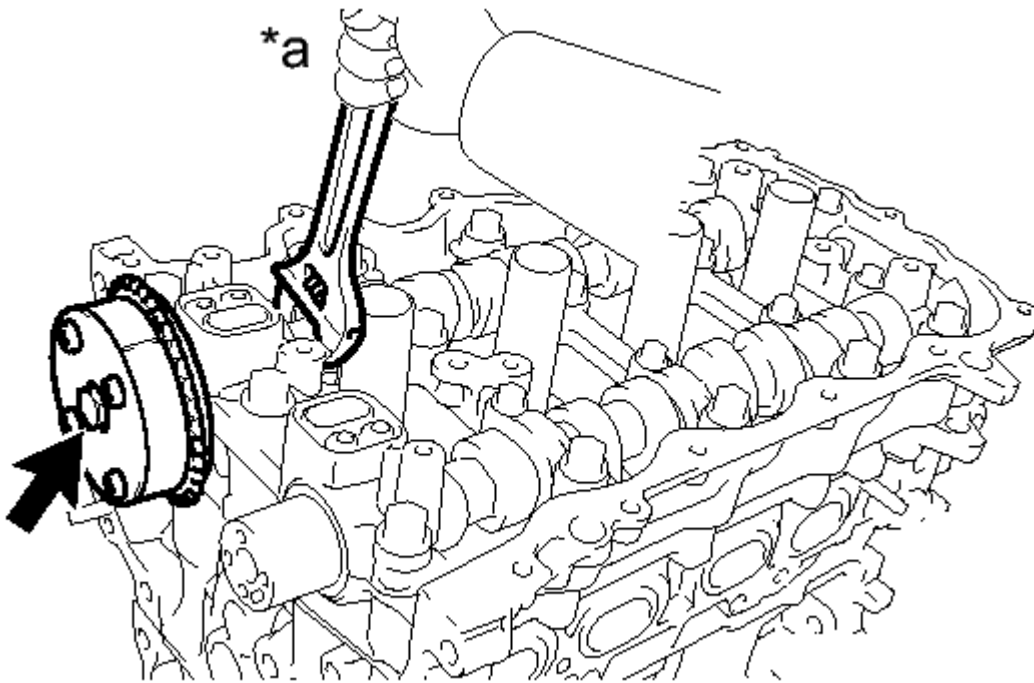


Fig. 45: Tightening The Flange Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

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

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

- d. Check that the camshaft timing gear can move in the retard direction (clockwise) and locks in the most retarded position.

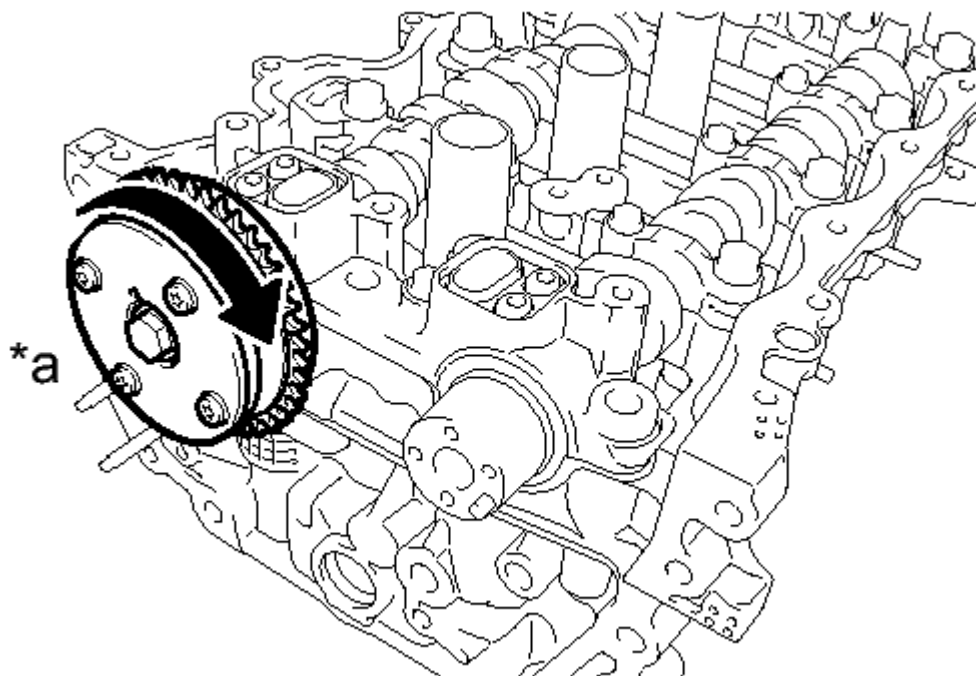


Fig. 46: Locking Camshaft Timing Gear In Most Retarded Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Lock
----	------

8. INSTALL CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY

- a. Check that the straight pin is installed on the No. 2 camshaft.

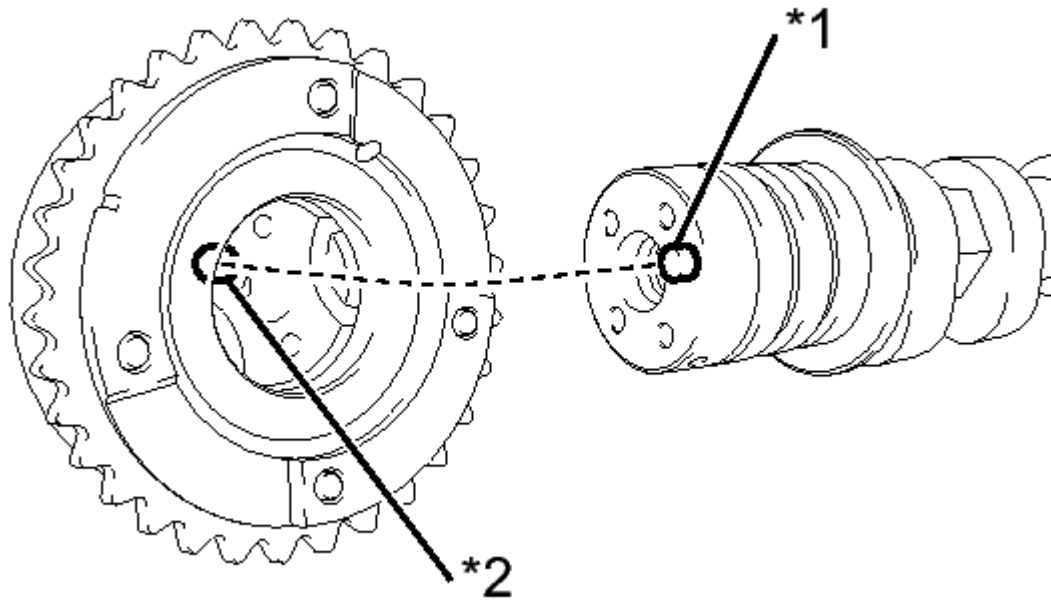
**P**

Fig. 47: Aligning Camshaft Timing Exhaust Gear Straight Pin And Straight Pin Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

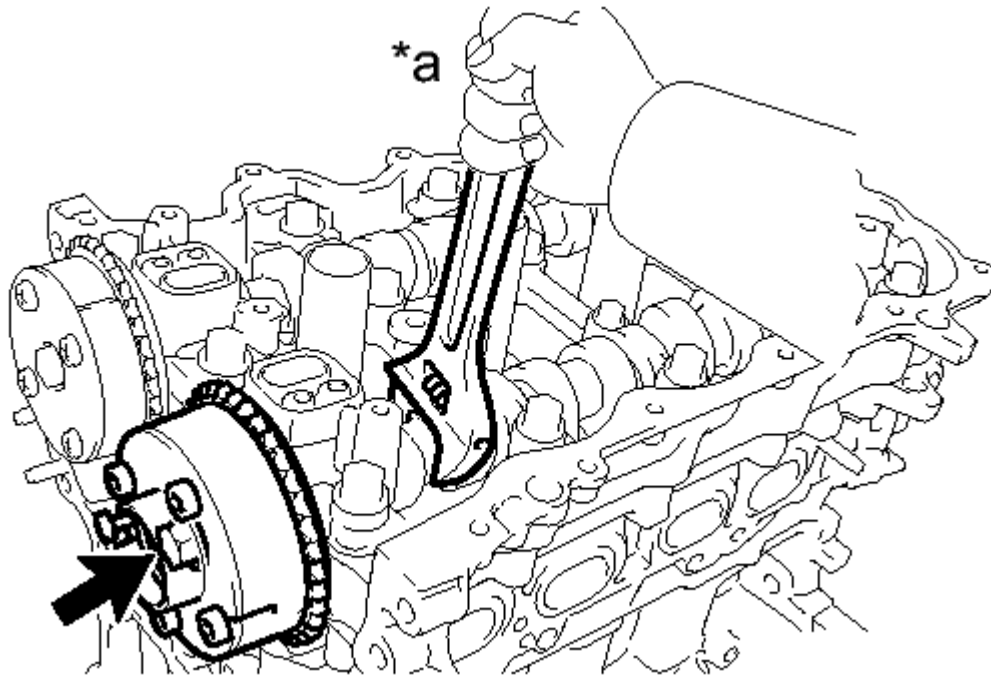
TEXT IN ILLUSTRATION

*1	Straight Pin
*2	Straight Pin hole

- b. Put the camshaft timing exhaust gear and No. 2 camshaft together by aligning the straight pin hole and straight pin.

NOTE: Do not forcefully push in the camshaft timing gear assembly. This may cause the camshaft straight pin tip to damage the installation surface of the camshaft timing gear assembly.

- c. Tighten the flange bolt with the camshaft timing exhaust gear secured in place.

**Fig. 48: Tightening The Flange Bolt**

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

TEXT IN ILLUSTRATION

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

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

d. Make sure that the camshaft timing exhaust gear is locked.

9. **INSTALL TIMING CHAIN GUIDE** See step 16
10. **INSTALL CHAIN SUB-ASSEMBLY** See step 17
11. **INSTALL TIMING CHAIN TENSION ARM** See step 18
12. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY** See step 19
13. **INSTALL TIMING CHAIN COVER OIL SEAL** . Refer to **INSTALLATION - Step 1**
14. **INSTALL TIMING CHAIN COVER SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 4**
15. **INSTALL CRANKSHAFT PULLEY** See step 27
16. **INSTALL WATER PUMP PULLEY** See step 28
17. **INSTALL CRANKSHAFT POSITION SENSOR** See step 33
18. **INSTALL CAMSHAFT BEARING CAP OIL HOLE GASKET** See step 34
19. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY** See step 35
20. **INSTALL V-RIBBED BELT TENSIONER ASSEMBLY** See step 2
21. **INSTALL NO. 2 IDLE PULLEY ASSEMBLY WITH BRACKET** See step 3
22. **INSTALL NO. 1 WATER BY-PASS PIPE** See step 4

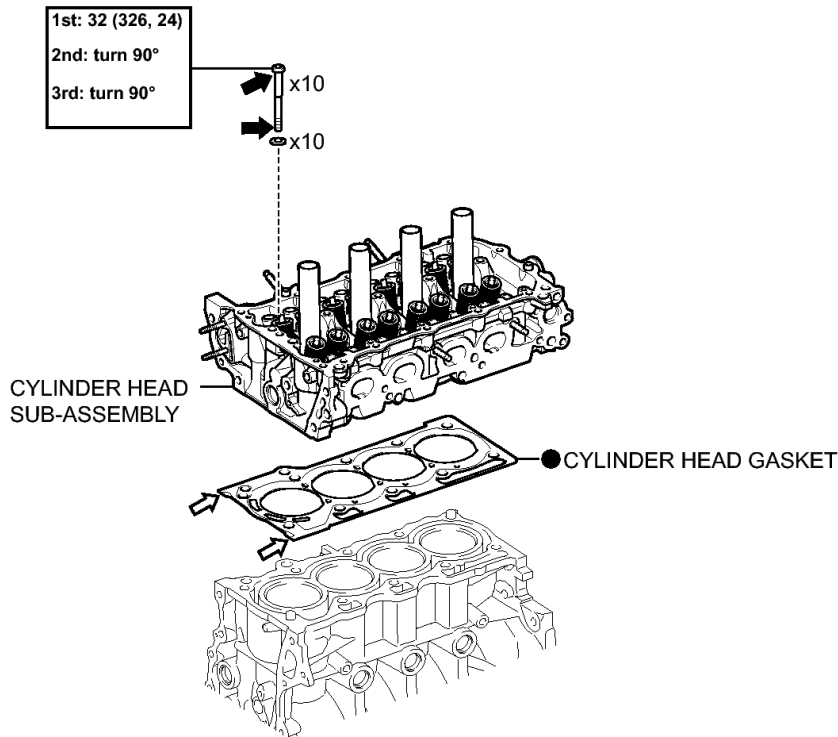
- 23. **INSTALL NO. 2 VENTILATION HOSE** See step 5
- 24. **INSTALL VENTILATION HOSE** See step 6
- 25. **INSTALL NO. 1 IGNITION COIL** See step 7
- 26. **INSTALL INJECTOR VIBRATION INSULATOR** . Refer to **INSTALLATION - Step 1**
- 27. **INSTALL NO. 1 DELIVERY PIPE SPACER** . Refer to **INSTALLATION - Step 2**
- 28. **INSTALL FUEL INJECTOR ASSEMBLY** . Refer to **INSTALLATION - Step 3**
- 29. **INSTALL FUEL DELIVERY PIPE** . Refer to **INSTALLATION - Step 4**
- 30. **INSTALL ENGINE OIL LEVEL DIPSTICK GUIDE** See step 13
- 31. **INSTALL ENGINE OIL LEVEL DIPSTICK**
- 32. **INSTALL NO. 4 ENGINE WIRE** See step 15
- 33. **INSTALL INTAKE MANIFOLD ASSEMBLY** See step 16
- 34. **INSTALL INTAKE MANIFOLD STAY** See step 17
- 35. **CONNECT NO. 4 WATER BY-PASS HOSE** See step 18
- 36. **CONNECT NO. 2 WATER BY-PASS HOSE** See step 19
- 37. **CONNECT VENTILATION HOSE** See step 20
- 38. **INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY** See step 21
- 39. **INSTALL MANIFOLD STAY** See step 22
- 40. **INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR** See step 23
- 41. **INSTALL GENERATOR ASSEMBLY** See step 24
- 42. **INSTALL ENGINE ASSEMBLY WITH TRANSAXLE**

Refer to **INSTALLATION**

CYLINDER HEAD GASKET

COMPONENTS

ILLUSTRATION



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

● Non-reusable part

← Engine oil

↩ Seal packing black

H

Fig. 49: Identifying Cylinder Head Gasket Replacement Components With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

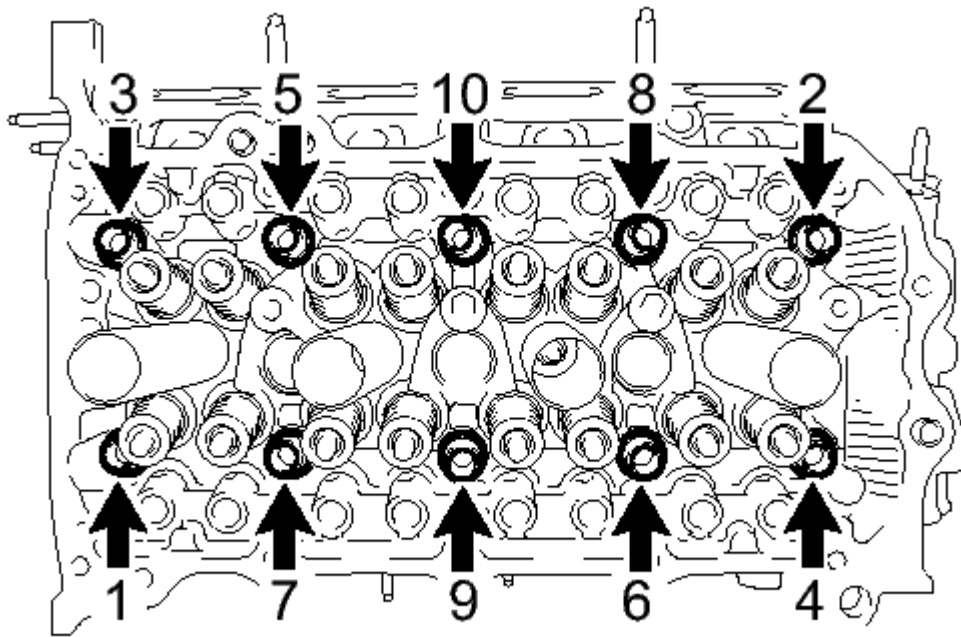
REMOVAL

1. REMOVE CAMSHAFT

Refer to **REMOVAL**

2. REMOVE CYLINDER HEAD SUB-ASSEMBLY

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

**P****Fig. 50: Identifying Cylinder Head Bolts And Washers**

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

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

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

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

3. REMOVE CYLINDER HEAD GASKET

- a. Remove the cylinder head gasket.

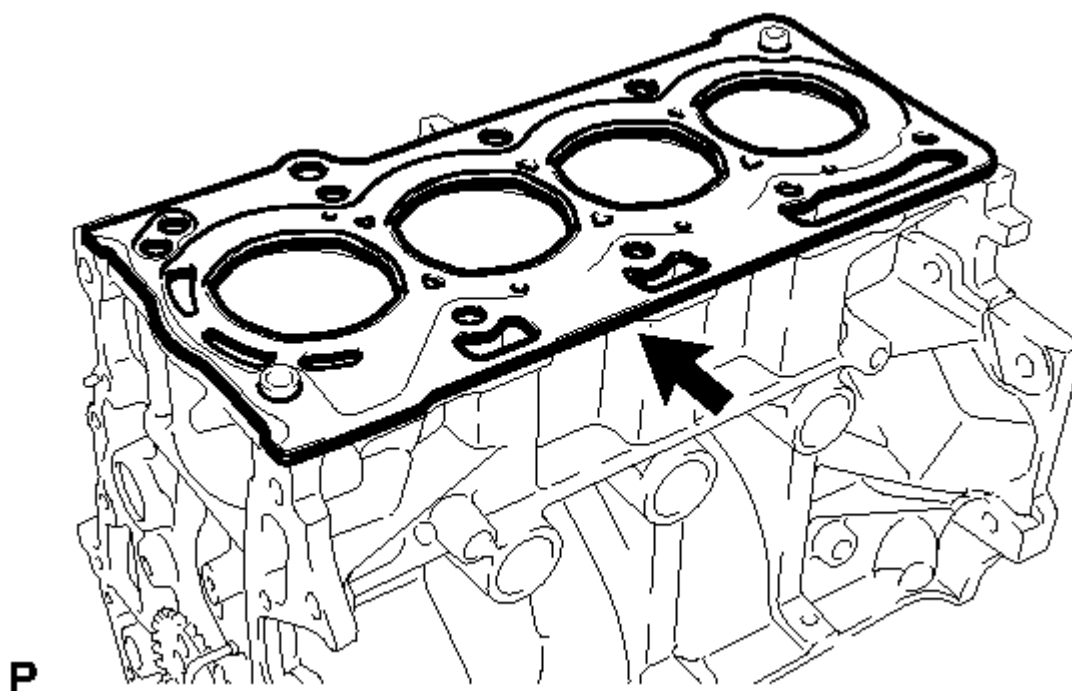
**P**

Fig. 51: Identifying Cylinder Head Gasket

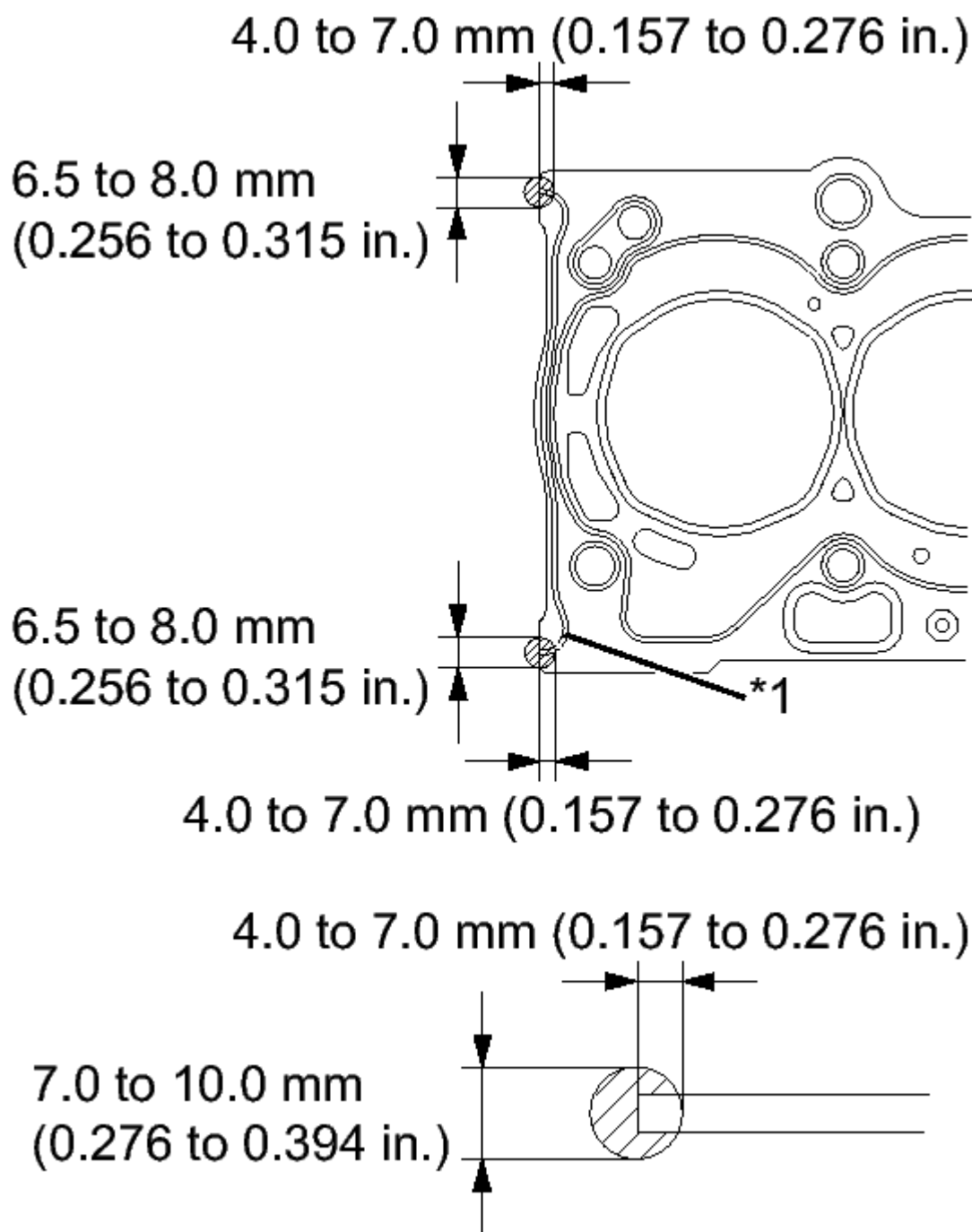
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSPECT CYLINDER HEAD FOR FLATNESS** See step 1
5. **INSPECT CYLINDER HEAD FOR CRACKS** See step 2
6. **INSPECT CYLINDER HEAD SET BOLT** See step 15

INSTALLATION

INSTALLATION

1. **INSTALL CYLINDER HEAD GASKET**
 - a. Apply seal packing to a new cylinder head gasket as shown in the illustration.

**Fig. 52: Applying Seal Packing**

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

TEXT IN ILLUSTRATION

*1	Bead
----	------

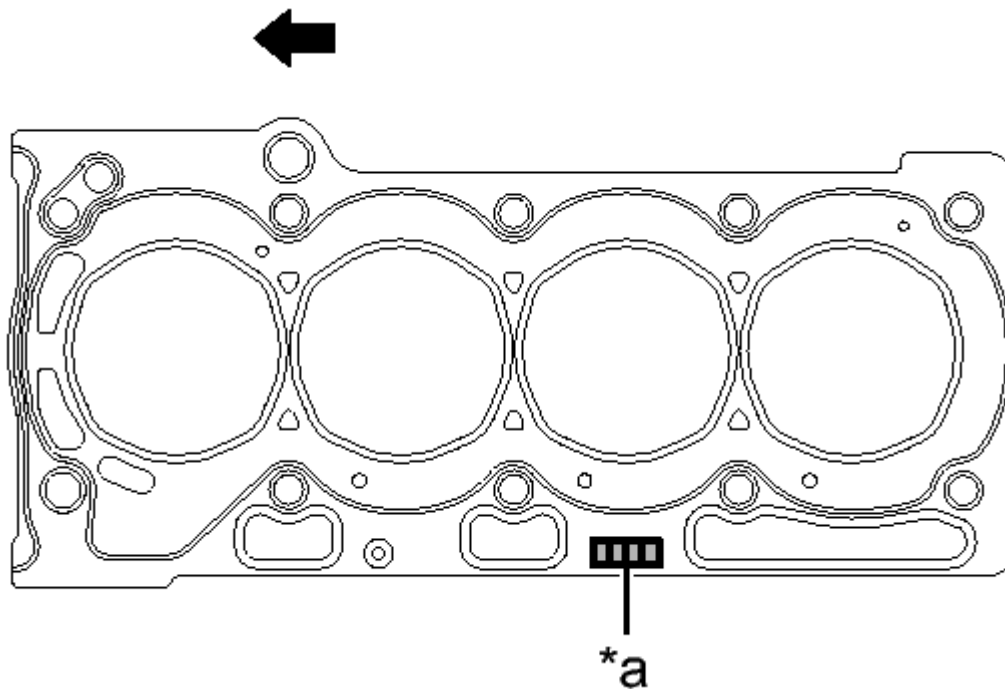
Seal packing

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

NOTE:

- Clean the sealing surfaces of the cylinder head gasket, cylinder head and cylinder block.
- Apply seal packing to the bead on the cylinder head gasket.
- Install the cylinder head within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.

b. Place the gasket on the cylinder block surface with the Lot No. stamp facing upward.



P

Fig. 53: Identifying Lot No. Stamp Facing Upward
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Lot No.
	Engine Front

**NOTE:**

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

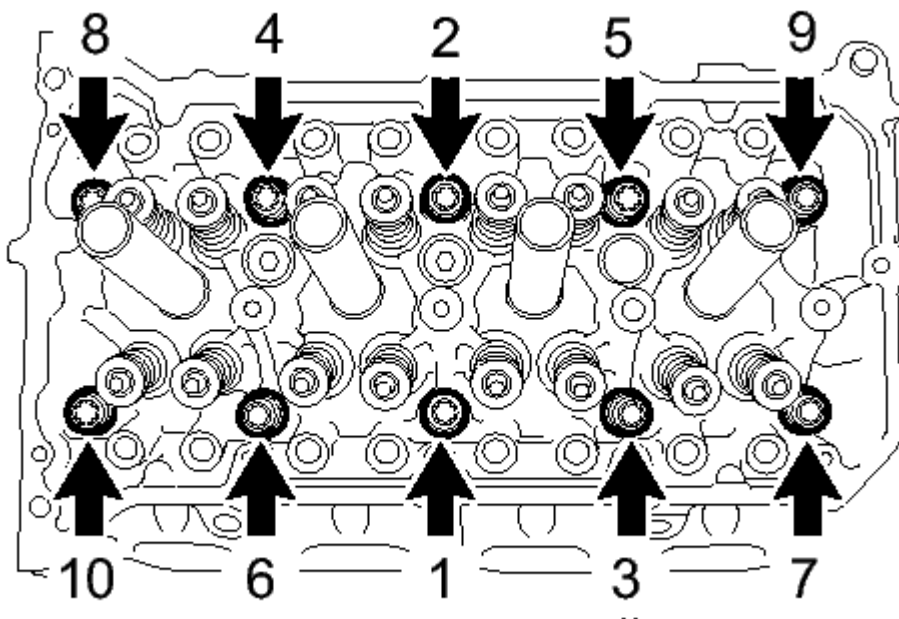
2. INSTALL CYLINDER HEAD SUB-ASSEMBLY**T**

Fig. 54: Locating Cylinder Head Bolts And Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

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

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

Torque: 32 N*m (326 kgf*cm, 24 ft.*lbf)

- d. Mark the front side of the cylinder head bolts with paint.

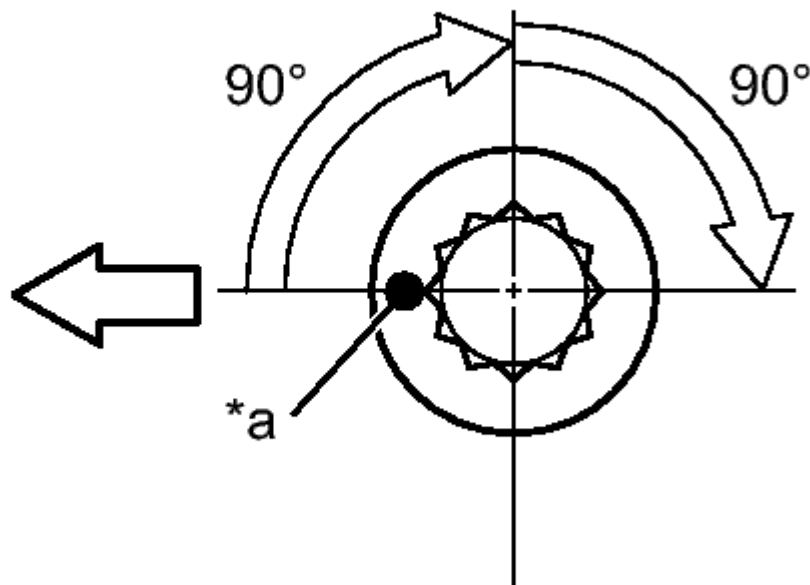
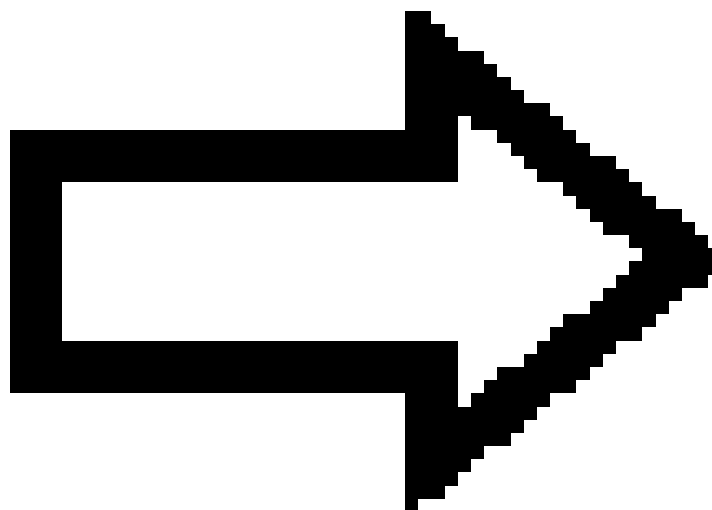


Fig. 55: Identifying Cylinder Head Bolts Paint Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Paint Mark



Engine Front

- e. Retighten the cylinder head bolts an additional 90°, and then once more 90° as shown in the illustration.

NOTE: **Do not tighten the same bolt twice consecutively.**

- f. Check that the paint mark is now at a 180° angle to the front.
- g. After tightening the cylinder head bolts, wipe off the seal packing material that seeped out from the contact surface between the cylinder head and cylinder block.

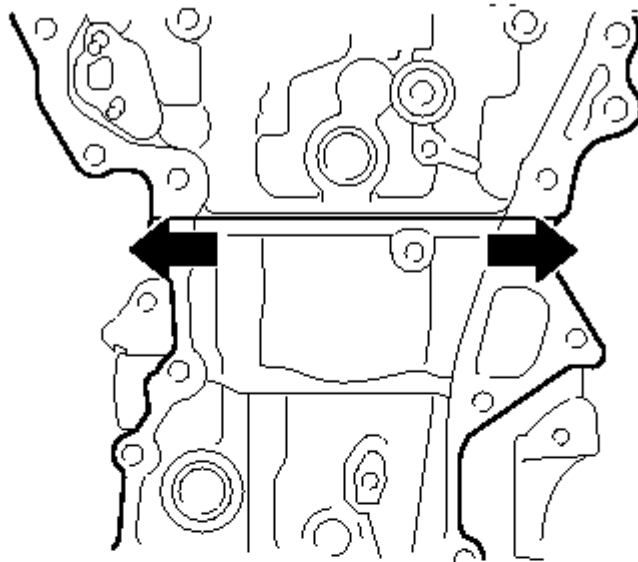
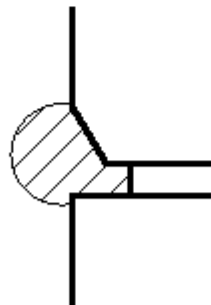
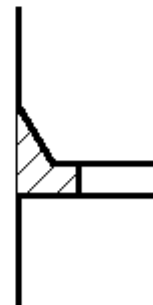
a**b*****c**

Fig. 56: Smoothing The Seal Packing Material To The Cylinder Head And Cylinder Block
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Direction to wipe off
-----------	-----------------------

*b	Before wiping off
*c	After wiping off

NOTE:

- Be sure to wipe off the seal packing from inside to outside, parallel to the joint line.

Be sure to avoid clogging the bolt holes when wiping off the seal packing.

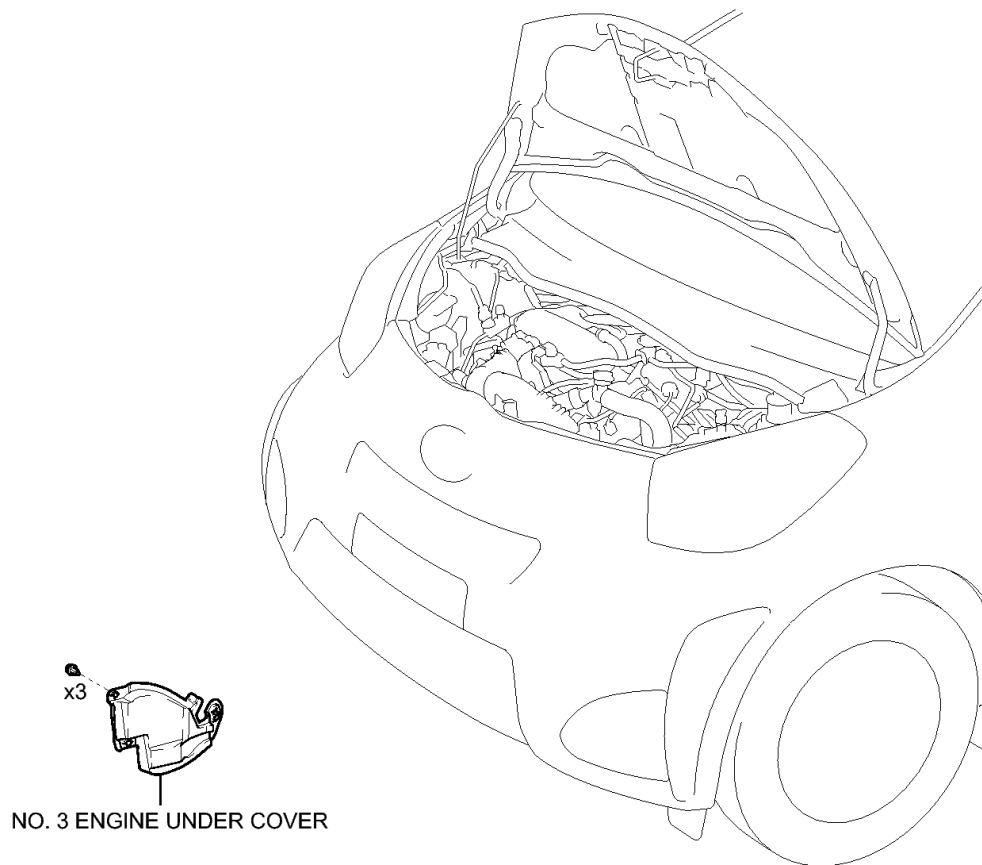
3. INSTALL CAMSHAFT

Refer to INSTALLATION

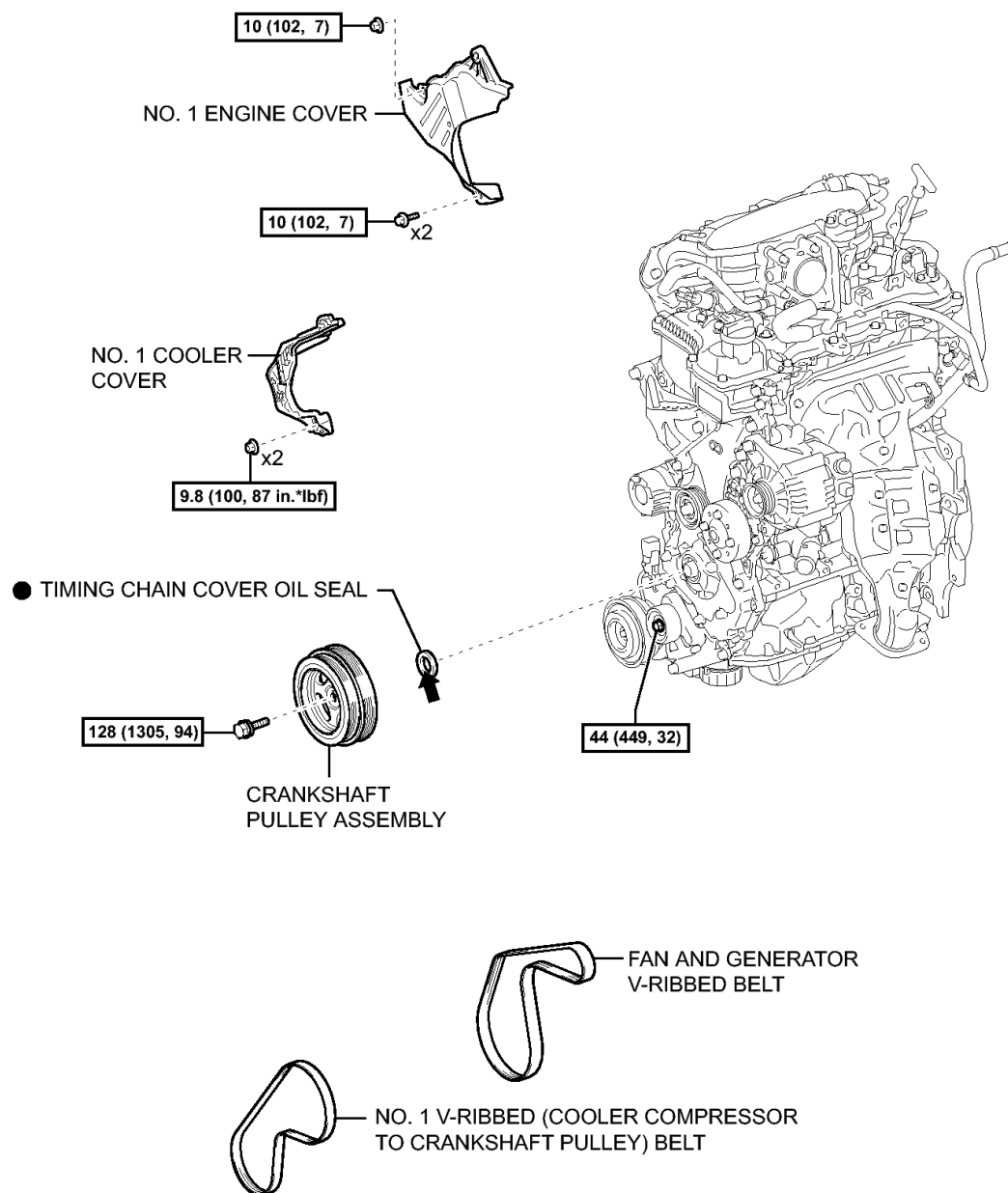
FRONT CRANKSHAFT OIL SEAL

COMPONENTS

ILLUSTRATION



H
Fig. 57: Identifying Front Crankshaft Oil Seal Replacement Components (1 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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

● Non-reusable part

← MP grease

H

Fig. 58: Identifying Front Crankshaft Oil Seal Replacement Components With Torque Specifications (2 Of 2)

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

REMOVAL**REMOVAL**

1. **REMOVE FRONT WHEEL RH**
2. **REMOVE NO. 3 ENGINE UNDER COVER** See step 12
3. **REMOVE NO. 1 COOLER COVER** See step 2
4. **REMOVE NO. 1 ENGINE COVER** See step 3
5. **REMOVE NO. 1 V-RIBBED (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT**
See step 4
6. **REMOVE FAN AND GENERATOR V-RIBBED BELT** See step 5
7. **REMOVE CRANKSHAFT PULLEY ASSEMBLY**

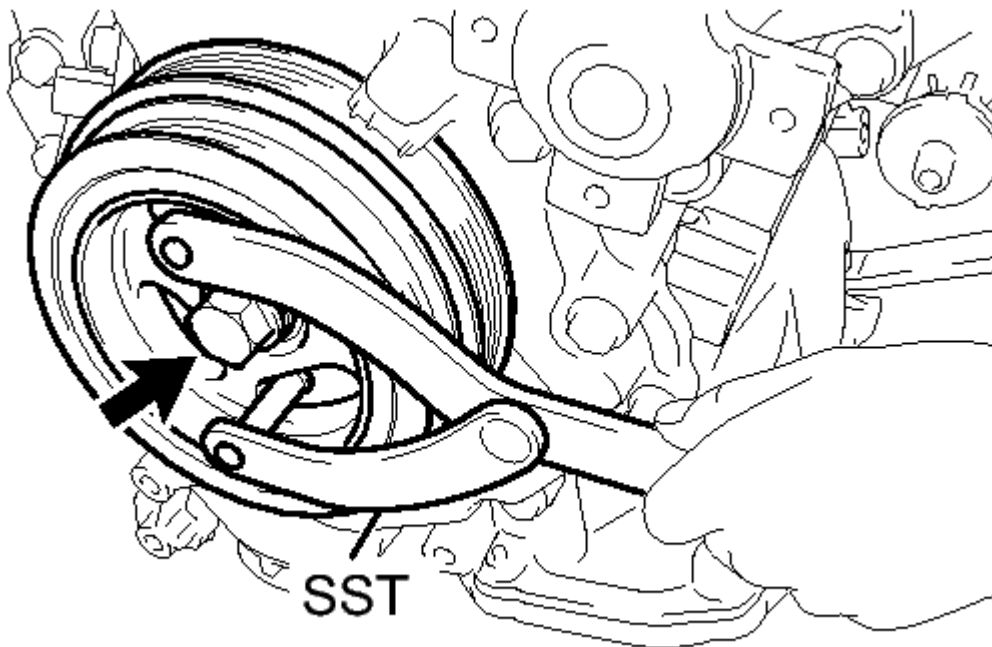
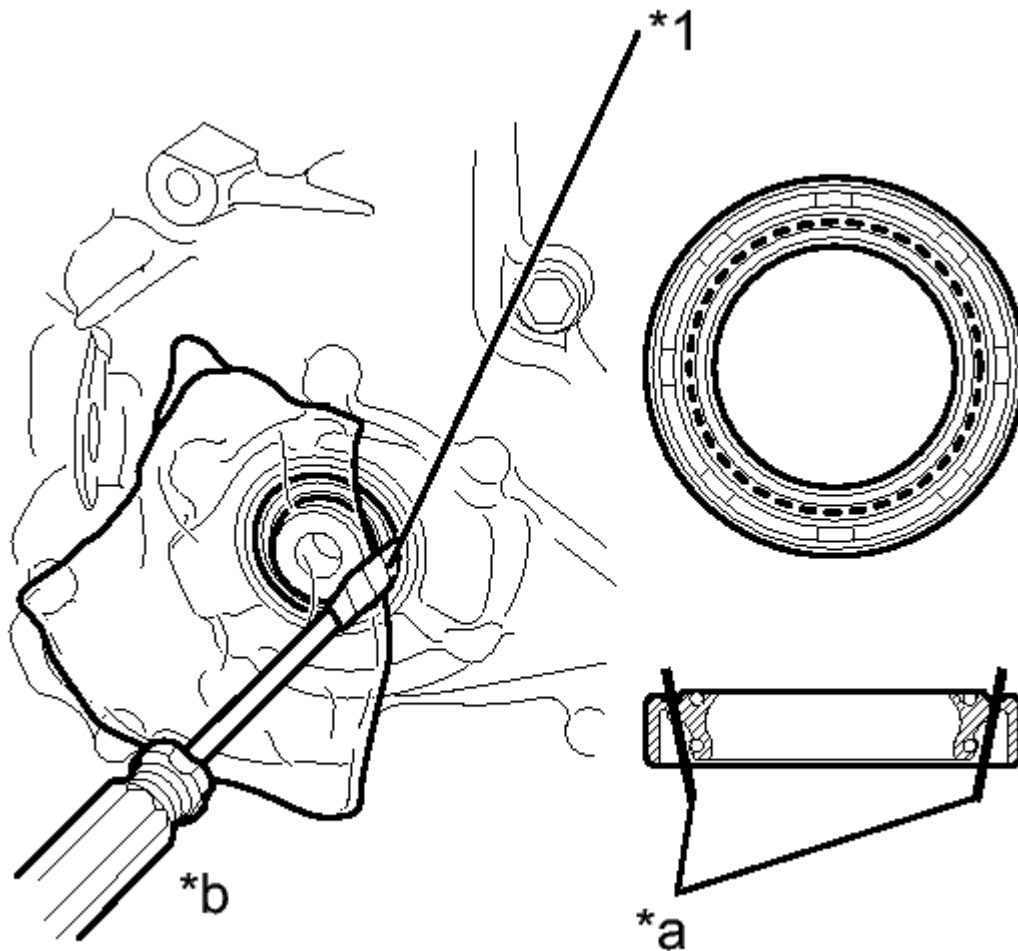
**P**

Fig. 59: Removing Crankshaft Pulley Bolt

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

- a. Using SST, remove the crankshaft pulley bolt.
 - **SST: 09960-10010**
09962-01000
09963-01000
 - b. Remove the crankshaft pulley from the crankshaft.
8. **REMOVE TIMING CHAIN COVER OIL SEAL**

**C****Fig. 60: Prying Out Oil Seal**

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

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

TEXT IN ILLUSTRATION

*1	Protective Tape
*a	Cut Position
*b	Pry Out

- b. Using a screwdriver with its tip wrapped with protective tape, pry out the timing chain cover oil seal.

NOTE:

- Do not damage the surface of the oil seal press fit hole.
- After removing, check the crankshaft for damage. If damaged,

smooth the surface with 400-grit sandpaper.

INSTALLATION

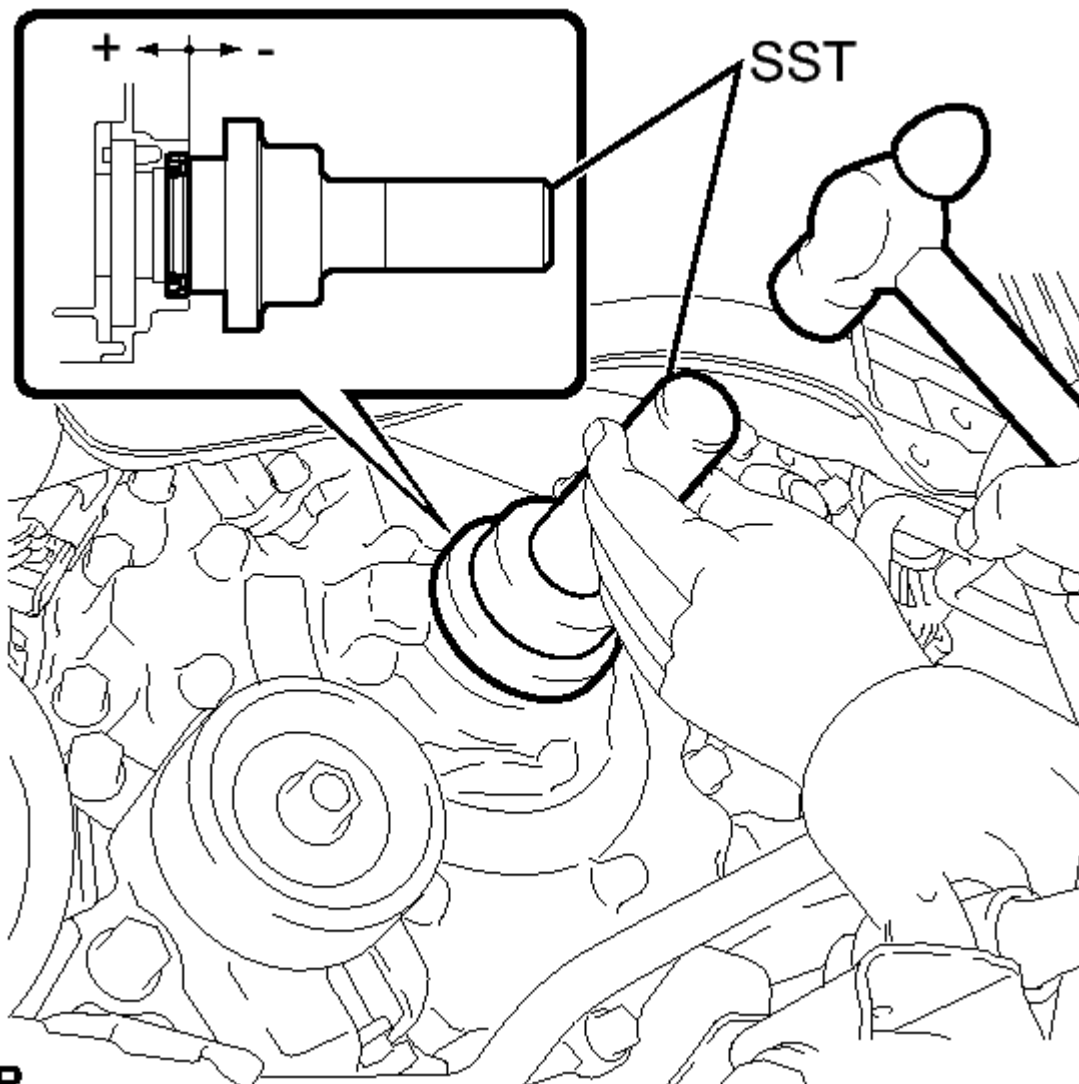
INSTALLATION

1. INSTALL TIMING CHAIN COVER OIL SEAL

- a. Apply MP grease to the lip of a new timing chain cover oil seal.

NOTE: Keep the lip free of foreign matter.

- b. Using SST and a hammer, tap in the timing chain cover oil seal until its surface is flush with the timing chain cover edge.



P

Fig. 61: Installing Timing Chain Cover Oil Seal

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

- **SST: 09223-22010**

Oil seal tap in depth

-0.5 to 1.0 mm (-0.0197 to 0.0394 in.)

NOTE:

- **Do not tap the oil seal at an angle.**
- **Wipe off extra grease from the crankshaft.**

2. INSTALL CRANKSHAFT PULLEY ASSEMBLY

- a. Align the pulley set key with the key groove of the crankshaft pulley, and then slide on the crankshaft pulley.

- **SST: 09960-10010**

09962-01000

09963-01000

- b. Using SST, install the crankshaft pulley bolt.

Torque: 128 N*m (1305 kgf*cm, 94 ft.*lbf)

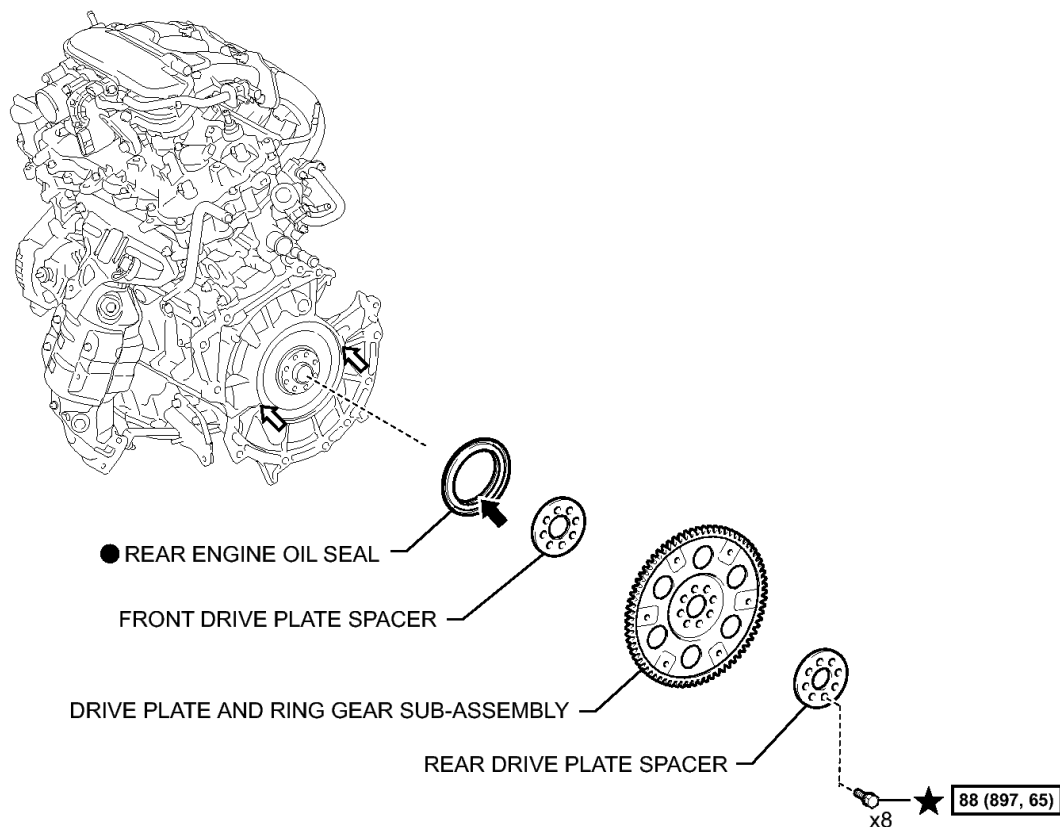
3. **INSTALL FAN AND GENERATOR V-RIBBED BELT** See step 1
4. **INSTALL NO. 1 V-RIBBED (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT**
See step 2
5. **INSPECT FAN AND GENERATOR V-RIBBED BELT** See step 4
6. **INSPECT NO. 1 V-RIBBED (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT**
See step 5
7. **INSPECT FOR ENGINE OIL LEAK**
8. **INSTALL NO. 1 ENGINE COVER** See step 5
9. **INSTALL NO. 1 COOLER COVER** See step 6
10. **INSTALL NO. 3 ENGINE UNDER COVER** See step 79
11. **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.*lbf)]: Specified torque

● Non-reusable part

← MP grease

↔ Seal packing black

★ Precoated part

H

Fig. 62: Identifying Rear Crankshaft Oil Seal Components With Torque Specifications
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

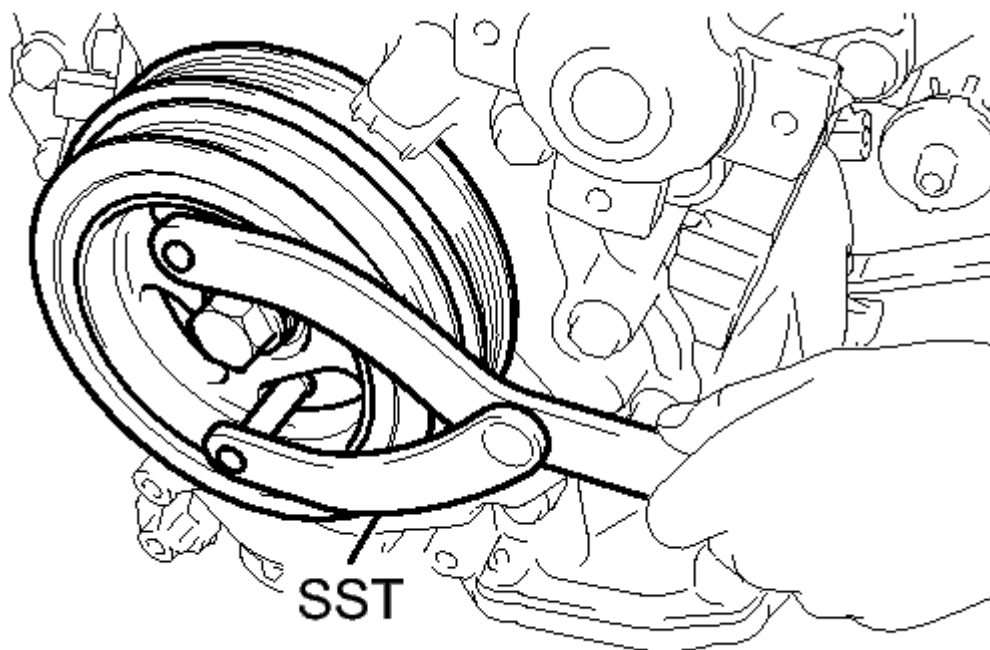
REMOVAL

1. REMOVE CONTINUOUSLY VARIABLE TRANSAXLE ASSEMBLY

Refer to **REMOVAL**

2. REMOVE DRIVE PLATE AND RING GEAR SUB-ASSEMBLY

- a. Using SST, hold the crankshaft.



P

Fig. 63: Holding The Crankshaft

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

- SST: 09960-10010
09962-01000
09963-01000

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

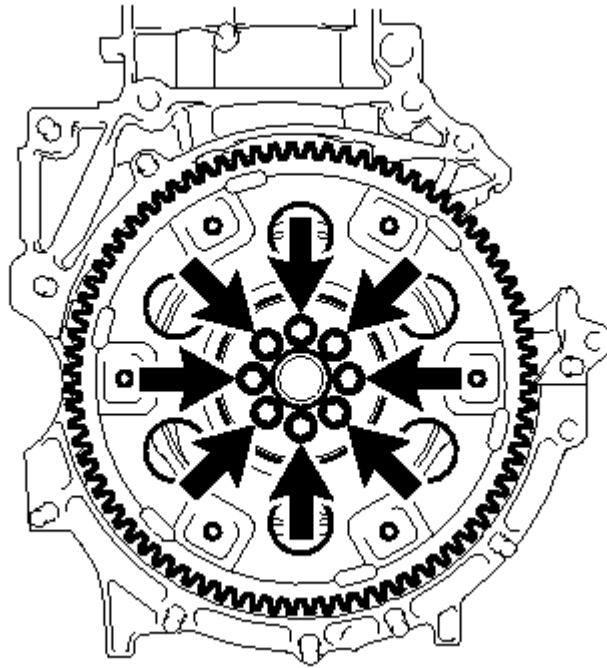
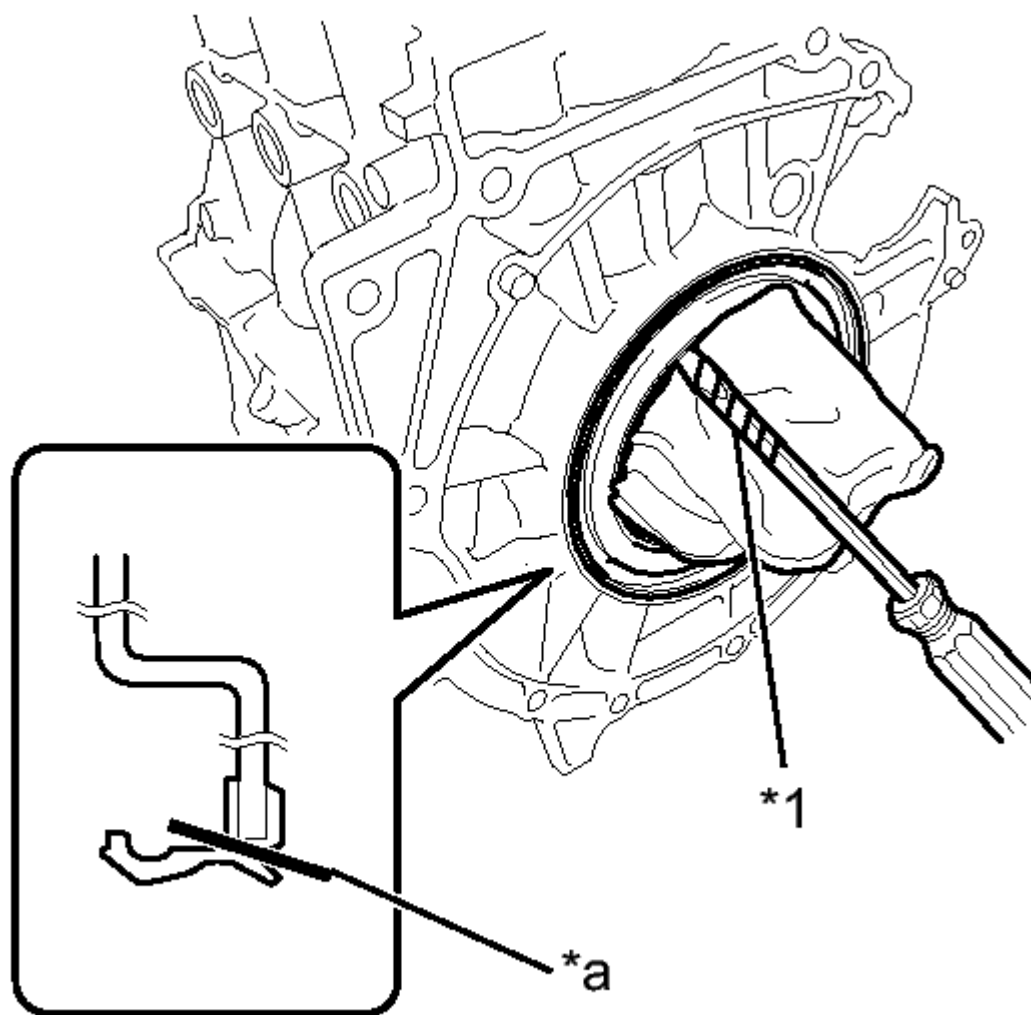
**P**

Fig. 64: Identifying Rear Drive Plate Spacer Bolts

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

3. REMOVE REAR ENGINE OIL SEAL

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

**C****Fig. 65: Removing Rear Crankshaft Oil Seal**

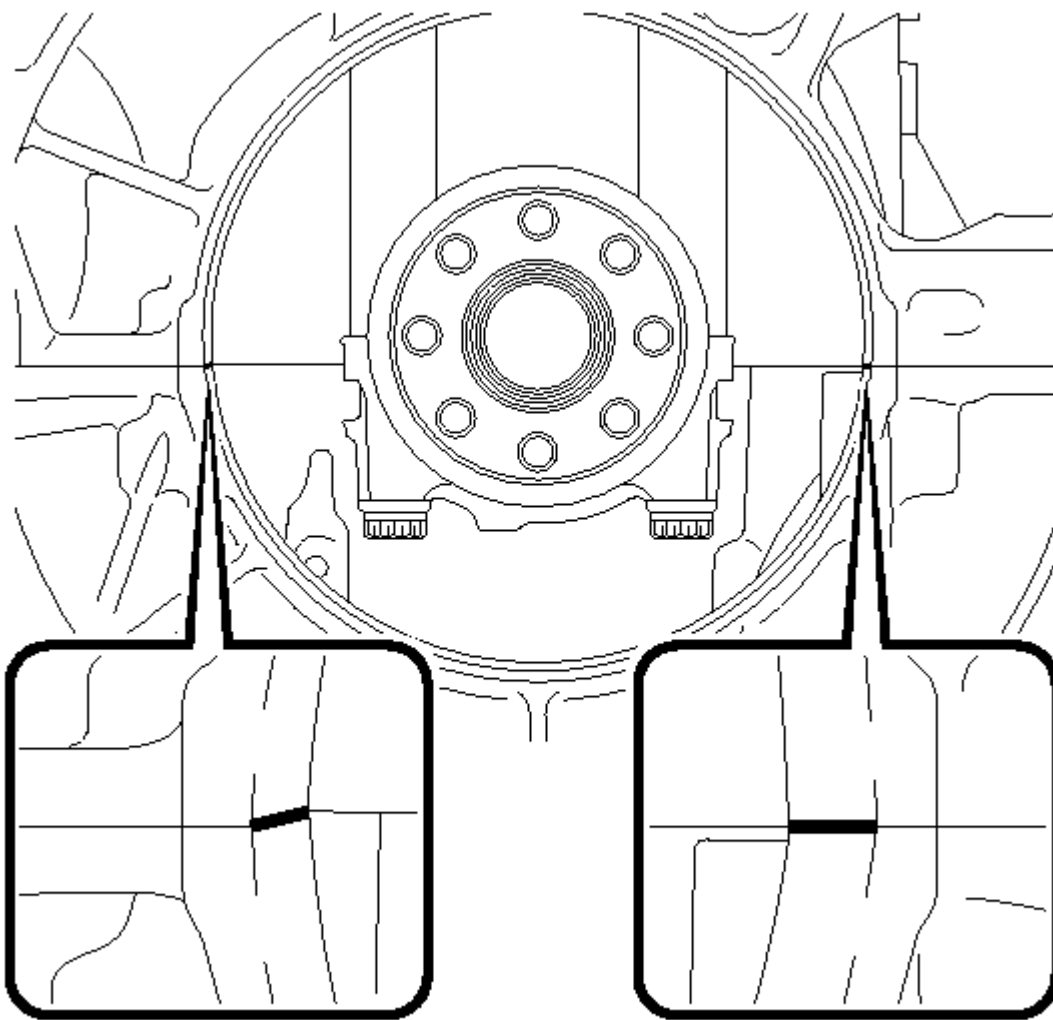
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Protective Tape
*a	Cut Position

- b. Using a screwdriver with its tip wrapped with protective tape, pry out the rear engine oil seal.

INSTALLATION**INSTALLATION****1. INSTALL REAR ENGINE OIL SEAL**

**P****Fig. 66: Applying Seal Packing**

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

- a. Remove any old packing material and be careful not to drop any oil on the contact surfaces of the oil pan and cylinder block.
- b. Apply seal packing in a continuous bead as shown in the illustration.

Seal packing

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

NOTE:

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

- c. Wipe off the excess seal packing, leaving only the specified amount in the areas shown in the illustration.

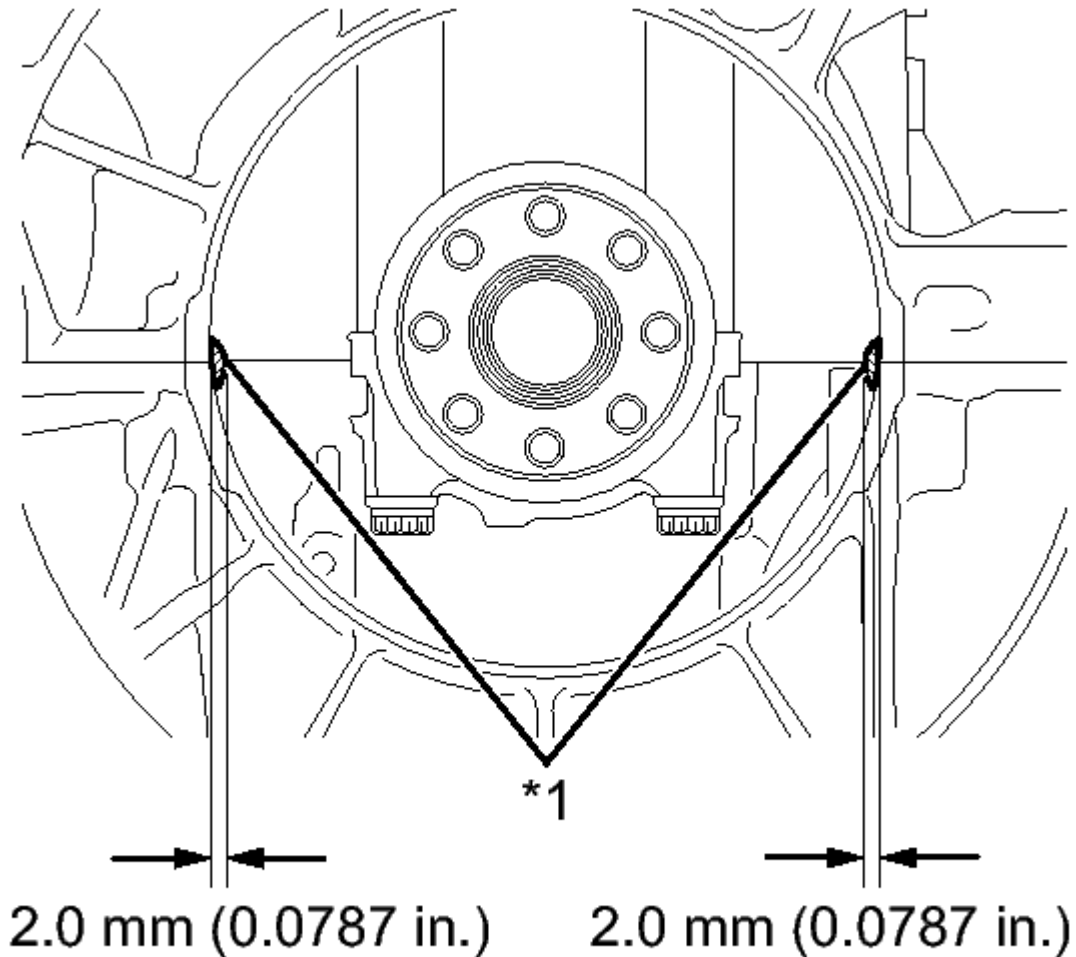
**P**

Fig. 67: Identifying Excess Seal Packing

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

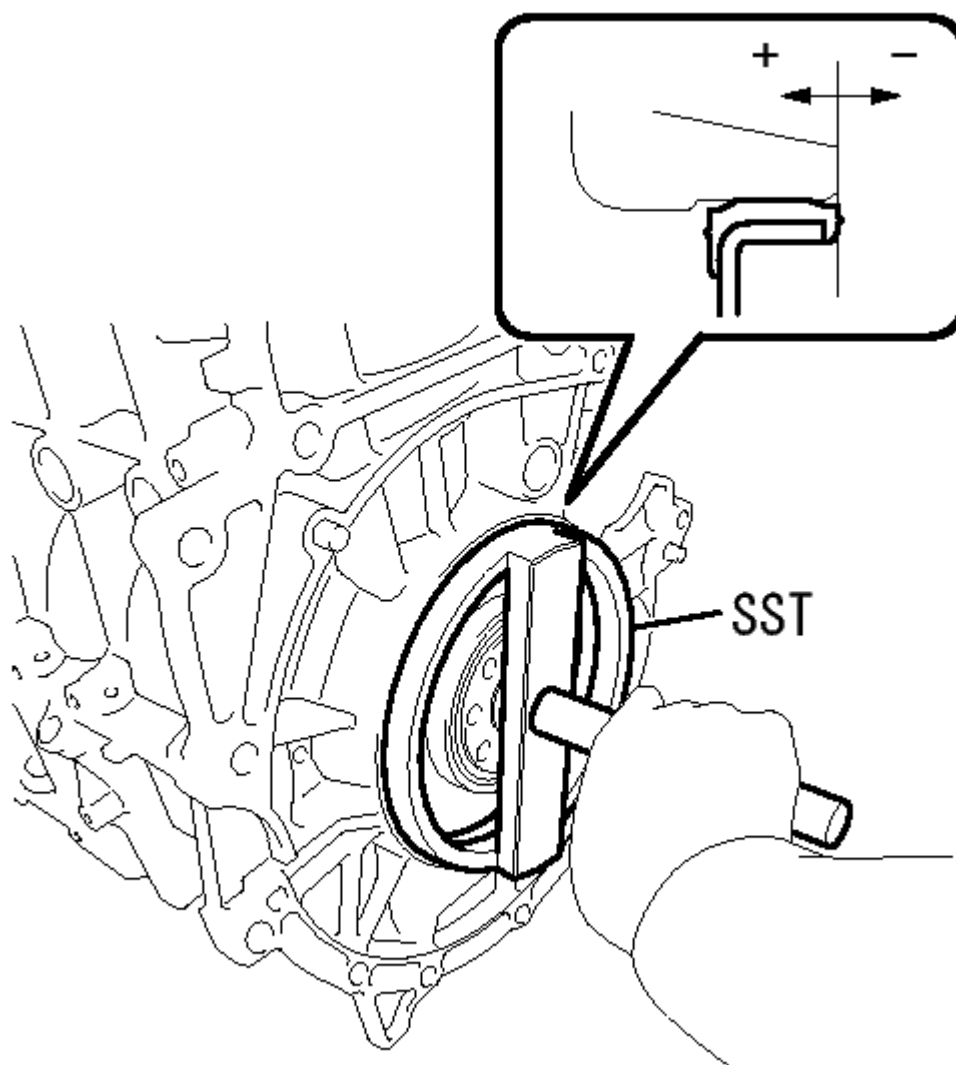
TEXT IN ILLUSTRATION

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

- d. Apply MP grease to the lip of a new rear engine oil seal.

NOTE: **Keep the lip free from foreign matter.**

- e. Using SST and a hammer, tap in the rear engine oil seal until its surface is flush with the cylinder block and oil pan.

**H****Fig. 68: Installing Rear Engine Oil Seal**

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

- SST: 09950-70010
09951-07150
- SST: 09223-47020

Oil seal tap in depth

-0.2 to 1.2 mm (-0.0079 to 0.0472 in.)

NOTE:

- Uniformly tap in the oil seal.
- Do not tap the rear engine oil seal at an angle.
- Wipe off extra grease from the crankshaft.

2. INSTALL DRIVE PLATE AND RING GEAR SUB-ASSEMBLY

- a. Using SST, hold the crankshaft.

- **SST: 09960-10010**

09962-01000

09963-01000

- b. Install the front drive plate spacer, the drive plate and ring gear and the rear drive plate spacer to the crankshaft.

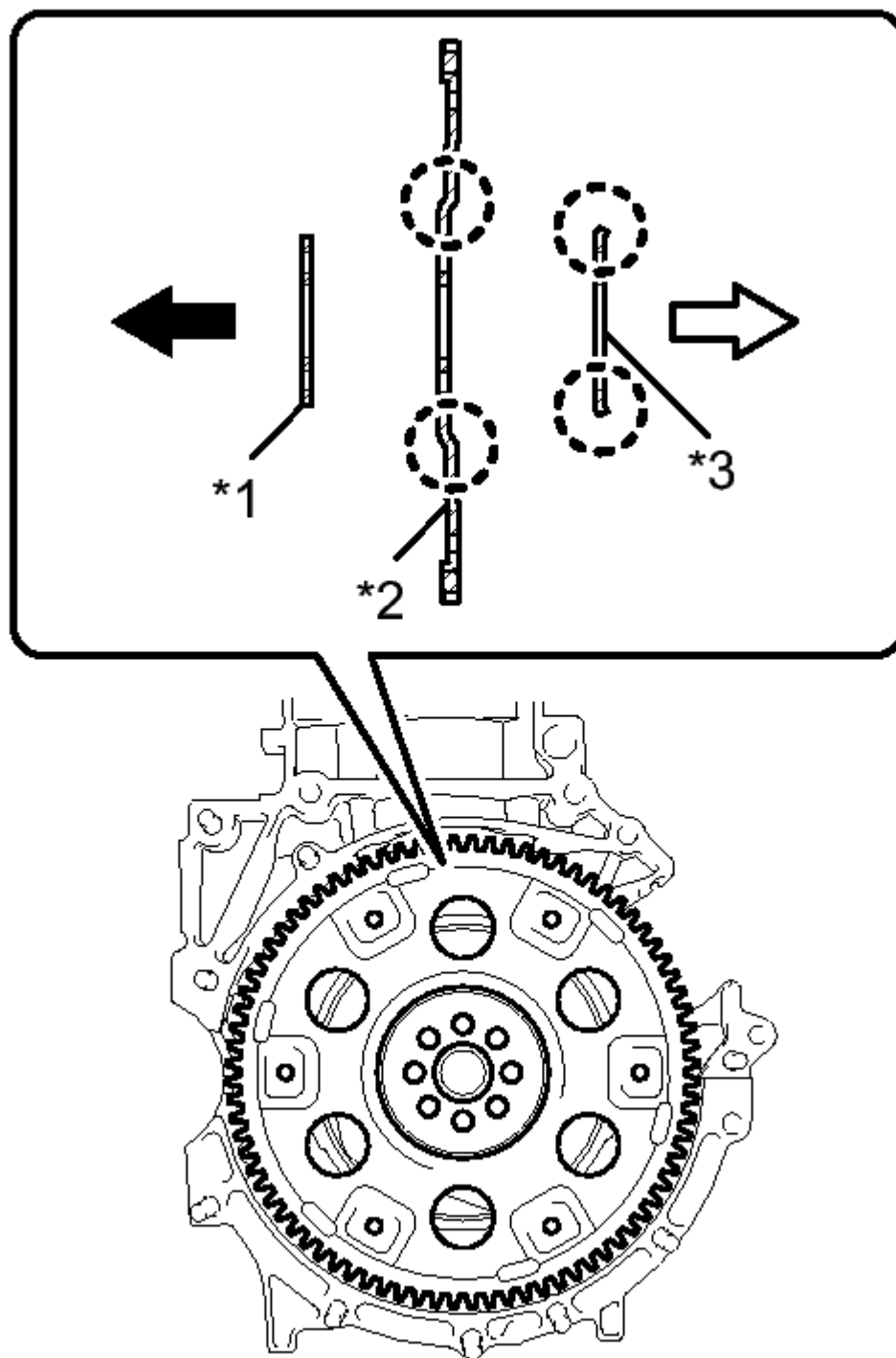
**P**

Fig. 69: Identifying Front Drive Plate Spacer, Drive Plate And Ring Gear, And Rear Drive Plate Spacer

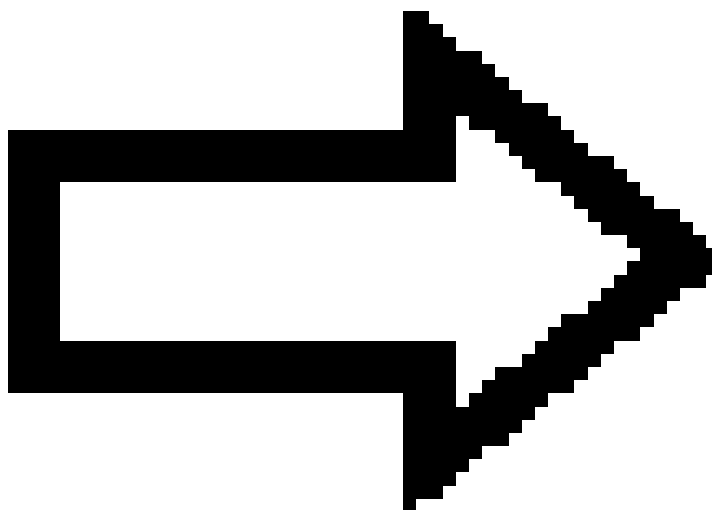
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

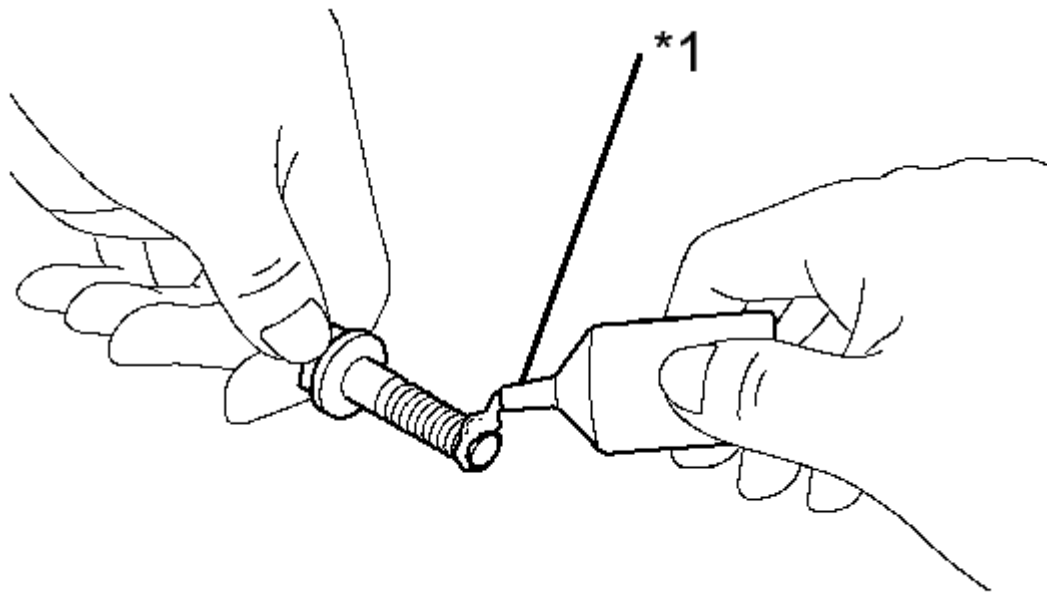
2012 Scion iQ

2012 ENGINE Engine Mechanical (Service Information) - iQ

*1	Front Drive Plate Spacer
*2	Drive Plate and Ring Gear
*3	Rear Drive Plate Spacer
	Engine
	Transaxle

**HINT:**

- The front spacer is reversible.
 - As the rear drive plate spacer and the drive plate are not reversible, be sure to install them in the direction shown in the illustration.
- c. Clean the 8 bolts and their holes.
- d. Apply adhesive to 2 or 3 end threads of each of the 8 bolts.



Y
Fig. 70: Applying Adhesive
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Adhesive
----	----------

Adhesive

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

- e. Install and uniformly tighten the 8 bolts in several steps in sequence shown in the illustration.

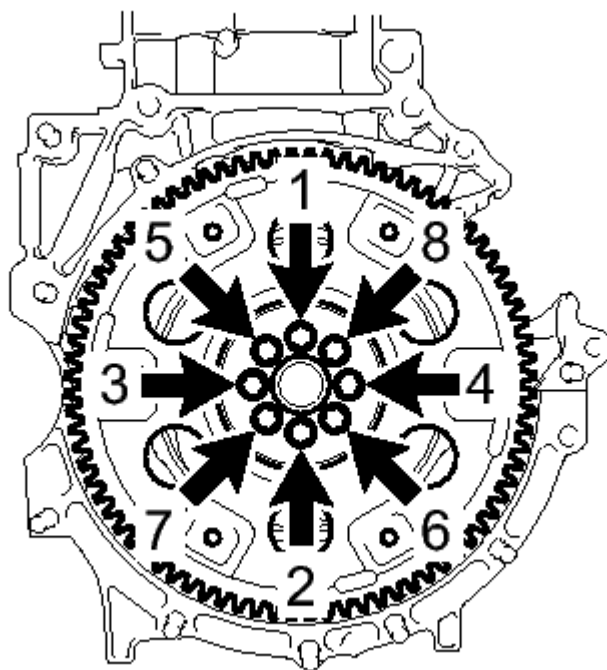
**P**

Fig. 71: Identifying Rear Drive Plate Spacer Bolts

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

Torque: 88 N*m (897 kgf*cm, 65 ft.*lbf)

NOTE: Do not start the engine for at least an hour after installing the drive plate.

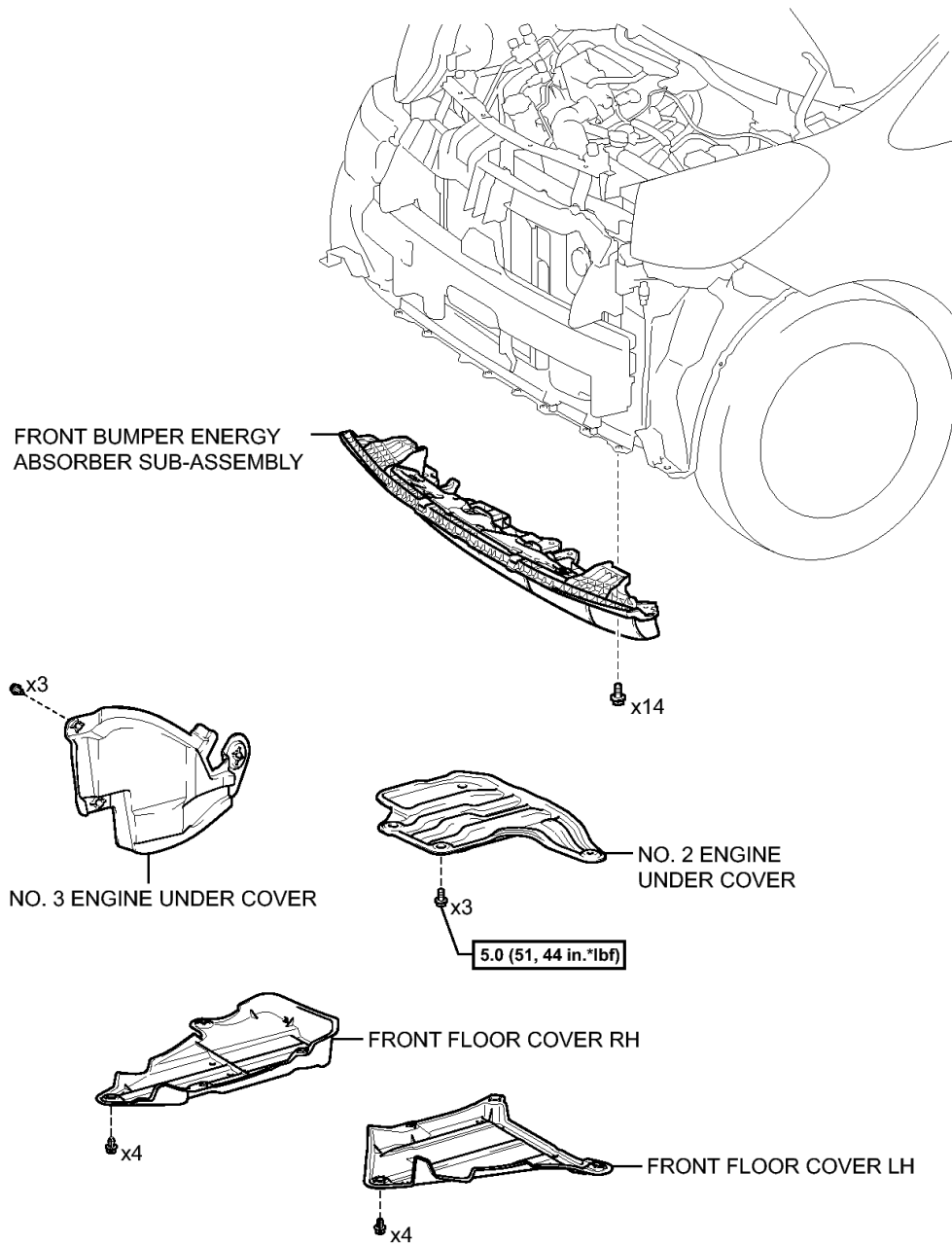
3. INSTALL CONTINUOUSLY VARIABLE TRANSAXLE ASSEMBLY

Refer to INSTALLATION

ENGINE ASSEMBLY

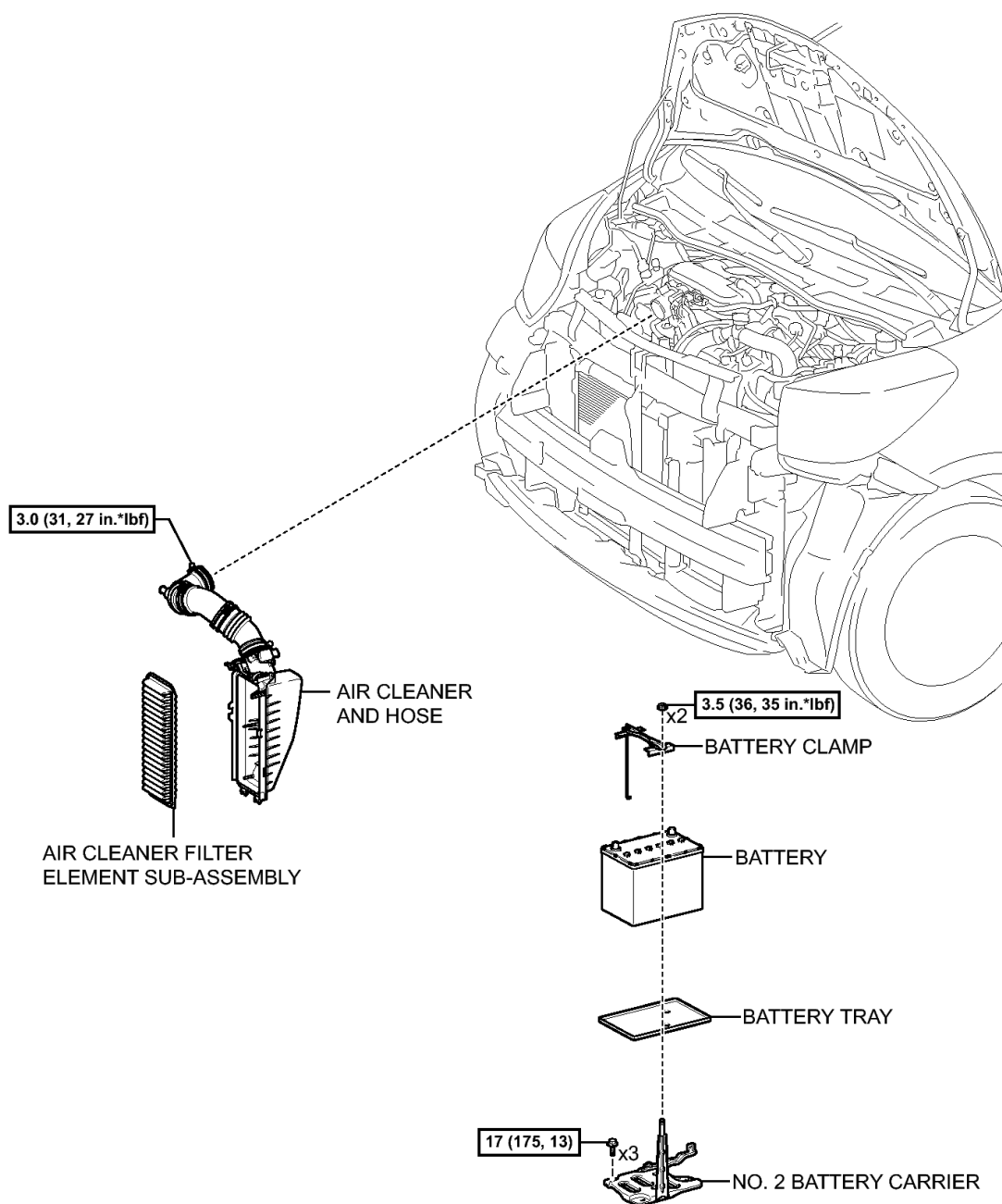
COMPONENTS

ILLUSTRATION



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

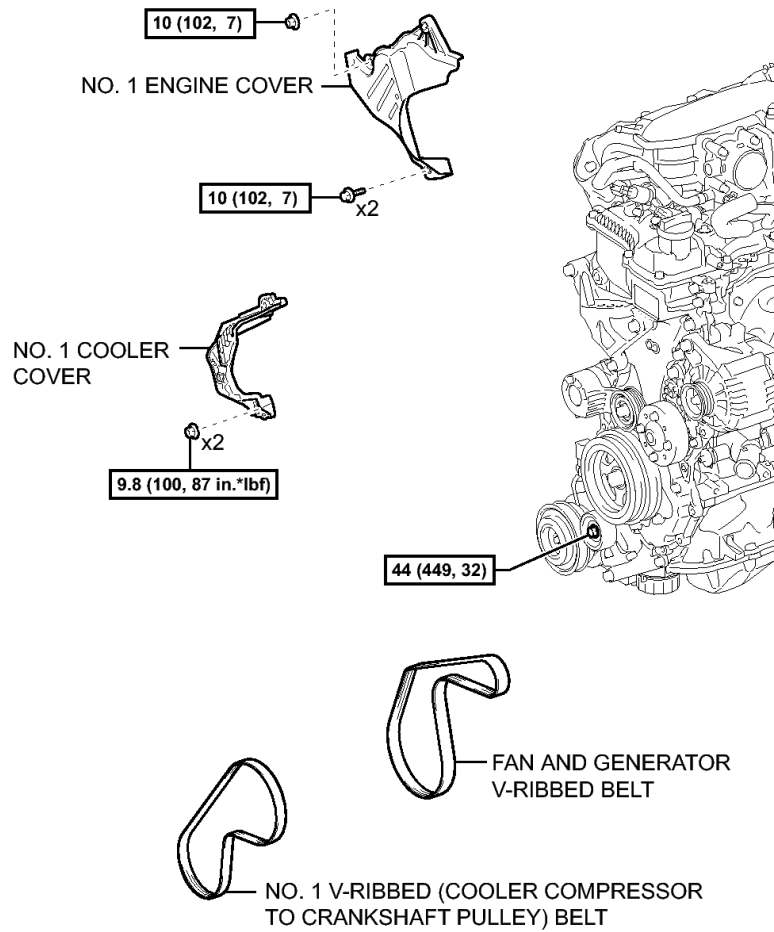
Fig. 72: Identifying Engine Assembly Replacement Components (1 Of 10)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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

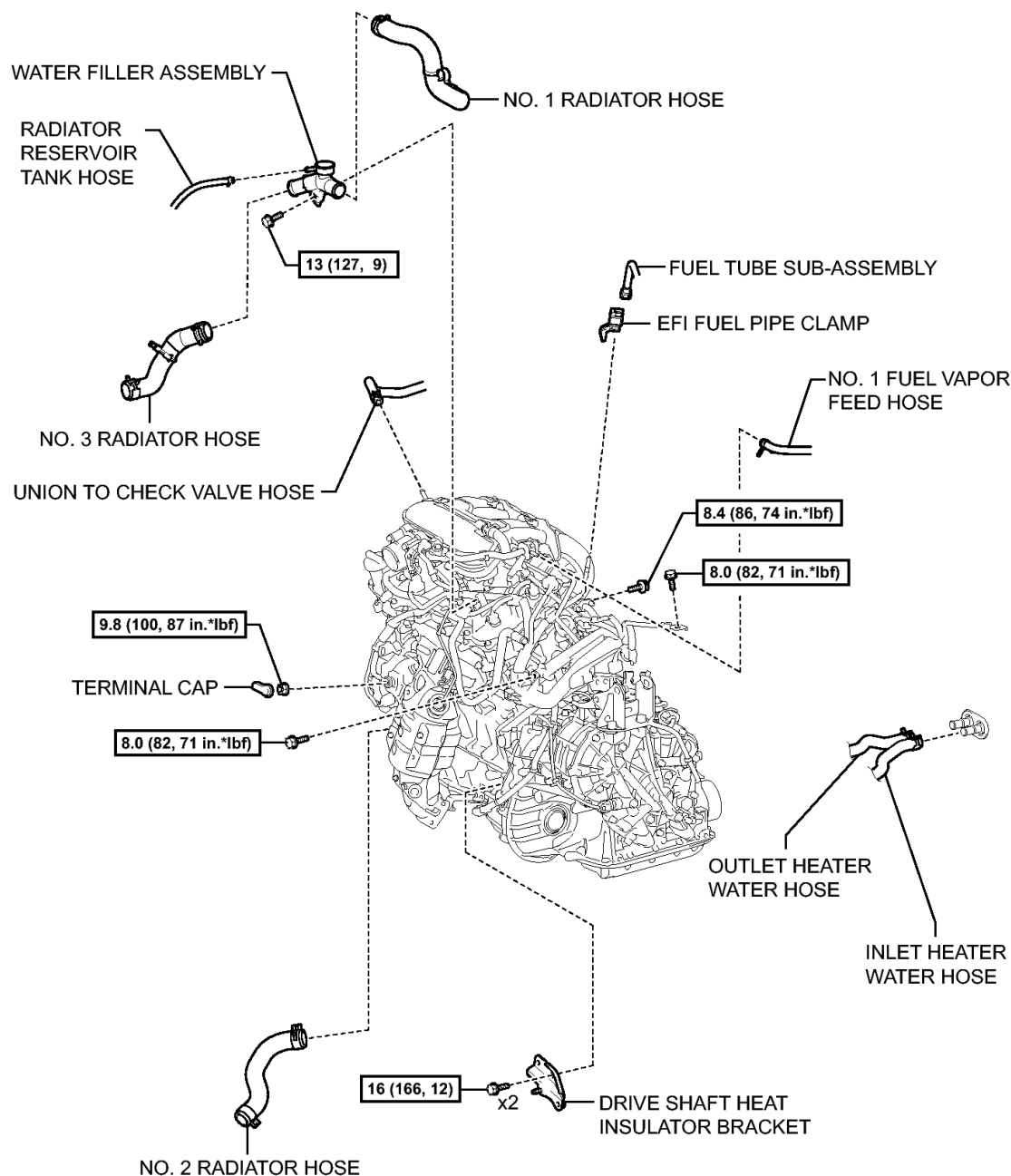
P

Fig. 73: Identifying Engine Assembly Replacement Components With Torque Specifications (2 Of 10)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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

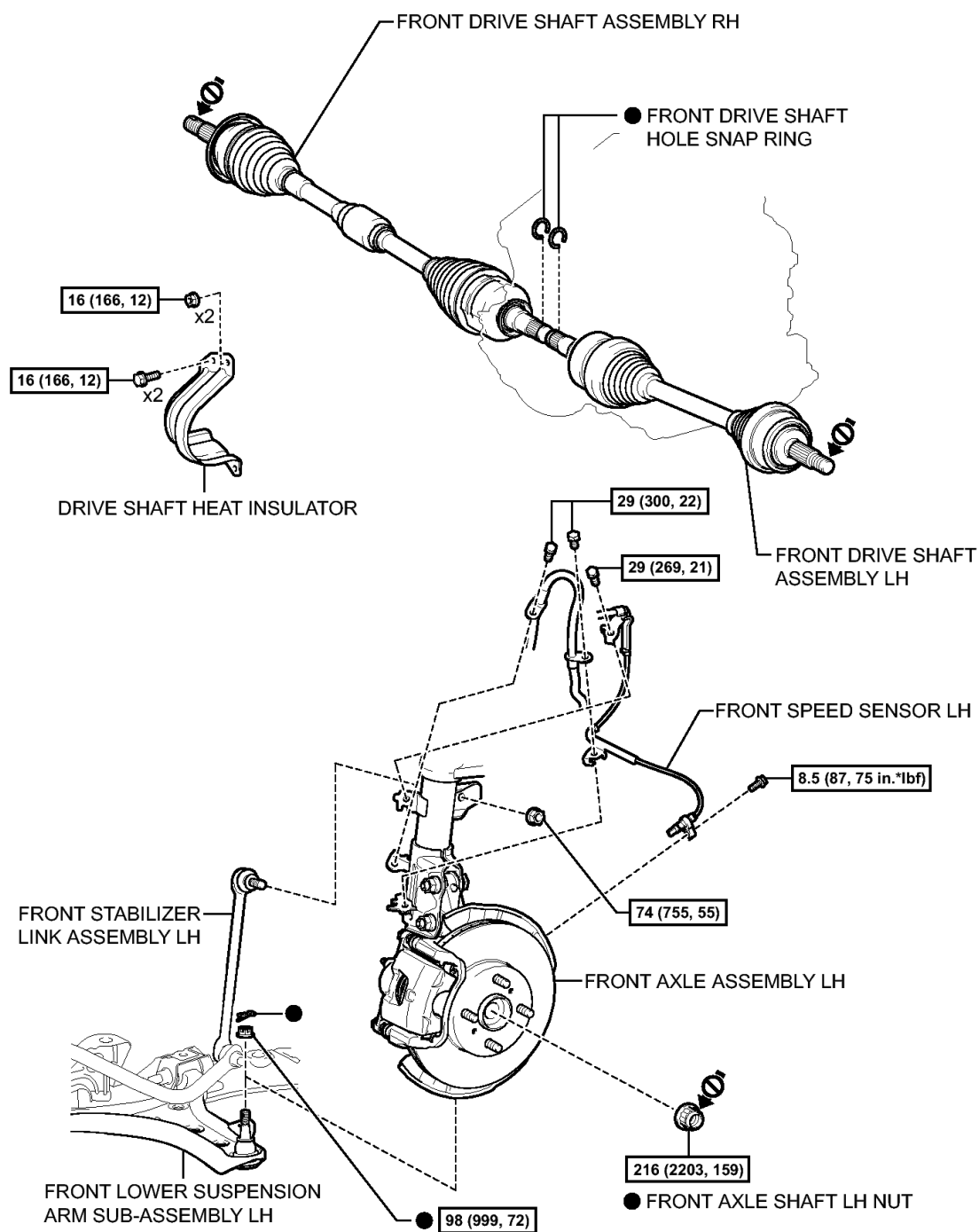
Fig. 74: Identifying Engine Assembly Replacement Components With Torque Specifications (3 Of 10)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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

H

Fig. 75: Identifying Engine Assembly Replacement Components With Torque Specifications (4 Of 10)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

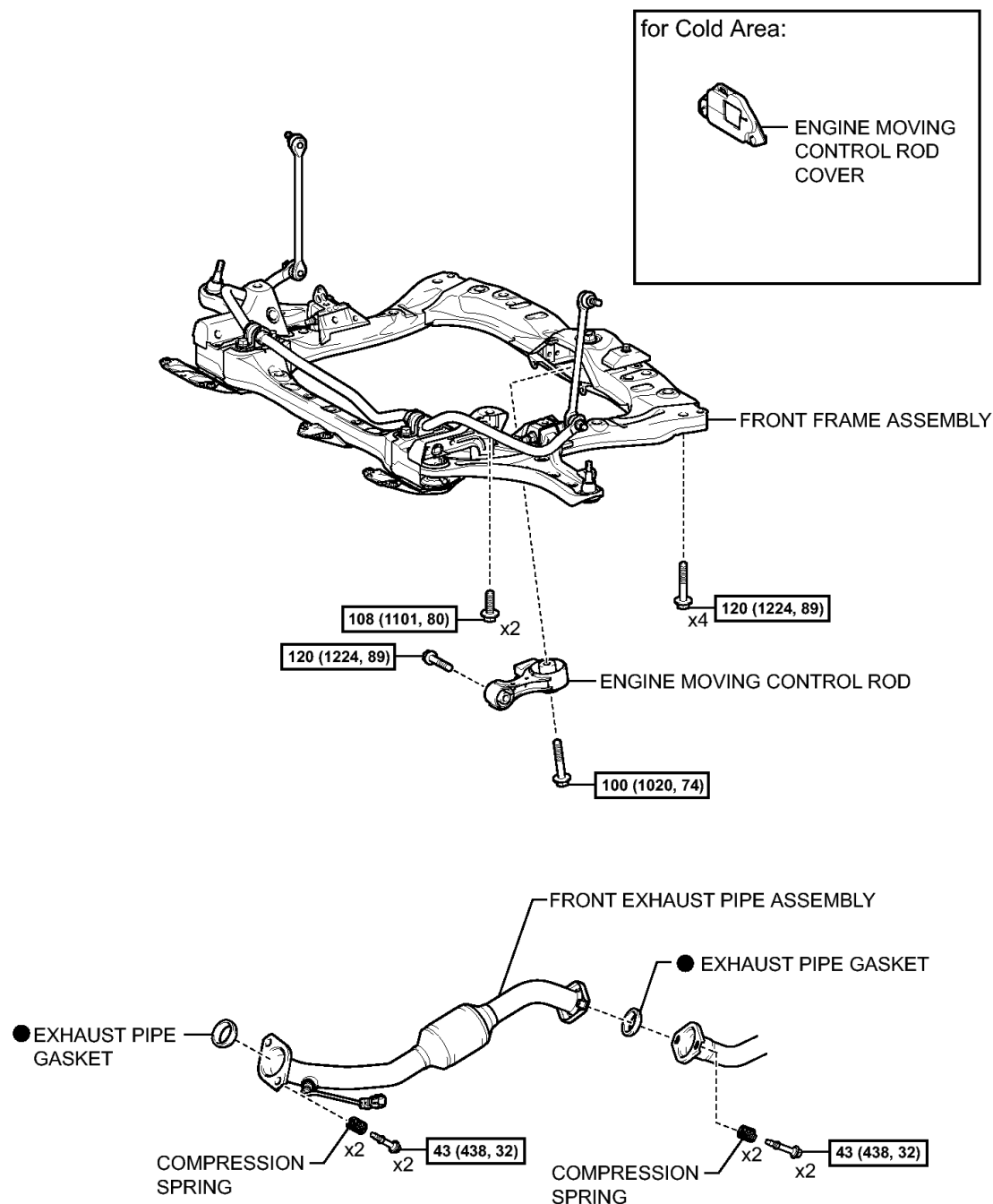


[N*m (kgf*cm, ft.*lbf)]: Specified torque

● Non-reusable part

⚡ Do not apply lubricants to the threaded parts

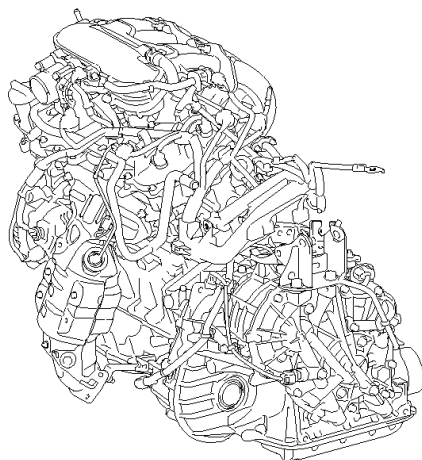
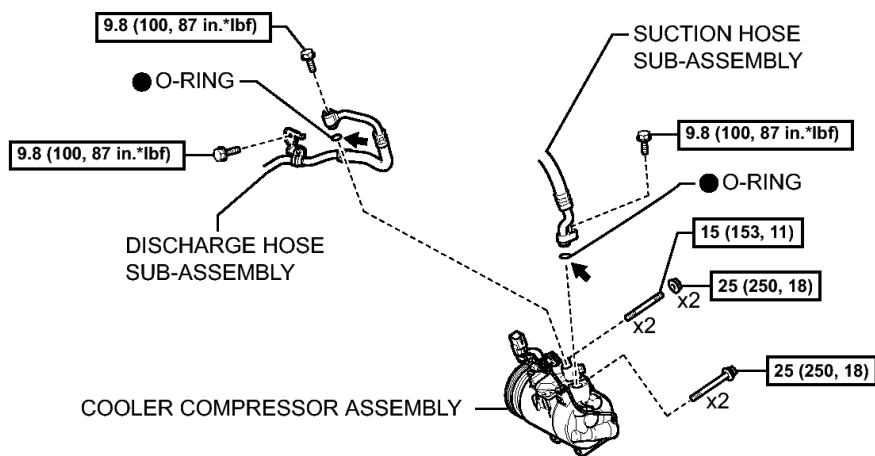
Fig. 76: Identifying Engine Assembly Replacement Components With Torque Specifications (5 Of 10)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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

● Non-reusable part

Fig. 77: Identifying Engine Assembly Replacement Components With Torque Specifications (6 Of 10)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



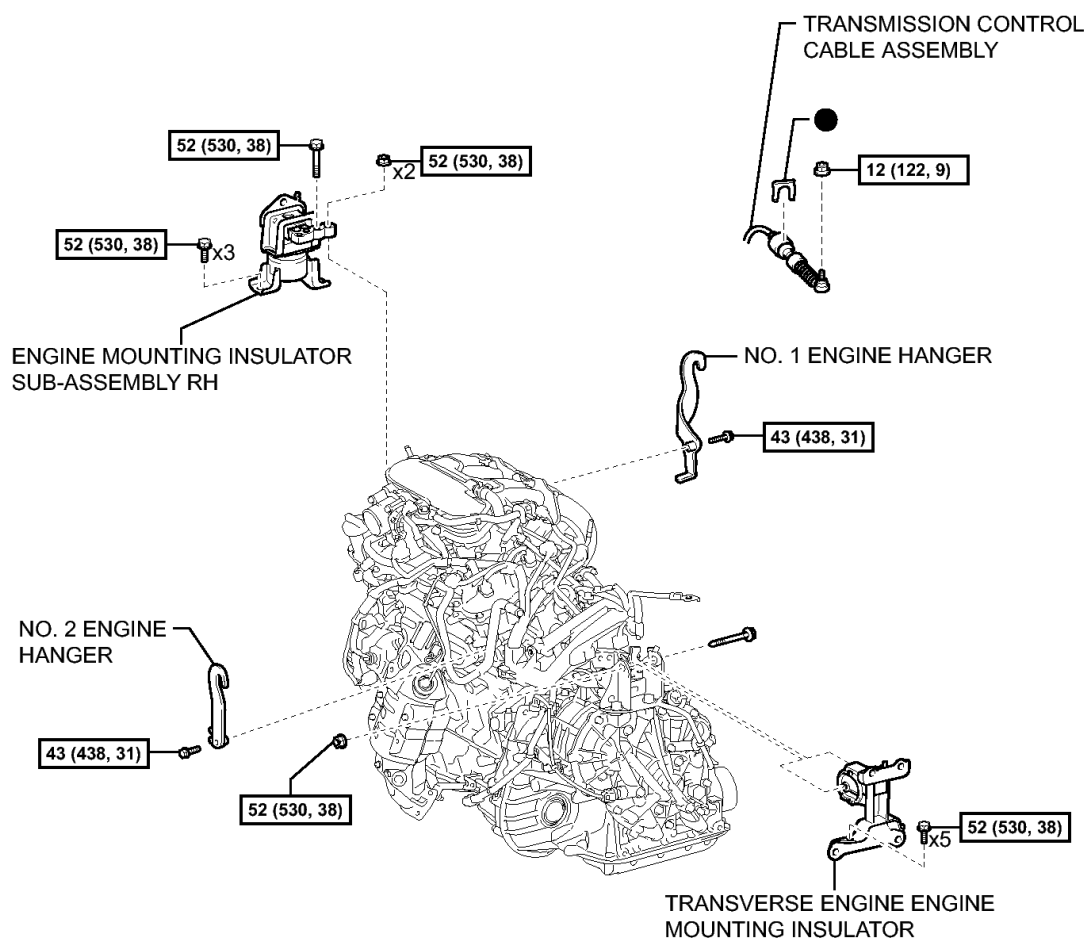
N*m (kgf*cm, ft.*lbf): Specified torque

● Non-reusable part

← Compressor Oil ND-OIL8 or equivalent

H

Fig. 78: Identifying Engine Assembly Replacement Components With Torque Specifications (7 Of 10)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

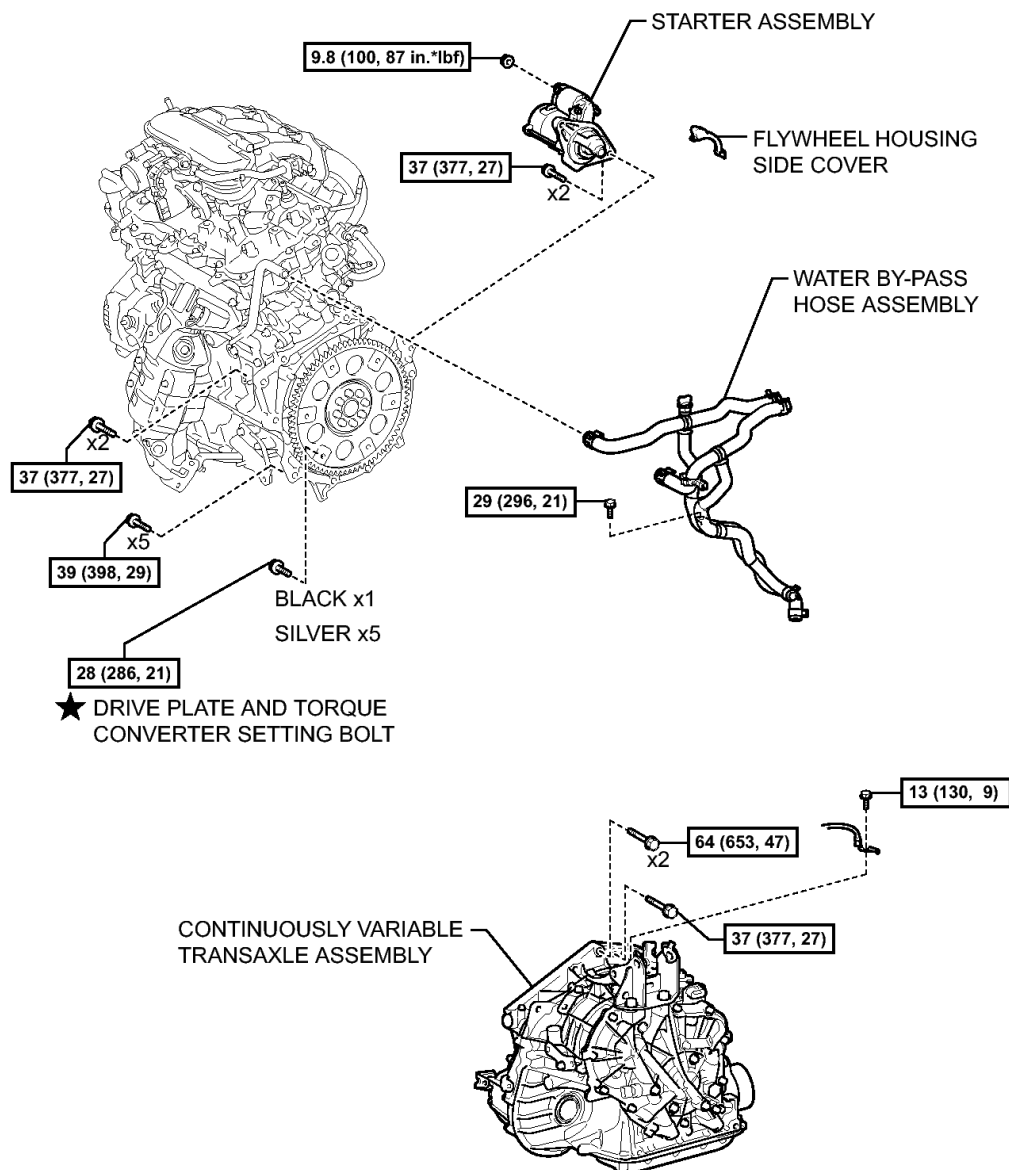


N*m (kgf*cm, ft.*lbf): Specified torque

● Non-reusable part

H

Fig. 79: Identifying Engine Assembly Replacement Components With Torque Specifications (8 Of 10)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

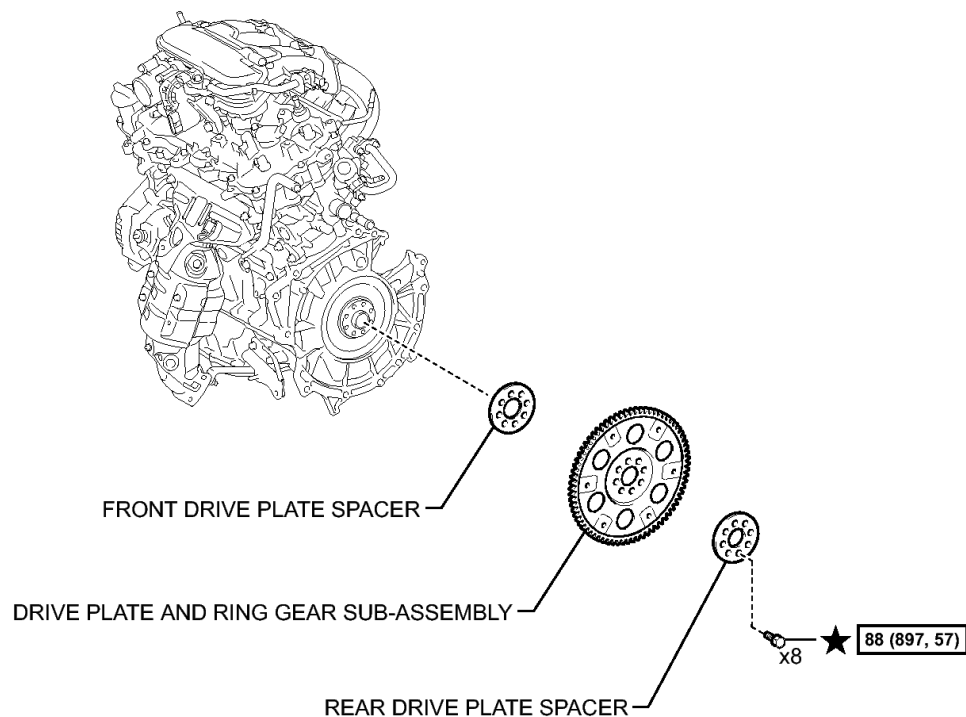


N*m (kgf*cm, ft.*lbf): Specified torque

★ Precoated part

H

Fig. 80: Identifying Engine Assembly Replacement Components With Torque Specifications (9 Of 10)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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

★ Precoated part

H

Fig. 81: Identifying Engine Assembly Replacement Components With Torque Specifications (10 Of 10)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

REMOVAL

1. **RECOVER REFRIGERANT FROM REFRIGERATION SYSTEM** . Refer to **REPLACEMENT - Step 1**

2. DISCHARGE FUEL SYSTEM PRESSURE

Refer to **PRECAUTION**

3. **DRAIN ENGINE COOLANT** . Refer to **REPLACEMENT - Step 1**

4. **DRAIN CONTINUOUSLY VARIABLE TRANSAXLE FLUID** . Refer to **REMOVAL - Step 2**

5. **REMOVE FRONT WHEELS**

6. **REMOVE FRONT BUMPER COVER**

Refer to **REMOVAL**

7. **REMOVE FRONT BUMPER ENERGY ABSORBER SUB-ASSEMBLY** . Refer to **DISASSEMBLY - Step 21**

8. **REMOVE WINDSHIELD WIPER MOTOR AND LINK**

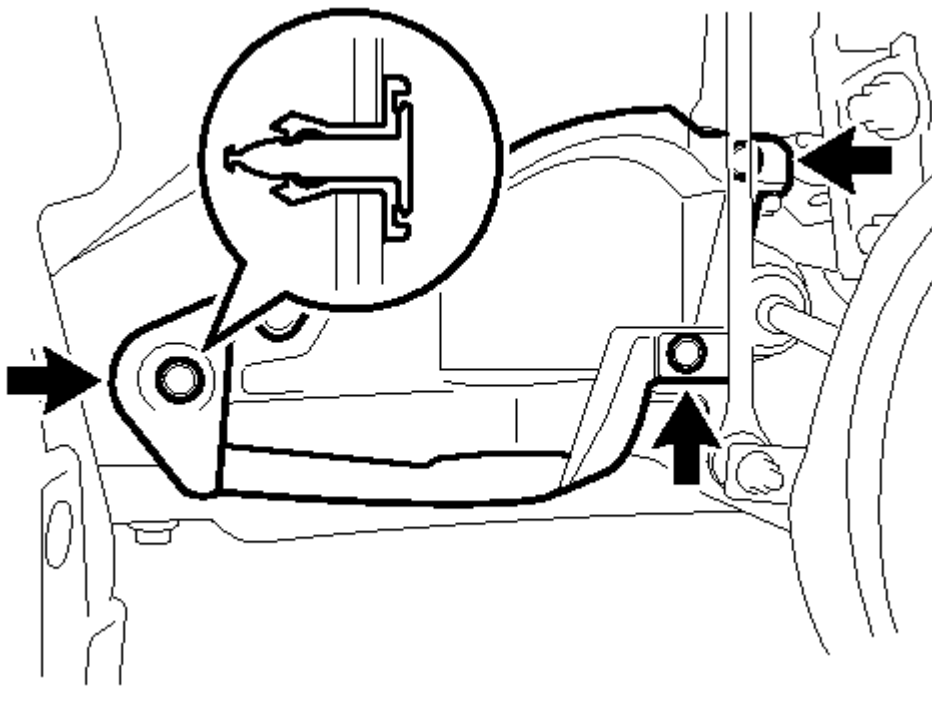
Refer to **REMOVAL**

9. **REMOVE FRONT FLOOR COVER LH**

10. **REMOVE FRONT FLOOR COVER RH**

11. **REMOVE NO. 2 ENGINE UNDER COVER**

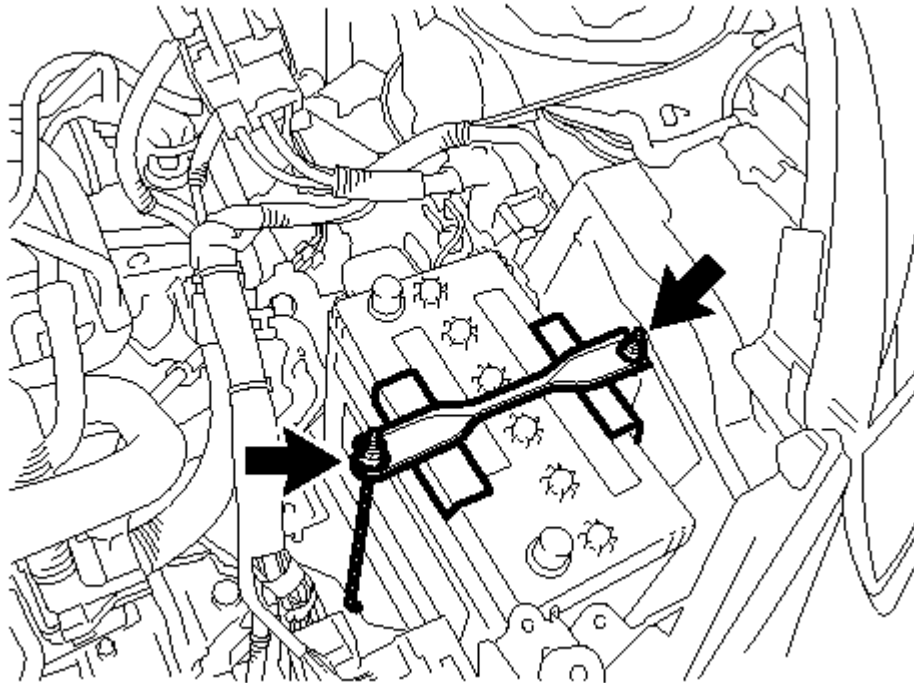
12. **REMOVE NO. 3 ENGINE UNDER COVER**



T

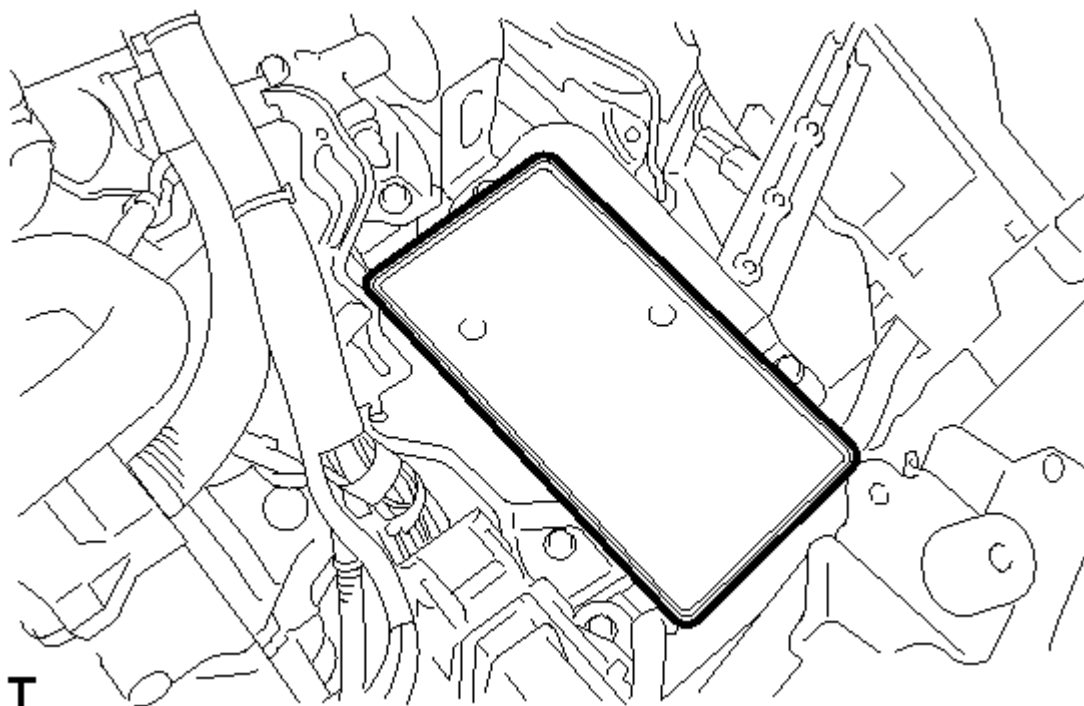
Fig. 82: Identifying No. 3 Engine Under Cover Clips
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Remove the 3 clips and the No. 3 engine under cover.
- 13. **REMOVE NO. 1 COOLER COVER** See step 2
- 14. **REMOVE NO. 1 ENGINE COVER** See step 3
- 15. **REMOVE FRONT EXHAUST PIPE ASSEMBLY** . Refer to **REMOVAL - Step 3**
- 16. **REMOVE EXHAUST PIPE GASKET (for Front Side)**
- 17. **REMOVE EXHAUST PIPE GASKET (for Rear Side)**
- 18. **REMOVE NO. 1 V-RIBBED (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT**
See step 4
- 19. **REMOVE FAN AND GENERATOR V-RIBBED BELT** See step 5
- 20. **REMOVE BATTERY**
 - a. Disconnect the cables from the battery terminals.
 - b. Remove the 2 nuts and the battery clamp.

**T****Fig. 83: Identifying Battery Clamp Nuts**

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

- c. Remove the battery.
- 21. **REMOVE BATTERY TRAY**

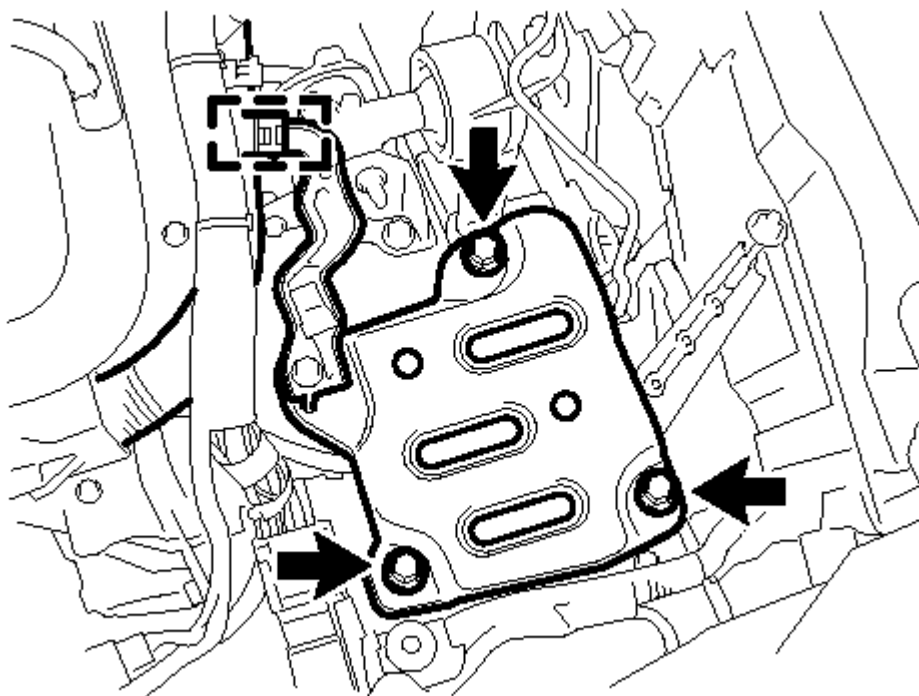


T

Fig. 84: Identifying Battery Tray

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

- a. Remove the battery tray.

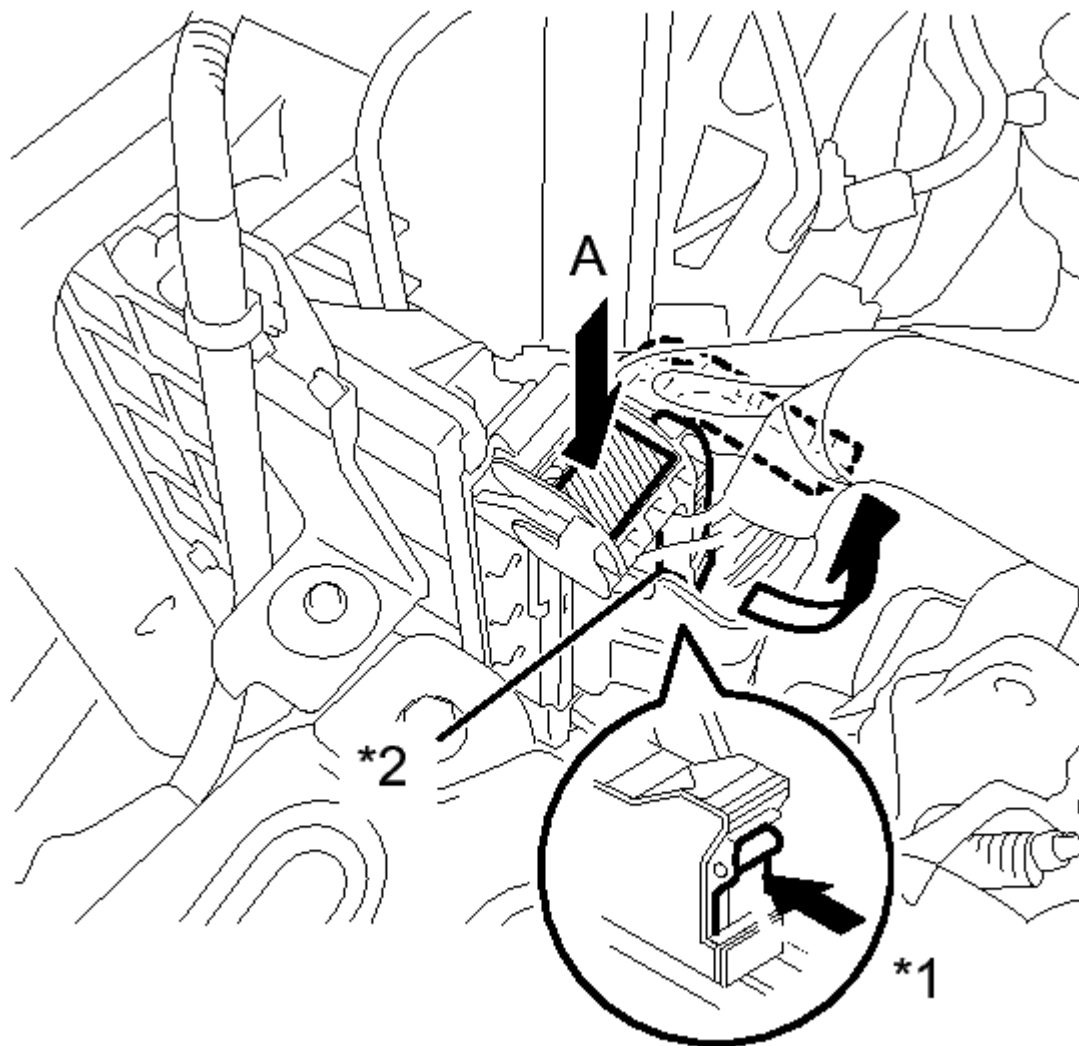
22. REMOVE NO. 2 BATTERY CARRIER

T

Fig. 85: Identifying No. 2 Battery Carrier Bolts And Harness Clamp

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

- a. Disengage the harness clamp from the No. 2 battery carrier.
 - b. Remove the 3 bolts and the No. 2 battery carrier.
23. **REMOVE AIR CLEANER AND HOSE** . Refer to **REMOVAL - Step 5**
24. **REMOVE AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY**
25. **DISCONNECT ENGINE WIRE**



T

Fig. 86: Disconnecting The ECM Connector

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

- a. Turn the lever and disconnect the ECM connector.

TEXT IN ILLUSTRATION

*1	Lock Button B
----	---------------

*2	Lever
----	-------

NOTE:

- Depress the lock button B while depressing A, and turn the lever.
- Do not turn the lever more than 90°.
- Do not turn the lever before depressing the lock button B.

- b. Disconnect the 2 connectors from the battery terminal.

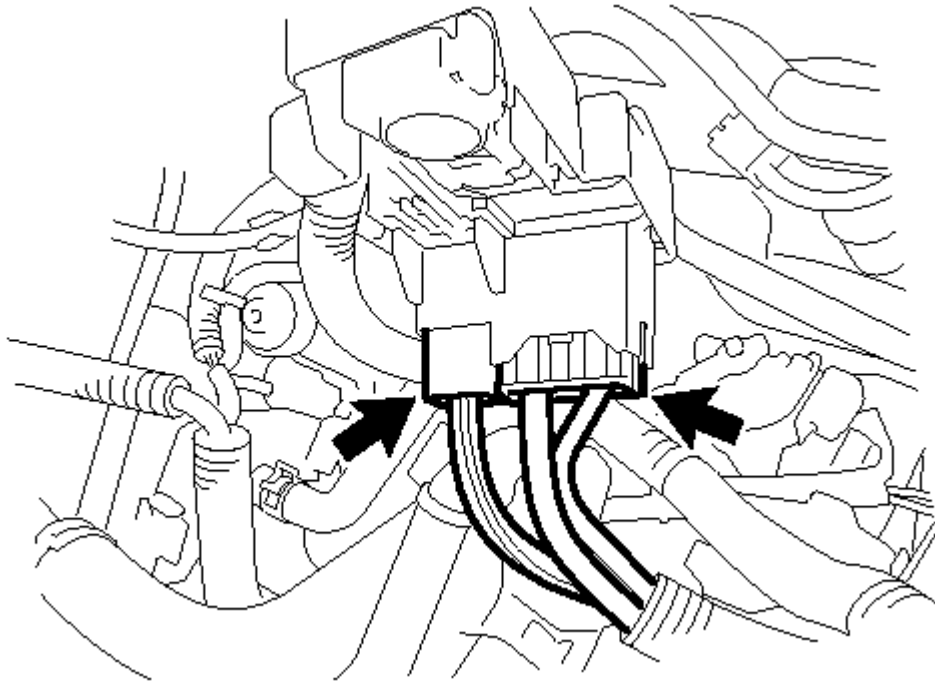
**T**

Fig. 87: Identifying Battery Terminal Connectors

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

- c. Remove the engine room junction block cover.
- d. Remove the 4 connectors and 2 clamps from the engine room junction block

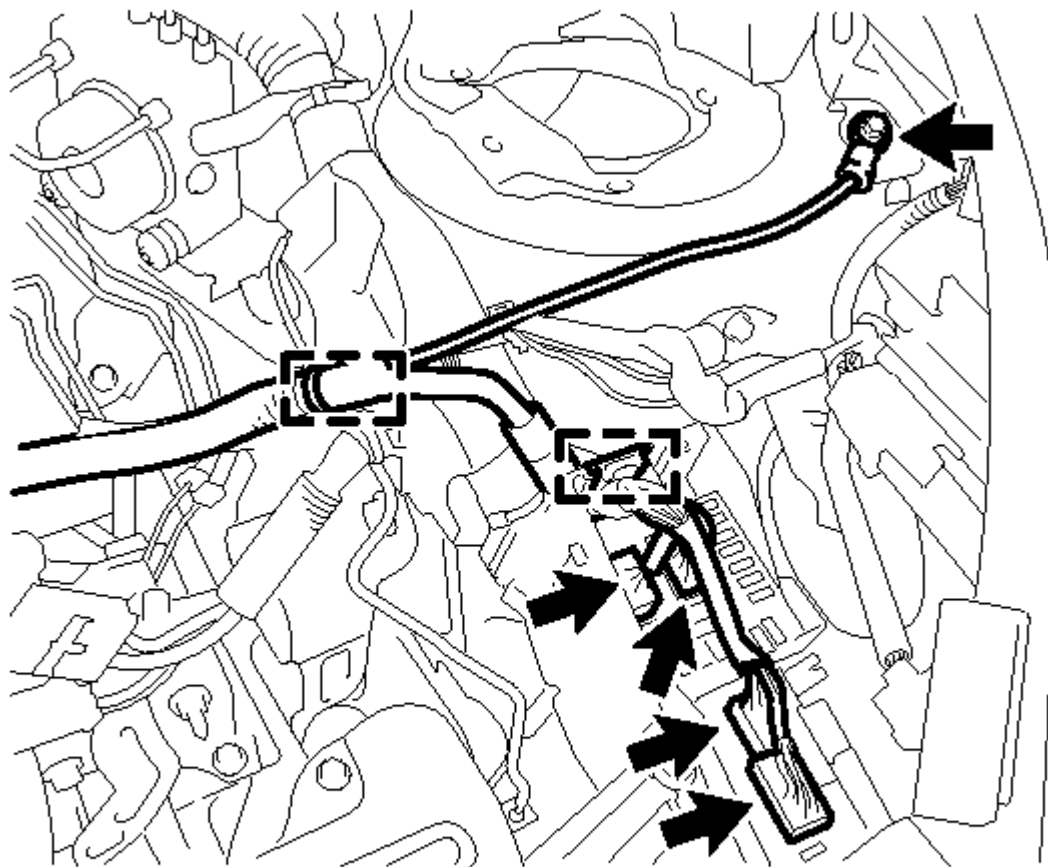
**T**

Fig. 88: Identifying Engine Room Junction Block Connectors And Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Remove the ground bolt and harness clamp and disconnect the engine wire.

26. DISCONNECT RADIATOR RESERVOIR TANK HOSE

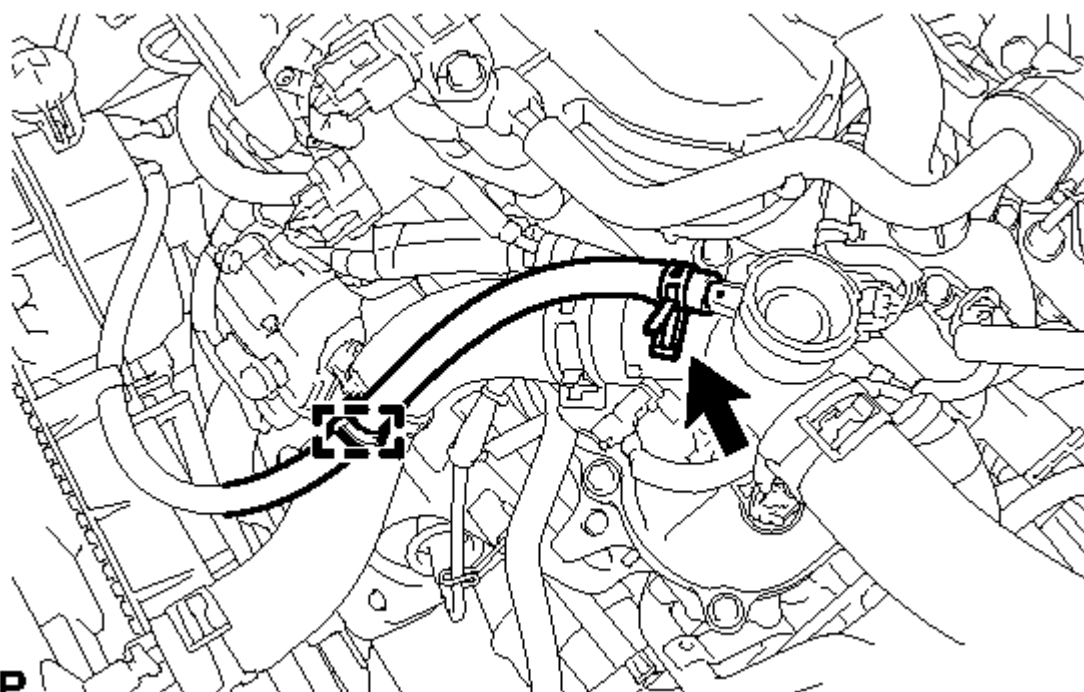


Fig. 89: Identifying Radiator Reservoir Tank Hose Clamp

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

- a. Disengage the radiator reservoir tank hose from the hose clamp.
- b. Loosen the clip and disconnect the radiator reservoir tank hose.

27. REMOVE NO. 3 RADIATOR HOSE

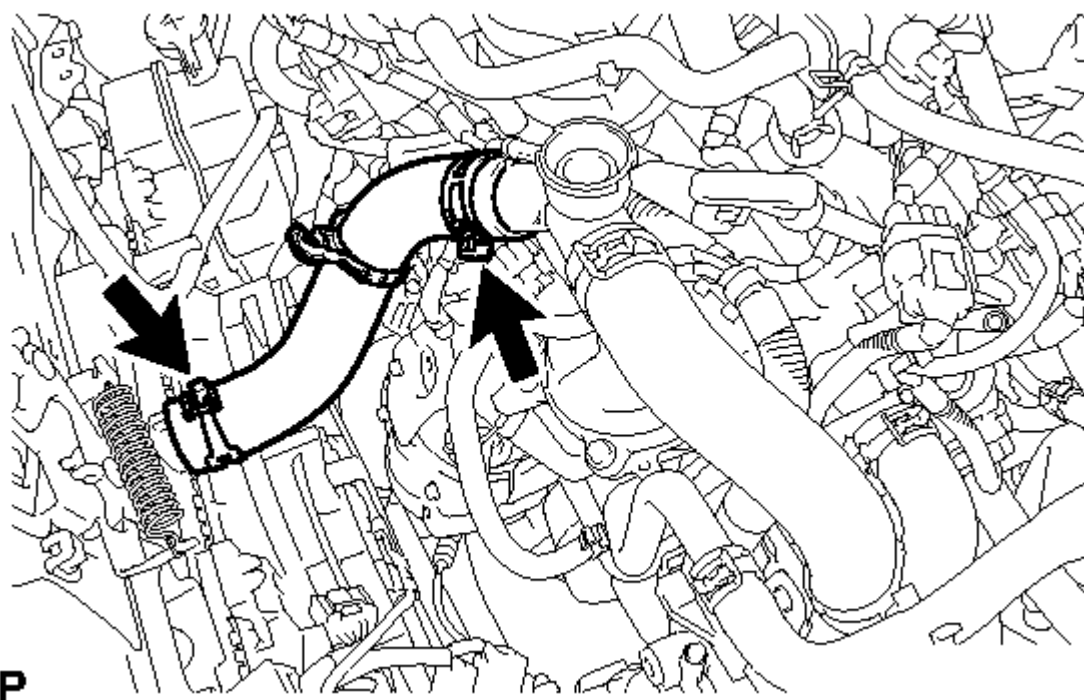


Fig. 90: Identifying No. 3 Radiator Hose Clips
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Loosen the 2 clips and remove the No. 3 radiator hose.
- 28. **DISCONNECT NO. 2 RADIATOR HOSE** . Refer to **REMOVAL - Step 9**
- 29. **DISCONNECT NO. 1 FUEL VAPOR FEED HOSE**

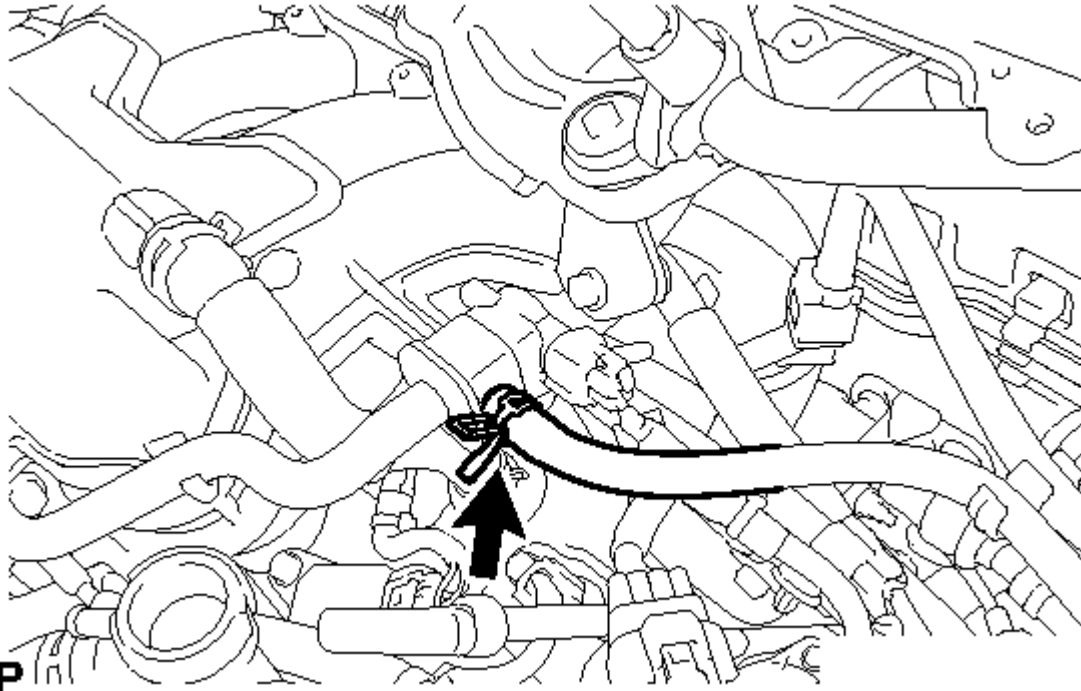


Fig. 91: Identifying No. 1 Fuel Vapor Feed Hose Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Loosen the clip and disconnect the No. 1 fuel vapor feed hose.
- 30. **REMOVE EFI FUEL PIPE CLAMP** . Refer to **REMOVAL - Step 3**
- 31. **DISCONNECT FUEL TUBE SUB-ASSEMBLY** . Refer to **REMOVAL - Step 4**
- 32. **DISCONNECT INLET HEATER WATER HOSE** . Refer to **REMOVAL - Step 10**
- 33. **DISCONNECT OUTLET HEATER WATER HOSE** . Refer to **REMOVAL - Step 11**
- 34. **SEPARATE TRANSMISSION CONTROL CABLE ASSEMBLY**

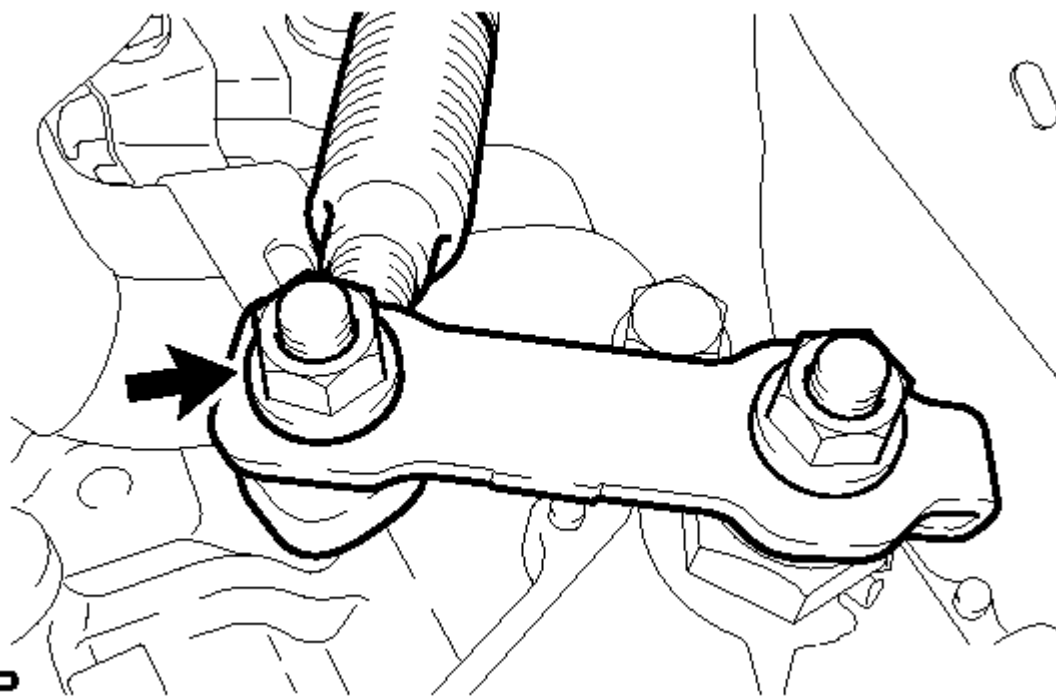
**P**

Fig. 92: Identifying Transmission Control Cable Nut

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

- a. Remove the nut and disconnect the transmission control cable from the transmission control shaft lever.
- b. Remove the clip and separate the transmission control cable from the No. 1 transmission control cable bracket.

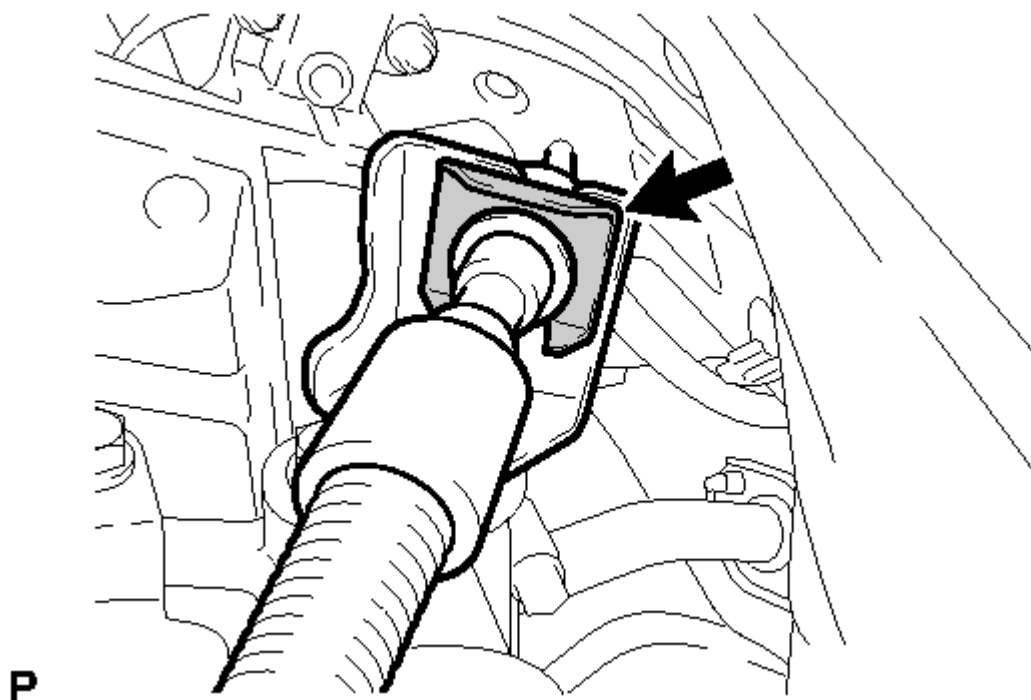


Fig. 93: Identifying Transmission Control Cable Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

35. DISCONNECT UNION TO CHECK VALVE HOSE

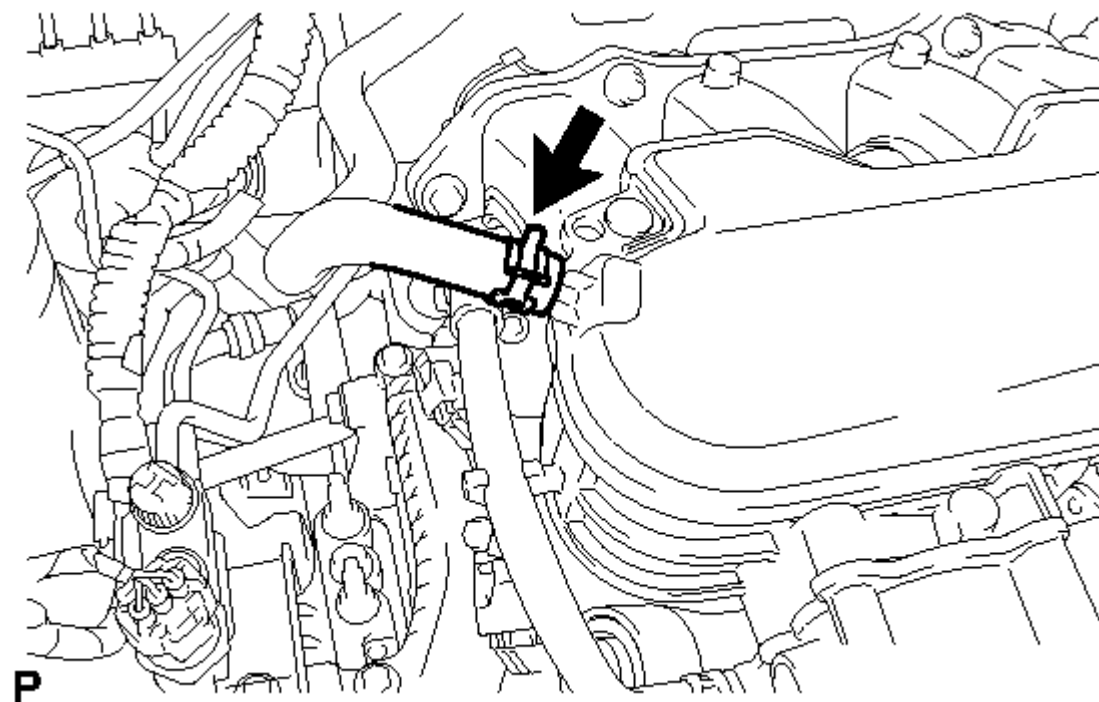


Fig. 94: Identifying Check Valve Hose Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Loosen the clip and disconnect union to check valve hose.

36. **REMOVE FRONT AXLE SHAFT LH NUT** . Refer to **REMOVAL - Step 2**

37. **REMOVE FRONT AXLE SHAFT RH NUT**

HINT:

The removal procedure for the RH side is the same as that for the LH side.

38. **SEPARATE FRONT SPEED SENSOR LH** . Refer to **REMOVAL - Step 3**

39. **SEPARATE FRONT SPEED SENSOR RH**

HINT:

The removal procedure for the RH side is the same as that for the LH side.

40. **SEPARATE FRONT STABILIZER LINK ASSEMBLY LH** . Refer to **REMOVAL - Step 2**

41. **SEPARATE FRONT STABILIZER LINK ASSEMBLY RH**

HINT:

The removal procedure for the RH side is the same as that for the LH side.

42. **SEPARATE FRONT LOWER SUSPENSION ARM SUB-ASSEMBLY LH** . Refer to **REMOVAL - Step 6**

43. **SEPARATE FRONT LOWER SUSPENSION ARM SUB-ASSEMBLY RH**

HINT:

The removal procedure for the RH side is the same as that for the LH side.

44. **SEPARATE FRONT AXLE ASSEMBLY LH** . Refer to **REMOVAL - Step 7**

45. **SEPARATE FRONT AXLE ASSEMBLY RH**

HINT:

The removal procedure for the RH side is the same as that for the LH side.

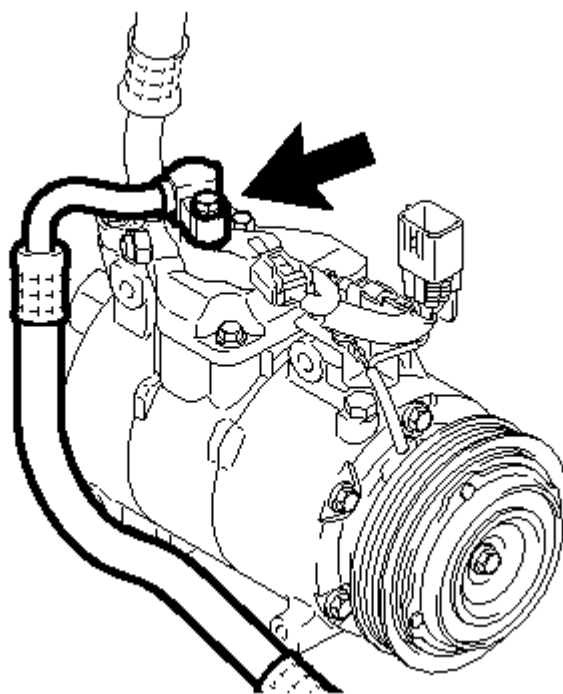
46. **REMOVE DRIVE SHAFT HEAT INSULATOR** . Refer to **REMOVAL - Step 9**

47. **REMOVE FRONT DRIVE SHAFT ASSEMBLY LH** . Refer to **REMOVAL - Step 10**

48. **REMOVE FRONT DRIVE SHAFT ASSEMBLY RH** . Refer to **REMOVAL - Step 11**

49. **REMOVE FRONT FRAME ASSEMBLY** . Refer to **REMOVAL - Step 11**

50. **DISCONNECT DISCHARGE HOSE SUB-ASSEMBLY**

**P****Fig. 95: Identifying Discharge Hose Bolt**

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

- a. Remove the bolt and disconnect the discharge hose from the compressor.
- b. Remove the O-ring from the discharge hose.

NOTE: **Seal the openings of the disconnected parts using vinyl tape to prevent the entry of moisture and foreign matter.**

- c. Remove the bolt and the separate the discharge hose.

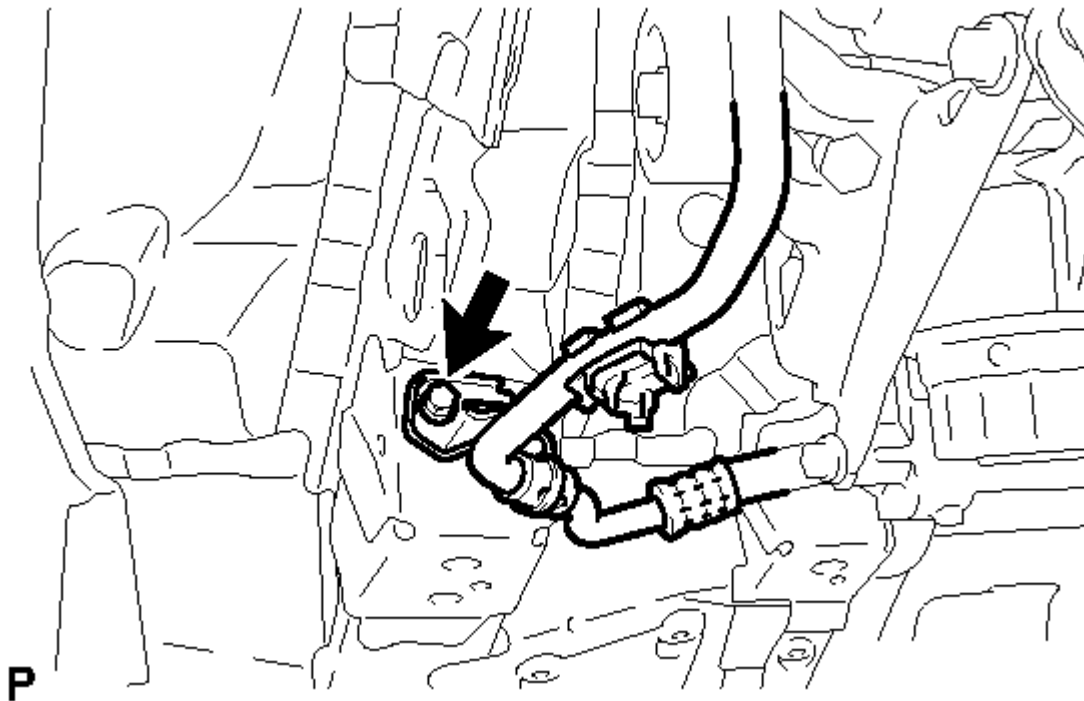


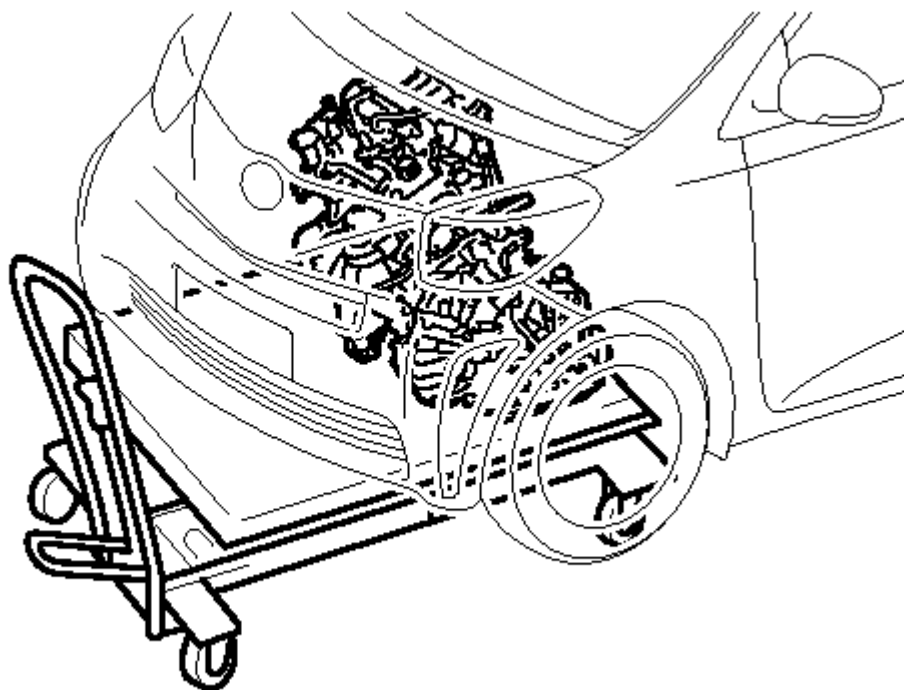
Fig. 96: Identifying Discharge Hose Bolt

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

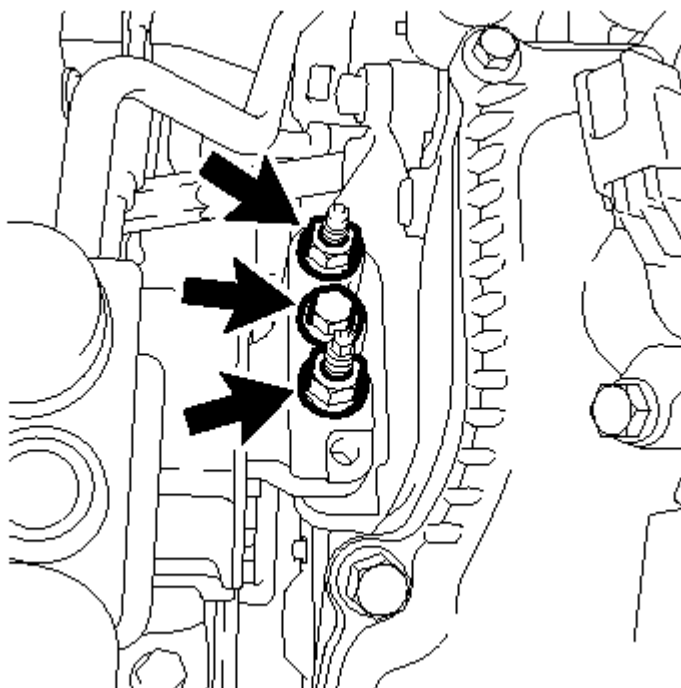
51. **DISCONNECT SUCTION HOSE SUB-ASSEMBLY** . Refer to **REMOVAL - Step 5**
52. **REMOVE COOLER COMPRESSOR ASSEMBLY** . Refer to **REMOVAL - Step 6**
53. **REMOVE ENGINE MOVING CONTROL ROD COVER (for Cold Area)** . Refer to **REMOVAL - Step 20**
54. **REMOVE ENGINE MOVING CONTROL ROD** . Refer to **REMOVAL - Step 21**
55. **REMOVE ENGINE ASSEMBLY WITH TRANSAXLE**
 - a. Set the engine lifter.

NOTE:

- Install a height adjustment attachment and plate lift attachment onto the engine assembly with transaxle.
- Securely suspend the engine assembly to prevent it from turning upside down, until it is secured to an engine stand.
- Do not perform any procedure while the engine assembly is suspended because doing so may cause the engine assembly to drop, resulting in injury. However, the engine assembly needs to be suspended when it is installed to or removed from an engine stand.

**T****Fig. 97: Setting The Engine Lifter****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- b. Remove the rope that secures the engine assembly and the body.
- c. Remove the bolt, 2 nuts and disconnect the engine mounting insulator RH.

**P****Fig. 98: Identifying Engine Mounting Insulator RH Nuts**

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

- d. Remove the through bolt and nut and disconnect the engine mounting insulator LH.

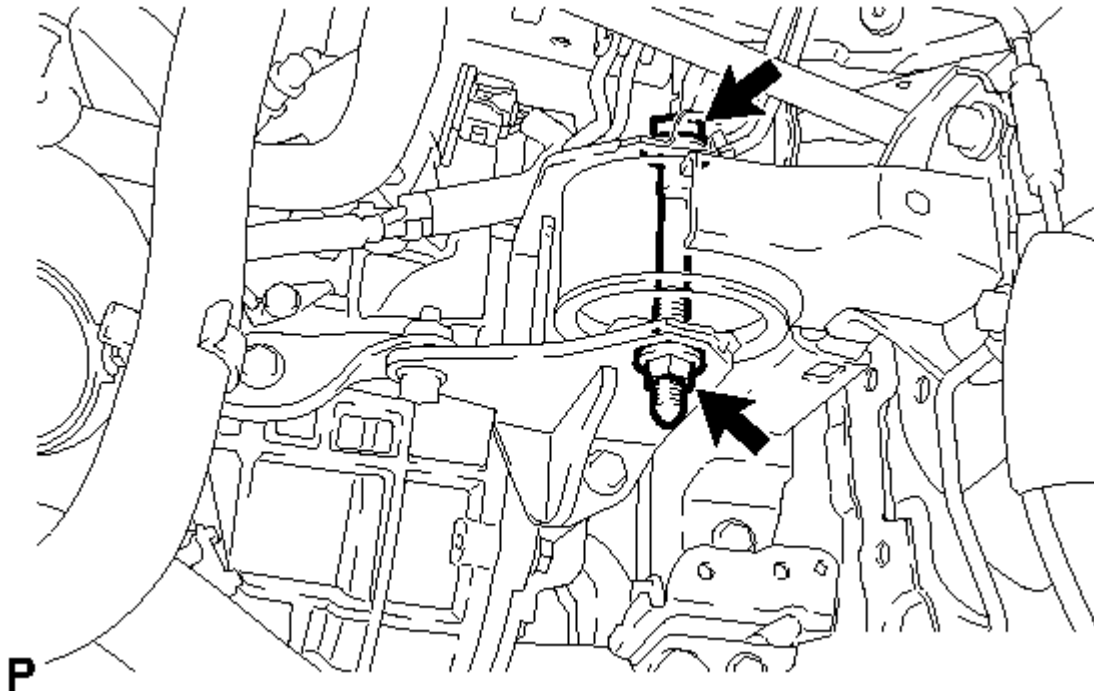
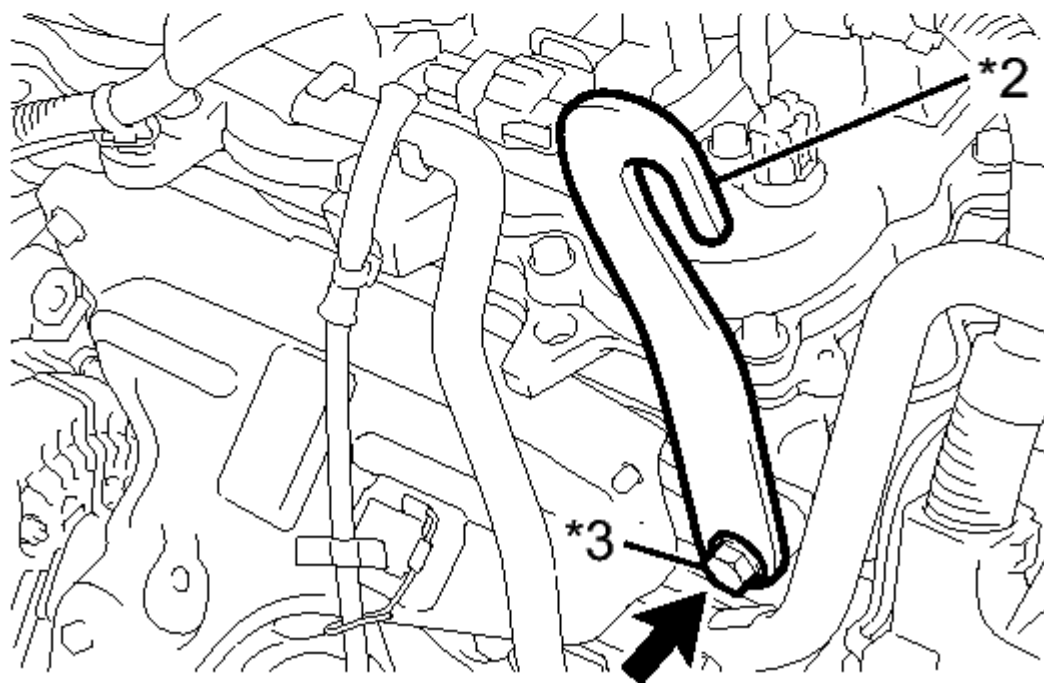
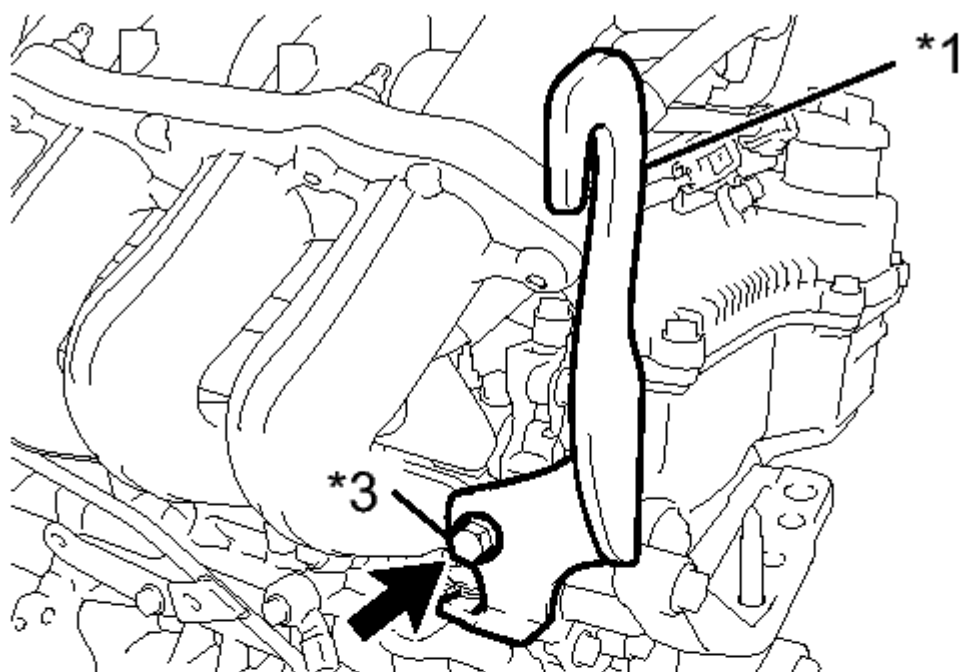


Fig. 99: Identifying Engine Mounting Insulator LH Through Bolt And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Install the engine hangers with the bolts, as shown in the illustration.

**P****Fig. 100: Identifying Engine Hangers And Bolts**

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

Torque: 43 N*m (438 kgf*cm, 31 ft.*lbf)

TEXT IN ILLUSTRATION

*1	No. 1 Engine Hanger
*2	No. 2 Engine Hanger
*3	Bolt

HINT:

No. 1 Engine Hanger	12281-47012
No. 2 Engine Hanger	12282-47010
Bolt	91552-81040

- f. Using an engine sling device and a chain block, suspend the engine assembly with transaxle.

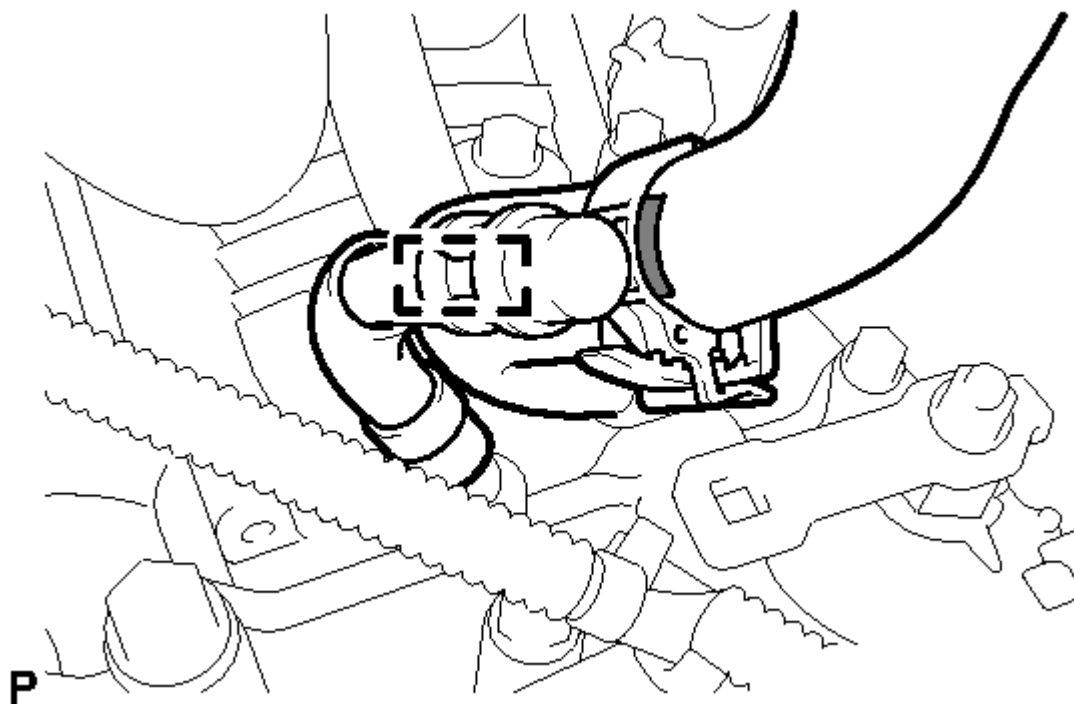
56. REMOVE WATER BY-PASS HOSE ASSEMBLY

Fig. 101: Identifying Breather Hose Clamp

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

- Disengage the clamp and separate the breather hose from the water by-pass hose.
- Remove the bolt and separate the water by-pass hose from the CVT.

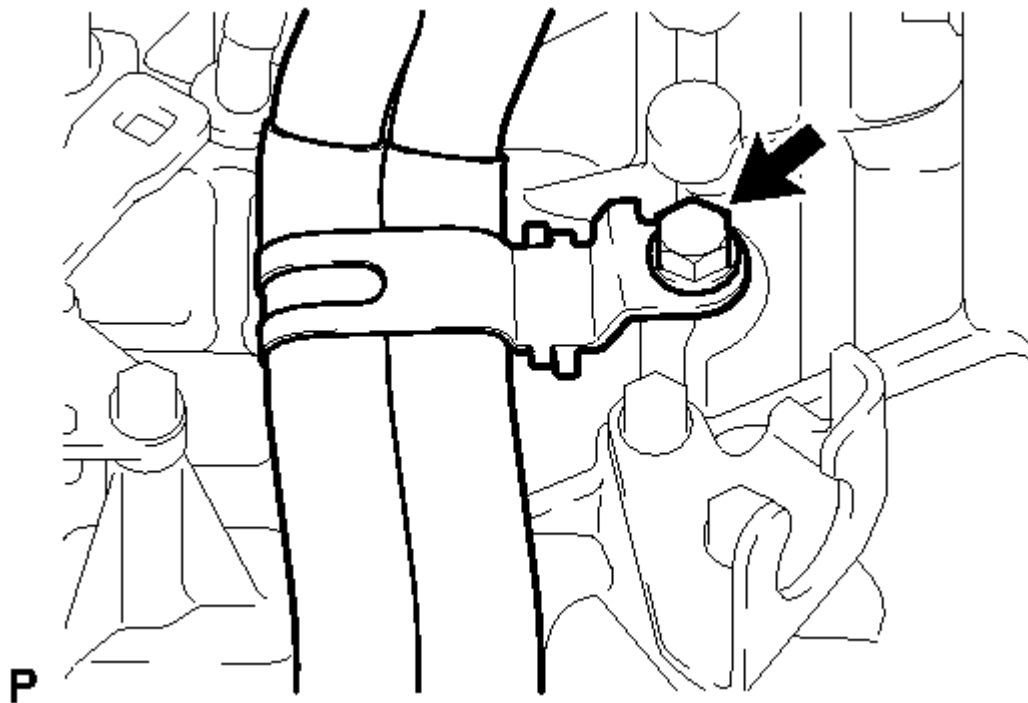


Fig. 102: Identifying Water By-Pass Hose Bracket Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Loosen the 2 clips and separate the 2 water by-pass hoses from the oil cooler.

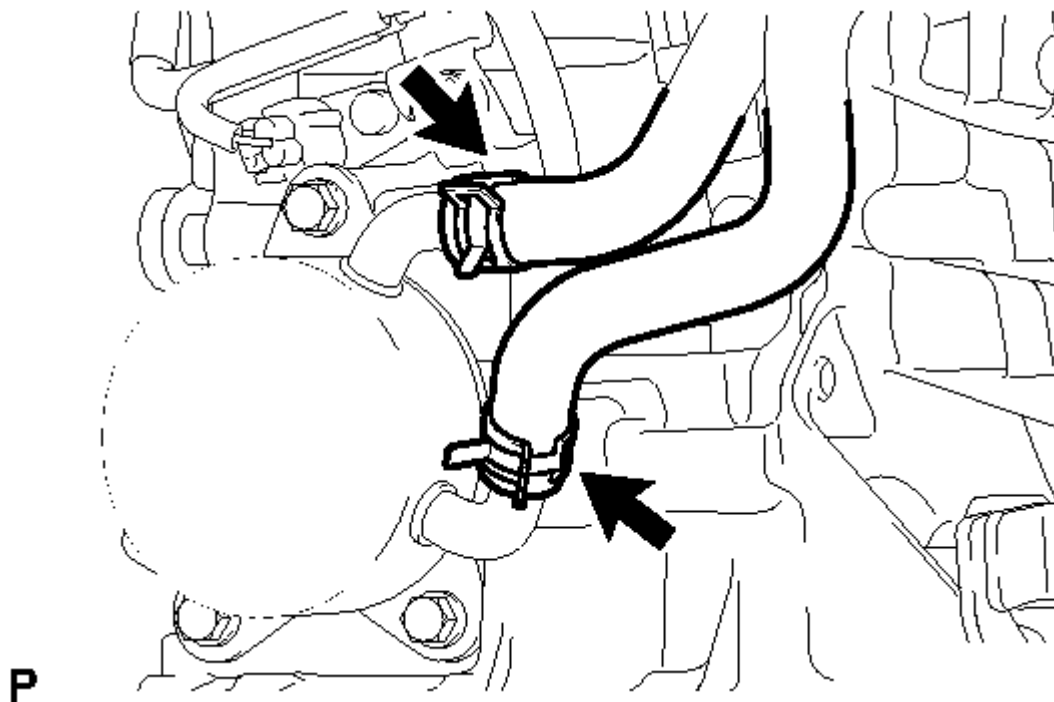


Fig. 103: Identifying Water By-Pass Hoses Clips
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Disengage the hose clamp.

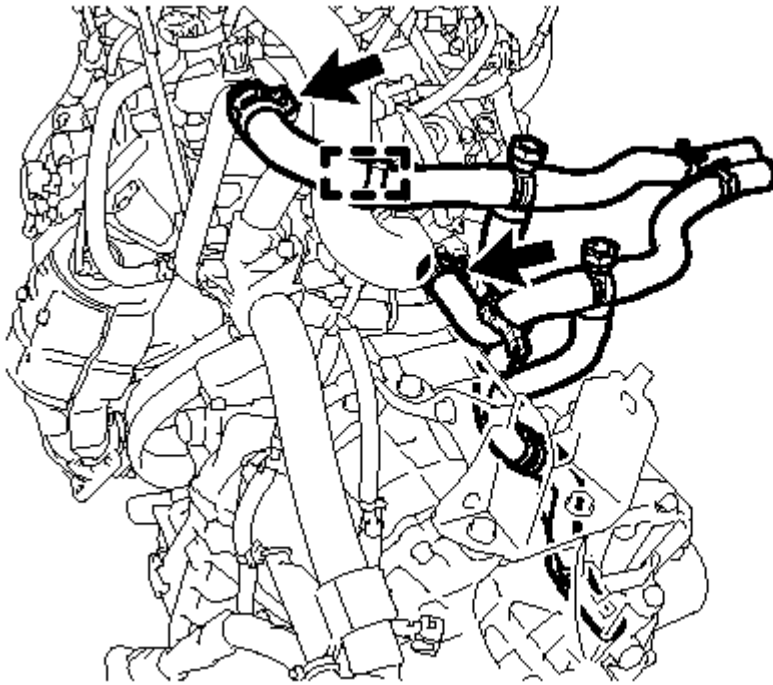


Fig. 104: Identifying Water By-Pass Hoses Clips
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Loosen the 2 clips and remove the water by-pass hose.

57. REMOVE NO. 1 RADIATOR HOSE

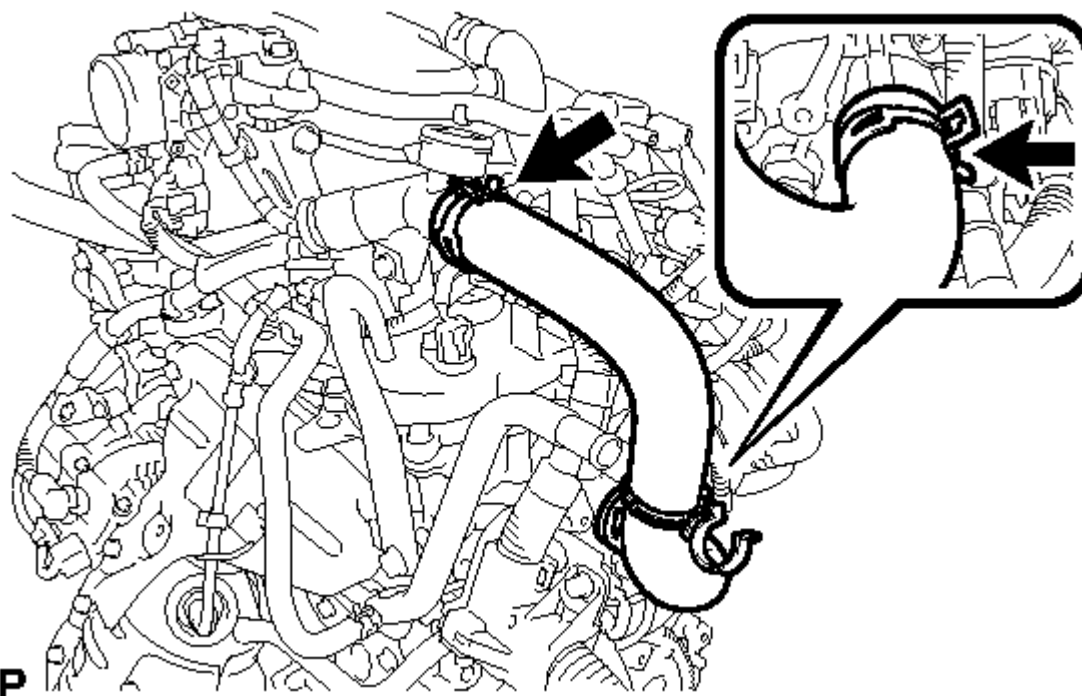


Fig. 105: Identifying No. 1 Radiator Hose Clips

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

- a. Loosen the 2 clips and remove the No. 1 radiator hose.

58. REMOVE WATER FILLER ASSEMBLY

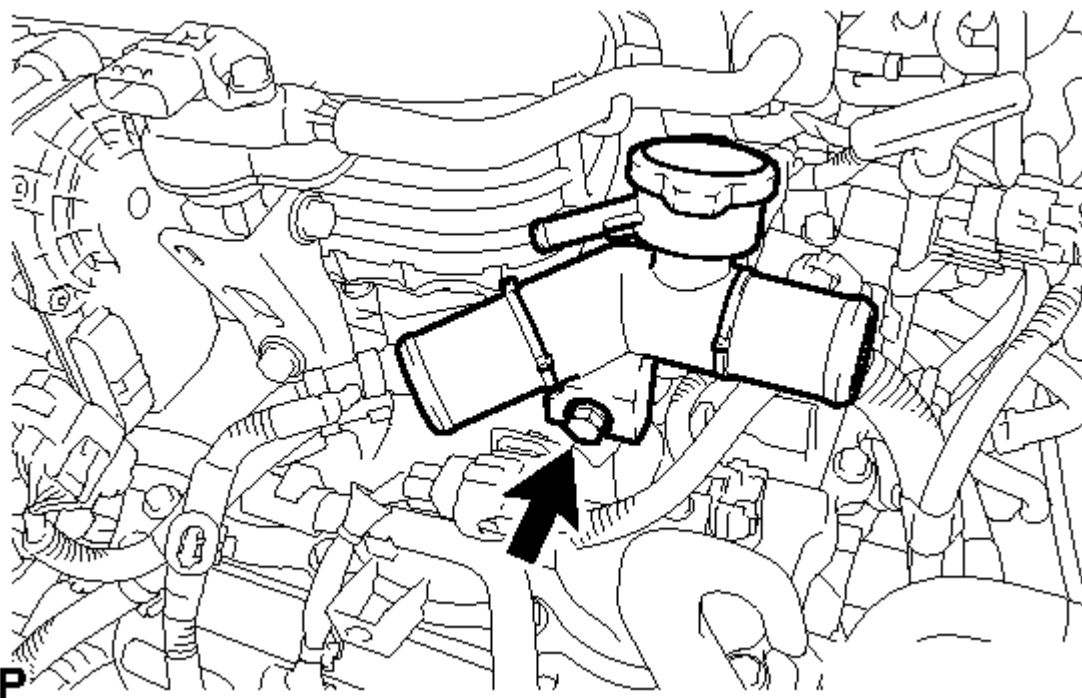


Fig. 106: Identifying Water Filler Bolt

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

- a. Remove the bolt and the water filler.

59. REMOVE NO. 2 RADIATOR HOSE

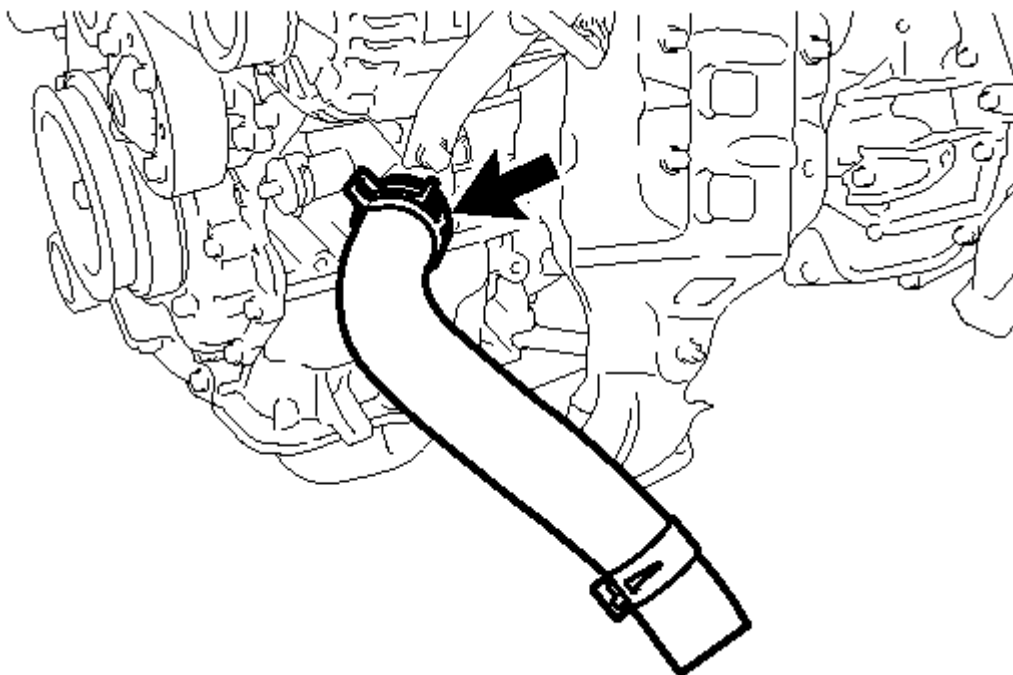
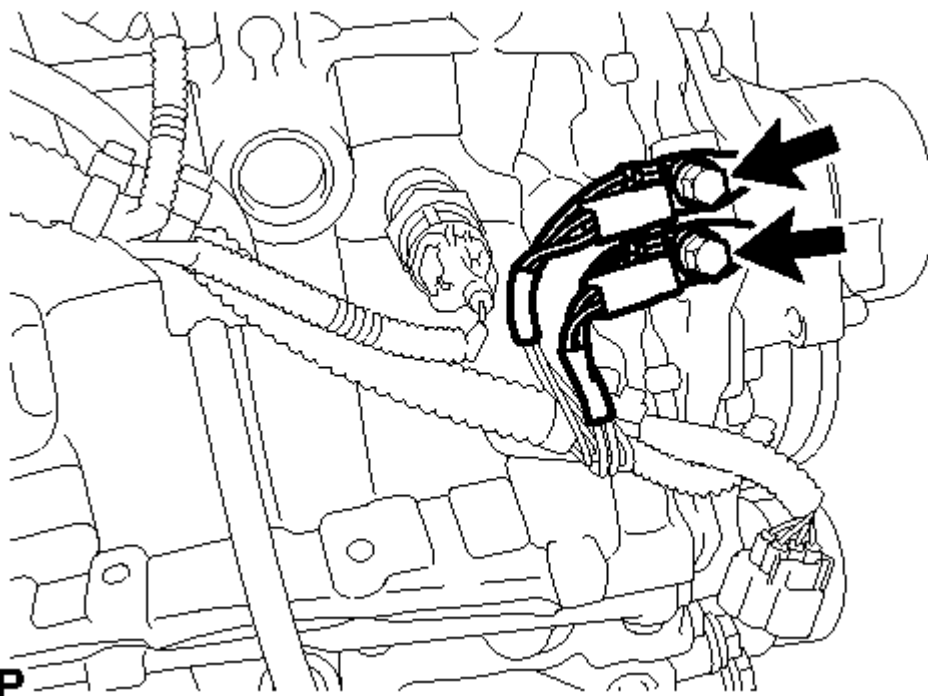


Fig. 107: Identifying No. 2 Radiator Hose Clip

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

- a. Loosen the clip and remove the No. 2 radiator hose.

60. REMOVE ENGINE WIRE

**P****Fig. 108: Identifying Ground Wire Bolts****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- a. Remove the 2 ground bolts and separate the ground wire from the cylinder block.
- b. Remove the nut from the starter.
- c. Remove the bolt and separate the engine wire from the wiring harness bracket.

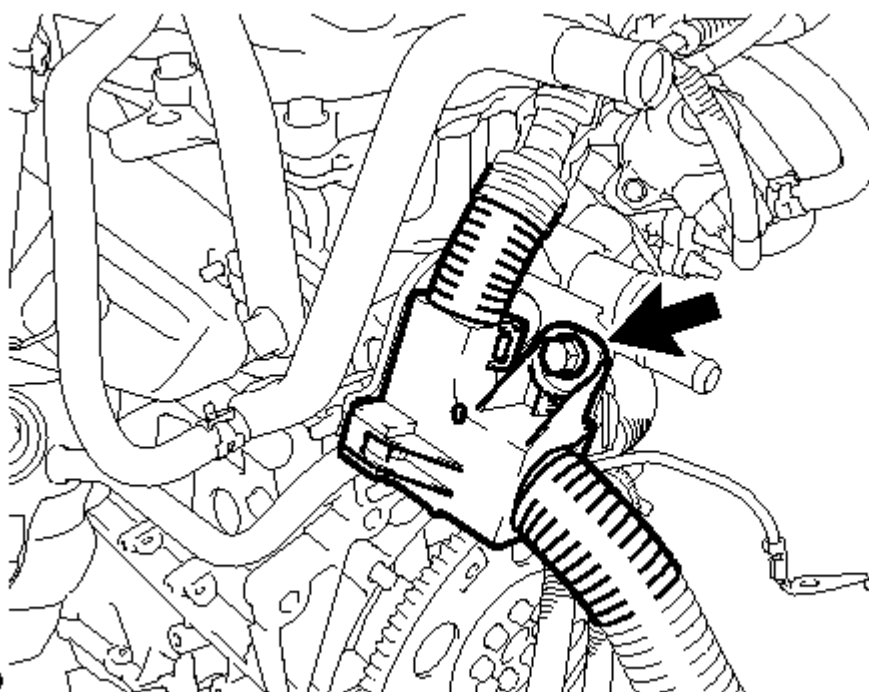
**P**

Fig. 109: Identifying Engine Wire Bolt

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

- d. Remove the terminal cap from the generator.
- e. Remove the nut from the generator.
- f. Remove the ground bolt and separate the ground wire from the transaxle.

**Fig. 110: Identifying Ground Wire Bolt**

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

- g. Disconnect all of the clamps and connectors and remove the engine wire from the engine assembly with transaxle.
- 61. **REMOVE DRIVE SHAFT HEAT INSULATOR BRACKET** . Refer to **REMOVAL - Step 2**
 - 62. **REMOVE FLYWHEEL HOUSING SIDE COVER** . Refer to **REMOVAL - Step 3**
 - 63. **REMOVE STARTER ASSEMBLY** . Refer to **REMOVAL - Step 4**
 - 64. **REMOVE DRIVE PLATE AND TORQUE CONVERTER SETTING BOLT** . Refer to **REMOVAL - Step 10**
 - 65. **REMOVE CONTINUOUSLY VARIABLE TRANSAXLE ASSEMBLY** . Refer to **REMOVAL - Step 11**
 - 66. **REMOVE DRIVE PLATE AND RING GEAR SUB-ASSEMBLY** See step 2
 - 67. **REMOVE ENGINE MOUNTING INSULATOR SUB-ASSEMBLY RH**

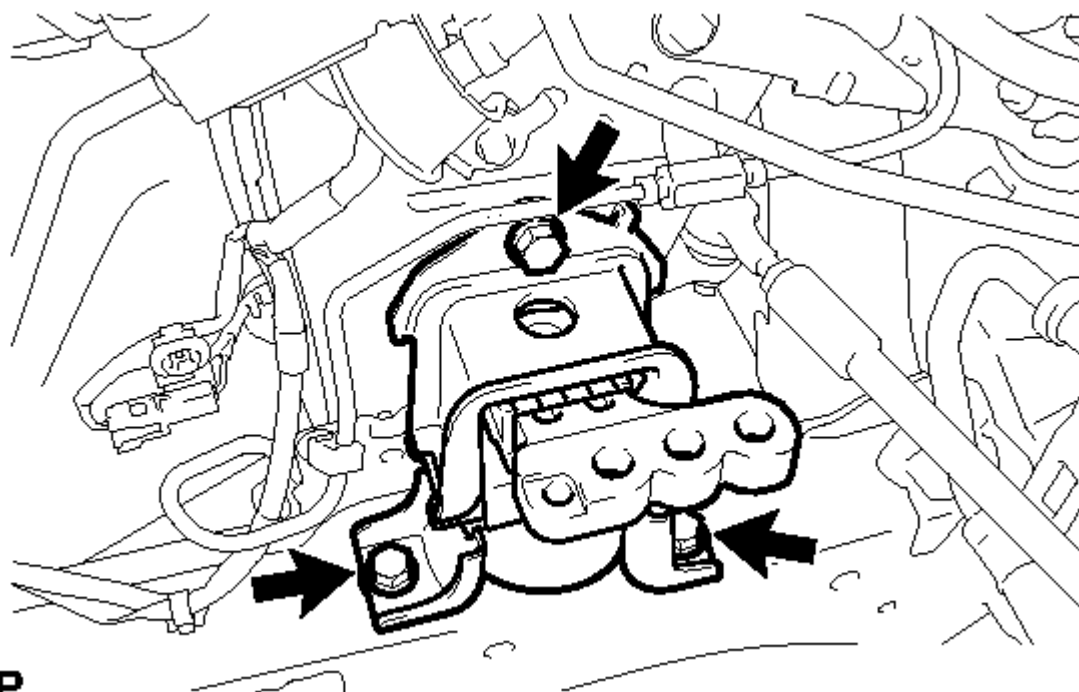
**P**

Fig. 111: Identifying Transverse Engine Mounting Insulator RH Bolts

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

HINT:

Only perform this procedure when replacement of the engine moving mounting insulator RH is necessary.

- a. Remove the 3 bolts and the transverse engine mounting insulator.

68. REMOVE TRANSVERSE ENGINE MOUNTING INSULATOR

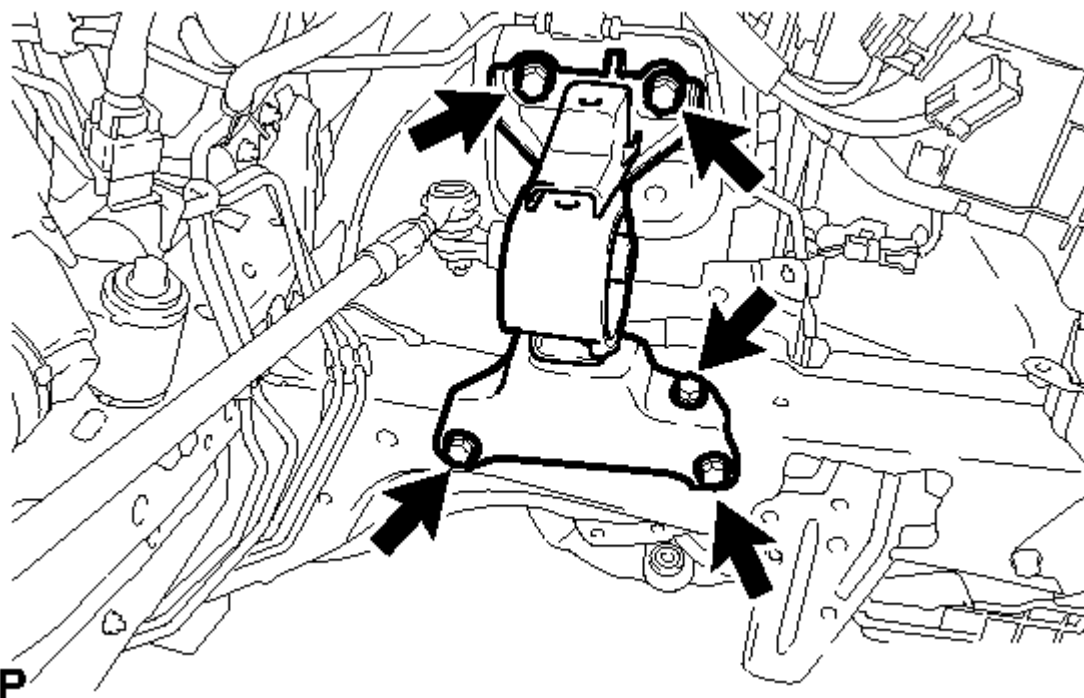
**P**

Fig. 112: Identifying Transverse Engine Mounting Insulator Bolts

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

HINT:

Only perform this procedure when replacement of the transverse engine mounting insulator is necessary.

- a. Remove the 5 bolts and the transverse engine mounting insulator.

INSTALLATION

INSTALLATION

1. INSTALL TRANSVERSE ENGINE MOUNTING INSULATOR

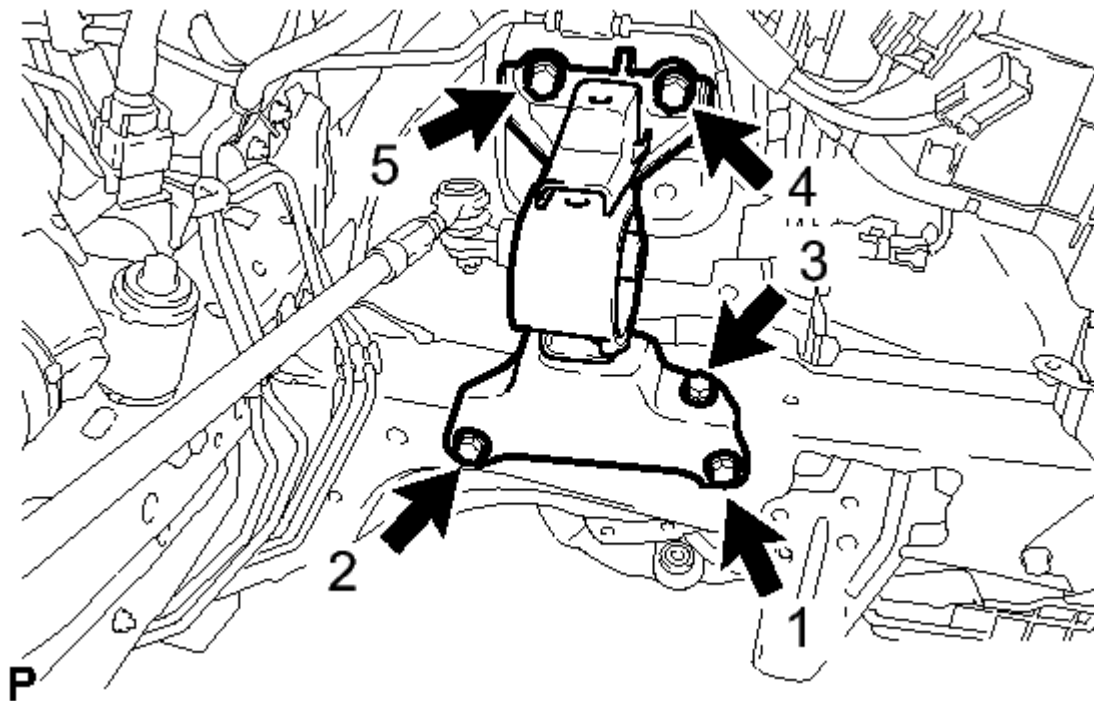


Fig. 113: Identifying Transverse Engine Mounting Insulator Bolts

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

HINT:

Only perform this procedure when replacement of the transverse engine mounting insulator is necessary.

- a. Temporarily install the transverse engine mounting insulator with the 5 bolts.
- b. Fully tighten the 5 bolts in the order shown in the illustration.

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

2. INSTALL ENGINE MOUNTING INSULATOR SUB-ASSEMBLY RH

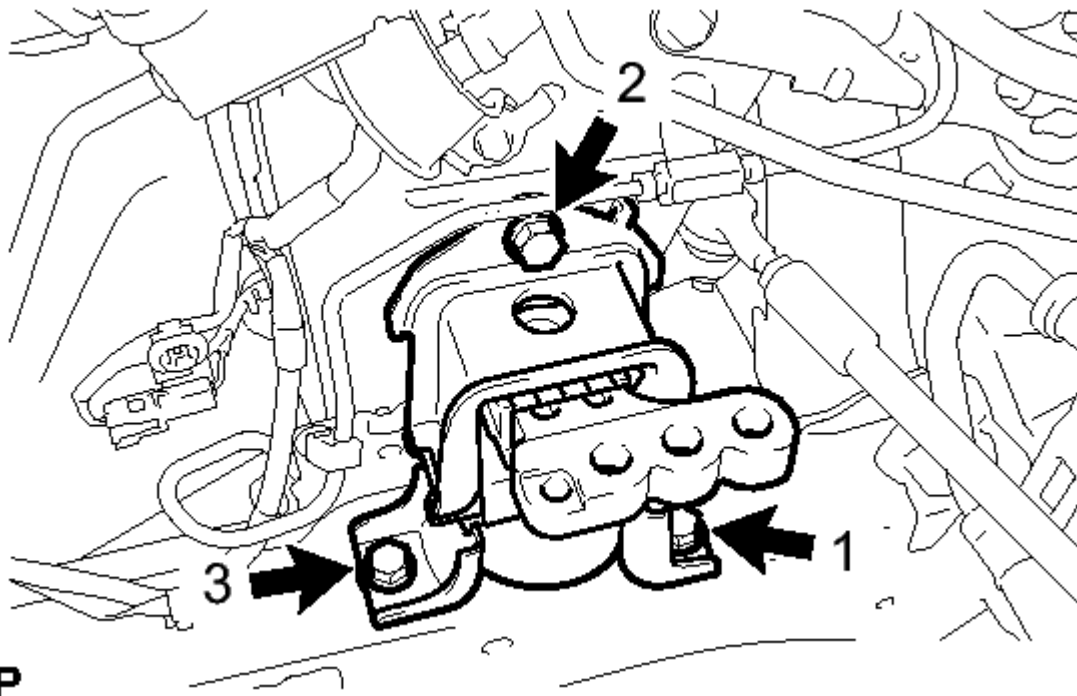
**P**

Fig. 114: Identifying Transverse Engine Mounting Insulator RH Bolts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Only perform this procedure when replacement of the engine mounting insulator RH is necessary.

- a. Temporarily install the engine mounting insulator RH with the 3 bolts.
- b. Fully tighten the 3 bolts in the order shown in the illustration.

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

3. **INSTALL DRIVE PLATE AND RING GEAR SUB-ASSEMBLY** See step 2
4. **INSTALL CONTINUOUSLY VARIABLE TRANSAXLE ASSEMBLY** . Refer to **INSTALLATION - Step 8**
5. **INSTALL DRIVE PLATE AND TORQUE CONVERTER SETTING BOLT** . Refer to **INSTALLATION - Step 9**
6. **INSTALL STARTER ASSEMBLY** . Refer to **INSTALLATION - Step 1**
7. **INSTALL FLYWHEEL HOUSING SIDE COVER** . Refer to **INSTALLATION - Step 2**
8. **INSTALL DRIVE SHAFT HEAT INSULATOR BRACKET** . Refer to **INSTALLATION - Step 14**
9. **INSTALL ENGINE WIRE**
 - a. Install the engine wire onto the engine assembly with transaxle.
 - b. Install the ground wire onto the transaxle with the bolt.

Torque: 13 N*m (130 kgf*cm, 9 ft.*lbf)

- c. Install the nut to the generator.

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

- d. Install the terminal cap to the generator.
- e. Install the engine wire onto the wiring harness bracket with the bolt.

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

- f. Install the nut to the starter.

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

- g. Install the 2 ground wires onto the cylinder block with the 2 bolts.

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

10. INSTALL NO. 2 RADIATOR HOSE

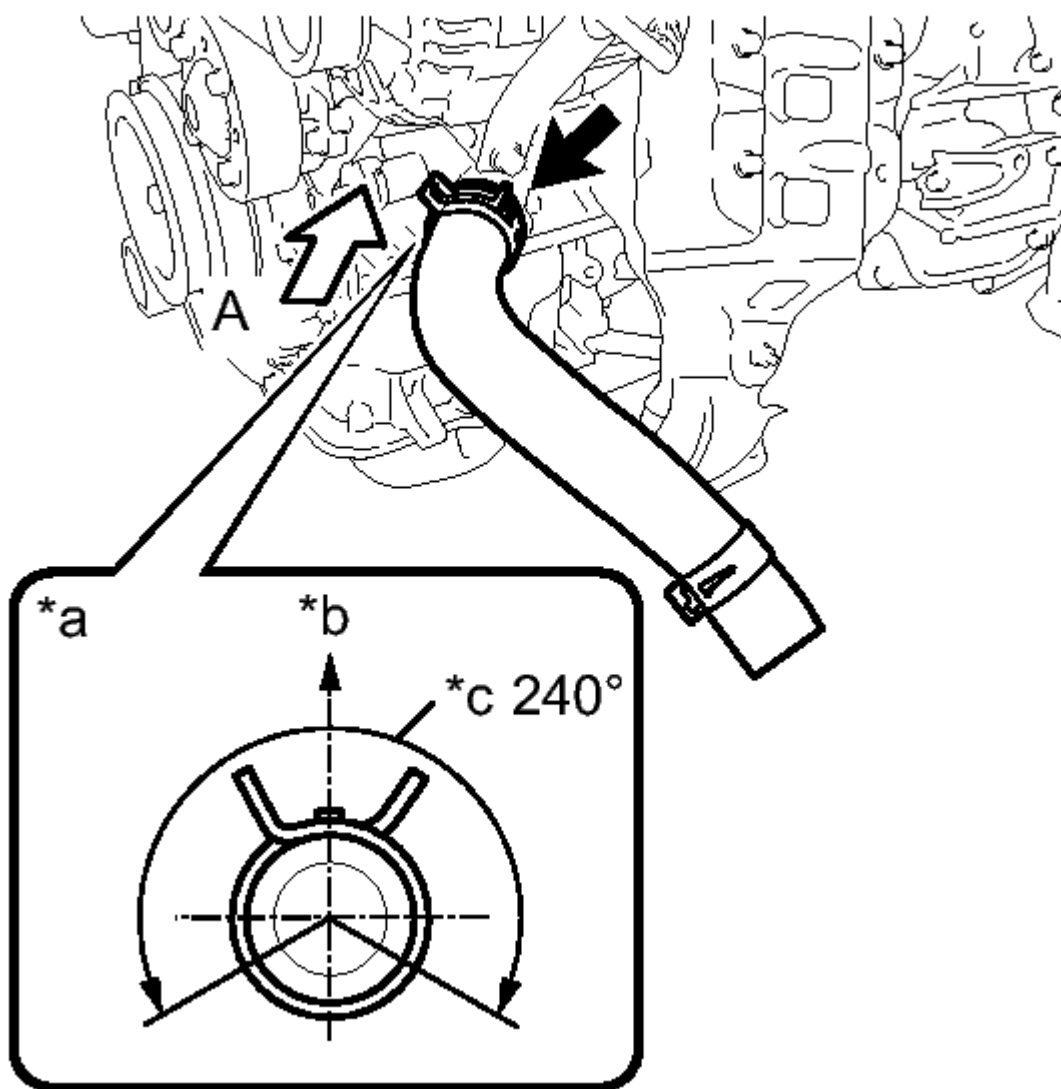


Fig. 115: Identifying No. 2 Radiator Hose Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Install the No. 2 radiator hose with the clip.

TEXT IN ILLUSTRATION

*a	View A
*b	Upper
*c	Clip installation range

NOTE: Install the clip so that its claws are within the clip installation range.

11. INSTALL WATER FILLER ASSEMBLY

- a. Install the water filler with the bolt.

Torque: 13 N*m (127 kgf*cm, 9 ft.*lbf)

12. INSTALL NO. 1 RADIATOR HOSE

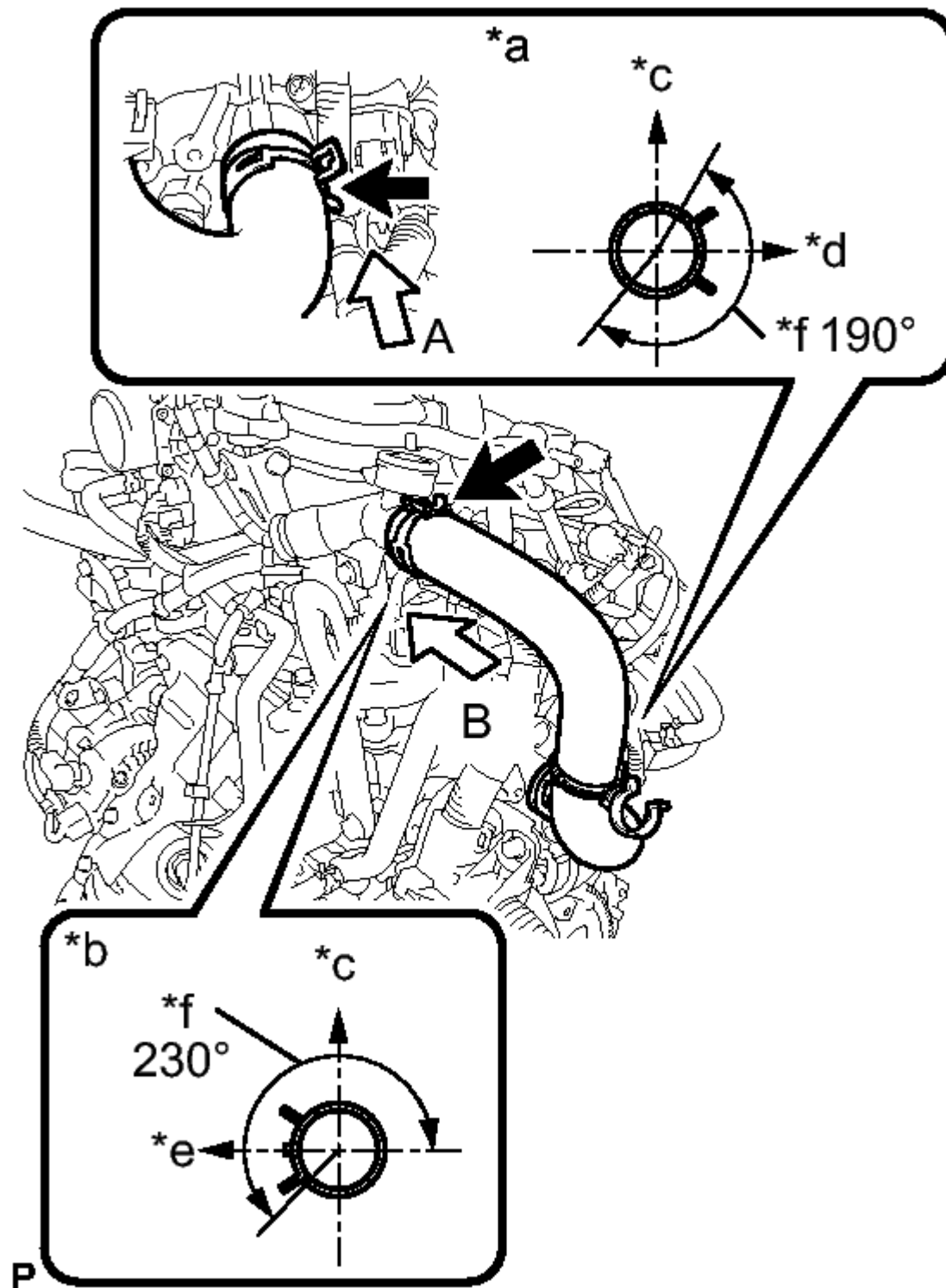


Fig. 116: Identifying No. 1 Radiator Hose Clips

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

- a. Install the No. 1 radiator hose with the 2 clips.

TEXT IN ILLUSTRATION

*a	View A
*b	View B
*c	Upper
*d	Rear of Vehicle
*e	Front of Vehicle
*f	Clip installation range

NOTE: **Install the clip so that its claws are within the clip installation range.**

13. INSTALL WATER BY-PASS HOSE ASSEMBLY

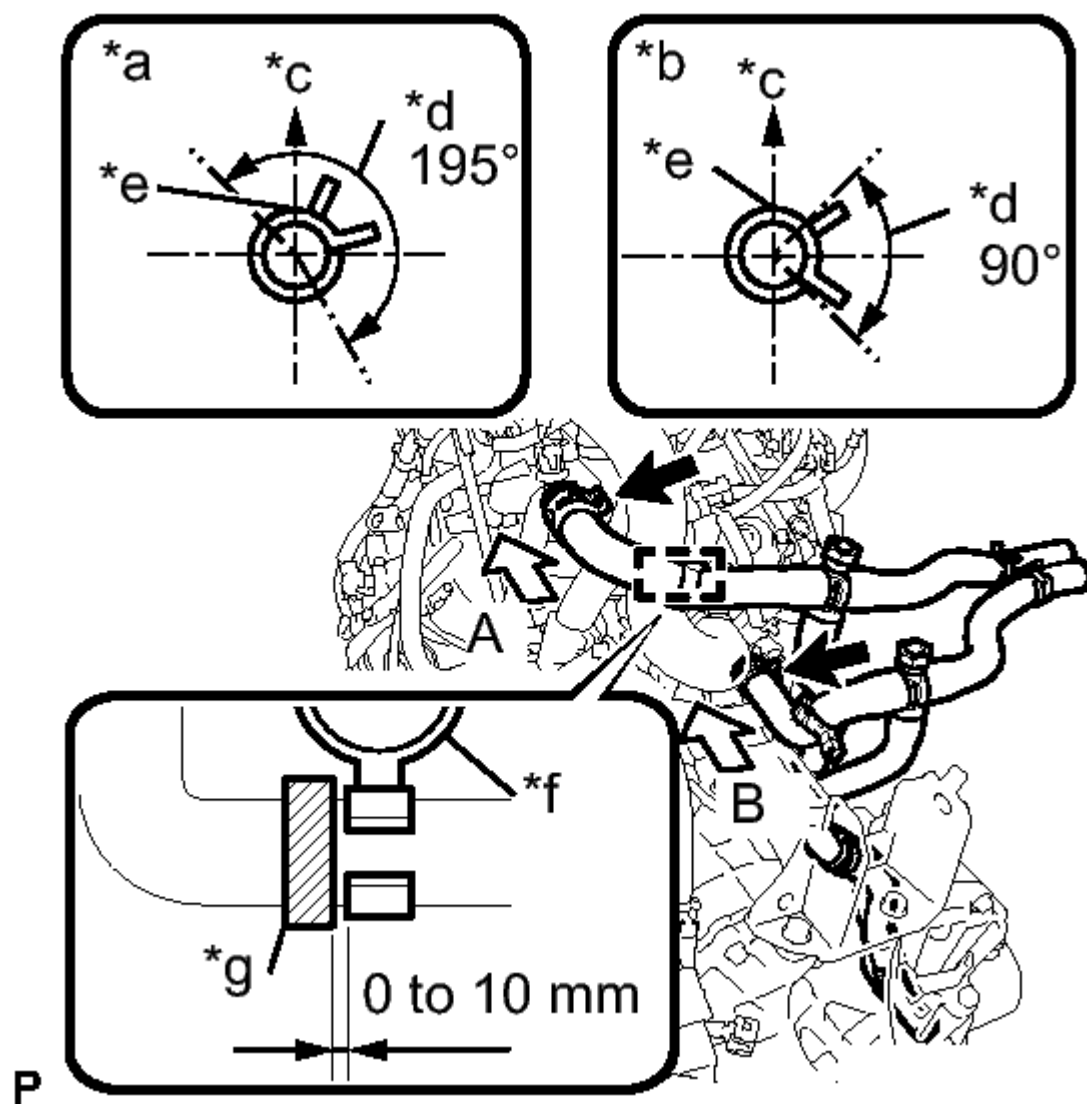


Fig. 117: Identifying Water By-Pass Hose Clips
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

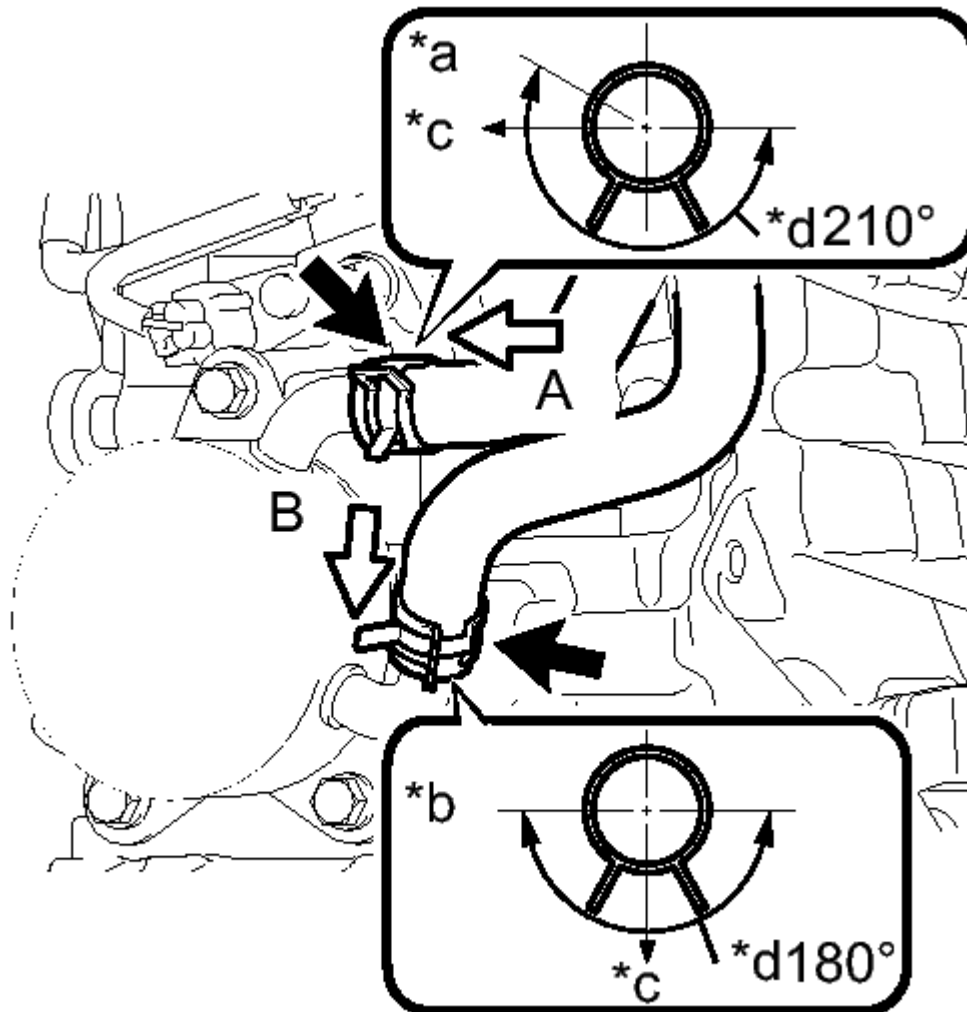
- a. Install the water by-pass hose with the 2 clips.

TEXT IN ILLUSTRATION

*a	View A
*b	View B
*c	Upper
*d	Clip installation range
*e	Paint mark of the hose
*f	Hose clamp
*g	Stopper

NOTE: Install the clip so that its claws are within the clip installation range.

- b. Engage the hose clamp.
- c. Connect the 2 water by-pass hoses to the oil cooler with the 2 clips.



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Fig. 118: Identifying Water By-Pass Hose Clips

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

TEXT IN ILLUSTRATION

*a	View A
*b	View B
*c	Rear of Vehicle
*d	Clip installation range

NOTE: Install the clip so that its claws are within the clip installation range.

- d. Install the water by-pass hose onto the CVT with the bolt.

Torque: 29 N*m (296 kgf*cm, 21 ft.*lbf)

- e. Engage the clamp and install the breather hose to the water by-pass hose.

14. INSTALL ENGINE ASSEMBLY WITH TRANSAXLE

- a. Set the engine assembly with transaxle on the engine lifter.
- b. Operate the engine lifter and lift the engine assembly with transaxle to the position where the engine mounting insulator RH and transverse engine mounting insulator 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.**

- c. Install the transverse engine mounting insulator with the through bolt and nut.

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

- d. Install the engine mounting insulator RH with the bolt and 2 nuts.

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

- e. Secure the hole (A) shown in the illustration and the body with a piece of rope.

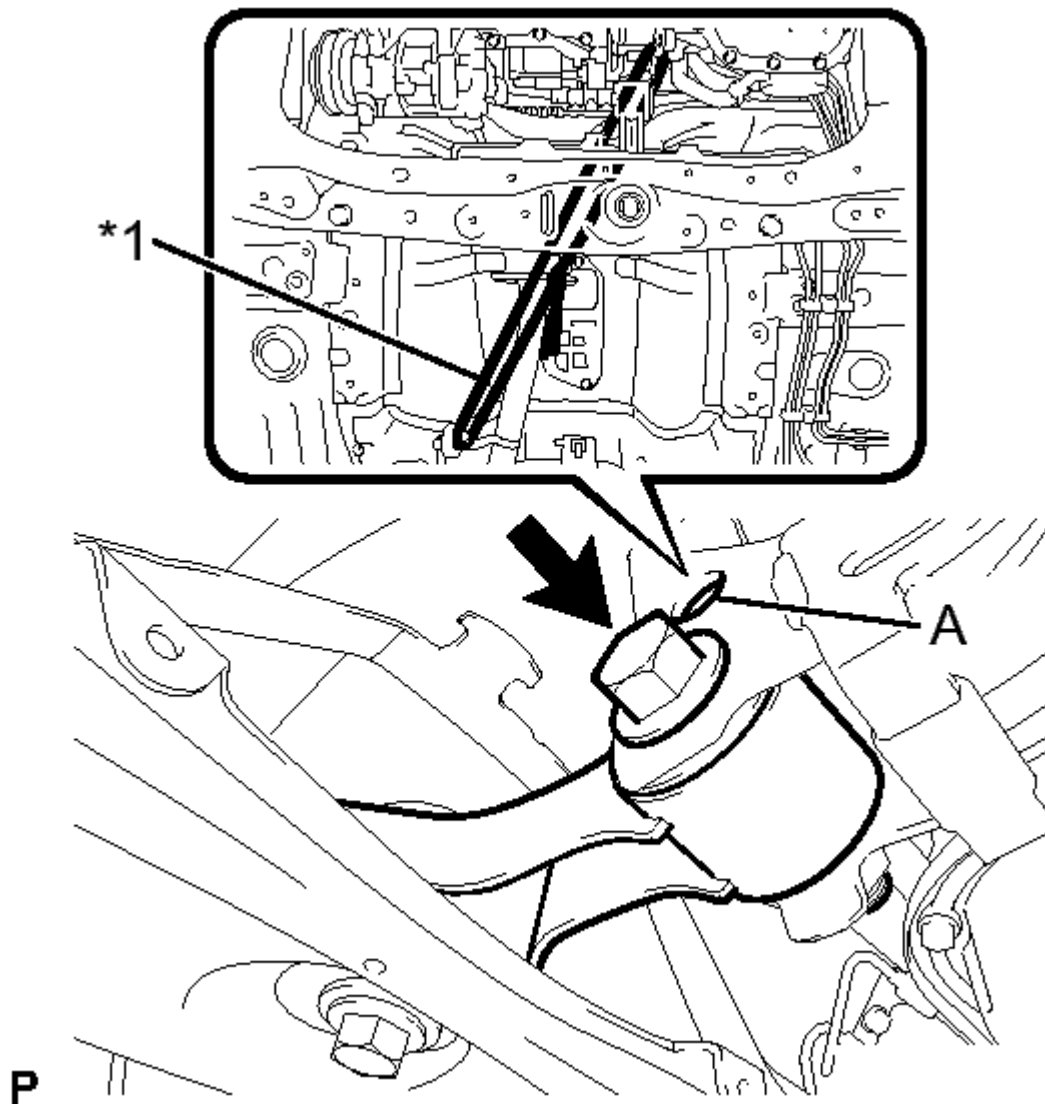


Fig. 119: Identifying The Hole For The Piece Of Rope
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Rope
----	------

NOTE: When installing the engine assembly with the transaxle, make sure that the engine assembly does not move to the vehicle front, to prevent it from contacting other parts.

- f. Remove the 2 bolts and the 2 engine hangers.
15. **INSTALL ENGINE MOVING CONTROL ROD** . Refer to **INSTALLATION - Step 1**
16. **INSTALL ENGINE MOVING CONTROL ROD COVER (for Cold Area)** . Refer to **INSTALLATION - Step 2**
17. **INSTALL COOLER COMPRESSOR ASSEMBLY** . Refer to **INSTALLATION - Step 2**

18. **INSTALL SUCTION HOSE SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 3**

19. **INSTALL DISCHARGE HOSE SUB-ASSEMBLY**

- a. Connect the discharge hose to the vehicle with the bolt.

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

- b. Remove the attached vinyl tape from the discharge hose.
c. Sufficiently apply compressor oil to a new O-ring and the fitting surface of the cooler compressor.

Compressor oil

ND-OIL 8 or equivalent

- d. Install the O-ring onto the discharge hose.
e. Connect the discharge hose to the cooler compressor with the bolt.

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

20. **INSTALL FRONT FRAME ASSEMBLY** . Refer to **INSTALLATION - Step 11**

21. **INSTALL FRONT DRIVE SHAFT ASSEMBLY LH** . Refer to **INSTALLATION - Step 1**

22. **INSTALL FRONT DRIVE SHAFT ASSEMBLY RH** . Refer to **INSTALLATION - Step 2**

23. **INSTALL DRIVE SHAFT HEAT INSULATOR** . Refer to **INSTALLATION - Step 3**

24. **INSTALL FRONT AXLE ASSEMBLY LH** . Refer to **INSTALLATION - Step 4**

25. **INSTALL FRONT AXLE ASSEMBLY RH**

HINT:

The installation procedure for the RH side is the same as that for the LH side.

26. **INSTALL FRONT LOWER SUSPENSION ARM SUB-ASSEMBLY LH** . Refer to **INSTALLATION - Step 5**

27. **INSTALL FRONT LOWER SUSPENSION ARM SUB-ASSEMBLY RH**

HINT:

The installation procedure for the RH side is the same as that for the LH side.

28. **INSTALL FRONT STABILIZER LINK ASSEMBLY LH** . Refer to **INSTALLATION - Step 5**

29. **INSTALL FRONT STABILIZER LINK ASSEMBLY RH**

HINT:

The installation procedure for the RH side is the same as that for the LH side.

30. **INSTALL FRONT SPEED SENSOR LH** . Refer to **INSTALLATION - Step 10**

31. **INSTALL FRONT SPEED SENSOR RH**

HINT:

The installation procedure for the RH side is the same as that for the LH side.

32. **INSTALL FRONT AXLE SHAFT LH NUT** . Refer to **INSTALLATION - Step 11**

33. **INSTALL FRONT AXLE SHAFT RH NUT**

HINT:

The installation procedure for the RH side is the same as that for the LH side.

34. **INSTALL UNION TO CHECK VALVE HOSE**

- a. Install the union to check valve hose with the clip.

35. **INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY**

- a. Install the transmission control cable to the No. 1 transmission control cable bracket, using a new clip.
- b. Using the nut, connect the transmission control cable to the transmission control shaft lever.

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

36. **CONNECT OUTLET HEATER WATER HOSE** . Refer to **INSTALLATION - Step 5**

37. **CONNECT INLET HEATER WATER HOSE** . Refer to **INSTALLATION - Step 6**

38. **CONNECT FUEL TUBE SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 5**

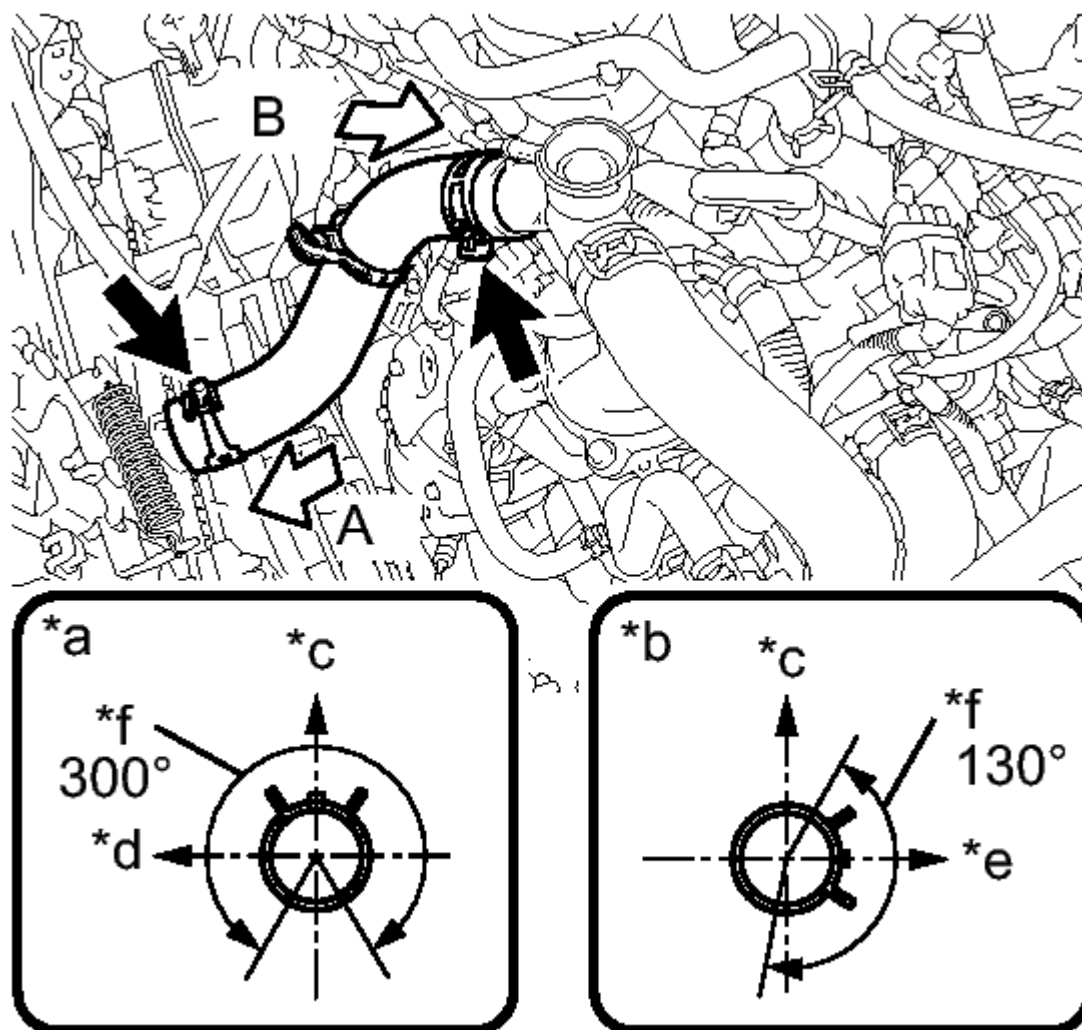
39. **INSTALL EFI FUEL PIPE CLAMP** . Refer to **INSTALLATION - Step 6**

40. **CONNECT NO. 1 FUEL VAPOR FEED HOSE**

- a. Connect the No. 1 fuel vapor feed hose with the clip.

41. **CONNECT NO. 2 RADIATOR HOSE** . Refer to **INSTALLATION - Step 7**

42. **INSTALL NO. 3 RADIATOR HOSE**



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Fig. 120: Identifying No. 3 Radiator Hose Clamps
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Install the No. 3 radiator hose with the 2 clamps.

TEXT IN ILLUSTRATION

*a	View A
*b	View B
*c	Upper
*d	LH
*e	Front of Vehicle
*f	Clip installation range

NOTE: Install the clip so that its claws are within the clip installation range.

43. CONNECT RADIATOR RESERVOIR TANK HOSE

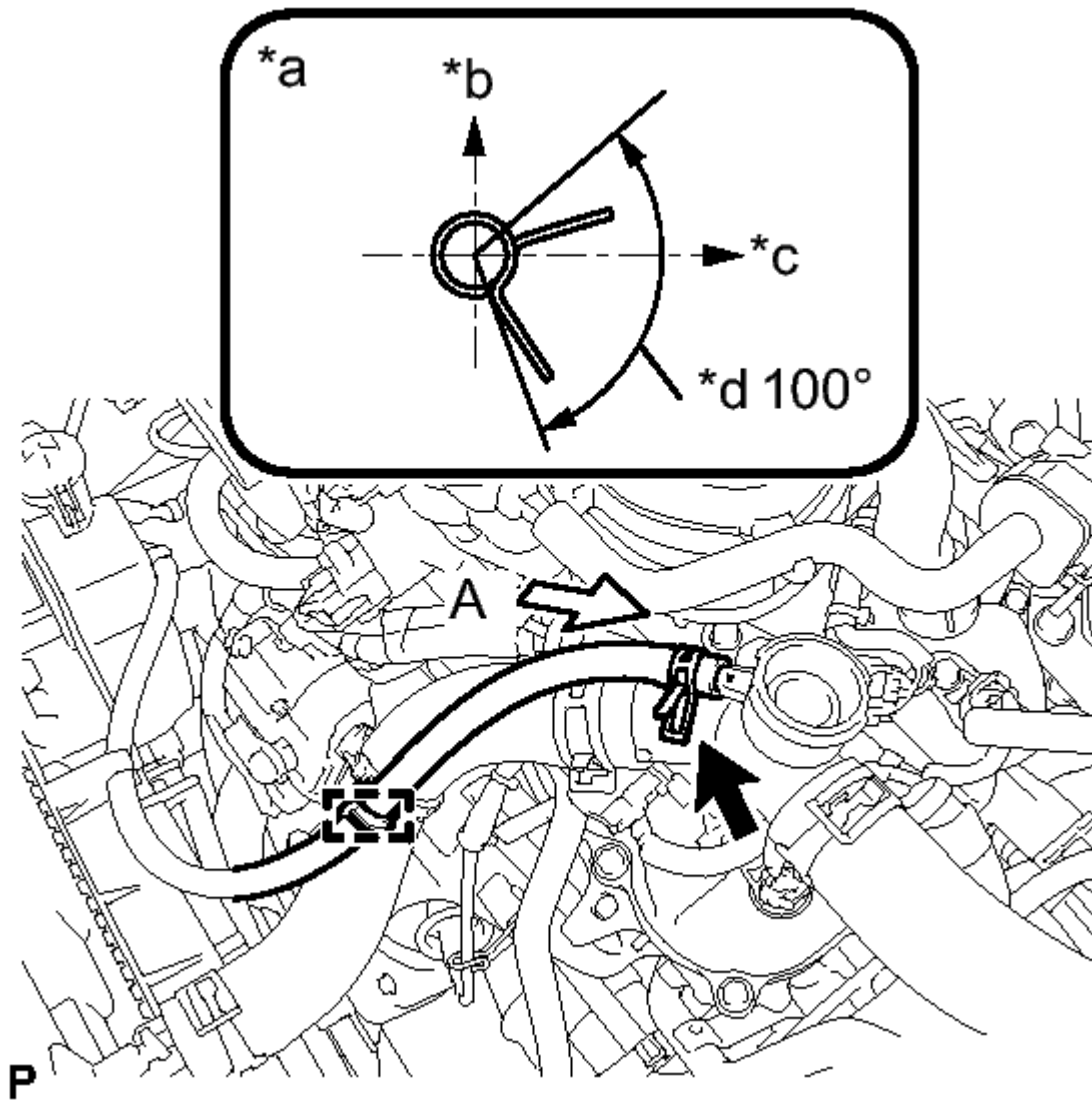


Fig. 121: Identifying Radiator Reservoir Tank Hose Clip
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Connect the radiator reservoir tank hose with the clip.

TEXT IN ILLUSTRATION

*a	View A
*b	Upper
*c	Front of Vehicle
*d	Clip installation range

NOTE: Install the clip so that its claws are within the clip installation range.

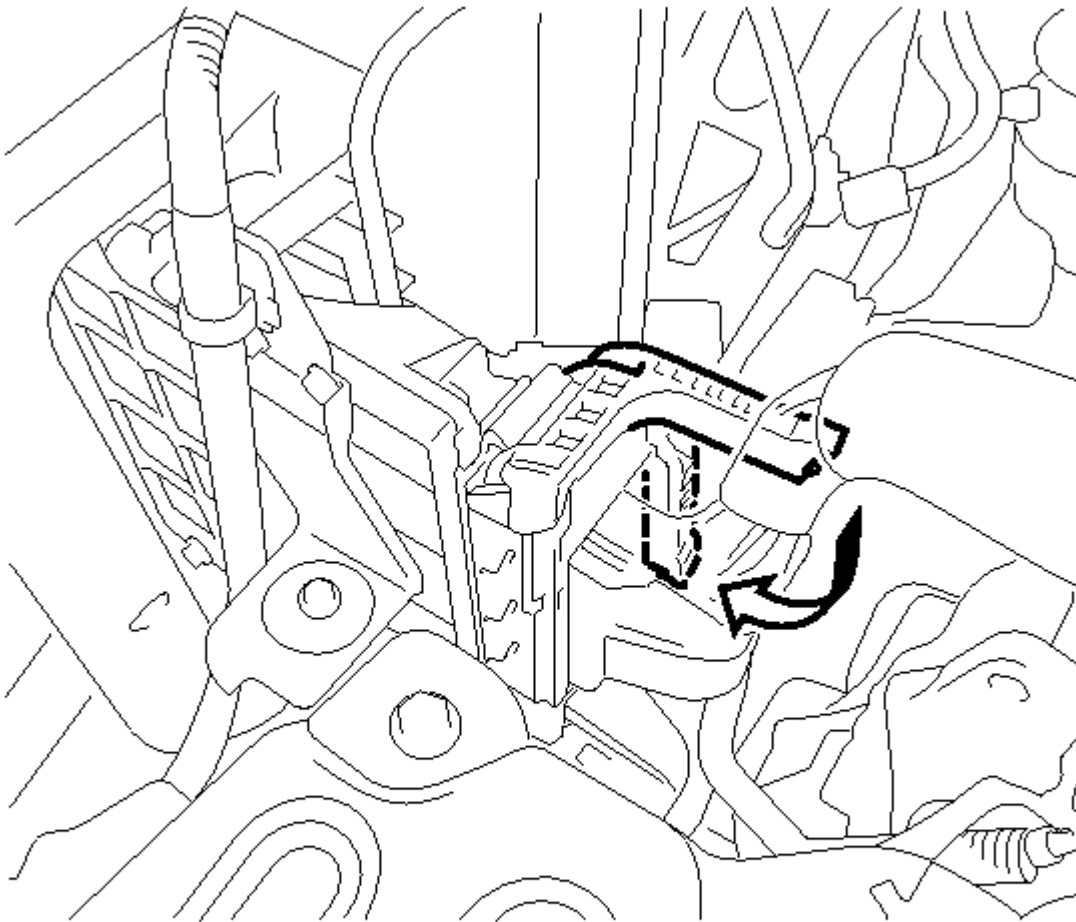
- b. Engage the hose clamp.

44. INSTALL ENGINE WIRE

- a. Connect the ground wire with the bolt.

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

- b. Connect the 4 engine wire connectors and 2 clamps to the engine room junction block.
- c. Install the junction block cover.
- d. Connect the 2 connectors to the battery terminal.
- e. Connect the engine wire connector to the ECM.



T

Fig. 122: Connecting The ECM Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Turn the lever and connect the ECM connector.

45. INSTALL AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY**46. INSTALL AIR CLEANER AND HOSE . Refer to INSTALLATION - Step 11****47. INSTALL NO. 2 BATTERY CARRIER**

- a. Install the No. 2 battery carrier with the 3 bolts.

Torque: 17 N*m (175 kgf*cm, 13 ft.*lbf)

- b. Engage the harness clamp.

48. INSTALL BATTERY TRAY

- a. Install the battery tray.

49. INSTALL BATTERY

- a. Install the battery onto the vehicle.
- b. Install the battery clamp with the 2 nuts.

Torque: 3.5 N*m (36 kgf*cm, 35 in.*lbf)

- c. Connect the cable to the battery terminal.

Torque: 5.0 N*m (55 kgf*cm, 43 in.*lbf)

50. INSTALL FAN AND GENERATOR V-RIBBED BELT See step 1**51. INSTALL NO. 1 V-RIBBED (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT
See step 2****52. INSTALL EXHAUST PIPE GASKET (for Front Side) . Refer to INSTALLATION - Step 1****53. INSTALL EXHAUST PIPE GASKET (for Rear Side) . Refer to INSTALLATION - Step 3****54. INSTALL FRONT EXHAUST PIPE ASSEMBLY . Refer to INSTALLATION - Step 9****55. INSTALL FRONT BUMPER ENERGY ABSORBER SUB-ASSEMBLY . Refer to REASSEMBLY - Step 1****56. INSTALL FRONT BUMPER COVER**

Refer to INSTALLATION

57. INSTALL FRONT WHEELS**58. INSPECT FAN AND GENERATOR V-RIBBED BELT See step 4****59. INSPECT NO. 1 V-RIBBED (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT
See step 5****60. ADD ENGINE COOLANT . Refer to REPLACEMENT - Step 2****61. ADD ENGINE OIL . Refer to REPLACEMENT - Step 4****62. CHARGE REFRIGERANT . Refer to REPLACEMENT - Step 2****63. ADD CONTINUOUSLY VARIABLE TRANSAXLE FLUID . Refer to ADJUSTMENT - Step 1****64. FLUID TEMPERATURE CHECK . Refer to ADJUSTMENT - Step 2**

- 65. **FLUID LEVEL CHECK** . Refer to **ADJUSTMENT - Step 3**
- 66. **INSPECT FOR ENGINE COOLANT LEAK** . Refer to **ON-VEHICLE INSPECTION - Step 1**
- 67. **INSPECT RESERVOIR ENGINE COOLANT LEVEL** . Refer to **ON-VEHICLE INSPECTION - Step 2**
- 68. **INSPECT FOR ENGINE OIL LEAK**
- 69. **INSPECT CONTINUOUSLY VARIABLE TRANSAXLE FLUID LEAK** . Refer to **ADJUSTMENT - Step 4**
- 70. **INSPECT FOR EXHAUST GAS LEAK**
- 71. **INSPECT FOR FUEL LEAK**
- 72. **INSPECT FOR REFRIGERANT LEAK** . Refer to **REPLACEMENT - Step 4**
- 73. **INSPECT IGNITION TIMING** See step 8
- 74. **INSPECT ENGINE IDLING SPEED** See step 9
- 75. **INSPECT CO/HC** See step 11
- 76. **INSPECT AND ADJUST FRONT WHEEL ALIGNMENT**

Refer to **ADJUSTMENT**

- 77. **INSTALL NO. 1 ENGINE COVER** See step 5
- 78. **INSTALL NO. 1 COOLER COVER** See step 6
- 79. **INSTALL NO. 3 ENGINE UNDER COVER**
 - a. Install the No. 3 engine under cover with the 3 clips.
- 80. **INSTALL NO. 2 ENGINE UNDER COVER**

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

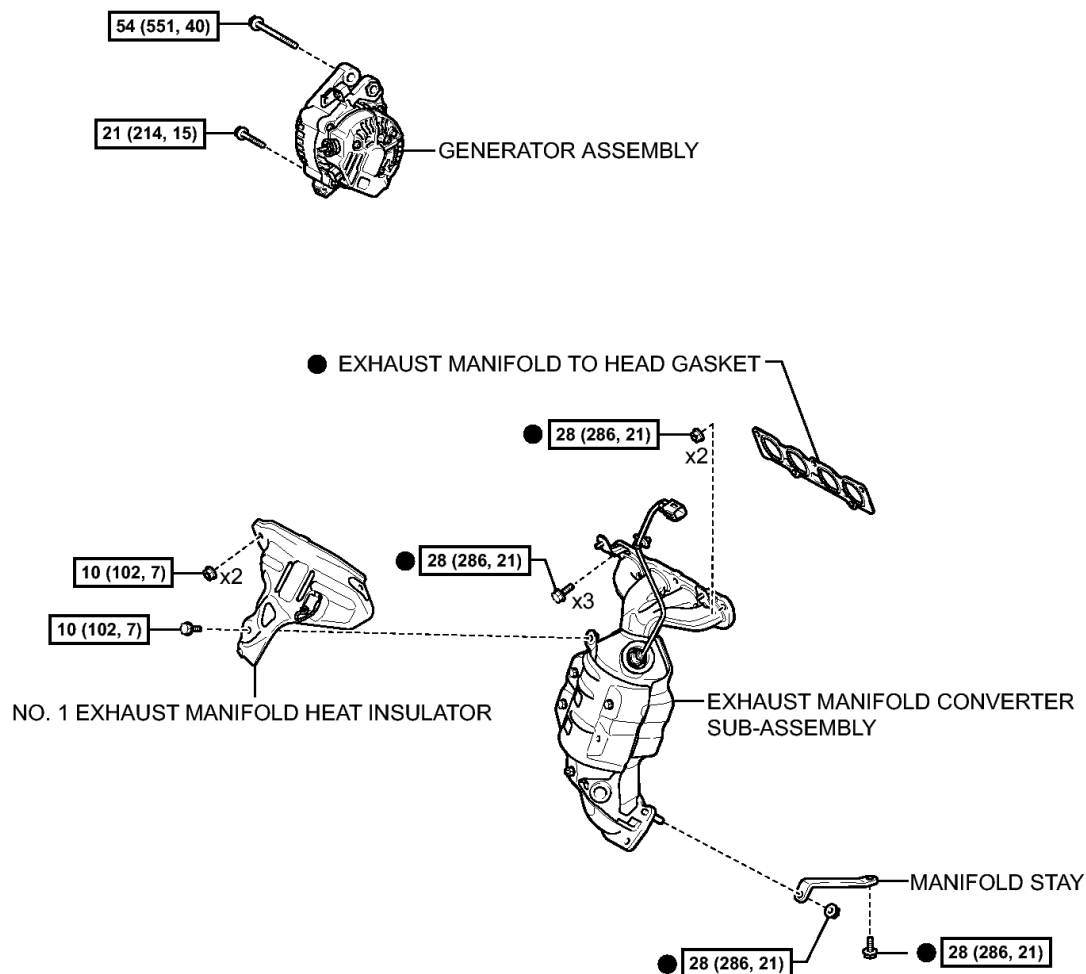
- 81. **INSTALL FRONT FLOOR COVER RH**
- 82. **INSTALL FRONT FLOOR COVER LH**
- 83. **INSTALL WINDSHIELD WIPER MOTOR AND LINK**

Refer to **INSTALLATION**

ENGINE UNIT

COMPONENTS

ILLUSTRATION

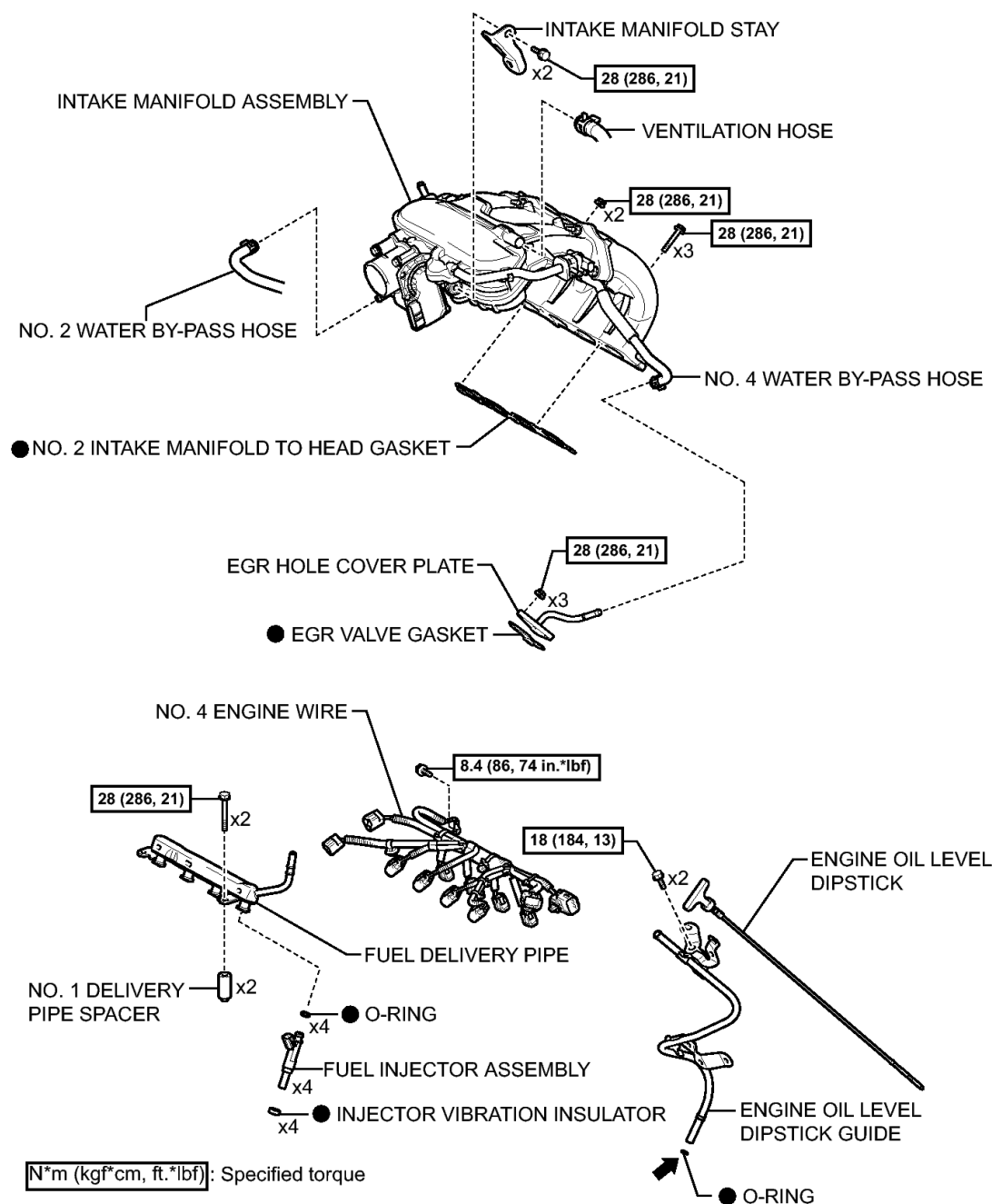


N*m (kgf*cm, ft.*lbf): Specified torque

● Non-reusable part

H

Fig. 123: Identifying Engine Unit Replacement Components With Torque Specifications (1 Of 8)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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Fig. 124: Identifying Engine Unit Replacement Components With Torque Specifications (2 Of 8)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

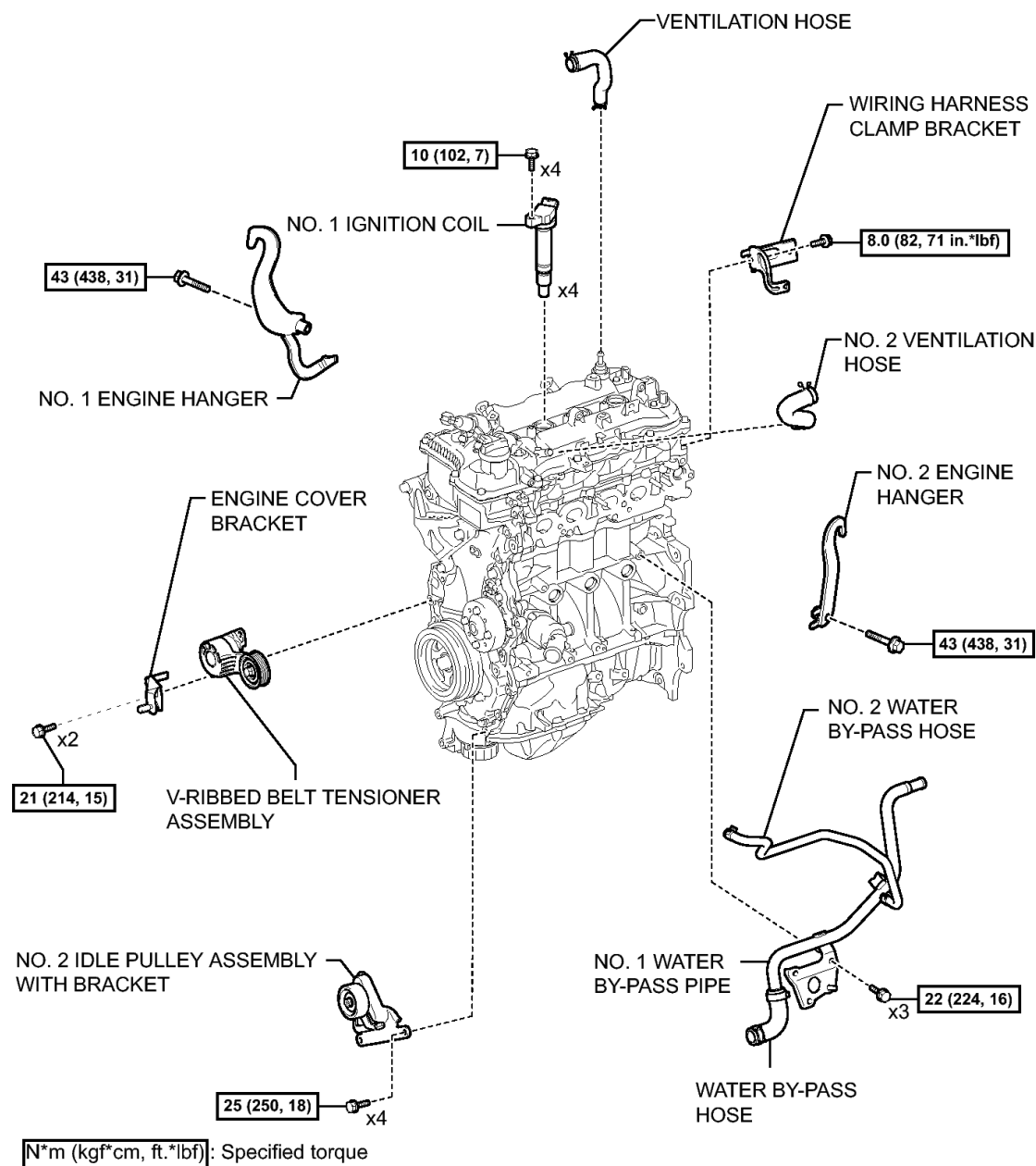


Fig. 125: Identifying Engine Unit Replacement Components With Torque Specifications (3 Of 8)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

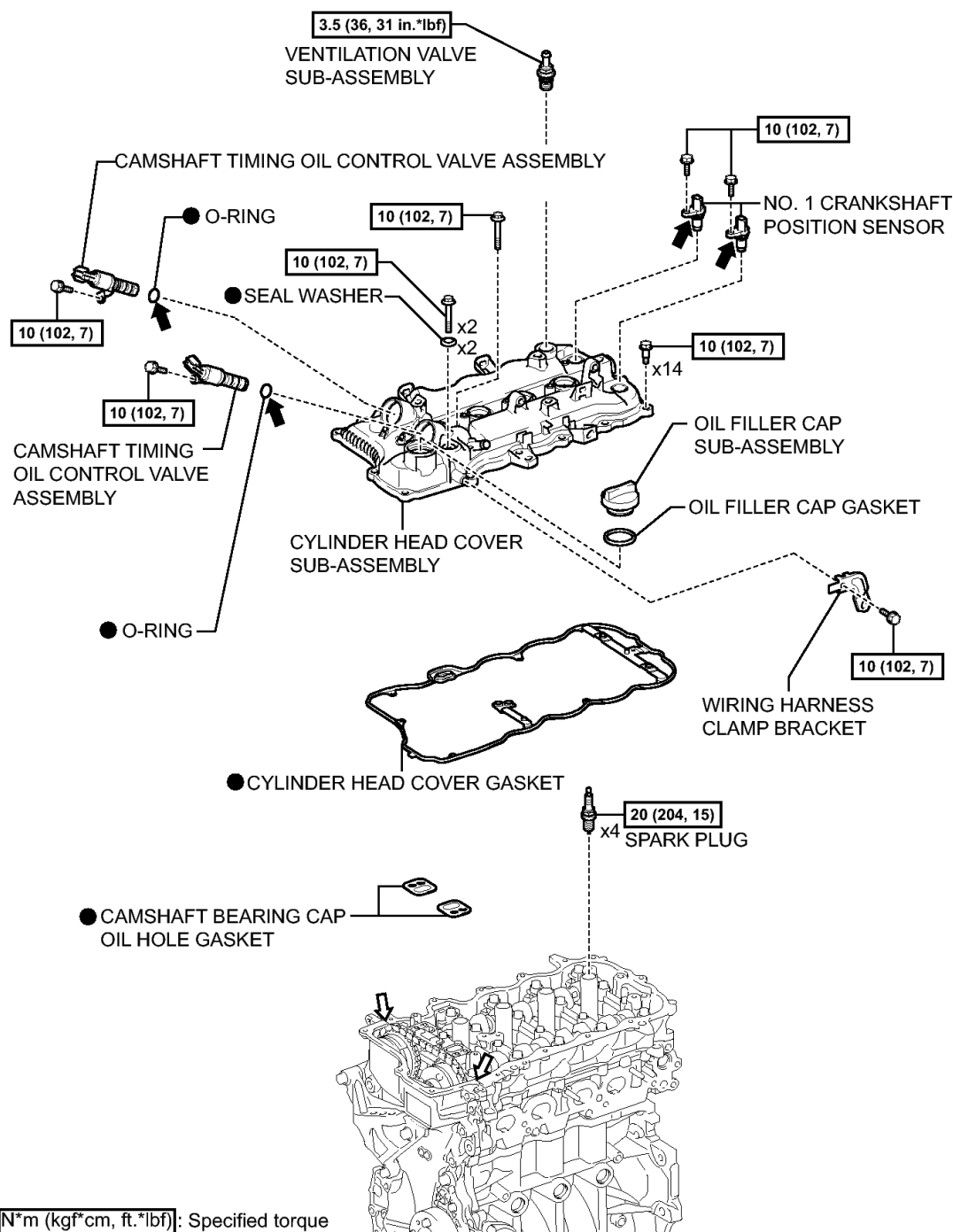


Fig. 126: Identifying Engine Unit Replacement Components With Torque Specifications (4 Of 8)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

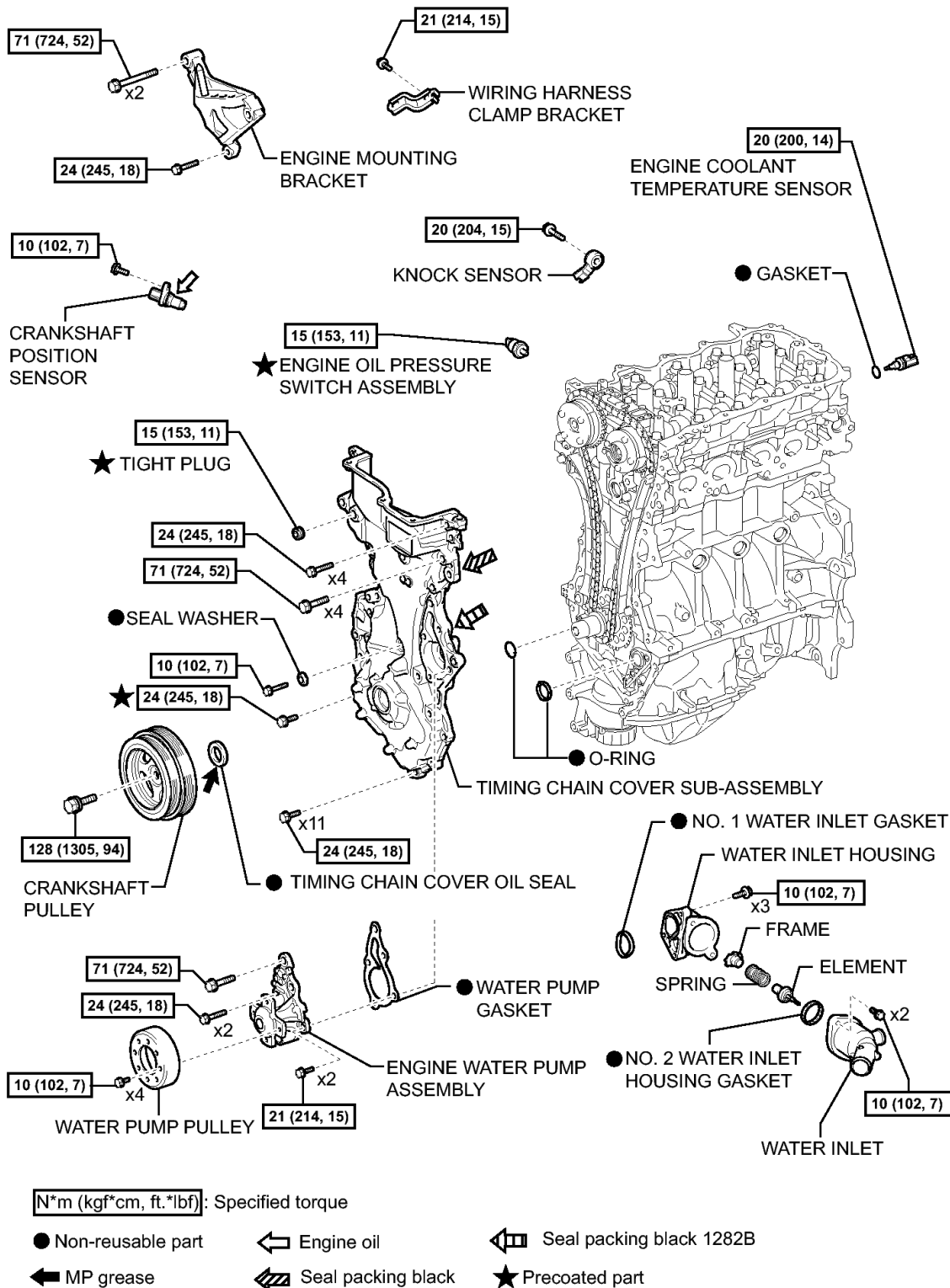
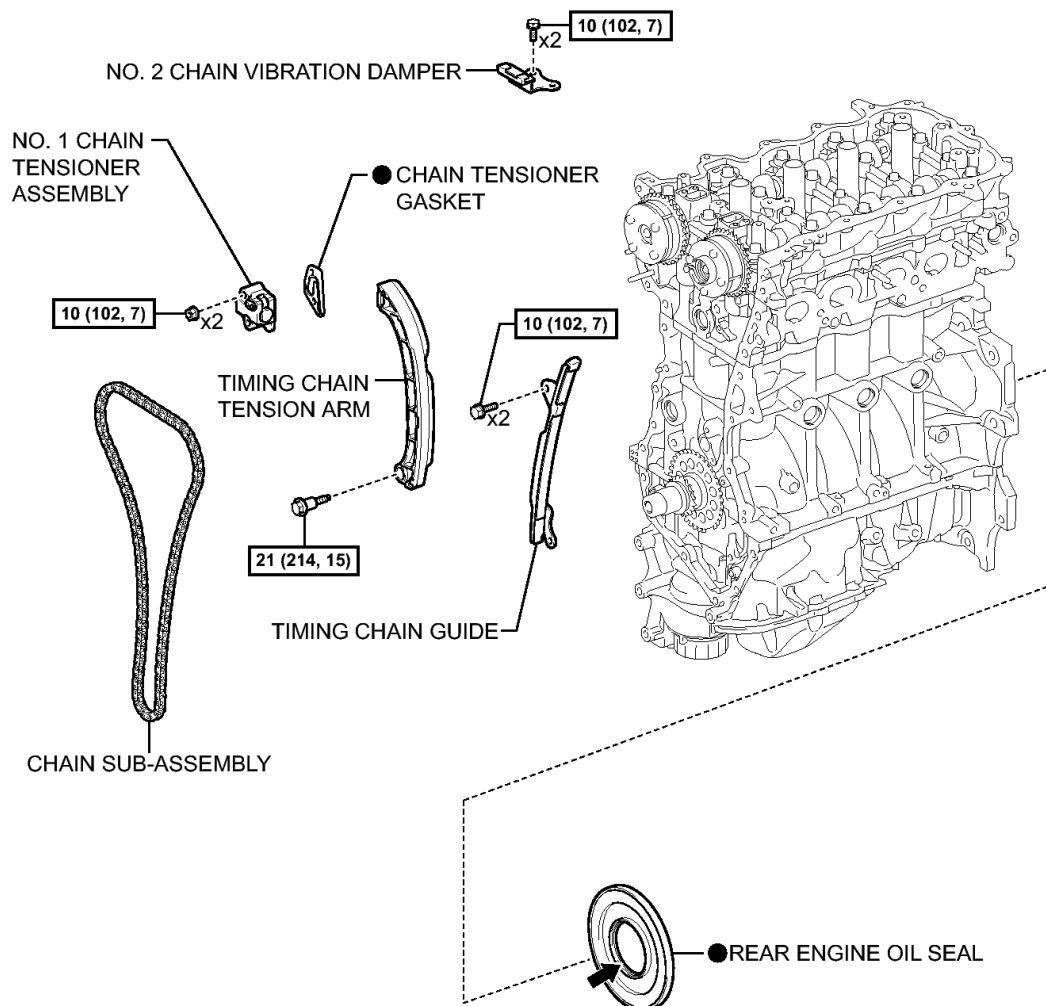


Fig. 127: Identifying Engine Unit Replacement Components With Torque Specifications (5 Of 8)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

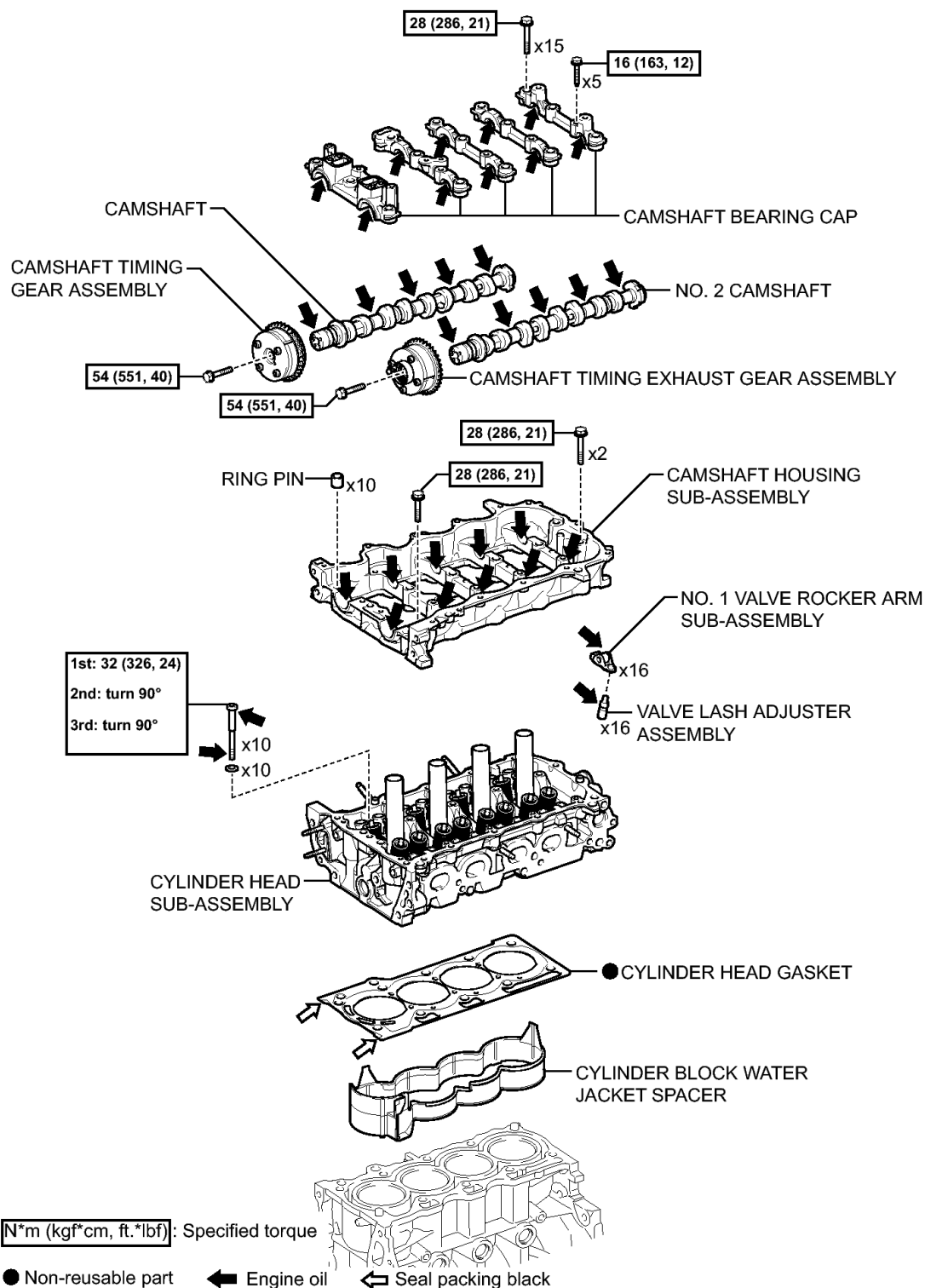


[N*m (kgf*cm, ft.*lbf)]: Specified torque

● Non-reusable part

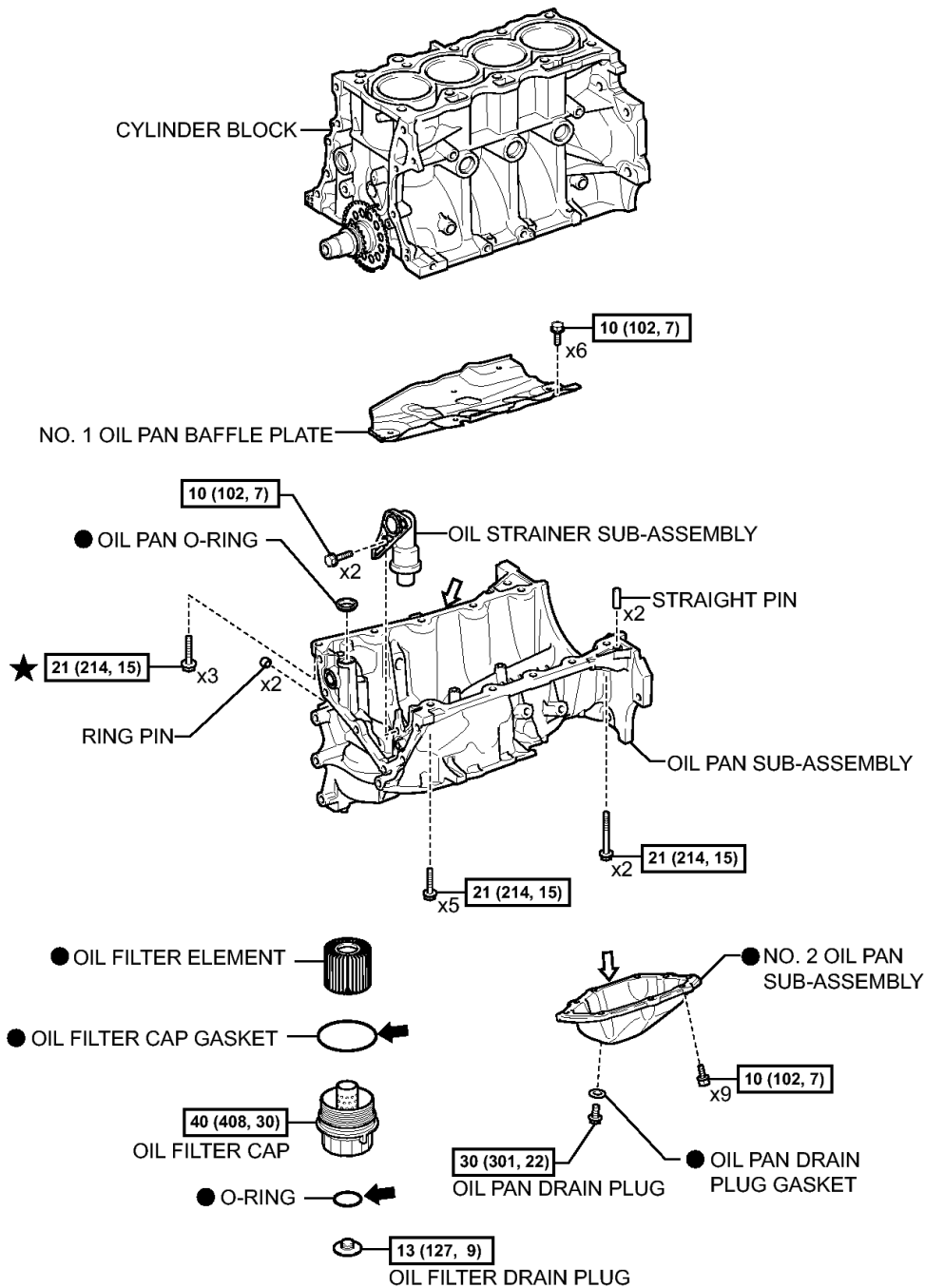
← MP Grease

Fig. 128: Identifying Engine Unit Replacement Components With Torque Specifications (6 Of 8)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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Fig. 129: Identifying Engine Unit Replacement Components With Torque Specifications (7 Of 8)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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

- Non-reusable part
- ↔ Seal packing black
- ← Engine oil
- ★ Precoated part

P

Fig. 130: Identifying Engine Unit Replacement Components With Torque Specifications (8 Of 8)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

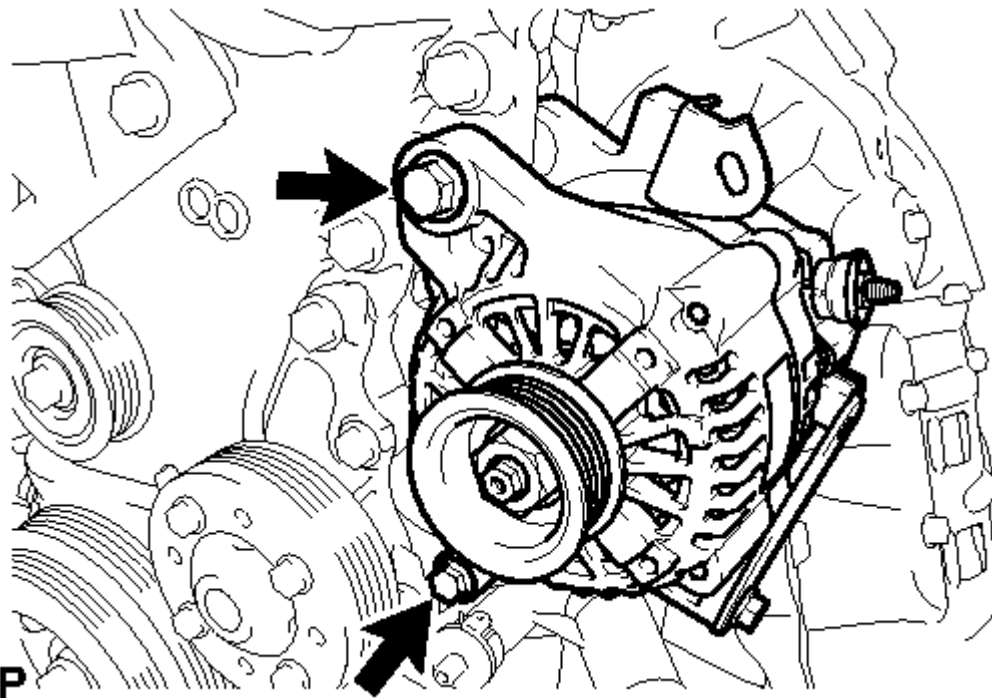
REMOVAL**1. REMOVE GENERATOR ASSEMBLY**

Fig. 131: Identifying Generator Bolts

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

- a. Remove the 2 bolts and the generator.

2. REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR



Fig. 132: Identifying Exhaust Manifold Heat Insulator Nuts And Bolt

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

- a. Remove the bolt, 2 nuts and the No. 1 exhaust manifold heat insulator.

3. REMOVE MANIFOLD STAY

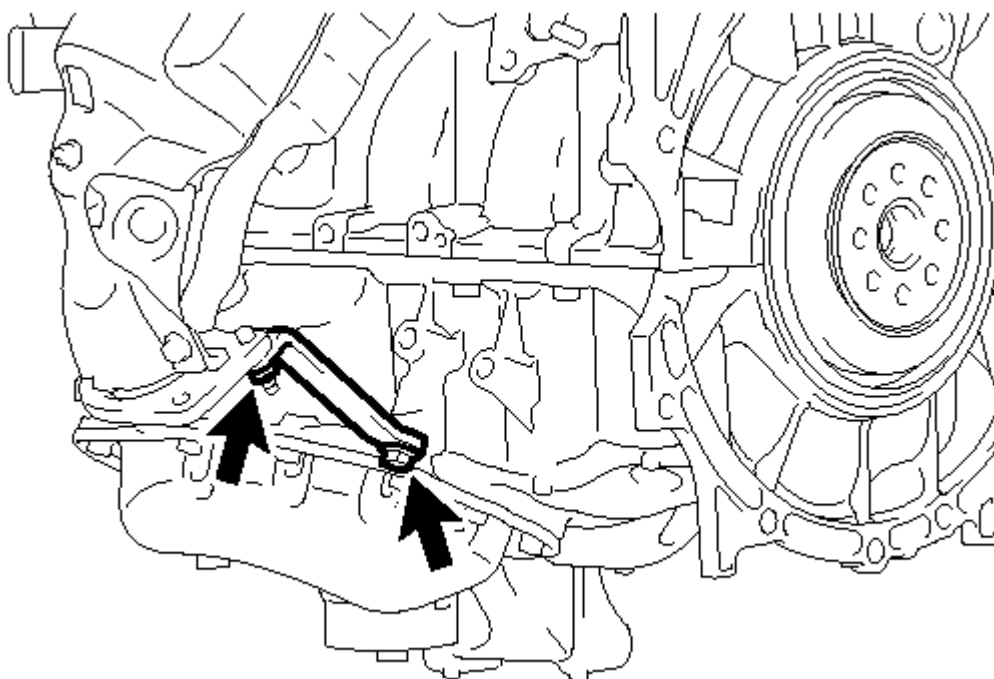


Fig. 133: Identifying Manifold Stay Nut And Bolt

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

- a. Remove the bolt, nut and the manifold stay.

4. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY

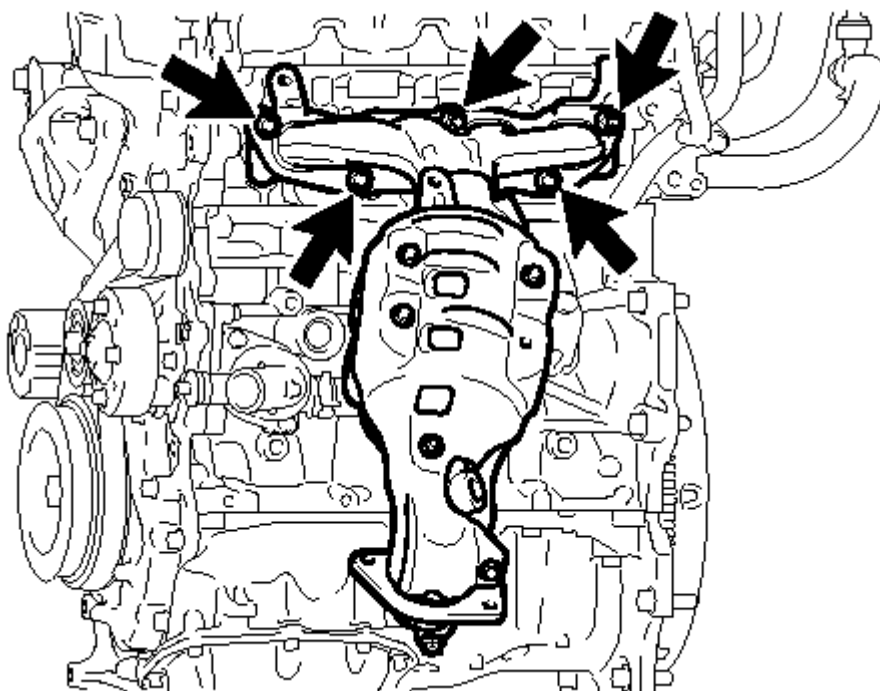
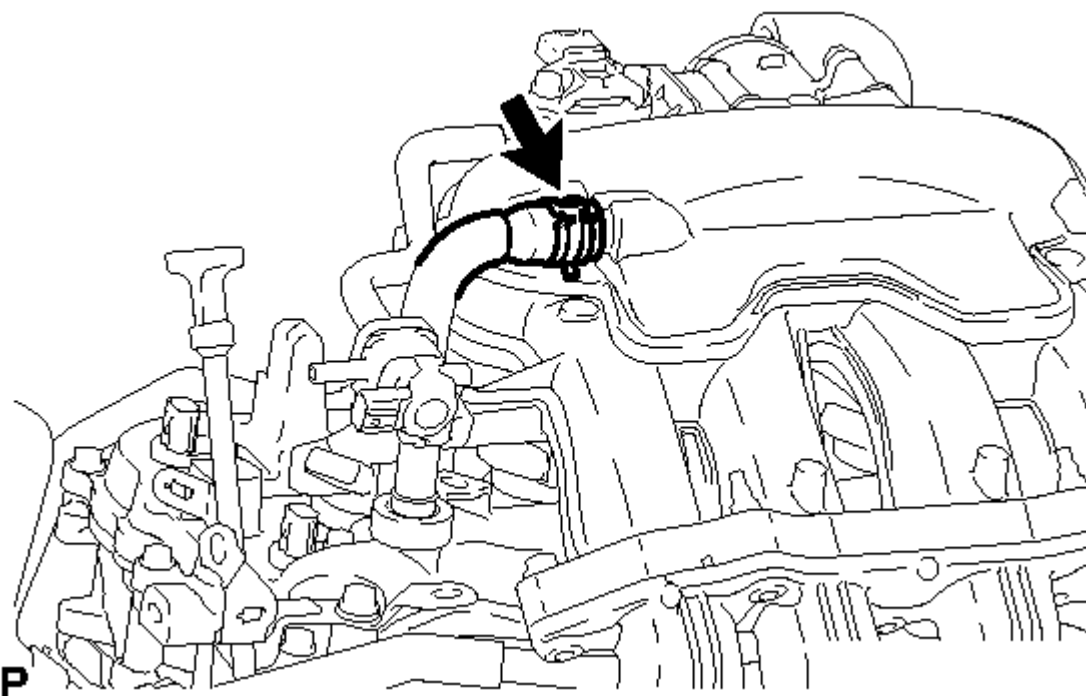


Fig. 134: Identifying Exhaust Manifold Converter Nuts And Bolts

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

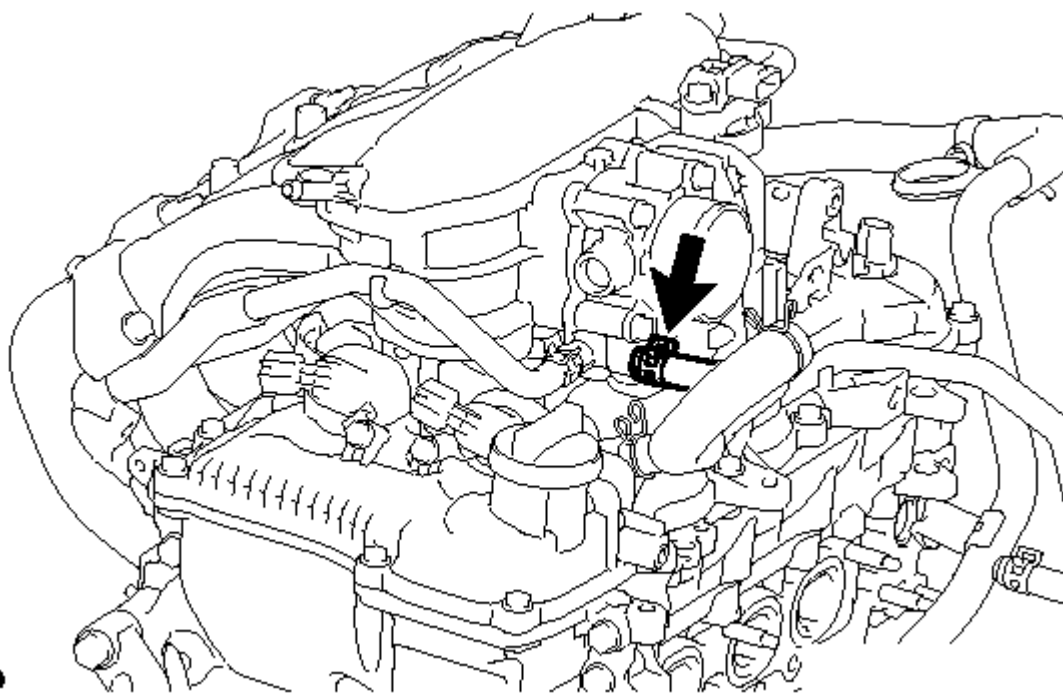
- a. Remove the 3 bolts, 2 nuts and the exhaust manifold converter.
- b. Remove the exhaust manifold to head gasket from the cylinder head.

5. DISCONNECT VENTILATION HOSE

**P****Fig. 135: Identifying Ventilation Hose Clip**

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

- a. Loosen the clip and disconnect the ventilation hose from the intake manifold.

6. DISCONNECT NO. 2 WATER BY-PASS HOSE**P****Fig. 136: Identifying No. 2 Water By-Pass Hose Clip**

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

- a. Loosen the clip and disconnect the No. 2 water by-pass hose from the throttle body.

7. DISCONNECT NO. 4 WATER BY-PASS HOSE

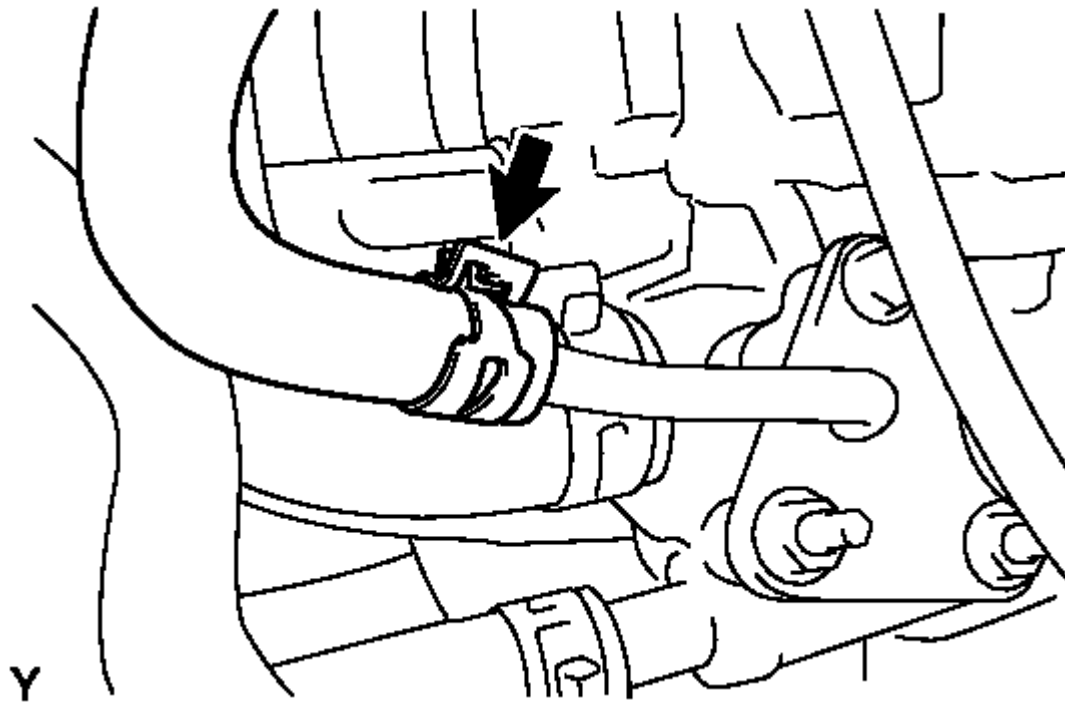
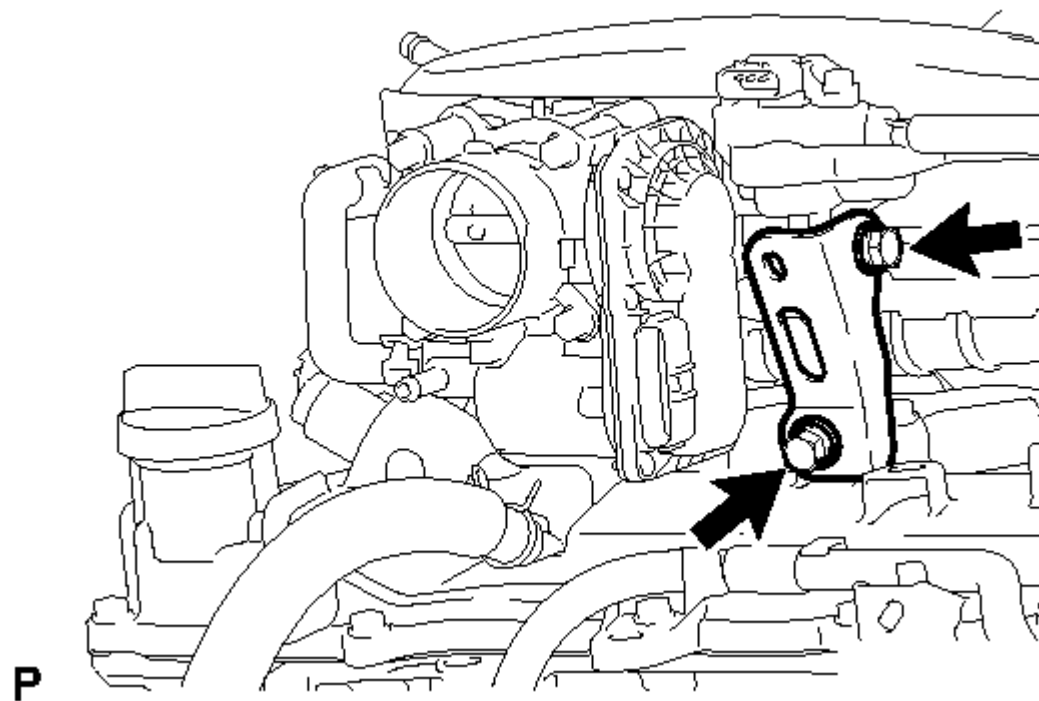


Fig. 137: Identifying No. 4 Water By-Pass Hose Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

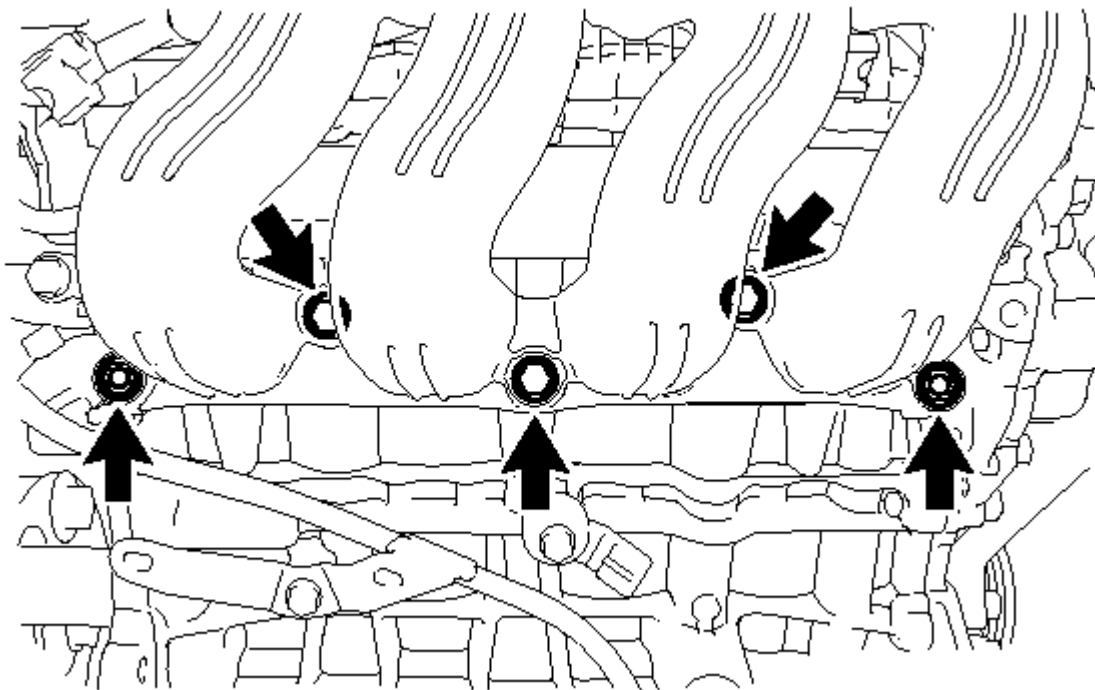
- a. Loosen the clip and disconnect the No. 4 water by-pass hose from the EGR hole cover plate.

8. REMOVE INTAKE MANIFOLD STAY

**P****Fig. 138: Identifying Intake Manifold Stay Bolts**

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

- a. Remove the 2 bolts and the intake manifold stay.

9. REMOVE INTAKE MANIFOLD ASSEMBLY**Fig. 139: Identifying Intake Manifold Nuts And Bolts**

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

- a. Remove the 3 bolts, 2 nuts and the intake manifold.
- b. Remove the No. 2 intake manifold to head gasket from the cylinder head.

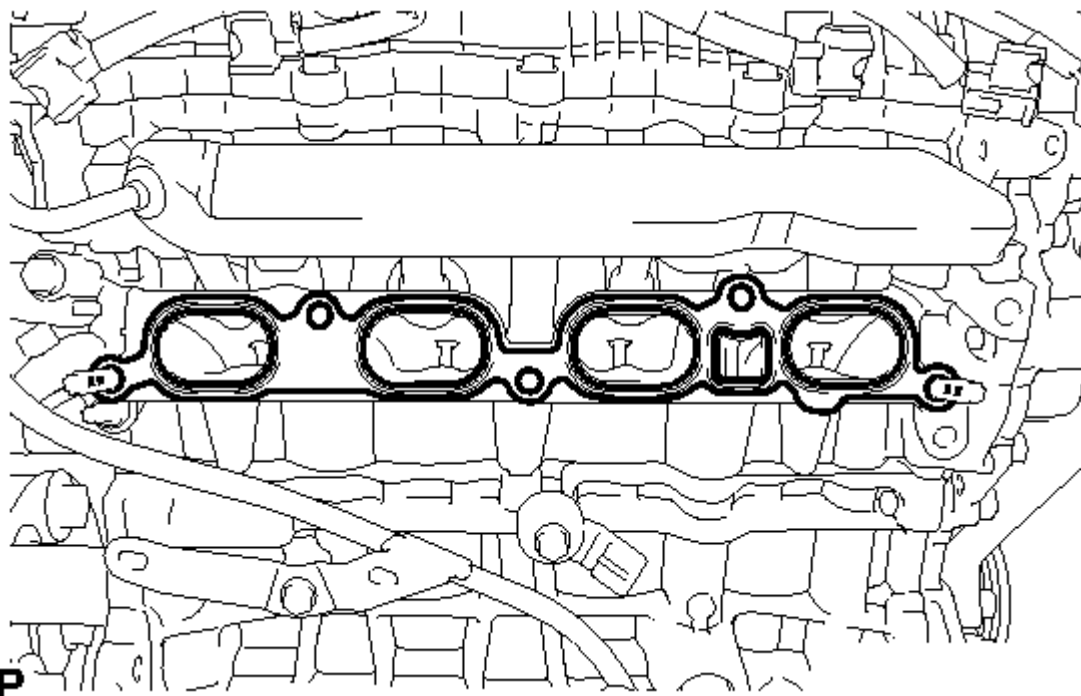


Fig. 140: Identifying Intake Manifold Head Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. REMOVE NO. 4 ENGINE WIRE

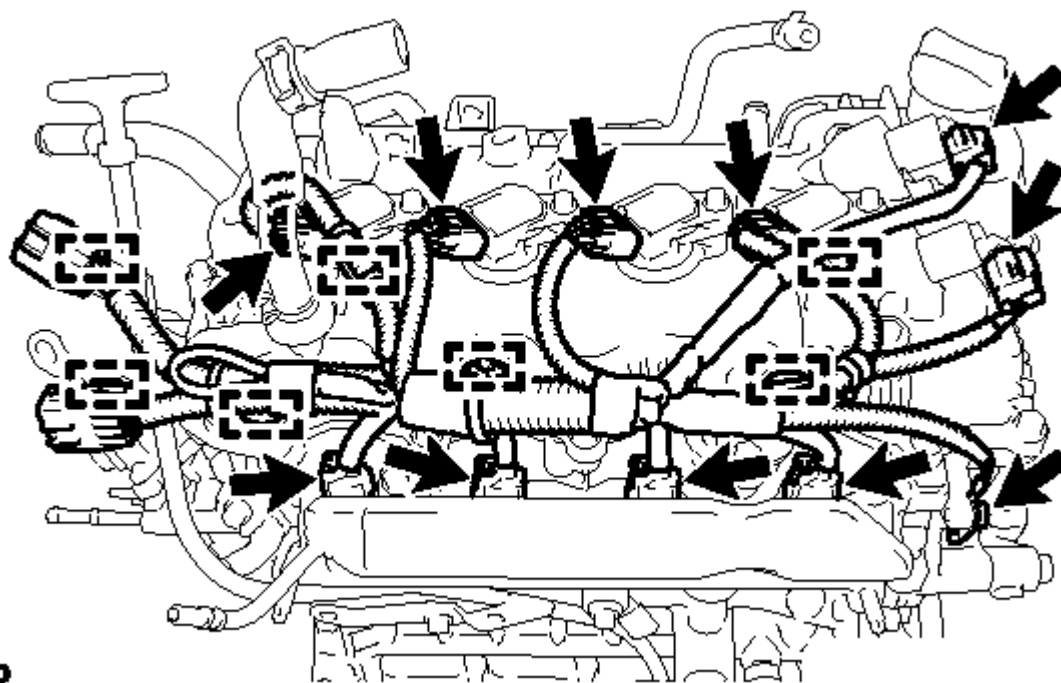
**P**

Fig. 141: Identifying Ignition Coil, Camshaft Timing Oil Control Valve Connectors, And Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Disconnect the 2 camshaft timing oil control valve connectors.
 - b. Disconnect the 4 ignition coil connectors.
 - c. Disconnect the 4 fuel injector connectors.
 - d. Remove the ground bolt.
 - e. Disengage the 7 clamps and remove the No. 4 engine wire.
11. **REMOVE ENGINE OIL LEVEL DIPSTICK**
 12. **REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE**

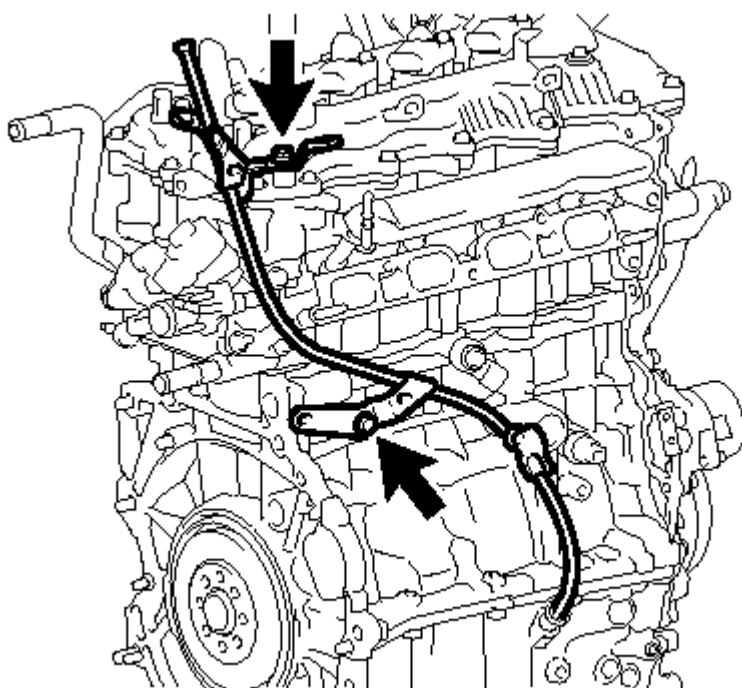
**P**

Fig. 142: Identifying Engine Oil Level Dipstick Guide Bolts

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

- a. Remove the 2 bolts and the engine oil level dipstick guide.
- b. Remove the O-ring from the oil level dipstick guide.

13. REMOVE EGR HOLE COVER PLATE

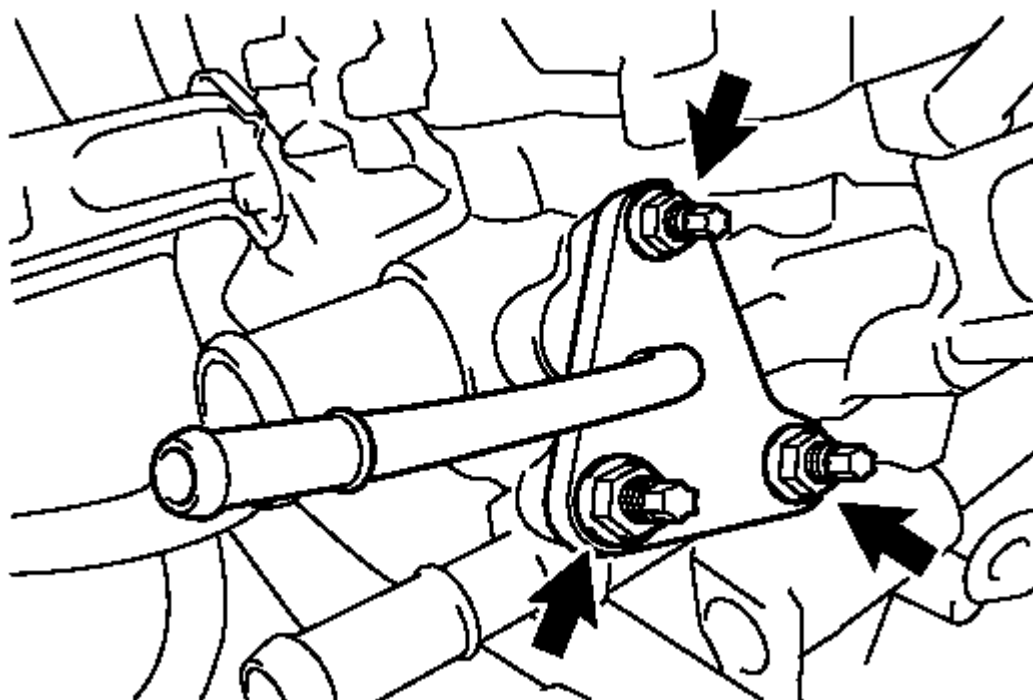
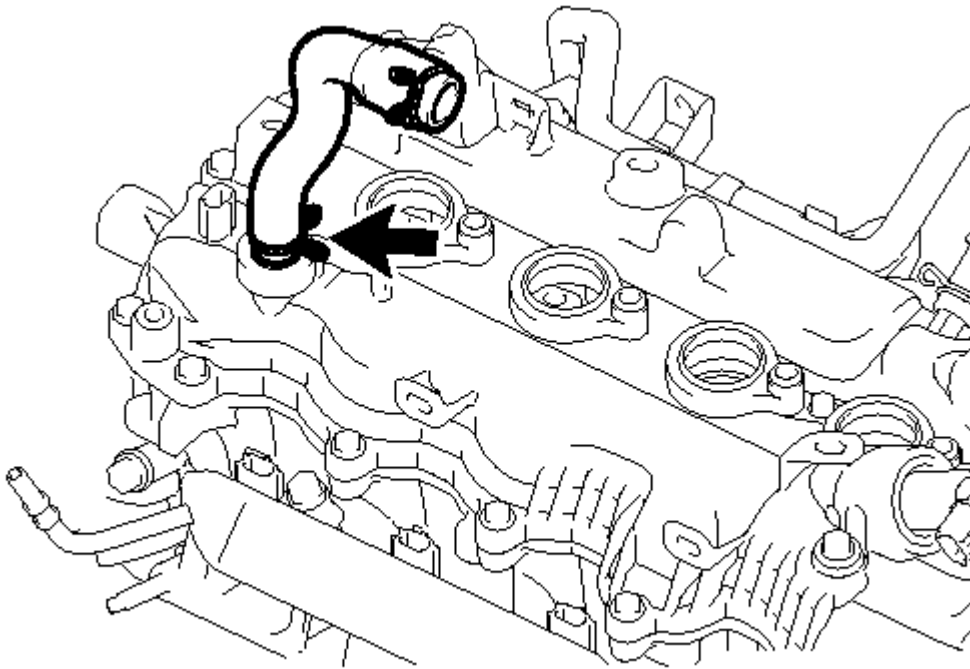


Fig. 143: Identifying EGR Hole Cover Plate Nuts

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

- a. Remove the 3 nuts and the EGR hole cover plate.
 - b. Remove the EGR valve gasket from the cylinder head.
14. **REMOVE FUEL DELIVERY PIPE** . Refer to **REMOVAL - Step 5**
 15. **REMOVE FUEL INJECTOR ASSEMBLY** . Refer to **REMOVAL - Step 6**
 16. **REMOVE NO. 1 DELIVERY PIPE SPACER** . Refer to **REMOVAL - Step 7**
 17. **REMOVE INJECTOR VIBRATION INSULATOR** . Refer to **REMOVAL - Step 8**
 18. **REMOVE NO. 1 IGNITION COIL**
 - a. Remove the 4 bolts and remove the 4 No. 1 ignition coils.
 19. **REMOVE VENTILATION HOSE**

**H****Fig. 144: Identifying Ventilation Hose Clamp**

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

- a. Remove the ventilation hose from the cylinder head cover.
20. **REMOVE NO. 2 VENTILATION HOSE**

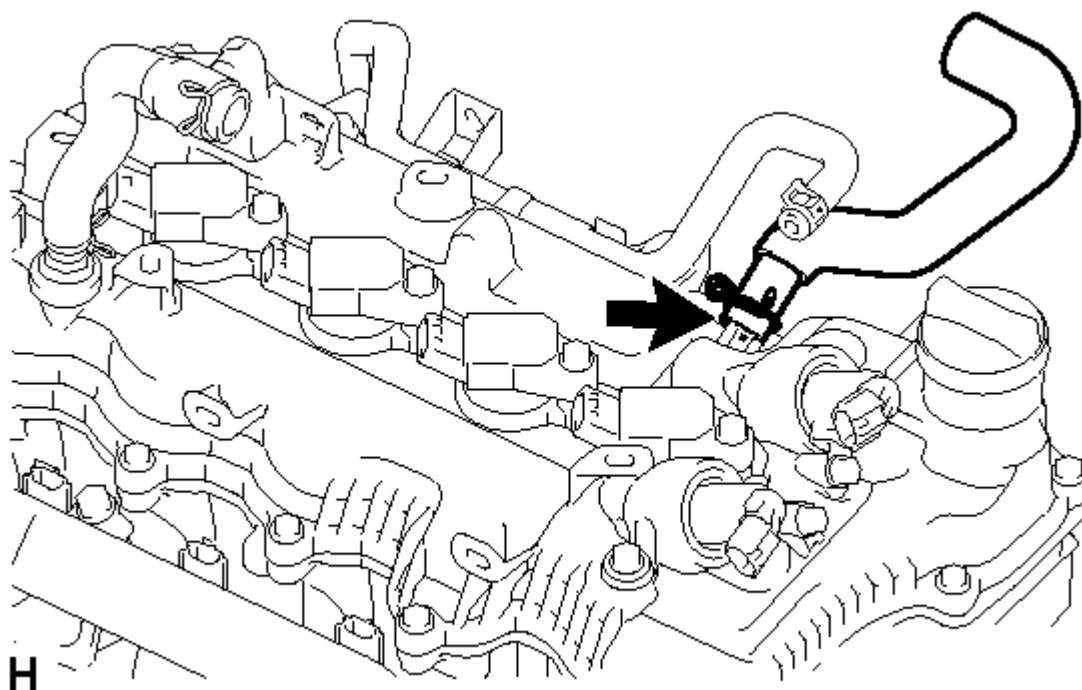


Fig. 145: Identifying No. 2 Ventilation Hose Clamp
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Remove the No. 2 ventilation hose from the cylinder head cover.

21. REMOVE NO. 1 WATER BY-PASS PIPE

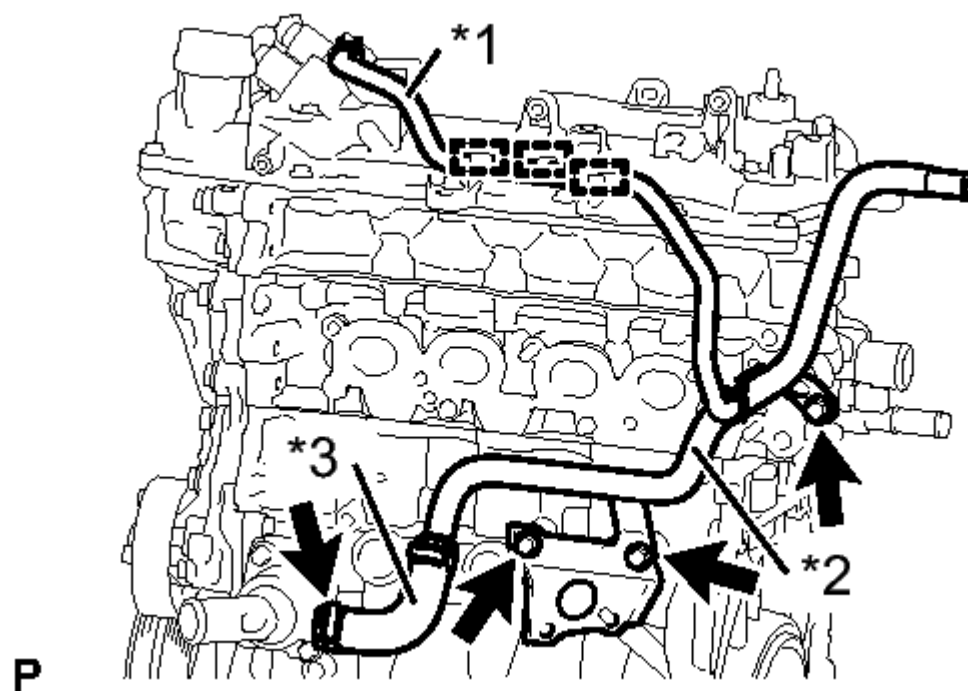


Fig. 146: Identifying No. 2 Water By-Pass Hose, No. 1 Water By-Pass Pipe, And Water By-Pass

Hose

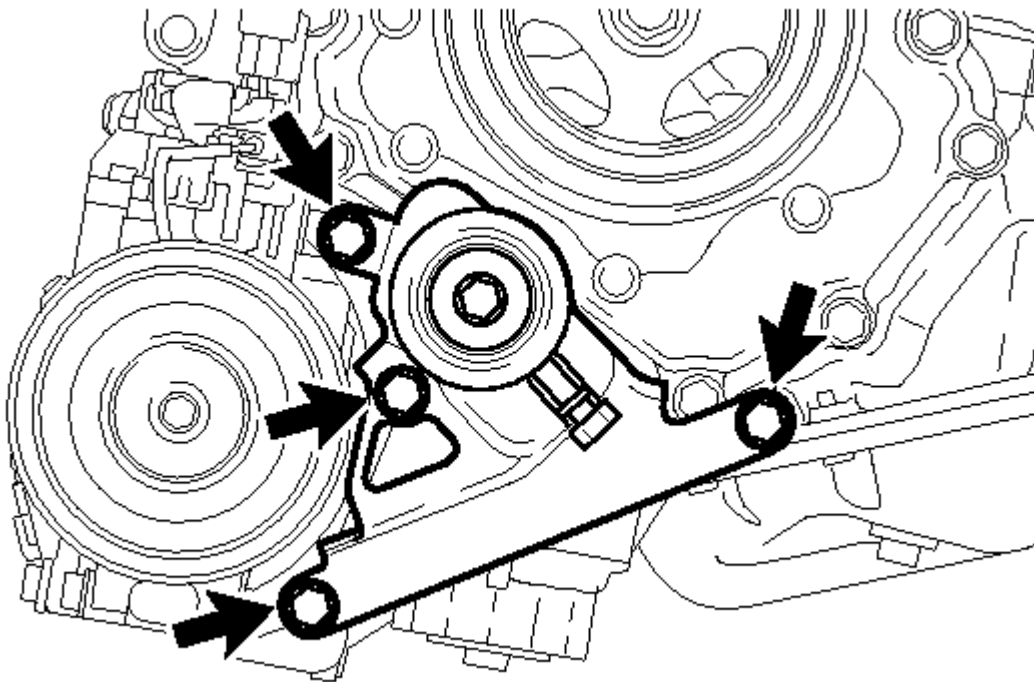
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Disengage the No. 2 water by-pass hose from the 3 clamps.

TEXT IN ILLUSTRATION

*1	No. 2 Water By-Pass Hose
*2	No. 1 Water By-Pass Pipe
*3	Water By-Pass Hose

- b. Remove the 3 bolts.
- c. Disconnect the water by-pass hose and remove the No. 1 water by-pass pipe.

22. REMOVE NO. 2 IDLE PULLEY ASSEMBLY WITH BRACKET**P****Fig. 147: Identifying No. 2 Idle Pulley Assembly Bolts**

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

- a. Remove the 4 bolts and the No. 2 idle pulley assembly with bracket.

23. REMOVE V-RIBBED BELT TENSIONER ASSEMBLY

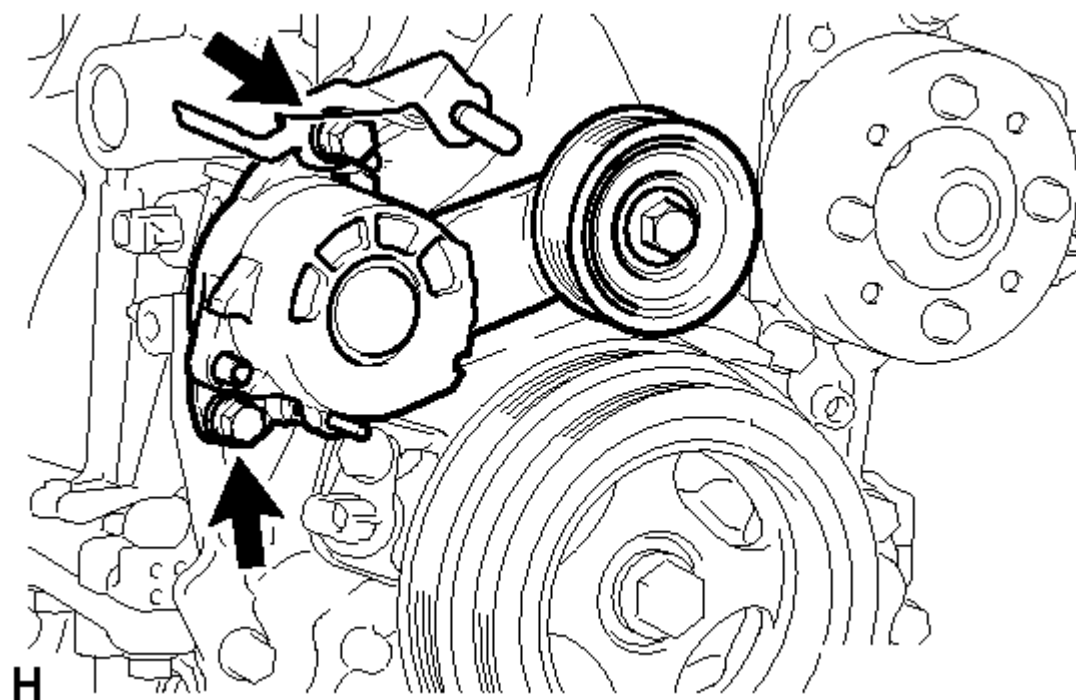


Fig. 148: Identifying V-Ribbed Belt Tensioner Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Remove the 2 bolts, engine cover bracket and V-ribbed belt tensioner.

24. REMOVE WIRING HARNESS CLAMP BRACKET

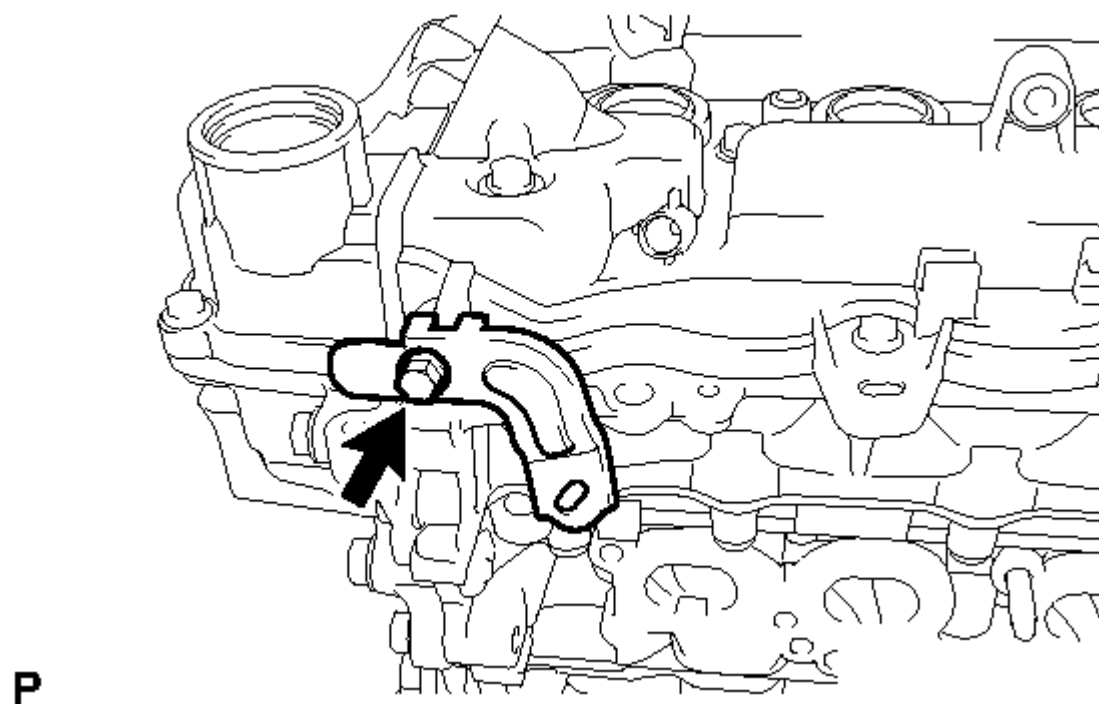


Fig. 149: Identifying Wiring Harness Clamp Bracket Bolt

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

- a. Remove the bolt and the wiring harness clamp bracket from the cylinder head cover.
- b. Remove the bolt and the wiring harness clamp bracket from the cylinder head.

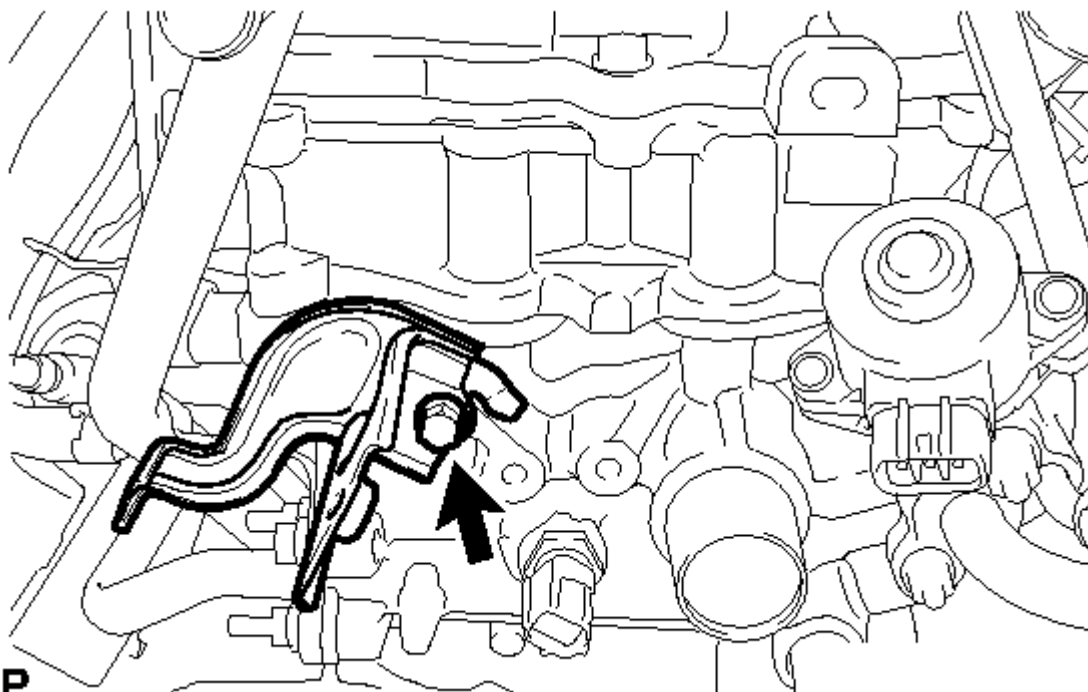


Fig. 150: Identifying Wiring Harness Clamp Bracket Bolt

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

- c. Remove the bolt and the wiring harness clamp bracket from the cylinder block.

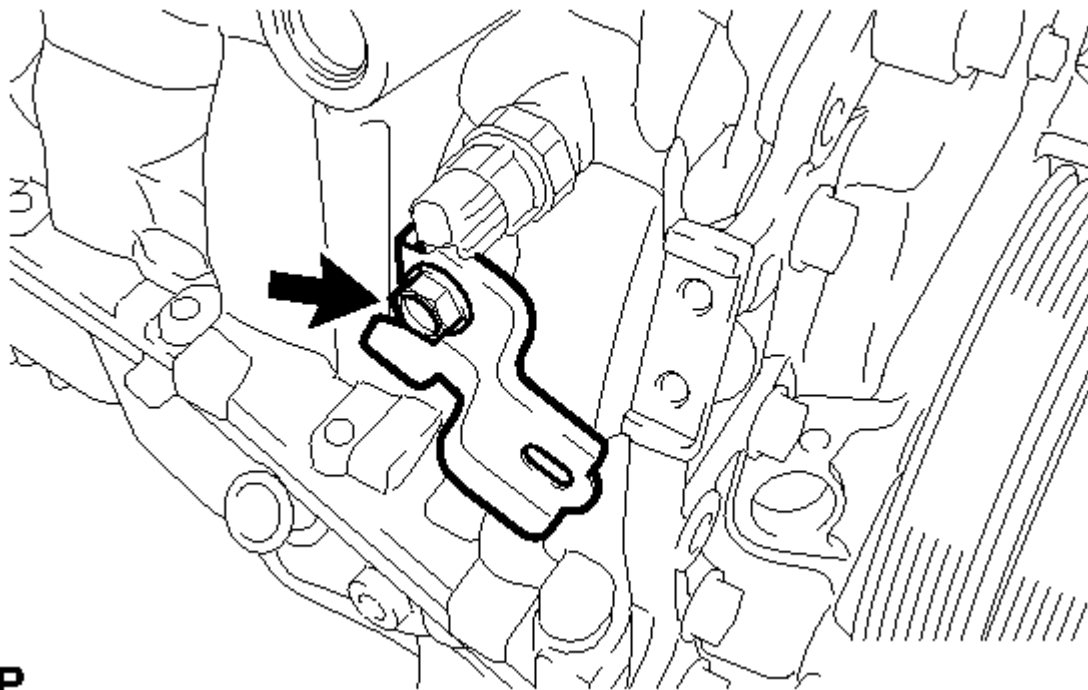
**P**

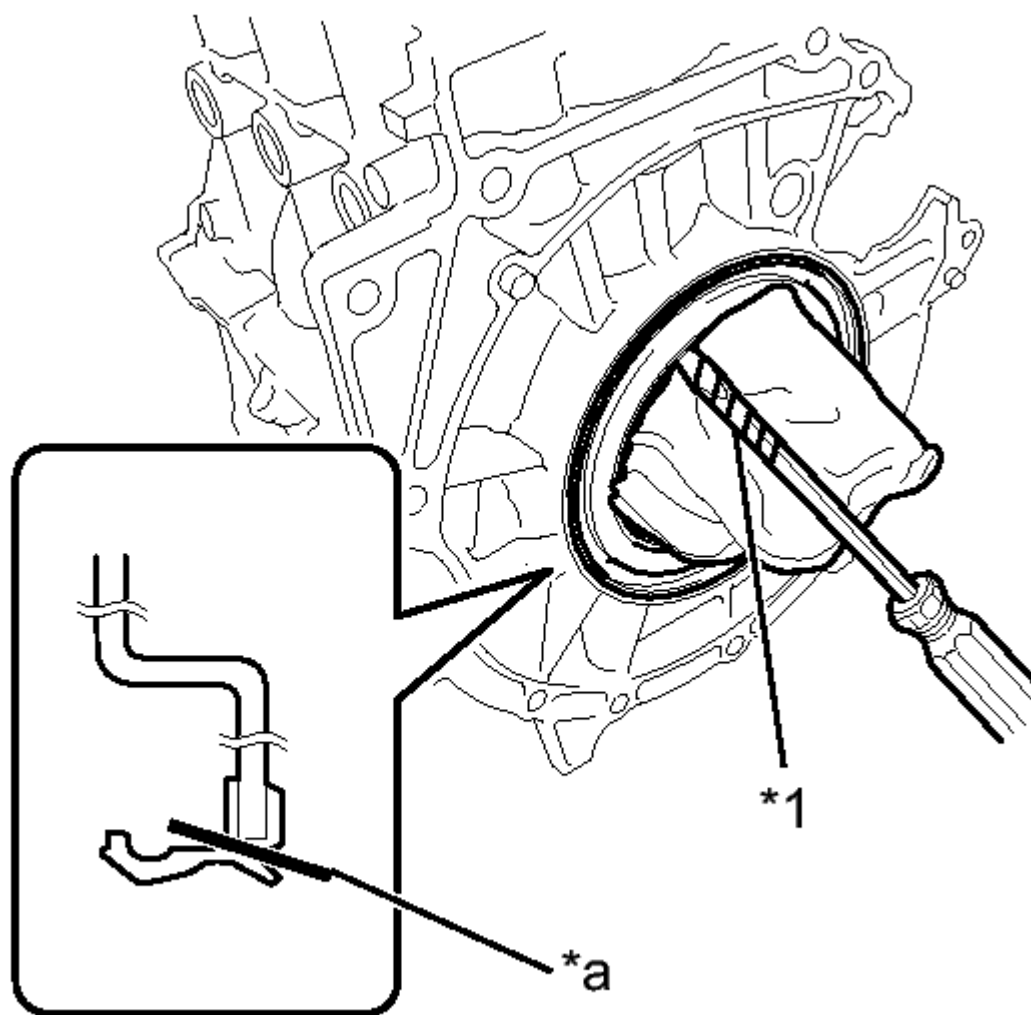
Fig. 151: Identifying Wiring Harness Clamp Bracket Bolt

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

DISASSEMBLY

DISASSEMBLY

1. **REMOVE REAR ENGINE OIL SEAL**
 - a. Using a knife, cut off the oil seal lip.

**C****Fig. 152: Removing Rear Engine Oil Seal**

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

TEXT IN ILLUSTRATION

*1	Protective Tape
*a	Cut Position

- b. Using a screwdriver with its tip wrapped with protective tape, pry out the rear engine oil seal.

2. REMOVE OIL FILLER CAP SUB-ASSEMBLY

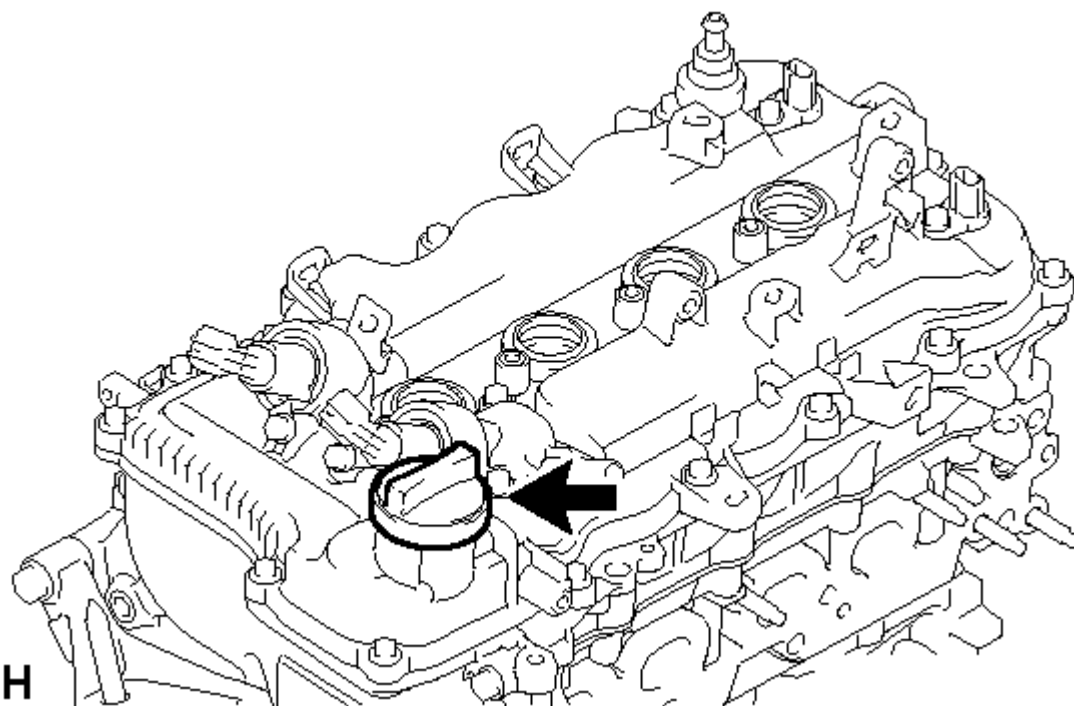
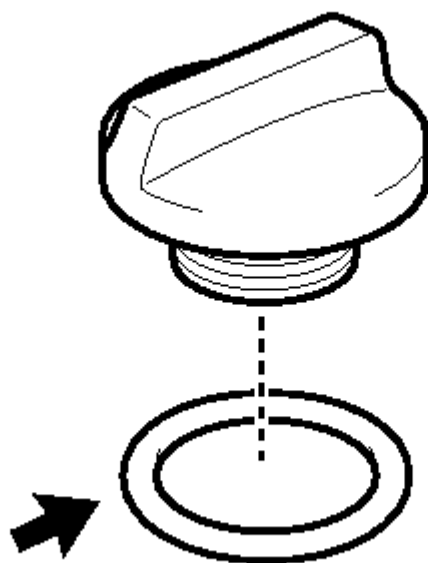


Fig. 153: Identifying Oil Filler Cap

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

- a. Remove the oil filler cap.
3. **REMOVE OIL FILLER CAP GASKET**
 - a. Remove the gasket from the oil filler cap.



T

Fig. 154: Locating Oil Filler Cap Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. REMOVE SPARK PLUG

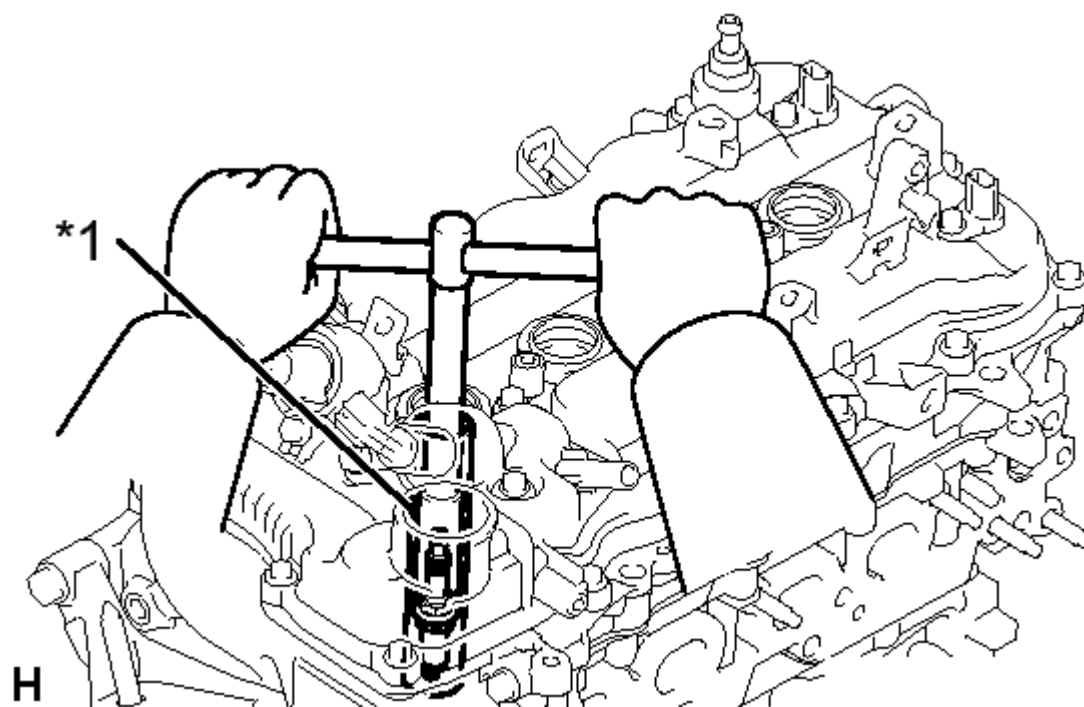


Fig. 155: Removing/Installing Spark Plugs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Using a 14 mm spark plug wrench, remove the 4 spark plugs.

TEXT IN ILLUSTRATION

*1	14 mm Spark Plug Wrench
----	-------------------------

5. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY

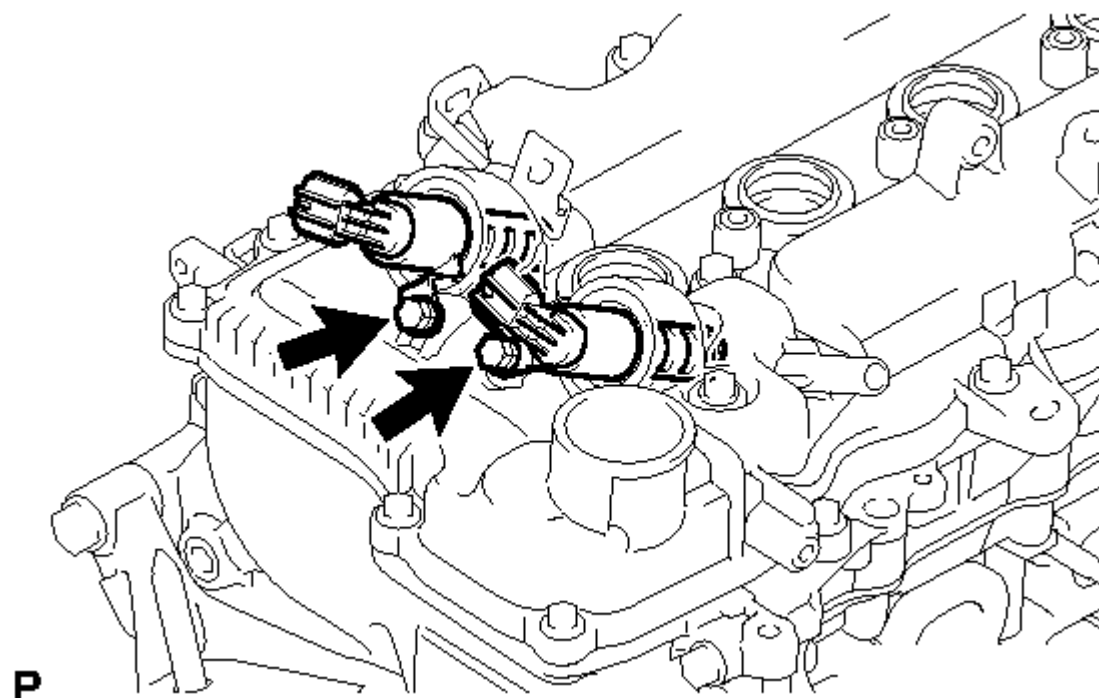


Fig. 156: Identifying Camshaft Timing Oil Control Valve Bolts

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

- a. Remove the 2 bolts, 2 O-rings and the 2 camshaft timing oil control valves.

6. REMOVE NO. 1 CRANKSHAFT POSITION SENSOR

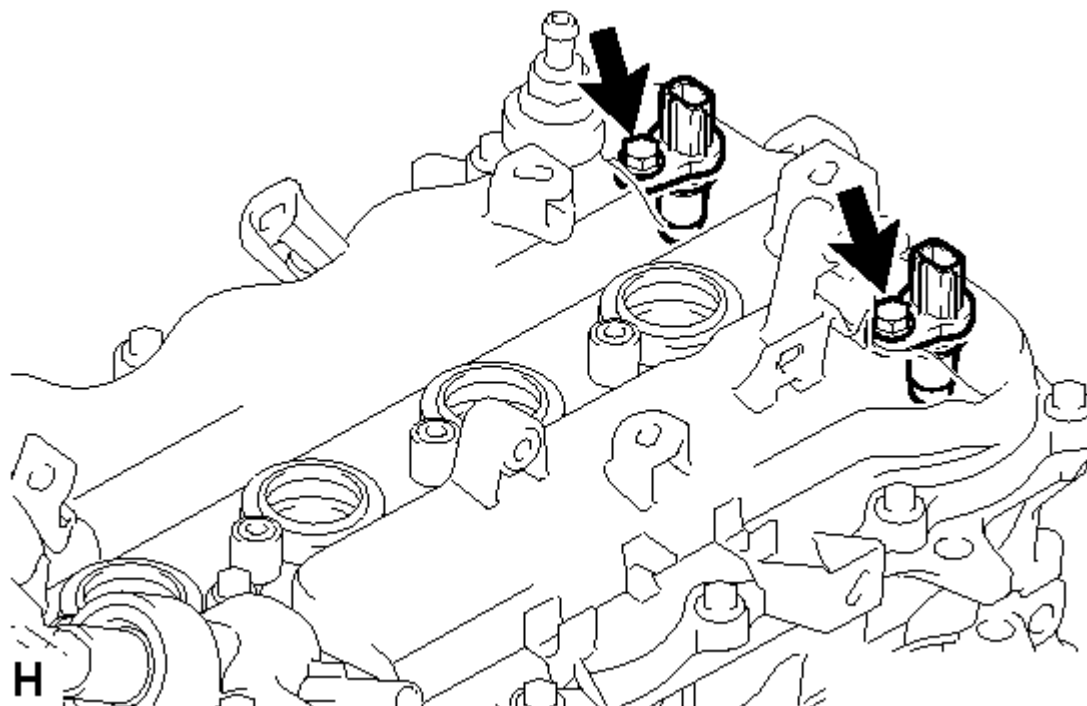


Fig. 157: Identifying No. 1 Crankshaft Position Sensors Bolts

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

- a. Remove the 2 bolts and the 2 No. 1 crankshaft position sensors.

7. REMOVE VENTILATION VALVE SUB-ASSEMBLY

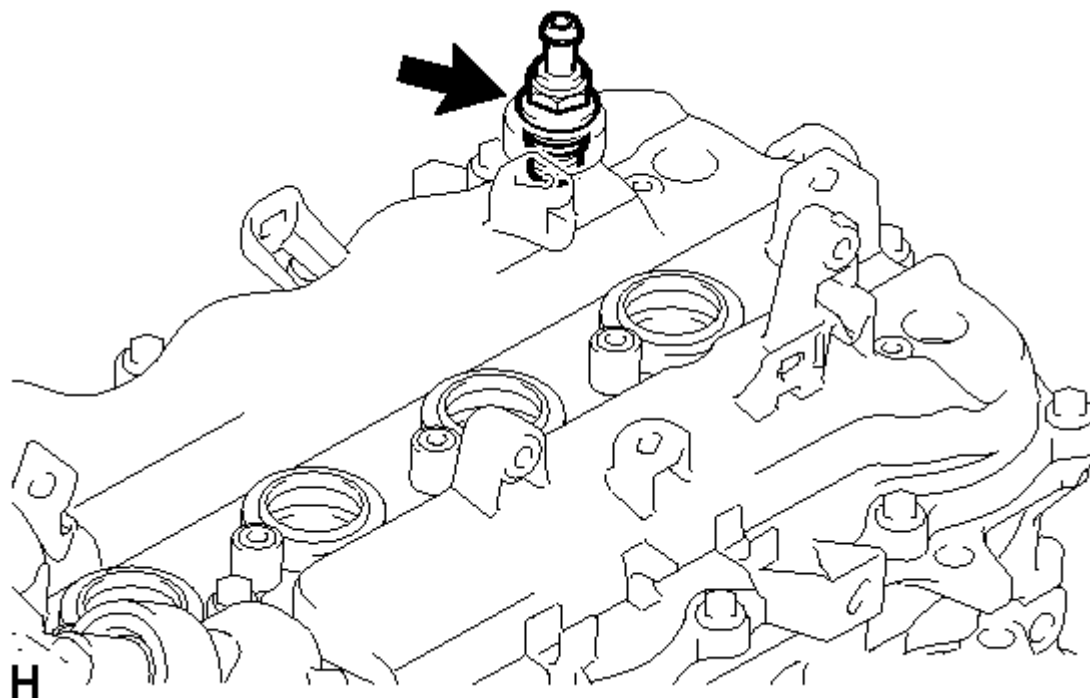


Fig. 158: Identifying Ventilation Valve

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

- a. Using a 27 mm deep socket wrench, remove the ventilation valve.

8. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY

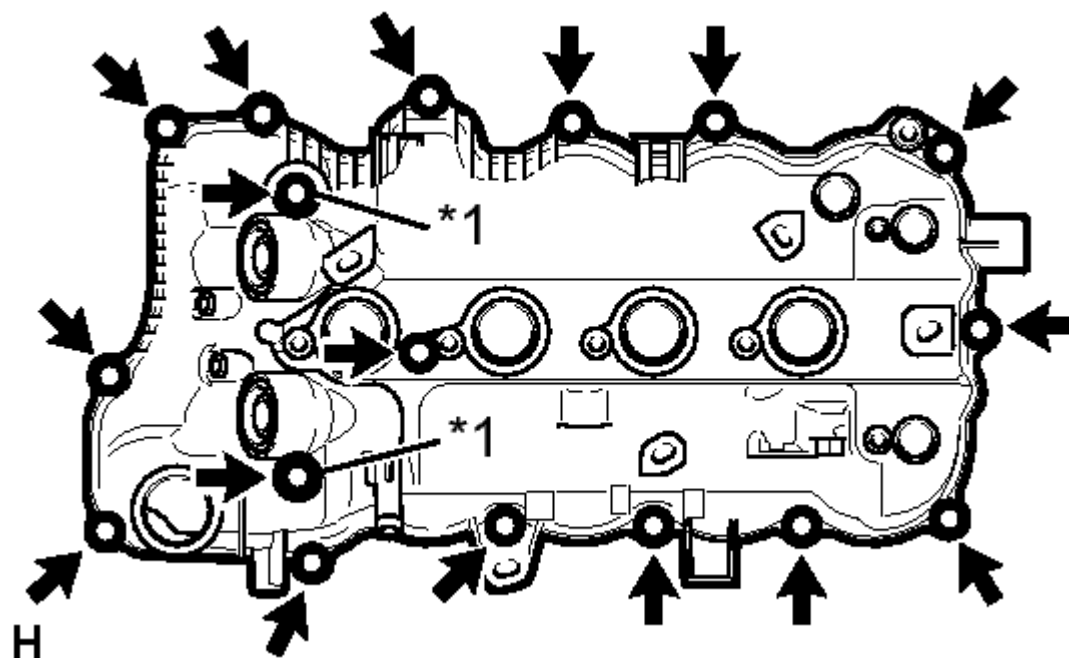


Fig. 159: Identifying Cylinder Head Cover Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

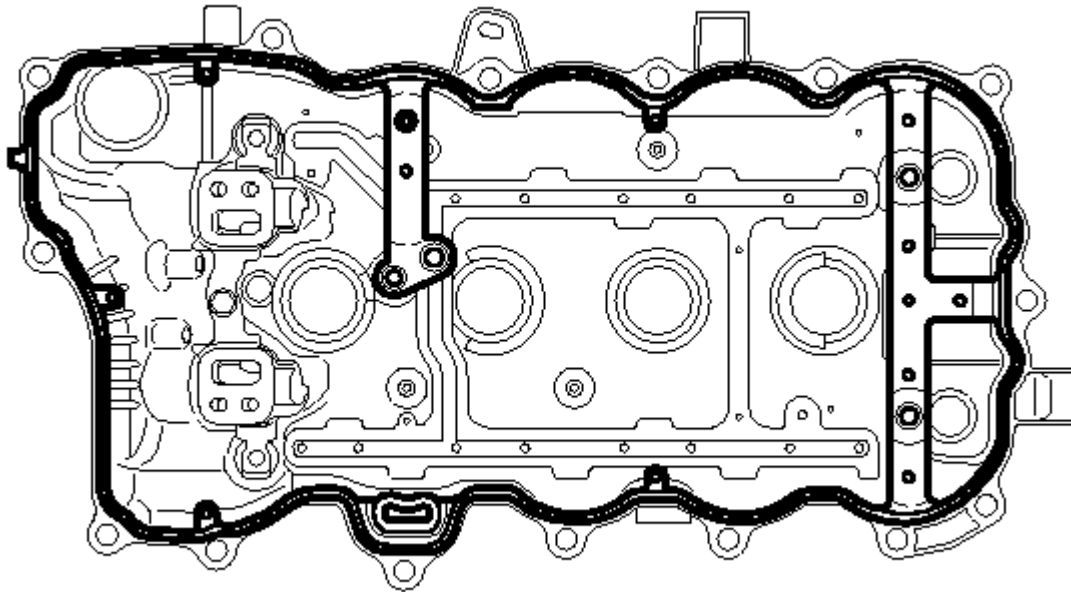
- a. Remove the 17 bolts, 2 seal washers and the cylinder head cover.

TEXT IN ILLUSTRATION

*1	Seal Washer
----	-------------

NOTE: Be careful not to drop any of the gaskets into the engine when removing the cylinder head cover because the gaskets may stick to the cylinder head cover.

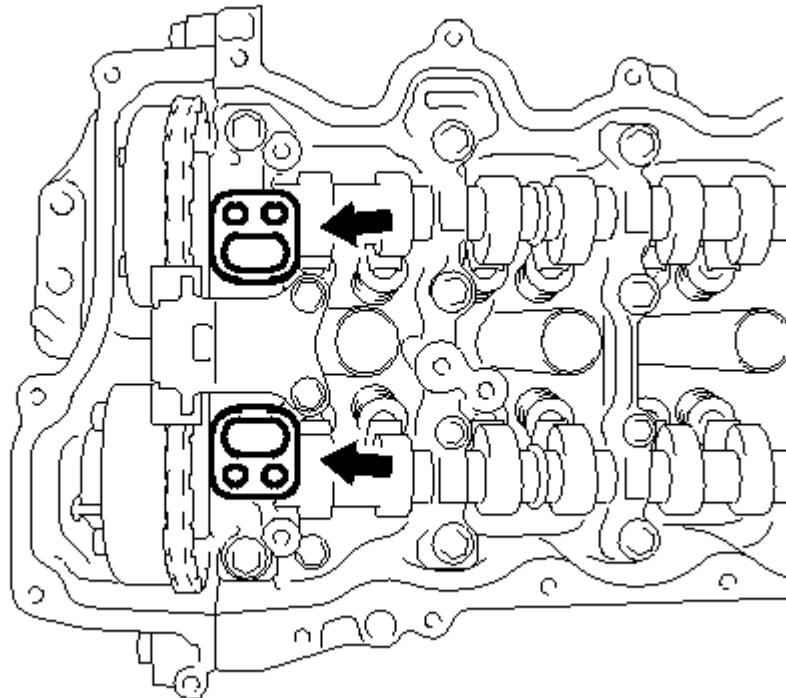
- b. Remove the cylinder head cover gasket.

**P****Fig. 160: Identifying Cylinder Head Cover Gasket**

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

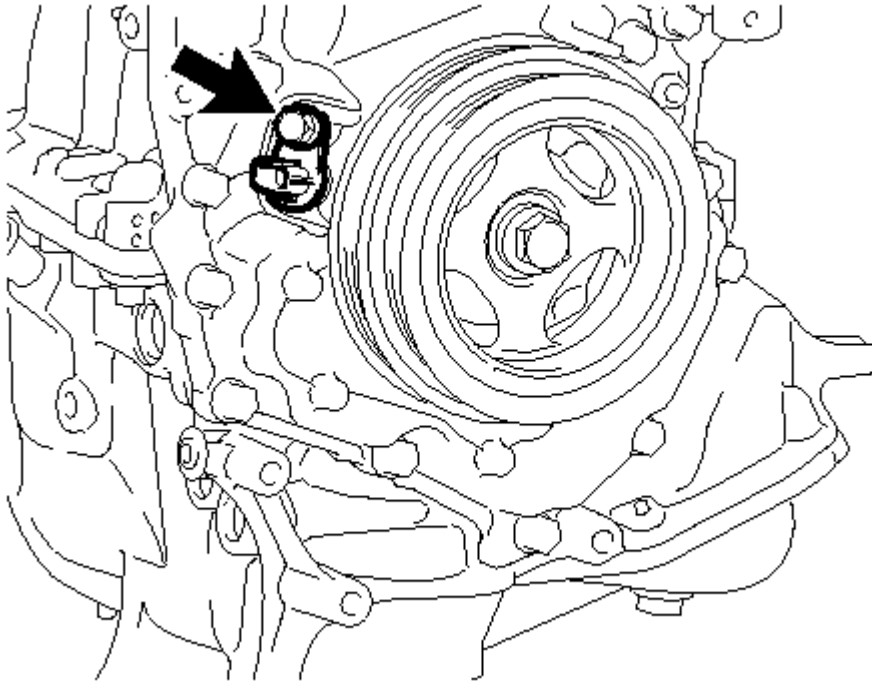
9. REMOVE CAMSHAFT BEARING CAP OIL HOLE GASKET

- a. Remove the 2 camshaft bearing cap oil hole gaskets from the camshaft bearing cap.

**C****Fig. 161: Identifying Camshaft Bearing Cap Oil Hole Gaskets**

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

10. REMOVE CRANKSHAFT POSITION SENSOR



P

Fig. 162: Identifying Crankshaft Position Sensor And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Remove the bolt and the crankshaft position sensor.

11. REMOVE ENGINE OIL PRESSURE SWITCH ASSEMBLY

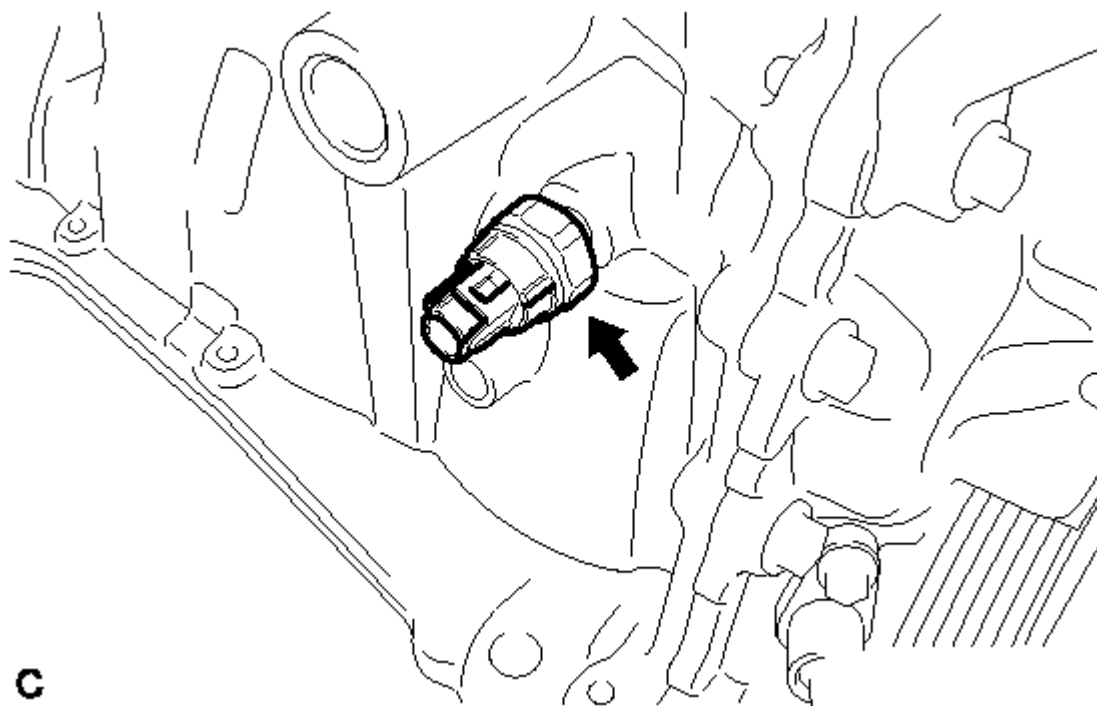


Fig. 163: Identifying Engine Oil Pressure Switch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

12. REMOVE KNOCK SENSOR

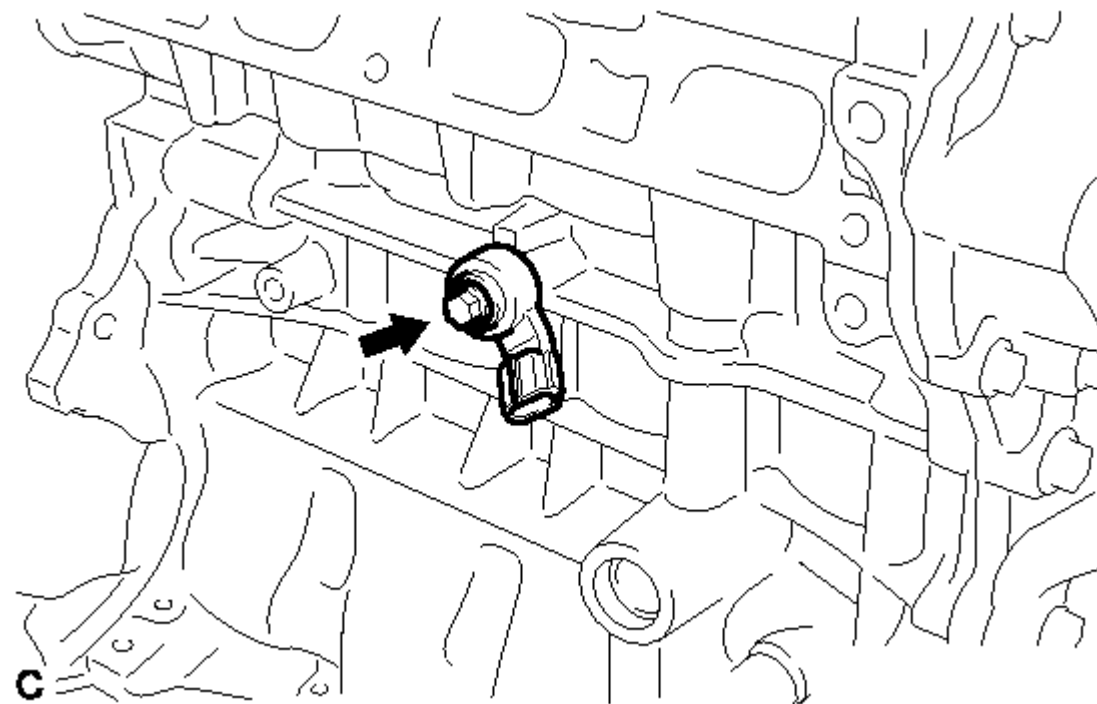


Fig. 164: Identifying Knock Sensor And Bolt

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

- a. Remove the bolt and sensor.

13. REMOVE ENGINE COOLANT TEMPERATURE SENSOR

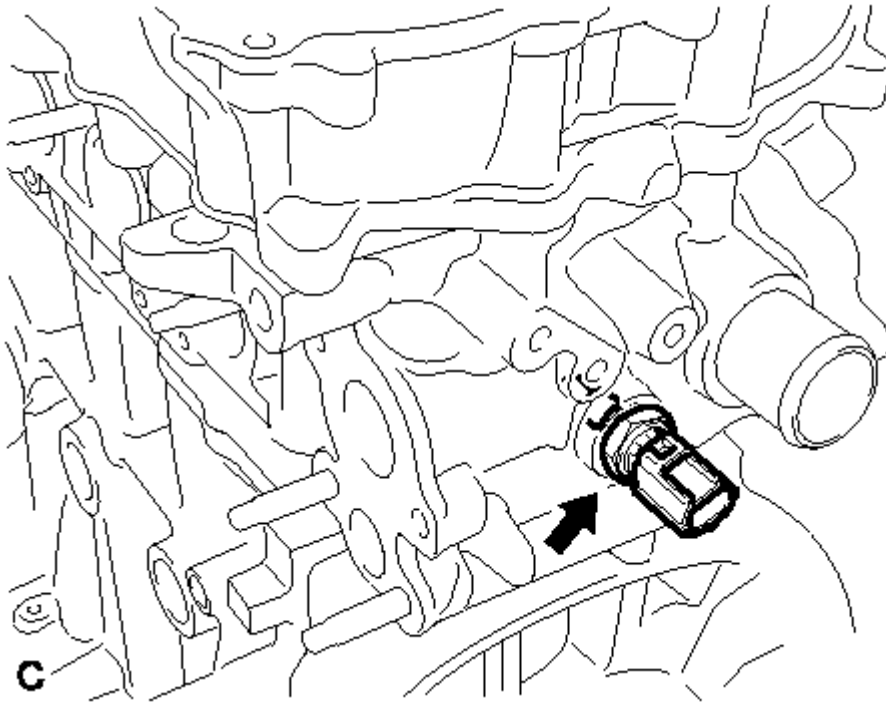


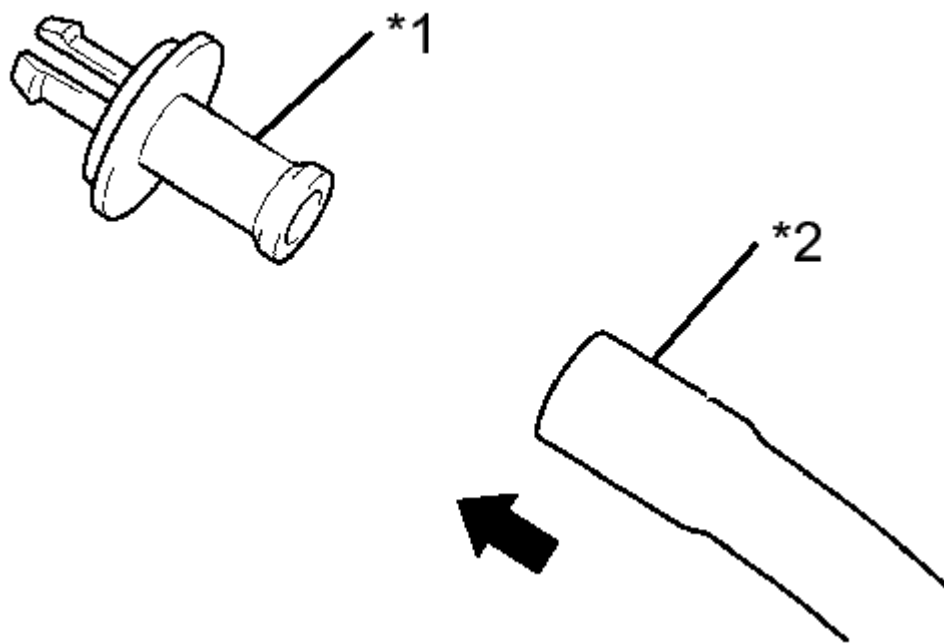
Fig. 165: Identifying Engine Coolant Temperature Sensor

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

- a. Using a 19 mm deep socket wrench, remove the engine coolant temperature sensor.
- b. Remove the gasket from the engine coolant temperature sensor.

14. REMOVE OIL FILTER ELEMENT

- a. Connect a hose with an inside diameter of 15 mm (0.591 in.) to the pipe.

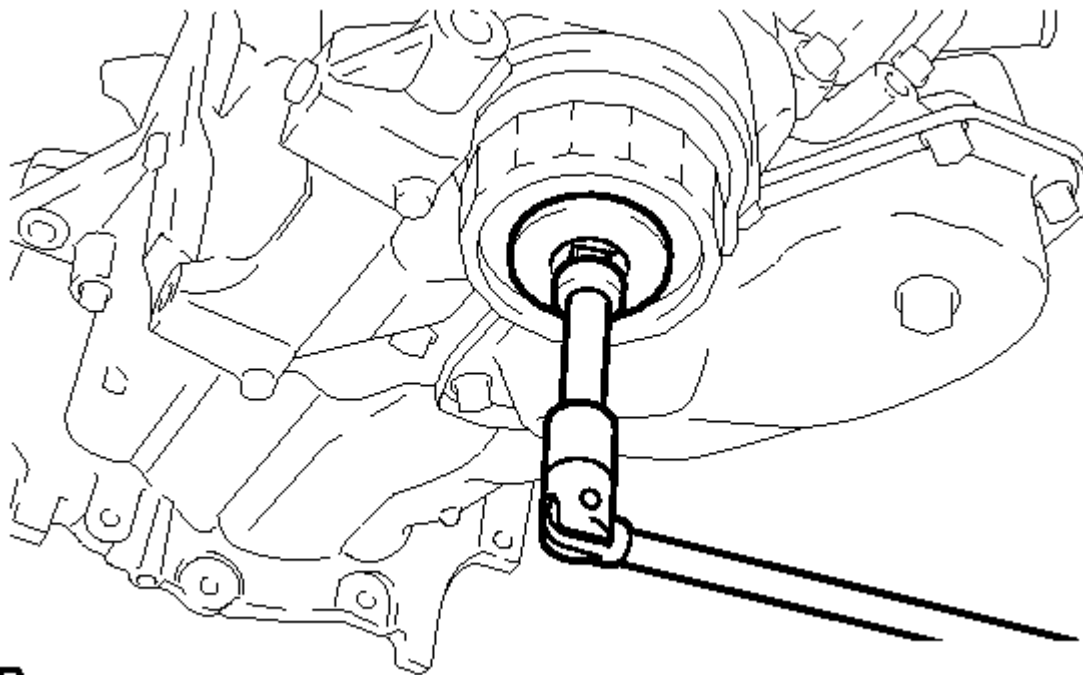
**Fig. 166: Connecting Hose To Pipe**

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

TEXT IN ILLUSTRATION

*1	Pipe
*2	Hose

- b. Remove the oil filter drain plug.

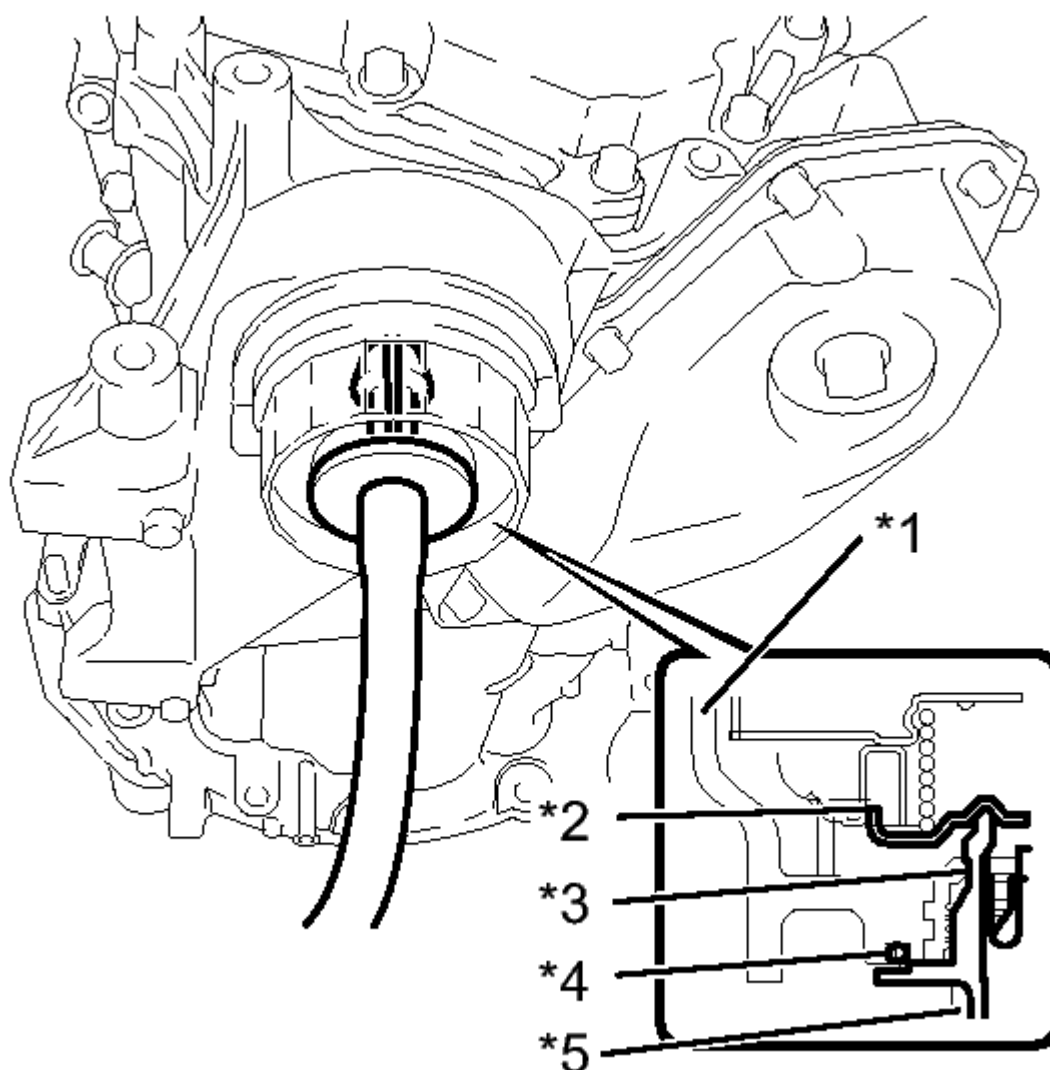


P

Fig. 167: Removing Oil Filter Drain Plug

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

- c. Install the pipe to the oil filter cap.

**P****Fig. 168: Installing Pipe To Oil Filter Cap**

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

TEXT IN ILLUSTRATION

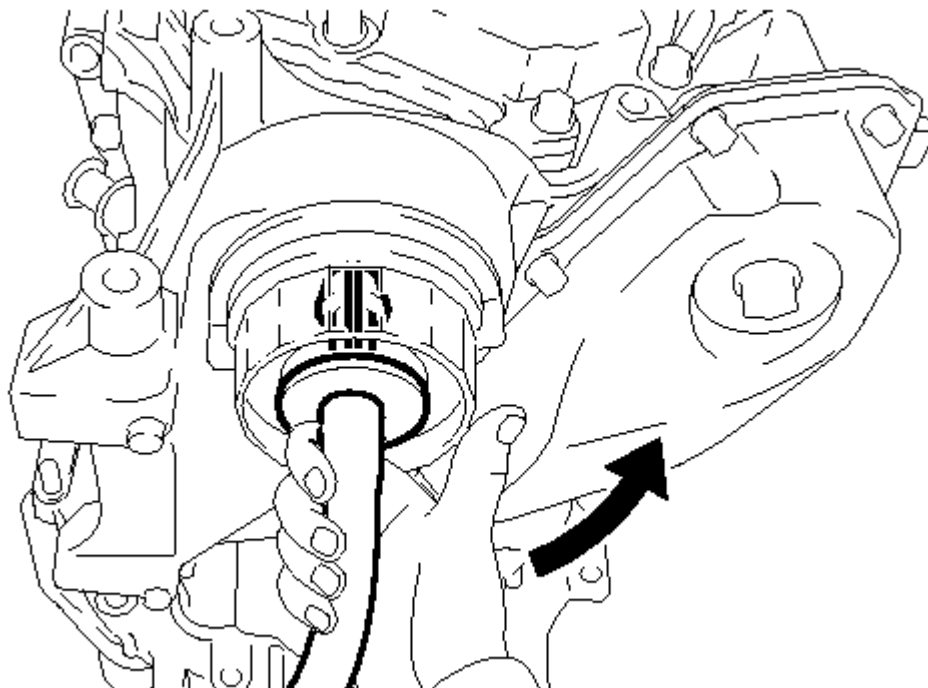
*1	Cap
*2	Valve
*3	Pipe
*4	O-ring
*5	Hose

NOTE: If the O-ring is removed with the drain plug, install the O-ring together with the pipe.

HINT:

Use a container to catch the draining oil.

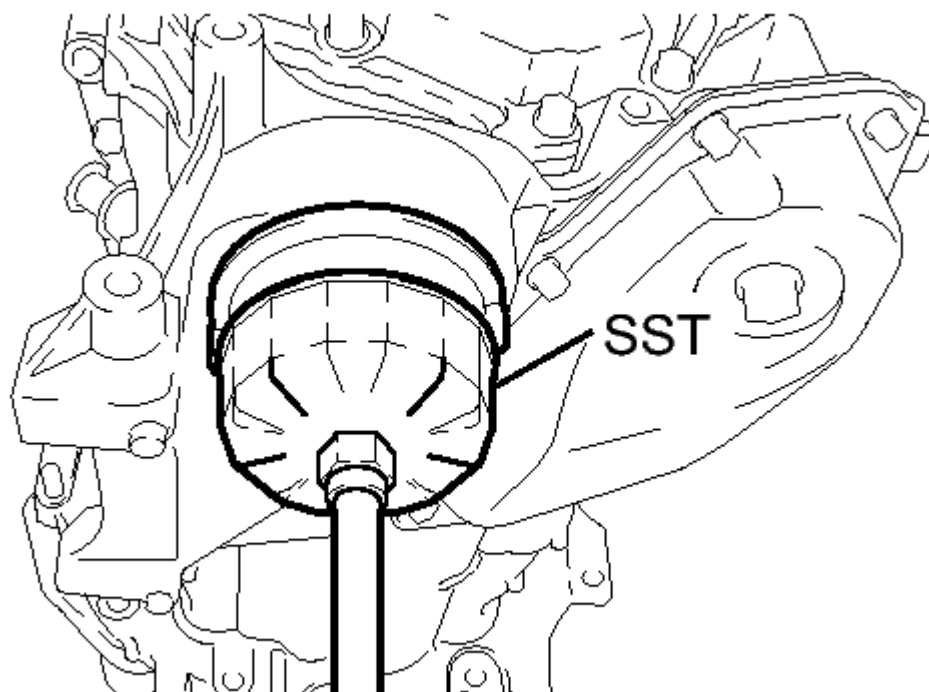
- d. Check that oil is drained from the oil filter. Then disconnect the pipe as shown in the illustration.



P

Fig. 169: Disconnecting Pipe From The Oil Filter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

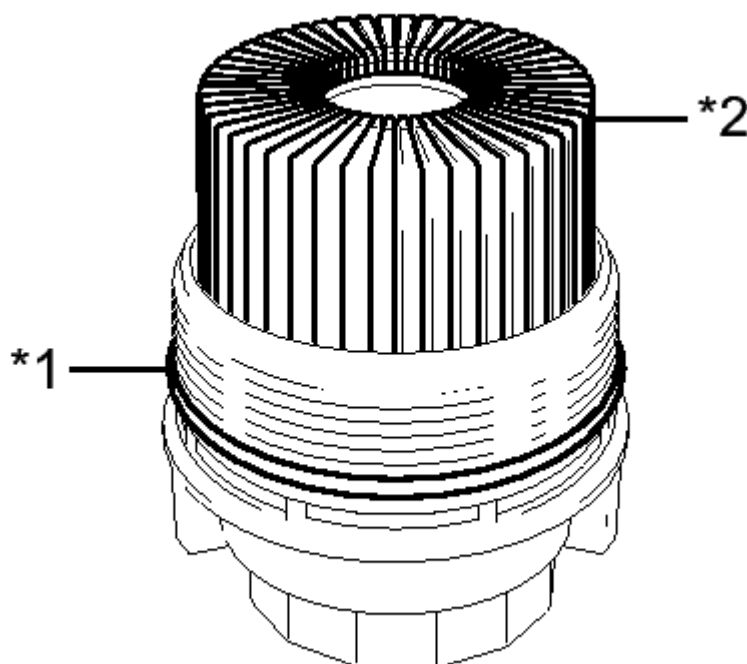
- e. Remove the O-ring.
- f. Using SST, remove the oil filter cap.

**P****Fig. 170: Removing The Oil Filter Cap**

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

- SST: 09228-06501

g. Remove the oil filter element and oil filter cap gasket from the oil filter cap.

**P****Fig. 171: Identifying Oil Filter Element And Cap Gasket**

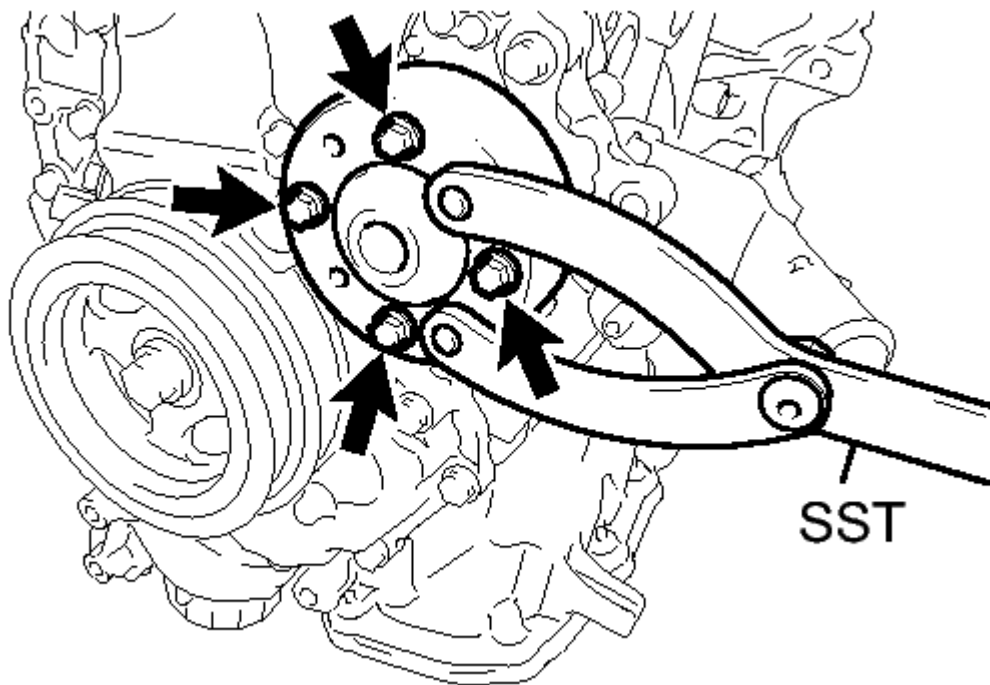
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Oil Filter Cap Gasket
*2	Oil Filter Element

NOTE: Be sure to remove the oil filter cap gasket by hand, without using any tools, to prevent damage to the groove.

15. REMOVE WATER PUMP PULLEY



P

Fig. 172: Identifying Water Pump Pulley Bolts

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

- a. Using SST, remove the 4 bolts and water pump pulley.

- **SST: 09960-10010**
09962-01000
09963-00600

16. SET NO. 1 CYLINDER TO TDC/COMPRESSION

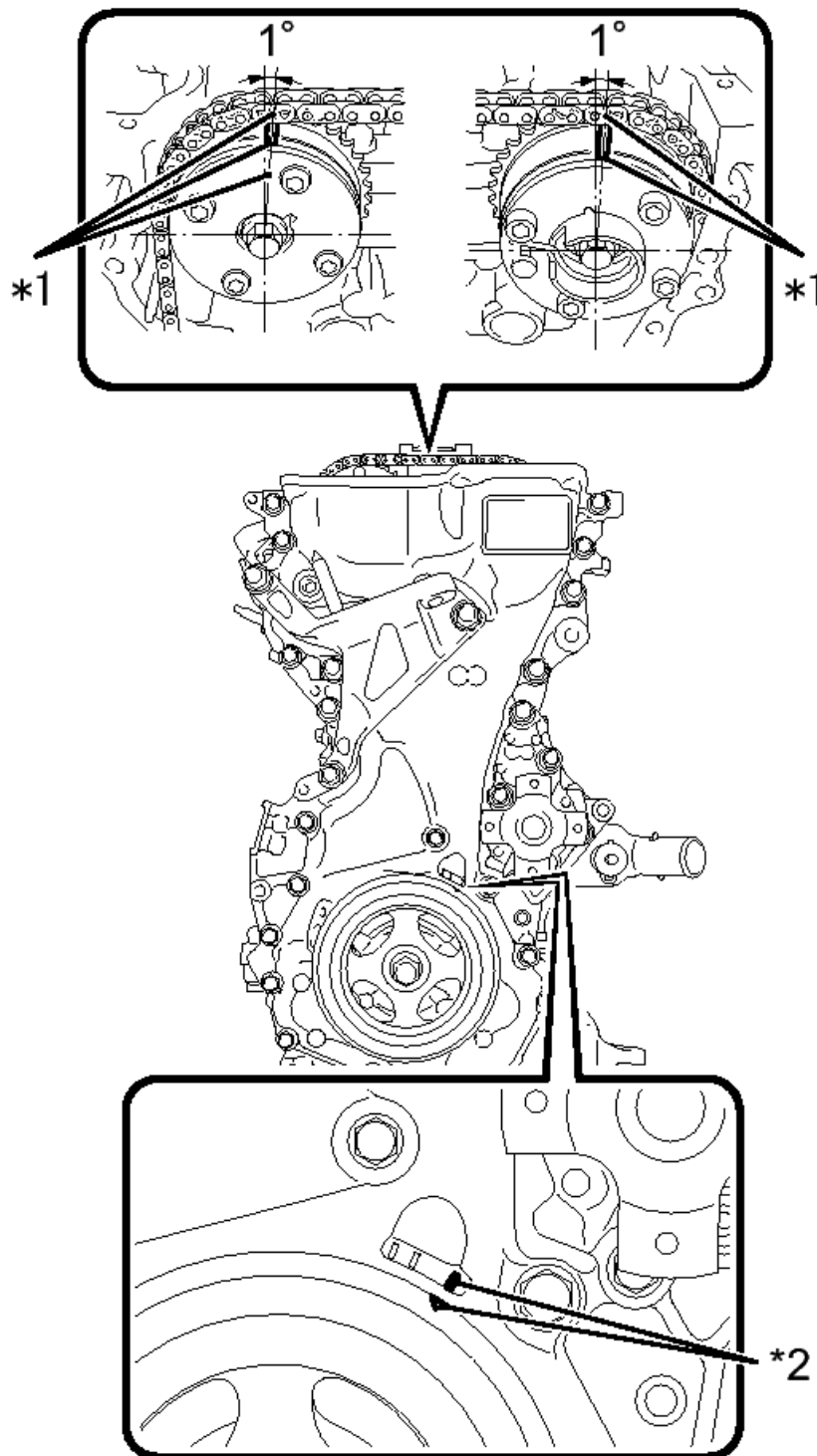
**P**

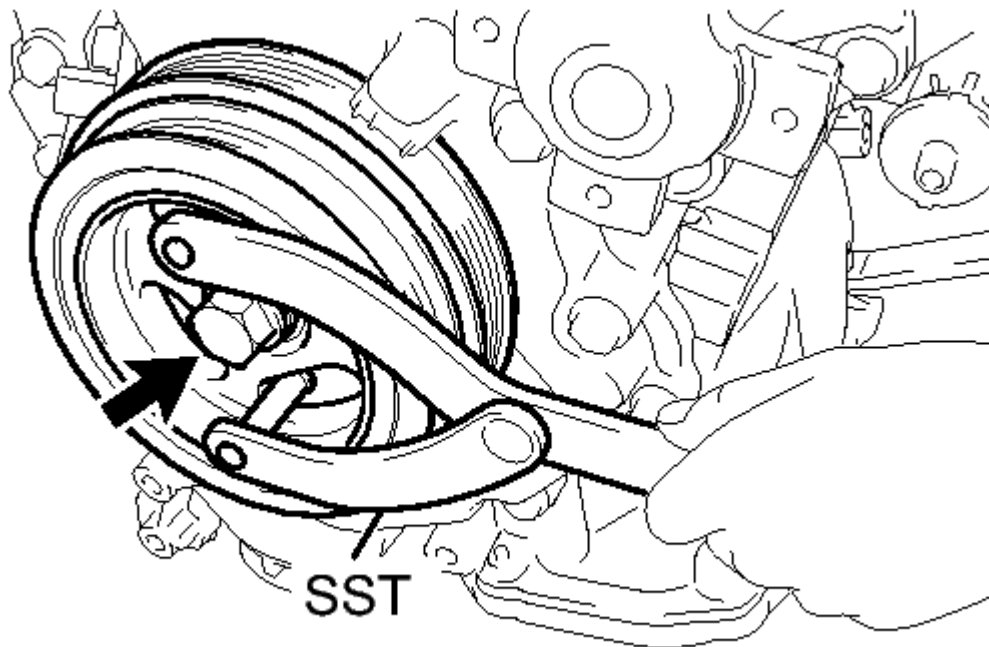
Fig. 173: Aligning Crankshaft Pulley Groove And Timing Chain Cover Groove
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Turn the crankshaft pulley until its groove and the groove of the timing chain cover are aligned.

TEXT IN ILLUSTRATION

*1	Timing Mark
*2	Groove

- b. Check that each timing mark of the camshaft timing gear and sprocket are located as shown in the illustration. If not, turn the crankshaft 1 revolution (360°) to align the timing marks as shown in the illustration.

17. REMOVE CRANKSHAFT PULLEY**P****Fig. 174: Identifying Crankshaft Pulley Bolt**

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

- a. Using SST, remove the crankshaft pulley bolt.

- SST: 09960-10010

09962-01000

09963-01000

- b. Remove the crankshaft pulley from the crankshaft.

18. **REMOVE TIMING CHAIN COVER SUB-ASSEMBLY** . Refer to **REMOVAL - Step 26**
19. **REMOVE TIGHT PLUG** . Refer to **REMOVAL - Step 27**
20. **REMOVE WATER INLET HOUSING** . Refer to **REMOVAL - Step 29**
21. **REMOVE WATER INLET** . Refer to **REMOVAL - Step 7**
22. **REMOVE NO. 2 WATER INLET HOUSING GASKET** . Refer to **REMOVAL - Step 8**
23. **REMOVE THERMOSTAT** . Refer to **REMOVAL - Step 9**
24. **REMOVE TIMING CHAIN COVER OIL SEAL**

- a. Using a screwdriver with its tip wrapped with protective tape, remove the timing chain cover oil seal.

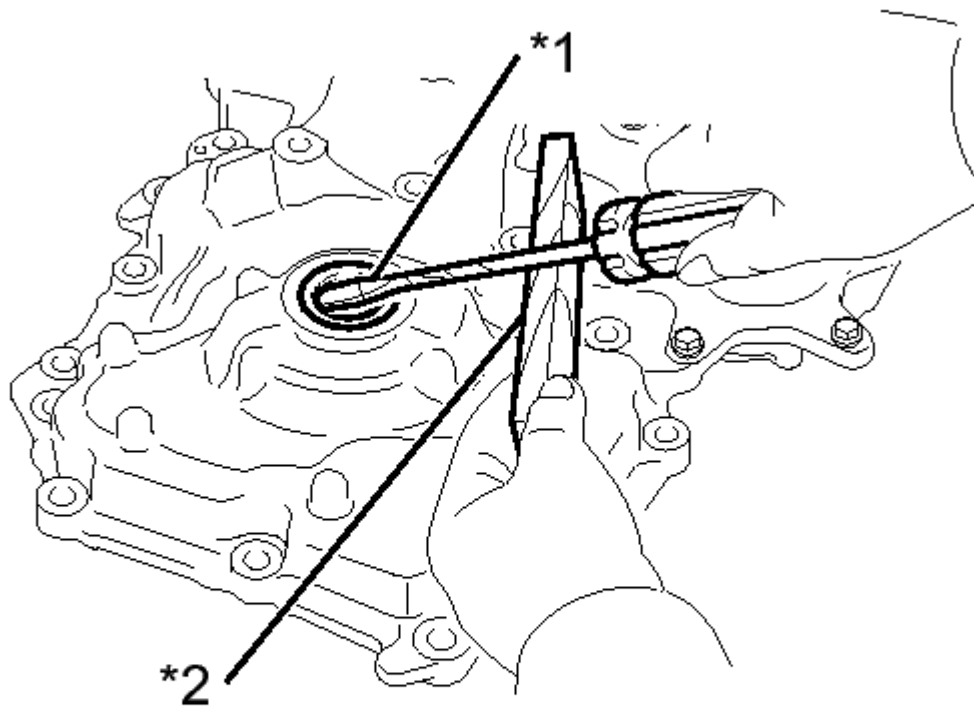


Fig. 175: Removing Timing Chain Cover Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Protective Tape
*2	Wooden Block

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

25. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY

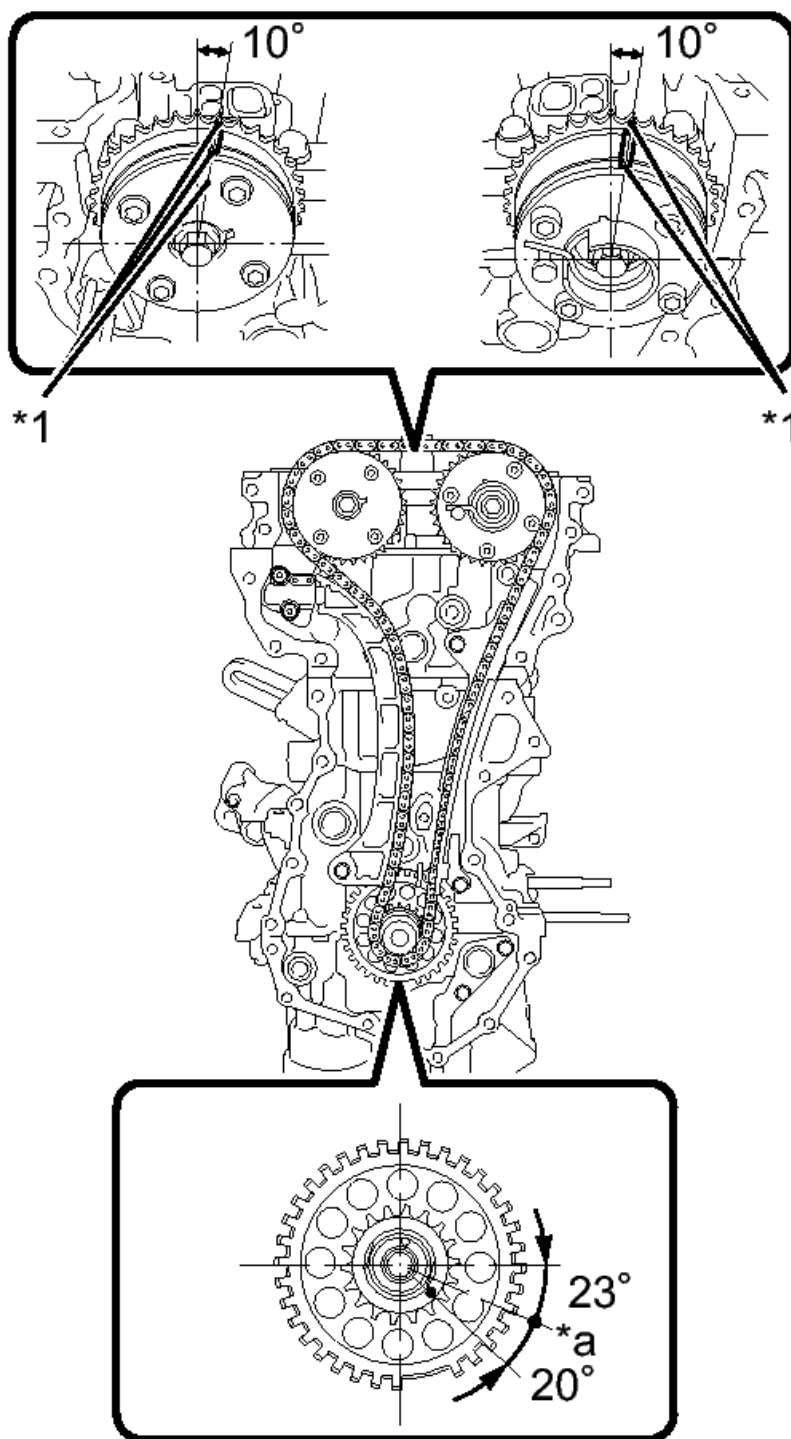
**P**

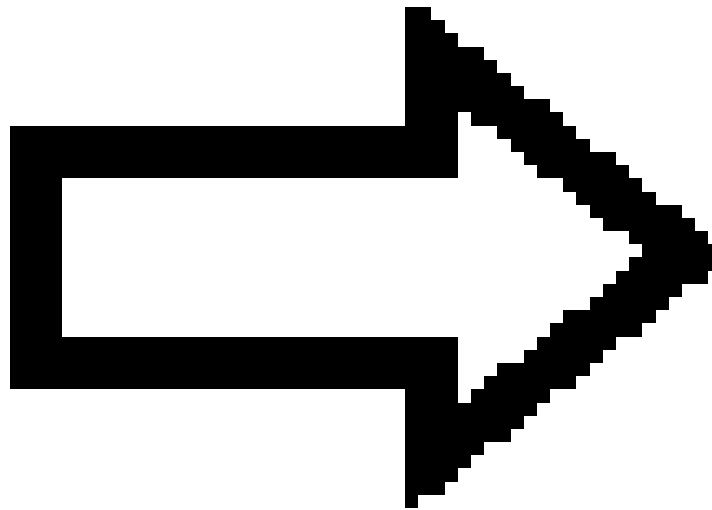
Fig. 176: Setting Camshaft Timing Gear, Exhaust Gear And Crankshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Set the camshaft timing gear, camshaft timing exhaust gear and crankshaft in the positions (20° ATDC) shown in the illustration.

*1	Timing Mark
*a	TDC

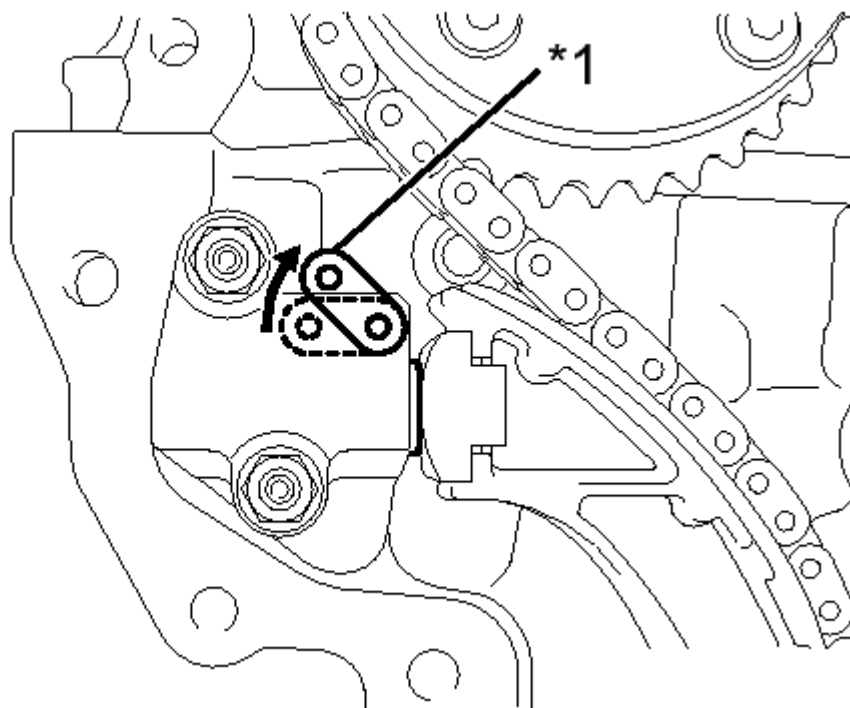
-

*1	Stopper Plate
*2	Plunger



Push

- c. Pull up the stopper plate with the plunger pushed to the end and lock the plunger.

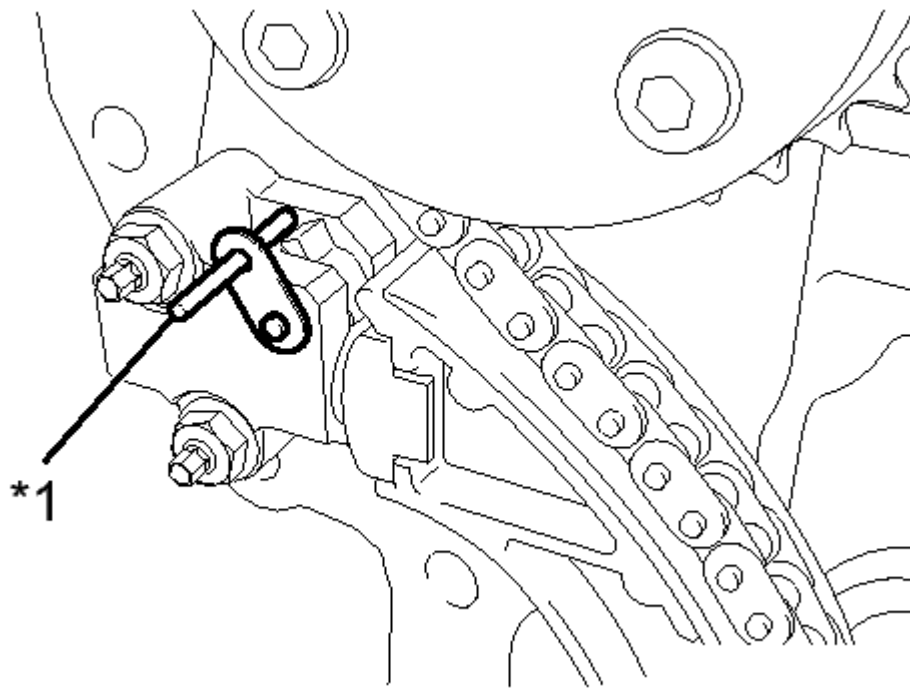
**C****Fig. 178: Identifying Stopper Plate And Plunger**

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

TEXT IN ILLUSTRATION

*1	Stopper Plate
----	---------------

- d. Insert a 3 mm (0.118 in.) diameter bar into the hole in the stopper plate and lock the plunger.

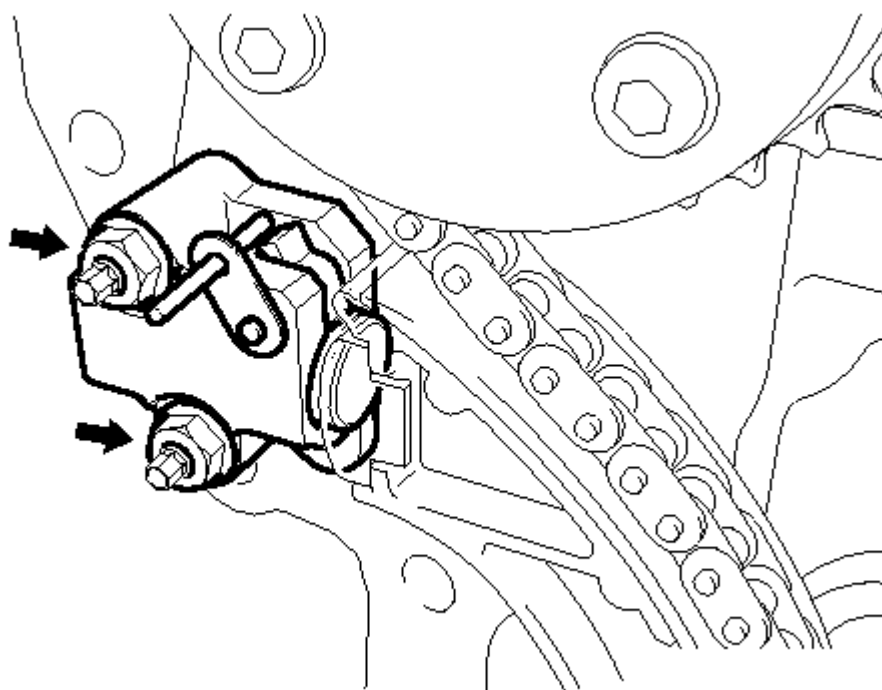
**C****Fig. 179: Locking The Plunger**

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

TEXT IN ILLUSTRATION

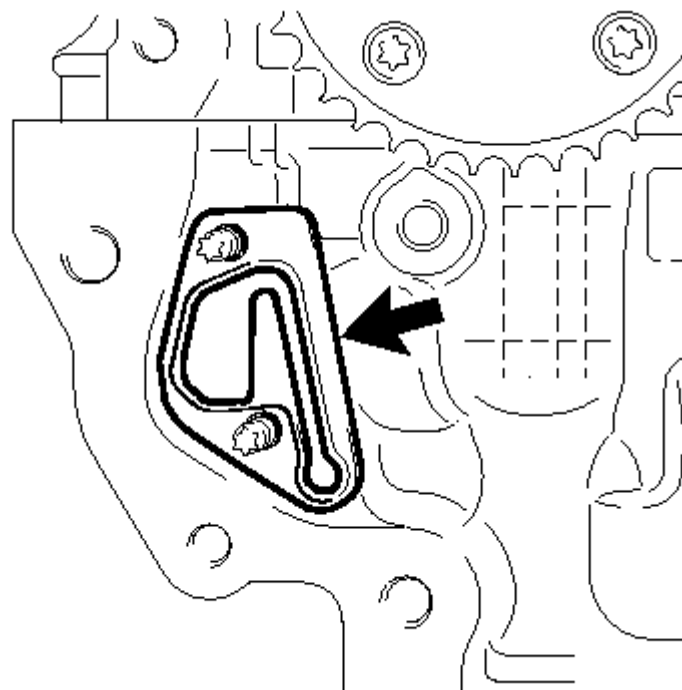
*1	Bar
----	-----

- e. Remove the 2 nuts and the No. 1 chain tensioner.

**C****Fig. 180: Identifying No. 1 Chain Tensioner Nuts**

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

- f. Remove the chain tensioner gasket from the cylinder head.

**P****Fig. 181: Identifying Chain Tensioner Gasket**

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

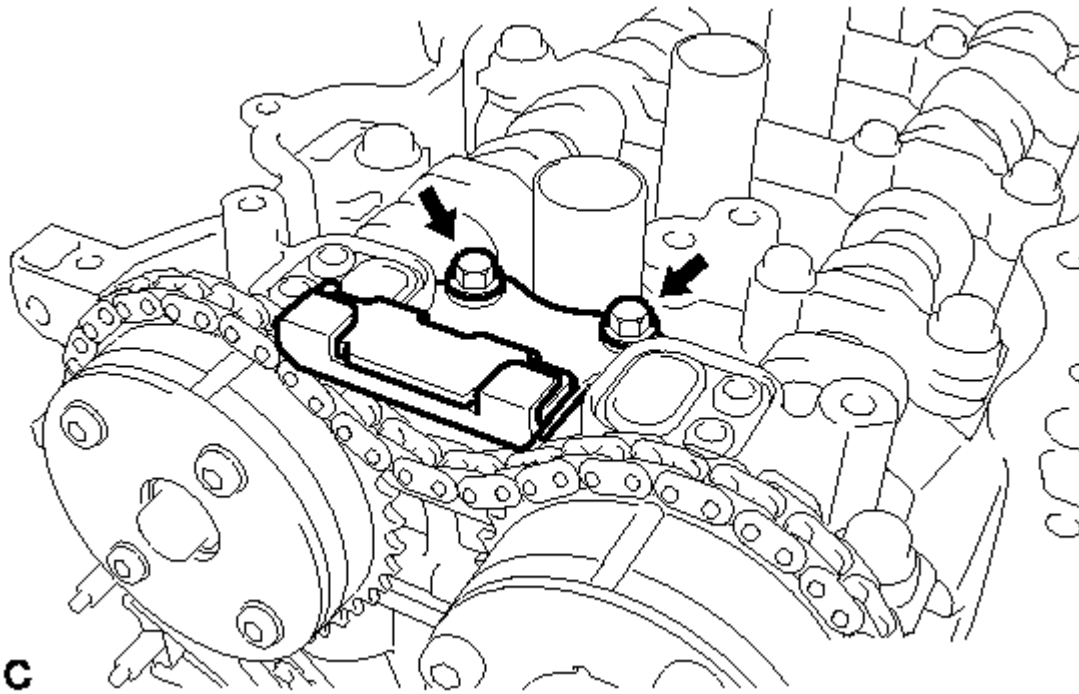
26. REMOVE NO. 2 CHAIN VIBRATION DAMPER

Fig. 182: Identifying No. 2 Chain Vibration Damper Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Remove the 2 bolts and the No. 2 chain vibration damper.

27. REMOVE TIMING CHAIN TENSION ARM

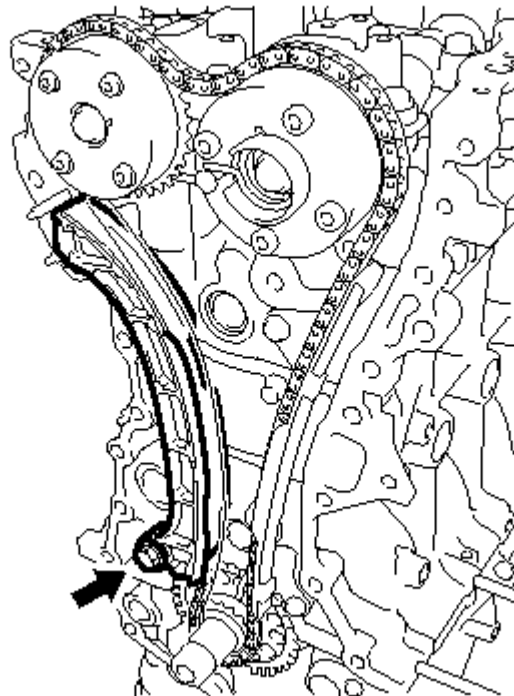
**C**

Fig. 183: Identifying Timing Chain Tension Arm Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Remove the bolt and the timing chain tension arm.
- 28. **REMOVE CHAIN SUB-ASSEMBLY**
 - a. Remove the chain.
- 29. **REMOVE TIMING CHAIN GUIDE**

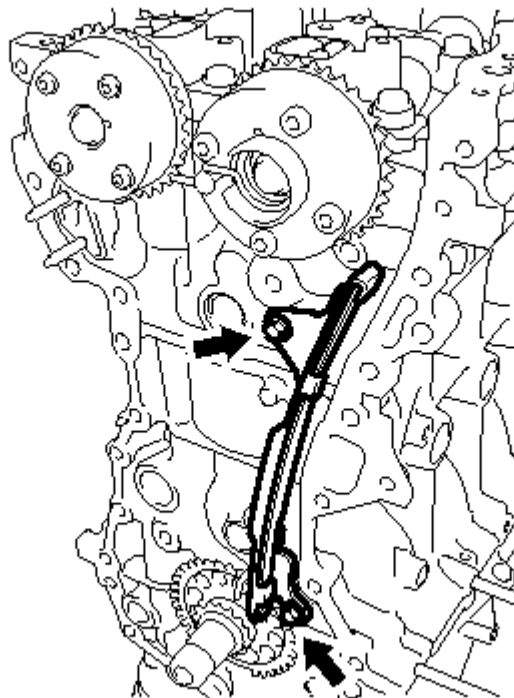


Fig. 184: Identifying Timing Chain Guide Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Remove the 2 bolts and the timing chain guide.

30. REMOVE CAMSHAFT TIMING GEAR ASSEMBLY

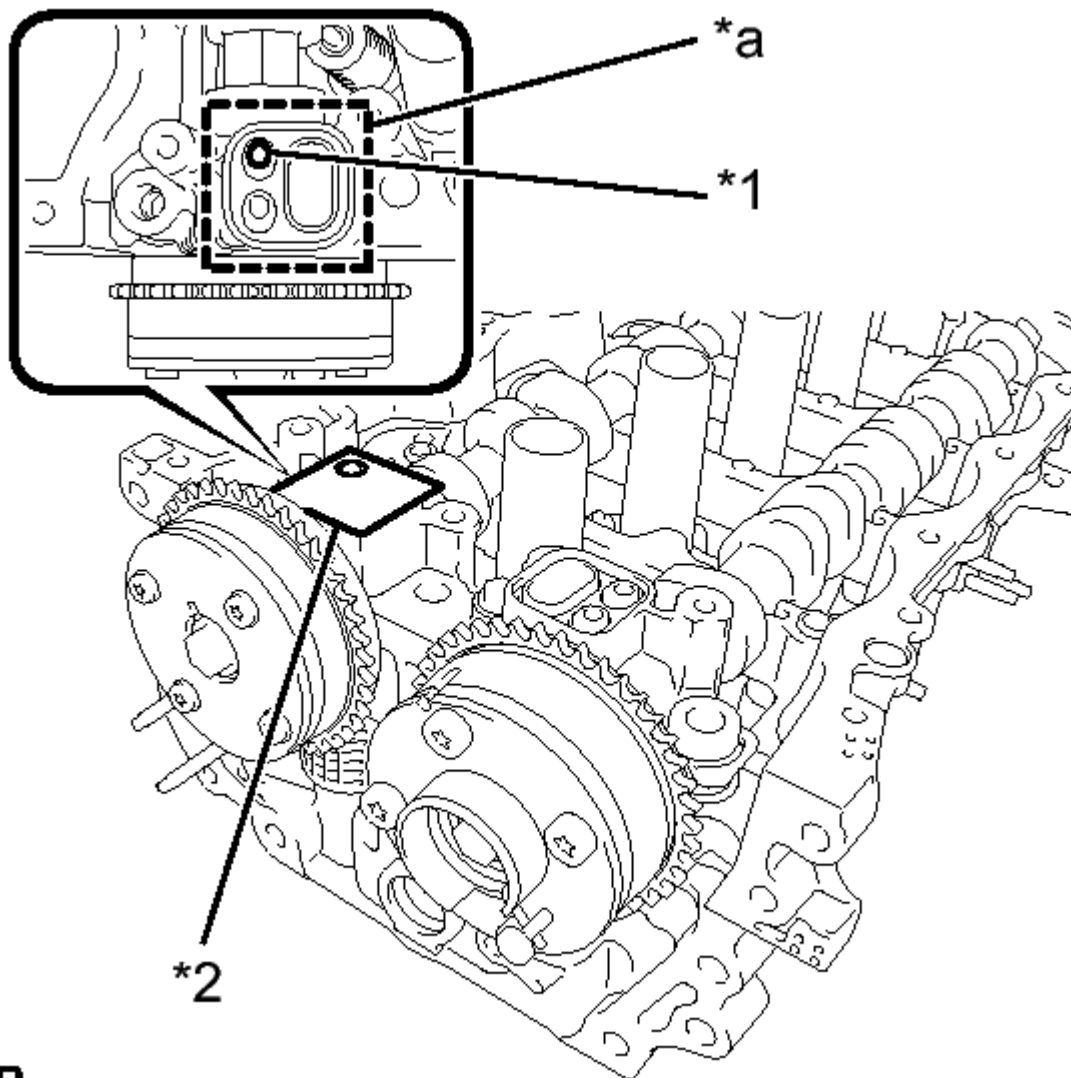
**P**

Fig. 185: Sealing The Oil Hole With Adhesive Tape
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Check the lock of the camshaft timing gear.
- Release the lock pin.

NOTE: Before removing the camshaft timing gear, make sure that the lock pin has been released.

- After cleaning and degreasing the VVT oil hole on the intake side of the No. 1 camshaft bearing cap, completely seal the oil hole with adhesive tape or equivalent as shown in the illustration to prevent air from leaking.

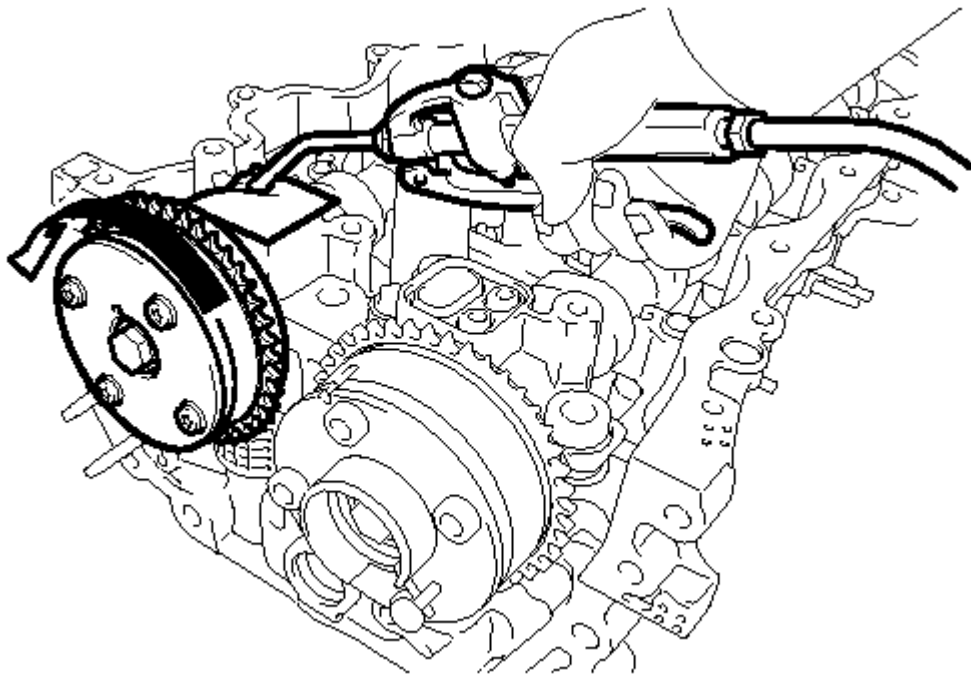
TEXT IN ILLUSTRATION

*1	Prick a Hole
----	--------------

*2	Adhesive Tape
*a	Adhesive Tape Sealing Area

NOTE: Be sure to cover the oil hole completely because air leaks due to insufficient sealing will prevent the lock pin from being released.

2. Prick a hole in the tape covering the oil hole as shown in the illustration (Procedure A).
3. Apply approximately 150 kPa (1.5 kgf/cm², 22 psi) of air pressure to the hole pricked in procedure A to release the lock pin.



P

Fig. 186: Applying Air Pressure To The Hole

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

NOTE:

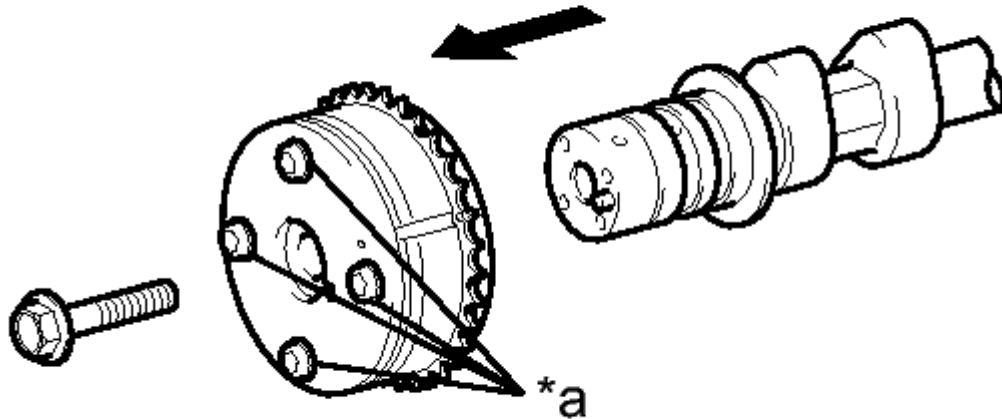
- If air leaks out, reattach adhesive tape.
- Cover the oil hole with a piece of cloth when applying air pressure to prevent oil from spraying.
- Do not lock the camshaft timing gear. If it is locked, release the lock pin again.

HINT:

- The camshaft timing gear may be turned in the advance direction without applying any force.
- If enough air pressure cannot be applied because of air leakage from the port, releasing

the lock pin may be difficult.

4. Remove the adhesive tape from the No. 1 camshaft bearing cap.
- c. Remove the flange bolt while holding the hexagonal portion of the camshaft, and then remove the camshaft timing gear.



C

Fig. 187: Identifying Camshaft Timing Gear Flange Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

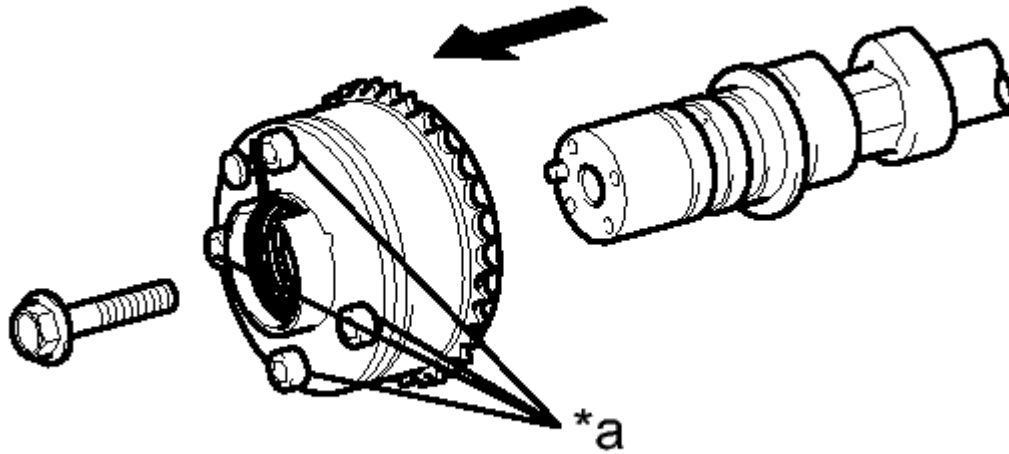
TEXT IN ILLUSTRATION

*a	Do Not Remove
----	---------------

NOTE:

- Before removing the camshaft timing gear, make sure that the lock pin has been released.
- Be sure not to remove the other 4 bolts.
- Keep the camshaft timing gear horizontal while removing it from the camshaft.

31. REMOVE CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY

**C****Fig. 188: Identifying Camshaft Timing Exhaust Gear Flange Bolt****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- a. Remove the flange bolt while holding the hexagonal portion of the camshaft, and then remove the camshaft timing exhaust gear.

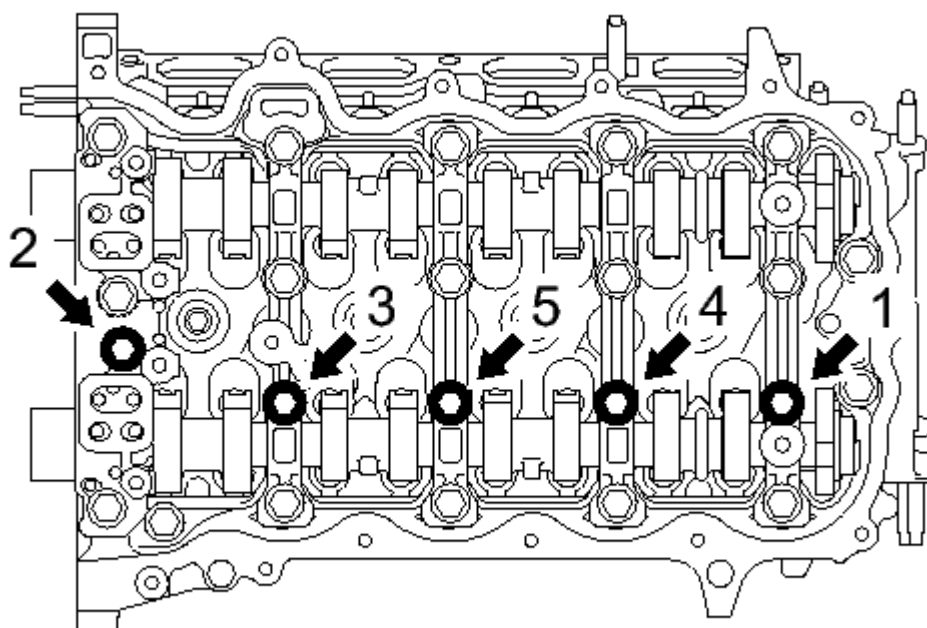
TEXT IN ILLUSTRATION

*a	Do Not Remove
----	---------------

NOTE:

- Be sure not to remove the other 4 bolts.
- Keep the camshaft timing exhaust gear horizontal while removing it from the camshaft.

32. REMOVE CAMSHAFT BEARING CAP

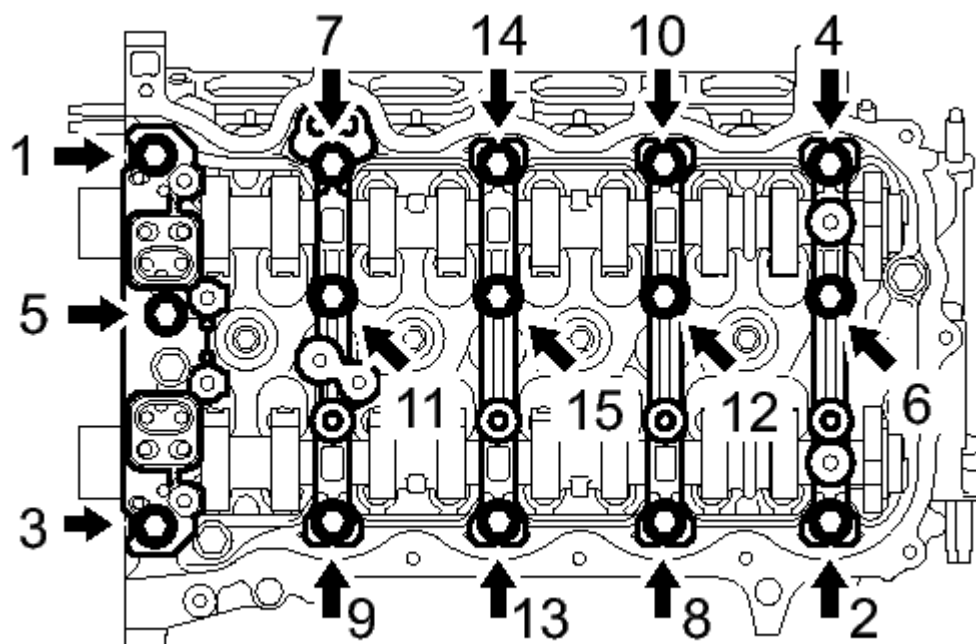


C

Fig. 189: Identifying Bearing Cap Bolts

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

- Uniformly loosen and remove the 5 bearing cap bolts in the sequence shown in the illustration.
- Uniformly loosen and remove the 15 bearing cap bolts in the sequence shown in the illustration.



C

Fig. 190: Identifying Bearing Cap Bolts

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

NOTE: Uniformly loosen the bolts while keeping the camshaft level.

- c. Remove the 5 bearing caps.

HINT:

Arrange the removed parts in the correct order.

33. REMOVE NO. 2 CAMSHAFT

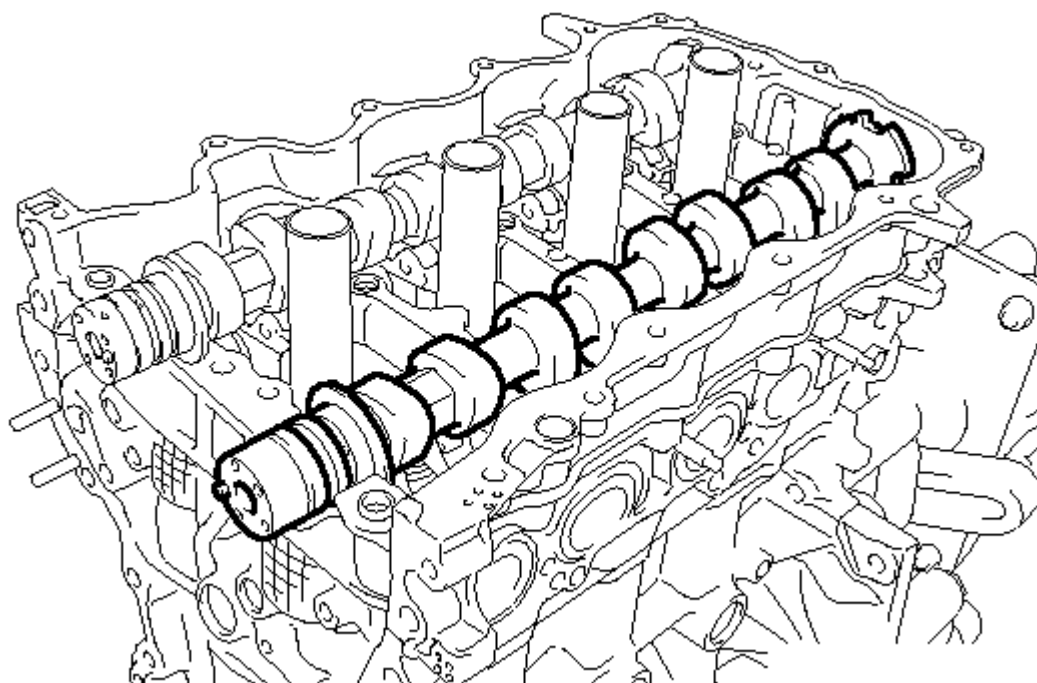


Fig. 191: Identifying No. 2 Camshaft

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

- a. Remove the No. 2 camshaft.

34. REMOVE CAMSHAFT

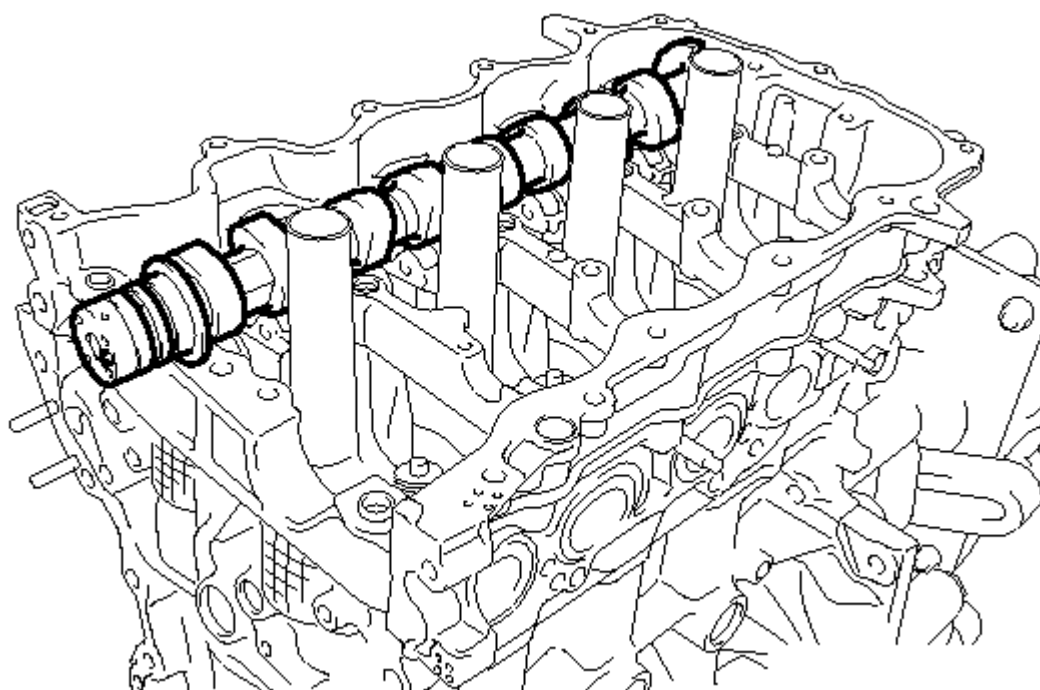
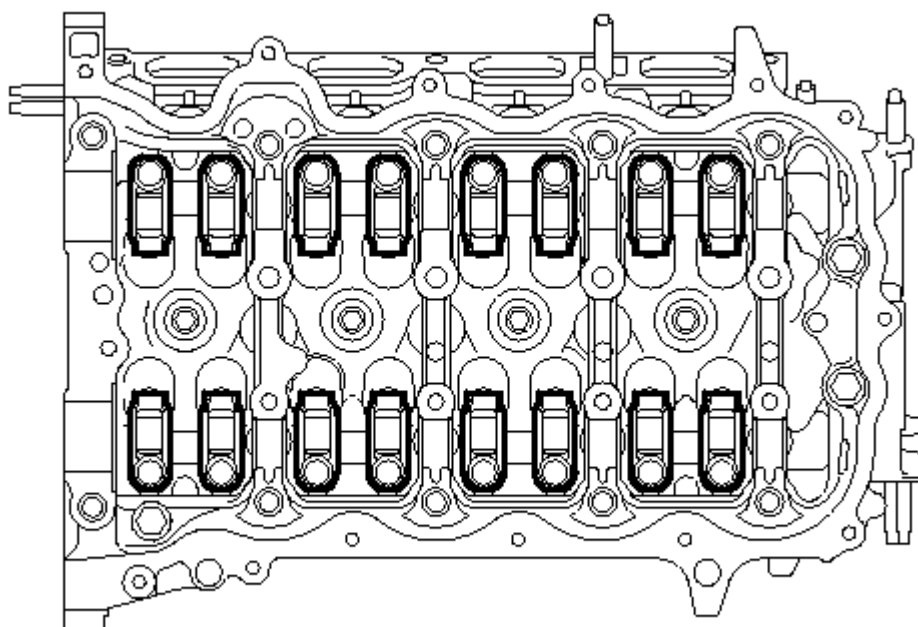


Fig. 192: Identifying Camshaft

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

- a. Remove the camshaft.

35. REMOVE NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY



C

Fig. 193: Identifying Valve Rocker Arms

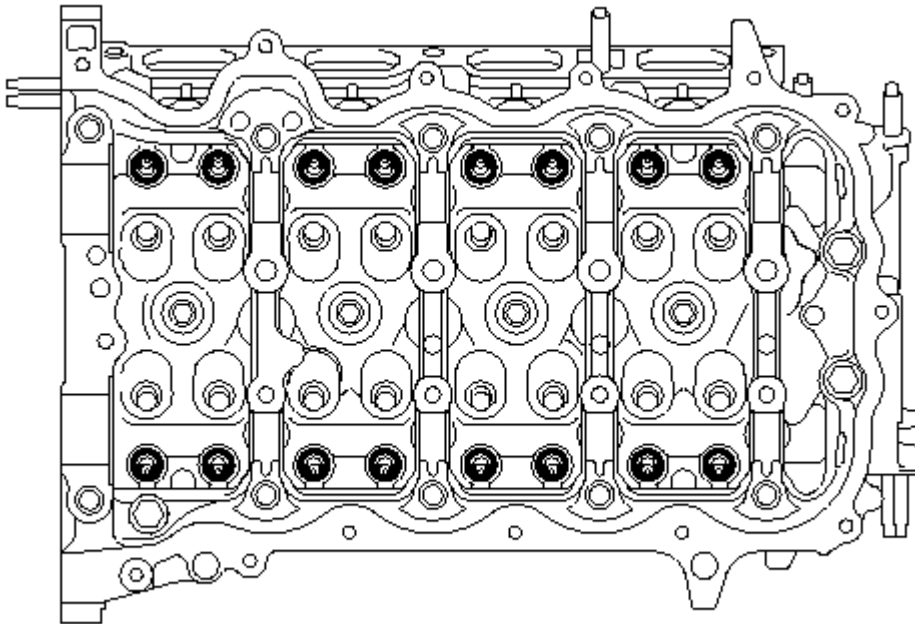
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Remove the 16 valve rocker arms.

HINT:

Arrange the removed parts in the correct order.

36. REMOVE VALVE LASH ADJUSTER ASSEMBLY



C

Fig. 194: Identifying Valve Lash Adjusters

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

- a. Remove the 16 valve lash adjusters from the cylinder head.

HINT:

Arrange the removed parts in the correct order.

37. REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY

- a. Remove the 3 bolts.

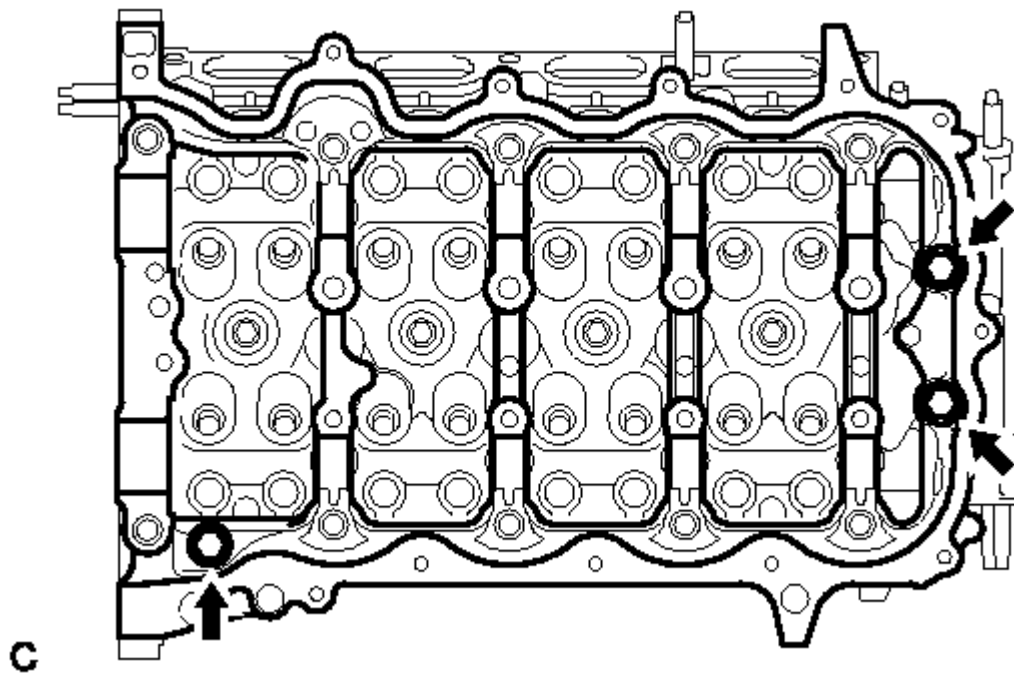
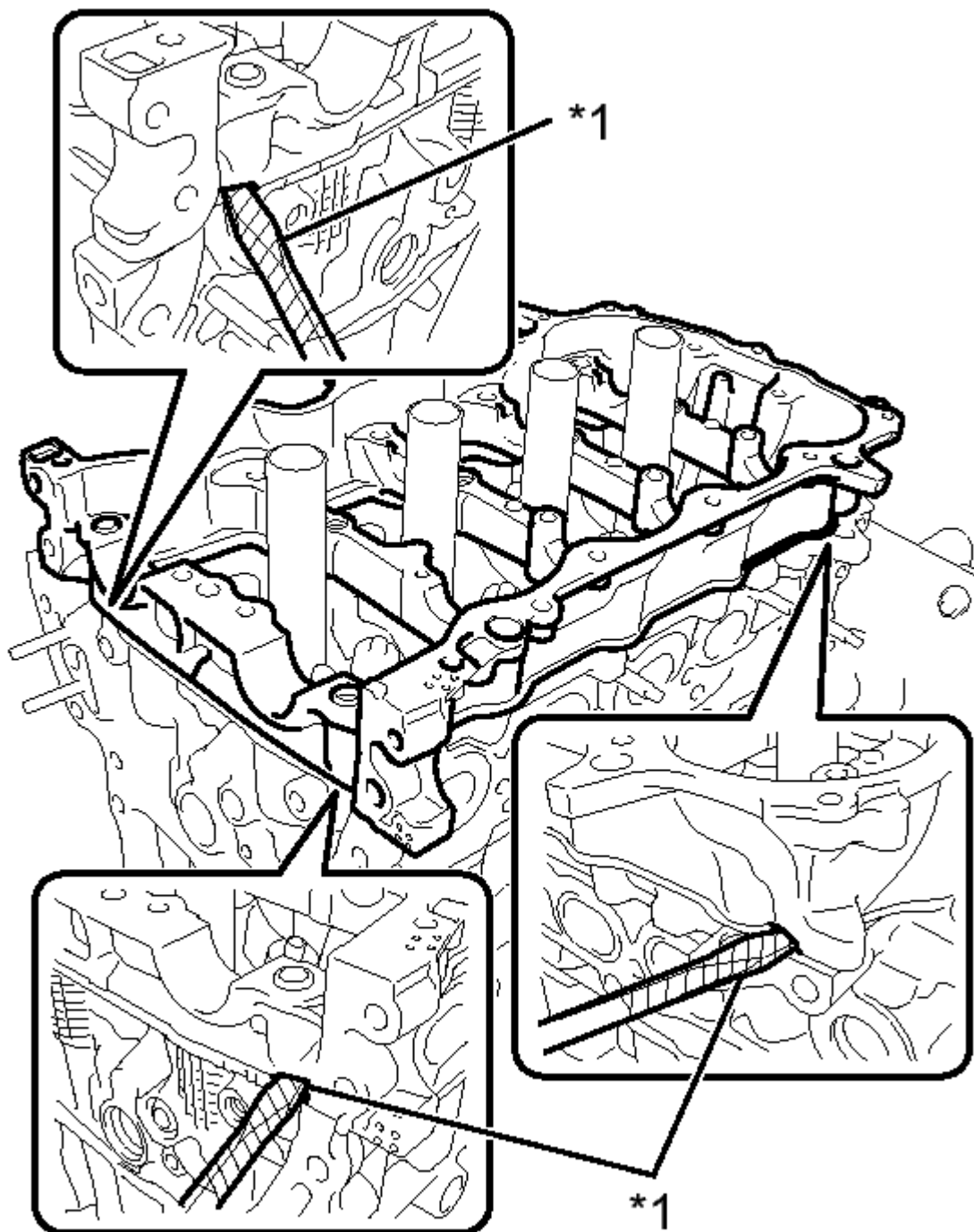


Fig. 195: Identifying Camshaft Housing Sub-Assembly Bolts

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

- b. Using a screwdriver with its tip wrapped with protective tape, remove the camshaft housing by prying between the cylinder head and camshaft housing.

**C****Fig. 196: Removing The Camshaft Housing**

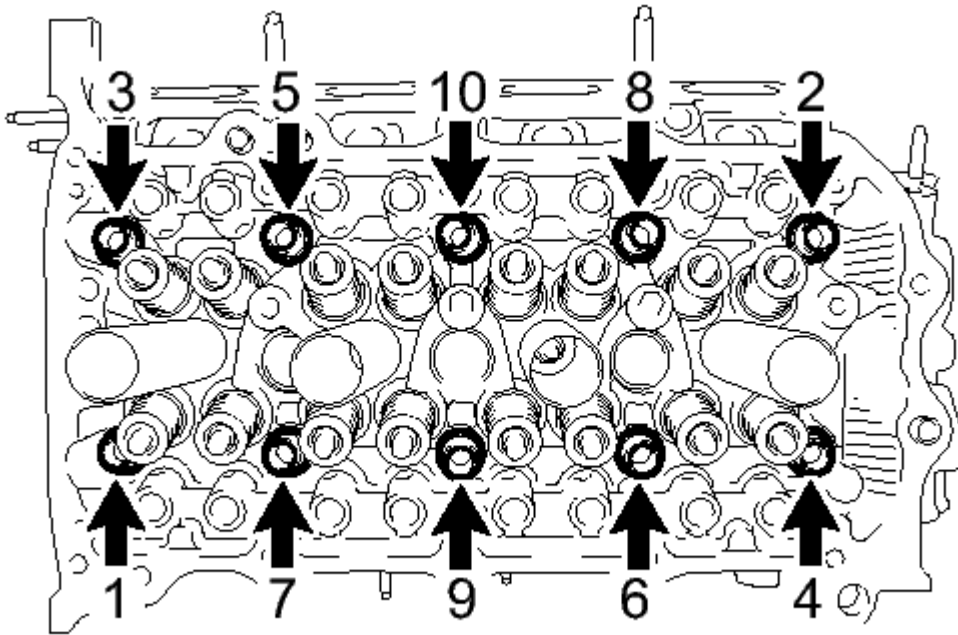
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

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

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

38. REMOVE CYLINDER HEAD SUB-ASSEMBLY



P

Fig. 197: Identifying Cylinder Head Bolts And Washers

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

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

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

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

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

39. REMOVE CYLINDER HEAD GASKET

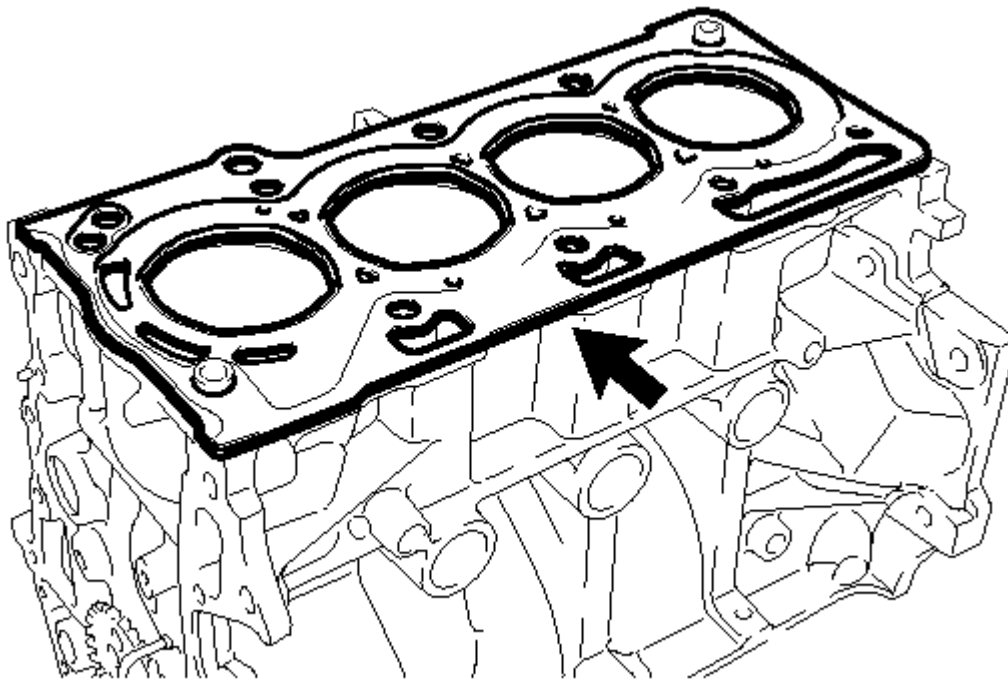


Fig. 198: Identifying Cylinder Head Gasket

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

- a. Remove the cylinder head gasket.

40. REMOVE CYLINDER BLOCK WATER JACKET SPACER

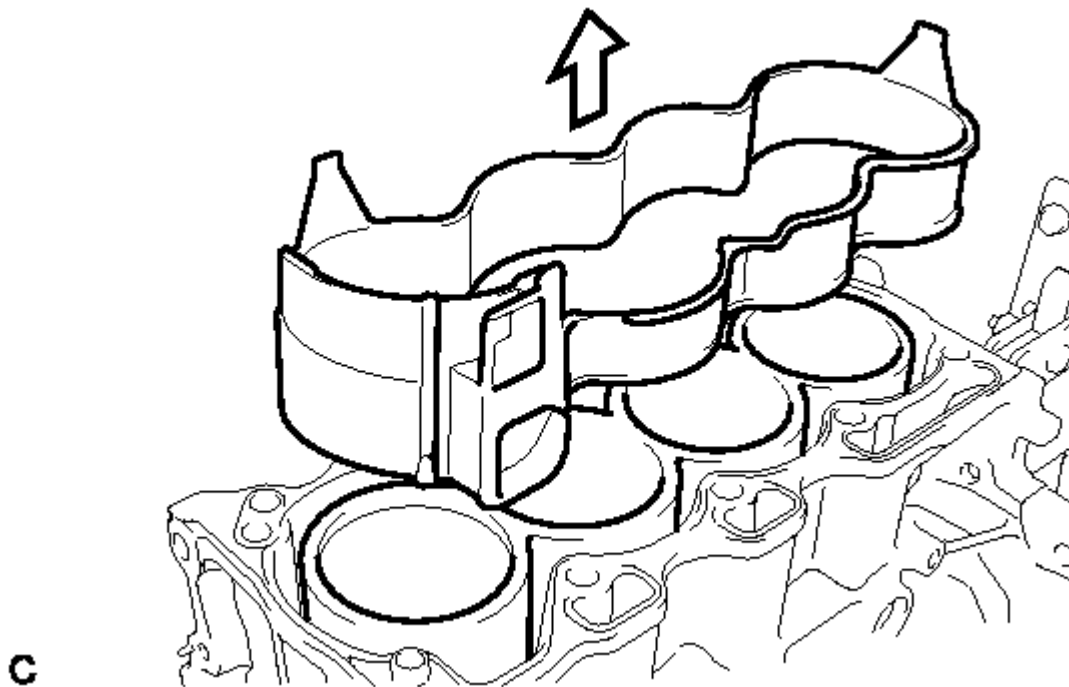
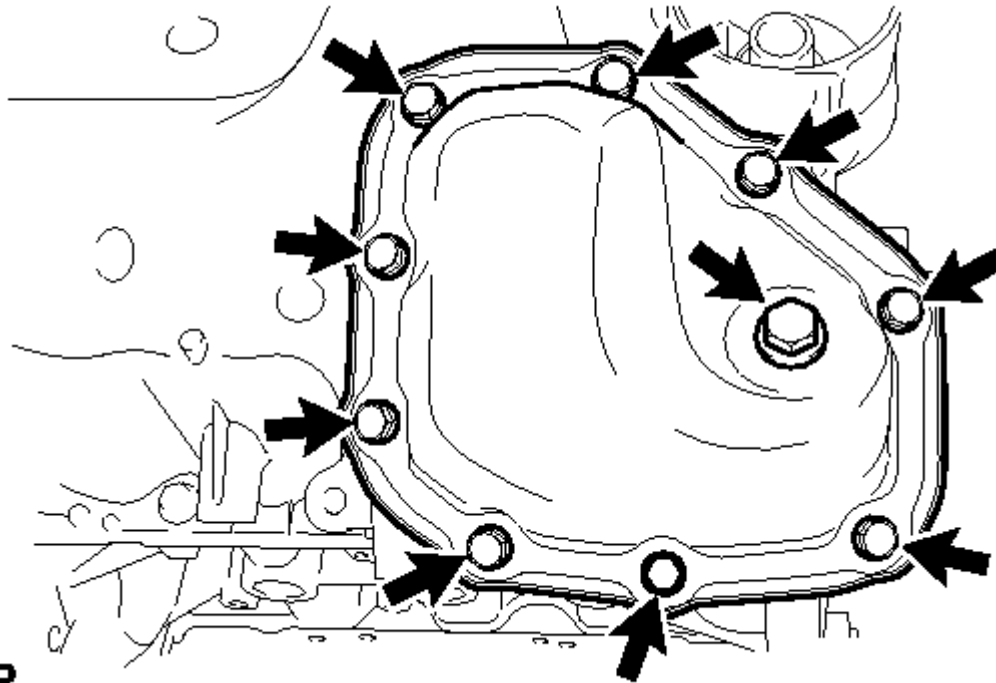


Fig. 199: Removing Cylinder Block Water Jacket Spacer

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

- a. Remove the cylinder block water jacket spacer from the cylinder block.

41. REMOVE NO. 2 OIL PAN SUB-ASSEMBLY

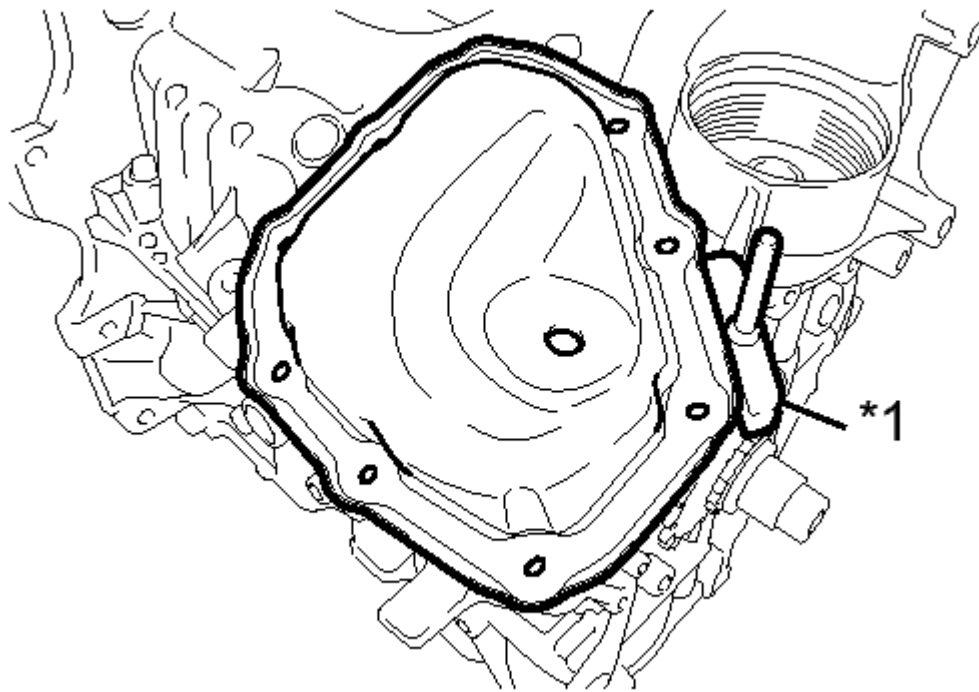


P

Fig. 200: Identifying Oil Pan Drain Plug And Bolts

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

- a. Remove the oil pan drain plug and gasket from the No. 2 oil pan.
- b. Remove the 9 bolts.
- c. Insert the blade of the oil pan seal cutter between the oil pans as shown in the diagram. Cut through the applied sealer and remove the No. 2 oil pan.

**P****Fig. 201: Identifying Oil Pan Seal Cutter**

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

TEXT IN ILLUSTRATION

*1	Oil Pan Seal Cutter
----	---------------------

NOTE: Be careful not to damage the contact surfaces of the oil pan.**42. REMOVE OIL PAN SUB-ASSEMBLY**

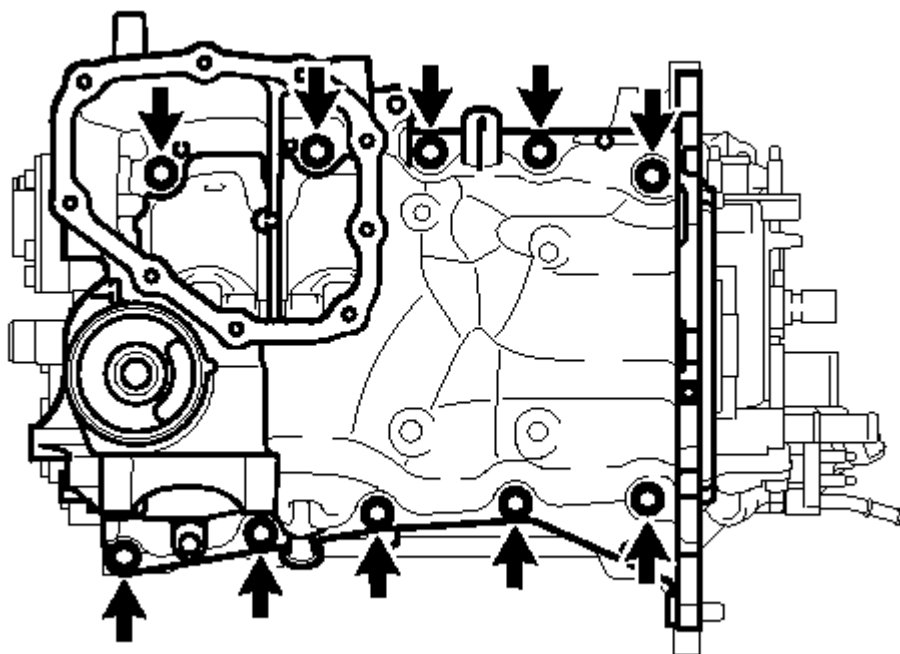
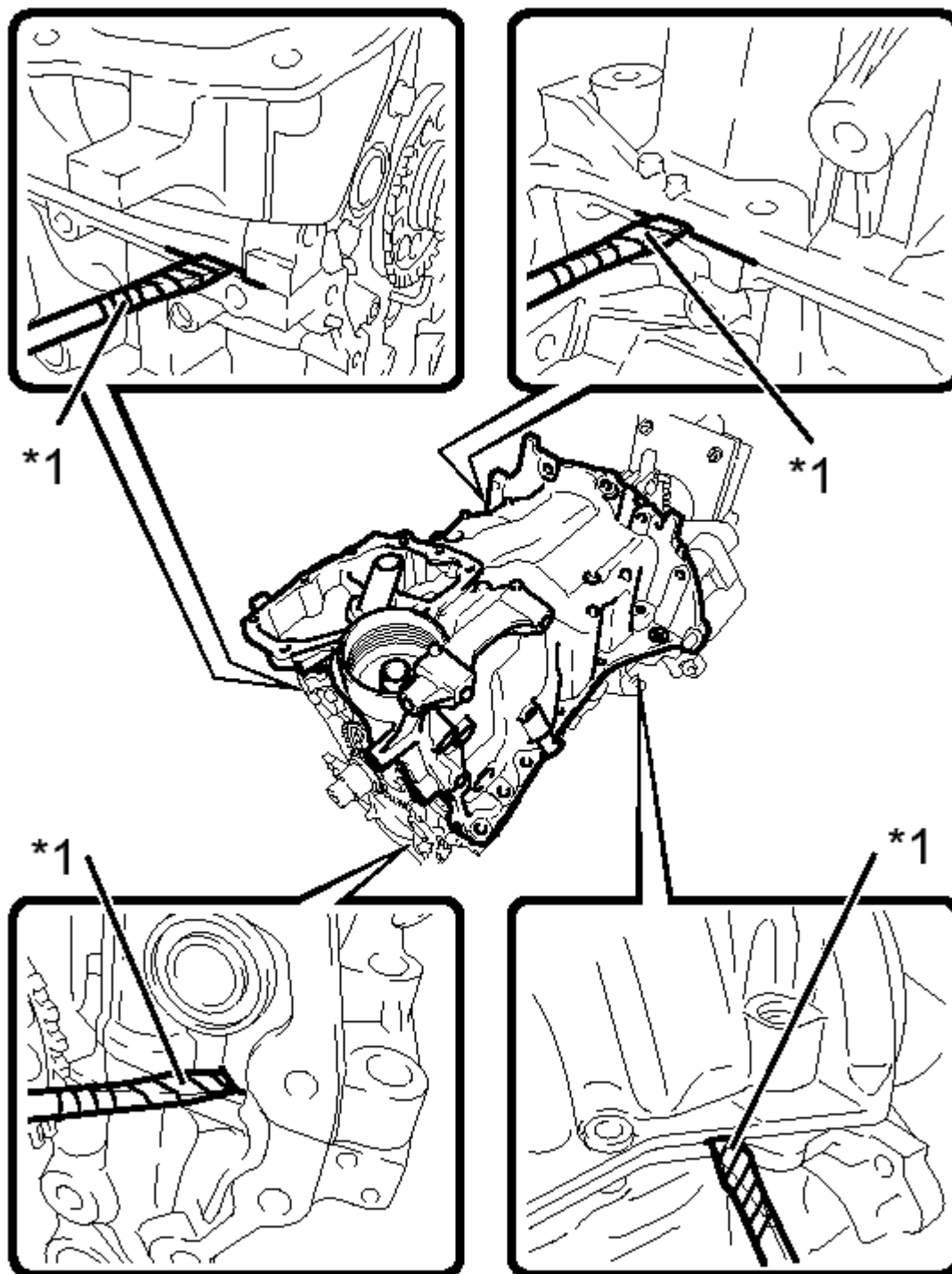
**P**

Fig. 202: Identifying Oil Pan Sub-Assembly Bolts

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

- a. Uniformly loosen and remove the 10 bolts.
- b. Using a screwdriver with its tip wrapped with protective tape, remove the oil pan by prying between the oil pan and cylinder block.

**P****Fig. 203: Removing The Oil Pan**

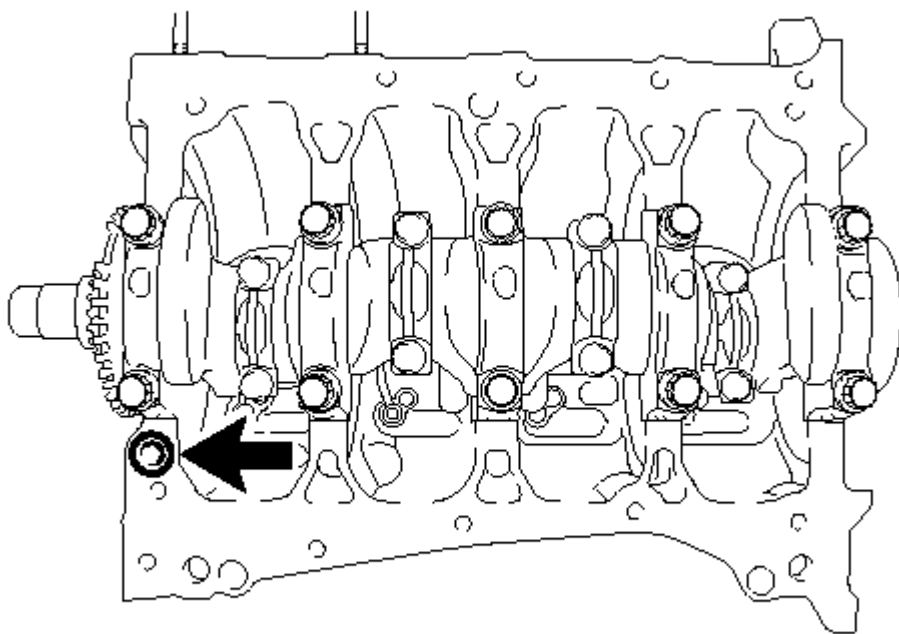
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

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

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

- c. Remove the oil pan O-ring from the cylinder block.



P

Fig. 204: Identifying Oil Pan O-Ring

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

43. REMOVE NO. 1 OIL PAN BAFFLE PLATE

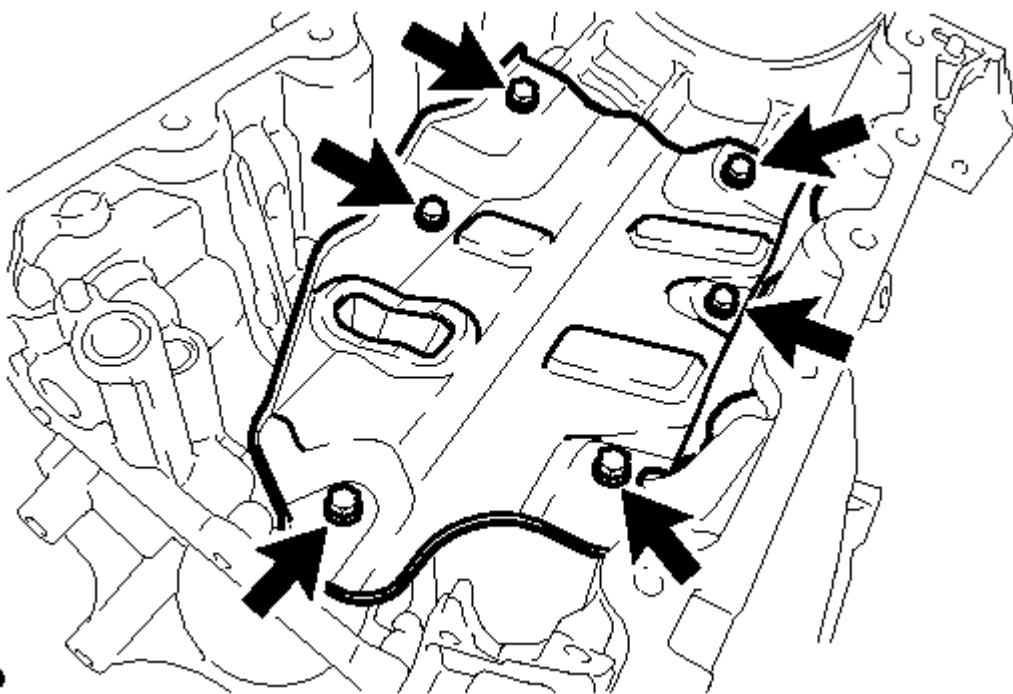
**P**

Fig. 205: Identifying Oil Pan Baffle Plate Bolts

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

- a. Remove the 6 bolts and the No. 1 oil pan baffle plate from the oil pan.

44. REMOVE OIL STRAINER SUB-ASSEMBLY

- a. Remove the 2 bolts and the oil strainer from the oil pan.

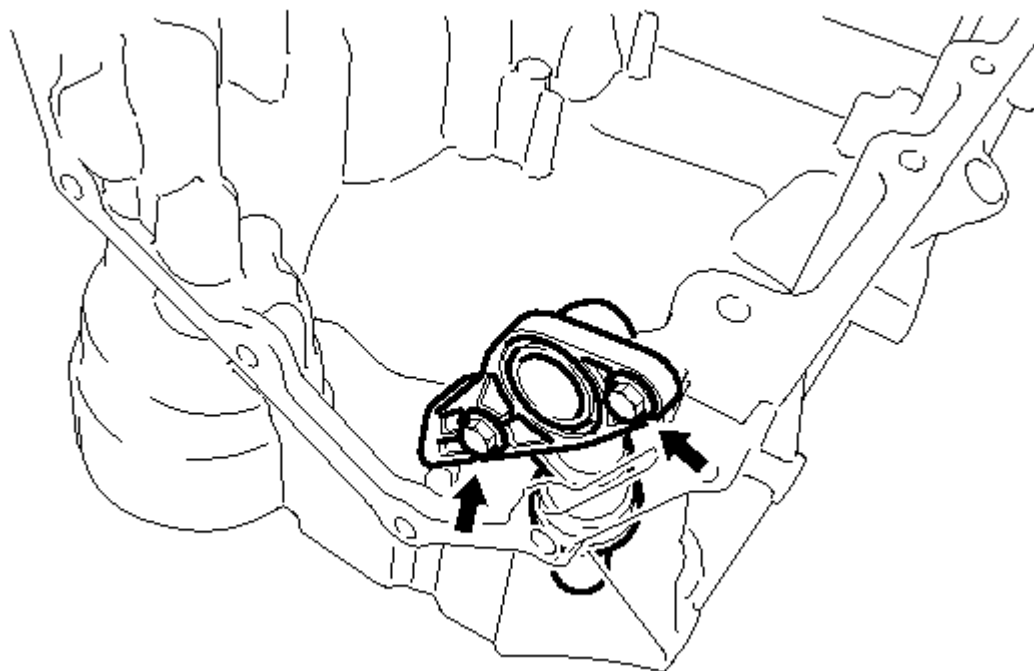
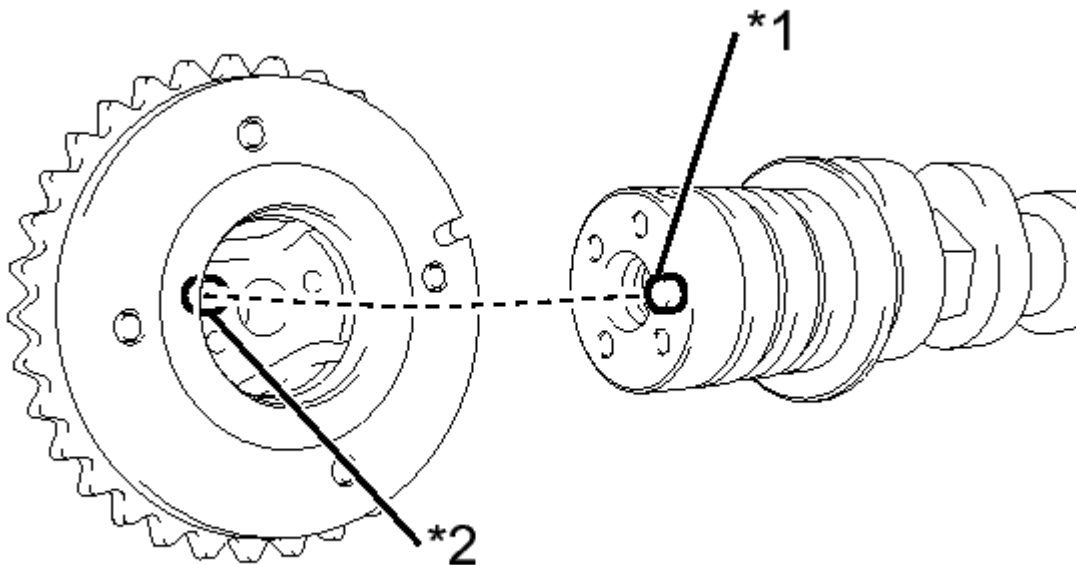
**C**

Fig. 206: Identifying Oil Strainer Bolts

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

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

- a. Install the camshaft timing gear.

**P****Fig. 207: Aligning Camshaft Timing Gear Straight Pin And Straight Pin Hole**

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

1. Check that the straight pin is installed on the camshaft.

TEXT IN ILLUSTRATION

*1	Straight Pin
*2	Straight Pin Hole

2. Put the camshaft timing gear and camshaft together by aligning the straight pin hole and straight pin.

NOTE:

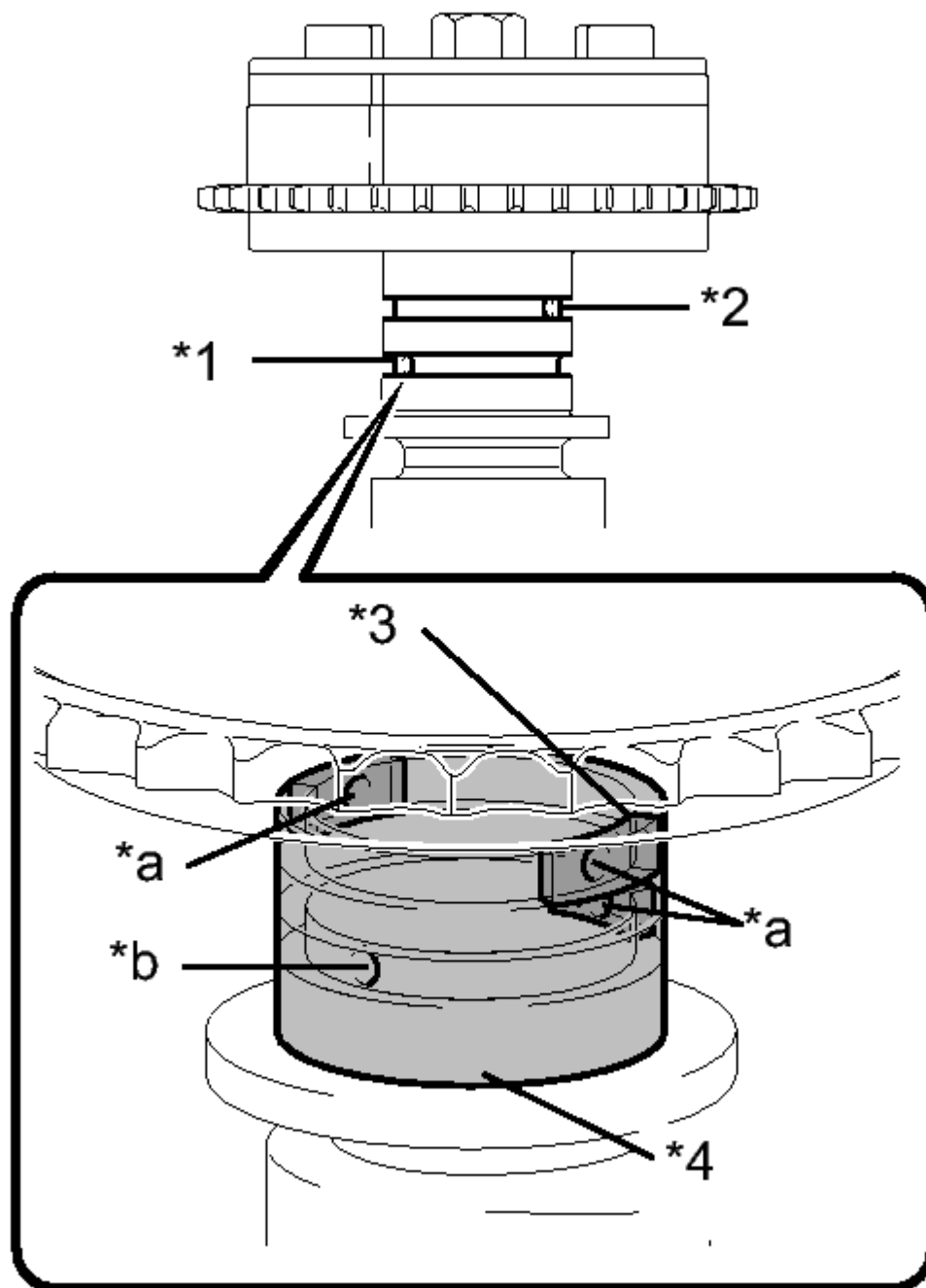
- Do not forcefully push in the camshaft timing gear. This may cause the camshaft straight pin tip to damage the installation surface of the camshaft timing gear.
- Do not turn the camshaft timing gear in the retard direction.

(clockwise).

3. Tighten the flange bolt with the camshaft timing gear secured in place.

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

- b. Check the lock of the camshaft timing gear.
 1. Confirm that the camshaft timing gear is locked.
- c. Release the lock pin.



P

Fig. 208: Identifying Cam Journal Oil Paths

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

TEXT IN ILLUSTRATION

*1	Advance Side Path
----	-------------------

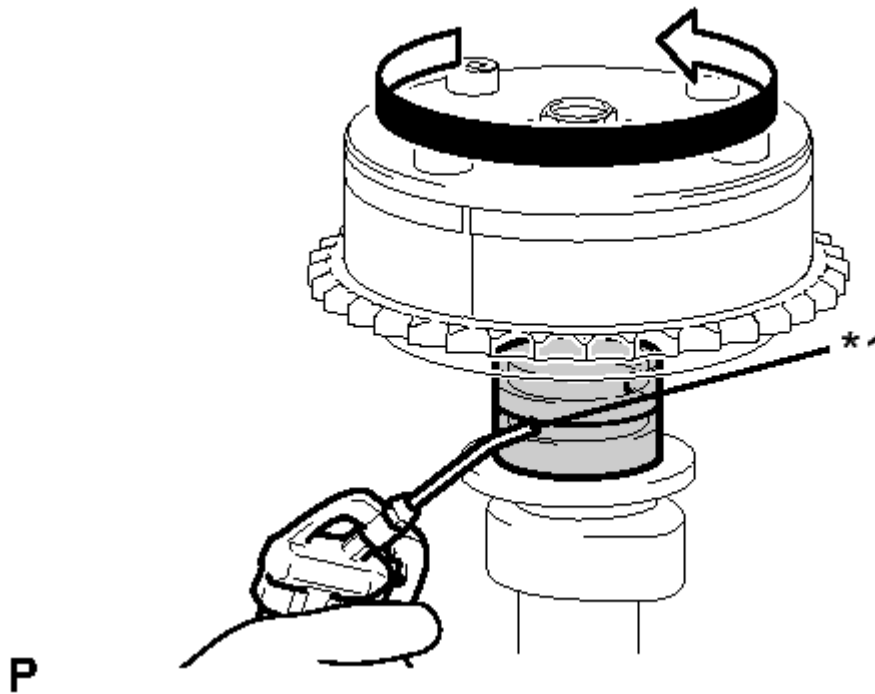
*2	Retard Side Path
*3	Rubber
*4	Vinyl Tape
*a	Close
*b	Open

1. Cover the 4 oil paths of the cam journal with vinyl tape as shown in the illustration.

HINT:

There are 4 oil paths in the groove of the camshaft. Plug three of the paths with pieces of rubber.

2. Prick a hole in the tape placed on the retard side path, on the opposite side to that of the advance side path, as shown in the illustration.
3. While applying approximately 150 kPa (1.5 kgf/cm², 22 psi) of air pressure to the oil paths, forcibly turn the camshaft timing gear in the advance direction (counterclockwise).



P

Fig. 209: Applying Air Pressure To The Oil Paths
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Advance Side Path
----	-------------------

NOTE:

- Cover the paths with a piece of cloth when applying

pressure to keep oil from splashing.

- **Do not lock the camshaft timing gear. If it is locked, release the lock pin again.**

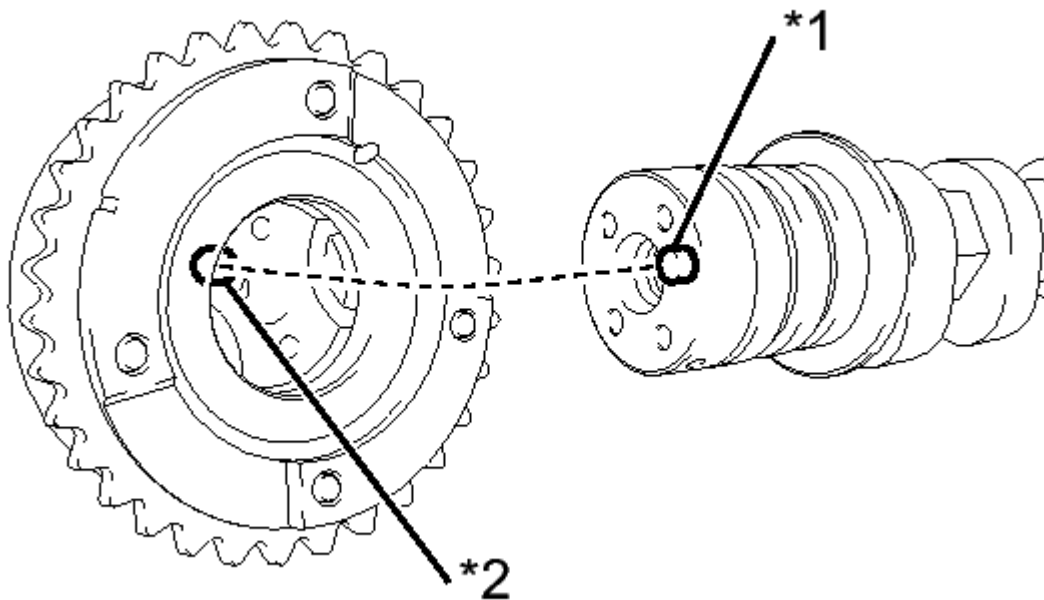
HINT:

- The camshaft timing gear may be turned in the advance direction without applying any force.
 - If enough air pressure cannot be applied because of air leaks from the port, releasing the lock pin may be difficult.
- d. Check for smooth rotation.
1. Turn the camshaft timing gear within its movable range (26.5 to 28.5°) 2 or 3 times, but do not turn it to the most retarded position. Make sure that the gear turns smoothly.

NOTE: Do not lock the camshaft timing gear. If it is locked, release the lock pin again.

2. INSPECT CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY

- a. Install the camshaft timing exhaust gear.



P

Fig. 210: Aligning Camshaft Timing Exhaust Gear Straight Pin And Straight Pin Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Check that the straight pin is installed on the No. 2 camshaft.

TEXT IN ILLUSTRATION

*1	Straight Pin
*2	Straight Pin Hole

2. Put the camshaft timing exhaust gear and No. 2 camshaft together by aligning the straight pin hole and straight pin.

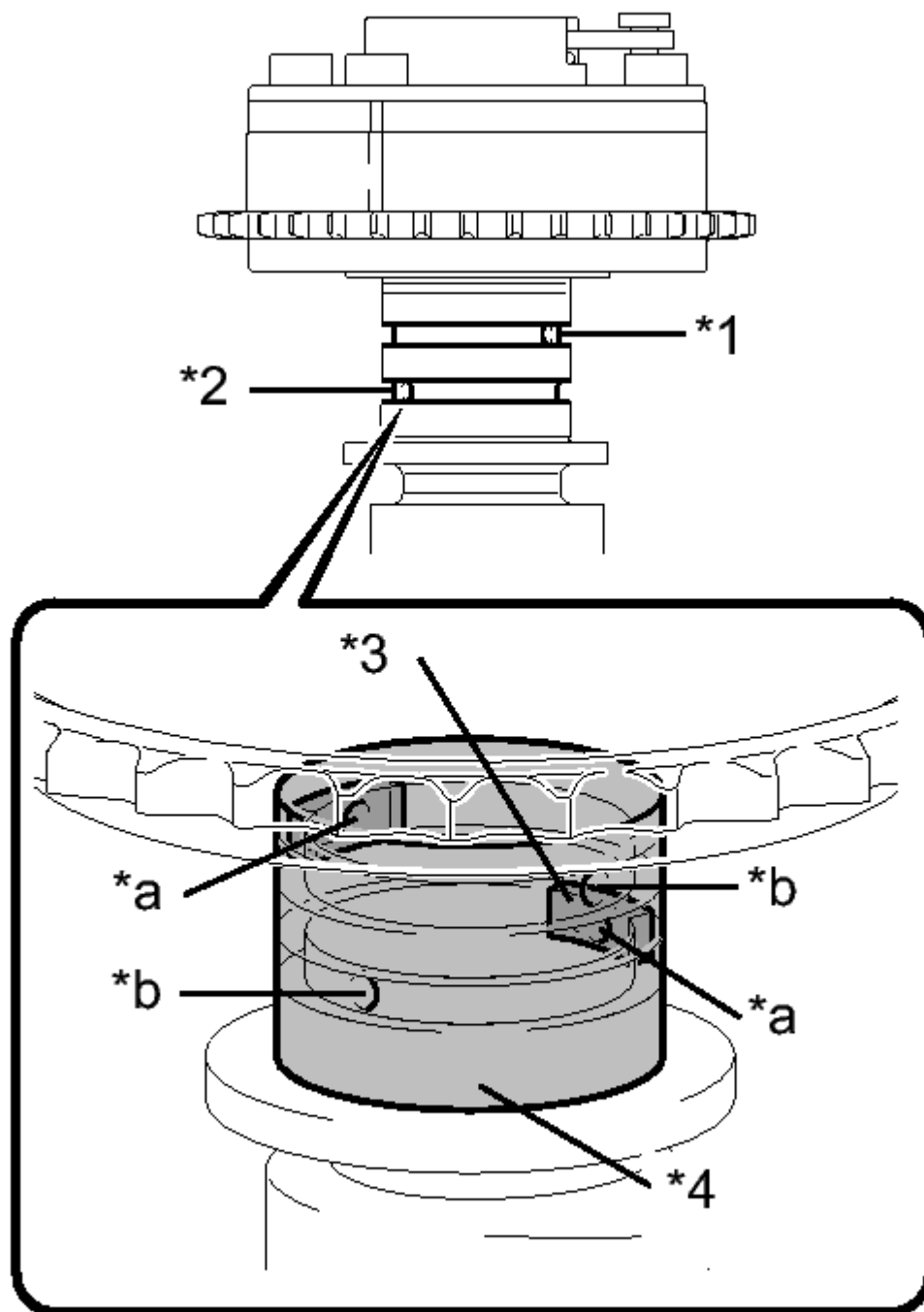
NOTE:

- Do not forcefully push in the camshaft timing gear. This may cause the camshaft straight pin tip to damage the installation surface of the camshaft timing gear.
- Be sure not to turn the camshaft timing exhaust gear in the retard direction (clockwise).

3. Tighten the flange bolt with the camshaft timing exhaust gear secured in place.

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

- b. Check the camshaft timing exhaust gear lock.
 1. Make sure that the camshaft timing exhaust gear is locked.
- c. Release the lock pin.



P

Fig. 211: Identifying Cam Journal Oil Paths

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

TEXT IN ILLUSTRATION

*1	Advance Side Path
----	-------------------

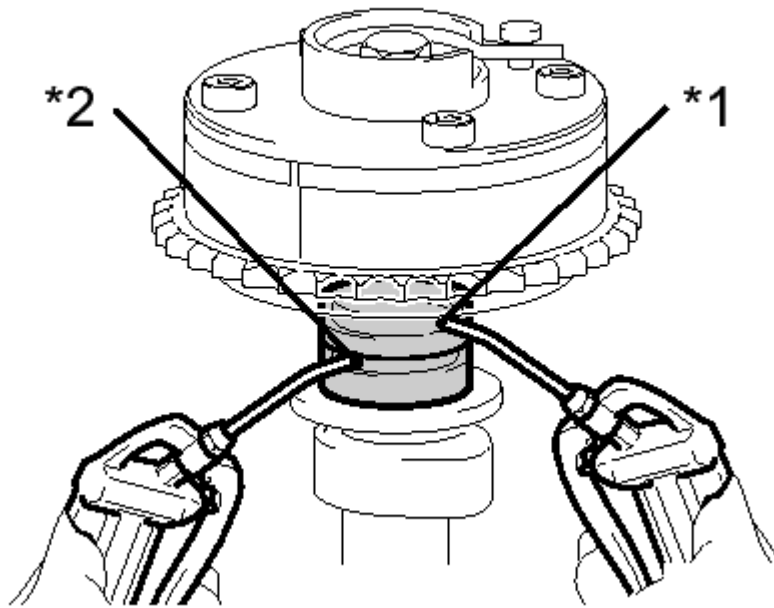
*2	Retard Side Path
*3	Rubber
*4	Vinyl Tape
*a	Close
*b	Open

1. Cover the 4 oil paths of the cam journal with vinyl tape as shown in the illustration.

HINT:

The 4 oil paths are provided in the grooves. Plug 2 paths with rubber pieces.

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



P

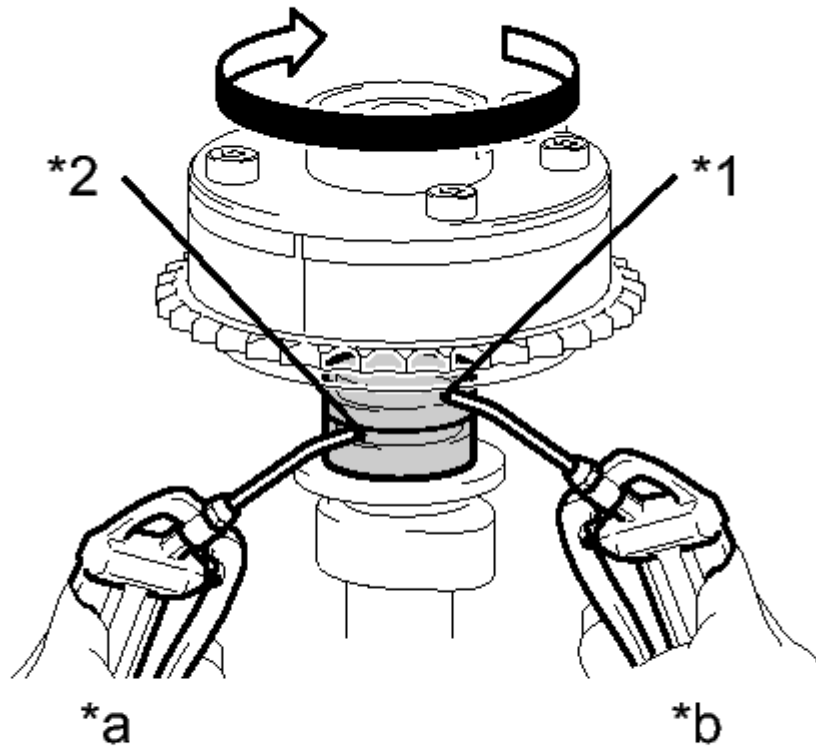
Fig. 212: Applying Air Pressure To The 2 Paths
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Advance Side Path
*2	Retard Side Path

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

4. Make sure that the camshaft timing exhaust gear turns in the retard direction (clock wise) when reducing the air pressure applied to the advance side path.



P

Fig. 213: Checking Camshaft Timing Exhaust Gear Turns In The Retard Direction
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Advance Side Path
*2	Retard Side Path
*a	Hold Pressure
*b	Reduce Pressure

HINT:

The lock pin is released and the camshaft timing exhaust gear turns in the retard direction.

5. When the camshaft timing exhaust gear moves to the most retarded position, release the air pressure from the advance side path, and then release the air pressure from the retard side path.

NOTE: Be sure to release the air pressure from the advance side path first. If the air pressure of the retard side path is released first, the camshaft timing exhaust gear may abruptly shift in the advance direction and break the lock pin or other parts.

- d. Check for smooth rotation.

1. Turn the camshaft timing exhaust gear within its movable range (19 to 21°) 2 or 3 times, but do not turn it to the most advanced position. Make sure that the gear turns smoothly.

NOTE: When the air pressure is released from the advance side path, and then from the retard side path, the gear automatically returns to the most advanced position due to the advance assist spring operation and locks. Gradually release the air pressure from the retard side path before performing the smooth rotation check.

- e. Check the lock at the most advanced position.

1. Make sure that the camshaft timing exhaust gear is locked at the most advanced position.

3. INSPECT CHAIN SUB-ASSEMBLY

- a. Pull the chain with a force of 147 N (15 kgf, 33.1 lbf) as shown in the illustration.

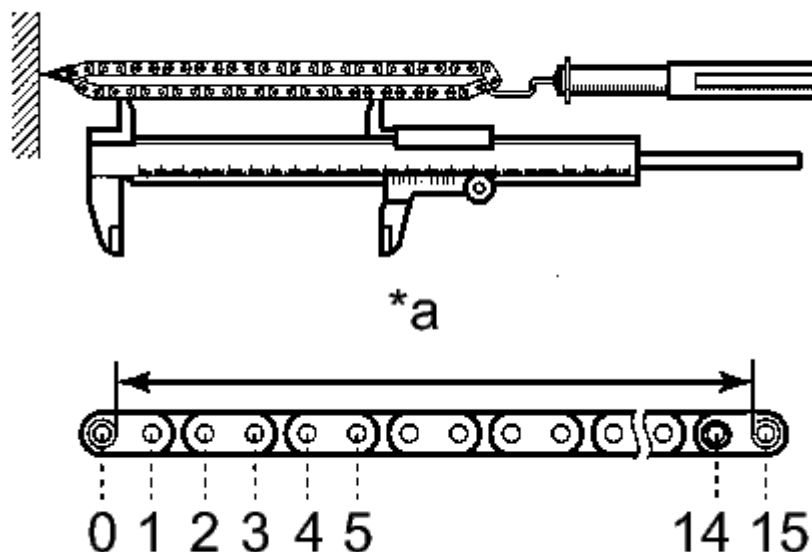


Fig. 214: Inspecting Chain Sub-Assembly

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

TEXT IN ILLUSTRATION

*a	Measurement Area
----	------------------

- b. Using a vernier caliper, measure the length of 15 links.

Maximum chain elongation

114.8 mm (4.519 in.)

HINT:

Perform the measurement at 3 random places. Use the average of the measurements.

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

4. INSPECT CAMSHAFT TIMING SPROCKET (for Intake Side)

- a. Place the chain around the camshaft timing gear.

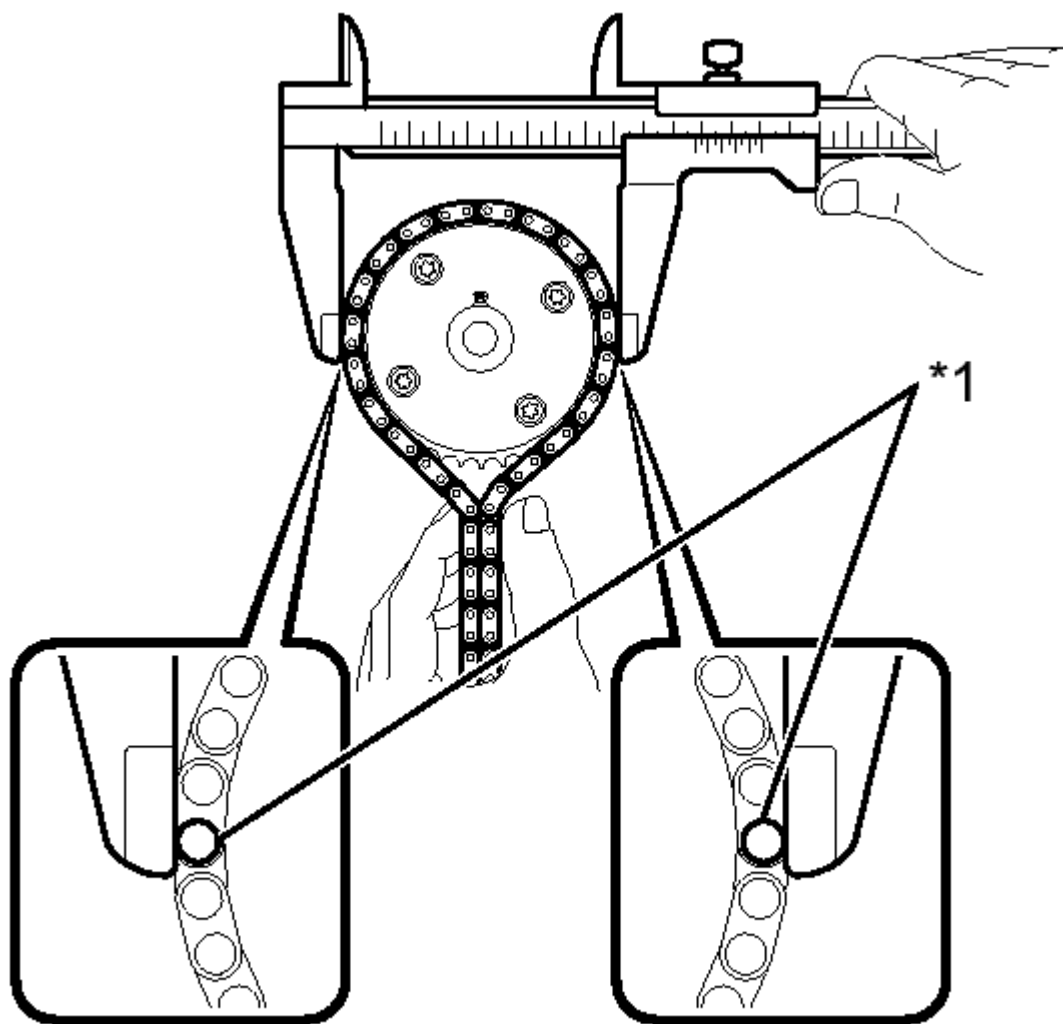
**P**

Fig. 215: Measuring Diameter Of Camshaft Timing Gear Sprocket And Chain (Intake Side)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a vernier caliper, measure the diameter of the sprocket and chain.

TEXT IN ILLUSTRATION

*1	Chain Roller
----	--------------

Minimum gear diameter (with chain)

96.8 mm (3.811 in.)

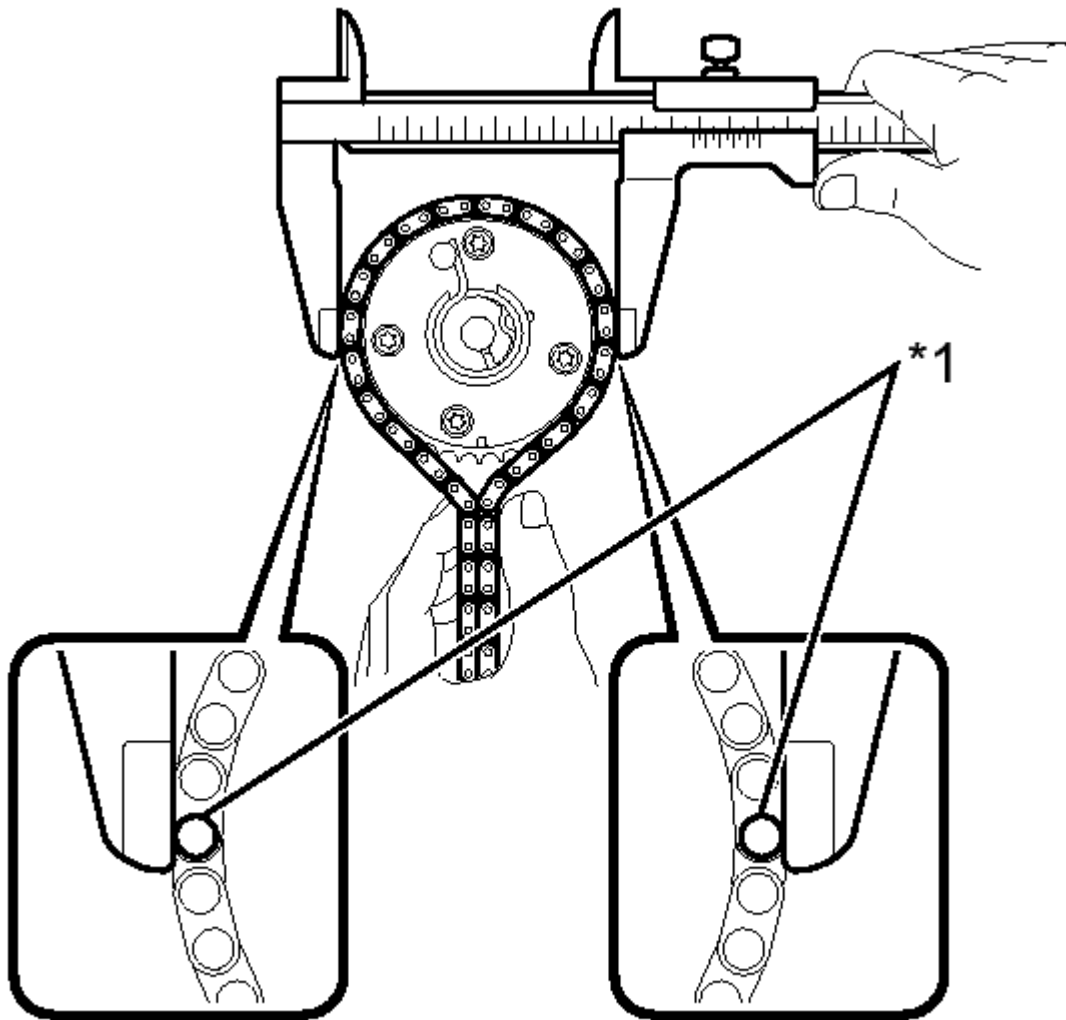
HINT:

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 camshaft timing gear.

5. INSPECT CAMSHAFT TIMING SPROCKET (for Exhaust Side)

- a. Place the chain around the camshaft timing exhaust gear.



P

Fig. 216: Measuring Diameter Of Camshaft Timing Exhaust Gear Sprocket And Chain (Exhaust Side)

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

- b. Using a vernier caliper, measure the diameter of the sprocket and chain.

TEXT IN ILLUSTRATION

*1	Chain Roller
----	--------------

Minimum sprocket diameter (with chain)

96.8 mm (3.811 in.)

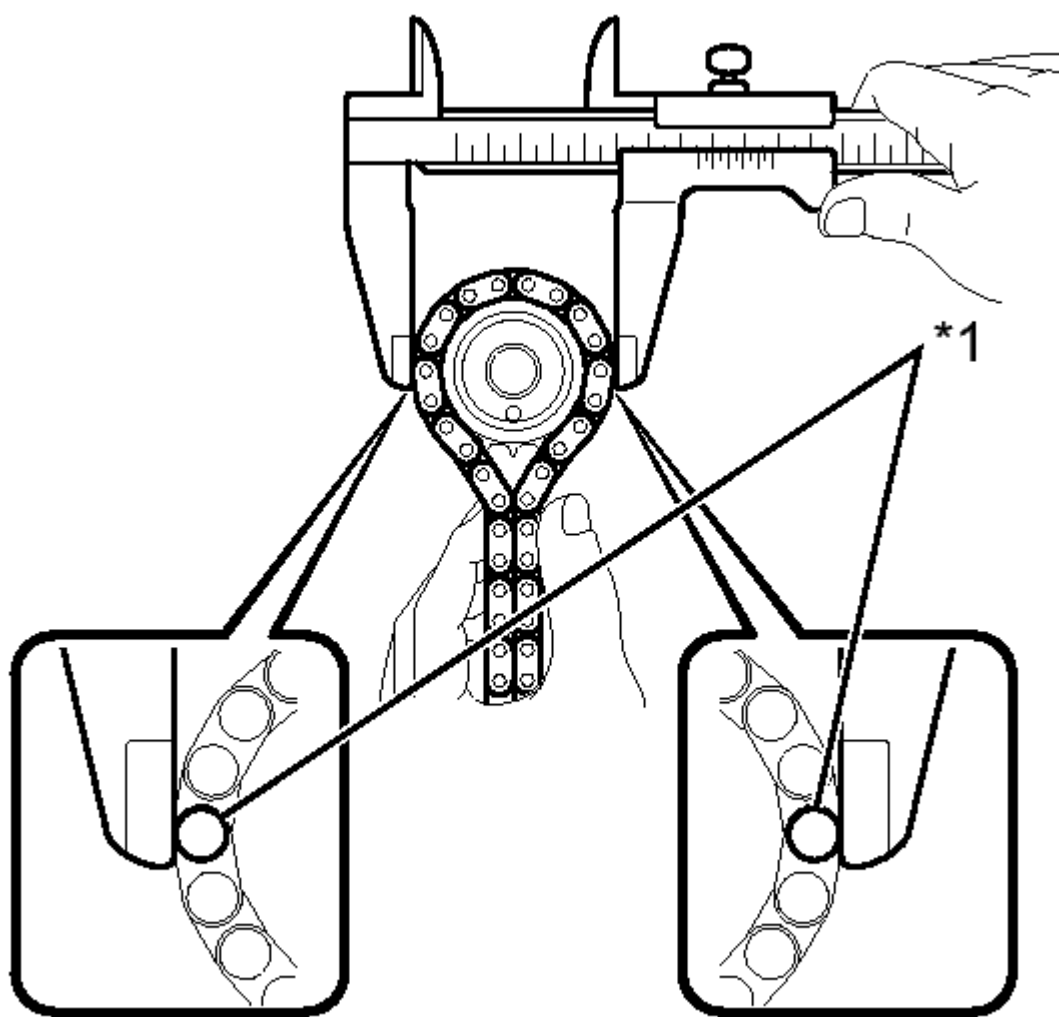
HINT:

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 camshaft timing exhaust gear.

6. INSPECT CRANKSHAFT TIMING SPROCKET

- a. Place the chain around the crankshaft.



P

Fig. 217: Measuring Diameter Of Crankshaft Timing Sprocket And Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a vernier caliper, measure the diameter of the sprocket and chain.

TEXT IN ILLUSTRATION

*1	Chain Roller
----	--------------

Minimum gear diameter (with chain)

51.1 mm (2.012 in.)

HINT:

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 crankshaft.

7. INSPECT TIMING CHAIN TENSION ARM

- a. Using a vernier caliper, measure the timing chain tension arm wear.

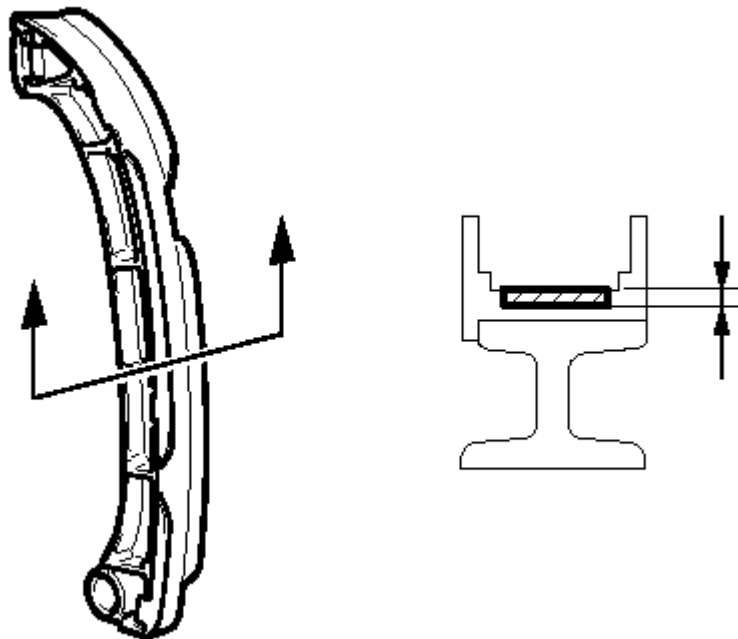
**P**

Fig. 218: Inspecting Timing Chain Tension Arm
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Minimum wear

1.0 mm (0.0394 in.)

If the wear is less than the minimum, replace the timing chain tension arm.

8. INSPECT TIMING CHAIN GUIDE

- a. Using a vernier caliper, measure the timing chain guide wear.

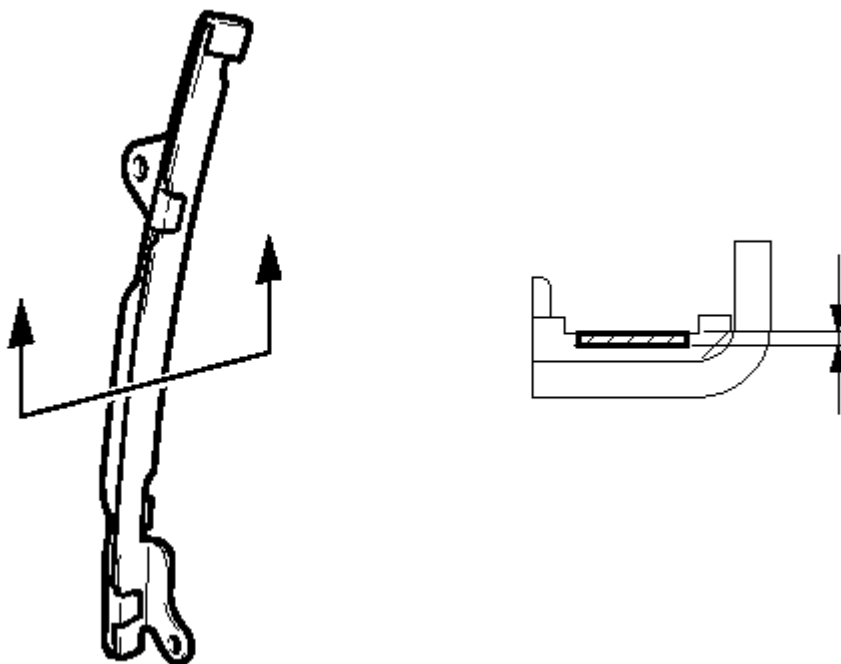
**P**

Fig. 219: Inspecting Timing Chain Guide

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

Minimum wear

1.0 mm (0.0394 in.)

If the wear is less than the minimum, replace the timing chain guide.

9. INSPECT NO. 2 CHAIN VIBRATION DAMPER

- a. Using a vernier caliper, measure the No. 2 chain vibration damper wear.

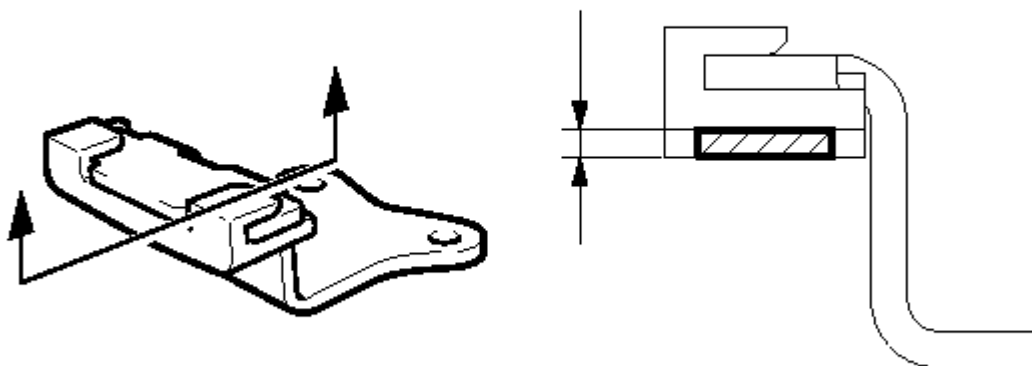
**P**

Fig. 220: Inspecting No. 2 Chain Vibration Damper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Minimum wear

1.0 mm (0.0394 in.)

If the wear is less than the minimum, replace the No. 2 chain vibration damper.

10. INSPECT NO. 1 CHAIN TENSIONER ASSEMBLY

- a. Check that the plunger moves smoothly when the ratchet pawl is raised by hand.

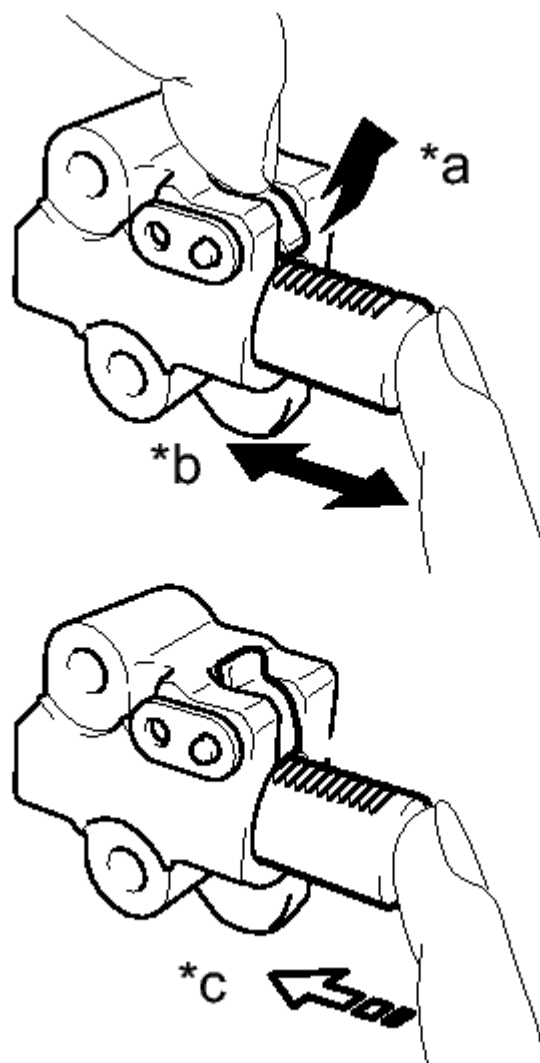
**P**

Fig. 221: Inspecting No. 1 Chain Tensioner Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

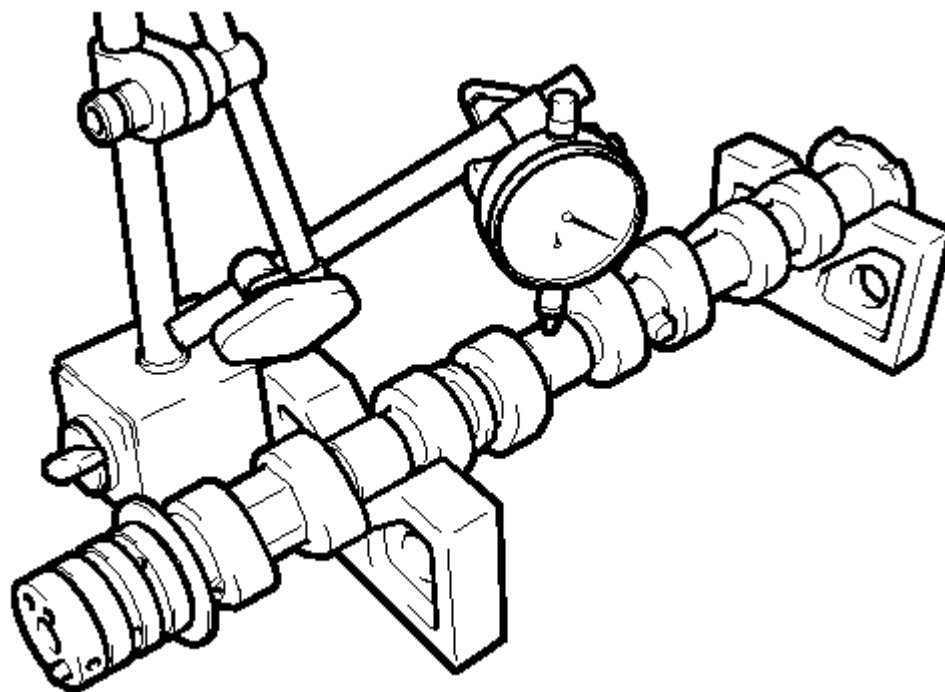
TEXT IN ILLUSTRATION

*a	Raise
*b	Move
*c	Lock

- b. Release the ratchet pawl, and then check that the plunger is locked in place by the ratchet pawl and does not move when pushed by hand.

11. INSPECT CAMSHAFT

- a. Inspect the camshaft for runout.

**P****Fig. 222: Inspecting Camshaft For Runout****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

0.04 mm (0.00157 in.)

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

- b. Inspect the cam lobes.

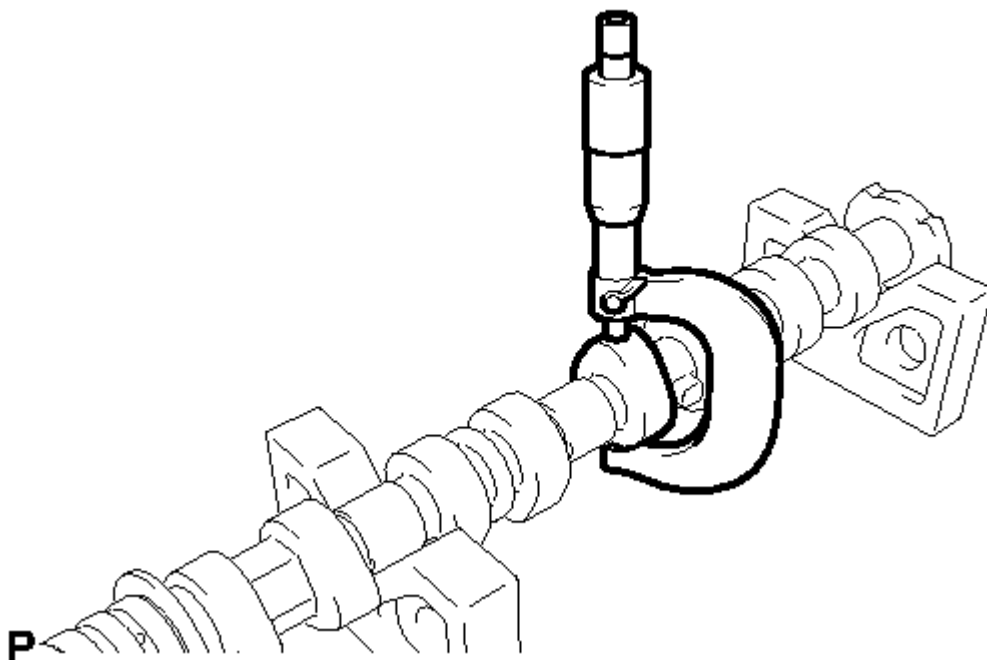


Fig. 223: Inspecting Cam Lobes

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

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

Standard cam lobe height

41.699 to 41.7989 mm (1.6417 to 1.6456 in.)

Minimum cam lobe height

41.549 mm (1.6358 in.)

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

- c. Inspect the camshaft journals.

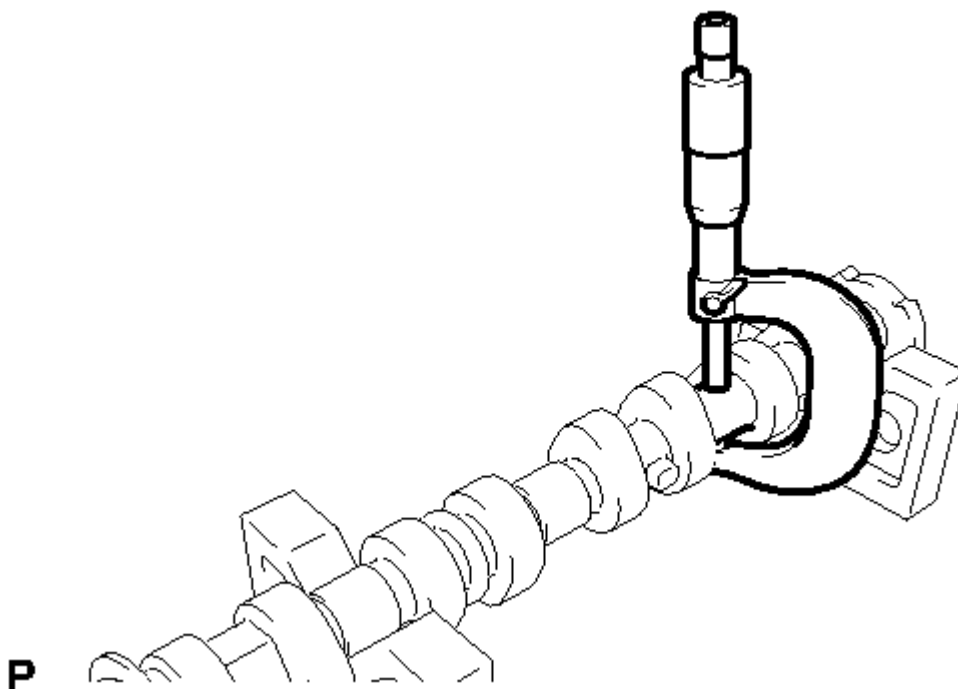


Fig. 224: Inspecting Camshaft Journals

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	34.454 to 34.470 mm (1.3565 to 1.3571 in.)
Other	22.954 to 22.970 mm (0.9037 to 0.9043 in.)

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

12. INSPECT NO. 2 CAMSHAFT

- a. Inspect the No. 2 camshaft for runout.

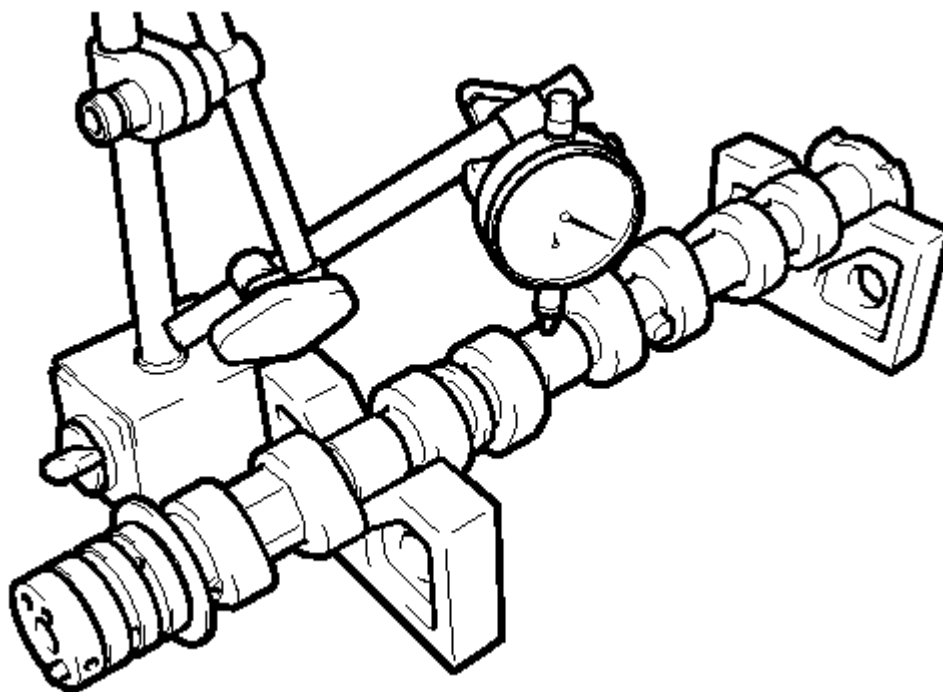
**P**

Fig. 225: Inspecting No. 2 Camshaft For Runout

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

1. Place the No. 2 camshaft on V-blocks.
2. Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout

0.04 mm (0.00157 in.)

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

- b. Inspect the cam lobes.

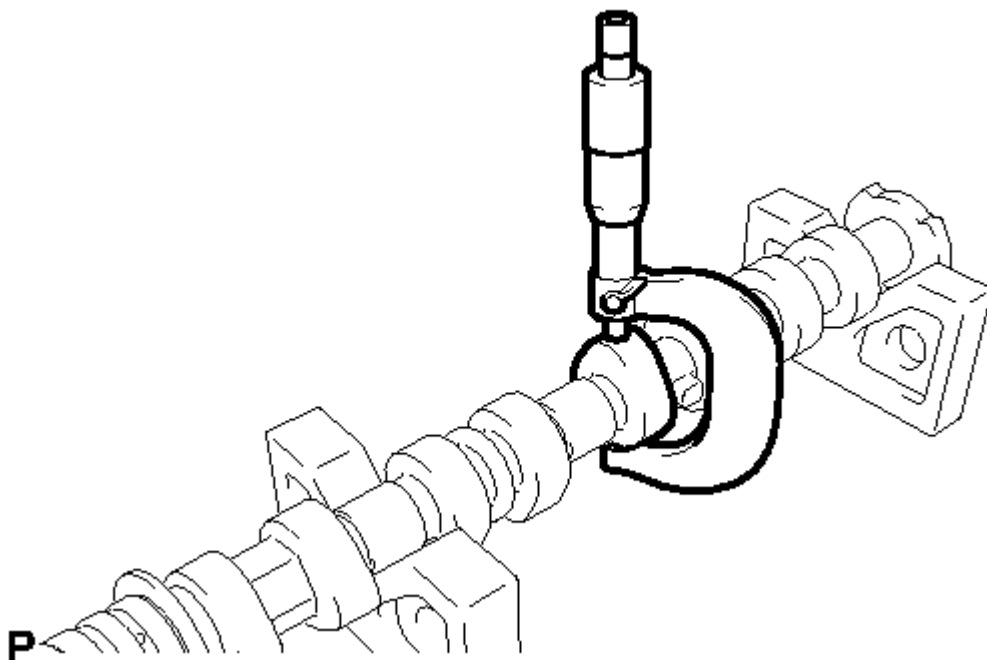


Fig. 226: Inspecting Cam Lobes

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

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

Standard cam lobe height

41.000 to 41.100 mm (1.6142 to 1.6181 in.)

Minimum cam lobe height

40.85 mm (1.6083 in.)

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

- c. Inspect the camshaft journals.

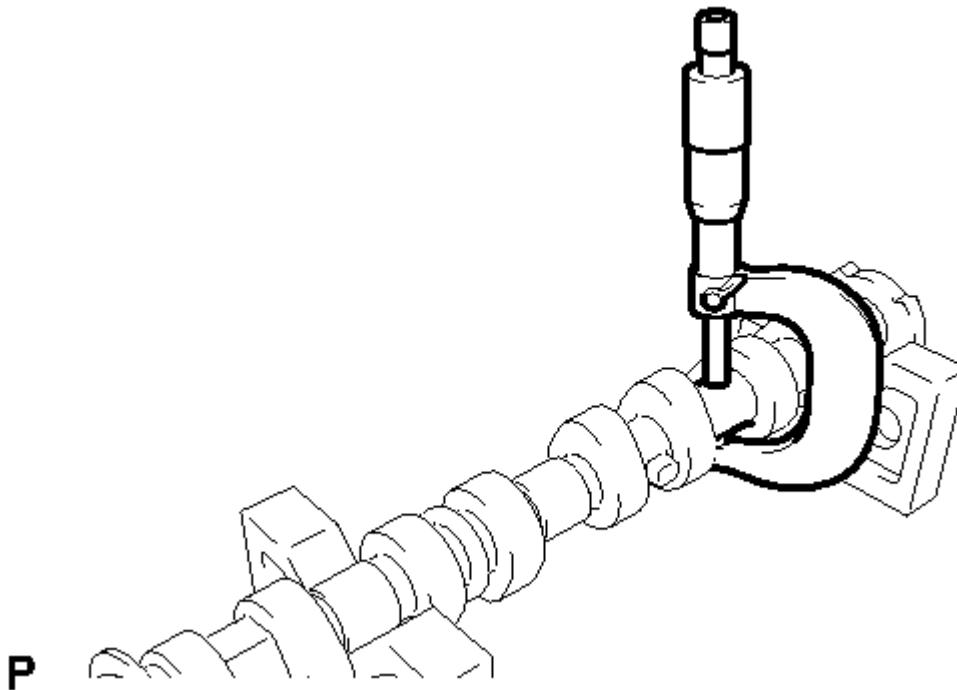


Fig. 227: Inspecting Camshaft Journals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Using a micrometer, measure the journal diameter.

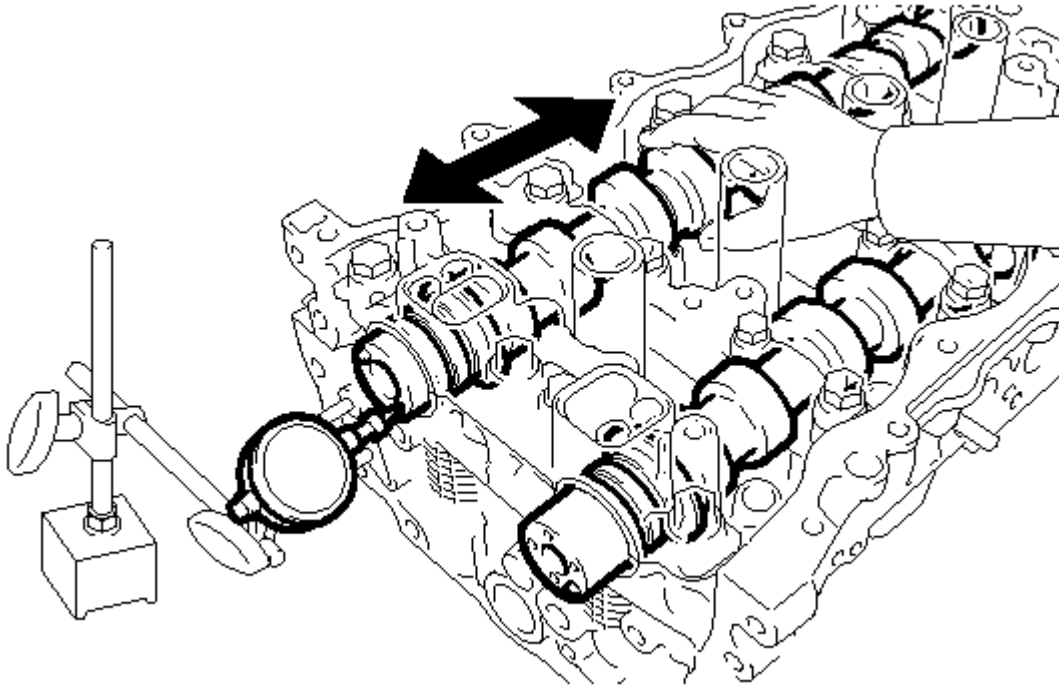
Standard Journal Diameter

Journal Position	Specified Condition
No. 1	34.454 to 34.470 mm (1.3565 to 1.3571 in.)
Other	22.954 to 22.970 mm (0.9037 to 0.9043 in.)

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

13. INSPECT CAMSHAFT THRUST CLEARANCE

- a. Install the camshaft See step 10.
- b. Install the No. 2 camshaft See step 11.

**P****Fig. 228: Inspecting Camshaft Thrust Clearance**

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

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

Standard Thrust Clearance

Item	Specified Condition
Intake	0.06 to 0.2 mm (0.00236 to 0.00787 in.)
Exhaust	0.06 to 0.2 mm (0.00236 to 0.00787 in.)

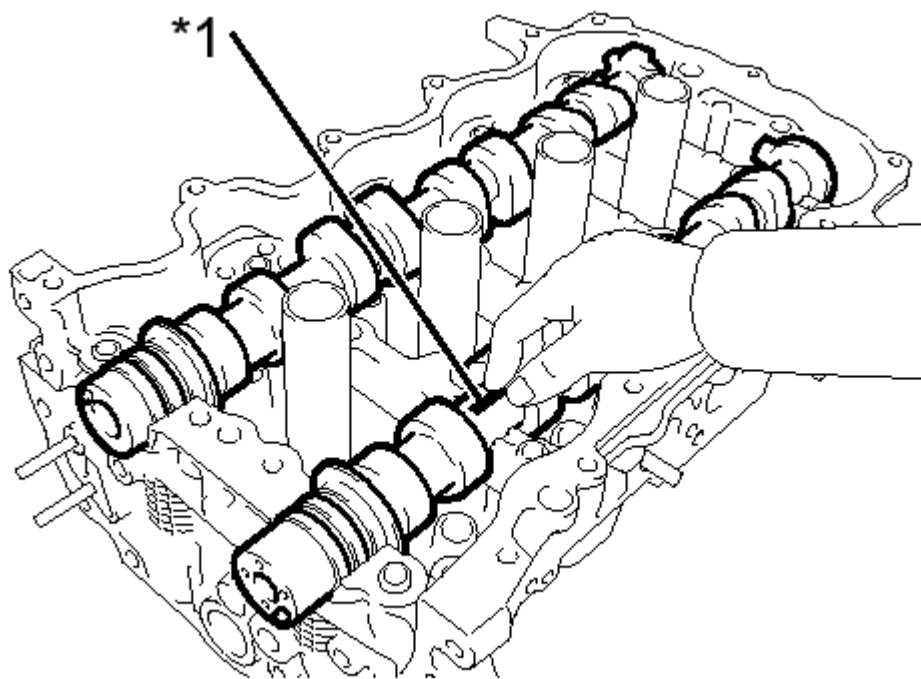
Maximum Thrust Clearance

Item	Specified Condition
Intake	0.215 mm (0.00846 in.)
Exhaust	0.215 mm (0.00846 in.)

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

14. INSPECT CAMSHAFT OIL CLEARANCE

- a. Clean the bearing caps and camshaft journals.

**P****Fig. 229: Laying A Strip Of Plastigage****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- b. Place the camshafts on the camshaft housing.
- c. Lay a strip of Plastigage across each of the camshaft journals.

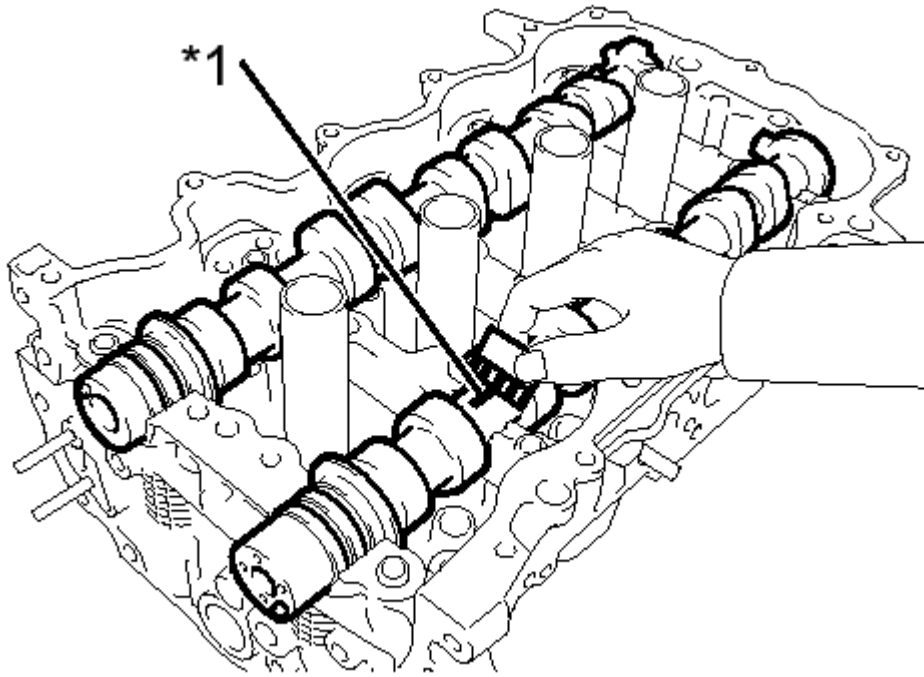
TEXT IN ILLUSTRATION

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

- d. Install the camshaft bearing cap See step 12.

NOTE: Do not turn the camshaft.

- e. Remove the camshaft bearing cap See step 32.
- f. Measure the Plastigage at its widest point.

**P****Fig. 230: Measuring The Plastigage At Its Widest Point**

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

TEXT IN ILLUSTRATION

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

Standard Oil Clearance

Item	Specified Condition
No. 1 camshaft journal	0.030 to 0.067 mm (0.00118 to 0.00264 in.)
Other camshaft journals	0.030 to 0.067 mm (0.00118 to 0.00264 in.)

Maximum Oil Clearance

Item	Specified Condition
No. 1 camshaft journal	0.08 mm (0.00315 in.)
Other camshaft journals	0.08 mm (0.00315 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 camshaft housing.

15. INSPECT CYLINDER HEAD SET BOLT

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

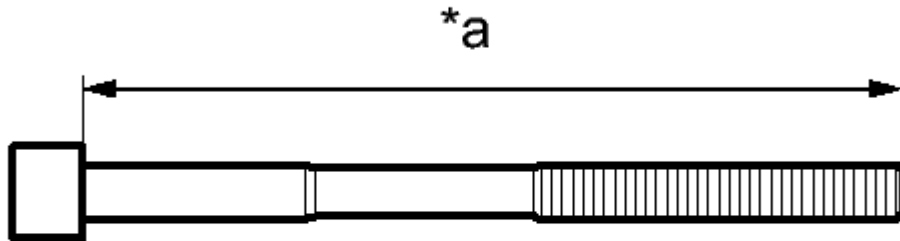


Fig. 231: Identifying Cylinder Head Set Bolt Length
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Measurement Length
----	--------------------

Standard bolt length

125.3 to 126.7 mm (4.9331 to 4.9882 in.)

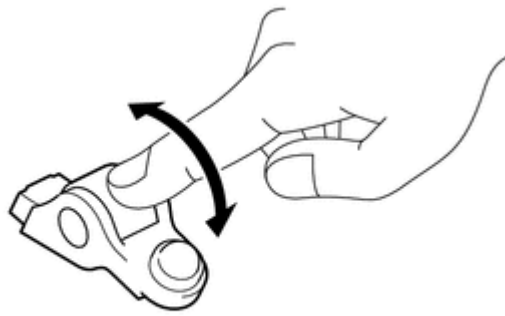
Maximum bolt length

128.2 mm (5.047 in.)

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

16. INSPECT NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY

- a. Turn the roller by hand to check that it turns smoothly.



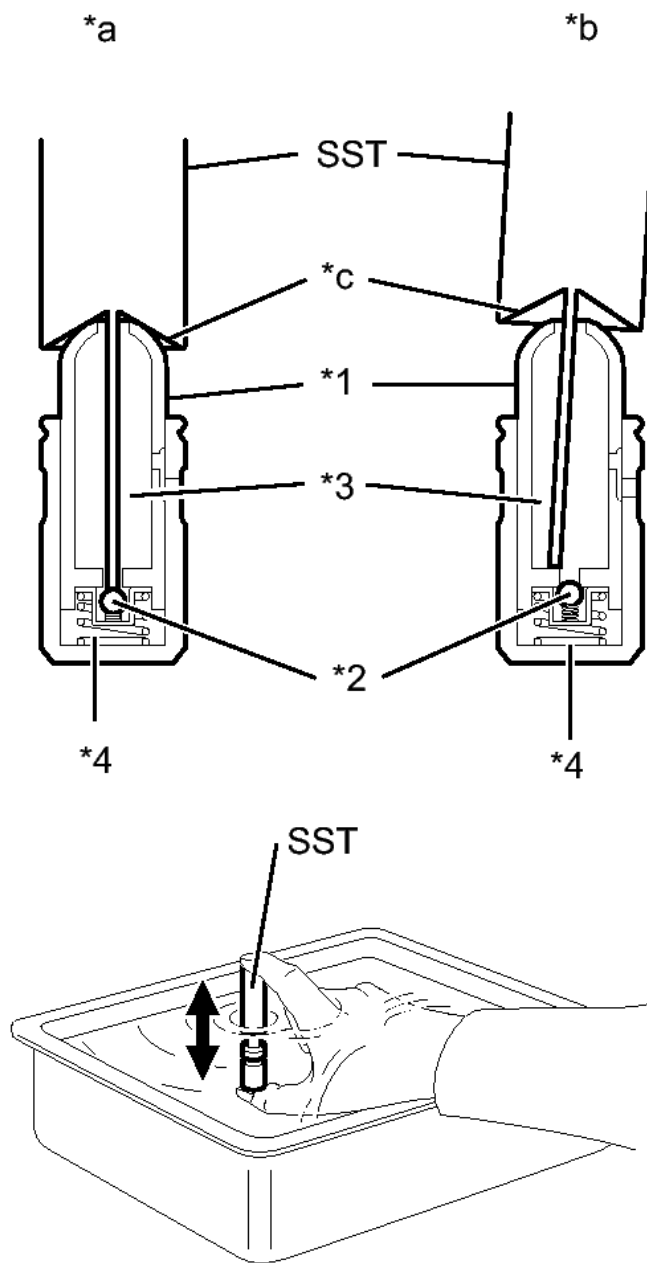
T

Fig. 232: Turning Roller By Hand For Checking Smoothly Turns
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

If the roller does not turn smoothly, replace the valve rocker arm.

17. INSPECT VALVE LASH ADJUSTER ASSEMBLY



T

Fig. 233: Identifying SST Components
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: • Keep the lash adjuster free of dirt and foreign matter.

- **Only use clean engine oil.**

- a. Place the lash adjuster into a container filled with engine oil.

TEXT IN ILLUSTRATION

*1	Plunger
*2	Check Ball
*3	Low Pressure Chamber
*4	High Pressure Chamber
*a	Correct
*b	Incorrect
*c	Taper Part

- b. Insert the tip of SST into the lash adjuster plunger and use the tip to press down on the check ball inside the plunger.

- **SST: 09276-75010**

- c. Squeeze SST and the lash adjuster together to move the plunger up and down 5 to 6 times.
- d. Check the movement of the plunger and bleed it.

OK

Plunger moves up and down.

NOTE: When bleeding the high-pressure chamber, make sure that the tip of SST is actually pressing the check ball as shown in the illustration. If the check ball is not pressed, the high-pressure chamber will not be bled.

- e. After bleeding, remove SST. Then, try to quickly and firmly press the plunger by hand.

OK

Plunger is very difficult to move.

If the result is not as specified, replace the lash adjuster.

18. INSPECT EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY

- a. Using a straightedge and feeler gauge, measure the warpage on the contact surface of the cylinder head.

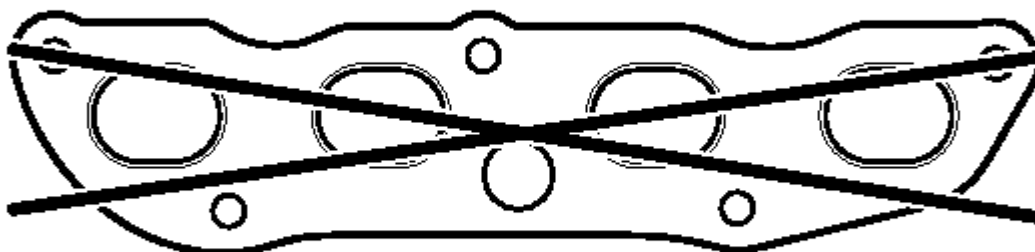
**P**

Fig. 234: Measuring Warpage On Contact Surface Of Exhaust Manifold Converter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum warpage

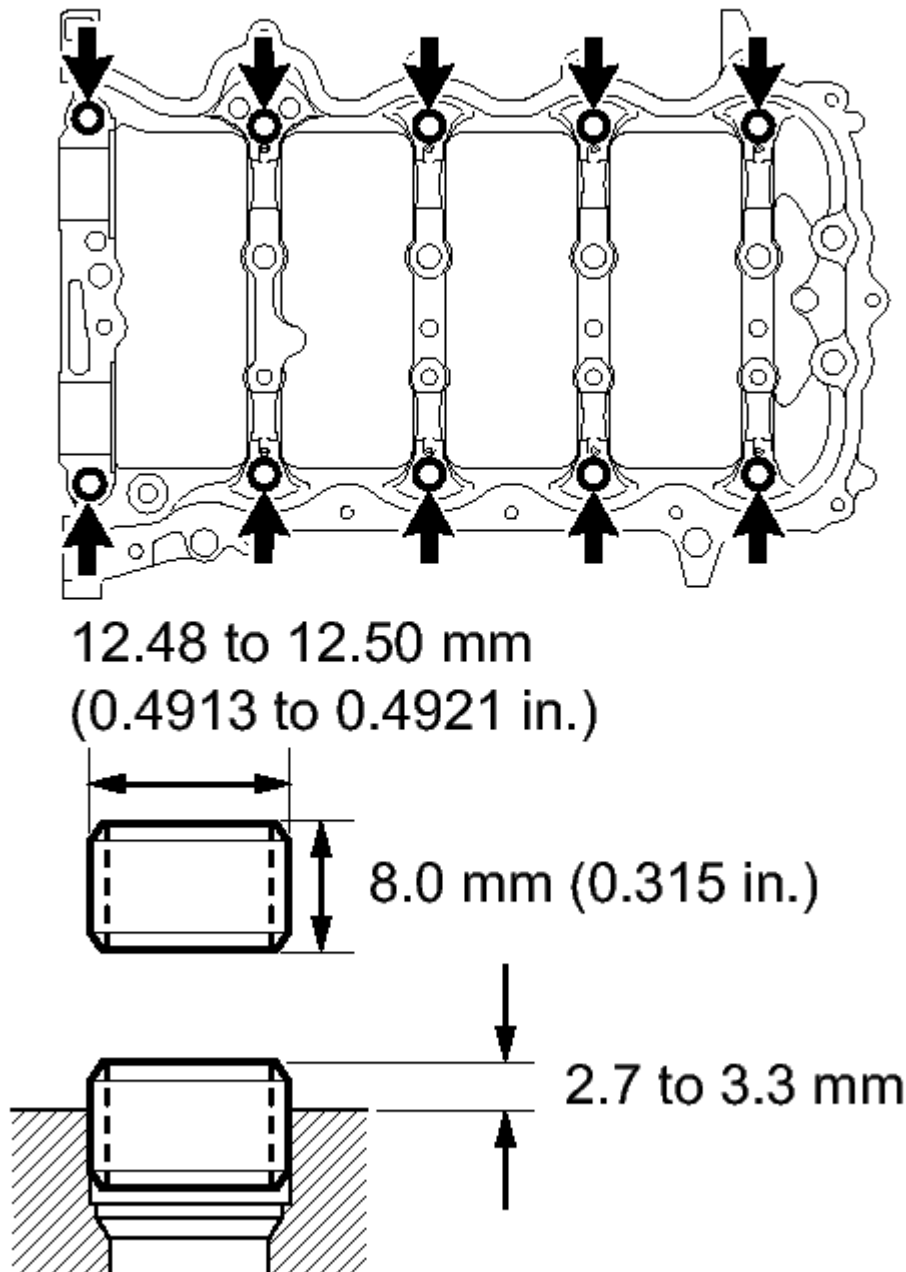
1.2 mm (0.0472 in.)

HINT:

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

REPLACEMENT**REPLACEMENT****1. REPLACE RING PIN**

*a

**P****Fig. 235: Identifying Ring Pins**

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

HINT:

It is not necessary to remove the ring pins unless they are being replaced.

- a. Remove the ring pins from the camshaft housing.
 1. Using a plastic hammer, tap in new ring pins to the specified protrusion height.

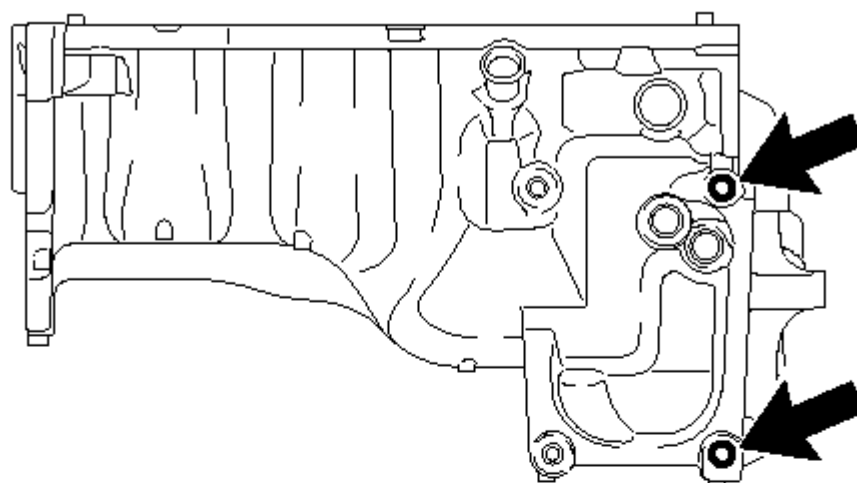
TEXT IN ILLUSTRATION

*a	Upper Side
----	------------

Protrusion height

2.7 to 3.3 mm (0.106 to 0.130 in.)

- b. Remove the ring pins from the oil pan sub-assembly.

***a**

10.98 to 11.00 mm
(0.432 to 0.433 in.)

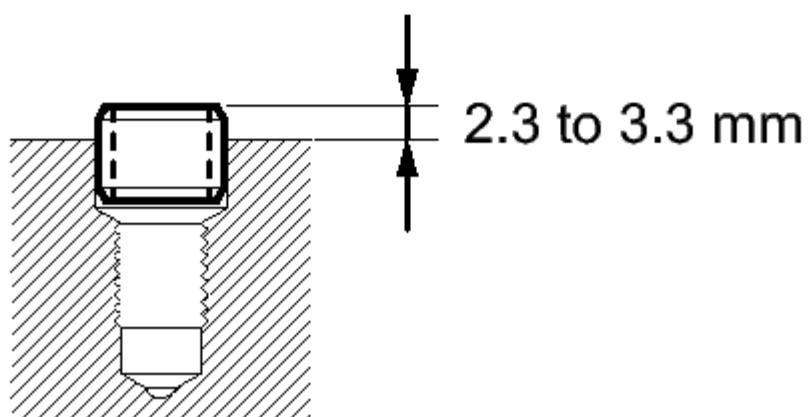
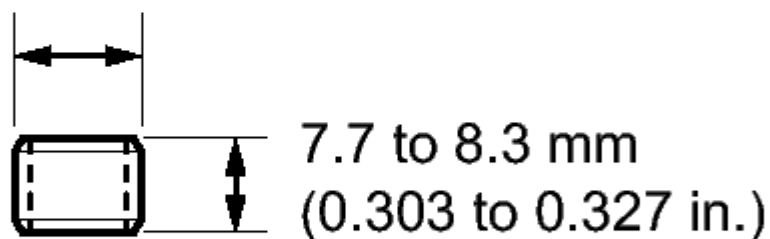
**P**

Fig. 236: Identifying Oil Pan Sub-Assembly Ring Pins
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Using a plastic hammer, tap in new ring pins to the specified protrusion height.

TEXT IN ILLUSTRATION

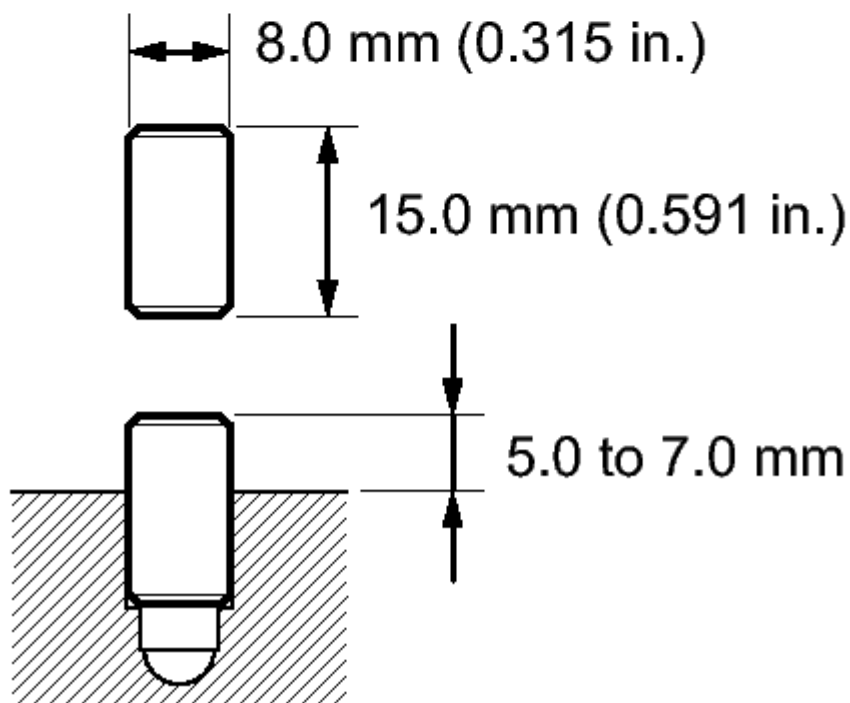
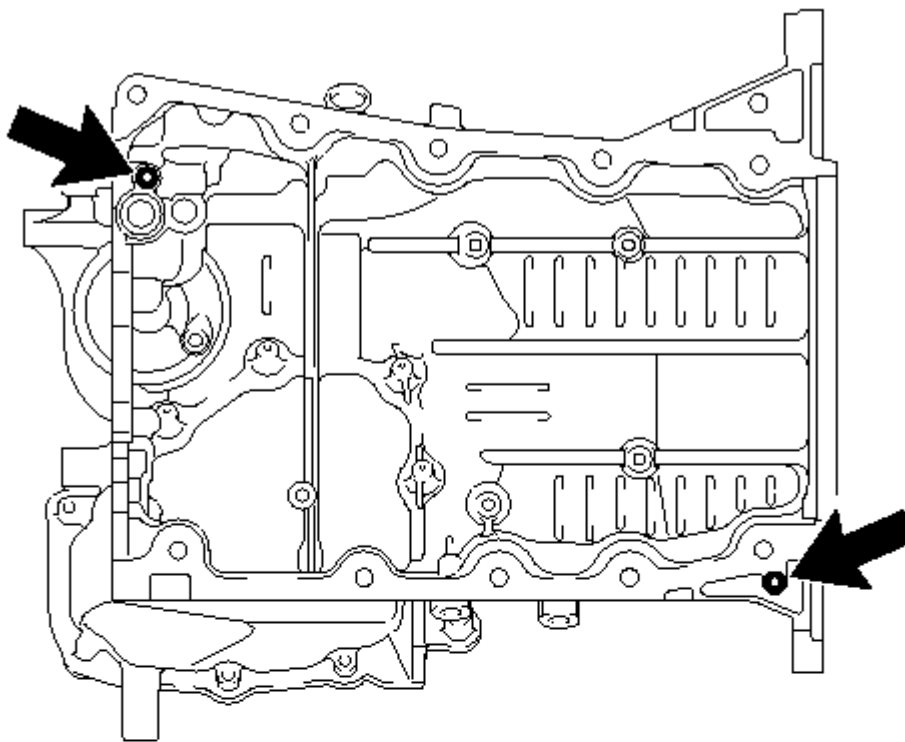
*a	RH Side
----	---------

Protrusion height

2.3 to 3.3 mm (0.091 to 0.130 in.)

2. REPLACE STRAIGHT PIN

*a

**P****Fig. 237: Identifying Straight Pins**

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

HINT:

It is not necessary to remove the straight pins unless they are being replaced.

- a. Remove the straight pins from the oil pan.
- b. Using a plastic hammer, tap in the straight pins to the specified protrusion height.

TEXT IN ILLUSTRATION

*a	Upper Side
----	------------

Protrusion height

5.0 to 7.0 mm (0.197 to 0.276 in.)

REASSEMBLY**REASSEMBLY****1. INSTALL OIL STRAINER SUB-ASSEMBLY**

- a. Install the oil strainer to the oil pan with the 2 bolts.

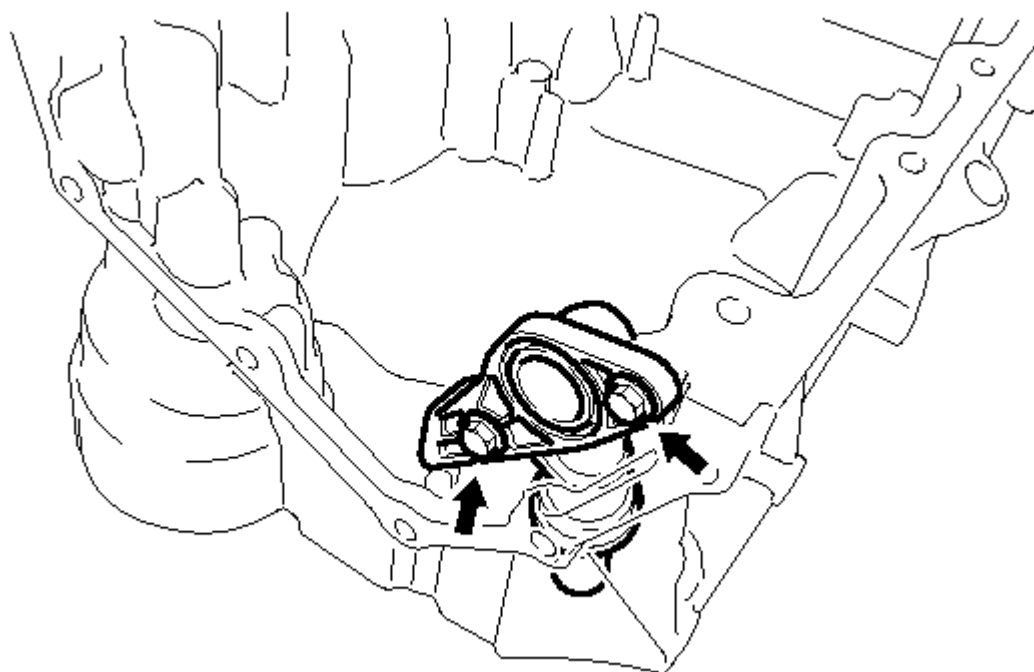
**C**

Fig. 238: Identifying Oil Strainer Bolts

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

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

2. INSTALL NO. 1 OIL PAN BAFFLE PLATE

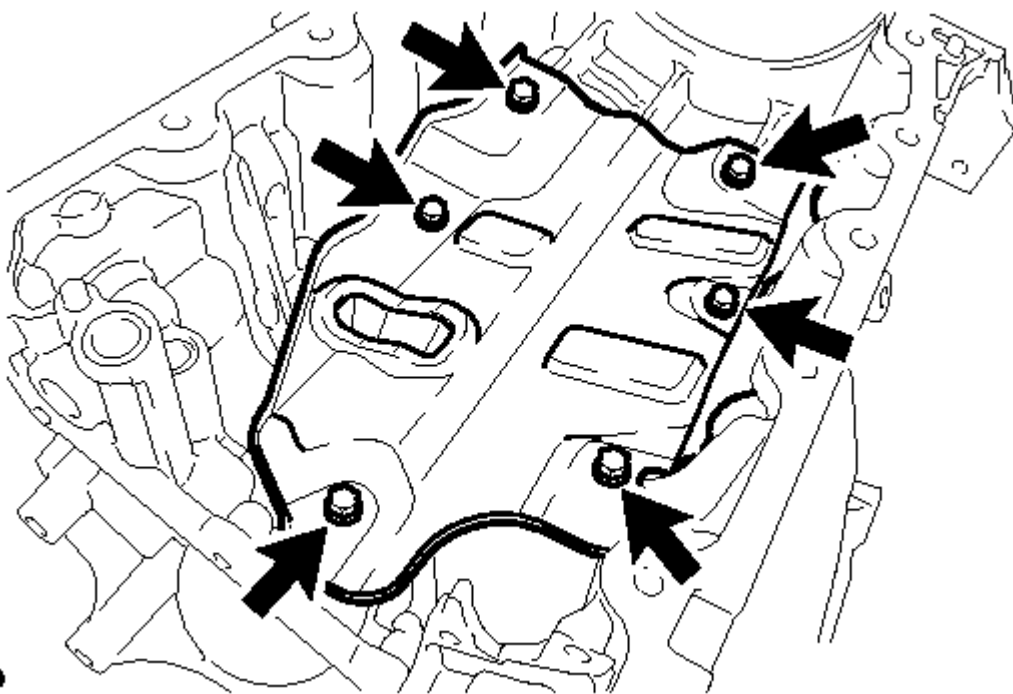
**P**

Fig. 239: Identifying Oil Pan Baffle Plate Bolts

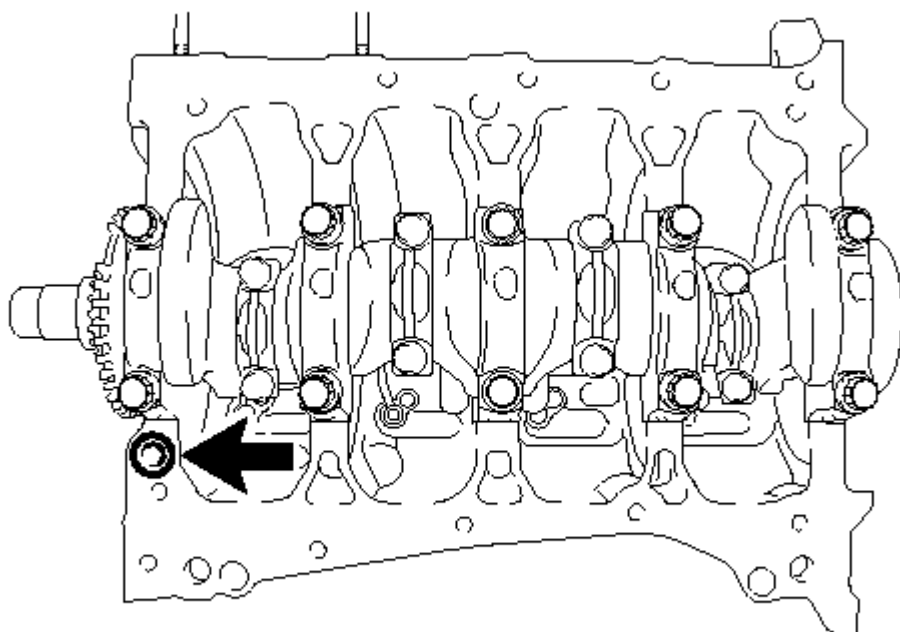
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Install the No. 1 oil pan baffle plate to the oil pan with the 6 bolts.

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

3. INSTALL OIL PAN SUB-ASSEMBLY

- a. Install a new oil pan O-ring to the cylinder block.

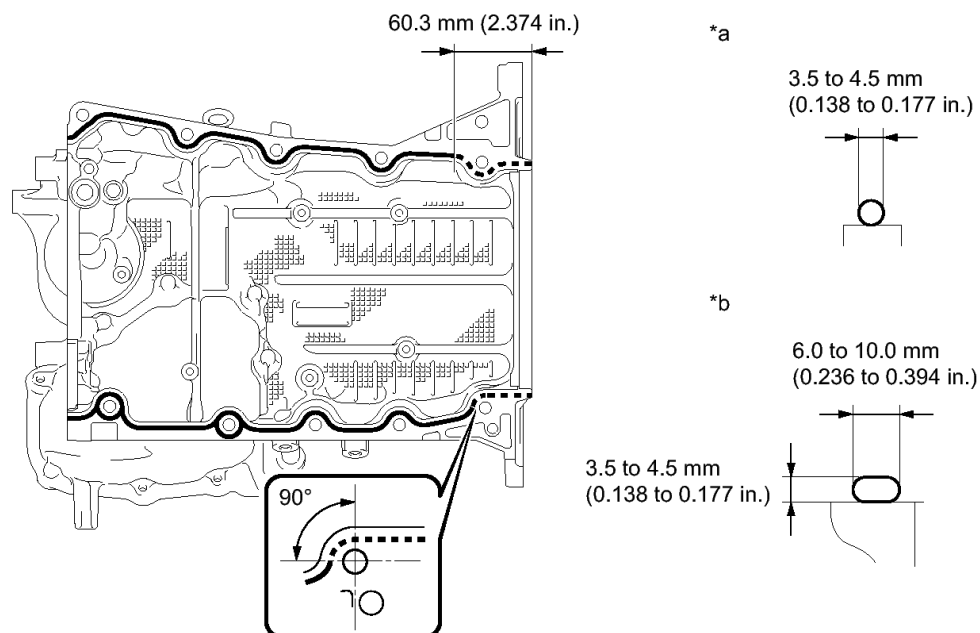


P

Fig. 240: Identifying Oil Pan O-Ring

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

- b. Apply seal packing to the places shown in the illustration.



P

Fig. 241: Applying Seal Packing

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

TEXT IN ILLUSTRATION

*a	Continuous Line Area	*b	Dashed Line Area
----	----------------------	----	------------------

Seal packing

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

NOTE:

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

c. Install the oil pan with the 10 bolts.

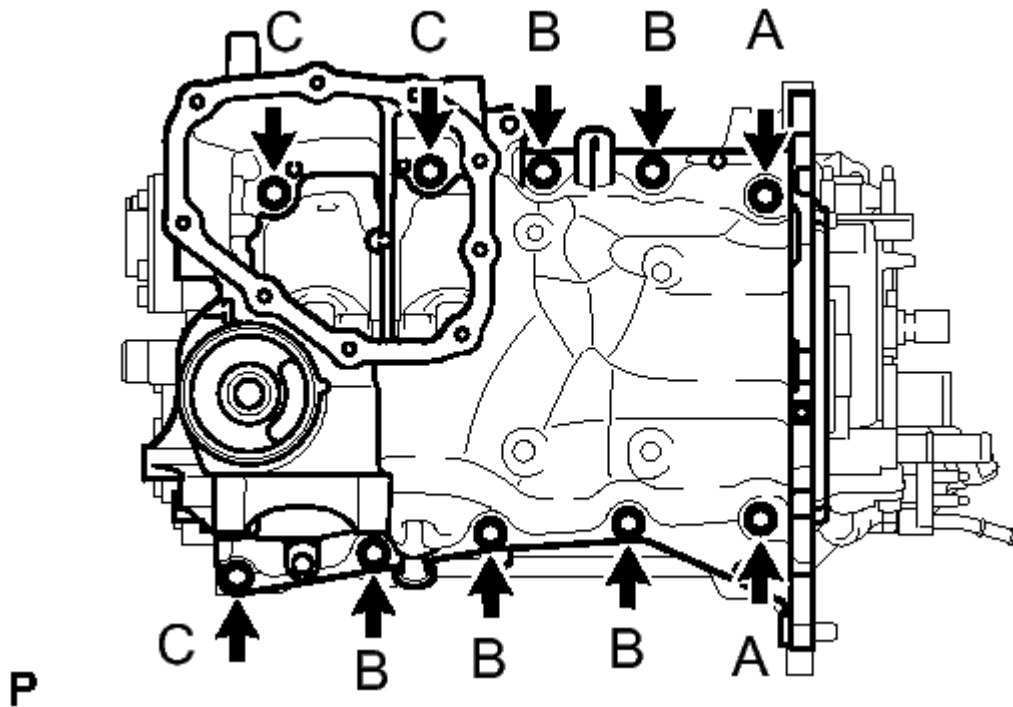


Fig. 242: Identifying Oil Pan Bolts

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

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

HINT:

- Apply adhesive to the threads of bolts C.
- Apply adhesive to bolts C more than 7.0 mm from the bolt tip.

Bolt C

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

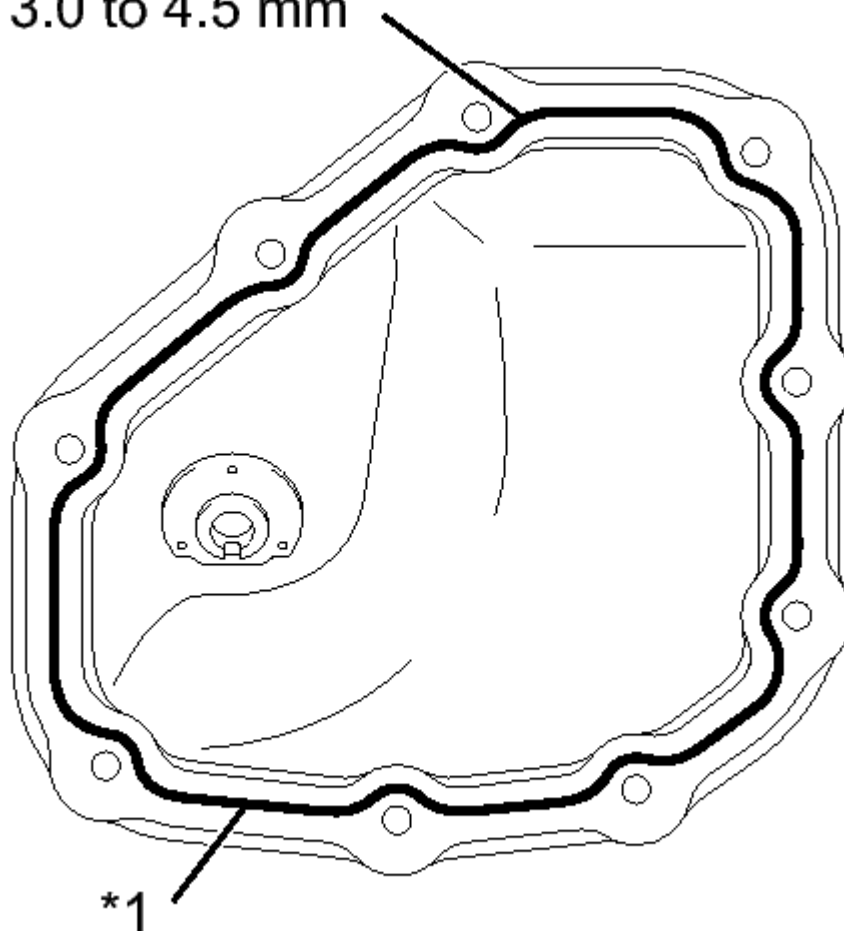
Bolt Length

Item	Length
Bolt A	55 mm (2.165 in.)
Bolt B	30 mm (1.181 in.)
Bolt C	30 mm (1.181 in.)

- d. Wipe off any excess seal packing with a clean piece of cloth.

4. INSTALL NO. 2 OIL PAN SUB-ASSEMBLY

*a 3.0 to 4.5 mm



P

Fig. 243: Applying Seal Packing

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

NOTE: Do not reuse the No. 2 oil pan.

- a. Apply seal packing in a continuous bead to a new No. 2 oil pan as shown in the illustration.

TEXT IN ILLUSTRATION

*1	Seal Packing
*a	Bead Diameter

Seal packing

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

Bead diameter

3.0 to 4.5 mm (0.118 to 0.177 in.)

NOTE:

- Remove any oil from the contact surfaces.
- Install the No. 2 oil pan within 3 minutes and tighten the bolts within 10 minutes after applying seal packing.

- b. Install the No. 2 oil pan with the 9 bolts.

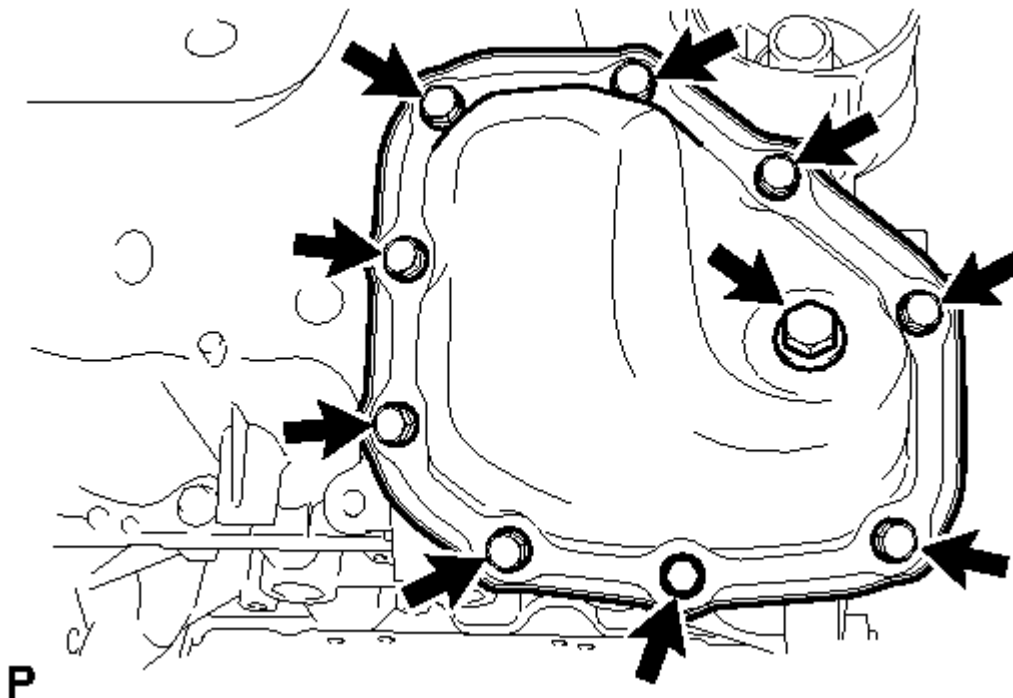


Fig. 244: Identifying No. 2 Oil Pan Bolts

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

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

- c. Install a new gasket and the oil pan drain plug.

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

5. INSTALL CYLINDER BLOCK WATER JACKET SPACER

- a. Install the cylinder block water jacket spacer to the cylinder block as shown in the illustration.

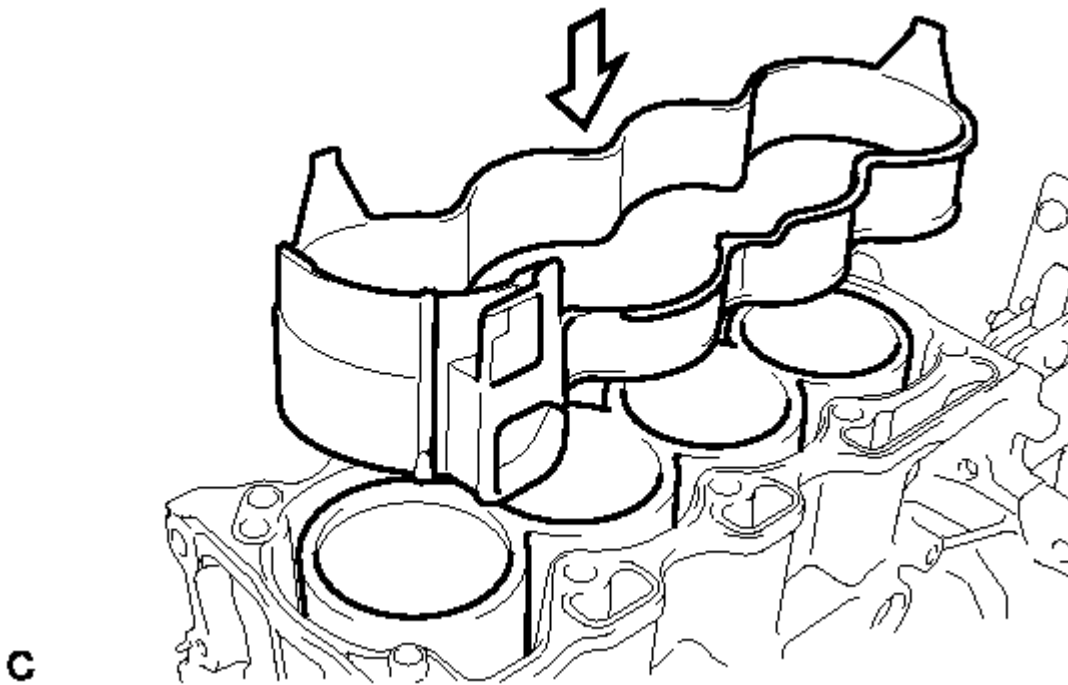


Fig. 245: Installing Cylinder Block Water Jacket Spacer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSTALL CYLINDER HEAD GASKET

- a. Apply seal packing to a new cylinder head gasket as shown in the illustration.

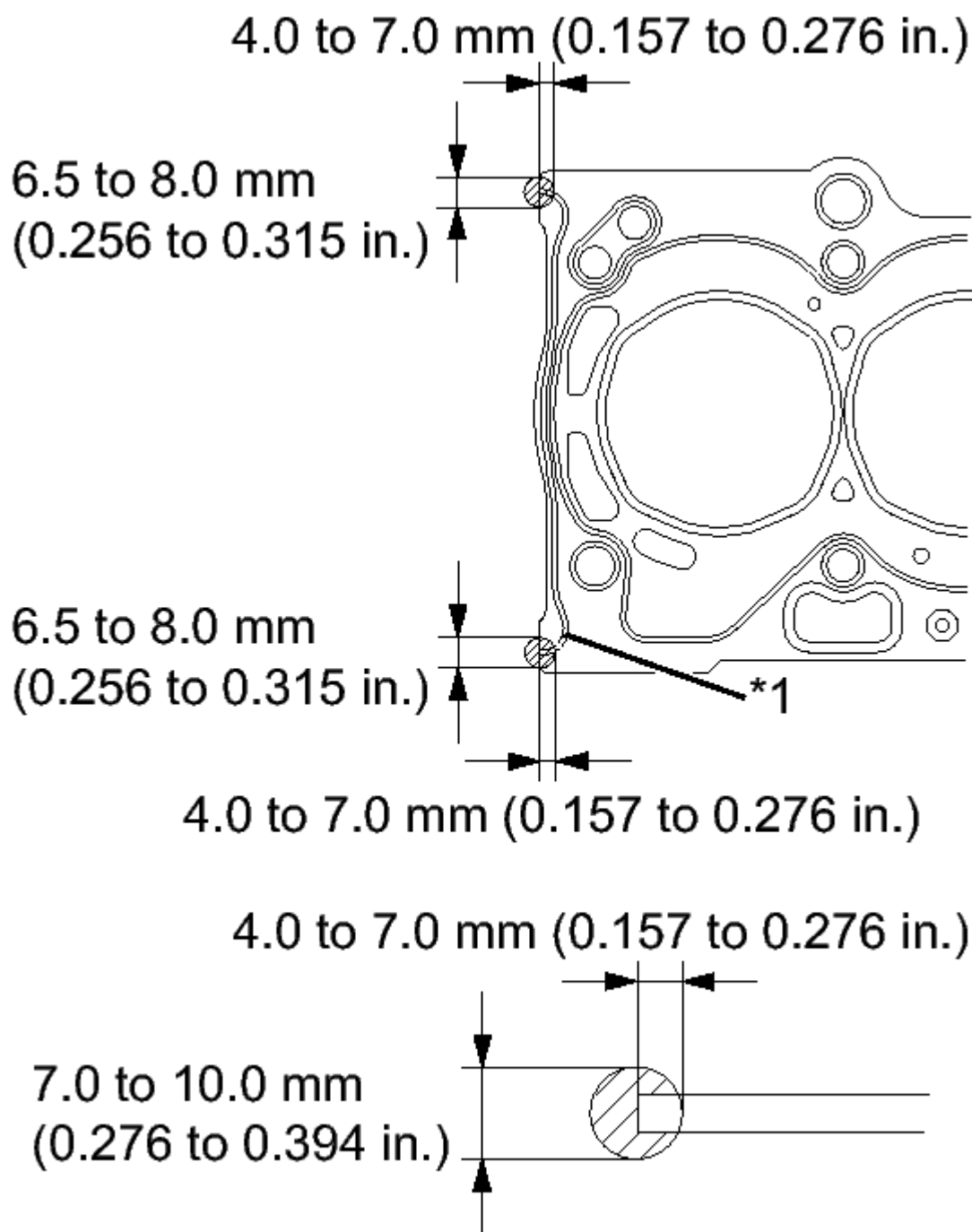


Fig. 246: Applying Seal Packing To Cylinder Head Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Bead
----	------

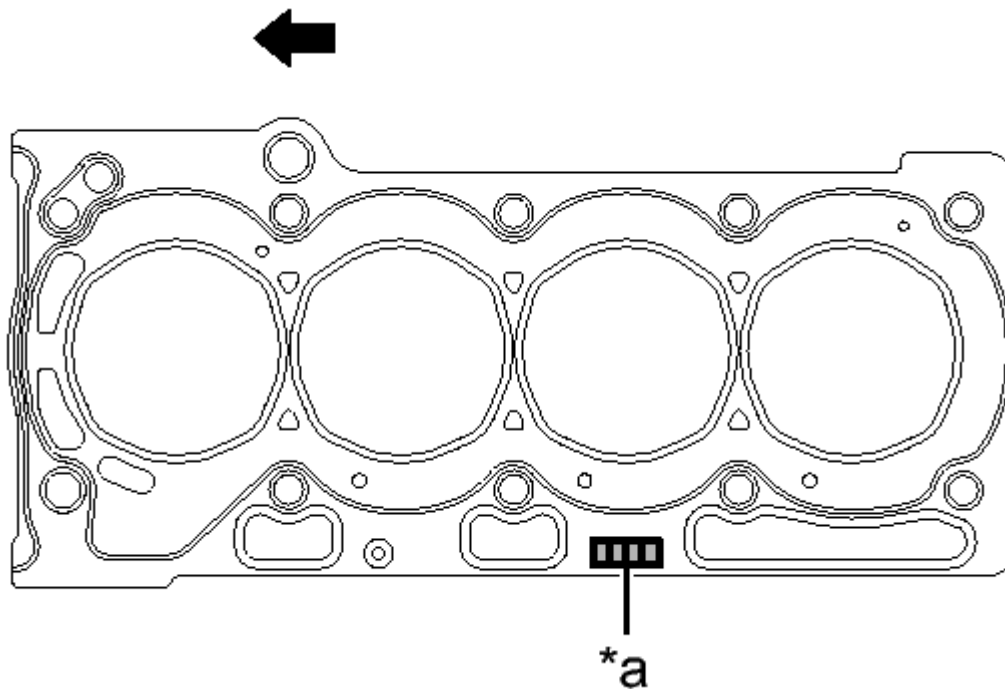
Seal packing

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

NOTE:

- Clean the sealing surfaces of the cylinder head gasket, cylinder head and cylinder block.
- Apply seal packing to the bead on the cylinder head gasket.
- Install the cylinder head within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.

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



P

Fig. 247: Identifying Lot No. Stamp Facing Upward
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Lot No.
	Engine Front

**NOTE:**

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

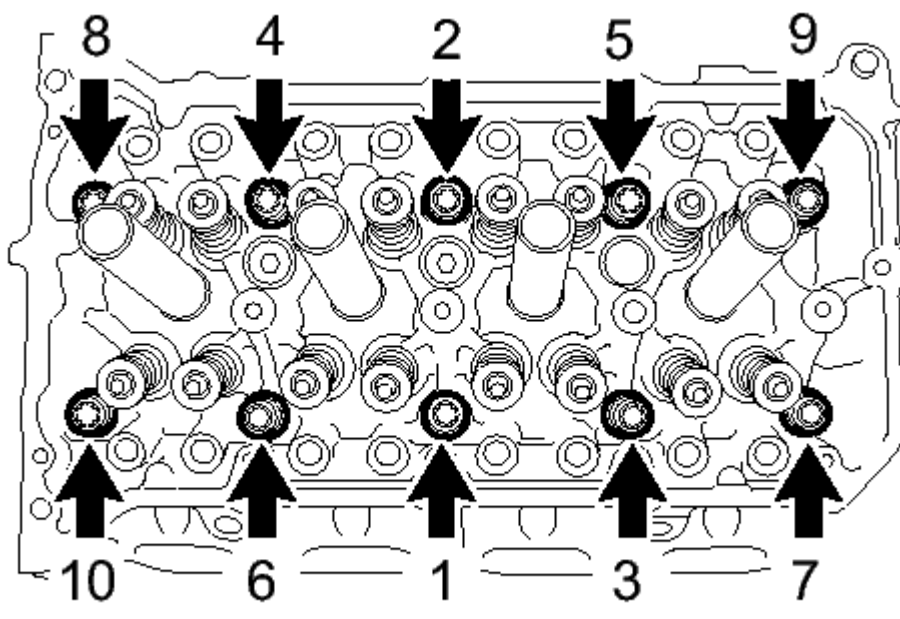
7. INSTALL CYLINDER HEAD SUB-ASSEMBLY**T**

Fig. 248: Locating Cylinder Head Bolts And Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

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

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

Torque: 32 N*m (326 kgf*cm, 24 ft.*lbf)

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

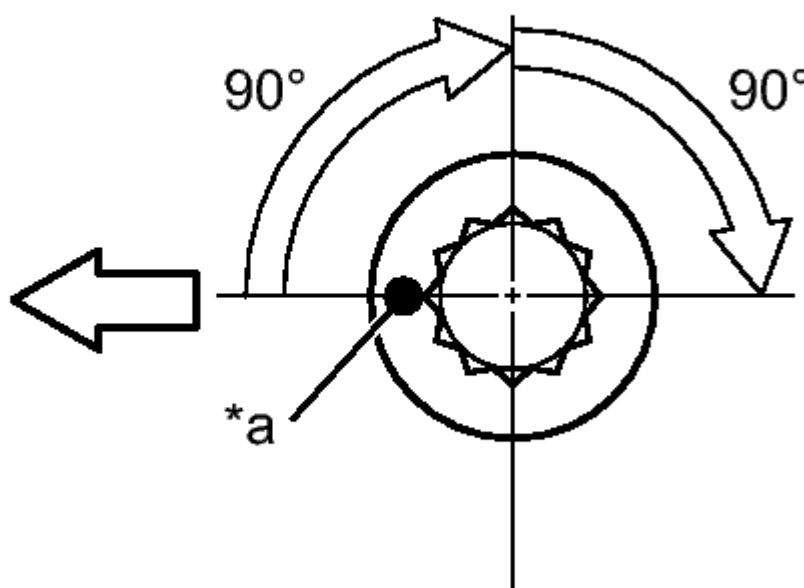
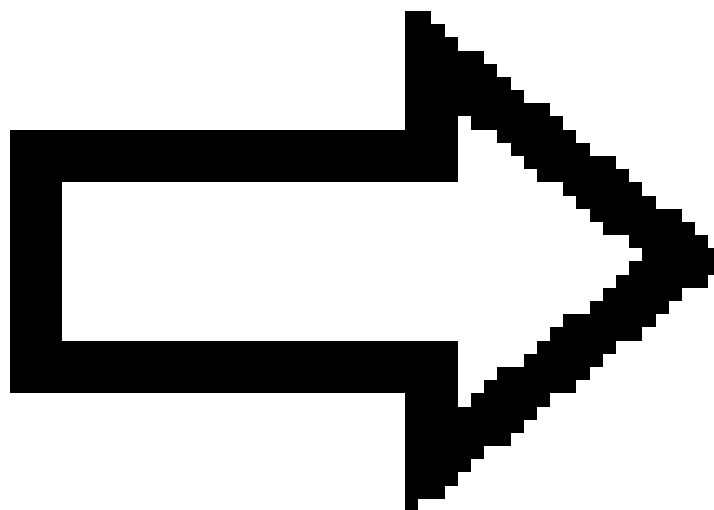


Fig. 249: Identifying Cylinder Head Bolts Paint Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Retighten the cylinder head bolts an additional 90°, and then once more 90° as shown in the illustration.

TEXT IN ILLUSTRATION

*a	Paint Mark



Engine Front

NOTE: **Do not tighten the same bolt twice consecutively.**

- f. Check that the paint mark is now at a 180° angle to the front.
- g. After tightening the cylinder head bolts, wipe off the seal packing material that seeped out from the contact surface between the cylinder head and cylinder block.

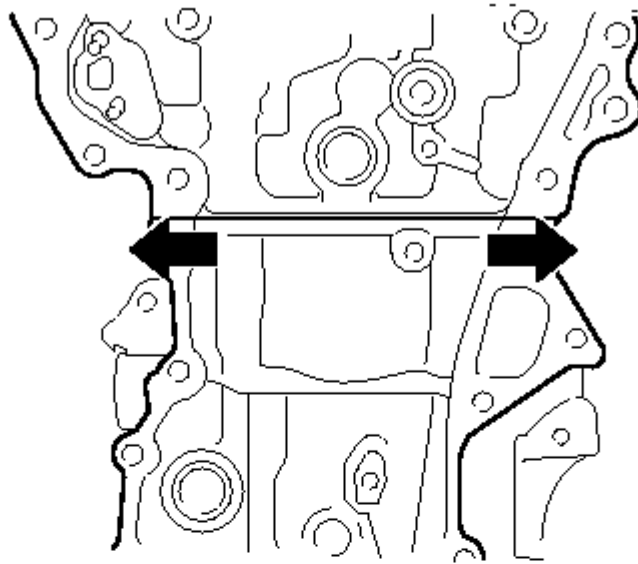
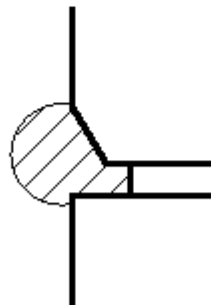
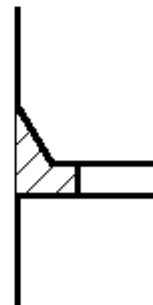
a**b*****c**

Fig. 250: Wiping Off Seal Packing Material
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

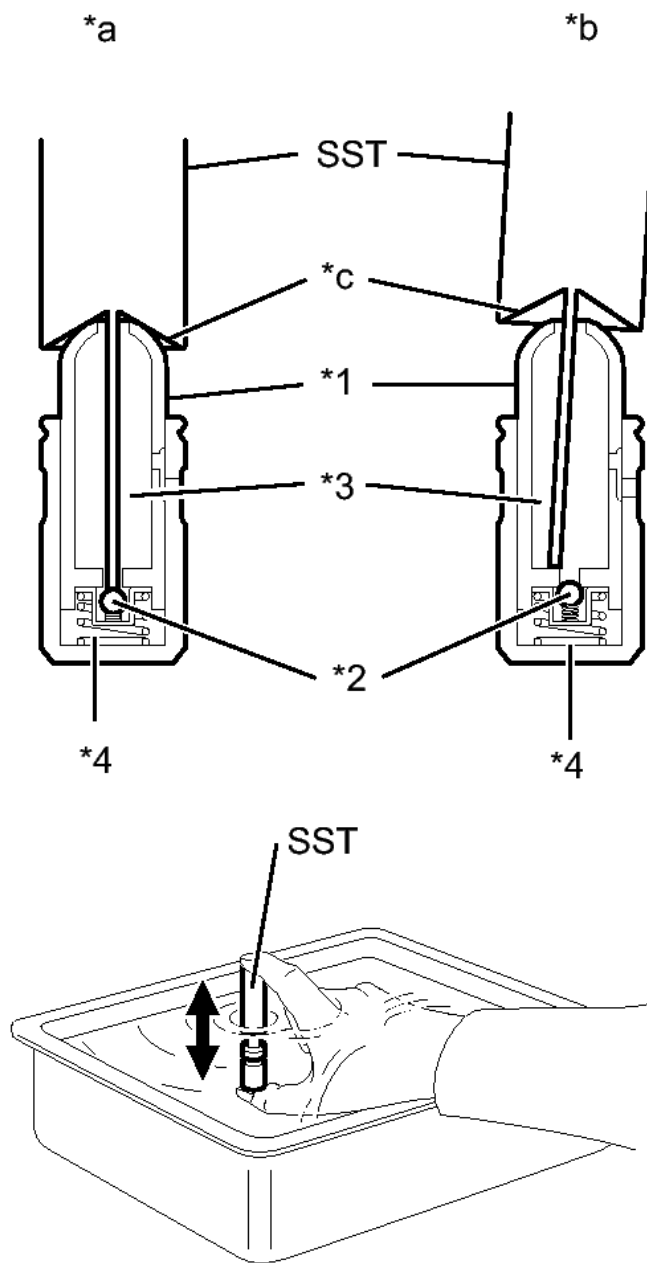
*a	Direction to wipe off
----	-----------------------

*b	Before wiping off
*c	After wiping off

NOTE:

- Be sure to wipe off the seal packing from inside to outside, parallel to the joint line.
- Be sure to avoid clogging the bolt holes when wiping off the seal packing.

8. INSTALL VALVE LASH ADJUSTER ASSEMBLY



T

Fig. 251: Identifying SST Components
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: • Keep the lash adjuster free of dirt and foreign matter.

- **Only use clean engine oil.**

- a. Place the lash adjuster into a container filled with engine oil.

TEXT IN ILLUSTRATION

*1	Plunger
*2	Check Ball
*3	Low Pressure Chamber
*4	High Pressure Chamber
*a	Correct
*b	Incorrect
*c	Taper Part

- b. Insert the tip of SST into the lash adjuster plunger and use the tip to press down on the check ball inside the plunger.

- **SST: 09276-75010**

- c. Squeeze SST and the lash adjuster together to move the plunger up and down 5 to 6 times.
- d. Check the movement of the plunger and bleed it.

OK

Plunger moves up and down.

NOTE: When bleeding the high-pressure chamber, make sure that the tip of SST is actually pressing the check ball as shown in the illustration. If the check ball is not pressed, the high-pressure chamber will not be bled.

- e. After bleeding, remove SST. Then, try to press the plunger quickly and firmly by hand.

OK

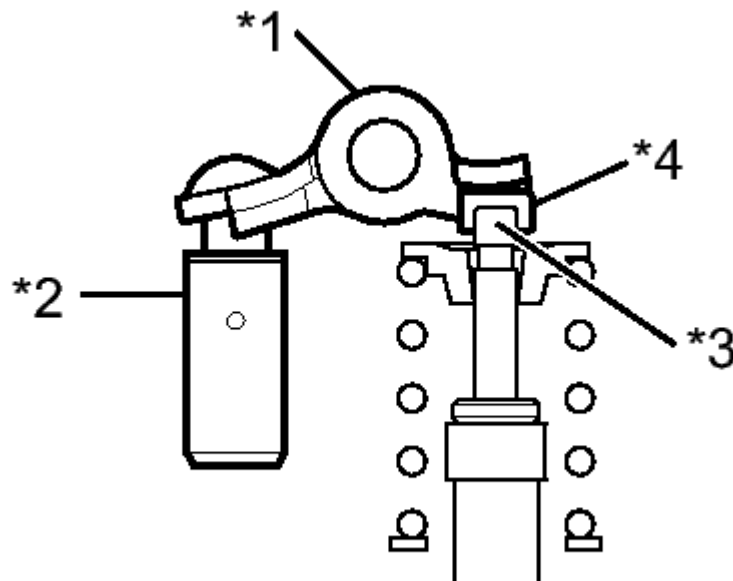
Plunger is very difficult to move.

If the result is not as specified, replace the lash adjuster.

- f. Install the lash adjusters.

NOTE: Install each lash adjuster to the same place it was removed from.

9. INSTALL NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY

**P****Fig. 252: Installing Valve Rocker Arms**

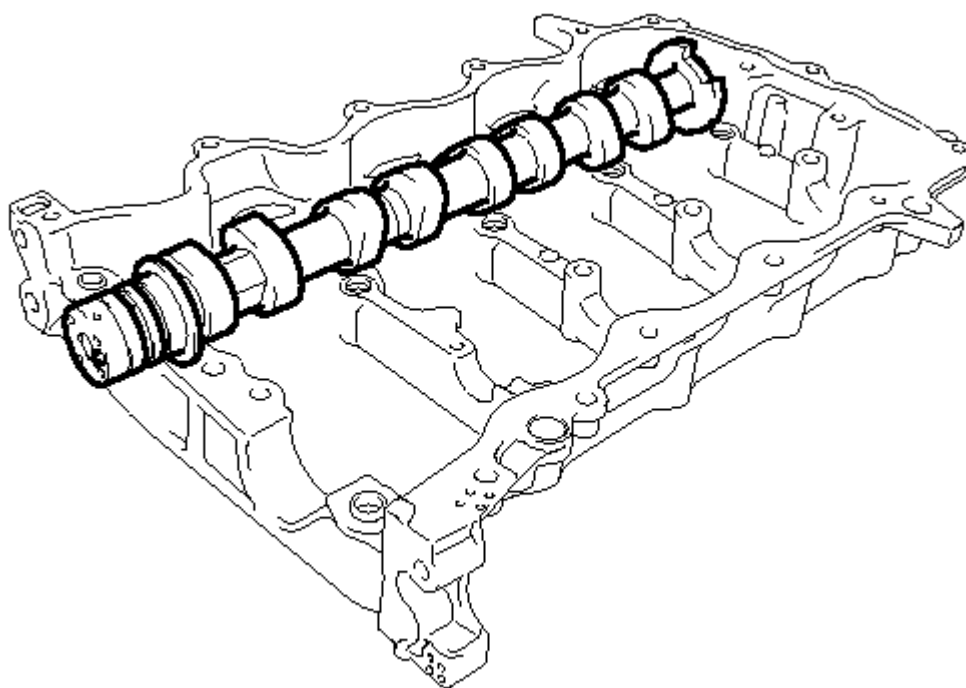
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Apply engine oil to the lash adjuster tip and valve stem cap end.
- Make sure that the valve rocker arms are installed as shown in the illustration.

TEXT IN ILLUSTRATION

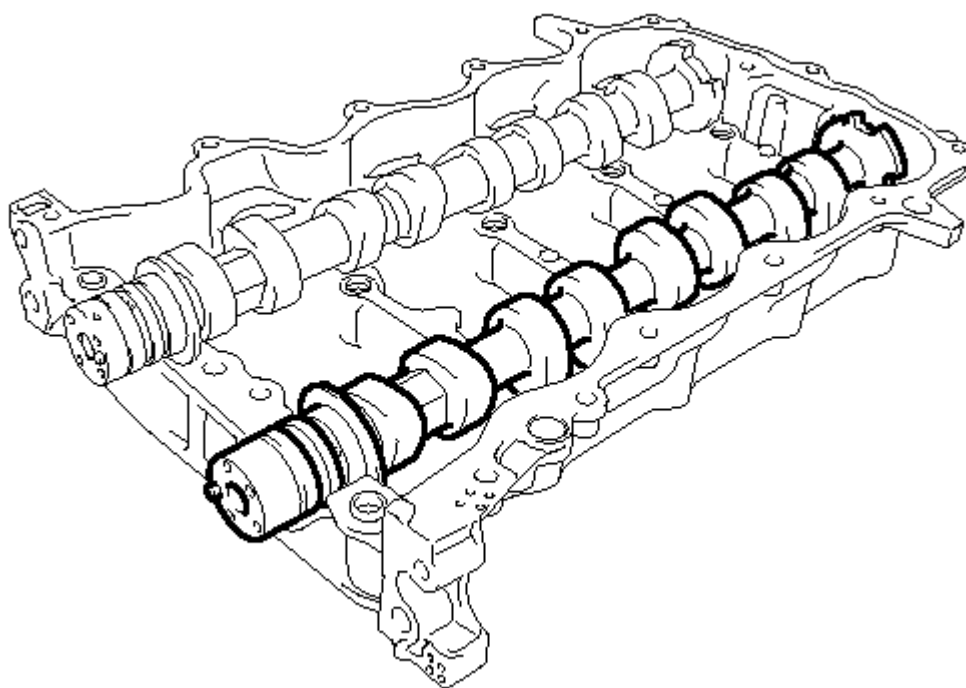
*1	Valve Rocker Arm
*2	Lash Adjuster
*3	Valve Stem
*4	Valve Stem Cap

10. INSTALL CAMSHAFT

**C****Fig. 253: Installing Camshaft****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- a. Clean the camshaft journals.
- b. Apply a light coat of engine oil to the camshaft journals and camshaft housing.
- c. Install the camshaft to the camshaft housing.

11. INSTALL NO. 2 CAMSHAFT

**C****Fig. 254: Installing No. 2 Camshaft****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- a. Clean the camshaft journals.
- b. Apply a light coat of engine oil to the camshaft journals and camshaft housing.
- c. Install the No. 2 camshaft to the camshaft housing.

12. INSTALL CAMSHAFT BEARING CAP

- a. Apply engine oil to the bearing caps.

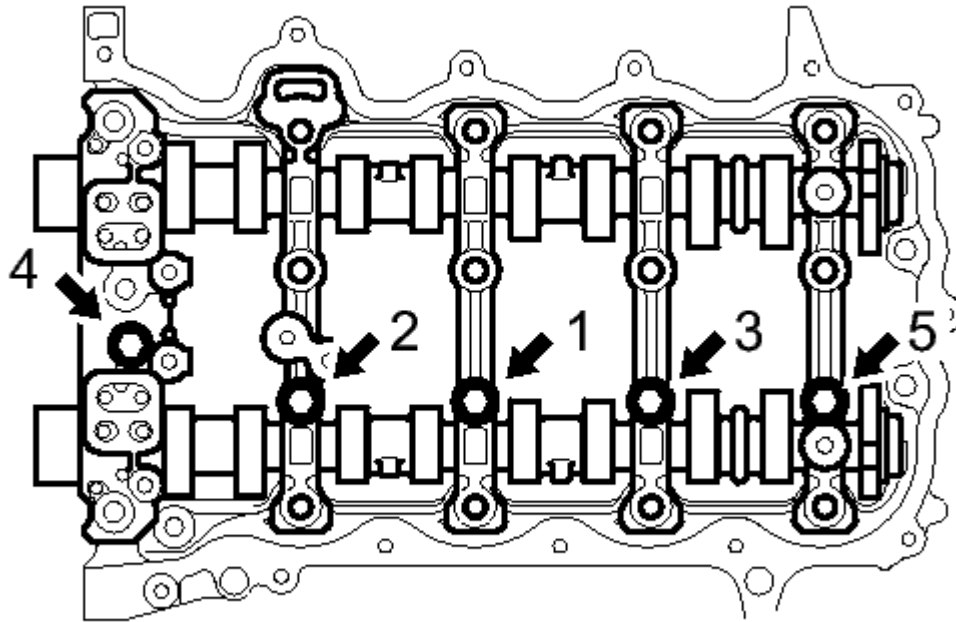
**C**

Fig. 255: Identifying Camshaft Bearing Caps

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

- b. Install the 5 bearing caps to the camshaft housing.
- c. Tighten the 5 bolts in the order shown in the illustration.

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

13. INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY

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

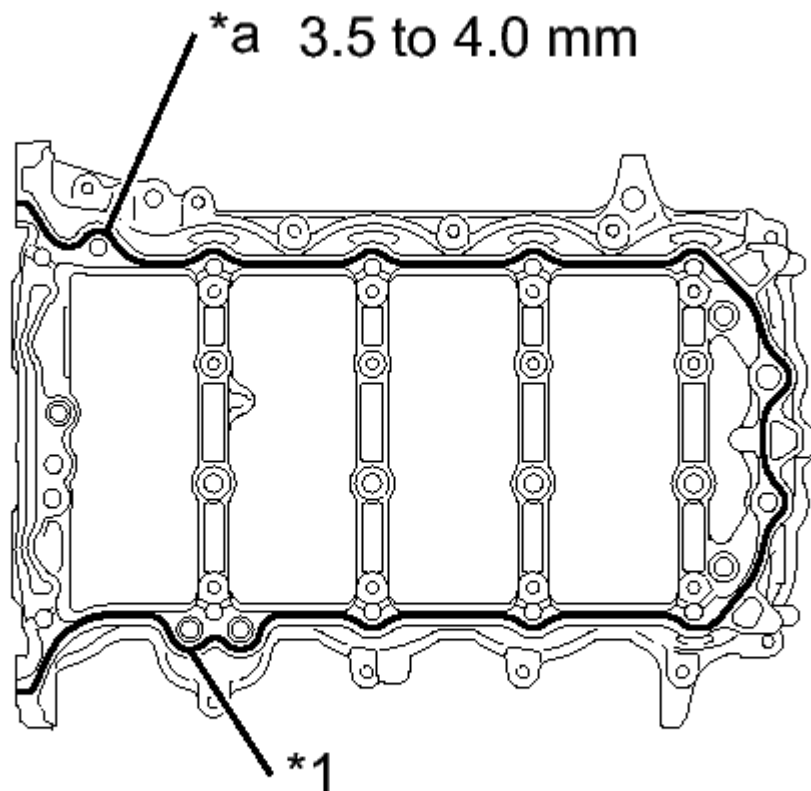
**C**

Fig. 256: Applying Camshaft Housing Seal Packing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Seal Packing
*a	Bead Diameter

Seal packing

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

Bead diameter

3.5 to 4.0 mm (0.138 to 0.158 in.)

NOTE:

- Remove any oil from the contact surfaces.
- Install the camshaft housing within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.
- Do not start the engine for at least 2 hours after installing.

- b. Set the crankshaft in the position (40° BTDC) shown in the illustration.

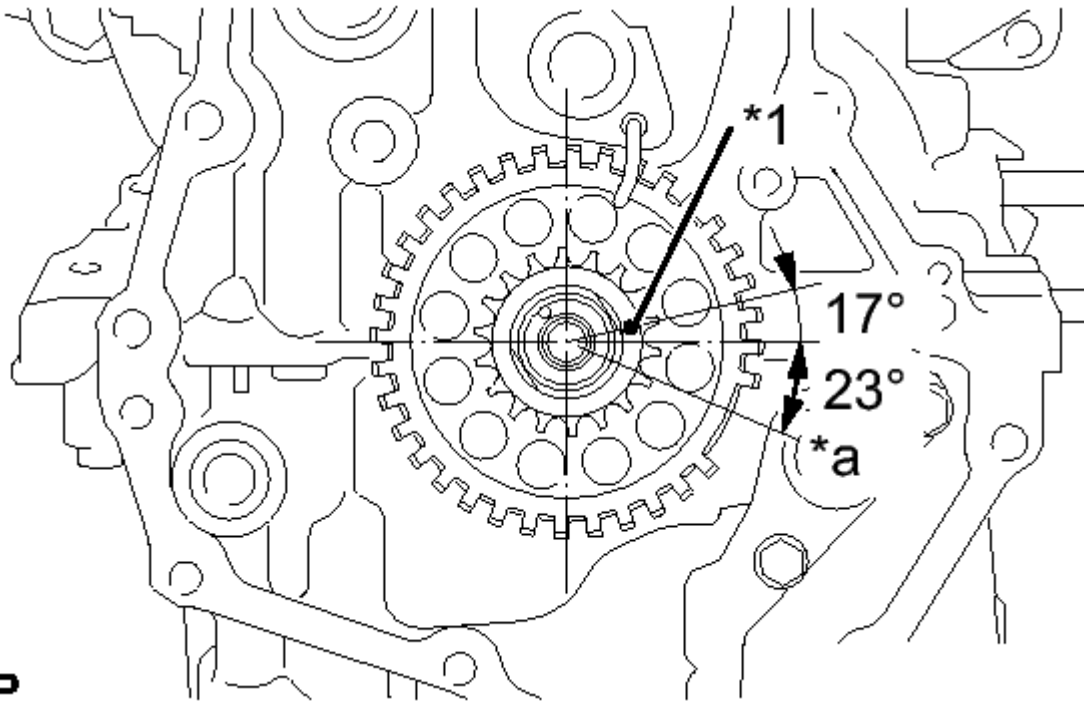
**P**

Fig. 257: Setting Crankshaft In Position

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

TEXT IN ILLUSTRATION

*1	Timing Mark
*a	TDC

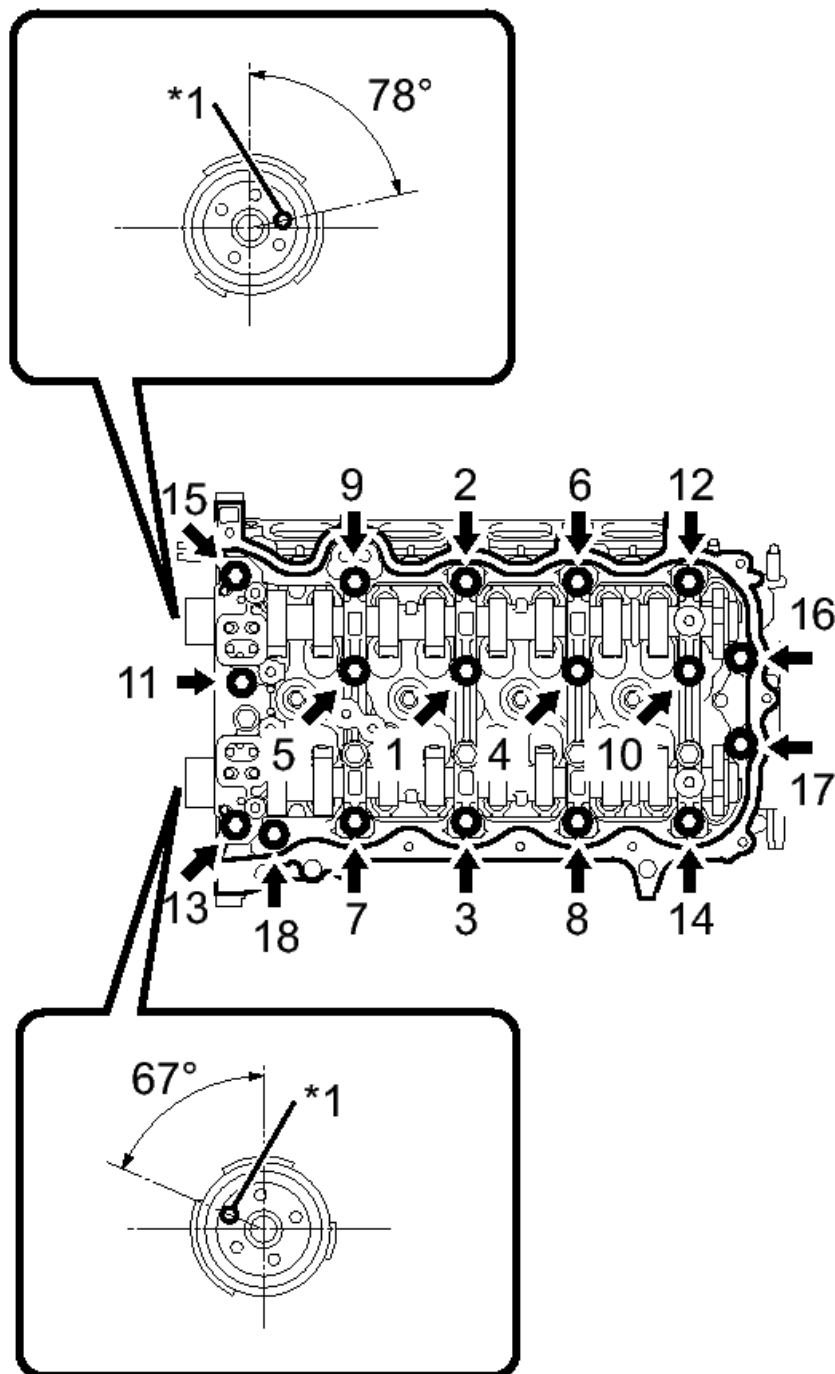
NOTE:

Turn the crankshaft clockwise when positioning the No. 1 cylinder after the camshaft housing is installed.

HINT:

Make sure that the timing mark of the crankshaft is positioned as shown in the illustration.

- c. Set the camshaft and No. 2 camshaft as shown in the illustration.



C

Fig. 258: Setting Camshaft And No. 2 Camshaft

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

TEXT IN ILLUSTRATION

*1	Straight Pin
----	--------------

HINT:

Make sure that the straight pin of the camshaft is positioned as shown in the illustration.

- d. Install the camshaft housing and tighten the 18 bolts in the order shown in the illustration.

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

NOTE:

- After installing the camshaft housing, make sure that the cam lobes are positioned as shown in the illustration.
- If any of the bolts are loosened during installation, remove the camshaft housing, clean the installation surfaces, and reapply seal packing.
- If the camshaft housing is removed because any of the bolts are loosened during installation, make sure that the previously applied seal packing does not enter any oil passages.
- After installing the camshaft housing, wipe off any seal packing that seeped out from between the housing and the cylinder head.

14. INSTALL CAMSHAFT TIMING GEAR ASSEMBLY

- a. Check that the straight pin is installed on the camshaft.

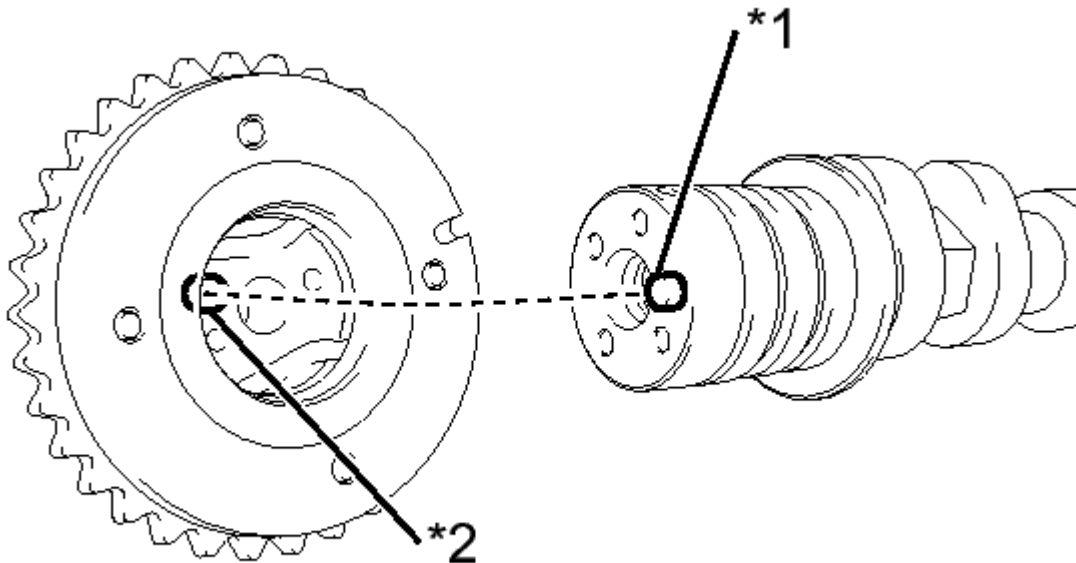
**P**

Fig. 259: Aligning Camshaft Timing Gear Straight Pin And Straight Pin Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Put the camshaft timing gear and camshaft together by aligning the straight pin hole and straight pin.

TEXT IN ILLUSTRATION

*1	Straight Pin
*2	Straight Pin Hole

NOTE:

- Do not forcefully push in the camshaft timing gear. This may cause the camshaft straight pin tip to damage the installation surface of the camshaft timing gear.
- Do not turn the camshaft timing gear in the retard direction (clockwise).

- c. Tighten the flange bolt with the camshaft timing gear secured in place.

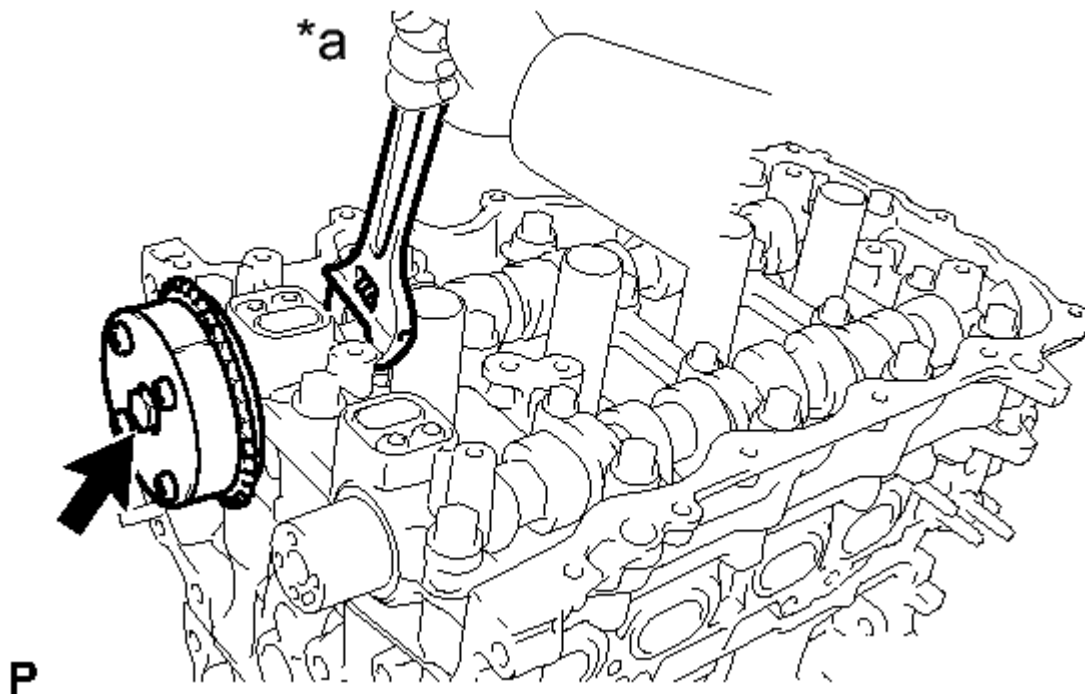


Fig. 260: Tightening Camshaft Timing Gear Flange Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

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

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

- d. Check that the camshaft timing gear can move in the retard direction (clockwise) and locks in the most retarded position.

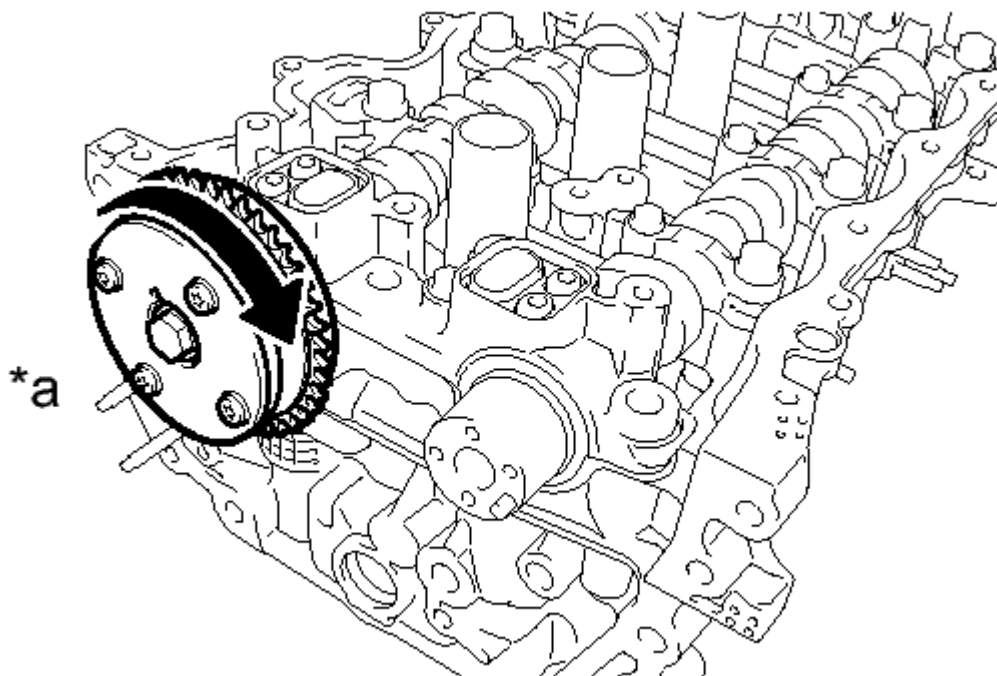
**P**

Fig. 261: Locking Camshaft Timing Gear In The Most Retarded Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Lock
----	------

15. INSTALL CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY

- a. Check that the straight pin is installed on the No. 2 camshaft.

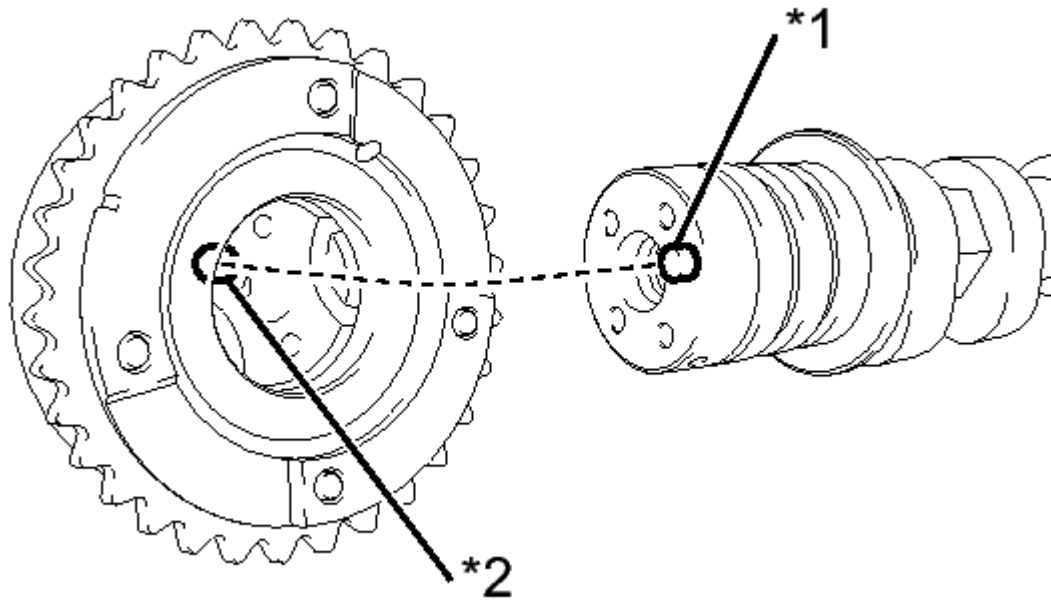
**P**

Fig. 262: Aligning Camshaft Timing Exhaust Gear Straight Pin And Straight Pin Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Put the camshaft timing exhaust gear and No. 2 camshaft together by aligning the straight pin hole and straight pin.

TEXT IN ILLUSTRATION

*1	Straight Pin
*2	Straight Pin Hole

NOTE: Do not forcefully push in the camshaft timing gear. This may cause the camshaft straight pin tip to damage the installation surface of the camshaft timing gear.

- c. Tighten the flange bolt with the camshaft timing exhaust gear secured in place.

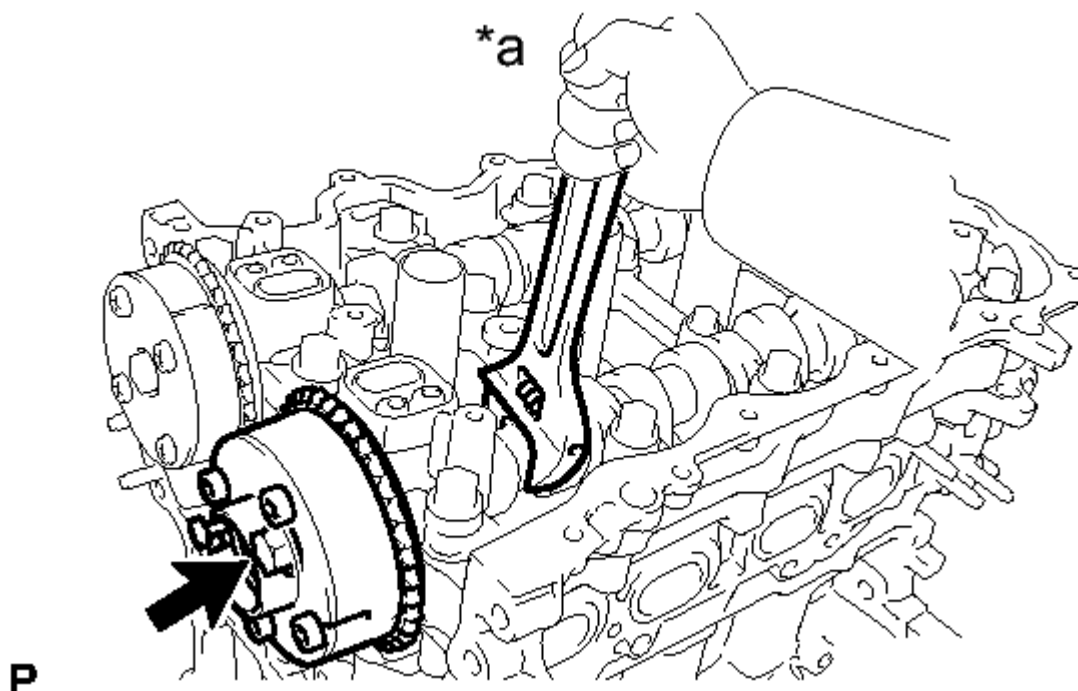


Fig. 263: Tightening Camshaft Timing Exhaust Gear Flange Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

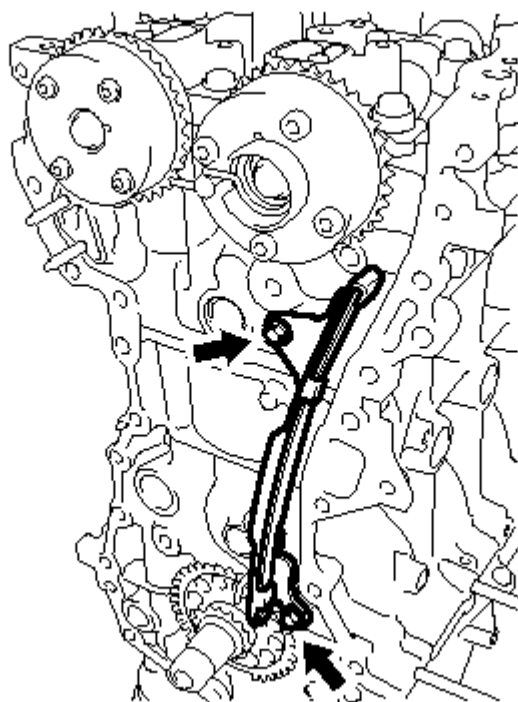
TEXT IN ILLUSTRATION

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

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

- d. Make sure that the camshaft timing exhaust gear is locked.

16. INSTALL TIMING CHAIN GUIDE



C
Fig. 264: Identifying Timing Chain Guide Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Install the timing chain guide with the 2 bolts.

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

17. INSTALL CHAIN SUB-ASSEMBLY

- a. Set the crankshaft in the position (90° ATDC) shown in the illustration.

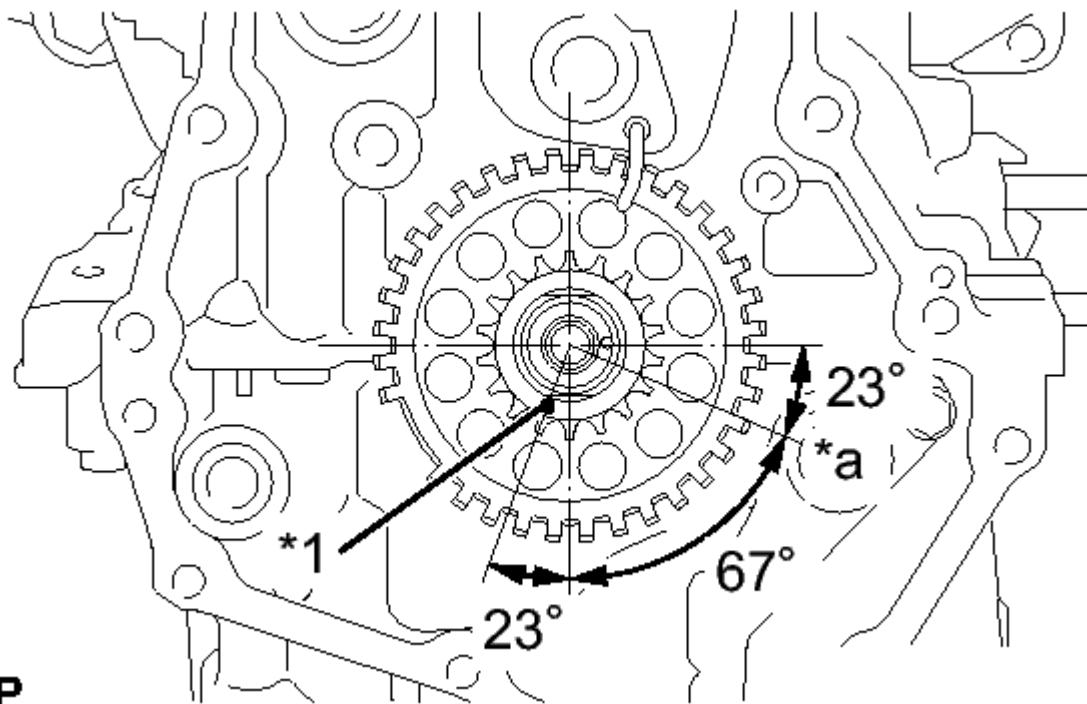


Fig. 265: Setting Crankshaft In Position

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

TEXT IN ILLUSTRATION

*1	Timing Mark
*a	TDC

HINT:

Make sure that the timing mark of the crankshaft is positioned as shown in the illustration.

- Set the camshaft timing gear and camshaft timing exhaust gear in the positions (20° ATDC) shown in the illustration.

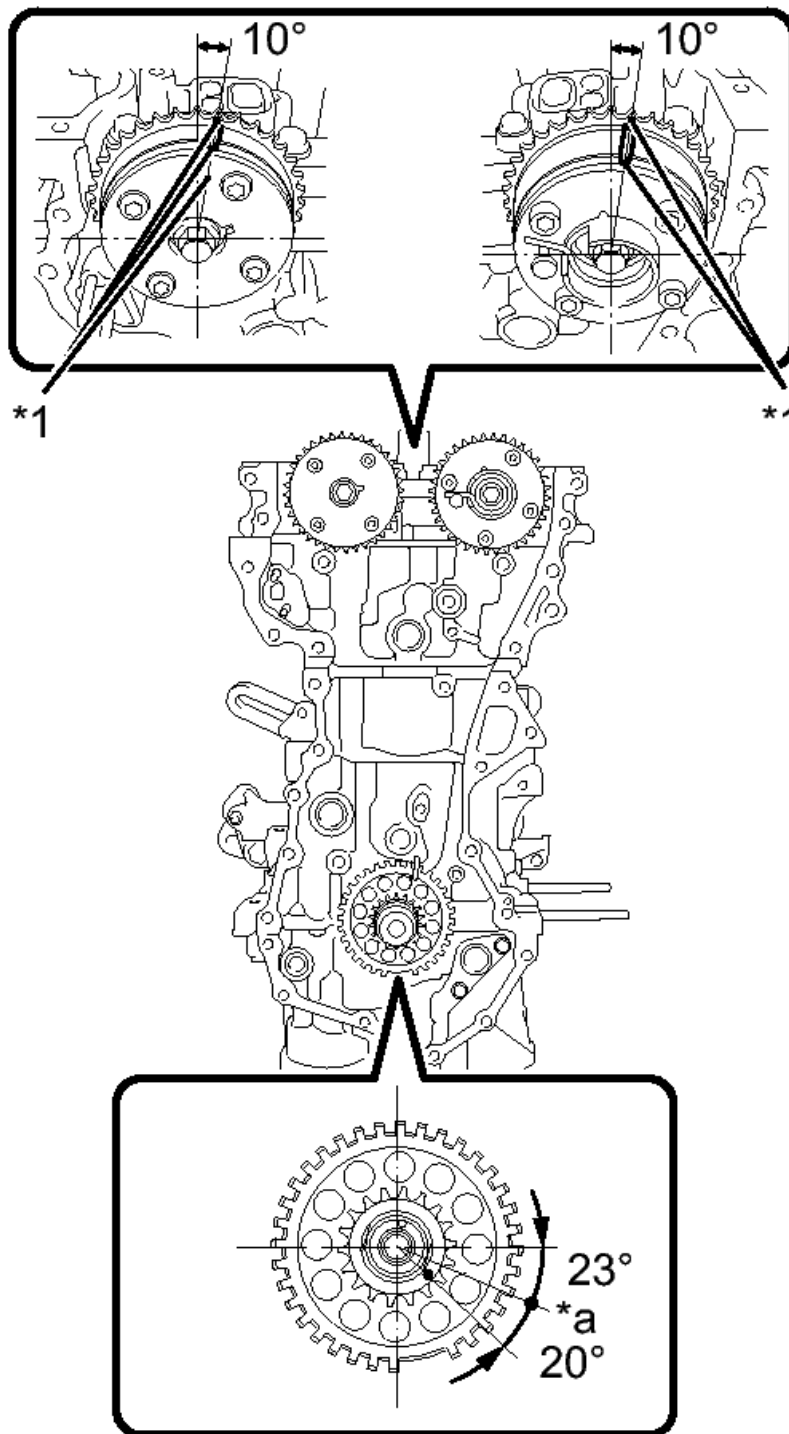
**P**

Fig. 266: Setting Camshaft Timing Gear And Camshaft Timing Exhaust Gear In Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Timing Mark
*a	TDC

- c. Set the crankshaft in the position (20° ATDC) shown in the illustration.
- d. Align the timing marks of the camshaft with the mark plates of the timing chain and install the timing chain.

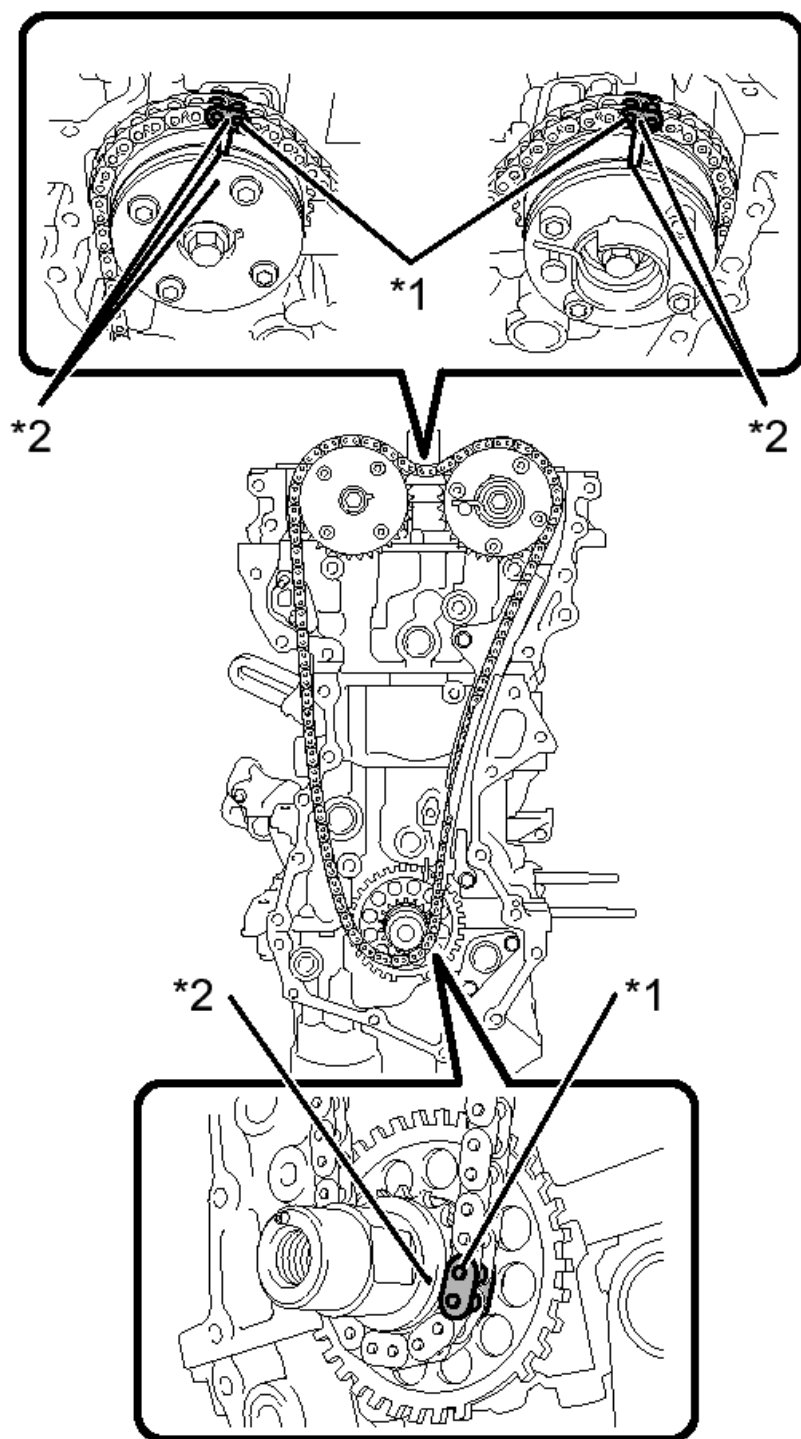
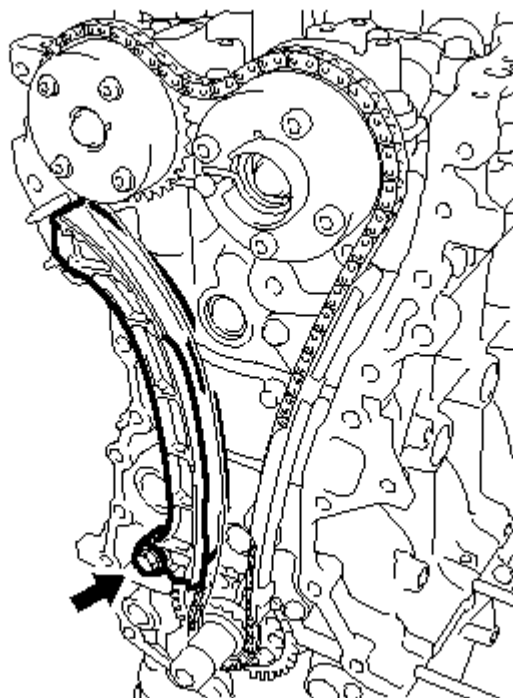
**C**

Fig. 267: Aligning Timing Marks Of Camshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Mark Plate
*2	Timing Mark

18. INSTALL TIMING CHAIN TENSION ARM



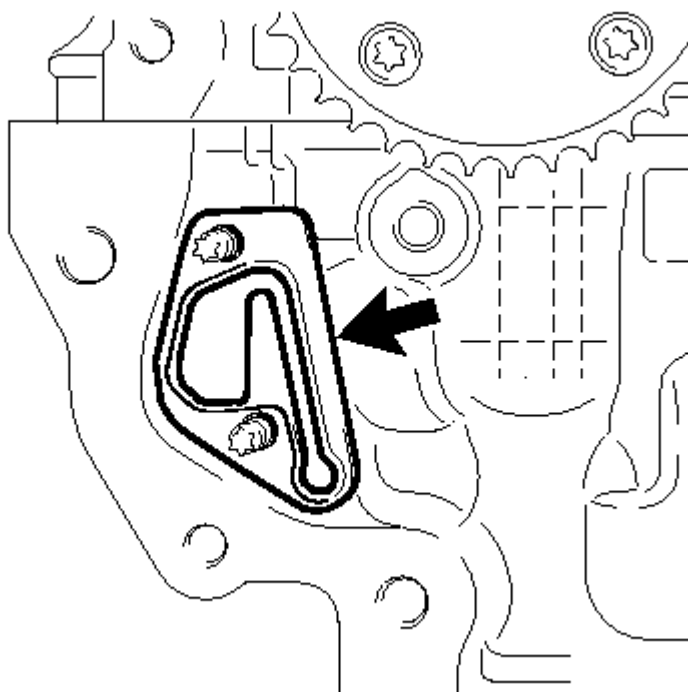
C

Fig. 268: Identifying Timing Chain Tension Arm Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

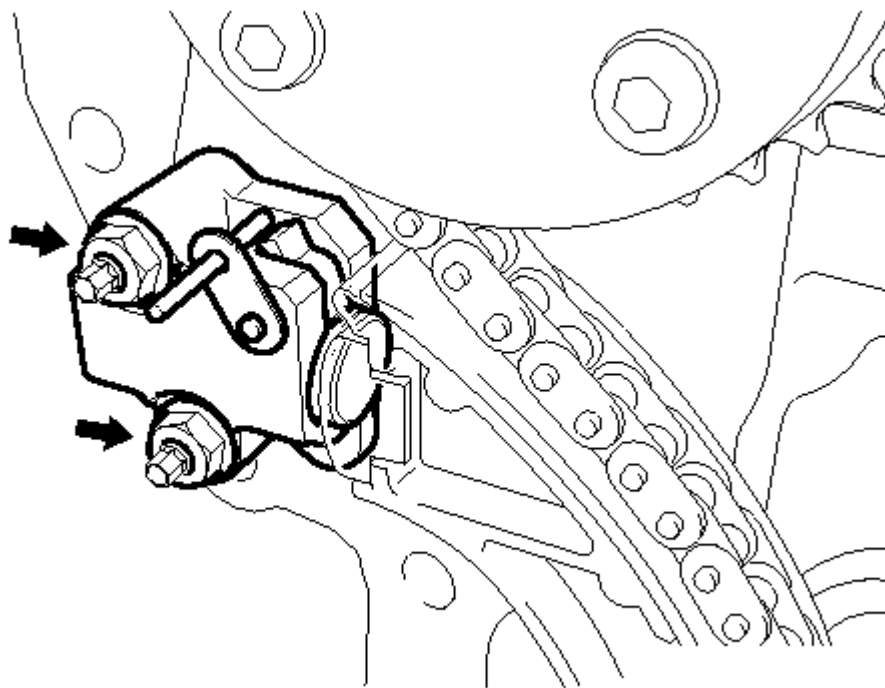
- Install the timing chain tension arm with the bolt.

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

19. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY

**P****Fig. 269: Identifying Chain Tensioner Gasket****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- a. Install a new chain tensioner gasket to the cylinder head.
- b. Install the No. 1 chain tensioner with the 2 nuts.

**C****Fig. 270: Identifying No. 1 Chain Tensioner Nuts**

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

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

- c. Install the No. 2 chain vibration damper with the 2 bolts.

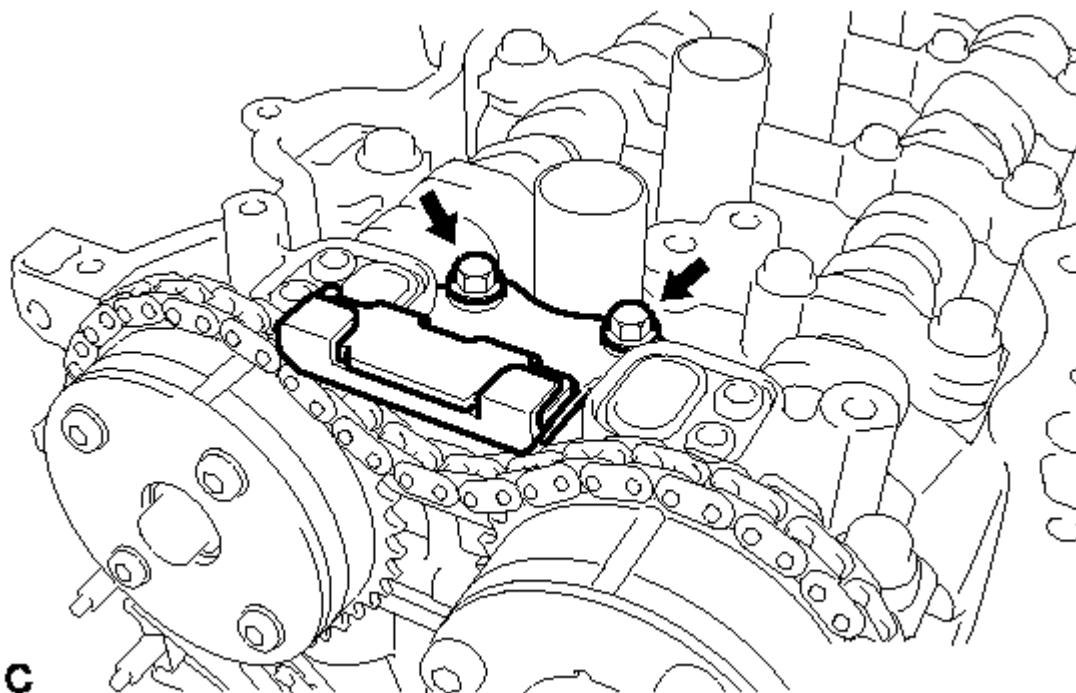
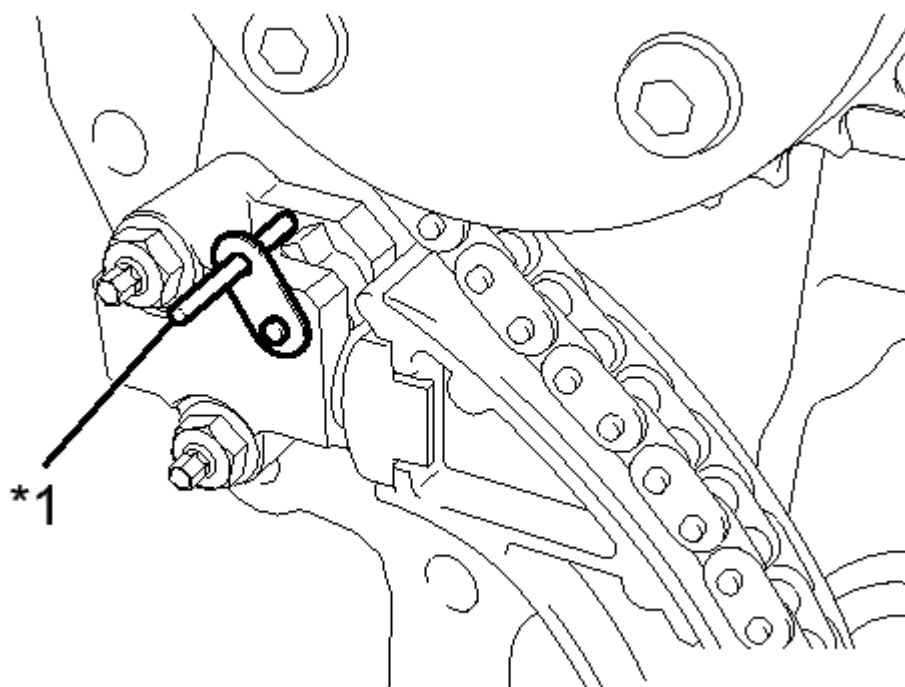


Fig. 271: Identifying No. 2 Chain Vibration Damper Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- d. Remove the bar from the No. 1 chain tensioner.

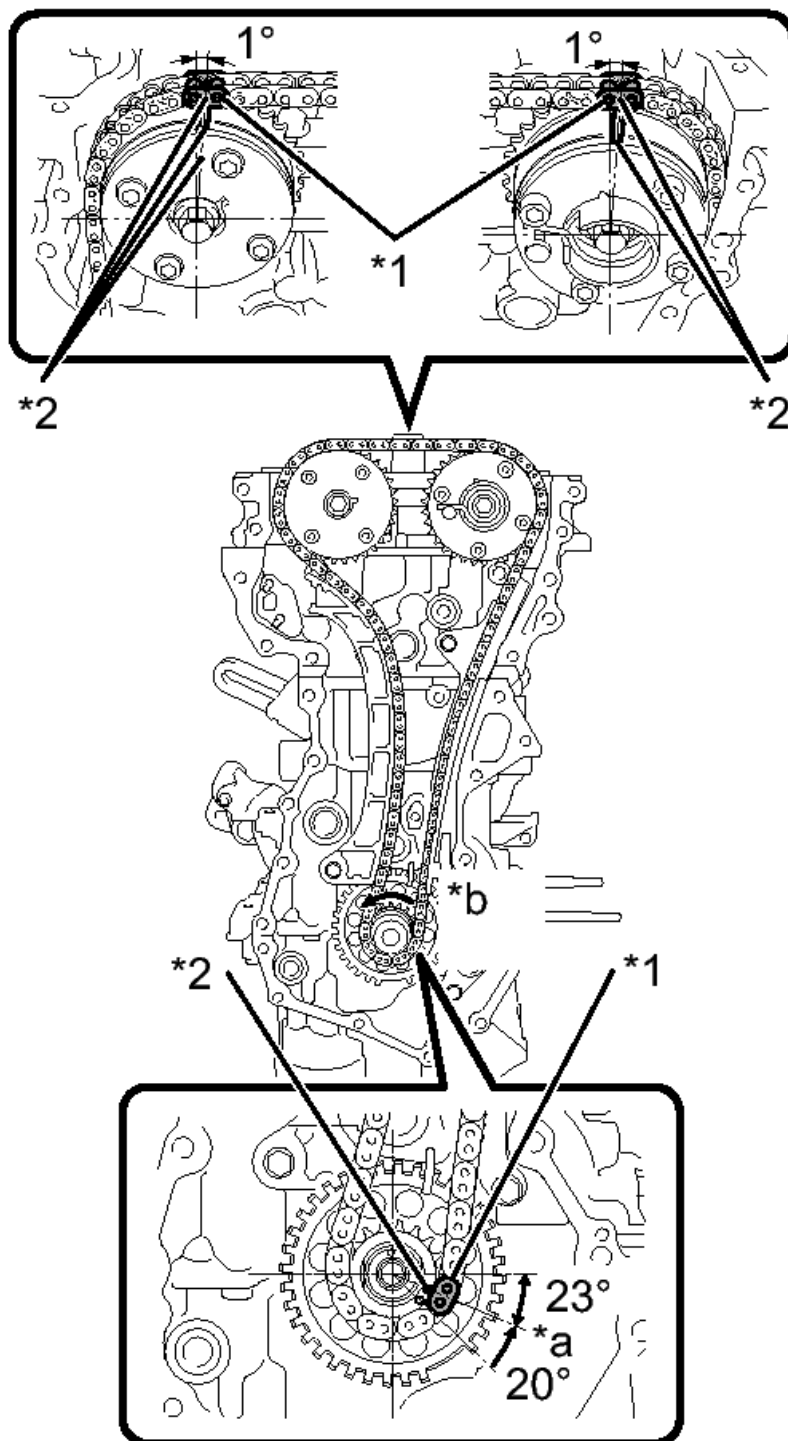
**C****Fig. 272: Unlocking The Plunger**

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

TEXT IN ILLUSTRATION

*1	Bar
----	-----

- e. Turn the crankshaft approximately 20° counterclockwise to set it to TDC. Make sure that the timing marks and mark plates are correctly positioned and that the chain is securely fit into the tension arm, guide and vibration damper.



C

Fig. 273: Identifying Timing Marks And Mark Plates Are Correctly Positioned
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Mark Plate
*2	Timing Mark
*a	TDC
*b	Turn

20. **INSTALL TIMING CHAIN COVER OIL SEAL** . Refer to **INSTALLATION - Step 1**
21. **INSTALL THERMOSTAT** . Refer to **INSTALLATION - Step 1**
22. **INSTALL NO. 2 WATER INLET HOUSING GASKET** . Refer to **INSTALLATION - Step 2**
23. **INSTALL WATER INLET** . Refer to **INSTALLATION - Step 3**
24. **INSTALL WATER INLET HOUSING** . Refer to **INSTALLATION - Step 2**
25. **INSTALL TIGHT PLUG** . Refer to **INSTALLATION - Step 3**
26. **INSTALL TIMING CHAIN COVER SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 4**
27. **INSTALL CRANKSHAFT PULLEY**
 - a. Align the pulley set key with the key groove of the crankshaft pulley, and then slide on the crankshaft pulley.

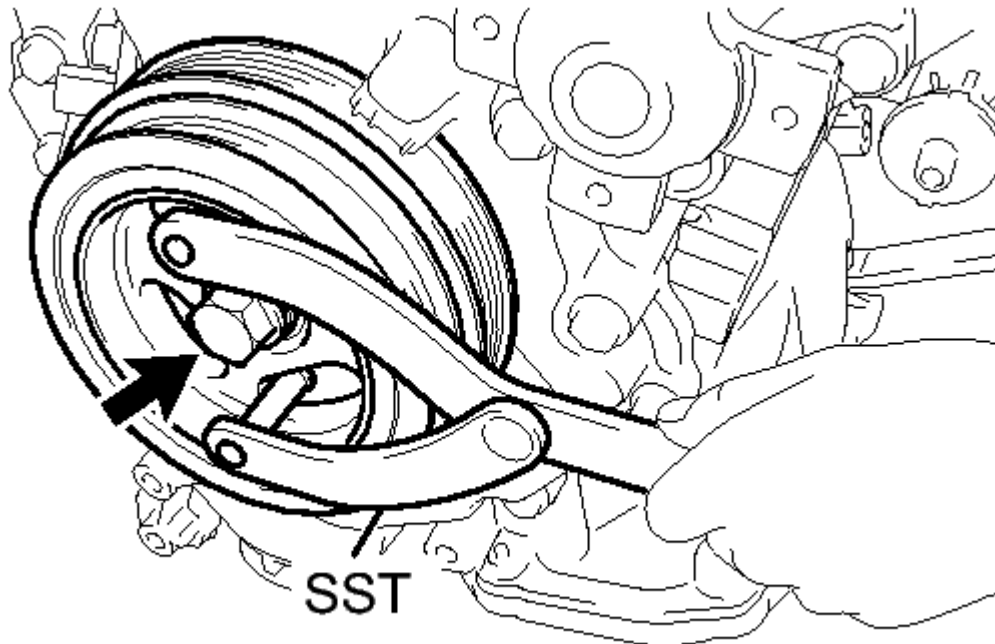
**P**

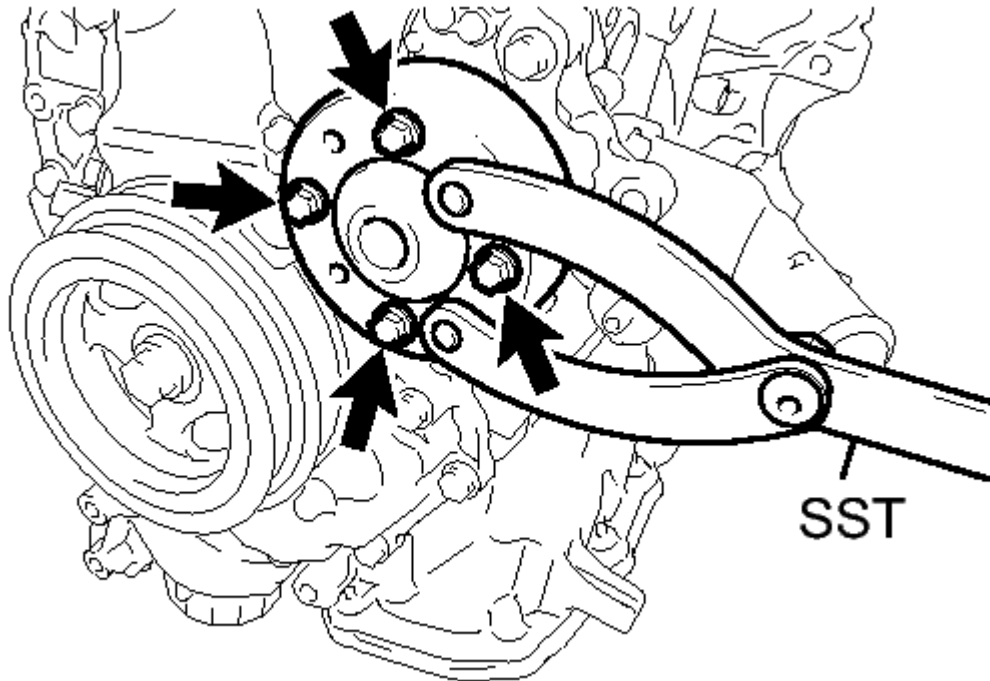
Fig. 274: Aligning The Pulley Set Key With The Key Groove Of Crankshaft Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using SST, install the crankshaft pulley bolt.
 - **SST: 09960-10010**
09962-01000
09963-01000

Torque: 128 N*m (1305 kgf*cm, 94 ft.*lbf)

28. INSTALL WATER PUMP PULLEY

- **SST: 09960-10010**
09962-01000
09963-00600



P

Fig. 275: Identifying Water Pump Pulley Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Using SST, install the water pump pulley with the 4 bolts.
 - **SST: 09960-10010**
09963-00600

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

29. INSTALL OIL FILTER ELEMENT

- a. Clean the inside of the oil filter cap, the threads and gasket groove.

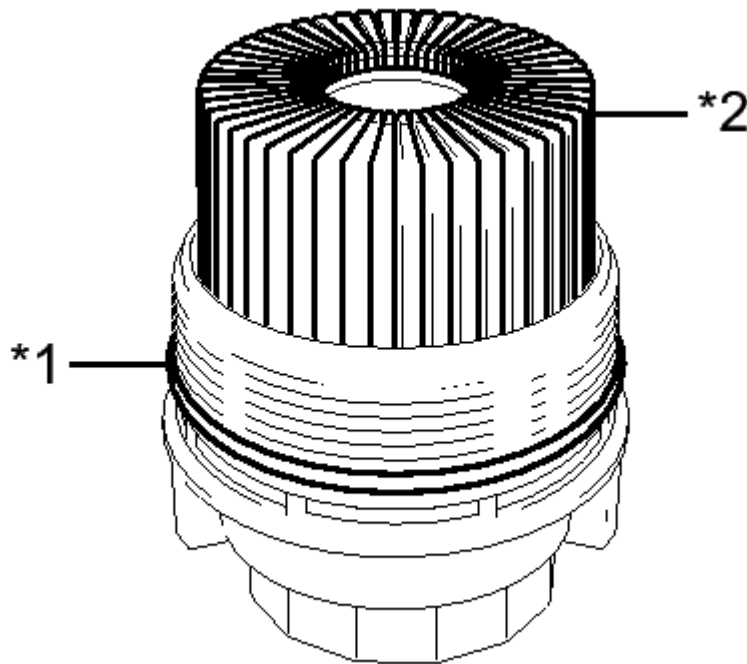
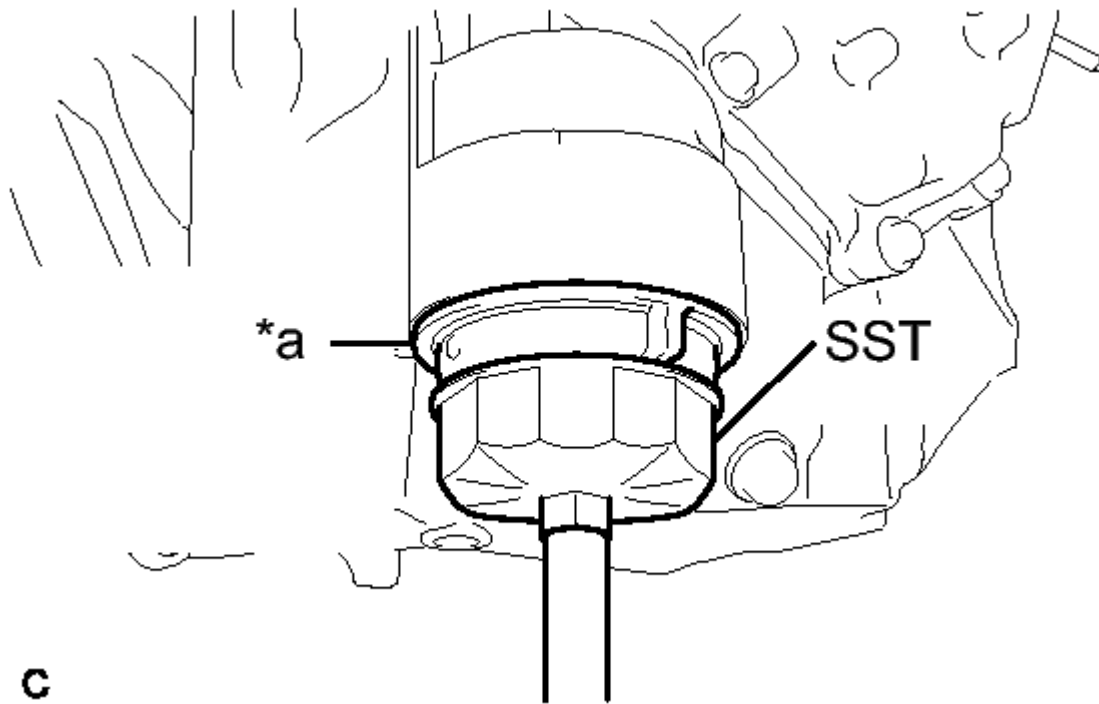
**P**

Fig. 276: Identifying Oil Filter Element and Cap Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Oil Filter Cap Gasket
*2	Oil Filter Element

- Apply a small amount of engine oil to a new oil filter cap gasket and install it to the oil filter cap.
- Set a new oil filter element to the oil filter cap.
- Remove any dirt or foreign matter from the installation surface of the engine.
- Apply a small amount of engine oil to the oil filter cap gasket again and temporarily tighten the oil filter cap.
- Using SST, tighten the oil filter cap.

**Fig. 277: Tightening Oil Filter Cap**

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

TEXT IN ILLUSTRATION

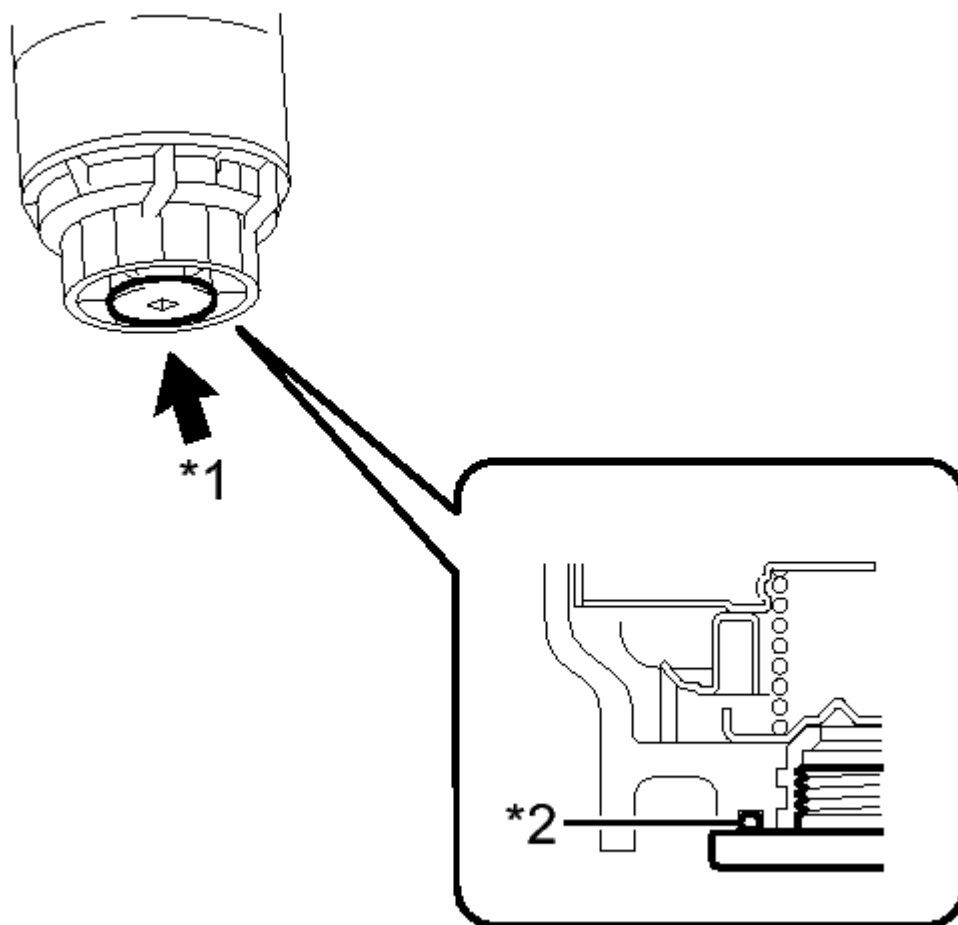
*a	No Clearance
----	--------------

- SST: 09228-06501

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

- Make sure that the oil filter is installed securely as shown in the illustration.
- Be careful that the oil filter cap gasket does not get caught between the parts.

- g. Apply a small amount of engine oil to a new drain plug O-ring, and install it to the oil filter cap.

**T****Fig. 278: Identifying Oil Filter Drain Plug O-Ring**

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

TEXT IN ILLUSTRATION

*1	Oil Filter Drain Plug
*2	O-ring

NOTE: Before installing the O-ring, remove any dirt or foreign matter from the installation surface of the oil filter cap.

- h. Install the oil filter drain plug.

Torque: 13 N*m (127 kgf*cm, 9 ft.*lbf)

NOTE: Be careful that the O-ring does not get caught between the parts.

30. INSTALL ENGINE COOLANT TEMPERATURE SENSOR

- a. Install a new gasket to the engine coolant temperature sensor.

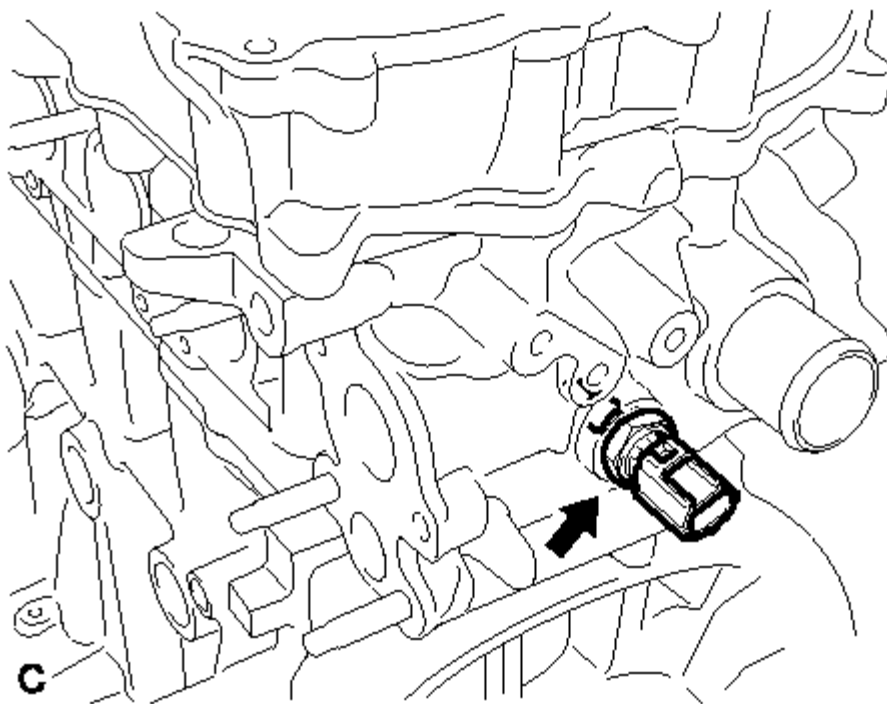


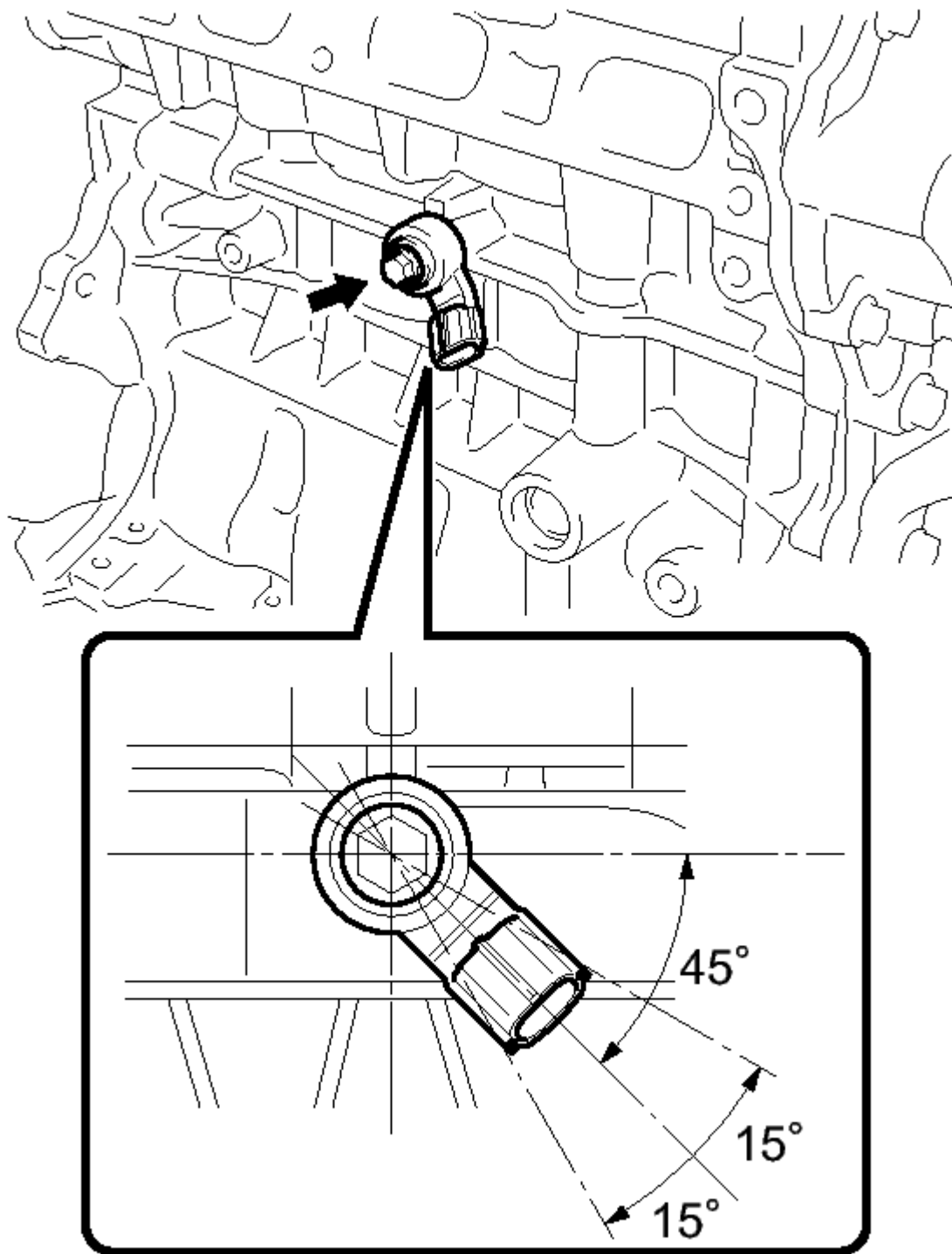
Fig. 279: Identifying Engine Coolant Temperature Sensor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a 19 mm deep socket wrench, install the engine coolant temperature sensor.

Torque: 20 N*m (200 kgf*cm, 14 ft.*lbf)

31. INSTALL KNOCK SENSOR

- a. Install the knock sensor with the bolt.

**C****Fig. 280: Installing Knock Sensor**

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

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

NOTE: Make sure that the knock sensor is as shown in the illustration.

32. INSTALL ENGINE OIL PRESSURE SWITCH ASSEMBLY

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

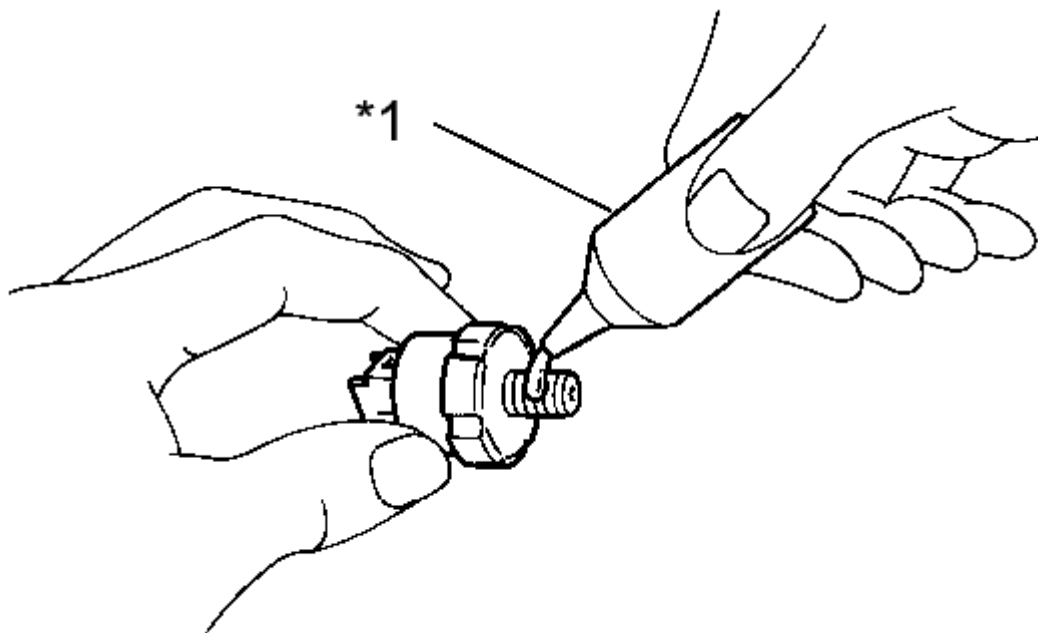


Fig. 281: Applying Adhesive To Threads Of Engine Oil Pressure Switch Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Adhesive
----	----------

Adhesive

Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

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

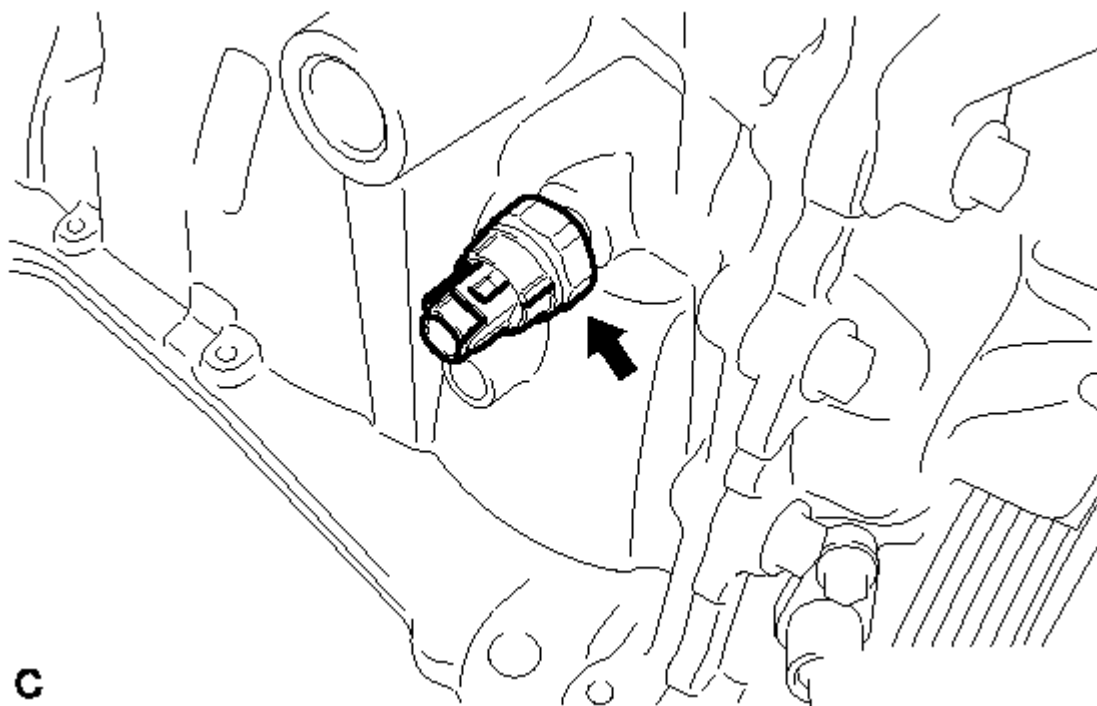


Fig. 282: Identifying Oil Pressure Switch

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

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

NOTE:

- Install the oil pressure switch within 3 minutes after applying adhesive.
- Do not start the engine within 1 hour after installation.

33. INSTALL CRANKSHAFT POSITION SENSOR

- a. Apply a light coat of engine oil to the O-ring of the sensor.

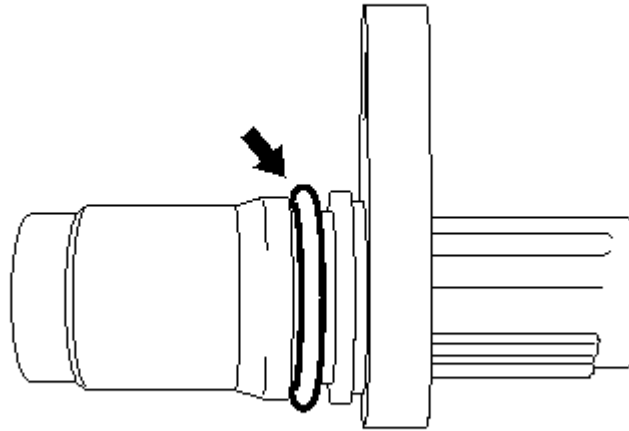
**C**

Fig. 283: Identifying Crankshaft Position Sensor O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the crankshaft position sensor with the bolt.

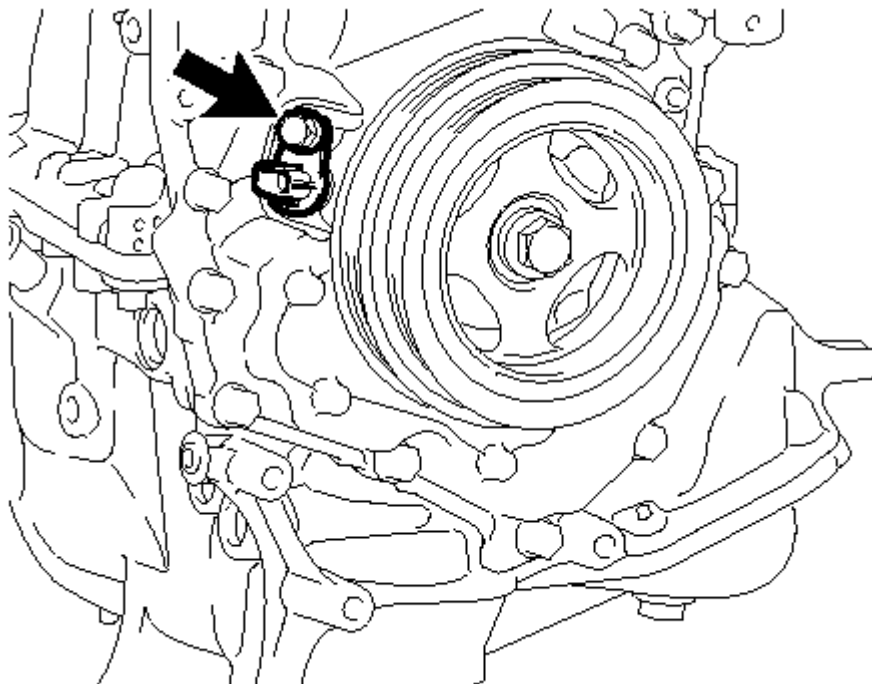
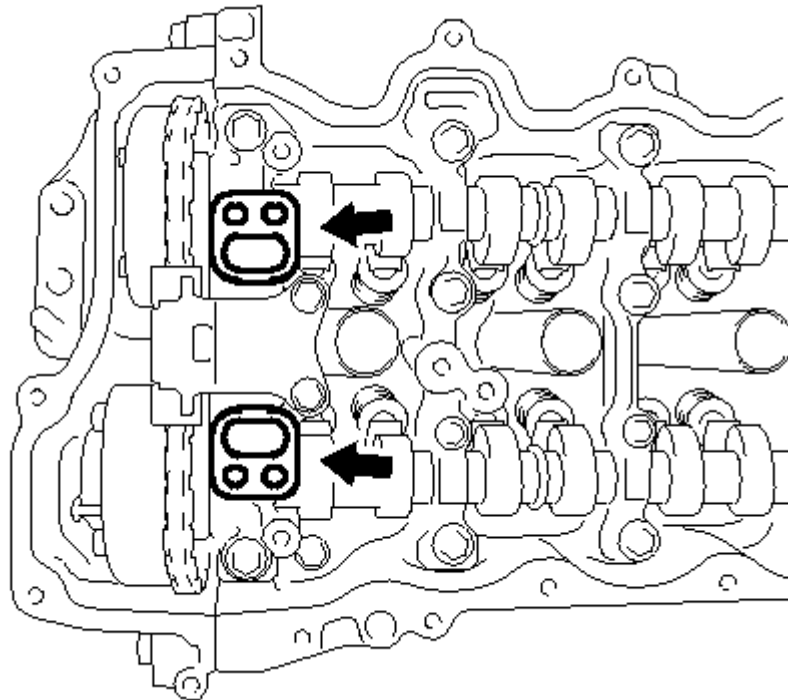
**P**

Fig. 284: Identifying Crankshaft Position Sensor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

34. INSTALL CAMSHAFT BEARING CAP OIL HOLE GASKET

- a. Install the 2 new camshaft bearing cap oil hole gaskets to the No. 1 camshaft bearing cap.

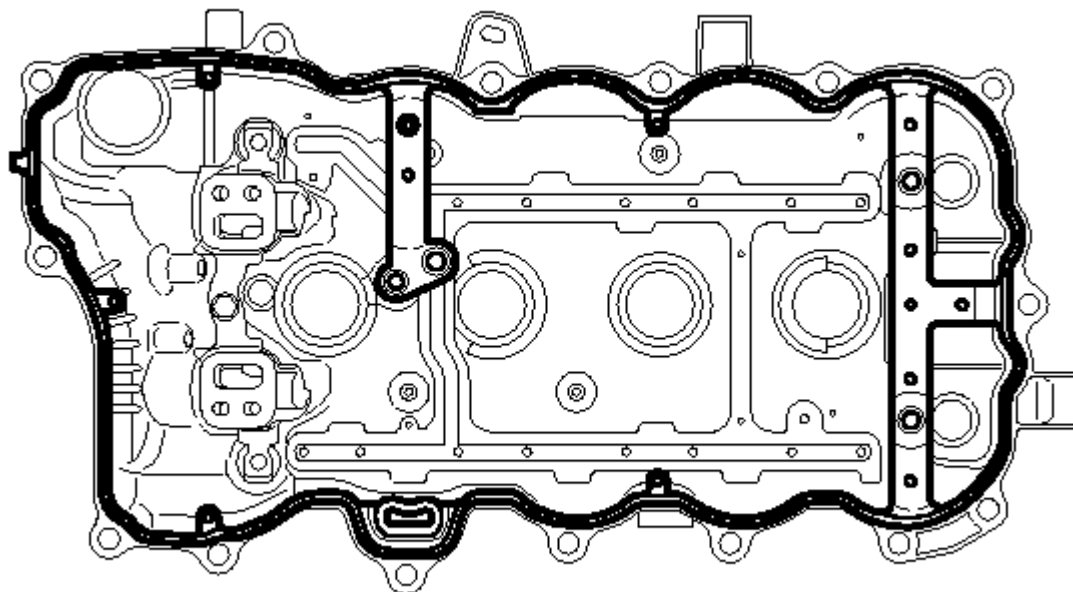


C

Fig. 285: Identifying Camshaft Bearing Cap Oil Hole Gaskets
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

35. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY

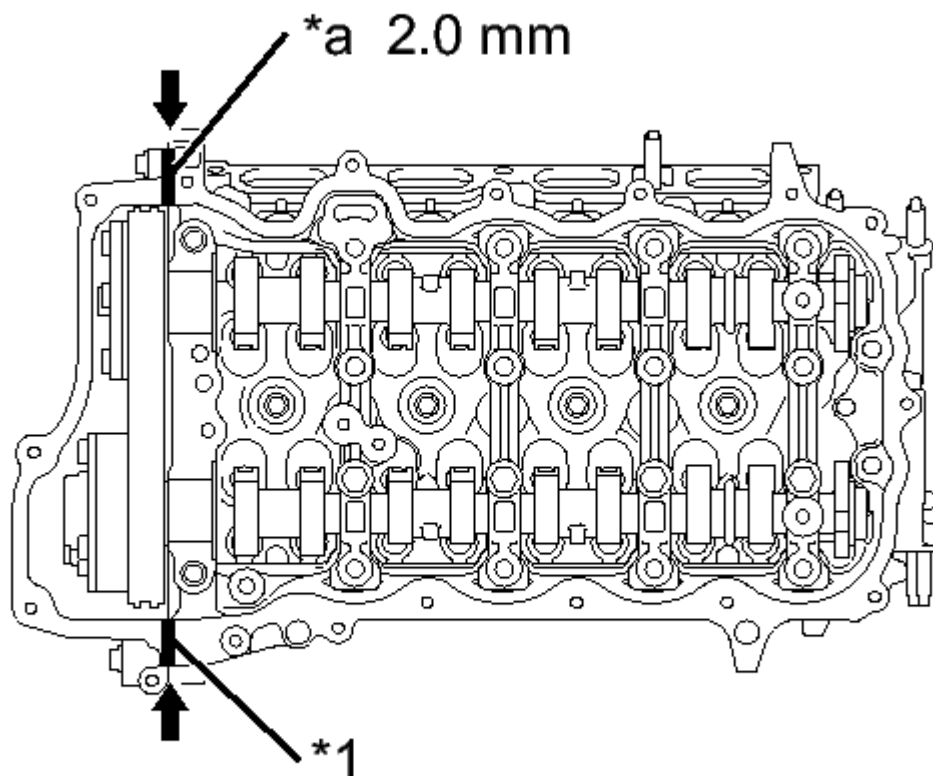
- a. Install a new gasket to the cylinder head cover.

**P****Fig. 286: Identifying Cylinder Head Cover Gasket**

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

NOTE: Remove any oil from the contact surfaces.

- b. Apply seal packing as shown the illustration.

**C****Fig. 287: Applying Seal Packing**

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

TEXT IN ILLUSTRATION

*1	Seal Packing
*a	Bead Diameter

Seal packing

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

Bead diameter

2.0 mm (0.0787 in.)

NOTE:

- Remove any oil from the contact surfaces.
- Install the cylinder head cover within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.
- Do not start the engine for at least 2 hours after the installation.

c. Temporarily install the cylinder head cover with 2 new seal washers and the 17 bolts.

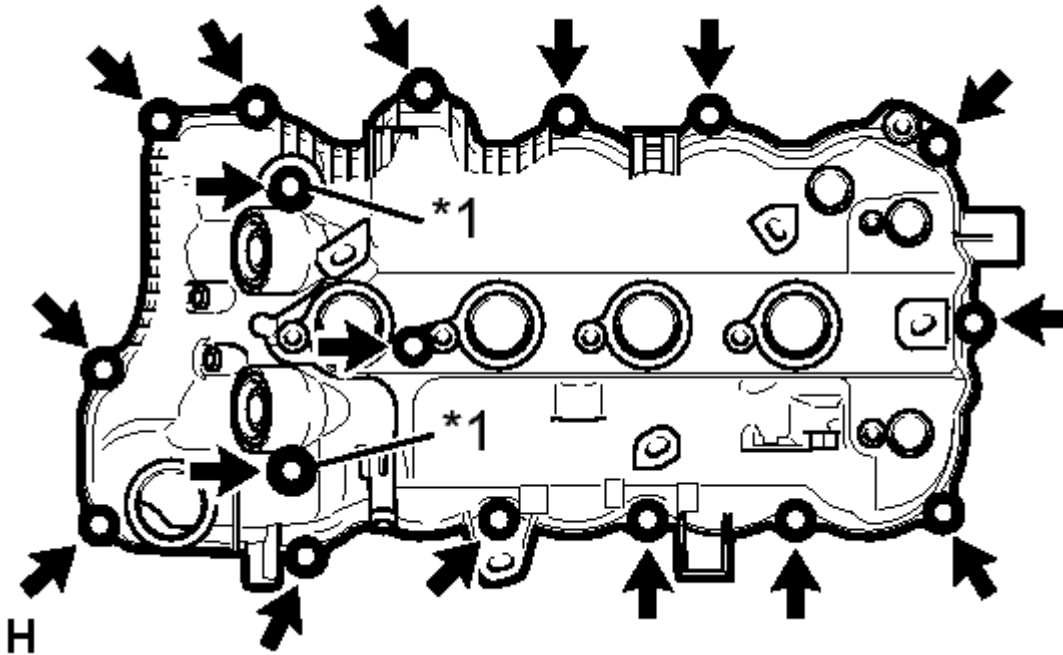


Fig. 288: Identifying Cylinder Head Cover Bolts

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

TEXT IN ILLUSTRATION

*1	Seal Washer
----	-------------

d. Apply a light coat of engine oil to the O-rings of the No. 1 crankshaft position sensors.

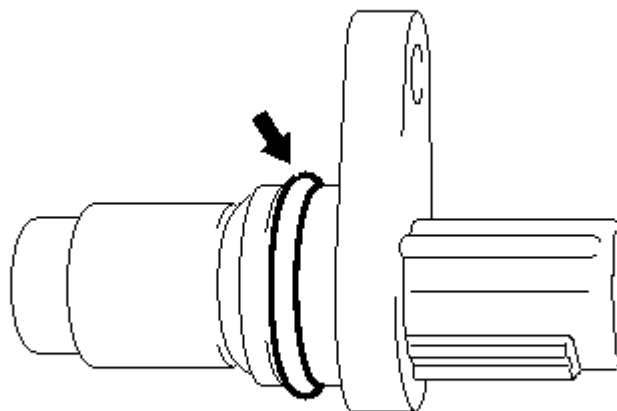
**C**

Fig. 289: Identifying Crankshaft Position Sensor O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Temporarily install the 2 No. 1 crankshaft position sensors with the 2 bolts.

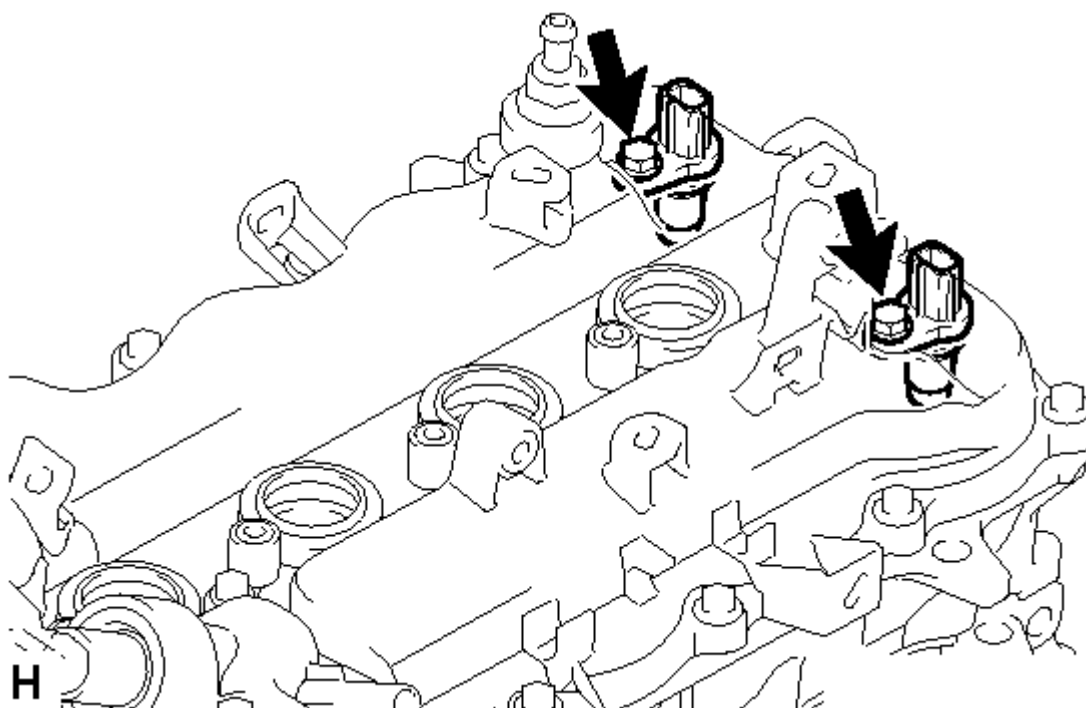


Fig. 290: Identifying Crankshaft Position Sensor Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Fully tighten the 19 bolts in the order shown in the illustration.

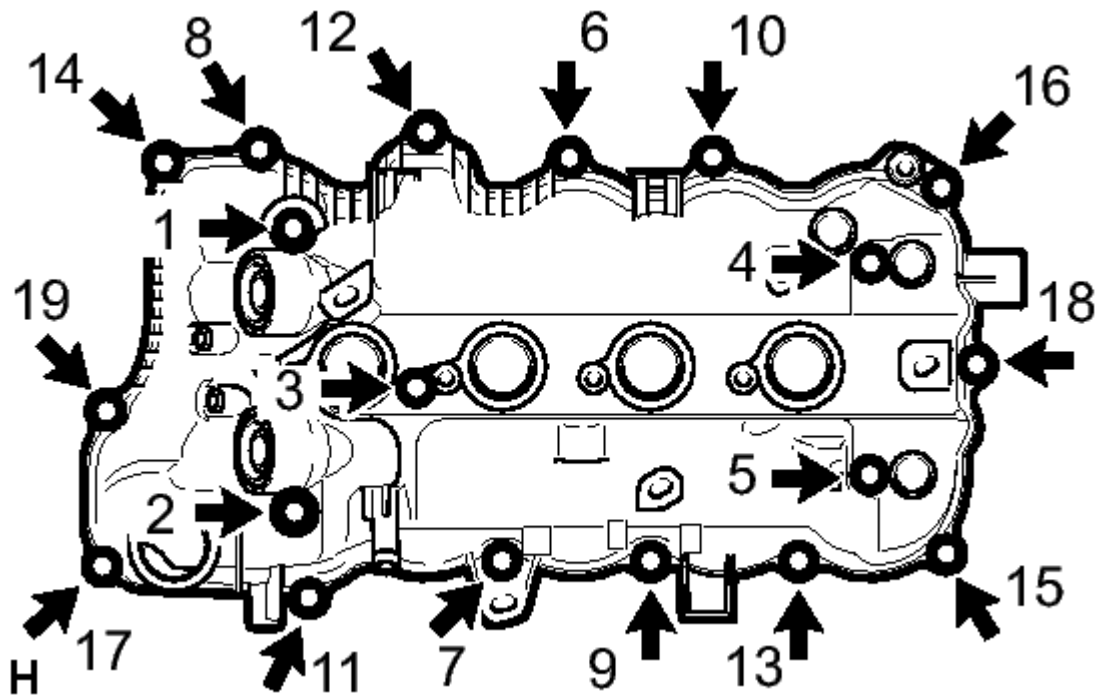


Fig. 291: Identifying Cylinder Head Cover Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

36. INSTALL VENTILATION VALVE SUB-ASSEMBLY

- a. Using a 27 mm deep socket wrench, install the ventilation valve.

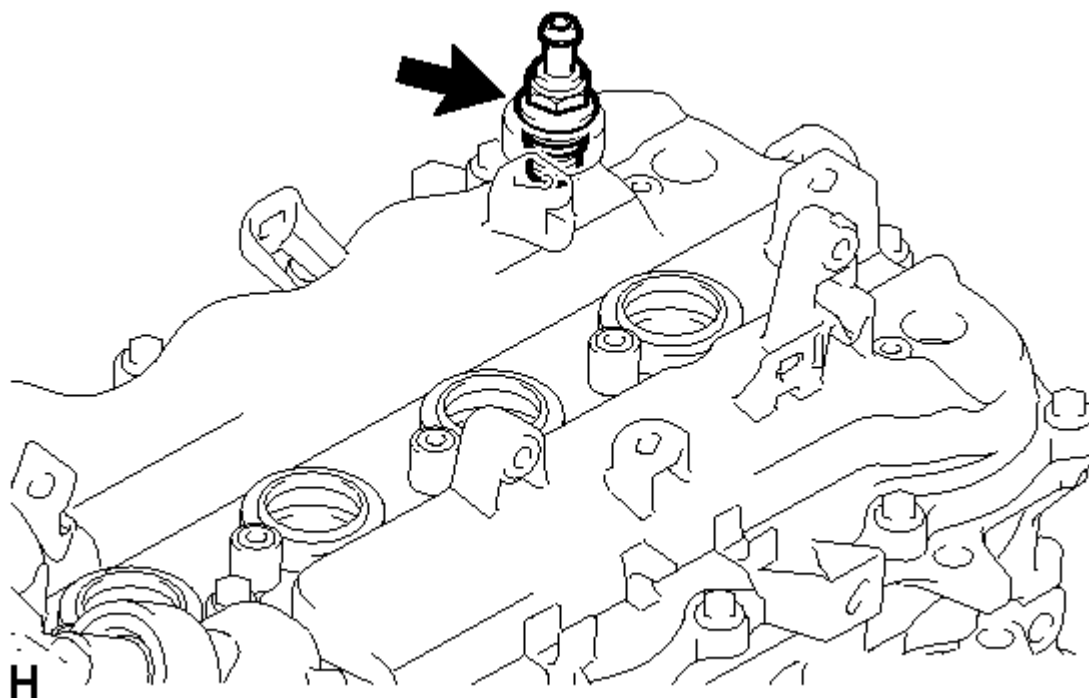


Fig. 292: Identifying Ventilation Valve

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

Torque: 3.5 N*m (36 kgf*cm, 31 in.*lbf)

37. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY

- a. Apply a light coat of engine oil to 2 new O-rings, and then install them onto the camshaft timing oil control valves.

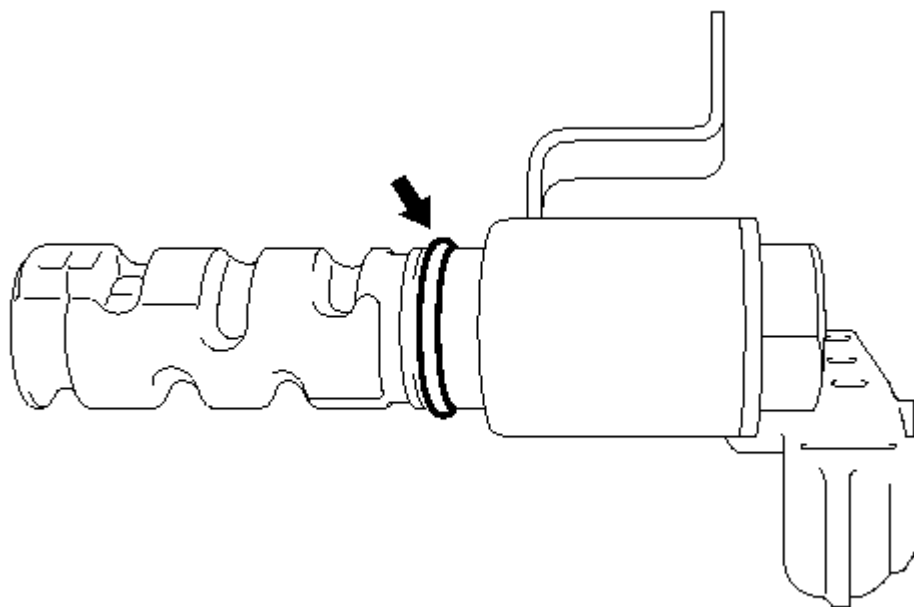
**C**

Fig. 293: Identifying Camshaft Timing Oil Control Valve O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the 2 camshaft timing oil control valves with the 2 bolts.

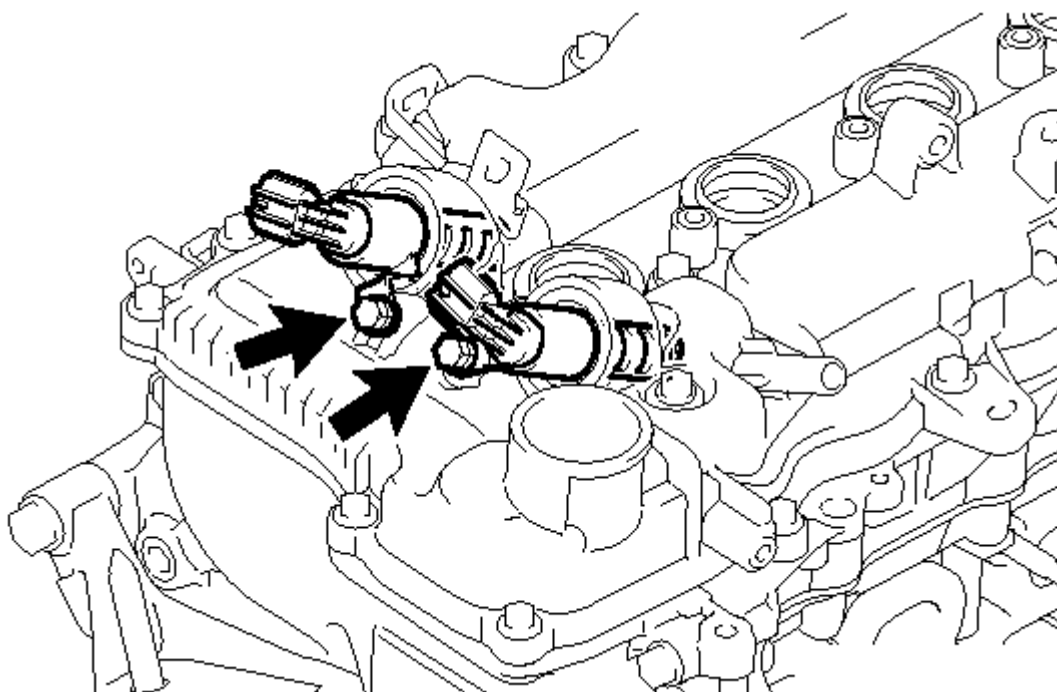
**P**

Fig. 294: Identifying Camshaft Timing Oil Control Valve Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

38. INSTALL SPARK PLUG

- a. Using a 14 mm spark plug wrench, install the 4 spark plugs.

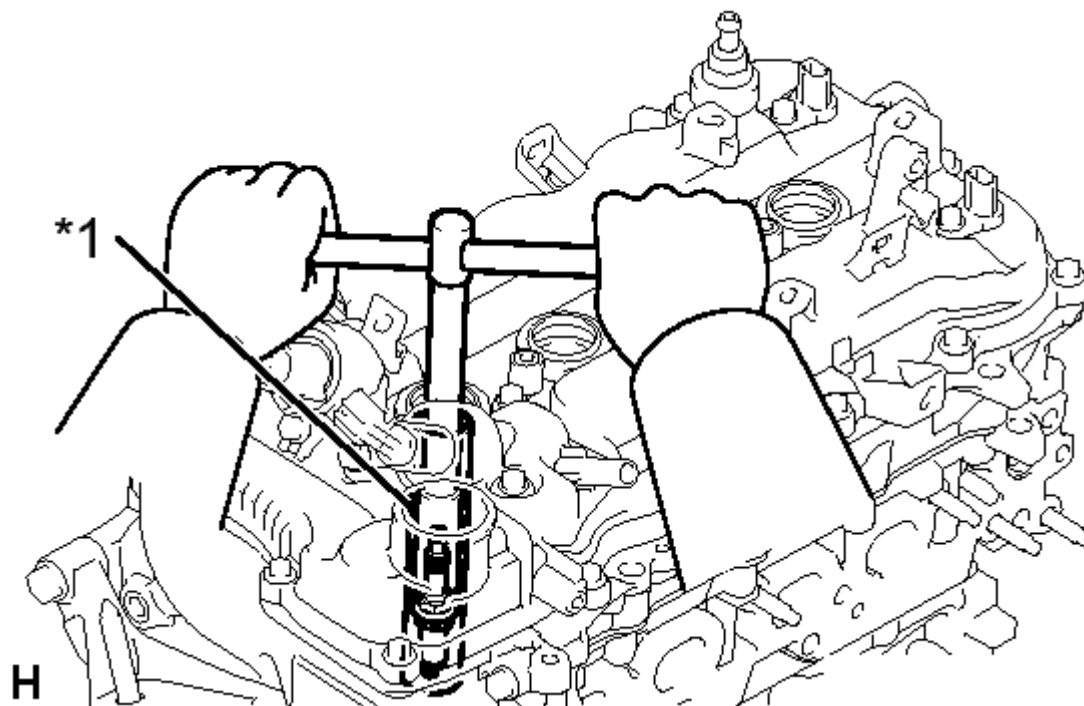


Fig. 295: Removing/Installing Spark Plugs

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

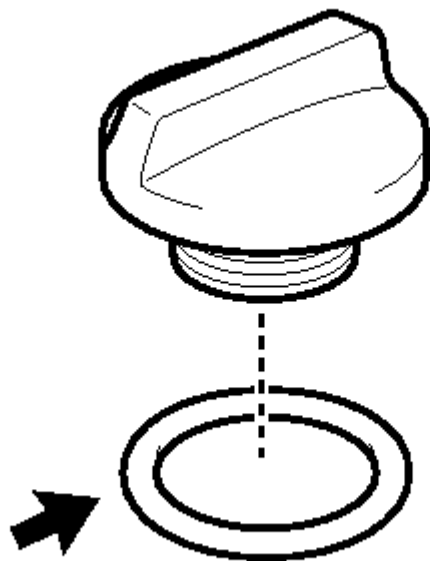
TEXT IN ILLUSTRATION

*1	14 mm Spark Plug Wrench
----	-------------------------

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

39. INSTALL OIL FILLER CAP GASKET

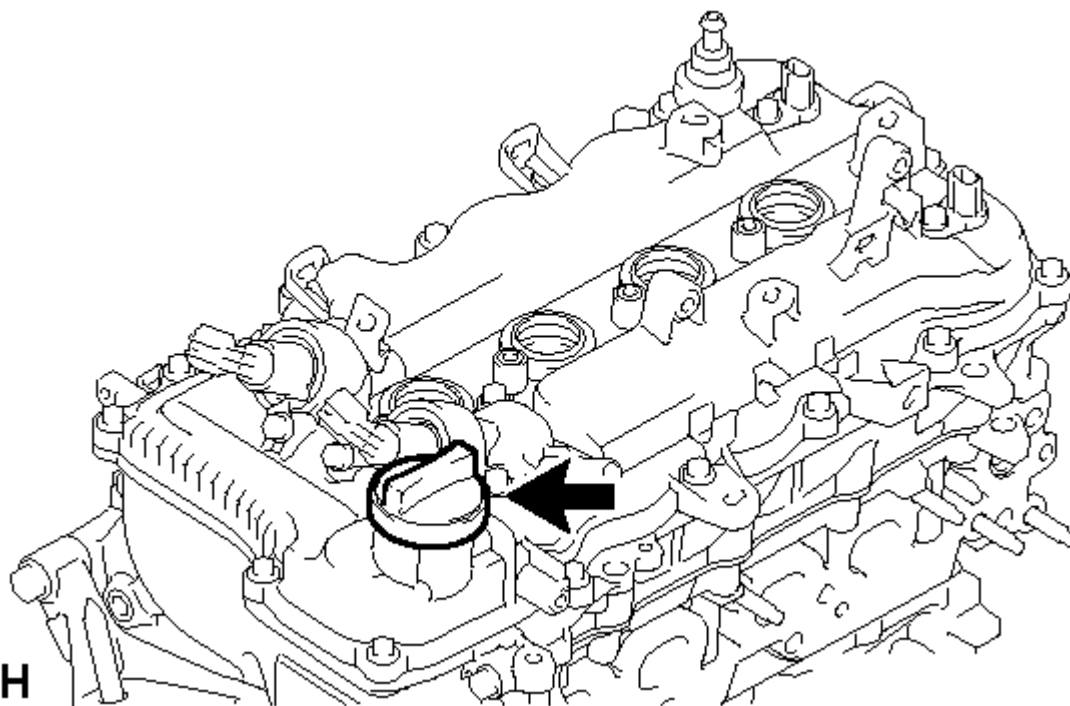
- a. Install the gasket to the cap.

**T****Fig. 296: Locating Oil Filler Cap Gasket**

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

40. INSTALL OIL FILLER CAP SUB-ASSEMBLY

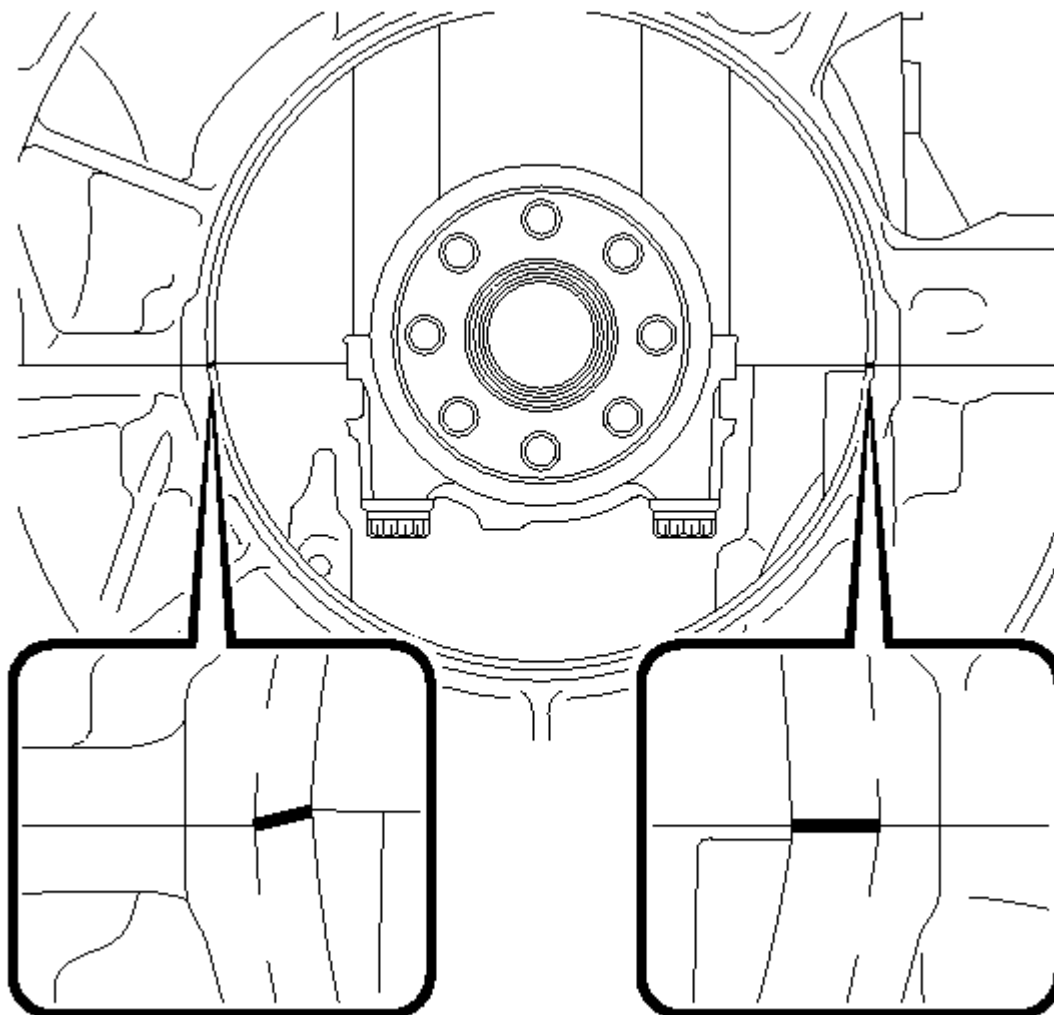
- a. Install the oil filler cap.

**H****Fig. 297: Identifying Oil Filler Cap**

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

41. INSTALL REAR ENGINE OIL SEAL

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



P

Fig. 298: Applying Seal Packing

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

Seal packing

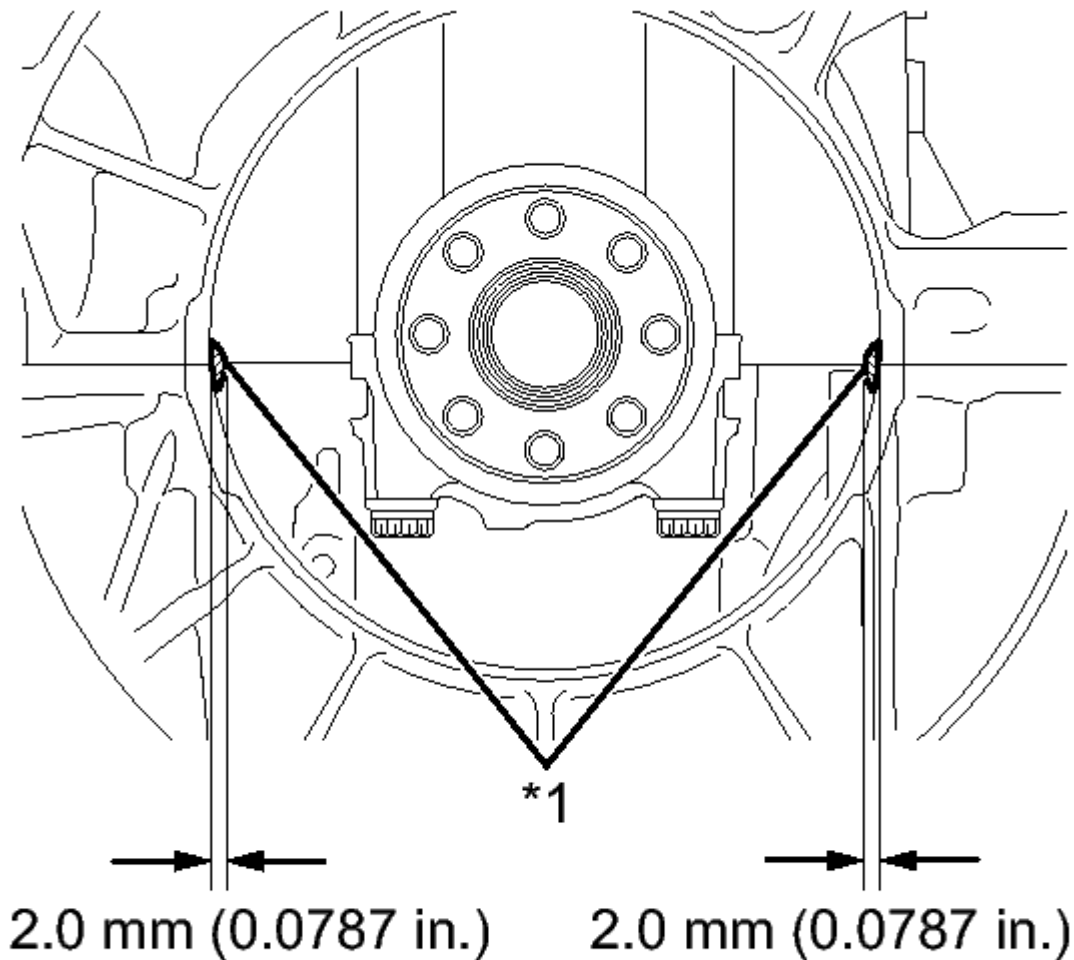
Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

NOTE:

- Remove any oil from the contact surfaces.
- Install a new rear engine oil seal within 3 minutes after applying seal packing.

- Do not start the engine for at least 2 hours after installing.

- b. Wipe off the excess seal packing, leaving only the specified amount in the areas shown in the illustration.



P

Fig. 299: Identifying Excess Seal Packing

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

TEXT IN ILLUSTRATION

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

- c. Apply MP grease to the lip of a new rear engine oil seal.

NOTE: Keep the lip free from foreign matter.

- d. Using SST and a hammer, tap in the rear engine oil seal until its surface is flush with the cylinder block and oil pan.

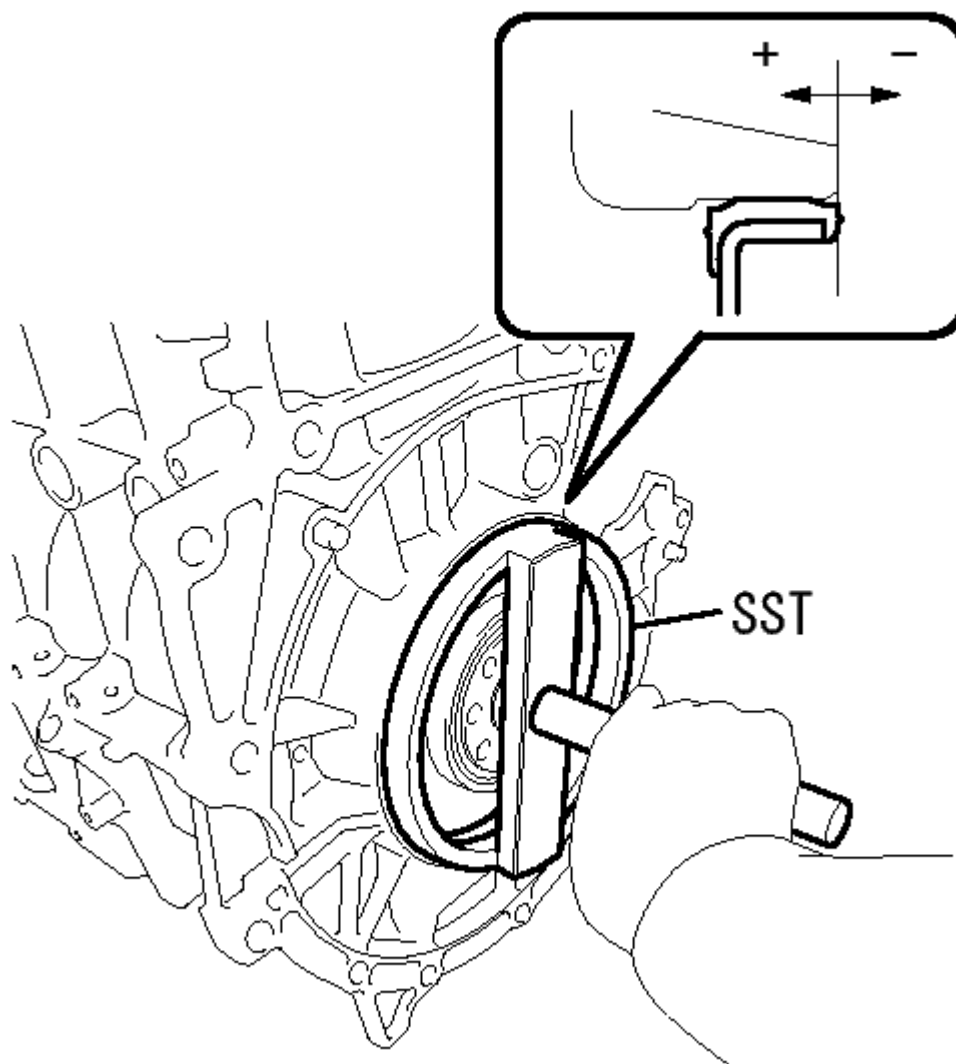
**H**

Fig. 300: Installing Rear Engine Oil Seal

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

- SST: 09223-47020
- SST: 09950-70010
09951-07150

Oil seal tap in depth

-0.2 to 1.2 mm (-0.00787 to 0.0472 in.)

NOTE:

- **Uniformly tap in the oil seal.**

- **Do not tap the rear engine oil seal at an angle.**
- **Wipe off extra grease from the crankshaft.**

INSTALLATION

INSTALLATION

1. INSTALL WIRING HARNESS CLAMP BRACKET

- a. Install the wiring harness clamp bracket to the cylinder head cover with the bolt.

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

- b. Install the wiring harness clamp bracket to the cylinder head with the bolt.

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

- c. Install the wiring harness clamp bracket to the cylinder block with the bolt.

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

2. INSTALL V-RIBBED BELT TENSIONER ASSEMBLY

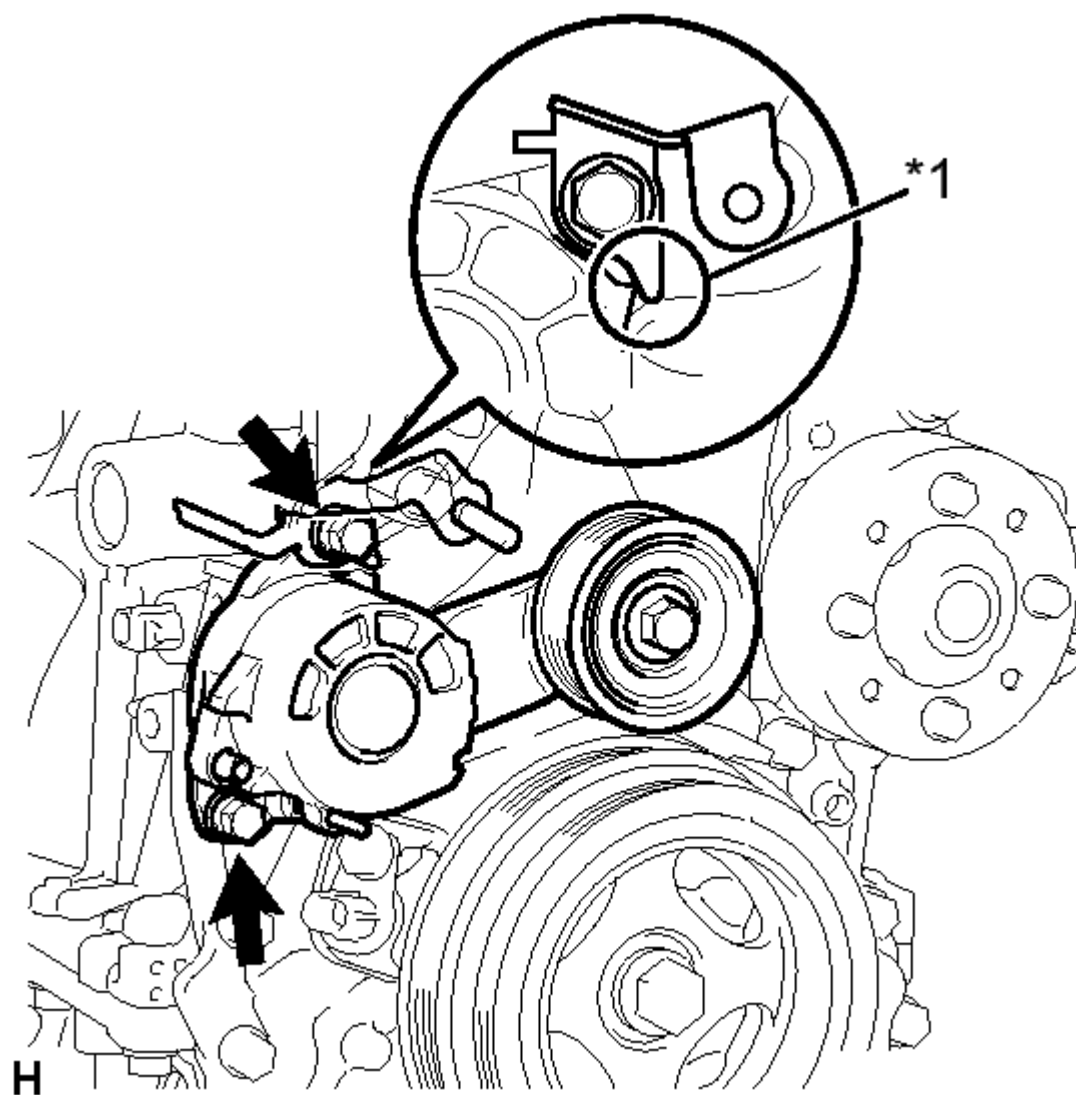


Fig. 301: Identifying Belt Tensioner Bolts

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

- a. Install the V-ribbed belt tensioner and engine cover bracket with the 2 bolts.

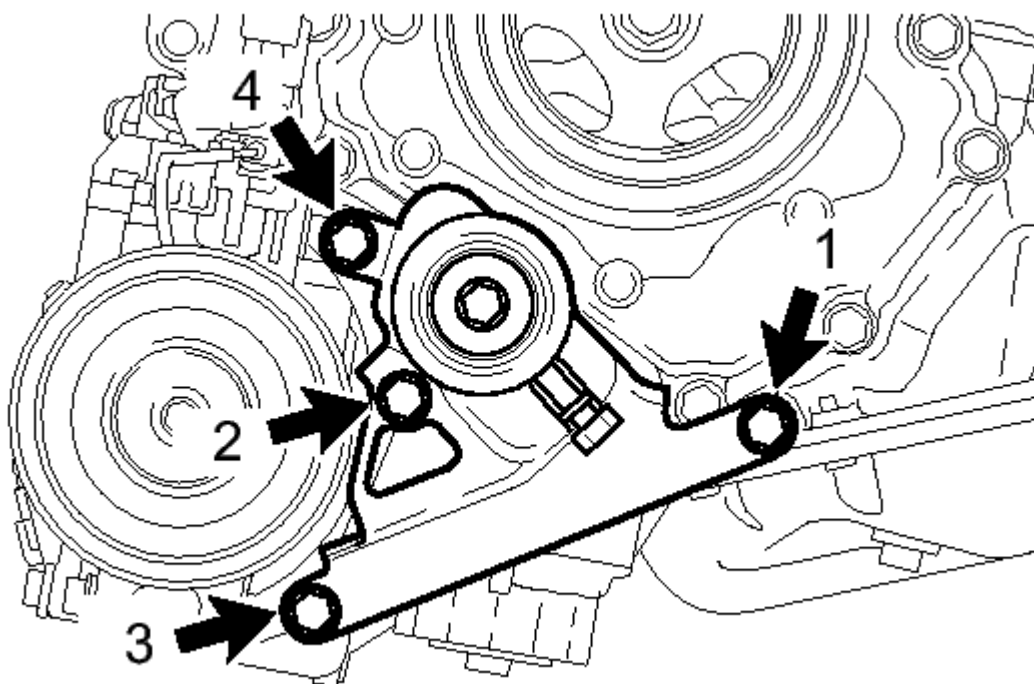
TEXT IN ILLUSTRATION

*1	Stopper
----	---------

NOTE: Attach stopper of the bracket to the belt tensioner.

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

3. INSTALL NO. 2 IDLE PULLEY ASSEMBLY WITH BRACKET

**P****Fig. 302: Identifying No. 2 Idle Pulley Bracket Bolts****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- a. Temporarily install the No. 2 idle pulley with bracket with the 4 bolts.
- b. Fully tighten the 4 bolts in the order shown in the illustration.

Torque: 25 N*m (250 kgf*cm, 18 ft.*lbf)**4. INSTALL NO. 1 WATER BY-PASS PIPE**

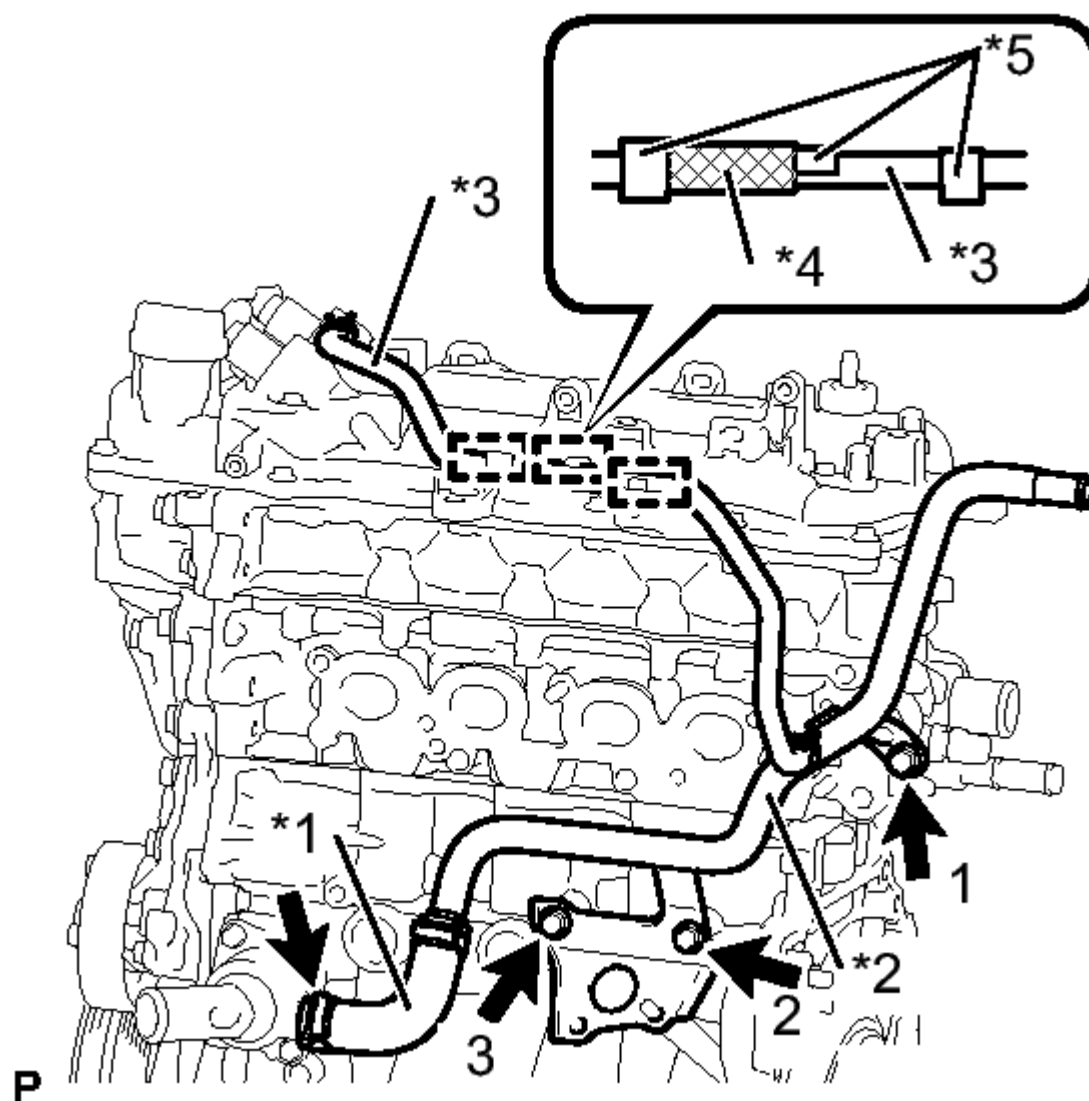


Fig. 303: Identifying No. 2 Water By-Pass Hose, No. 1 Water By-Pass Pipe, And Water By-Pass Hose

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

- a. Connect the water by-pass hose to the water inlet with the clip.

TEXT IN ILLUSTRATION

*1	Water By-Pass Hose
*2	No. 1 water by-pass pipe
*3	No. 2 Water By-Pass Hose
*4	Protector
*5	Clip

NOTE: Install the clip so that its claws face away from the engine.

- b. Temporarily install the No. 1 water by-pass pipe with the 3 bolts.
- c. Fully tighten the 3 bolts in the order shown in the illustration.

Torque: 22 N*m (224 kgf*cm, 16 ft.*lbf)

- d. Engage the No. 2 water by-pass hose to the 3 clamps as shown in the illustration.

5. INSTALL NO. 2 VENTILATION HOSE

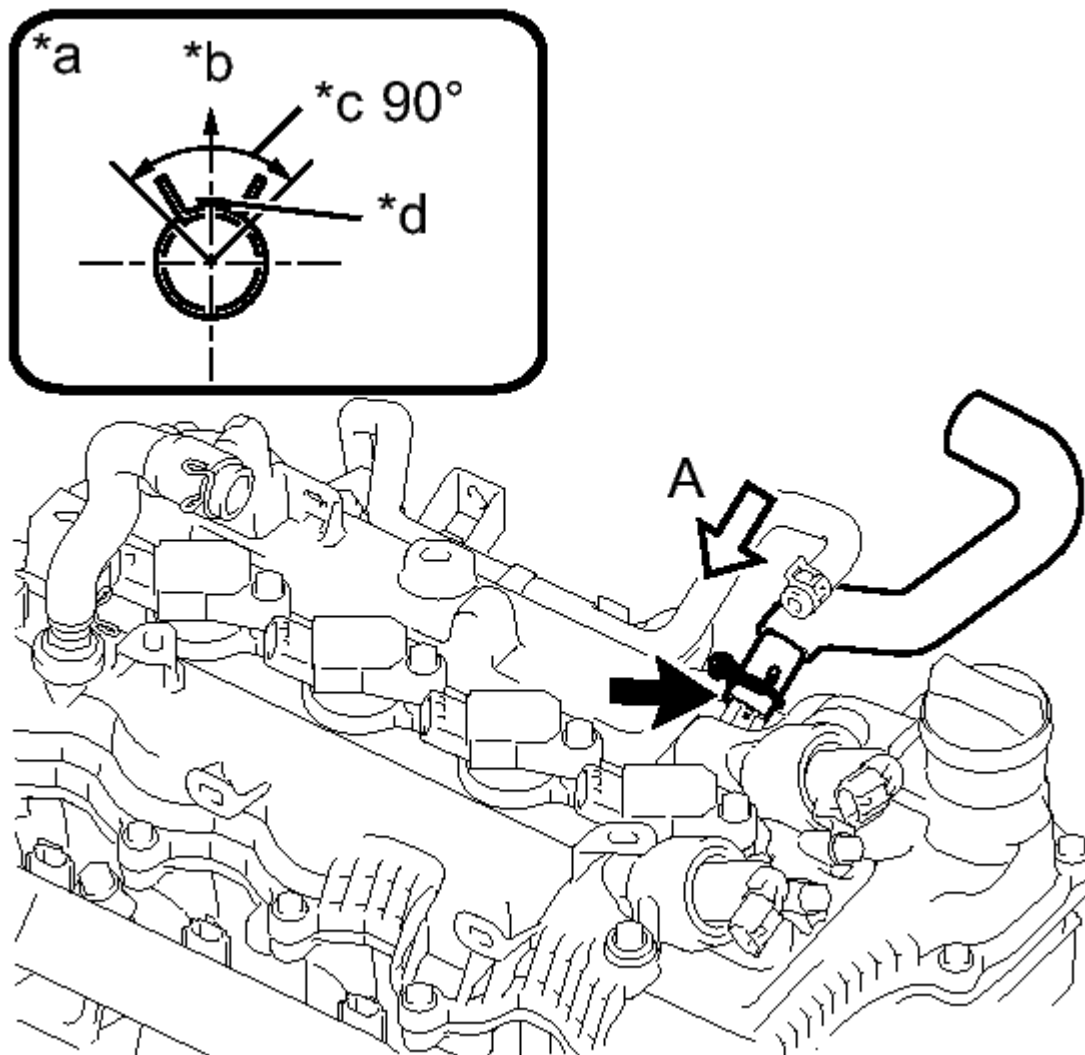


Fig. 304: Identifying No. 2 Ventilation Hose Clamp
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Install the ventilation hose to the cylinder head with the clip.

TEXT IN ILLUSTRATION

*a	View A
----	--------

*b	Upper
*c	Clip center installation range
*d	Paint mark of the hose

NOTE:

- Install the clip so that its claws are within the clip center installation range.
- The protrusion of the head cover should overlap the paint mark of the hose.

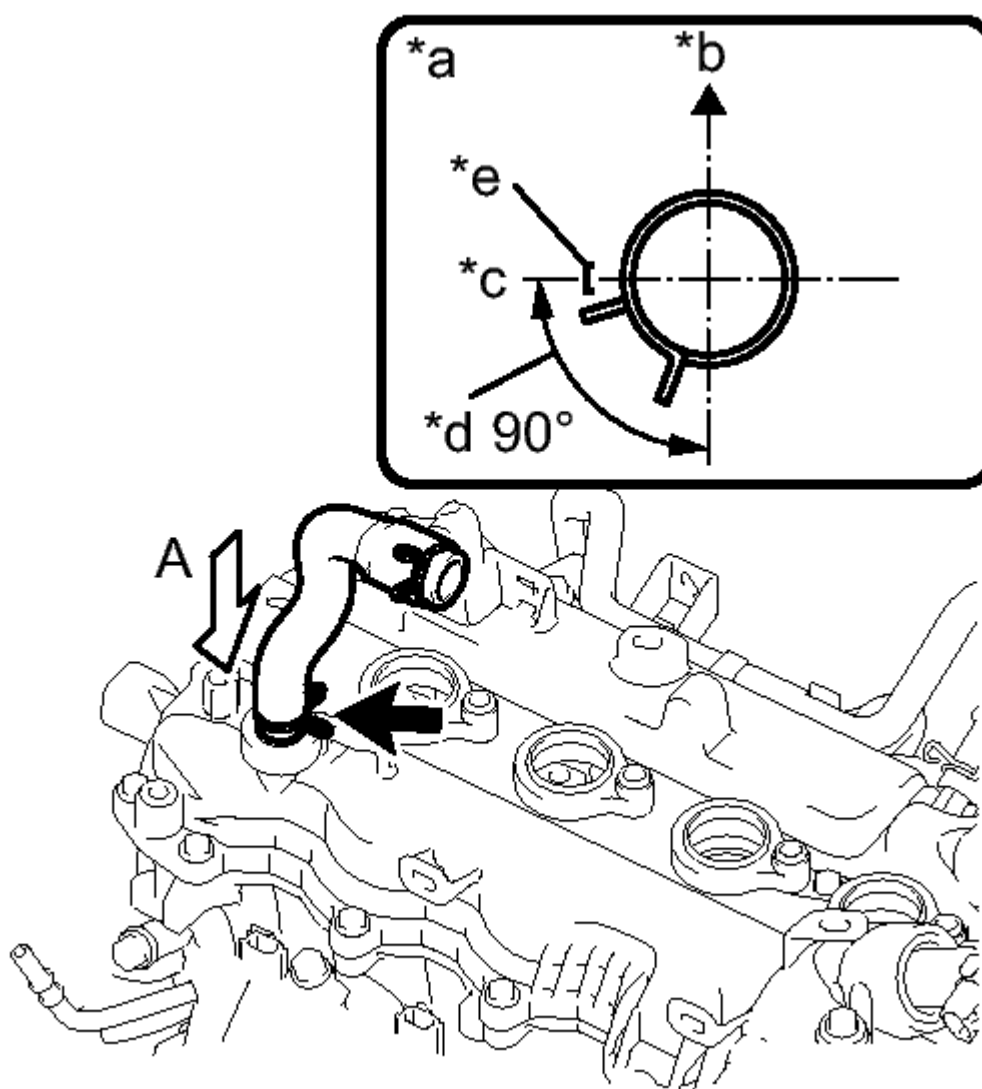
6. INSTALL VENTILATION HOSE

Fig. 305: Identifying Ventilation Hose Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Install the ventilation hose to the cylinder head with the clip.

TEXT IN ILLUSTRATION

*a	View A
*b	Left
*c	Rear
*d	Clip center installation range
*e	Paint mark of the hose

NOTE: **Install the clip so that its claws are within the clip center installation range.**

7. INSTALL NO. 1 IGNITION COIL

- a. Install the 4 ignition coils with the 4 bolts.

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

8. INSTALL INJECTOR VIBRATION INSULATOR . Refer to INSTALLATION - Step 1**9. INSTALL NO. 1 DELIVERY PIPE SPACER . Refer to INSTALLATION - Step 2****10. INSTALL FUEL INJECTOR ASSEMBLY . Refer to INSTALLATION - Step 3****11. INSTALL FUEL DELIVERY PIPE . Refer to INSTALLATION - Step 4****12. INSTALL EGR HOLE COVER PLATE**

- a. Install a new EGR valve gasket onto the cylinder head.
- b. Install the EGR hole cover plate with the 3 nuts.

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

13. INSTALL ENGINE OIL LEVEL DIPSTICK GUIDE

- a. Install a new O-ring to the oil level dipstick guide.

HINT:

Apply engine oil to the O-ring and install the oil level dipstick guide into the oil pan.

- b. Temporarily install the engine oil level dipstick guide with the 2 bolts.

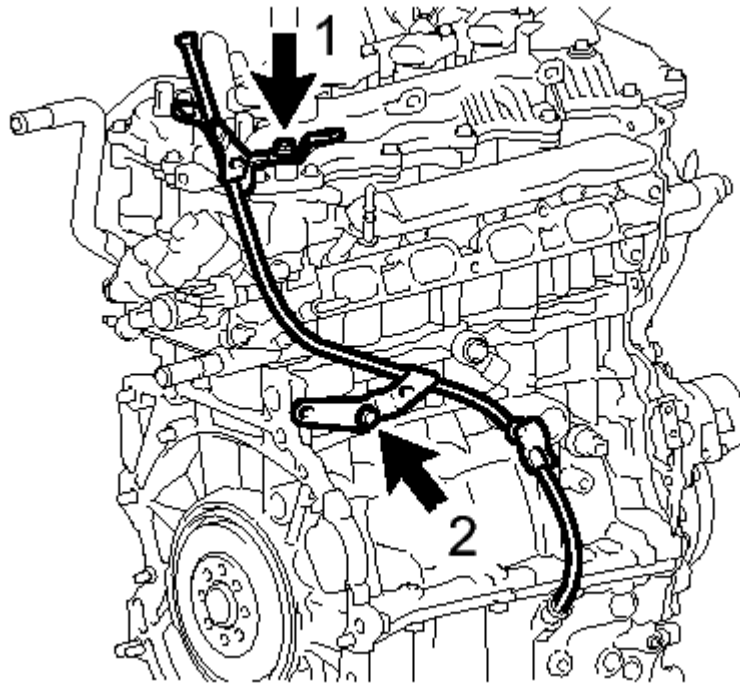
**P**

Fig. 306: Identifying Engine Oil Level Dipstick Guide Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Fully tighten the 2 bolts in the order shown in the illustration.

Torque: 18 N*m (184 kgf*cm, 13 ft.*lbf)

14. INSTALL ENGINE OIL LEVEL DIPSTICK

15. INSTALL NO. 4 ENGINE WIRE

- a. Engage the 7 clamps and install the No. 4 engine wire.
- b. Install the ground bolt.

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

- c. Connect the 4 fuel injector connectors.
- d. Connect the 4 ignition coil connectors.
- e. Connect the 2 camshaft timing oil control valve connectors.

16. INSTALL INTAKE MANIFOLD ASSEMBLY

- a. Install a new No. 2 intake manifold to head gasket onto the cylinder head.
- b. Temporarily install the intake manifold with the 3 bolts and 2 nuts.

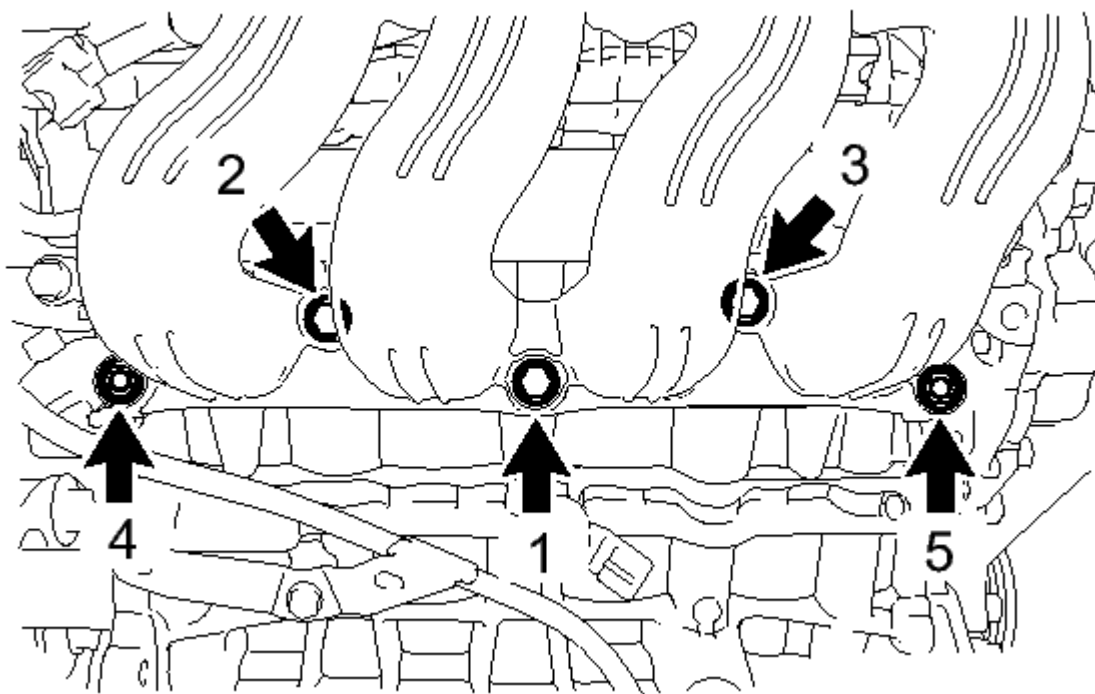


Fig. 307: Identifying Intake Manifold Nuts And Bolts

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

- c. Fully tighten the 3 bolts and 2 nuts in the order shown in the illustration.

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

17. INSTALL INTAKE MANIFOLD STAY

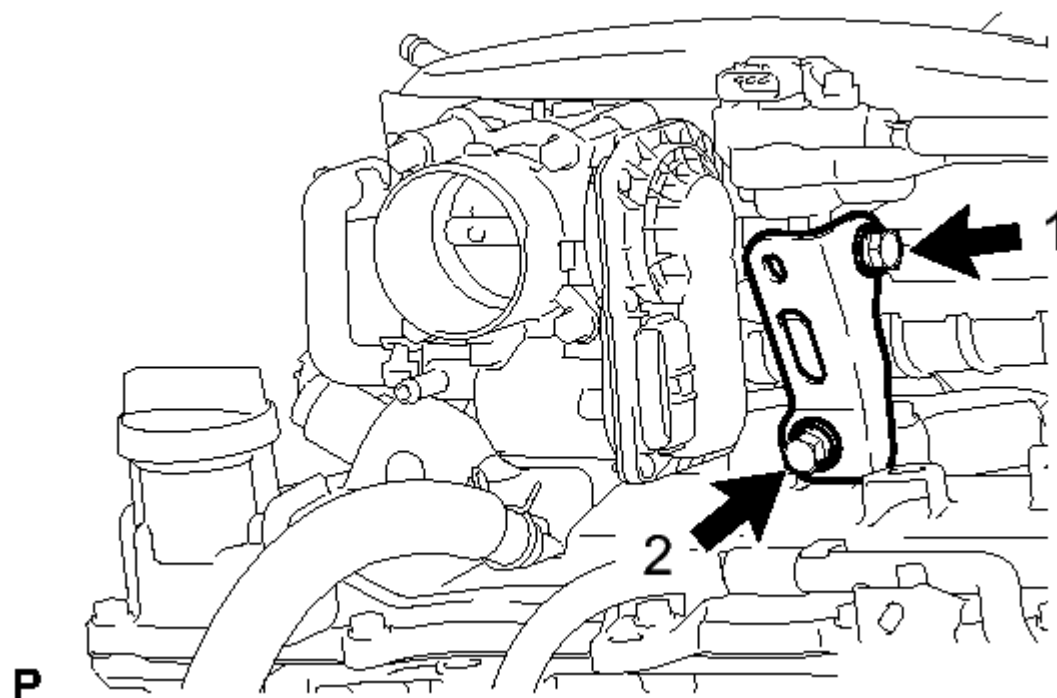
**P**

Fig. 308: Identifying Intake Manifold Stay Bolts

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

- a. Temporarily install the intake manifold stay with the 2 bolts.
- b. Fully tighten the 2 bolts in the order shown in the illustration.

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

18. CONNECT NO. 4 WATER BY-PASS HOSE

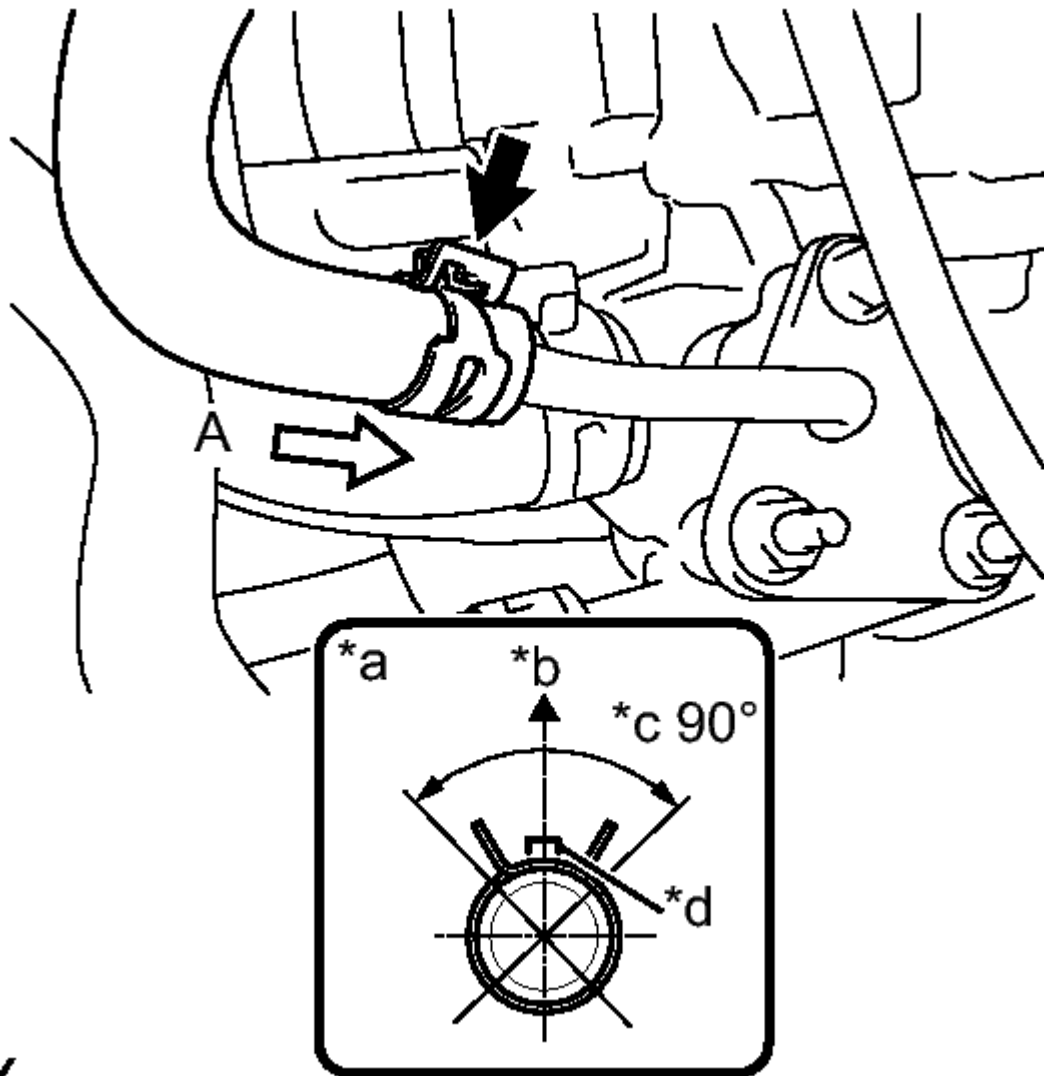


Fig. 309: Identifying No. 4 Water By-Pass Hose Clip
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Connect the No. 4 water by-pass hose to the EGR hole cover plate with the clip.

TEXT IN ILLUSTRATION

*a	View A
*b	Upper
*c	Clip center installation range
*d	Paint mark of the hose

NOTE: Install the clip so that its claws are within the clip center installation range.

19. CONNECT NO. 2 WATER BY-PASS HOSE

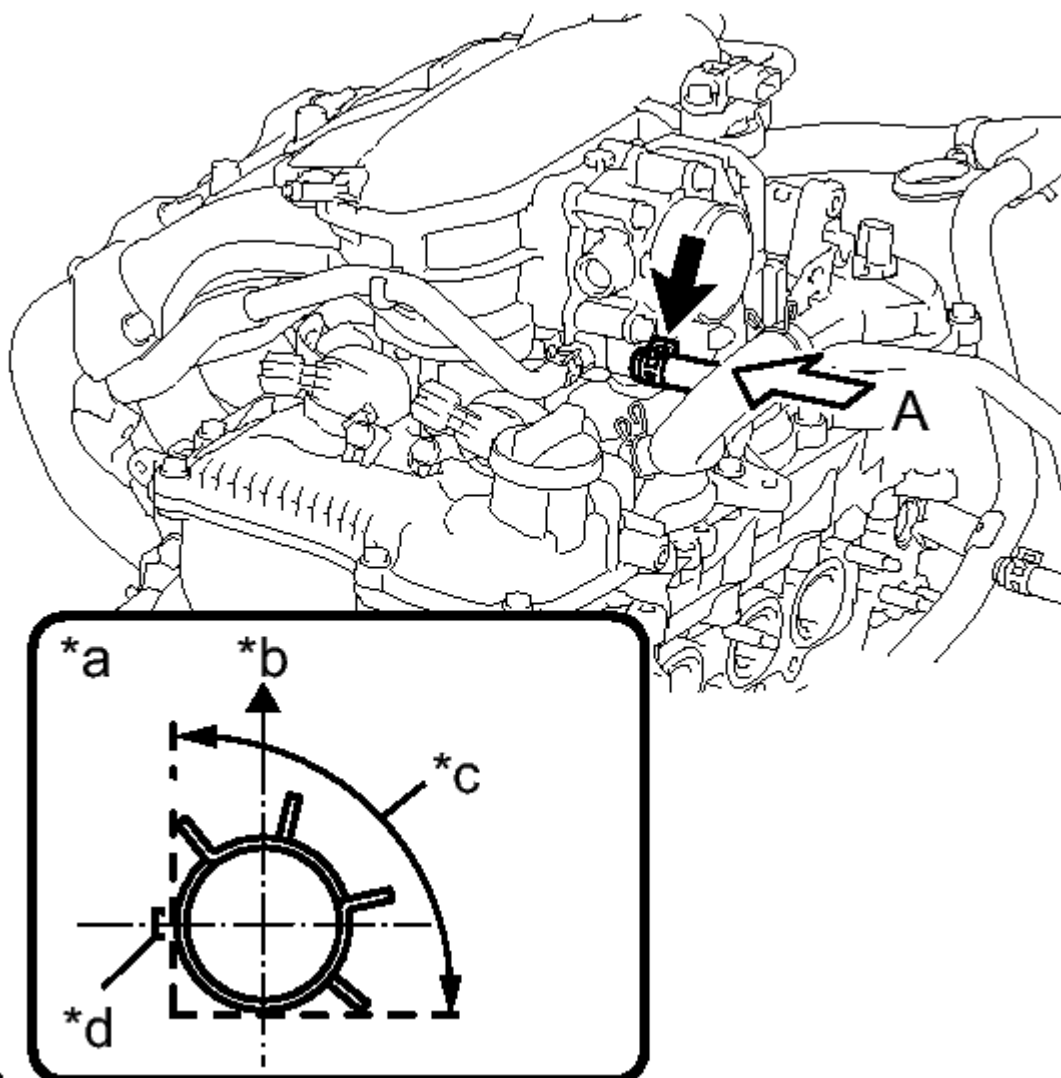


Fig. 310: Identifying No. 2 Water By-Pass Hose Clip
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Connect the No. 2 water by-pass hose to the throttle body with the clip.

TEXT IN ILLUSTRATION

*a	View A
*b	Upper
*c	Clip installation range
*d	Paint mark of the hose

NOTE:

- Install the clip so that its claws are within the clip installation range.
- Line up the rib of the throttle with motor body assembly with the center of the paint mark.

20. CONNECT VENTILATION HOSE

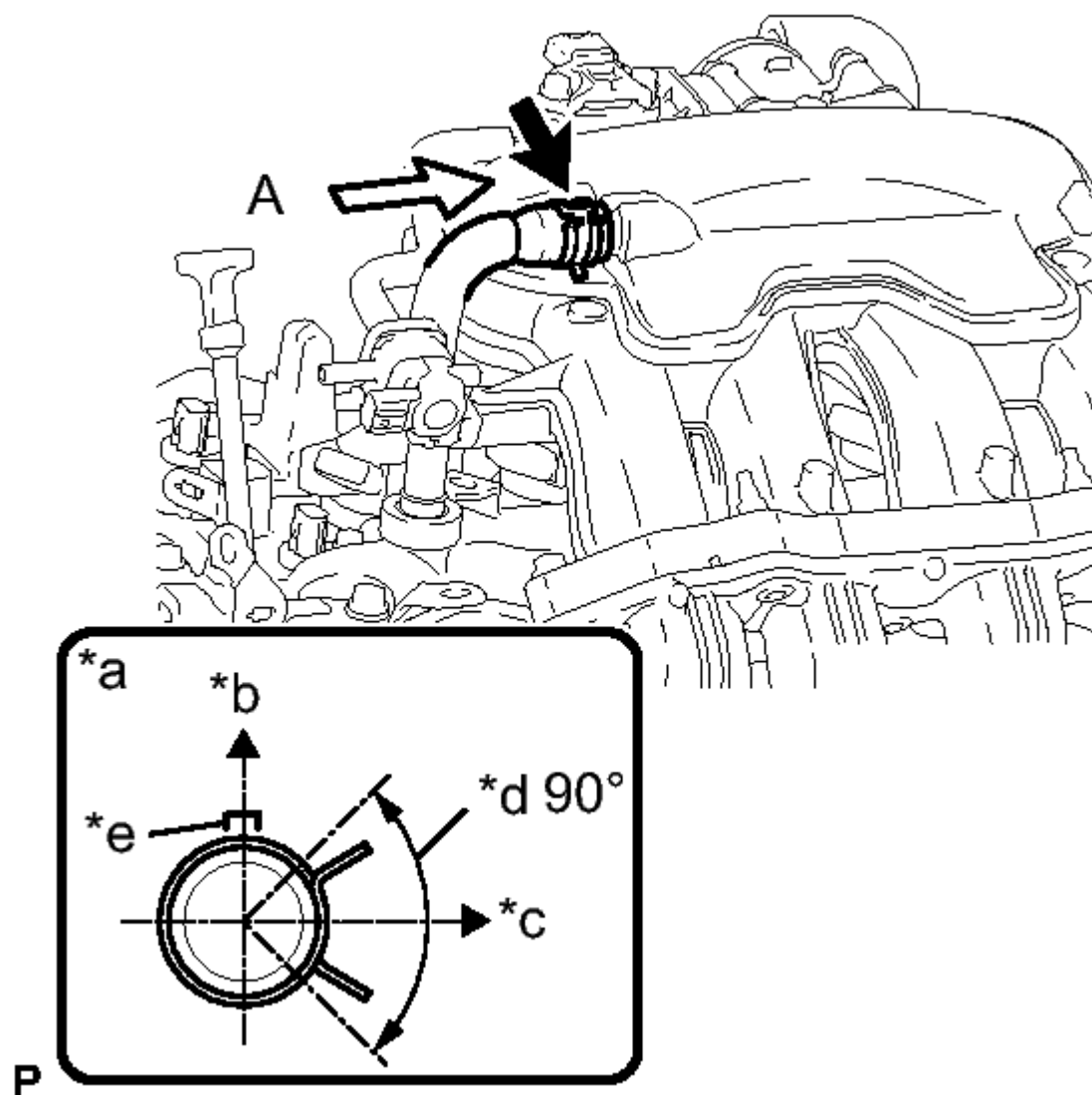


Fig. 311: Identifying Ventilation Hose Clip
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Connect the ventilation hose to the intake manifold with the clip.

TEXT IN ILLUSTRATION

*a	View A
*b	Upper
*c	Left
*d	Clip center installation range
*e	Paint mark of the hose

NOTE: Install the clip so that its claws are within the clip center installation

range.

21. INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY

- Install the new exhaust manifold to head gasket onto the cylinder head.
- Temporarily install the exhaust manifold converter with the 3 new bolts and 2 new nuts.

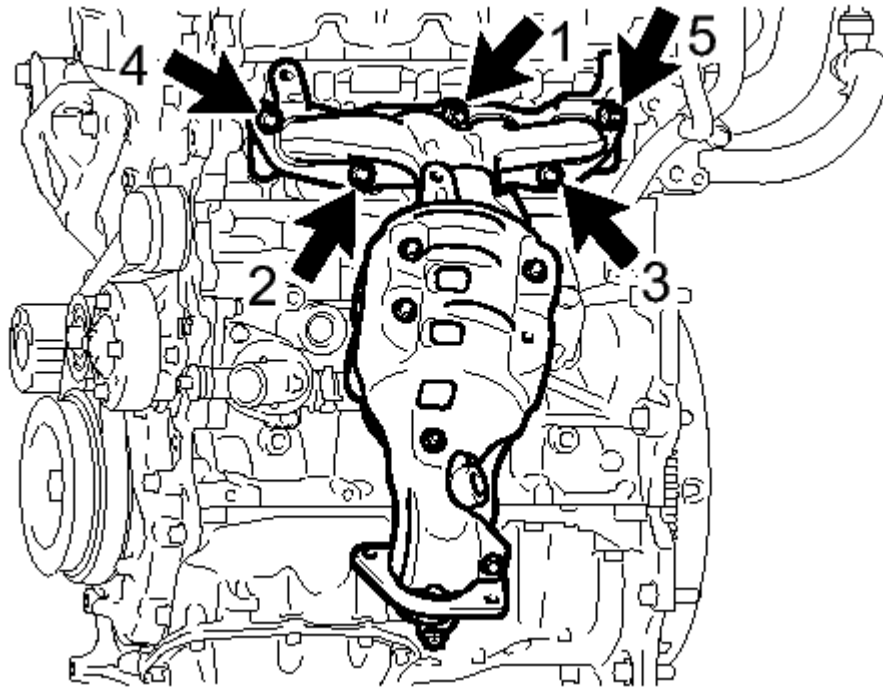
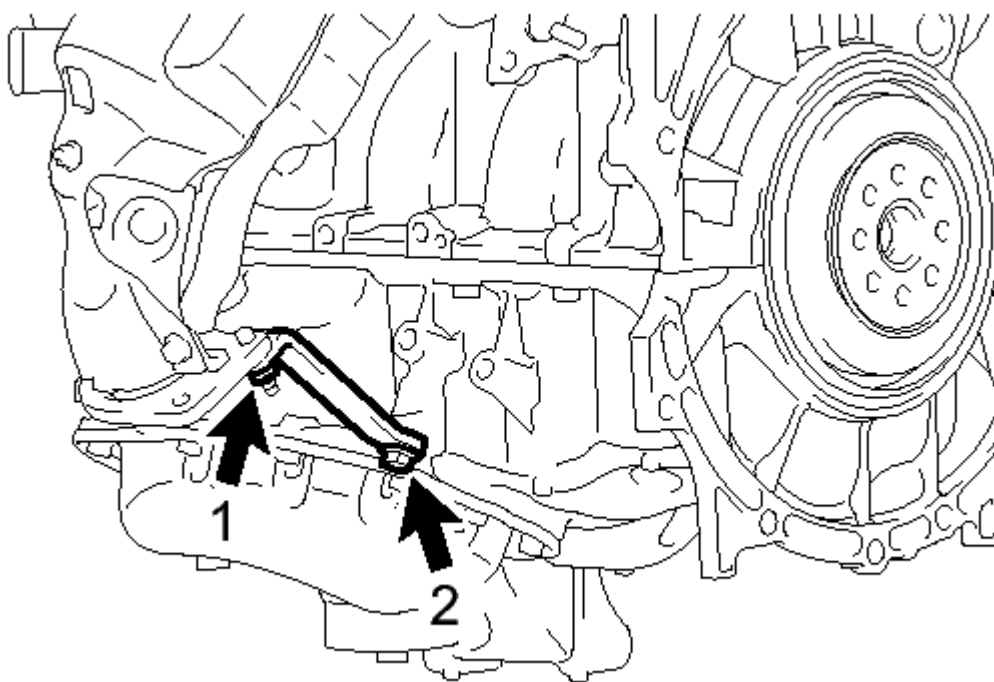


Fig. 312: Identifying Exhaust Manifold Converter Nuts And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Fully tighten the 3 bolts and 2 nuts in the order shown in the illustration.

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

22. INSTALL MANIFOLD STAY

**P****Fig. 313: Identifying Manifold Stay Nut And Bolt****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- a. Temporarily install the manifold stay with the new bolt and new nut.
- b. Fully tighten the bolt and nut in the order shown in the illustration.

Torque: 28 N*m (286 kgf*cm, 21 ft.*lbf)**23. INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR**



Fig. 314: Identifying Exhaust Manifold Heat Insulator Nuts And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Temporarily install the exhaust manifold heat insulator with the bolt and 2 nuts.
- b. Fully tighten the bolt and 2 nuts in the order shown in the illustration.

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

24. INSTALL GENERATOR ASSEMBLY

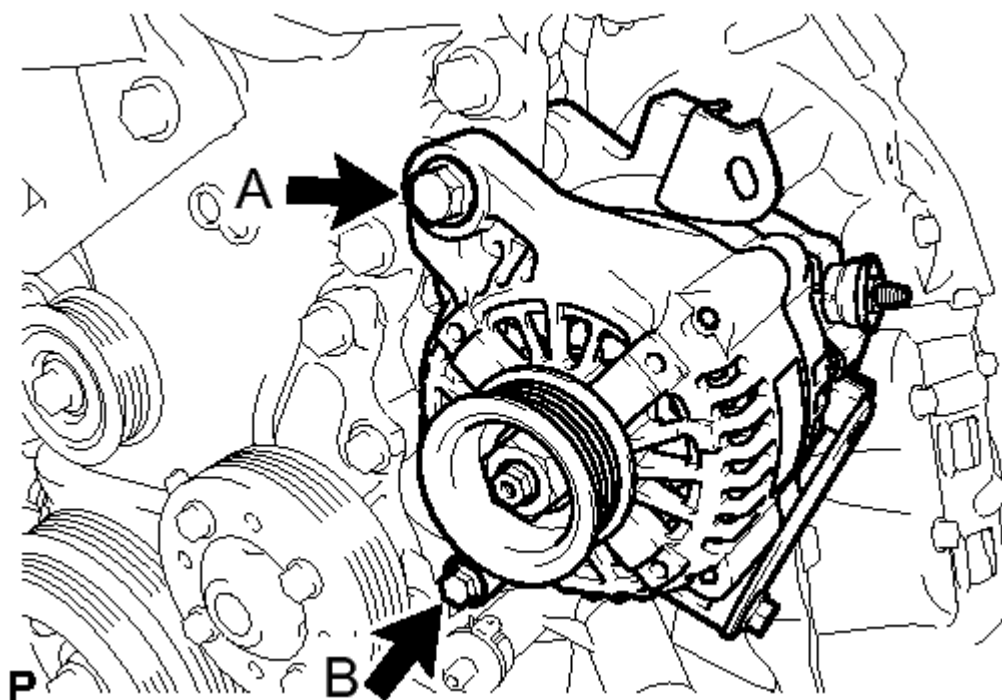


Fig. 315: Identifying Generator Bolts

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

- a. Install the generator with the 2 bolts.

Bolt A

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

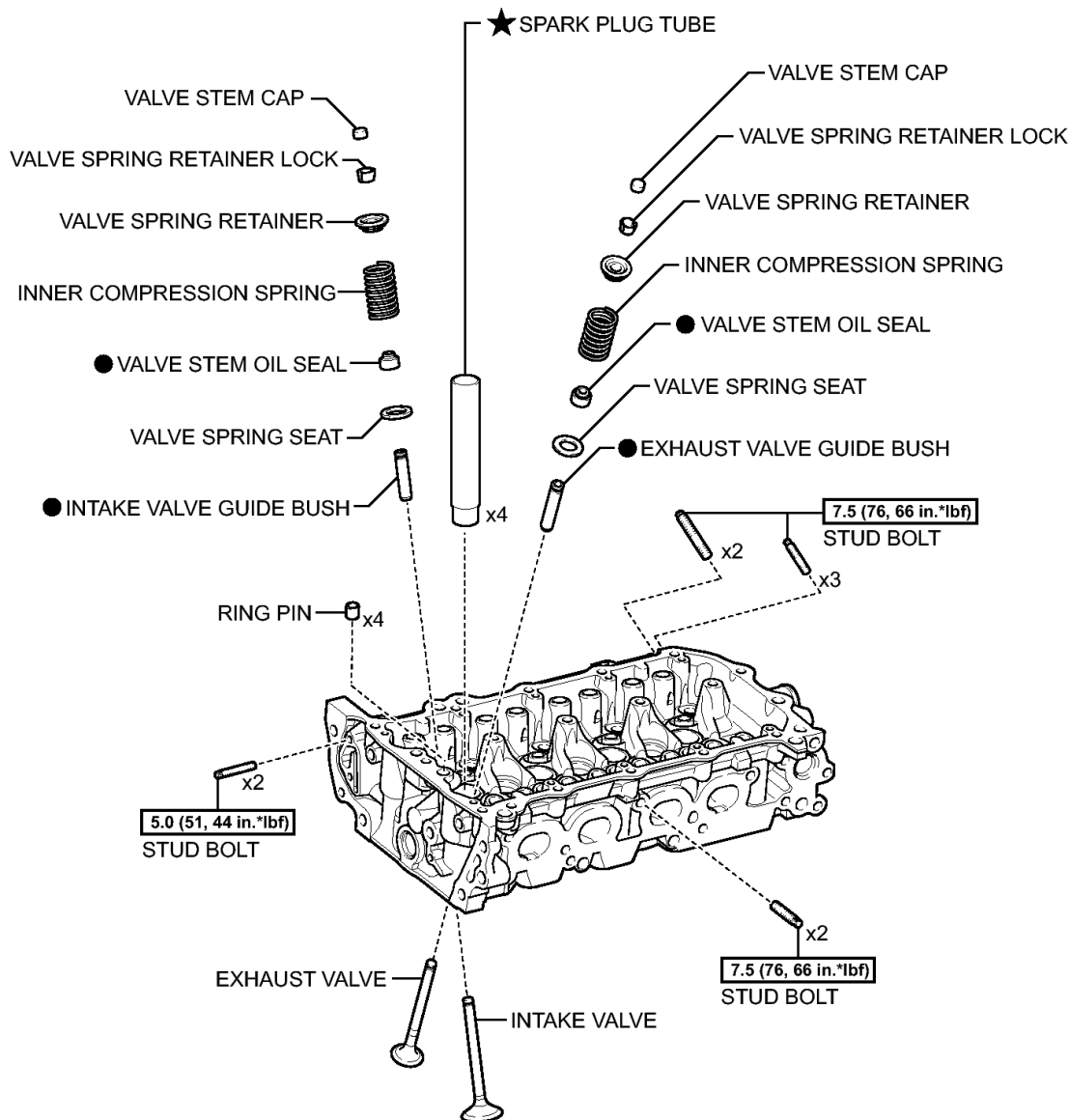
Bolt B

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

CYLINDER HEAD

COMPONENTS

ILLUSTRATION



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

● Non-reusable part

★ Precoated part

Fig. 316: Identifying Cylinder Head Replacement Components With Torque Specifications
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

DISASSEMBLY

1. REMOVE VALVE STEM CAP

- a. Remove the valve stem caps from the cylinder head.

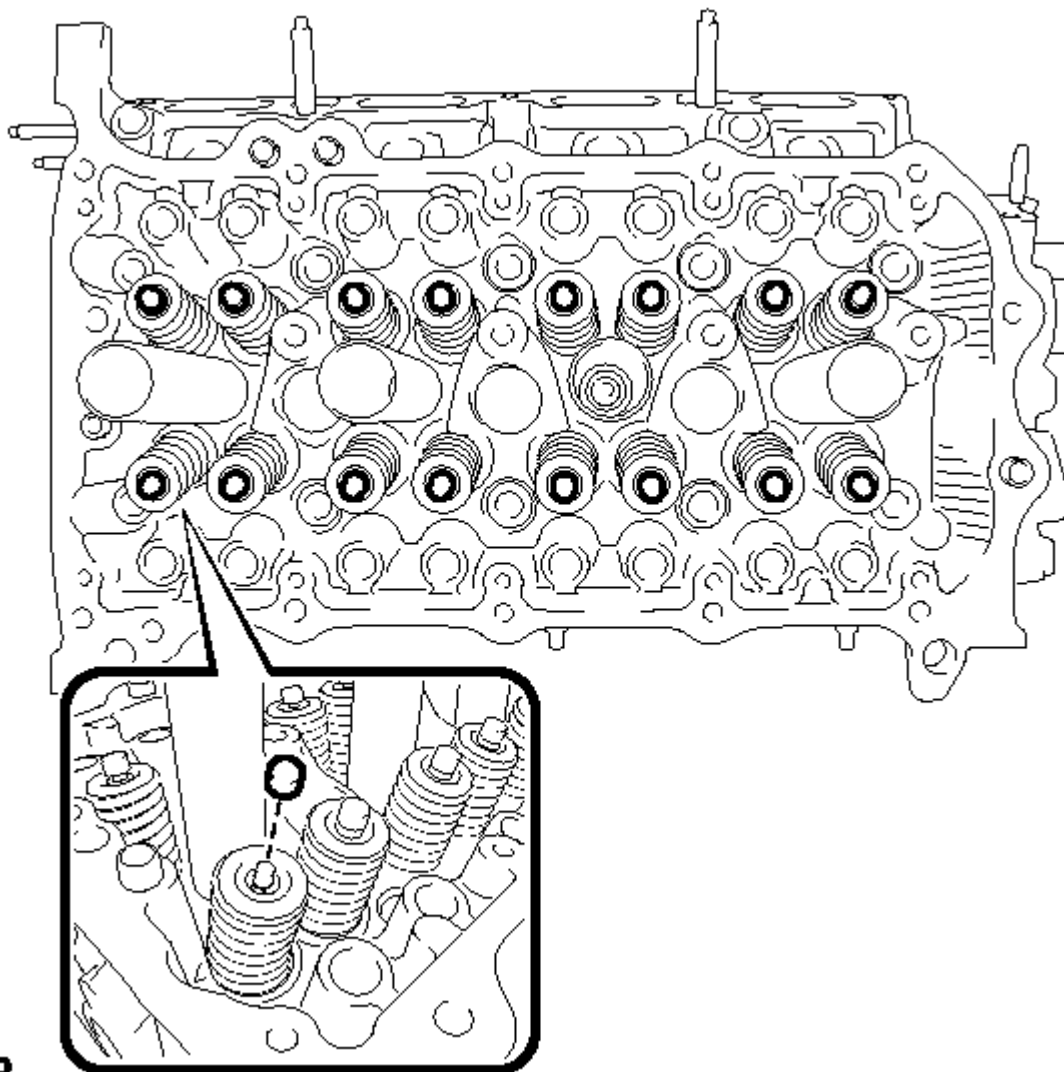
**P**

Fig. 317: Identifying Valve Stem Caps

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

HINT:

Arrange the removed parts in the correct order.

2. REMOVE INTAKE VALVE

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

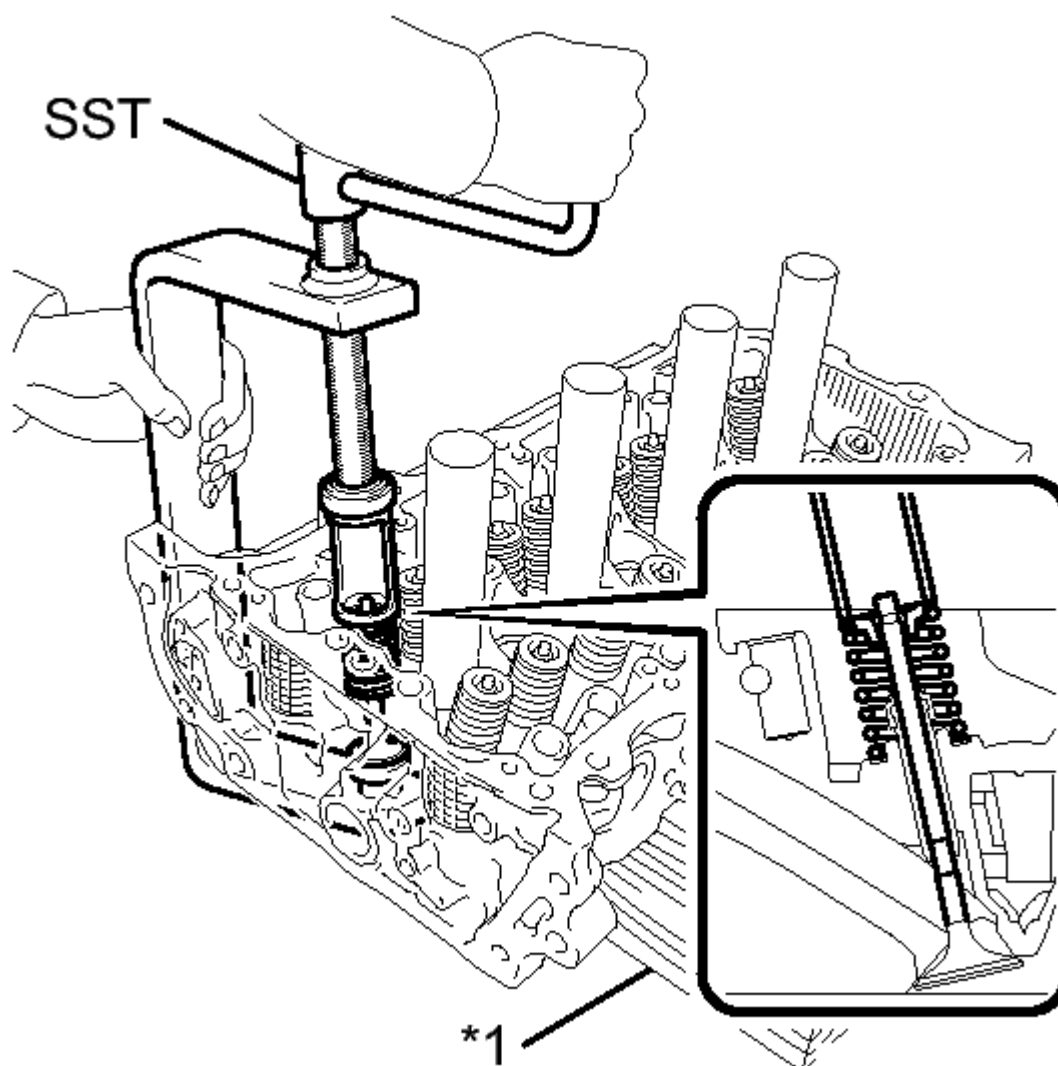
**P**

Fig. 318: Compressing And Removing Valve Retainer Locks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Wooden Block
----	--------------

- SST: 09202-70020
09202-00010

HINT:

Arrange the removed parts in the correct order.

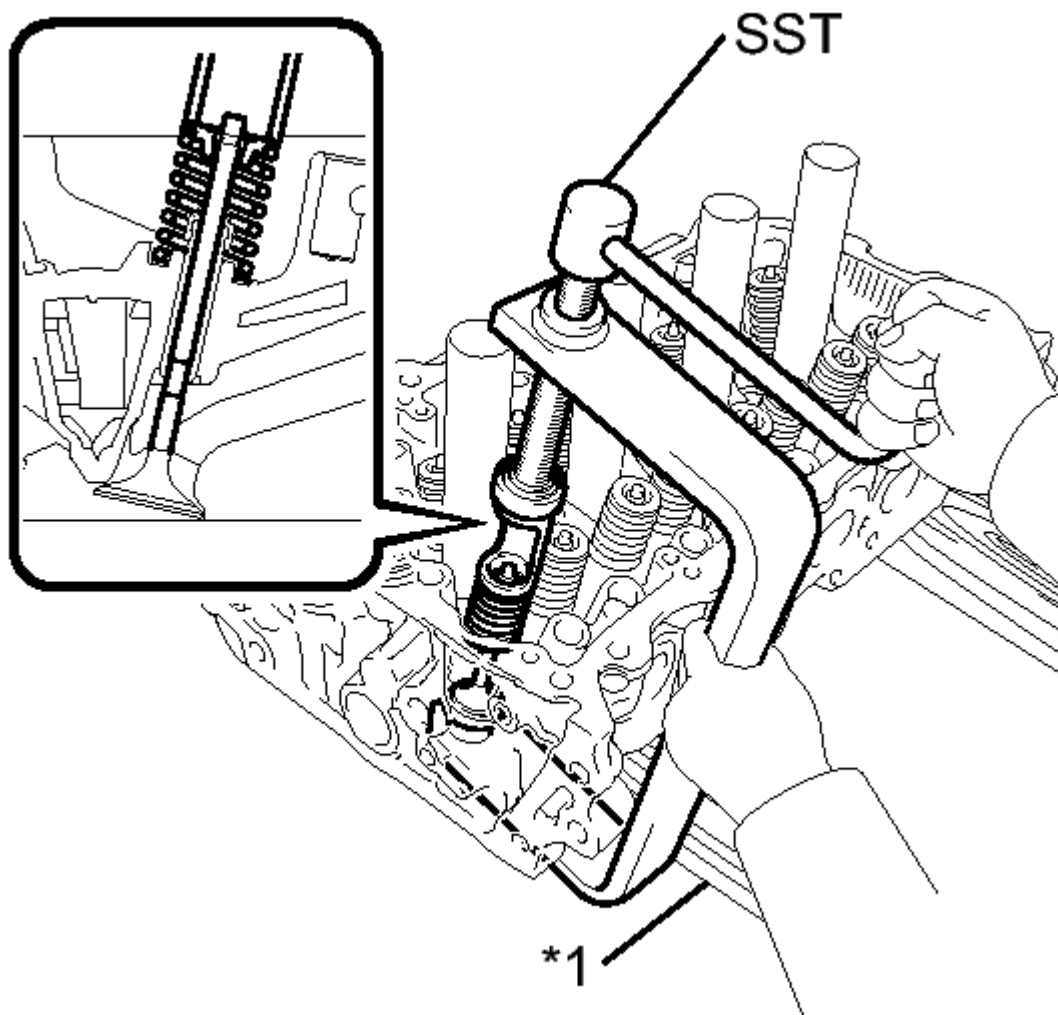
- Remove the retainer, valve spring and valve.

HINT:

Arrange the removed parts in the correct order.

3. REMOVE EXHAUST VALVE

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



P

Fig. 319: Compressing And Removing Valve Retainer Locks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Wooden Block
----	--------------

- SST: 09202-70020
09202-00010

HINT:

Arrange the removed parts in the correct order.

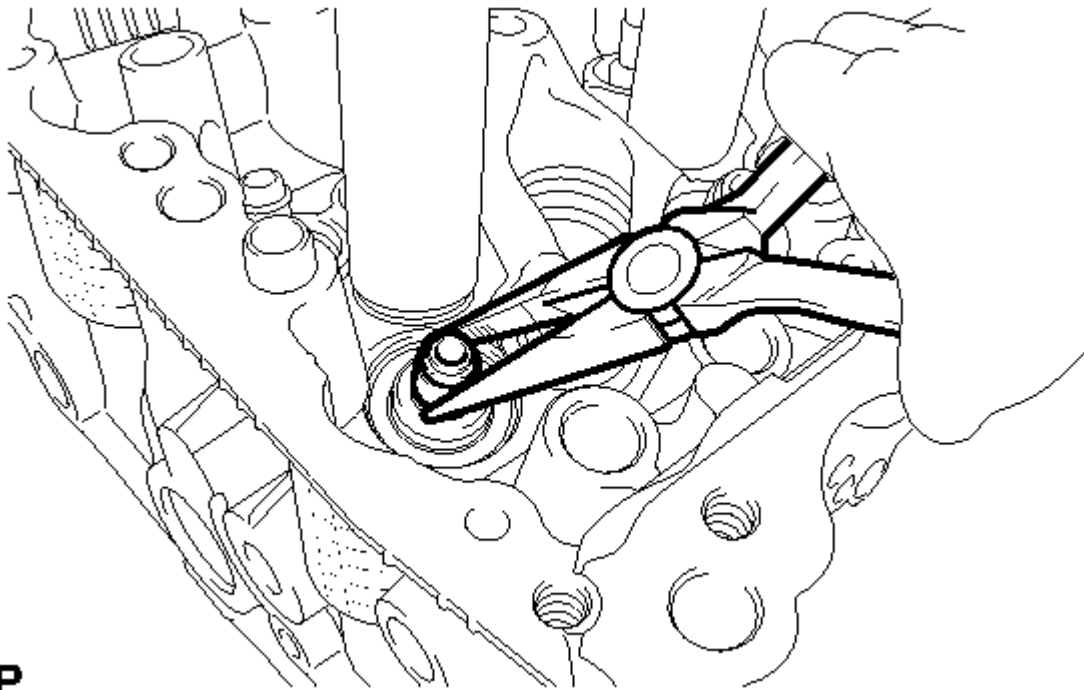
- b. Remove the retainer, valve spring and valve.

HINT:

Arrange the removed parts in the correct order.

4. REMOVE VALVE STEM OIL SEAL

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



P

Fig. 320: Removing Oil Seals

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

5. REMOVE VALVE SPRING SEAT

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

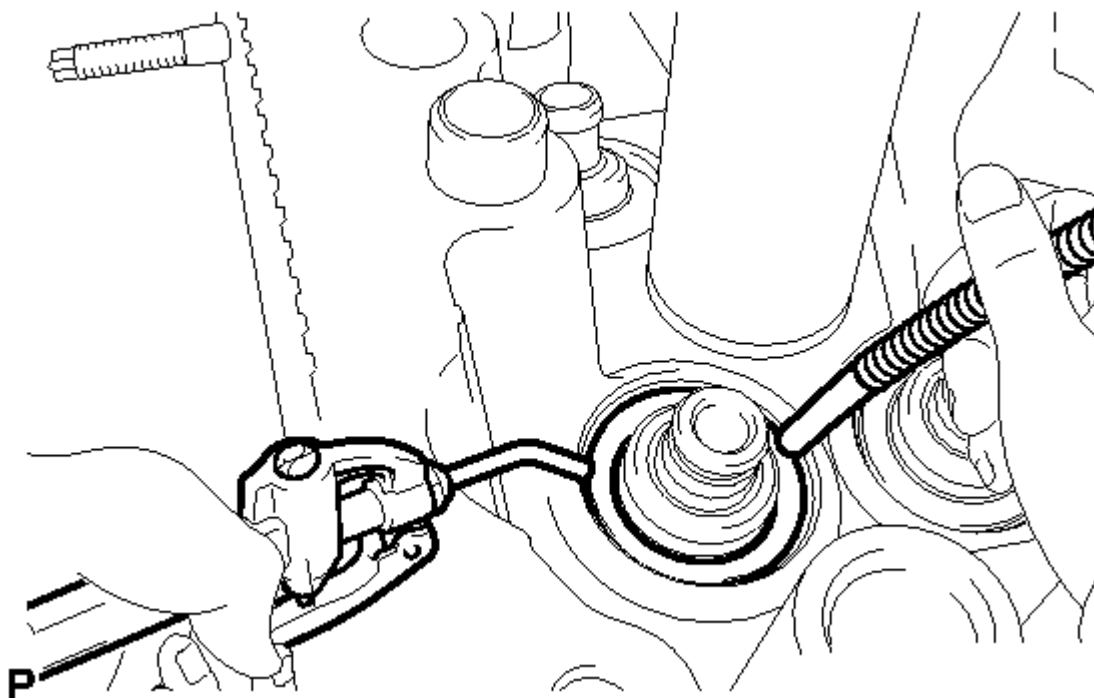


Fig. 321: Removing Valve Spring Seat

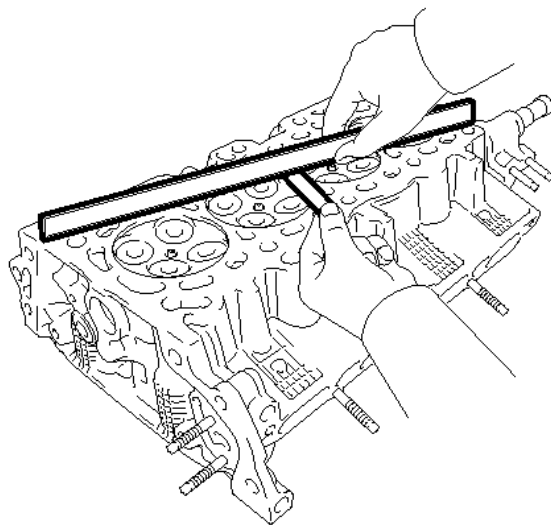
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

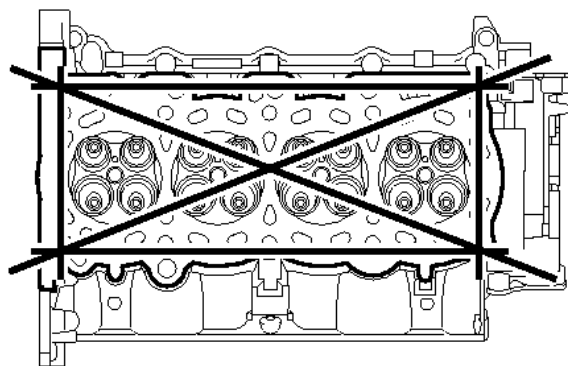
INSPECTION

1. INSPECT CYLINDER HEAD FOR FLATNESS

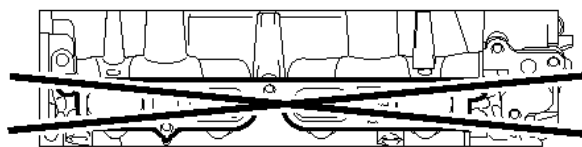
- a. Using a precision straightedge and a feeler gauge, measure the surfaces that contact the cylinder block and the manifolds for warpage.



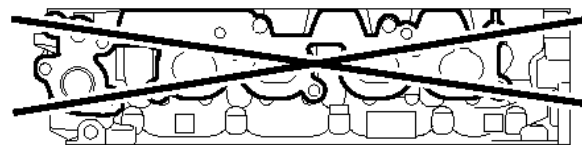
*a



*b



*c



P

Fig. 322: Identifying Contact Surfaces Of Cylinder Block And Manifolds
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Cylinder Block Side
----	---------------------

*b	Intake Manifold Side
*c	Exhaust Manifold Side

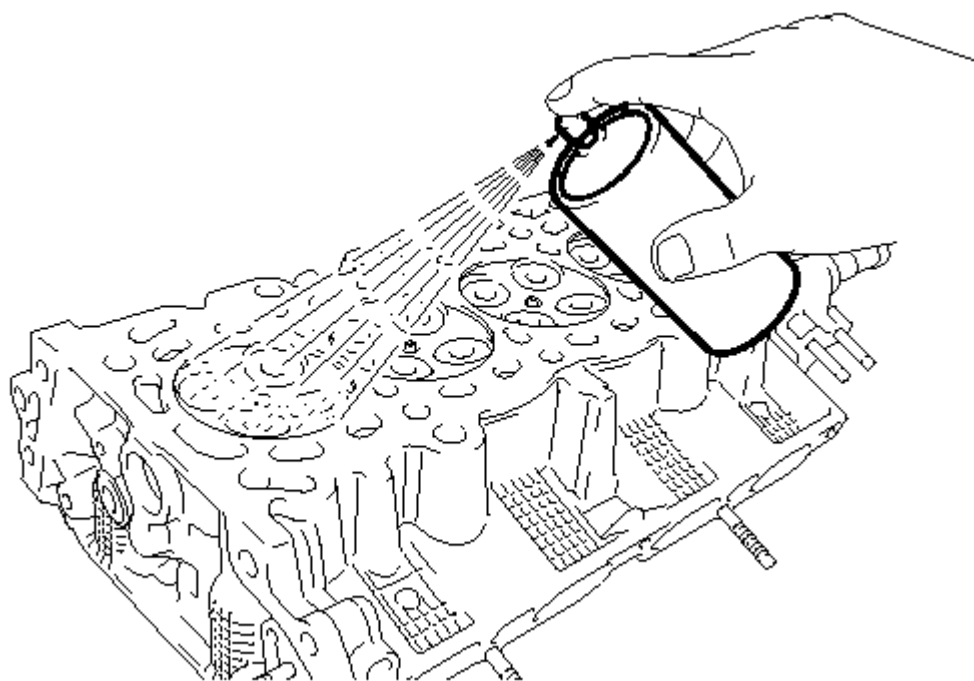
Maximum Warpage

Item	Specified Condition
Cylinder block side	0.05 mm (0.0020 in.)
Intake manifold side	0.10 mm (0.0039 in.)
Exhaust manifold side	0.10 mm (0.0039 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 head surface for cracks.



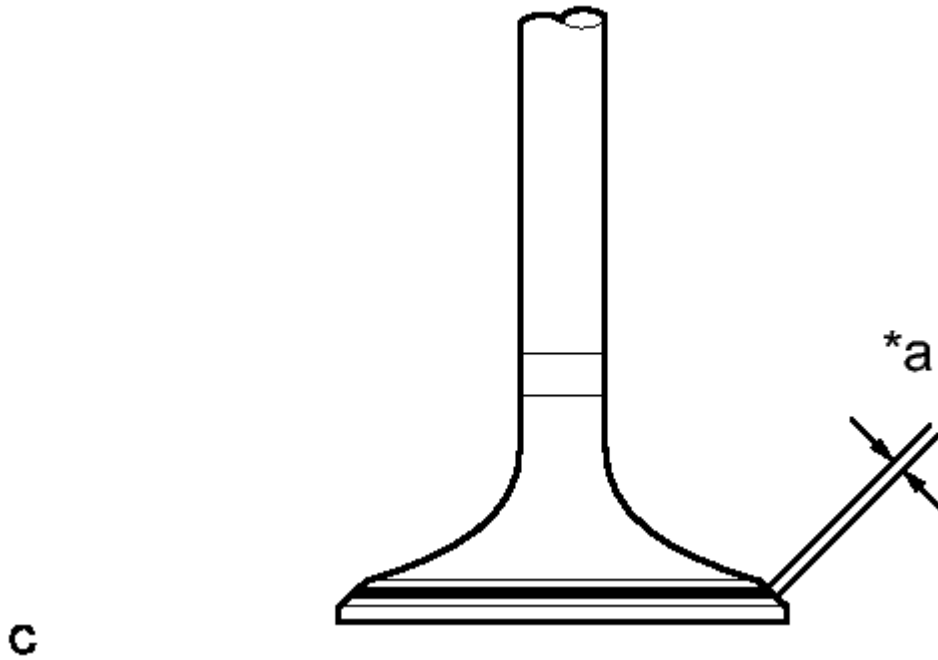
P

Fig. 323: Inspecting Cylinder Head For Cracks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If cracked, replace the cylinder head.

3. INSPECT VALVE SEATS

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

**Fig. 324: Inspecting Valve Seats**

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

- b. Lightly press the valve face against the valve seat.
- c. Check the valve face and valve seat according to the following procedure:
 1. If Prussian blue appears 360° around the valve face, the valve face is concentric. If not, replace the valve.

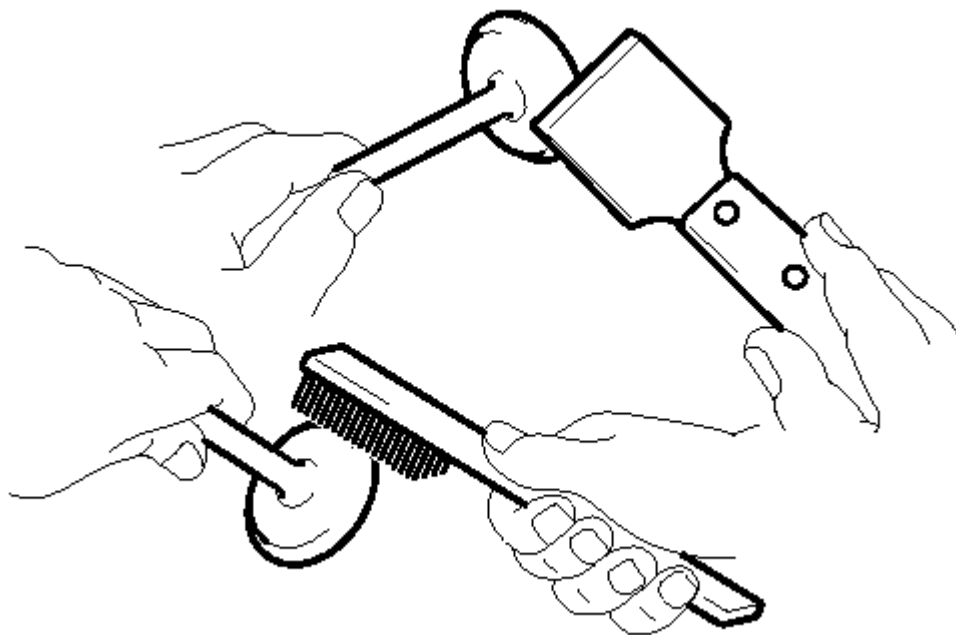
TEXT IN ILLUSTRATION

*a	Width
----	-------

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 valve seat width between 1.0 and 1.4 mm (0.0394 to 0.0551 in.).

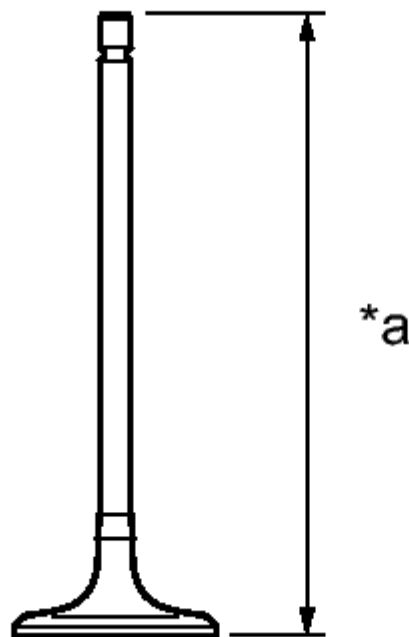
4. INSPECT INTAKE VALVE

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

**P****Fig. 325: Cleaning Valve Head**

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

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

**T****Fig. 326: Identifying Overall Length Of Intake Valve**

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

TEXT IN ILLUSTRATION

*a	Overall Length
----	----------------

Standard overall length

103.35 mm (4.0689 in.)

Minimum margin thickness

102.85 mm (4.0492 in.)

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

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

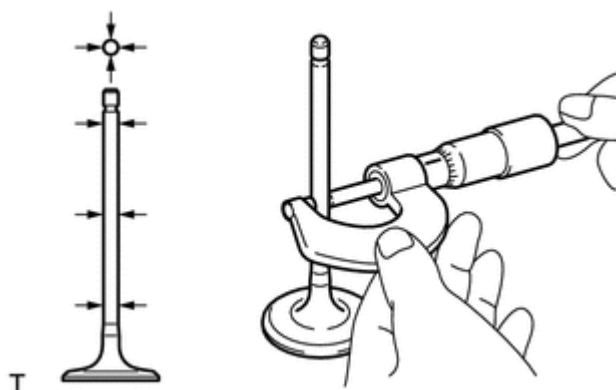


Fig. 327: Measuring Diameter Of Valve Stem

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

Valve stem diameter

5.470 to 5.485 mm (0.21535 to 0.21594 in.)

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

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

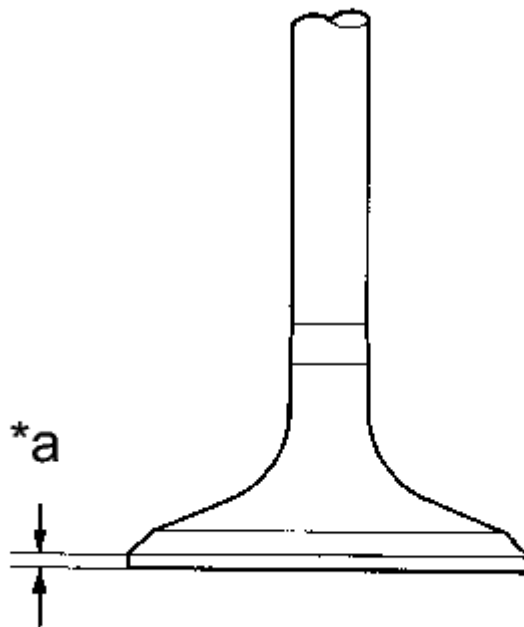


Fig. 328: Measuring Valve Head Margin Thickness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Margin Thickness
----	------------------

Standard margin thickness

1.0 mm (0.0394 in.)

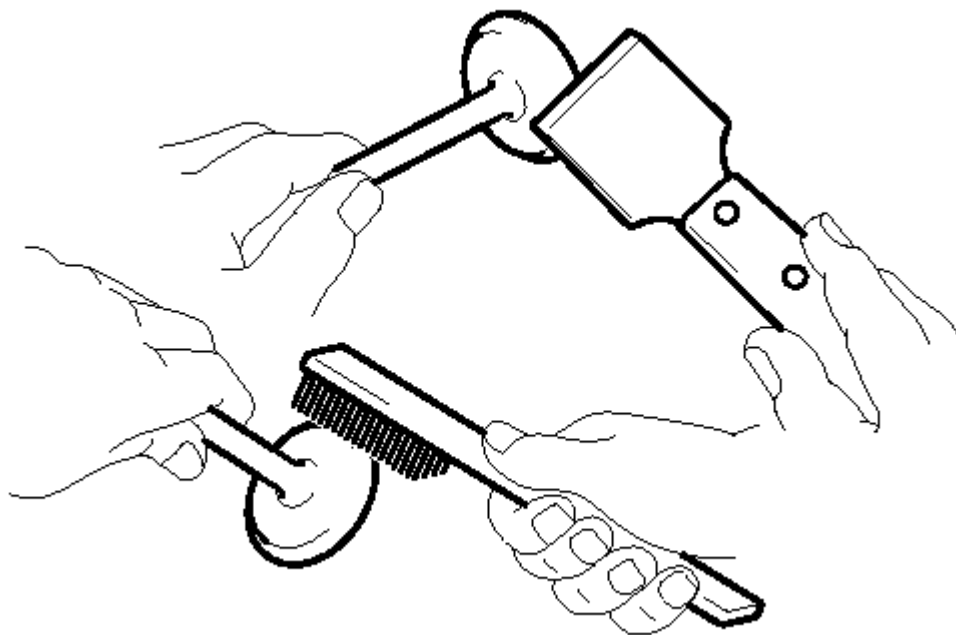
Minimum margin thickness

0.5 mm (0.0197 in.)

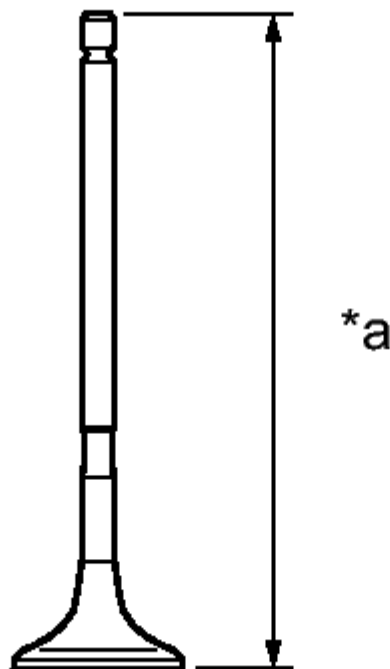
If the margin thickness is less than the minimum, replace the valve.

5. INSPECT EXHAUST VALVE

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

**P****Fig. 329: Cleaning Valve Head****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

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

**T****Fig. 330: Identifying Overall Length Of Exhaust Valve****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

TEXT IN ILLUSTRATION

*a	Overall Length
----	----------------

Standard overall length

104.5 mm (4.114 in.)

Minimum overall length

104.0 mm (4.0945 in.)

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

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

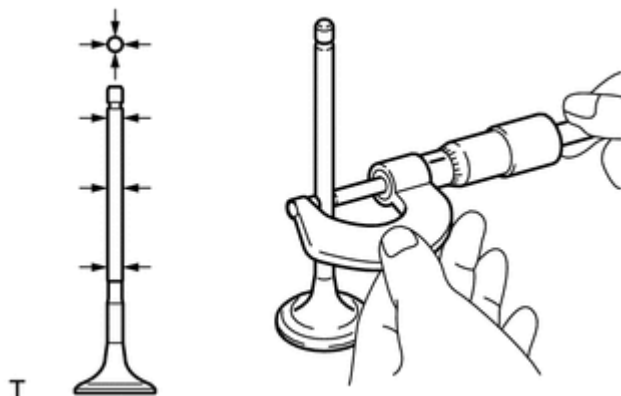


Fig. 331: Measuring Diameter Of Valve Stem

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

Valve stem diameter

5.465 to 5.480 mm (0.21516 to 0.21575 in.)

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

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

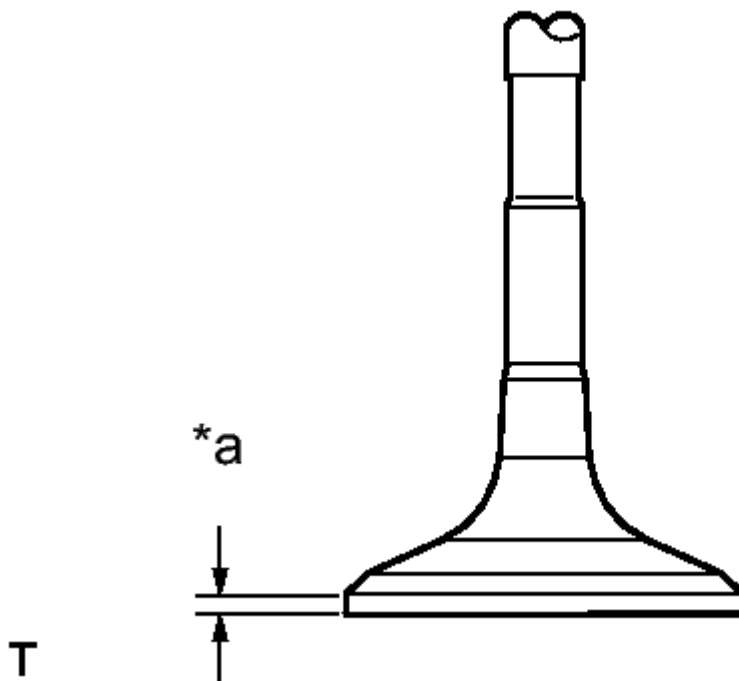


Fig. 332: Measuring Valve Head Margin Thickness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Margin Thickness
----	------------------

Standard margin thickness

1.15 mm (0.0453 in.)

Minimum margin thickness

0.65 mm (0.0255 in.)

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

6. INSPECT VALVE GUIDE BUSH OIL CLEARANCE

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

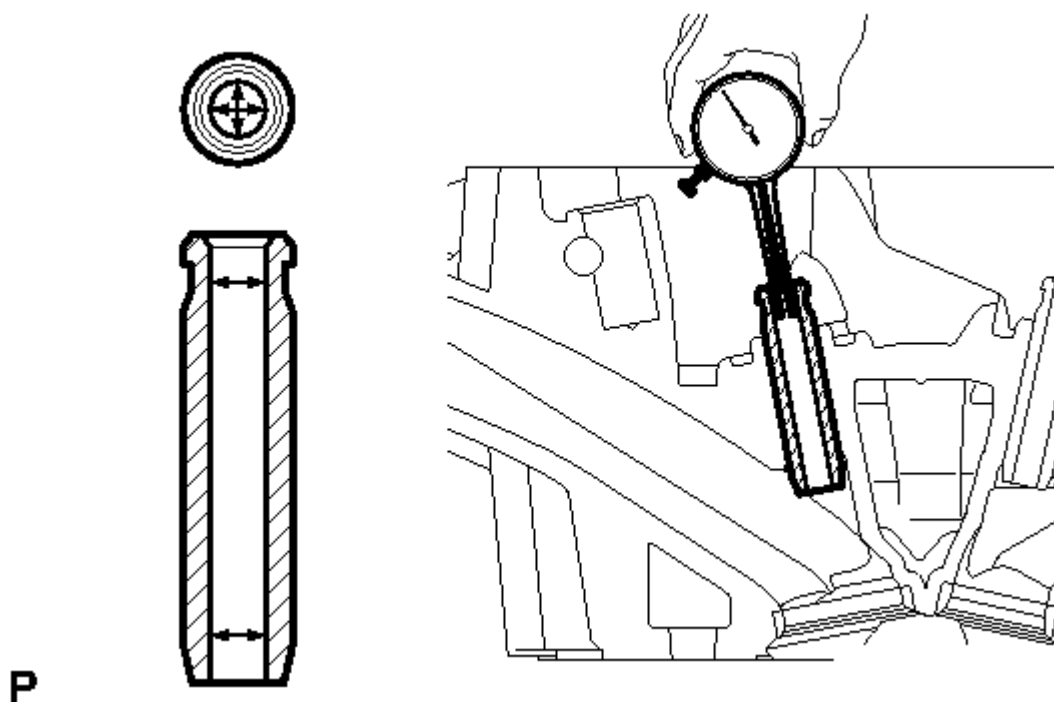
**P**

Fig. 333: Measuring Inside Diameter Of Guide Bush
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Bushing inside diameter

5.51 to 5.53 mm (0.2169 to 0.2177 in.)

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

Standard Oil Clearance

Item	Specified Condition
Intake	0.025 to 0.060 mm (0.000984 to 0.00236 in.)
Exhaust	0.030 to 0.065 mm (0.00118 to 0.00256 in.)

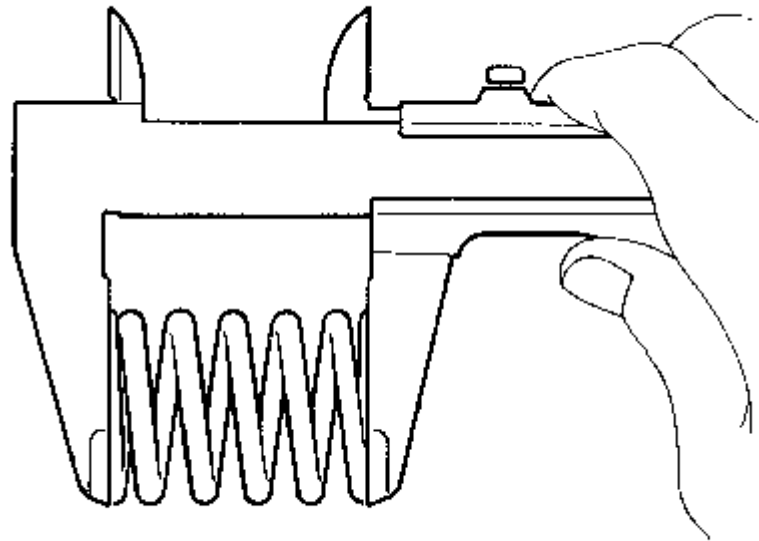
Maximum Oil Clearance

Item	Specified Condition
Intake	0.080 mm (0.00315 in.)
Exhaust	0.085 mm (0.00335 in.)

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

7. INSPECT COMPRESSION SPRING

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



EM0801

Fig. 334: Measuring Free Length Of Valve Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Free length

51.19 mm (2.0154 in.)

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

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

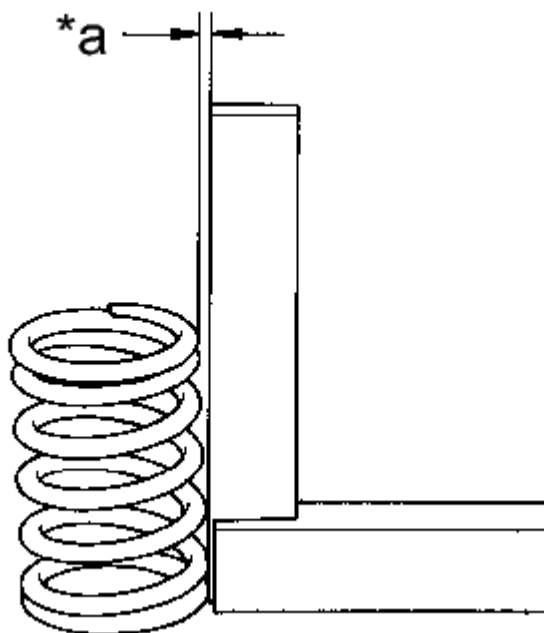


Fig. 335: Measuring Deviation Of Compression Spring Using Steel Set Square
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Deviation
----	-----------

Maximum deviation

1.8 mm (0.0709 in.)

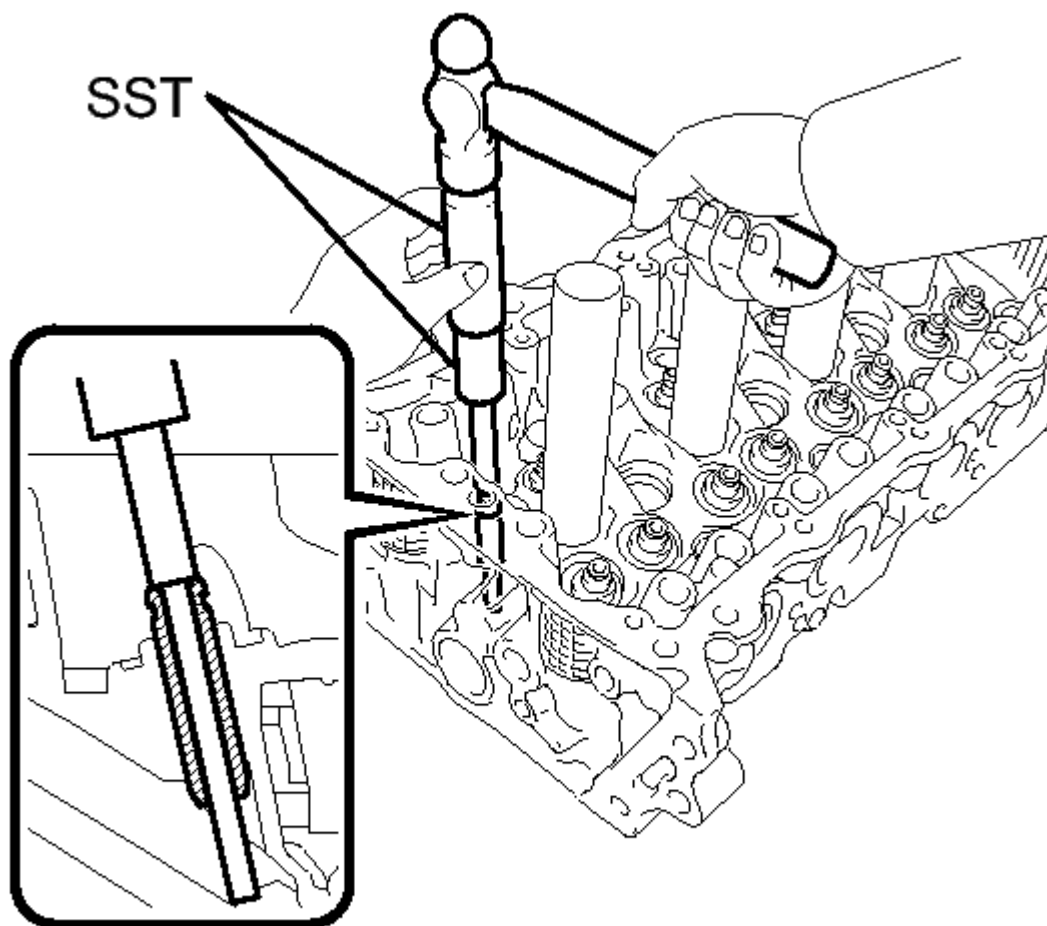
If the deviation is greater than the maximum, replace the valve spring.

REPLACEMENT

REPLACEMENT

1. REPLACE INTAKE VALVE GUIDE BUSH

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

**P****Fig. 336: Replacing Intake Valve Guide Bush**

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

- b. Place the cylinder head on wooden blocks.
- c. Using SST and a hammer, tap out the guide bush.
 - **SST: 09201-10000**
09201-01050
 - **SST: 09950-70010**
09951-07100
- d. Using a caliper gauge, measure the bush bore diameter of the cylinder head.

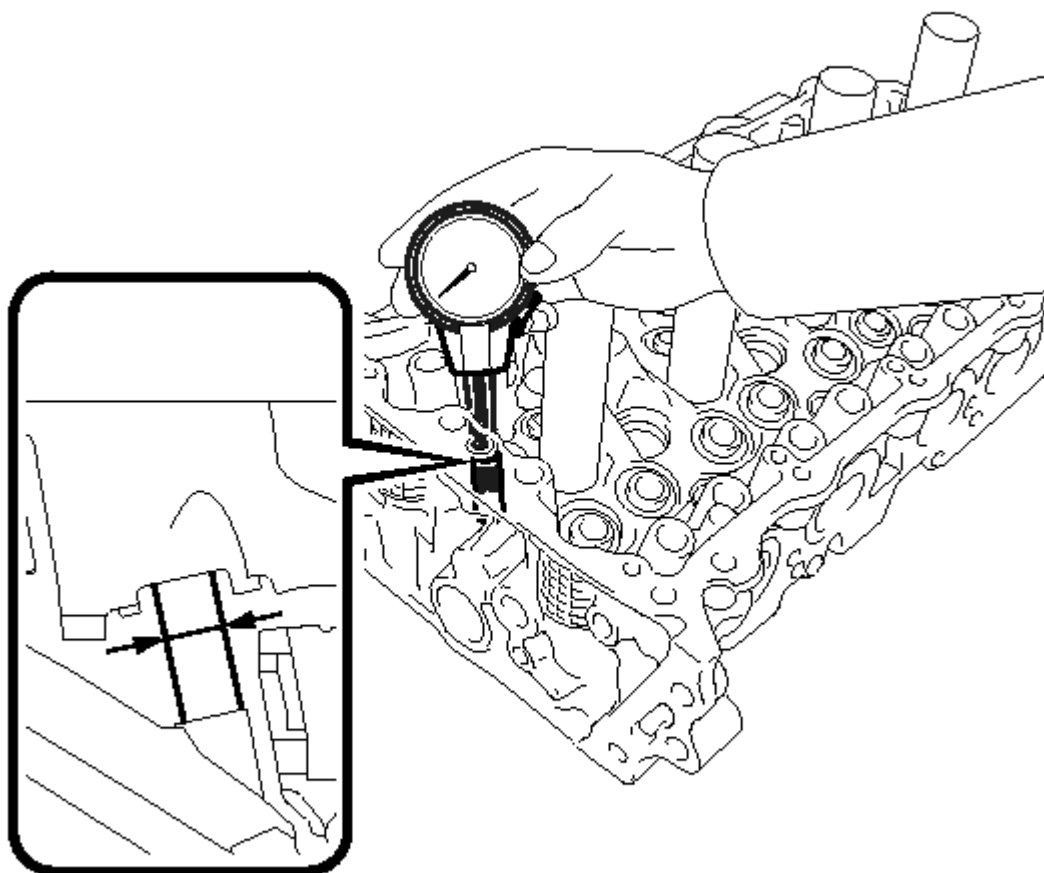
**P**

Fig. 337: Measuring Bush Bore Diameter Of Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Bush bore diameter

10.285 to 10.306 mm (0.40492 to 0.40575 in.)

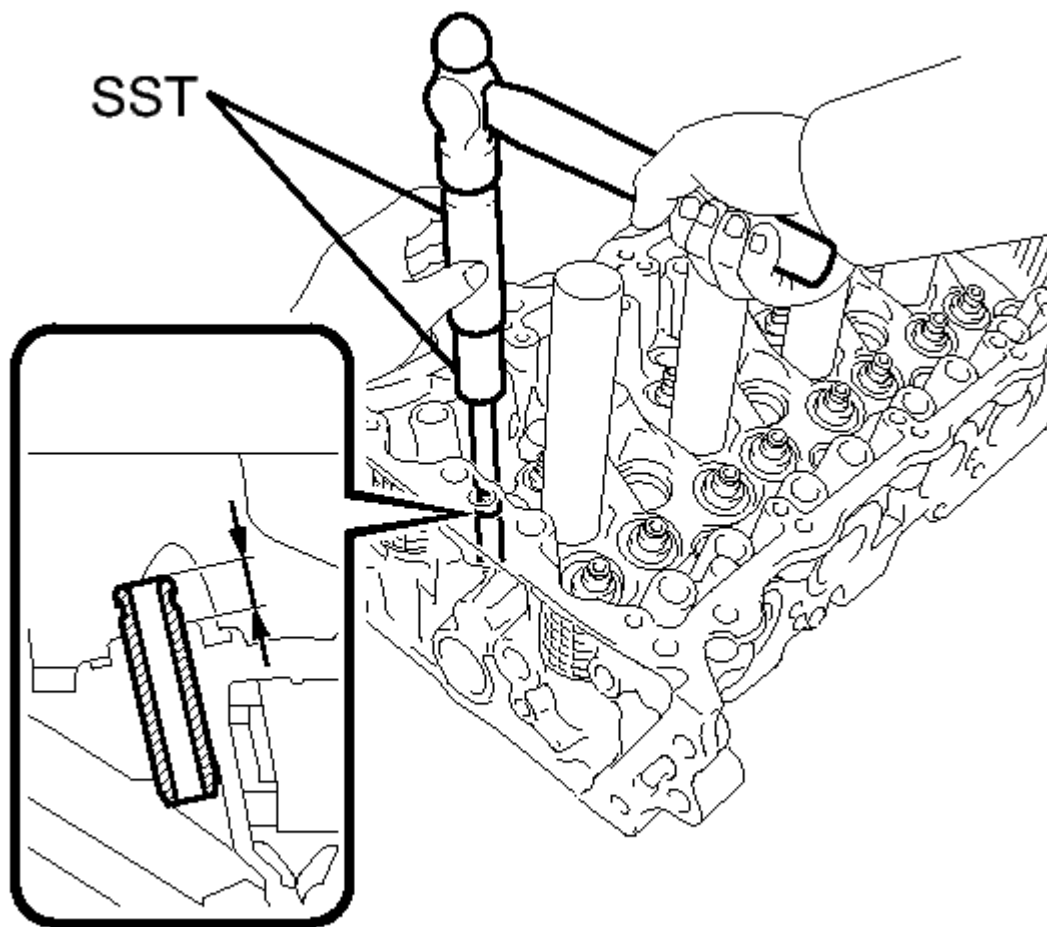
Select a New Guide Bush (STD or O/S 0.05)

Bush Size	Bush Bore Diameter
STD	10.285 to 10.306 mm (0.40492 to 0.40575 in.)
O/S 0.05	10.335 to 10.356 mm (0.40689 to 0.40772 in.)

If the bush bore diameter of the cylinder head is greater than 10.306 mm (0.40575 in.), machine the bush bore to the dimension of 10.335 to 10.356 mm (0.40689 to 0.40772 in.) to install an O/S 0.05 valve guide bush. If the bush bore diameter of the cylinder head is greater than 10.356 mm

(0.40772 in.), replace the cylinder head.

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



P

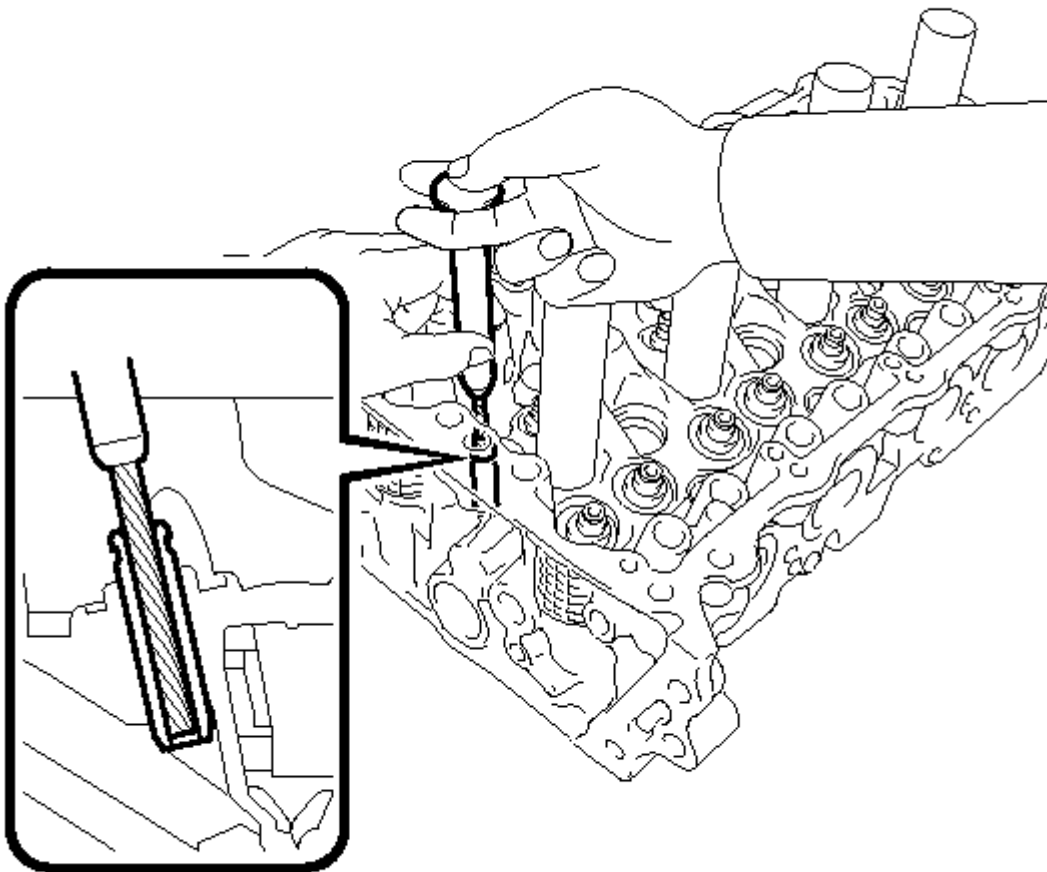
Fig. 338: Installing Guide Bush To Specified Protrusion Height
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Protrusion height

9.6 to 10.0 mm (0.378 to 0.394 in.)

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



P

Fig. 339: Reaming The Guide Bush

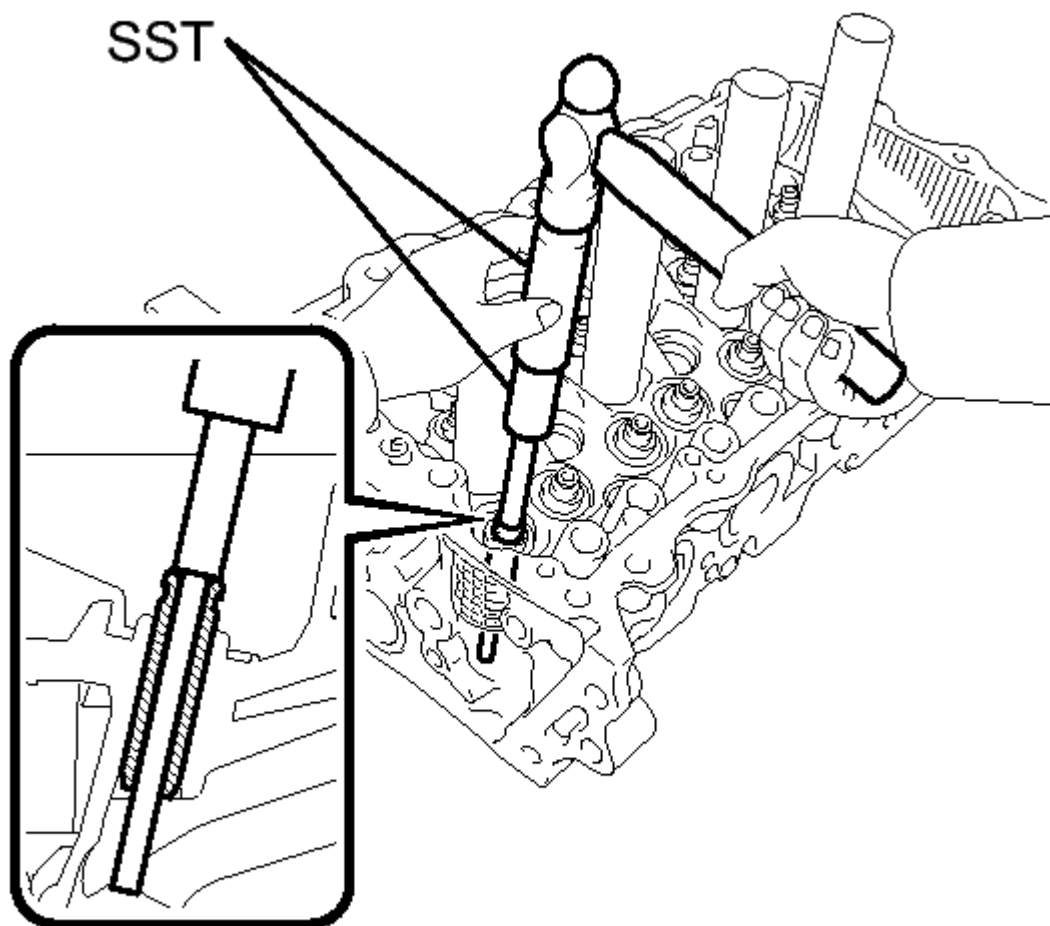
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard oil clearance

0.025 to 0.060 mm (0.000984 to 0.00236 in.)

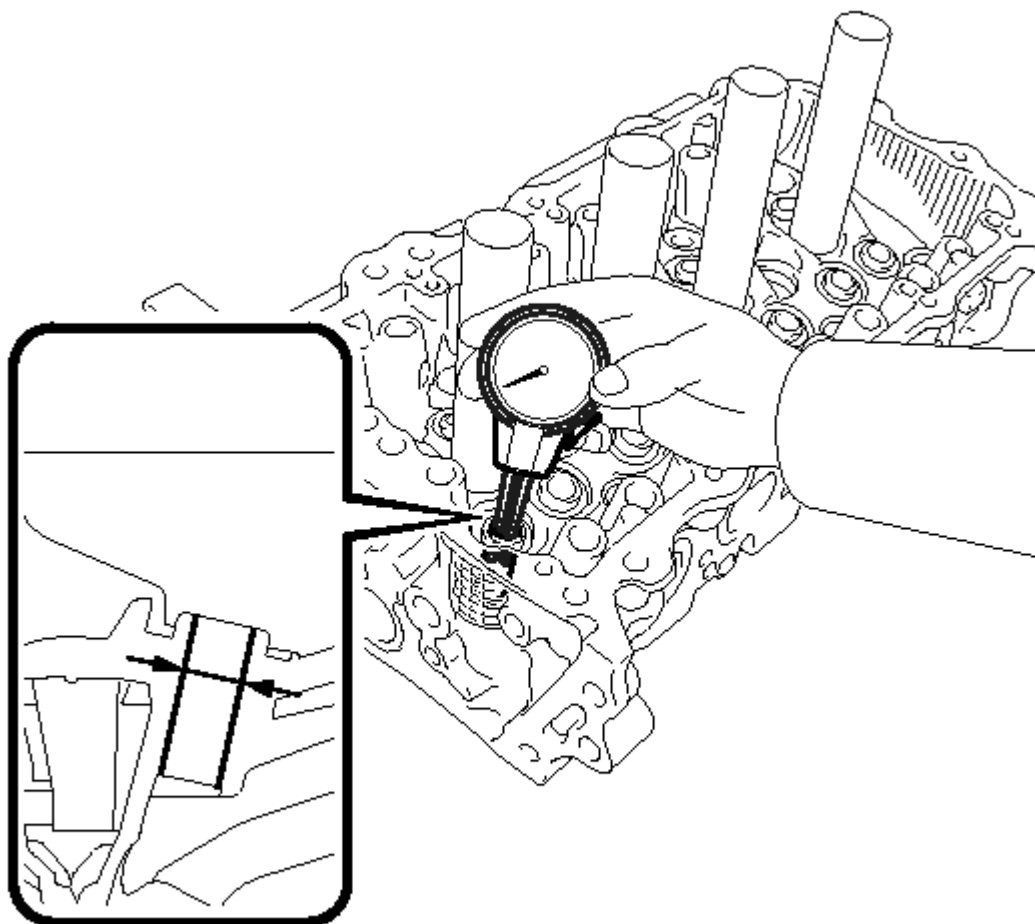
2. REPLACE EXHAUST VALVE GUIDE BUSH

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

**P****Fig. 340: Replacing Exhaust Valve Guide Bush**

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

- b. Place the cylinder head on wooden blocks.
- c. Using SST and a hammer, tap out the guide bush.
 - **SST: 09201-10000**
09201-01050
 - **SST: 09950-70010**
09951-07100
- d. Using a caliper gauge, measure the bush bore diameter of the cylinder head.

**P****Fig. 341: Measuring Bush Bore Diameter****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

Standard diameter

10.285 to 10.306 mm (0.40492 to 0.40575 in.)

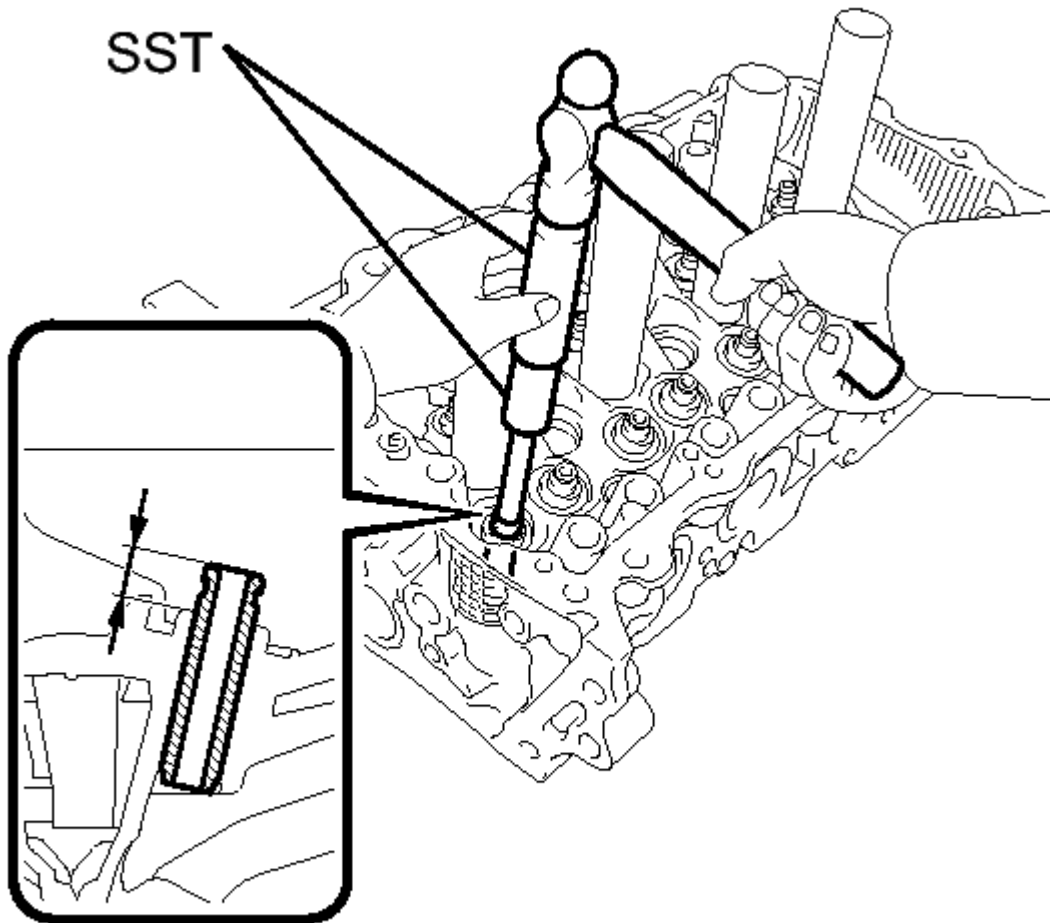
Select a New Guide Bush (STD or O/S 0.05)

Bush Size	Bush Bore Diameter
STD	10.285 to 10.306 mm (0.40492 to 0.40575 in.)
O/S 0.05	10.335 to 10.356 mm (0.40689 to 0.40772 in.)

If the bush bore diameter of the cylinder head is greater than 10.306 mm (0.40575 in.), machine the bush bore to the dimension of 10.335 to 10.356 mm (0.40689 to 0.40772 in.) to install an O/S 0.05 valve guide bush. If the bush bore diameter of the cylinder head is greater than 10.356 mm

(0.40772 in.), replace the cylinder head.

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



P

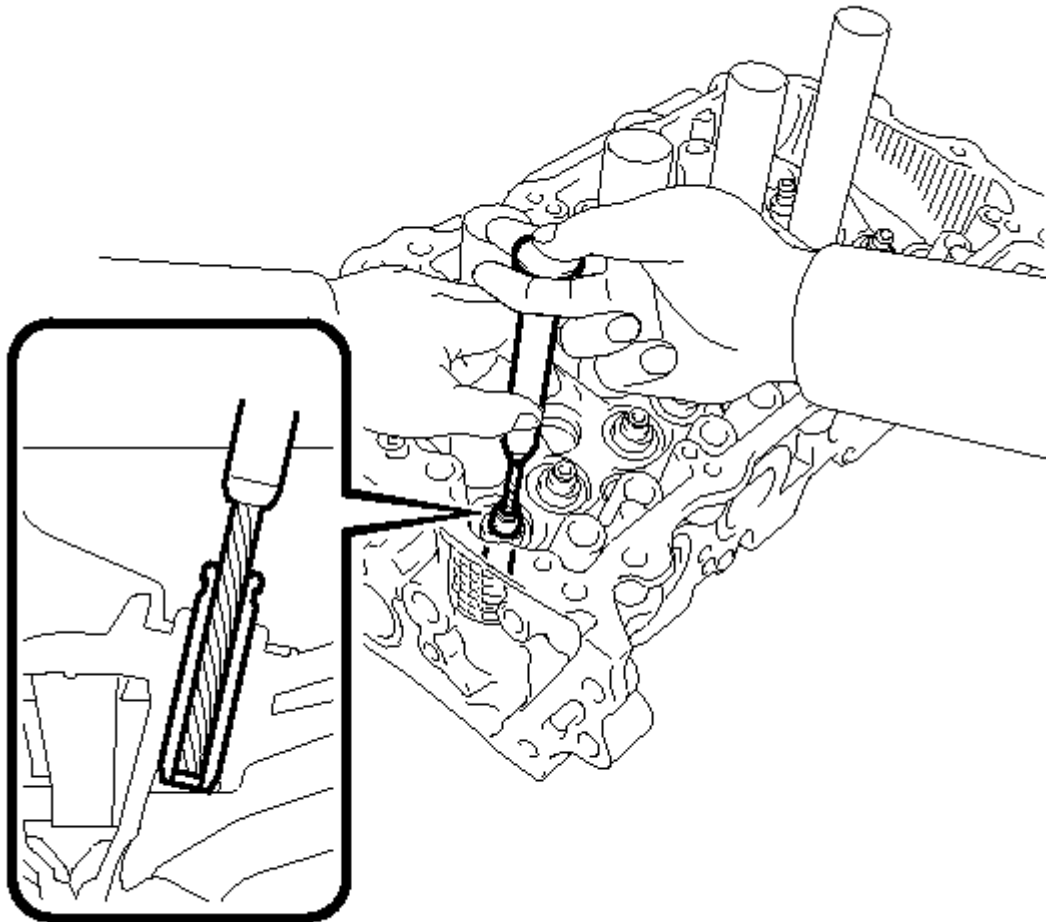
Fig. 342: Installing Guide Bush to Specified Protrusion Height
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Protrusion height

9.6 to 10.0 mm (0.378 to 0.394 in.)

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



P

Fig. 343: Reaming The Guide Bush

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

Standard oil clearance

0.030 to 0.065 mm (0.00118 to 0.00256 in.)

3. REPLACE RING PIN

NOTE: It is not necessary to remove the ring pins unless they are being replaced.

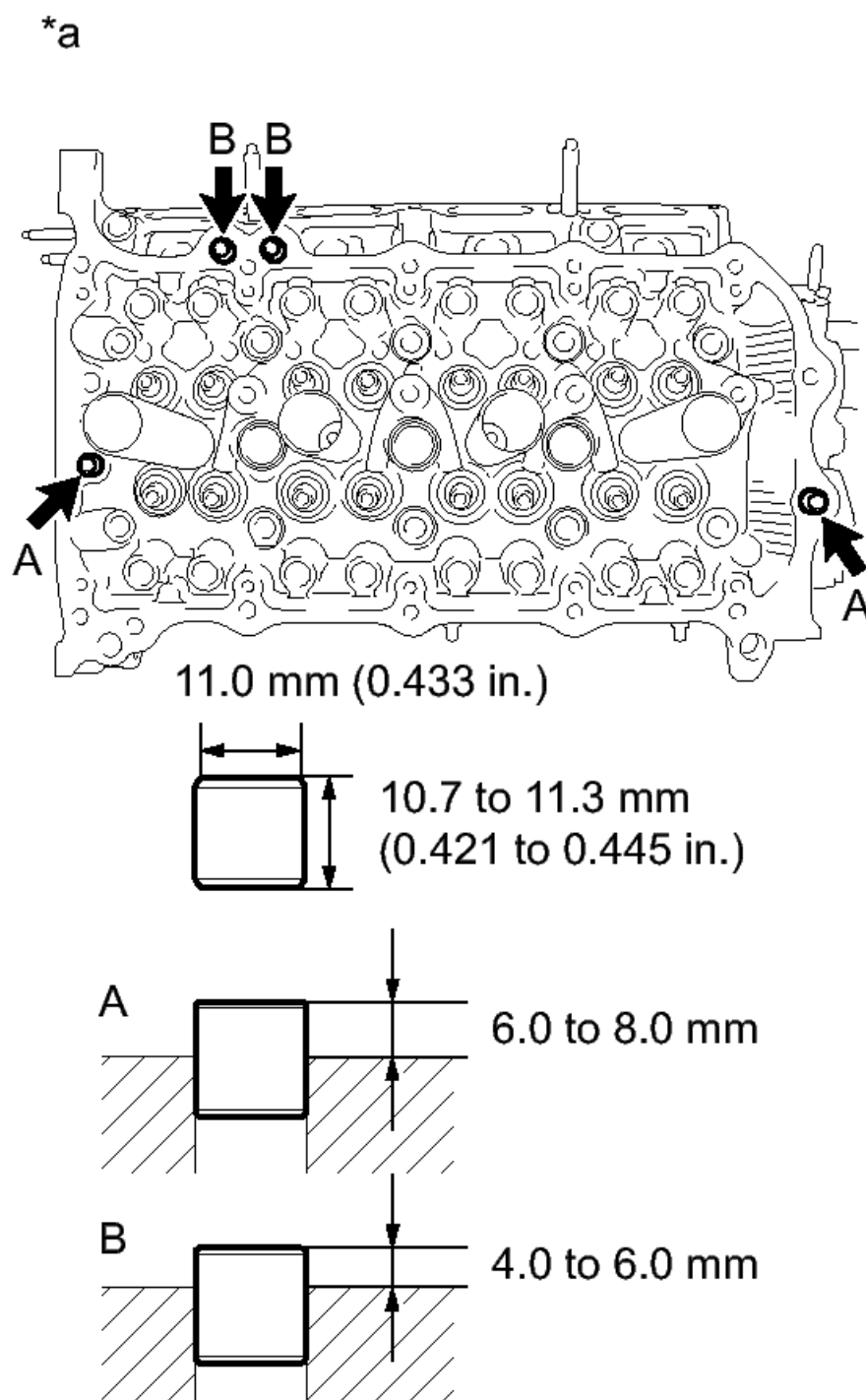
**P**

Fig. 344: Identifying Ring Pins Specified Protrusion Height
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Remove the ring pins.

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

TEXT IN ILLUSTRATION

*a	Upper Side
----	------------

Protrusion Height

Item	Protrusion Height
Ring pin A	6.0 to 8.0 mm (0.236 to 0.315 in.)
Ring pin B	4.0 to 6.0 mm (0.157 to 0.236 in.)

4. REPLACE STUD BOLT

NOTE: If any of the stud bolts is deformed or the threads are damaged, replace it.

- a. Using "TORX" socket wrenches E5 and E8, remove the stud bolts.

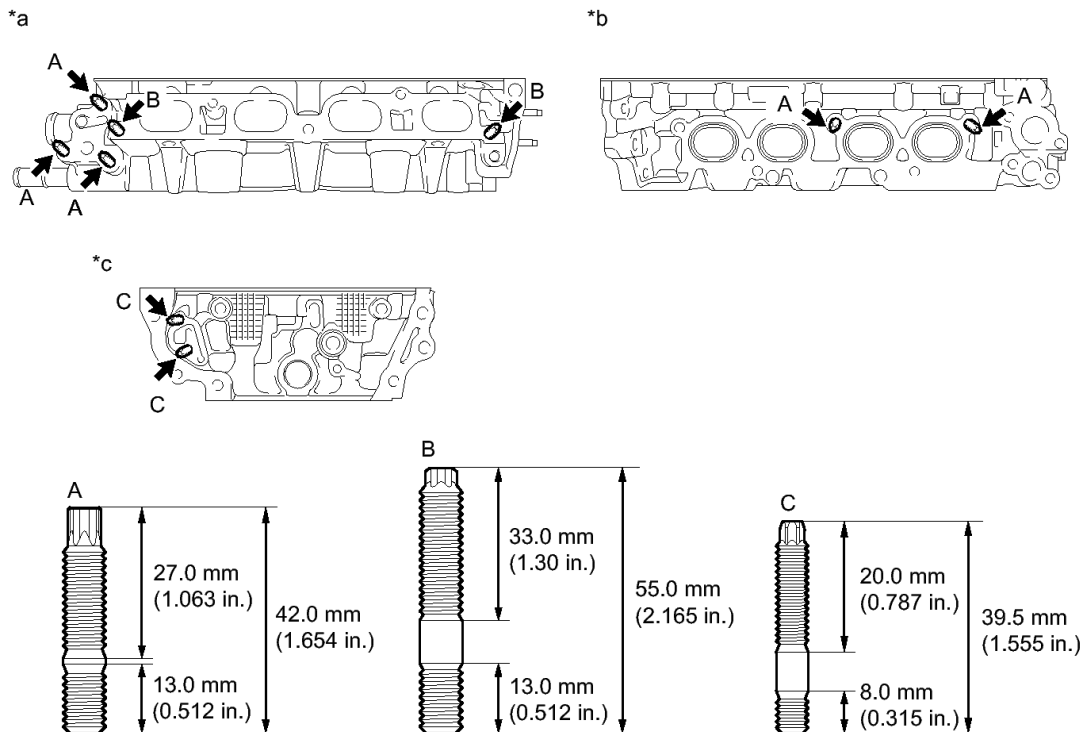


Fig. 345: Identifying Stud Bolts

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

TEXT IN ILLUSTRATION

*a	Intake Side	*b	Exhaust Side
*c	Front Side	-	-

- b. Using "TORX" socket wrenches E5 and E8, install the stud bolts.

Stud bolt A and B

Torque: 7.5 N*m (76 kgf*cm, 66 in.*lbf)

Stud bolt C

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

REASSEMBLY

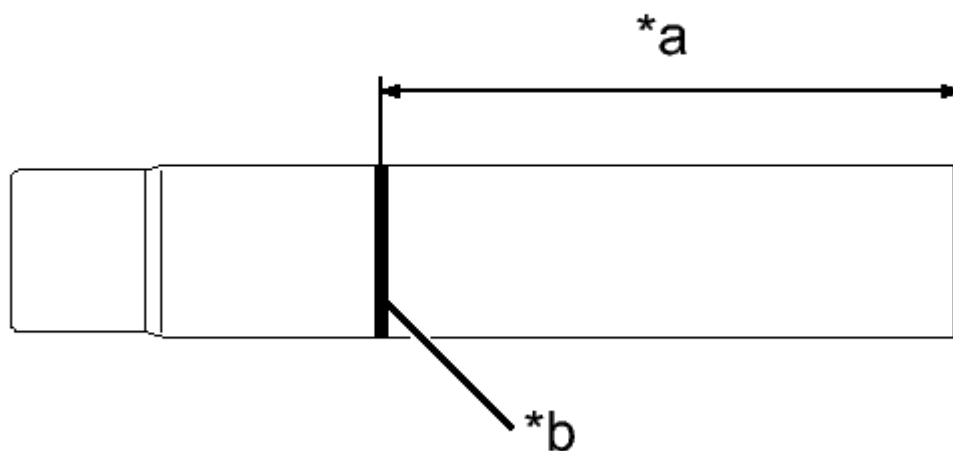
REASSEMBLY

1. INSTALL SPARK PLUG TUBE

HINT:

When replacing the cylinder head with a new one, perform the following procedure.

- a. Using paint, mark the standard position from the edge.



C

Fig. 346: Identifying Protrusion Height

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

TEXT IN ILLUSTRATION

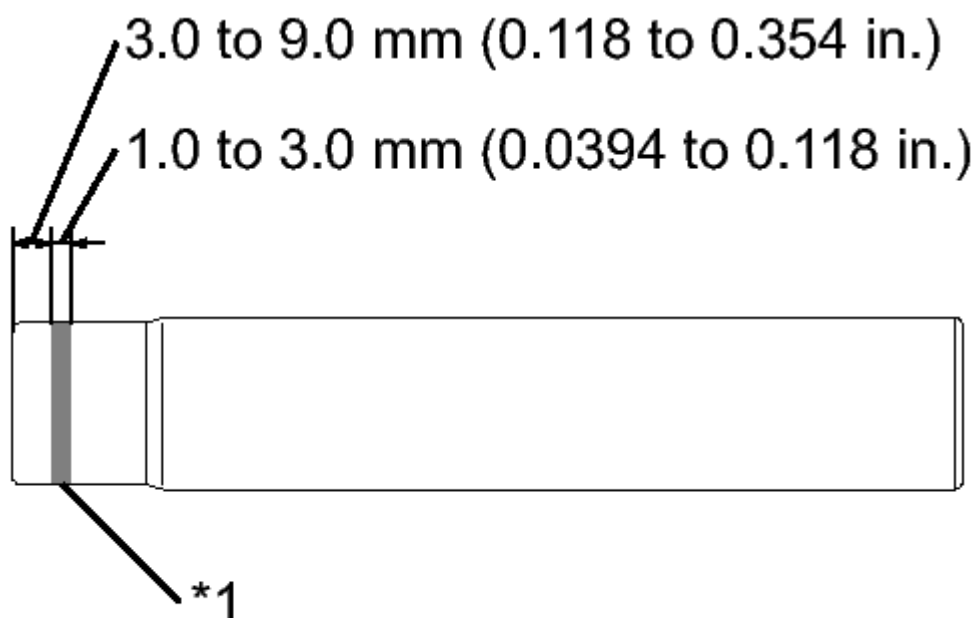
*a	Protrusion Height
----	-------------------

*b	Mark
----	------

Standard protrusion height

88.7 to 90.2 mm (3.492 to 3.551 in.)

- b. Apply adhesive to the spark plug tube where it will be pressed into the cylinder head.



C

Fig. 347: Applying Adhesive To Spark Plug Tube
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Adhesive
----	----------

Adhesive

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

- c. Using a press and wooden block, install the spark plug tube to the required protrusion height.

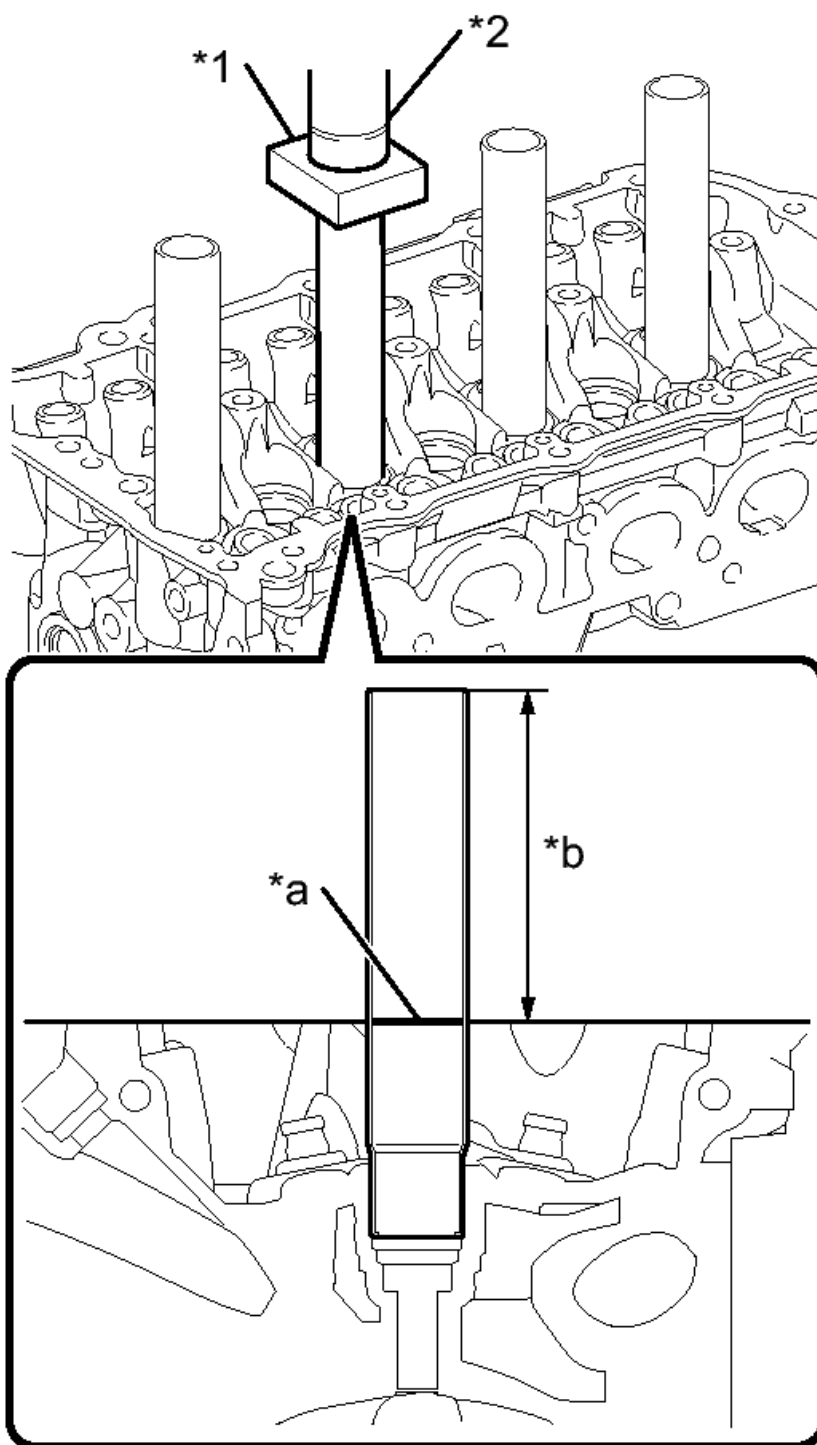
**C**

Fig. 348: Installing Spark Plug Tube To Required Protrusion Height
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Wooden Block
*2	Press
*a	Mark
*b	Protrusion Height

Standard protrusion height

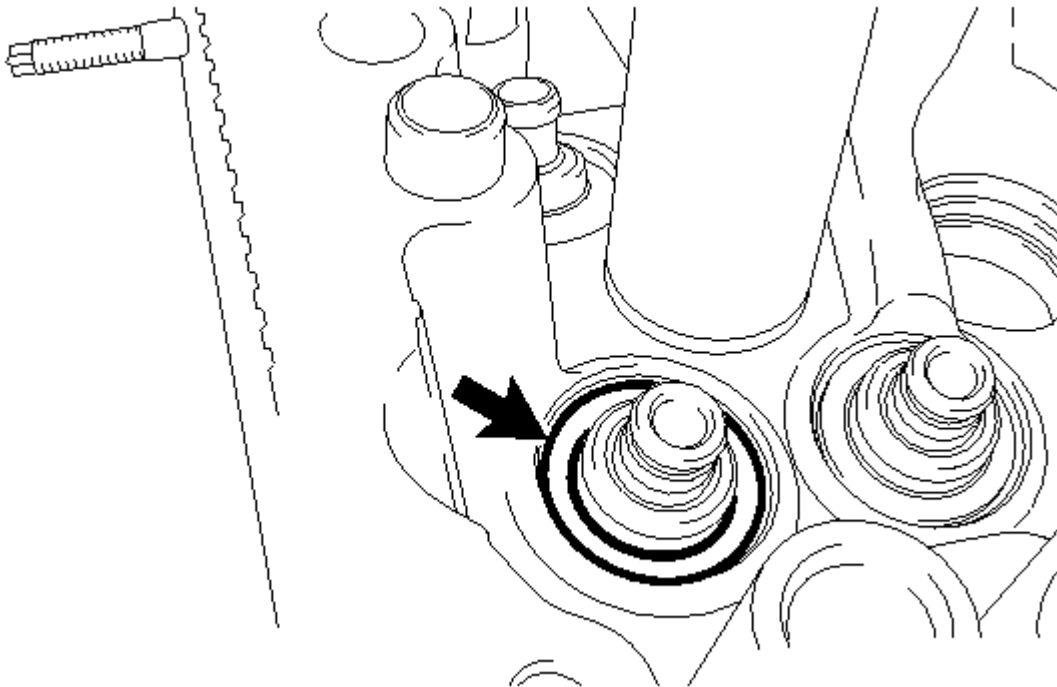
88.7 to 90.2 mm (3.492 to 3.551 in.)

NOTE:

- Install the spark plug tube within 3 minutes after applying adhesive.
- Do not start the engine within 1 hour after installation.
- Do not deform the spark plug tube.
- Be careful not to drip the adhesive.

2. INSTALL VALVE SPRING SEAT

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



P

Fig. 349: Identifying Valve Spring Seats

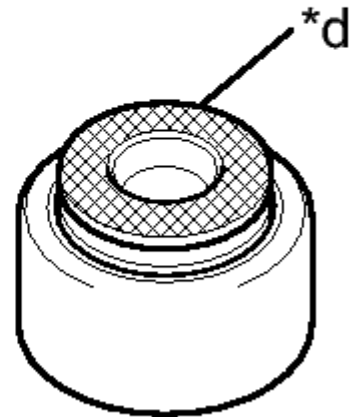
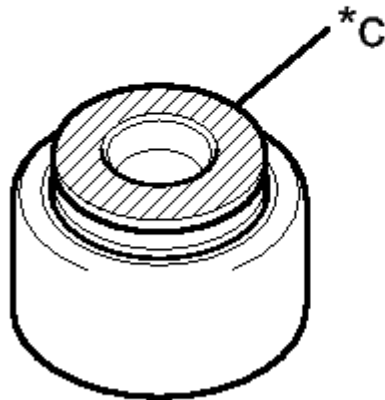
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL VALVE STEM OIL SEAL

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

*a

*b

**C****Fig. 350: Identifying Valve Stem Oil Seal**

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

TEXT IN ILLUSTRATION

*a	Intake Side
*b	Exhaust Side
*c	Gray
*d	Black

NOTE: Pay close attention when installing the intake and exhaust oil seals. Installing the intake oil seal into the exhaust side or installing the exhaust oil seal to the intake side may 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 seals.

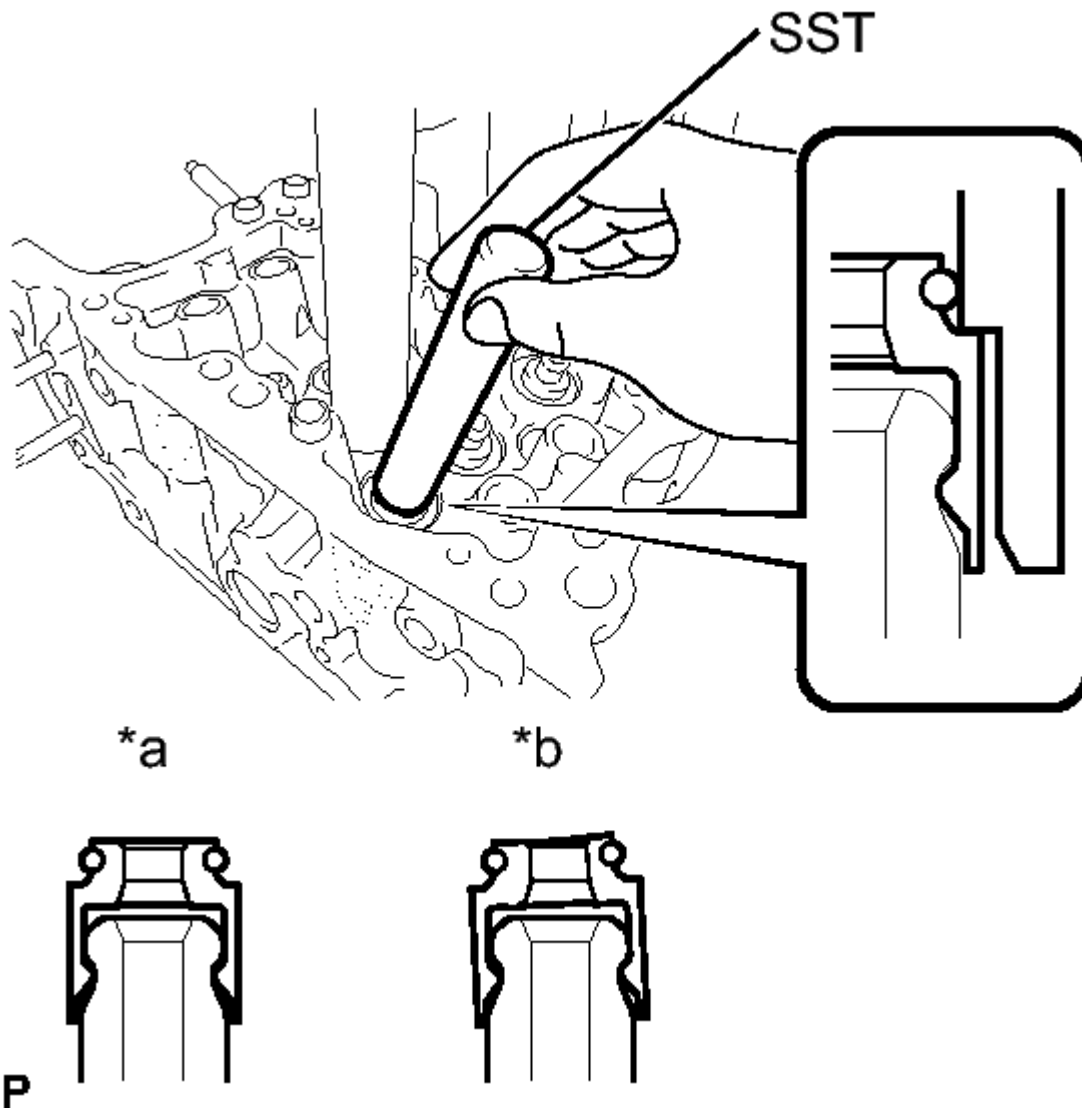


Fig. 351: Pushing In Oil Seals

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

TEXT IN ILLUSTRATION

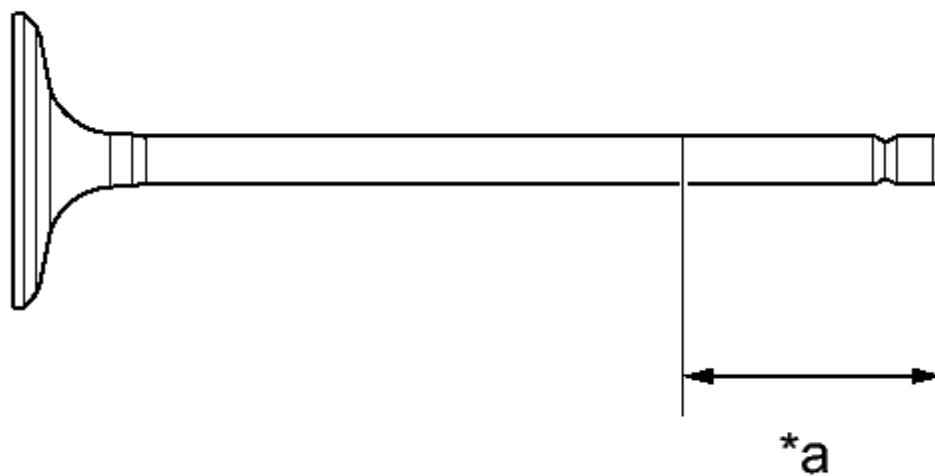
*a	Correct
*b	Incorrect

- SST: 09201-41020

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

4. INSTALL INTAKE VALVE

- Sufficiently apply engine oil to the tip area of the intake valve shown in the illustration.



T

Fig. 352: Identifying Intake Valve Tip

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

TEXT IN ILLUSTRATION

*a	30 mm (1.18 in.) or more
----	--------------------------

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

NOTE: **Install the same parts to their original positions.**

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

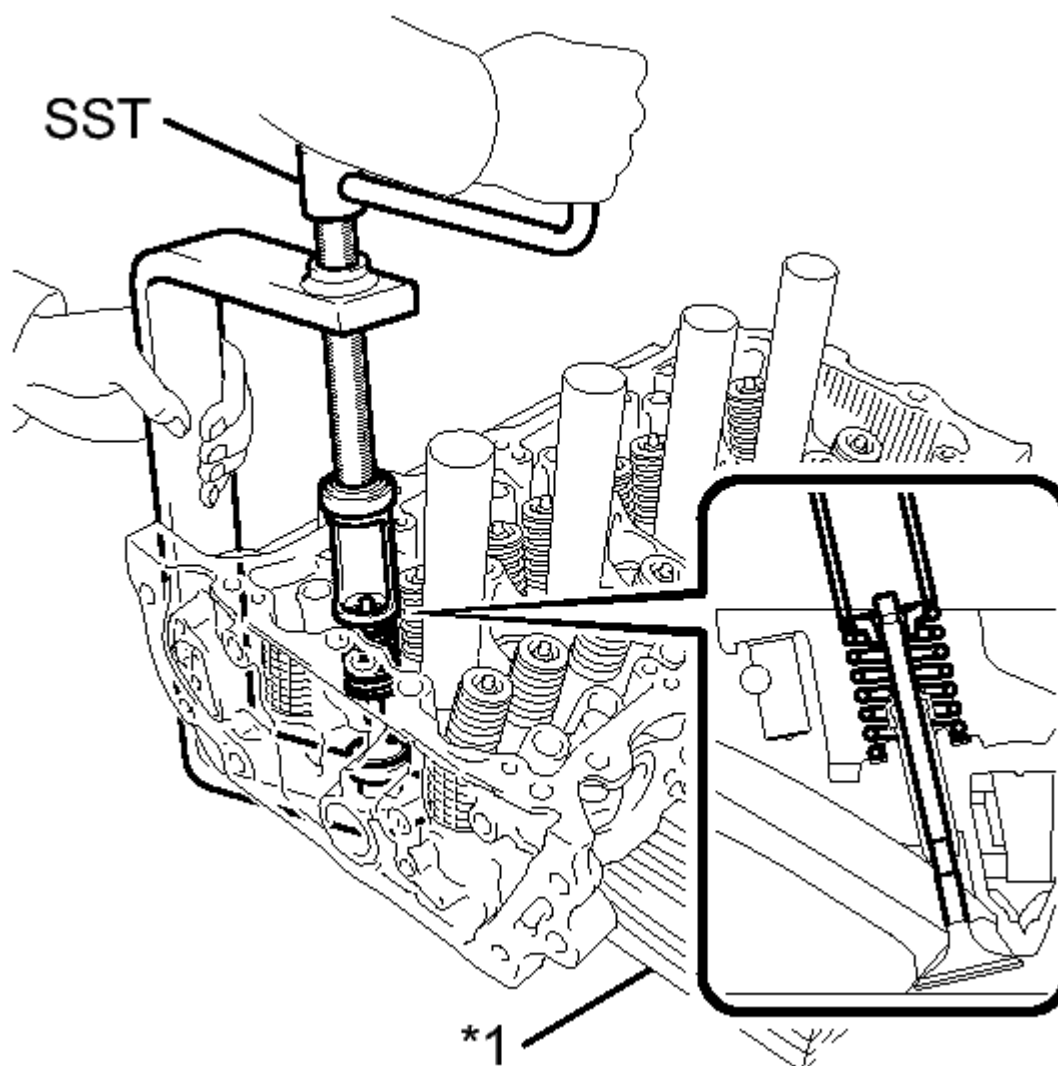
**P**

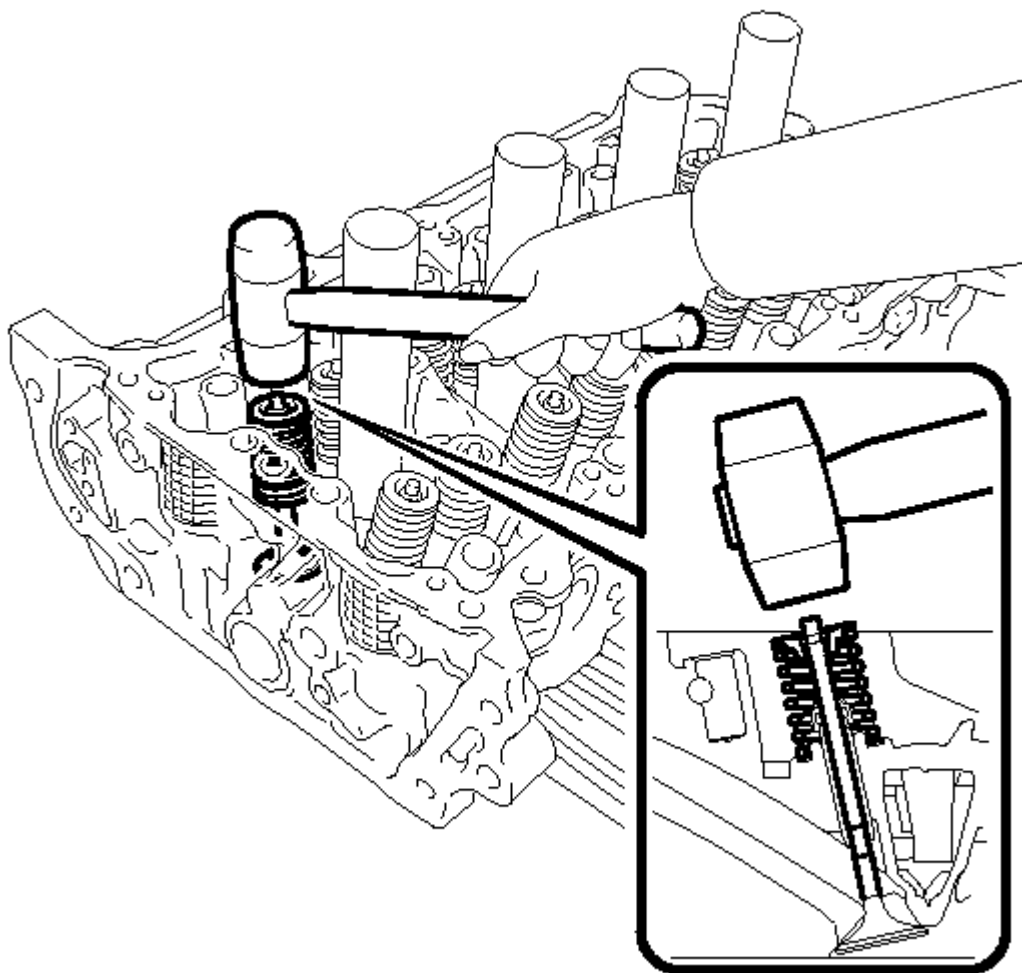
Fig. 353: Compressing And Removing Valve Retainer Locks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Wooden Block
----	--------------

- SST: 09202-70020
09202-00010

d. Using a plastic hammer, lightly tap the valve stem tip to ensure a proper fit.

**P****Fig. 354: Tapping The Valve Stem Tip**

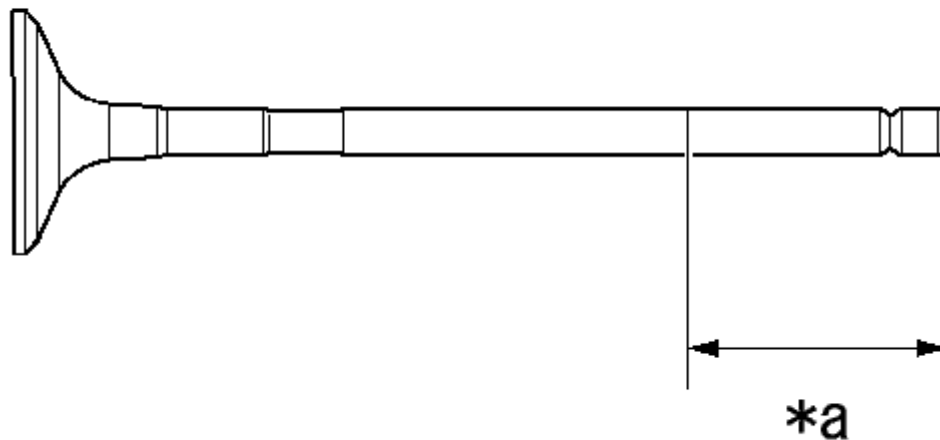
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Be careful not to damage the valve stem tip.
- Be careful not to tap the retainer.

5. INSTALL EXHAUST VALVE

- a. Sufficiently apply engine oil to the tip area of the exhaust valve shown in the illustration.



T

Fig. 355: Identifying Exhaust Valve Tip

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

TEXT IN ILLUSTRATION

*a	30 mm (1.18 in.) or more
----	--------------------------

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

NOTE: **Install the same parts to their original positions.**

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

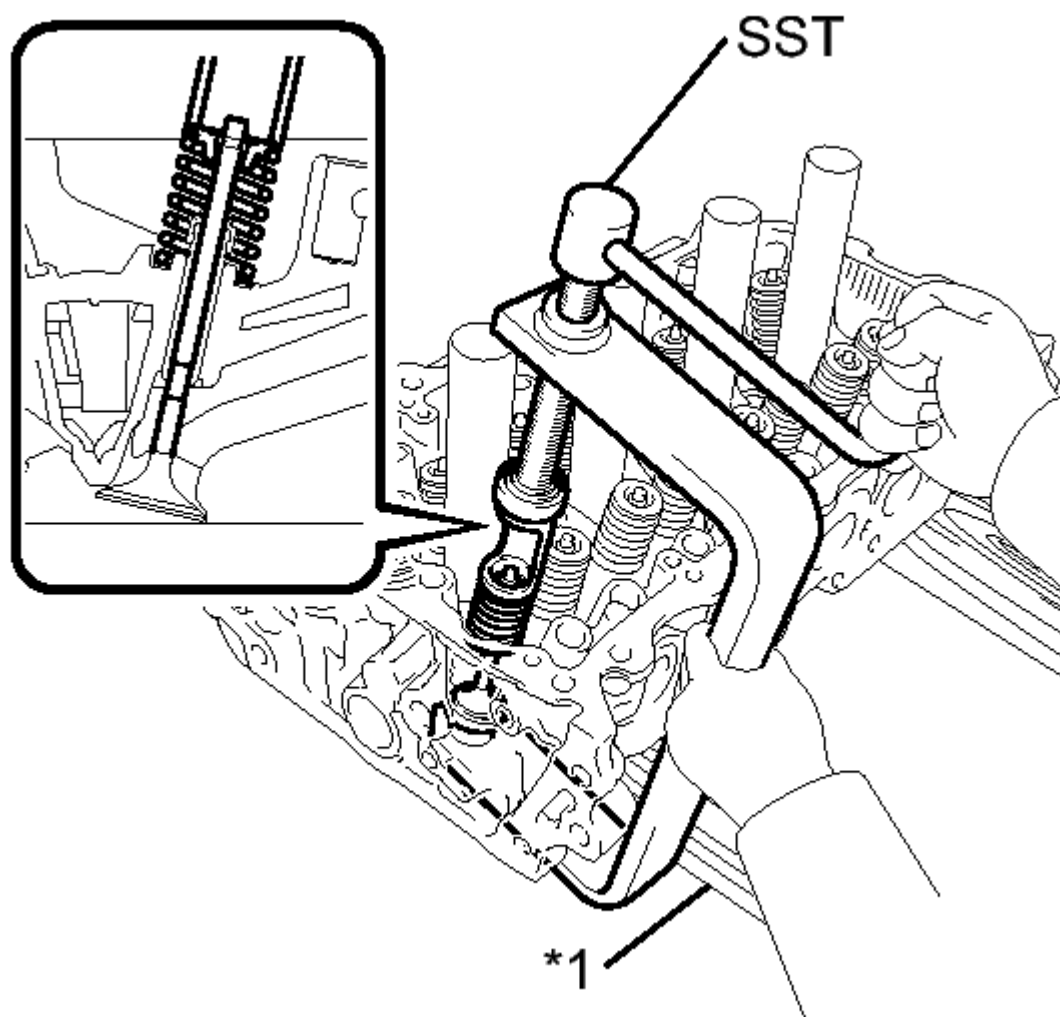
**P**

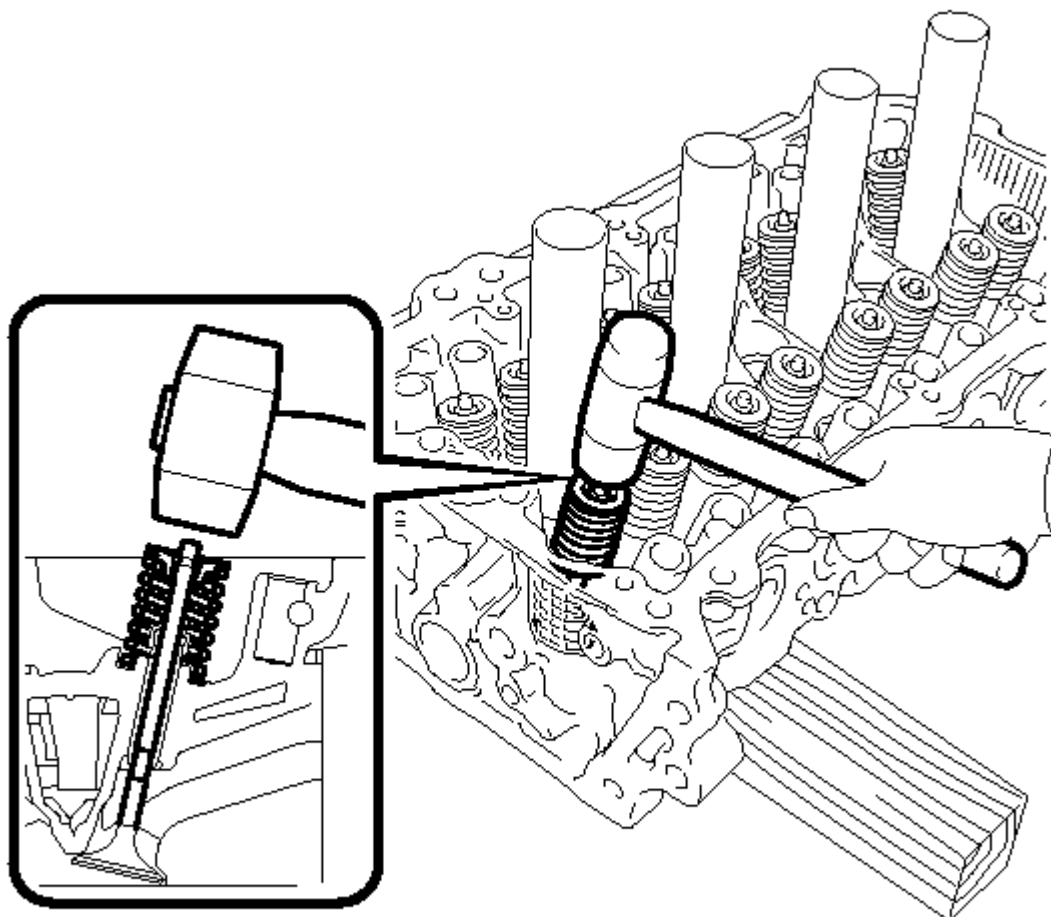
Fig. 356: Compressing And Removing Valve Retainer Locks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Wooden Block
----	--------------

- SST: 09202-70020
09202-00010

d. Using a plastic hammer, lightly tap the valve stem tip to ensure a proper fit.

**P****Fig. 357: Tapping The Valve Stem Tip**

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

NOTE:

- Be careful not to damage the valve stem tip.
- Be careful not to tap the retainer.

6. INSTALL VALVE STEM CAP

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

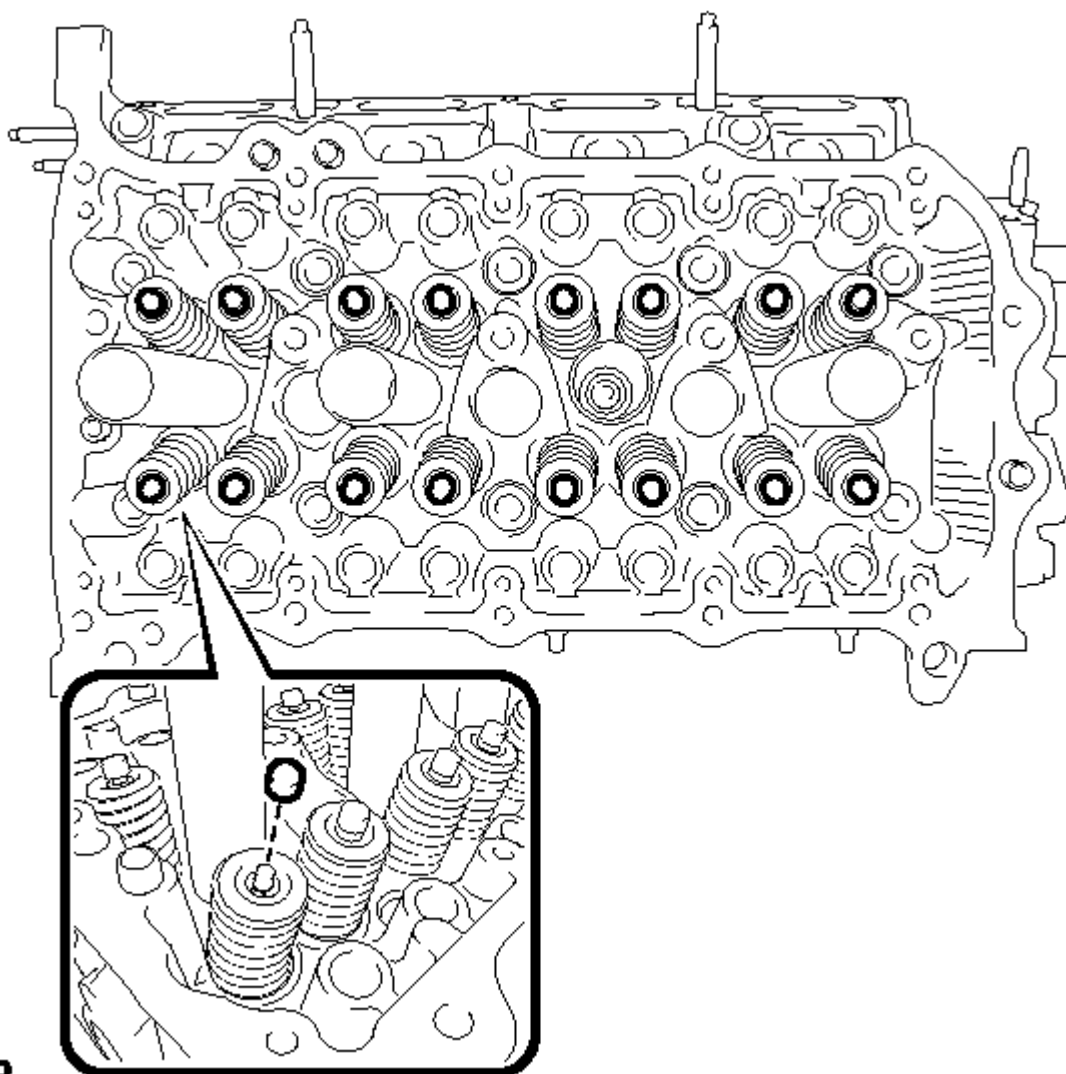
**P**

Fig. 358: Identifying Valve Stem Caps

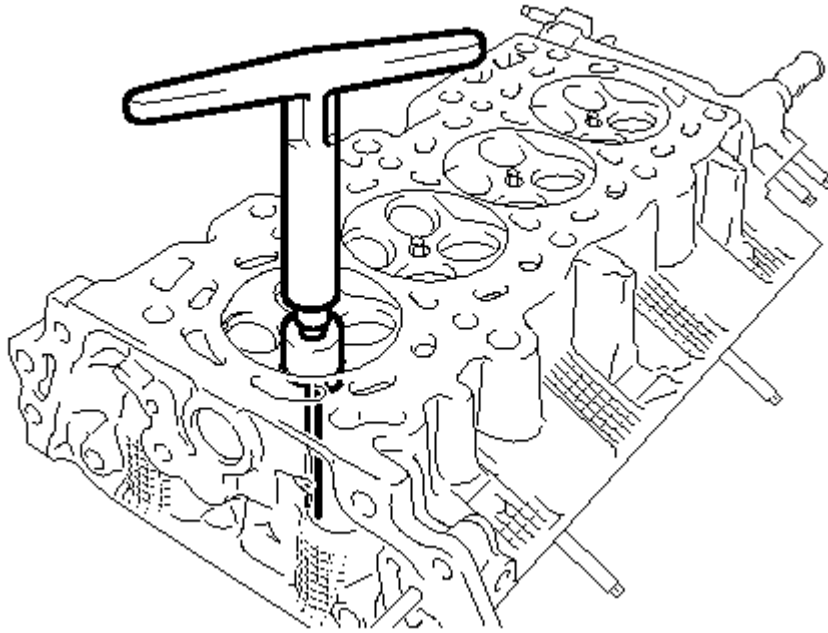
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the valve stem caps to the cylinder head.

REPAIR

REPAIR

1. REPAIR INTAKE VALVE SEATS

**P****Fig. 359: Grinding Valve Seat Using Cutter****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.****NOTE:**

- **Repair the seat while checking the seating position.**
 - **Keep the lip free of 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° and 60° cutters, correct the valve seat so that the valve contacts the entire circumference of the seat. The contact should be in the center of the valve seat, and the valve seat width should be maintained within the specified range around the entire circumference of the seat.

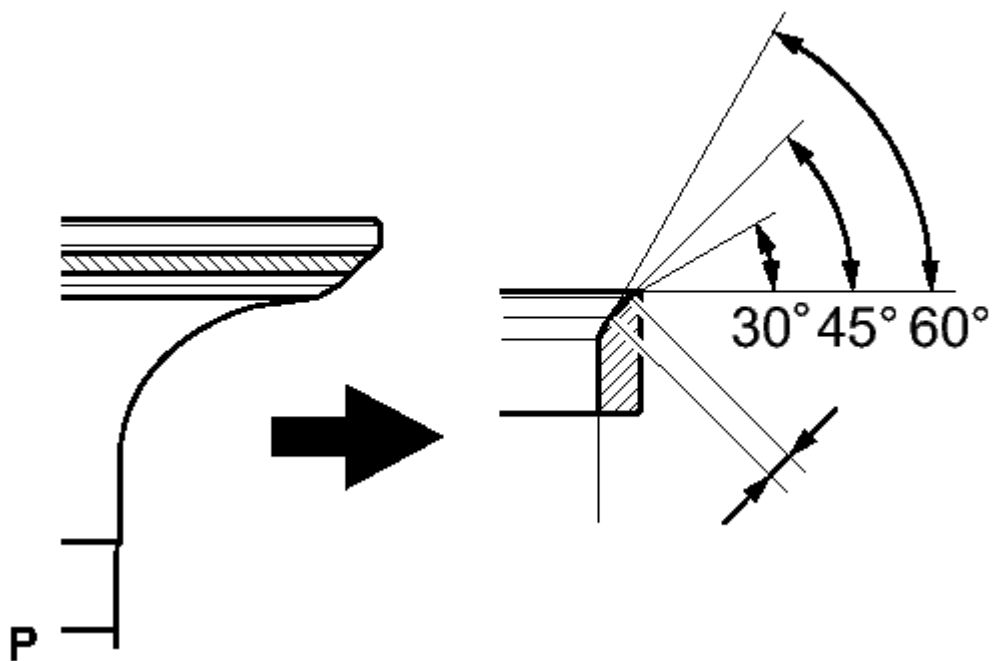


Fig. 360: Identifying Valve Seat Angle

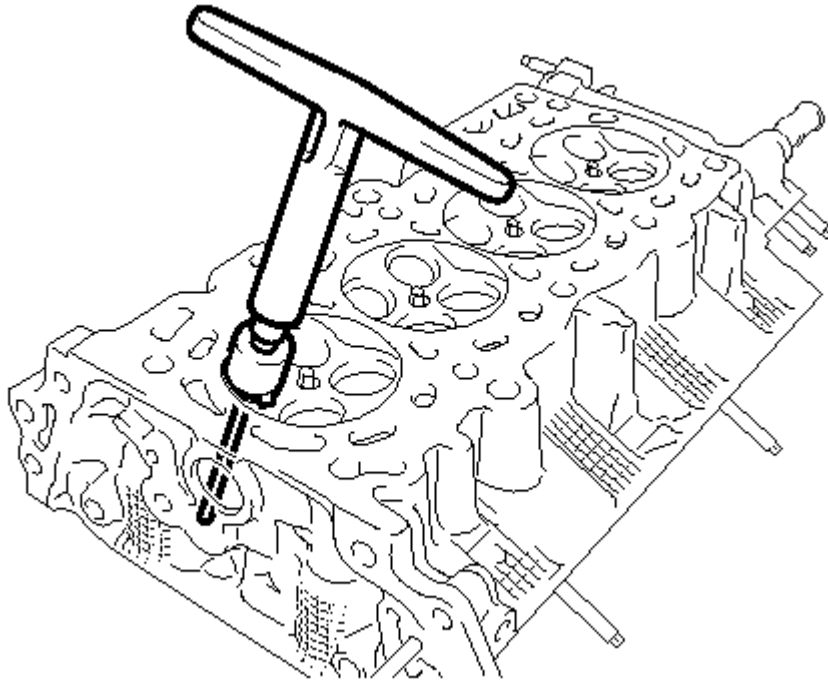
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Valve seat width

1.0 to 1.4 mm (0.039 to 0.055 in.)

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

2. REPAIR EXHAUST VALVE SEATS

**P****Fig. 361: Grinding Valve Seat Using Cutter****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.****NOTE:**

- Repair the seat while checking the seating position.
 - Keep the lip free of 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° and 75° cutters, correct the valve seat so that the valve contacts the entire circumference of the seat. The contact should be in the center of the valve seat, and the valve seat width should be maintained within the specified range around the entire circumference of the seat.

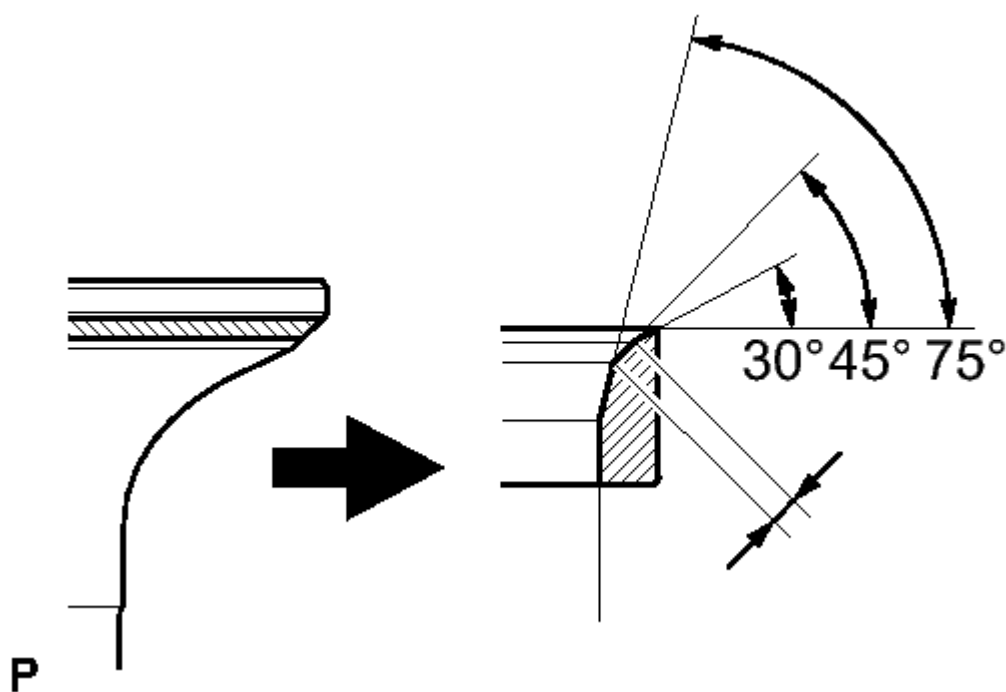


Fig. 362: Identifying Valve Seat Angle

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

Valve seat width

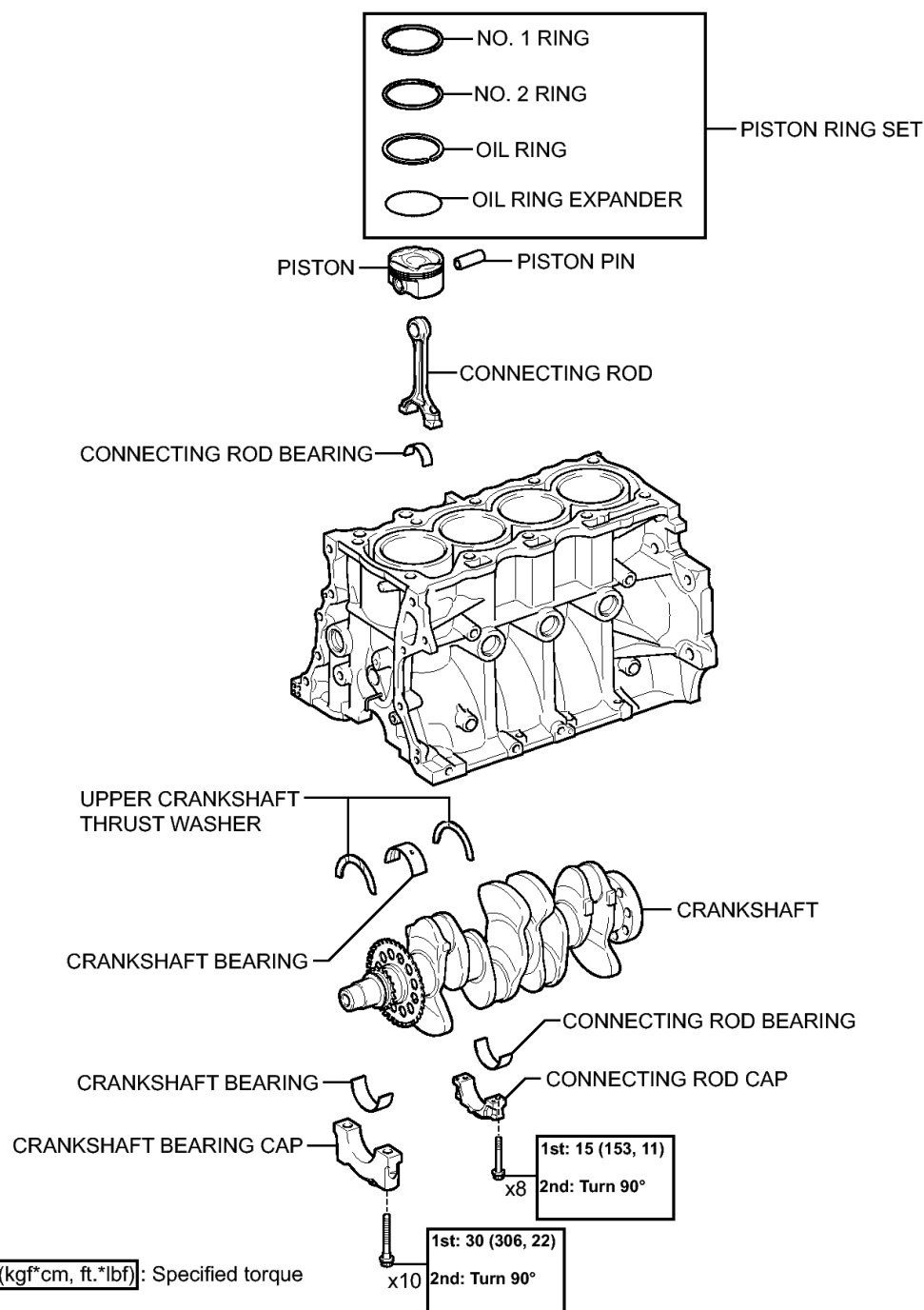
1.0 to 1.4 mm (0.039 to 0.055 in.)

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

CYLINDER BLOCK

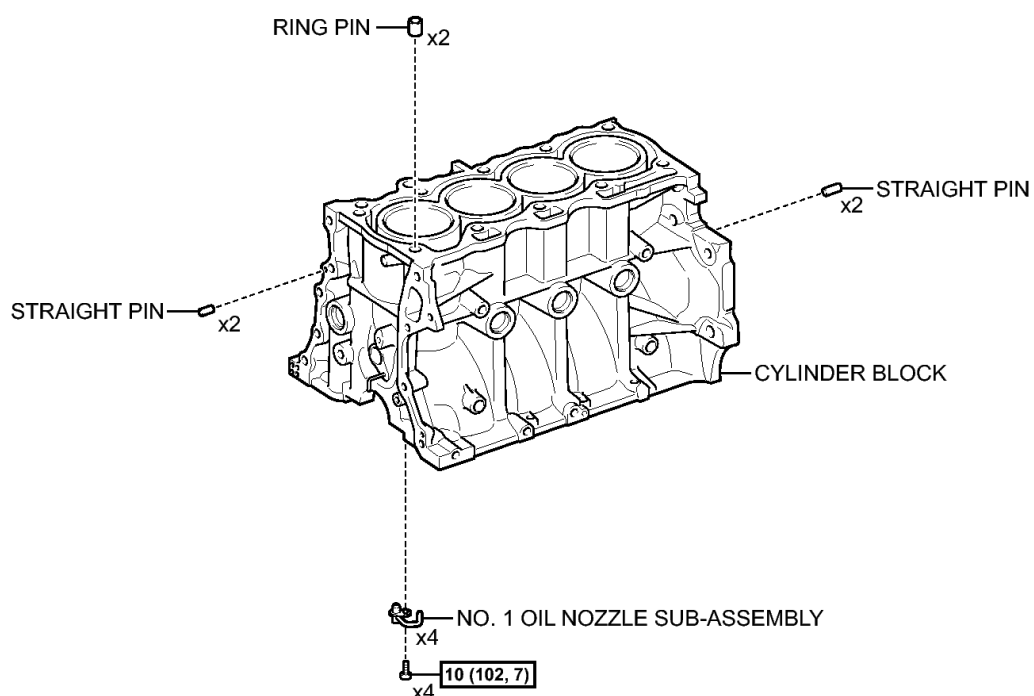
COMPONENTS

ILLUSTRATION



P

Fig. 363: Identifying Cylinder Block Replacement Components With Torque Specifications (1 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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

Fig. 364: Identifying Cylinder Block Replacement Components With Torque Specifications (2 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

DISASSEMBLY

1. REMOVE PISTON SUB-ASSEMBLY WITH CONNECTING ROD

- Using a ridge reamer, remove all of the carbon from the top of the cylinder.

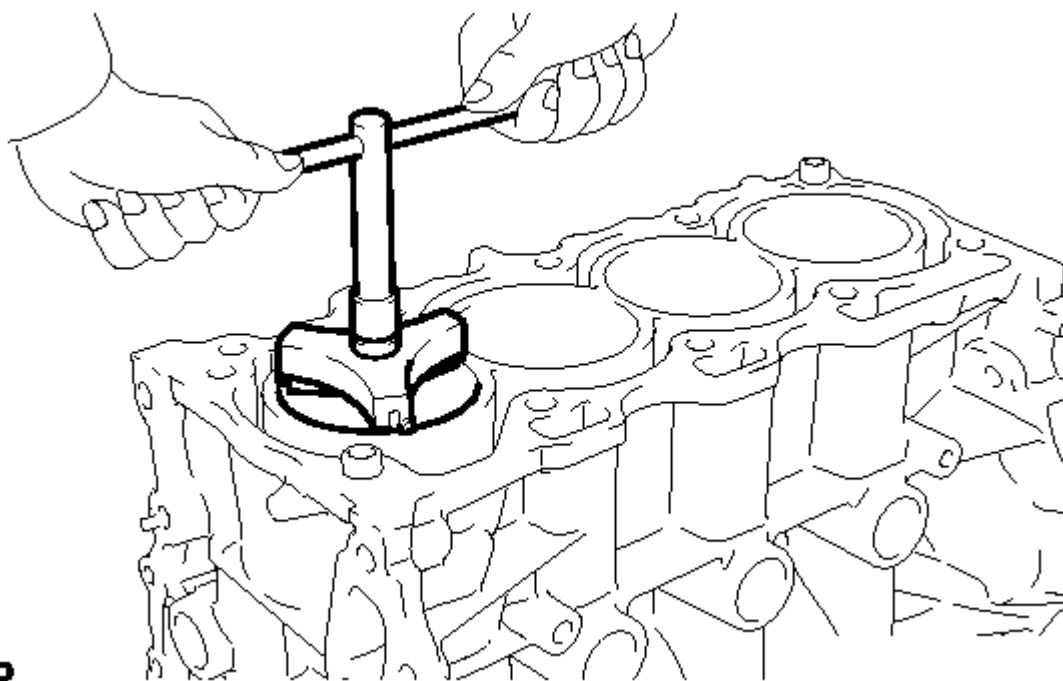
**P**

Fig. 365: Removing Carbon From Top Of Cylinder
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using SST, uniformly loosen the 2 bolts.

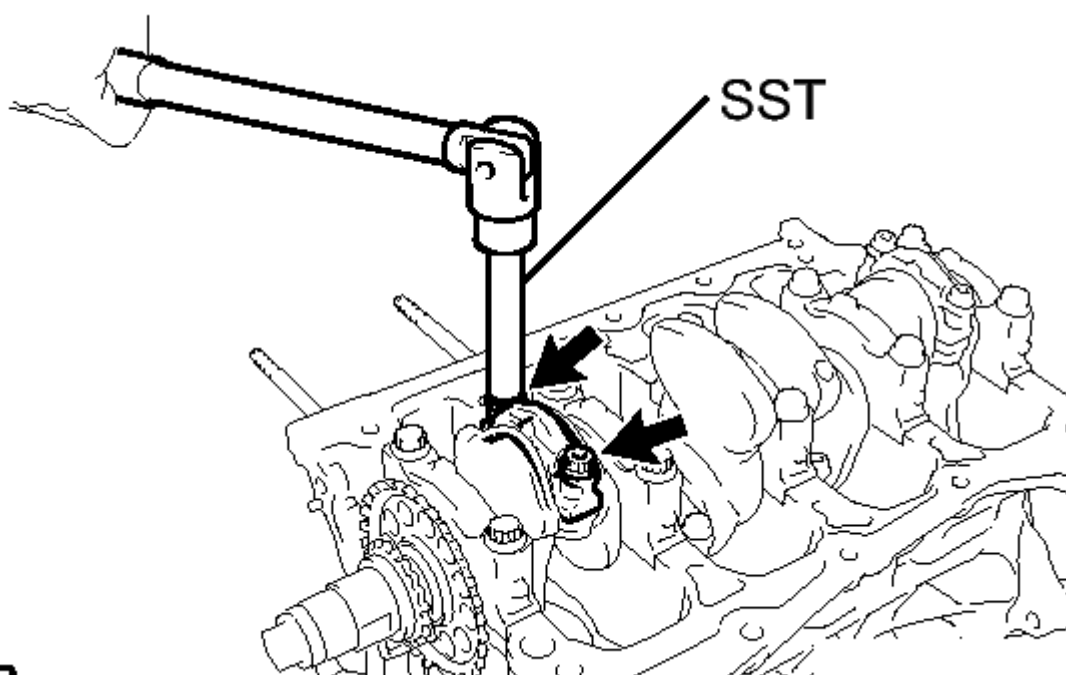
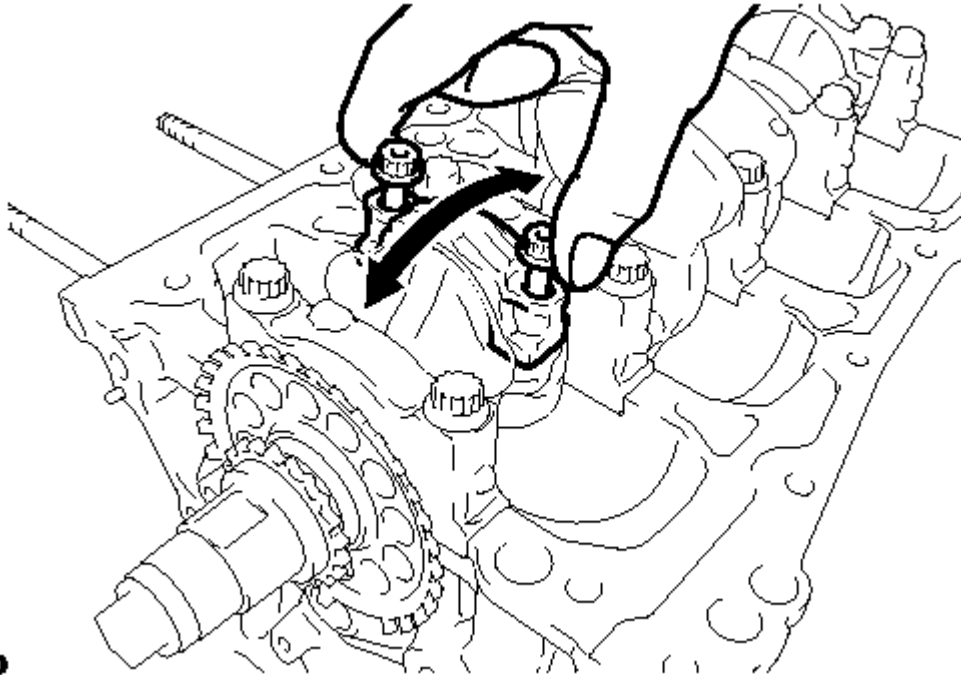
**P**

Fig. 366: Identifying Connecting Rod Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09205-16010

- 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.



P
Fig. 367: Removing The Connecting Rod Cap And Lower Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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.

NOTE: Do not disassemble the piston, piston pin and connecting rod. If the piston pin is removed, the piston, piston pin and connecting rod cannot be reused.

HINT:

- Keep each bearing, connecting rod and cap as a set.
- Arrange the piston and connecting rod assemblies in the correct order.

2. REMOVE CONNECTING ROD BEARING

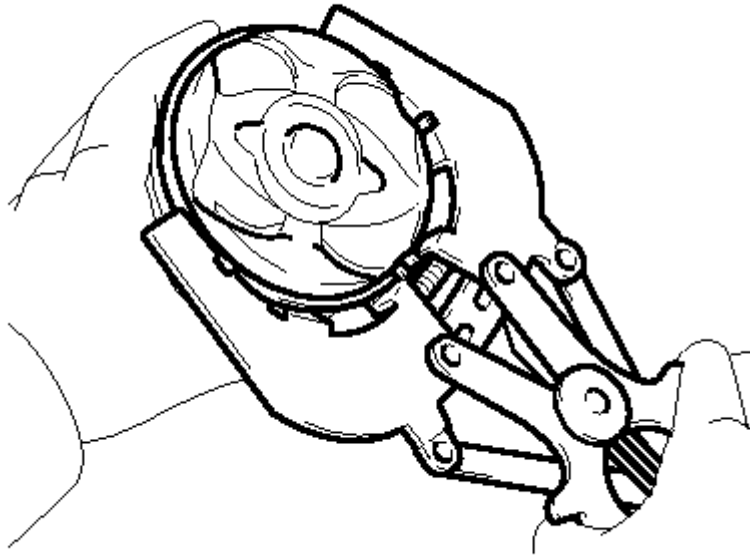
- a. Remove the connecting rod bearings.

HINT:

Arrange the removed parts in the correct order.

3. REMOVE PISTON RING SET

- a. Using a piston ring expander, remove the No. 1 ring and No. 2 ring.



P

Fig. 368: Removing Compression Rings

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

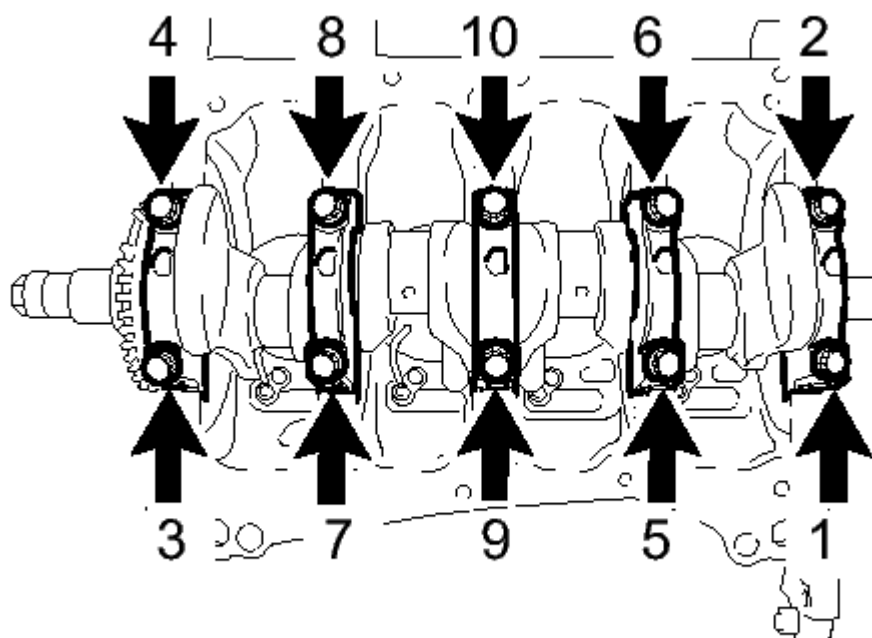
- b. Remove the oil ring and oil ring expander by hand.

HINT:

Arrange the removed parts in the correct order.

4. REMOVE CRANKSHAFT

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

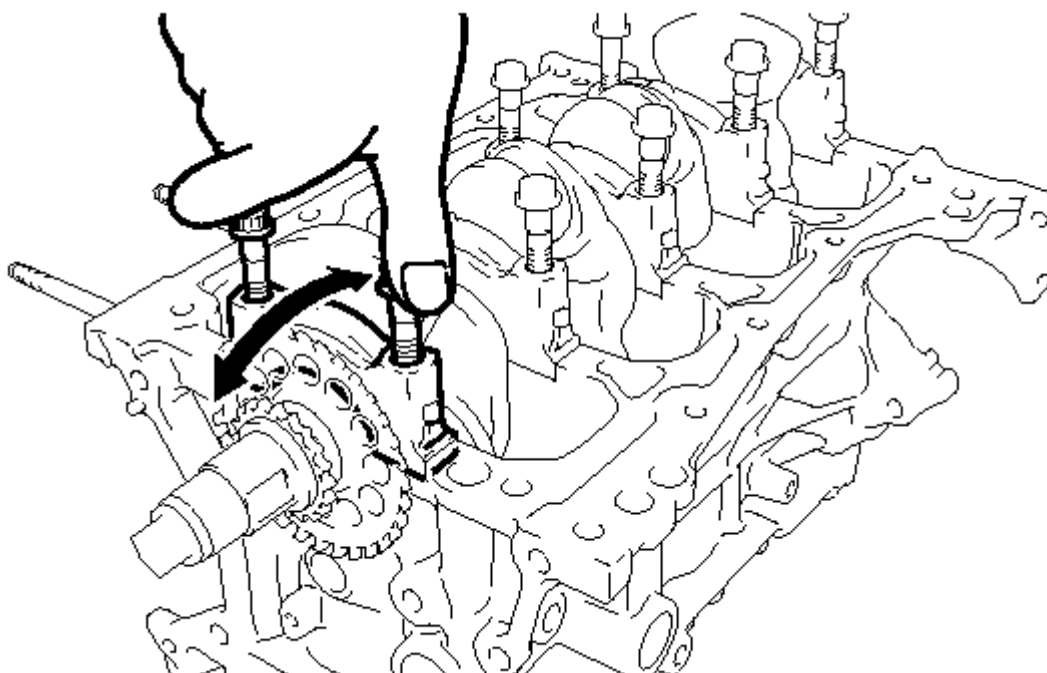


P

Fig. 369: Identifying Main Bearing Cap Bolts Loosening Sequence

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.



P

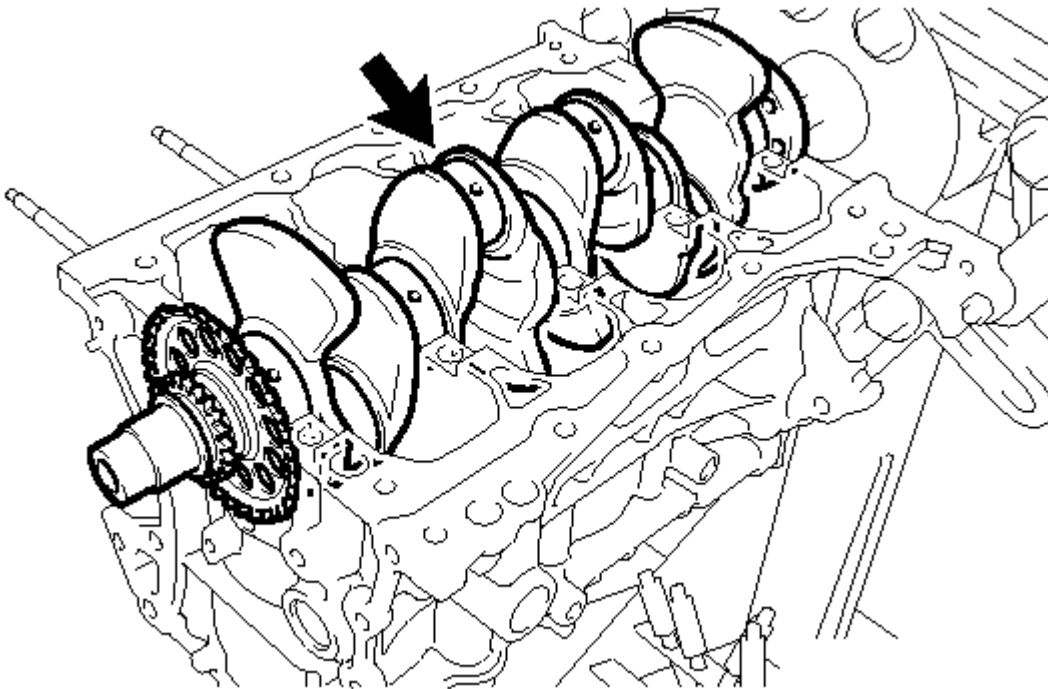
Fig. 370: Loosening Main Bearing Cap Bolts

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

NOTE: Insert the bolts into the caps in turn. Ease the cap out by gently pulling up and applying force toward the front and back sides 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 each lower bearing and main bearing cap as a set.
 - Arrange the main bearing caps in the correct order.
- c. Lift out the crankshaft.



P

Fig. 371: Identifying Crankshaft

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

5. REMOVE UPPER CRANKSHAFT THRUST WASHER

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

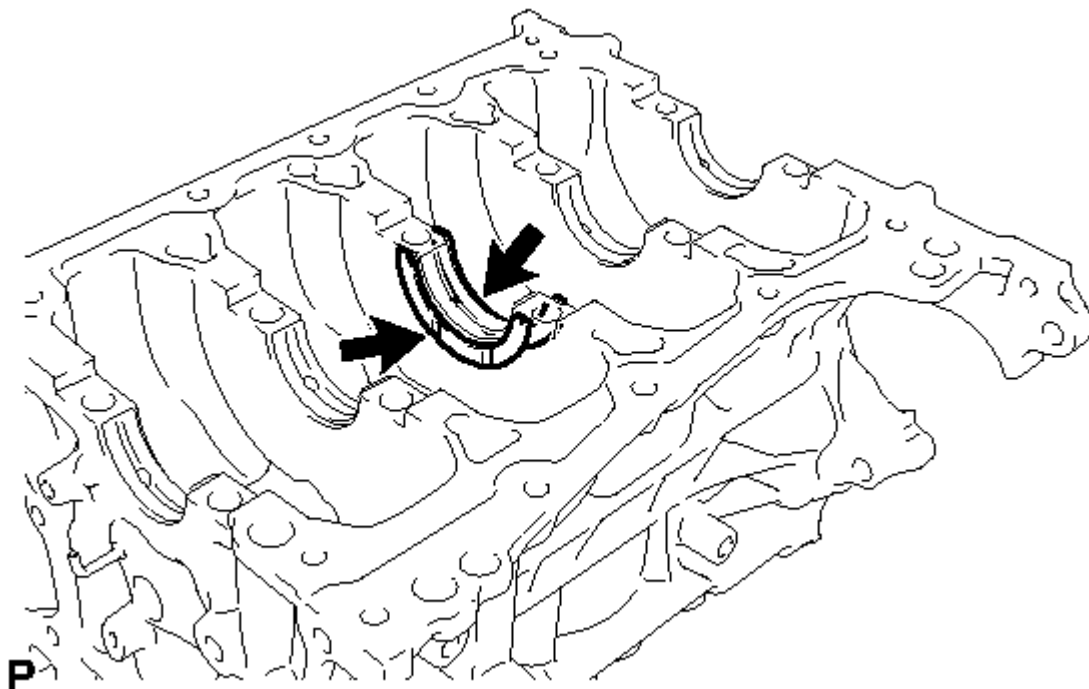


Fig. 372: Identifying Upper Crankshaft Thrust Washers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. REMOVE CRANKSHAFT BEARING

- a. Remove the 5 upper main bearings from the cylinder block.

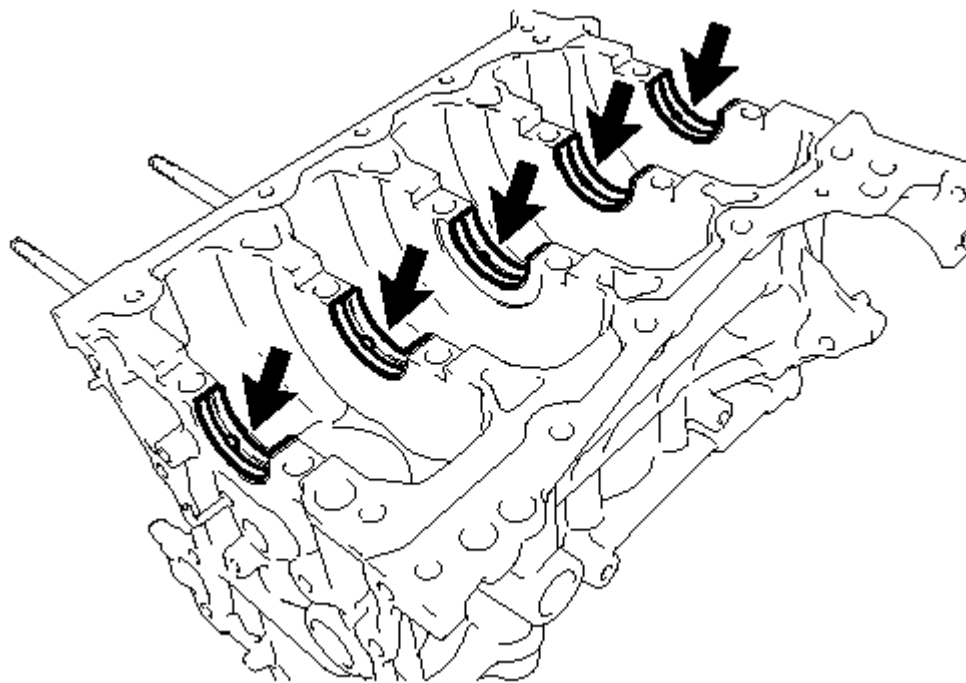


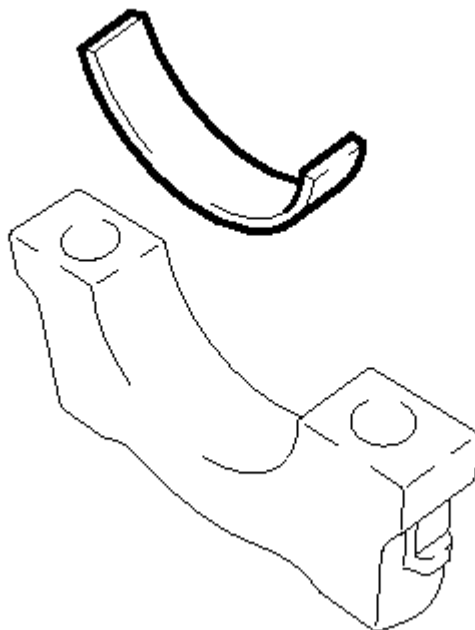
Fig. 373: Identifying Upper Main Bearings

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

HINT:

Arrange the bearings in the correct order.

- b. Remove the 5 lower main bearings from the 5 main bearing caps.



P

Fig. 374: Identifying Lower Main Bearing

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

HINT:

Arrange the bearings in the correct order.

7. REMOVE NO. 1 OIL NOZZLE SUB-ASSEMBLY

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

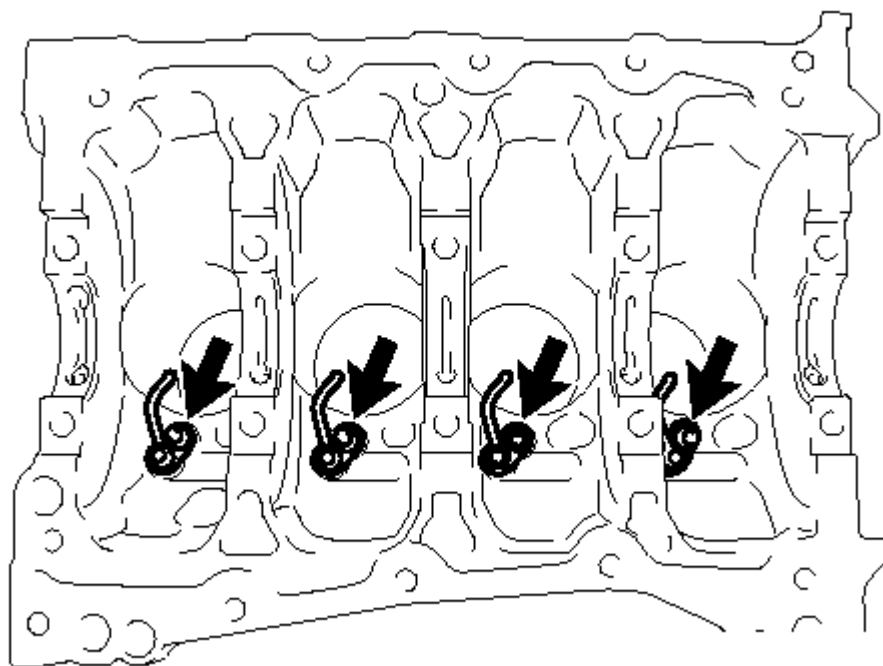
**P**

Fig. 375: Identifying Bolts And Oil Nozzles

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

8. CLEAN CYLINDER BLOCK

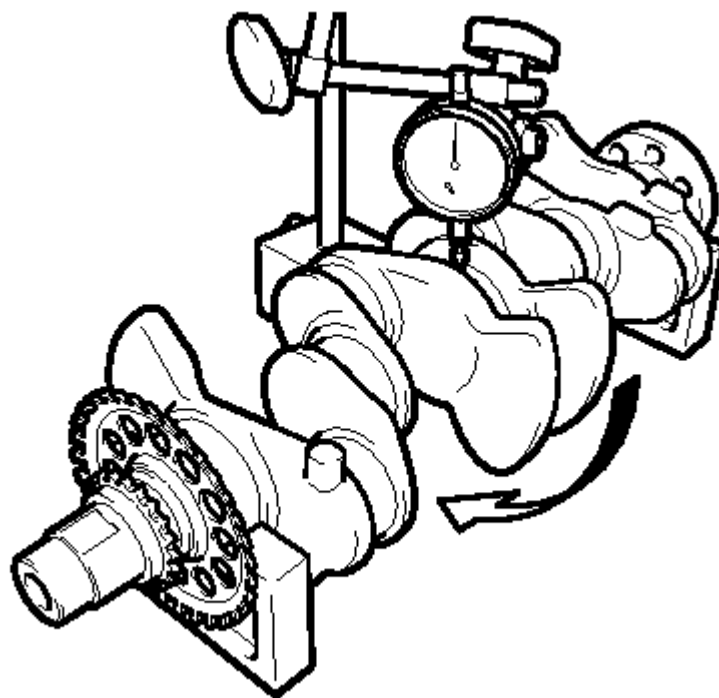
NOTE: If the cylinder is washed at high temperature, the cylinder liner will stick out beyond the cylinder block. Always wash the cylinder block at a temperature of 45°C (113°F) or less.

INSPECTION

INSPECTION

1. INSPECT CRANKSHAFT

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

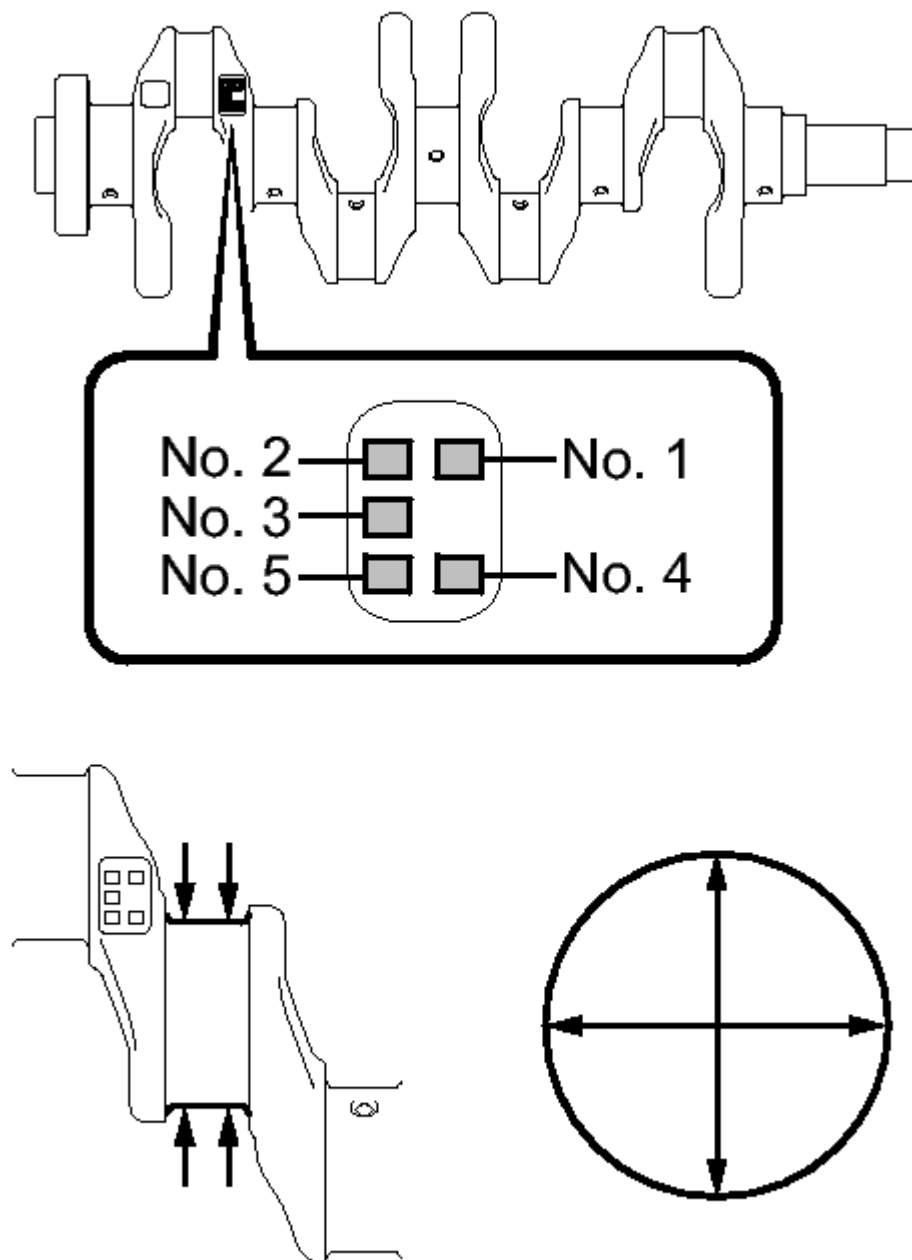
**P****Fig. 376: Measuring The Circle Runout****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

Maximum circle runout

0.02 mm (0.000787 in.)

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

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

**P****Fig. 377: Measuring Diameter Of Main Journals****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

Standard diameter

47.988 to 48.000 mm (1.88929 to 1.88976 in.)

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

- c. Check each main journal for taper and distortion as shown in the illustration.

Maximum taper and distortion

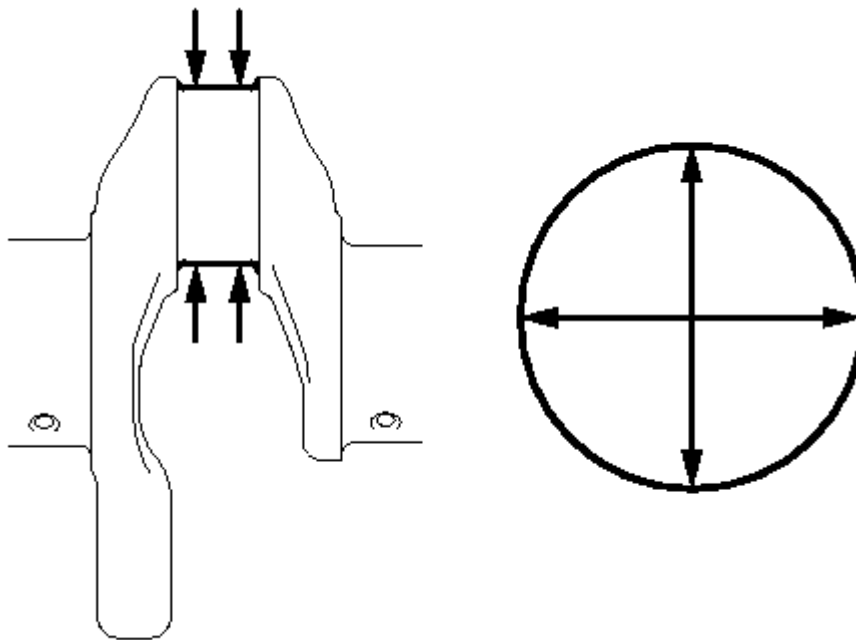
0.003 mm (0.000118 in.)

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

Standard Diameter (Reference)

Mark	Specified Condition
0	47.999 to 48.000 mm (1.88972 to 1.88976 in.)
1	47.997 to 47.998 mm (1.88964 to 1.88968 in.)
2	47.995 to 47.996 mm (1.88956 to 1.88960 in.)
3	47.993 to 47.994 mm (1.88948 to 1.88952 in.)
4	47.991 to 47.992 mm (1.88941 to 1.88945 in.)
5	47.988 to 47.990 mm (1.88929 to 1.88937 in.)

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



P

Fig. 378: Measuring Diameter Of Crank Pins

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

Standard diameter

41.992 to 42.000 mm (1.6532 to 1.6535 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.

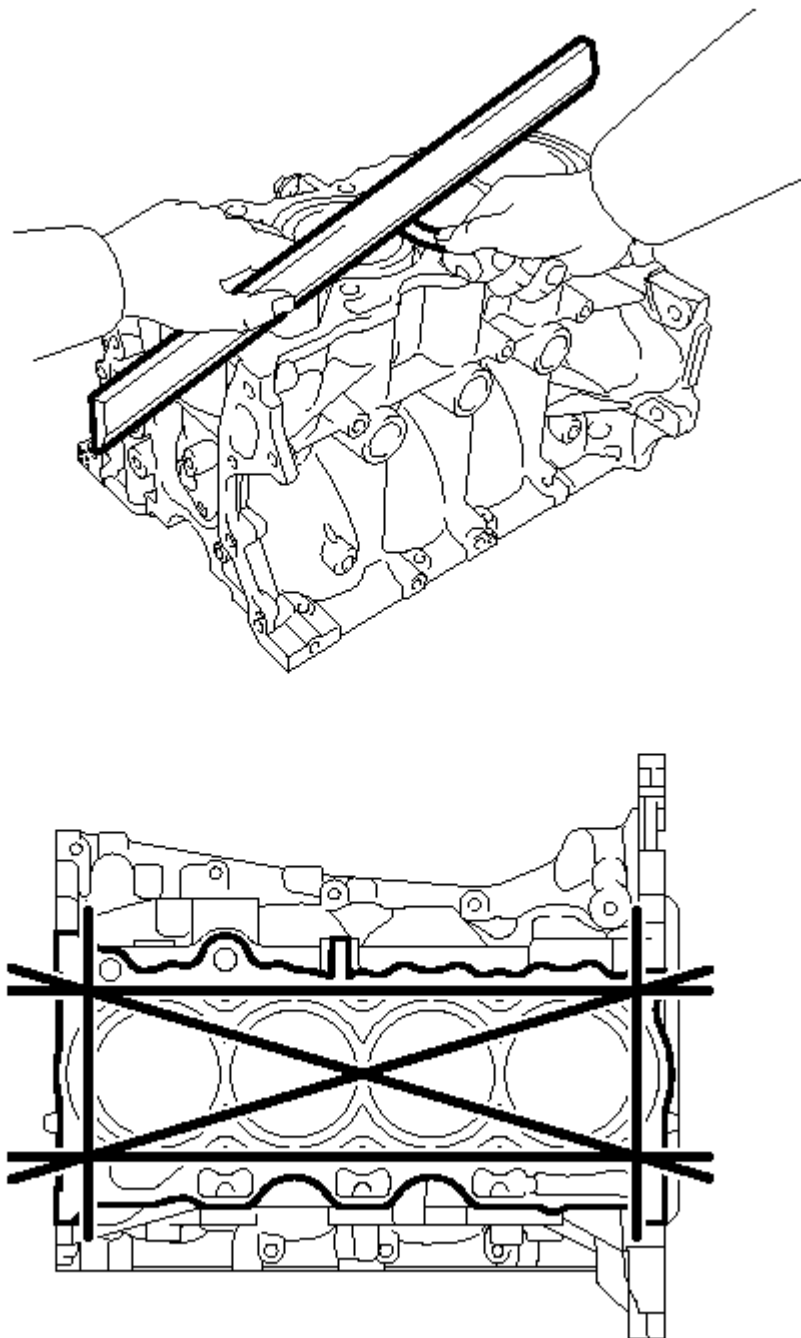
Maximum taper and distortion

0.003 mm (0.000118 in.)

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

2. 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.

**P****Fig. 379: Measuring Warpage Of Surface****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

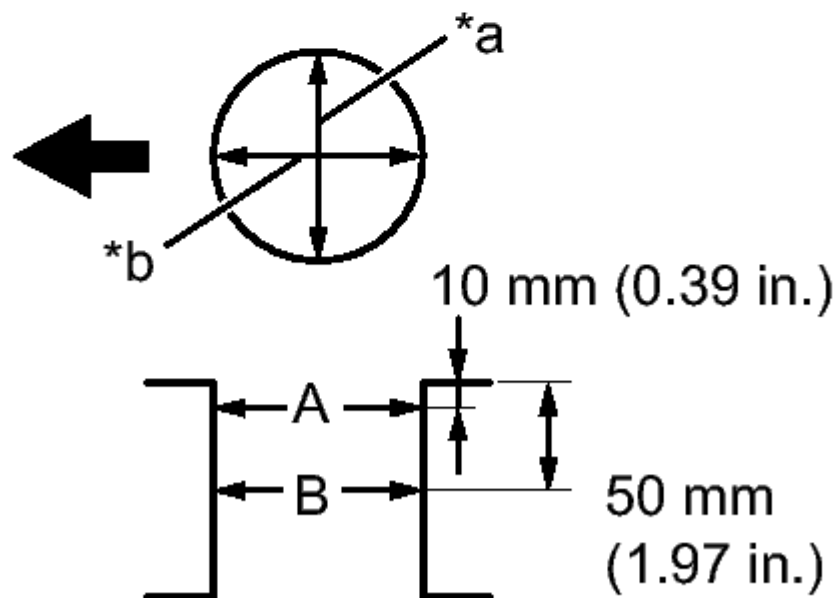
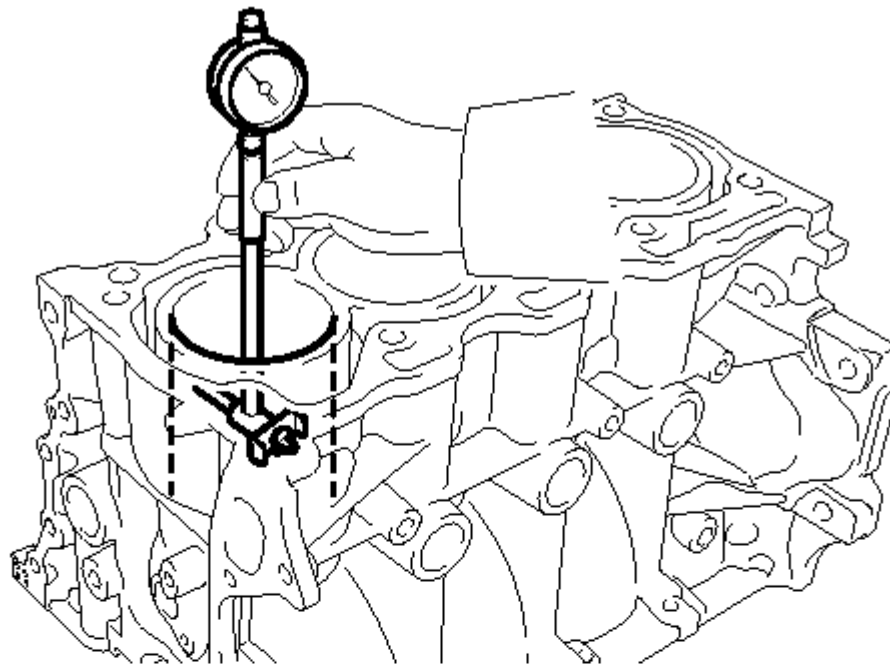
Maximum warpage

0.05 mm (0.00197 in.)

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

3. INSPECT CYLINDER BORE

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

**P****Fig. 380: Measuring Cylinder Bore Diameter**

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

TEXT IN ILLUSTRATION

Thrust

*a	Direction
*b	Axial Direction
	
	Engine Front

Standard diameter

72.500 to 72.513 mm (2.8543 to 2.8548 in.)

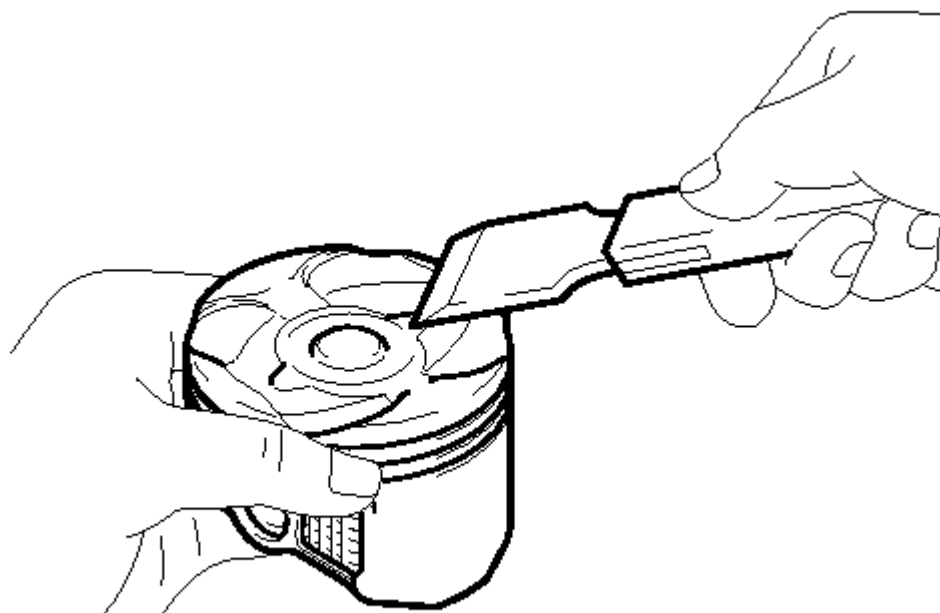
Maximum diameter

72.513 mm (2.8548 in.)

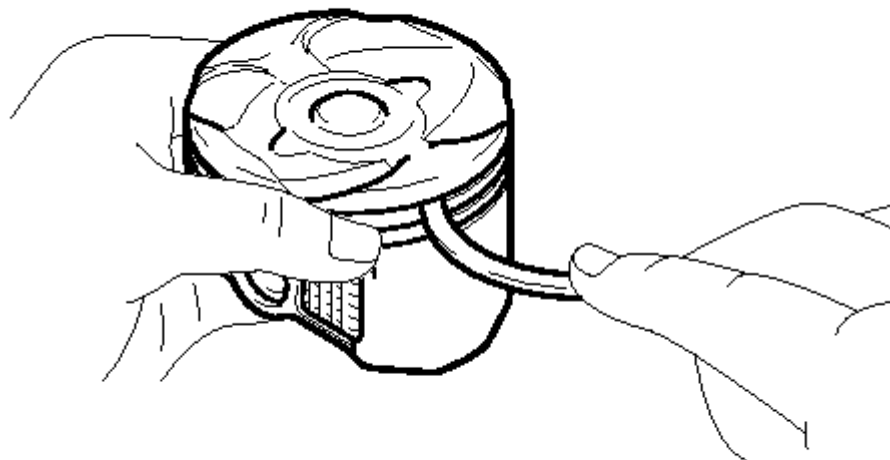
If the average diameter of the 4 positions is greater than the maximum, replace the cylinder block.

4. INSPECT PISTON

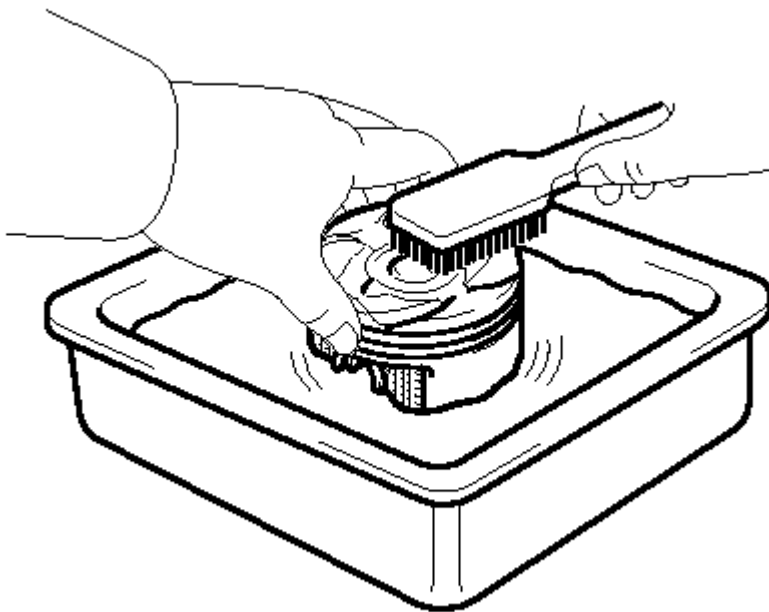
- a. Using a gasket scraper, remove the carbon from the top of the piston.

**P****Fig. 381: Removing Carbon From Piston Top****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

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

**P****Fig. 382: Cleaning Piston Ring Grooves****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

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



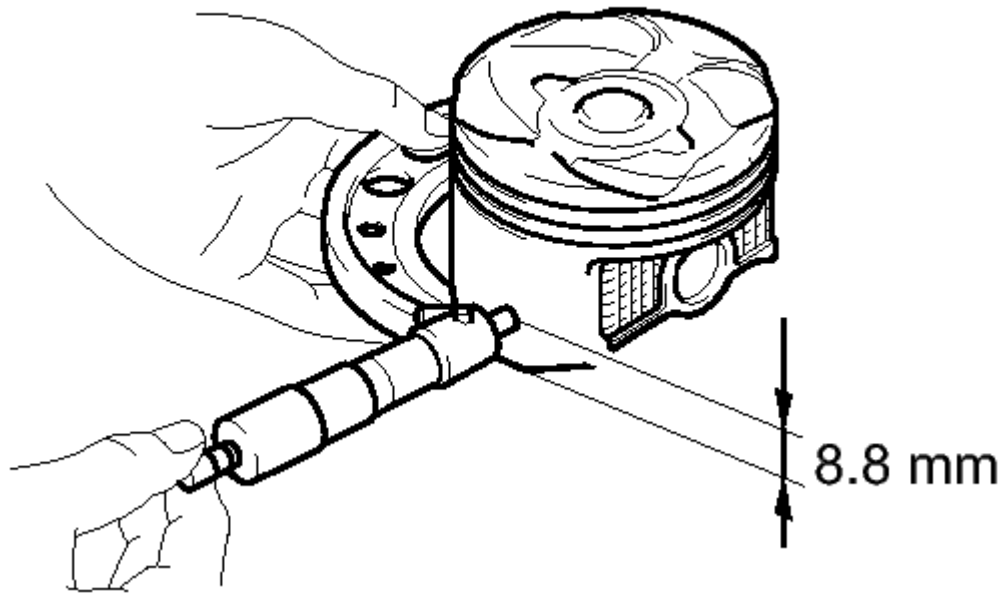
P

Fig. 383: 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 a point 8.8 mm (0.346 in.) from the piston bottom.

**P****Fig. 384: Measuring Piston Diameter****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

Standard piston diameter

72.435 to 72.445 mm (2.8518 to 2.8522 in.)

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

5. INSPECT PISTON OIL CLEARANCE

- a. Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance

0.055 to 0.078 mm (0.00217 to 0.00307 in.)

Maximum oil clearance

0.108 mm (0.00425 in.)

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

6. INSPECT RING GROOVE CLEARANCE

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

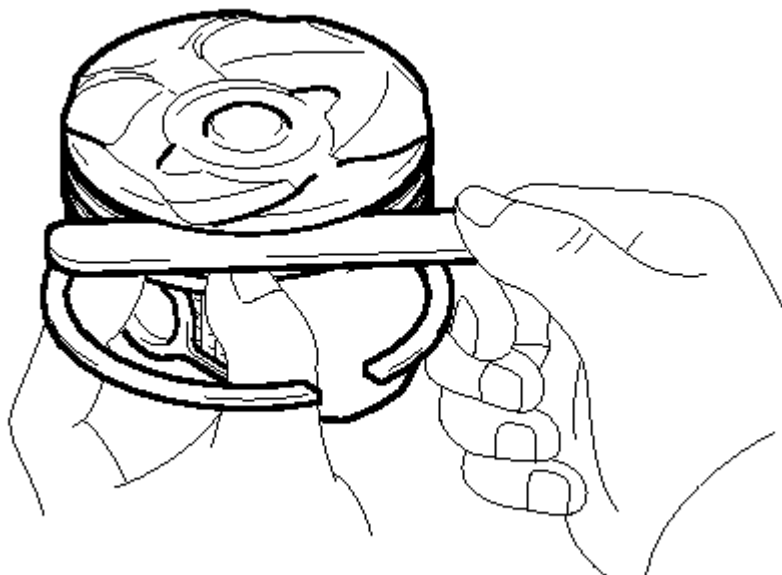
**P**

Fig. 385: Measuring Clearance Between Piston Ring And Wall Of Ring Groove
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

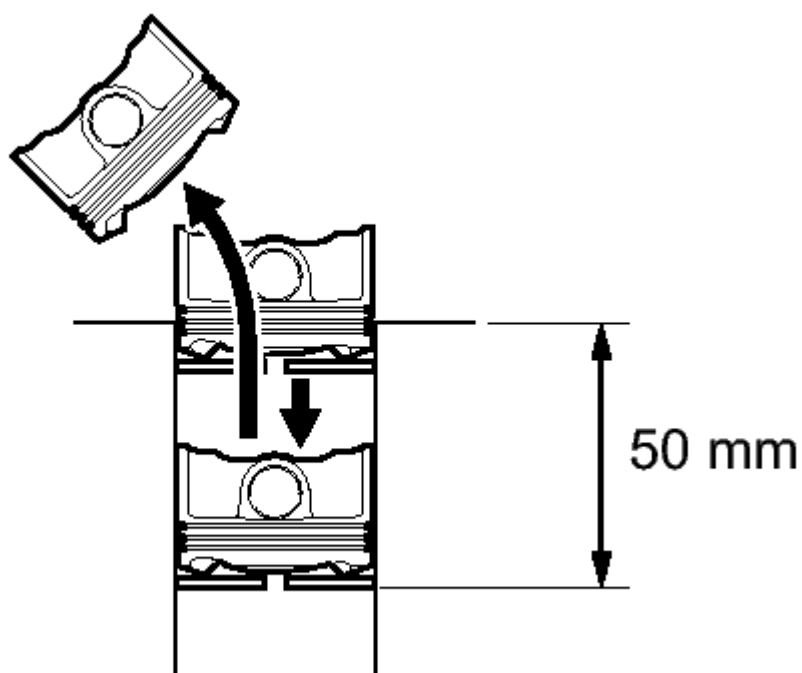
Standard Ring Groove Clearance

Item	Specified Condition
No. 1 ring	0.02 to 0.07 mm (0.0008 to 0.0028 in.)
No. 2 ring	0.02 to 0.06 mm (0.0008 to 0.0024 in.)
Oil ring	0.02 to 0.06 mm (0.0008 to 0.0024 in.)

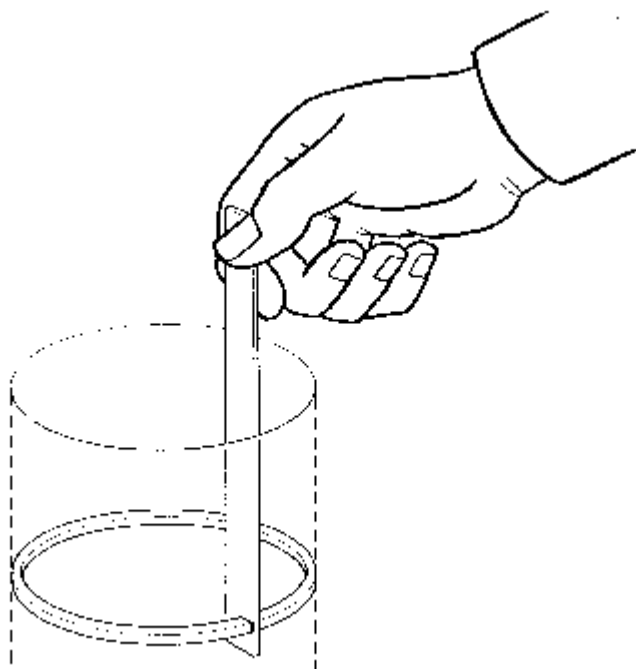
If the groove clearance is not as specified, replace the piston.

7. INSPECT PISTON RING END GAP

- a. Using a piston, push the piston ring a little beyond the bottom of the ring travel, 50 mm (1.97 in.) from the top of the cylinder block.

**P****Fig. 386: Pushing Piston Ring****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

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

**Fig. 387: Measuring End Gap****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

Standard End Gap

Item	Specified Condition
No. 1 ring	0.18 to 0.25 mm (0.00709 to 0.00984 in.)
No. 2 ring	0.30 to 0.45 mm (0.0118 to 0.0177 in.)
Oil ring	0.10 to 0.40 mm (0.00394 to 0.0157 in.)

Maximum End Gap

Item	Specified Condition
No. 1 ring	0.45 mm (0.0177 in.)
No. 2 ring	0.65 mm (0.0256 in.)
Oil ring	0.55 mm (0.0217 in.)

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

8. INSPECT CRANKSHAFT THRUST CLEARANCE

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

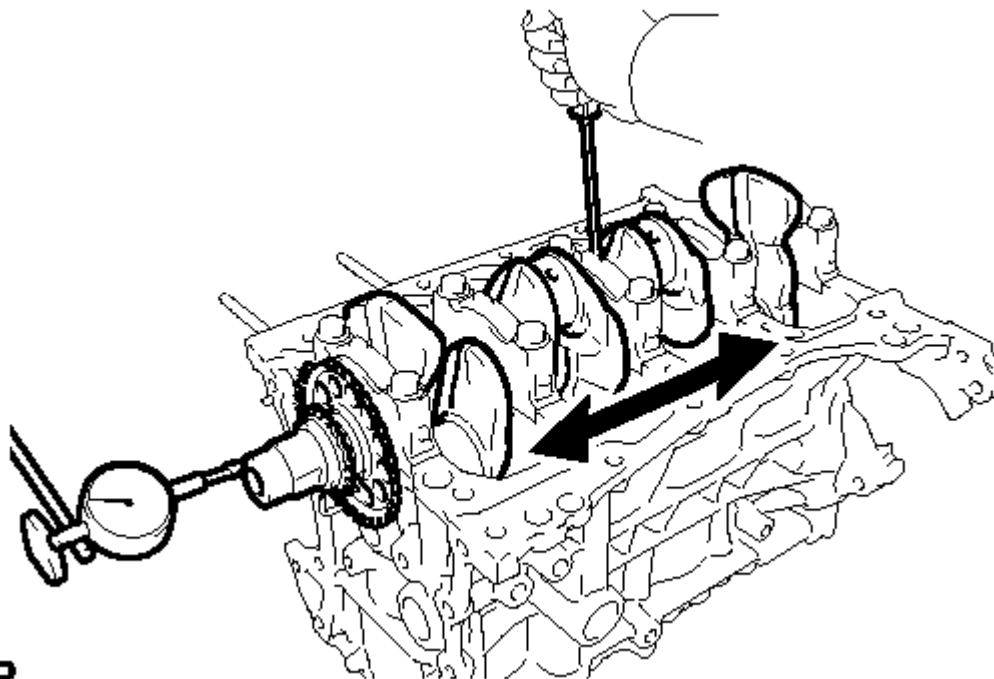
**P**

Fig. 388: Inspecting Crankshaft Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Standard thrust clearance

0.04 to 0.24 mm (0.00157 to 0.00945 in.)

Maximum thrust clearance

0.28 mm (0.0110 in.)

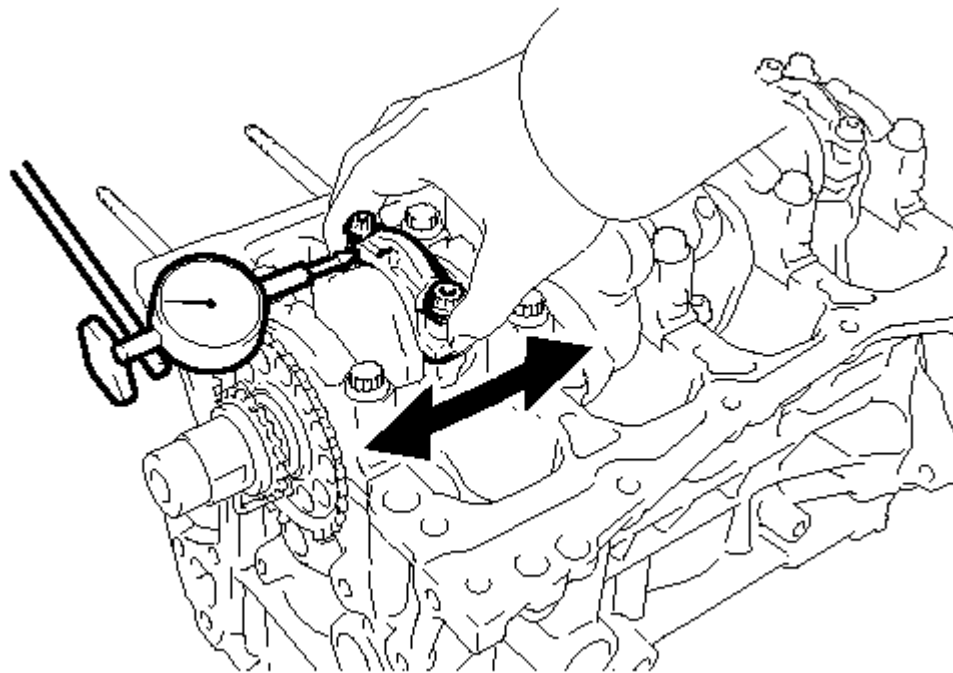
If the thrust clearance is greater than the maximum, replace the thrust washers as a set.

HINT:

The thrust washer thickness is 1.93 to 1.98 mm (0.0760 to 0.0780 in.).

9. INSPECT CONNECTING ROD THRUST CLEARANCE

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



P

Fig. 389: Inspecting Connecting Rod Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Standard thrust clearance

0.1 to 0.5 mm (0.00394 to 0.0197 in.)

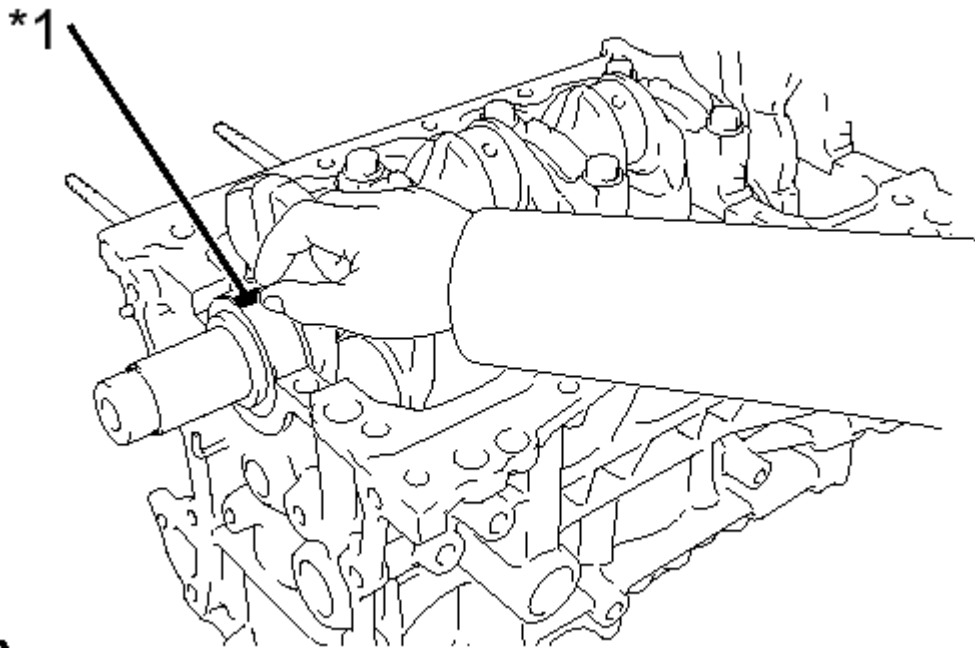
Maximum thrust clearance

0.5 mm (0.0197 in.)

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

10. INSPECT CRANKSHAFT OIL CLEARANCE

- a. Check the crank journal and bearing for pitting and scratches.



P

Fig. 390: Measuring Plastigage At Its Widest Point
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the crankshaft bearing. Refer to **REASSEMBLY**.
- c. Place the crankshaft on the cylinder block.

TEXT IN ILLUSTRATION

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

- d. Lay a strip of Plastigage across each journal.
- e. Examine the front marks and numbers and install the bearing caps on the cylinder block.

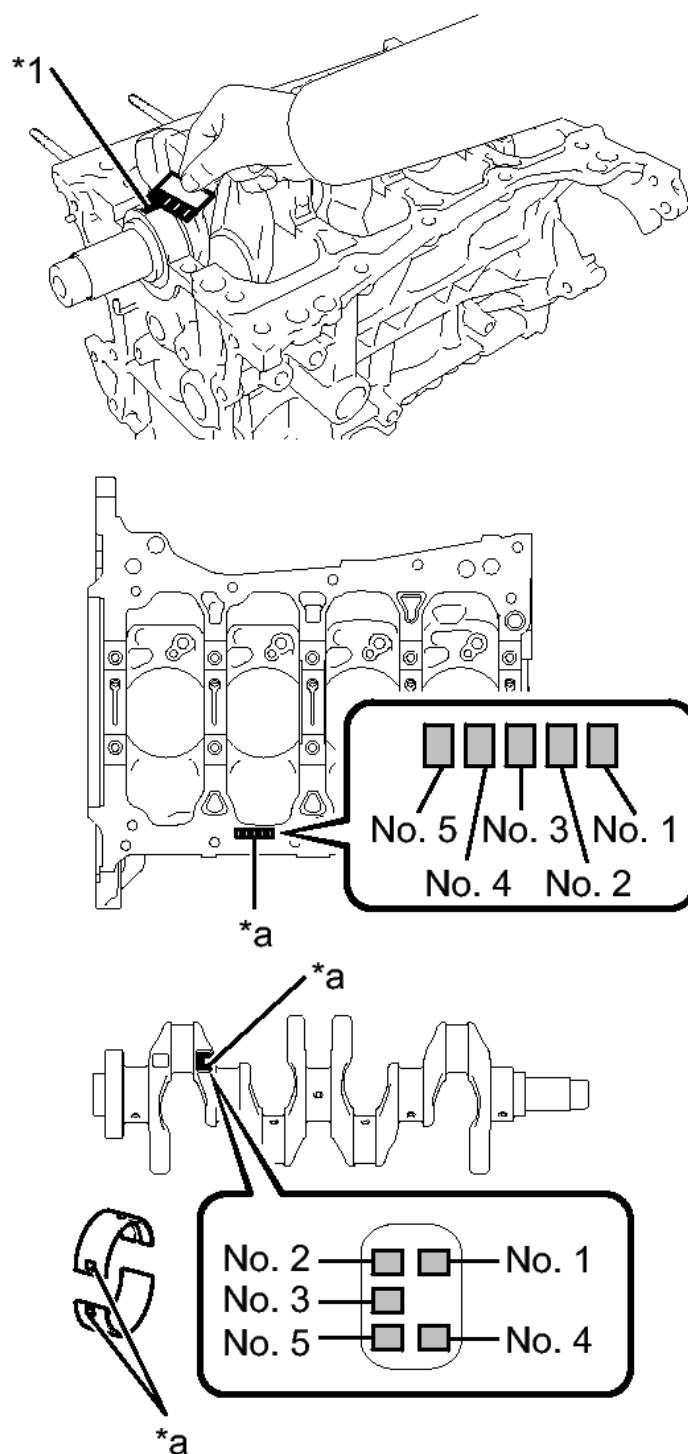
HINT:

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. Refer to **DISASSEMBLY**.
h. Measure the Plastigage at its widest point.



P

Fig. 391: Measuring Plastigage At Its Widest Point
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Plastigage
*a	Number Marks

Standard oil clearance

0.019 to 0.043 mm (0.000748 to 0.00169 in.)

Maximum oil clearance

0.049 mm (0.00192 in.)

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

NOTE: Remove the Plastigage completely after the measurement.

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 according to the chart below. There are 4 sizes of standard bearings, marked "2", "3", "4" and "5" accordingly.
- EXAMPLE: Cylinder block "3" + Crankshaft "5" = Total number 8 (Use bearing "4")

Cylinder block + Crankshaft	0 to 2	3 to 5	6 to 8	9 to 11
Bearing to be used	"2"	"3"	"4"	"5"

Standard Cylinder Block Journal Bore Diameter

Mark	Specified Condition
0	52.000 to 52.002 mm (2.04724 to 2.04732 in.)
1	52.003 to 52.004 mm (2.04736 to 2.04740 in.)
2	52.005 to 52.006 mm (2.04744 to 2.04748 in.)
3	52.007 to 52.009 mm (2.04752 to 2.04759 in.)
4	52.010 to 52.011 mm (2.04763 to 2.04767 in.)
5	52.012 to 52.013 mm (2.04771 to 2.04775 in.)
6	52.014 to 52.016 mm (2.04779 to 2.04787 in.)

Standard Crankshaft Journal Diameter

Mark	Specified Condition
0	47.999 to 48.000 mm (1.88972 to 1.88976 in.)
1	47.997 to 47.998 mm (1.88964 to 1.88968 in.)

2	47.995 to 47.996 mm (1.88956 to 1.88960 in.)
3	47.993 to 47.994 mm (1.88948 to 1.88952 in.)
4	47.991 to 47.992 mm (1.88941 to 1.88945 in.)
5	47.988 to 47.990 mm (1.88929 to 1.88937 in.)

Standard Bearing Center Wall Thickness

Mark	Specified Condition
2	1.994 to 1.997 mm (0.07850 to 0.07862 in.)
3	1.998 to 2.000 mm (0.07866 to 0.07874 in.)
4	2.001 to 2.003 mm (0.07878 to 0.07886 in.)
5	2.004 to 2.006 mm (0.07890 to 0.07898 in.)

11. INSPECT CONNECTING ROD OIL CLEARANCE

- a. Clean the crank pin and bearing.

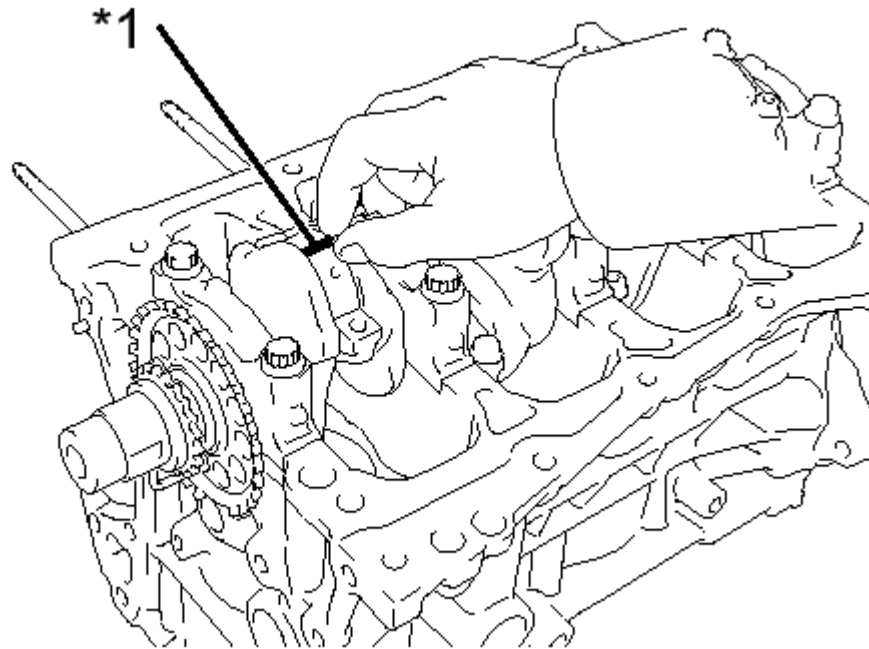
**P**

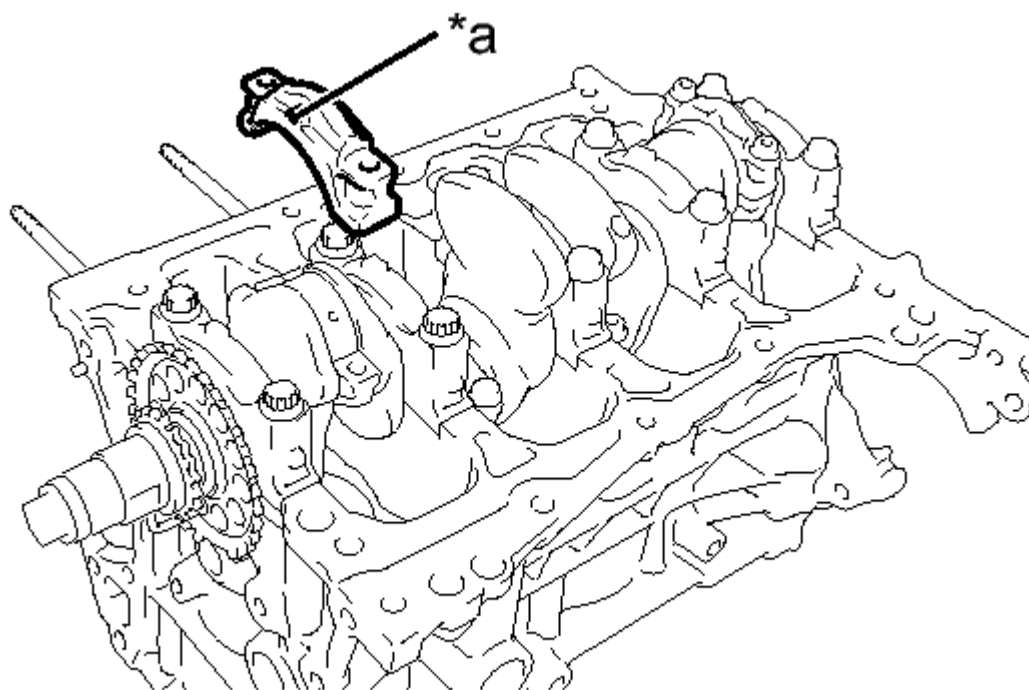
Fig. 392: Identifying Plastigage Across Crank Pin
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

TEXT IN ILLUSTRATION

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

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



P

Fig. 393: Identifying Front Mark Of Connecting Rod Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

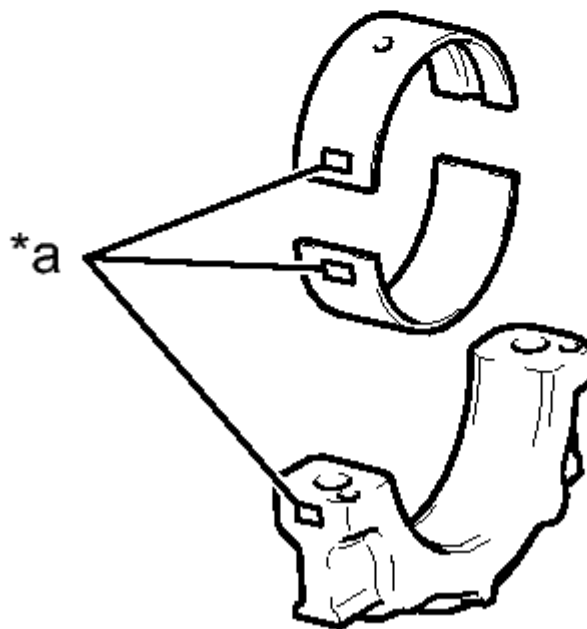
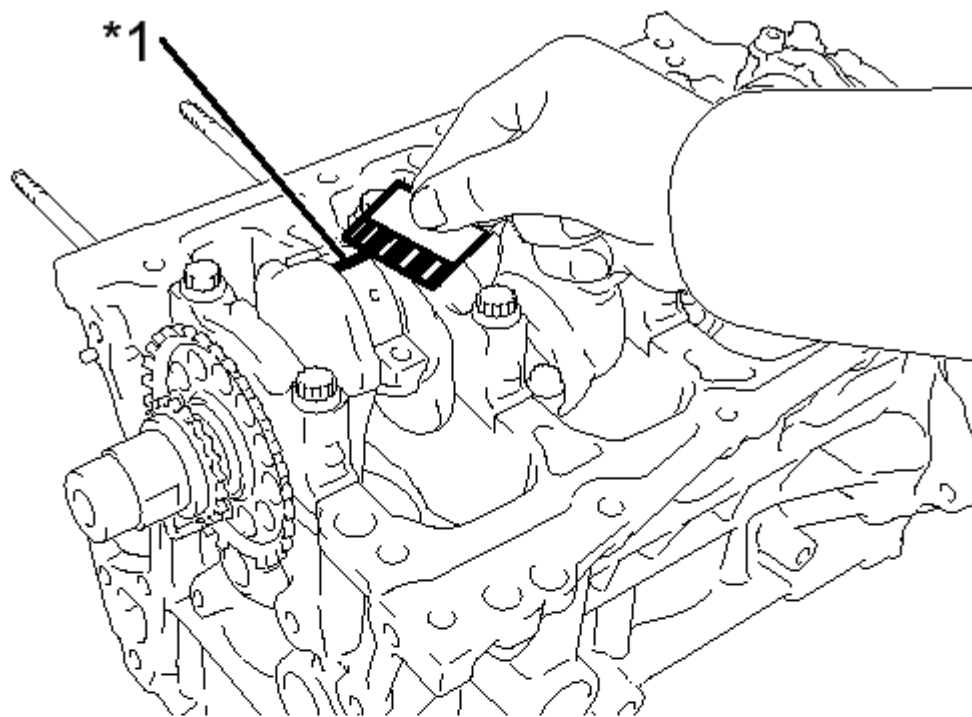
TEXT IN ILLUSTRATION

*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.



P

Fig. 394: Measuring Plastigage At Its Widest Point
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

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

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

Standard oil clearance

0.020 to 0.052 mm (0.000787 to 0.002047 in.)

Maximum oil clearance

0.058 mm (0.00228 in.)

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

NOTE: Completely remove the Plastigage after the measurement.

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 mark 1, 2, or 3 on its surface.

Standard Connecting Rod Large End Bore Diameter

Mark	Specified Condition
Mark 1	45.000 to 45.008 mm (1.77165 to 1.77197 in.)
Mark 2	45.009 to 45.016 mm (1.77200 to 1.77228 in.)
Mark 3	45.017 to 45.024 mm (1.77232 to 1.77259 in.)

Standard Connecting Rod Bearing Thickness

Mark	Specified Condition
Mark 1	1.492 to 1.495 mm (0.0587 to 0.05886 in.)
Mark 2	1.496 to 1.498 mm (0.05890 to 0.05898 in.)
Mark 3	1.499 to 1.501 mm (0.05902 to 0.0591 in.)

Standard Crankshaft Pin Diameter

Mark	Specified Condition
Mark 1, 2, 3	41.992 to 42.000 mm (1.6532 to 1.6535 in.)

12. INSPECT CONNECTING ROD BOLT

- Using a vernier caliper, measure the diameter of the bolt in the area shown in the illustration.

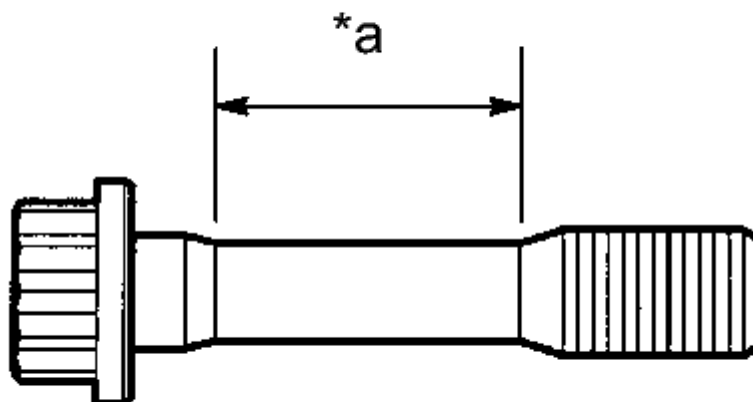


Fig. 395: Measuring The Tension Portion Diameter Of The Bolt Using Vernier Caliper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Measurement Area
----	------------------

Standard diameter

6.6 to 6.7 mm (0.2598 to 0.2638 in.)

Minimum diameter

6.4 mm (0.2520 in.)

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

13. INSPECT CRANKSHAFT BEARING CAP SET BOLT

- a. Using a vernier caliper, measure the length of the bolts.

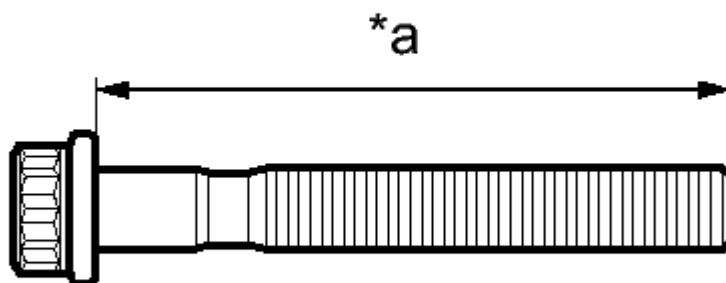


Fig. 396: Identifying Bolt Length Dimension

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

TEXT IN ILLUSTRATION

*a	Measurement Length
----	--------------------

Standard bolt length

75.3 to 76.7 mm (2.965 to 3.020 in.)

Maximum bolt length

77.2 mm (3.039 in.)

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

- b. Using a vernier caliper, measure the diameter of the bolt in the area shown in the illustration.

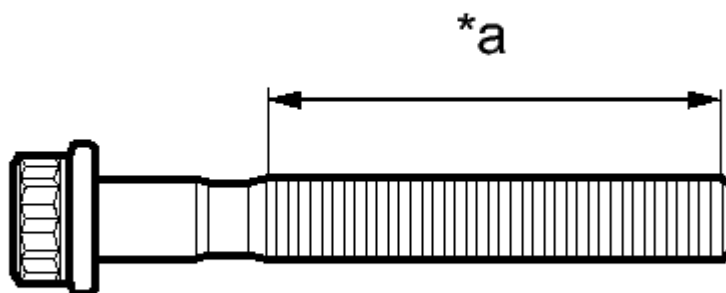


Fig. 397: Identifying Bolt Length Dimension

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

TEXT IN ILLUSTRATION

*a	Measurement Area
----	------------------

Standard bolt diameter

9.94 to 9.96 mm (0.3914 to 0.3921 in.)

Minimum bolt diameter

9.6 mm (0.377 in.)

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

14. INSPECT NO. 1 OIL NOZZLE SUB-ASSEMBLY

- a. Check the oil nozzles for damage or clogging.

HINT:

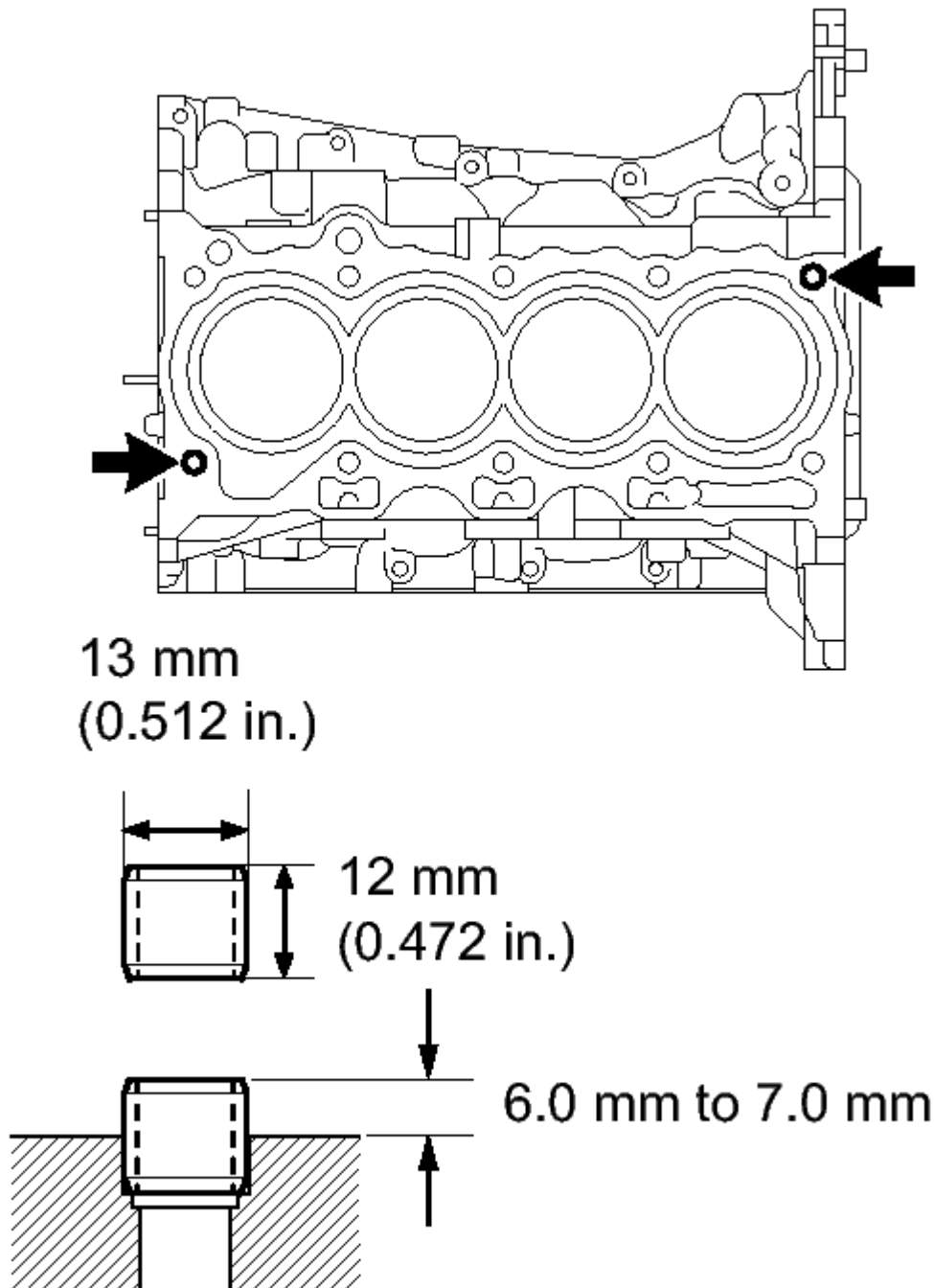
If there is damage or clogging, replace the oil nozzle.

REPLACEMENT

REPLACEMENT

1. REPLACE RING PIN

*a

**P****Fig. 398: Identifying Ring Pins**

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

NOTE: It is not necessary to remove the ring pins unless they are being replaced.

- a. Remove the ring pins.

TEXT IN ILLUSTRATION

*a	Upper Side
----	------------

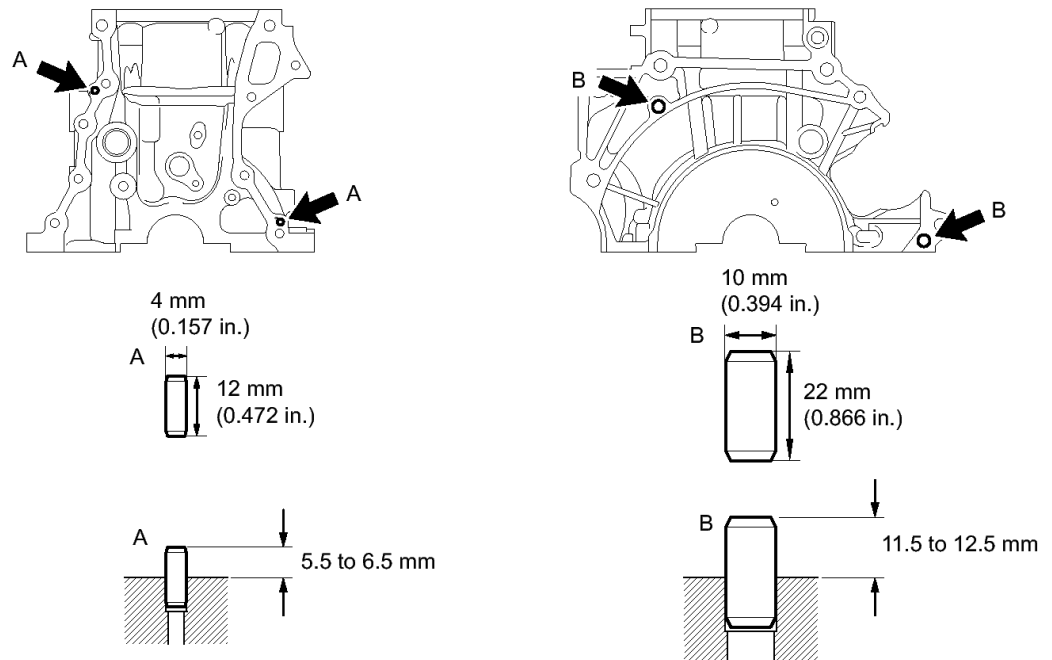
- b. Using a plastic hammer, tap in the ring pins.

Standard protrusion

6.0 to 7.0 mm (0.236 to 0.276 in.)

2. REPLACE STRAIGHT PIN

NOTE: It is not necessary to remove the straight pins unless they are being replaced.



P

Fig. 399: Identifying Straight Pin Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Standard Protrusion

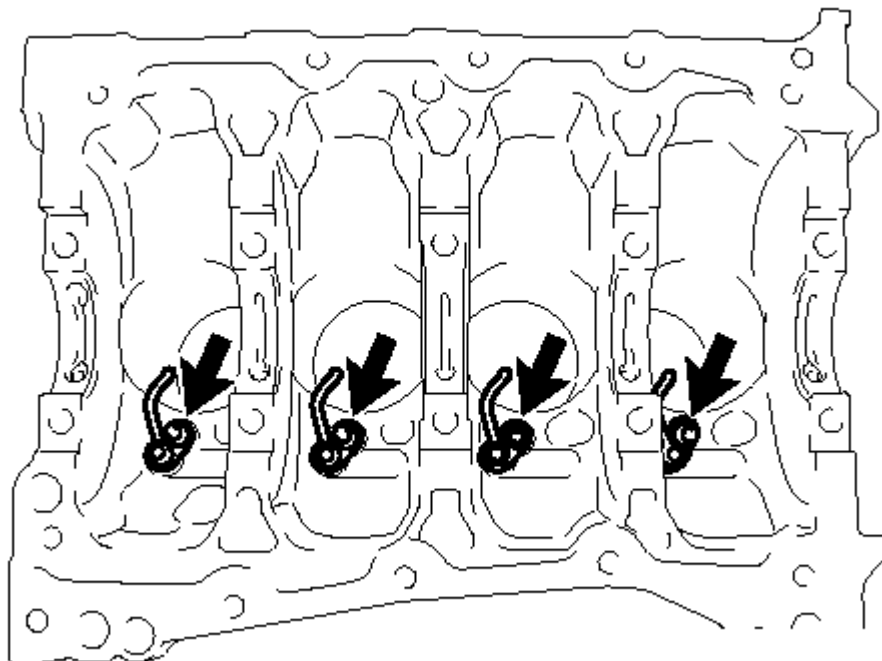
Item	Protrusion
Pin A	5.5 to 6.5 mm (0.217 to 0.256 in.)
Pin B	11.5 to 12.5 mm (0.453 to 0.492 in.)

REASSEMBLY

REASSEMBLY

1. INSTALL NO. 1 OIL NOZZLE SUB-ASSEMBLY

- Using a 5 mm socket hexagon wrench, install the oil nozzles with the bolts.

**P****Fig. 400: Identifying Bolts And Oil Nozzles**

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

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

2. INSTALL PISTON

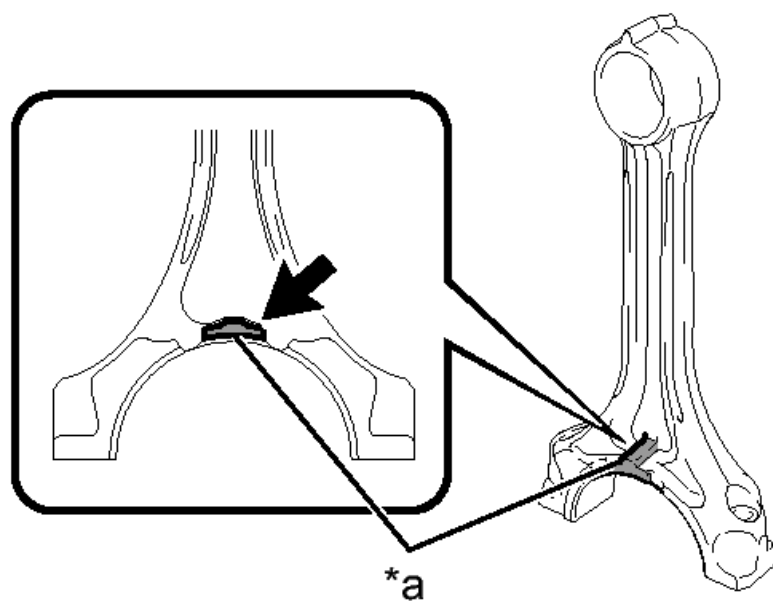
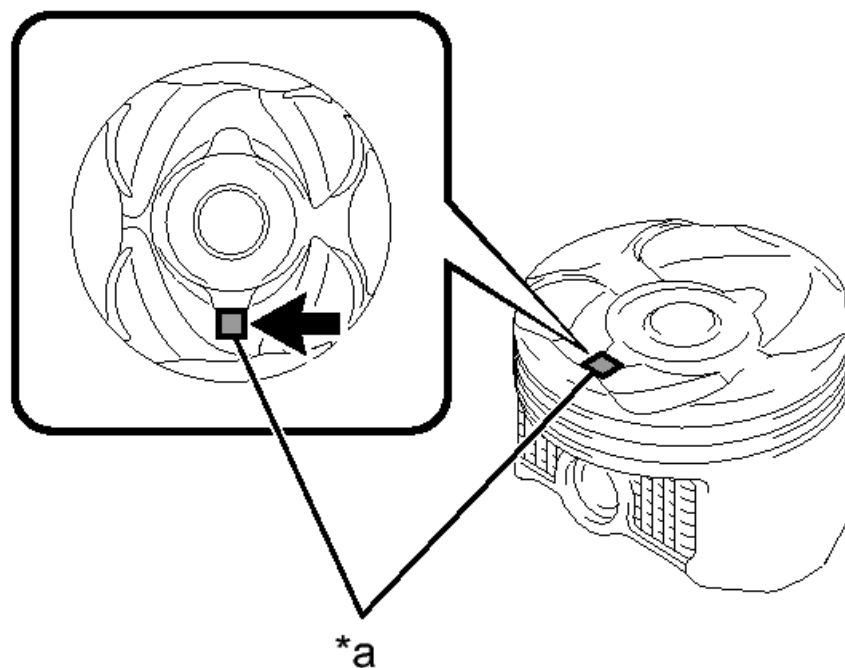
**P**

Fig. 401: Aligning Front Marks Of Piston And Connecting Rod
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

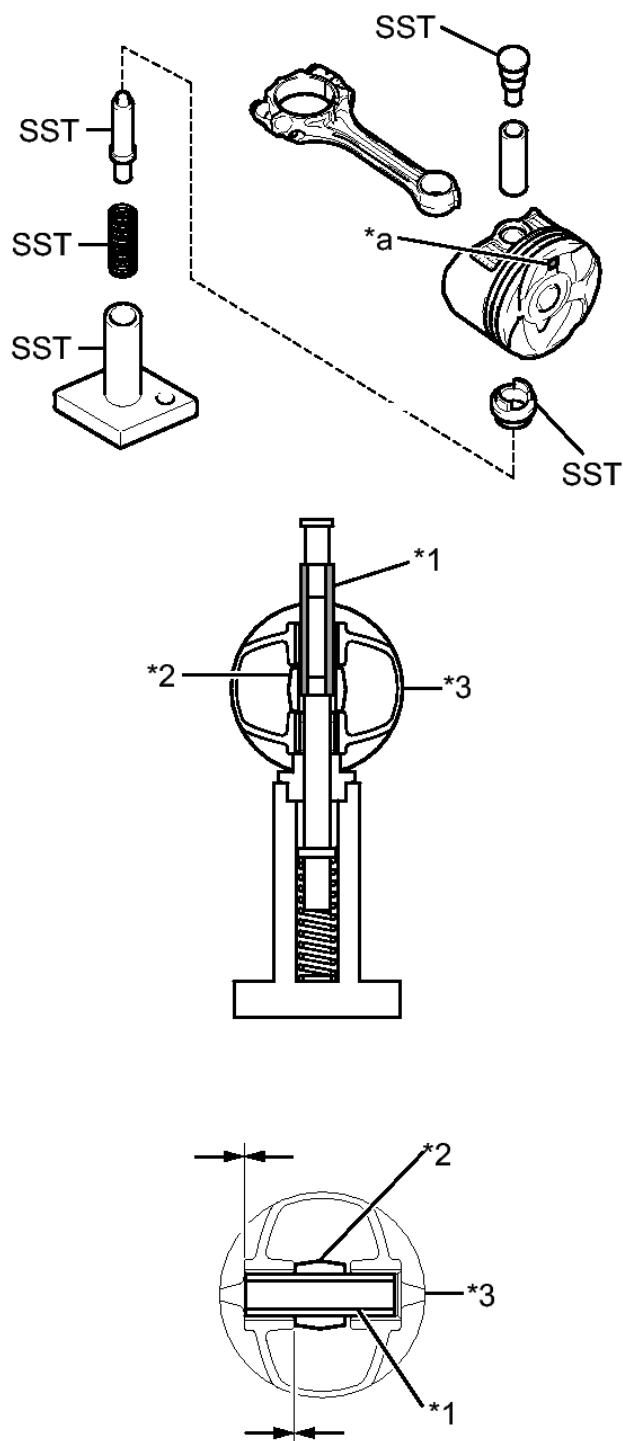
- a. Gradually heat a new connecting rod to 80°C (176°F) or more.
- b. Coat a new piston pin and pin holes in a new piston with engine oil.

- c. Align the front marks of the piston and connecting rod.

TEXT IN ILLUSTRATION

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

- d. Using SST, press in the piston pin.



P

Fig. 402: Identifying Piston Pin, Connecting Rod, Piston, and Front Mark
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Piston Pin
*2	Connecting Rod
*3	Piston
*a	Front Mark

- **SST: 09221-25026**

09221-00021

09221-00030

09221-00090

09221-00100

09221-00150

NOTE:

- **Press in the piston pin from the side of the piston with the front mark shown in the illustration.**
- **With the connecting rod fully inserted into the piston end, press in the piston pin until it is flush with the piston surface.**

- e. Check the fitting condition between the piston and piston pin by trying to move the piston back and forth on the piston pin.

3. INSTALL PISTON RING SET

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

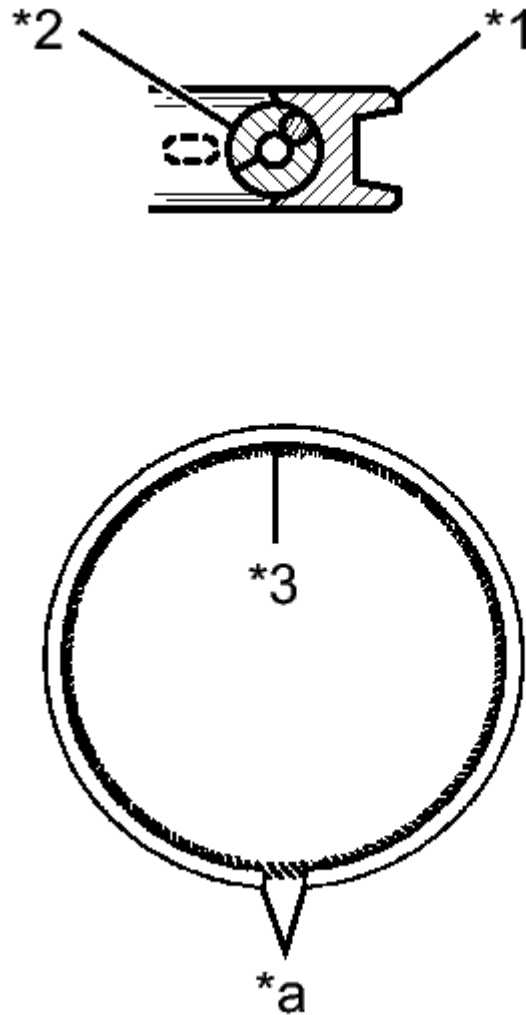


Fig. 403: Identifying Oil Ring Expander And Oil Ring Rail
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

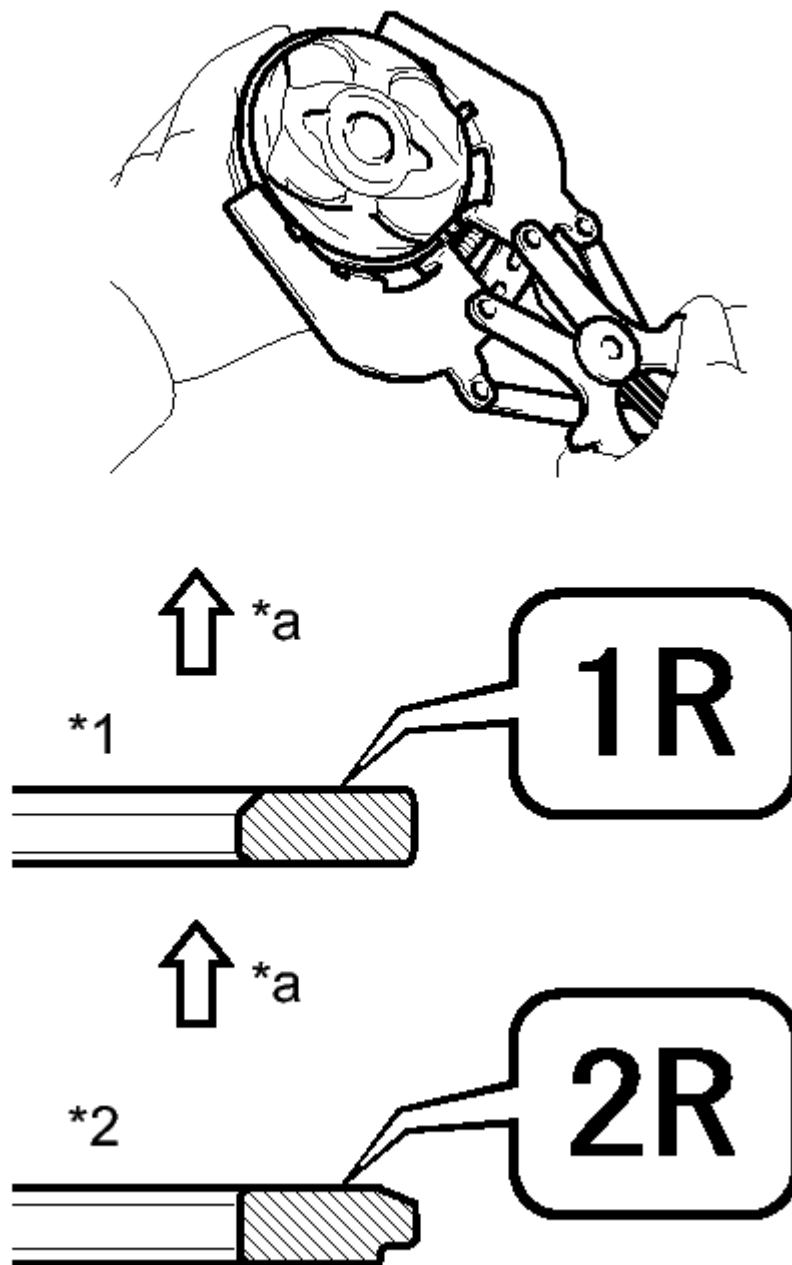
TEXT IN ILLUSTRATION

*1	Oil Ring
*2	Oil Ring Expander
*3	Coil Joint
*a	Oil Ring Ends

NOTE:

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

- b. Using a piston ring expander, install the No. 1 ring and No. 2 ring as shown in the illustration.

**P****Fig. 404: Installing Piston Ring**

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

TEXT IN ILLUSTRATION

*1	No. 1 Ring
----	------------

*2	No. 2 Ring
*a	Upward

NOTE:

- Install the No. 1 ring with the code mark (1R) facing upward.
- Install the No. 2 ring with the code mark (2R) facing upward.

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

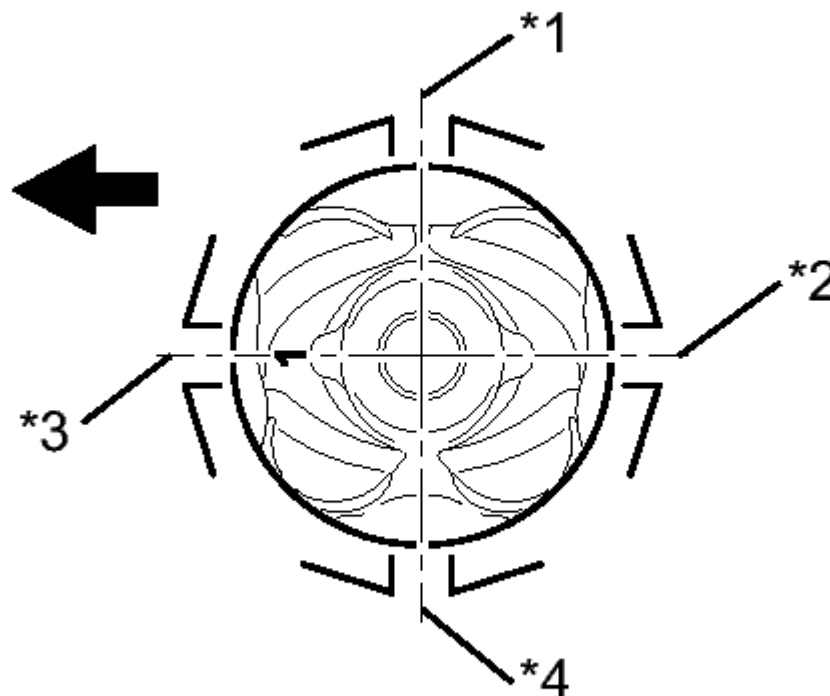
**P**

Fig. 405: Identifying Piston Ring Gap Direction

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

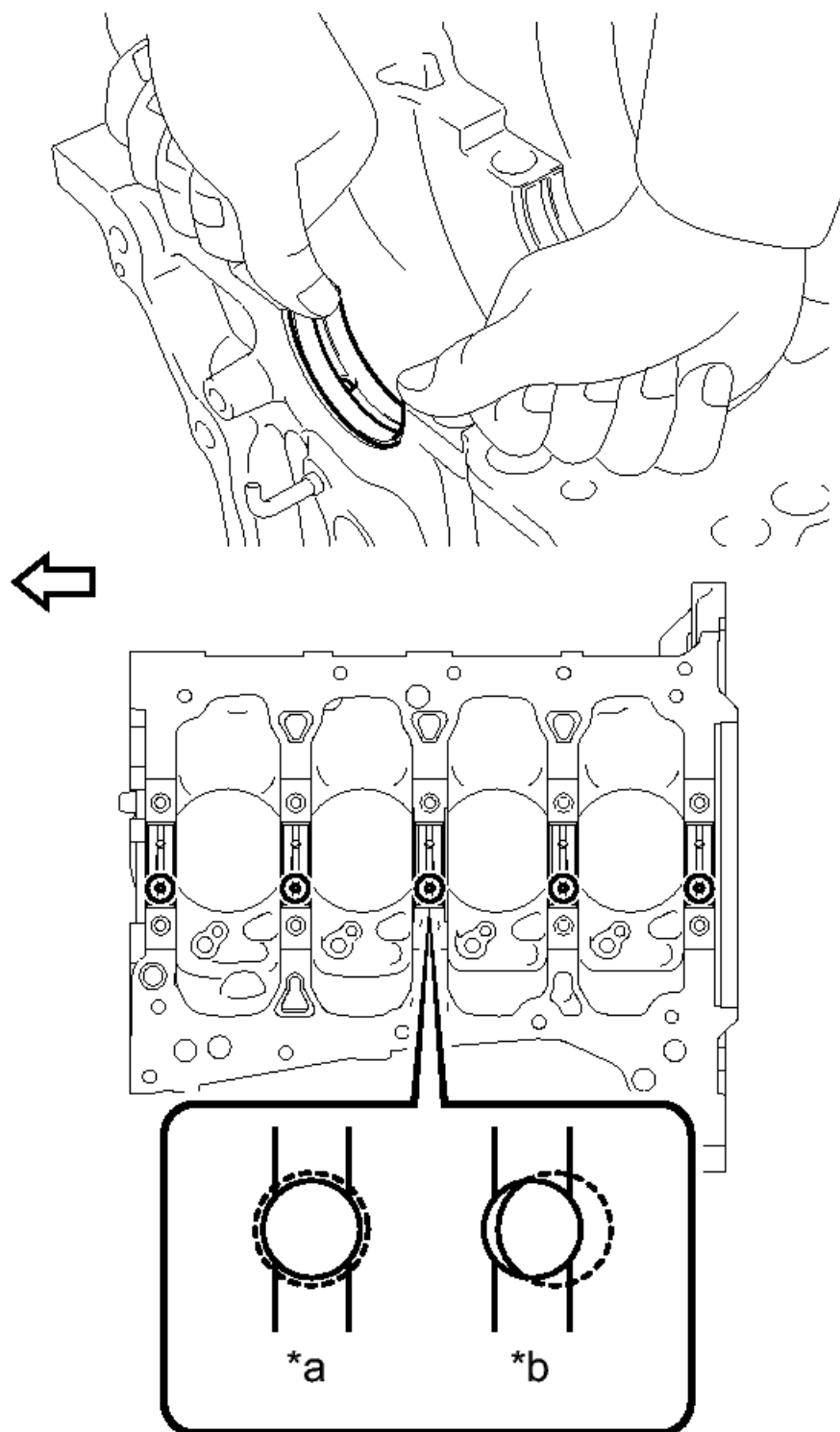
TEXT IN ILLUSTRATION

*1	Oil Ring
*2	No. 2 Ring

*3	No. 1 Ring
*4	Oil Ring Expander
	
Engine Front	

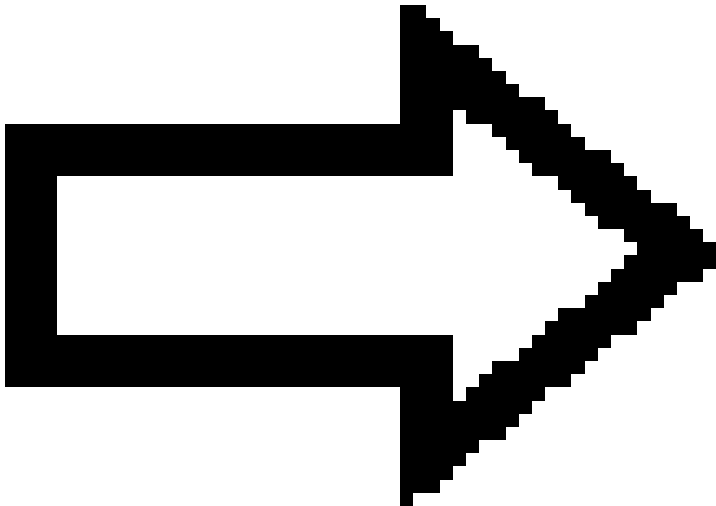
4. INSTALL CRANKSHAFT BEARING

- Install the upper bearing.

**P****Fig. 406: Installing The Upper Bearing**

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

TEXT IN ILLUSTRATION

*a	Correct
*b	Incorrect
	
	Engine Front

NOTE:

- Align the oil holes on the bearing and cylinder block.
- Do not apply engine oil to the bearings or the contact surfaces.

b. Install the lower bearing.

1. Install the lower bearing onto the bearing cap.
2. Using a vernier caliper, measure the distance between the bearing cap edge and the lower bearing edge.

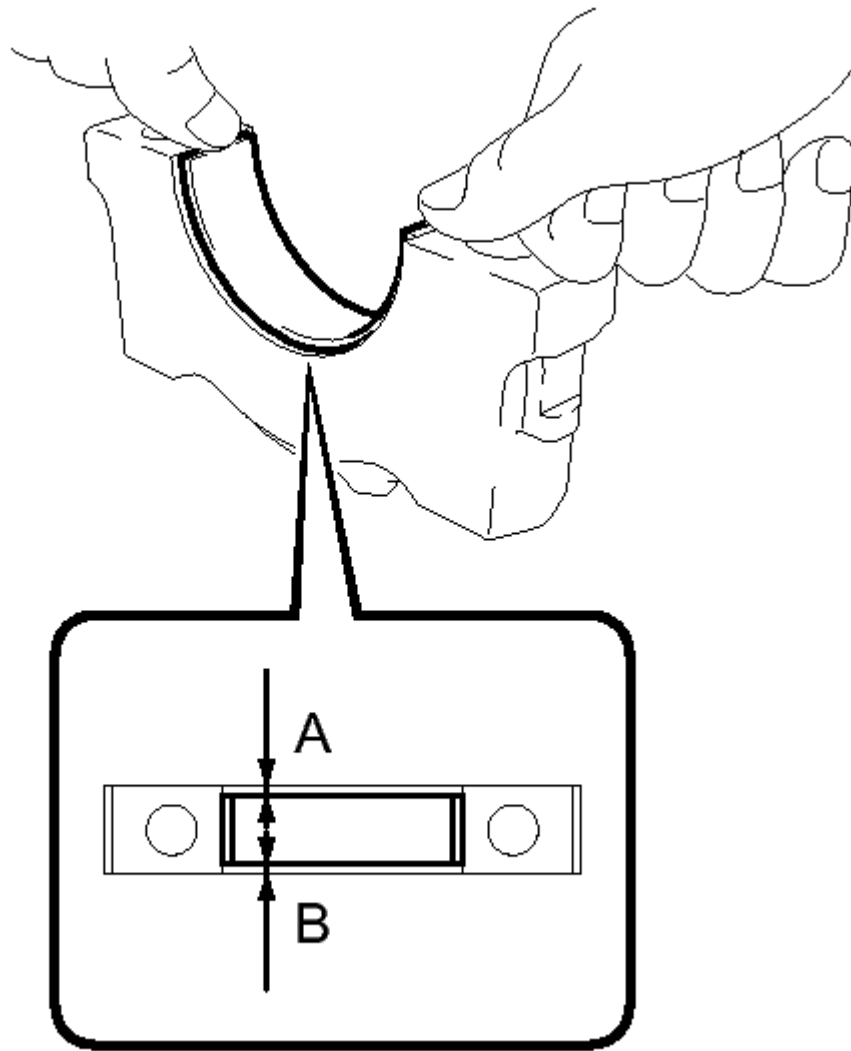
**P**

Fig. 407: Identifying Distance Between Cylinder Block Edge And Upper Bearing Edge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

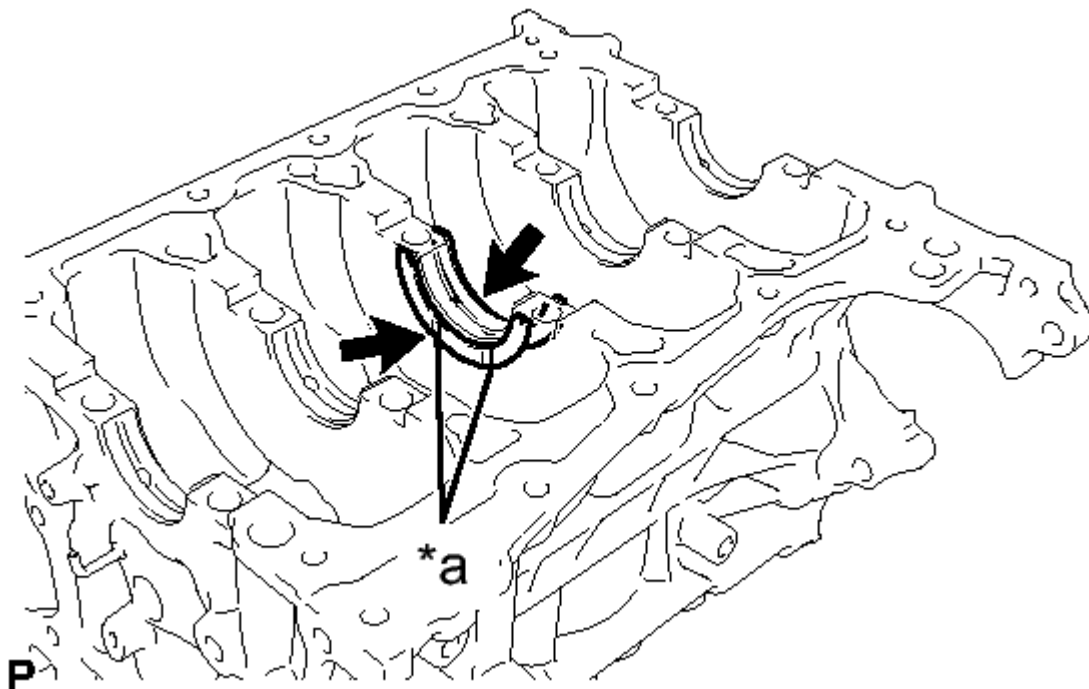
Dimension (A - B)

0.7 mm (0.0276 in.) or less

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

5. INSTALL UPPER CRANKSHAFT THRUST WASHER

- Install the 2 thrust washers under the No. 3 journal of the cylinder block with the oil grooves facing outward.

**Fig. 408: Identifying Thrust Washers**

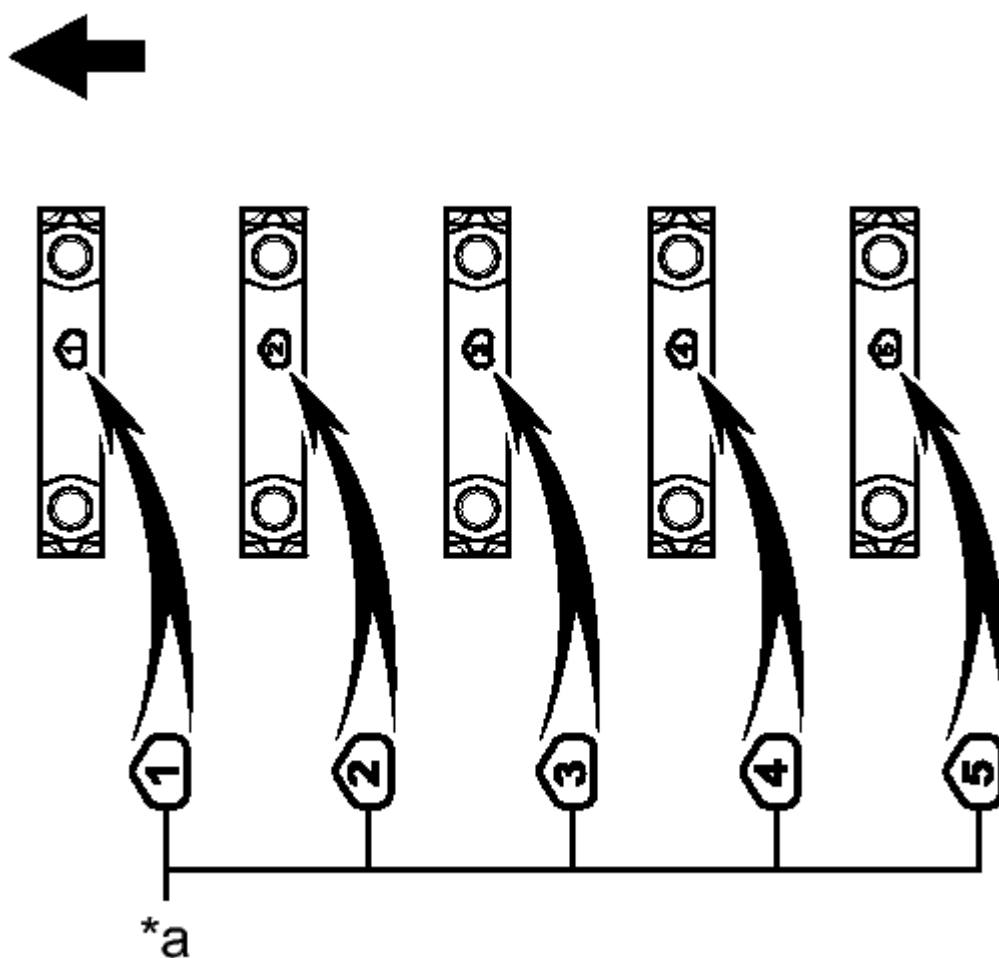
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Oil Grooves
----	-------------

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

6. INSTALL CRANKSHAFT

**P****Fig. 409: Identifying Marks On Bearing Caps**

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

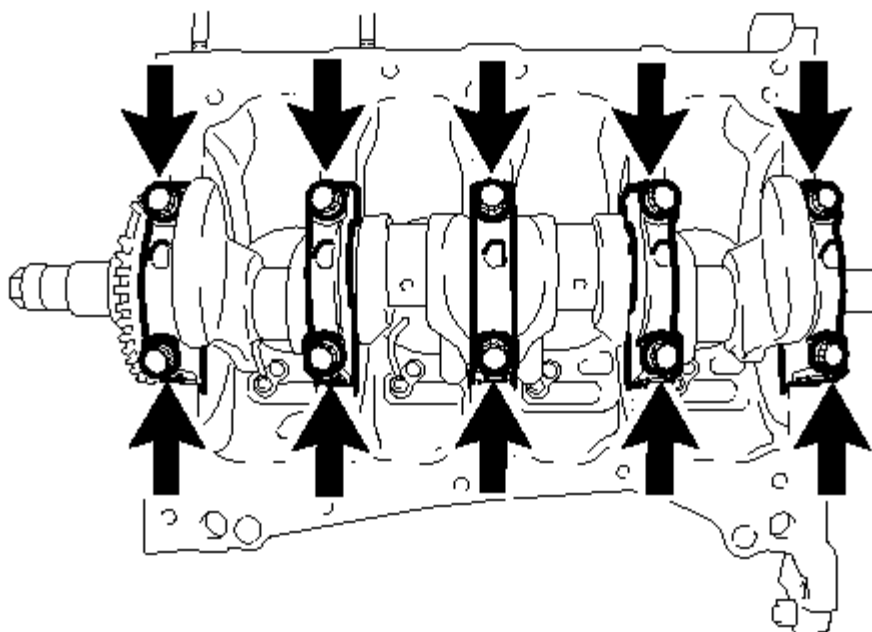
- a. Apply engine oil to the upper bearings and install the crankshaft on the cylinder block.

TEXT IN ILLUSTRATION

*a		Number Mark
		Engine Front



- b. Apply engine oil to the lower bearings.
- c. Examine the number marks and install the bearing caps on the cylinder block.
- d. Apply a light coat of engine oil to the threads and under the bearing cap bolts.
- e. Temporarily install the 10 main bearing cap bolts.

**P****Fig. 410: Identifying Main Bearing Cap Bolts****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

f. Step 1

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

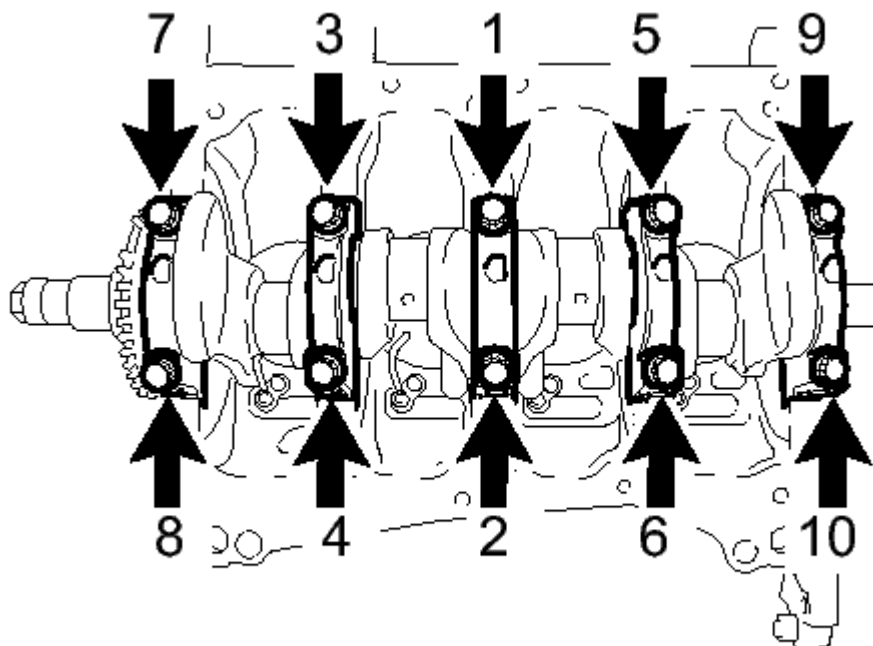
**P**

Fig. 411: Identifying Main Bearing Cap Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

g. Step 2

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

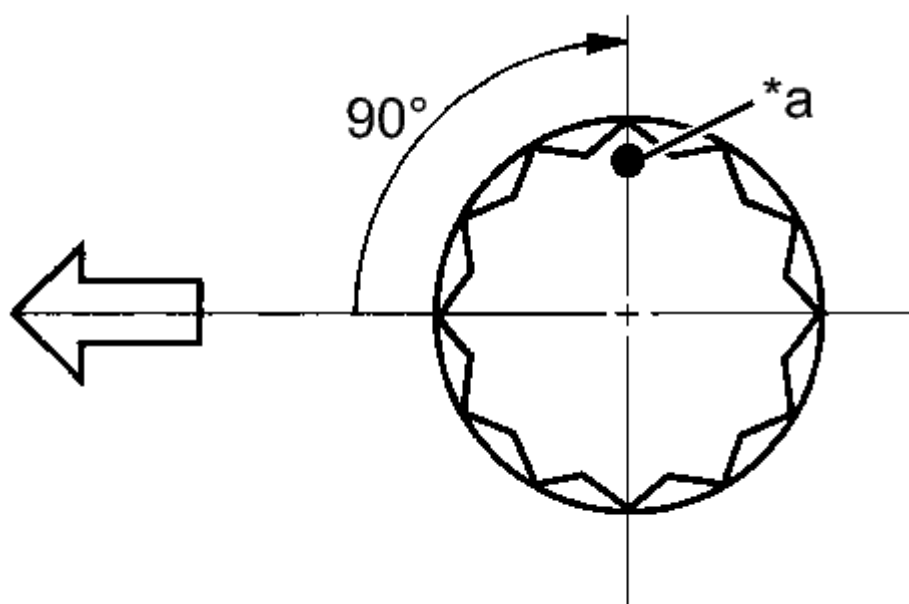
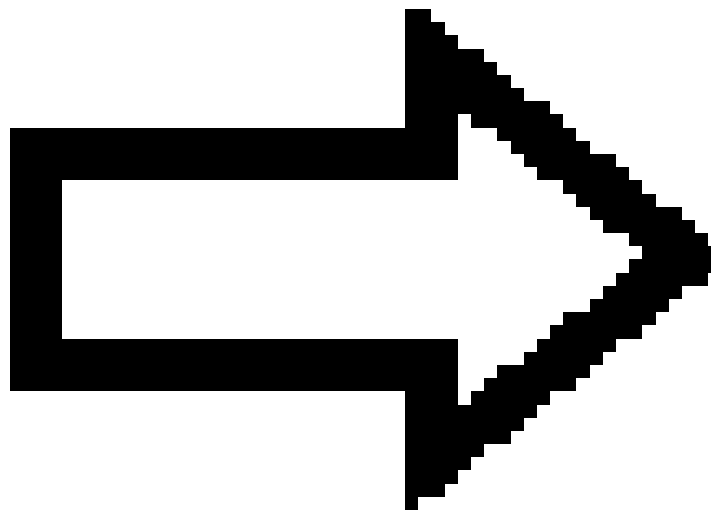


Fig. 412: Retightening Bearing Cap Bolts 90 Degrees
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Further tighten the bearing cap bolts an additional 90° in the numerical order shown in the previous illustration.

TEXT IN ILLUSTRATION

*a	Paint Mark
	Engine Front



- h. Check that the paint mark is now at a 90° angle to the front.
- i. Check that the crankshaft turns smoothly.
- j. Check the crankshaft thrust clearance See step 8.

7. INSTALL CONNECTING ROD BEARING

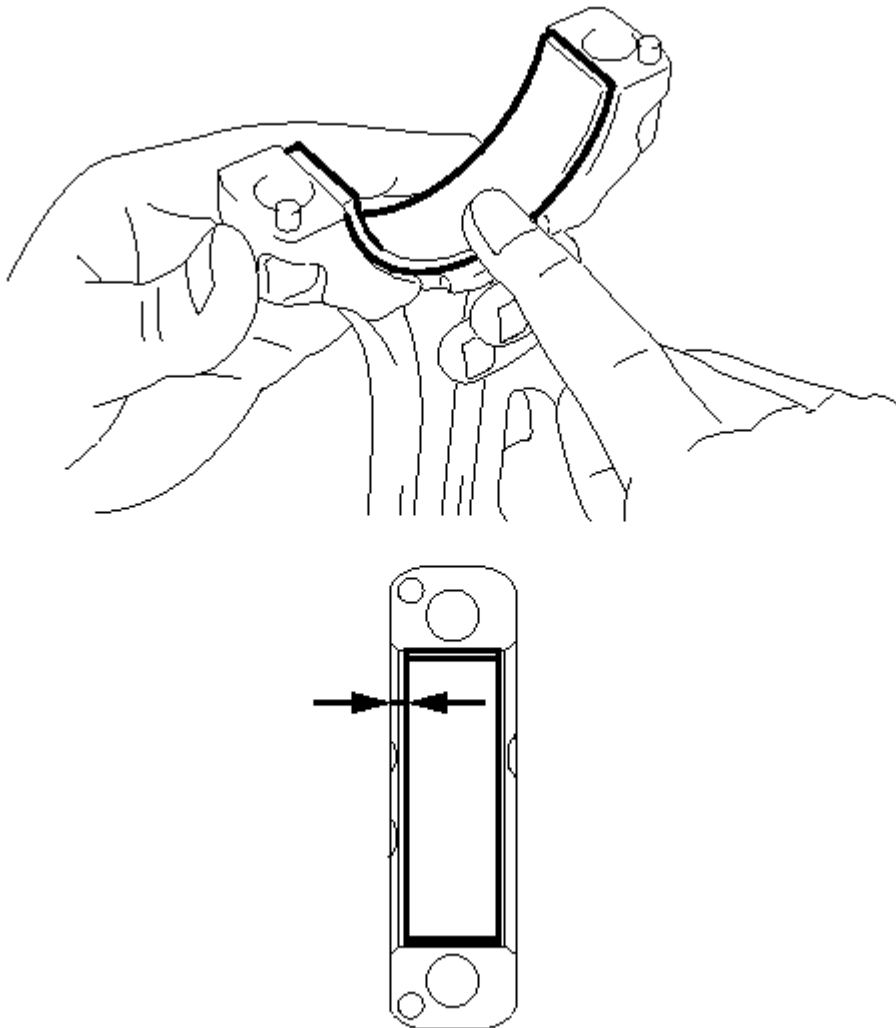
**P**

Fig. 413: Identifying Distance Between Connecting Rod And Connecting Rod Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Install the connecting rod bearing to the connecting rod and bearing cap.
- Using a vernier caliper, measure the distance between the connecting rod edge and connecting rod bearing edge.

Dimension

2.2 to 2.6 mm (0.0866 to 0.102 in.)

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

- Using a vernier caliper, measure the distance between the bearing cap edge and connecting rod bearing edge.

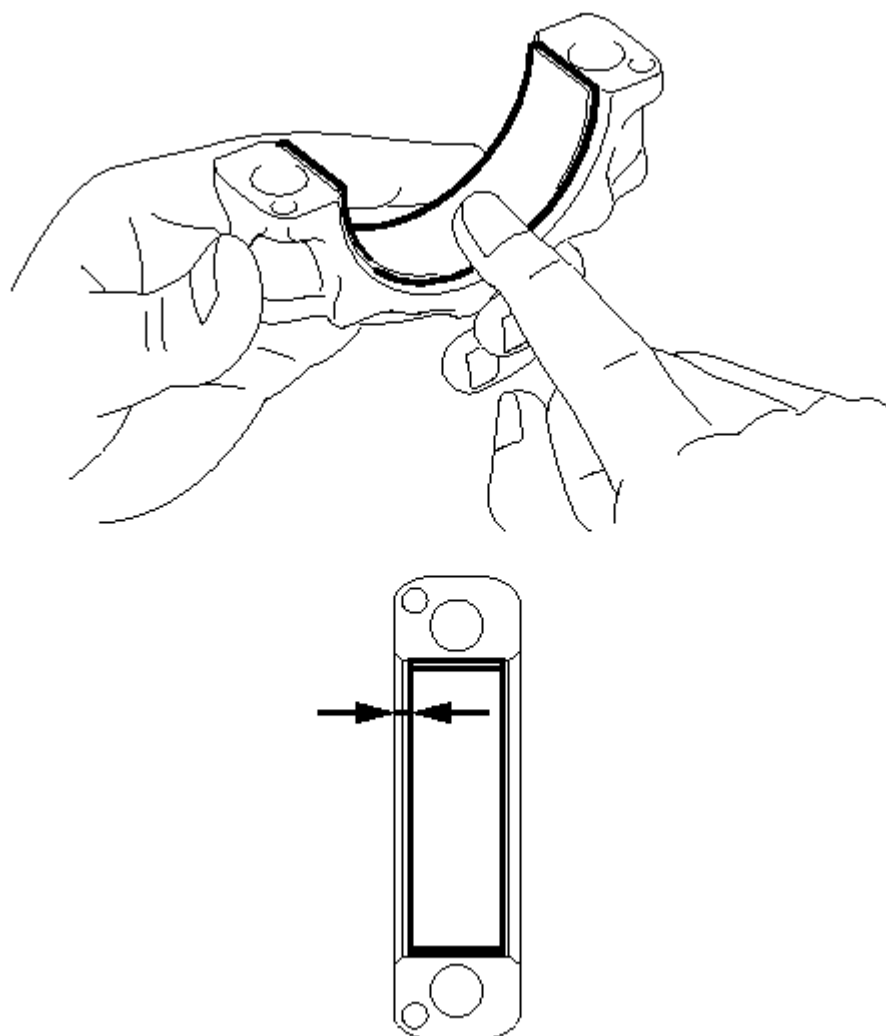
**P**

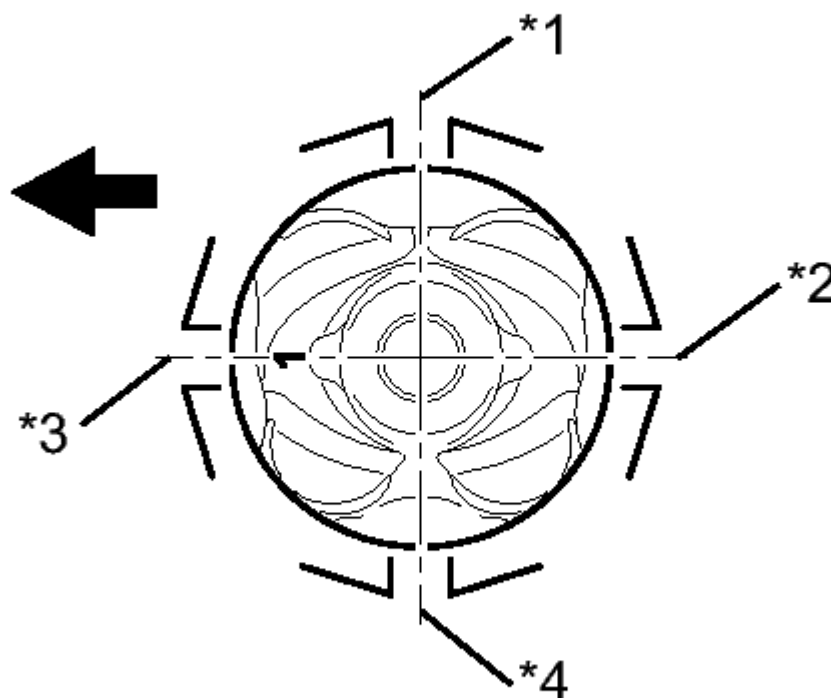
Fig. 414: Measuring Distance Between Bearing Cap Edge And Connecting Rod Bearing Edge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Dimension

2.2 to 2.6 mm (0.0866 to 0.102 in.)

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

8. INSTALL PISTON SUB-ASSEMBLY WITH CONNECTING ROD



P

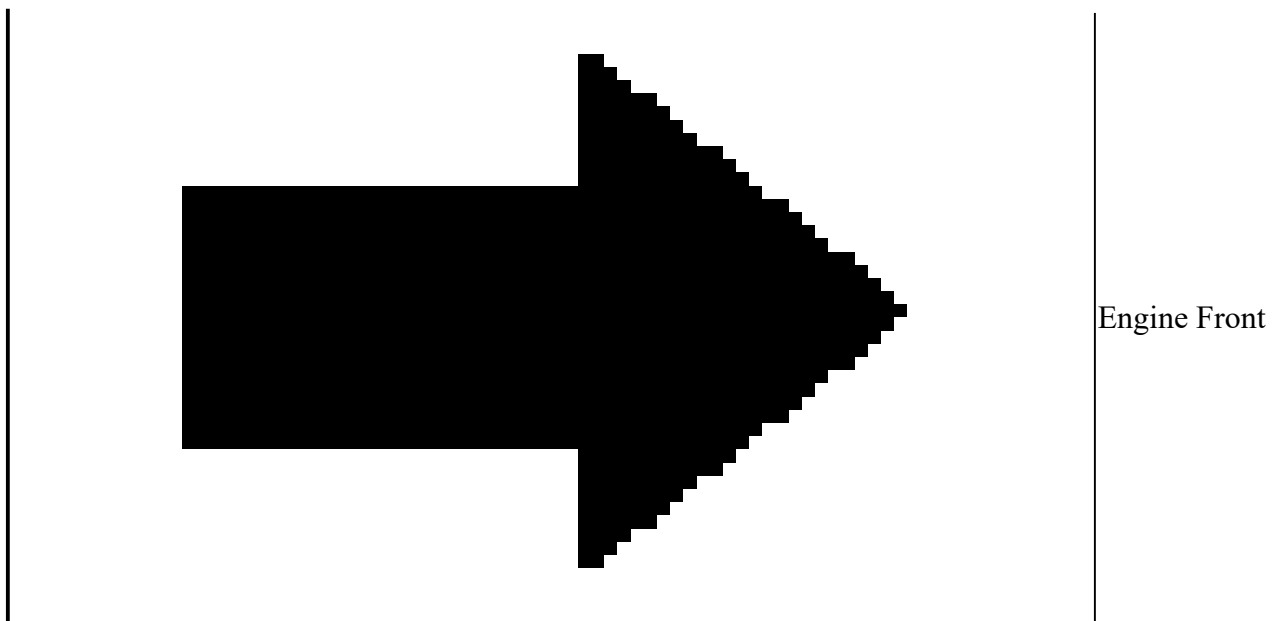
Fig. 415: Identifying Piston Ring Gap Direction

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

- Apply engine oil to the cylinder walls, the pistons, and the surfaces of the connecting rod bearings.
- Position the piston rings so that the ring ends are as shown in the illustration.

TEXT IN ILLUSTRATION

*1	Oil Ring
*2	No. 2 Ring
*3	No. 1 Ring
*4	Oil Ring Expander



NOTE: **Do not align the ring ends.**

- c. Using a piston ring compressor, push the correctly numbered piston and connecting rod assembly into the cylinder with the front mark of the piston facing forward.

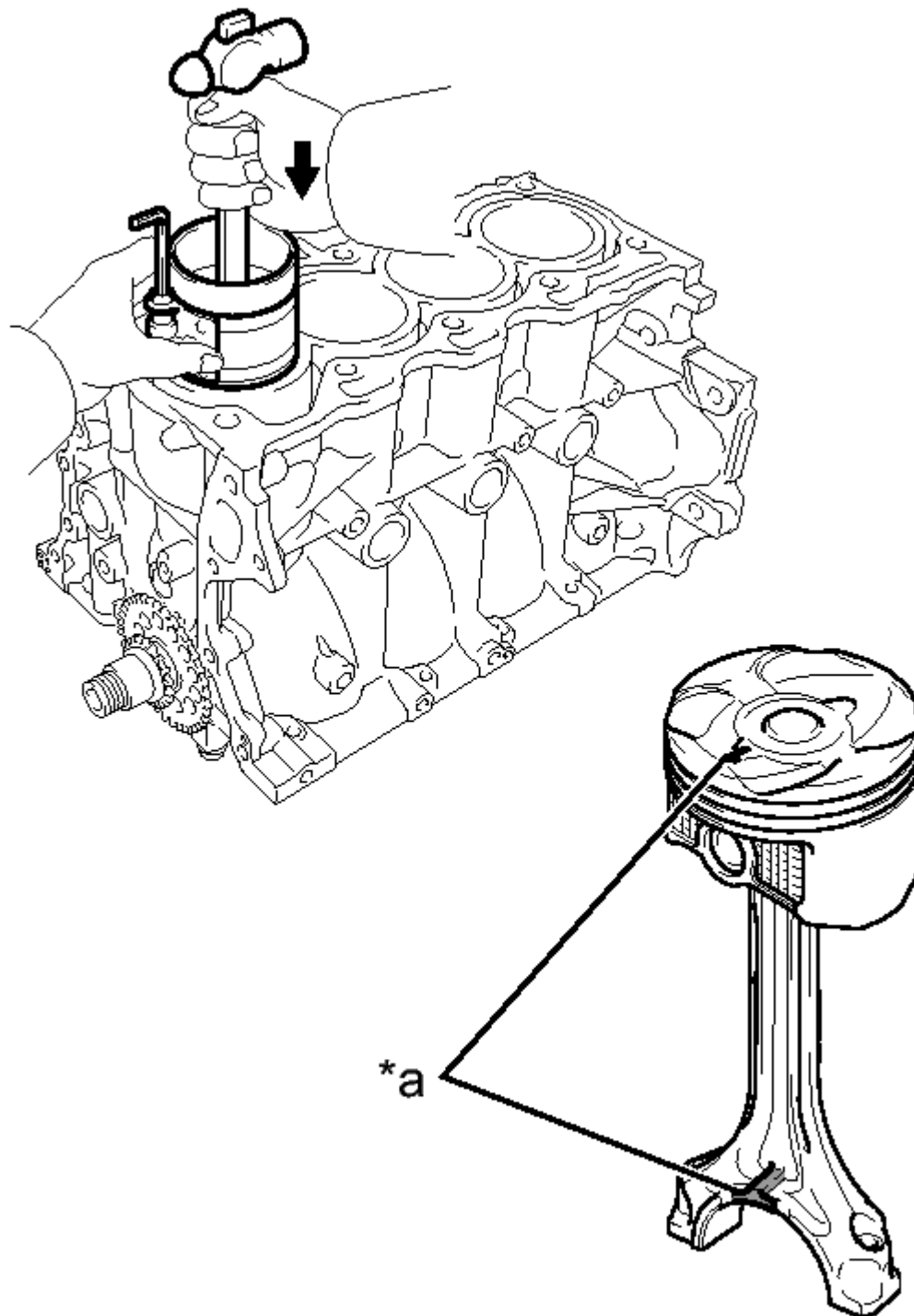
**P**

Fig. 416: Pushing Numbered Piston And Connecting Rod Assembly Into Cylinder
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

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

NOTE:

- When inserting the piston with connecting rod, do not allow it to make contact with the oil nozzle.
- Match the numbered connecting rod cap with the connecting rod.

- d. Check that the front mark of the connecting rod cap is facing in the correct direction.

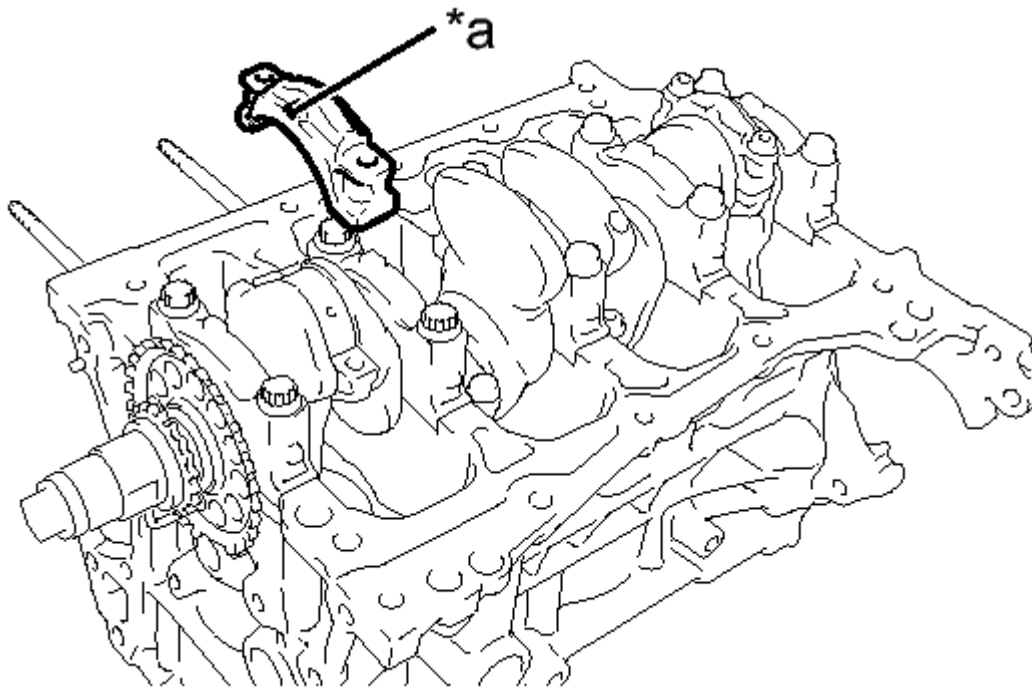
**P**

Fig. 417: Identifying Front Mark Of Connecting Rod Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

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

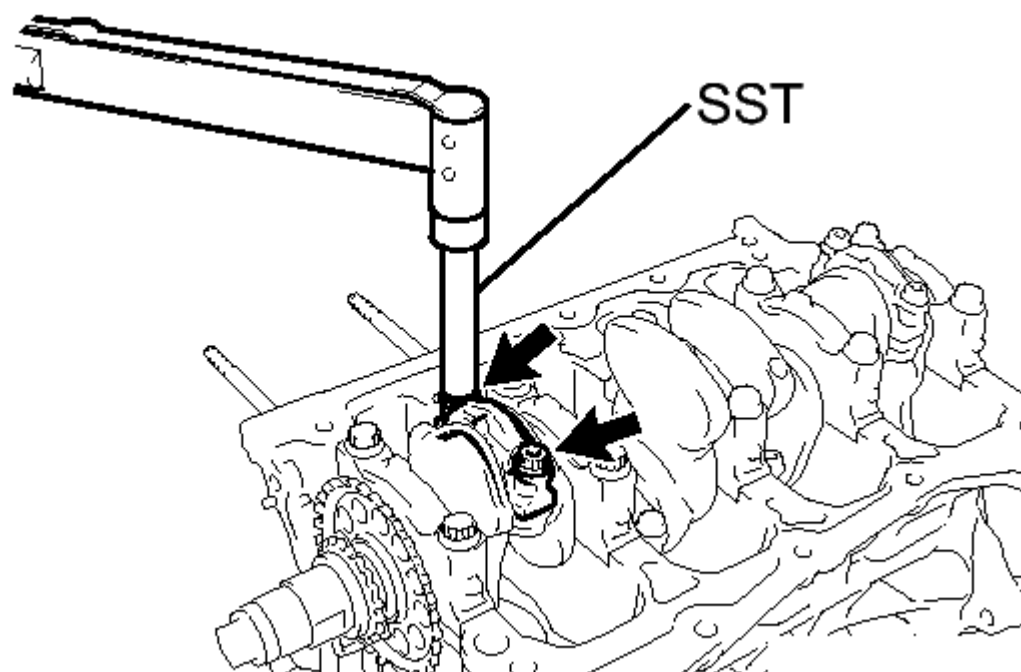
- e. Apply a light coat of engine oil to the threads and under the heads of the connecting rod cap bolts.
f. Install the connecting rod cap bolts.

NOTE:

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

- g. Step 1

1. Using SST, install and alternately tighten the bolts of the connecting rod cap in several steps.

**P****Fig. 418: Tightening Connecting Rod Cap Bolts**

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

- SST: 09205-16010

Torque: 15 N*m (153 kgf*cm, 11 ft.*lbf)**h. Step 2**

1. Mark the front of the connecting rod cap bolts with paint.

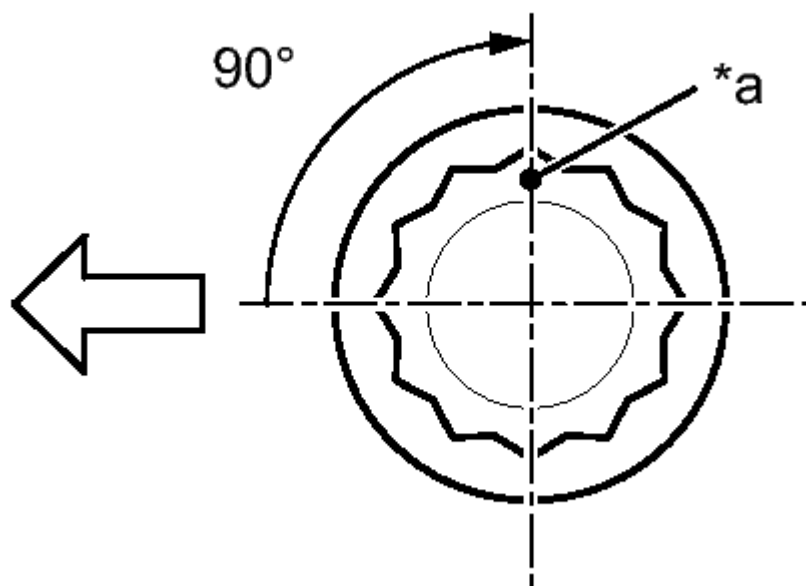
**P**

Fig. 419: Retightening Connecting Rod Bolts By 90 Degrees
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Further tighten the cap bolts an additional 90° as shown in the illustration.

TEXT IN ILLUSTRATION

*a	Paint Mark
	Engine Front

- i. Check that the crankshaft turns smoothly.

- j. Check the connecting rod thrust clearance See step 9.