ENGINE

ON-VEHICLE INSPECTION

ON-VEHICLE INSPECTION

1. **INSPECT ENGINE COOLANT**

   Refer to **ON-VEHICLE INSPECTION**

2. **INSPECT ENGINE OIL**

   Refer to **ON-VEHICLE INSPECTION**

3. **INSPECT BATTERY**

   Refer to **ON-VEHICLE INSPECTION**

4. **INSPECT AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY**
   a. Remove the air cleaner sub-assembly. Refer to **REMOVAL - Step 7** .
   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 sub-assembly. Refer to **INSTALLATION - Step 4** .
5. **INSPECT FAN AND GENERATOR V BELT**

   See step 1

6. **INSPECT V-RIBBED BELT TENSIONER ASSEMBLY**
   a. Remove the fan and generator V 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 fan and generator V belt. Refer to **INSTALLATION**.

7. **INSPECT SPARK PLUG**

Refer to **ON-VEHICLE INSPECTION**

8. **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 2.

9. **INSPECT IGNITION TIMING**

a. Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or more.

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 main switch on.
4. Enter the following menus: Powertrain / Engine / Data List / IGN Advance.

Standard ignition timing

9.5 to 24.5° BTDC at idle

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.**

HINT:

Refer to the Techstream operator 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 / Active Test / Connect the TC and TE1.
7. Monitor IGN Advance.

8. Perform the Active Test.

   Standard ignition timing

   8 to 12° BTDC at idle

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

   HINT:

   Refer to the Techstream operator manual for further details.

c. When not using the Techstream:
   1. Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.

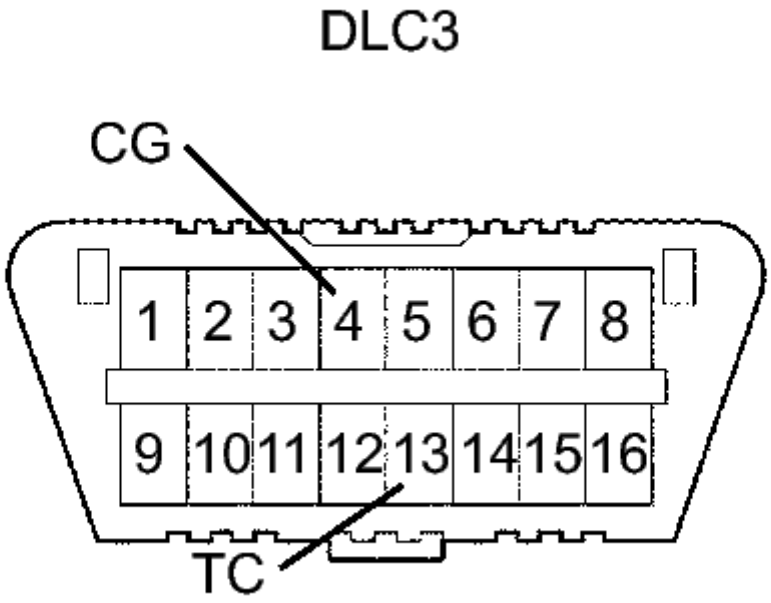


Fig. 1: DLC3 Connector End View
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- **SST: 09843-18040**

NOTE:

- **Confirm the terminal numbers before connecting them. Connecting the wrong terminals can damage the engine.**
- **Check the ignition timing with the cooling fans off.**
- **Turn off all the electrical systems and the A/C.**

- **When checking the ignition timing, the transaxle should be in neutral or park.**

2. Remove the V-bank cover sub-assembly. See step 24.
3. Connect the timing light tester probe to the ignition coil wire for No. 1 cylinder.

NOTE: Use a timing light that detects primary signals.

4. Check the ignition timing at idle.

   Standard ignition timing

   8 to 12° BTDC at idle

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

HINT:

Run the engine at 1000 to 1300 RPM for 5 seconds, and then check that the engine RPM returns to idle speed.

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

   Standard ignition timing

   9.5 to 24.5° BTDC at idle

7. Confirm that the ignition timing advances immediately when the engine RPM is increased.
8. Remove the timing light from the engine.
9. Install the V-bank cover sub-assembly. See step 95.

10. **INSPECT ENGINE IDLE SPEED**

a. Connect the Techstream to the DLC3.
b. Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or more.
c. Turn the Techstream main switch on.
d. Enter the following menus: Powertrain / Engine / Data List / Engine Speed.
e. Read the value displayed on the tester.

   Standard idle speed

   600 to 700 RPM

NOTE:

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

HINT:

Refer to the Techstream operator manual for further details.

11. **INSPECT COMPRESSION**
    a. Warm up the engine until the engine coolant temperature reaches 75°C (167°F) or more.
    b. Stop the engine.
    c. Remove the 6 spark plugs. Refer to **REMOVAL** .
    d. Disconnect the injector connectors.
    e. Check the cylinder compression pressure.

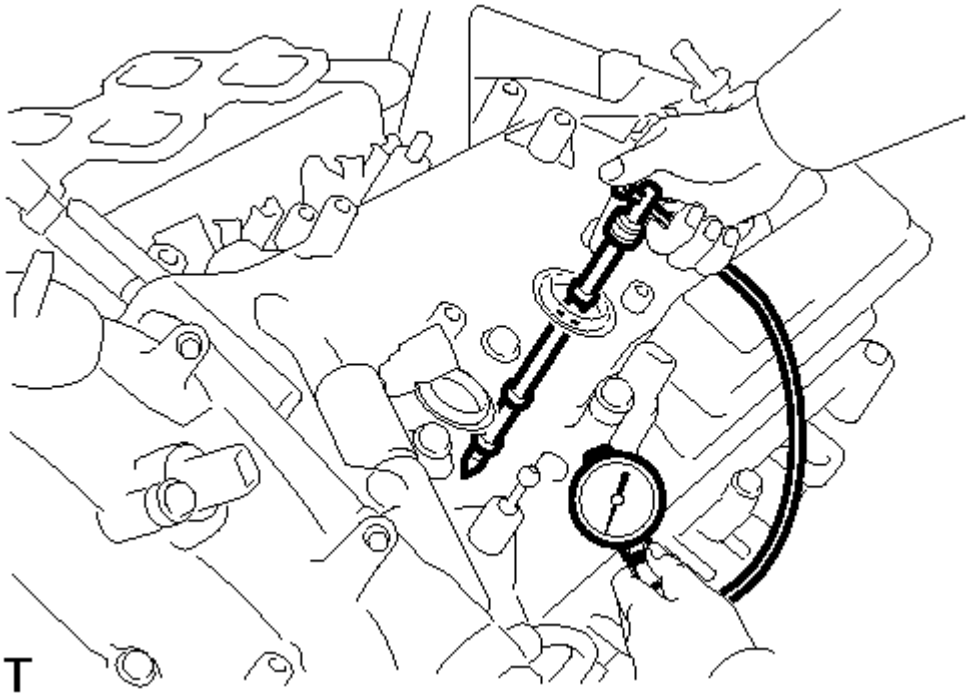


Fig. 2: Checking Cylinder Compression Pressure
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

   Standard compression pressure

1.3 MPa (13 kgf/cm^2 , 189 psi)

Minimum pressure

0.98 MPa (10 kgf/cm^2 , 142 psi)

Difference between each cylinder

0.1 MPa (1.0 kgf/cm^2 , 15 psi)

NOTE:

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

   HINT:

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

f. Connect the injector connectors.

g. Install the 6 spark plugs. Refer to **INSTALLATION** .

12. **INSPECT CO/HC**

HINT:

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

a. Start the engine.
b. Keep the engine speed at 2500 RPM for approximately 180 seconds.
c. Insert the CO/HC meter testing probe at least 40 cm (1.31 ft.) into the tailpipe during idle.
d. Immediately check CO/HC concentration during idle and when running at 2500 RPM.

HINT:

When performing the 2 mode (with the engine idling/running at 2500 RPM) test, follow the measurement order determined by applicable local regulations.

If the CO/HC concentration does not comply with the regulations, perform troubleshooting in the

order given below.

1. Check for DTCs. Refer to **DIAGNOSTIC TROUBLE CODE CHART** .
2. See the table below for possible causes, then inspect and correct the applicable causes if necessary.

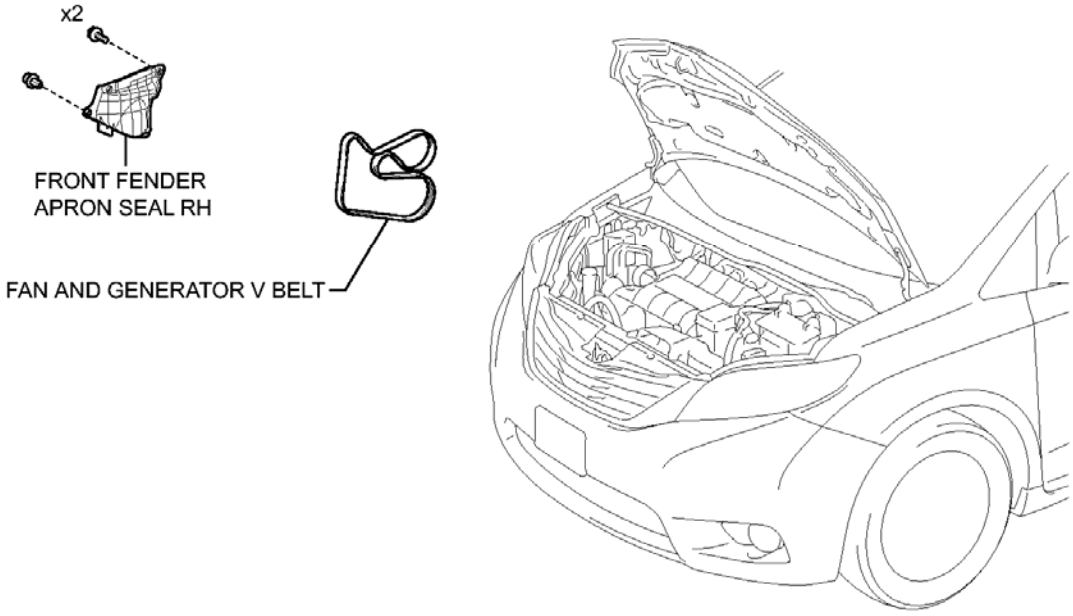
CO	HC	Problem	Cause
Normal	High	Rough idle	a. Faulty ignitions: • Incorrect valve timing • Fouled, shorted or improperly gapped plugs b. Incorrect valve clearance (valve lash adjuster) c. Leaks in intake or exhaust valves d. Leaks in cylinders
Low	High	Rough idle (Fluctuating HC reading)	a. Vacuum leaks: • PCV hoses • Intake manifold • Throttle body assembly • Brake booster line b. Lean mixture causing misfire
			a. Restricted air cleaner filter element sub-assembly b. Plugged PCV valve c. Faulty SFI system: • Faulty fuel

High	High	Rough idle (Black smoke from exhaust)	pressure regulator • Defective engine coolant temperature sensor • Defective mass air flow meter • Faulty ECM • Faulty injector assemblies • Faulty throttle position sensor (built in throttle body assembly)

DRIVE BELT

COMPONENTS

ILLUSTRATION



P

Fig. 3: Drive Belt Replacement Components
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ON-VEHICLE INSPECTION

ON-VEHICLE INSPECTION

1. **INSPECT FAN AND GENERATOR V BELT**
    a. Check the belt for wear, cracks or other signs of damage.

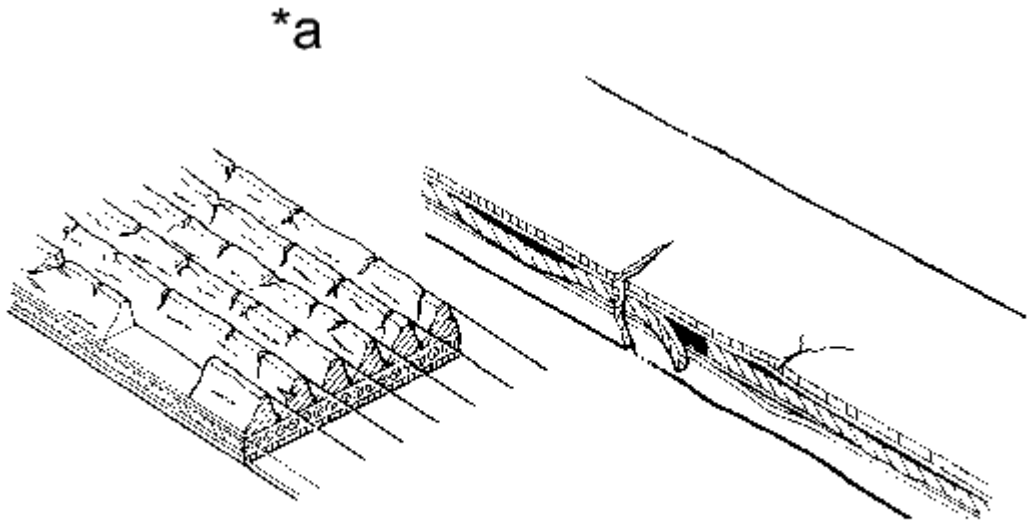


Fig. 4: Inspecting Condition Of Fan & Generator V Belt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	INCORRECT

If any of the following defects is found, replace the fan and generator V belt.

- 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.

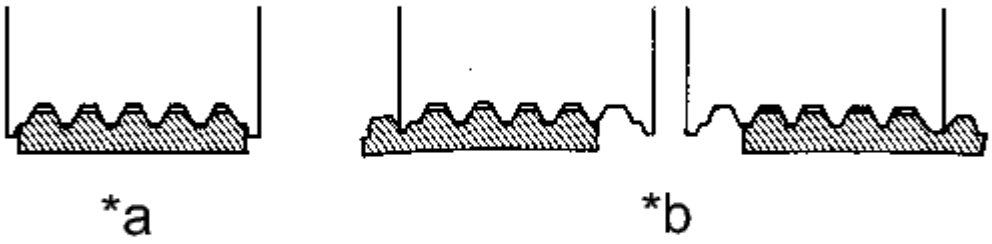


Fig. 5: Checking V Belt For Proper Installation
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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 fan and generator V belt. Install a new fan and generator V belt correctly.

REMOVAL

REMOVAL

1. **REMOVE FRONT WHEEL RH**
2. **REMOVE FRONT FENDER APRON SEAL RH** See step 10
3. **REMOVE FAN AND GENERATOR V BELT**
    a. Release the V-ribbed belt tension by turning the V-ribbed belt tensioner counterclockwise, and remove the fan and generator V belt from the V-ribbed belt tensioner.

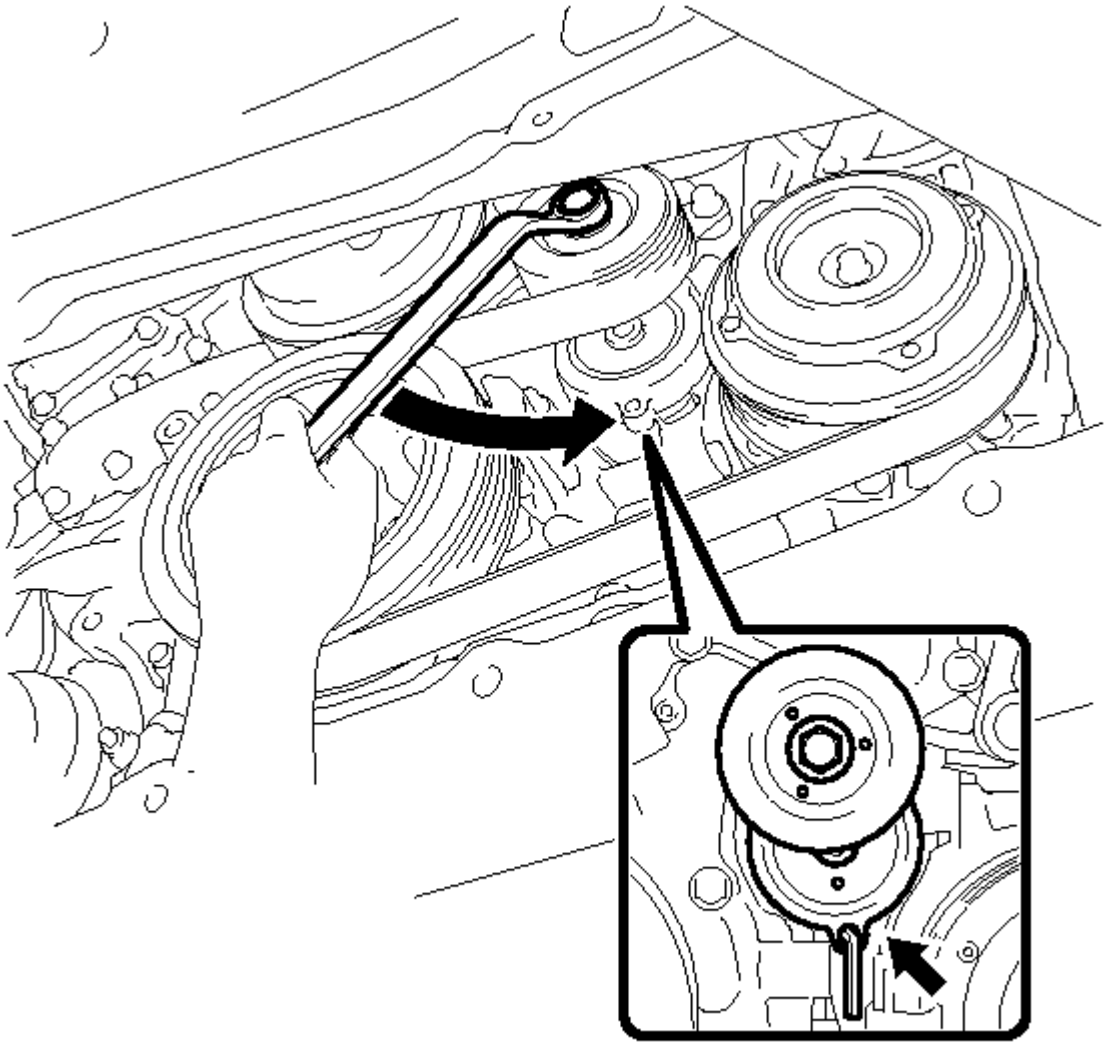


Fig. 6: Identifying Belt Tensioner
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. While turning the V-ribbed belt tensioner counterclockwise, align with its holes, and then insert a 5 mm hexagon wrench into the holes to fix the V-ribbed belt tensioner.

INSTALLATION

INSTALLATION

1. **INSTALL FAN AND GENERATOR V BELT**
   a. Install the fan and generator V belt.

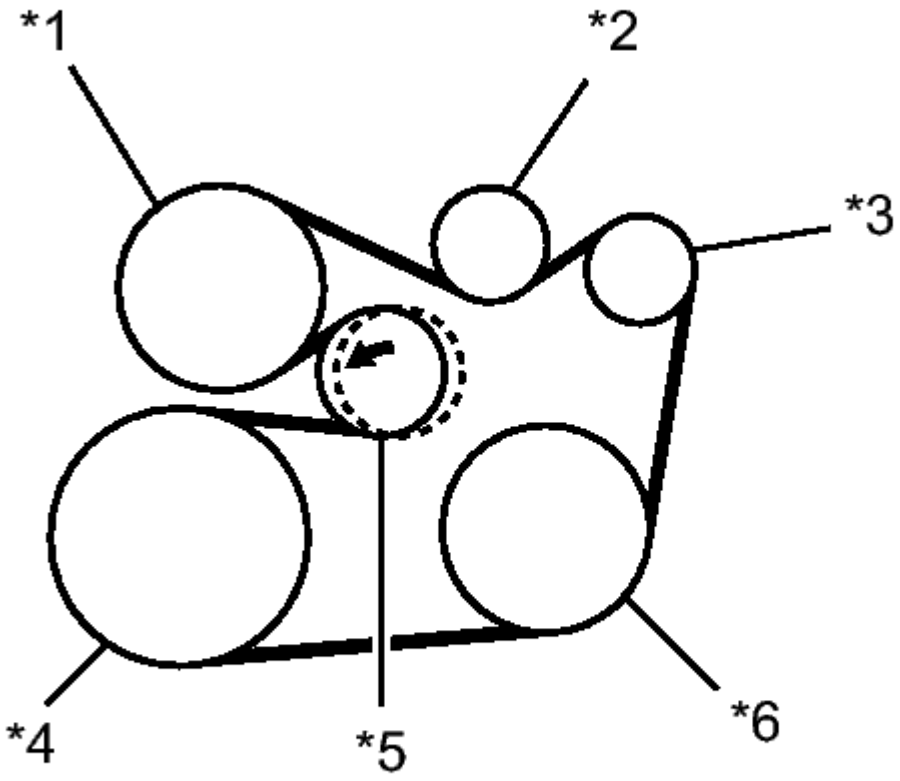


Fig. 7: Fan Belt Routing Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Water Pump
*2	Idler
*3	Generator
*4	Crankshaft
*5	Tensioner
*6	A/C Compressor

b. Turn the V-ribbed belt tensioner counterclockwise and remove the 5 mm hexagon wrench.
c. After installing the fan and generator V belt, check that it fits properly in the ribbed grooves.

Confirm that the belt has not slipped out of the grooves on the bottom of the crank pulley by hand.

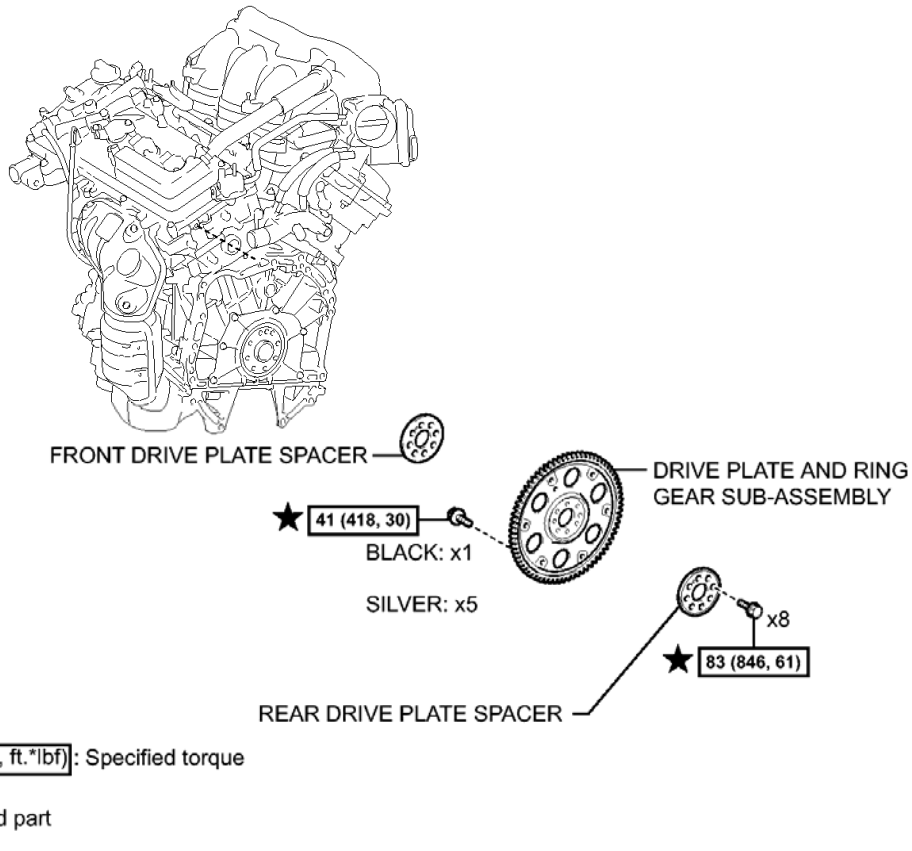
2. **INSTALL FRONT FENDER APRON SEAL RH** See step 97
3. **INSTALL FRONT WHEEL RH**

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

CAMSHAFT

COMPONENTS

ILLUSTRATION



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Fig. 8: Camshaft Replacement Components With Torque Specifications (1 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

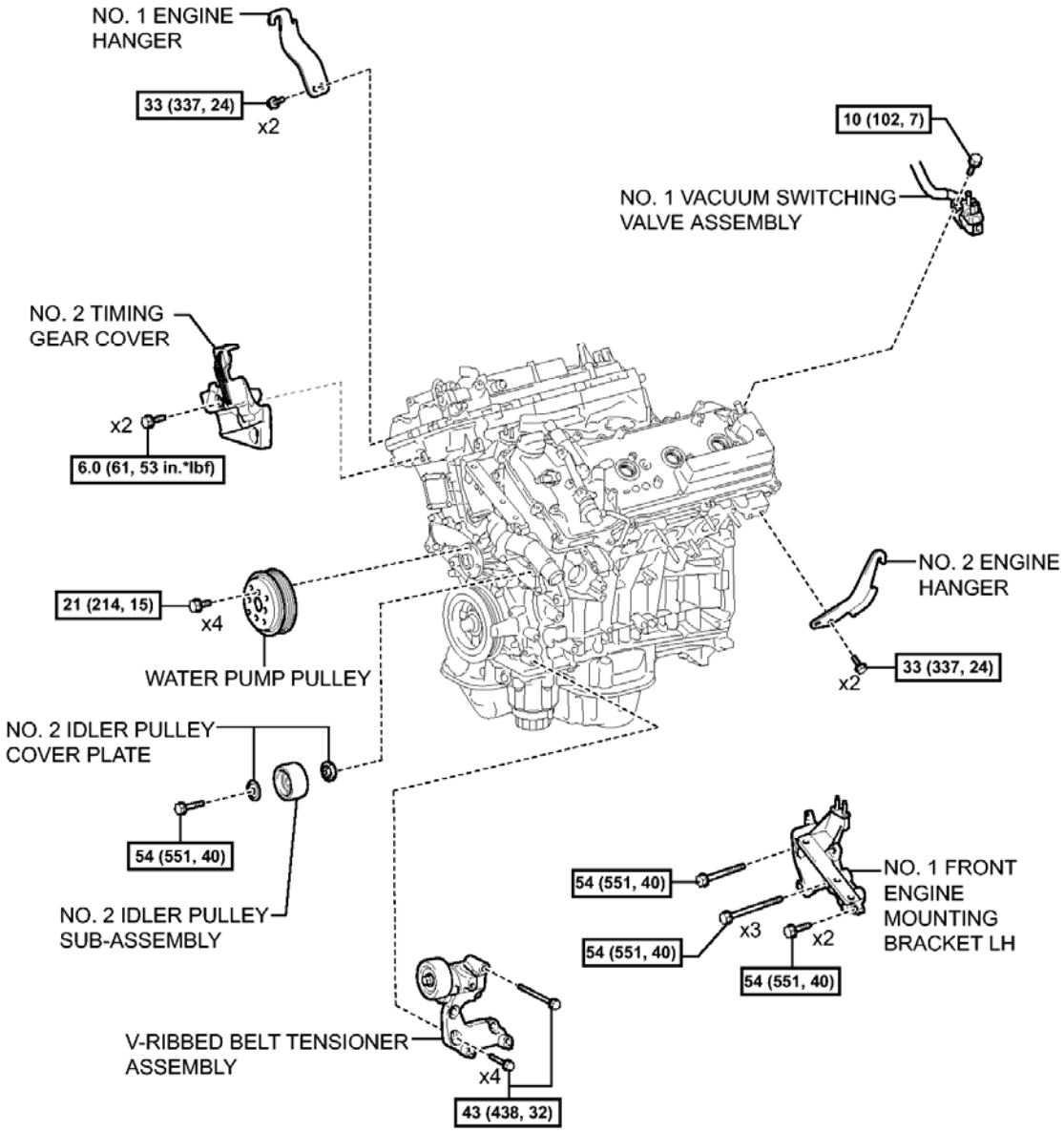
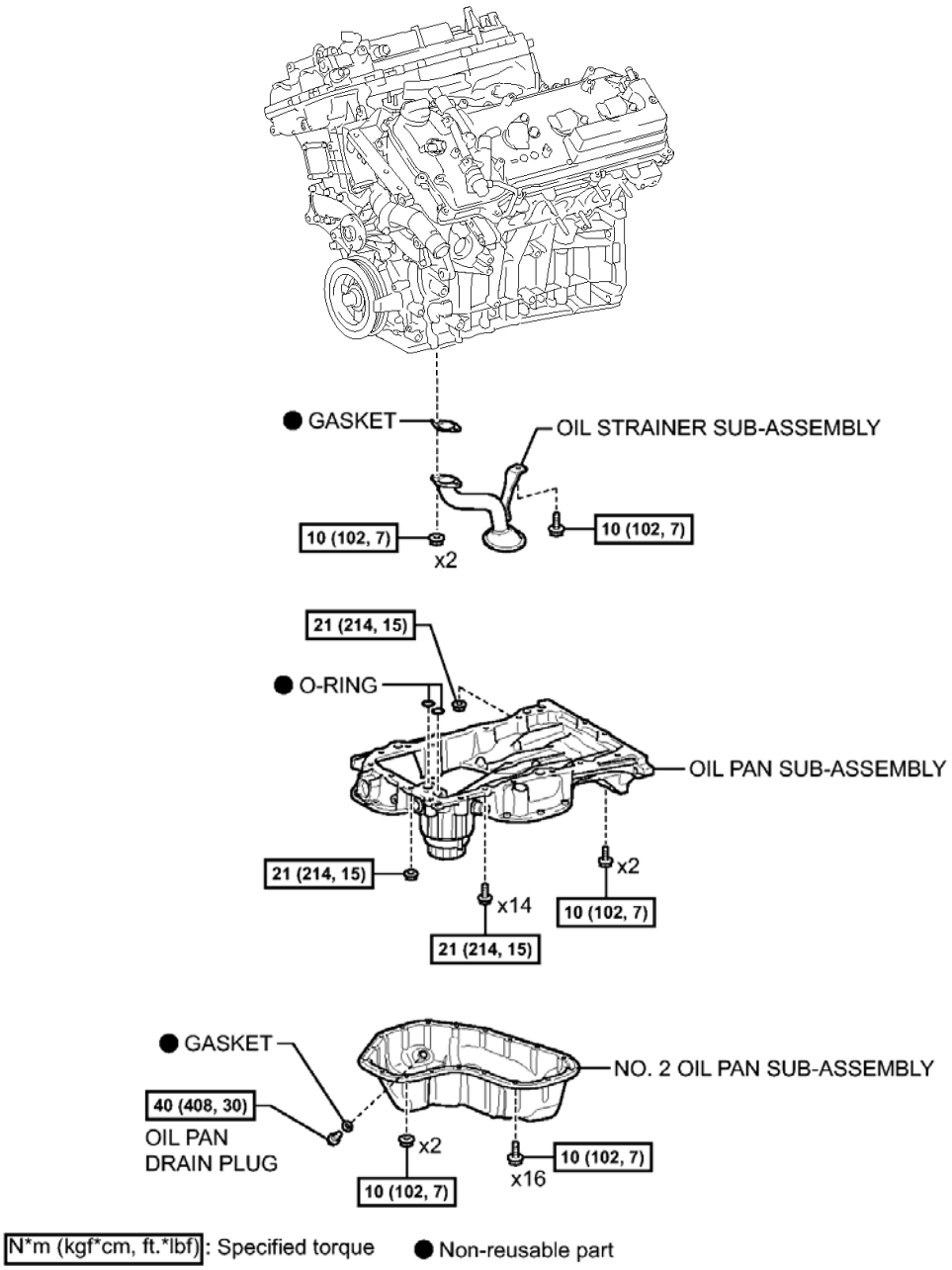


Fig. 9: Camshaft Replacement Components With Torque Specifications (2 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

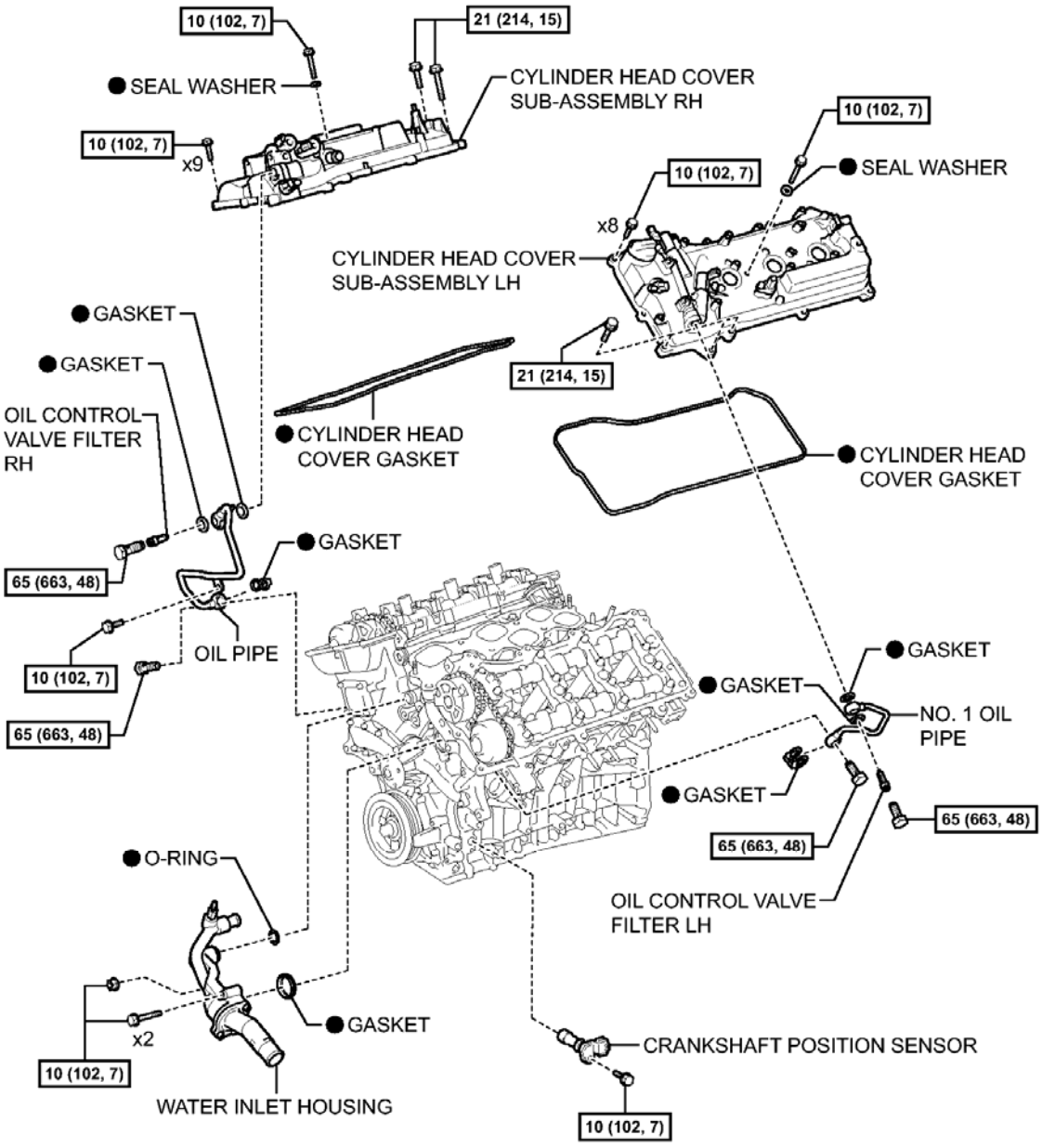
ILLUSTRATION



P

Fig. 10: Camshaft Replacement Components With Torque Specifications (3 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



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

● Non-reusable part

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Fig. 11: Camshaft Replacement Components With Torque Specifications (4 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

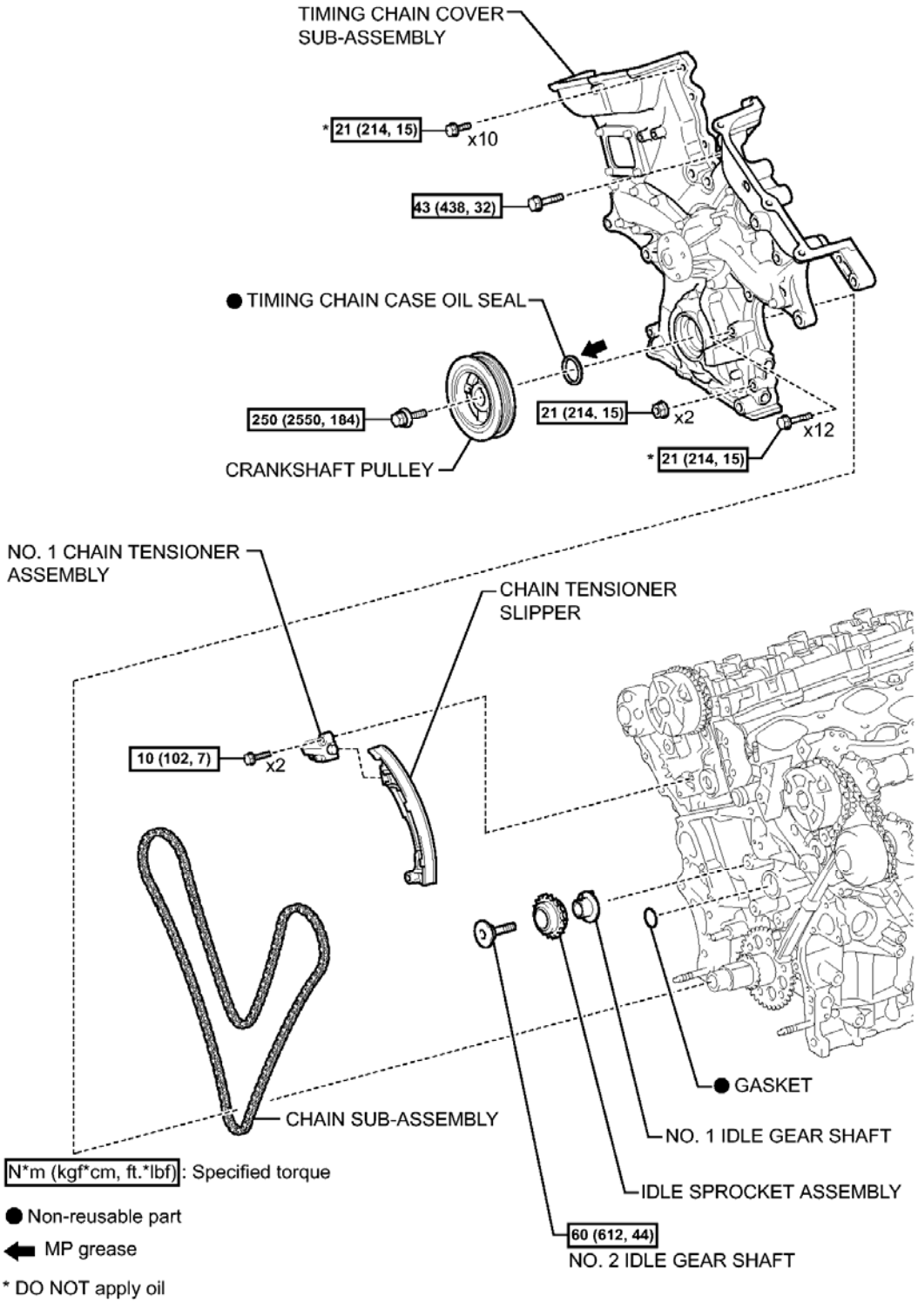


Fig. 12: Camshaft Replacement Components With Torque Specifications (5 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

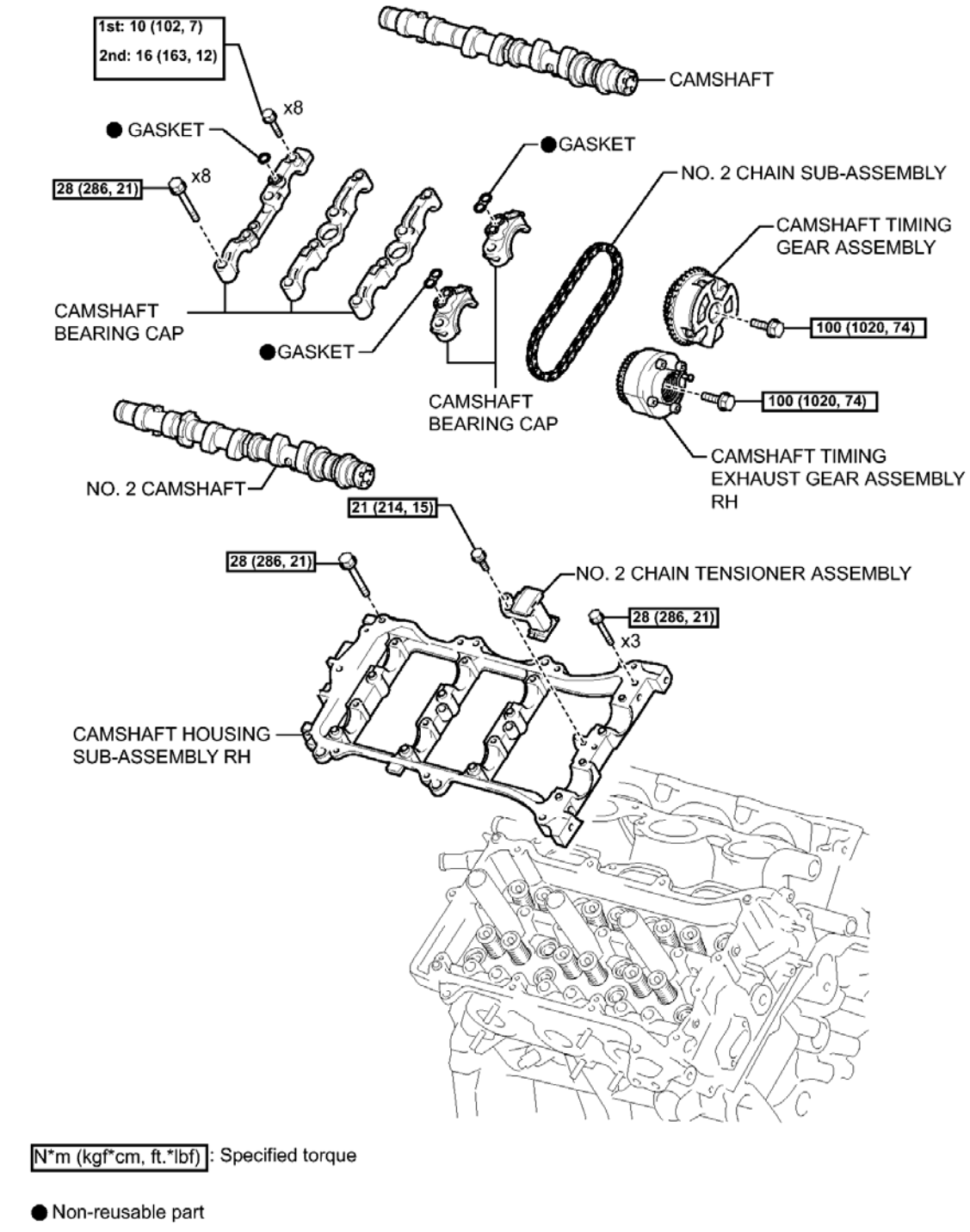


Fig. 13: Camshaft Replacement Components With Torque Specifications (6 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

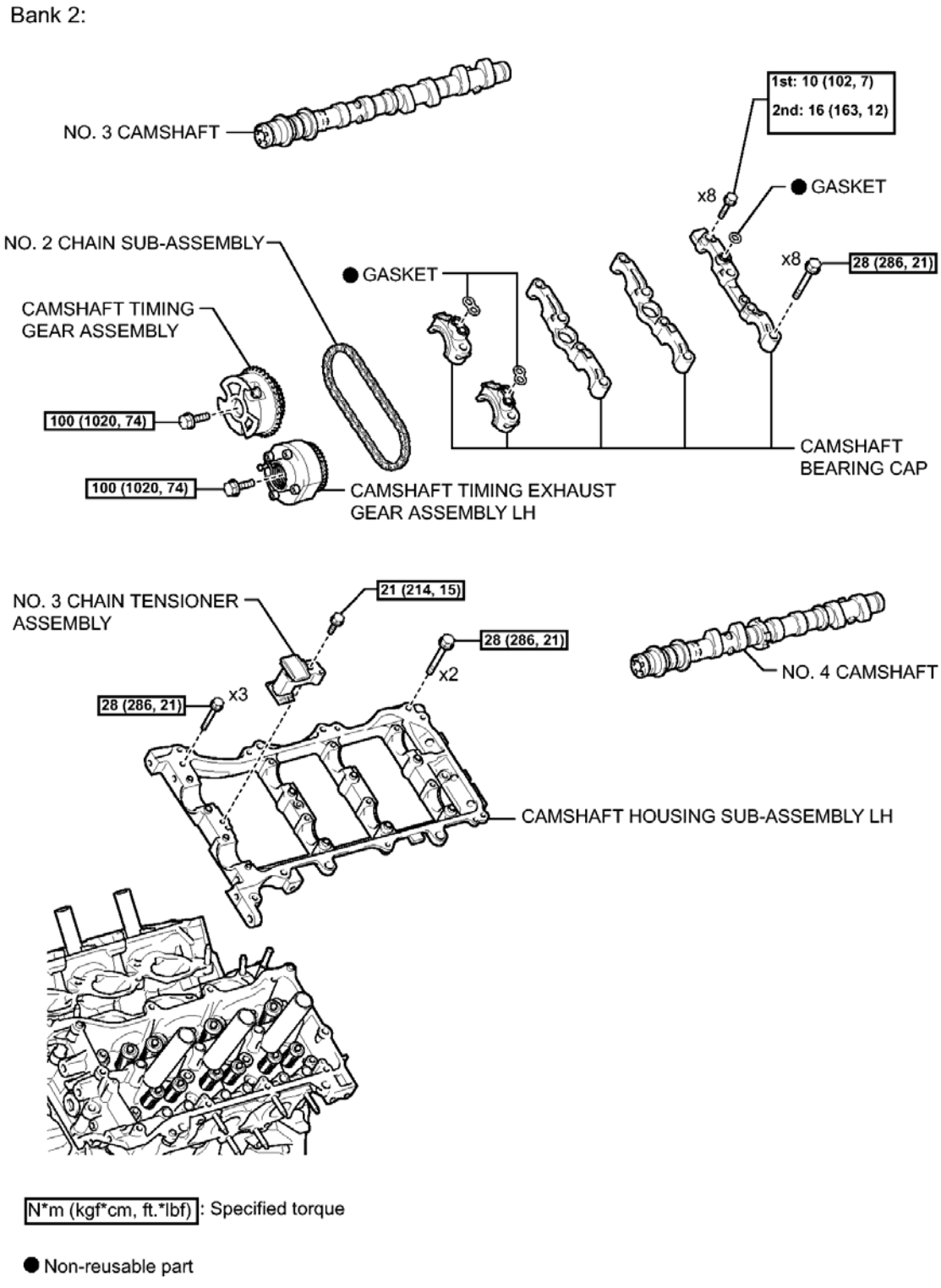


Fig. 14: Camshaft Replacement Components With Torque Specifications (7 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

REMOVAL

1. **REMOVE AUTOMATIC TRANSAXLE ASSEMBLY (for 2WD)**

   Refer to **REMOVAL**

2. **REMOVE AUTOMATIC TRANSAXLE ASSEMBLY (for AWD)**

   Refer to **REMOVAL**

3. **REMOVE DRIVE PLATE AND RING GEAR SUB-ASSEMBLY** See step 3
4. **INSTALL ENGINE ON ENGINE STAND**
5. **REMOVE ENGINE HANGER** See step 2
6. **REMOVE IGNITION COIL ASSEMBLY**

   Refer to **REMOVAL**

7. **REMOVE INTAKE MANIFOLD**

   Refer to **REMOVAL**

8. **REMOVE EXHAUST MANIFOLD SUB-ASSEMBLY**

   Refer to **REMOVAL**

9. **REMOVE V-RIBBED BELT TENSIONER ASSEMBLY** See step 15
10. **REMOVE NO. 2 TIMING GEAR COVER** See step 16
11. **REMOVE WATER PUMP PULLEY** . Refer to **REMOVAL - Step 10**
12. **REMOVE NO. 2 IDLER PULLEY SUB-ASSEMBLY** See step 18
13. **REMOVE NO. 1 VACUUM SWITCHING VALVE ASSEMBLY** See step 19
14. **REMOVE CRANKSHAFT POSITION SENSOR** . Refer to **REMOVAL - Step 2**
15. **REMOVE NO. 1 OIL PIPE** See step 8
16. **REMOVE OIL PIPE** See step 9
17. **REMOVE CRANKSHAFT PULLEY** See step 4
18. **REMOVE FRONT NO. 1 ENGINE MOUNTING BRACKET LH** See step 17
19. **REMOVE WATER INLET HOUSING** See step 18
20. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY (for Bank 1)** See step 20
21. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY LH (for Bank 2)** See step 21
22. **REMOVE NO. 2 OIL PAN SUB-ASSEMBLY** See step 22
23. **REMOVE OIL STRAINER SUB-ASSEMBLY** See step 23
24. **REMOVE OIL PAN SUB-ASSEMBLY** See step 24
25. **REMOVE TIMING CHAIN COVER SUB-ASSEMBLY** . Refer to **REMOVAL - Step 14**

26. **REMOVE TIMING GEAR CASE OR TIMING CHAIN CASE OIL SEAL** . Refer to **REMOVAL - Step 15**
27. **SET NO. 1 CYLINDER TO TDC/COMPRESSION** See step 31
28. **REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY** See step 32
29. **REMOVE CHAIN TENSIONER SLIPPER** See step 33
30. **REMOVE CHAIN SUB-ASSEMBLY** See step 34
31. **REMOVE IDLE SPROCKET ASSEMBLY** See step 35
32. **REMOVE CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 1)**
    a. While raising the No. 2 chain tensioner assembly, insert a pin of 1.0 mm (0.0394 in.) diameter into the hole to hold the No. 2 chain tensioner assembly.

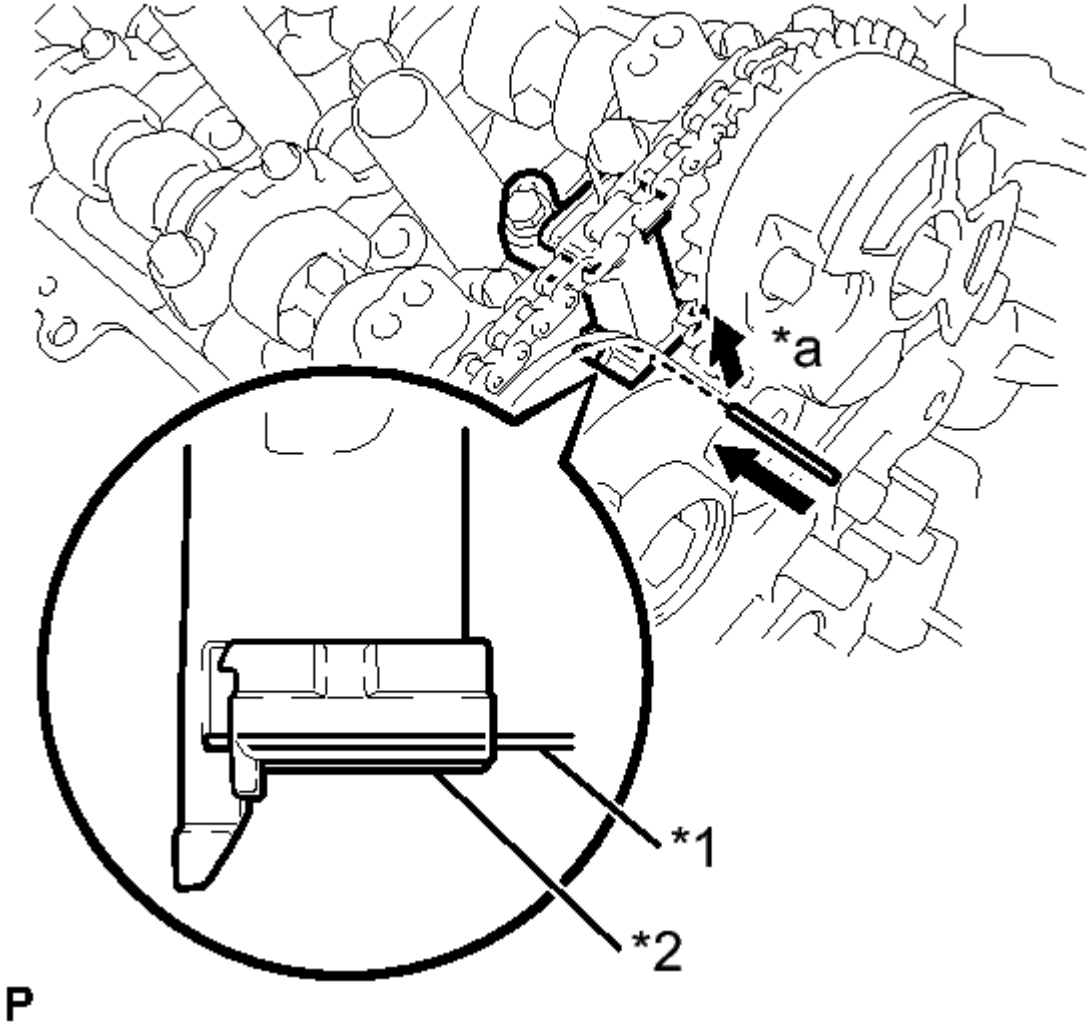


Fig. 15: Raising No. 2 Chain Tensioner & Inserting Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Pin
*2	Plunger
*a	Push

b. Using SST to hold the hexagonal portion of each camshaft, loosen the flange bolts of the camshaft timing gear assembly and the camshaft timing exhaust gear assembly RH.

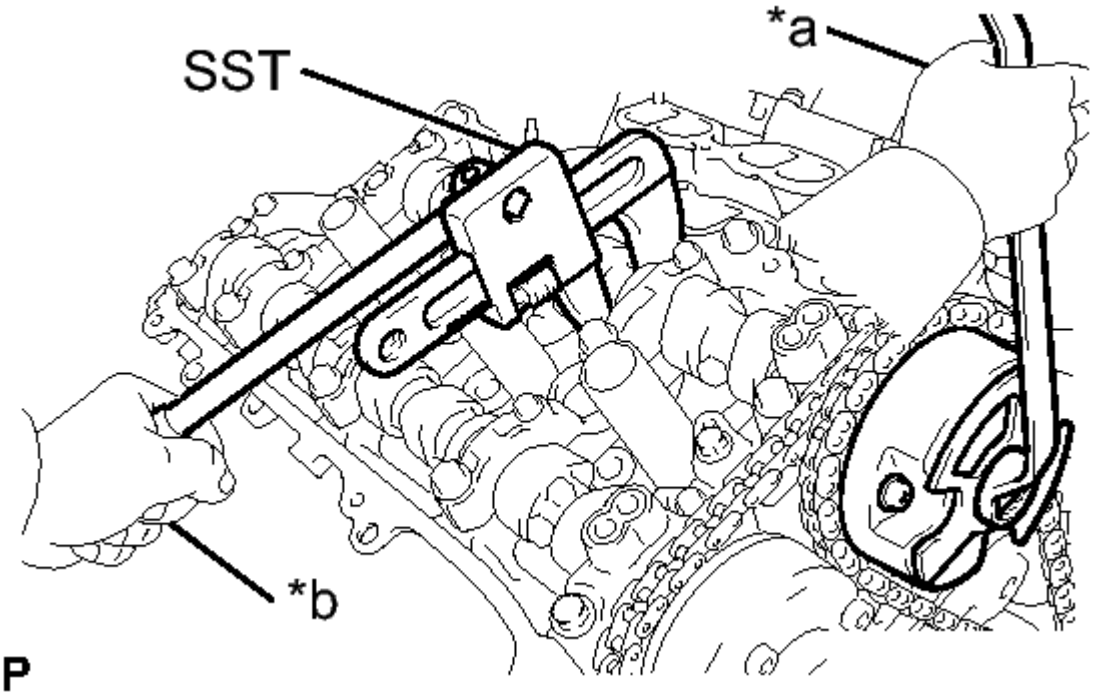


Fig. 16: Remove/Install RH Camshaft Timing Gear & Exhaust Gear Assembly Flange Bolts Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Turn
*b	Hold

- **SST: 09922-10010**

NOTE:

- **Be careful not to damage the cylinder head with SST.**
- **Do not loosen the other bolts. If any of the bolts is loosened, replace the camshaft timing gear assembly and/or the camshaft timing exhaust gear assembly with a new one.**

c. Remove the 2 bolts and the camshaft timing gear assembly together with the No. 2 chain.

33. **REMOVE NO. 2 CHAIN TENSIONER ASSEMBLY**

a. Remove the bolt and No. 2 chain tensioner assembly.

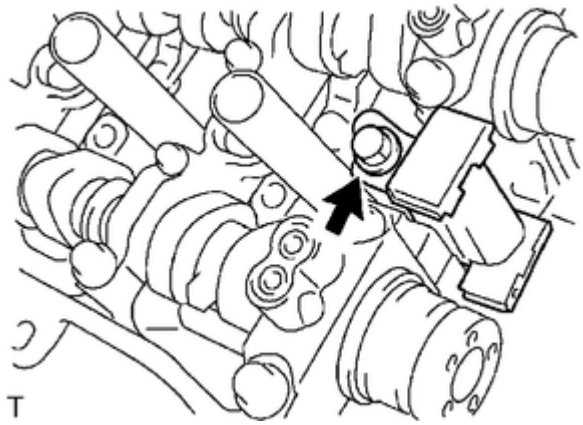


Fig. 17: Identifying No. 2 Chain Tensioner Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

34. **REMOVE CAMSHAFT BEARING CAP (for Bank 1)**
    a. Check that the camshafts are positioned as shown in the illustration.

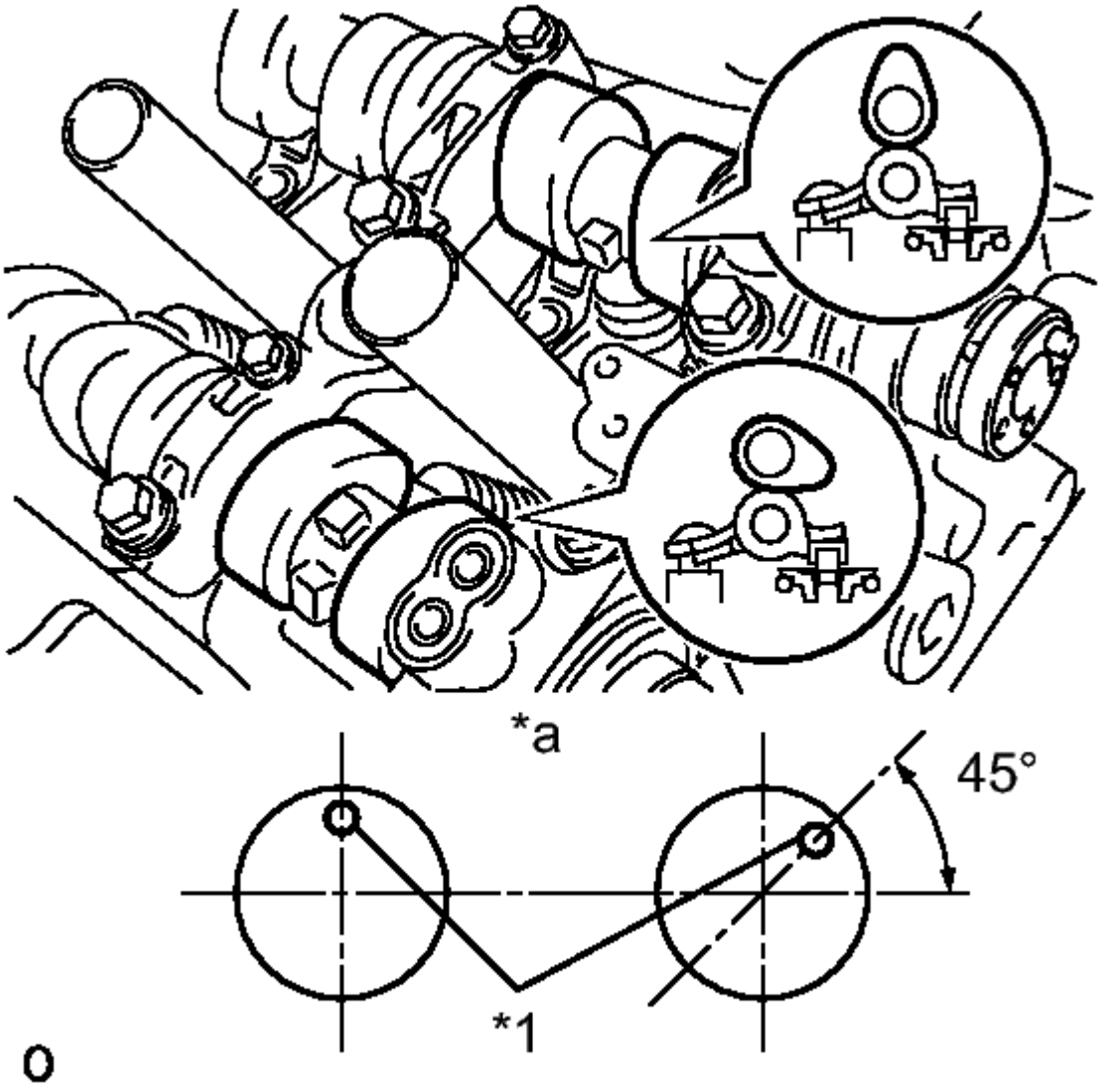


Fig. 18: Identifying Camshaft Position (For Bank 1)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Knock Pin
*a	Front View

b. Uniformly loosen and remove the 8 bearing cap bolts in several steps and in the sequence shown in the illustration.

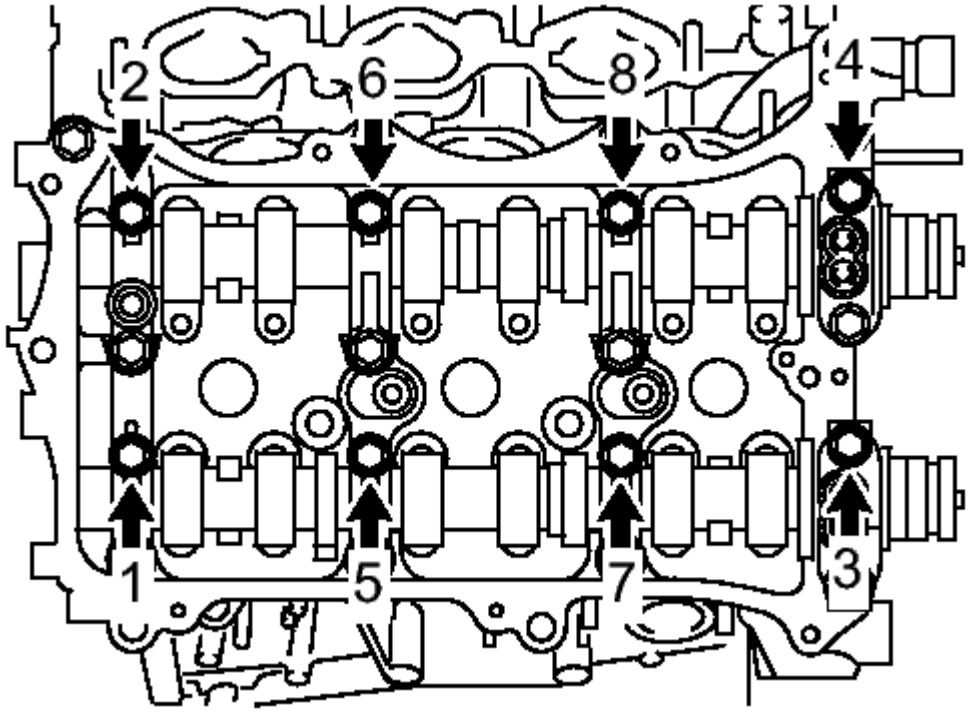


Fig. 19: Identifying 8 Camshaft Bearing Cap Bolts With Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Uniformly loosen and remove the 12 bearing cap bolts in several steps and in the sequence shown in the illustration.

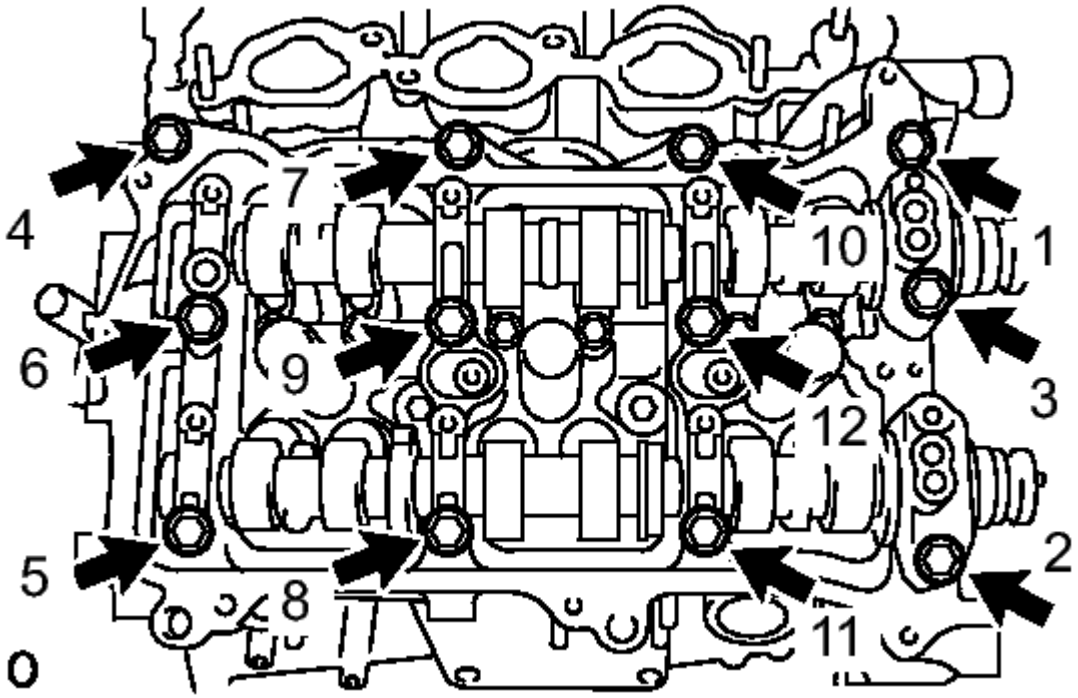


Fig. 20: Identifying Bearing Cap Bolts

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

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

d. Remove the 5 camshaft bearing caps.

35. **REMOVE CAMSHAFT**

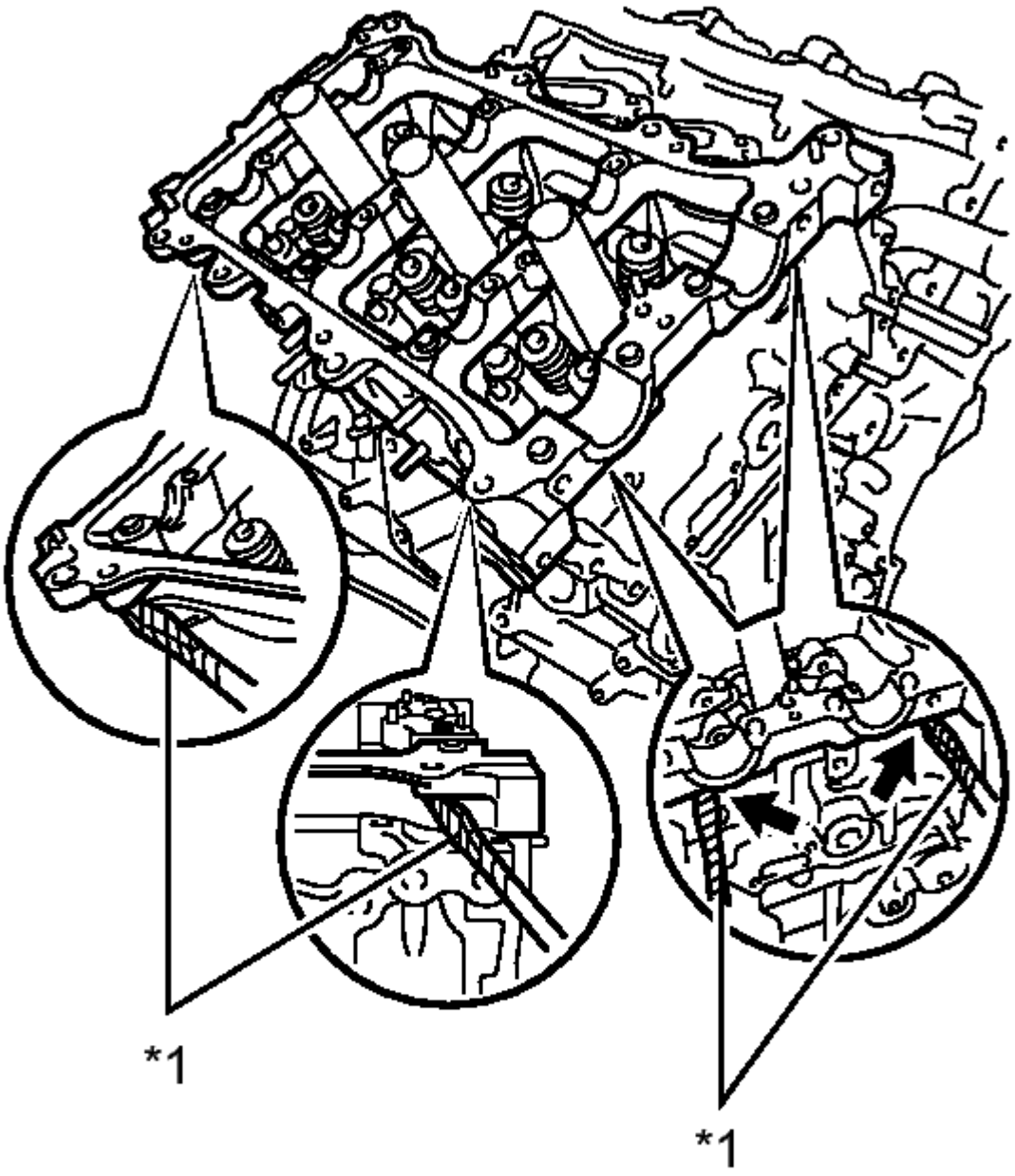
a. Remove the camshaft.

36. **REMOVE NO. 2 CAMSHAFT**

a. Remove the No. 2 camshaft.

37. **REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY RH**

a. Remove the camshaft housing sub-assembly RH by prying between the cylinder head and camshaft housing sub-assembly RH with a screwdriver.



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Fig. 21: Identifying RH Camshaft Housing Sub-Assembly Prying Areas
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	Protective

*1	Tape

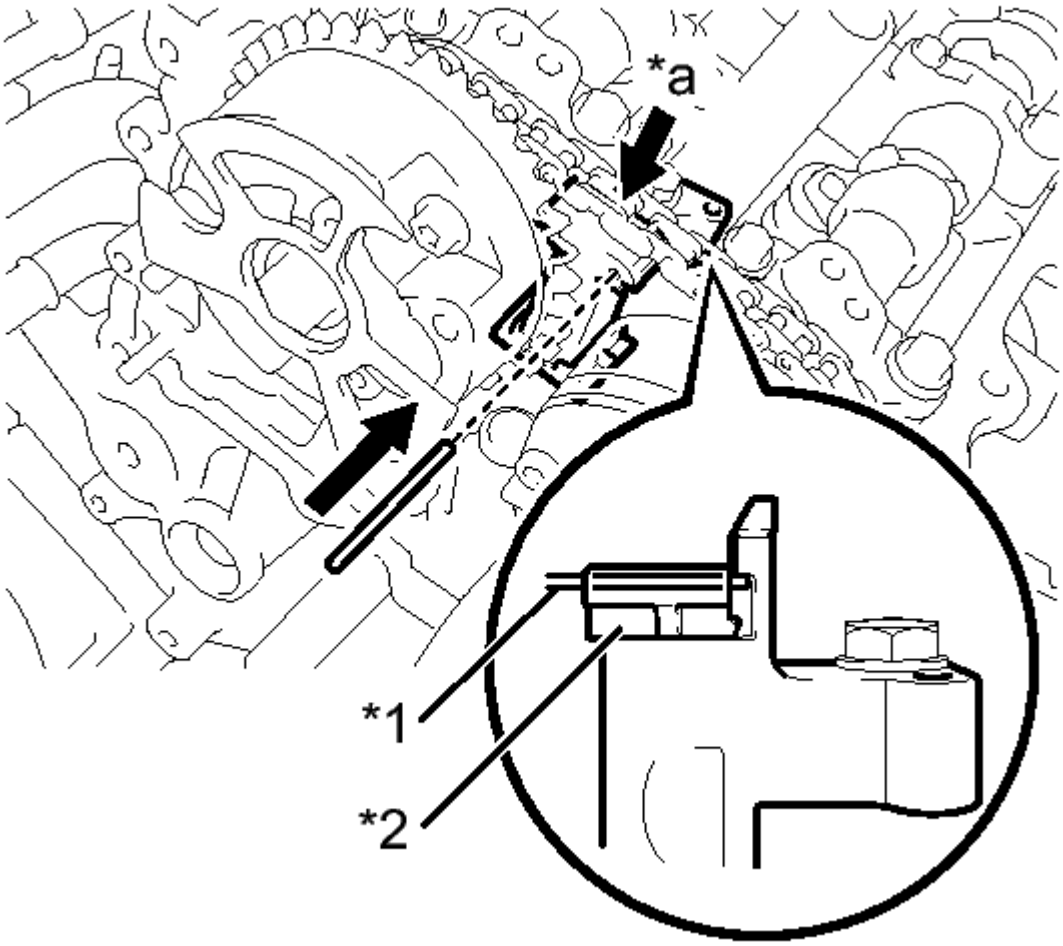
NOTE: **Be careful not to damage the contact surfaces of the cylinder head and camshaft housing sub-assembly RH.**

HINT:

Tape the screwdriver tip before use.

38. **REMOVE CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 2)**

a. While pushing down the No. 3 chain tensioner assembly, insert a pin of 1.0 mm (0.0394 in.) diameter into the hole to hold the No. 3 chain tensioner assembly.



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Fig. 22: Pushing Down No. 3 Chain Tensioner & Inserting Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Pin
*2	Plunger
*a	Push

b. Using SST to hold the hexagonal portion of each camshaft, loosen the flange bolts of the camshaft timing gear assembly and the camshaft timing exhaust gear assembly LH.

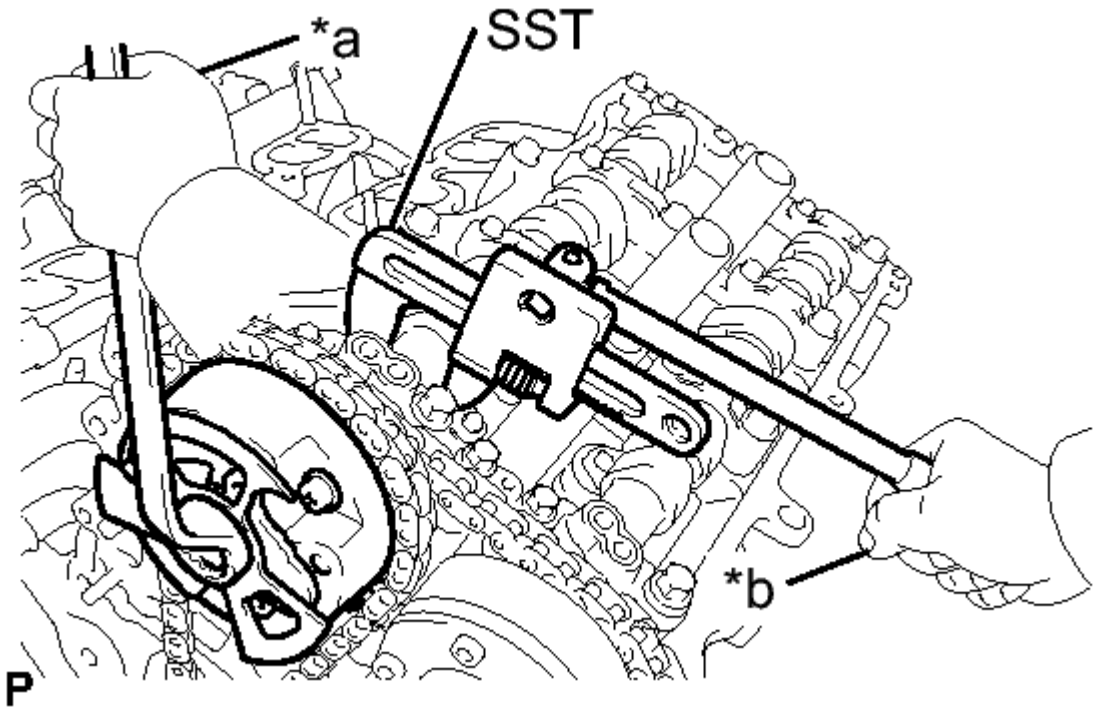


Fig. 23: Remove/Install LH Camshaft Timing Gear & Exhaust Gear Assembly Flange Bolts Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Turn
*b	Hold

- **SST: 09922-10010**

NOTE:

- **Be careful not to damage the cylinder head with SST.**
- **Do not loosen the other bolts. If any of the bolts is loosened, replace the camshaft timing gear assembly and/or the camshaft timing exhaust gear assembly with a new one.**

c. Remove the 2 bolts and the camshaft timing gear together with the No. 2 chain.

39. **REMOVE NO. 3 CHAIN TENSIONER ASSEMBLY**

a. Remove the bolt and No. 3 chain tensioner assembly.

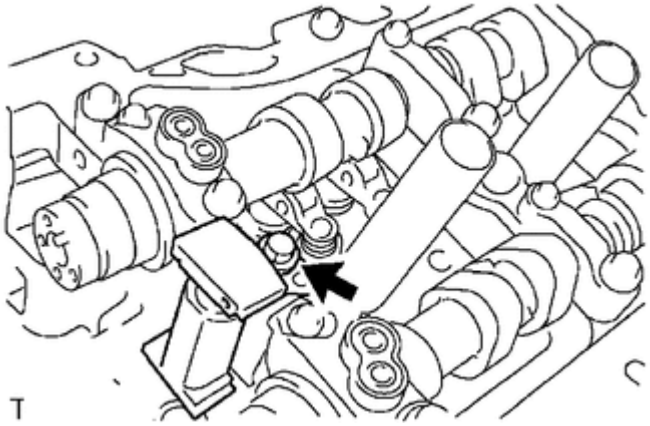


Fig. 24: Identifying No. 3 Chain Tensioner Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

40. **REMOVE CAMSHAFT BEARING CAP (for Bank 2)**
    a. Check that the camshafts are positioned as shown in the illustration.

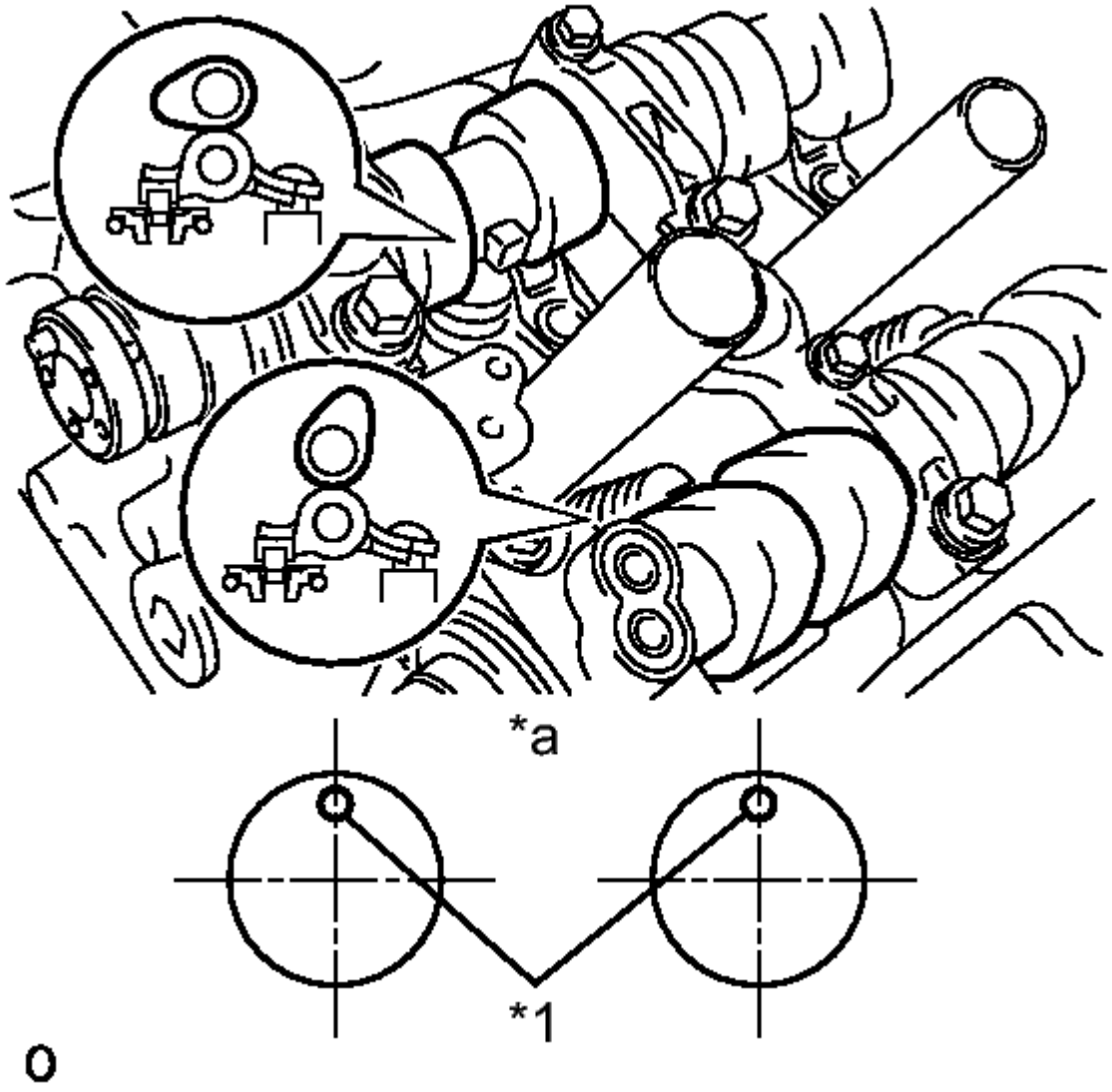


Fig. 25: Identifying Camshaft Position (For Bank 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Knock Pin
*a	Front View

b. Uniformly loosen and remove the 8 bearing cap bolts in several steps and in the sequence shown in the illustration.

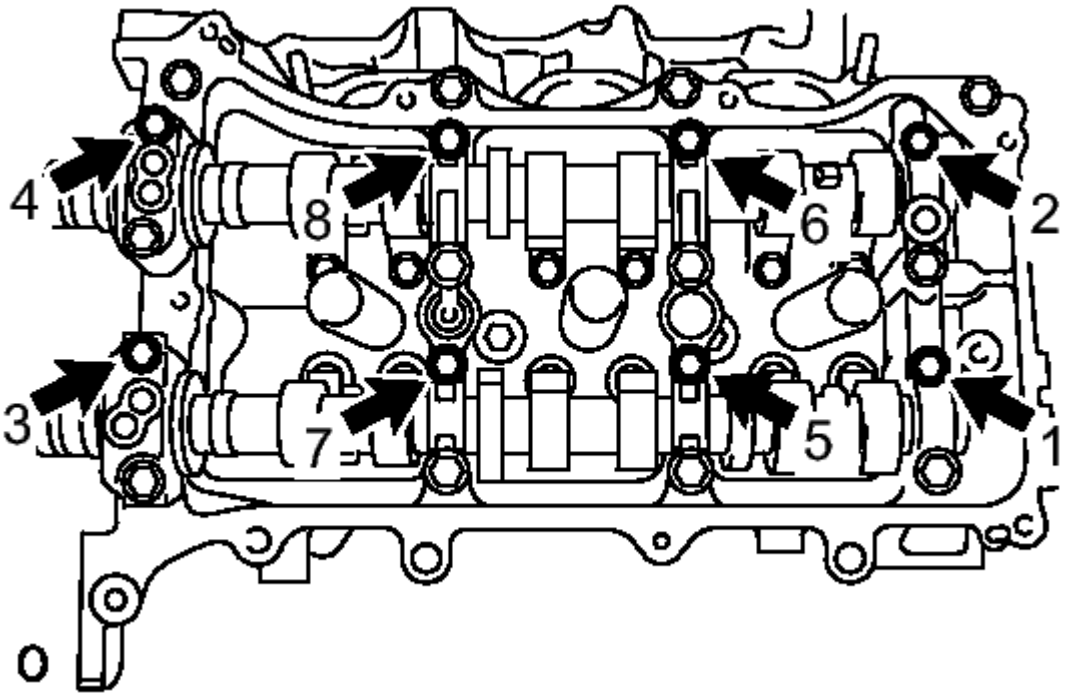


Fig. 26: Identifying Bearing Cap Bolts With Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Uniformly loosen and remove the 13 bearing cap bolts in several steps and in the sequence shown in the illustration.

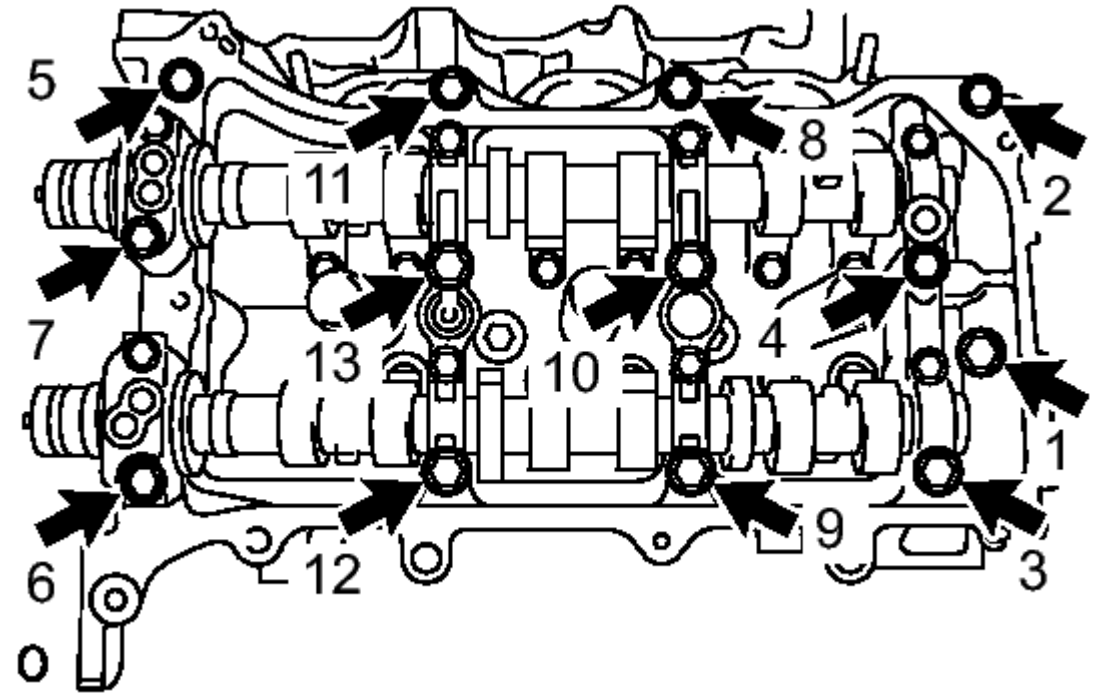


Fig. 27: Identifying Bearing Cap Bolts With Loosening Sequence

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

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

d. Remove the 5 camshaft bearing caps.

41. **REMOVE NO. 3 CAMSHAFT**

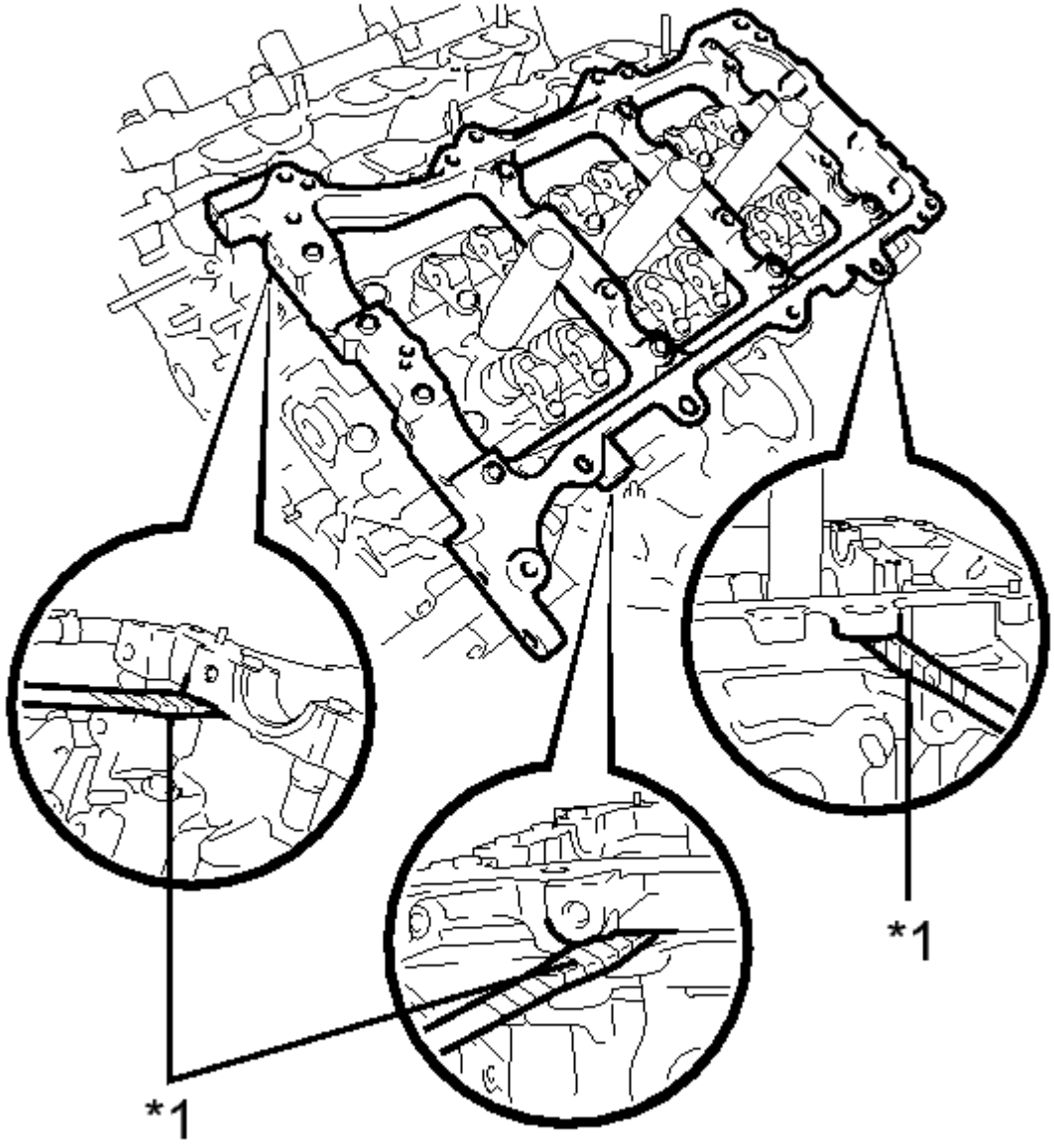
a. Remove the No. 3 camshaft.

42. **REMOVE NO. 4 CAMSHAFT**

a. Remove the No. 4 camshaft.

43. **REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY LH**

a. Remove the camshaft housing sub-assembly LH by prying between the cylinder head and camshaft housing sub-assembly LH with a screwdriver.



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Fig. 28: Removing Camshaft Housing Sub-Assembly LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	Protective

*1	Tape

NOTE: **Be careful not to damage the contact surfaces of the cylinder head and camshaft housing sub-assembly LH.**

HINT:

Tape the screwdriver tip before use.

INSTALLATION

INSTALLATION

1. **INSTALL NO. 3 CAMSHAFT**
   a. Apply a light coat of engine oil to the No. 3 camshaft journals and camshaft housing sub-assembly LH.
   b. Install the No. 3 camshaft to the camshaft housing sub-assembly LH.
2. **INSTALL NO. 4 CAMSHAFT**
   a. Apply a light coat of engine oil to the No. 4 camshaft journals and camshaft housing sub-assembly LH.
   b. Install the No. 4 camshaft to the camshaft housing sub-assembly LH.
3. **INSTALL CAMSHAFT BEARING CAP (for Bank 2)**
   a. Apply engine oil to the camshaft bearing caps.
   b. Make sure of the marks and numbers on the camshaft bearing caps and place them in each proper position and direction.

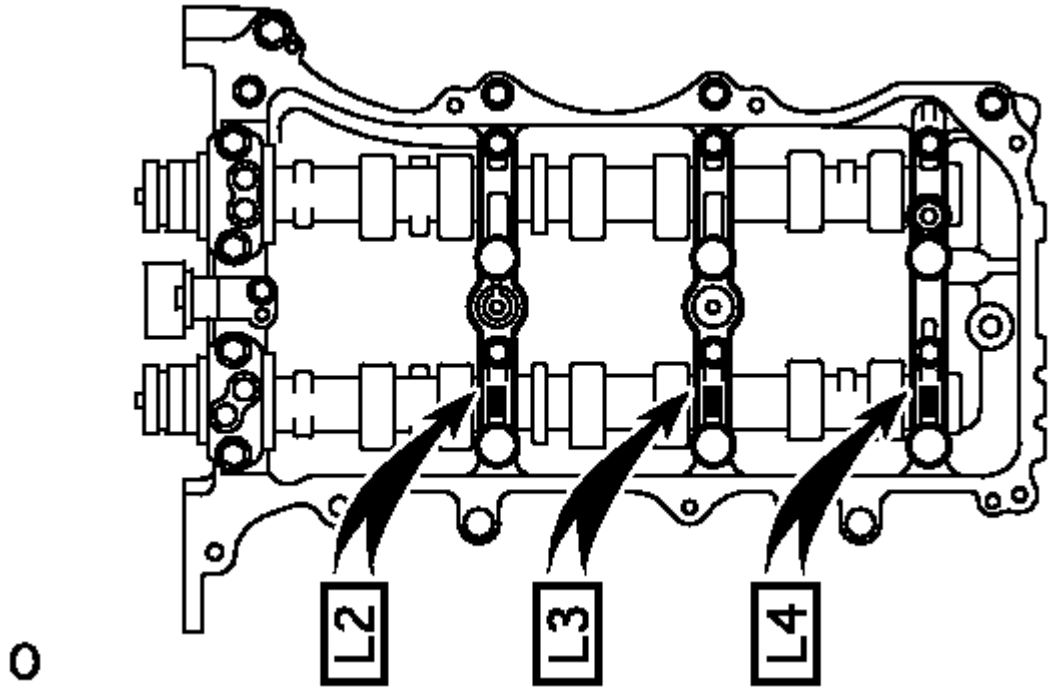


Fig. 29: Identifying Marks And Numbers On Camshaft Bearing Caps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Temporarily tighten the 8 bolts in the order shown in the illustration.

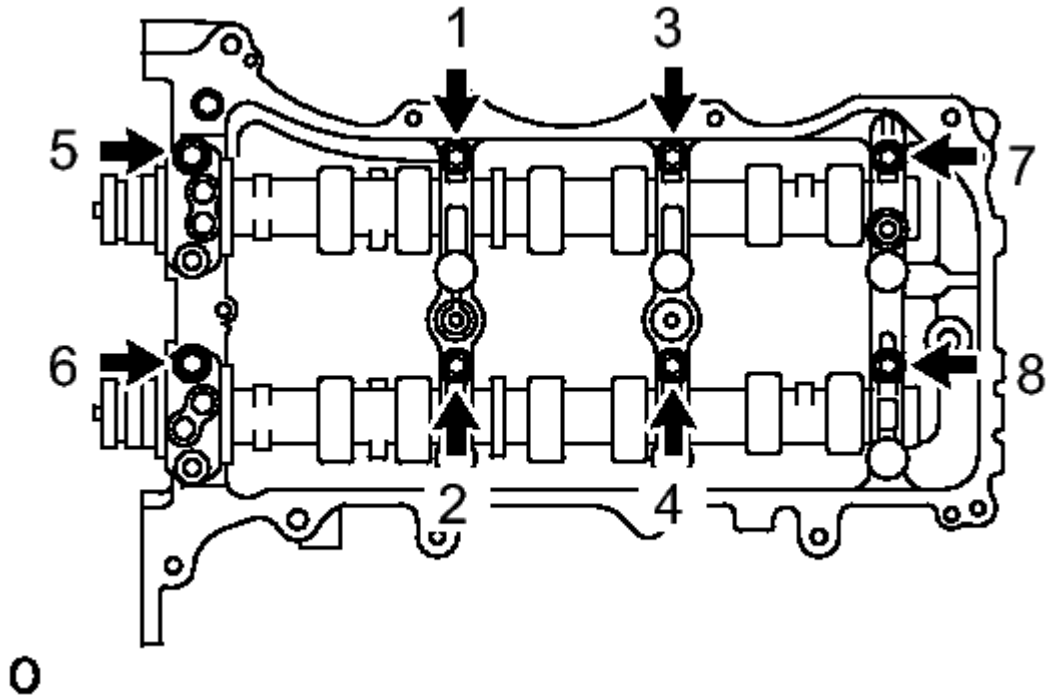
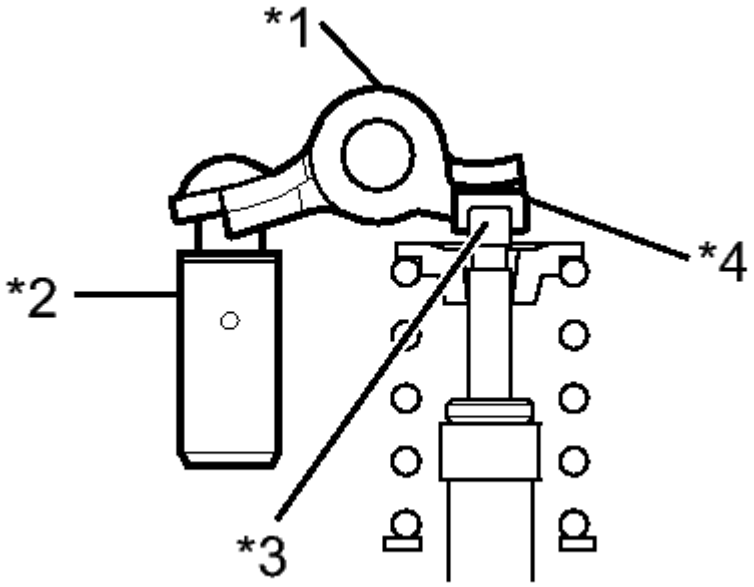


Fig. 30: Identifying Camshaft Bearing Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

4. **INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY LH**
   a. Make sure that the valve rocker arm is installed as shown in the illustration.



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Fig. 31: Identifying Camshaft Valve Rocker Arm, Lash Adjuster, Valve Stem & Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Valve Rocker Arm
*2	Lash Adjuster
*3	Valve Stem
*4	Valve Stem Cap

   b. Apply seal packing in a continuous line as shown in the illustration.

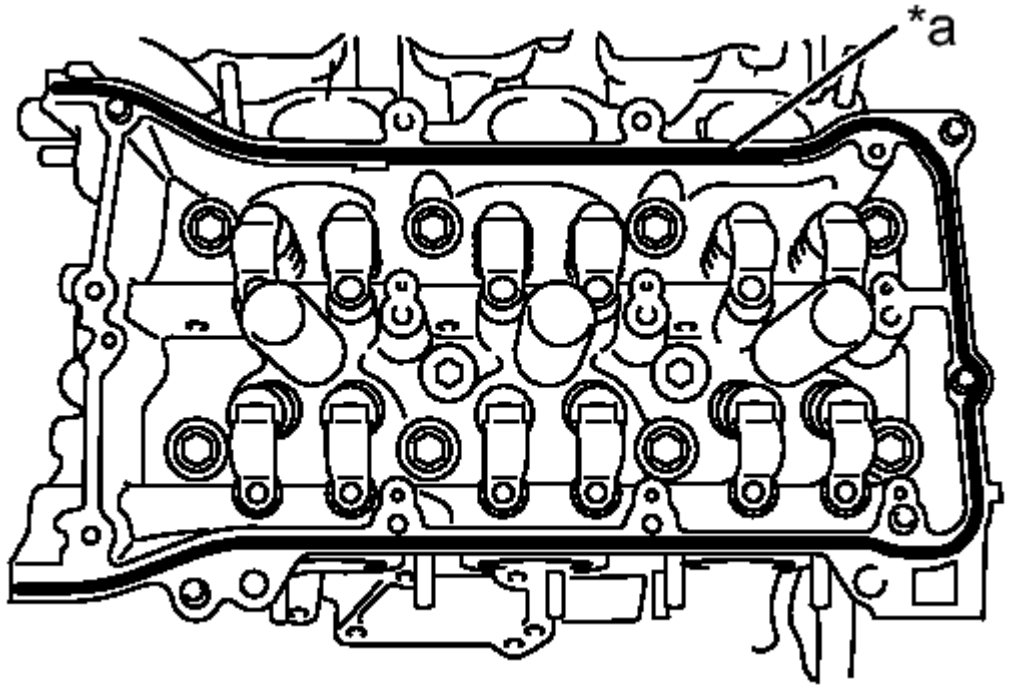


Fig. 32: Identifying Camshaft Housing Sub-Assembly Seal Packing Applying Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Seal packing diameter (3.5 to 4.5 mm)

Seal packing

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

Seal diameter

3.5 to 4.5 mm (0.138 to 0.177 in.)

NOTE:

- **Remove any oil from the contact surface.**
- **Install the camshaft housing sub-assembly LH 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.**

c. Install the camshaft housing sub-assembly LH and tighten the 13 bolts in the order shown in the illustration.

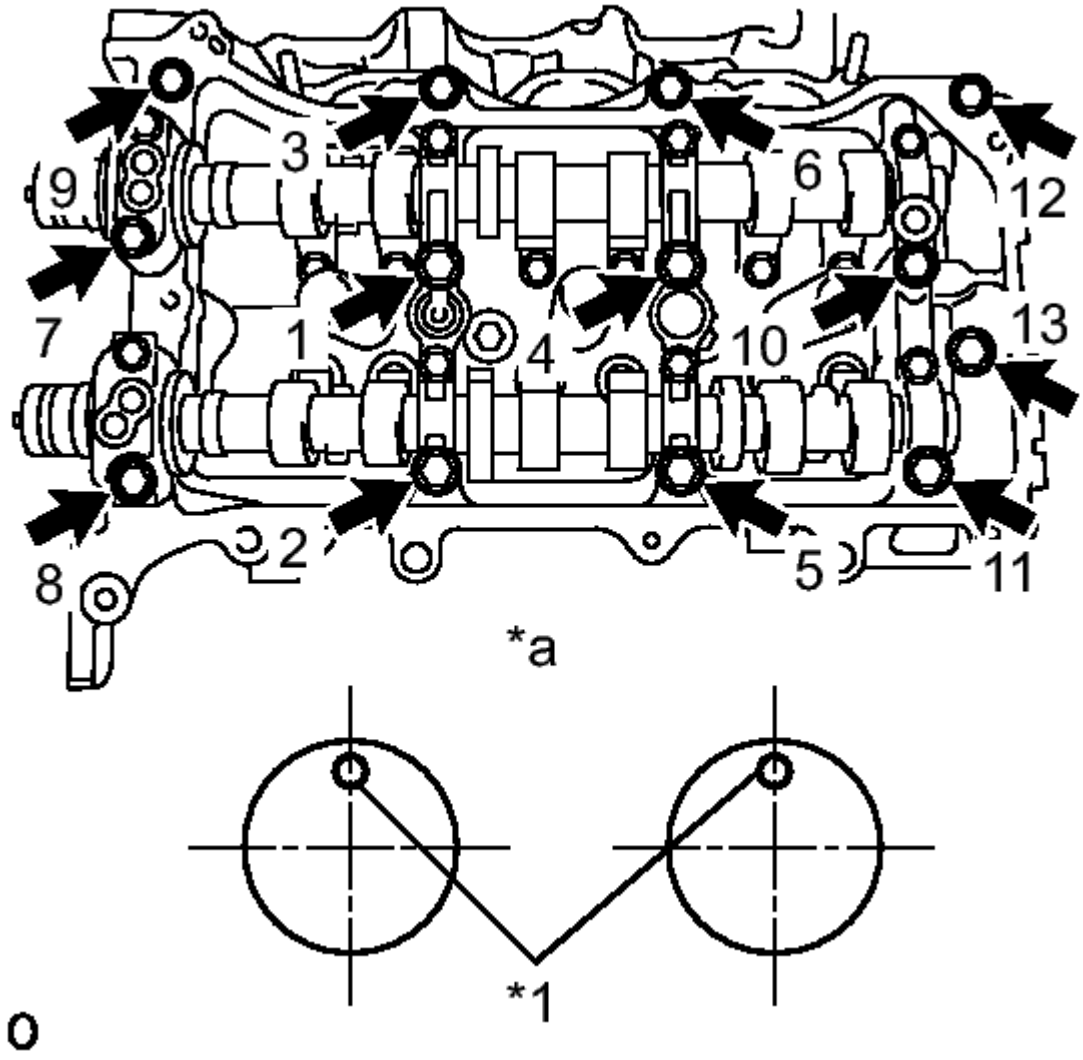


Fig. 33: Identifying LH Camshaft Housing Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Knock Pin
*a	Front View

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

NOTE:

- **When installing the camshaft housing sub-assembly LH, it is necessary to correctly position the camshafts as shown in the illustration. Failure to correctly position these parts may result in damage due to contact between the pistons and valves. If a**

camshaft is rotated with a piston at TDC, valve contact will occur.

- **If any of the bolts are loosened during installation, remove the camshaft housing sub-assembly LH, clean the installation surfaces, and reapply seal packing.**
- **If the camshaft housing sub-assembly LH 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.**

d. Tighten the 8 bolts in the order shown in the illustration.

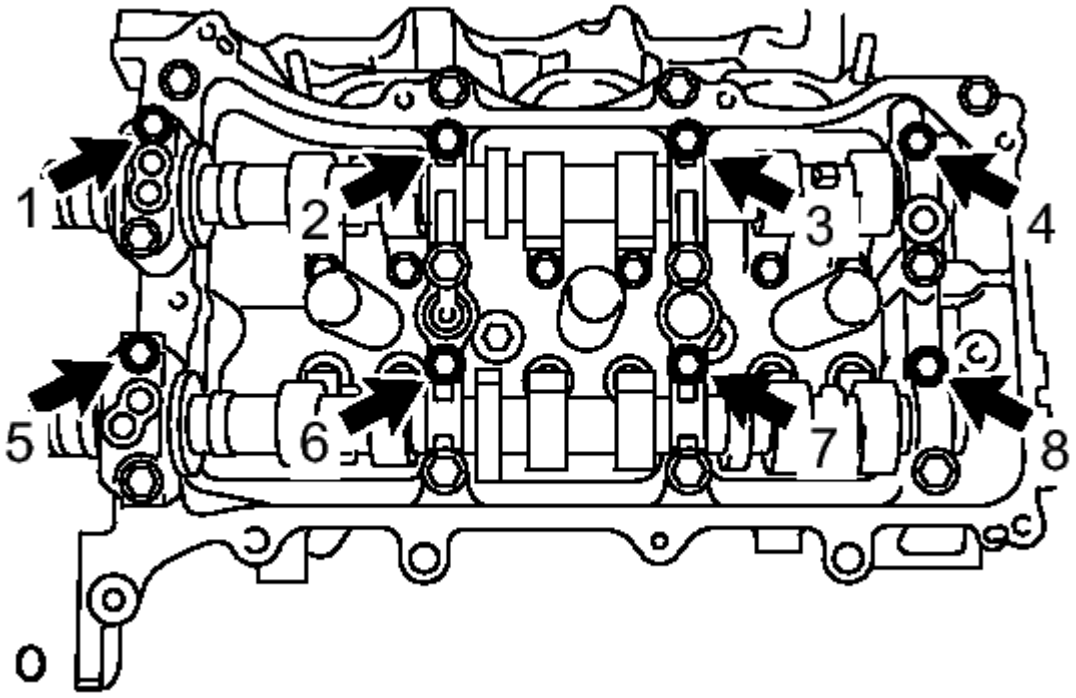


Fig. 34: Identifying Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

5. **INSTALL CAMSHAFT**
   a. Apply a light coat of engine oil to the camshaft journals and camshaft housing sub-assembly RH.
   b. Install the camshaft to the camshaft housing sub-assembly RH.
6. **INSTALL NO. 2 CAMSHAFT**
   a. Apply a light coat of engine oil to the No. 2 camshaft journals and camshaft housing sub-assembly RH.
   b. Install the No. 2 camshaft to the camshaft housing sub-assembly RH.
7. **INSTALL CAMSHAFT BEARING CAP (for Bank 1)**

a. Apply engine oil to the camshaft bearing caps.
b. Make sure of the marks and numbers on the camshaft bearing caps and place them in each proper position and direction.

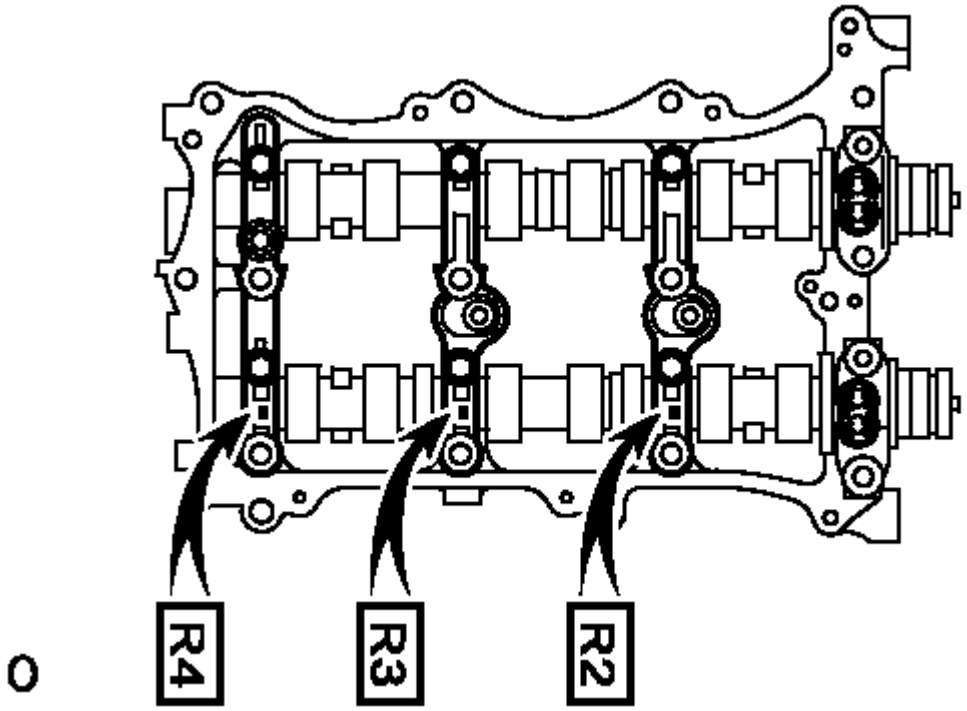


Fig. 35: Identifying Marks And Numbers On Camshaft Bearing Caps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Temporarily tighten the 8 bearing cap bolts in the order shown in the illustration.

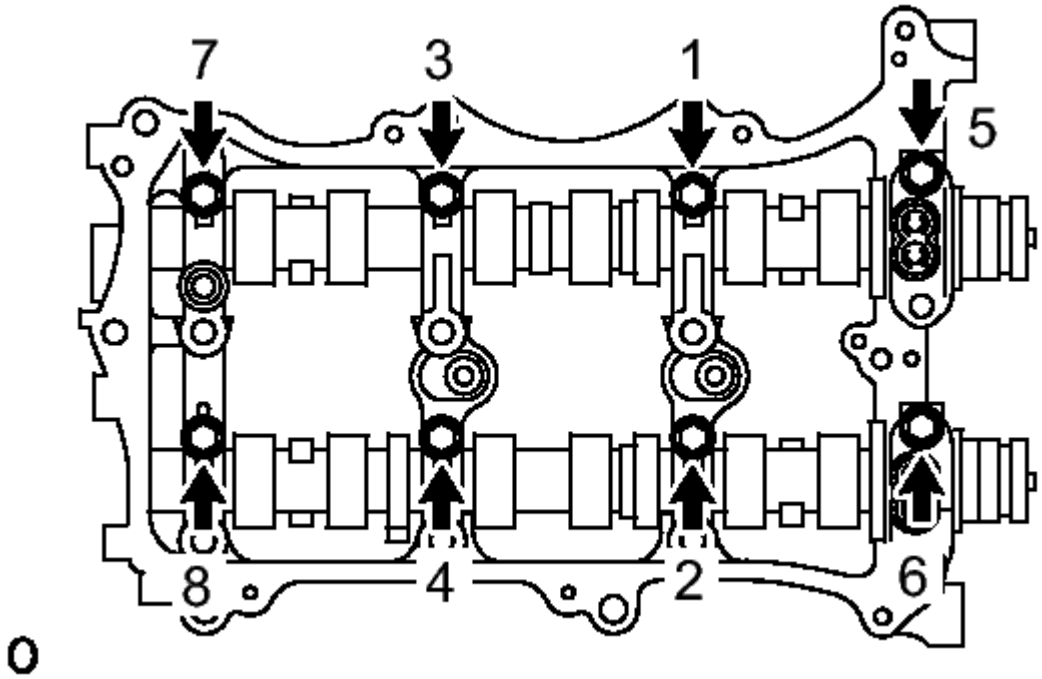
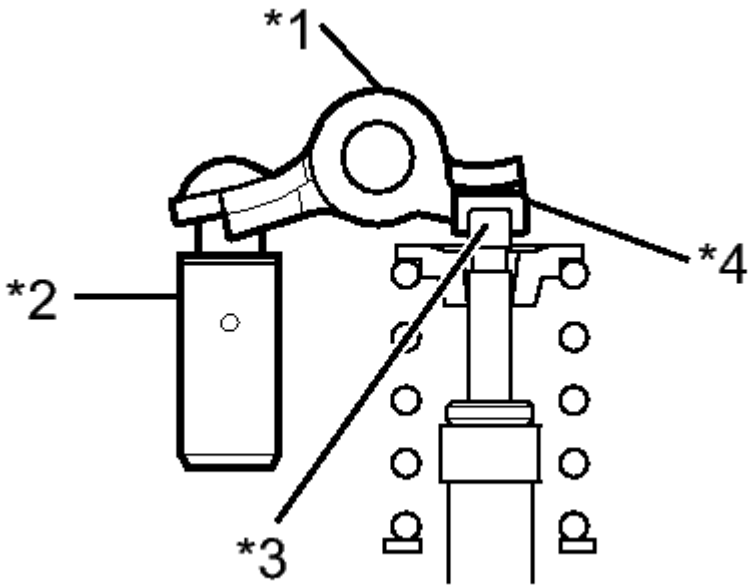


Fig. 36: Identifying Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

8. **INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY RH**
   a. Make sure that the No. 1 valve rocker arm sub-assembly is installed as shown in the illustration.



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Fig. 37: Identifying Camshaft Valve Rocker Arm, Lash Adjuster, Valve Stem & Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Valve Rocker Arm
*2	Lash Adjuster
*3	Valve Stem
*4	Valve Stem Cap

b. Apply seal packing in a continuous line as shown in the illustration.

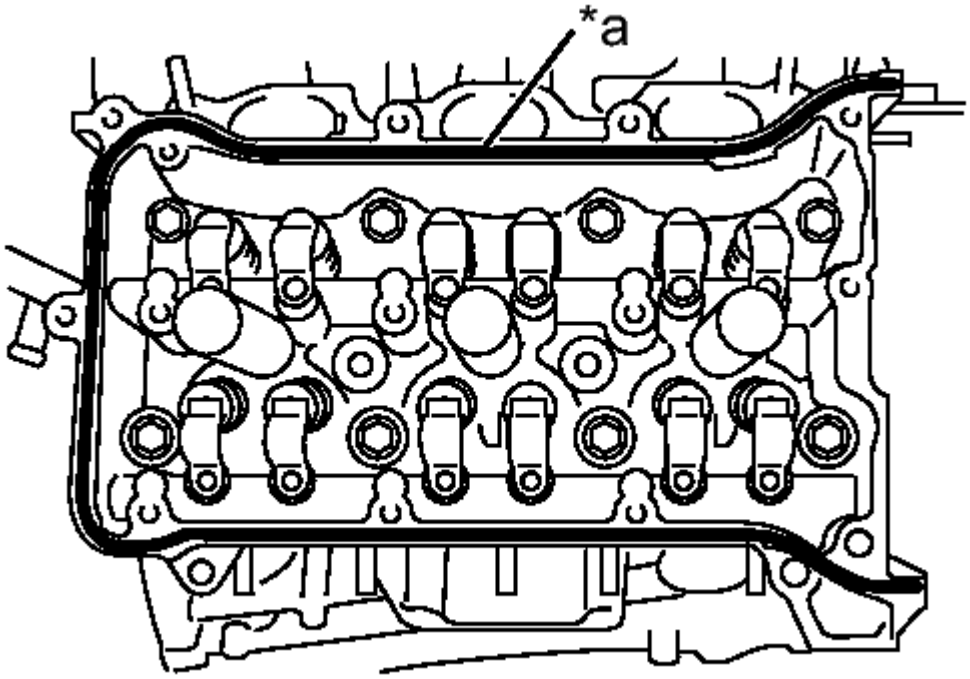


Fig. 38: Identifying Camshaft Housing Seal Packing Applying Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Seal packing diameter (3.5 to 4.5 mm)

Seal packing

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

Seal diameter

3.5 to 4.5 mm (0.138 to 0.177 in.)

NOTE:

- **Remove any oil from the contact surface.**
- **Install the camshaft housing sub-assembly RH 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.**

c. Install the camshaft housing sub-assembly RH and tighten the 12 bolts in the order shown in the illustration.

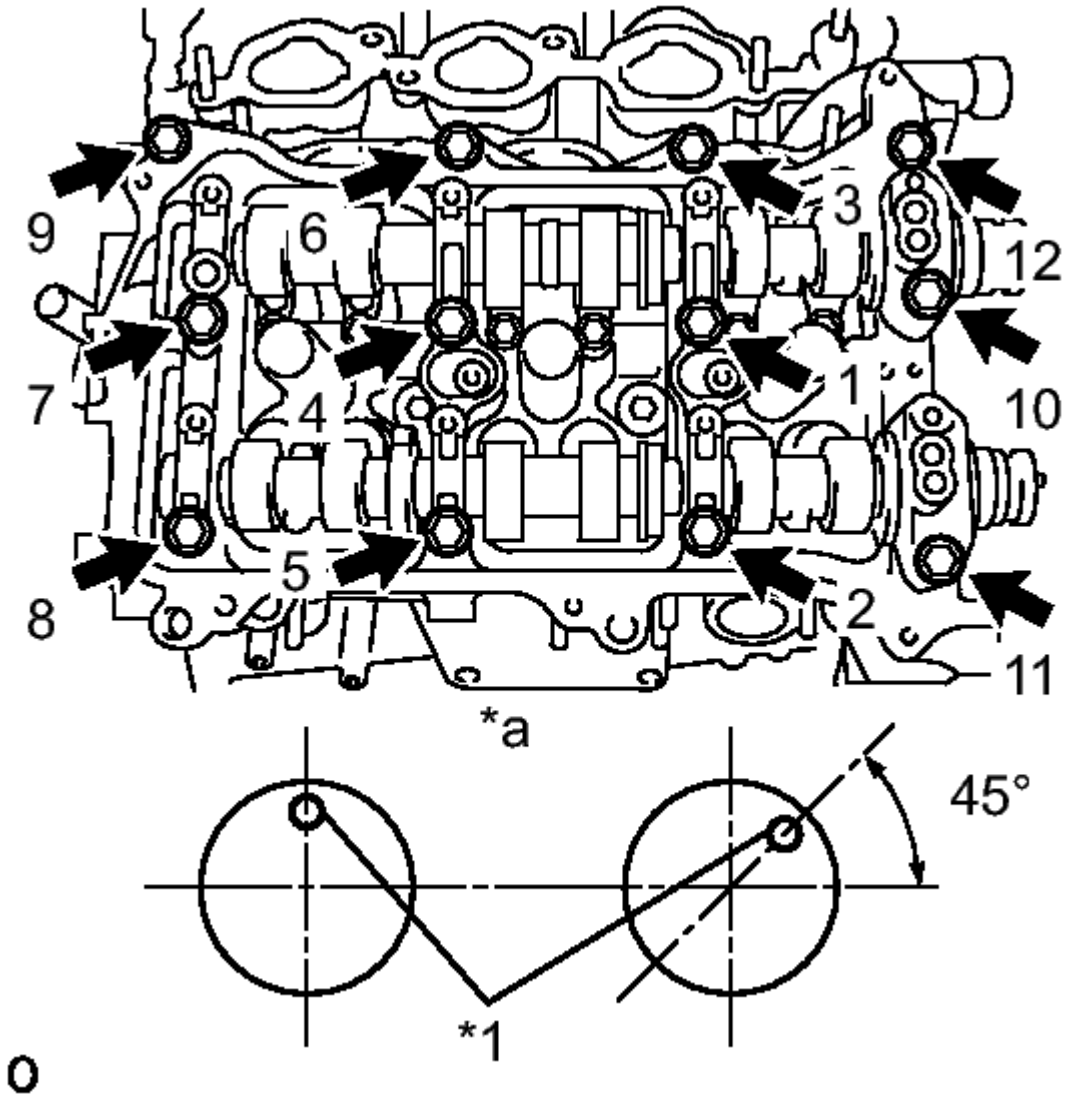


Fig. 39: Identifying RH Camshaft Housing Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Knock Pin
*a	Front View

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

NOTE:

- **When installing the camshaft housing RH, it is necessary to correctly position the camshafts as shown in the illustration.**

  Failure to correctly position these parts may result in damage

due to contact between the pistons and valves. If a camshaft is rotated with a piston at TDC, valve contact will occur.

- **If any of the bolts are loosened during installation, remove the camshaft housing sub-assembly RH, clean the installation surfaces, and reapply seal packing.**
- **If the camshaft housing sub-assembly RH 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.**

d. Tighten the 8 bolts in the order shown in the illustration.

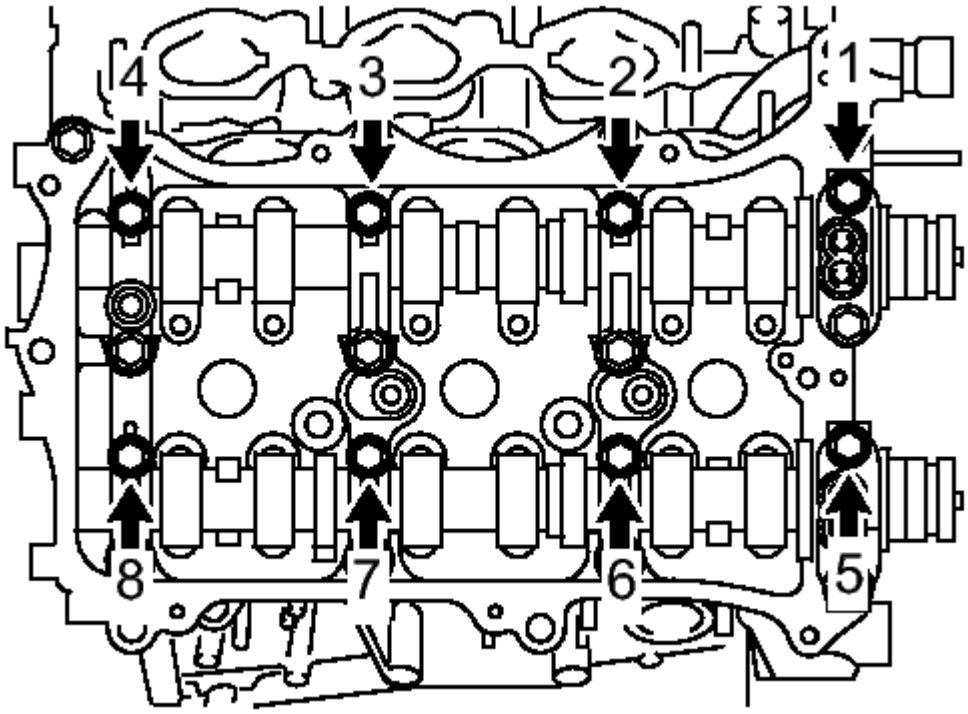


Fig. 40: Identifying RH Camshaft Housing Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

9. **INSTALL NO. 3 CHAIN TENSIONER ASSEMBLY**
   a. Install the No. 3 chain tensioner assembly with the bolt.

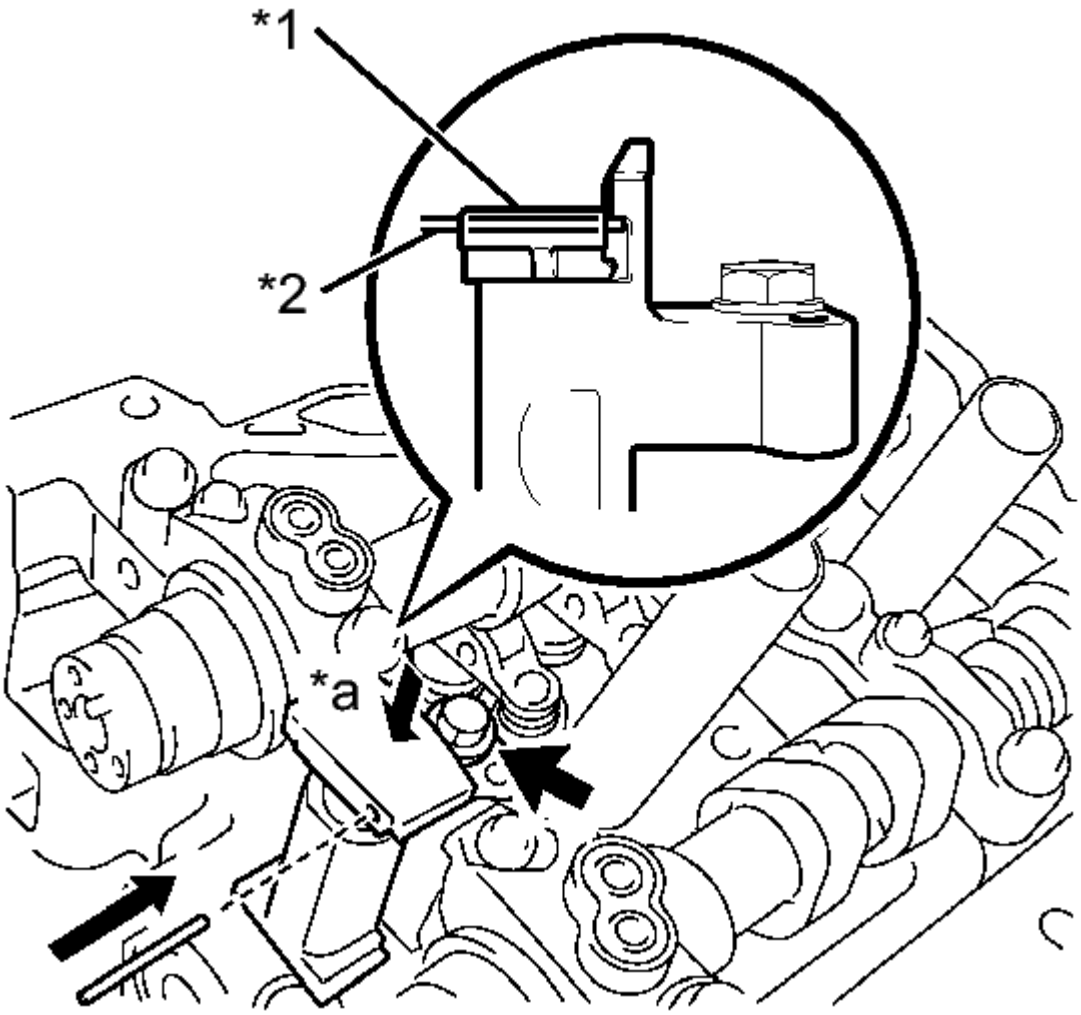


Fig. 41: Installing No. 3 Chain Tensioner Assembly & Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

b. While pushing in the tensioner, insert a pin of 1.0 mm (0.0394 in.) diameter into the hole to hold it.

TEXT IN ILLUSTRATION

*1	Plunger
*2	Pin
*a	Push

10. **INSTALL CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 2)**
    a. Align the mark plates (yellow) with the timing marks of the camshaft timing gear assemblies as shown in the illustration.

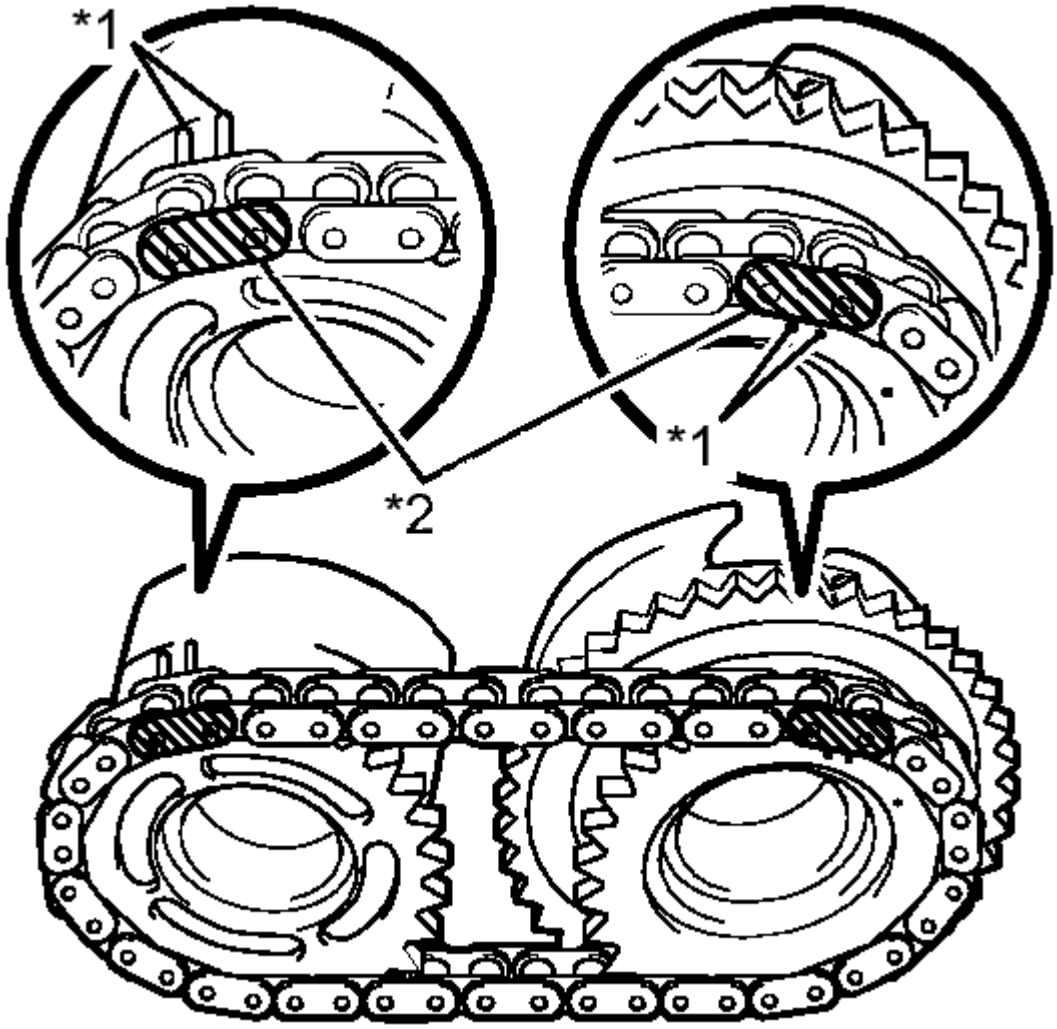


Fig. 42: Identifying Mark Plates & Timing Marks Of Camshaft Timing Gear Assemblies (For Bank 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Timing Mark
*2	Mark Plate (yellow)

b. Apply a light coat of engine oil to the bolt threads and bolt-seating surface.
c. Align the knock pin of the camshaft with the pin hole of the camshaft timing gear assembly. Install the camshaft timing gear assembly and camshaft timing exhaust gear LH with the No. 2 chain sub-assembly installed.

d. Using SST to hold the hexagonal portion of each camshaft, tighten the flange bolts of the camshaft timing gear assembly and the camshaft timing exhaust gear assembly LH.

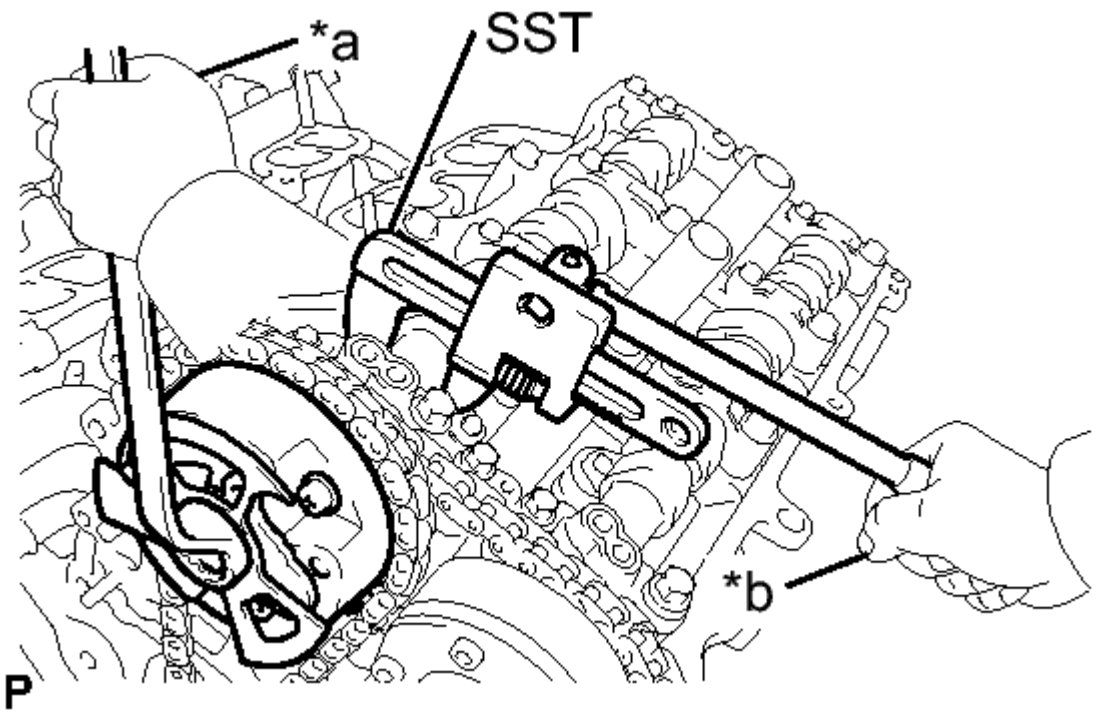


Fig. 43: Remove/Install LH Camshaft Timing Gear & Exhaust Gear Assembly Flange Bolts Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Turn
*b	Hold

- **SST: 09922-10010**

Torque: 100 N*m (1020 kgf*cm, 74 ft.*lbf)

e. Remove the pin from the No. 3 chain tensioner assembly.

11. **INSTALL NO. 2 CHAIN TENSIONER ASSEMBLY**

a. Install the No. 2 chain tensioner assembly with the bolt.

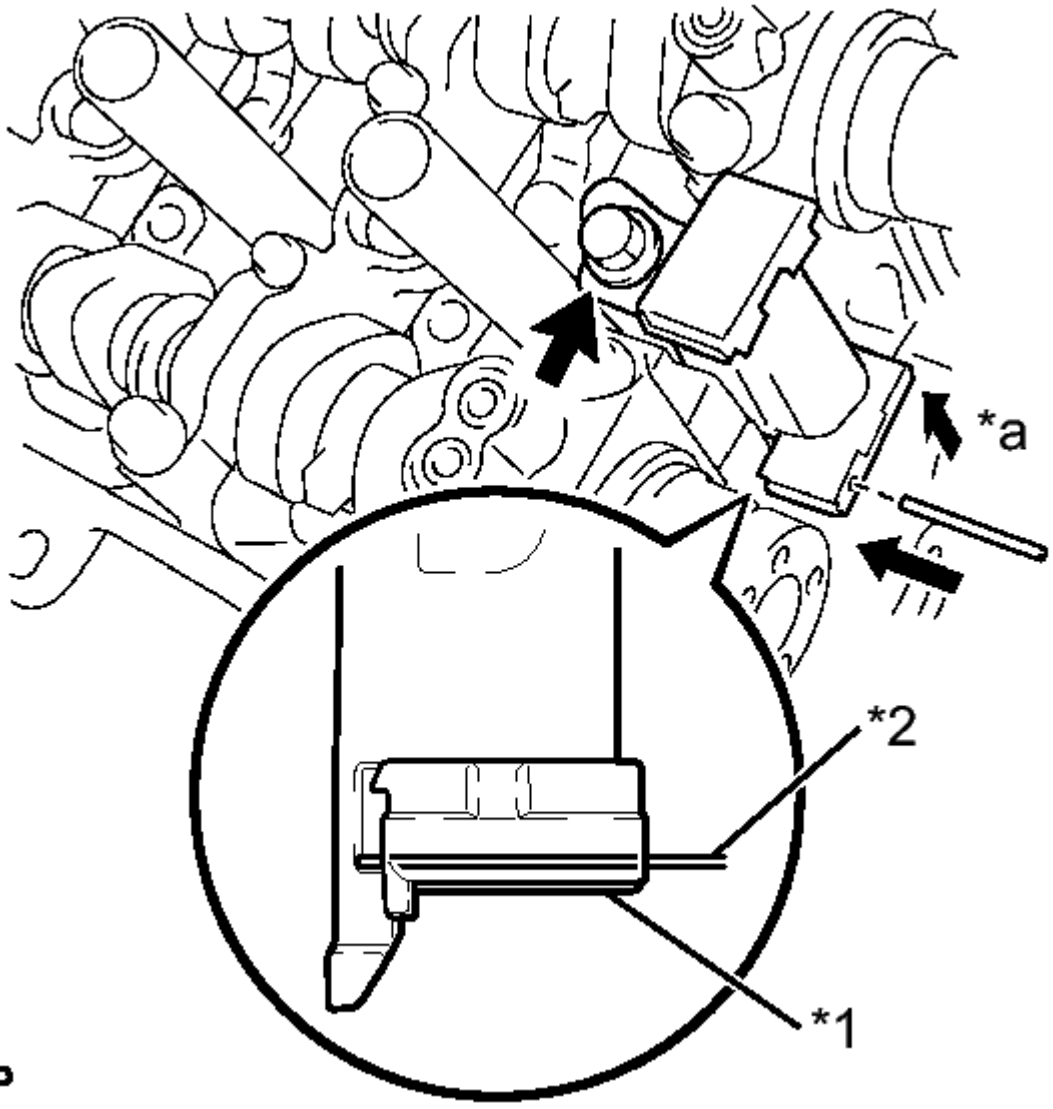


Fig. 44: Installing No. 2 Chain Tensioner Assembly & Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

b. While pushing in the No. 2 chain tensioner assembly, insert a pin of 1.0 mm (0.0394 in.) diameter into the hole to hold it.

TEXT IN ILLUSTRATION

*1	Plunger
*2	Pin
*a	Push

12. **INSTALL CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 1)**

a. Align the mark plates (yellow) with the timing marks of the camshaft timing gear assemblies as

shown in the illustration.

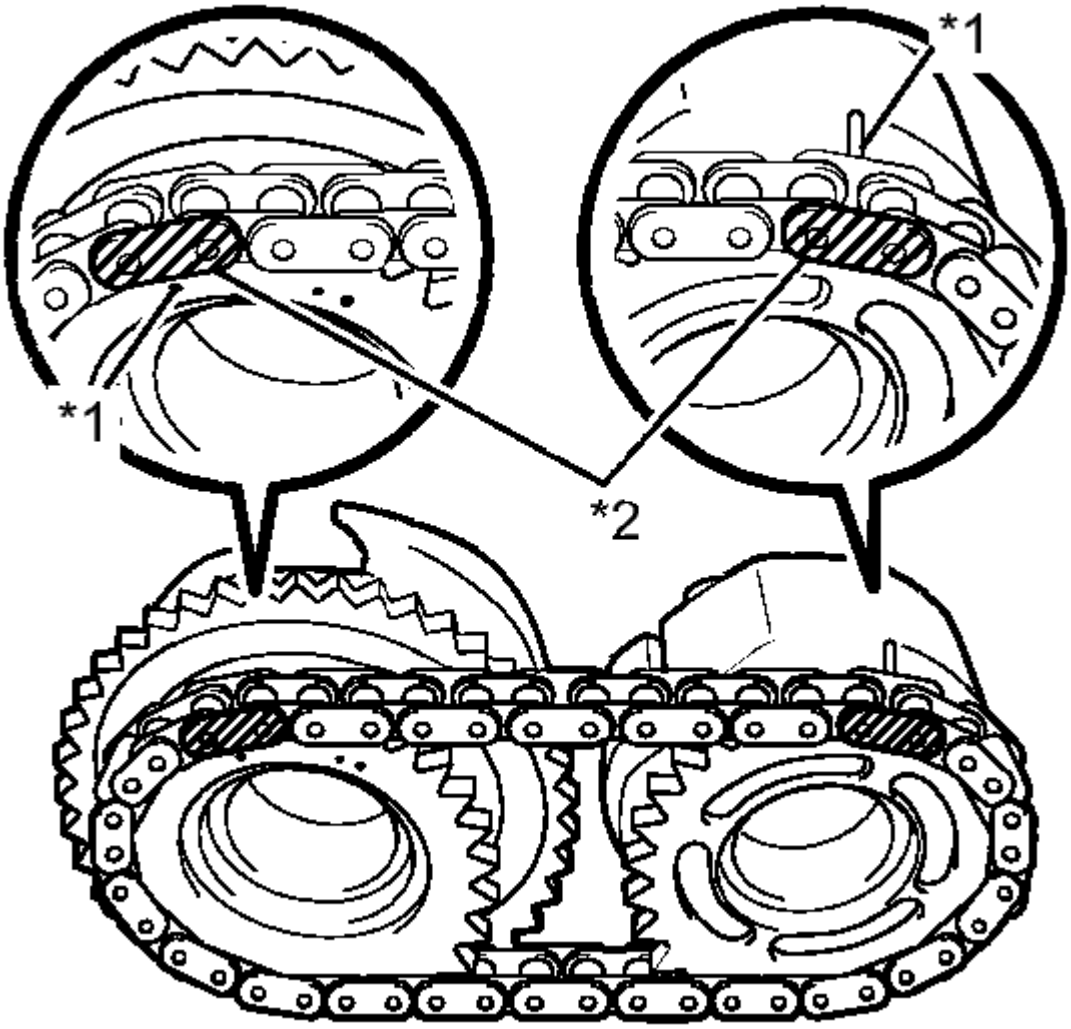


Fig. 45: Identifying Mark Plates & Timing Marks Of Camshaft Timing Gear Assemblies (For Bank 1)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Timing Mark
*2	Mark Plate (yellow)

b. Apply a light coat of engine oil to the bolt threads and bolt-seating surface.
c. Align the knock pin of the camshaft with the pin hole of the camshaft timing gear assembly. Install the camshaft timing gear assembly and camshaft timing exhaust gear assembly with the No. 2 chain

sub-assembly installed.

d. Using SST to hold the hexagonal portion of each camshaft, tighten the flange bolts of the camshaft timing gear assembly and the camshaft timing exhaust gear assembly RH.

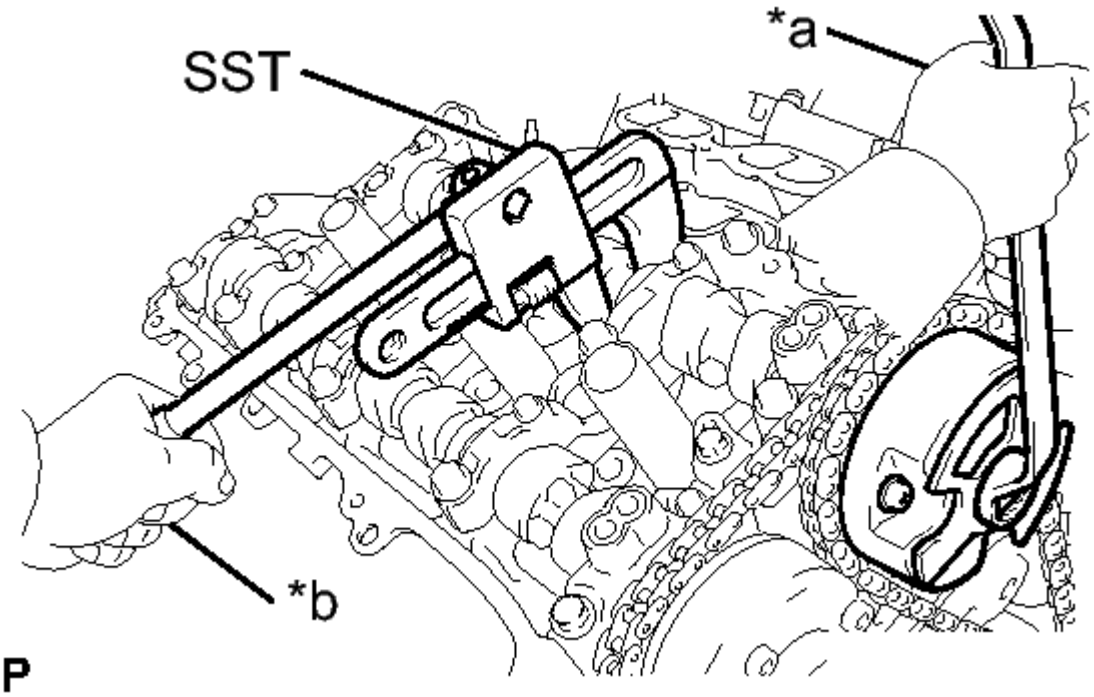


Fig. 46: Remove/Install RH Camshaft Timing Gear & Exhaust Gear Assembly Flange Bolts Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Turn
*b	Hold

- **SST: 09922-10010**

Torque: 100 N*m (1020 kgf*cm, 74 ft.*lbf)

e. Remove the pin from the No. 2 chain tensioner assembly.

13. **INSTALL IDLE SPROCKET ASSEMBLY** See step 26
14. **INSTALL CHAIN SUB-ASSEMBLY** See step 27
15. **INSTALL CHAIN TENSIONER SLIPPER** See step 28
16. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY** See step 29
17. **INSPECT VALVE TIMING** See step 30
18. **INSTALL TIMING GEAR CASE OR TIMING CHAIN CASE OIL SEAL** . Refer to **INSTALLATION - Step 1**
19. **INSTALL TIMING CHAIN COVER SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 2**

20. **INSTALL WATER INLET HOUSING** See step 34
21. **INSTALL FRONT NO. 1 ENGINE MOUNTING BRACKET LH** See step 35
22. **INSTALL OIL PAN SUB-ASSEMBLY** See step 37
23. **INSTALL OIL STRAINER SUB-ASSEMBLY** See step 38
24. **INSTALL NO. 2 OIL PAN SUB-ASSEMBLY** See step 39
25. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY (for Bank 1)** See step 41
26. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY LH (for Bank 2)** See step 42
27. **INSTALL CRANKSHAFT PULLEY** See step 2
28. **INSTALL NO. 1 OIL PIPE** See step 51
29. **INSTALL OIL PIPE** See step 52
30. **INSTALL CRANKSHAFT POSITION SENSOR** . Refer to **INSTALLATION - Step 1**
31. **INSTALL NO. 1 VACUUM SWITCHING VALVE ASSEMBLY** See step 5
32. **INSTALL WATER PUMP PULLEY** . Refer to **INSTALLATION - Step 2**
33. **INSTALL NO. 2 IDLER PULLEY SUB-ASSEMBLY** See step 7
34. **INSTALL NO. 2 TIMING GEAR COVER** See step 8
35. **INSTALL V-RIBBED BELT TENSIONER ASSEMBLY** See step 9
36. **INSTALL EXHAUST MANIFOLD SUB-ASSEMBLY**

    Refer to **INSTALLATION**

37. **INSTALL INTAKE MANIFOLD**

    Refer to **INSTALLATION**

38. **INSTALL IGNITION COIL ASSEMBLY**

    Refer to **INSTALLATION**

39. **INSTALL ENGINE HANGER** See step 22
40. **REMOVE ENGINE FROM ENGINE STAND**
41. **INSTALL DRIVE PLATE AND RING GEAR SUB-ASSEMBLY** See step 2
42. **INSTALL AUTOMATIC TRANSAXLE ASSEMBLY (for 2WD)**

    Refer to **INSTALLATION**

43. **INSTALL AUTOMATIC TRANSAXLE ASSEMBLY (for AWD)**

    Refer to **INSTALLATION**

CYLINDER HEAD GASKET

COMPONENTS

ILLUSTRATION

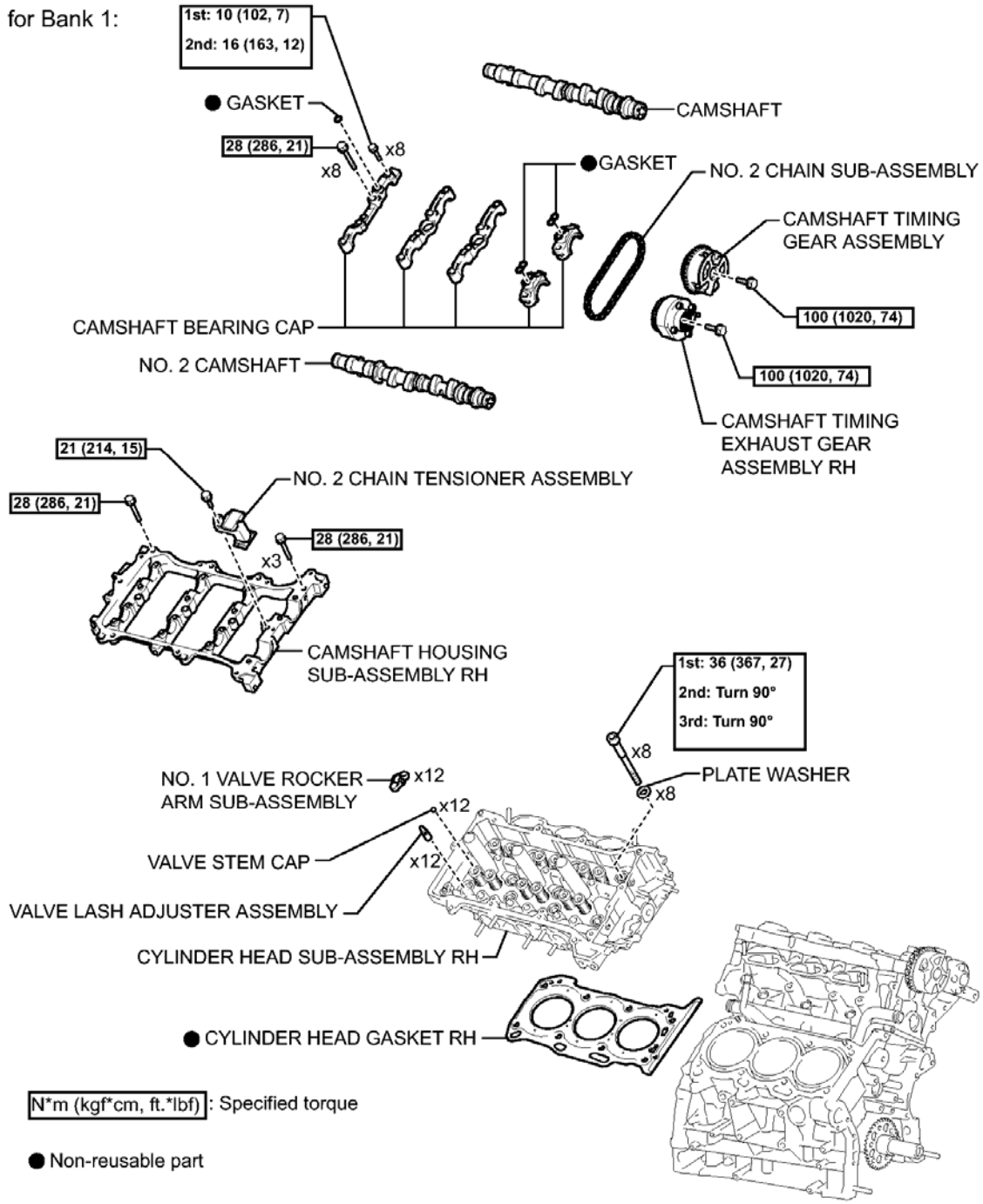


Fig. 47: Cylinder Head Gasket Replacement Components With Torque Specifications (1 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

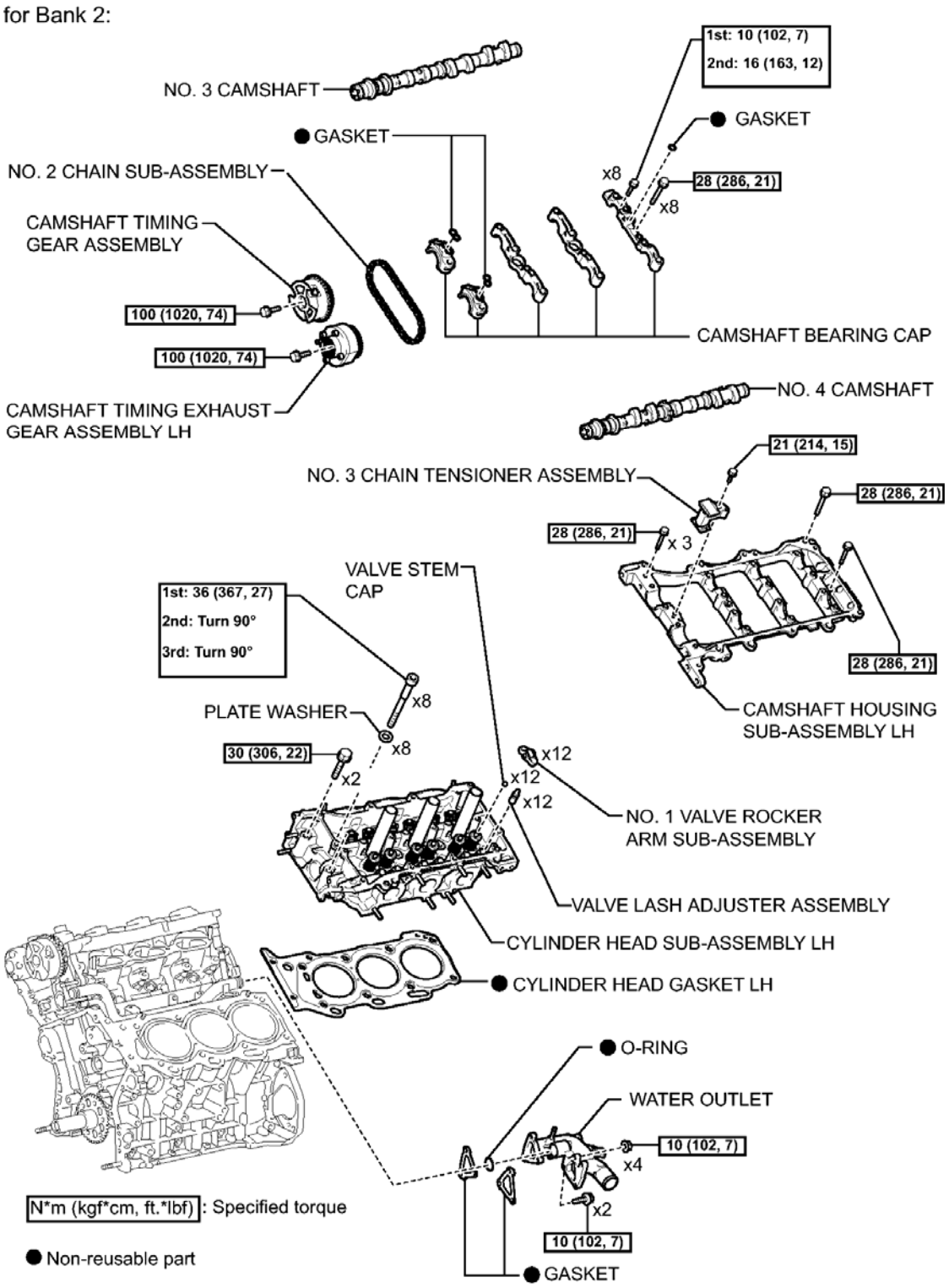


Fig. 48: Cylinder Head Gasket Replacement Components With Torque Specifications (2 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

REMOVAL

1. **REMOVE CAMSHAFT**

   Refer to **REMOVAL**

2. **REMOVE NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY**
   a. Remove the 24 valve rocker arms.

      HINT:

      Arrange the removed parts in the correct order.

3. **REMOVE VALVE LASH ADJUSTER ASSEMBLY**
   a. Remove the 24 valve lash adjuster assemblies from the cylinder head.

      HINT:

      Arrange the removed parts in the correct order.

4. **REMOVE VALVE STEM CAP**
   a. Remove the 24 valve stem caps.
5. **REMOVE WATER OUTLET** See step 19
6. **REMOVE CYLINDER HEAD SUB-ASSEMBLY RH**
   a. Using a 10 mm bi-hexagon wrench, uniformly loosen the 8 cylinder head bolts in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.

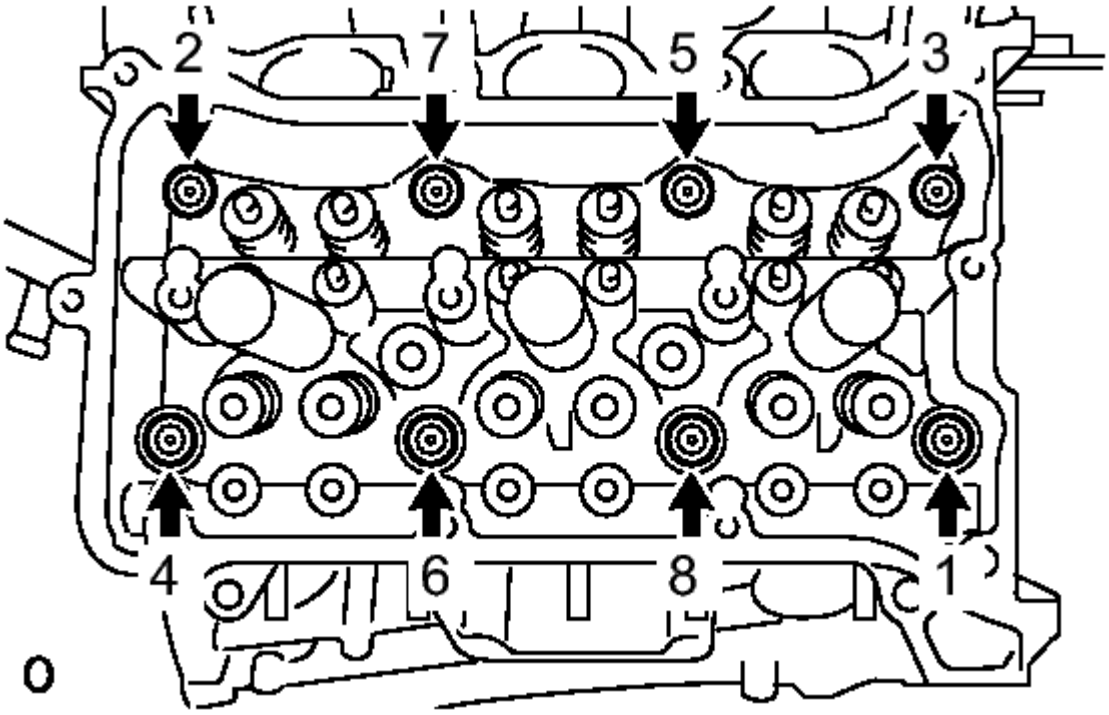


Fig. 49: Identifying Cylinder Head Bolts And Plate Washers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

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

HINT:

Arrange the removed parts in the correct order.

b. Remove the cylinder head sub-assembly RH.

7. **REMOVE CYLINDER HEAD GASKET RH**
   a. Remove the cylinder head gasket RH.
8. **REMOVE CYLINDER HEAD SUB-ASSEMBLY LH**
   a. Uniformly loosen and remove the 2 cylinder head set bolts in several steps and in the sequence shown in the illustration.

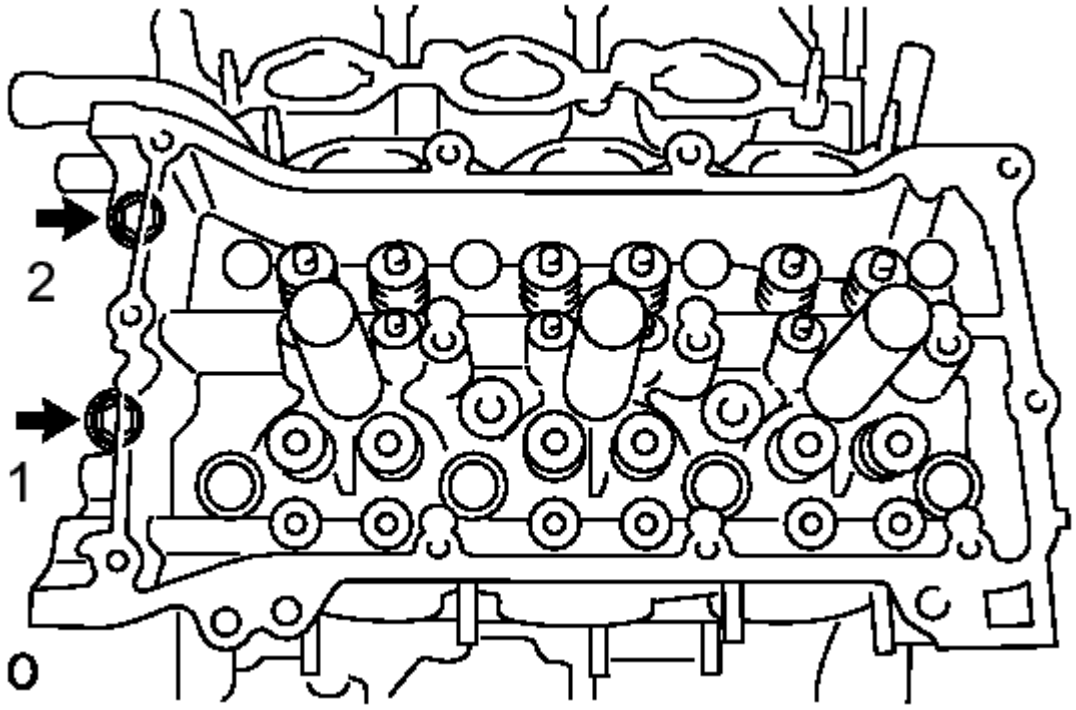


Fig. 50: Identifying Head Bolts With Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using a 10 mm bi-hexagon wrench, uniformly loosen the 8 bolts in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.

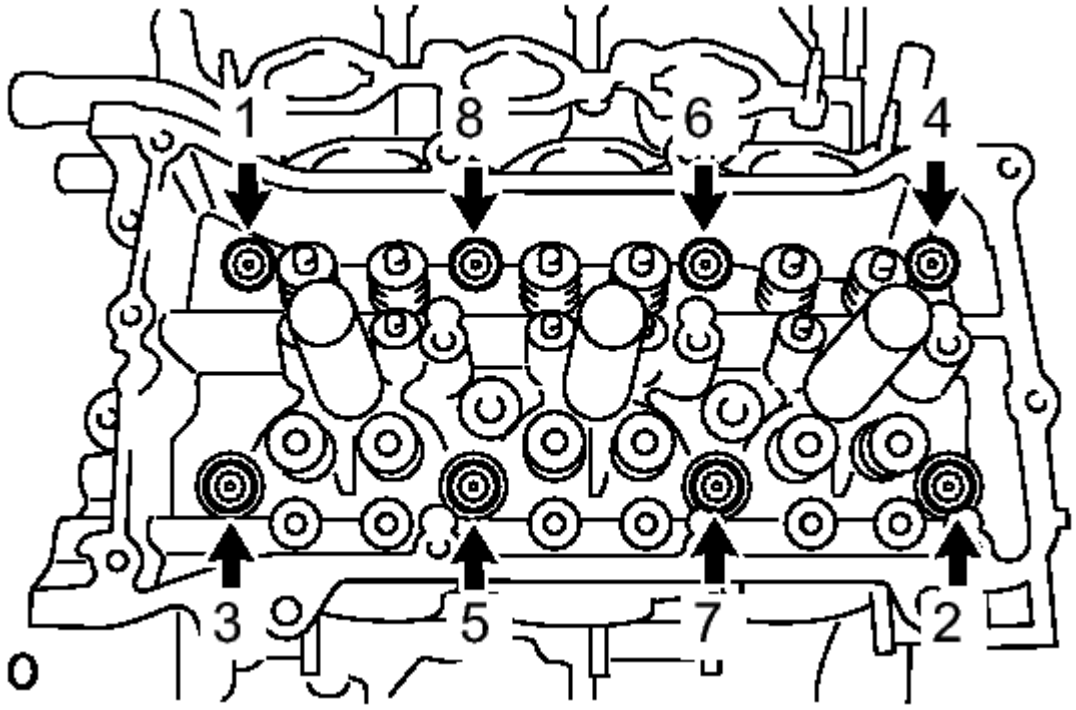


Fig. 51: Identifying Cylinder Head Bolts And Plate Washers With Loosening Sequence

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

NOTE:

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

HINT:

Be sure to keep separate the removed parts for each installation position.

c. Remove the cylinder head sub-assembly LH.

9. **REMOVE CYLINDER HEAD GASKET LH**
   a. Remove the cylinder head gasket LH.

INSTALLATION

INSTALLATION

1. **INSTALL CYLINDER HEAD GASKET RH**
   a. Place a new cylinder head gasket RH on the cylinder block surface with the Lot No. stamp upward.

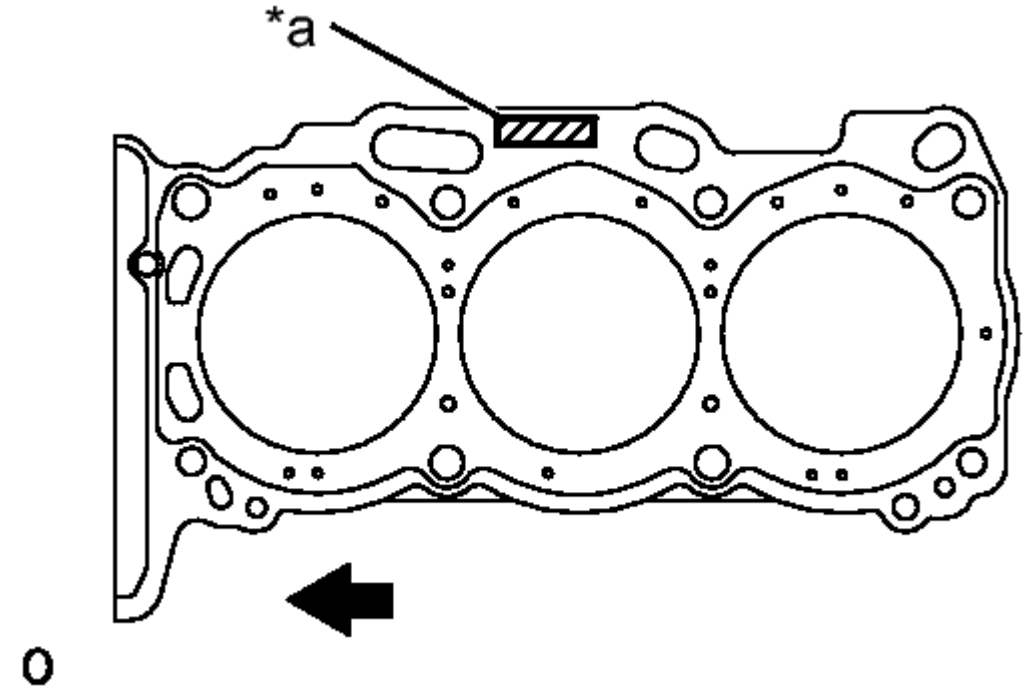


Fig. 52: Identifying RH Cylinder Head Gasket, Lot No. & Engine Front Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Lot No.
	Engine Front

NOTE:

- **Be careful of the installation direction.**
- **Gently lower the cylinder head in order not to damage the gasket with the bottom part of the head.**

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

a. Place the cylinder head on the cylinder block.

NOTE: **Be careful not to allow oil to adhere to the bottom part of the cylinder head.**

HINT:

The cylinder head bolts are tightened in 3 progressive steps.

b. Apply a light coat of engine oil to the threads and under the heads of the cylinder head bolts.

c. Step 1

1. Using a 10 mm bi-hexagon wrench, install and uniformly tighten the 8 cylinder head bolts with the plate washers in several steps and in the sequence shown in the illustration.

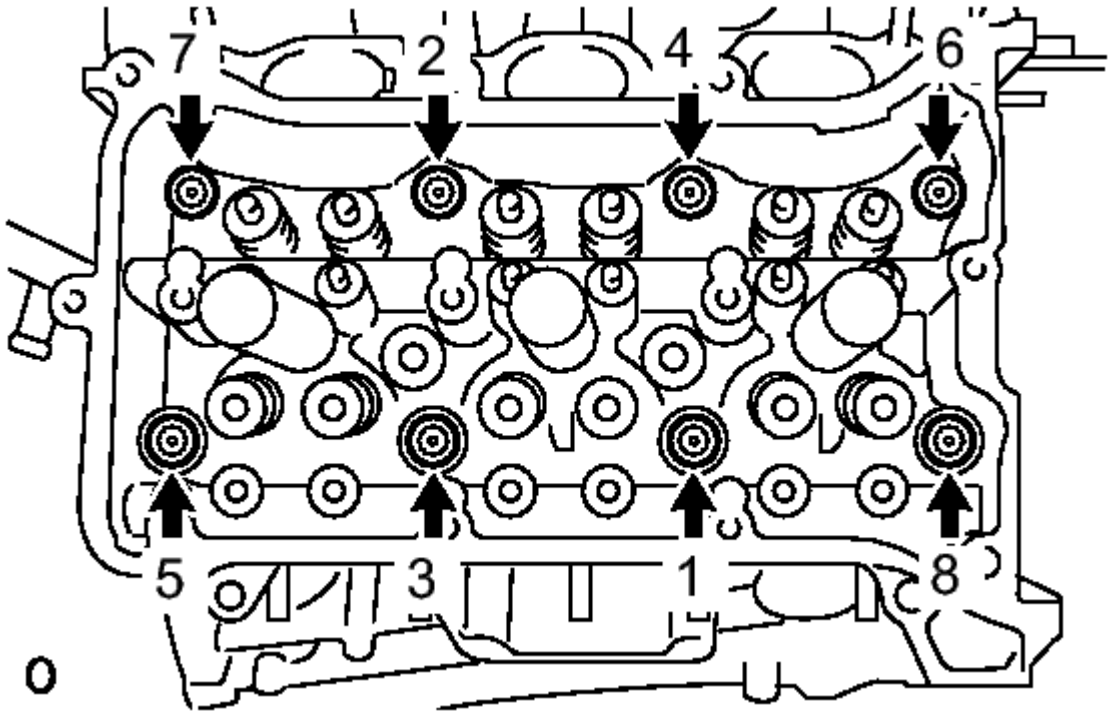


Fig. 53: Identifying Cylinder Head Bolts With Tightening Sequence

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

Torque: 36 N*m (367 kgf*cm, 27 ft.*lbf)

d. Step 2

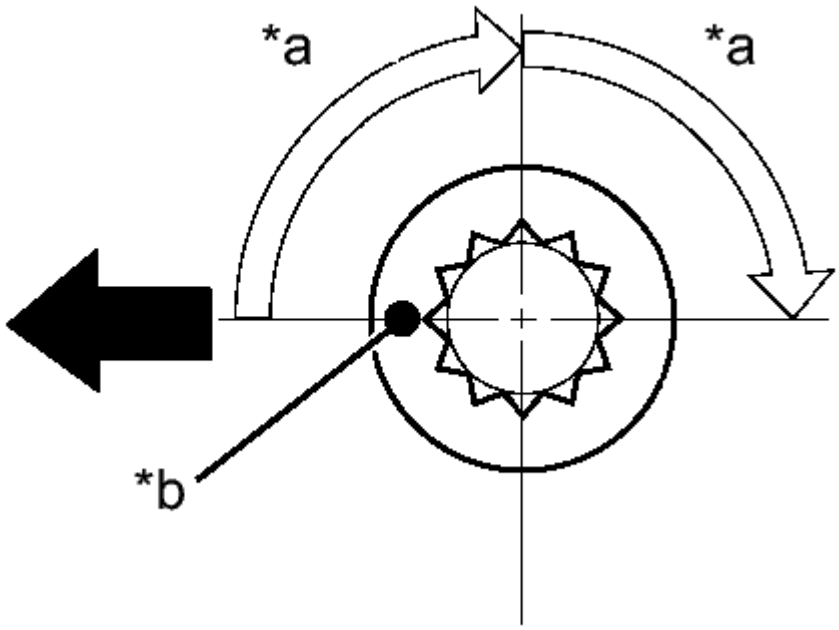


Fig. 54: Turning Head Bolt An Additional 90°
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Turn 90°
*b	Painted Mark
.	Engine Front

1. Mark the cylinder head bolt head with paint as shown in the illustration.
2. Tighten the cylinder head bolts another 90°.

e. Step 3

1. Tighten the cylinder head bolts an additional 90°.
2. Check that the painted mark is now facing rearward.

3. **INSTALL CYLINDER HEAD GASKET LH**

a. Place a new cylinder head gasket LH on the cylinder block surface with the Lot No. stamp upward.

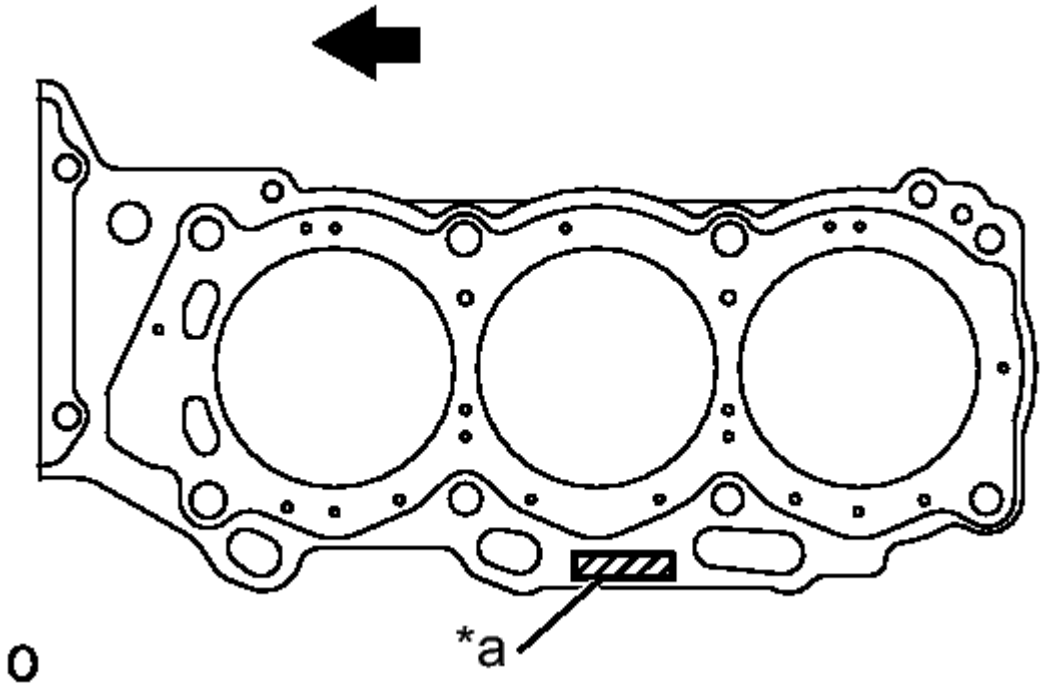


Fig. 55: Identifying LH Cylinder Head Gasket, Lot No. & Engine Front Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Lot No.
	Engine Front

NOTE:

- **Be careful of the installation direction.**
- **Gently lower the cylinder head in order not to damage the gasket with the bottom part of the head.**

4. **INSTALL CYLINDER HEAD SUB-ASSEMBLY LH**
   a. Place the cylinder head on the cylinder block.

NOTE: **Be careful not to allow oil to adhere to the bottom part of the cylinder head.**

HINT:

The cylinder head bolts are tightened in 3 progressive steps.

   b. Apply a light coat of engine oil to the threads and under the heads of the cylinder head bolts.
   c. Step 1

1. Using a 10 mm bi-hexagon wrench, install and uniformly tighten the 8 cylinder head bolts with the plate washers in several steps in the sequence shown in the illustration.

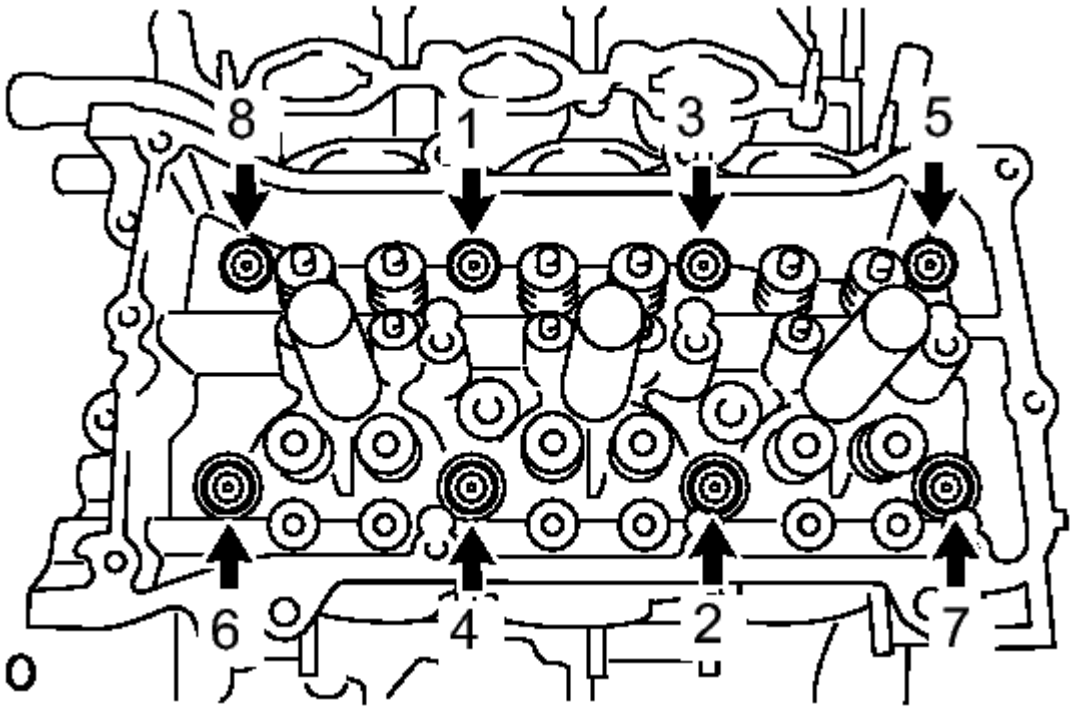


Fig. 56: Identifying Cylinder Head Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 36 N*m (367 kgf*cm, 27 ft.*lbf)

d. Step 2

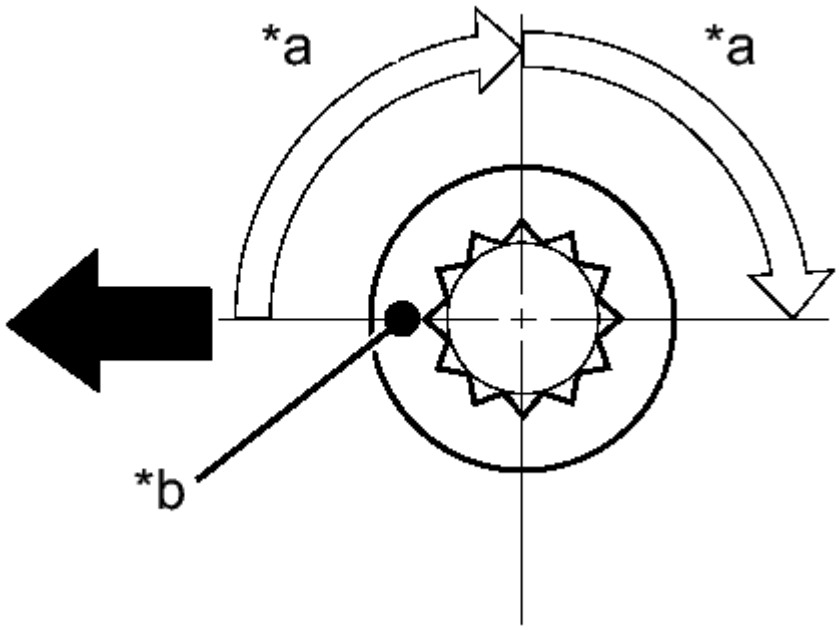


Fig. 57: Turning Head Bolt An Additional 90°
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Turn 90°
*b	Painted Mark
.	Engine Front

1. Mark the cylinder head bolt head with paint as shown in the illustration.
2. Tighten the cylinder head bolts another 90°.

e. Step 3
   1. Tighten the cylinder head bolts an additional 90°.
   2. Check that the painted mark is now facing rearward.

f. Tighten the 2 bolts in the order shown in the illustration.

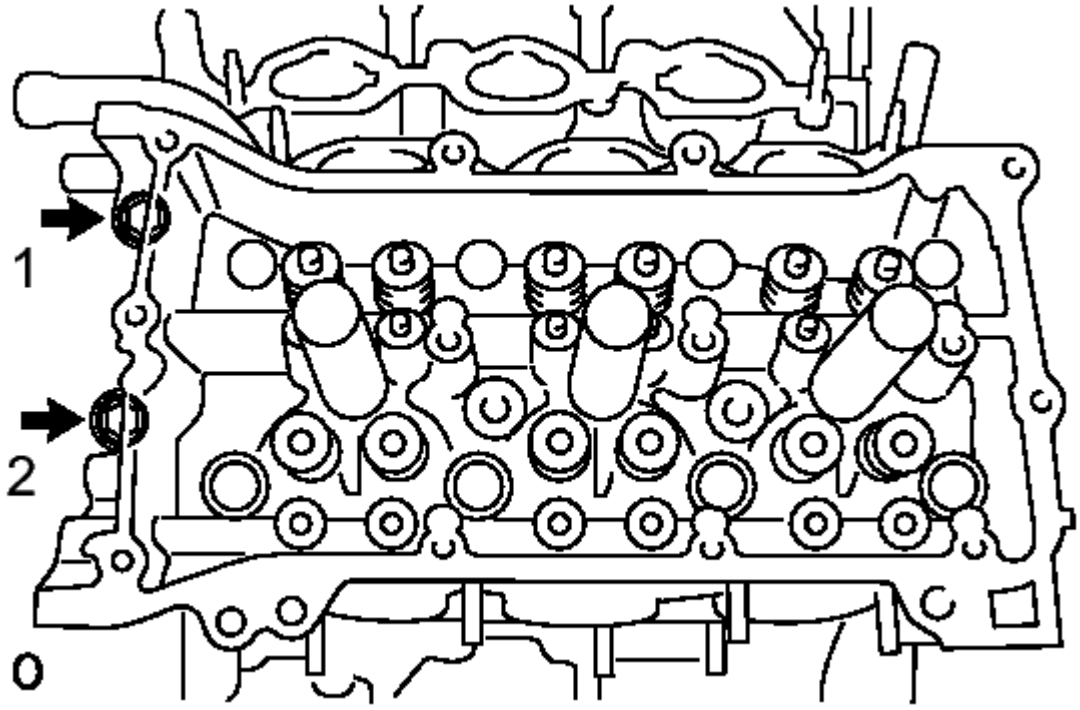


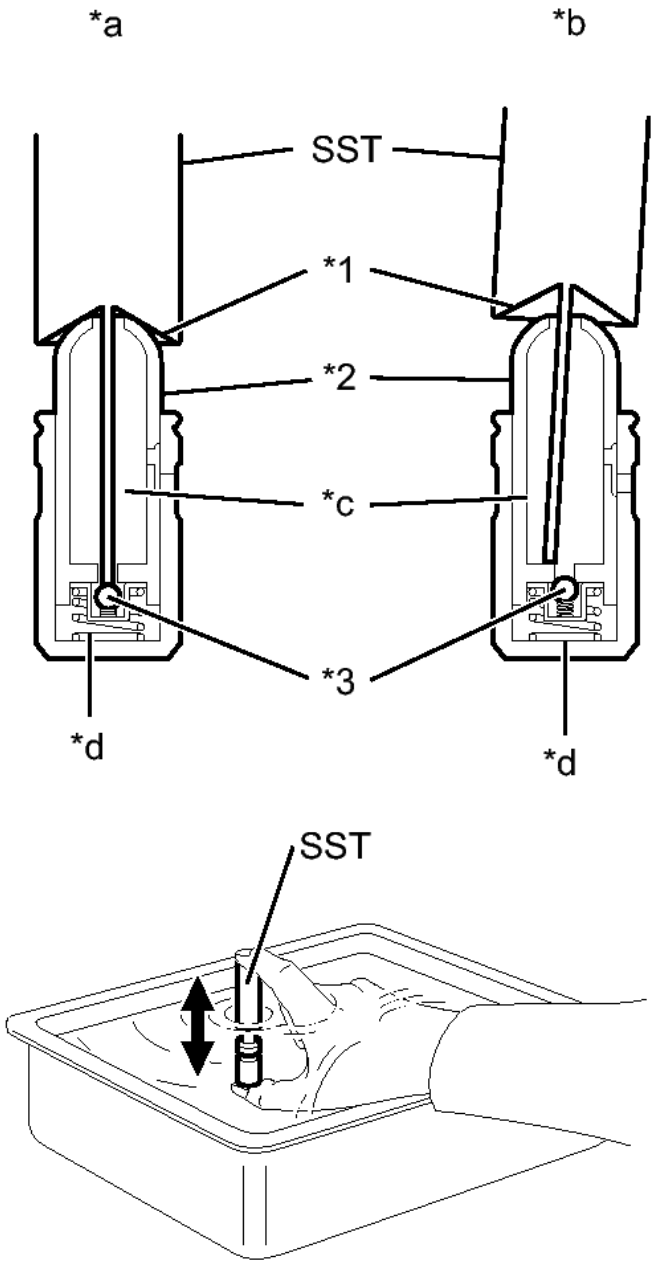
Fig. 58: Identifying Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

5. **INSTALL WATER OUTLET** See step 43
6. **INSTALL VALVE STEM CAP**
   a. Install the 24 valve stem caps.
7. **INSTALL VALVE LASH ADJUSTER ASSEMBLY**

NOTE:
- **Keep the lash adjuster free of dirt and foreign objects.**
- **Only use clean engine oil.**

   a. Place the lash adjuster into a container filled with engine oil.
   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.



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Fig. 59: Bleeding Valve Lash Adjuster Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Tapered Part
*2	Plunger
*3	Check Ball
*a	CORRECT
*b	INCORRECT
*c	Low Pressure Chamber
*d	High Pressure Chamber

- **SST: 09276-75010**

c. Squeeze SST and lash adjuster together to move the plunger up and down 5 to 6 times.

d. Check the movement of the plunger and bleed the air.

OK

Plunger moves up and down.

NOTE: When bleeding air from 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, air will not bleed.

e. After bleeding the air, 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 valve lash adjuster.

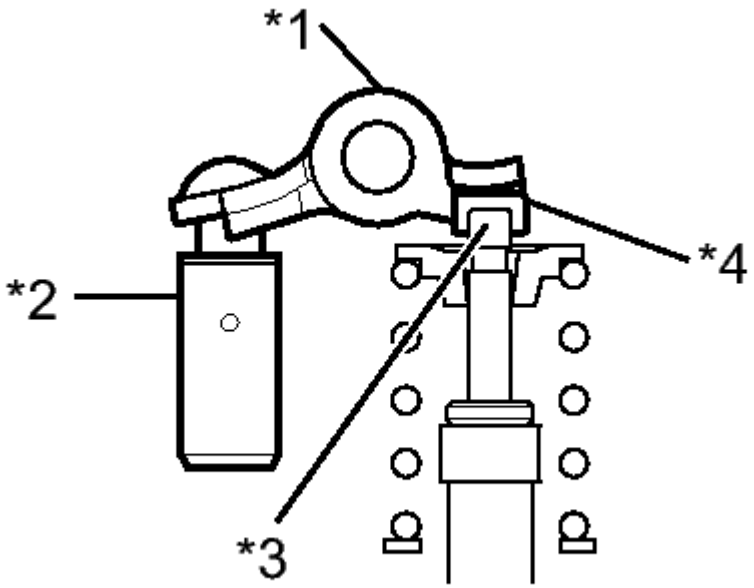
f. Install the valve lash adjusters.

NOTE: Install each valve lash adjuster to the same place it was removed from.

8. **INSTALL NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY**

a. Apply engine oil to the lash adjuster tip and valve stem cap end.

b. Install the valve rocker arm as shown in the illustration.



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Fig. 60: Identifying Camshaft Valve Rocker Arm, Lash Adjuster, Valve Stem & Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Valve Rocker Arm
*2	Lash Adjuster
*3	Valve Stem
*4	Valve Stem Cap

9. **INSTALL CAMSHAFT**

   Refer to **INSTALLATION**

FRONT CRANKSHAFT OIL SEAL

COMPONENTS

ILLUSTRATION

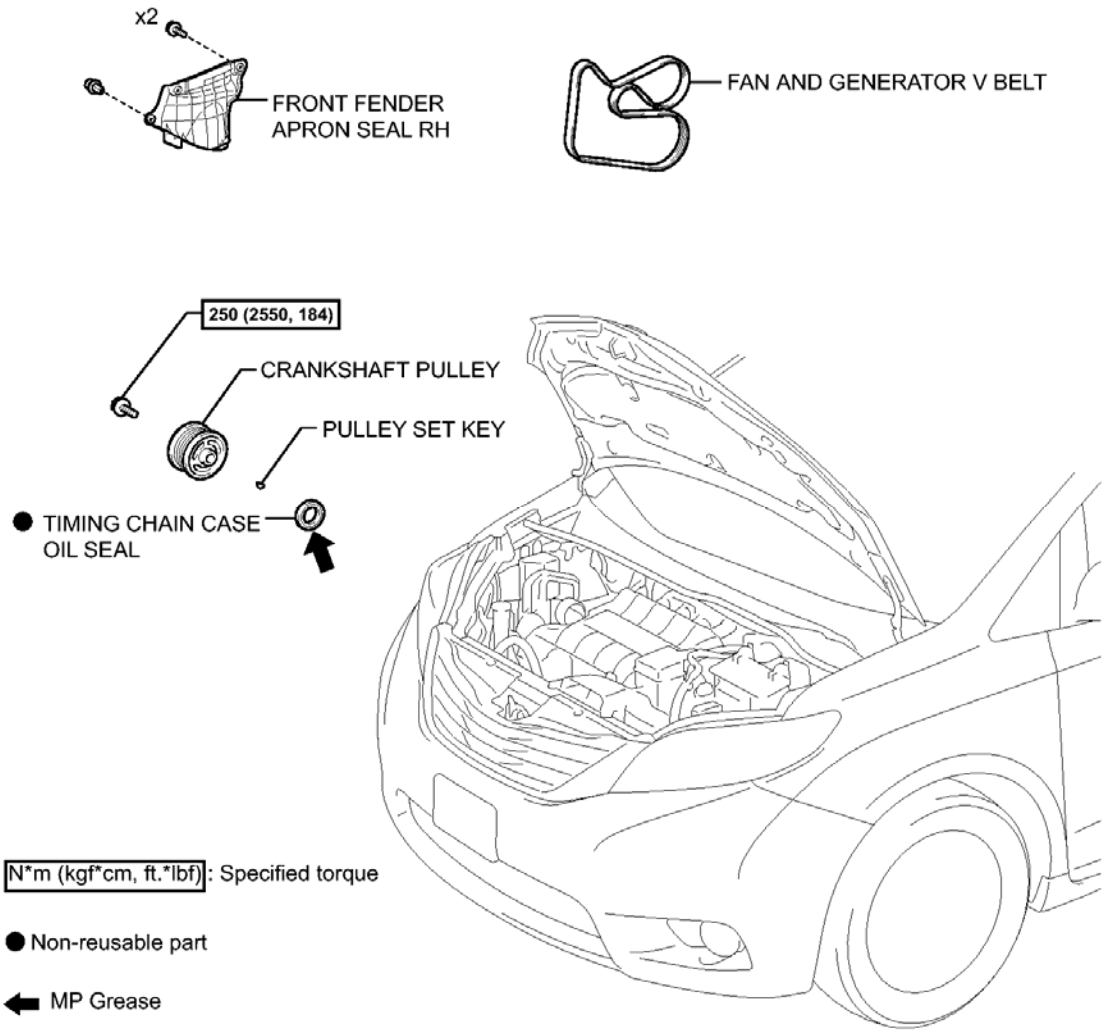


Fig. 61: Front Crankshaft Oil Seal Replacement Components With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

REMOVAL

1. **REMOVE FRONT WHEEL RH**
2. **REMOVE FRONT FENDER APRON SEAL RH** See step 10
3. **REMOVE FAN AND GENERATOR V BELT** See step 3
4. **REMOVE CRANKSHAFT PULLEY**
    a. Using SST, loosen the crankshaft pulley bolt.

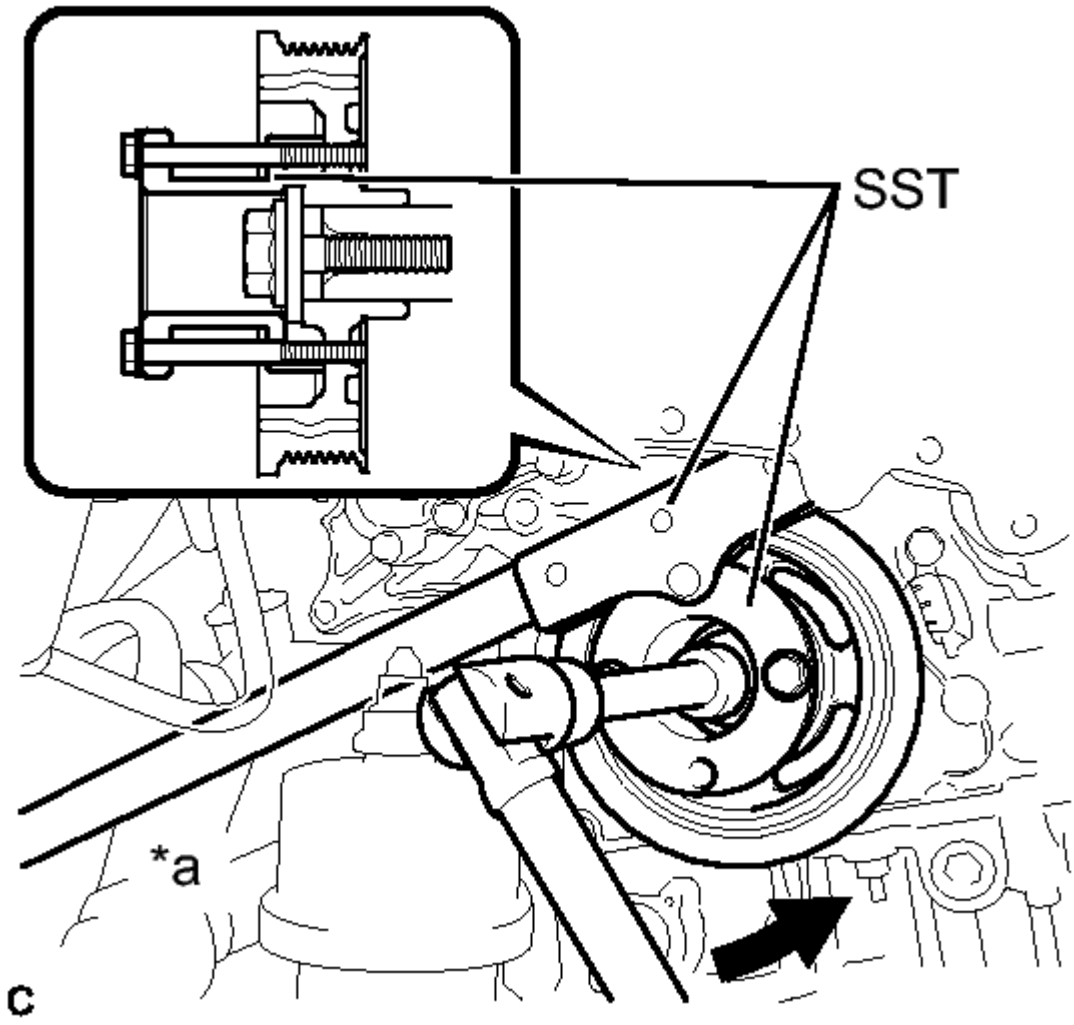


Fig. 62: Removing Crankshaft Pulley Bolt Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- **SST: 09213-70011**
  09213-70020
- **SST: 09330-00021**

TEXT IN ILLUSTRATION

*a	Hold
c	Turn

b. Using SST, remove the crankshaft pulley bolt and crankshaft pulley.

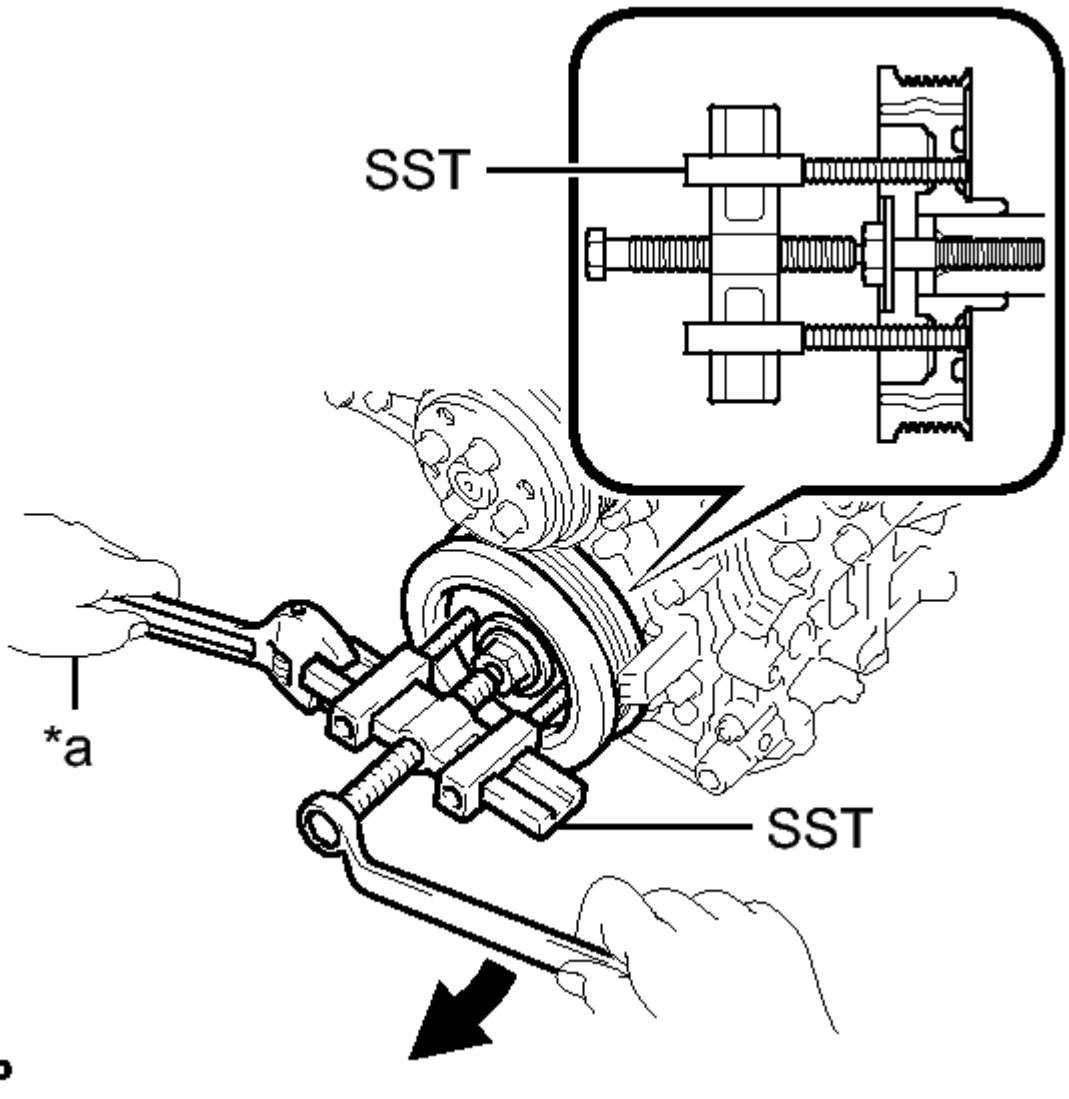


Fig. 63: Removing Crankshaft Pulley Bolt & Crankshaft Pulley Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

TEXT IN ILLUSTRATION

*a	Hold
·	Turn

c. Remove the pulley set key from the crankshaft.

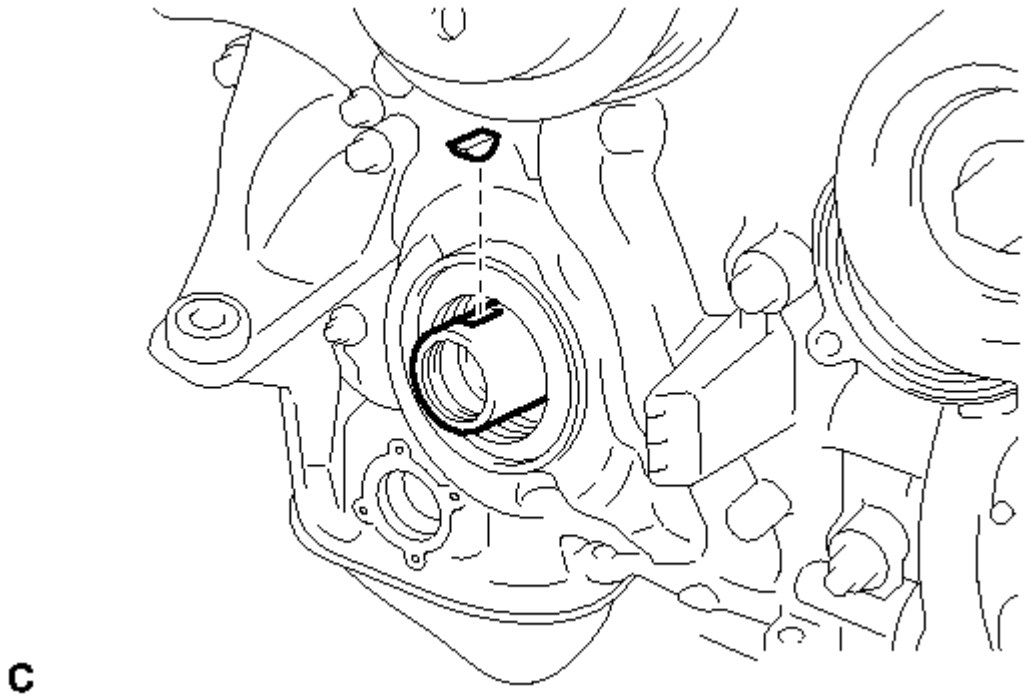


Fig. 64: Identifying Crankshaft & Set Key
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **REMOVE TIMING CHAIN CASE OIL SEAL**
   a. Using a knife, cut off the timing chain case oil seal lip.

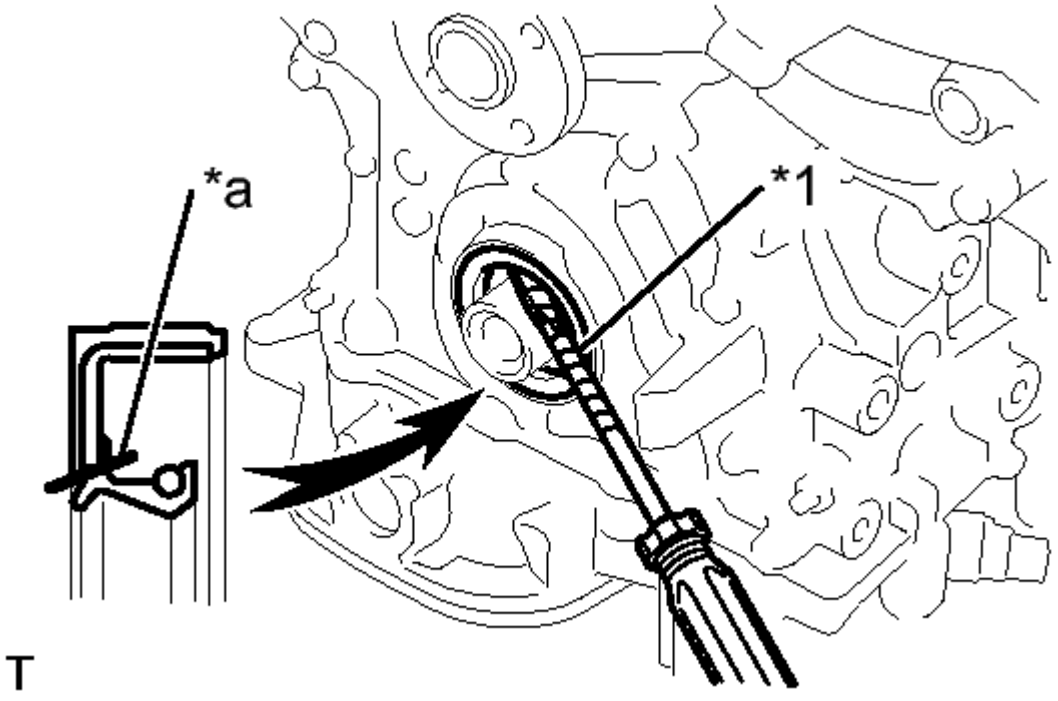


Fig. 65: Removing Timing Chain Case Oil Seal Using A Screwdriver

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

TEXT IN ILLUSTRATION

*1	Protective Tape
*a	Cut Position

b. Using a screwdriver, pry out the timing chain case oil seal.

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

HINT:

Tape the screwdriver tip before use.

INSTALLATION

INSTALLATION

1. **INSTALL TIMING CHAIN CASE OIL SEAL**
   a. Apply MP grease to a new timing chain case oil seal lip.

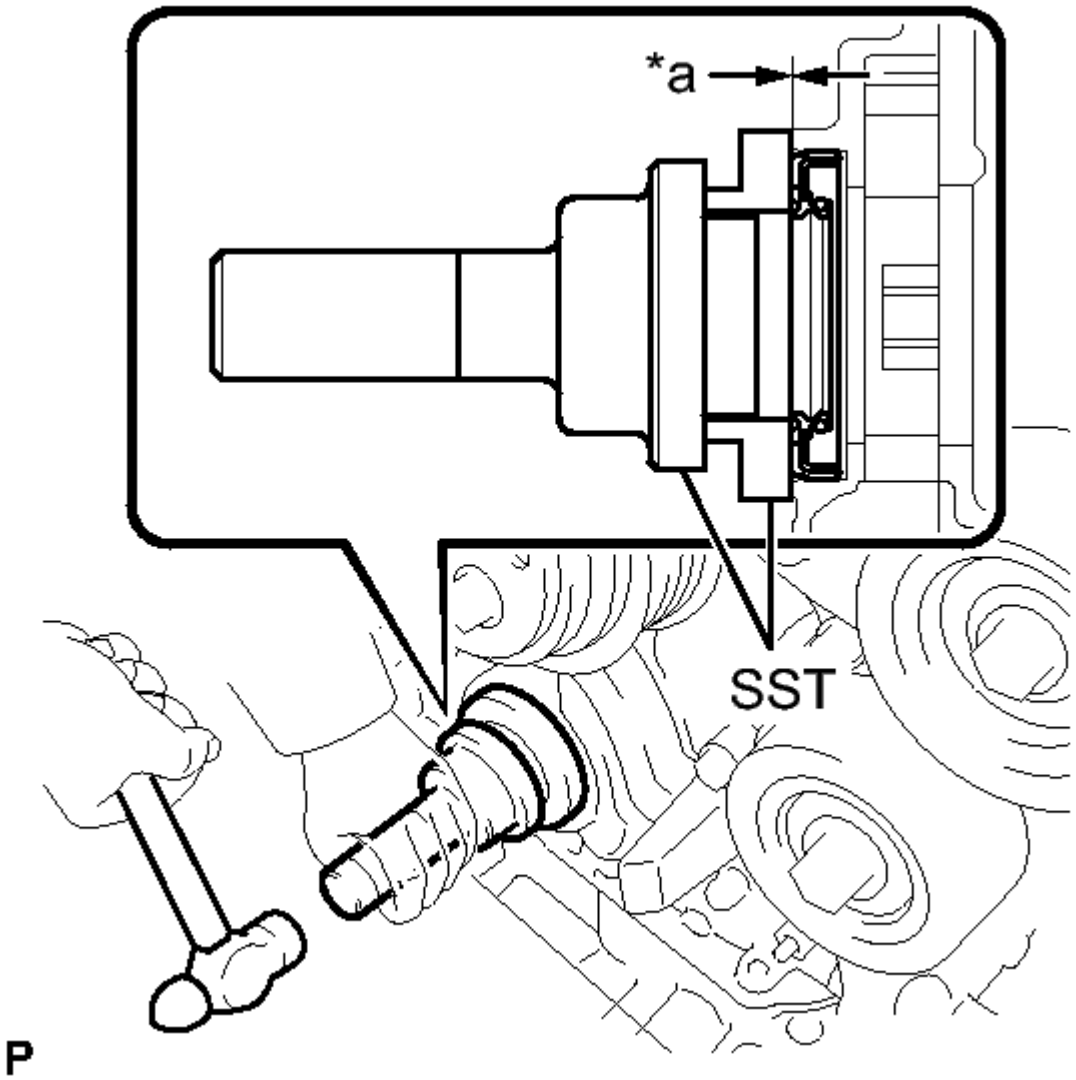


Fig. 66: Installing Timing Chain Case Oil Seal Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

TEXT IN ILLUSTRATION

*a	Oil seal tap in depth (0 to 1.0 mm)

- **SST: 09223-22010**
- **SST: 09506-35010**

Oil seal tap in depth

0 to 1.0 mm (0 to 0.0393 in.)

NOTE:

- **Keep the lip free of foreign matter.**
- **Do not tap the timing chain case oil seal at an angle.**

2. **INSTALL CRANKSHAFT PULLEY**
   a. Align the pulley set key with the key groove of the pulley, and slide on the pulley.
   b. Using SST, install the pulley bolt.

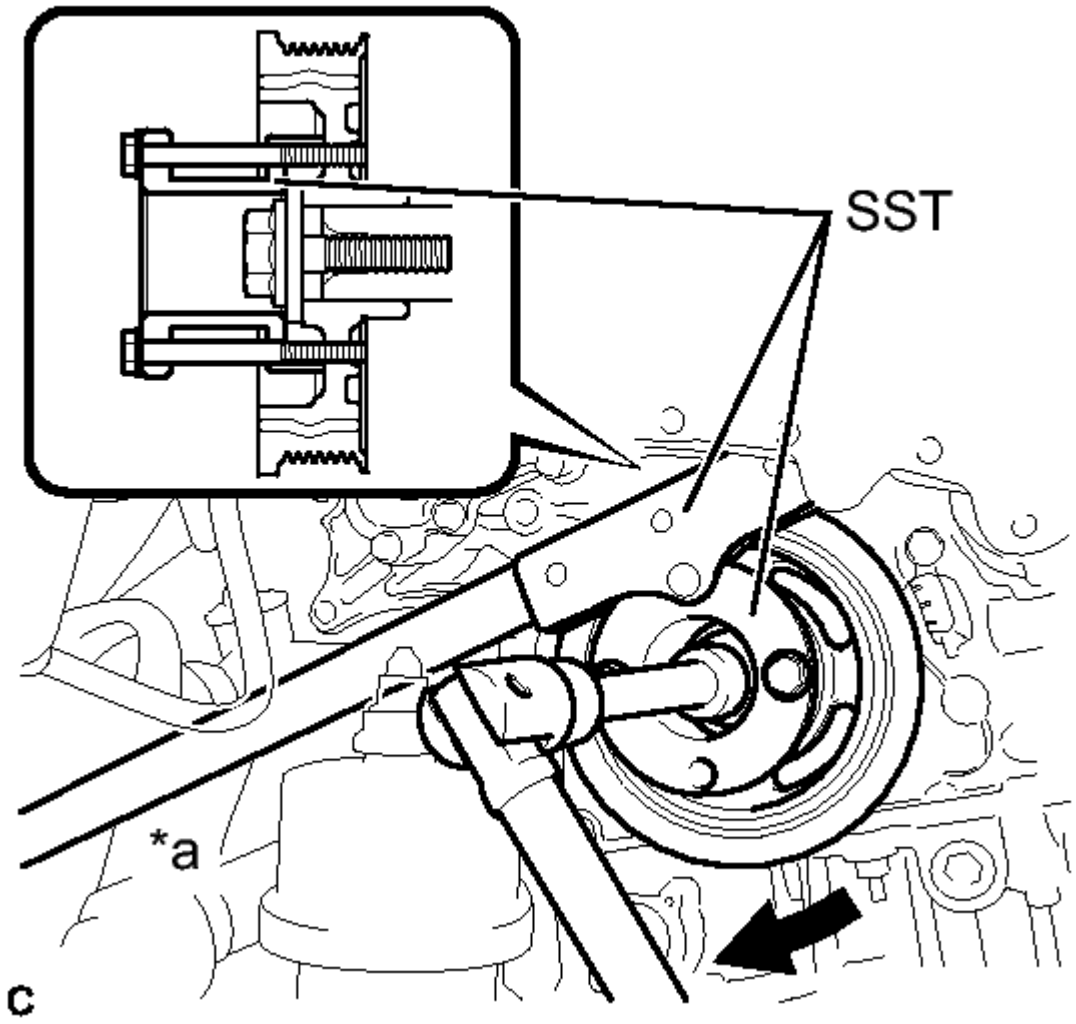


Fig. 67: Installing Crankshaft Pulley Bolt Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- **SST: 09213-70011**
  09213-70020
- **SST: 09330-00021**

Torque: 250 N*m (2550 kgf*cm, 184 ft.*lbf)

TEXT IN ILLUSTRATION

*a	Hold
·	Turn

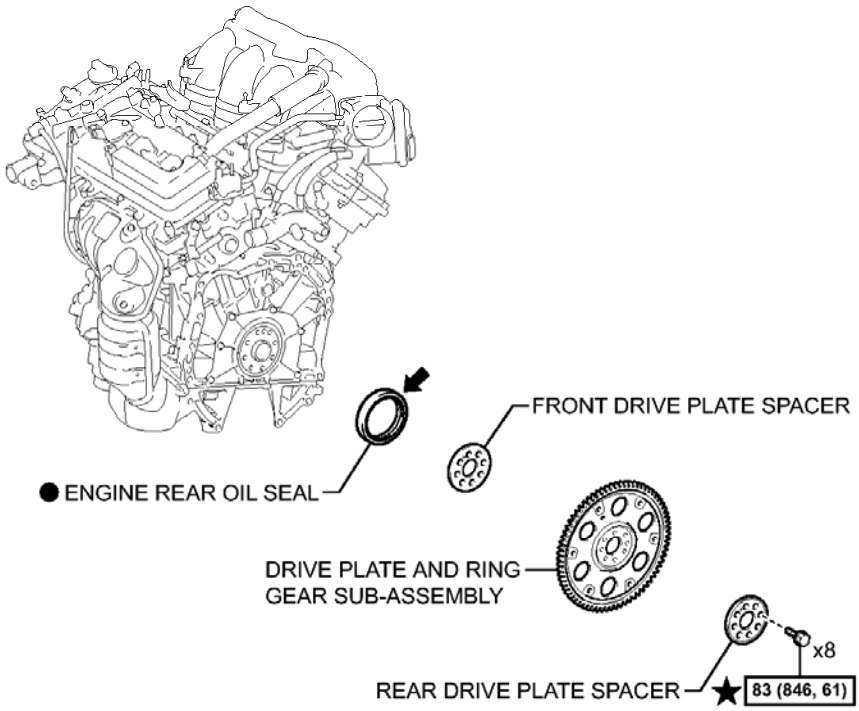
3. **INSTALL FAN AND GENERATOR V BELT** See step 1
4. **INSTALL FRONT FENDER APRON SEAL RH**
5. **INSTALL FRONT WHEEL RH**

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

REAR CRANKSHAFT OIL SEAL

COMPONENTS

ILLUSTRATION



P

Fig. 68: Rear Crankshaft Oil Seal Replacement Components With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

REMOVAL

1. **REMOVE AUTOMATIC TRANSAXLE ASSEMBLY (for 2WD)**

   Refer to **REMOVAL**

2. **REMOVE AUTOMATIC TRANSAXLE ASSEMBLY (for AWD)**

Refer to **REMOVAL**

3. **REMOVE DRIVE PLATE AND RING GEAR SUB-ASSEMBLY**
   a. Using SST, hold the crankshaft pulley.

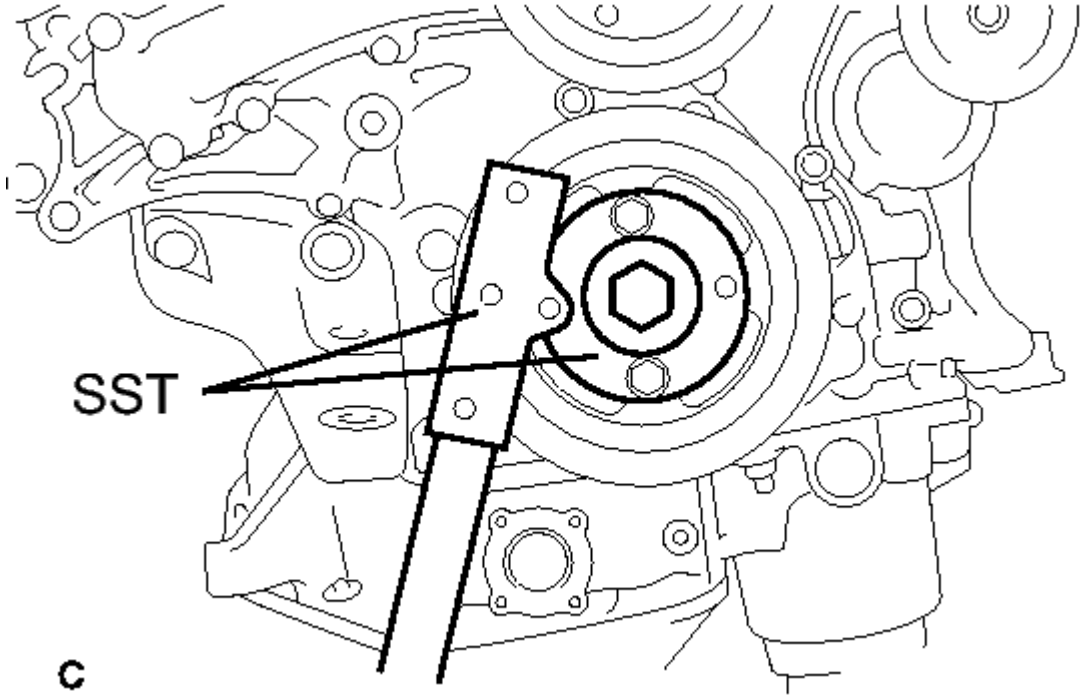
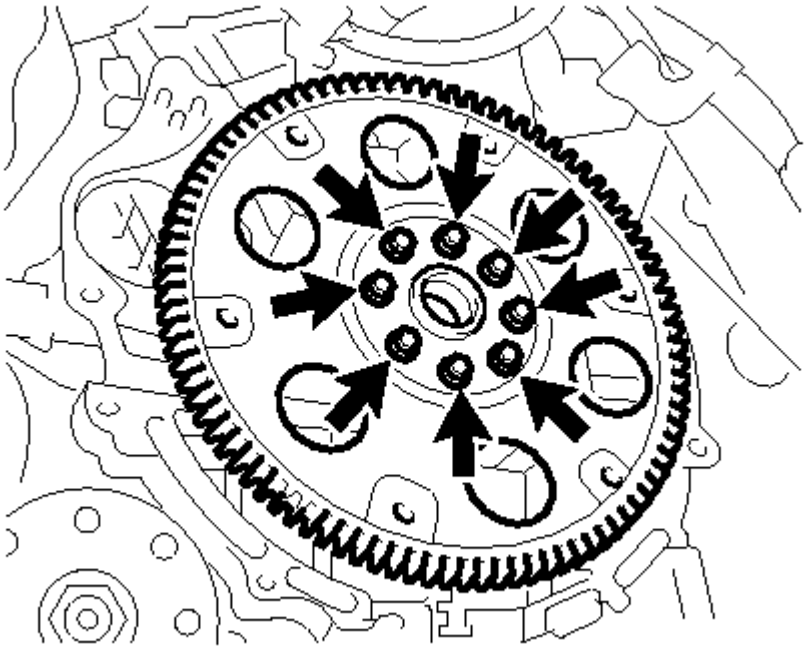


Fig. 69: Identifying Crankshaft Pulley And SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- **SST: 09213-70011**
  09213-70020
- **SST: 09330-00021**

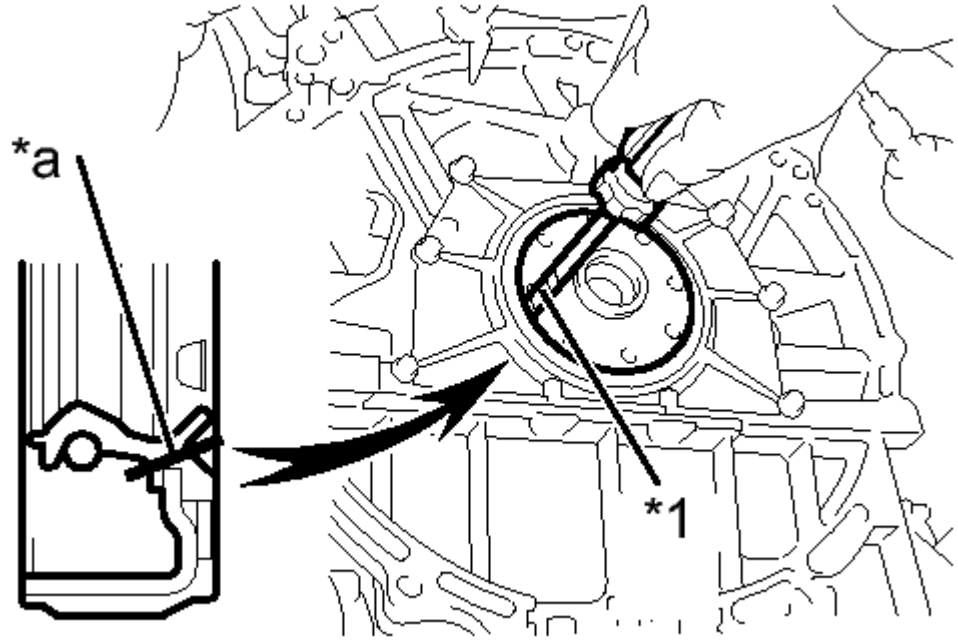
   b. Remove the 8 bolts, front drive plate spacer, drive plate and ring gear sub-assembly and rear drive plate spacer.



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Fig. 70: Identifying Bolts, Front Spacer, Drive Plate & Rear Spacer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **REMOVE ENGINE REAR OIL SEAL**
   a. Using a knife, cut off the engine rear oil seal lip.



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Fig. 71: Removing Engine Rear Oil Seal Using A Screwdriver

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

TEXT IN ILLUSTRATION

*1	Protective Tape
*a	Cut Position

b. Using a screwdriver, pry out the engine rear oil seal.

NOTE: Be careful not to damage the crankshaft.

HINT:

Tape the screwdriver tip before use.

INSTALLATION

INSTALLATION

1. **INSTALL ENGINE REAR OIL SEAL**
   a. Apply MP grease to a new engine rear oil seal lip.

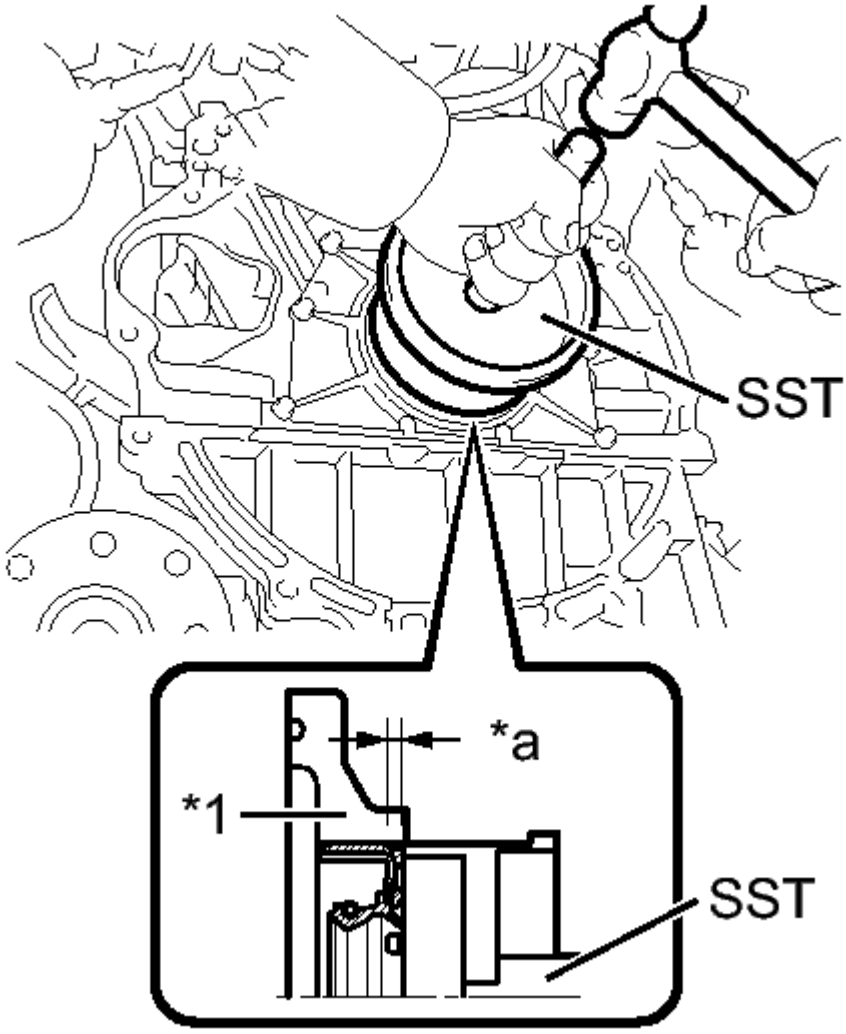


Fig. 72: Installing Engine Rear Oil Seal Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Retainer
*a	Oil seal tap in depth (-0.5 to 0.5 mm)

b. Using SST and a hammer, tap in the engine rear oil seal.
   - **SST: 09223-15030**
   - **SST: 09950-70010**

09951-07150

Oil seal tap in depth

-0.5 to 0.5 mm (-0.0196 to 0.0196 in.)

2. **INSTALL DRIVE PLATE AND RING GEAR SUB-ASSEMBLY**
   a. Using SST, hold the crankshaft pulley.
      - **SST: 09213-70011**
        09213-70020
      - **SST: 09330-00021**
   b. Clean the 8 bolts and 8 bolt holes.
   c. Install the front drive plate spacer.

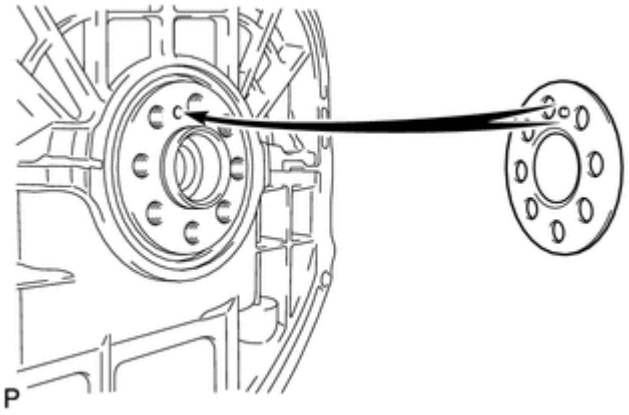


Fig. 73: Aligning Pin With Pin Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Align the pin of the front drive plate spacer with the pin hole of the crankshaft.

   d. Install the drive plate and ring gear sub-assembly and rear drive plate spacer onto the crankshaft.

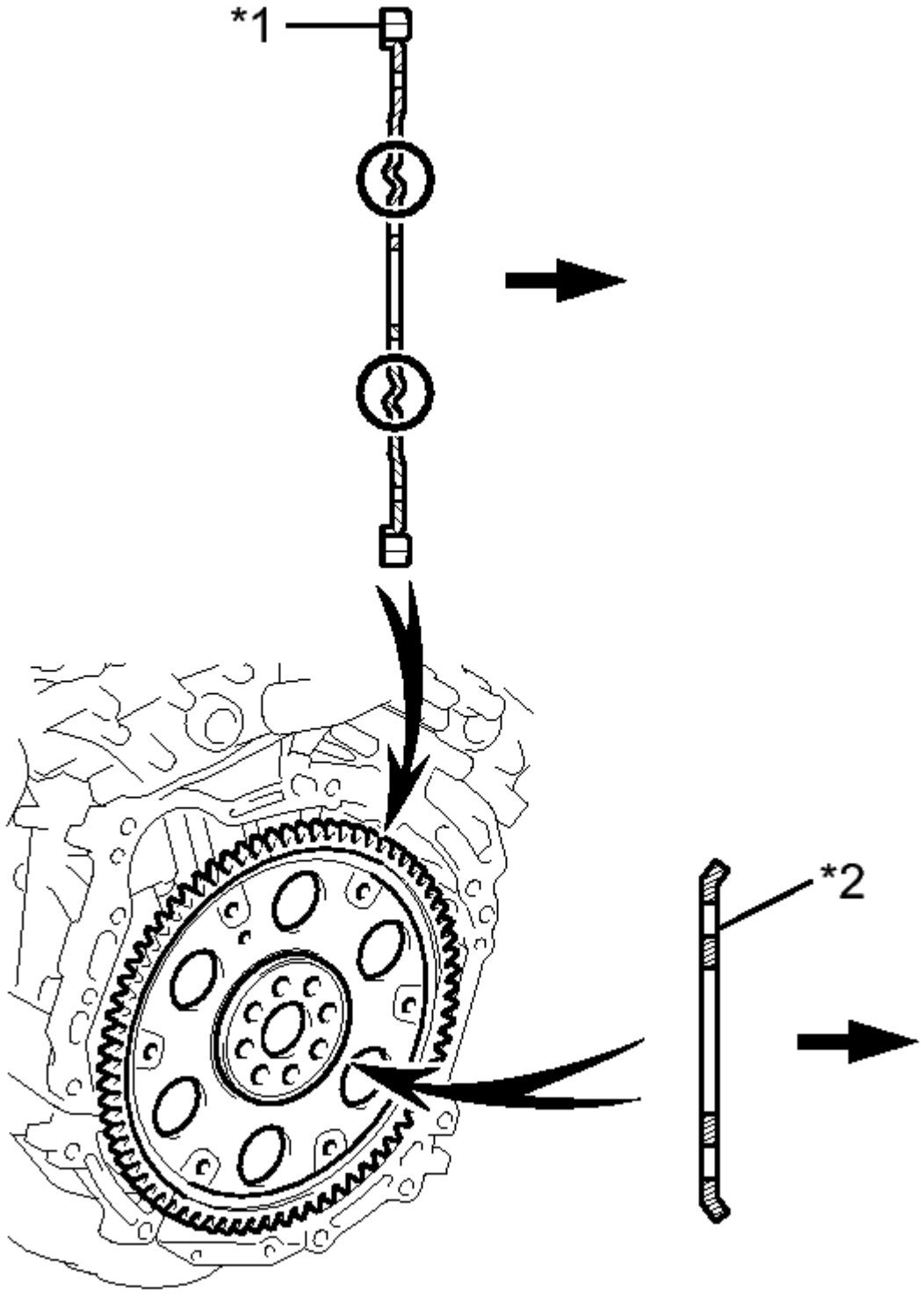


Fig. 74: Identifying Drive Plate/Ring Gear & Rear Drive Plate Spacer Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	Drive

*1	Plate
*2	Rear Spacer
	Transaxle Side

e. Apply adhesive to 2 or 3 threads of the 8 bolts.

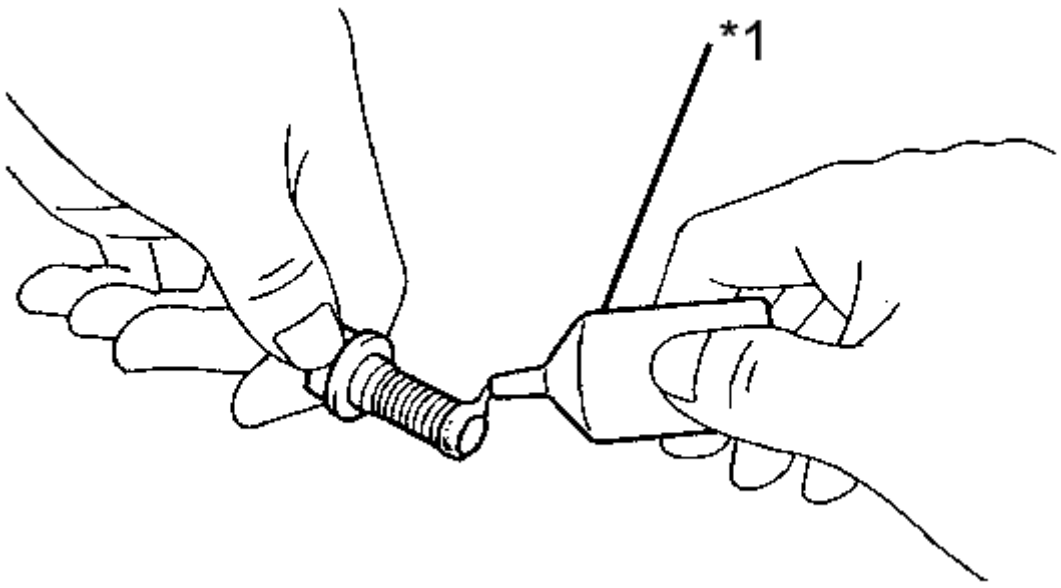


Fig. 75: Applying Adhesive To Bolt Threads
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

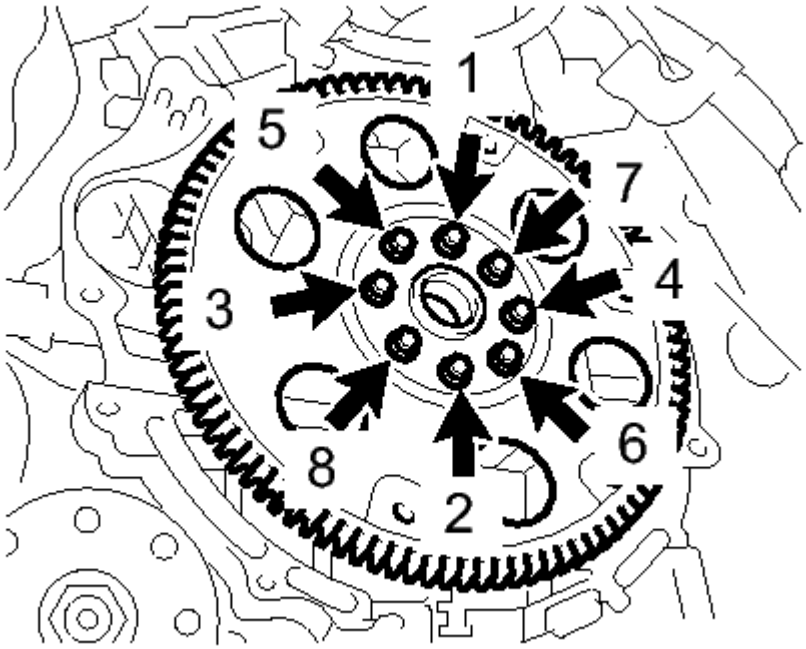
TEXT IN ILLUSTRATION

*1	Adhesive

Adhesive

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

f. In several steps, uniformly install and tighten the 8 bolts in the sequence shown in the illustration.



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Fig. 76: Identifying Mounting Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

3. **INSTALL AUTOMATIC TRANSAXLE ASSEMBLY (for 2WD)**

   Refer to **INSTALLATION**

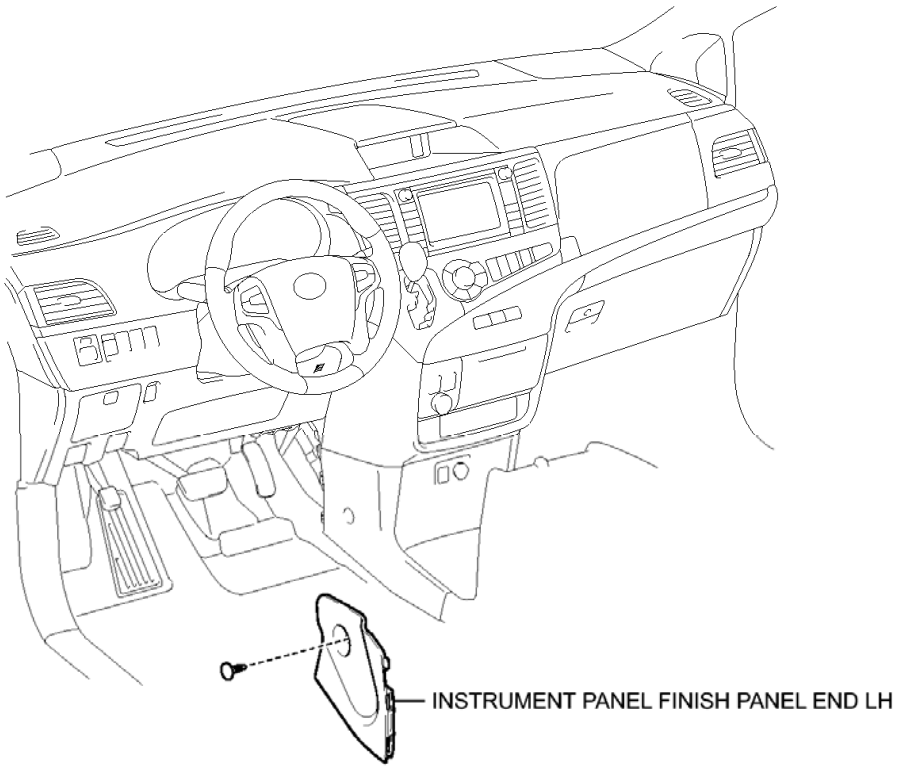
4. **INSTALL AUTOMATIC TRANSAXLE ASSEMBLY (for AWD)**

   Refer to **INSTALLATION**

ENGINE ASSEMBLY

COMPONENTS

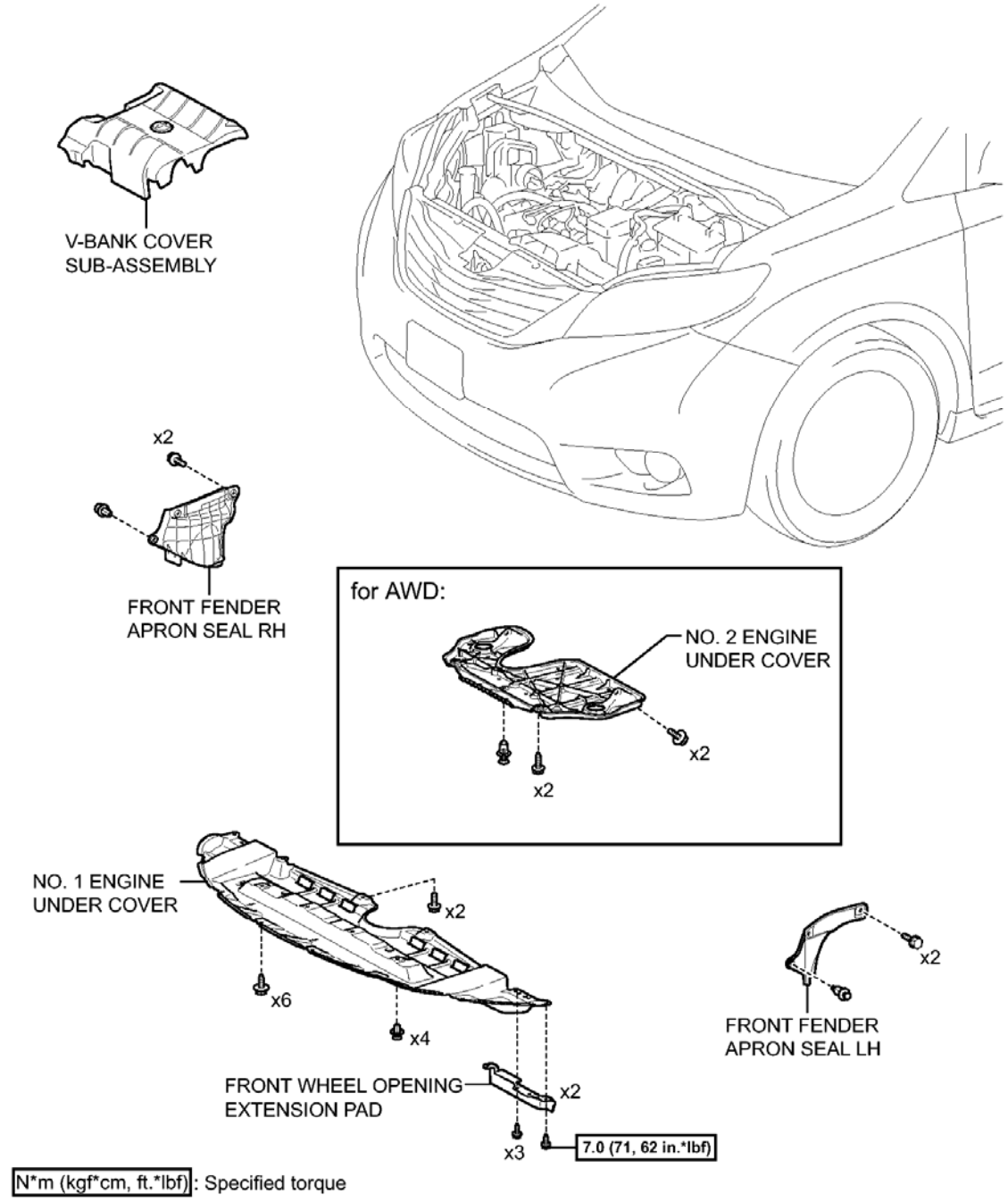
ILLUSTRATION



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Fig. 77: Engine Assembly Replacement Components (1 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

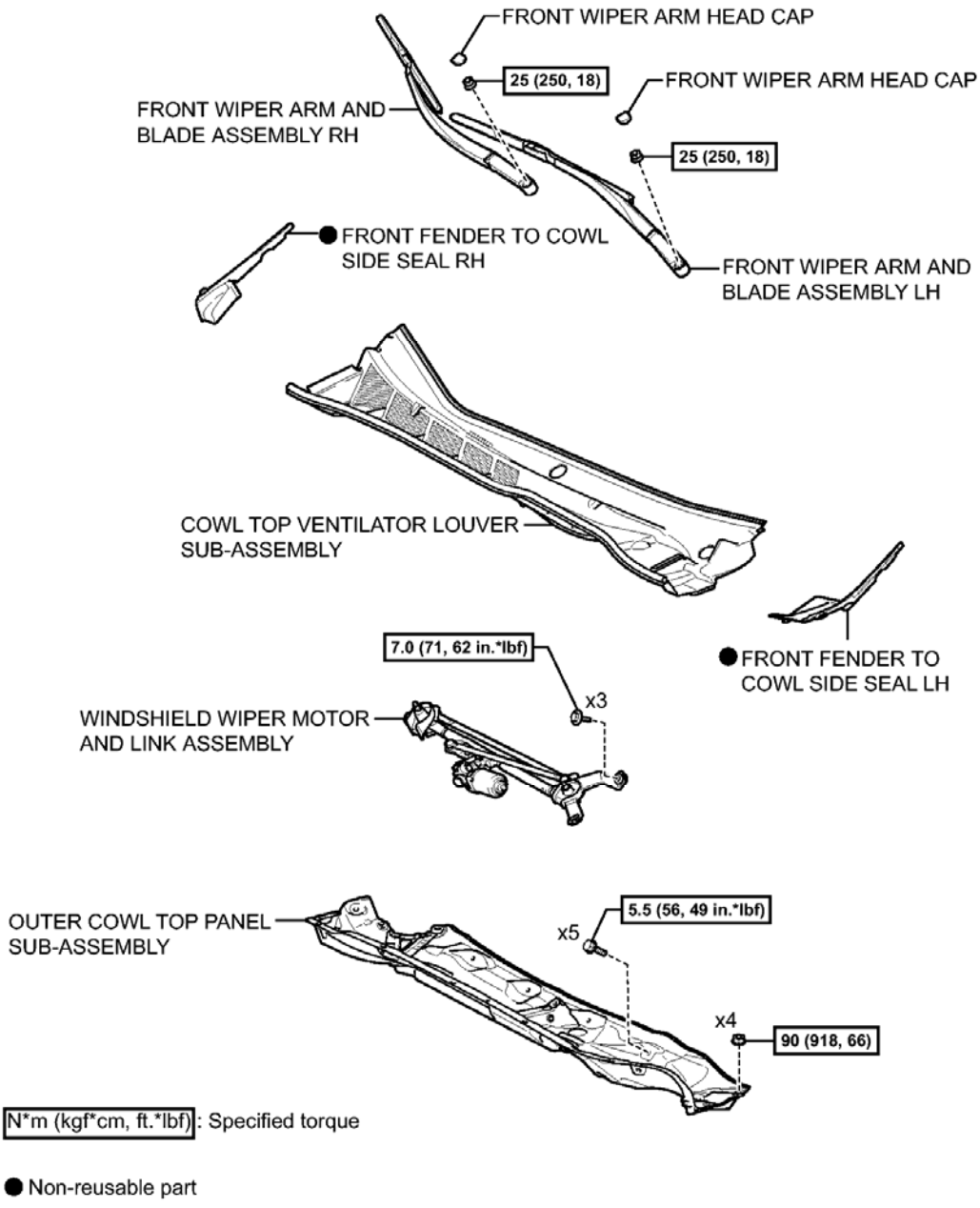
ILLUSTRATION



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Fig. 78: Engine Assembly Replacement Components With Torque Specifications (2 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



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Fig. 79: Engine Assembly Replacement Components With Torque Specifications (3 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

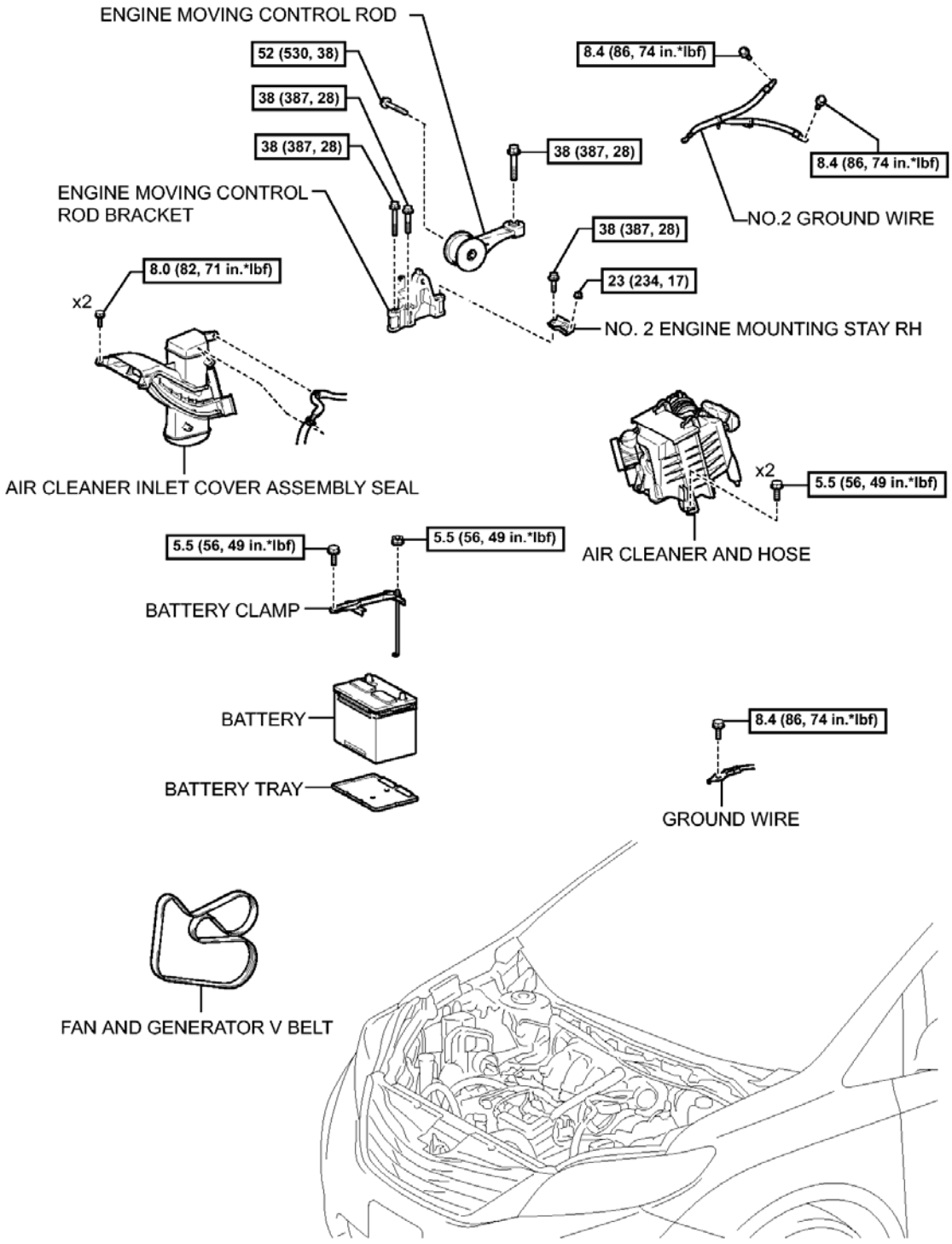
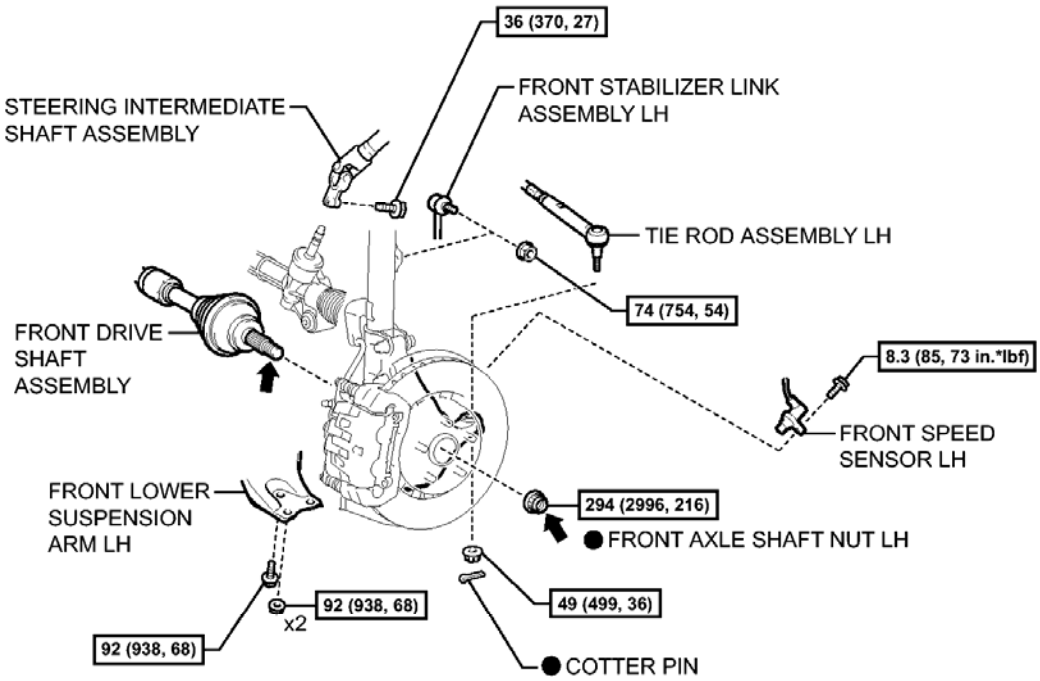


Fig. 80: Engine Assembly Replacement Components With Torque Specifications (4 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



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

● Non-reusable part

⬅ Do not apply lubricants to the threaded parts

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Fig. 81: Engine Assembly Replacement Components With Torque Specifications (5 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

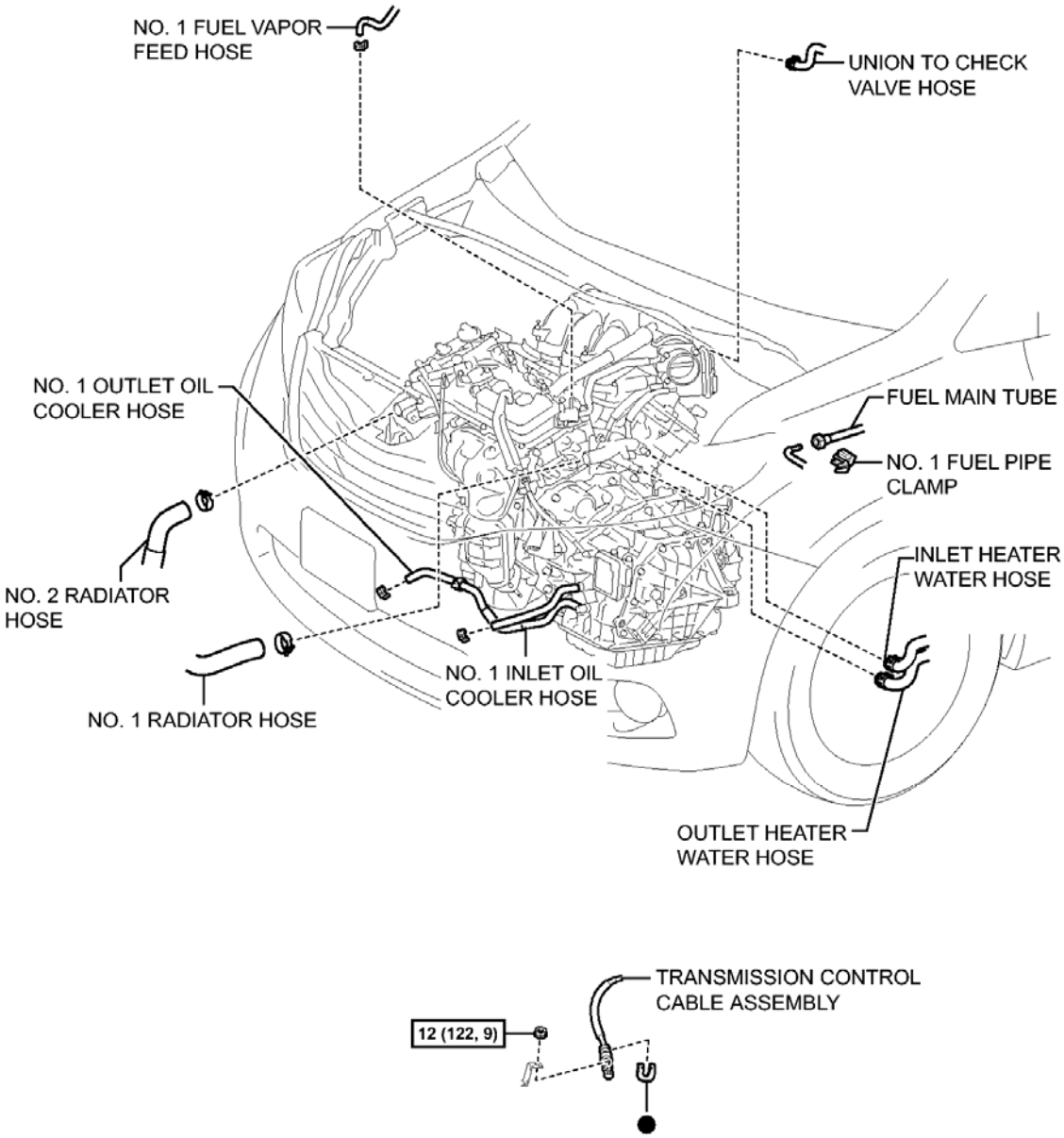
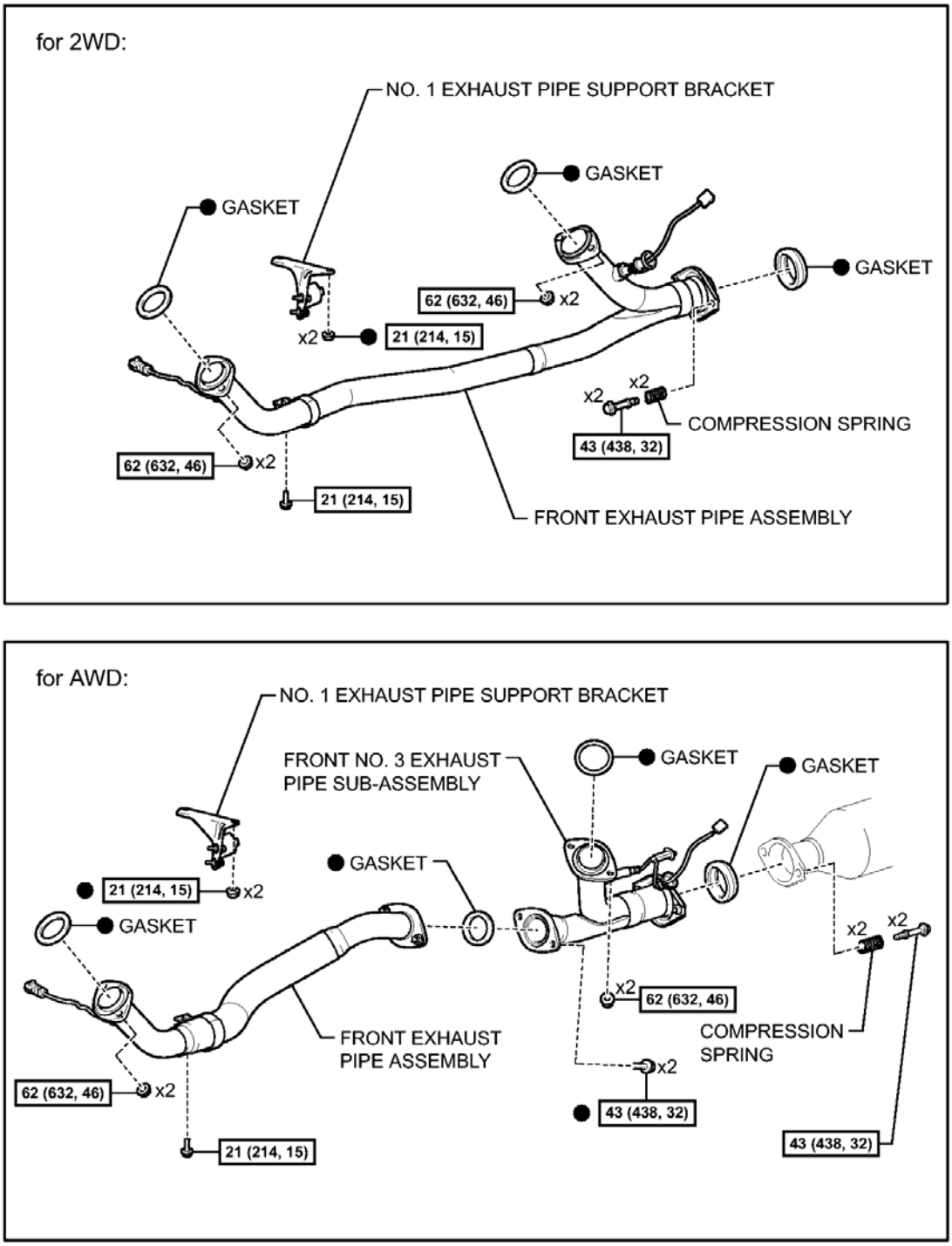


Fig. 82: Engine Assembly Replacement Components With Torque Specifications (6 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

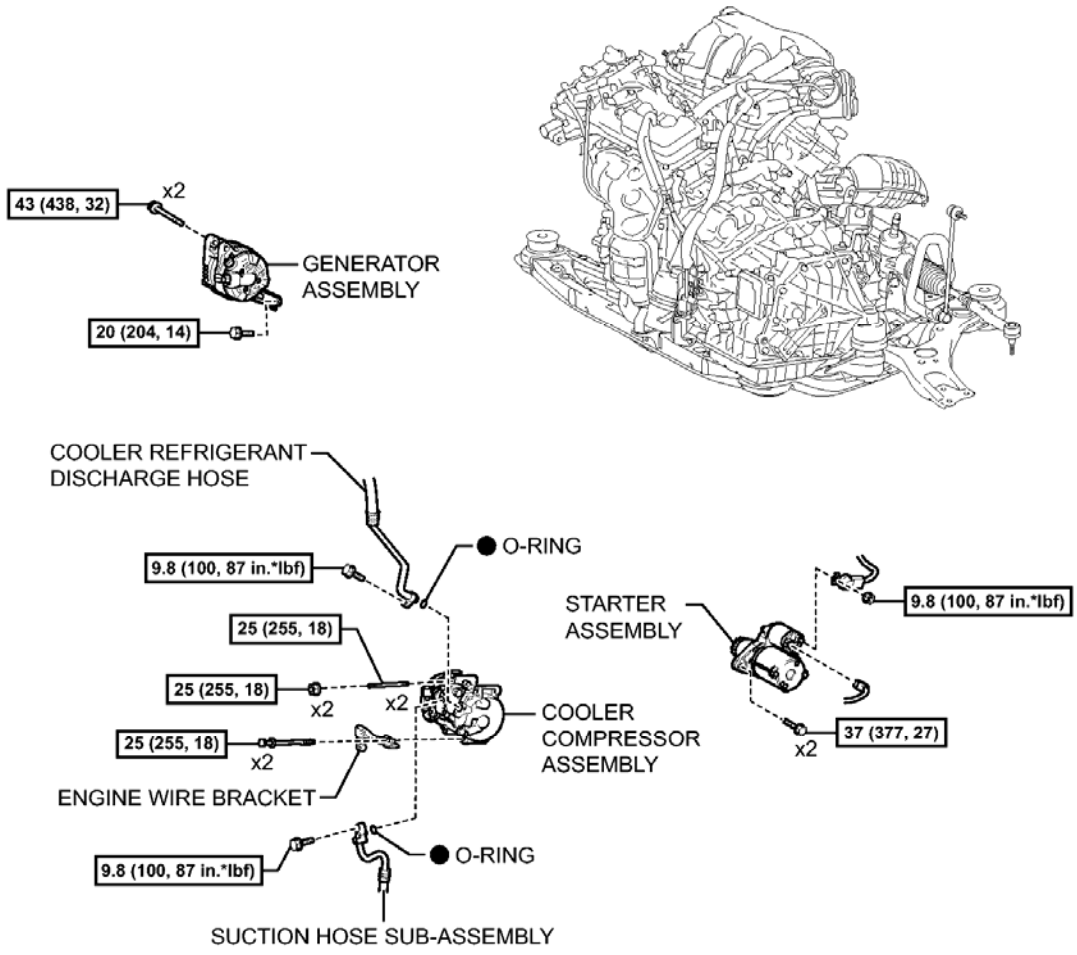
ILLUSTRATION



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Fig. 83: Engine Assembly Replacement Components With Torque Specifications (7 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

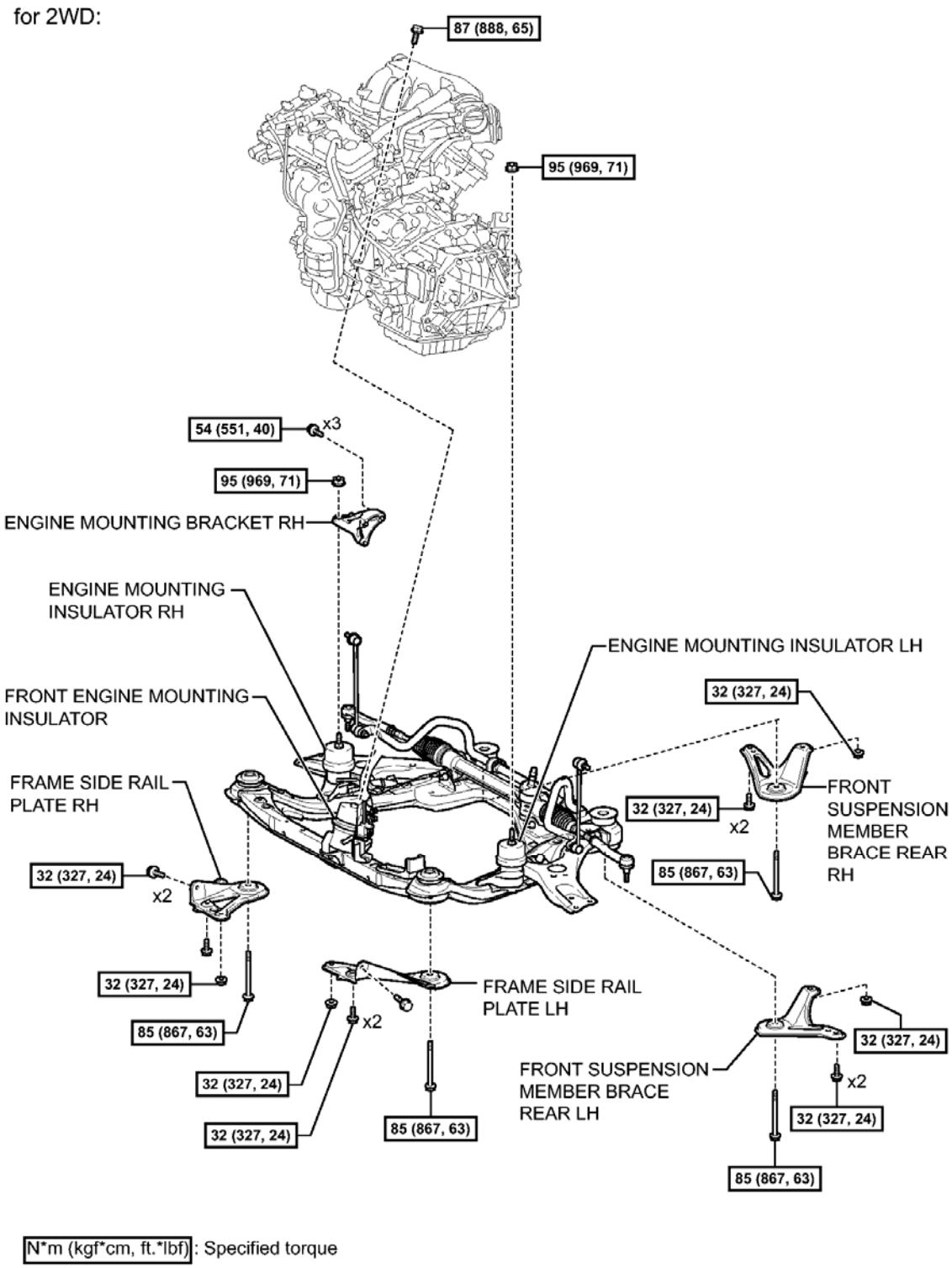
ILLUSTRATION



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Fig. 84: Engine Assembly Replacement Components With Torque Specifications (8 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



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Fig. 85: Engine Assembly Replacement Components With Torque Specifications (9 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

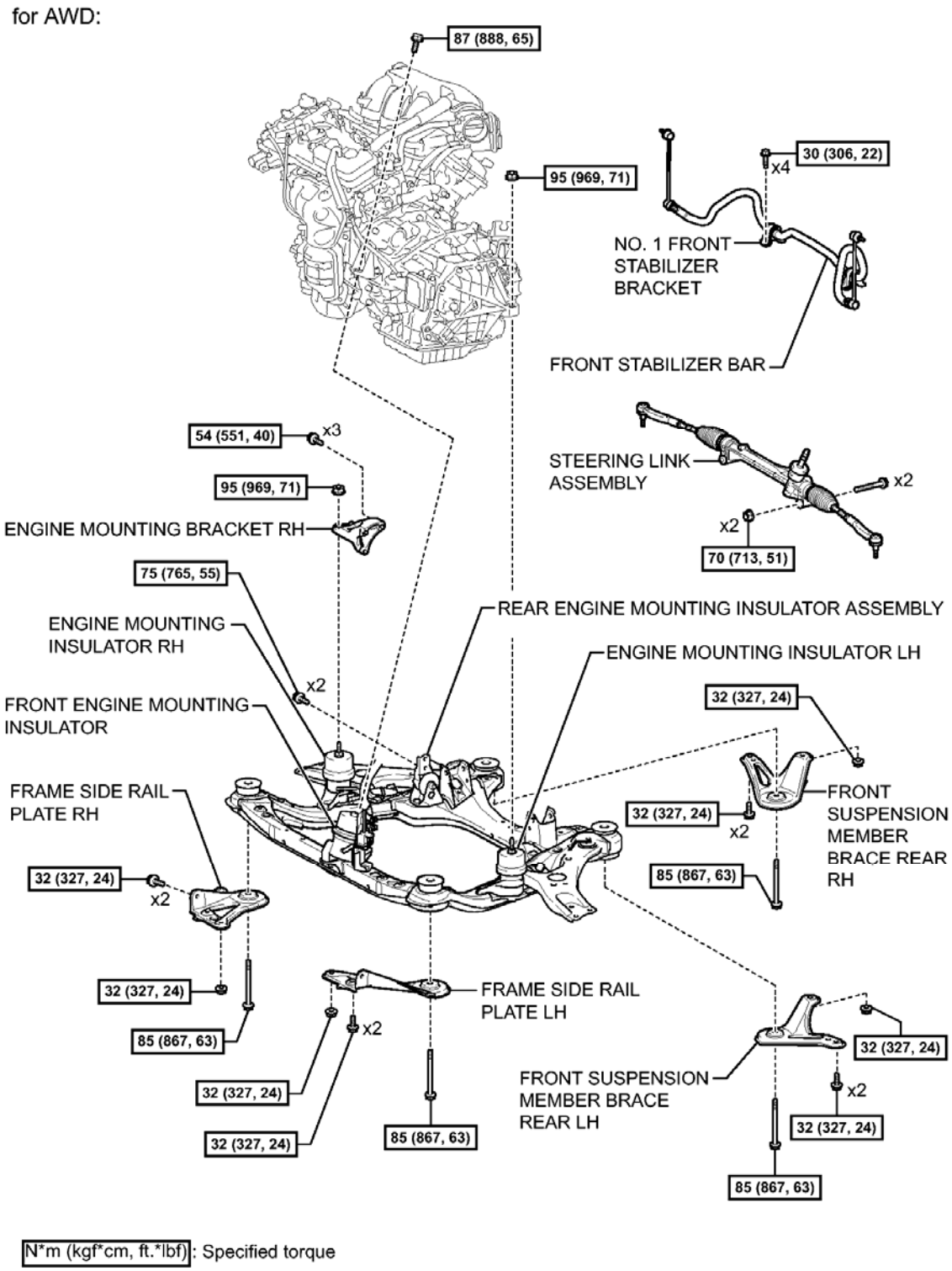
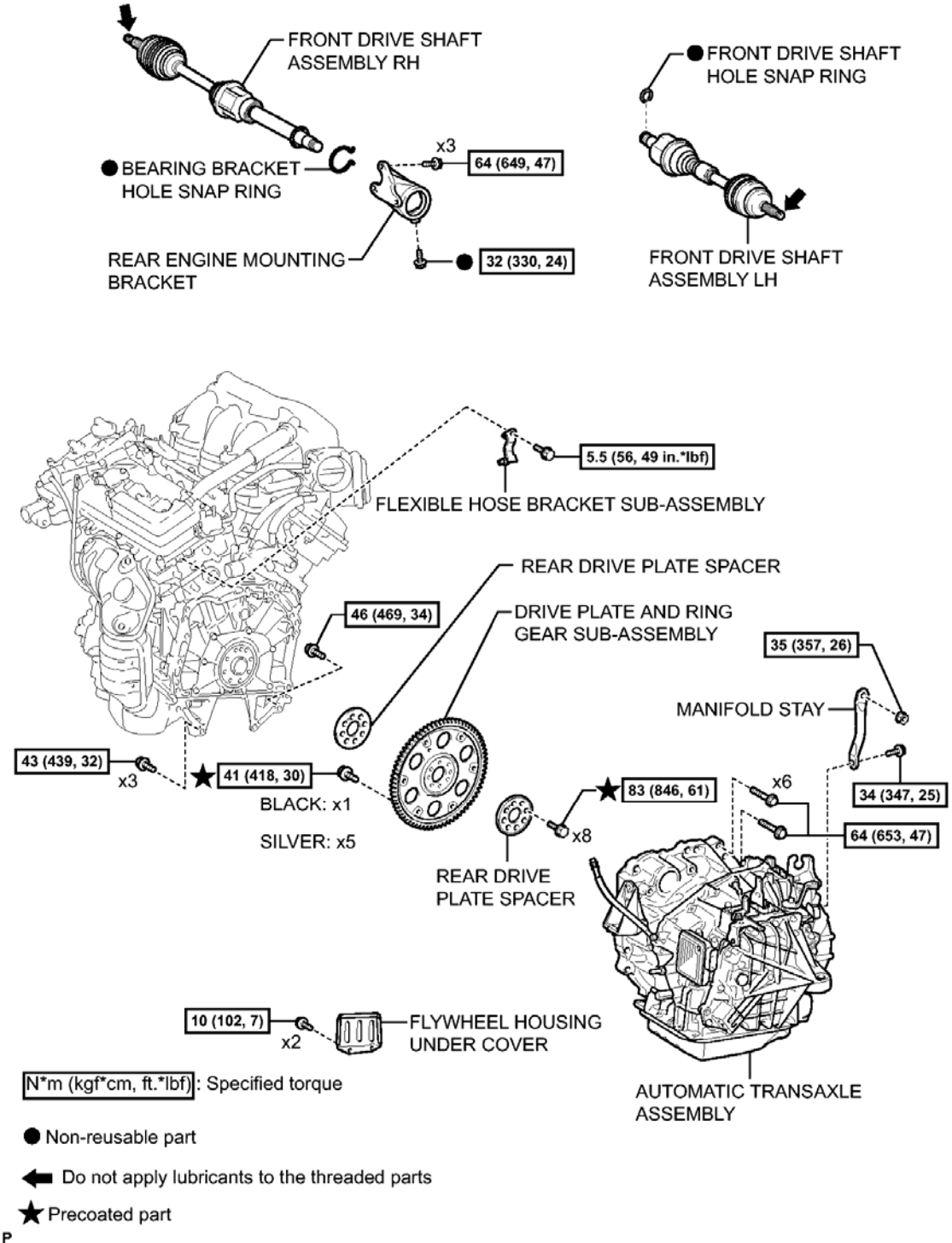


Fig. 86: Engine Assembly Replacement Components With Torque Specifications (10 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

for 2WD:



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Fig. 87: Engine Assembly Replacement Components With Torque Specifications (11 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

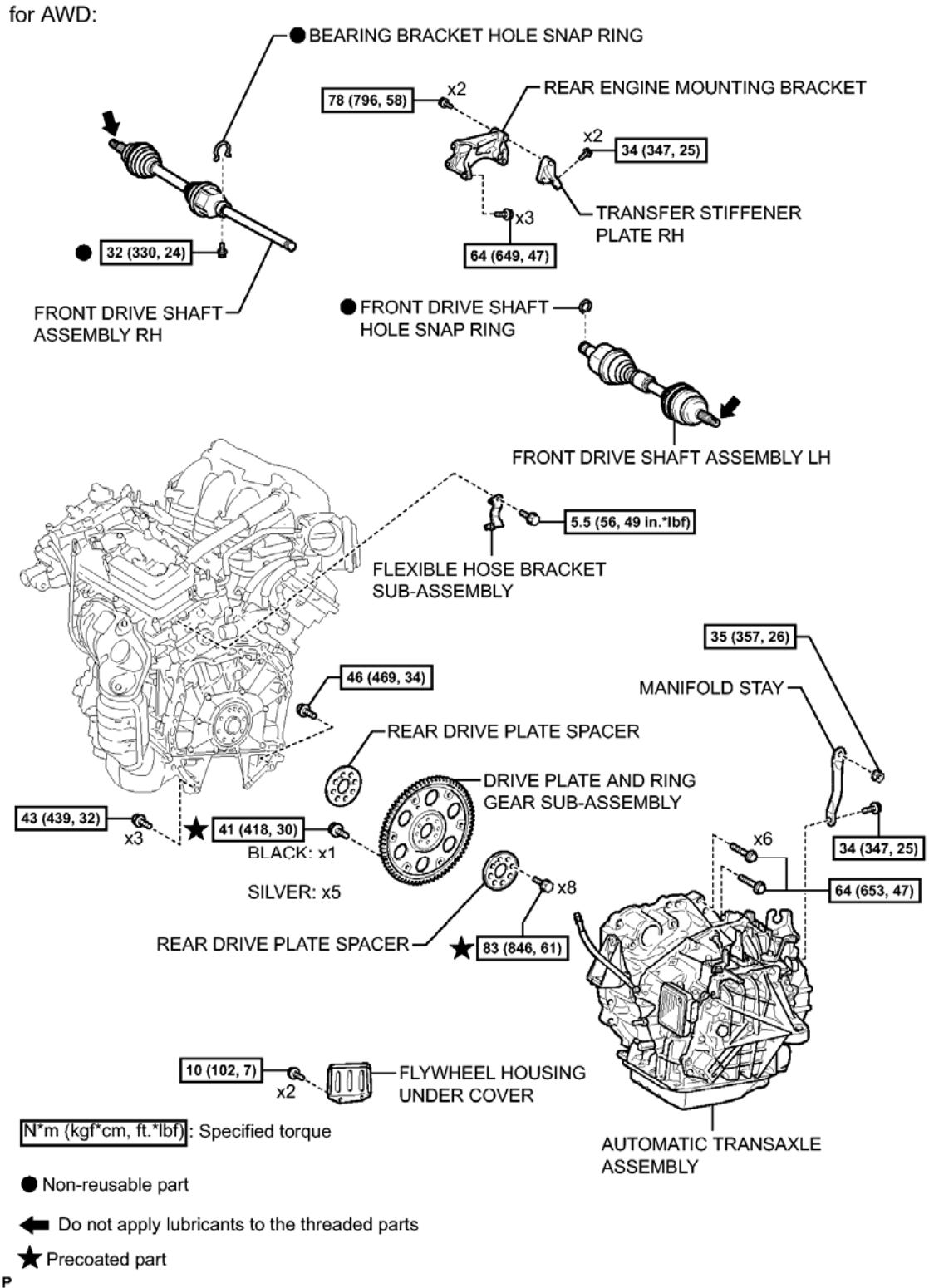


Fig. 88: Engine Assembly Replacement Components With Torque Specifications (12 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

REMOVAL

1. **ALIGN FRONT WHEELS FACING STRAIGHT AHEAD**
2. **RECOVER REFRIGERANT FROM REFRIGERATION SYSTEM** . Refer to **REPLACEMENT - Step 1**
3. **DISCHARGE FUEL SYSTEM PRESSURE**

   Refer to **ON-VEHICLE INSPECTION**

4. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

   NOTE: When disconnecting the cable, some systems need to be initialized after the cable is reconnected. Refer to INITIALIZATION .

5. **REMOVE INSTRUMENT PANEL FINISH PANEL END LH** . Refer to **REMOVAL - Step 1**
6. **REMOVE FRONT WHEEL**
7. **REMOVE NO. 1 ENGINE UNDER COVER** . Refer to **REMOVAL - Step 4**
8. **REMOVE NO. 2 ENGINE UNDER COVER (for AWD)** . Refer to **REMOVAL - Step 5**
9. **REMOVE FRONT FENDER APRON SEAL LH**
   a. Remove the 2 bolts, clip and front fender apron seal LH.

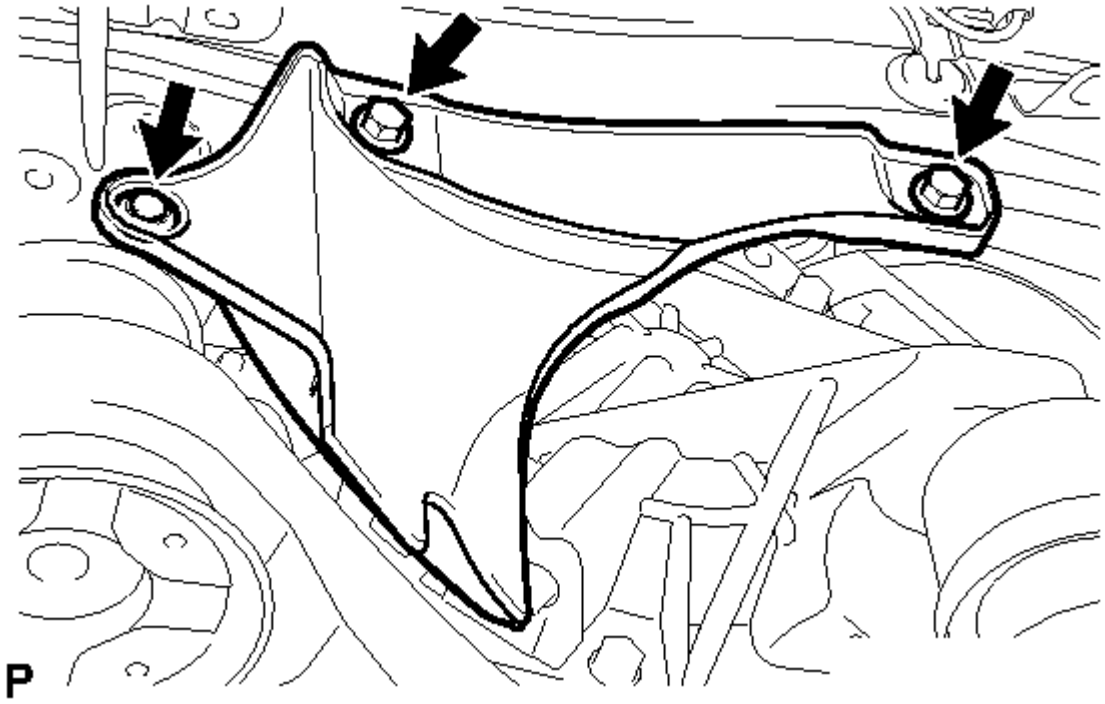


Fig. 89: Identifying Front Fender Apron Seal LH Bolts And Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. **REMOVE FRONT FENDER APRON SEAL RH**

a. Remove the 2 bolts, clip and front fender apron seal RH.

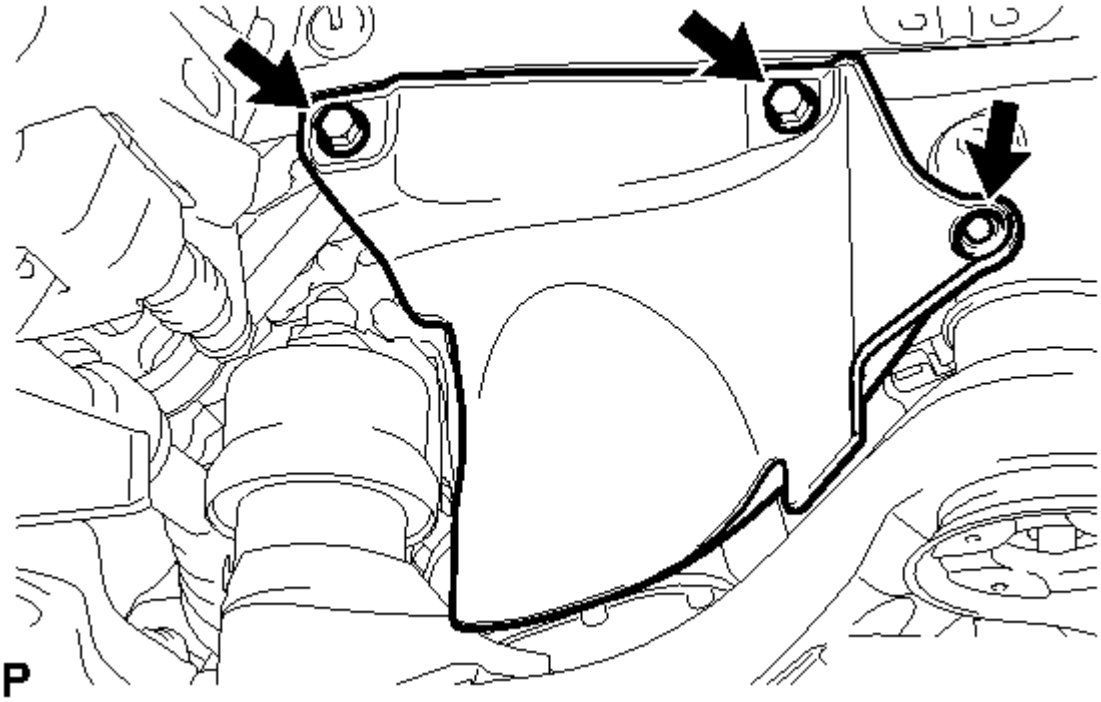


Fig. 90: Identifying Front Fender Apron Seal RH Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. **DRAIN ENGINE OIL** . Refer to **REPLACEMENT - Step 1**
12. **DRAIN ENGINE COOLANT** . Refer to **REPLACEMENT - Step 3**
13. **DRAIN AUTOMATIC TRANSAXLE FLUID (for 2WD)** . Refer to **REPLACEMENT - Step 1**
14. **DRAIN AUTOMATIC TRANSAXLE FLUID (for AWD)** . Refer to **REPLACEMENT - Step 1**
15. **DRAIN TRANSFER OIL (for AWD)** . Refer to **REPLACEMENT - Step 1**
16. **REMOVE FRONT WIPER ARM HEAD CAP** . Refer to **REMOVAL - Step 1**
17. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH** . Refer to **REMOVAL - Step 2**
18. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH** . Refer to **REMOVAL - Step 3**
19. **REMOVE FRONT FENDER TO COWL SIDE SEAL LH** . Refer to **REMOVAL - Step 4**
20. **REMOVE FRONT FENDER TO COWL SIDE SEAL RH** . Refer to **REMOVAL - Step 5**
21. **REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** . Refer to **REMOVAL - Step 6**
22. **REMOVE WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** . Refer to **REMOVAL - Step 7**
23. **REMOVE OUTER COWL TOP PANEL SUB-ASSEMBLY** . Refer to **REMOVAL - Step 10**
24. **REMOVE V-BANK COVER SUB-ASSEMBLY**
    a. Hold the front of the V-bank cover sub-assembly and raise it to disengage the 2 retainers on the front of the V-bank cover sub-assembly. Continue to raise the V-bank cover sub-assembly to disengage the 2 retainers on the rear of the V-bank cover sub-assembly and remove the V-bank

cover sub-assembly.

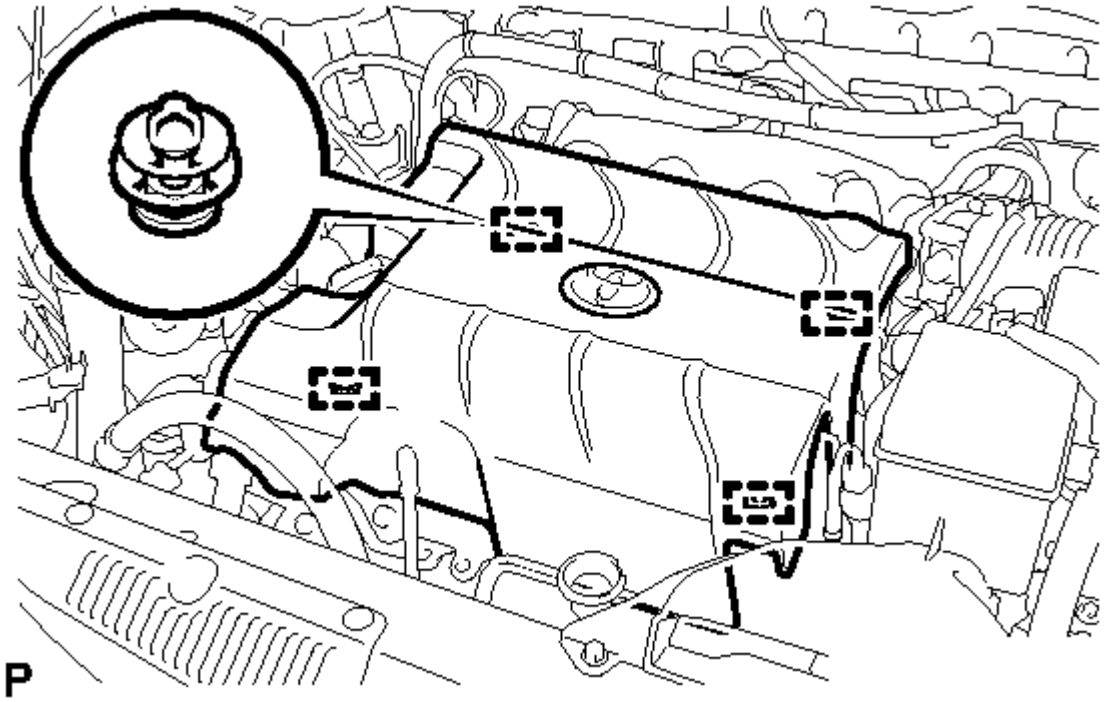


Fig. 91: Identifying V-Bank Cover Sub-Assembly & Retainers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Attempting to disengage both front and rear retainers at the same time may cause the V-bank cover sub-assembly to break.

25. **REMOVE AIR CLEANER INLET COVER ASSEMBLY SEAL**
    a. Disconnect the 3 vacuum hose clamps from the air cleaner inlet cover assembly seal.

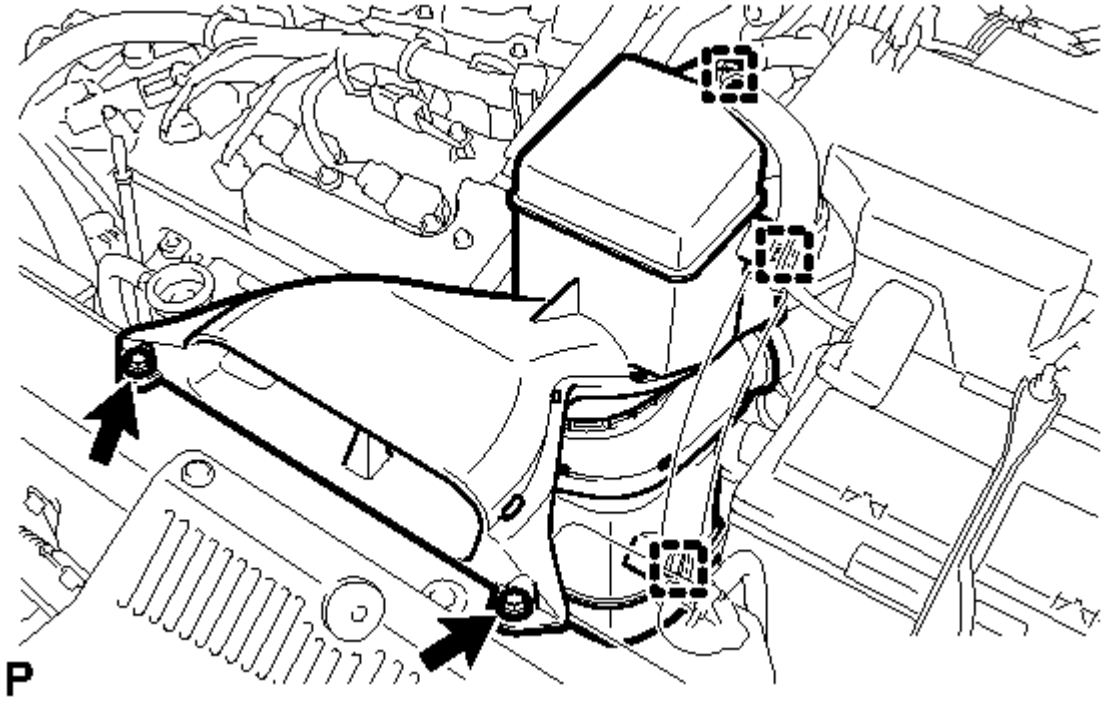


Fig. 92: Identifying Air Cleaner Inlet Cover Assembly Seal, Vacuum Hose & Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the 2 bolts and air cleaner inlet cover assembly seal.

26. **REMOVE BATTERY**

a. Disconnect the positive (+) cable from the positive (+) battery terminal.

b. Loosen the nut, and remove the bolt from the battery clamp.

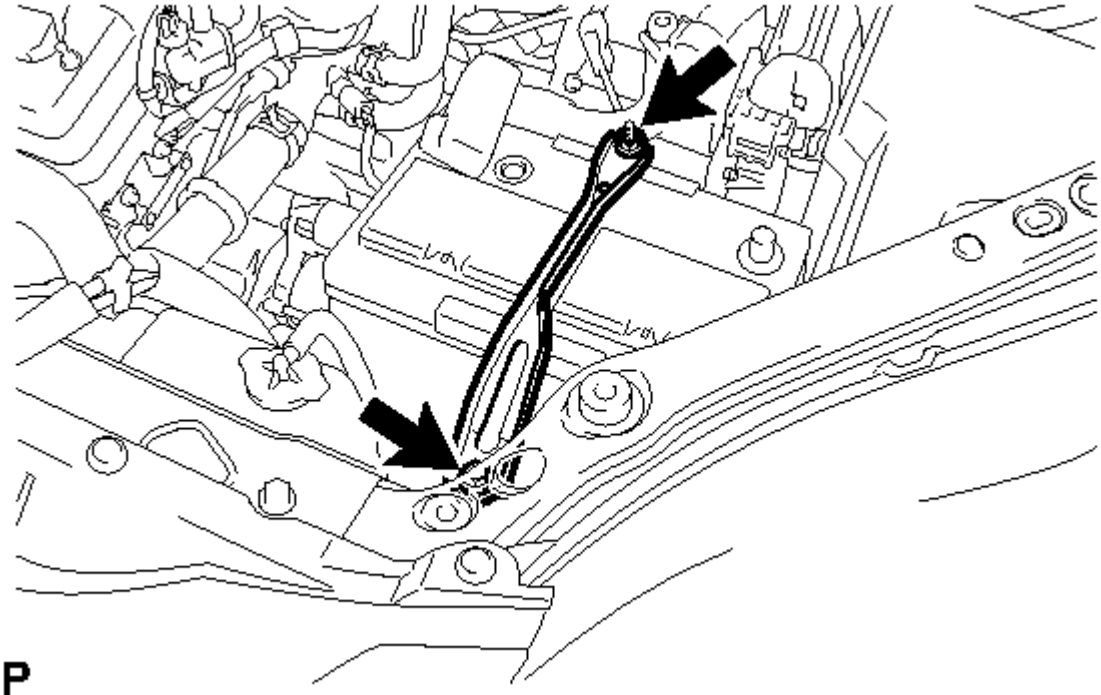
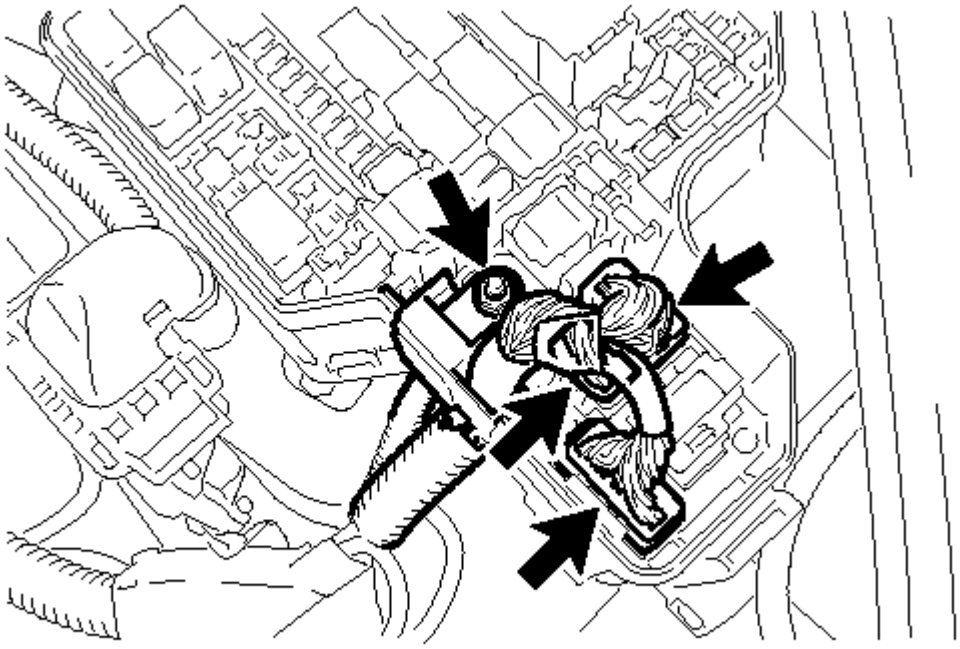


Fig. 93: Identifying Battery Clamp & Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Remove the battery and battery tray.

27. **REMOVE AIR CLEANER AND HOSE** . Refer to **REMOVAL - Step 7**
28. **DISCONNECT ENGINE WIRE**
    a. Remove the relay block cover.
    b. Remove the 2 bolts and separate the 2 ground wires.
    c. Disconnect the 3 connectors.



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Fig. 94: Identifying Engine Wire Connectors, Ground Wires & Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Remove the nut.
e. Using a screwdriver, unlock the claw and separate the engine wire from the engine room relay block.
f. Pull up the lever to disconnect the ECM connector.

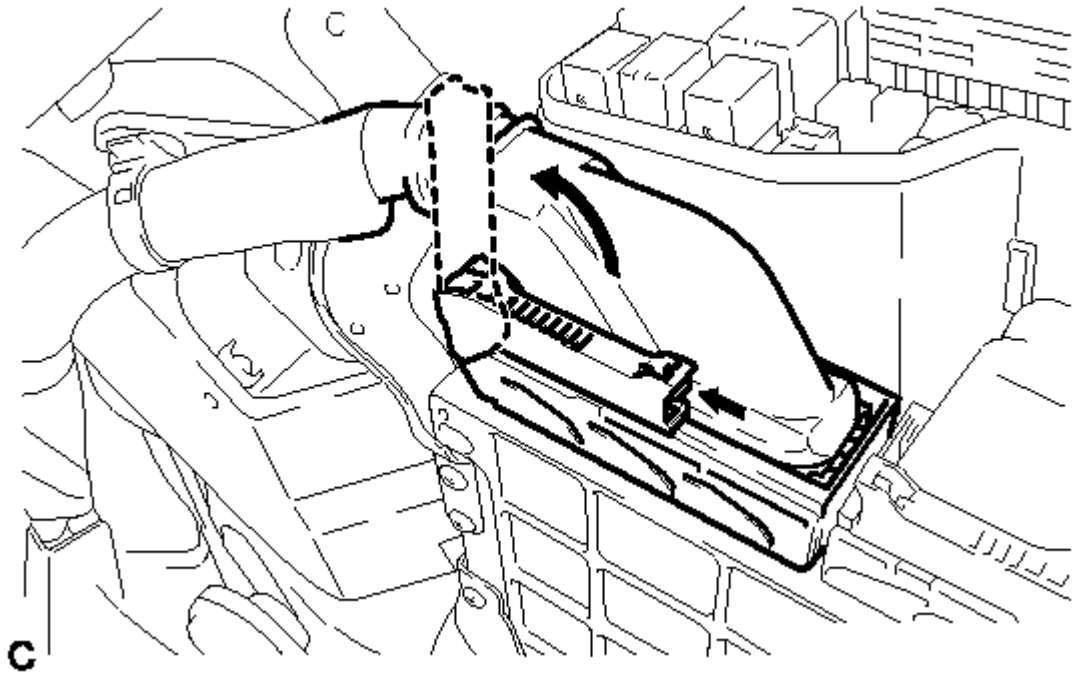


Fig. 95: Disconnecting ECM Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

29. **DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**
    a. Remove the nut from the control shaft lever.

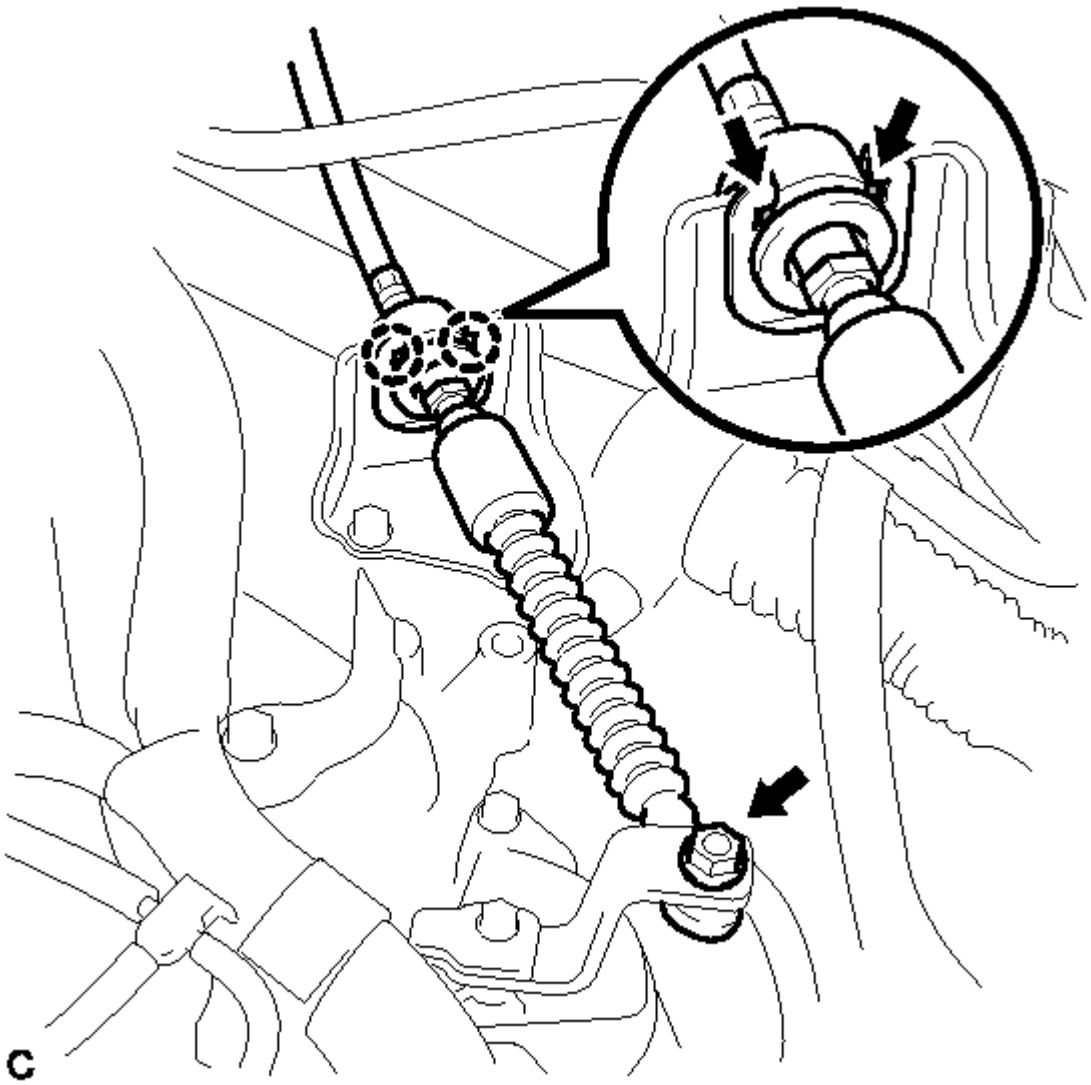


Fig. 96: Identifying Control Shaft Lever Nut And Control Cable Bracket Clip With Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using a screwdriver, disengage the 4 claws and disconnect the control cable with clip from the control cable bracket.

c. Remove the clip.

30. **DISCONNECT NO. 1 FUEL VAPOR FEED HOSE**

a. Disconnect the No. 1 fuel vapor feed hose.

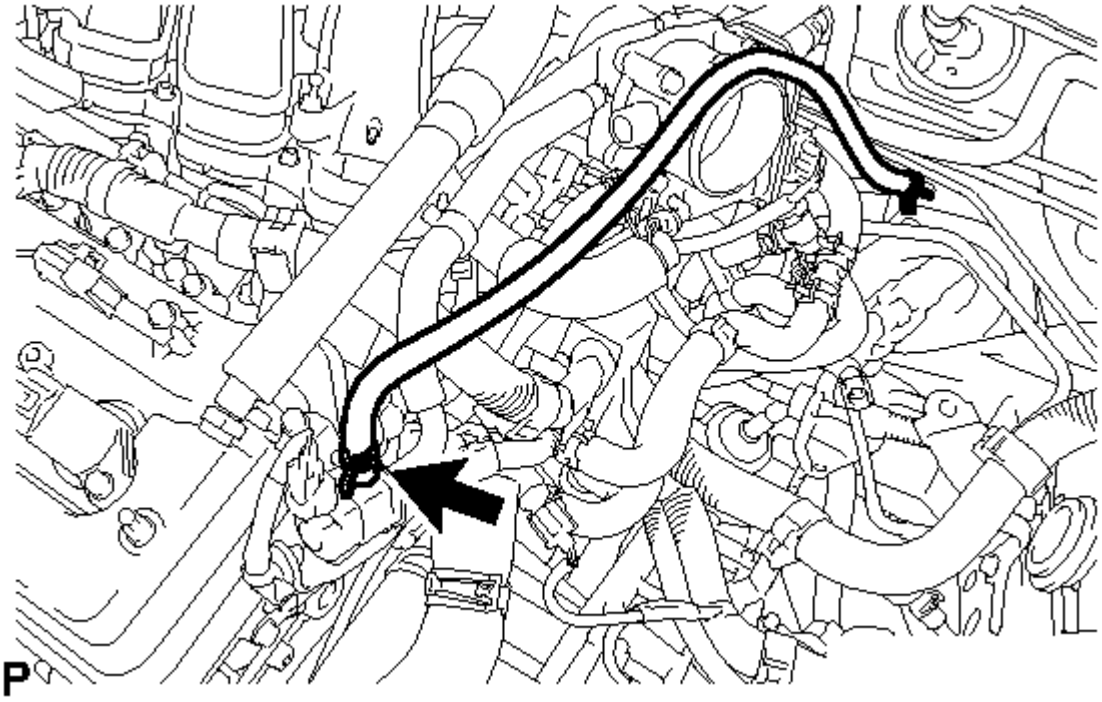


Fig. 97: Identifying No. 1 Fuel Vapor Feed Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

31. **DISCONNECT NO. 1 RADIATOR HOSE**
    a. Disconnect the No. 1 radiator hose.

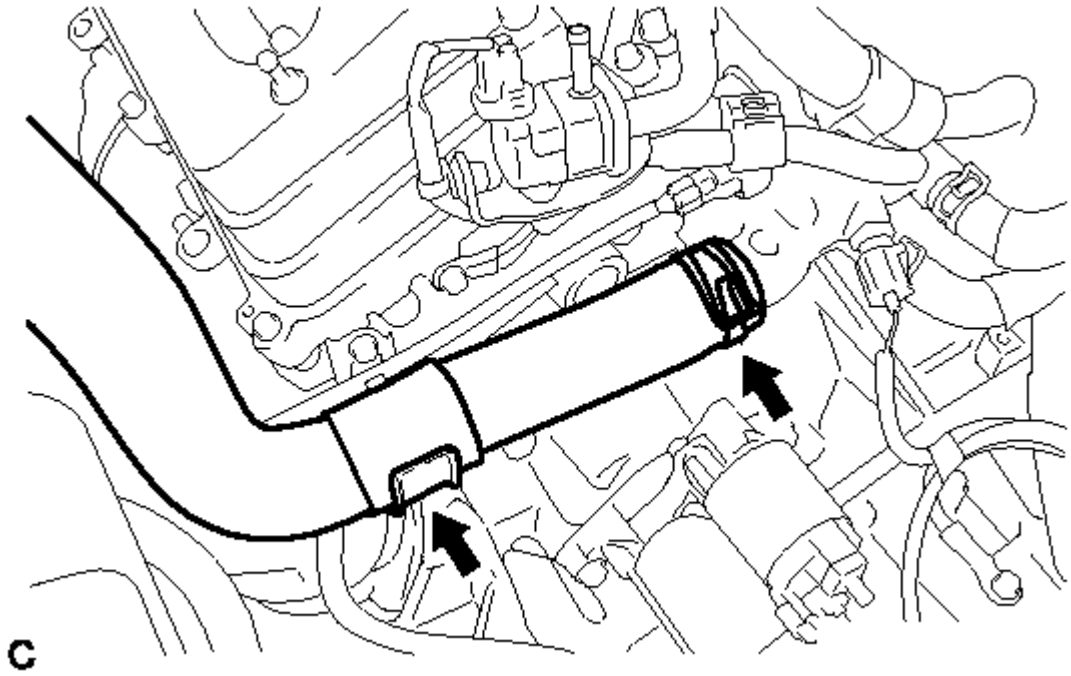


Fig. 98: Identifying No. 1 Radiator Hose & Clamp

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

b. Separate the No. 1 radiator hose from the radiator pipe clamp.

32. **DISCONNECT NO. 2 RADIATOR HOSE**

a. Disconnect the No. 2 radiator hose.

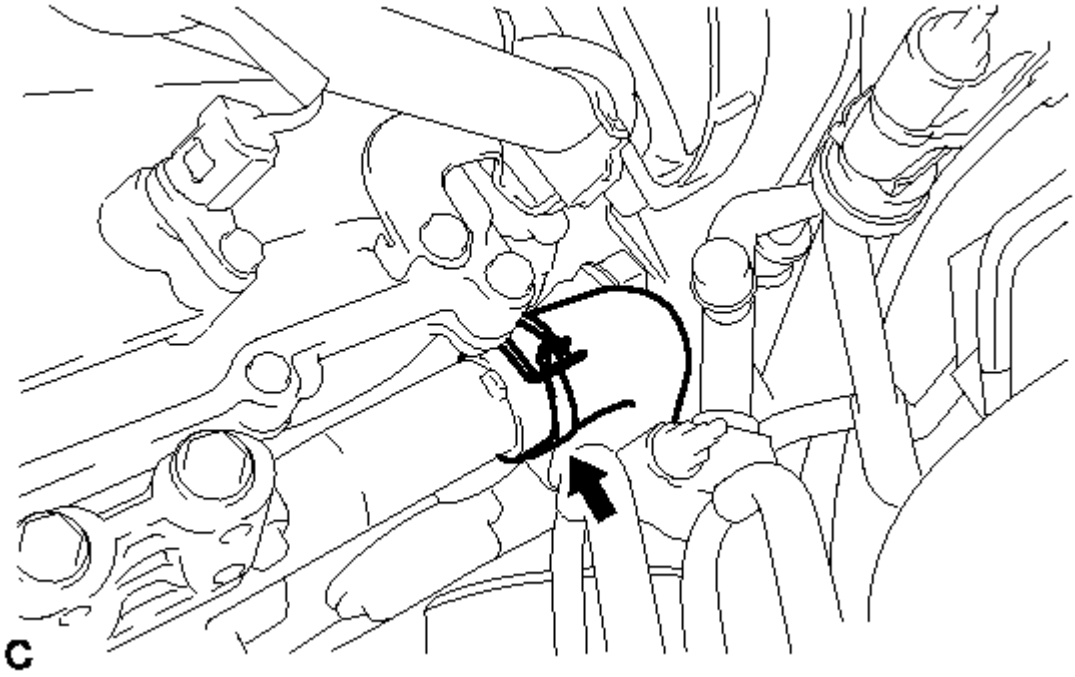


Fig. 99: Identifying No. 2 Radiator Hose & Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

33. **DISCONNECT INLET HEATER WATER HOSE**

a. Disconnect the inlet heater water hose.

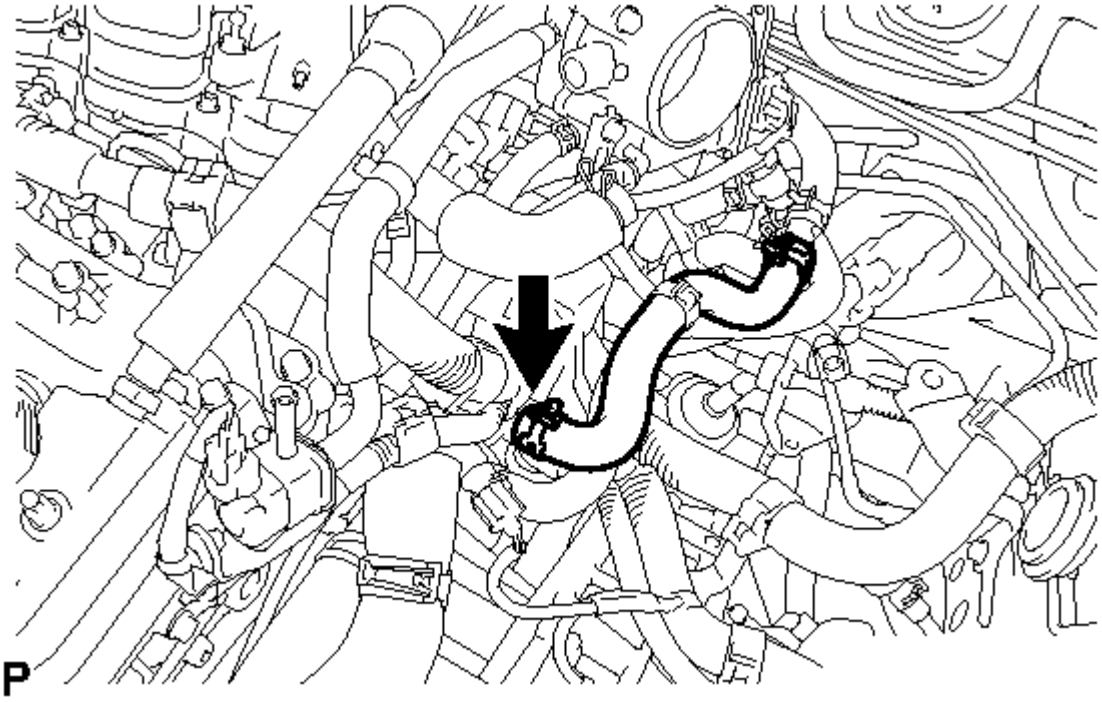


Fig. 100: Identifying Inlet Heater Water Hose & Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

34. **DISCONNECT OUTLET HEATER WATER HOSE**
    a. Disconnect the outlet heater water hose.

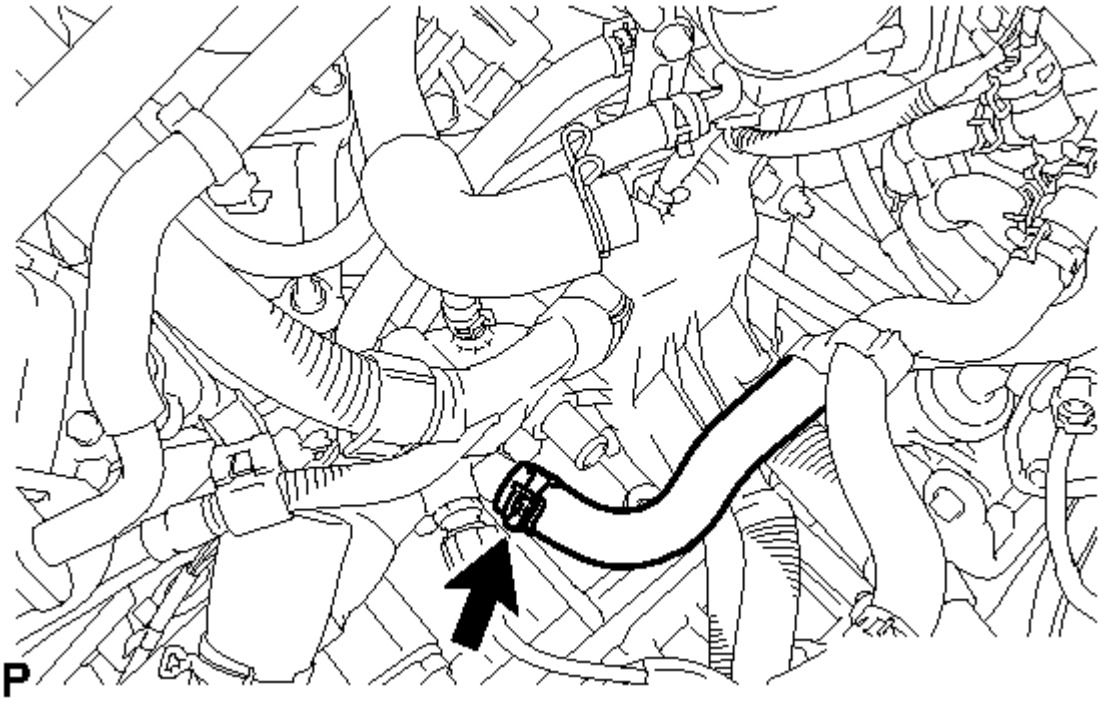


Fig. 101: Identifying Outlet Heater Water Hose & Clip

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

35. **DISCONNECT FUEL MAIN TUBE**

a. Remove the No. 1 fuel pipe clamp.

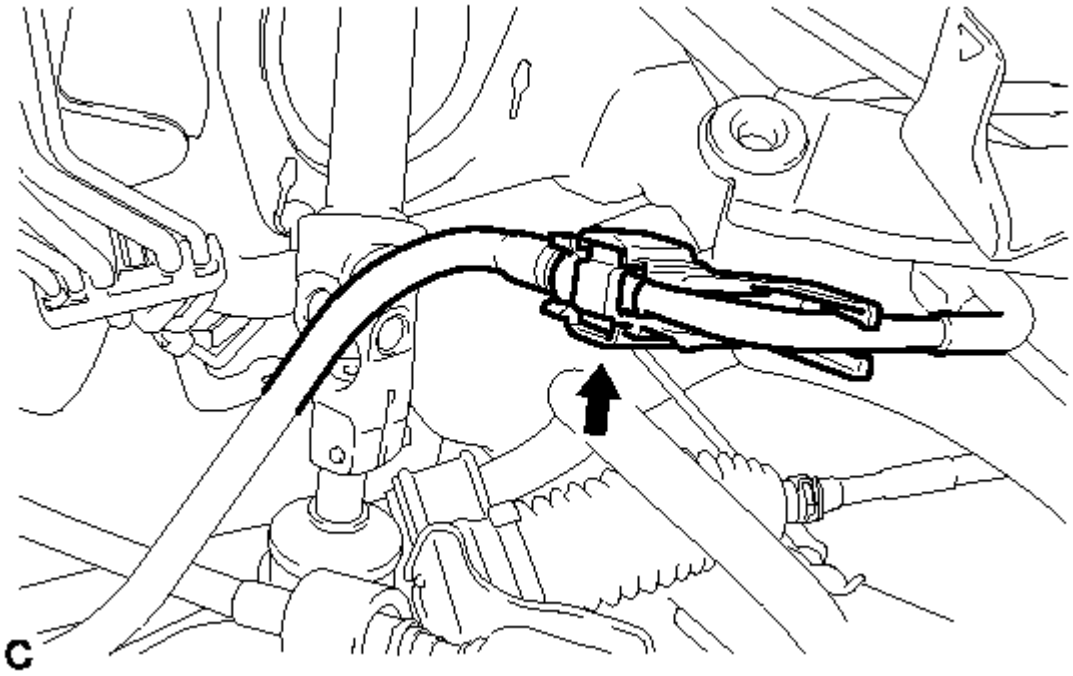
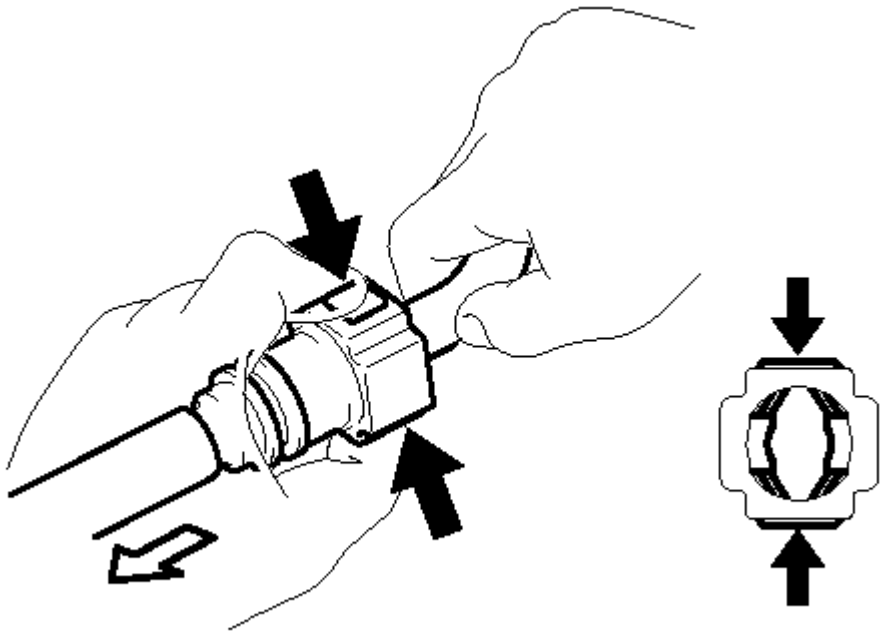


Fig. 102: Identifying No. 1 Fuel Pipe Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Disconnect the connector from the pipe by hand. When the connector and the pipe are stuck, push in and pull on the connector to release it. Pull the connector out of the pipe carefully.



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Fig. 103: Disconnecting Fuel Main Tube Connector & Pipe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

1	Pinch
2	Pull

NOTE:

- **Check for any dirt and foreign matter contamination in the pipe and around the connector. Clean if necessary. Foreign matter may damage the O-rings or cause leaks in the seal between the pipe and connector.**
- **Do not use any tools to separate the pipe and connector.**
- **Do not forcefully bend or twist the nylon tube.**
- **Check for any dirt and foreign matter on the pipe seal surface. Clean if necessary.**
- **Put the pipe and connector ends in plastic bags to prevent damage and dirt contamination.**
- **If the pipe and connector are stuck together, pinch the tube between your fingers and turn it carefully to free it. Then disconnect the hose.**

36. **DISCONNECT UNION TO CHECK VALVE HOSE**
    a. Disconnect the union to check valve hose.

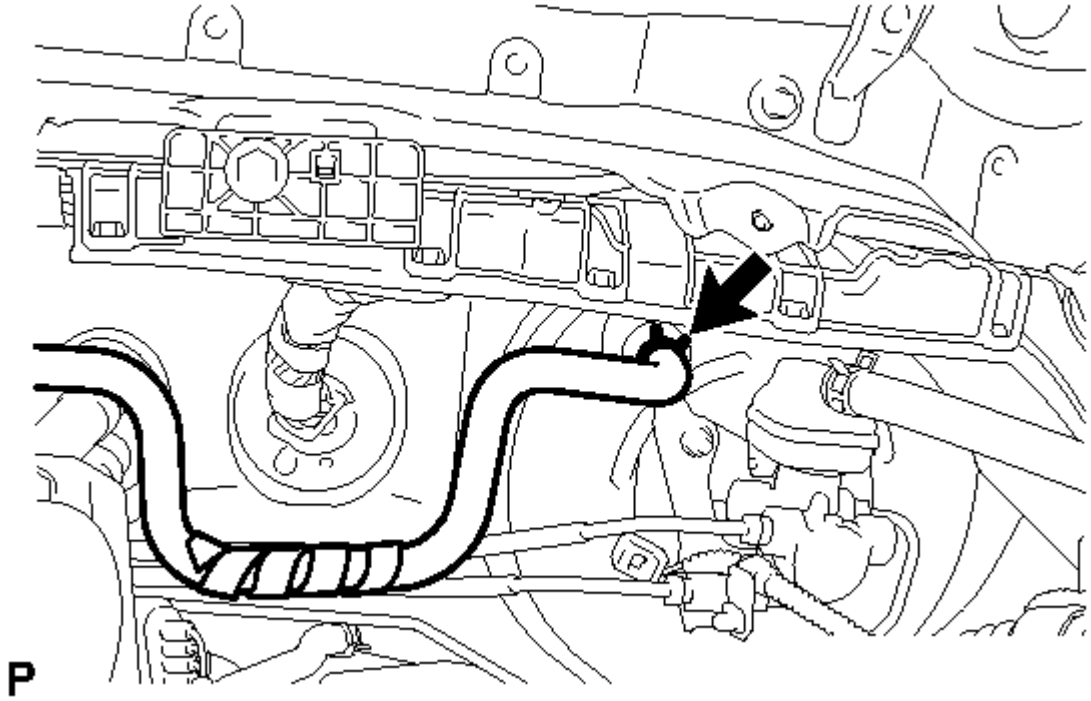


Fig. 104: Identifying Union To Check Valve Hose & Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

37. **DISCONNECT NO. 1 TRANSMISSION OIL COOLER HOSE ASSEMBLY**
    a. Disconnect the No. 1 transmission oil cooler hose from the radiator.

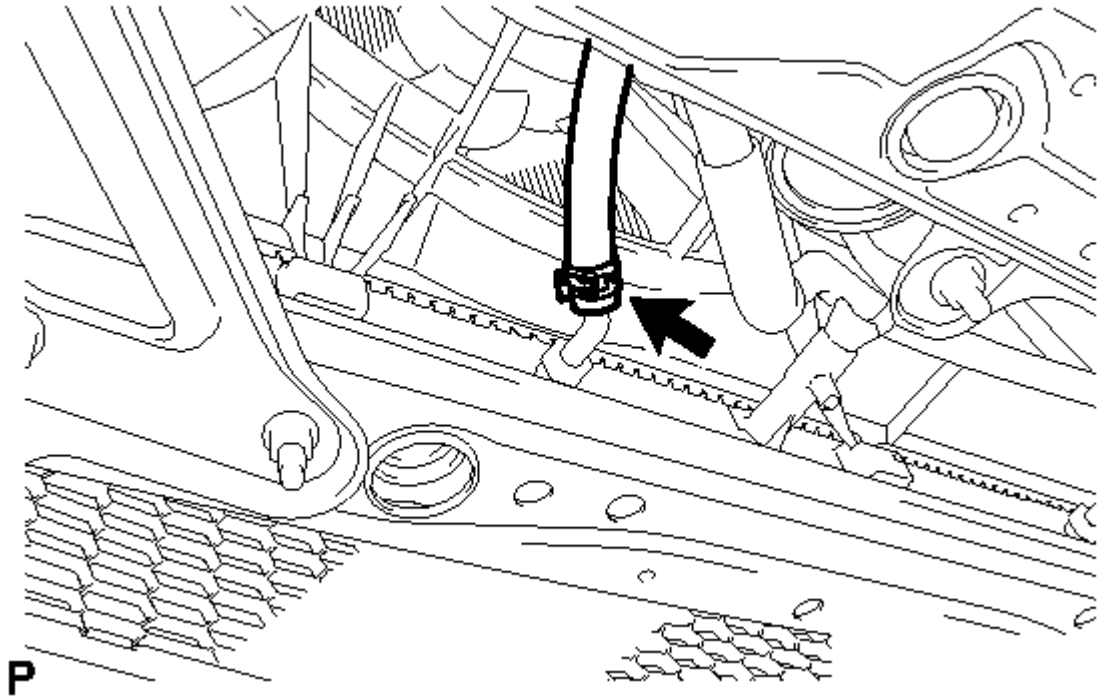


Fig. 105: Identifying No. 1 Transmission Oil Cooler Hose & Clip

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

38. **DISCONNECT OUTLET OIL COOLER HOSE**
    a. Disconnect the outlet oil cooler hose from the radiator.

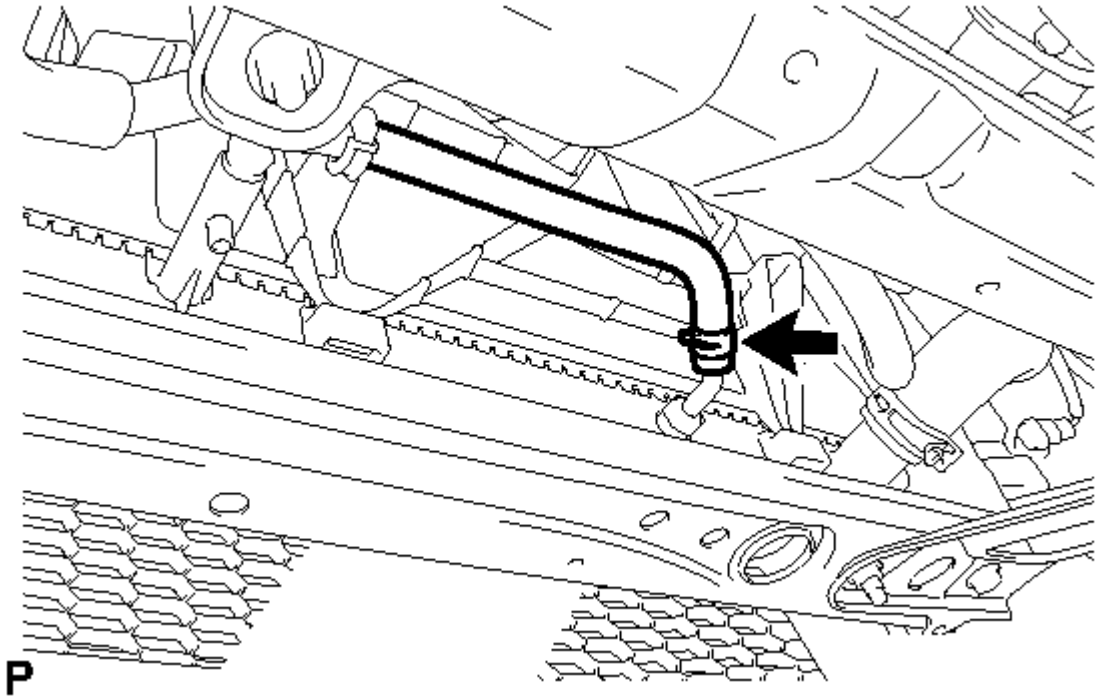


Fig. 106: Identifying Outlet Oil Cooler Hose & Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

39. **REMOVE NO. 2 ENGINE MOUNTING STAY RH**
    a. Remove the 2 bolts and separate the No. 2 ground wire.

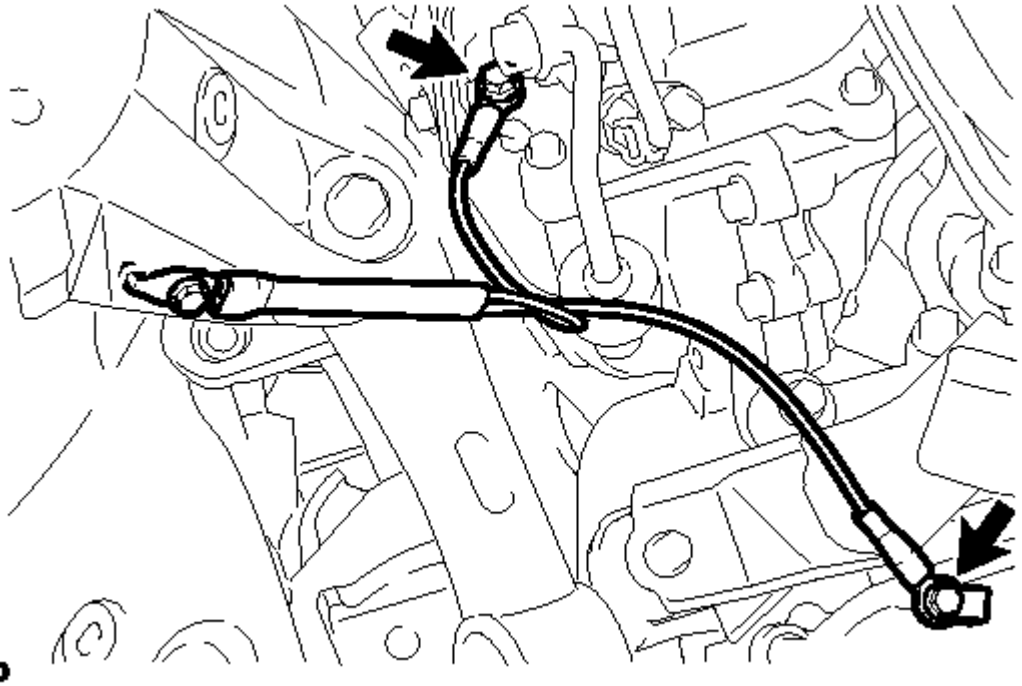


Fig. 107: Identifying No. 2 Ground Wire & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the bolt, 2 nuts and No. 2 engine mounting stay RH.

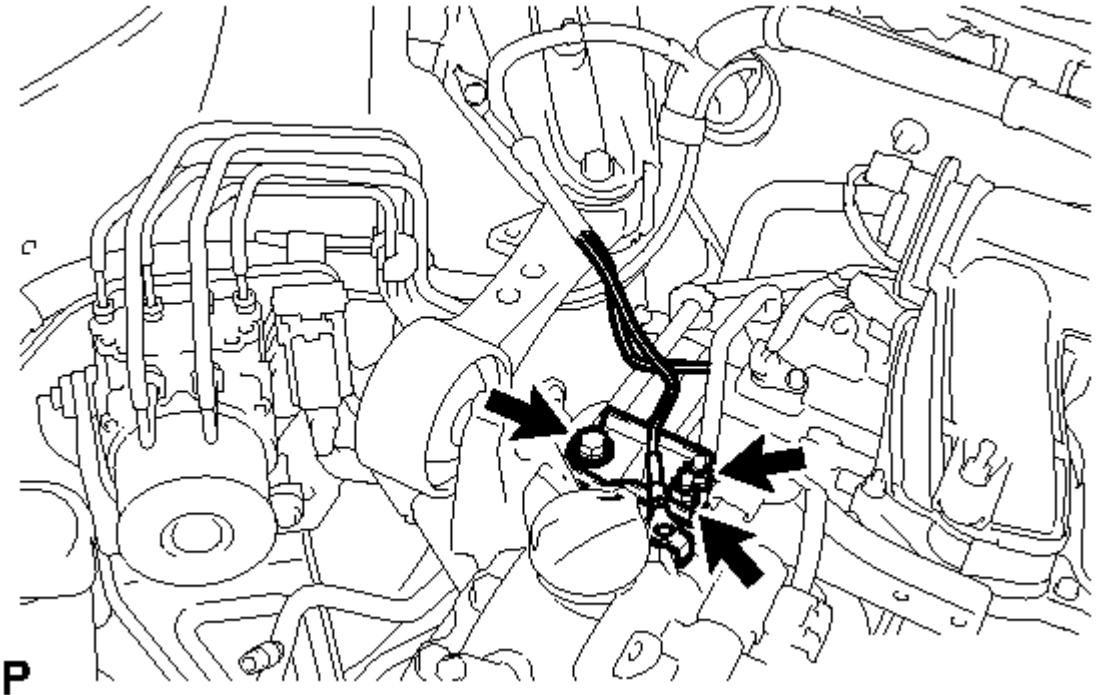


Fig. 108: Identifying No. 2 RH Engine Mounting Stay & Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

40. **REMOVE ENGINE MOVING CONTROL ROD BRACKET**

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

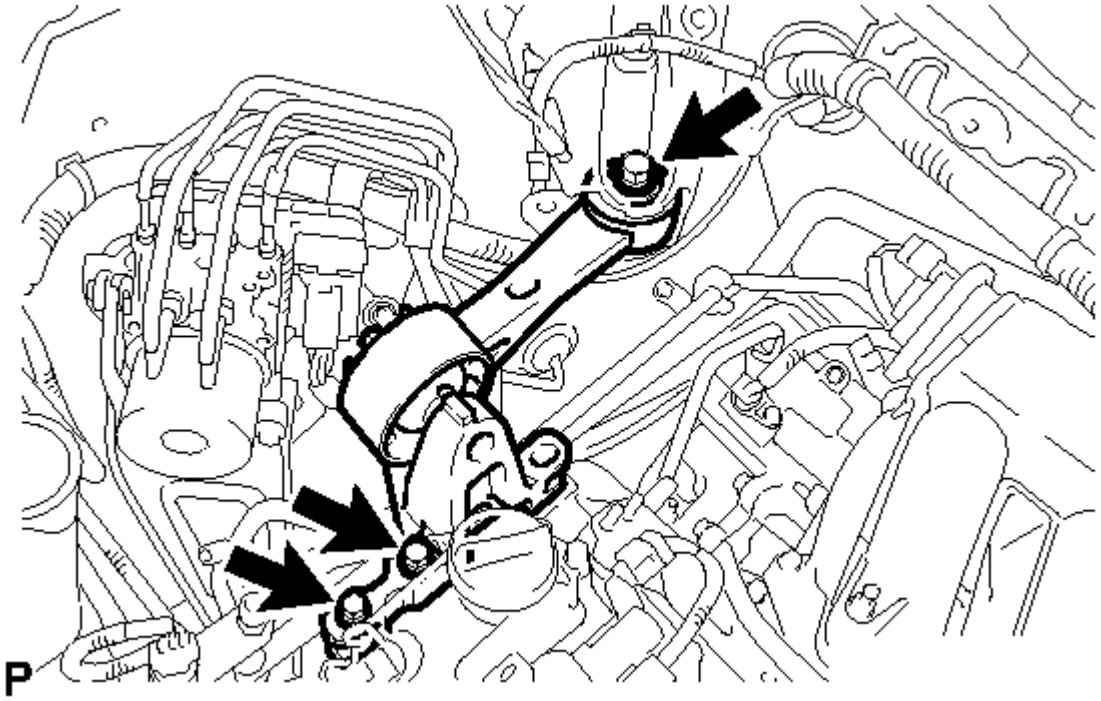
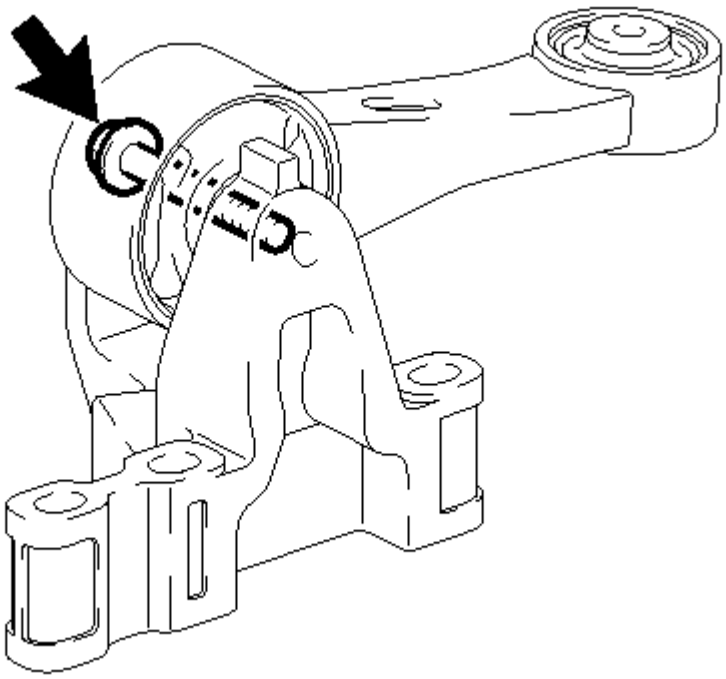


Fig. 109: Identifying Engine Moving Control Rod Bracket, Rod & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

41. **REMOVE ENGINE MOVING CONTROL ROD**

a. Remove the bolt and engine moving control rod from the engine moving control rod bracket.



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Fig. 110: Identifying Engine Moving Control Rod Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Perform this procedure only when replacement of the engine moving control rod is necessary.

42. **DISCONNECT DISCHARGE HOSE SUB-ASSEMBLY** . Refer to **REMOVAL - Step 19**
43. **DISCONNECT SUCTION HOSE SUB-ASSEMBLY** . Refer to **REMOVAL - Step 20**
44. **REMOVE PROPELLER WITH CENTER BEARING SHAFT ASSEMBLY (for AWD)**

    Refer to **REMOVAL**

45. **REMOVE NO. 1 EXHAUST PIPE SUPPORT BRACKET** . Refer to **REMOVAL - Step 5**
46. **REMOVE FRONT EXHAUST PIPE ASSEMBLY (for 2WD)** . Refer to **REMOVAL - Step 8**
47. **REMOVE FRONT EXHAUST PIPE ASSEMBLY (for AWD)** . Refer to **REMOVAL - Step 9**
48. **SECURE STEERING WHEEL** . Refer to **REMOVAL - Step 1**
49. **SEPARATE STEERING INTERMEDIATE SHAFT ASSEMBLY** . Refer to **REMOVAL - Step 4**
50. **REMOVE FRONT AXLE SHAFT NUT LH** . Refer to **REMOVAL - Step 6**
51. **REMOVE FRONT AXLE SHAFT NUT RH**

    HINT:

    Perform the same procedure as for the LH side.

52. **SEPARATE FRONT STABILIZER LINK ASSEMBLY LH** . Refer to **REMOVAL - Step 12**
53. **SEPARATE FRONT STABILIZER LINK ASSEMBLY RH**

    HINT:

    Perform the same procedure as for the LH side.

54. **SEPARATE FRONT SPEED SENSOR LH** . Refer to **REMOVAL - Step 8**
55. **SEPARATE FRONT SPEED SENSOR RH**

    HINT:

    Perform the same procedure as for the LH side.

56. **SEPARATE TIE ROD ASSEMBLY LH** . Refer to **REMOVAL - Step 9**
57. **SEPARATE TIE ROD ASSEMBLY RH**

    HINT:

    Perform the same procedure as for the LH side.

58. **SEPARATE FRONT LOWER SUSPENSION ARM LH** . Refer to **REMOVAL - Step 9**
59. **SEPARATE FRONT LOWER SUSPENSION ARM RH**

    HINT:

    Perform the same procedure as for the LH side.

60. **SEPARATE FRONT DRIVE SHAFT ASSEMBLY** . Refer to **REMOVAL - Step 10**
61. **REMOVE FRONT DRIVE SHAFT ASSEMBLY LH** . Refer to **REMOVAL - Step 12**
62. **REMOVE FRONT DRIVE SHAFT ASSEMBLY RH (for 2WD)** . Refer to **REMOVAL - Step 16**
63. **REMOVE FLYWHEEL HOUSING UNDER COVER**
    a. Remove the 2 bolts and flywheel housing under cover.

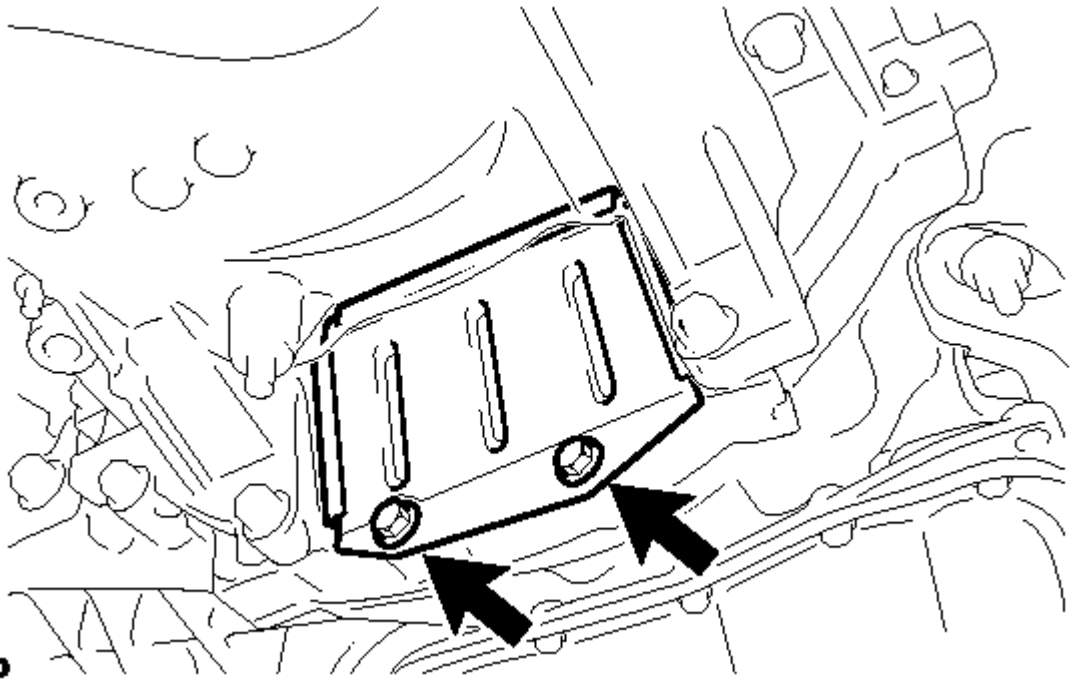


Fig. 111: Identifying Flywheel Housing Under Cover & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

64. **REMOVE DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT**
    a. Using SST, hold the crankshaft pulley.

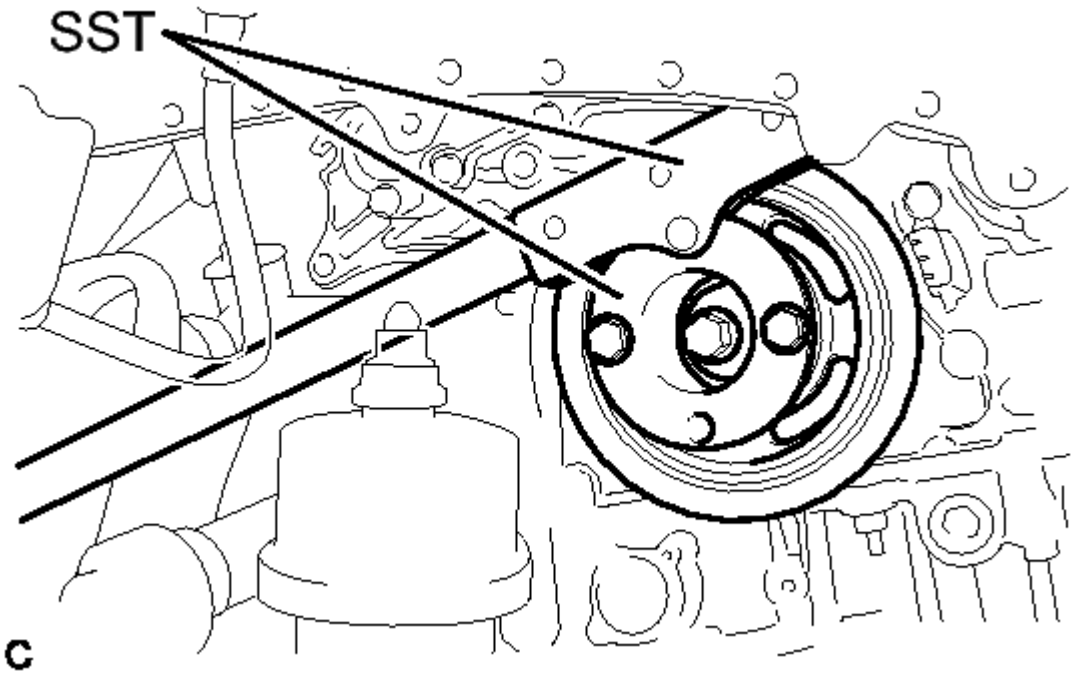


Fig. 112: Holding Crankshaft Pulley Using SST

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

- **SST: 09213-70011**
  09213-70020
- **SST: 09330-00021**

b. Remove the 6 drive plate and torque converter clutch setting bolts.

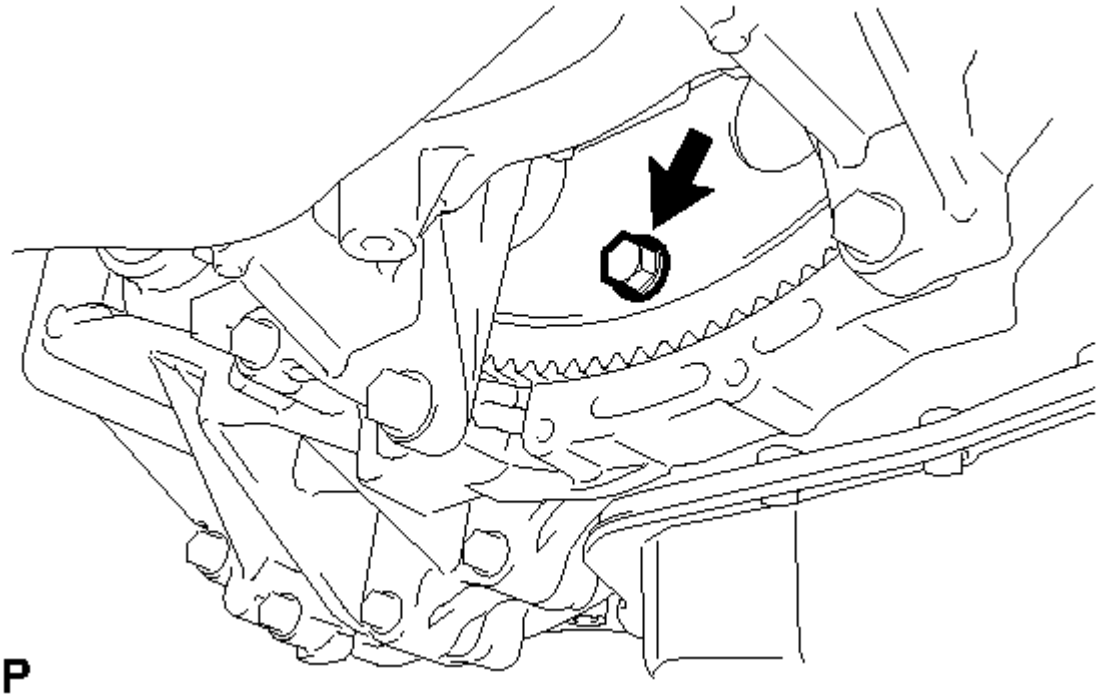


Fig. 113: Identifying Drive Plate And Torque Converter Clutch Setting Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

65. **REMOVE ENGINE ASSEMBLY WITH TRANSAXLE**

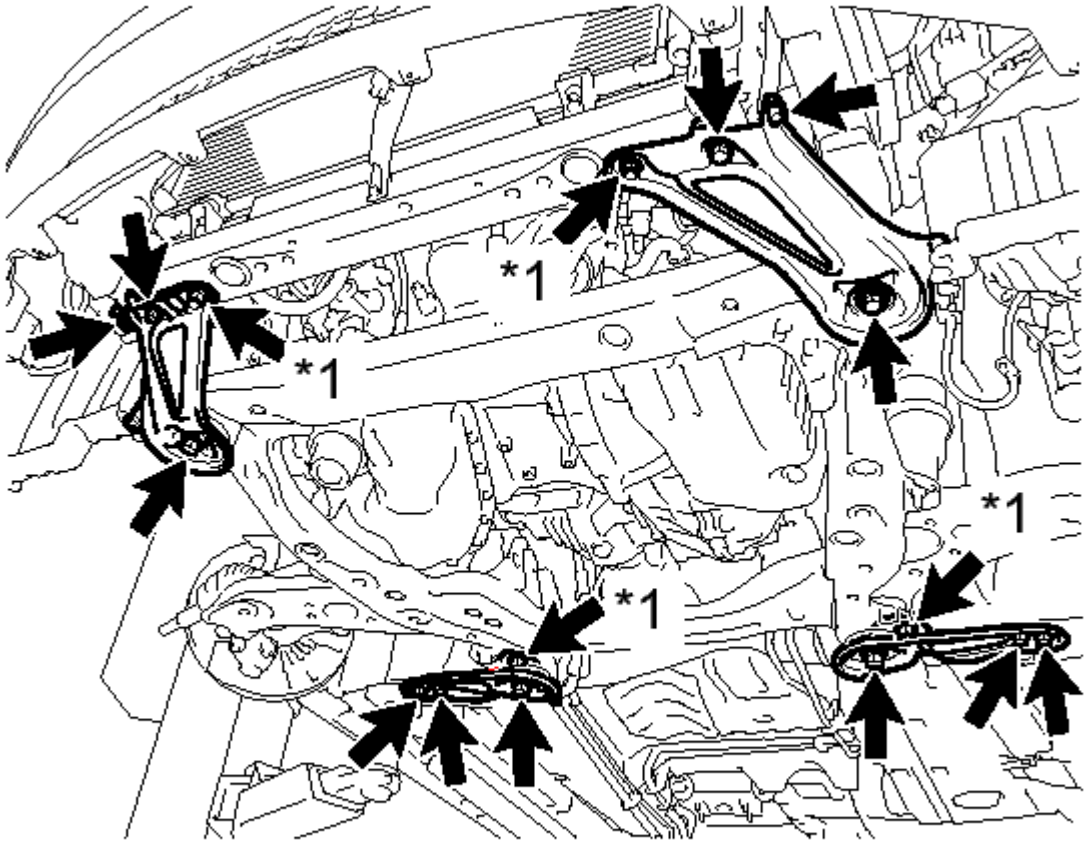
a. Set the engine lifter.

NOTE:

- **Install a height adjustment attachment and plate lift attachment onto the engine assembly with transaxle.**
- **Securely support 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.**

b. Remove the 2 clamps and separate the front fender liner LH and RH from the frame side rail plates LH and RH.

c. Remove the 6 bolts, 2 nuts and frame side rail plates LH and RH.



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Fig. 114: Identifying LH/RH Frame Side Rail Plates, Nuts & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Nut

d. Remove the 6 bolts, 2 nuts and front suspension member rear braces LH and RH.
e. Operate the engine lifter, then remove the engine assembly from the vehicle.

NOTE:

- **Make sure that the engine is clear of all wiring and hoses.**
- **While lowering the engine from the vehicle, do not allow it to contact the vehicle.**

f. Install the 2 engine hangers with the 4 bolts.

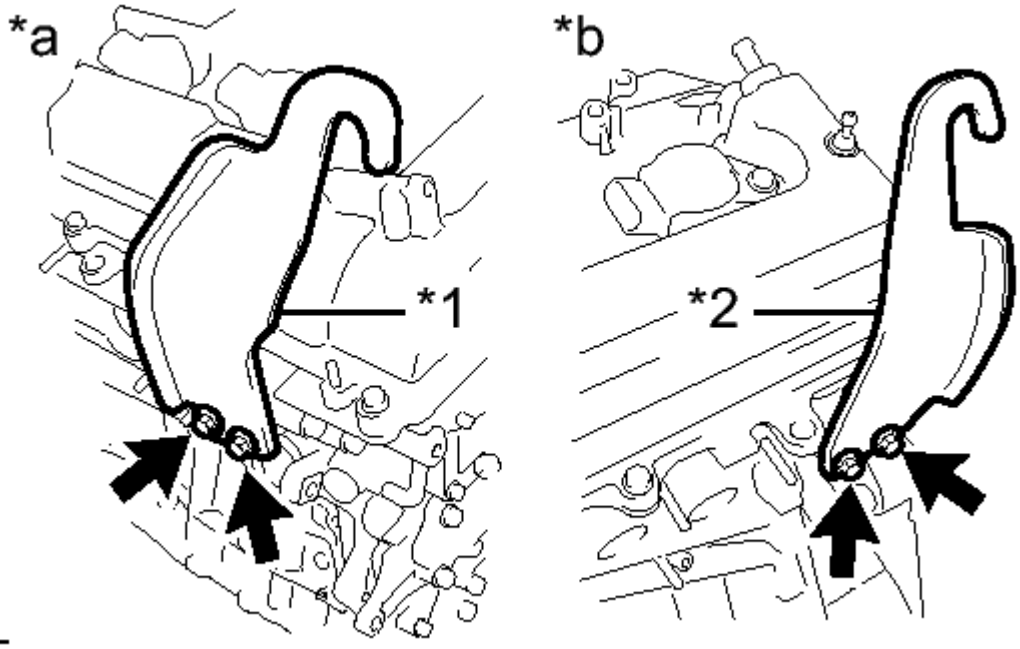


Fig. 115: Identifying No. 1/No. 2 Engine Hangers & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	No. 1 Engine Hanger
*2	No. 2 Engine Hanger
*a	for Bank 1
*b	for Bank 2

Torque: 33 N*m (337 kgf*cm, 24 ft.*lbf)

PART NO.

Item	Part No.
No. 1 engine hanger	12281-31120
No. 2	

engine hanger	12282-31100
Bolt	91671-10825

g. Attach the sling device to the engine hangers and chain block.

66. **REMOVE FAN AND GENERATOR V BELT** See step 3
67. **REMOVE GENERATOR ASSEMBLY** . Refer to **REMOVAL - Step 5**
68. **REMOVE COOLER COMPRESSOR ASSEMBLY** . Refer to **REMOVAL - Step 21**
69. **REMOVE STARTER ASSEMBLY** . Refer to **REMOVAL - Step 5**
70. **REMOVE FLEXIBLE HOSE BRACKET SUB-ASSEMBLY**
    a. Separate the breather plug hose and sensor wire from the flexible hose bracket sub-assembly.

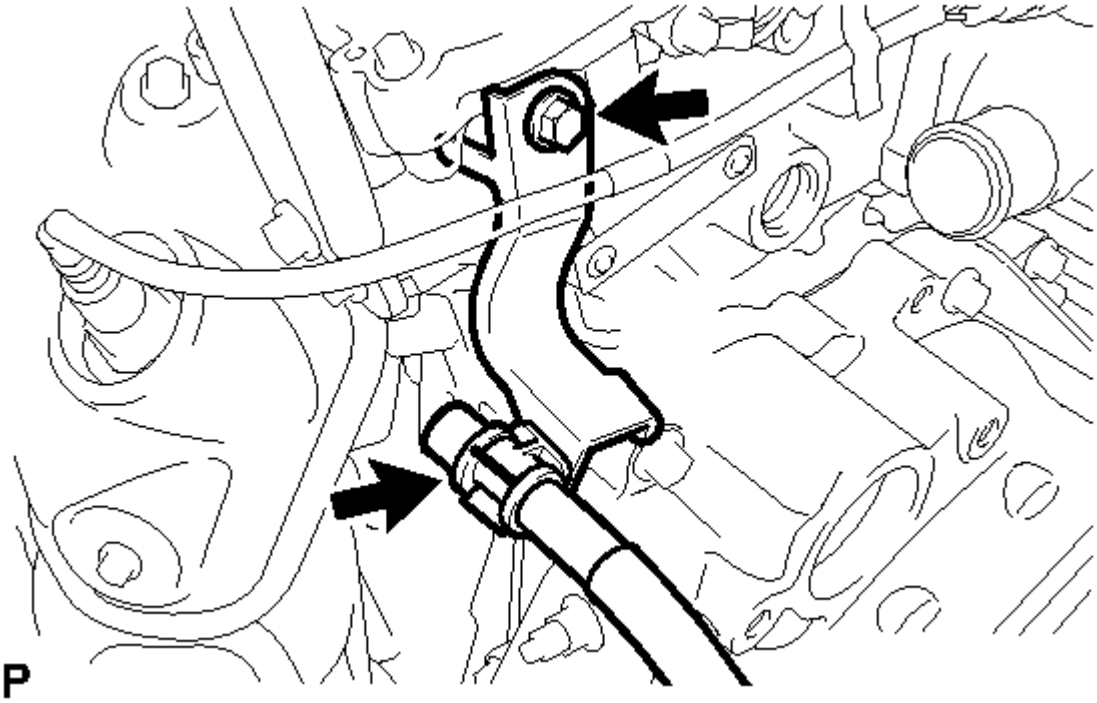


Fig. 116: Identifying Flexible Hose Bracket & Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

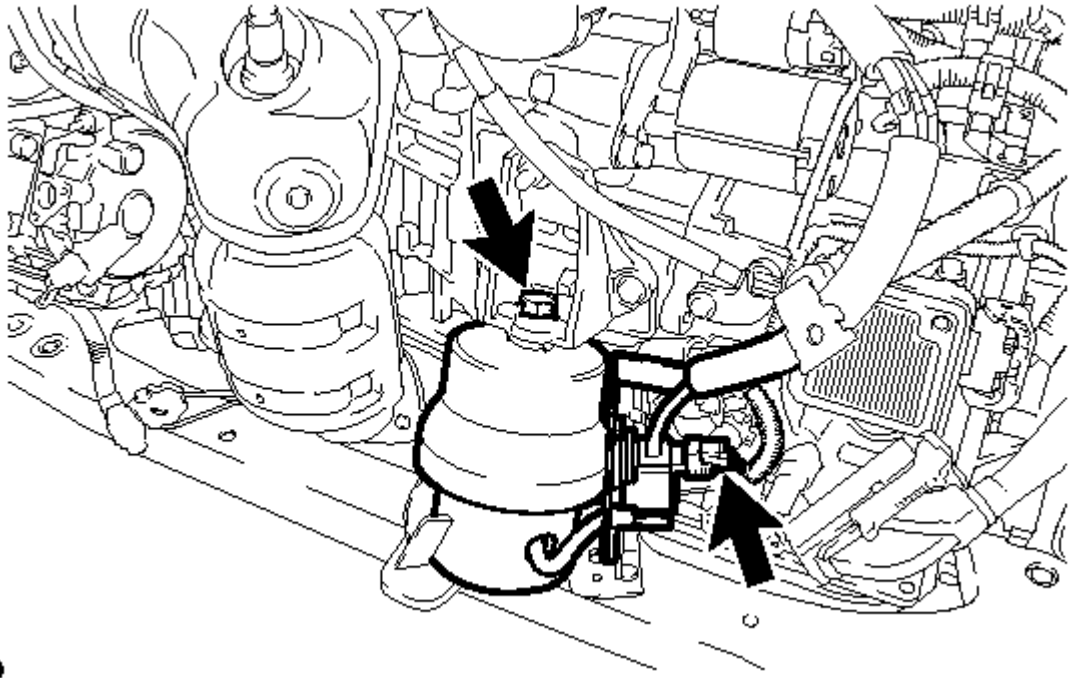
    b. Remove the bolt and flexible hose bracket sub-assembly.

71. **REMOVE ENGINE WIRE**
    a. Remove the engine wire from the engine with transaxle.
72. **REMOVE NO. 1 FRONT STABILIZER BRACKET LH (for AWD)** . Refer to **REMOVAL - Step 7**
73. **REMOVE NO. 1 FRONT STABILIZER BRACKET RH (for AWD)**

HINT:

Perform the same procedure as for the LH side.

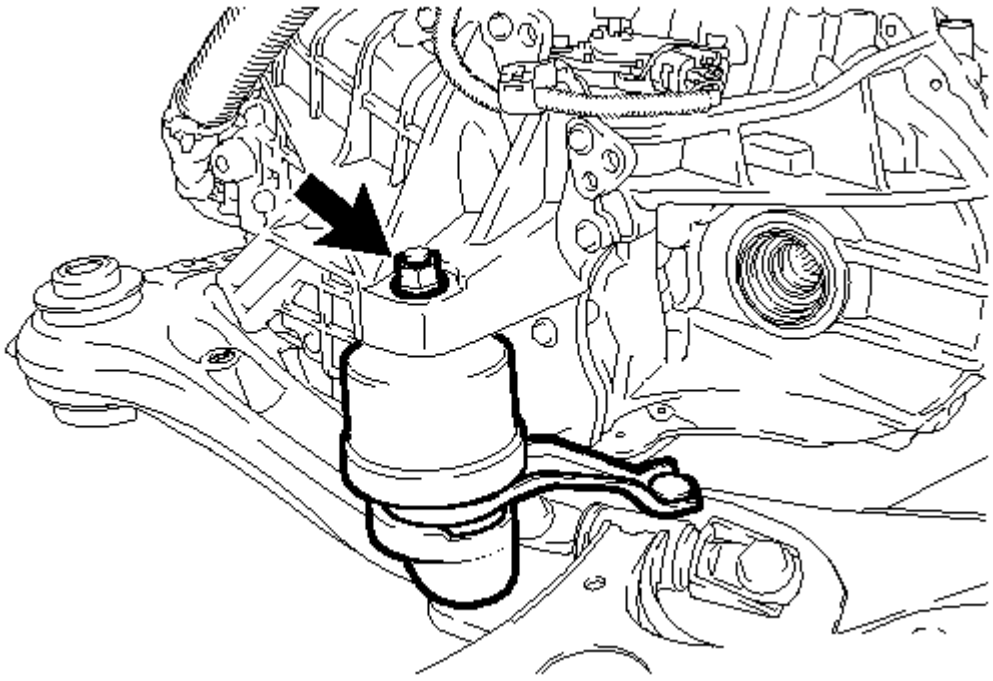
74. **REMOVE FRONT STABILIZER BAR (for AWD)**
75. **REMOVE STEERING GEAR ASSEMBLY (for AWD)** . Refer to **REMOVAL - Step 5**
76. **SEPARATE FRONT ENGINE MOUNTING INSULATOR**
    a. Disconnect the wire clamp and connector.



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Fig. 117: Identifying Front Engine Mounting Insulator Wire Clamp & Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Remove the bolt and separate the front engine mounting insulator.
77. **SEPARATE ENGINE MOUNTING INSULATOR LH**
    a. Remove the nut and separate the engine mounting insulator LH.

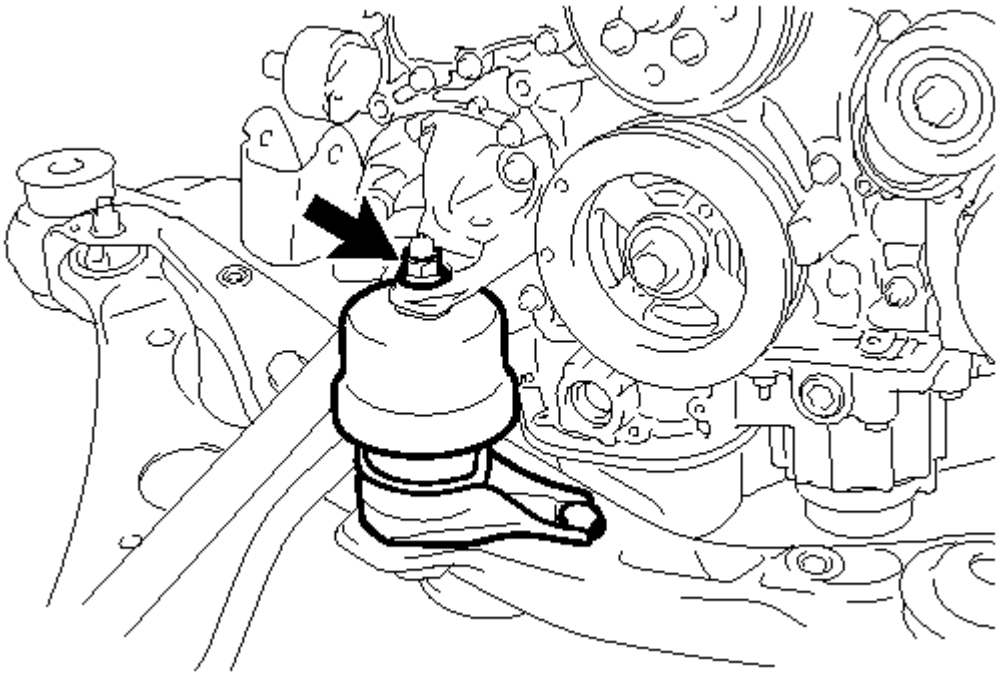


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Fig. 118: Identifying LH Engine Mounting Insulator & Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

78. **SEPARATE ENGINE MOUNTING INSULATOR RH**

a. Remove the nut and separate the engine mounting insulator RH.



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Fig. 119: Identifying RH Engine Mounting Insulator & Nut

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

79. **SEPARATE REAR ENGINE MOUNTING INSULATOR ASSEMBLY (for AWD)**
    a. Remove the 2 bolts and separate the rear engine mounting insulator assembly.

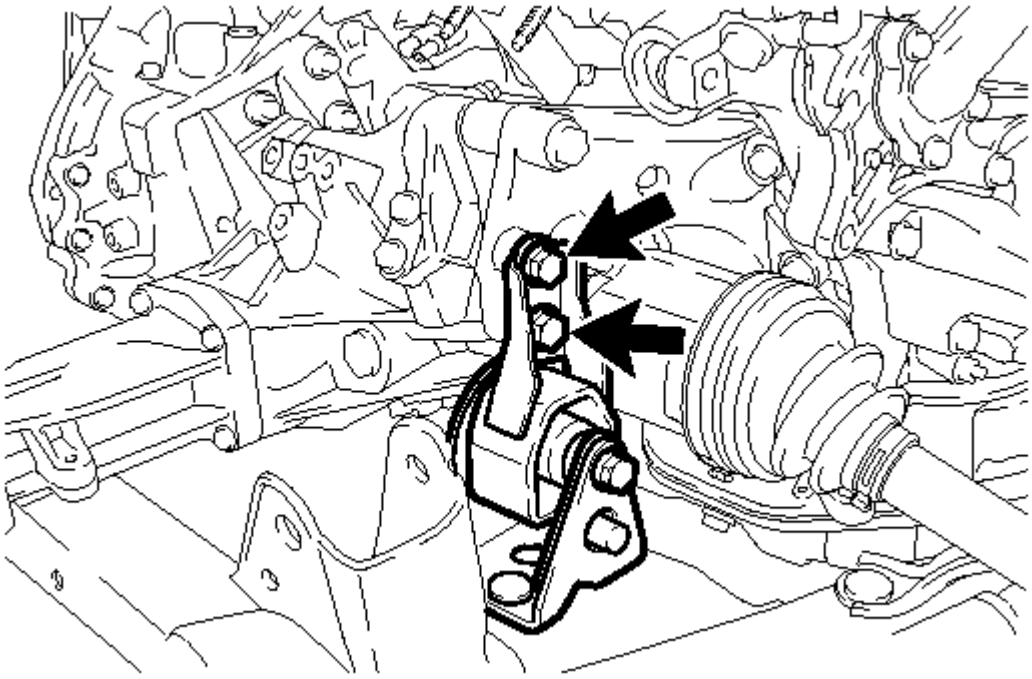


Fig. 120: Identifying Rear Engine Mounting Insulator Assembly & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Do not remove the rear engine mounting insulator assembly through bolts. Doing so makes it difficult to install the rear engine mounting insulator assembly.

80. **REMOVE FRONT DRIVE SHAFT ASSEMBLY RH (for AWD)** . Refer to **REMOVAL - Step 16**
81. **REMOVE MANIFOLD STAY**
    a. Remove the bolt, nut and manifold stay.

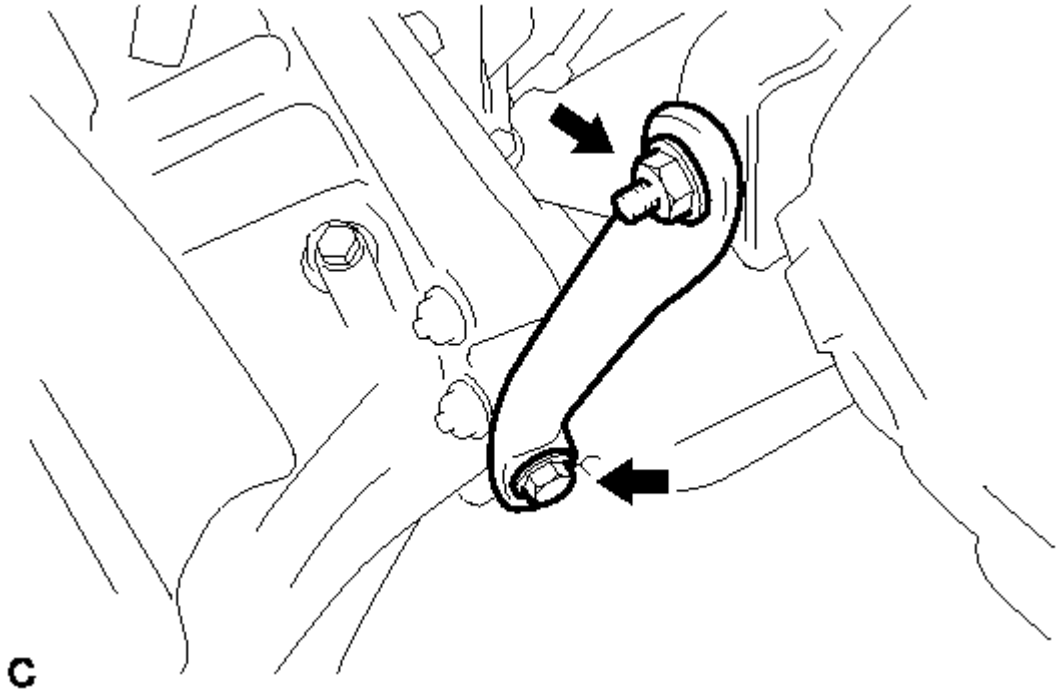


Fig. 121: Identifying Bolt, Nut, And Manifold Stay
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

82. **REMOVE TRANSFER STIFFENER PLATE RH (for AWD)**
    a. Remove the 4 bolts and transfer stiffener plate RH.

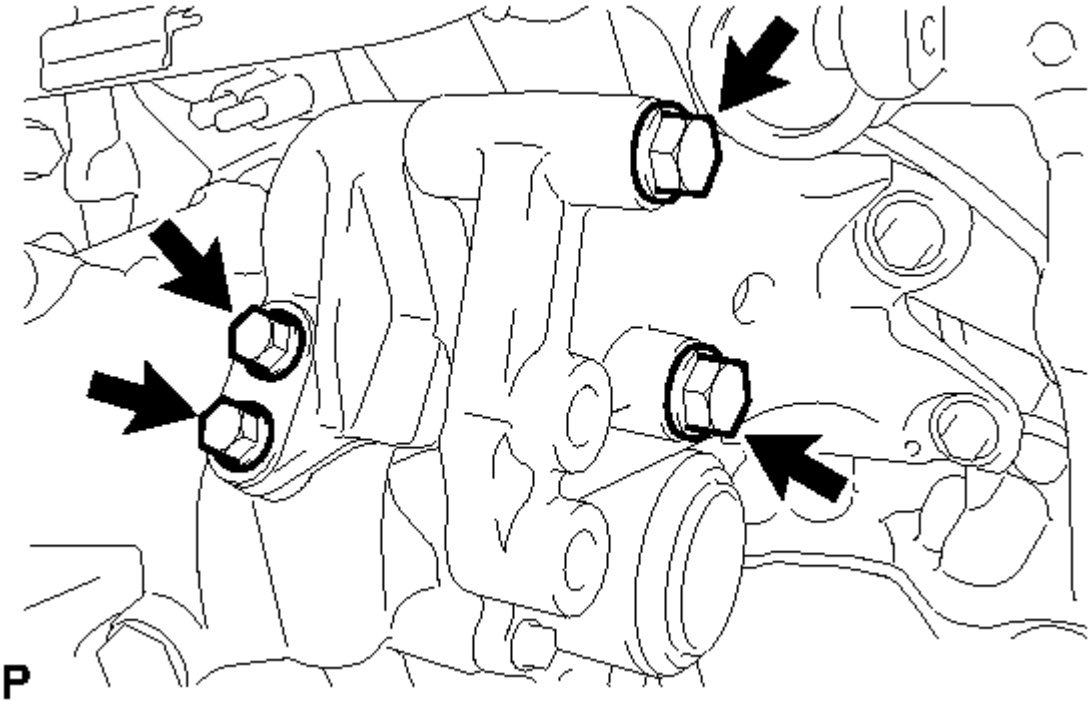


Fig. 122: Identifying Bolts And Transfer Stiffener Plate RH

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

83. **REMOVE AUTOMATIC TRANSAXLE ASSEMBLY (for 2WD)** . Refer to **REMOVAL - Step 6**
84. **REMOVE AUTOMATIC TRANSAXLE ASSEMBLY (for AWD)** . Refer to **REMOVAL - Step 7**
85. **REMOVE ENGINE MOUNTING BRACKET RH**
    a. Remove the 3 bolts and engine mounting bracket RH.

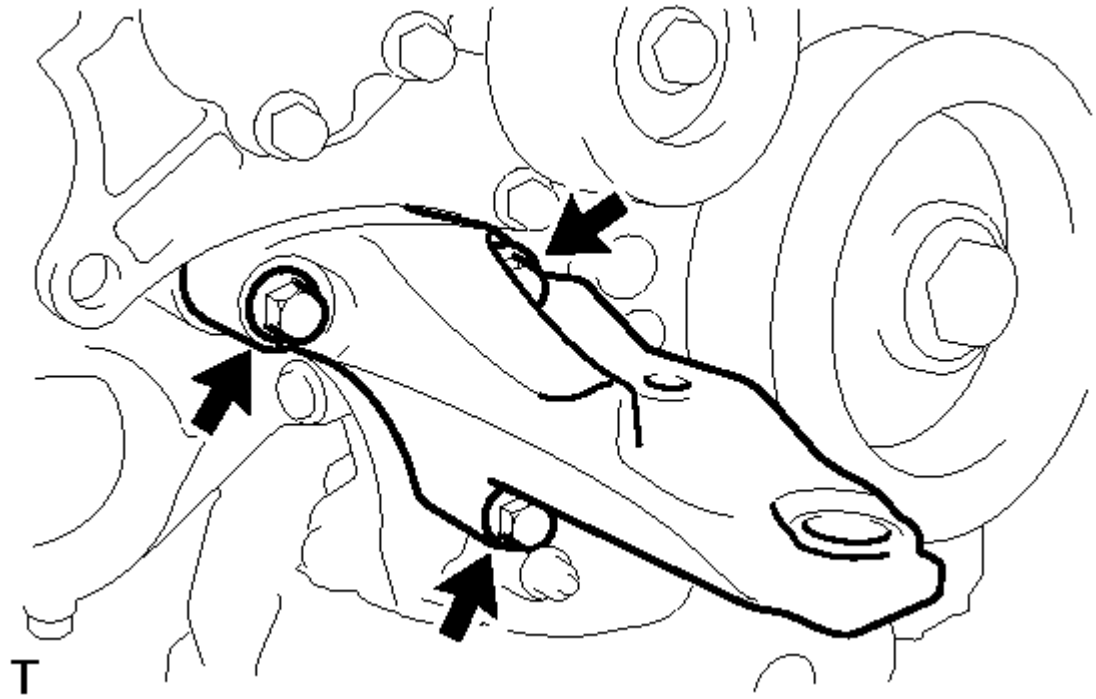


Fig. 123: Identifying Engine Mounting Bracket RH With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

86. **REMOVE REAR ENGINE MOUNTING BRACKET (for 2WD)**
    a. Remove the 3 bolts and rear engine mounting bracket.

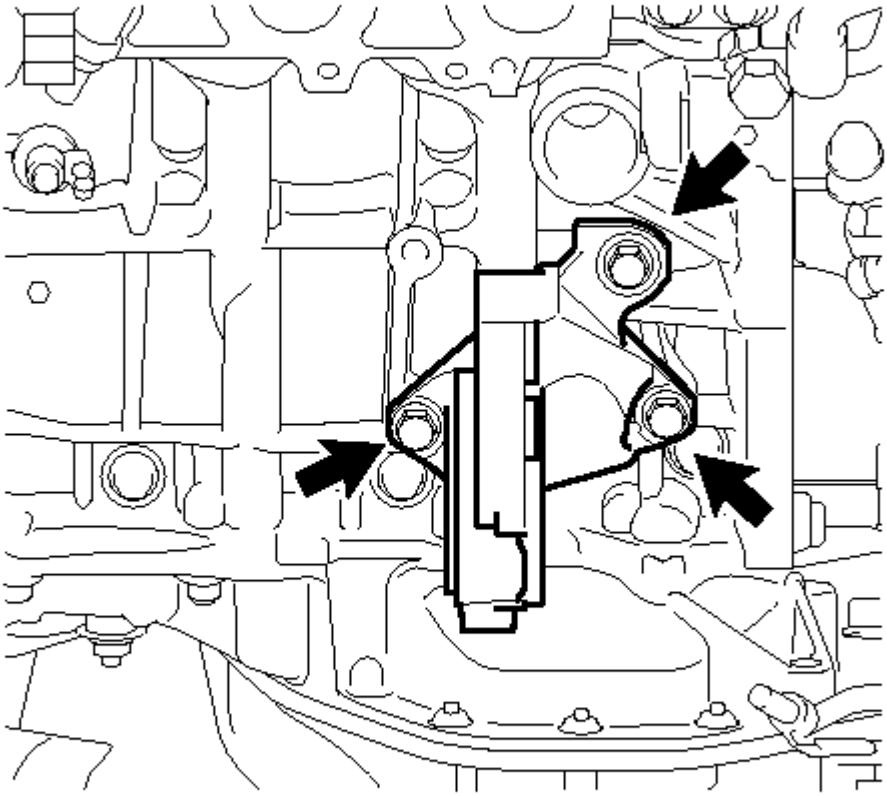


Fig. 124: Identifying Drive Shaft Bearing Bracket (For 2WD)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

87. **REMOVE REAR ENGINE MOUNTING BRACKET (for AWD)**
    a. Remove the 3 bolts and rear engine mounting bracket.

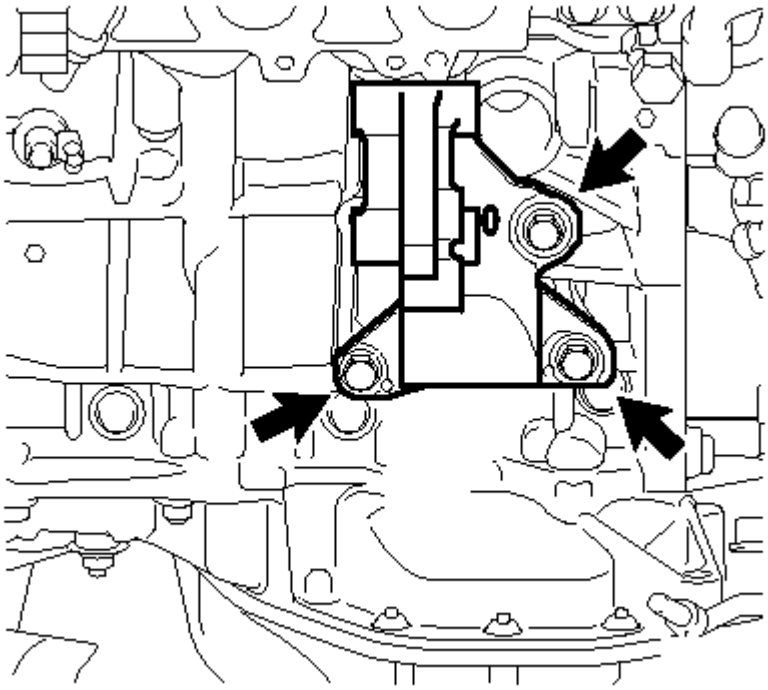


Fig. 125: Identifying Bolts And Engine Mounting Bracket RR
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

88. **REMOVE DRIVE PLATE AND RING GEAR SUB-ASSEMBLY** See step 3

INSTALLATION

INSTALLATION

1. **INSTALL DRIVE PLATE AND RING GEAR SUB-ASSEMBLY** See step 2
2. **INSTALL REAR ENGINE MOUNTING BRACKET (for 2WD)**
   a. Install the rear engine mounting bracket with the 3 bolts.

      Torque: 64 N*m (649 kgf*cm, 47 ft.*lbf)

3. **INSTALL REAR ENGINE MOUNTING BRACKET (for AWD)**
   a. Install the rear engine mounting bracket with the 3 bolts.

      Torque: 64 N*m (649 kgf*cm, 47 ft.*lbf)

4. **INSTALL ENGINE MOUNTING BRACKET RH**
   a. Install the engine mounting bracket RH with the 3 bolts.

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

5. **INSTALL AUTOMATIC TRANSAXLE ASSEMBLY (for 2WD)** . Refer to **INSTALLATION - Step**

10

6. **INSTALL AUTOMATIC TRANSAXLE ASSEMBLY (for AWD)** . Refer to **INSTALLATION - Step 11**
7. **INSTALL TRANSFER STIFFENER PLATE RH (for AWD)**
    a. Install the transfer stiffener plate RH with the 4 bolts.

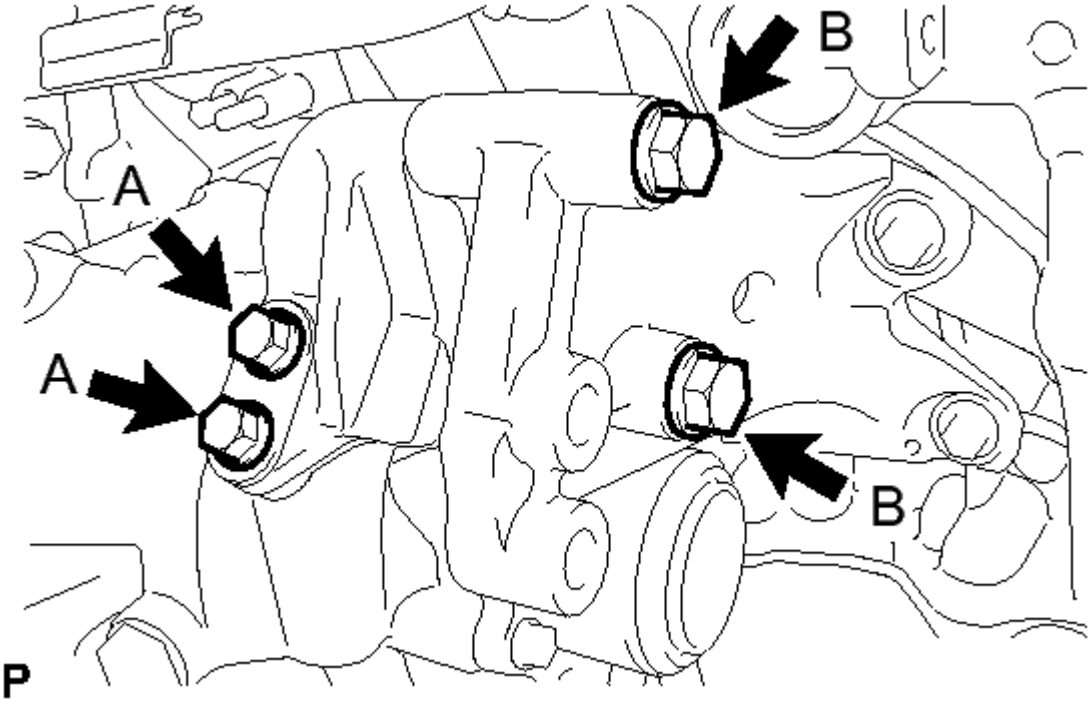


Fig. 126: Identifying Bolts And Transfer Stiffener Plate RH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Bolt A

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

Bolt B

Torque: 78 N*m (796 kgf*cm, 58 ft.*lbf)

8. **INSTALL MANIFOLD STAY**
    a. Install the manifold stay with the bolt and nut.

Bolt

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

Nut

Torque: 35 N*m (357 kgf*cm, 26 ft.*lbf)

9. **INSTALL FLEXIBLE HOSE BRACKET SUB-ASSEMBLY**
   a. Install the flexible hose bracket sub-assembly with the bolt.

      Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)

   b. Install the sensor wire and the breather plug hose to the flexible hose bracket sub-assembly.
10. **INSTALL FRONT DRIVE SHAFT ASSEMBLY RH (for AWD)** . Refer to **INSTALLATION - Step 2**
11. **INSTALL REAR ENGINE MOUNTING INSULATOR ASSEMBLY (for AWD)**
    a. Install the rear engine mounting insulator assembly with the 2 bolts.

       Torque: 75 N*m (765 kgf*cm, 55 ft.*lbf)

12. **INSTALL ENGINE MOUNTING INSULATOR RH**
    a. Install the engine mounting insulator RH with the nut.

       Torque: 95 N*m (969 kgf*cm, 71 ft.*lbf)

13. **INSTALL ENGINE MOUNTING INSULATOR LH**
    a. Install the engine mounting insulator LH with the nut.

       Torque: 95 N*m (969 kgf*cm, 71 ft.*lbf)

14. **INSTALL FRONT ENGINE MOUNTING INSULATOR**
    a. Install the front engine mounting insulator with the bolt.

       Torque: 87 N*m (888 kgf*cm, 65 ft.*lbf)

    b. Connect the connector
15. **INSTALL STEERING GEAR ASSEMBLY (for AWD)** . Refer to **INSTALLATION - Step 3**
16. **INSTALL FRONT STABILIZER BAR (for AWD)** . Refer to **INSTALLATION - Step 1**
17. **INSTALL NO. 1 FRONT STABILIZER BRACKET LH (for AWD)** . Refer to **INSTALLATION - Step 7**
18. **INSTALL NO. 1 FRONT STABILIZER BRACKET RH (for AWD)**

    HINT:

    Perform the same procedure as for the LH side.

19. **INSTALL ENGINE WIRE**
    a. Install the engine wire to the engine with transaxle.
20. **INSTALL STARTER ASSEMBLY** . Refer to **INSTALLATION - Step 1**

21. **INSTALL COOLER COMPRESSOR ASSEMBLY** . Refer to **INSTALLATION - Step 1**
22. **INSTALL GENERATOR ASSEMBLY** . Refer to **INSTALLATION - Step 1**
23. **INSTALL FAN AND GENERATOR V BELT** See step 3
24. **INSTALL ENGINE ASSEMBLY WITH TRANSAXLE**
    a. Set the engine assembly with transaxle on the engine lifter.

NOTE:

- **Install a height adjustment attachment and plate lift attachment onto the engine assembly with transaxle.**
- **Do not position a height adjustment attachment or plate lift attachment onto the front frame assembly.**

HINT:

Place the engine on wooden blocks or equivalents so that the engine is level.

    b. Remove the 4 bolts and 2 engine hangers.

TEXT IN ILLUSTRATION

*1	No. 1 Engine Hanger
*2	No. 2 Engine Hanger
*a	for Bank 1
*b	for Bank 2

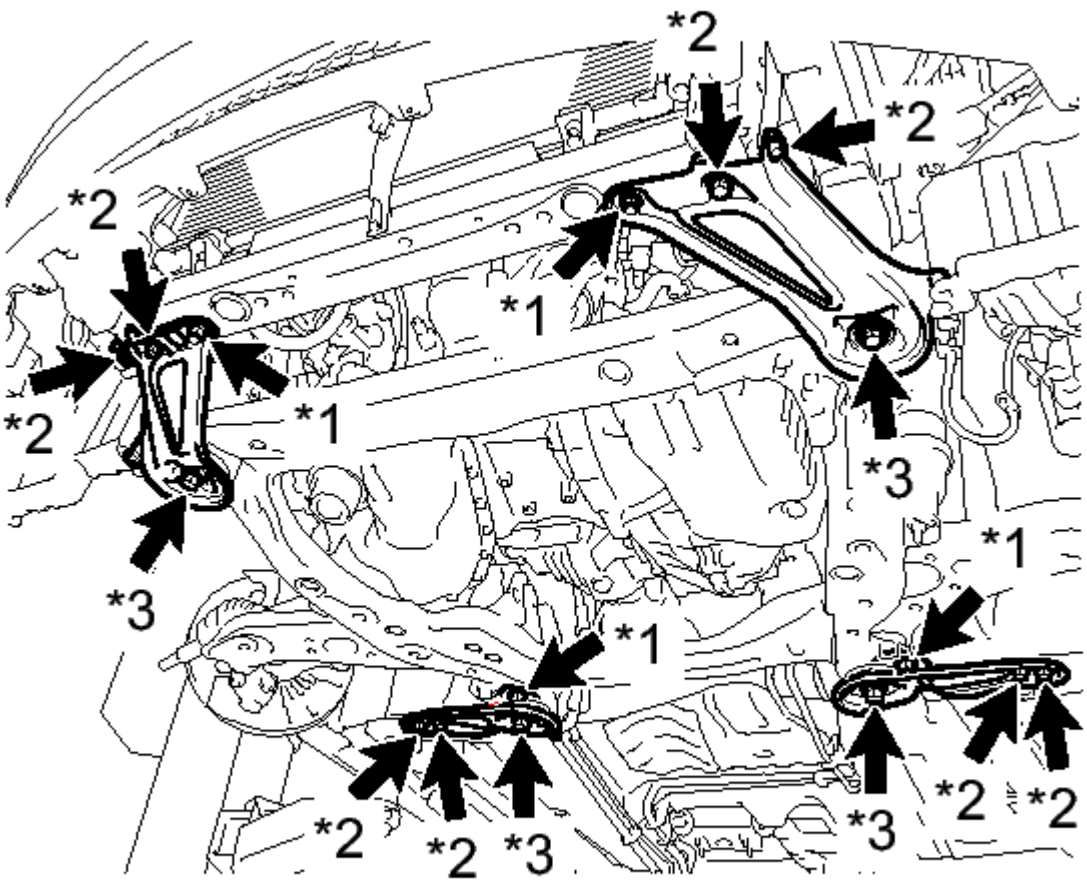
    c. Install the engine assembly with transaxle to the vehicle.

NOTE: **Do not raise the engine more than necessary. If the engine is raised excessively, the vehicle may also be lifted up.**

HINT:

- 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.

    d. Install the frame side rail plates RH and LH with the 6 bolts and 2 nuts.



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Fig. 127: Identifying RH/LH Frame Side Rail Plates, Nuts & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Nut
*2	Bolt A
*3	Bolt B

Nut

Torque: 32 N*m (327 kgf*cm, 24 ft.*lbf)

Bolt A

Torque: 32 N*m (327 kgf*cm, 24 ft.*lbf)

Bolt B

Torque: 85 N*m (867 kgf*cm, 63 ft.*lbf)

e. Install the front suspension member brace rear RH and LH with the 6 bolts and 2 nuts.

TEXT IN ILLUSTRATION

*1	Nut
*2	Bolt A
*3	Bolt B

Nut

Torque: 32 N*m (327 kgf*cm, 24 ft.*lbf)

Bolt A

Torque: 32 N*m (327 kgf*cm, 24 ft.*lbf)

Bolt B

Torque: 85 N*m (867 kgf*cm, 63 ft.*lbf)

25. **INSTALL DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT**

a. Using SST, hold the crankshaft pulley.

- **SST: 09213-70011**

  09213-70020

- **SST: 09330-00021**

b. Apply a few drops of adhesive to 2 or 3 threads of the 6 drive plate and torque converter clutch setting bolt tips.

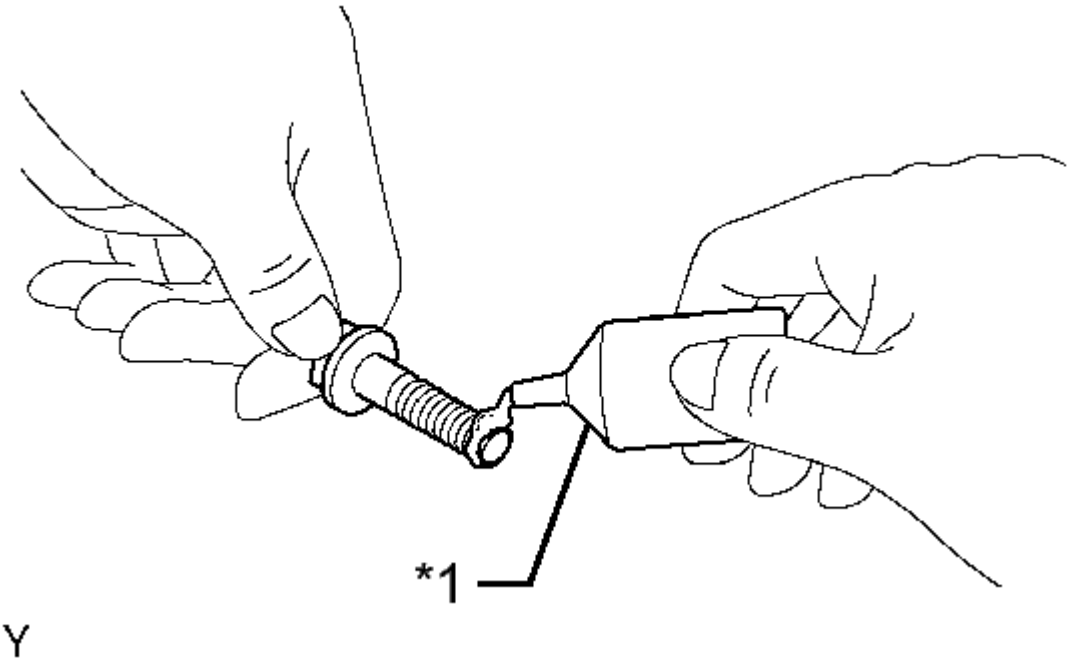


Fig. 128: Applying Adhesive To Bolt Threads
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Adhesive 1324

Adhesive

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent.

c. Tighten the 6 drive plate and torque converter clutch setting bolts.

Torque: 41 N*m (418 kgf*cm, 30 ft.*lbf)

NOTE: Install the black colored bolt first, and then the silver colored 5 bolts.

26. **INSTALL FLYWHEEL HOUSING UNDER COVER**
    a. Install the flywheel housing under cover with the 2 bolts.

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

27. **INSTALL FRONT DRIVE SHAFT ASSEMBLY LH** . Refer to **INSTALLATION - Step 1**
28. **INSTALL FRONT DRIVE SHAFT ASSEMBLY RH (for 2WD)** . Refer to **INSTALLATION - Step 2**
29. **INSTALL FRONT LOWER SUSPENSION ARM LH** . Refer to **INSTALLATION - Step 7**

30. **INSTALL FRONT LOWER SUSPENSION ARM RH**

    HINT:

    Perform the same procedure as for the LH side.

31. **CONNECT TIE ROD ASSEMBLY LH** . Refer to **INSTALLATION - Step 9**
32. **CONNECT TIE ROD ASSEMBLY RH**

    HINT:

    Perform the same procedure as for the LH side.

33. **CONNECT FRONT SPEED SENSOR LH** . Refer to **INSTALLATION - Step 10**
34. **CONNECT FRONT SPEED SENSOR RH**

    HINT:

    Perform the same procedure as for the LH side.

35. **CONNECT FRONT STABILIZER LINK ASSEMBLY LH** . Refer to **INSTALLATION - Step 10**
36. **CONNECT FRONT STABILIZER LINK ASSEMBLY RH**

    HINT:

    Perform the same procedure as for the LH side.

37. **INSTALL FRONT AXLE SHAFT NUT LH** . Refer to **INSTALLATION - Step 12**
38. **INSTALL FRONT AXLE SHAFT NUT RH**

    HINT:

    Perform the same procedure as for the LH side.

39. **CONNECT STEERING INTERMEDIATE SHAFT ASSEMBLY** . Refer to **INSTALLATION - Step 4**
40. **INSTALL FRONT EXHAUST PIPE ASSEMBLY** . Refer to **INSTALLATION - Step 11**
41. **INSTALL FRONT EXHAUST PIPE ASSEMBLY (for AWD)** . Refer to **INSTALLATION - Step 12**
42. **INSTALL NO. 1 EXHAUST PIPE SUPPORT BRACKET** . Refer to **INSTALLATION - Step 4**
43. **INSTALL PROPELLER WITH CENTER BEARING SHAFT ASSEMBLY (for AWD)**

    Refer to **INSTALLATION**

44. **CONNECT SUCTION HOSE SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 2**
45. **CONNECT DISCHARGE HOSE SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 3**

46. **INSTALL ENGINE MOVING CONTROL ROD**

a. Temporarily install the engine moving control rod to the engine moving control rod bracket with the bolt.

HINT:

Perform this procedure only when replacement of the engine moving control rod is necessary.

47. **INSTALL ENGINE MOVING CONTROL ROD BRACKET**

a. When replacing the engine moving control rod.

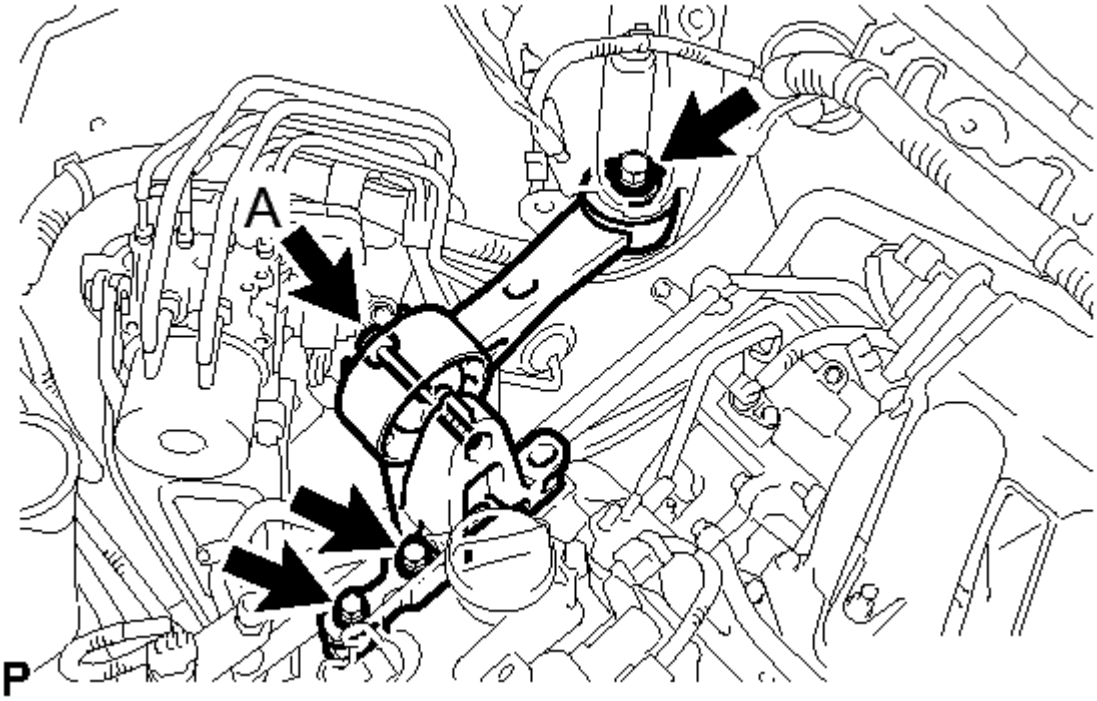


Fig. 129: Identifying Engine Moving Control Rod Bracket, Rod & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Temporarily install the engine moving control rod and engine moving control rod bracket with the 4 bolts.
2. Install the engine moving control rod bracket with the bolts except A.

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

3. Tighten the bolt A.

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

b. When not replacing the engine moving control rod.

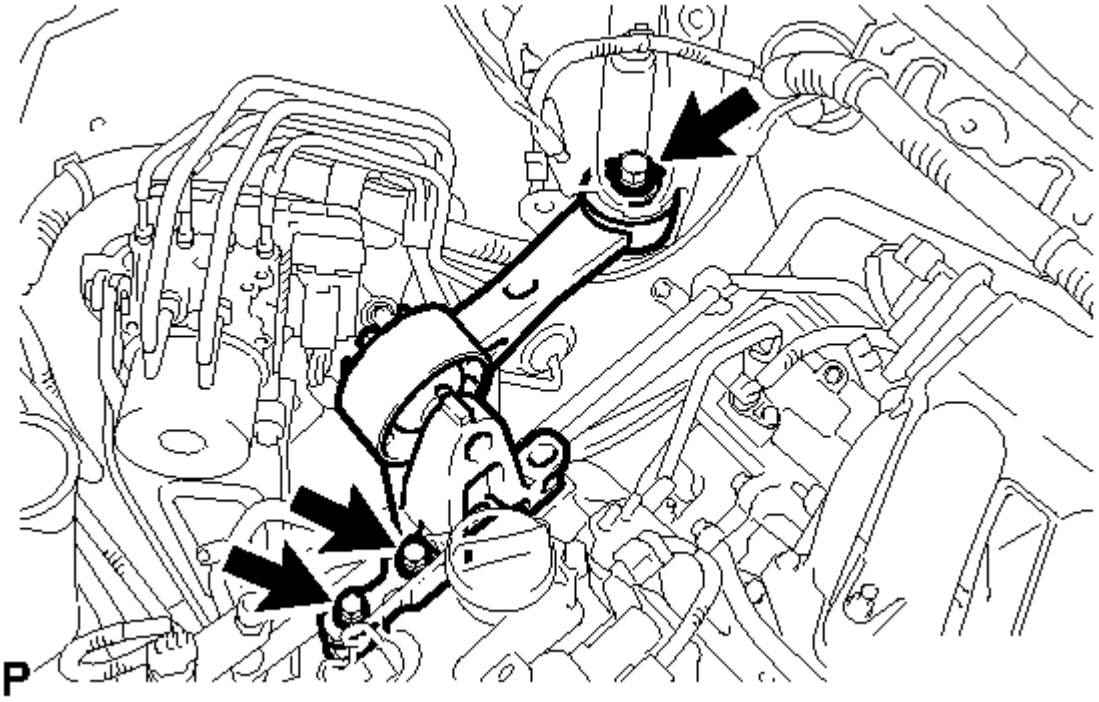


Fig. 130: Identifying Engine Moving Control Rod Bracket, Rod & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Install the engine moving control rod bracket with the 3 bolts.

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

48. **INSTALL NO. 2 ENGINE MOUNTING STAY RH**
    a. Install the No. 2 engine mounting stay RH with the bolt and 2 nuts.

       Bolt

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

       Nut

       Torque: 23 N*m (234 kgf*cm, 17 ft.*lbf)

    b. Install the No. 2 ground wire with the 2 bolts.

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

49. **CONNECT UNION TO CHECK VALVE HOSE**
    a. Connect the union to check valve hose.
50. **CONNECT NO. 1 INLET OIL COOLER HOSE**
    a. Connect the No. 1 inlet oil cooler hose.

51. **CONNECT NO. 1 OUTLET OIL COOLER HOSE**
    a. Connect the No. 1 outlet oil cooler hose.
52. **CONNECT FUEL MAIN TUBE**
    a. Push in the fuel tube connector to the fuel main tube until the fuel tube connector makes a "click" sound.

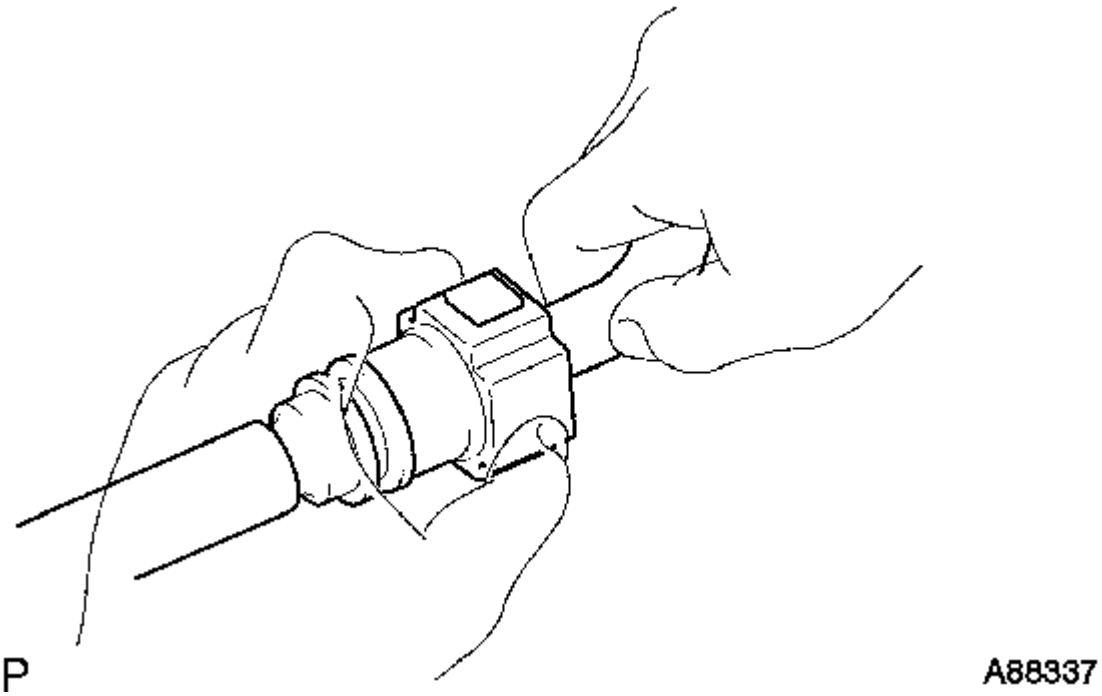


Fig. 131: Connecting Fuel Main Tube
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- **Check that there is no damage or foreign objects on the fuel tube connector.**
- **After connecting, check that the fuel tube connector and the pipe are securely connected by pulling on them.**

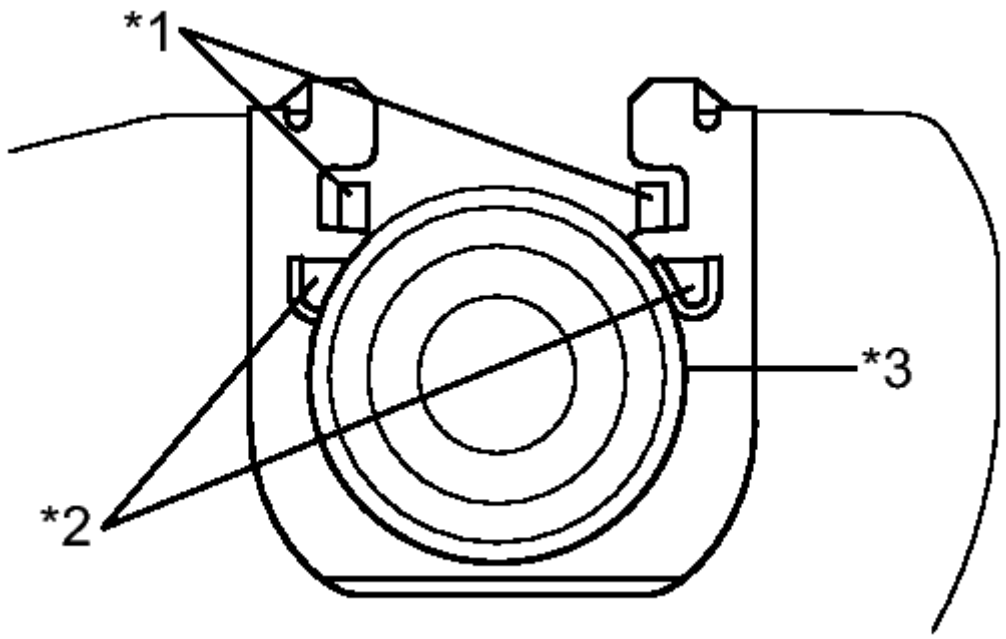
    b. Install the No. 1 EFI fuel pipe clamp.

    HINT:

    The half connection prevention connector prevents the fuel hose connector cover from being locked if the fuel tube is not securely connected.

53. **CONNECT OUTLET HEATER WATER HOSE**
    a. Connect the outlet heater water hose.
54. **CONNECT INLET HEATER WATER HOSE**
    a. Connect the inlet heater water hose.

55. **CONNECT NO. 1 RADIATOR HOSE**
    a. Install the No. 1 radiator hose to the radiator pipe clamp.
    b. Connect the No. 1 radiator hose.
56. **CONNECT NO. 2 RADIATOR HOSE**
    a. Connect the No. 2 radiator hose.
57. **CONNECT NO. 1 FUEL VAPOR FEED HOSE**
    a. Connect the No. 1 fuel vapor feed hose.
58. **CONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**
    a. Install a new clip to the control cable bracket.
    b. Install the control cable to the control cable bracket.



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Fig. 132: Identifying Transmission Control Cable Assembly, Clip & Cable Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Claw (A)
*2	Claw (B)
*3	Control Cable

NOTE:

- **Make sure that the claws (A) on the clip are securely fit into the bracket holes.**

- **Make sure that the cable is securely installed inside of the claws (B) of the clip.**

c. Connect the transmission control cable to the control shaft lever with the nut.

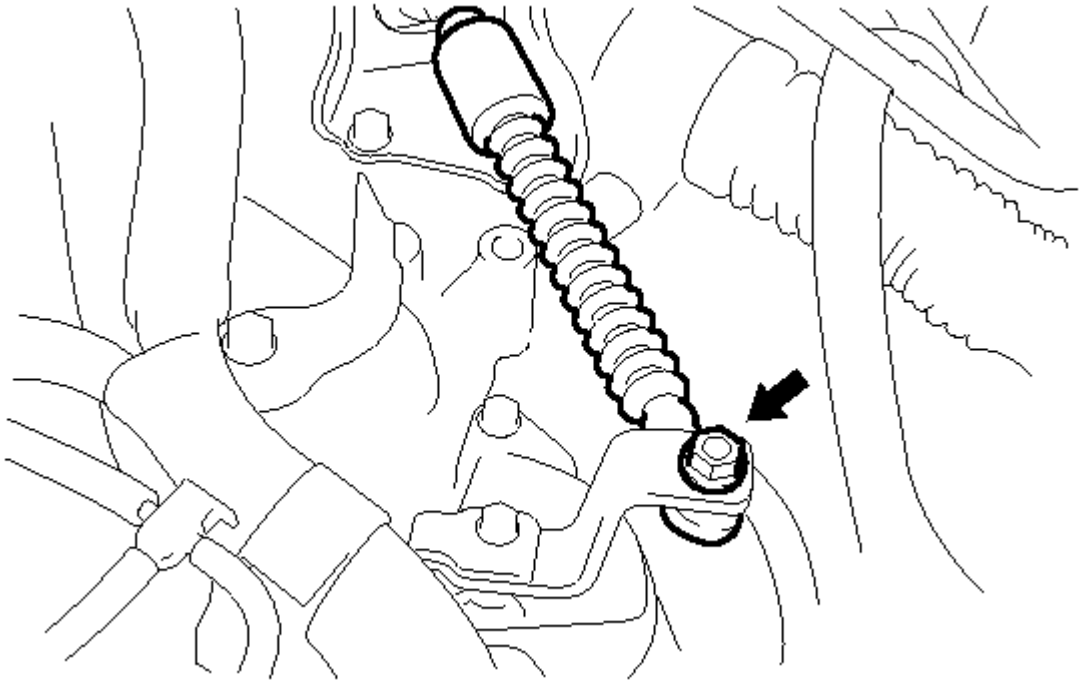


Fig. 133: Identifying Control Shaft Lever Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE: Before connecting the transmission control cable assembly, check that the park/neutral position switch and the shift lever are in N.

59. **CONNECT ENGINE WIRE**

a. Connect the connector to the ECM with the lock lever.

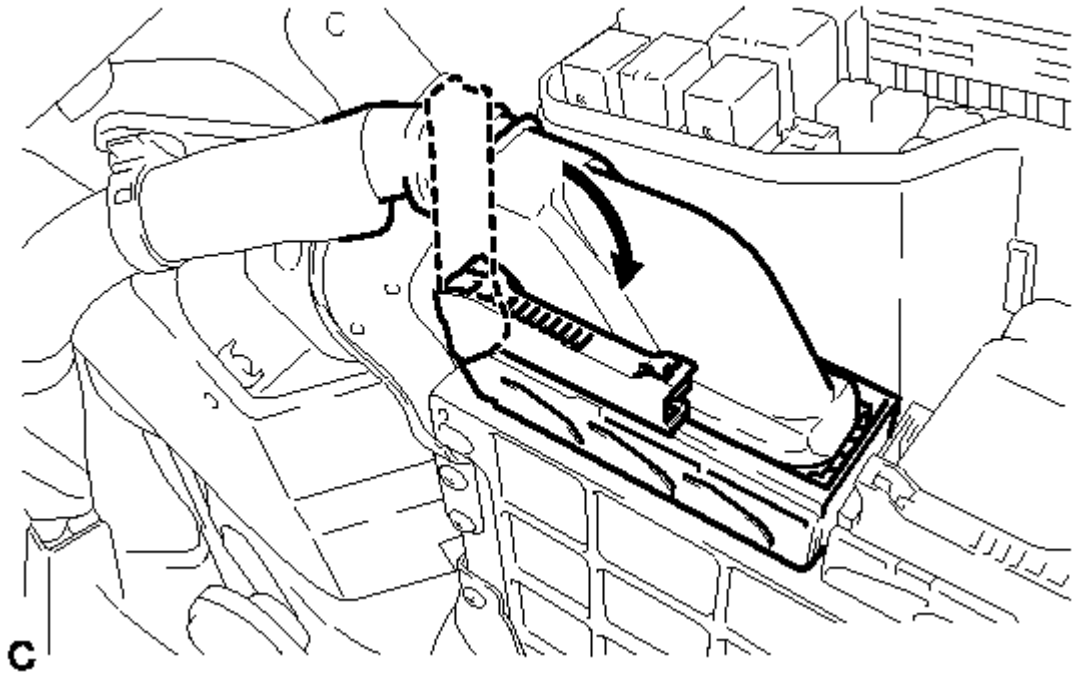


Fig. 134: Connecting ECM Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Connect the engine wire to the engine room junction block.
c. Install the engine wire with the nut and 3 connectors.

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

d. Install the ground wire with the 2 bolts.

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

e. Install the engine room relay block cover.

60. **INSTALL AIR CLEANER AND HOSE** . Refer to **INSTALLATION - Step 4**
61. **INSTALL BATTERY**
    a. Install the battery and battery tray.
    b. Install the battery clamp with the bolt and nut.

    Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)

    c. Connect the positive (+) cable to the positive (+) battery terminal.

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

62. **INSTALL AIR CLEANER INLET COVER ASSEMBLY SEAL**

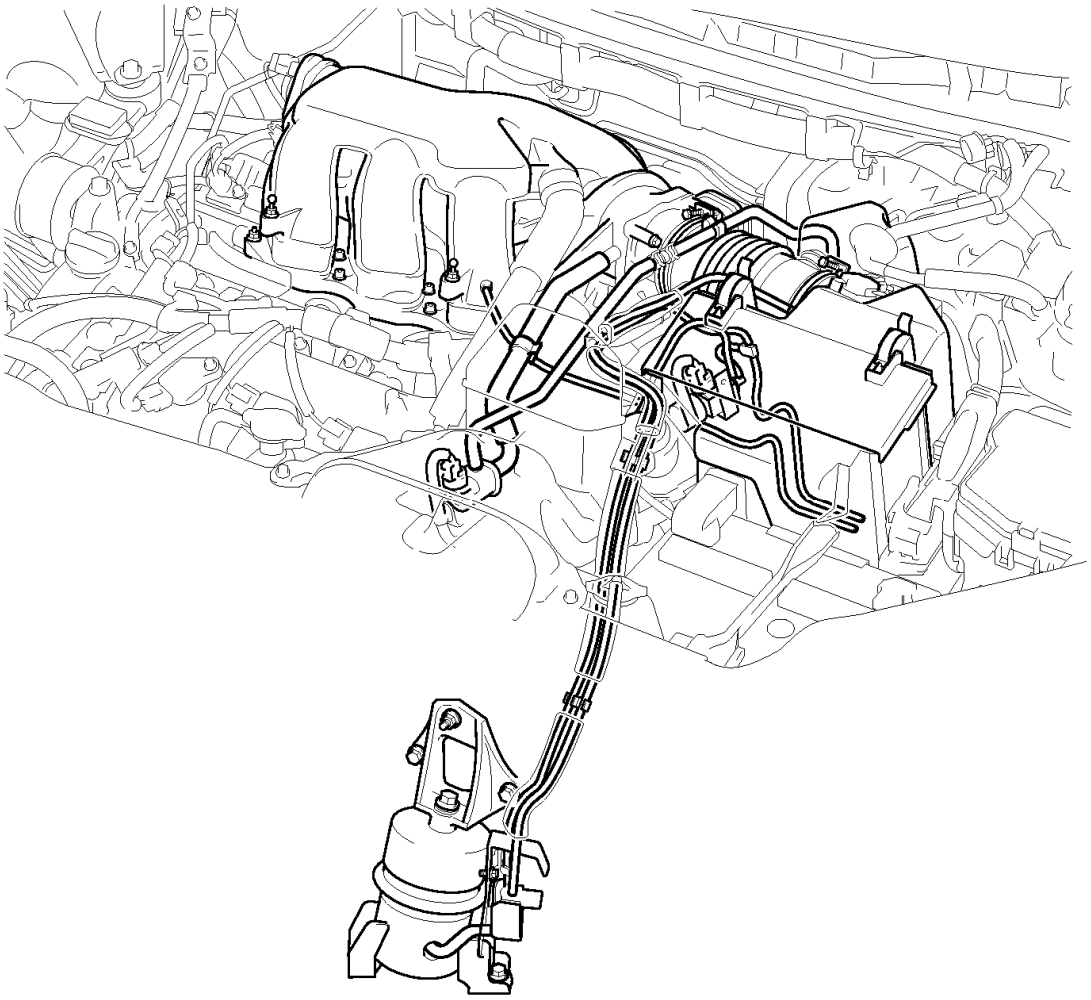
a. Install the air cleaner inlet cover assembly seal with the 2 bolts.

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

b. Connect the 2 vacuum hose clamps to the air cleaner inlet cover assembly seal.

63. **INSPECT VACUUM HOSES**

a. Inspect the vacuum hoses.



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Fig. 135: Identifying Vacuum Hoses
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

64. **INSTALL OUTER COWL TOP PANEL SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 12**
65. **INSTALL WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** . Refer to **INSTALLATION - Step 2**
66. **INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 3**

67. **INSTALL FRONT FENDER TO COWL SIDE SEAL LH** . Refer to **INSTALLATION - Step 4**
68. **INSTALL FRONT FENDER TO COWL SIDE SEAL RH** . Refer to **INSTALLATION - Step 5**
69. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY RH** . Refer to **INSTALLATION - Step 6**
70. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY LH** . Refer to **INSTALLATION - Step 7**
71. **INSTALL FRONT WIPER ARM HEAD CAP** . Refer to **INSTALLATION - Step 8**
72. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

    NOTE: When disconnecting the cable, some systems need to be initialized after the cable is reconnected. Refer to INITIALIZATION .

73. **INSTALL FRONT WHEEL**

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

74. **ADD ENGINE OIL** . Refer to **REPLACEMENT - Step 4**
75. **ADD ENGINE COOLANT** . Refer to **REPLACEMENT - Step 4**
76. **ADD TRANSFER OIL (for AWD)** . Refer to **REPLACEMENT - Step 2**
77. **INSPECT TRANSFER OIL (for AWD)** . Refer to **ON-VEHICLE INSPECTION - Step 1**
78. **ADD AUTOMATIC TRANSAXLE FLUID (for 2WD)**

    Refer to **ADJUSTMENT**

79. **ADD AUTOMATIC TRANSAXLE FLUID (for AWD)**

    Refer to **ADJUSTMENT**

80. **WARM UP ENGINE**
81. **INSPECT ENGINE OIL LEVEL** . Refer to **ON-VEHICLE INSPECTION - Step 1**
82. **INSPECT ENGINE COOLANT LEVEL** . Refer to **ON-VEHICLE INSPECTION - Step 2**
83. **CHARGE WITH REFRIGERANT** . Refer to **REPLACEMENT - Step 2**
84. **INSPECT FOR FUEL LEAK** . Refer to **ON-VEHICLE INSPECTION - Step 1**
85. **INSPECT FOR COOLANT LEAK** . Refer to **ON-VEHICLE INSPECTION - Step 1**
86. **INSPECT FOR OIL LEAK**
87. **INSPECT FOR EXHAUST GAS LEAK**
88. **INSPECT IGNITION TIMING** See step 9
89. **INSPECT ENGINE IDLE SPEED** See step 10
90. **INSPECT CO/HC** See step 12
91. **CHECK FOR SPEED SENSOR SIGNAL**

    Refer to **TEST MODE PROCEDURE**

92. **INSPECT SHIFT LEVER POSITION (for 2WD)** . Refer to **INSTALLATION - Step 25**
93. **INSPECT SHIFT LEVER POSITION (for AWD)** . Refer to **ON-VEHICLE INSPECTION - Step 1**
94. **INSPECT AND ADJUST FRONT WHEEL ALIGNMENT**

    Refer to **ADJUSTMENT**

95. **INSTALL V-BANK COVER SUB-ASSEMBLY**
    a. Fit the 4 retainers and install the V-bank cover sub-assembly.
96. **INSTALL FRONT FENDER APRON SEAL LH**
    a. Install the front fender apron seal LH with the 2 bolts and clip.
97. **INSTALL FRONT FENDER APRON SEAL RH**
    a. Install the front fender apron seal RH with the 2 bolts and clip.
98. **INSTALL NO. 2 ENGINE UNDER COVER (for AWD)** . Refer to **INSTALLATION - Step 15**
99. **INSTALL NO. 1 ENGINE UNDER COVER** . Refer to **INSTALLATION - Step 16**
100. **INSTALL INSTRUMENT PANEL FINISH PANEL END LH** . Refer to **INSTALLATION - Step 8**

ENGINE UNIT

COMPONENTS

ILLUSTRATION

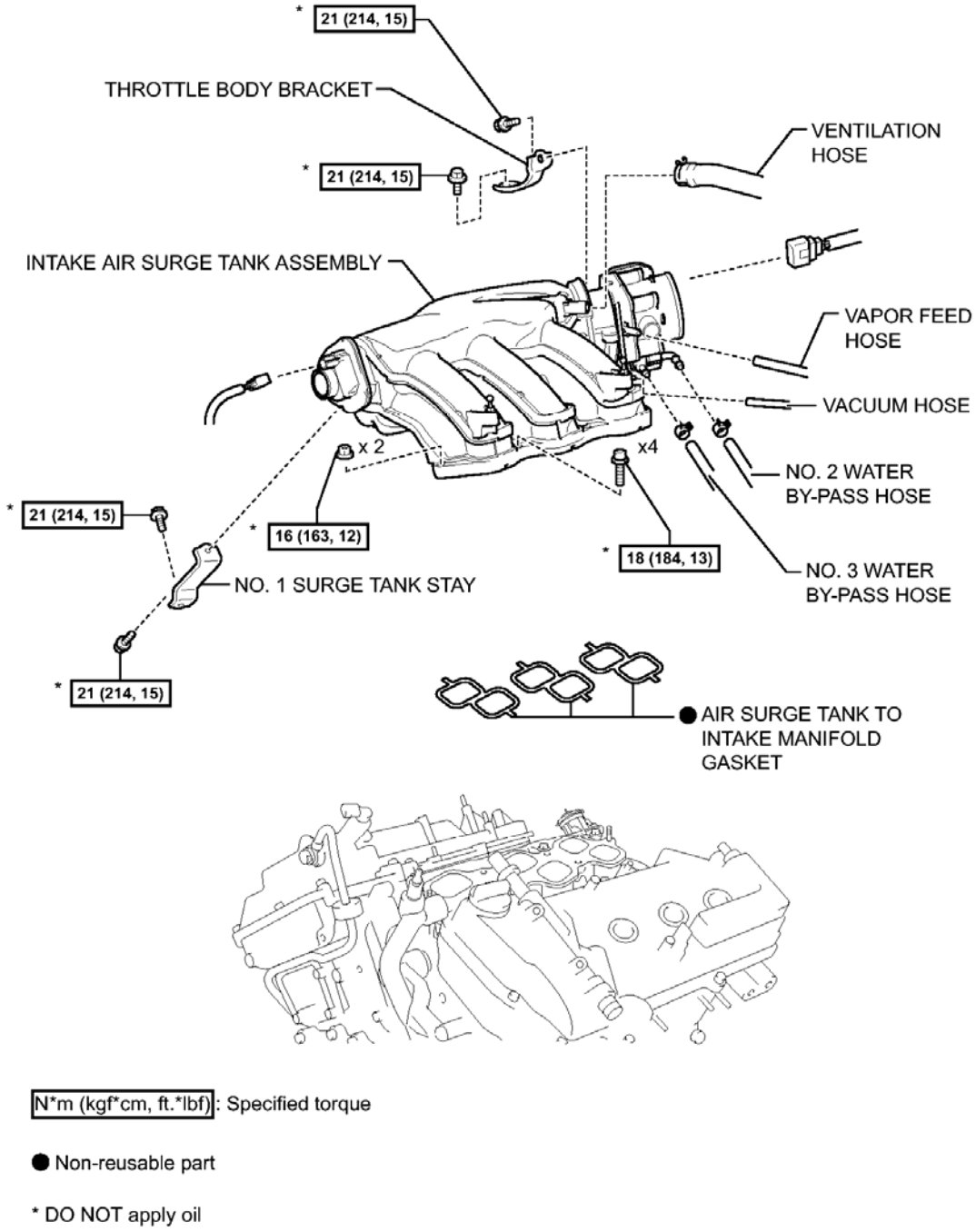
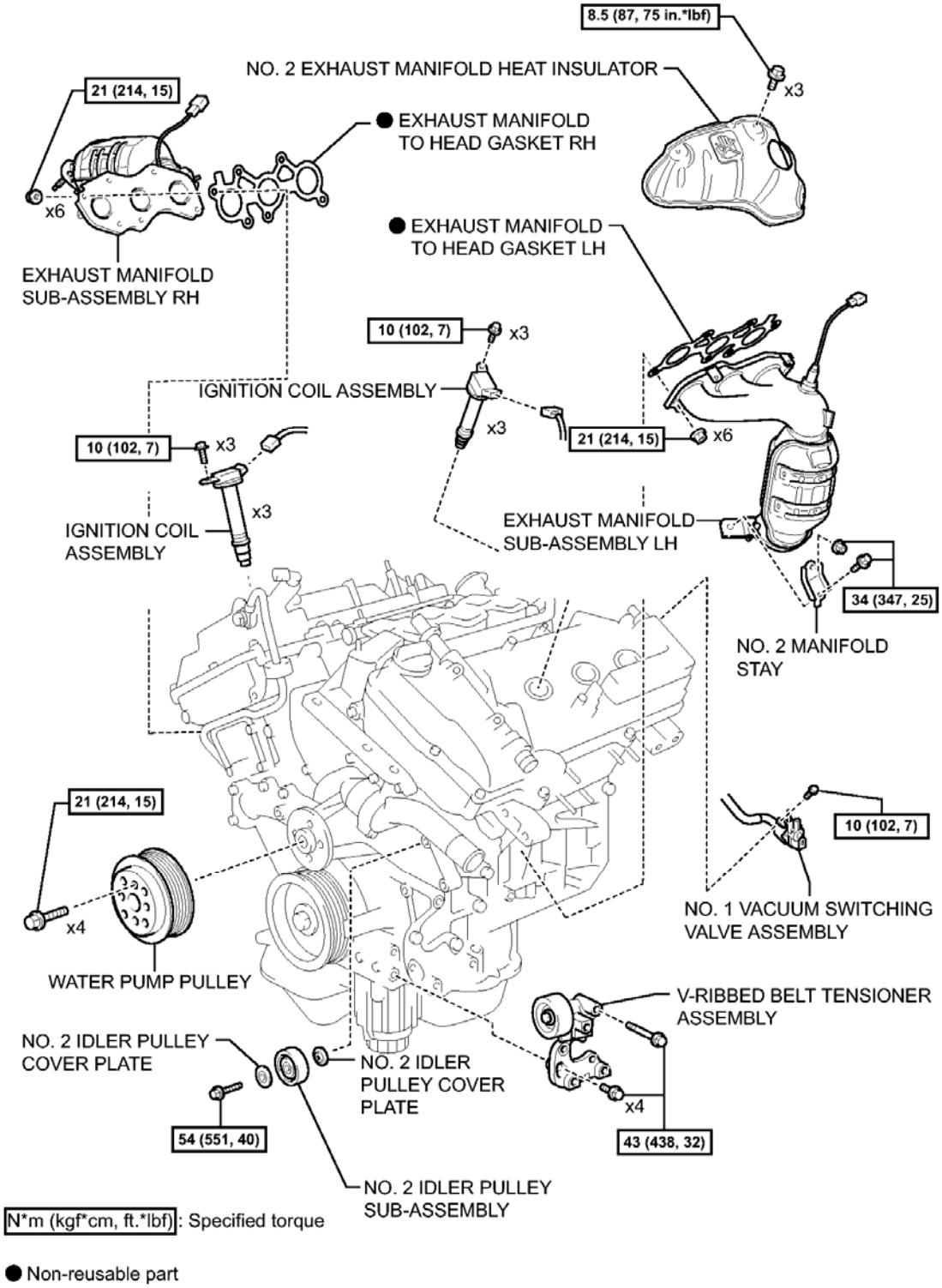


Fig. 136: Engine Unit Replacement Components With Torque Specifications (1 Of 13)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

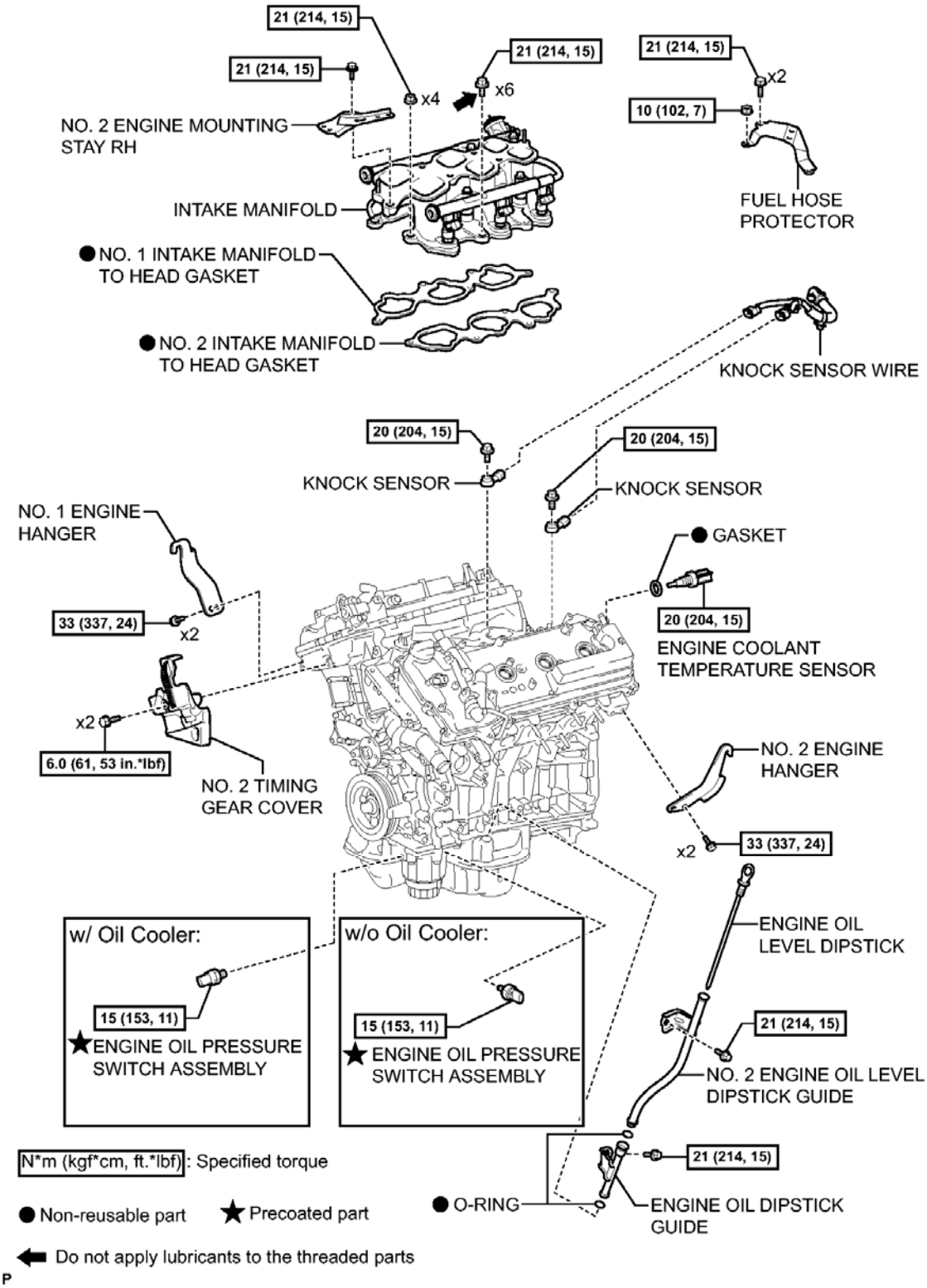
ILLUSTRATION



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Fig. 137: Engine Unit Replacement Components With Torque Specifications (2 Of 13)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

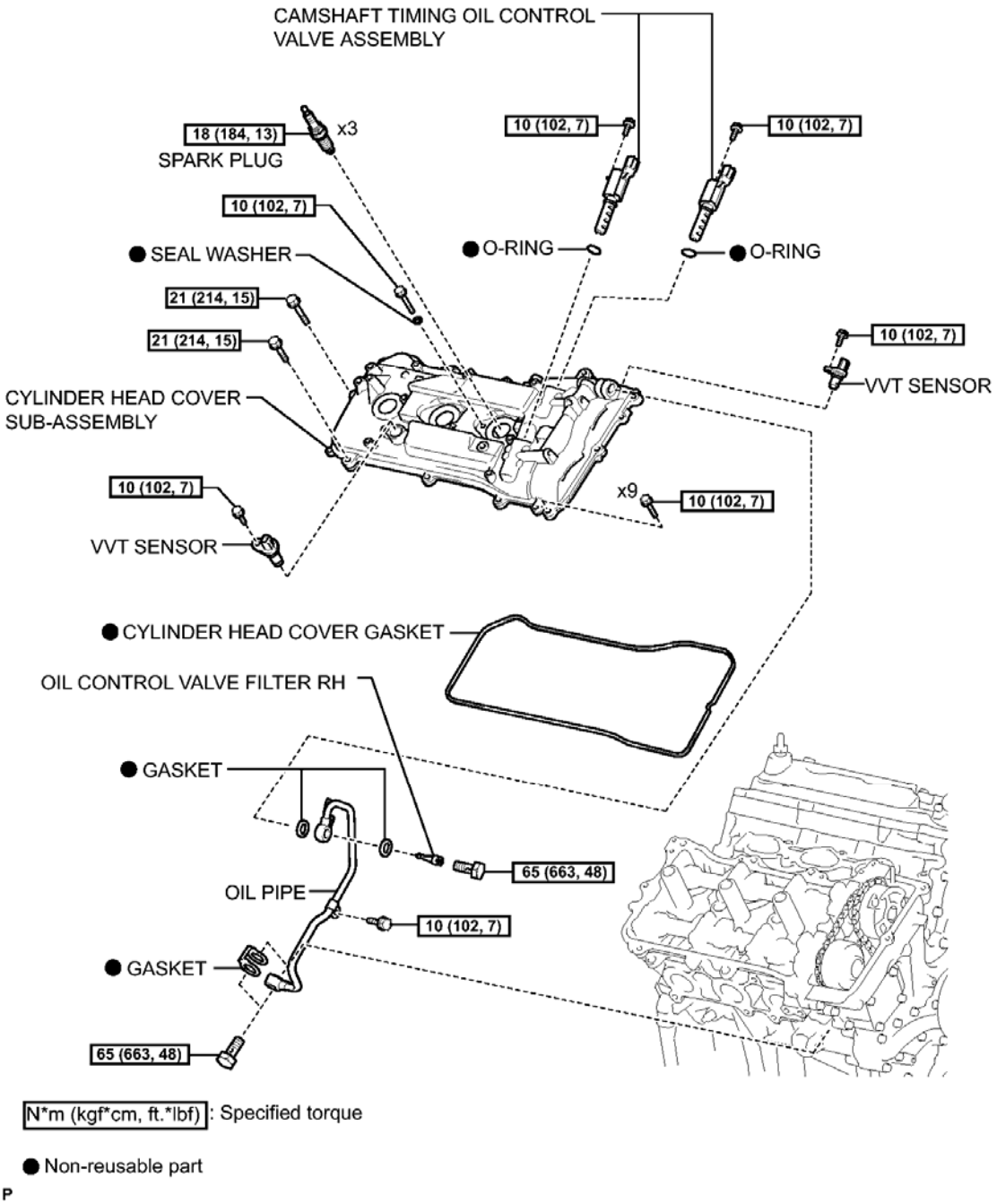


P

Fig. 138: Engine Unit Replacement Components With Torque Specifications (3 Of 13)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

for Bank 1:



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Fig. 139: Engine Unit Replacement Components With Torque Specifications (4 Of 13)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

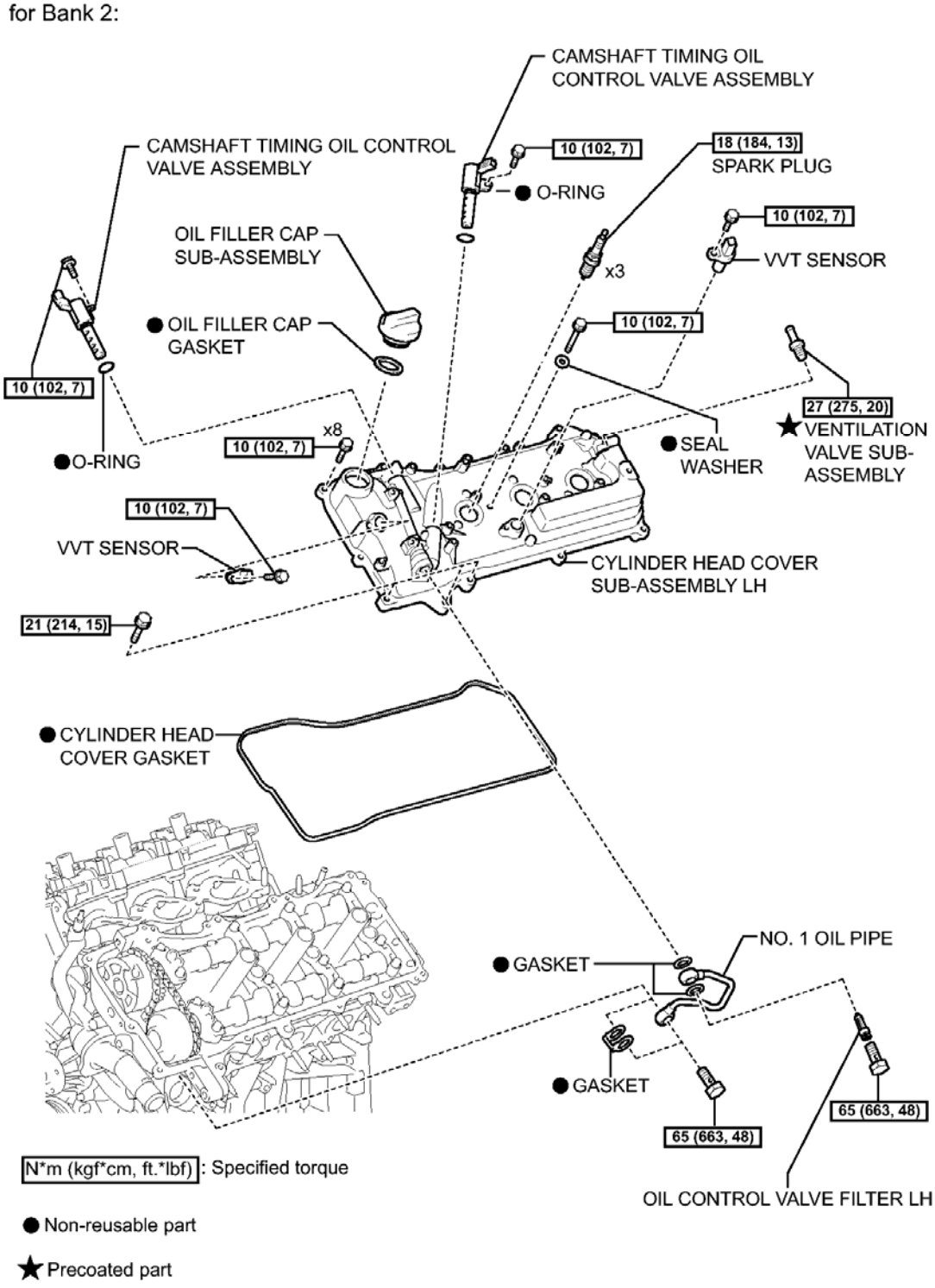
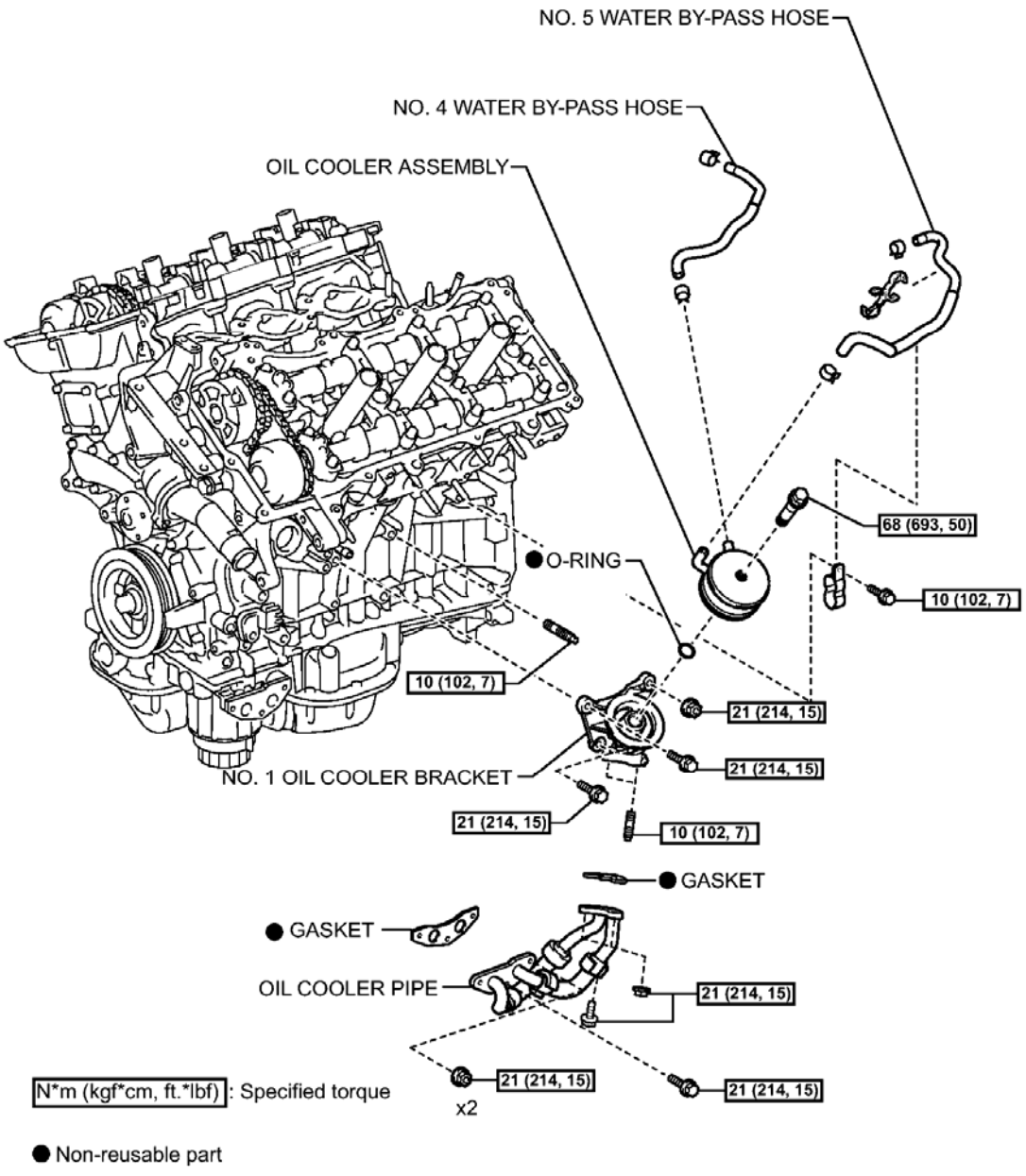


Fig. 140: Engine Unit Replacement Components With Torque Specifications (5 Of 13)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

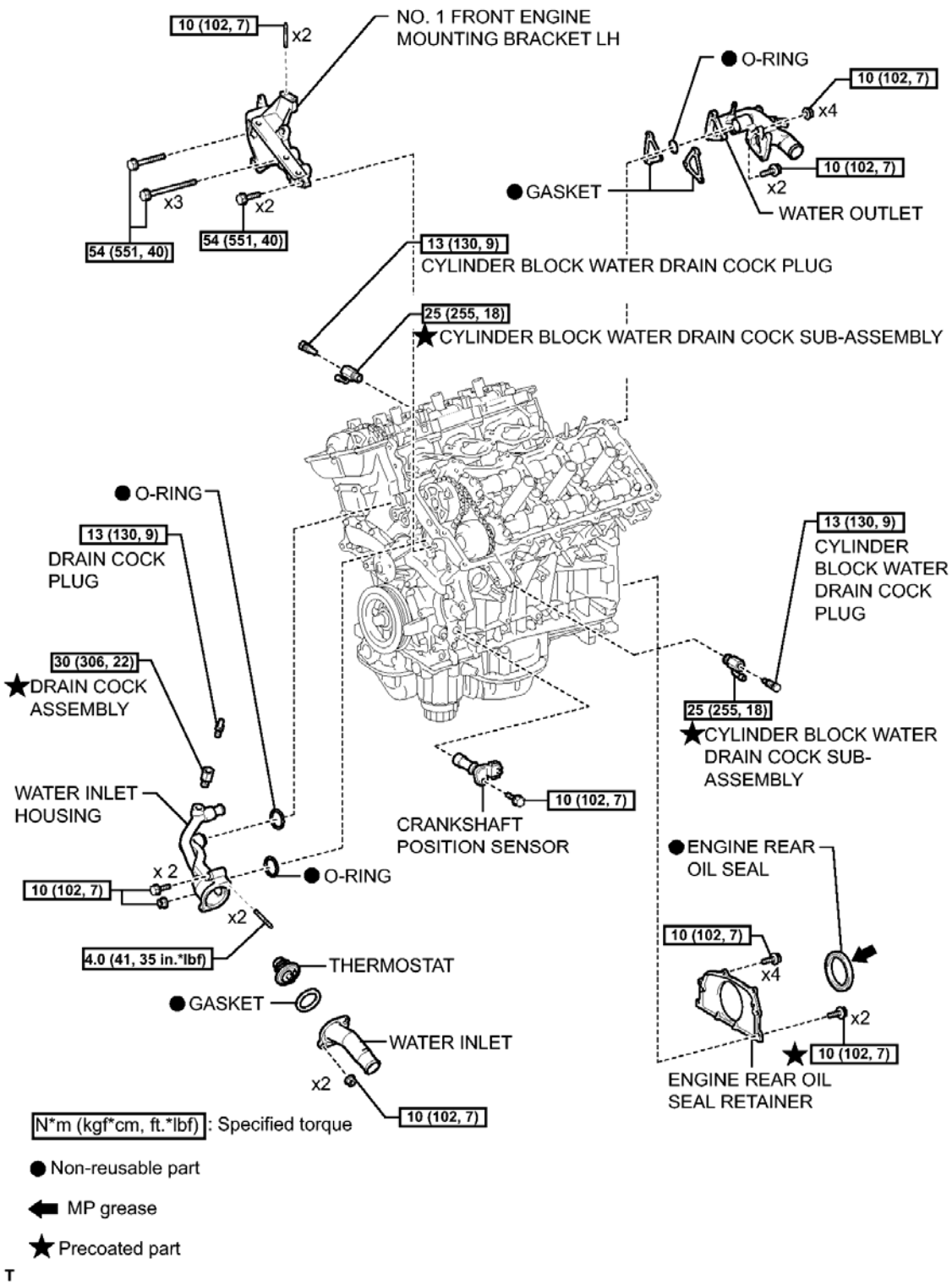
w/ Oil Cooler:



o

Fig. 141: Engine Unit Replacement Components With Torque Specifications (6 Of 13)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

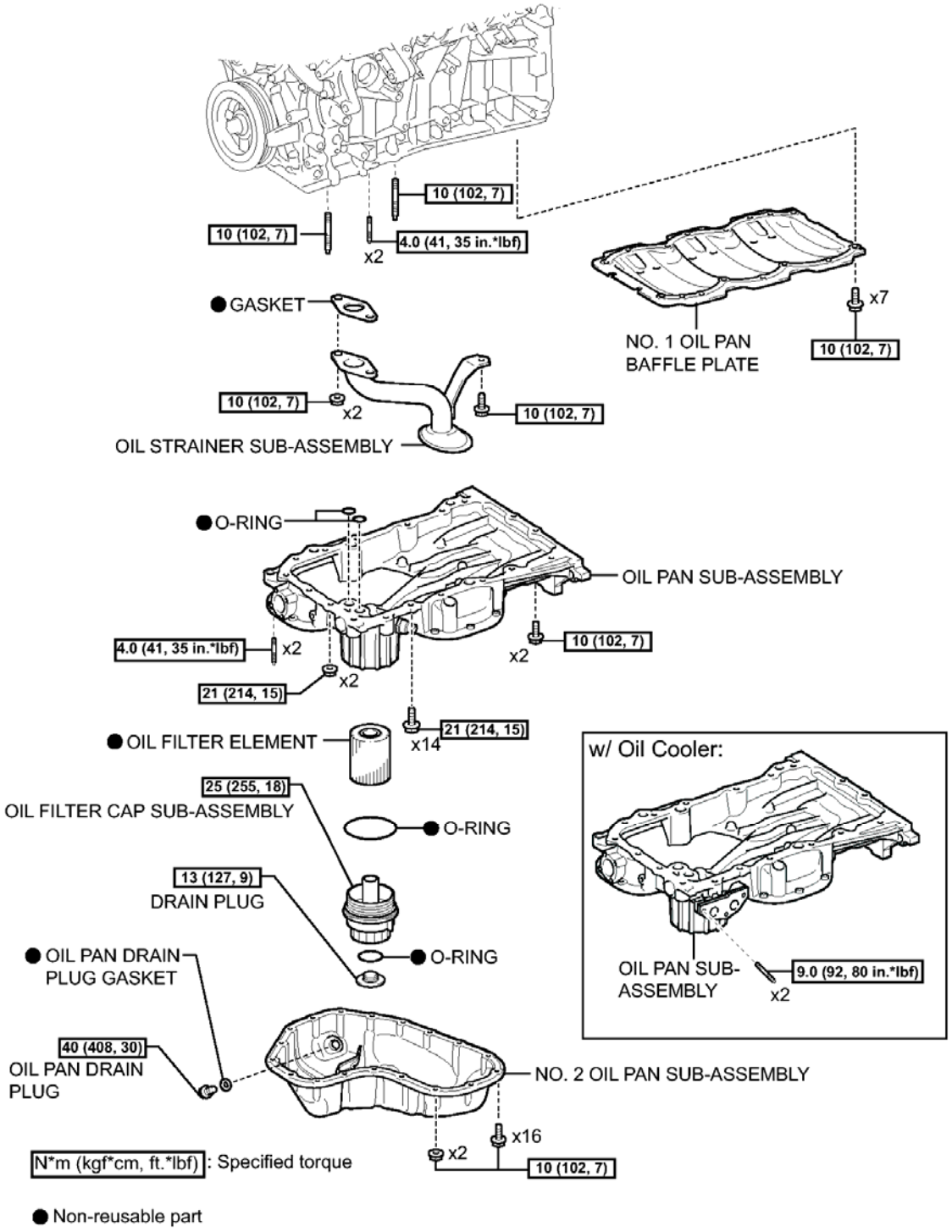
ILLUSTRATION



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Fig. 142: Engine Unit Replacement Components With Torque Specifications (7 Of 13)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



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Fig. 143: Engine Unit Replacement Components With Torque Specifications (8 Of 13)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

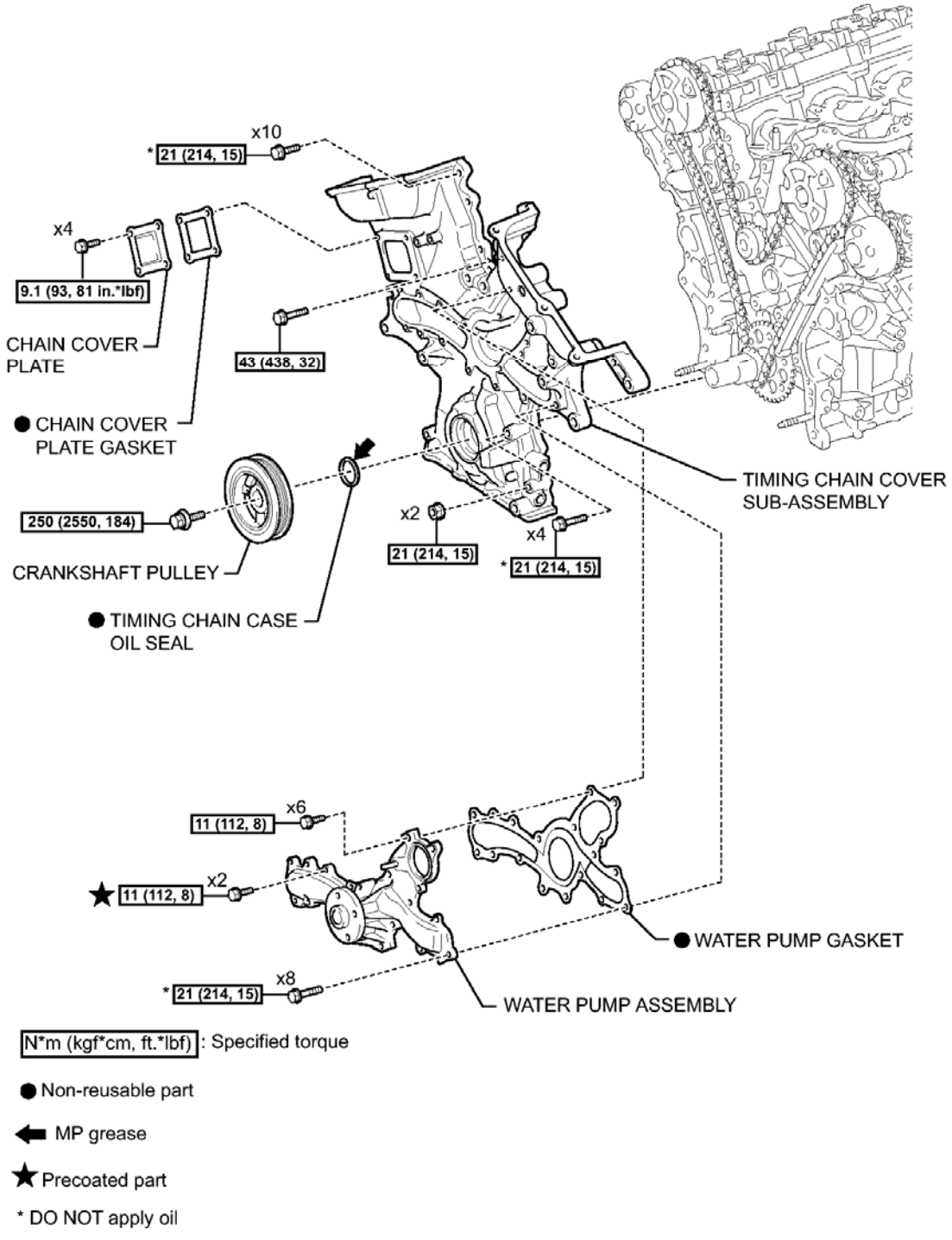


Fig. 144: Engine Unit Replacement Components With Torque Specifications (9 Of 13)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

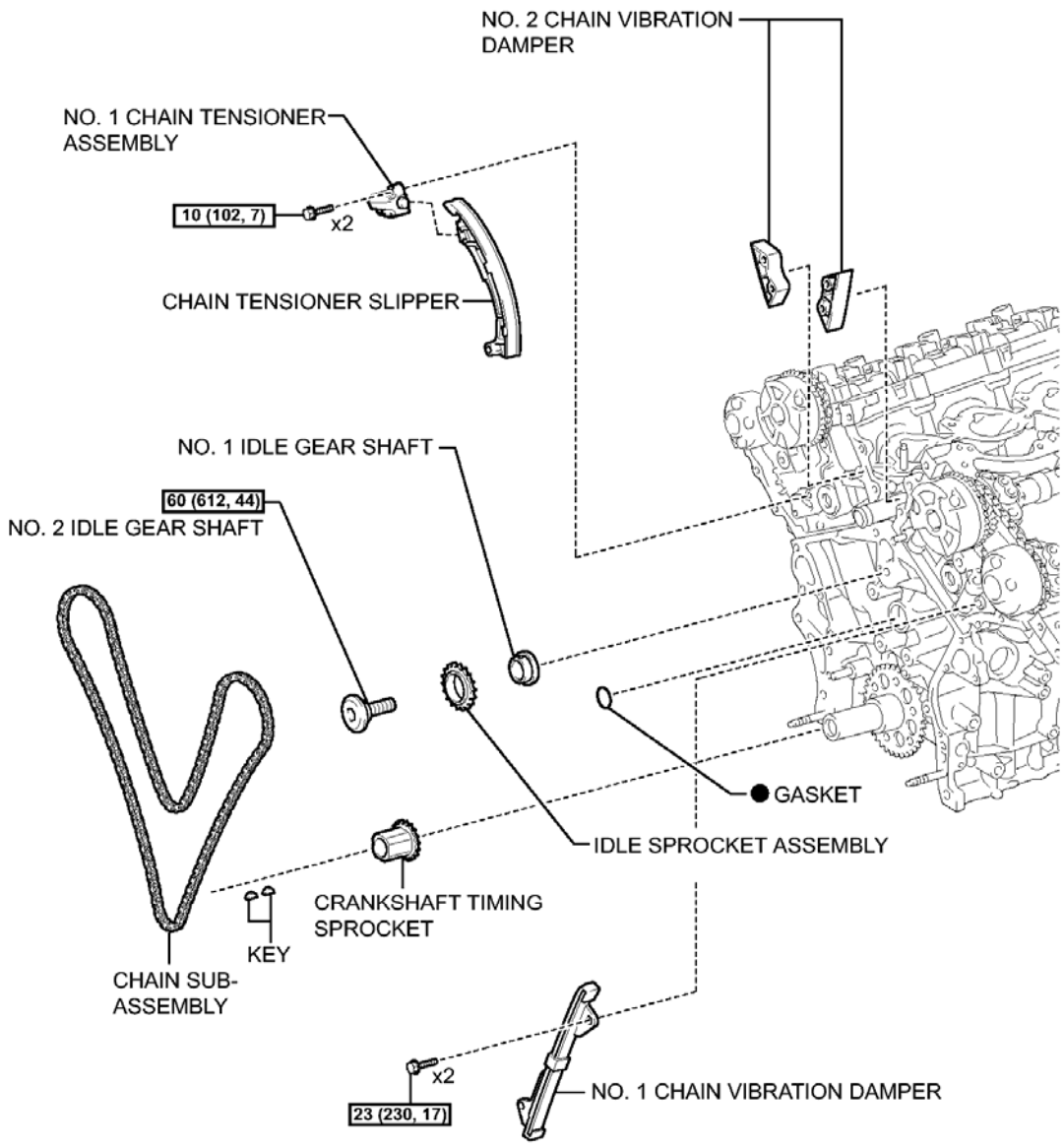


Fig. 145: Engine Unit Replacement Components With Torque Specifications (10 Of 13)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

for Bank 1:

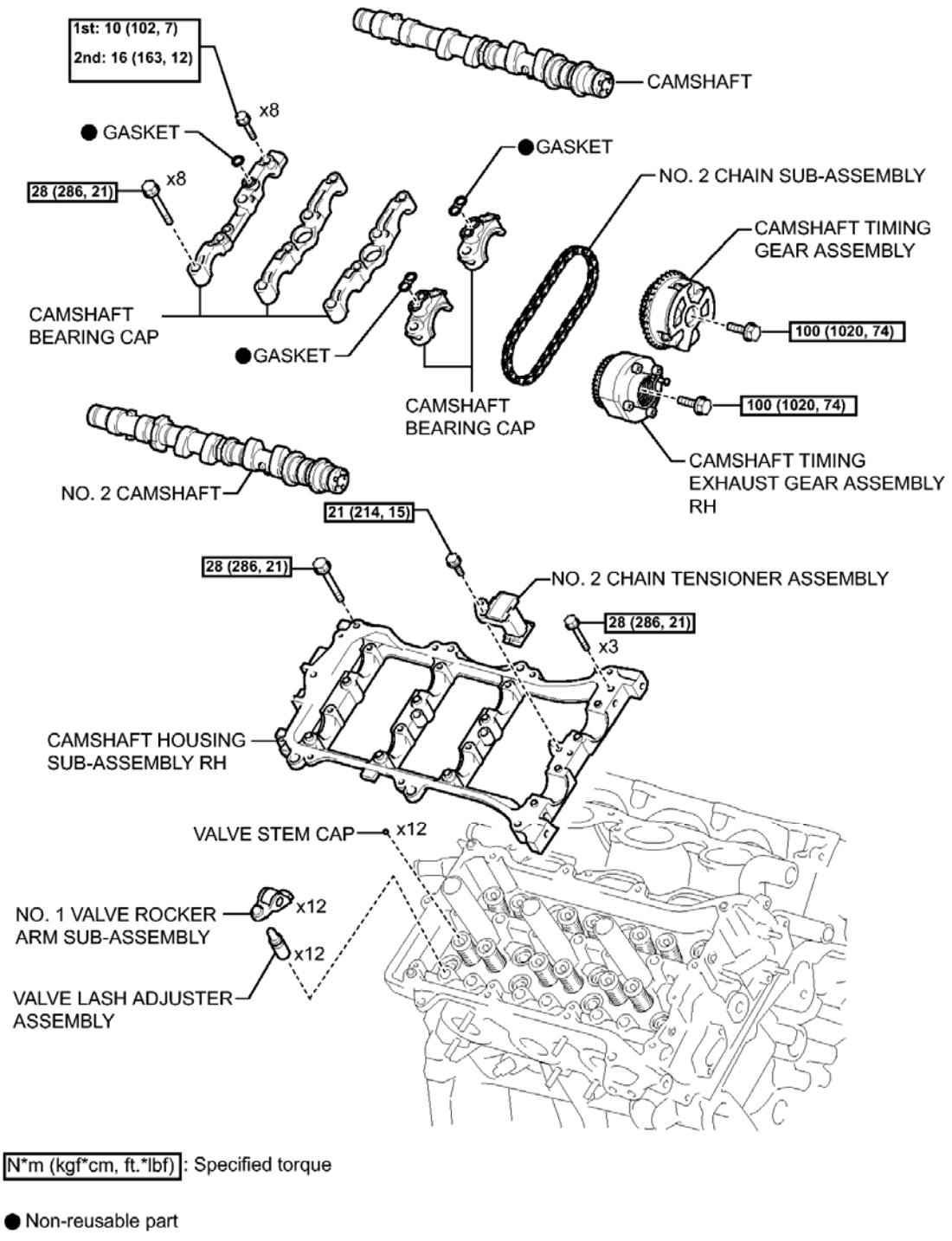


Fig. 146: Engine Unit Replacement Components With Torque Specifications (11 Of 13)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

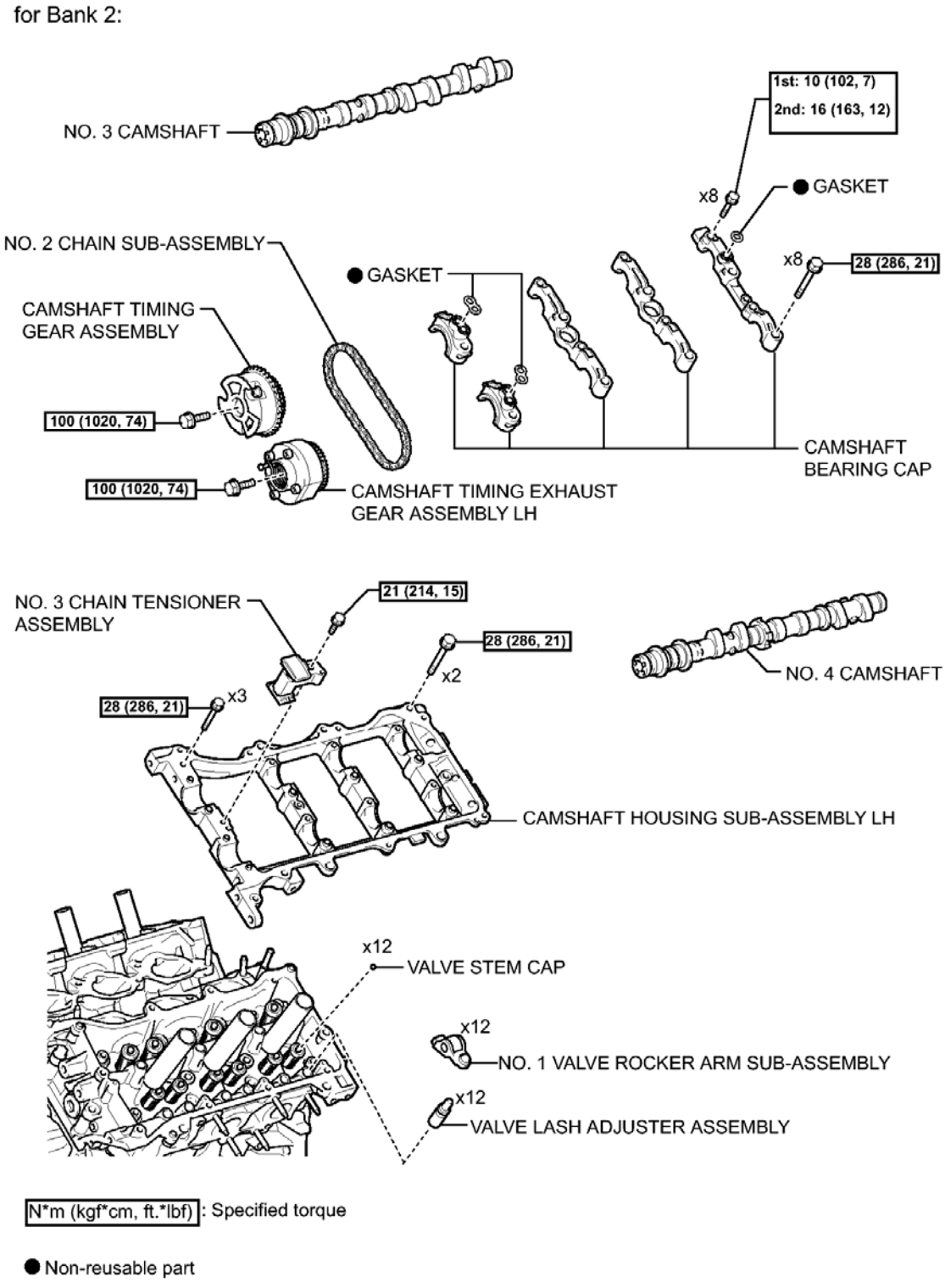
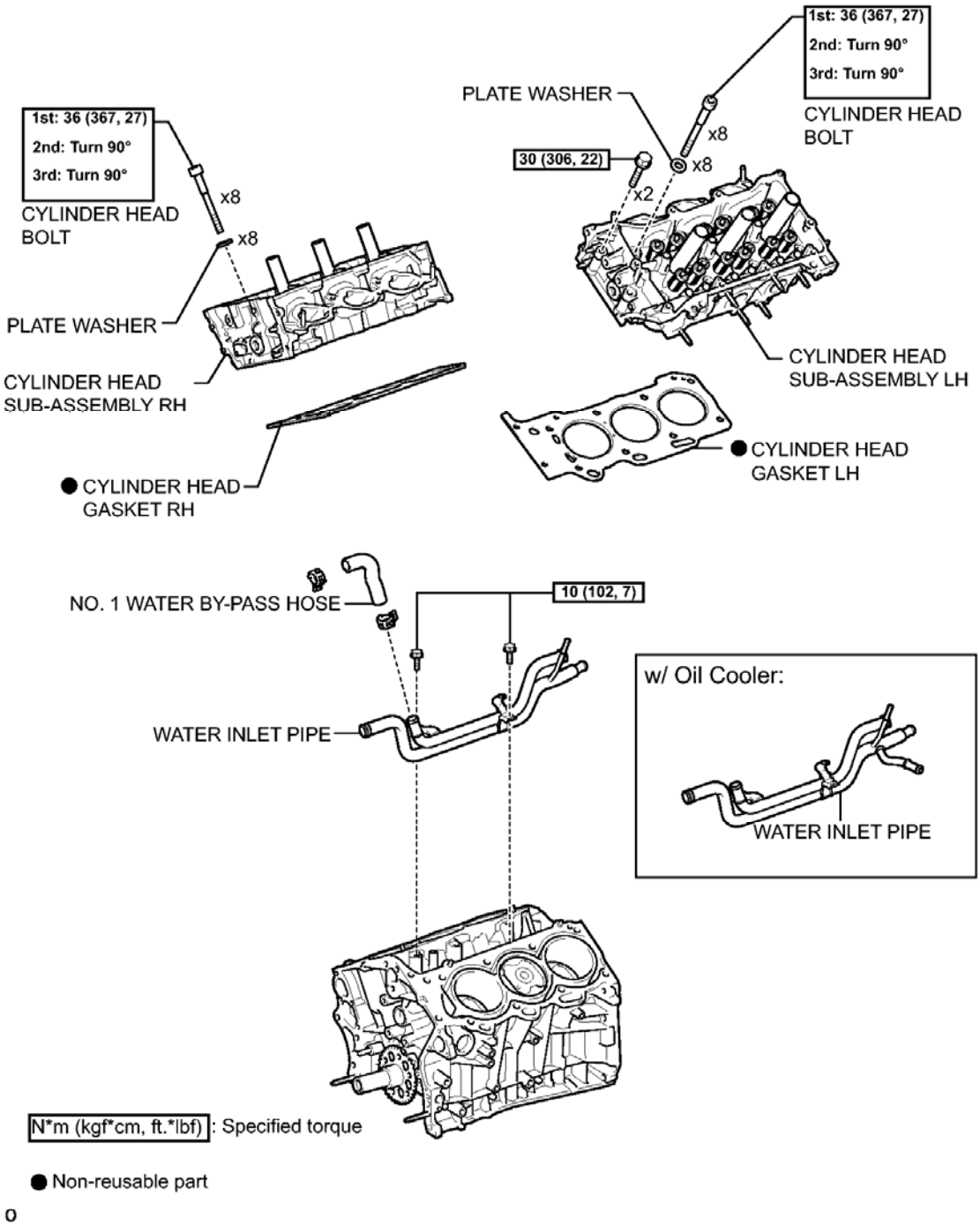


Fig. 147: Engine Unit Replacement Components With Torque Specifications (12 Of 13)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



o

Fig. 148: Engine Unit Replacement Components With Torque Specifications (13 Of 13)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

REMOVAL

1. **INSTALL ENGINE ON ENGINE STAND**

a. Install the engine onto an engine stand with the bolts.

2. **REMOVE ENGINE HANGER**
   a. Remove the 4 bolts and 2 engine hangers.

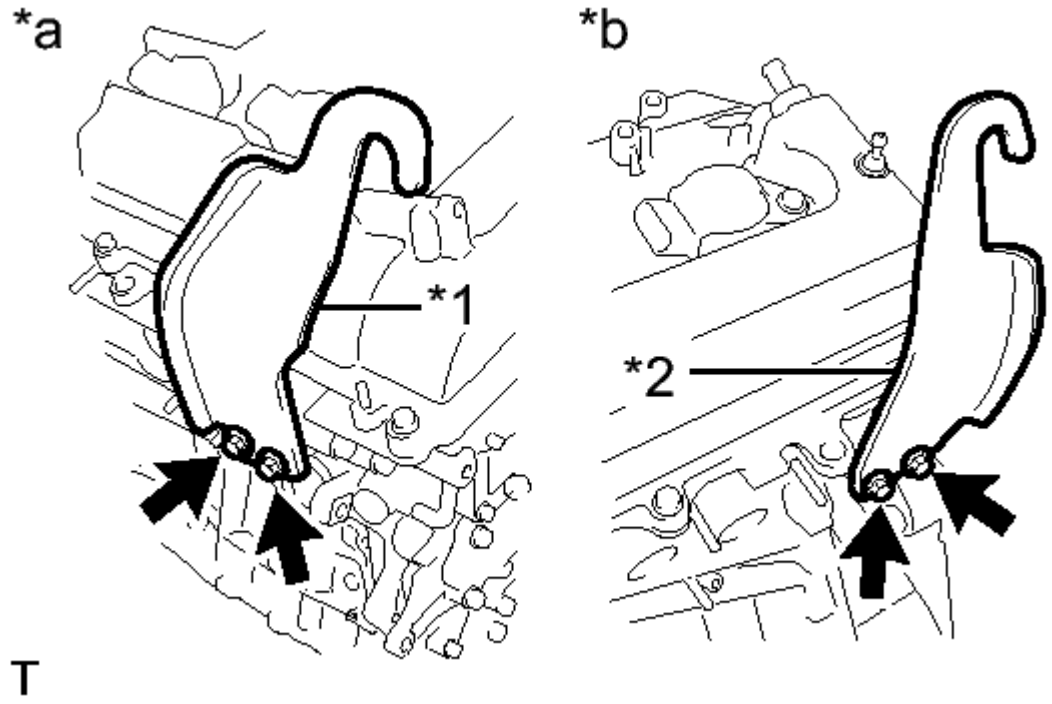


Fig. 149: Identifying No. 1/No. 2 Engine Hangers & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	No. 1 engine hanger
*2	No. 2 engine hanger
*a	Bank 1
*b	Bank 2

3. **REMOVE INTAKE AIR SURGE TANK ASSEMBLY** . Refer to **REMOVAL - Step 5**
4. **REMOVE NO. 1 SURGE TANK STAY**
   a. Remove the bolt and No. 1 surge tank stay.

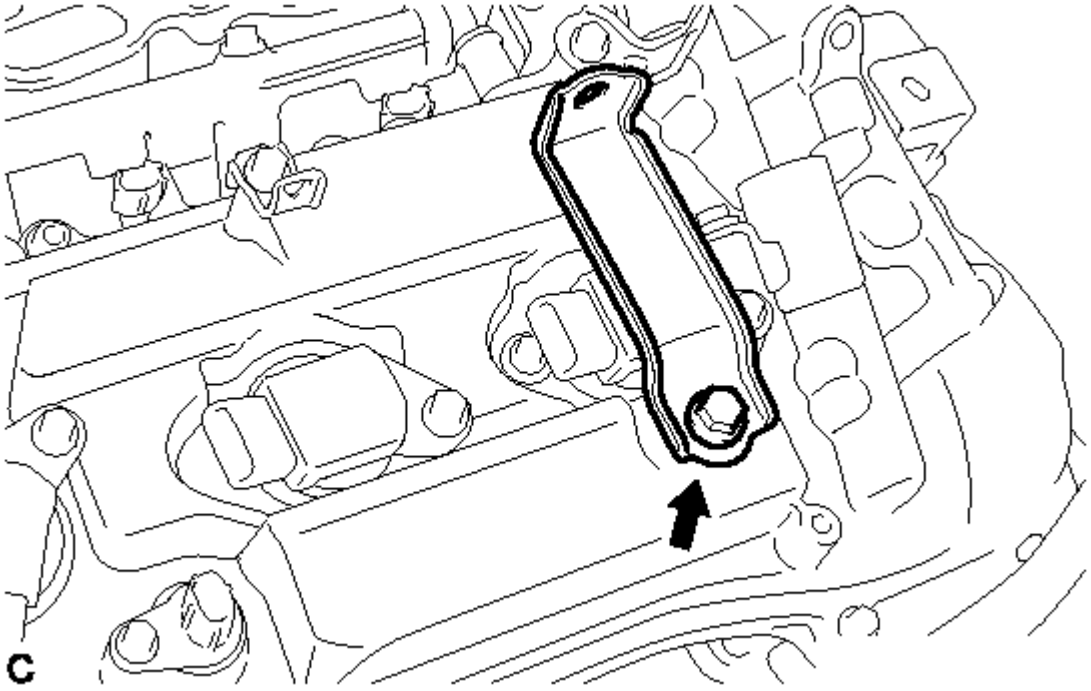


Fig. 150: Identifying No. 1 Surge Tank Stay & Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **REMOVE THROTTLE BODY BRACKET**
   a. Remove the bolt and throttle body bracket.

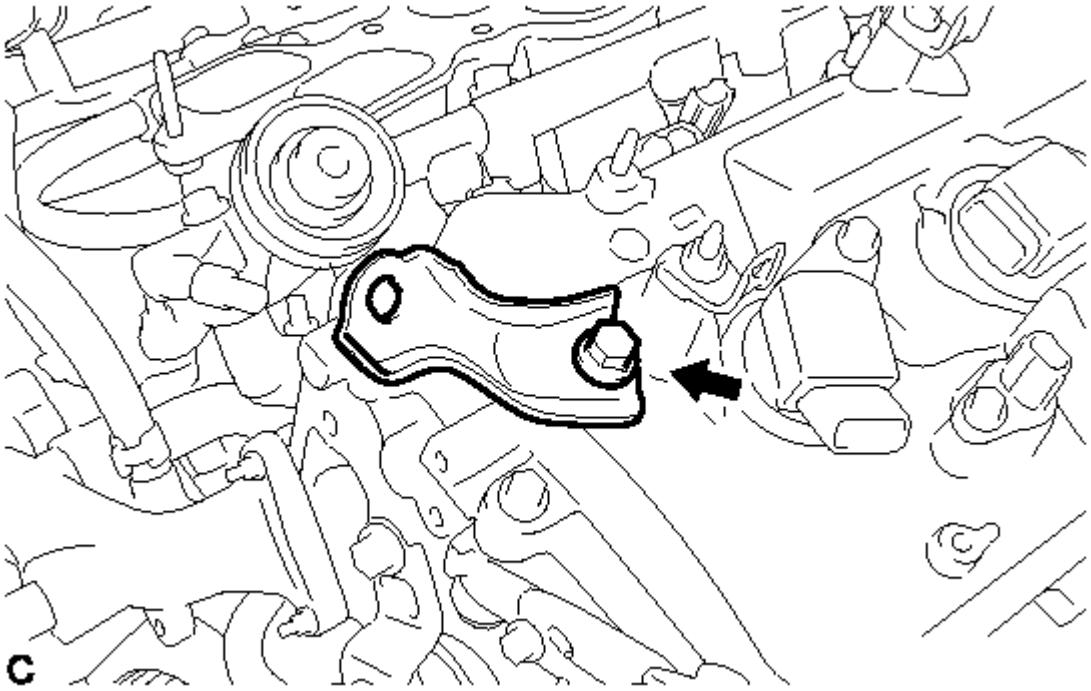


Fig. 151: Identifying Throttle Body Bracket & Bolt

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

6. **REMOVE IGNITION COIL ASSEMBLY** . Refer to **REMOVAL - Step 3**
7. **REMOVE NO. 2 ENGINE MOUNTING STAY RH**
    a. Remove the bolt and No. 2 engine mounting stay RH.

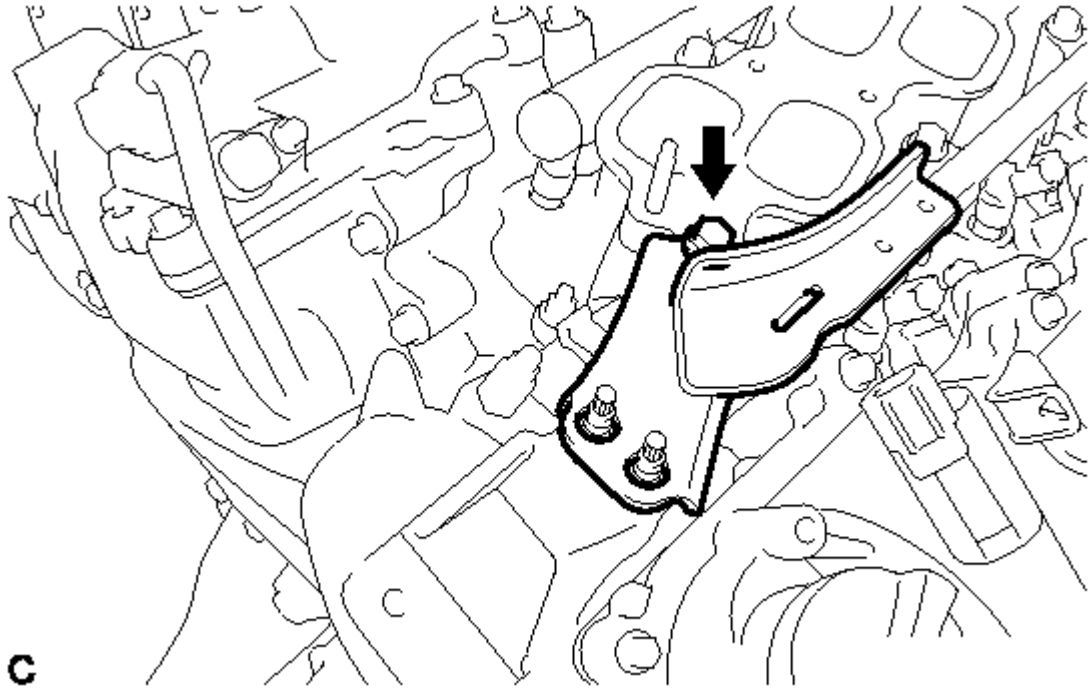


Fig. 152: Identifying No. 2 RH Engine Mounting Stay & Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **REMOVE FUEL HOSE PROTECTOR**
    a. Remove the 2 bolts and nut, and then remove the fuel hose protector.

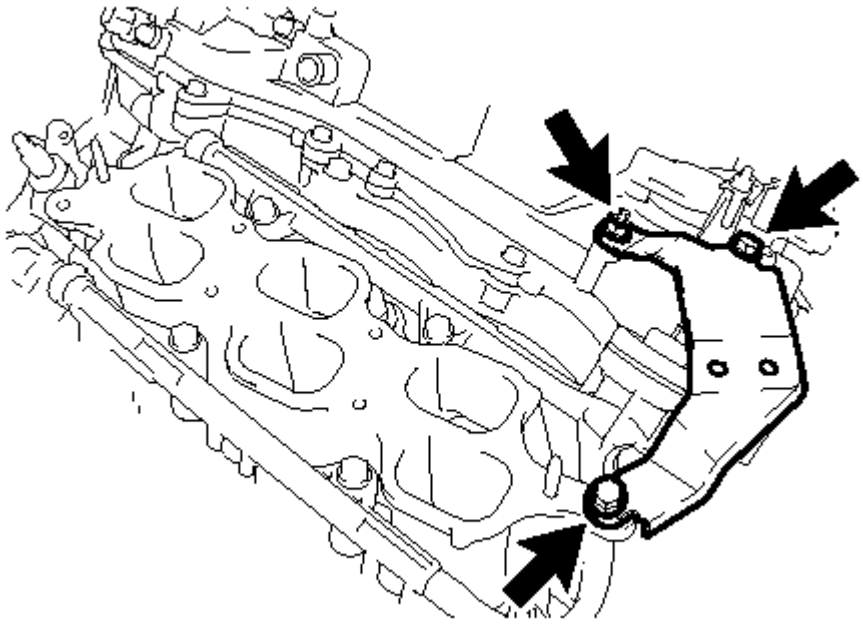


Fig. 153: Identifying Fuel Hose Protector, Nut & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. **REMOVE INTAKE MANIFOLD**
   a. Uniformly loosen and remove the 6 bolts and 4 nuts.

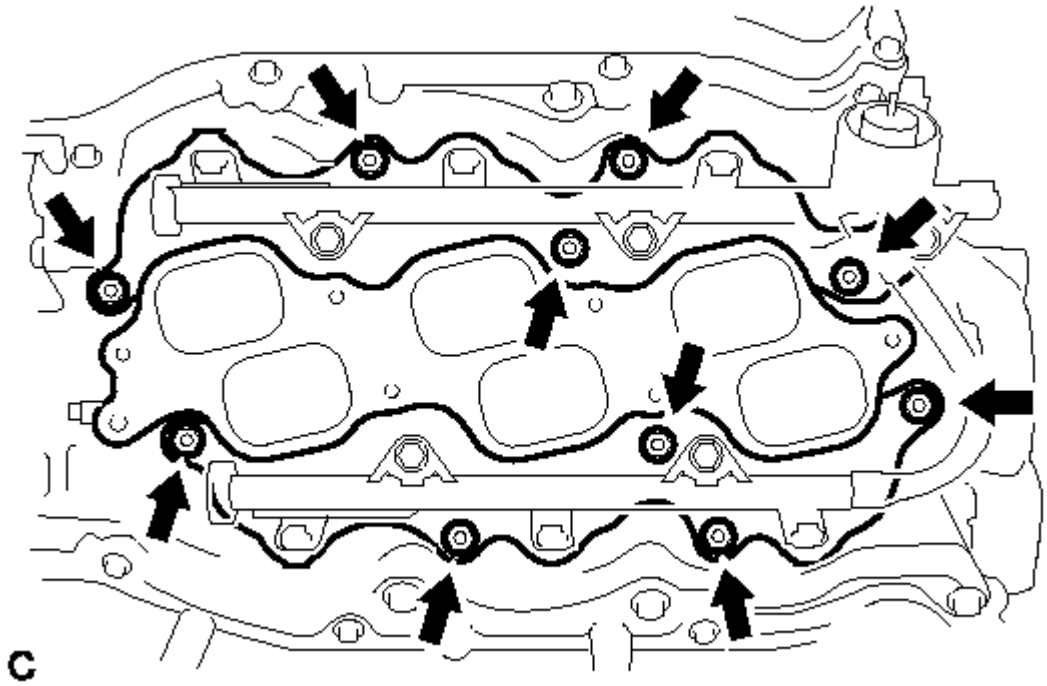


Fig. 154: Identifying Intake Manifold Bolts

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

b. Remove the intake manifold and 2 gaskets.

10. **REMOVE EXHAUST MANIFOLD SUB-ASSEMBLY RH**

a. Uniformly loosen and remove the 6 nuts.

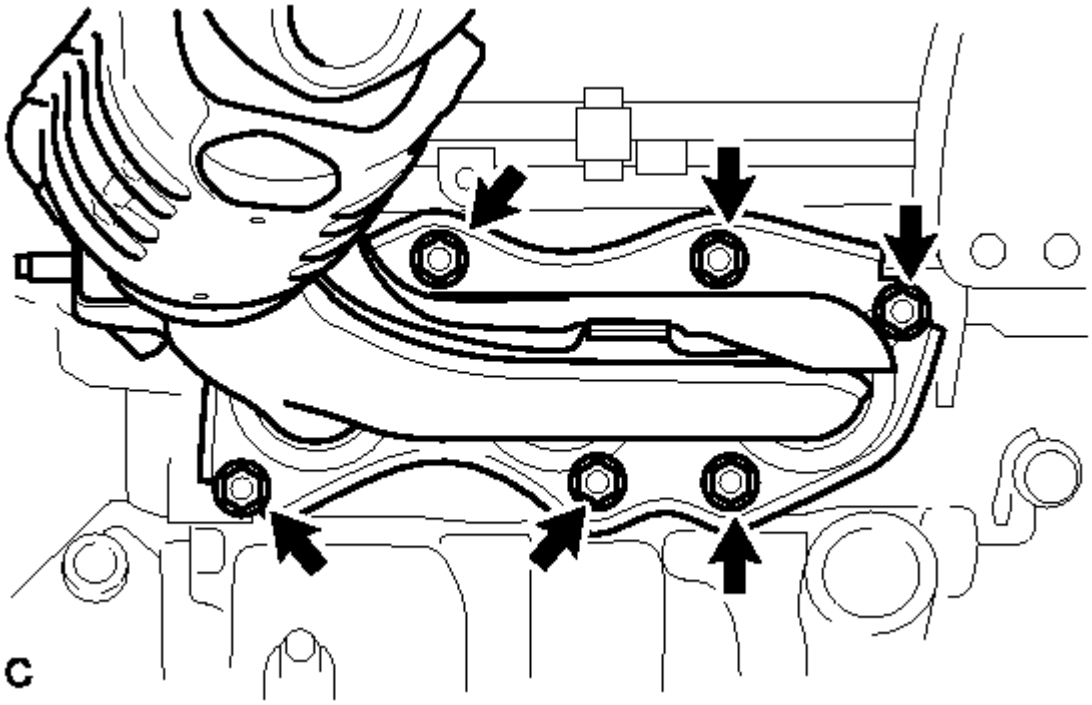


Fig. 155: View Of RH Exhaust Manifold & Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the exhaust manifold sub-assembly RH and gasket.

11. **REMOVE NO. 2 ENGINE OIL LEVEL DIPSTICK GUIDE**

a. Remove the oil level dipstick.

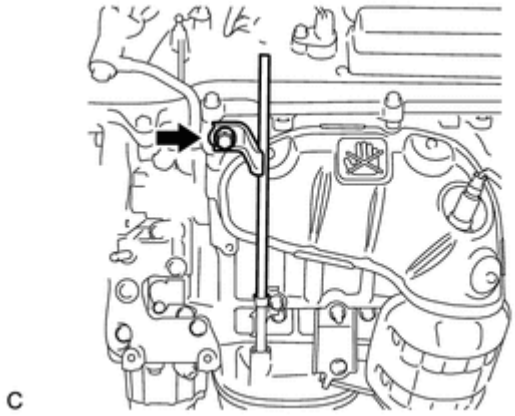
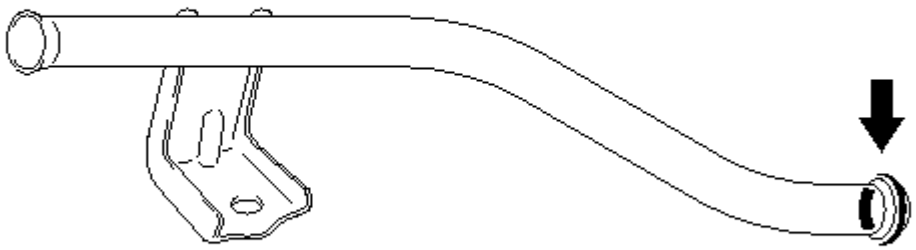


Fig. 156: Identifying No. 2 Engine Oil Level Dipstick Guide

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

b. Remove the bolt and No. 2 engine oil level dipstick guide.
c. Remove the O-ring from the No. 2 engine oil level dipstick guide.



C

Fig. 157: Identifying No 2 Engine Oil Level Dipstick Guide And O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. **REMOVE NO. 2 MANIFOLD STAY** . Refer to **REMOVAL - Step 15**
13. **REMOVE NO. 2 EXHAUST MANIFOLD HEAT INSULATOR** . Refer to **REMOVAL - Step 16**
14. **REMOVE EXHAUST MANIFOLD SUB-ASSEMBLY LH**
    a. Uniformly loosen and remove the 6 nuts.

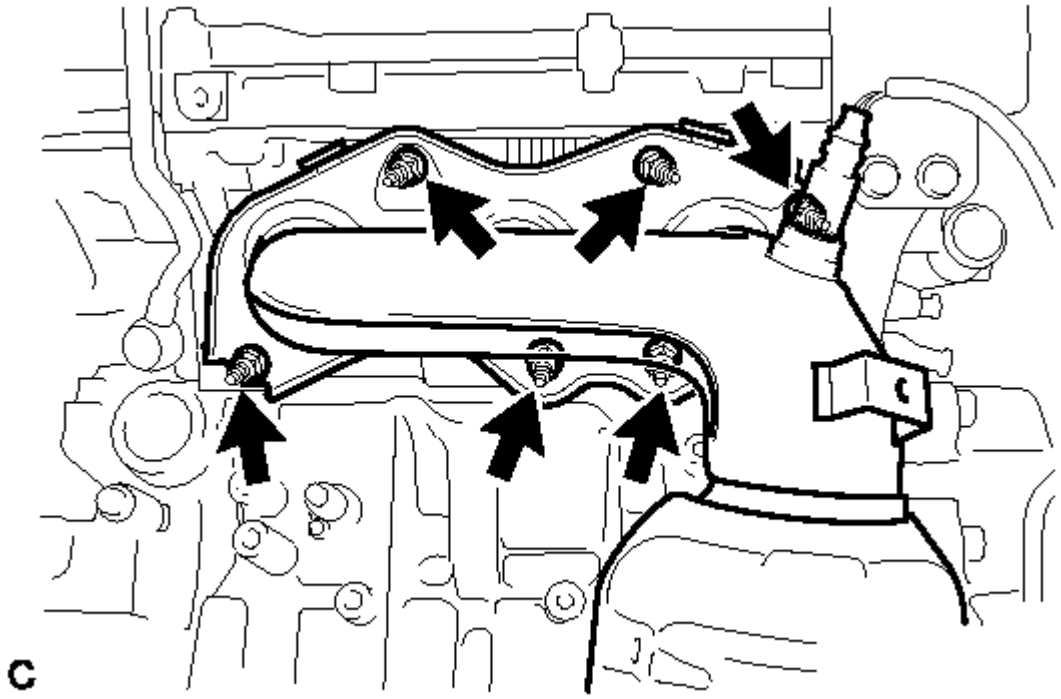


Fig. 158: Identifying Exhaust Manifold Sub-Assembly LH & Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the exhaust manifold assembly LH and gasket.

15. **REMOVE V-RIBBED BELT TENSIONER ASSEMBLY**

a. Remove the 5 bolts and V-ribbed belt tensioner assembly.

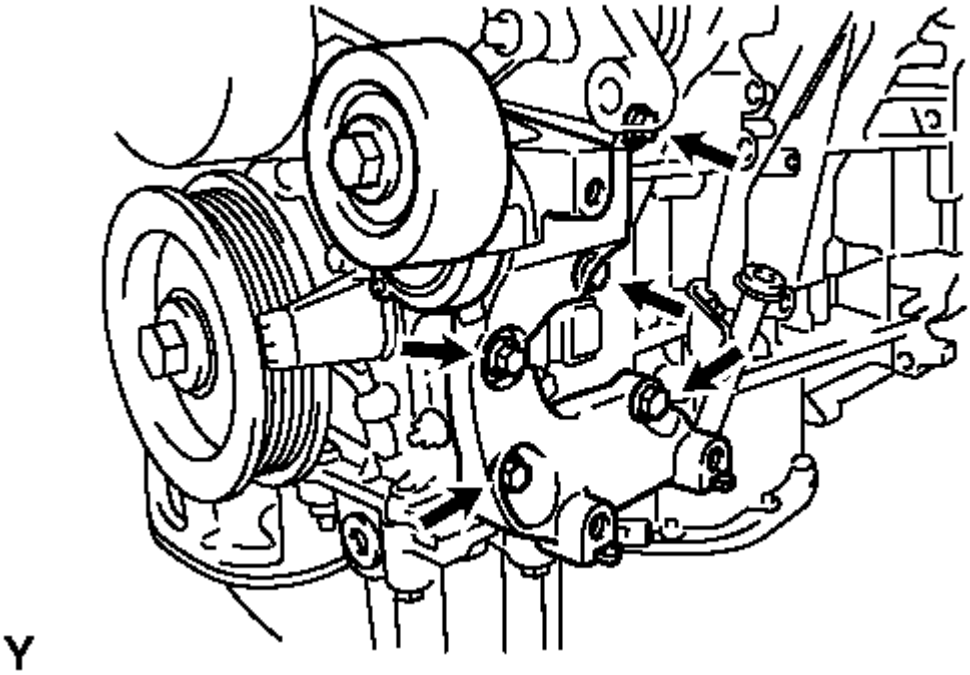


Fig. 159: Identifying V-Ribbed Belt Tensioner Assembly Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

16. **REMOVE NO. 2 TIMING GEAR COVER**
    a. Remove the 2 bolts and No. 2 timing gear cover.

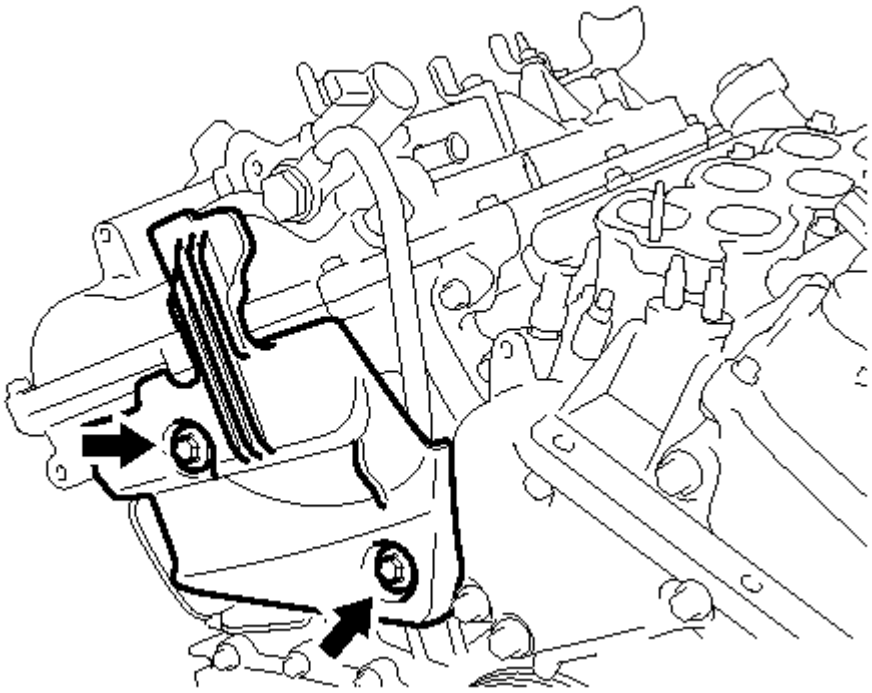


Fig. 160: Identifying No 2 Timing Gear Cover And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. **REMOVE WATER PUMP PULLEY** . Refer to **REMOVAL - Step 10**
18. **REMOVE NO. 2 IDLER PULLEY SUB-ASSEMBLY**
    a. Remove the bolt, No. 2 idler pulley cover plate, No. 2 idler pulley sub-assembly and idler pulley cover plate.

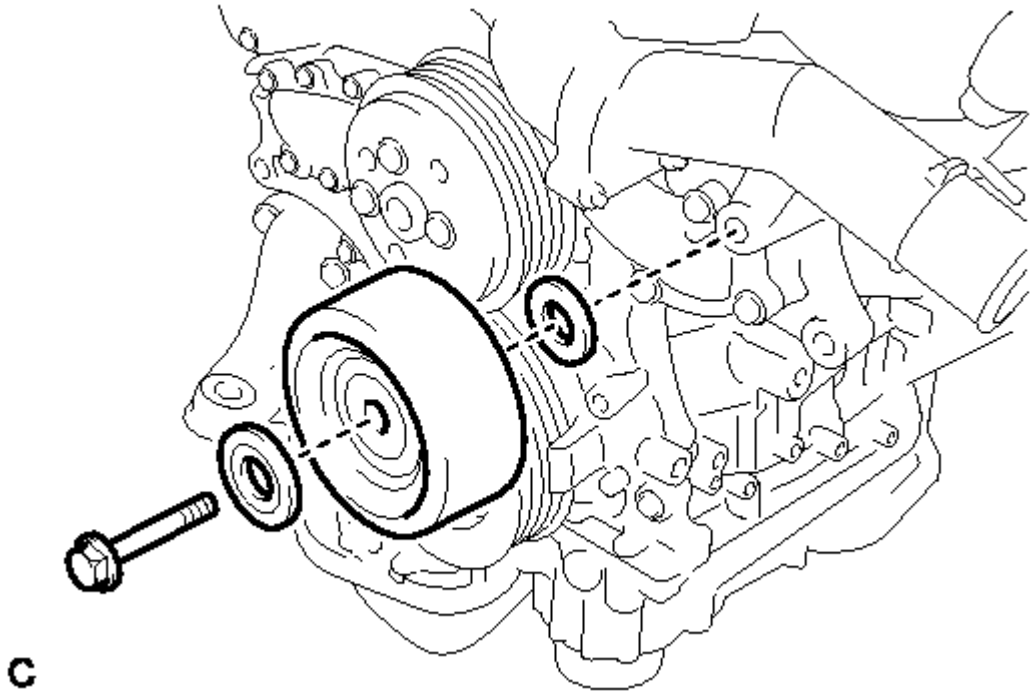


Fig. 161: Identifying No 2 Idler Pulley Sub-Assembly And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

19. **REMOVE NO. 1 VACUUM SWITCHING VALVE ASSEMBLY**
    a. Remove the bolt and No. 1 vacuum switching valve.



Fig. 162: Identifying No. 1 Vacuum Switching Valve Assembly & Bolt

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

20. **REMOVE ENGINE OIL PRESSURE SWITCH ASSEMBLY**

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

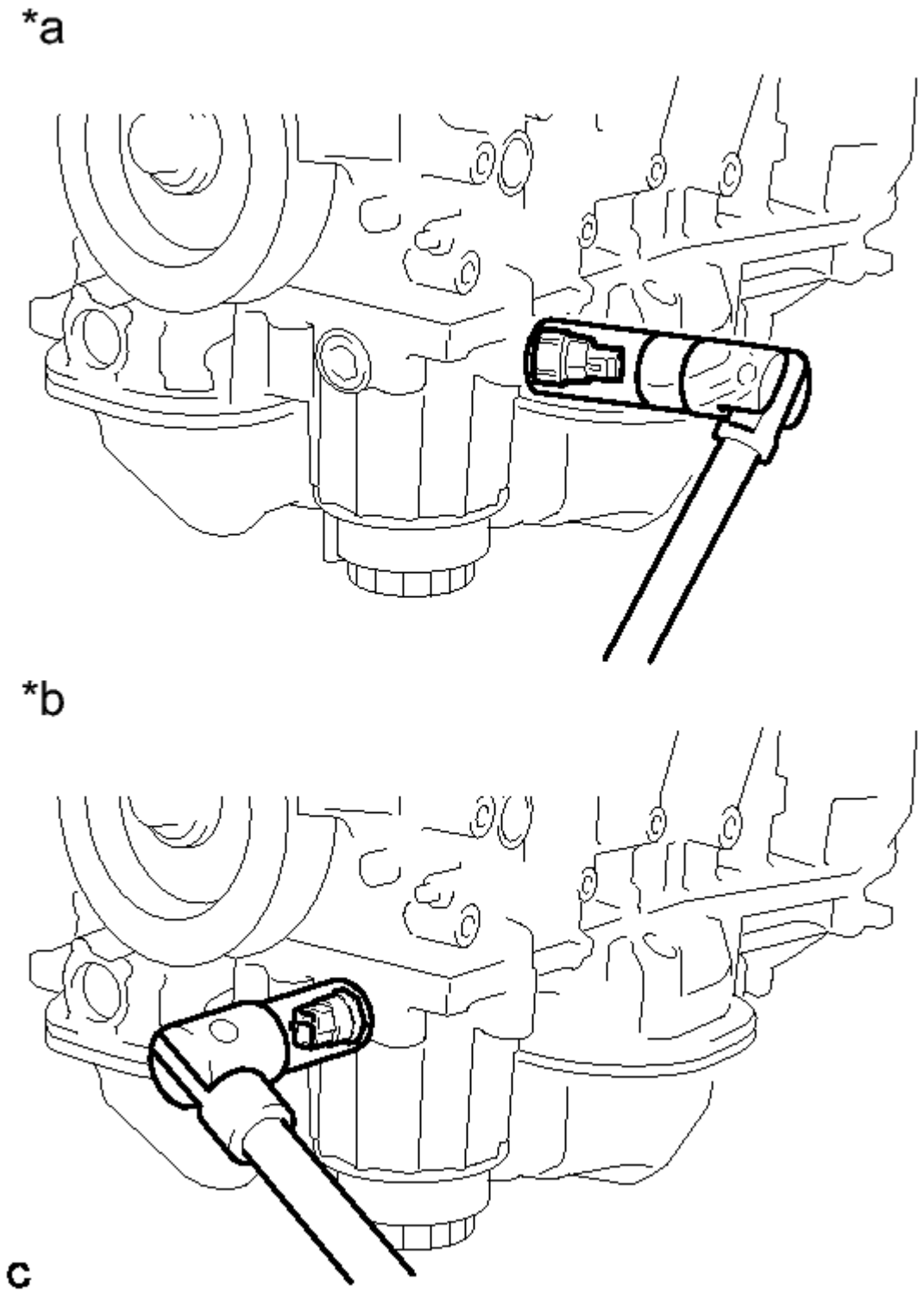


Fig. 163: Removing Engine Oil Pressure Switch Using A Deep Socket Wrench
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	w/o Oil Cooler
*b	w/ Oil Cooler

21. **REMOVE KNOCK SENSOR WIRE**
    a. Disconnect the 2 knock sensor connectors and knock sensor wire connector.

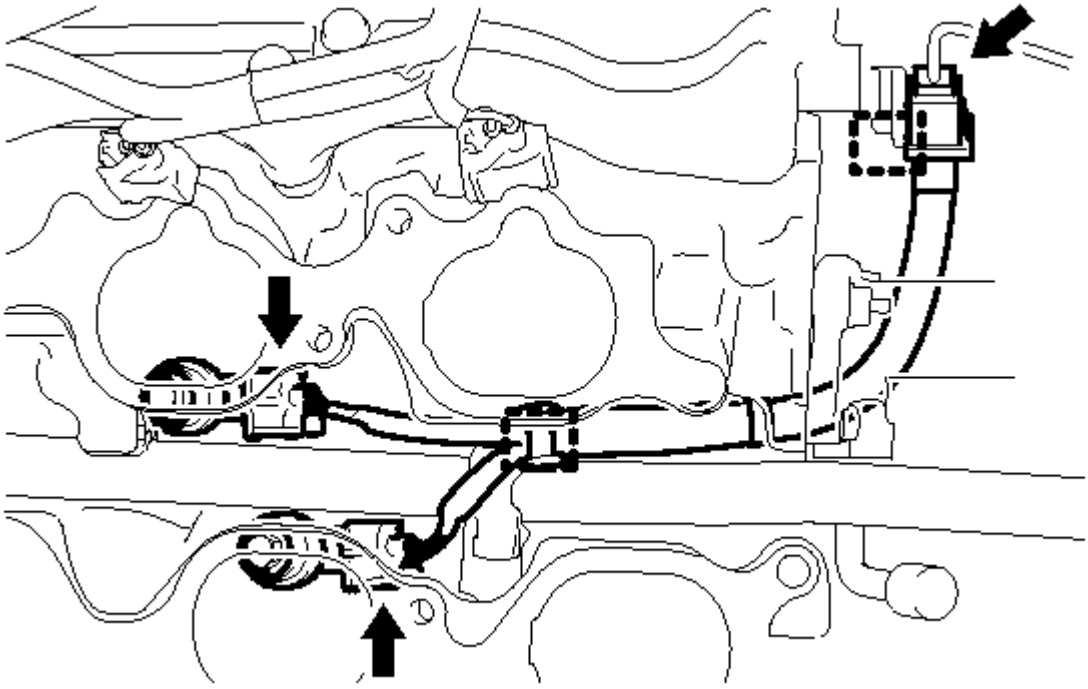


Fig. 164: Identifying Knock Control Sensor Connectors, Clamps And Knock Control Sensor Wire Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Disconnect the 2 clamps and remove the knock sensor wire from the engine assembly.
22. **REMOVE KNOCK SENSOR** . Refer to **REMOVAL - Step 2**
23. **REMOVE ENGINE COOLANT TEMPERATURE SENSOR** . Refer to **REMOVAL - Step 8**

DISASSEMBLY

DISASSEMBLY

1. **REMOVE OIL FILLER CAP SUB-ASSEMBLY**

a. Remove the oil filler cap sub-assembly and oil filler gasket.

2. **REMOVE SPARK PLUG** . Refer to **REMOVAL - Step 4**
3. **REMOVE OIL PAN DRAIN PLUG**
   a. Remove the oil pan drain plug and oil pan drain plug gasket.

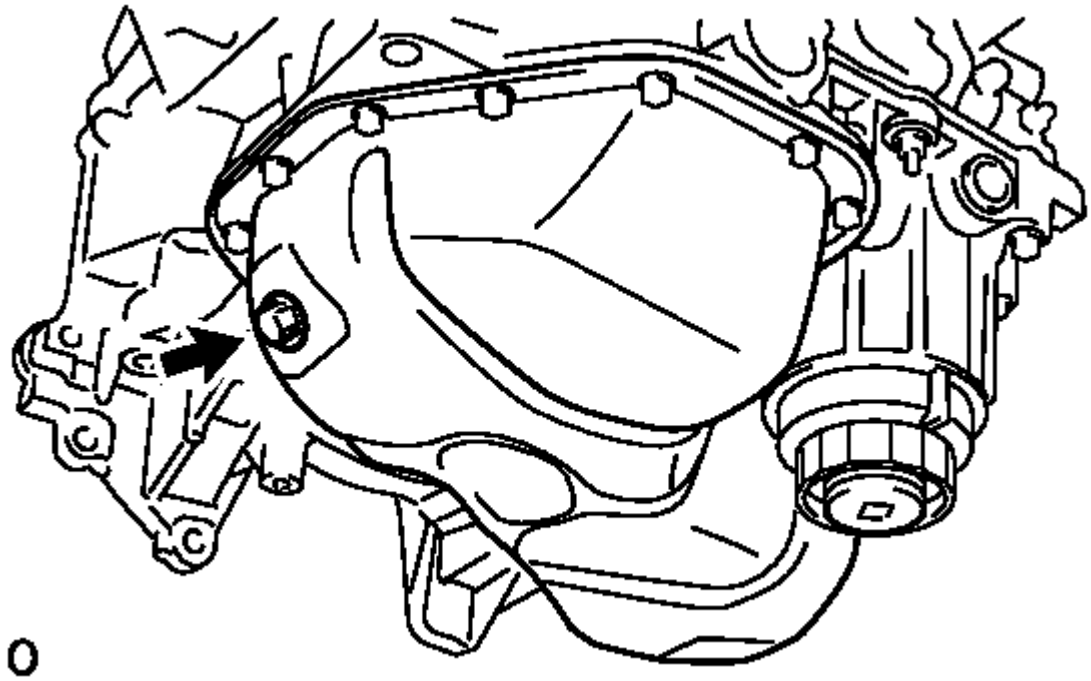


Fig. 165: Identifying Oil Pan Drain Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **REMOVE VENTILATION VALVE SUB-ASSEMBLY**
   a. Remove the ventilation valve sub-assembly.

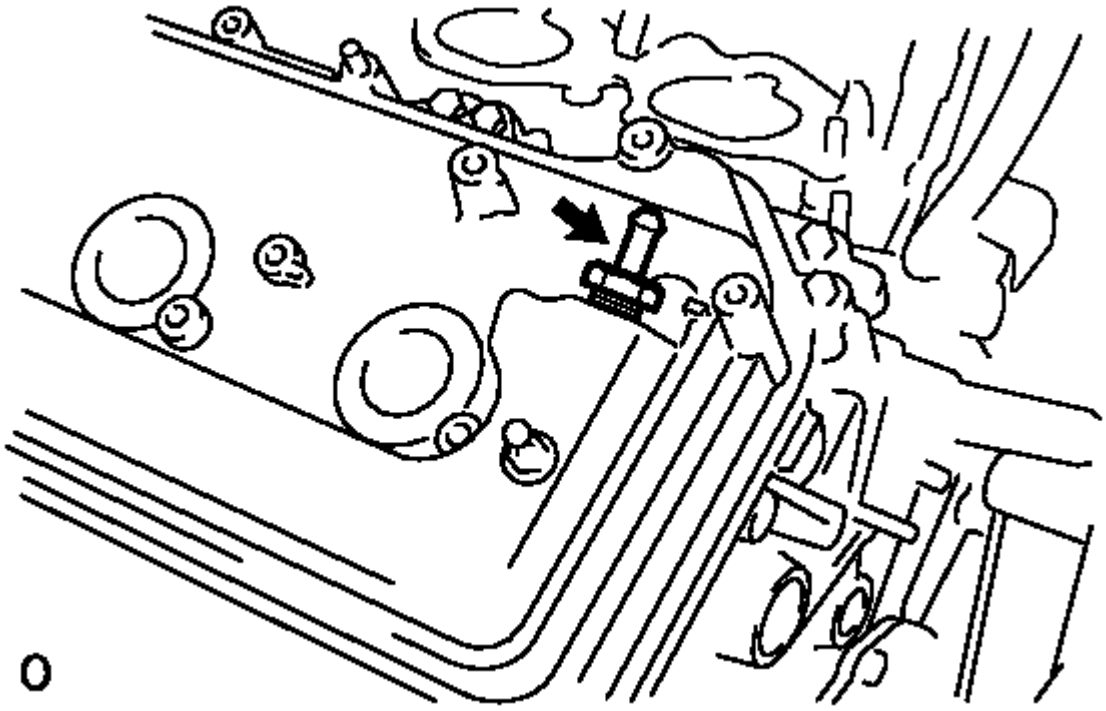


Fig. 166: Identifying Ventilation Valve Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **REMOVE VVT SENSOR**

   Refer to **REMOVAL**

6. **REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY**

   Refer to **REMOVAL**

7. **REMOVE CRANKSHAFT POSITION SENSOR** . Refer to **REMOVAL - Step 2**
8. **REMOVE NO. 1 OIL PIPE**
   a. Remove the 2 oil pipe unions, gaskets and No. 1 oil pipe.

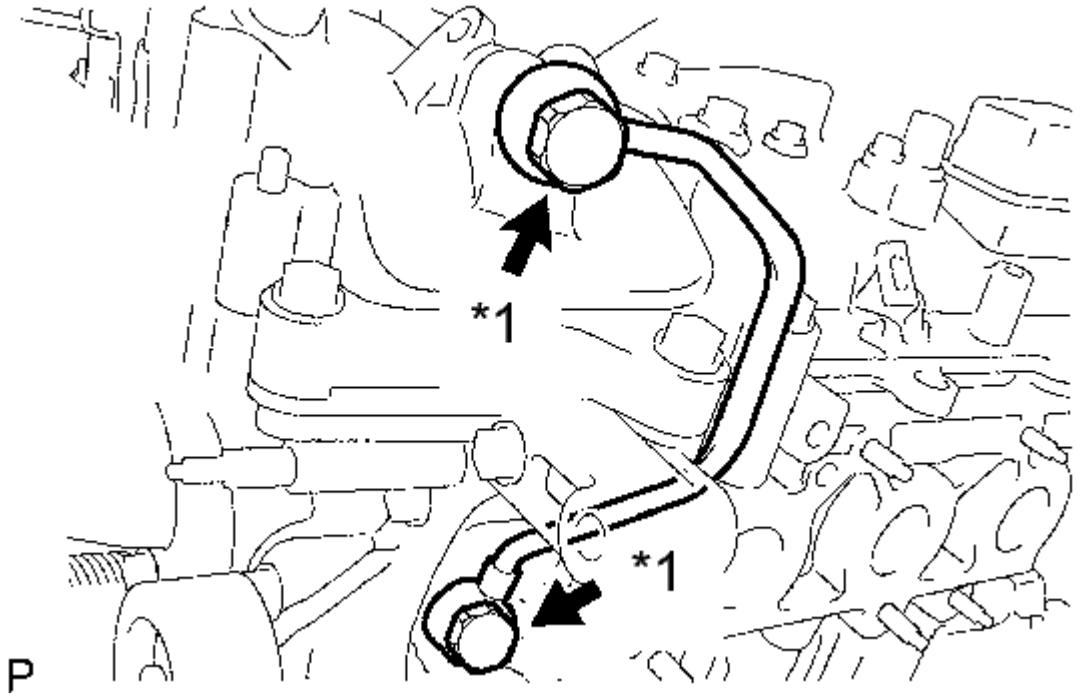


Fig. 167: Identifying Oil Pipe Union And No. 1 Oil Pipe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

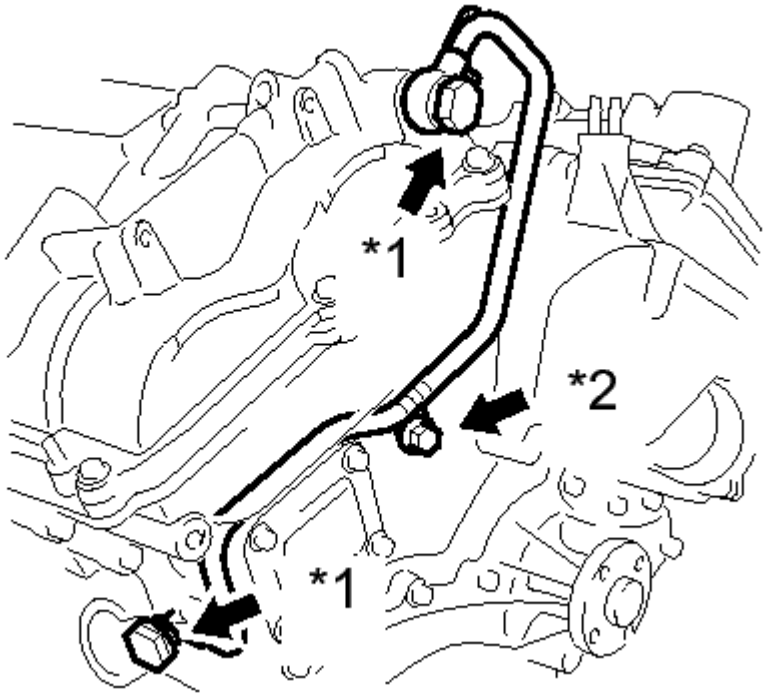
TEXT IN ILLUSTRATION

*1	Oil Pipe Union

b. Remove the oil control valve filter LH and gaskets.

9. **REMOVE OIL PIPE**

a. Remove the bolt.



c

Fig. 168: Identifying Oil Pipe Union Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Oil Pipe Union
*2	Bolt

b. Remove the 2 oil pipe unions and oil pipe.
c. Remove the oil control valve filter RH and gaskets.

10. **REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY**

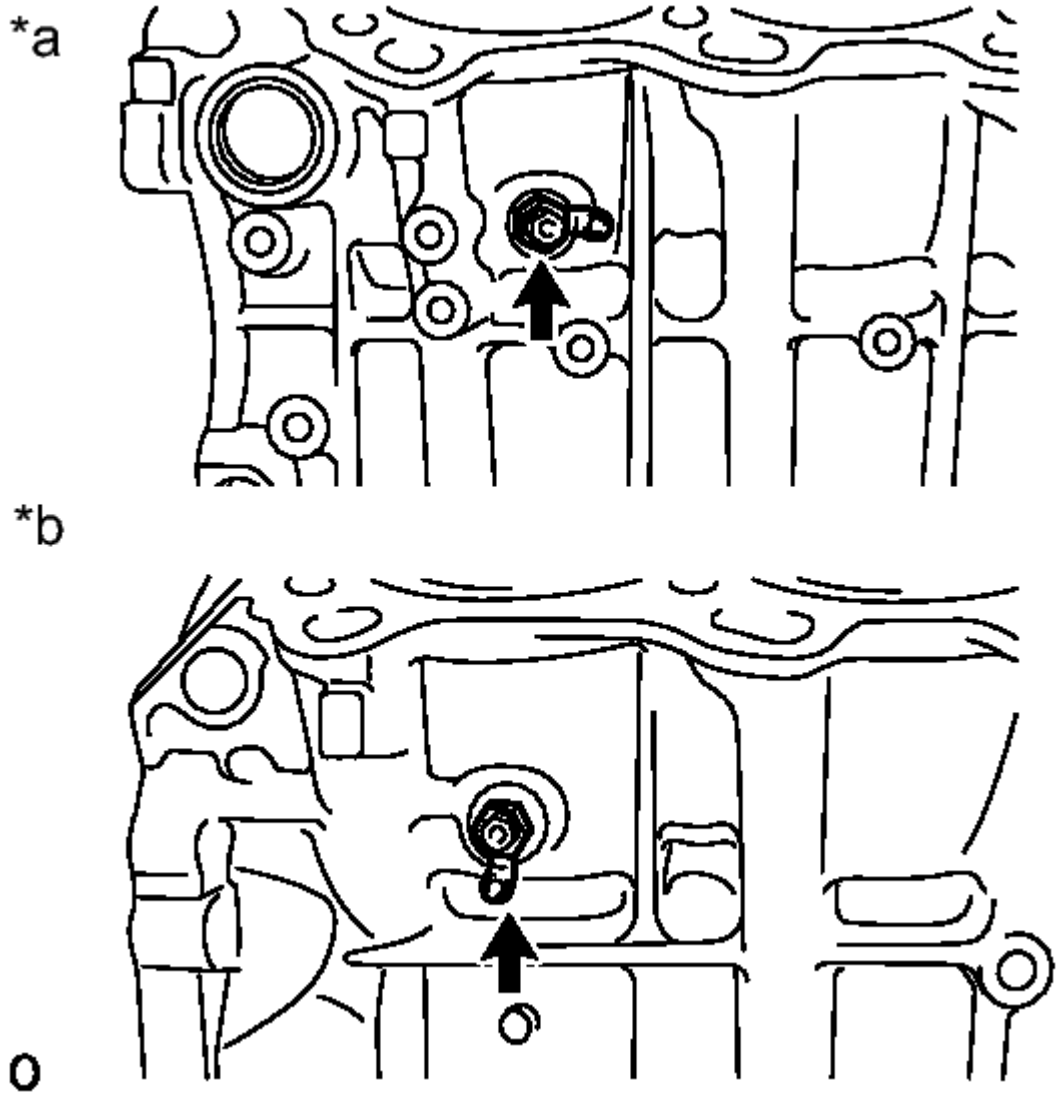


Fig. 169: Identifying Bank 1 & Bank 2 Cylinder Block Water Drain Cock Sub-Assemblies
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	for Bank 1
*b	for Bank 2

a. Remove the 2 cylinder block water drain cock sub-assemblies from the cylinder block.
b. Remove the 2 cylinder block water drain cock plugs from the 2 water drain cock sub-assemblies.

11. **REMOVE OIL FILTER ELEMENT** . Refer to **REPLACEMENT - Step 2**
12. **REMOVE CRANKSHAFT PULLEY** See step 4

13. **REMOVE OIL COOLER ASSEMBLY (w/ Oil Cooler)**

a. Remove the bolt, 2 clamps and 4 clips, and disconnect the 2 water by-pass hoses.

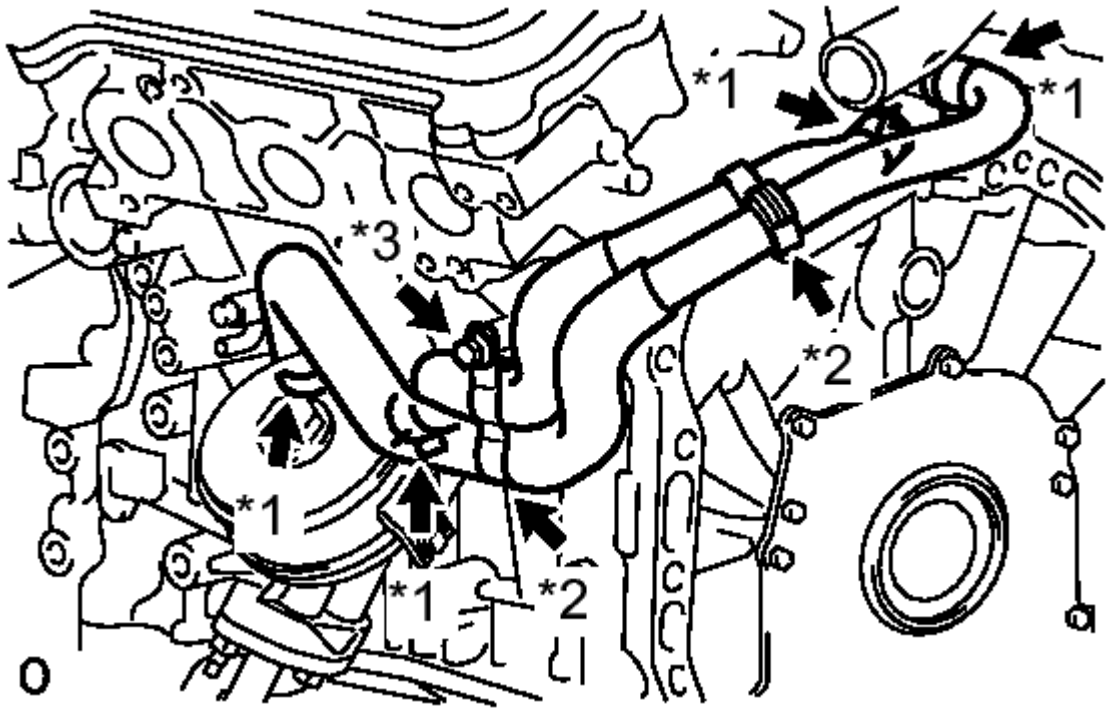


Fig. 170: Identifying Water By-Pass Hoses & Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Clip
*2	Clamp
*3	Bolt

b. Remove the union bolt, oil cooler assembly, and O-ring.

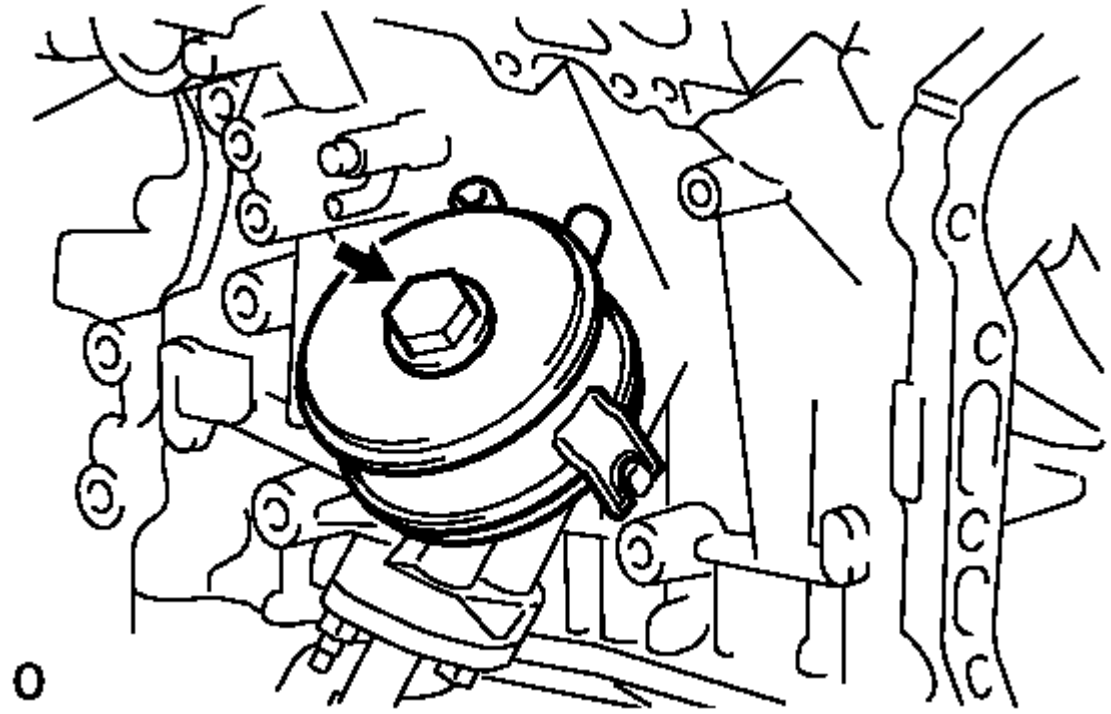


Fig. 171: Identifying Oil Cooler Union Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. **REMOVE NO. 1 OIL COOLER BRACKET (w/ Oil Cooler)**
    a. Remove the 3 bolts, 3 nuts, and oil cooler pipe with the No. 1 oil cooler bracket.

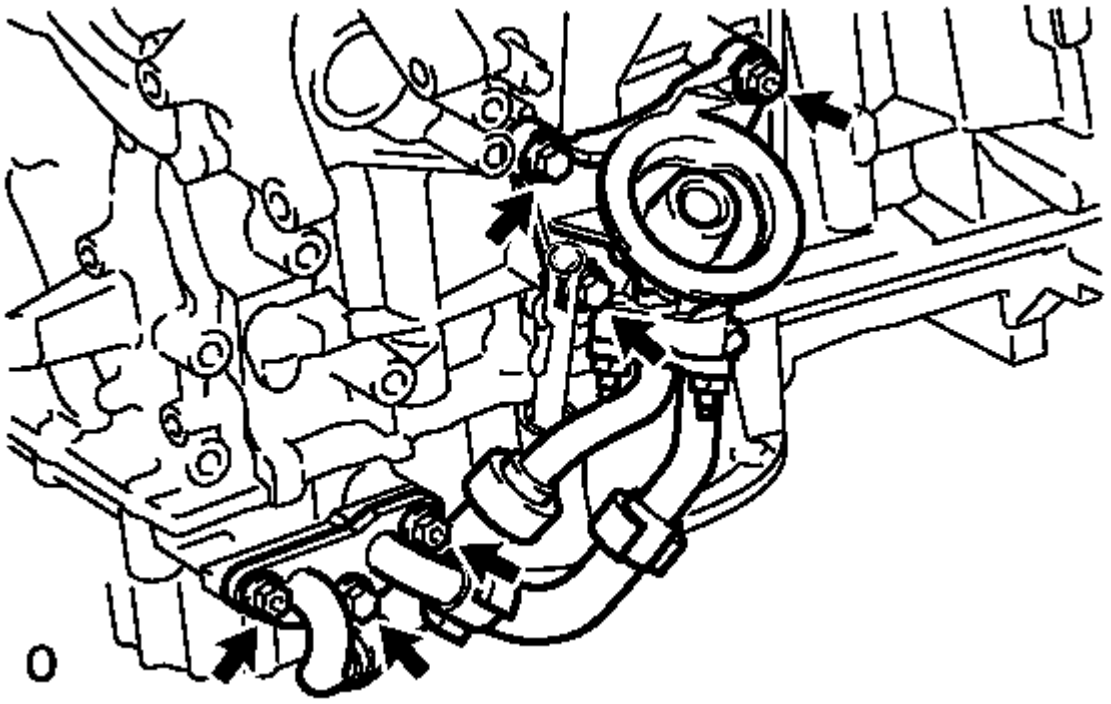


Fig. 172: Identifying Bolts, Nuts, And Oil Cooler Pipe With No. 1 Oil Cooler Bracket

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

b. Remove the bolt, 2 nuts, No. 1 oil cooler bracket, and gasket.

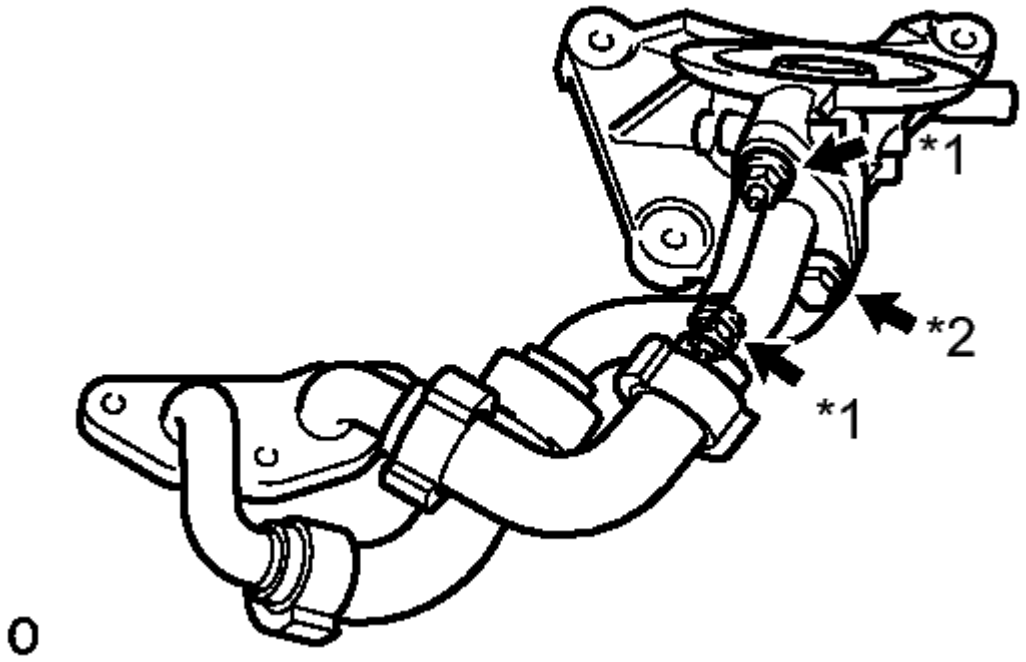


Fig. 173: Identifying No. 1 Oil Cooler Bracket, Nuts And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

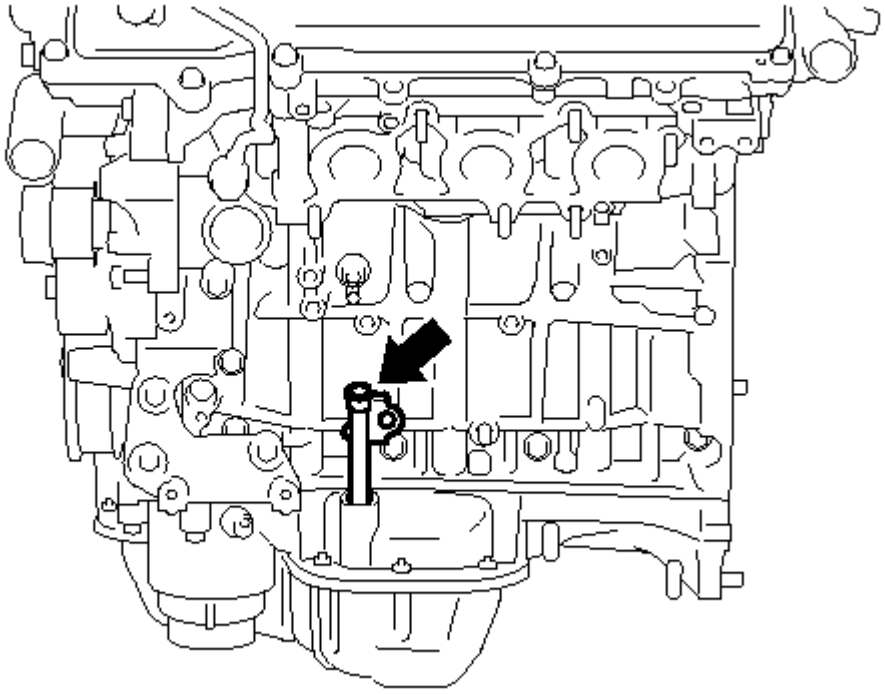
TEXT IN ILLUSTRATION

*1	Nut
*2	Bolt

c. Using an E8 "TORX" socket wrench, remove the 2 stud bolts.

15. **REMOVE ENGINE OIL DIPSTICK GUIDE (w/ Oil Cooler)**

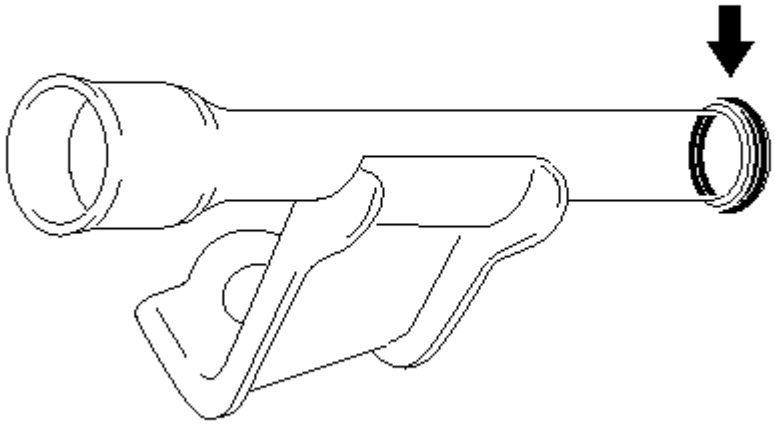
a. Remove the engine oil dipstick guide.



C

Fig. 174: Identifying Engine Oil Dipstick Guide
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the O-ring.



C

Fig. 175: Identifying Engine Oil Level Dipstick Guide And O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

16. **REMOVE ENGINE OIL DIPSTICK GUIDE (w/o Oil Cooler)**

a. Remove the bolt and engine oil dipstick guide.

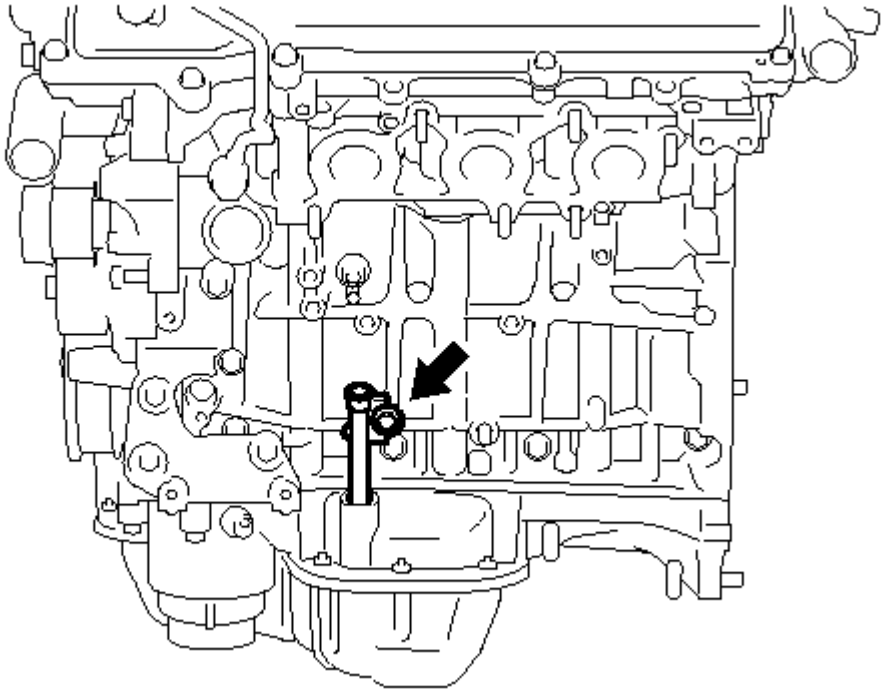
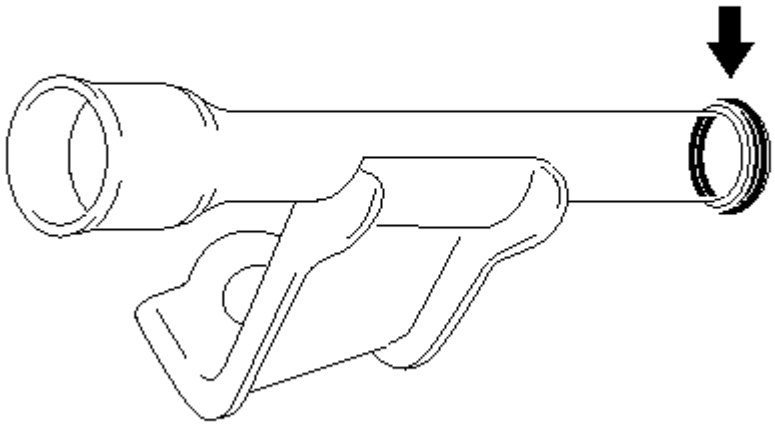


Fig. 176: Identifying Engine Oil Level Dipstick Guide And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the O-ring.



C

Fig. 177: Identifying Engine Oil Level Dipstick Guide And O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. **REMOVE NO. 1 FRONT ENGINE MOUNTING BRACKET LH**
    a. Remove the 6 bolts and No. 1 front engine mounting bracket LH.

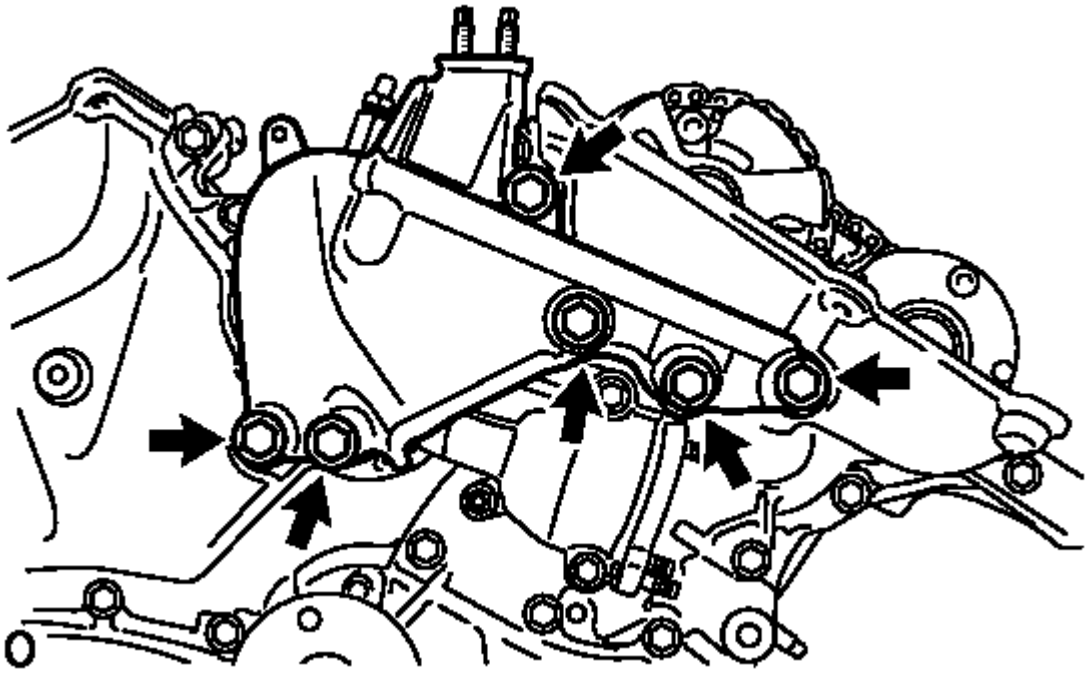


Fig. 178: Identifying Engine Mounting Bracket Front And Bolts

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

b. Using an E8 "TORX" socket wrench, remove the 2 stud bolts.

18. **REMOVE WATER INLET HOUSING**

a. Remove the 2 nuts, water inlet and thermostat.

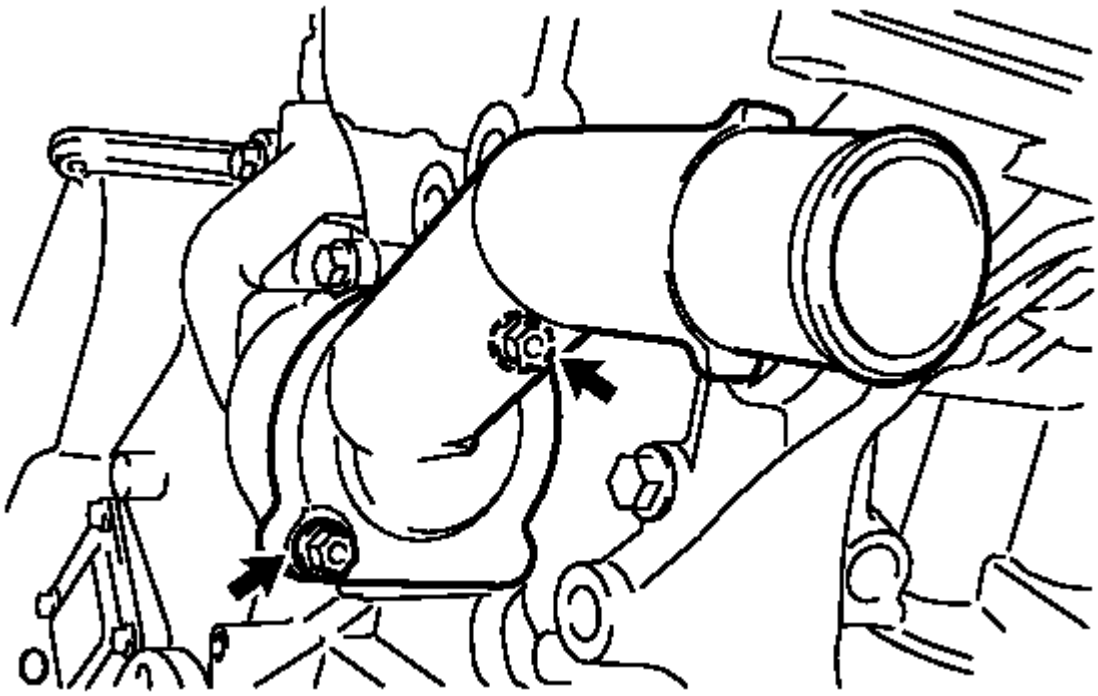


Fig. 179: Identifying Water Inlet With Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the gasket.
c. Remove the 2 stud bolts.
d. Separate the No. 1 water by-pass hose from the water inlet housing.
e. Remove the drain cock plug.

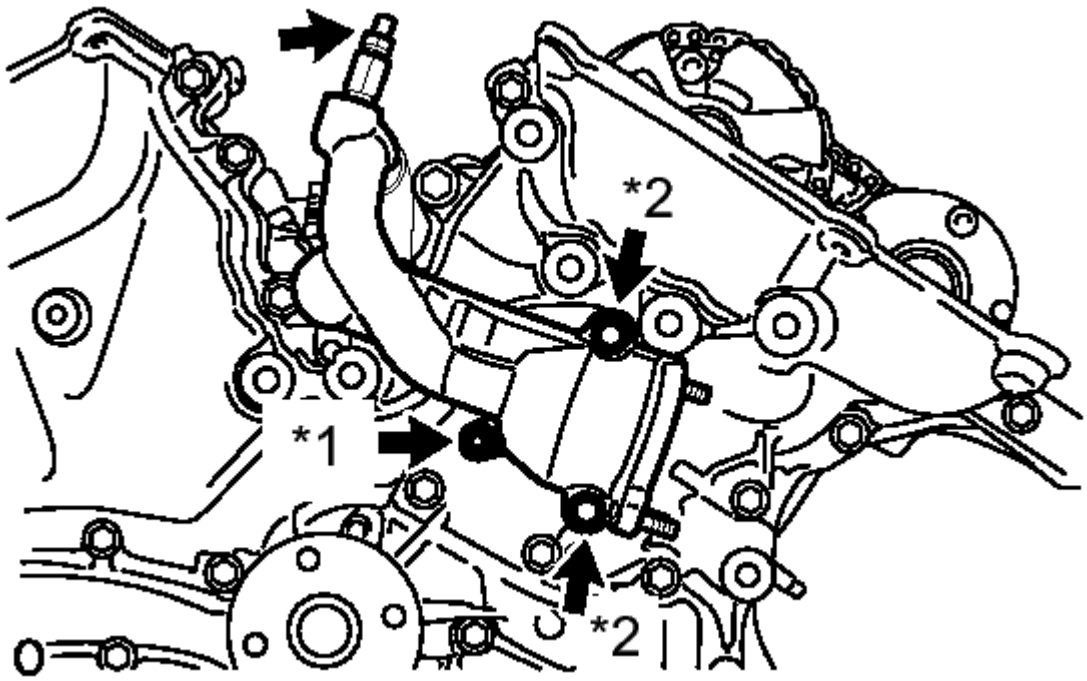


Fig. 180: Identifying Water Inlet Housing Drain Cock Plug & Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Nut
*2	Bolt

f. Remove the drain cock assembly.
g. Remove the 2 bolts, nut, and water inlet housing.
h. Remove the 2 O-rings.

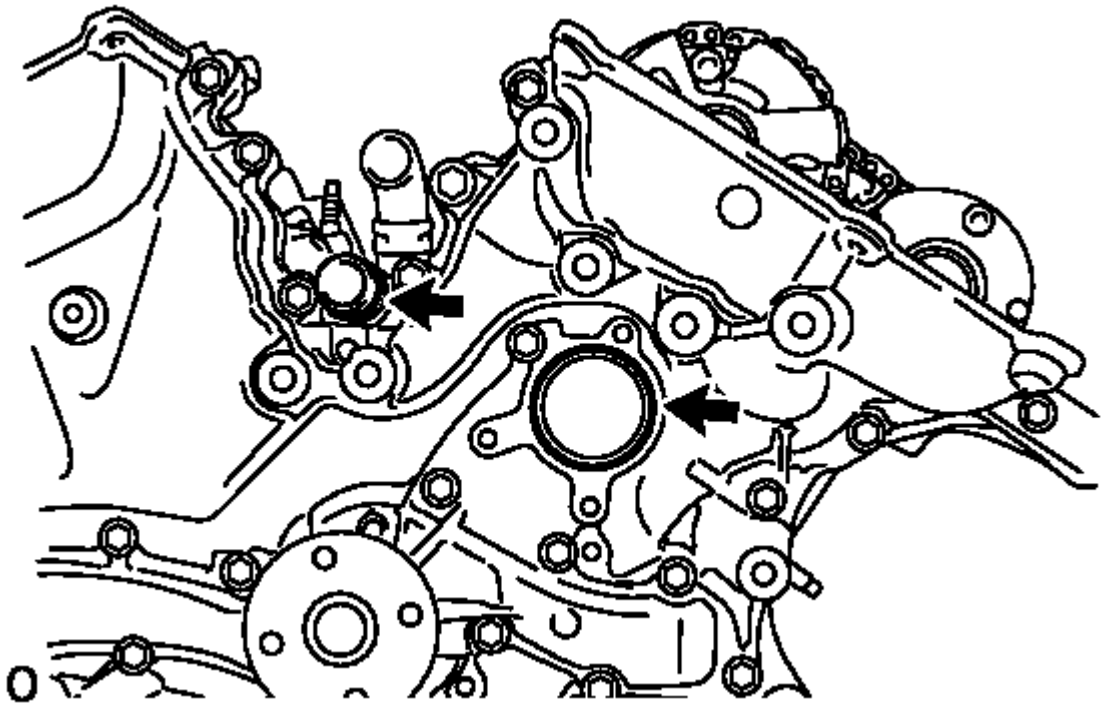


Fig. 181: Identifying O-Rings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

19. **REMOVE WATER OUTLET**
    a. Remove the 2 bolts, 4 nuts and water outlet.

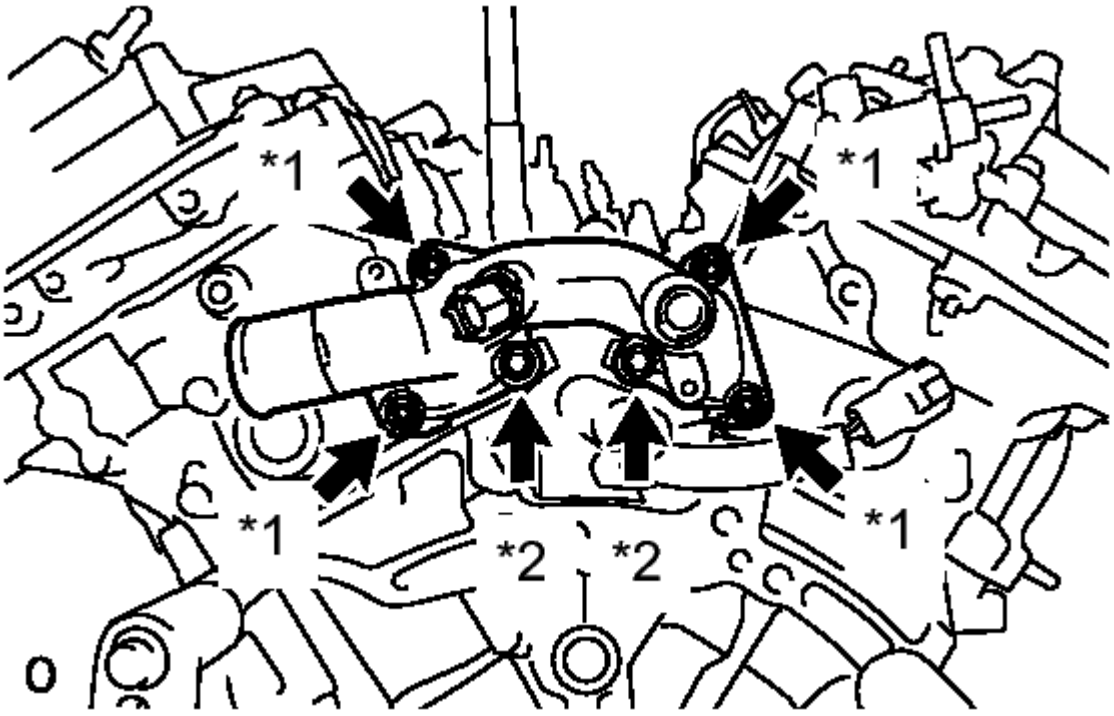


Fig. 182: Identifying Water Outlet With Bolts And Nuts

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

TEXT IN ILLUSTRATION

*1	Nut
*2	Bolt

b. Remove the 2 gaskets and O-ring.

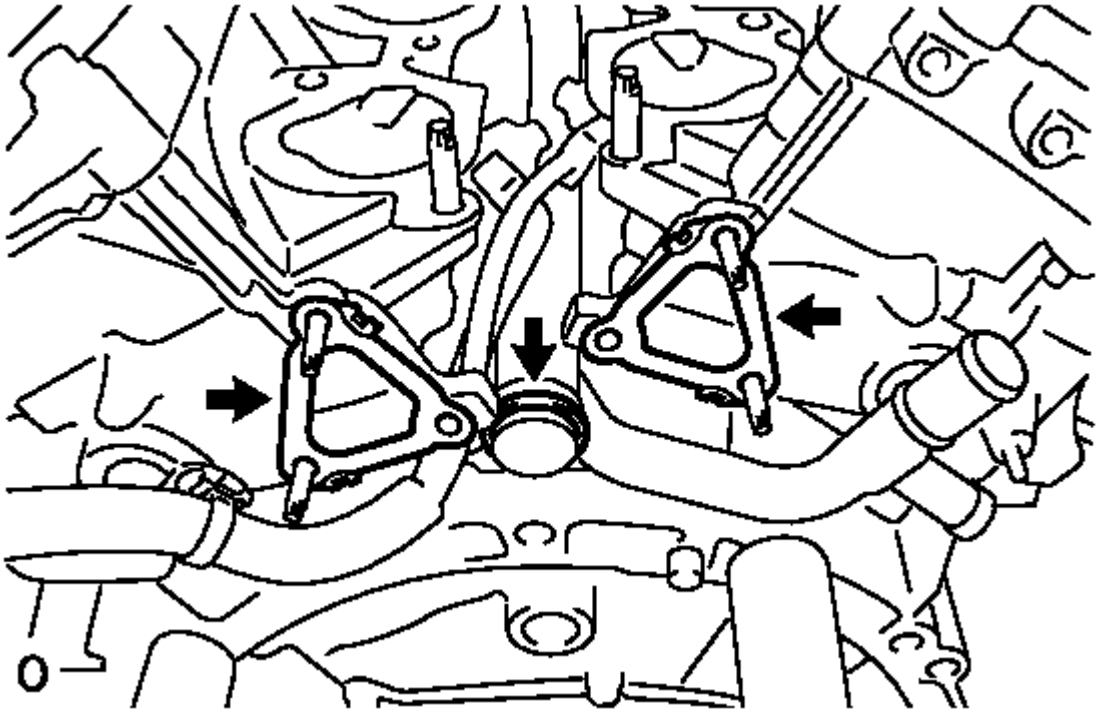


Fig. 183: Identifying Gaskets And O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

20. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY**

a. Remove the 12 bolts, seal washer, cylinder head cover sub-assembly and cylinder head cover gasket.

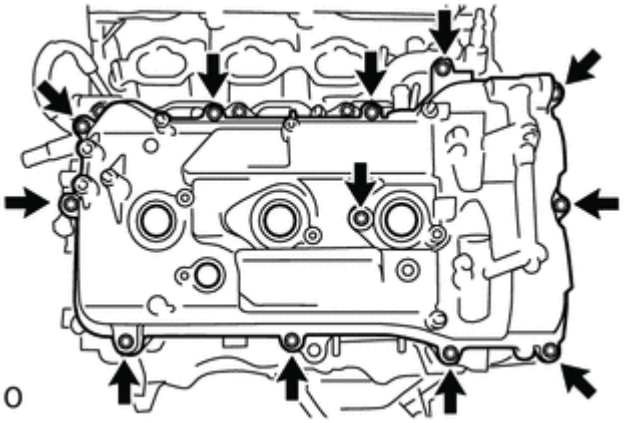


Fig. 184: Identifying Bolts, Head Cover And Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the 3 gaskets.

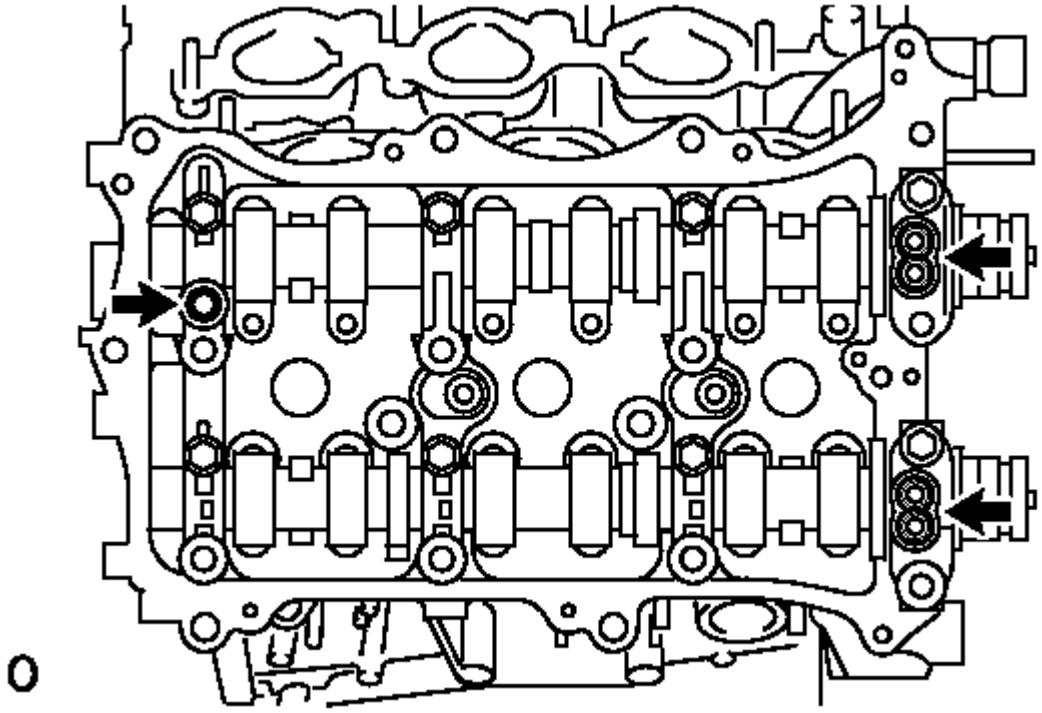


Fig. 185: Identifying Gaskets
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

21. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY LH**

a. Remove the 12 bolts, seal washer, cylinder head cover sub-assembly LH and cylinder head cover gasket.

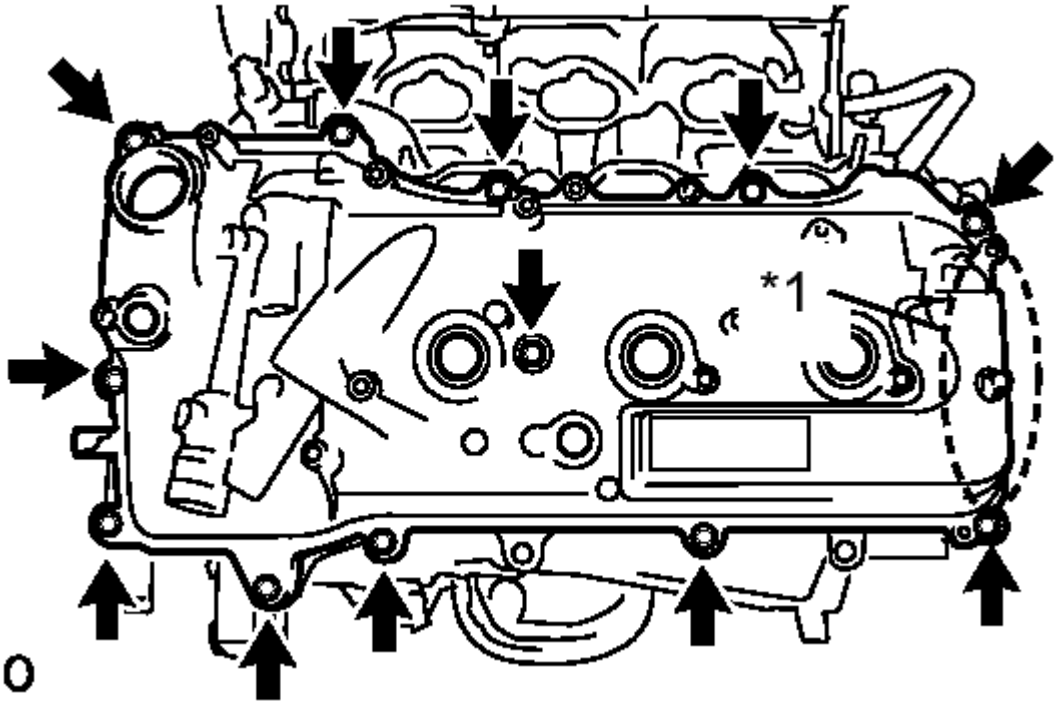


Fig. 186: Identifying Gaskets
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Baffle Plate

NOTE: **The baffle plate is located on the back of the portion shown in the illustration. Do not damage the baffle plate when removing the cylinder head cover sub-assembly LH.**

b. Remove the 3 gaskets.

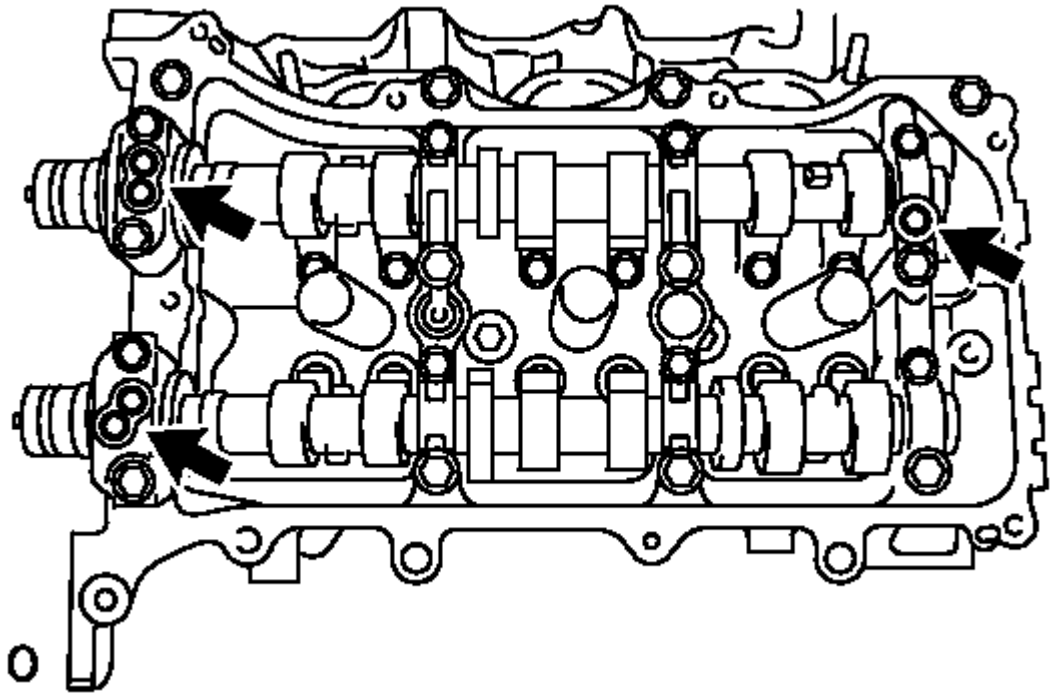


Fig. 187: Identifying Gaskets
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

22. **REMOVE NO. 2 OIL PAN SUB-ASSEMBLY**
    a. Remove the 16 bolts and 2 nuts.

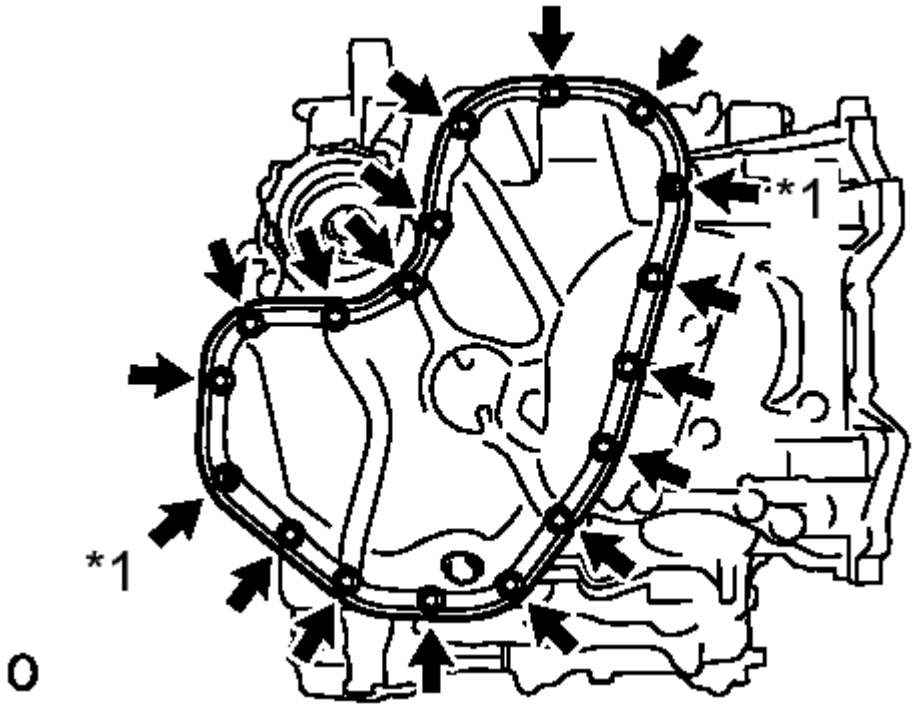


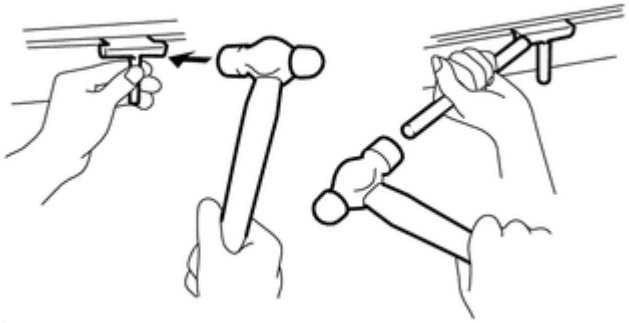
Fig. 188: Identifying No 2 Oil Pan Sub-Assembly, Bolts And Nuts

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

TEXT IN ILLUSTRATION

*1	Nut

b. Insert the blade of the oil pan seal cutter between the oil pans. Cut through the applied sealer and remove the No. 2 oil pan sub-assembly.



T

Fig. 189: Inserting Blade Of Oil Pan Seal Cutter Between Oil Pans
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Be careful not to damage the contact surfaces of the oil pans.

c. Using an E6 "TORX" socket wrench, remove the 2 stud bolts.

23. **REMOVE OIL STRAINER SUB-ASSEMBLY**

a. Remove the bolt, 2 nuts, oil strainer sub-assembly and gasket.

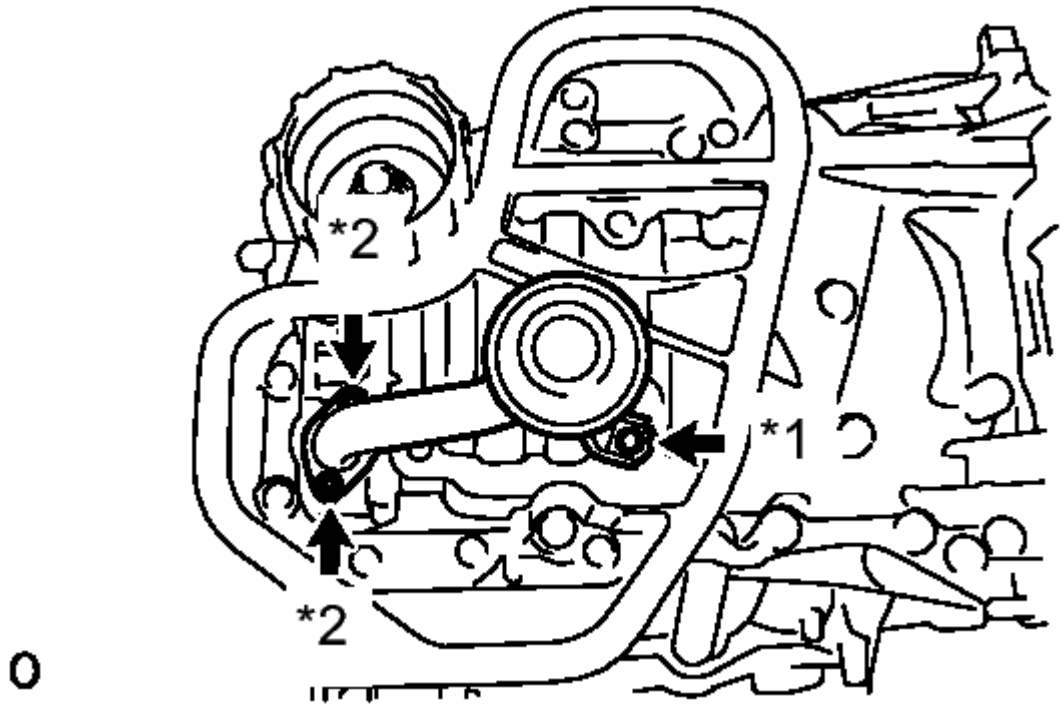


Fig. 190: Identifying Oil Pan Sub-Assembly With Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Bolt
*2	Nut

b. Using an E6 "TORX" socket wrench, remove the 2 stud bolts.

24. **REMOVE OIL PAN SUB-ASSEMBLY**

a. Remove the 16 bolts and 2 nuts.

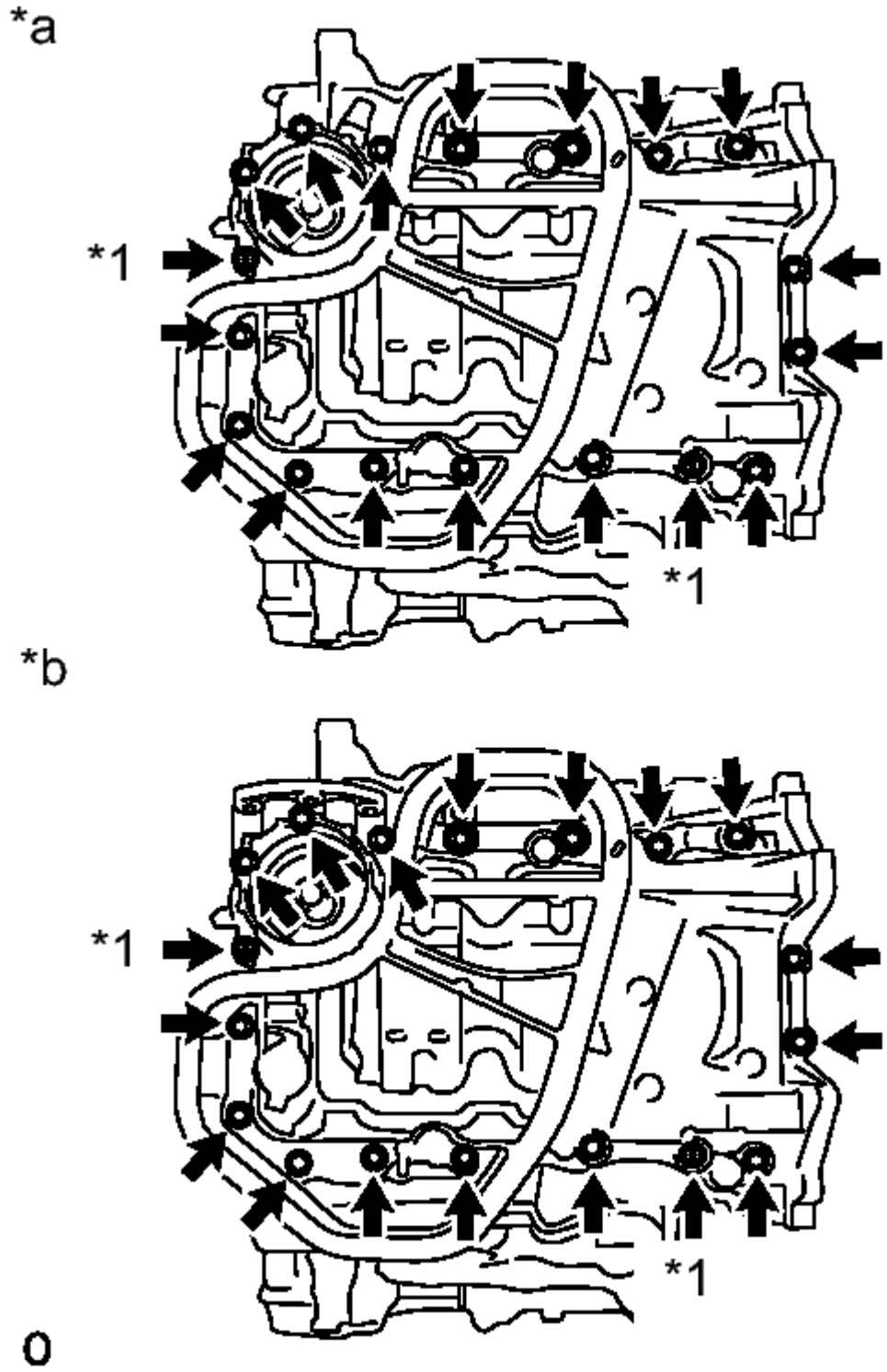


Fig. 191: Identifying Oil Pan Sub-Assembly Nuts & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Nut

*a	w/o Oil Cooler
*b	w/ Oil Cooler

HINT:

Be sure to clean the bolts and stud bolts and check the threads for cracks or other damage.

b. Remove the oil pan sub-assembly by prying between the oil pan sub-assembly and cylinder block sub-assembly with a screwdriver.

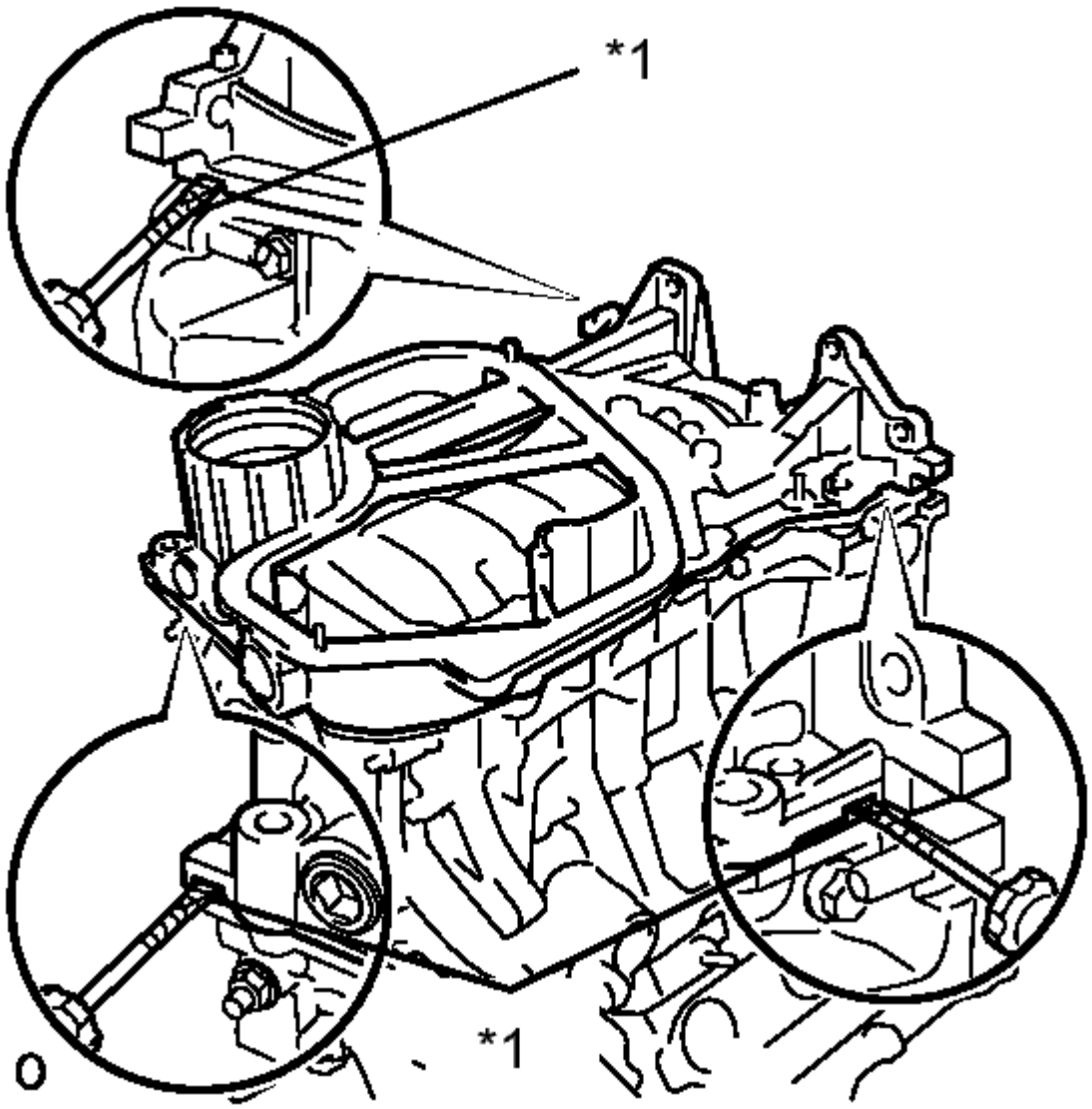


Fig. 192: Identifying Oil Pan Sub-Assembly And Pry Points
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Protective Tape

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

HINT:

Tape the screwdriver tip before use.

c. Remove the 2 O-rings.

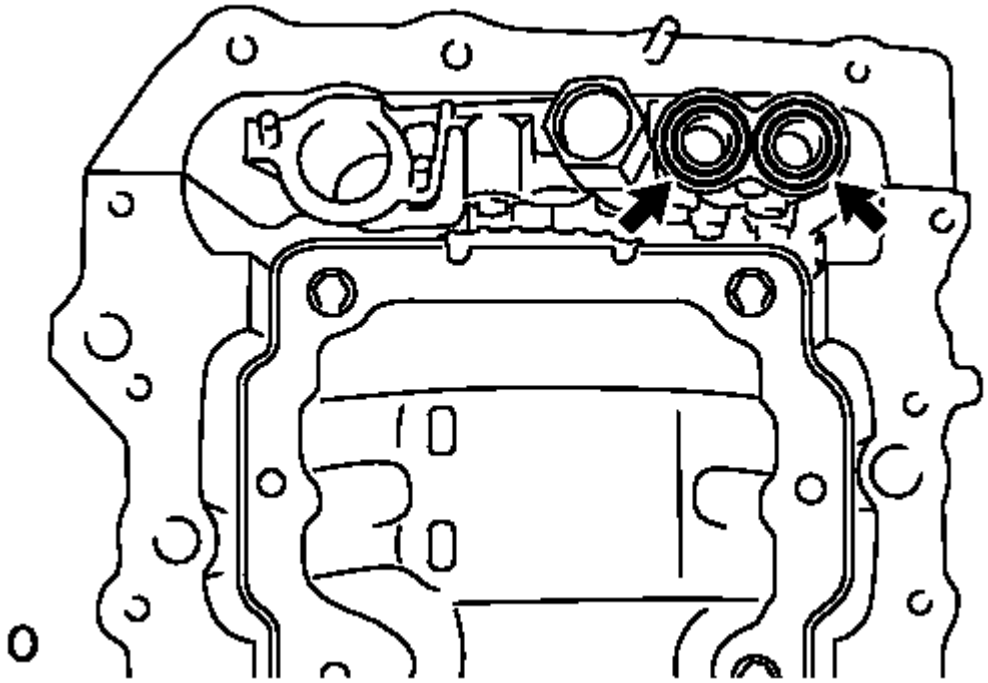


Fig. 193: Identifying O-Rings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Using an E8 "TORX" socket wrench, remove the 4 stud bolts.

25. **REMOVE NO. 1 OIL PAN BAFFLE PLATE**

a. Remove the 7 bolts and No. 1 oil pan baffle plate.

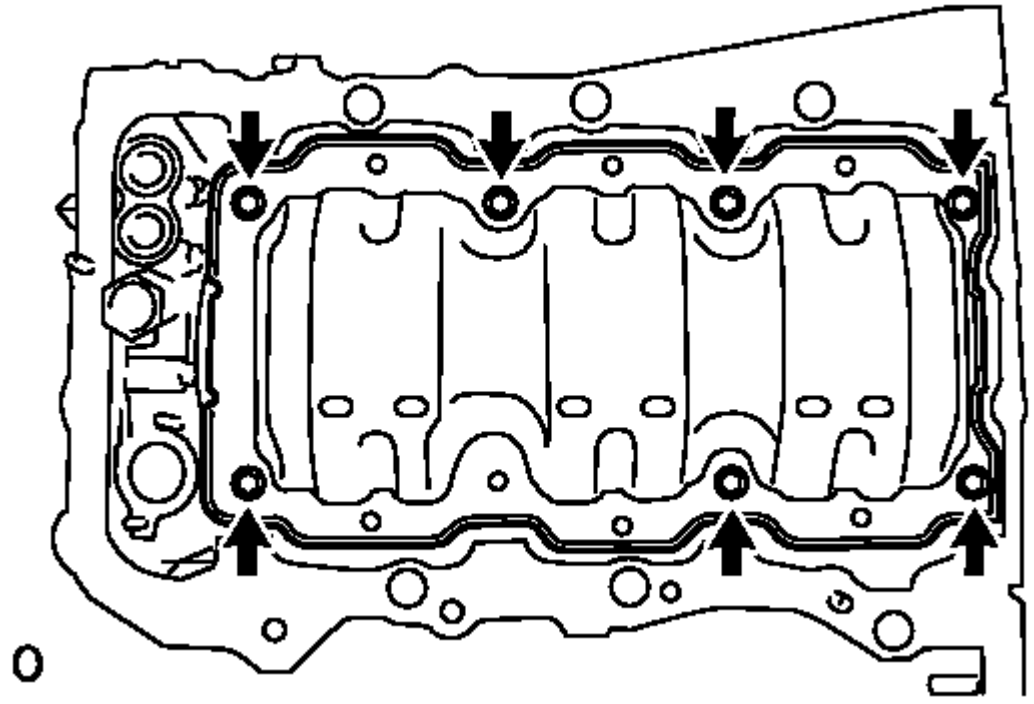


Fig. 194: Identifying Oil Pan Baffle Plate Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

26. **REMOVE ENGINE REAR OIL SEAL RETAINER**
    a. Remove the 6 bolts.

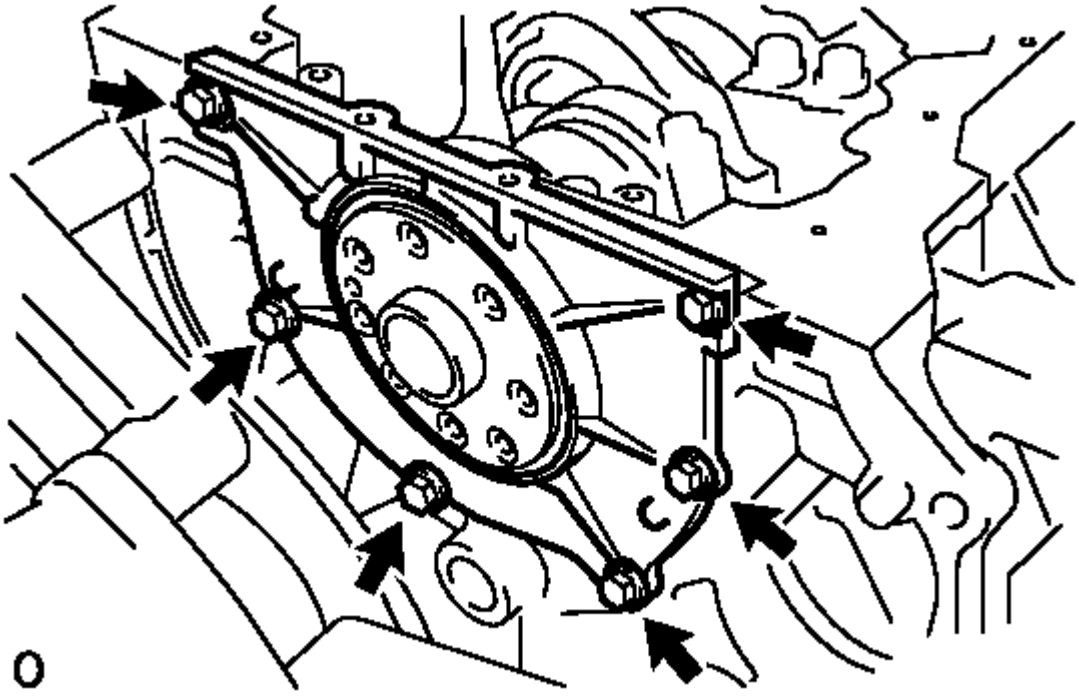


Fig. 195: Identifying Engine Rear Oil Seal Retainer Bolts

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

b. Using a screwdriver, pry out the engine rear oil seal retainer.

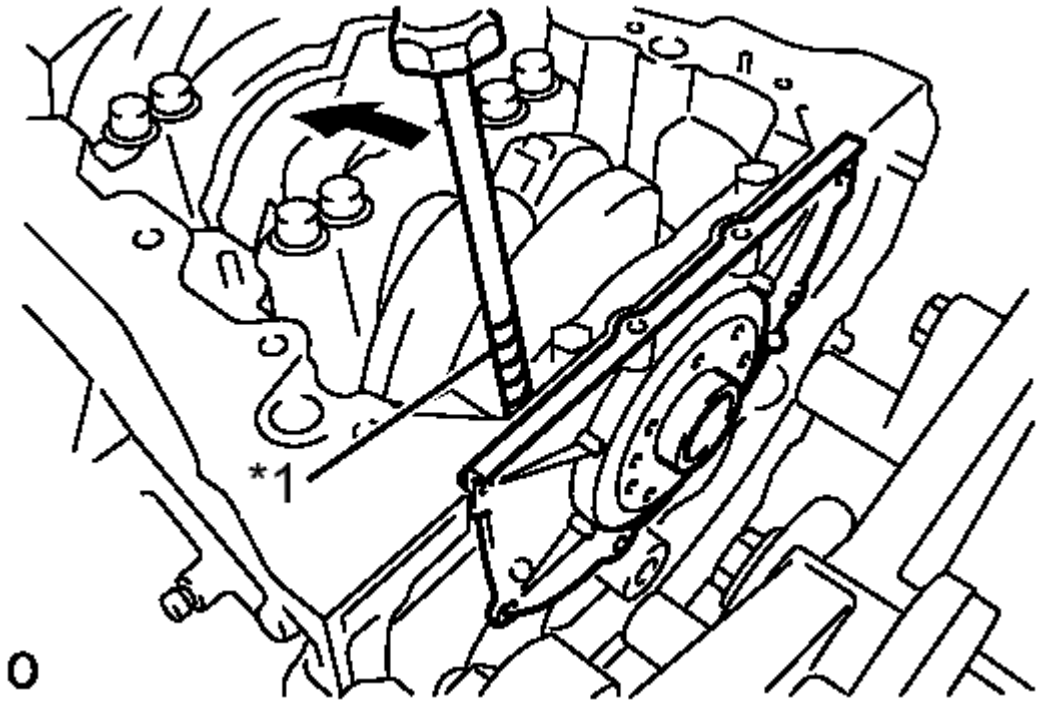


Fig. 196: Prying Out Engine Rear Oil Seal Retainer Using A Screwdriver
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Protective Tape
·	Pry

NOTE: Be careful not to damage the engine rear oil seal retainer.

HINT:

Tape the screwdriver tip before use.

27. **REMOVE ENGINE REAR OIL SEAL**

a. Place the engine rear oil seal retainer on wooden blocks.

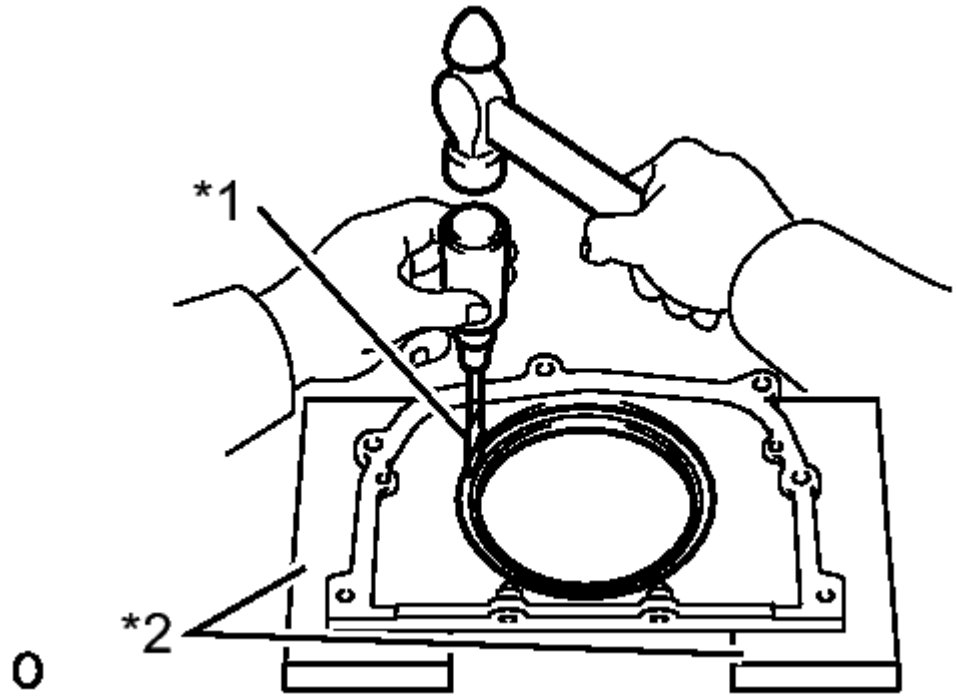


Fig. 197: Removing Engine Rear Oil Using A Screwdriver
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Protective Tape
*2	Wooden Block

HINT:

Tape the screwdriver tip before use.

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

NOTE: Be careful not to damage the engine rear oil seal retainer.

HINT:

Tape the screwdriver tip before use.

28. **REMOVE WATER PUMP ASSEMBLY**
    a. Remove the 16 bolts, water pump assembly and water pump gasket.

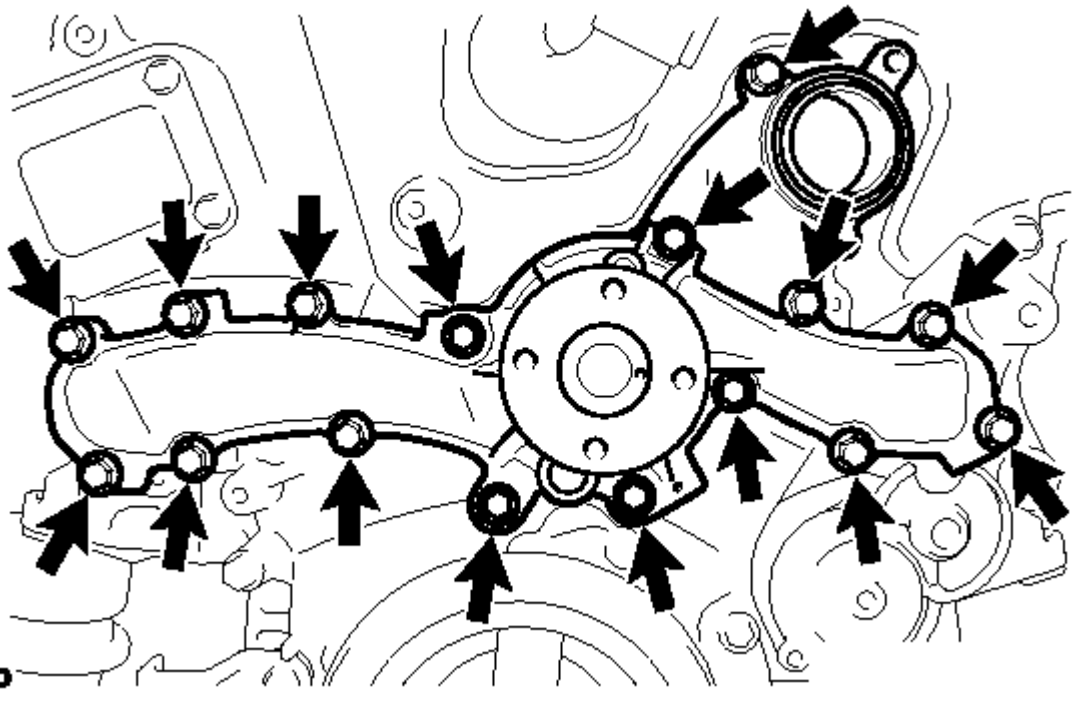


Fig. 198: Identifying Bolts, Water Pump And Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

29. **REMOVE TIMING CHAIN COVER SUB-ASSEMBLY**
    a. Remove the 15 bolts and 2 nuts as shown in the illustration.

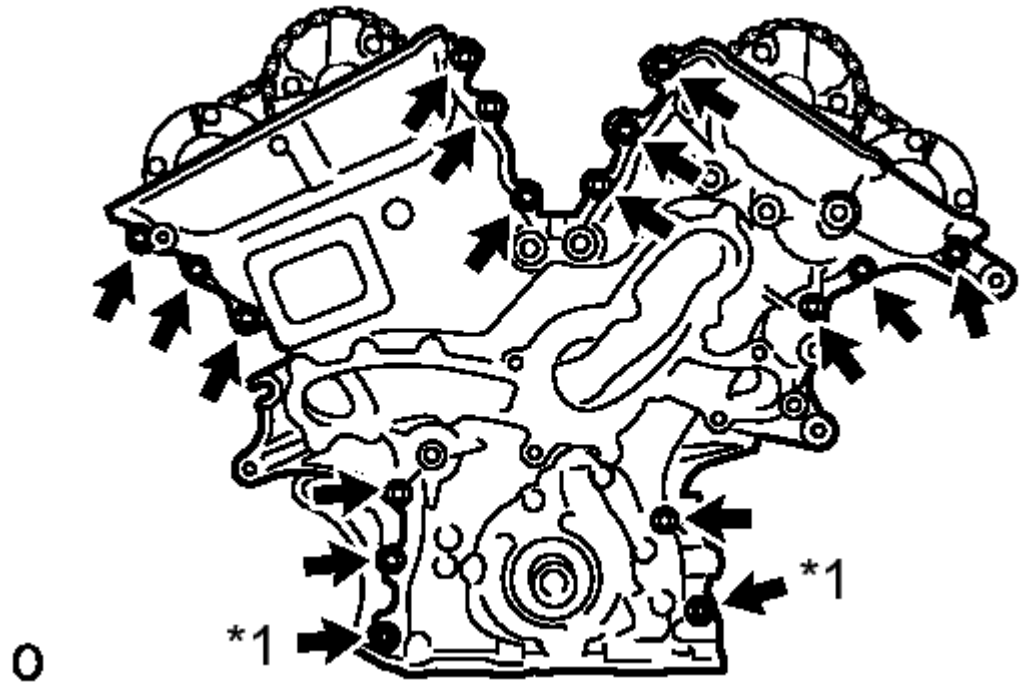


Fig. 199: Identifying Timing Chain Cover Sub-Assembly Nuts & Bolts

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

TEXT IN ILLUSTRATION

*1	Nut

b. Remove the timing chain cover sub-assembly by prying between the timing chain cover and cylinder head sub-assembly or cylinder block sub-assembly with a screwdriver.

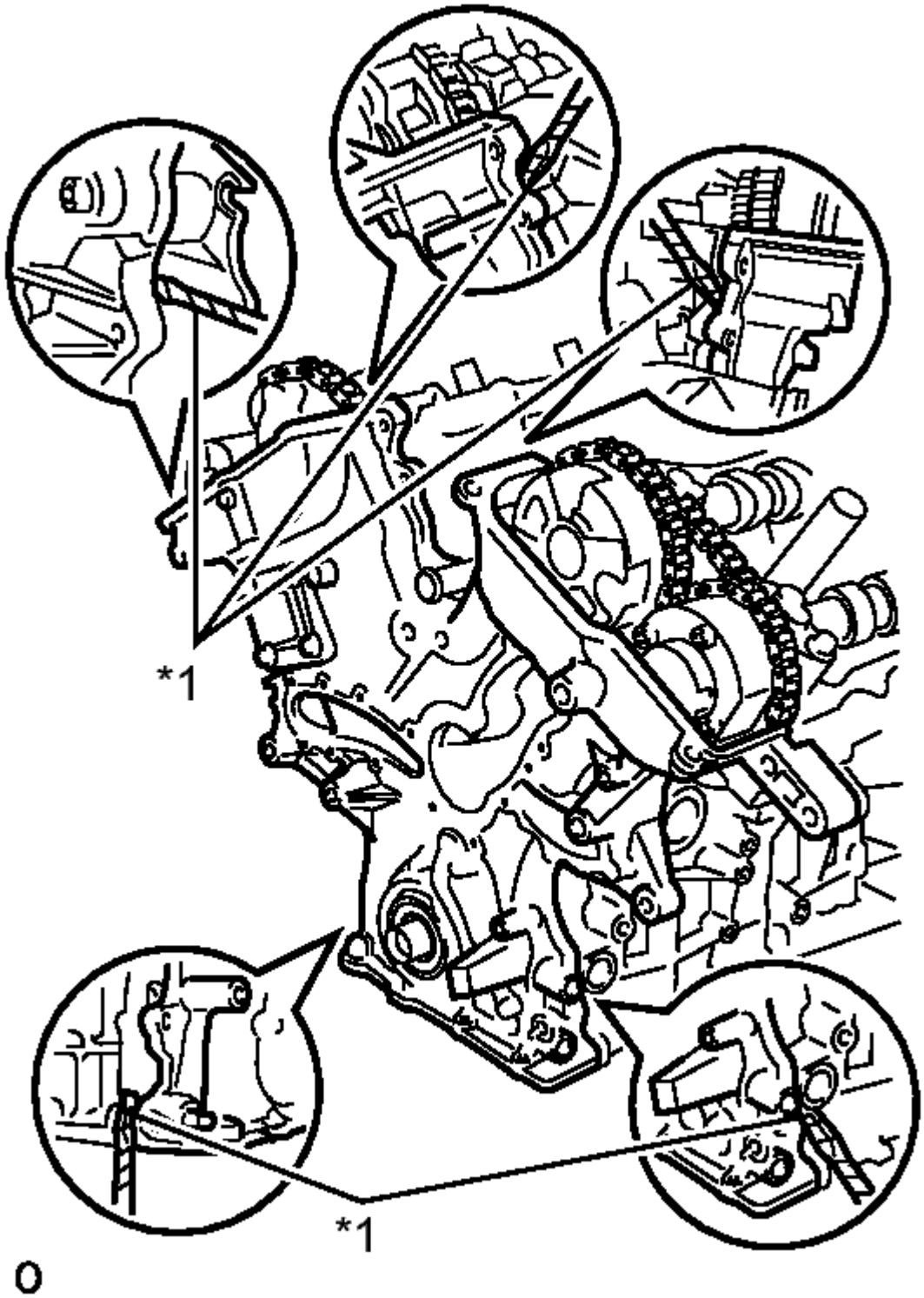


Fig. 200: Identifying Timing Chain Cover Sub-Assembly Prying Points
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	Protective

*1	Tape

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

HINT:

Tape the screwdriver tip before use.

c. Remove the 4 bolts, chain cover plate and chain cover plate gasket.
d. Remove the gasket.

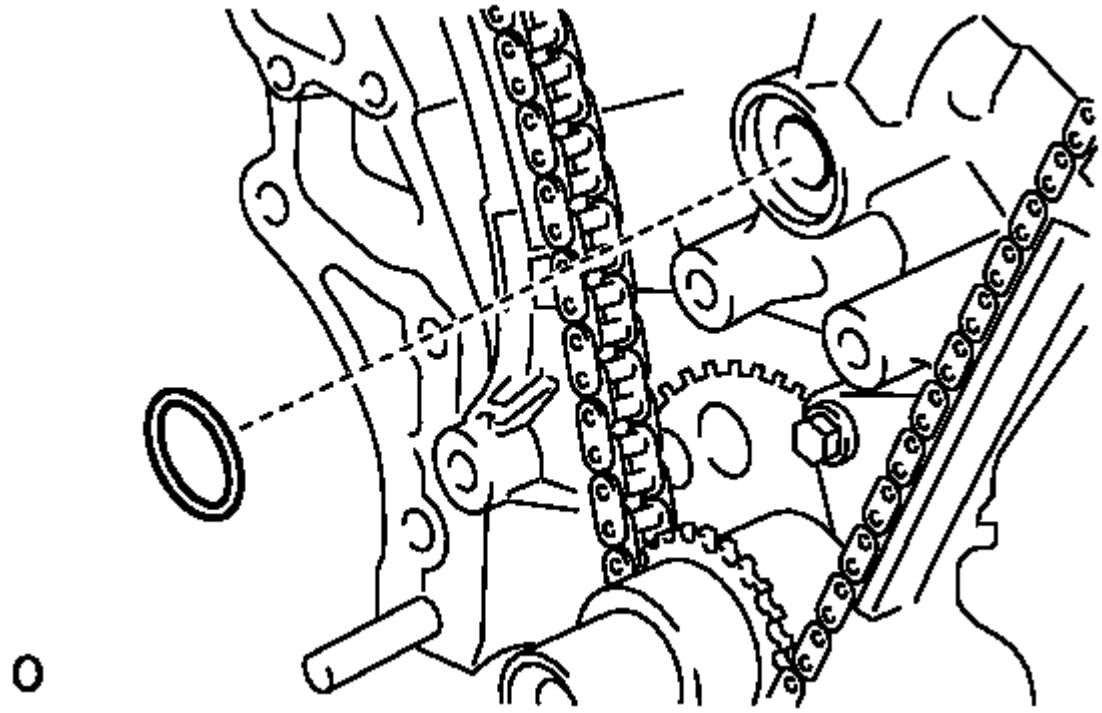


Fig. 201: Identifying Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

30. **REMOVE TIMING CHAIN CASE OIL SEAL**
    a. Using a screwdriver, pry out the timing chain case oil seal.

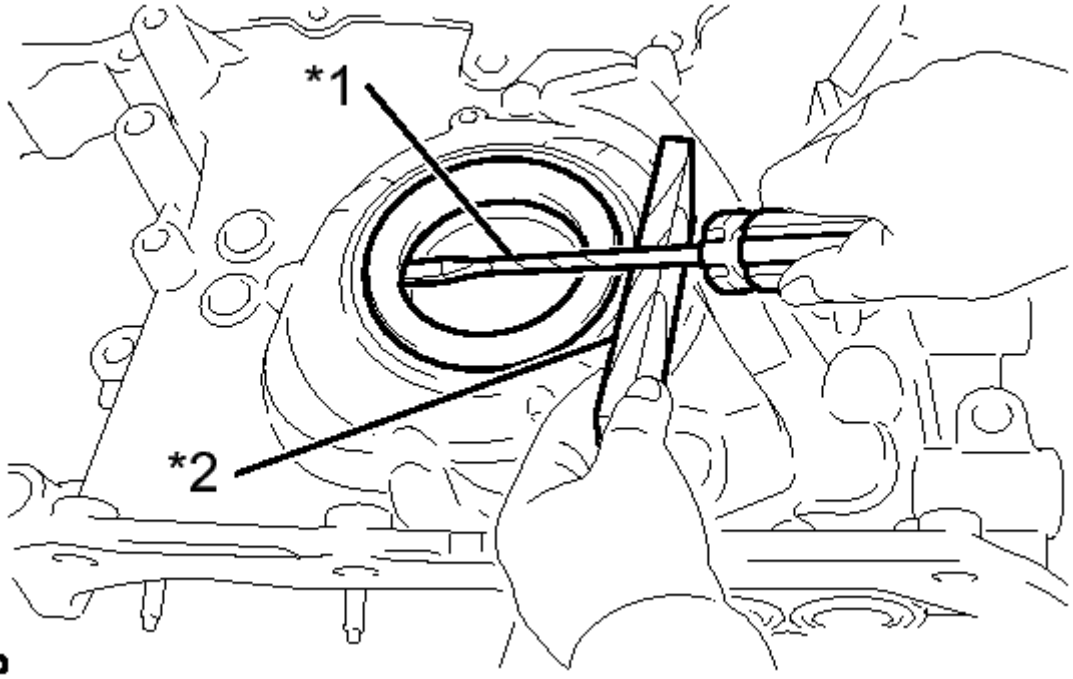


Fig. 202: Removing Timing Chain Case Oil Seal Using A Screwdriver
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Protective Tape
*2	Wooden Block

HINT:

Tape the screwdriver tip before use.

31. **SET NO. 1 CYLINDER TO TDC/COMPRESSION**
    a. Temporarily tighten the pulley set bolt.
    b. Turn the crankshaft clockwise to align the timing mark on the crank angle sensor plate with the RH block bore center line (TDC/compression).

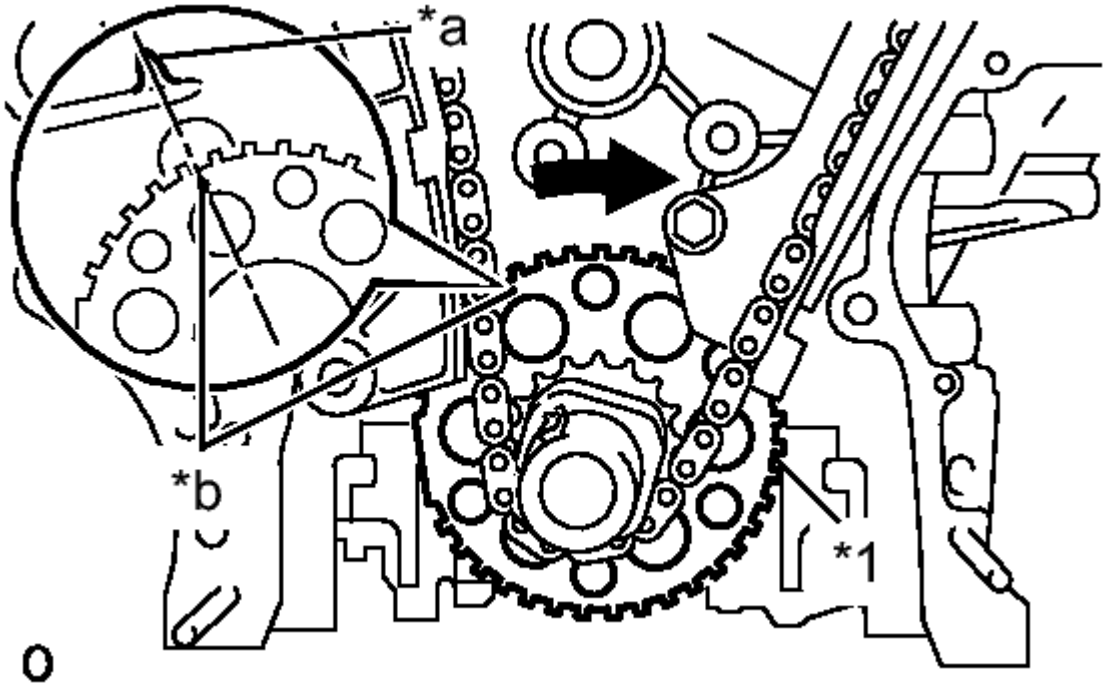


Fig. 203: Turning Crankshaft Clockwise & Aligning Crank Angle Sensor Plate With RH Block Bore Center Line
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Sensor Plate
*a	Center Line
*b	Timing Mark

c. Check that the timing marks of the camshaft timing gears are aligned with the timing marks of the bearing cap as shown in the illustration.

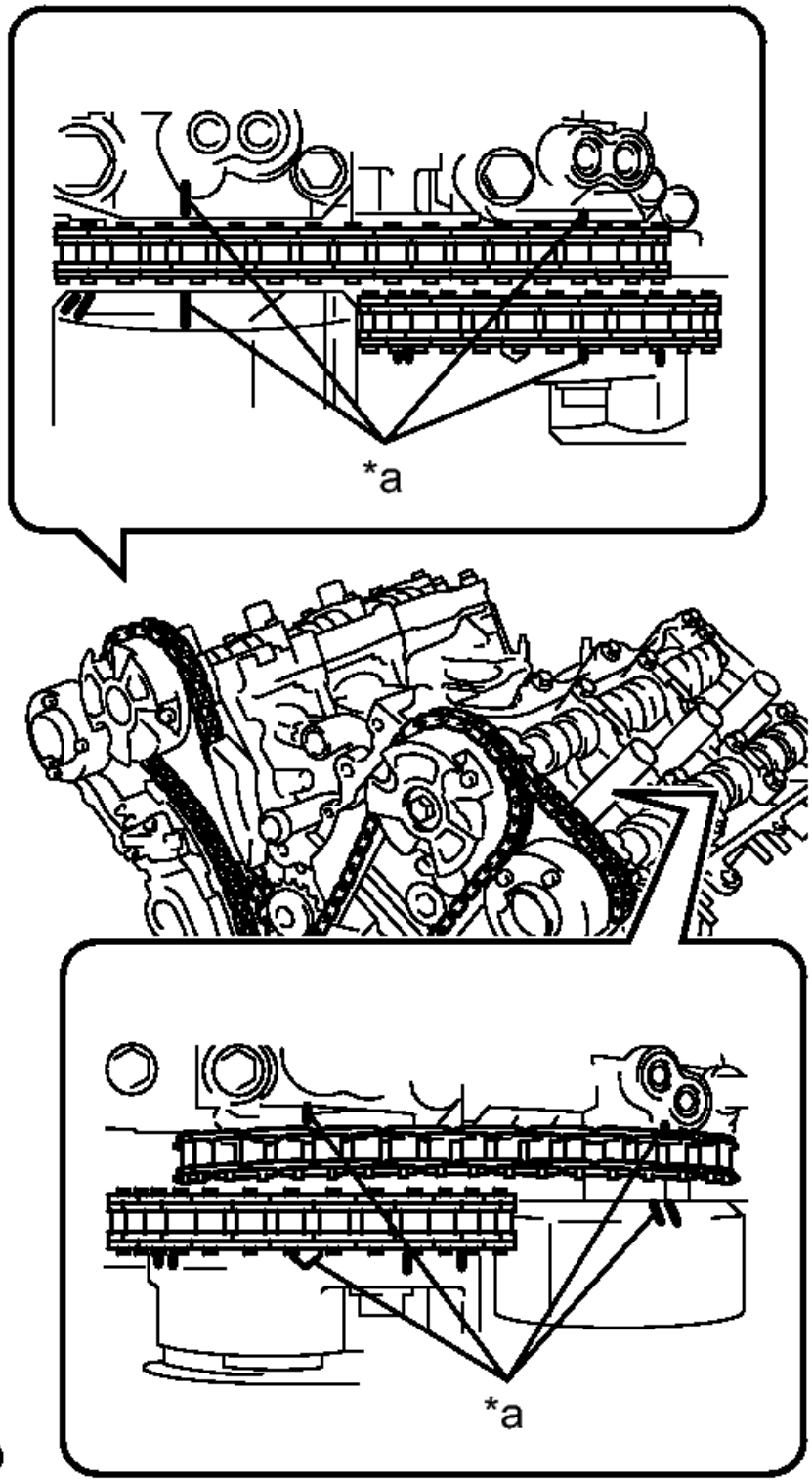


Fig. 204: Identifying Alignment Of Camshaft Timing Gear & Bearing Cap Timing Marks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Timing Mark

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

32. **REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY**

a. Move the stopper plate upward to release the lock, and push the plunger deep into the tensioner.

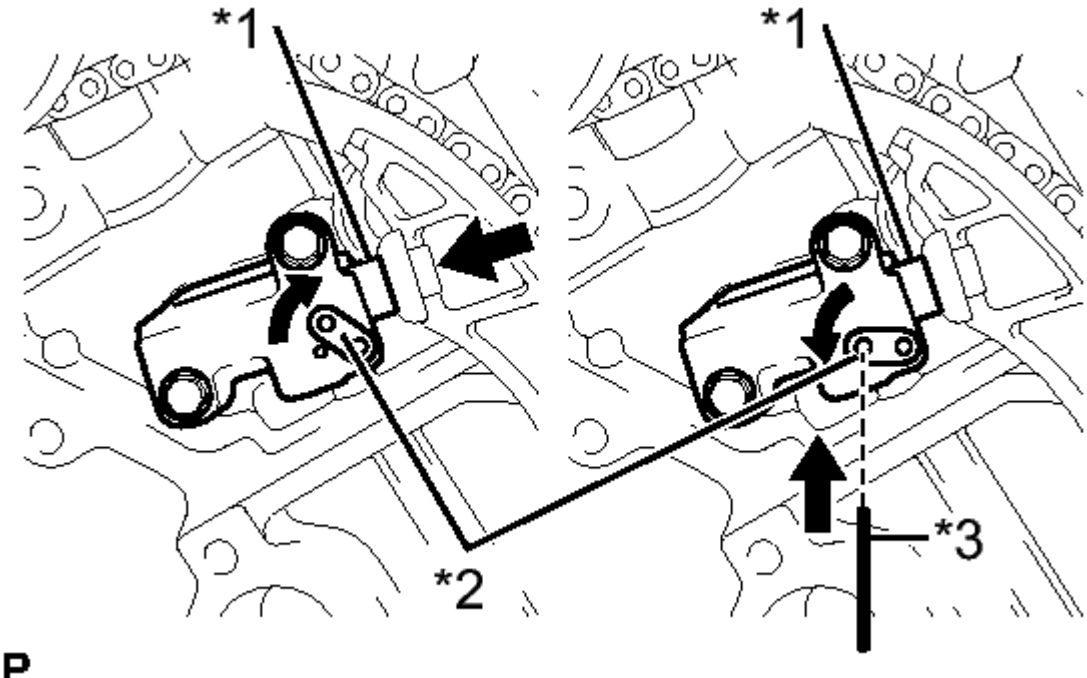


Fig. 205: Removing No. 1 Chain Tensioner Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Plunger
*2	Stopper Plate
*3	Pin

b. Move the stopper plate downward to set the lock, and insert a pin of 1.27 mm diameter (0.0500 in.) into the stopper plate hole.

c. Remove the 2 bolts and No. 1 chain tensioner assembly.

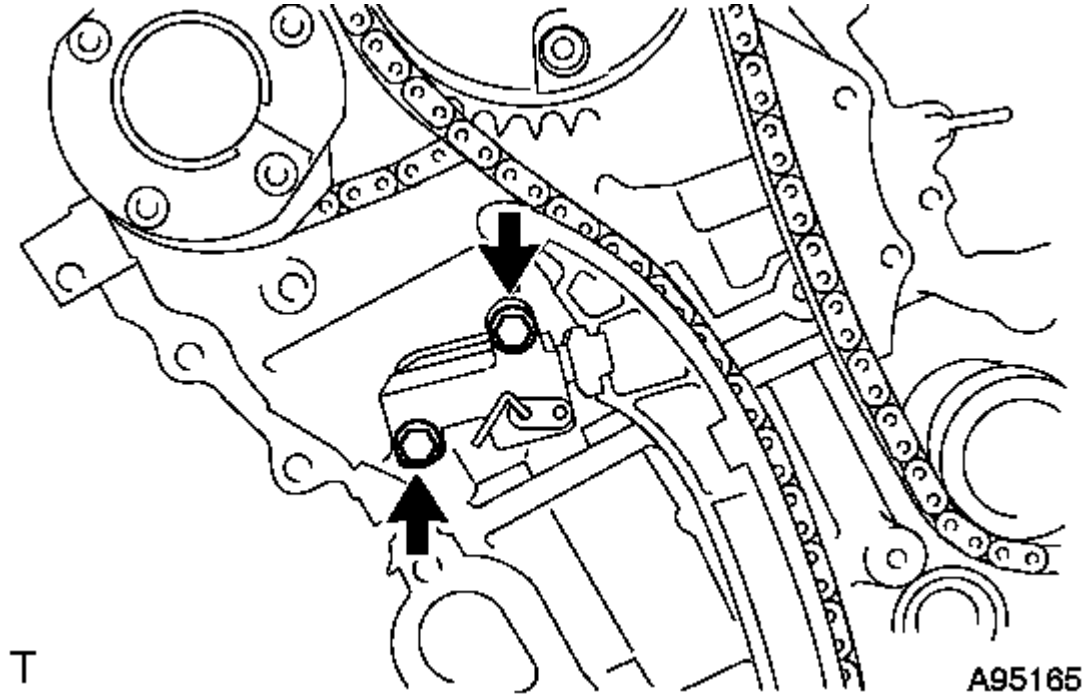


Fig. 206: Identifying Chain Tensioner With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

33. **REMOVE CHAIN TENSIONER SLIPPER**
    a. Remove the chain tensioner slipper.
34. **REMOVE CHAIN SUB-ASSEMBLY**
    a. Turn the crankshaft counterclockwise 10° to loosen the chain of the crankshaft timing sprocket.

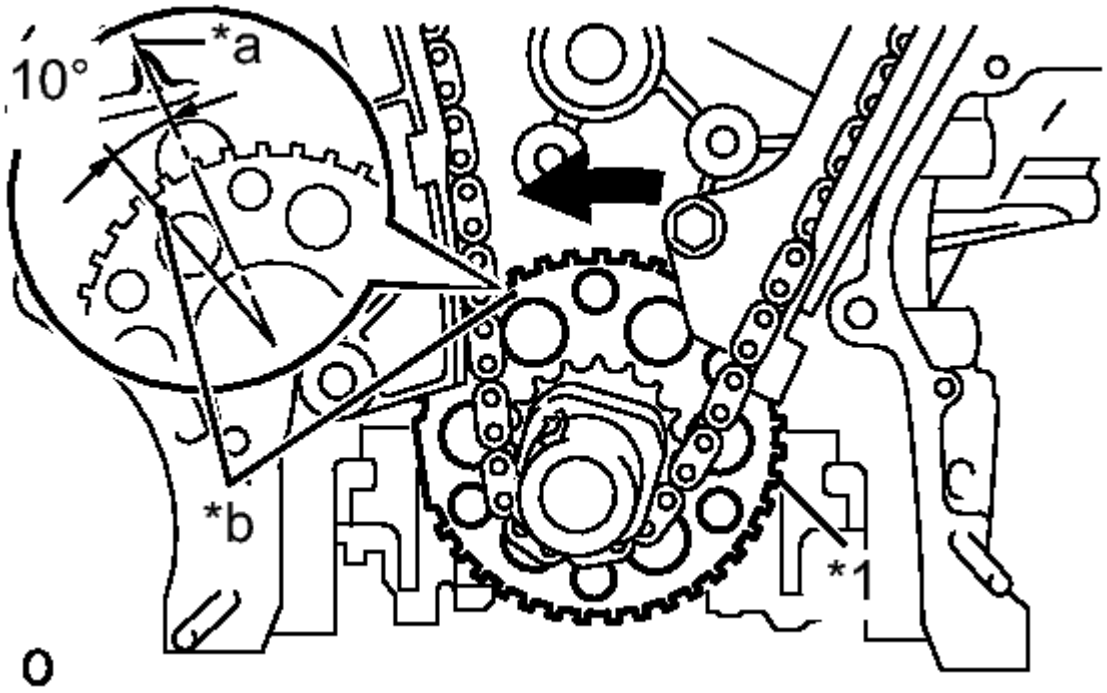


Fig. 207: Turning Crankshaft 10° Counterclockwise
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Sensor Plate
*a	Center Line
*b	Timing Mark

b. Remove the pulley set bolt.
c. Remove the chain sub-assembly from the crankshaft timing sprocket and place it on the crankshaft.

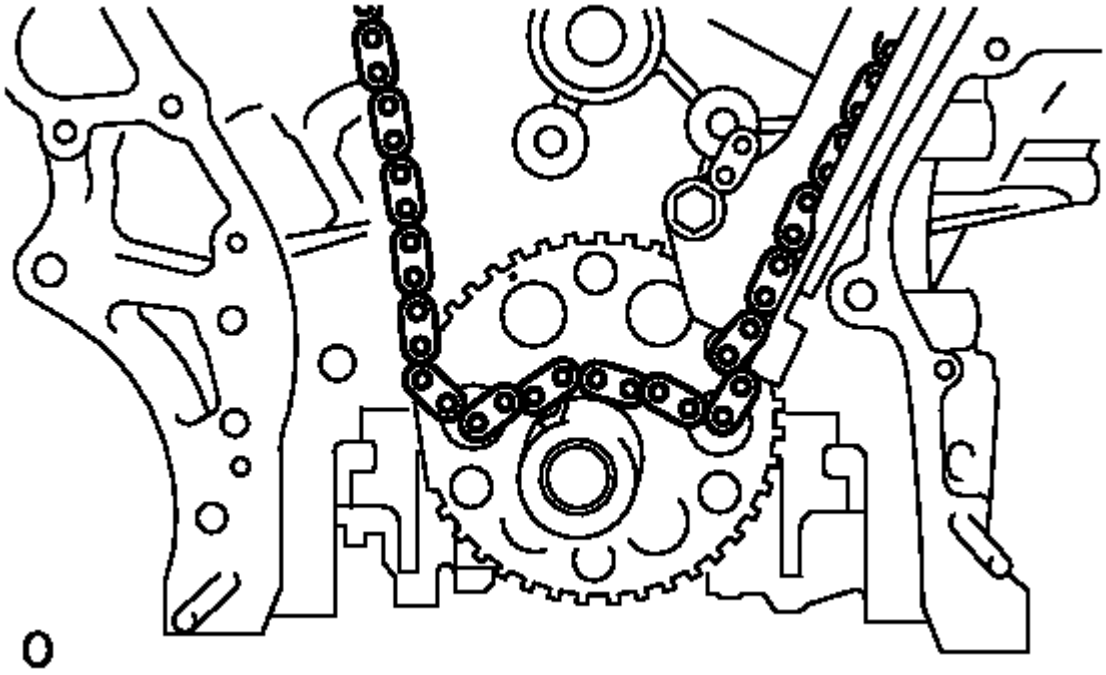


Fig. 208: Identifying Chain Set
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Turn the camshaft timing gear assembly on bank 1 clockwise (approximately 60°) and set it as shown in the illustration. Be sure to loosen the chain sub-assembly between the banks.

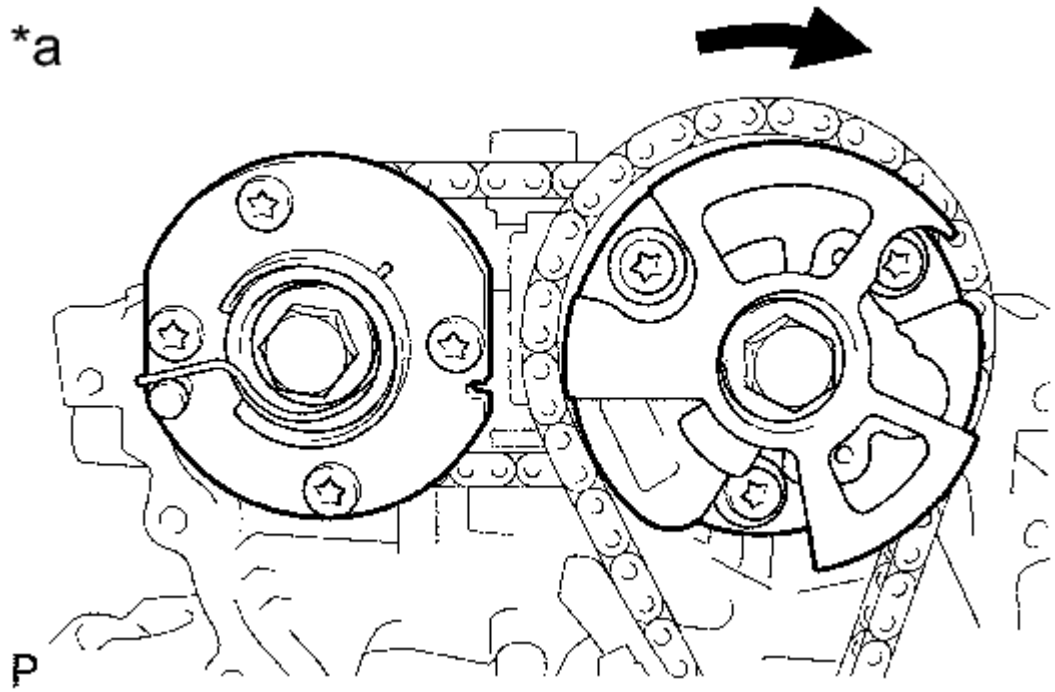


Fig. 209: Turning Camshaft Timing Gear Assembly Clockwise (Bank 1)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	for Bank 1

e. Remove the chain sub-assembly.

35. **REMOVE IDLE SPROCKET ASSEMBLY**

a. Using a 10 mm hexagon wrench, remove the No. 2 idle gear shaft, idle sprocket assembly and No. 1 idle gear shaft.

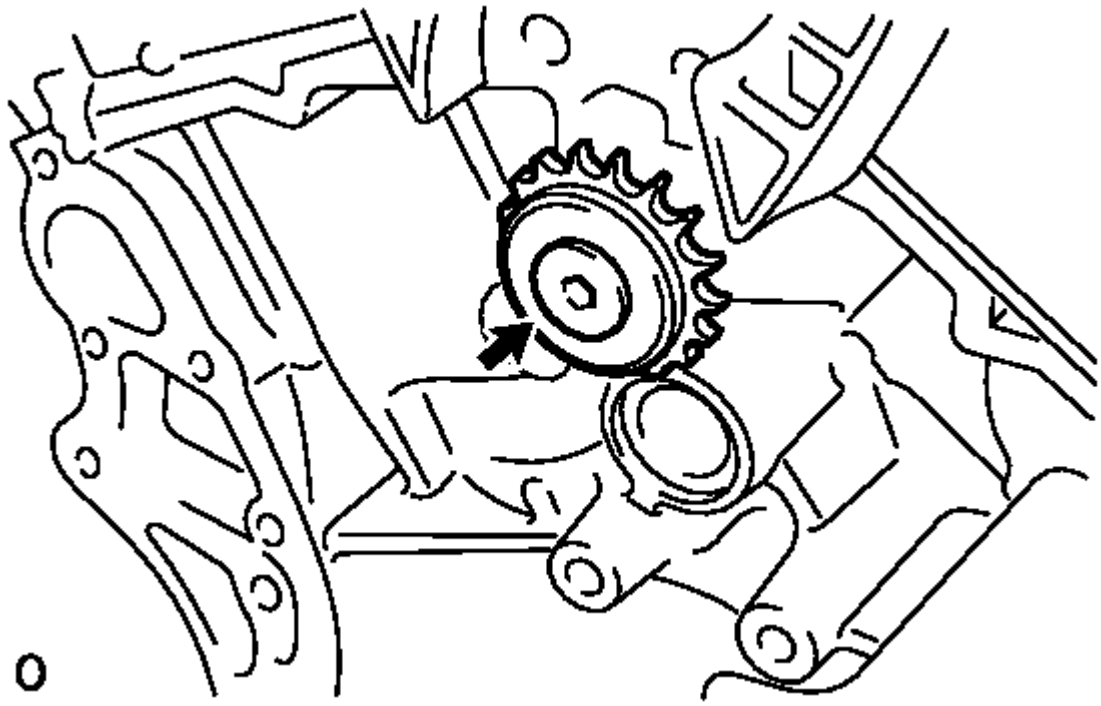


Fig. 210: Identifying Idle Gear Shaft No. 2, Idle Sprocket And Idle Gear Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

36. **REMOVE NO. 1 CHAIN VIBRATION DAMPER**

a. Remove the 2 bolts and No. 1 chain vibration damper.

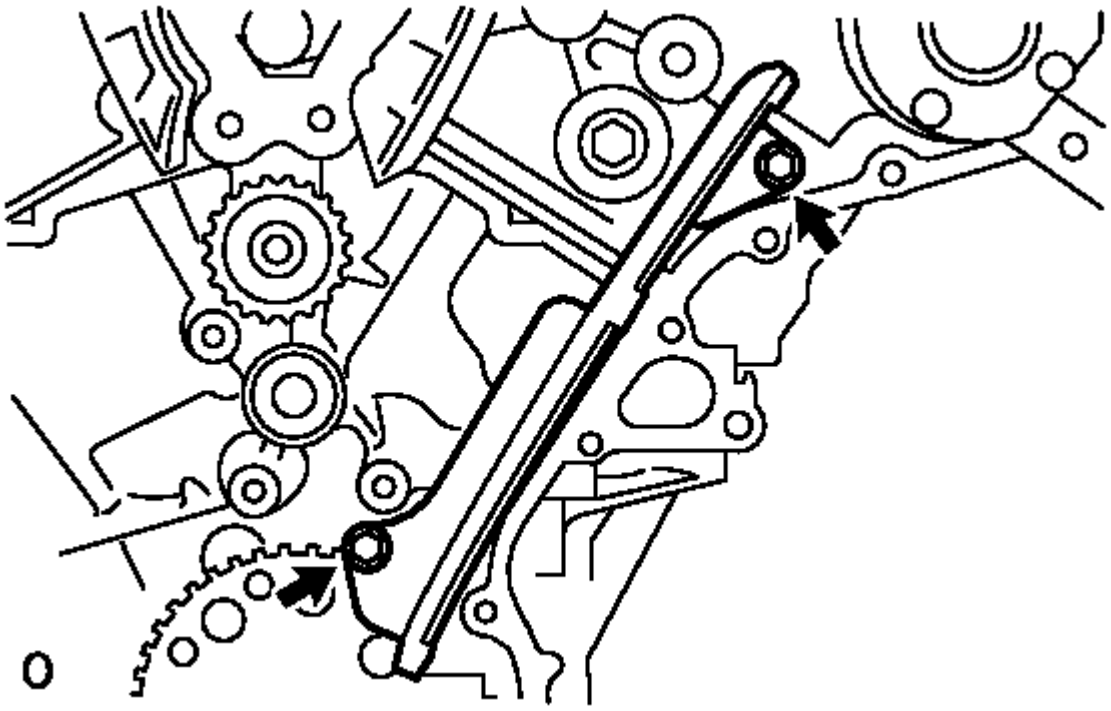


Fig. 211: Identifying Chain Vibration Damper With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

37. **REMOVE NO. 2 CHAIN VIBRATION DAMPER**
    a. Remove the 2 No. 2 chain vibration dampers.
38. **REMOVE CRANKSHAFT TIMING SPROCKET**
    a. Remove the crankshaft timing sprocket from the crankshaft.

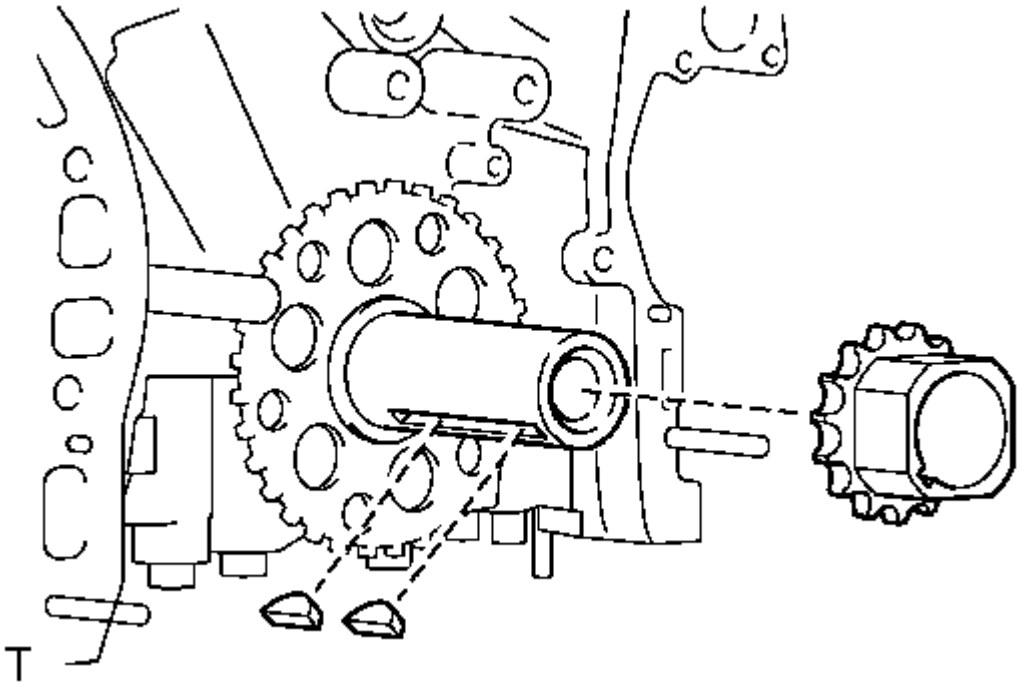


Fig. 212: Identifying Crankshaft Timing Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the 2 keys from the crankshaft.

39. **REMOVE CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 1)** See step 32
40. **REMOVE NO. 2 CHAIN TENSIONER ASSEMBLY** See step 33
41. **REMOVE CAMSHAFT BEARING CAP (for Bank 1)** See step 34
42. **REMOVE CAMSHAFT** See step 35
43. **REMOVE NO. 2 CAMSHAFT** See step 36
44. **REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY RH** See step 37
45. **REMOVE CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 2)** See step 38
46. **REMOVE NO. 3 CHAIN TENSIONER ASSEMBLY** See step 39
47. **REMOVE CAMSHAFT BEARING CAP (for Bank 2)** See step 40
48. **REMOVE NO. 3 CAMSHAFT** See step 41
49. **REMOVE NO. 4 CAMSHAFT** See step 42
50. **REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY LH** See step 43
51. **REMOVE NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY** See step 2
52. **REMOVE VALVE LASH ADJUSTER ASSEMBLY** See step 3
53. **REMOVE VALVE STEM CAP** See step 4
54. **REMOVE CYLINDER HEAD SUB-ASSEMBLY RH** See step 6
55. **REMOVE CYLINDER HEAD GASKET RH** See step 7
56. **REMOVE CYLINDER HEAD SUB-ASSEMBLY LH** See step 8
57. **REMOVE CYLINDER HEAD GASKET LH** See step 9

58. **REMOVE WATER INLET PIPE**

a. Remove 2 clamps and separate the No. 1 water by-pass hose.

b. Remove the 2 bolts and water inlet pipe.

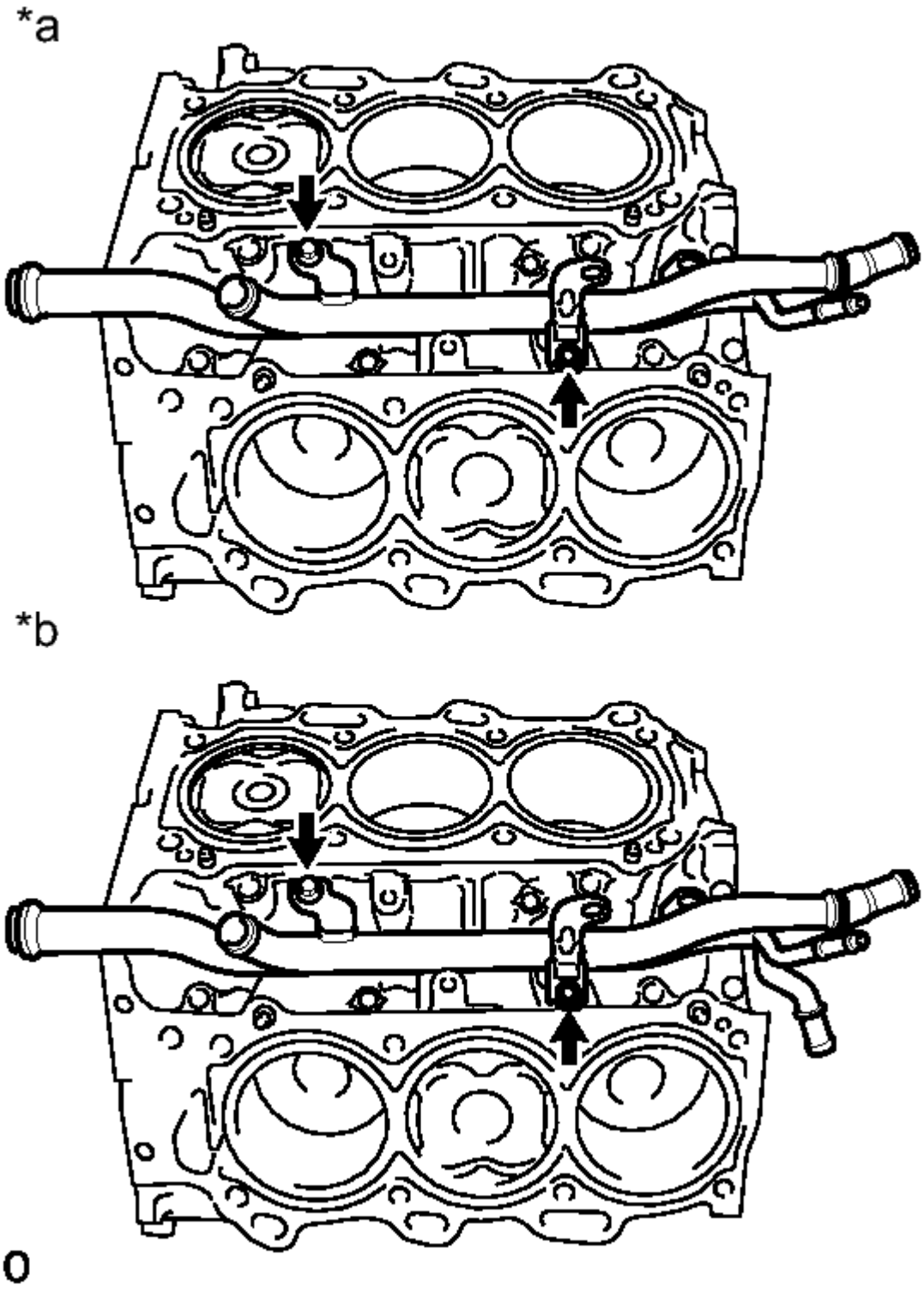


Fig. 213: Identifying Water Inlet Pipe & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

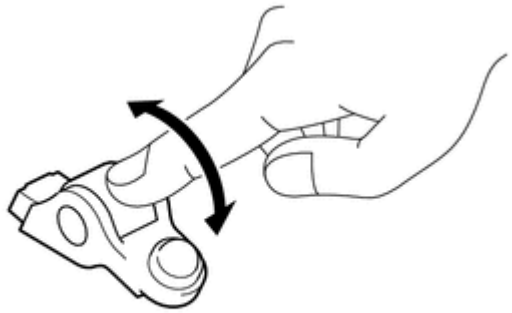
TEXT IN ILLUSTRATION

*a	w/o Oil Cooler
*b	w/ Oil Cooler

INSPECTION

INSPECTION

1. **INSPECT NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY**
   a. Turn the roller by hand to check that it turns smoothly.



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Fig. 214: Turning Roller By Hand For Checking Smoothly Turns
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

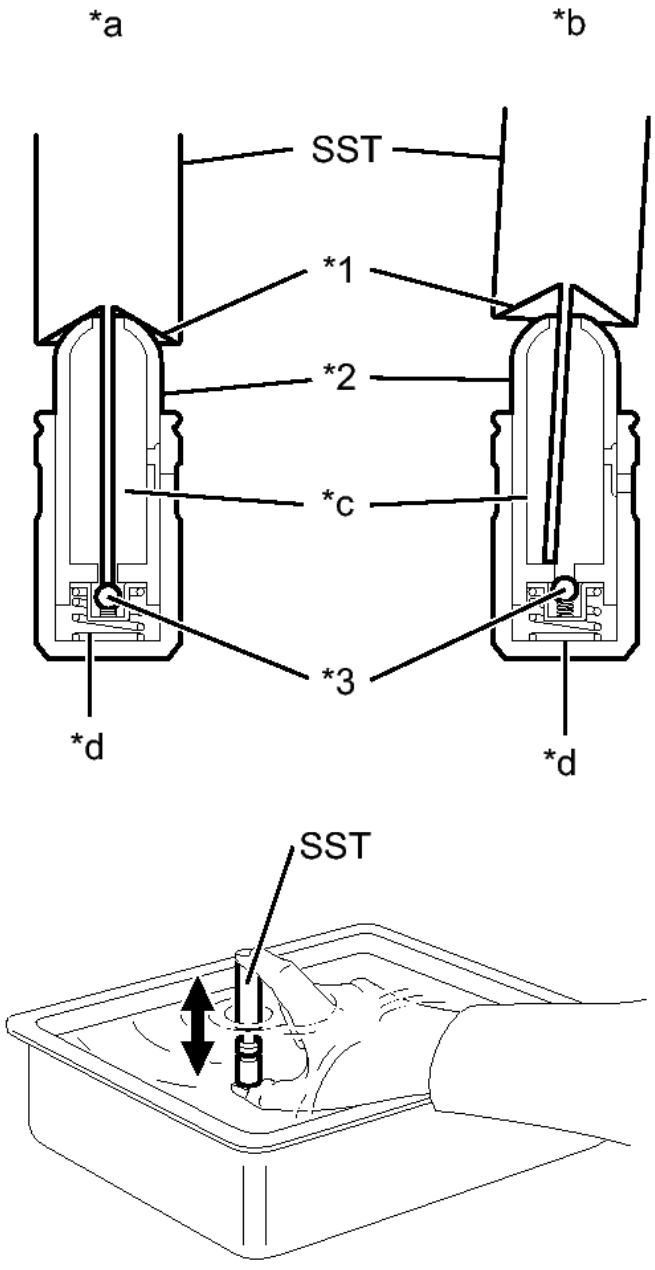
If the roller does not turn smoothly, replace the No. 1 valve rocker arm sub-assembly.

2. **INSPECT VALVE LASH ADJUSTER ASSEMBLY**

NOTE:

- **Keep the valve lash adjuster assembly free of dirt and foreign objects.**
- **Only use clean engine oil.**

   a. Place the valve lash adjuster assembly into a container filled with engine oil.
   b. Insert the tip of SST into the valve lash adjuster assembly plunger and use the tip to press down on the check ball inside the plunger.



T

Fig. 215: Bleeding Valve Lash Adjuster Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Tapered Part
*2	Plunger
*3	Check Ball
*a	CORRECT
*b	INCORRECT
*c	Low Pressure Chamber
*d	High Pressure Chamber

- **SST: 09276-75010**

c. Squeeze SST and valve lash adjuster assembly together to move the plunger up and down 5 to 6 times.

d. Check the movement of the plunger and bleed the air.

OK

Plunger moves up and down.

NOTE: When bleeding air from 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, air will not bleed.

e. After bleeding the air, 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 valve lash adjuster assembly.

3. **INSPECT CAMSHAFT**

a. Inspect the camshaft for runout.

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

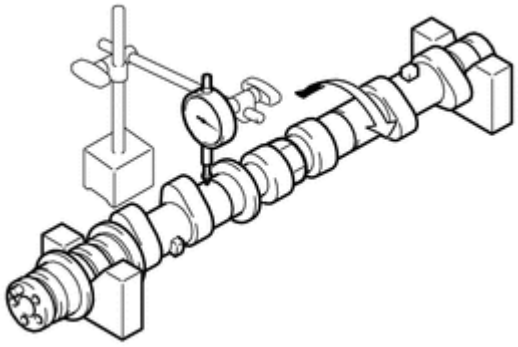


Fig. 216: Measuring Circle Runout At Center Journal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum runout

0.04 mm (0.00157 in.)

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

HINT:

Check the oil clearance after replacing the camshaft.

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

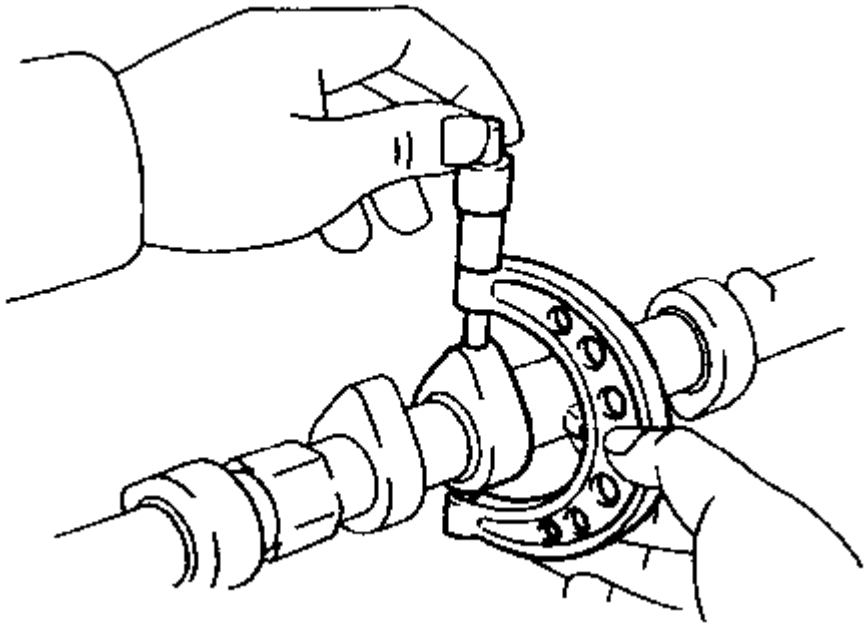


Fig. 217: Checking Cam Lobe Height

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

Standard Cam Lobe Height

Item	Specification
Intake camshaft	44.316 to 44.416 mm (1.7448 to 1.7486 in.)
Exhaust camshaft	44.262 to 44.362 mm (1.7426 to 1.7465 in.)

Minimum Cam Lobe Height

Item	Specification
Intake camshaft	44.166 mm (1.7388 in.)
Exhaust camshaft	44.112 mm (1.7366 in.)

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

c. Using a micrometer, measure the journal diameter.

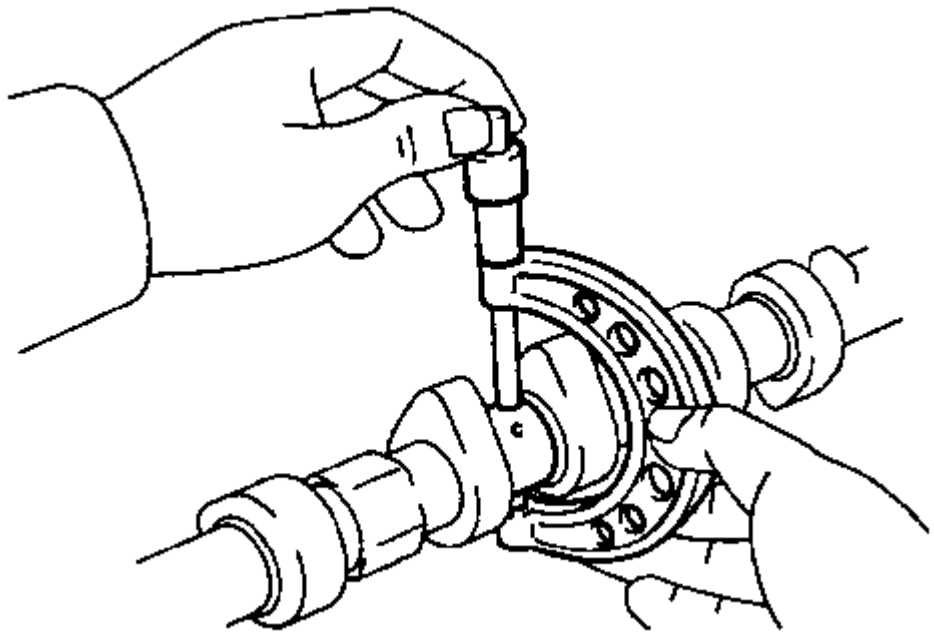


Fig. 218: Measuring Journal Diameter

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

Standard Journal Diameter

Item	Specification
No. 1 journal	35.946 to 35.960 mm (1.4152 to 1.4157 in.)
Other journals	25.959 to 25.975 mm (1.0221 to 1.0226 in.)

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

4. **INSPECT CAMSHAFT TIMING GEAR ASSEMBLY**
   a. Clamp the camshaft in a vise.

NOTE: Be careful not to damage the camshaft in the vise.

   b. Put the camshaft timing gear assembly and camshaft together by aligning the key groove and straight pin.

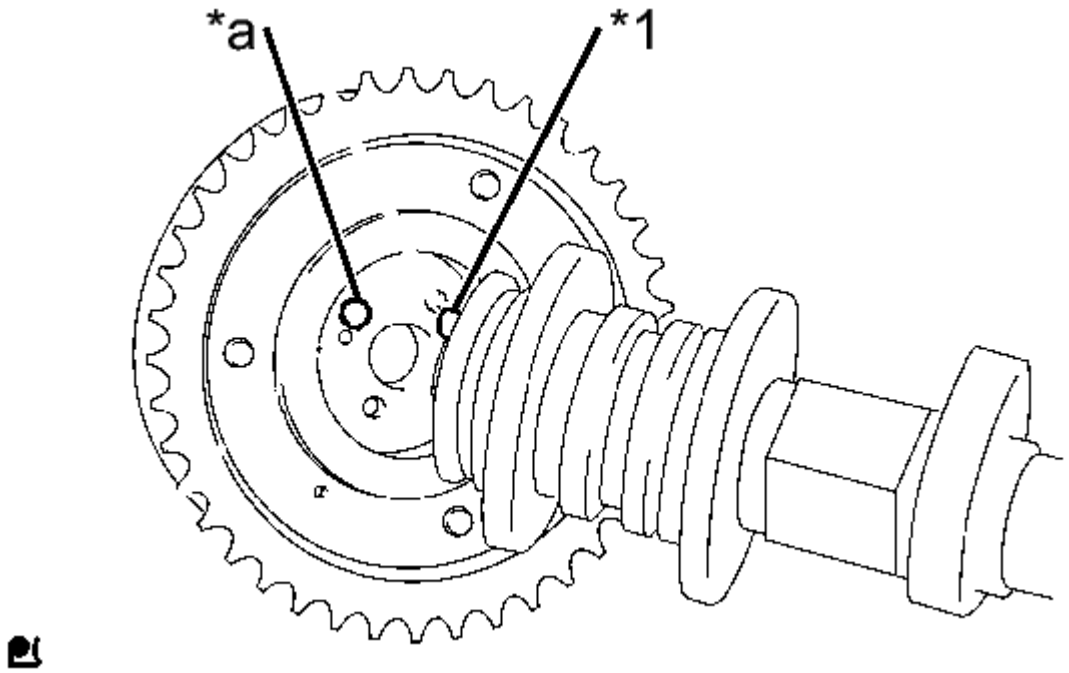


Fig. 219: Identifying Camshaft Timing Gear Key Groove & Camshaft Straight Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Straight Pin
*a	Key Groove

c. Lightly press and turn the camshaft timing gear assembly against the camshaft, and press harder after the pin enters the groove.

NOTE: Be sure not to turn the camshaft timing gear assembly in the retard direction.

d. Check that there is no clearance between the camshaft timing gear assembly flange and the camshaft.

e. Tighten the flange bolt while holding the camshaft.

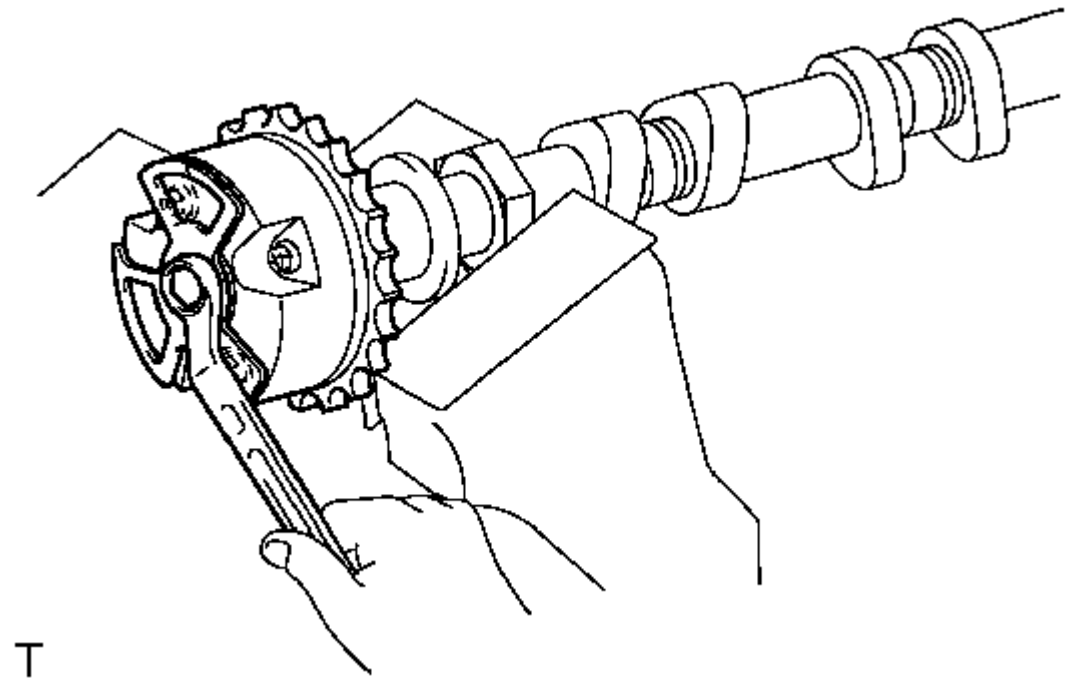


Fig. 220: Checking Lock Of Camshaft Timing Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 100 N*m (1020 kgf*cm, 74 ft.*lbf)

f. Check the lock of the camshaft timing gear assembly.

1. Clamp the camshaft in a vise, and confirm that the camshaft timing gear assembly is locked.

NOTE: Be careful not to damage the camshaft.

g. Release the lock pin.

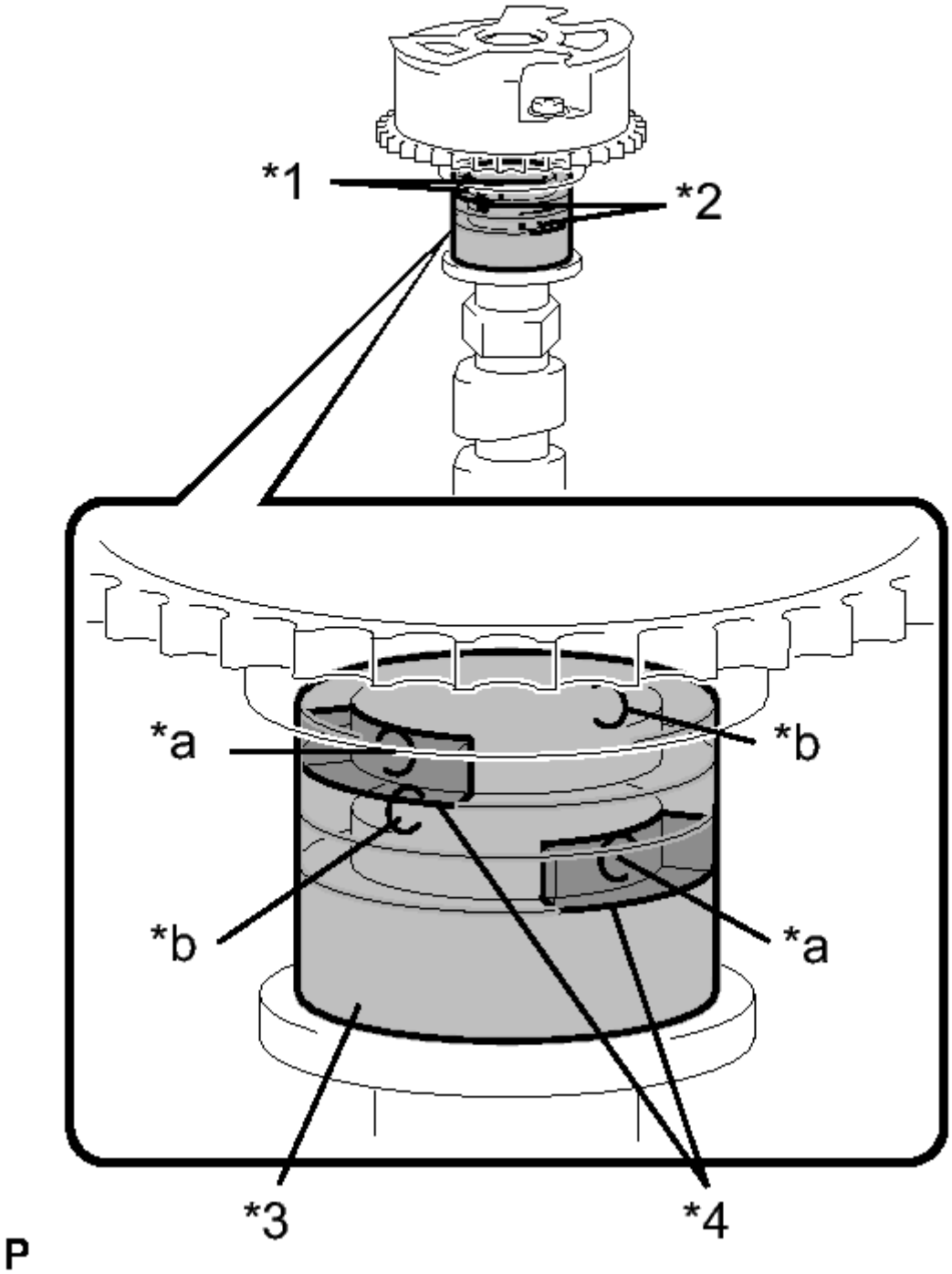


Fig. 221: Covering 4 Oil Paths Of The Cam Journal Using Vinyl Tape
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

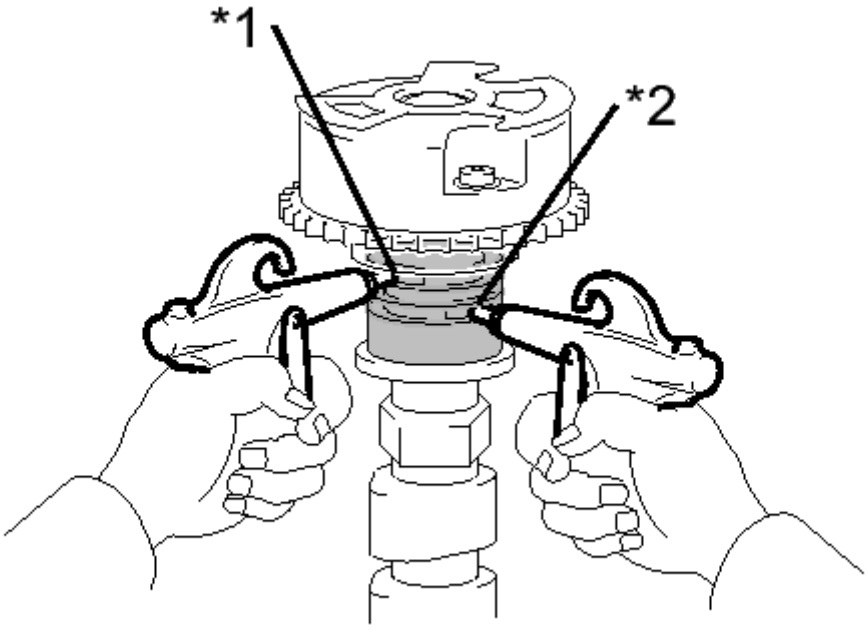
*1	Advance Side Path
*2	Retard Side Path
*3	Vinyl Tape
*4	Rubber
*a	Close
*b	Open

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

   HINT:

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

2. Break through the tape on the advance side path and the retard side path on the opposite side of the hole of the advance side path, as shown in the illustration.
3. Apply approximately 200 kPa (2.0 kgf/cm^2 , 29 psi) of air pressure to the 2 opened paths.



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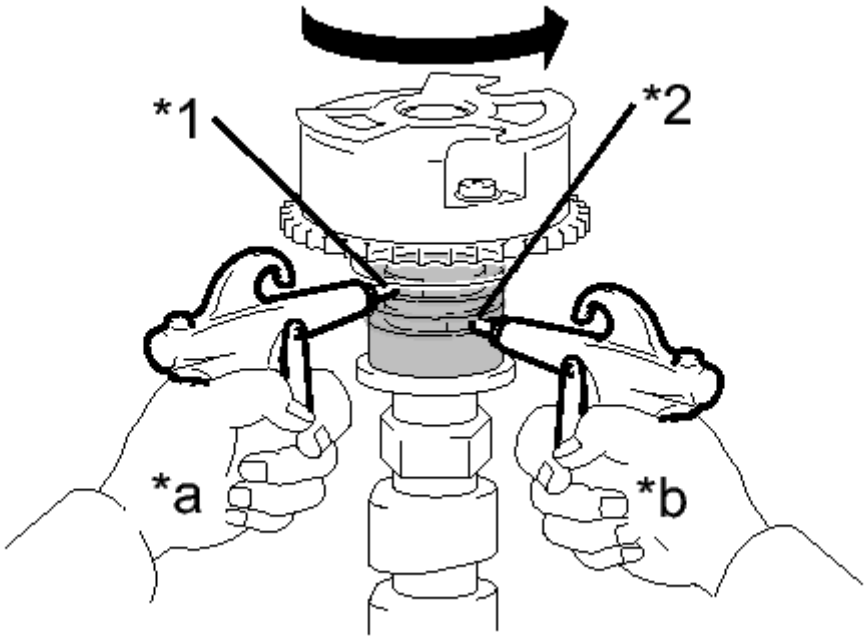
Fig. 222: Applying Air Pressure To Advanced & Retard Side Paths
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Advanced Side Path
*2	Retard Side Path

WARNING: Cover the paths with a piece of cloth when applying pressure to prevent oil from spraying.

4. Check that the camshaft timing gear assembly rotates in the advance direction when reducing the air pressure applied to the retard side path.



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Fig. 223: Checking Camshaft Timing Gear Rotation With Air Pressure Applied To Retard Side Path
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

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

HINT:

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

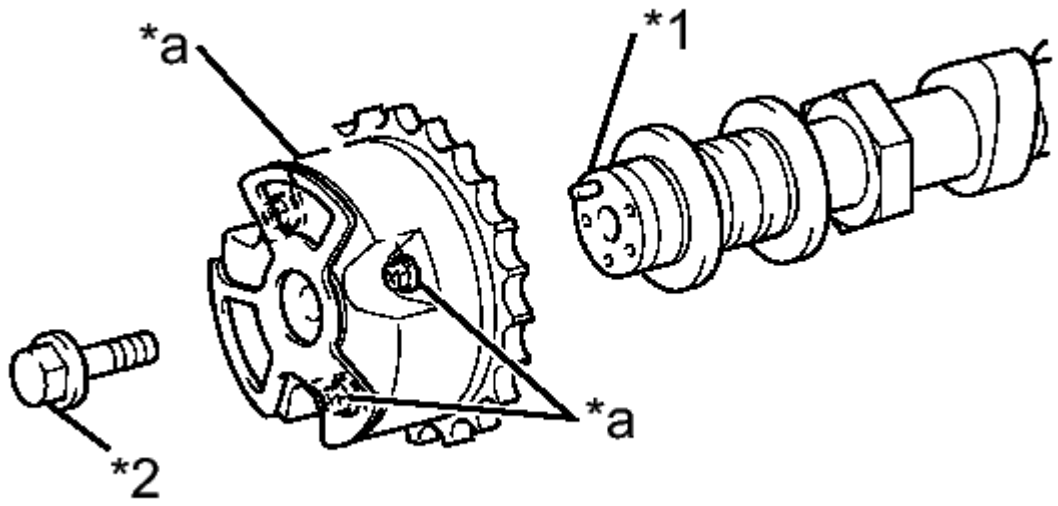
5. When the camshaft timing gear assembly reaches the most advanced position, release the air pressure first from the retard side path and next from the advance side path.

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

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

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

i. Check the lock in the most retarded position.
   1. Confirm that the camshaft timing gear assembly locks at the most retarded position.
j. Remove the flange bolt and camshaft timing gear assembly.



T

Fig. 224: Identifying 3 Bolts Not To Be Removed
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Straight Pin
	Flange

*2	Bolt
*a	Do Not Remove

NOTE:

- **Do not remove the other 3 bolts.**
- **If planning to reuse the camshaft timing gear, be sure to release the straight pin lock before installing the camshaft timing gear.**

5. **INSPECT CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY**
   a. Clamp the camshaft in a vise.

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

   b. Put the camshaft timing exhaust gear assembly and camshaft together by aligning the key groove and straight pin.

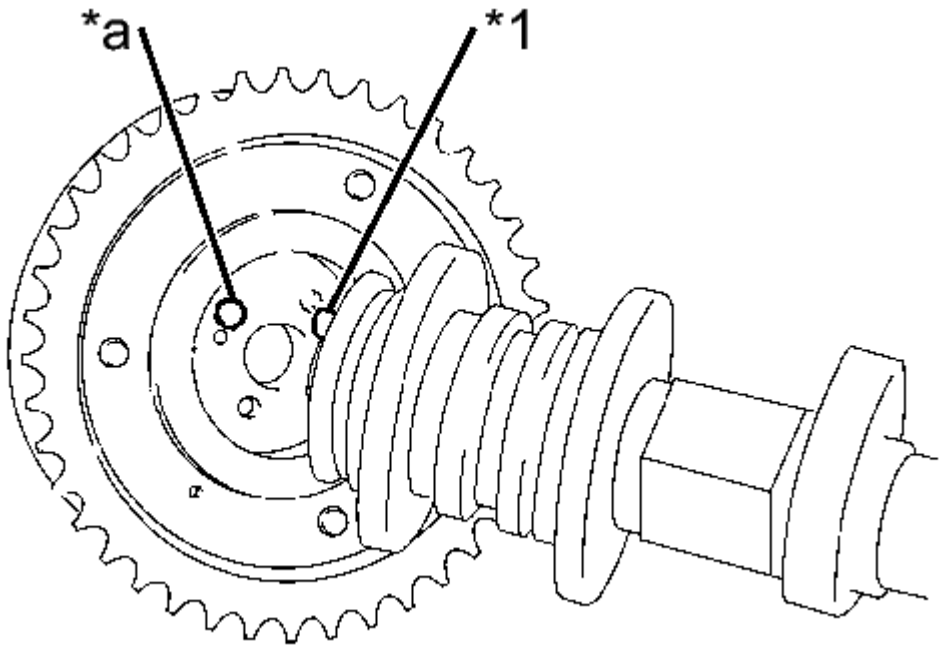


Fig. 225: Identifying Camshaft Timing Gear Key Groove & Camshaft Straight Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

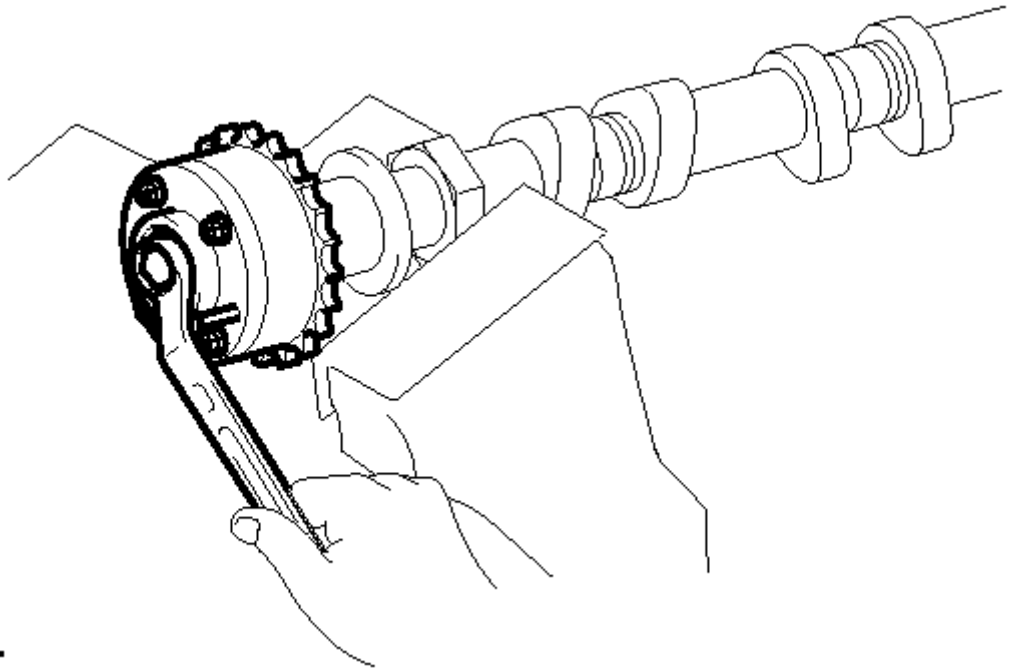
TEXT IN ILLUSTRATION

*1	Straight Pin
*a	Key Groove

c. Lightly press and turn the camshaft timing gear assembly against the camshaft, and press harder after the pin enters the groove.

NOTE: Be sure not to turn the camshaft timing exhaust gear in the retard direction.

d. Check that there is no clearance between the gear flange and the camshaft.
e. Tighten the flange bolt while holding the camshaft.



T

Fig. 226: Checking Camshaft Timing Exhaust Gear Lock
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 100 N*m (1020 kgf*cm, 74 ft.*lbf)

f. Check the camshaft timing exhaust gear lock.
    1. Make sure that the camshaft timing exhaust gear assembly locks.
g. Release the lock pin.

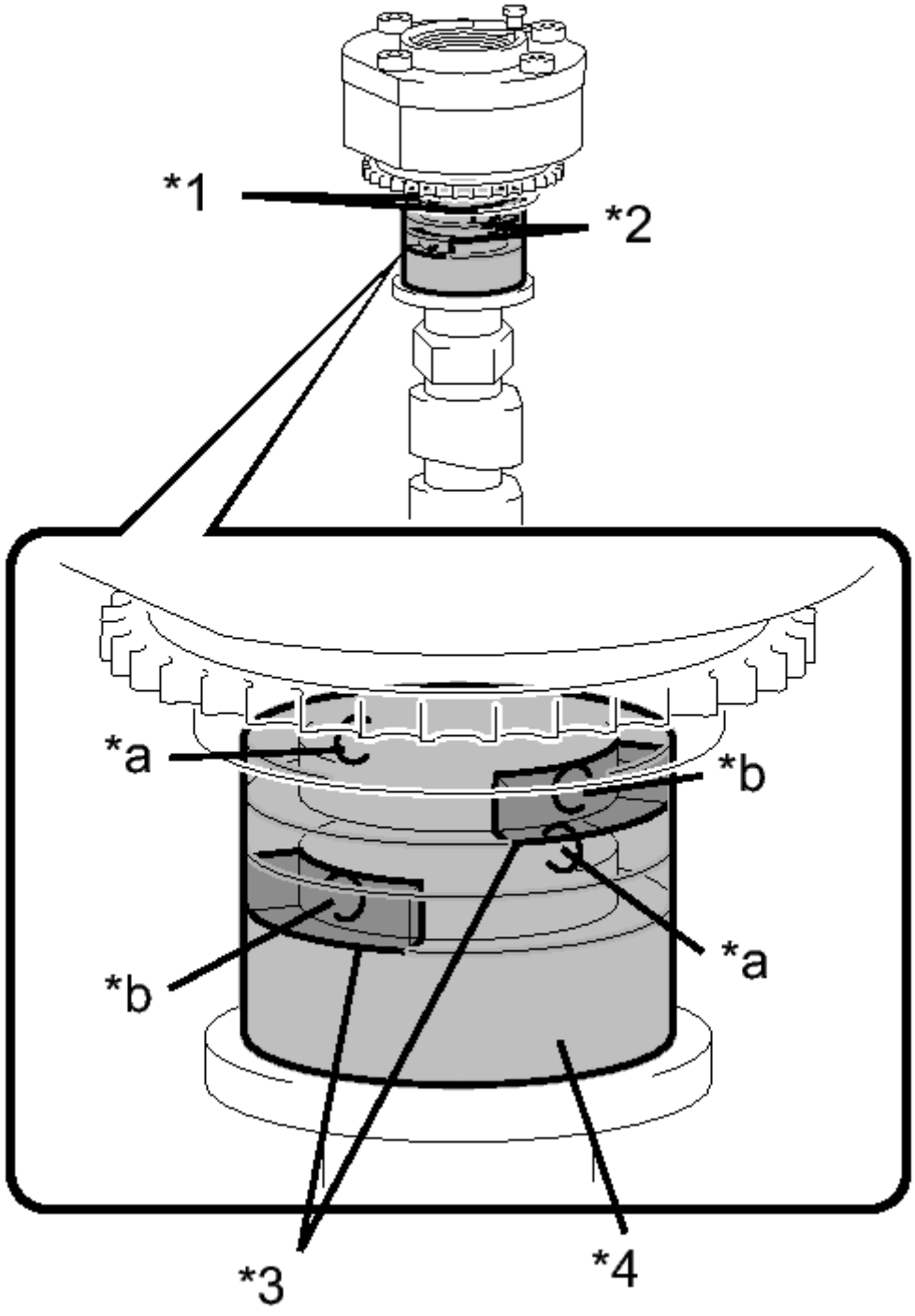


Fig. 227: Covering 4 Oil Paths Of The Cam Journal Using Vinyl Tape
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	Retard

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

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

   HINT:

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

2. Break through the tape on the advance side path and the retard side path on the opposite side of the hole of the advance side path, as shown in the illustration.
3. Apply approximately 200 kPa (2.0 kgf/cm^2 , 29 psi) of air pressure to the 2 opened paths (the advance side path and the retard side path).

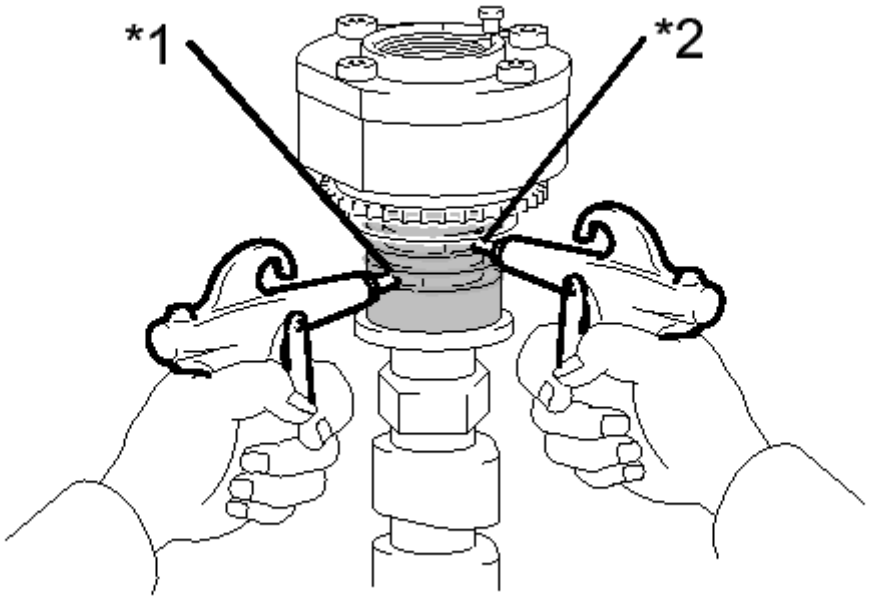


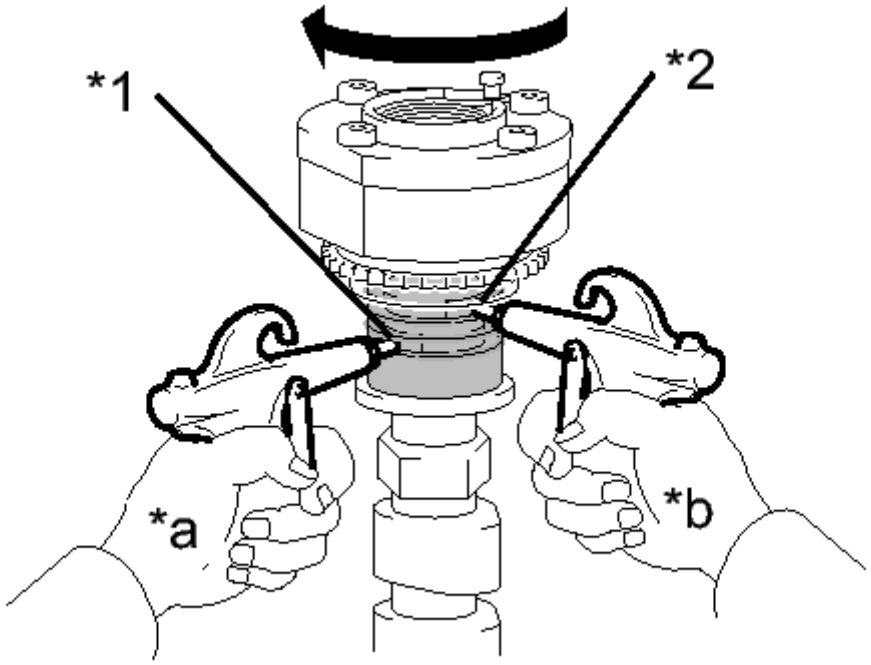
Fig. 228: Applying Air Pressure To Advanced & Retard Side Paths
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Advanced Side Path
*2	Retard Side Path

WARNING: Cover the paths with a piece of cloth when applying pressure to prevent oil from spraying.

4. Make sure that the camshaft timing exhaust gear assembly rotates in the retard direction when reducing the air pressure applied to the advance side path.



P

Fig. 229: Checking Camshaft Timing Exhaust Gear Rotation With Air Pressure Applied To Advance Side Path
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

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

HINT:

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

5. When the camshaft timing exhaust gear assembly moves to the most retarded position, release the air pressure first 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 assembly may abruptly shift in the advance direction and break the lock pin or other parts.**

h. Check for smooth rotation.
   1. Turn the camshaft timing exhaust gear assembly within its movable range (18.5°) 2 or 3 times, but do not turn it to the most advanced position. Make sure that the gear assembly turns smoothly.

NOTE: **When the air pressure is released from the advance side path and then from the retard side path, the gear assembly 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.**

i. Check the lock at the most advanced position.
   1. Make sure that the camshaft timing exhaust gear assembly locks at the most advanced position.
j. Remove the flange bolt and camshaft timing exhaust gear assembly.

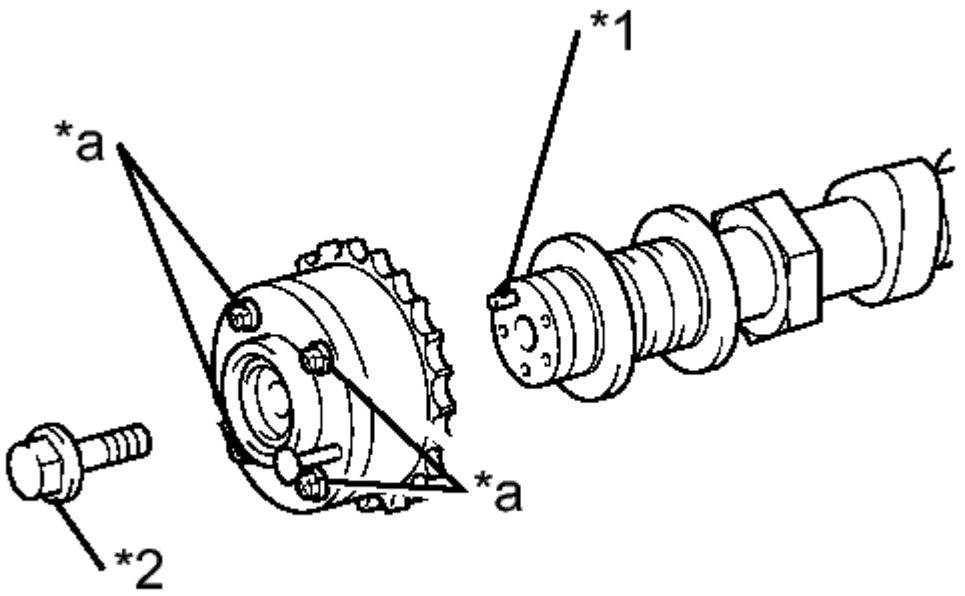


Fig. 230: Identifying 4 Bolts Not To Be Removed
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Straight Pin
*2	Flange Bolt
*a	Do Not Remove

NOTE:

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

6. **INSPECT CYLINDER HEAD SET BOLT**
   a. Using a vernier caliper, measure the diameter of the threads at the measurement point.

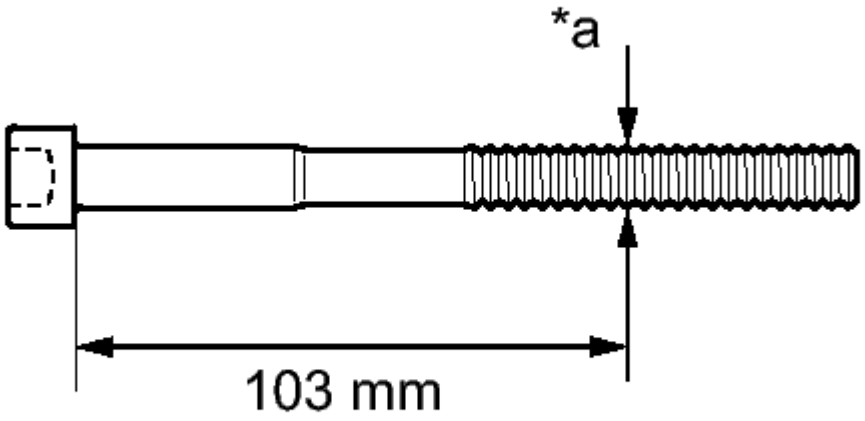


Fig. 231: Inspecting Cylinder Head Set Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Measurement Point

Standard diameter

10.85 to 11.00 mm (0.4272 to 0.4330 in.)

Minimum diameter

10.70 mm (0.4212 in.)

Measurement point (distance from the seat)

103 mm (4.06 in.)

HINT:

- If the diameter is less than the minimum, replace the cylinder head bolt. Failure to do so may lead to engine damage.
- If there is any thread deformation, replace the cylinder head bolt with a new one.

7. **INSPECT CHAIN SUB-ASSEMBLY**
   a. Pull the chain sub-assembly with a force of 147 N (15 kgf, 33 lbf) as shown in the illustration.

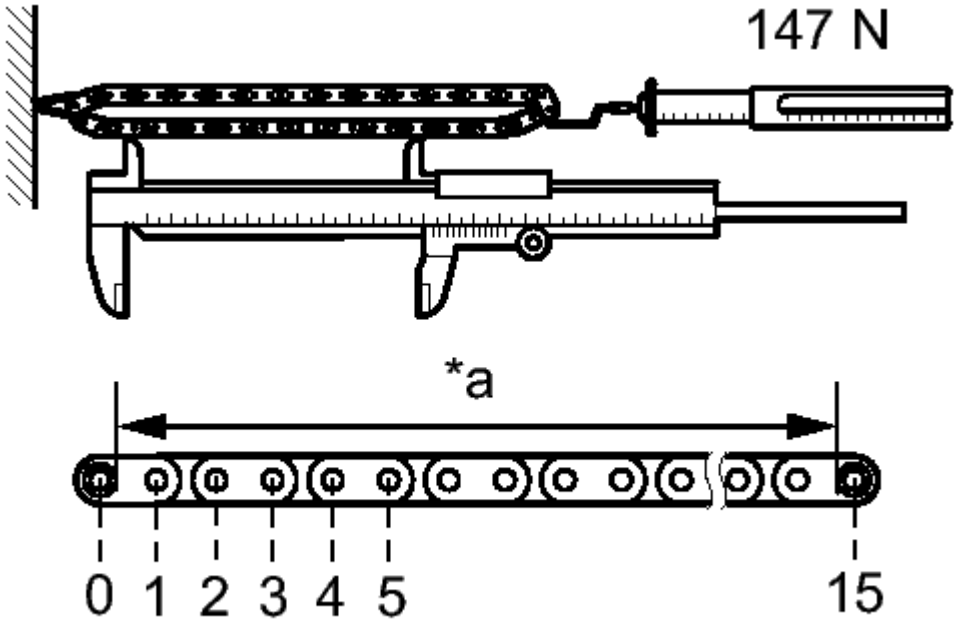


Fig. 232: Inspecting Chain Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

TEXT IN ILLUSTRATION

*a	Measuring Point

Maximum chain elongation

136.9 mm (5.389 in.)

NOTE: 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 sub-assembly.

8. **INSPECT NO. 2 CHAIN SUB-ASSEMBLY**
   a. Pull the No. 2 chain sub-assembly with a force of 147 N (15 kgf, 33 lbf) as shown in the illustration.

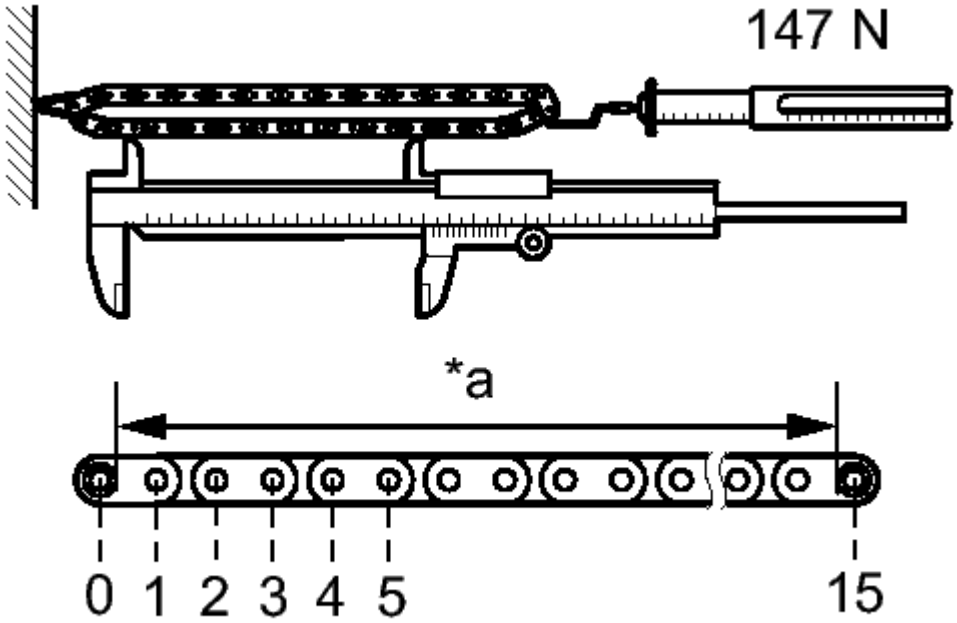


Fig. 233: Inspecting Chain Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

TEXT IN ILLUSTRATION

*a	Measuring Point

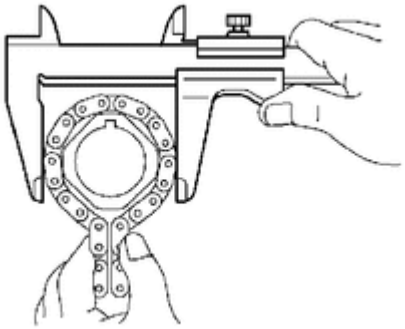
Maximum chain elongation

137.6 mm (5.417 in.)

NOTE: 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 sub-assembly.

9. **INSPECT CRANKSHAFT TIMING SPROCKET**
   a. Place the chain around the sprocket.
   b. Using a vernier caliper, measure the sprocket diameter with the chain sub-assembly.



Y

Fig. 234: Checking Crankshaft Timing Sprocket Diameter With Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Minimum sprocket diameter (with chain)

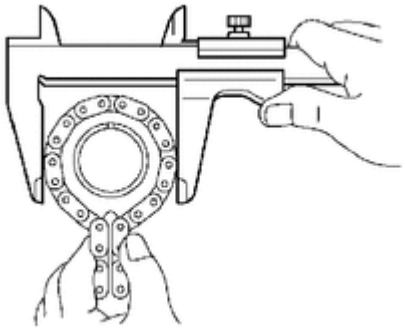
61.4 mm (2.418 in.)

HINT:

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

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

10. **INSPECT IDLE SPROCKET ASSEMBLY**
    a. Place the chain around the sprocket.
    b. Using a vernier caliper, measure the sprocket diameter with the chain.



Y

Fig. 235: Checking Idle Sprocket Diameter With Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Minimum sprocket diameter (with chain)

61.4 mm (2.418 in.)

HINT:

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

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

11. **INSPECT IDLE GEAR SHAFT OIL CLEARANCE**
    a. Using a micrometer, measure the idle gear shaft diameter.

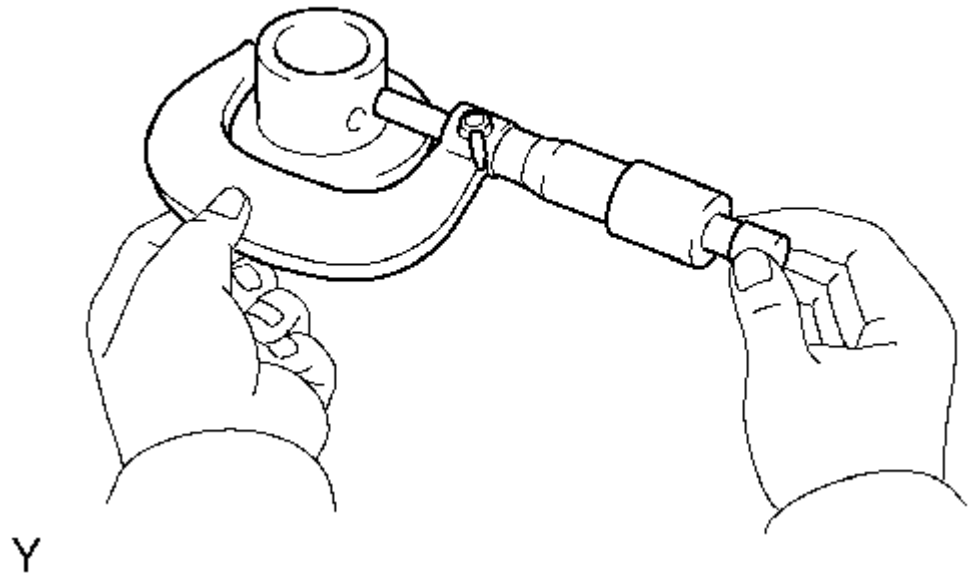


Fig. 236: Checking Idle Gear Shaft Diameter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard idle gear shaft diameter

22.987 to 23.000 mm (0.9050 to 0.9055 in.)

    b. Using a caliper gauge, measure the inside diameter of the idle sprocket assembly.



P

Fig. 237: Checking Inside Diameter Of Idle Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard idle gear inside diameter

23.020 to 23.030 mm (0.9063 to 0.9067 in.)

c. Subtract the idle gear shaft diameter measurement from the idle sprocket inside diameter measurement.

Standard oil clearance

0.020 to 0.043 mm (0.000787 to 0.00169 in.)

Maximum oil clearance

0.093 mm (0.00366 in.)

If the thrust oil clearance is greater than the maximum, replace the idle gear shaft and idle sprocket assembly.

12. **INSPECT NO. 1 CHAIN TENSIONER ASSEMBLY**
    a. Move the stopper plate upward to release the lock. Push the plunger and check that it moves smoothly.

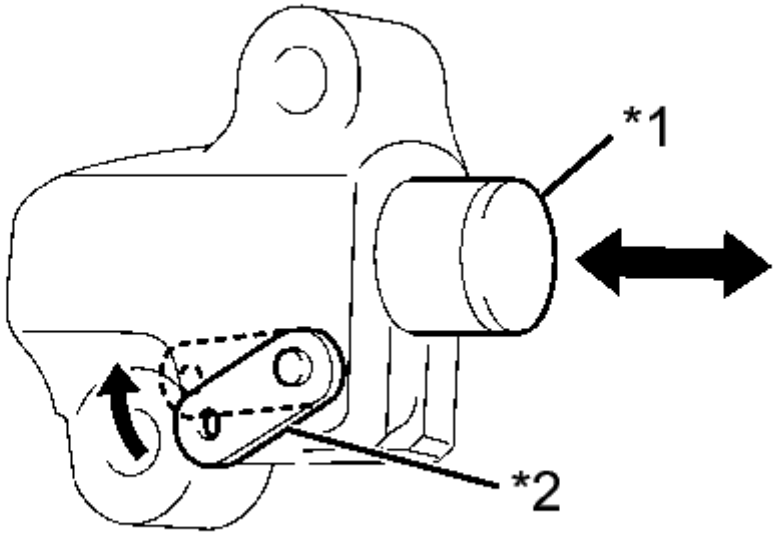


Fig. 238: Measuring Worn Depth Of No 2 Chain Tensioner Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Plunger
*2	Stopper Plate

If necessary, replace the No. 1 chain tensioner assembly.

13. **INSPECT NO. 2 CHAIN TENSIONER ASSEMBLY**
    a. Check that the plunger moves smoothly.

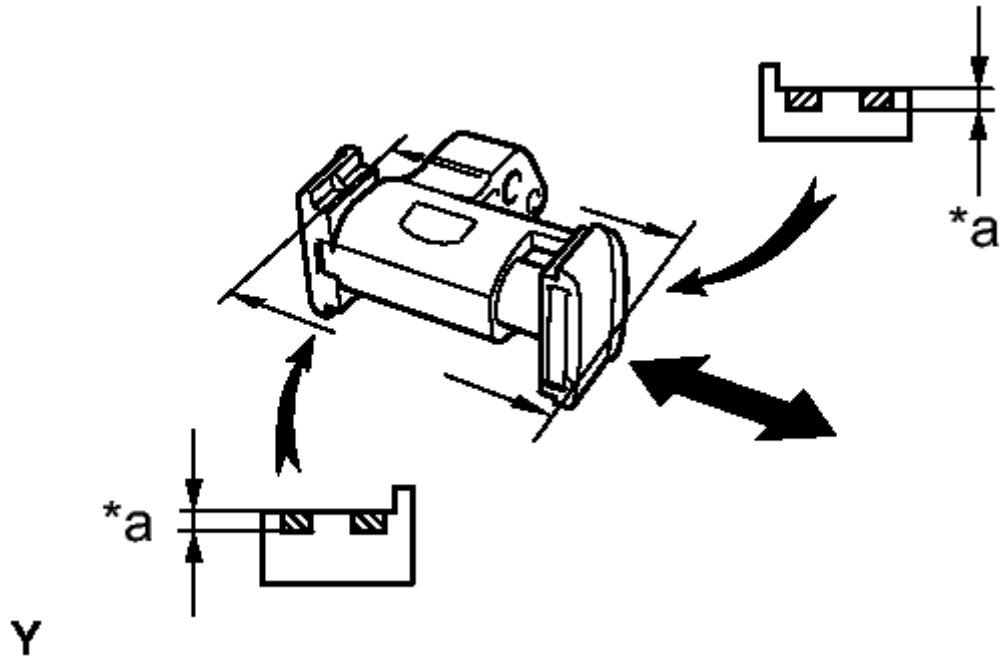


Fig. 239: Inspecting No. 2 Chain Tensioner Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Depth

b. Using a vernier caliper, measure the worn depth of the No. 2 chain tensioner assembly.

Maximum depth

0.9 mm (0.0354 in.)

If the depth is greater than the maximum, replace the No. 2 chain tensioner assembly.

14. **INSPECT NO. 3 CHAIN TENSIONER ASSEMBLY**

a. Check that the plunger moves smoothly.

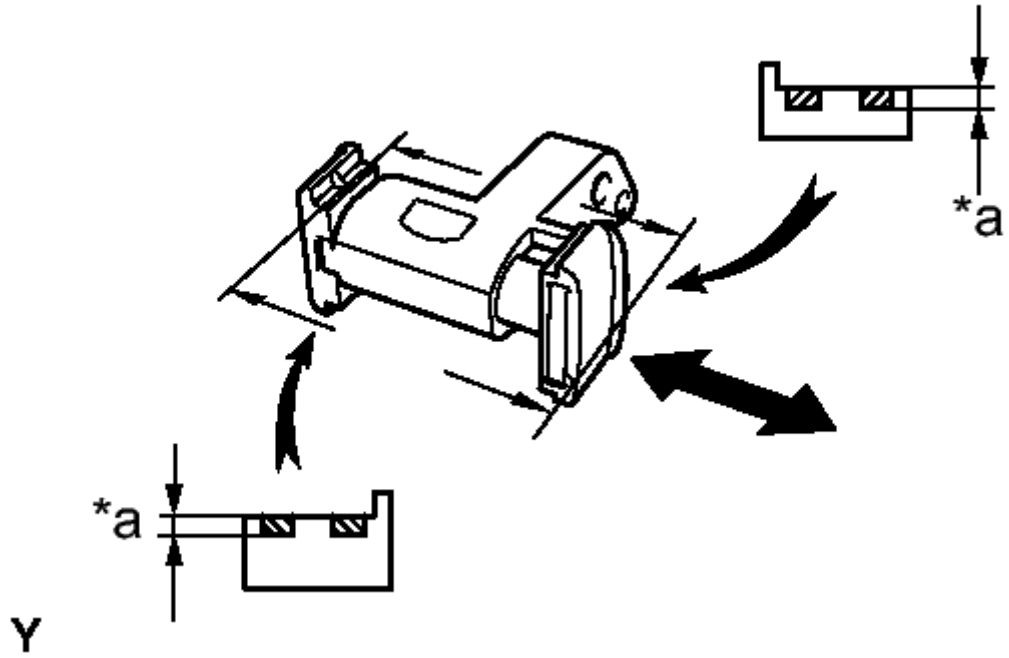


Fig. 240: Inspecting No. 3 Chain Tensioner Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Depth

b. Using a vernier caliper, measure the worn depth of the No. 3 chain tensioner assembly.

Maximum depth

0.9 mm (0.0354 in.)

If the depth is greater than the maximum, replace the No. 3 chain tensioner assembly.

15. **INSPECT CHAIN TENSIONER SLIPPER**

a. Measure the worn depth of the chain tensioner slipper.

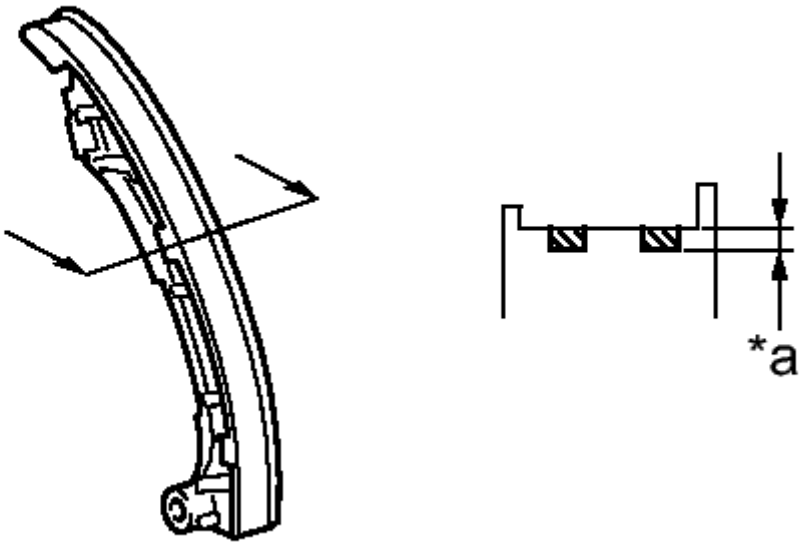


Fig. 241: Inspecting Worn Depth Of Chain Tensioner Slipper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Depth

Maximum depth

1.0 mm (0.0394 in.)

If the depth is greater than the maximum, replace the chain tensioner slipper.

16. **INSPECT NO. 1 CHAIN VIBRATION DAMPER**
    a. Using a vernier caliper, measure the worn depth of the No. 1 chain vibration damper.

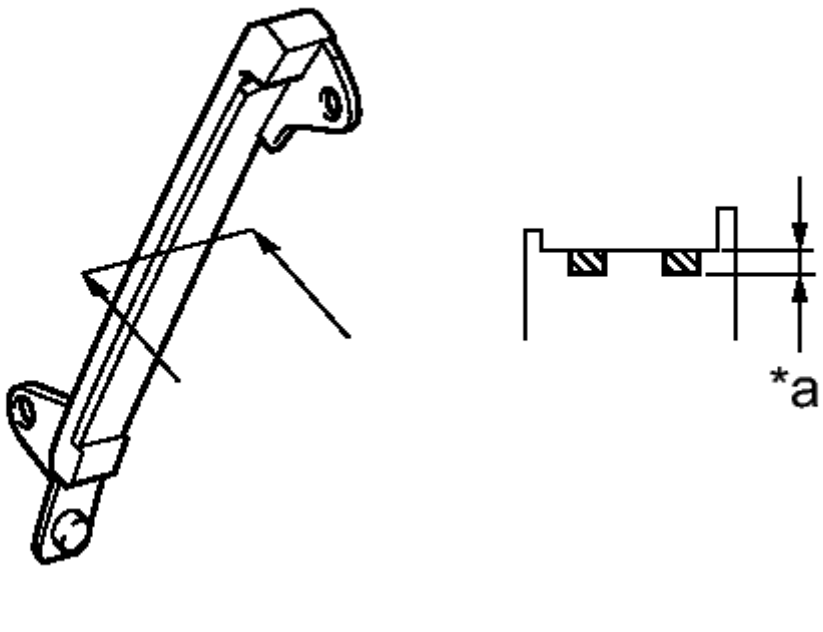


Fig. 242: Inspecting Worn Depth Of No. 1 Chain Vibration Damper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Depth

Maximum depth

1.0 mm (0.0394 in.)

If the depth is greater than the maximum, replace the No. 1 chain vibration damper.

17. **INSPECT NO. 2 CHAIN VIBRATION DAMPER**
    a. Using a vernier caliper, measure the worn depth of the No. 2 chain vibration damper.

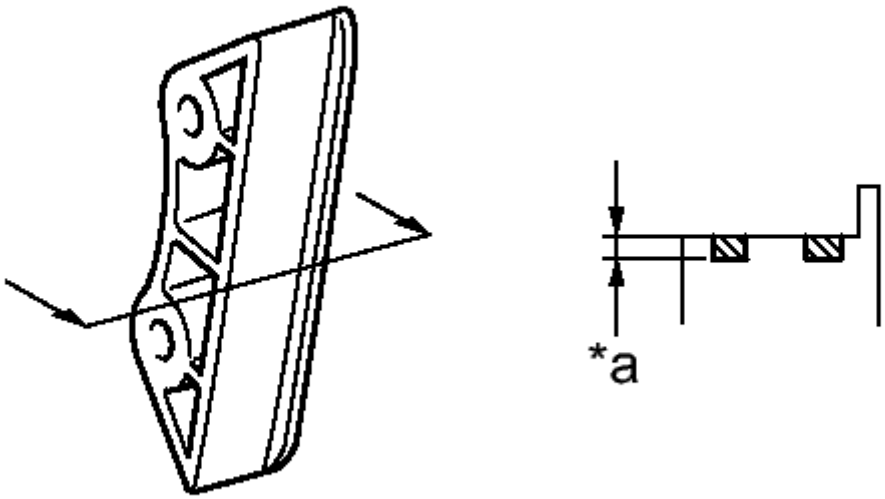


Fig. 243: Inspecting Worn Depth Of No. 2 Chain Vibration Damper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

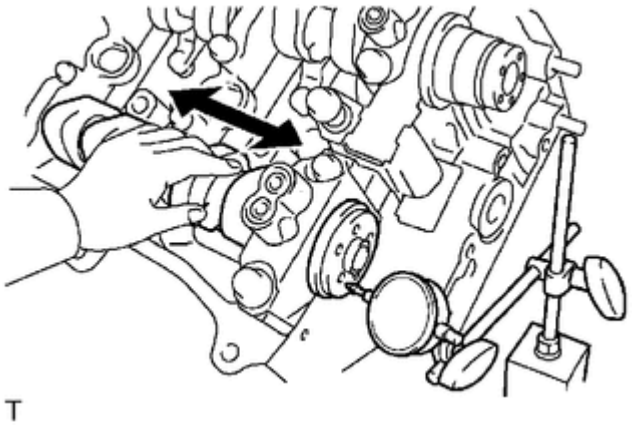
*a	Depth

Maximum depth

1.0 mm (0.0394 in.)

If the depth is greater than the maximum, replace the No. 2 chain vibration damper.

18. **INSPECT CAMSHAFT THRUST CLEARANCE**
    a. Inspect the bank 1 camshaft thrust clearance.
        1. Install the bank 1 camshaft. Refer to **INSTALLATION**.
        2. Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.



T

Fig. 244: Checking Camshaft Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard thrust clearance

0.08 to 0.13 mm (0.00315 to 0.00512 in.)

Maximum thrust clearance

0.15 mm (0.00591 in.)

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

b. Inspect the bank 2 camshaft thrust clearance.
    1. Install the bank 2 camshaft. Refer to **INSTALLATION**.
    2. Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

    Standard thrust clearance

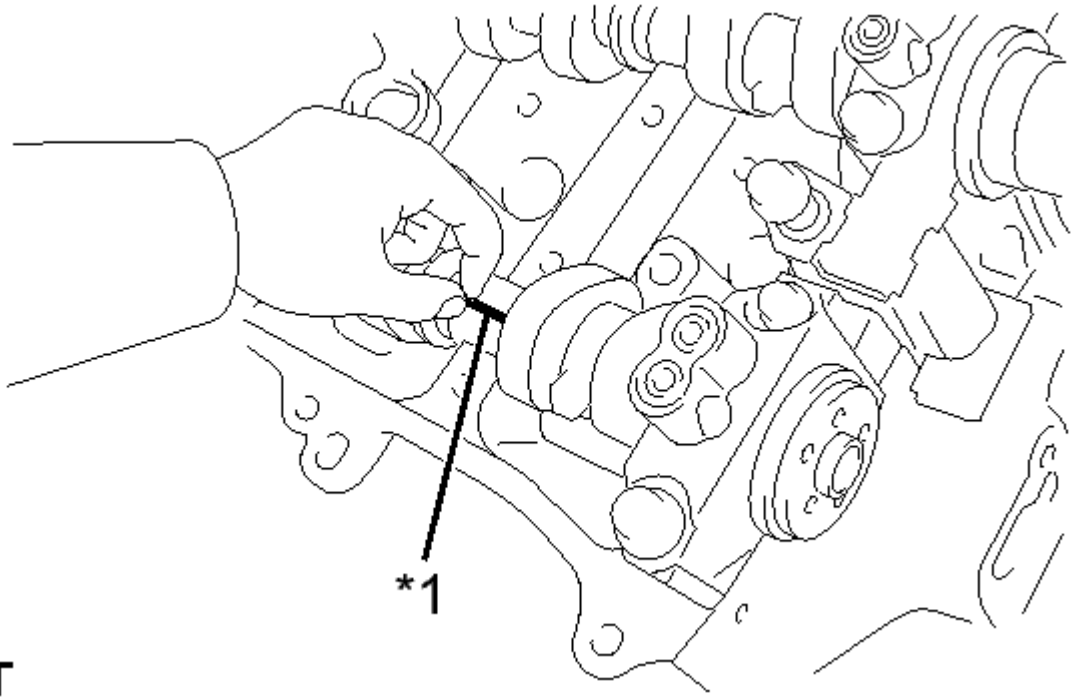
    0.08 to 0.13 mm (0.00315 to 0.00512 in.)

    Maximum thrust clearance

    0.15 mm (0.00591 in.)

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

19. **INSPECT CAMSHAFT OIL CLEARANCE (for Bank 1)**
    a. Clean the camshaft bearing caps, camshaft housing and camshaft journals.
    b. Place the camshafts on the camshaft housing.
    c. Lay a strip of Plastigage across each camshaft journal.



T

Fig. 245: Applying Plastigage Across Camshaft Journal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Plastigage

d. Install the camshaft bearing caps. Refer to **INSTALLATION**.

NOTE: Do not turn the camshaft.

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

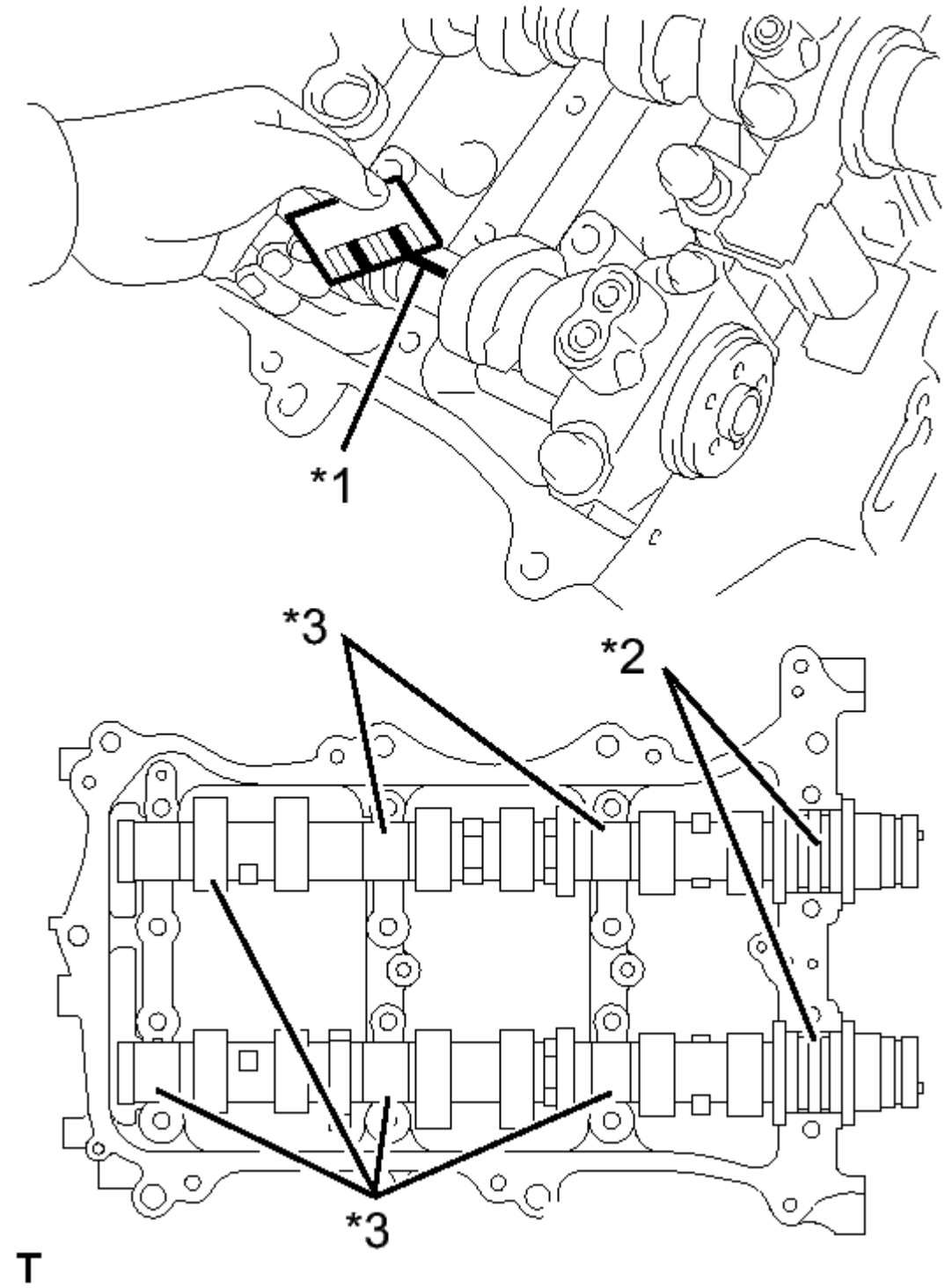


Fig. 246: Measuring Widest Point Of Plastigage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Plastigage

*2	No. 1 Journal
*3	Other Journals

Standard Oil Clearance

Item	Oil Clearance
No. 1 journal	0.032 to 0.071 mm (0.00126 to 0.00280 in.)
Other journals	0.025 to 0.062 mm (0.000984 to 0.00244 in.)

Maximum Oil Clearance

Item	Oil Clearance
No. 1 journal	0.10 mm (0.00394 in.)
Other journals	0.09 mm (0.00354 in.)

If the oil clearance is greater than the maximum, replace the camshaft. If necessary, replace the camshaft housing.

20. **INSPECT CAMSHAFT OIL CLEARANCE (for Bank 2)**
    a. Clean the camshaft bearing caps, camshaft housing and camshaft journals.
    b. Place the camshafts on the camshaft housing.
    c. Lay a strip of Plastigage across each camshaft journal.

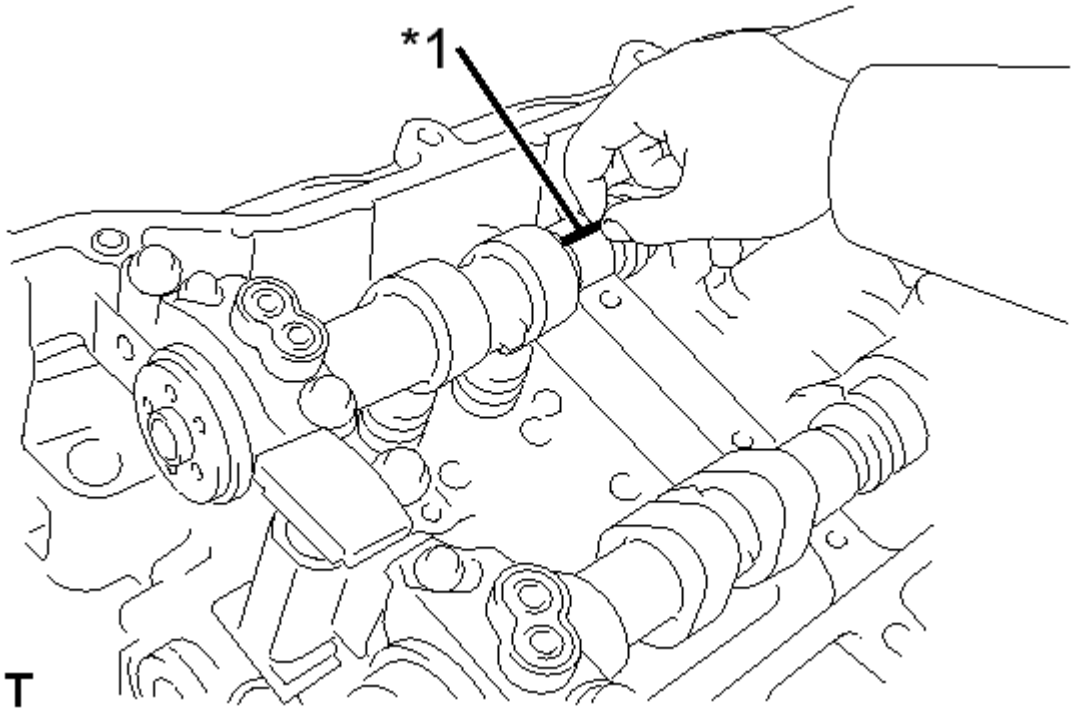


Fig. 247: Applying Plastigage Across Camshaft Journal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

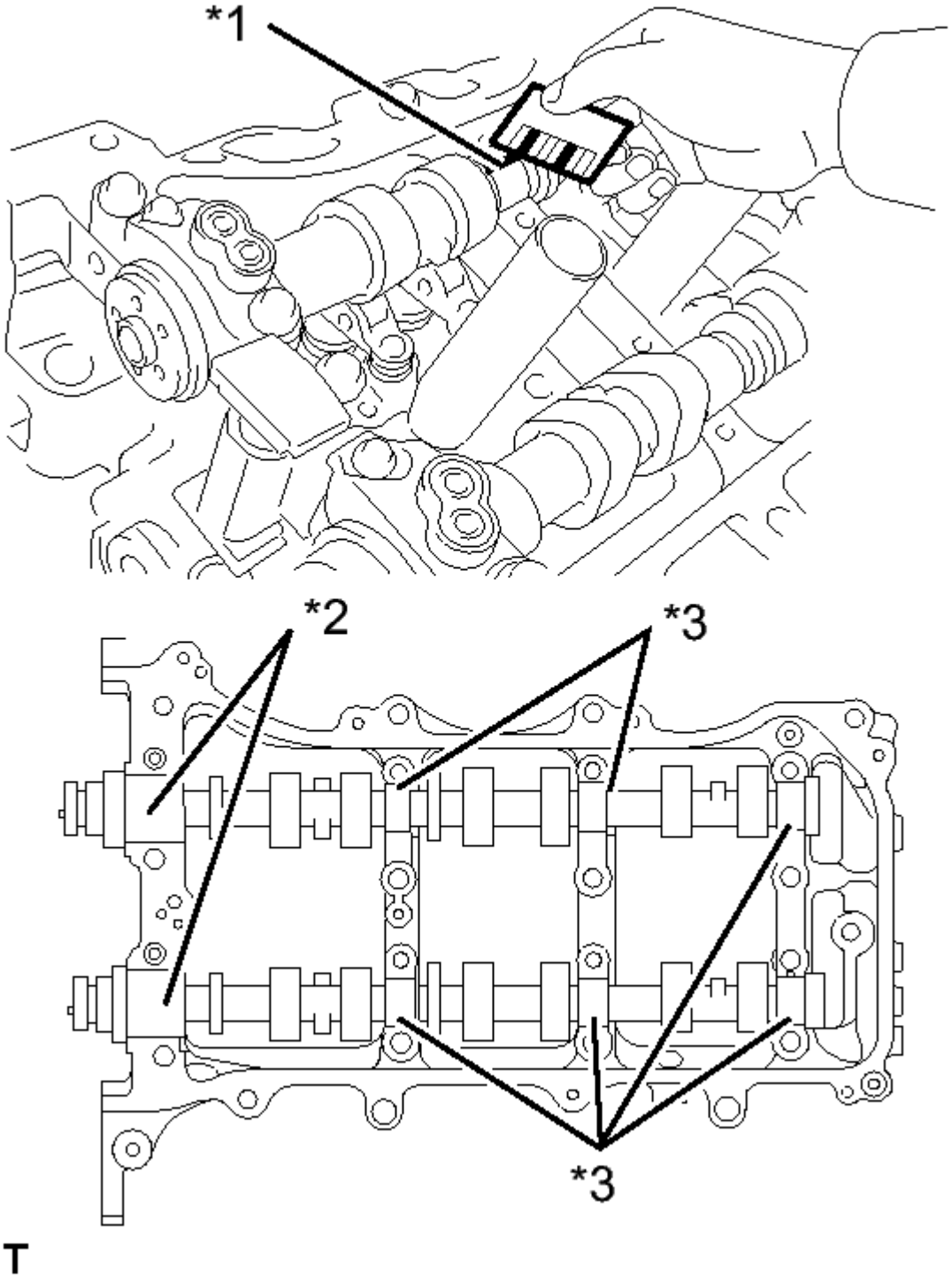
TEXT IN ILLUSTRATION

*1	Plastigage

d. Install the camshaft bearing caps. Refer to **INSTALLATION**.

NOTE: Do not turn the camshaft.

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



T

Fig. 248: Measuring Widest Point Of Plastigage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Plastigage

*2	No. 1 Journal
*3	Other Journals

Standard Oil Clearance

Item	Oil Clearance
No. 1 journal	0.032 to 0.071 mm (0.00126 to 0.00280 in.)
Other journals	0.025 to 0.062 mm (0.000984 to 0.00244 in.)

Maximum Oil Clearance

Item	Oil Clearance
No. 1 journal	0.10 mm (0.00394 in.)
Other journals	0.09 mm (0.00354 in.)

If the oil clearance is greater than the maximum, replace the camshaft. If necessary, replace the camshaft housing sub-assembly.

21. **INSPECT EXHAUST MANIFOLD SUB-ASSEMBLY LH**

    a. Using a precision straightedge and feeler gauge, measure the warpage on the contact surface of the cylinder head.

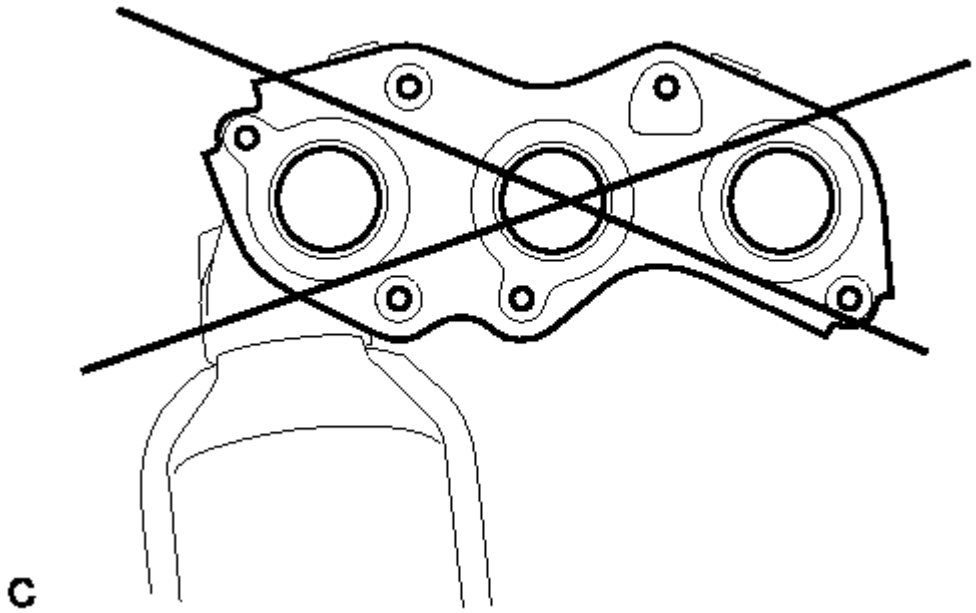


Fig. 249: Inspecting Exhaust Manifold Sub-Assembly LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum warpage

0.7 mm (0.0276 in.)

HINT:

The maximum allowable warpage of each installation surface is 0.3 mm (0.0118 in.).

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

22. **INSPECT EXHAUST MANIFOLD SUB-ASSEMBLY RH**
    a. Using a precision straightedge and feeler gauge, measure the warpage on the contact surface of the cylinder head.

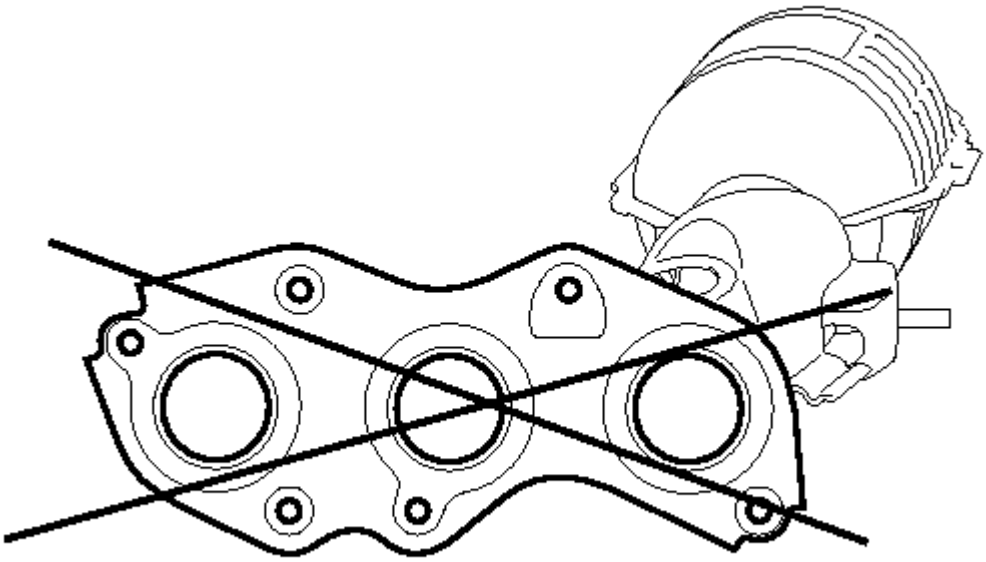


Fig. 250: Measuring Surface Contacting Surge Tank For Warpage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum warpage

0.7 mm (0.0276 in.)

HINT:

The maximum allowable warpage of each installation surface is 0.3 mm (0.0118 in.).

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

23. **INSPECT INTAKE MANIFOLD**

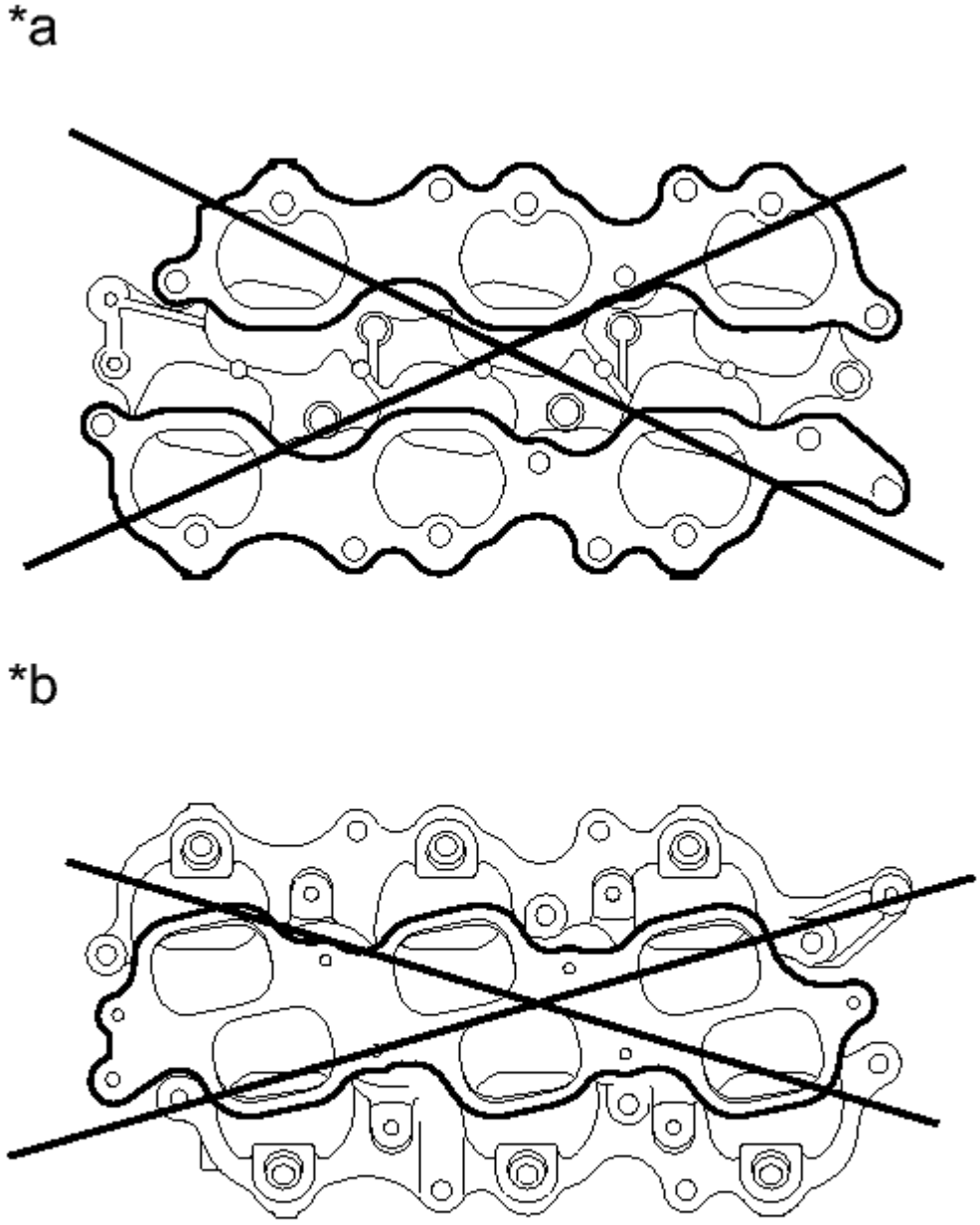


Fig. 251: Inspecting Intake Manifold
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	Cylinder

*a	Head Side
*b	Surge Tank Side

a. Cylinder head side:
    1. Using a precision straightedge and feeler gauge, measure the surface contacting the cylinder head for warpage.

       Maximum warpage

       0.1 mm (0.00394 in.)

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

b. Surge tank side:
    1. Using a precision straightedge and feeler gauge, measure the surface contacting the surge tank for warpage.

       Maximum warpage

       0.1 mm (0.00394 in.)

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

REASSEMBLY

REASSEMBLY

1. **INSTALL ENGINE REAR OIL SEAL**
    a. Place the oil seal retainer on wooden blocks.
    b. Using SST, tap in a new engine rear oil seal until its surface is flush with the engine rear oil seal retainer edge.

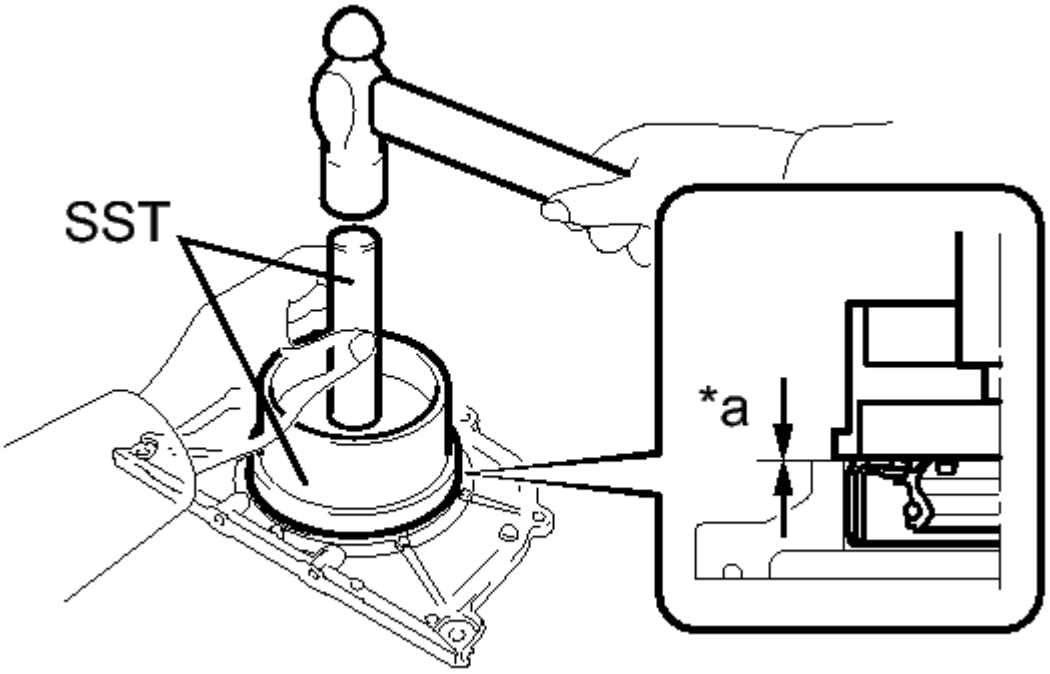


Fig. 252: Installing Engine Rear Oil Seal Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- **SST: 09223-15030**
- **SST: 09950-70010**
  09951-07100

TEXT IN ILLUSTRATION

*a	Depth

NOTE:

- **Keep the lip free of foreign matter.**
- **Do not tap on the engine rear oil seal at an angle.**

2. **INSTALL ENGINE REAR OIL SEAL RETAINER**
   a. Apply seal packing in a continuous line as shown in the illustration.

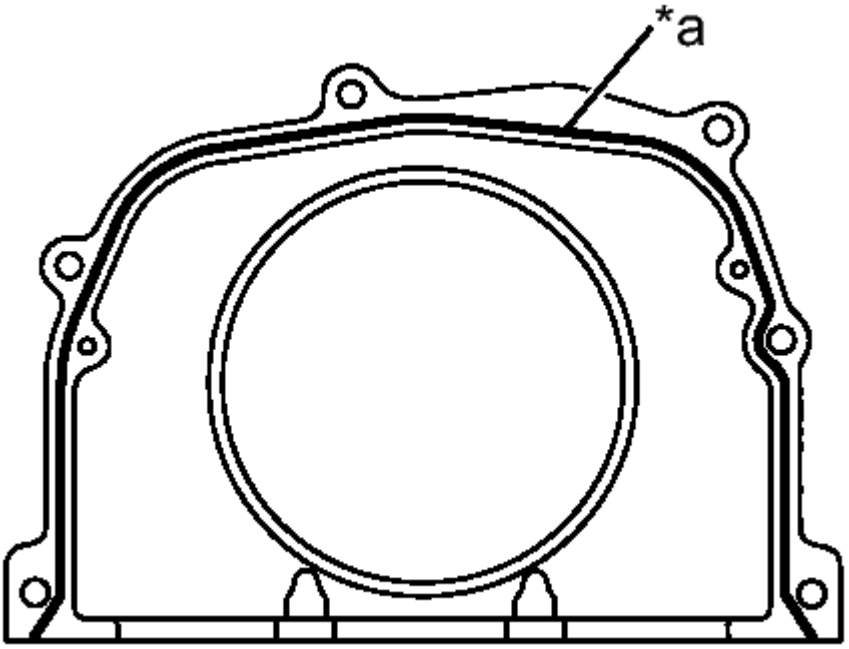


Fig. 253: Identifying Rear Oil Seal Retainer Seal Packing Applying Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Seal Packing Diameter (2.0 to 3.0 mm (0.0787 to 0.118 in.))

Seal packing

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

Seal diameter

2.0 to 3.0 mm (0.0787 to 0.118 in.)

NOTE:

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

b. Install the engine rear oil seal retainer with the 6 bolts.

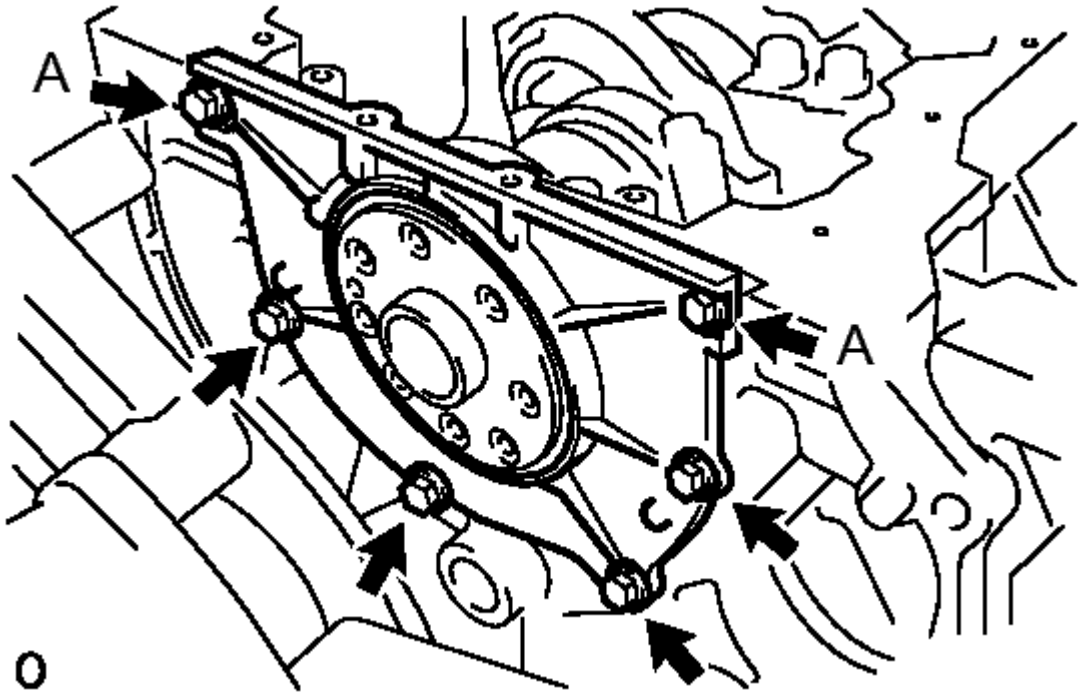


Fig. 254: Installing Oil Seal Retainer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE: Be sure to apply adhesive 1324 to the bolts in the places indicated by A before installing them.

Adhesive

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

3. **INSTALL WATER INLET PIPE**

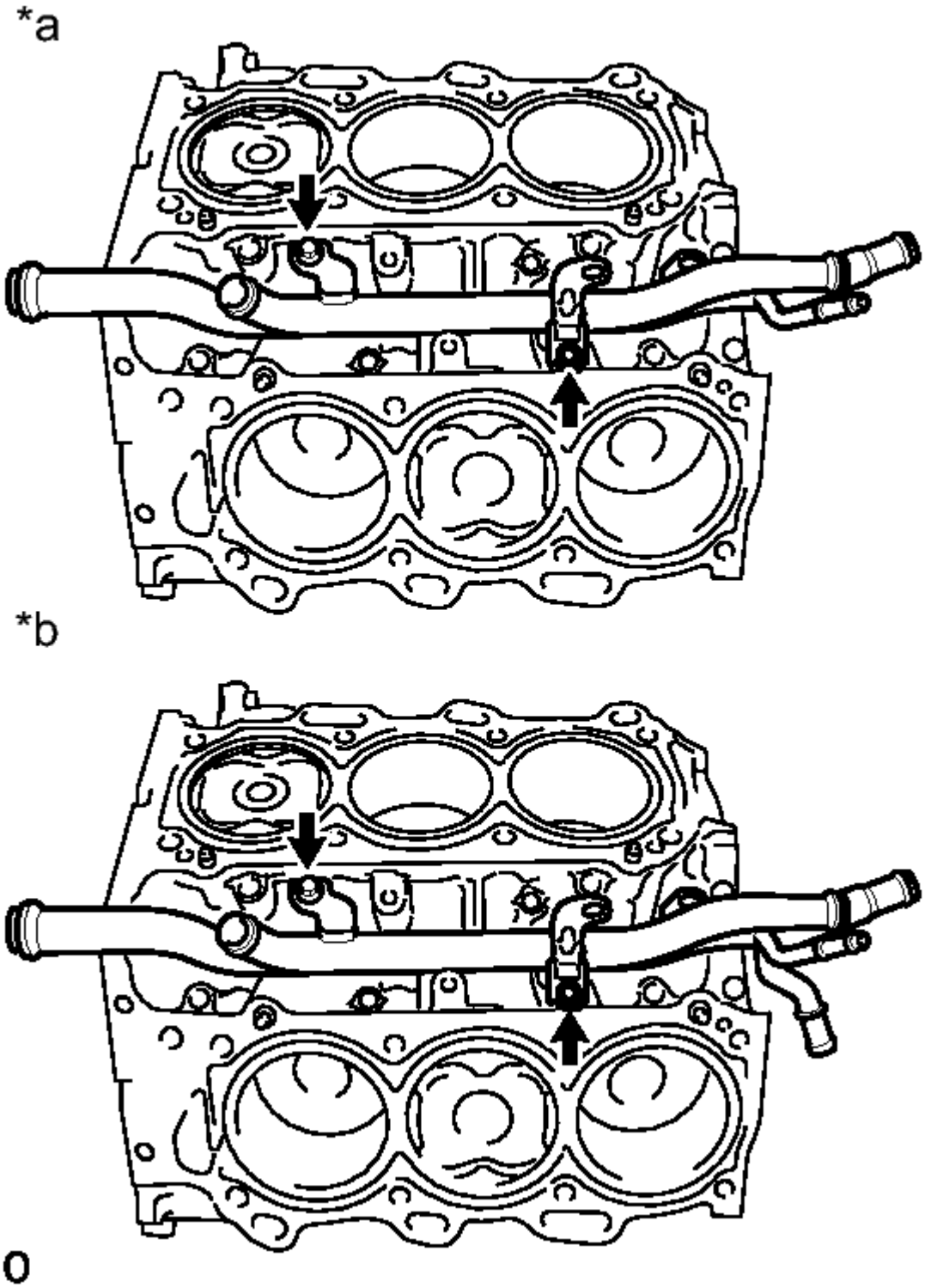


Fig. 255: Identifying Water Inlet Pipe & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	w/o

*a	Oil Cooler
*b	w/ Oil Cooler

a. Install the water inlet pipe with the 2 bolts.

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

b. Install the No. 1 water by-pass hose.

4. **INSTALL CYLINDER HEAD GASKET RH** See step 1
5. **INSTALL CYLINDER HEAD SUB-ASSEMBLY RH** See step 2
6. **INSTALL CYLINDER HEAD GASKET LH** See step 3
7. **INSTALL CYLINDER HEAD SUB-ASSEMBLY LH** See step 4
8. **INSTALL VALVE STEM CAP** See step 6
9. **INSTALL VALVE LASH ADJUSTER ASSEMBLY** See step 7
10. **INSTALL NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY** See step 8
11. **INSTALL NO. 3 CAMSHAFT** See step 1
12. **INSTALL NO. 4 CAMSHAFT** See step 2
13. **INSTALL CAMSHAFT BEARING CAP (for Bank 2)** See step 3
14. **INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY LH** See step 4
15. **INSTALL CAMSHAFT** See step 5
16. **INSTALL NO. 2 CAMSHAFT** See step 6
17. **INSTALL CAMSHAFT BEARING CAP (for Bank 1)** See step 7
18. **INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY RH** See step 8
19. **INSTALL NO. 3 CHAIN TENSIONER ASSEMBLY** See step 9
20. **INSTALL CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 2)** See step 10
21. **INSTALL NO. 2 CHAIN TENSIONER ASSEMBLY** See step 11
22. **INSTALL CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 1)** See step 12
23. **INSTALL NO. 1 CHAIN VIBRATION DAMPER**
    a. Install the No. 1 chain vibration damper with the 2 bolts.

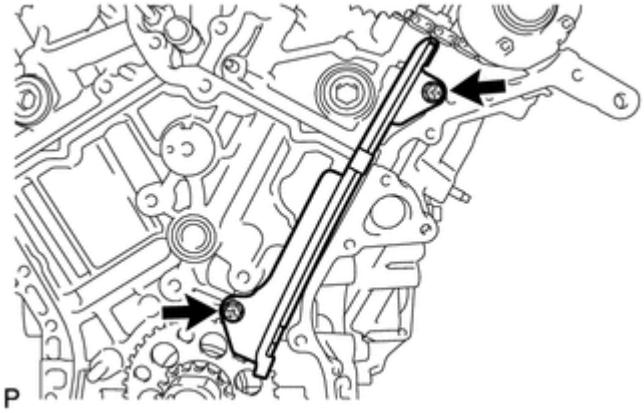


Fig. 256: Identifying No. 1 Chain Vibration Damper Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 23 N*m (230 kgf*cm, 17 ft.*lbf)

24. **INSTALL NO. 2 CHAIN VIBRATION DAMPER**
    a. Install the 2 No. 2 chain vibration dampers.
25. **INSTALL CRANKSHAFT TIMING SPROCKET**
    a. Install the 2 keys and crankshaft timing sprocket as shown in the illustration.

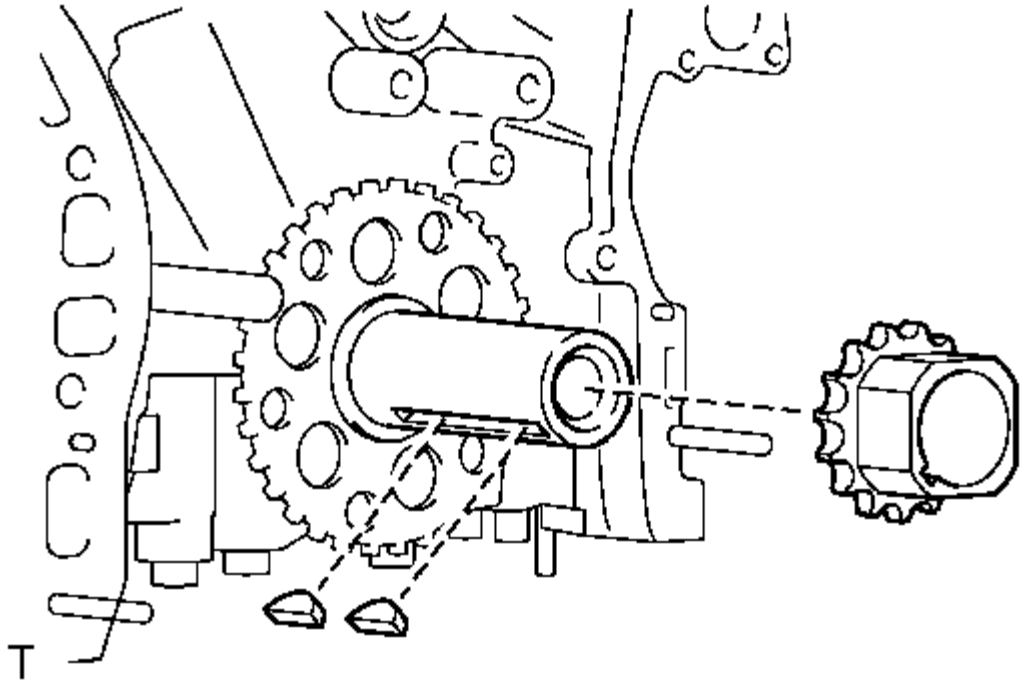


Fig. 257: Identifying Crankshaft Timing Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

26. **INSTALL IDLE SPROCKET ASSEMBLY**
    a. Apply a light coat of engine oil to the rotating surface of the No. 1 idle gear shaft.

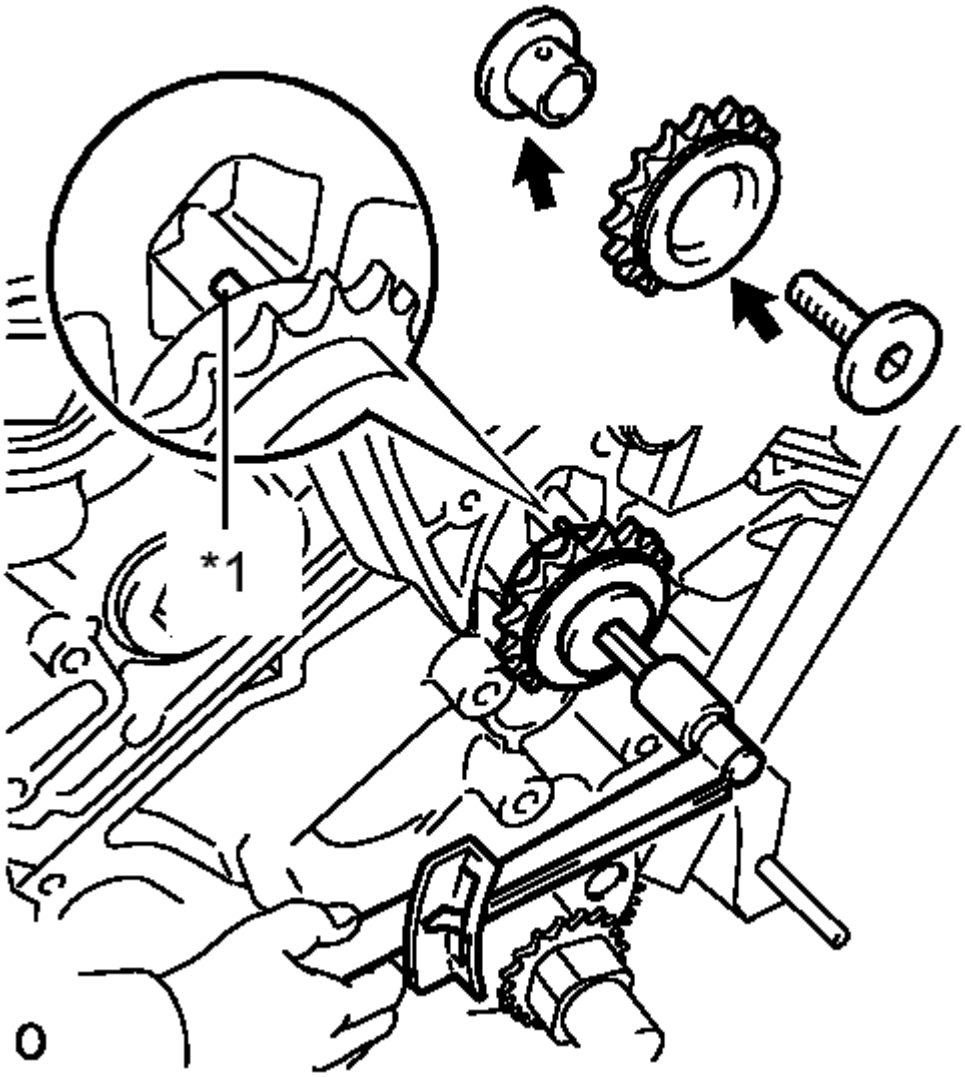


Fig. 258: Installing Idle Sprocket Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Knock Pin

b. Temporarily install the No. 1 idle gear shaft and idle sprocket with the No. 2 idle gear shaft while aligning the knock pin of the No. 1 idle gear shaft with the knock pin groove of the cylinder block.

NOTE: Be careful of the idle gear installation position.

HINT:

Check that no foreign objects are on the No. 1 and No. 2 idle gear shafts.

c. Using a 10 mm hexagon wrench, tighten the No. 2 idle gear shaft.

Torque: 60 N*m (612 kgf*cm, 44 ft.*lbf)

HINT:

After installing the idle sprocket assembly, check that the idle sprocket turns smoothly.

27. **INSTALL CHAIN SUB-ASSEMBLY**

a. Align the mark plates and timing marks as shown in the illustration and install the chain.

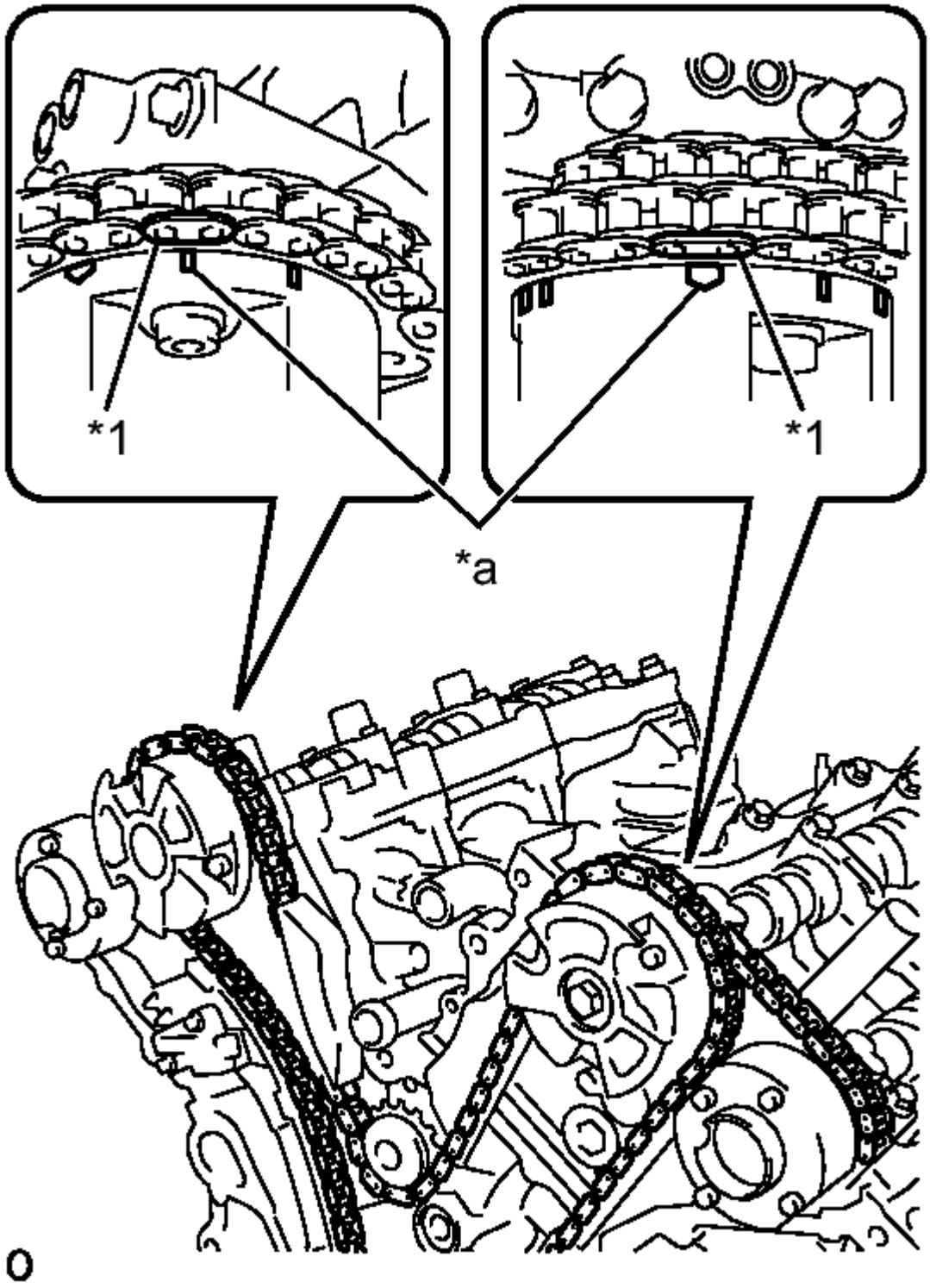


Fig. 259: Identifying Chain Mark Plates & Timing Marks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	Mark

*1	Plate
*a	Timing Mark

HINT:

The camshaft mark plates are orange.

b. Do not pass the chain over the crankshaft, just temporarily place it on the crankshaft.

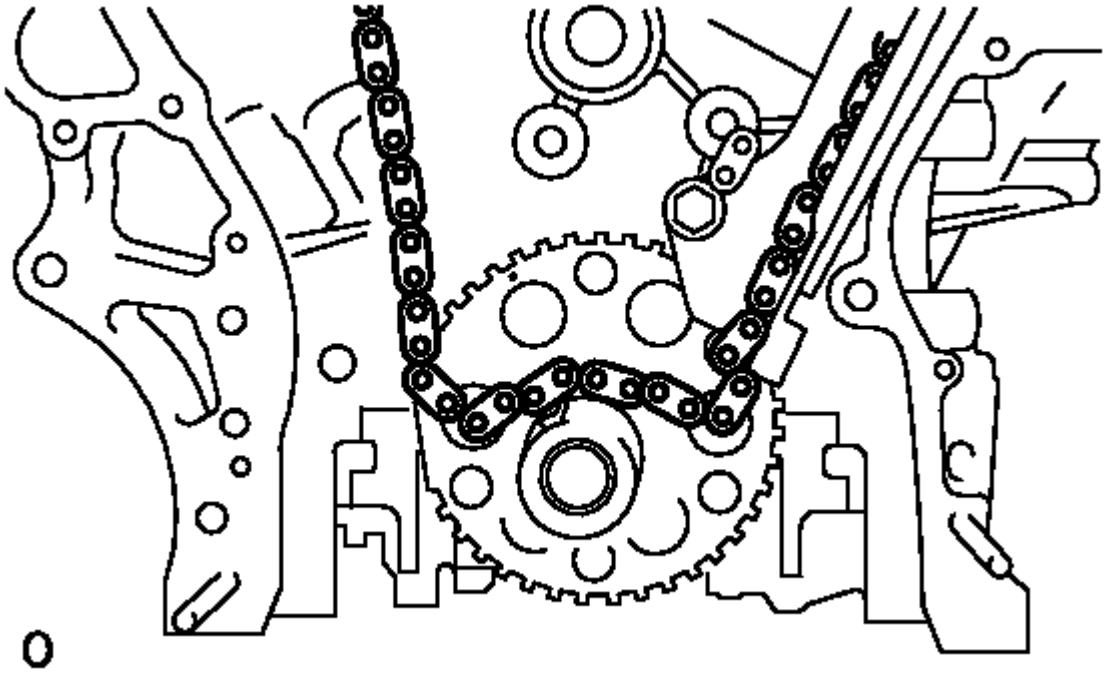


Fig. 260: Identifying Chain Set
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Turn the camshaft timing gear assembly on bank 1 counterclockwise to tighten the chain between the banks.

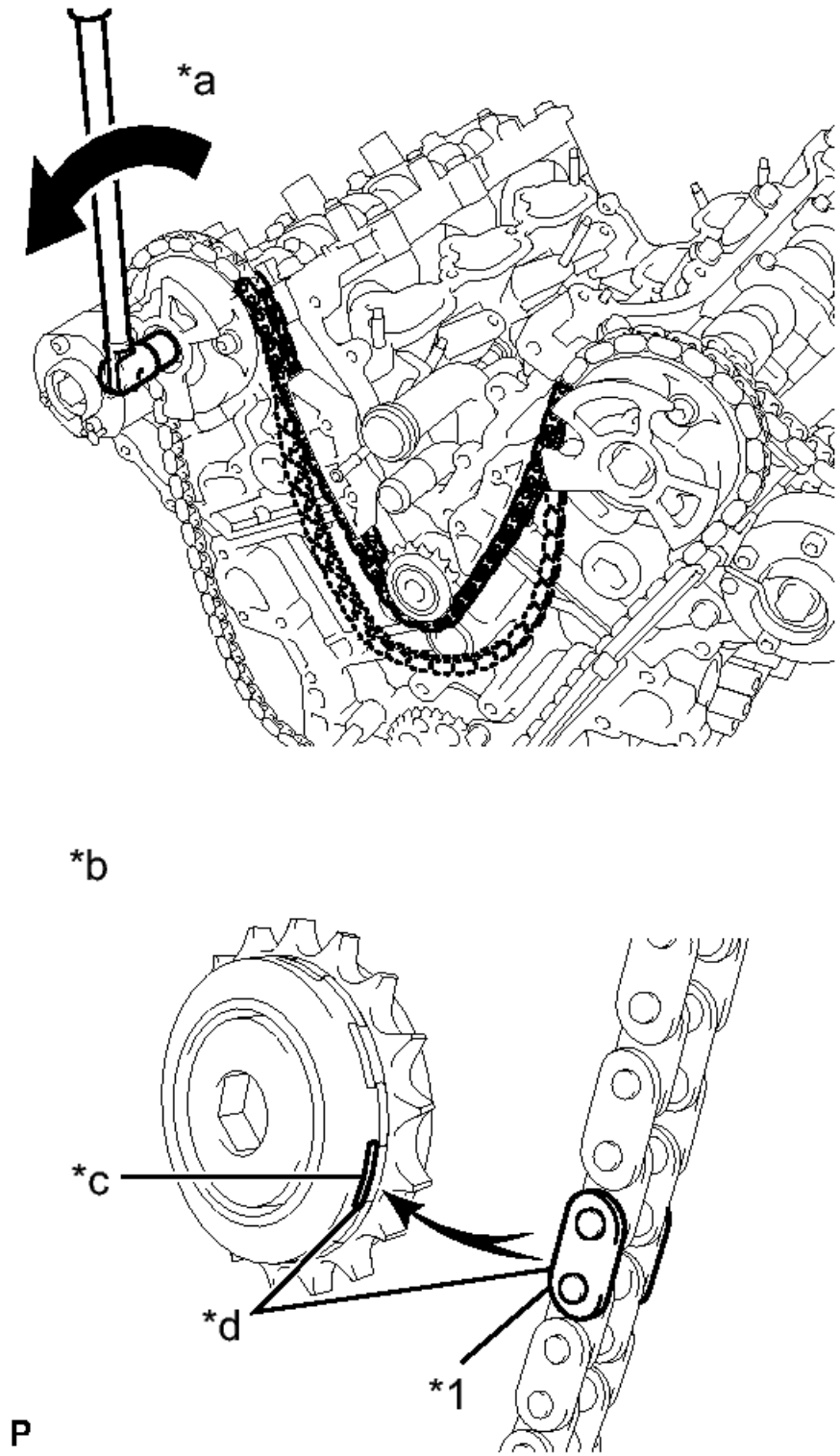


Fig. 261: Turning Bank 1 Camshaft Timing Gear Counterclockwise & Aligning Mark Plate/Timing Marks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Mark Plate
*a	Turn
*b	When the idle sprocket is reused
*c	Mark
*d	Align

NOTE: When the idle sprocket assembly is reused, align the chain plate with the mark where the plate had been in order to tighten the chain between the banks.

d. Align the mark plate and timing marks as shown in the illustration and install the chain onto the crankshaft timing sprocket.

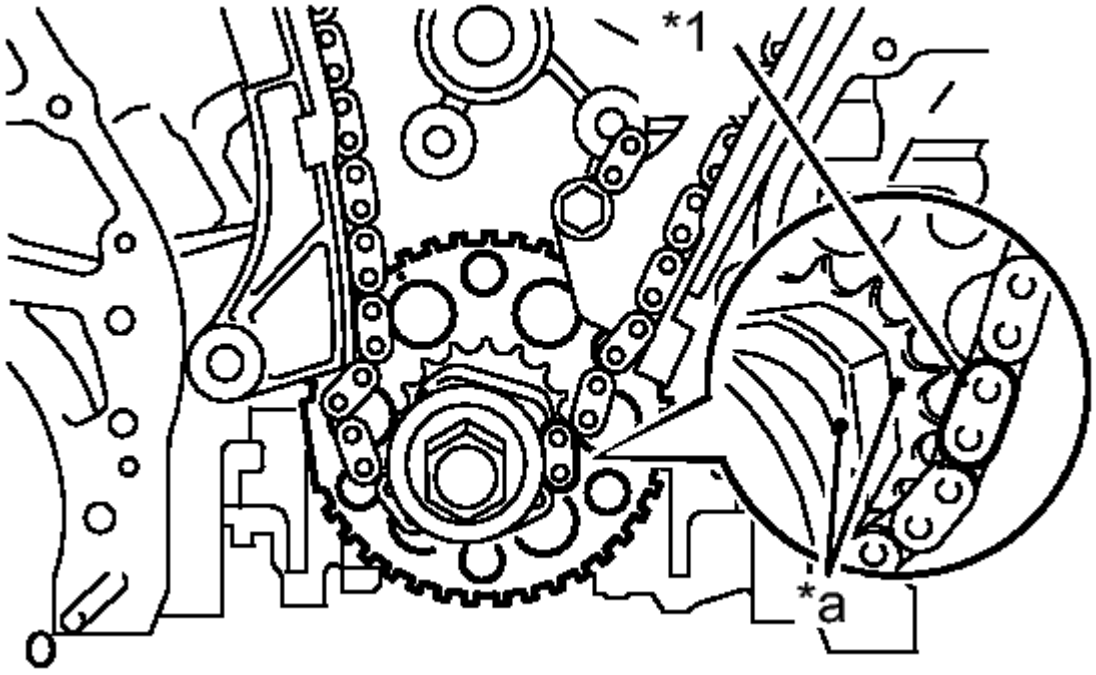


Fig. 262: Identifying Chain Mark Plate & Timing Marks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Mark Plate
*a	Timing Mark

HINT:

The crankshaft mark plate is yellow.

e. Temporarily tighten the pulley set bolt.
f. Turn the crankshaft clockwise to set it to the RH block bore center line (TDC/compression).

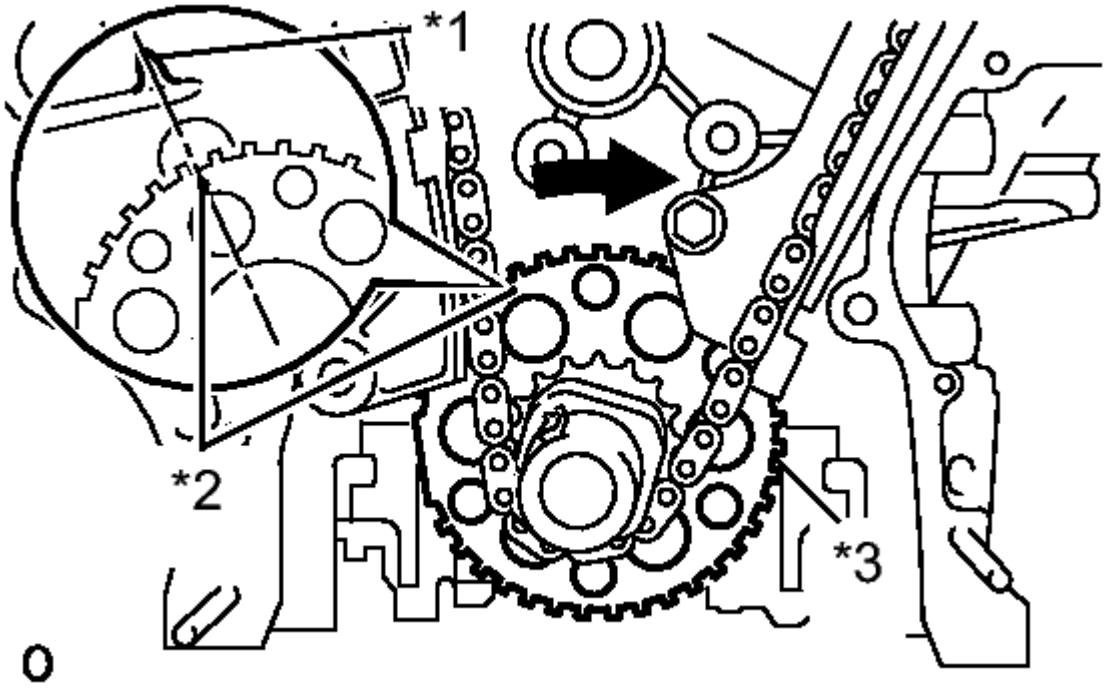


Fig. 263: Turning Crankshaft Clockwise To Set RH Block Bore Center Line (TDC/Compression)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Center Line
*2	Timing Mark
*3	Sensor Plate

28. **INSTALL CHAIN TENSIONER SLIPPER**
    a. Install the chain tensioner slipper.
29. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY**
    a. Move the stopper plate upward to release the lock, and push the plunger deep into the tensioner.

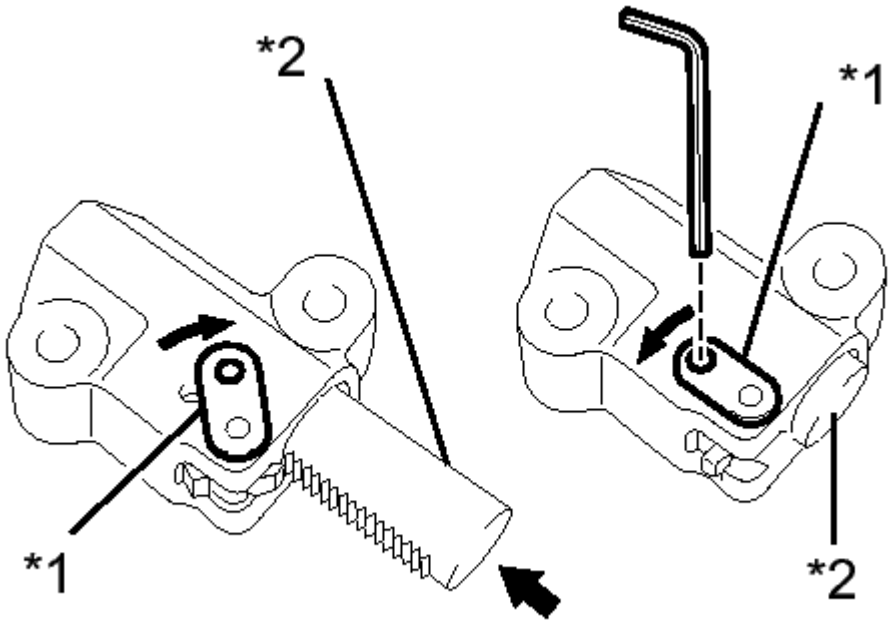


Fig. 264: Turning Stopper Plate Upward & Pushing Plunger Into Tensioner
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Stopper Plate
*2	Plunger

b. Move the stopper plate downward to set the lock, and insert a hexagon wrench into the hole of the stopper plate.
c. Install the No. 1 chain tensioner assembly with the 2 bolts.

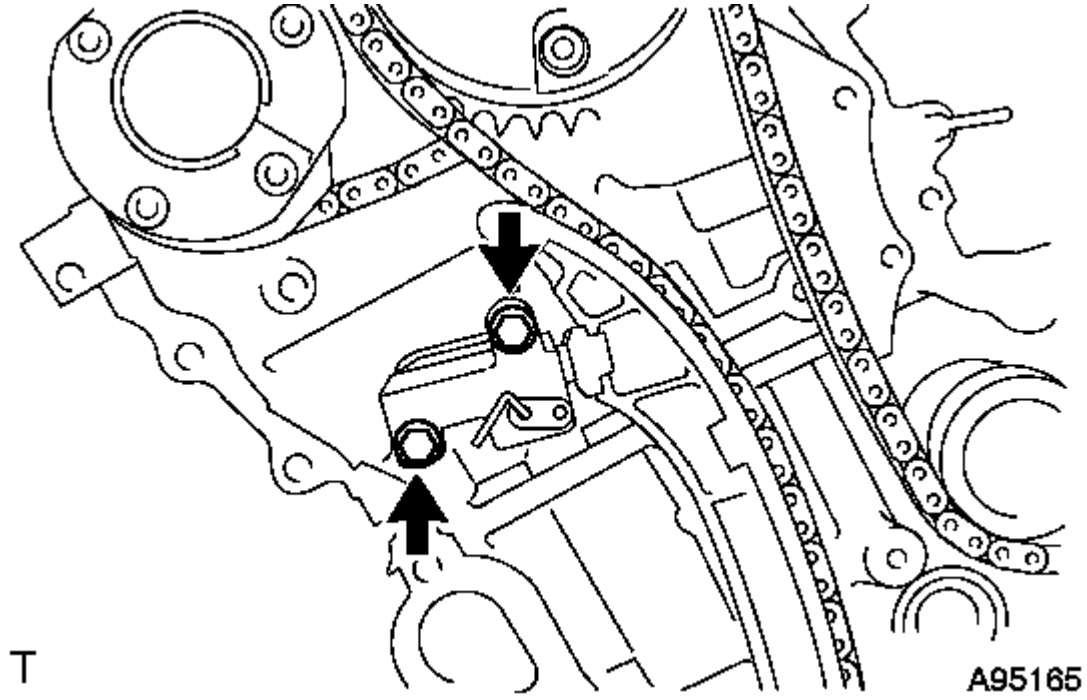


Fig. 265: Identifying Chain Tensioner With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

d. Remove the hexagon wrench from the No. 1 chain tensioner assembly.

30. **INSPECT VALVE TIMING**

a. Check the camshaft timing marks.

NOTE:

- **Check each timing mark from a viewpoint directly inline with the center of the camshaft and the timing mark on each camshaft timing gear.**
- **If the timing marks are checked from any other viewpoint, the valve timing may appear misaligned.**

b. Check that each camshaft timing mark is positioned as shown in the illustration.

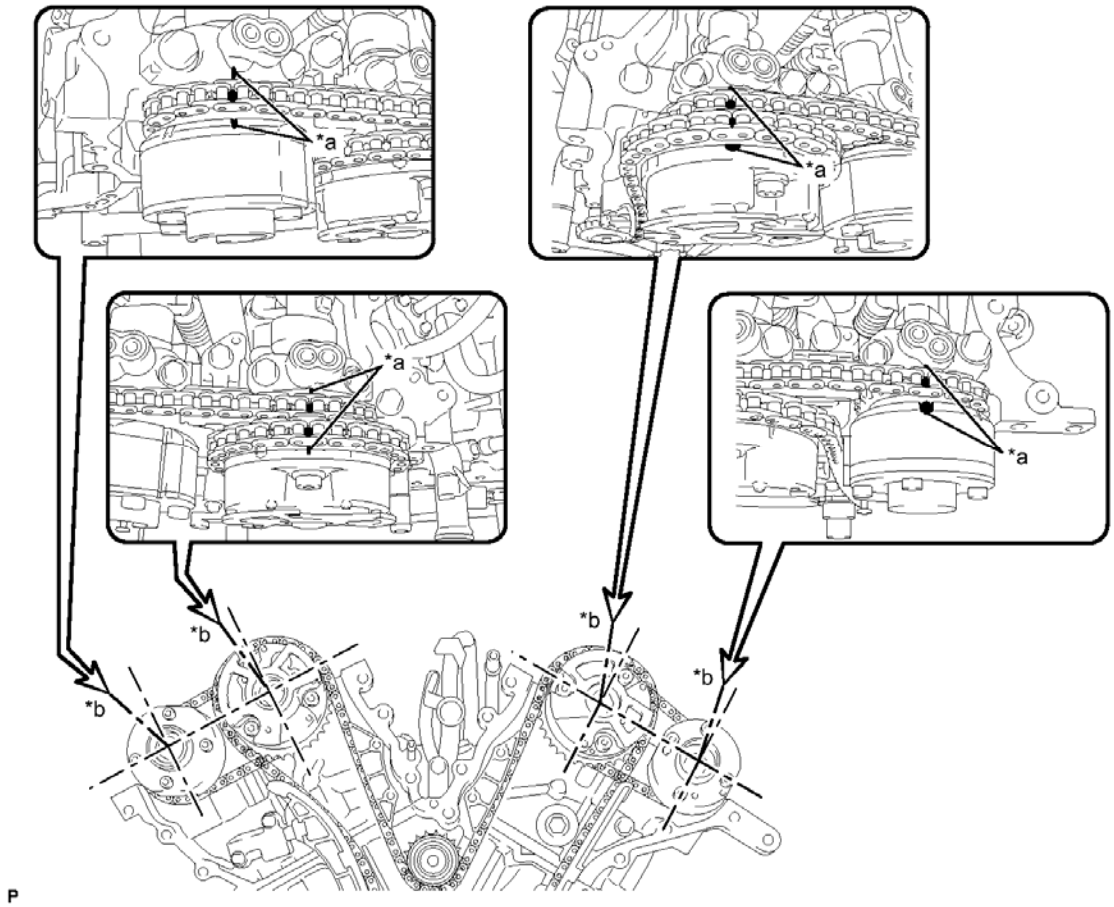


Fig. 266: Identifying Camshaft Timing Mark Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Timing Mark	*b	Viewpoint

HINT:

For the intake camshaft:

Be sure to check mark A at the point when marks B, C, and D are positioned in line. If the marks are checked from any other viewpoint, they cannot be checked correctly.

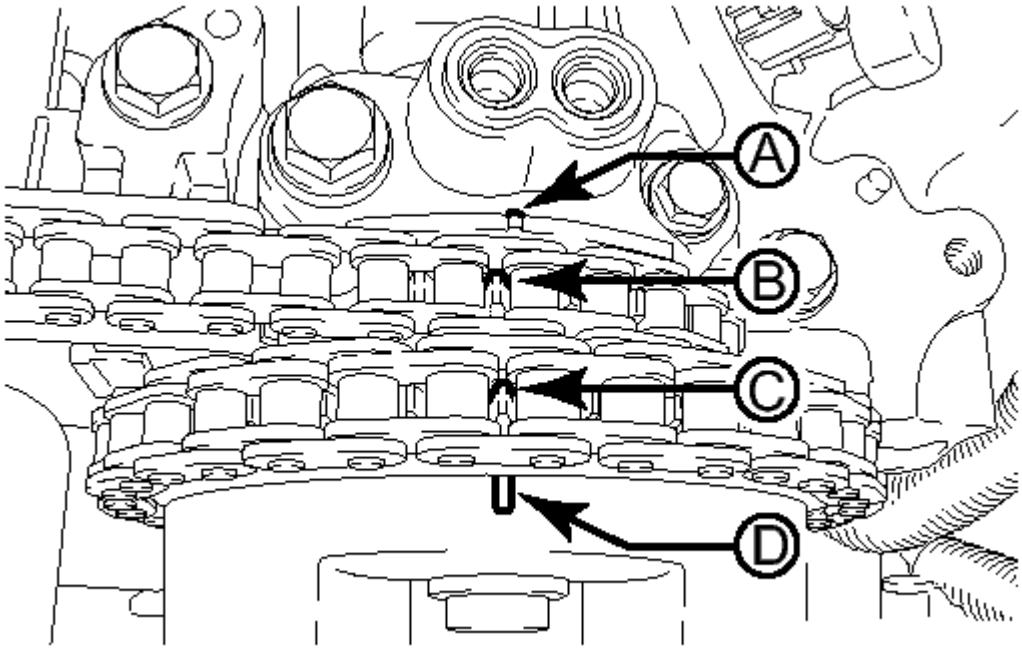


Fig. 267: Identifying Camshaft Timing Mark Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. If the valve timing is misaligned, reinstall the timing chain.
d. Remove the pulley set bolt.

31. **INSTALL TIMING CHAIN CASE OIL SEAL**
    a. Using SST, tap in a new timing chain case oil seal until its surface is flush with the timing gear case edge.

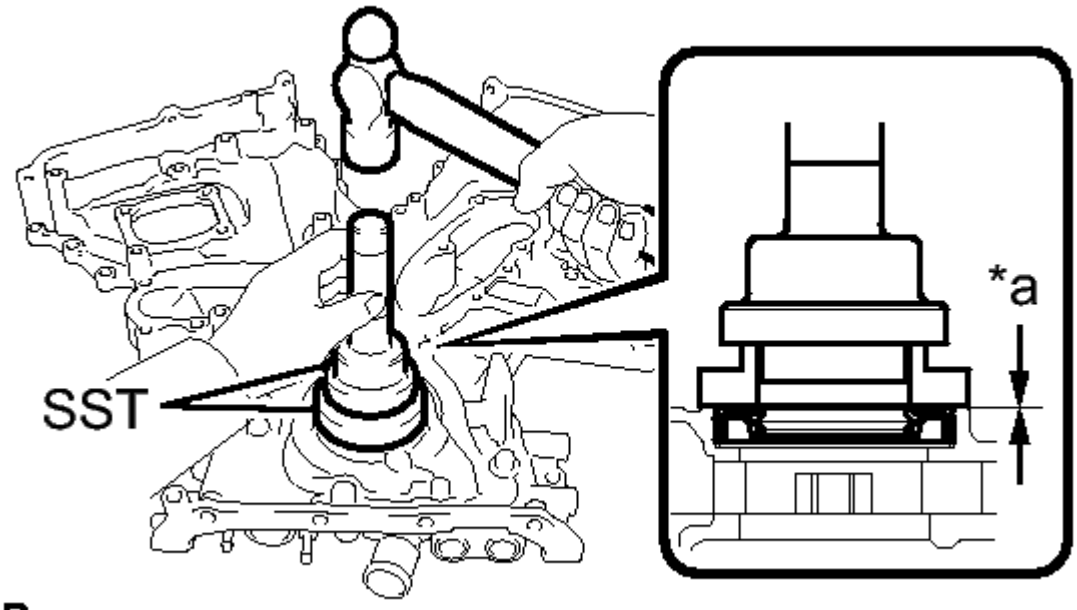


Fig. 268: Installing Timing Chain Case Oil Seal Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Depth

- **SST: 09223-22010**
- **SST: 09506-35010**

Oil seal tap in depth

0 to 1.0 mm (0 to 0.0394 in.)

NOTE:

- **Keep the lip free of foreign matter.**
- **Do not tap on the oil seal at an angle.**
- **Make sure that the oil seal edge does not stick out of the timing chain case.**

32. **INSTALL WATER PUMP ASSEMBLY**
    a. Install a new water pump gasket and the water pump assembly with the 8 bolts.

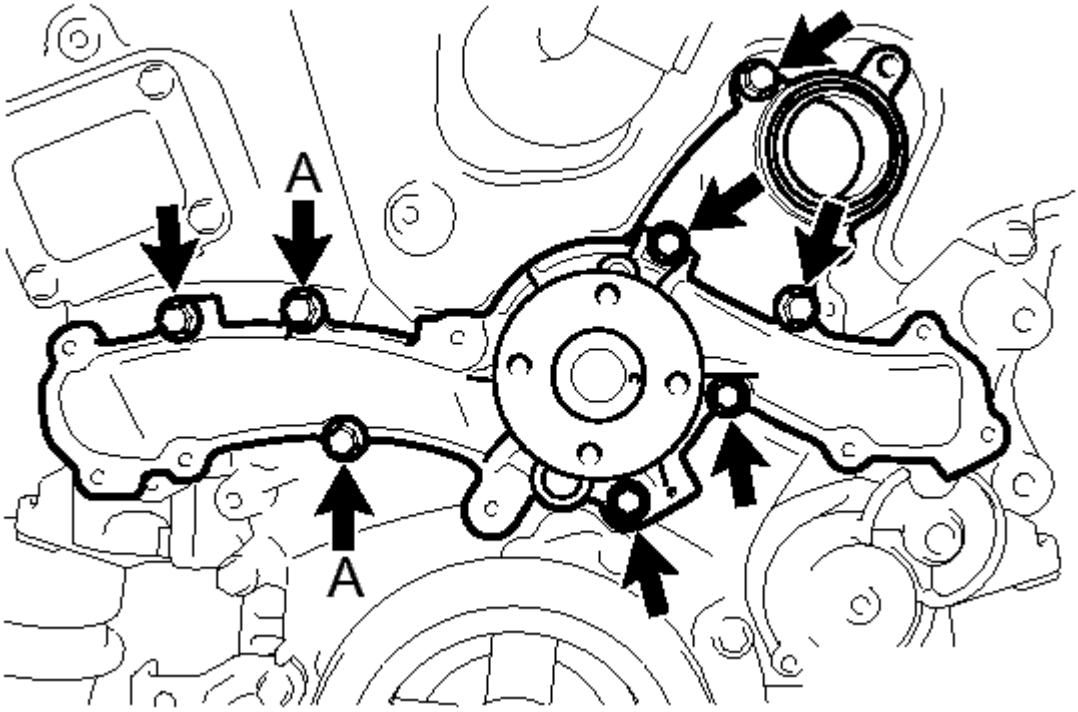
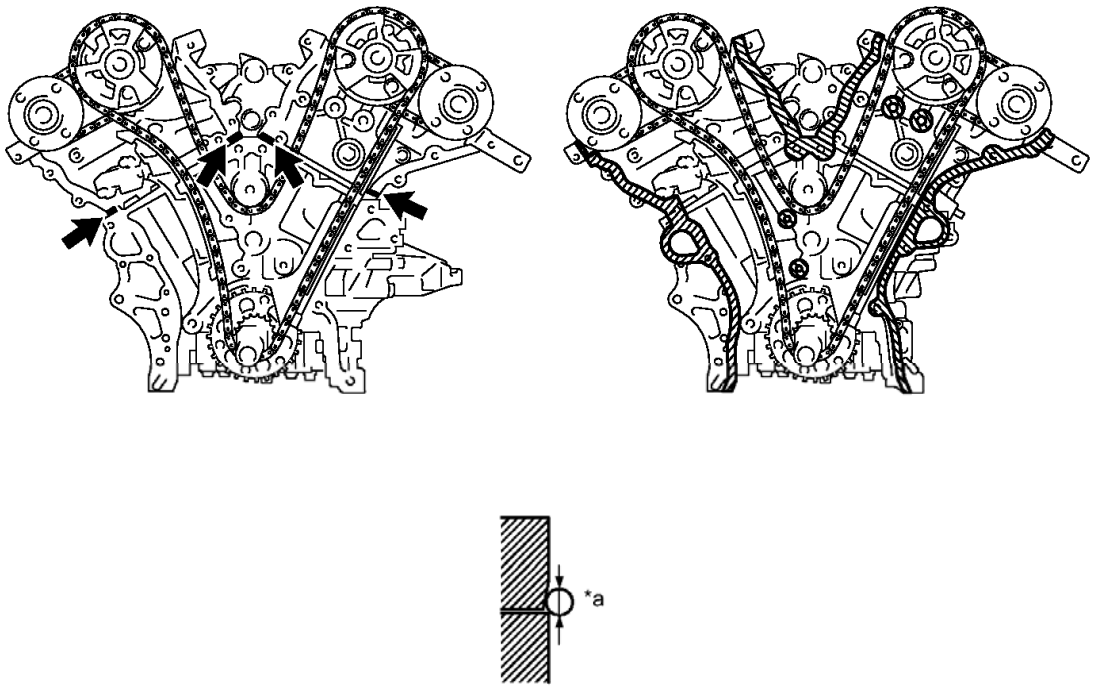


Fig. 269: Identifying Water Pump Assembly And Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE: Be sure to replace the bolts indicated by A with new ones or reuse them after applying adhesive 1344.

33. **INSTALL TIMING CHAIN COVER SUB-ASSEMBLY**
    a. Apply seal packing in a continuous line to the engine unit as shown in the following illustration.



o

Fig. 270: Identifying Timing Chain Cover Sub-Assembly Seal Applying Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Seal Diameter: 3.0 mm or more		Seal Packing
	Be sure to clean and grease the contact surface	-	-

Seal packing

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

Seal diameter

3.0 mm (0.118 in.)

NOTE:

- **Be sure to clean and degrease the contact surfaces, especially**

the surfaces indicated by C in the illustration.

- **If there is oil on the contact surfaces, wipe them with an oil-free cloth before applying seal packing.**
- **Install the chain cover within 3 minutes.**
- **Do not start the engine for at least 2 hours after installing.**

b. Apply seal packing in a continuous line to the timing chain cover as shown in the following illustration.

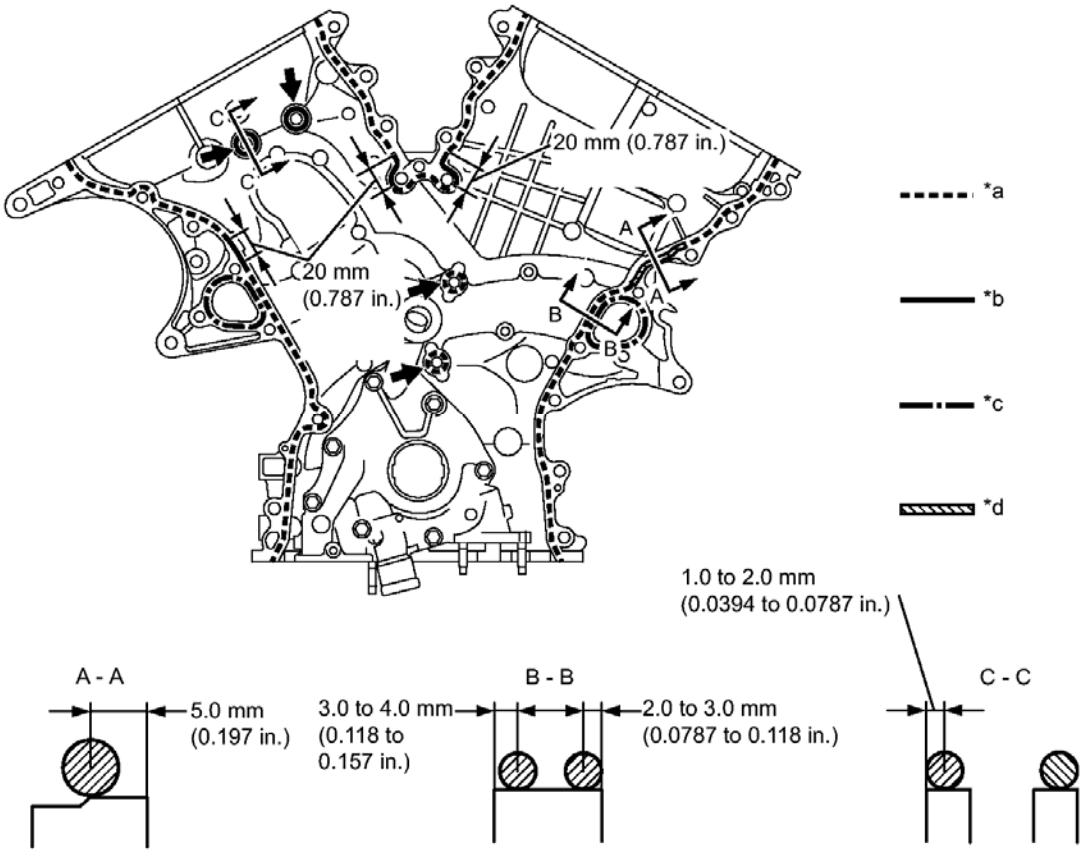


Fig. 271: Identifying Timing Chain Cover Seal Packing Applying Areas
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Dashed line area (Seal packing: Toyota Genuine Seal	*b	Continuous line area (Seal packing: Toyota Genuine Seal

	Packing Black, Three Bond 1207B or equivalent)		Packing Black, Three Bond 1207B or equivalent)
*c	Alternate long and short dashed line area (Seal packing: Toyota Genuine Seal Packing 1282B, Three Bond 1282B or equivalent)	*d	Diagonal line area (Seal packing: Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent)
	Be sure to apply seal packing	-	-

Seal packing

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

Toyota Genuine Seal Packing 1282B, Three Bond 1282B or equivalent

NOTE:

- **If there is oil on the contact surfaces, wipe them with an oil-free cloth before applying seal packing.**
- **Install the chain 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 installing.**

SEAL PACKING APPLICATION CHART

Area	Seal Packing Diameter	Application Position from Inside Seal Line
Continuous Line Area	4.5 mm or more (0.177	1.0 to 2.0 mm (0.0394 to 0.0787

	in.)	in.)
Alternate Long and Short Dashed Line Area	3.5 mm or more (0.138 in.)	2.0 to 3.0 mm (0.0787 to 0.118 in.)
Dashed Line Area	3.5 mm or more (0.138 in.)	3.0 to 4.0 mm (0.118 to 0.158 in.)
Diagonal Line Area	6.0 mm or more (0.236 in.)	5.0 mm (0.197 in.)

c. Install a new gasket.

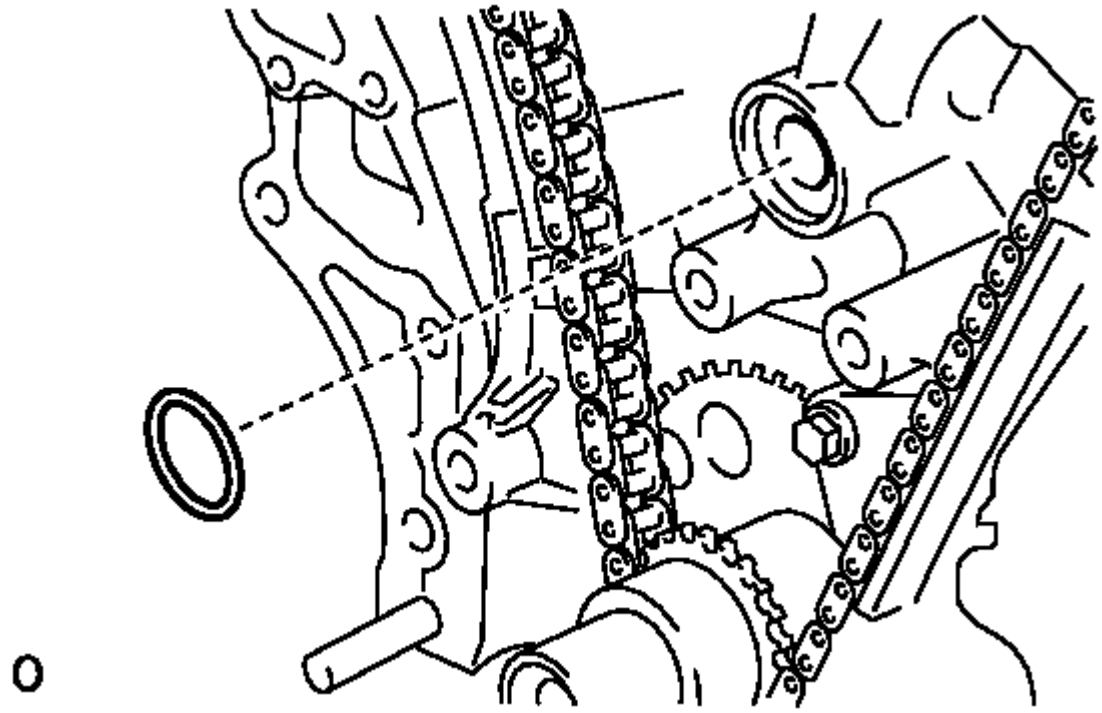


Fig. 272: Identifying Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Align the oil pump's drive rotor spline and the crankshaft as shown in the illustration. Install the spline and chain cover to the crankshaft.

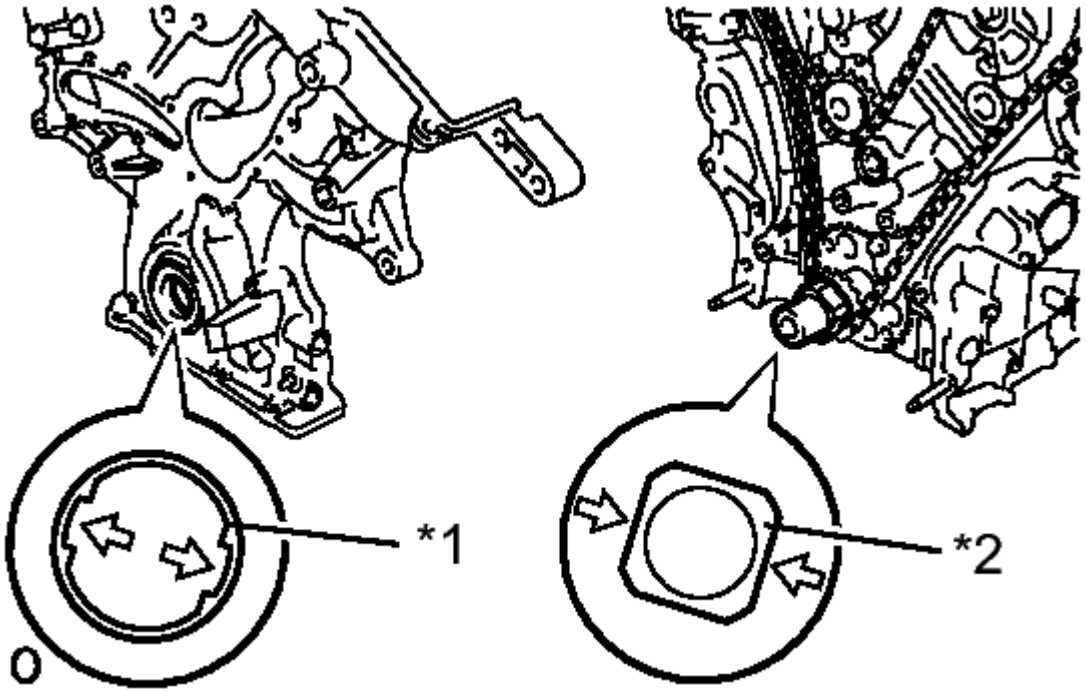


Fig. 273: Aligning Oil Pump Drive Rotor Spline & Crankshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Drive Rotor Spline
*2	Crankshaft

e. Temporarily tighten the timing chain cover with the 23 bolts and 2 nuts.

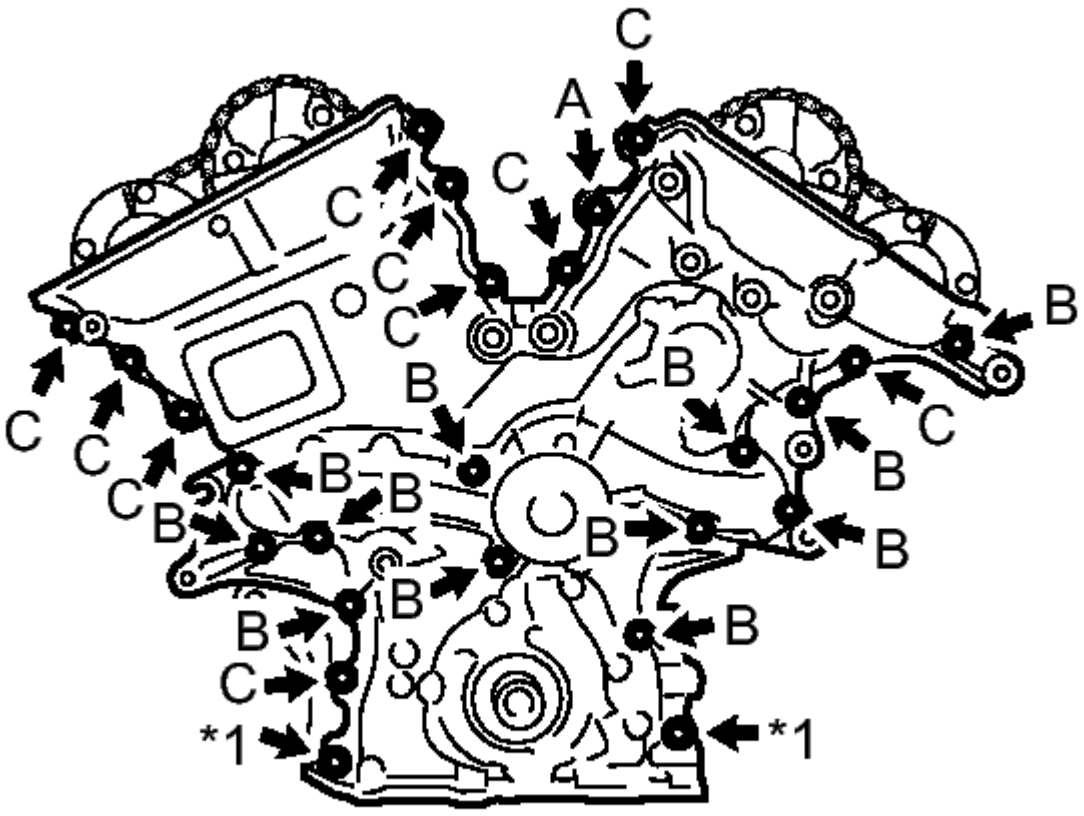


Fig. 274: Identifying Timing Chain Cover Nuts & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Nut

BOLT LENGTH

Item	Length
Bolt A	40 mm (1.57 in.)
Bolt B	55 mm (2.17 in.)
Bolt	25 mm

C	(0.98 in.)

NOTE: Make sure that there is no oil on the bolt and nut threads.

f. Fully tighten the bolts in this order: Area 1 and Area 2.

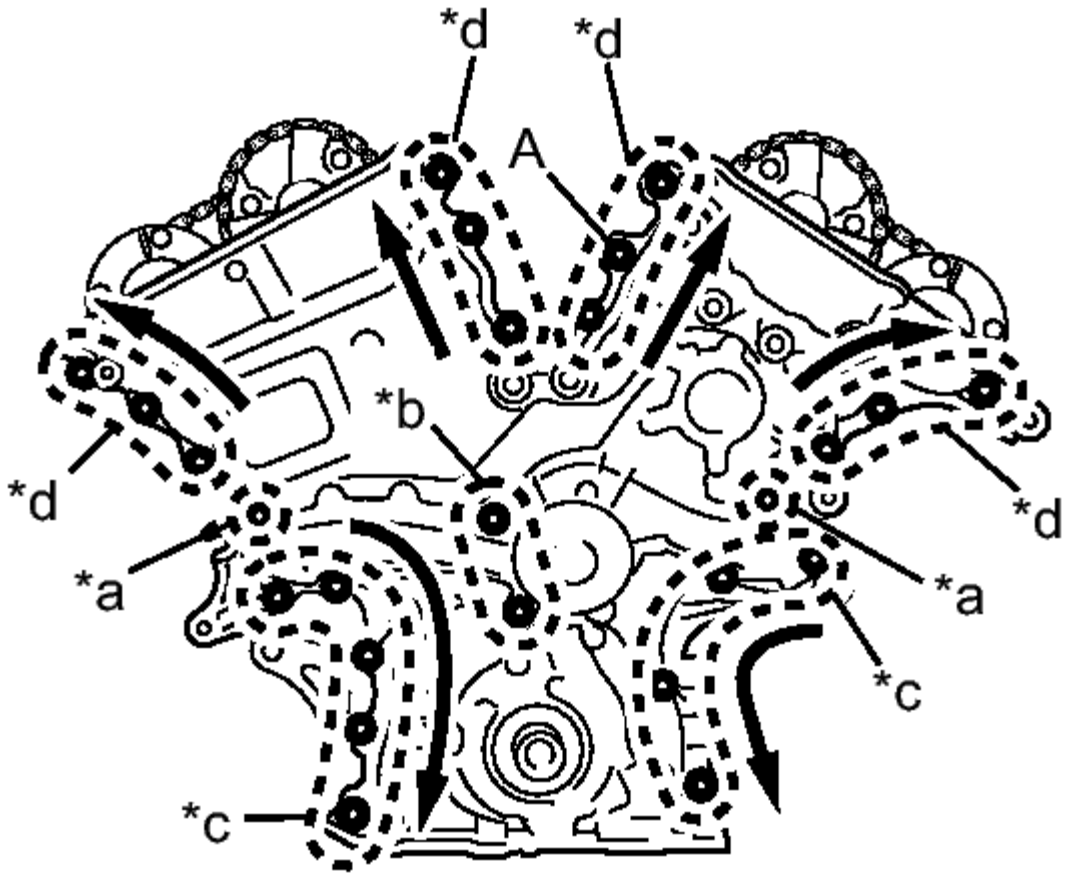


Fig. 275: Tightening Timing Chain Cover Nuts & Bolts Areas
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Area 1
*b	Area 2

*c	Area 3
*d	Area 4

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

g. Fully tighten the bolts in Area 3.

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

HINT:

First tighten the upper bolts and nuts followed by lower bolts and nuts as shown in the illustration.

h. Fully tighten the bolts in Area 4.

Bolt A

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

Except bolt A

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

HINT:

Tighten the bolts in the order of lower to upper as shown in the illustration.

i. Install a new chain cover plate gasket and the chain cover plate with the 4 bolts.

Torque: 9.1 N*m (93 kgf*cm, 81 in.*lbf)

34. **INSTALL WATER INLET HOUSING**

a. Install 2 new O-rings.

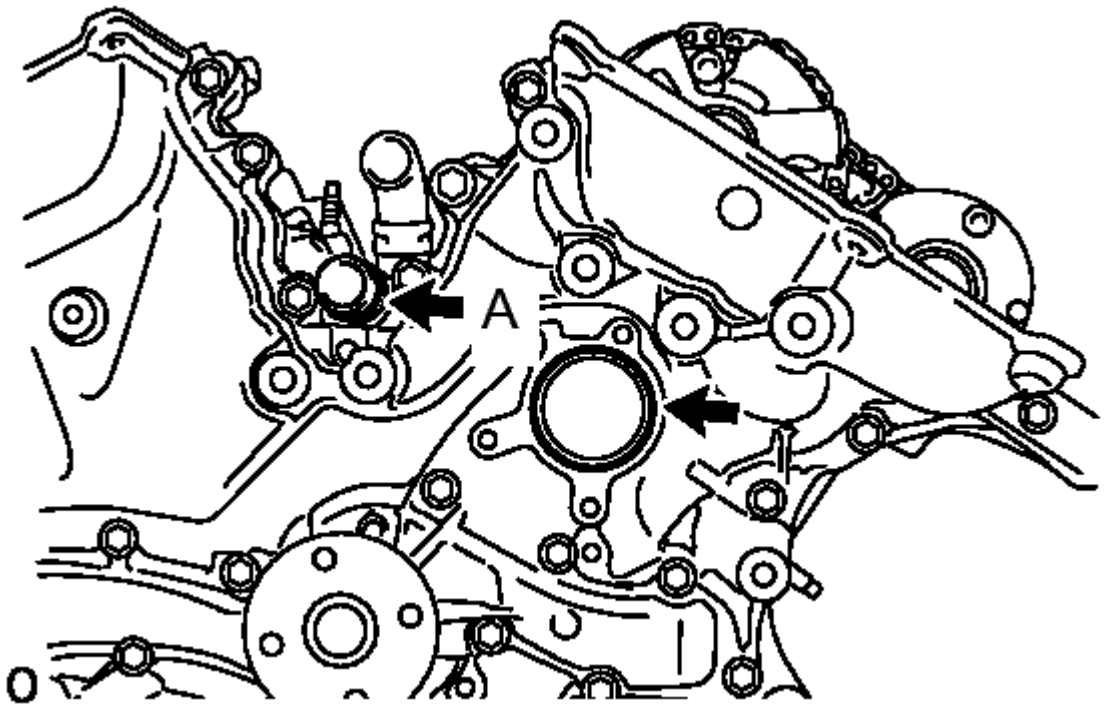


Fig. 276: Identifying O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Apply a small amount of water or soapy water to O-ring (A) shown in the illustration before installation.

b. Install the 2 stud bolts.

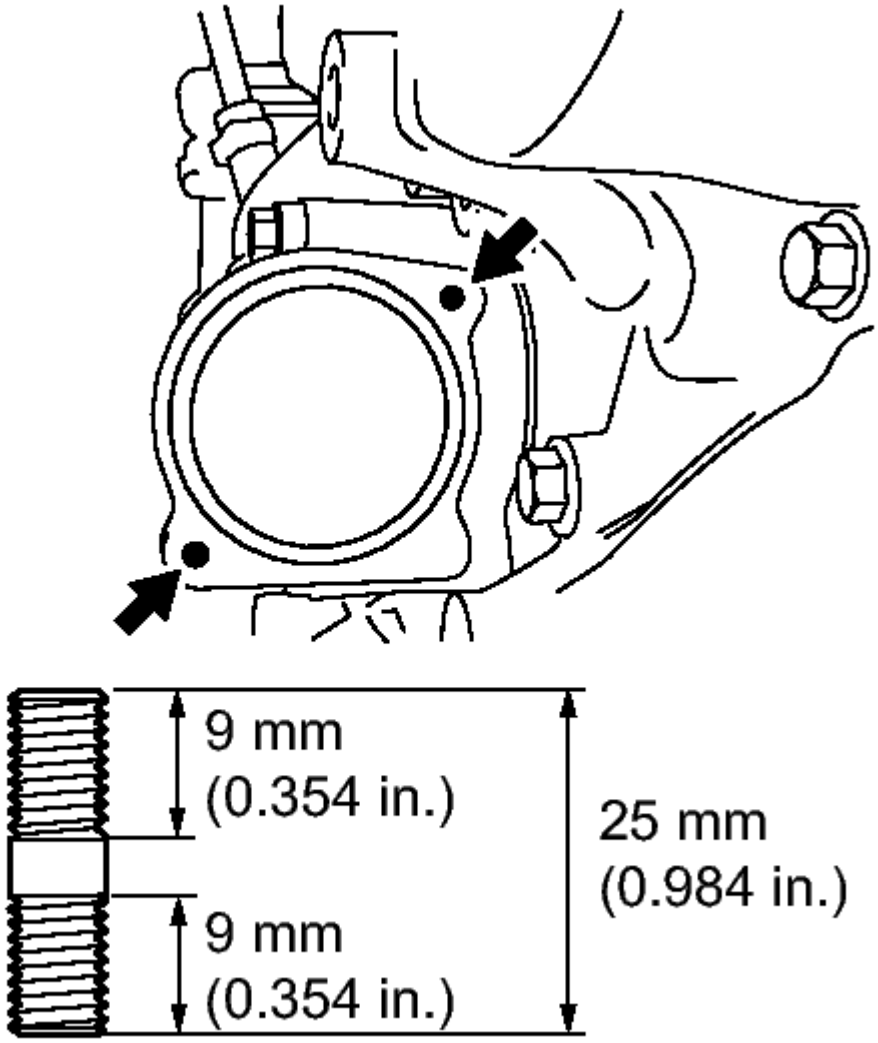


Fig. 277: Identifying Water Inlet Housing Studs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 4.0 N*m (41 kgf*cm, 35 in.*lbf)

c. Install the water inlet housing with the 2 bolts and nut.

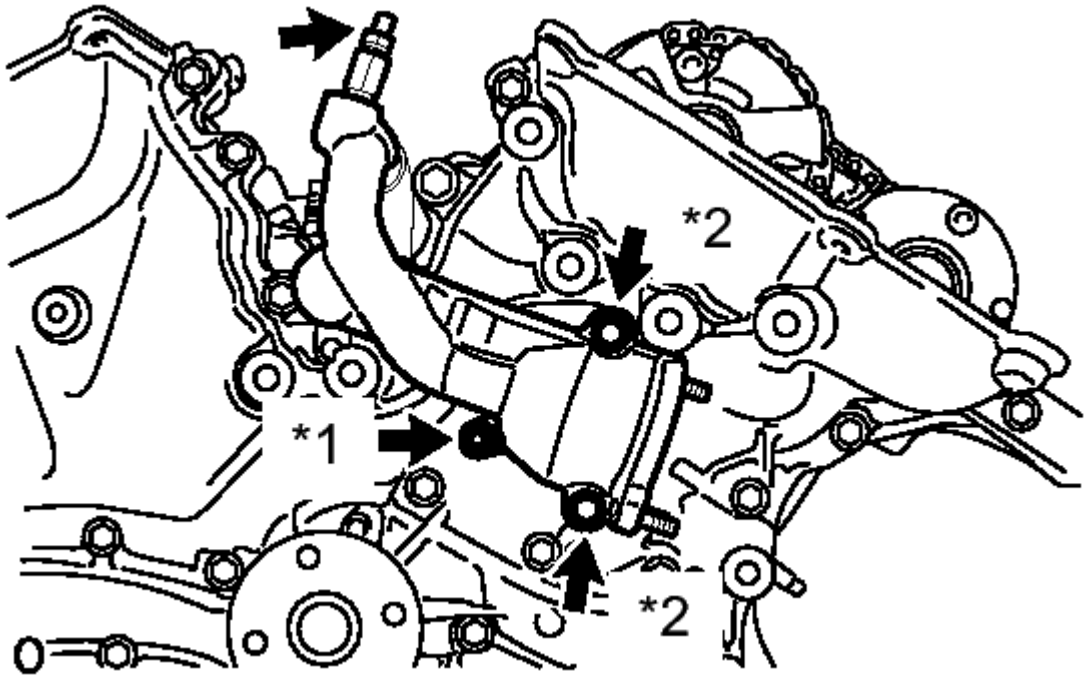


Fig. 278: Aligning Thermostat Jiggle Valve With Upper Stud Bolt Angle
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Nut
*2	Bolt

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

NOTE: Be careful that the O-ring does not get caught between the parts.

d. Connect the No. 1 water by-pass hose.
e. Apply adhesive around the drain cock.

Adhesive

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

f. Install the drain cock assembly to the water inlet housing.

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

g. Install the drain cock plug to the drain cock assembly.

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

h. Install a new gasket to the thermostat.

i. Align the thermostat jiggle valve with the upper stud bolt, and insert the thermostat in the water inlet housing.

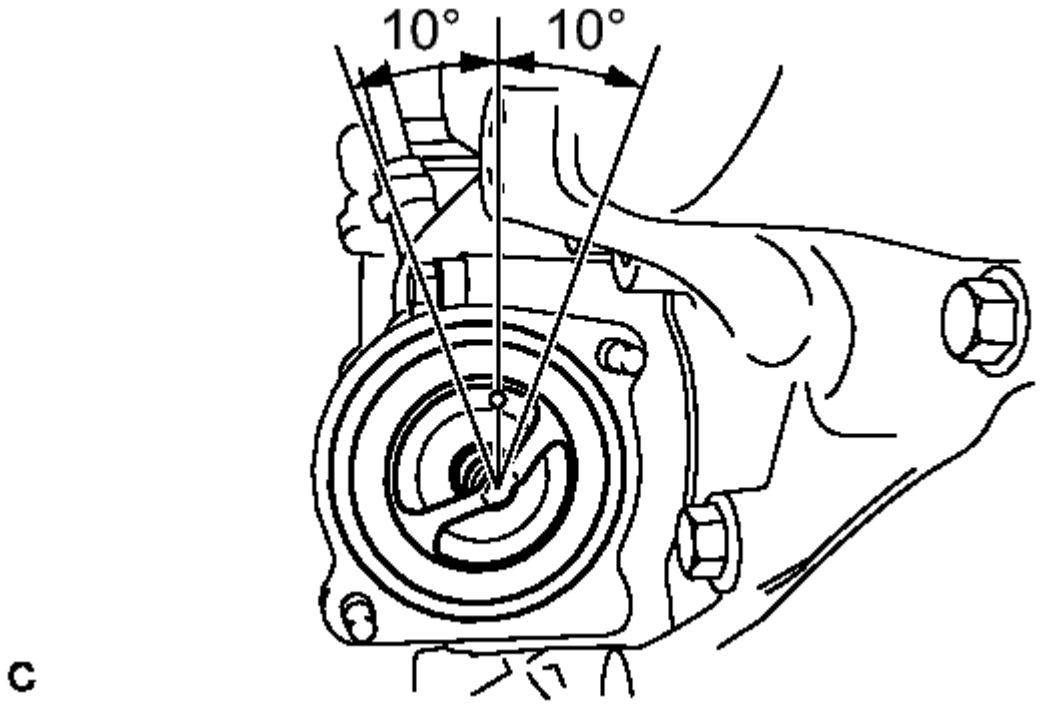


Fig. 279: Identifying Jiggle Valve Angles
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

The jiggle valve may be set within 10° of either side of the prescribed position.

j. Install the water inlet with the 2 nuts.

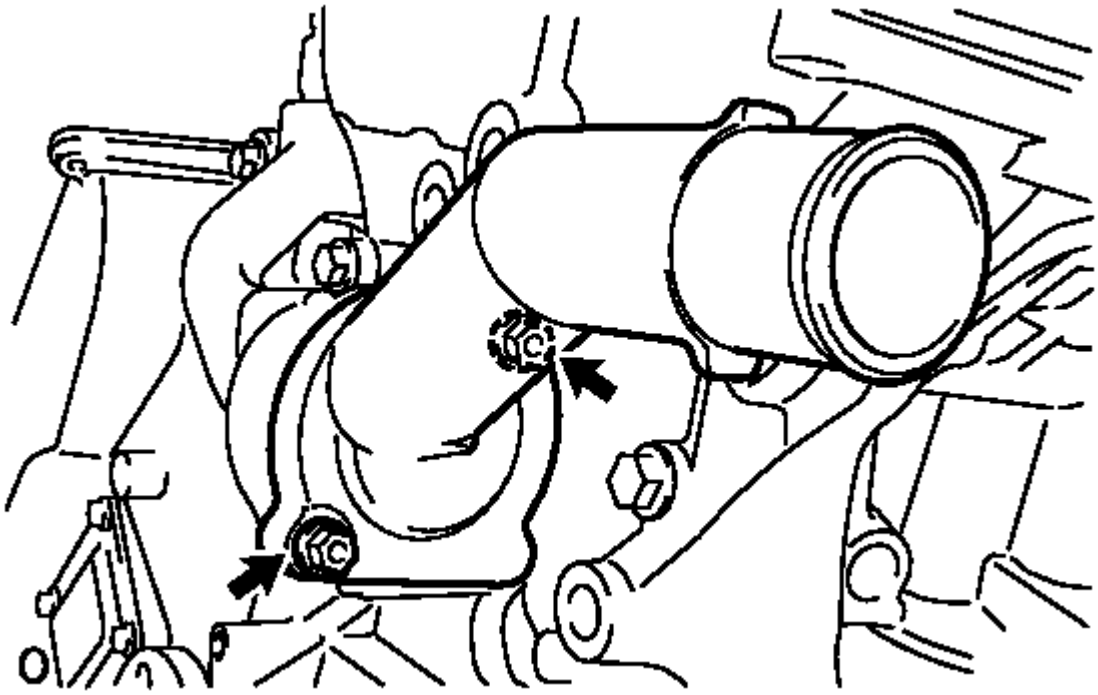


Fig. 280: Identifying Water Inlet With Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

35. **INSTALL NO. 1 FRONT ENGINE MOUNTING BRACKET LH**

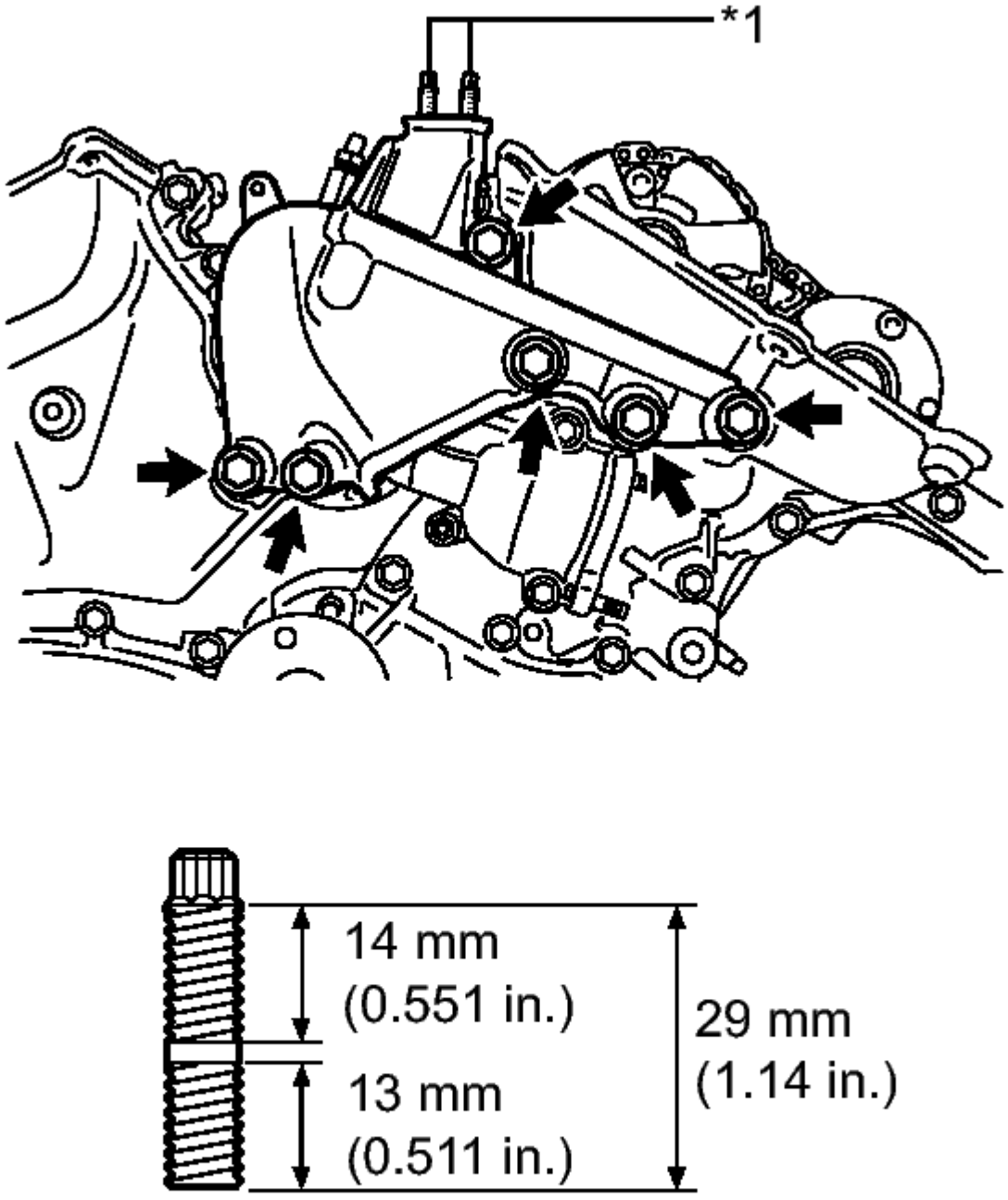


Fig. 281: Identifying No. 1 LH Front Engine Mounting Bracket Bolts & Stud Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	Stud

*1	Bolt

a. Using an E8 "TORX" socket wrench, install the 2 stud bolts.

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

b. Install the No. 1 front engine mounting bracket LH with the 6 bolts.

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

NOTE:

- **Install the water inlet and mounting bracket within 15 minutes after installing the chain cover.**
- **Do not start the engine for at least 2 hours after installation.**

36. **INSTALL NO. 1 OIL PAN BAFFLE PLATE**

a. Install the No. 1 oil pan baffle plate with the 7 bolts.

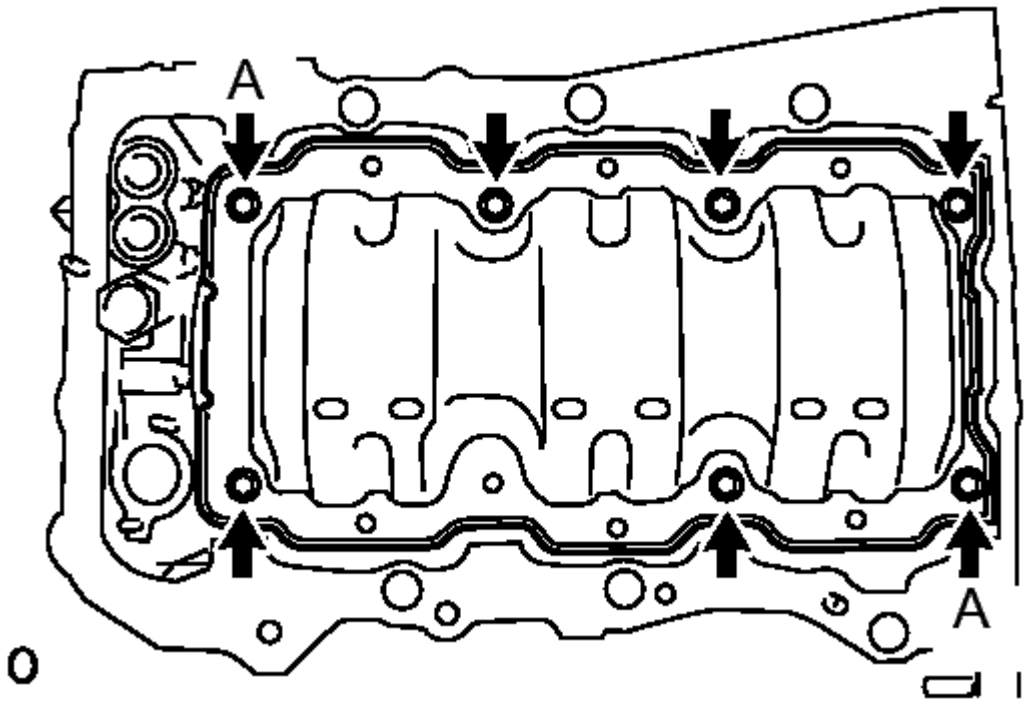


Fig. 282: Identifying Oil Pan Baffle Plate Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

HINT:

Temporarily tighten the 7 bolts. Fully tighten the 2 bolts (A) shown in the illustration before tightening the other bolts.

37. **INSTALL OIL PAN SUB-ASSEMBLY**

a. Using an E8 "TORX" socket wrench, install the 4 stud bolts.

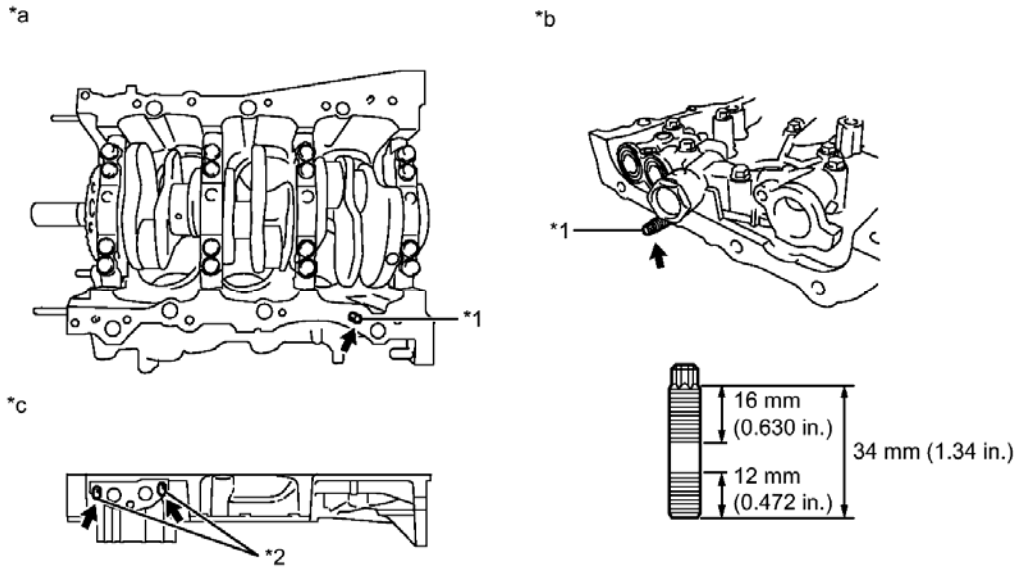


Fig. 283: Identifying Oil Pain Sub-Assembly Stud Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Bolt A	*2	Bolt B
*a	Lower Cylinder Block	*b	Timing Chain Cover
*c	Oil Pan LH Side (w/ Oil Cooler)	-	-

Bolt A

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

Bolt B

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

b. Install 2 new O-rings.

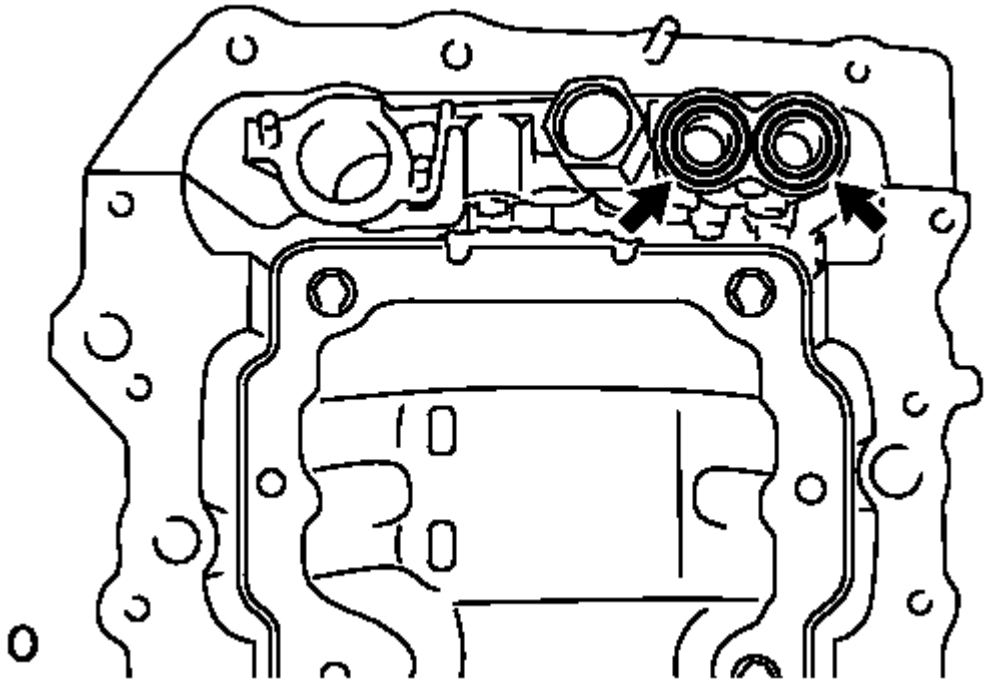


Fig. 284: Identifying O-Rings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Apply seal packing in a continuous line as shown in the illustration.

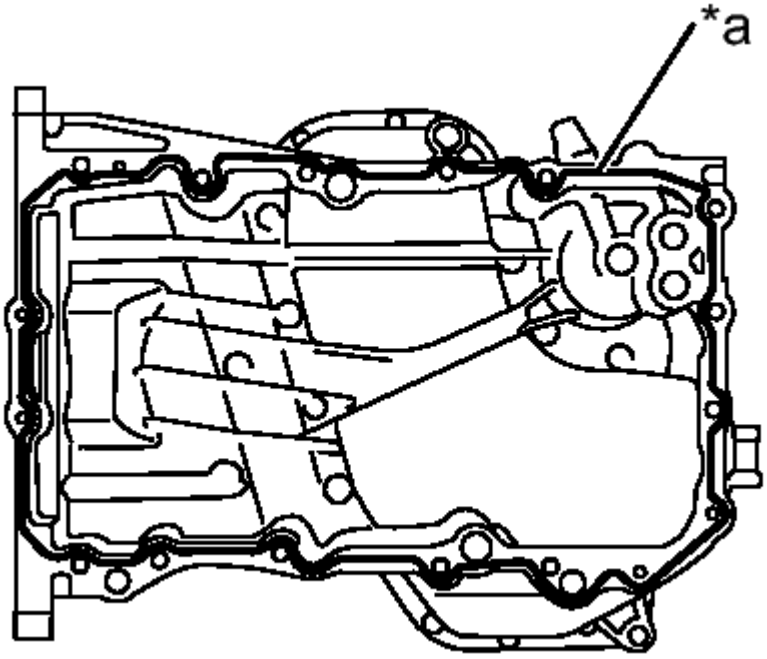


Fig. 285: Identifying Oil Pan Seal Packing Applying Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Seal Diameter

Seal packing

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

Seal diameter

3.0 to 4.0 mm (0.118 to 0.157 in.)

NOTE:

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

d. Install the oil pan with the 16 bolts and 2 nuts.

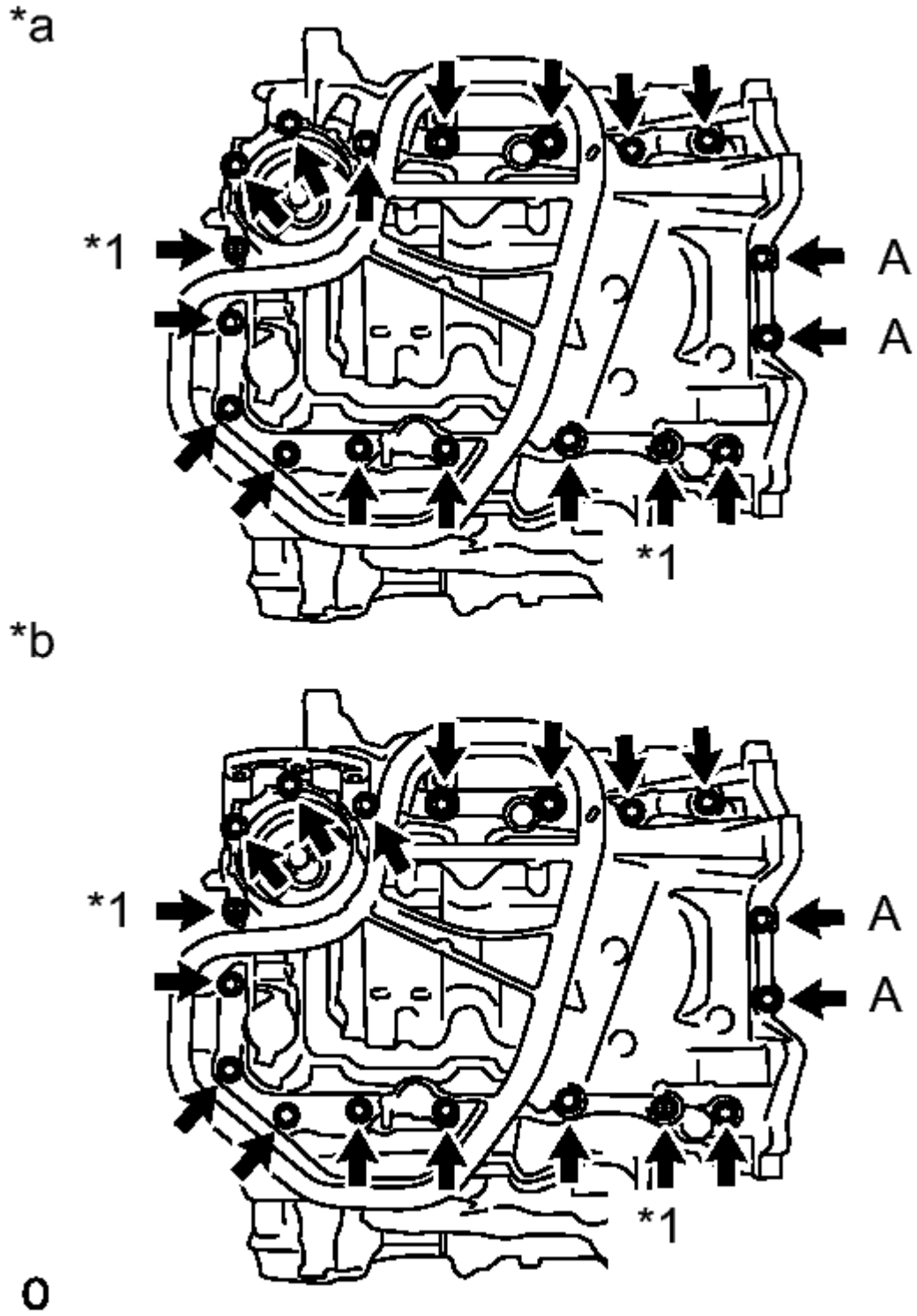


Fig. 286: Identifying Oil Pan Sub-Assembly Nuts & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Nut

*a	w/o Oil Cooler
*b	w/ Oil Cooler

Bolts A

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

Except bolts A

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

38. **INSTALL OIL STRAINER SUB-ASSEMBLY**
    a. Using an E6 "TORX" socket, install the 2 stud bolts as shown in the illustration.

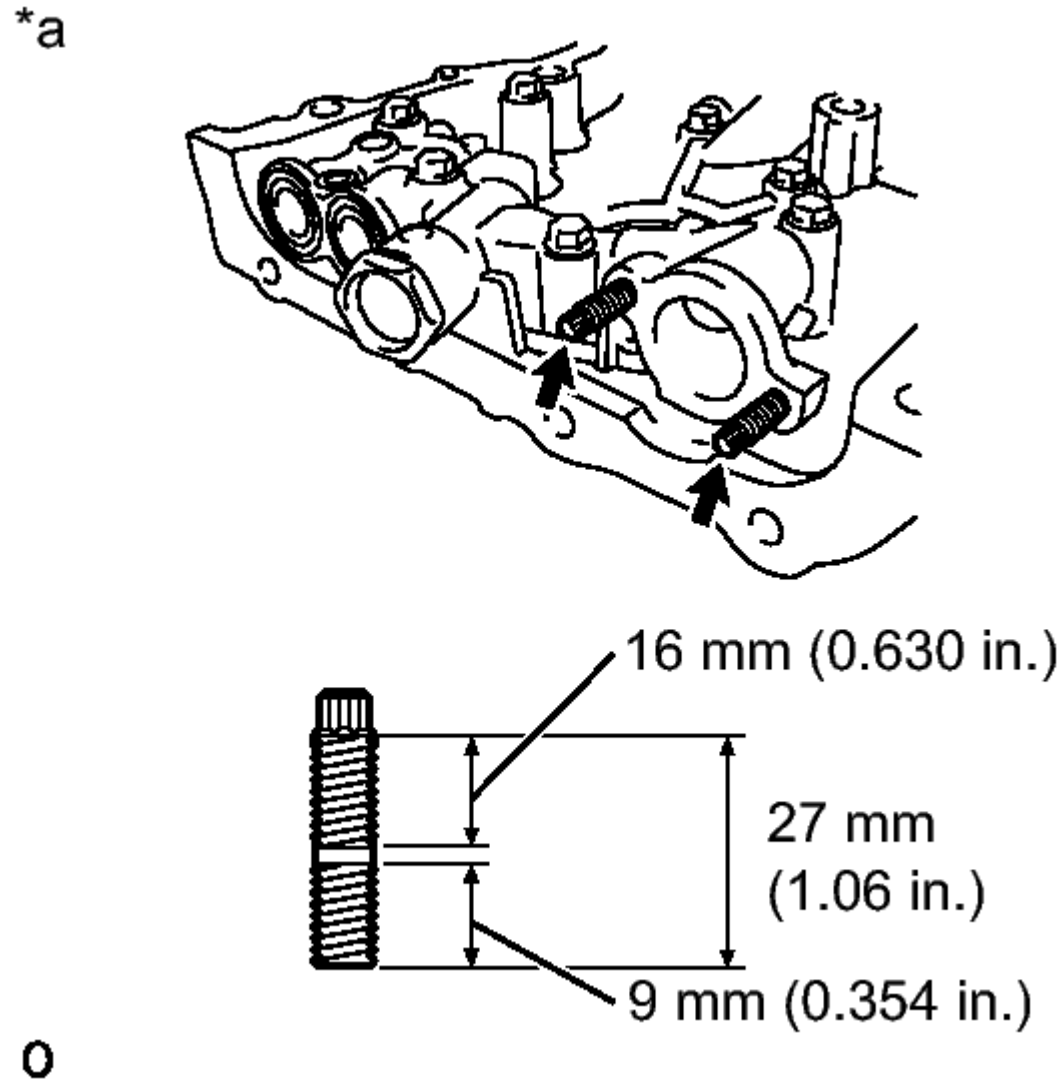


Fig. 287: Identifying Oil Strainer Stud Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Timing Chain Cover

Torque: 4.0 N*m (41 kgf*cm, 35 in.*lbf)

b. Install a new gasket and the oil strainer sub-assembly with the bolt and 2 nuts.

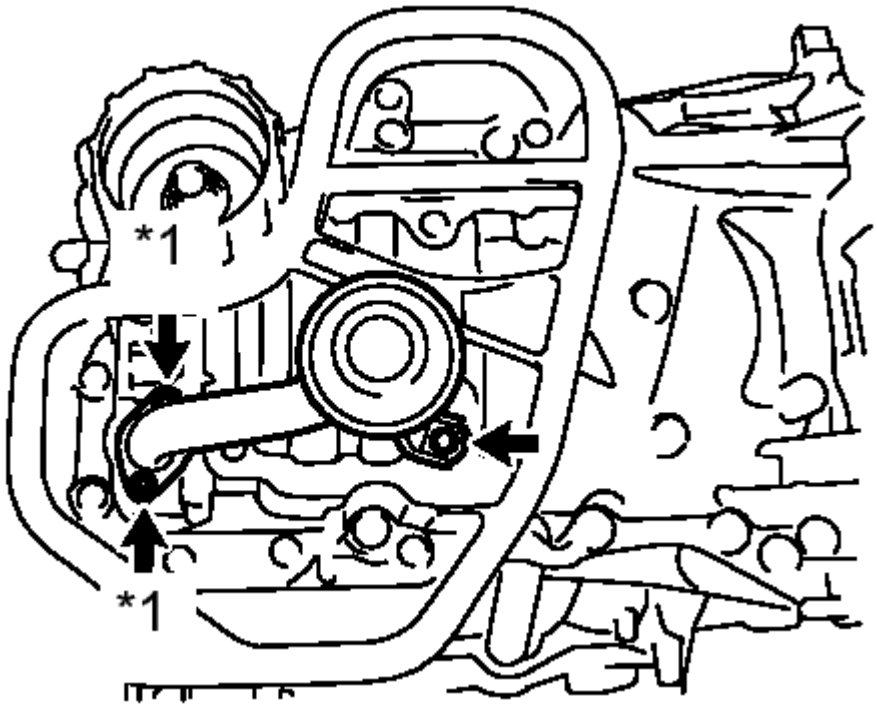


Fig. 288: Identifying Oil Strainer Sub-Assembly Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Nut

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

39. **INSTALL NO. 2 OIL PAN SUB-ASSEMBLY**
    a. Using an E6 "TORX" socket, install the 2 stud bolts as shown in the illustration.

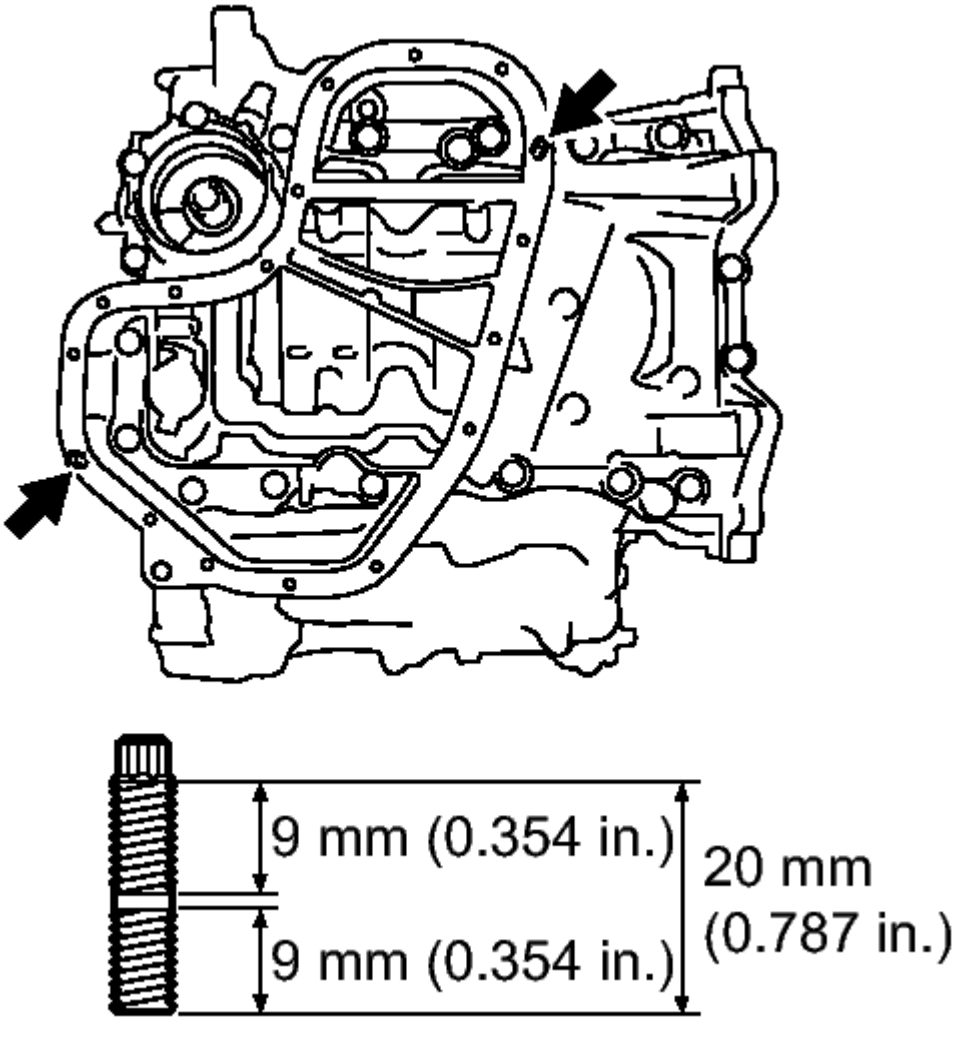


Fig. 289: Identifying Location Of Stud Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 4.0 N*m (41 kgf*cm, 35 in.*lbf)

b. Apply seal packing in a continuous line as shown in the illustration.

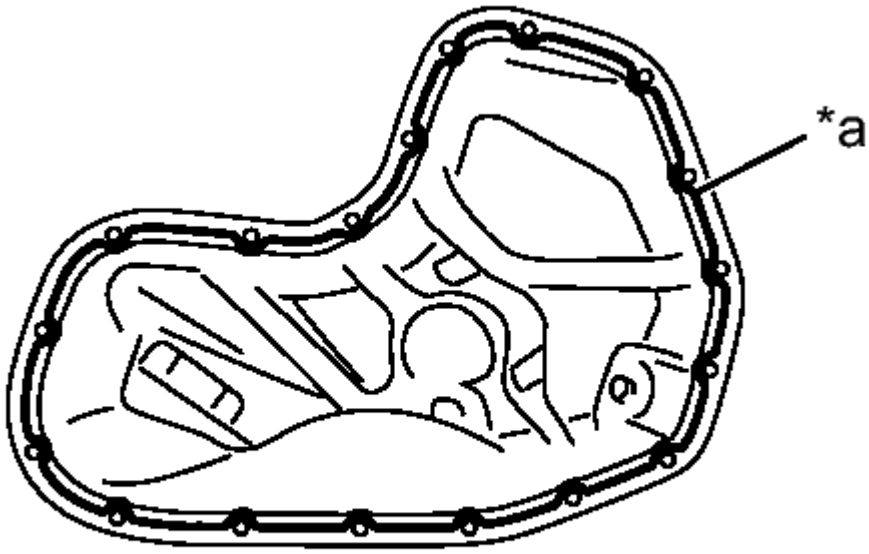


Fig. 290: Identifying No. 2 Oil Pan Seal Packing Applying Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Seal Diameter

Seal packing

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

Seal diameter

3.0 to 4.0 mm (0.118 to 0.157 in.)

NOTE:

- **Remove any oil from the contact surface.**
- **Install the No. 2 oil pan sub-assembly within 3 minutes after applying seal packing.**
- **Do not start the engine for at least 2 hours after installing.**

c. Install the No. 2 oil pan sub-assembly with the 16 bolts and 2 nuts.

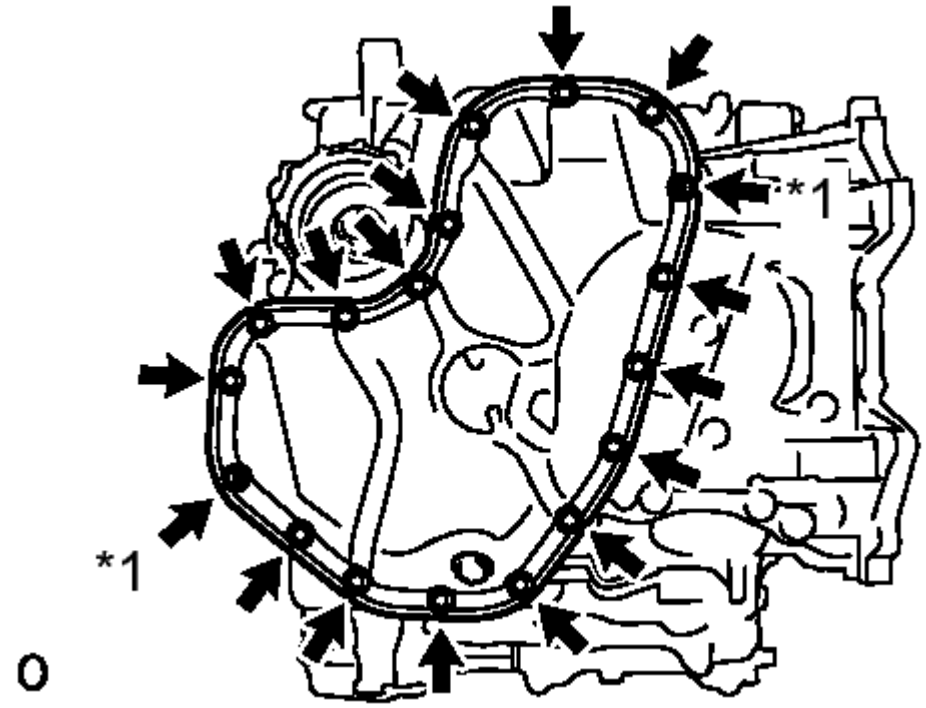


Fig. 291: Identifying No 2 Oil Pan Sub-Assembly, Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Nut

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

40. **INSTALL OIL PAN DRAIN PLUG**
    a. Install a new oil pan drain plug gasket and the oil pan drain plug.

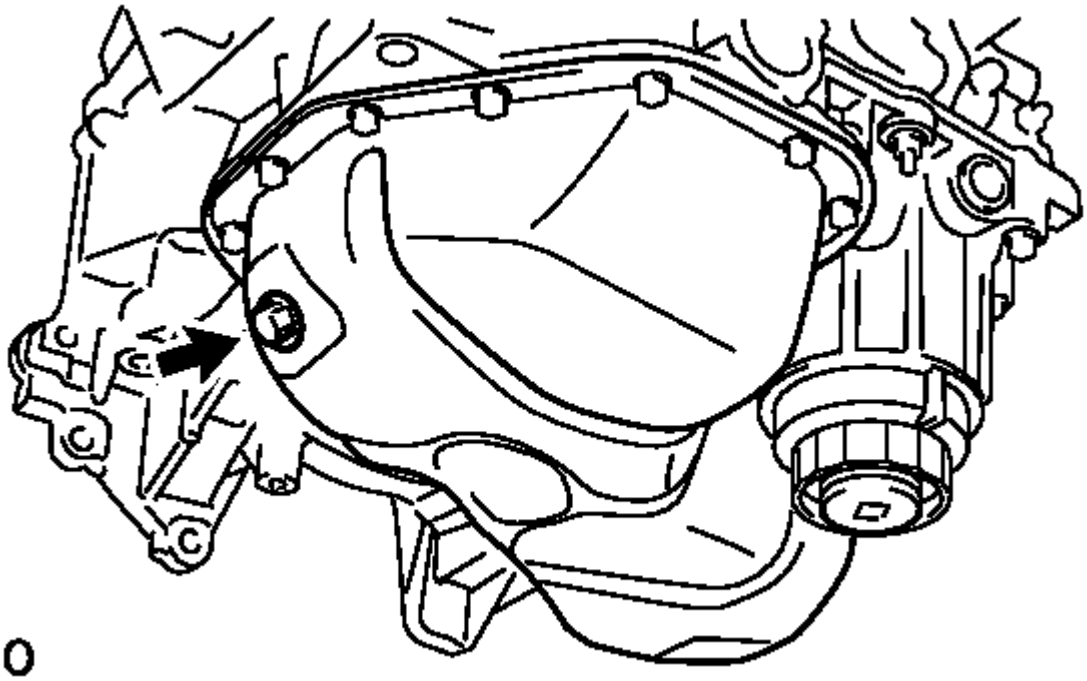


Fig. 292: Identifying Oil Pan Drain Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

41. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY**
    a. Apply seal packing as shown in the illustration.

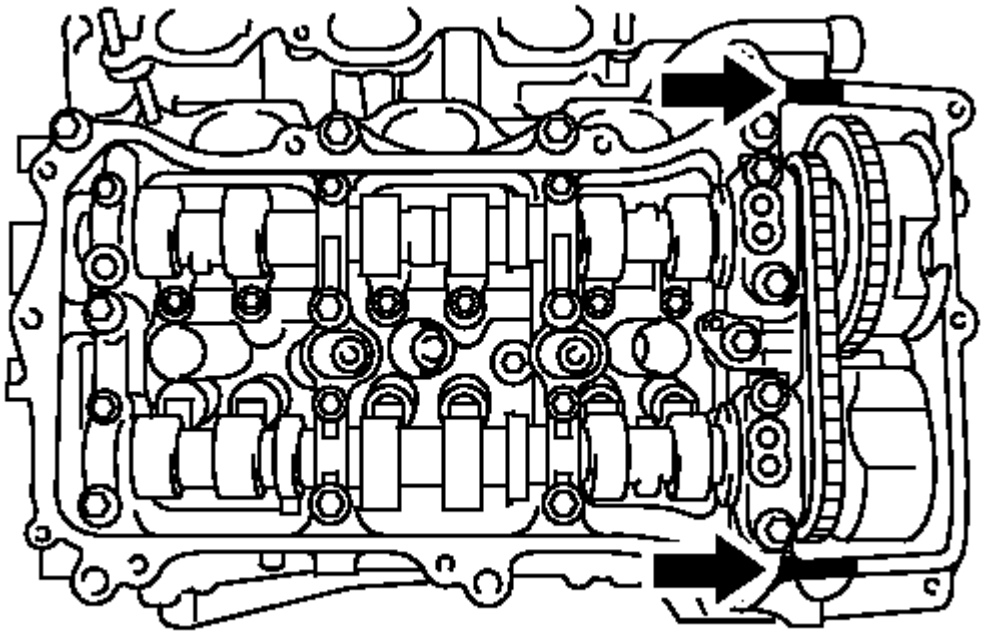


Fig. 293: Identifying Cylinder Head Cover Seal Packing Applying Areas
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

1	Seal Packing

Seal packing

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

NOTE:

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

b. Install 3 new gaskets as shown in the illustration.

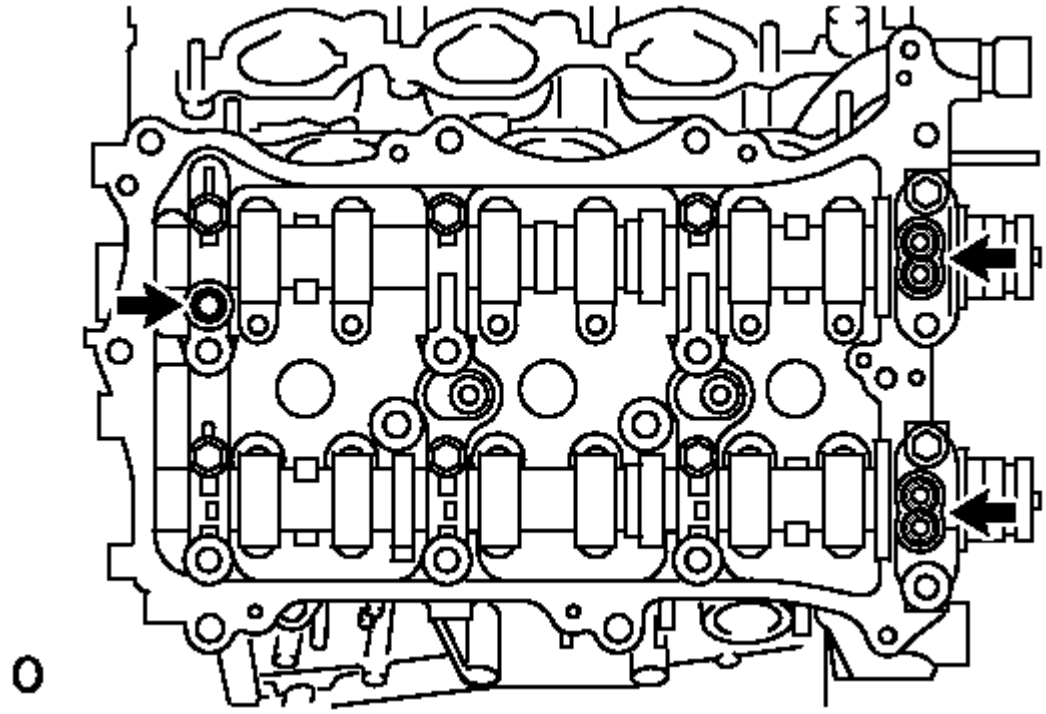


Fig. 294: Identifying Gaskets
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Install a new cylinder head cover gasket to the cylinder head cover sub-assembly.
d. Install the head cover with the 12 bolts and a new seal washer.

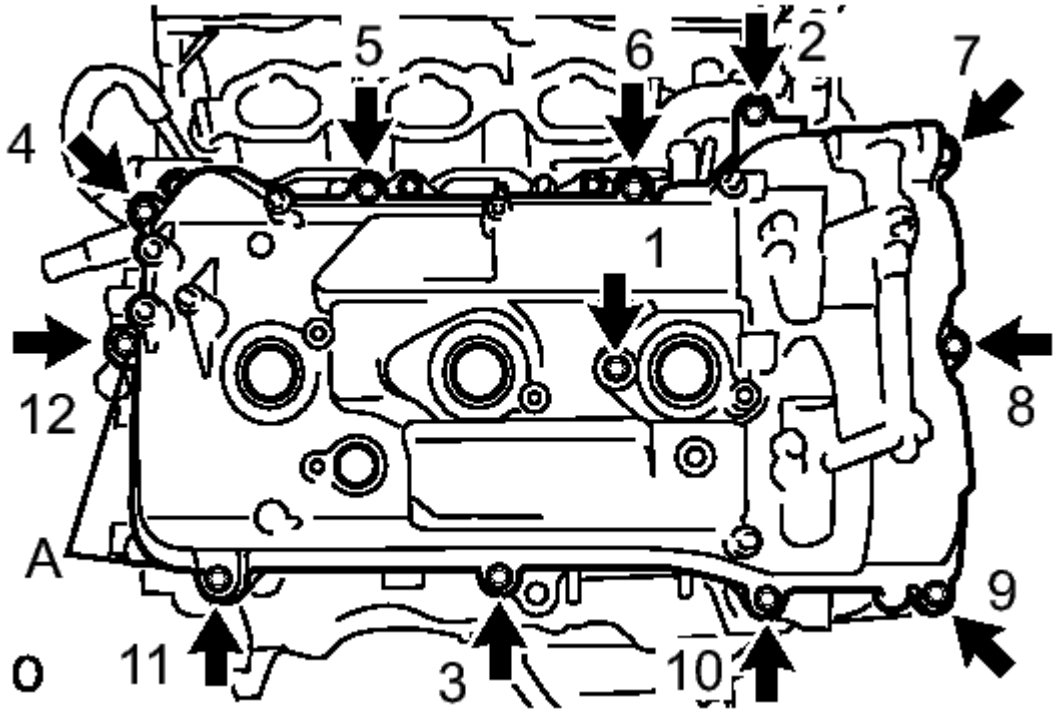


Fig. 295: Identifying Head Cover With Bolts

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

Bolts A

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

Except bolts A

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

HINT:

After tightening all bolts, check the tightening torque of 1 and 11. Retighten the bolt if necessary.

42. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY LH**
    a. Apply seal packing as shown in the illustration.

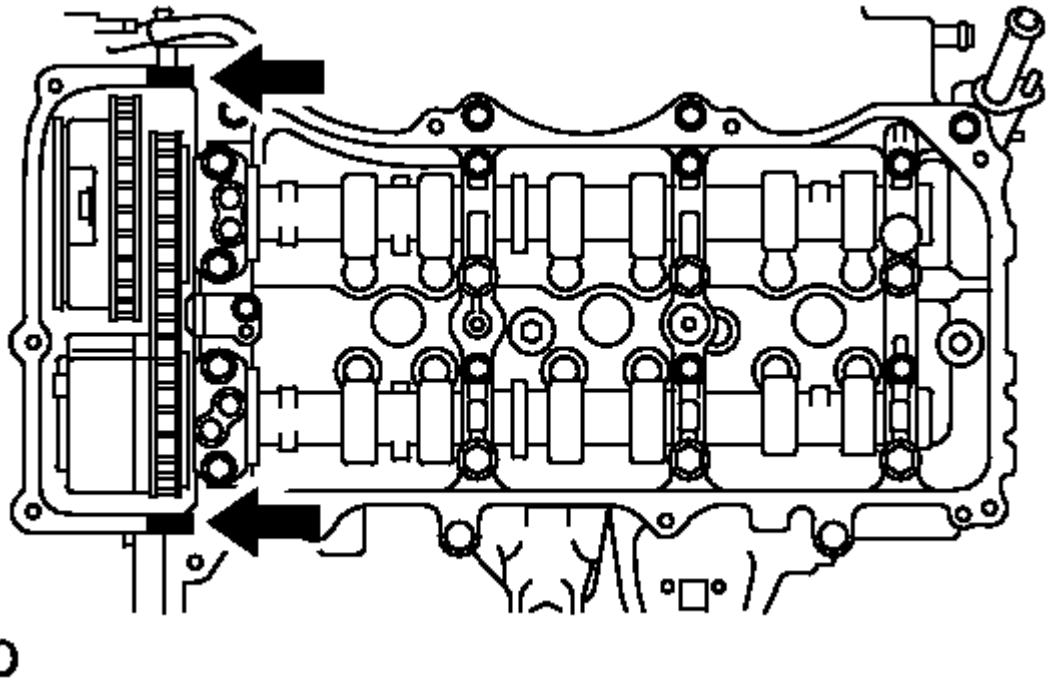


Fig. 296: Identifying LH Cylinder Head Cover Seal Packing Applying Areas
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

1	Seal Packing

Seal packing

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

NOTE:

- **Remove any oil from the contact surfaces.**
- **Install the cylinder head cover sub-assembly LH within 3 minutes after applying seal packing.**
- **Do not start the engine for at least 2 hours after installing.**

b. Install 3 new gaskets as shown in the illustration.

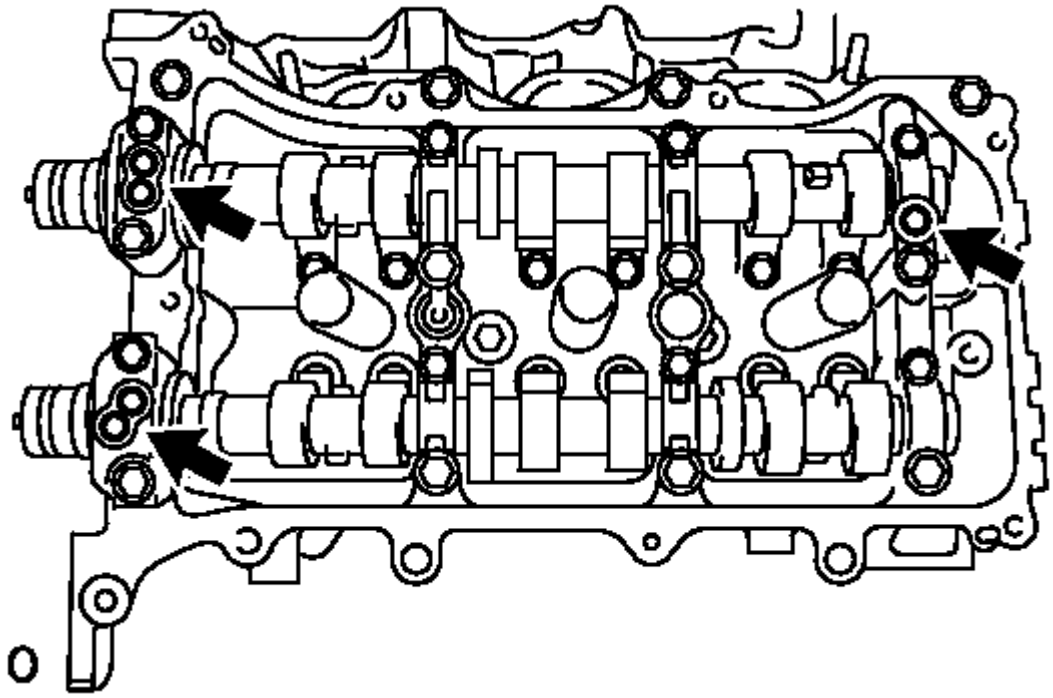


Fig. 297: Identifying Gaskets
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Install a new cylinder head cover gasket to the cylinder head cover sub-assembly LH.
d. Install the cylinder head cover sub-assembly LH with the 12 bolts and a new seal washer.

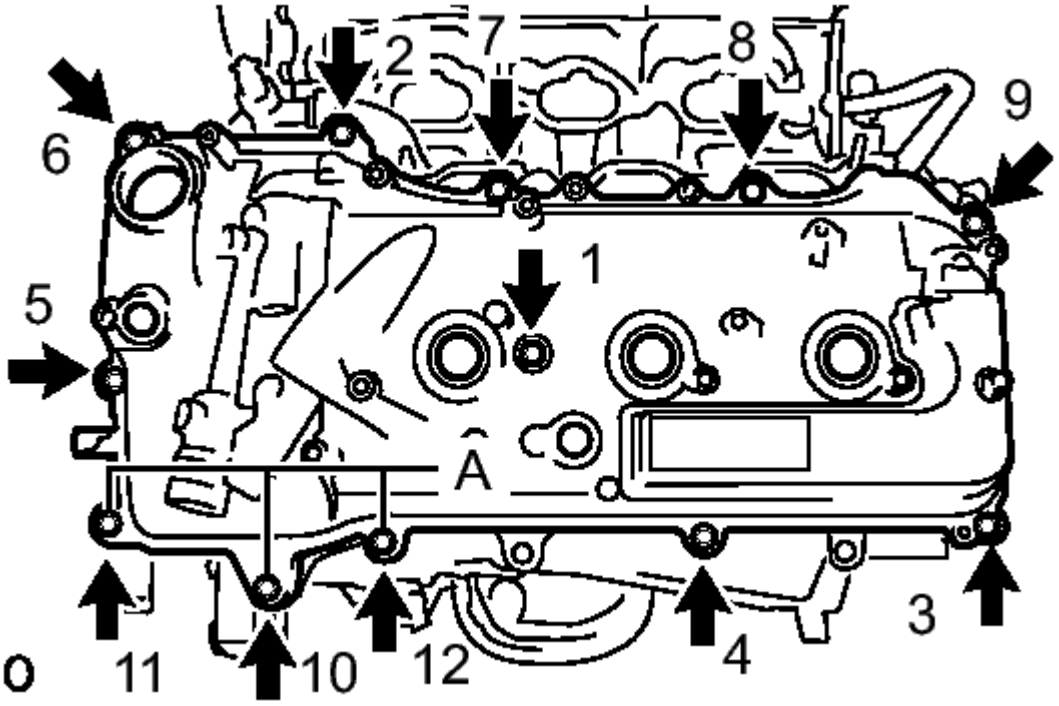


Fig. 298: Identifying Gaskets And O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Bolts A

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

Except bolts A

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

HINT:

After tightening all bolts, check the tightening torque of 1 and 10. Retighten the bolt if necessary.

43. **INSTALL WATER OUTLET**
    a. Install 2 new gaskets and a new O-ring.

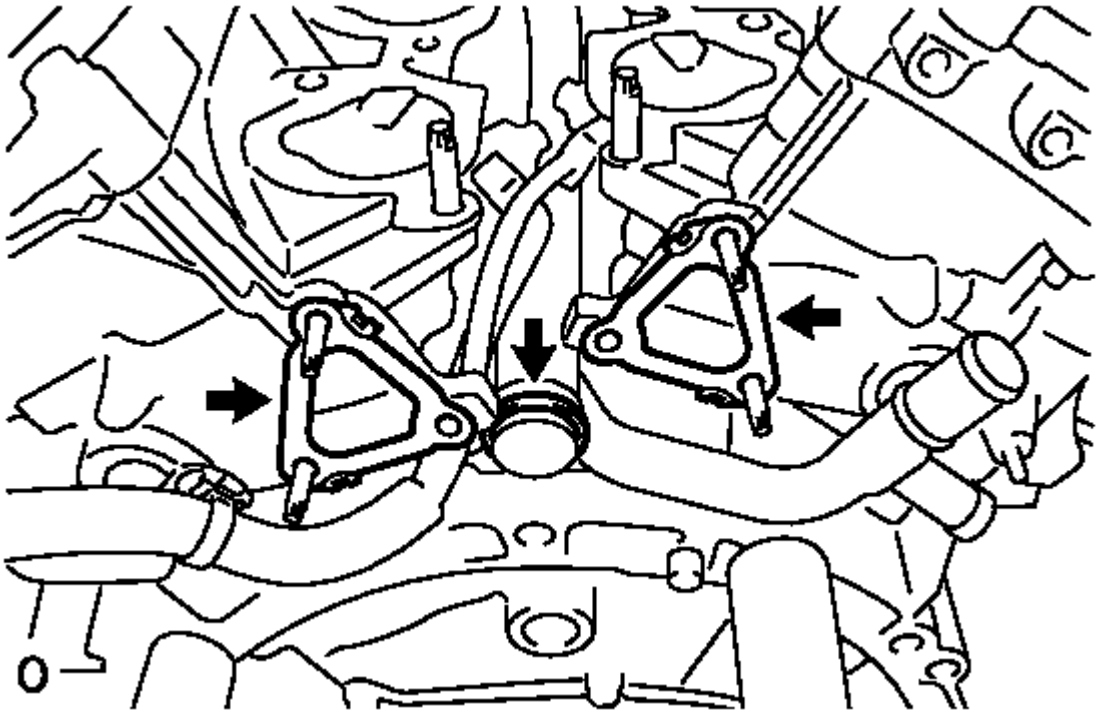


Fig. 299: Identifying Gaskets And O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Apply soapy water to the O-ring.

b. Install the water outlet with the 2 bolts and 4 nuts.

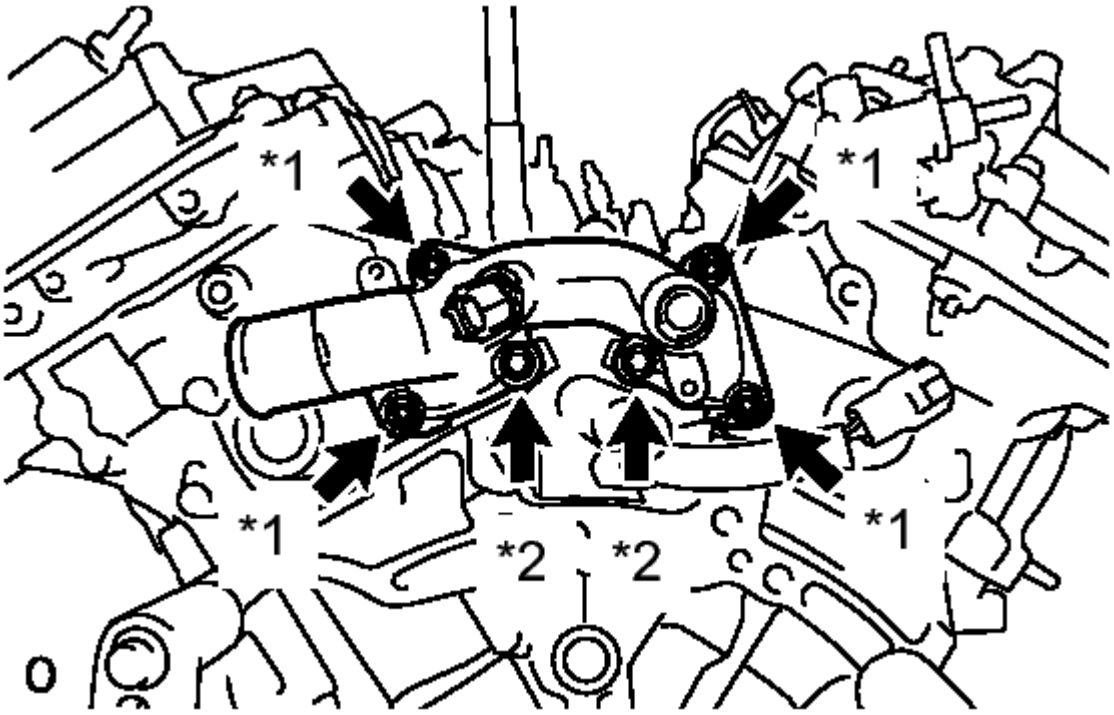


Fig. 300: Identifying Water Outlet With Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

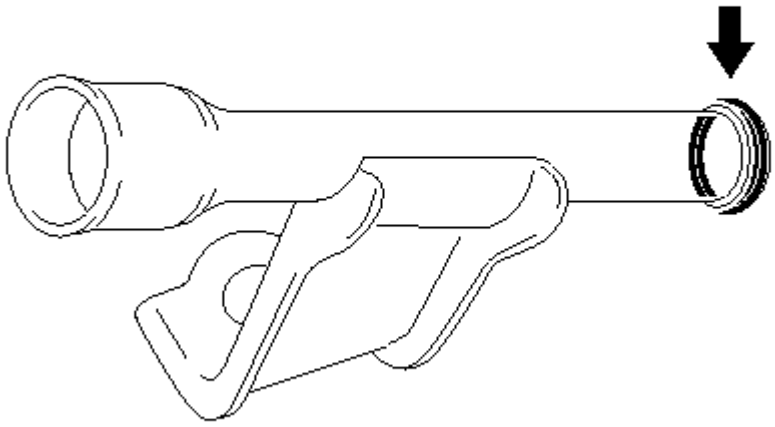
TEXT IN ILLUSTRATION

*1	Nut
*2	Bolt

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

NOTE: Be careful that the O-ring does not get caught between the parts.

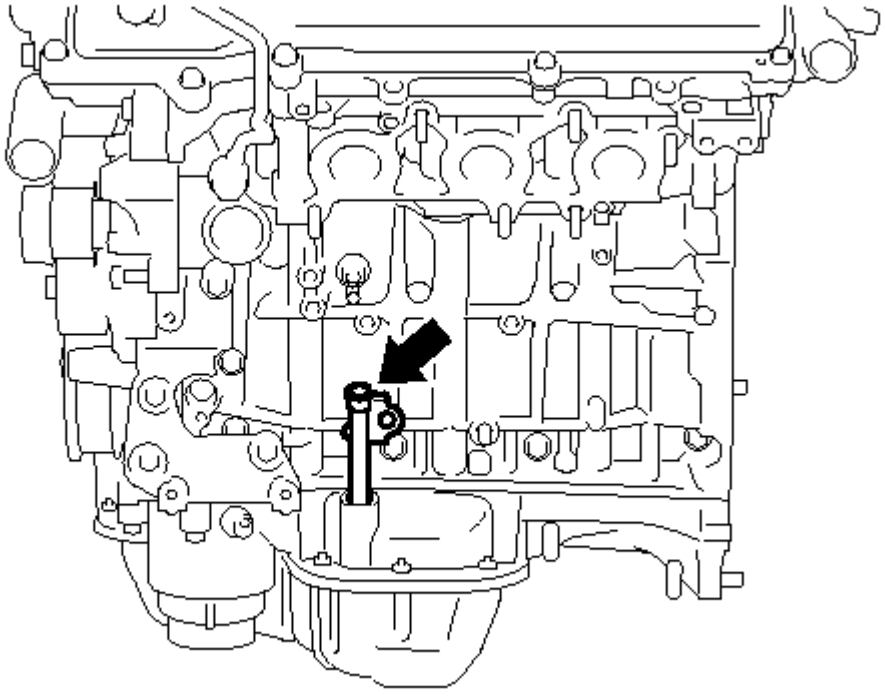
44. **INSTALL ENGINE OIL DIPSTICK GUIDE (w/ Oil Cooler)**
    a. Apply a light coat of engine oil to a new O-ring and install it to the engine oil dipstick guide.



C

Fig. 301: Identifying Engine Oil Level Dipstick Guide And O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Install the engine oil dipstick guide.

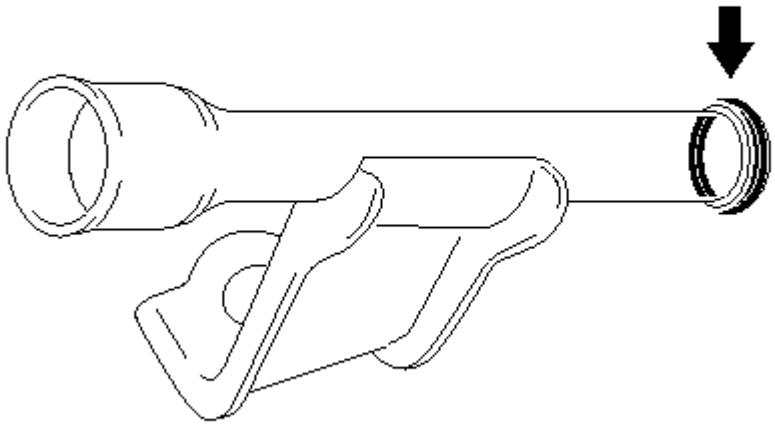


C

Fig. 302: Identifying Engine Oil Dipstick Guide
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

45. **INSTALL ENGINE OIL DIPSTICK GUIDE (w/o Oil Cooler)**

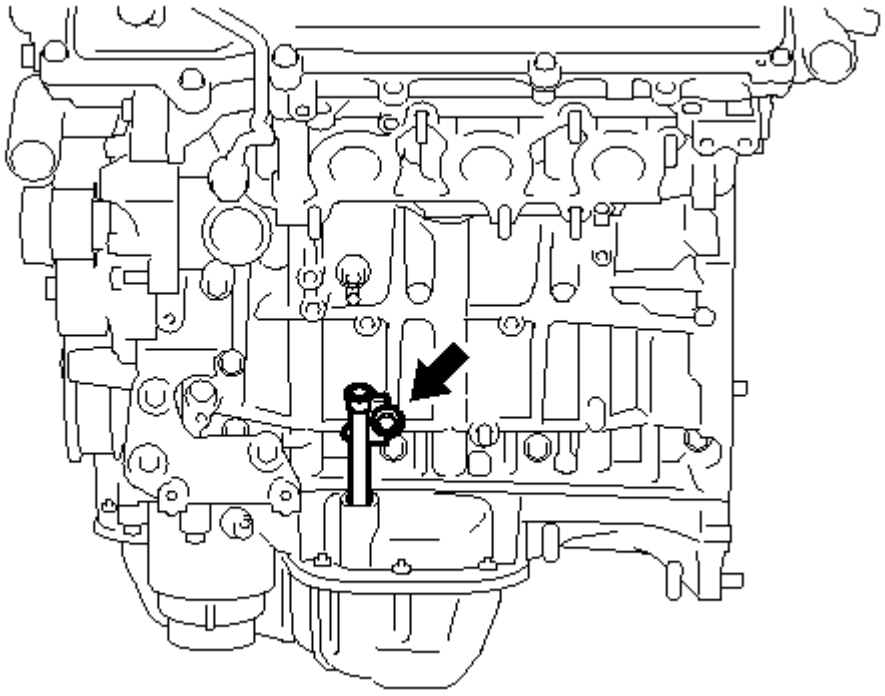
a. Apply a light coat of engine oil to a new O-ring and install it to the engine oil dipstick guide.



C

Fig. 303: Identifying Engine Oil Level Dipstick Guide And O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Install the engine oil dipstick guide with the bolt.



C

Fig. 304: Identifying Engine Oil Level Dipstick Guide And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

46. **INSTALL NO. 1 OIL COOLER BRACKET (w/ Oil Cooler)**
    a. Using an E8 "TORX" socket, install the 2 stud bolts as shown in the illustration.

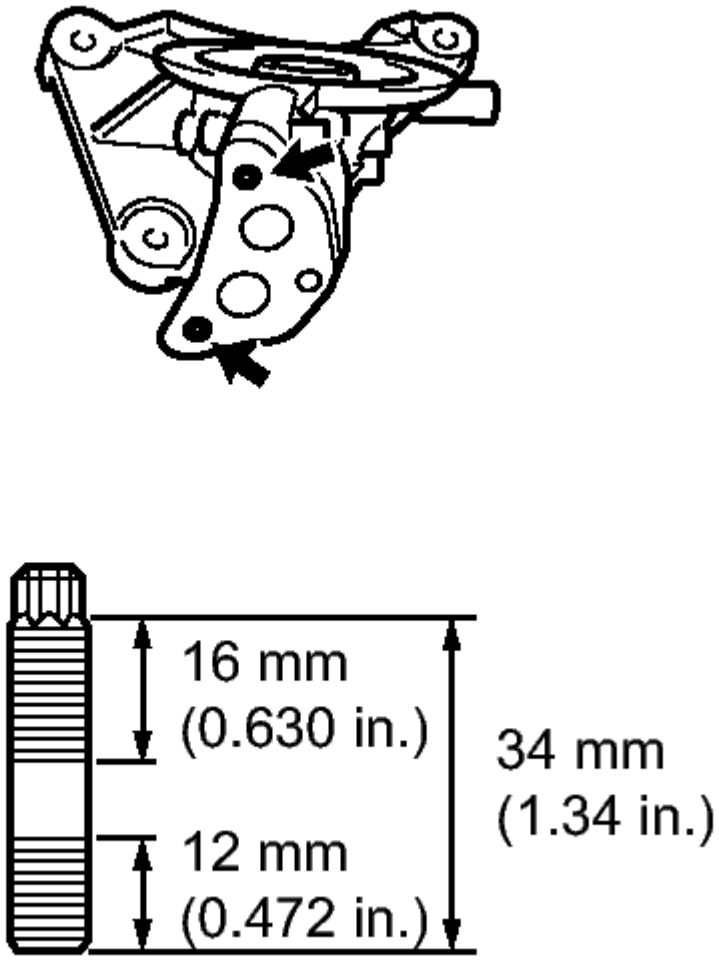


Fig. 305: Identifying Bolt And Nuts With No 1 Oil Cooler Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

b. Install a new gasket to the No. 1 oil cooler bracket.

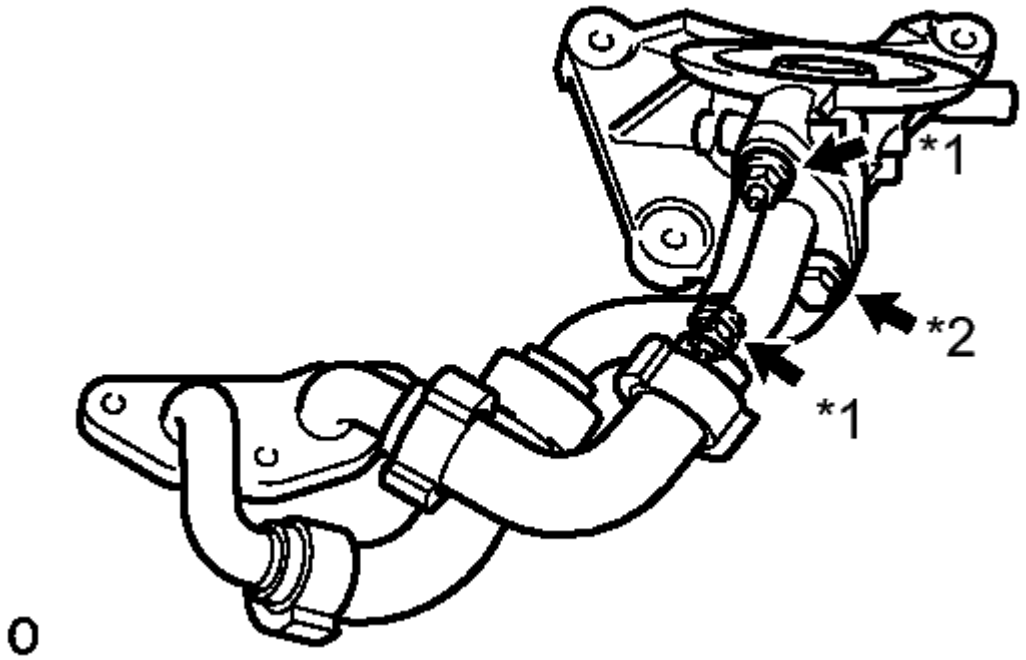


Fig. 306: Identifying No. 1 Oil Cooler Bracket, Nuts And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Nut
*2	Bolt

c. Install the oil cooler pipe with the bolt and 2 nuts.

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

d. Install a new gasket to the No. 1 oil pan.

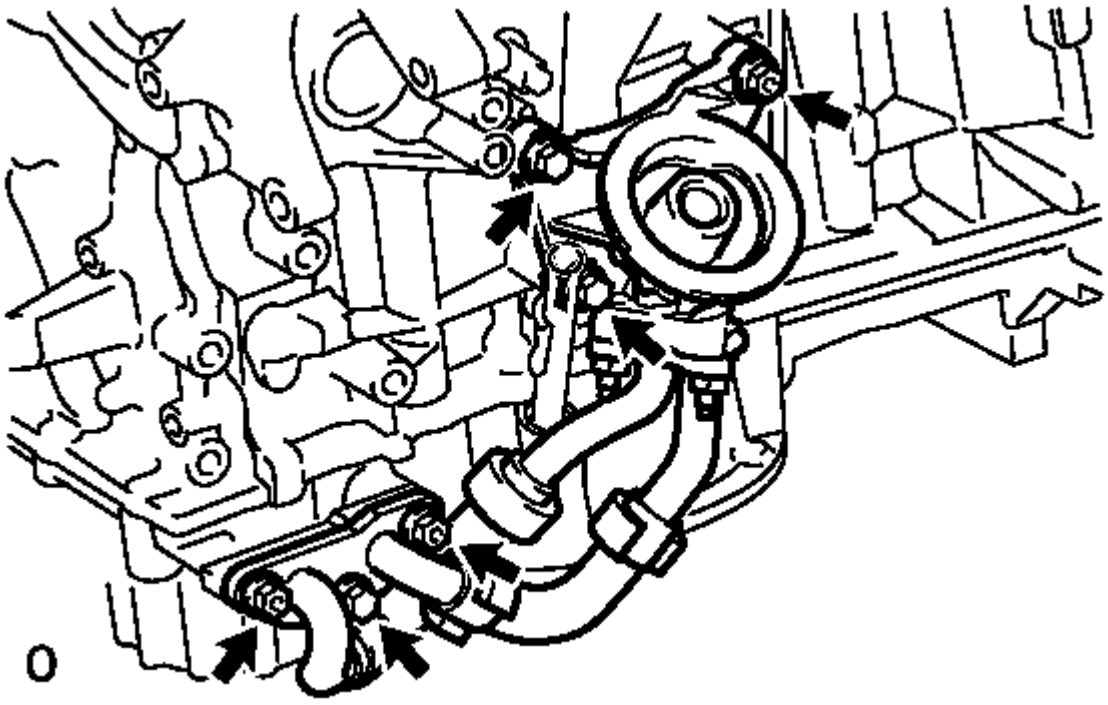


Fig. 307: Identifying Bolts, Nuts, And Oil Cooler Pipe With No. 1 Oil Cooler Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Install the No. 1 oil cooler bracket with oil cooler pipe with the 3 bolts and 3 nuts.

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

47. **INSTALL OIL COOLER ASSEMBLY (w/ Oil Cooler)**
    a. Install a new O-ring.

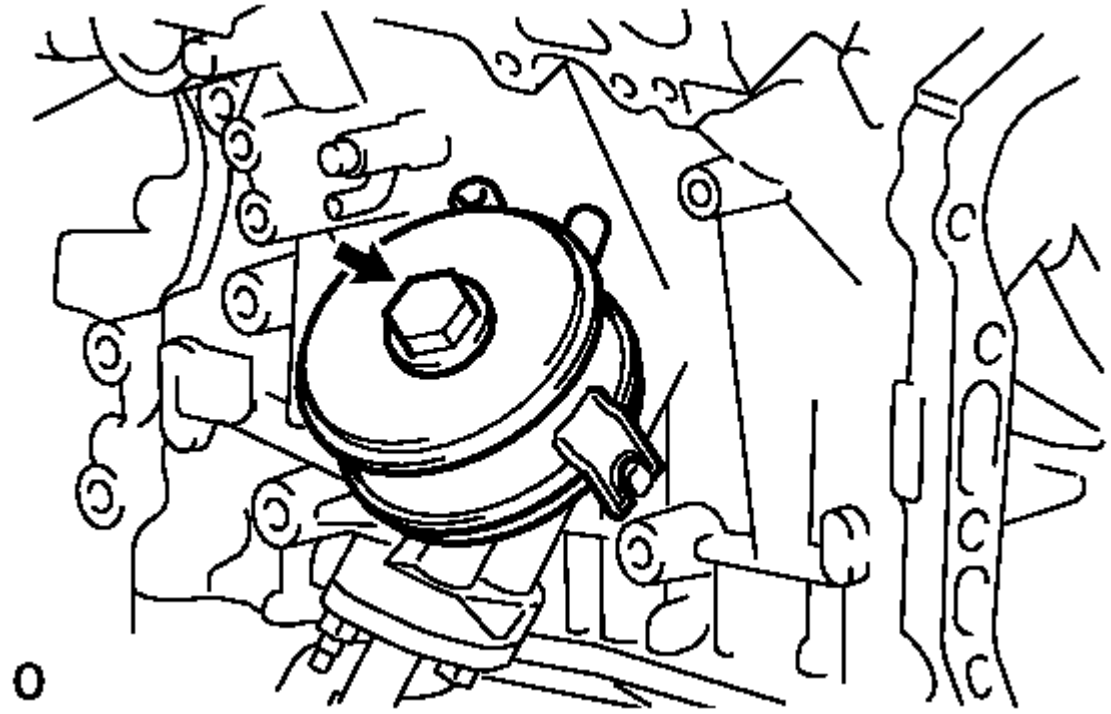


Fig. 308: Identifying Oil Cooler Union Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Install the oil cooler assembly with the union bolt.

   Torque: 68 N*m (693 kgf*cm, 50 ft.*lbf)

c. Install the 2 water by-pass hoses with the bolt, 2 clamps, and 4 clips.

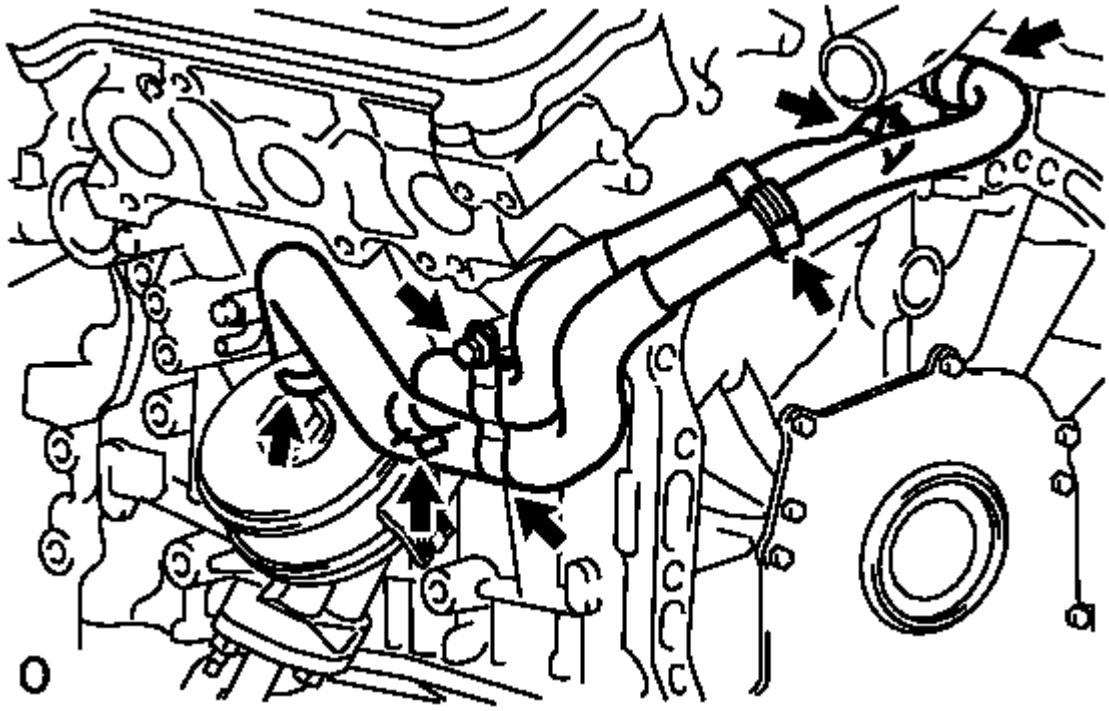


Fig. 309: Identifying Bolt, Clamps, And Clips
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

48. **INSTALL CRANKSHAFT PULLEY** See step 2
49. **INSTALL OIL FILTER ELEMENT** . Refer to **REPLACEMENT - Step 3**
50. **INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY**
    a. Apply adhesive around the drain cock sub-assembly.

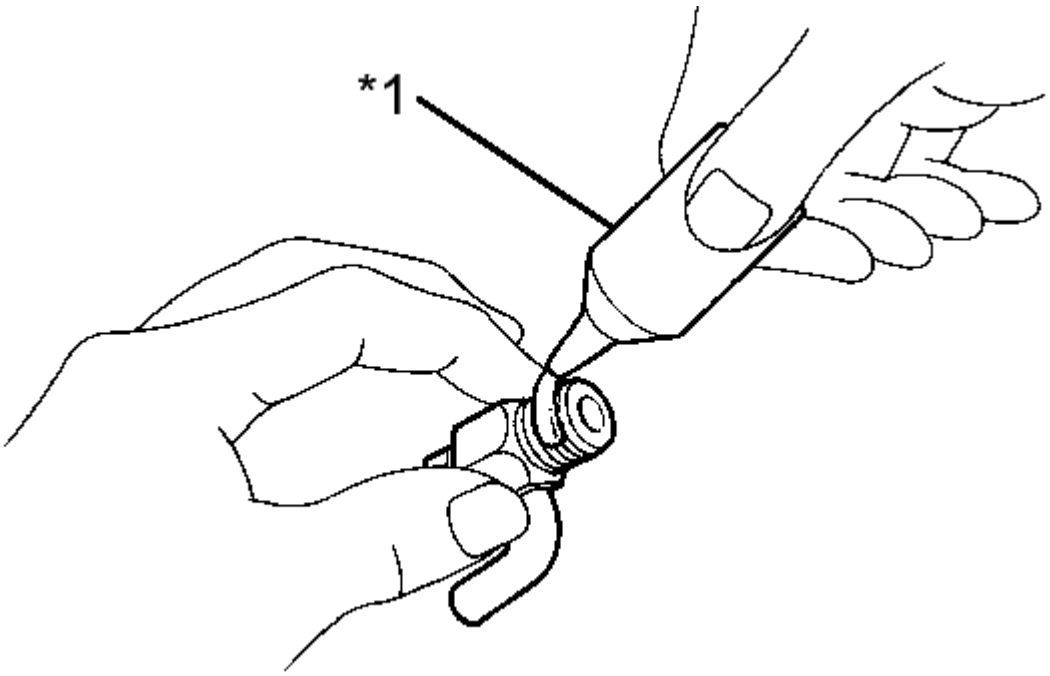


Fig. 310: Applying Adhesive To Drain Cock Sub-Assembly Threads
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Adhesive

Adhesive

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

b. Install the water drain cocks as shown in the illustration.

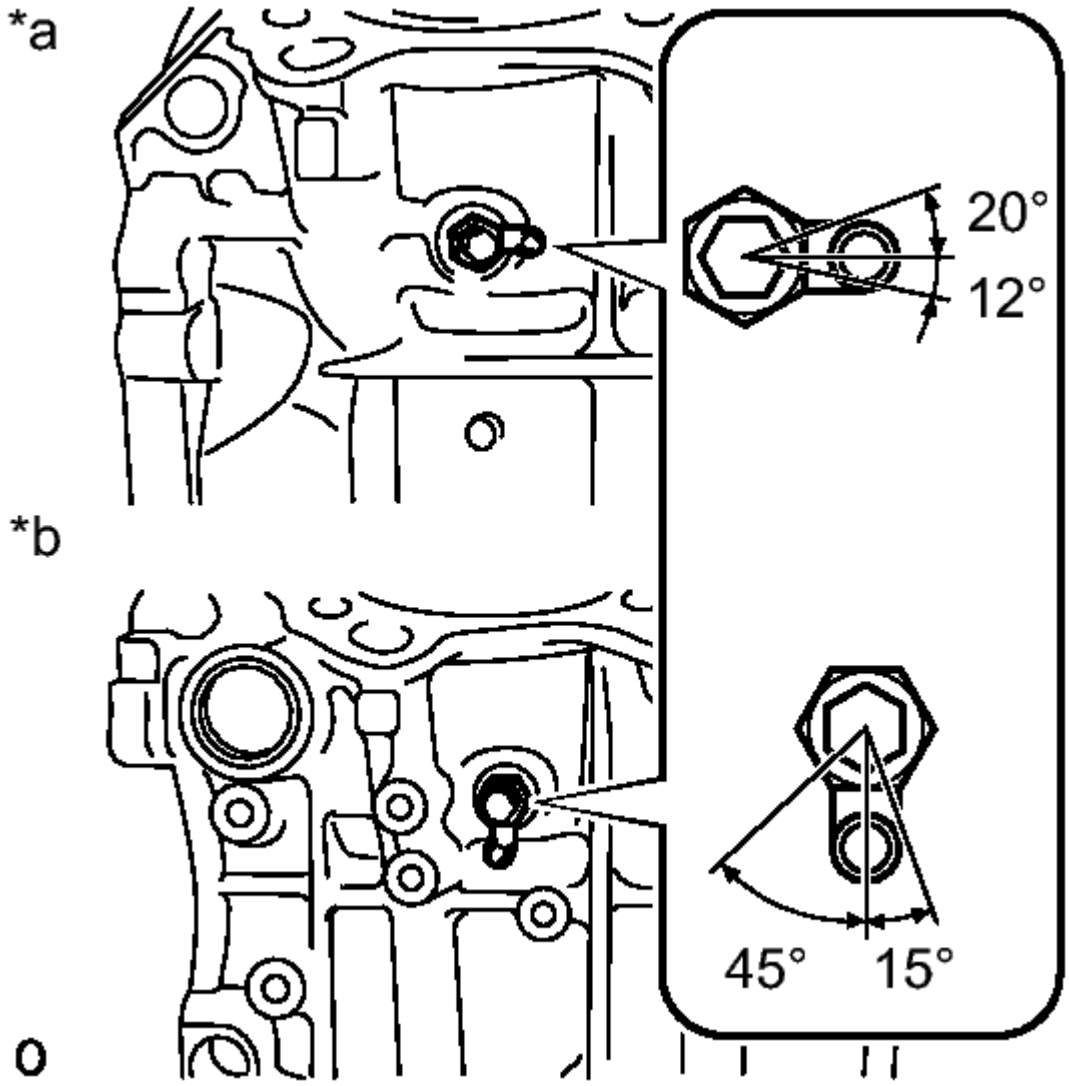


Fig. 311: Identifying Bank 1 & Bank 2 Drain Cock Angles
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	for Bank 1
*b	for Bank 2

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

NOTE: **Do not rotate the drain cocks more than 1 revolution (360°) after tightening the drain cocks with the specified torque.**

c. Install the water drain cock plugs to the water drain cocks.

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

51. **INSTALL NO. 1 OIL PIPE**

a. Make sure that there is no foreign matter on the mesh of the oil control valve filter LH.

NOTE: Do not touch the mesh when installing the oil control valve filter.

b. Install the oil control valve filter LH to the oil pipe union. Install new gaskets and temporarily install the oil pipe (on the head cover side) with the union.

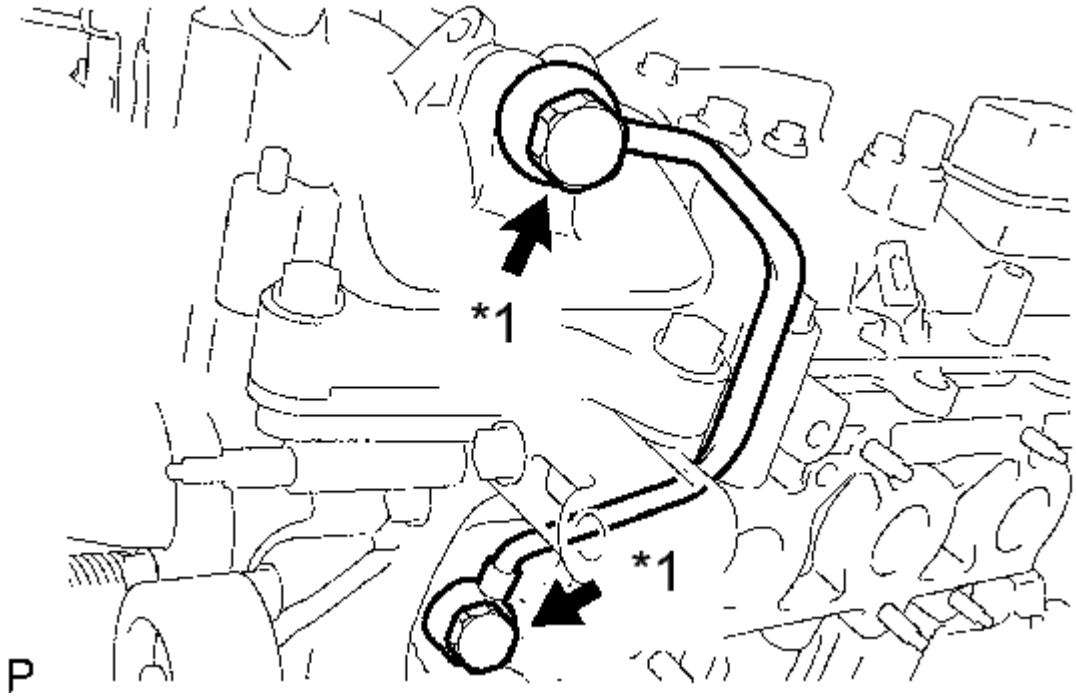


Fig. 312: Identifying Oil Pipe Union And No. 1 Oil Pipe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Oil Pipe Union

c. Install a new gasket and temporarily install the oil pipe (on the cylinder head side) with the union.

d. Tighten the oil pipe union (on the head cover side).

Torque: 65 N*m (663 kgf*cm, 48 ft.*lbf)

e. Tighten the oil pipe union (on the cylinder head side).

Torque: 65 N*m (663 kgf*cm, 48 ft.*lbf)

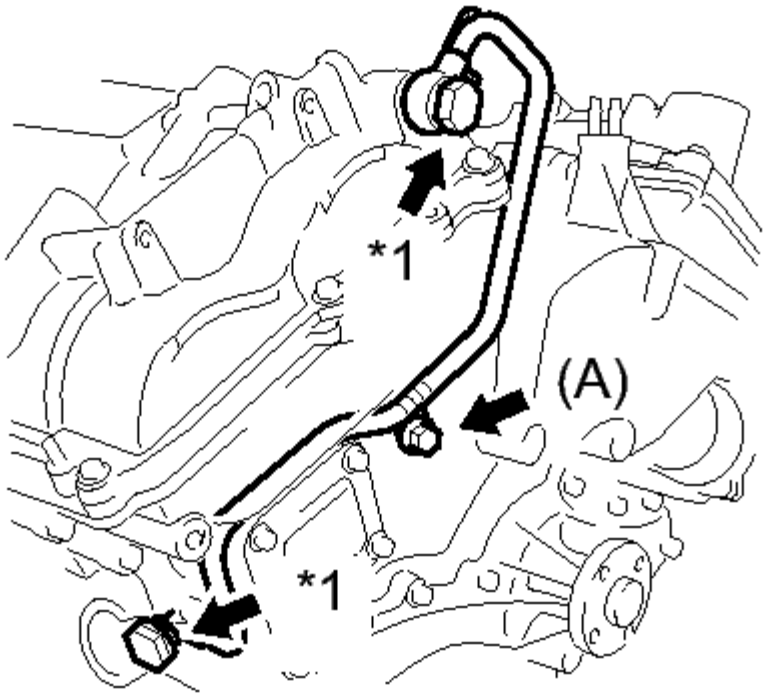
NOTE: If the link that connects the gaskets is broken, remove the connecting link by using side cutters or a similar tool.

52. **INSTALL OIL PIPE**

a. Make sure that there is no foreign matter on the mesh of the oil control valve filter RH.

NOTE: Do not touch the mesh when installing the oil control valve filter.

b. Install the oil control valve filter RH to the oil pipe union. Install new gaskets and temporarily install the oil pipe (on the head cover side) with the union.



C

Fig. 313: Identifying Cylinder Head Oil Pipe (RH)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Oil Pipe Union

c. Install a new gasket and temporarily install the oil pipe (on the cylinder head side) with the union.

d. Install the bolt (A) to the cylinder head.

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

e. Tighten the oil pipe union (on the head cover side).

Torque: 65 N*m (663 kgf*cm, 48 ft.*lbf)

f. Tighten the oil pipe union (on the cylinder head side).

Torque: 65 N*m (663 kgf*cm, 48 ft.*lbf)

NOTE: **If the link that connects the gaskets is broken, remove the connecting link by using side cutters or a similar tool.**

53. **INSTALL CRANKSHAFT POSITION SENSOR** . Refer to **INSTALLATION - Step 1**
54. **INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY**

Refer to **INSTALLATION**

55. **INSTALL VVT SENSOR**

Refer to **INSTALLATION**

56. **INSTALL VENTILATION VALVE SUB-ASSEMBLY**
    a. Apply adhesive around the ventilation valve sub-assembly.

    Adhesive

    Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

    b. Using a deep socket wrench 19 mm, install the ventilation valve sub-assembly.

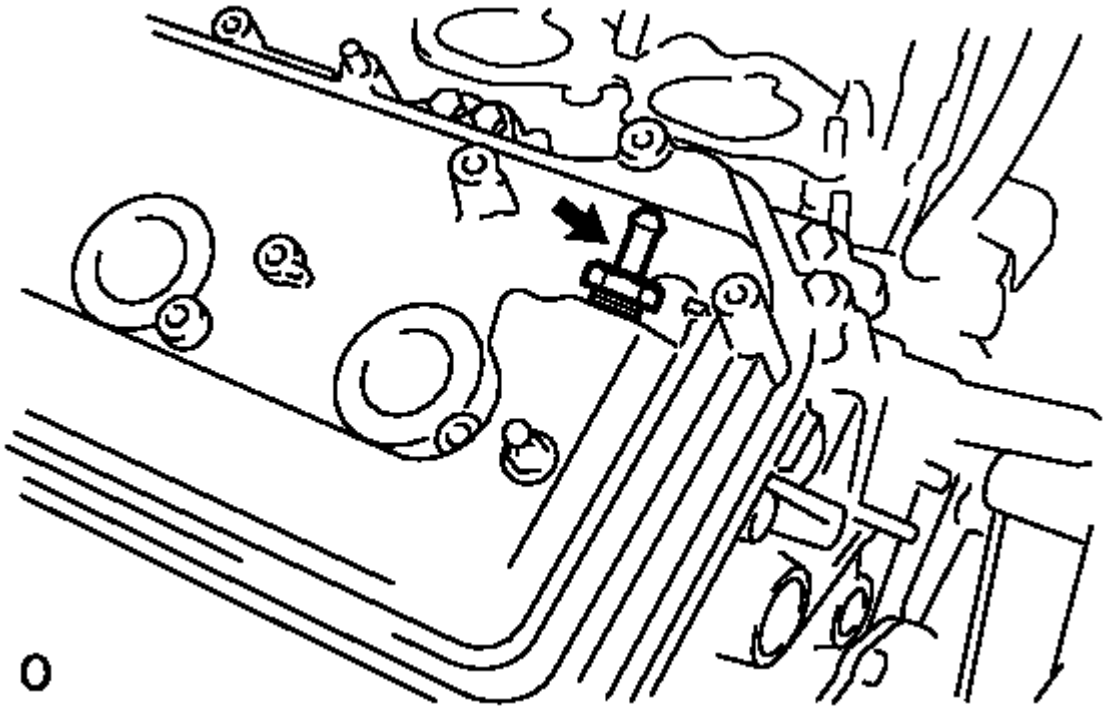


Fig. 314: Identifying Ventilation Valve Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 27 N*m (275 kgf*cm, 20 ft.*lbf)

57. **INSTALL SPARK PLUG** . Refer to **INSTALLATION - Step 1**
58. **INSTALL OIL FILLER CAP SUB-ASSEMBLY**
    a. Install a new oil filler gasket.
    b. Install the oil filler cap sub-assembly.

INSTALLATION

INSTALLATION

1. **INSTALL ENGINE COOLANT TEMPERATURE SENSOR** . Refer to **INSTALLATION - Step 1**
2. **INSTALL KNOCK SENSOR** . Refer to **INSTALLATION - Step 1**
3. **INSTALL KNOCK SENSOR WIRE**
    a. Connect the 2 clamps, 2 knock sensor connectors and knock sensor wire connector.
4. **INSTALL ENGINE OIL PRESSURE SWITCH ASSEMBLY**
    a. Clean the threads of the oil pressure switch. Apply adhesive to 2 or 3 threads of the oil pressure switch assembly.

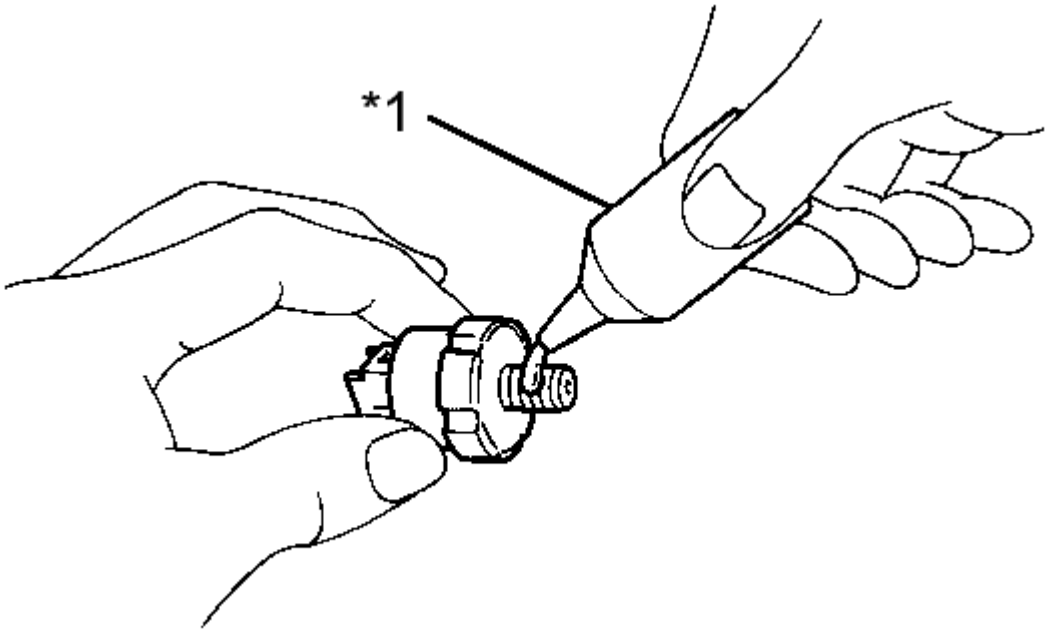


Fig. 315: Applying Adhesive To Oil Pressure Switch Threads
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Adhesive

Adhesive

Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

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

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

NOTE: Do not start the engine within 1 hour after installation to prevent oil leaks.

5. **INSTALL NO. 1 VACUUM SWITCHING VALVE ASSEMBLY**
   a. Install the No. 1 vacuum switching valve with the bolt.

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

6. **INSTALL WATER PUMP PULLEY** . Refer to **INSTALLATION - Step 2**
7. **INSTALL NO. 2 IDLER PULLEY SUB-ASSEMBLY**
   a. Install the idler pulley cover plate, No. 2 idler pulley sub-assembly and No. 2 idler pulley cover plate with the bolt.

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

8. **INSTALL NO. 2 TIMING GEAR COVER**
   a. Install the No. 2 timing gear cover with the 2 bolts.

      Torque: 6.0 N*m (61 kgf*cm, 53 in.*lbf)

9. **INSTALL V-RIBBED BELT TENSIONER ASSEMBLY**
   a. Temporarily install the V-ribbed belt tensioner assembly with the 5 bolts.

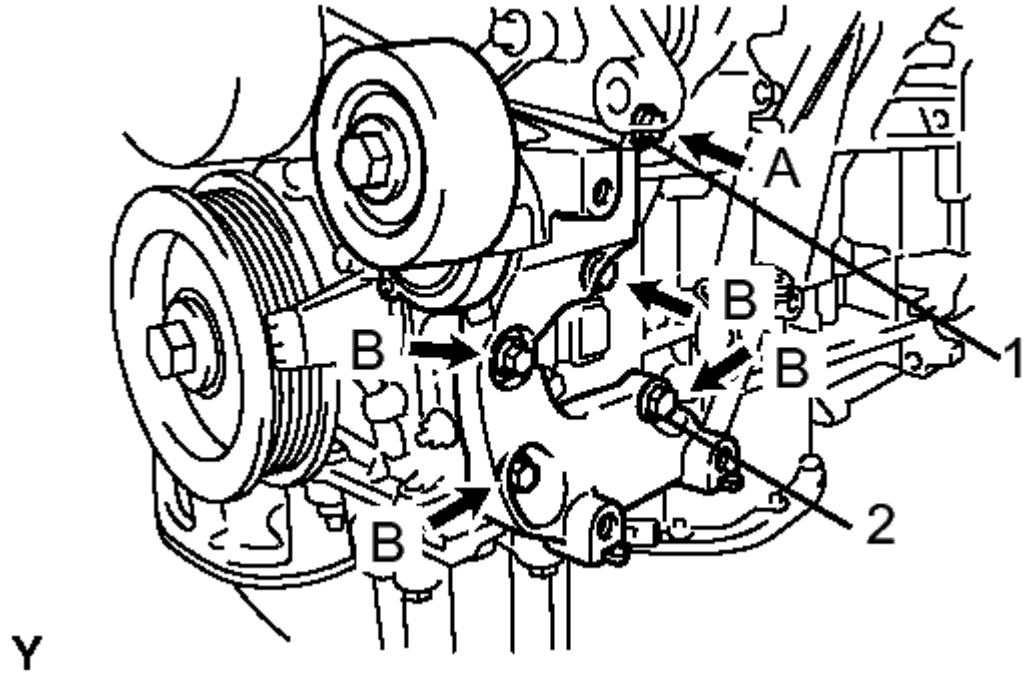


Fig. 316: Identifying V-Ribbed Belt Tensioner
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Each bolt length is as follows:

A: 70 mm (2.76 in.)

B: 33 mm (1.30 in.)

   b. Install the V-ribbed belt tensioner assembly by tightening the bolt 1 and bolt 2 in the order shown in the illustration.

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

   c. Tighten the other bolts.

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

10. **INSTALL EXHAUST MANIFOLD SUB-ASSEMBLY LH**

a. Install a new gasket as shown in the illustration.

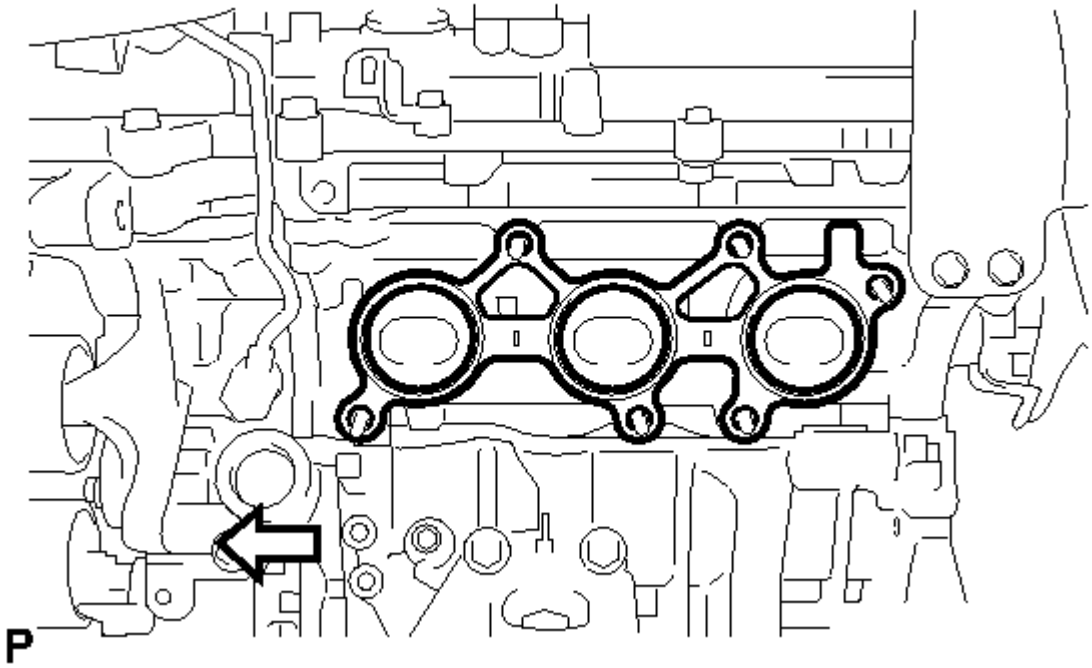


Fig. 317: Identifying LH Exhaust Manifold Gasket Engine Front Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

Engine Front

b. Install the exhaust manifold sub-assembly LH with the 6 nuts in the order shown in the illustration.

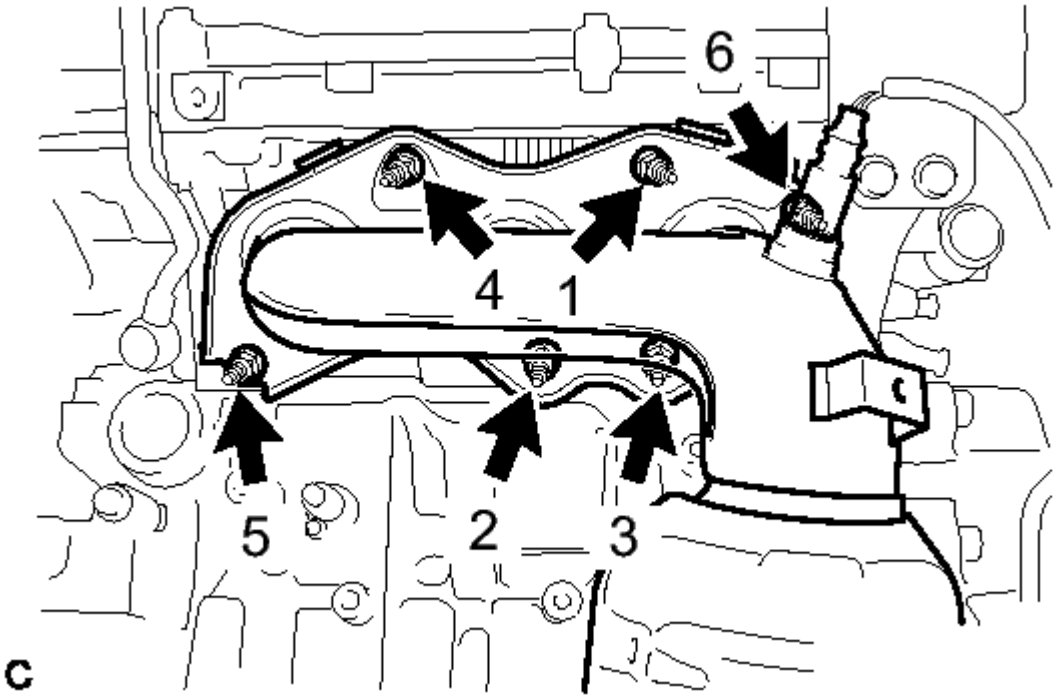


Fig. 318: Identifying Exhaust Manifold Sub-Assembly LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

11. **INSTALL NO. 2 EXHAUST MANIFOLD HEAT INSULATOR** . Refer to **INSTALLATION - Step 4**
12. **INSTALL NO. 2 MANIFOLD STAY** . Refer to **INSTALLATION - Step 5**
13. **INSTALL NO. 2 ENGINE OIL LEVEL DIPSTICK GUIDE**
    a. Install a new O-ring to the No. 2 engine oil level dipstick guide.
    b. Apply a light coat of engine oil to the O-ring.
    c. Push in the No. 2 engine oil level dipstick guide end into the engine oil level dipstick guide.
    d. Install the No. 2 engine oil level dipstick guide with the bolt.

    Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

    e. Install the engine oil level dipstick.
14. **INSTALL EXHAUST MANIFOLD SUB-ASSEMBLY RH**
    a. Install a new gasket as shown in the illustration.

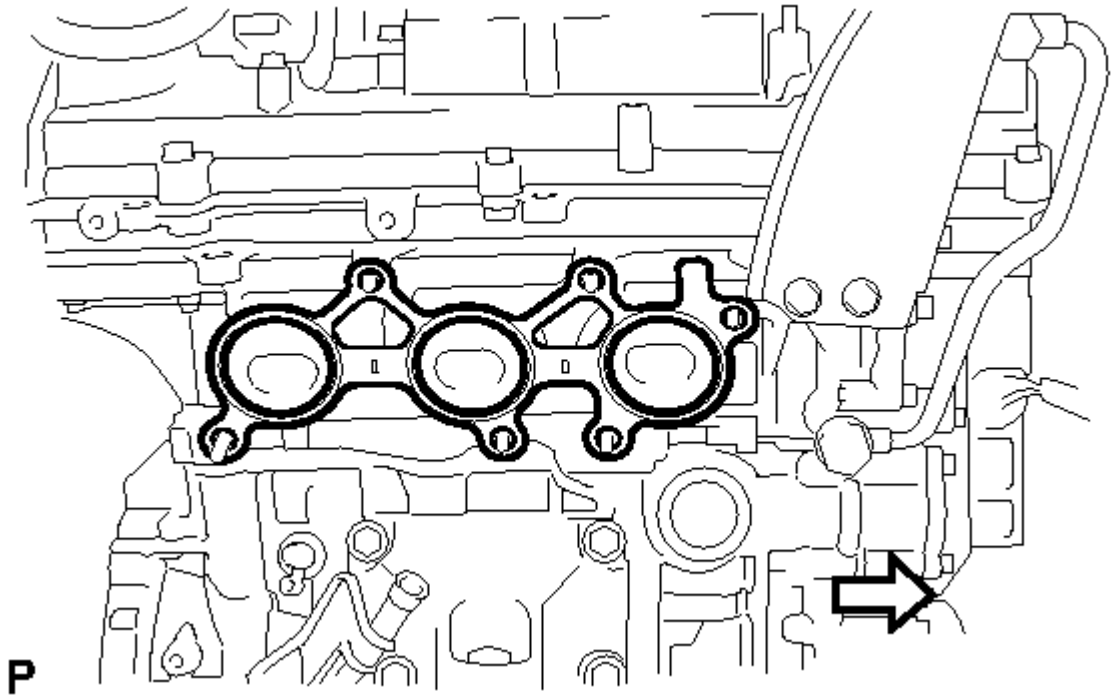


Fig. 319: Identifying RH Exhaust Manifold Gasket Engine Front Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

Engine Front

b. Install the exhaust manifold sub-assembly RH with the 6 nuts in the order shown in the illustration.

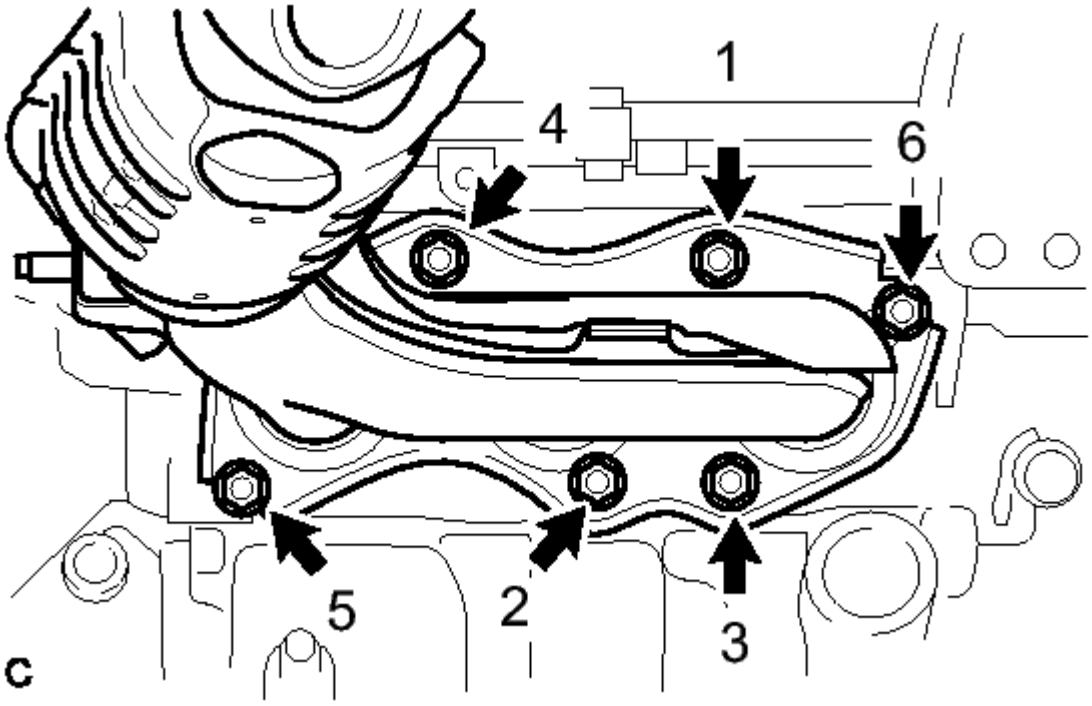


Fig. 320: Identifying RH Exhaust Manifold Nuts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

15. **INSTALL INTAKE MANIFOLD**

NOTE: **DO NOT apply oil to the bolts listed below:**

Tightening Part
Intake Manifold and Cylinder Head Sub-assembly RH
Intake Manifold and Cylinder Head Sub-assembly LH

a. Set a new gasket on each cylinder head.

NOTE:

- **Align the port holes of the gasket and cylinder head.**
- **Make sure that the gasket is installed in the correct direction.**

b. Set the intake manifold on the cylinder heads.

c. Install and tighten the 6 bolts and 4 nuts uniformly in several steps.

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

16. **INSTALL FUEL HOSE PROTECTOR**

a. Install the fuel hose protector with the 2 bolts and nut.

Bolt

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

Nut

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

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

a. Install the No. 2 engine mounting stay RH with the bolt.

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

18. **INSTALL IGNITION COIL ASSEMBLY** . Refer to **INSTALLATION - Step 2**

19. **INSTALL NO. 1 SURGE TANK STAY**

a. Install the No. 1 surge tank stay with the bolt.

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

20. **INSTALL THROTTLE BODY BRACKET**

a. Install the throttle body bracket with the bolt.

Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

21. **INSTALL INTAKE AIR SURGE TANK ASSEMBLY** . Refer to **INSTALLATION - Step 6**

22. **INSTALL ENGINE HANGERS**

a. Install the 2 engine hangers with the 4 bolts as shown in the illustration.

PART NO.

Item	Part No.

No. 1 engine hanger	12281-31120
No. 2 engine hanger	12282-31100
Bolt	91671-10825

Torque: 33 N*m (337 kgf*cm, 24 ft.*lbf)

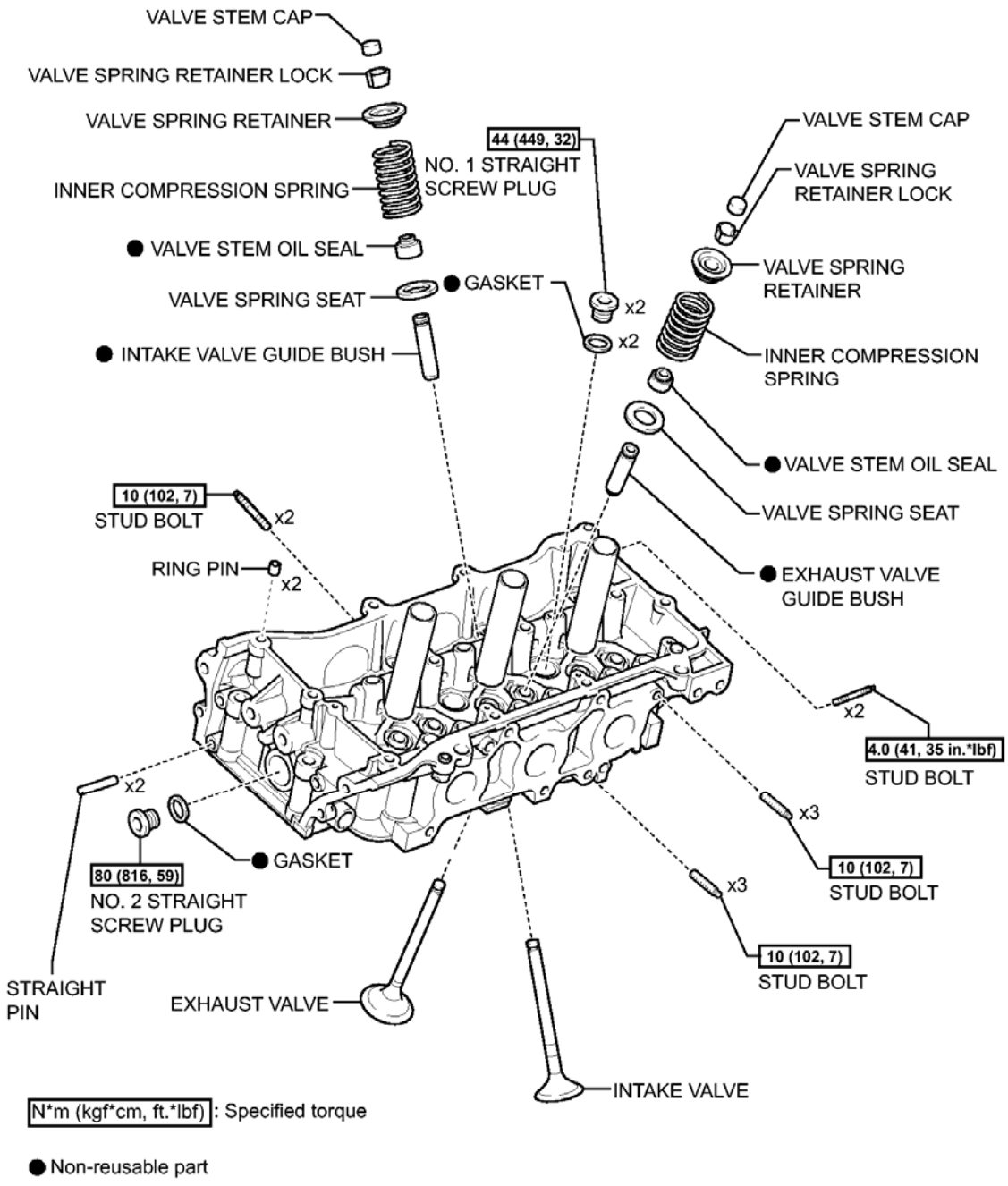
b. Attach the engine sling device and hang the engine with the chain block.

23. **REMOVE ENGINE STAND**

CYLINDER HEAD

COMPONENTS

ILLUSTRATION



P

Fig. 321: 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 heads.

HINT:

Arrange the removed parts in the correct order.

2. **REMOVE INTAKE VALVE**
   a. Using SST, compress the inner compression spring and remove the valve spring retainer locks.

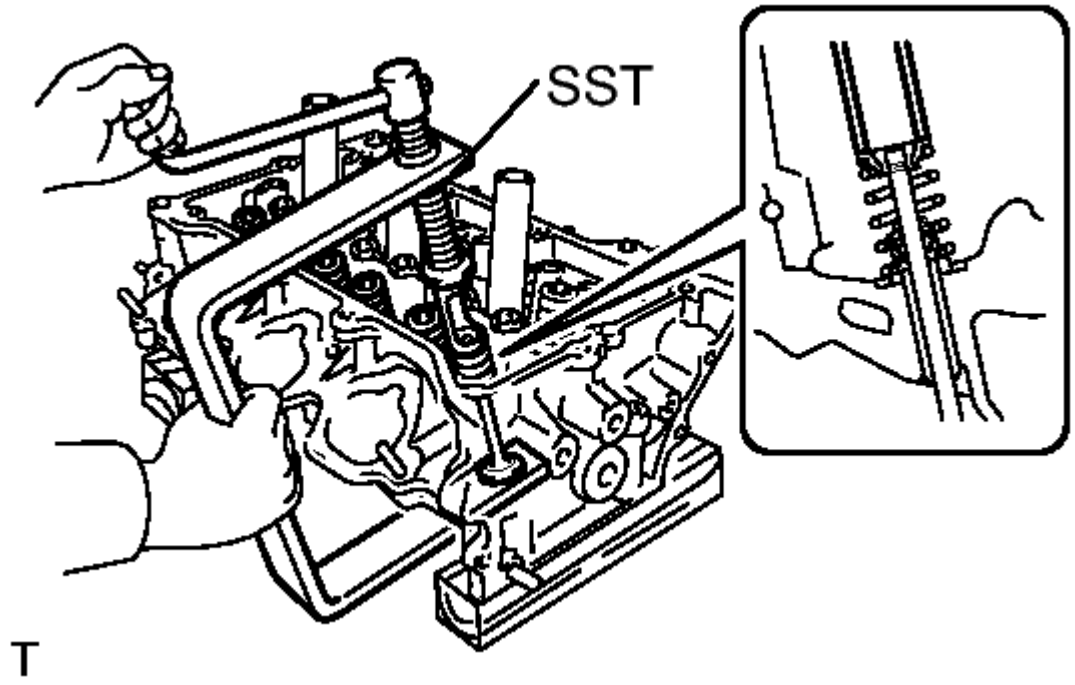


Fig. 322: Compressing Compression Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- **SST: 09202-70020**
  09202-00010
  09202-01010
  09202-01020

   b. Remove the valve spring retainer, inner compression spring and intake valve.

HINT:

Arrange the removed parts in the correct order.

3. **REMOVE EXHAUST VALVE**
   a. Using SST, compress the inner compression spring and remove the valve spring retainer locks.

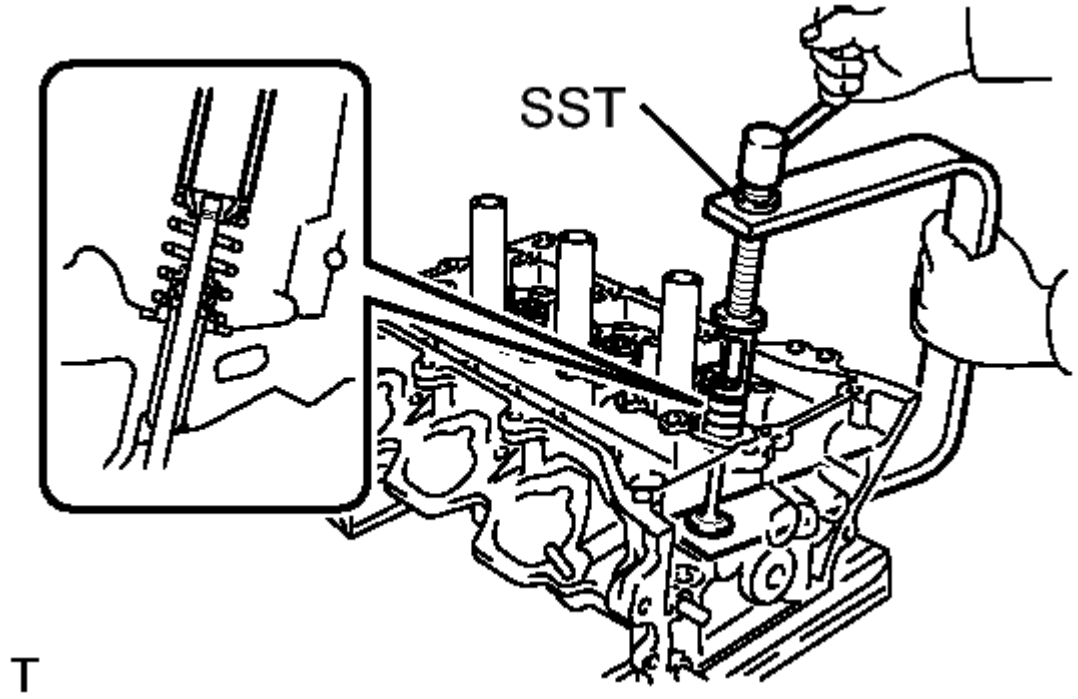


Fig. 323: Compressing Compression Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- **SST: 09202-70020**
  09202-00010
  09202-01010
  09202-01020

b. Remove the valve spring retainer, inner compression spring and exhaust valve.

HINT:

Arrange the removed parts in the correct order.

4. **REMOVE VALVE STEM OIL SEAL**
   a. Using needle-nose pliers, remove the valve stem oil seals.

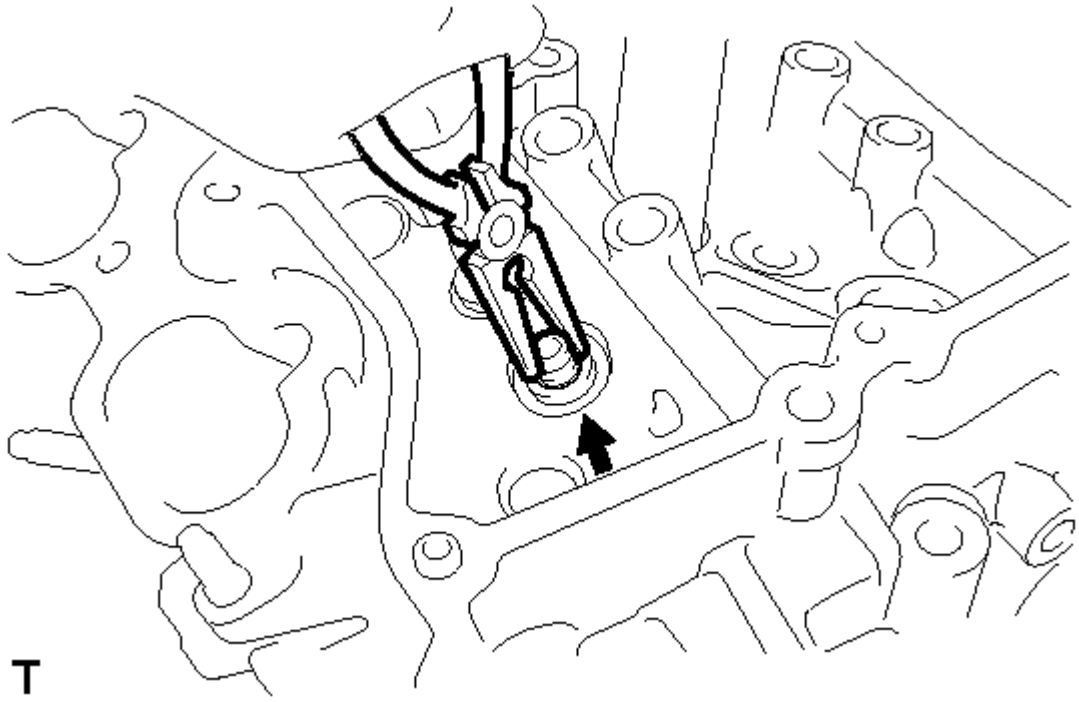


Fig. 324: Removing Valve Stem Oil Seal Using Needle-Nose Pliers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **REMOVE VALVE SPRING SEAT**
   a. Using compressed air and a Magnet Hand, remove the valve spring seats by blowing air onto them.

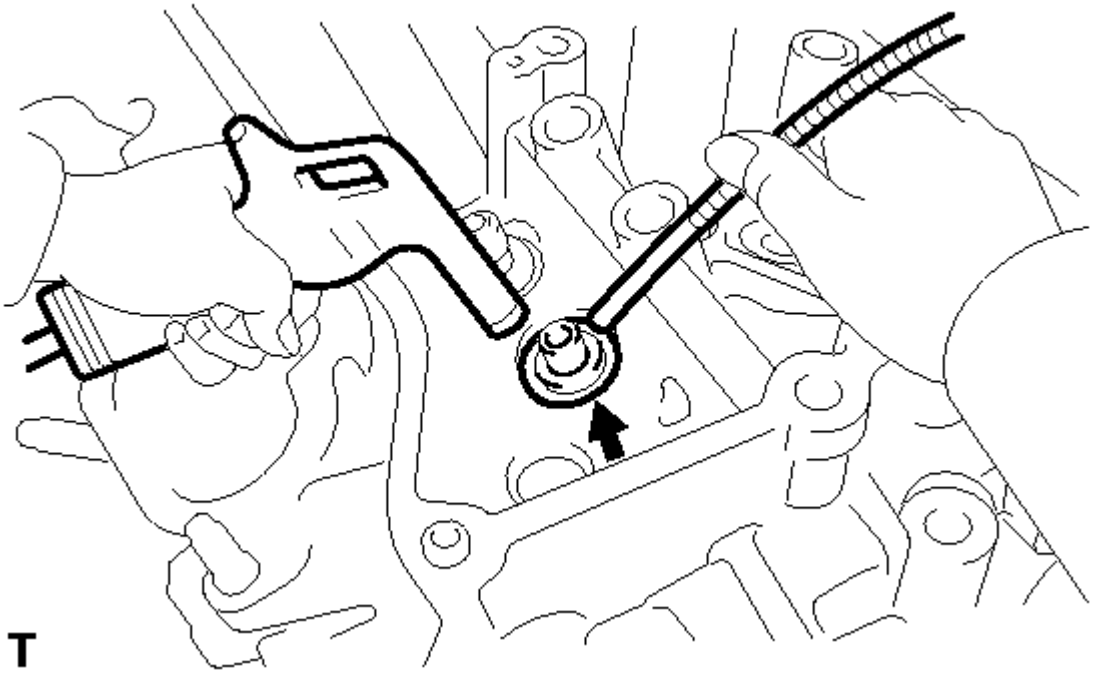


Fig. 325: Removing Valve Spring Seat

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

6. **REMOVE NO. 1 STRAIGHT SCREW PLUG**

   a. Using a 10 mm hexagon wrench, remove the 4 No. 1 straight screw plugs and 4 gaskets.

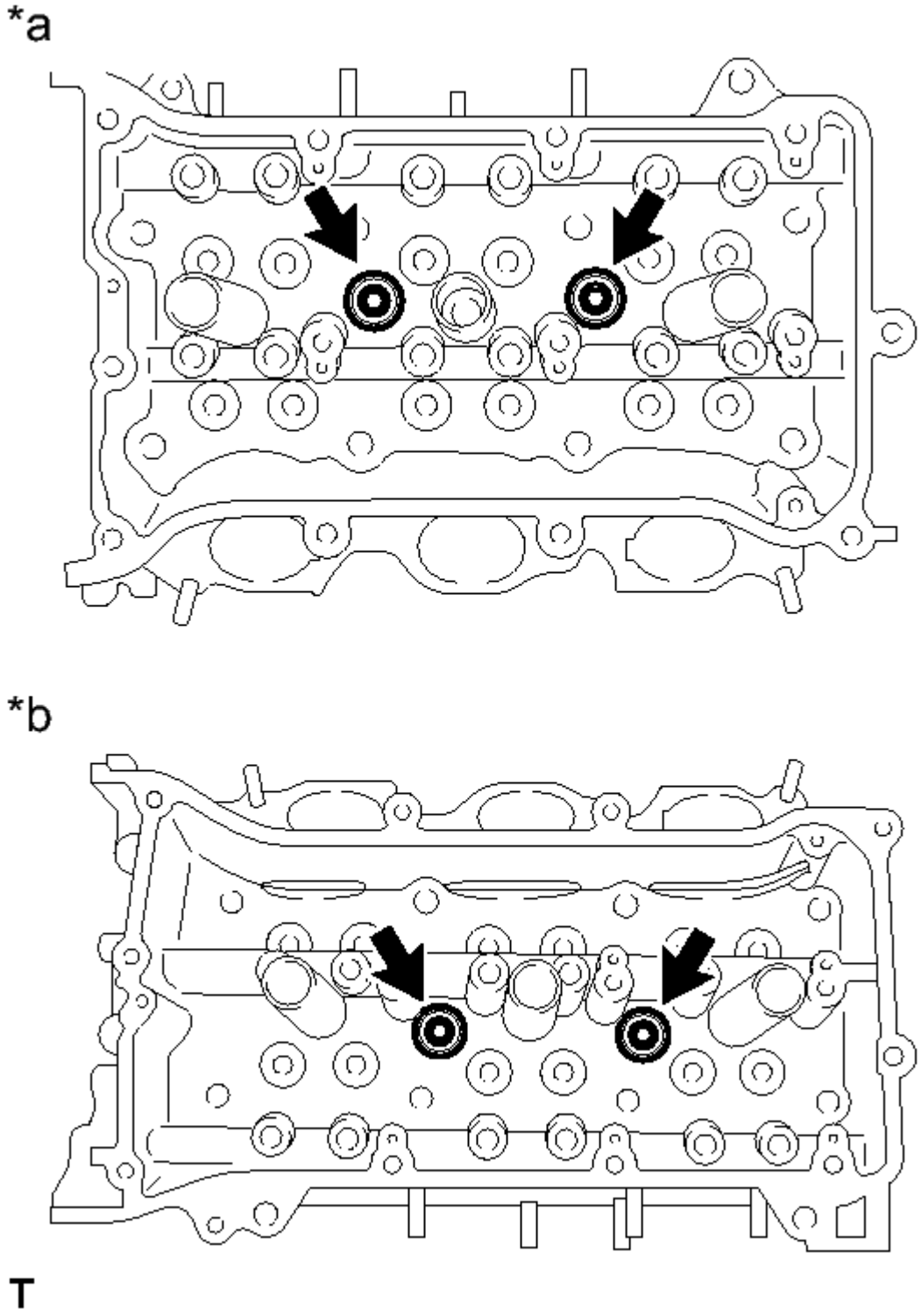


Fig. 326: Identifying No. 1 Straight Screw Plugs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	for Bank 1
*b	for Bank 2

NOTE: **If water leaks from a straight screw plug or the plug is corroded, replace it.**

7. **REMOVE NO. 2 STRAIGHT SCREW PLUG**
   a. Using a 14 mm hexagon wrench, remove the 2 No. 2 straight screw plugs and 2 gaskets.

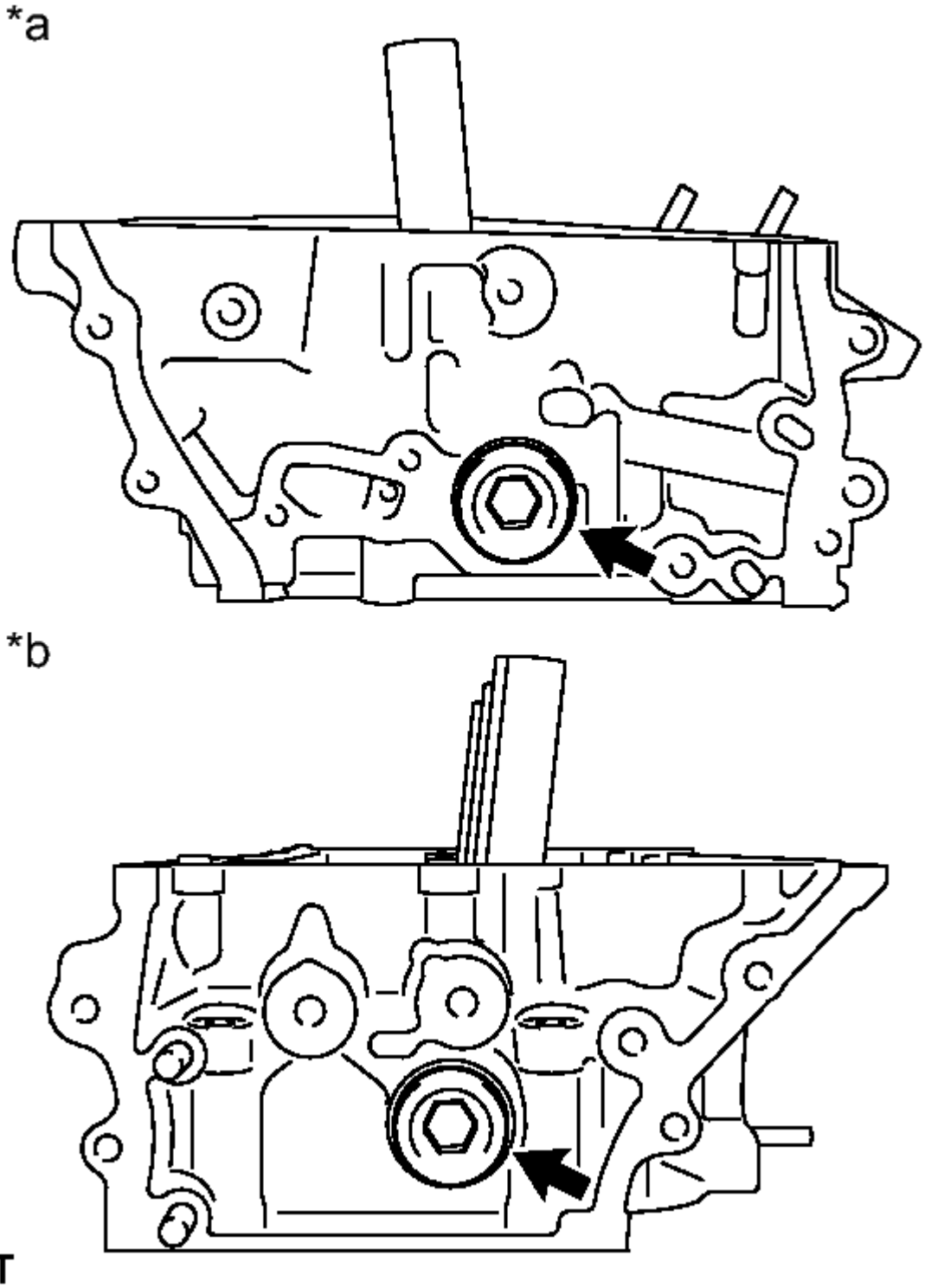


Fig. 327: Identifying No. 2 Straight Screw Plugs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	for

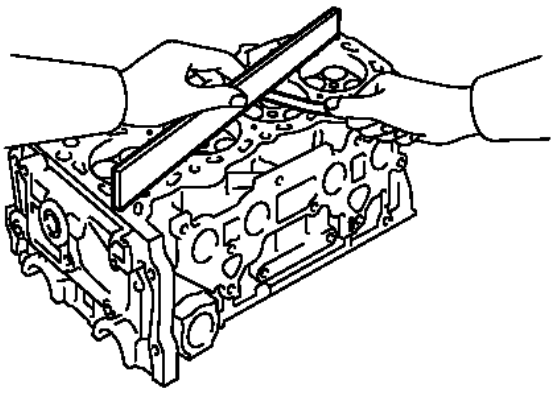
*a	Bank 1
*b	for Bank 2

NOTE: **If water leaks from a straight screw plug or the plug is corroded, replace it.**

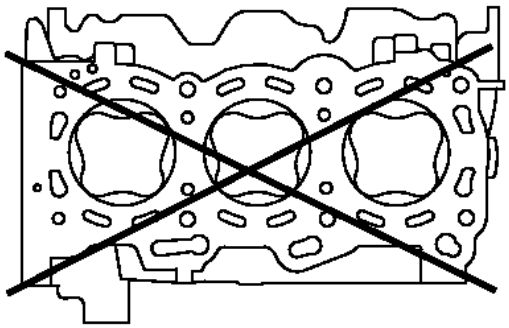
INSPECTION

INSPECTION

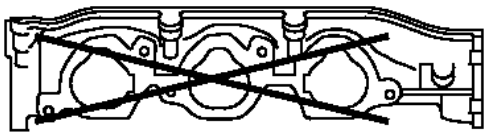
1. **INSPECT CYLINDER HEAD SUB-ASSEMBLY**



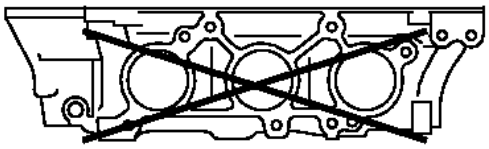
*a



*b



*c



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Fig. 328: Inspecting Cylinder Head Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Cylinder Head Lower Side
*b	Intake Side
*c	Exhaust Side

a. Using a precision straightedge and feeler gauge, measure the warpage of the contact surface of the cylinder block sub-assembly and manifolds.

Standard Warpage

Item	Warpage
Cylinder head lower	0.05 mm (0.00197 in.)
Intake	0.08 mm (0.00315 in.)
Exhaust	0.08 mm (0.00315 in.)

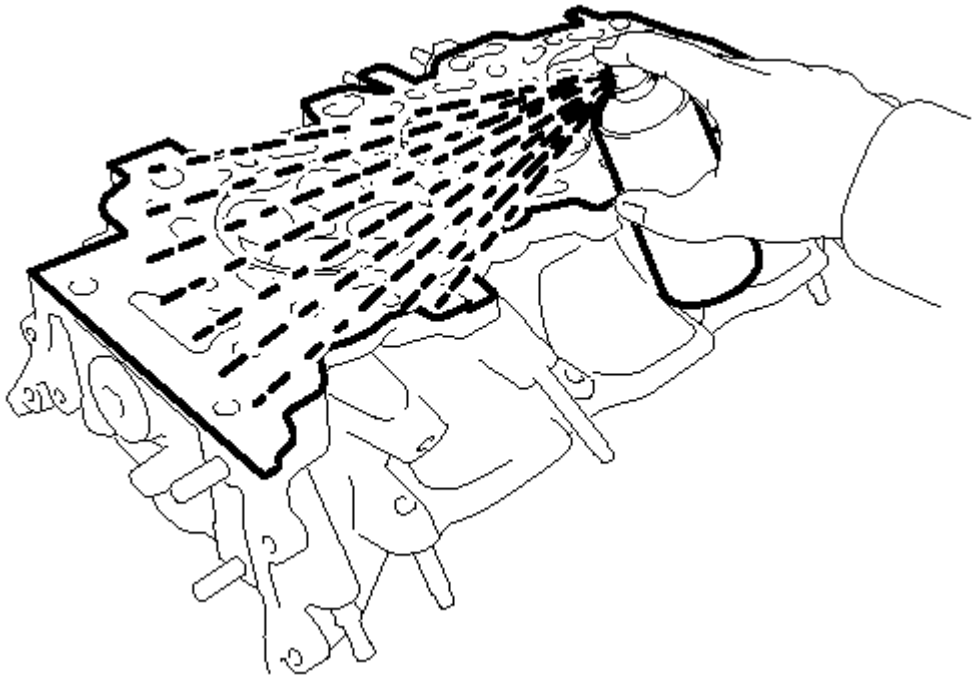
Maximum Warpage

Item	Warpage
Cylinder head lower	0.10 mm (0.00394 in.)
Intake	0.10 mm (0.00394 in.)
Exhaust	0.10 mm (0.00394 in.)

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

2. **INSPECT CYLINDER HEAD FOR CRACKS**

a. Using a dye penetrant, check the intake ports, exhaust ports and cylinder surface for cracks.

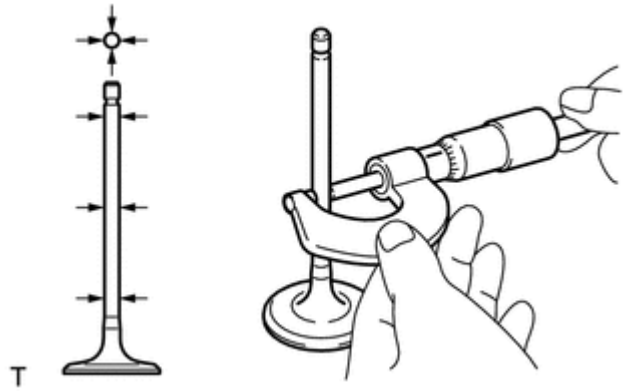


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Fig. 329: Checking Intake Ports, Exhaust Ports And Cylinder Surface For Cracks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If cracked, replace the cylinder head sub-assembly.

3. **INSPECT INTAKE VALVE**
   a. Using a micrometer, measure the diameter of the valve stem.



T

Fig. 330: Measuring Diameter Of Valve Stem
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Valve stem diameter

5.470 to 5.485 mm (0.2154 to 0.2159 in.)

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

b. Using a vernier caliper, measure the valve head margin thickness.

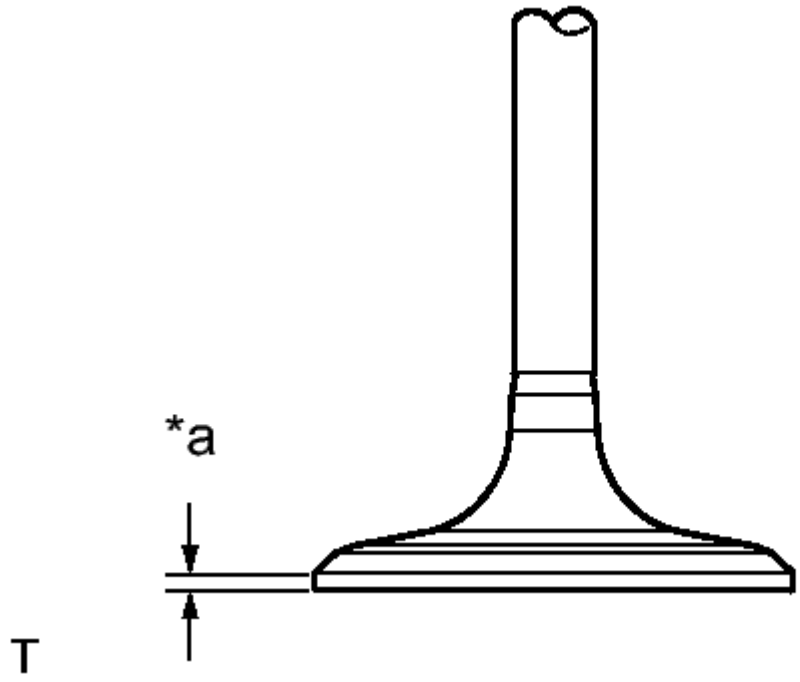


Fig. 331: Measuring Intake Valve Head Margin Thickness Using A Vernier Caliper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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 intake valve.

c. Using a vernier caliper, measure the valve overall length.

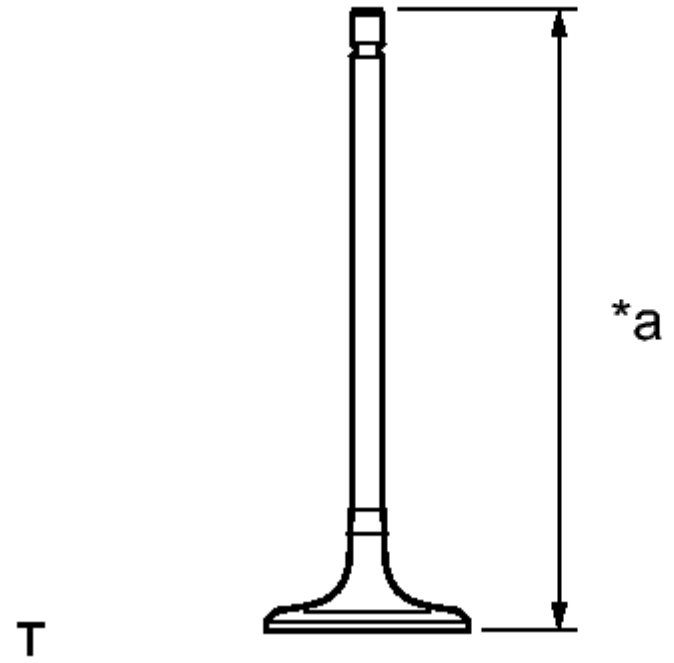


Fig. 332: Identifying Overall Length Of Intake Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Overall Length

Standard overall length

105.85 mm (4.1673 in.)

Minimum overall length

105.35 mm (4.1476 in.)

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

4. **INSPECT EXHAUST VALVE**
    a. Using a micrometer, measure the diameter of the valve stem.

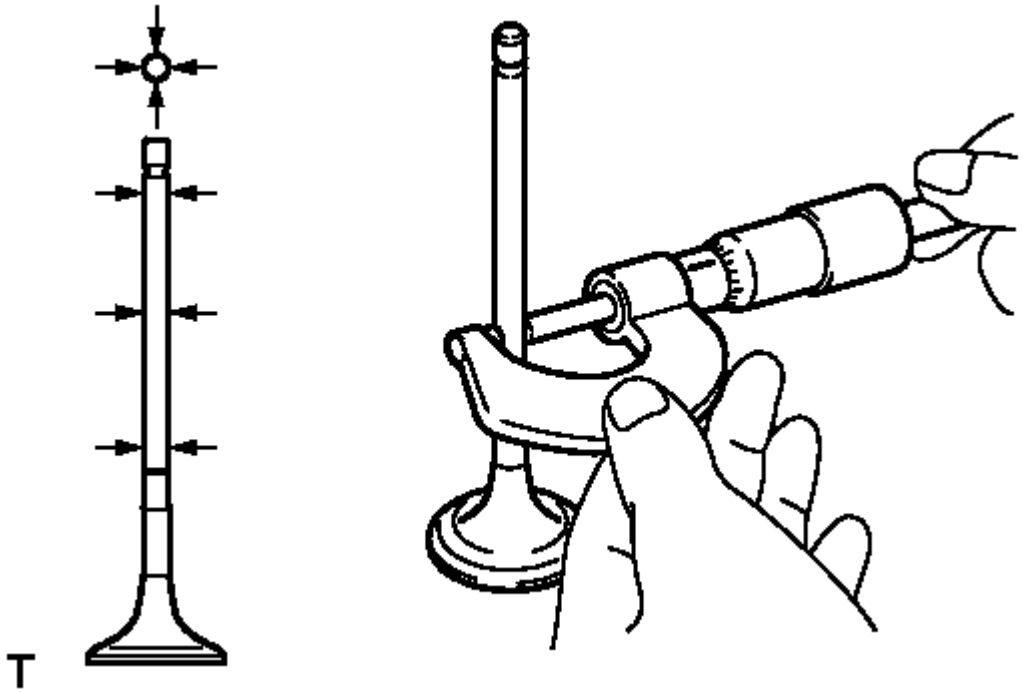


Fig. 333: Checking Diameter Of Exhaust Valve Stem
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Valve stem diameter

5.465 to 5.480 mm (0.2152 to 0.2157 in.)

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

b. Using a vernier caliper, measure the valve head margin thickness.

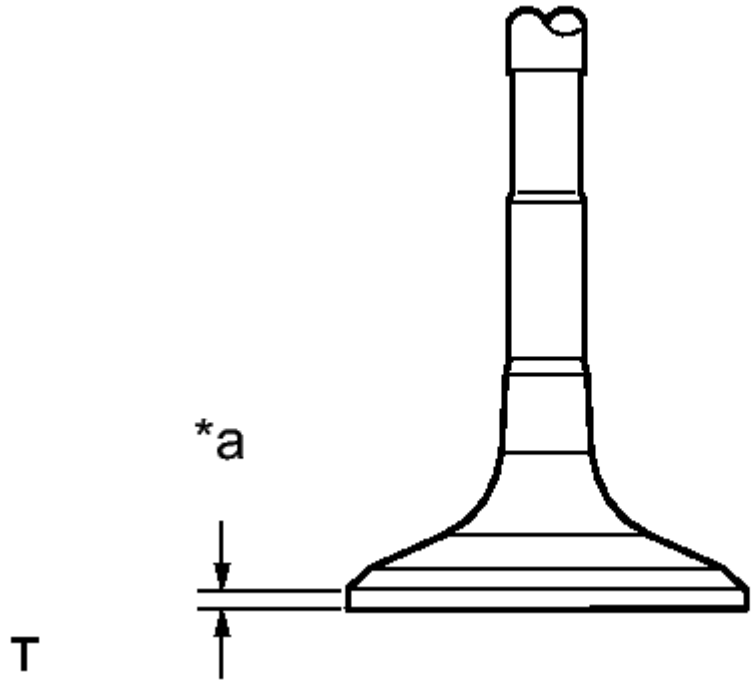


Fig. 334: Measuring Exhaust Valve Head Margin Thickness Using A Vernier Caliper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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 exhaust valve.

c. Using a vernier caliper, measure the valve overall length.

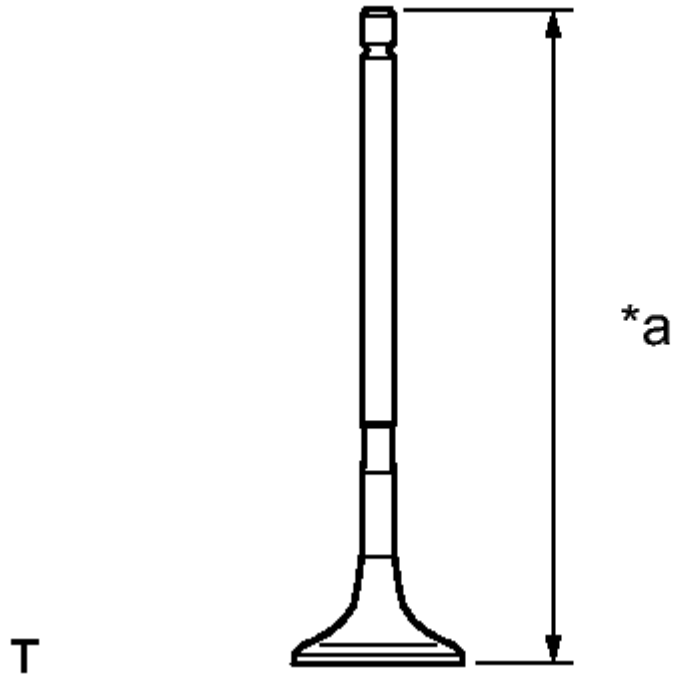


Fig. 335: Identifying Overall Length Of Exhaust Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Overall Length

Standard overall length

110.40 mm (4.3464 in.)

Minimum overall length

109.90 mm (4.3268 in.)

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

5. **INSPECT INTAKE VALVE SEAT**
   a. Apply a light coat of Prussian blue to the valve face.
   b. Lightly press the valve face against the valve seat.
   c. Check the valve face and valve spring seat by using the following procedure:

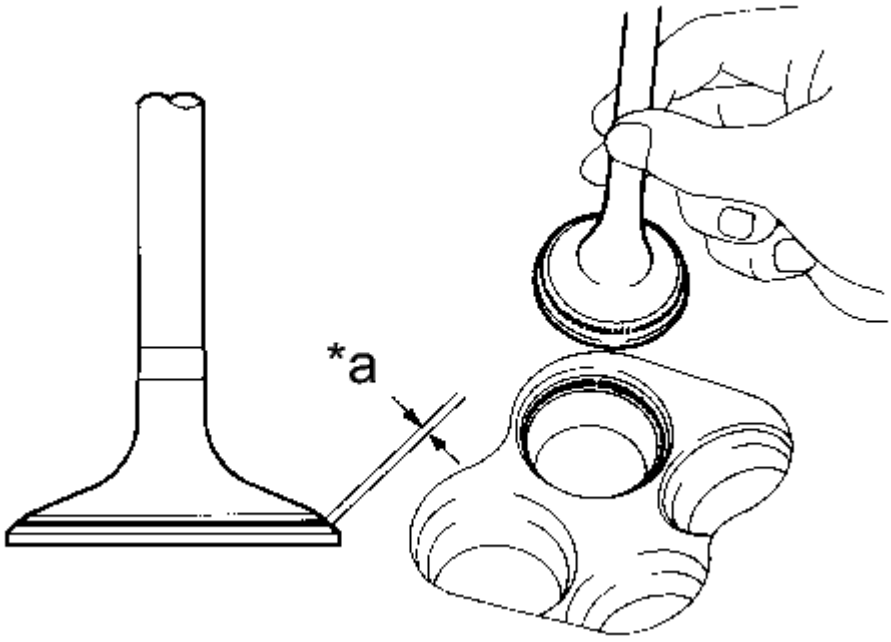


Fig. 336: Inspecting Intake Valve Seat
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Width

1. If Prussian blue appears around the entire valve face, the valve face is concentric. If not, replace the valve.
2. If Prussian blue appears around the entire valve seat, the guide and valve face are concentric. If not, resurface the valve spring seat.
3. Check that the valve spring seat contacts in the middle of the valve face with the width between 1.1 and 1.6 mm (0.0433 and 0.0630 in.).

6. **INSPECT EXHAUST VALVE SEAT**
   a. Apply a light coat of Prussian blue to the valve face.
   b. Lightly press the valve face against the valve spring seat.
   c. Check the valve face and valve spring seat by using the following procedure:

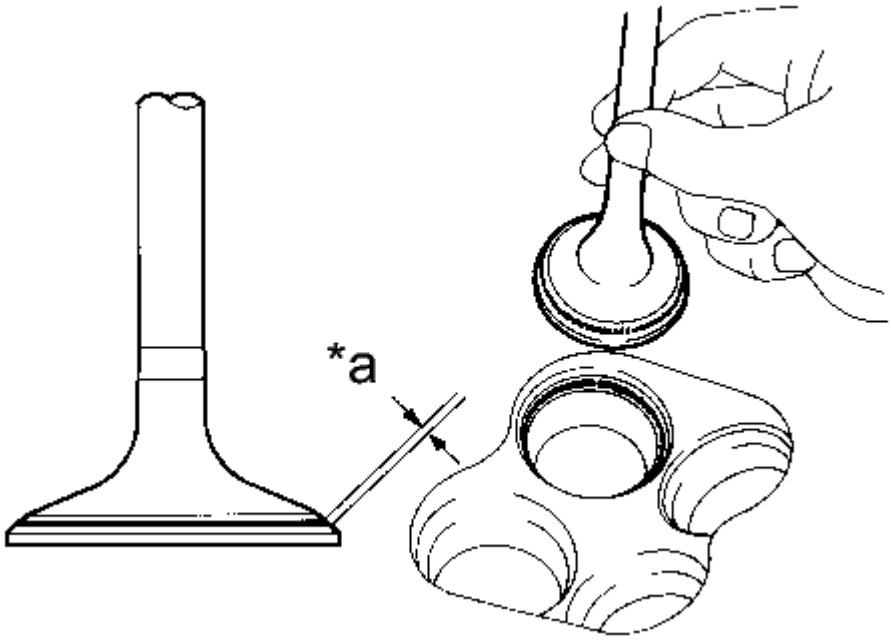


Fig. 337: Inspecting Intake Valve Seat
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Width

1. If Prussian blue appears around the entire valve face, the valve face is concentric. If not, replace the valve.
2. If Prussian blue appears around the entire valve seat, the guide and valve face are concentric. If not, resurface the valve spring seat.
3. Check that the valve spring seat contacts in the middle of the valve face with the width between 1.1 and 1.6 mm (0.0433 and 0.0630 in.).

7. **INSPECT INNER COMPRESSION SPRING**
   a. Using a vernier caliper, measure the free length of the inner compression spring.

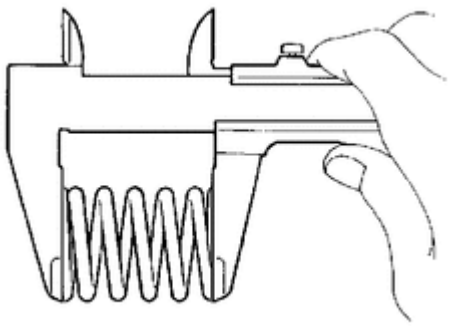


Fig. 338: Measuring Free Length Of Inner Compression Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Free length

45.91 mm (1.8075 in.)

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

b. Using a steel square, measure the deviation of the inner compression spring.

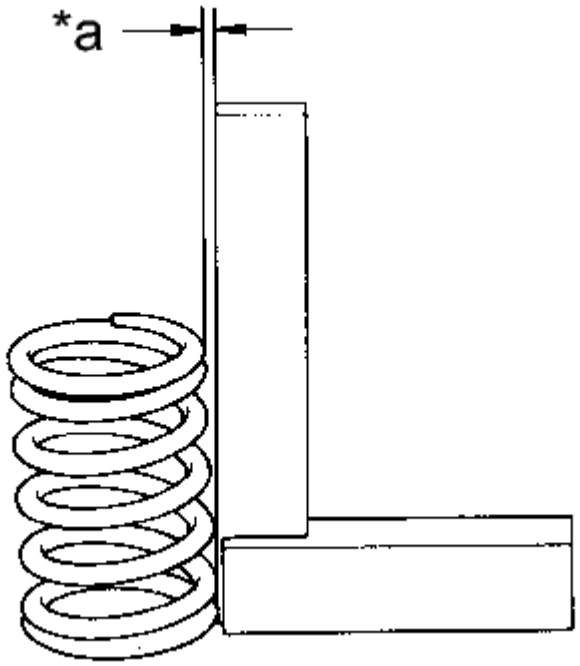


Fig. 339: Measuring Deviation Of Inner Compression Spring Using Steel Square
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Deviation

Maximum deviation

1.0 mm (0.0394 in.)

Maximum angle (reference)

2°

If the deviation is greater than the maximum, replace the inner compression spring.

8. **INSPECT VALVE GUIDE BUSH OIL CLEARANCE**
   a. Using a caliper gauge, measure the inside diameter of the valve guide bush.

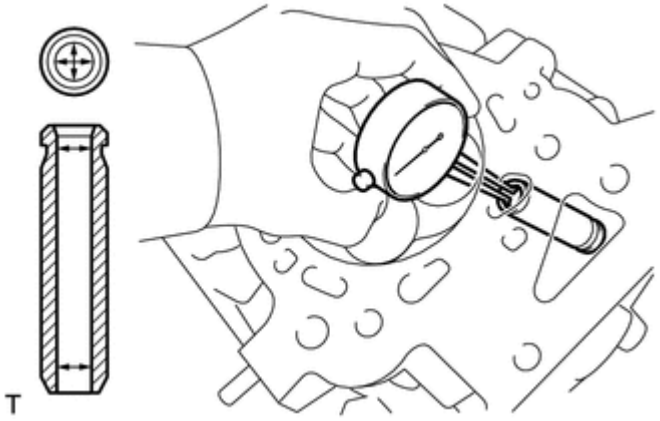


Fig. 340: Checking Inside Diameter Of Guide Bush
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Bush inside diameter

5.510 to 5.530 mm (0.2169 to 0.2177 in.)

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

Standard Oil Clearance

Item	Clearance
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	Clearance
Intake	0.08 mm (0.00315 in.)
	0.10 mm

Exhaust	(0.00394 in.)

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

REPLACEMENT

REPLACEMENT

1. **REPLACE INTAKE VALVE GUIDE BUSH**
   a. Heat the cylinder head to 80 to 100°C (176 to 212°F).
   b. Place the cylinder head on wooden blocks.
   c. Using SST and a hammer, tap out the intake valve guide bushes.

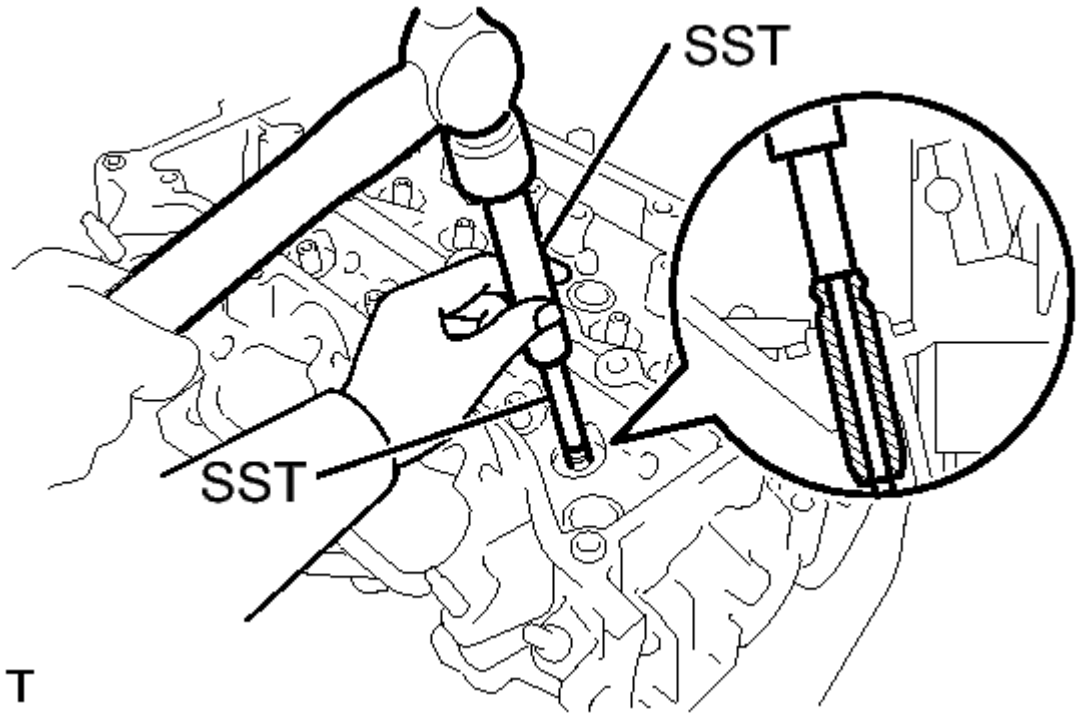


Fig. 341: Tapping Out Intake Valve Guide Bush Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

   d. Using a caliper gauge, measure the intake valve guide bush bore diameter of the cylinder head.

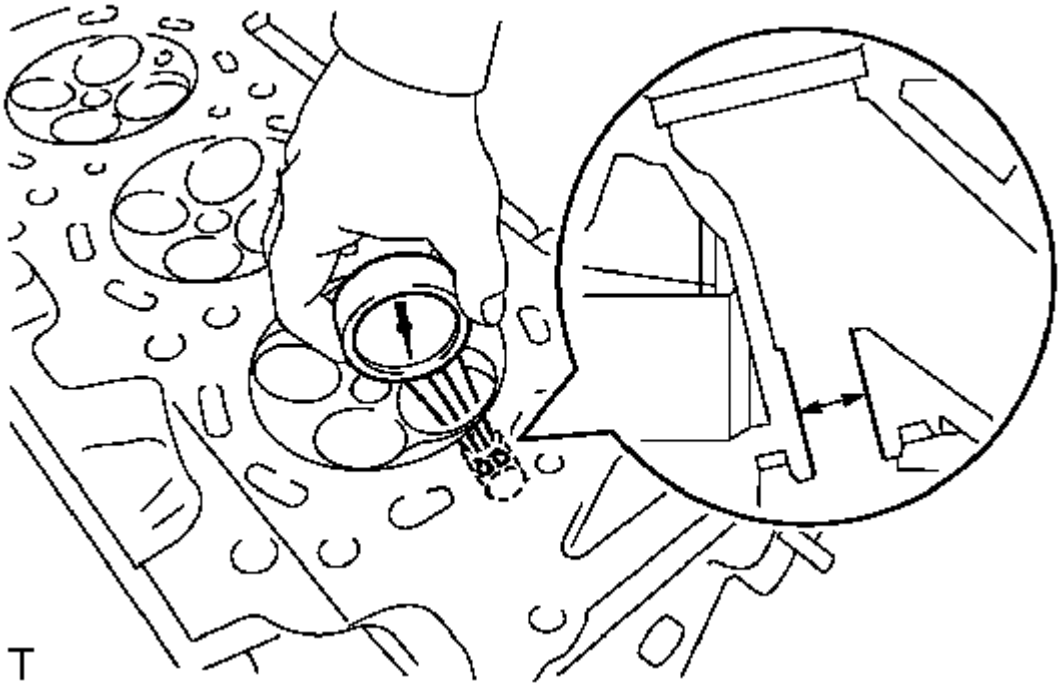


Fig. 342: Checking Bush Bore Diameter Of Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Cylinder bore diameter

10.285 to 10.306 mm (0.4049 to 0.4057 in.)

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

Bush Size	Bush Bore Diameter
STD	10.333 to 10.344 mm (0.4068 to 0.4072 in.)
O/S 0.05	10.383 to 10.394 mm (0.4088 to 0.4092 in.)

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

valve guide bush.

If the bush bore diameter of the cylinder head is greater than 10.356 mm (0.4077 in.), replace the cylinder head.

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, tap in new intake valve guide bushes to the specified protrusion height.

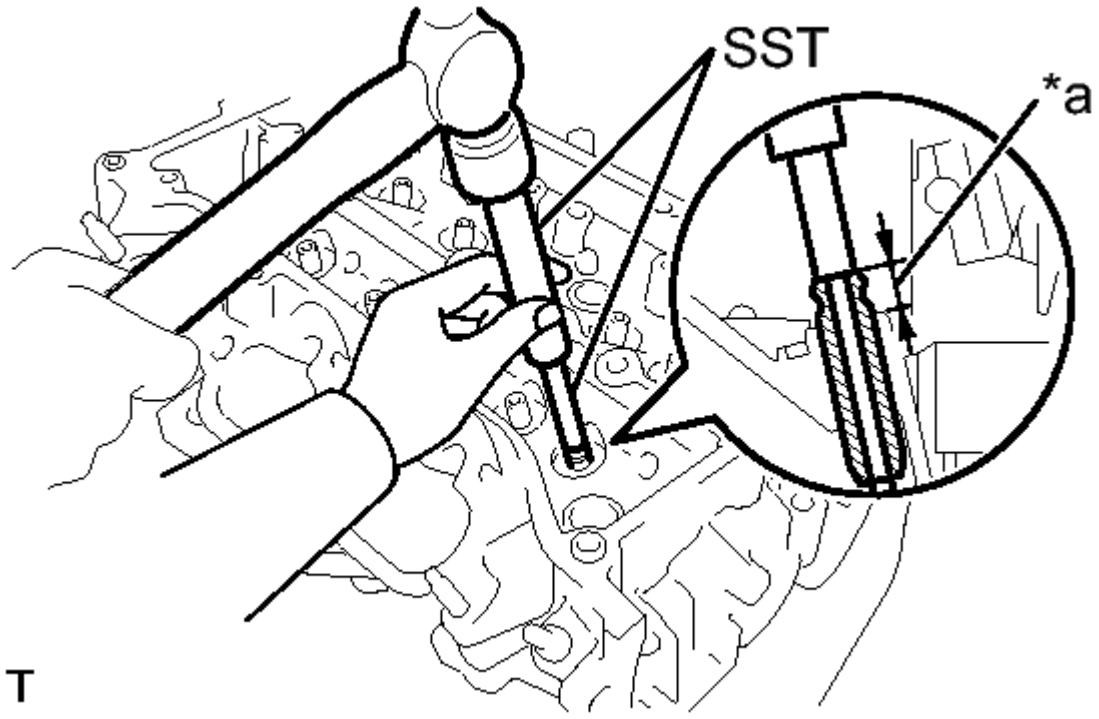


Fig. 343: Tapping In Intake Valve Guide Bush Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Protrusion Height

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

Protrusion height

9.30 to 9.70 mm (0.3661 to 0.3819 in.)

h. Using a sharp 5.5 mm reamer, ream the valve guide bushings to obtain the specified clearance.

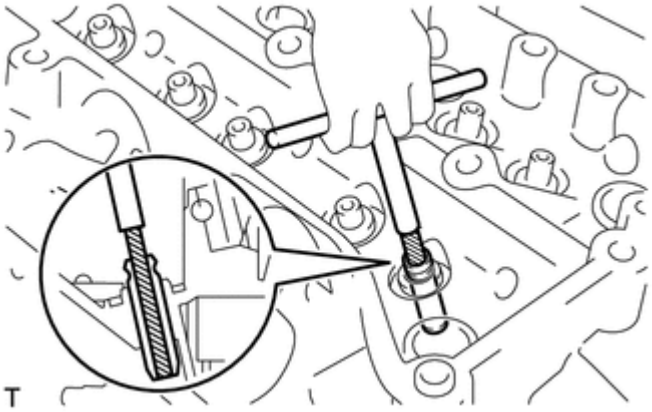


Fig. 344: Reaming Valve Guide Bush
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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).
   b. Place the cylinder head on wooden blocks.
   c. Using SST and a hammer, tap out the exhaust valve guide bushes.
      - **SST: 09201-10000**
        09201-01050
      - **SST: 09950-70010**
        09951-07100
   d. Using a caliper gauge, measure the exhaust valve guide bush bore diameter of the cylinder head.

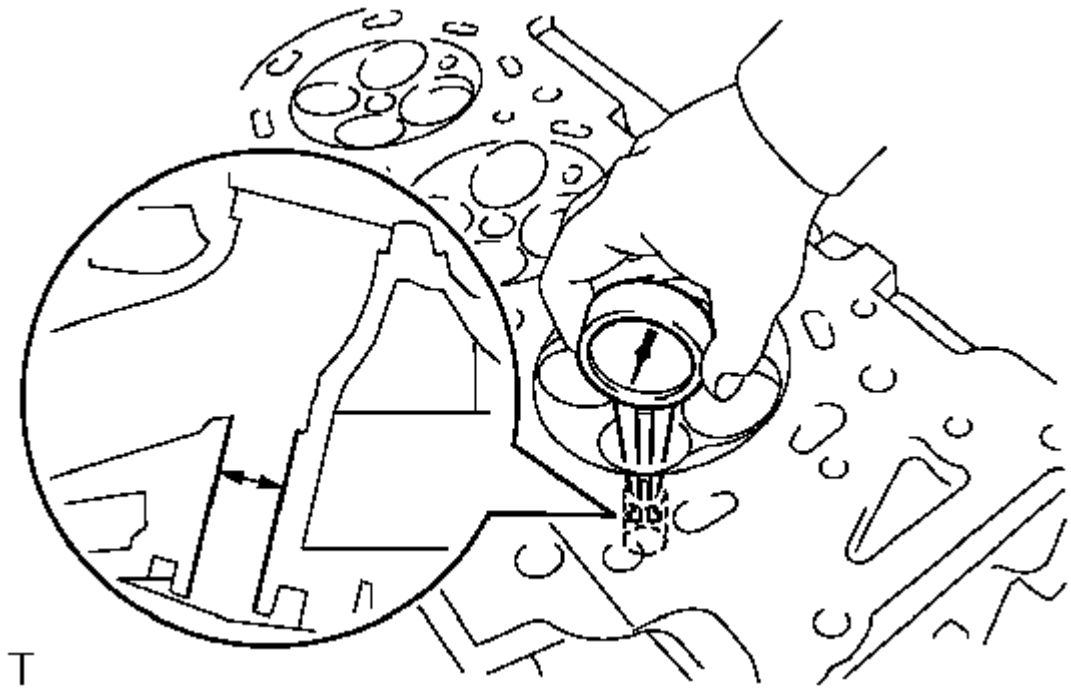


Fig. 345: Checking Bush Bore Diameter Of Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Cylinder bore diameter

10.285 to 10.306 mm (0.4049 to 0.4057 in.)

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

Bush Size	Bush Bore Diameter
STD	10.333 to 10.344 mm (0.4068 to 0.4072 in.)
O/S 0.05	10.383 to 10.394 mm (0.4088 to 0.4092 in.)

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

valve guide bush.

If the bush bore diameter of the cylinder head is greater than 10.356 mm (0.4077 in.), replace the cylinder head.

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, tap in new exhaust valve guide bushes to the specified protrusion height.

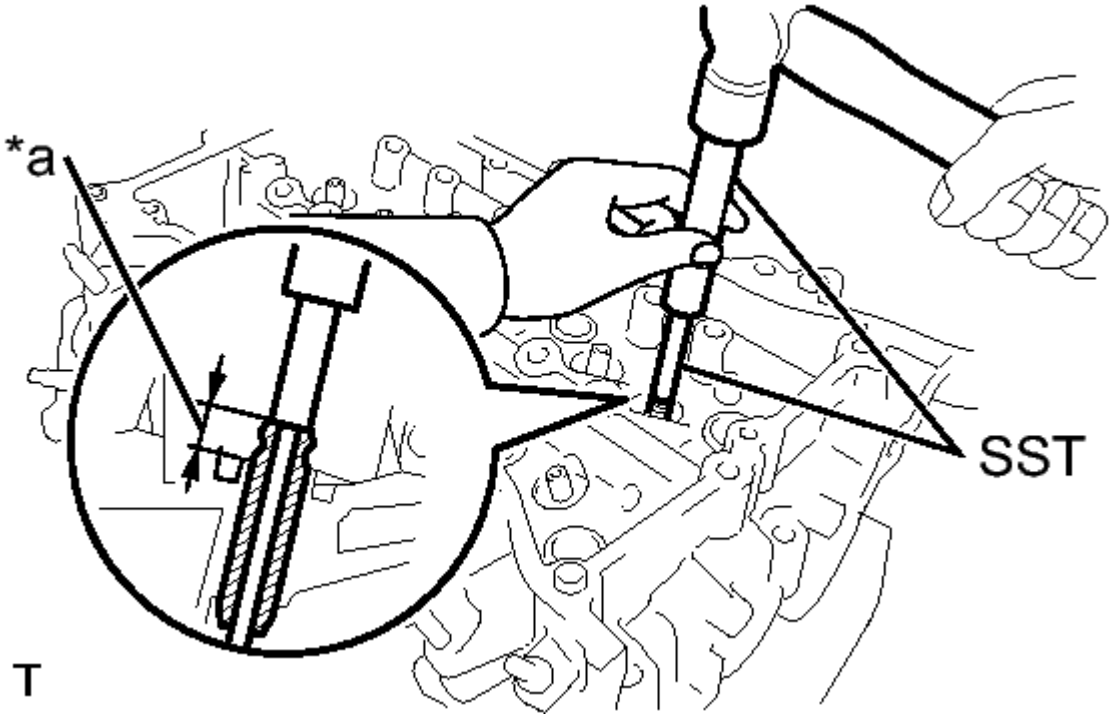


Fig. 346: Tapping In Exhaust Valve Guide Bush Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Protrusion Height

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

Protrusion height

9.30 to 9.70 mm (0.3661 to 0.3819 in.)

h. Using a sharp 5.5 mm reamer, ream the valve guide bushings to obtain the specified clearance.

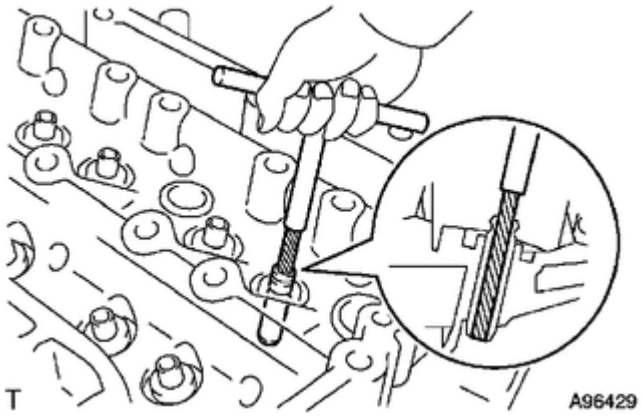


Fig. 347: Reaming Valve Guide Bushing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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 pin unless it is being replaced.

a. Using a plastic hammer, tap in new ring pins to the specified protrusion height.

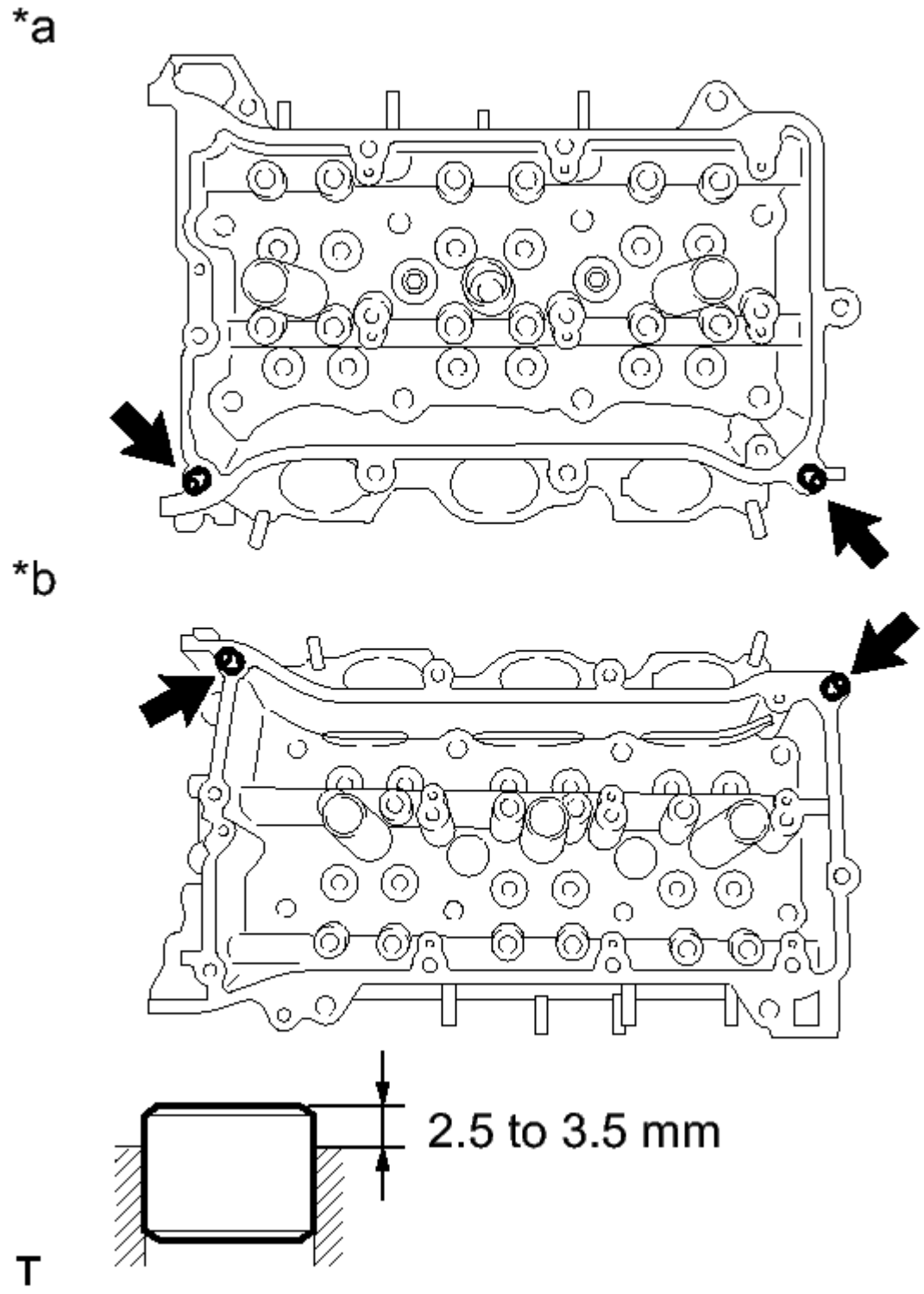


Fig. 348: Identifying Cylinder Head Ring Pins
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	for

*a	Bank 1
*b	for Bank 2

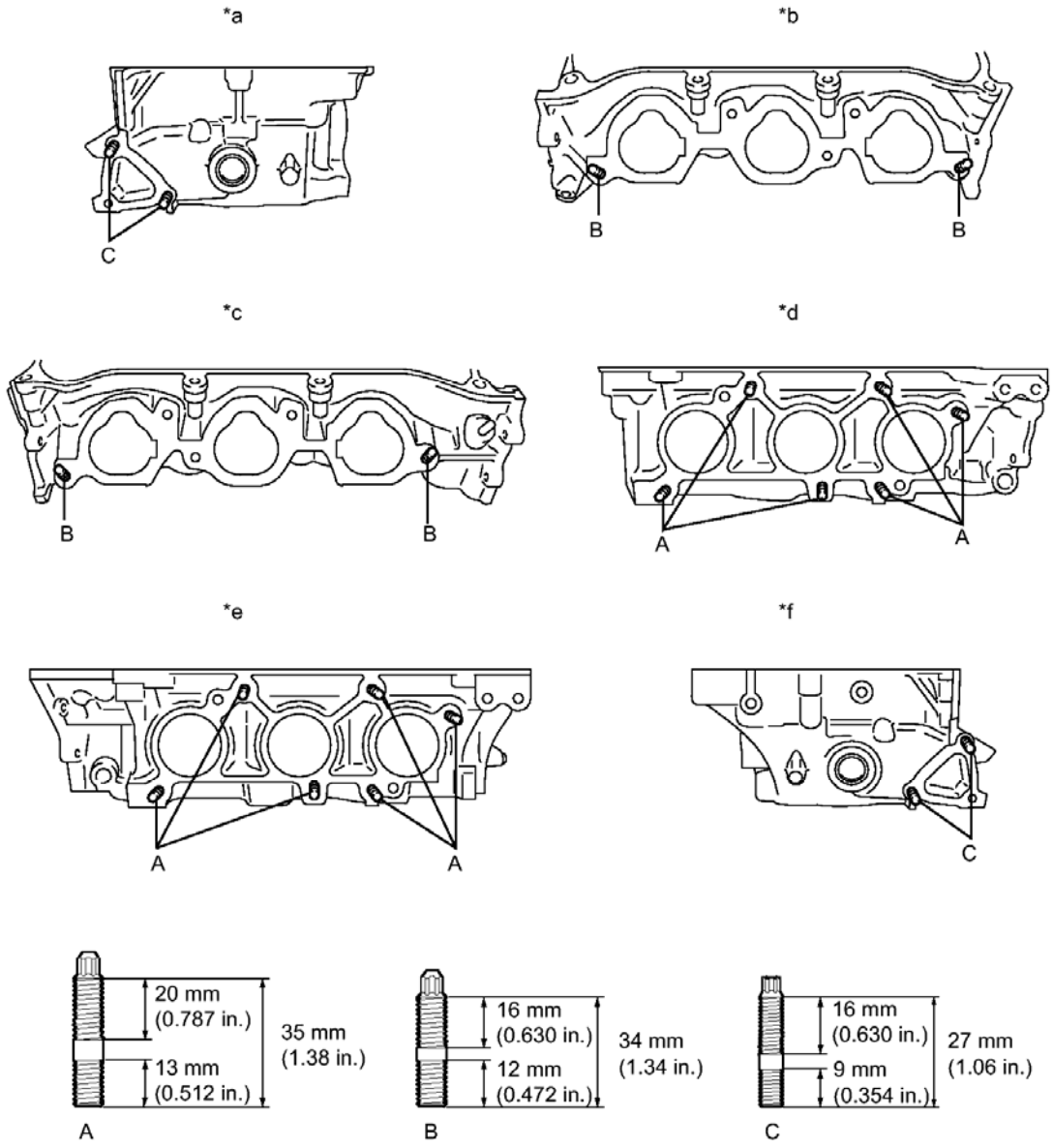
Specified protrusion height

2.5 to 3.5 mm (0.0984 to 0.138 in.)

4. **REPLACE STUD BOLT**

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

a. Using an E6 and E8 "TORX" sockets, install the stud bolts.



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Fig. 349: Identifying Cylinder Head Stud Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Bank 1 Rear Side	*b	Bank 1 Intake Side
*c	Bank 2 Intake Side	*d	Bank 1 Exhaust Side
*e	Bank 2 Exhaust	*f	Bank 2 Rear

	Side		Side

Bolts A and B

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

Bolt C

Torque: 4.0 N*m (41 kgf*cm, 35 in.*lbf)

5. **REPLACE STRAIGHT PIN**

NOTE: If a straight pin is deformed, replace it.

a. Using a plastic hammer, tap in new straight pins as shown in the illustration.

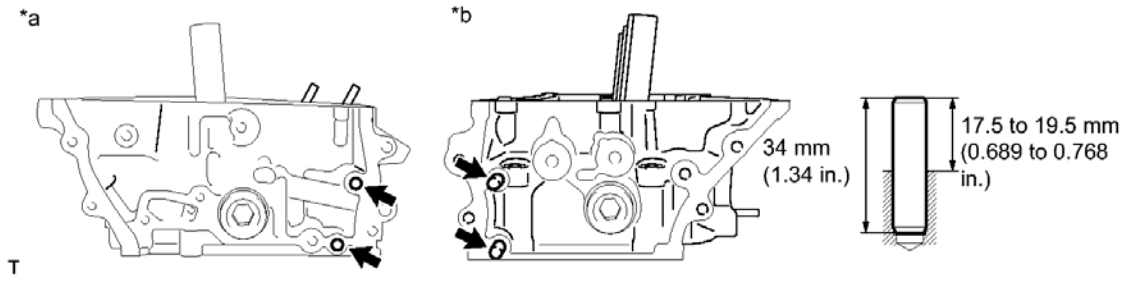


Fig. 350: Identifying Cylinder Head Straight Pins
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	for Bank 1	*b	for Bank 2

Protrusion height

17.5 to 19.5 mm (0.689 to 0.768 in.)

REASSEMBLY

REASSEMBLY

1. **INSTALL NO. 1 STRAIGHT SCREW PLUG**
   a. Using a 10 mm hexagon wrench, install 4 new gaskets and the 4 No. 1 straight screw plugs.

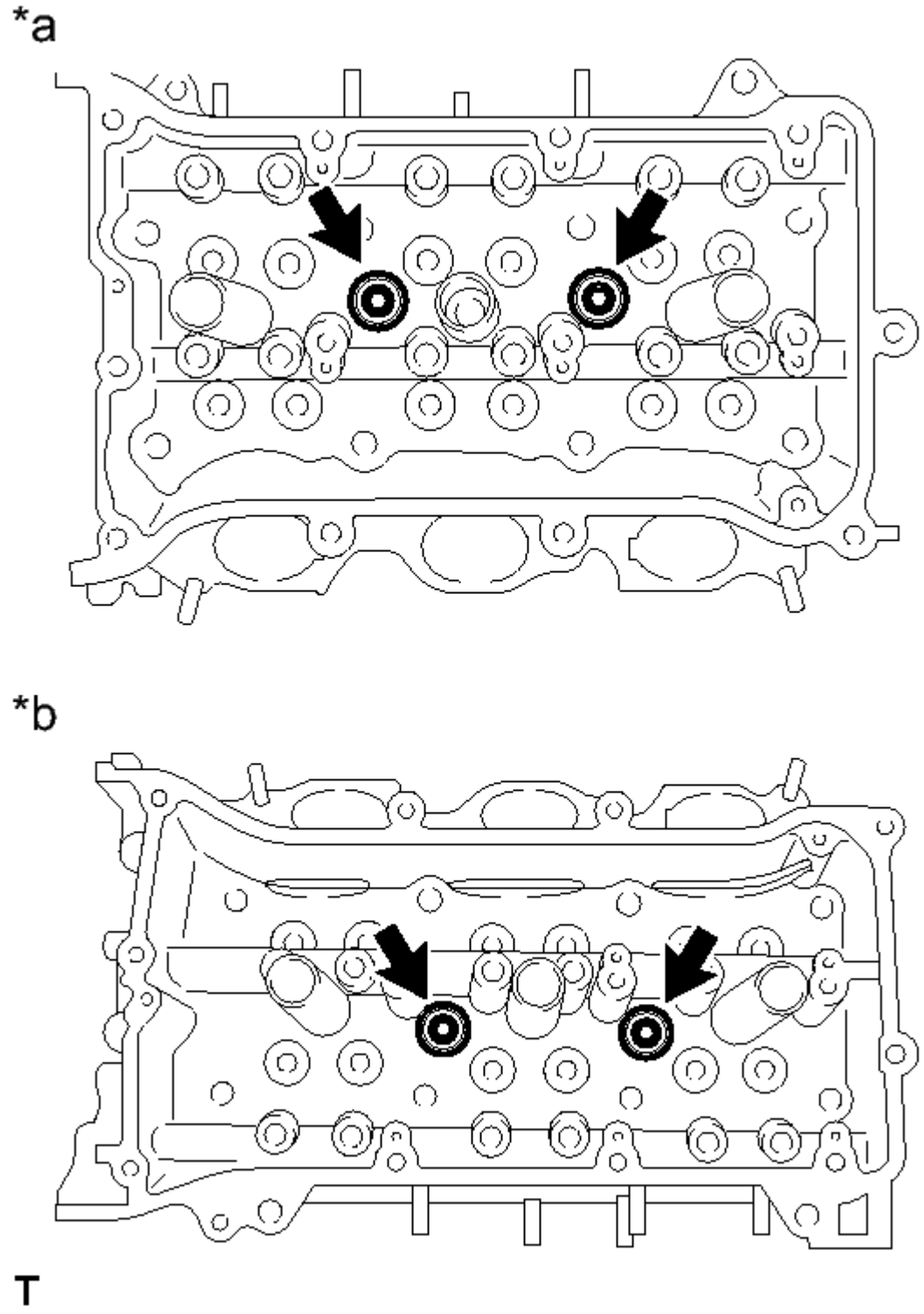


Fig. 351: Identifying No. 1 Straight Screw Plugs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	Bank

*a	1
*b	Bank 2

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

2. **INSTALL NO. 2 STRAIGHT SCREW PLUG**
   a. Using a 14 mm hexagon wrench, install 2 new gaskets and the 2 No. 2 straight screw plugs.

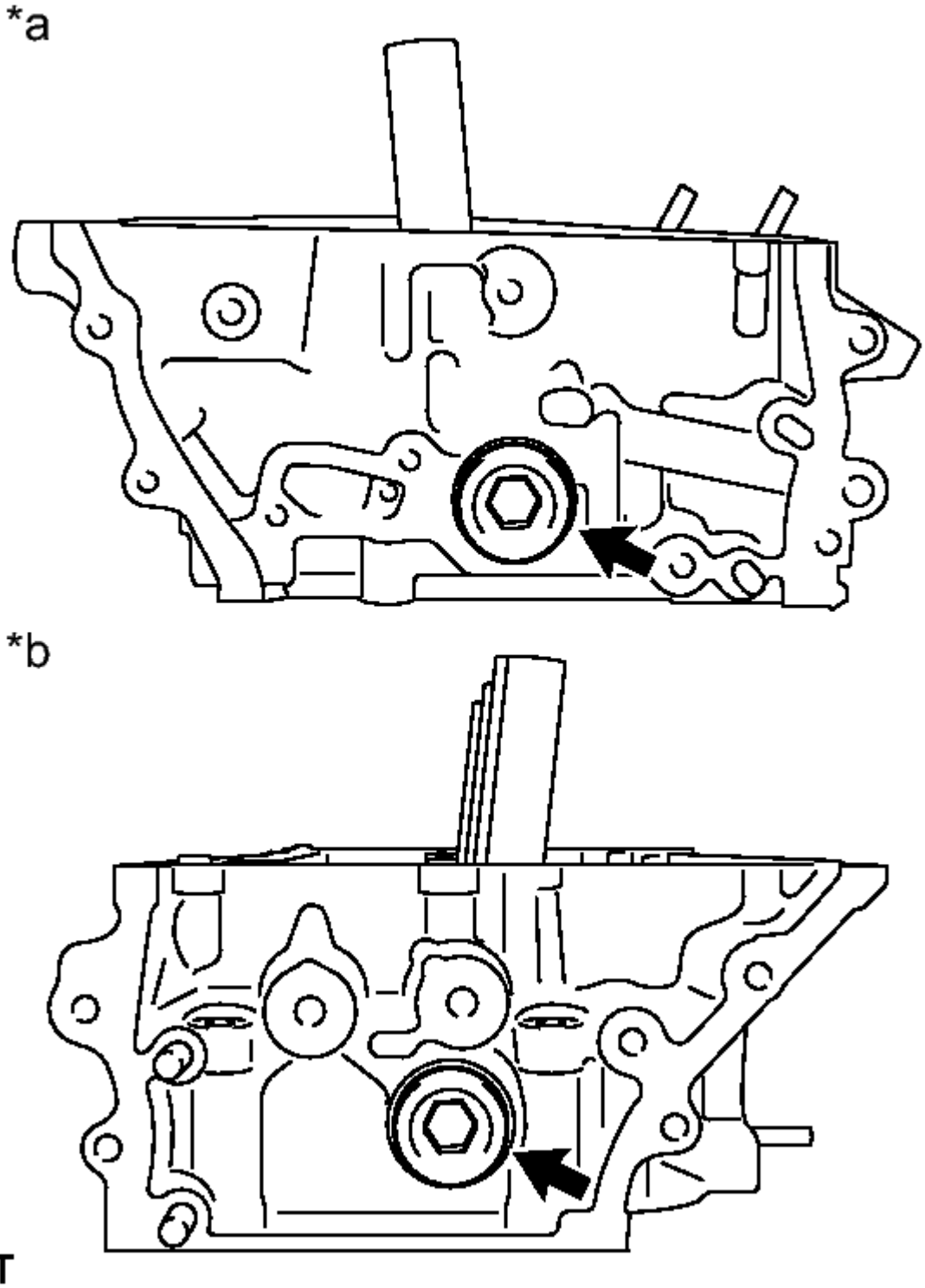


Fig. 352: Identifying No. 2 Straight Screw Plugs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	Bank

*a	1
*b	Bank 2

Torque: 80 N*m (816 kgf*cm, 59 ft.*lbf)

3. **INSTALL VALVE SPRING SEAT**
   a. Install the valve spring seats to the cylinder head.
4. **INSTALL VALVE STEM OIL SEAL**
   a. Apply a light coat of engine oil to new valve stem oil seals.

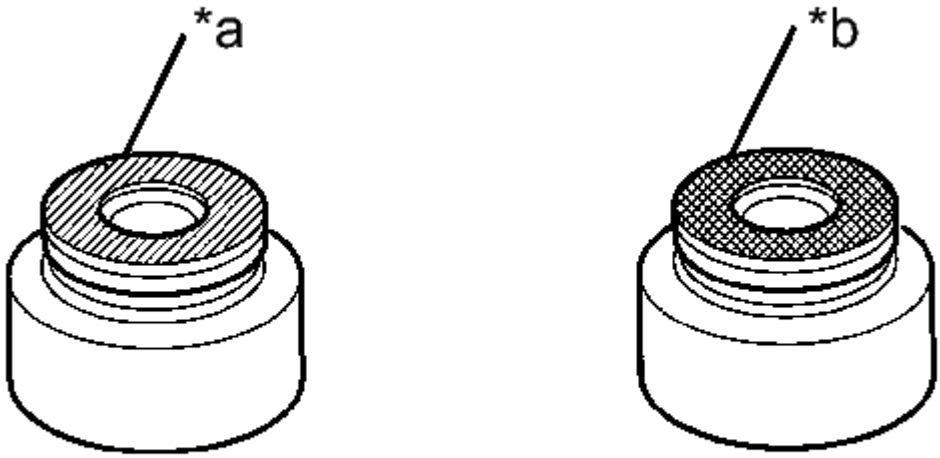


Fig. 353: Identifying Valve Stem Oil Seals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

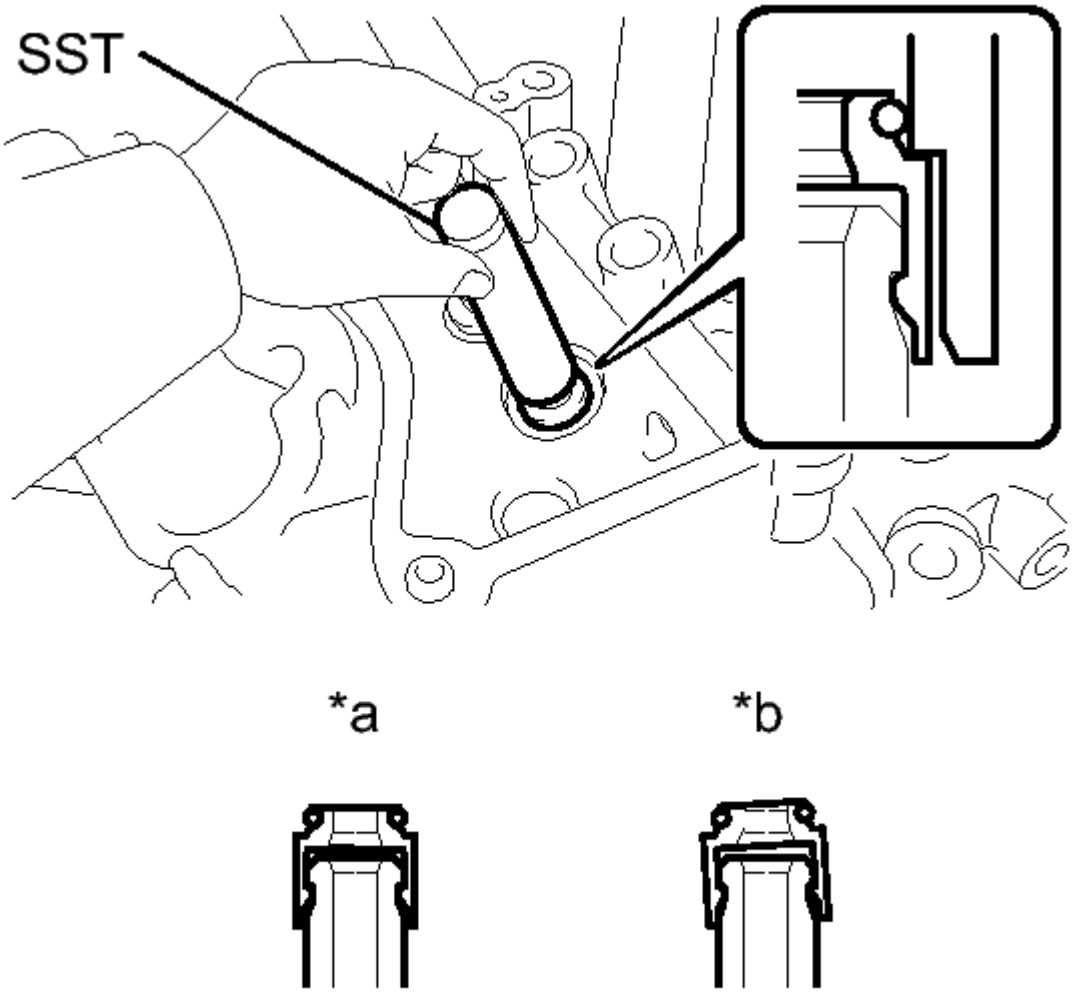
*a	Gray (Intake Side)
*b	Black (Exhaust Side)

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

HINT:

The intake valve oil seals are gray and the exhaust valve oil seals are black.

b. Using SST, push in the oil seals.



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Fig. 354: Installing Valve Stem Oil Seals Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

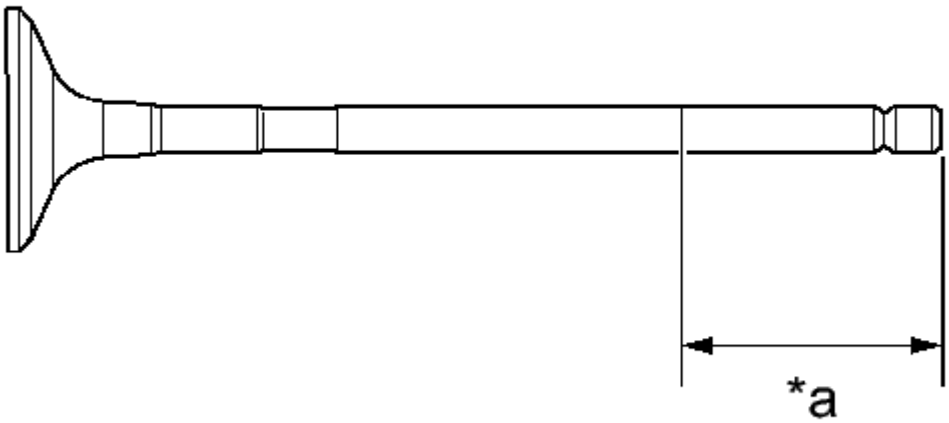
TEXT IN ILLUSTRATION

*a	CORRECT
*b	INCORRECT

- **SST: 09201-41020**

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

5. **INSTALL EXHAUST VALVE**
   a. Apply a sufficient coat of engine oil to the tip area of the exhaust valve shown in the illustration.



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Fig. 355: Identifying Exhaust Valve Engine Oil Applying Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	30 mm (1.18 in.) or more

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

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

   c. Using SST, compress the inner compression spring and install the 2 valve spring retainer locks.

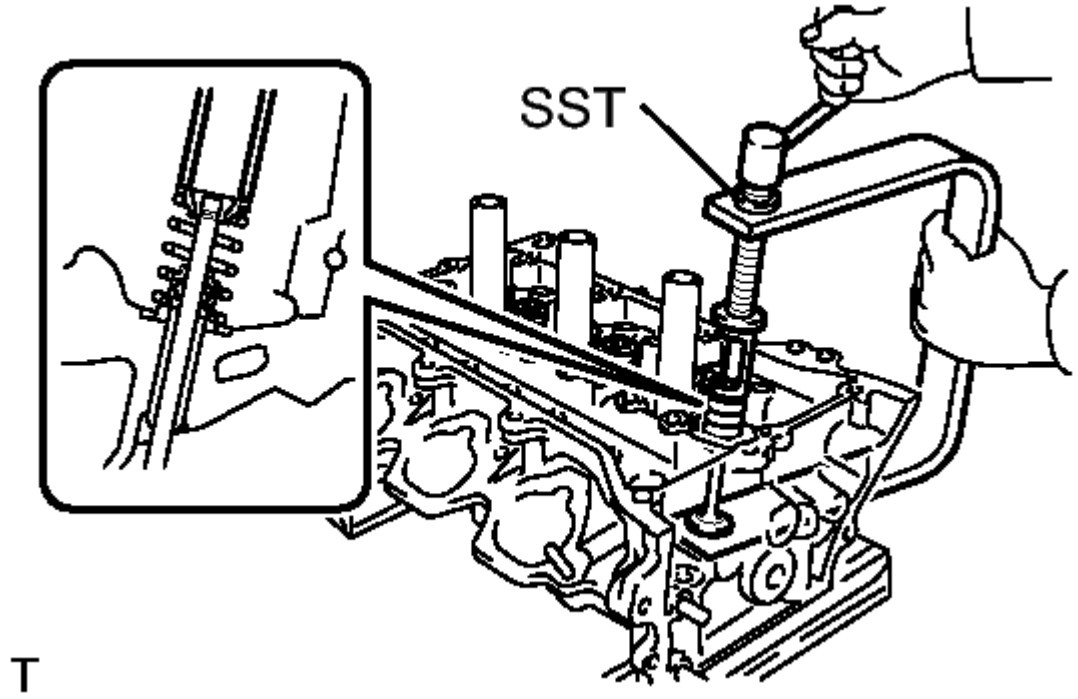


Fig. 356: Compressing Compression Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- **SST: 09202-70020**
  09202-00010
  09202-01010
  09202-01020

d. Using a plastic hammer, lightly tap the valve stem tip to ensure a proper fit.

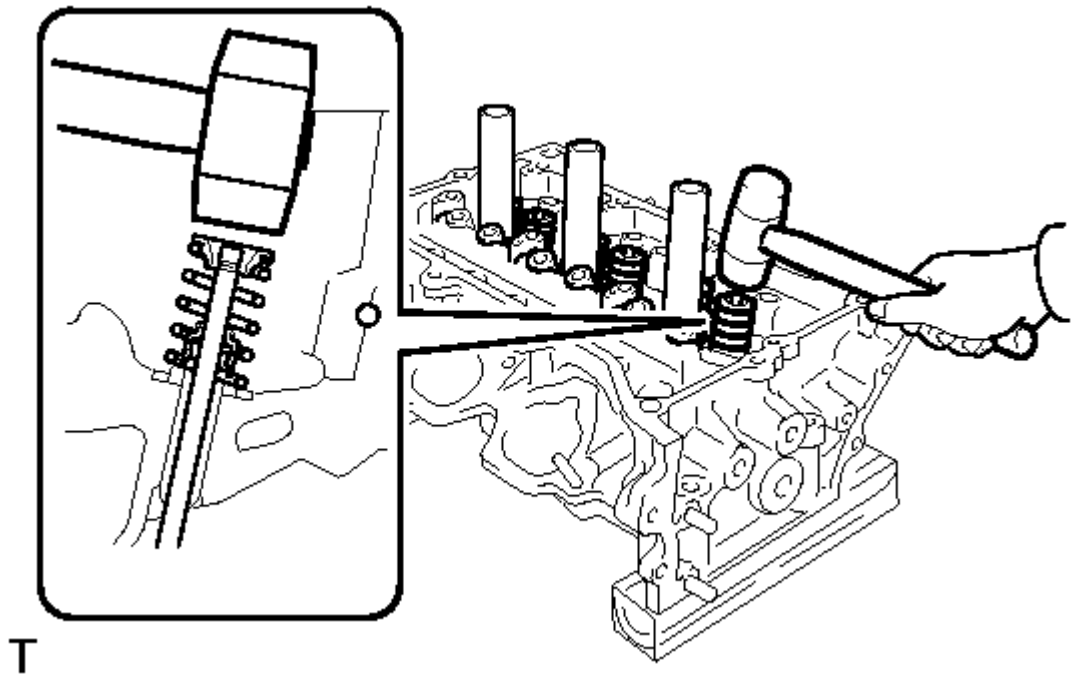
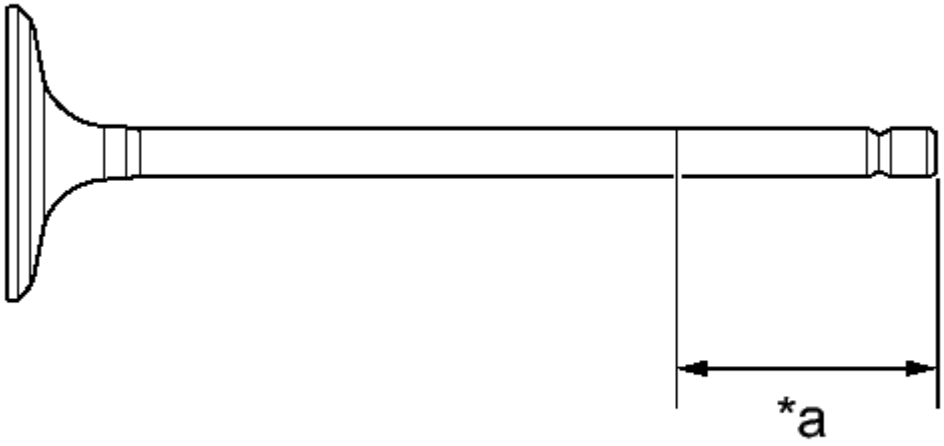


Fig. 357: Tapping Valve Stem Tip To Ensure Proper Fit
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Be careful not to damage the retainer.

6. **INSTALL INTAKE VALVE**
   a. Apply a sufficient coat of engine oil to the tip area of the intake valve shown in the illustration.



T

Fig. 358: Identifying Intake Valve Engine Oil Applying Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	30 mm (1.18 in.) or more

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

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

c. Using SST, compress the inner compression spring and install the 2 valve spring retainer locks.

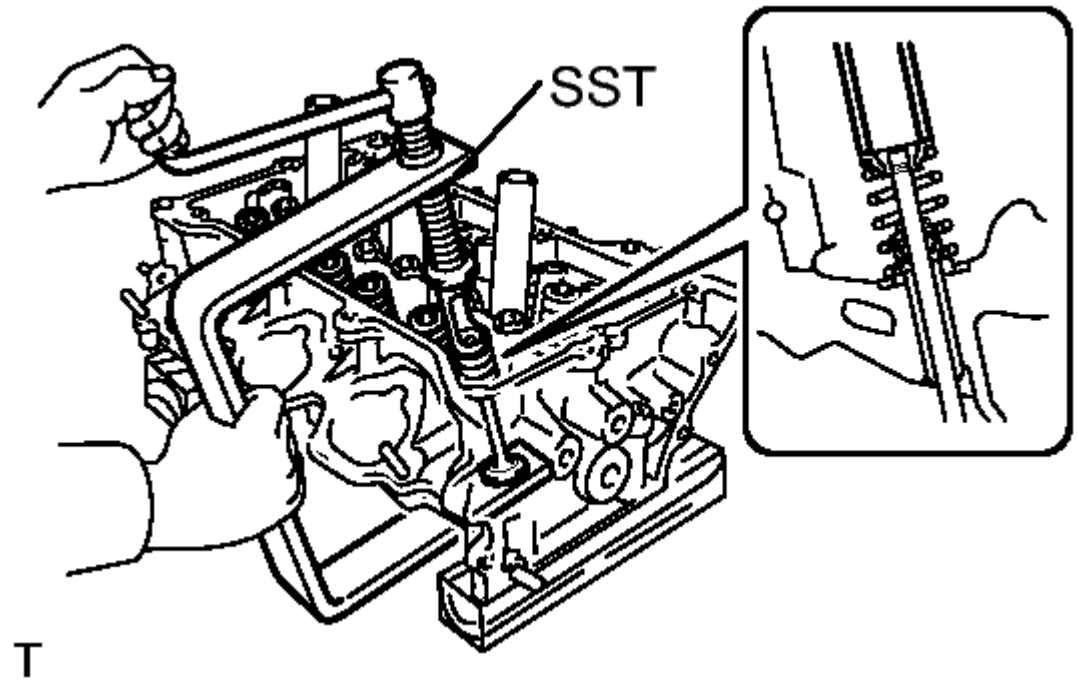


Fig. 359: Compressing Compression Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- **SST: 09202-70020**
  09202-00010
  09202-01010
  09202-01020

d. Using a plastic hammer, lightly tap the valve stem tip to ensure a proper fit.

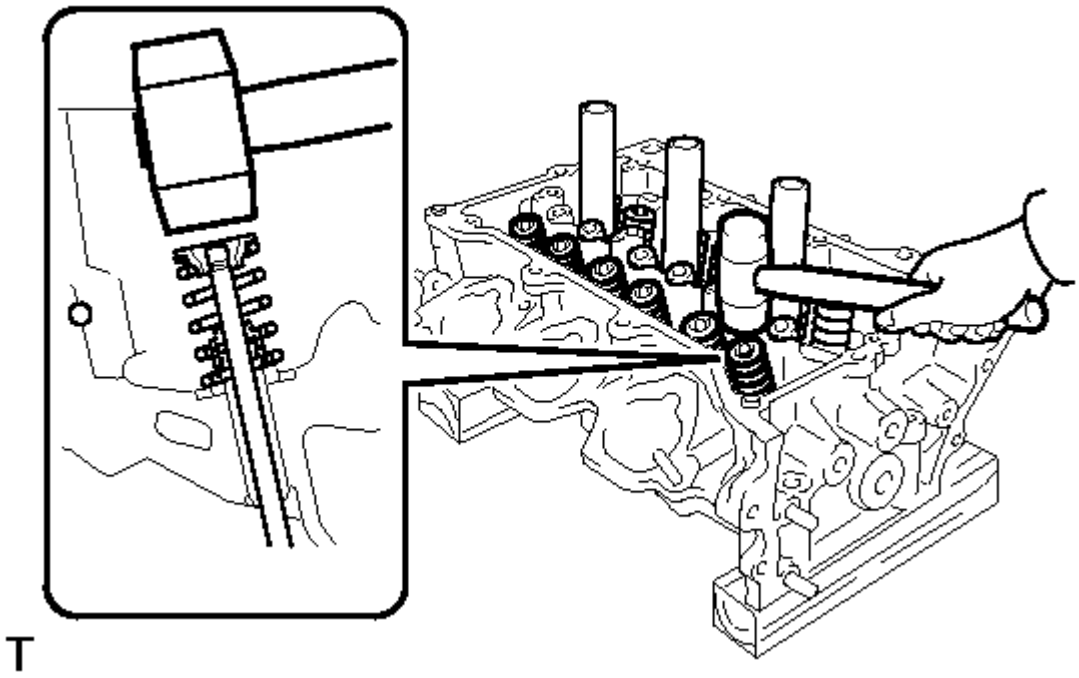


Fig. 360: Tapping Valve Stem Tip To Ensure Proper Fit
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Be careful not to damage the retainer.

7. **INSTALL VALVE STEM CAP**
   a. Apply a light coat of engine oil to the valve stem caps.
   b. Install the valve stem caps on the valves.

REPAIR

REPAIR

1. **REPAIR INTAKE VALVE SEAT**

NOTE:
- **Repair the intake valve 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 greater than the specification.

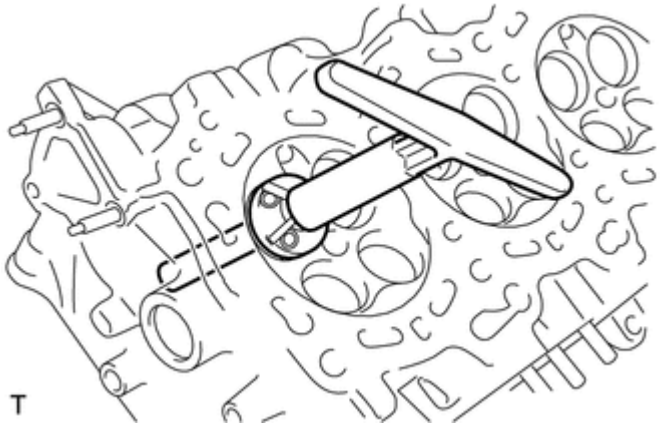
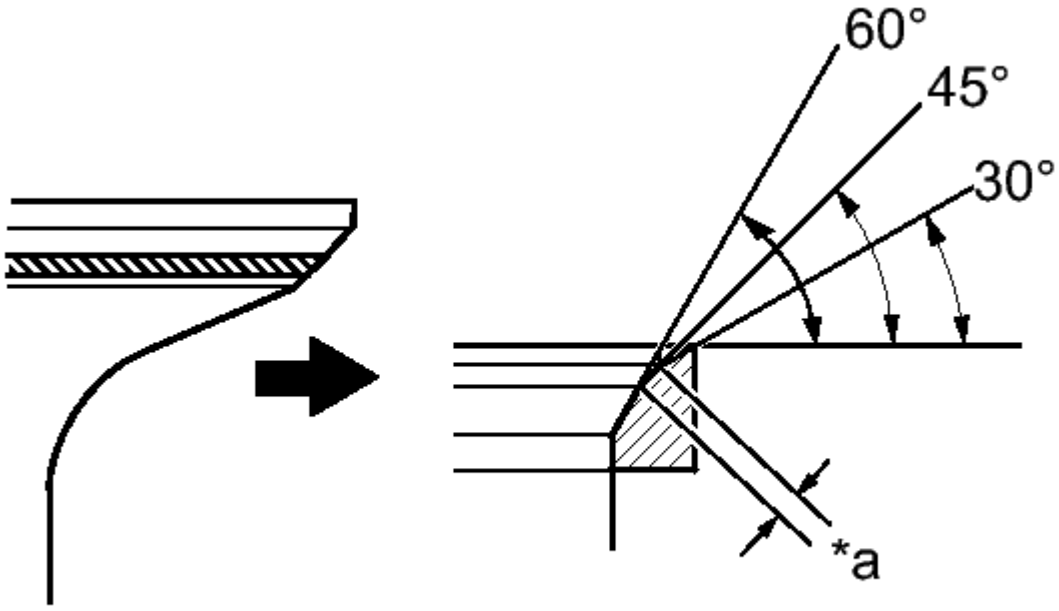


Fig. 361: Resurfacing Valve Seat
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using 30° and 60° cutters, correct the valve seat so that the intake valve contacts the entire circumference of the seat. The contact should be in the center of the intake valve seat, and the intake valve seat width should be maintained within the specified range around the entire circumference of the intake valve seat.



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Fig. 362: Identifying Intake Valve Seat Contacts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Width

Width

1.1 to 1.6 mm (0.0433 to 0.0630 in.)

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

2. **REPAIR EXHAUST VALVE SEAT**

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 greater than the specification.

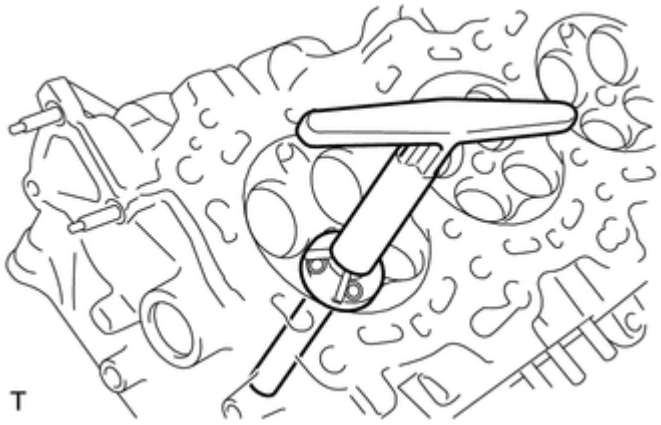
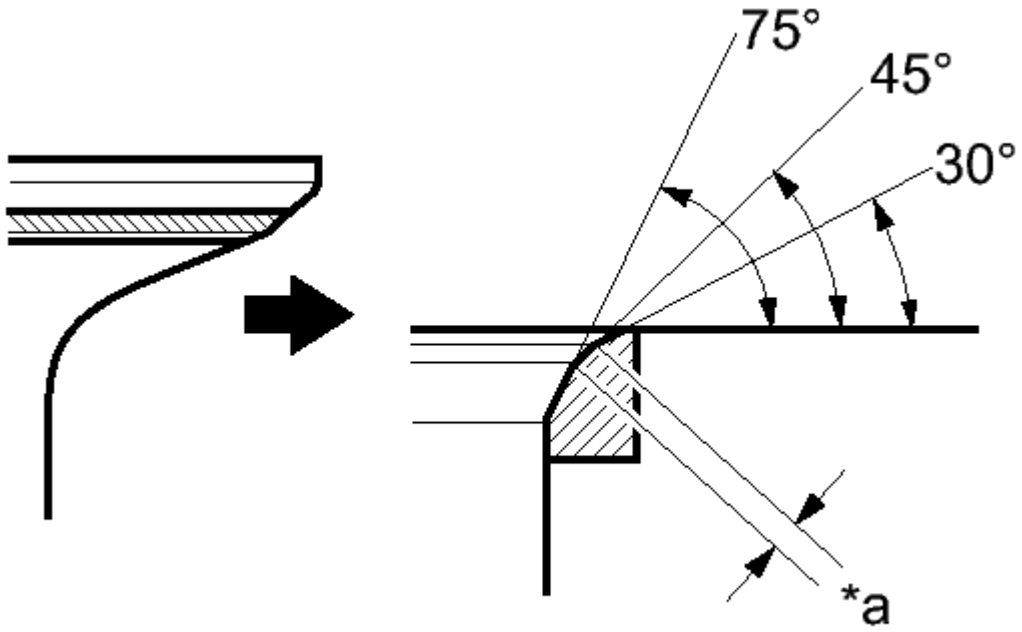


Fig. 363: Resurfacing Valve Seat
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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



T

Fig. 364: Identifying Exhaust Valve Seat Contacts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Width

Width

1.1 to 1.6 mm (0.0433 to 0.0630 in.)

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

CYLINDER BLOCK

COMPONENTS

ILLUSTRATION

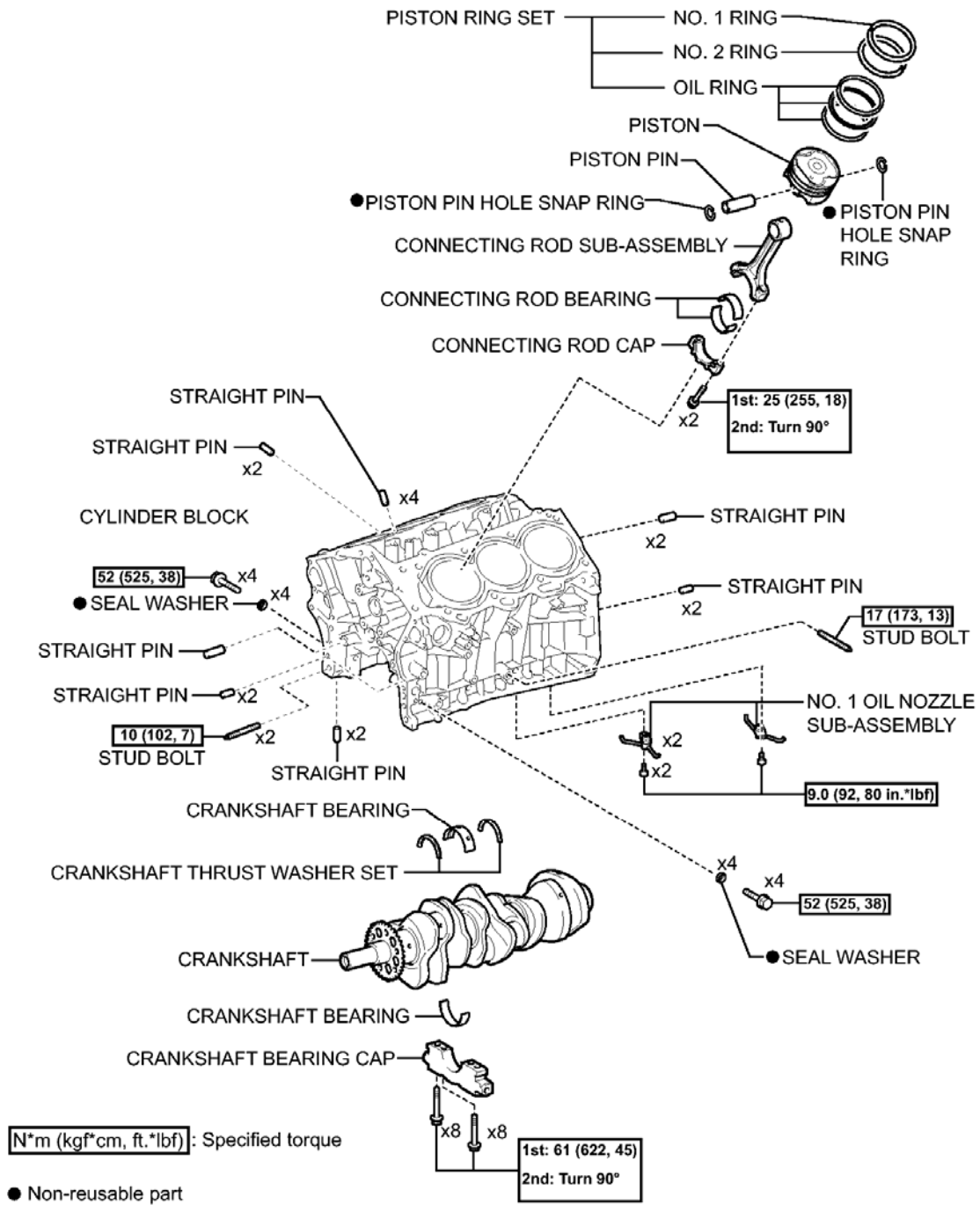


Fig. 365: Cylinder Block Replacement Components With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

DISASSEMBLY

1. **REMOVE PISTON SUB-ASSEMBLY WITH CONNECTING ROD**

a. Check that the matchmarks on the connecting rod sub-assembly and connecting rod cap are aligned.

HINT:

The matchmarks on the connecting rod sub-assembly and connecting rod cap are guides for the correct reassembly.

b. Remove the 2 connecting rod cap bolts.

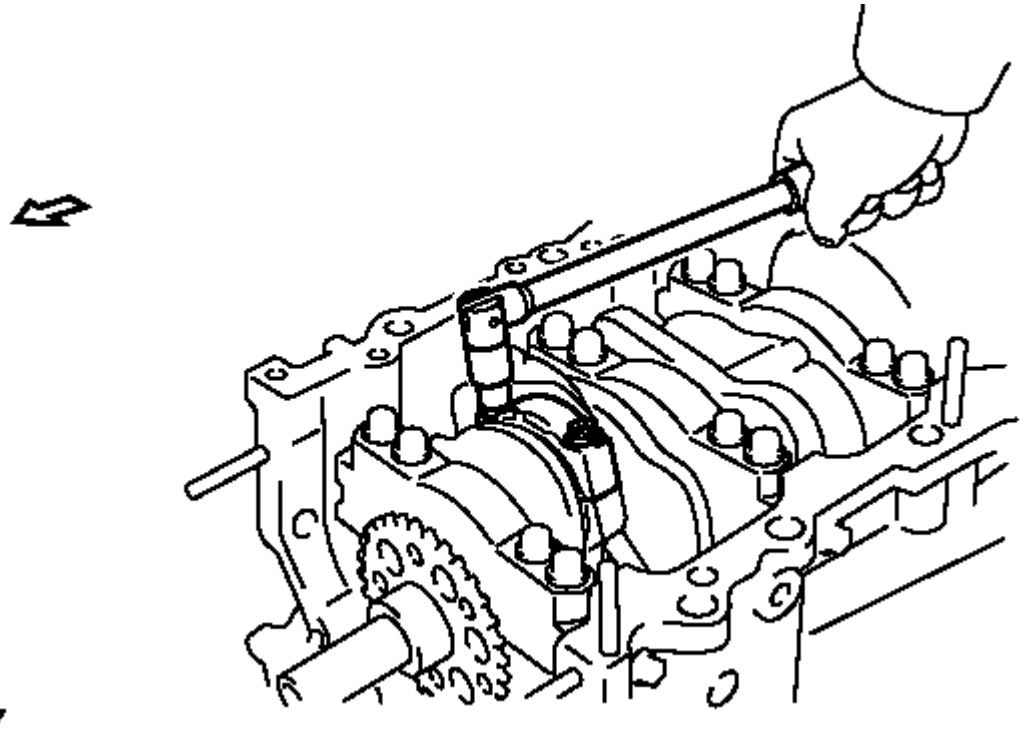


Fig. 366: Removing Connecting Rod Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

Engine Front

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.

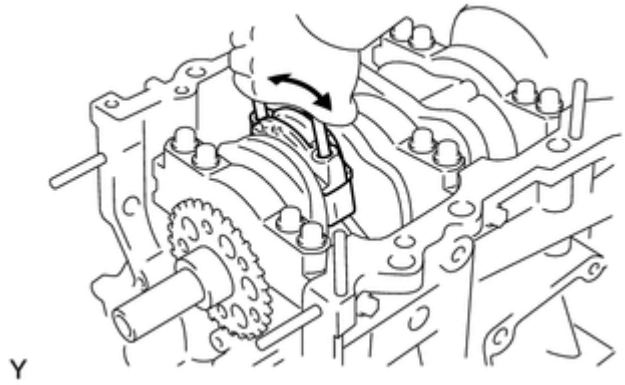


Fig. 367: Removing Connecting Rod Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Keep the lower bearing inserted to the connecting rod cap.

d. Using a ridge reamer, remove all the carbon from the top of the cylinder.

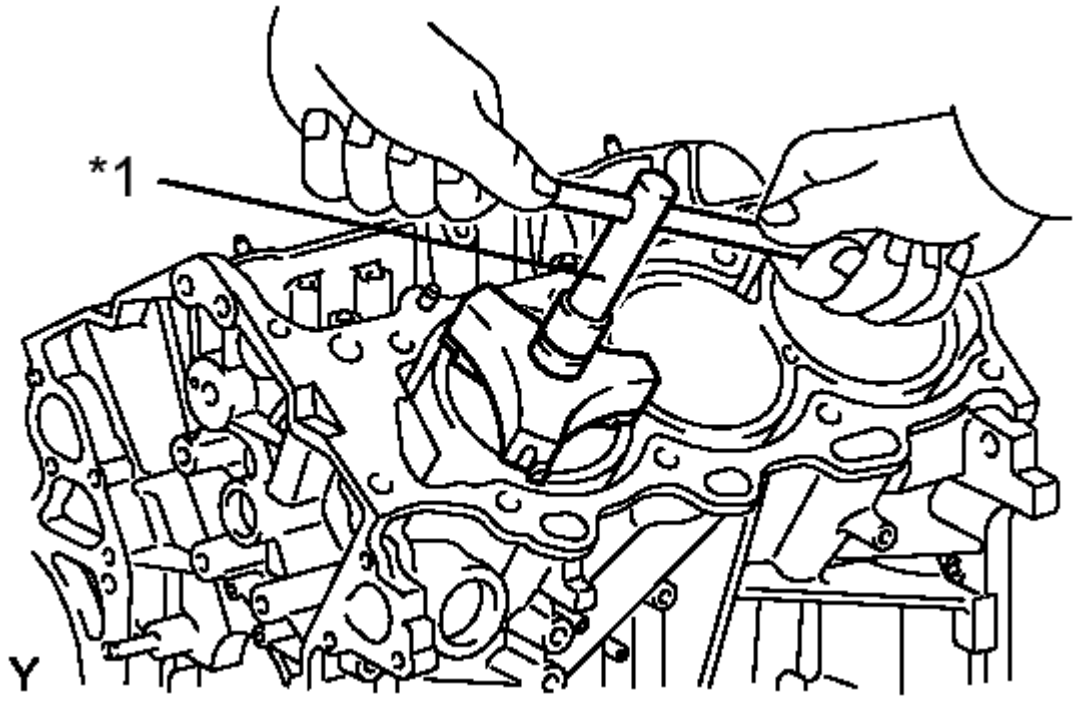


Fig. 368: Removing Carbon From Top Of Cylinder
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Ridge Reamer

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

HINT:

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

2. **REMOVE CONNECTING ROD BEARING**

HINT:

Arrange the removed parts in the correct order.

3. **REMOVE PISTON RING SET**

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

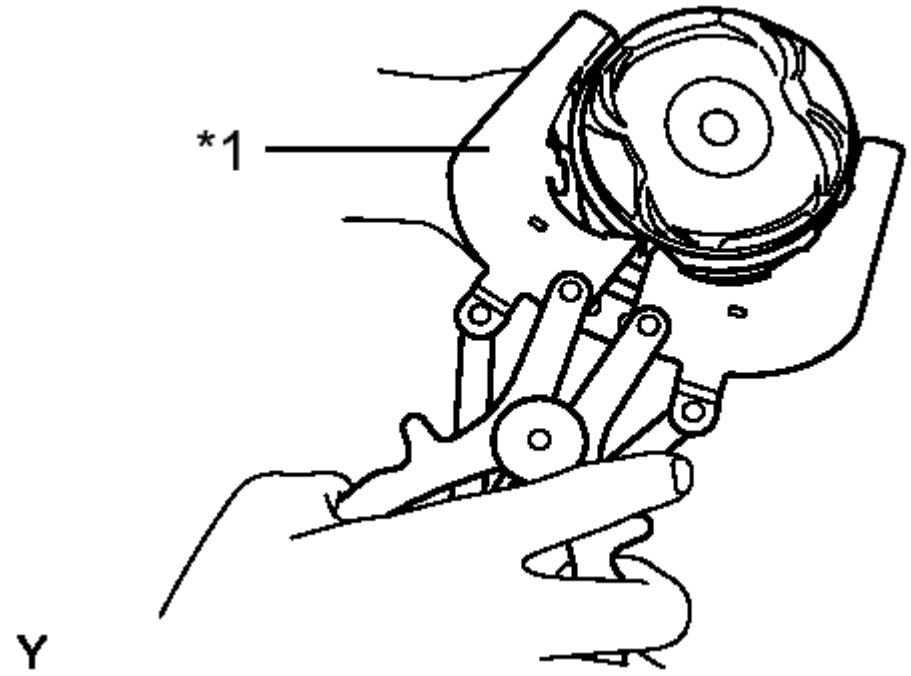


Fig. 369: Removing Compression Rings Using Compression Ring Expander
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Piston Ring Expander

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

HINT:

Arrange the removed parts in the correct order.

4. **REMOVE PISTON**
   a. Check the fitting condition between the piston and piston pin.

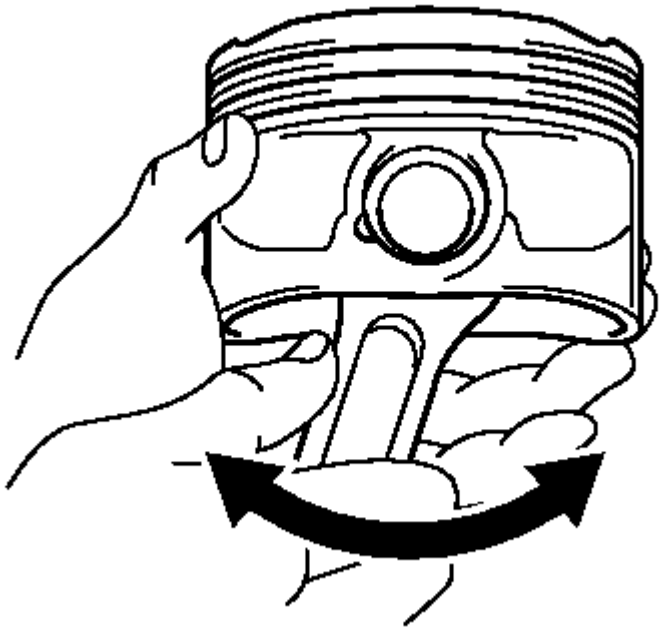


Fig. 370: Checking Fitting Condition Between Piston And Piston Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

      1. Try to move the piston back and forth on the piston pin.

         If any movement is felt, replace the piston and pin as a set.

   b. Disconnect the connecting rod from the piston.

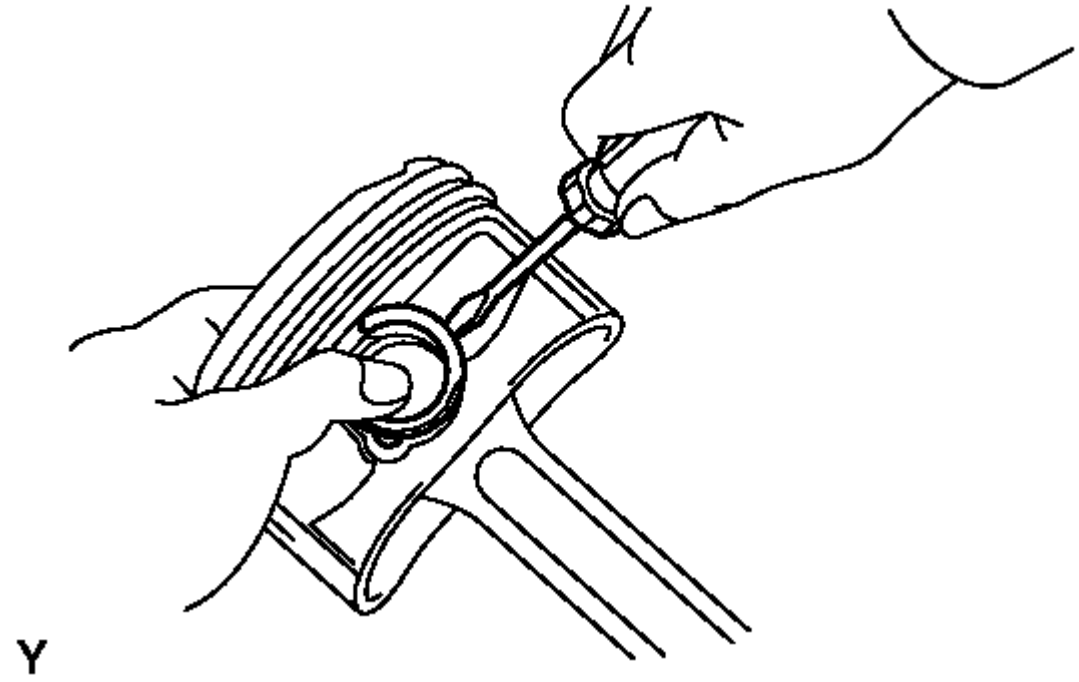


Fig. 371: Prying Off Snap Rings From Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Using a screwdriver, pry off the piston pin hole snap rings from the piston.
2. Gradually heat the piston to approximately 80°C (176°F).

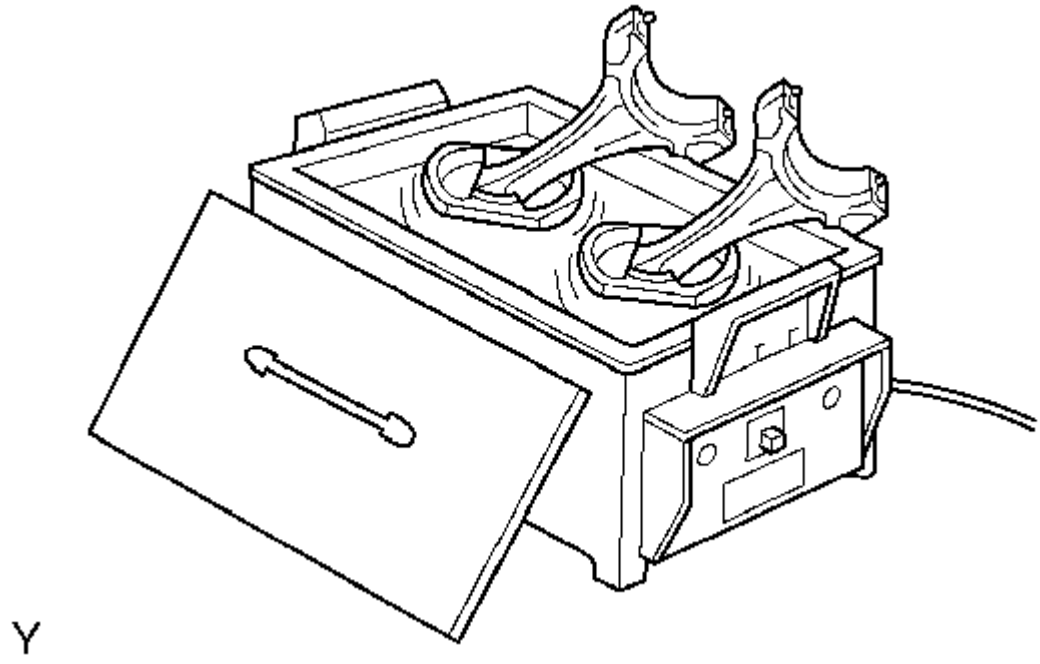


Fig. 372: Heating Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. Using a brass bar and a plastic hammer, lightly tap out the piston pin and remove the connecting rod sub-assembly.

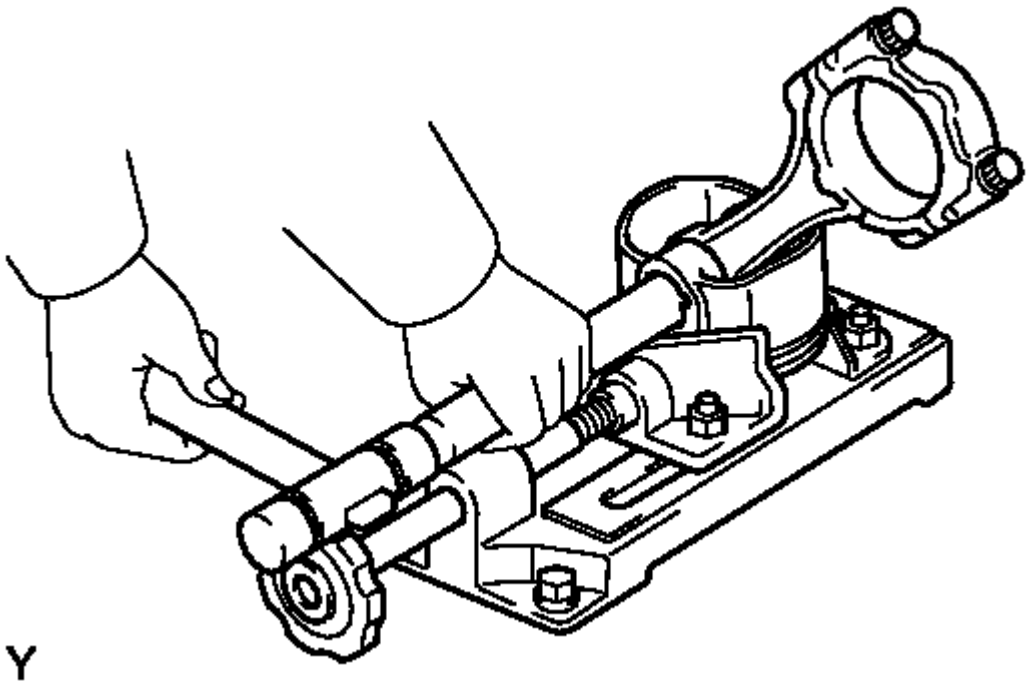


Fig. 373: Removing Connecting Rod
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

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

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

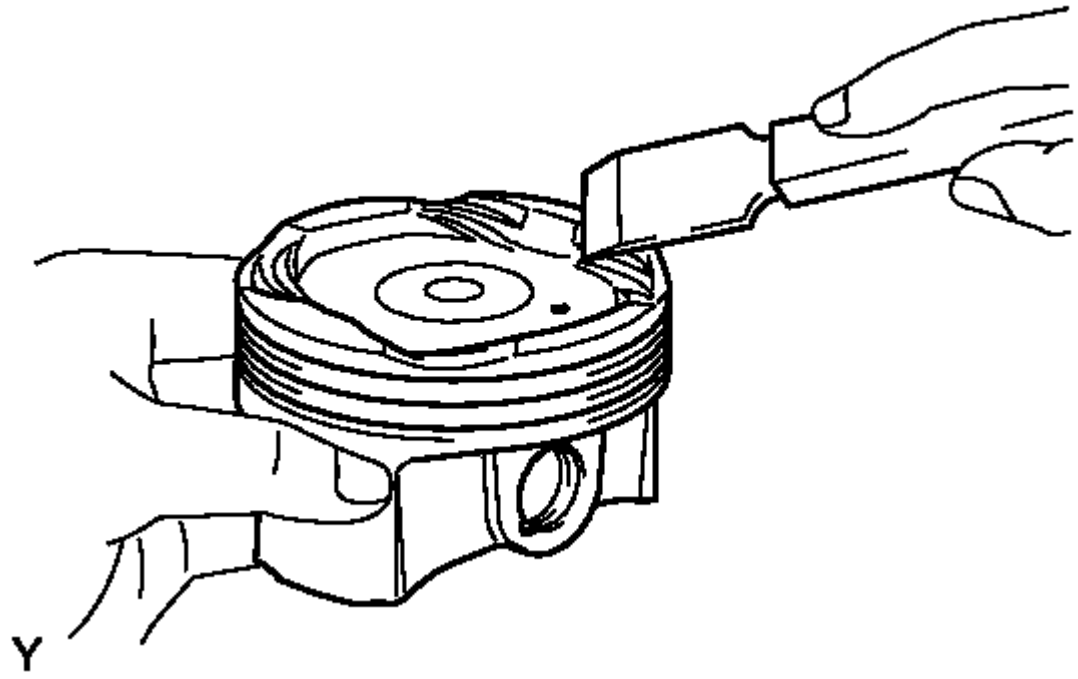


Fig. 374: Removing Carbon From Piston Top
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

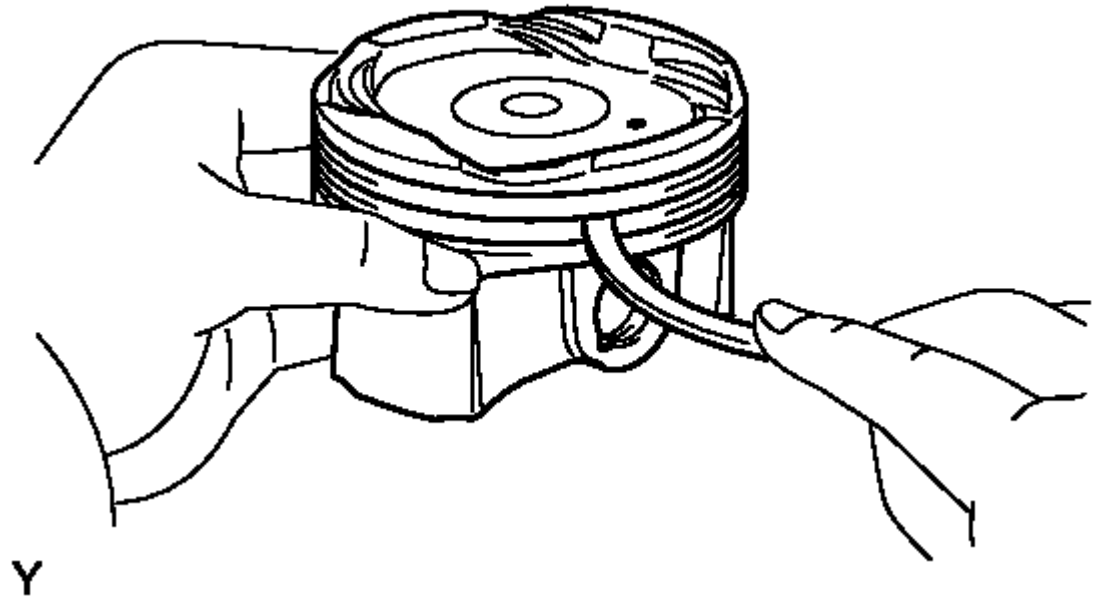
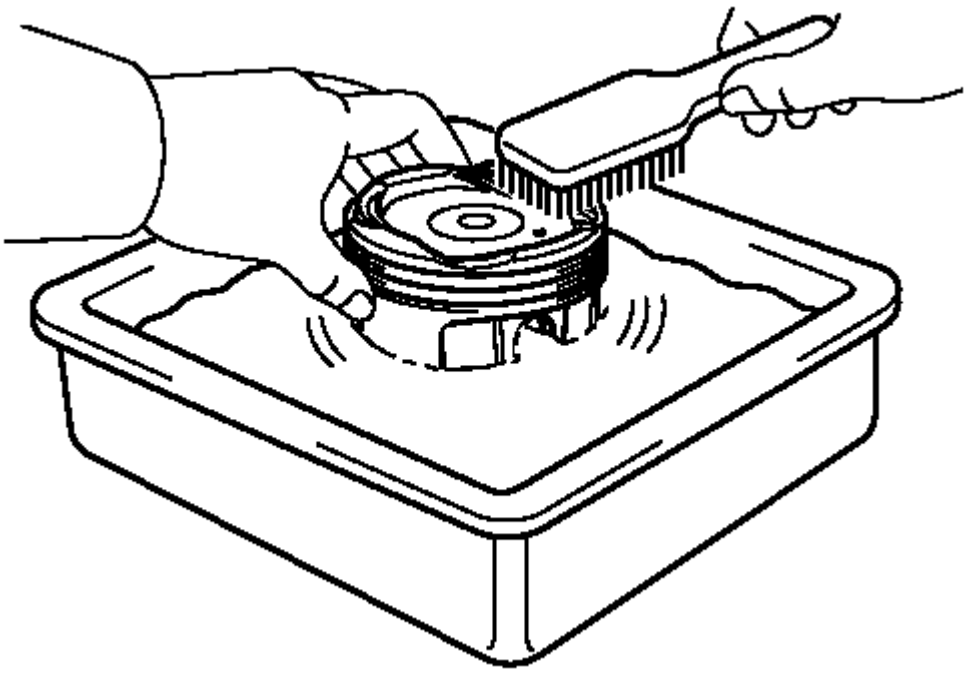


Fig. 375: Cleaning Piston Ring Grooves
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Using solvent and a brush, thoroughly clean the piston.



Y

Fig. 376: Cleaning Piston Using Solvent And Brush
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Do not use a wire brush.

5. **REMOVE CRANKSHAFT**
   a. Uniformly loosen and remove the 8 crankshaft bearing cap bolts and the 8 seal washers in several steps and in the sequence shown in the illustration.

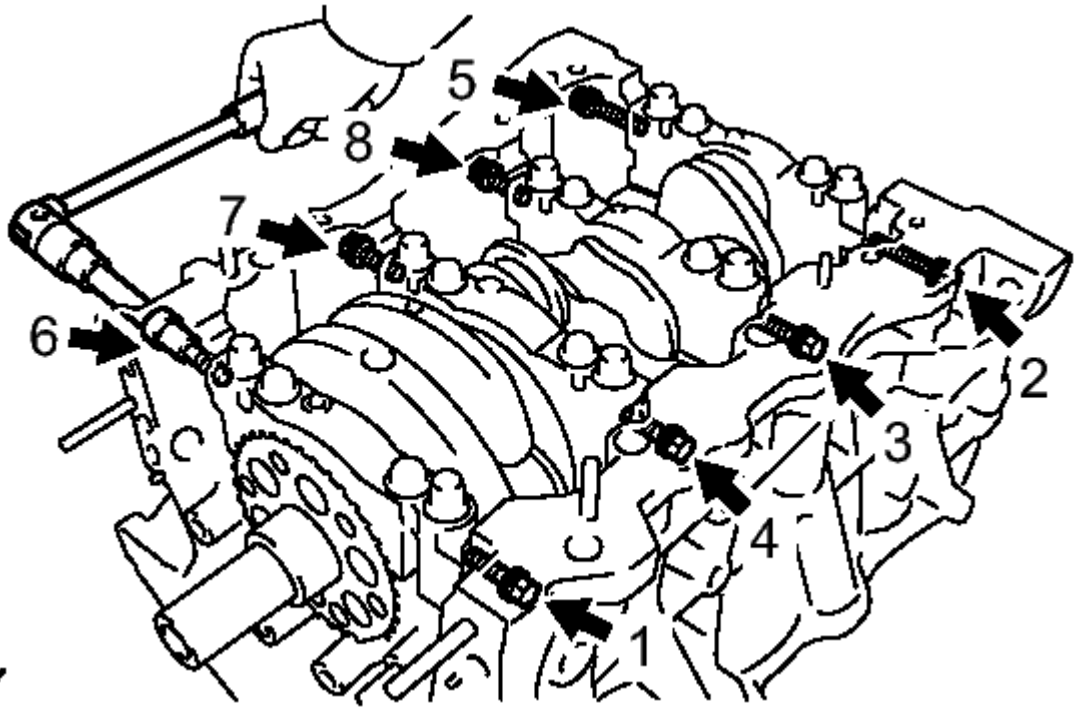


Fig. 377: Removing Main Bearing Cap Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Uniformly loosen the 16 crankshaft bearing cap bolts, in several steps and in the sequence shown in the illustration.

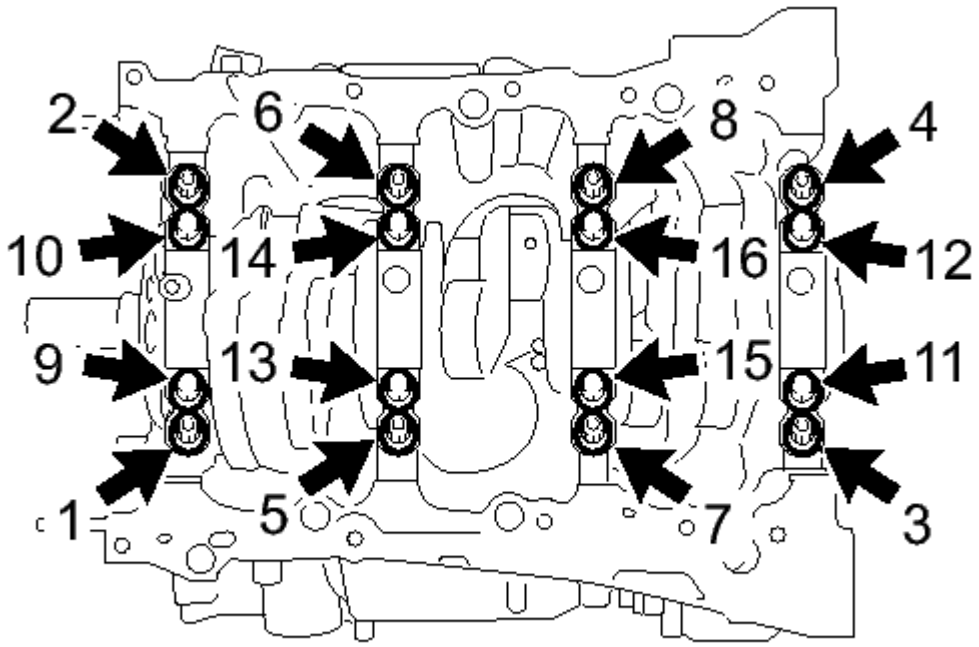
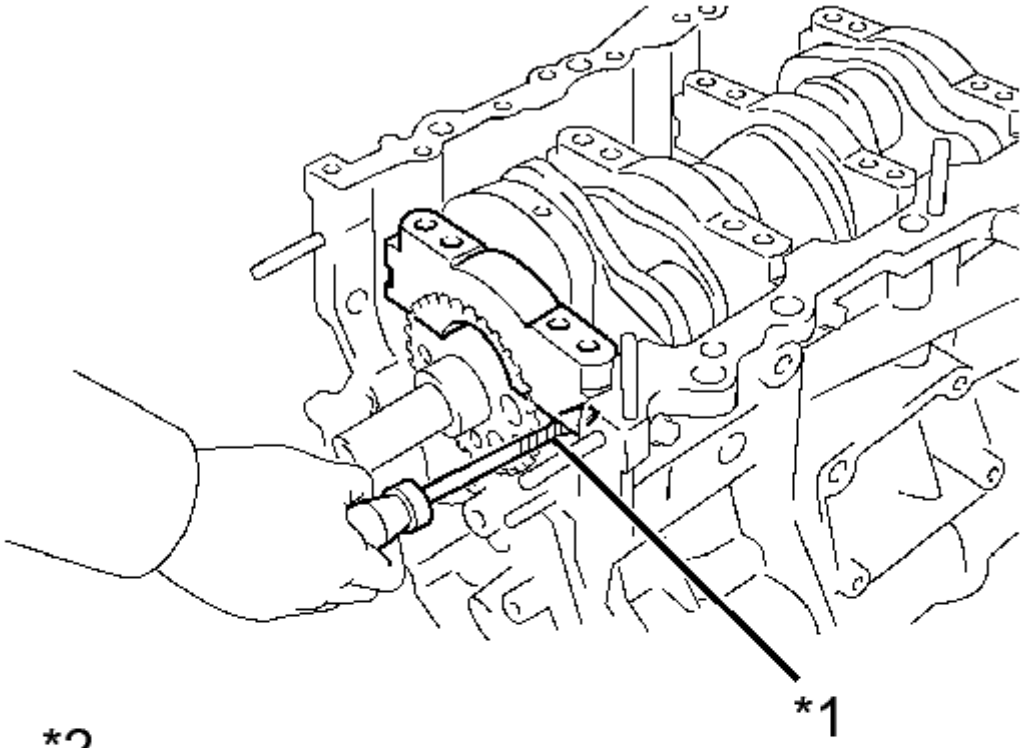


Fig. 378: Identifying Bearing Cap Bolts Loosening Sequence

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

c. Using a screwdriver, pry out the crankshaft bearing caps. Remove the 4 crankshaft bearing caps and lower crankshaft bearings.



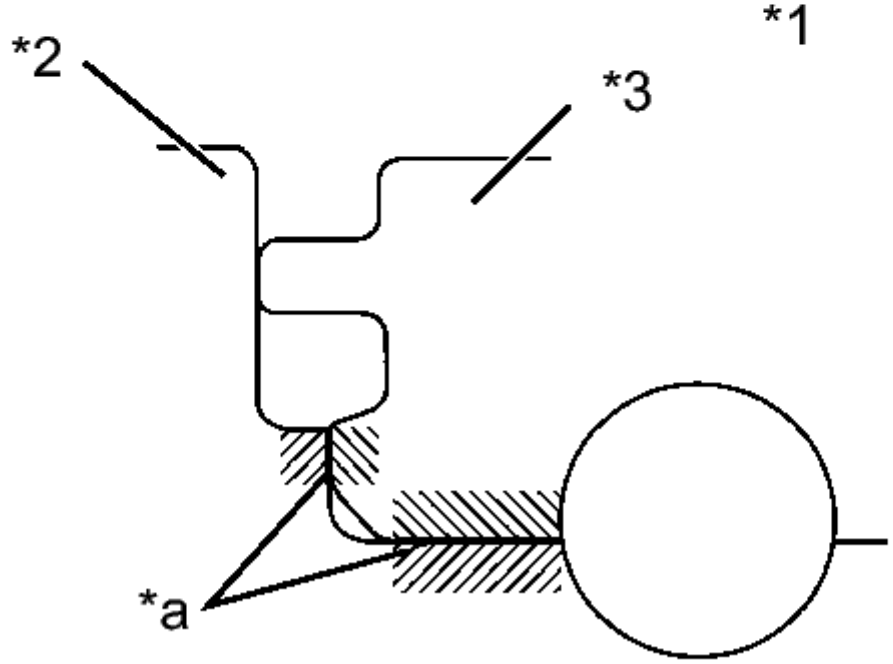


Fig. 379: Prying Out Crankshaft Bearing Cap Using A Screwdriver
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Protective Tape
*2	Cylinder Block
*3	Bearing Cap
*a	Joint Surface

NOTE:

- **Push up on the cap slowly and evenly, alternating from the right and left side so that the bearing cap can be removed.**
- **Be careful not to damage the joint surface of the cylinder block and the crankshaft bearing cap.**

d. Remove the crankshaft.

6. **REMOVE CRANKSHAFT BEARING**
   a. Remove the upper crankshaft bearings and lower crankshaft bearings.

      HINT:

      Arrange the removed parts in the correct order.

7. **REMOVE CRANKSHAFT THRUST WASHER SET**
   a. Remove the upper crankshaft thrust washers from the cylinder block sub-assembly.

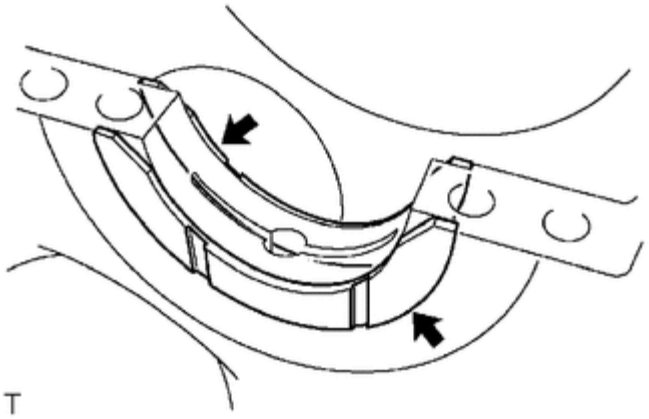


Fig. 380: Identifying Upper Bearings And Upper Thrust Washers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **REMOVE NO. 1 OIL NOZZLE SUB-ASSEMBLY**

a. Using a 5 mm hexagon wrench, remove the 3 bolts and No. 1 oil nozzle sub-assemblies.

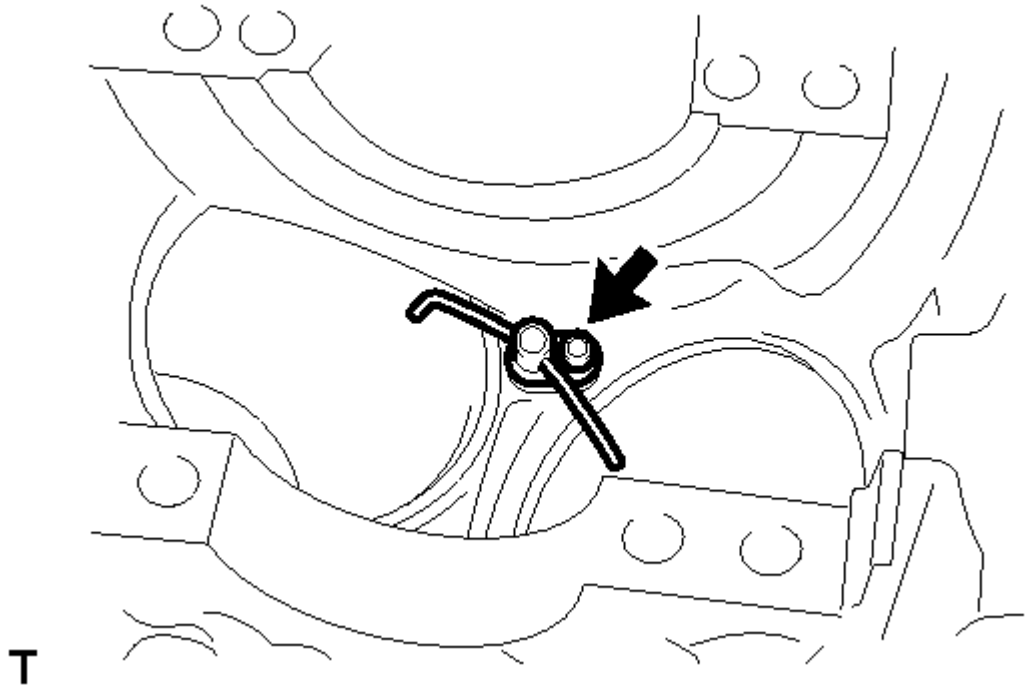


Fig. 381: Identifying Bolt And No. 1 Oil Nozzle
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Check the 3 oil nozzles for damage or clogging.

If necessary, replace the No. 1 oil nozzle sub-assembly.

9. **CLEAN CYLINDER BLOCK**

INSPECTION

INSPECTION

1. **INSPECT CONNECTING ROD THRUST CLEARANCE**
   a. Install the connecting rod cap. See step 8.
   b. Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

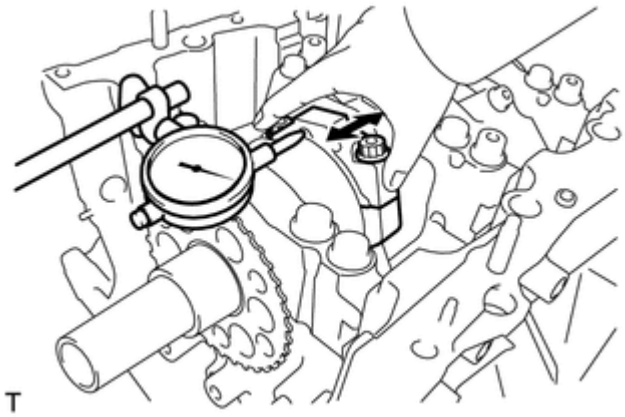


Fig. 382: Measuring Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard thrust clearance

0.15 to 0.40 mm (0.00591 to 0.0157 in.)

Maximum thrust clearance

0.50 mm (0.0197 in.)

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

2. **INSPECT CONNECTING ROD OIL CLEARANCE**
   a. Clean the crank pin and bearing.
   b. Check the crank pin and bearing for pitting and scratches.
   c. Lay a strip of Plastigage on the crank pin.

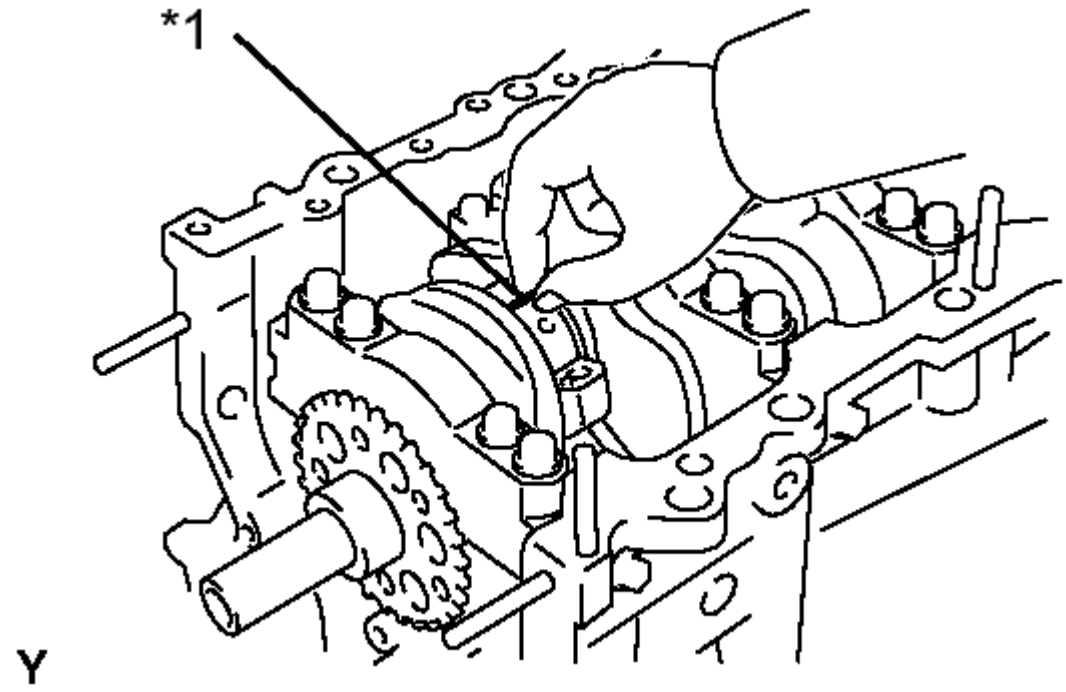


Fig. 383: Identifying Front Mark Of Connecting Rod Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Plastigage

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

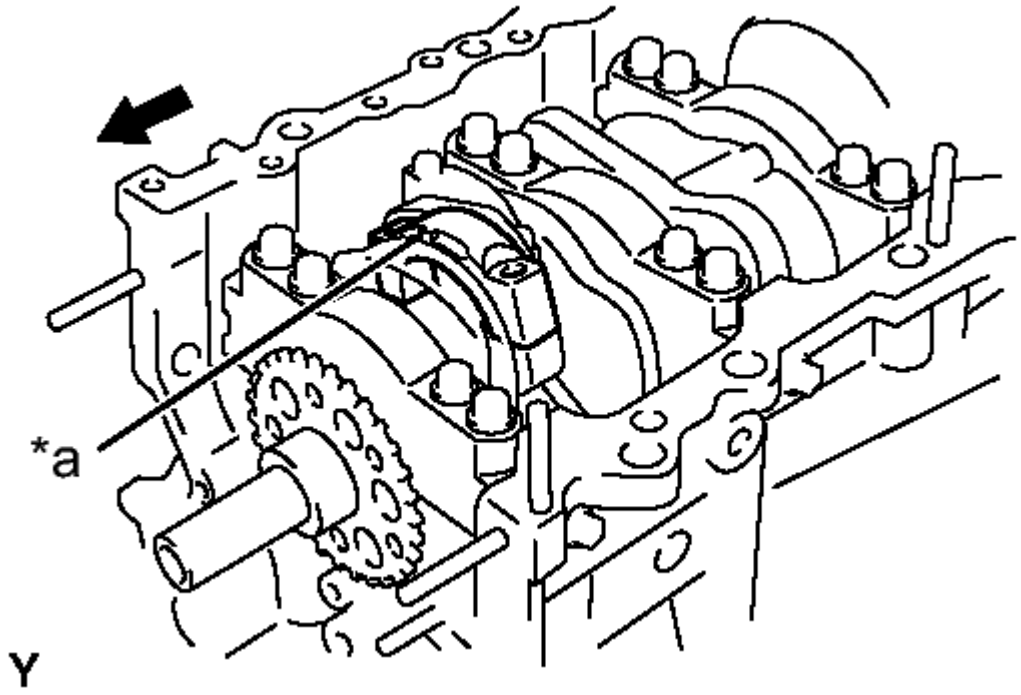


Fig. 384: Identifying Front Mark Of Connecting Rod Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

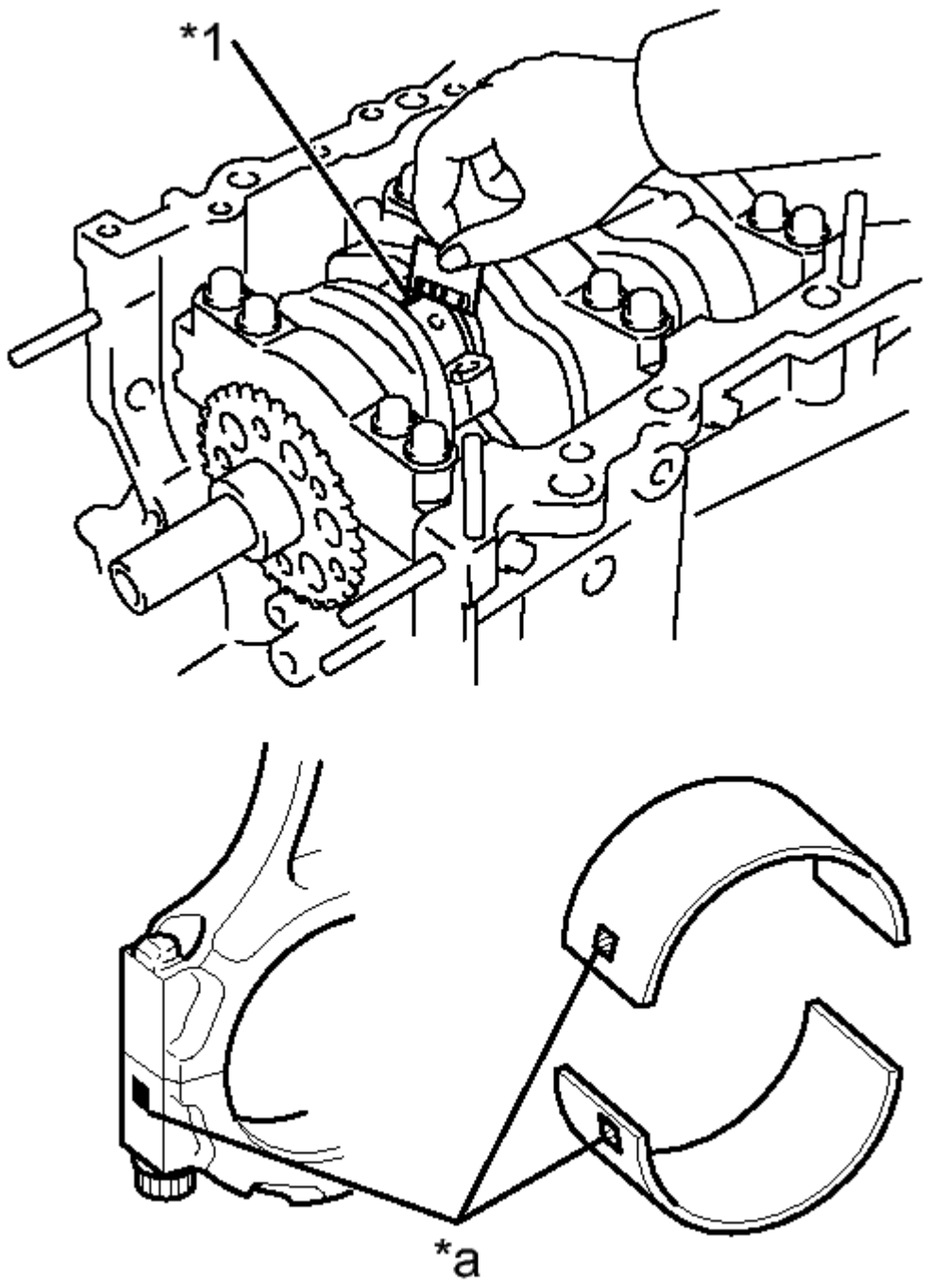
TEXT IN ILLUSTRATION

*a	Front Mark
.	Engine Front

e. Install the connecting rod cap. See step 8.

NOTE: Do not turn the crankshaft.

f. Remove the 2 bolts and connecting rod cap. See step 1.
g. Measure the Plastigage at its widest point.



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Fig. 385: Measuring Widest Point Of Plastigage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Plastigage

*a	Mark 1, 2, 3, or 4

Standard oil clearance

0.045 to 0.067 mm (0.00177 to 0.00264 in.)

Maximum oil clearance

0.070 mm (0.00276 in.)

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

HINT:

If replacing a bearing, replace it with one that has the same number as its respective connecting rod cap. Each bearing standard thickness is indicated by a number (1, 2, 3 or 4) marked on its surface.

Connecting Rod Diameter

Mark	Diameter
1	56.000 to 56.006 mm (2.20472 to 2.20496 in.)
2	56.007 to 56.012 mm (2.20500 to 2.20519 in.)
3	56.013 to 56.018 mm (2.20523 to 2.20543 in.)
	56.019 to 56.024 mm

4	(2.20547 to 2.20566 in.)

Connecting Rod Bearing Center Wall Thickness

Mark	Thickness
1	1.481 to 1.484 mm (0.05831 to 0.05843 in.)
2	1.484 to 1.487 mm (0.05843 to 0.05854 in.)
3	1.487 to 1.490 mm (0.05854 to 0.05866 in.)
4	1.490 to 1.493 mm (0.05866 to 0.05878 in.)

Standard crankshaft pin diameter

52.992 to 53.000 mm (2.0863 to 2.0866 in.)

NOTE: Completely remove the Plastigage after the measurement.

3. **INSPECT CYLINDER BLOCK FOR WARPAGE**
   a. Using a precision straightedge and feeler gauge, measure the warpage of the contact surface of the cylinder head gasket.

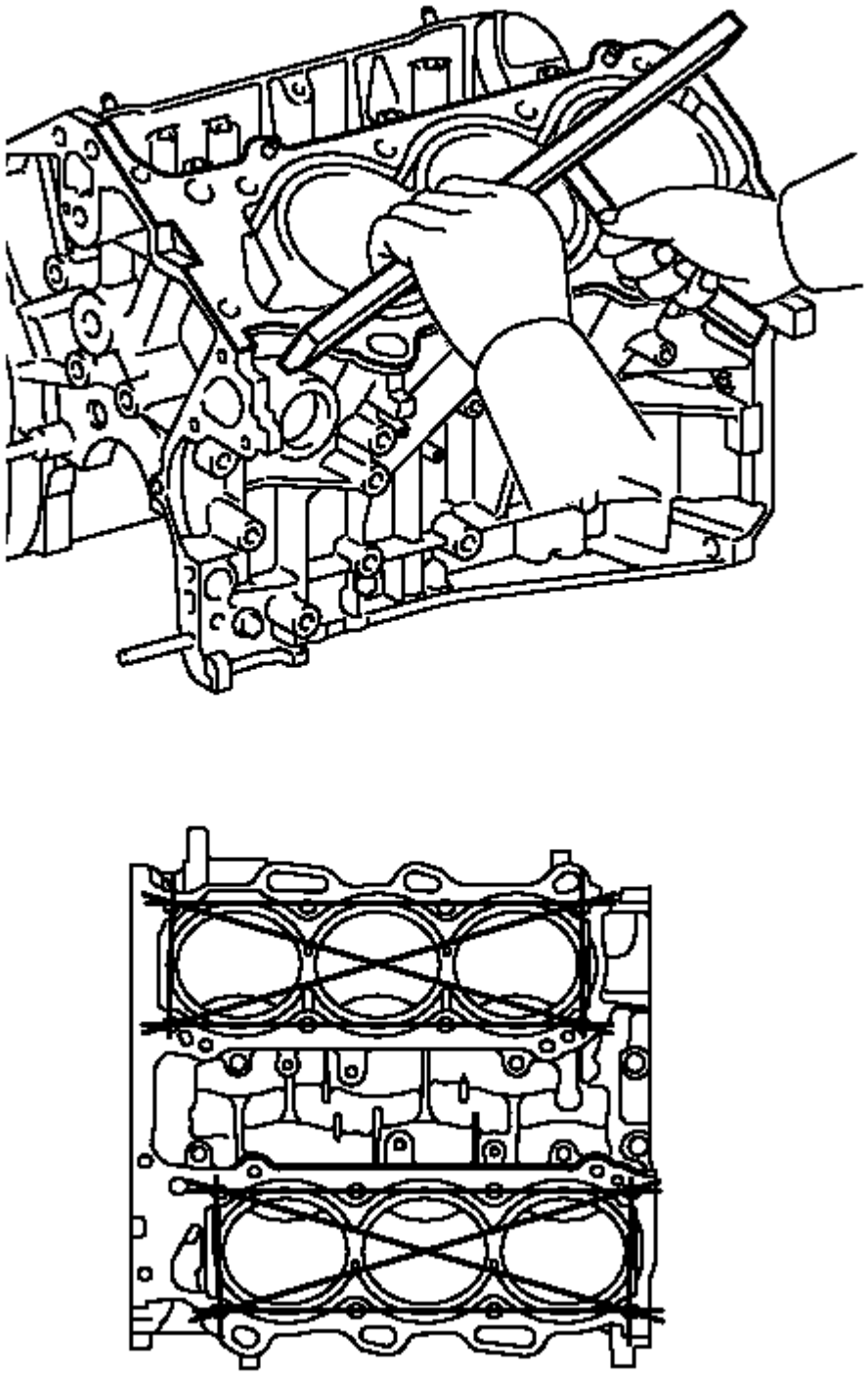


Fig. 386: Measuring Warpage Of Contact Surface Of Cylinder Head Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum warpage

0.07 mm (0.00276 in.)

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

4. **INSPECT CYLINDER BORE**
   a. Visually check the cylinder for vertical scratches.

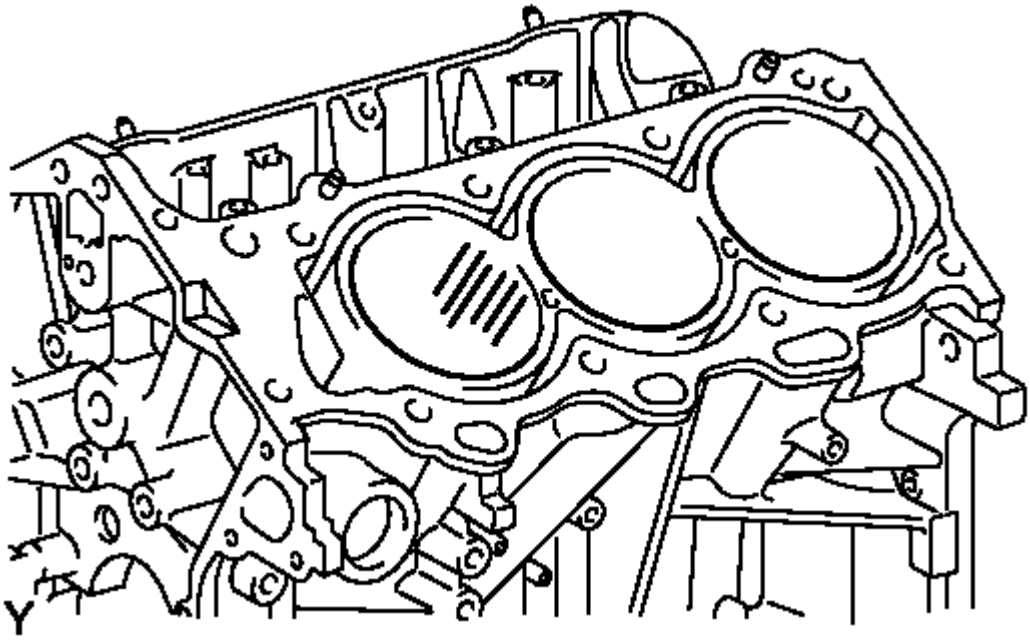


Fig. 387: Checking Cylinder
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If deep scratches are present, rebore all the 6 cylinders. If necessary, replace the cylinder block.

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

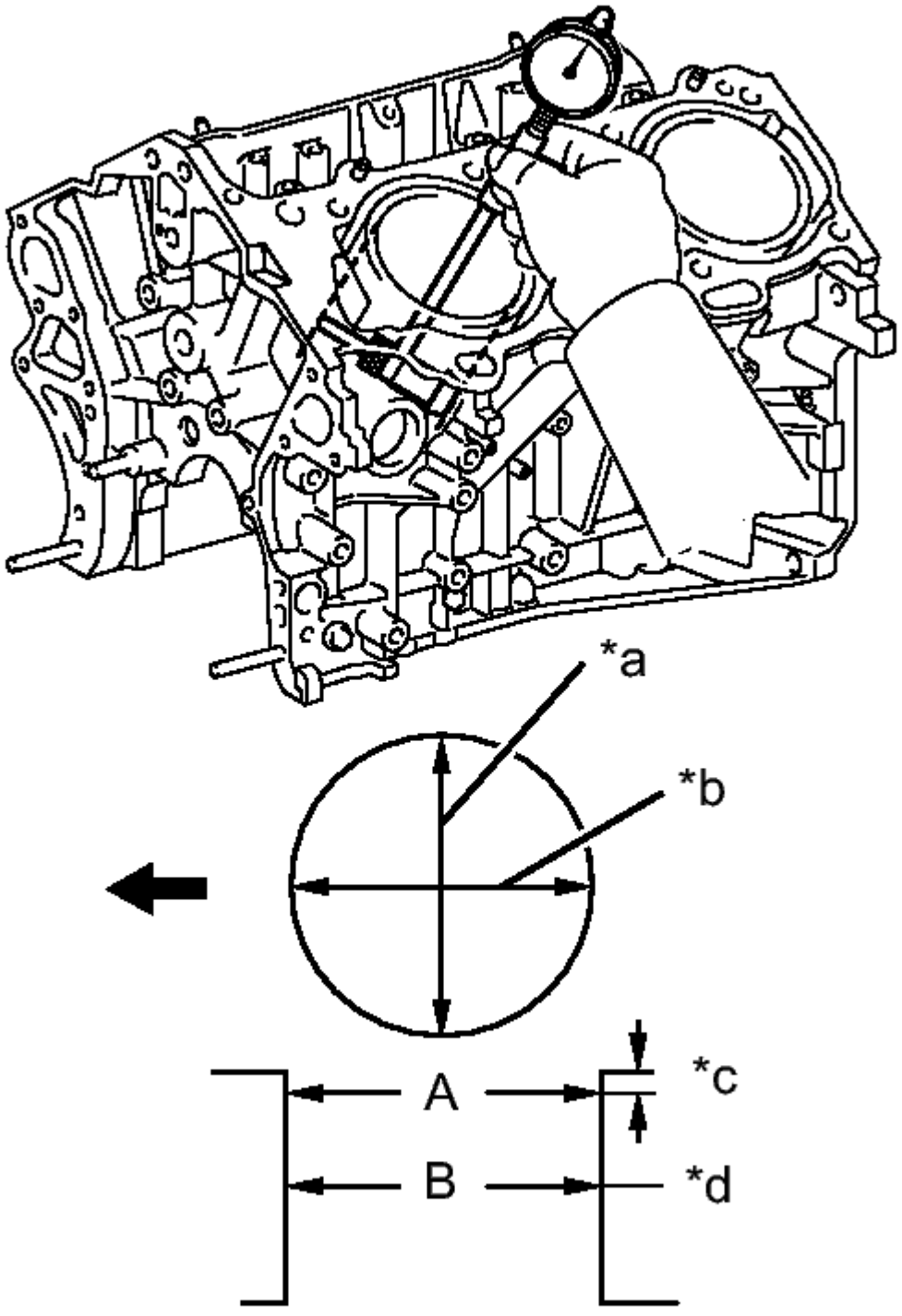


Fig. 388: Measuring Cylinder Bore Diameter Using A Cylinder Gauge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard diameter

94.000 to 94.012 mm (3.7008 to 3.7013 in.)

Maximum diameter

94.13 mm (3.7059 in.)

TEXT IN ILLUSTRATION

*a	Axial Direction
*b	Thrust Direction
*c	10 mm (0.394 in.)
*d	Center
·	Front

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

5. **INSPECT PISTON**
   a. Using a micrometer, measure the piston diameter at right angles to the piston center line where the distance from the piston end is as specified.

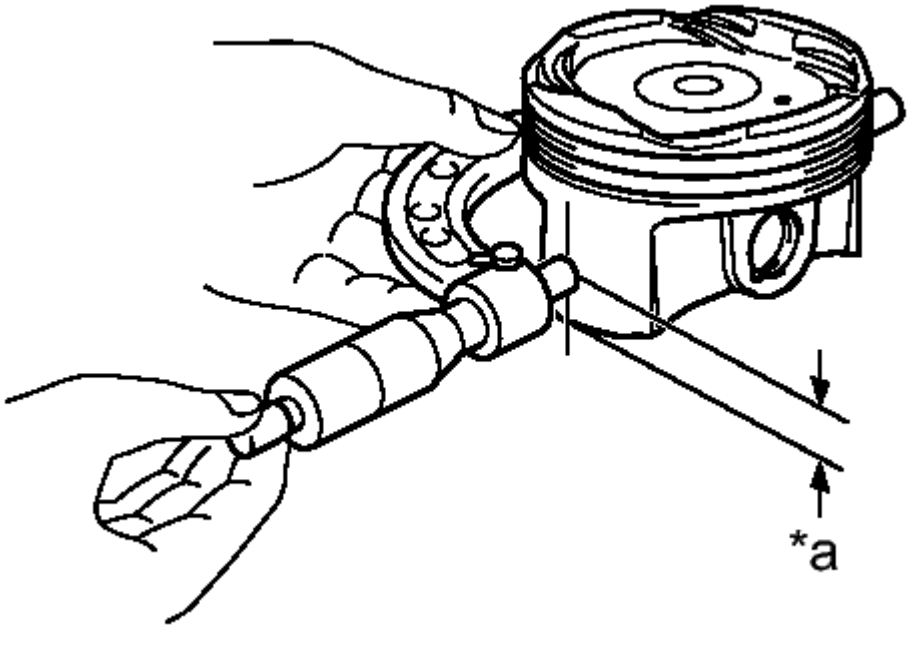


Fig. 389: Measuring Piston Diameter Using A Micrometer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Distance

8.9 mm (0.3504 in.)

Standard diameter

93.960 to 93.980 mm (3.6992 to 3.7000 in.)

Minimum diameter

93.830 mm (3.6941 in.)

TEXT IN ILLUSTRATION

*a	Distance

If the piston diameter is less than the minimum, replace the piston and piston pin as a set.

6. **INSPECT PISTON OIL CLEARANCE**
   a. Measure the cylinder bore diameter in the thrust directions.
   b. Subtract the piston diameter measurement from the cylinder bore diameter measurement.

   Standard oil clearance

   0.020 to 0.052 mm (0.000787 to 0.00205 in.)

   Maximum oil clearance

   0.060 mm (0.00236 in.)

   If the oil clearance is greater than the maximum, replace all the pistons. If necessary, replace the cylinder block sub-assembly.

7. **INSPECT RING GROOVE CLEARANCE**
   a. Using a feeler gauge, measure the clearance between a new piston ring and the wall of the ring groove.

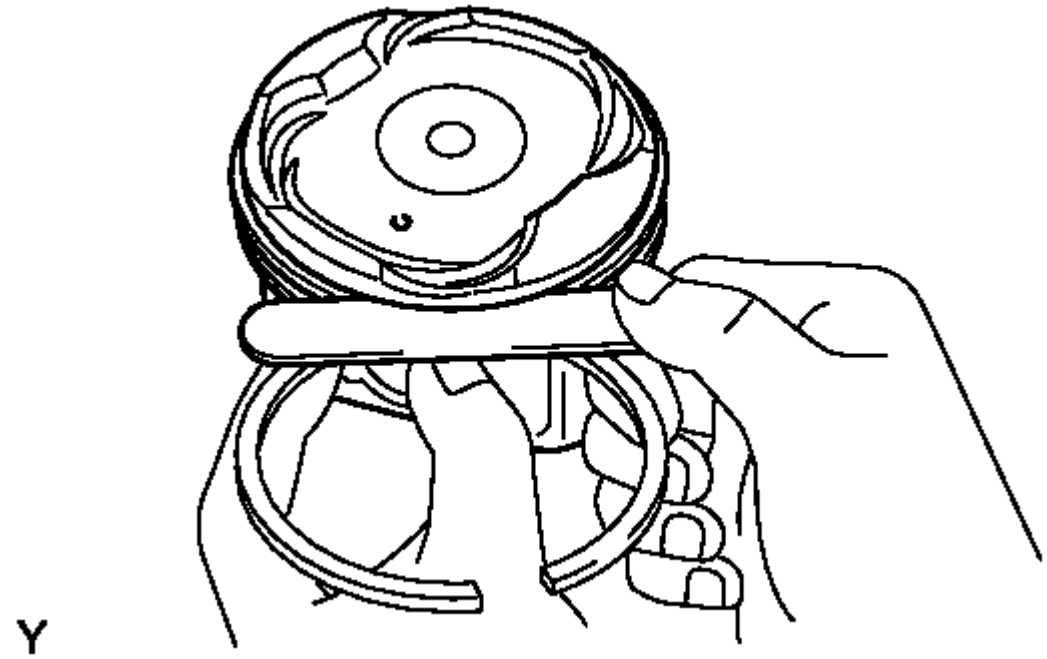


Fig. 390: Measuring Ring Groove
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Ring Groove Clearance

Item	Clearance
No. 1	0.020 to 0.070 mm (0.000787 to 0.00276 in.)
No. 2	0.020 to 0.060 mm (0.000787 to 0.00236 in.)
Oil	0.070 to 0.150 mm (0.00276 to 0.00591 in.)

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

8. **INSPECT PISTON PIN OIL CLEARANCE**
    a. Using a caliper gauge, measure the inside diameter of the piston pin hole.

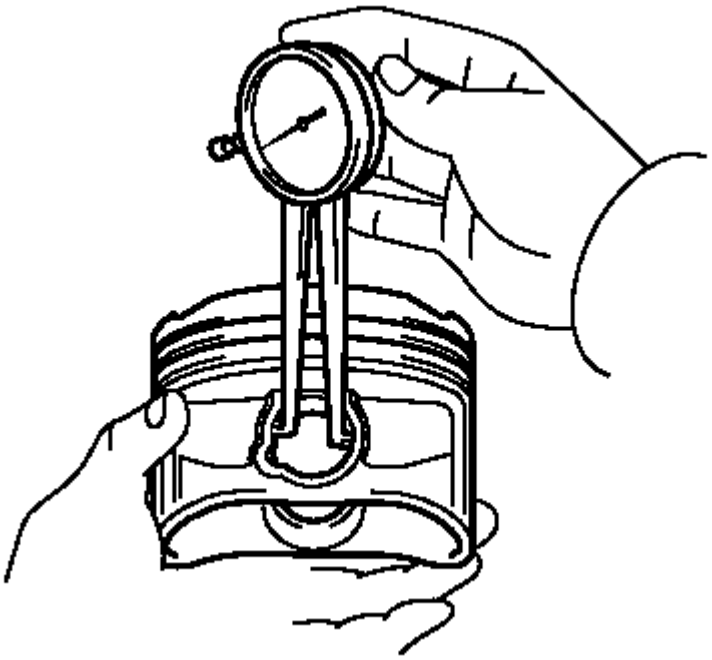


Fig. 391: Measuring Inside Diameter Of Piston Pin Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Piston Pin Hole Inside Diameter

Mark	Diameter
A	22.001 to 22.004 mm (0.8662 to 0.8663 in.)
B	22.004 to 22.007 mm (0.8663 to 0.8664 in.)
C	22.007 to 22.010 mm (0.8664 to 0.8665 in.)

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

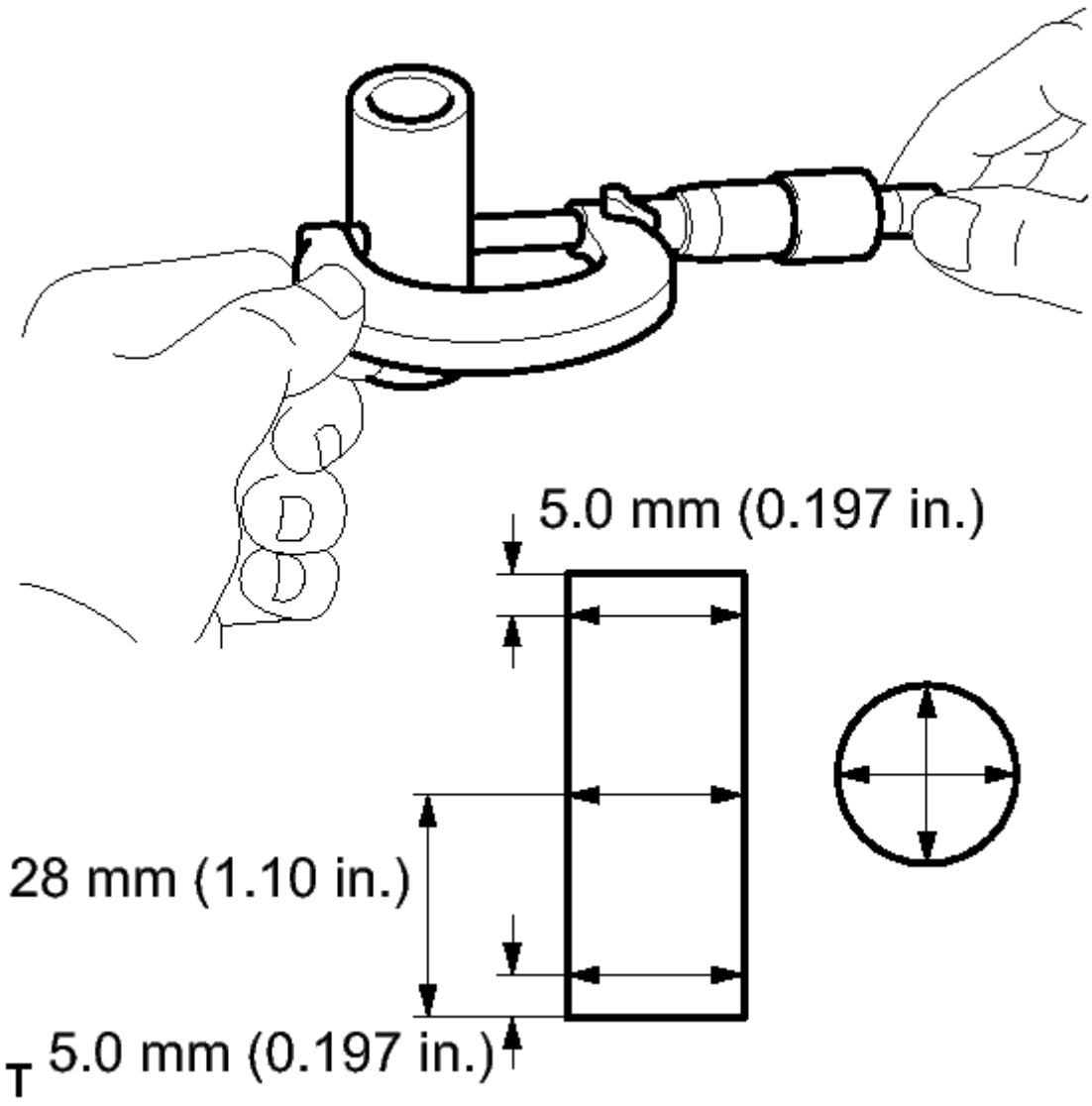


Fig. 392: Measuring Inside Diameter Of Connecting Rod Bushing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Piston Pin Diameter

Mark	Diameter
A	21.997 to 22.000 mm (0.8660 to 0.8661 in.)
B	22.000 to 22.003 mm (0.8661

	to 0.8663 in.)
C	22.003 to 22.006 mm (0.8663 to 0.8664 in.)

c. Subtract the piston pin diameter measurement from the piston pin hole diameter measurement.

Standard oil clearance

0.001 to 0.007 mm (0.0000394 to 0.000276 in.)

Maximum oil clearance

0.015 mm (0.000591 in.)

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

d. Using a caliper gauge, measure the inside diameter of the connecting rod bushing.

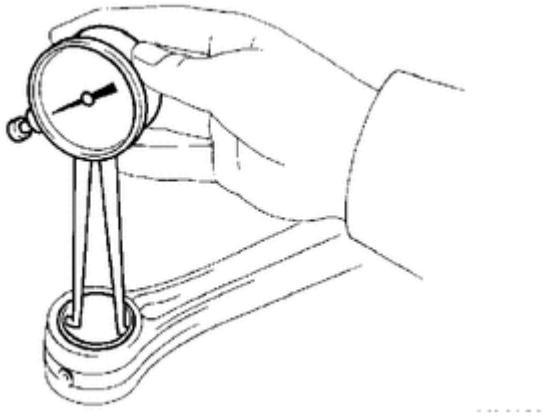


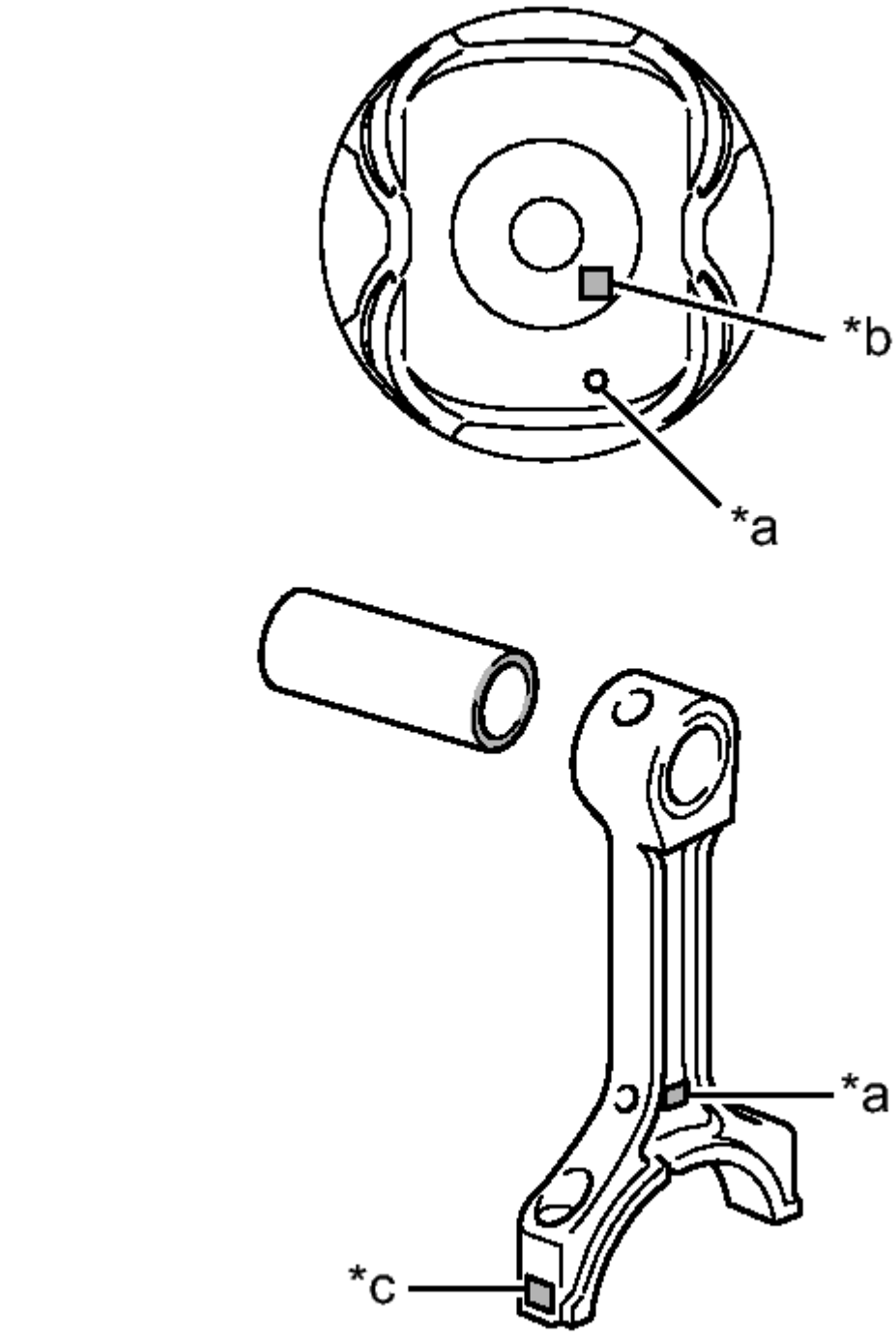
Fig. 393: Checking Inside Diameter Of Connecting Rod Bushing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Bushing Inside Diameter

Mark	Diameter
A	22.005 to 22.008 mm (0.86634 to 0.86645

	in.)
B	22.009 to 22.011 mm (0.86649 to 0.86657 in.)
C	22.012 to 22.014 mm (0.86661 to 0.86669 in.)

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



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Fig. 394: Identifying Front Mark, Piston Pin Hole Inside Diameter Mark & Connecting Rod Bushing Inside Diameter Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front Mark
*b	Piston Pin Hole Inside Diameter Mark
*c	Connecting Rod Bushing Inside Diameter Mark

Standard oil clearance

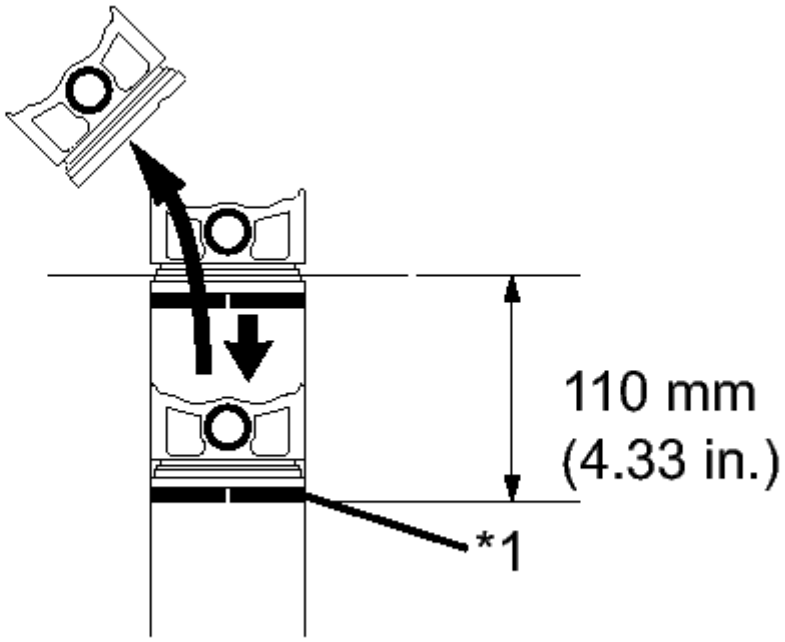
0.005 to 0.011 mm (0.000197 to 0.000433 in.)

Maximum oil clearance

0.030 mm (0.00118 in.)

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

9. **INSPECT PISTON RING END GAP**
   a. Insert the piston ring into the cylinder bore.
   b. Using a piston, push the piston ring slightly beyond the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block sub-assembly.



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Fig. 395: Inserting Piston Ring Into Cylinder Bore Using A Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Piston Ring

c. Using a feeler gauge, measure the end gap.

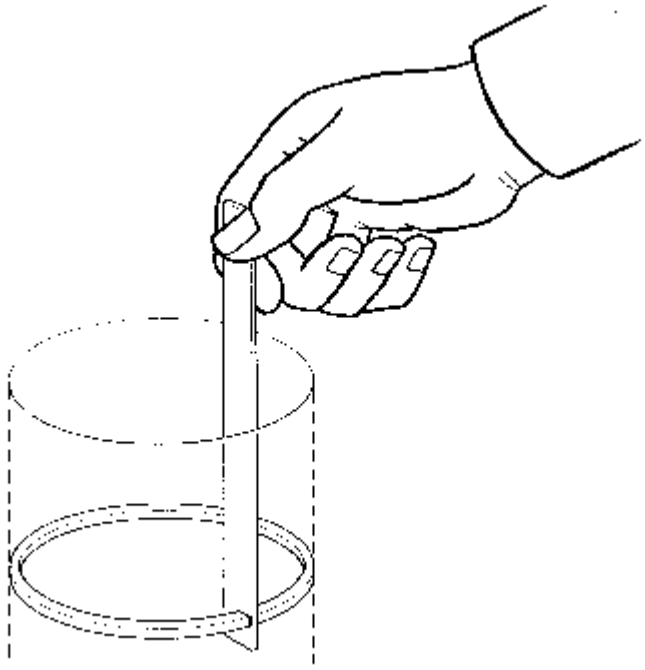


Fig. 396: Checking End Gap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard End Gap

Item	End Gap
No. 1	0.22 to 0.32 mm (0.00866 to 0.0126 in.)
No. 2	0.35 to 0.45 mm (0.0138 to 0.0177 in.)
Oil	0.10 to 0.40 mm (0.00394 to 0.0157 in.)

Maximum End Gap

Item	End Gap
No. 1	0.50 mm (0.0197 in.)
No. 2	0.85 mm (0.0335 in.)
Oil	0.60 mm (0.0236 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, rebore all the 6 cylinders or replace the cylinder block sub-assembly.

10. **INSPECT CRANKSHAFT THRUST CLEARANCE**
    a. Install the crankshaft bearing cap. See step 8.
    b. Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

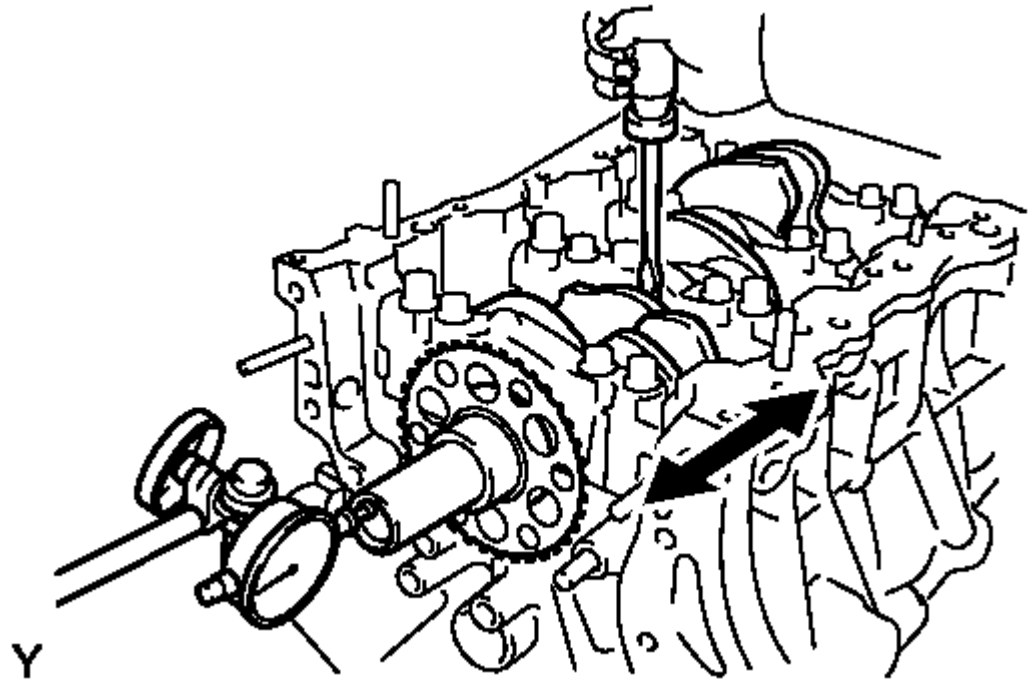


Fig. 397: Measuring Crankshaft Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard thrust clearance

0.04 to 0.24 mm (0.00157 to 0.00945 in.)

Maximum thrust clearance

0.30 mm (0.0118 in.)

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

Thrust washer thickness

2.43 to 2.48 mm (0.0957 to 0.0976 in.)

11. **INSPECT CONNECTING ROD SUB-ASSEMBLY**
    a. Using a rod aligner and feeler gauge, check the connecting rod alignment.

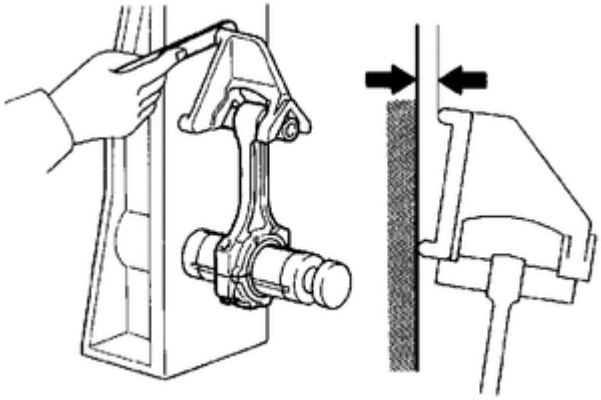


Fig. 398: Checking Connecting Rod
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Check for out-of-alignment.

   Maximum out-of-alignment

   0.05 mm (0.00197 in.) per 100 mm (3.94 in.)

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

2. Check for twist.

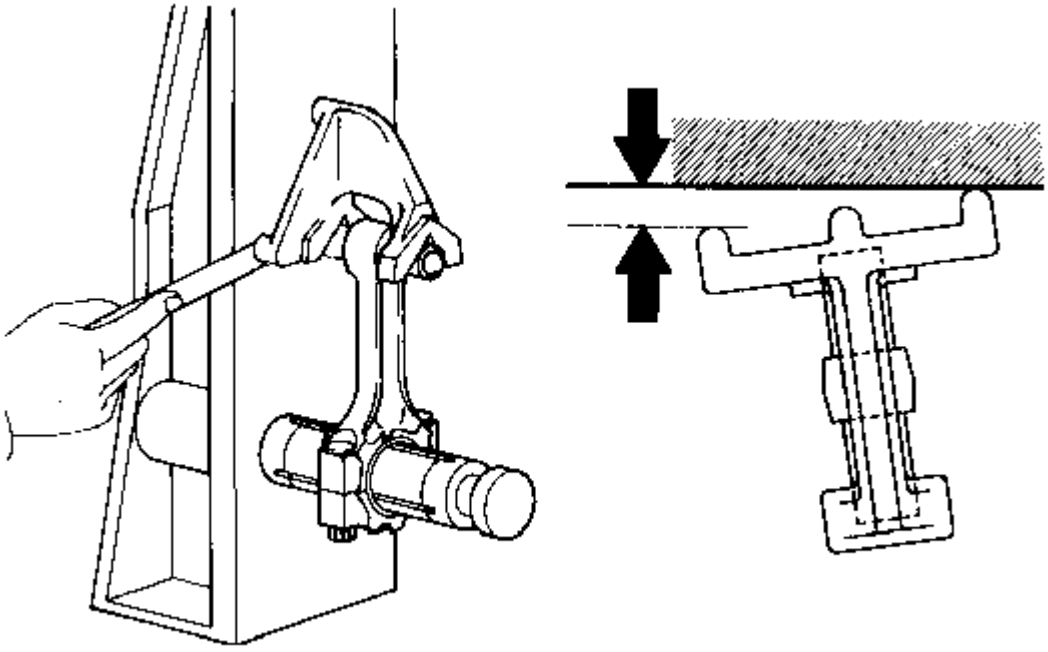


Fig. 399: Checking Connecting Rod For Twist
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum twist

0.15 mm (0.00591 in.) per 100 mm (3.94 in.)

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

12. **INSPECT CONNECTING ROD BOLT**
    a. Using a vernier caliper, measure the diameter of the bolt in the area shown in the illustration.

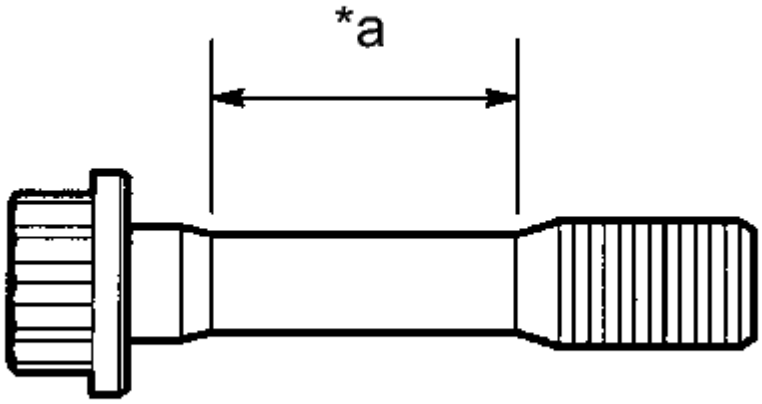


Fig. 400: Inspecting Connecting Rod Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Measurement Area

Standard diameter

7.2 to 7.3 mm (0.283 to 0.287 in.)

Minimum diameter

7.0 mm (0.276 in.)

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

HINT:

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

13. **INSPECT CRANKSHAFT**
    a. Inspect for runout.
        1. Clean the crank journal.

2. Place the crankshaft on V-blocks.
3. Using a dial indicator, measure the runout at the center journal.

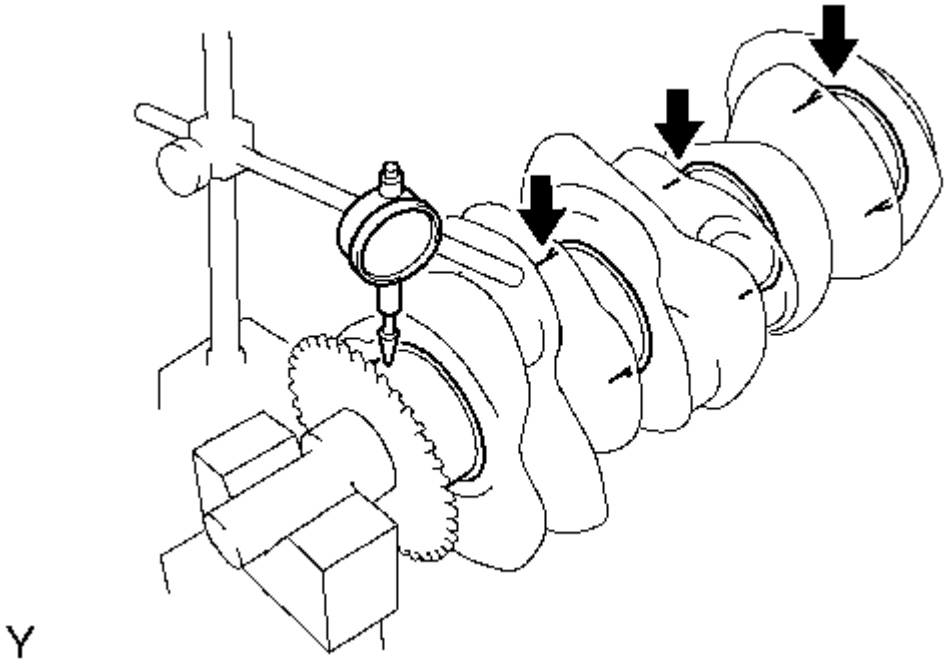


Fig. 401: Checking Circle Runout At Center Journal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum runout

0.06 mm (0.00236 in.)

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

b. Inspect the main journals.
   1. Using a micrometer, measure the diameter of each main journal.

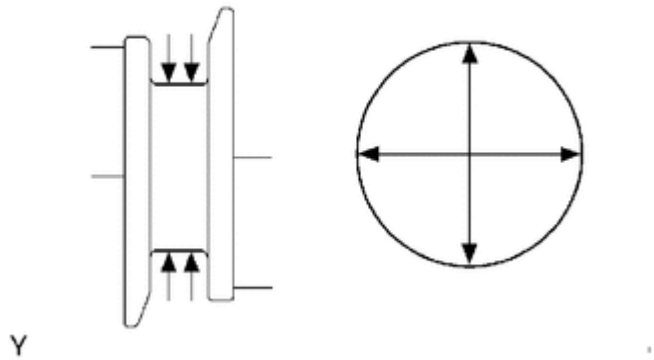


Fig. 402: Checking Main Journal For Taper And Out-Of Round
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard journal diameter

60.988 to 61.000 mm (2.4011 to 2.4016 in.)

If the diameter is not as specified, check the oil clearance. If necessary, replace the crankshaft.

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

   Maximum taper and out-of-round

   0.02 mm (0.000787 in.)

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

c. Inspect the crank pin.
   1. Using a micrometer, measure the diameter of each crank pin.

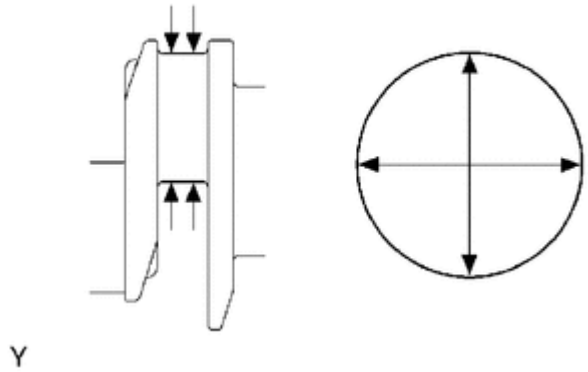


Fig. 403: Checking Crank Pin For Taper And Out-Of Round
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Crank pin diameter

52.992 to 53.000 mm (2.0863 to 2.0866 in.)

If the diameter is not as specified, check the oil clearance. If necessary, replace the crankshaft.

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

   Maximum taper and out-of-round

0.02 mm (0.000787 in.)

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

14. **INSPECT CRANKSHAFT OIL CLEARANCE**
    a. Check the crank journal and crankshaft bearing for pitting and scratches.
    b. Install the crankshaft bearing. See step 8.
    c. Place the crankshaft on the cylinder block.
    d. Lay a strip of Plastigage across each journal.

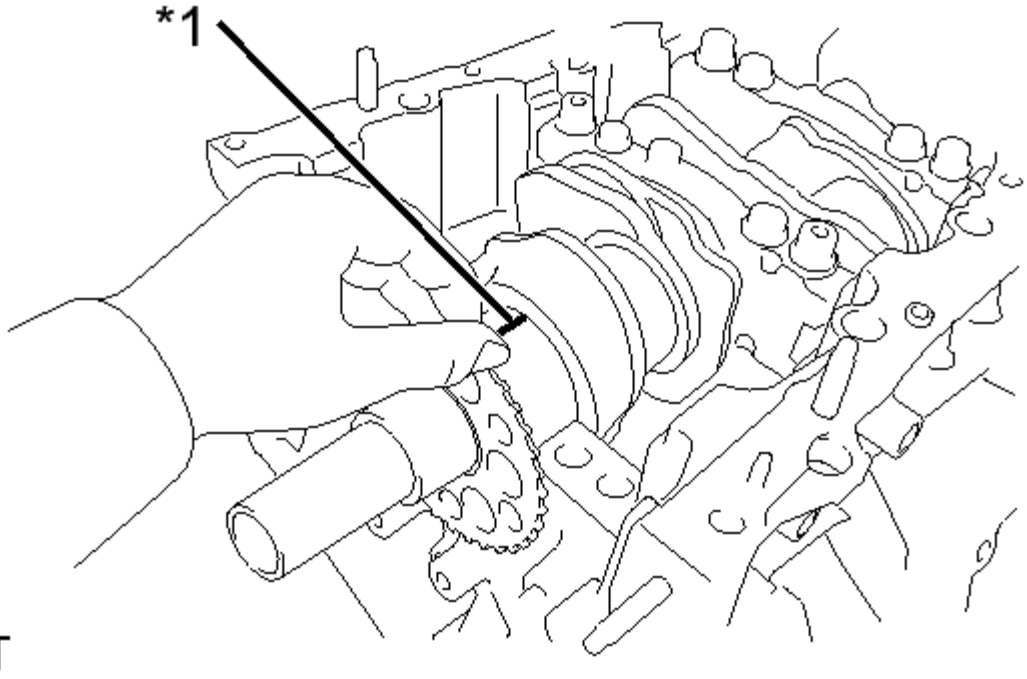


Fig. 404: Applying Plastigage Across Crankshaft Journal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Plastigage

    e. Examine the front marks and numbers to install the crankshaft 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. See step 8.

    NOTE: Do not turn the crankshaft.

g. Remove the main bearing caps. See step 1.
h. Measure the Plastigage at its widest point.

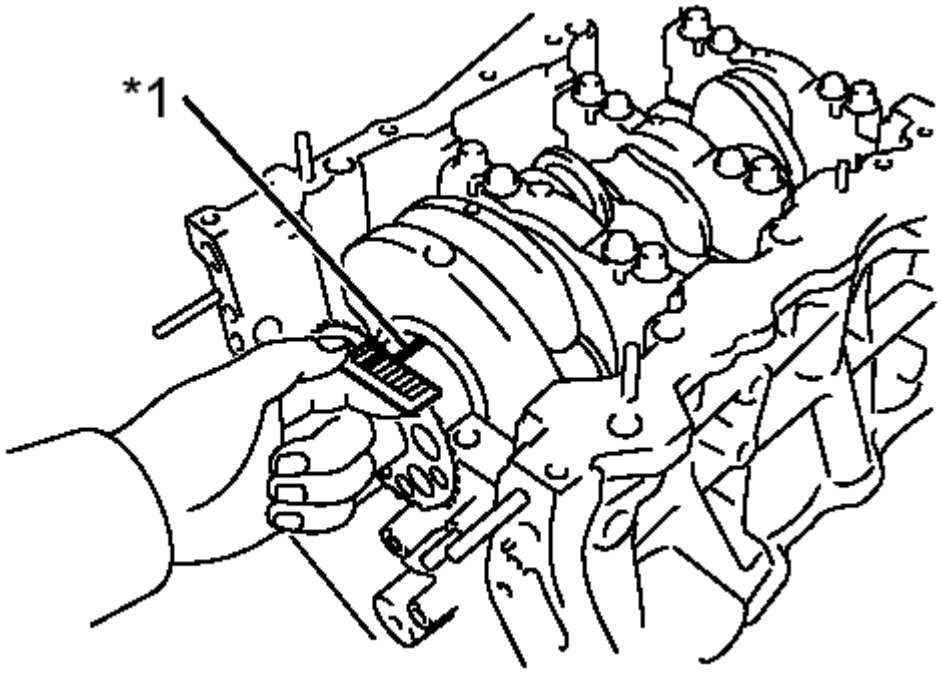


Fig. 405: Measuring Widest Point Of Plastigage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Plastigage

Standard oil clearance

0.026 to 0.047 mm (0.00102 to 0.00185 in.)

Maximum oil clearance

0.050 mm (0.00197 in.)

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

NOTE: Completely remove the Plastigage after the measurement.

i. If replacing a bearing, replace it with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then refer to the table below for the appropriate bearing number. There are 5 sizes of standard bearings, marked "1", "2", "3", "4" and "5" accordingly.

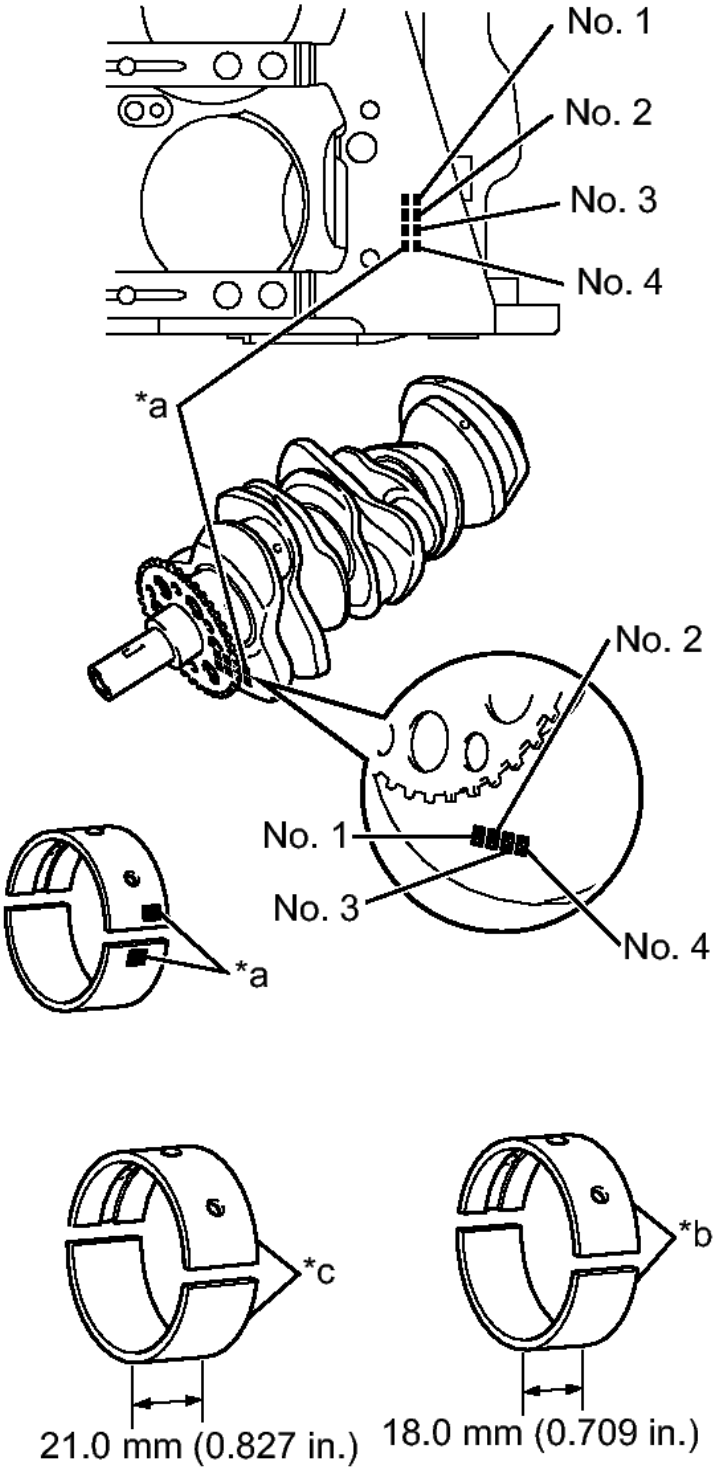


Fig. 406: Identifying Bearing Number Marks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Number Mark
*b	No. 2 and No. 3 Journal Bearing
*c	No. 1 and No. 4 Journal Bearing

JOURNAL BEARINGS

Cylinder block + Crankshaft	0 - 5	6 - 11	12 - 17	18 - 23	24 - 28
Bearing to be used	"1"	"2"	"3"	"4"	"5"

HINT:

EXAMPLE: Cylinder block "11" + Crankshaft "06" = Total number 17 (Use bearing "3")

Crankshaft Main Journal Diameter

Mark	Diameter
"00"	60.999 to 61.000 mm (2.40153 to 2.40157 in.)
"01"	60.998 to 60.999 mm (2.40149 to 2.40153 in.)
"02"	60.997 to 60.998 mm (2.40145 to 2.40149 in.)
	60.996 to

"03"	60.997 mm (2.40141 to 2.40145 in.)
"04"	60.995 to 60.996 mm (2.40137 to 2.40141 in.)
"05"	60.994 to 60.995 mm (2.40133 to 2.40137 in.)
"06"	60.993 to 60.994 mm (2.40129 to 2.40133 in.)
"07"	60.992 to 60.993 mm (2.40126 to 2.40129 in.)
"08"	60.991 to 60.992 mm (2.40122 to 2.40126 in.)
"09"	60.990 to 60.991 mm (2.40118 to 2.40122

	in.)
"10"	60.989 to 60.990 mm (2.40114 to 2.40118 in.)
"11"	60.988 to 60.989 mm (2.40110 to 2.40114 in.)

Standard Upper Bearing Center Wall Thickness (No. 1 and No. 4 journal)

Mark	Thickness
"1"	2.500 to 2.503 mm (0.09843 to 0.09854 in.)
"2"	2.503 to 2.506 mm (0.09854 to 0.09866 in.)
"3"	2.506 to 2.509 mm (0.09866 to 0.09878 in.)
"4"	2.509 to 2.512 mm (0.09878 to 0.09890 in.)
"5"	2.512 to 2.515 mm (0.09890 to 0.09902 in.)

Standard Lower Bearing Center Wall Thickness (No. 1 and No. 4 journal)

Mark	Thickness
"1"	2.478 to 2.481 mm (0.09756 to 0.09768 in.)
"2"	2.481 to 2.484 mm (0.09768 to 0.09780 in.)
"3"	2.484 to 2.487 mm (0.09780 to 0.09791 in.)
"4"	2.487 to 2.490 mm (0.09791 to 0.09803 in.)
"5"	2.490 to 2.493 mm (0.09803 to 0.09815 in.)

Standard Upper Bearing Center Wall Thickness (No. 2 and No. 3 journal)

Mark	Thickness
"1"	2.478 to 2.481 mm (0.09756 to 0.09768 in.)
"2"	2.481 to 2.484 mm (0.09768 to 0.09780 in.)
"3"	2.484 to 2.487 mm (0.09780 to 0.09791 in.)
	2.487 to

"4"	2.490 mm (0.09791 to 0.09803 in.)
"5"	2.490 to 2.493 mm (0.09803 to 0.09815 in.)

Standard Lower Bearing Center Wall Thickness (No. 2 and No. 3 journal)

Mark	Thickness
"1"	2.500 to 2.503 mm (0.09843 to 0.09854 in.)
"2"	2.503 to 2.506 mm (0.09854 to 0.09866 in.)
"3"	2.506 to 2.509 mm (0.09866 to 0.09878 in.)
"4"	2.509 to 2.512 mm (0.09878 to 0.09890 in.)
"5"	2.512 to 2.515 mm (0.09890 to 0.09902 in.)

15. **INSPECT CRANKSHAFT BEARING CAP SET BOLT**
    a. Using a vernier caliper, measure the diameter of the threads at the measurement point.

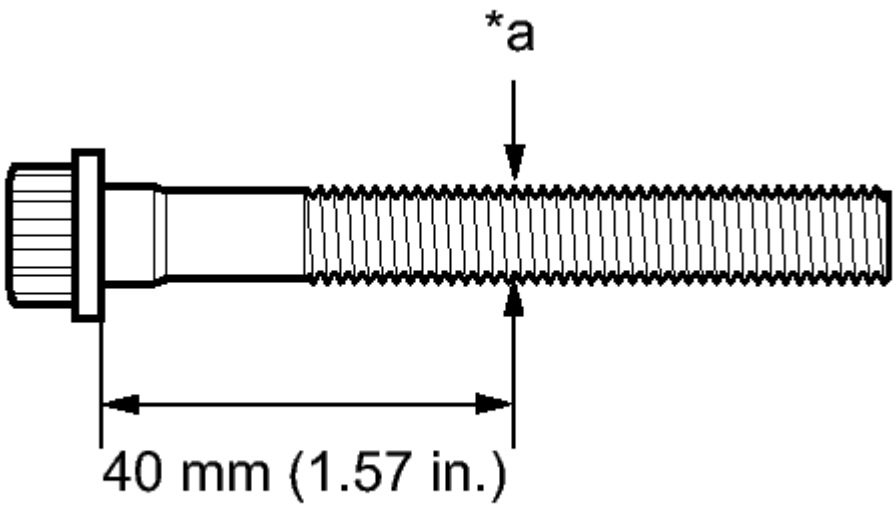


Fig. 407: Inspecting Crankshaft Bearing Cap Set Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Measurement Point

Standard diameter

10.8 to 11.0 mm (0.4252 to 0.4331 in.)

Minimum diameter

10.7 mm (0.4213 in.)

Measurement Point

40 mm (1.57 in.)

HINT:

- If the diameter is less than the minimum, replace the crankshaft bearing cap set bolt. Failure to do so may lead to engine damage.
- If there is any thread deformation, replace the crankshaft bearing cap set bolt with a new one.

16. **INSPECT NO. 1 OIL NOZZLE SUB-ASSEMBLY**
    a. Check the oil nozzles for damage or clogs.

HINT:

If there is damage or clogs, replace the oil nozzle.

REPLACEMENT

REPLACEMENT

1. **REPLACE STRAIGHT PIN**
   a. Using a plastic hammer, tap in new straight pins to the cylinder block.

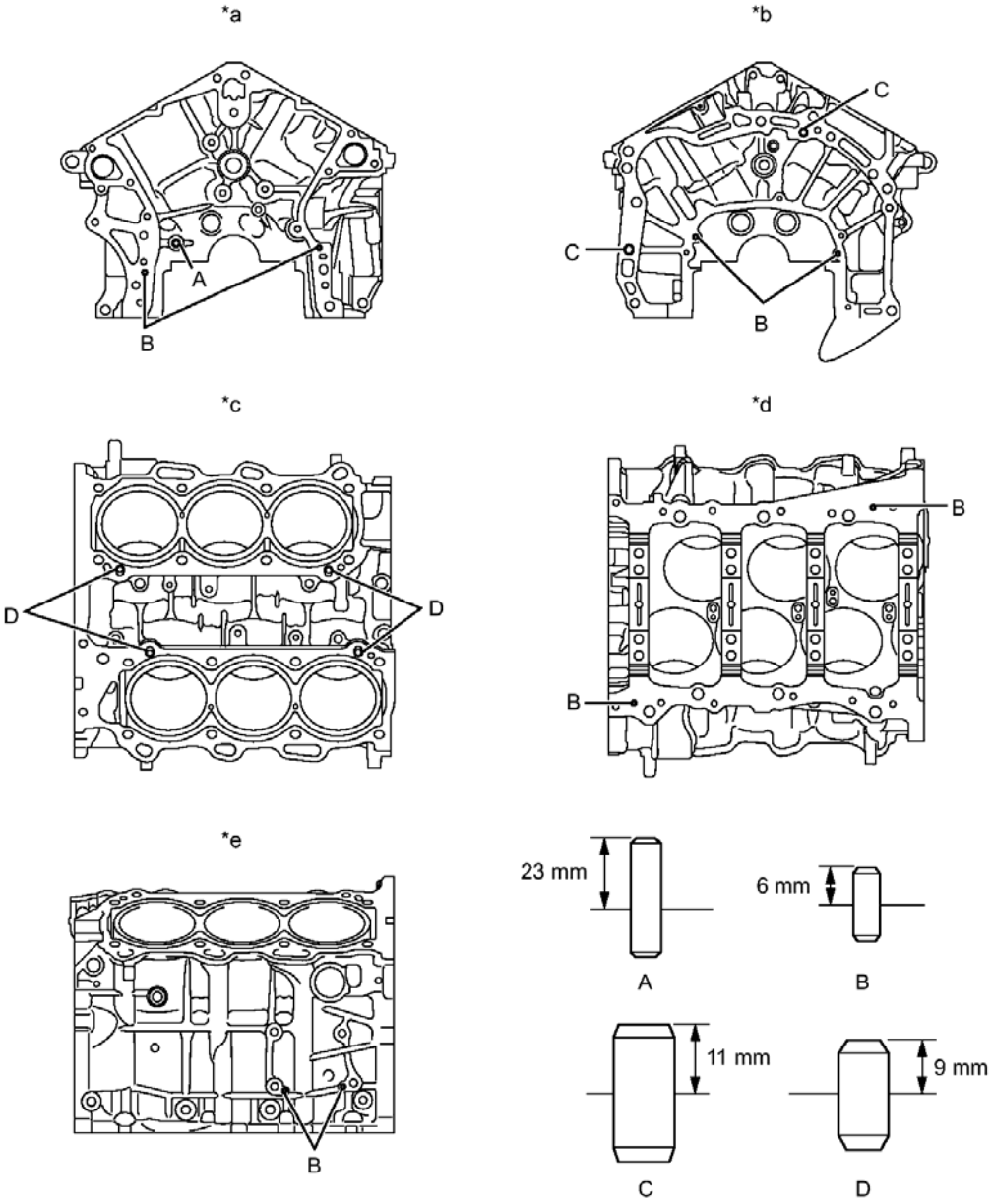


Fig. 408: Identifying Cylinder Block Straight Pins
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front Cylinder Block	*b	Rear Cylinder Block
*c	Upper Cylinder Block	*d	Lower Cylinder Block
*e	Cylinder Block RH Side	-	-

Standard Protrusion

Item	Protrusion
Pin A	23 mm (0.906 in.)
Pin B	6 mm (0.236 in.)
Pin C	11 mm (0.433 in.)
Pin D	9 mm (0.354 in.)

2. **REPLACE STUD BOLT**
   a. Using an E8 and E10 "TORX" sockets, install the stud bolts.

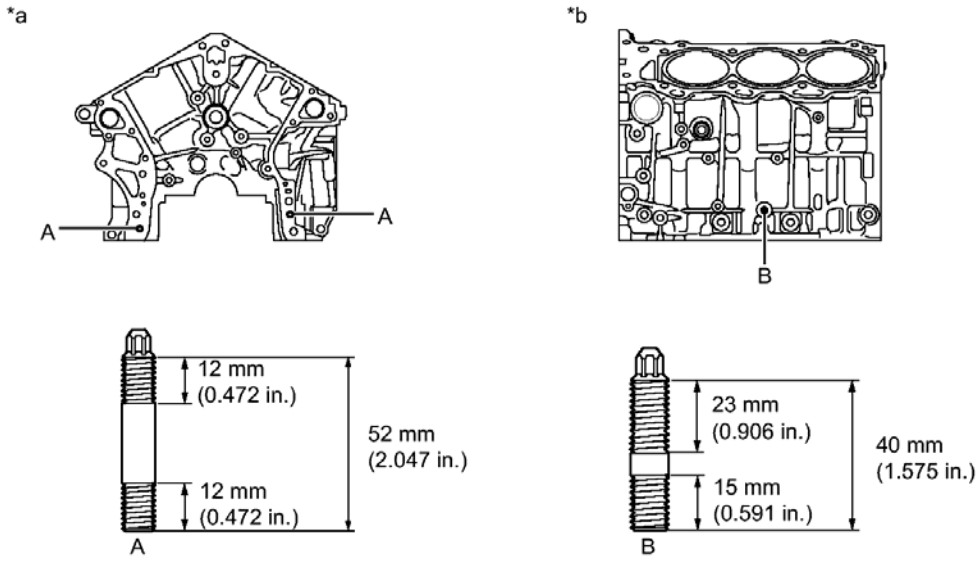


Fig. 409: Identifying Cylinder Block Stud Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front Cylinder Block	*b	Cylinder Block LH Side

Bolt A

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

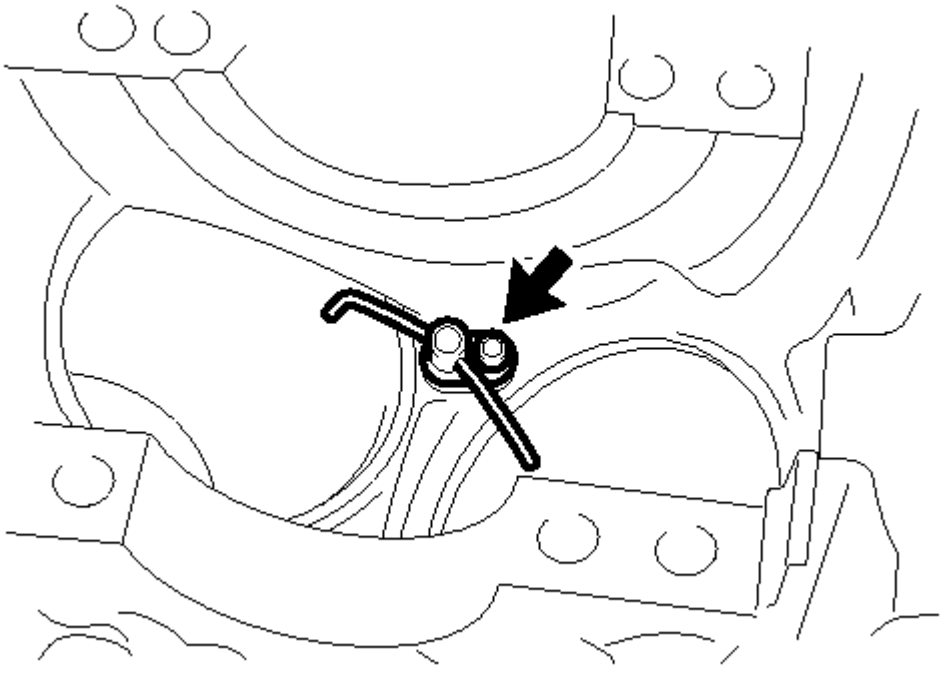
Bolt B

Torque: 17 N*m (173 kgf*cm, 13 ft.*lbf)

REASSEMBLY

REASSEMBLY

1. **INSTALL NO. 1 OIL NOZZLE SUB-ASSEMBLY**
   a. Using a 5 mm hexagon wrench, install the No. 1 oil nozzle sub-assemblies with the 3 bolts.



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Fig. 410: Identifying Bolt And No. 1 Oil Nozzle
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

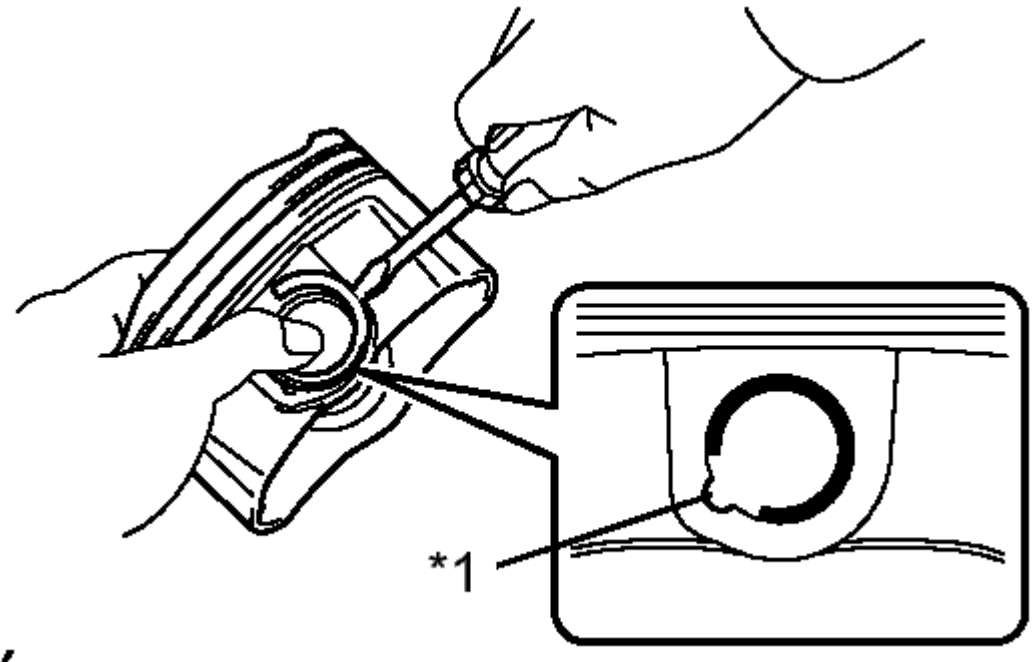


Fig. 411: Installing New Piston Pin Hole Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Service Hole

HINT:

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

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

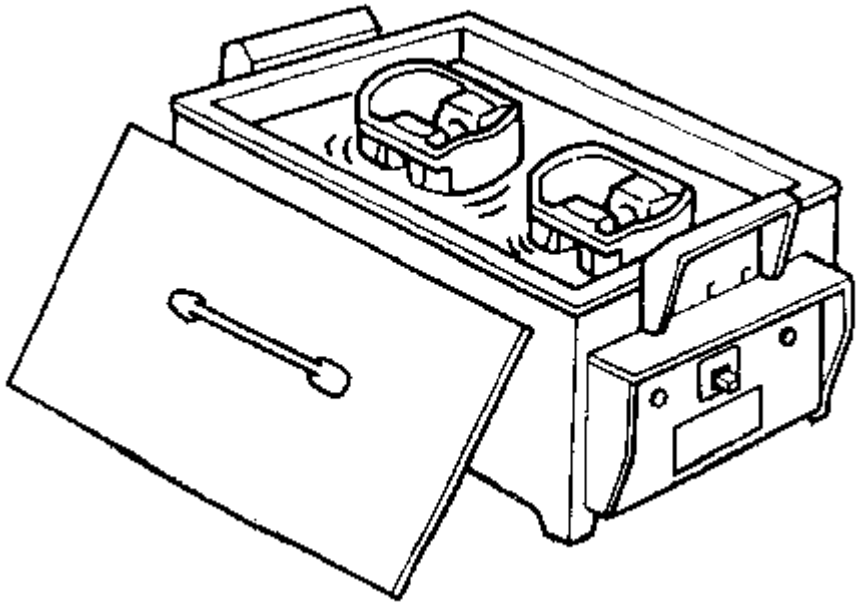


Fig. 412: Heating Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Coat the piston pin with engine oil.
d. Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb.

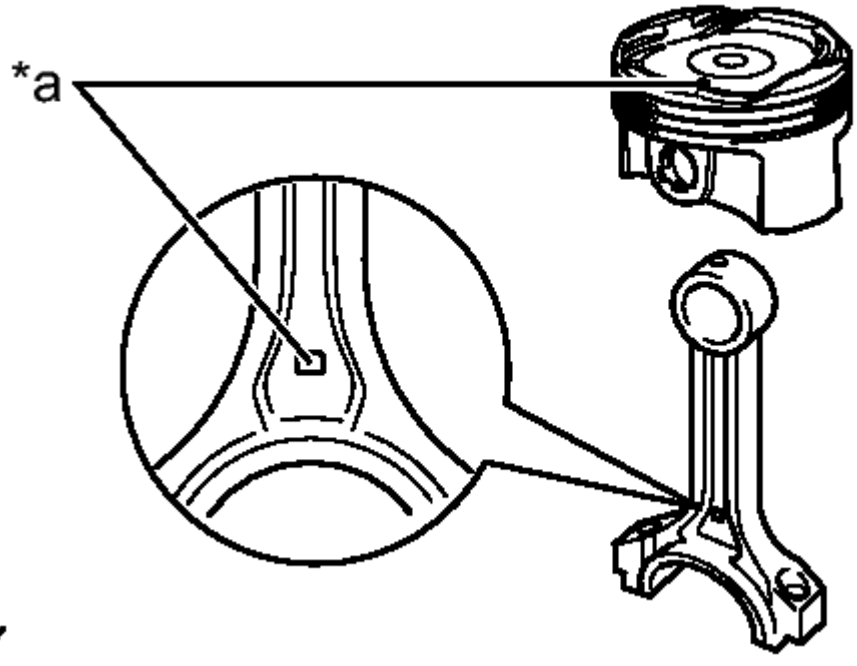


Fig. 413: Identifying Piston & Connecting Rod Front Marks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

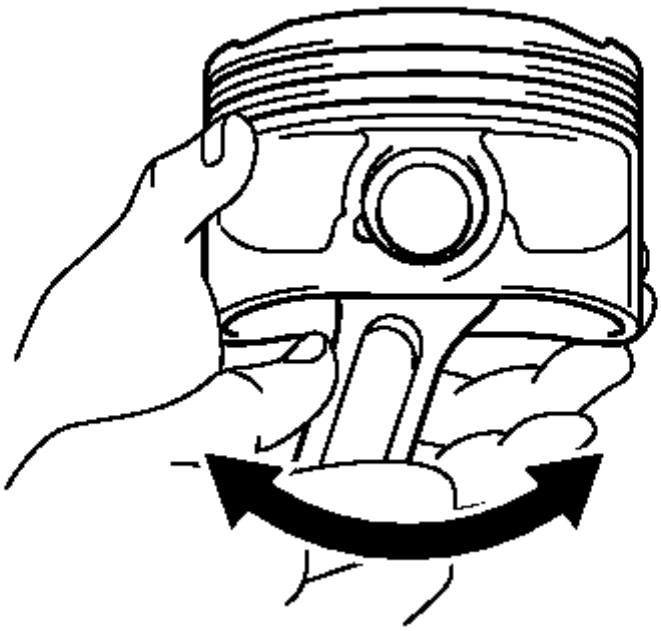
TEXT IN ILLUSTRATION

*a	Front Mark

HINT:

The piston and pin are a matched set.

e. Check the fitting condition between the piston and piston pin by trying to move the piston back and forth on the piston pin.



Y

Fig. 414: Checking Fitting Condition Between Piston And Piston Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Using a screwdriver, install a new piston pin hole snap ring at the other end of the piston pin hole.

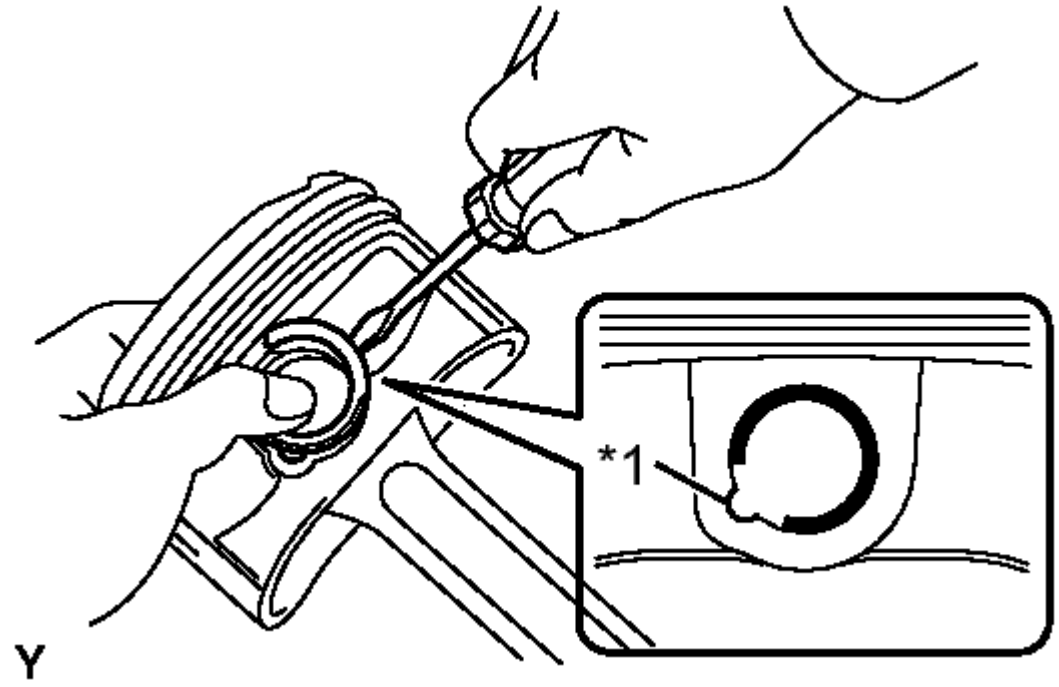


Fig. 415: Installing Piston Pin Hole Snap Ring Using A Screwdriver
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

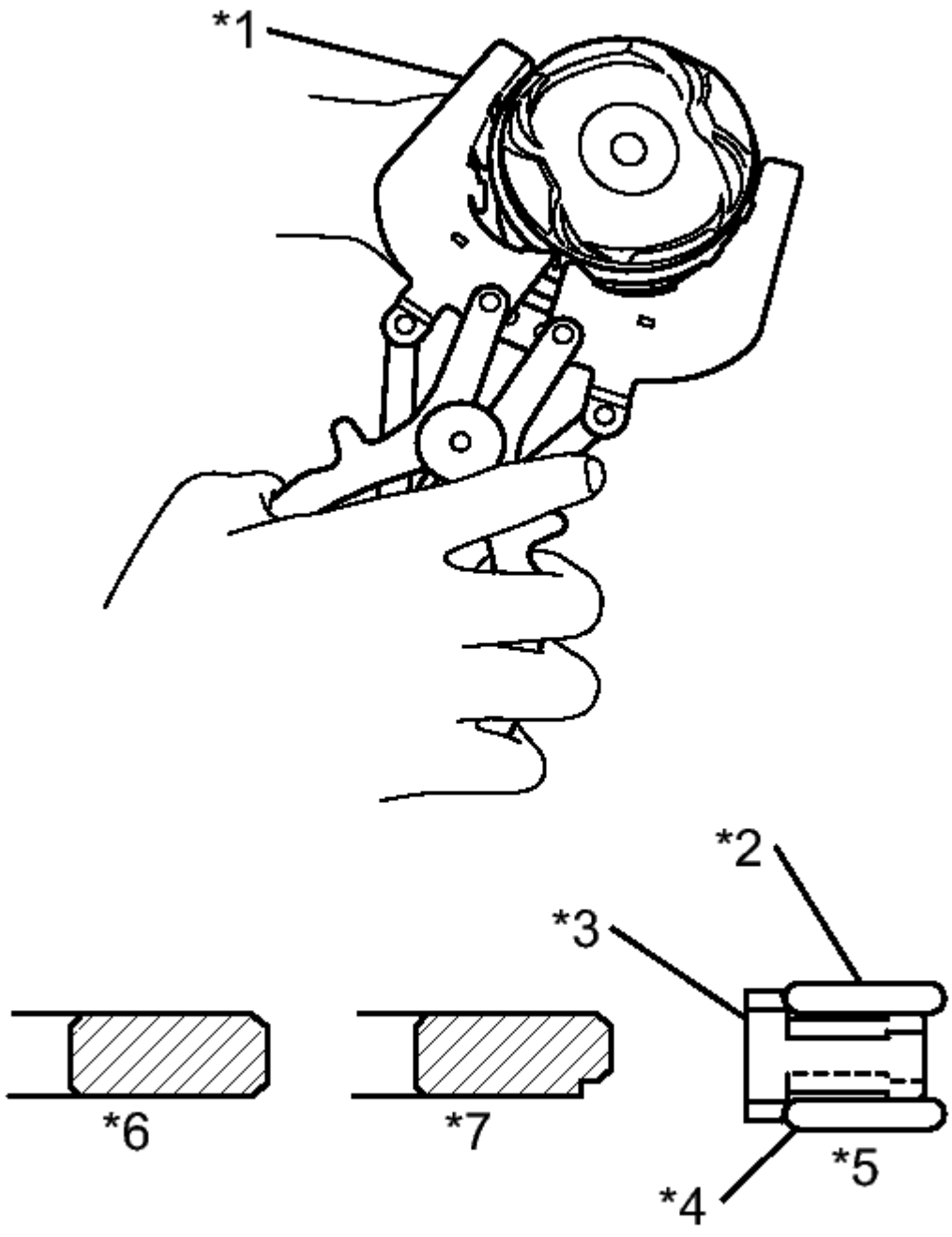
TEXT IN ILLUSTRATION

*1	Service Hole

HINT:

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

3. **INSTALL PISTON RING SET**
   a. Install the oil ring expander and 2 side rails by hand.
   b. Using a piston ring expander, install the compression ring as shown in the illustration.



Y

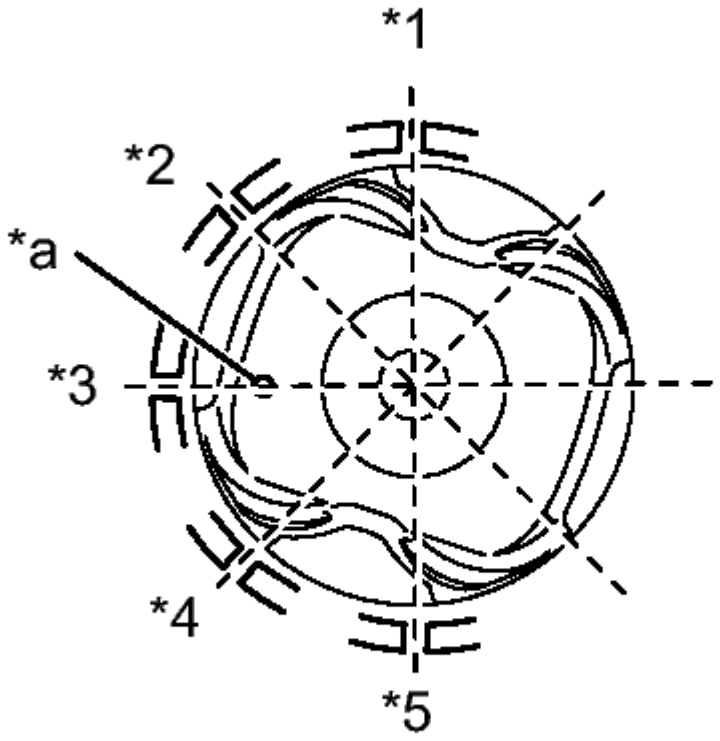
Fig. 416: Installing Compression Ring Using A Piston Ring Expander
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	Piston

*1	Ring Expander
*2	Upper Side Rail
*3	Oil Ring Expander
*4	Lower Side Rail
*5	Oil Ring
*6	No. 1 Ring
*7	No. 2 Ring

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



Y

Fig. 417: Identifying Piston Ring Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Lower Side Rail
*2	No. 2 Ring
*3	Oil Ring Expander
*4	No. 1 Ring
*5	Upper Side Rail
*a	Front

Mark

NOTE: Do not align the ring ends.

4. **INSTALL CRANKSHAFT BEARING**
   a. Clean the main journal and both surfaces of the bearings.

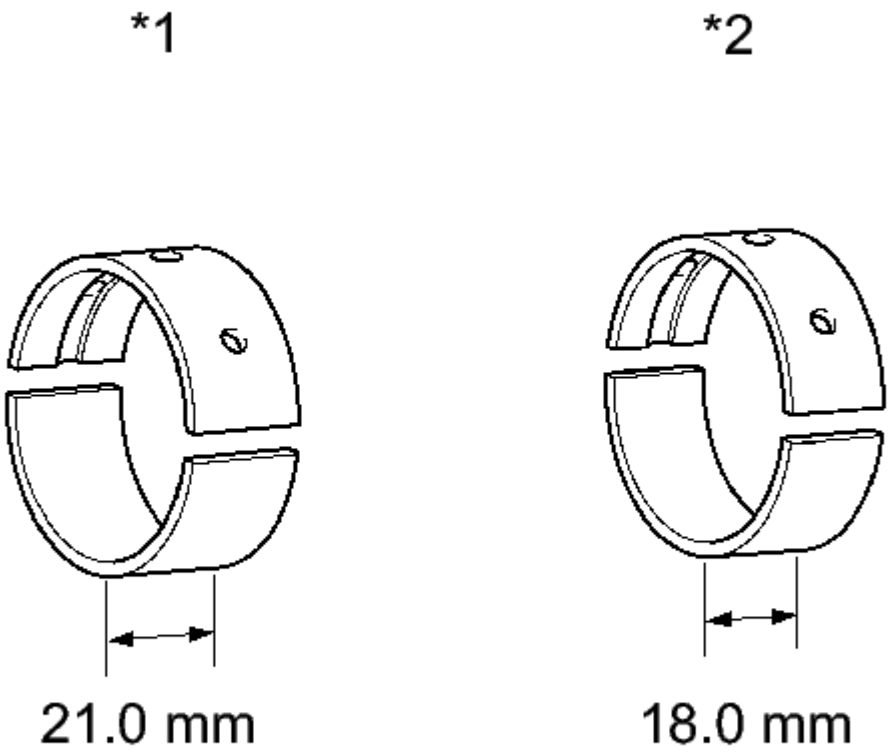


Fig. 418: Installing Upper Crankshaft Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	No. 1 and No. 4 Journal

	Bearing
*2	No. 2 and No. 3 Journal Bearing

NOTE: **Main bearings come in widths between 18.0 mm (0.709 in.) and 21.0 mm (0.827 in.). Install the 21.0 mm (0.827 in.) bearings in the No. 1 and No. 4 cylinder block journal positions with the main bearing cap. Install the 18.0 mm (0.709 in.) bearings in the No. 2 and No. 3 positions.**

b. Install the upper crankshaft bearing.

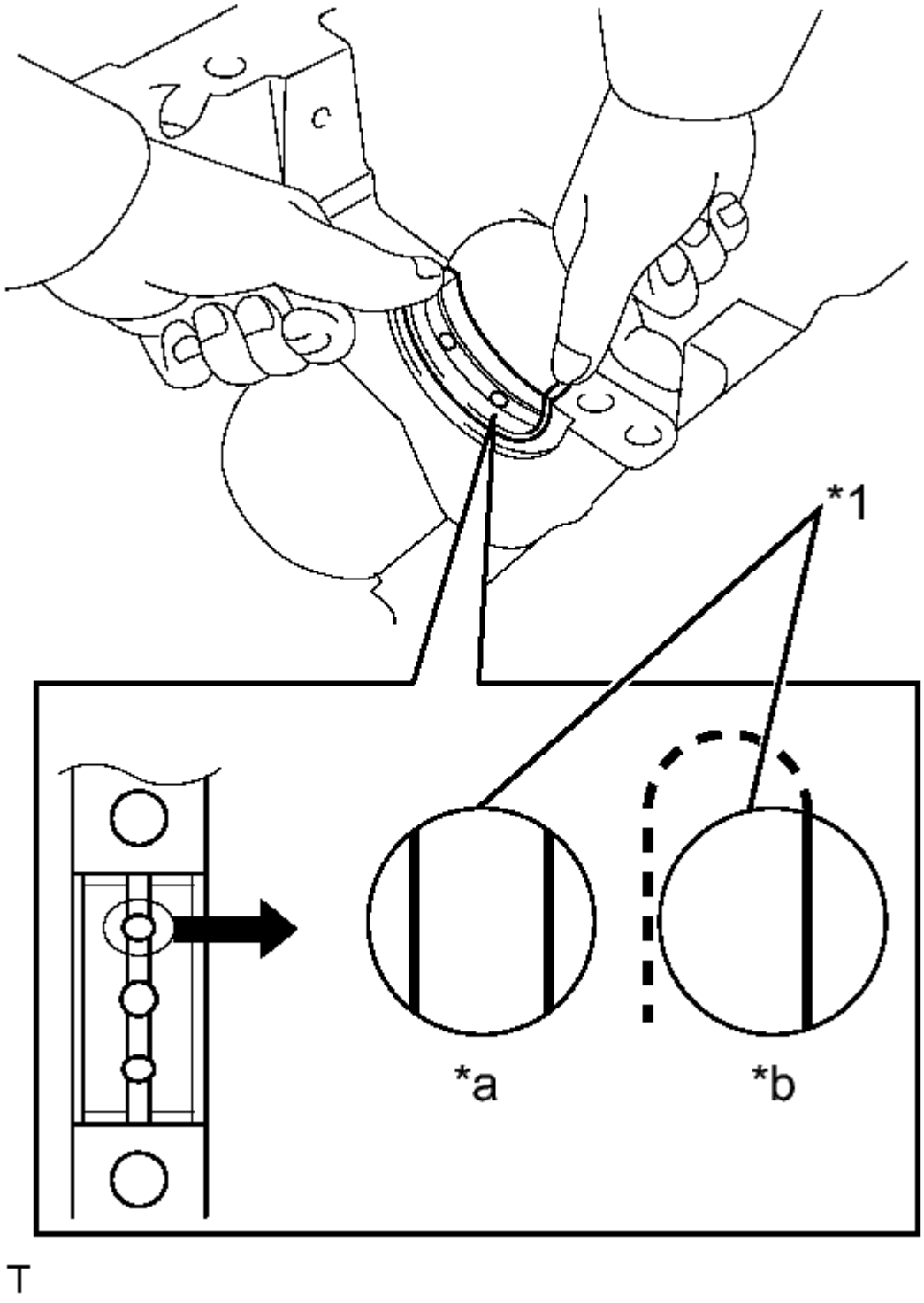


Fig. 419: Installing Upper Crankshaft Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Install the upper crankshaft bearings to the cylinder block as shown in the illustration.

TEXT IN ILLUSTRATION

*1	Upper Bearing
*a	CORRECT
*b	INCORRECT

NOTE:

- **Do not apply engine oil to the bearings and the contact surfaces.**
- **Both sides of the oil groove in the cylinder block should be visible through the oil feed holes in the bearing. The amount visible on each side of the holes should be equal.**

c. Install the lower crankshaft bearing.

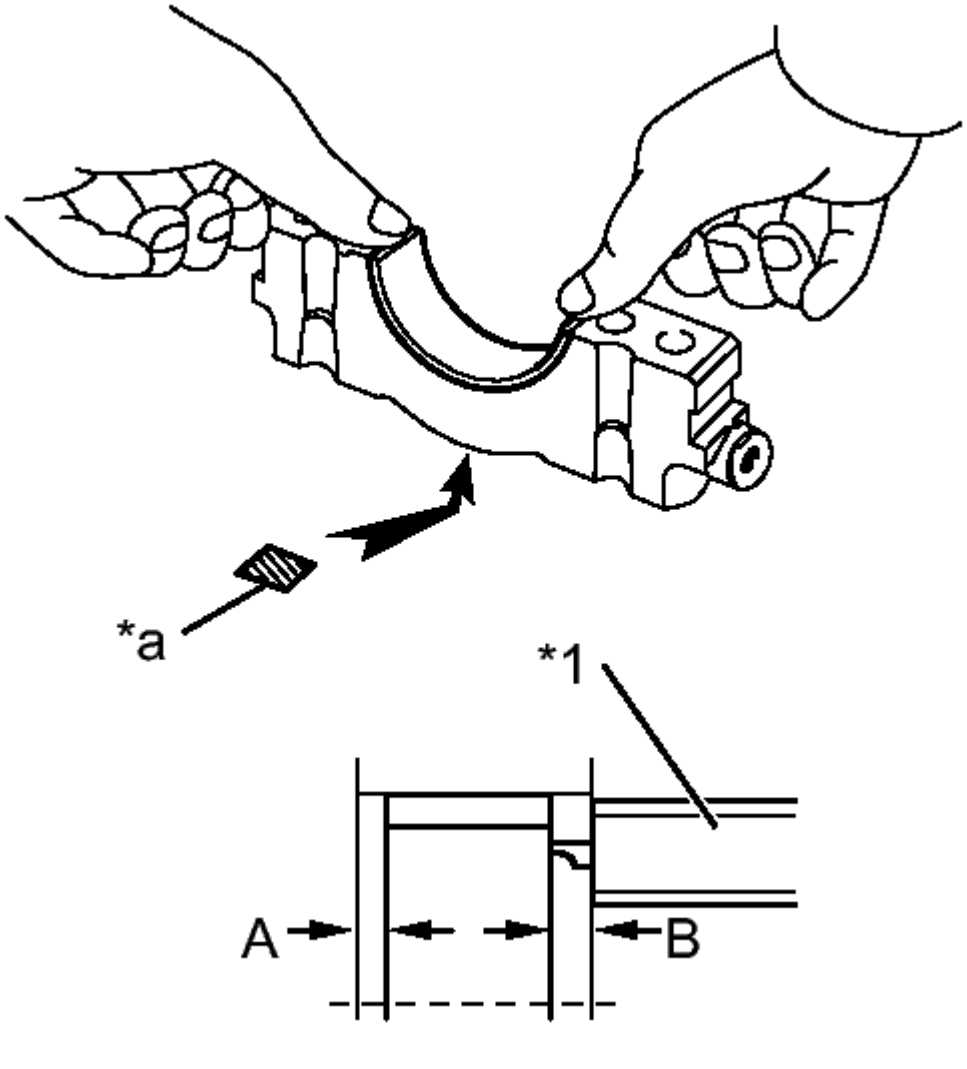


Fig. 420: Installing Lower Crankshaft Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Vernier Caliper
*a	Mark 1, 2, 3, 4 or 5

1. Install the lower crankshaft bearings to the crankshaft bearing caps.
2. Using a vernier caliper, measure the distance between the crankshaft bearing cap edge and the lower crankshaft bearing edge.

   Dimension (A - B)

   0.7 mm (0.0276 in.) or less

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

5. **INSTALL CRANKSHAFT THRUST WASHER SET**
   a. Apply engine oil to the crankshaft thrust washer.
   b. Install the 2 upper crankshaft thrust washers under the No. 2 journal position of the cylinder block sub-assembly with the oil grooves facing outward.

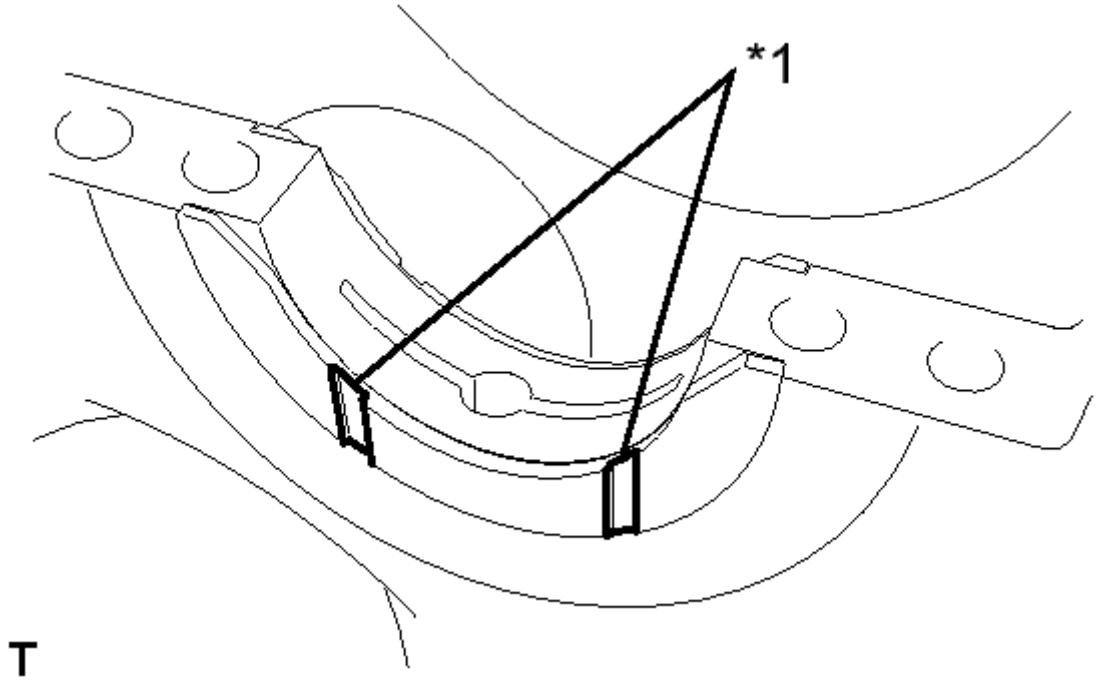
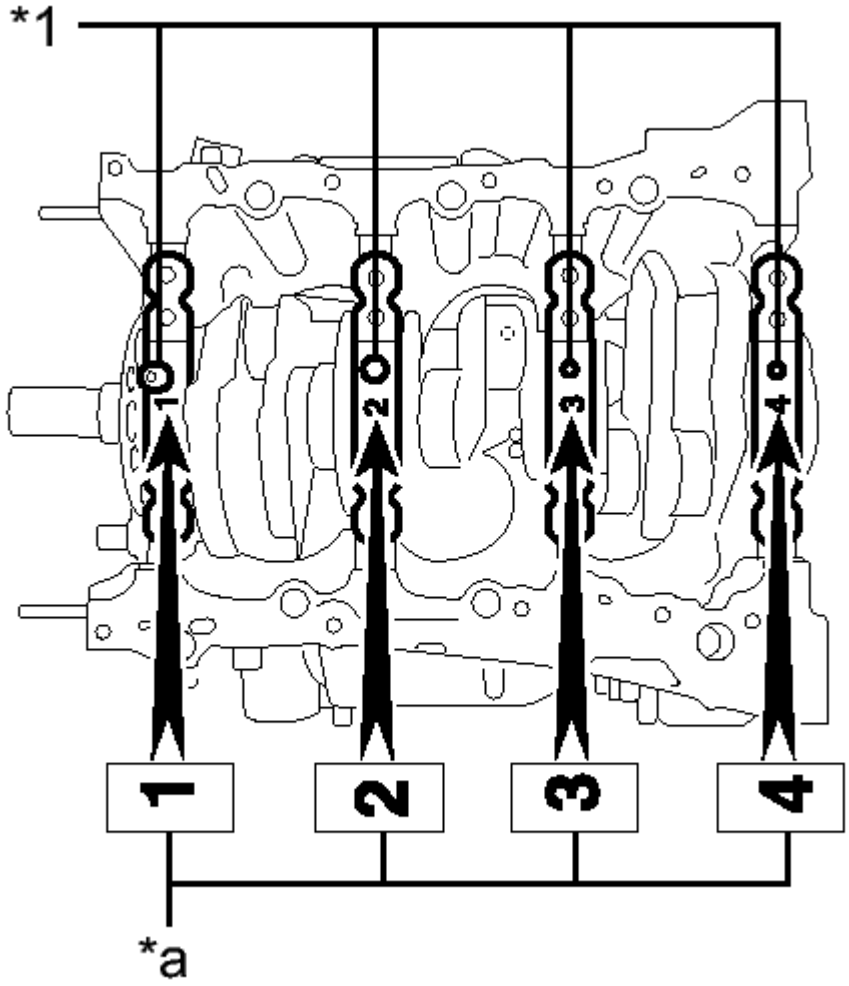


Fig. 421: Identifying Oil Grooves Facing Outward
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Oil Grooves

6. **INSTALL CRANKSHAFT**
   a. Apply engine oil to the upper bearing, then place the crankshaft on the cylinder block.
   b. Confirm the projections and numbers on the main bearing caps and install the crankshaft bearing caps on the cylinder block.



T

Fig. 422: Identifying Main Bearing Cap Projections & Numbers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Projection
	Number

*a	Mark

HINT:

A number is marked on each main bearing cap to indicate the installation position.

c. Apply a light coat of engine oil to the threads and under the heads of the crankshaft bearing cap bolts.

d. Temporarily install the 8 crankshaft bearing cap bolts to the inside positions.

e. Insert the crankshaft bearing cap with your hand until the clearance between the crankshaft bearing cap and the cylinder block is less than 6 mm (0.236 in.) by marking the 2 internal crankshaft bearing cap bolts as a guide.

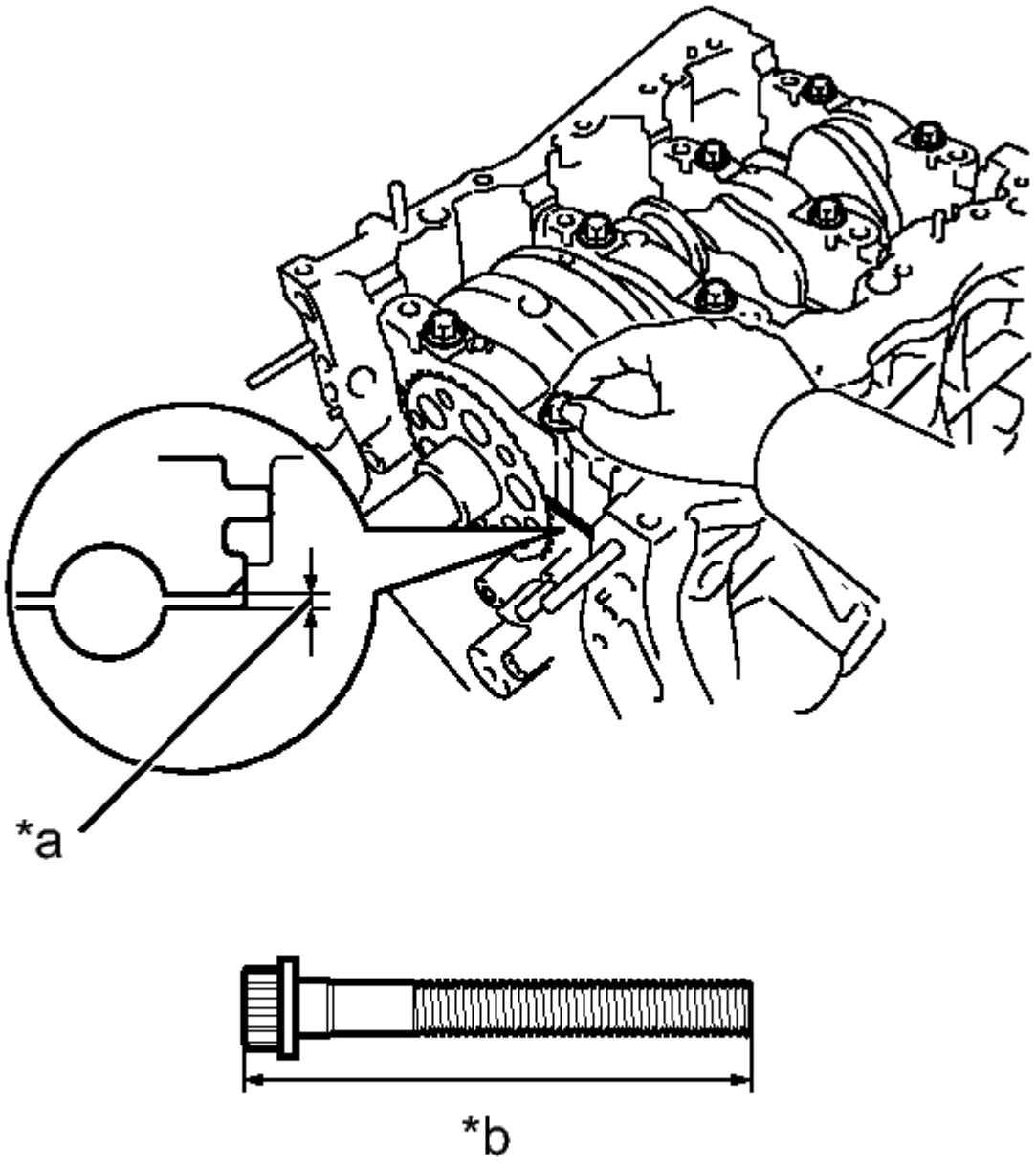


Fig. 423: Identifying Crankshaft Bearing Cap & Cylinder Block Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	Less

*a	than 6 mm
*b	Bolt Length 100 to 102 mm

Bolt length

100 to 102 mm (3.94 to 4.02 in.)

f. Using a plastic hammer, lightly tap the crankshaft bearing cap to ensure a proper fit.

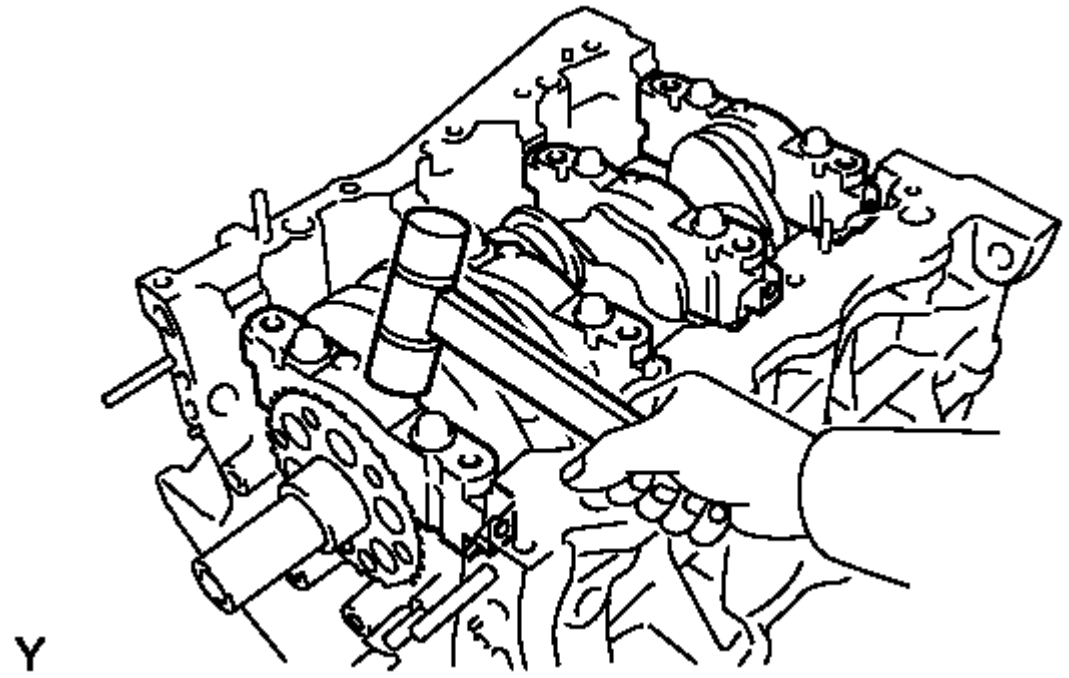


Fig. 424: Tapping Bearing Cap To Ensure Proper Fit
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Apply a light coat of engine oil to the threads and under the heads of the 8 crankshaft bearing cap bolts.
h. Install the 8 crankshaft bearing cap bolts to the outside positions.

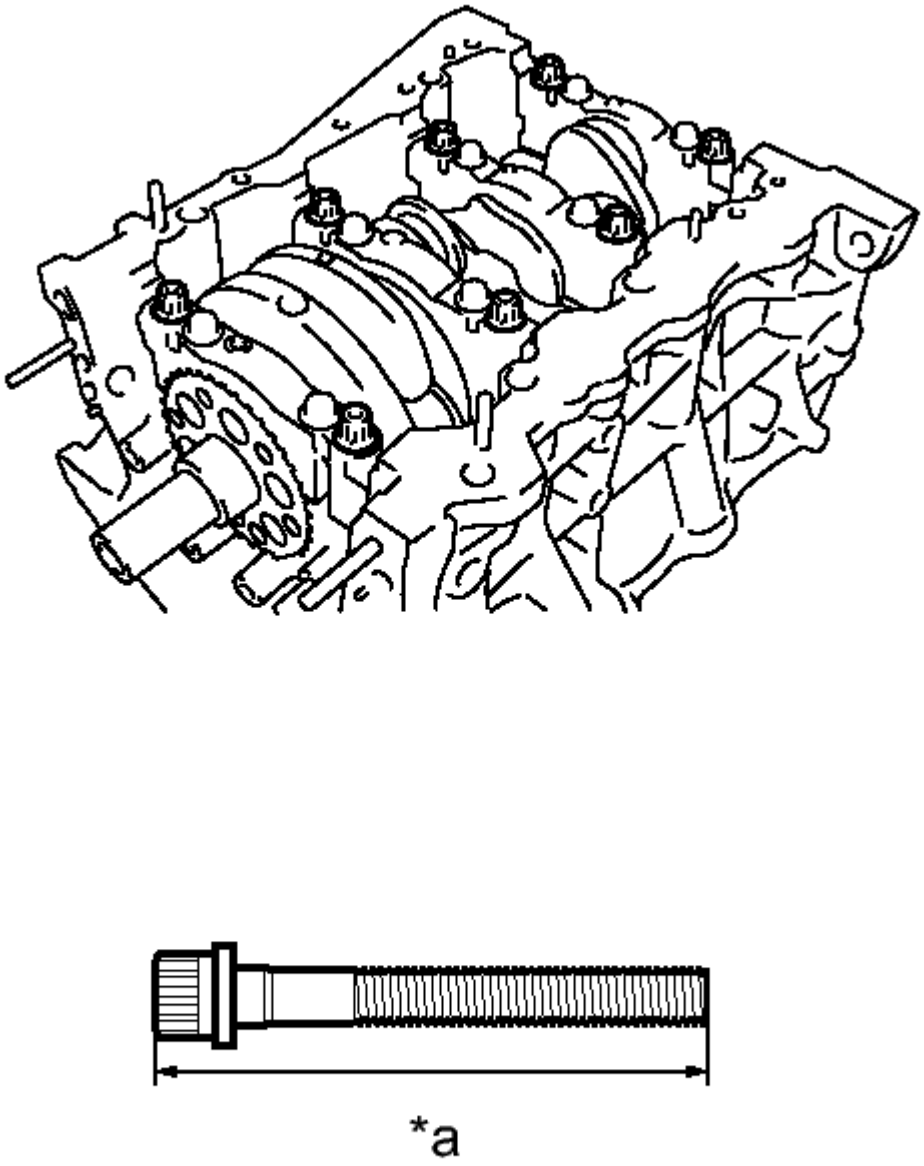


Fig. 425: Identifying Crankshaft Bearing Cap Bolt Length
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	Bolt

*a	Length

Bolt length

105.5 to 107.5 mm (4.15 to 4.23 in.)

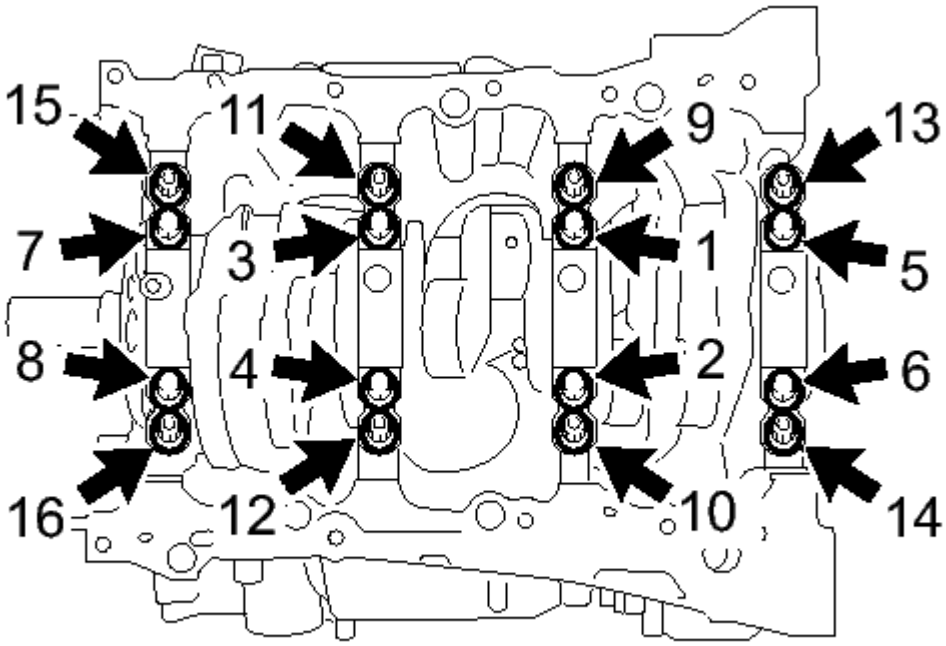
i. Install the crankshaft bearing cap bolts.

HINT:

The crankshaft bearing cap bolts are tightened in 2 progressive steps.

j. Step 1

1. Install and uniformly tighten the 16 crankshaft bearing cap bolts in several steps and in the sequence shown in the illustration.



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Fig. 426: Identifying Main Bearing Cap Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 61 N*m (622 kgf*cm, 45 ft.*lbf)

If any of the crankshaft bearing cap bolts does not meet the torque specified, replace it.

k. Step 2

TEXT IN ILLUSTRATION

*a	Paint Mark
*b	Turn 90°
	Engine Front

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

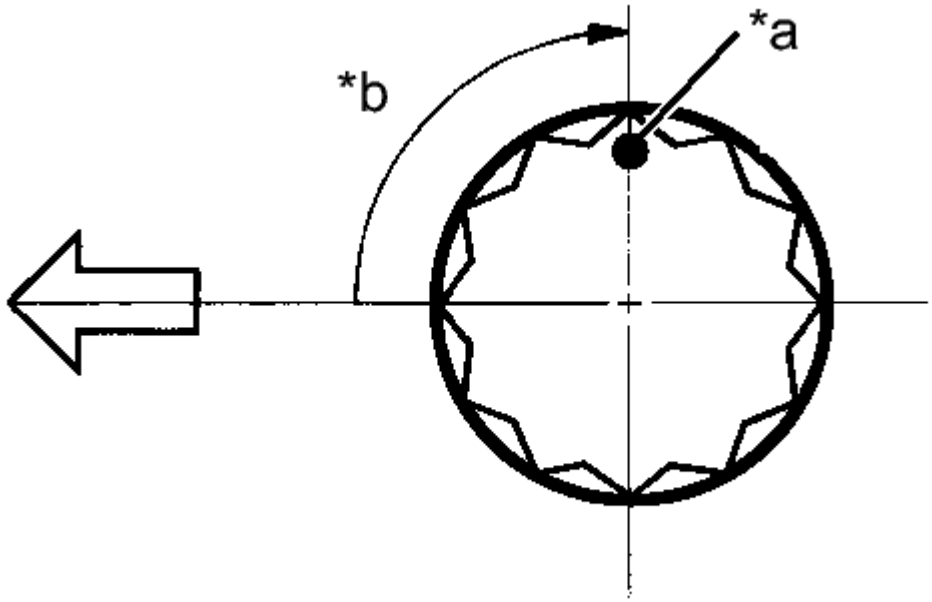


Fig. 427: Identifying Connecting Rod Bolt Paint Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Retighten the bearing cap bolts 90° in the sequence shown in the illustration.
3. Check that the painted mark is now at a 90° angle to the front of the engine.

l. Install 8 new seal washers and uniformly tighten the 8 crankshaft bearing cap bolts in several steps and in the sequence shown in the illustration.

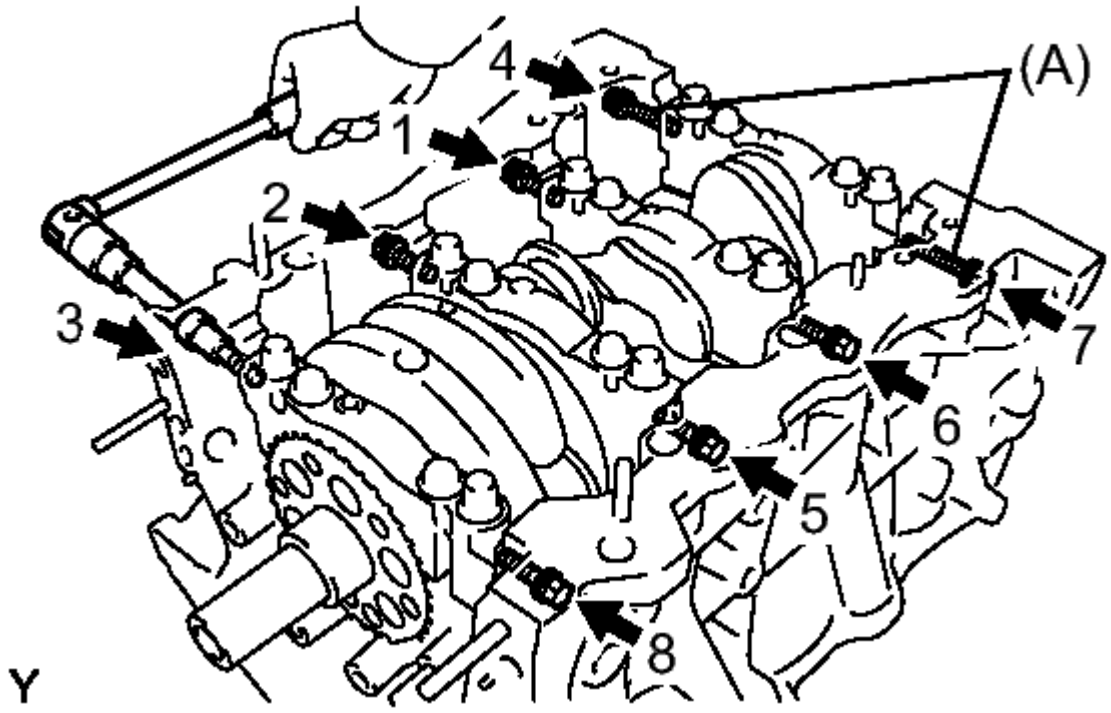


Fig. 428: Identifying Main Bearing Cap With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 52 N*m (525 kgf*cm, 38 ft.*lbf)

Bolt Length

Item	Length
Bolt A	45 mm (1.77 in.)
Except bolt A	30 mm (1.18 in.)

m. Check that the crankshaft turns smoothly.
n. Check the crankshaft thrust clearance. See step 10.

7. **INSTALL CONNECTING ROD BEARING**
   a. Install the connecting rod bearing to the connecting rod and connecting rod cap.
   b. Using a vernier caliper, measure the distance between the connecting rod and bearing cap edges and the connecting rod bearing edge.

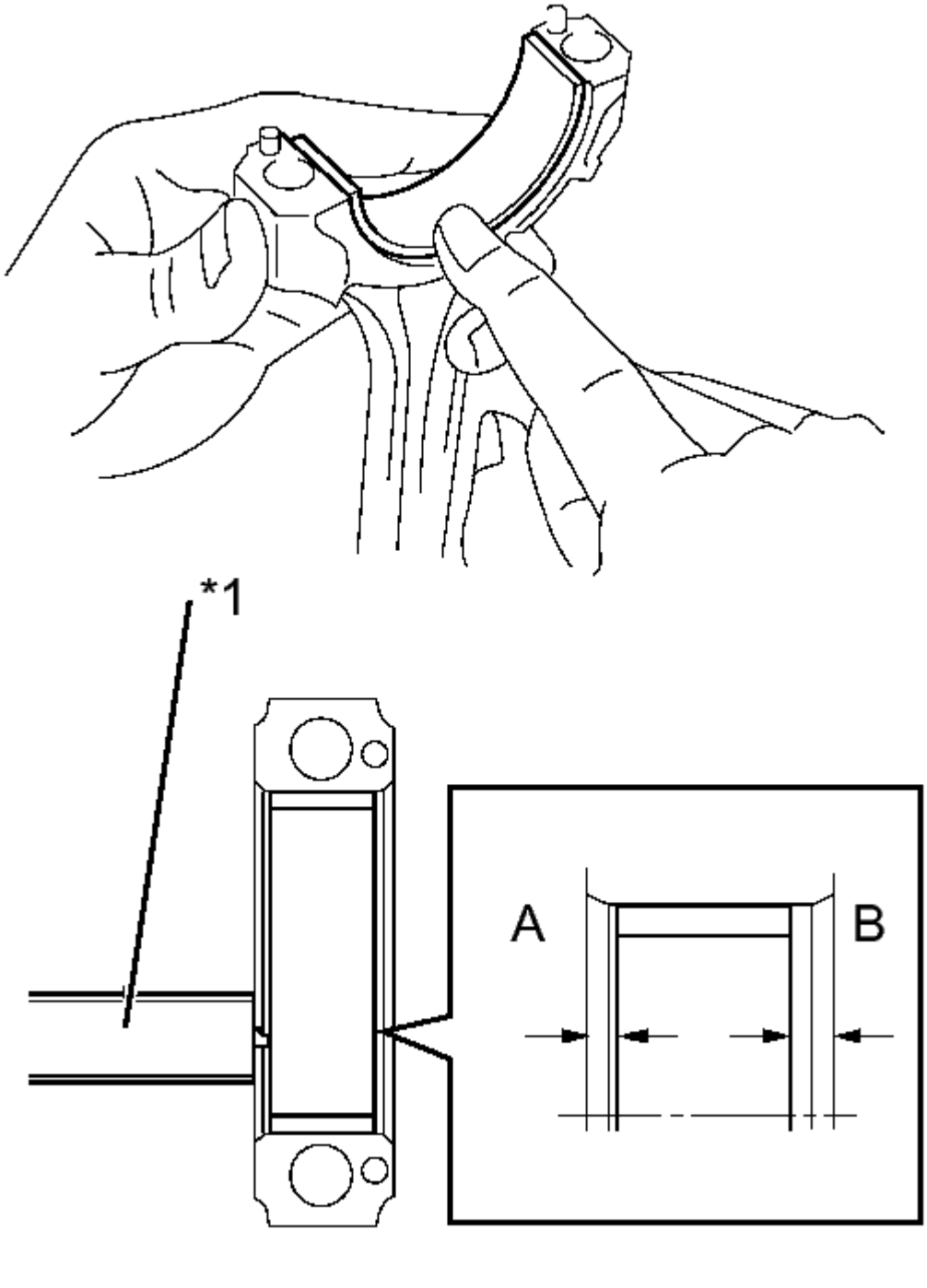


Fig. 429: Installing Connecting Rod Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

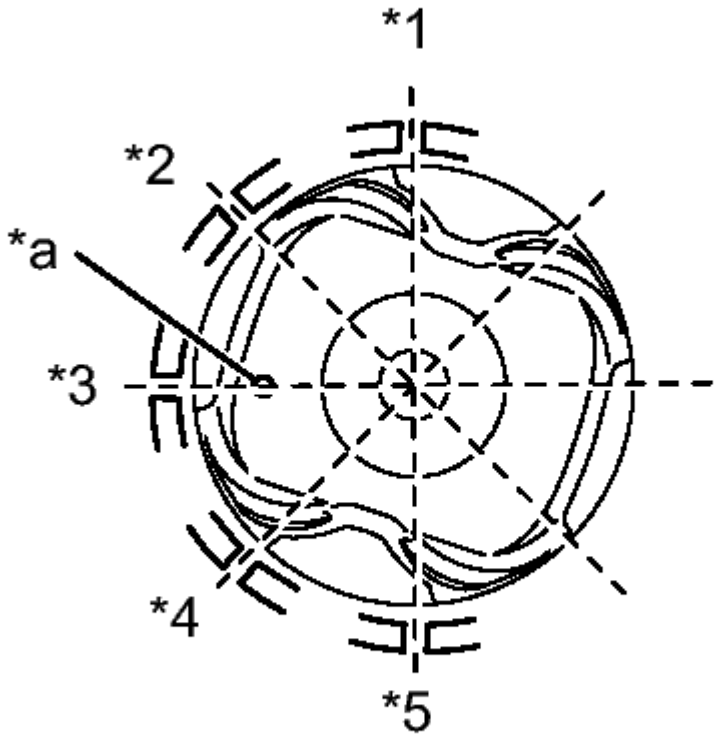
*1	Vernier Caliper

Dimension (A - B)

0.7 mm (0.0276 in.) or less

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

8. **INSTALL PISTON SUB-ASSEMBLY WITH CONNECTING ROD**
   a. Apply engine oil to the cylinder walls, the pistons, and the surfaces of the connecting rod bearings.
   b. Position the piston rings so that the ring ends are as shown in the illustration.



Y

Fig. 430: Identifying Piston Ring Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Lower

	Side Rail
*2	No. 2 Ring
*3	Oil Ring Expander
*4	No. 1 Ring
*5	Upper Side Rail
*a	Front Mark

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.

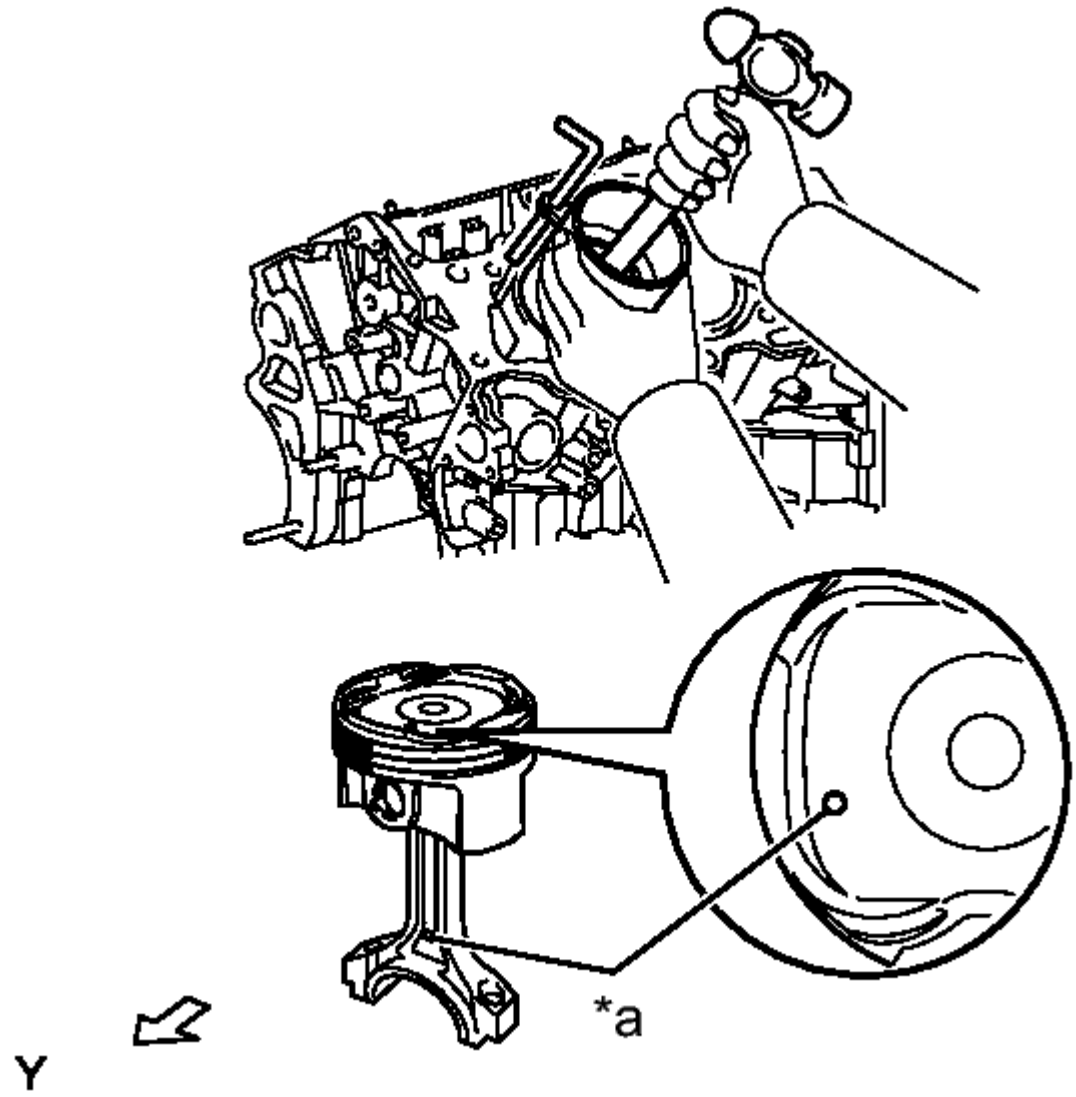


Fig. 431: Pushing Piston & Connecting Rod Assembly Into Cylinder Using A Piston Ring Compressor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front Mark
	Engine Front

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

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

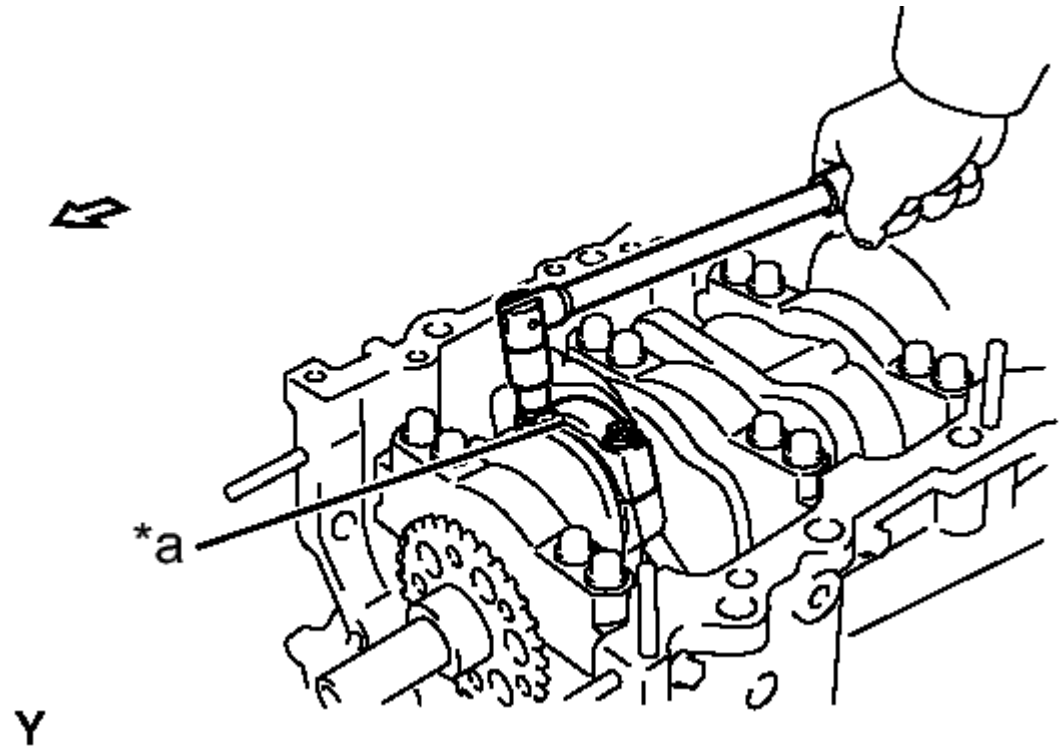


Fig. 432: Installing Connecting Rod Cap Bolt With Front Mark Facing Forward
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front Mark
	Engine Front

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.

HINT:

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

g. Step 1
    1. Install and alternately tighten the bolts of the connecting rod cap in several steps.

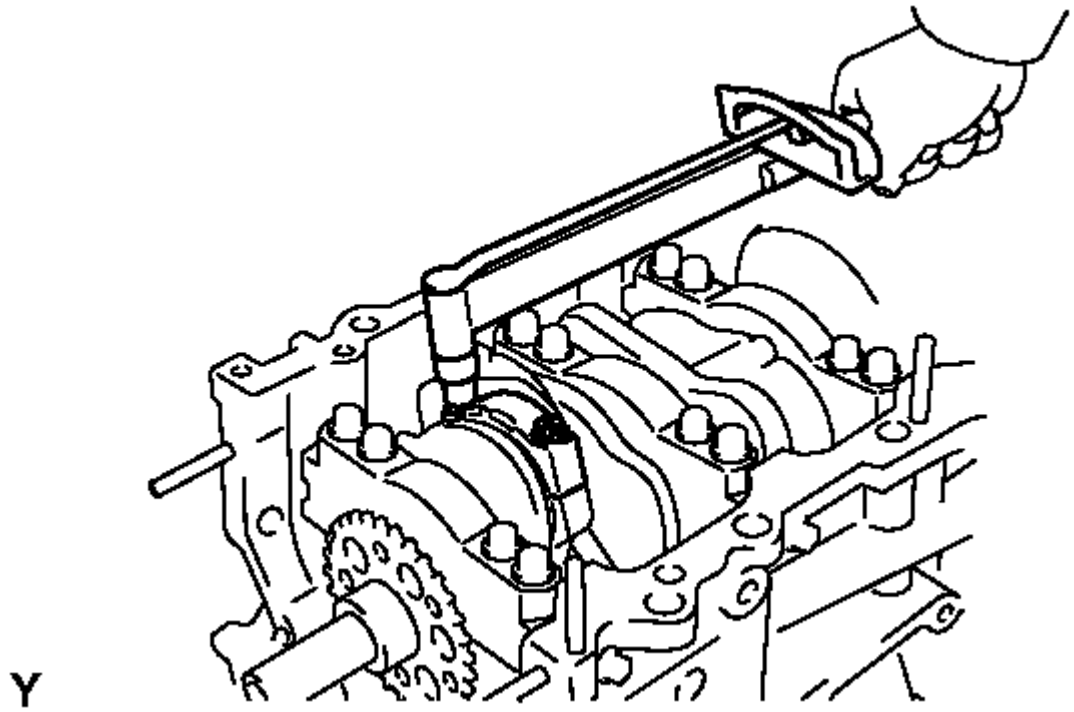


Fig. 433: Tightening Connecting Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

h. Step 2

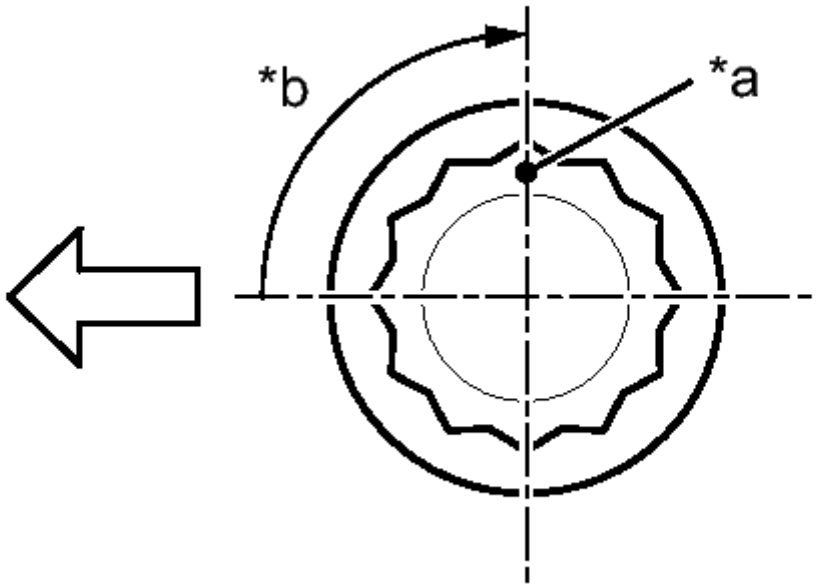


Fig. 434: Identifying Connecting Rod Cap Bolt Paint Mark

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

TEXT IN ILLUSTRATION

*a	Paint Mark
*b	Turn 90°
	Engine Front

1. Mark the front side of each connecting rod cap bolt with paint.
2. Retighten the cap bolts 90° as shown in the illustration.
3. Check the painted mark is now at a 90° angle to the front.

i. Confirm that the crankshaft turns smoothly.

j. Check the connecting rod thrust clearance. See step 1.