

2010 ENGINE**Engine Mechanical (2ZR-FE) (Service Information) - Corolla****ENGINE****ON-VEHICLE INSPECTION****ON-VEHICLE INSPECTION****1. INSPECT ENGINE COOLANT****HINT:**

Refer to ON-VEHICLE INSPECTION .

2. INSPECT ENGINE OIL**HINT:**

Refer to ON-VEHICLE INSPECTION .

3. INSPECT BATTERY**HINT:**

Refer to INSTALLATION .

4. INSPECT AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY

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

5. INSPECT SPARK PLUG . Refer to ON-VEHICLE INSPECTION - Step 2**6. INSPECT V-RIBBED BELT** See step 1**7. INSPECT VALVE AND 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 inspection above again. If any defects or problems are found during the inspection above, perform a lash adjuster inspection See step 2.

8. INSPECT IGNITION TIMING

- a. When using the Techstream:
 1. Warm up and stop the engine.
 2. Connect the Techstream to the DLC3.
 3. Turn the ignition switch to ON.
 4. Enter Data List Mode on the Techstream.

HINT:

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

5. Inspect the ignition timing at idle.

Ignition timing

8 to 12 degrees BTDC

NOTE:

- Turn all the electrical systems and the A/C off.
- Inspect the ignition timing with the cooling fans off.
- When checking the ignition timing, shift the transmission to the neutral position.

6. Enter the following menus : TC (TE1) / OFF.
 7. Turn the ignition switch off.
 8. Disconnect the Techstream from the DLC3.
- b. When not using the Techstream:
1. Remove the No. 2 cylinder head cover. Refer to **REMOVAL**.
 2. Connect the tester probe of a timing light to the wire of the ignition connector for No. 1 cylinder.

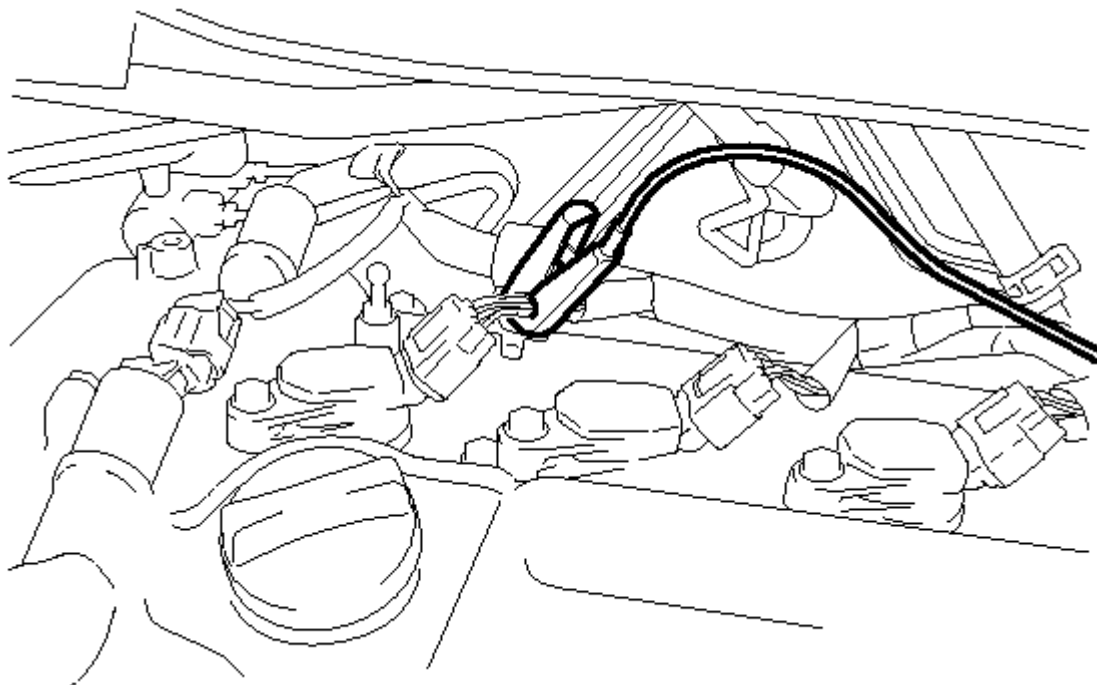


Fig. 1: Connecting Timing Light Tester Probe To Ignition Wire Connector For No. 1 Cylinder

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

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

3. Warm up and stop the engine.
4. Connect the clip of the timing light to the wire harness.

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

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

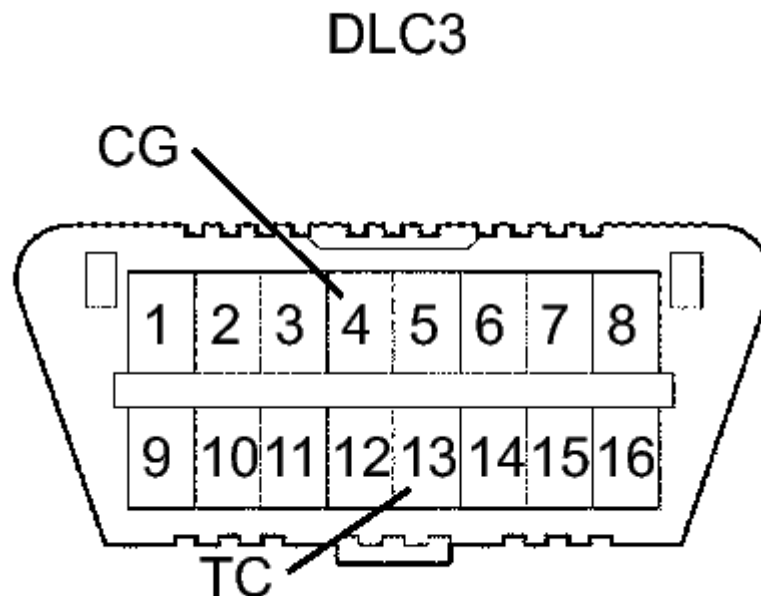


Fig. 2: Identifying DLC3 Connector

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

- SST: 09843-18040

NOTE: Examine the terminal numbers before connecting them.
Connecting the wrong terminals can damage the engine.

6. Inspect the ignition timing at idle.

Ignition timing

8 to 12 degrees BTDC

NOTE:

- Turn all the electrical systems and the A/C off.
- Inspect the ignition timing with the cooling fans off.
- When checking the ignition timing, shift the transmission to either neutral or park.

7. Disconnect SST from terminals 13 (TC) and 4 (CG) of the DLC3.
8. Turn the ignition switch off.

9. Remove the timing light.

10. Install the No. 2 cylinder head cover. Refer to **INSTALLATION**.

9. INSPECT ENGINE IDLE SPEED

- a. Warm up and stop the engine.
- b. Connect the Techstream to the DLC3.
- c. Turn the ignition switch to ON.
- d. Enter Data List Mode on the Techstream.

HINT:

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

- e. Inspect the engine idle speed.

Idle speed

600 to 700 RPM

NOTE:

- Turn all the electrical systems and the A/C off.
- Inspect the idle speed with the cooling fans off.
- When checking the idle speed, shift the transmission to either neutral or park.

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

10. INSPECT COMPRESSION

- a. Warm up and stop the engine.
- b. Remove the No. 2 cylinder head cover. Refer to **REMOVAL**.
- c. Remove the 4 ignition coils.
- d. Remove the 4 spark plugs. Refer to **REMOVAL**.
- e. Disconnect the 4 fuel injector connectors.
- f. Inspect the cylinder compression pressure.

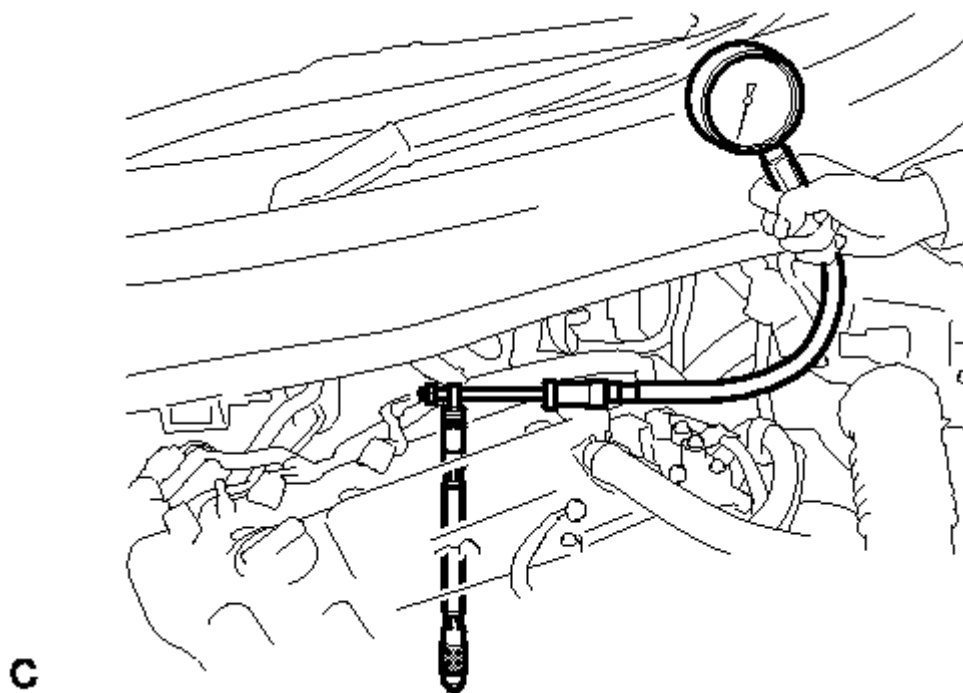


Fig. 3: Inspecting Cylinder Compression Pressure
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Compression

1373 kPa (14.0 kgf/cm², 199 psi)

Minimum pressure

1079 kPa (11.0 kgf/cm², 157 psi)

Difference between each cylinder

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

NOTE:

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

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

HINT:

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

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

- j. Install the No. 2 cylinder head cover. Refer to **INSTALLATION**.

11. INSPECT CO/HC

HINT:

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

- a. Start the engine.
- b. Run the engine at 2500 RPM for approximately 180 seconds.
- c. Insert the CO/HC meter testing probe at least 40 cm (1.3 ft.) into the tailpipe while idling.
- d. Check the CO/HC concentration during idle and when the engine is running at 2500 RPM.

HINT:

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

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

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

CO	HC	Problem	Possible Cause
Normal	High	Rough idle	<ol style="list-style-type: none"> a. Faulty ignition: <ul style="list-style-type: none"> • Incorrect timing • Fouled, shorted or improperly gapped plugs b. Incorrect valve clearance c. Leakage from intake and exhaust valves d. Leakage from cylinders
		Rough idle	<ol style="list-style-type: none"> a. Vacuum leaks: <ul style="list-style-type: none"> • PCV hoses

2010 Toyota Corolla LE

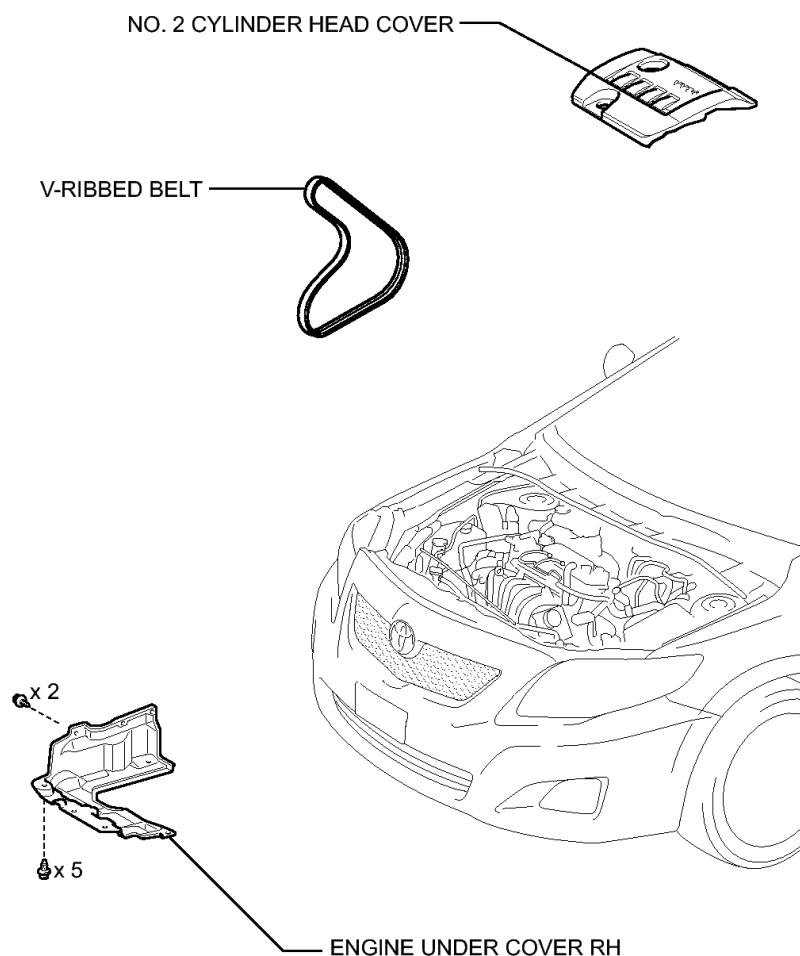
2010 ENGINE Engine Mechanical (2ZR-FE) (Service Information) - Corolla

Low	High	(Fluctuating HC reading)	<ul style="list-style-type: none">• Intake manifold• Throttle body• Brake booster line b. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	<ul style="list-style-type: none">a. Restricted air cleaner filter elementb. Plugged PCV valvec. Faulty EFI system:<ul style="list-style-type: none">• Faulty pressure regulator• Faulty engine coolant temperature sensor• Faulty mass air flow meter• Faulty ECM• Faulty injectors• Throttle body

DRIVE BELT

COMPONENTS

ILLUSTRATION



c

Fig. 4: Identifying Drive Belt Replacement Components
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ON-VEHICLE INSPECTION

ON-VEHICLE INSPECTION

1. INSPECT V-RIBBED BELT

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

INCORRECT

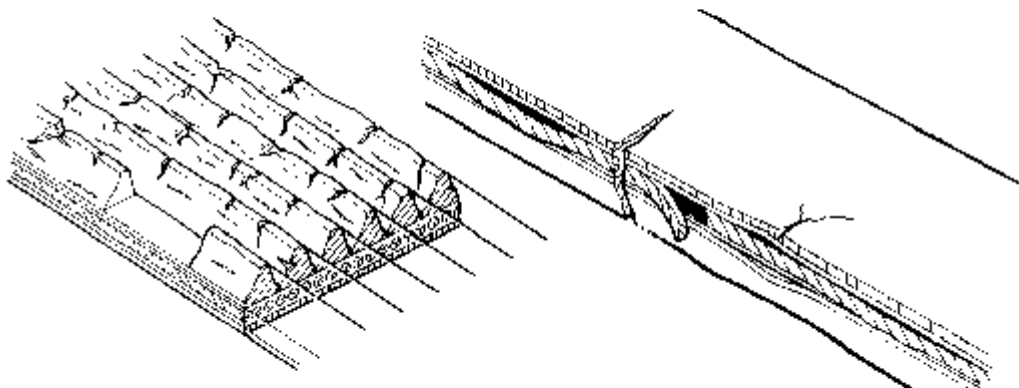


Fig. 5: Checking Drive Belt For Excessive Wear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

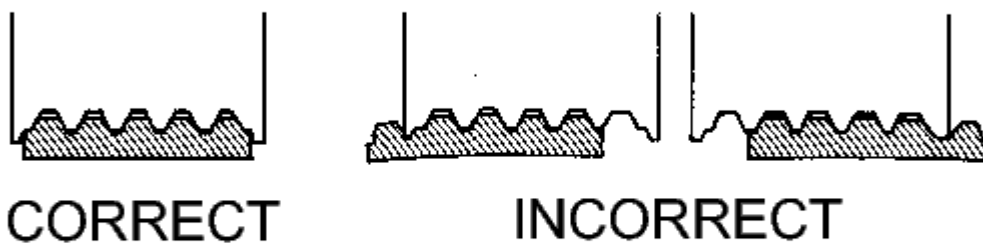


Fig. 6: Identifying Correct And Incorrect Ribbed Grooves

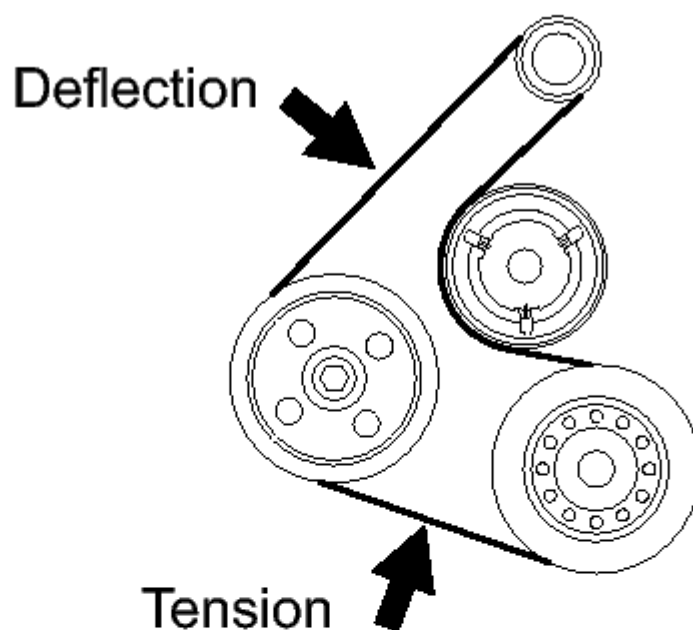
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

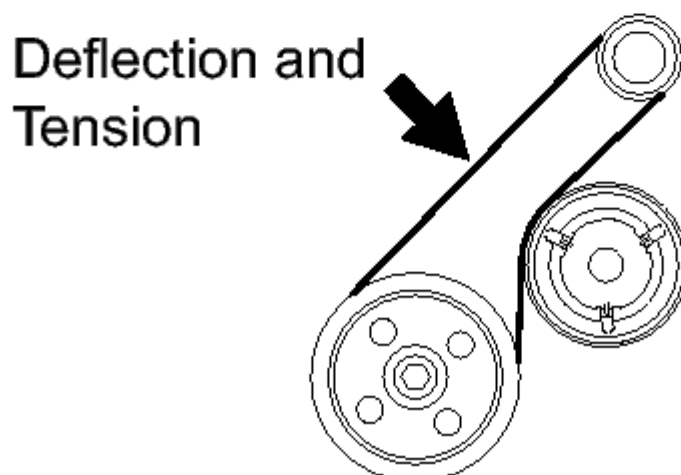
Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley. If it has slipped out, replace the V-ribbed belt. Install a new V-ribbed belt correctly.

- c. Check the V belt deflection and tension.

w/ Air Conditioning System:



w/o Air Conditioning System:



P

Fig. 7: View Of Drive Belt And Pulley

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

Deflection

Item	Specified Condition
New belt	7.0 to 8.2 mm (0.276 to 0.323 in.)
Used belt	7.6 to 10.0 mm (0.299 to 0.394 in.)

Tension

Item	Specified Condition
New belt	700 to 800 N (71 to 82 kg, 157 to 180 lb)
Used belt	550 to 750 N (56 to 77 kg, 124 to 169 lb)

If the belt deflection is not as specified, adjust it.

HINT:

- When inspecting the V belt deflection, apply 98 N (10 kgf) tensile force to it.
- After installing a new belt, run the engine for approximately 5 minutes and then readjust the tension to (new belt) specifications.
- Check the V-ribbed belt deflection and tension at the specified point.
- V-ribbed belt tension and deflection should be checked after 2 revolutions of the engine.
- V-ribbed belt tension and deflection should be checked at TDC crank angle and cold condition.
- When adjusting a belt, adjust its deflection and tension to the intermediate values of the specification.
- When reinstalling a belt which has been used for over 5 minutes, adjust its deflection and tension to the used belt specification.
- When using a belt tension gauge, confirm its accuracy by using a master gauge first.
- If using a sonic tension meter:

Input data for sonic tension meter

Weight

15 g/rib*m

Width

6 ribs

Span

188 mm (7.40 in.) (w/ air Conditioning)

282 mm (11.1 in.) (w/o air Conditioning)

REMOVAL**REMOVAL**

1. **REMOVE NO. 2 CYLINDER HEAD COVER** See step 10
2. **REMOVE ENGINE UNDER COVER RH**
3. **REMOVE V-RIBBED BELT**
 - a. Loosen bolts A and B.

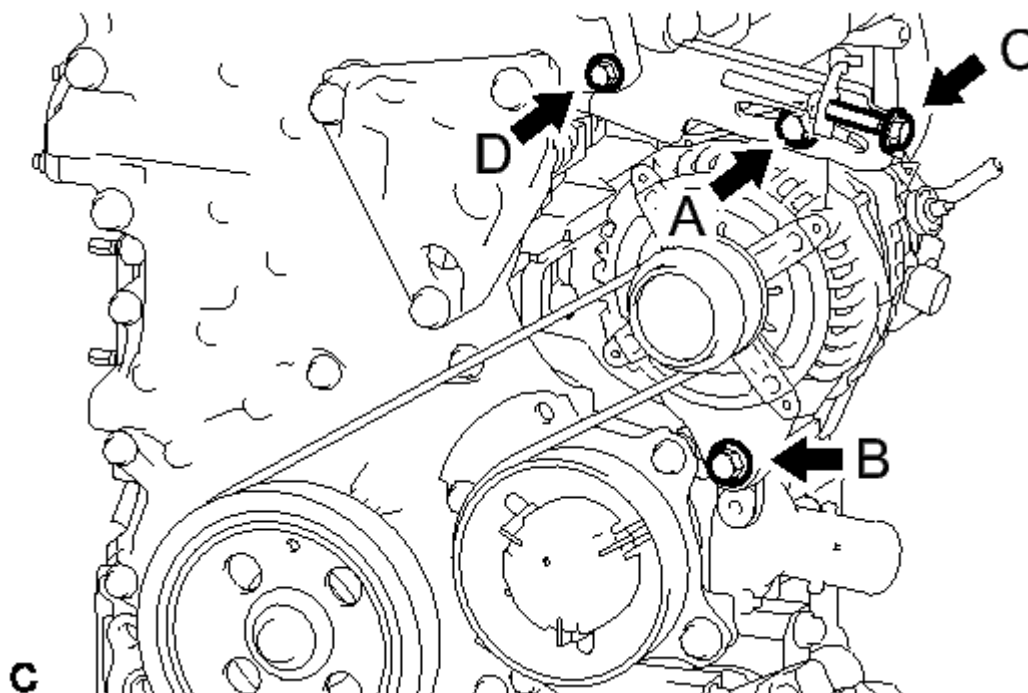


Fig. 8: Locating Bolts And V-Ribbed Belt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Loosen bolt C, then remove the V-ribbed belt.

NOTE: Do not loosen bolt D.

INSTALLATION**INSTALLATION**

1. **INSTALL V-RIBBED BELT**
 - a. Install the belt.
2. **ADJUST V-RIBBED BELT**
 - a. Turn bolt C to adjust the tension of the V-ribbed belt.

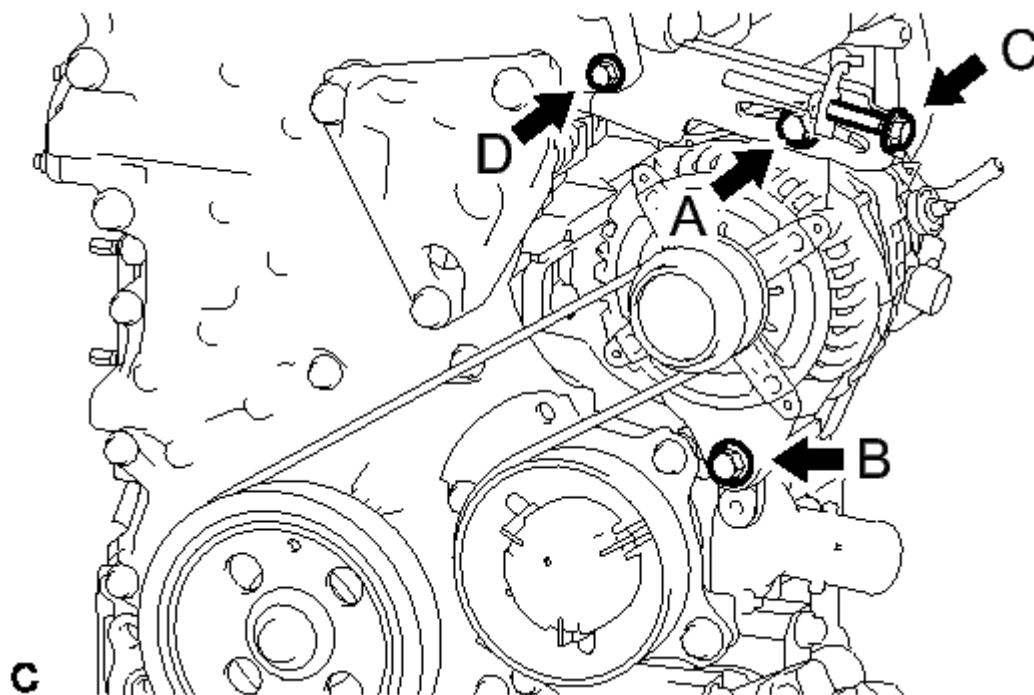


Fig. 9: Locating Bolts And V-Ribbed Belt
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Tighten bolts A and B.

Bolt A

Torque: 19 N*m (190 kgf*cm, 14 ft.*lbf)

Bolt B

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

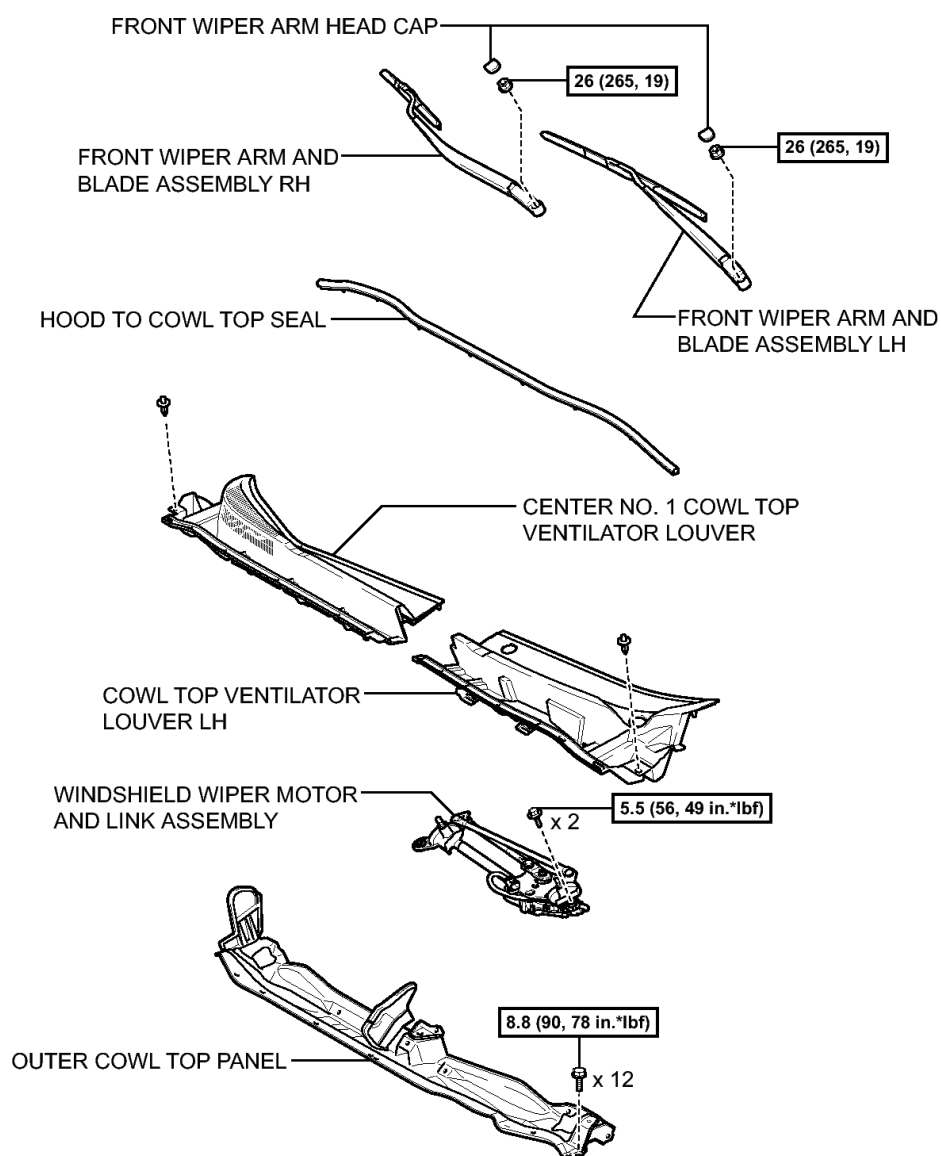
NOTE: Confirm that bolt D is not loosened.

- 3. **INSPECT V-RIBBED BELT** See step 1
- 4. **INSTALL ENGINE UNDER COVER RH**
- 5. **INSTALL NO. 2 CYLINDER HEAD COVER** See step 85

CAMSHAFT

COMPONENTS

ILLUSTRATION



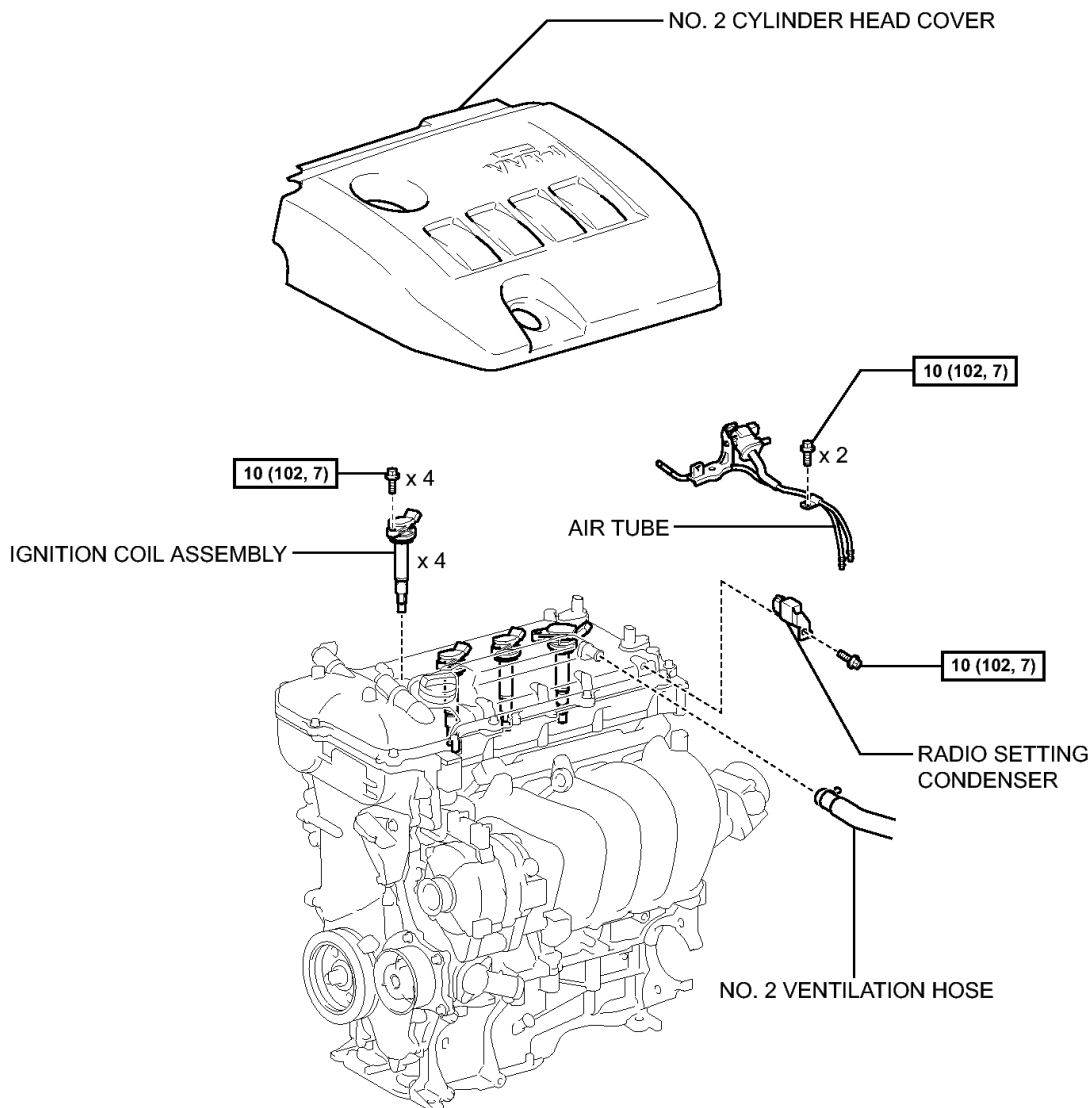
N*m (kgf*cm, ft.*lbf) : Specified torque

P

Fig. 10: Identifying Front Windshield Wiper Assembly Replacement Components With Torque Specifications

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

ILLUSTRATION

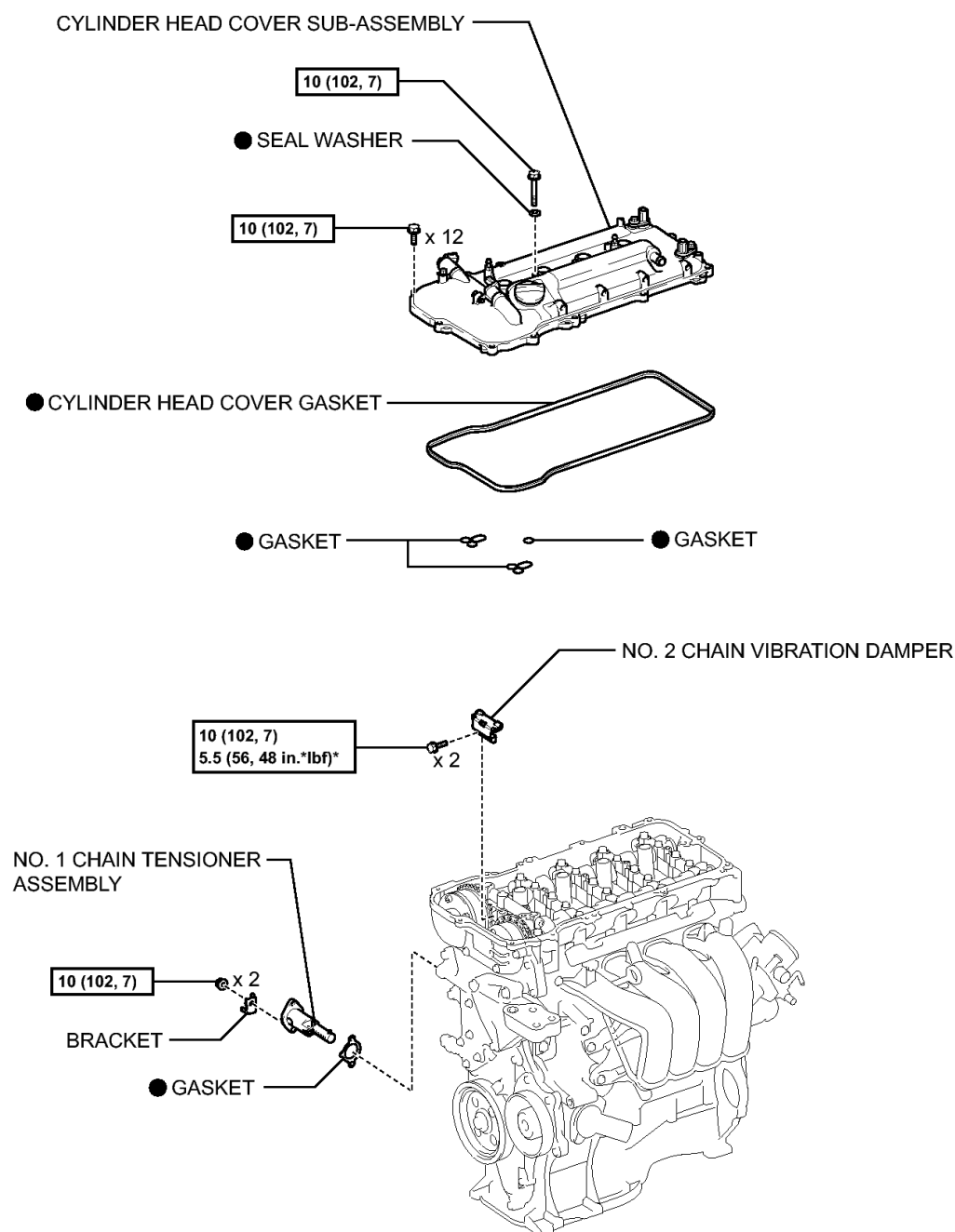


N*m (kgf*cm, ft.*lbf): Specified torque

T

Fig. 11: Identifying No. 2 Camshaft Replacement Components With Torque Specifications
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



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

* For use with SST

● Non-reusable part

c

Fig. 12: View Of Cylinder Head Components With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

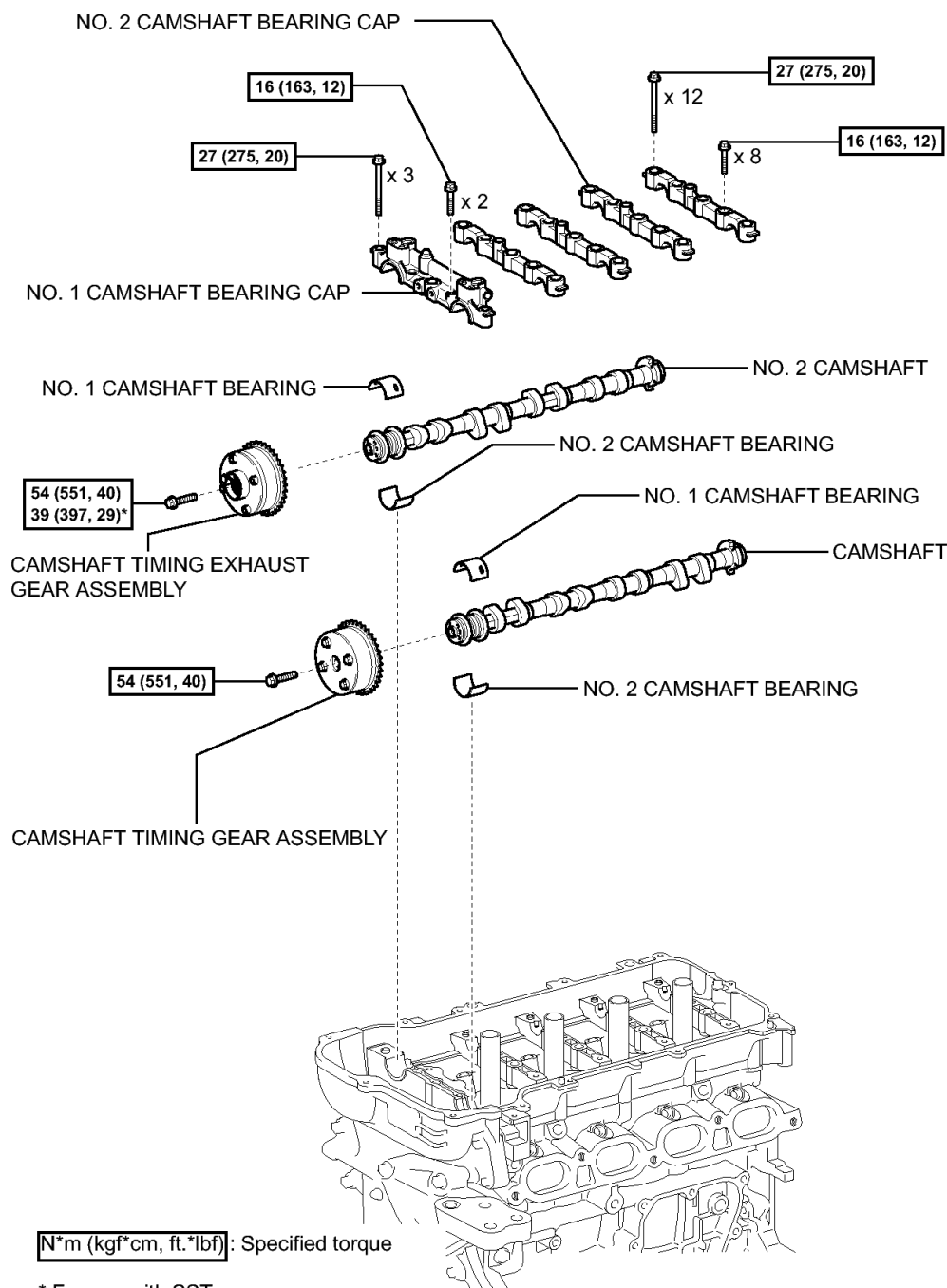


Fig. 13: Identifying Camshaft Replacement Components With Torque Specifications
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

REMOVAL

1. **REMOVE FRONT WIPER ARM HEAD CAP** . Refer to **REMOVAL - Step 1**

2. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH** . Refer to **REMOVAL - Step 2**
3. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH** . Refer to **REMOVAL - Step 3**
4. **REMOVE HOOD TO COWL TOP SEAL** . Refer to **REMOVAL - Step 4**
5. **REMOVE CENTER NO. 1 COWL TOP VENTILATOR LOUVER** . Refer to **REMOVAL - Step 5**
6. **REMOVE COWL TOP VENTILATOR LOUVER LH** . Refer to **REMOVAL - Step 6**
7. **REMOVE WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** . Refer to **REMOVAL - Step 7**
8. **REMOVE OUTER COWL TOP PANEL (for TMC Made)** . Refer to **REMOVAL - Step 14**
9. **REMOVE OUTER COWL TOP PANEL (except TMC Made)** . Refer to **REMOVAL - Step 15**
10. **REMOVE NO. 2 CYLINDER HEAD COVER** See step 10
11. **REMOVE IGNITION COIL ASSEMBLY** . Refer to **REMOVAL - Step 2**
12. **REMOVE RADIO SETTING CONDENSER** See step 19
13. **DISCONNECT NO. 2 VENTILATION HOSE**
 - a. Disconnect the No. 2 ventilation hose.

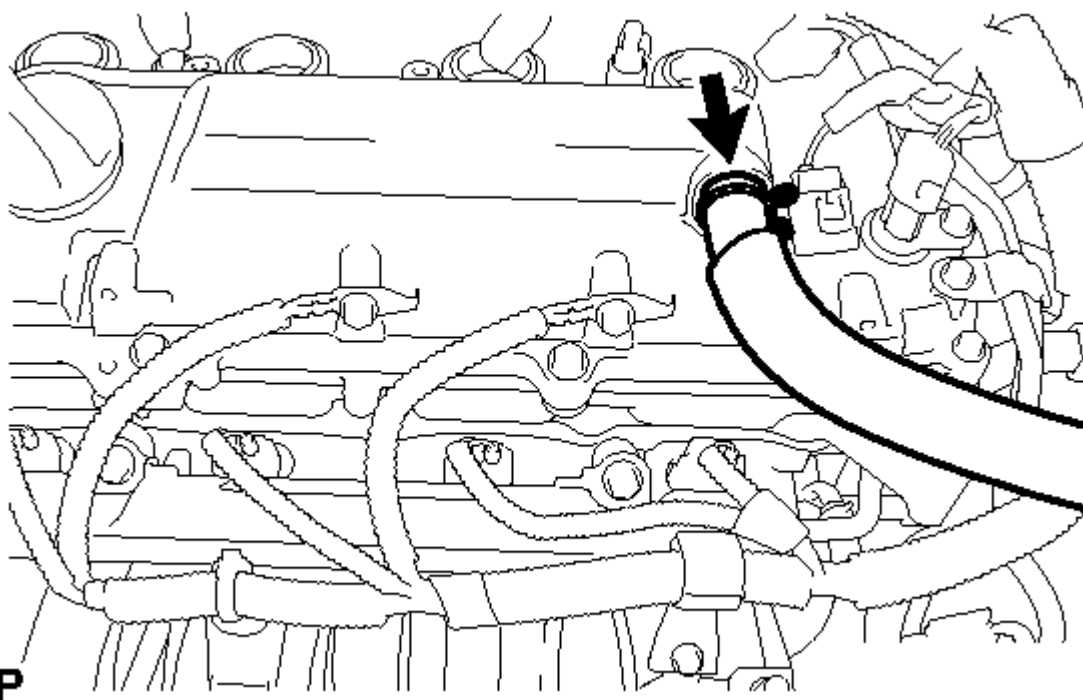


Fig. 14: Locating No. 2 Ventilation Hose

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

14. **DISCONNECT ENGINE WIRE**

- a. Remove the 2 bolts, 5 connectors, 5 clamps and disconnect the engine wire.

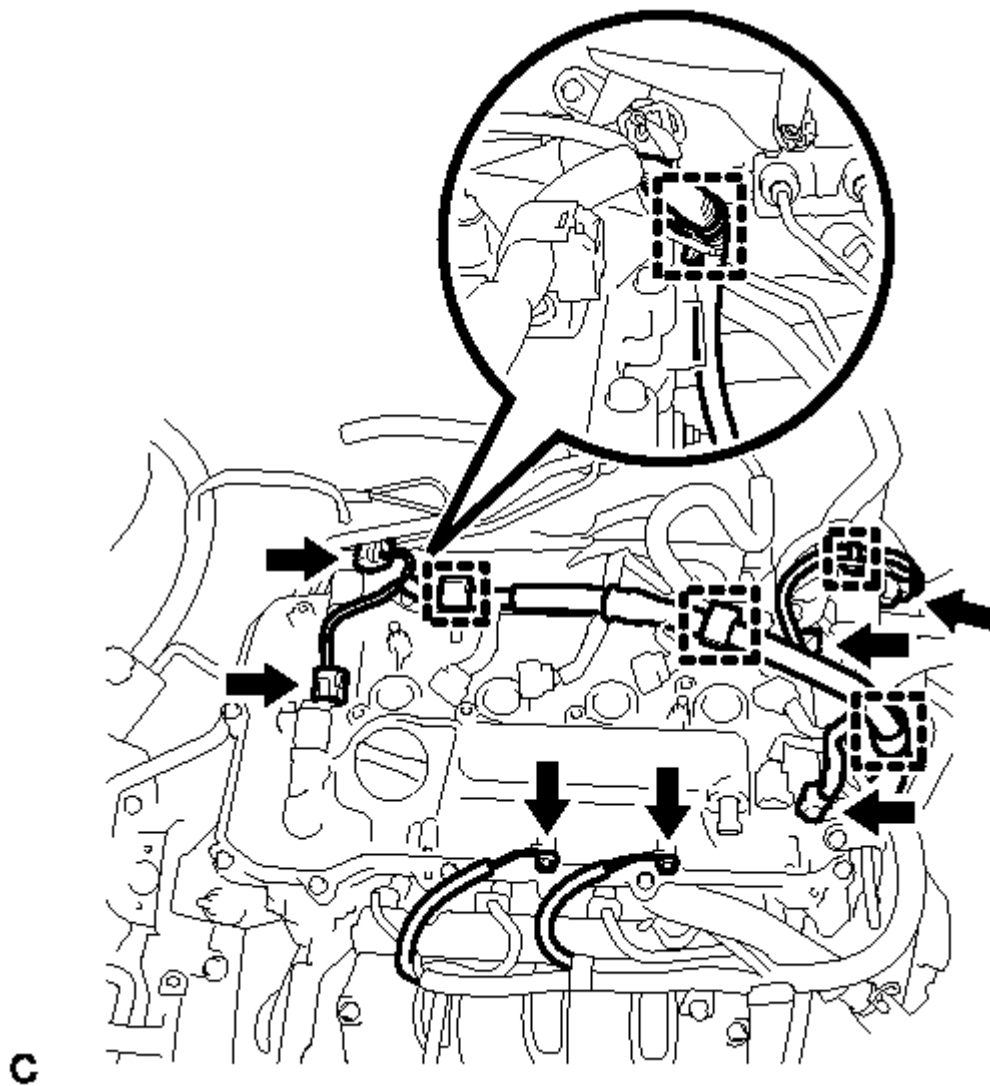


Fig. 15: Identifying Engine Wire Bolts, Connectors & Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. REMOVE AIR TUBE

- a. Remove the 2 bolts, 4 hoses and air tube assembly.

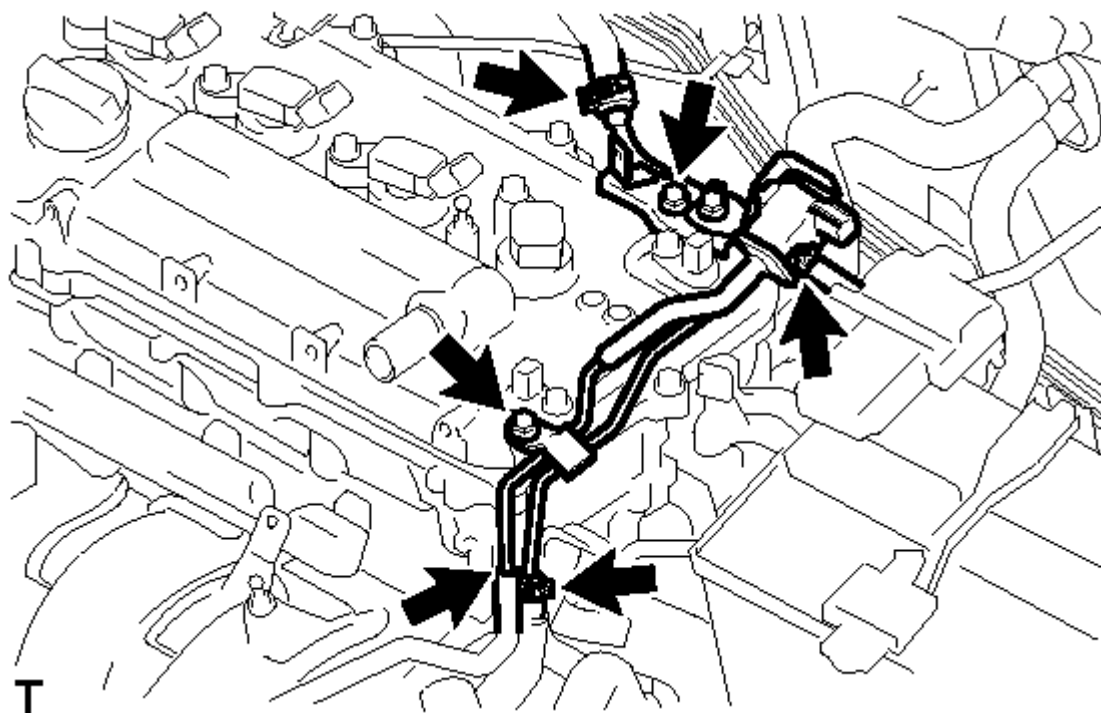
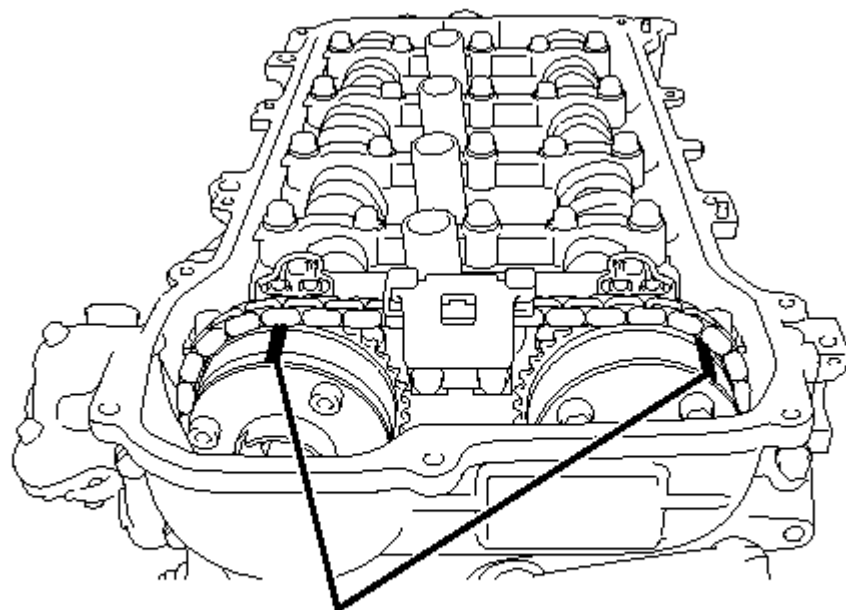
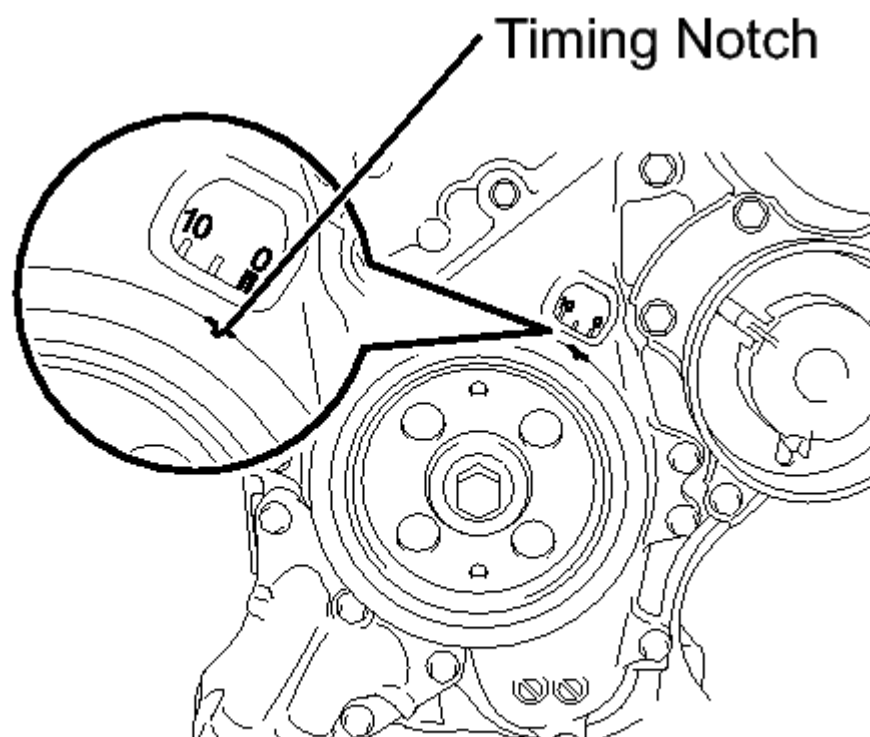


Fig. 16: Identifying Air Tube Assembly Bolts & Hoses
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

16. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY** See step 7
17. **SET NO. 1 CYLINDER TO TDC/COMPRESSION**
 - a. Turn the crankshaft pulley until its timing notch (groove) and the timing mark "0" of the timing chain cover are aligned.



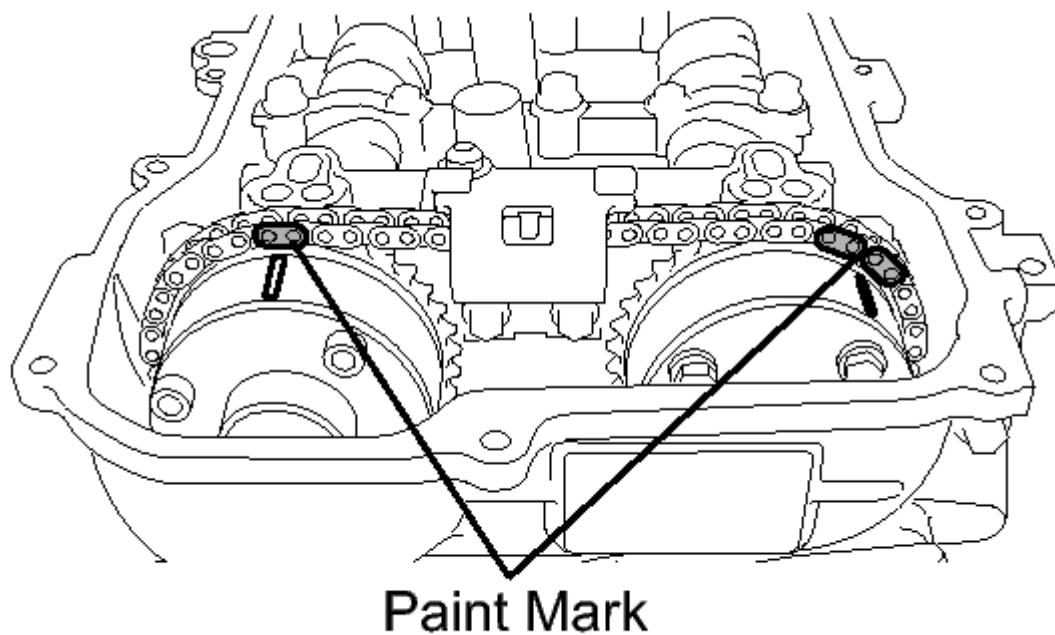
Matchmark



T

Fig. 17: Aligning Crankshaft Pulley & Timing Chain Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Check that each matchmark of the camshaft timing gear and camshaft timing exhaust gear are aligned with each matchmark located as shown in the illustration. If not, turn the crankshaft 1 revolution (360°) to align the timing marks as shown in the illustration.
- c. Place paint marks on the chain in alignment with the timing marks on the camshaft timing gear and camshaft timing exhaust gear.



C

Fig. 18: Identifying Paint Marks On Camshaft Timing Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. REMOVE NO. 2 CHAIN VIBRATION DAMPER

- a. Using SST, remove the 2 bolts and No. 2 chain vibration damper from the camshaft bearing cap.

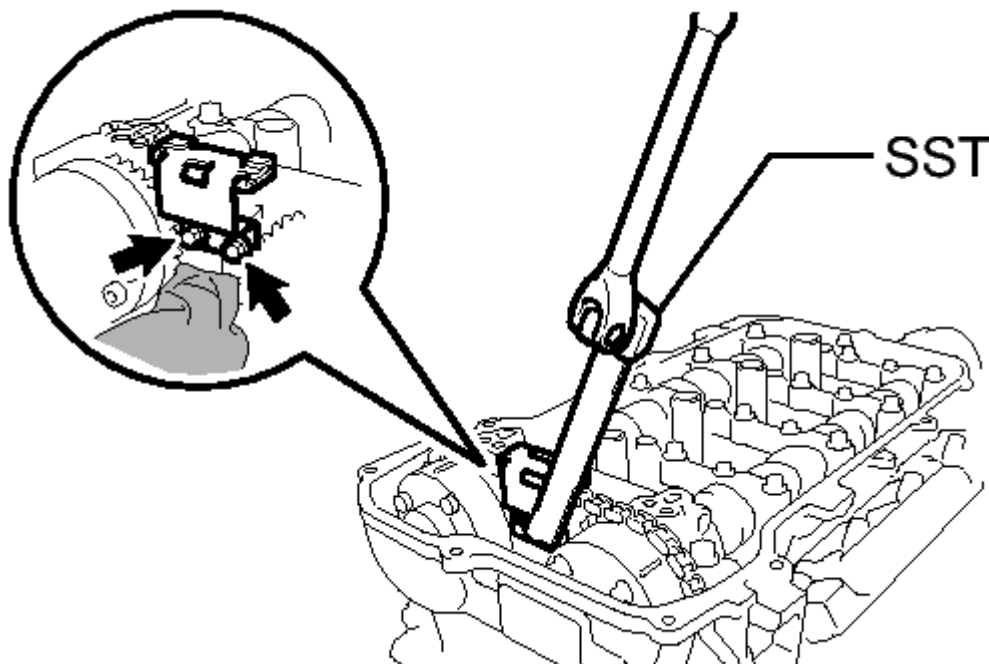


Fig. 19: Locating Bolts And No 2 Chain Vibration Damper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09961-00950

19. **REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY** See step 1020. **REMOVE CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY**

- a. While holding the hexagonal portion of the No. 2 camshaft with a wrench, loosen the camshaft timing exhaust gear bolt with SST.

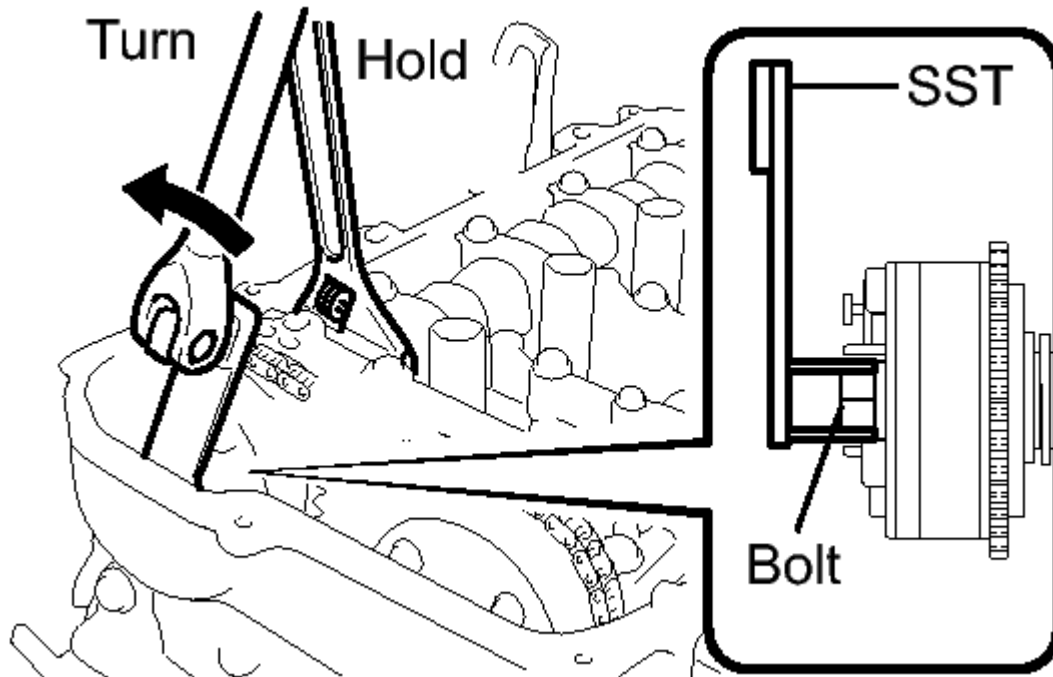


Fig. 20: Removing Camshaft Timing Exhaust Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09249-37010

NOTE: Do not remove the other 4 bolts ("TORX" bolt). If any of them is removed, replace the camshaft timing exhaust gear assembly.

HINT:

The bolt cannot be removed separately from the camshaft timing exhaust gear assembly due to lack of space.

- b. Hold the hexagonal portion of the intake camshaft with a wrench and turn it slightly counterclockwise to release the chain.

NOTE: Do not turn the intake camshaft more than necessary.

HINT:

Be sure to loosen the chain because the camshaft timing exhaust gear assembly cannot be removed with the chain tensioned.

- c. While removing the chain, pull out the camshaft timing exhaust gear assembly horizontally and then upward with the bolts installed.

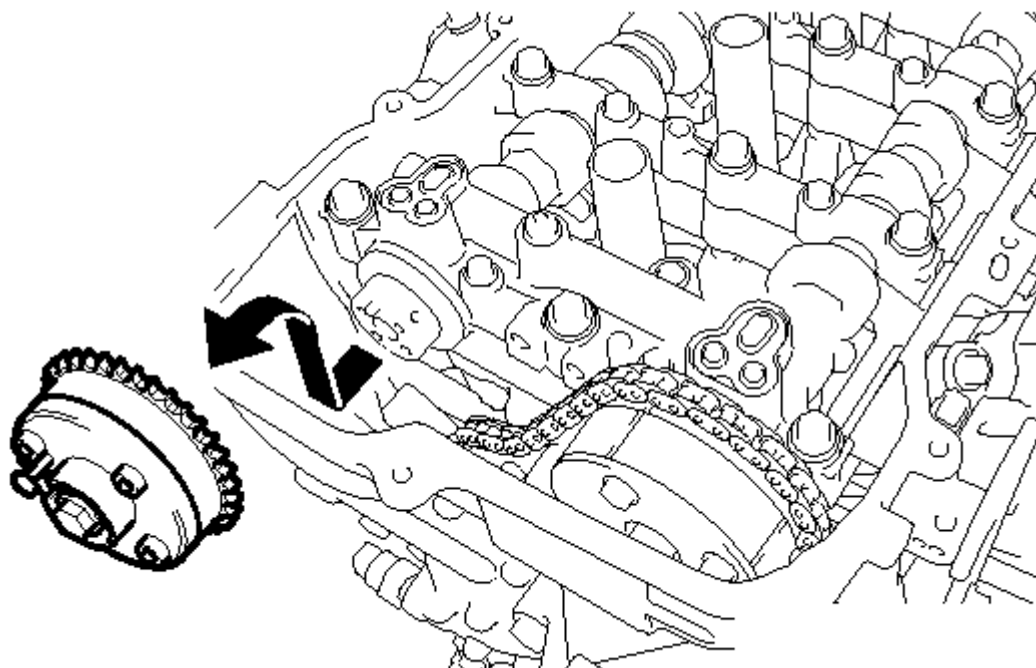


Fig. 21: Removing Camshaft Timing Exhaust Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

21. INSPECT CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY

- a. Temporarily install the camshaft timing exhaust gear assembly.
 1. Install the bolt to the camshaft timing exhaust gear assembly.

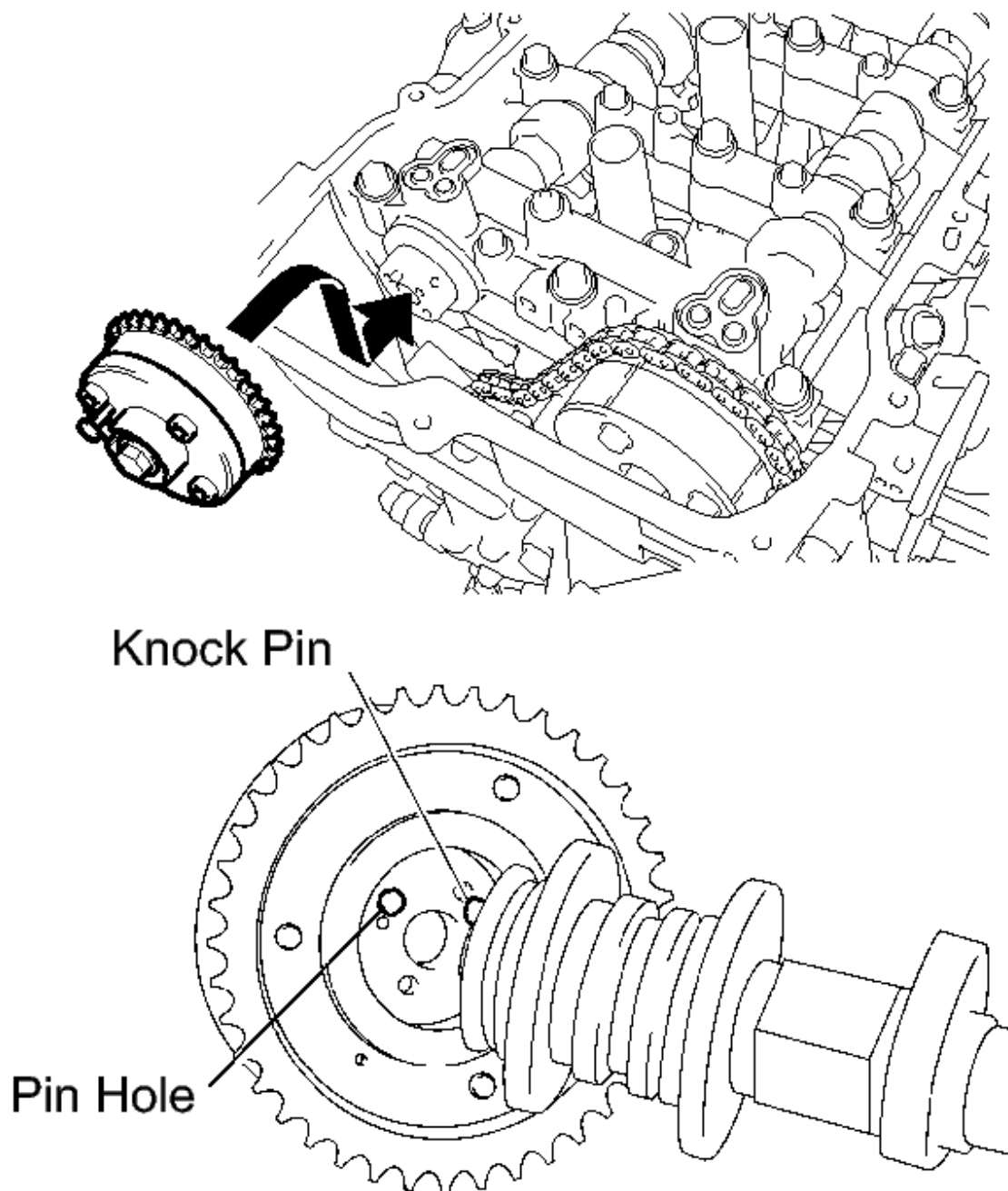


Fig. 22: Checking Camshaft Timing Exhaust Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Align the knock pin on the No. 2 camshaft with the pin hole in the camshaft timing exhaust gear assembly and temporarily install the camshaft timing exhaust gear assembly to the No. 2 camshaft with the bolt.

NOTE:

- Do not install the chain onto the gear at this step.
- Do not allow the chain to interfere with the gear when

installing the gear assembly.

- b. Inspect the camshaft timing exhaust gear lock.
 - 1. Check that the camshaft timing exhaust gear is locked.
- c. Inspect camshaft timing exhaust gear operation.
 - 1. After cleaning and degreasing the exhaust side VVT oil hole on the No. 1 camshaft bearing cap, completely seal the oil hole with adhesive tape or equivalent as shown in the illustration to prevent air from leaking.

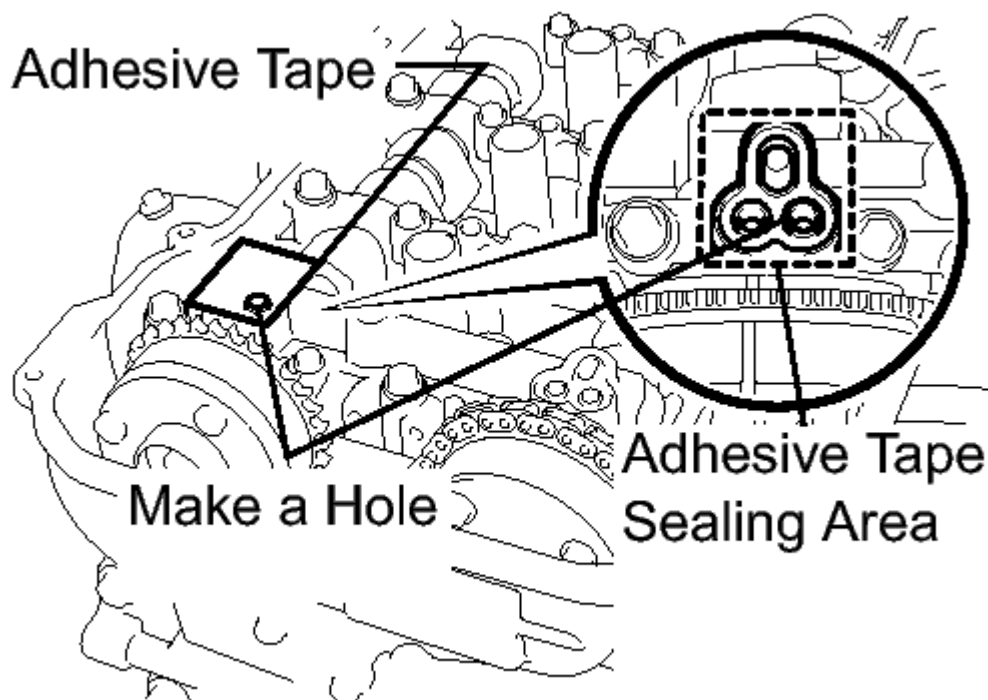


Fig. 23: Identifying Adhesive Tape Applying Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- 2. Make a hole in the adhesive tape covering the oil hole as shown in the illustration. (Procedure B)
- 3. Apply approximately 200 kPa (2.0 kgf/cm², 28 psi.) of air pressure to the hole made in procedure B to release the lock pin.

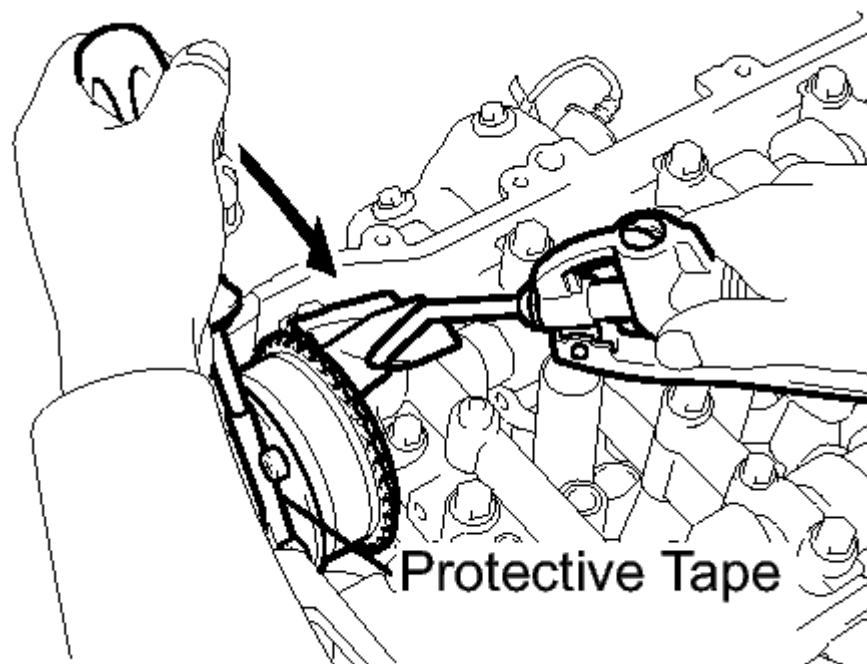


Fig. 24: Releasing Lock Pin By Applying Air Pressure To Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

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

4. Using a screwdriver with its tip taped, forcibly turn the camshaft timing exhaust gear in the retard direction (clockwise).

NOTE:

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

HINT:

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

5. Using a screwdriver with its tip taped, turn the camshaft timing exhaust gear within its movable range (20°) 2 or 3 times without turning it to the most advanced position. Check that the camshaft timing gear turns smoothly.

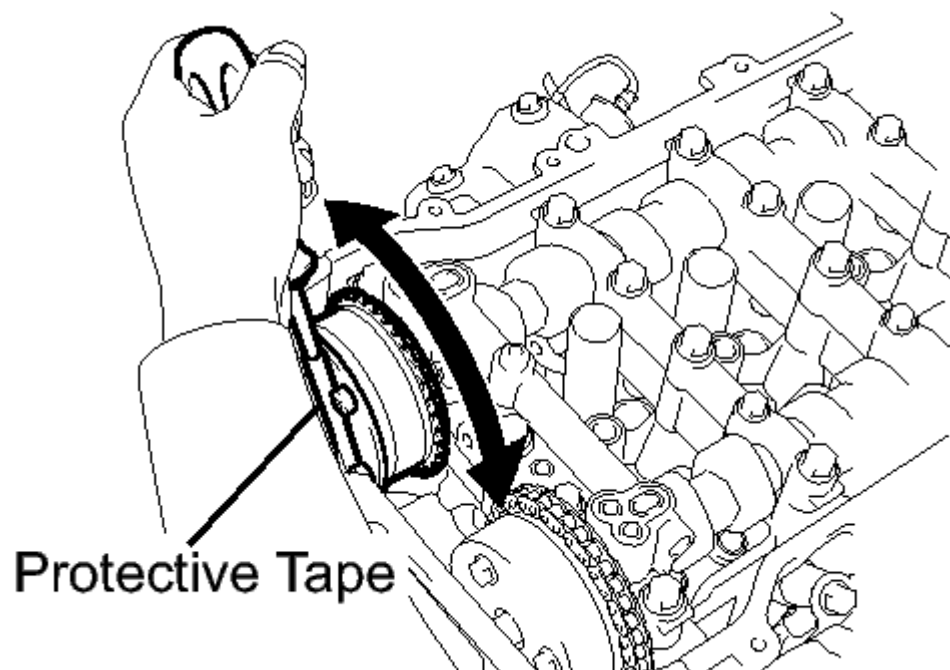


Fig. 25: Checking That Camshaft Timing Gear Turns Smoothly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. Lock the camshaft timing exhaust gear.

NOTE: Check that the camshaft timing exhaust gear assembly locks at the most advanced position (the most advanced position of its movable range) and cannot be rotated any further.

7. Remove the adhesive tape from the No. 1 camshaft bearing cap.
- d. Remove the camshaft timing exhaust gear assembly.
 1. Remove the temporarily installed camshaft timing exhaust gear assembly.

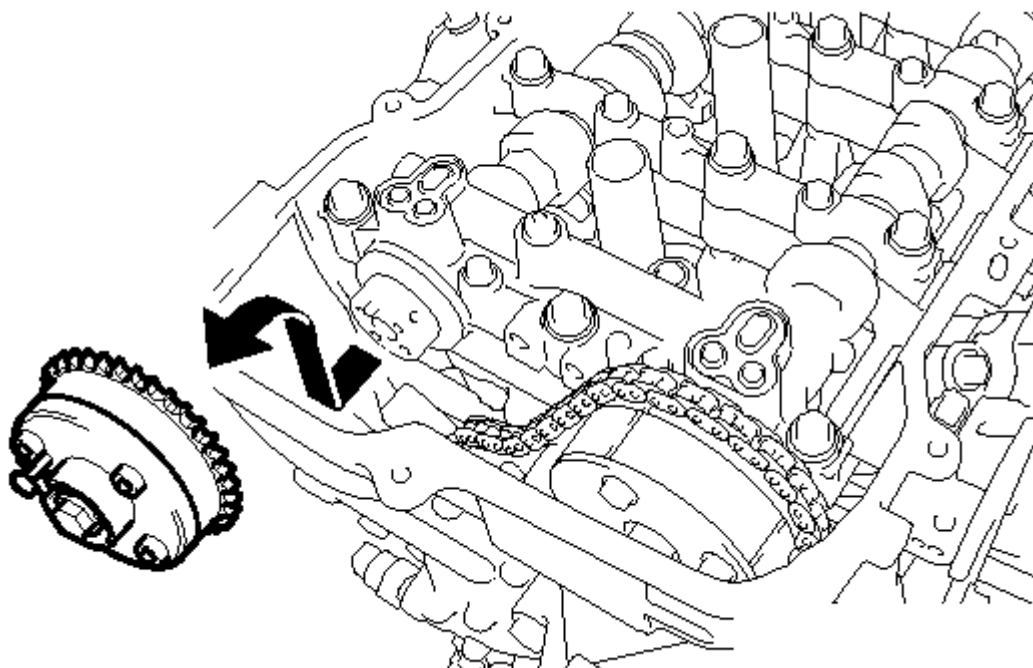


Fig. 26: Removing Camshaft Timing Exhaust Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

22. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY

- a. Inspect the camshaft timing gear lock.
 1. Check that the camshaft timing gear is locked.
- b. Inspect camshaft timing gear operation.
 1. After cleaning and degreasing the intake side VVT oil hole on the No. 1 camshaft bearing cap, completely seal the oil hole with adhesive tape or equivalent as shown in the illustration to prevent air from leaking.

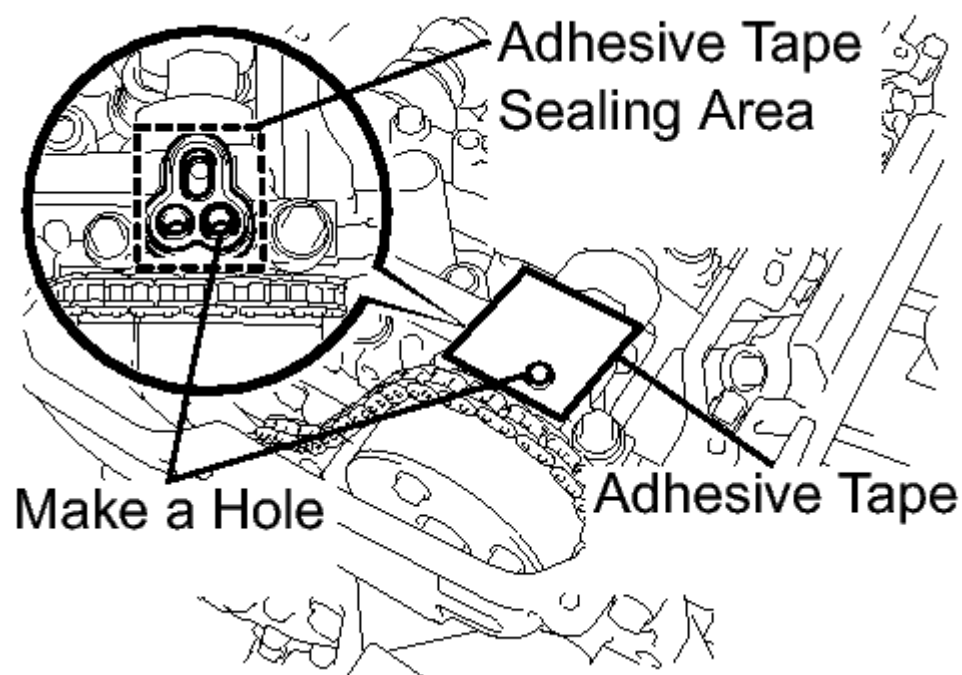


Fig. 27: Identifying Adhesive Tape Applying Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

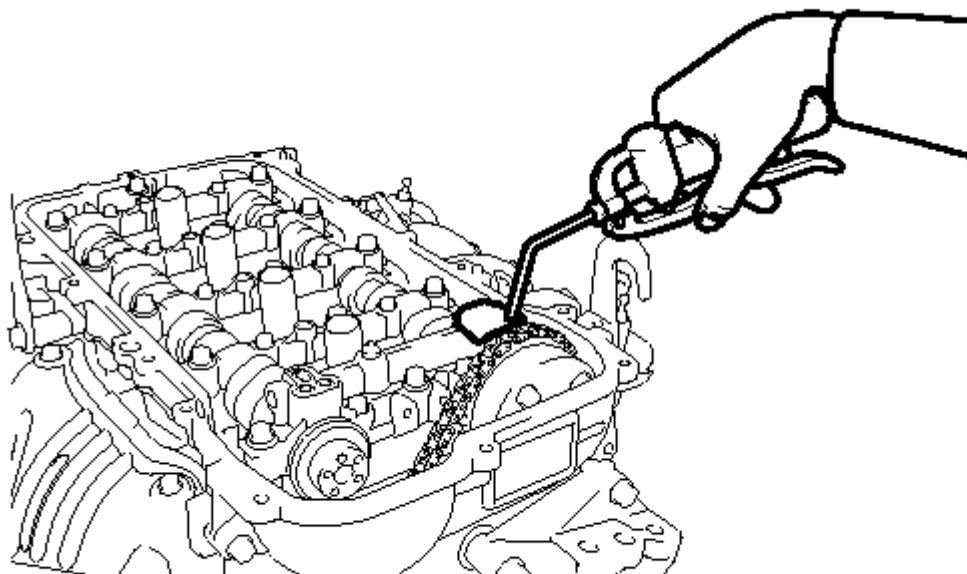


Fig. 28: Applying Air Pressure to Release Lock Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

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

4. Forcibly turn the camshaft timing gear in the advance direction (counterclockwise).

HINT:

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

5. Turn the camshaft timing gear within its movable range (27.5°) 2 or 3 times without turning it to the most retarded position. Check that the camshaft timing gear turns smoothly.

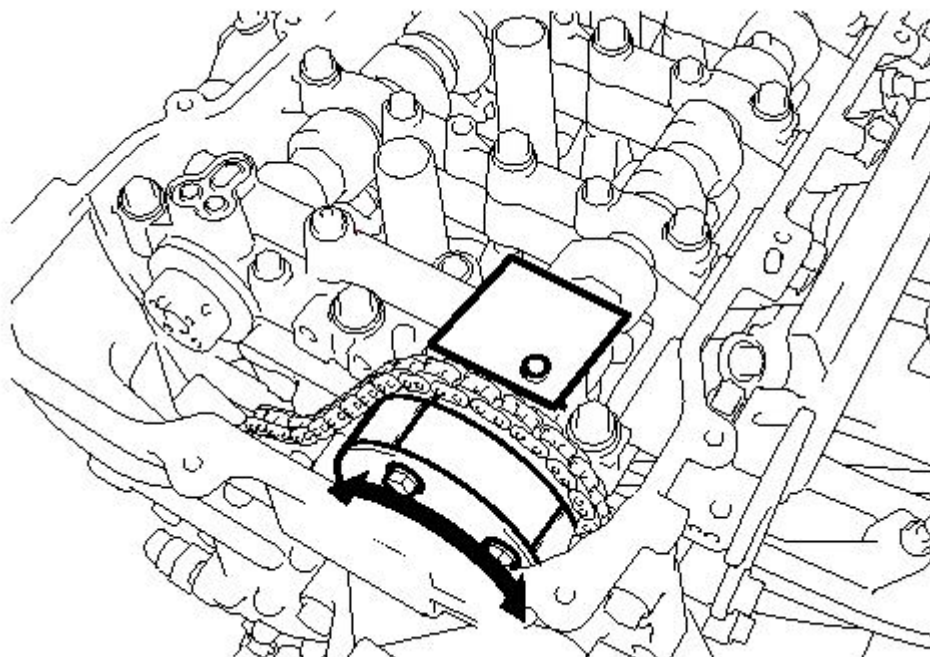


Fig. 29: Removing Adhesive Tape From No. 1 Camshaft Bearing Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

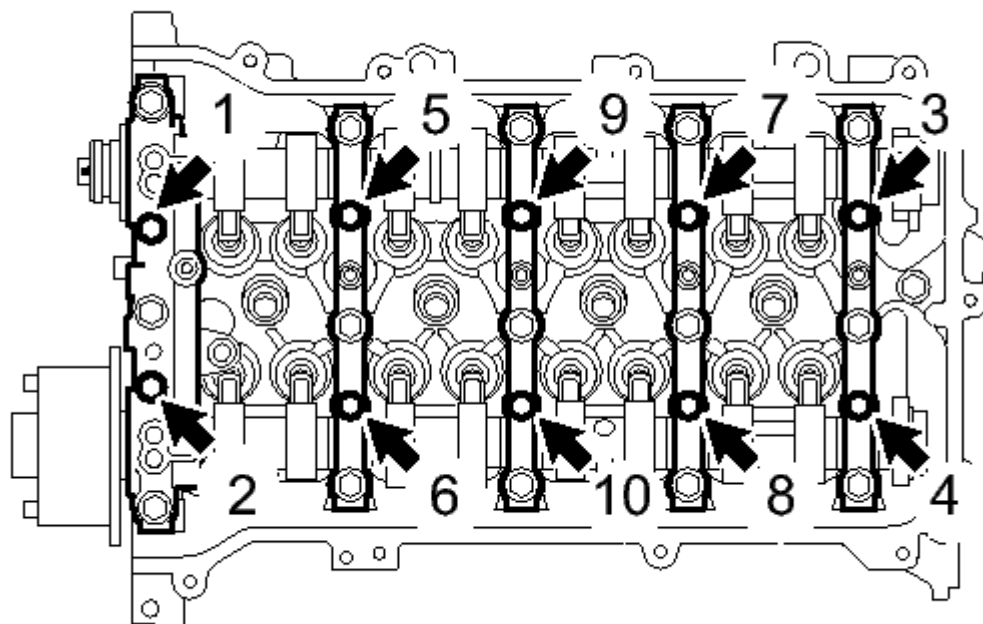
NOTE:

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

6. Remove the adhesive tape from the No. 1 camshaft bearing cap.

23. REMOVE CAMSHAFT BEARING CAP

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



T

Fig. 30: Loosening Sequence For Bearing Cap Bolts

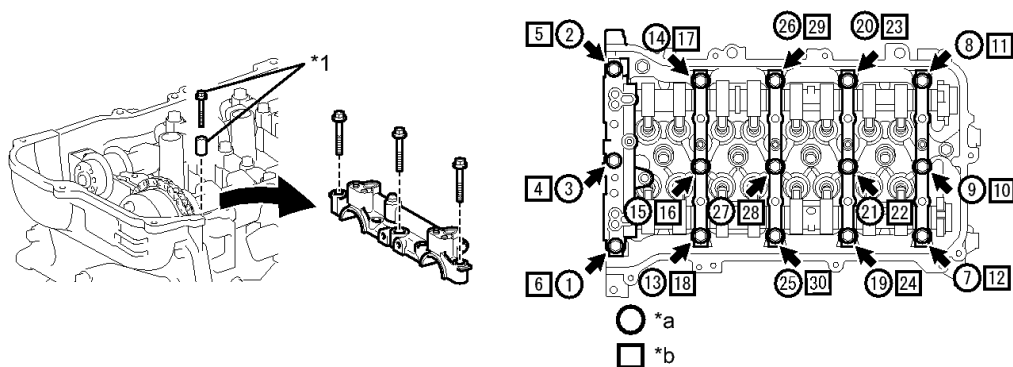
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Be sure not to loosen the other 15 bearing cap bolts in this step.

HINT:

Arrange the removed parts in the correct order.

- b. Remove the bolts and bearing caps in the order shown in the illustration. Immediately after removing bearing caps, install service bolts and spacers in the order shown in the illustration.



c

Fig. 31: Loosening/Tightening Order For Bolts And Bearing Caps

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

TEXT IN ILLUSTRATION

*1	Service Bolt and Spacer (used to temporarily secure the camshaft	-	-
----	--	---	---

	housing)		
*a	The removal order of the parts	*b	The installation order of the bolts and spacers for temporarily tightening the camshaft housing

Torque: 27 N*m (275 kgf*cm, 20 ft.*lbf)

NOTE:

- If the bolts are loosened all at once, FIPG on the camshaft housing and cylinder head may peel off, resulting in oil oozing. Therefore, be sure to install the service bolts and spacers to one bearing cap at a time.
- Do not install the bearing caps when installing the service bolts and spacers.

HINT:

- Arrange the removed parts in the correct order.
- Part number for the service bolts used to temporarily secure the camshaft housing: 91551-G0875 (15 bolts)
- Part number for the service washers used to temporarily secure the camshaft housing: 90387-12048 (15 spacers)

24. REMOVE NO. 2 CAMSHAFT

- a. Remove the No. 2 camshaft from the camshaft housing.

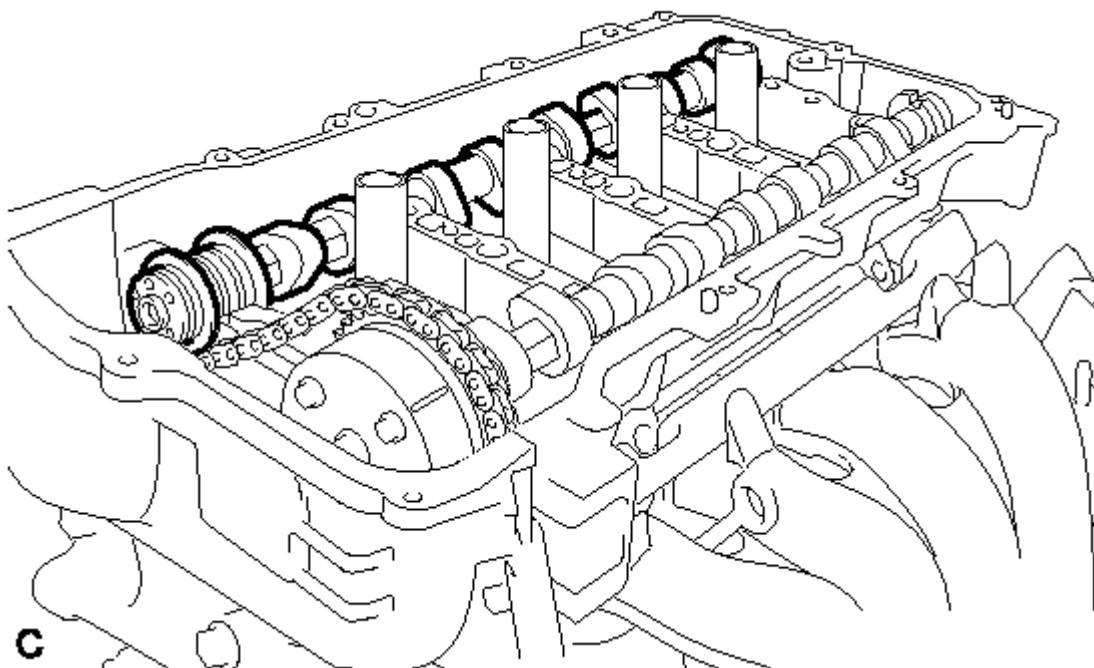


Fig. 32: View Of No. 2 Camshaft From Camshaft Housing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

25. REMOVE CAMSHAFT

- a. Hold up the chain and remove the camshaft from the camshaft housing.

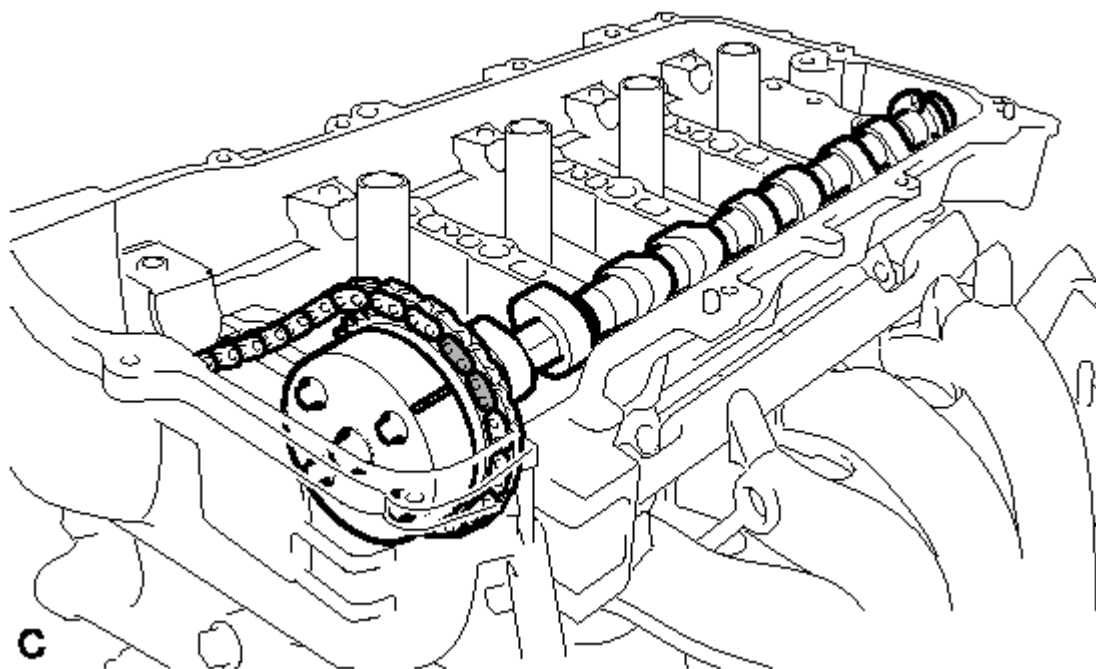


Fig. 33: View Of Camshaft, Chain And Housing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Suspend the chain with a string or equivalent.

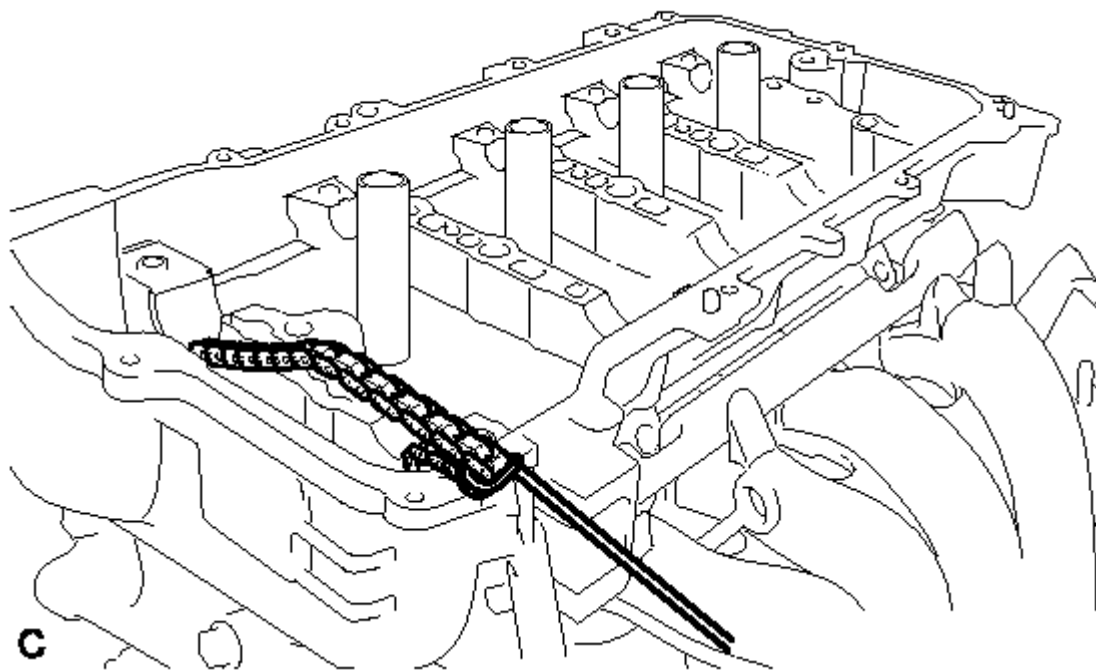
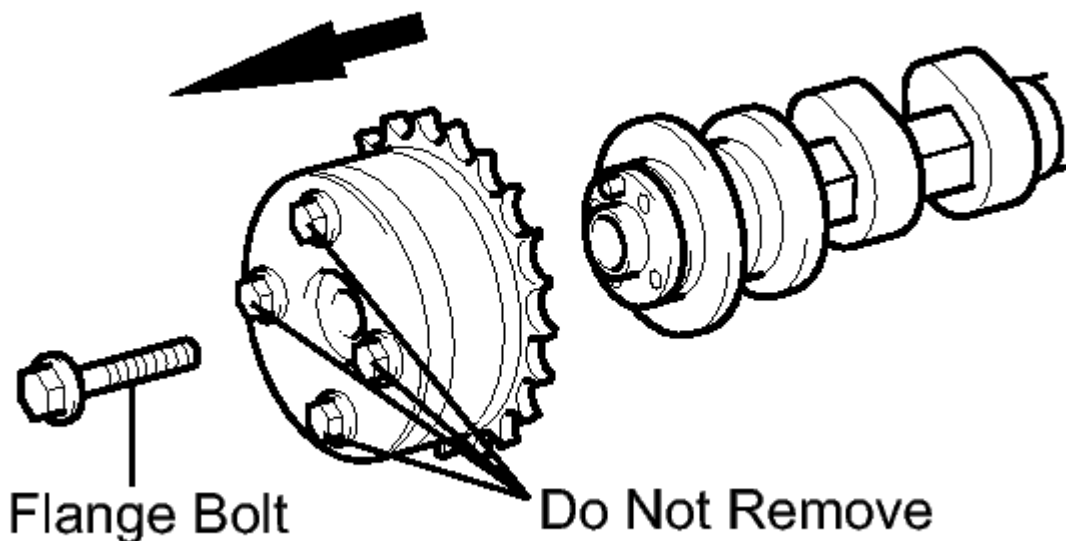


Fig. 34: Suspending Chain With String Or Equivalent
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

26. REMOVE CAMSHAFT TIMING GEAR ASSEMBLY

- a. Secure the hexagonal portion of the camshaft in a soft jaw vise.
- b. Remove the flange bolt and the camshaft timing gear assembly.

**T****Fig. 35: Identifying Flange Bolt**

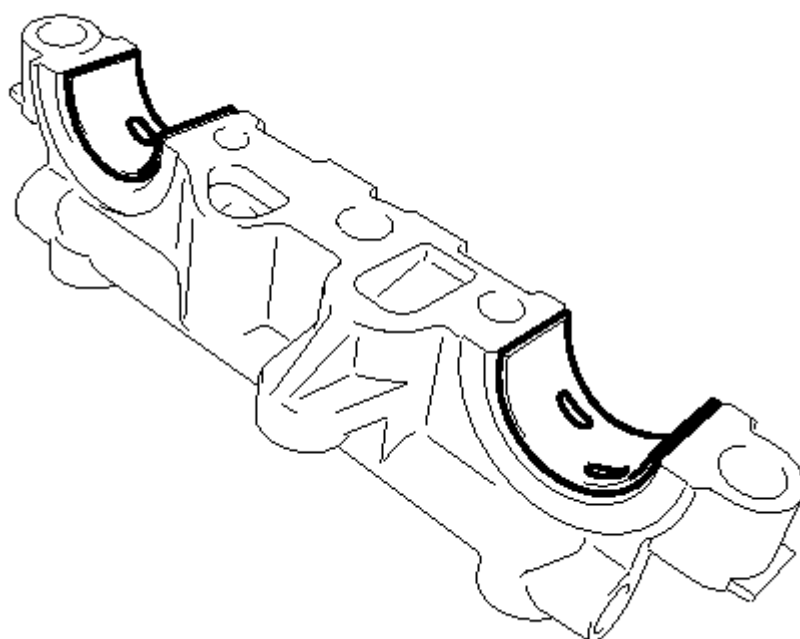
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

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

27. REMOVE NO. 1 CAMSHAFT BEARING

- a. Remove the 2 No. 1 camshaft bearings.



T

Fig. 36: Identifying No. 1 Camshaft Bearings

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

HINT:

Arrange the removed parts in the correct order.

28. REMOVE NO. 2 CAMSHAFT BEARING

- a. Remove the 2 No. 2 camshaft bearings.

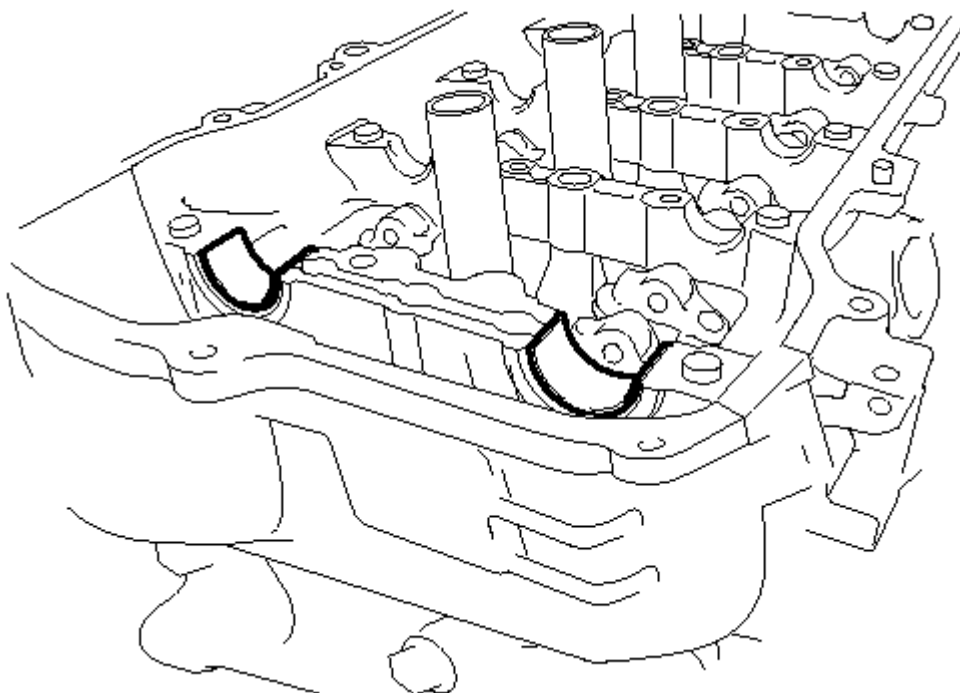


Fig. 37: View Of No. 2 Camshaft Bearings

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

HINT:

Arrange the removed parts in the correct order.

INSTALLATION

INSTALLATION

1. INSTALL NO. 1 CAMSHAFT BEARING

- a. Clean both surfaces of the 2 No. 1 camshaft bearings.

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

- b. Install the 2 No. 1 camshaft bearings.
- c. Using a vernier caliper, measure the distance between the bearing cap edge and the camshaft bearing edge.

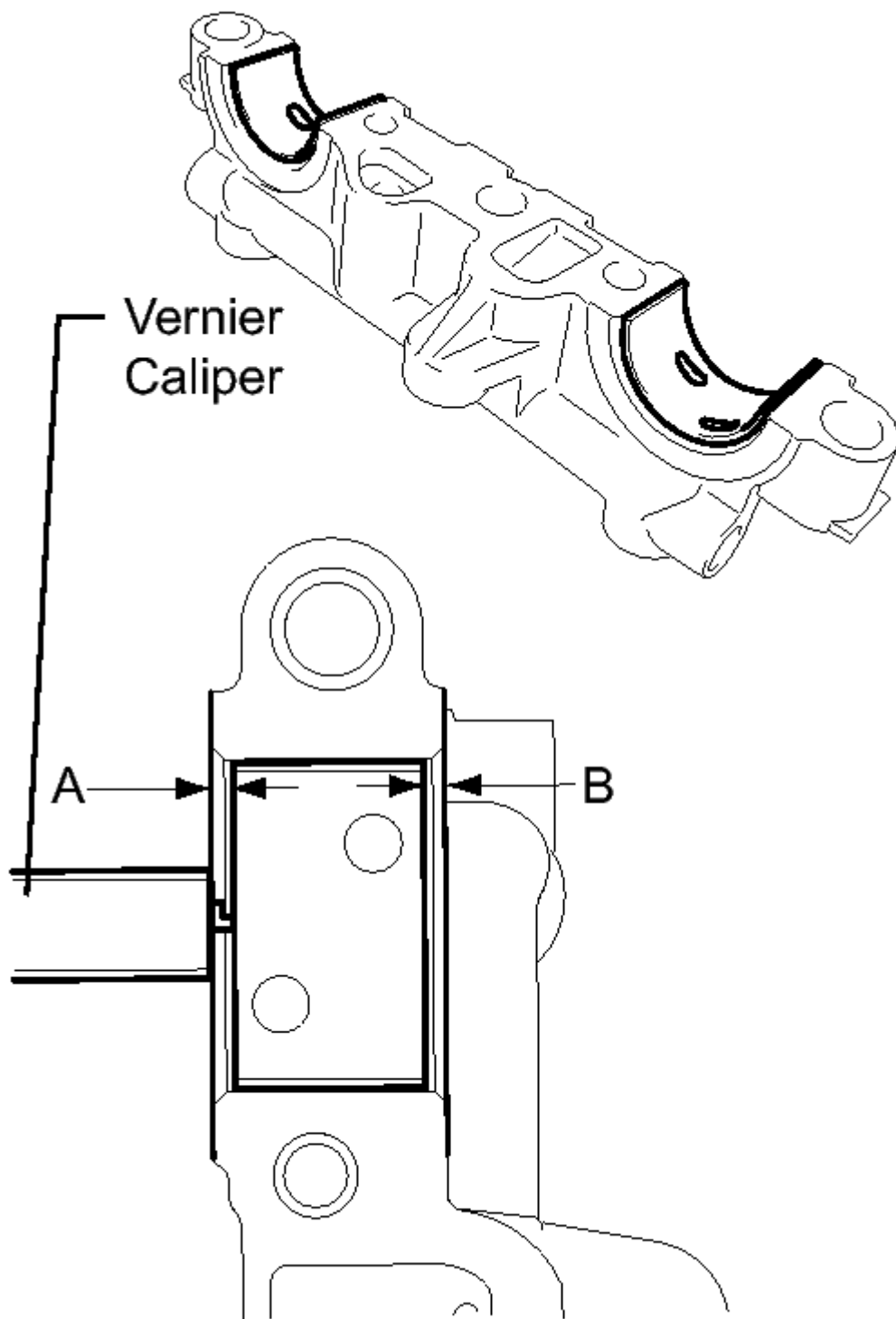


Fig. 38: Measuring Distance Between Bearing Cap Edge And Camshaft Bearing Edge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Dimension (A - B)

0.7 mm (0.0276 in.) or less

NOTE: Position the bearings to the center of the bearing cap by

measuring dimensions A and B.

2. INSTALL NO. 2 CAMSHAFT BEARING

- a. Clean both surfaces of the 2 No. 2 camshaft bearings.

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

- b. Install the 2 No. 2 camshaft bearings.
- c. Using a vernier caliper, measure the distance between the bearing cap edge and the camshaft bearing edge.

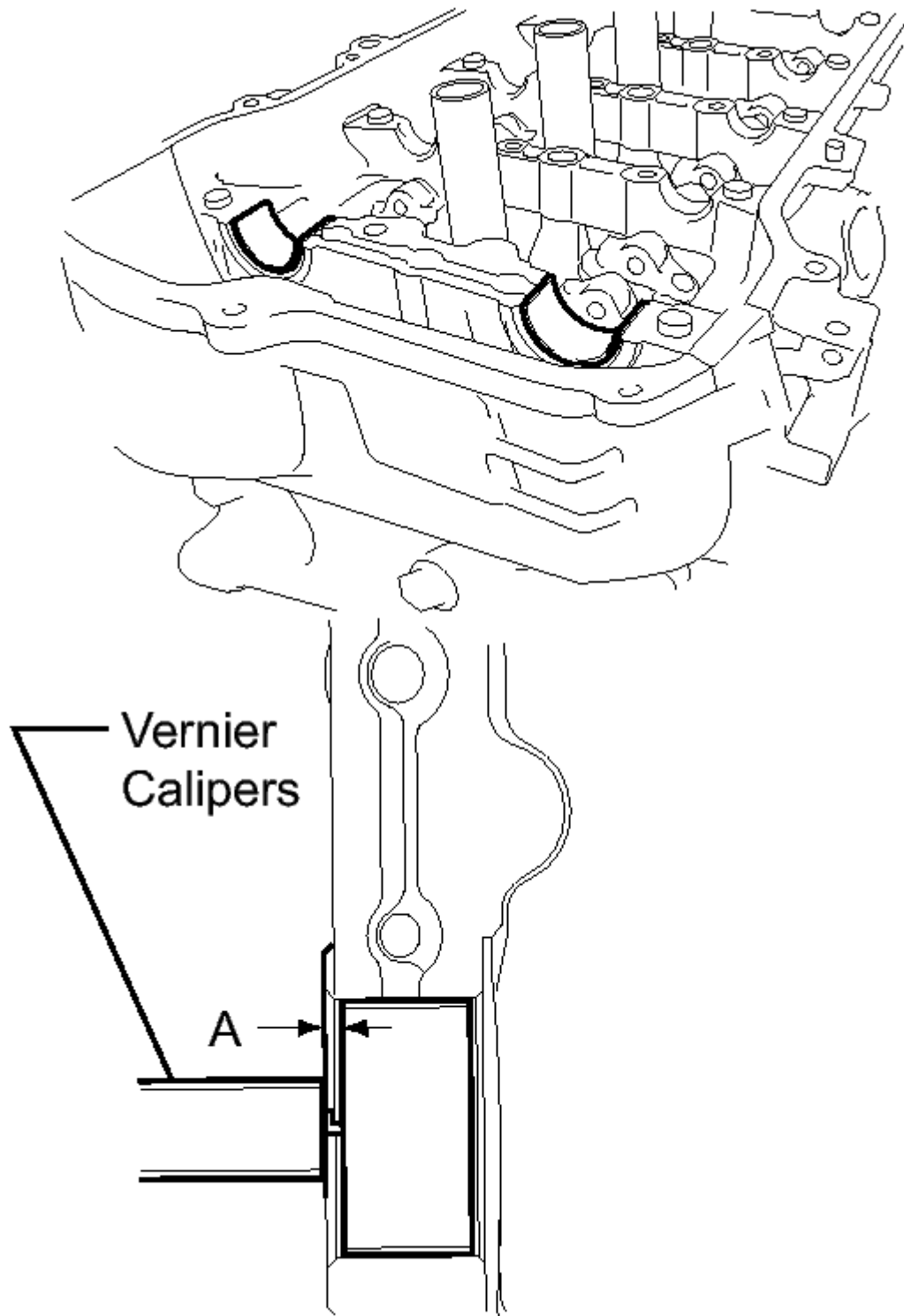


Fig. 39: Measuring Distance Between Bearing Cap Edge And Camshaft Bearing Edge With Vernier Caliper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Dimension (A)

1.05 to 1.75 mm (0.0413 to 0.0689 in.)

NOTE: Position the bearings to the center of the bearing cap by measuring dimension A.

3. INSTALL CAMSHAFT TIMING GEAR ASSEMBLY

- a. Secure the hexagonal portion of the camshaft in a soft jaw vise.
- b. Check that the knock pin is installed on the camshaft.
- c. Put the camshaft timing gear and camshaft together with the knock pin and key groove misaligned, as shown in the illustration.

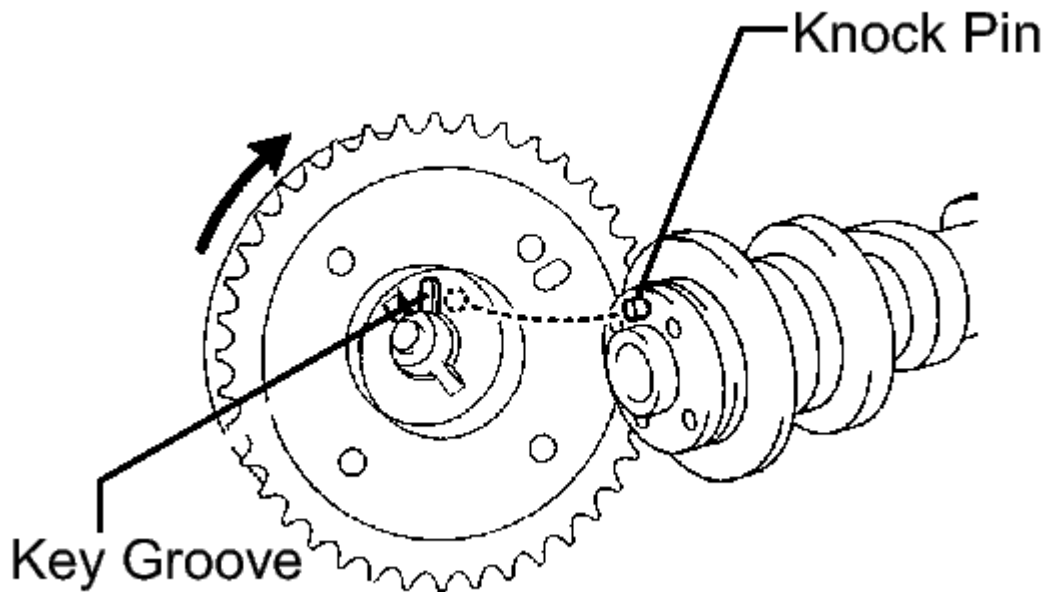
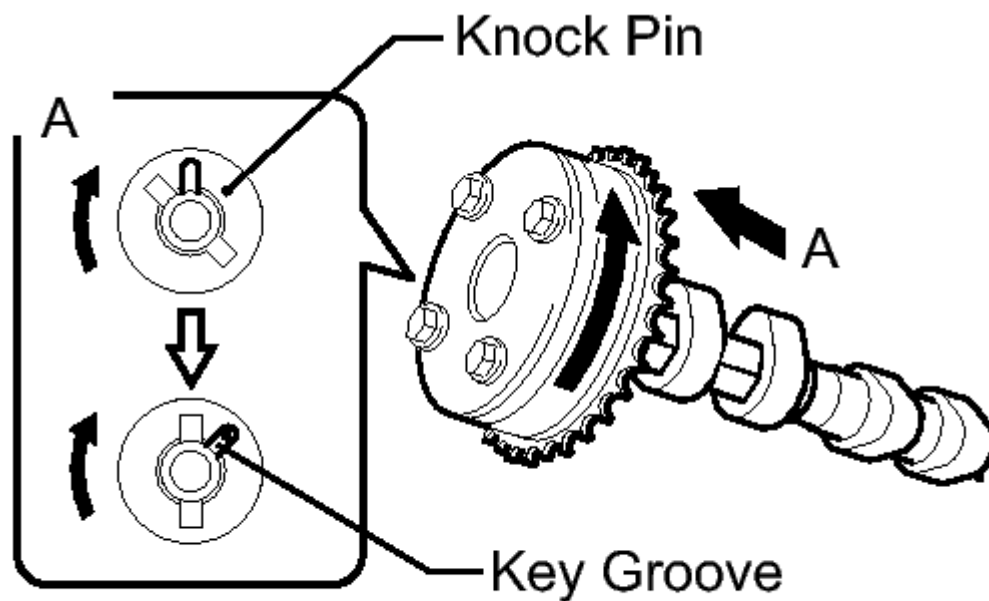


Fig. 40: Identifying Knock Pin & Key Groove
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- d. Turn the camshaft timing gear as shown in the illustration while pushing it gently against the camshaft. Push further at the position where the pin fits into the groove.

**T****Fig. 41: Turning Camshaft Timing Gear****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

NOTE: Do not turn the camshaft timing gear in the retard direction (the right angle).

- e. Check that there is no clearance between the camshaft timing gear and camshaft flange.

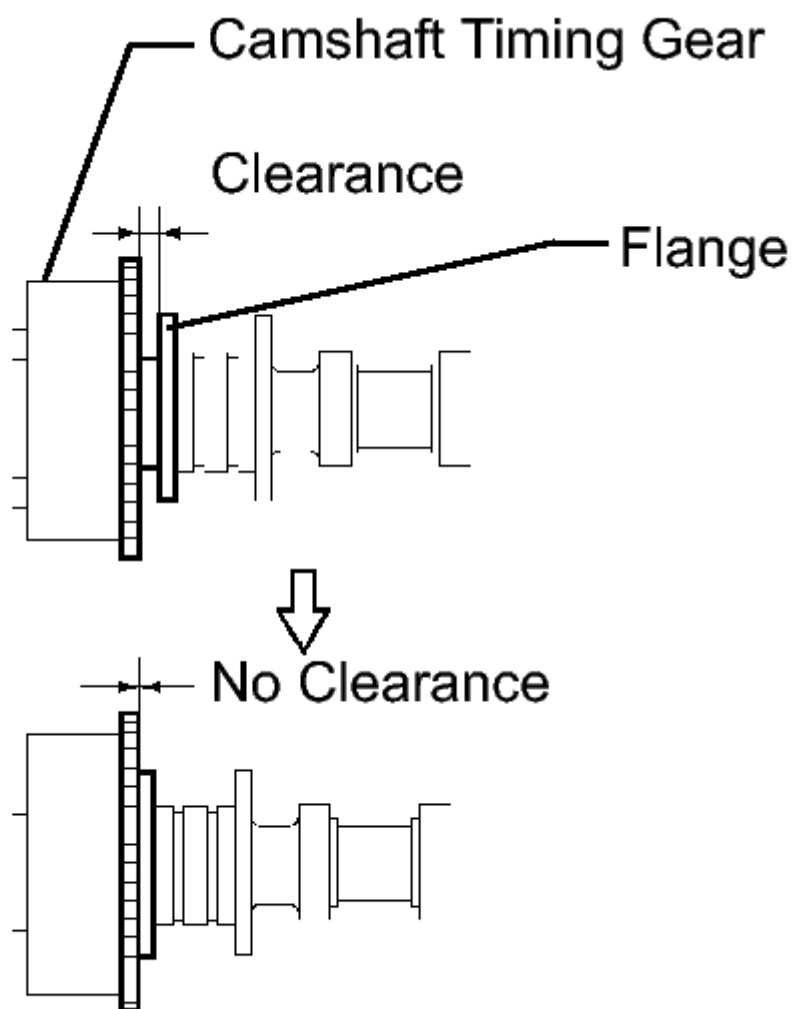


Fig. 42: Checking Clearance Between Camshaft Timing Gear And Camshaft Flange
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

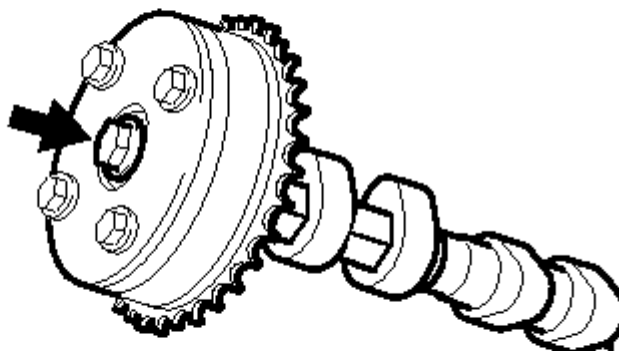


Fig. 43: Tightening Flange Bolt

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

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

NOTE: When tightening the bolts, do not allow the camshaft timing gear assembly to rotate.

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

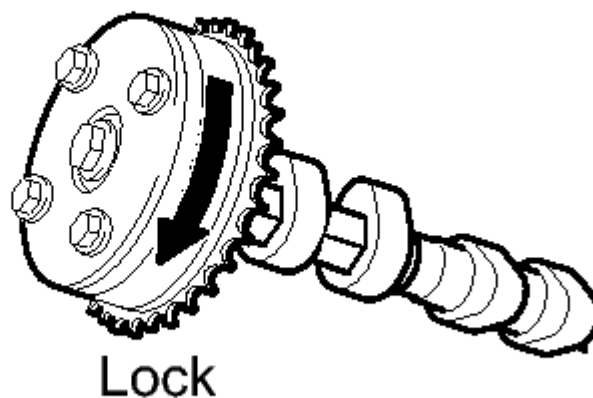
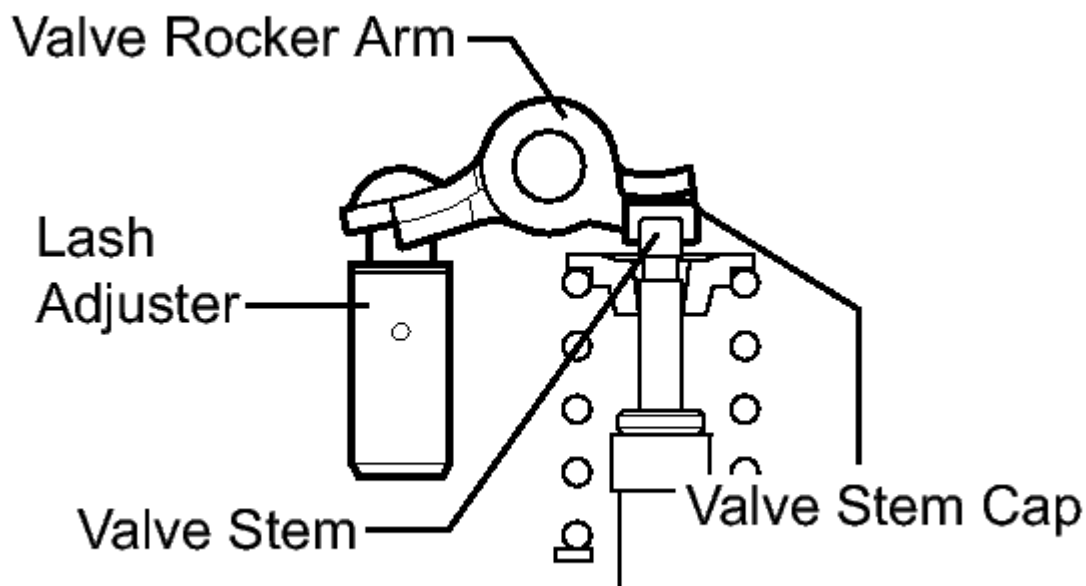


Fig. 44: Checking Camshaft Timing Gear Can Move To Retard Angle Side
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSTALL CAMSHAFT

- a. Make sure that the valve rocker arm is installed as shown in the illustration.



P

Fig. 45: Applying Engine Oil To Lash Adjuster Tips And Valve Stem Cap Ends
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Clean the camshaft journals.
- c. Apply a light coat of engine oil to the camshaft journals, camshaft housings and bearing caps.
- d. Hold up the chain and align the matchmark and the paint mark and install the camshaft.

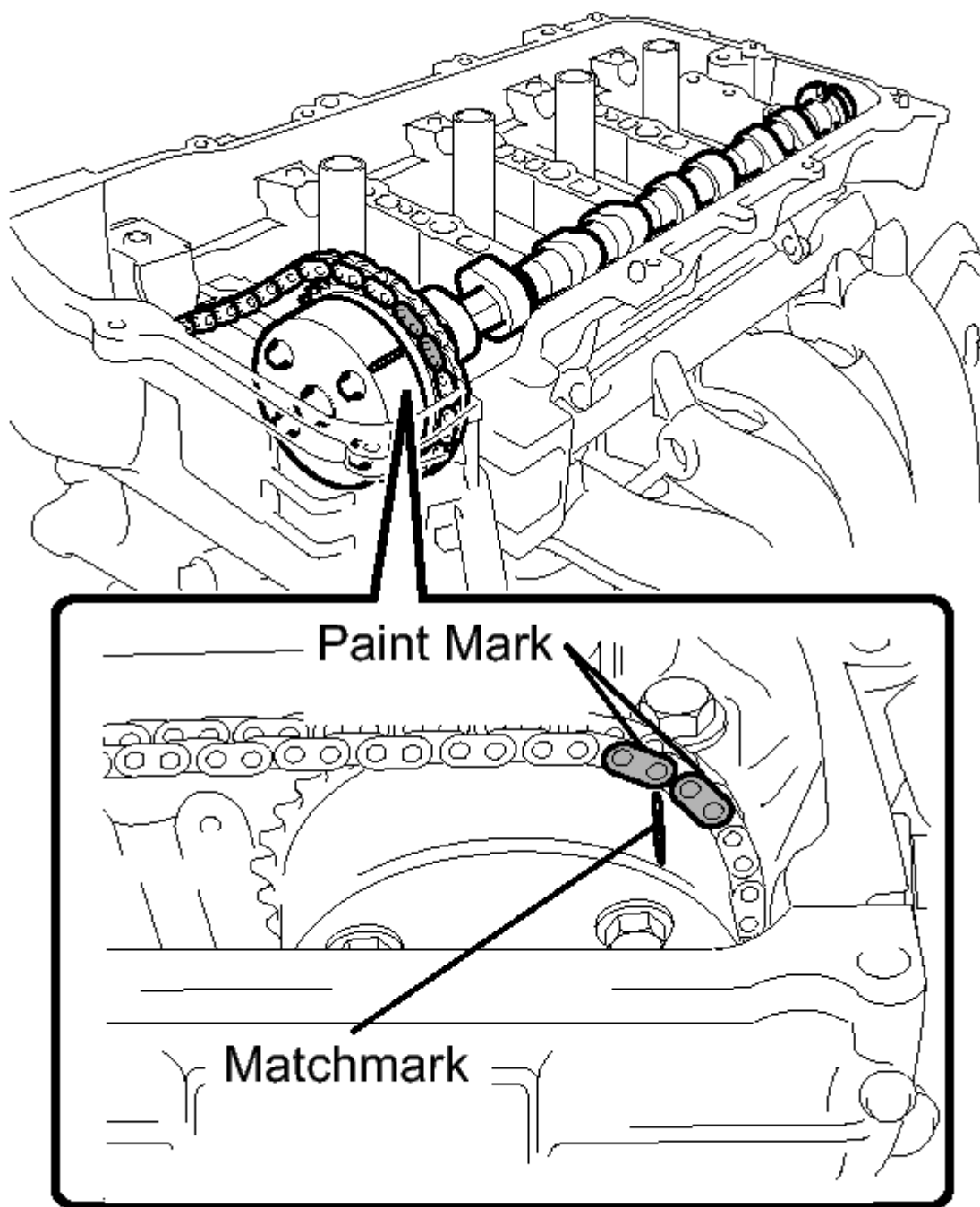
**C**

Fig. 46: Aligning Camshaft Matchmark And Paint Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSTALL NO. 2 CAMSHAFT

- Make sure that the valve rocker arm is installed as shown in the illustration.

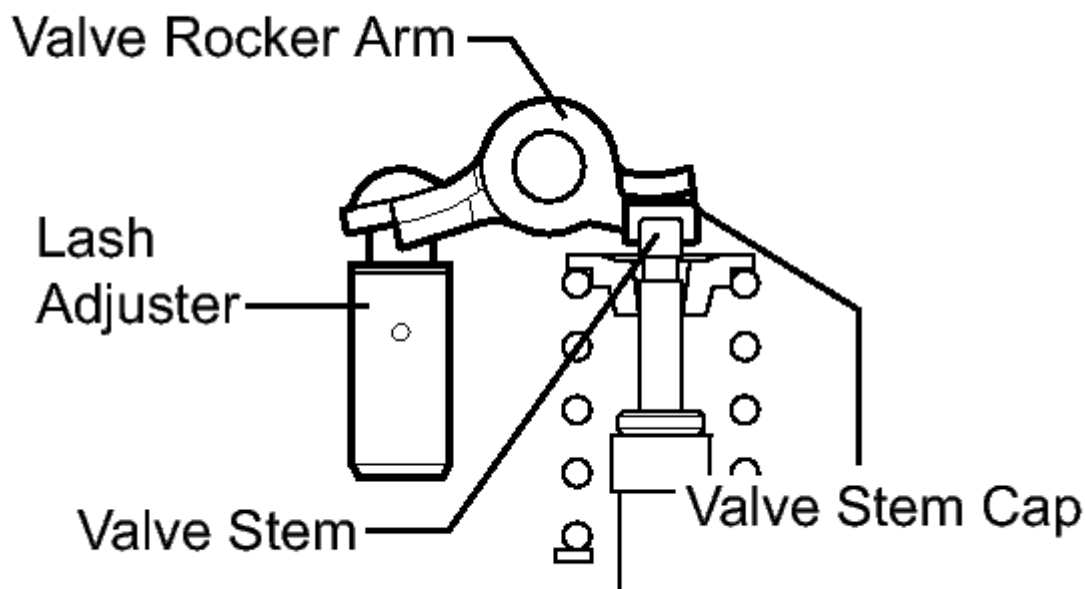
**P**

Fig. 47: Applying Engine Oil To Lash Adjuster Tips And Valve Stem Cap Ends
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

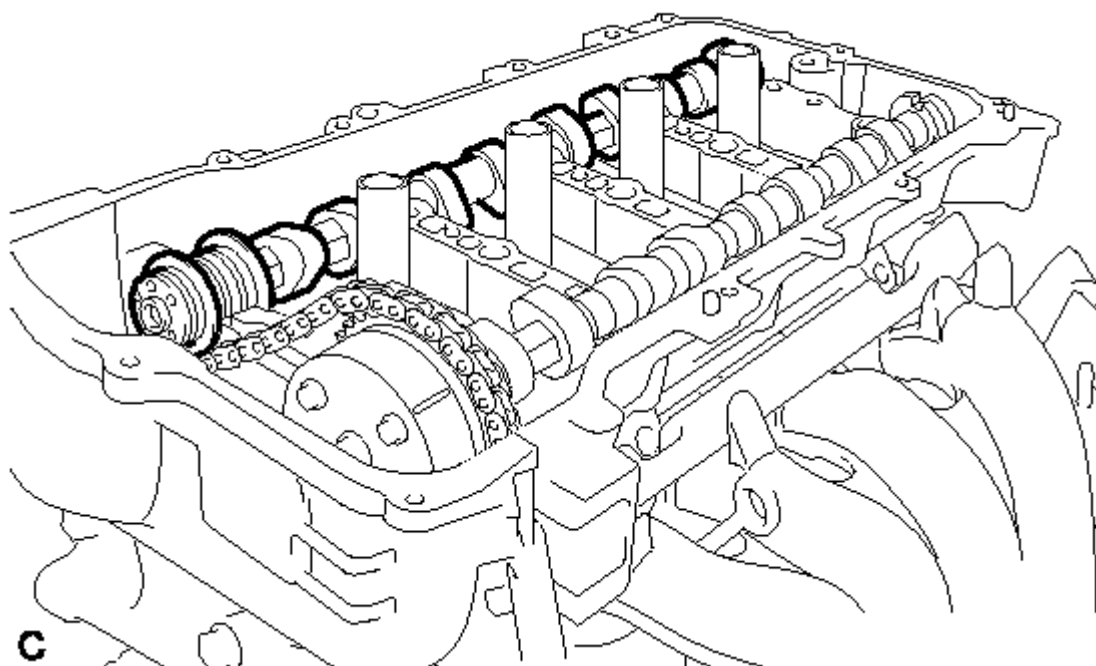


Fig. 48: View Of No. 2 Camshaft From Camshaft Housing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSTALL CAMSHAFT BEARING CAP

- a. Check the marks and numbers on the camshaft bearing caps, and then remove the service bolts and spacers in the order shown in the illustration. Immediately after removing the service bolts and spacers in the location for bearing caps, install the bearing caps with the bolts in the order shown in the illustration.

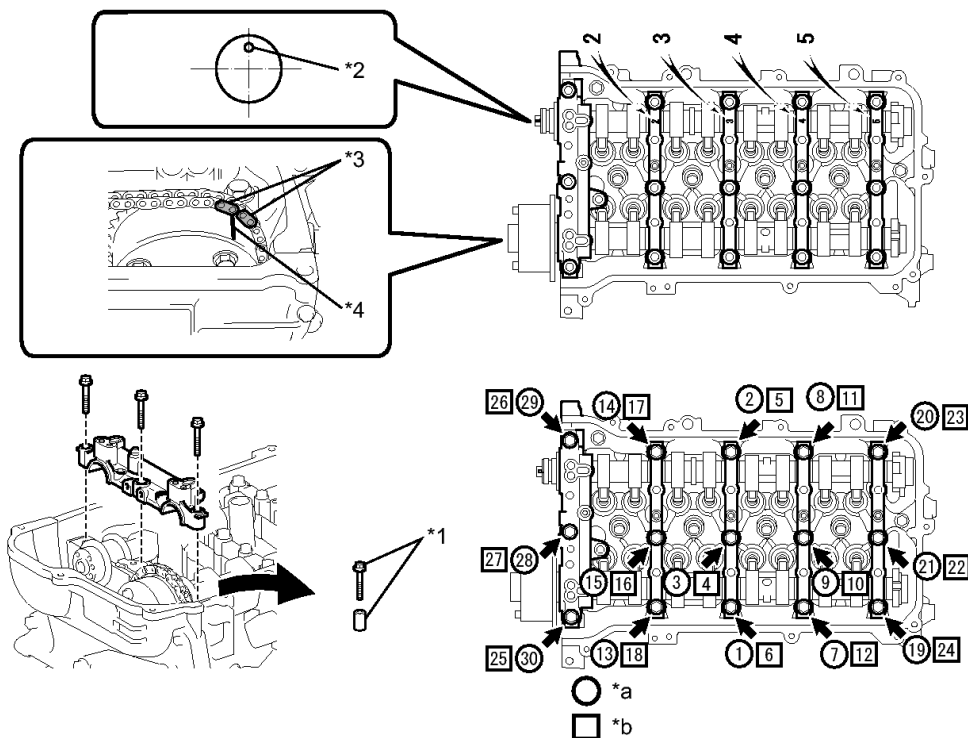


Fig. 49: Removing/Installing Bearing Caps And Bolts In Sequence
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Service Bolt and Spacer (used to temporarily secure the camshaft housing)	*2	Knock Pin
*3	Paint Mark	*4	Matchmark
*a	The removal order of the bolts and spacers for temporarily tightening the camshaft housing	*b	The installation order of the parts

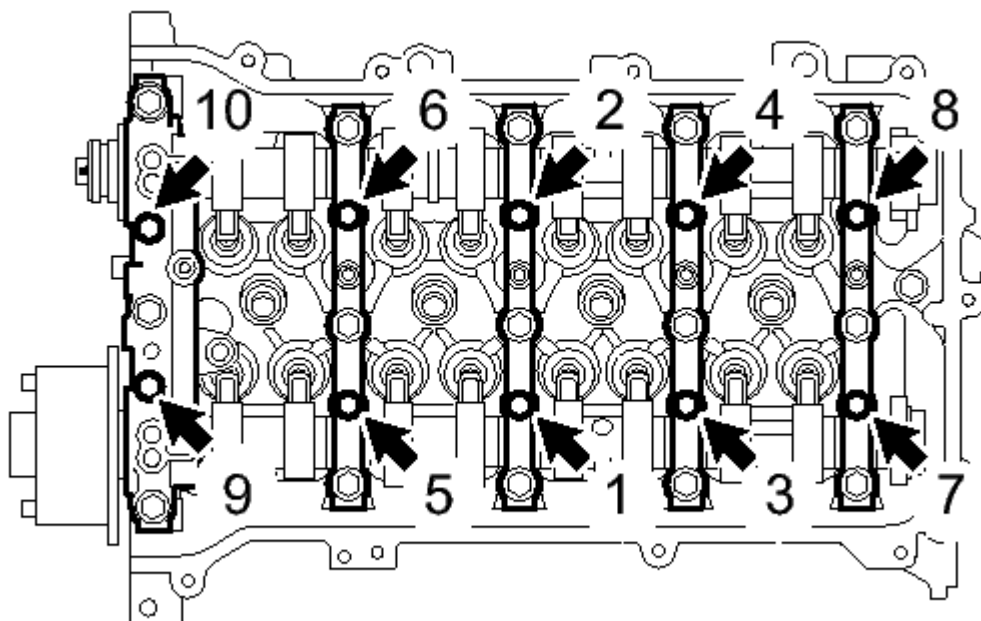
Torque: 27 N*m (275 kgf*cm, 20 ft.*lbf)

NOTE: If the bolts are loosened all at once, FIPG on the camshaft housing and cylinder head may peel off, resulting in oil oozing. Therefore, be sure to remove the service bolt and spacer from one bearing cap at a time.

HINT:

Make sure that the orientation of the knock pin and matchmark on the camshaft is as shown in the illustration.

- b. Tighten the 10 bolts in the order shown in the illustration.



T

Fig. 50: Tightening Bolt Sequence

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

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

- c. Check the torque of each bolt again.

7. INSTALL CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY

- a. Hold the hexagonal portion of the intake camshaft with a wrench and turn it slightly counterclockwise to release the chain.

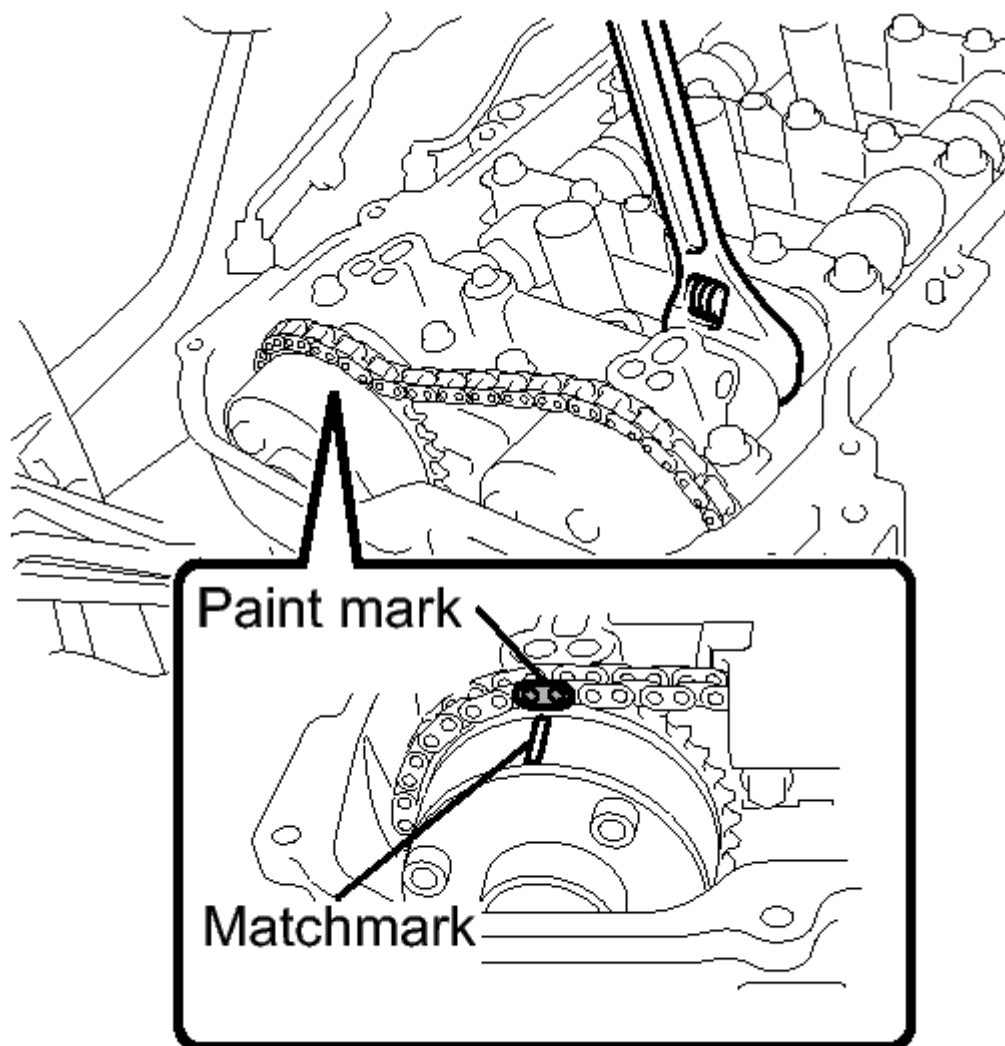
**C**

Fig. 51: Installing/Removing Camshaft Timing Exhaust Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the bolt to the camshaft timing exhaust gear assembly.
- c. Align the paint mark with the matchmark to install the chain.

NOTE:

- Do not turn the intake camshaft more than necessary.
 - Do not install the camshaft timing exhaust gear to the camshaft at this time. Make sure to only install the chain to the camshaft timing exhaust gear.
- d. Put the camshaft timing exhaust gear and camshaft together by aligning the key groove and knock pin.

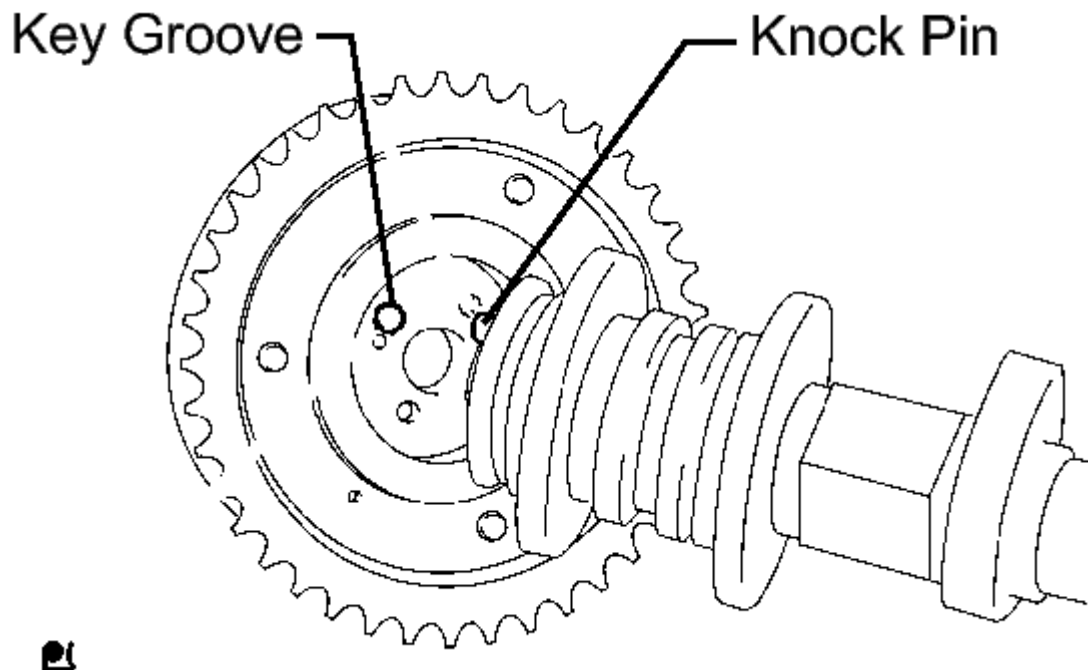


Fig. 52: Identifying Key Groove & Knock Pin

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

NOTE:

- If the straight pin cannot be aligned with the pin hole, hold the hexagonal portion of the No. 2 camshaft with a wrench and turn it slightly to install the gear.
 - Do not turn the No. 2 camshaft more than necessary.
 - Do not forcefully push in the camshaft timing exhaust gear assembly. This may cause the camshaft knock pin tip to damage the installation surface of the camshaft timing exhaust gear assembly.
- e. Using SST and a wrench, hold the hexagonal portion of the No. 2 camshaft and install the camshaft timing exhaust gear assembly to the No. 2 camshaft.

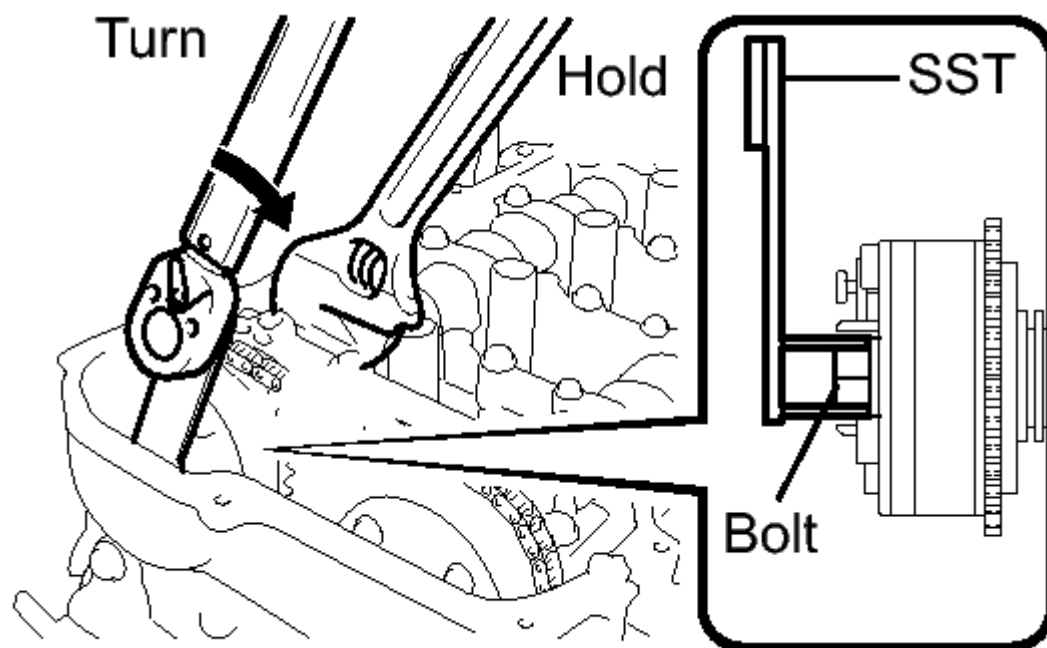


Fig. 53: Holding Hexagonal Portion Of No. 2 Camshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09249-37010

without SST

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

with SST

Torque: 39 N*m (397 kgf*cm, 29 ft.*lbf)

NOTE:

- The "with SST" torque value can be obtained by using a torque wrench with a fulcrum length of 260 mm (10.24 in.) and SST of 100 mm (3.94 in.). Refer to **PRECAUTION** .
- This torque value is effective when SST is parallel to the torque wrench.

8. INSTALL NO. 2 CHAIN VIBRATION DAMPER

- a. Using SST, install the No. 2 chain vibration damper with the 2 bolts.

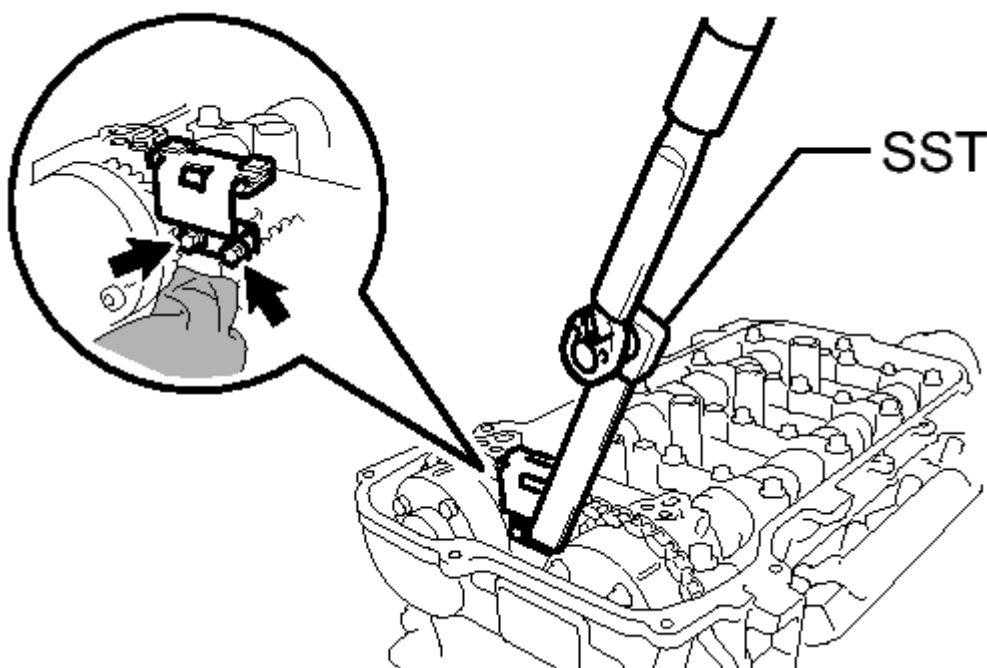


Fig. 54: Installing No. 2 Chain Vibration Damper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09961-00950

without SST

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

with SST

Torque: 5.5 N*m (56 kgf*cm, 48 in.*lbf)

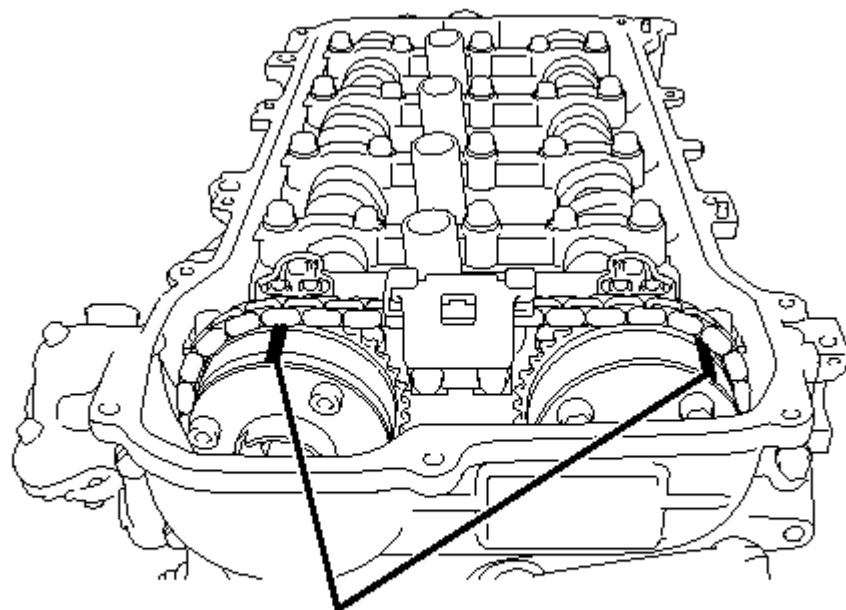
NOTE:

- The "with SST" torque value can be obtained by using a torque wrench with a fulcrum length of 180 mm (7.09 in.) and SST of 150 mm (5.91 in.). Refer to **PRECAUTION**.
- This torque value is effective when SST is parallel to the torque wrench.

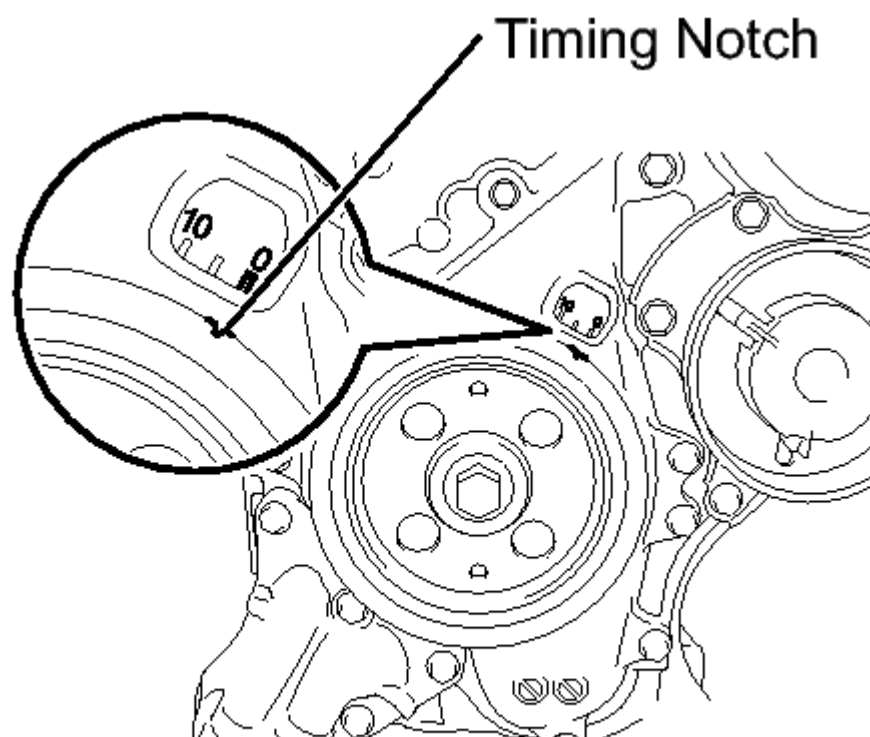
9. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY** See step 39

10. **SET NO. 1 CYLINDER TO TDC / COMPRESSION**

- a. Turn the crankshaft pulley until its timing notch (groove) and the timing mark "0" of the timing chain cover are aligned.



Matchmark



T

Fig. 55: Aligning Crankshaft Pulley & Timing Chain Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

11. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY** See step 41
12. **INSTALL AIR TUBE**

- a. Install the air tube assembly with the 2 bolts.

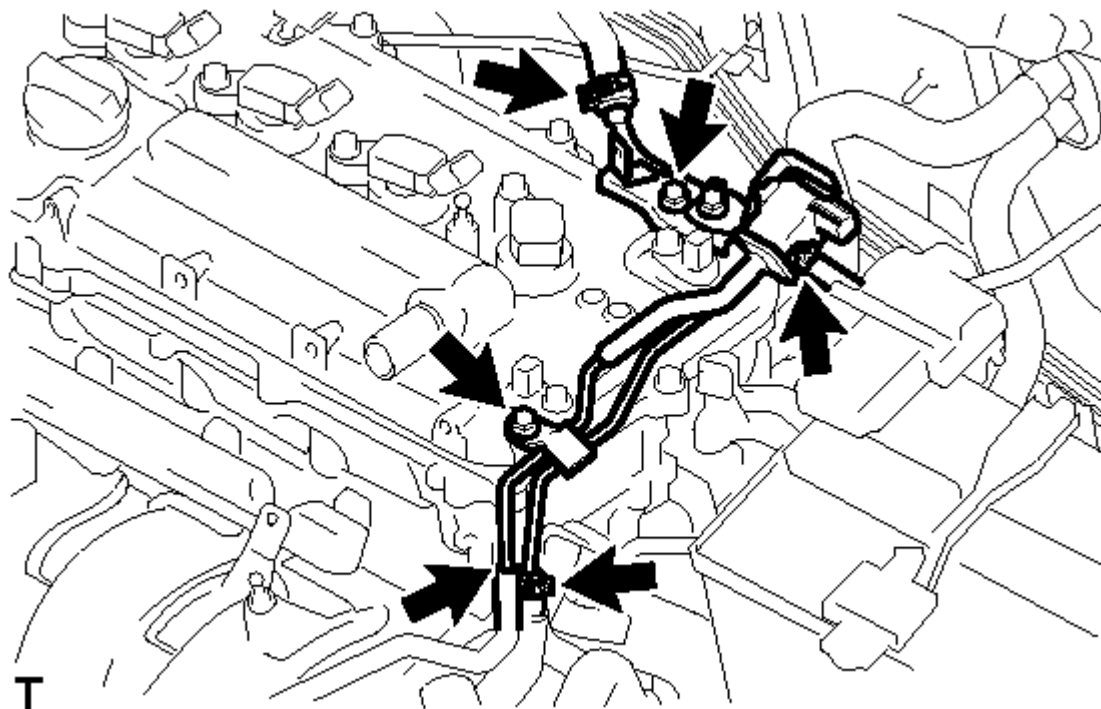


Fig. 56: Identifying Air Tube Assembly Bolts & Hoses
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- b. Connect the 4 hoses.
13. **CONNECT ENGINE WIRE**
 - a. Connect the 5 connectors and install the wire harness with the 2 bolts and 5 clamps.

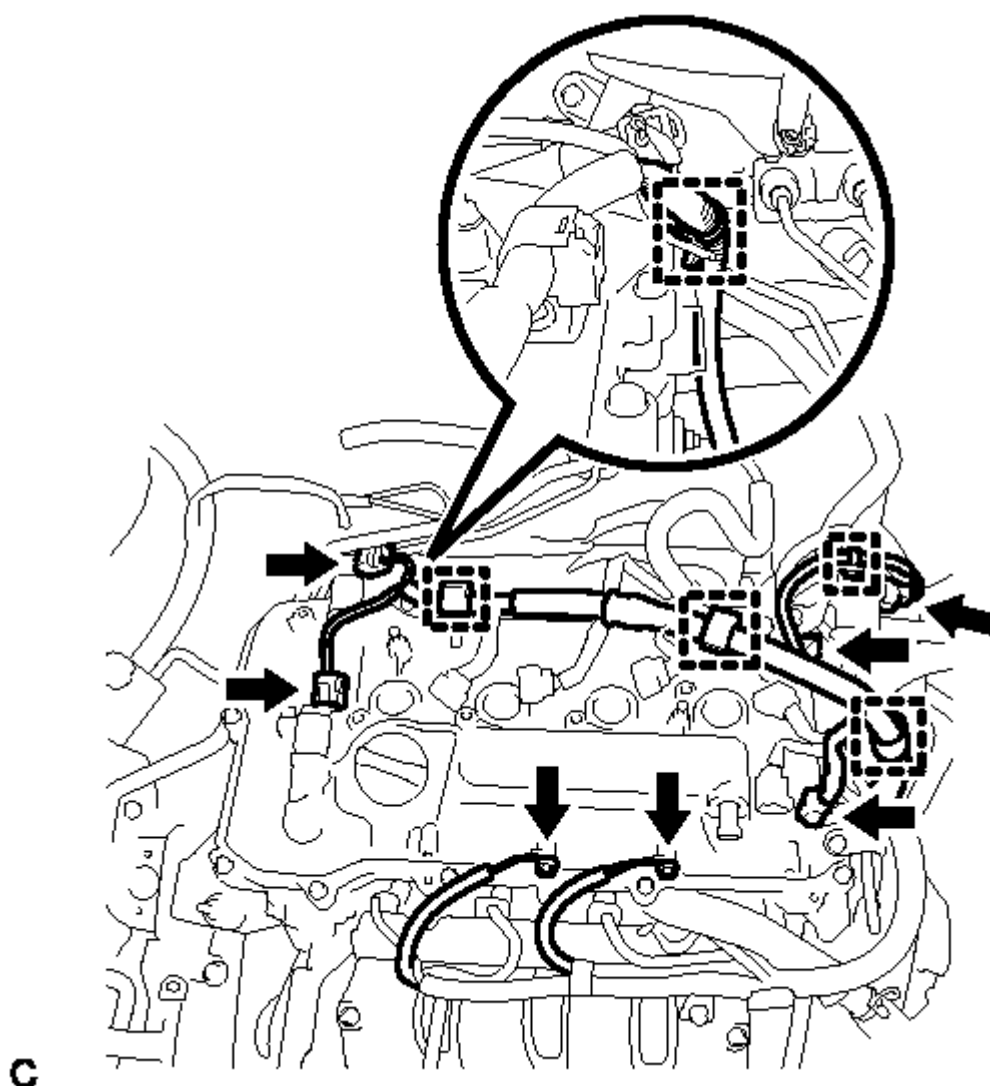


Fig. 57: Identifying Engine Wire Bolts, Connectors & Clamps
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

14. CONNECT NO. 2 VENTILATION HOSE

- a. Connect the No. 2 ventilation hose.

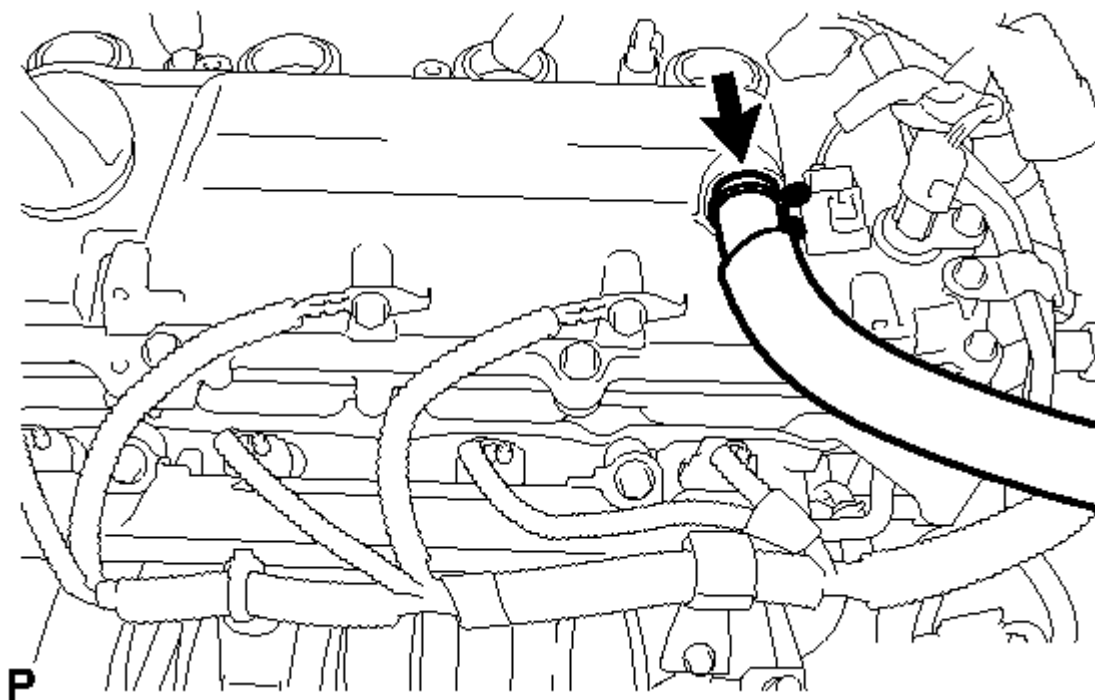


Fig. 58: Locating No. 2 Ventilation Hose

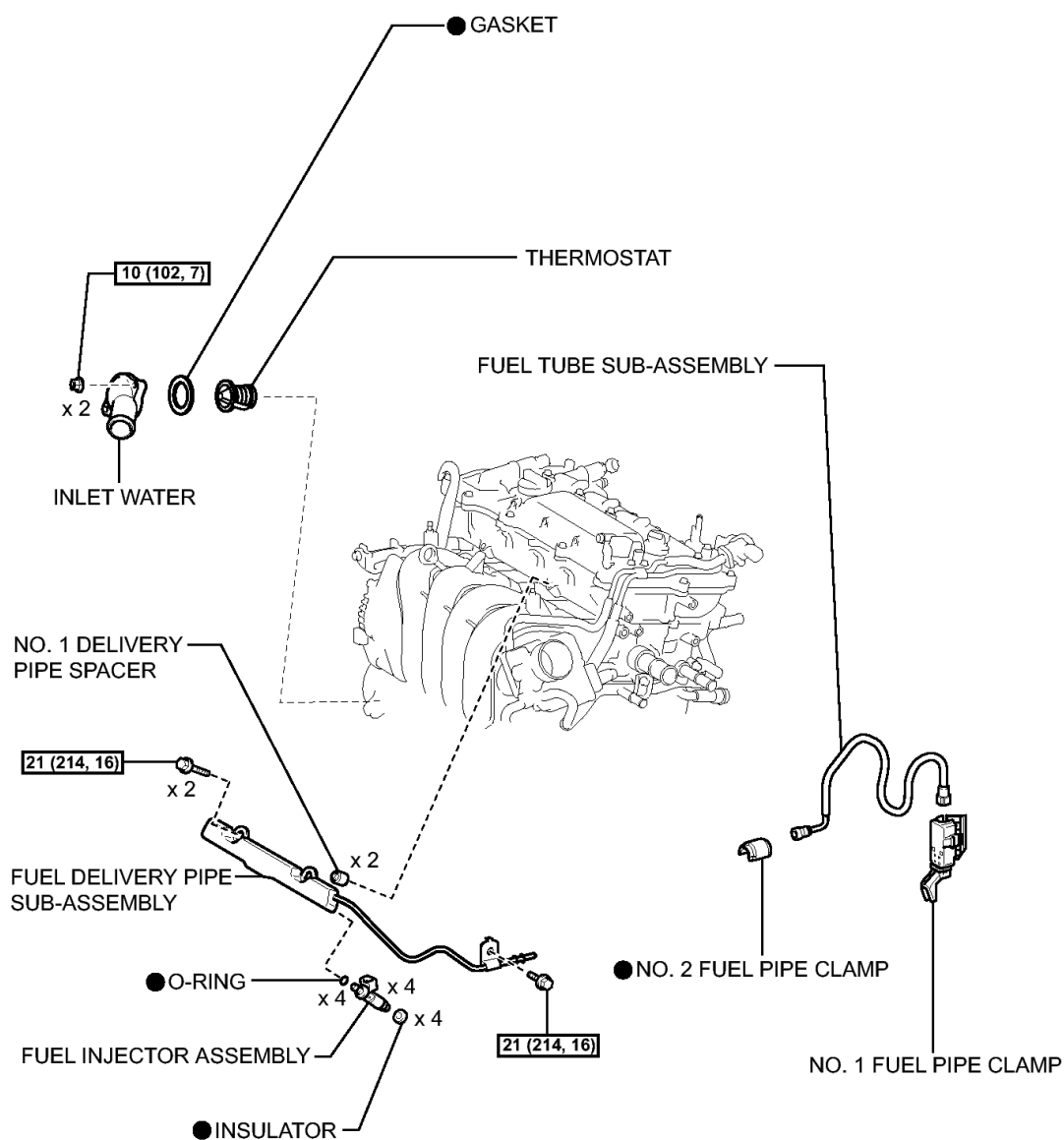
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. **INSTALL RADIO SETTING CONDENSER** See step 1
16. **INSTALL IGNITION COIL ASSEMBLY** . Refer to **INSTALLATION - Step 2**
17. **INSPECT FOR ENGINE OIL LEAK**
18. **INSTALL NO. 2 CYLINDER HEAD COVER** See step 85
19. **INSTALL OUTER COWL TOP PANEL (for TMC Made)** . Refer to **INSTALLATION - Step 13**
20. **INSTALL OUTER COWL TOP PANEL (except TMC Made)** . Refer to **INSTALLATION - Step 14**
21. **INSTALL WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** . Refer to **INSTALLATION - Step 2**
22. **INSTALL COWL TOP VENTILATOR LOUVER LH** . Refer to **INSTALLATION - Step 3**
23. **INSTALL CENTER NO. 1 COWL TOP VENTILATOR LOUVER** . Refer to **INSTALLATION - Step 4**
24. **INSTALL HOOD TO COWL TOP SEAL** . Refer to **INSTALLATION - Step 5**
25. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY RH** . Refer to **INSTALLATION - Step 6**
26. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY LH** . Refer to **INSTALLATION - Step 7**
27. **INSTALL FRONT WIPER ARM HEAD CAP** . Refer to **INSTALLATION - Step 8**
28. **INSPECT IGNITION TIMING** See step 8
29. **INSPECT ENGINE IDLING SPEED** See step 9

CYLINDER HEAD GASKET

COMPONENTS

ILLUSTRATION



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

● Non-reusable part

c

Fig. 59: Identifying Engine Unit Replacement Components With Torque Specifications (1 Of 7)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

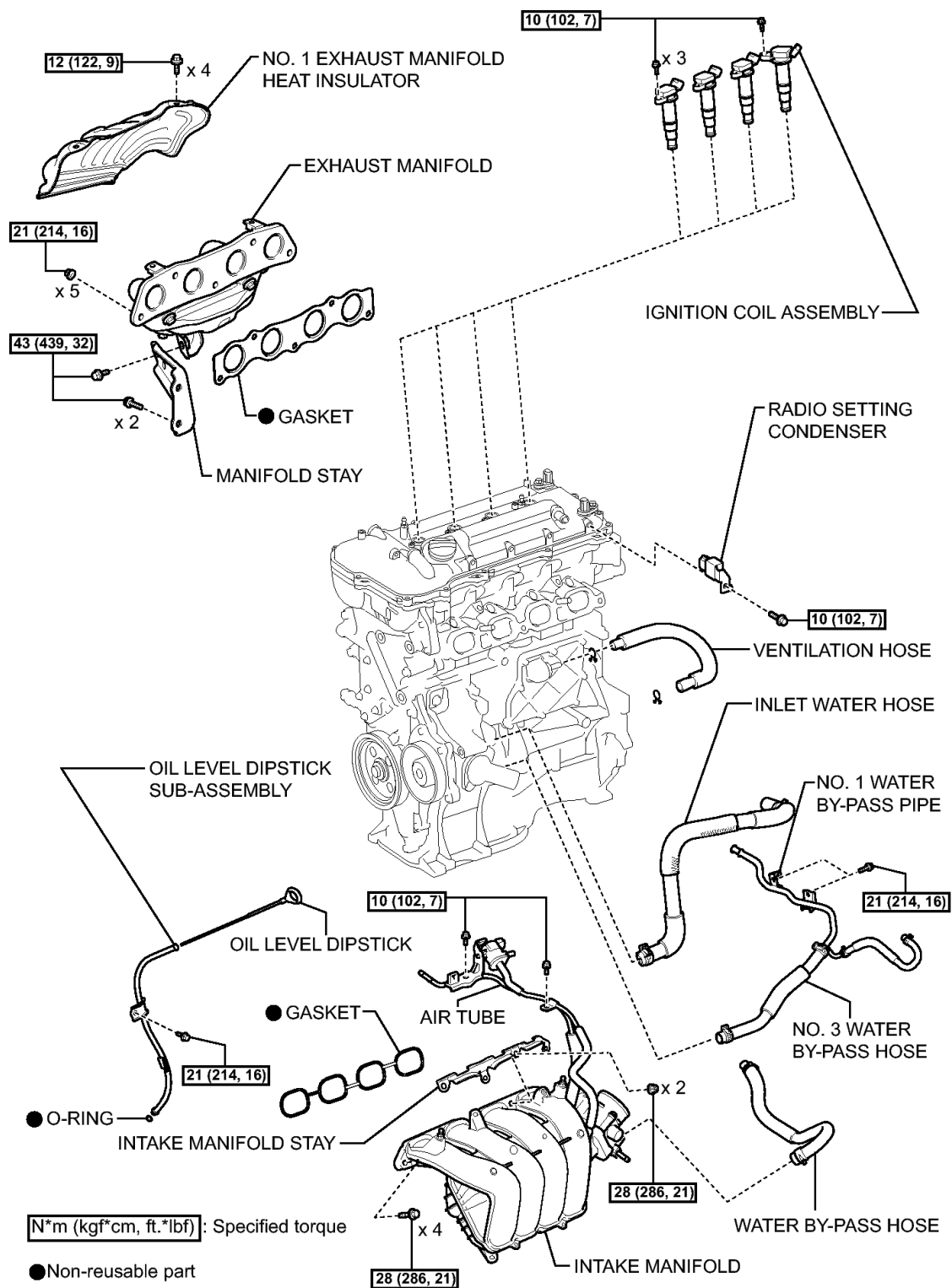
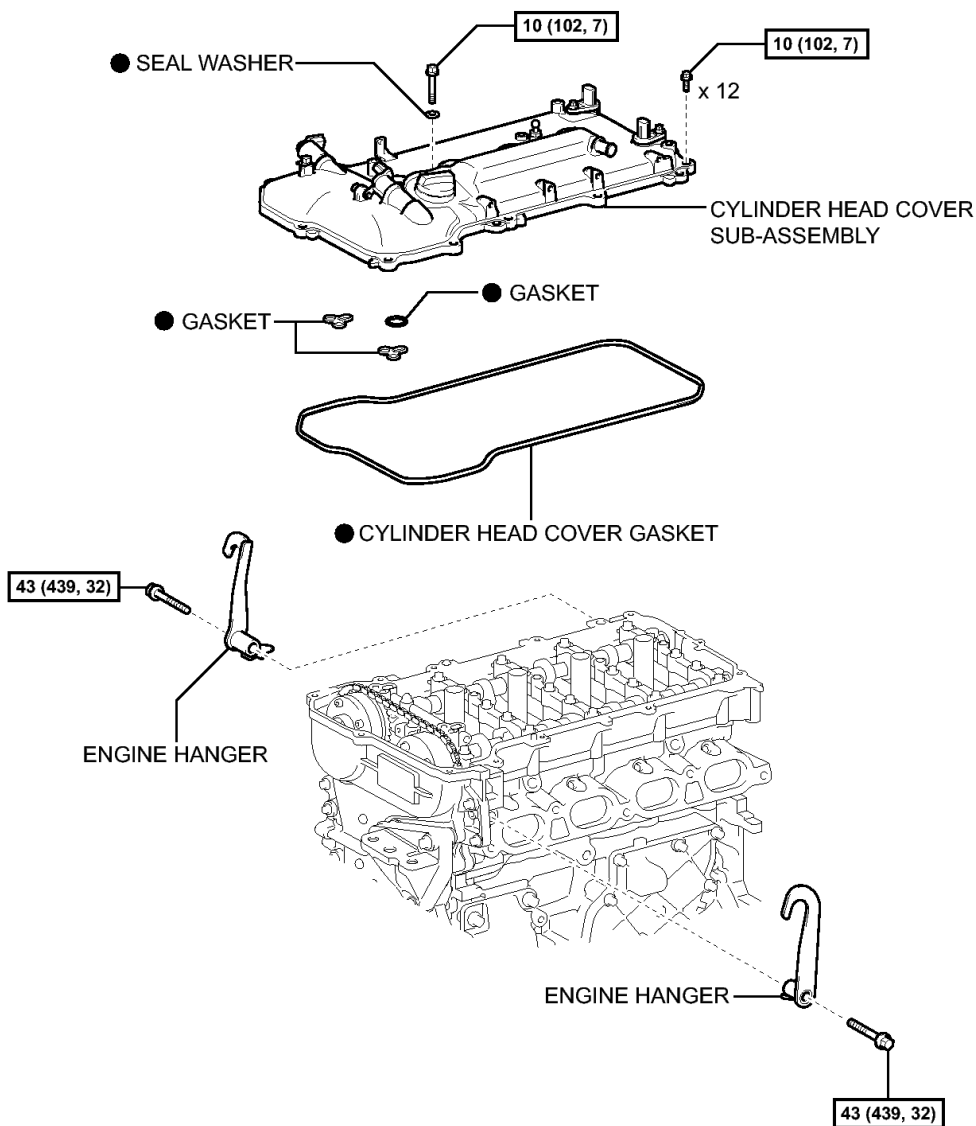


Fig. 60: Identifying Camshaft Replacement Components With Torque Specifications (2 Of 6)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



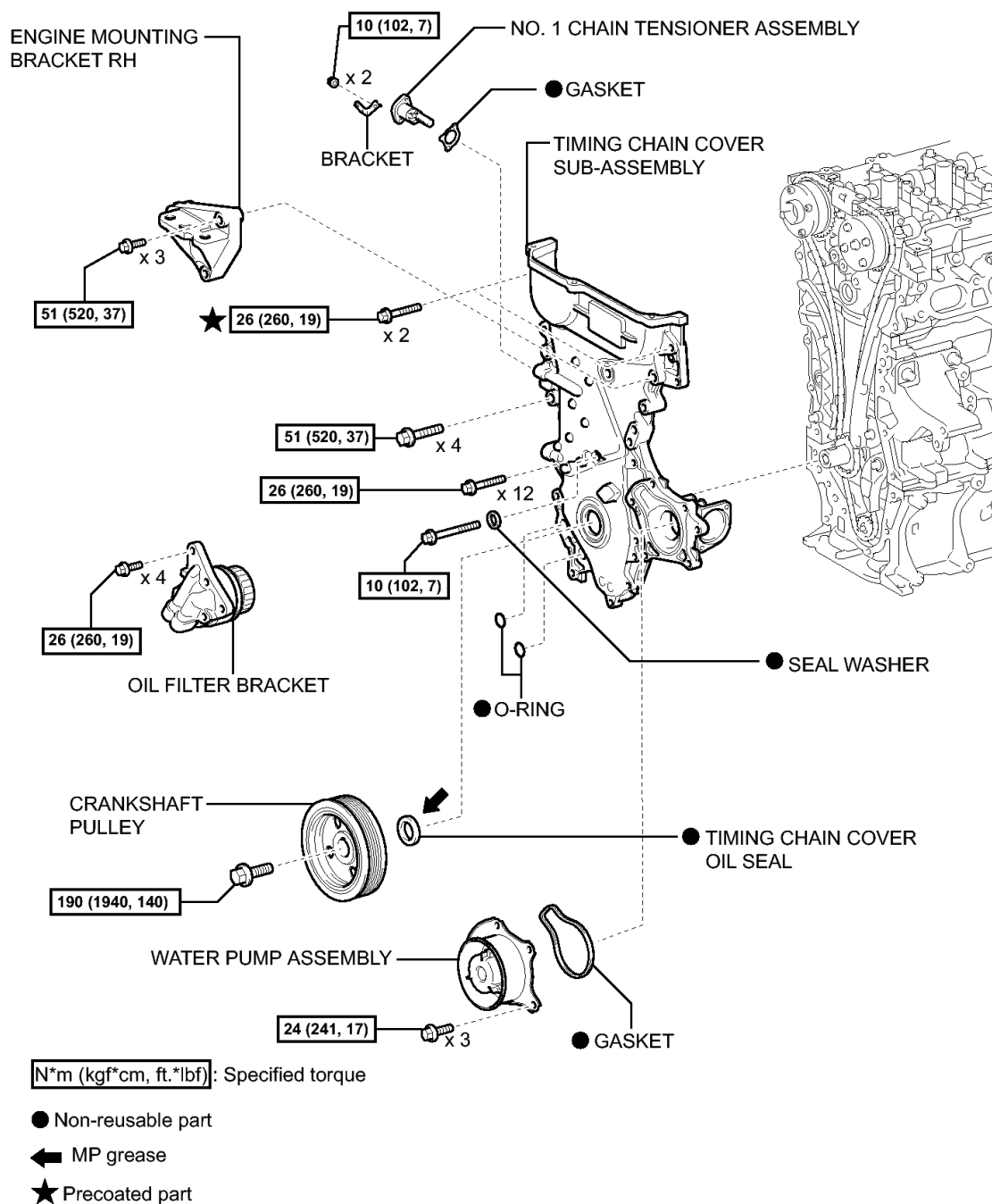
[N*m (kgf*cm, ft.*lbf)]: Specified torque

● Non-reusable part

T

Fig. 61: Identifying Camshaft Replacement Components With Torque Specification (3 Of 6)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

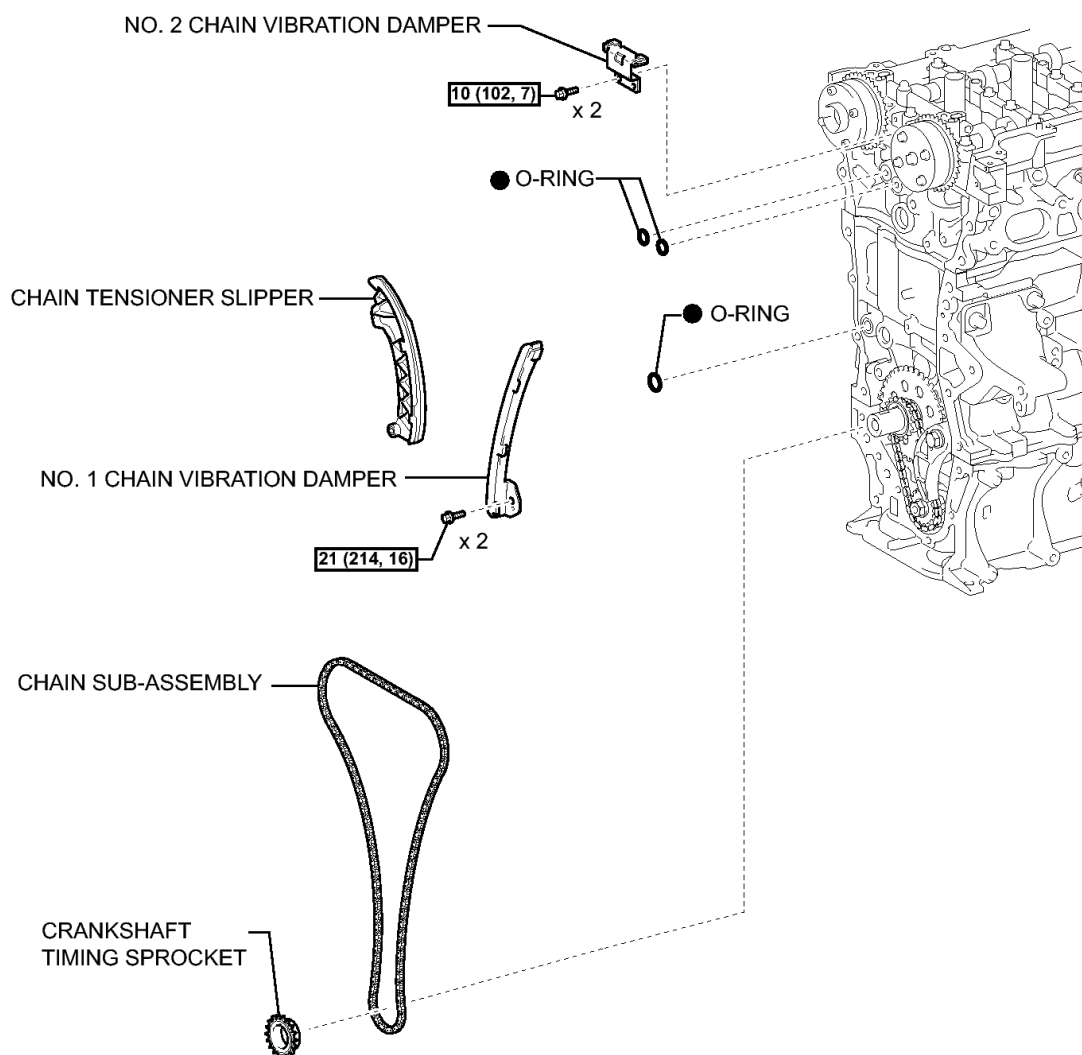
ILLUSTRATION



T

Fig. 62: Identifying Camshaft Replacement Components With Torque Specification (4 Of 6)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



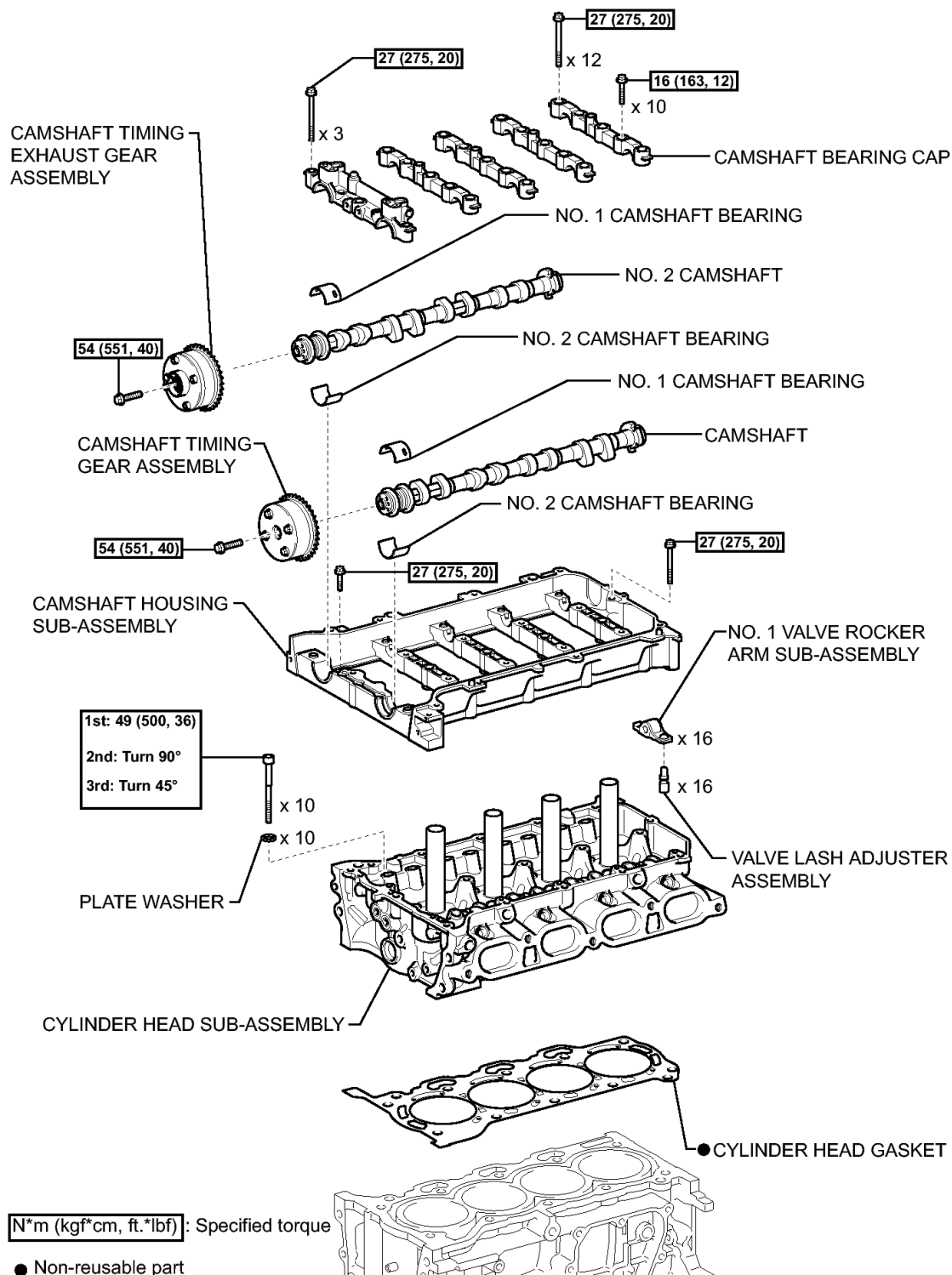
[N*m (kgf*cm, ft.*lbf)]: Specified torque

● Non-reusable part

T

Fig. 63: Identifying Camshaft Replacement Components With Torque Specifications (5 Of 6)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



T

Fig. 64: Identifying Camshaft Replacement Components With Torque Specifications (6 Of 6)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

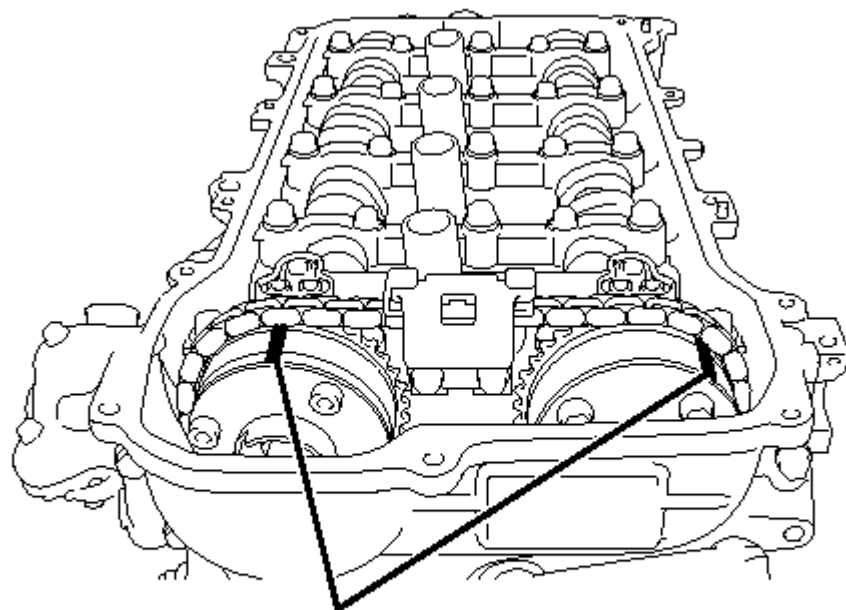
REMOVAL

1. REMOVE ENGINE ASSEMBLY WITH TRANSAXLE

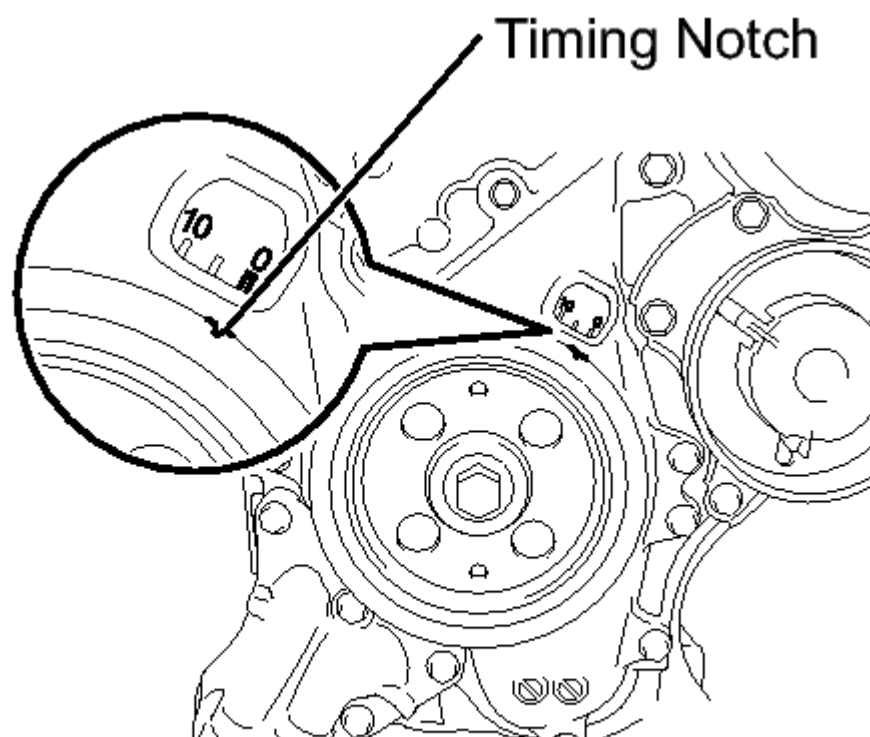
HINT:

Refer to **REMOVAL**.

2. **INSTALL ENGINE STAND** See step 1
3. **REMOVE INTAKE MANIFOLD** . Refer to **REMOVAL - Step 5**
4. **DISCONNECT FUEL TUBE SUB-ASSEMBLY** . Refer to **REMOVAL - Step 6**
5. **REMOVE FUEL DELIVERY PIPE SUB-ASSEMBLY** . Refer to **REMOVAL - Step 7**
6. **REMOVE FUEL INJECTOR ASSEMBLY** . Refer to **REMOVAL - Step 8**
7. **REMOVE IGNITION COIL ASSEMBLY** . Refer to **REMOVAL - Step 2**
8. **REMOVE OIL LEVEL DIPSTICK SUB-ASSEMBLY** See step 8
9. **REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR** See step 9
10. **REMOVE MANIFOLD STAY** See step 10
11. **REMOVE EXHAUST MANIFOLD** See step 11
12. **REMOVE VENTILATION HOSE** See step 12
13. **DISCONNECT NO. 3 WATER BY-PASS HOSE** See step 13
14. **REMOVE NO. 1 WATER BY-PASS PIPE** See step 14
15. **REMOVE WATER BY-PASS HOSE** See step 15
16. **REMOVE INLET WATER HOSE** See step 16
17. **REMOVE INLET WATER** . Refer to **REMOVAL - Step 2**
18. **REMOVE THERMOSTAT** . Refer to **REMOVAL - Step 3**
19. **REMOVE RADIO SETTING CONDENSER** See step 19
20. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY** See step 7
21. **SET NO. 1 CYLINDER TO TDC/COMPRESSION**
 - a. Turn the crankshaft pulley until its groove and the timing mark "0" of the timing chain cover are aligned.



Timing Mark



Timing Notch

T

Fig. 65: Identifying Camshaft Timing Gear And Sprocket With Timing Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

22. **REMOVE CRANKSHAFT PULLEY** See step 5

23. **REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY** See step 10

24. **REMOVE TIMING CHAIN COVER SUB-ASSEMBLY** . Refer to **REMOVAL - Step 24**
25. **REMOVE TIMING CHAIN COVER OIL SEAL** See step 18
26. **REMOVE CHAIN TENSIONER SLIPPER**
 - a. Remove the chain tensioner slipper.

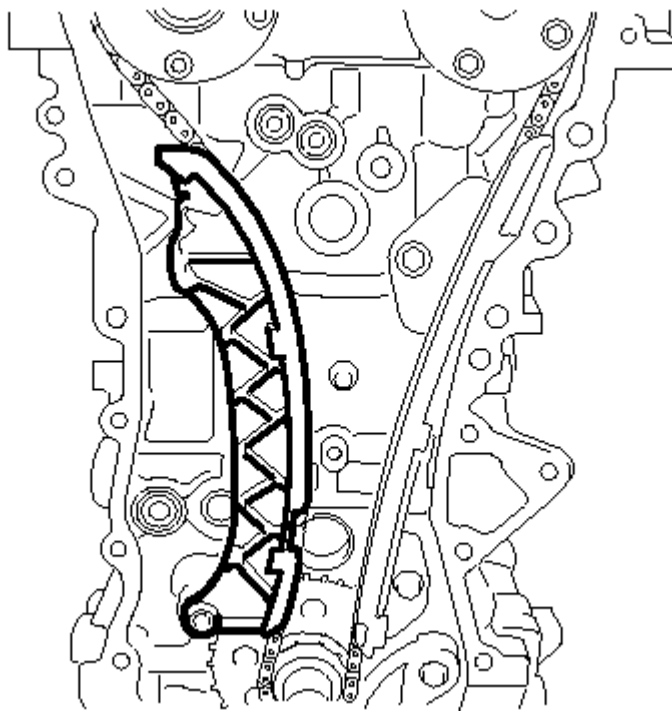
**T**

Fig. 66: Identifying Chain Tensioner Slipper

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

27. **REMOVE NO. 1 CHAIN VIBRATION DAMPER**
 - a. Remove the 2 bolts and No. 1 chain vibration damper.

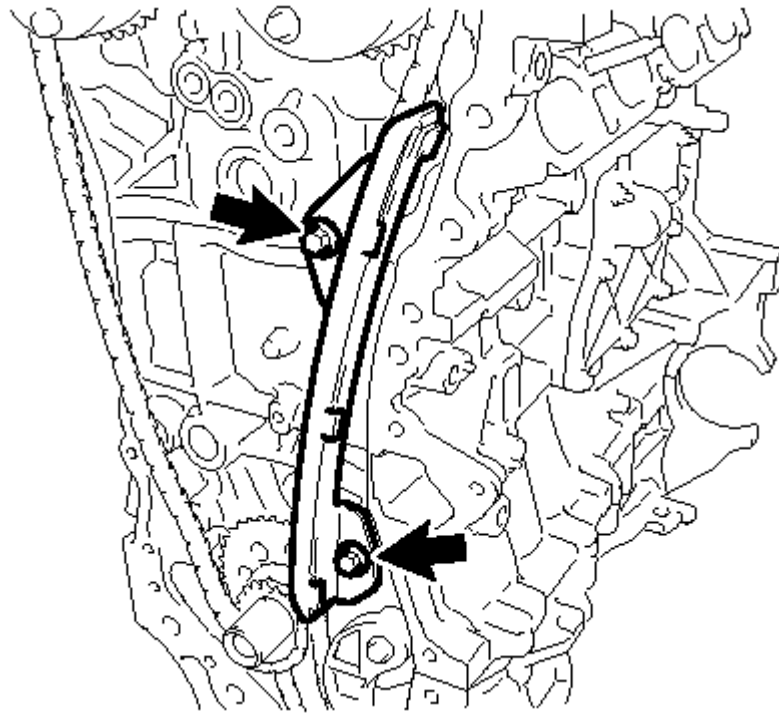
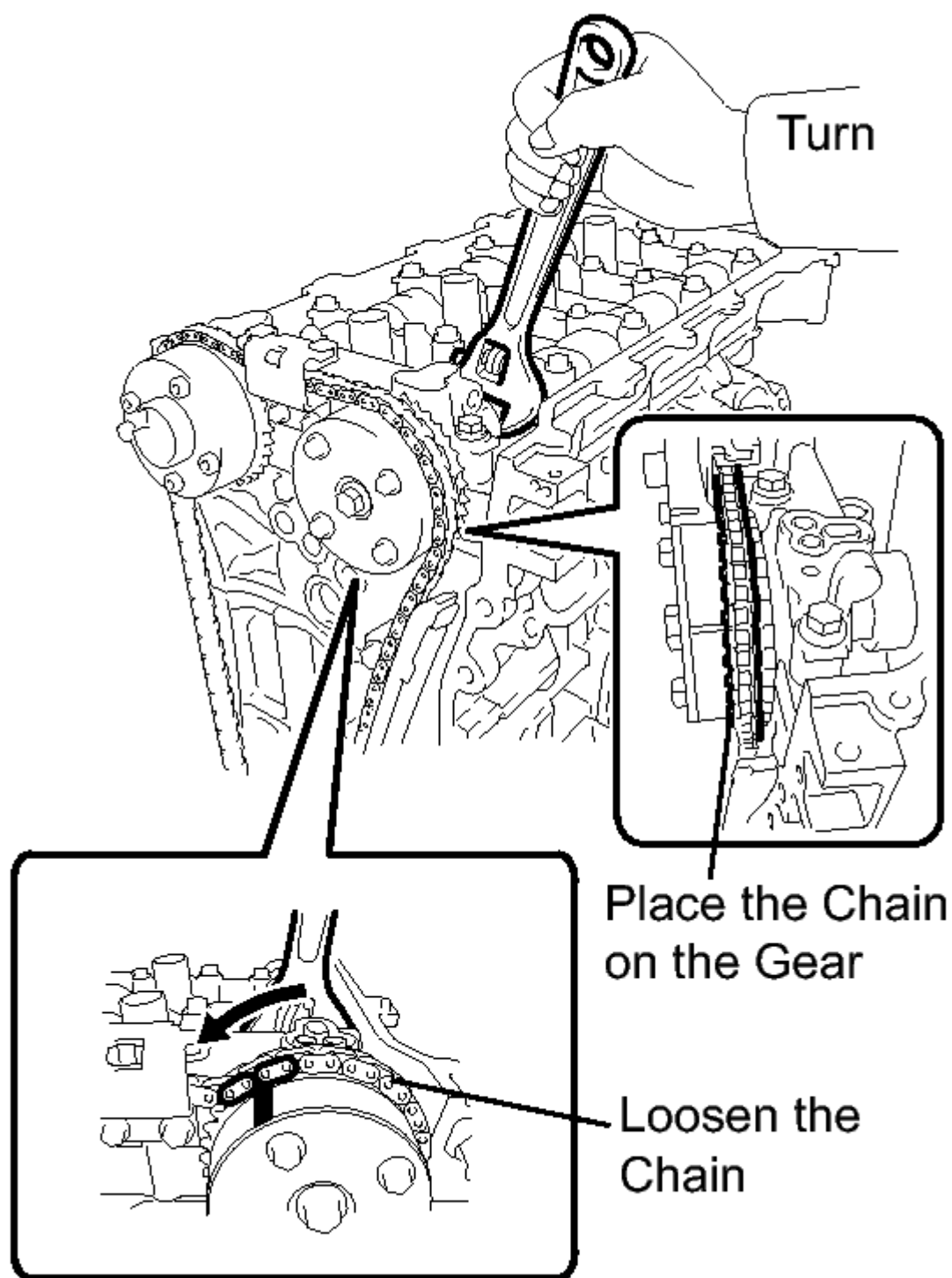
**T**

Fig. 67: Locating Bolts And Chain Vibration Damper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

28. REMOVE CHAIN SUB-ASSEMBLY

- a. Hold the hexagonal portion of the camshaft with a wrench and turn the camshaft timing gear assembly counterclockwise to loosen the chain between the camshaft timing gears.

**T****Fig. 68: Removing Chain Sub-Assembly**

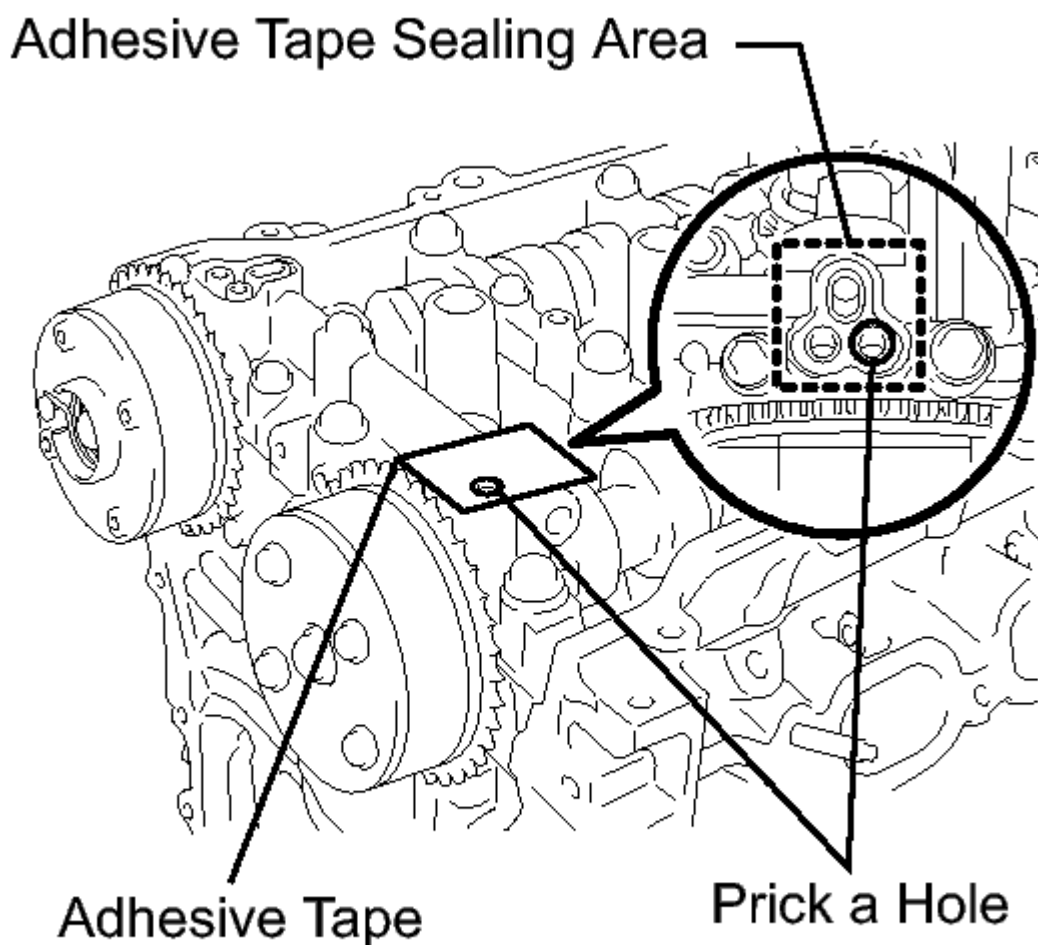
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. With the chain loosened, release the chain from the camshaft timing gear assembly and place it on the camshaft timing gear assembly.

HINT:

Be sure to release the chain from the sprocket completely.

- c. Turn the camshaft clockwise to return it to the original position and remove the chain.
- 29. **REMOVE NO. 2 CHAIN VIBRATION DAMPER** . Refer to **REMOVAL - Step 29**
- 30. **INSPECT CAMSHAFT TIMING GEAR ASSEMBLY**
 - a. Inspect the lock of the camshaft timing gear.
 - b. After cleaning and degreasing the VVT oil hole on the intake side of the No. 1 camshaft bearing cap, completely seal the oil hole with adhesive tape or equivalent as shown in the illustration to prevent air from leaking.

**C****Fig. 69: Identifying Adhesive Tape Sealing Area**

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

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

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

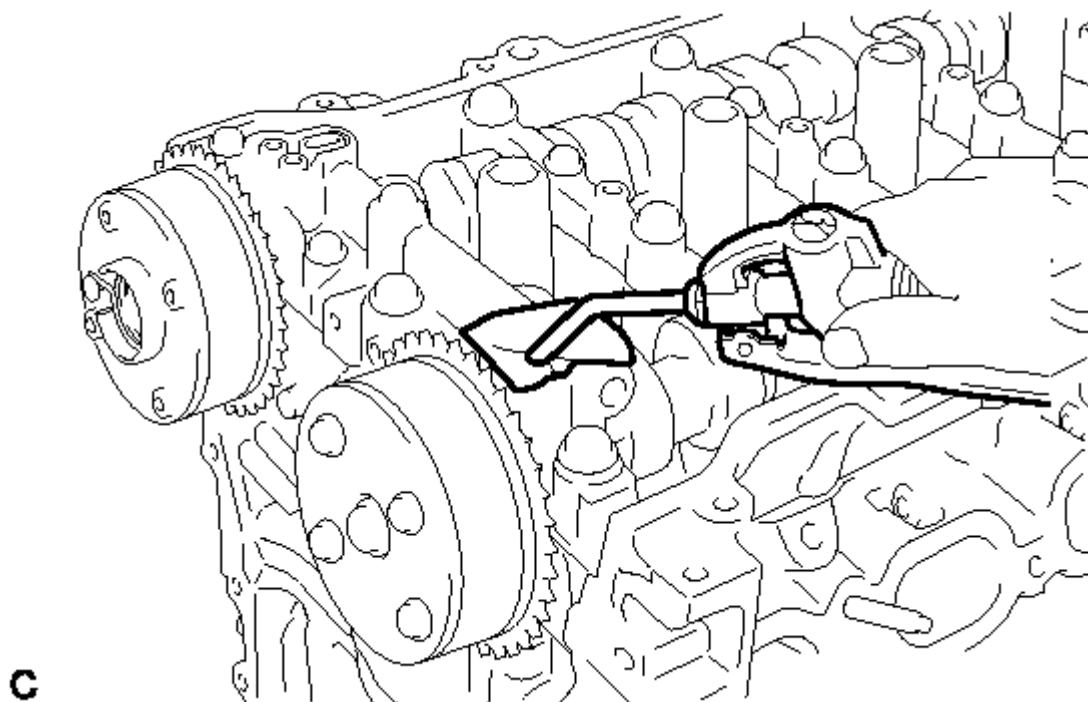


Fig. 70: Applying Air Pressure To Hole

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

NOTE:

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

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

HINT:

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

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

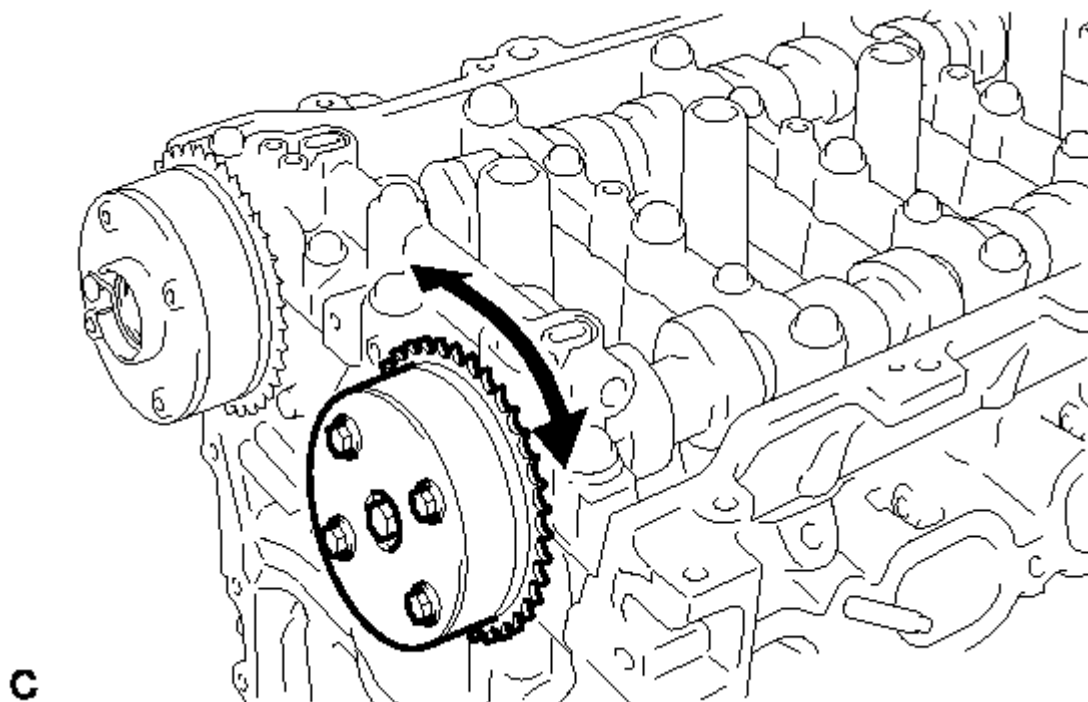


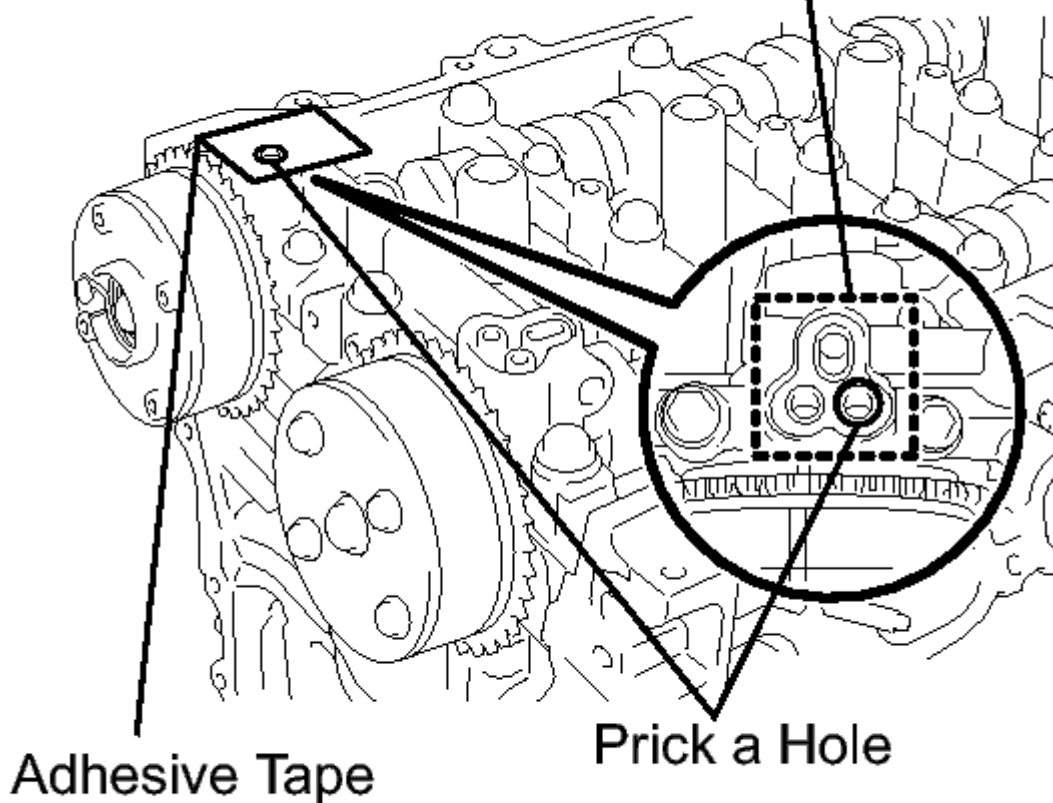
Fig. 71: Inspecting Camshaft Timing Exhaust Gear Assembly
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

31. INSPECT CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY

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

Adhesive Tape Sealing Area



C

Fig. 72: Identifying Adhesive Tape Sealing Area

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

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

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

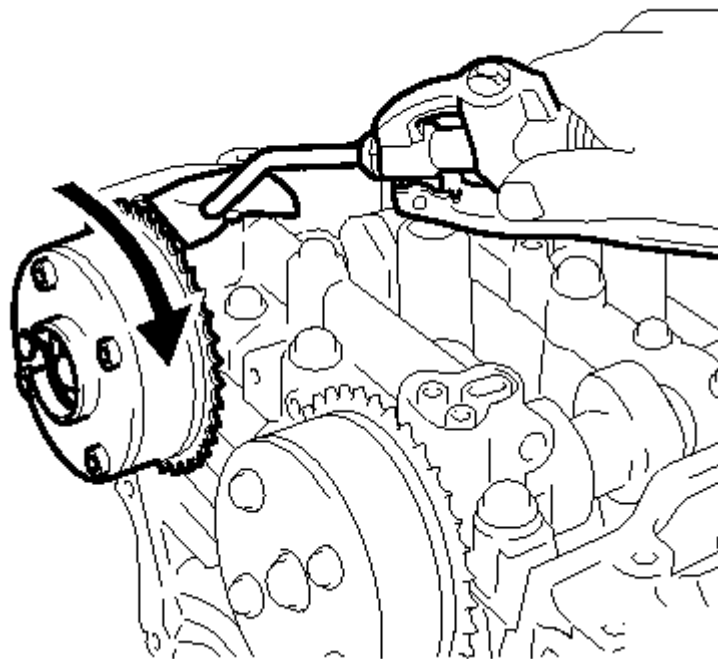
**C**

Fig. 73: Applying Air Pressure To Lock Pin

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

NOTE:

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

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

NOTE:

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

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

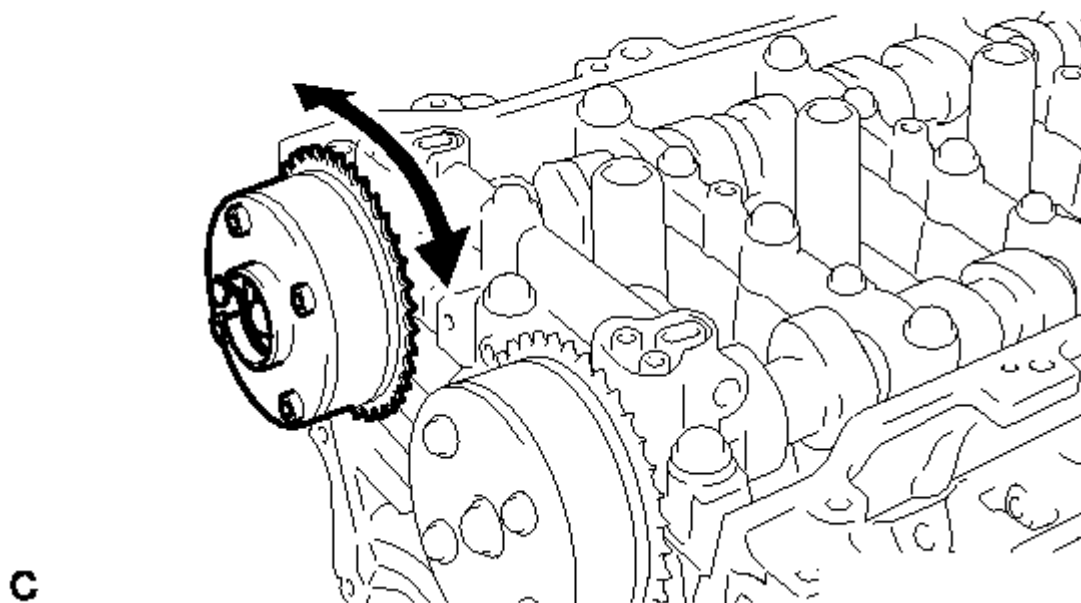


Fig. 74: Turning Camshaft Timing Exhaust Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

32. REMOVE CAMSHAFT TIMING GEAR ASSEMBLY

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

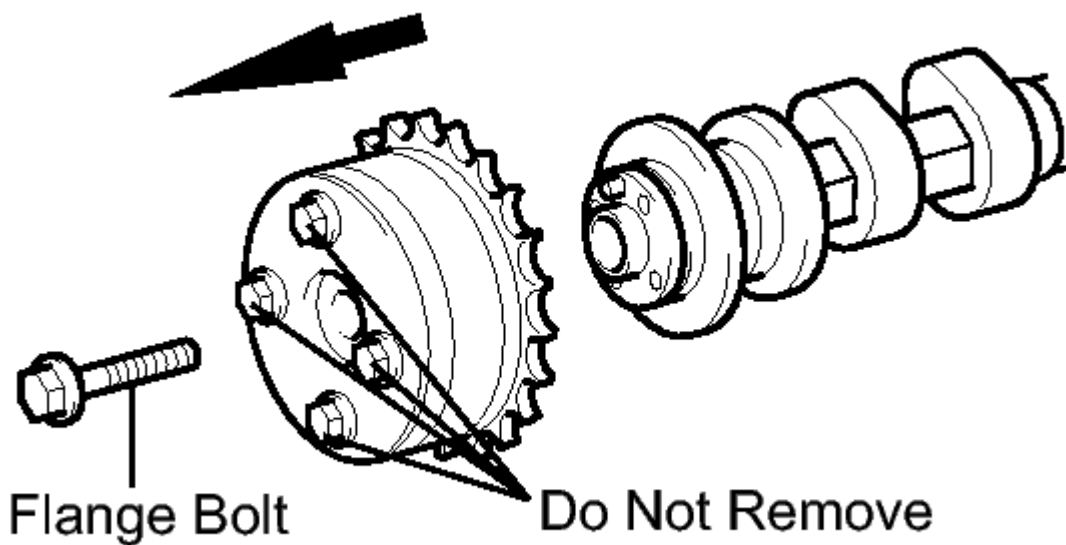


Fig. 75: Identifying Flange Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

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

33. REMOVE CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY

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

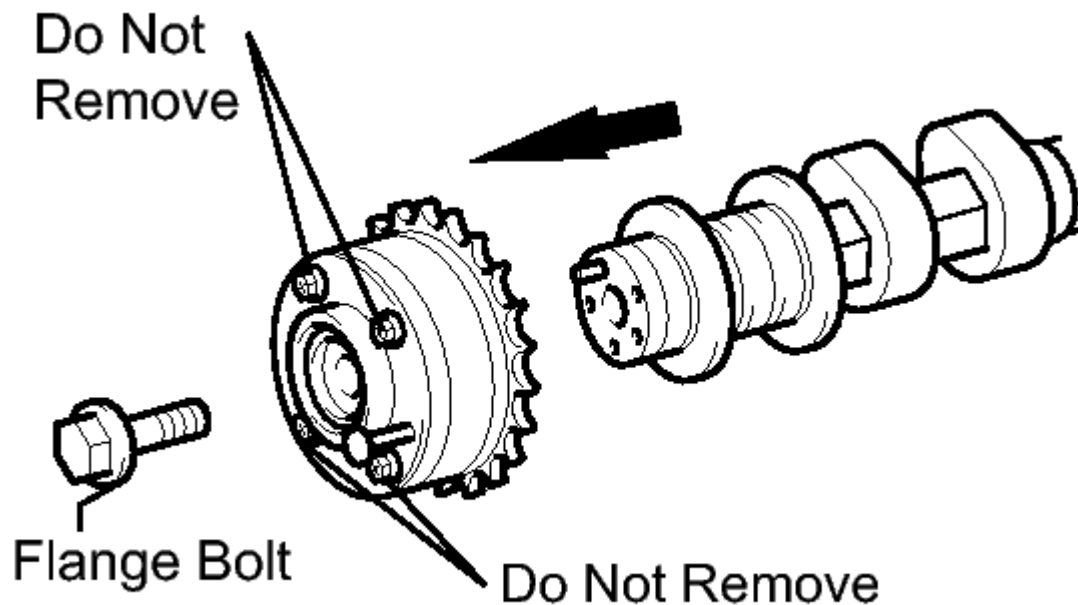
**T**

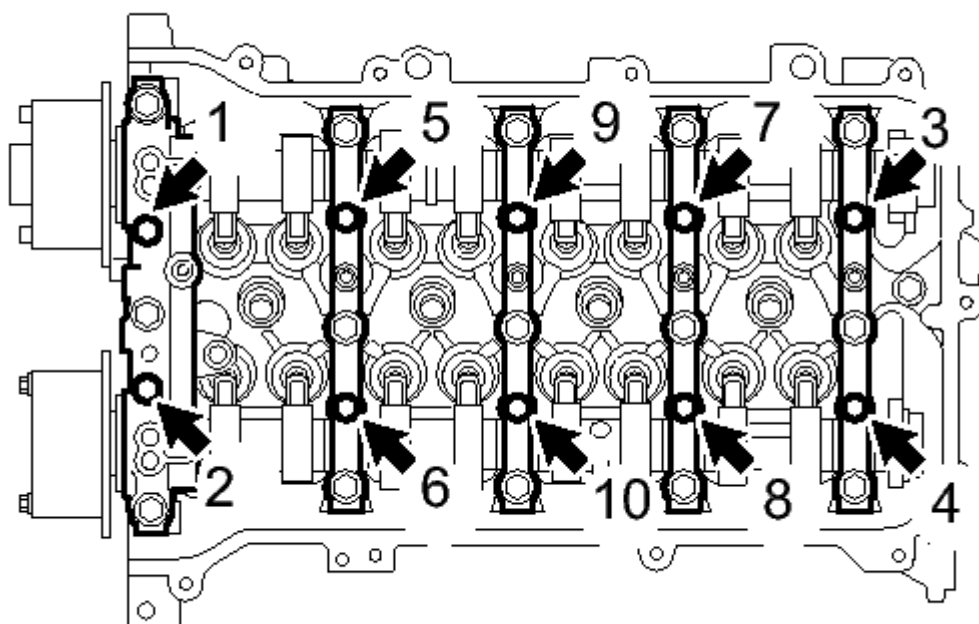
Fig. 76: Identifying Camshaft Timing Exhaust Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

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

34. REMOVE CAMSHAFT BEARING CAP

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

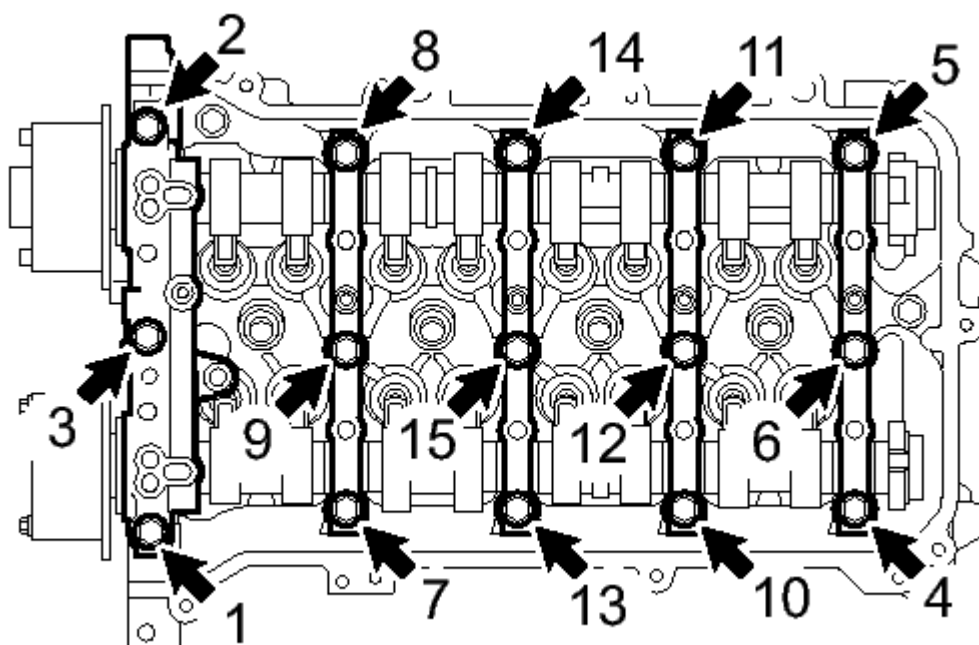


T

Fig. 77: Identifying Bearing Cap Bolts And Loosening Sequence

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

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

**Fig. 78: Identifying Bearing Cap Bolts And Loosening Sequence**

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

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

- c. Remove the 5 bearing caps.

HINT:

Arrange the removed parts in the correct order.

35. REMOVE CAMSHAFT

- a. Remove the camshaft.

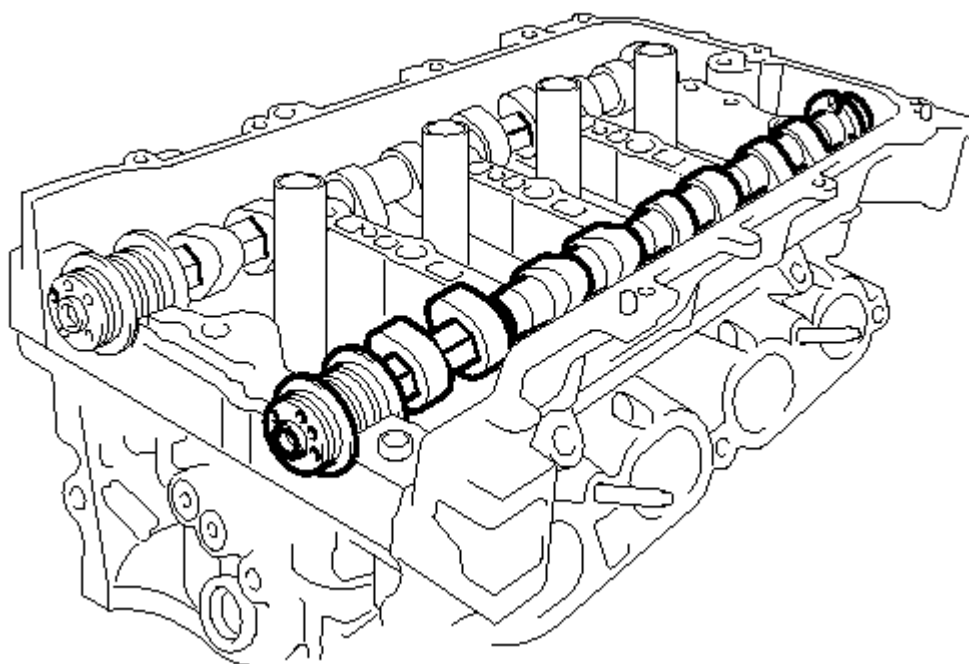
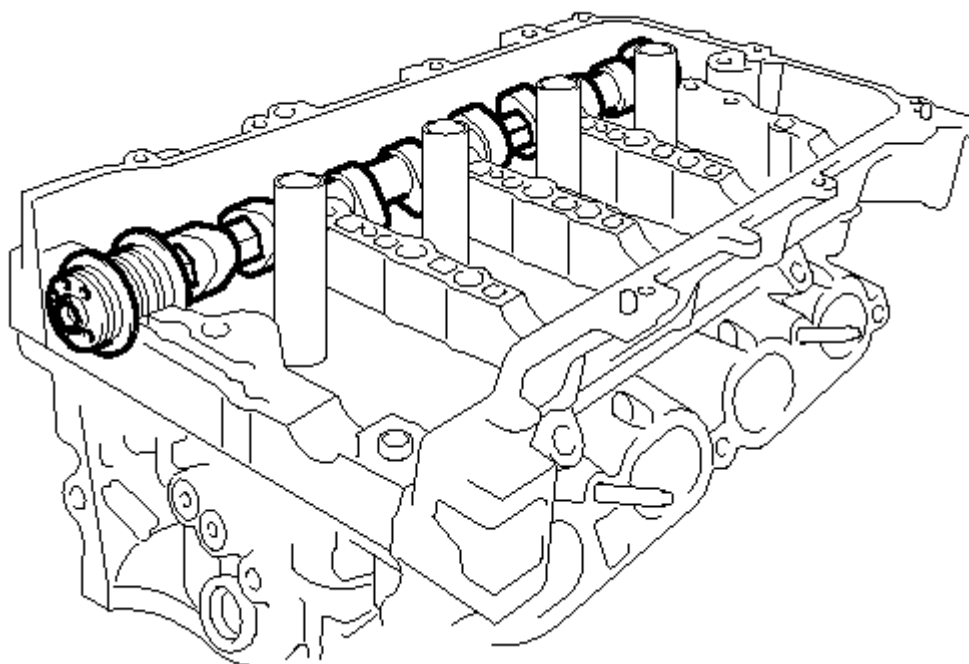
**T**

Fig. 79: Identifying Camshaft

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

36. REMOVE NO. 2 CAMSHAFT

- a. Remove the No. 2 camshaft.

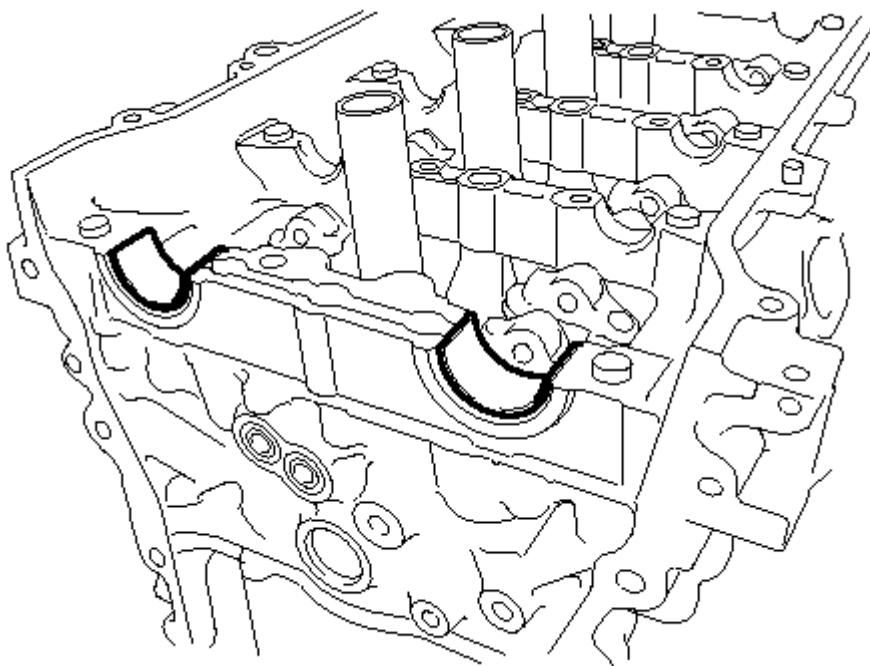


T

Fig. 80: Identifying No. 2 Camshaft

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

37. **REMOVE NO. 1 CAMSHAFT BEARING** See step 27
38. **REMOVE NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY** See step 34
39. **REMOVE VALVE LASH ADJUSTER ASSEMBLY** See step 35
40. **REMOVE NO. 2 CAMSHAFT BEARING**
 - a. Remove the 2 No. 2 camshaft bearings.



T

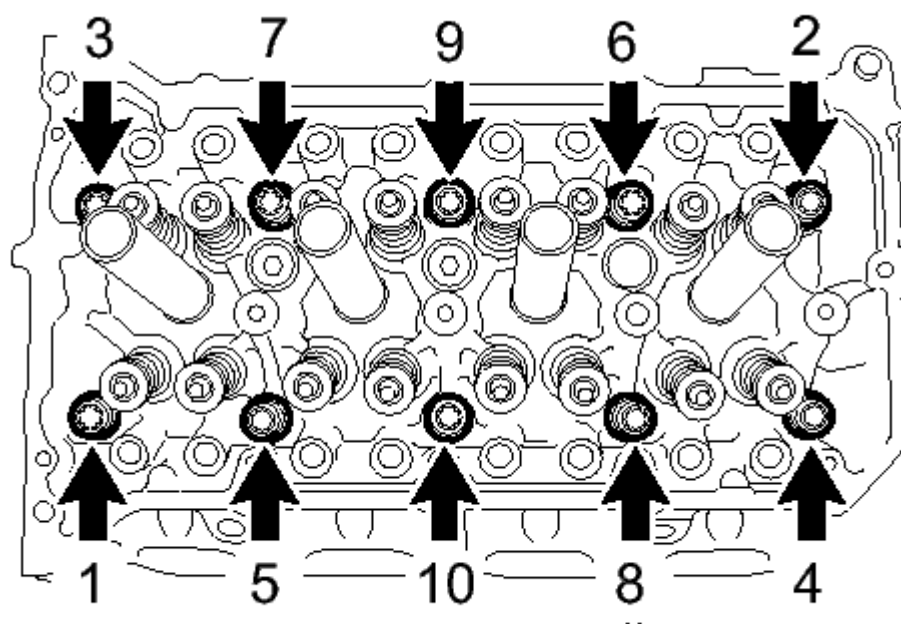
Fig. 81: Identifying No. 2 Camshaft Bearings

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

41. **REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY** See step 39

42. **REMOVE CYLINDER HEAD SUB-ASSEMBLY**

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



T

Fig. 82: Locating Cylinder Head Bolts And Loosening Sequence

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

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

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

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

43. **REMOVE CYLINDER HEAD GASKET**

- a. Remove the cylinder head gasket.

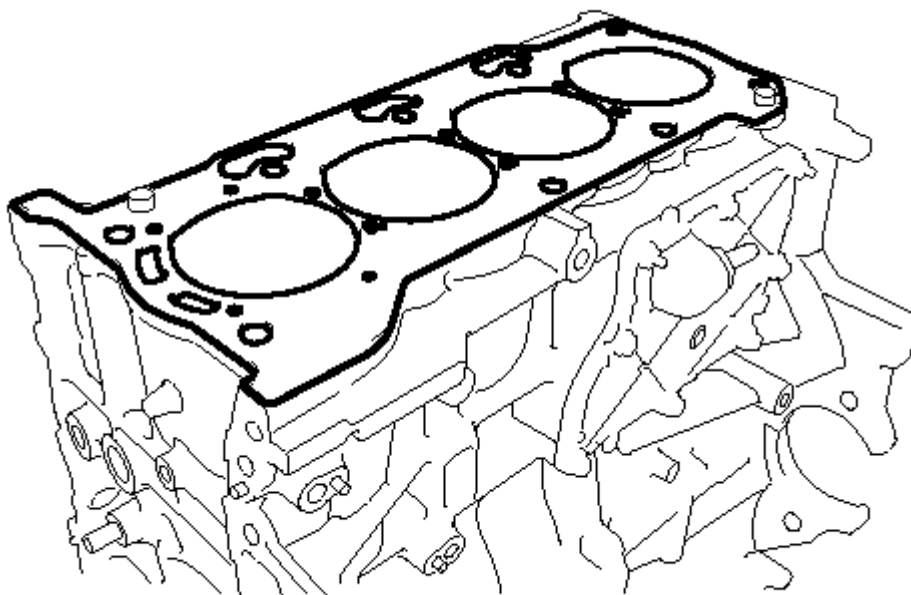
**T**

Fig. 83: Identifying Cylinder Head Gasket

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

- 44. **INSPECT NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY** See step 1
- 45. **INSPECT VALVE LASH ADJUSTER ASSEMBLY** See step 2
- 46. **INSPECT CYLINDER HEAD SET BOLT** See step 19

INSTALLATION

INSTALLATION

1. INSTALL CYLINDER HEAD GASKET

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

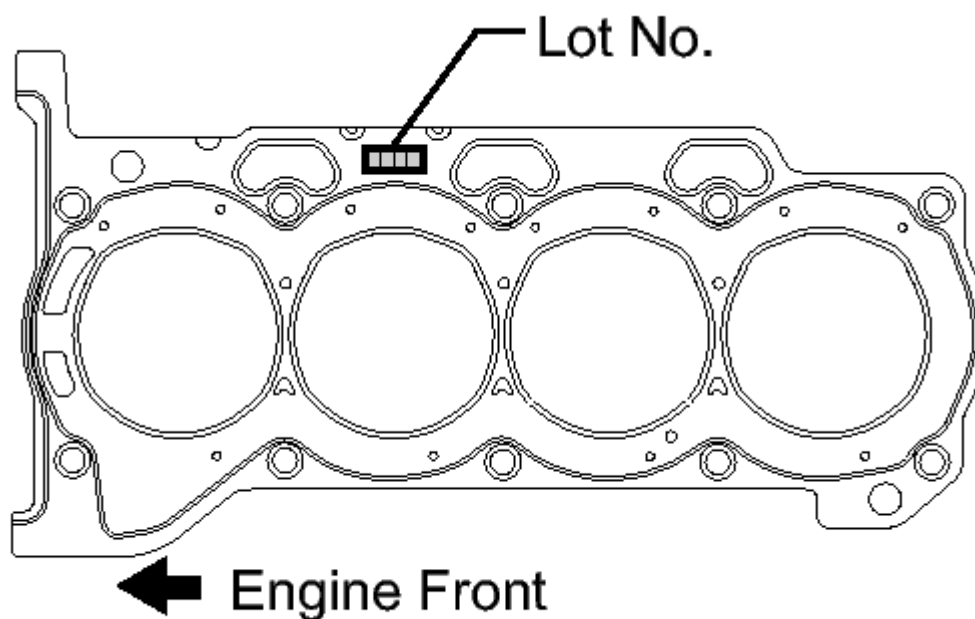
**T**

Fig. 84: Identifying Cylinder Block Surface With Lot No. Stamp Facing Upward
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

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

2. INSTALL CYLINDER HEAD SUB-ASSEMBLY**HINT:**

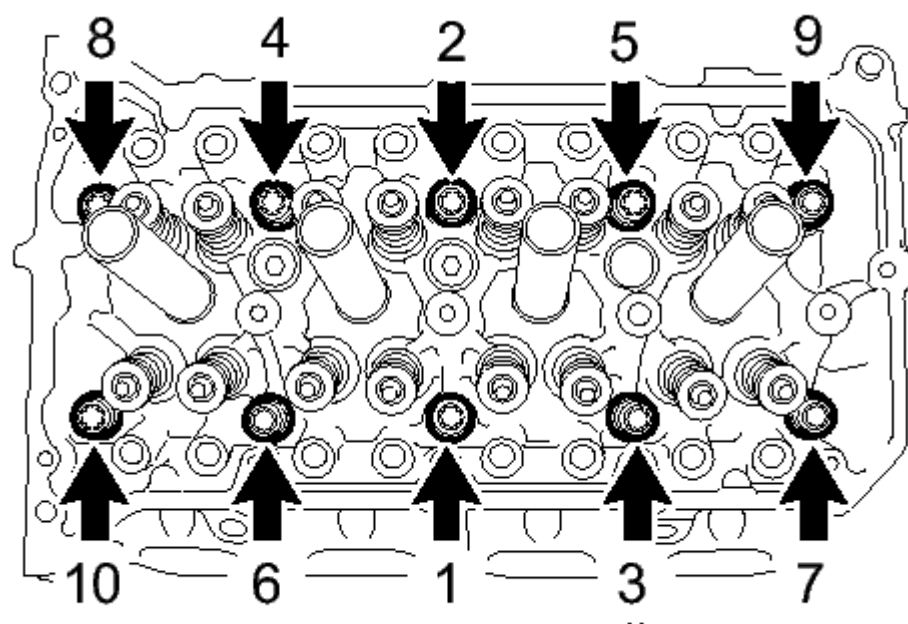
The cylinder head bolts are tightened in 2 progressive steps.

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

NOTE:

Do not drop the washers into the cylinder head.

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

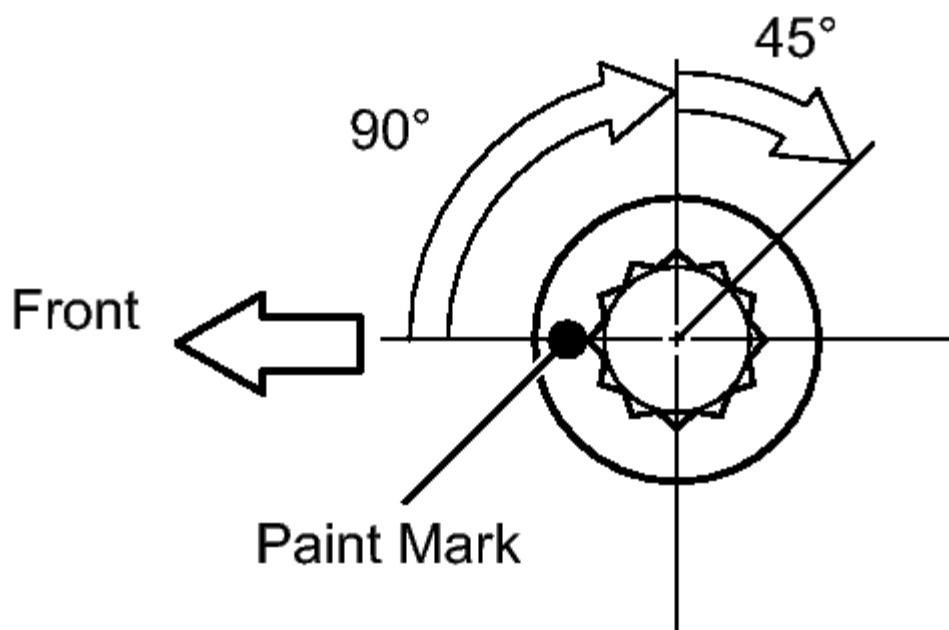


T

Fig. 85: Locating Cylinder Head Bolts And Tightening Sequence
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 49 N*m (500 kgf*cm, 36 ft.*lbf)

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



O

Fig. 86: Identifying Cylinder Head Bolt Tightening Direction
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Retighten the cylinder head bolts an additional 90°, then once more 45° as shown in the

illustration.

f. Check that the paint mark is now at a 135° angle to the front.

3. **INSTALL VALVE LASH ADJUSTER ASSEMBLY** See step 10

4. **INSTALL NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY** See step 11

5. **INSTALL NO. 1 CAMSHAFT BEARING** See step 1

6. **INSTALL NO. 2 CAMSHAFT BEARING**

a. Clean both surfaces of the bearings.

b. Install the 2 No. 2 camshaft bearings.

c. Using a vernier caliper, measure the distance between the bearing cap edge and the camshaft bearing edge.

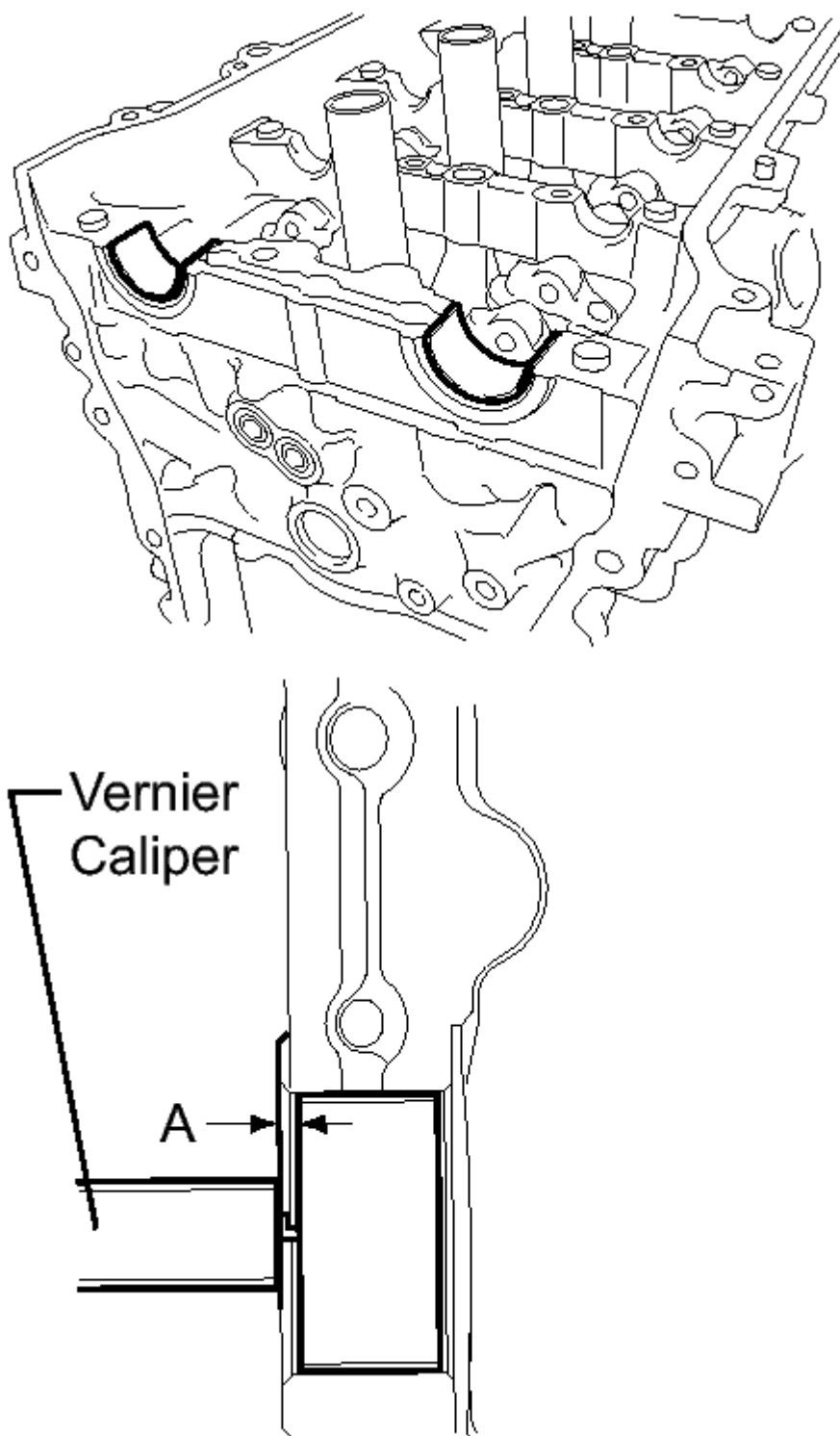


Fig. 87: Measuring Distance Between Bearing Cap Edge And Camshaft Bearing Edge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Dimension (A)

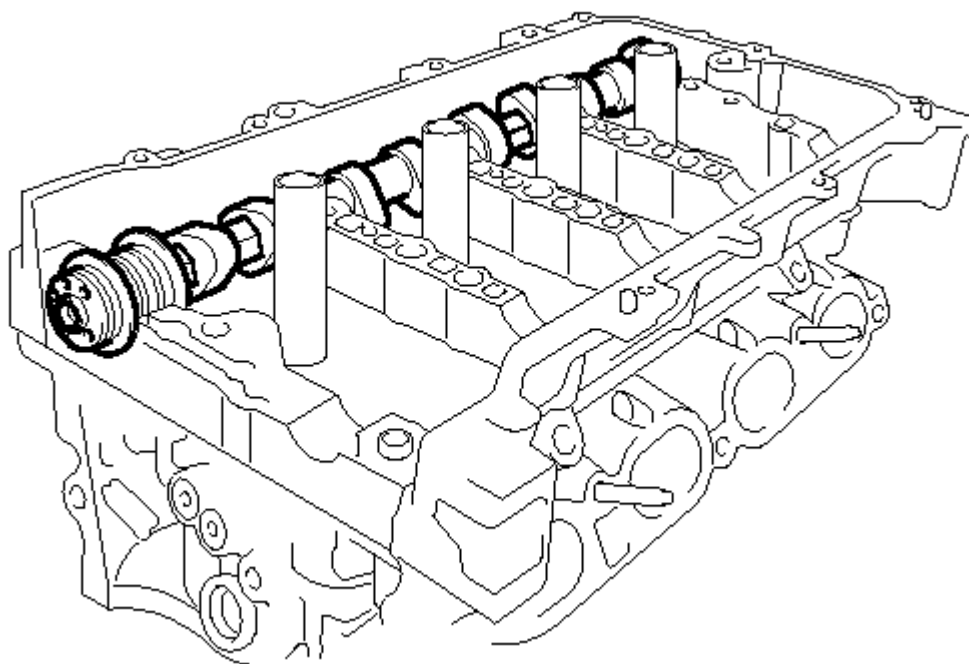
1.05 to 1.75 mm (0.0413 to 0.0689 in.)

NOTE: Position the bearings to the center of the bearing cap by

measuring dimension A.

7. INSTALL NO. 2 CAMSHAFT

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



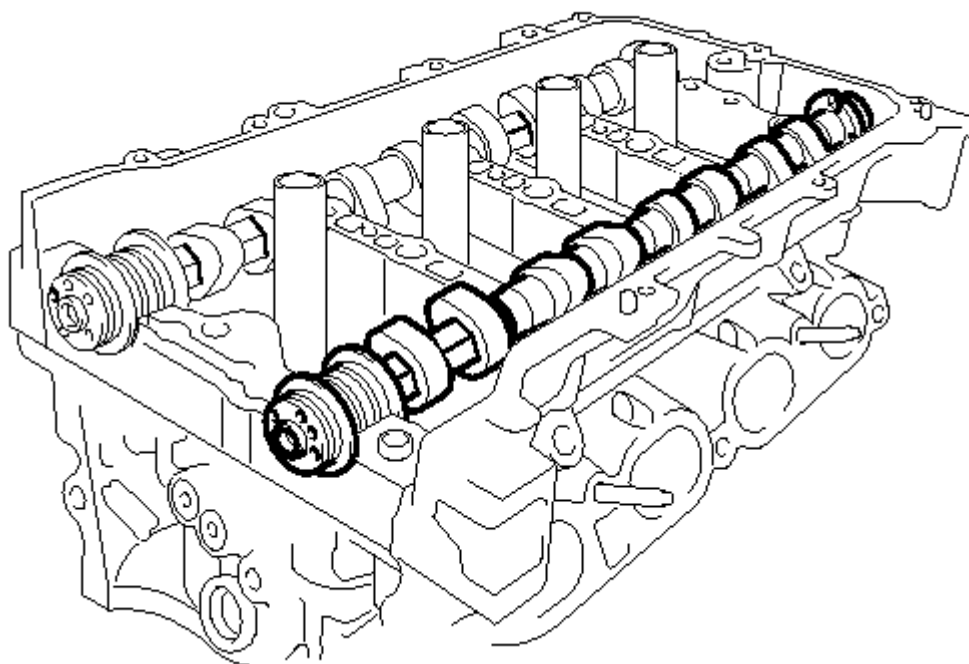
T

Fig. 88: Identifying No. 2 Camshaft

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

8. INSTALL CAMSHAFT

- a. Clean the camshaft journals.
- b. Apply a light coat of engine oil to the camshaft journals, camshaft housings and bearing caps.
- c. Install the camshaft to the camshaft housing.



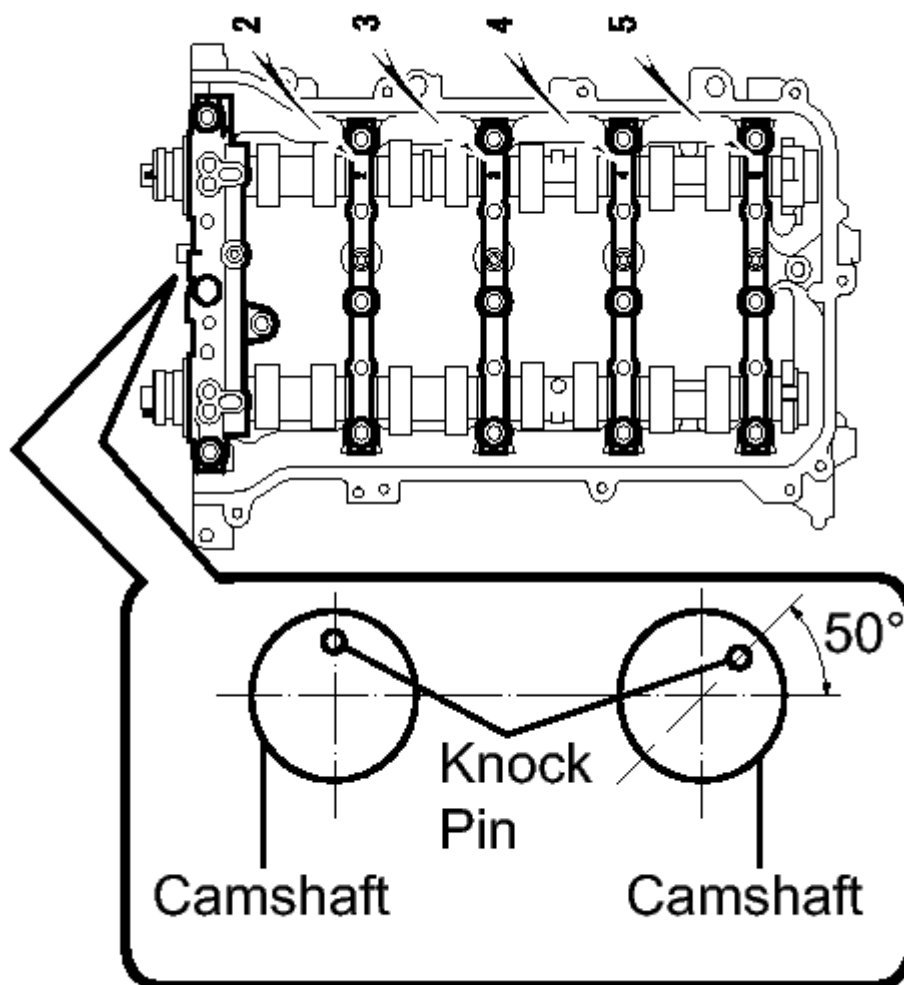
T

Fig. 89: Identifying Camshaft

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

9. INSTALL CAMSHAFT BEARING CAP

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

**T****Fig. 90: Identifying Knock Pin Of Camshaft**

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

HINT:

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

- c. Tighten the 10 bolts in the order shown in the illustration.

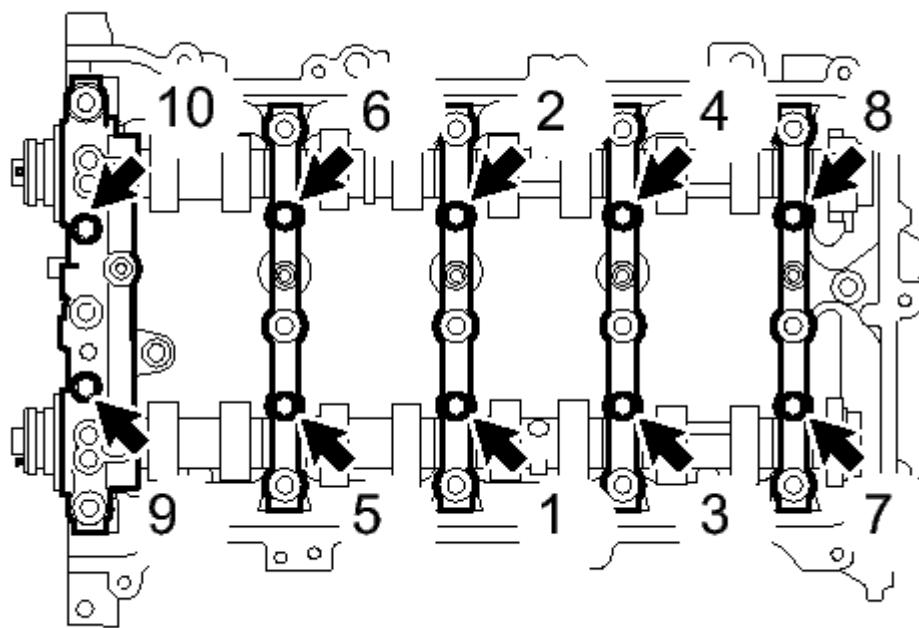
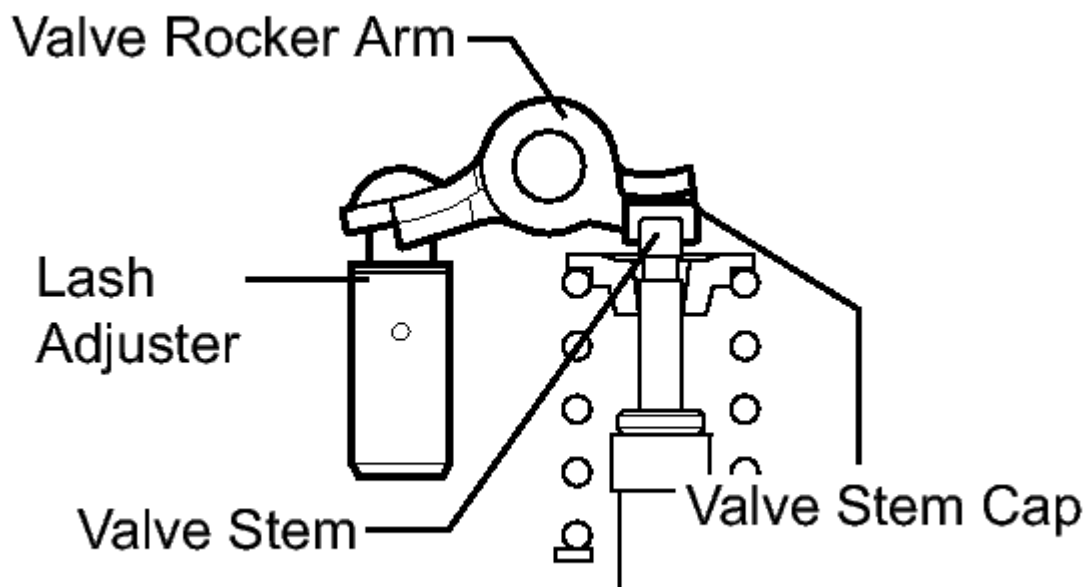


Fig. 91: Locating Bolts And Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

10. INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY

- Make sure that the valve rocker arm is installed as shown in the illustration.



P

Fig. 92: Identifying Valve Rocker Arm And Valve Stem Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

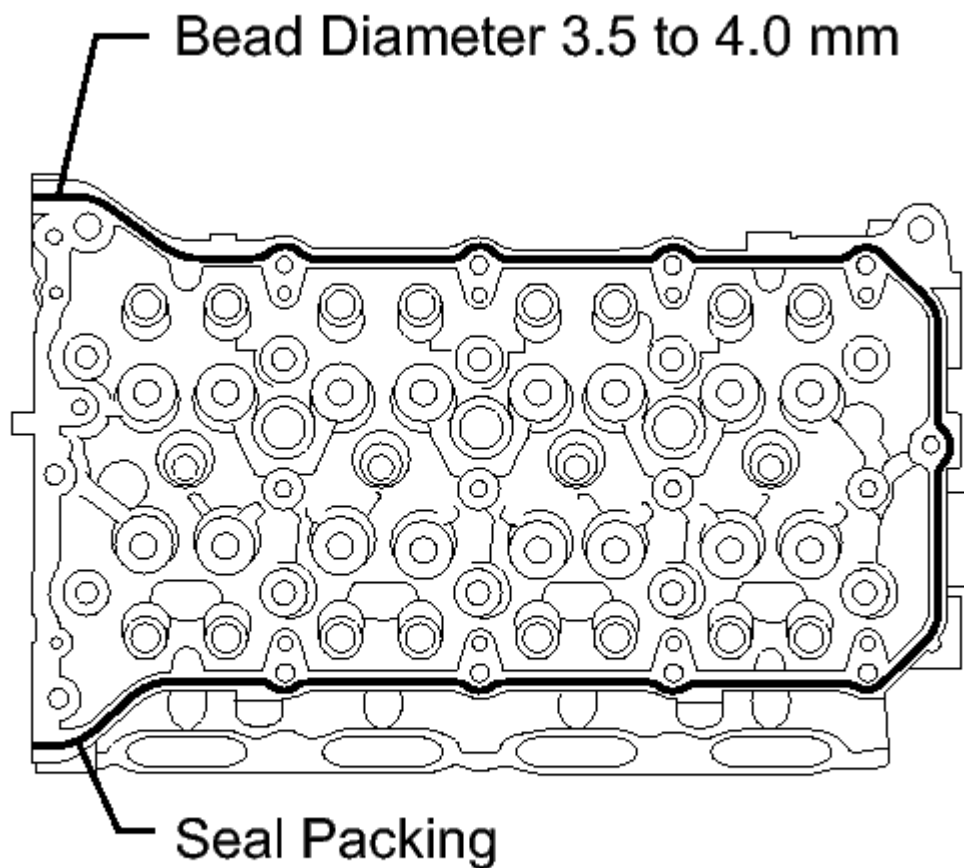


Fig. 93: Identifying Camshaft Housing Seal Packing Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Seal packing

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

Bead diameter

3.5 to 4.0 mm (0.138 to 0.158 in.)

NOTE:

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

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

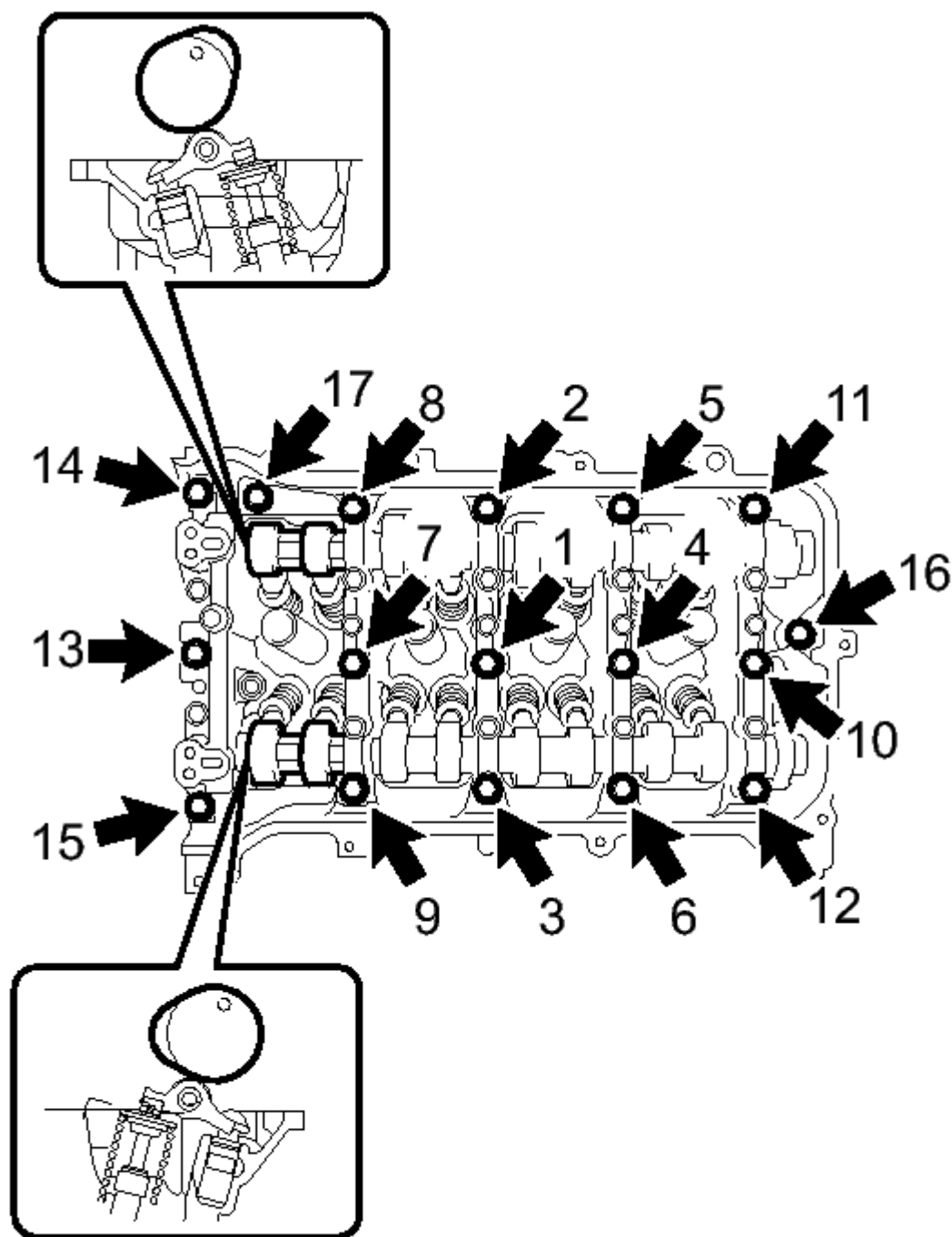


Fig. 94: Locating Camshaft Housing Bolts And Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the camshaft housing and tighten the 17 bolts in the order shown in the illustration.

Torque: 27 N*m (275 kgf*cm, 20 ft.*lbf)

NOTE:

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

11. INSTALL CAMSHAFT TIMING GEAR ASSEMBLY

- a. Check that the knock pin is installed on the camshaft.
- b. Put the camshaft timing gear and camshaft together with the straight pin and key groove misaligned, as shown in the illustration.

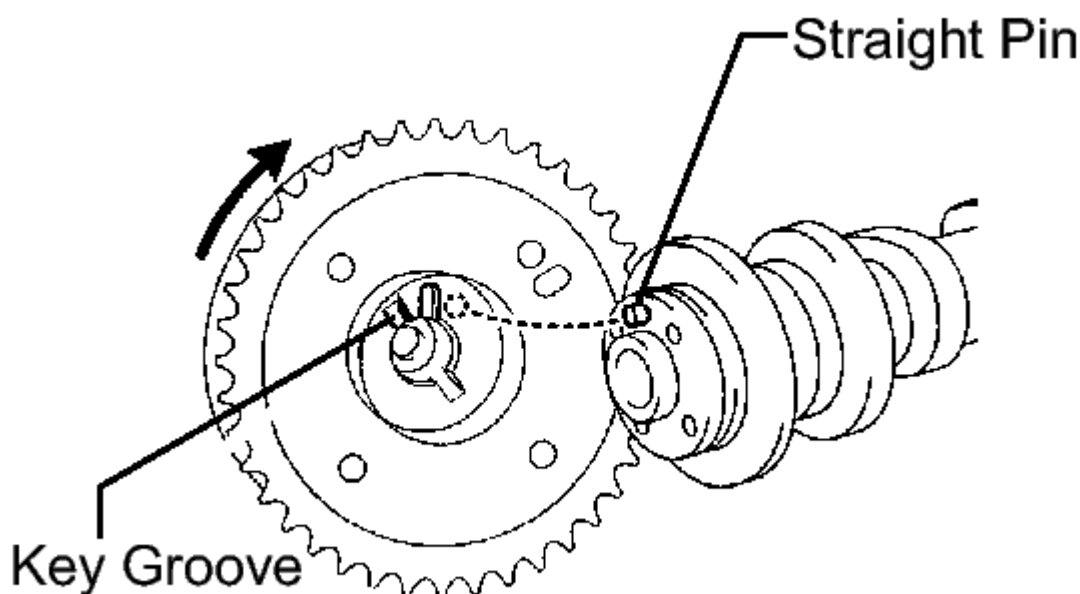


Fig. 95: Identifying Straight Pin And Key Groove
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

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

- c. Turn the camshaft timing gear as shown in the illustration while pushing it gently against the camshaft. Push further at the position where the pin fits into the groove.

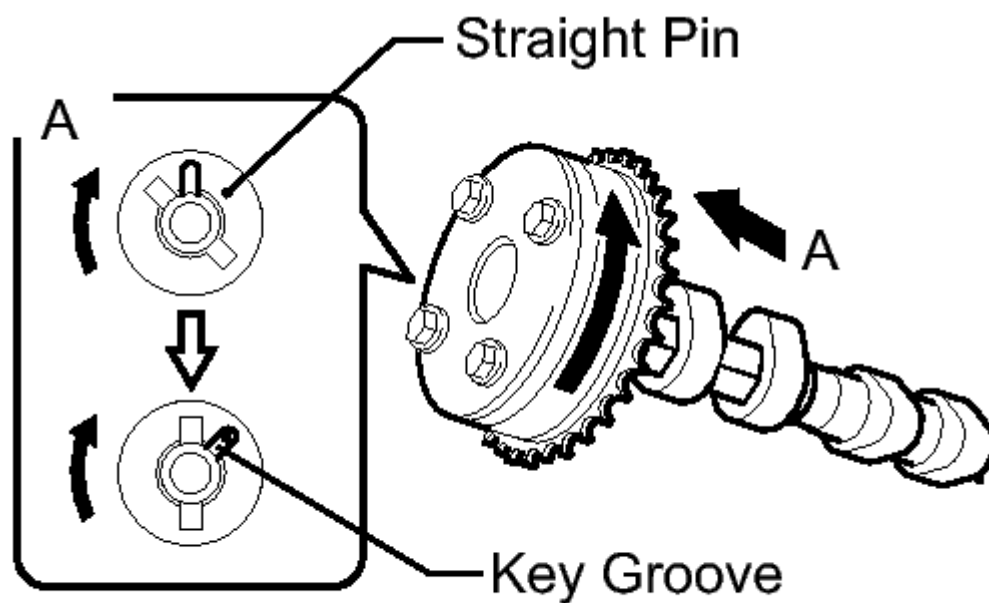
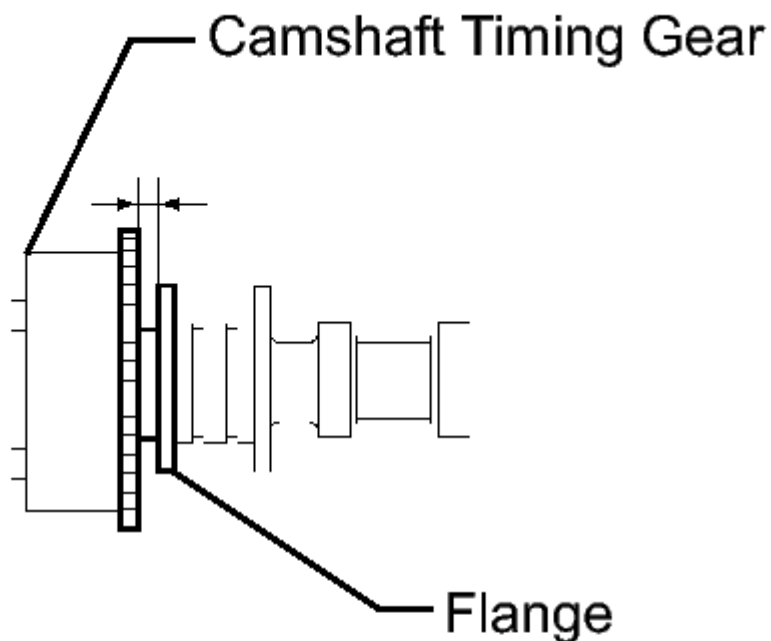
**T**

Fig. 96: Identifying Straight Pin And Key Groove

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

NOTE: Do not turn the camshaft timing gear in the retard direction (clockwise).

- d. Measure the clearance between the gear and the camshaft flange.



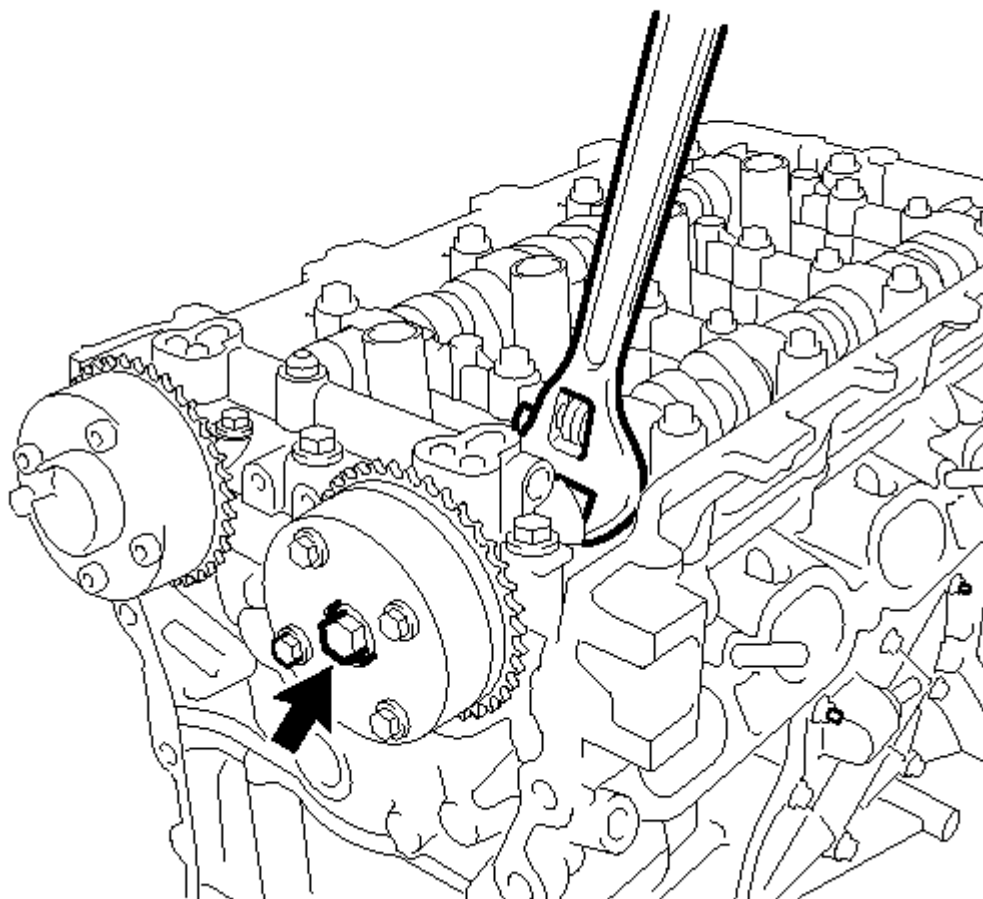
Clearance: 0.1 to 0.4 mm

Fig. 97: Identifying Clearance Between Gear And Camshaft Flange
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Clearance

0.1 to 0.4 mm (0.004 to 0.016 in.)

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



T

Fig. 98: Locating Flange Bolt

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

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

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

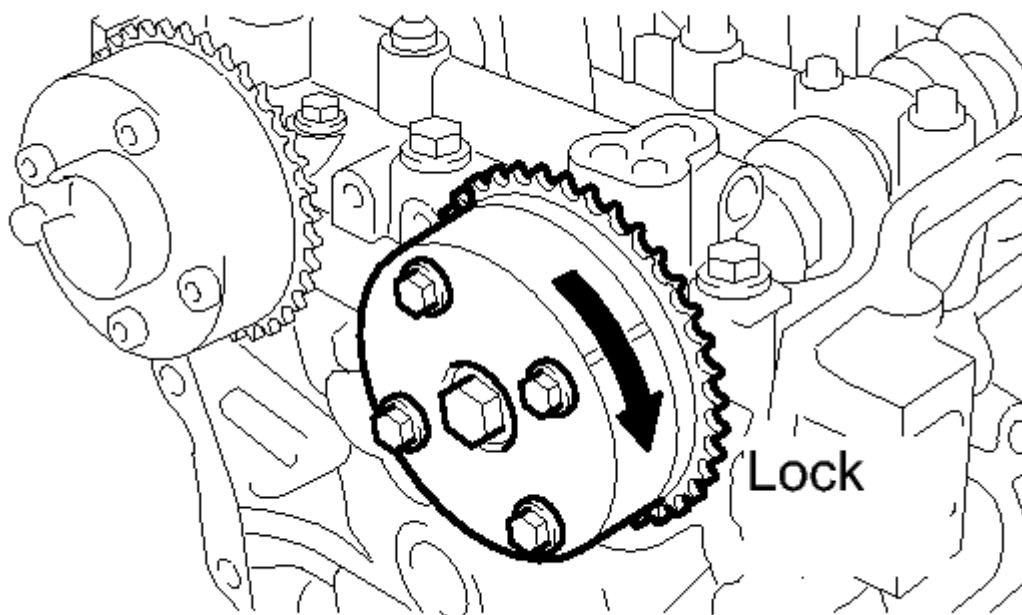
**T**

Fig. 99: Identifying Camshaft Timing Gear Direction
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. INSTALL CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY

- Check that the knock pin is installed on the camshaft.
- Put the camshaft timing exhaust gear and camshaft together by aligning the key groove and straight pin.

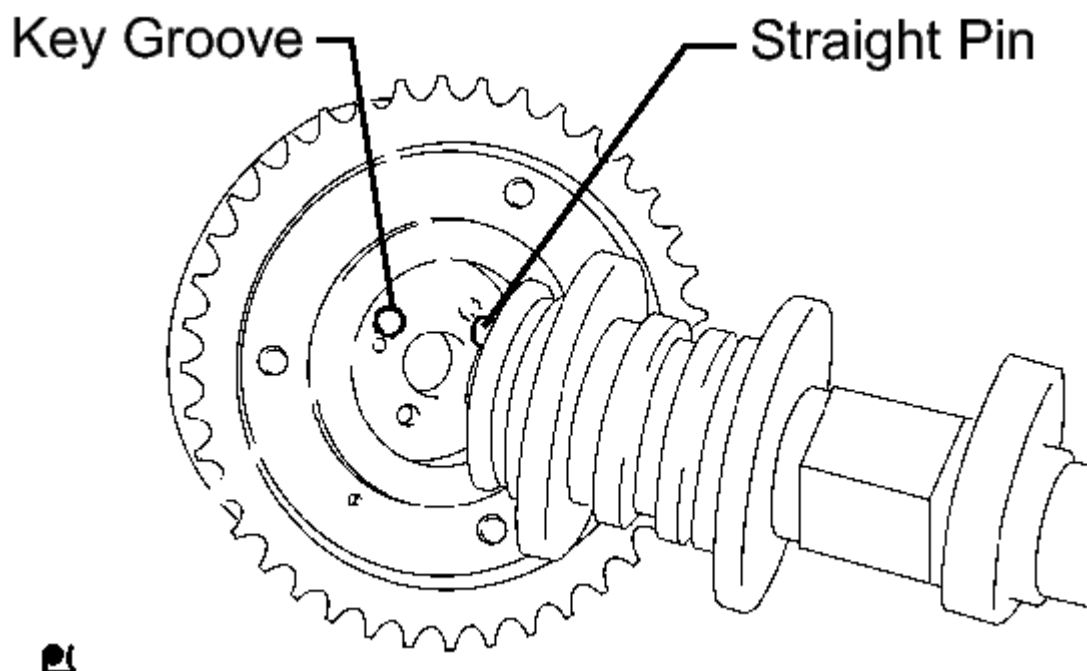
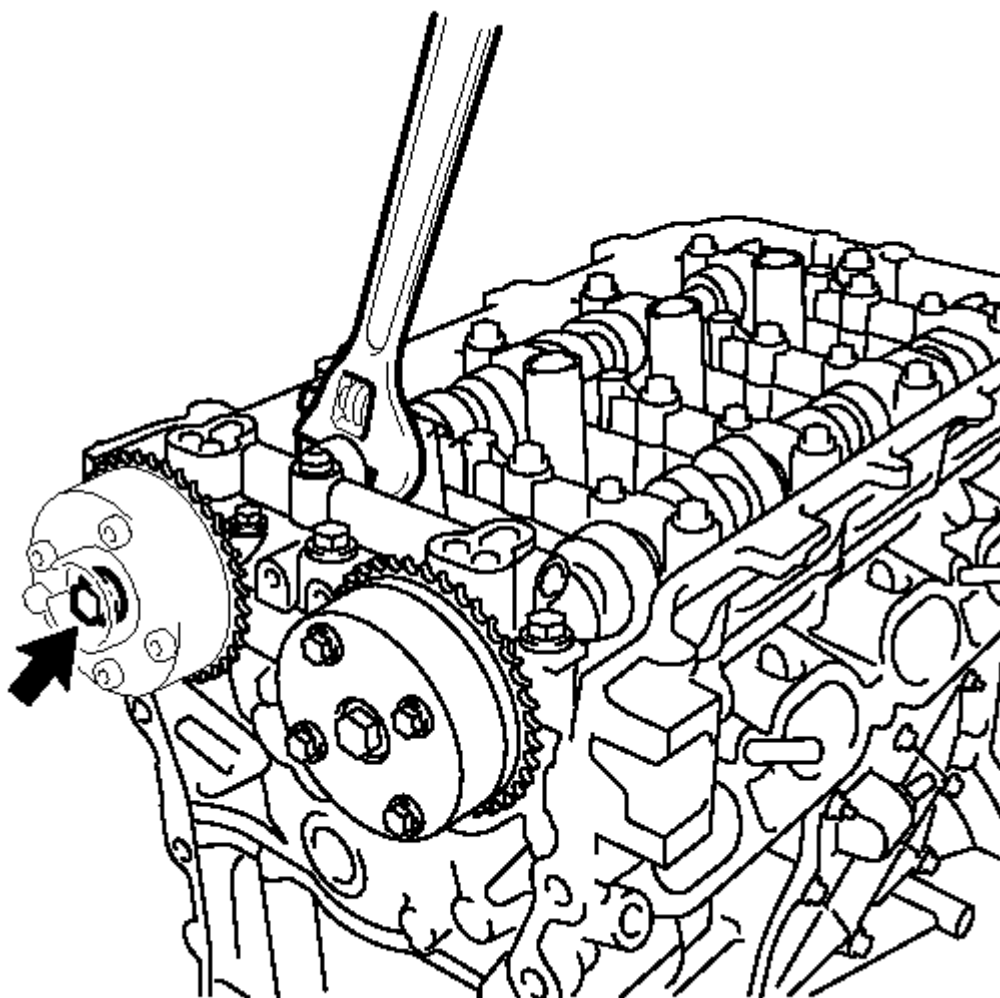


Fig. 100: Aligning Key Groove And Straight Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Lightly press the gear against the camshaft, and turn the gear. Push further at the position where the pin enters the groove.

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

- d. Check that there is no clearance between the gear and the camshaft flange.
- e. Tighten the flange bolt with the camshaft timing exhaust gear secured.



T

Fig. 101: Locating Flange Bolt

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

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

- f. Check the camshaft timing exhaust gear lock.

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

13. INSTALL NO. 1 CHAIN VIBRATION DAMPER

- a. Install the No. 1 chain vibration damper with the 2 bolts.

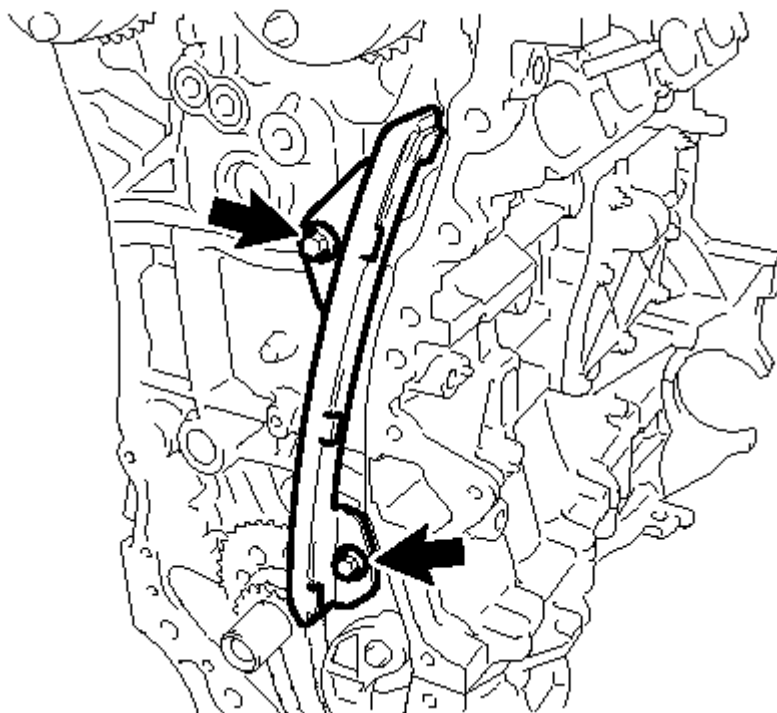
**T**

Fig. 102: Locating No. 1 Chain Vibration Damper And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 21 N*m (214 kgf*cm, 16 ft.*lbf)

14. **INSTALL NO. 2 CHAIN VIBRATION DAMPER** . Refer to **INSTALLATION - Step 7**
15. **INSTALL CHAIN SUB-ASSEMBLY**
 - a. Check the No. 1 cylinder TDC/compression.
 1. Temporarily tighten the crankshaft pulley bolt.
 2. Turn the crankshaft counterclockwise to position the timing gear key to the top.

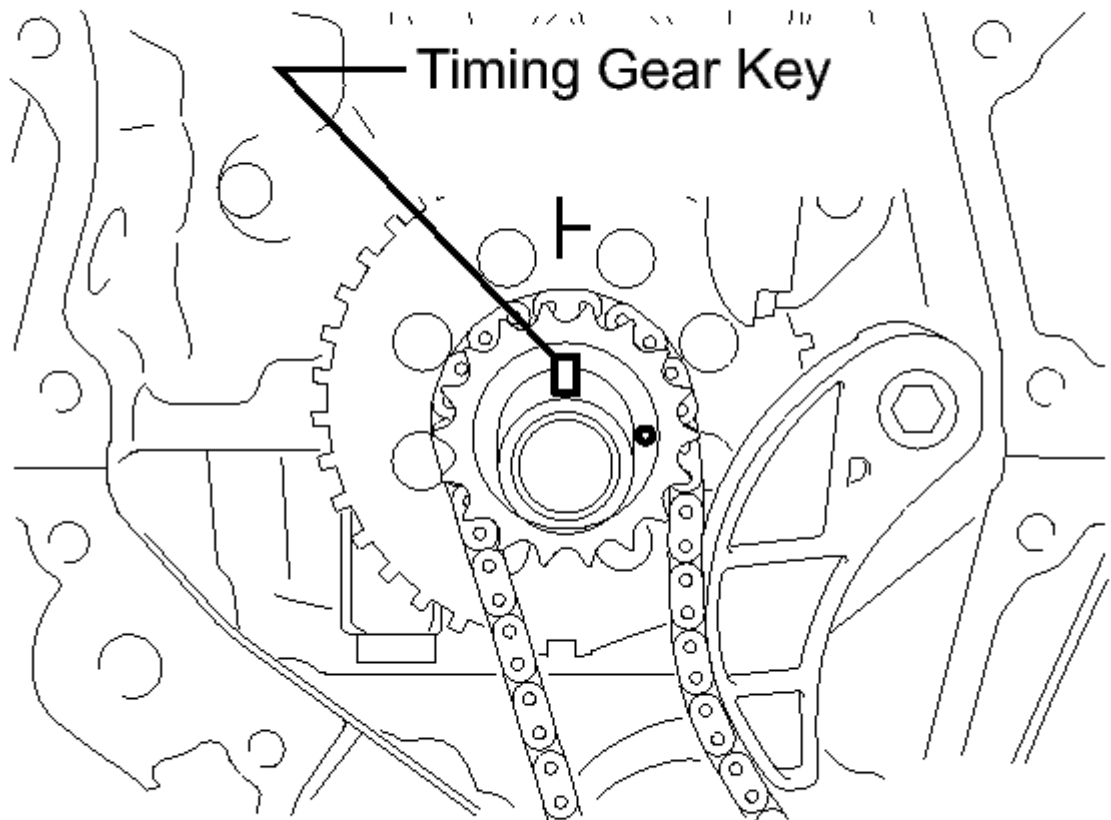


Fig. 103: Identifying Timing Gear Key
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. Remove the crankshaft pulley bolt.
4. Check the timing marks on each camshaft timing gear.

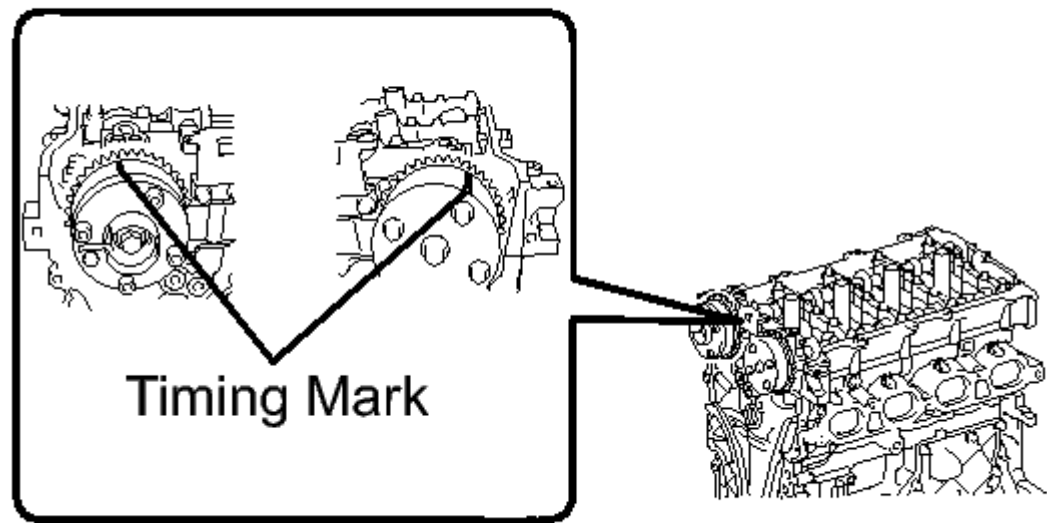
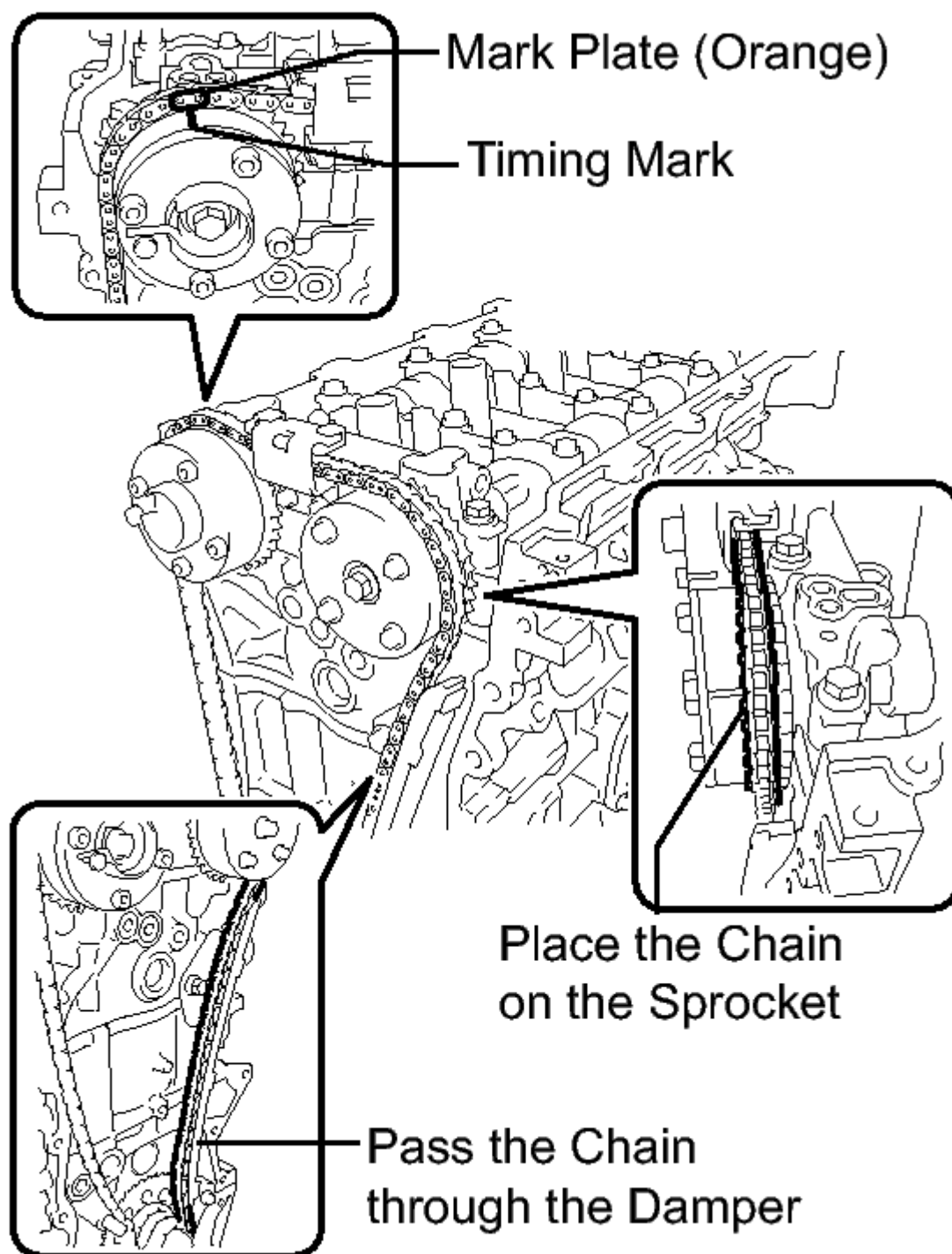


Fig. 104: Identifying Timing Mark On Camshaft Timing Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Align the mark plate (orange) with the timing mark of the No. 2 camshaft as shown in the illustration and install the chain.



T

Fig. 105: Identifying Mark Plate And Timing Mark
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

- Be sure to position the mark plate at the front of the engine.
- The mark plate on the camshaft side is colored orange.
- Do not pass the chain around the sprocket of the camshaft timing gear assembly. Only

place it on the sprocket.

- Pass the chain through the No. 1 vibration damper.
- c. Place the chain on the crankshaft without passing it around the shaft.

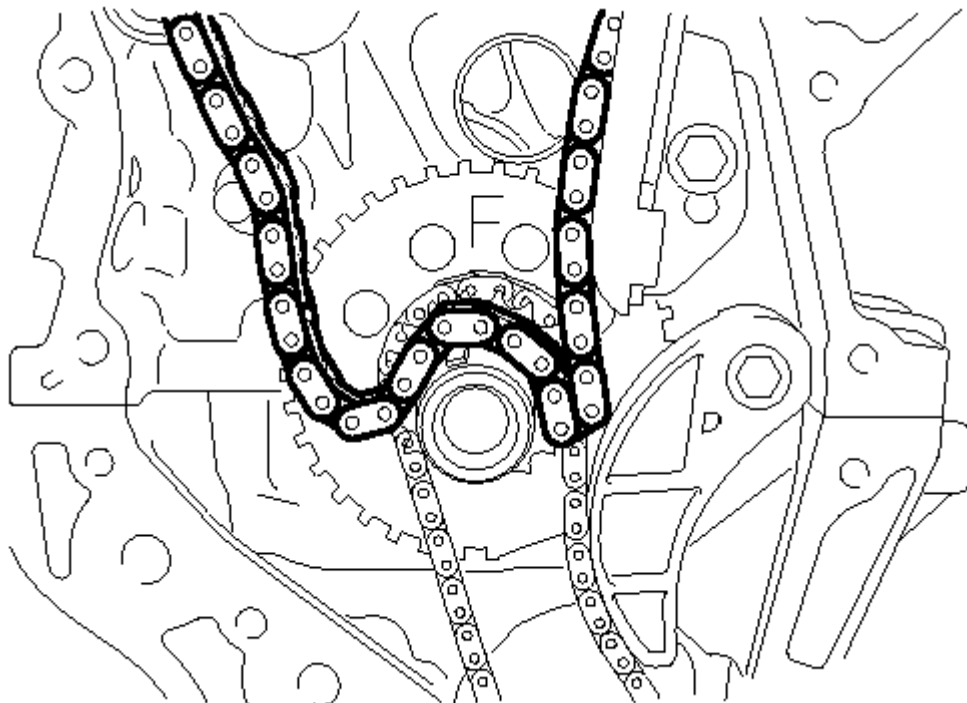
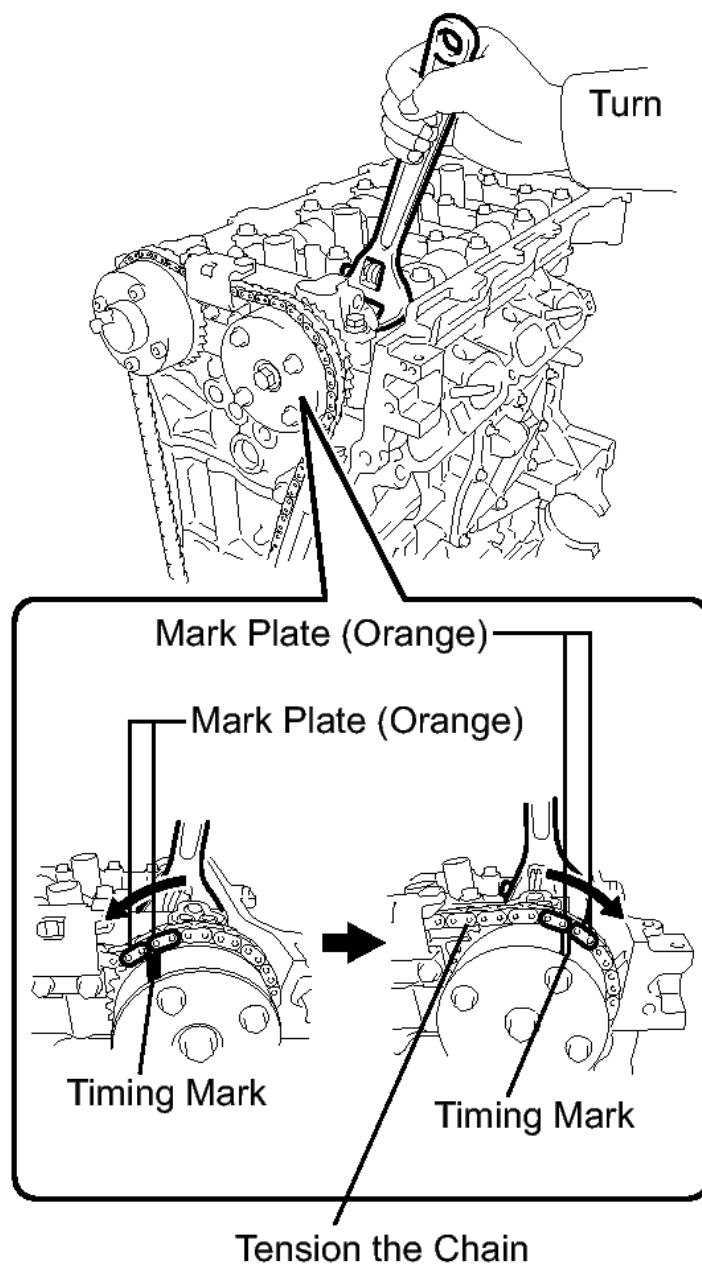


Fig. 106: Identifying Chain On Crankshaft

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

- d. Hold the hexagonal portion of the camshaft with a wrench and turn the camshaft timing gear assembly counterclockwise to align the mark plate (orange) and timing mark.



T

Fig. 107: Aligning Mark Plate (Orange) And Timing Mark
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

- Be sure to position the mark plate at the front of the engine.
 - The mark plate on the camshaft side is colored orange.
- e. Hold the hexagonal portion of the camshaft with a wrench and turn the camshaft timing gear

assembly clockwise.

HINT:

To tension the chain, slowly turn the camshaft timing gear assembly clockwise to prevent the chain from being misaligned.

- f. Align the mark plate (yellow) and timing mark and install the chain to the crankshaft timing gear.

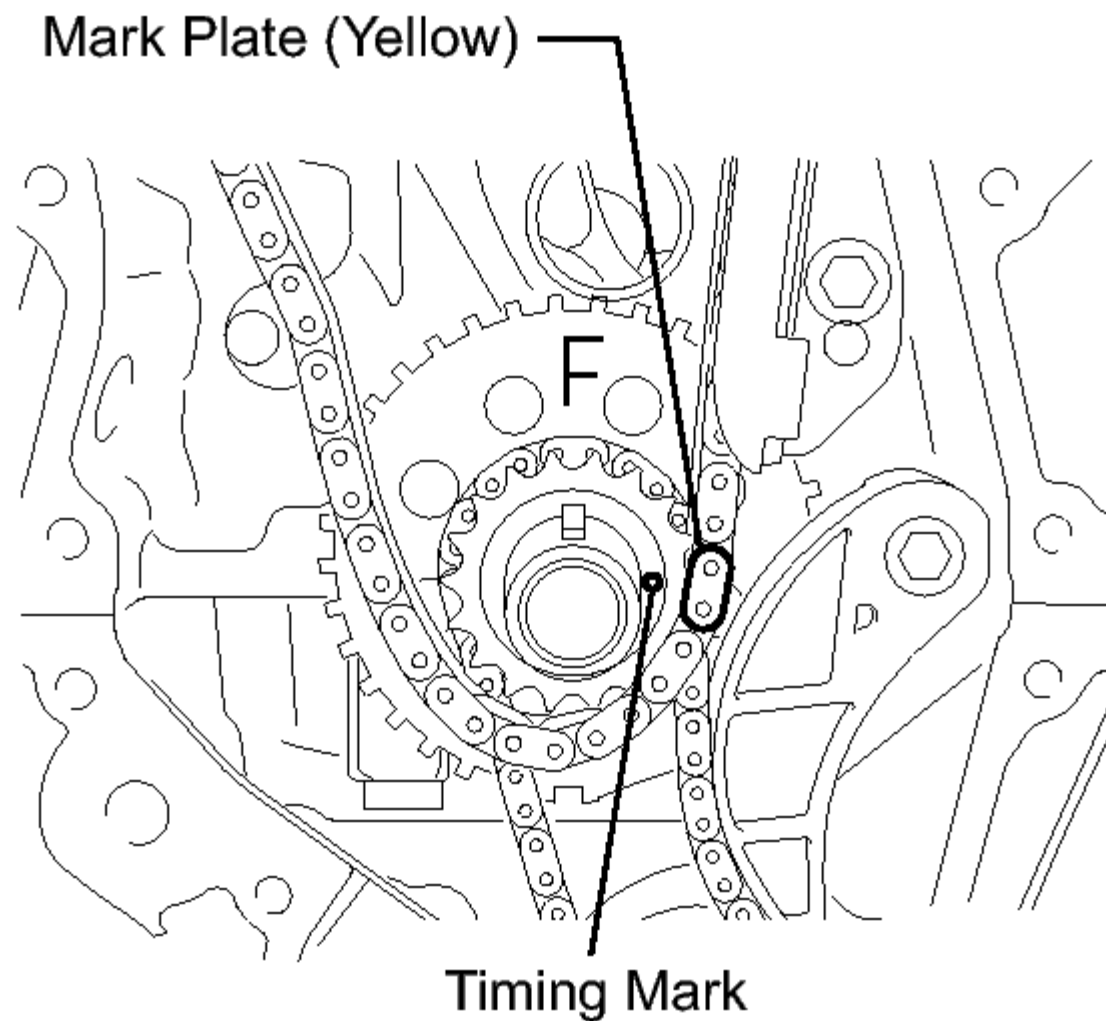
**T**

Fig. 108: Identifying Mark Plate (Yellow) And Timing Mark (1 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

The mark plate on the crankshaft side is colored yellow.

- g. Recheck each timing mark at TDC/compression.

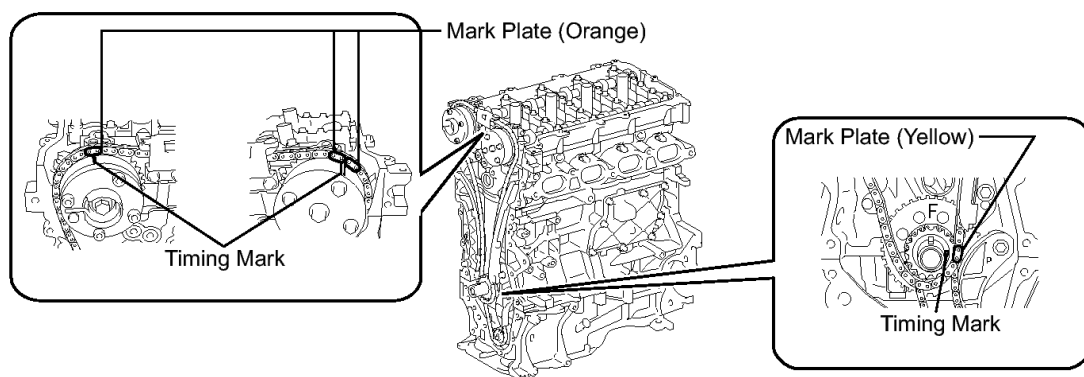
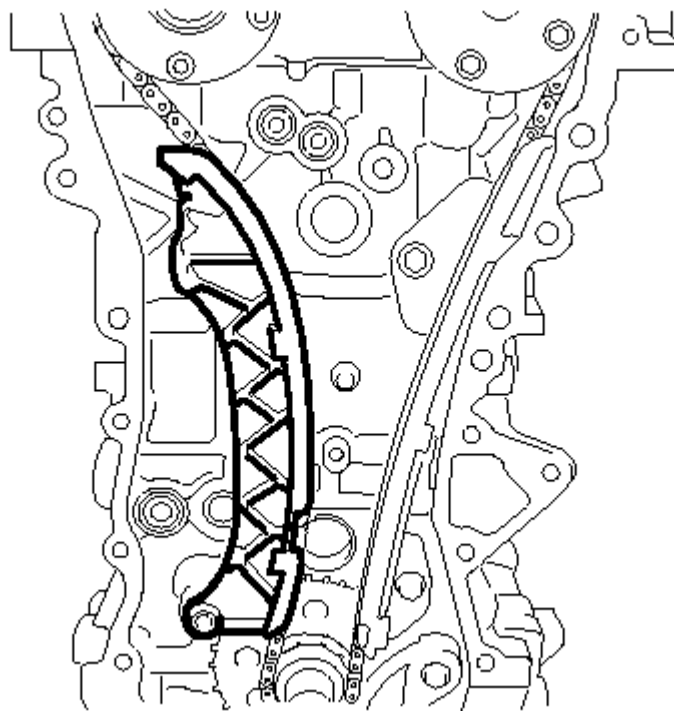


Fig. 109: Identifying Mark Plate (Yellow) And Timing Mark (2 Of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

16. INSTALL CHAIN TENSIONER SLIPPER

- a. Install the chain tensioner slipper.



T

Fig. 110: Identifying Chain Tensioner Slipper
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

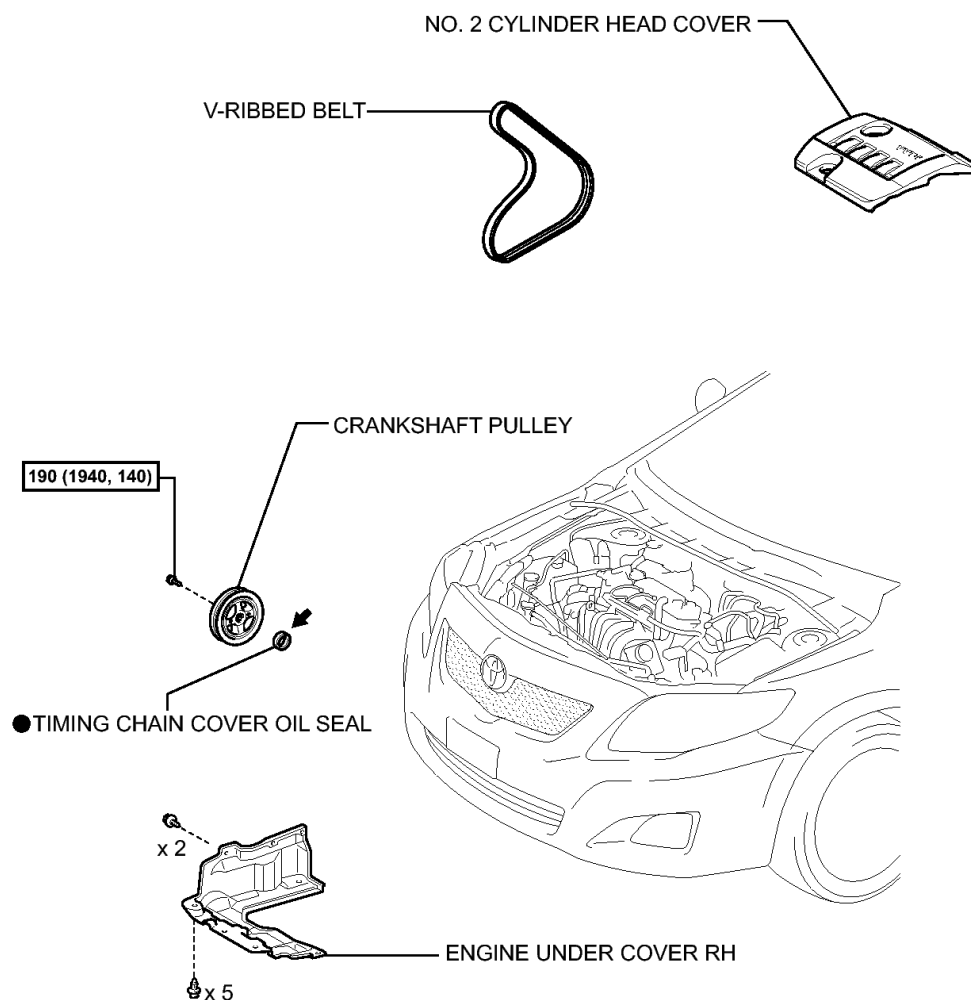
17. **INSTALL TIMING CHAIN COVER OIL SEAL** See step 31
18. **INSTALL TIMING CHAIN COVER SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 11**
19. **INSTALL CRANKSHAFT PULLEY** See step 2
20. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY** See step 39
21. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY** See step 41
22. **INSTALL RADIO SETTING CONDENSER** See step 1
23. **INSTALL THERMOSTAT** . Refer to **INSTALLATION - Step 1**
24. **INSTALL INLET WATER** . Refer to **INSTALLATION - Step 2**

25. **INSTALL INLET WATER HOSE** See step 4
26. **INSTALL WATER BY-PASS HOSE** See step 5
27. **INSTALL NO. 1 WATER BY-PASS PIPE** See step 6
28. **CONNECT NO. 3 WATER BY-PASS HOSE**
29. **INSTALL VENTILATION HOSE** See step 8
30. **INSPECT EXHAUST MANIFOLD** See step 9
31. **INSTALL EXHAUST MANIFOLD** See step 9
32. **INSTALL MANIFOLD STAY** See step 10
33. **INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR** See step 11
34. **INSTALL OIL LEVEL DIPSTICK SUB-ASSEMBLY** See step 12
35. **INSTALL IGNITION COIL ASSEMBLY** . Refer to **INSTALLATION - Step 2**
36. **INSTALL FUEL INJECTOR ASSEMBLY** . Refer to **INSTALLATION - Step 1**
37. **INSTALL NO. 1 DELIVERY PIPE SPACER** . Refer to **INSTALLATION - Step 2**
38. **INSTALL FUEL DELIVERY PIPE SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 3**
39. **INSTALL FUEL TUBE SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 4**
40. **INSTALL INTAKE MANIFOLD** . Refer to **INSTALLATION - Step 1**
41. **REMOVE ENGINE STAND** See step 21
42. **INSTALL ENGINE ASSEMBLY WITH TRANSAXLE**

HINT:

Refer to **INSTALLATION**.

FRONT CRANKSHAFT OIL SEAL**COMPONENTS****ILLUSTRATION**



190 (1940, 140) N*m (kgf*cm, ft.*lbf): Specified torque

● Non-reusable part

← MP grease

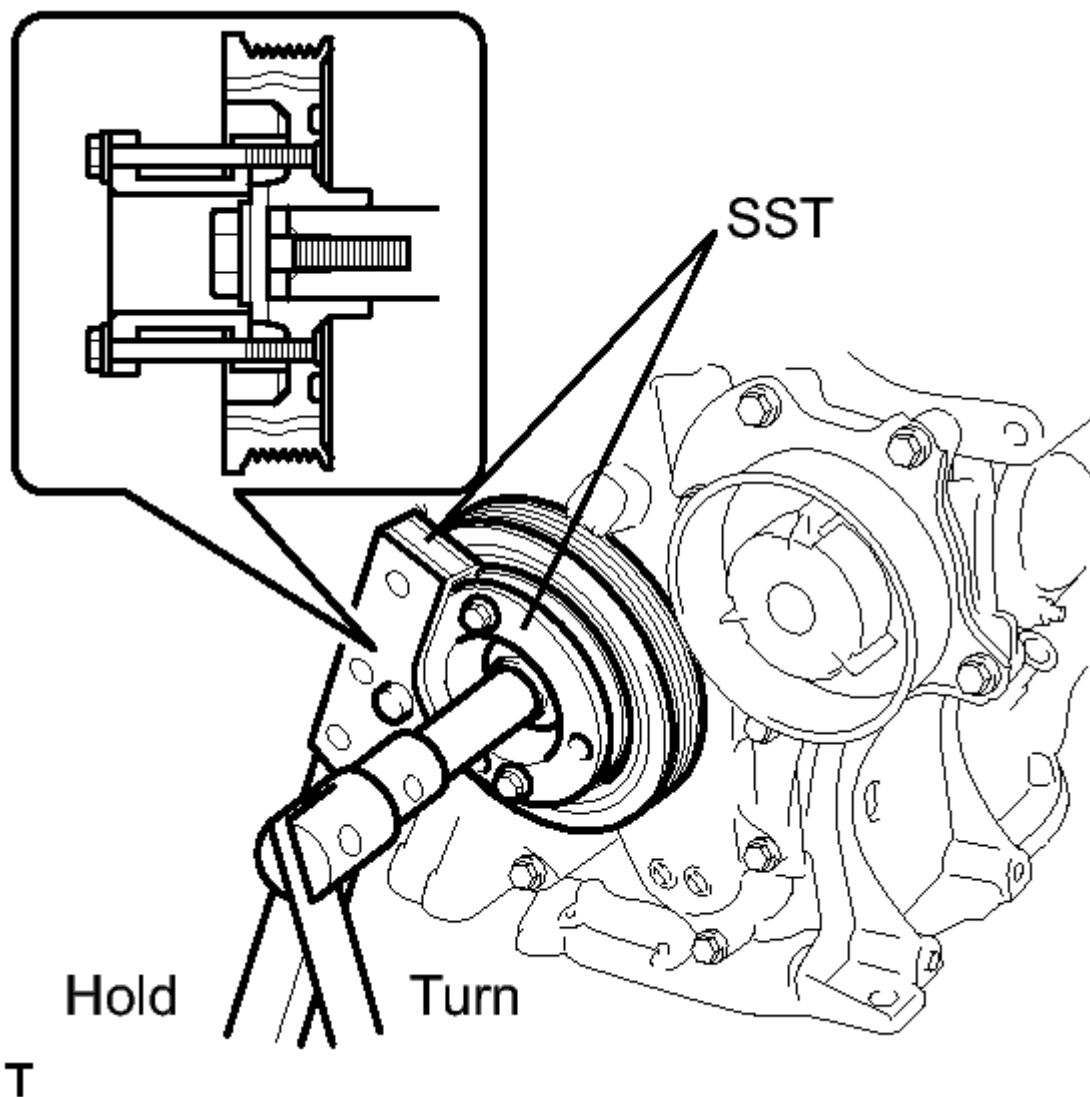
c

Fig. 111: Identifying Front Crankshaft Oil Seal Replacement Components With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

REMOVAL

1. **REMOVE FRONT WHEEL RH**
2. **REMOVE ENGINE UNDER COVER RH**
3. **REMOVE NO. 2 CYLINDER HEAD COVER** See step 10
4. **REMOVE V-RIBBED BELT** See step 3
5. **REMOVE CRANKSHAFT PULLEY**
 - a. Using SST, hold the pulley in place and loosen the pulley bolt.

**T****Fig. 112: Removing Crankshaft Pulley**

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

- SST: 09213-58014
91551-80840
- SST: 09330-00021

NOTE:

Check the SST installation positions when installing them to prevent the SST fixing bolts from coming into contact with the timing chain cover sub-assembly.

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

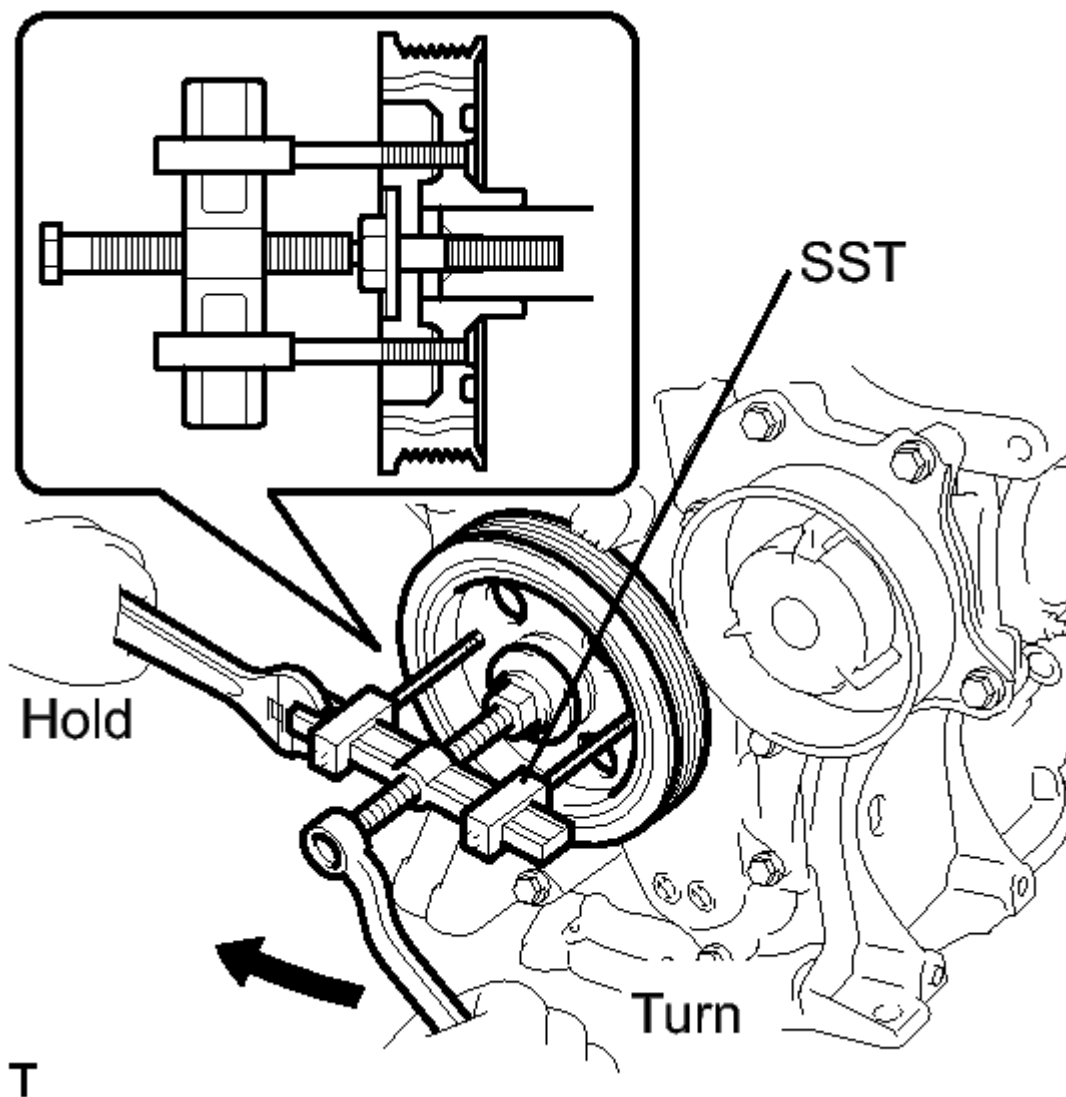


Fig. 113: Removing Crankshaft Pulley And Pulley Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09950-50013

09951-05010

09952-05010

09953-05020

09954-05021

6. REMOVE TIMING CHAIN COVER OIL SEAL

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

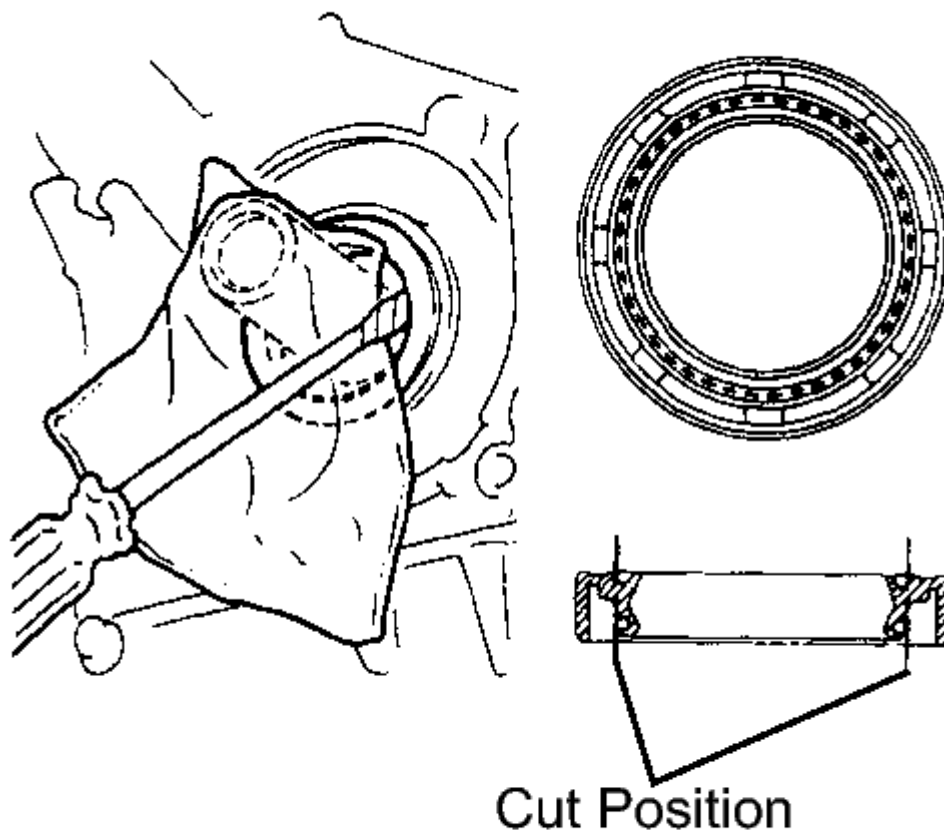


Fig. 114: Prying Out Oil Seal

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

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

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

INSTALLATION

INSTALLATION

1. INSTALL TIMING CHAIN COVER OIL SEAL

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

NOTE: Keep the lip free of foreign matter.

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

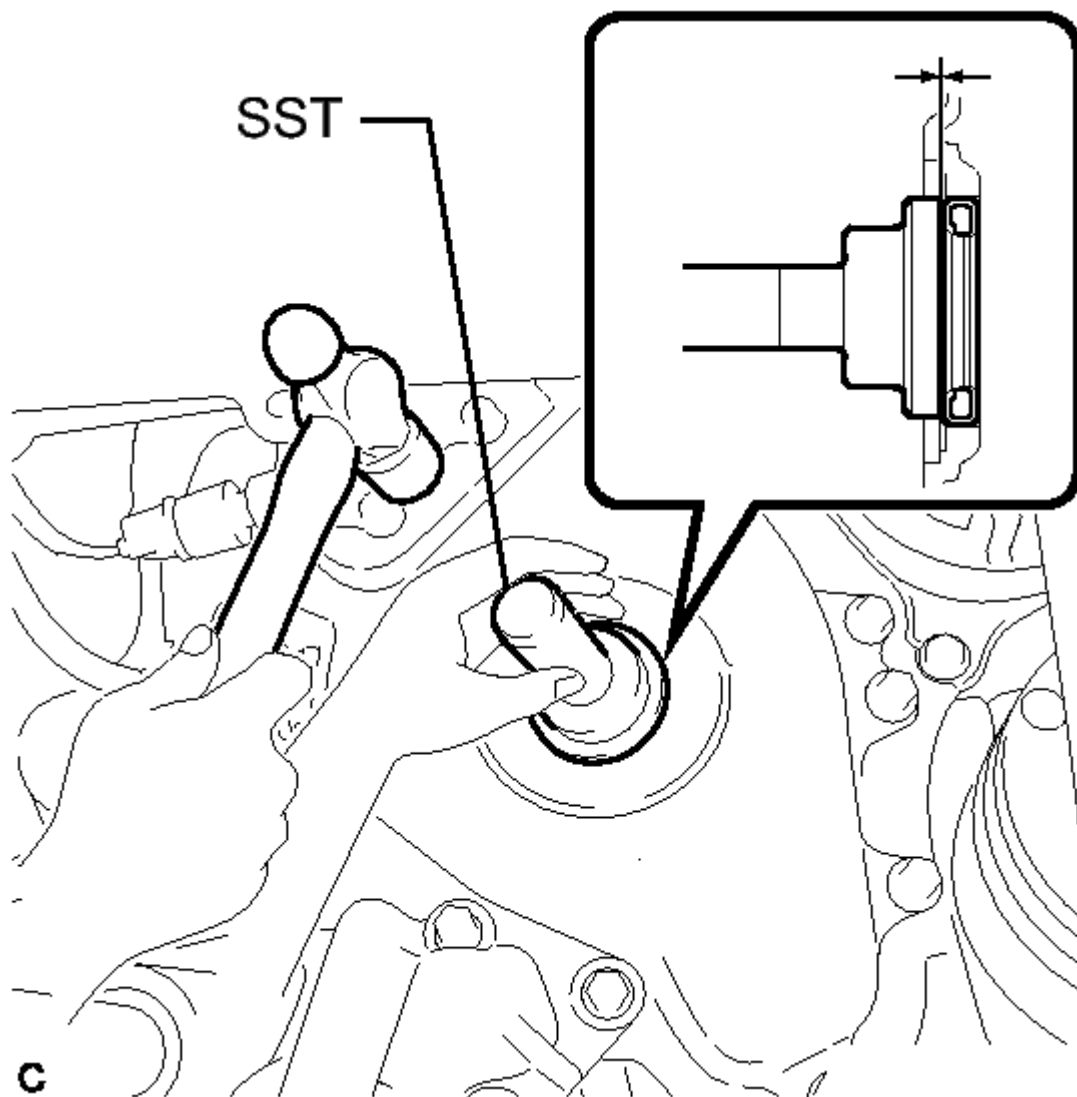


Fig. 115: Tapping Oil Seal

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

- SST: 09223-22010

NOTE: Wipe off extra grease from the crankshaft.

2. INSTALL CRANKSHAFT PULLEY

- Align the pulley set key with the key groove of the pulley.
- Using SST, hold the pulley in place and tighten the bolt.

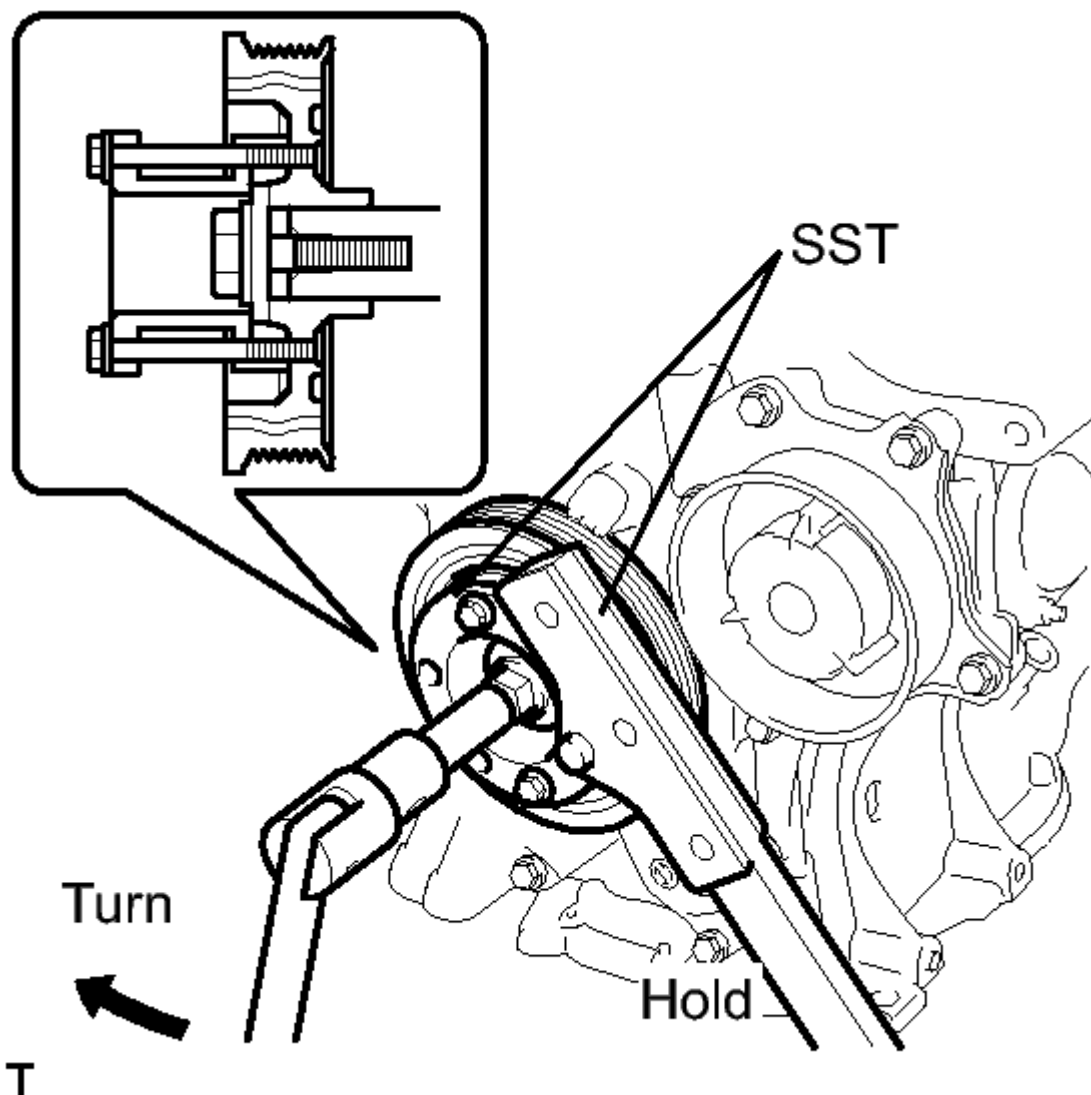


Fig. 116: Tightening Pulley Bolt

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

- SST: 09213-58014
91551-80840
- SST: 09330-00021

Torque: 190 N*m (1940 kgf*cm, 140 ft.*lbf)

NOTE: Check the SST installation positions when installing them to prevent the SST fixing bolts from coming into contact with the timing chain cover sub-assembly.

3. **INSTALL V-RIBBED BELT** See step 1
4. **ADJUST V-RIBBED BELT** See step 2
5. **INSPECT V-RIBBED BELT** See step 1
6. **ADD ENGINE OIL** . Refer to **REPLACEMENT - Step 4**
7. **INSPECT FOR ENGINE OIL LEAK**

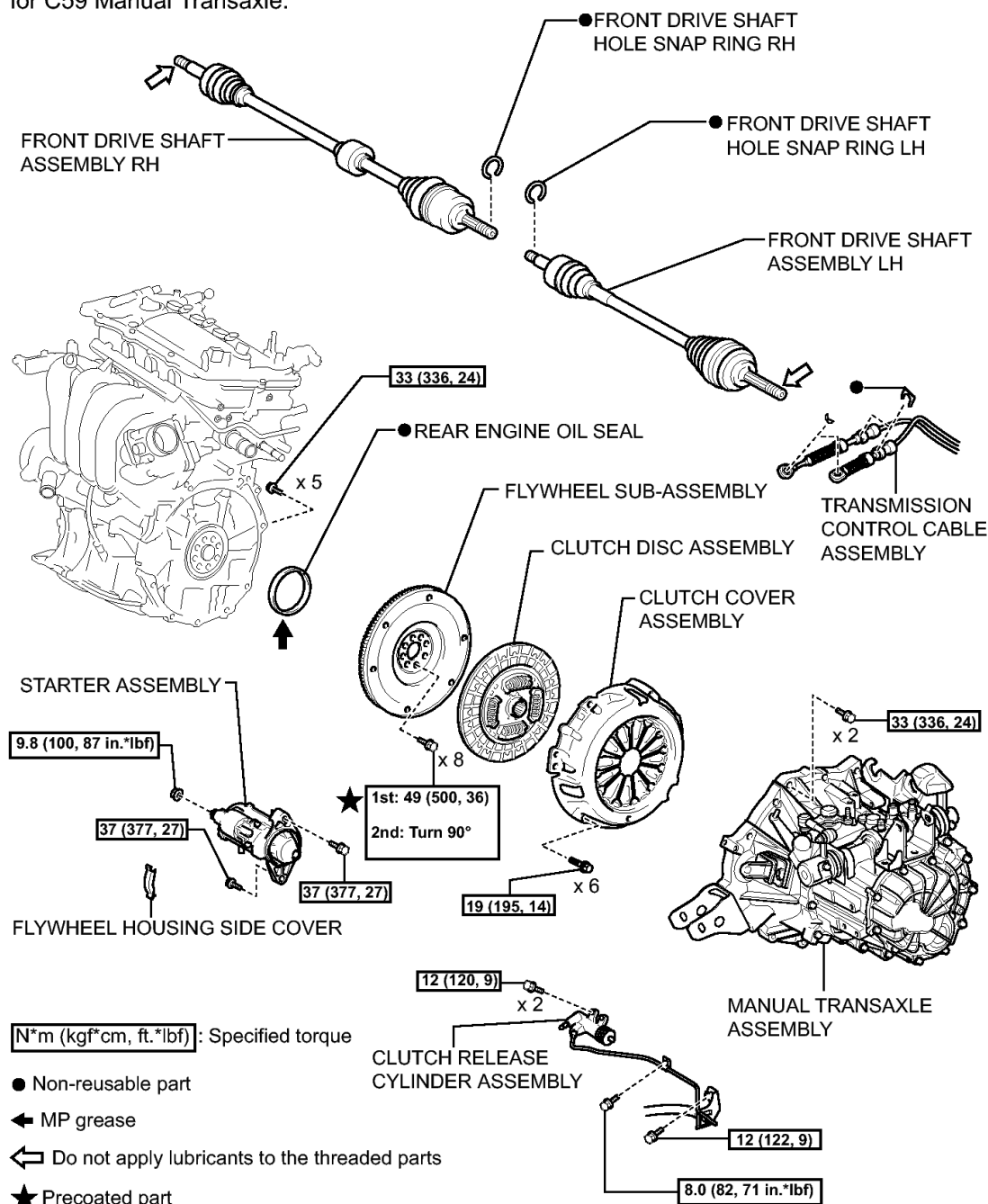
8. **INSTALL NO. 2 CYLINDER HEAD COVER** See step 85
9. **INSTALL ENGINE UNDER COVER RH**
10. **INSTALL FRONT WHEEL RH**

REAR CRANKSHAFT OIL SEAL

COMPONENTS

ILLUSTRATION

for C59 Manual Transaxle:



c

Fig. 117: Identifying Rear Crankshaft Oil Seal Replacement Components With Torque Specifications

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

for U341E Automatic Transaxle (for TMC Made):



Courtes

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

ILLUSTRATION

C

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

REMOVAL

HINT:

Refer to **REMOVAL**.

2. REMOVE MANUAL TRANSAXLE ASSEMBLY (for Manual Transaxle)

HINT:

Refer to **REMOVAL - Step 6** for C59.

3. REMOVE AUTOMATIC TRANSAXLE ASSEMBLY (for Automatic Transaxle)

HINT:

Refer to **REMOVAL - Step 11** for U341E.

4. REMOVE CLUTCH COVER ASSEMBLY (for Manual Transaxle) . Refer to **REMOVAL - Step 6**

5. REMOVE CLUTCH DISC ASSEMBLY (for Manual Transaxle) . Refer to **REMOVAL - Step 7**

6. REMOVE FLYWHEEL SUB-ASSEMBLY (for Manual Transaxle)

- a. Using SST, hold the crankshaft.

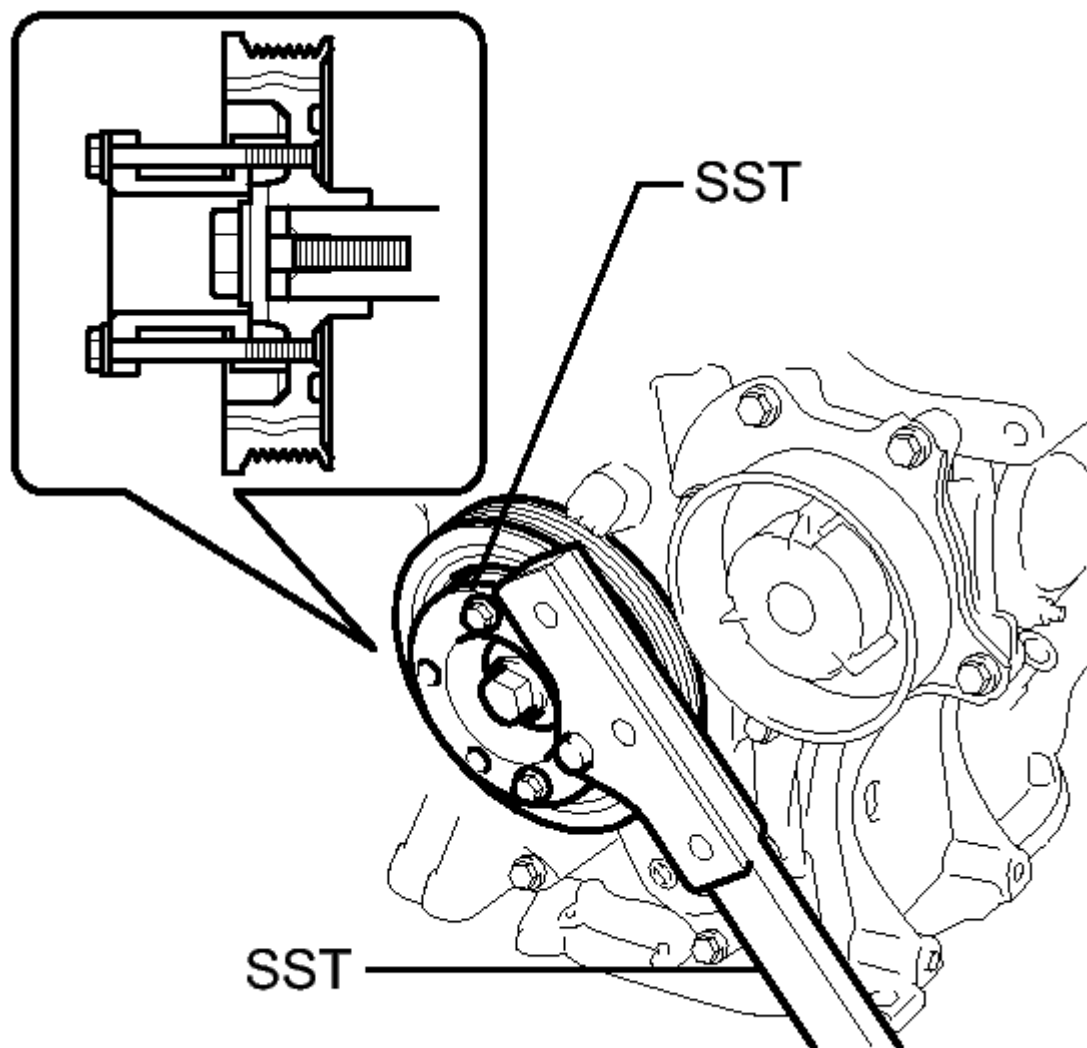


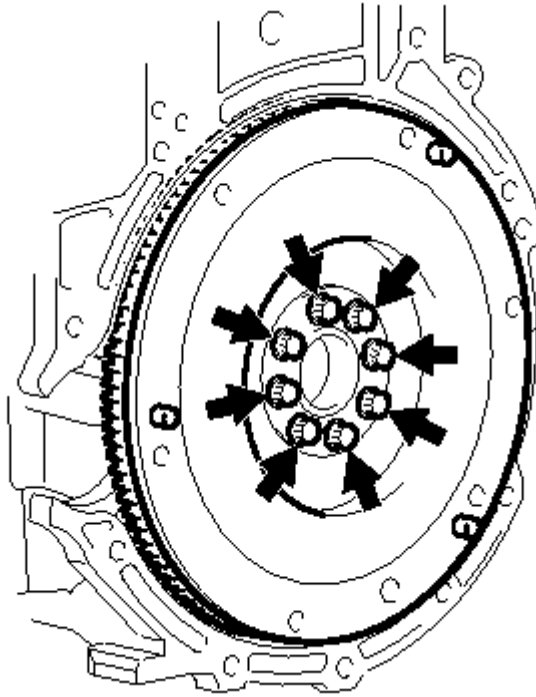
Fig. 120: Removing Crankshaft Pulley Bolt

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

- SST: 09213-58014
91551-80840
- SST: 09330-00021

NOTE: Check the SST installation positions when installing them to prevent the SST fixing bolts from coming into contact with the timing chain cover sub-assembly.

- b. Remove the 8 bolts and flywheel.



T

Fig. 121: Locating Bolts And Flywheel Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. **REMOVE DRIVE PLATE AND RING GEAR SUB-ASSEMBLY (for Automatic Transaxle)**
 - a. Using SST, hold the crankshaft.

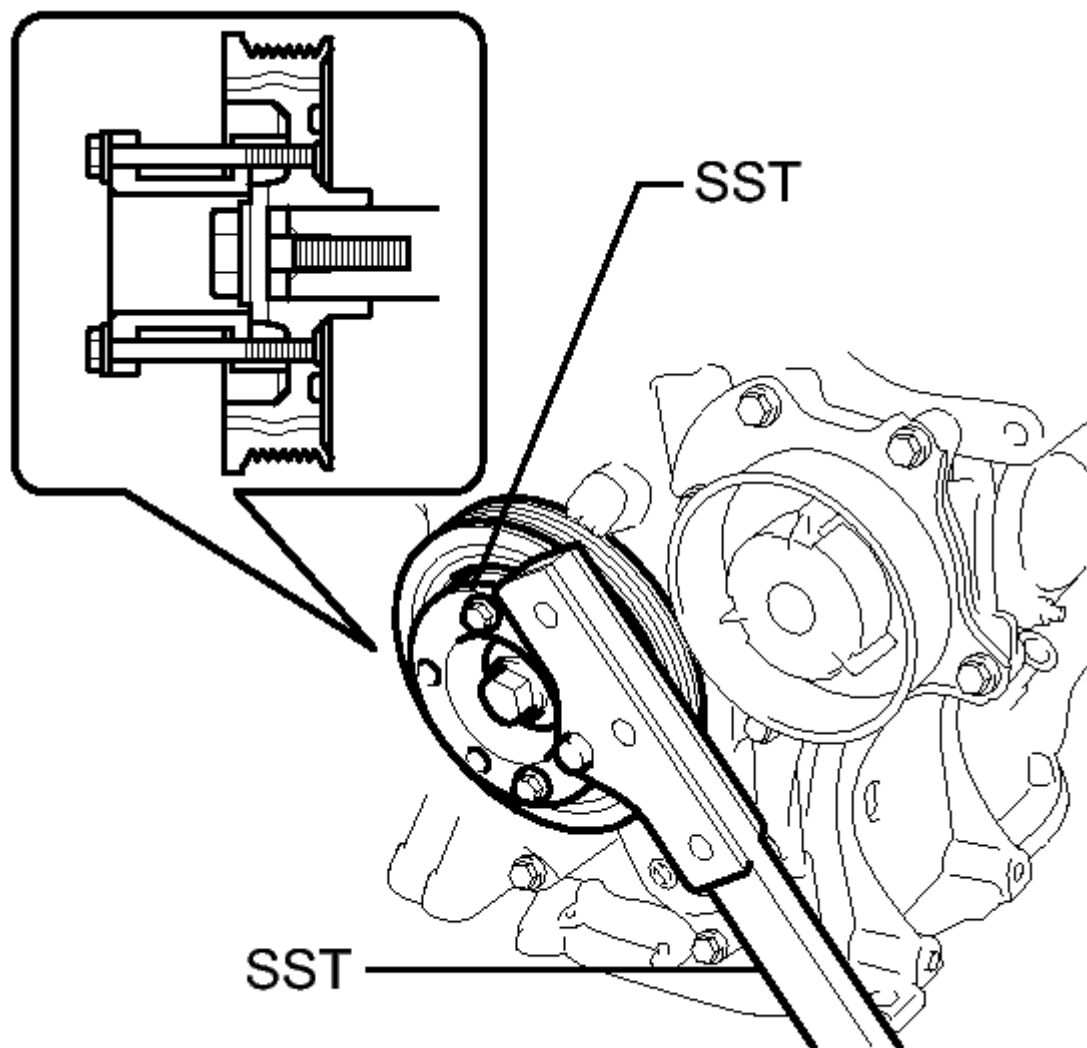


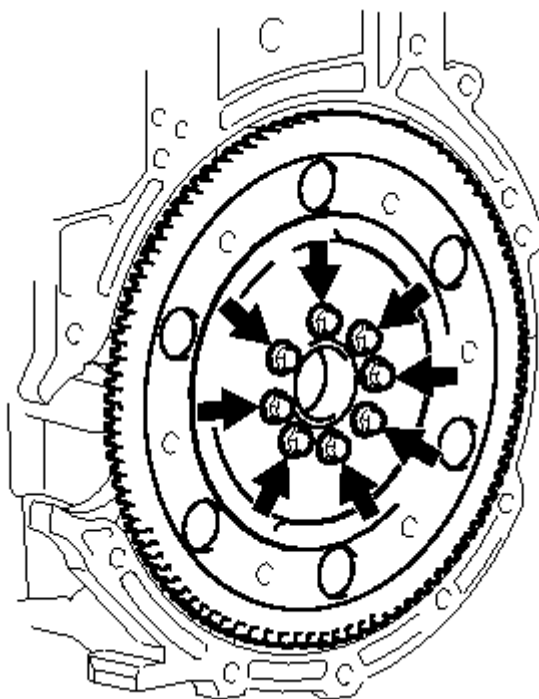
Fig. 122: Removing Crankshaft Pulley Bolt

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

- SST: 09213-58014
91551-80840
- SST: 09330-00021

NOTE: Check the SST installation positions when installing them to prevent the SST fixing bolts from coming into contact with the timing chain cover sub-assembly.

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



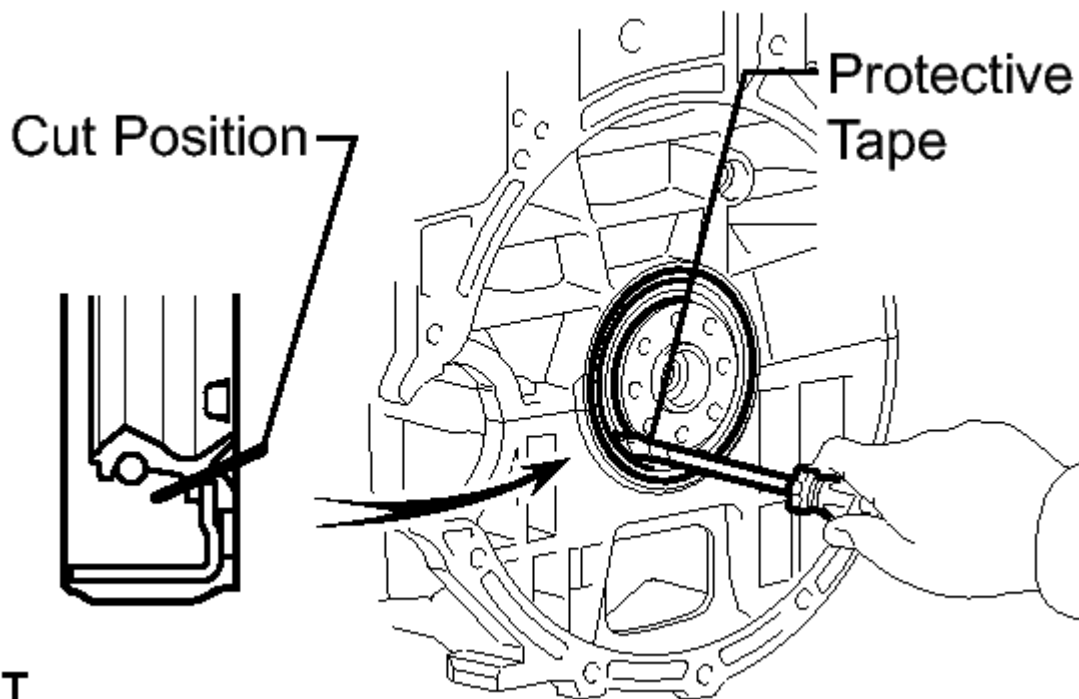
T

Fig. 123: Locating Bolts And Drive Plate

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

8. REMOVE REAR ENGINE OIL SEAL

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



T

Fig. 124: Removing Rear Engine Oil Seal

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

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

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

INSTALLATION

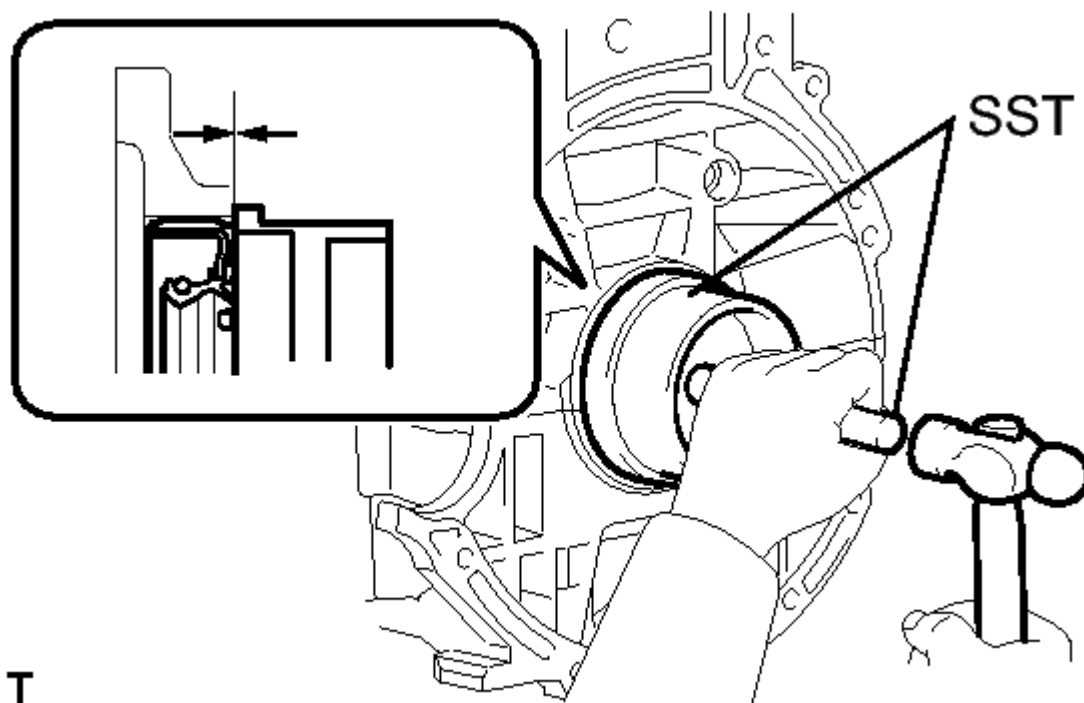
INSTALLATION

1. INSTALL REAR ENGINE OIL SEAL

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

NOTE: Keep the lip free from foreign matter.

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



T

Fig. 125: Installing Rear Engine Oil Seal

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

- SST: 09223-15030
- SST: 09950-70010
- 09951-07100

NOTE:

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

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

- a. Using SST, hold the crankshaft.

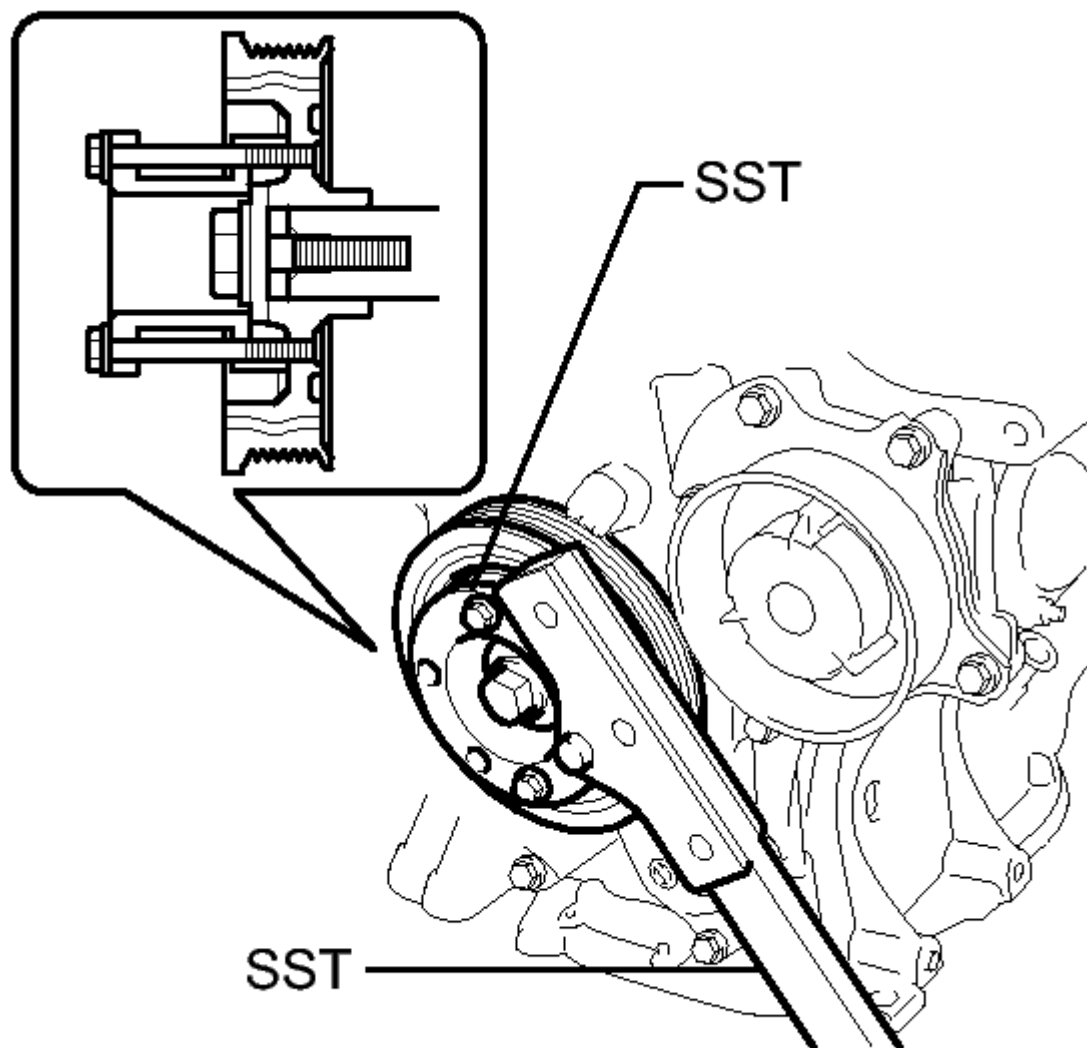
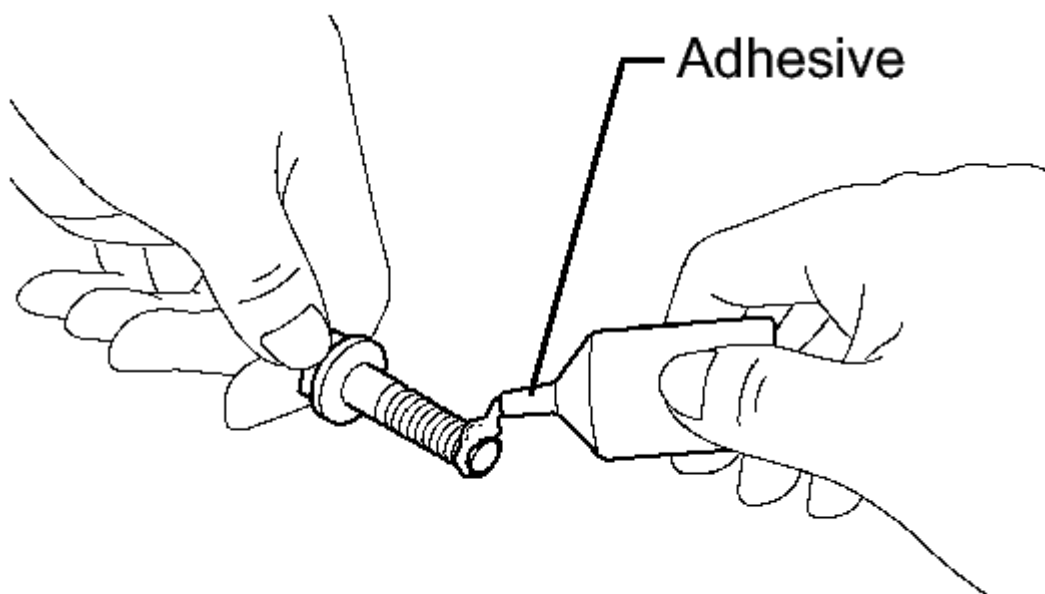


Fig. 126: Removing Crankshaft Pulley Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09213-58014
91551-80840
- SST: 09330-00021

NOTE: Check the SST installation positions when installing them to prevent the SST fixing bolts from coming into contact with the timing chain cover sub-assembly.

- b. Apply adhesive to 2 or 3 threads of the bolt ends.



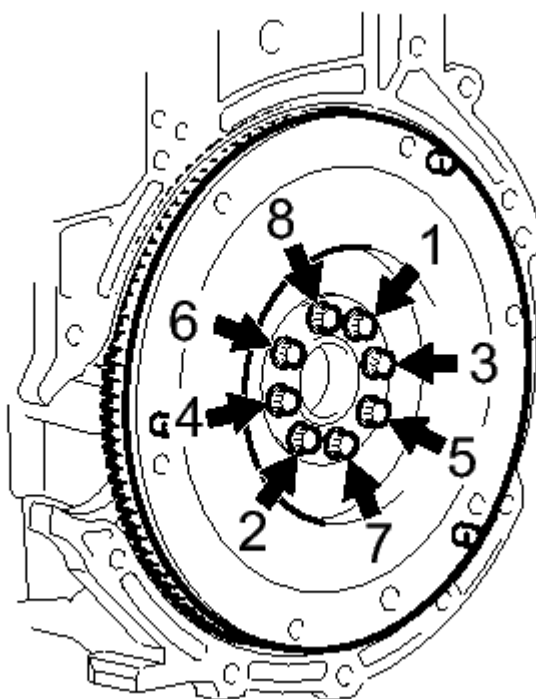
Y

Fig. 127: Applying Adhesive To End Or Threads Of Bolts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Adhesive

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

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

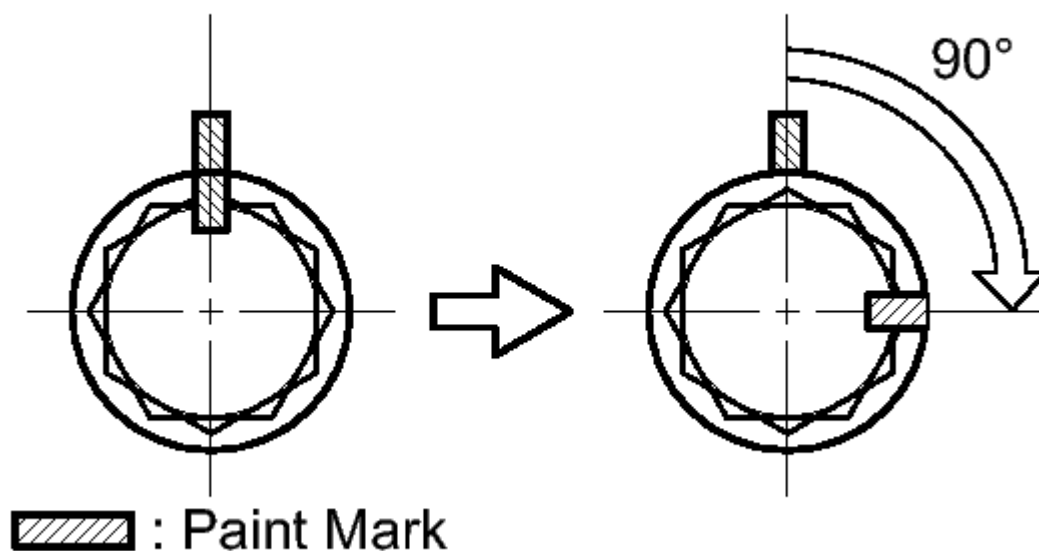


T

Fig. 128: Locating Flywheel And Bolts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 49 N*m (500 kgf*cm, 36 ft.*lbf)

- d. Mark the top of the bolts with paint.



P

Fig. 129: Identifying Paint Marks On Upper Edge Of Bolt Heads
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Retighten the 8 bolts an additional 90° in the same sequence.
f. Check that the paint marks are now at a 90° angle to the top.
g. Check that the crankshaft turns smoothly.
3. **INSTALL DRIVE PLATE AND RING GEAR SUB-ASSEMBLY (for Automatic Transaxle)**
- a. Using SST, hold the crankshaft.

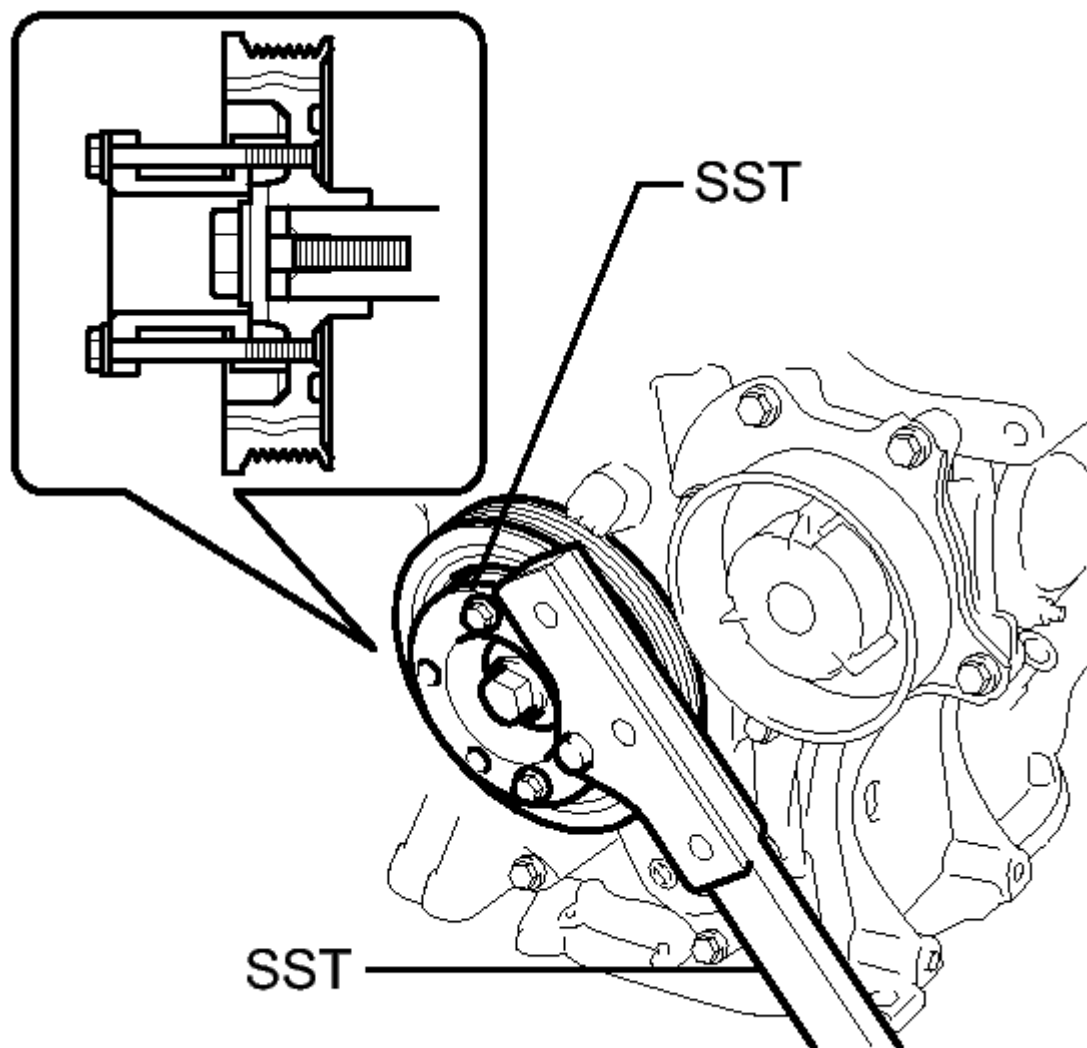
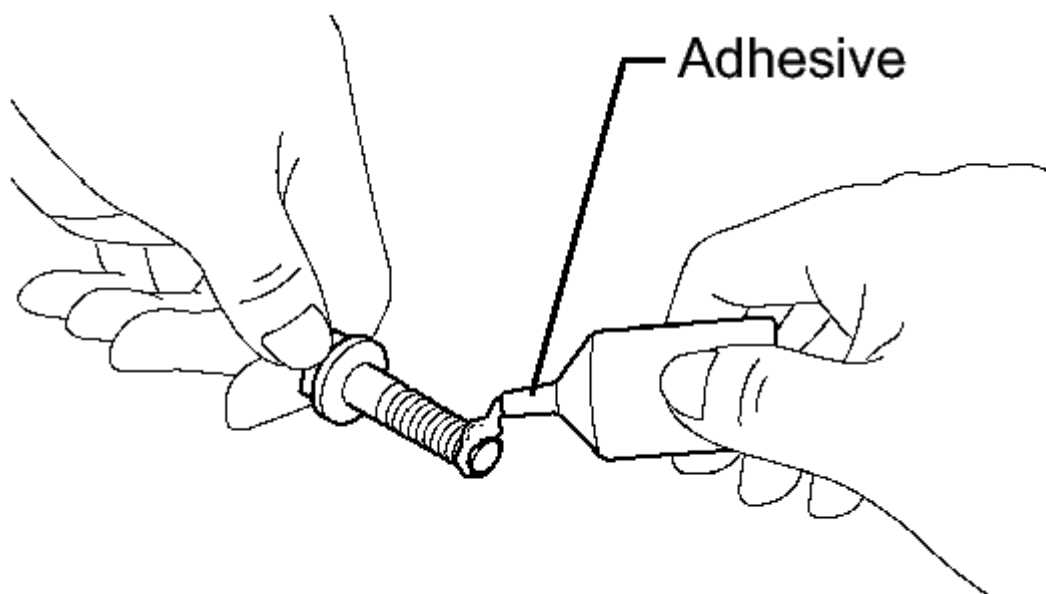


Fig. 130: Removing Crankshaft Pulley Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09213-58014
91551-80840
- SST: 09330-00021

NOTE: Check the SST installation positions when installing them to prevent the SST fixing bolts from coming into contact with the timing chain cover sub-assembly.

- Clean the bolts and the bolt holes.
- Apply a few drops of adhesive to 2 or 3 threads of the 8 bolts tip.



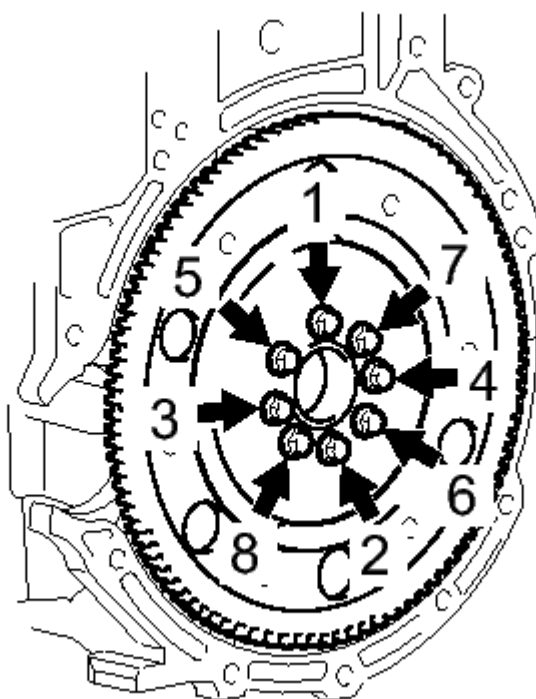
Y

Fig. 131: Applying Adhesive To End Or Threads Of Bolts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Adhesive

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

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



T

Fig. 132: Identifying Drive Plate Bolts Tightening Sequence
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

4. **INSTALL CLUTCH DISC ASSEMBLY (for Manual Transaxle)** . Refer to **INSTALLATION - Step 1**
5. **INSTALL CLUTCH COVER ASSEMBLY (for Manual Transaxle)** . Refer to **INSTALLATION - Step 2**
6. **INSPECT AND ADJUST CLUTCH COVER ASSEMBLY (for Manual Transaxle)** . Refer to **INSTALLATION - Step 3**
7. **INSTALL MANUAL TRANSAXLE ASSEMBLY (for Manual Transaxle)**

HINT:

Refer to **INSTALLATION** for C59.

8. **INSTALL AUTOMATIC TRANSAXLE ASSEMBLY (for Automatic Transaxle)**

HINT:

Refer to **INSTALLATION** for U341E.

9. **INSTALL ENGINE ASSEMBLY WITH TRANSAXLE**

HINT:

Refer to **INSTALLATION**.

ENGINE ASSEMBLY

COMPONENTS

ILLUSTRATION

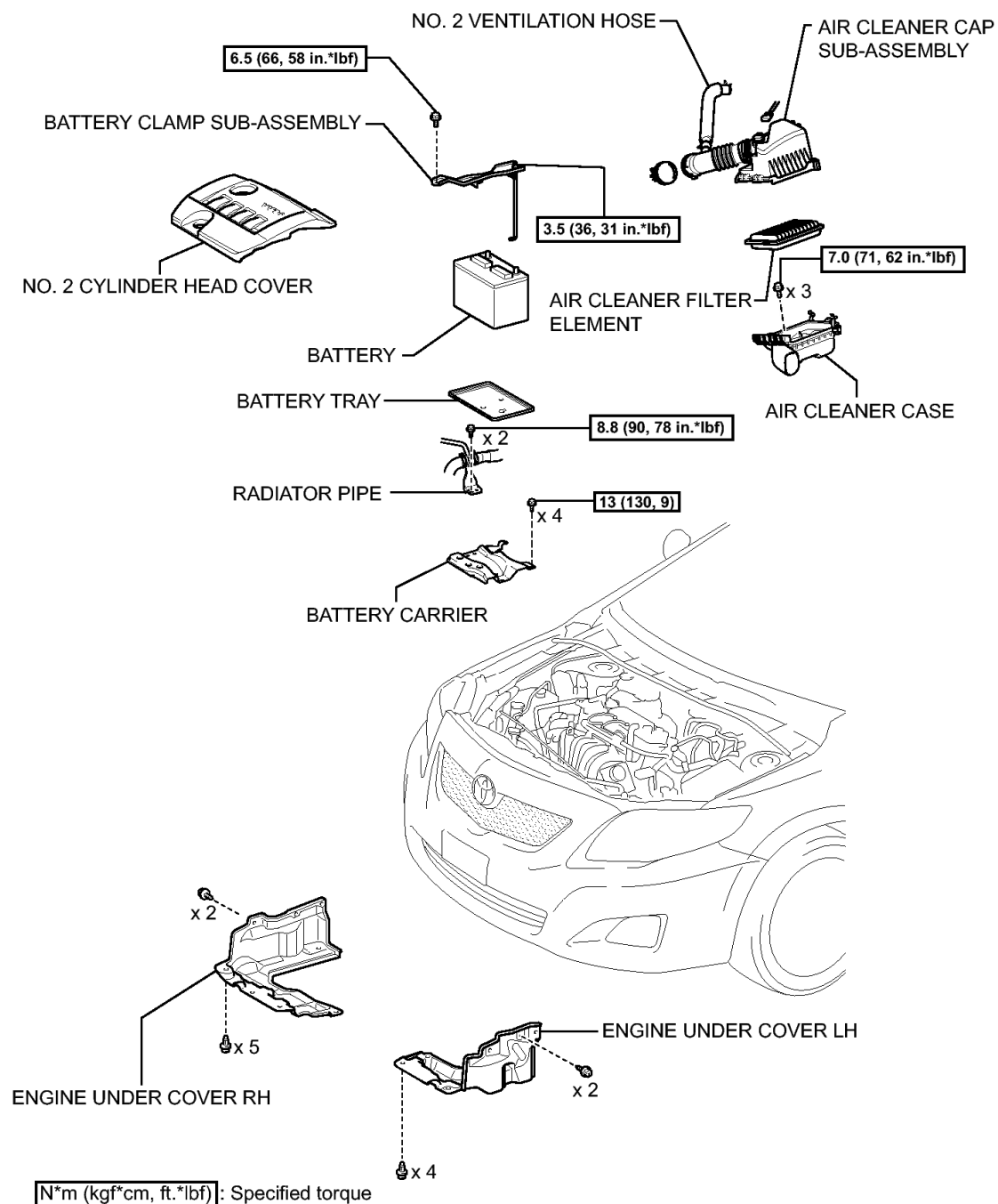
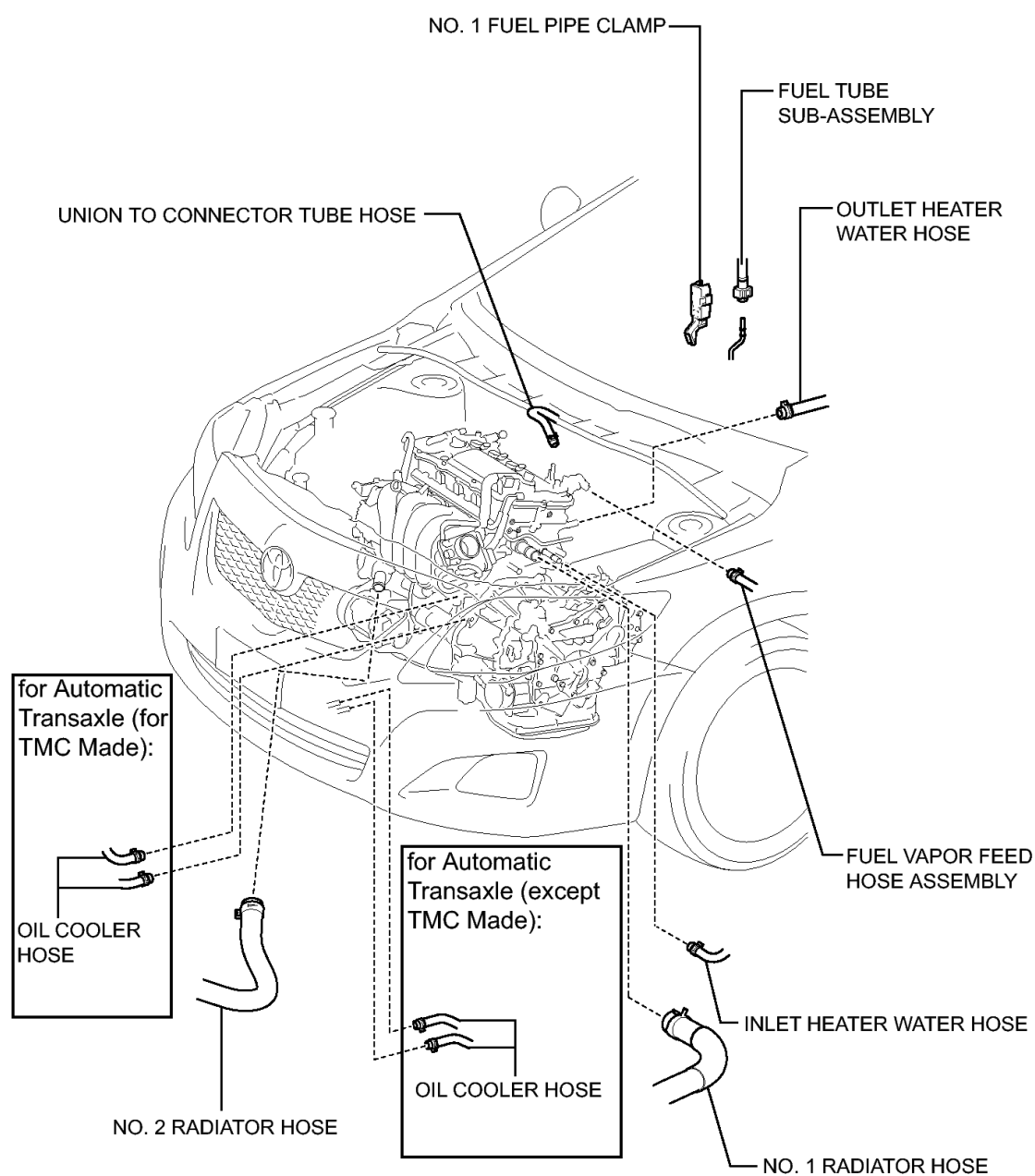


Fig. 133: Identifying Engine Assembly Replacement Components With Torque Specifications (1 Of 9)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

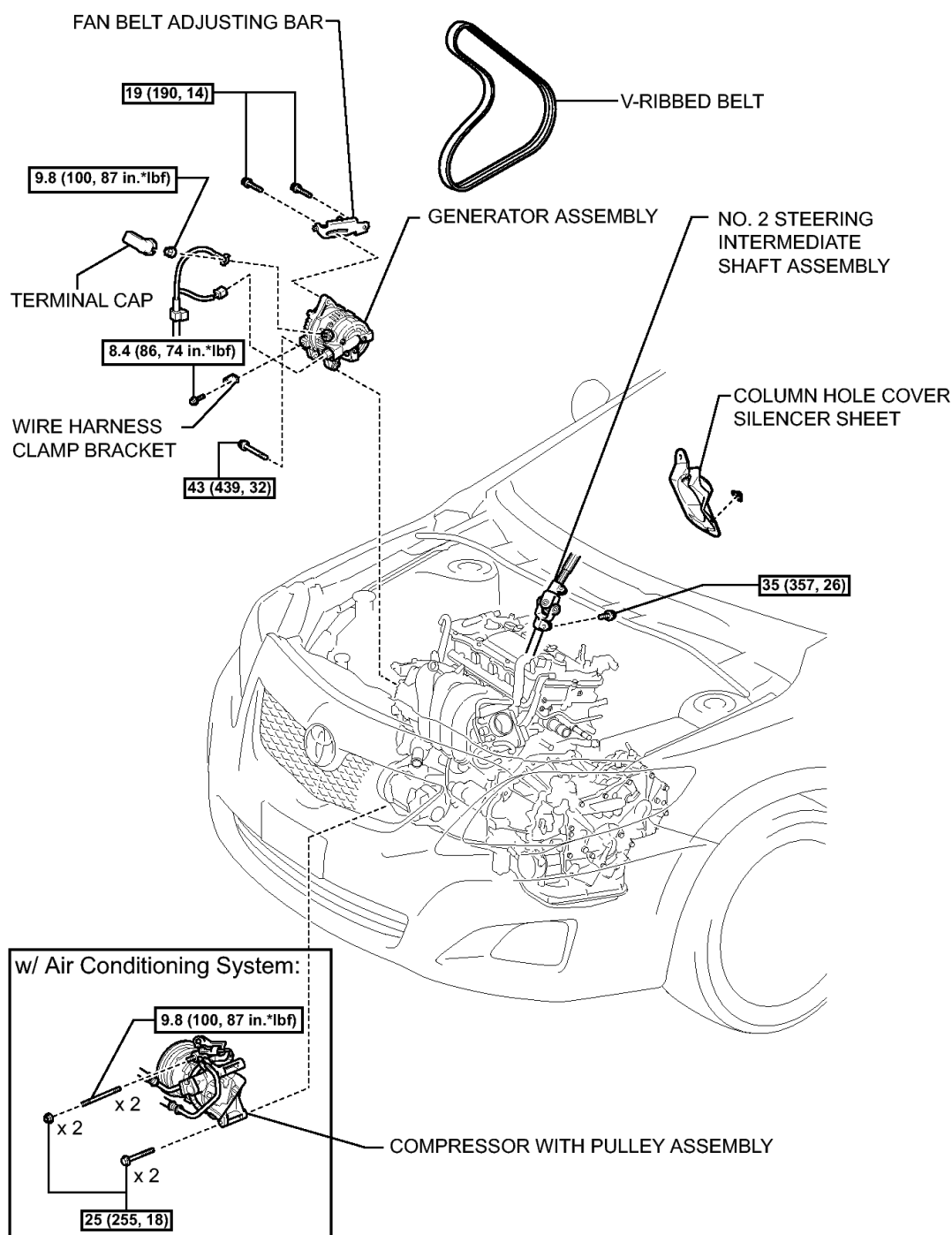
ILLUSTRATION



c

Fig. 134: Identifying Engine Assembly Replacement Components (2 Of 9)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



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

c

Fig. 135: Identifying Engine Assembly Replacement Components With Torque Specifications (3 Of 9)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

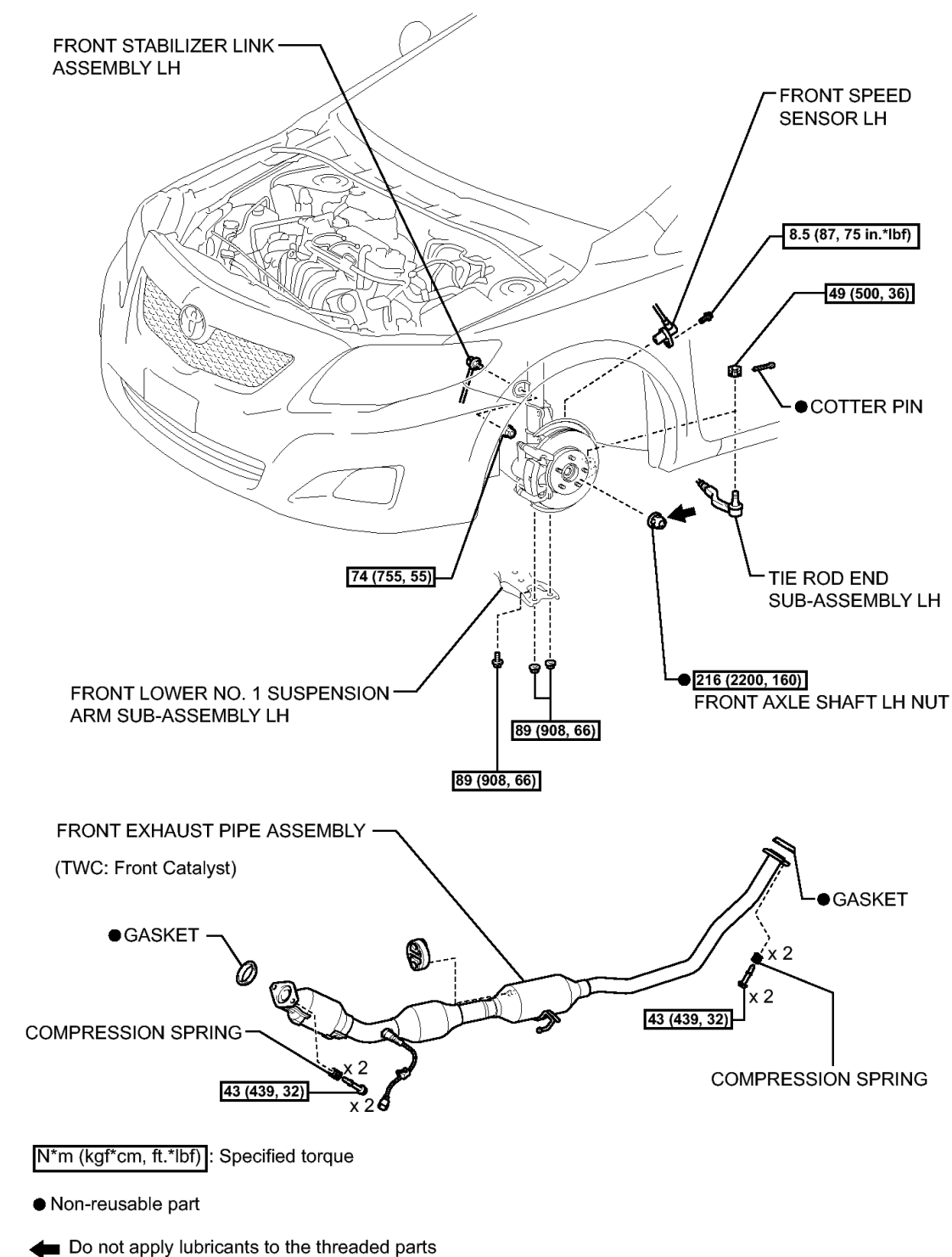
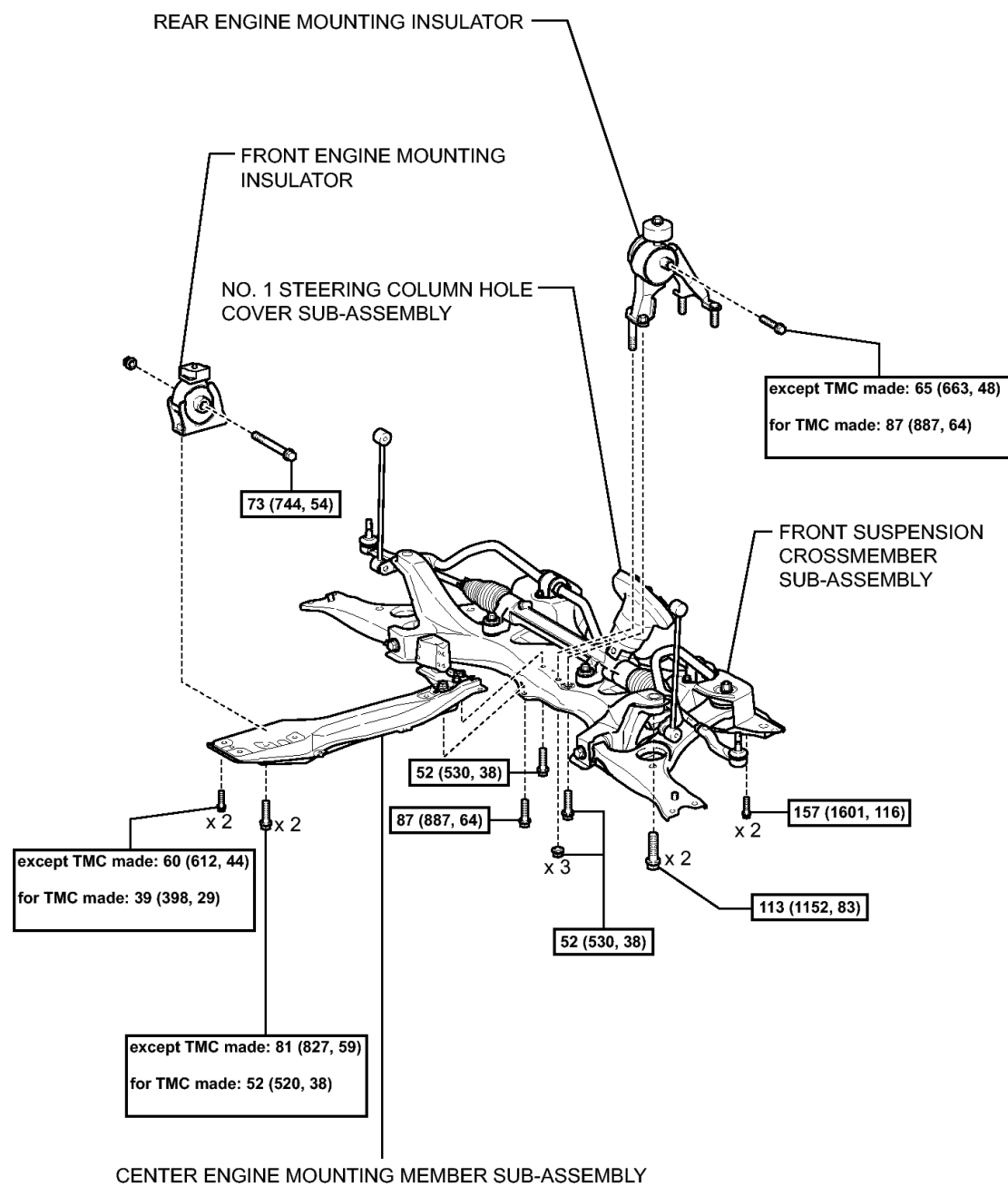


Fig. 136: Identifying Engine Assembly Replacement Components With Torque Specifications (4 Of 9)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

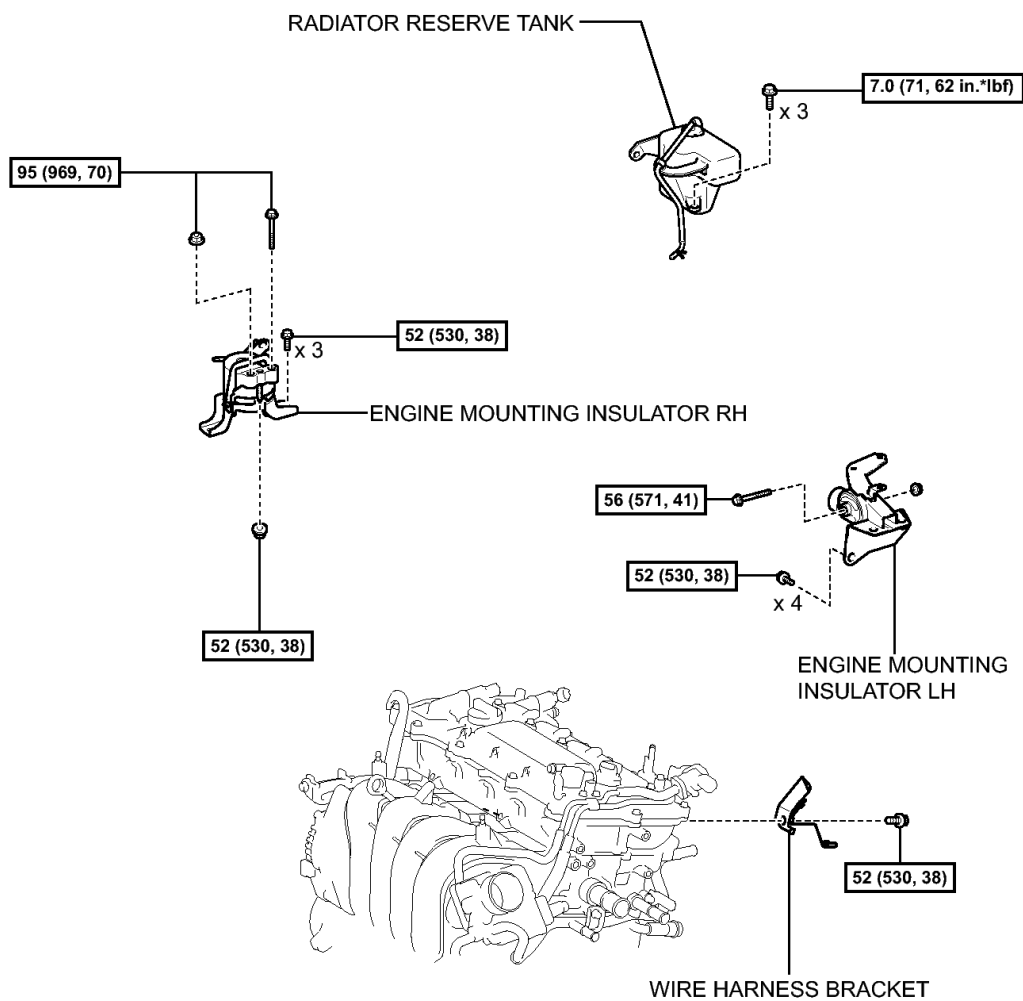


[N*m (kgf*cm, ft.*lbf)]: Specified torque

c

Fig. 137: Identifying Engine Assembly Replacement Components With Torque Specifications (5 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



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

c

Fig. 138: Identifying Engine Assembly Replacement Components With Torque Specifications (6 Of 8)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

FRONT DRIVE SHAFT ASSEMBLY RH

FRONT DRIVE SHAFT HOLE SNAP RING RH

FRONT DRIVE SHAFT HOLE SNAP RING LH

FRONT DRIVE SHAFT ASSEMBLY LH

33 (336, 24)

x 5

FLYWHEEL SUB-ASSEMBLY

CLUTCH DISC ASSEMBLY

CLUTCH COVER ASSEMBLY

TRANSMISSION CONTROL CABLE ASSEMBLY

STARTER ASSEMBLY

9.8 (100, 87 in.*lbf)

37 (377, 27)

FLYWHEEL HOUSING SIDE COVER

1st: 49 (500, 36)
2nd: Turn 90°

19 (195, 14)

x 6

MANUAL TRANSAXLE ASSEMBLY

12 (120, 9)

x 2

CLUTCH RELEASE CYLINDER ASSEMBLY

12 (122, 9)

8.0 (82, 71 in.*lbf)

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

● Non-reusable part

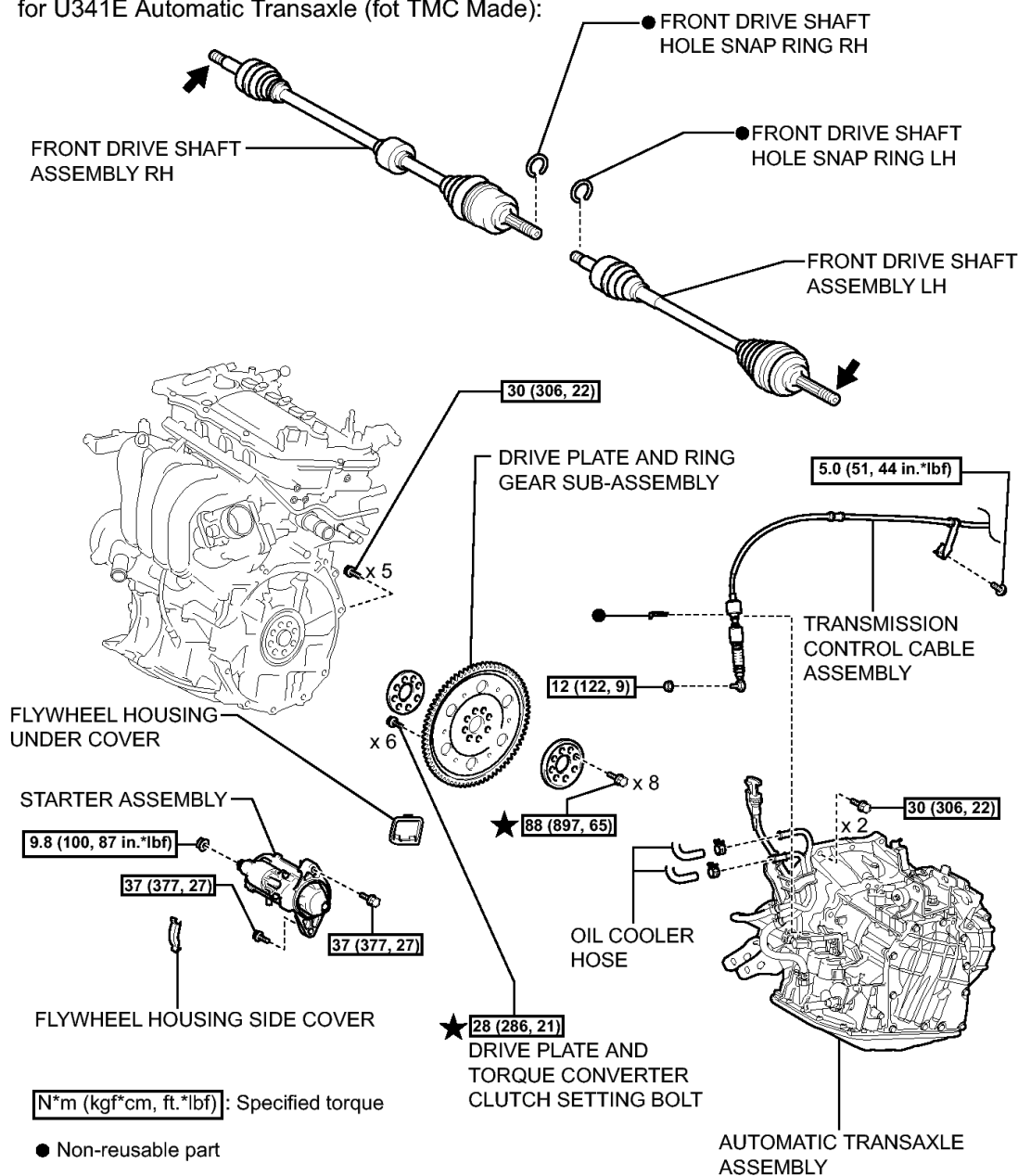
⬅ Do not apply lubricants to the threaded parts

★ Precoated part

C

ILLUSTRATION

for U341E Automatic Transaxle (for TMC Made):

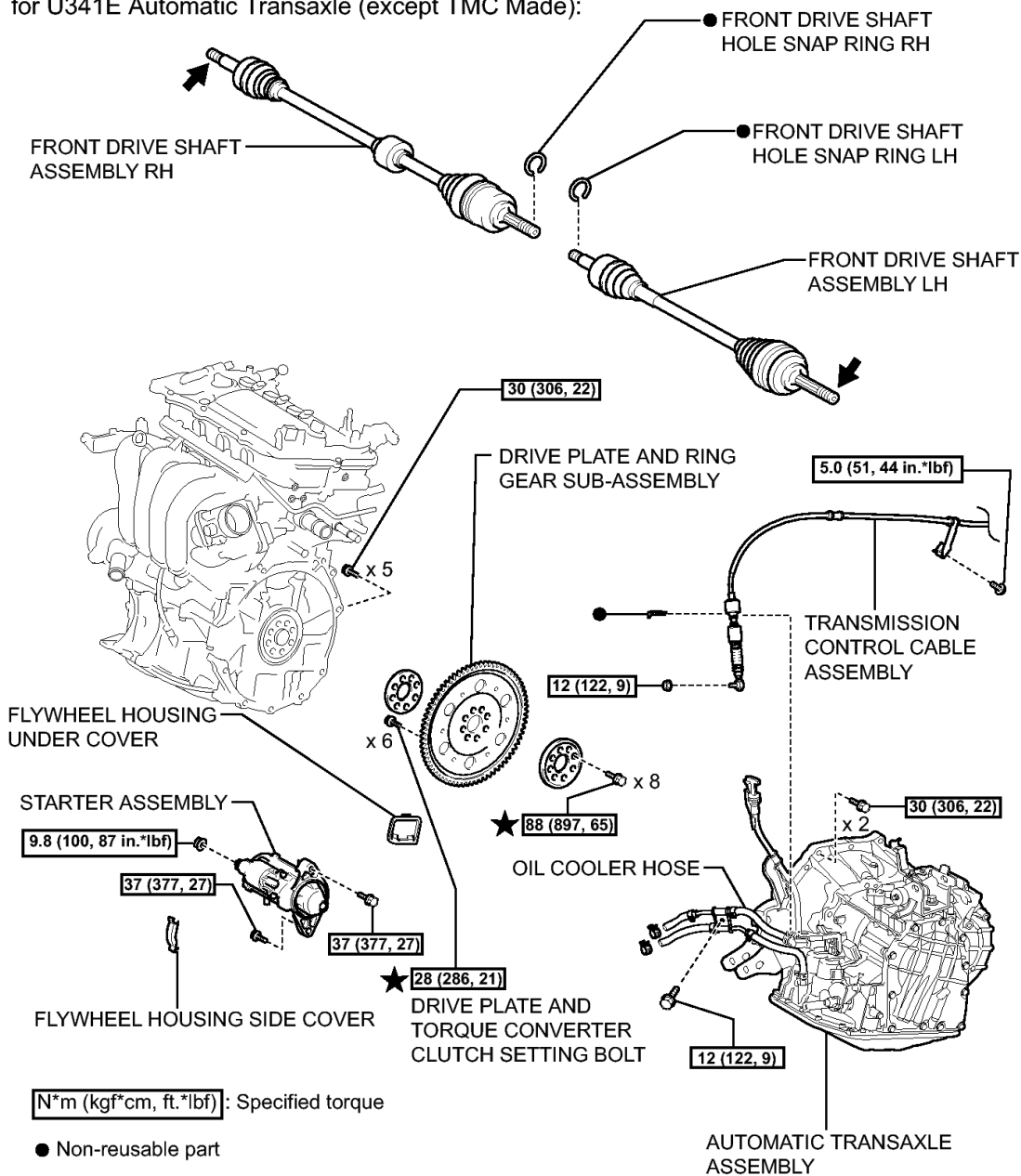


c

Fig. 140: Identifying Engine Assembly Replacement Components With Torque Specifications (8 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

for U341E Automatic Transaxle (except TMC Made):



c

Fig. 141: Identifying Engine Assembly Replacement Components With Torque Specifications (9 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

REMOVAL

1. DISCHARGE FUEL SYSTEM PRESSURE

HINT:

Refer to **PRECAUTION**.

2. **ALIGN FRONT WHEELS FACING STRAIGHT AHEAD**
3. **REMOVE FRONT WHEEL**
4. **REMOVE ENGINE UNDER COVER LH**
5. **REMOVE ENGINE UNDER COVER RH**
6. **DRAIN ENGINE COOLANT** . Refer to **REPLACEMENT - Step 1**
7. **DRAIN ENGINE OIL** . Refer to **REPLACEMENT - Step 1**
8. **DRAIN MANUAL TRANSAXLE OIL** (for Manual Transaxle)

HINT:

Refer to **REPLACEMENT** for C59.

9. **DRAIN AUTOMATIC TRANSAXLE FLUID** (for Automatic Transaxle)

HINT:

Refer to **REMOVAL** for U341E.

10. **REMOVE NO. 2 CYLINDER HEAD COVER**

- a. Hold the rear of the cover and raise it to disengage the 2 clips on the rear of the cover. Continue to raise the cover to disengage the 2 clips on the front of the cover to remove the cover.

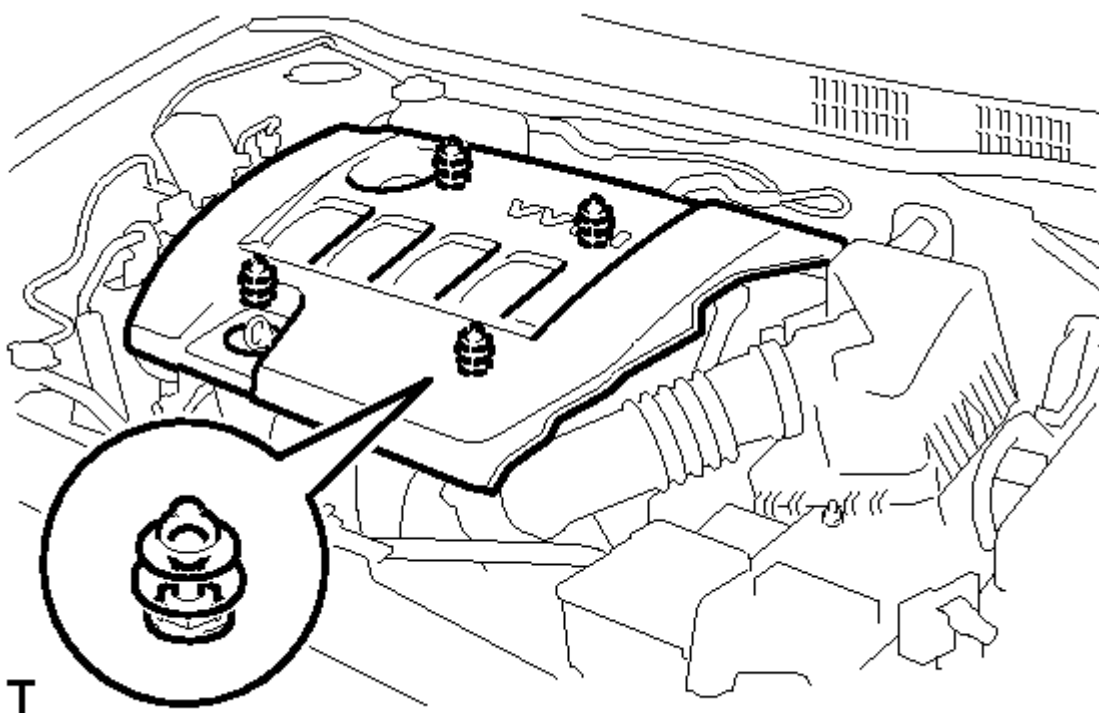
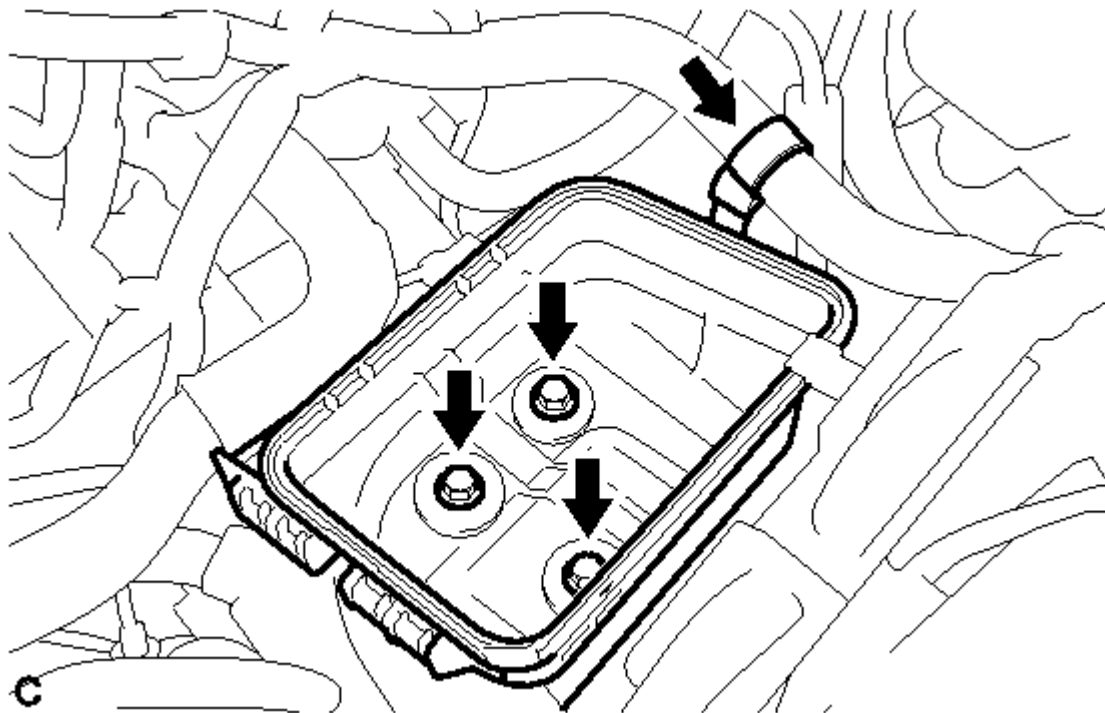


Fig. 142: Identifying No. 2 Cylinder Head Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Attempting to disengage both front and rear clips at the same time may cause the cover to break.

11. REMOVE AIR CLEANER CAP SUB-ASSEMBLY . Refer to REMOVAL - Step 3**12. REMOVE AIR CLEANER CASE**

- a. Separate the air cleaner filter element from the air cleaner.
- b. Disconnect the engine wire harness clamp from air cleaner case.

**Fig. 143: Locating Battery Bolts**

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

- c. Remove the 3 bolts and the air cleaner case.

13. REMOVE BATTERY

- a. Disconnect the battery cables.
- b. Remove the bolt and loosen the nut.
- c. Remove the battery.

14. REMOVE BATTERY CARRIER

- a. Separate the 2 wire harness clamps from the battery carrier.

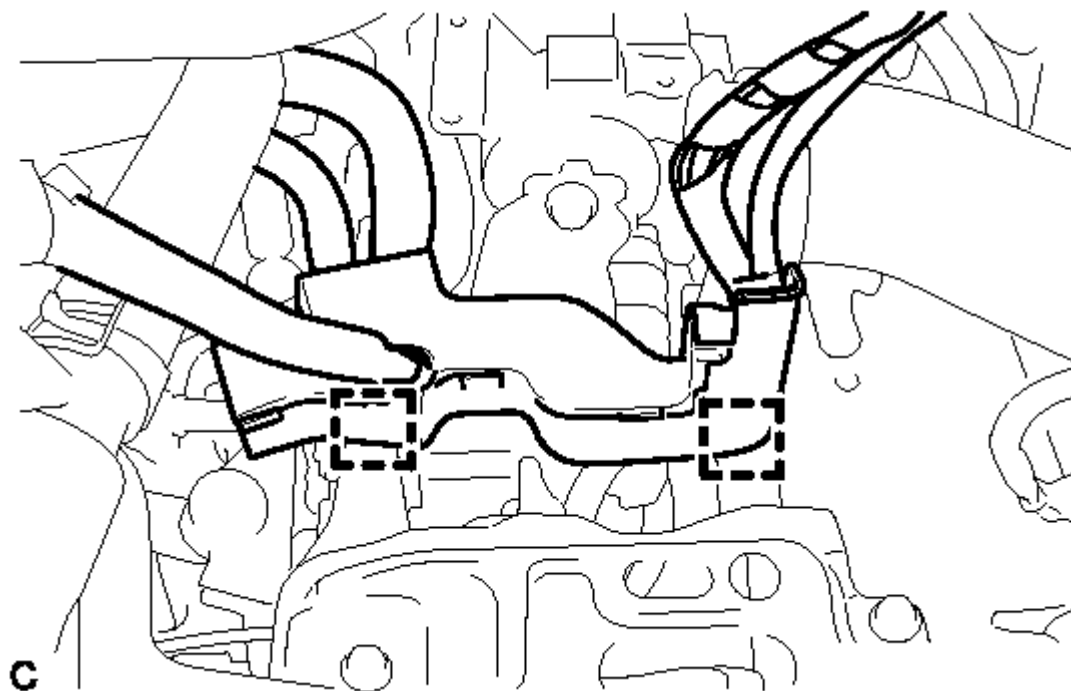


Fig. 144: Identifying Wire Harness Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 2 bolts.

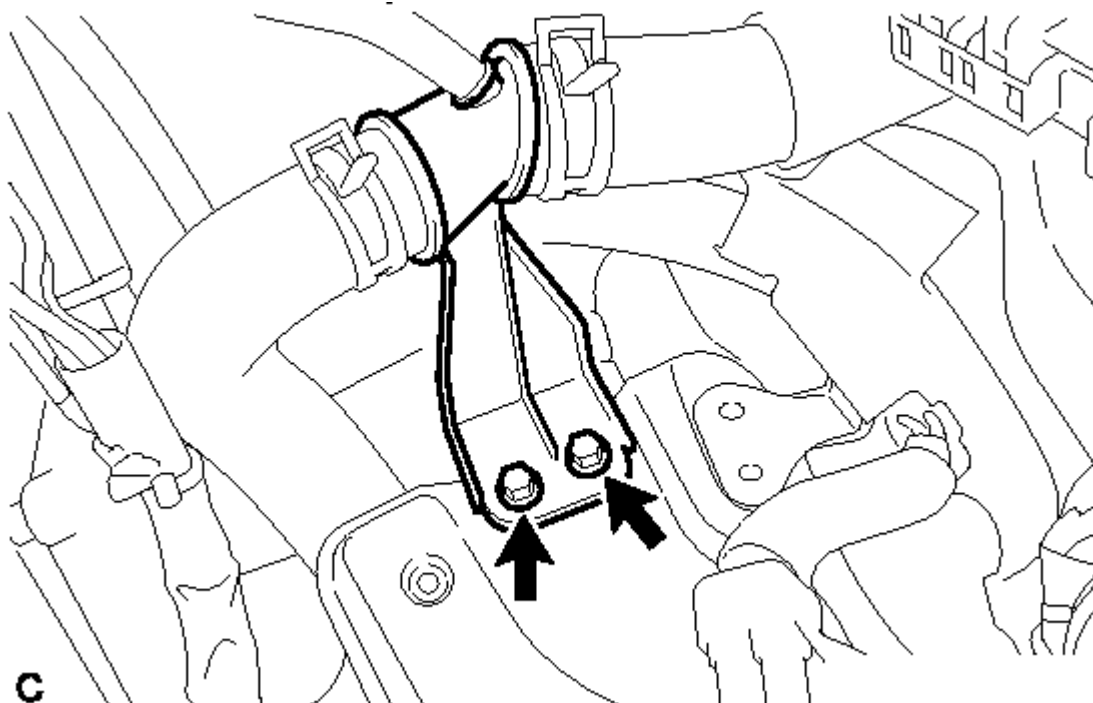


Fig. 145: Identifying Battery Carrier Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Separate the radiator pipe from the battery carrier.
- d. Remove the 4 bolts and battery carrier.

15. DISCONNECT NO. 1 RADIATOR HOSE

- a. Disengage the clamp*1.

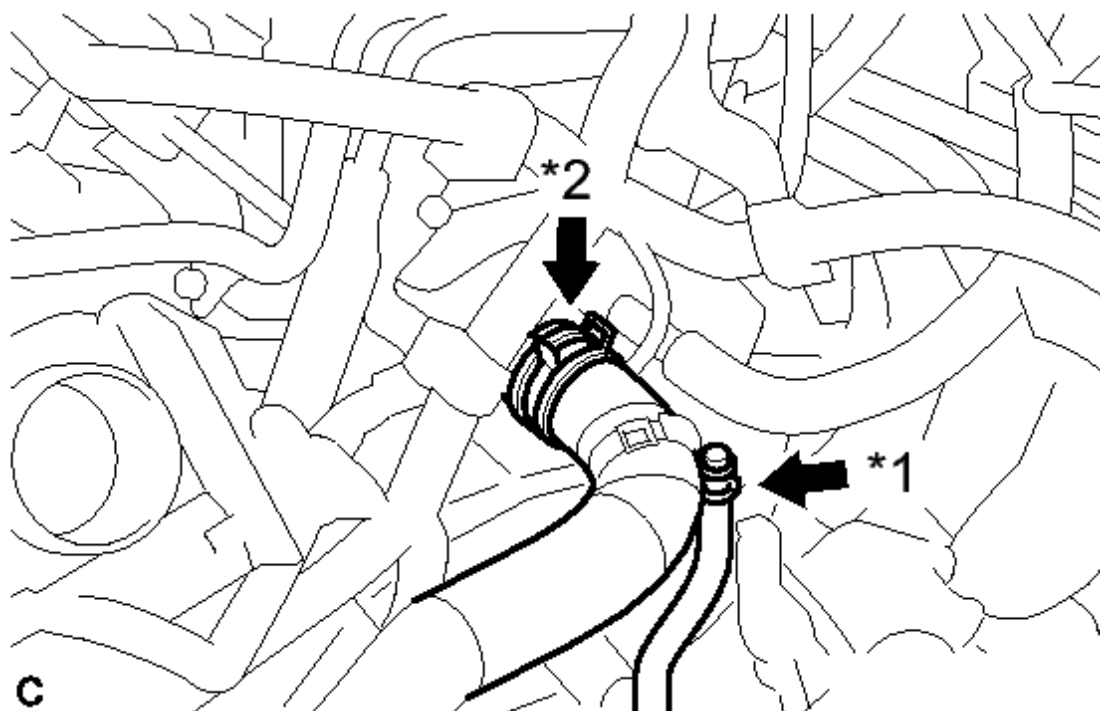


Fig. 146: Locating No. 1 Radiator Hose

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

- b. Disconnect the No. 1 radiator hose from the cylinder head with the clamp*2.

16. DISCONNECT NO. 2 RADIATOR HOSE

- a. Disconnect the No. 2 radiator hose from the water inlet hose.

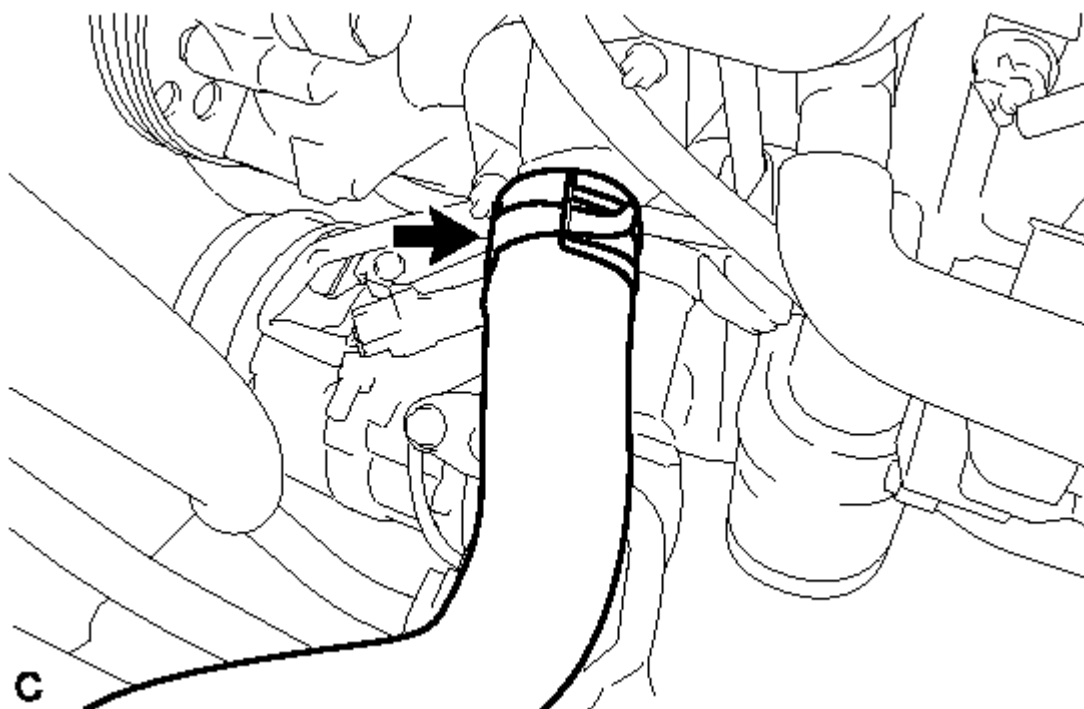
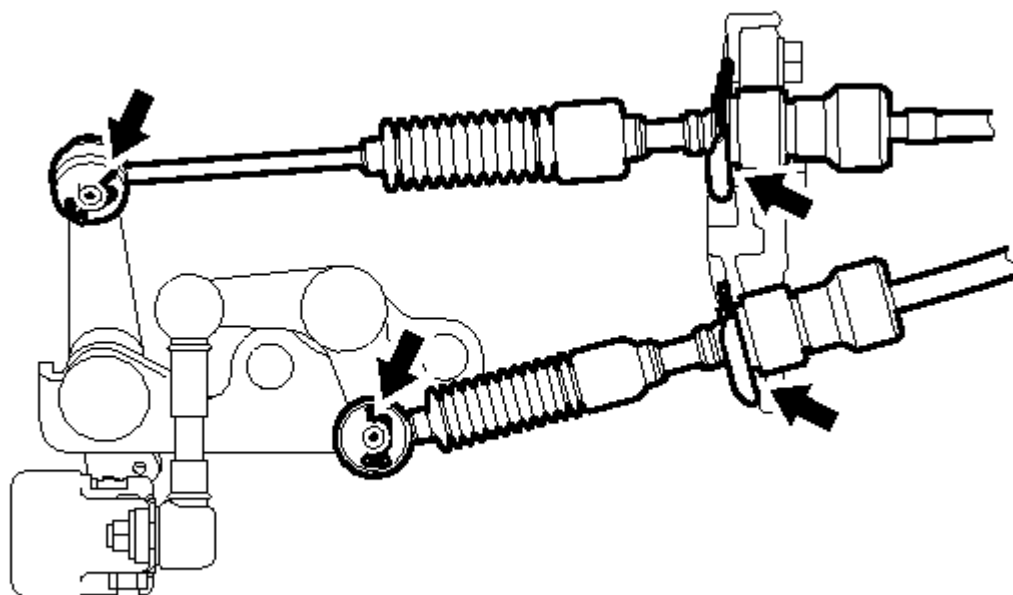


Fig. 147: Locating No. 2 Radiator Hose

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

17. **DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY (for Manual Transaxle)**
 - a. Remove the 2 clips and disconnect the 2 cables from the transaxle.

**C****Fig. 148: Locating Transmission Control Cable Assembly (Manual Transaxle)**

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

- b. Remove the 2 clips and disconnect the 2 cables from the control cable bracket.
18. **DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY (for Automatic Transaxle)**
 - a. Disconnect the control cable from the control cable support.

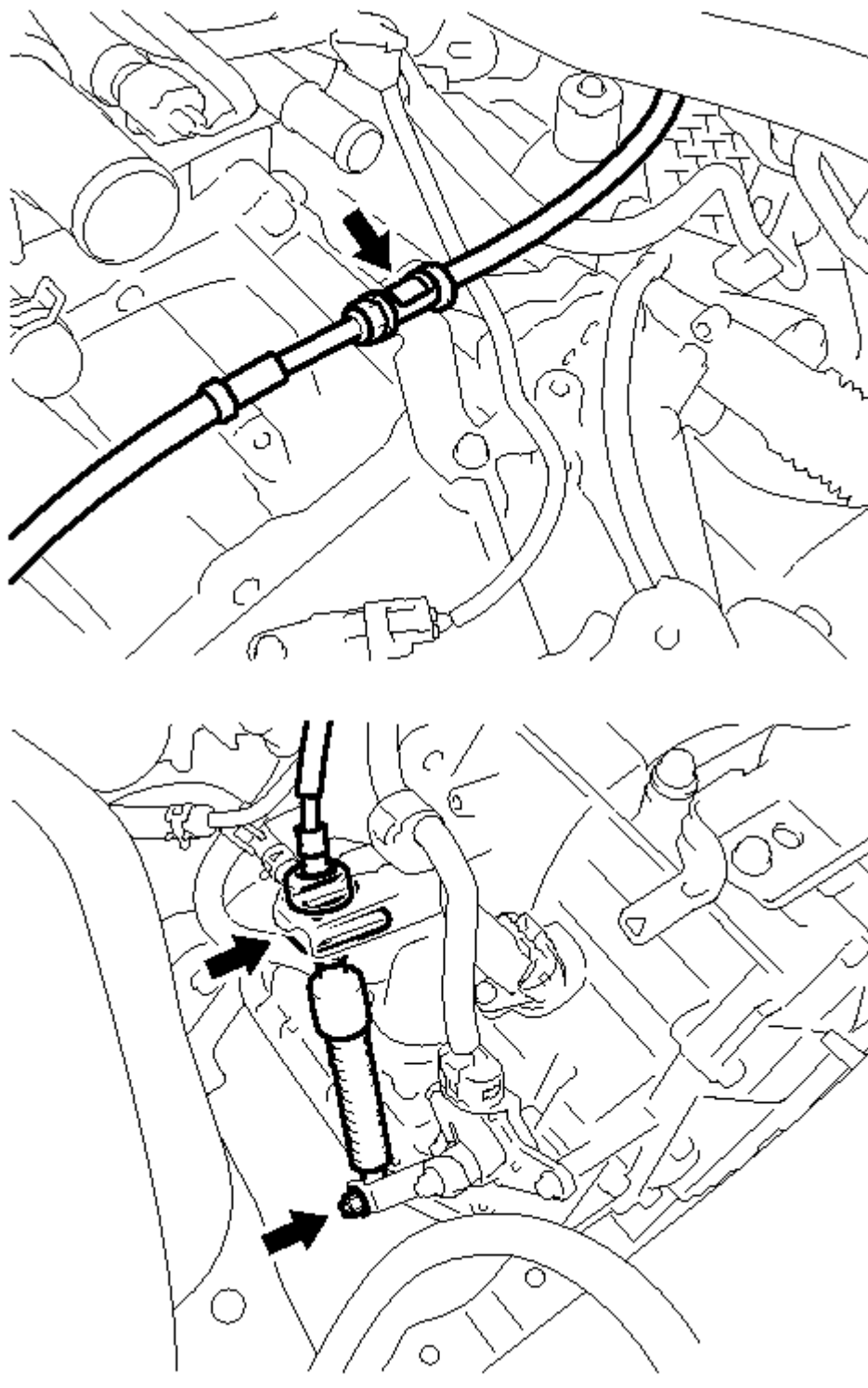
**C**

Fig. 149: Locating Transmission Control Cable Assembly (Automatic Transaxle)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the nut and disconnect the control cable from the control shaft lever.
- c. Remove the clip and disconnect the control cable from the control cable bracket.
- d. Remove the bolt and disconnect the clamp of the control cable.

19. DISCONNECT FUEL VAPOR FEED HOSE ASSEMBLY

- a. Disconnect the fuel vapor feed hose.

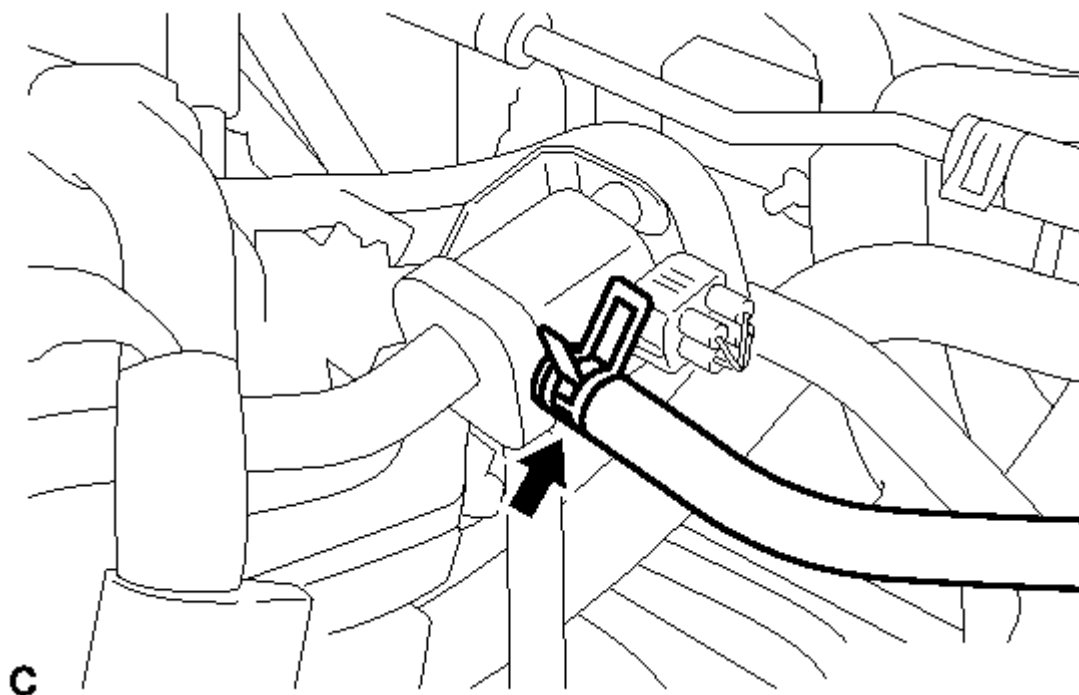


Fig. 150: Locating Fuel Vapor Feed Hose

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

20. DISCONNECT UNION TO CONNECTOR TUBE HOSE

- a. Disconnect the union to connector tube hose.

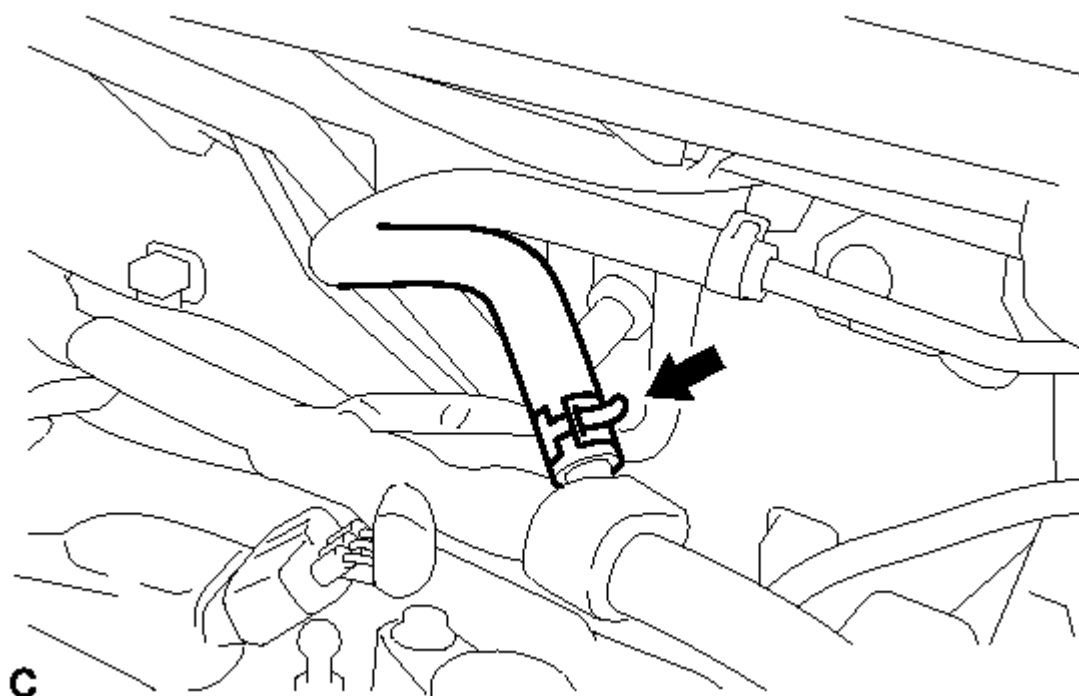


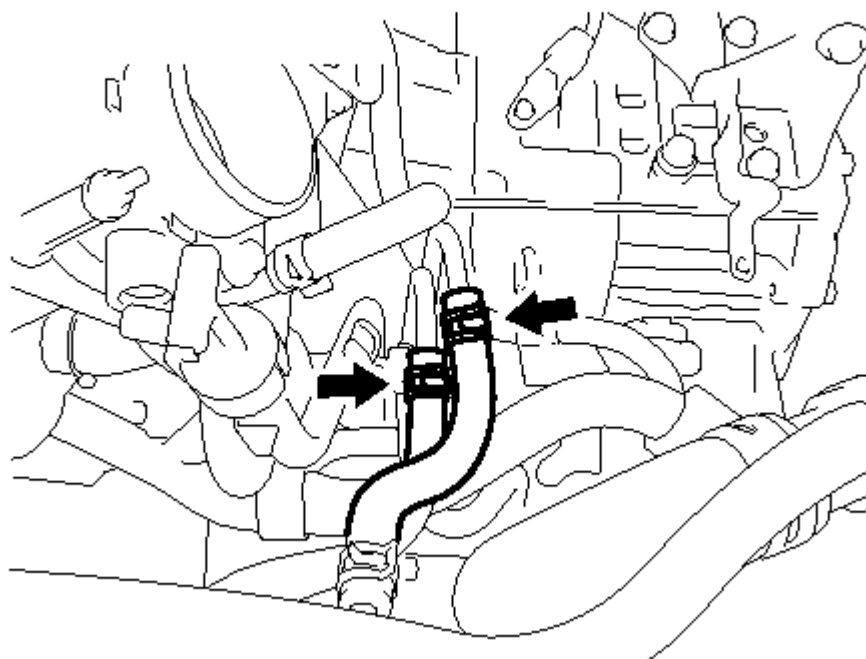
Fig. 151: Locating Connector Tube Hose Clamp

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

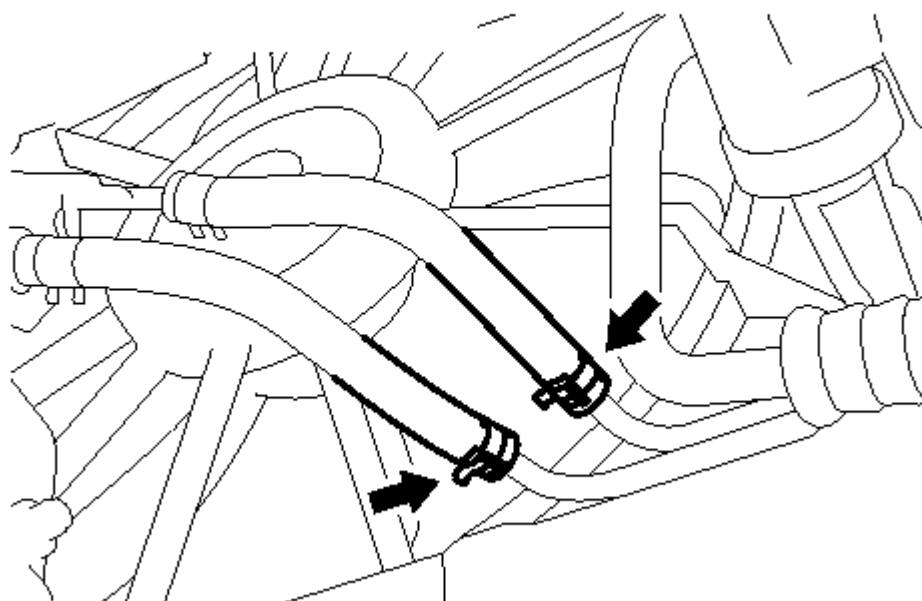
21. DISCONNECT OIL COOLER HOSE (for Automatic Transaxle)

- a. Disconnect the 2 oil cooler hoses from the oil cooler tube.

for TMC Made:



except TMC Made:



C

Fig. 152: Locating Oil Cooler Hoses Clamp

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

22. DISCONNECT OUTLET HEATER WATER HOSE

- a. Disconnect the outlet heater water hose from the engine.

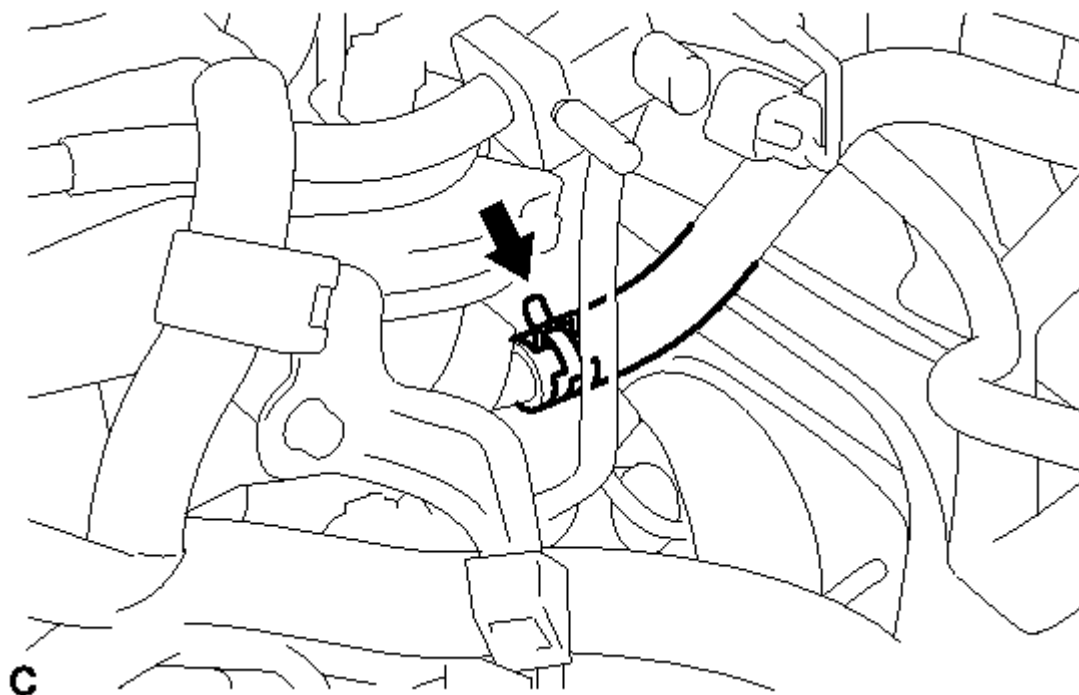


Fig. 153: Identifying Outlet Heater Water Hose With Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

23. DISCONNECT INLET HEATER WATER HOSE

- a. Disconnect the inlet heater water hose from the engine.

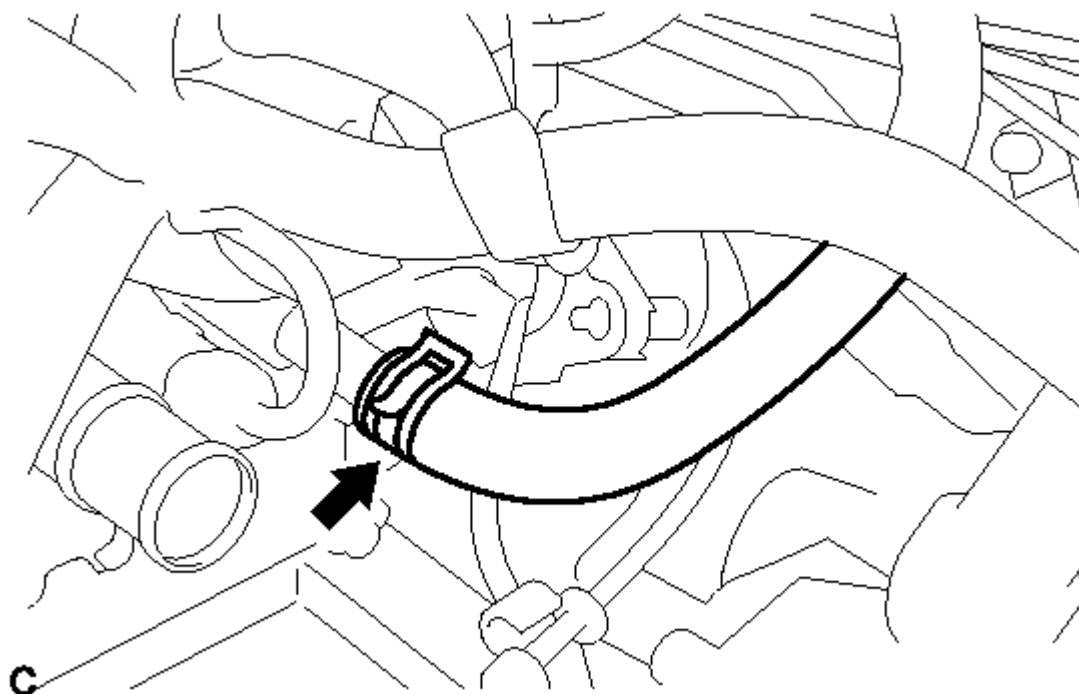


Fig. 154: Locating Inlet Heater Water Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

24. DISCONNECT FUEL TUBE SUB-ASSEMBLY

- a. Release the claw and remove the No. 1 fuel pipe clamp.

No. 1 Fuel Pipe Clamp

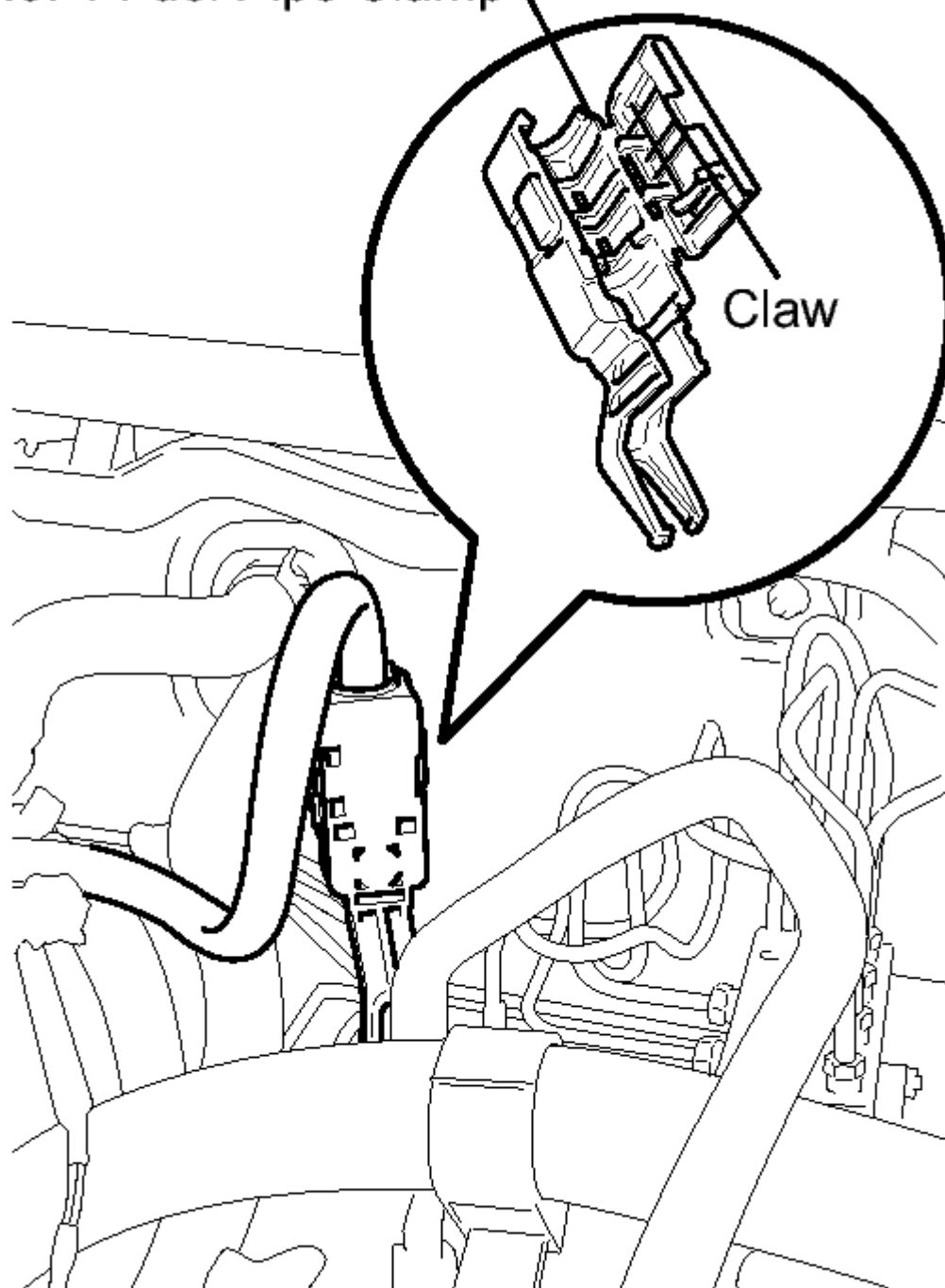
**C**

Fig. 155: Identifying No. 1 Fuel Pipe Clamp

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

- b. Pinch the retainer as illustrated, then pull the fuel tube connector out of the pipe.

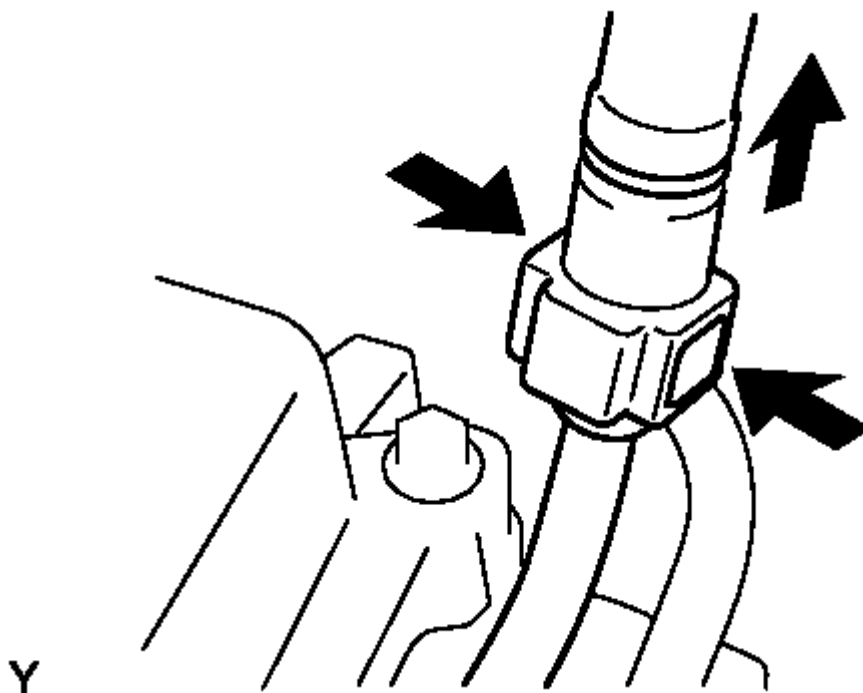


Fig. 156: Locating Fuel Tube Connector Retainer

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

NOTE:

- Remove any dirt and foreign matter from the fuel tube connector before performing this work.
- Do not allow any scratches or foreign matter on the parts when disconnecting, as the fuel tube connector has the O-rings that seal the pipe.
- Perform this work by hand. Do not use any tools.
- Do not forcibly bend, kink or twist the nylon tube.
- Protect the disconnected parts by covering them with vinyl bags after disconnecting the fuel tube.
- If the fuel tube connector and pipe are stuck, push and pull to release them.

25. **REMOVE V-RIBBED BELT** See step 3

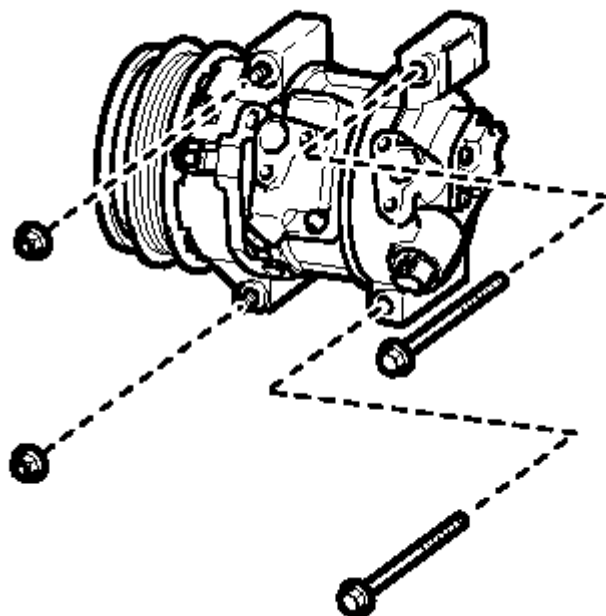
26. **REMOVE GENERATOR ASSEMBLY** . Refer to **REMOVAL - Step 4**

27. **REMOVE FAN BELT ADJUSTING BAR**

- a. Remove the bolt and fan belt adjusting bar.

28. **SEPARATE COMPRESSOR WITH PULLEY ASSEMBLY (w/ Air Conditioning System)**

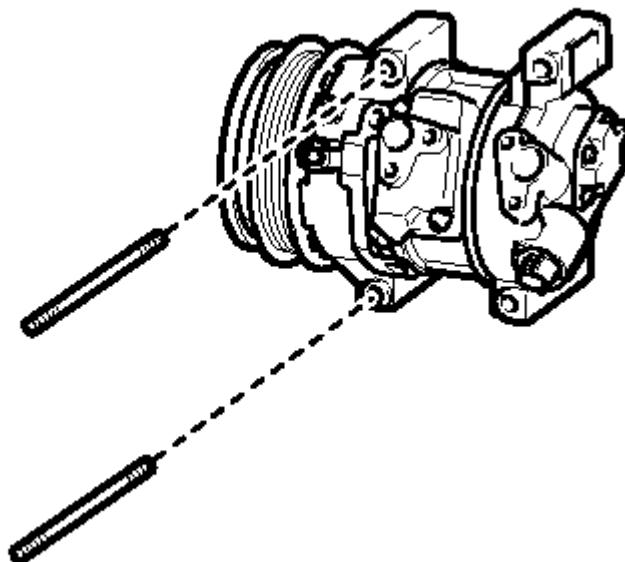
- a. Disconnect the connector.
- b. Remove the 2 bolts and 2 nuts.



P

Fig. 157: Identifying Compressor Assembly Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using a "TORX" socket wrench (E8), remove the 2 stud bolts and compressor with pulley assembly.



P

Fig. 158: Identifying Compressor Stud Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Secure the compressor and hoses off to the side instead of discharging the A/C system.

29. SEPARATE CLUTCH RELEASE CYLINDER ASSEMBLY (for Manual Transaxle)

- a. Remove the 4 bolts and clutch tube bracket, and separate the clutch release cylinder assembly.



Fig. 159: Locating Clutch Tube Bracket Bolts

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

30. DISCONNECT WIRE HARNESS

- a. Pull up the lever to disconnect the ECM connector and release the clamp.

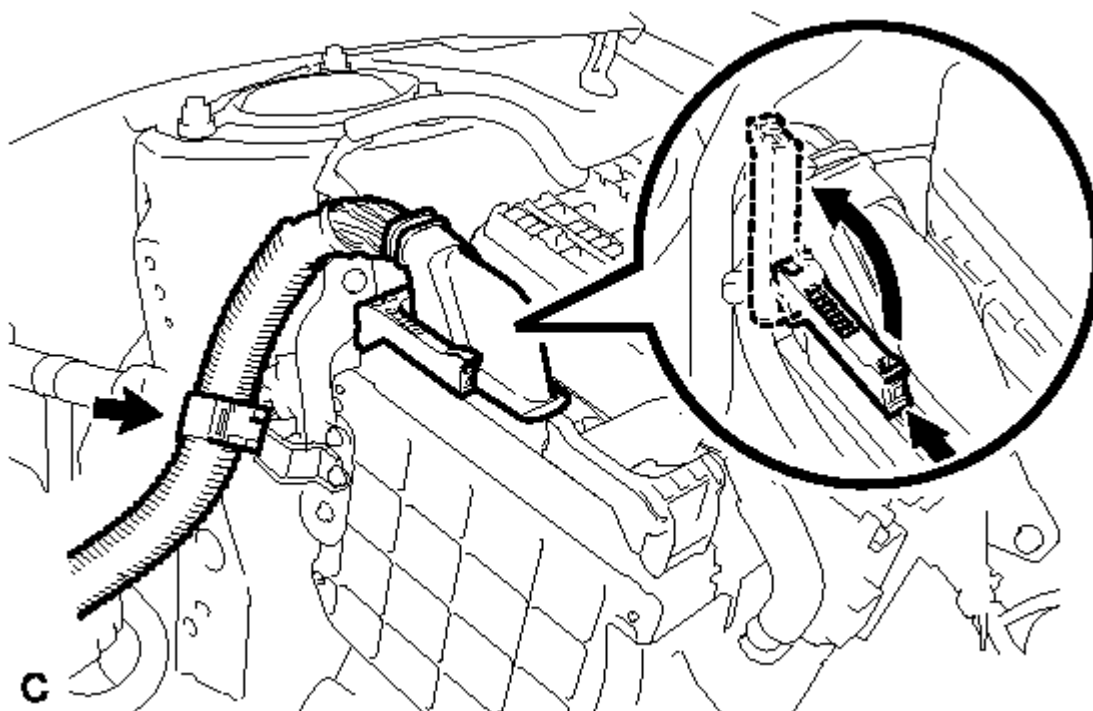


Fig. 160: Locating Engine Room Relay Block Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 2 nuts.

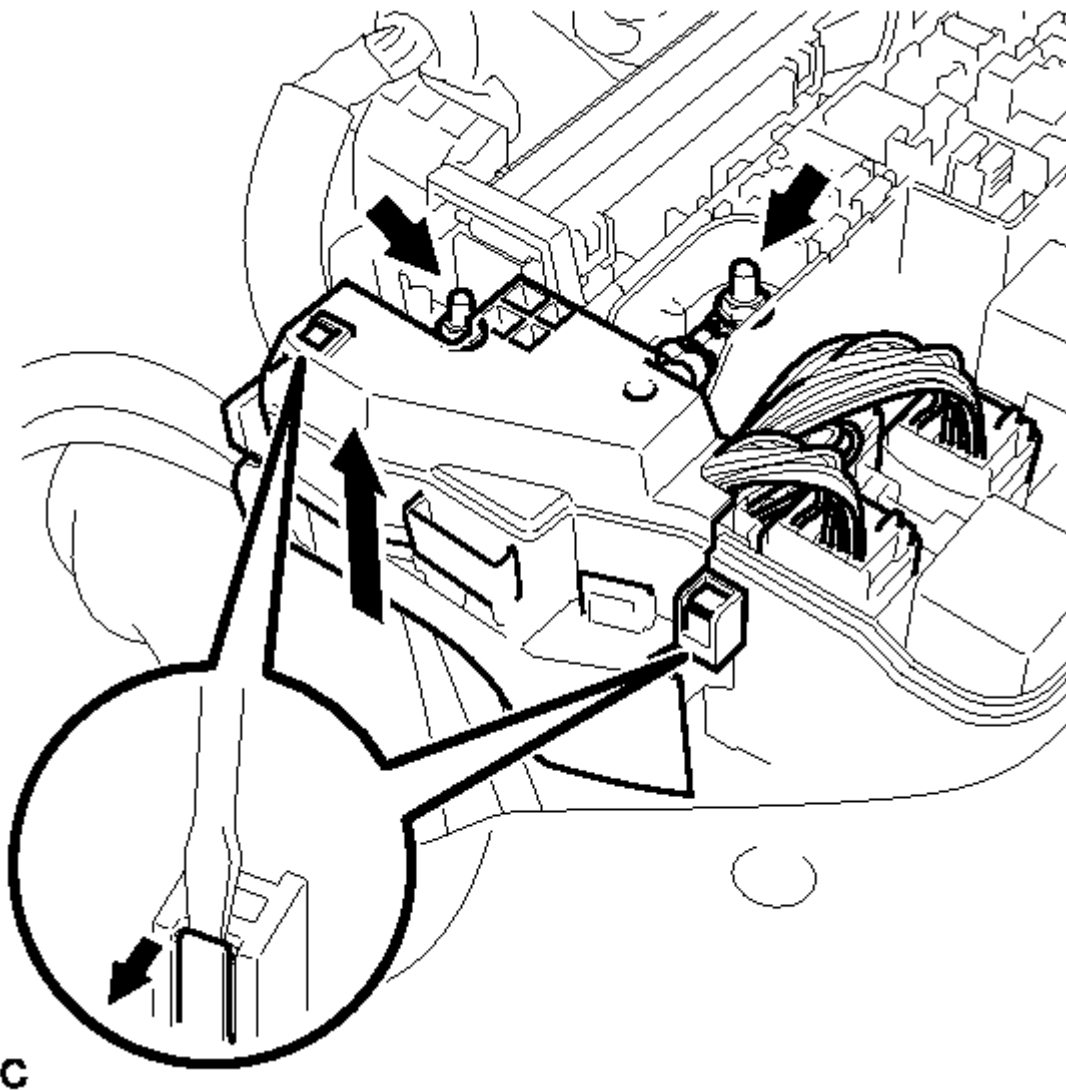


Fig. 161: Disconnecting Wire Harness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the 3 connectors and 2 clamps from the engine room junction block and disconnect the wire harness.
- d. Remove the bolt and clamp (for Manual Transaxle).

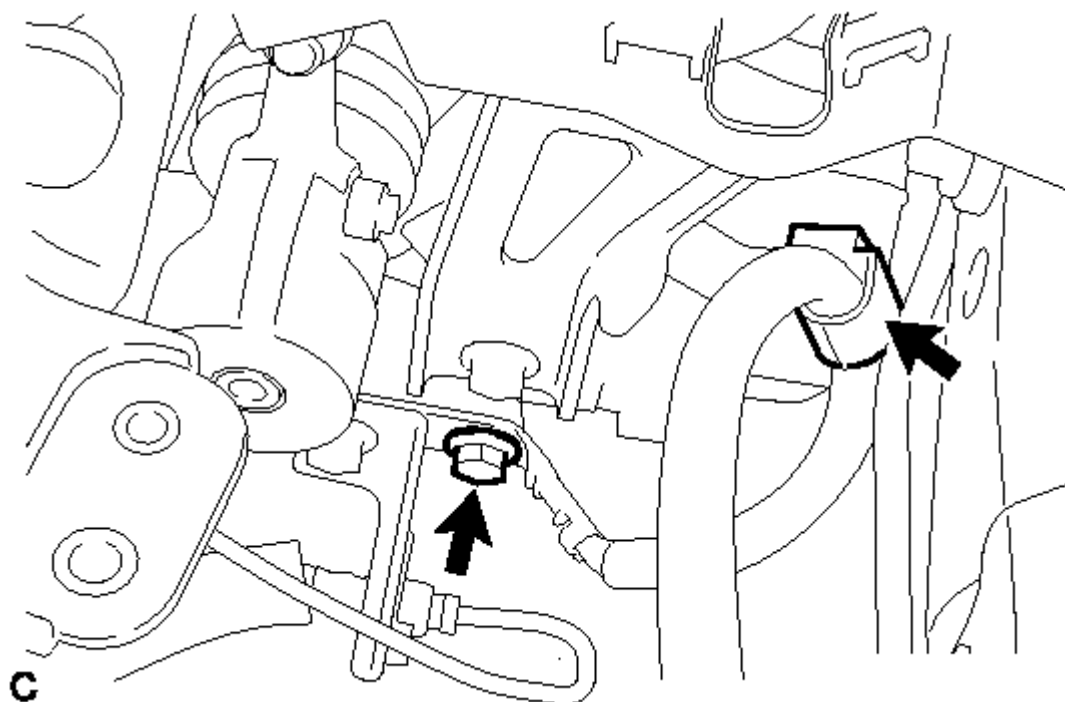


Fig. 162: Identifying Bolt And Clamp (Manual Transaxle)

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

- e. Remove the bolt and clamp (for Automatic Transaxle).

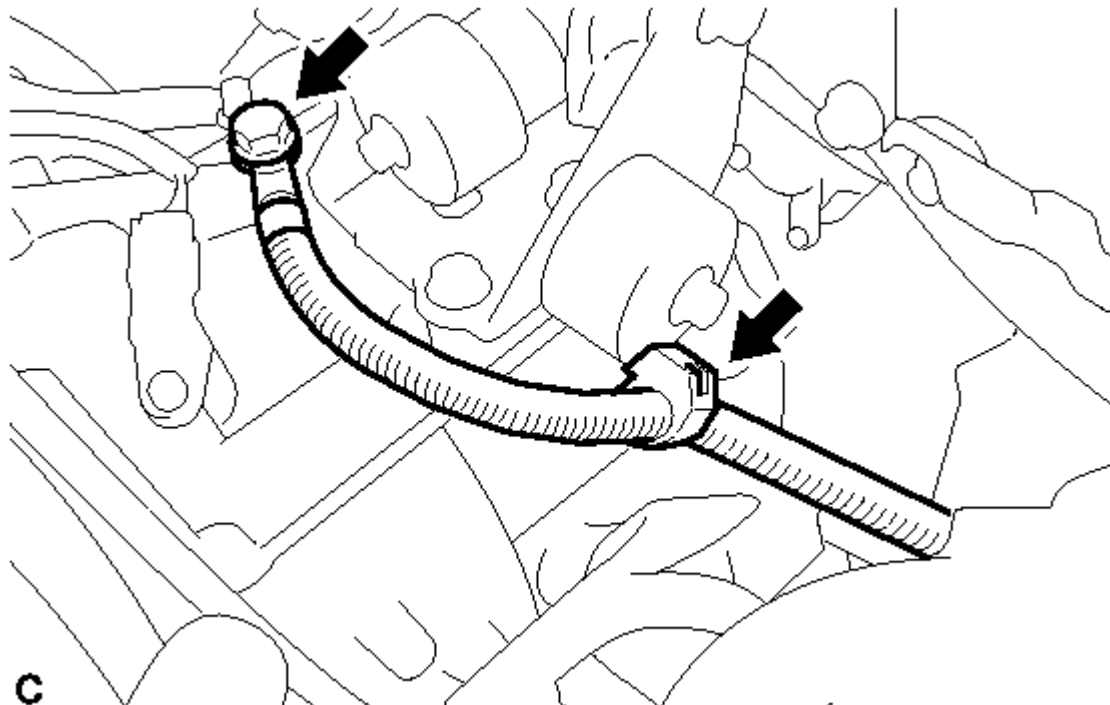


Fig. 163: Identifying Wire Harnesses And Connectors

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

- f. Disconnect all the wire harnesses and connectors.

Make sure that no wire harness is connected between the body and engine.

- 31. **SECURE STEERING WHEEL** . Refer to **REMOVAL - Step 2**
- 32. **REMOVE COLUMN HOLE COVER SILENCER SHEET** . Refer to **REMOVAL - Step 8**
- 33. **SEPARATE NO. 2 STEERING INTERMEDIATE SHAFT ASSEMBLY** . Refer to **REMOVAL - Step 9**
- 34. **DISCONNECT NO. 1 STEERING COLUMN HOLE COVER SUB-ASSEMBLY** . Refer to **REMOVAL - Step 5**
- 35. **REMOVE FRONT EXHAUST PIPE ASSEMBLY** . Refer to **REMOVAL - Step 13**
- 36. **REMOVE FRONT AXLE SHAFT LH NUT** . Refer to **REMOVAL - Step 6**
- 37. **REMOVE FRONT AXLE SHAFT RH NUT**

HINT:

Perform the same procedure for the LH side.

- 38. **DISCONNECT FRONT SPEED SENSOR LH** . Refer to **REMOVAL - Step 4**
- 39. **DISCONNECT FRONT SPEED SENSOR RH**

HINT:

Perform the same procedure for the LH side.

- 40. **SEPARATE TIE ROD END SUB-ASSEMBLY LH** . Refer to **REMOVAL - Step 9**
- 41. **SEPARATE TIE ROD END SUB-ASSEMBLY RH**

HINT:

Perform the same procedure for the LH side.

- 42. **SEPARATE FRONT STABILIZER LINK ASSEMBLY LH** . Refer to **REMOVAL - Step 11**
- 43. **SEPARATE FRONT STABILIZER LINK ASSEMBLY RH**

HINT:

Perform the same procedure for the LH side.

- 44. **SEPARATE FRONT LOWER NO. 1 SUSPENSION ARM SUB-ASSEMBLY LH** . Refer to **REMOVAL - Step 8**
- 45. **SEPARATE FRONT LOWER NO. 1 SUSPENSION ARM SUB-ASSEMBLY RH**

HINT:

Perform the same procedure for the LH side.

- 46. **SEPARATE STEERING KNUCKLE WITH AXLE HUB LH**
 - a. Put matchmarks on the drive shaft and axle hub.

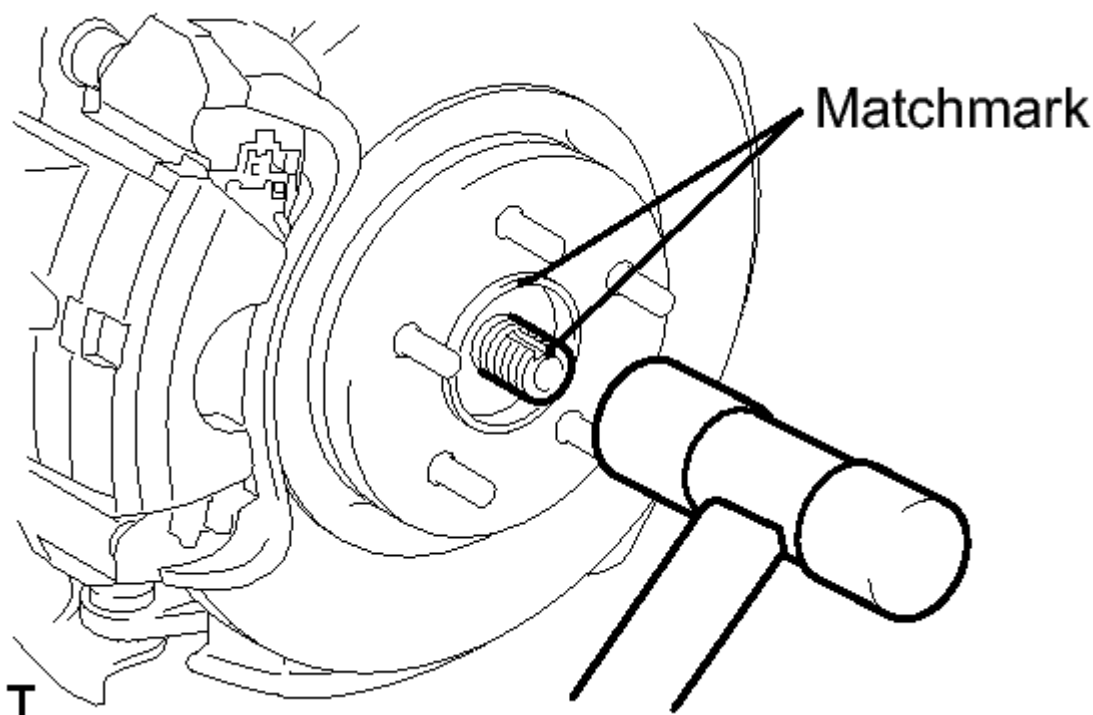


Fig. 164: Putting Matchmarks On Drive Shaft And Axle Hub
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Do not punch the marks.

- b. Using a plastic-faced hammer, disconnect the front axle assembly LH.

NOTE:

- Be careful not to damage the boot and speed sensor rotor.
- Do not excessively push out the drive shaft from the axle assembly.

47. SEPARATE STEERING KNUCKLE WITH AXLE HUB RH

HINT:

Perform the same procedure for the LH side.

48. **REMOVE FRONT DRIVE SHAFT ASSEMBLY LH** . Refer to **REMOVAL - Step 20**
49. **REMOVE FRONT DRIVE SHAFT ASSEMBLY RH** . Refer to **REMOVAL - Step 21**
50. **REMOVE FRONT DRIVE SHAFT HOLE SNAP RING LH** . Refer to **REMOVAL - Step 22**
51. **REMOVE FRONT DRIVE SHAFT HOLE SNAP RING RH** . Refer to **REMOVAL - Step 23**
52. **REMOVE FLYWHEEL HOUSING UNDER COVER (for Automatic Transaxle)** . Refer to **REMOVAL - Step 2**
53. **REMOVE DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT (for Automatic Transaxle)** . Refer to **REMOVAL - Step 3**
54. **REMOVE FRONT SUSPENSION CROSSMEMBER SUB-ASSEMBLY** . Refer to **REMOVAL - Step 15**
55. **REMOVE CENTER ENGINE MOUNTING MEMBER SUB-ASSEMBLY** . Refer to

REMOVAL - Step 17**56. REMOVE ENGINE ASSEMBLY WITH TRANSAXLE**

- a. Set the engine lifter.

NOTE: Place the engine on wooden blocks or equivalent so that the engine is level.

- b. Remove the bolt and 2 nuts, and separate the engine mounting insulator RH.

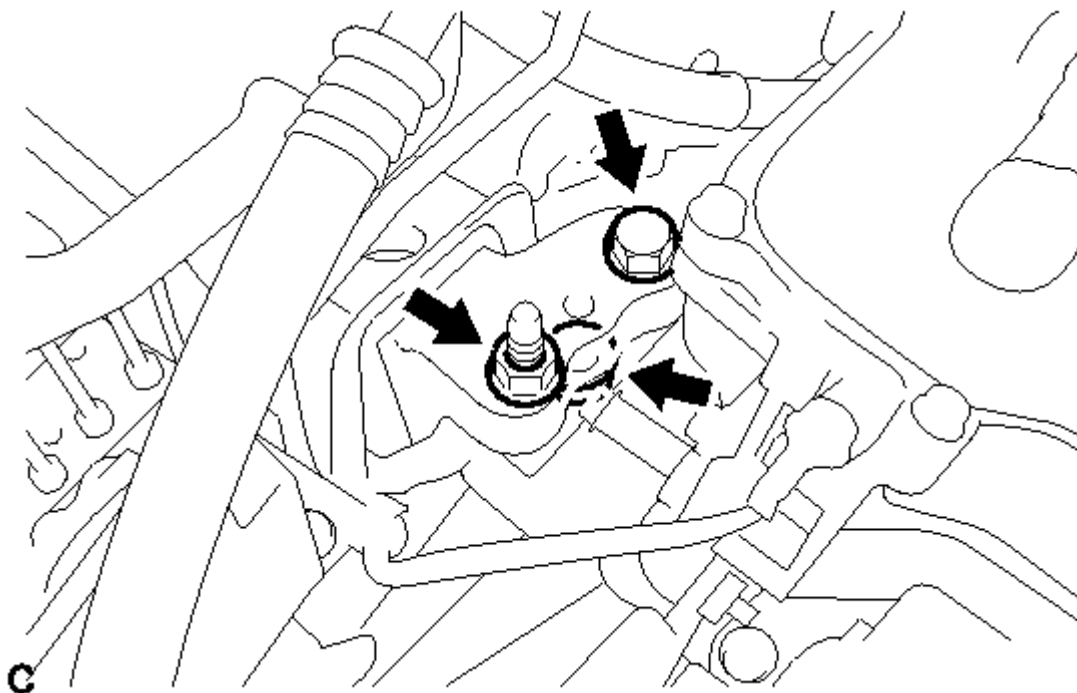


Fig. 165: Identifying Engine Mounting Insulator Nuts (RH)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the through bolt and nut, and separate the engine mounting insulator LH.

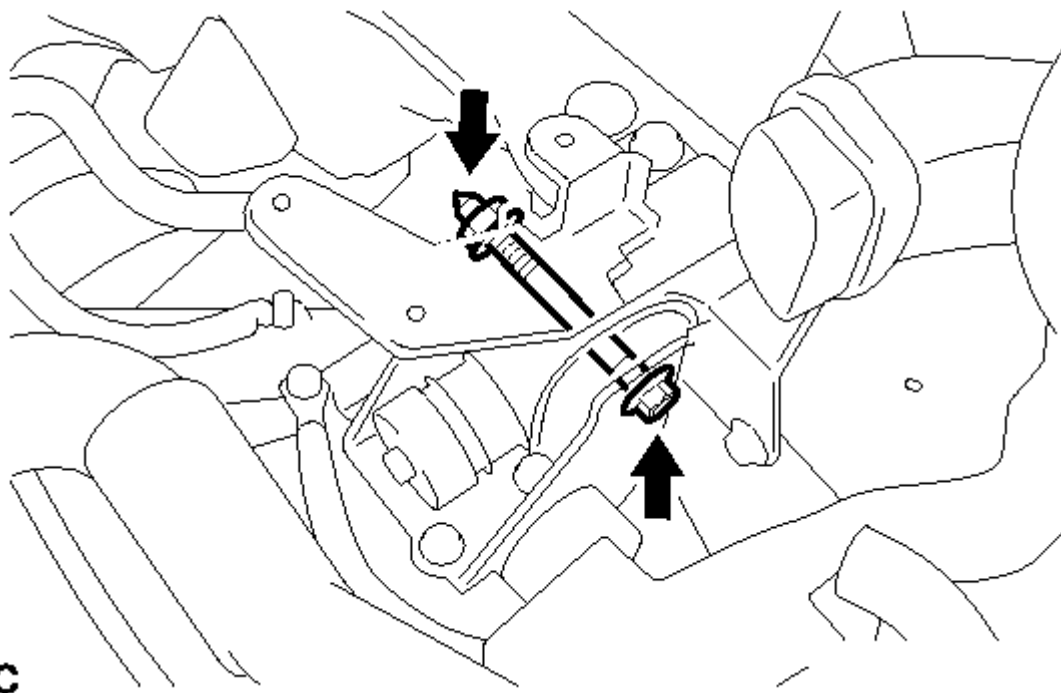


Fig. 166: Identifying Engine Mounting Insulator Nuts (LH)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Carefully remove the engine with transaxle from the vehicle.

57. REMOVE FRONT ENGINE MOUNTING INSULATOR

a. Remove the bolt, nut and front engine mounting insulator.

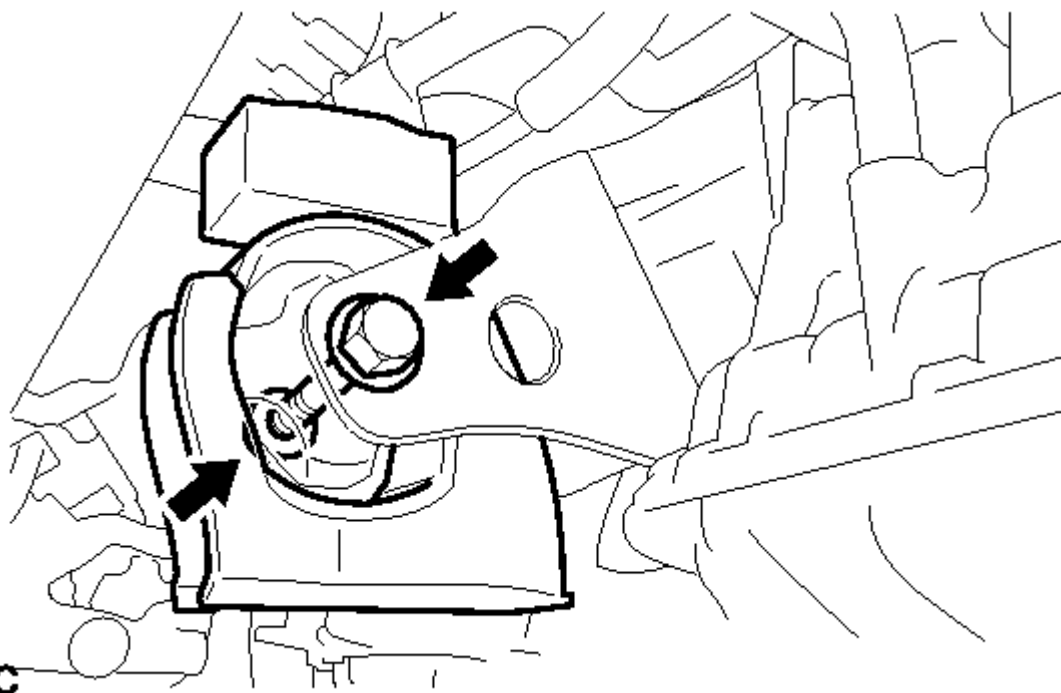


Fig. 167: Identifying Front Engine Mounting Insulator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

58. REMOVE REAR ENGINE MOUNTING INSULATOR

- a. Remove the through bolt and rear engine mounting insulator.



Fig. 168: Identifying Engine Mounting Bracket With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

59. REMOVE ENGINE MOUNTING INSULATOR LH

- a. Remove the 4 bolts and engine mounting insulator LH.

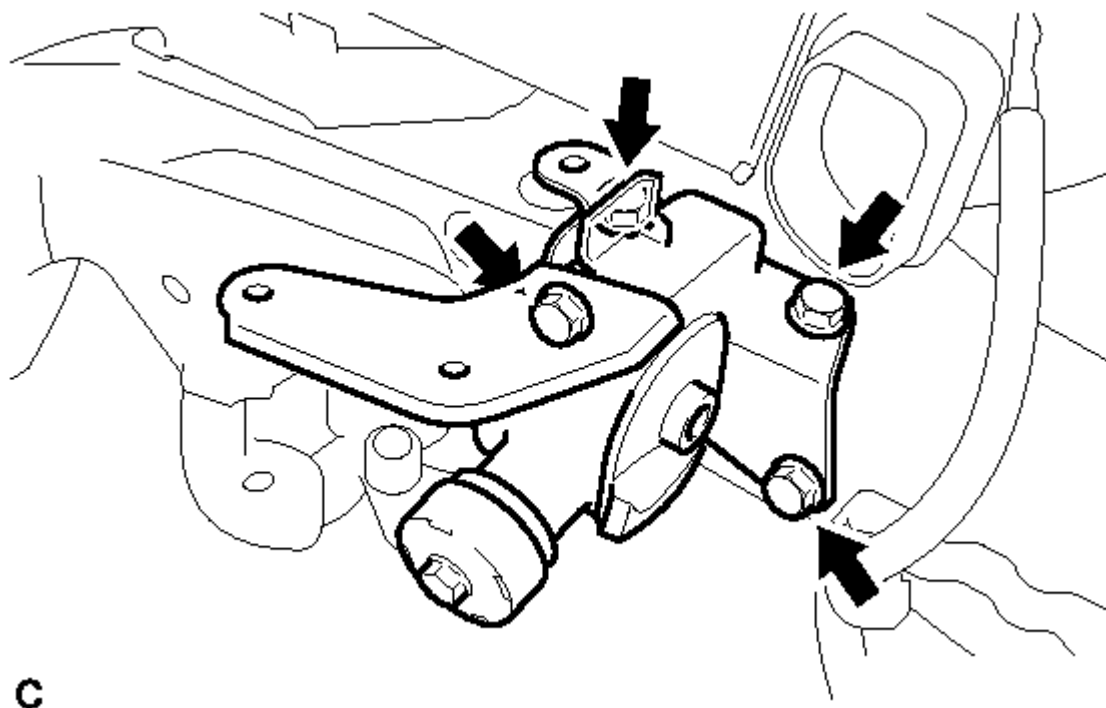


Fig. 169: Identifying Engine Mounting Insulator LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Perform this procedure only when replacement of the engine mounting insulator is necessary.

60. REMOVE ENGINE MOUNTING INSULATOR RH

- a. Disconnect the clamp, and release the relay block assembly.

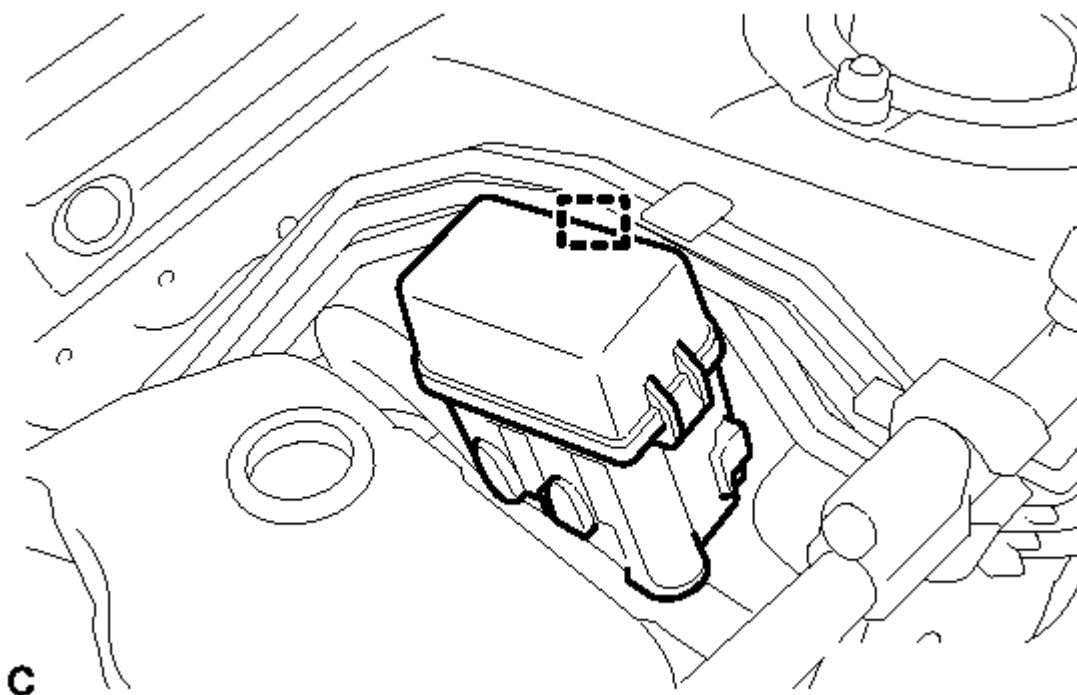


Fig. 170: Identifying Clamp And Relay Block Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 3 bolts and radiator reserve tank.

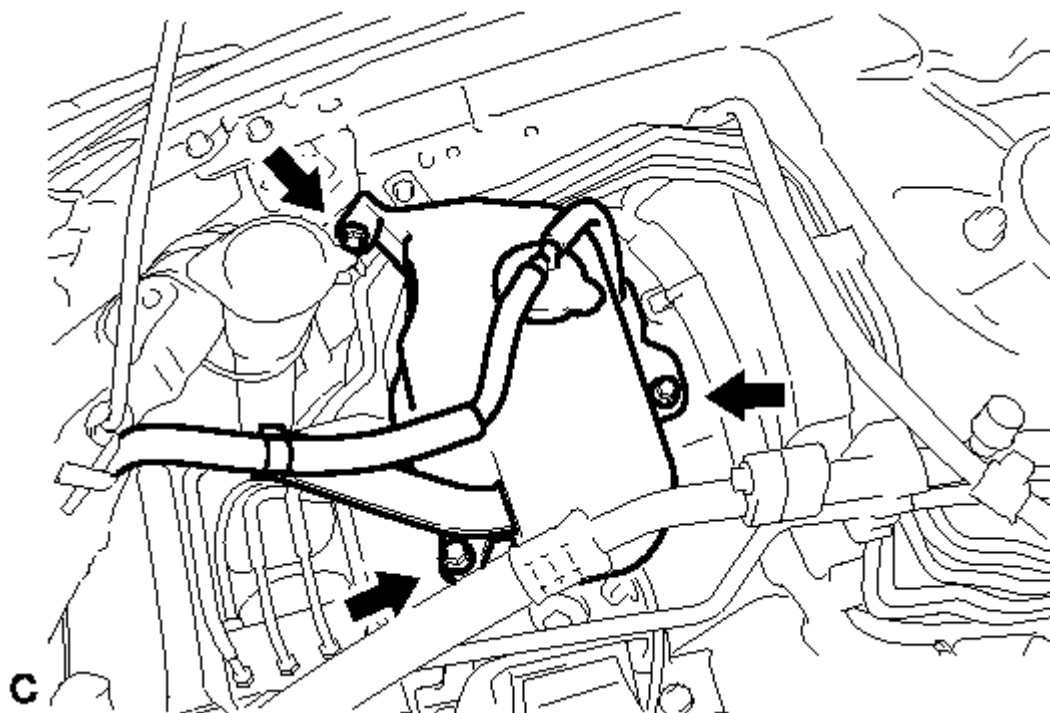


Fig. 171: Identifying Radiator Reserve Tank Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the 3 bolts and engine mounting insulator RH.

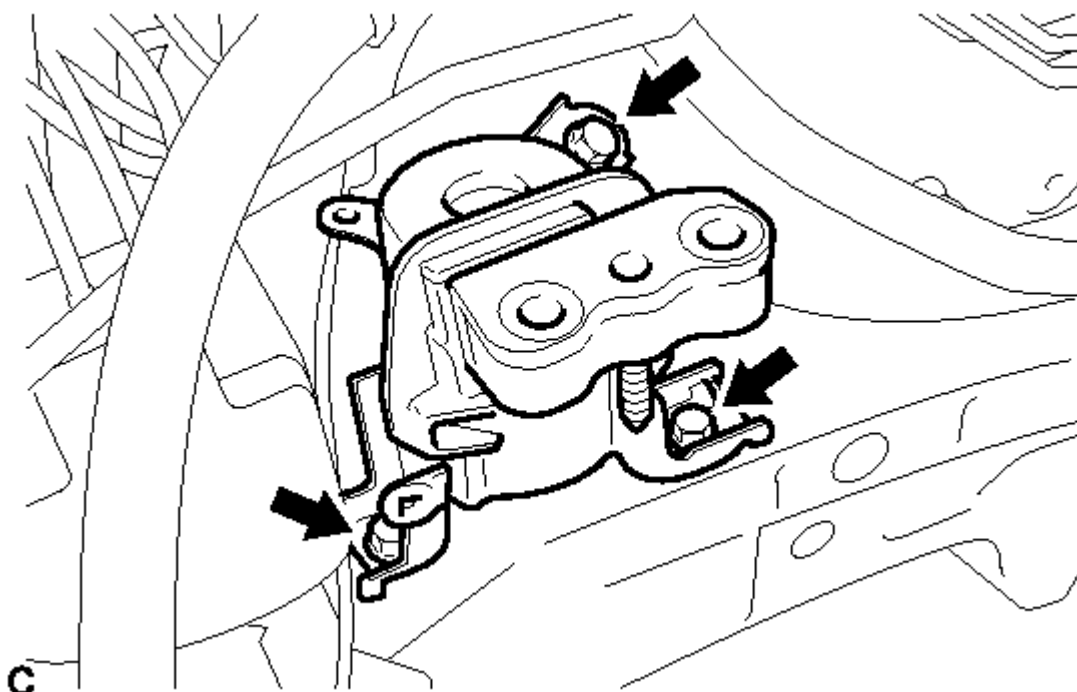


Fig. 172: Identifying Engine Mounting Insulator RH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Perform this procedure only when replacement of the engine mounting insulator is necessary.

61. INSTALL ENGINE HANGER

- a. Remove the bolt and wire harness bracket.

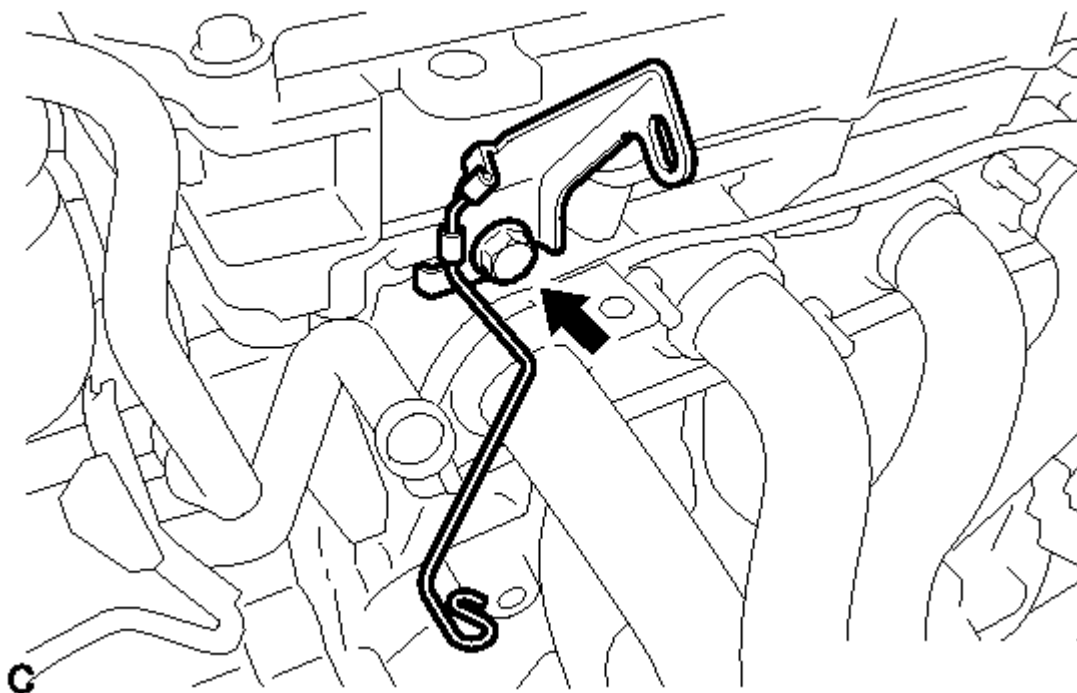


Fig. 173: Identifying Wire Harness Bracket

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

- b. Install the 2 engine hangers with the 2 bolts.

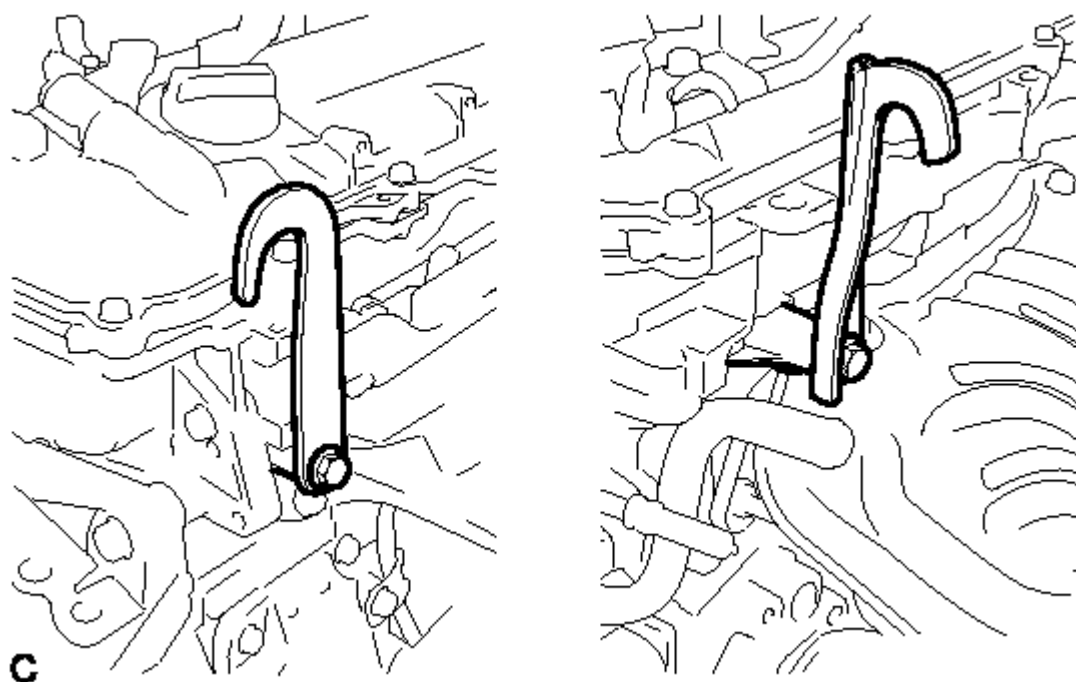


Fig. 174: Identifying Engine Hangers With Bolts

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

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

Part Name	Part No.
No. 1 engine hanger	12281-37021
No. 2 engine hanger	12282-37011
Bolt	91552-81050

- 62. **REMOVE FLYWHEEL HOUSING SIDE COVER**
- 63. **REMOVE STARTER ASSEMBLY** . Refer to **REMOVAL - Step 3**
- 64. **REMOVE MANUAL TRANSAXLE ASSEMBLY (for Manual Transaxle)**

HINT:

Refer to **REMOVAL** for C59.

- 65. **REMOVE AUTOMATIC TRANSAXLE ASSEMBLY (for Automatic Transaxle)**

HINT:

Refer to **REMOVAL** for U341E.

- 66. **REMOVE CLUTCH COVER ASSEMBLY (for Manual Transaxle)** . Refer to **REMOVAL - Step 6**
- 67. **REMOVE CLUTCH DISC ASSEMBLY (for Manual Transaxle)** . Refer to **REMOVAL - Step 7**
- 68. **REMOVE FLYWHEEL SUB-ASSEMBLY (for Manual Transaxle)** See step 6
- 69. **REMOVE DRIVE PLATE AND RING GEAR SUB-ASSEMBLY (for Automatic Transaxle)**
See step 7
- 70. **REMOVE ENGINE WIRE**

INSTALLATION

INSTALLATION

- 1. **INSTALL ENGINE WIRE**
- 2. **INSTALL FLYWHEEL SUB-ASSEMBLY (for Manual Transaxle)** See step 2
- 3. **INSTALL DRIVE PLATE AND RING GEAR SUB-ASSEMBLY (for Automatic Transaxle)** See step 3
- 4. **INSTALL CLUTCH DISC ASSEMBLY (for Manual Transaxle)** . Refer to **INSTALLATION - Step 1**
- 5. **INSTALL CLUTCH COVER ASSEMBLY (for Manual Transaxle)** . Refer to **INSTALLATION - Step 2**
- 6. **INSPECT AND ADJUST CLUTCH COVER ASSEMBLY (for Manual Transaxle)** . Refer to **INSTALLATION - Step 3**
- 7. **INSTALL MANUAL TRANSAXLE ASSEMBLY (for Manual Transaxle)**

HINT:

Refer to **INSTALLATION - Step 5** for C59.

8. INSTALL AUTOMATIC TRANSAXLE ASSEMBLY (for Automatic Transaxle)

HINT:

Refer to **INSTALLATION - Step 10** for U341E.

9. INSTALL STARTER ASSEMBLY . Refer to INSTALLATION - Step 1

10. INSTALL FLYWHEEL HOUSING SIDE COVER

11. INSTALL FRONT ENGINE MOUNTING INSULATOR

- a. Install the front engine mounting insulator with the nut and bolt.

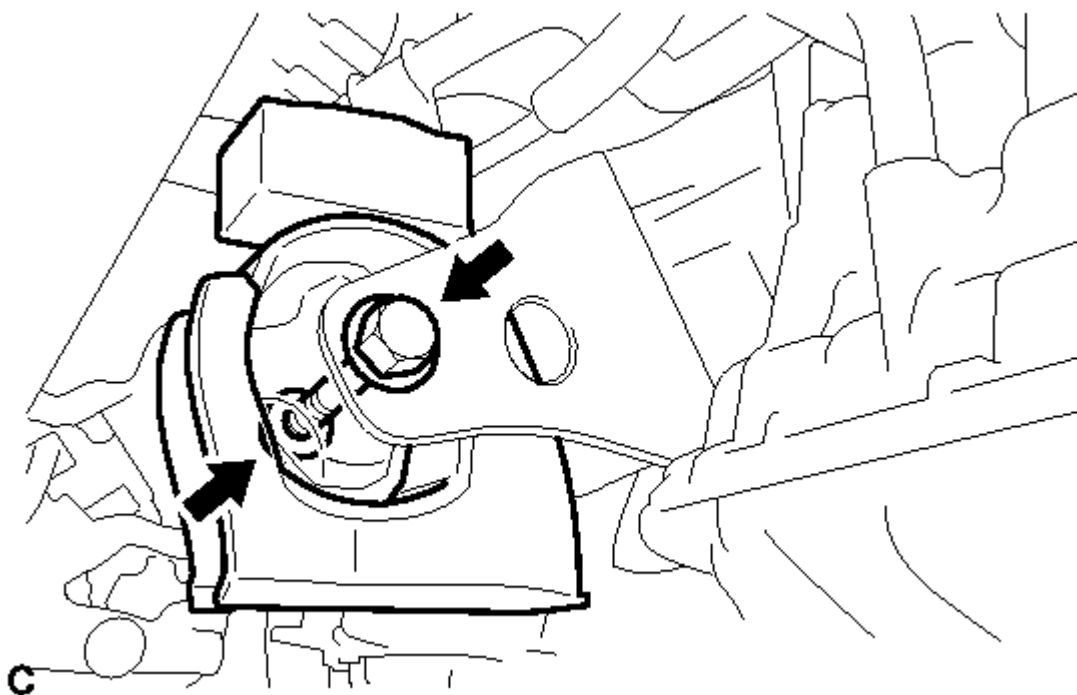


Fig. 175: Identifying Front Engine Mounting Insulator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 73 N*m (744 kgf*cm, 54 ft.*lbf)

12. INSTALL REAR ENGINE MOUNTING INSULATOR

- a. Install the rear engine mounting insulator to the engine mounting bracket with the through bolt.



Fig. 176: Identifying Engine Mounting Bracket With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

except TMC made

Torque: 65 N*m (663 kgf*cm, 48 ft.*lbf)

for TMC made

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

13. INSTALL ENGINE MOUNTING INSULATOR LH

- a. Temporarily install the engine mounting insulator LH with the 4 bolts.

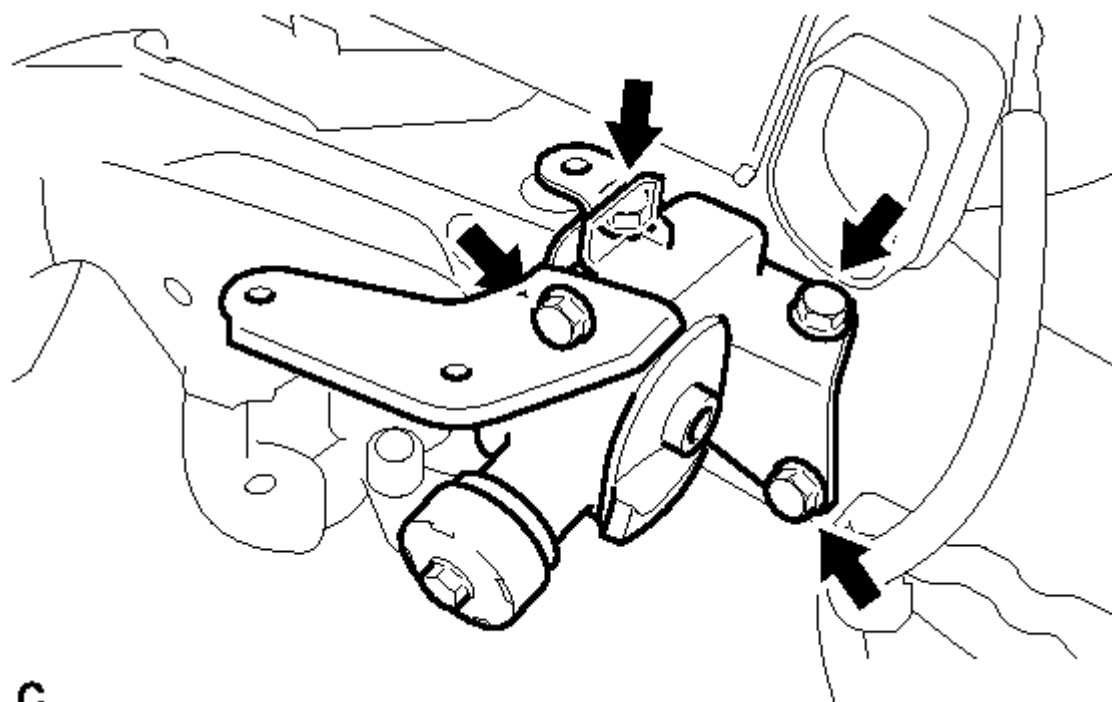
**C**

Fig. 177: Identifying Engine Mounting Insulator LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Tighten the 4 bolts.

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

HINT:

Perform this procedure only when replacement of the engine mounting insulator is necessary.

14. INSTALL ENGINE MOUNTING INSULATOR RH

- a. Install the engine mounting insulator RH with the 3 bolts.

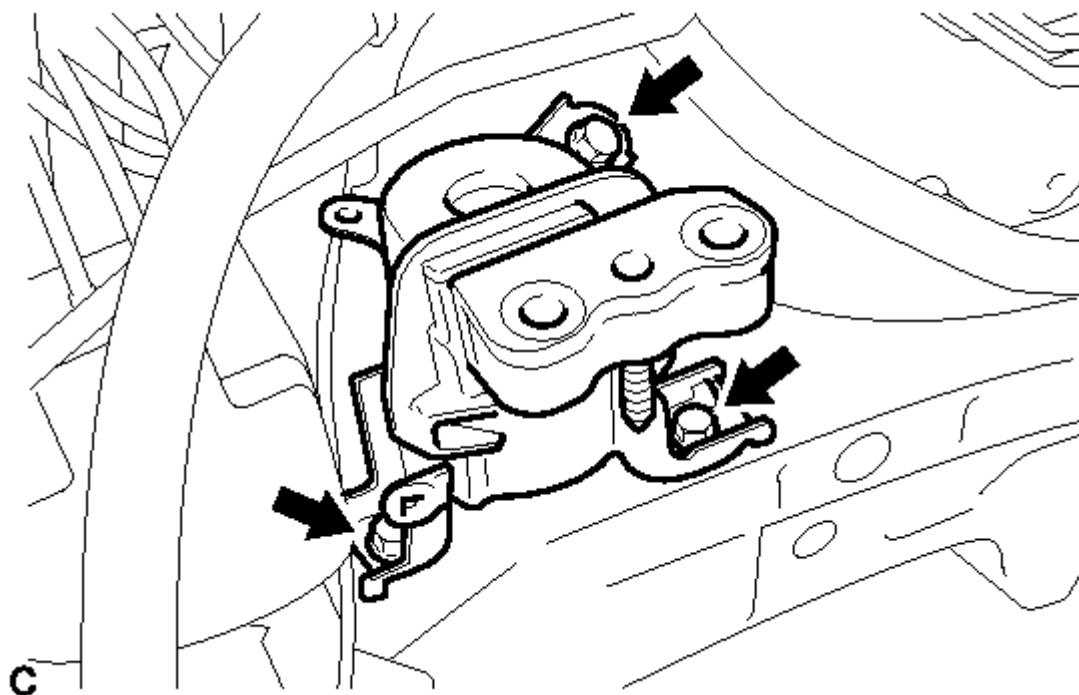


Fig. 178: Identifying Engine Mounting Insulator RH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Perform this procedure only when replacement of the engine mounting insulator is necessary.

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

- b. Install the radiator reserve tank with the 3 bolts.

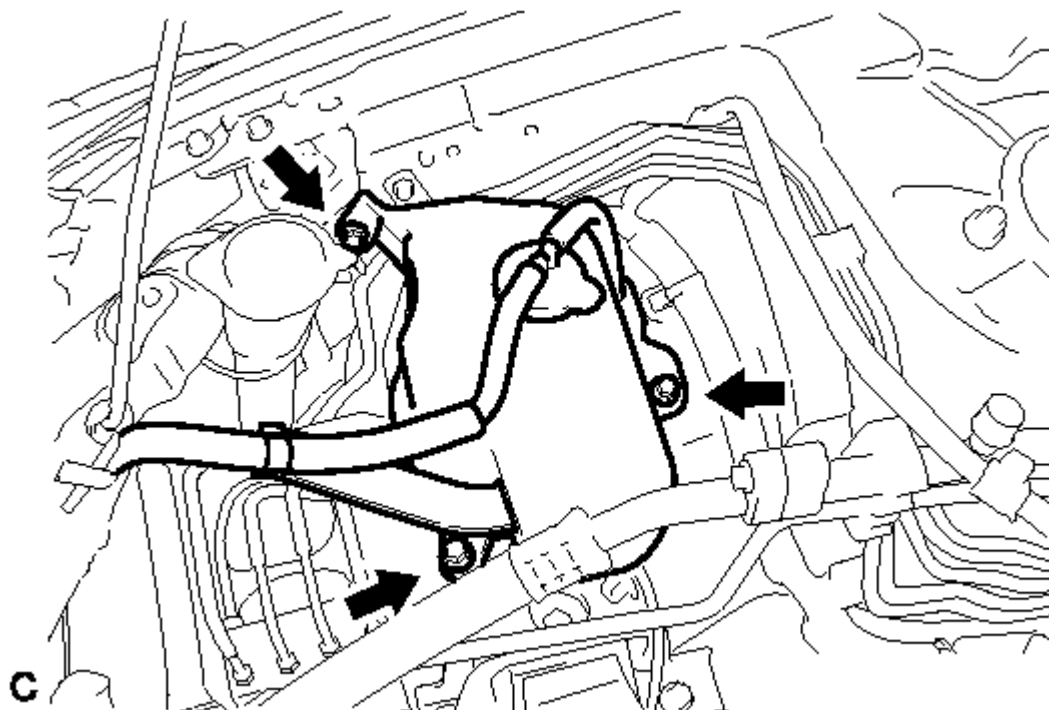


Fig. 179: Identifying Radiator Reserve Tank Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- c. Install the relay block assembly.

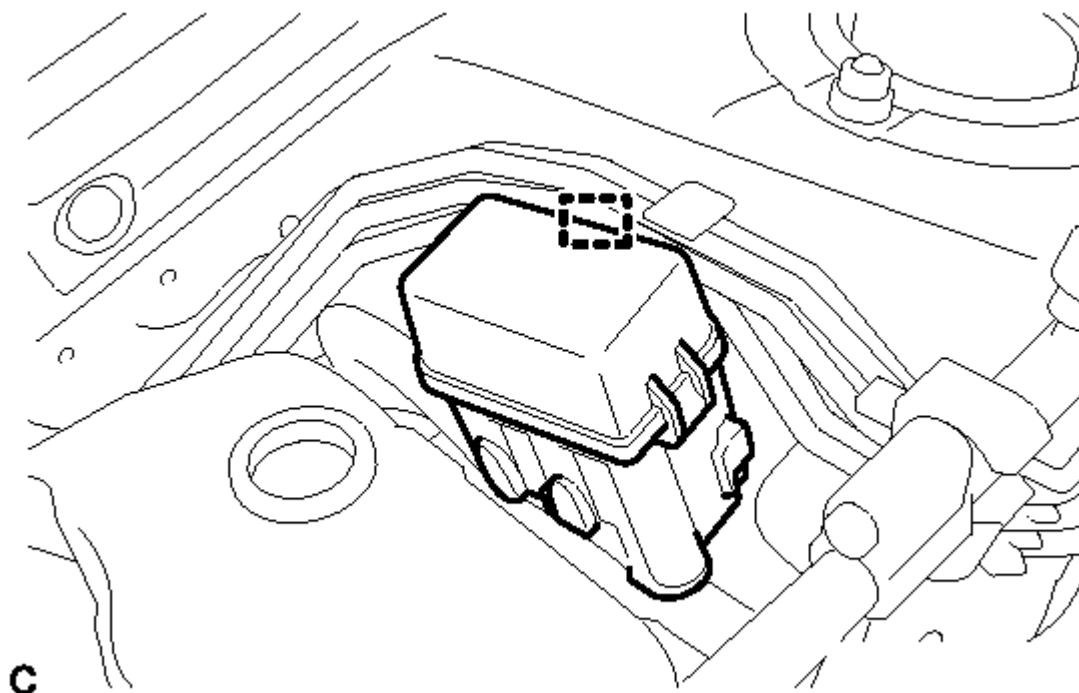


Fig. 180: Identifying Clamp And Relay Block Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. INSTALL ENGINE ASSEMBLY WITH TRANSAXLE

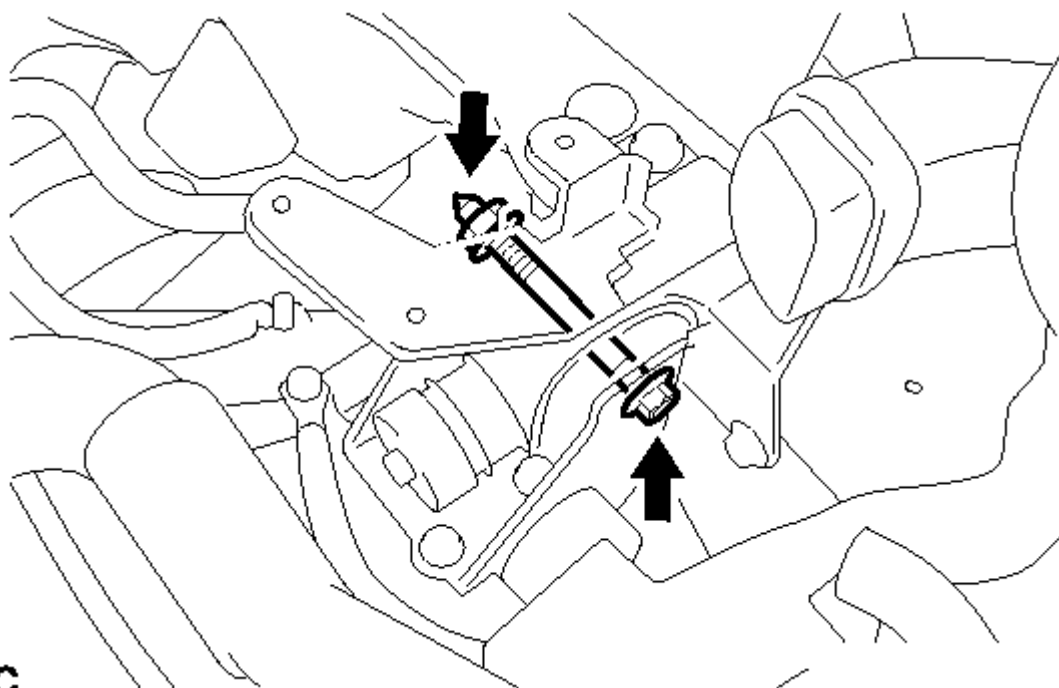
- Set the engine assembly with transaxle and front suspension crossmember on the engine lifter.
- Operate the engine lifter and lift the engine assembly with transaxle and front suspension crossmember to the position where the engine mounting insulators RH and LH can be installed.

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

NOTE:

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

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



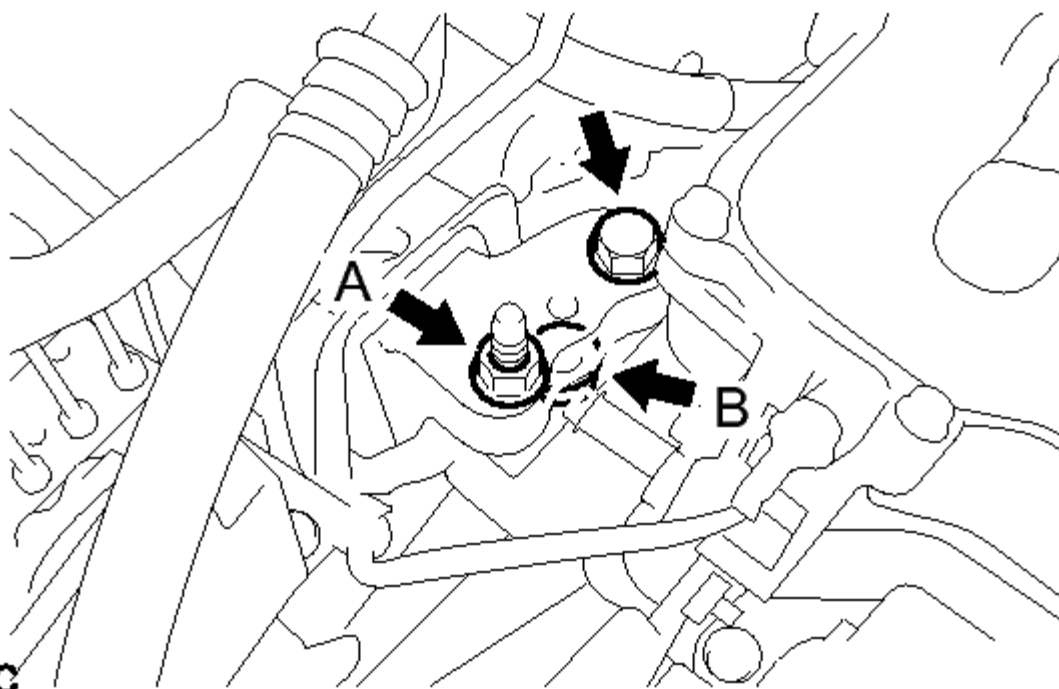
C

Fig. 181: Identifying Engine Mounting Insulator Nuts (LH)

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

Torque: 56 N*m (571 kgf*cm, 41 ft.*lbf)

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



C

Fig. 182: Identifying Engine Mounting Insulator RH With Bolt And Nuts

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

Nut A

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

Nut B

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

Bolt

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

16. **TEMPORARILY INSTALL CENTER ENGINE MOUNTING MEMBER SUB-ASSEMBLY** . Refer to INSTALLATION - Step 7
17. **INSTALL FRONT SUSPENSION CROSSMEMBER SUB-ASSEMBLY** . Refer to INSTALLATION - Step 8
18. **FULLY TIGHTEN CENTER ENGINE MOUNTING MEMBER SUB-ASSEMBLY** . Refer to INSTALLATION - Step 10
19. **REMOVE ENGINE HANGER**
 - a. Remove the 2 bolts and 2 engine hangers.
 - b. Install the wire harness bracket with the bolt.

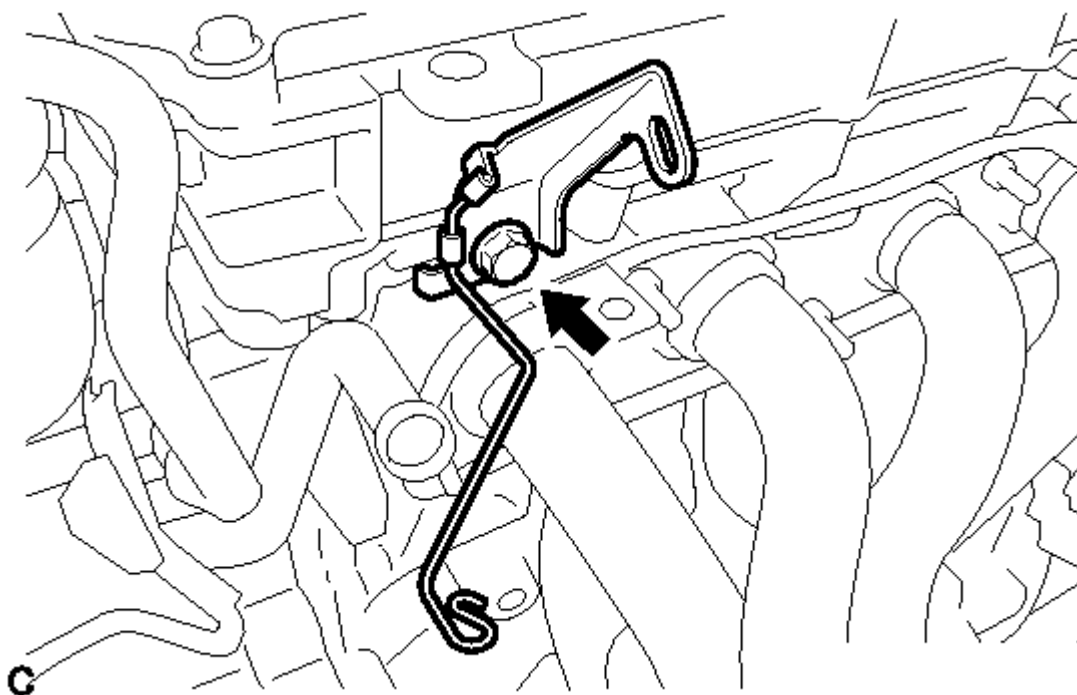
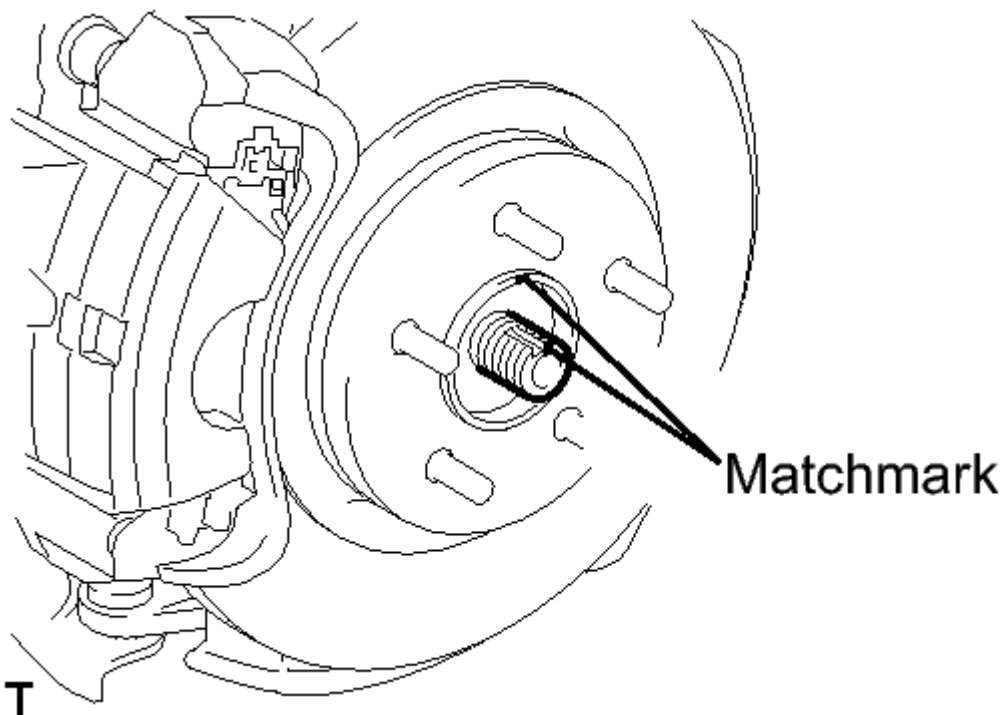


Fig. 183: Identifying Wire Harness Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 60 N*m (612 kgf*cm, 44 ft.*lbf)

20. **INSTALL DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT (for Automatic Transaxle)** . Refer to INSTALLATION - Step 18
21. **INSTALL FLYWHEEL HOUSING UNDER COVER (for Automatic Transaxle)** . Refer to INSTALLATION - Step 19

22. **INSTALL FRONT DRIVE SHAFT HOLE SNAP RING LH** . Refer to **INSTALLATION - Step 1**
23. **INSTALL FRONT DRIVE SHAFT HOLE SNAP RING RH** . Refer to **INSTALLATION - Step 2**
24. **INSTALL FRONT DRIVE SHAFT ASSEMBLY LH** . Refer to **INSTALLATION - Step 3**
25. **INSTALL FRONT DRIVE SHAFT ASSEMBLY RH** . Refer to **INSTALLATION - Step 4**
26. **INSTALL STEERING KNUCKLE WITH AXLE HUB LH**
 - a. Align the matchmarks and connect the front drive shaft assembly to the front axle assembly LH.



T
Fig. 184: Aligning Shaft Splines In Drive Shaft To Steering Knuckle With Axle Hub
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

27. **INSTALL STEERING KNUCKLE WITH AXLE HUB RH**

HINT:

Perform the same procedure for the LH side.

28. **INSTALL FRONT LOWER NO. 1 SUSPENSION ARM SUB-ASSEMBLY LH** . Refer to **INSTALLATION - Step 3**
29. **INSTALL FRONT LOWER NO. 1 SUSPENSION ARM SUB-ASSEMBLY RH**

HINT:

Perform the same procedure for the LH side.

30. **INSTALL FRONT STABILIZER LINK ASSEMBLY LH** . Refer to **INSTALLATION - Step 16**
31. **INSTALL FRONT STABILIZER LINK ASSEMBLY RH**

HINT:

Perform the same procedure for the LH side.

- 32. **CONNECT TIE ROD END SUB-ASSEMBLY LH** . Refer to **INSTALLATION - Step 12**
- 33. **CONNECT TIE ROD END SUB-ASSEMBLY RH**

HINT:

Perform the same procedure for the LH side.

- 34. **INSTALL FRONT SPEED SENSOR LH** . Refer to **INSTALLATION - Step 7**
- 35. **INSTALL FRONT SPEED SENSOR RH**

HINT:

Perform the same procedure for the LH side.

- 36. **INSTALL FRONT AXLE SHAFT LH NUT** . Refer to **INSTALLATION - Step 17**
- 37. **INSTALL FRONT AXLE SHAFT RH NUT**

HINT:

Perform the same procedure for the LH side.

- 38. **INSTALL FRONT EXHAUST PIPE ASSEMBLY** . Refer to **INSTALLATION - Step 4**
- 39. **INSTALL NO. 1 STEERING COLUMN HOLE COVER SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 14**
- 40. **INSTALL NO. 2 STEERING INTERMEDIATE SHAFT ASSEMBLY** . Refer to **INSTALLATION - Step 5**
- 41. **INSTALL COLUMN HOLE COVER SILENCER SHEET** . Refer to **INSTALLATION - Step 9**
- 42. **INSTALL WIRE HARNESS**
 - a. Install the earth wire to the engine compartment with the bolt and clamp (for Manual Transaxle).

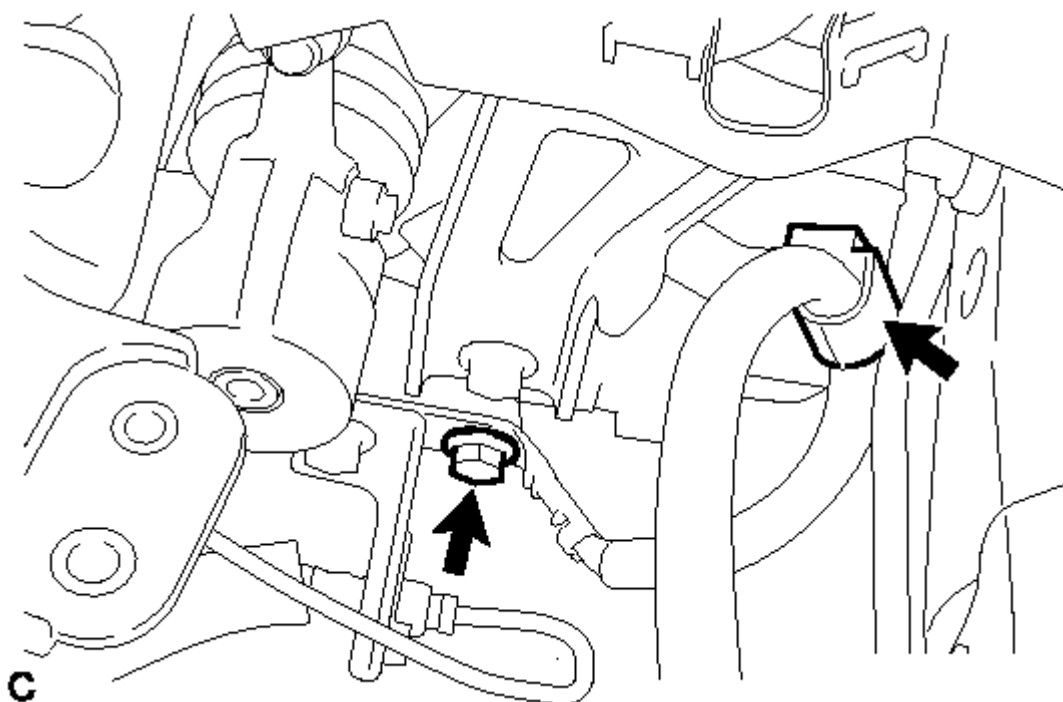


Fig. 185: Identifying Bolt And Clamp (Manual Transaxle)

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

Torque: 13 N*m (130 kgf*cm, 10 ft.*lbf)

- b. Install the earth wire to the engine compartment with the bolt and clamp (for Automatic Transaxle).

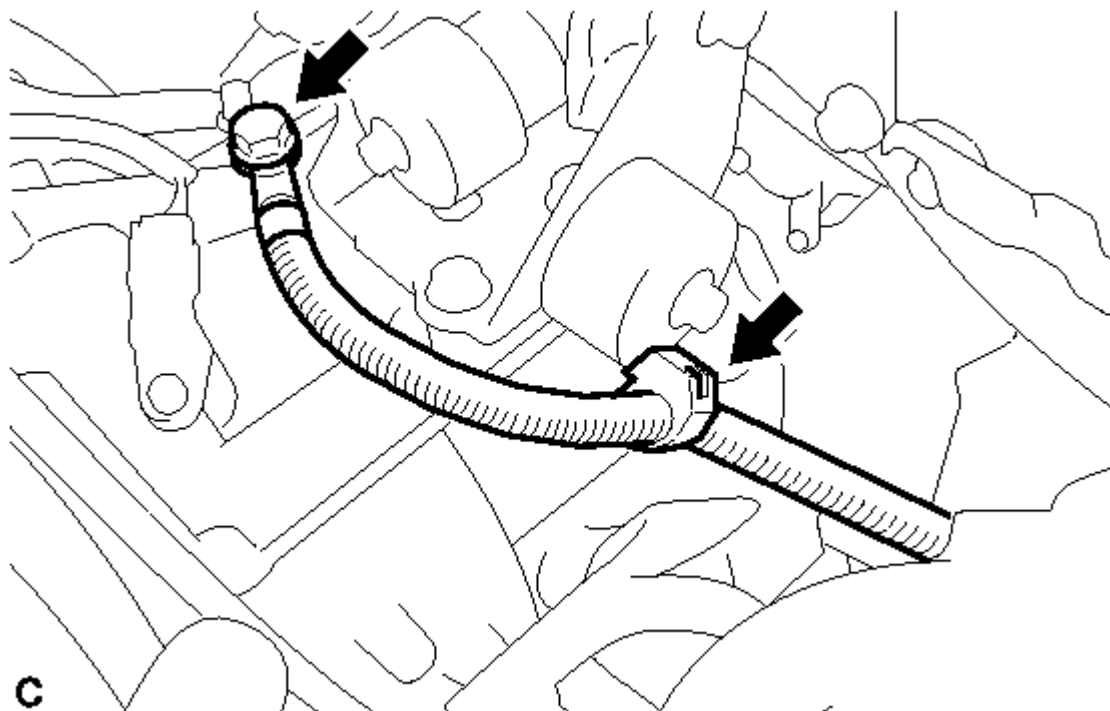
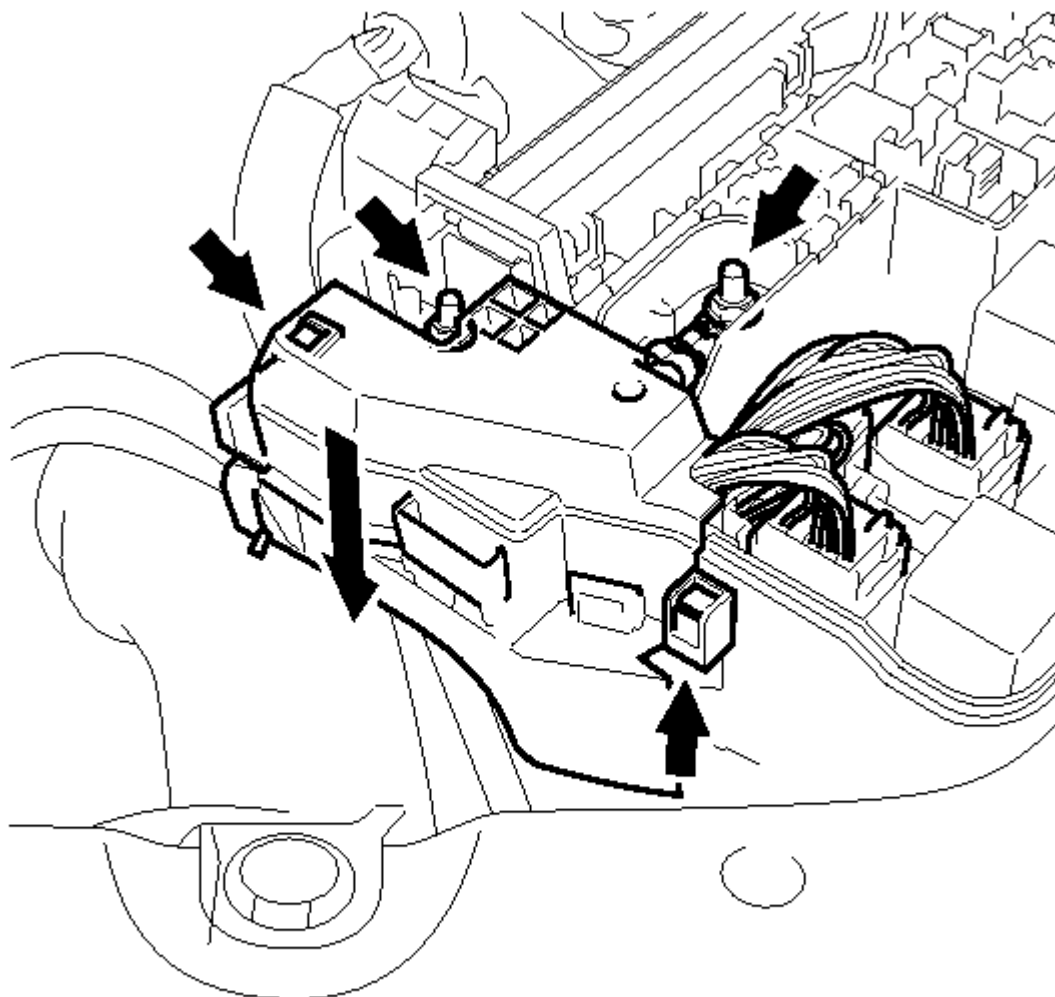


Fig. 186: Identifying Wire Harnesses And Connectors

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

Torque: 26 N*m (260 kgf*cm, 19 ft.*lbf)

- c. Install the wire harness with the 2 nuts.



C

Fig. 187: Identifying Wire Harness With Nuts

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

Torque: 8.4 N*m (85 kgf*cm, 74 in.*lbf)

- d. Connect the 3 connectors and 2 wire harness clamps to the engine room junction block.
e. Connect the connector to the ECU with the lock lever and connect the clamp.

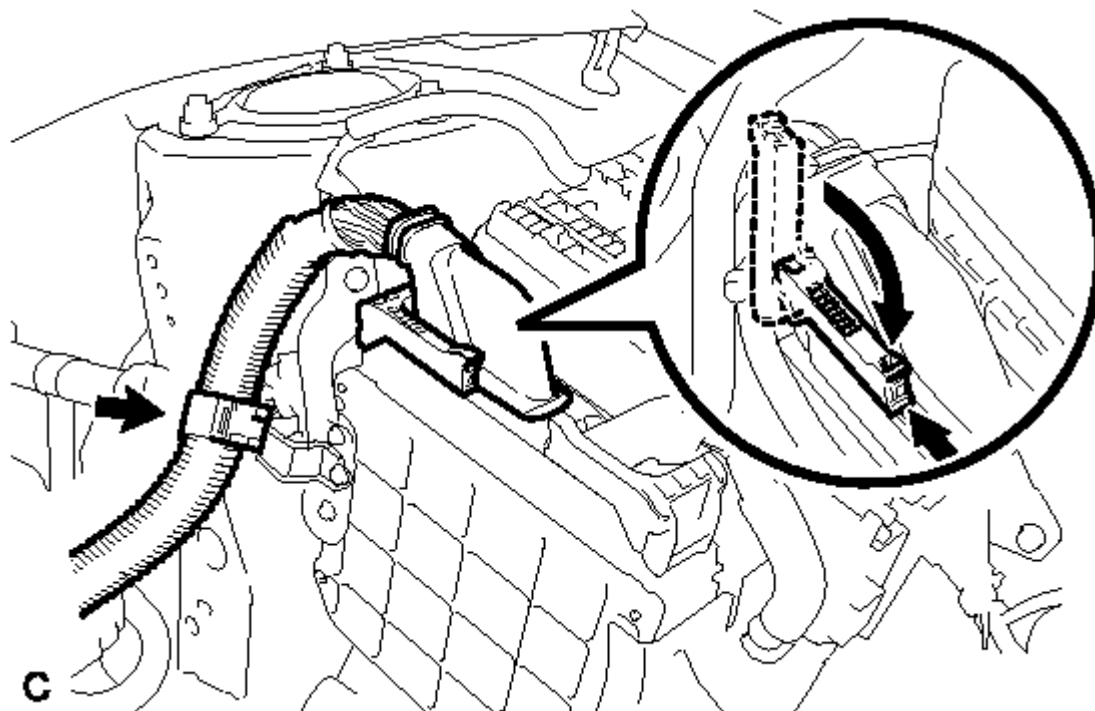


Fig. 188: Locating Engine Control Computer With Clamp And Lock Lever
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

43. **INSTALL CLUTCH RELEASE CYLINDER ASSEMBLY (for Manual Transaxle)**
- Install the clutch release cylinder assembly with the 4 bolts and clutch tube bracket.

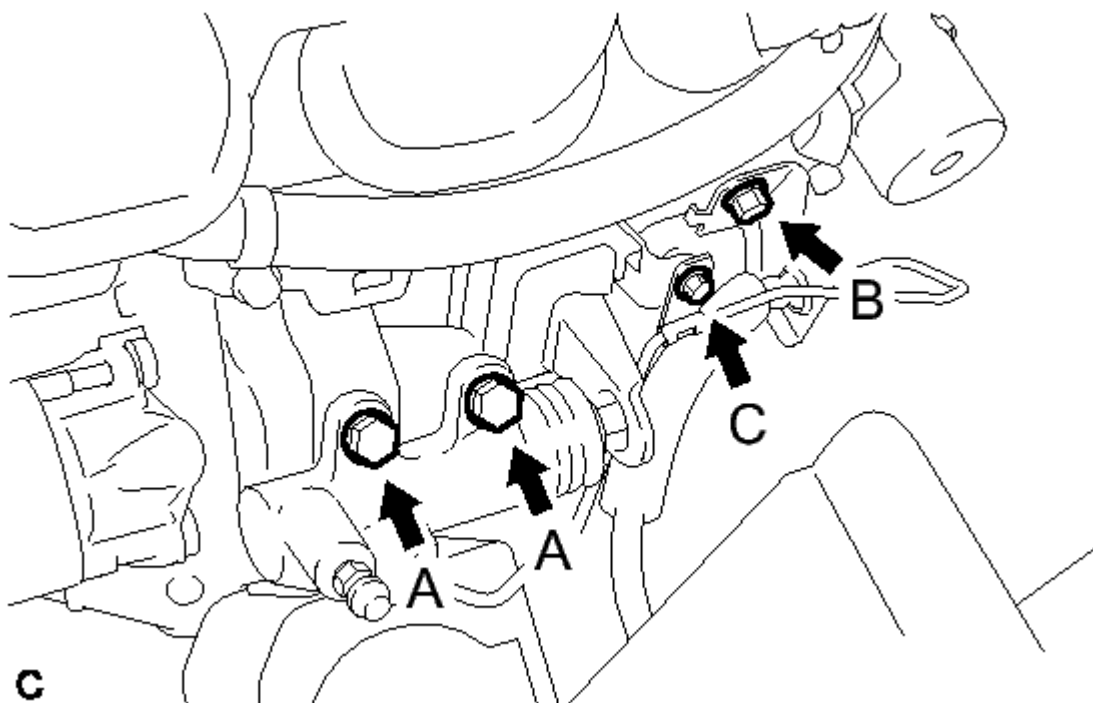


Fig. 189: Locating Clutch Release Cylinder Assembly Bolts (For Manual Transaxle)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Bolt A

Torque: 12 N*m (120 kgf*cm, 9 ft.*lbf)

Bolt B

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

Bolt C

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

44. **INSTALL COMPRESSOR WITH PULLEY ASSEMBLY (w/ Air Conditioning System)** . Refer to **INSTALLATION - Step 2**
45. **INSTALL FAN BELT ADJUSTING BAR**
- a. Install the bolt and fan belt adjusting bar.

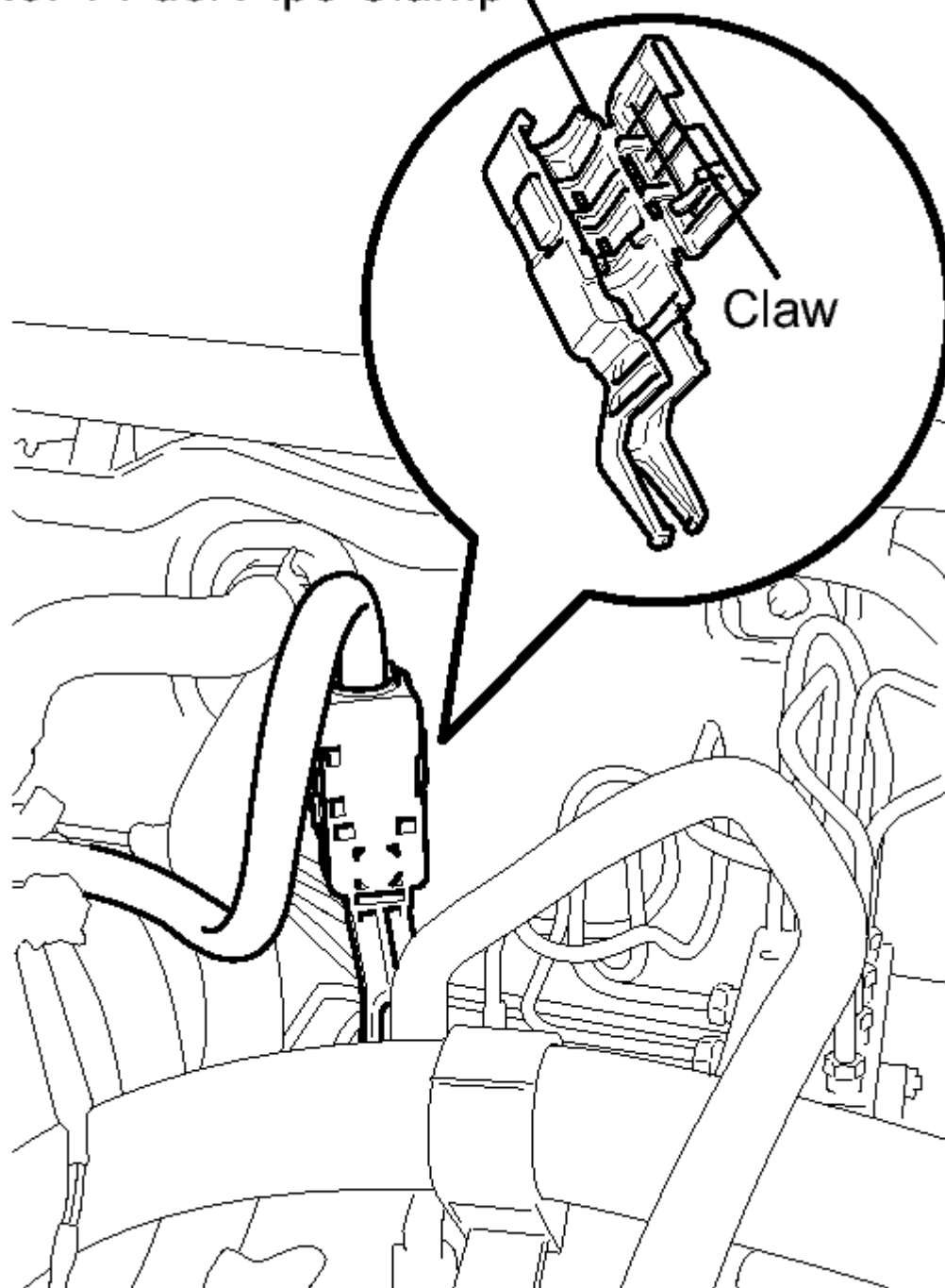
Torque: 19 N*m (194 kgf*cm, 14 ft.*lbf)

46. **INSTALL GENERATOR ASSEMBLY** . Refer to **INSTALLATION - Step 1**
47. **INSTALL V-RIBBED BELT** See step 1
48. **ADJUST V-RIBBED BELT** See step 2
49. **INSPECT V-RIBBED BELT** See step 1
50. **CONNECT FUEL TUBE SUB-ASSEMBLY**
- a. Connect the fuel tube connector and fuel pipe.

WARNING: Align the fuel tube connector with the pipe, then push the fuel tube connector in until the retainer makes a "click" sound. If the connection is tight, apply a small amount of engine oil to the tip of the pipe. After connecting, pull on the pipe and connector to make sure that they are securely connected.

- b. Engage the claw and install the No. 1 fuel pipe clamp.

No. 1 Fuel Pipe Clamp



C

Fig. 190: Identifying No. 1 Fuel Pipe Clamp

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

51. CONNECT INLET HEATER WATER HOSE

- a. Connect the inlet heater water hose with the clamp.

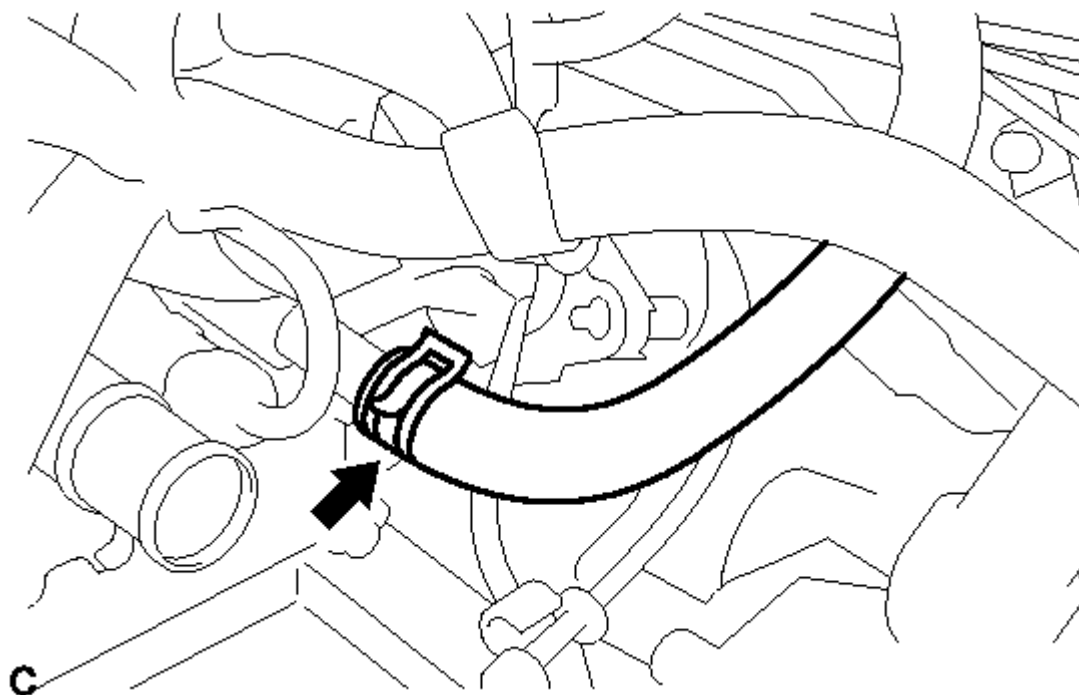


Fig. 191: Locating Inlet Heater Water Hose

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

52. CONNECT OUTLET HEATER WATER HOSE

- a. Connect the outlet heater water hose with the clamp.

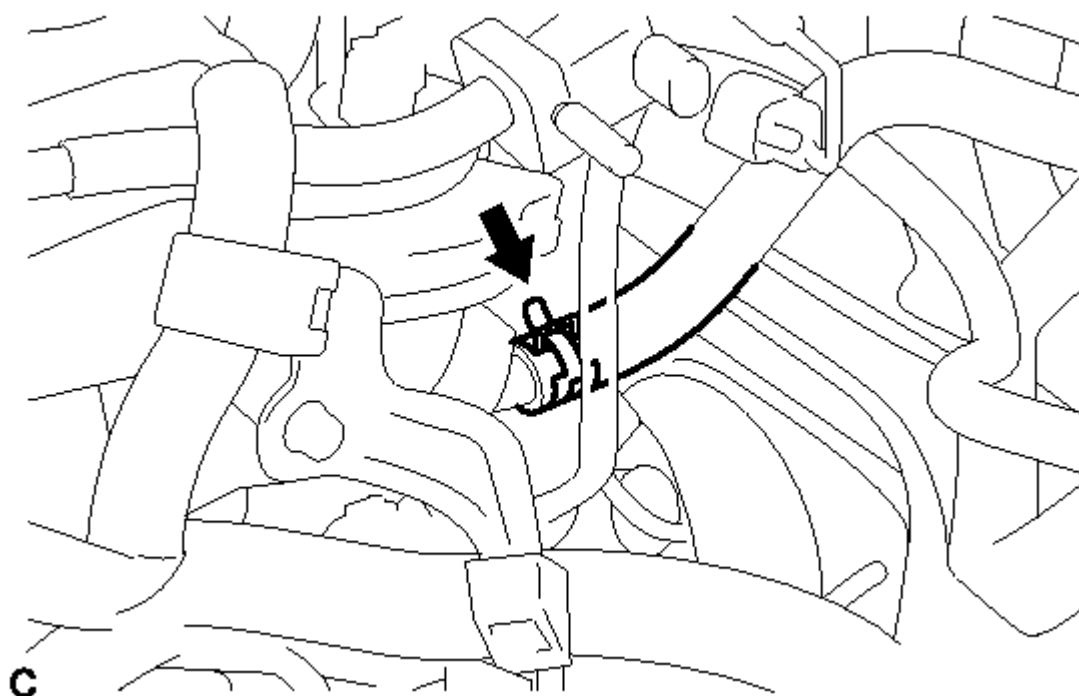


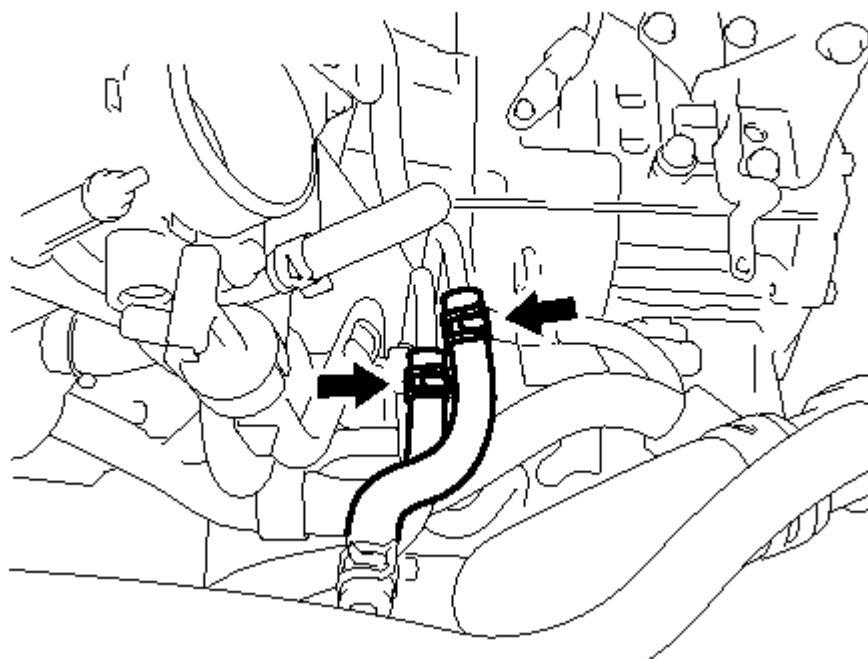
Fig. 192: Identifying Outlet Heater Water Hose With Clamp

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

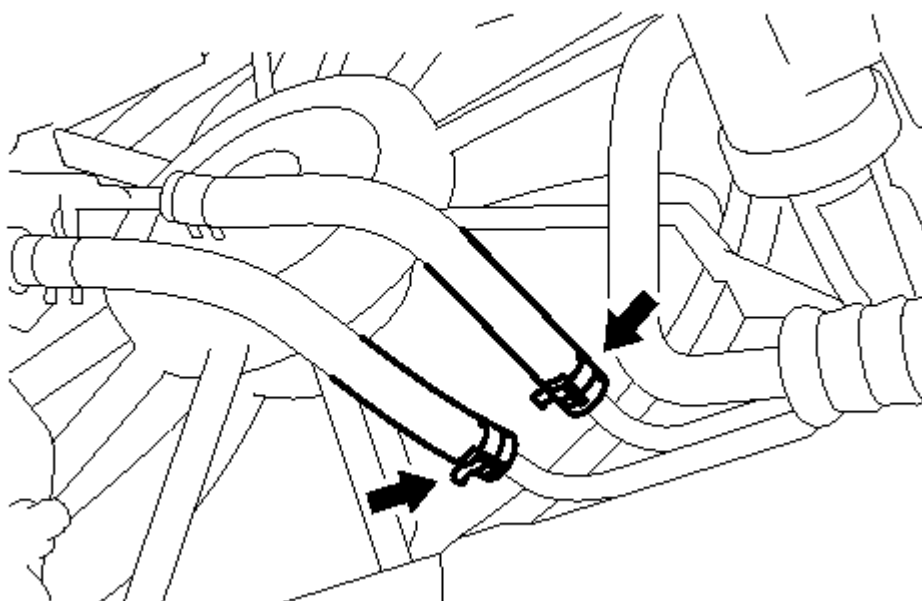
53. CONNECT OIL COOLER HOSE (for Automatic Transaxle)

- a. Connect the 2 oil cooler hoses with the clamps.

for TMC Made:



except TMC Made:



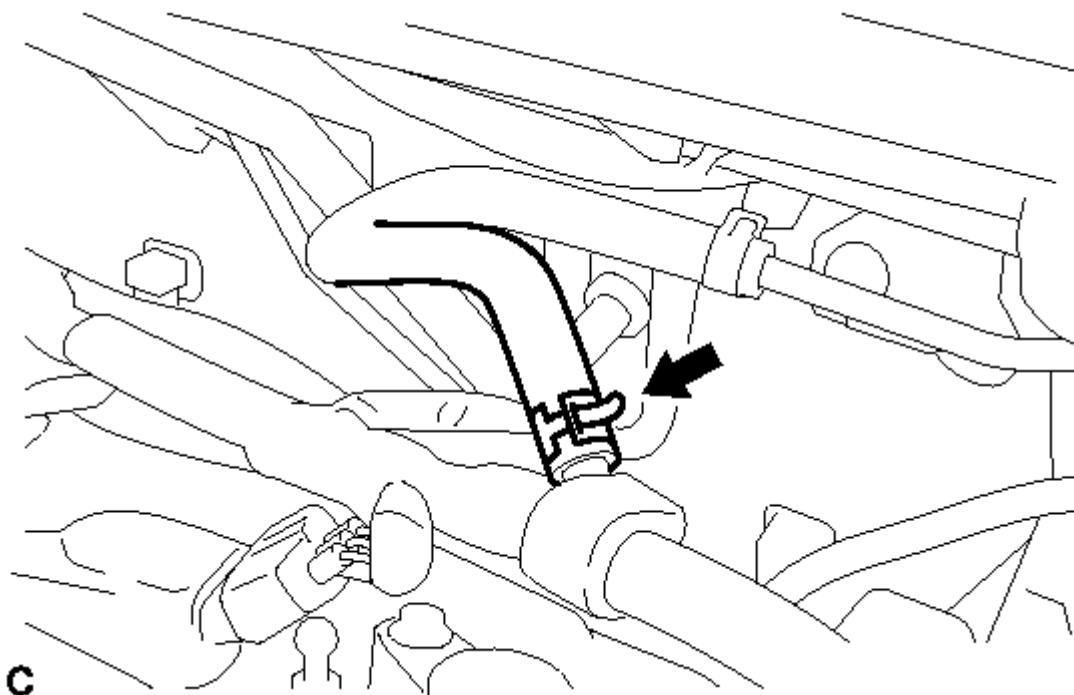
C

Fig. 193: Locating Oil Cooler Hoses Clamp

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

54. CONNECT UNION TO CONNECTOR TUBE HOSE

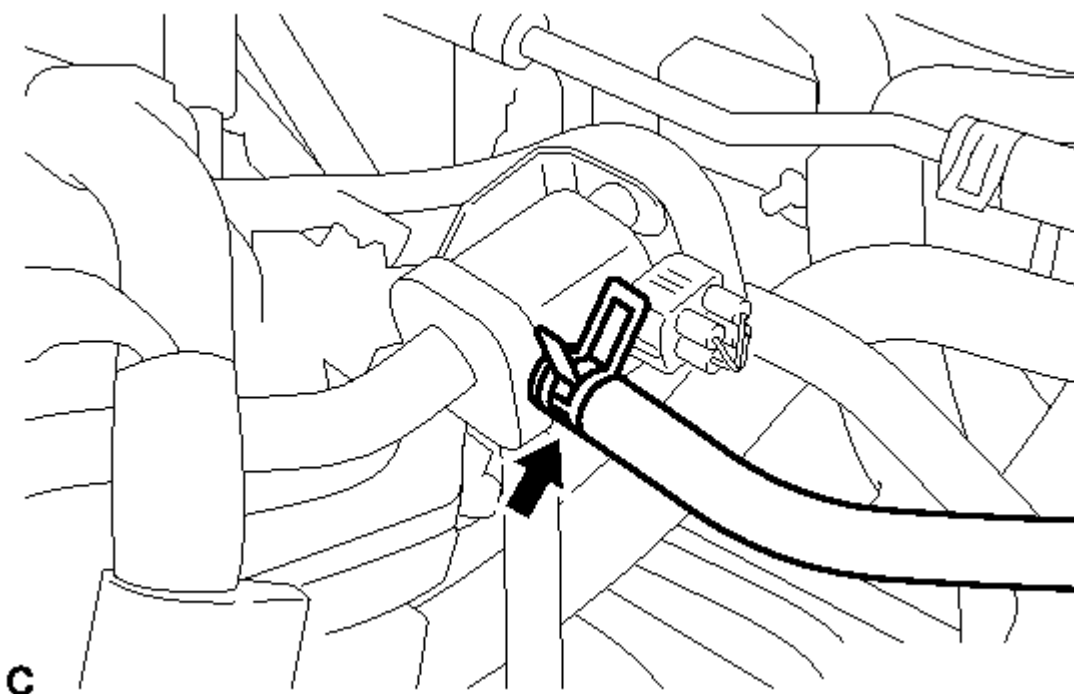
- a. Connect the union to connector tube hose.



C
Fig. 194: Locating Connector Tube Hose Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

55. CONNECT FUEL VAPOR FEED HOSE ASSEMBLY

- a. Connect the fuel vapor feed hose assembly.



C
Fig. 195: Locating Fuel Vapor Feed Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

56. INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY (for Manual Transaxle)

- a. Install the transmission control cable to the control cable bracket with 2 new clips.

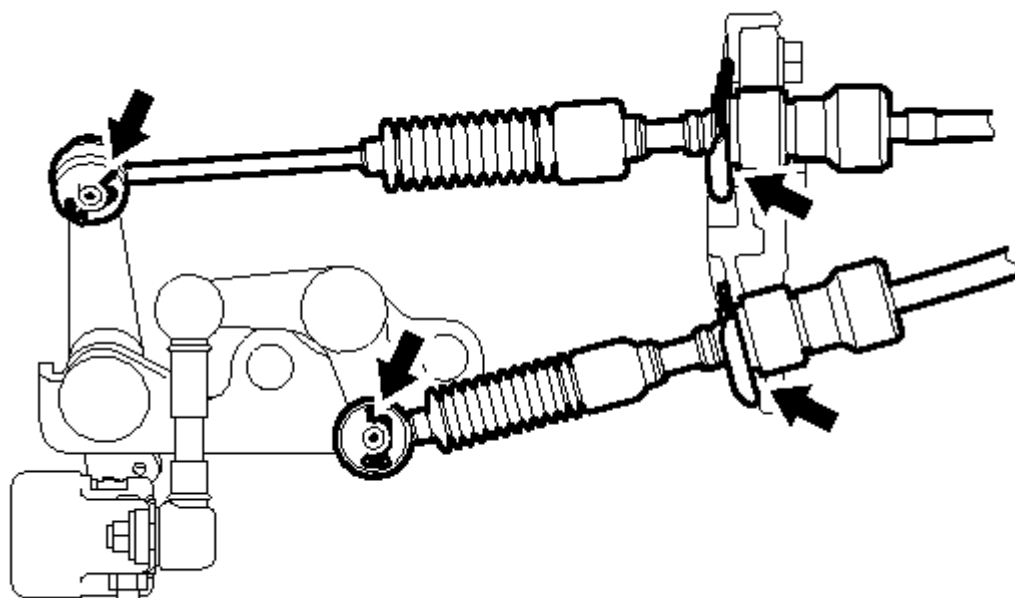
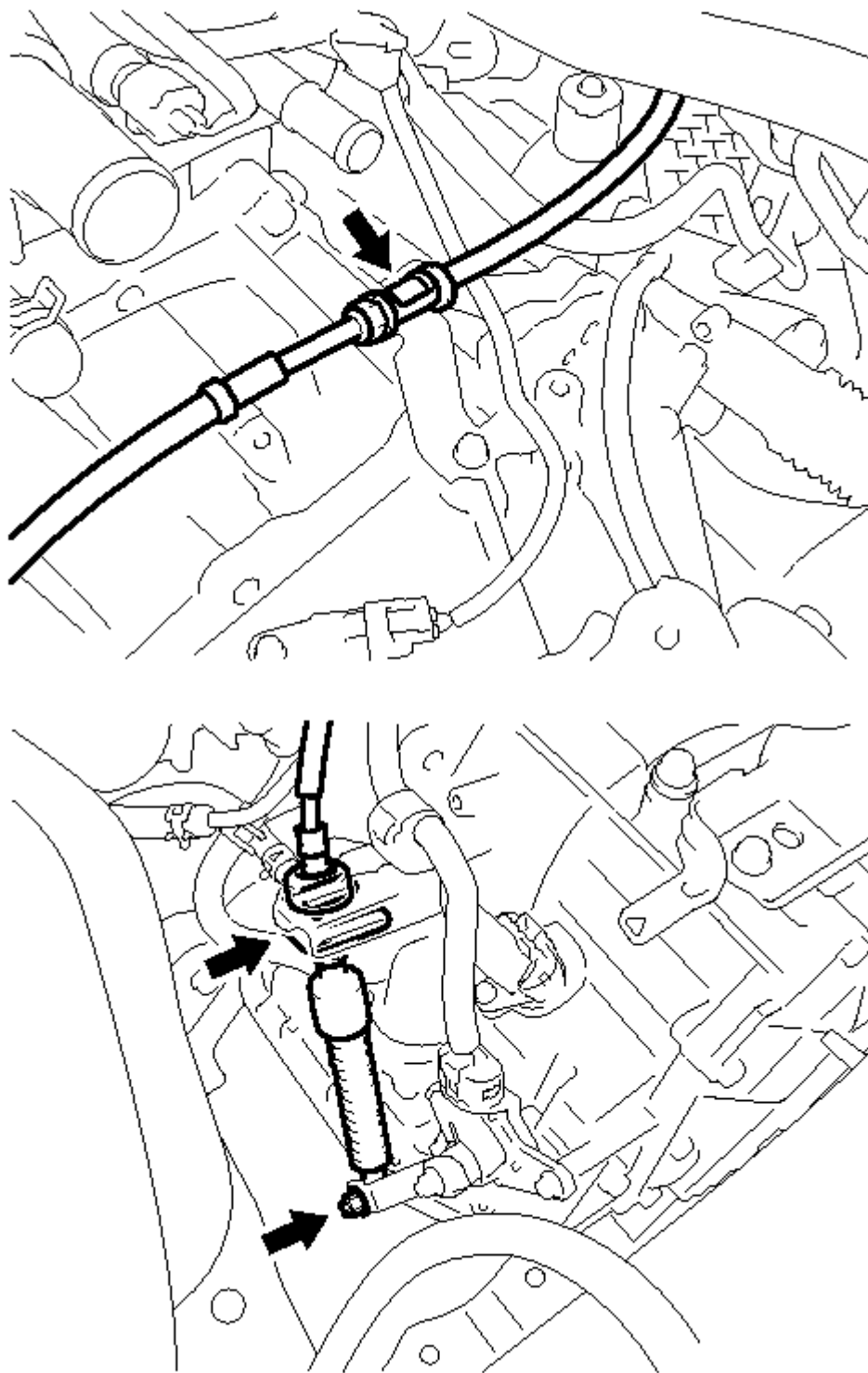
**C**

Fig. 196: Locating Transmission Control Cable Assembly (Manual Transaxle)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the transmission control cable to the transaxle with the 2 clips.
57. **INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY (for Automatic Transaxle)**
- a. Secure the control cable onto the control cable bracket with a new clip.



C

Fig. 197: Locating Transmission Control Cable Assembly (Automatic Transaxle)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Connect the control cable onto the control shaft lever with the nut.

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

- c. Connect the control cable to the cable support.

- d. Connect the clamp of the control cable with the bolt.

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

58. CONNECT NO. 2 RADIATOR HOSE

- a. Connect the No. 2 radiator hose with the clamp.

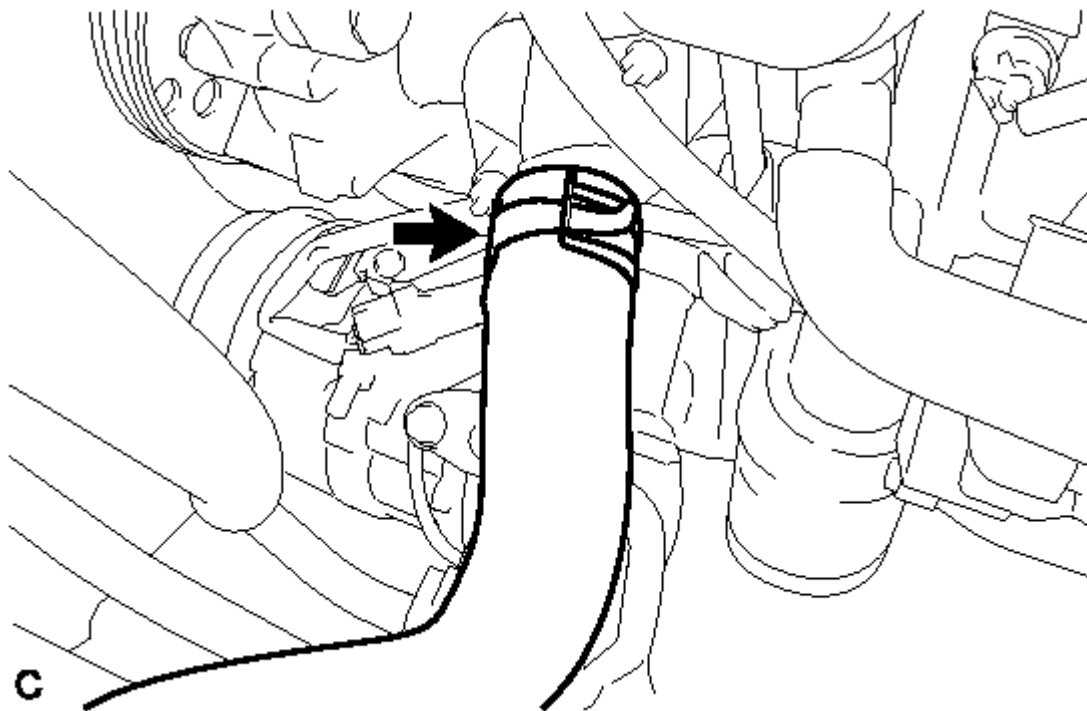


Fig. 198: Locating No. 2 Radiator Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

59. CONNECT NO. 1 RADIATOR HOSE

- a. Connect the No. 1 radiator hose with the clamp.

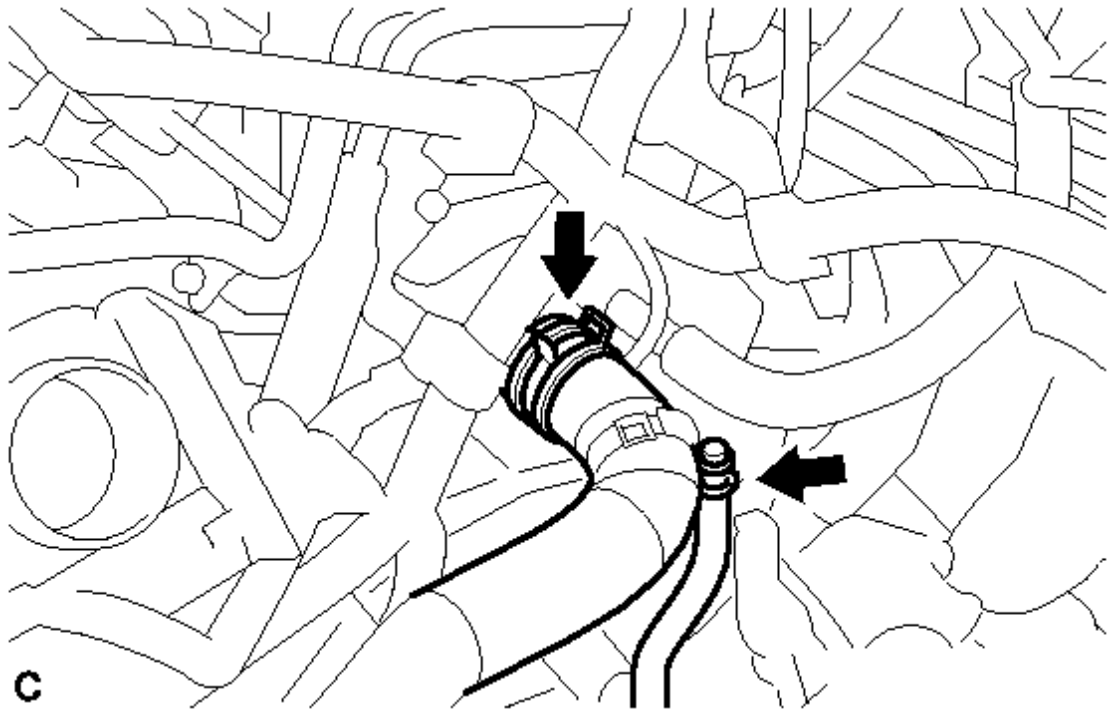


Fig. 199: Locating Battery Carrier With Bolts

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

- b. Connect the clamp.

60. INSTALL BATTERY CARRIER

- a. Install the battery carrier with the 4 bolts.

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

- b. Connect the radiator pipe with the 2 bolts.

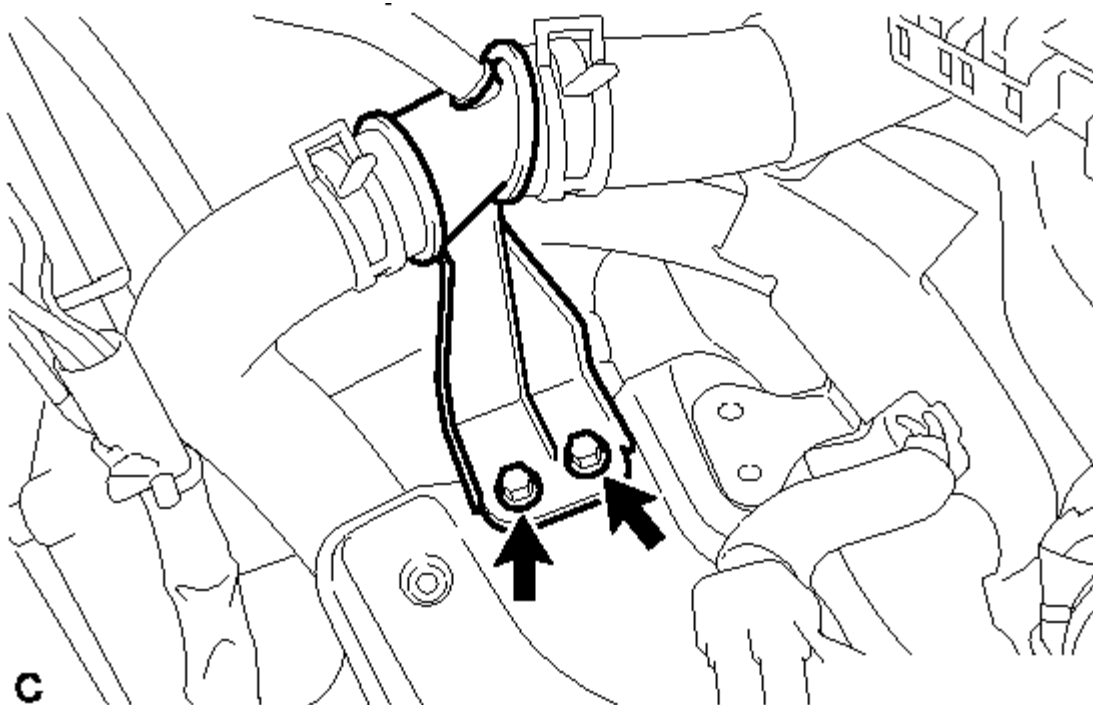
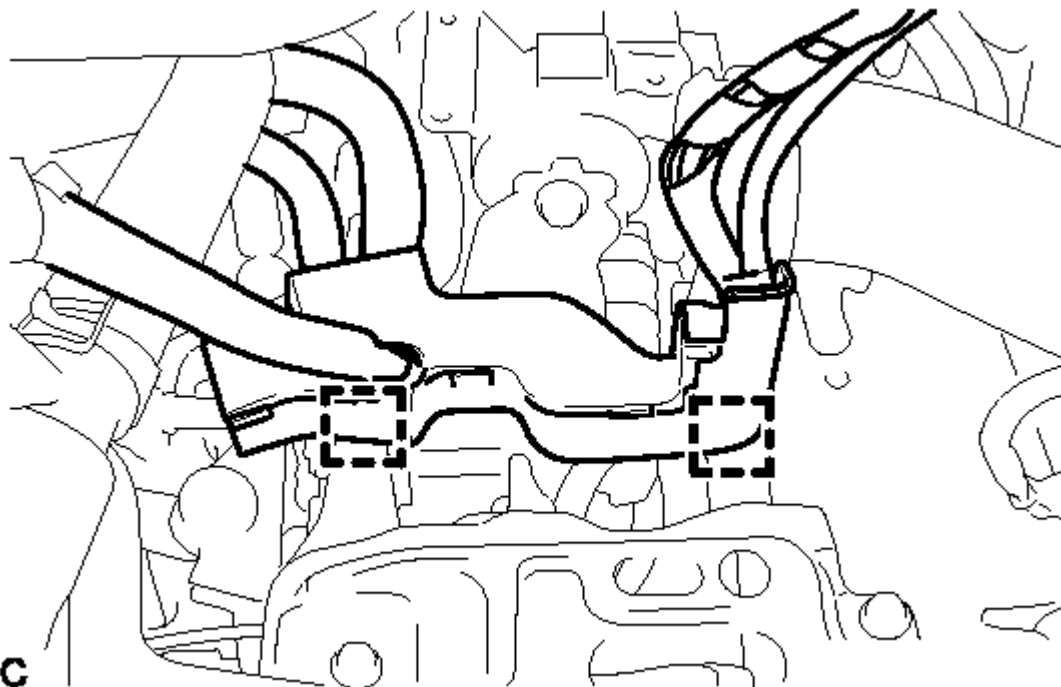


Fig. 200: Identifying Battery Carrier Bolts

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

Torque: 8.8 N*m (90 kgf*cm, 78 in.*lbf)

- c. Connect the 2 wire harness clamps.

**Fig. 201: Identifying Wire Harness Clamps**

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

61. INSTALL BATTERY

- a. Install the battery clamp with the bolt and nut.

for bolt**Torque: 6.5 N*m (66 kgf*cm, 58 in.*lbf)****for nut****Torque: 3.5 N*m (36 kgf*cm, 31 in.*lbf)**

- b. Connect the battery cables.

Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)**62. INSTALL AIR CLEANER CASE**

- a. Install the air cleaner case with the 3 bolts.

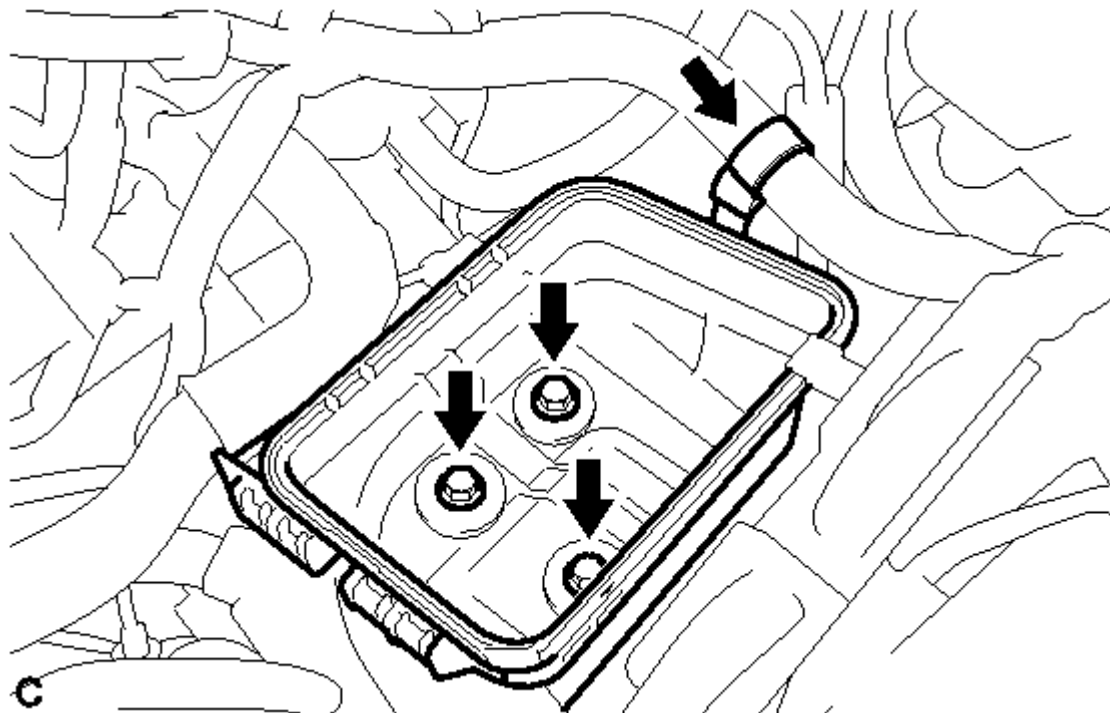


Fig. 202: Locating Battery Bolts

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

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

- b. Install the wire harness clamp to the air cleaner case.
 - c. Install the air cleaner filter element.
63. **INSTALL AIR CLEANER CAP SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 2**
64. **ADD TRANSAXLE OIL (for Manual Transaxle)**

HINT:

Refer to **REPLACEMENT** for C59.

65. **INSPECT AND ADJUST TRANSAXLE OIL (for Manual Transaxle)**

HINT:

Refer to **ON-VEHICLE INSPECTION** for C59.

66. **ADD AUTOMATIC TRANSAXLE FLUID (for Automatic Transaxle)**

HINT:

Refer to **INSTALLATION - Step 5** for U341E.

67. **INSPECT TRANSAXLE FLUID LEVEL (for Automatic Transaxle)**

HINT:

Refer to **ON-VEHICLE INSPECTION - Step 1** for U341E.

- 68. **INSPECT FOR AUTOMATIC TRANSAXLE FLUID LEAK (for Automatic Transaxle)**
- 69. **INSPECT SHIFT LEVER POSITION (for Automatic Transaxle)**

HINT:

Refer to **ADJUSTMENT** for U341E.

- 70. **ADJUST SHIFT LEVER POSITION (for Automatic Transaxle)**

HINT:

Refer to **ADJUSTMENT** for U341E.

- 71. **ADD ENGINE COOLANT** . Refer to **REPLACEMENT - Step 2**
- 72. **ADD ENGINE OIL** . Refer to **REPLACEMENT - Step 4**
- 73. **INSPECT ENGINE OIL LEVEL** . Refer to **ON-VEHICLE INSPECTION - Step 1**
- 74. **INSPECT FOR FUEL LEAK** . Refer to **ON-VEHICLE INSPECTION - Step 1**
- 75. **INSPECT FOR ENGINE COOLANT LEAK** . Refer to **ON-VEHICLE INSPECTION - Step 1**
- 76. **INSPECT FOR OIL LEAK**
- 77. **INSPECT FOR EXHAUST GAS LEAK**
- 78. **INSTALL ENGINE UNDER COVER LH**
- 79. **INSTALL ENGINE UNDER COVER RH**
- 80. **INSTALL FRONT WHEELS**

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

- 81. **INSPECT IGNITION TIMING** See step 8
- 82. **INSPECT ENGINE IDLE SPEED** See step 9
- 83. **INSPECT CO/HC** See step 11
- 84. **ADJUST FRONT WHEEL ALIGNMENT**

HINT:

Refer to **ADJUSTMENT** .

- 85. **INSTALL NO. 2 CYLINDER HEAD COVER**
 - a. Engage the 4 clips to install the No. 2 cylinder head cover.

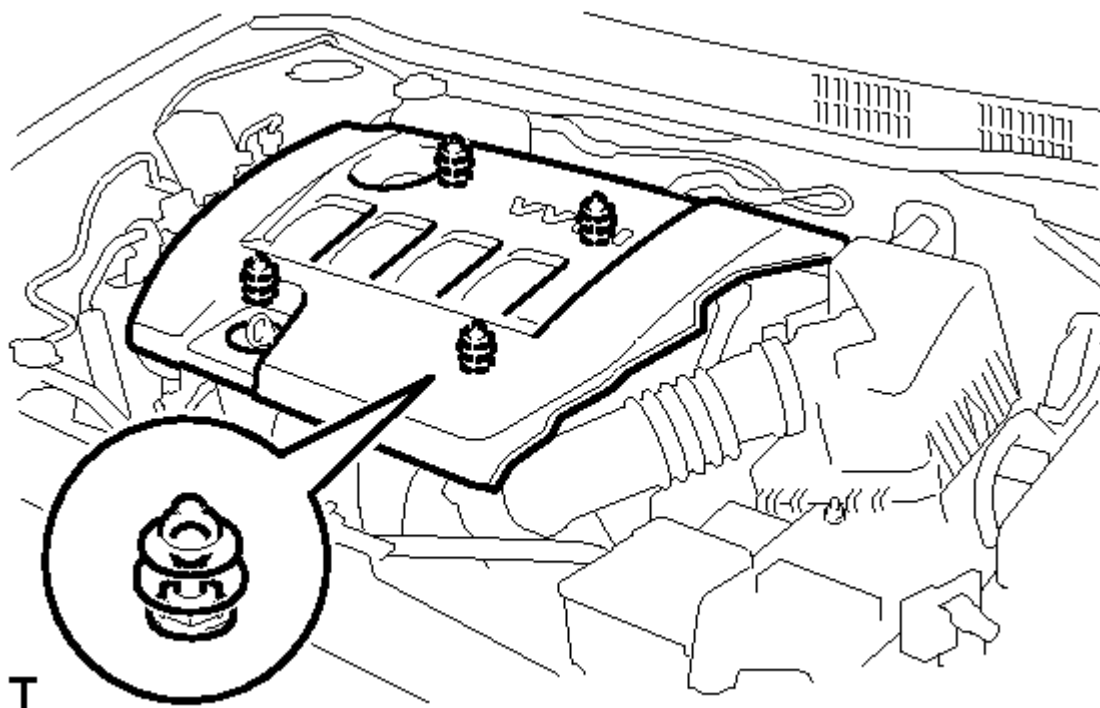


Fig. 203: Identifying No. 2 Cylinder Head Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Be sure to engage the clips securely.
- Do not apply excessive force or do not hit the cover to engage the clips. This may cause the cover to break.

86. CHECK ABS SPEED SENSOR SIGNAL

HINT:

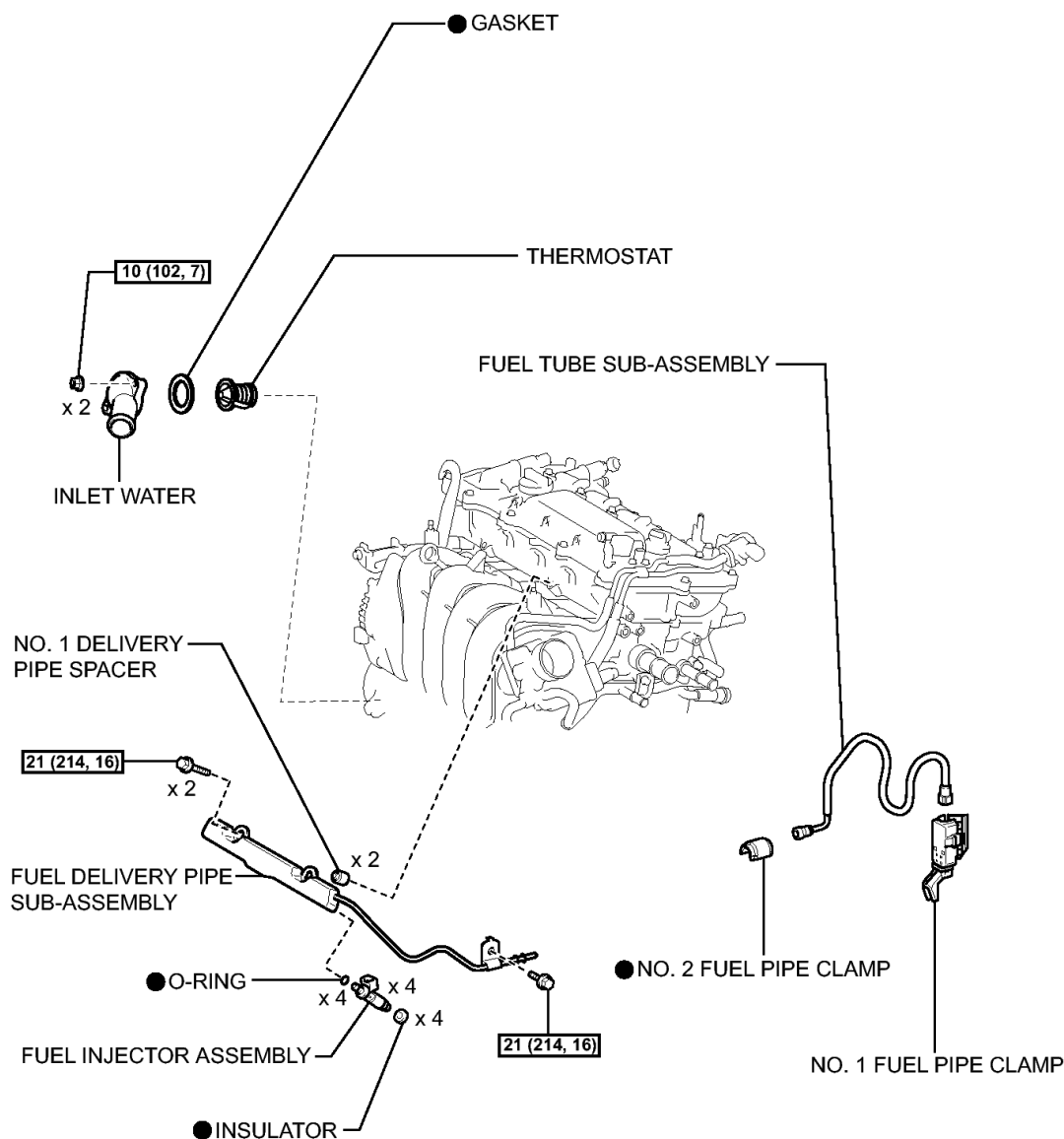
Refer to TEST MODE PROCEDURE for ABS.

Refer to TEST MODE PROCEDURE for VSC.

ENGINE UNIT

COMPONENTS

ILLUSTRATION



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

● Non-reusable part

c

Fig. 204: Exploded View Of Engine Unit Replacement Components With Torque Specifications (1 Of 7)

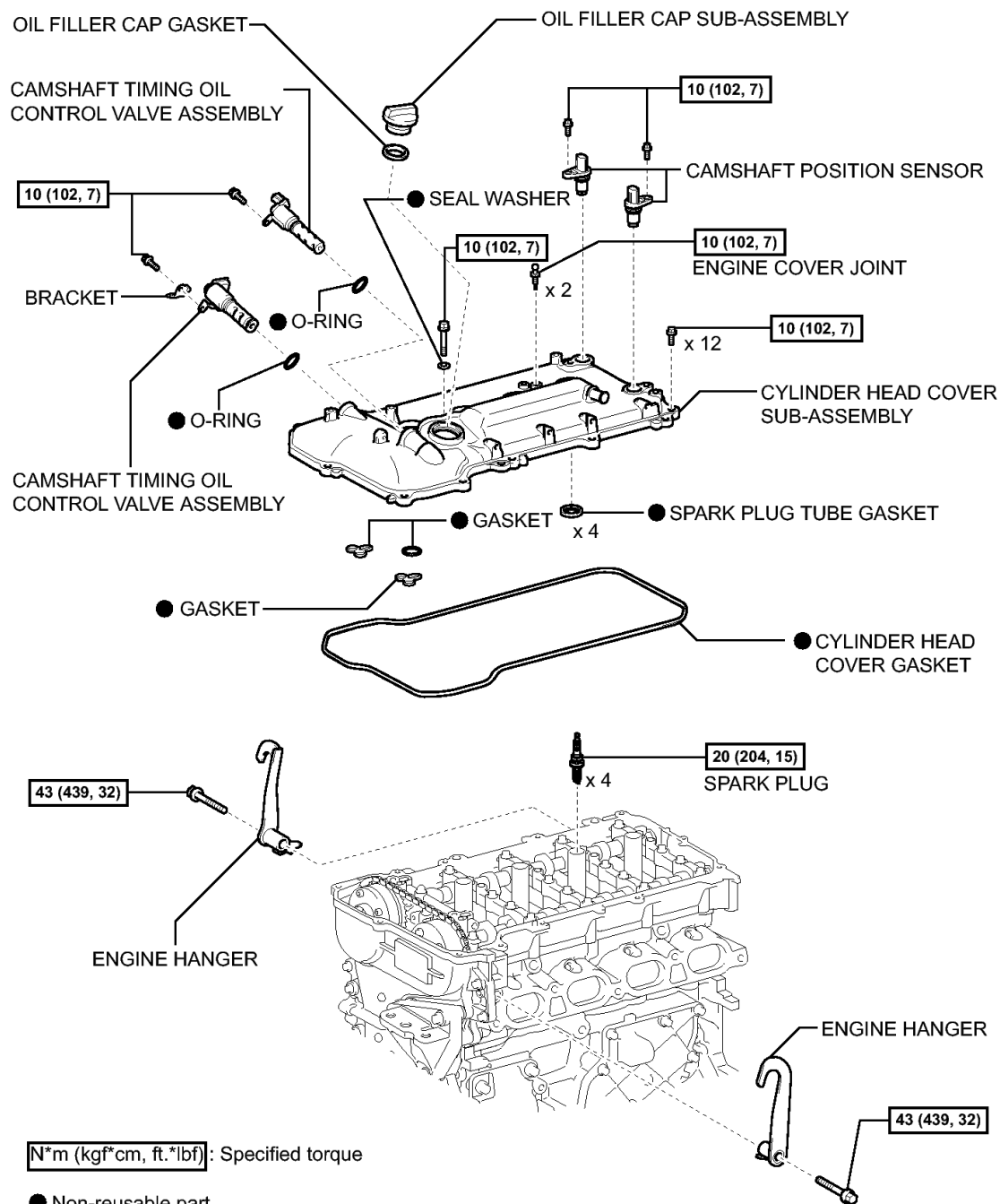
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



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

lunes, 22 de mayo de 2017 15:10:33

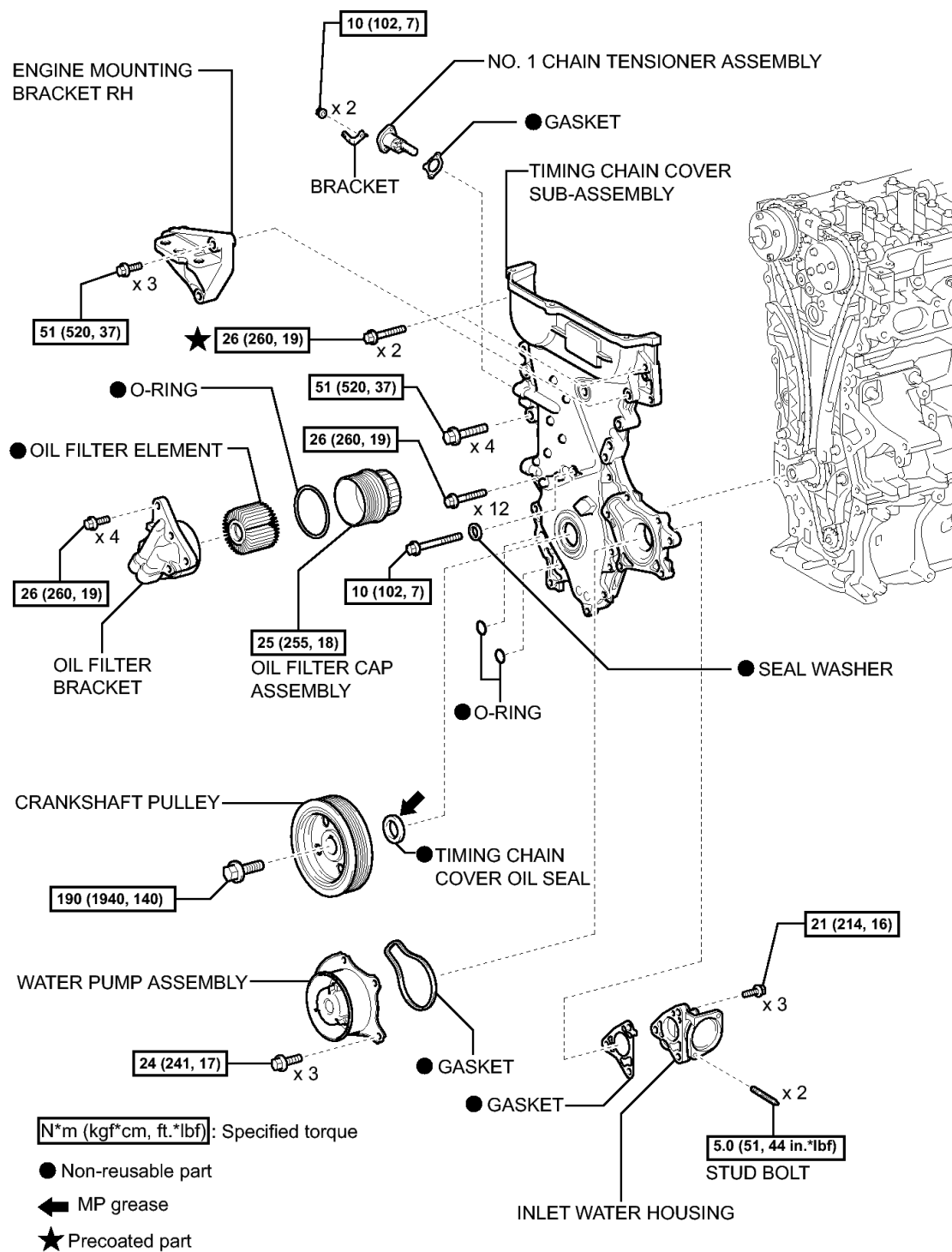


T

Fig. 206: Exploded View Of Engine Unit Replacement Components With Torque Specifications (3 Of 7)

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

ILLUSTRATION

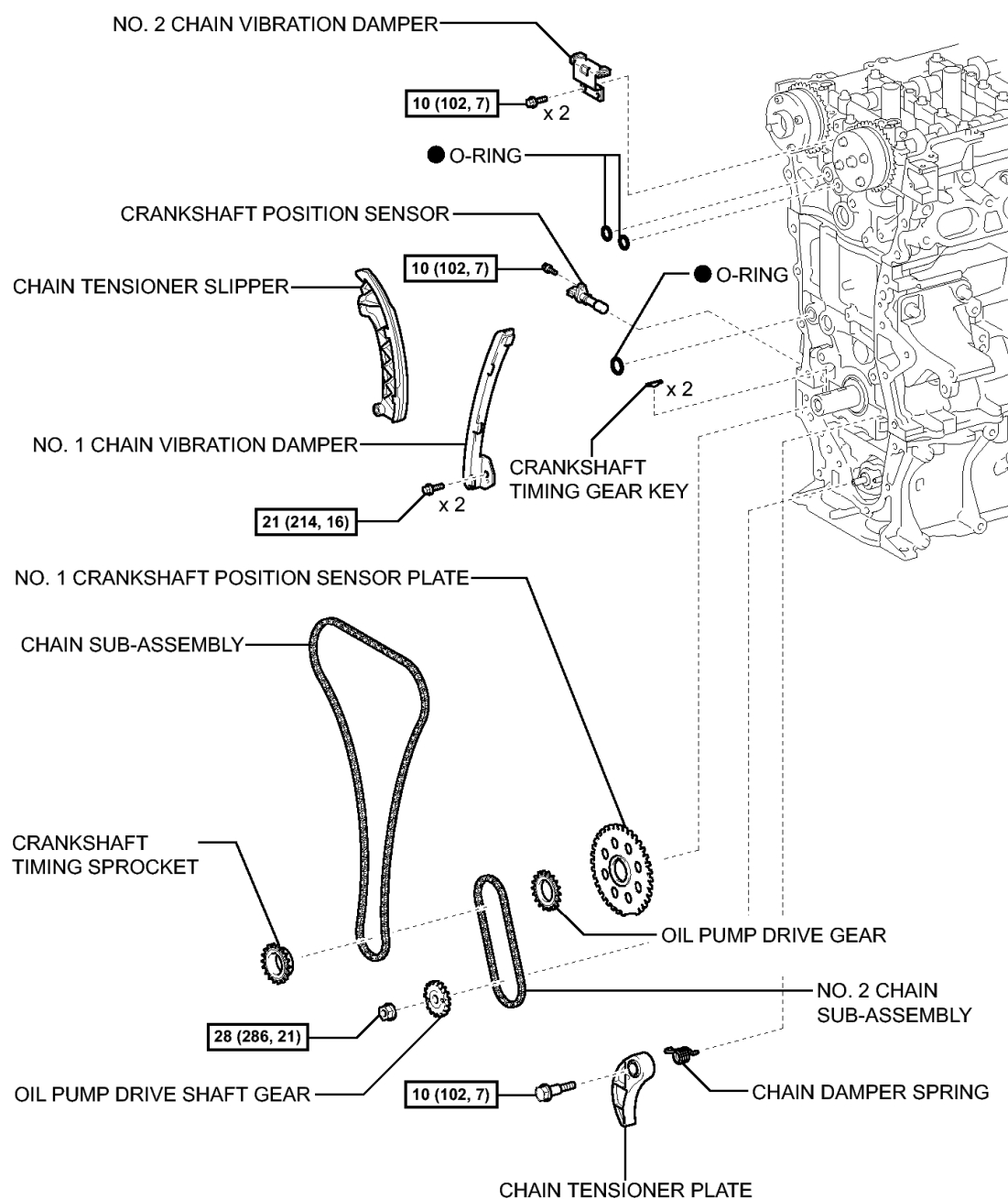


T

Fig. 207: Exploded View Of Engine Unit Replacement Components With Torque Specifications (4 Of 7)

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

ILLUSTRATION



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

● Non-reusable part

T

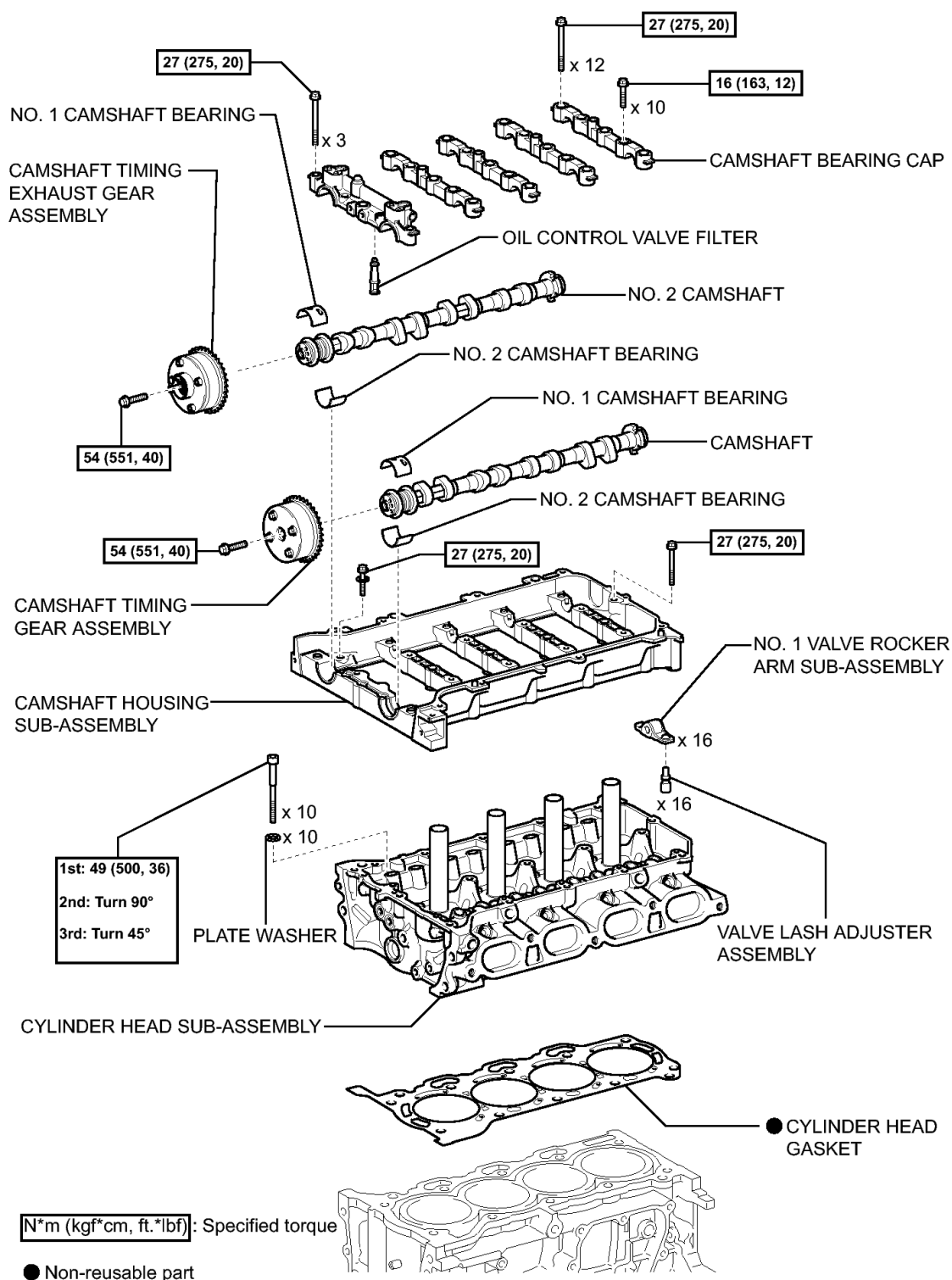
Fig. 208: Exploded View Of Engine Unit Replacement Components With Torque Specifications (5 Of 7)

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

ILLUSTRATION

2010 Toyota Corolla LE

2010 ENGINE Engine Mechanical (2ZR-FE) (Service Information) - Corolla

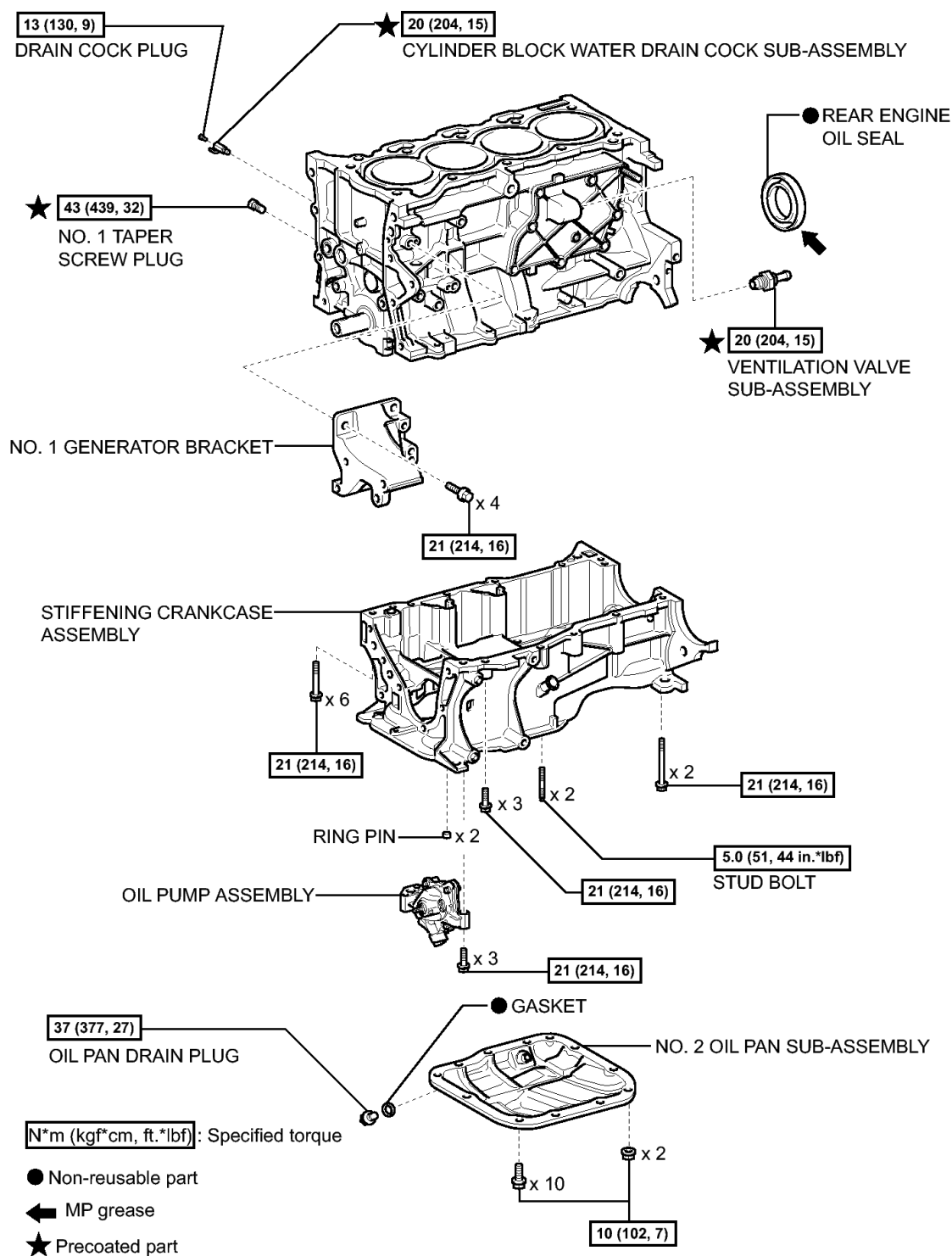


T

Fig. 209: Exploded View Of Engine Unit Replacement Components With Torque Specifications (6 Of 7)

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

ILLUSTRATION



T

Fig. 210: Exploded View Of Engine Unit Replacement Components With Torque Specifications (7 Of 7)

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

REMOVAL

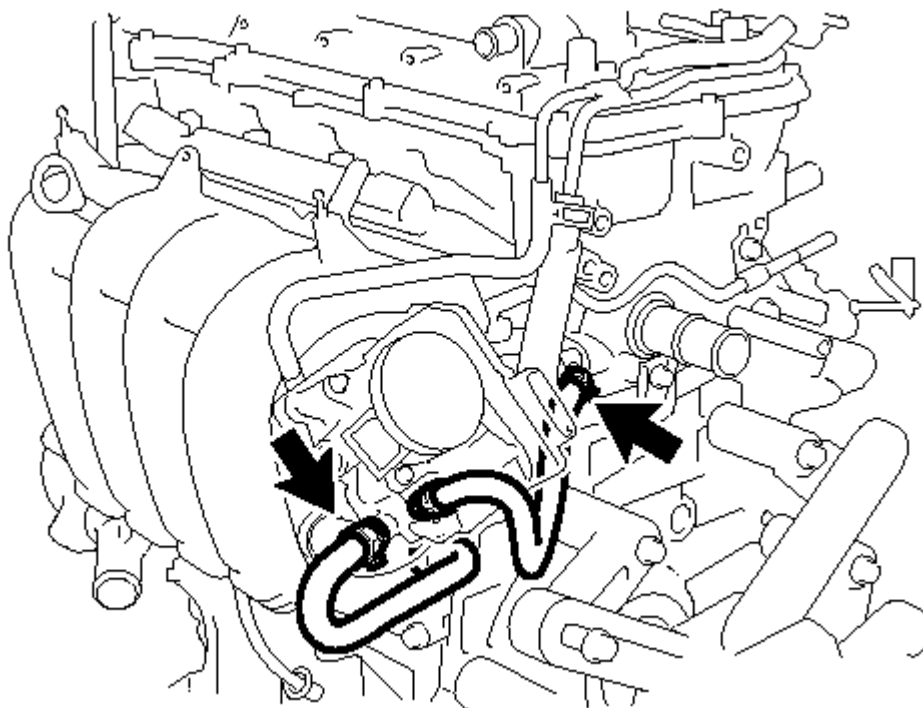
REMOVAL

1. INSTALL ENGINE STAND

- a. Set the engine on an engine stand.

2. REMOVE ENGINE HANGER See step 19**3. REMOVE INTAKE MANIFOLD**

- a. Remove the wire harness clamp bracket.
- b. Remove the 2 bolts and disconnect the air tube.
- c. Disconnect the ventilation hose from the intake manifold.
- d. Disconnect the 2 water by-pass hoses.

**T****Fig. 211: Locating Water By-Pass Hoses****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- e. Remove the 4 bolts, 2 nuts and intake manifold and intake manifold stay.

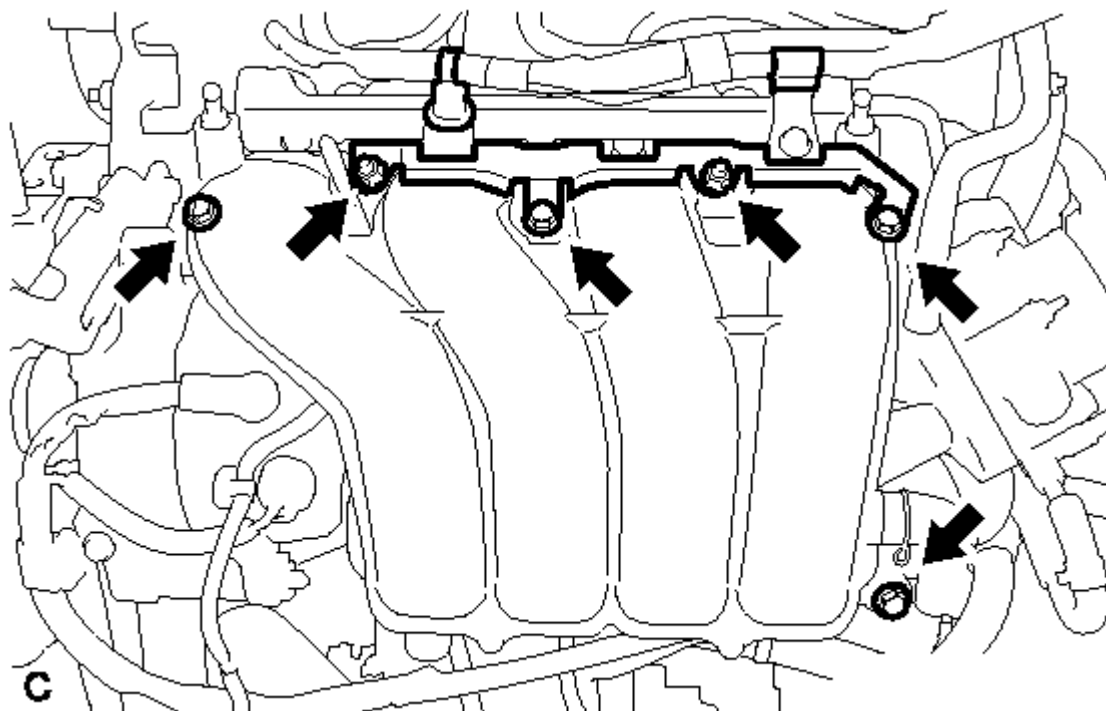
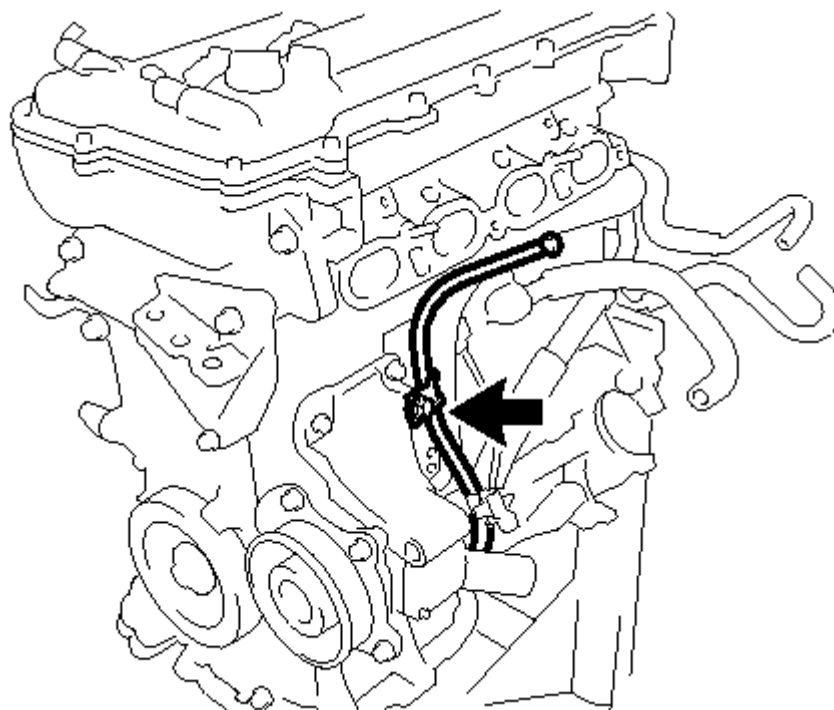


Fig. 212: Locating Intake Manifold And Intake Manifold Stay
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Remove the gasket from the intake manifold.
4. **DISCONNECT FUEL TUBE SUB-ASSEMBLY** . Refer to **REMOVAL - Step 6**
5. **REMOVE FUEL DELIVERY PIPE SUB-ASSEMBLY** . Refer to **REMOVAL - Step 7**
6. **REMOVE FUEL INJECTOR ASSEMBLY** . Refer to **REMOVAL - Step 8**
7. **REMOVE IGNITION COIL ASSEMBLY**
 - a. Remove the 4 bolts and 4 ignition coils.
8. **REMOVE OIL LEVEL DIPSTICK SUB-ASSEMBLY**
 - a. Remove the bolt and oil level dipstick.

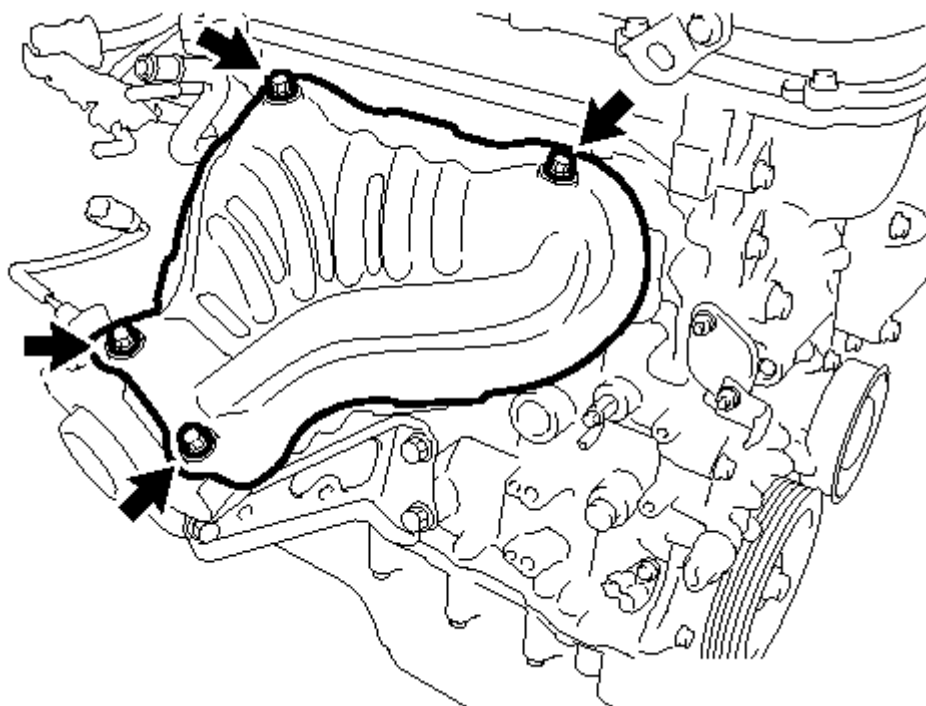
**T****Fig. 213: Locating Oil Level Dipstick**

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

- b. Remove the O-ring from the oil level dipstick.

9. REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

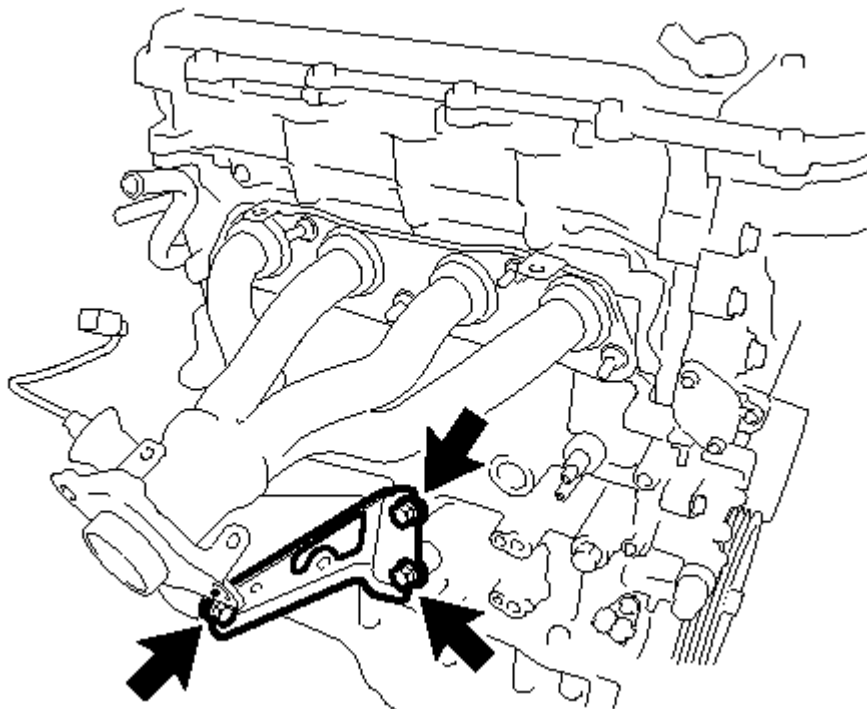
- a. Remove the 4 bolts and exhaust manifold heat insulator.

**T****Fig. 214: Locating Exhaust Manifold Heat Insulator With Bolts**

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

10. REMOVE MANIFOLD STAY

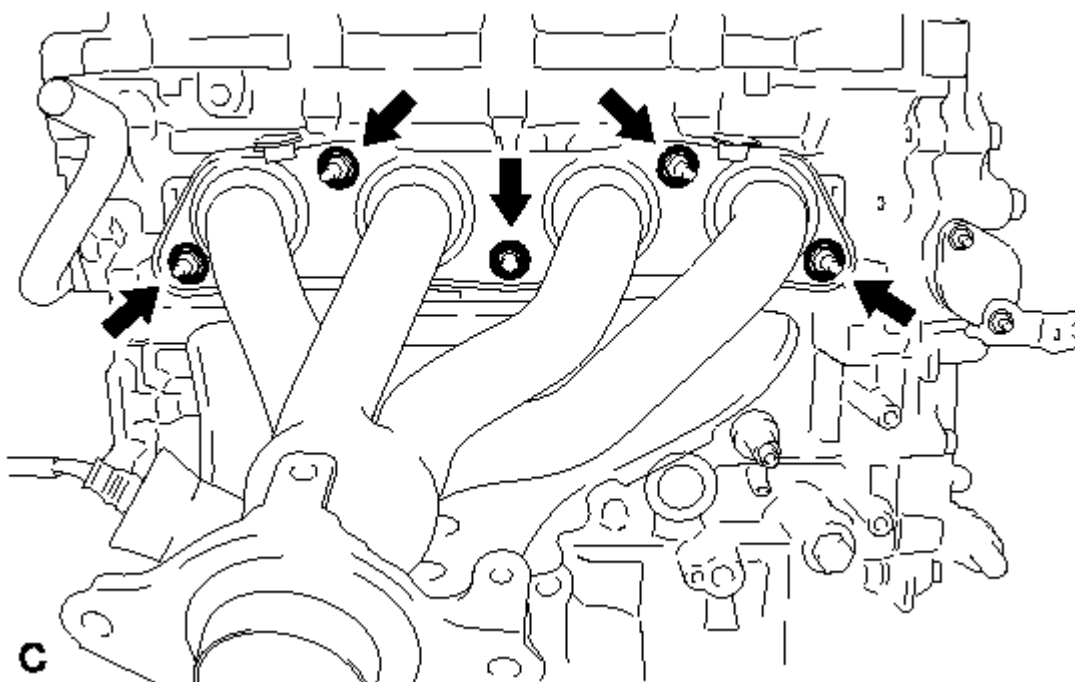
- a. Remove the 3 bolts and manifold stay.

**T****Fig. 215: Locating Manifold Stay Bolts**

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

11. REMOVE EXHAUST MANIFOLD

- a. Remove the 5 nuts and exhaust manifold.

**C****Fig. 216: Locating Exhaust Manifold Nuts**

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

12. REMOVE VENTILATION HOSE

- a. Remove the ventilation hose.

13. DISCONNECT NO. 3 WATER BY-PASS HOSE

- a. Disconnect the No. 3 water by-pass hose from the water inlet housing.

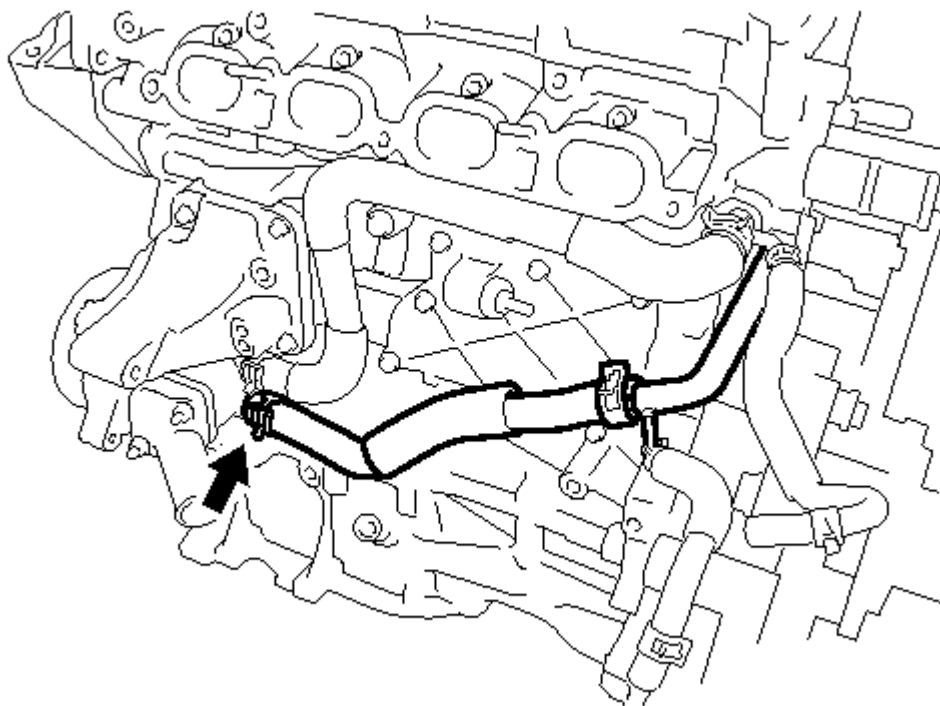
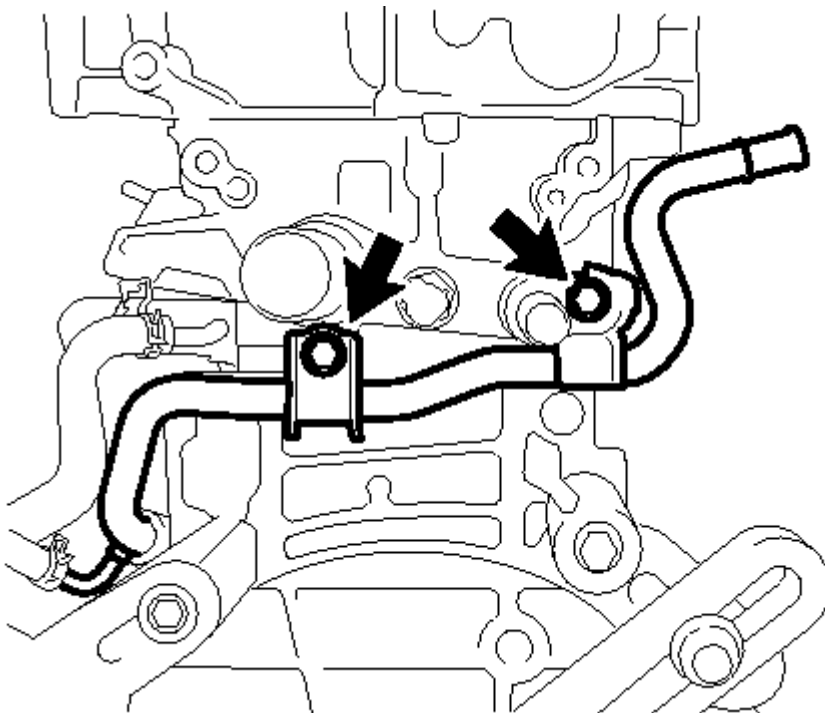
**C**

Fig. 217: Locating No. 3 Water By-Pass Hose

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

14. REMOVE NO. 1 WATER BY-PASS PIPE

- a. Remove the 2 bolts and No. 1 water by-pass pipe.



T

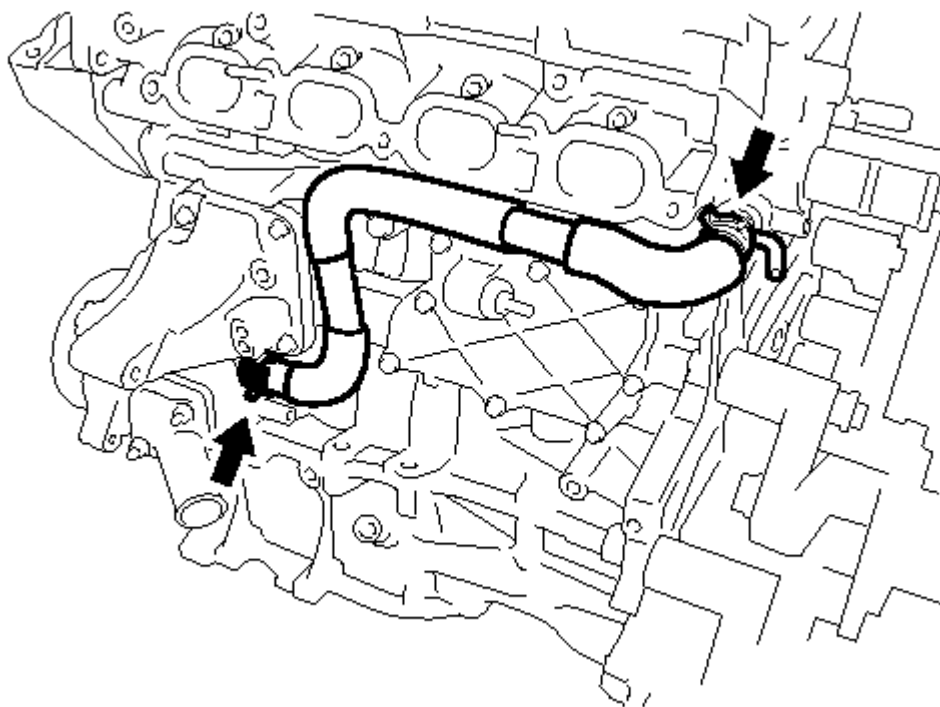
Fig. 218: Locating Clamp And Water By-Pass Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. REMOVE WATER BY-PASS HOSE

- a. Remove the clamp and water by-pass hose.

16. REMOVE INLET WATER HOSE

- a. Remove the 2 clamps and inlet water hose.



C

Fig. 219: Locating Inlet Water Hose Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. **REMOVE INLET WATER** . Refer to **REMOVAL - Step 2**
18. **REMOVE THERMOSTAT** . Refer to **REMOVAL - Step 3**
19. **REMOVE RADIO SETTING CONDENSER**
 - a. Remove the bolt and radio setting condenser.

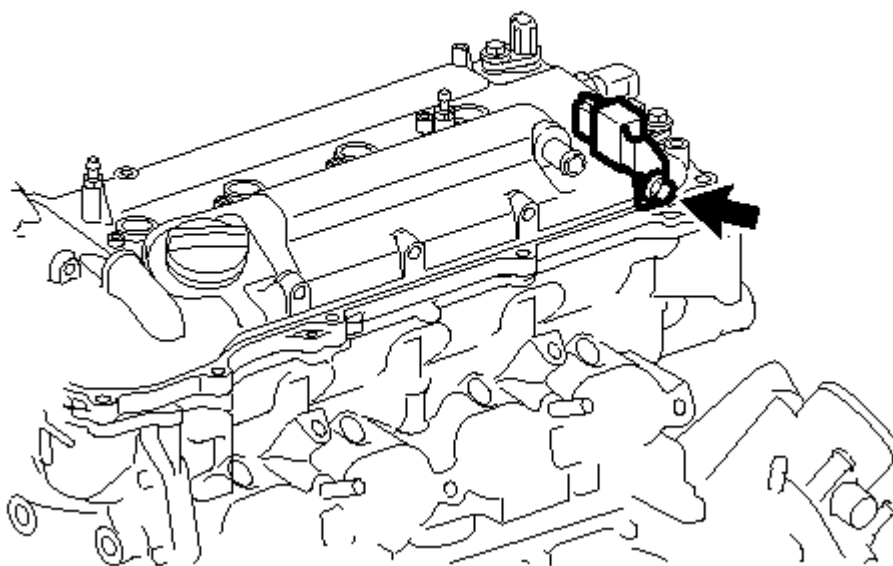
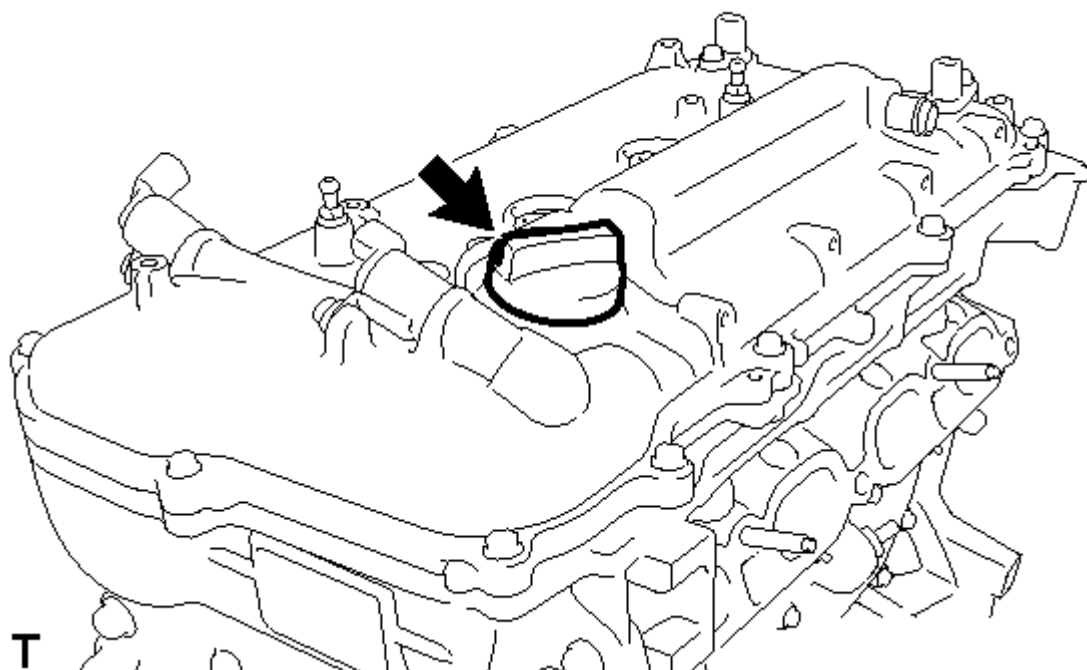


Fig. 220: Locating Radio Setting Condenser
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

DISASSEMBLY

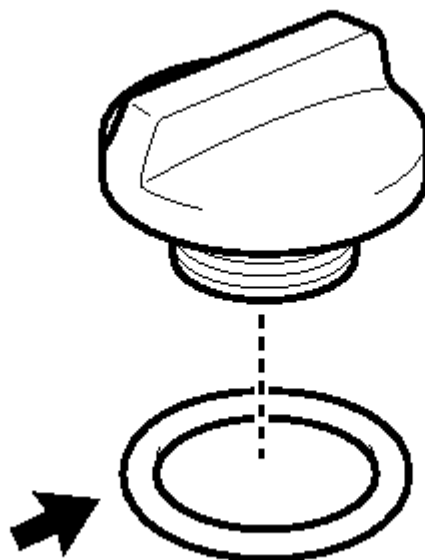
1. **REMOVE OIL FILLER CAP SUB-ASSEMBLY**
 - a. Remove the oil filler cap.



T
Fig. 221: Locating Oil Filler Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. REMOVE OIL FILLER CAP GASKET

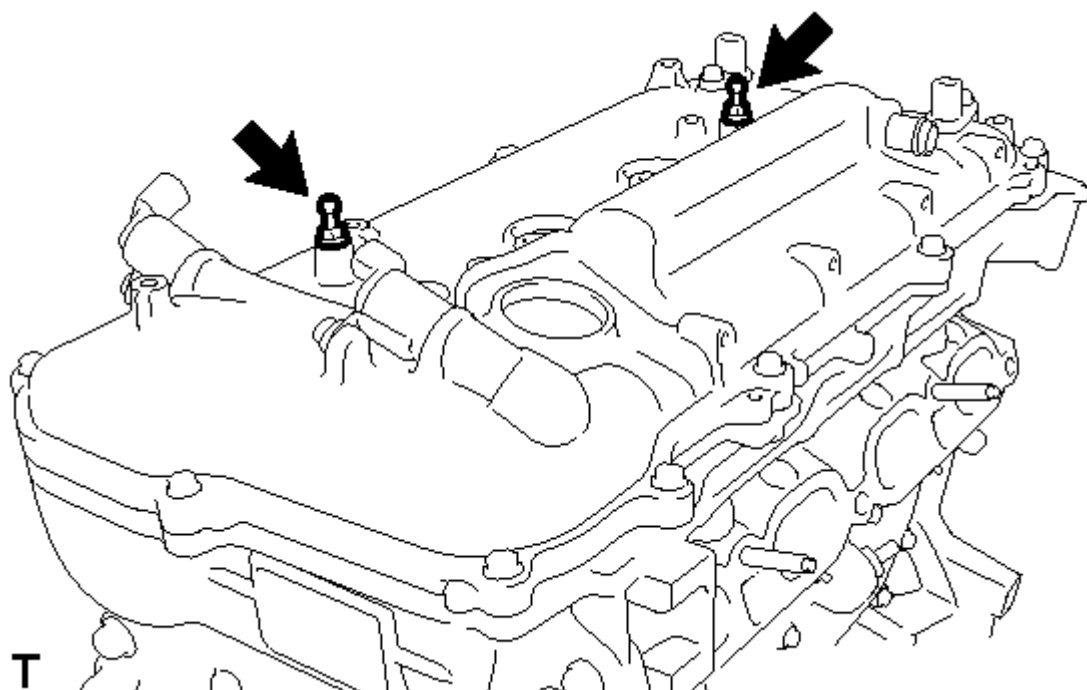
- a. Remove the gasket from the oil filler cap.



T
Fig. 222: Locating Oil Filler Cap Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. REMOVE ENGINE COVER JOINT

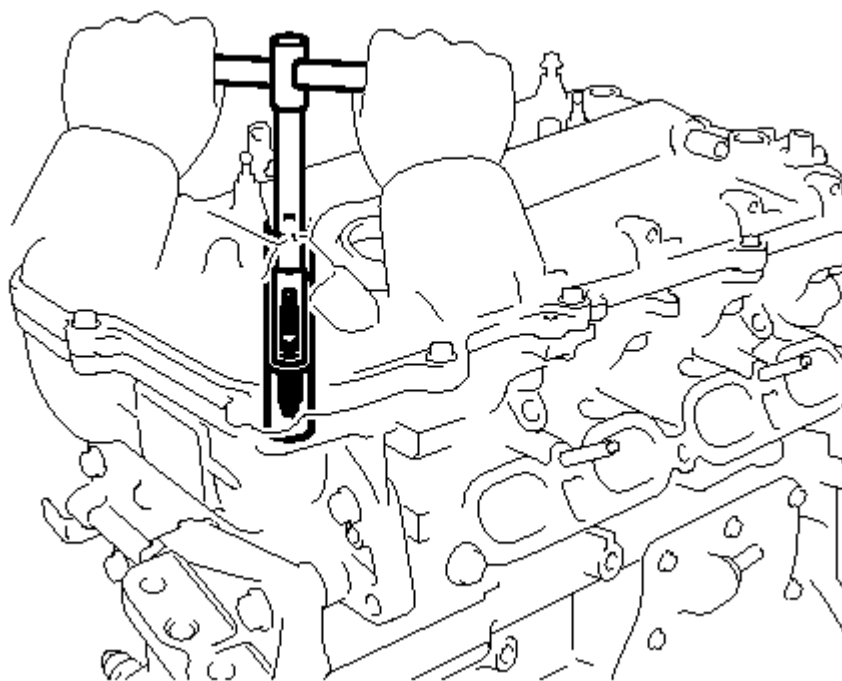
- a. Remove the 2 engine cover joints.

**Fig. 223: Locating Engine Cover Joints**

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

4. REMOVE SPARK PLUG

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

**Fig. 224: Removing/Installing Spark Plug**

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

5. REMOVE CAMSHAFT POSITION SENSOR

- a. Remove the 2 bolts and 2 sensors.

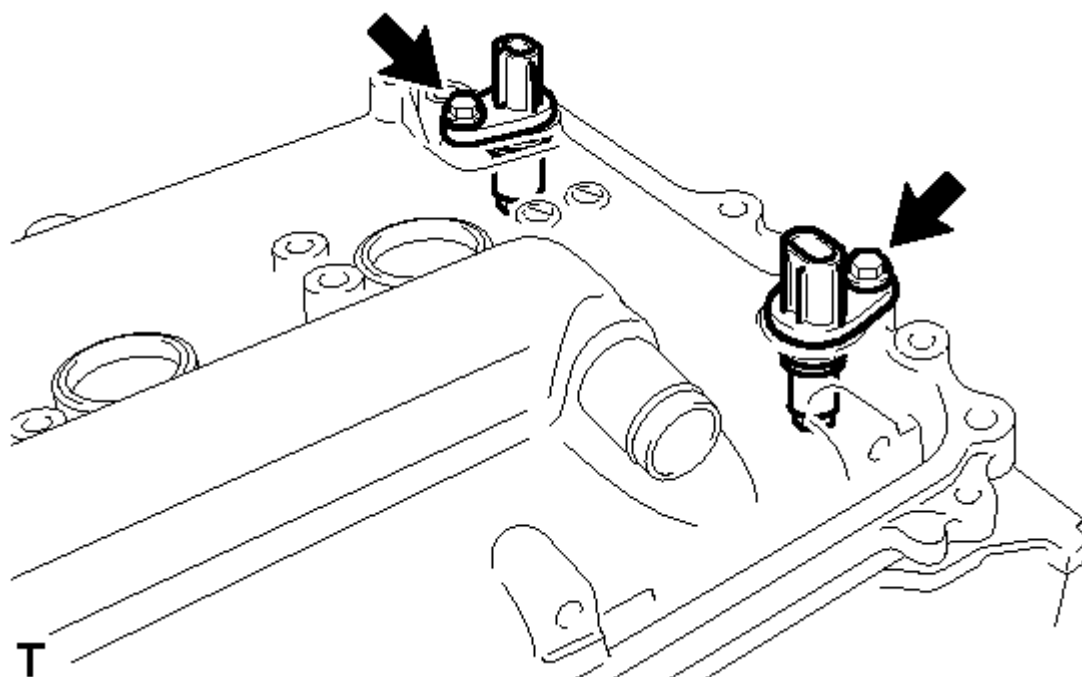


Fig. 225: Locating Bolts And Sensors

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

6. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY

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

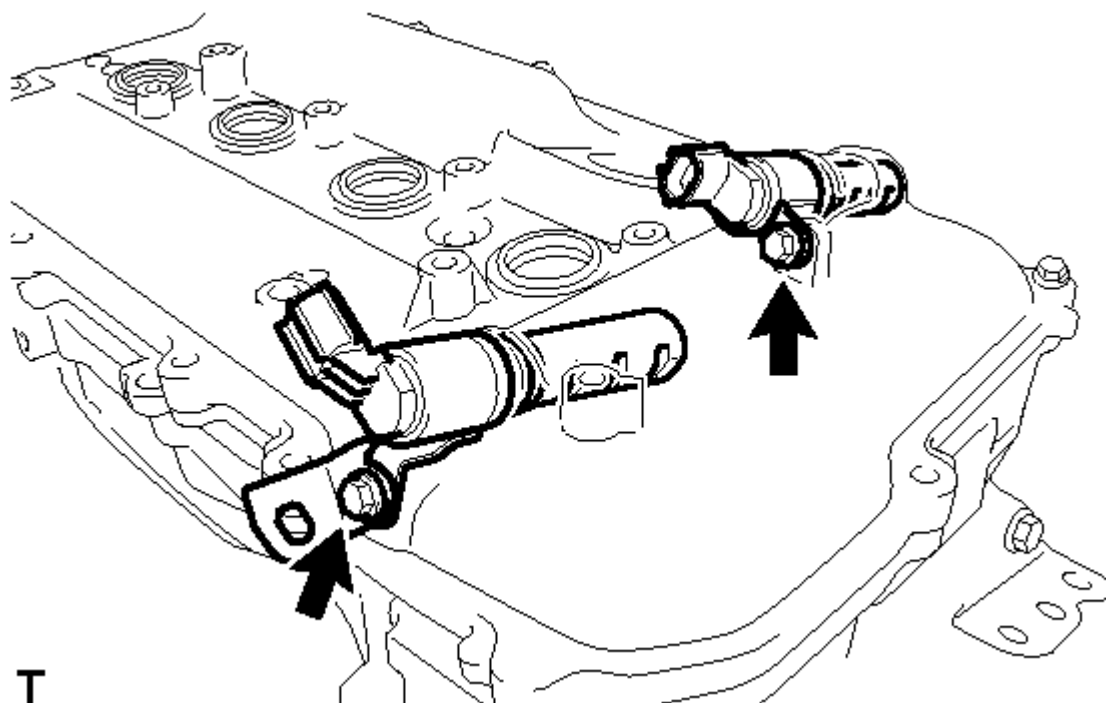


Fig. 226: Locating Bolts, O-Rings, Bracket And Oil Control Valves

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

7. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY

- a. Remove the 13 bolts, seal washer and cylinder head cover.

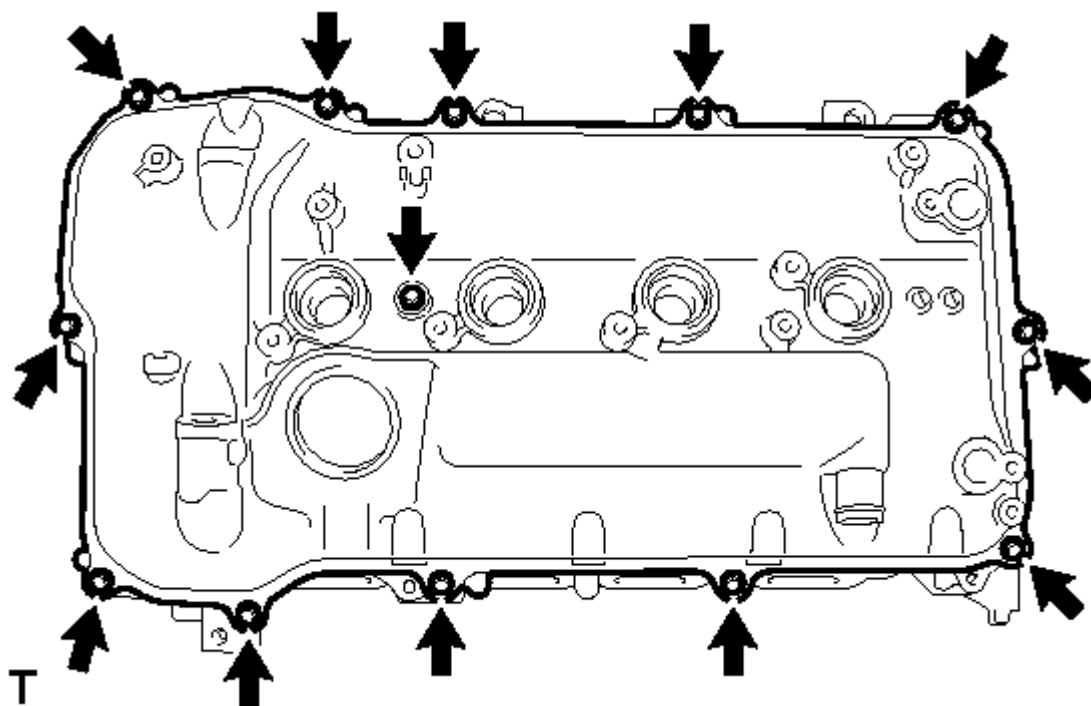


Fig. 227: Locating Bolts, Seal Washer And Cylinder Head Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- b. Remove the cylinder head cover gasket.

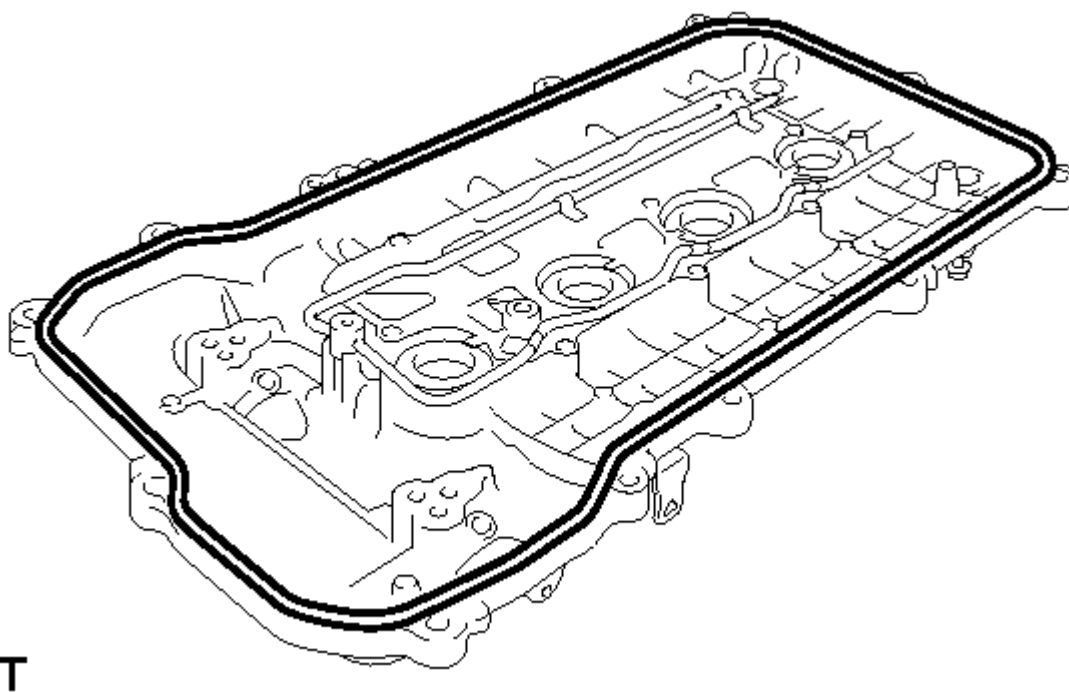
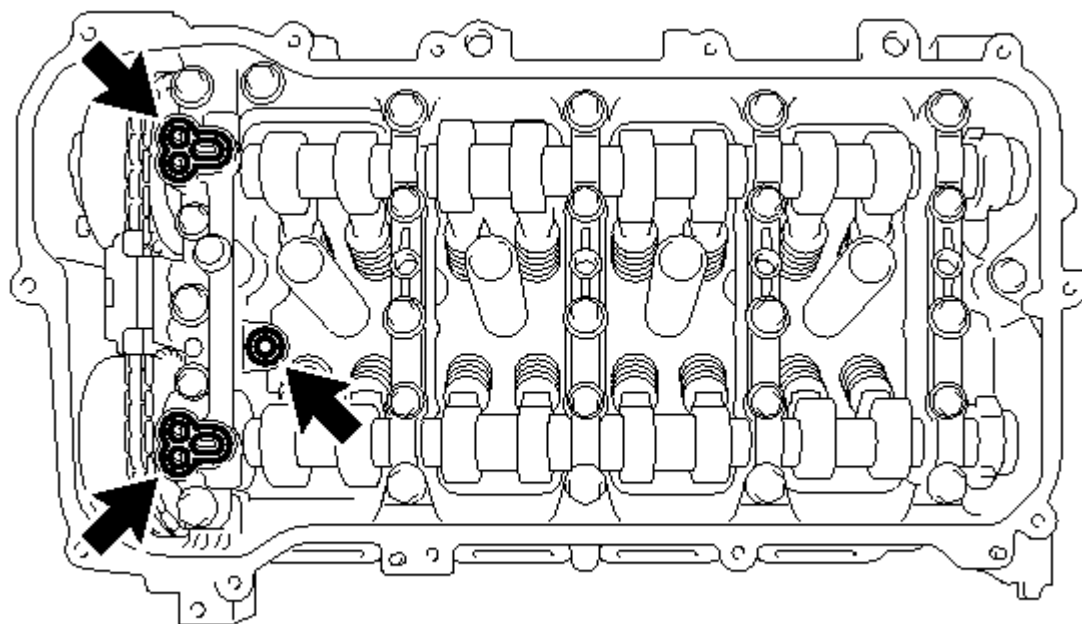


Fig. 228: Identifying Cylinder Head Cover Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the 3 gaskets from the camshaft bearing cap.

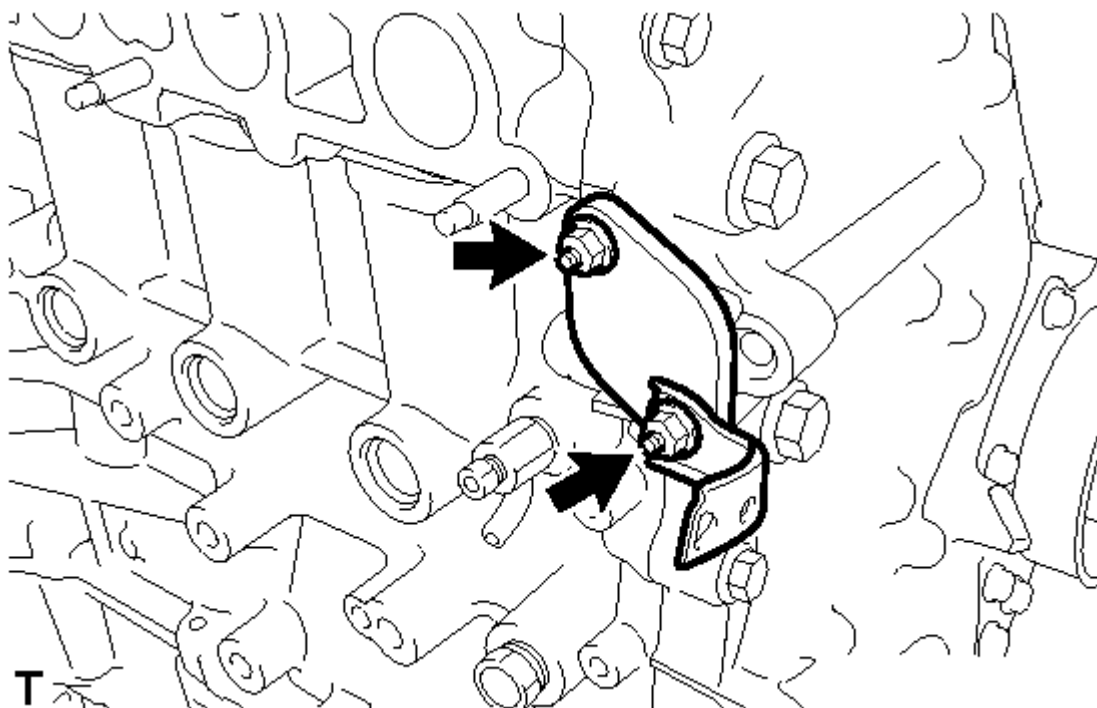


T

Fig. 229: Locating Gaskets

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

8. **SET NO. 1 CYLINDER TO TDC/COMPRESSION** See step 21
9. **REMOVE CRANKSHAFT PULLEY** See step 5
10. **REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY**
 - a. Remove the 2 nuts, bracket, tensioner and gasket.



T

Fig. 230: Locating No. 1 Chain Tensioner Assembly And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

11. REMOVE CRANKSHAFT POSITION SENSOR

- a. Remove the bolt and sensor.

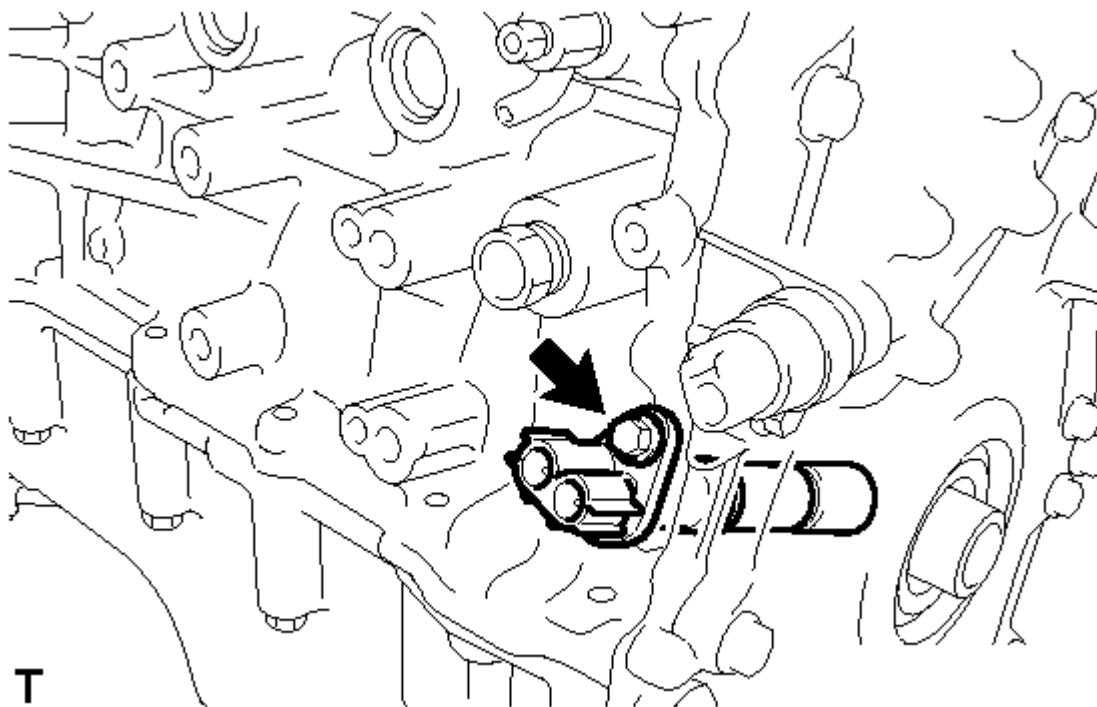


Fig. 231: Locating Bolt And Crankshaft Position Sensor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. REMOVE ENGINE OIL PRESSURE SWITCH ASSEMBLY

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

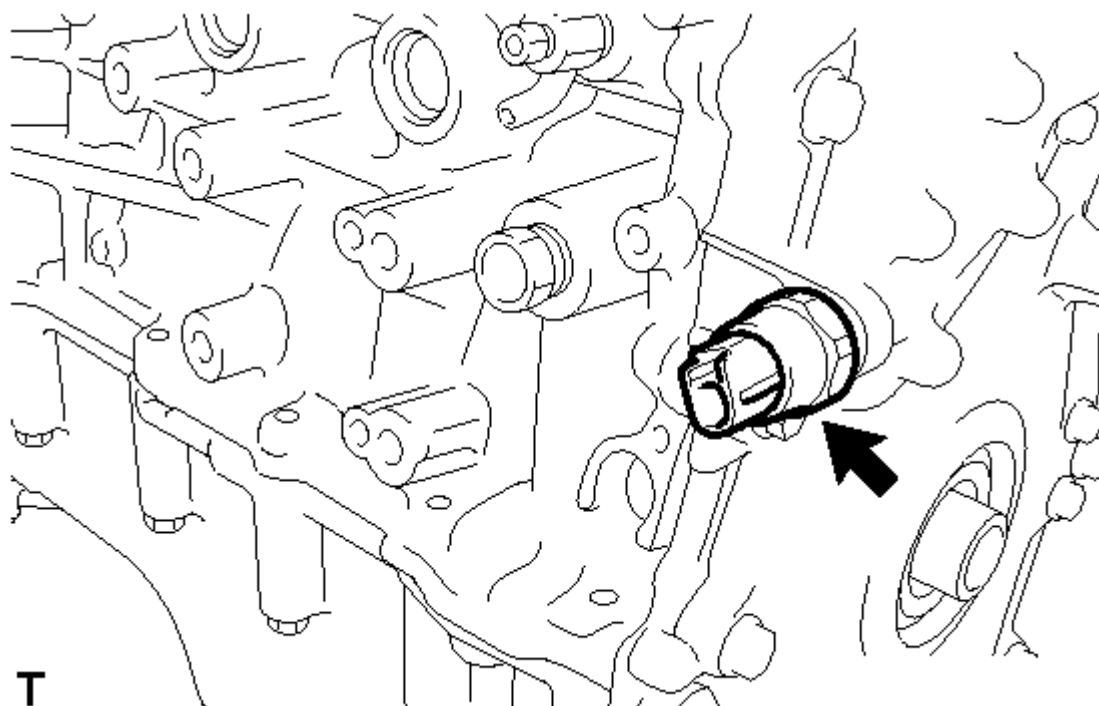


Fig. 232: Locating Engine Oil Pressure Switch Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. REMOVE NO. 1 TAPER SCREW PLUG

- a. Remove the taper screw plug.

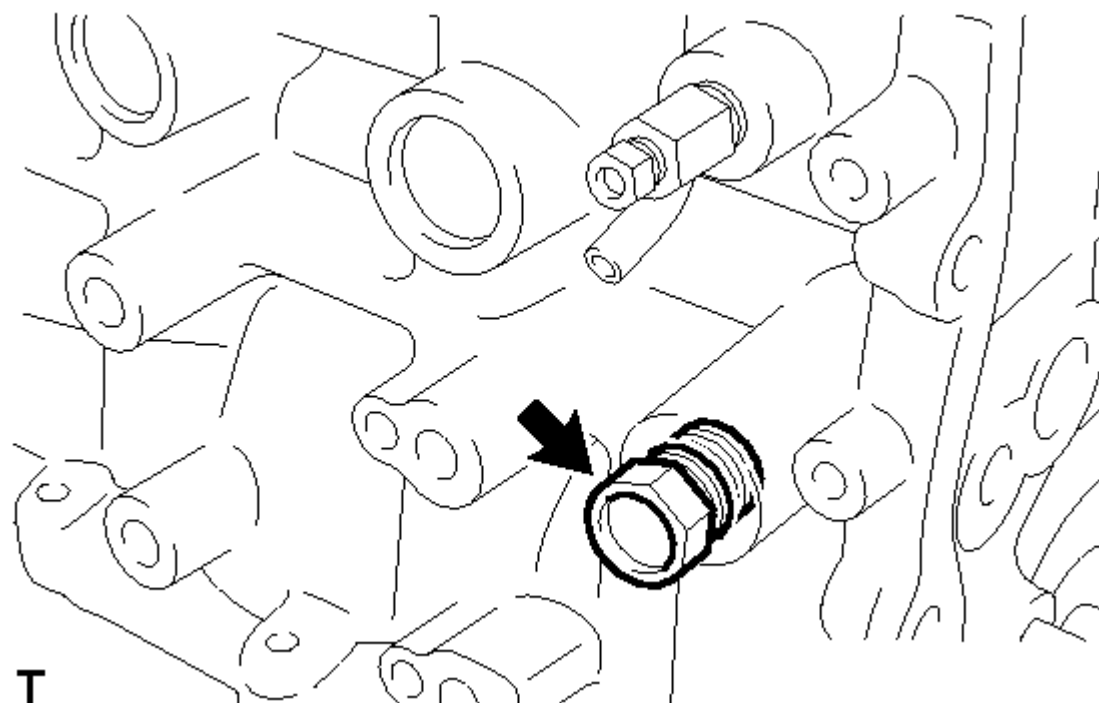


Fig. 233: Locating No. 1 Taper Screw Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. REMOVE KNOCK CONTROL SENSOR

- a. Remove the bolt and sensor.

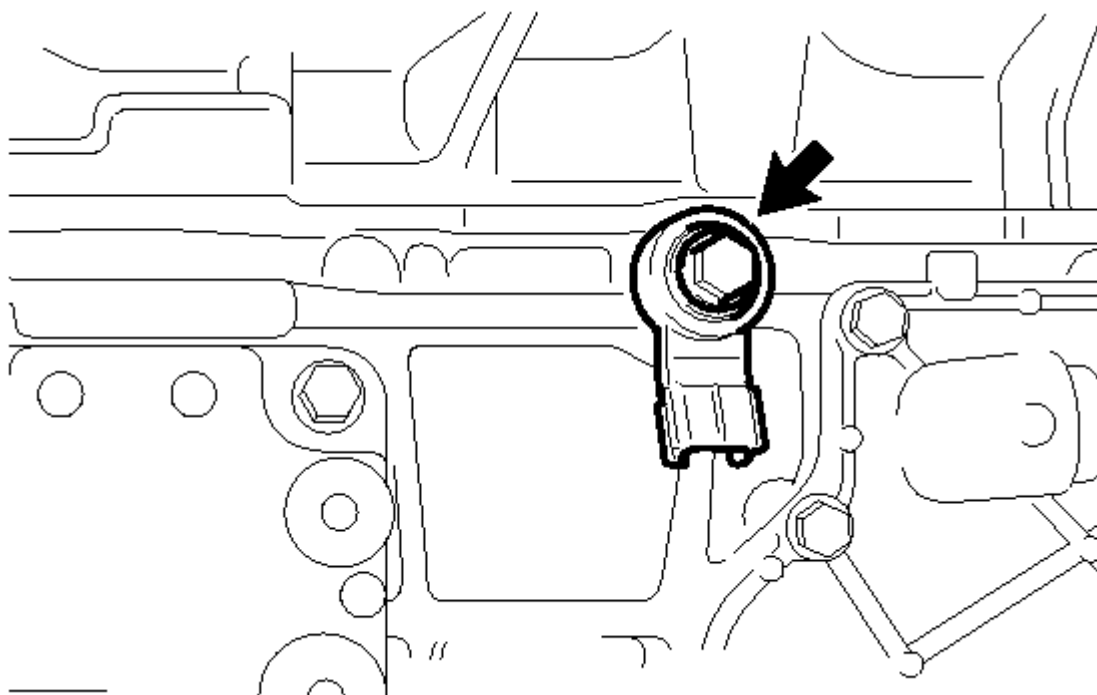


Fig. 234: Locating Bolt And Knock Sensor

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

15. REMOVE ENGINE COOLANT TEMPERATURE SENSOR

- a. Using a 19 mm deep socket wrench, remove the sensor.

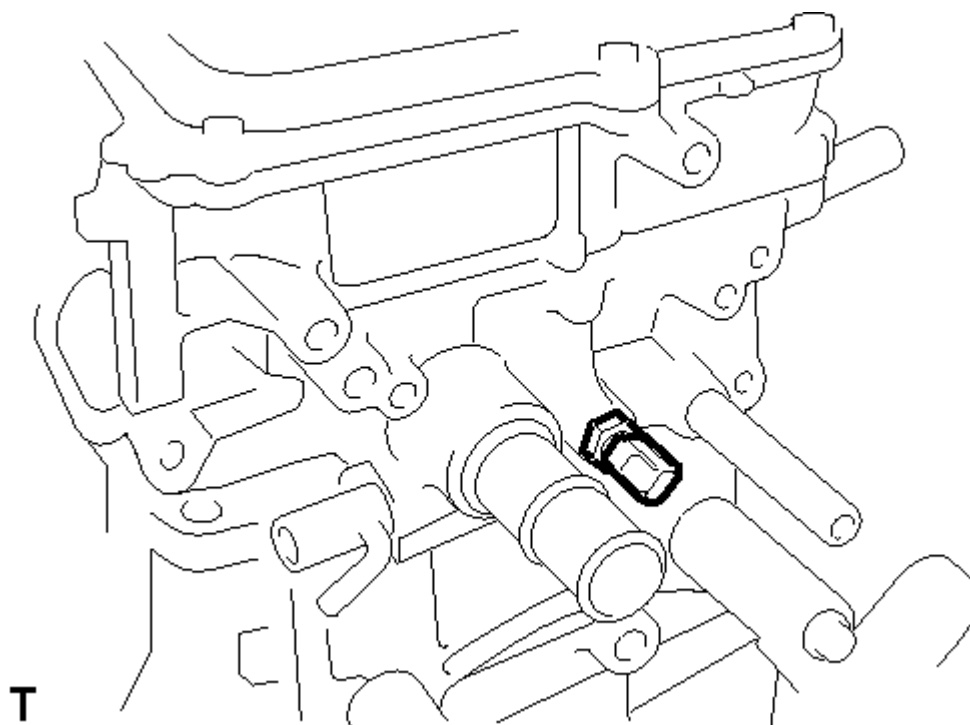


Fig. 235: Identifying Engine Coolant Temperature Sensor

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

- b. Remove the gasket from the engine coolant temperature sensor.

16. **REMOVE OIL FILTER CAP ASSEMBLY** . Refer to **REPLACEMENT - Step 2**
17. **REMOVE TIMING CHAIN COVER SUB-ASSEMBLY** . Refer to **REMOVAL - Step 24**
18. **REMOVE TIMING CHAIN COVER OIL SEAL**
 - a. Using a screwdriver and hammer, remove the oil seal.

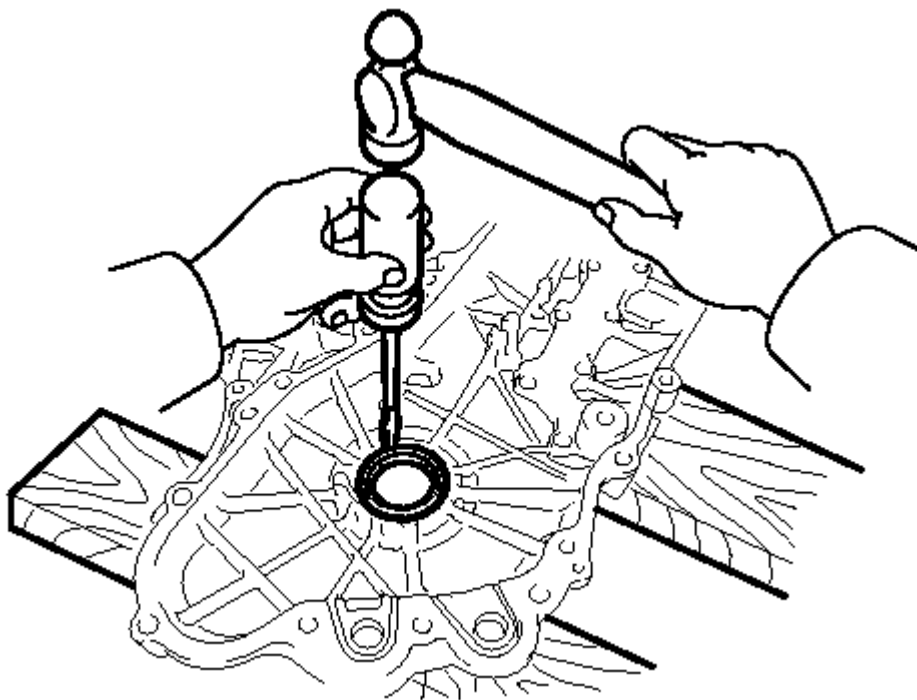
**T**

Fig. 236: Removing Oil Seal

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

NOTE: Be careful not to damage the timing chain cover.

HINT:

Tape the screwdriver tip before use.

19. **REMOVE INLET WATER HOUSING**
 - a. Remove the 3 bolts, gasket and inlet water housing.

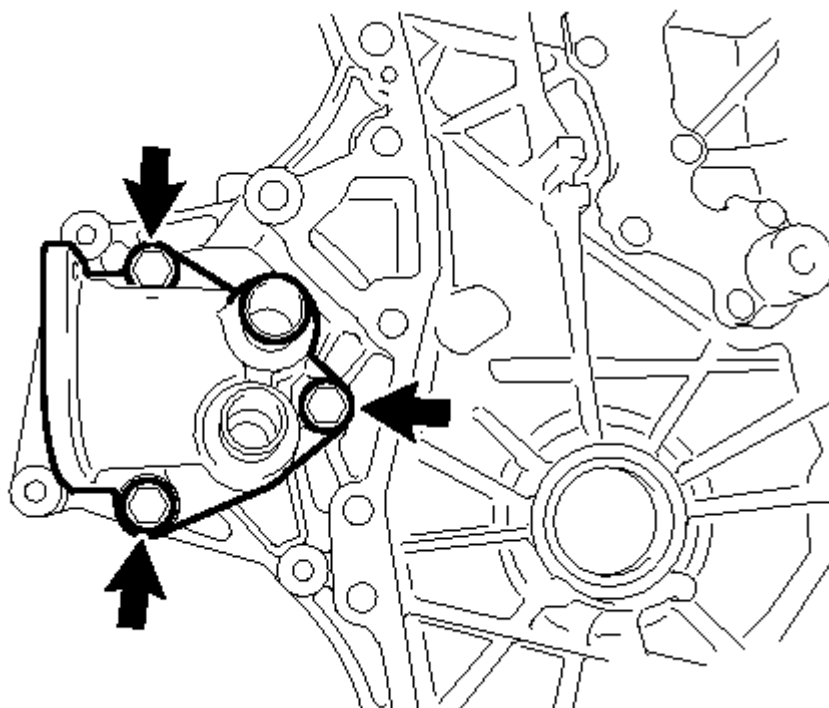
**T**

Fig. 237: Locating Bolts, Gasket And Water Inlet Housing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

20. REMOVE NO. 1 GENERATOR BRACKET

- a. Remove the 4 bolts and No. 1 generator bracket.

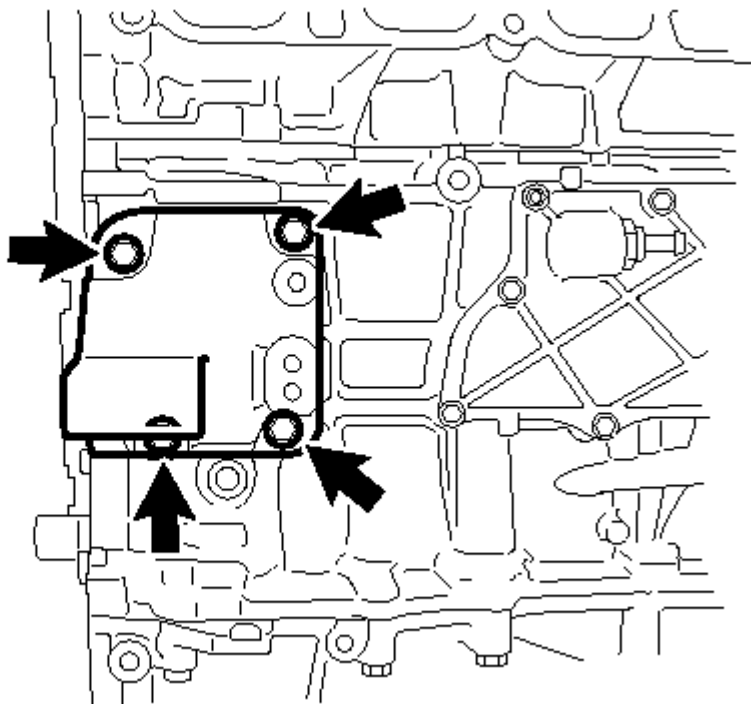
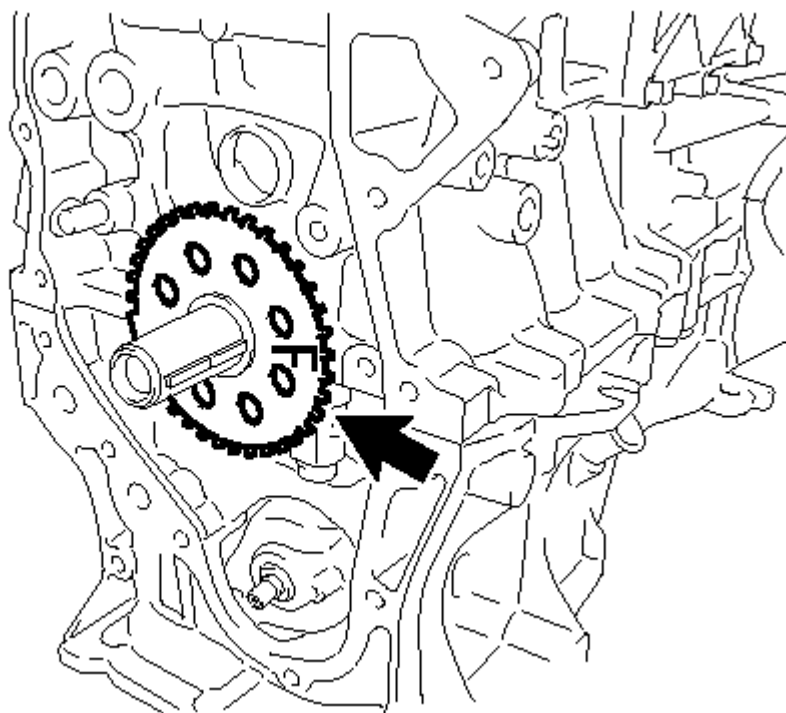
**T**

Fig. 238: Locating Bolts And Generator Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

21. REMOVE CHAIN TENSIONER SLIPPER See step 26

22. REMOVE NO. 1 CHAIN VIBRATION DAMPER See step 27

- 23. **REMOVE CHAIN SUB-ASSEMBLY** See step 28
- 24. **REMOVE NO. 2 CHAIN VIBRATION DAMPER** . Refer to **REMOVAL - Step 29**
- 25. **REMOVE CRANKSHAFT TIMING SPROCKET** . Refer to **REMOVAL - Step 30**
- 26. **REMOVE NO. 2 CHAIN SUB-ASSEMBLY** . Refer to **REMOVAL - Step 31**
- 27. **REMOVE NO. 1 CRANKSHAFT POSITION SENSOR PLATE**
 - a. Remove the No. 1 crankshaft position sensor plate.



T
Fig. 239: Identifying No. 1 Crankshaft Position Sensor Plate
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- 28. **REMOVE CRANKSHAFT TIMING GEAR KEY**
 - a. Using a screwdriver, remove the 2 crankshaft timing gear keys.

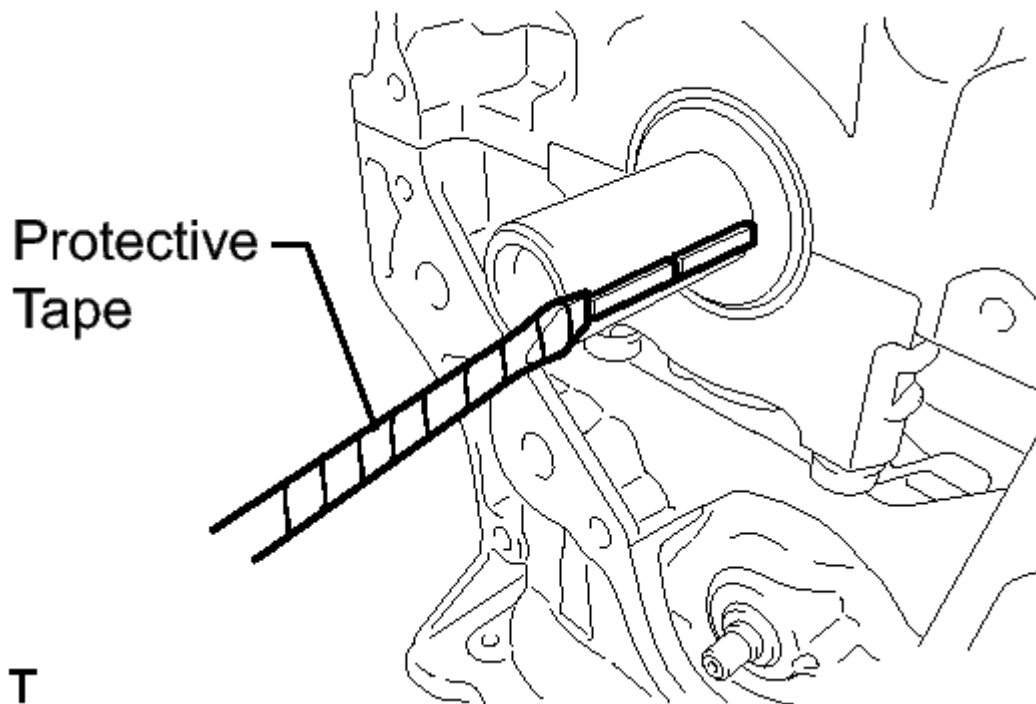
**T**

Fig. 240: Removing Crankshaft Timing Gear Keys
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Tape the screwdriver tip before use.

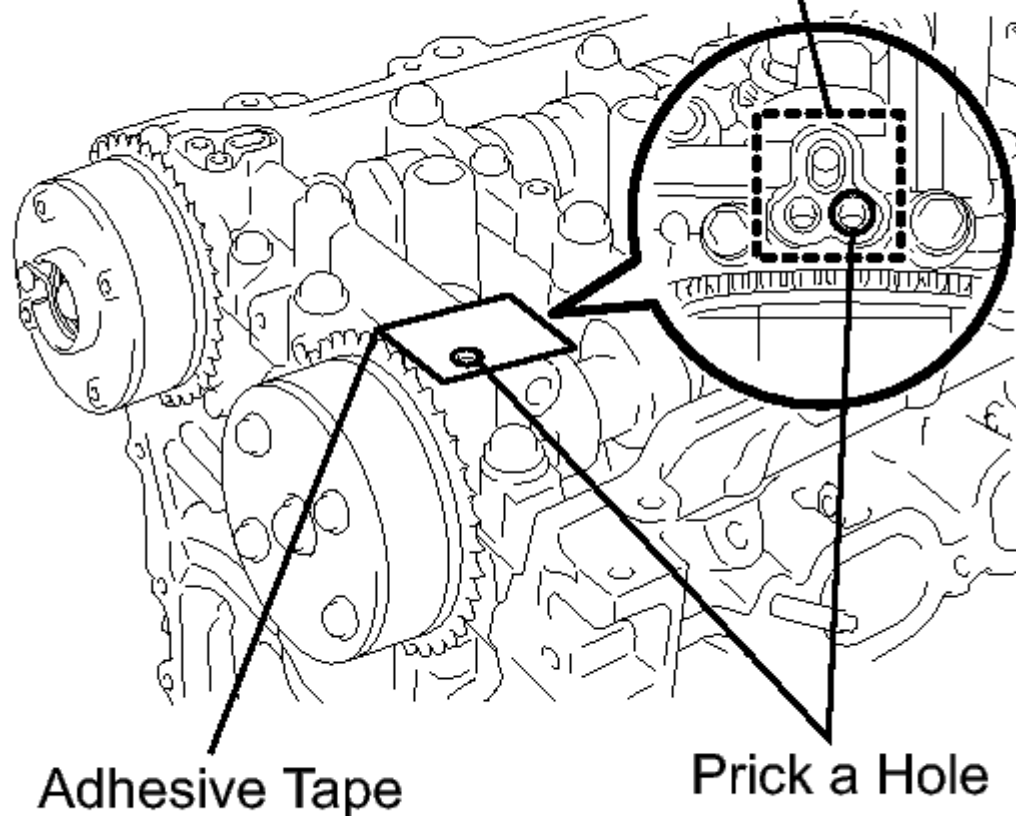
29. REMOVE CAMSHAFT TIMING GEAR ASSEMBLY

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

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

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

Adhesive Tape Sealing Area

**C****Fig. 241: Identifying Adhesive Tape Sealing Area**

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

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

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

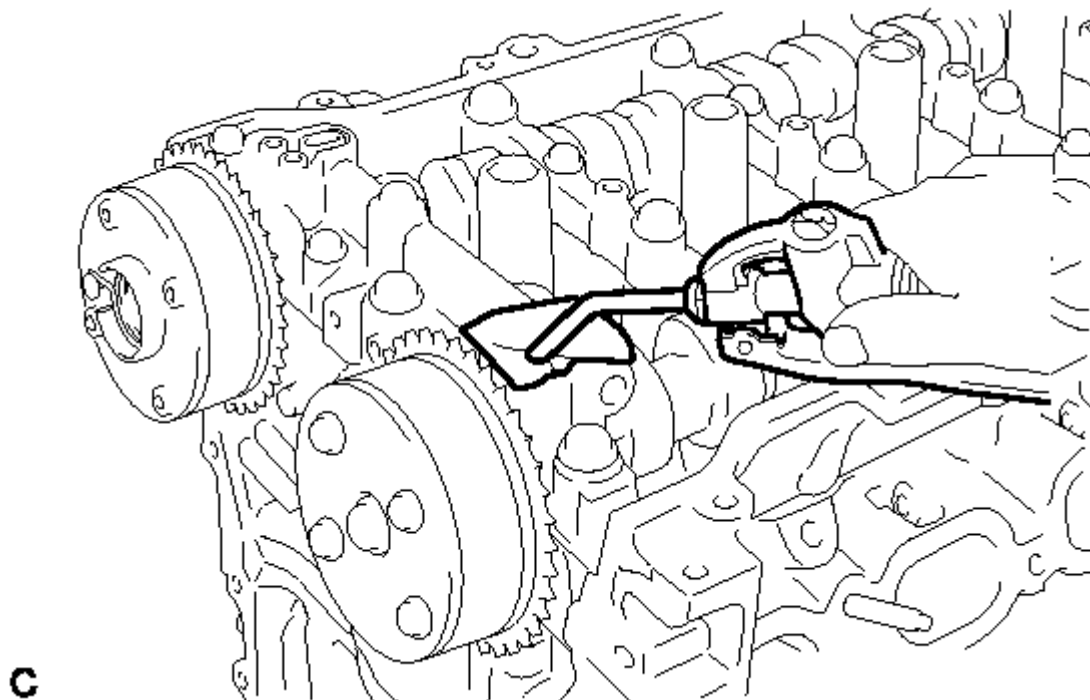


Fig. 242: Applying Air Pressure To Hole

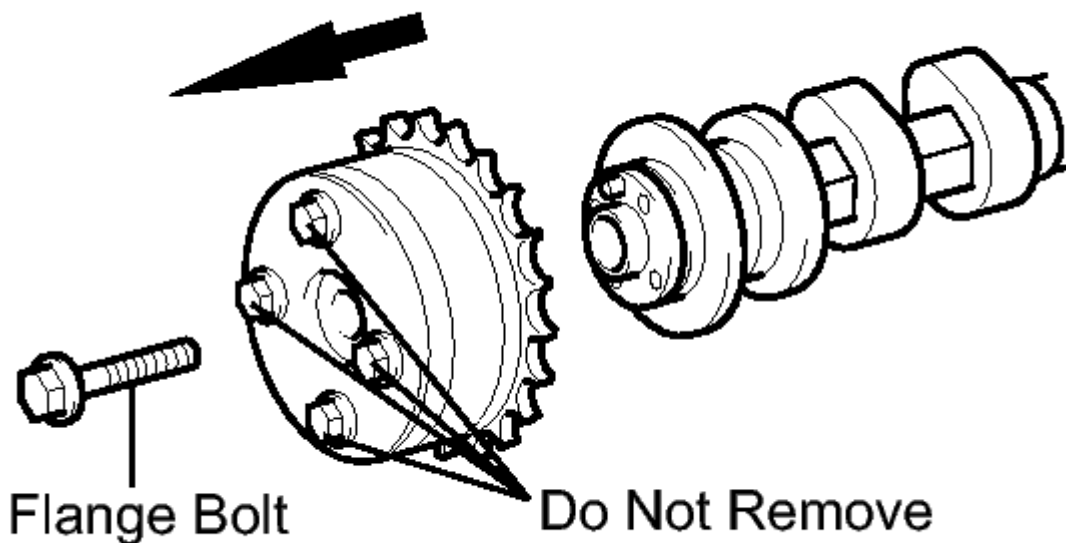
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

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

HINT:

- The camshaft timing gear assembly may be turned in the advance direction without applying any force.
 - If enough air pressure cannot be applied because of air leakage from the port, releasing the lock pin may be difficult.
4. Remove the adhesive tape from the No. 1 camshaft bearing cap.
- c. Remove the flange bolt while holding the hexagonal portion of the camshaft, then remove the camshaft timing gear assembly.

**T****Fig. 243: Identifying Flange Bolt**

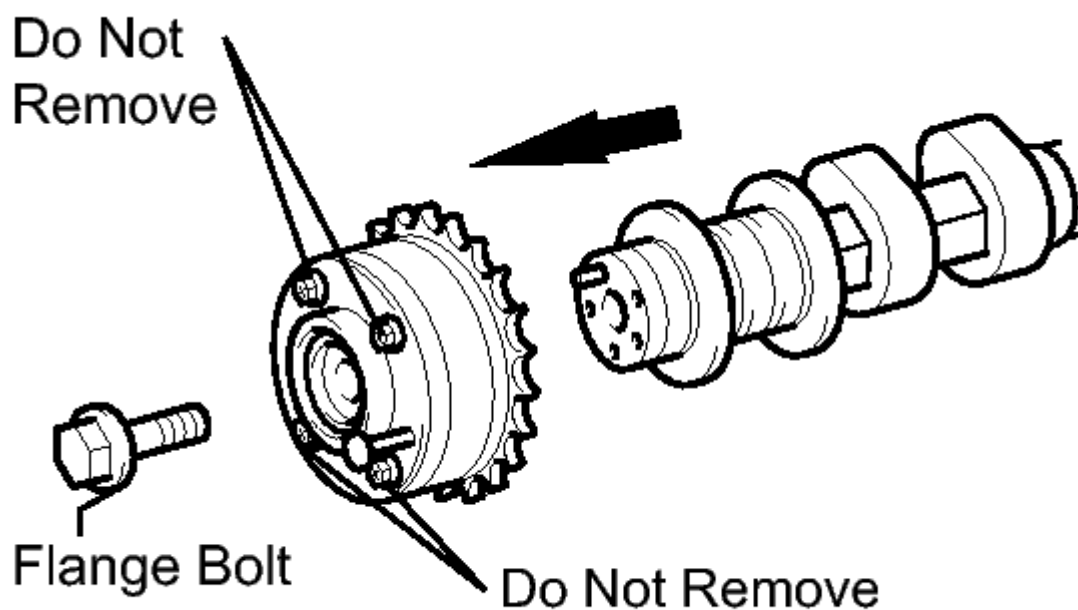
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

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

30. REMOVE CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY

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



T

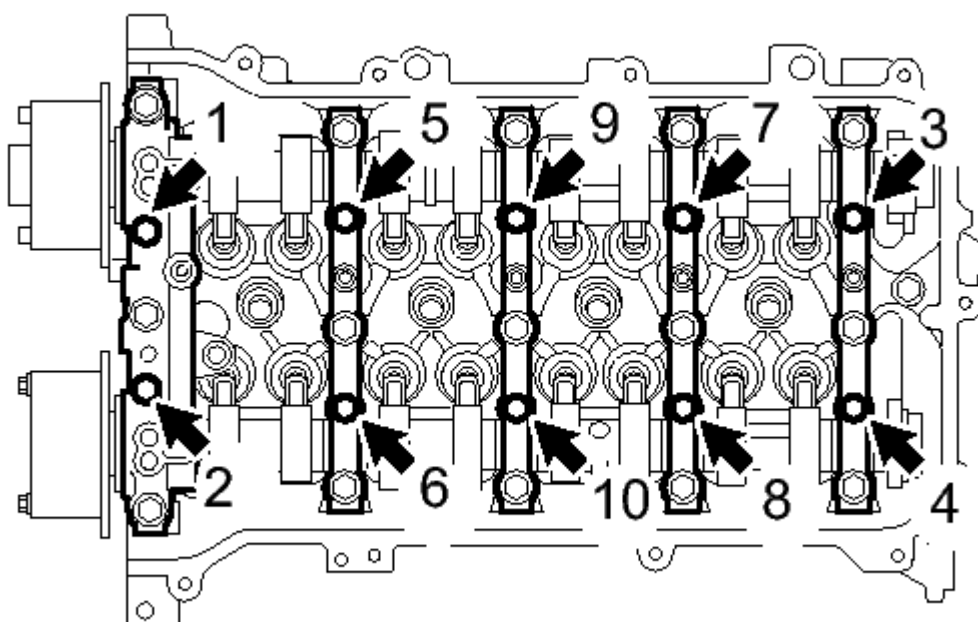
Fig. 244: Identifying Camshaft Timing Exhaust Gear And Flange Bolt
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

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

31. REMOVE CAMSHAFT BEARING CAP

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

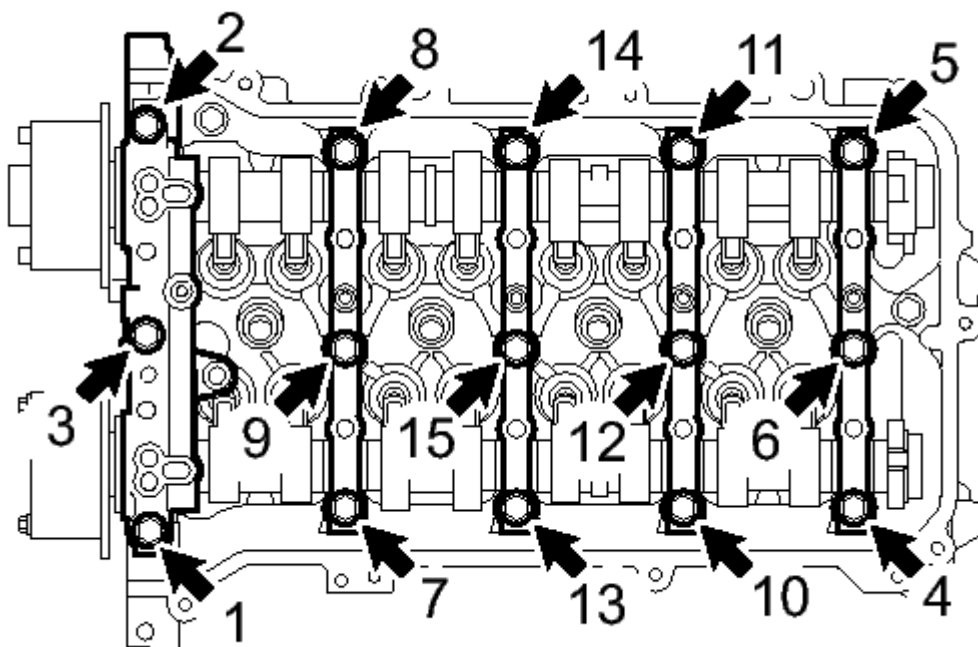


T

Fig. 245: Identifying Bearing Cap Bolts And Loosening Sequence

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

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

**Fig. 246: Identifying Bearing Cap Bolts And Loosening Sequence**

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

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

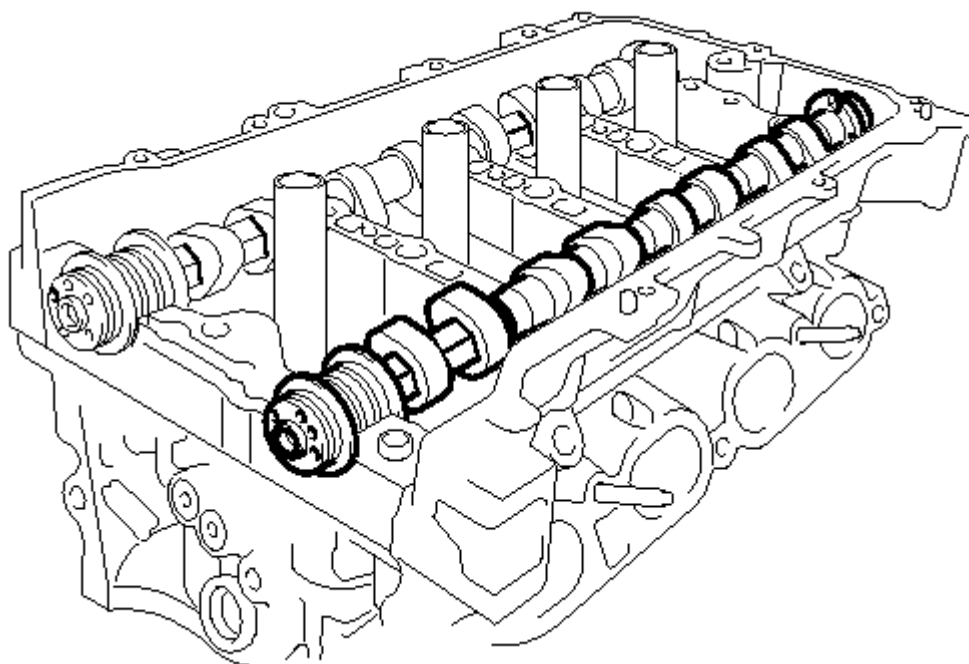
- c. Remove the 5 bearing caps.

HINT:

Arrange the removed parts in the correct order.

32. REMOVE CAMSHAFT

- a. Remove the camshaft.



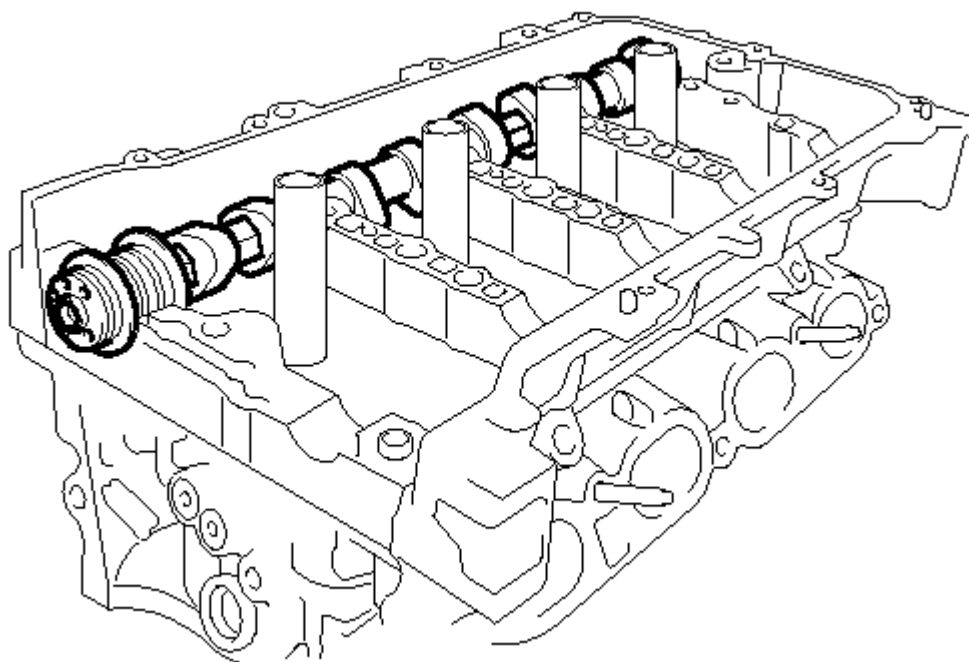
T

Fig. 247: Identifying Camshaft

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

33. REMOVE NO. 2 CAMSHAFT

- a. Remove the No. 2 camshaft.



T

Fig. 248: Identifying No. 2 Camshaft

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

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

- a. Remove the 16 valve rocker arms.

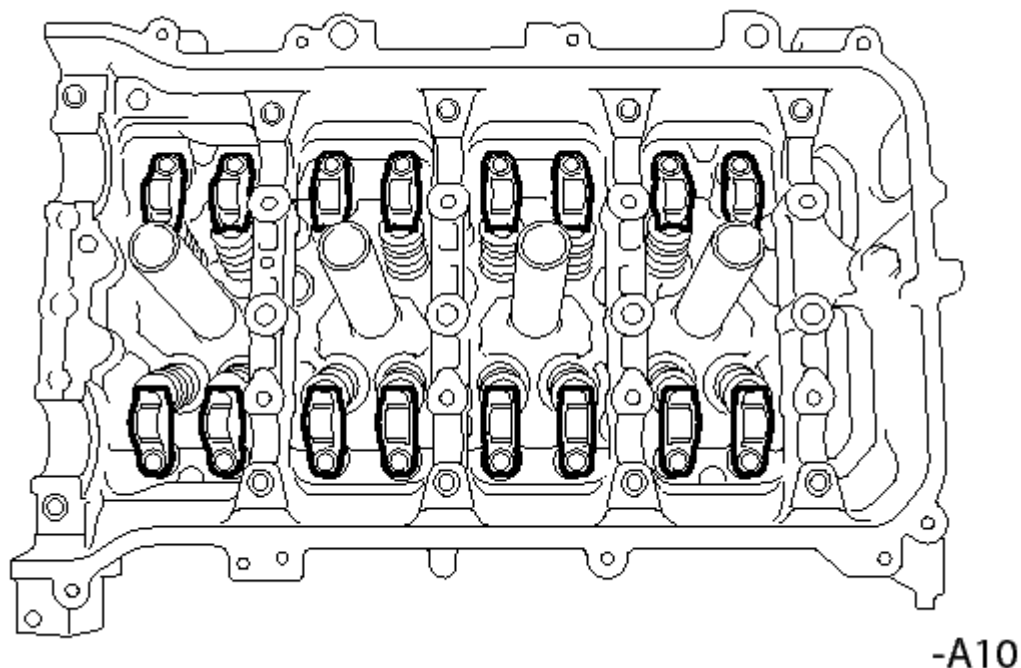


Fig. 249: Identifying Valve Rocker Arms
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Arrange the removed parts in the correct order.

35. REMOVE VALVE LASH ADJUSTER ASSEMBLY

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

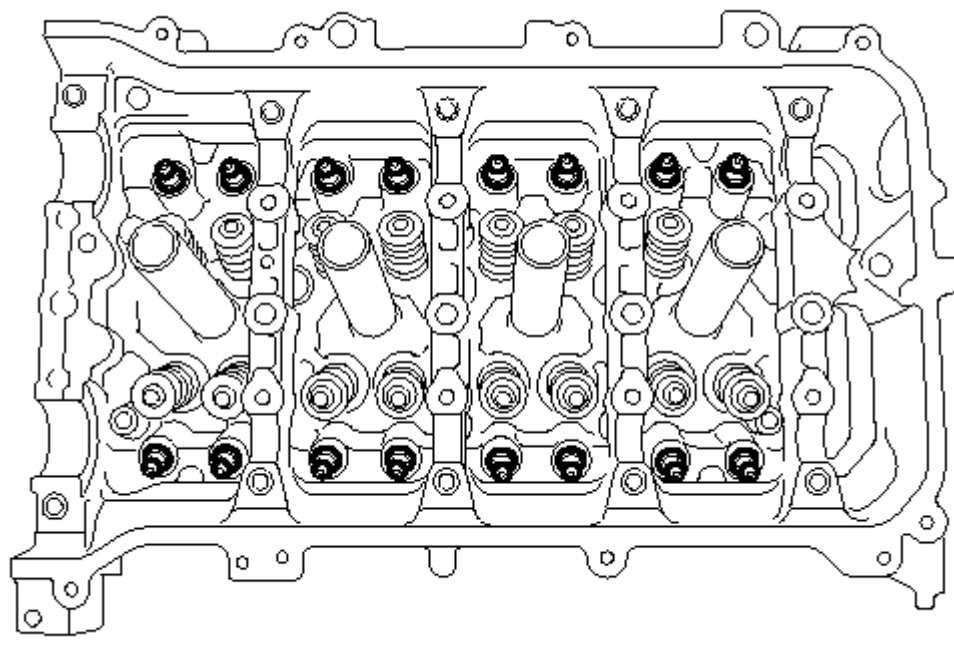


Fig. 250: Identifying Valve Lash Adjusters

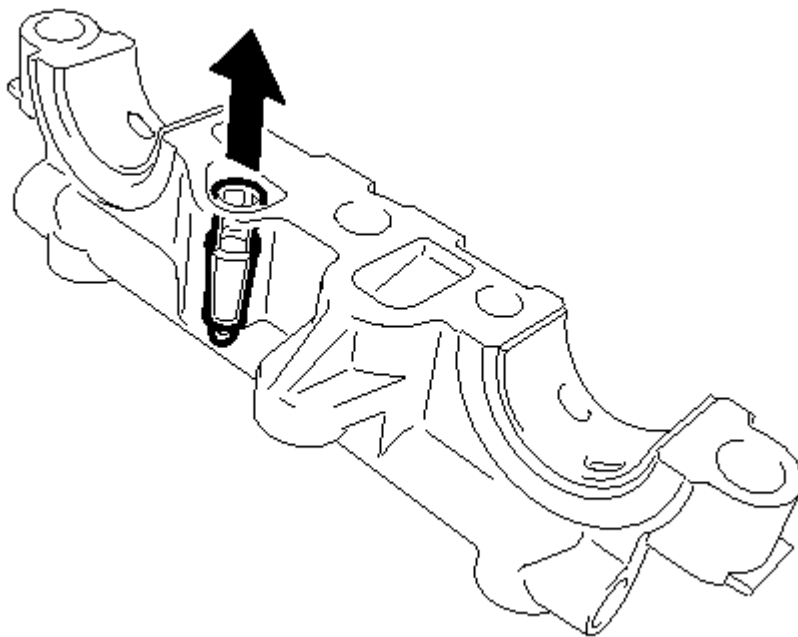
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Arrange the removed parts in the correct order.

36. REMOVE OIL CONTROL VALVE FILTER

- a. Remove the oil control valve filter.



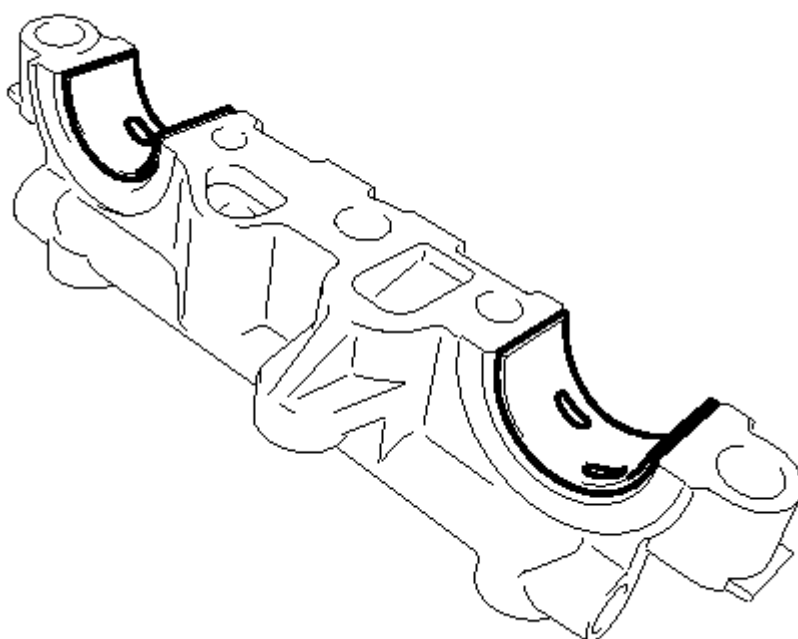
T

Fig. 251: Removing Oil Control Valve Filter

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

37. REMOVE NO. 1 CAMSHAFT BEARING

- a. Remove the 2 No. 1 camshaft bearings.



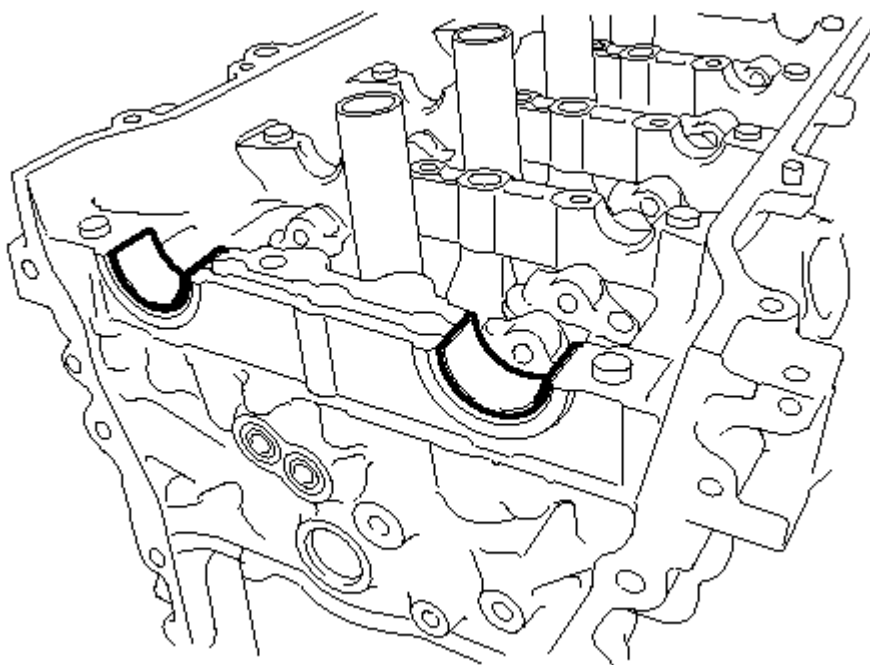
T

Fig. 252: Identifying No. 1 Camshaft Bearings

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

38. REMOVE NO. 2 CAMSHAFT BEARING

- a. Remove the 2 No. 2 camshaft bearings.



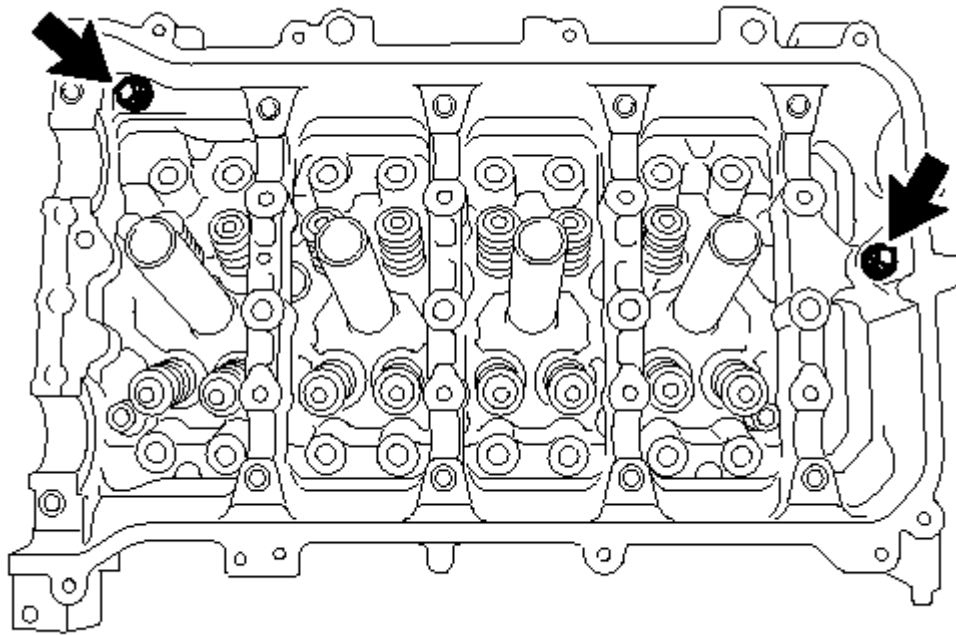
T

Fig. 253: Identifying No. 2 Camshaft Bearings

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

39. REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY

- a. Remove the 2 bolts.

**T****Fig. 254: Locating Bolts****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- b. Remove the camshaft housing by prying between the cylinder head and camshaft housing with a screwdriver.

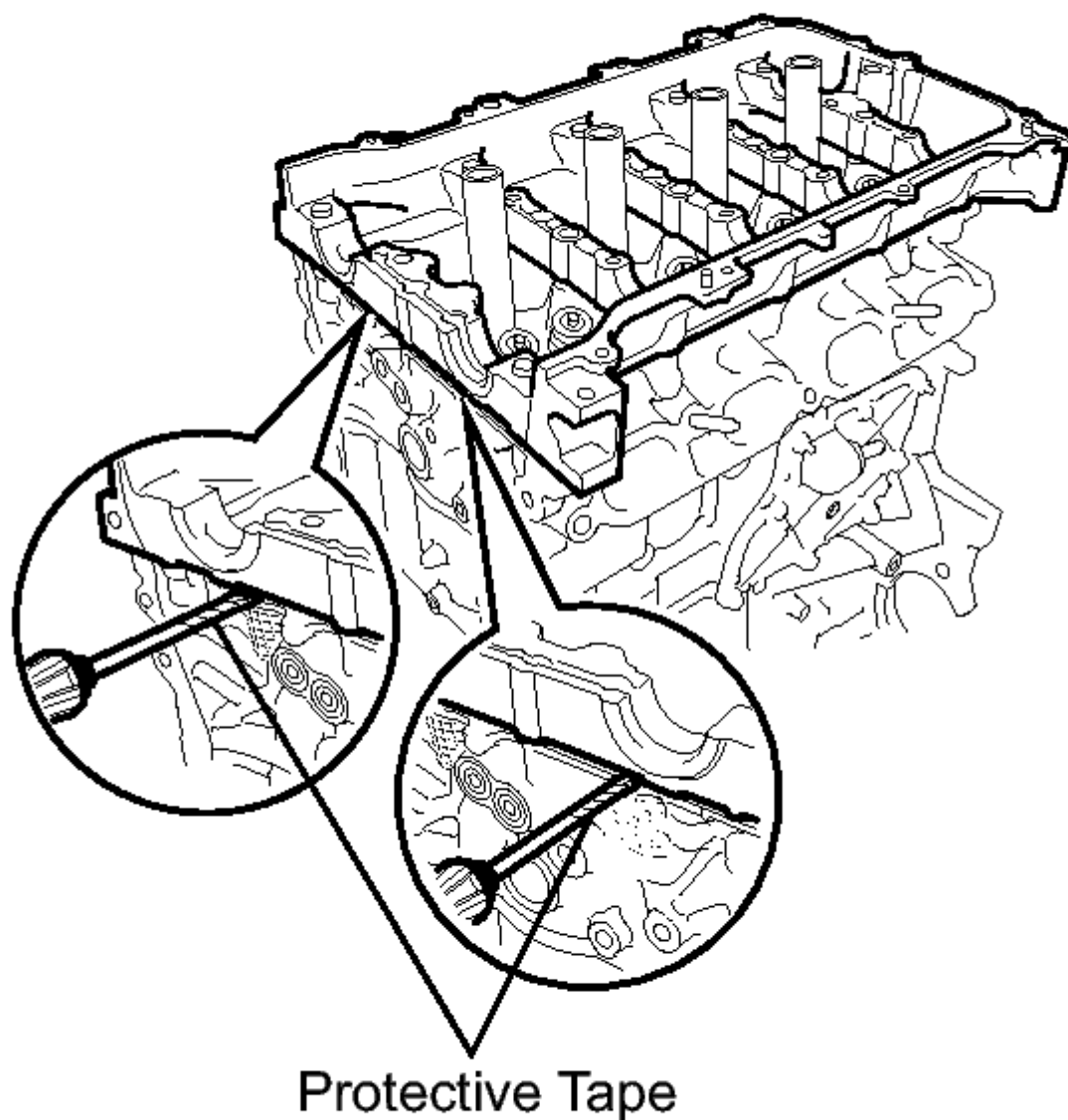


Fig. 255: Removing Camshaft Housing By Prying
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

HINT:

Tape the screwdriver tip before use.

40. **REMOVE CYLINDER HEAD SUB-ASSEMBLY** See step 42
41. **REMOVE CYLINDER HEAD GASKET** See step 43
42. **REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY**
 - a. Remove the water drain cock plug from the water drain cock sub-assembly.

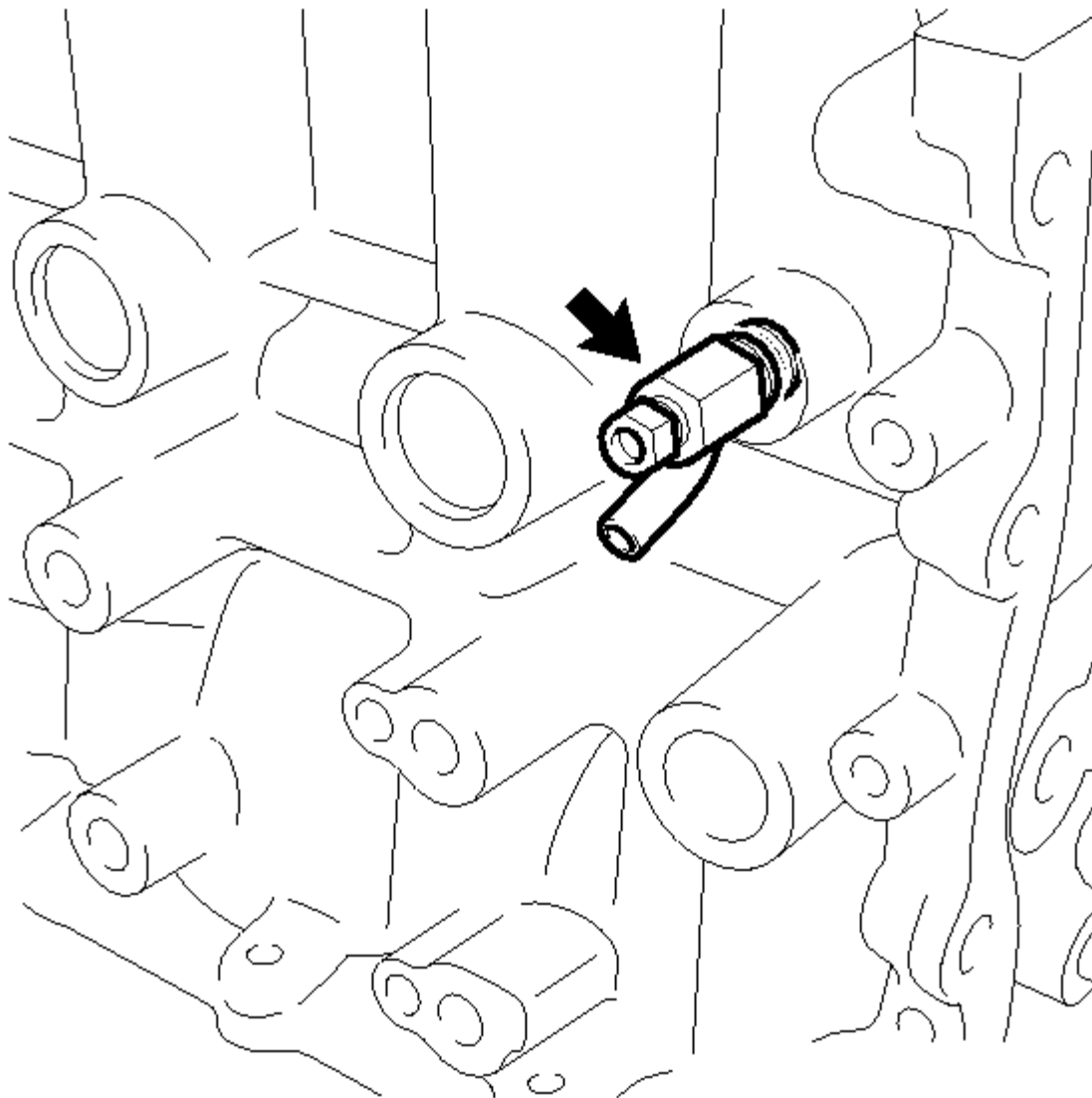
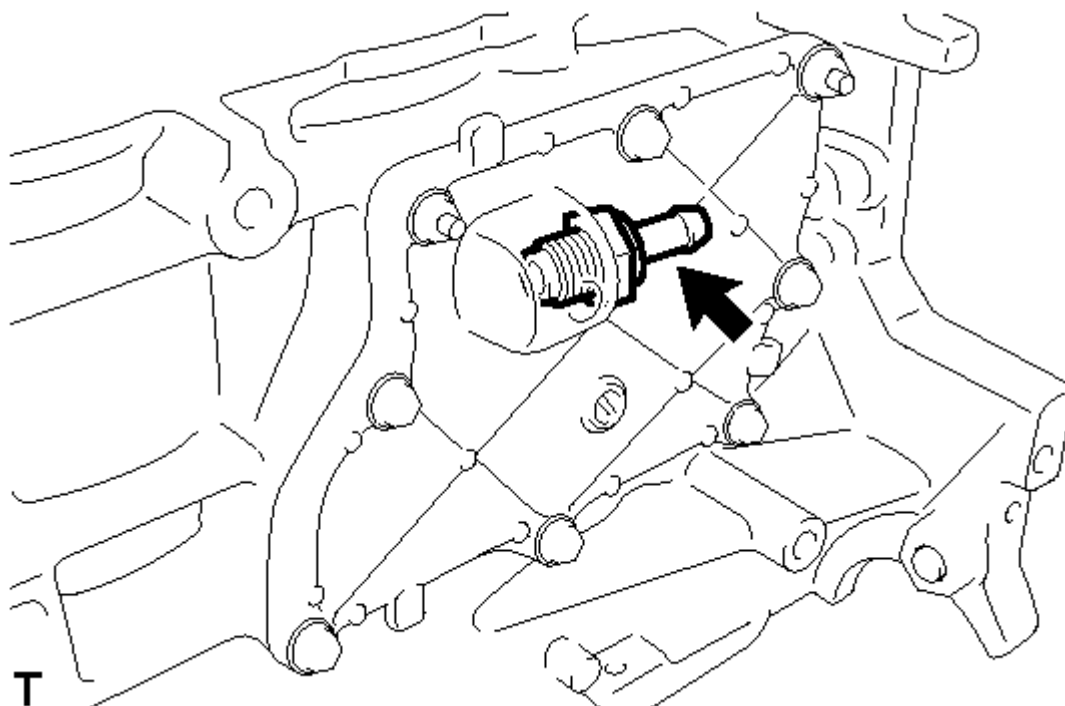


Fig. 256: Locating Water Drain Cock Plug

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

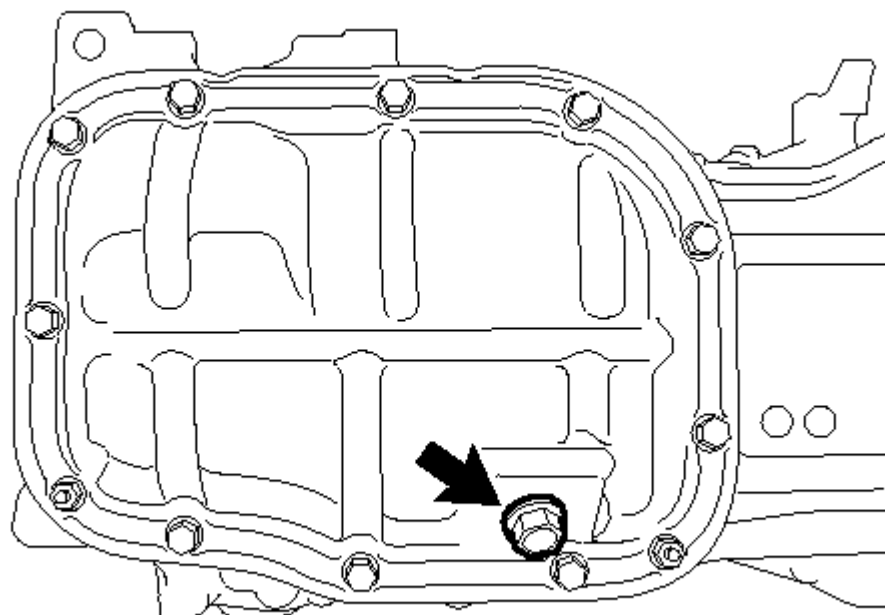
- b. Remove the cylinder block water drain cock sub-assembly from the cylinder block.
43. **REMOVE VENTILATION VALVE SUB-ASSEMBLY**
 - a. Remove the ventilation valve.

**Fig. 257: Locating Ventilation Valve**

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

44. REMOVE OIL PAN DRAIN PLUG

- a. Remove the oil pan drain plug and gasket.

**Fig. 258: Locating Oil Pan Drain Plug**

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

45. REMOVE NO. 2 OIL PAN SUB-ASSEMBLY . Refer to **REMOVAL - Step 33****46. REMOVE OIL PUMP ASSEMBLY** . Refer to **REMOVAL - Step 34**

47. REMOVE REAR ENGINE OIL SEAL

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

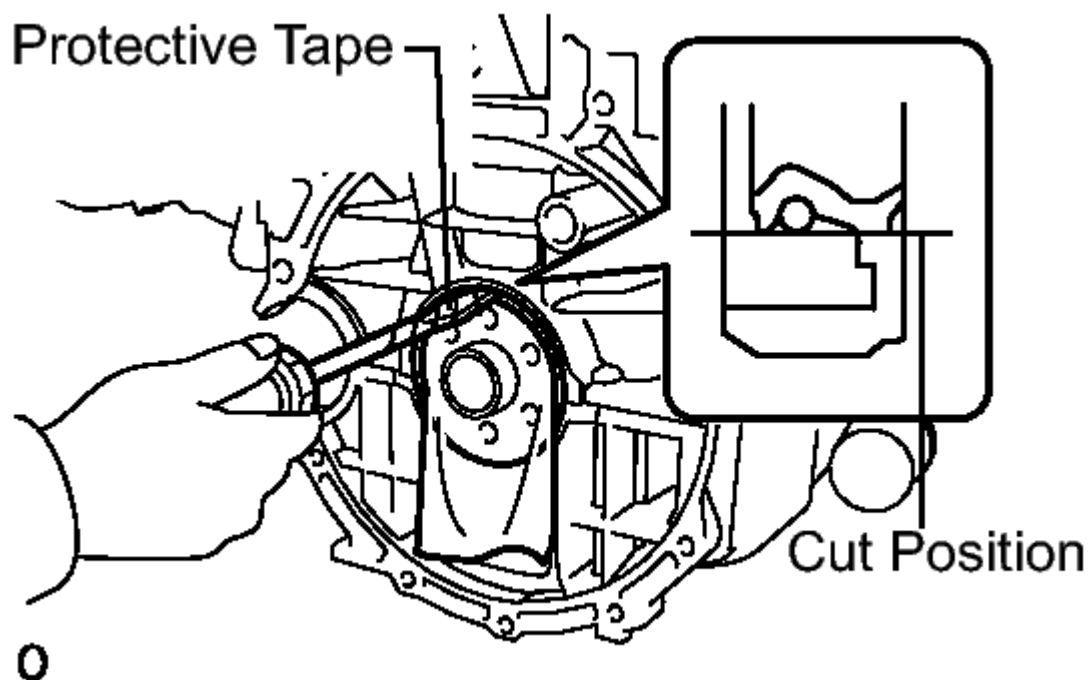


Fig. 259: Prying Out Oil Seal

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

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

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

48. REMOVE STIFFENING CRANKCASE ASSEMBLY

- a. Uniformly loosen and remove the 11 bolts.

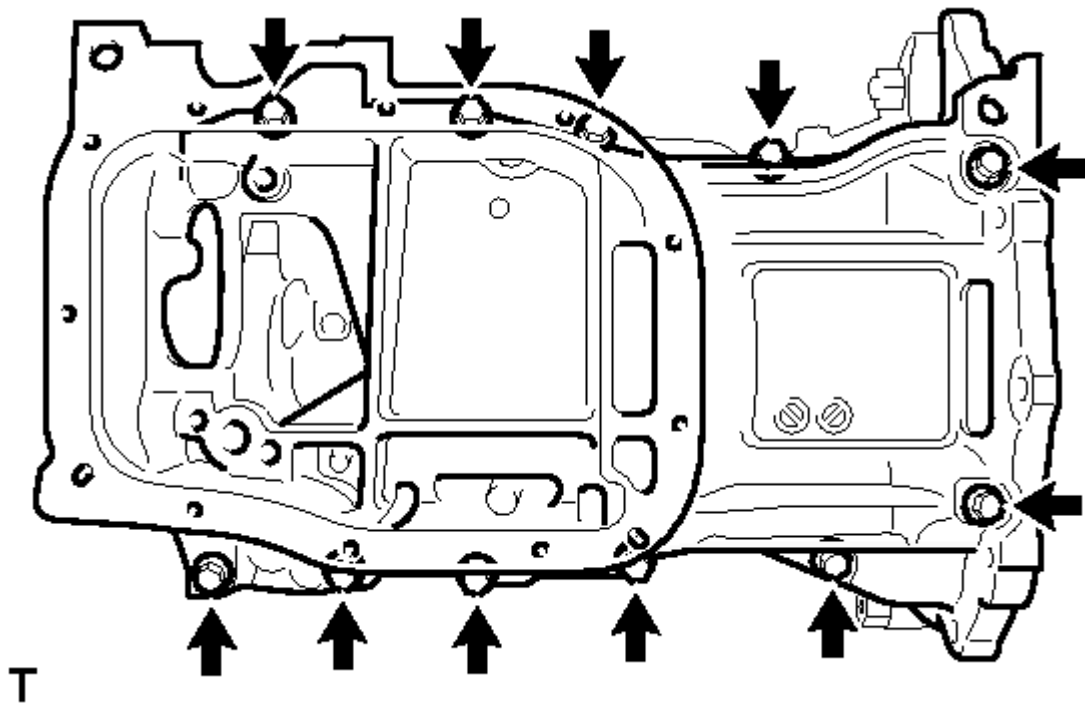
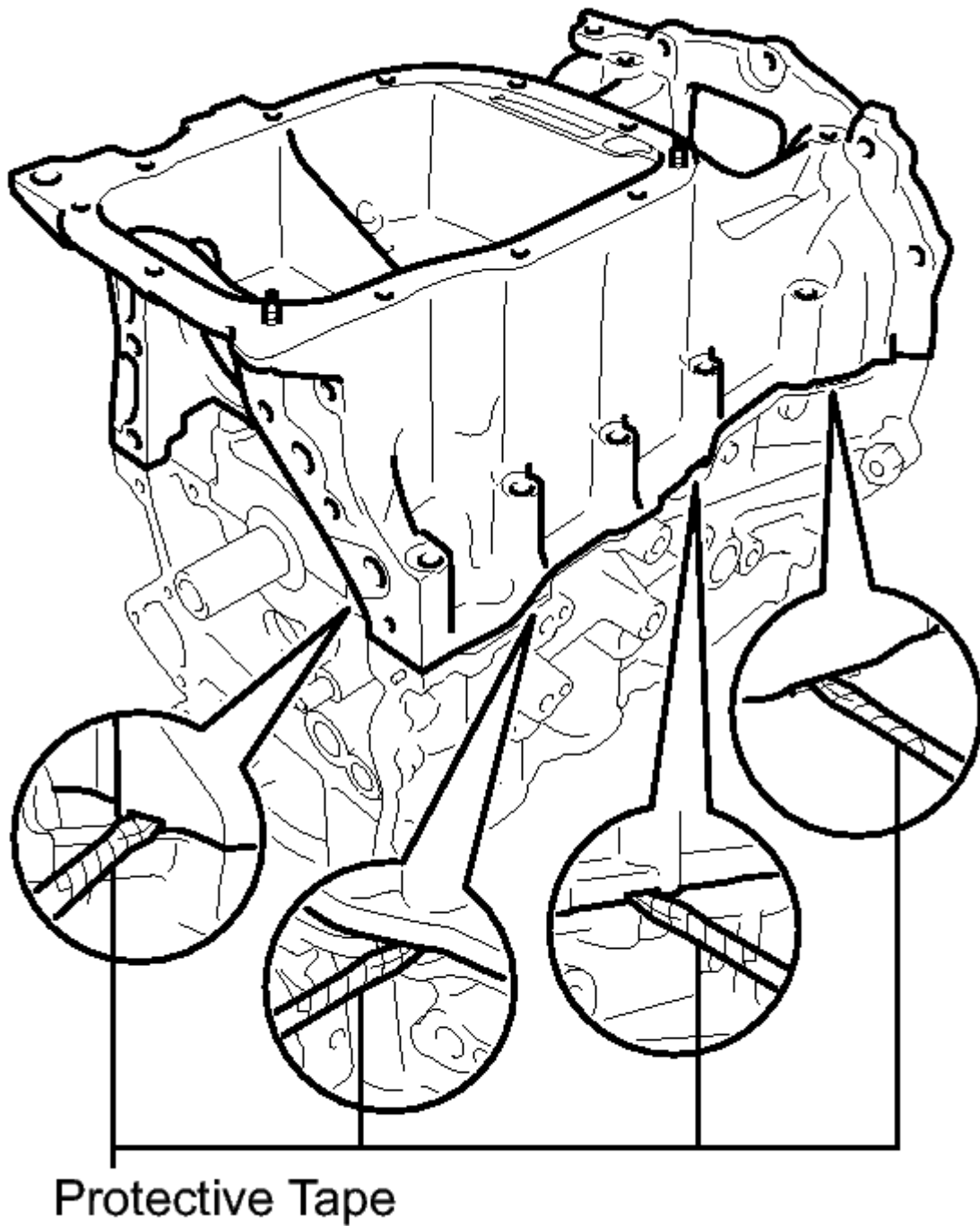


Fig. 260: Locating Bolts

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

- b. Using a screwdriver, remove the crankcase by prying between the crankcase and cylinder block.



T

Fig. 261: Prying Between Crankcase And Cylinder Block
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

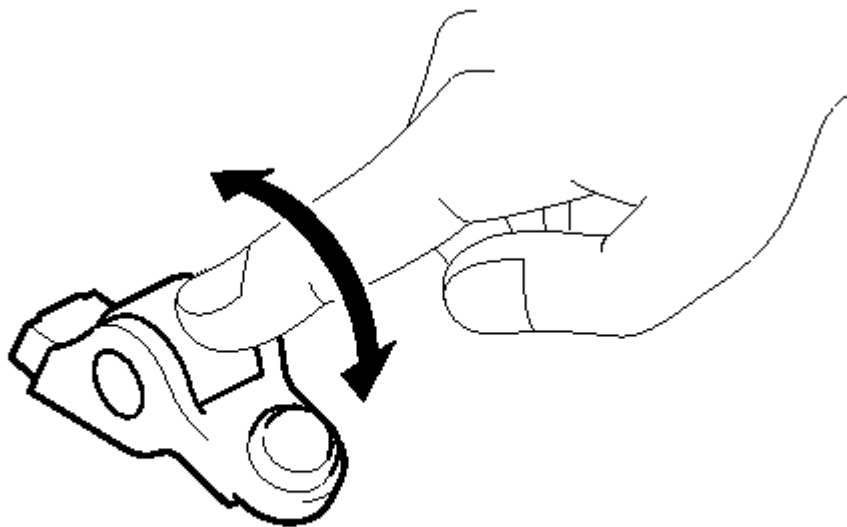
NOTE: Be careful not to damage the contact surfaces of the crankcase and cylinder block.

INSPECTION

INSPECTION

1. INSPECT NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY

- a. Turn the roller by hand to check that it turns smoothly.



T

Fig. 262: Turning Roller By Hand For Checking Smoothly Turns
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

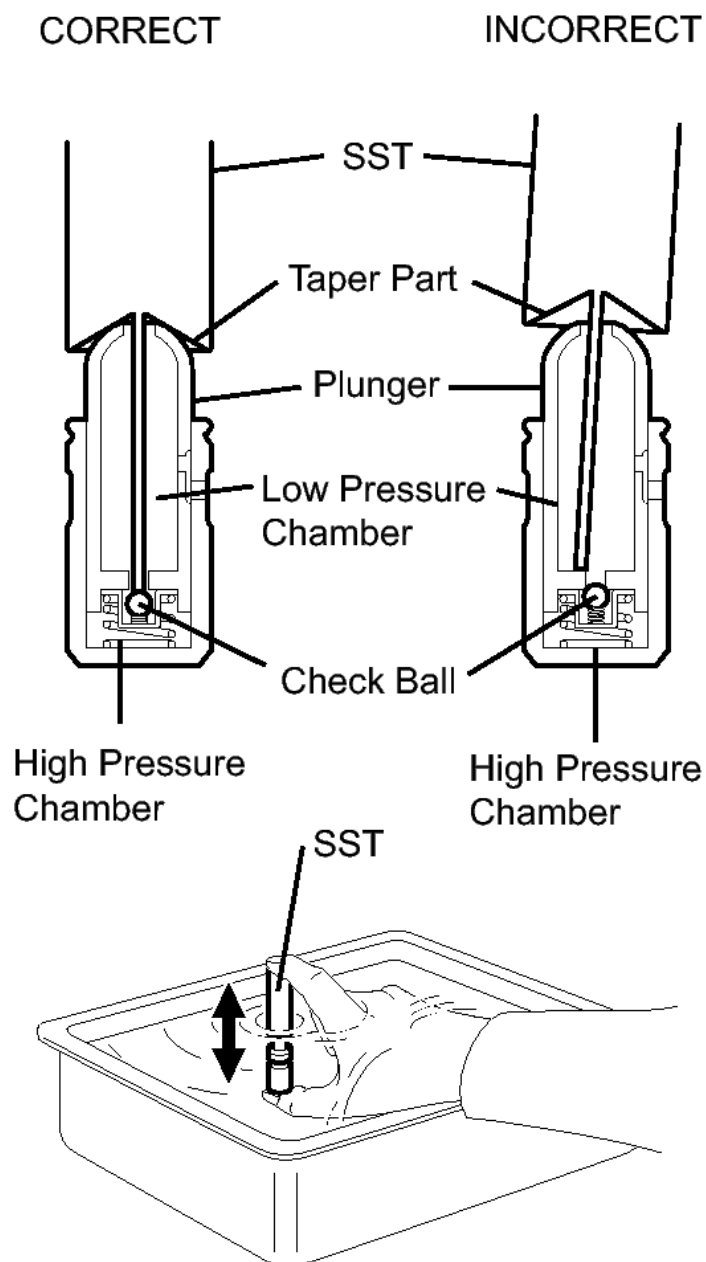
If the roller does not turn smoothly, replace the valve rocker arm sub-assembly.

2. INSPECT VALVE LASH ADJUSTER ASSEMBLY

NOTE:

- Keep the lash adjuster free of dirt and foreign matter.
- Only use clean engine oil.

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



T

Fig. 263: Identifying Lash Adjuster Plunger Correct And Incorrect Position
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

• SST: 09276-75010

- c. Squeeze SST and the lash adjuster together to move the plunger up and down 5 to 6 times.
- d. Check the movement of the plunger and bleed it.

OK

Plunger moves up and down.

NOTE: When bleeding the high-pressure chamber, make sure that the tip of SST is actually pressing the check ball as shown in the illustration. If the check ball is not pressed, the high-pressure chamber will not be bled.

- e. After bleeding, remove SST. Then try to quickly and firmly press the plunger by hand.

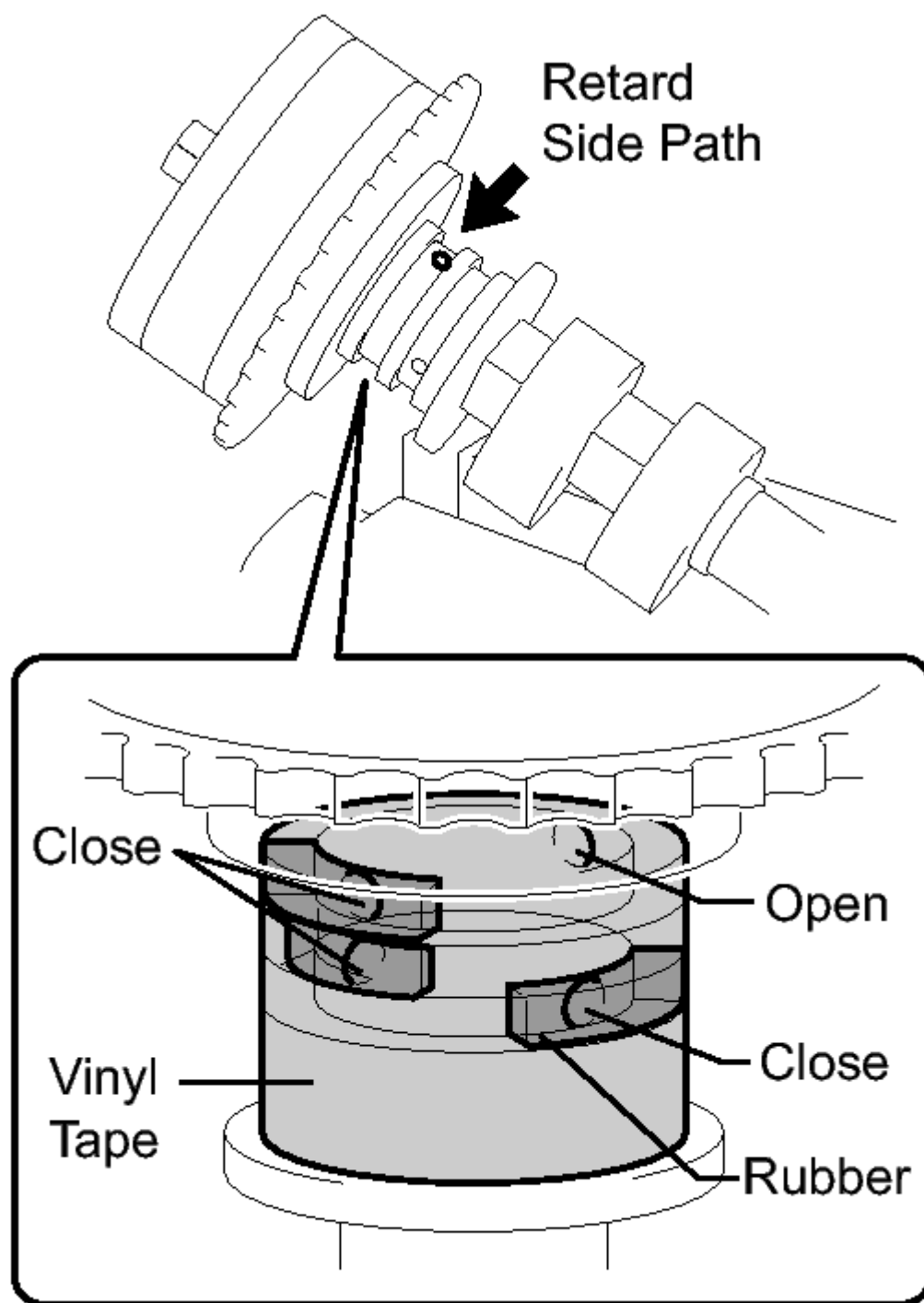
OK

Plunger is very difficult to move.

If the result is not as specified, replace the lash adjuster.

3. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY

- a. Install the camshaft timing gear. Refer to **INSTALLATION**.
- b. Check the lock of the camshaft timing gear.
 - 1. Confirm that the camshaft timing gear is locked.
- c. Release the lock pin.

**T****Fig. 264: Locating Retard Side Path**

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

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

HINT:

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

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

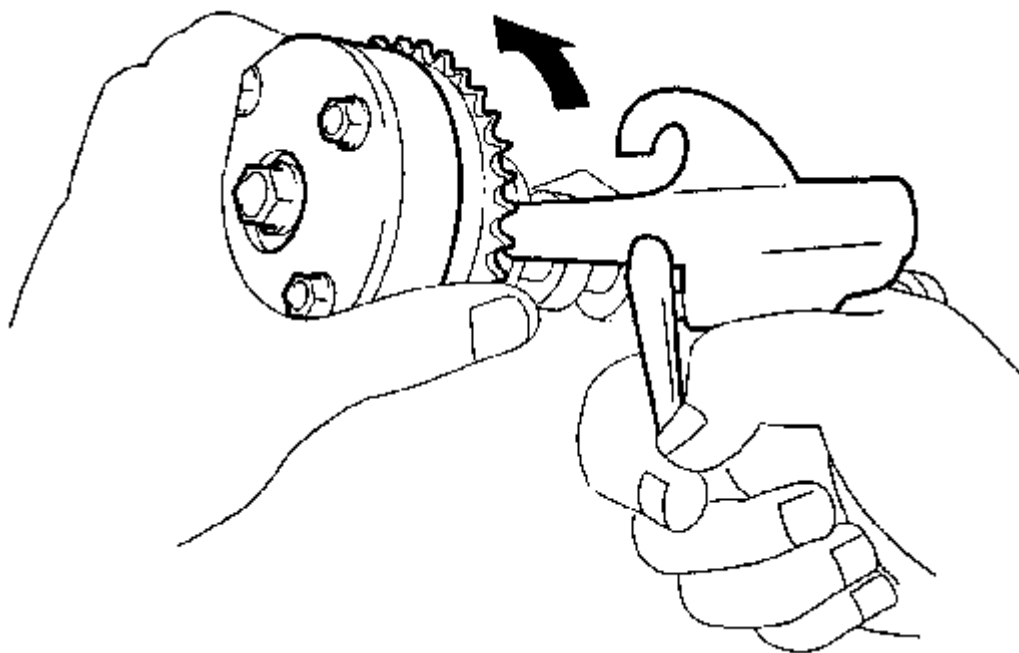


Fig. 265: Applying Air Pressure To Oil Paths
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

HINT:

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

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

4. INSPECT CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY

- a. Install the camshaft timing exhaust gear. Refer to **INSTALLATION**.
- b. Check the camshaft timing exhaust gear lock.
 1. Make sure that the camshaft timing exhaust gear is locked.
- c. Release the lock pin.

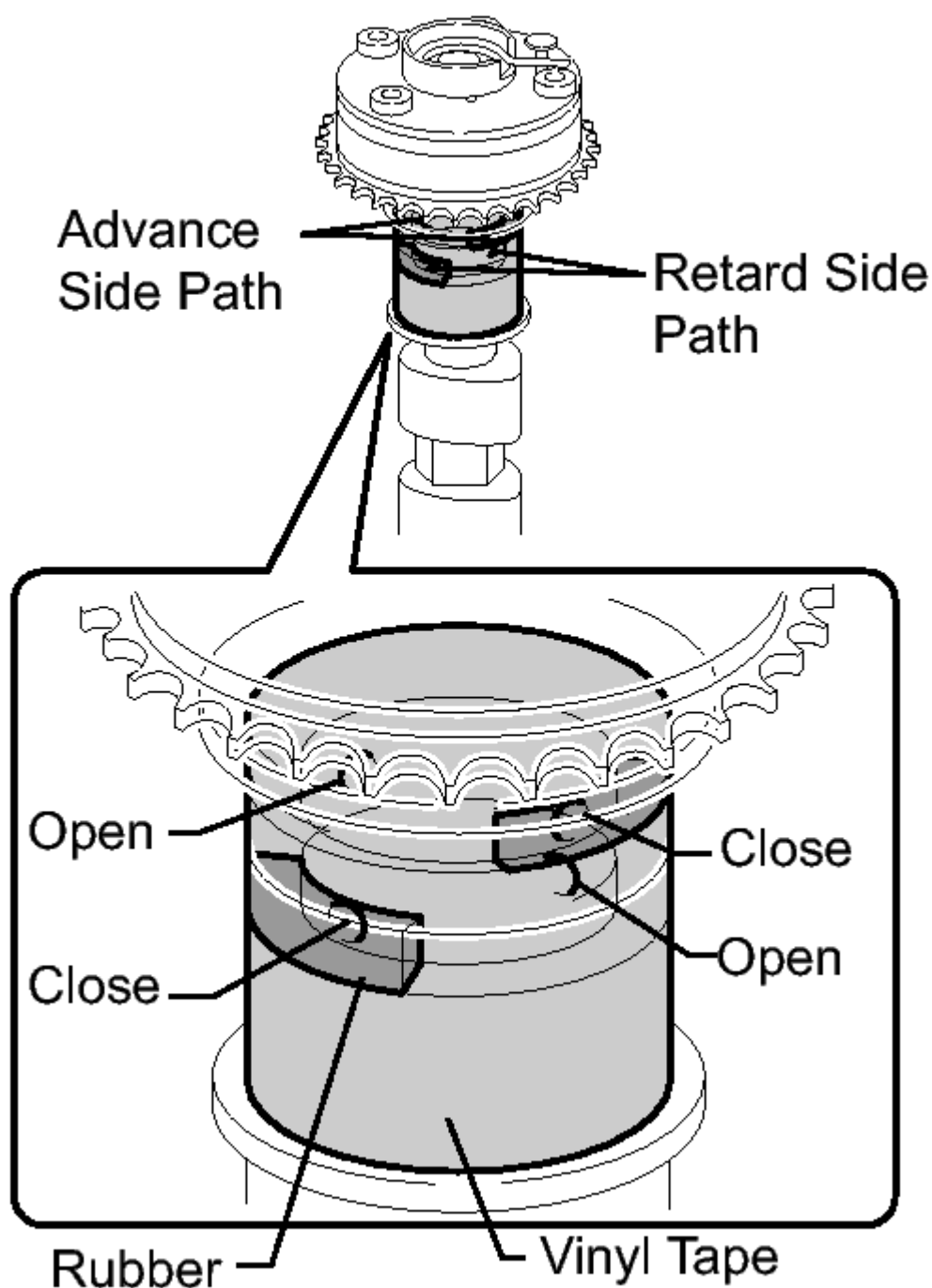
**T**

Fig. 266: Covering Oil Paths Of Cam Journal With Vinyl Tape
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

HINT:

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

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

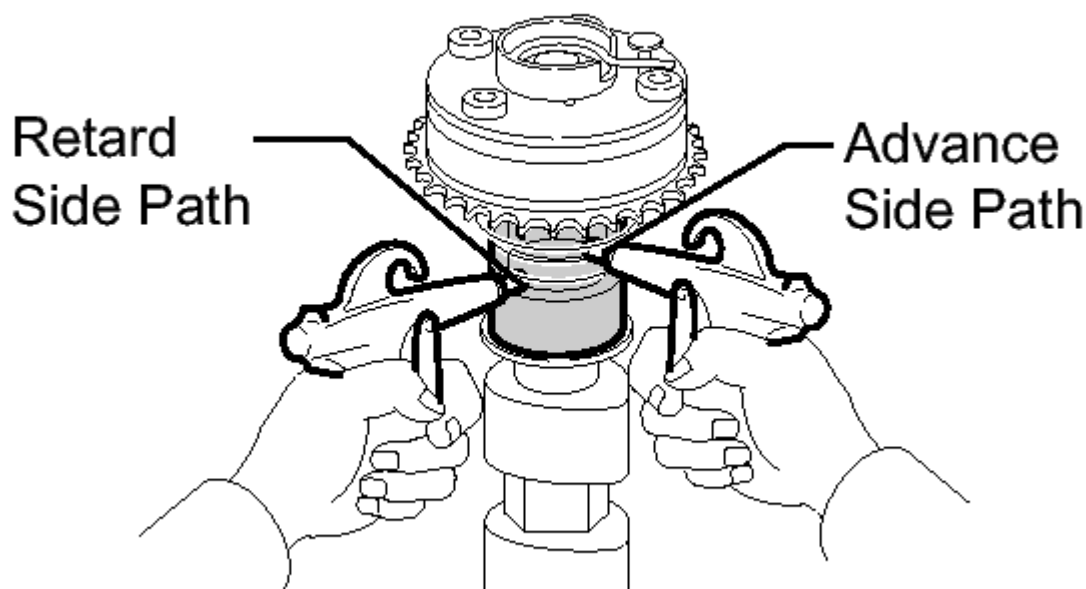
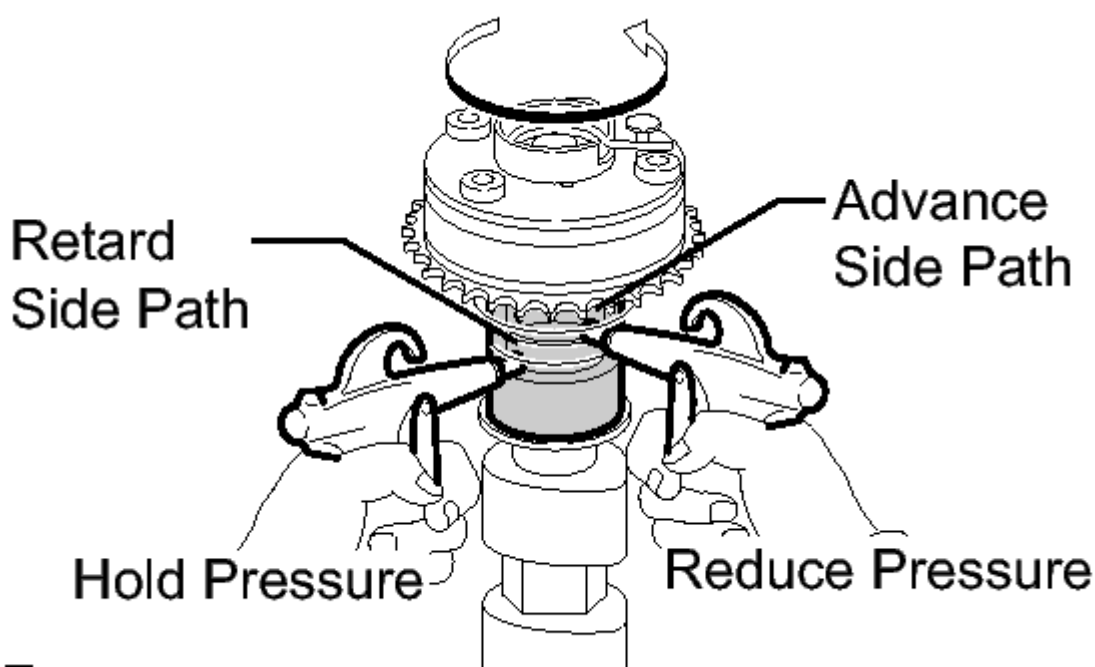
**T**

Fig. 267: Applying Air Pressure To Advance Side Path
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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



T

Fig. 268: Applying Air Pressure To Advance Side Path
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

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

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

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

- d. Check for smooth rotation.

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

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

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

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

5. INSPECT CHAIN SUB-ASSEMBLY

- a. Pull the chain with a force of 147 N (15 kgf, 33 lbf) as shown in the illustration.

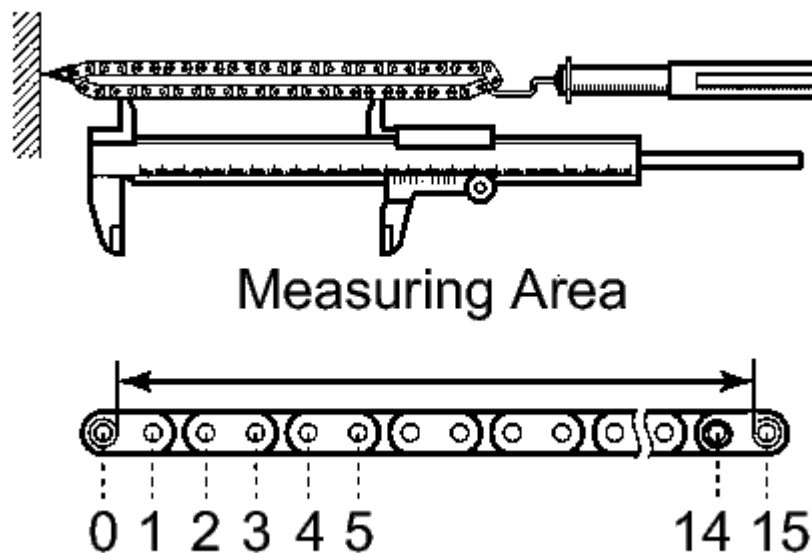


Fig. 269: Measuring Length Of Links

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

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

Maximum chain elongation

115.2 mm (4.535 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.

6. INSPECT NO. 2 CHAIN SUB-ASSEMBLY

- a. Pull the chain with a force of 147 N (15 kgf, 33 lbf) as shown in the illustration.

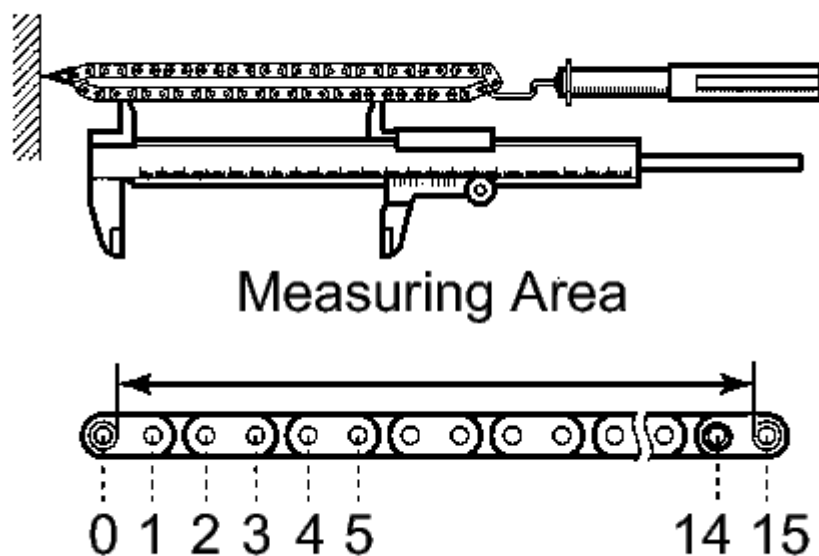


Fig. 270: Measuring Length Of Links

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

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

Maximum chain elongation

102.1 mm (4.019 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 No. 2 chain.

7. INSPECT OIL PUMP DRIVE GEAR

- a. Place the chain around the gear.

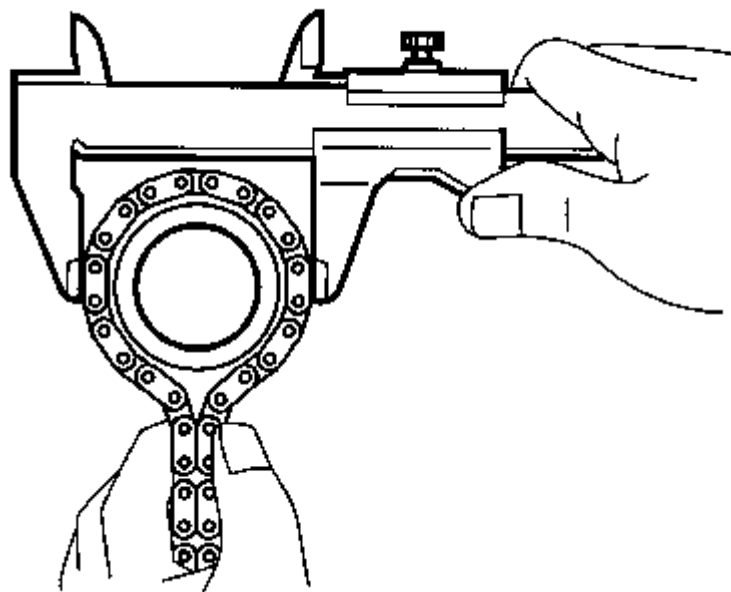


Fig. 271: Measuring Timing Gear Diameter With Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Minimum gear diameter (with chain)

48.2 mm (1.898 in.)

NOTE: **The vernier caliper must be in contact with the chain rollers when measuring.**

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

8. INSPECT OIL PUMP DRIVE SHAFT GEAR

- a. Place the chain around the gear.

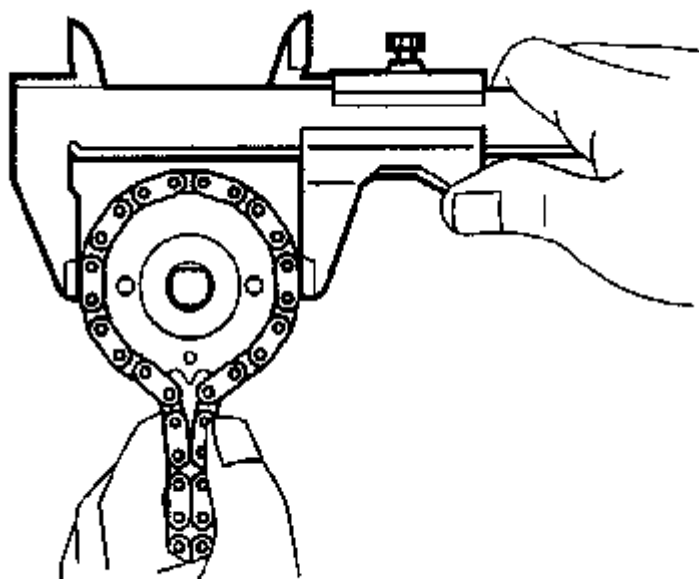


Fig. 272: Inspecting Oil Pump Drive Shaft Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Minimum gear diameter (with chain)

48.8 mm (1.921 in.)

NOTE: **The vernier caliper must be in contact with the chain rollers when measuring.**

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

9. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY

- a. Place the chain around the gear.

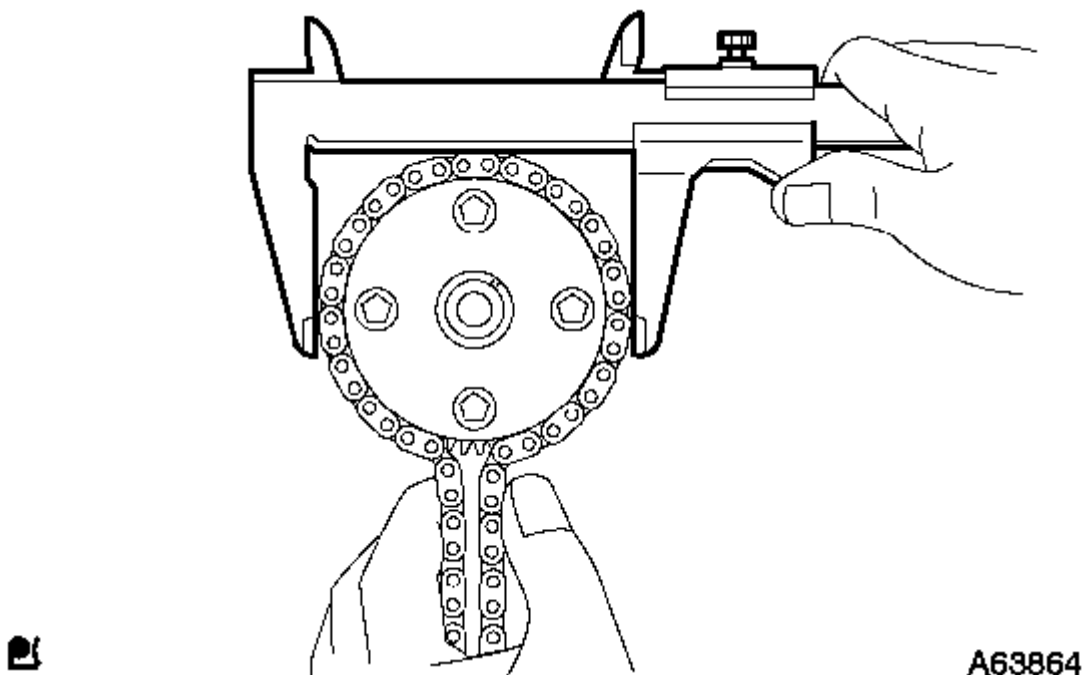


Fig. 273: Inspecting Camshaft Timing Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Minimum gear diameter (with chain)

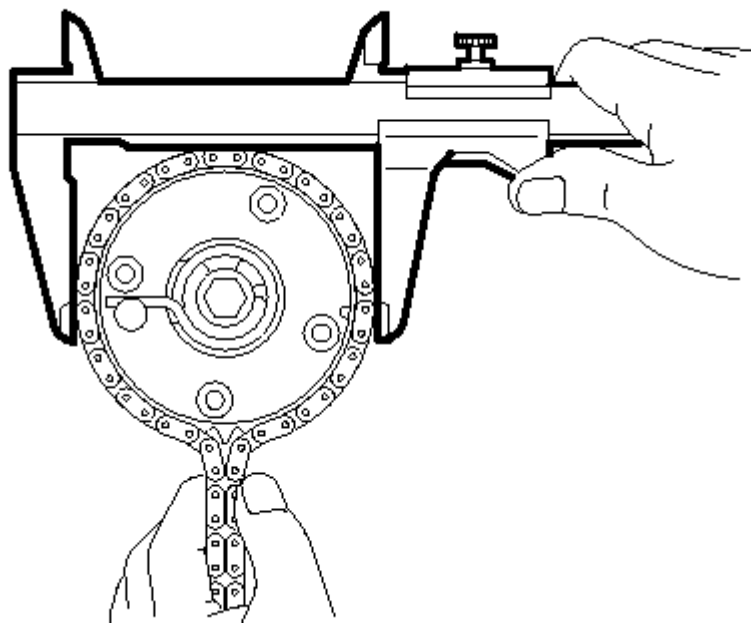
96.8 mm (3.811 in.)

NOTE: The vernier caliper must be in contact with the chain rollers when measuring.

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

10. INSPECT CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY

- a. Place the chain around the sprocket.



T

Fig. 274: Measuring Diameter Of Gear And Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Minimum sprocket diameter (with chain)

96.8 mm (3.811 in.)

NOTE: The vernier caliper must be in contact with the chain rollers when measuring.

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

11. INSPECT CRANKSHAFT TIMING GEAR

- a. Place the chain around the gear.

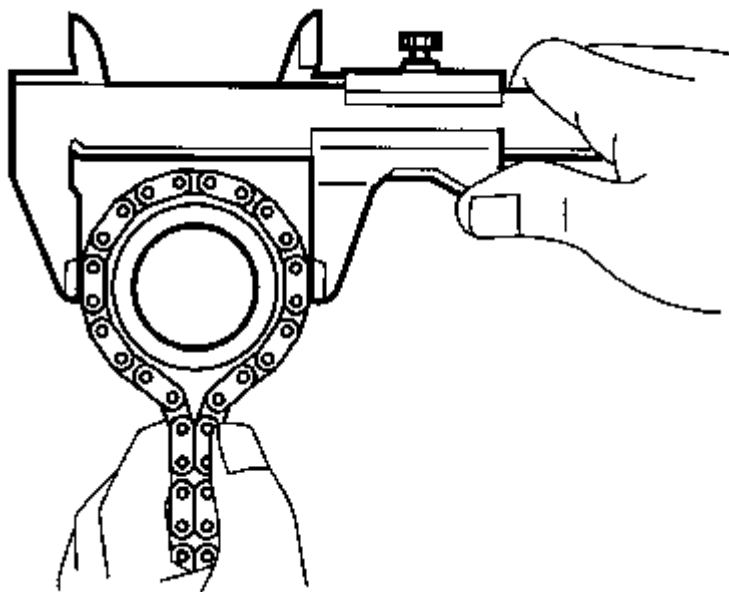


Fig. 275: Measuring Timing Gear Diameter With Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Minimum gear diameter (with chain)

51.1 mm (2.012 in.)

NOTE: **The vernier caliper must be in contact with the chain rollers when measuring.**

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

12. INSPECT CHAIN TENSIONER SLIPPER

- a. Using a vernier caliper, measure the tensioner slipper wear.

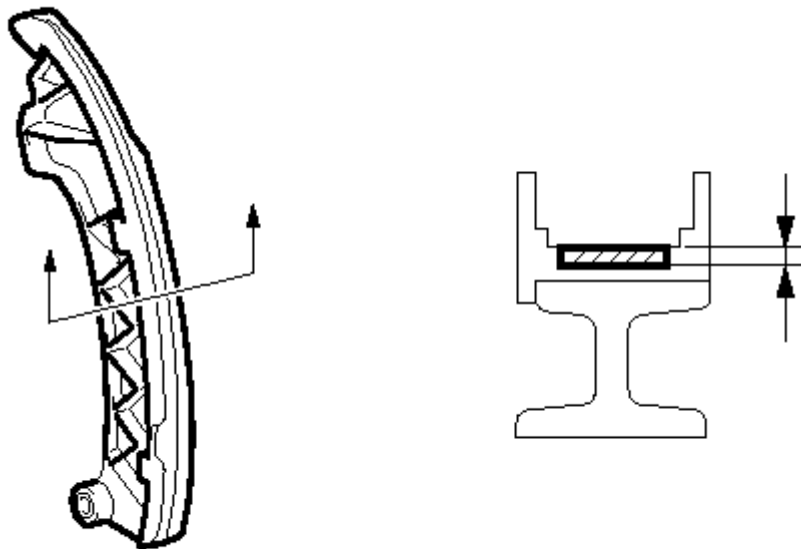
**T**

Fig. 276: Identifying Tensioner Slipper Wear Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum wear

1.0 mm (0.039 in.)

If the wear is greater than the maximum, replace the chain tensioner slipper.

13. INSPECT NO. 1 CHAIN VIBRATION DAMPER

- a. Using a vernier caliper, measure the vibration damper wear.

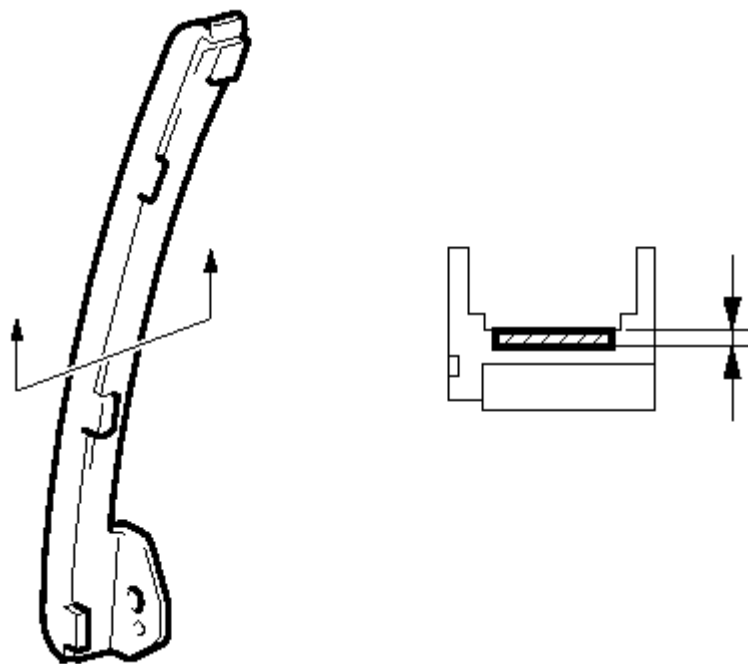
**T**

Fig. 277: Identifying Vibration Damper Wear Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum wear

1.0 mm (0.039 in.)

If the wear is greater than the maximum, replace the No. 1 chain vibration damper.

14. INSPECT NO. 2 CHAIN VIBRATION DAMPER

- a. Using a vernier caliper, measure the vibration damper wear.

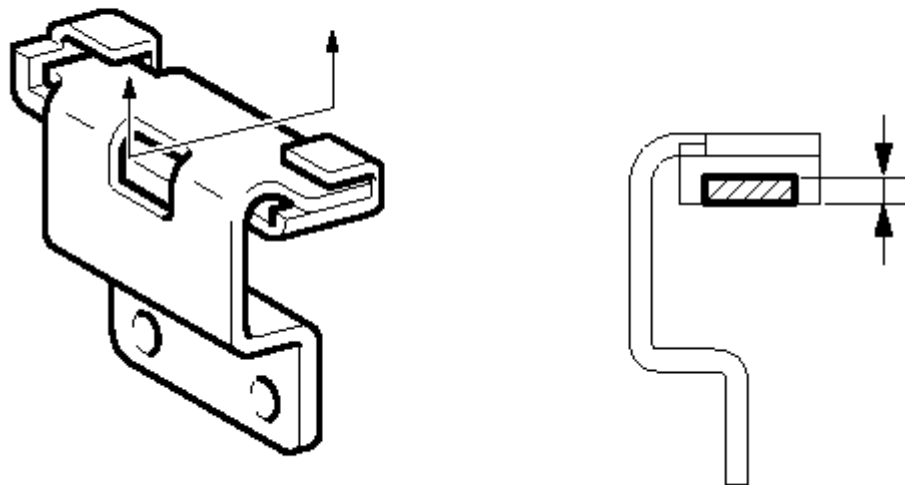
**T**

Fig. 278: Identifying Vibration Damper Wear Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum wear

1.0 mm (0.039 in.)

If the wear is greater than the maximum, replace the No. 2 chain vibration damper.

15. INSPECT CHAIN TENSIONER PLATE

- a. Using a vernier caliper, measure the chain tensioner plate wear.

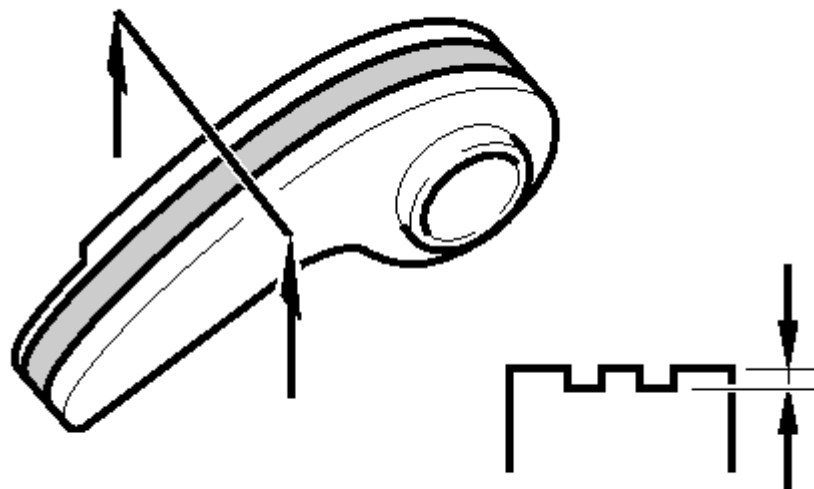
**T**

Fig. 279: Identifying Vibration Damper Wear

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

Maximum wear

1.0 mm (0.039 in.)

If the wear is greater than the maximum, replace the chain tensioner plate.

16. INSPECT NO. 1 CHAIN TENSIONER

- a. Check that the plunger moves smoothly when the ratchet pawl is raised by hand.

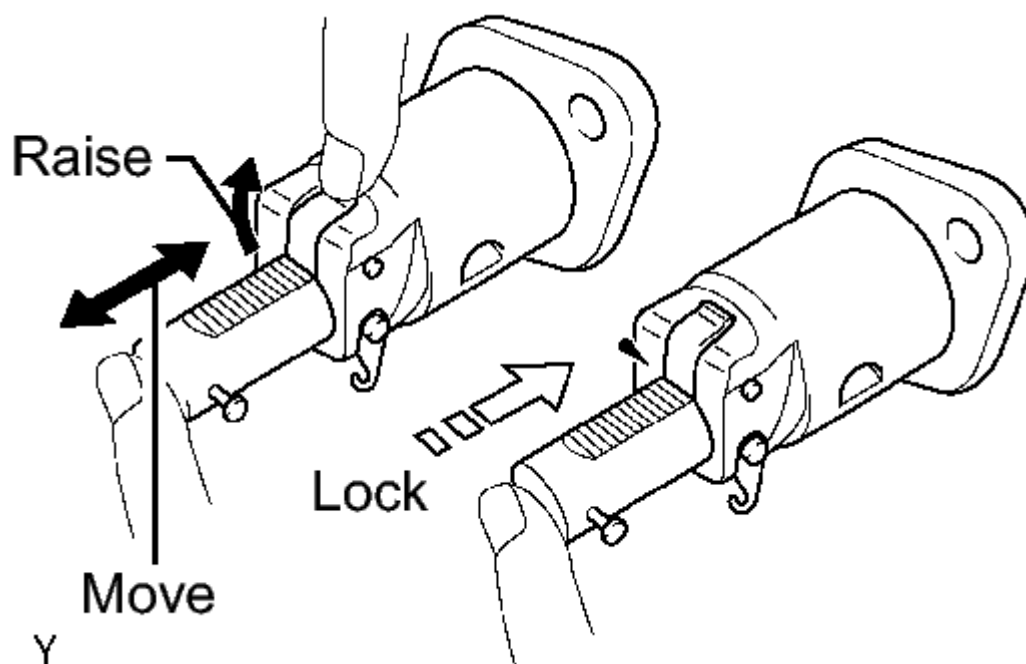


Fig. 280: Inspecting No. 1 Chain Tensioner

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

- b. Release the ratchet pawl, then check that the plunger is locked in place by the ratchet pawl and does not move when pushed by hand.

17. INSPECT CAMSHAFT

- a. Inspect the camshaft for runout.

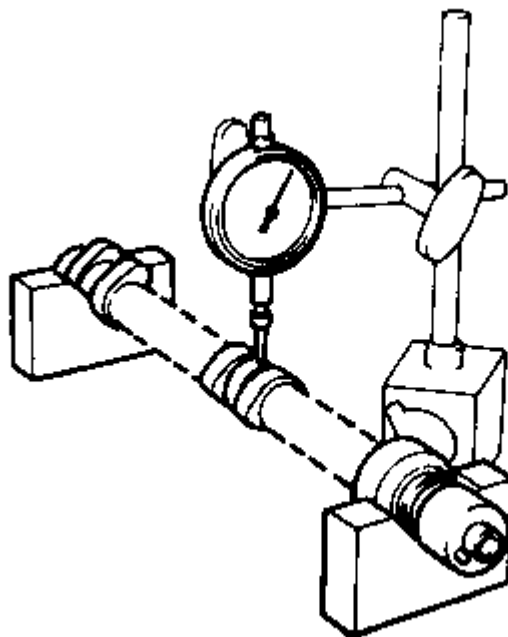


Fig. 281: Inspecting Camshaft For Runout

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

1. Place the camshaft on V-blocks.

2. Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout

0.04 mm (0.0016 in.)

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

- b. Inspect the cam lobes.

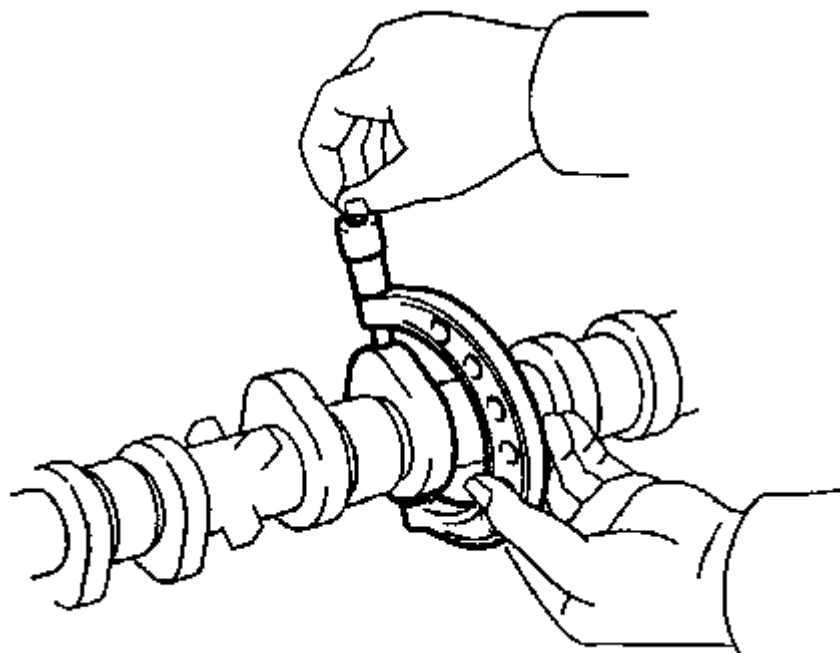


Fig. 282: Inspecting Cam Lobes

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

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

Standard cam lobe height

42.816 to 42.916 mm (1.6857 to 1.6896 in.)

Minimum cam lobe height

42.666 mm (1.6798 in.)

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

- c. Inspect the camshaft journals.

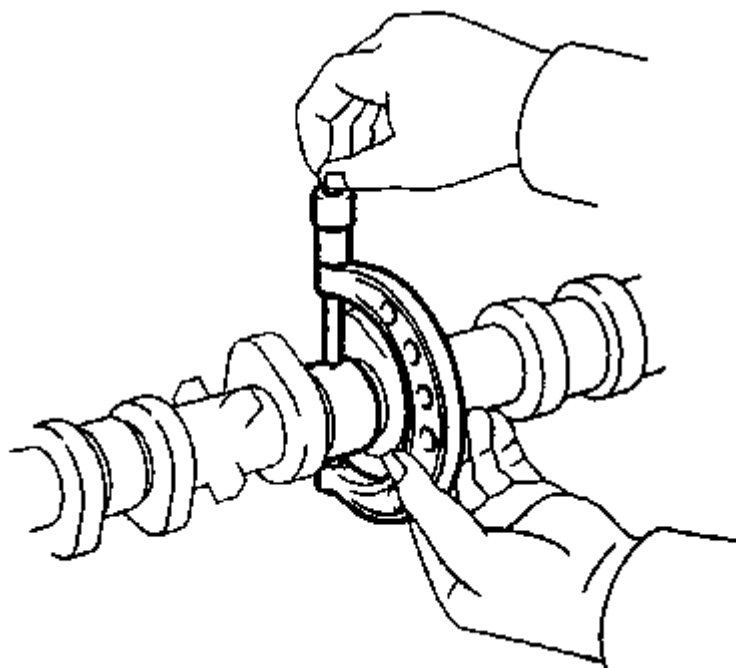


Fig. 283: Inspecting Camshaft Journals

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

1. Using a micrometer, measure the journal diameter.

Standard Journal Diameter

Journal Position	Specified Condition
No. 1	34.449 to 34.465 mm (1.3563 to 1.3569 in.)
Other	22.949 to 22.965 mm (0.9035 to 0.9041 in.)

If the journal diameter is not as specified, check the oil clearance. Refer to **INSPECTION**.

18. INSPECT NO. 2 CAMSHAFT

- a. Inspect the No. 2 camshaft for runout.

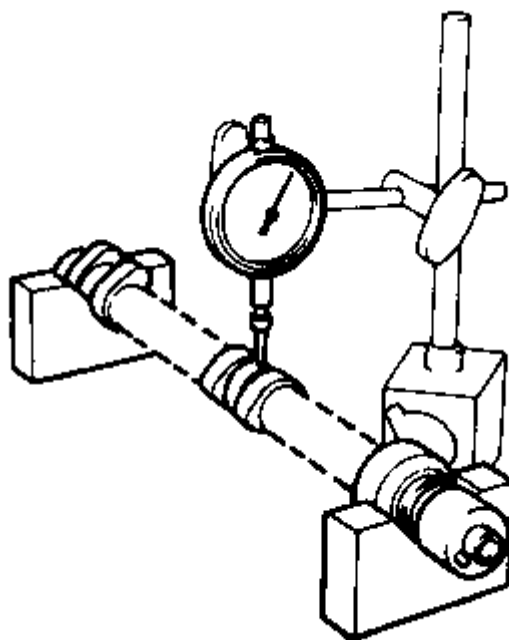


Fig. 284: Inspecting Camshaft For Runout

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

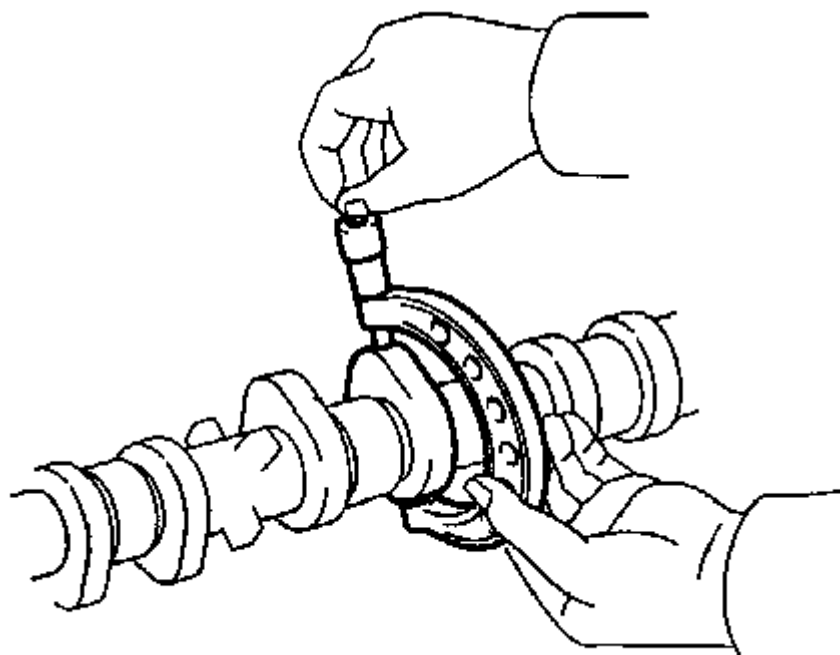
1. Place the No. 2 camshaft on V-blocks.
2. Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout

0.04 mm (0.0016 in.)

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

- b. Inspect the cam lobes.

**Fig. 285: Inspecting Cam Lobes**

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

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

Standard cam lobe height

44.336 to 44.436 mm (1.7455 to 1.7494 in.)

Minimum cam lobe height

44.186 mm (1.7396 in.)

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

- c. Inspect the camshaft journals.

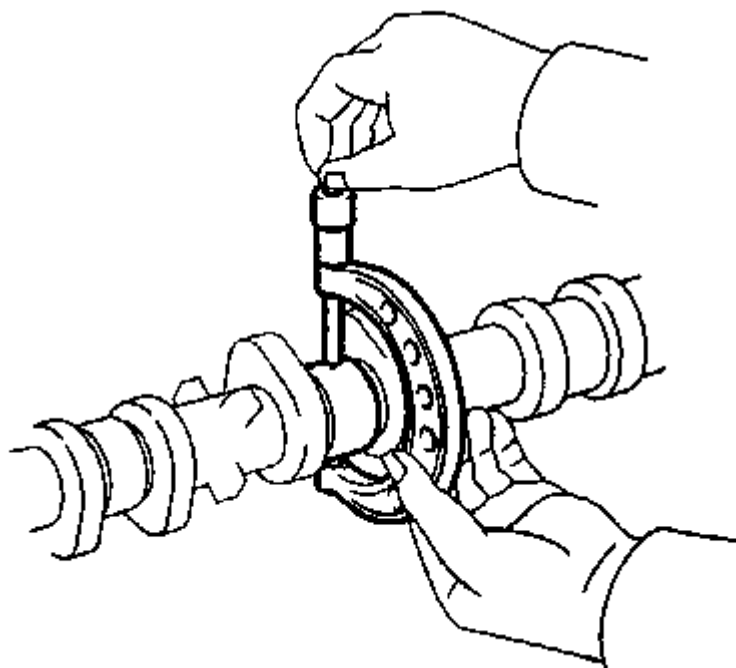


Fig. 286: Inspecting Camshaft Journals

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

1. Using a micrometer, measure the journal diameter.

Standard Journal Diameter

Journal Position	Specified Condition
No. 1	34.449 to 34.465 mm (1.3563 to 1.3569 in.)
Other	22.949 to 22.965 mm (0.9035 to 0.9041 in.)

If the journal diameter is not as specified, check the oil clearance. Refer to **INSPECTION**.

19. INSPECT CYLINDER HEAD SET BOLT

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

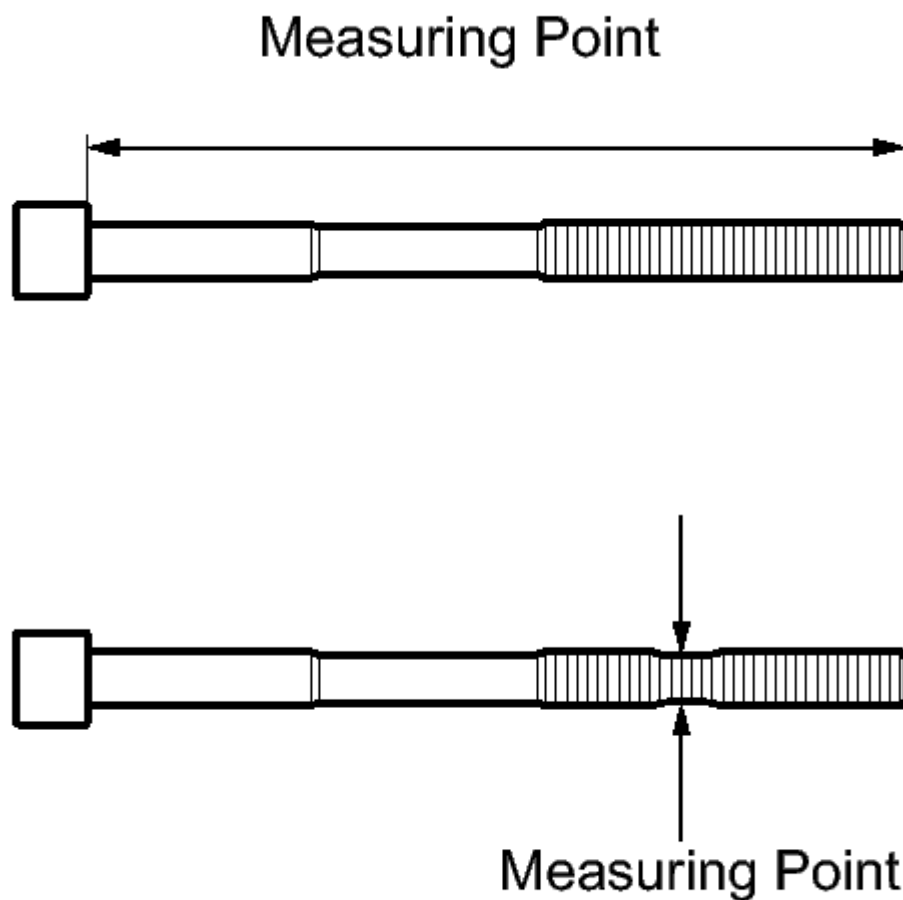


Fig. 287: Identifying Length Of Cylinder Head Set Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard bolt length

146.8 to 148.2 mm (5.7795 to 5.8346 in.)

Maximum bolt length

149.2 mm (5.874 in.)

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

- b. Using a vernier caliper, measure the minimum diameter of the elongated thread at the measuring point.

Standard outside diameter

9.77 to 9.96 mm (0.3846 to 0.3921 in.)

Minimum outside diameter

9.4 mm (0.3701 in.)

HINT:

Using a straightedge, visually check thinner areas of the threaded part of the cylinder head set bolt.

If the diameter is less than the minimum, replace the cylinder head set bolt.

20. INSPECT EXHAUST MANIFOLD

- a. Using a precision straightedge and feeler gauge, measure the warpage on the contact surface of the cylinder head.

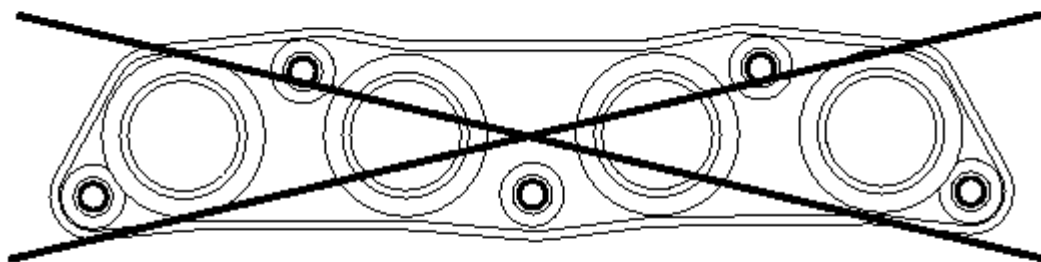


Fig. 288: Measuring Warpage On Contact Surface Of Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum warpage

0.7 mm (0.028 in.)

HINT:

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

REPLACEMENT

REPLACEMENT

1. REPLACE RING PIN

- a. Remove the 2 ring pins.
- b. Install 2 new ring pins to the crankcase.

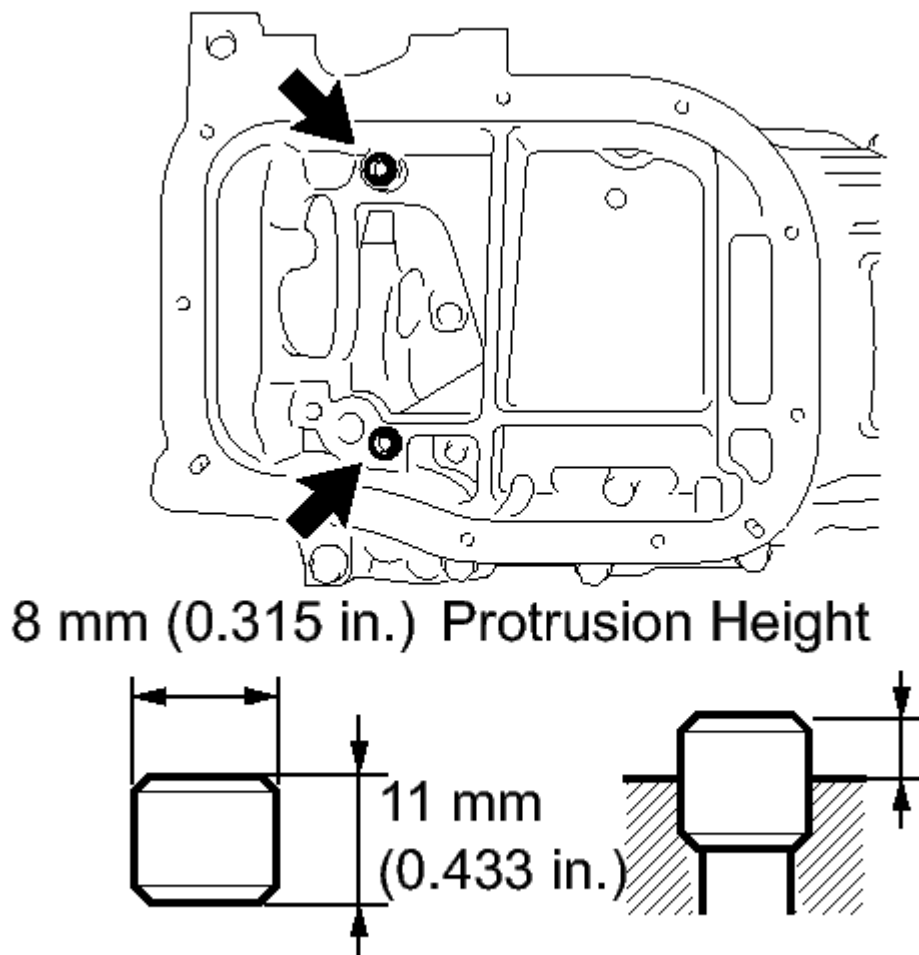


Fig. 289: Identifying Stud Bolts Diameter
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard protrusion

3 mm (0.118 in.)

2. REPLACE STUD BOLT

- a. For crankcase:
 1. Remove the 2 stud bolts.
 2. Using a "TORX" socket E5, install the 2 stud bolts as shown in the illustration.

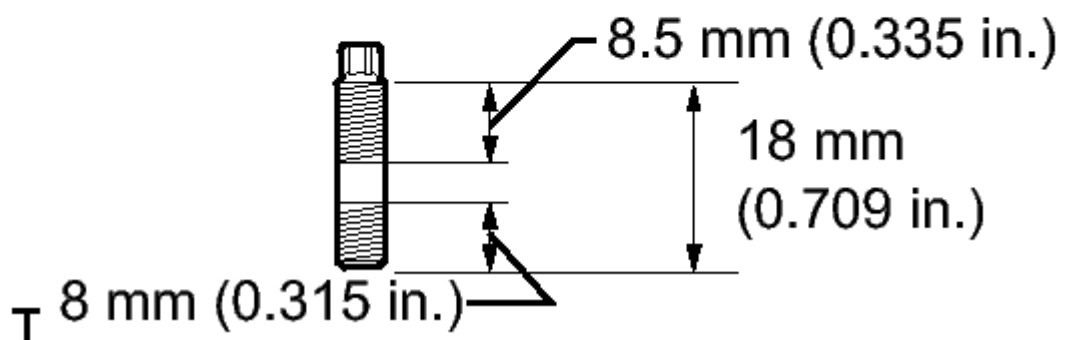
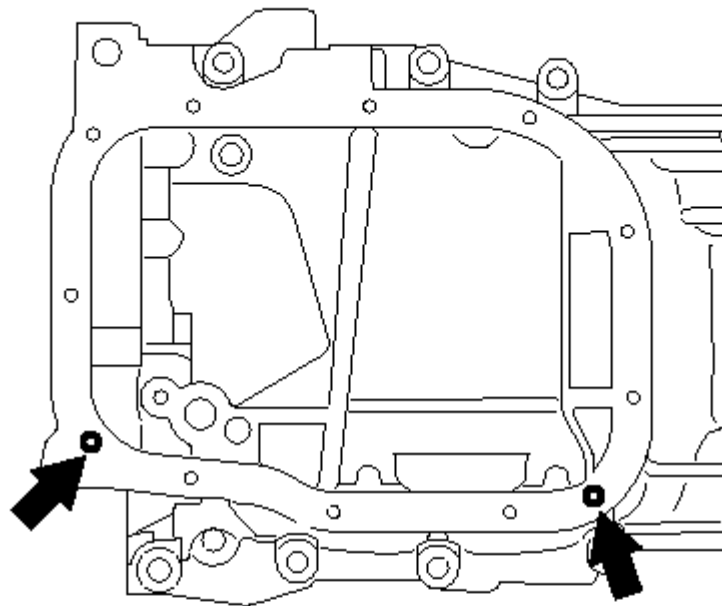


Fig. 290: Locating Stud Bolt

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

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

b. For water inlet housing:

1. Remove the 2 stud bolts.
2. Using a "TORX" socket E5, install the 2 stud bolts as shown in the illustration.

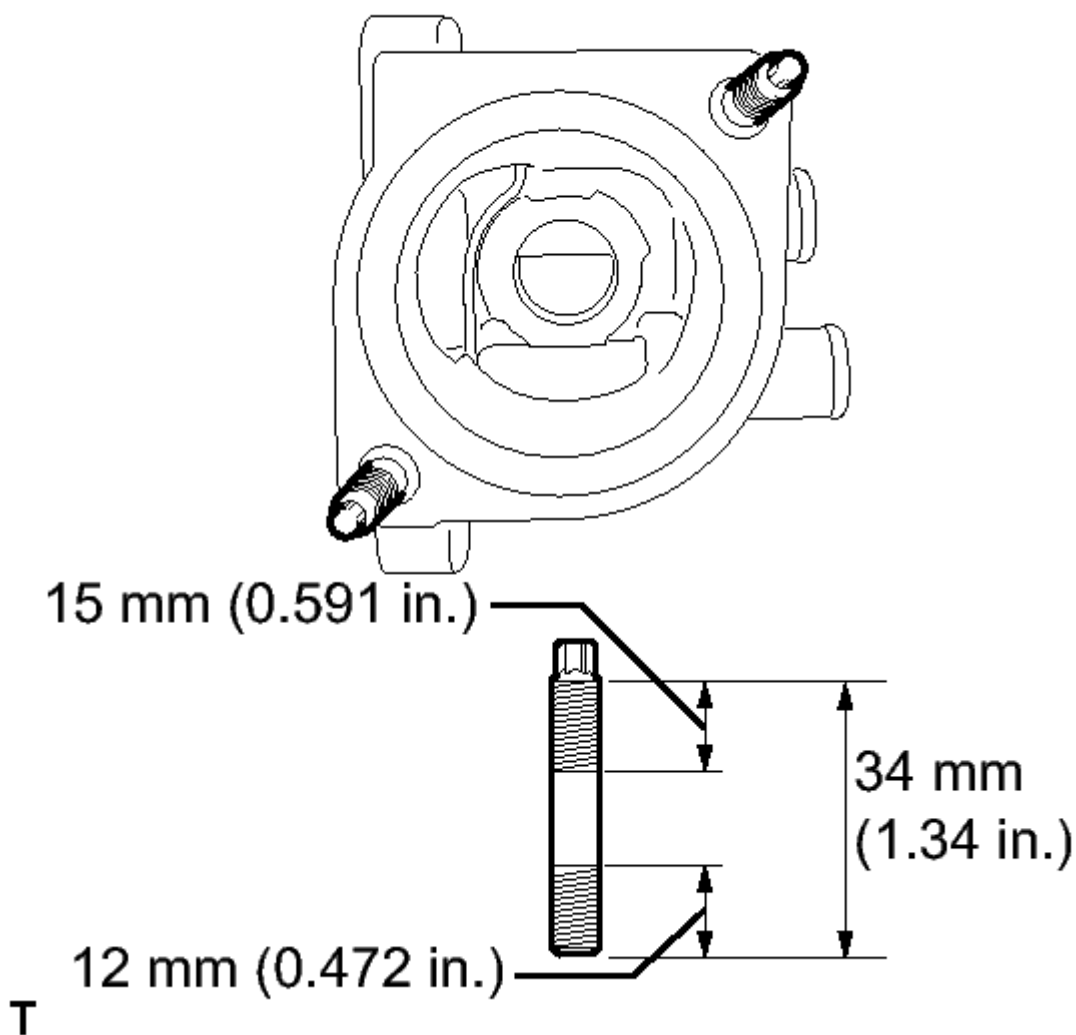


Fig. 291: Identifying Stud Bolt Dimension
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

3. REPLACE SPARK PLUG TUBE GASKET

- a. Pry up the claws of the ventilation baffle plate.

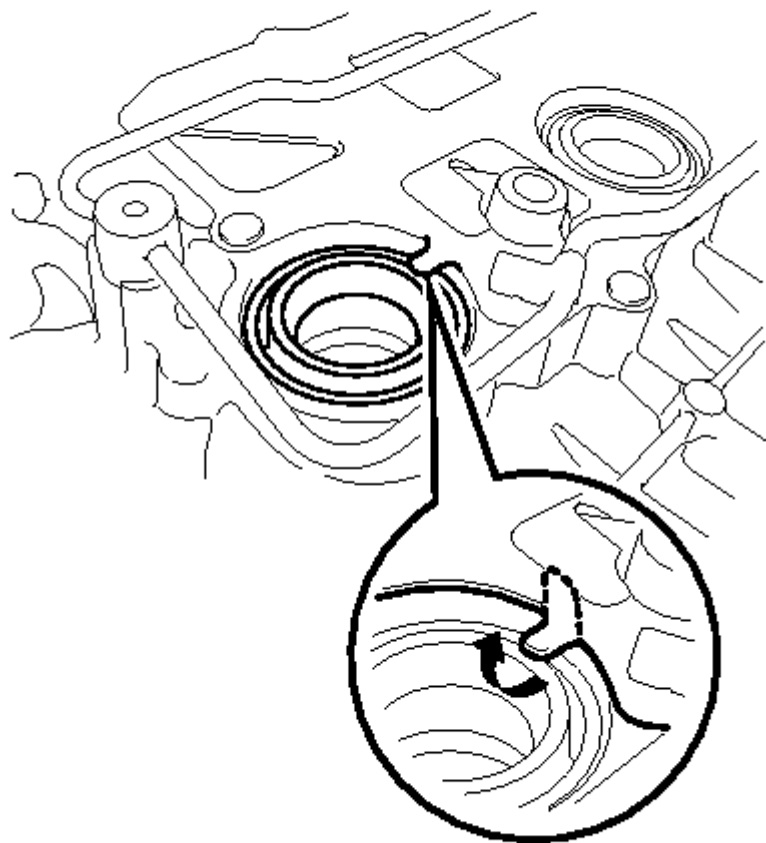


Fig. 292: Identifying Claws Of Baffle Plate

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

NOTE: Do not deform the claws of the baffle plate more than necessary.

- b. Remove the 4 gaskets from the cylinder head covers.

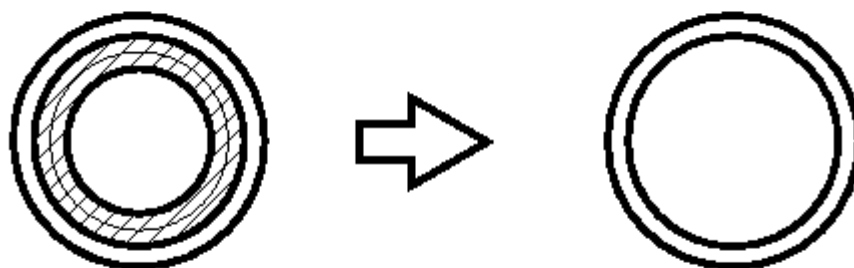
NOTE:

- Prevent the plug tube gaskets from being deformed as much as possible. The removed gaskets will be used when reinstalling the gaskets.
- Do not damage the connection of the cylinder head cover.

1. Using a cutter, cut off the sealing part of the removed plug tube gasket.

Before Cutting Off

After Cutting Off




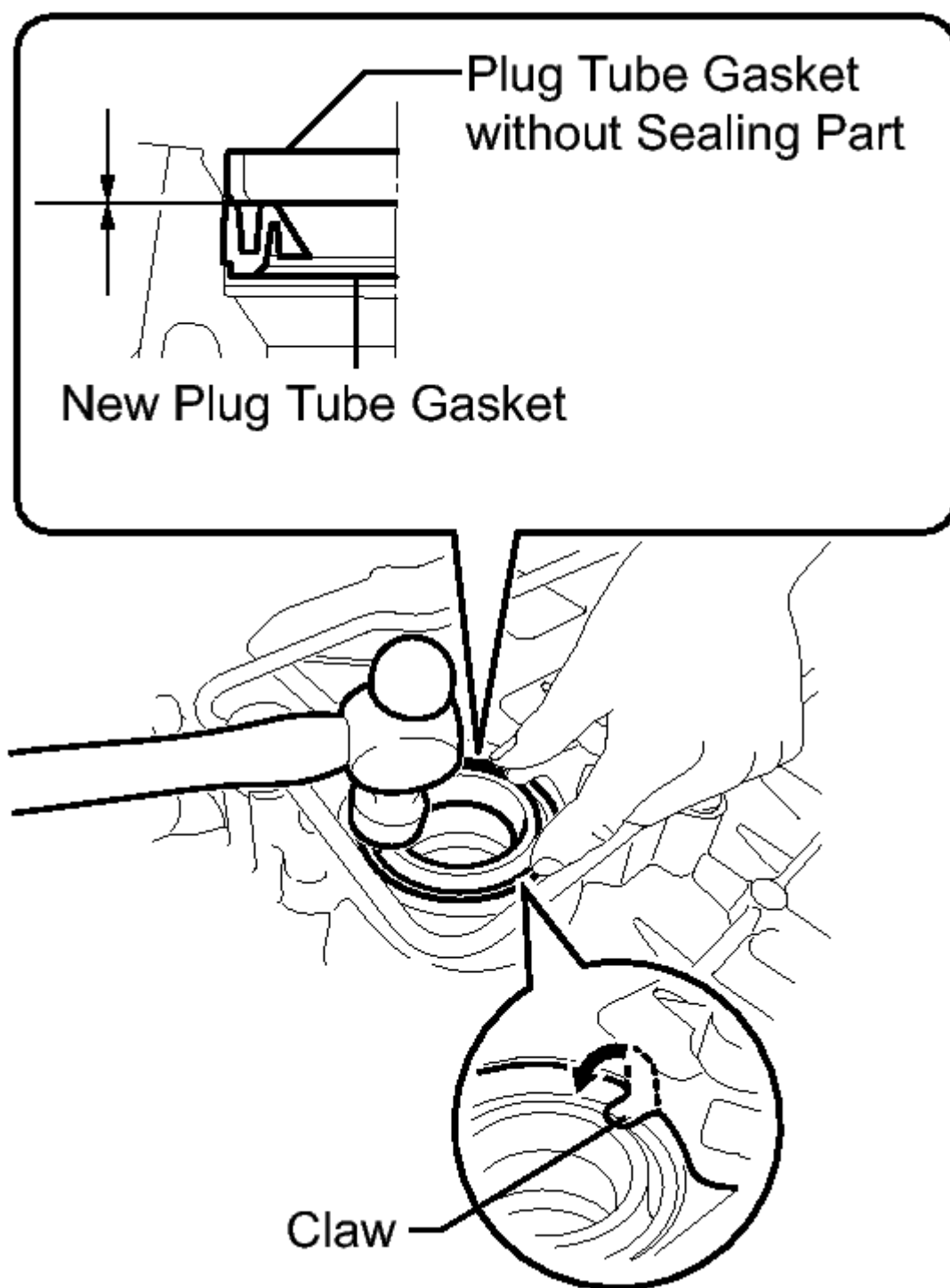
T  : Area to be Cut Off

Fig. 293: Identifying Plug Tube Gasket

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

2. Using the plug tube gasket which has had the sealing part cut off, uniformly press in a new plug tube gasket all the way.



T

Fig. 294: Removing/Installing Plug Tube Gasket
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

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

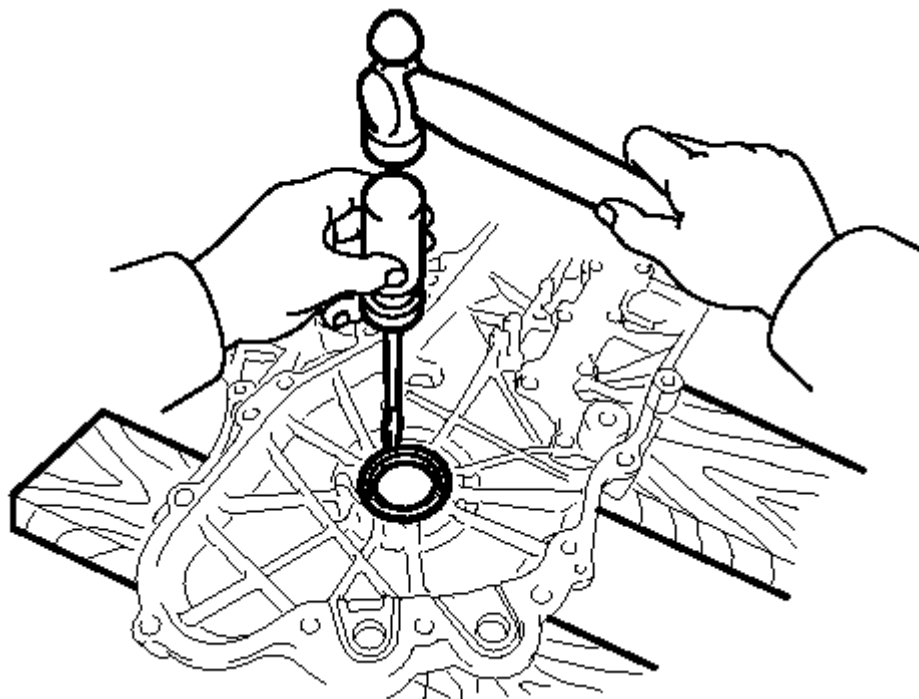
HINT:

If a plug tube gasket that will be used to install a new gasket is deformed, and cannot be positioned on a new gasket, correct the deformation using pliers.

- c. Return the claws of the ventilation baffle plate to their original positions.

4. REPLACE TIMING CHAIN COVER OIL SEAL

- a. Using a screwdriver and hammer, remove the oil seal.



T

Fig. 295: Removing Oil Seal

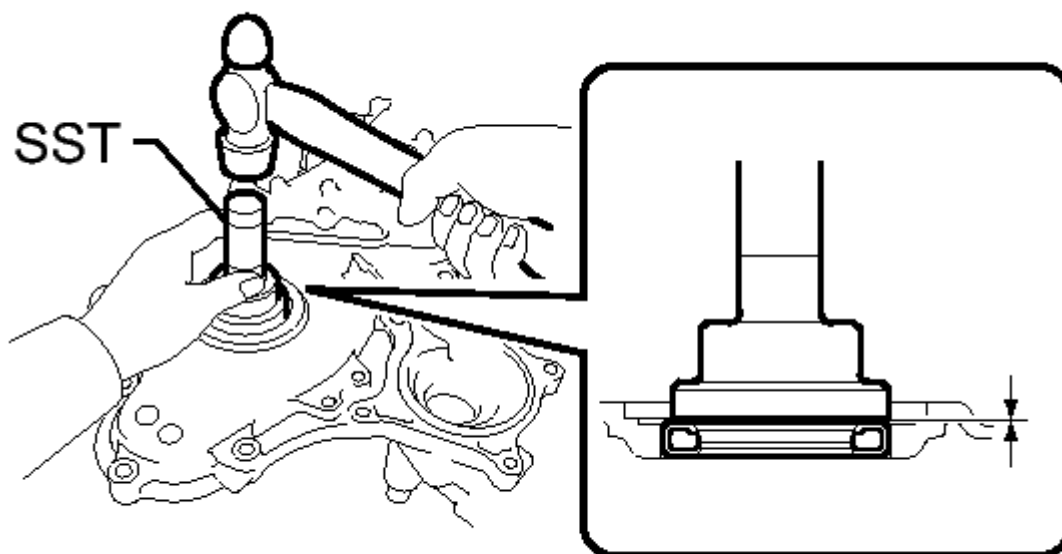
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Be careful not to damage the timing chain cover oil seal.

HINT:

Tape the screwdriver tip before use.

- b. Using SST, tap in a new oil seal until its surface is flush with the timing gear case edge.

**T****Fig. 296: Tapping Oil Seal**

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

- SST: 09223-22010

c. Apply a light coat of MP grease to the lip of the oil seal.

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 cover.

5. REPLACE REAR ENGINE OIL SEAL

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

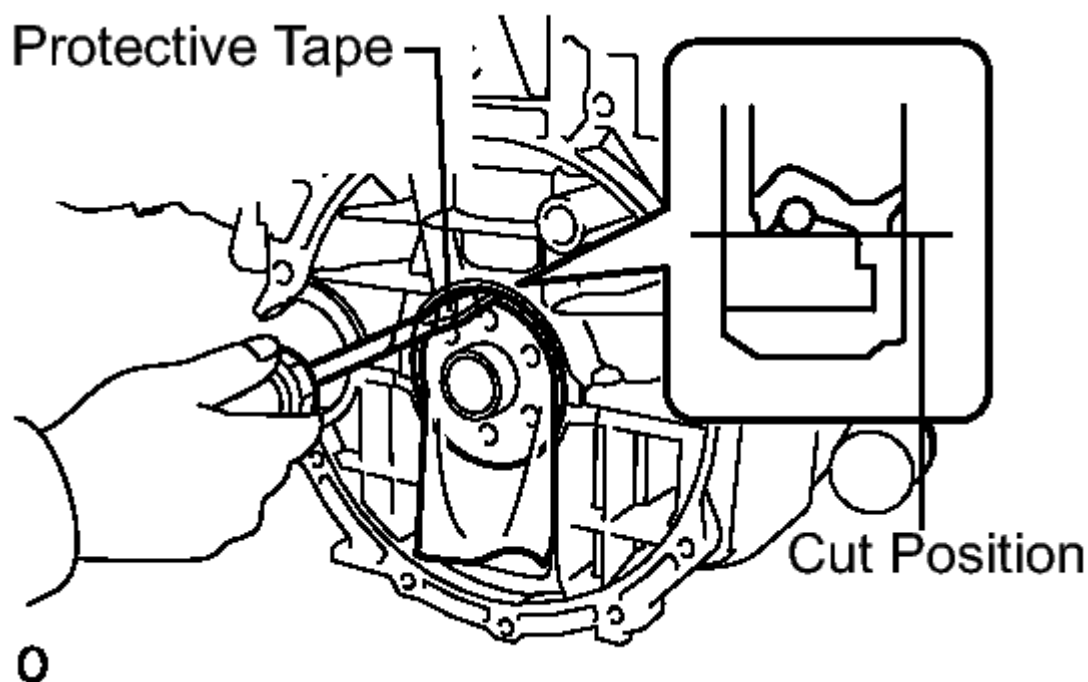


Fig. 297: Prying Out Oil Seal

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

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

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

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

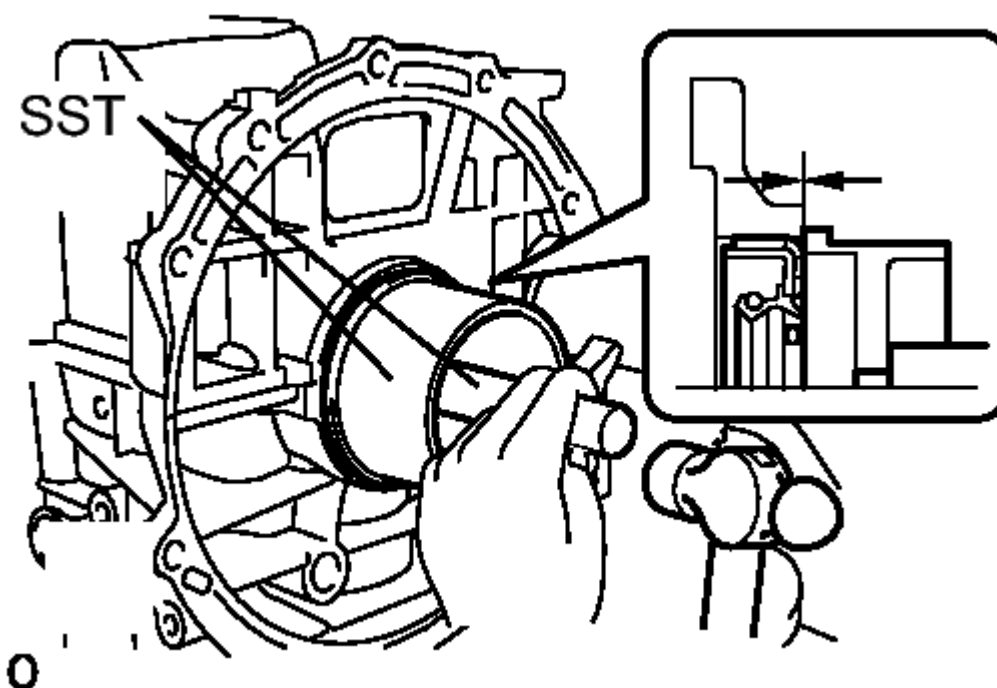


Fig. 298: Tapping Oil Seal

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

- SST: 09223-15030
- SST: 09950-70010
09951-07100

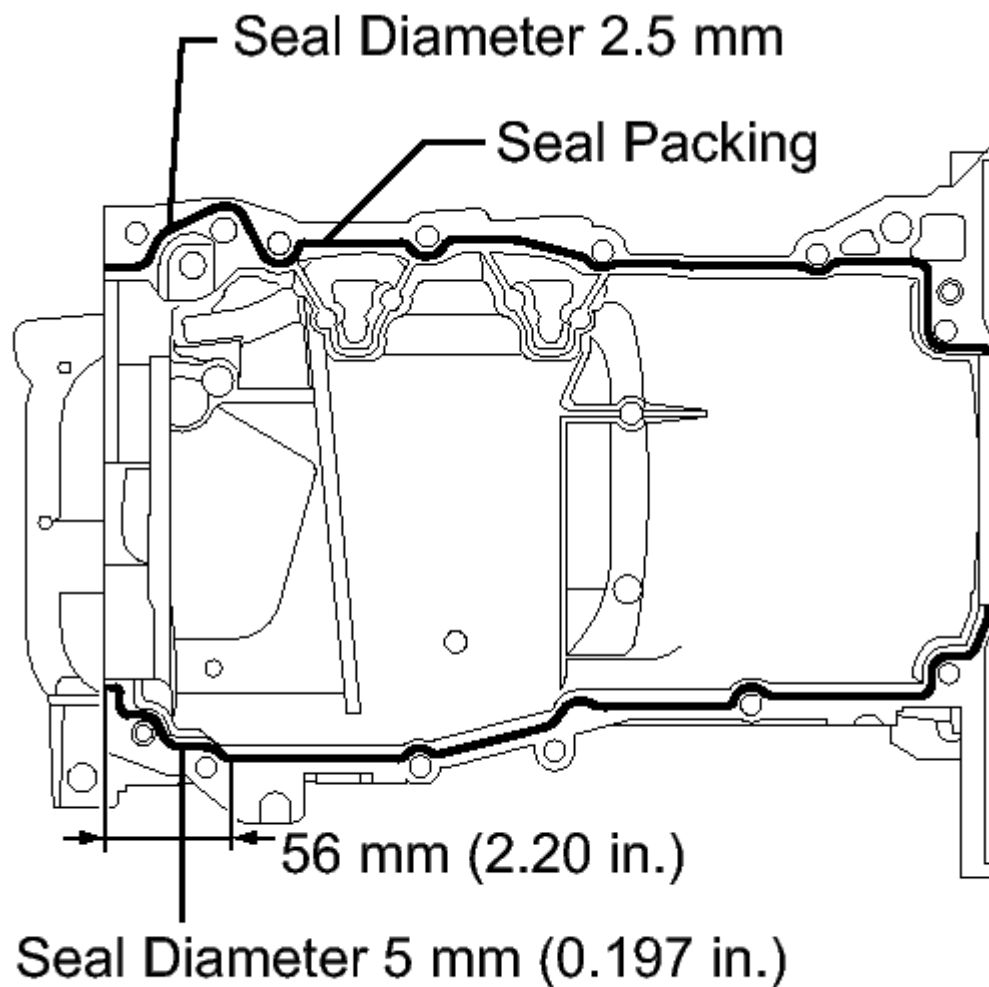
NOTE:

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

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

NOTE:**Wipe off extra grease on the crankshaft.****REASSEMBLY****REASSEMBLY****1. INSTALL STIFFENING CRANKCASE ASSEMBLY**

- a. Apply seal packing in a continuous bead (diameter: 2.5 mm (0.0984 in.)) to the places shown in the illustration.

**T****Fig. 299: Applying Seal Packing**

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

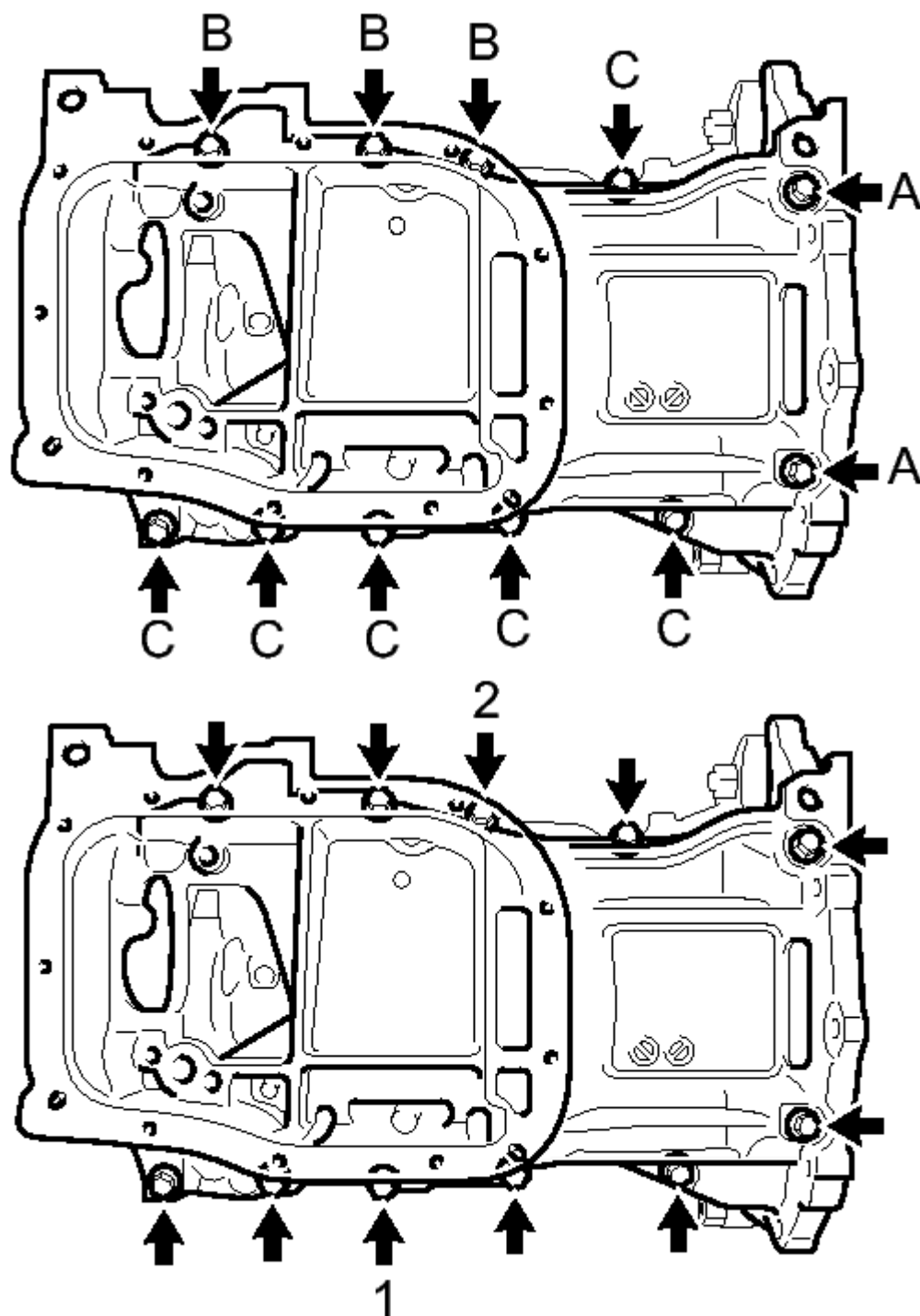
Seal packing

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

NOTE:

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

- b. Install the stiffening crankcase with the 11 bolts.

**Fig. 300: Locating Bolts**

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

Torque: 21 N*m (214 kgf*cm, 16 ft.*lbf)

Bolt Length

Item	Length

Bolt A	138 mm (5.43 in.)
Bolt B	35 mm (1.38 in.)
Bolt C	70 mm (2.76 in.)

- c. Recheck the torque for bolts 1 and 2.

Torque: 21 N*m (214 kgf*cm, 16 ft.*lbf)

- d. Wipe off any excess seal packing with a clean piece of cloth.

2. INSTALL REAR ENGINE OIL SEAL

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

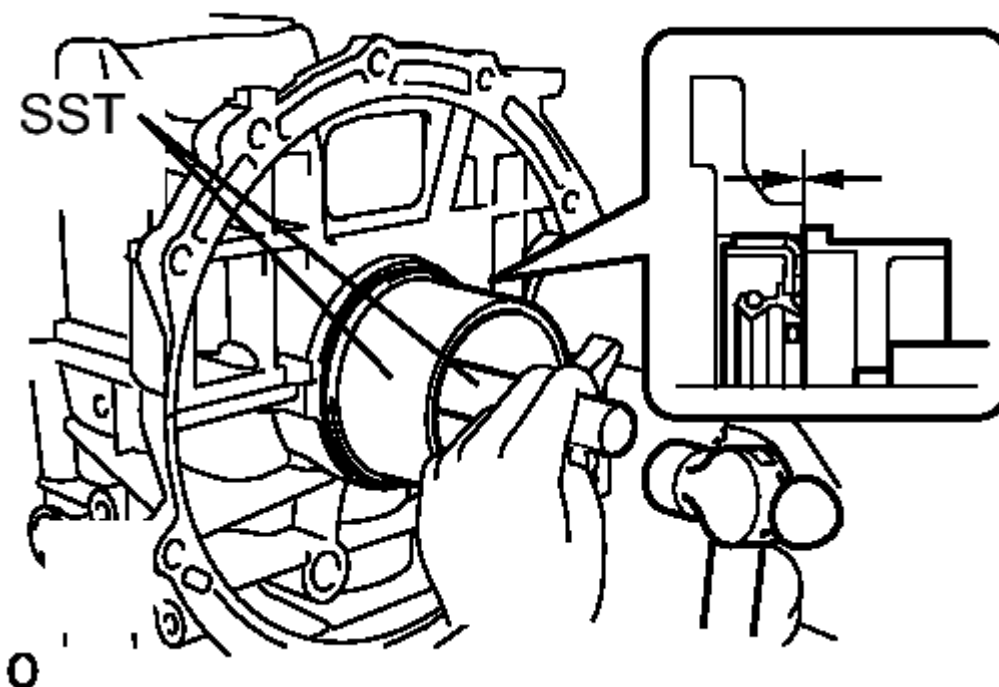


Fig. 301: Tapping Oil Seal

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

- SST: 09223-15030
- SST: 09950-70010
- 09951-07100

NOTE:

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

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

NOTE:

Wipe off extra grease on the crankshaft.

3. INSTALL OIL PUMP ASSEMBLY . Refer to INSTALLATION - Step 1

4. **INSTALL NO. 2 OIL PAN SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 2**
5. **INSTALL OIL PAN DRAIN PLUG**
 - a. Install a new gasket and the oil pan drain plug.

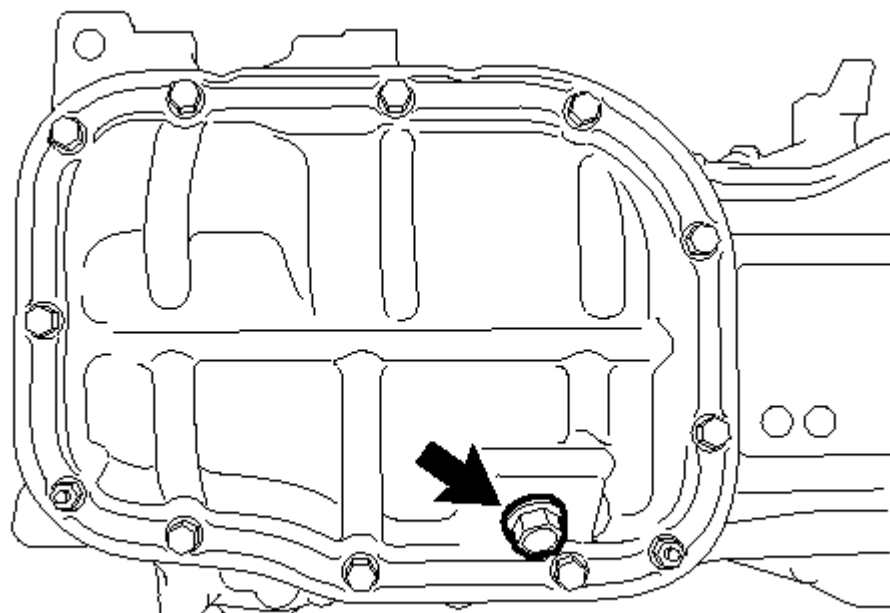
**T**

Fig. 302: Locating Oil Pan Drain Plug

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

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

6. **INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY**
 - a. Apply adhesive to the threads of the drain cock.

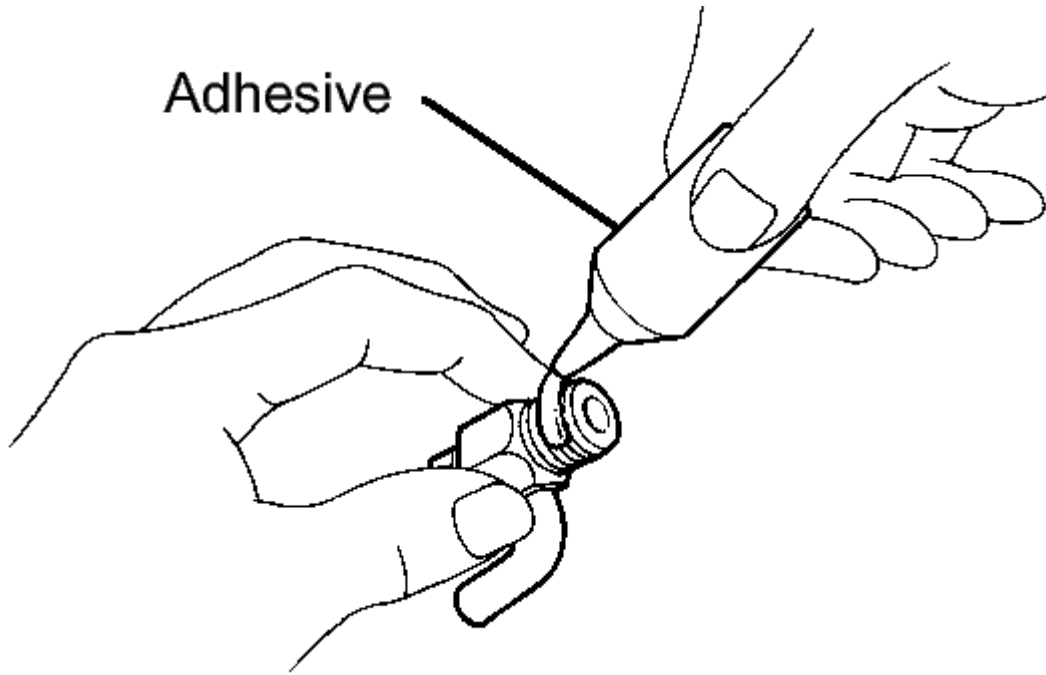
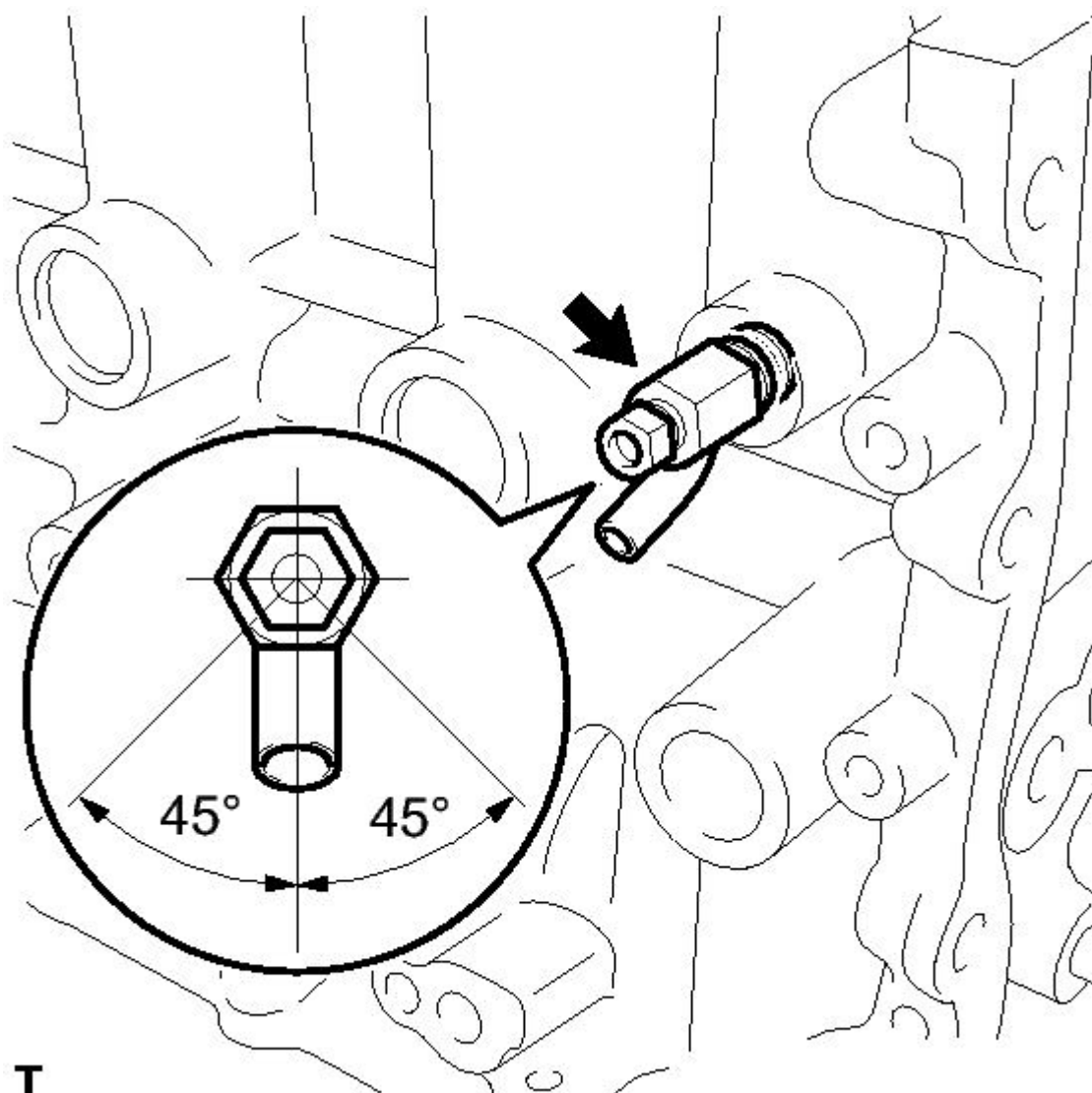


Fig. 303: Applying Adhesive Around Drain Cocks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Adhesive

Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

- b. Install the water drain cock as shown in the illustration.

**T****Fig. 304: Locating Water Drain Cock Plug**

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

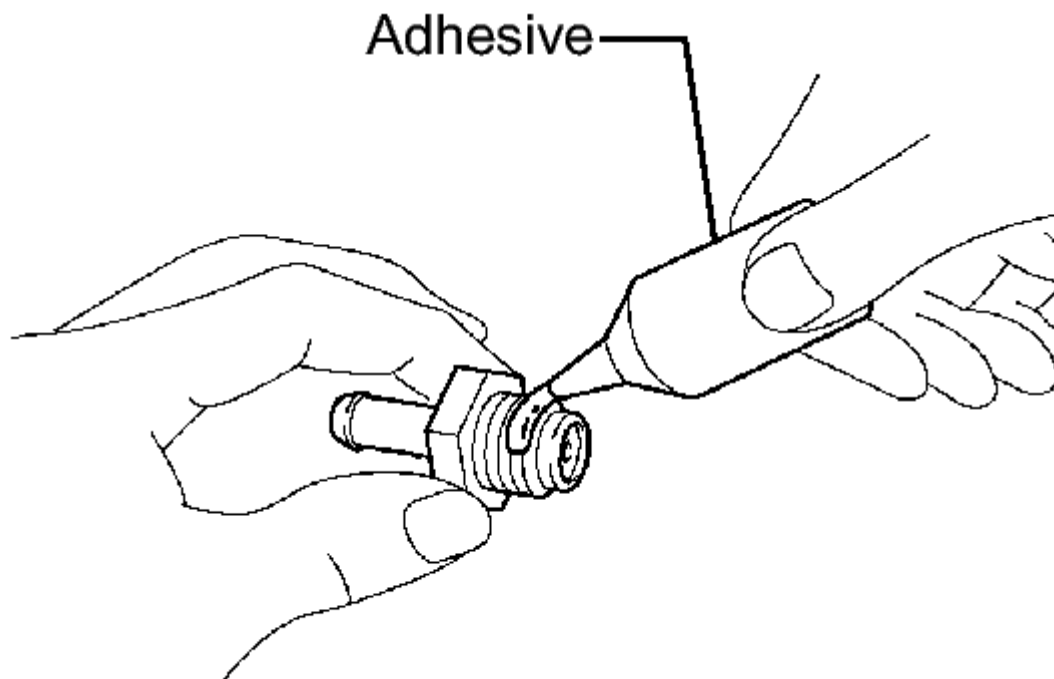
Torque: 20 N*m (204 kgf*cm, 15 ft.*lbf)**NOTE:**

- Do not rotate the drain cock more than 1 revolution (360°) after tightening it to the specified torque.
- Install the water drain cock within 3 minutes after applying seal packing.
- Do not start the engine for at least 2 hours after installing the water drain cock.

- c. Install the water drain cock plug to the water drain cock.

Torque: 13 N*m (130 kgf*cm, 9 ft.*lbf)**7. INSTALL VENTILATION VALVE SUB-ASSEMBLY**

- a. Apply adhesive to the threads of the ventilation valve.



N

Fig. 305: Applying Adhesive To Threads Of Ventilation Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Adhesive

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

- b. Install the ventilation valve.

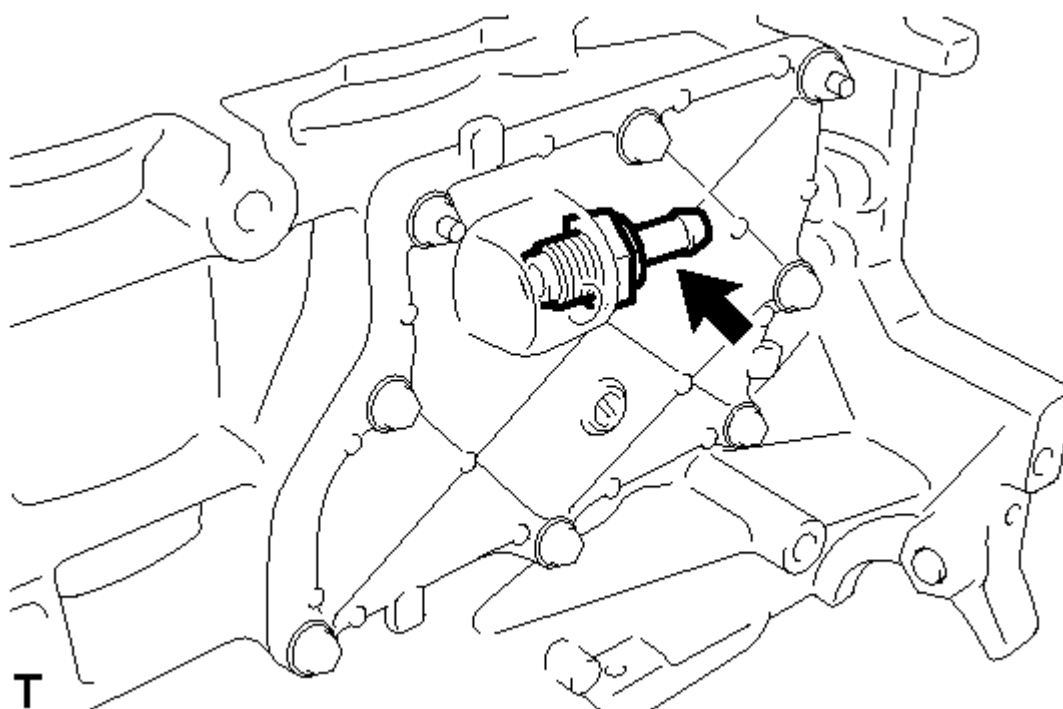


Fig. 306: Locating Ventilation Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

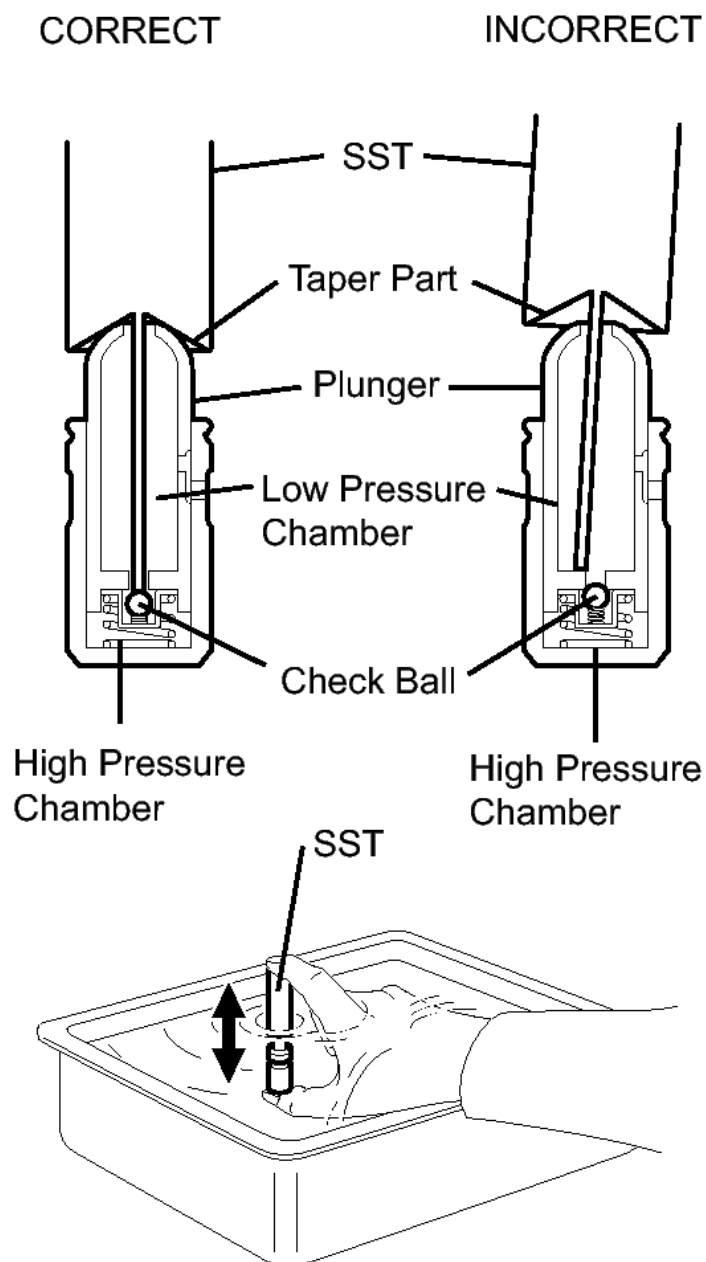
NOTE:

- **Install the crankcase within 3 minutes after applying seal packing.**
- **Do not start the engine for at least 2 hours after installing the ventilation valve.**

8. **INSTALL CYLINDER HEAD GASKET** See step 1
9. **INSTALL CYLINDER HEAD SUB-ASSEMBLY** See step 2
10. **INSTALL VALVE LASH ADJUSTER ASSEMBLY**

NOTE:

- **Keep the lash adjuster free of dirt and foreign matter.**
 - **Only use clean engine oil.**
- a. Place the lash adjuster into a container filled with engine oil.
 - 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.



T

Fig. 307: Identifying Lash Adjuster Plunger Correct And Incorrect Position
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

• SST: 09276-75010

- c. Squeeze SST and the lash adjuster together to move the plunger up and down 5 to 6 times.
- d. Check the movement of the plunger and bleed it.

OK

Plunger moves up and down.

NOTE: When bleeding 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, the high-pressure chamber will not be bled.

- e. After bleeding, remove SST. Then, try to press the plunger quickly and firmly by hand.

OK

Plunger is very difficult to move.

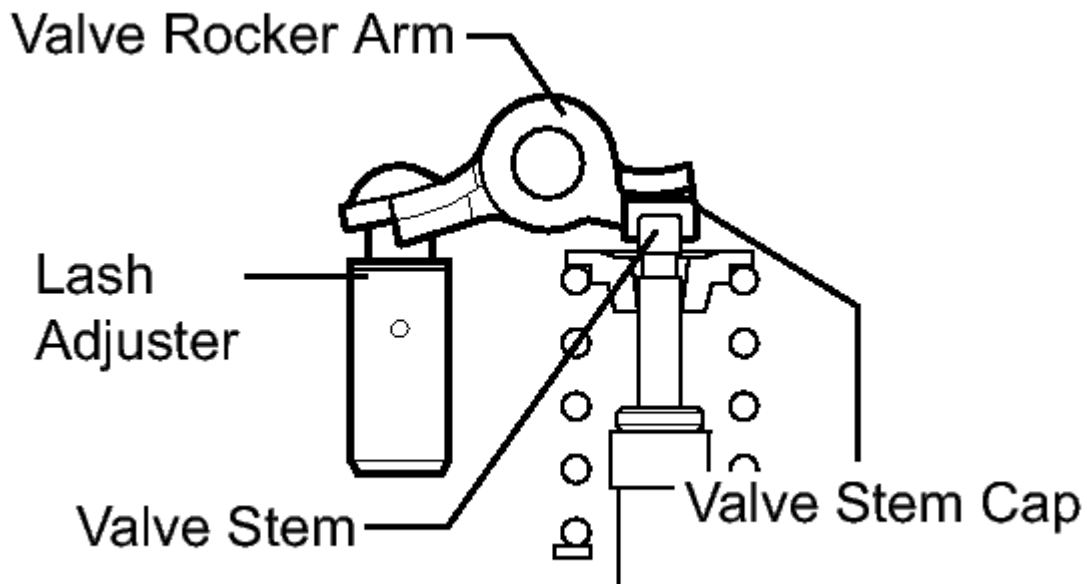
If the result is not as specified, replace the lash adjuster.

- f. Install the lash adjusters.

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

11. INSTALL NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY

- a. Apply engine oil to the lash adjuster tip and valve stem cap end.
- b. Make sure that the valve rocker arms are installed as shown in the illustration.



P

Fig. 308: Identifying Valve Rocker Arm And Valve Stem Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. INSTALL NO. 1 CAMSHAFT BEARING

- a. Clean the both surfaces of the bearings.
- b. Install the 2 No. 1 camshaft bearings.

- c. Using a vernier caliper, measure the distance between the bearing cap edge and the camshaft bearing edge.

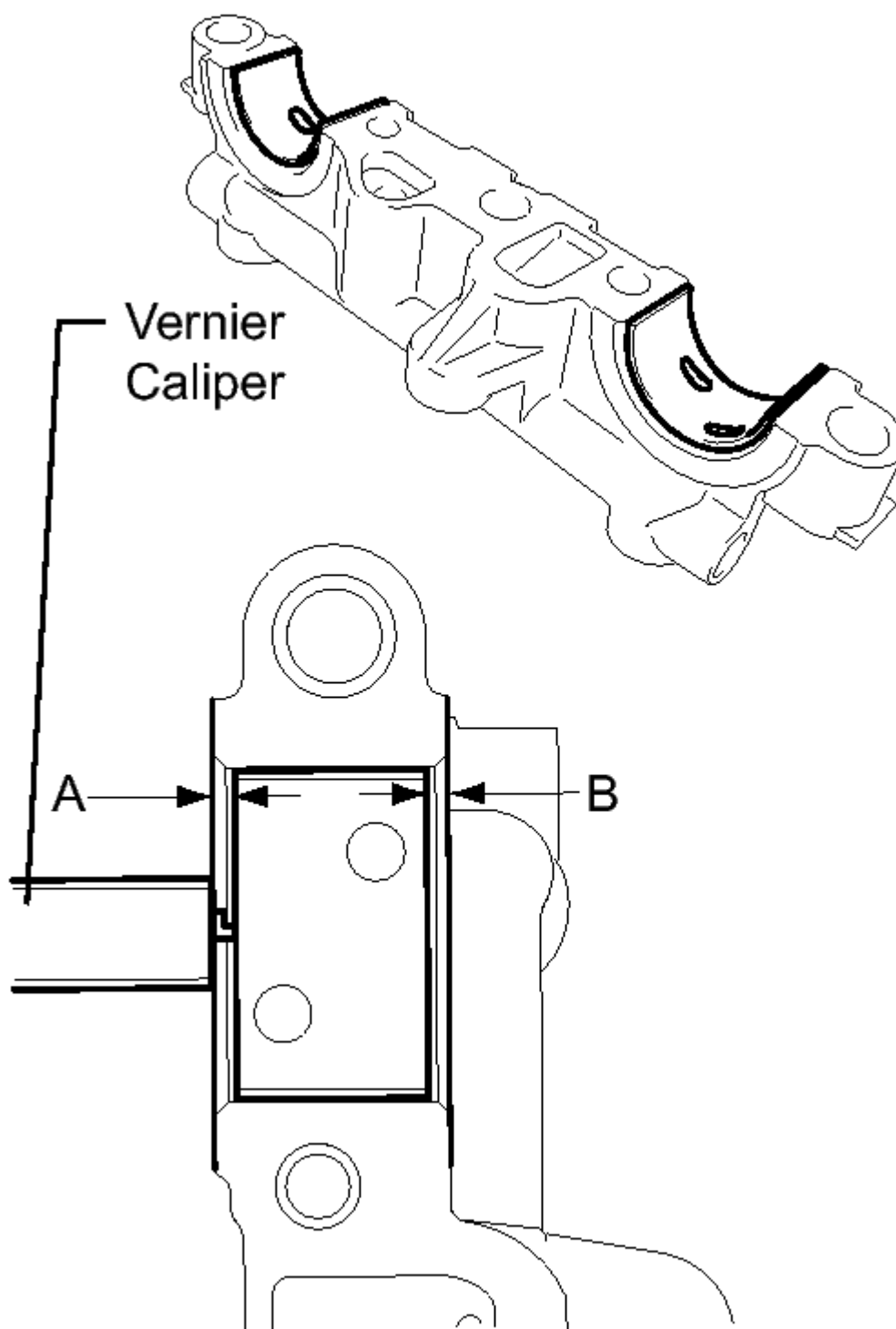


Fig. 309: Measuring Distance Between Bearing Cap Edge And Camshaft Bearing Edge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Dimension (A - B)

0.7 mm (0.0276 in.) or less

NOTE: Position the bearings to the center of the bearing cap by measuring dimensions A and B.

13. INSTALL OIL CONTROL VALVE FILTER

- a. Check that no foreign matter is on the mesh part of the filter.
- b. Install the oil control valve filter.

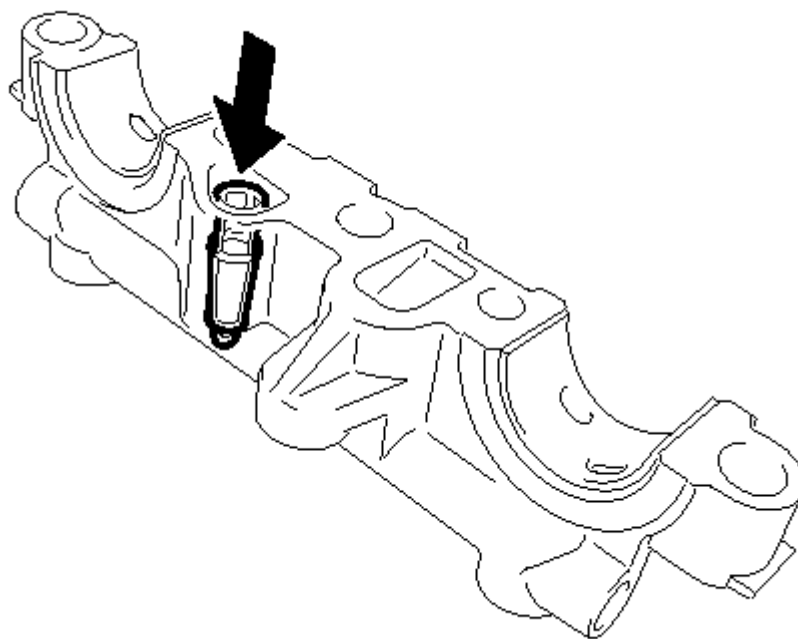


Fig. 310: Installing Oil Control Valve Filter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Do not touch the mesh when installing the oil control valve filter.

14. INSTALL NO. 2 CAMSHAFT BEARING

- a. Clean both surfaces of the bearings.
- b. Install the 2 No. 2 camshaft bearings.
- c. Using a vernier caliper, measure the distance between the bearing cap edge and the camshaft bearing edge.

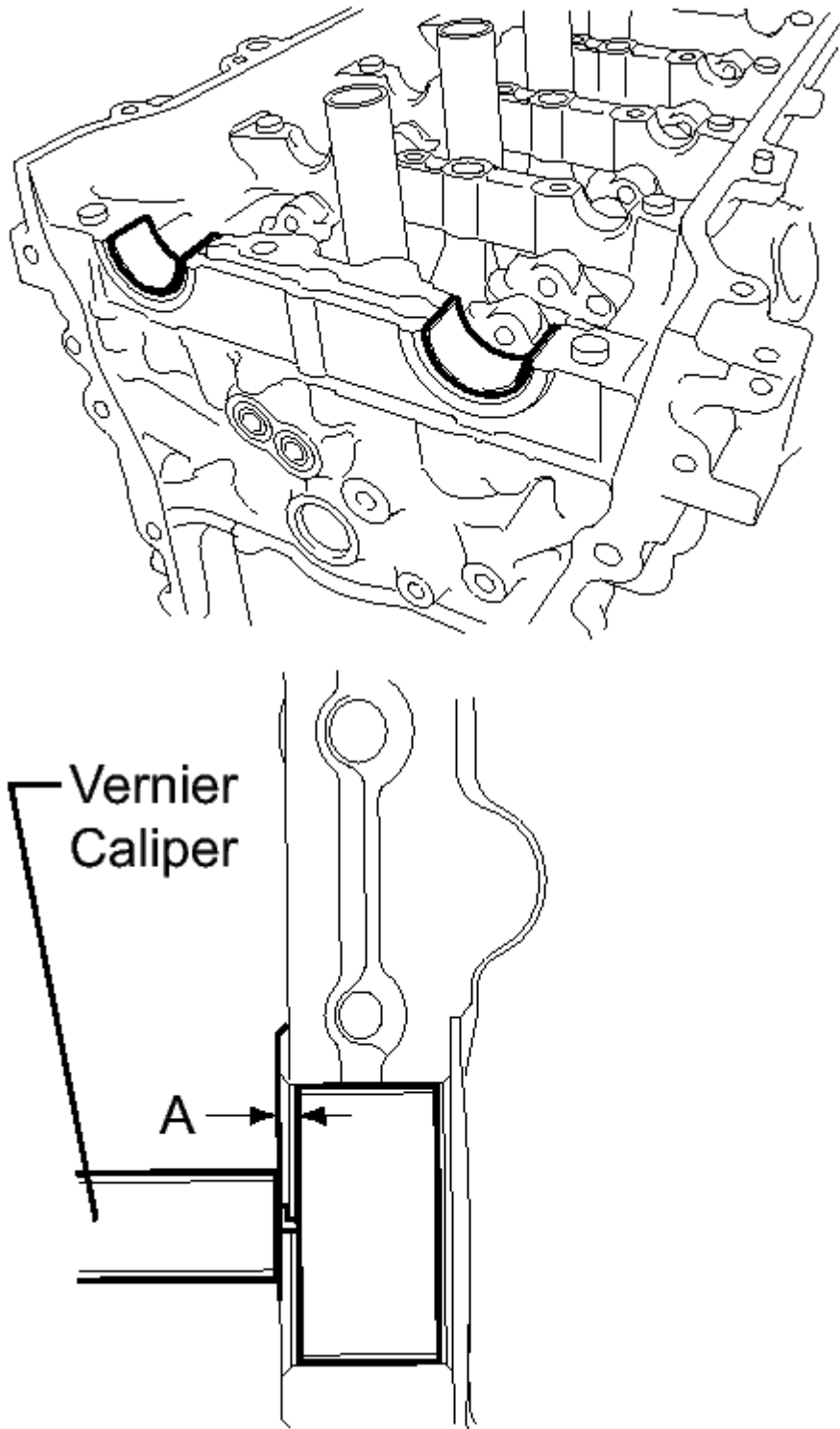


Fig. 311: Measuring Distance Between Bearing Cap Edge And Camshaft Bearing Edge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Dimension (A)

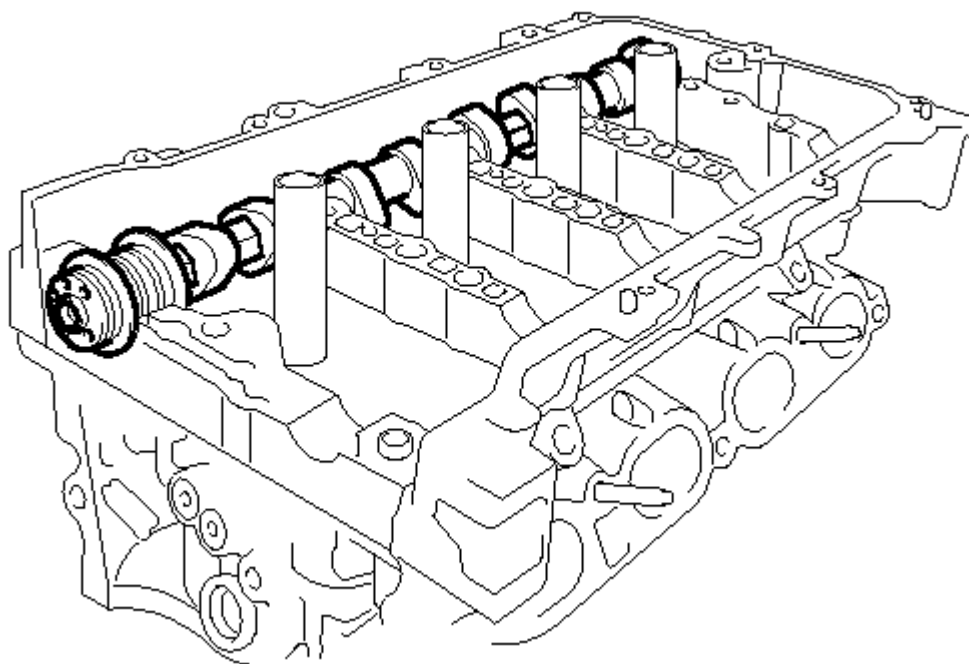
1.05 to 1.75 mm (0.041 to 0.069 in.)

NOTE: Position the bearings to the center of the bearing cap by

measuring dimension A.

15. INSTALL NO. 2 CAMSHAFT

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



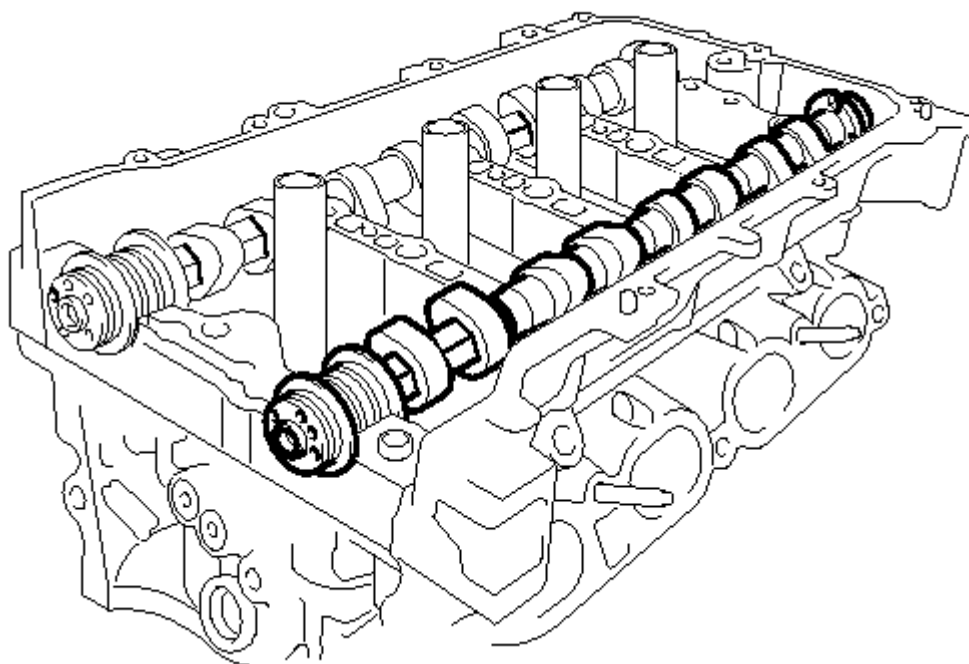
T

Fig. 312: Identifying No. 2 Camshaft

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

16. INSTALL CAMSHAFT

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



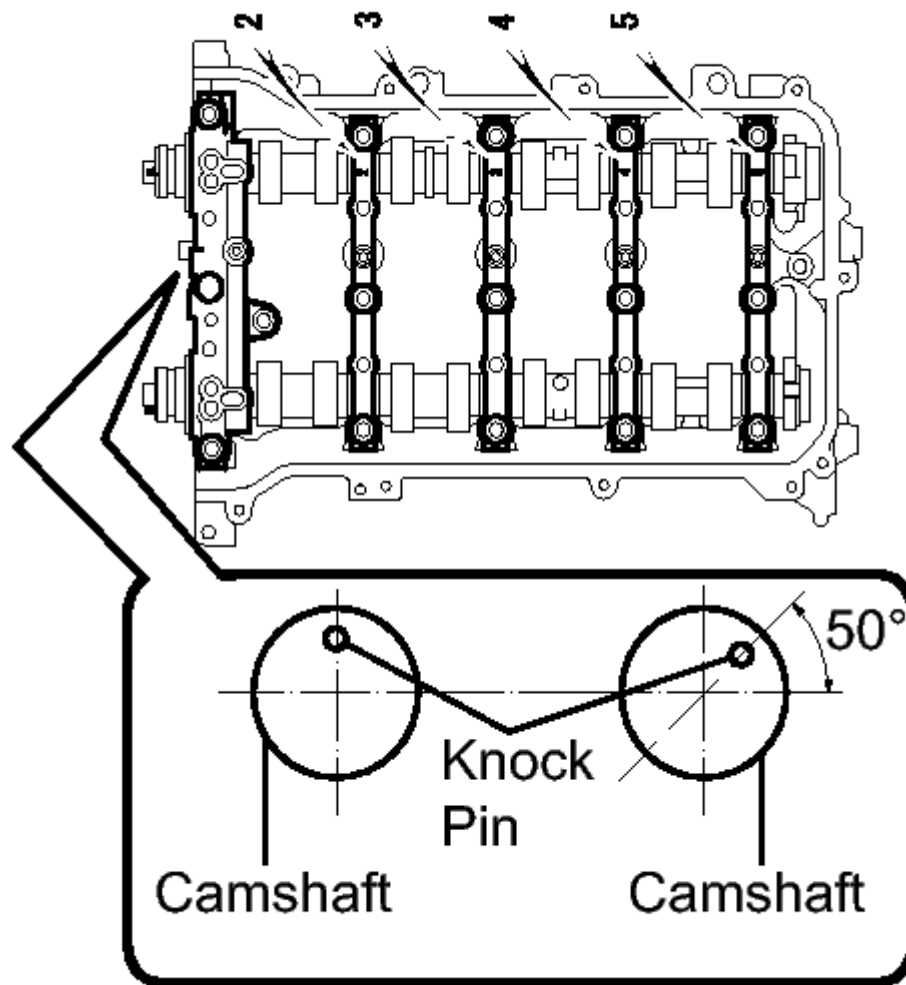
T

Fig. 313: Identifying Camshaft

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

17. INSTALL CAMSHAFT BEARING CAP

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

**T****Fig. 314: Identifying Knock Pin Of Camshaft**

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

HINT:

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

- c. Tighten the 10 bolts in the order shown in the illustration.

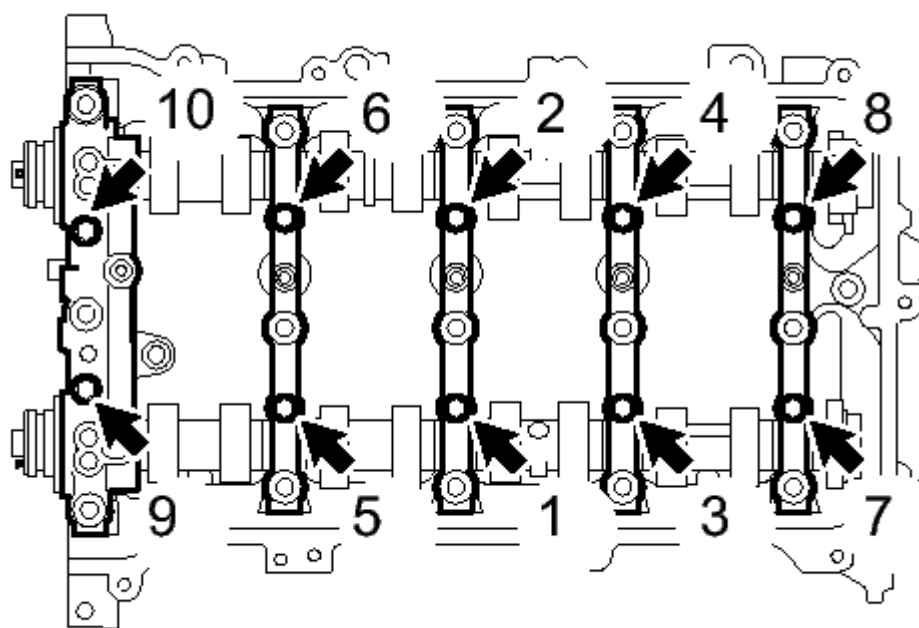
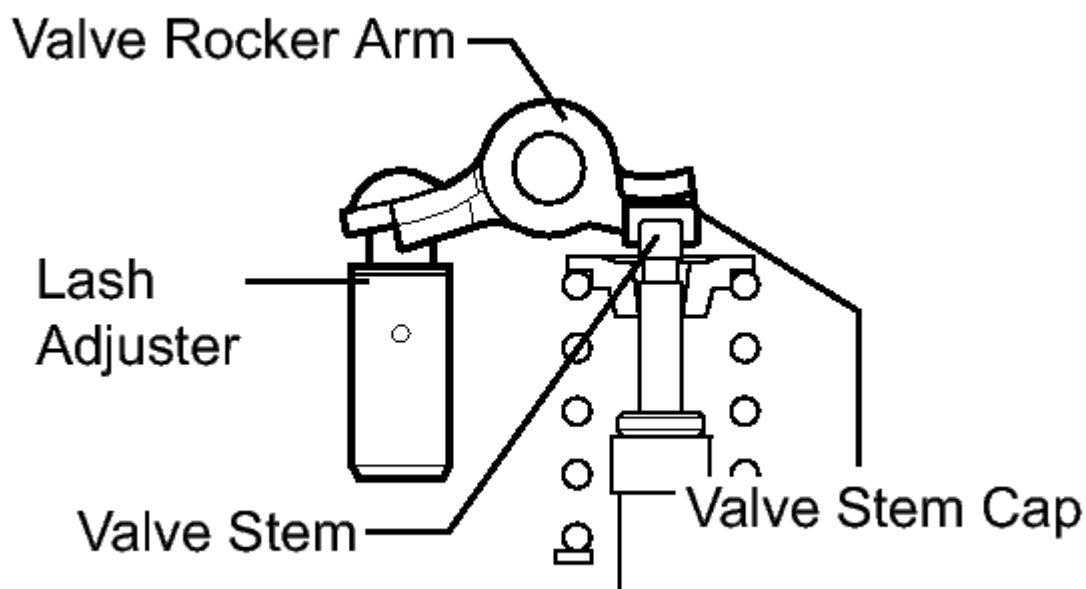


Fig. 315: Locating Bolts And Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

18. INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY

- a. Make sure that the valve rocker arms are installed as shown in the illustration.



P

Fig. 316: Identifying Valve Rocker Arm And Valve Stem Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

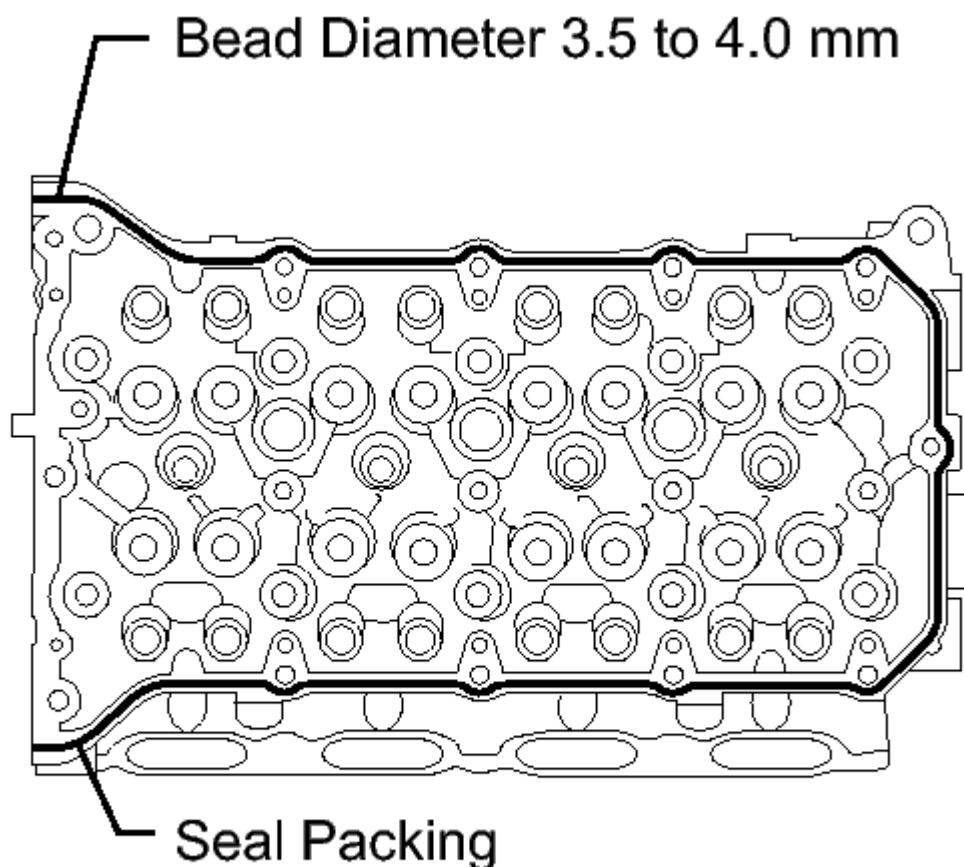


Fig. 317: Identifying Camshaft Housing Seal Packing Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Seal packing

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

Bead diameter

3.5 to 4.0 mm (0.138 to 0.158 in.)

NOTE:

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

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

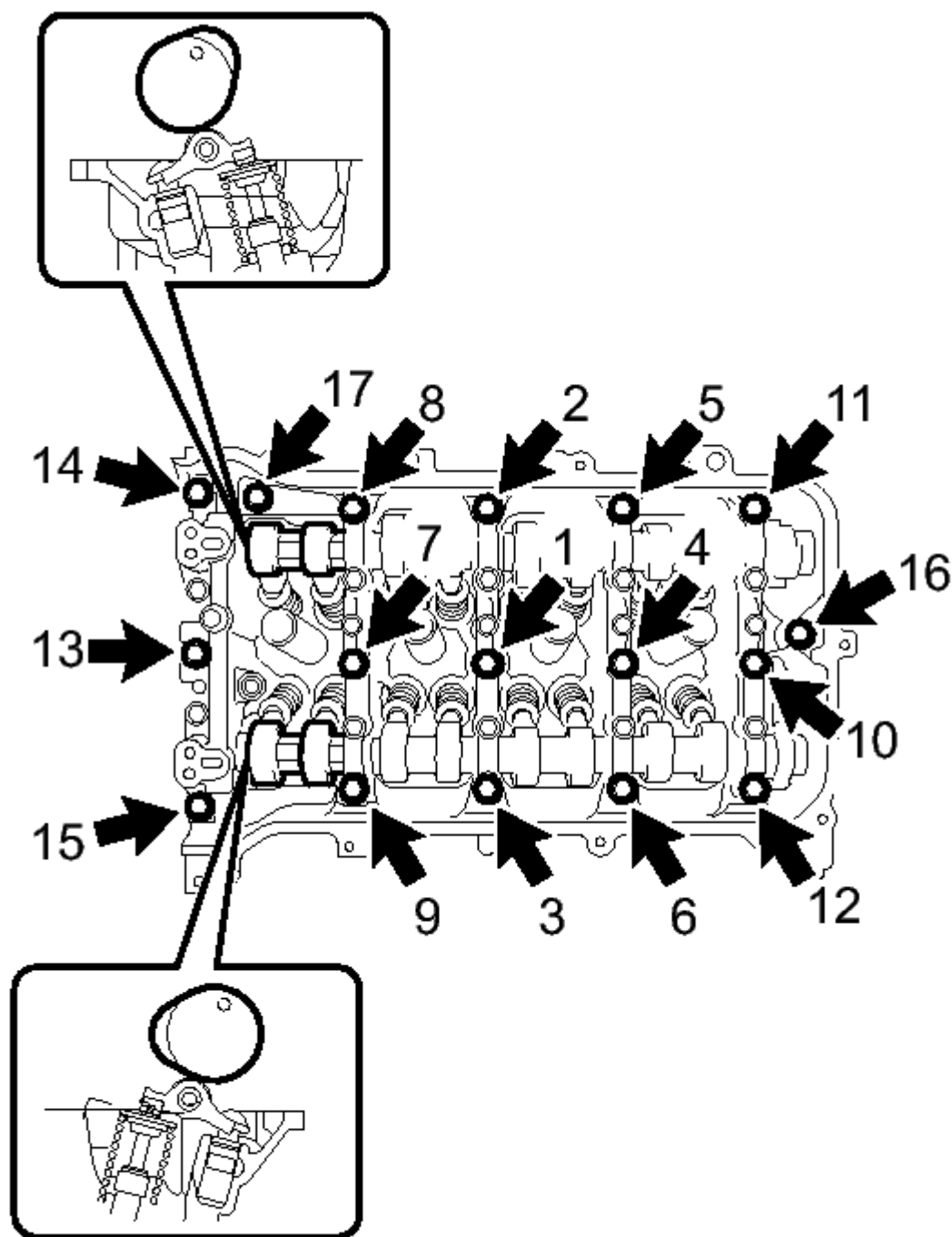


Fig. 318: Locating Camshaft Housing Bolts And Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the camshaft housing and tighten the 17 bolts in the order shown in the illustration.

Torque: 27 N*m (275 kgf*cm, 20 ft.*lbf)

NOTE:

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

19. INSTALL CAMSHAFT TIMING GEAR ASSEMBLY

- a. Check that the knock pin is installed on the camshaft.
- b. Put the camshaft timing gear and camshaft together with the straight pin and key groove misaligned, as shown in the illustration.

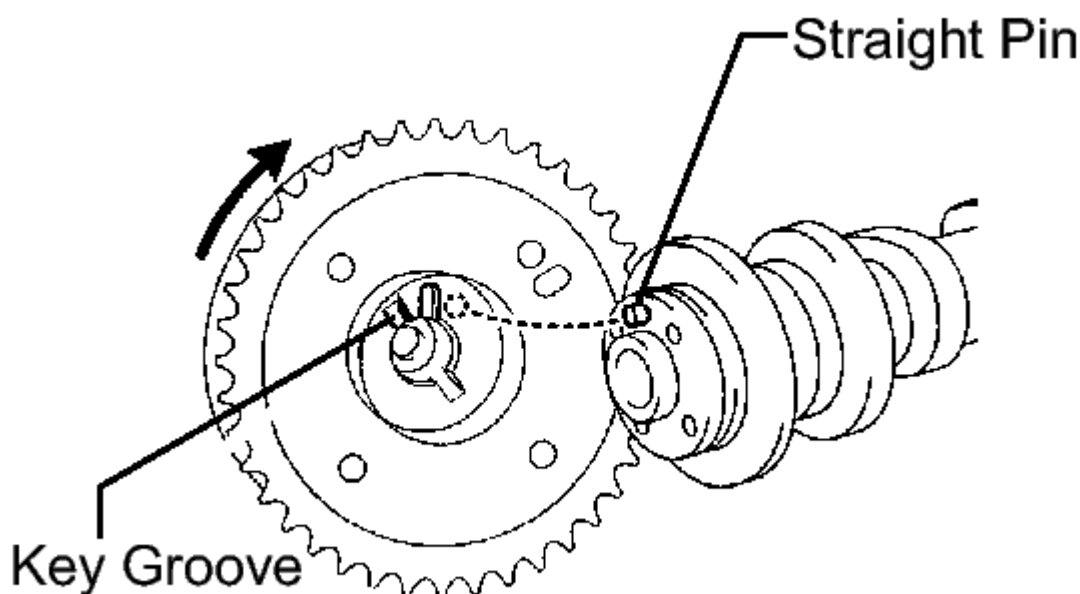
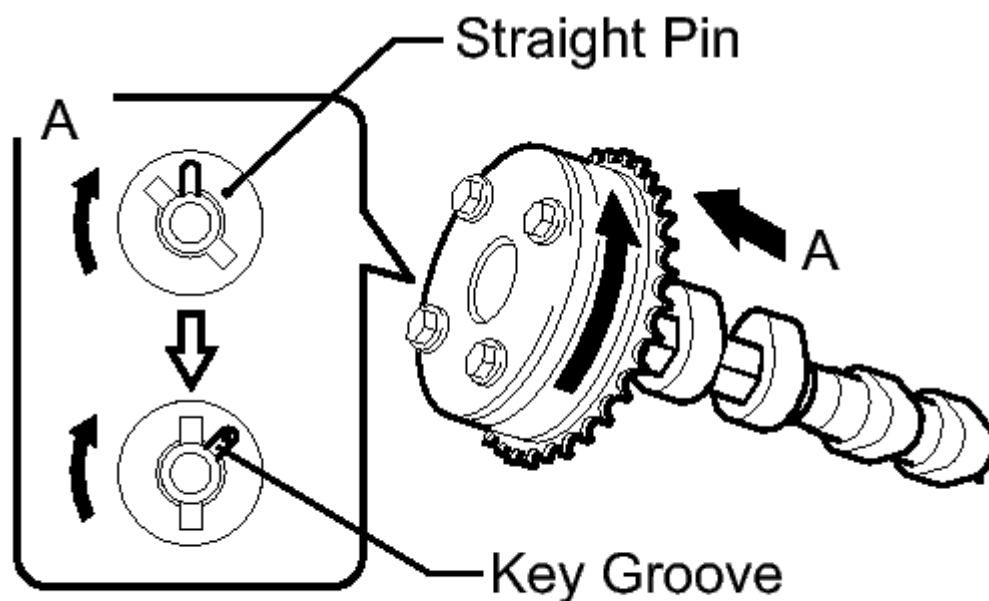


Fig. 319: Identifying Straight Pin And Key Groove
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

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

- c. Turn the camshaft timing gear as shown in the illustration while pushing it gently against the camshaft. Push further at the position where the pin fits into the groove.

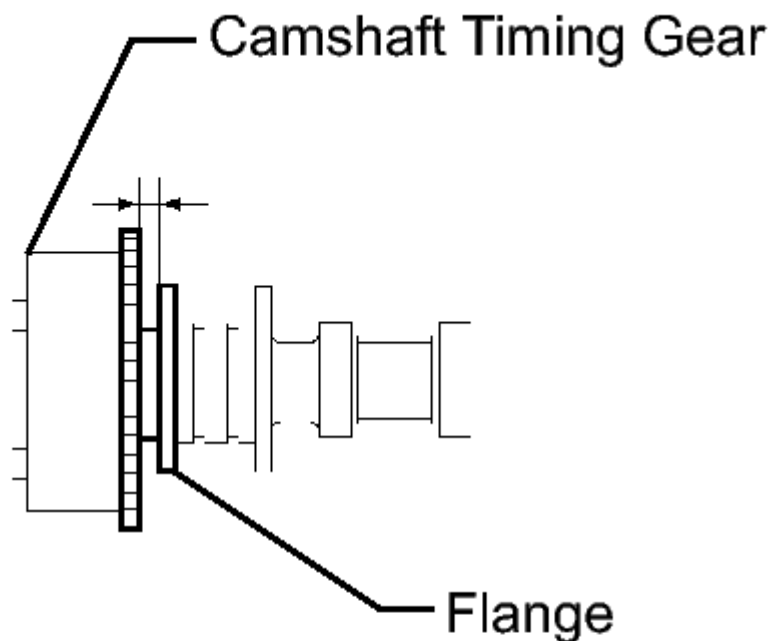


T

Fig. 320: Identifying Straight Pin And Key Groove
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Do not turn the camshaft timing gear in the retard direction (clockwise).

- d. Measure the clearance between the gear and the camshaft flange.



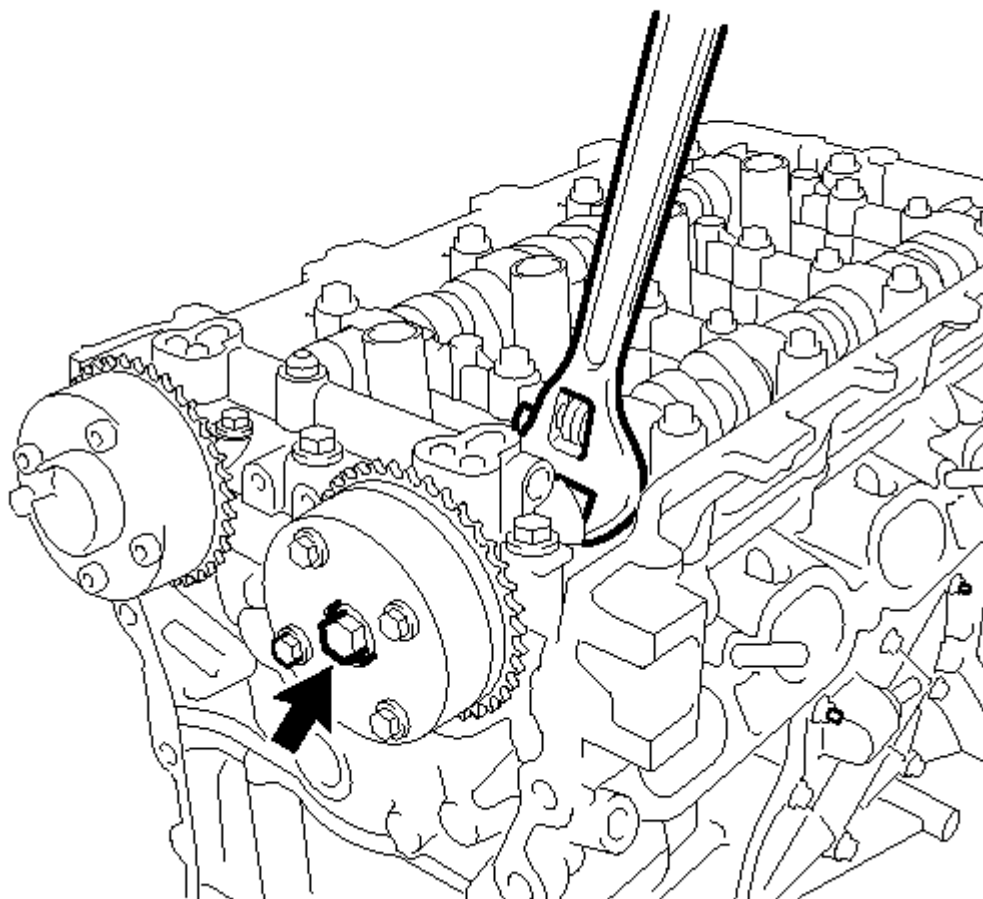
Clearance: 0.1 to 0.4 mm

Fig. 321: Measuring Clearance Between Gear And Camshaft Flange
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Clearance

0.1 to 0.4 mm (0.004 to 0.016 in.)

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



T

Fig. 322: Locating Flange Bolt

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

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

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

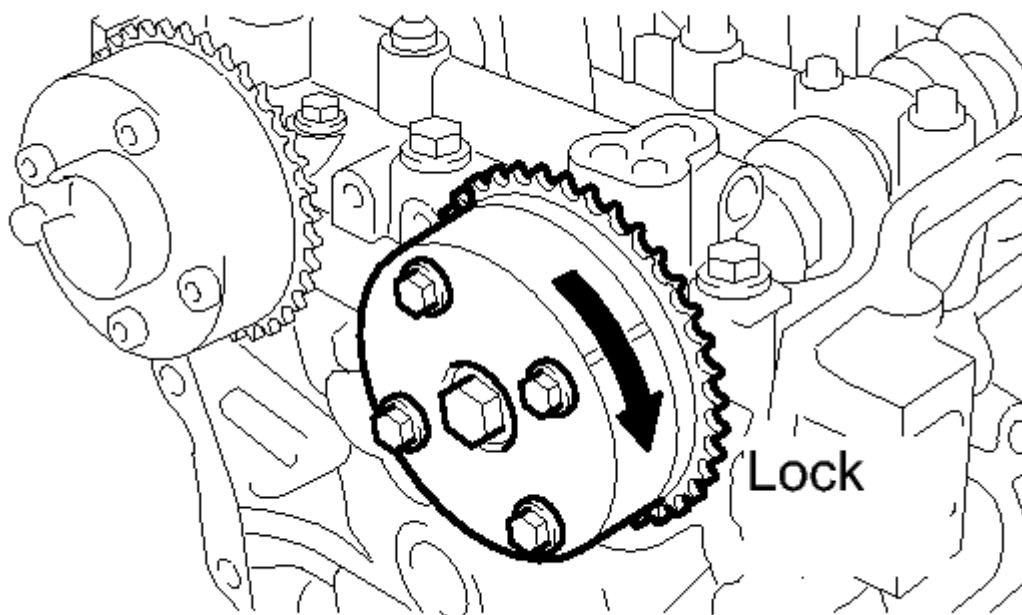
**T**

Fig. 323: Identifying Camshaft Timing Gear Direction
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

20. INSTALL CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY

- a. Check that the knock pin is installed on the camshaft.
- b. Put the camshaft timing exhaust gear and camshaft together by aligning the key groove and straight pin.

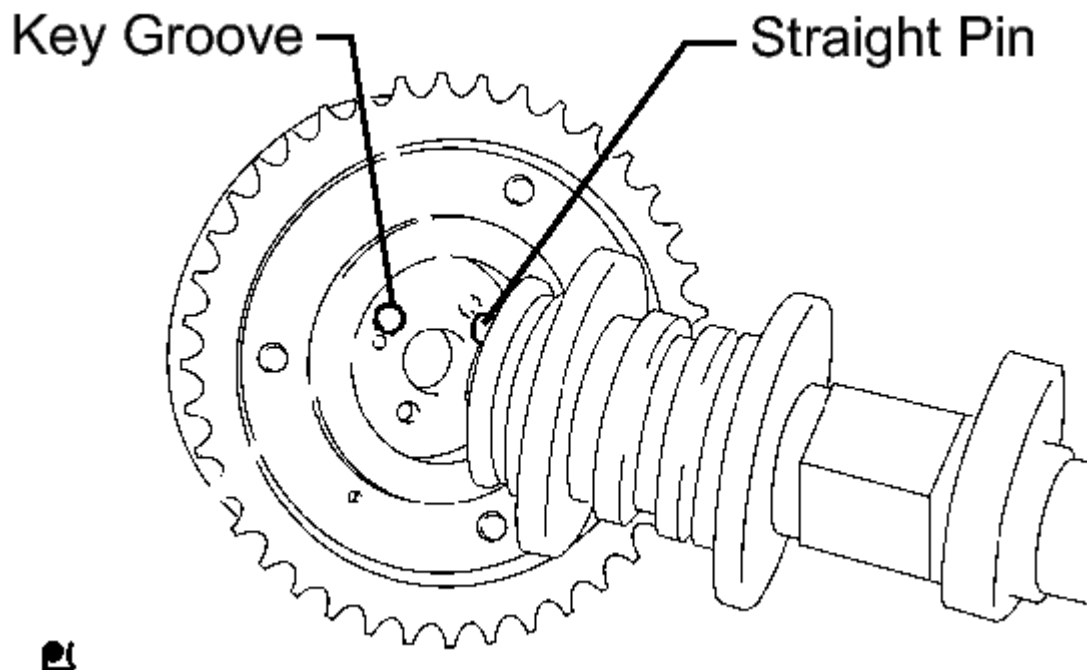
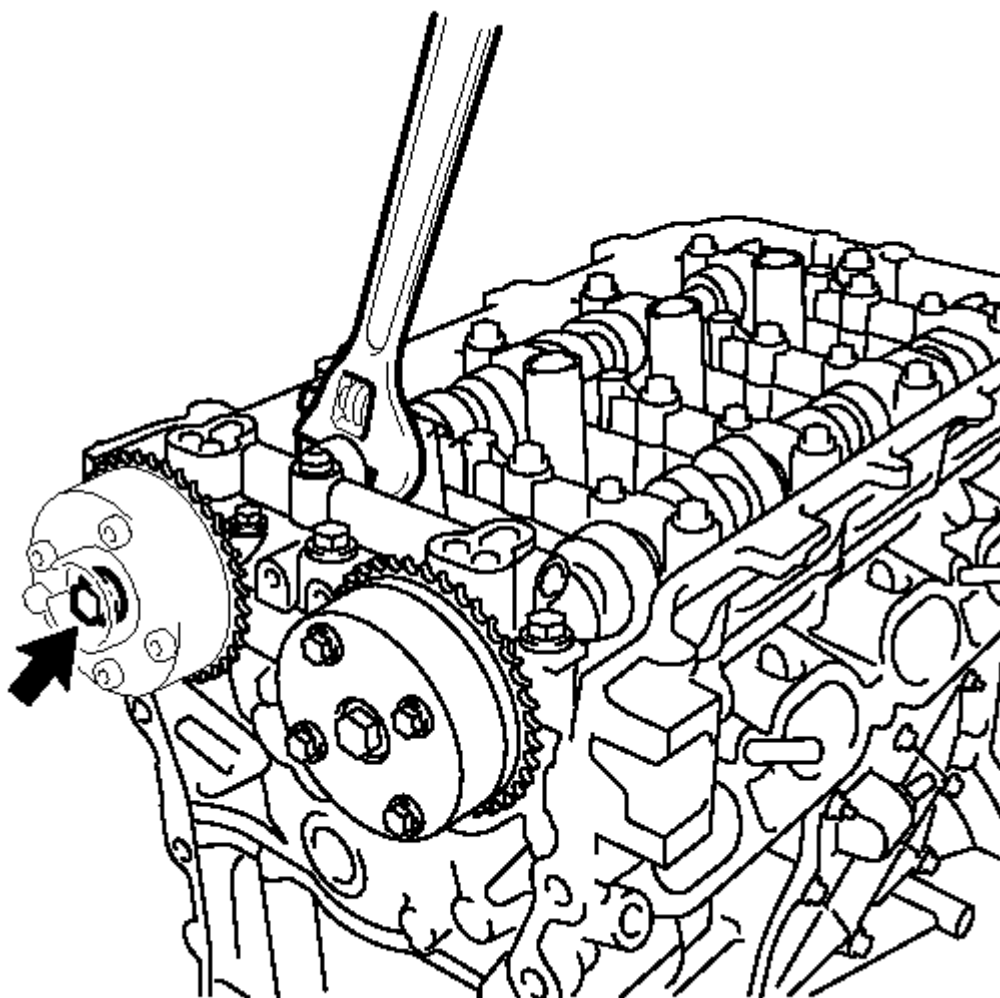


Fig. 324: Aligning Key Groove And Straight Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Lightly press the gear against the camshaft, and turn the gear. Push further at the position where the pin enters the groove.

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

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



T

Fig. 325: Locating Flange Bolt

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

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

- f. Check the camshaft timing exhaust gear lock.
 - 1. Make sure that the camshaft timing exhaust gear is locked.

21. INSTALL CRANKSHAFT TIMING GEAR KEY

- a. Using a plastic-faced hammer, tap in the 2 crankshaft timing gear keys.

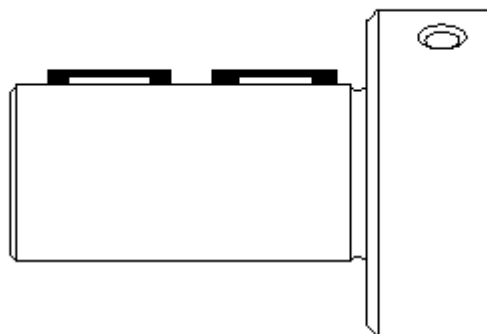


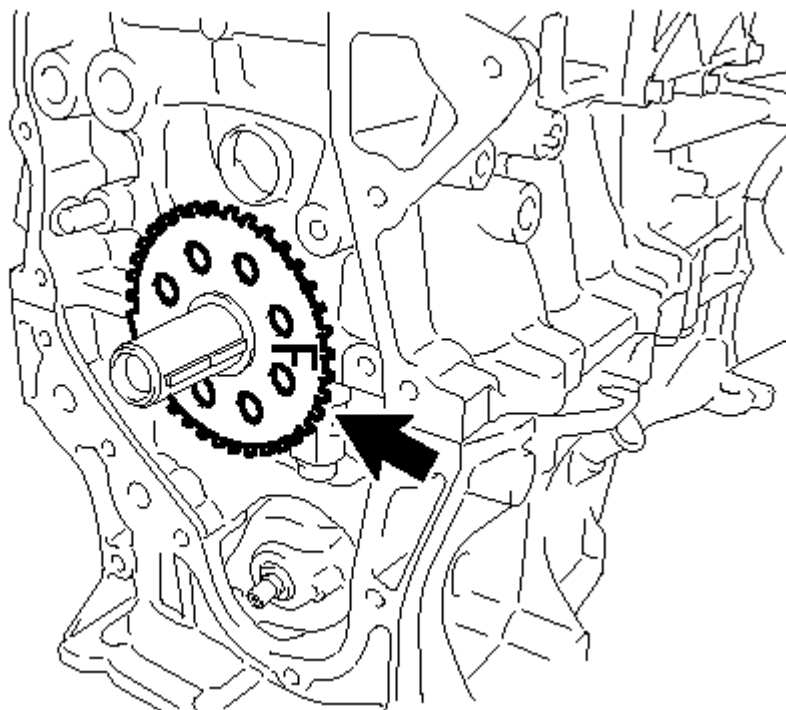
Fig. 326: Identifying Crankshaft Timing Gear Keys
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Tap in the crankshaft timing gear keys until they contact the crankshaft as shown in the illustration.

22. INSTALL NO. 1 CRANKSHAFT POSITION SENSOR PLATE

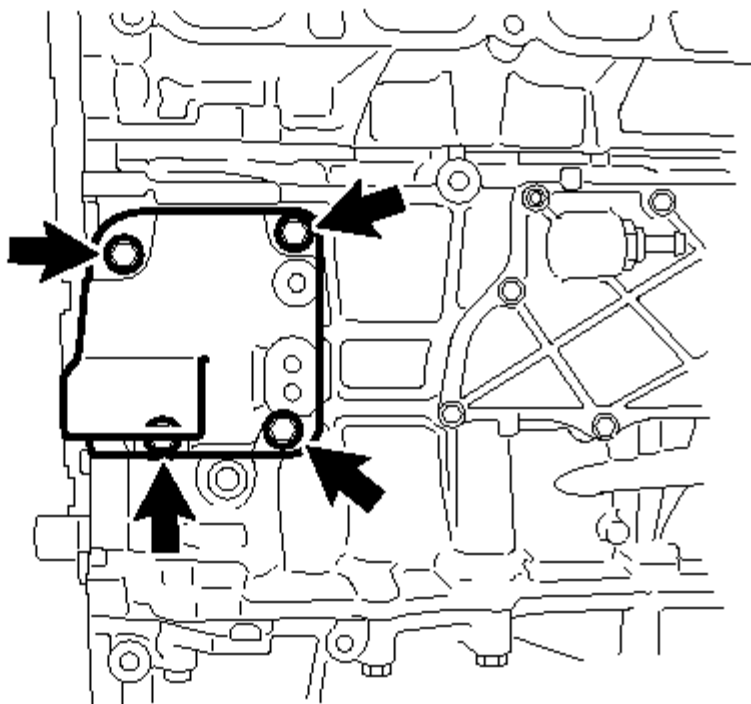
- a. Install the sensor plate with the "F" mark facing forward.



T

Fig. 327: Identifying No. 1 Crankshaft Position Sensor Plate
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

23. **INSTALL NO. 2 CHAIN SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 4**
24. **INSTALL CRANKSHAFT TIMING SPROCKET** . Refer to **INSTALLATION - Step 5**
25. **INSTALL NO. 1 CHAIN VIBRATION DAMPER** See step 13
26. **INSTALL NO. 2 CHAIN VIBRATION DAMPER** . Refer to **INSTALLATION - Step 7**
27. **INSTALL CHAIN SUB-ASSEMBLY** See step 15
28. **INSTALL CHAIN TENSIONER SLIPPER** See step 16
29. **INSTALL NO. 1 GENERATOR BRACKET**
 - a. Install the No. 1 generator bracket with the 4 bolts.

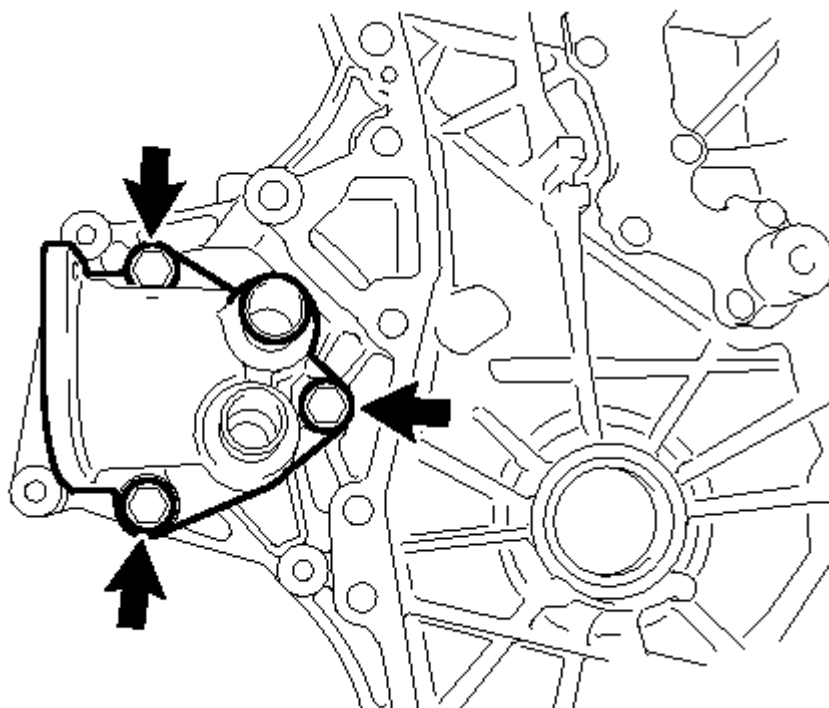


T

Fig. 328: Locating Bolts And Generator Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 21 N*m (214 kgf*cm, 16 ft.*lbf)

30. **INSTALL INLET WATER HOUSING**
 - a. Install the inlet water housing with the 3 bolts.



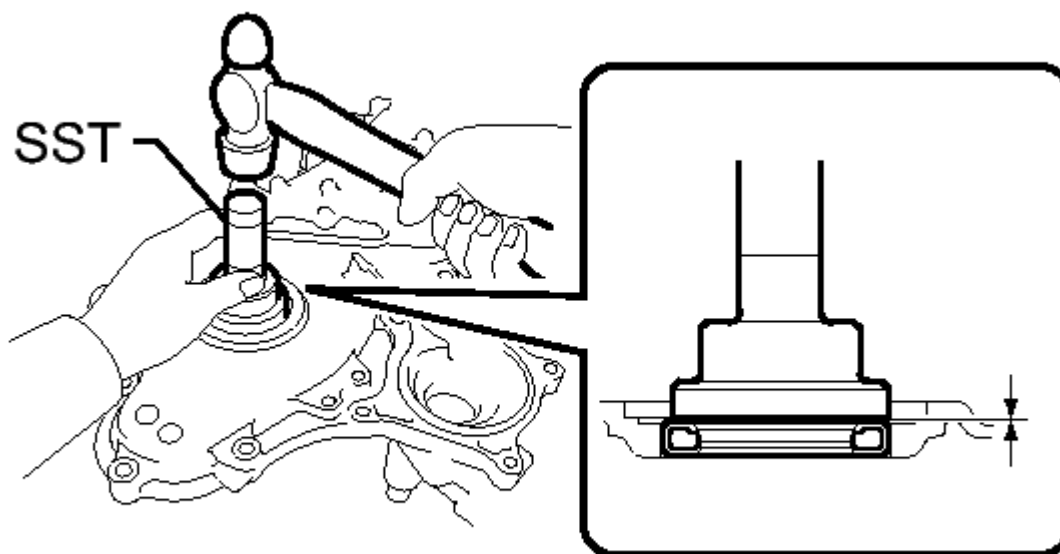
T

Fig. 329: Locating Bolts, Gasket And Water Inlet Housing
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 21 N*m (214 kgf*cm, 16 ft.*lbf)

31. INSTALL TIMING CHAIN COVER OIL SEAL

- a. Using SST, tap in a new oil seal until its surface is flush with the timing gear case edge.



T

Fig. 330: Tapping Oil Seal
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- **SST: 09223-22010**

- b. Apply a light coat of MP grease to the lip of the oil seal.

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 cover.**

32. **INSTALL TIMING CHAIN COVER SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 11**

33. **INSTALL CRANKSHAFT PULLEY** See step 2

34. **INSTALL ENGINE OIL PRESSURE SWITCH ASSEMBLY**

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

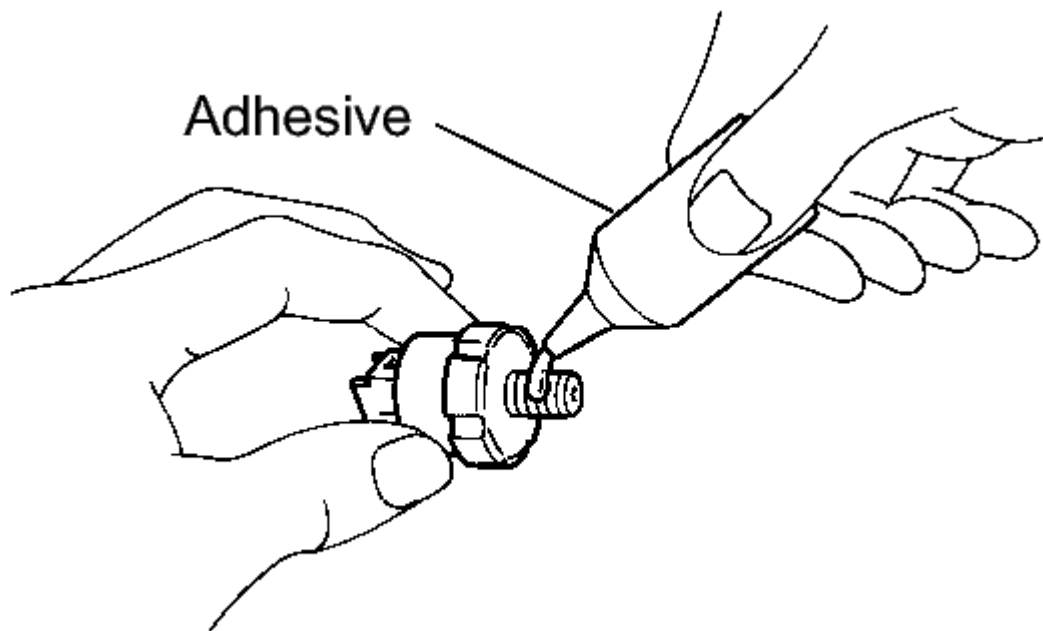
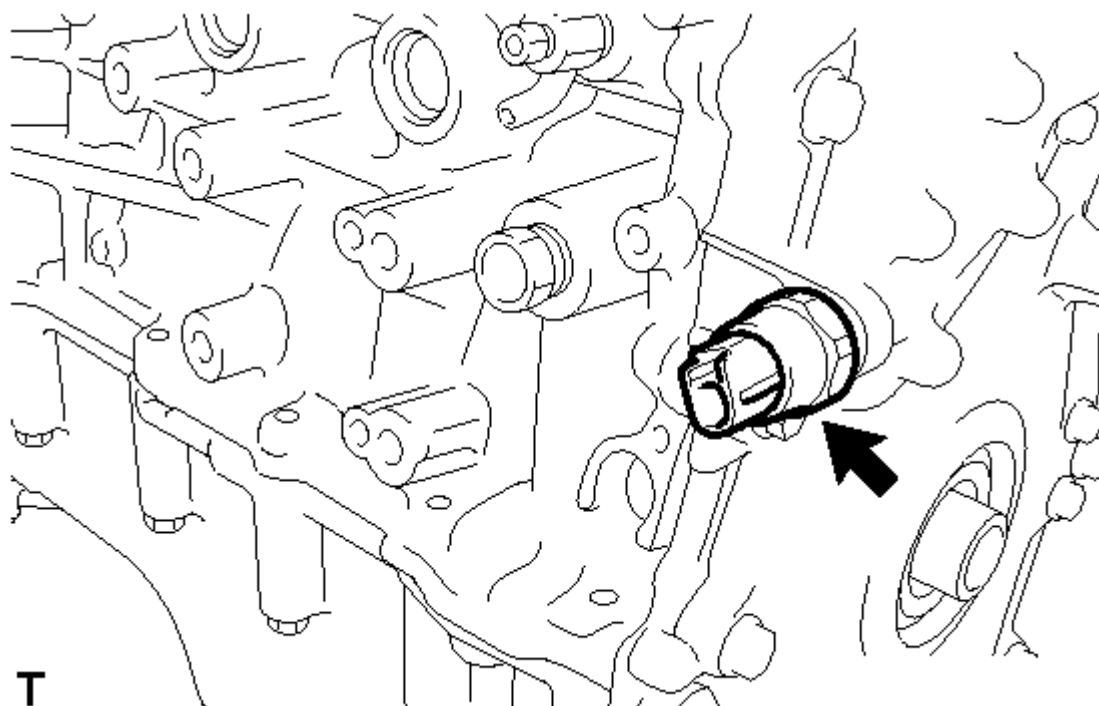


Fig. 331: Applying Adhesive To Threads Of Oil Pressure Switch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Adhesive

Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

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



T
Fig. 332: Locating Engine Oil Pressure Switch Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

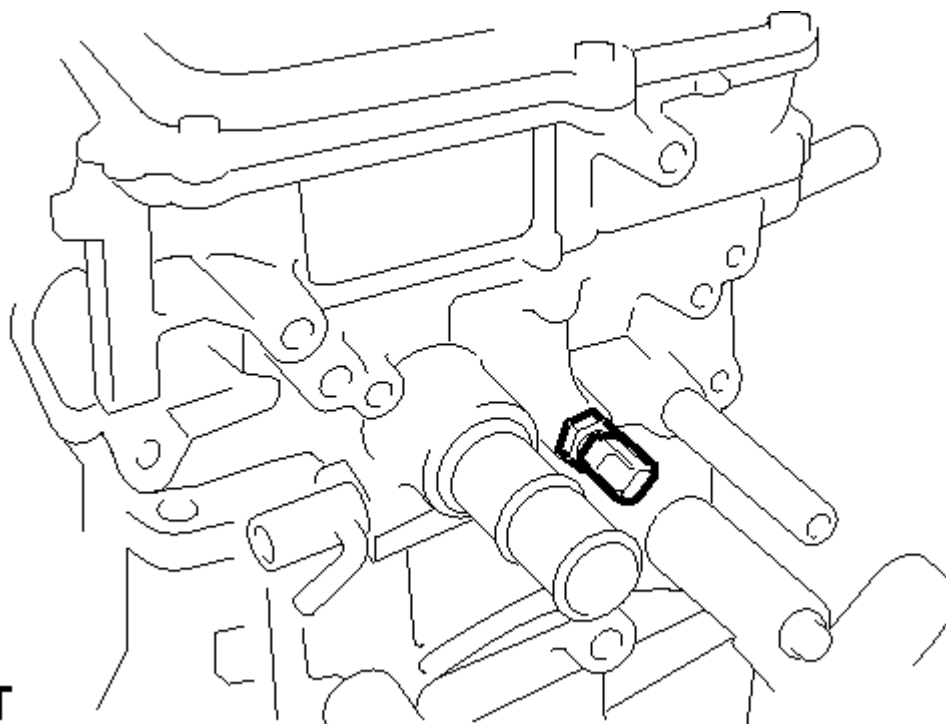
Torque: 15 N*m (153 kgf*cm, 11 ft.*lbf)

NOTE:

- Install the oil pressure switch within 3 minutes after applying adhesive.
- Do not start the engine within 1 hour after installation.

35. INSTALL ENGINE COOLANT TEMPERATURE SENSOR

- a. Install a new gasket to the engine coolant temperature sensor.



T
Fig. 333: Identifying Engine Coolant Temperature Sensor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a 19 mm deep socket wrench, install the temperature sensor.

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

36. INSTALL KNOCK CONTROL SENSOR

- a. Install the knock control sensor with the bolt.

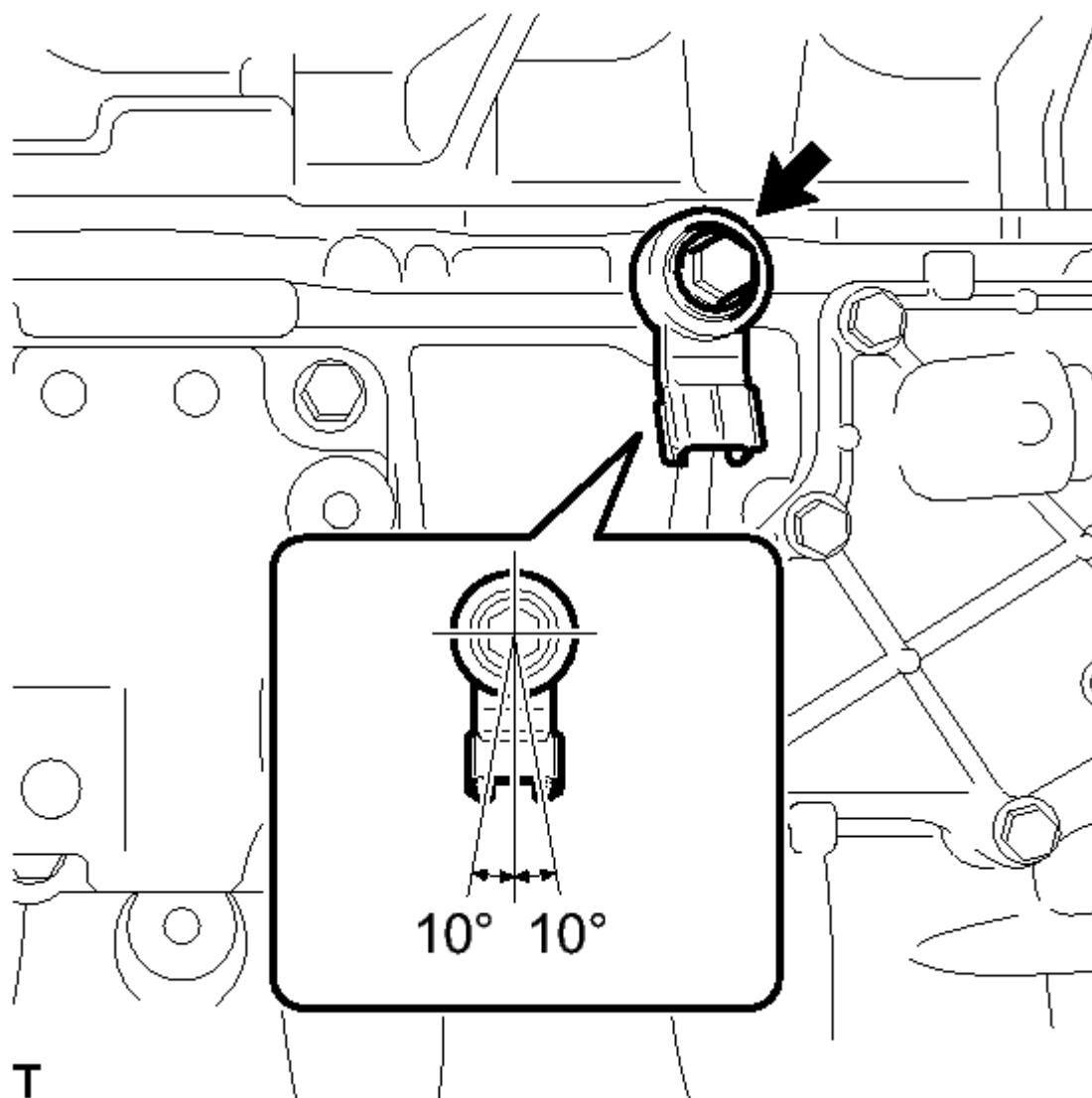
**T**

Fig. 334: Locating Knock Control Sensor With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 21 N*m (214 kgf*cm, 16 ft.*lbf)

NOTE: Make sure that the knock control sensor is in the correct position.

37. INSTALL NO. 1 TAPER SCREW PLUG

- a. Apply adhesive to 2 or 3 threads of the plug, and install the plug.

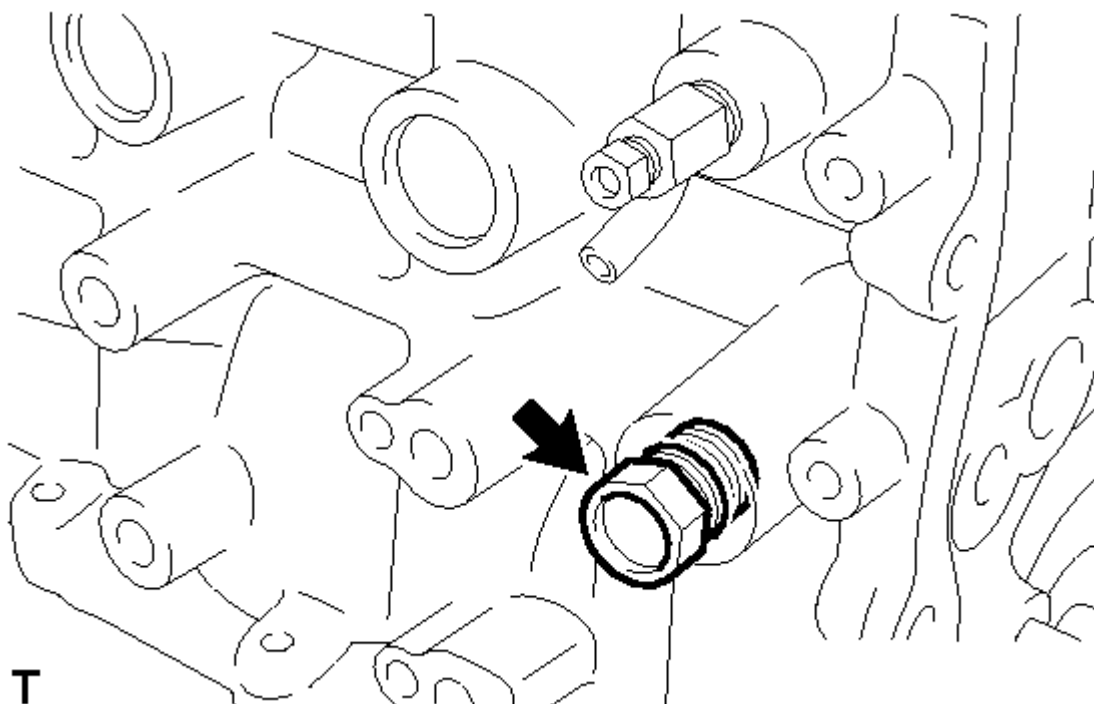


Fig. 335: Locating No. 1 Taper Screw Plug

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

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

NOTE:

- Install the plug within 3 minutes after applying adhesive.
- Do not start the engine within 1 hour after installation.

Adhesive

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

38. INSTALL CRANKSHAFT POSITION SENSOR

- a. Apply a light coat of engine oil to the O-ring of the sensor.

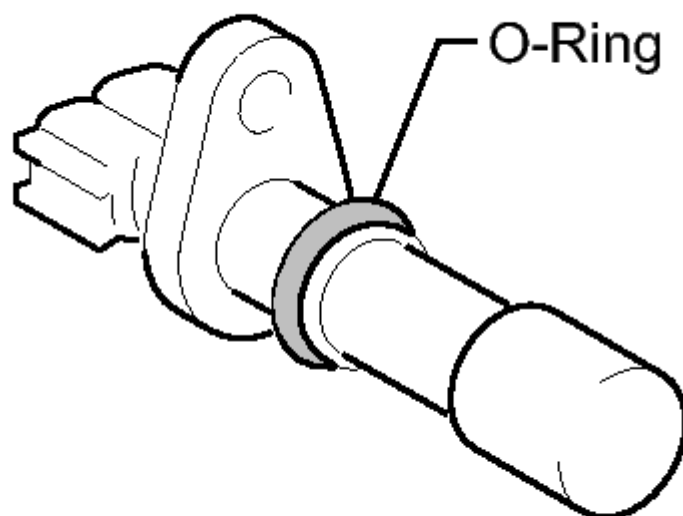
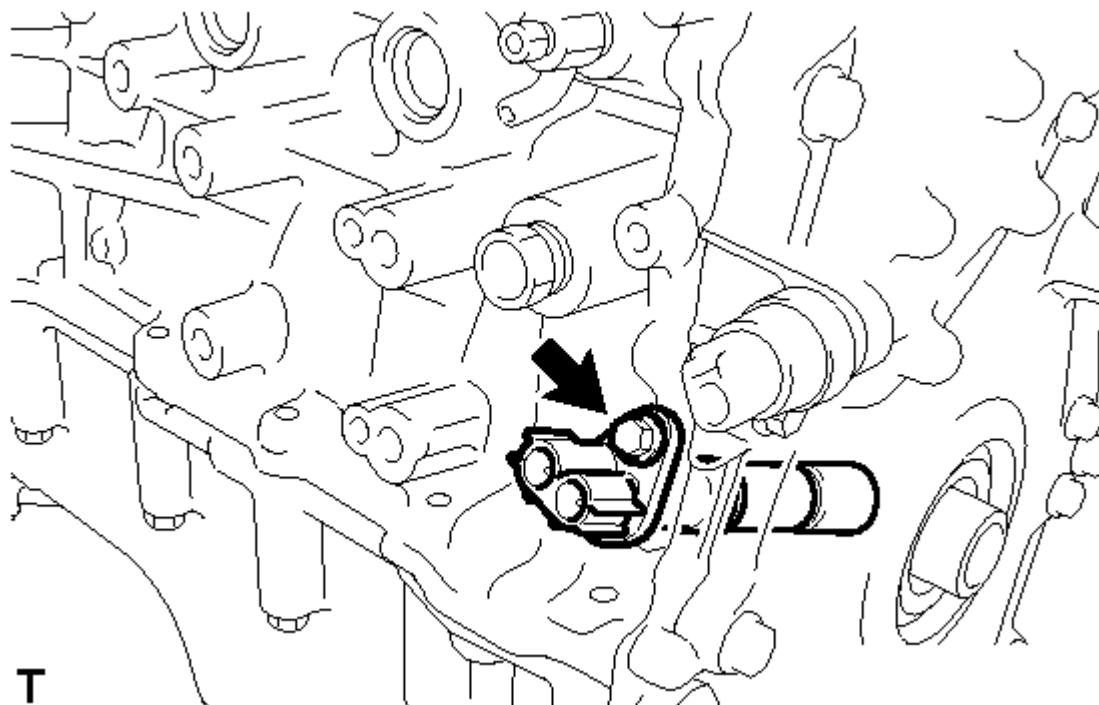


Fig. 336: Identifying O-Ring Of Sensor

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

- b. Install the crankshaft position sensor with the bolt.



T

Fig. 337: Locating Bolt And Crankshaft Position Sensor

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

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

39. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY

- a. Release the ratchet pawl, then fully push in the plunger and engage the hook to the pin so that the plunger is in the position shown in the illustration.

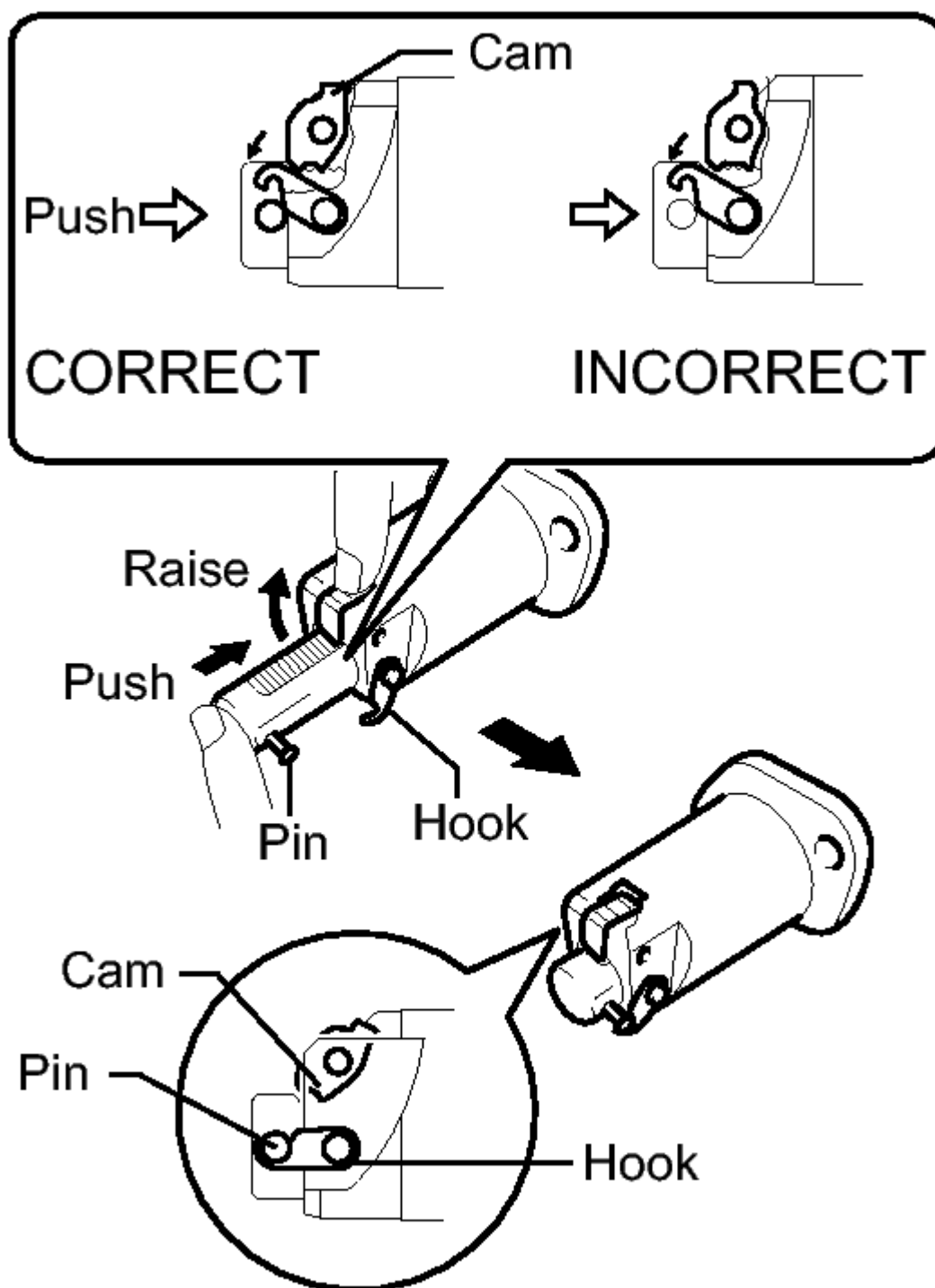
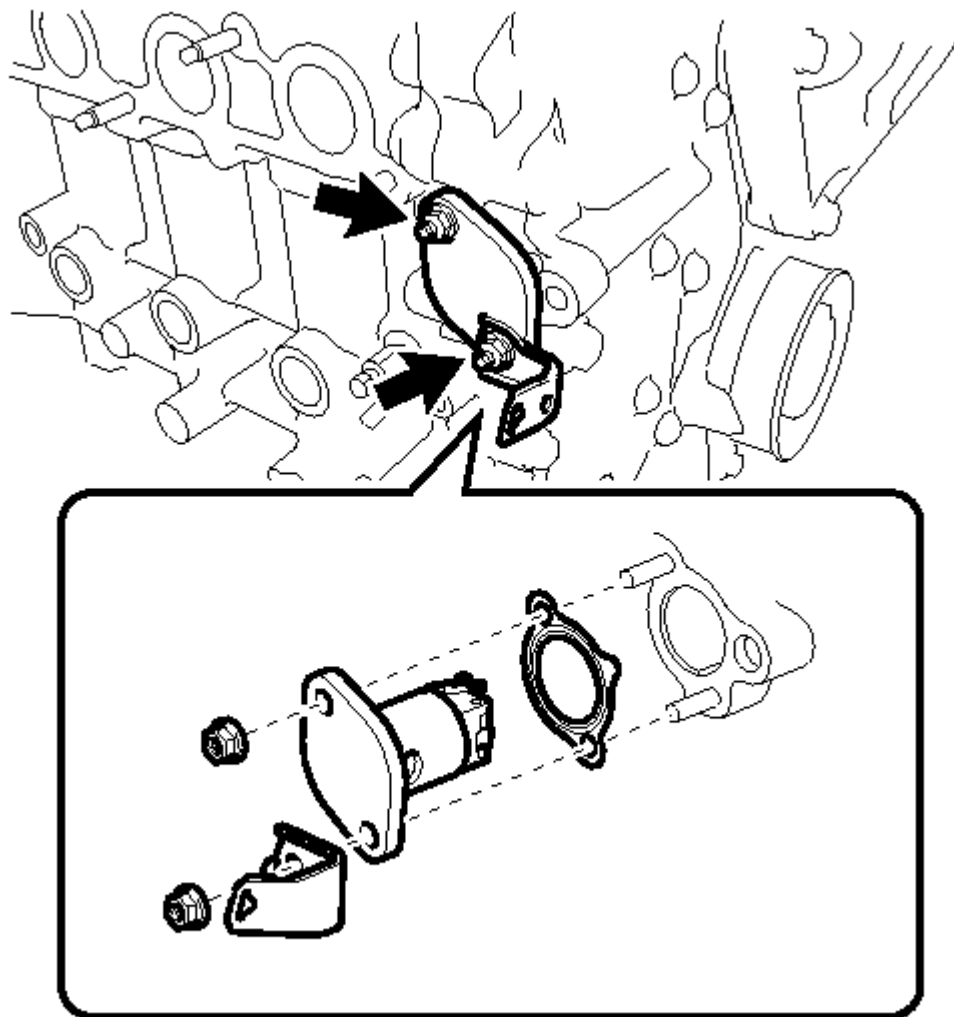
**T**

Fig. 338: Checking No. 1 Chain Tensioner Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Make sure that the cam engages the first tooth of the plunger to allow the hook to pass over the pin.

- b. Install a new gasket, bracket and No. 1 chain tensioner with the 2 nuts.



T

Fig. 339: Locating Gasket, Bracket And No. 1 Chain Tensioner
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

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

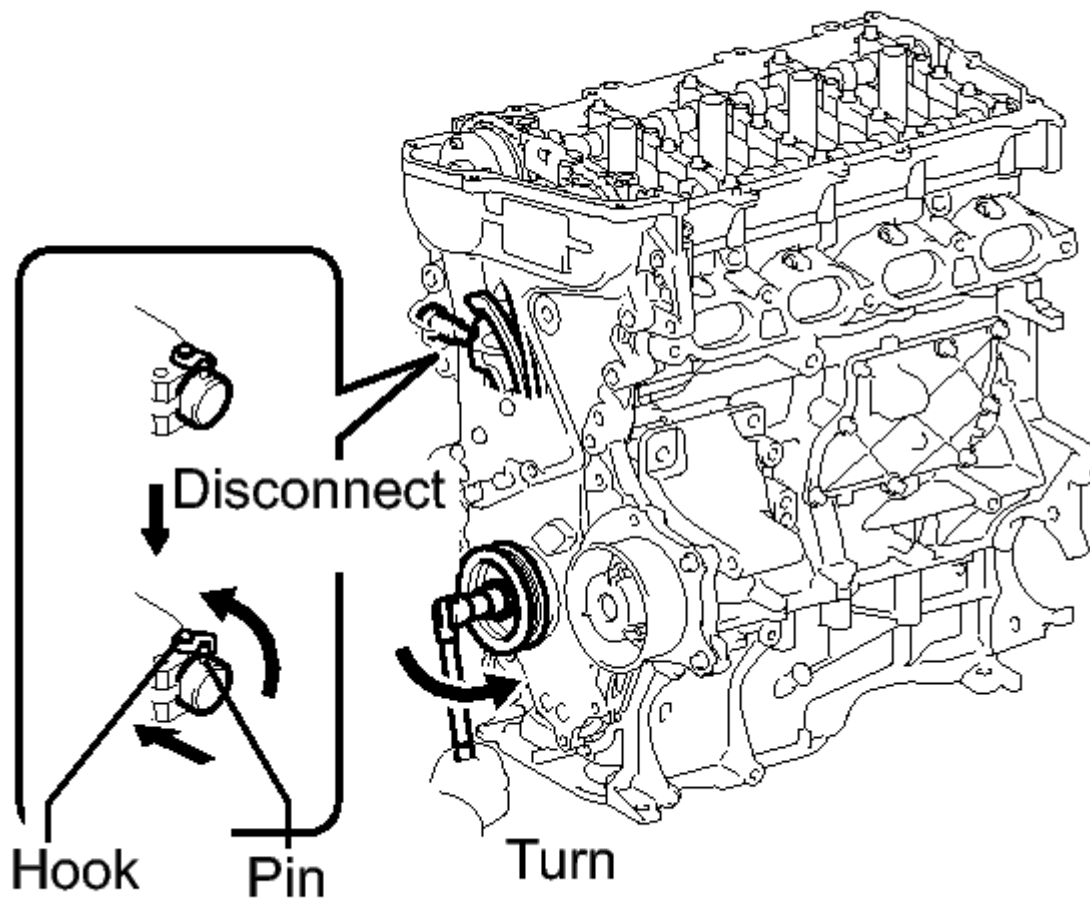
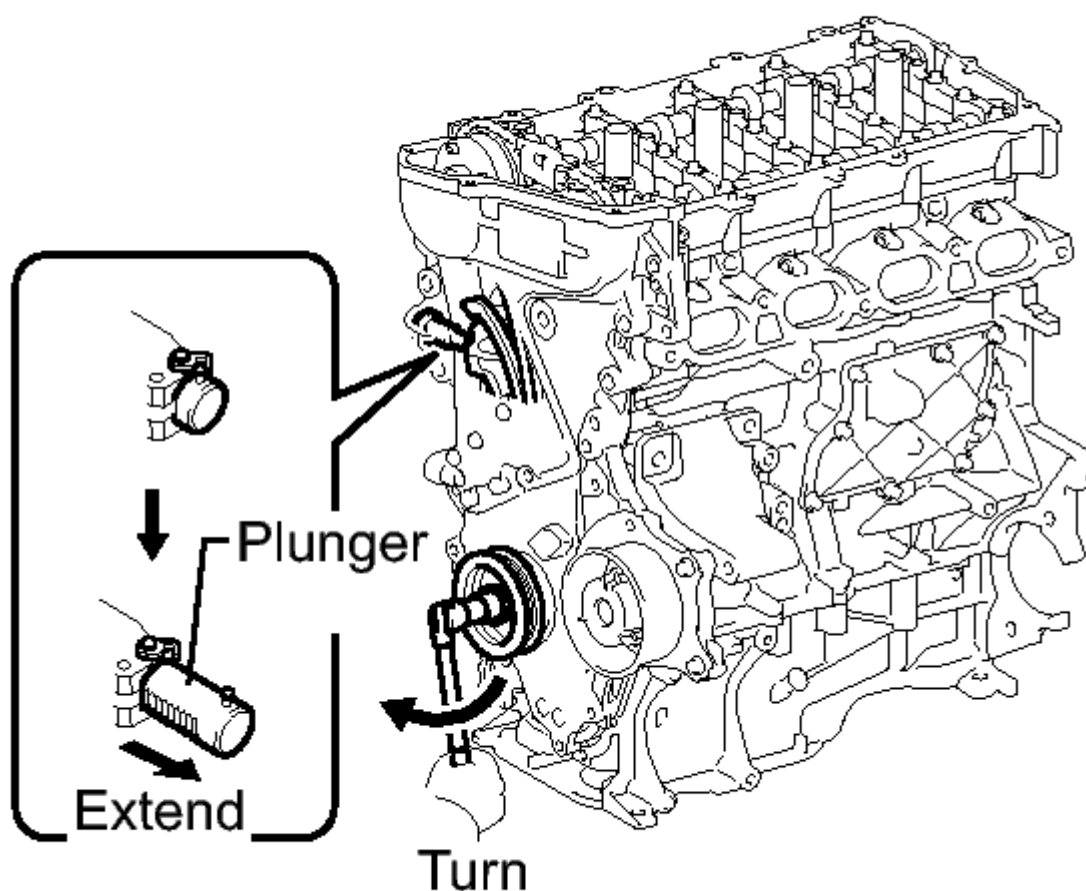


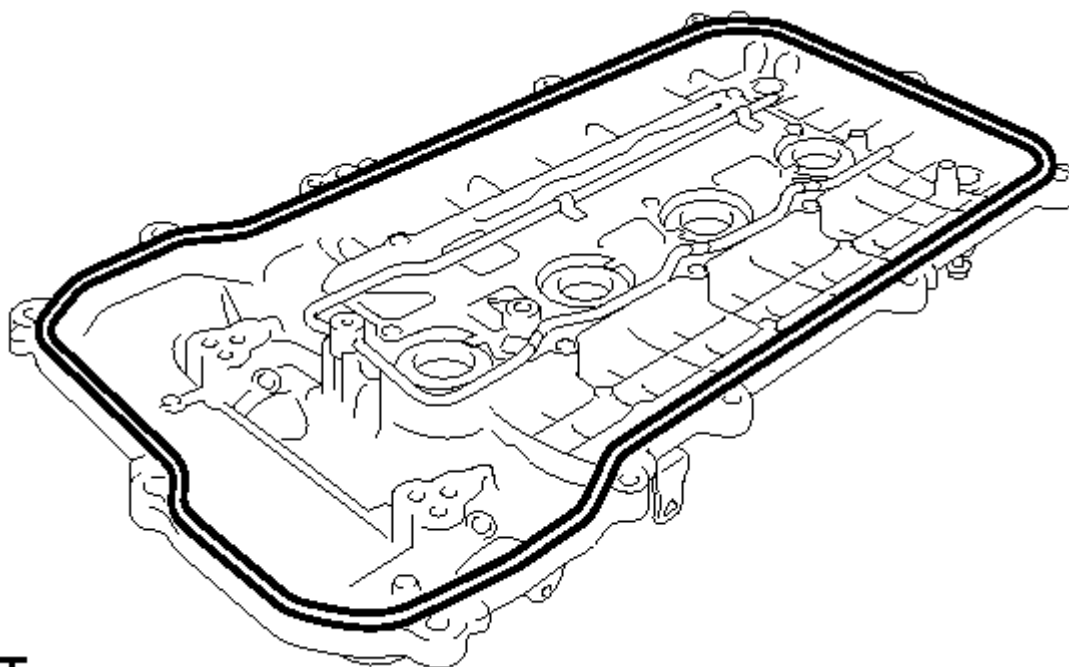
Fig. 340: Disconnecting Hook From Plunger Knock Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

**T****Fig. 341: Checking Plunger**

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

40. **INSTALL OIL FILTER CAP ASSEMBLY** . Refer to **REPLACEMENT - Step 3**
41. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY**
 - a. Install a new gasket to the cylinder head cover.

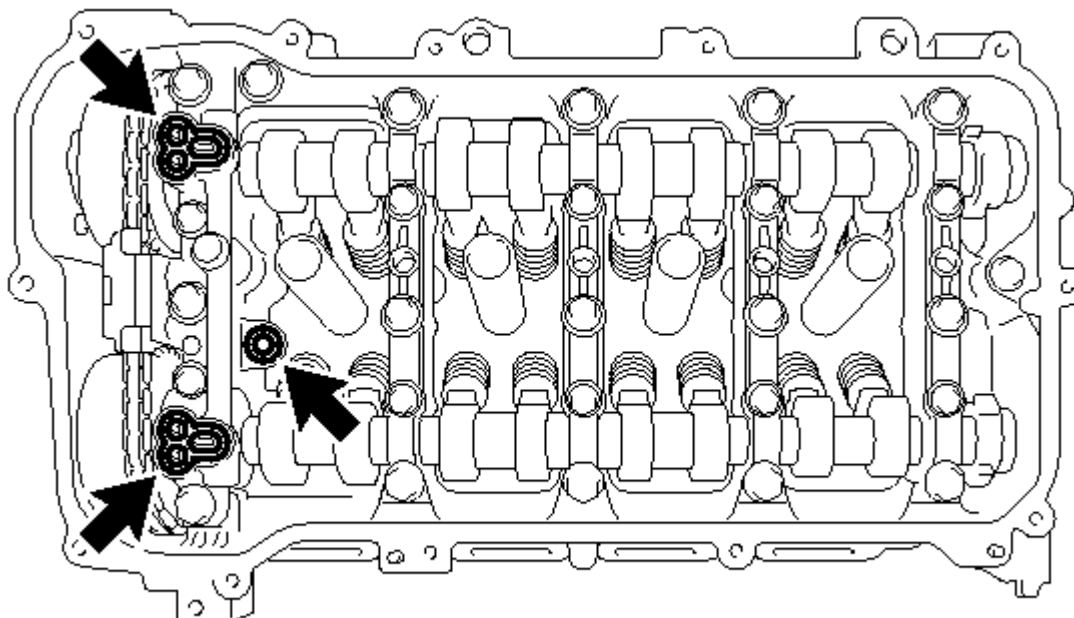


T

Fig. 342: Identifying Cylinder Head Cover Gasket
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Remove any oil from the contact surfaces.

- b. Install 3 new gaskets to the No. 1 camshaft bearing cap.



T

Fig. 343: Locating Gaskets
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Apply seal packing as shown the illustration.

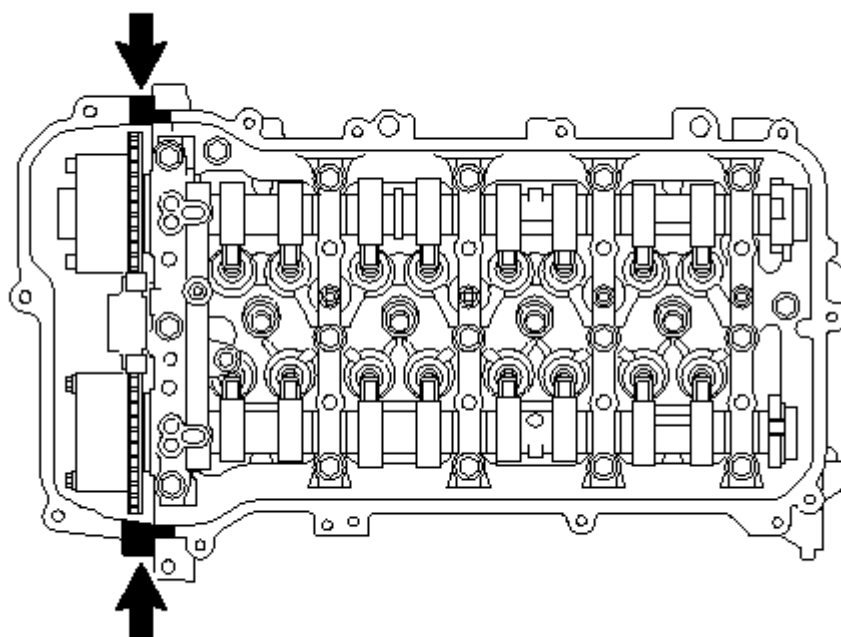


Fig. 344: Identifying Seal Packing Applying Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Seal packing

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

NOTE:

- Remove any oil from the contact surfaces.
- Install the cylinder head cover within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.
- Do not start the engine for at least 2 hours after the installation.

- d. Install the cylinder head cover with a new seal washer and the 13 bolts.

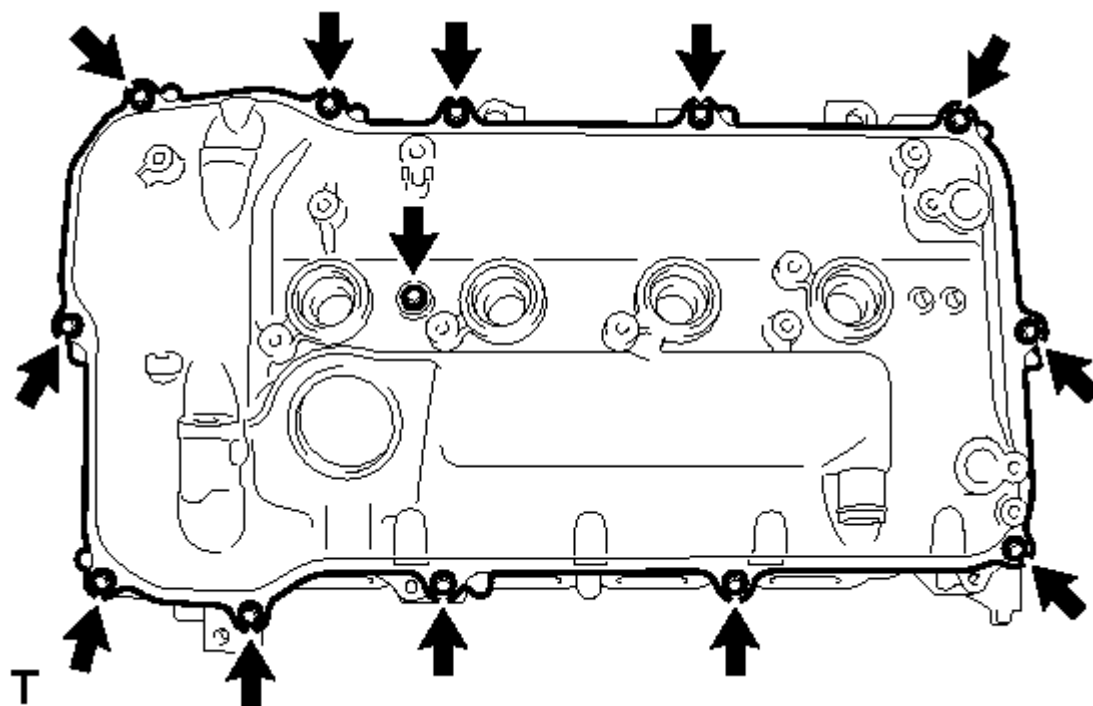


Fig. 345: Locating Bolts, Seal Washer And Cylinder Head Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

42. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY

- a. Apply a light coat of engine oil to 2 new O-rings, then install them onto the camshaft timing oil control valves.

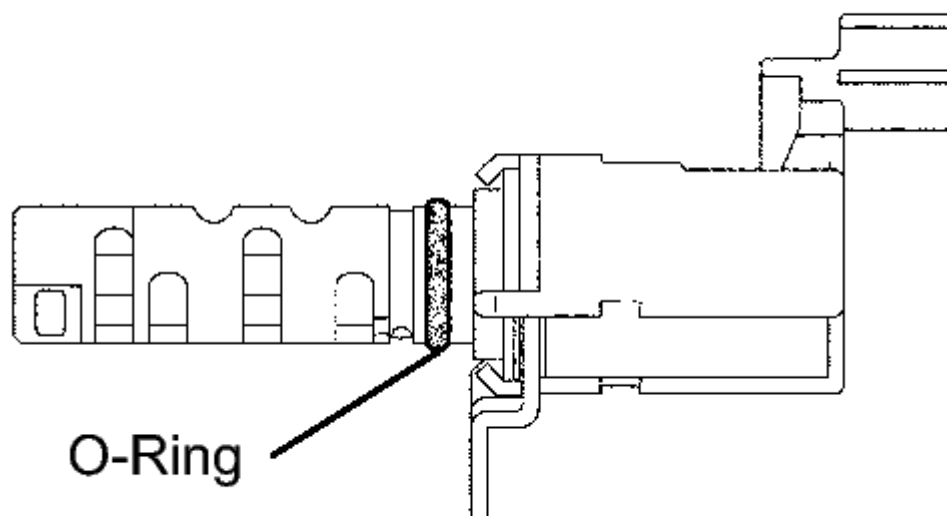


Fig. 346: Identifying O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the 2 camshaft timing oil control valves and bracket with the 2 bolts.

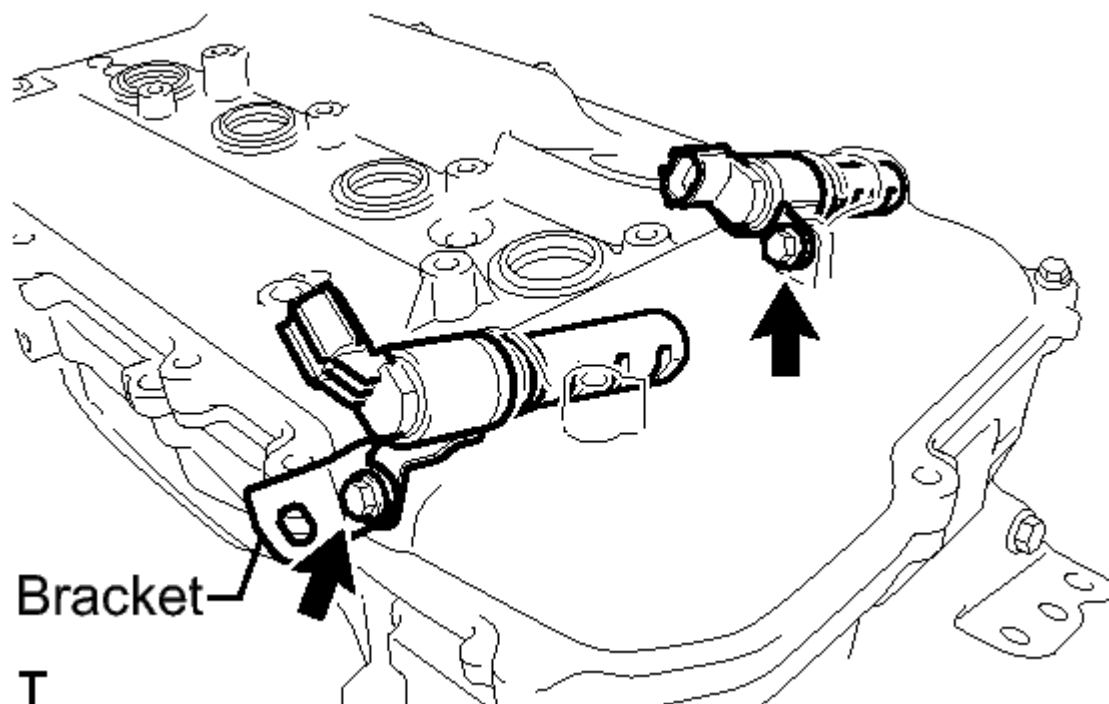
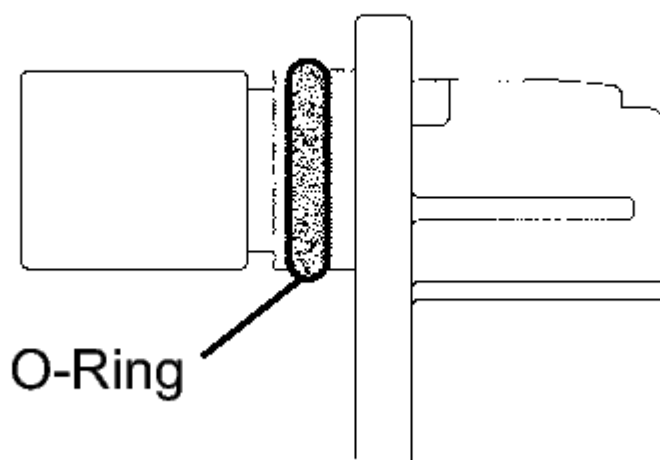


Fig. 347: Locating Camshaft Timing Oil Control Valves And Bracket
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

43. INSTALL CAMSHAFT POSITION SENSOR

- a. Apply a light coat of engine oil to the O-rings of the sensors.



P

Fig. 348: Identifying Camshaft Position Sensor O-Ring

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

- b. Install the 2 sensors with the 2 bolts.

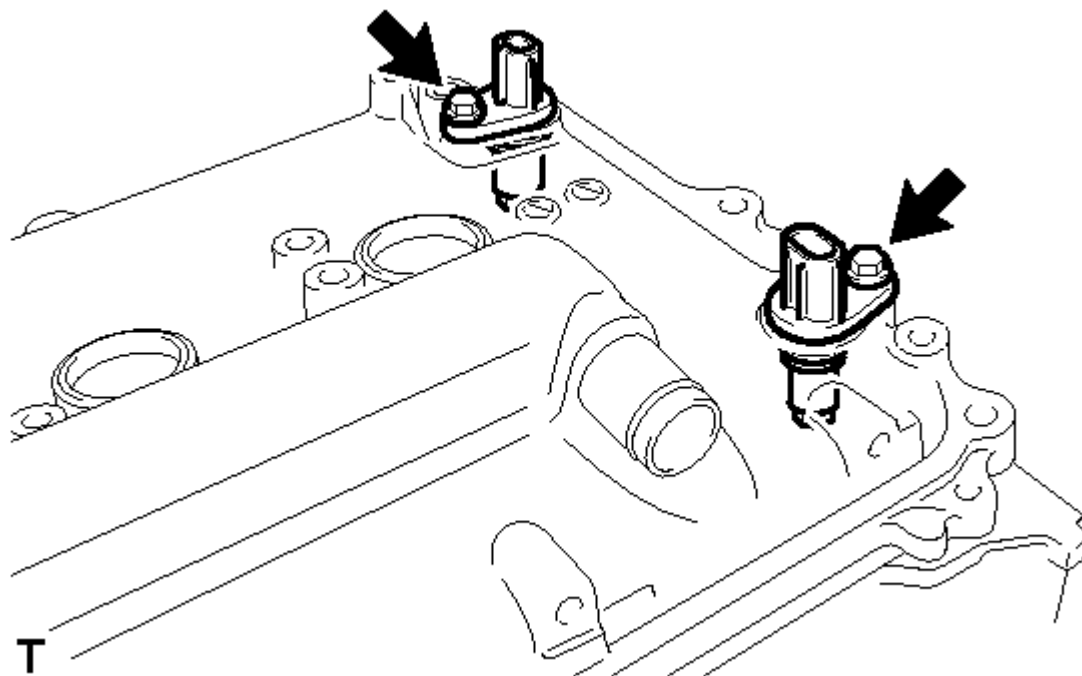


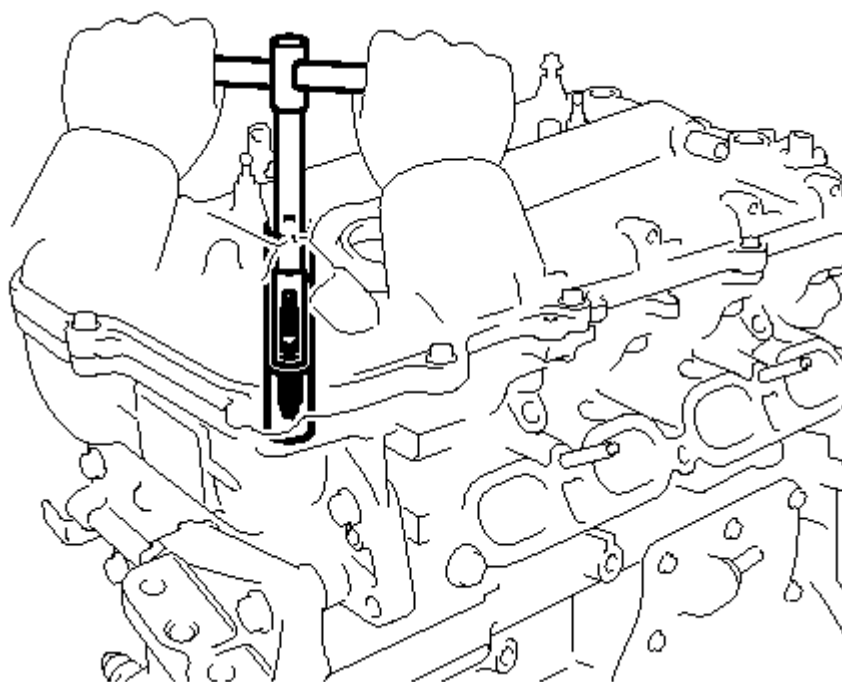
Fig. 349: Locating Bolts And Sensors

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

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

44. INSTALL SPARK PLUG

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



T

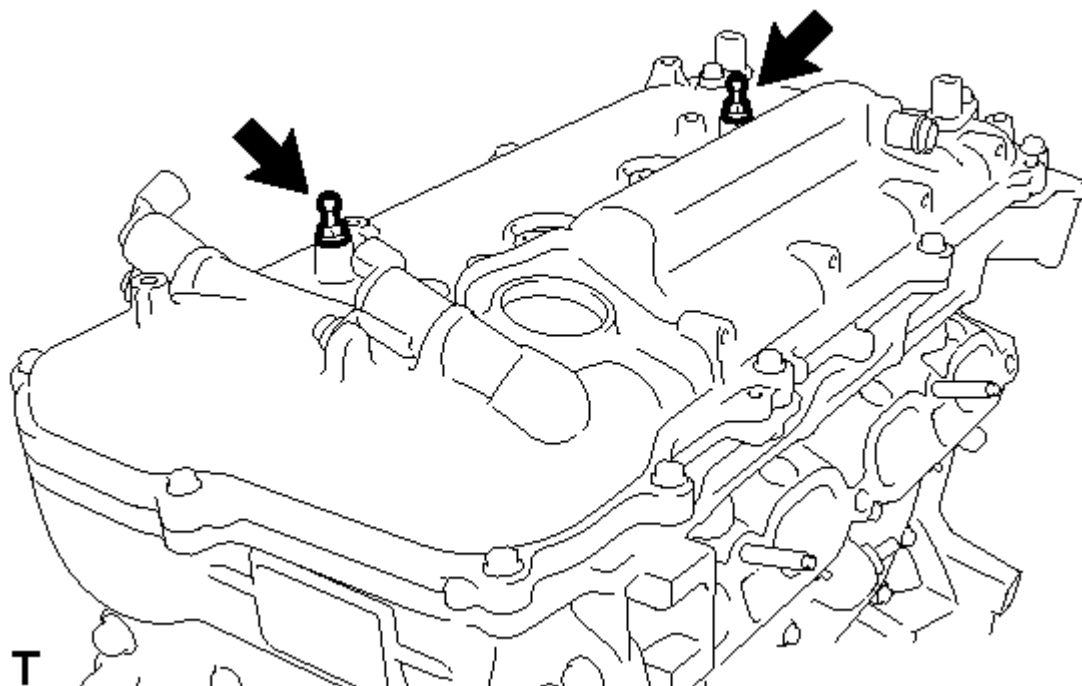
Fig. 350: Removing/Installing Spark Plug

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

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

45. INSTALL ENGINE COVER JOINT

- a. Install the 2 engine cover joints.



T

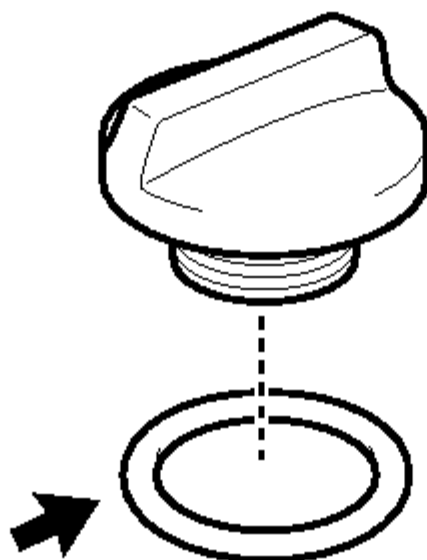
Fig. 351: Locating Engine Cover Joints

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

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

46. INSTALL OIL FILLER CAP GASKET

- a. Install the gasket to the cap.



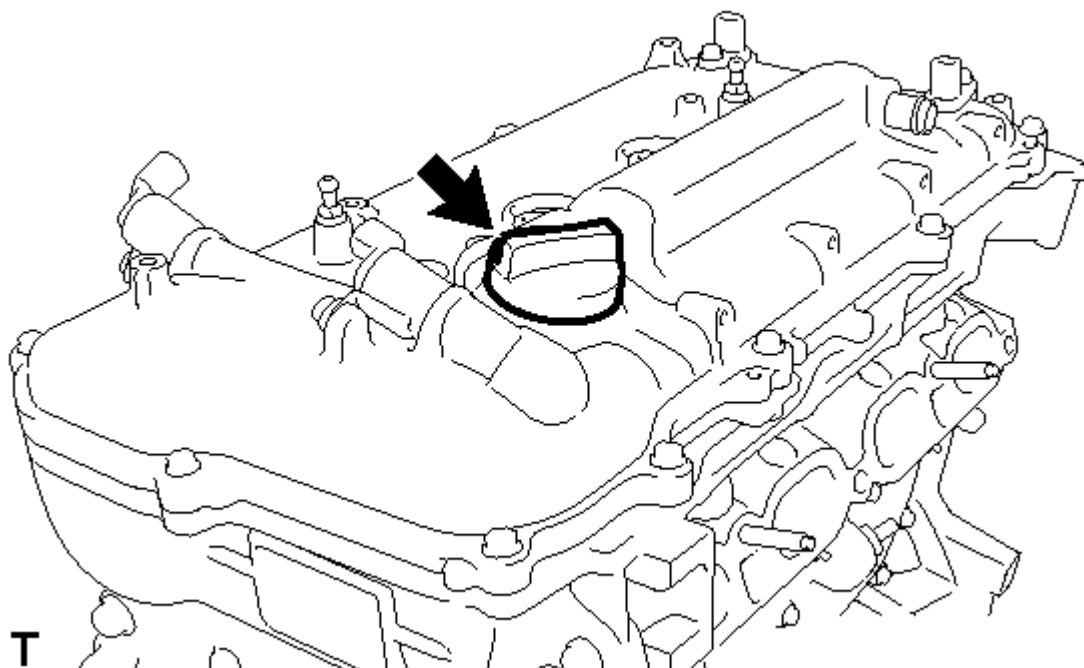
T

Fig. 352: Locating Oil Filler Cap Gasket

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

47. INSTALL OIL FILLER CAP SUB-ASSEMBLY

- a. Install the oil filler cap.



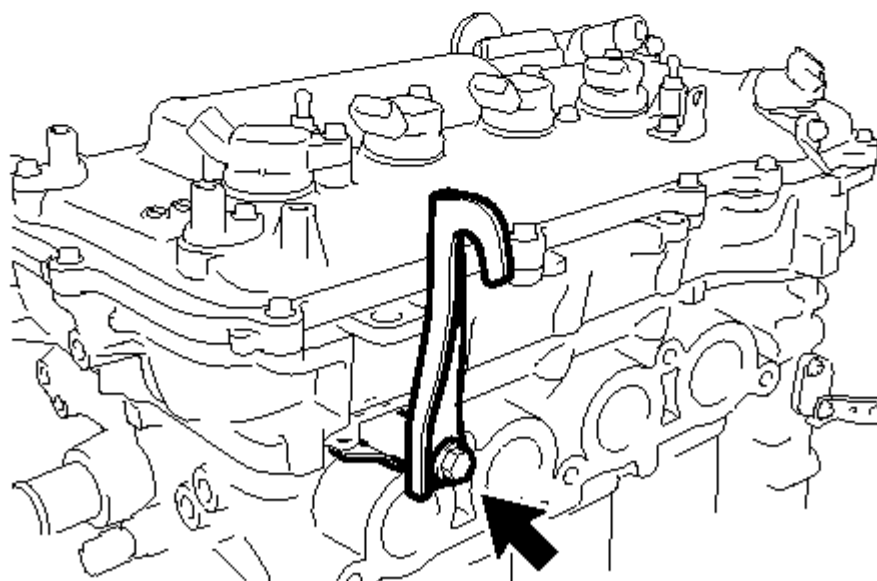
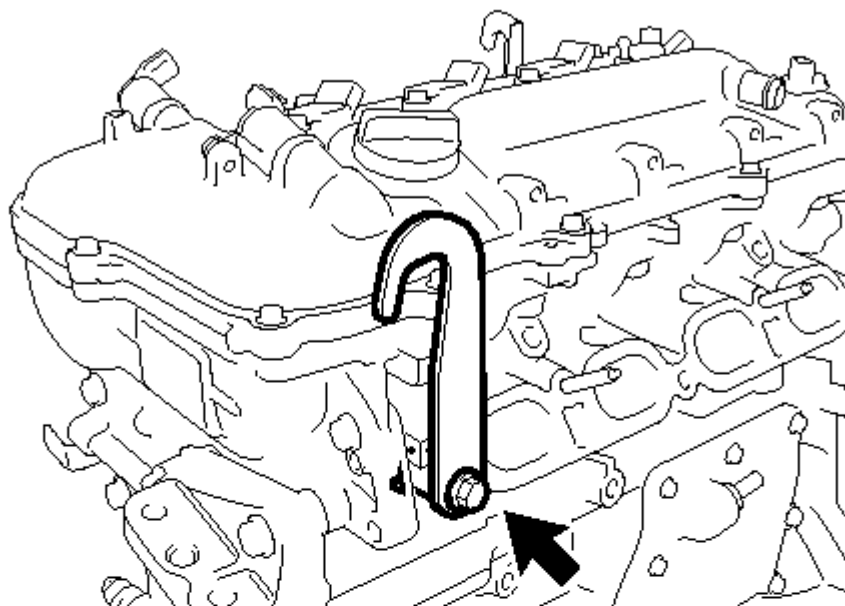
T

Fig. 353: Locating Oil Filler Cap

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

48. INSTALL ENGINE HANGER

- a. Install the 2 engine hangers with the 2 bolts.



T

Fig. 354: Identifying Engine Hangers With Bolts

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

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

INSTALLATION

INSTALLATION

1. INSTALL RADIO SETTING CONDENSER

- a. Install the radio setting condenser with the bolt.

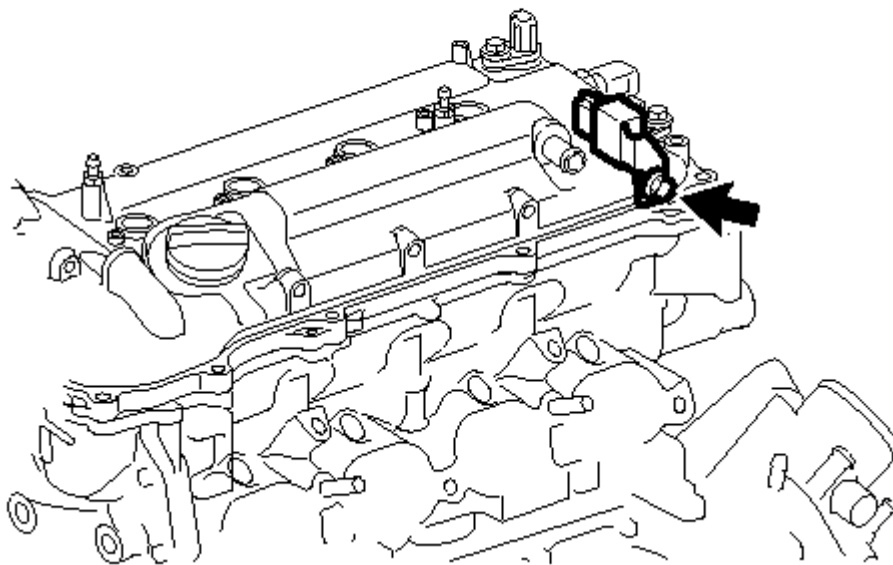
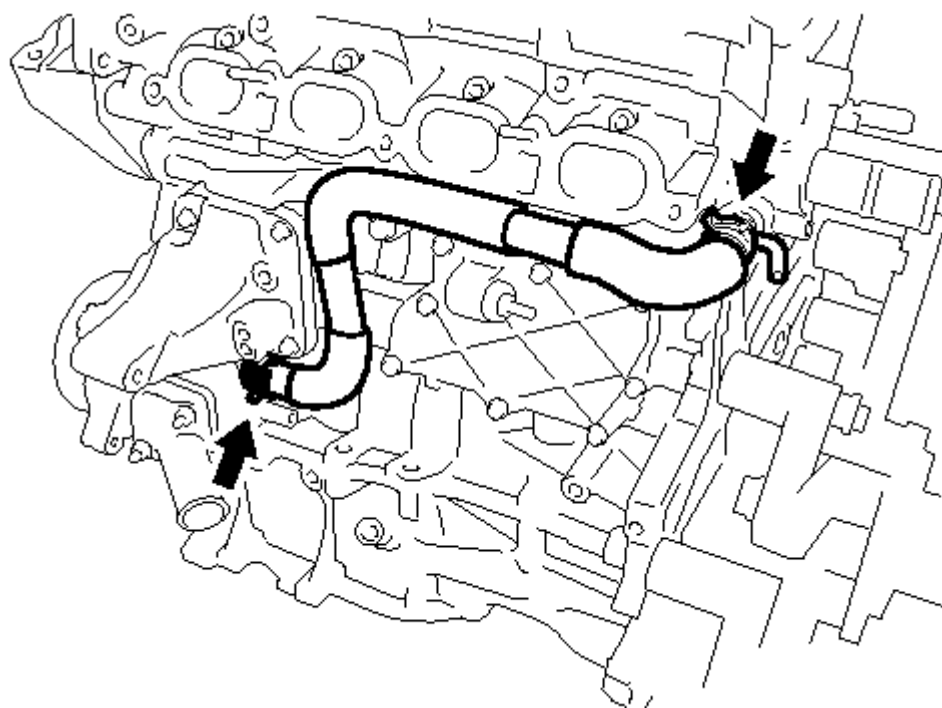


Fig. 355: Locating Radio Setting Condenser

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

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

2. **INSTALL THERMOSTAT** . Refer to **INSTALLATION - Step 1**
3. **INSTALL INLET WATER** . Refer to **INSTALLATION - Step 2**
4. **INSTALL INLET WATER HOSE**
 - a. Install the inlet water hose with the 2 clamps.



C

Fig. 356: Locating Inlet Water Hose Clamps

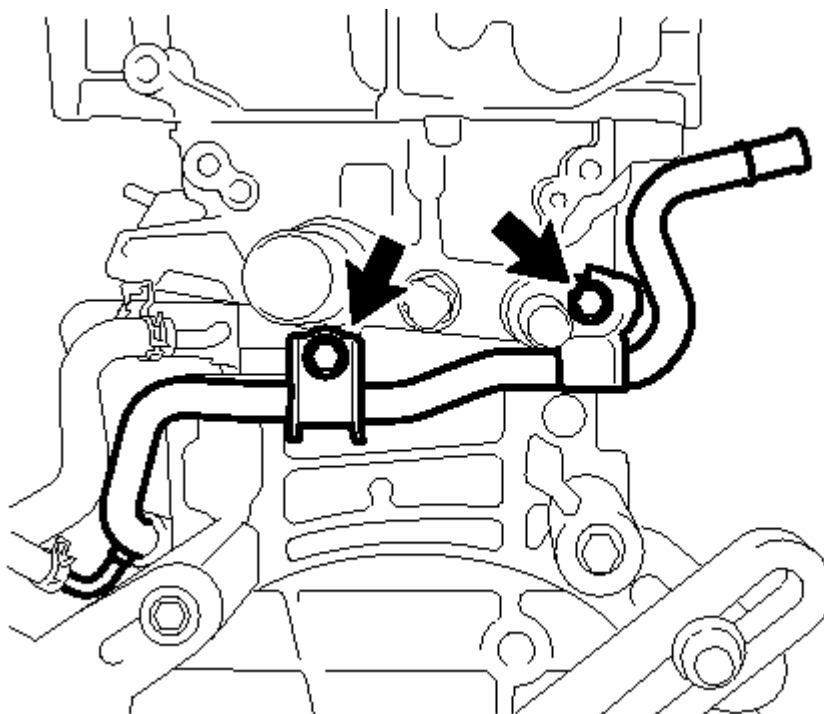
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSTALL WATER BY-PASS HOSE

- a. Install the water by-pass hose with the clamp.

6. INSTALL NO. 1 WATER BY-PASS PIPE

- a. Install the No. 1 water by-pass pipe with the 2 bolts.



T

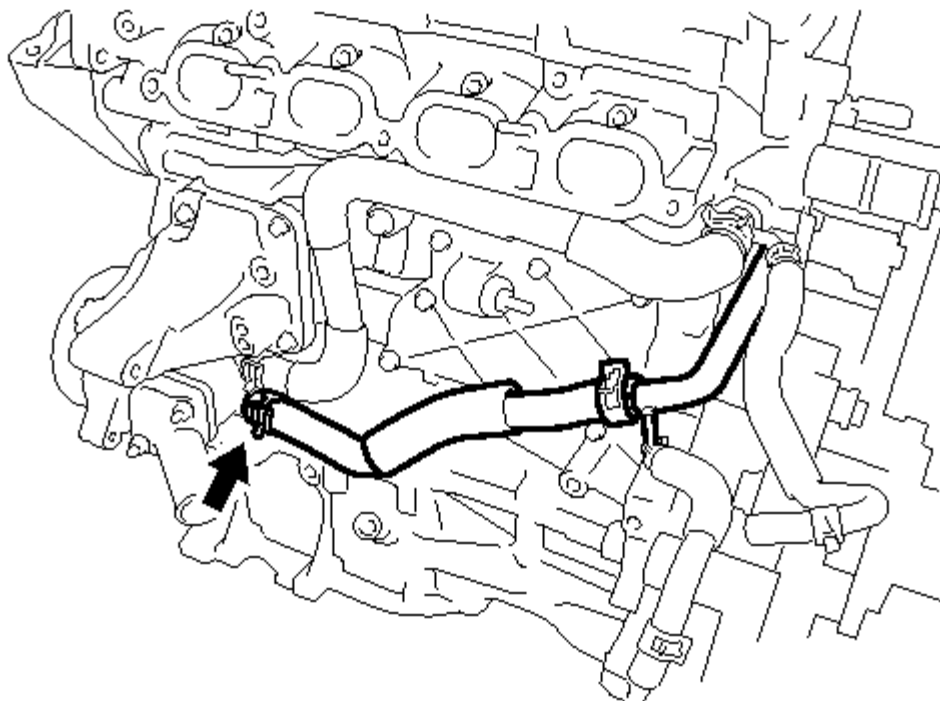
Fig. 357: Locating Clamp And Water By-Pass Hose

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

Torque: 21 N*m (214 kgf*cm, 16 ft.*lbf)

7. CONNECT NO. 3 WATER BY-PASS HOSE

- a. Connect the No. 3 water by-pass hose to the inlet water housing.



C

Fig. 358: Locating No. 3 Water By-Pass Hose

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

8. INSTALL VENTILATION HOSE

- a. Install the ventilation hose.

9. INSTALL EXHAUST MANIFOLD

- a. Install a new gasket onto the exhaust manifold.

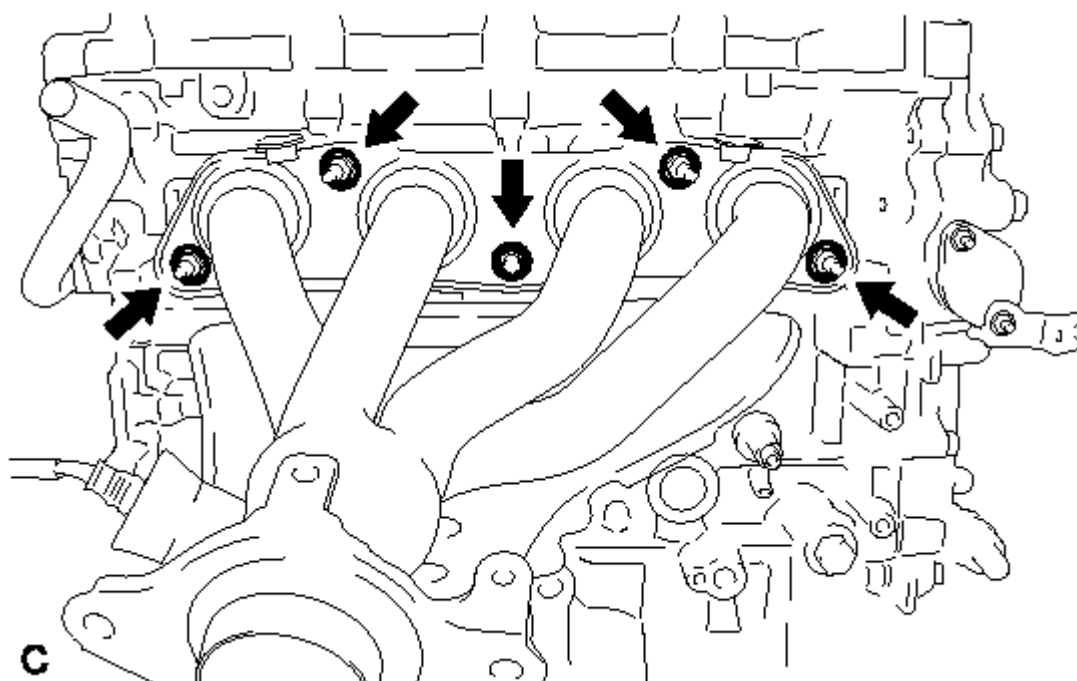


Fig. 359: Locating Exhaust Manifold Nuts

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

- b. Install the exhaust manifold with the 5 nuts.

Torque: 21 N*m (214 kgf*cm, 16 ft.*lbf)

10. INSTALL MANIFOLD STAY

- a. Install the manifold stay with the 3 bolts.

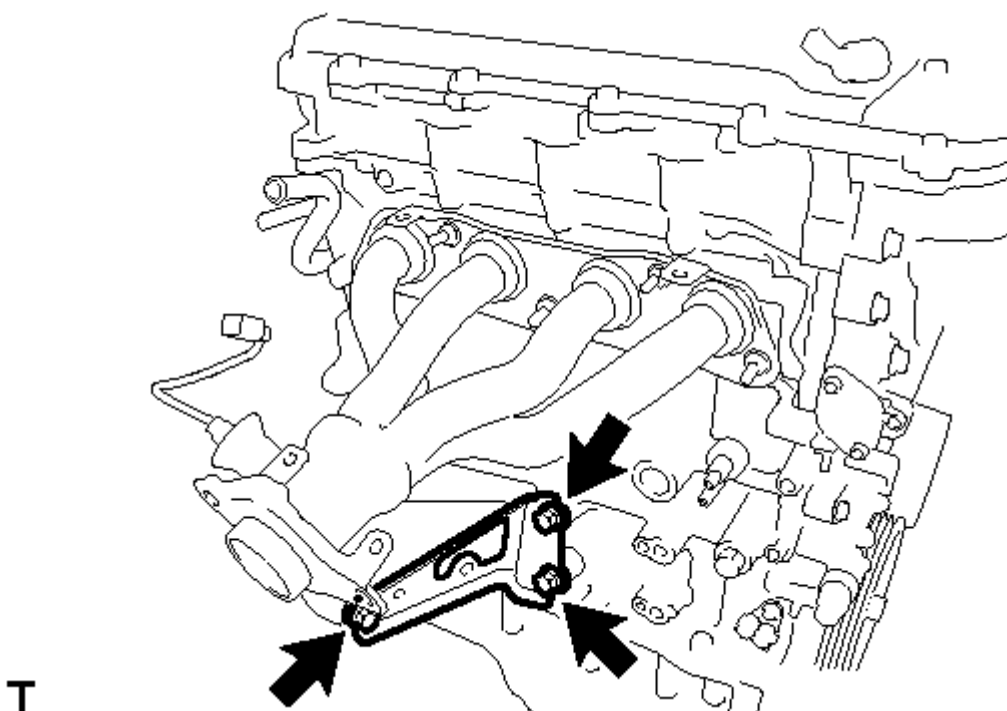


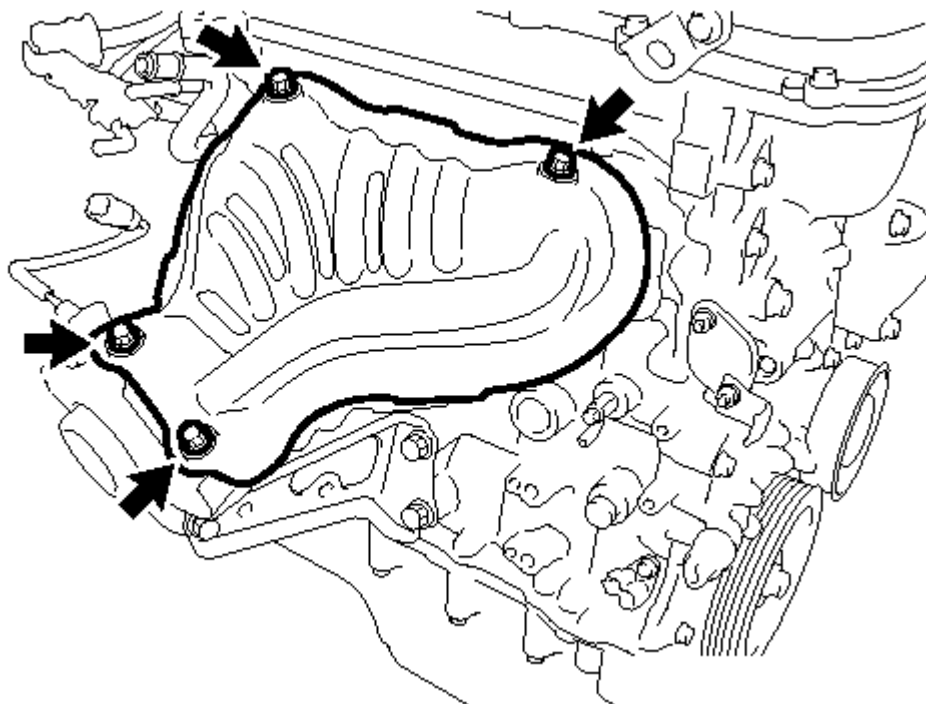
Fig. 360: Locating Manifold Stay Bolts

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

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

11. INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

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



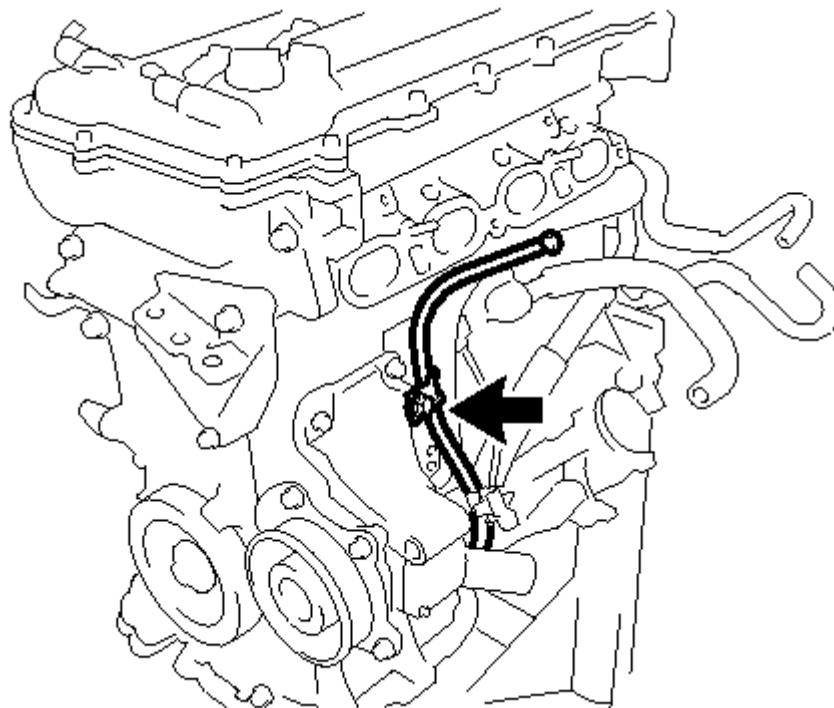
T

Fig. 361: Locating Exhaust Manifold Heat Insulator With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

12. INSTALL OIL LEVEL DIPSTICK SUB-ASSEMBLY

- a. Apply engine oil to a new O-ring.



T

Fig. 362: Locating Oil Level Dipstick

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

- b. Install the oil level dipstick with the bolt through the new O-ring.

Torque: 21 N*m (214 kgf*cm, 16 ft.*lbf)

13. INSTALL IGNITION COIL ASSEMBLY

- a. Install the 4 ignition coils with the 4 bolts.

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

14. INSTALL FUEL INJECTOR ASSEMBLY . Refer to INSTALLATION - Step 1

15. INSTALL NO. 1 DELIVERY PIPE SPACER . Refer to INSTALLATION - Step 2

16. INSTALL FUEL DELIVERY PIPE SUB-ASSEMBLY . Refer to INSTALLATION - Step 3

17. CONNECT FUEL TUBE SUB-ASSEMBLY . Refer to INSTALLATION - Step 4

18. INSTALL INTAKE MANIFOLD

- a. Install a new gasket to the intake manifold.
- b. Install the intake manifold and intake manifold stay with the 4 bolts and 2 nuts.

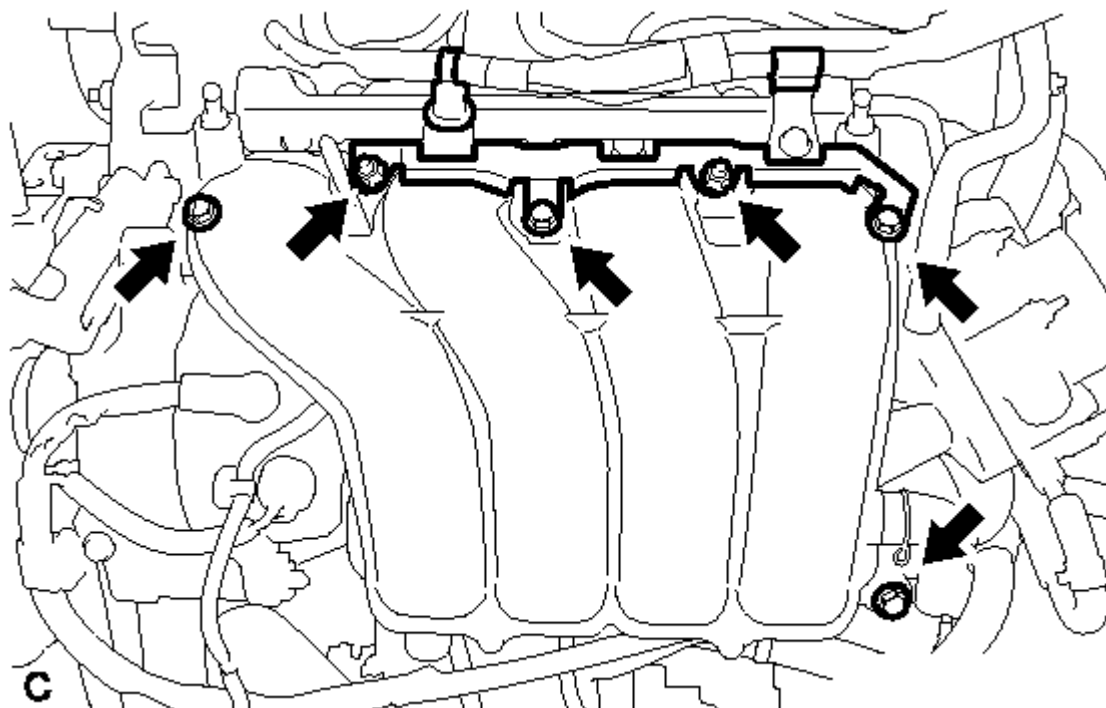


Fig. 363: Locating Intake Manifold And Intake Manifold Stay
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- c. Connect the 2 water by-pass hoses.

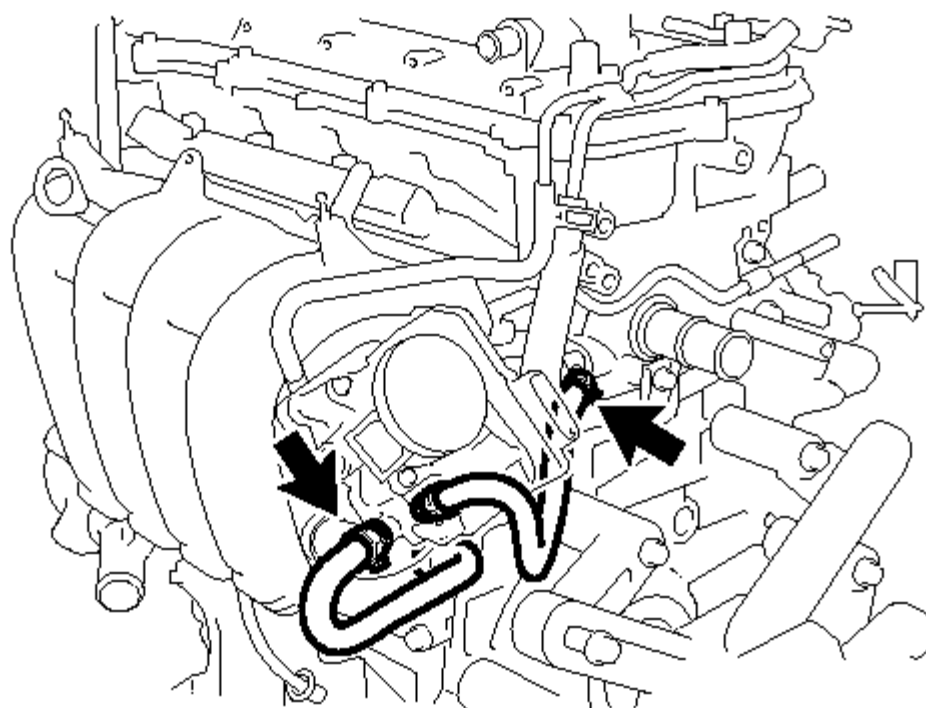


Fig. 364: Locating Water By-Pass Hoses
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Connect the ventilation hose to the intake manifold.

- e. Install the air tube with the 2 bolts.

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

- f. Install the wire harness bracket.

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

19. INSTALL FAN BELT ADJUSTING BAR

- a. Install the bolt and fan belt adjusting bar.

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

20. INSTALL ENGINE HANGER See step 61

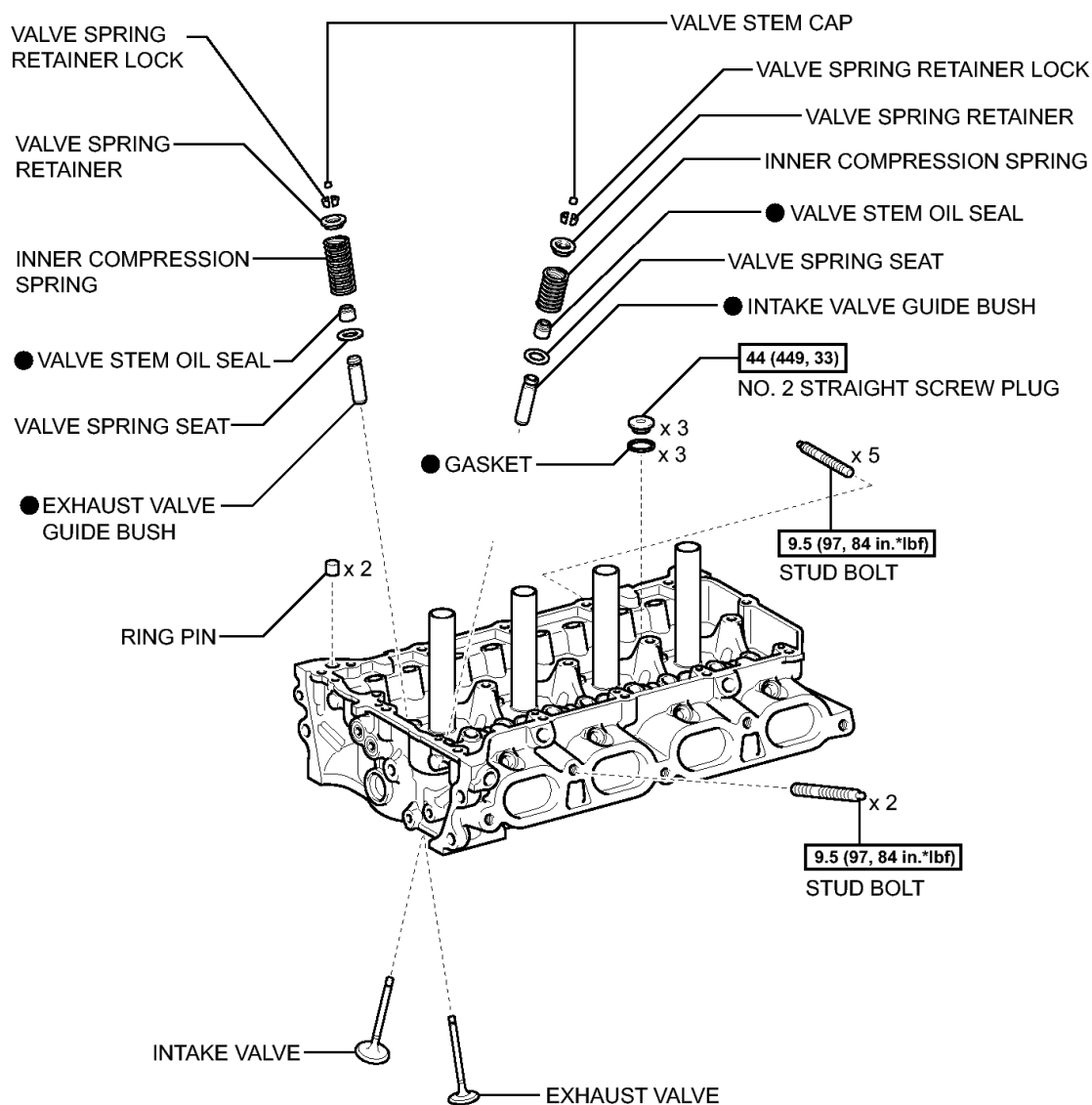
21. REMOVE ENGINE STAND

- a. Attach the engine to the sling device with the chain block.
- b. Remove the engine from the engine stand.

CYLINDER HEAD

COMPONENTS

ILLUSTRATION



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

● Non-reusable part

T

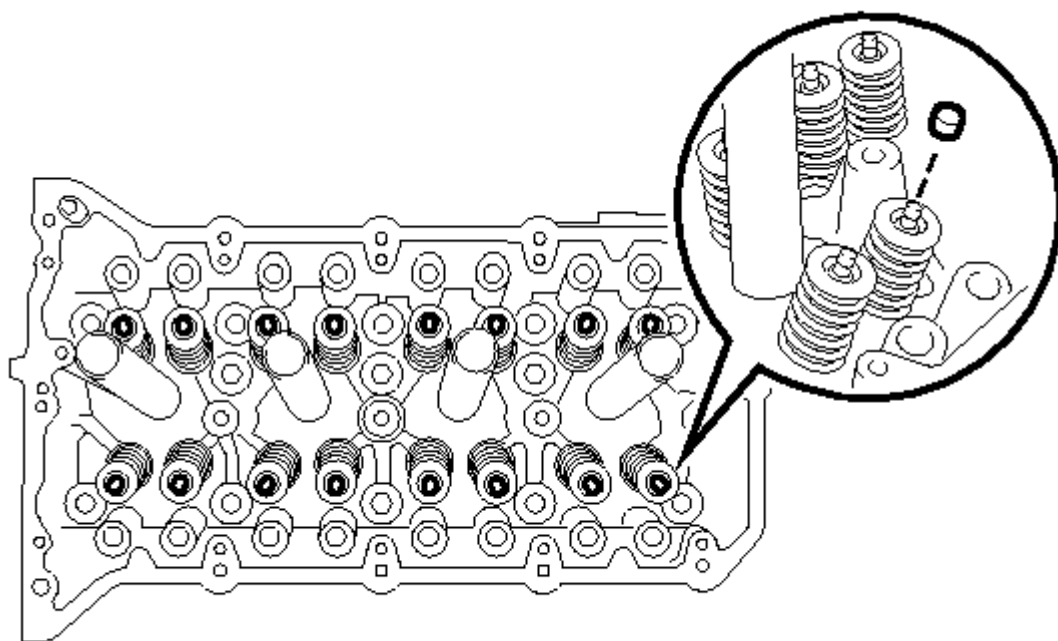
Fig. 365: Identifying Cylinder Head Replacement Components With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

DISASSEMBLY

1. REMOVE VALVE STEM CAP

- Remove the valve stem caps from the cylinder head.



T

Fig. 366: Identifying Valve Stem Caps

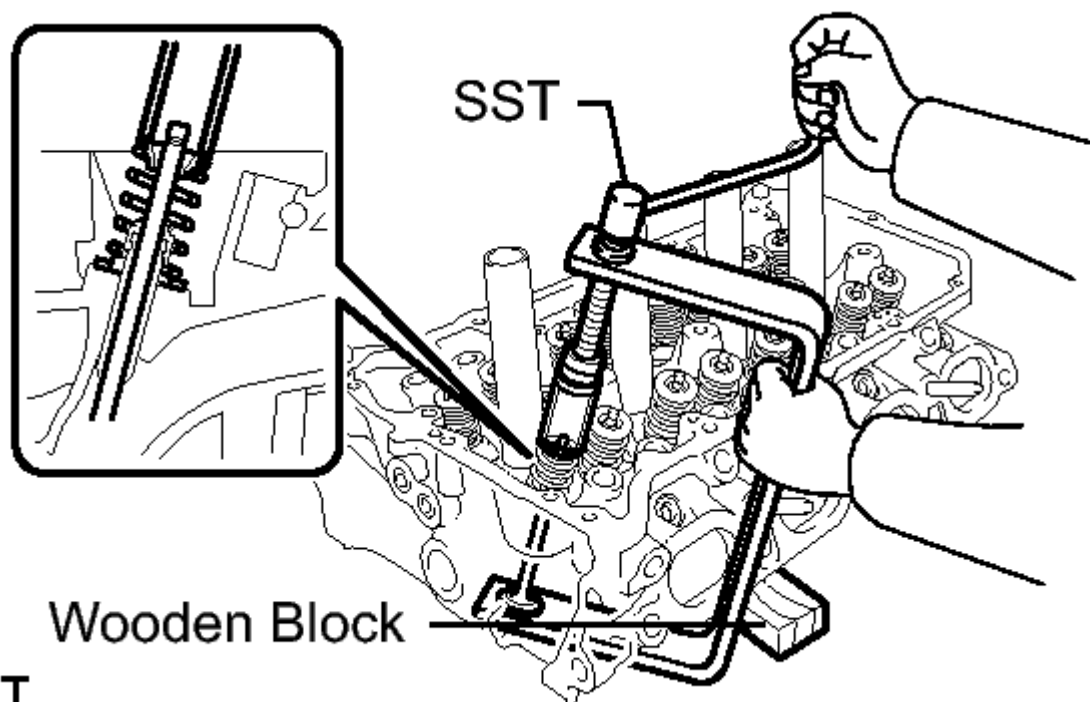
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Arrange the removed parts in the correct order.

2. REMOVE INTAKE VALVE

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



T

Fig. 367: Compressing Spring

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

- SST: 09202-70020
09202-00010

HINT:

Arrange the removed parts in the correct order.

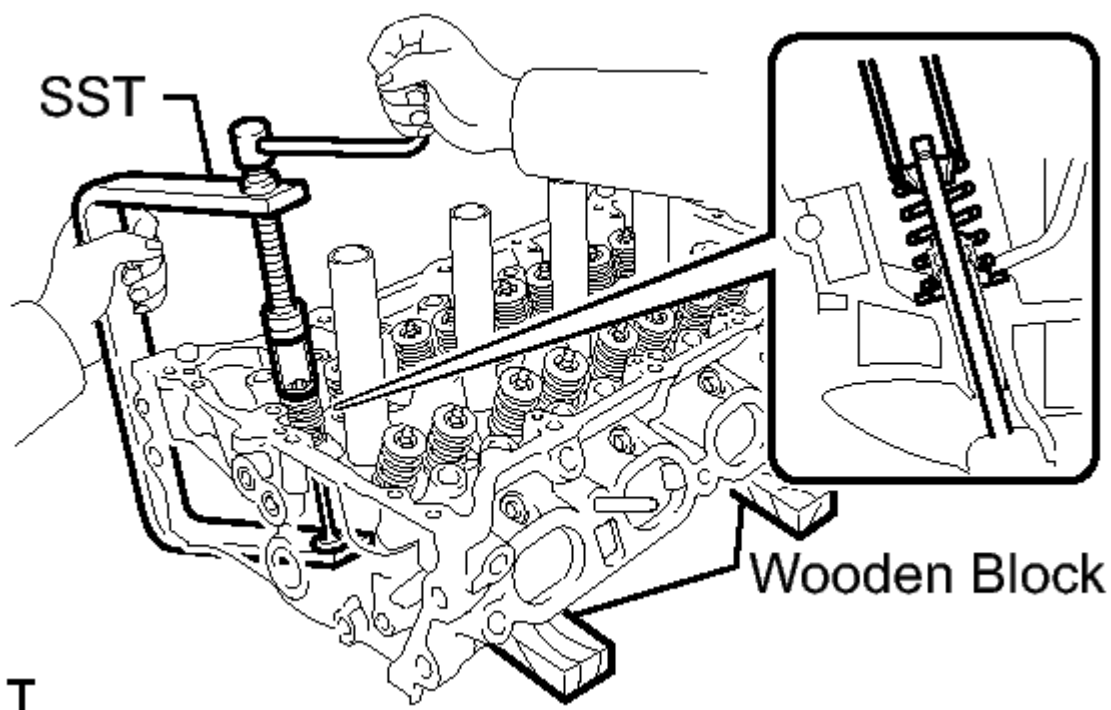
- Remove the retainer, valve spring and valve.

HINT:

Arrange the removed parts in the correct order.

3. REMOVE EXHAUST VALVE

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



T
Fig. 368: Compressing Valve Retainer Locks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09202-70020
09202-00010

HINT:

Arrange the removed parts in the correct order.

- Remove the retainer, valve spring and valve.

HINT:

Arrange the removed parts in the correct order.

4. REMOVE VALVE STEM OIL SEAL

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

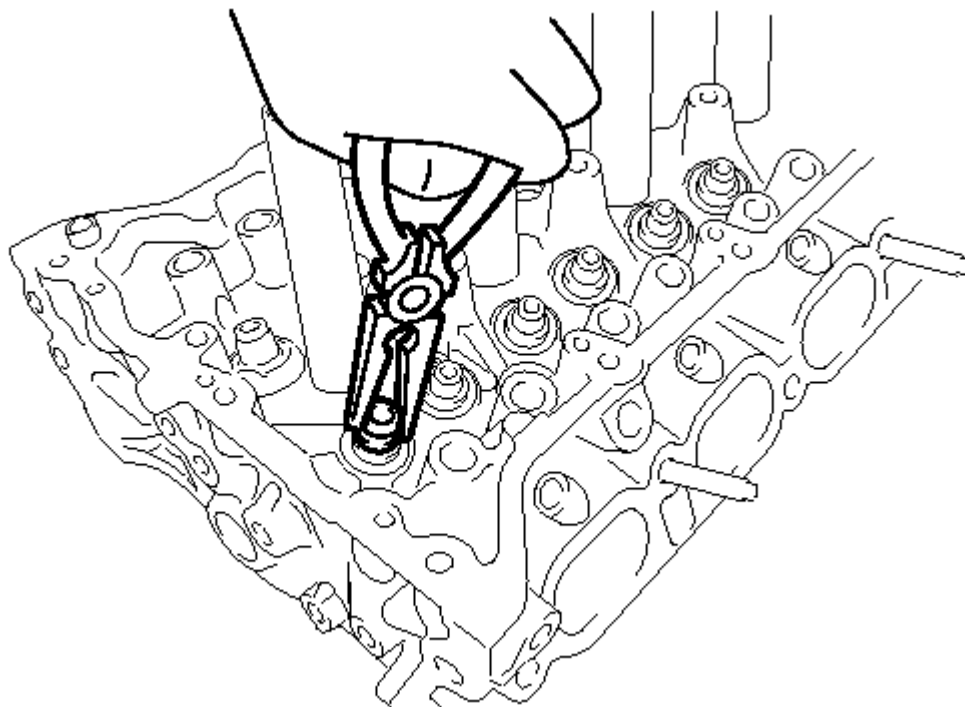
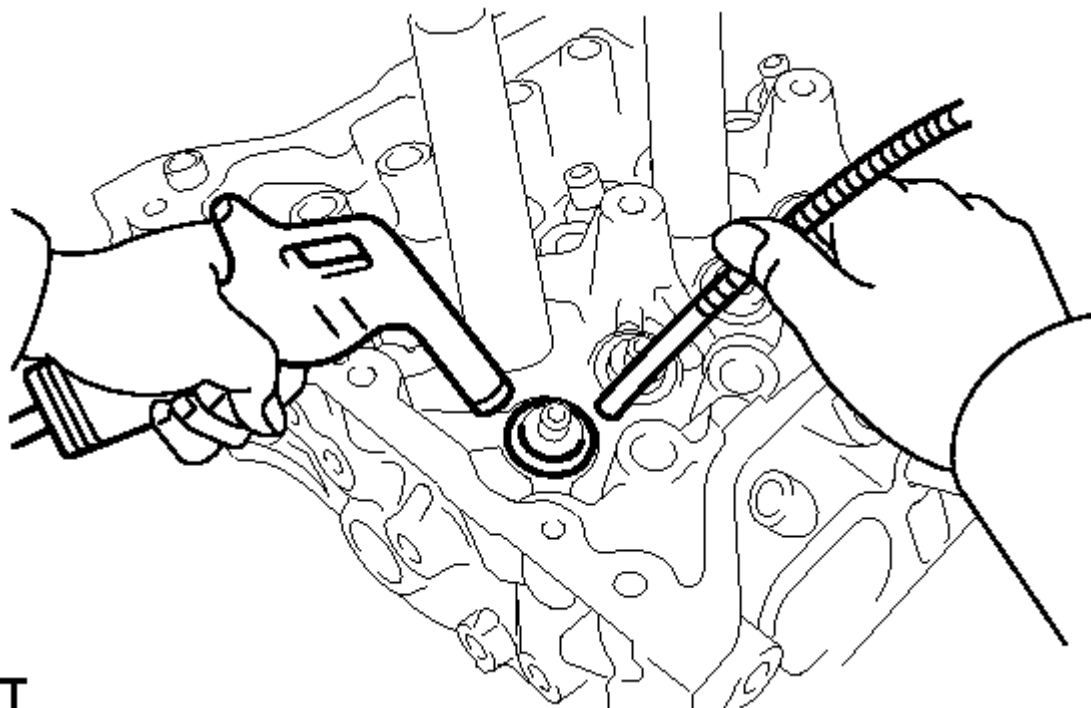
**T**

Fig. 369: Removing Oil Seals

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

5. REMOVE VALVE SPRING SEAT

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



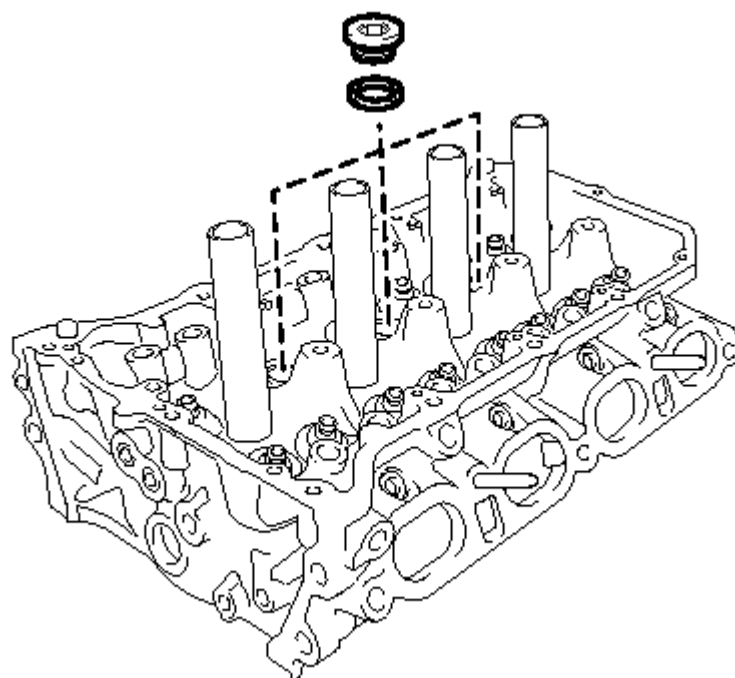
T

Fig. 370: Removing Valve Spring Seats

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

6. REMOVE NO. 2 STRAIGHT SCREW PLUG

- a. Using a 10 mm straight hexagon wrench, remove the 3 screw plugs and 3 gaskets.



T

Fig. 371: Identifying Screw Plugs And Gaskets

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

NOTE: If water leaks from any of the straight screw plugs or if a plug is

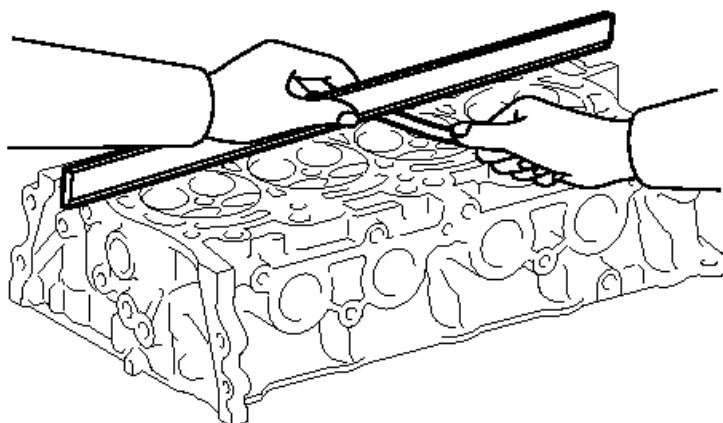
corroded, replace it.

INSPECTION

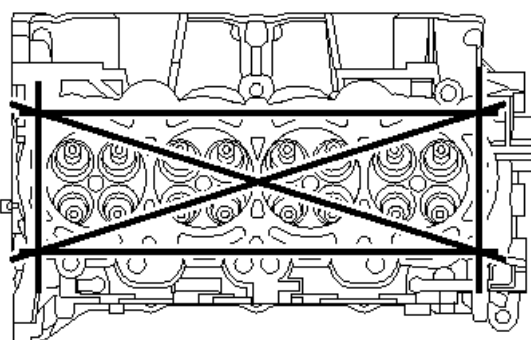
INSPECTION

1. INSPECT CYLINDER HEAD FOR FLATNESS

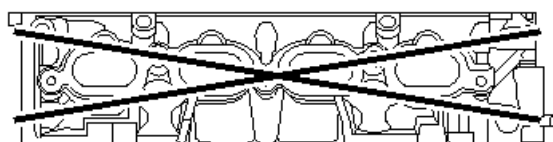
- a. Using a precision straight edge and a feeler gauge, measure the surfaces contacting the cylinder block and the manifolds for warpage.



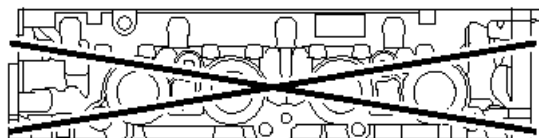
Cylinder Block Side:



Intake Side:



Exhaust Side:



T

Fig. 372: Inspecting Cylinder Head For Flatness

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

Maximum Warpage

Item	Specified Condition
Cylinder block side	0.05 mm (0.0020 in.)
Intake manifold side	0.10 mm (0.0039 in.)

Exhaust manifold side

0.10 mm (0.0039 in.)

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

2. INSPECT CYLINDER HEAD FOR CRACKS

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

**T**

Fig. 373: Inspecting Cylinder Head For Cracks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If cracked, replace the cylinder head.

3. INSPECT VALVE SEATS

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

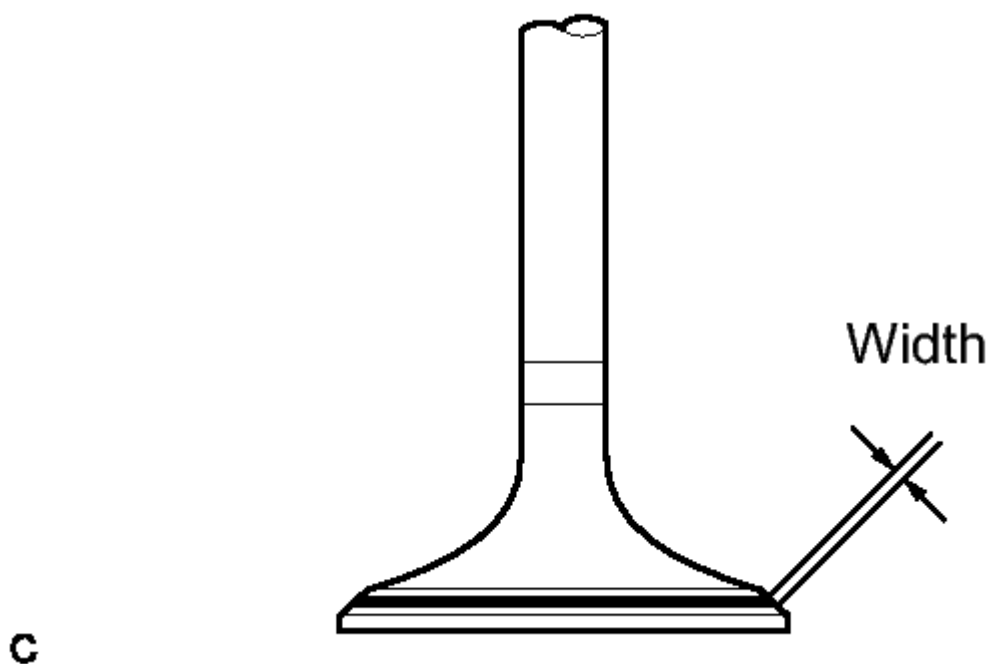


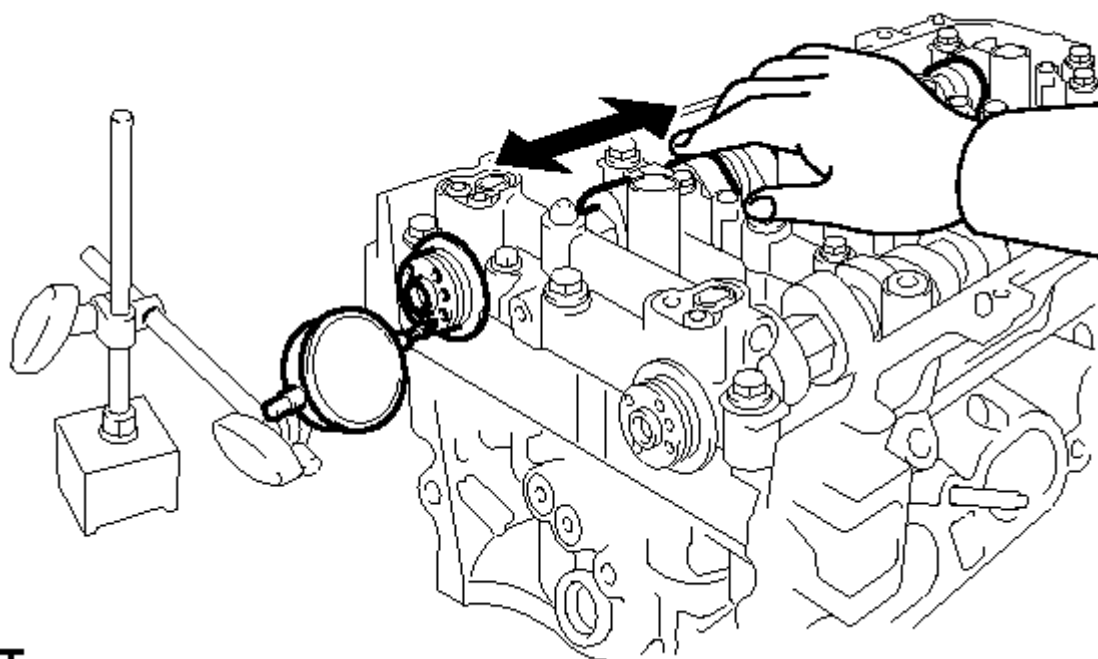
Fig. 374: Identifying Valve Seats Width

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

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

4. INSPECT CAMSHAFT THRUST CLEARANCE

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



T

Fig. 375: Measuring Thrust Clearance

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

Standard Thrust Clearance

Item	Specified Condition
Intake	0.06 to 0.155 mm (0.0024 to 0.0061 in.)
Exhaust	0.06 to 0.155 mm (0.0024 to 0.0061 in.)

Maximum Thrust Clearance

Item	Specified Condition
Intake	0.17 mm (0.0067 in.)
Exhaust	0.17 mm (0.0067 in.)

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

5. INSPECT CAMSHAFT OIL CLEARANCE

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

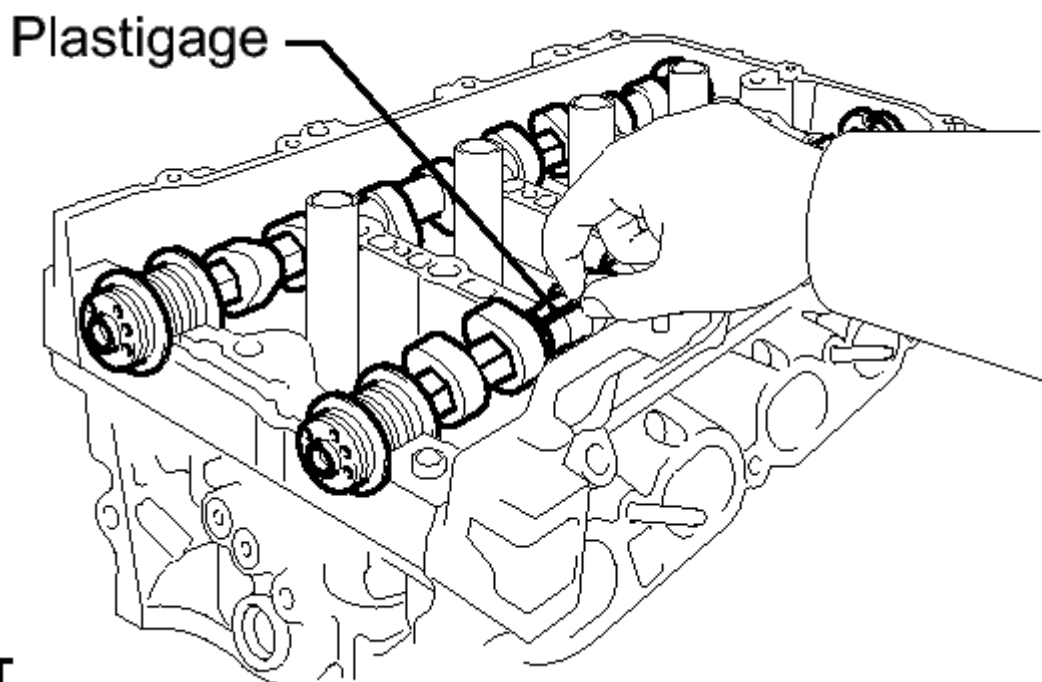
**T**

Fig. 376: Inspecting Camshaft Oil Clearance

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

- d. Install the bearing caps. Refer to INSTALLATION.

NOTE: Do not turn the camshaft.

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

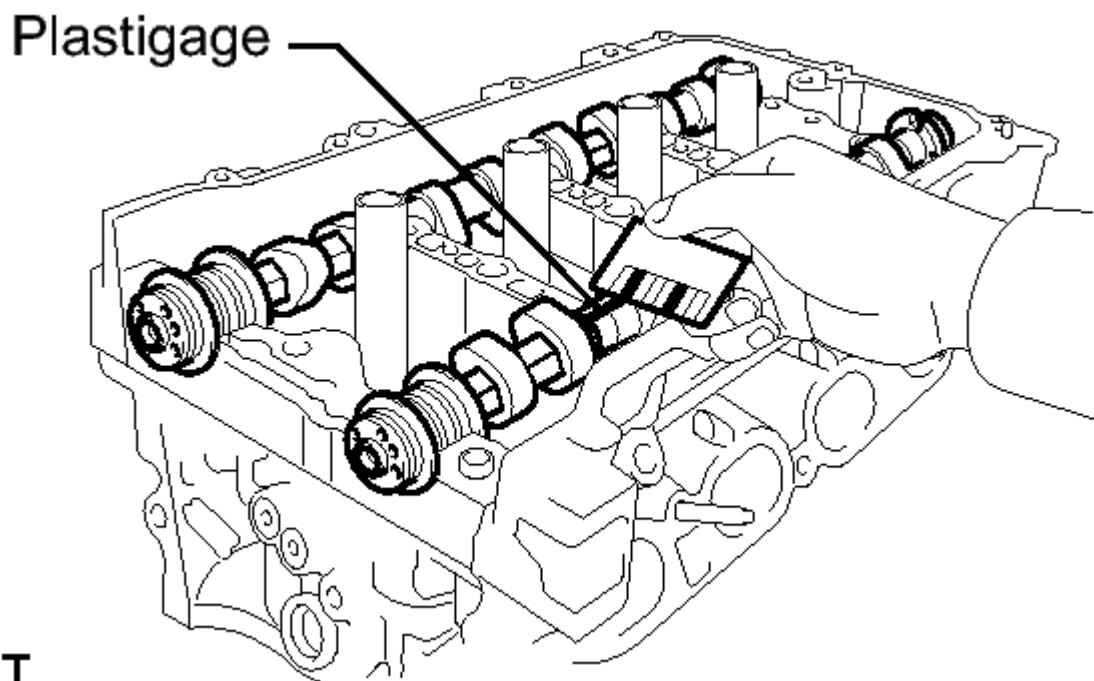
**T**

Fig. 377: Measuring Plastigage At Its Widest Point
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard Oil Clearance

Item	Specified Condition
Camshaft No. 1 journal	0.030 to 0.063 mm (0.0012 to 0.0025 in.)
Camshaft other journals	0.035 to 0.072 mm (0.0014 to 0.0028 in.)

Maximum Oil Clearance

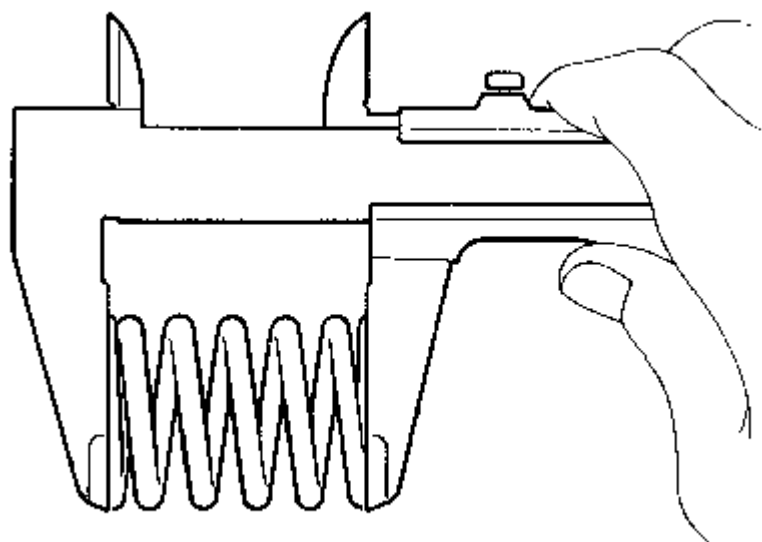
Item	Specified Condition
Camshaft No. 1 journal	0.085 mm (0.0033 in.)
Camshaft other journals	0.09 mm (0.0035 in.)

NOTE: Completely remove the Plastigage after the inspection.

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

6. INSPECT COMPRESSION SPRING

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



EM0801

Fig. 378: Measuring Free Length Of Valve Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Free length

53.36 mm (2.1008 in.)

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

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

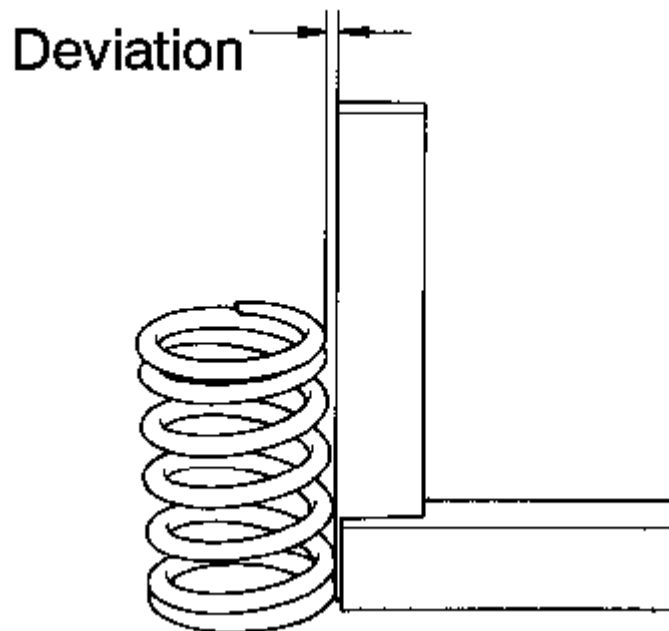


Fig. 379: Measuring Deviation Of Valve Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

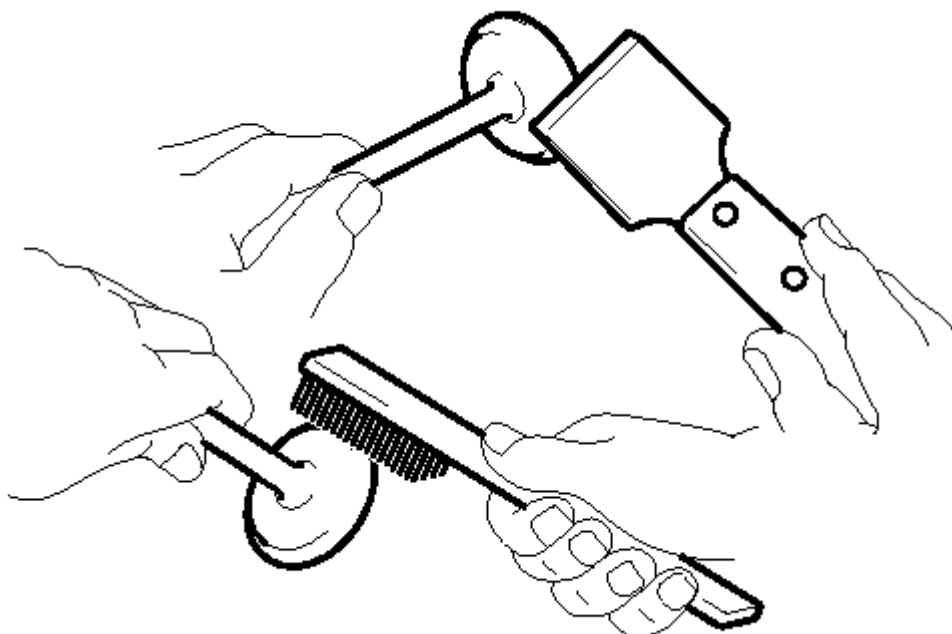
Maximum deviation

1.0 mm (0.0394 in.)

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

7. INSPECT INTAKE VALVE

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

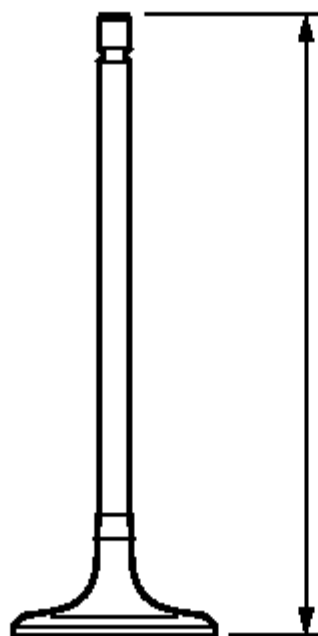


P

Fig. 380: Cleaning Valve Head

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

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



Overall Length

T

Fig. 381: Identifying Valve's Overall Length

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

Standard overall length

109.34 mm (4.3047 in.)

Minimum overall length

108.84 mm (4.2850 in.)

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

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

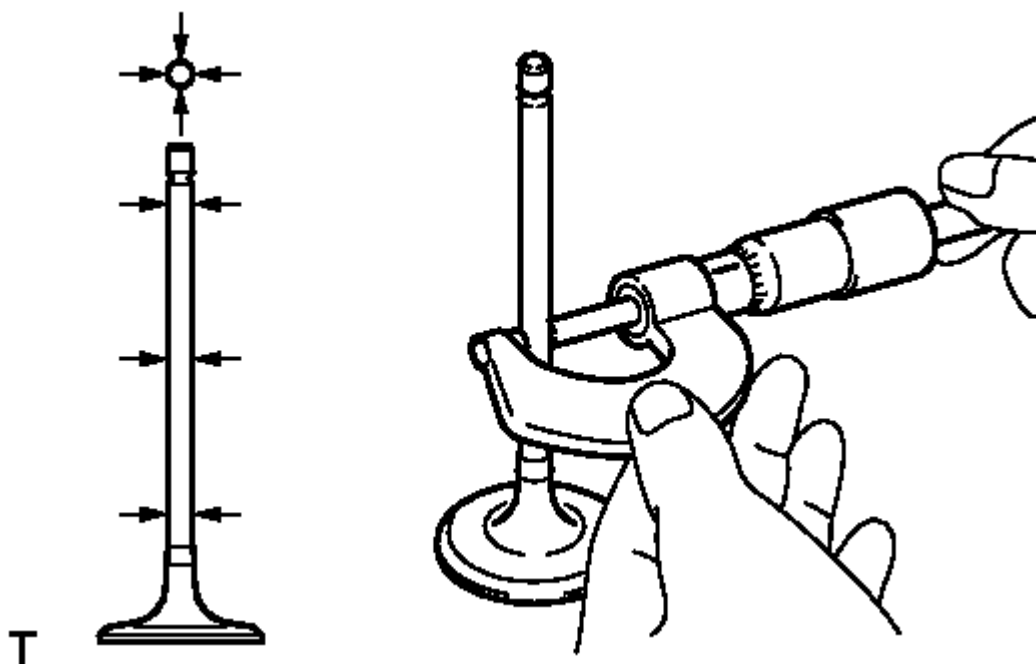


Fig. 382: Measuring Diameter Of Valve Stem

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 diameter is not as specified, check the oil clearance.

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

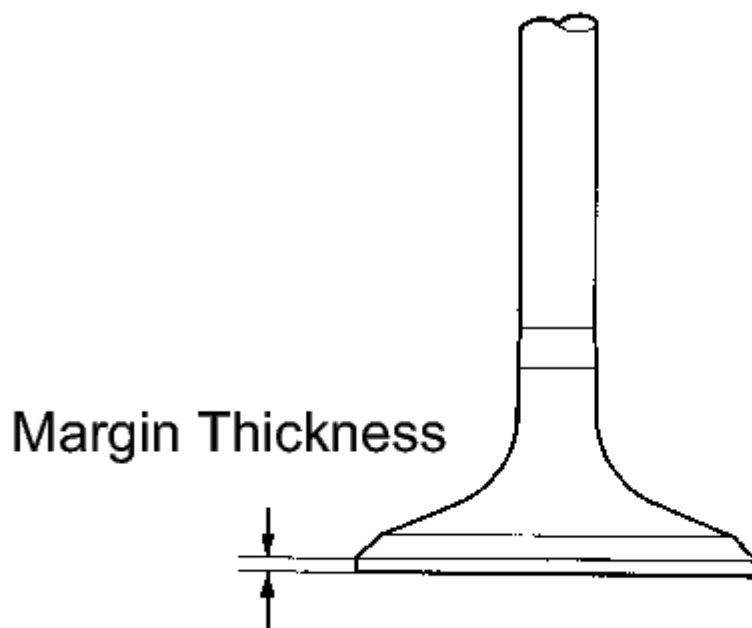


Fig. 383: Measuring Valve Head Margin Thickness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard margin thickness

1.0 mm (0.0394 in.)

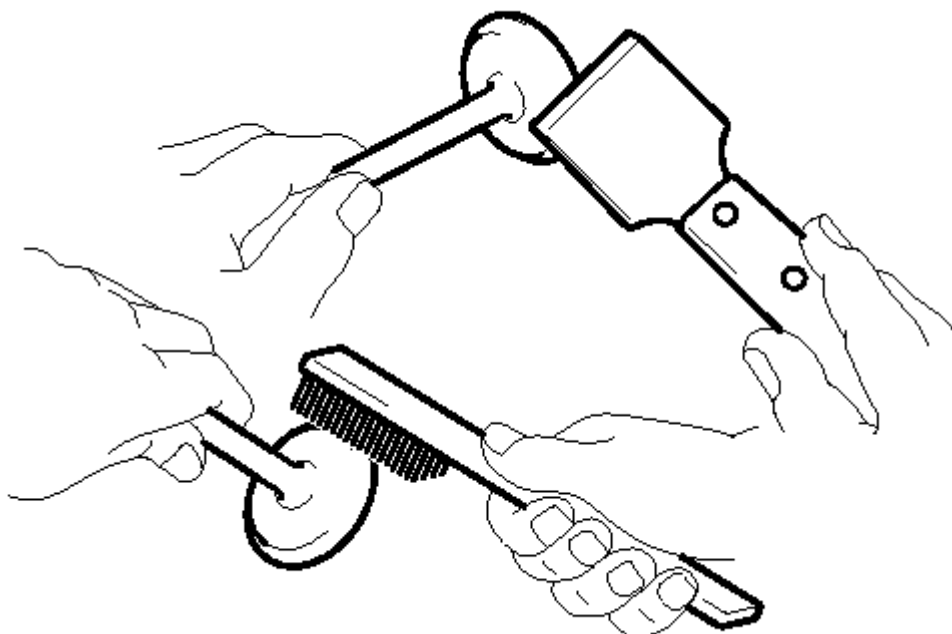
Minimum margin thickness

0.5 mm (0.0197 in.)

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

8. INSPECT EXHAUST VALVE

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

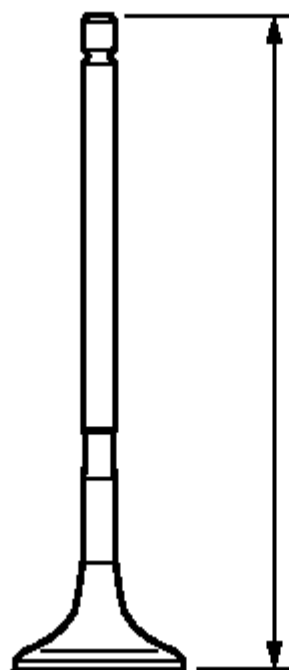


P

Fig. 384: Cleaning Valve Head

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

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



Overall Length

T

Fig. 385: Identifying Valve Overall Length

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

Standard overall length

108.25 mm (4.2618 in.)

Minimum overall length

107.75 mm (4.2421 in.)

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

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

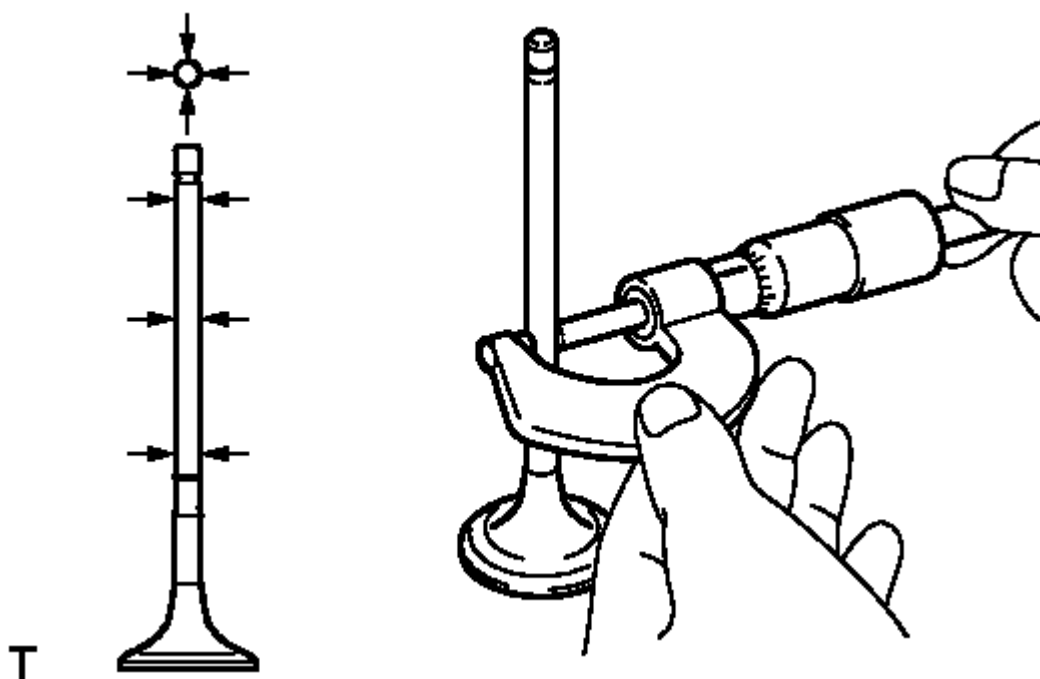


Fig. 386: Measuring Diameter Of Valve Stem

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

Valve stem diameter

5.465 to 5.480 mm (0.2152 to 0.2157 in.)

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

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

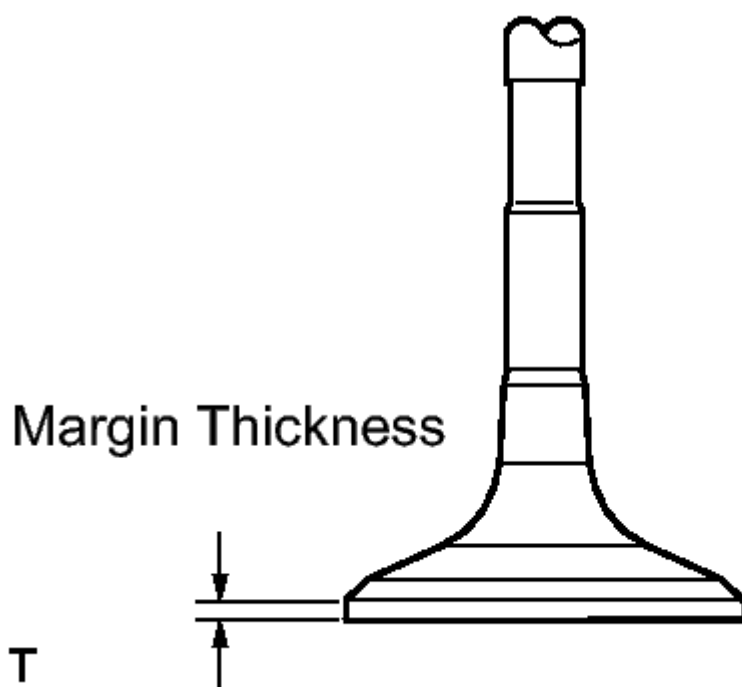


Fig. 387: Identifying Valve Head Margin Thickness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard margin thickness

1.01 mm (0.0398 in.)

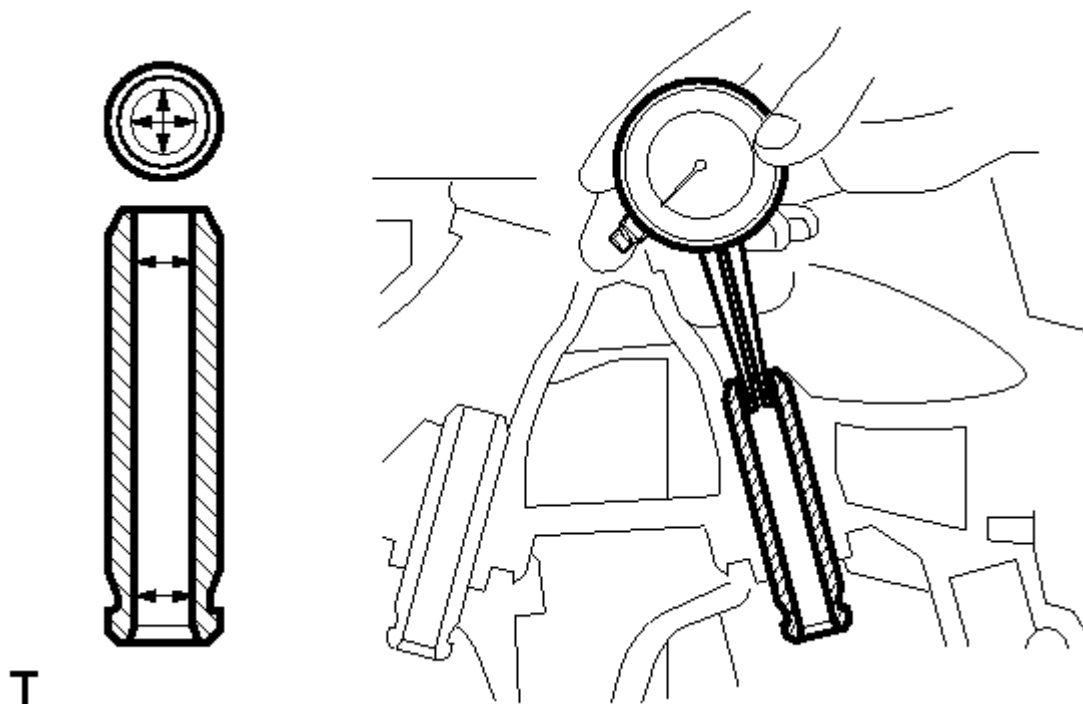
Minimum margin thickness

0.5 mm (0.0197 in.)

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

9. INSPECT VALVE GUIDE BUSH OIL CLEARANCE

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



T

Fig. 388: Measuring Inside Diameter Of Guide Bush
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Bushing inside diameter

5.510 to 5.530 mm (0.2169 to 0.2177 in.)

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

Standard Oil Clearance

Item	Specified Condition
Intake	0.025 to 0.060 mm (0.0010 to 0.0024 in.)
Exhaust	0.030 to 0.065 mm (0.0012 to 0.0026 in.)

Maximum Oil Clearance

Item	Specified Condition
Intake	0.080 mm (0.0031 in.)
Exhaust	0.085 mm (0.0033 in.)

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

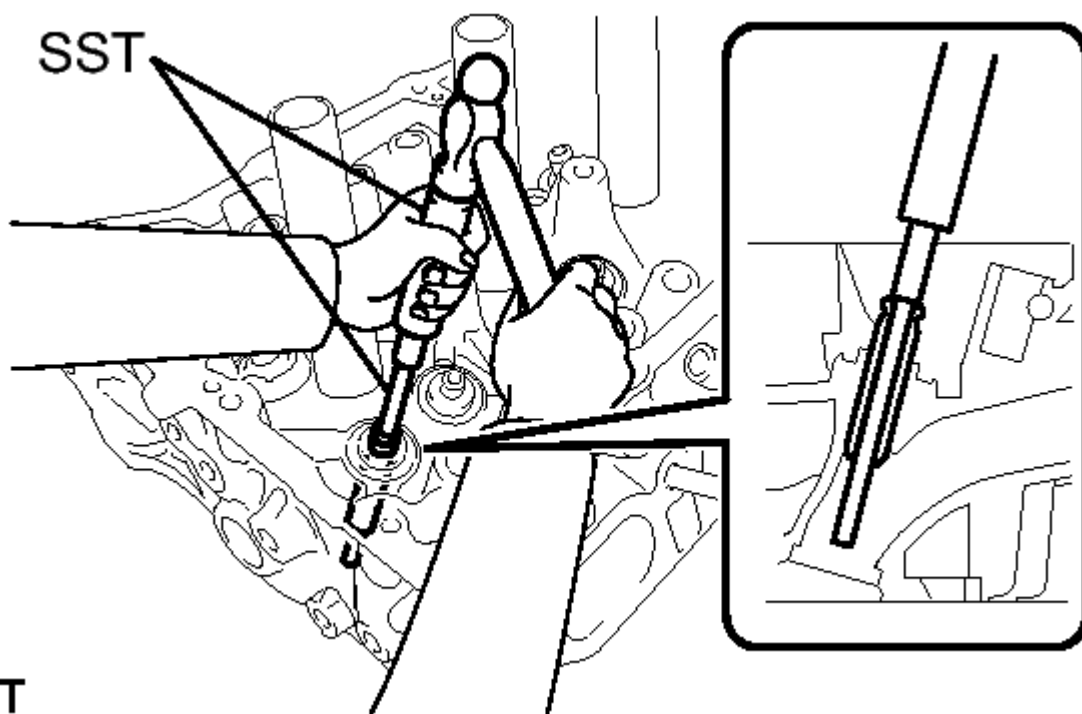
**T**

Fig. 389: Tapping Out Guide Bush

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 bush bore diameter of the cylinder head.

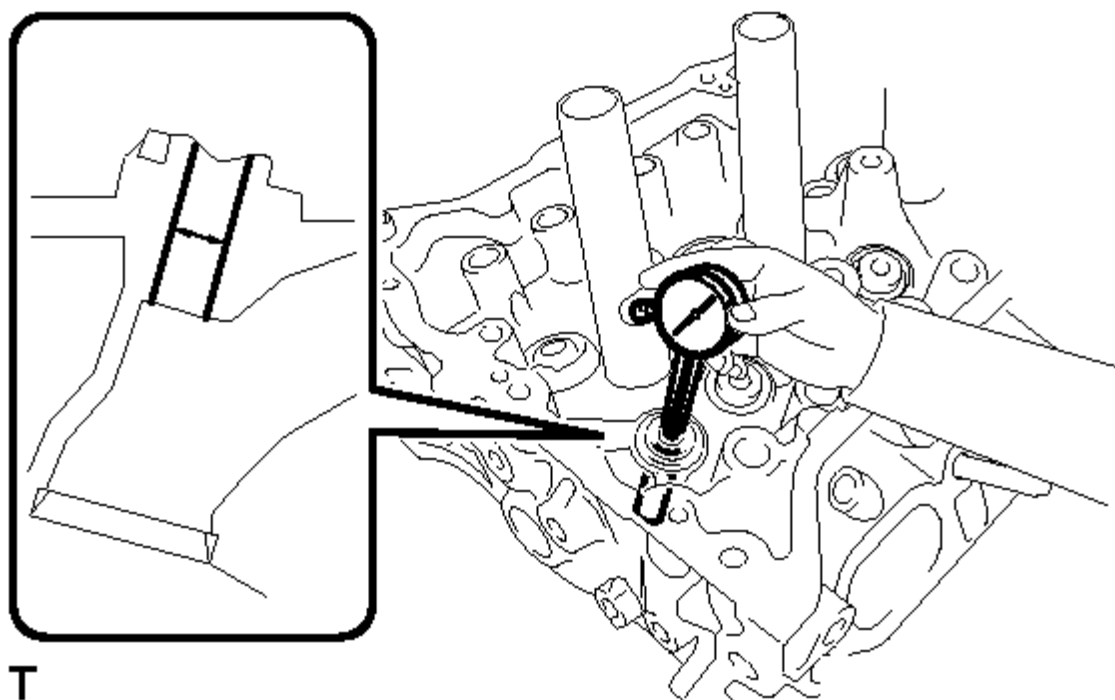
**T**

Fig. 390: Measuring Bush Bore Diameter Of Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Cylinder bore diameter

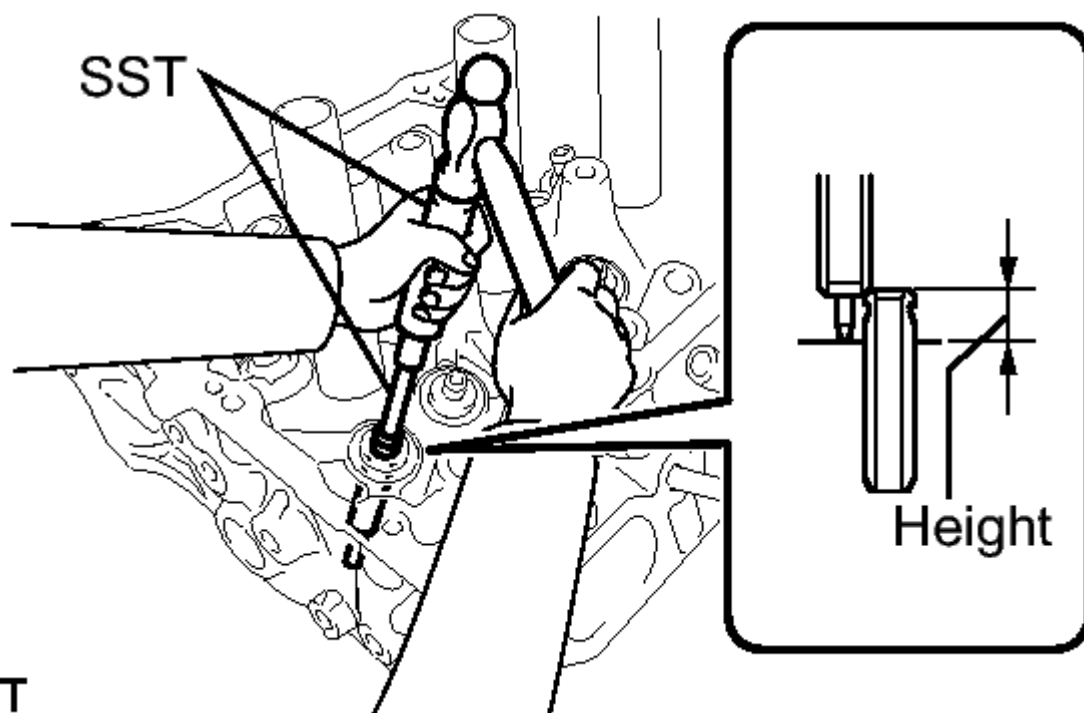
10.285 to 10.306 mm (0.4049 to 0.4057 in.)

Select a New Guide Bush (STD or O/S 0.05)

Bush Size	Bush Bore Diameter
STD	10.285 to 10.306 mm (0.4049 to 0.4057 in.)
O/S 0.05	10.335 to 10.356 mm (0.4069 to 0.4077 in.)

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

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

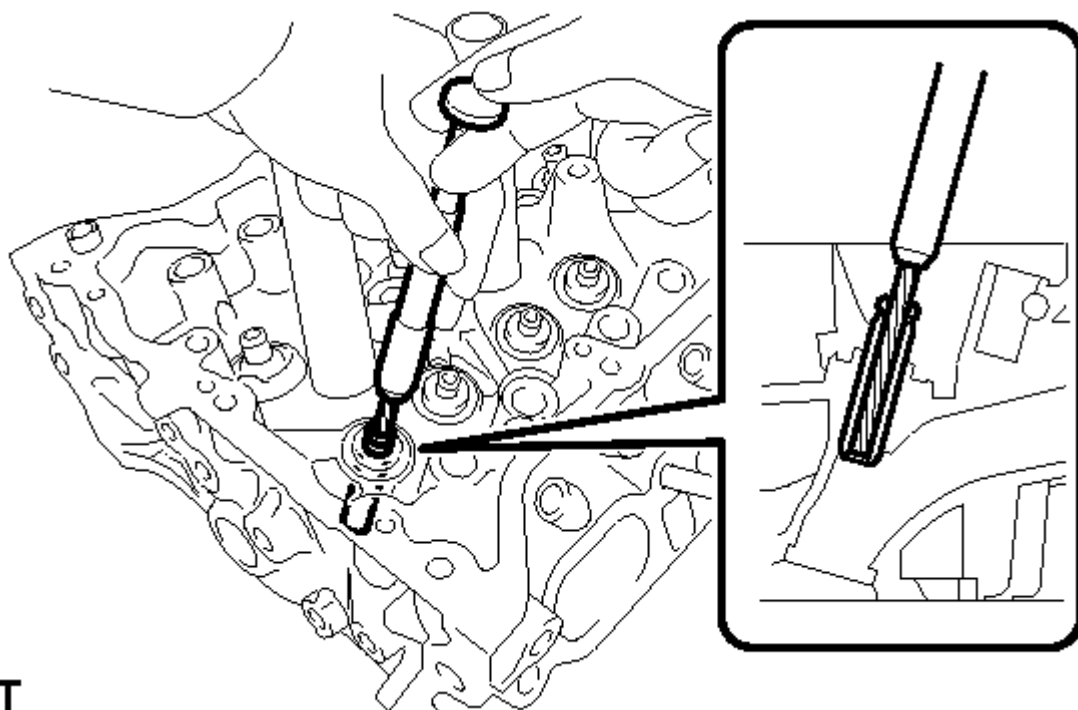
**T****Fig. 391: Tapping Guide Bush****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

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

Protrusion height

9.9 to 10.3 mm (0.3898 to 0.4055 in.)

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

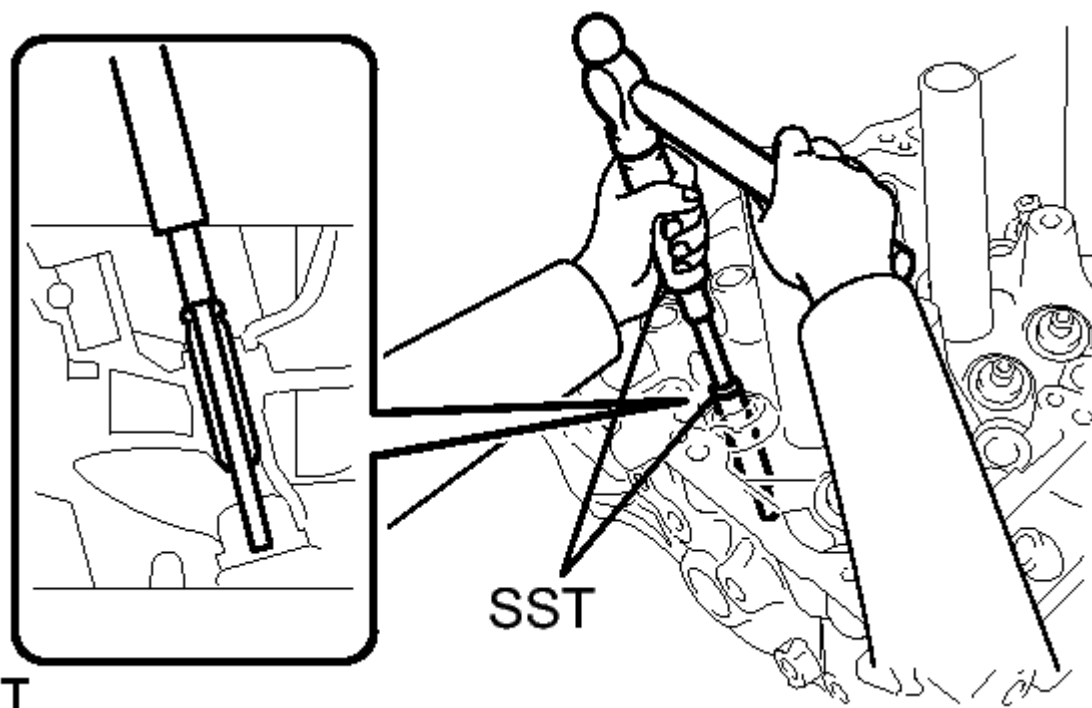
**T****Fig. 392: Reaming Guide Bush****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

Standard oil clearance

0.025 to 0.060 mm (0.0010 to 0.0024 in.)

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 guide bush.



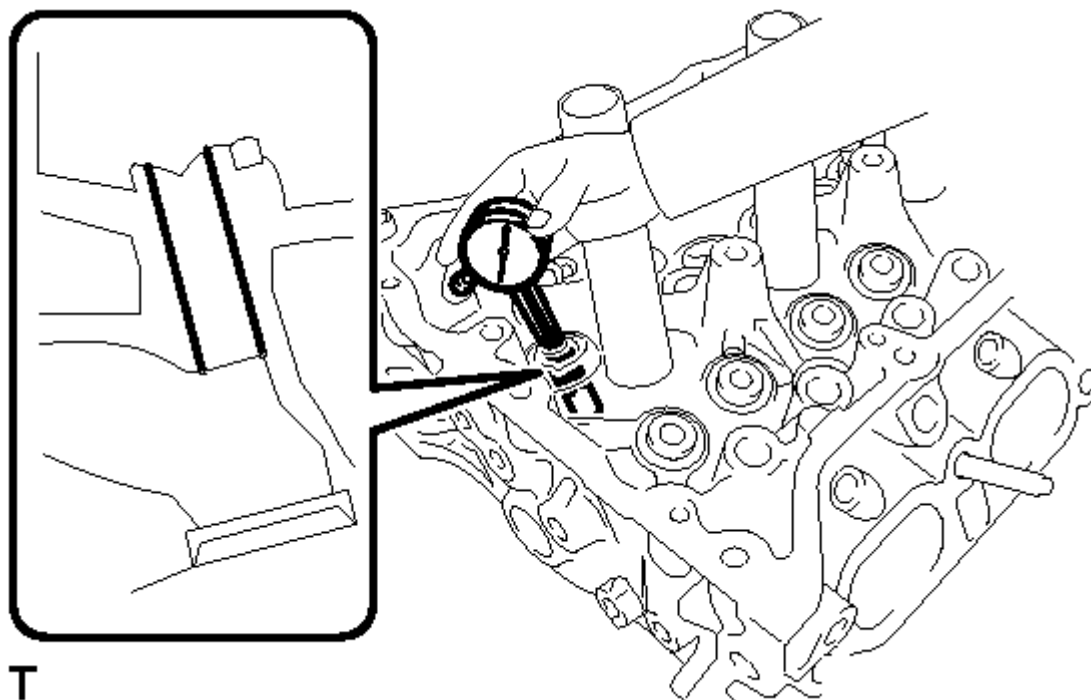
T

Fig. 393: Tapping Out Guide Bush

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 bush bore diameter of the cylinder head.



T

Fig. 394: Measuring Bush Bore Diameter Of Cylinder Head

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

Diameter

10.285 to 10.306 mm (0.4049 to 0.4057 in.)

Select a New Guide Bush (STD or O/S 0.05)

Bush Size	Bush Bore Diameter
STD	10.285 to 10.306 mm (0.4049 to 0.4057 in.)
O/S 0.05	10.335 to 10.356 mm (0.4069 to 0.4077 in.)

If the bush bore diameter of the cylinder head is greater than 10.306 mm (0.4057 in.), machine the bush bore to the dimension of 10.335 to 10.356 mm (0.4069 to 0.4077 in.) to install 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 and a hammer, tap a new guide bush into the specified protrusion height.

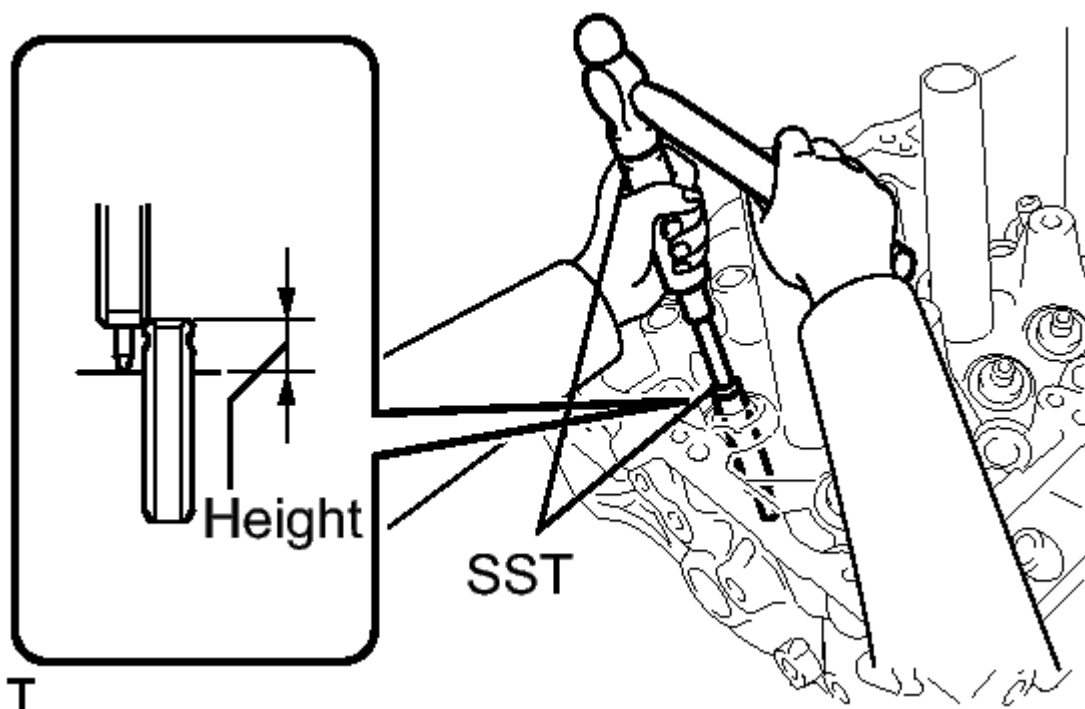


Fig. 395: Tapping Guide Bush

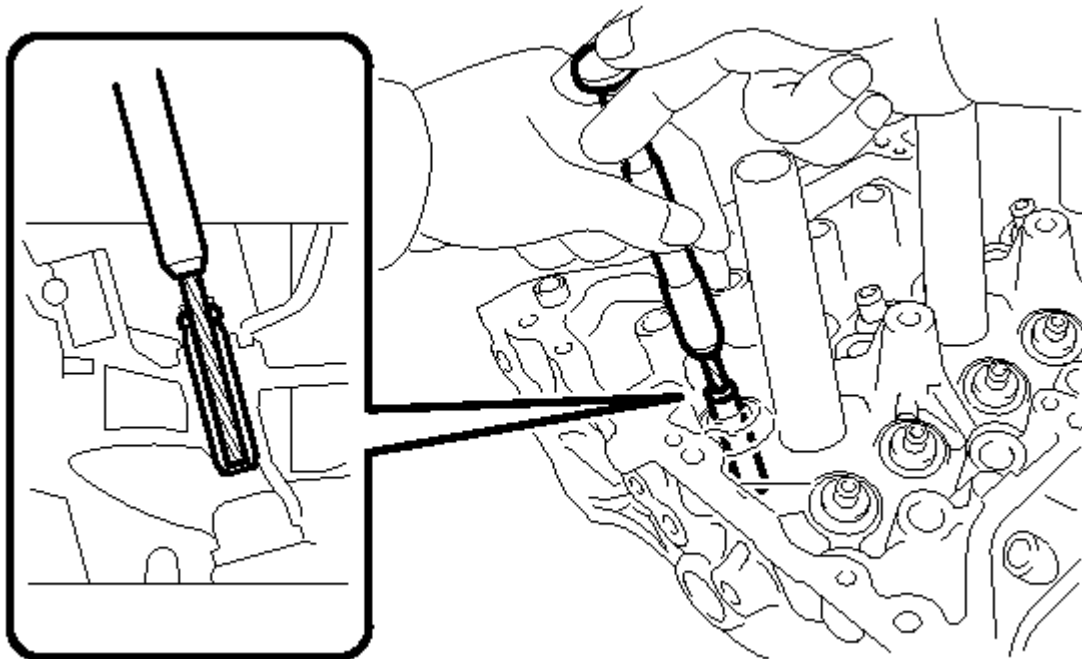
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Protrusion height

11.15 to 11.55 mm (0.4390 to 0.4547 in.)

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



T

Fig. 396: Reaming Guide Bush

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

Standard oil clearance

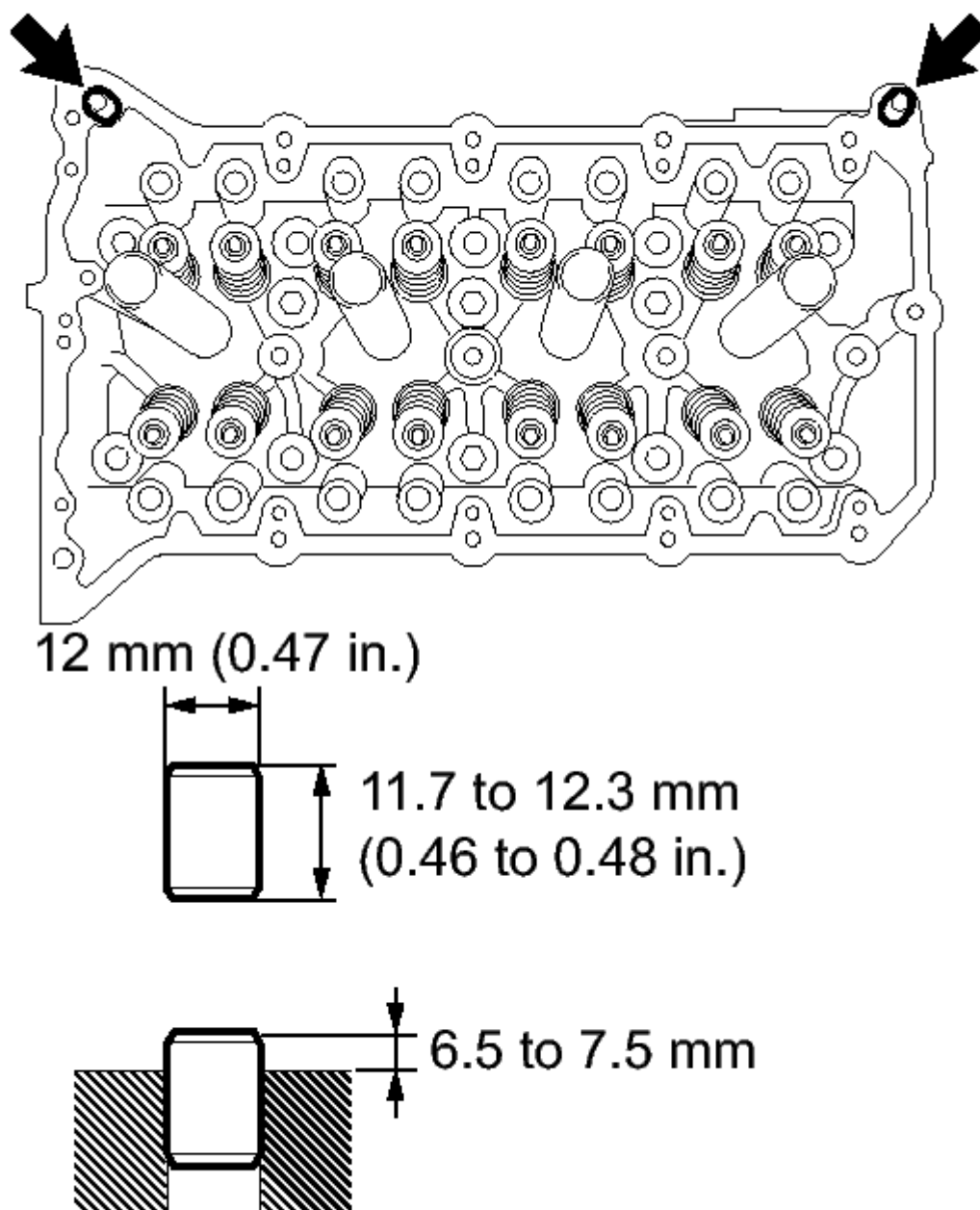
0.030 to 0.065 mm (0.0012 to 0.0026 in.)

3. REPLACE RING PIN

NOTE: It is not necessary to remove the ring pins unless they are being replaced.

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

Upper Side:

**Fig. 397: Locating Stud Bolt**

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

Protrusion height

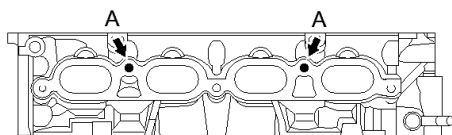
6.5 to 7.5 mm (0.26 to 0.30 in.)

4. REPLACE STUD BOLT

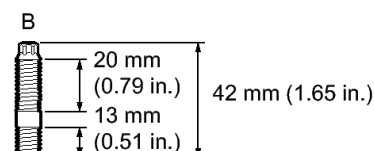
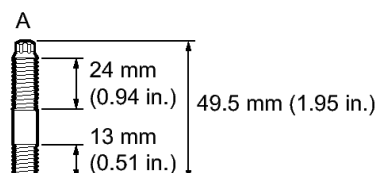
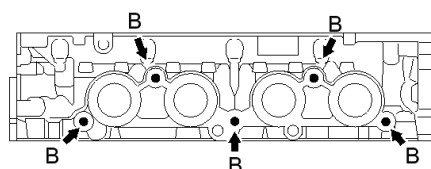
NOTE: If any of the stud bolts is deformed or the threads are damaged, replace it.

- a. Remove the stud bolts.
- b. Using an E8 "TORX" socket, install the stud bolts.

Intake Side:



Exhaust Side:



T

Fig. 398: Identifying Stud Bolts Height
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

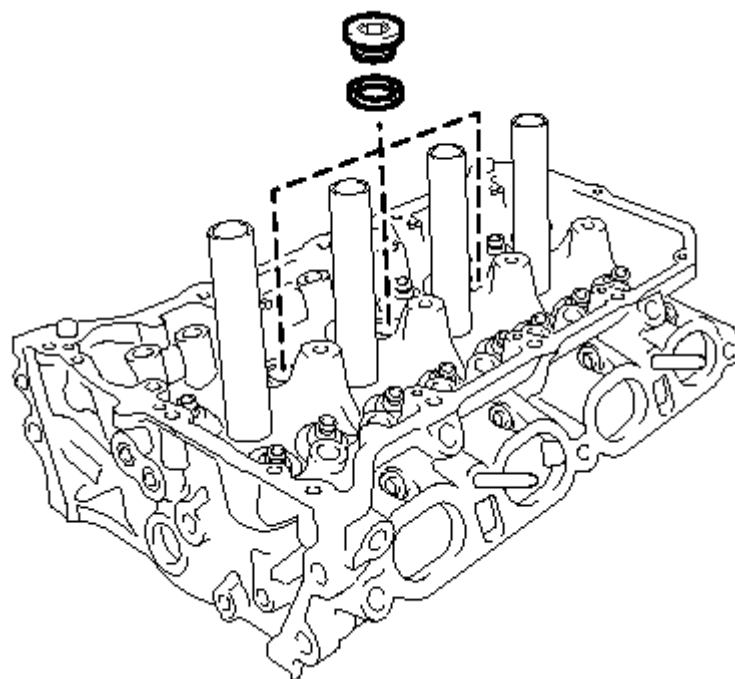
Torque: 9.5 N*m (97 kgf*cm, 84 in.*lbf)

REASSEMBLY

REASSEMBLY

1. INSTALL NO. 2 STRAIGHT SCREW PLUG

- a. Using a 10 mm straight hexagon wrench, install 3 new gaskets and the 3 straight screw plugs.



T

Fig. 399: Identifying Screw Plugs And Gaskets

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

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

2. INSTALL VALVE SPRING SEAT

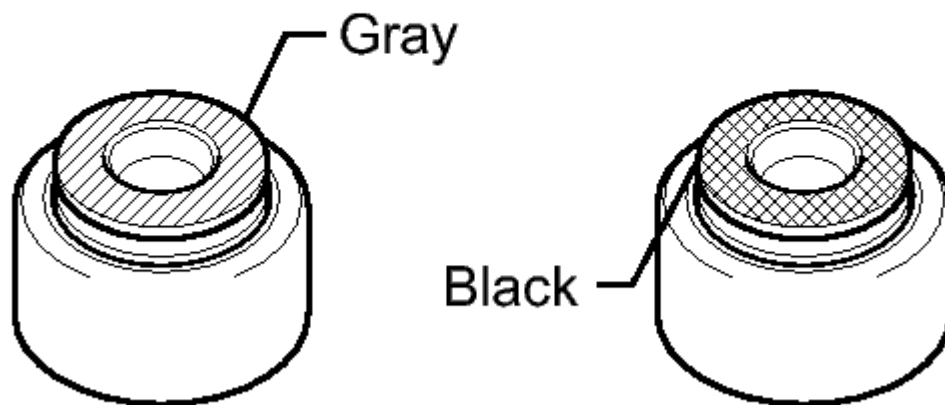
- a. Install the valve spring seats to the cylinder head.

3. INSTALL VALVE STEM OIL SEAL

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

Intake Side:

Exhaust Side:



C

Fig. 400: Identifying Intake And Exhaust Oil Seals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Pay close attention when installing the intake and exhaust oil seals. Installing the intake oil seal into the exhaust side or installing the exhaust oil seal to the intake side may cause installation problems later.

HINT:

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

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

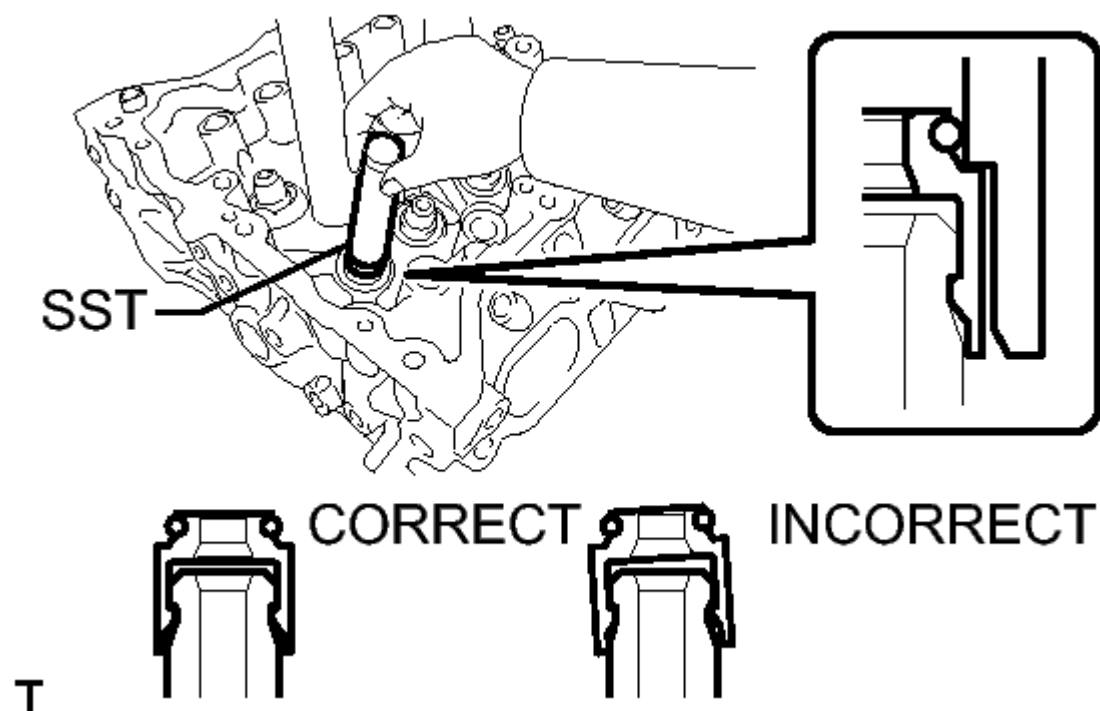


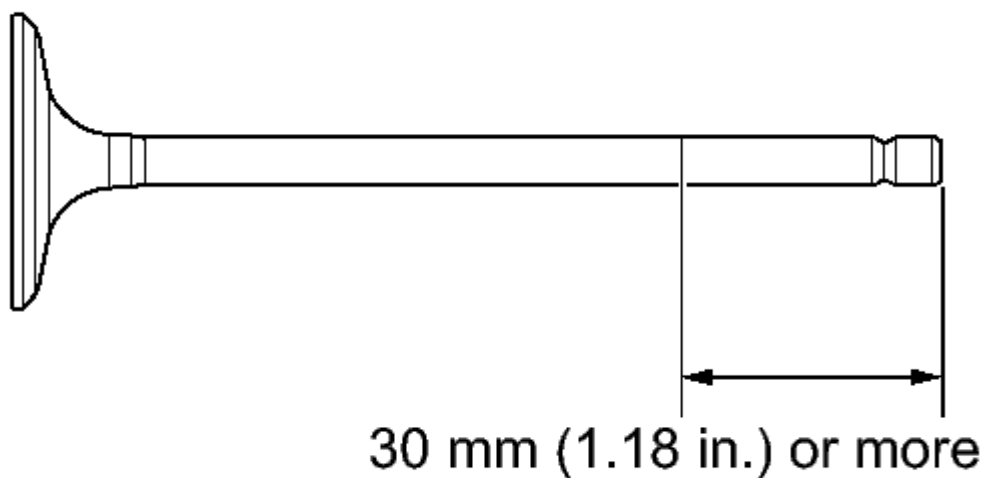
Fig. 401: Pushing Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09201-41020

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

4. INSTALL INTAKE VALVE

- a. Sufficiently apply engine oil to the tip area of the intake valve shown in the illustration.



T

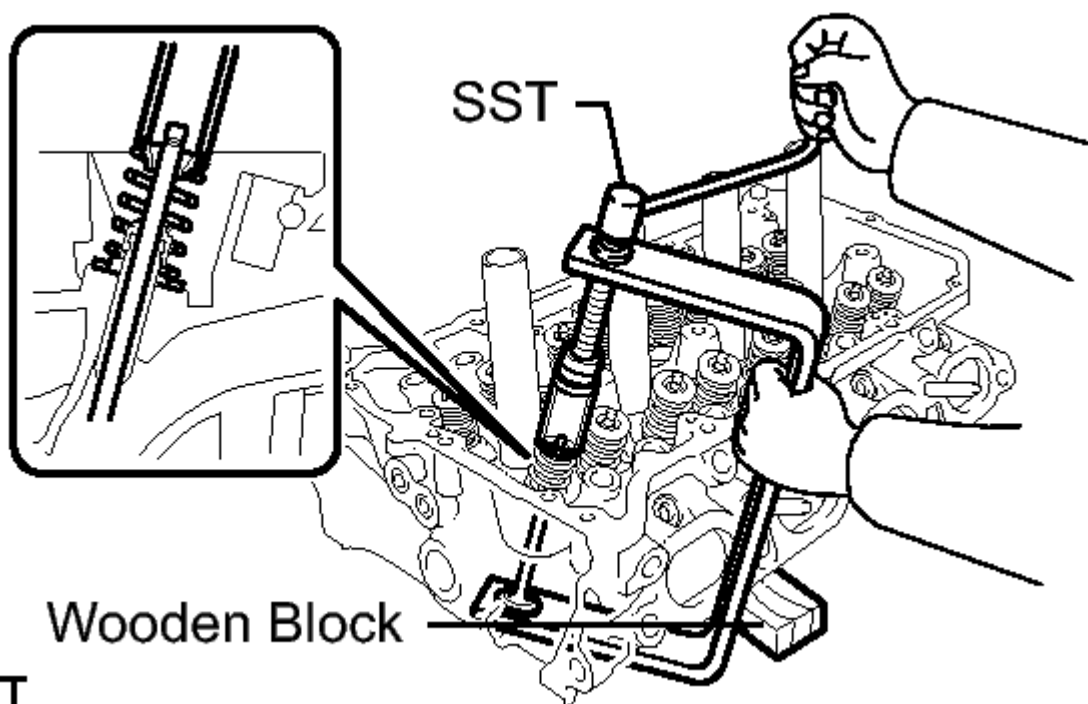
Fig. 402: Identifying Intake Valve Dimension

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

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

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

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



T

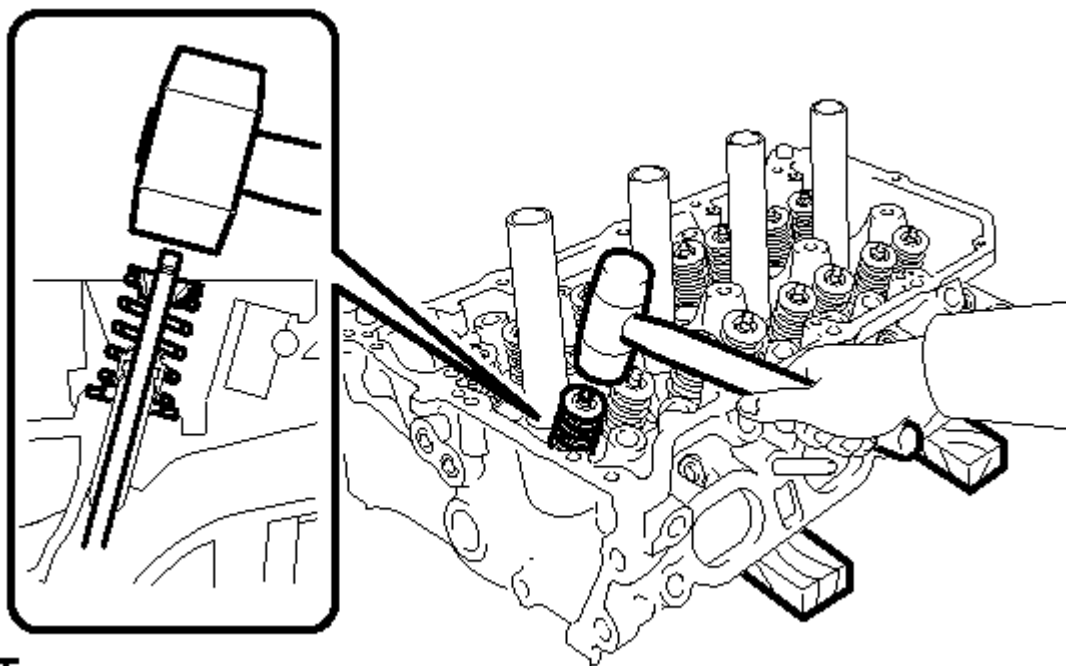
Fig. 403: Compressing Spring

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

- **SST: 09202-70020**

09202-00010

- d. Using a plastic-faced hammer, lightly tap the valve stem tip to ensure a proper fit.



T

Fig. 404: Tapping Valve Stem

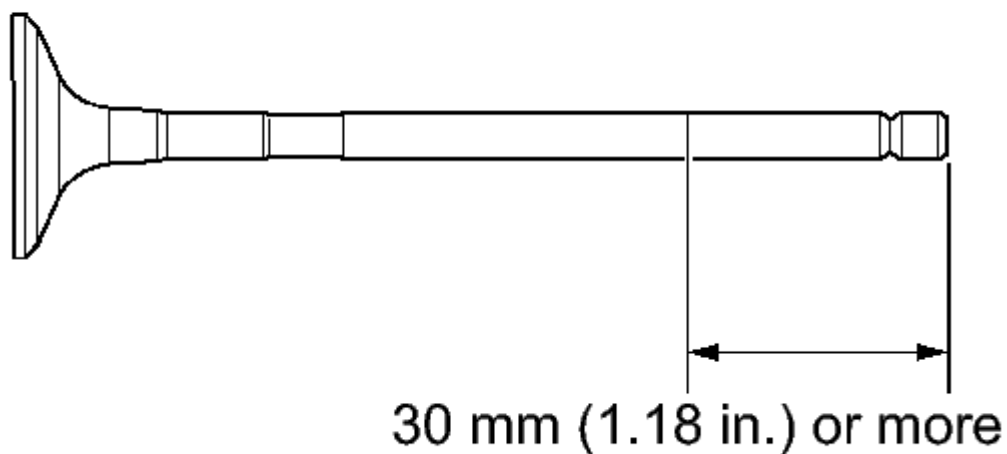
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Be careful not to damage the valve stem tip.
- Be careful not to damage the retainer.

5. INSTALL EXHAUST VALVE

- a. Sufficiently apply engine oil to the tip area of the exhaust valve shown in the illustration.



T

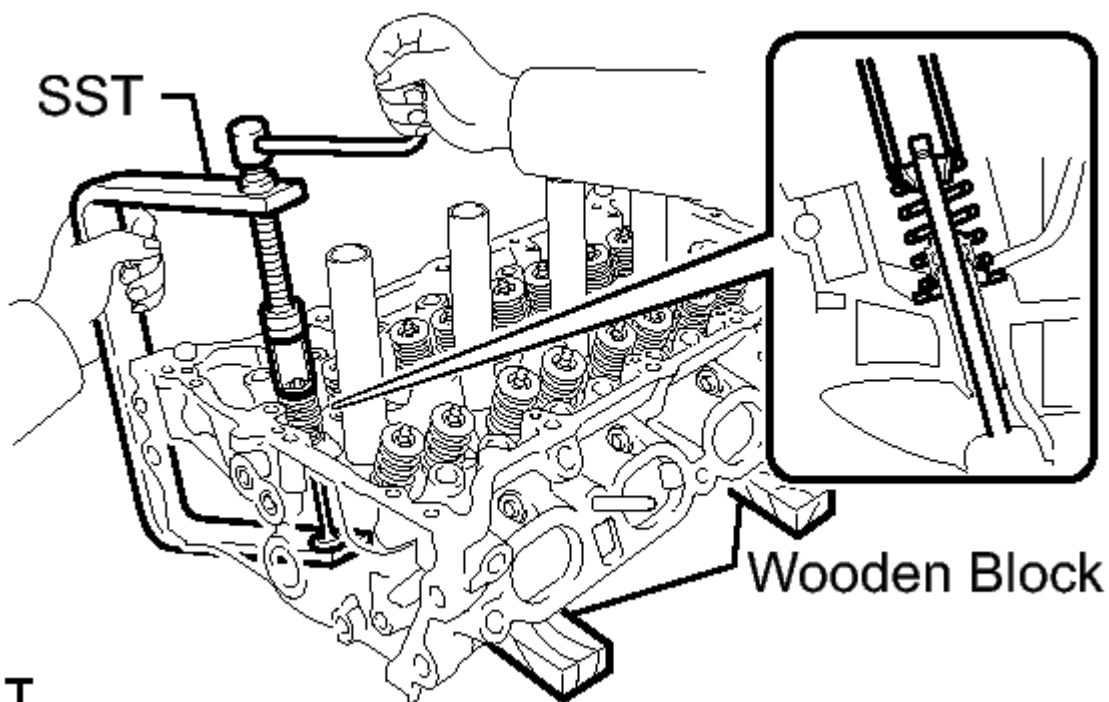
Fig. 405: Identifying Exhaust Valve Dimension

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

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

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

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



T

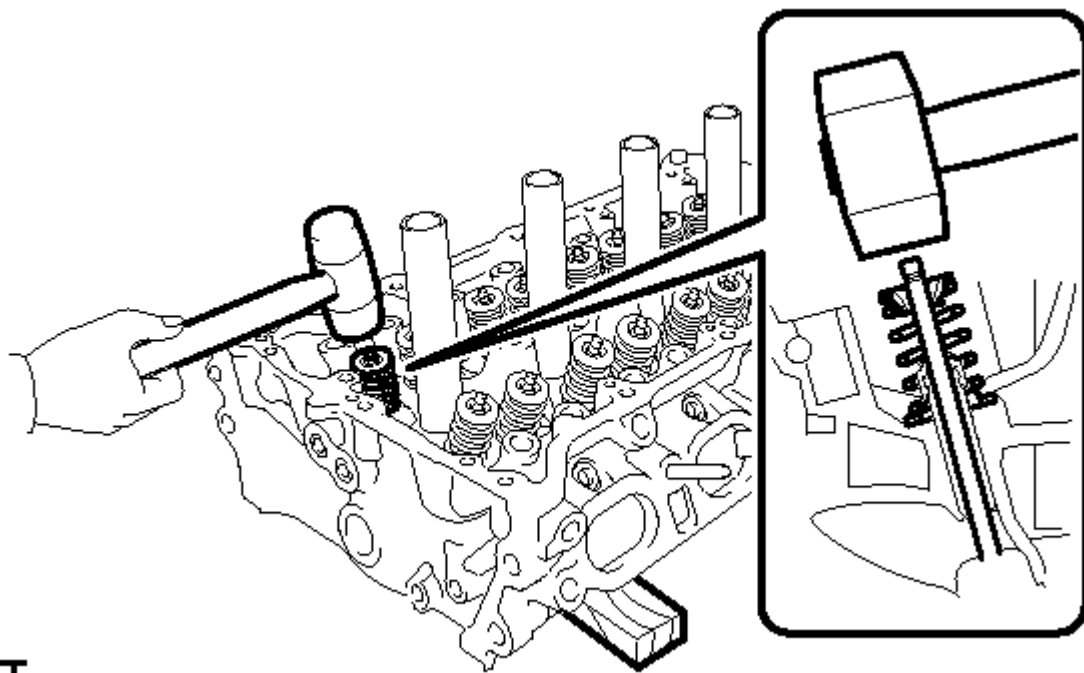
Fig. 406: Compressing Valve Retainer Locks

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

- **SST: 09202-70020**

09202-00010

- d. Using a plastic-faced hammer, lightly tap the valve stem tip to ensure a proper fit.



T

Fig. 407: Tapping Valve Stem

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

NOTE:

- Be careful not to damage the valve stem tip.
- Be careful not to damage the retainer.

6. INSTALL VALVE STEM CAP

- a. Apply a light coat of engine oil to the valve stem caps.
- b. Install the valve stem caps to the cylinder head.

REPAIR

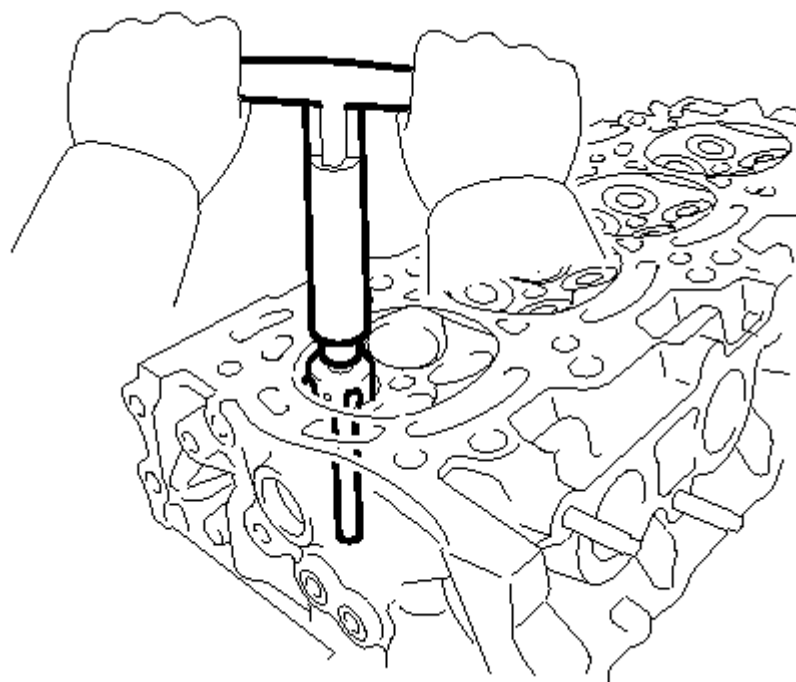
REPAIR

1. REPAIR VALVE SEATS

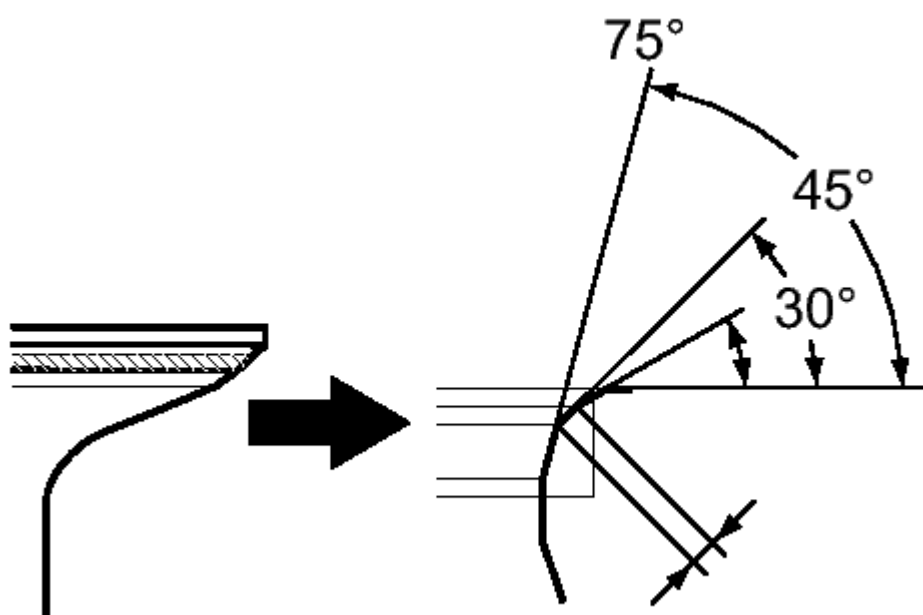
NOTE:

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

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

**T****Fig. 408: Grinding Valve Seat Using Cutter****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

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

**Fig. 409: Identifying Valve Seat Angle****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

Valve Seat Width

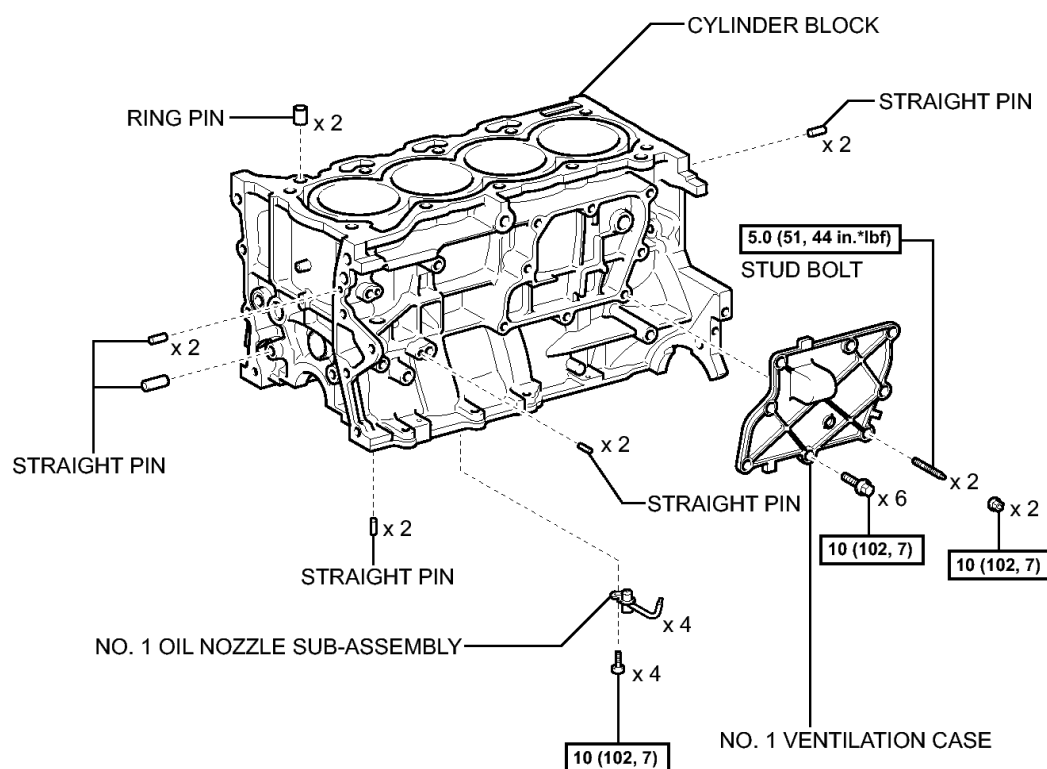
Item	Specified Condition
Intake Side	1.0 to 1.4 mm (0.039 to 0.055 in.)
Exhaust Side	1.0 to 1.4 mm (0.039 to 0.055 in.)

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

CYLINDER BLOCK

COMPONENTS

ILLUSTRATION



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

Fig. 410: Identifying Cylinder Block Replacement Components With Torque Specifications (1 Of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

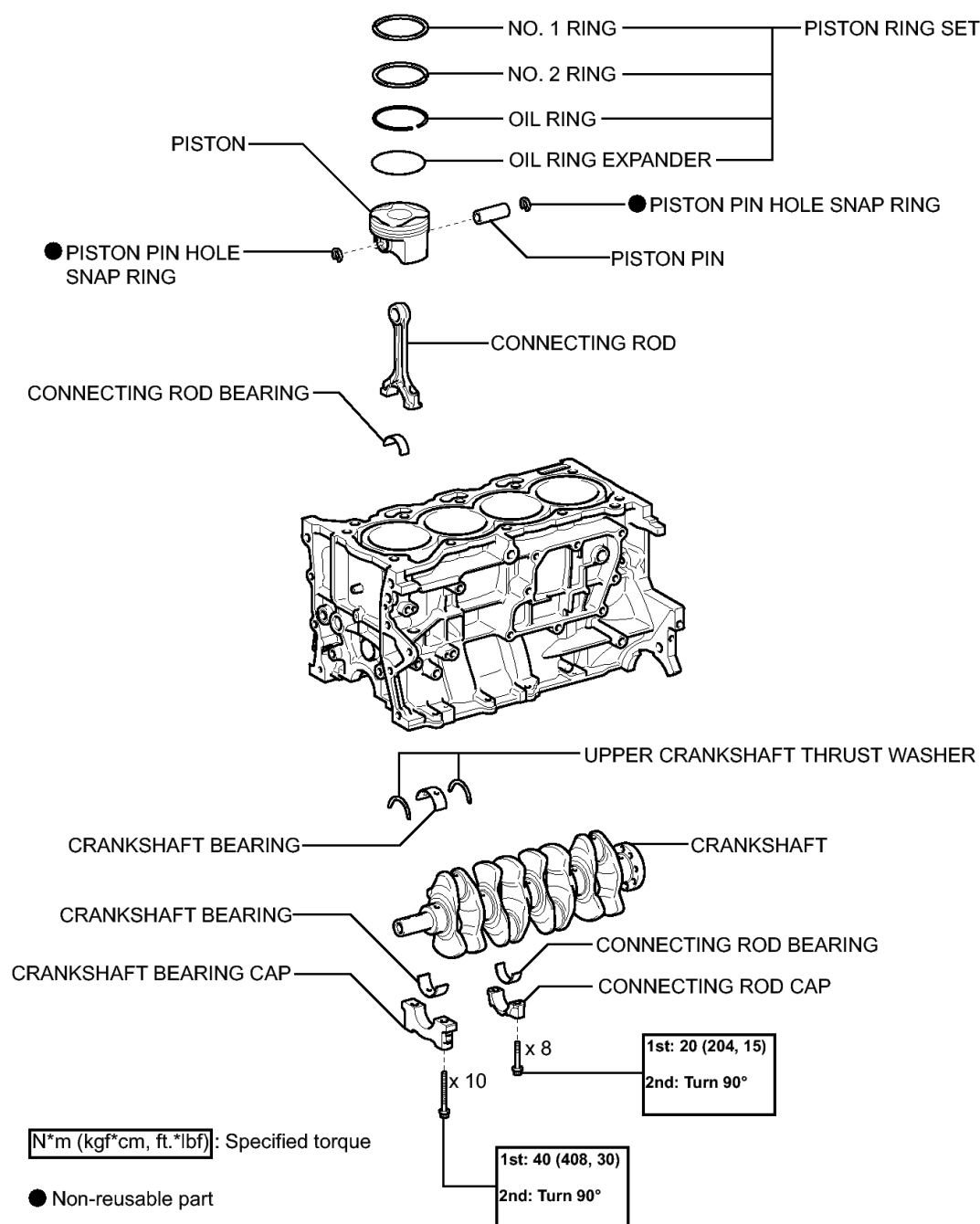


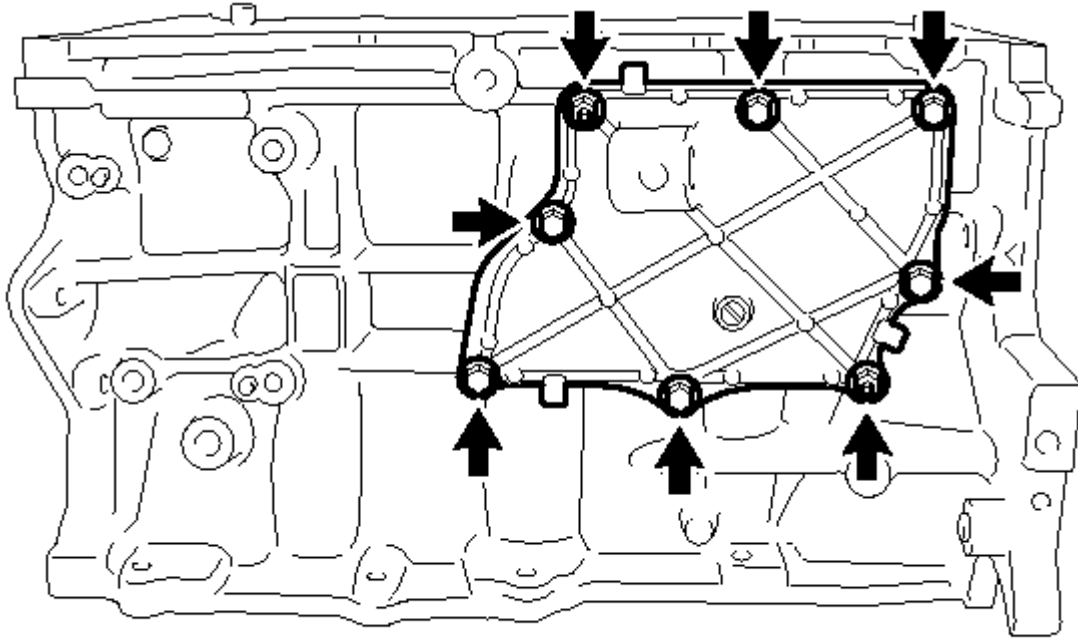
Fig. 411: Identifying Cylinder Block Replacement Components With Torque Specifications (2 Of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

DISASSEMBLY

1. REMOVE NO. 1 VENTILATION CASE

- Remove the 6 bolts and 2 nuts.

**T****Fig. 412: Locating No. 1 Ventilation Case Bolts****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- b. Remove the No. 1 ventilation case by prying between the No. 1 ventilation case and cylinder block with a screwdriver as shown in the illustration.

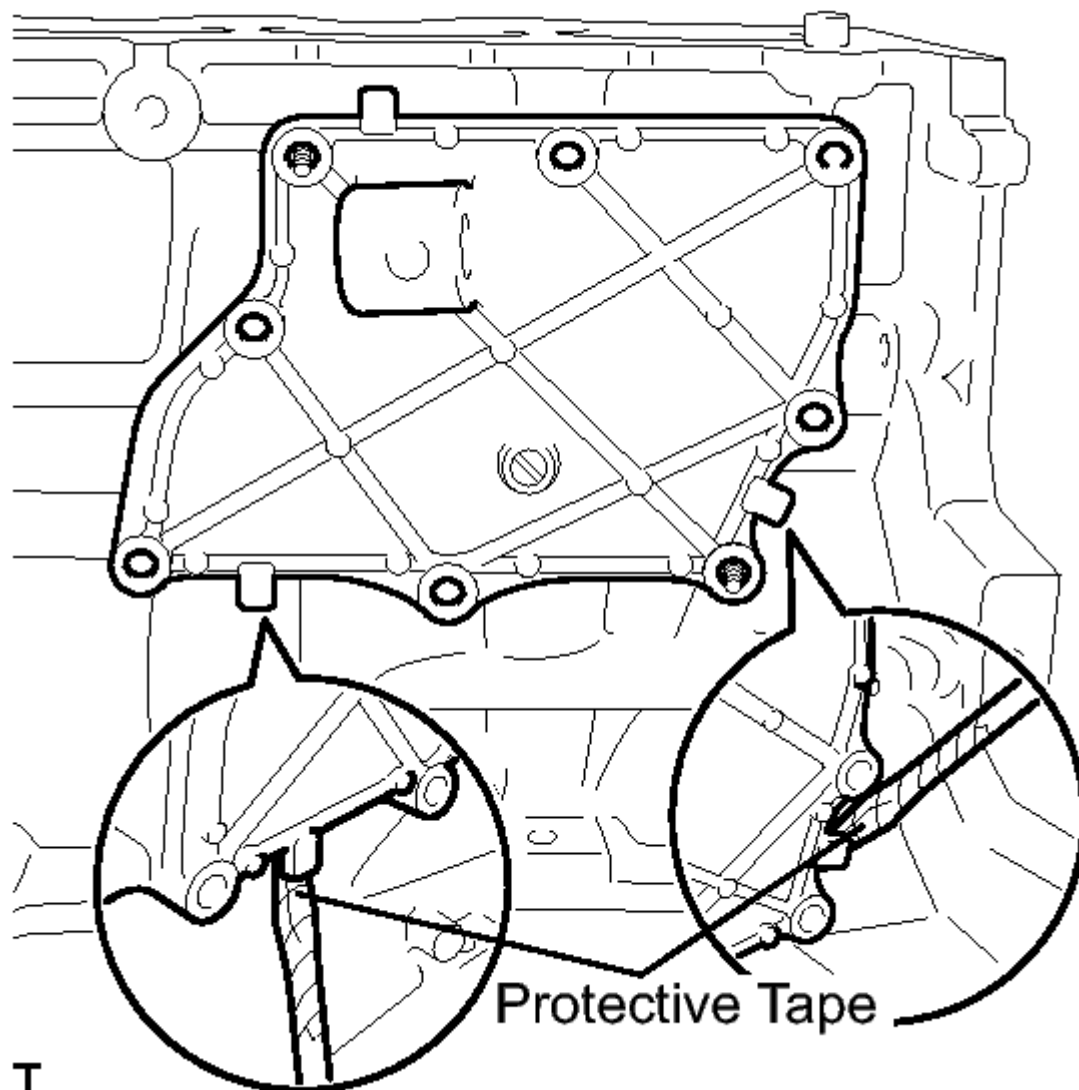


Fig. 413: Prying No. 1 Ventilation Case

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

NOTE: Be careful not to damage the contact surfaces of the cylinder block and No. 1 ventilation case.

HINT:

Tape the screwdriver tip before use.

2. REMOVE PISTON SUB-ASSEMBLY WITH CONNECTING ROD

- a. Using a ridge reamer, remove all the carbon from the top of the cylinder.

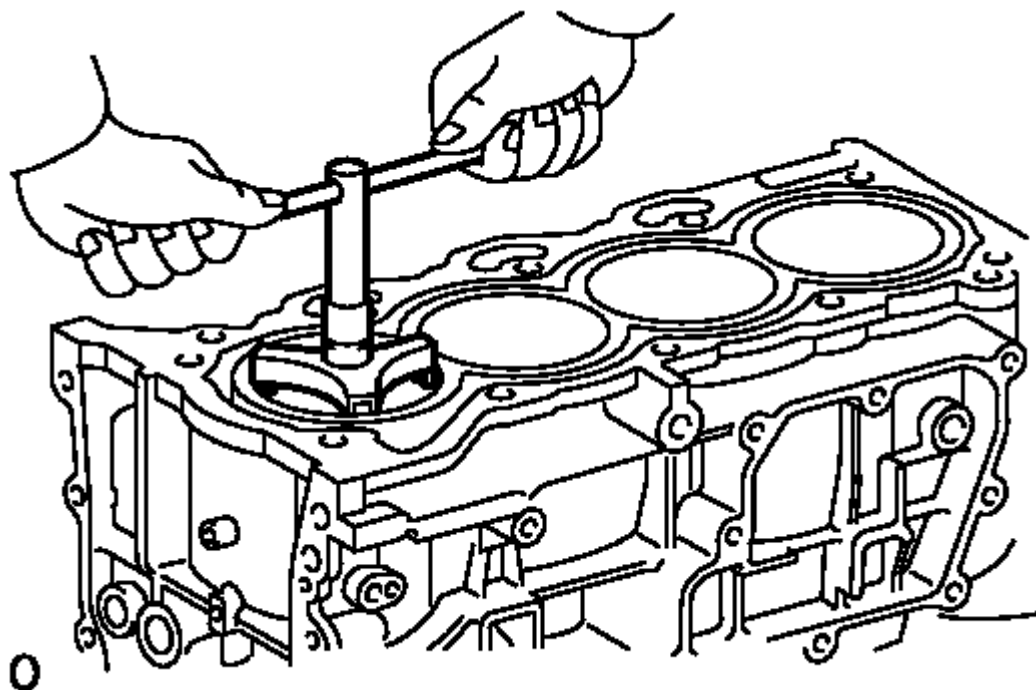
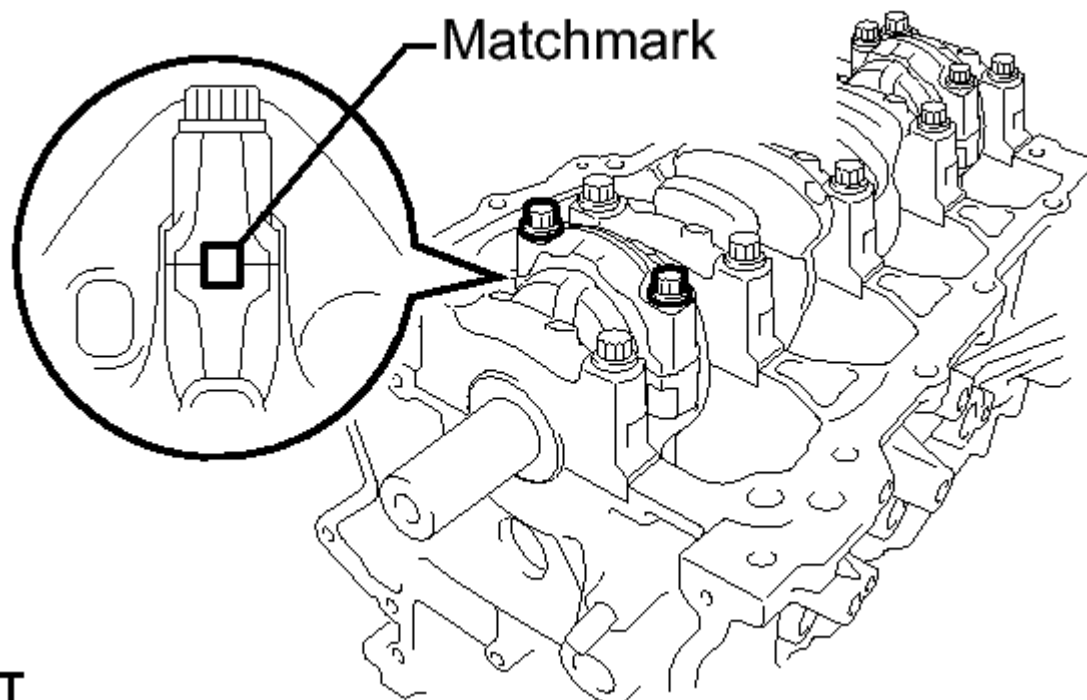


Fig. 414: Removing Carbon From Top Of Cylinder
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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



T

Fig. 415: Identifying Matchmarks On Connecting Rod
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

The matchmarks on the connecting rods and caps are provided to ensure correct reassembly.

- c. Using SST, uniformly loosen the 2 bolts.

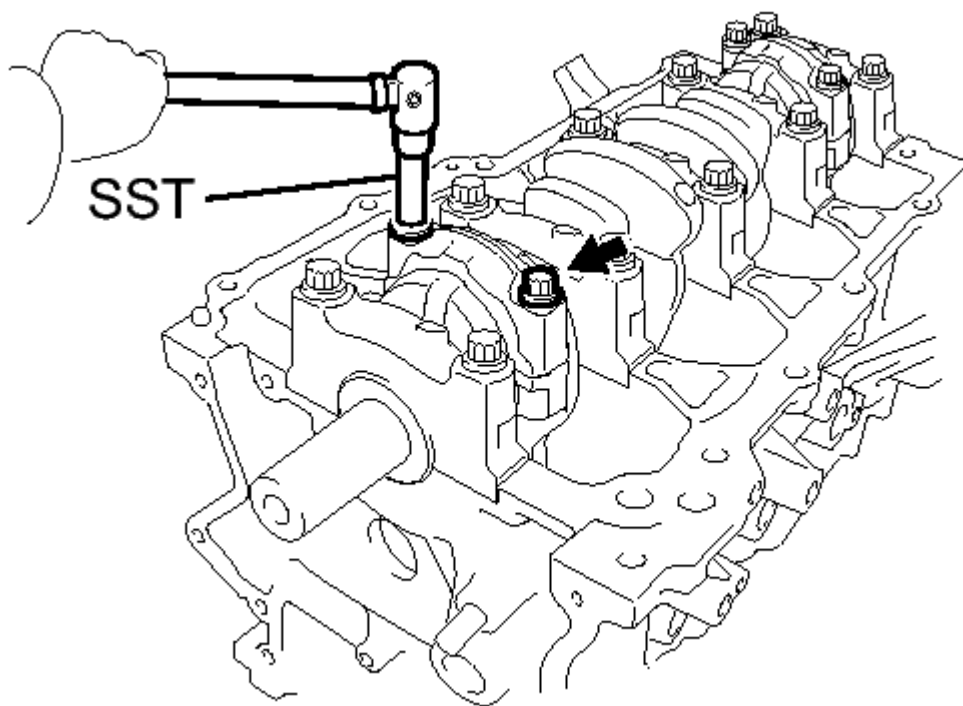
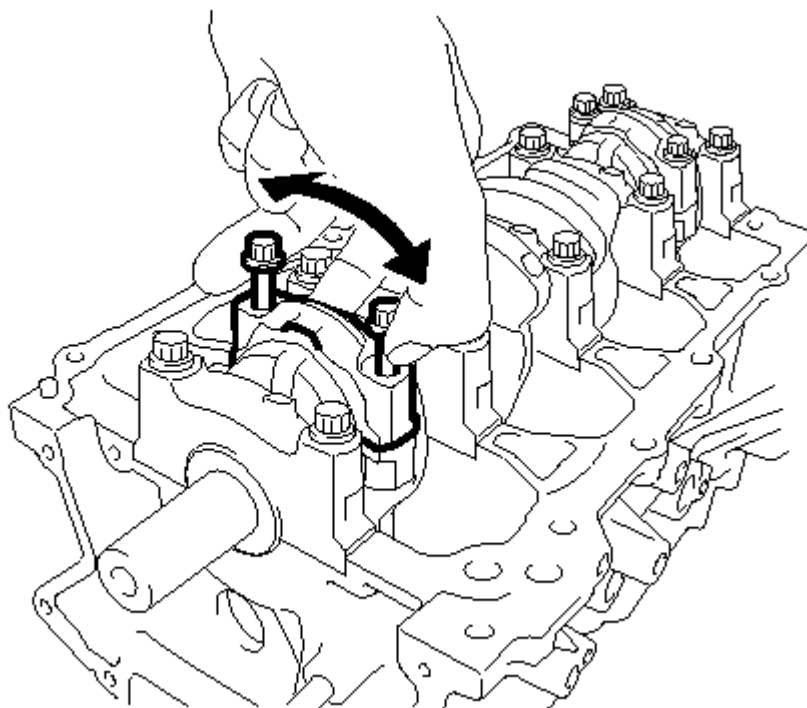


Fig. 416: Loosening Bolts

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

- SST: 09205-16010

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



T

Fig. 417: Loosening Connecting Rod Cap Bolts

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

HINT:

Keep the lower bearing inserted in the connecting rod cap.

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

HINT:

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

3. REMOVE CONNECTING ROD BEARING

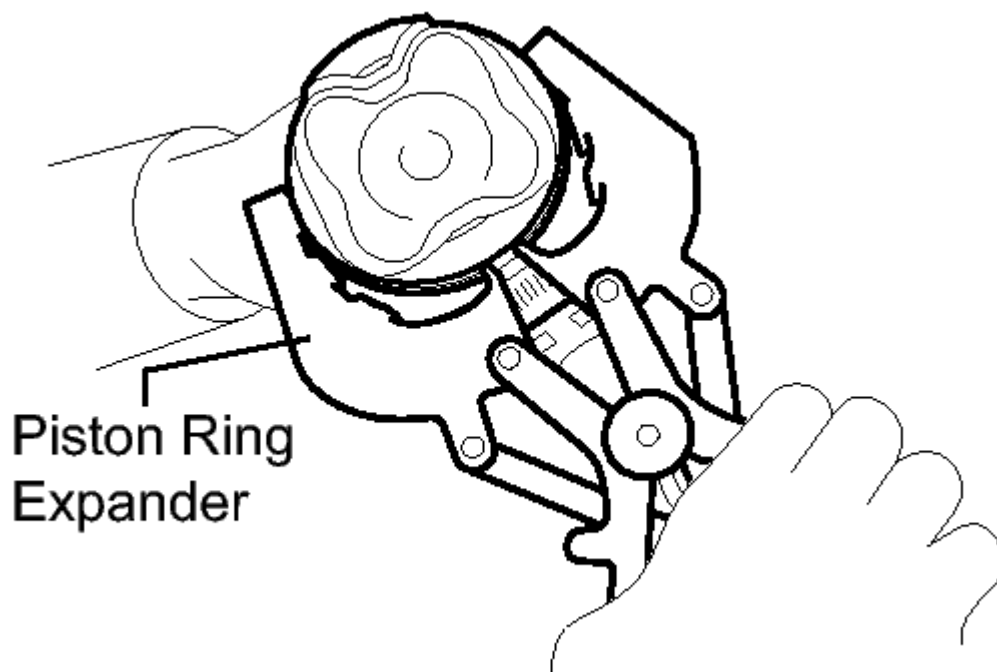
- a. Remove the connecting rod bearings.

HINT:

Arrange the removed parts in the correct order.

4. REMOVE PISTON RING SET

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

**T****Fig. 418: Removing Compression Rings**

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

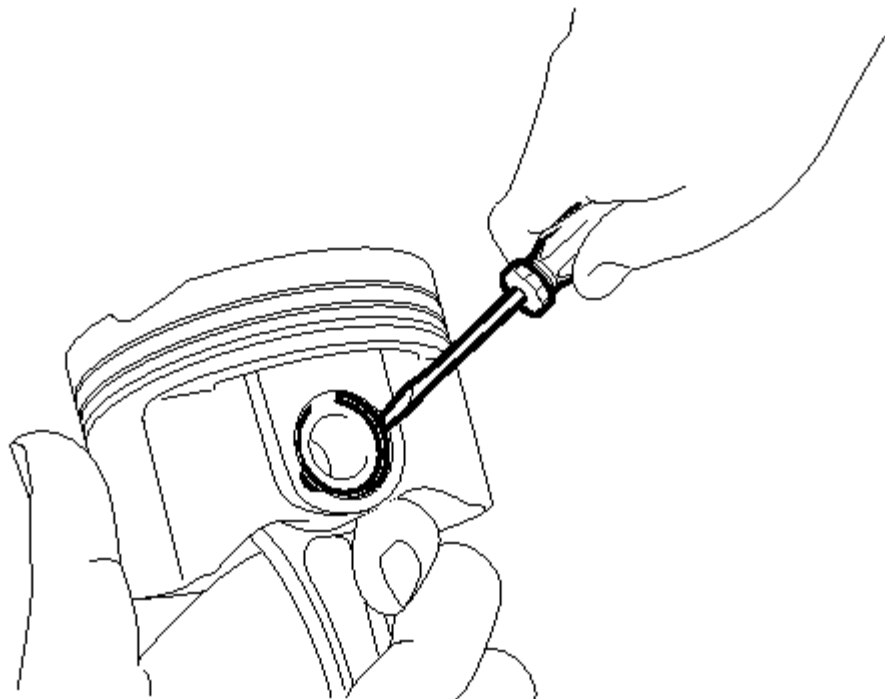
- b. Remove the oil ring rail and oil ring expander by hand.

HINT:

Arrange the removed parts in the correct order.

5. REMOVE PISTON

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

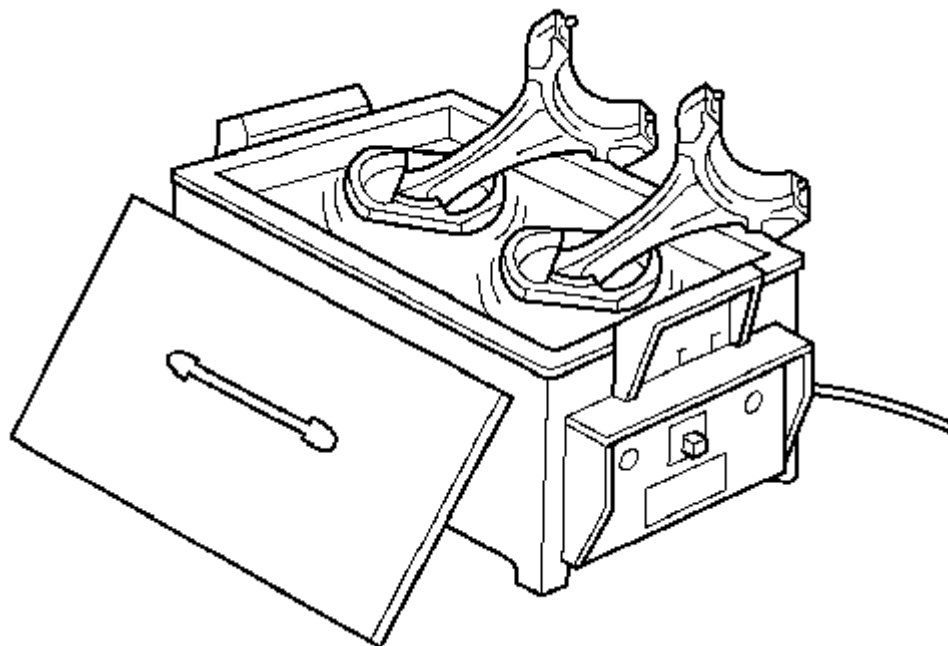


T

Fig. 419: Prying Out Snap Rings

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

- b. Gradually heat each piston to approximately 80 to 90°C (176 to 194°F).

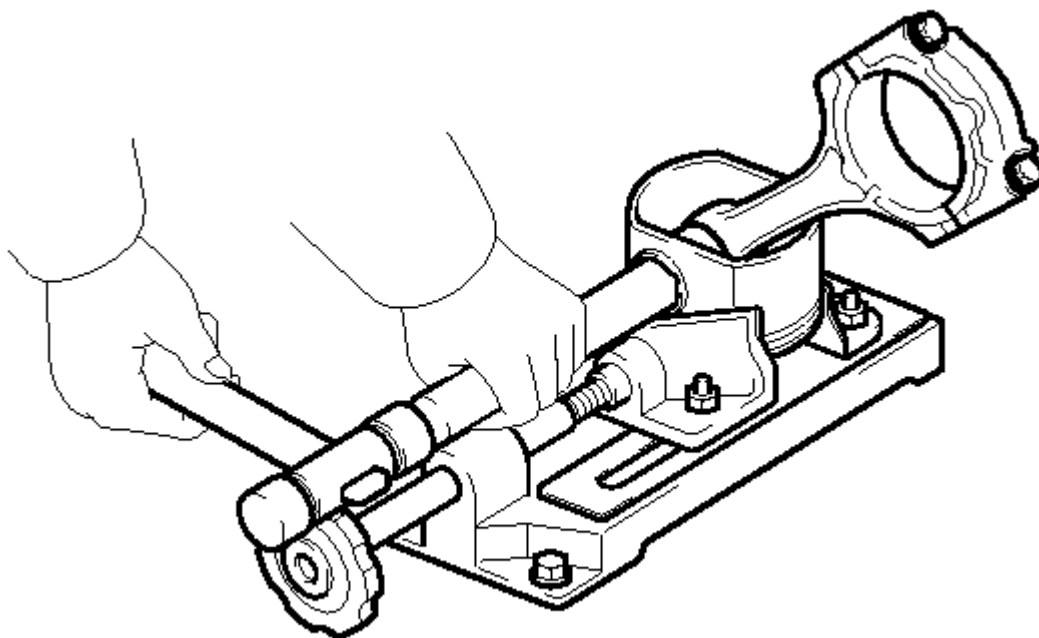


Y

Fig. 420: Heating Piston

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

- c. Using a plastic hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.



P

Fig. 421: Removing Connecting Rod

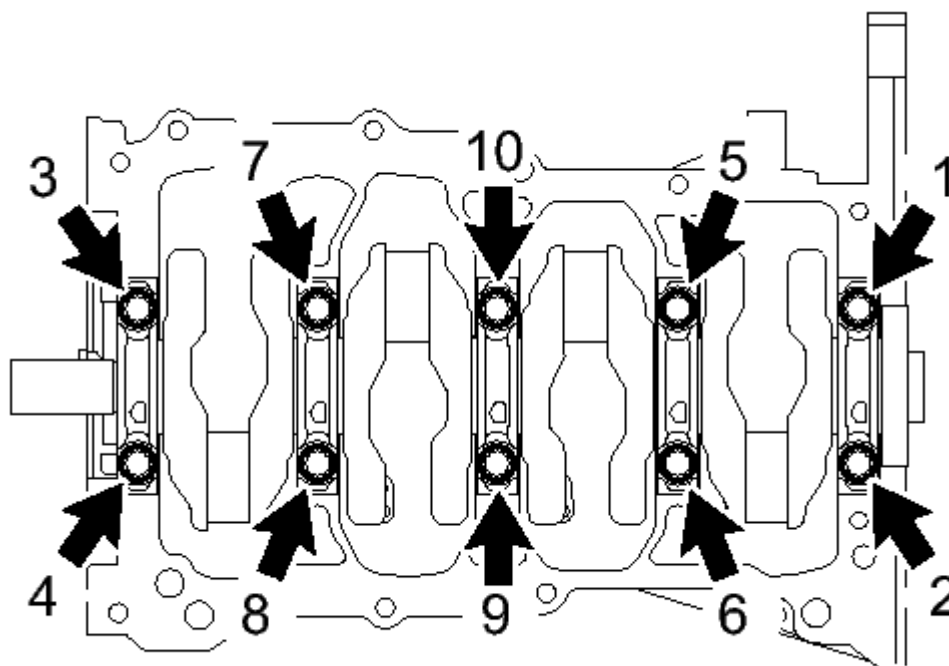
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

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

6. REMOVE CRANKSHAFT

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

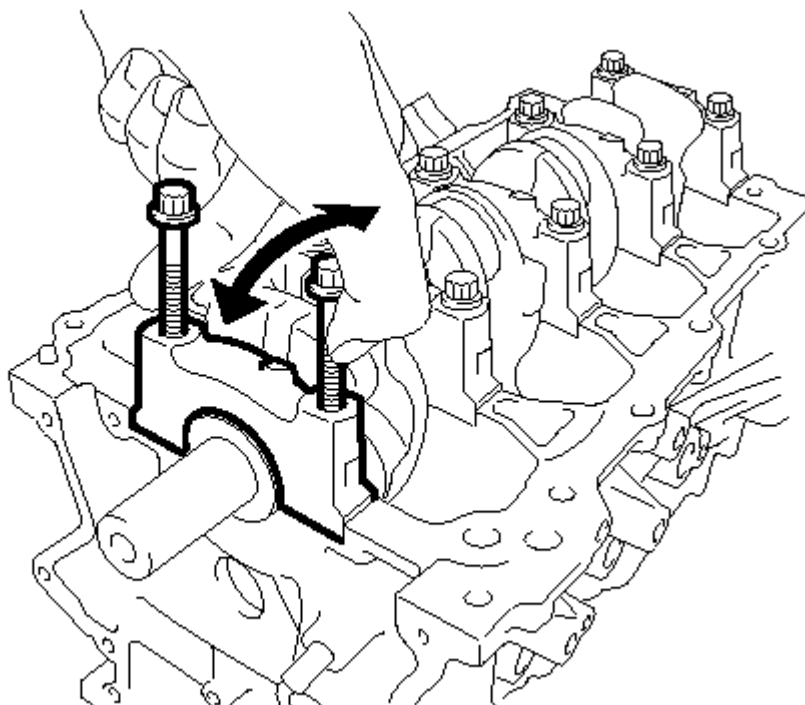


T

Fig. 422: Locating Main Bearing Cap Bolts And Loosening Sequence

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

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



T

Fig. 423: Loosening Main Bearing Cap Bolts

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

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

damage the contact surfaces of the cap and cylinder block.

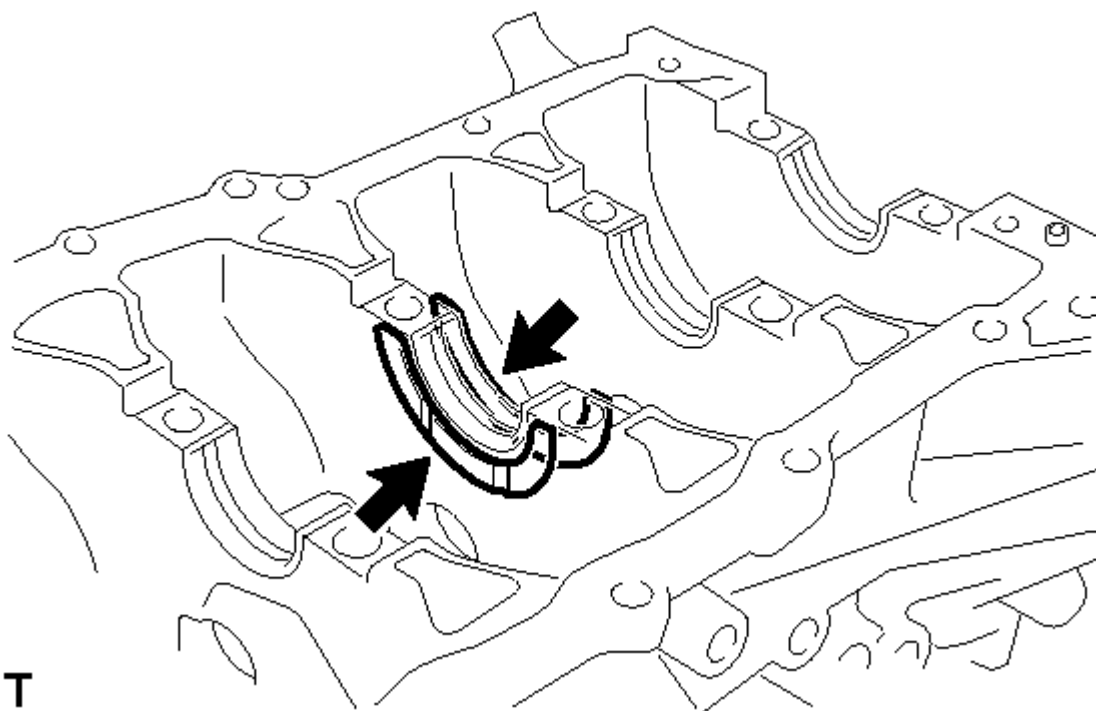
HINT:

- Keep the lower bearing and main bearing cap as a set.
- Arrange the main bearing caps in the correct order.

c. Lift out the crankshaft.

7. REMOVE UPPER CRANKSHAFT THRUST WASHER

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

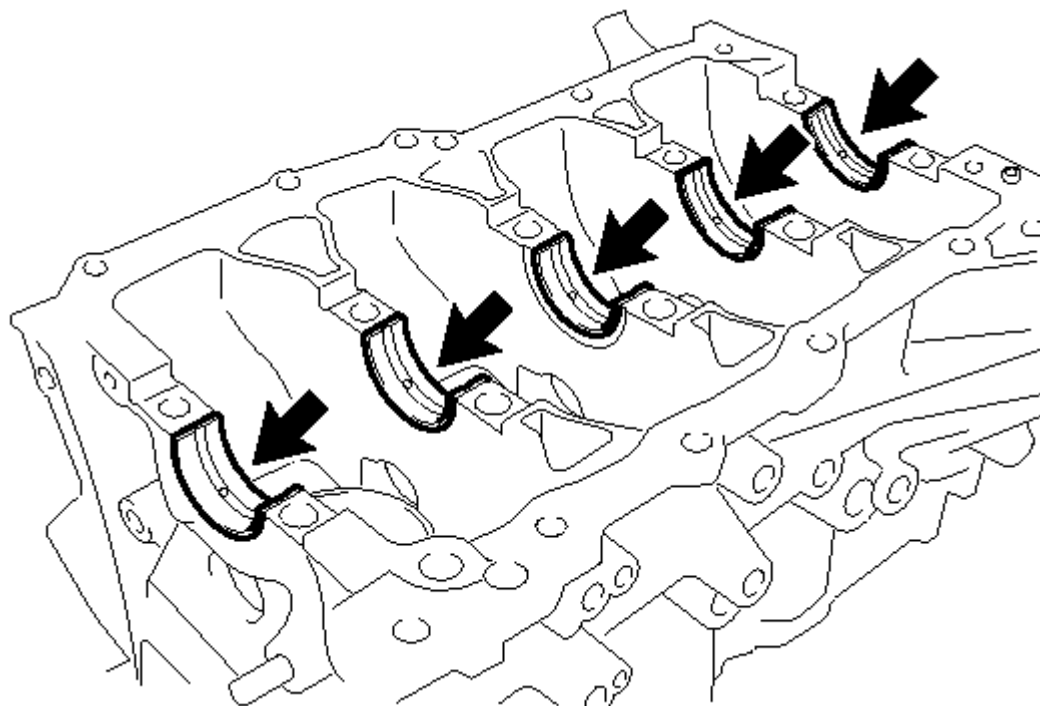


T

Fig. 424: Locating Upper Crankshaft Thrust Washers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. REMOVE CRANKSHAFT BEARING

- a. Remove the 5 upper main bearings from the cylinder block.

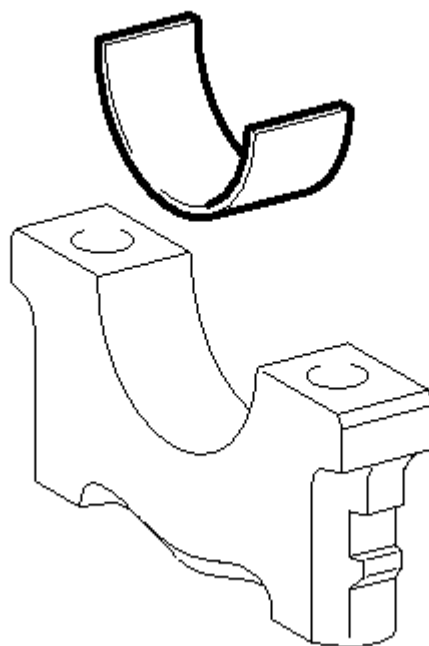
**T****Fig. 425: Locating Upper Main Bearings**

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

HINT:

Arrange the bearings in the correct order.

- b. Remove the 5 lower main bearings from the 5 main bearing caps.

**T****Fig. 426: Identifying Lower Main Bearing**

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

HINT:

Arrange the bearings in the correct order.

9. REMOVE NO. 1 OIL NOZZLE SUB-ASSEMBLY

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

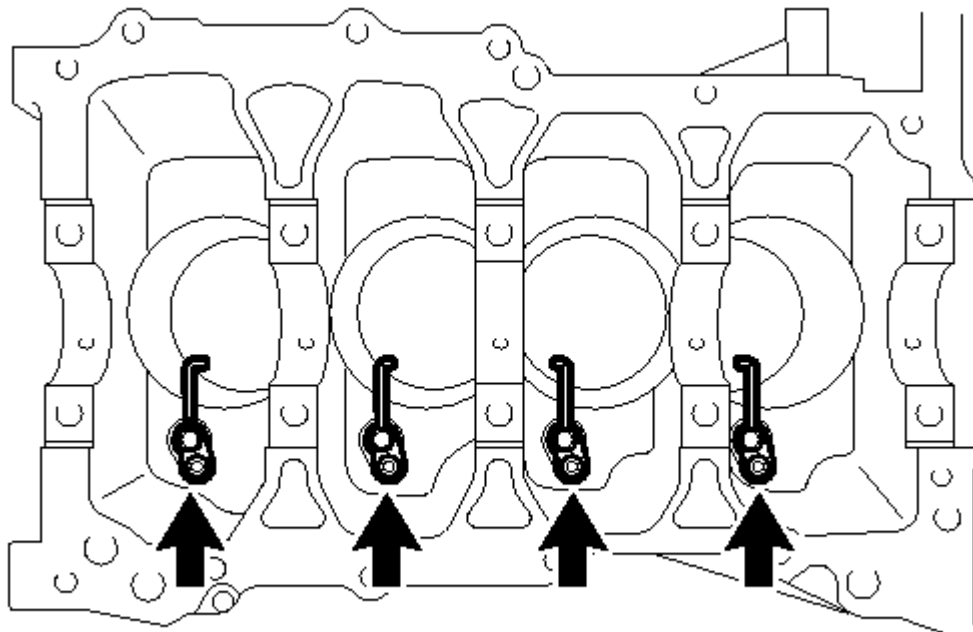
**T**

Fig. 427: Locating Bolts And Oil Nozzles

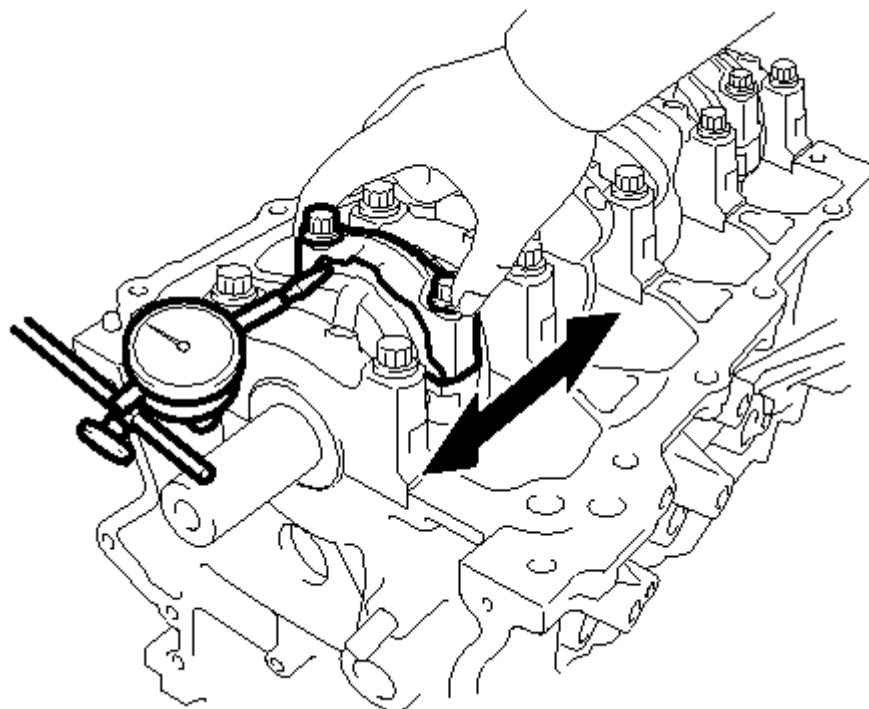
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. CLEAN CYLINDER BLOCK

NOTE: If the cylinder is washed at high temperature, the cylinder liner will stick out beyond the cylinder block. Always wash the cylinder block at a temperature of 45°C (113°F) or less.

INSPECTION**INSPECTION****1. INSPECT CONNECTING ROD THRUST CLEARANCE**

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

**T****Fig. 428: Measuring Thrust Clearance****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

Standard thrust clearance

0.160 to 0.342 mm (0.0063 to 0.0135 in.)

Maximum thrust clearance

0.342 mm (0.0135 in.)

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

2. INSPECT CONNECTING ROD OIL CLEARANCE

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

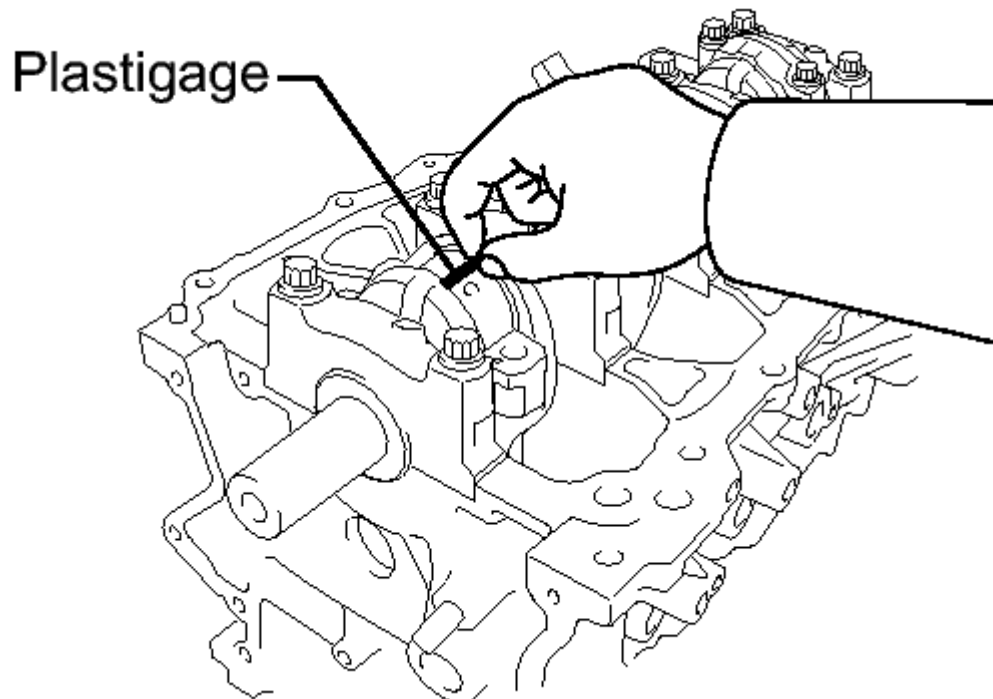
**T**

Fig. 429: Laying Strip Of Plastigage On Crank Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

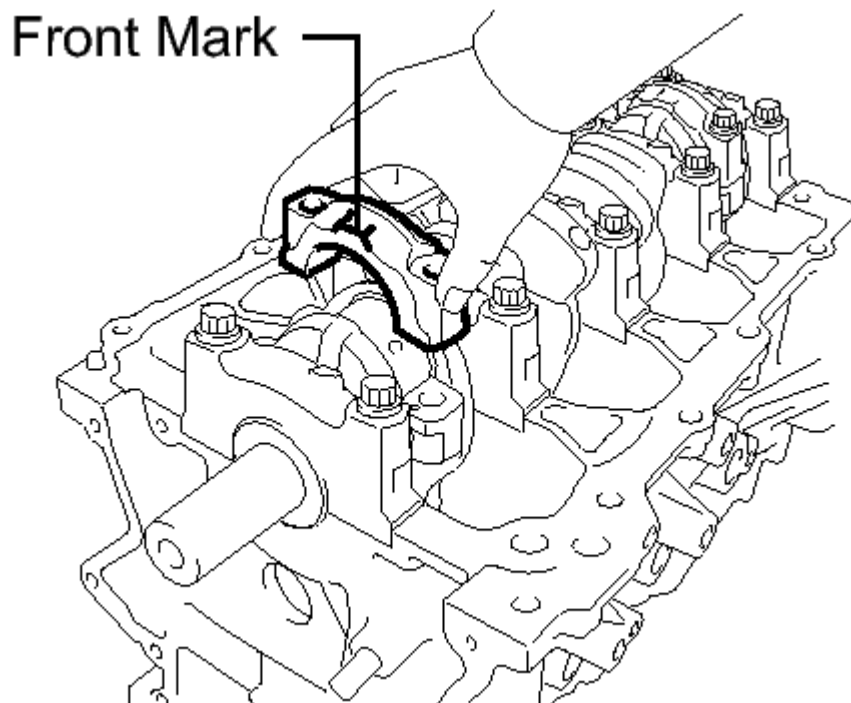
**T**

Fig. 430: Identifying Front Mark Of Connecting Rod Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE: Do not turn the crankshaft.

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

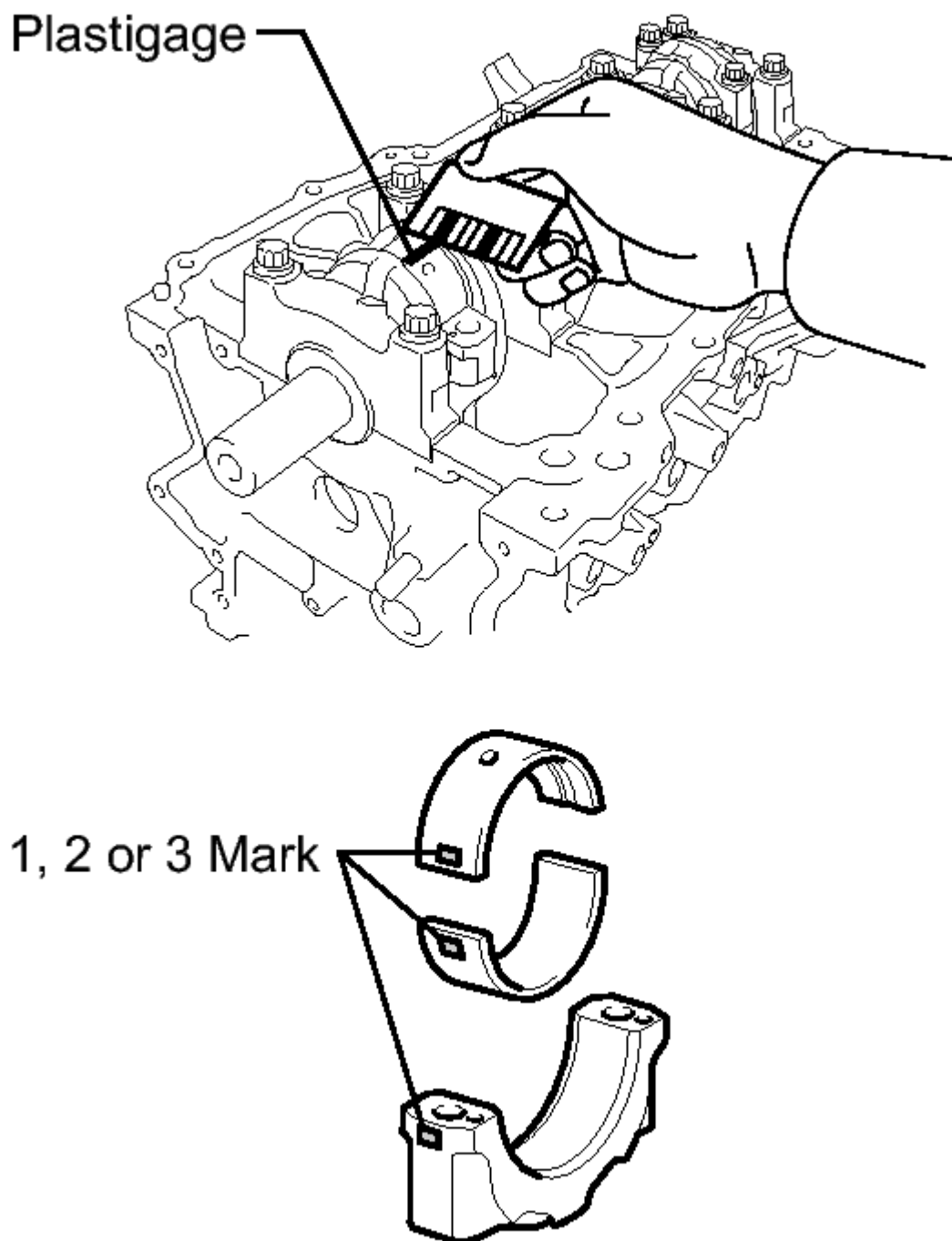
**T**

Fig. 431: Measuring Plastigage At Its Widest Point
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard oil clearance

0.030 to 0.062 mm (0.0012 to 0.0024 in.)

Maximum oil clearance

0.07 mm (0.0028 in.)

If the oil clearance is greater than the maximum, replace the connecting rod bearings. If necessary, inspect the crankshaft.

NOTE: **Completely remove the Plastigage after the measurement.**

HINT:

If replacing a bearing, replace it with one that has the same number as its respective connecting rod cap. Each standard bearing thickness is indicated by a 1, 2, or 3 mark on its surface.

Standard Connecting Rod Large End Bore Diameter

Mark	Specified Condition
Mark 1	47.000 to 47.008 mm (1.8504 to 1.8507 in.)
Mark 2	47.009 to 47.016 mm (1.8507 to 1.8510 in.)
Mark 3	47.017 to 47.024 mm (1.8511 to 1.8513 in.)

Standard Connecting Rod Bearing Thickness

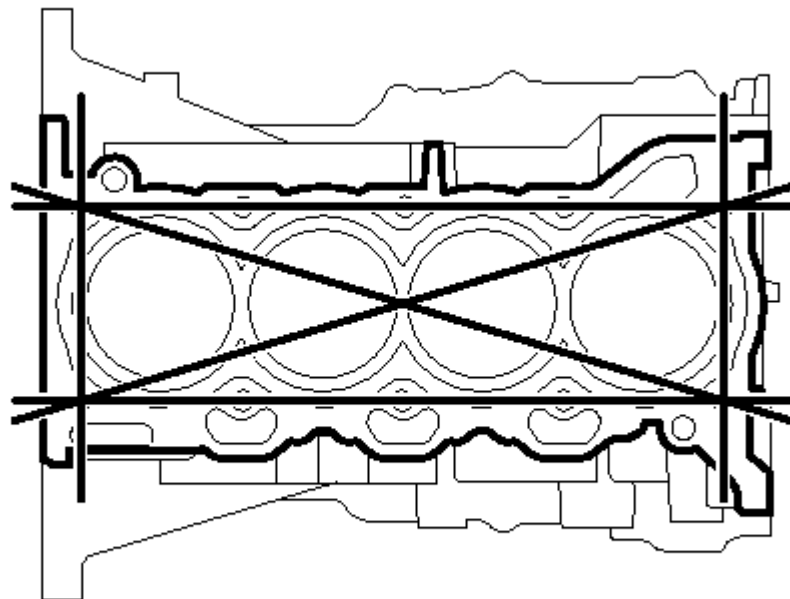
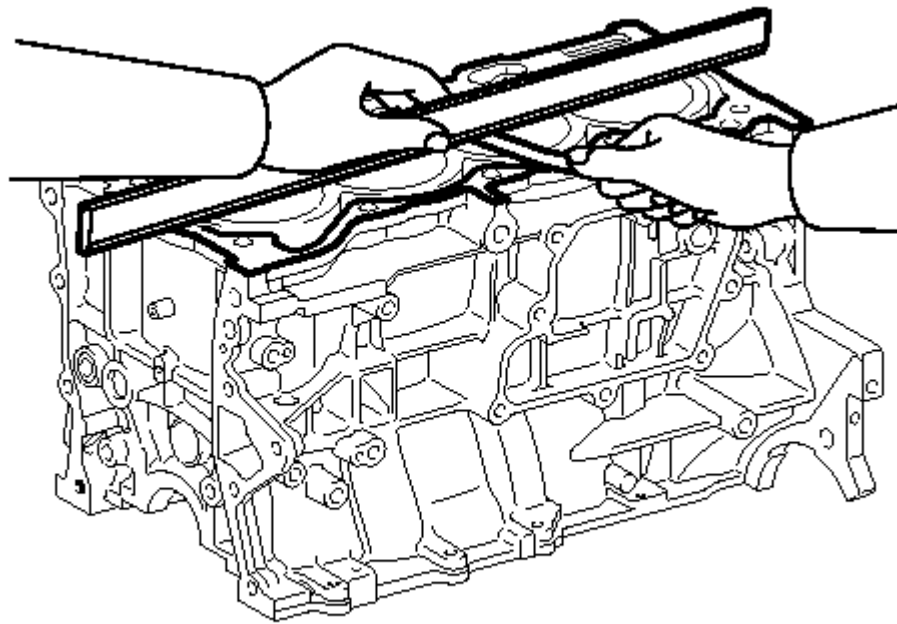
Mark	Specified Condition
Mark 1	1.489 to 1.493 mm (0.0586 to 0.0588 in.)
Mark 2	1.494 to 1.497 mm (0.0588 to 0.0589 in.)
Mark 3	1.498 to 1.501 mm (0.0590 to 0.0591 in.)

Standard Crankshaft Pin Diameter

Mark	Specified Condition
Mark 1,2,3	43.992 to 44.000 mm (1.7320 to 1.7323 in.)

3. INSPECT CYLINDER BLOCK FOR WARPAGE

- a. Using a precision straightedge and feeler gauge, measure the warpage of the surface that is in contact with the cylinder head gasket.



T

Fig. 432: Measuring Warpage Of Surface

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

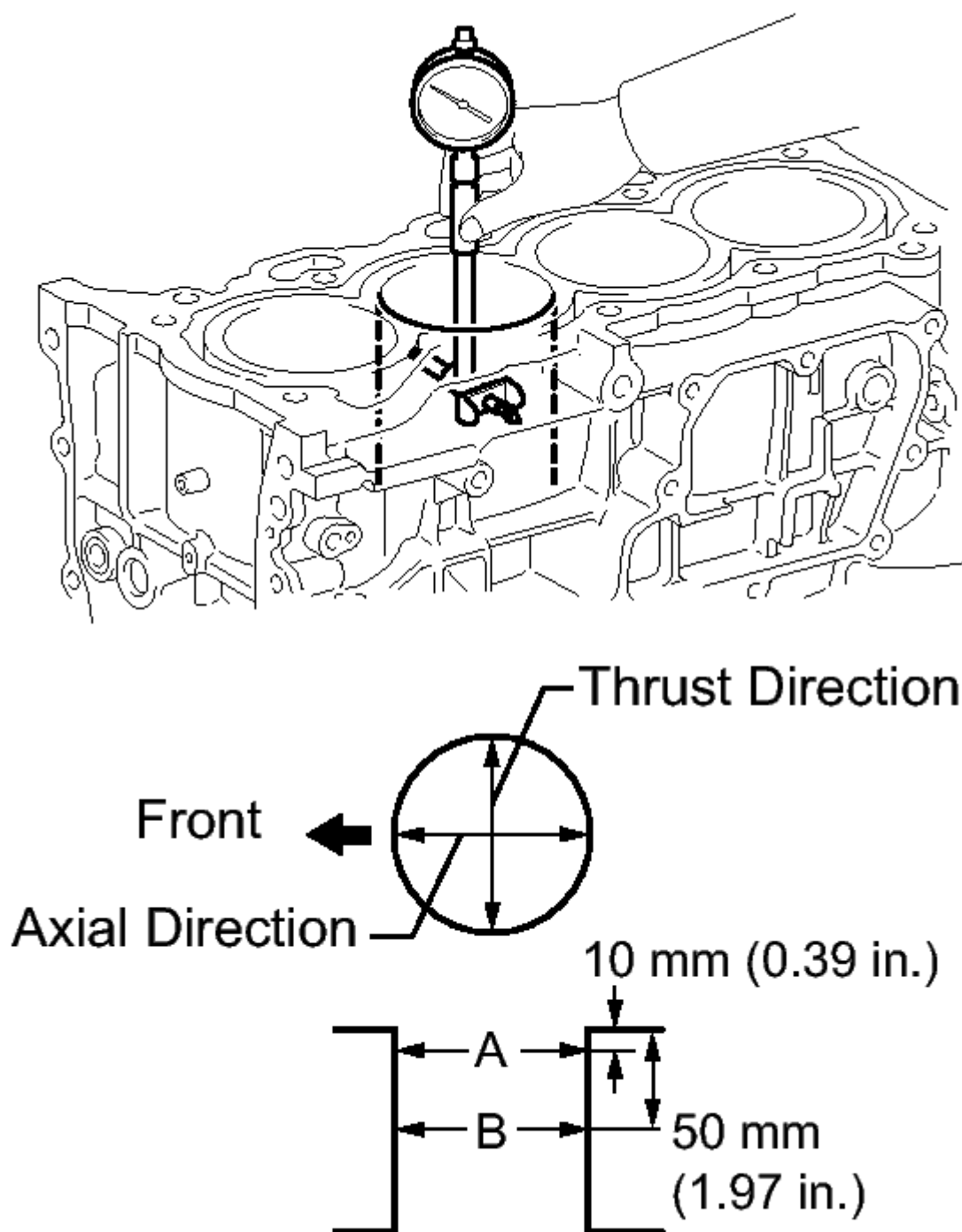
Maximum warpage

0.05 mm (0.0020 in.)

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

4. INSPECT CYLINDER BORE

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



T

Fig. 433: Inspecting Cylinder Bore

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

Standard diameter

80.500 to 80.513 mm (3.1693 to 3.1698 in.)

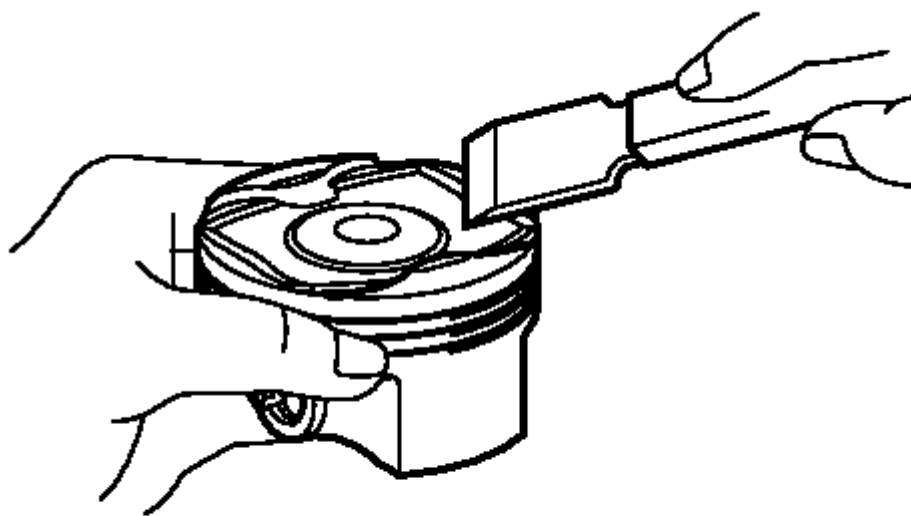
Maximum diameter

80.633 mm (3.1745 in.)

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

5. INSPECT PISTON

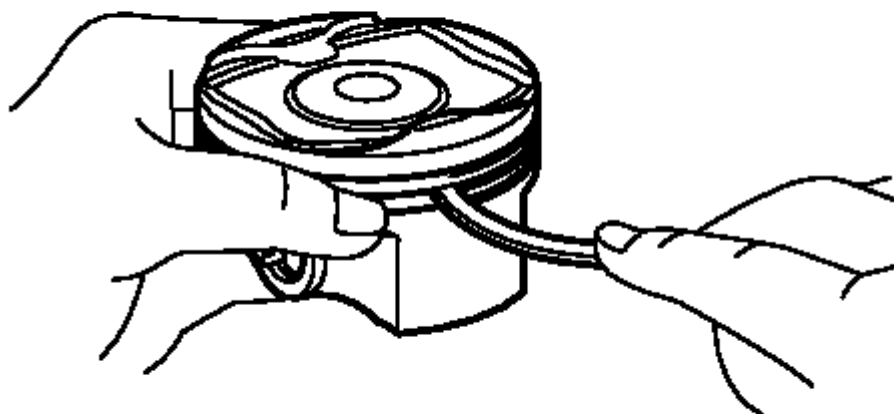
- a. Using a gasket scraper, remove the carbon from the top of the piston.



0

Fig. 434: Removing Carbon From Piston Top
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

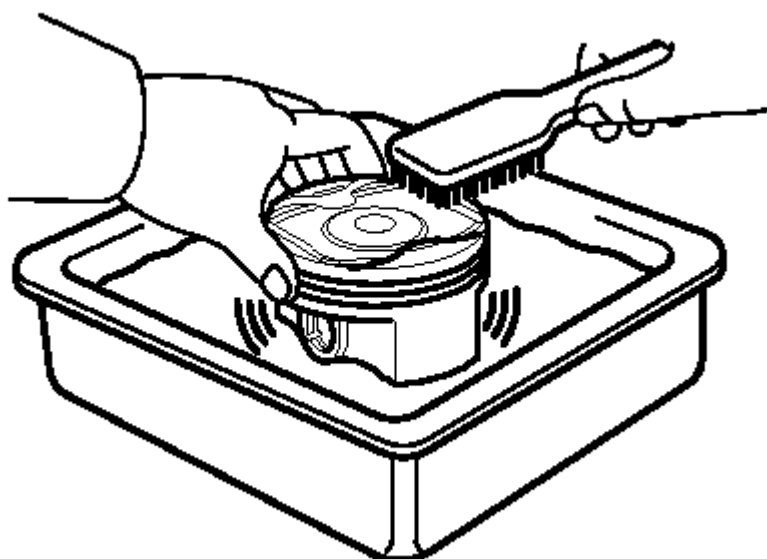


0

Fig. 435: Cleaning Piston Ring Grooves

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

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



0

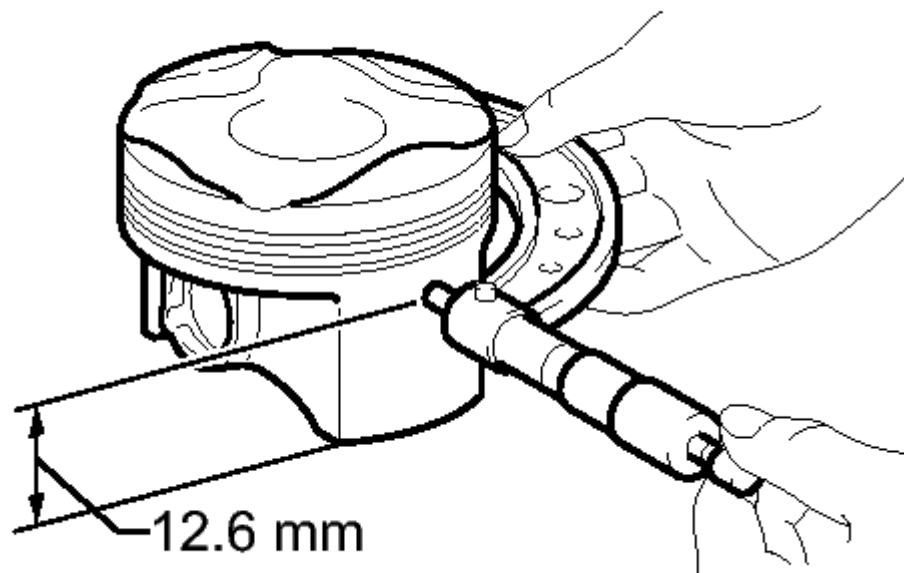
Fig. 436: Cleaning Piston

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

NOTE: Do not use a wire brush.

- d. Using a micrometer, measure the piston diameter at right angles to the piston pin hole, and at a

point 12.6 mm (0.4961 in.) from the piston head.



T

Fig. 437: Measuring Piston Diameter

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

Standard piston diameter

80.461 to 80.471 mm (3.1677 to 3.1681 in.)

If the diameter is not as specified, replace the piston.

6. INSPECT PISTON OIL CLEARANCE

- a. Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance

0.029 to 0.052 mm (0.0011 to 0.0020 in.)

Maximum oil clearance

0.09 mm (0.0035 in.)

If the oil clearance is greater than the maximum, replace all the pistons. If necessary, replace the cylinder block.

7. INSPECT RING GROOVE CLEARANCE

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

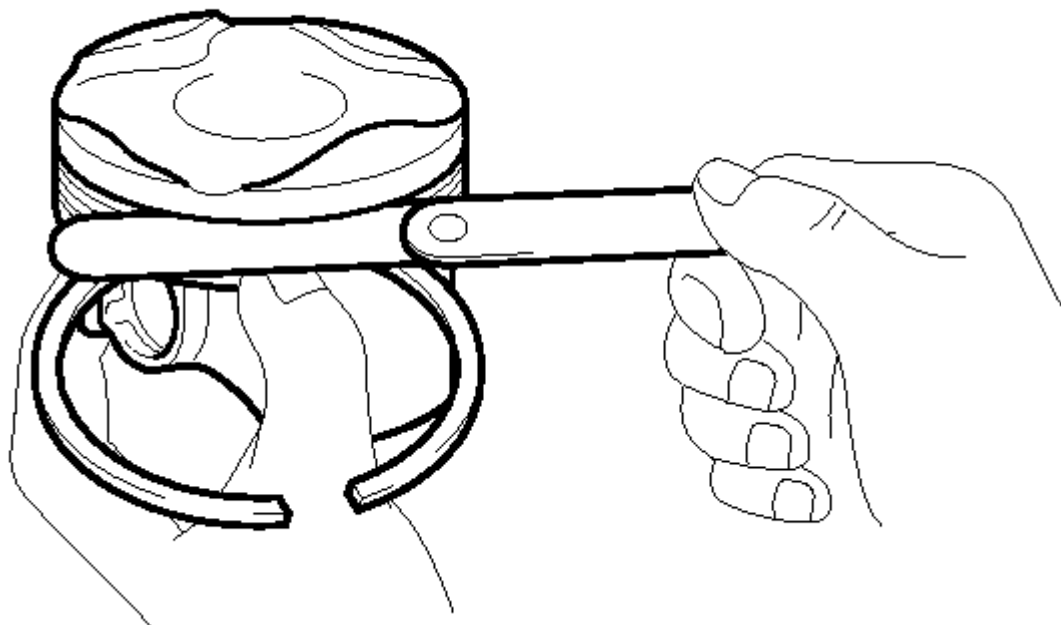
**T**

Fig. 438: Measuring Clearance Between Piston Ring And Wall Of Ring Groove
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

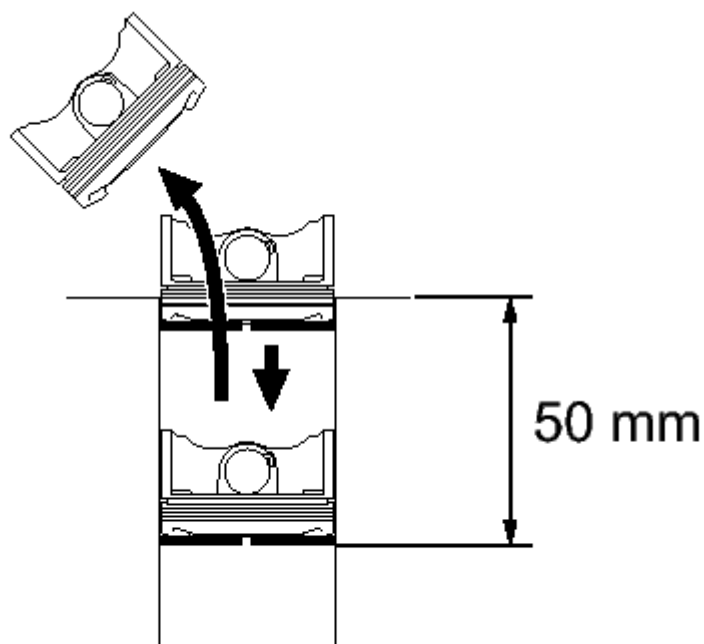
Standard Ring Groove Clearance

Item	Specified Condition
No. 1 Ring	0.02 to 0.07 mm (0.0008 to 0.0028 in.)
No. 2 Ring	0.02 to 0.06 mm (0.0008 to 0.0024 in.)
Oil Ring	0.02 to 0.065 mm (0.0008 to 0.0026 in.)

If the groove clearance is not as specified, replace the piston.

8. INSPECT PISTON RING END GAP

- Using a piston, push the piston ring a little beyond the bottom of the ring travel, 50 mm (1.97 in.) from the top of the cylinder block.



T

Fig. 439: Identifying Piston Ring End Gap

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

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

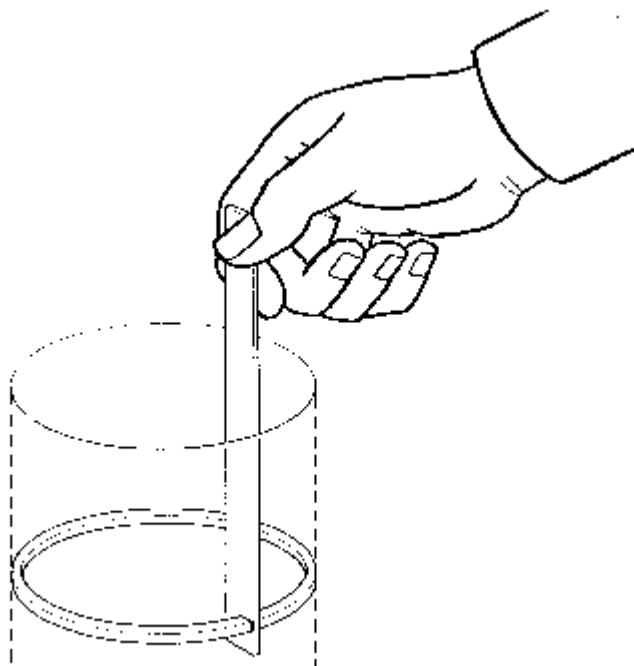


Fig. 440: Measuring End Gap

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

Standard End Gap

Item	Specified Condition

No. 1 Ring	0.2 to 0.3 mm (0.0079 to 0.0118 in.)
No. 2 Ring	0.3 to 0.5 mm (0.0118 to 0.0197 in.)
Oil Ring	0.1 to 0.4 mm (0.0039 to 0.0157 in.)

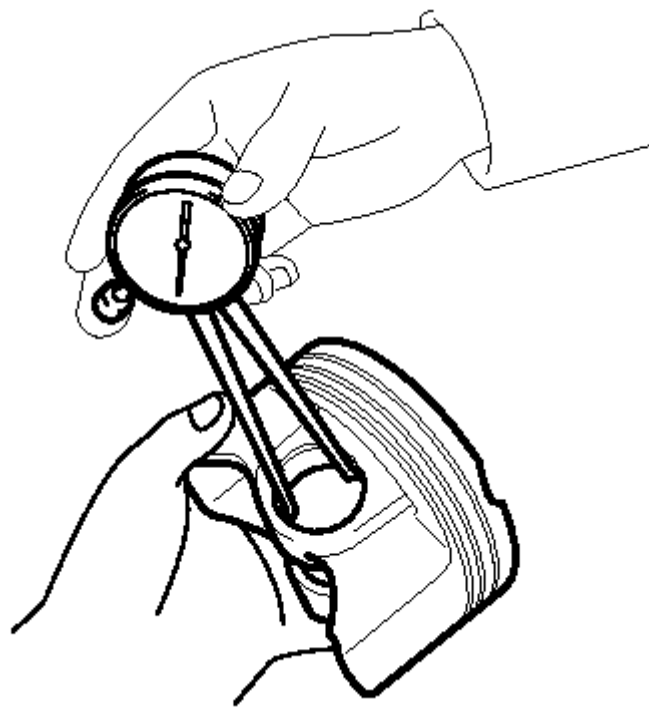
Maximum End Gap

Item	Specified Condition
No. 1 Ring	0.5 mm (0.0197 in.)
No. 2 Ring	0.7 mm (0.0276 in.)
Oil Ring	0.7 mm (0.0276 in.)

If the end gap is greater than the maximum, replace the piston ring. If the end gap is greater than the maximum, even with a new piston ring, replace the cylinder block.

9. INSPECT PISTON PIN OIL CLEARANCE

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



T

Fig. 441: Measuring Piston Pin Bore Diameter

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

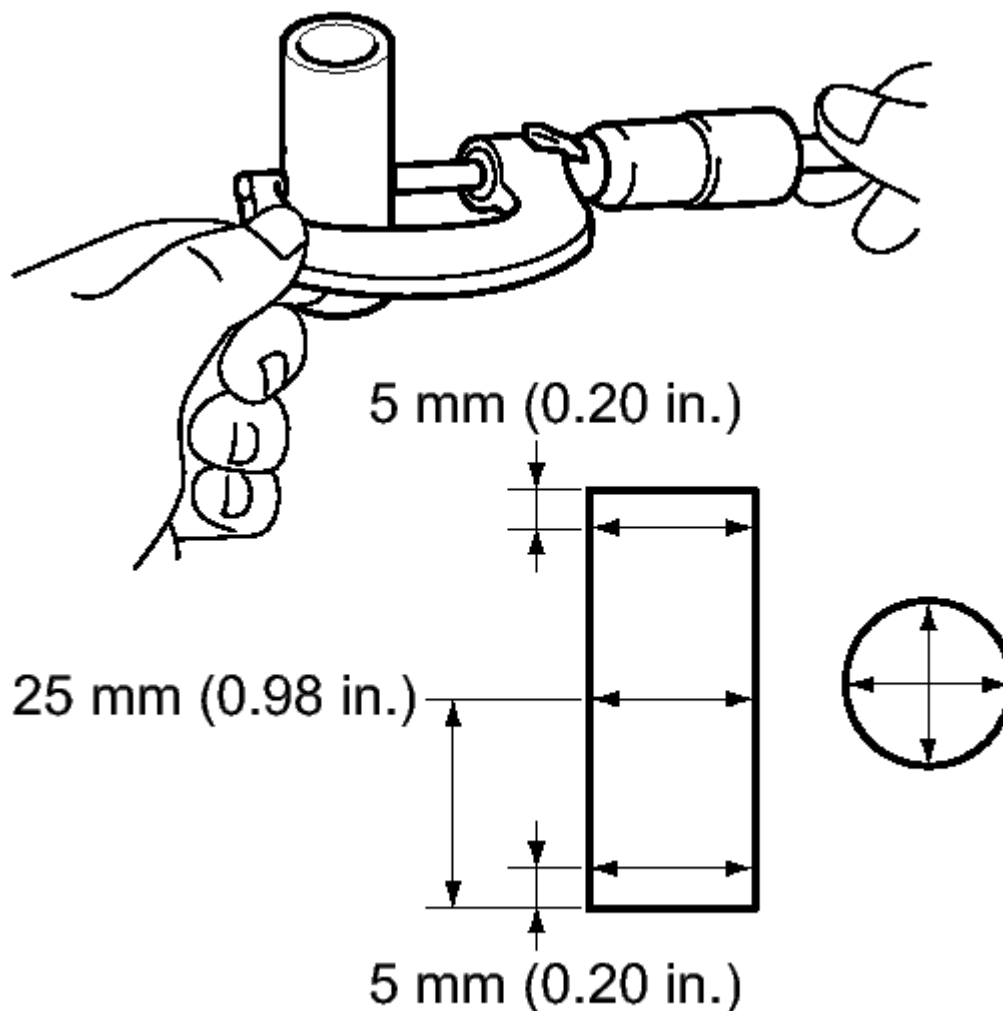
Standard piston pin bore diameter

20.006 to 20.015 mm (0.7876 to 0.7880 in.)

Item	Specified Condition
A	20.006 to 20.009 mm (0.7876 to 0.7878 in.)
B	20.010 to 20.012 mm (0.7878 to 0.7879 in.)
C	20.013 to 20.015 mm (0.7879 to 0.7880 in.)

If the diameter is not as specified, replace the piston.

- b. Using a micrometer, measure the piston pin diameter.



T

Fig. 442: Measuring Piston Pin Diameter

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

Standard piston pin diameter

20.004 to 20.013 mm (0.7876 to 0.7879 in.)

Item	Specified Condition
A	20.004 to 20.007 mm (0.7876 to 0.7877 in.)
B	20.008 to 20.010 mm (0.7877 to 0.7878 in.)
C	20.011 to 20.013 mm (0.7878 to 0.7879 in.)

If the diameter is not as specified, replace the piston pin.

- c. Using a caliper gauge, measure the connecting rod small end bore diameter.

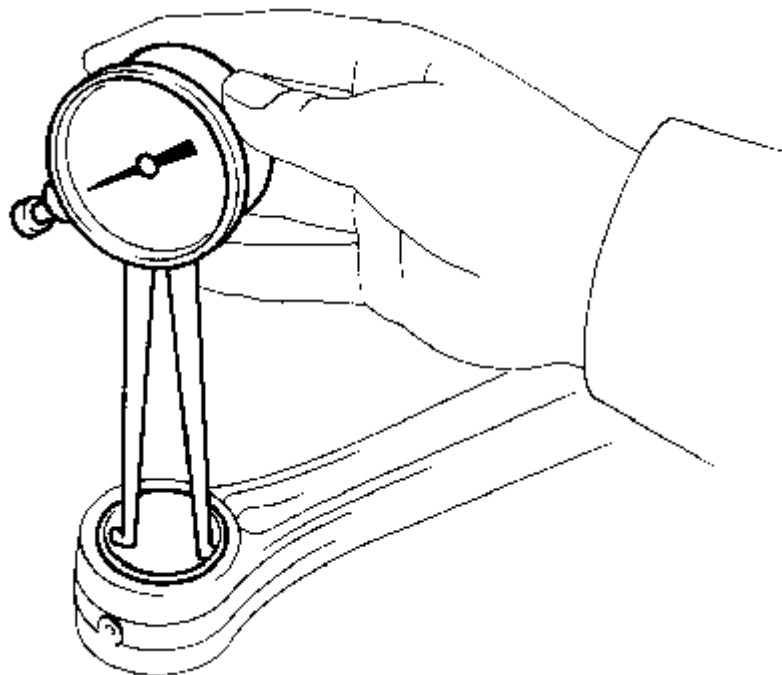


Fig. 443: Measuring Connecting Rod Small End Bore Diameter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard connecting rod small end bore diameter

20.012 to 20.021 mm (0.7879 to 0.7882 in.)

Item	Specified Condition
A	20.012 to 20.015 mm (0.7879 to 0.7880 in.)
B	20.016 to 20.018 mm (0.7880 to 0.7881 in.)
C	20.019 to 20.021 mm (0.7881 to 0.7882 in.)

If the diameter is not as specified, replace the connecting rod.

- d. Subtract the piston pin diameter measurement from the piston pin bore diameter measurement.

Upper Side:

Lower Side:

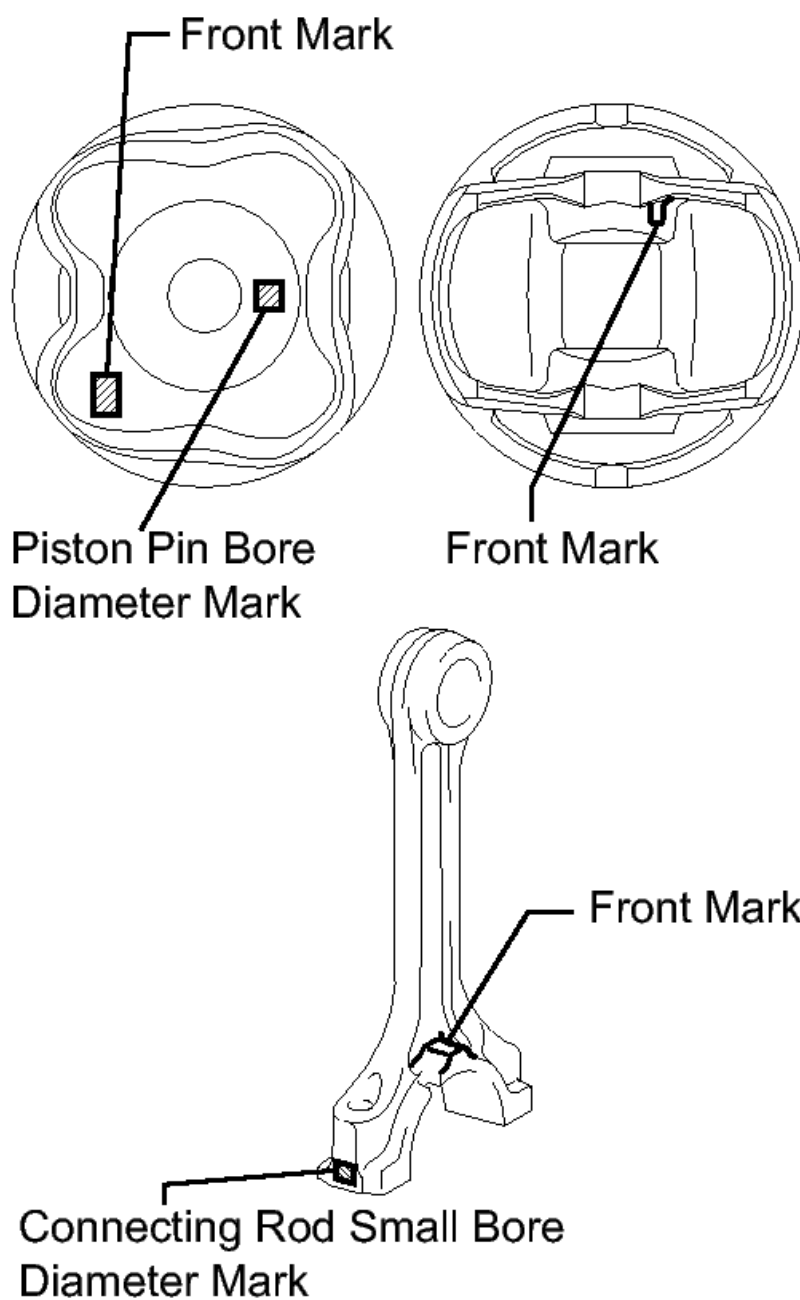


Fig. 444: Identifying Connecting Rod Small Bore Diameter Mark
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard oil clearance

-0.001 to 0.005 mm (-0.00004 to 0.0002 in.)

Maximum oil clearance

0.010 mm (0.0004 in.)

If the oil clearance is greater than the maximum, replace the connecting rod. If necessary, replace the piston and piston pin as a set.

- e. Subtract the piston pin diameter measurement from the connecting rod small end bore diameter measurement.

Standard oil clearance

0.005 to 0.011 mm (0.0002 to 0.0004 in.)

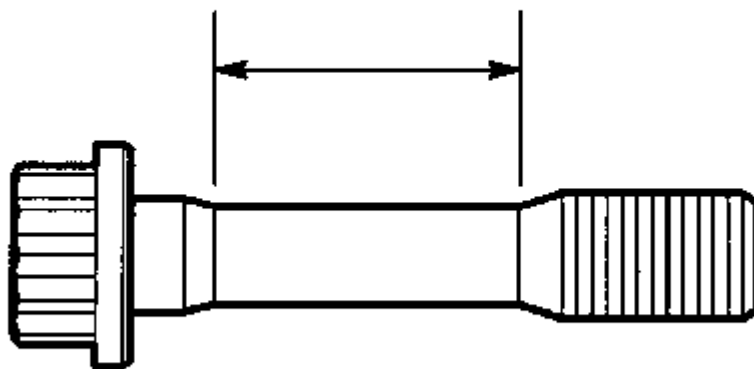
Maximum oil clearance

0.014 mm (0.0006 in.)

If the oil clearance is greater than the maximum, replace the connecting rod. If necessary, replace the connecting rod and piston pin as a set.

10. INSPECT CONNECTING ROD BOLT

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



A36651

Fig. 445: Identifying Connecting Rod Bolt Dimension
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard diameter

6.6 to 6.7 mm (0.2598 to 0.2638 in.)

Minimum diameter

6.4 mm (0.2520 in.)

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

11. INSPECT CONNECTING ROD SUB-ASSEMBLY

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

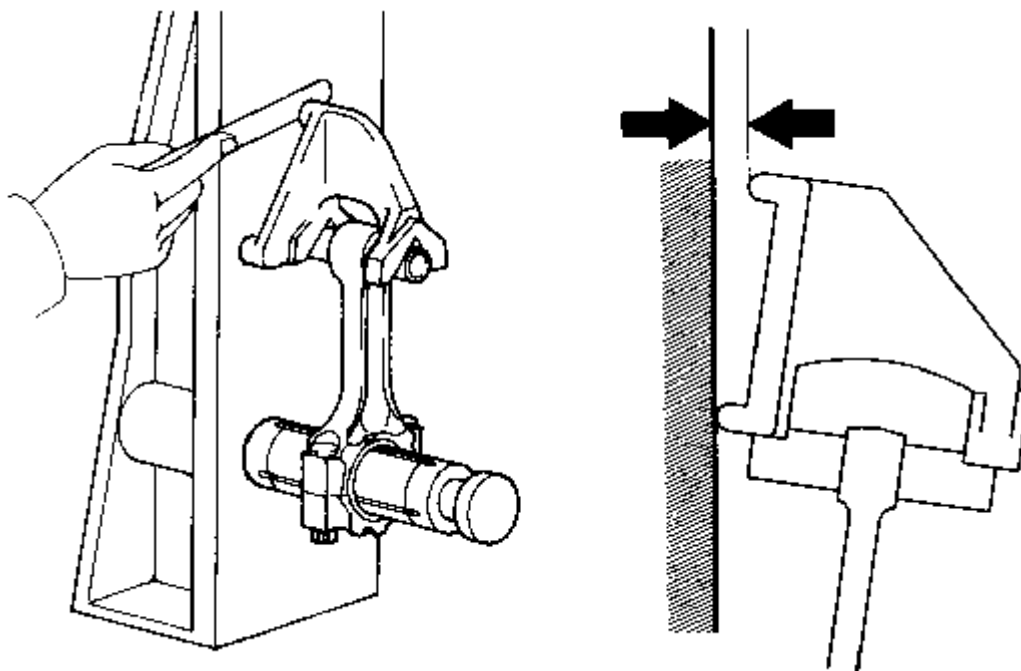


Fig. 446: Checking Connecting Rod Alignment
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Check for misalignment.

Maximum misalignment

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

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

2. Check for twist.

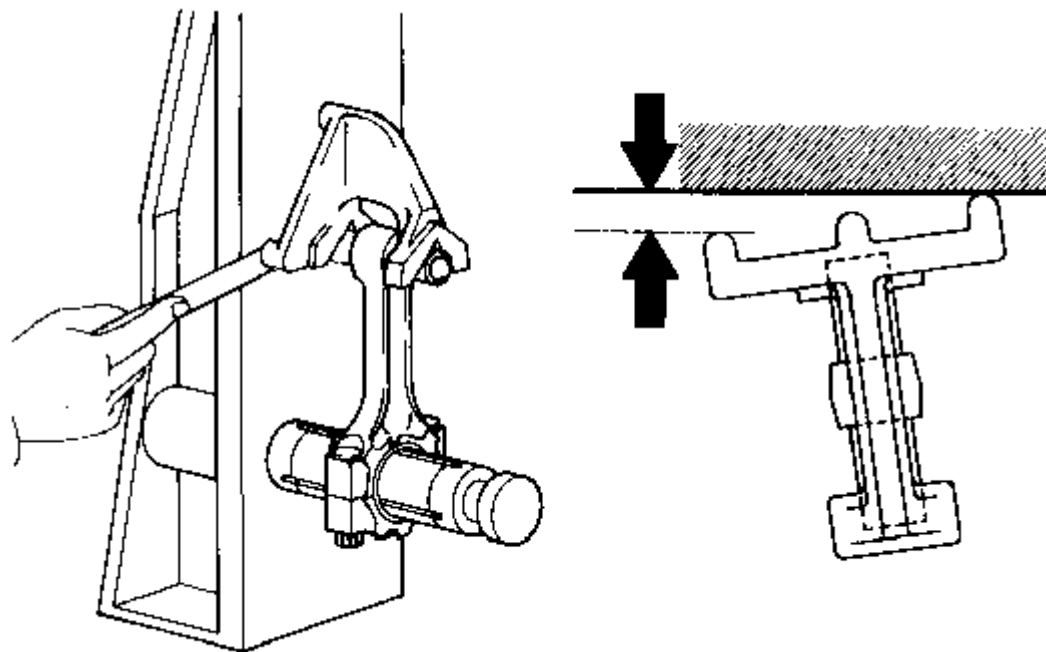


Fig. 447: Checking For Twist

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

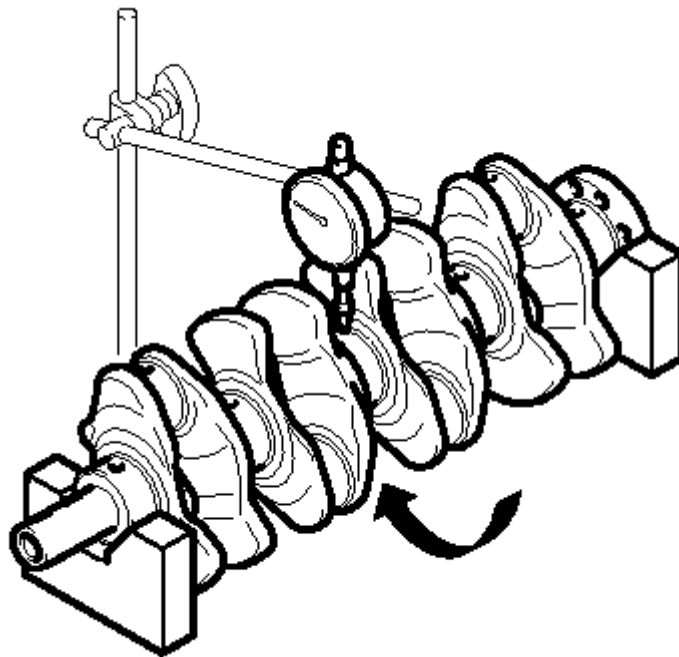
Maximum twist

0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

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

12. INSPECT CRANKSHAFT

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

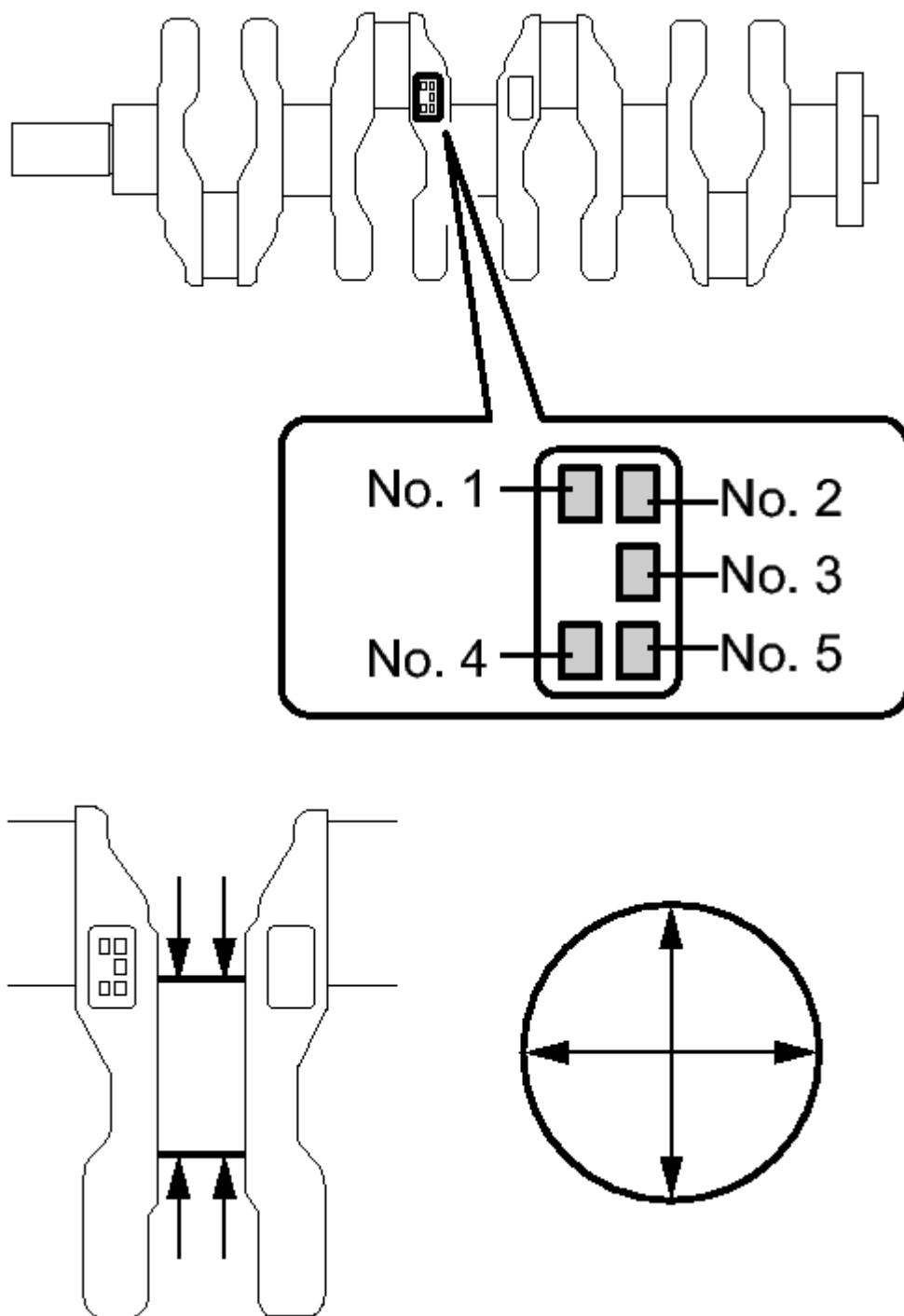
**T****Fig. 448: Measuring Circle Runout****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

Maximum circle runout

0.03 mm (0.0012 in.)

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

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



T

Fig. 449: Identifying Diameter Of Main Journal

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

Standard diameter

47.988 to 48.000 mm (1.8893 to 1.8898 in.)

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

- c. Check each main journal for taper and distortion as shown in the illustration.

Maximum taper and distortion

0.004 mm (0.0002 in.)

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

Standard Diameter (Reference)

Mark	Specified Condition
0	47.999 to 48.000 mm (1.8897 to 1.8898 in.)
1	47.997 to 47.998 mm (1.8896 to 1.8897 in.)
2	47.995 to 47.996 mm (1.8896 to 1.8896 in.)
3	47.993 to 47.994 mm (1.8895 to 1.8895 in.)
4	47.991 to 47.992 mm (1.8894 to 1.8894 in.)
5	47.988 to 47.990 mm (1.8893 to 1.8894 in.)

- d. Using a micrometer, measure the diameter of each crank pin.

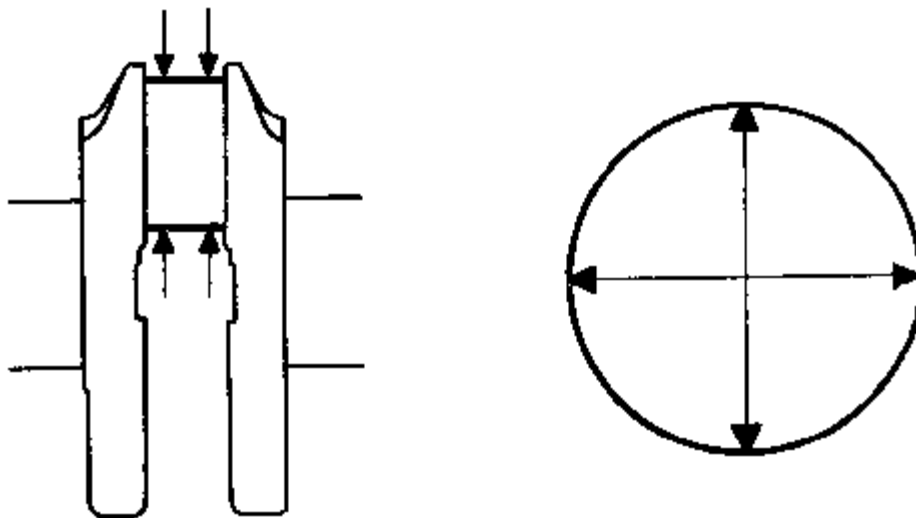


Fig. 450: Measuring Diameter Of Each Crank Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard diameter

43.992 to 44.000 mm (1.7320 to 1.7323 in.)

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

- e. Inspect each crank pin for taper and distortion as shown in the illustration.

Maximum taper and distortion

0.004 mm (0.0002 in.)

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

13. INSPECT CRANKSHAFT THRUST CLEARANCE

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

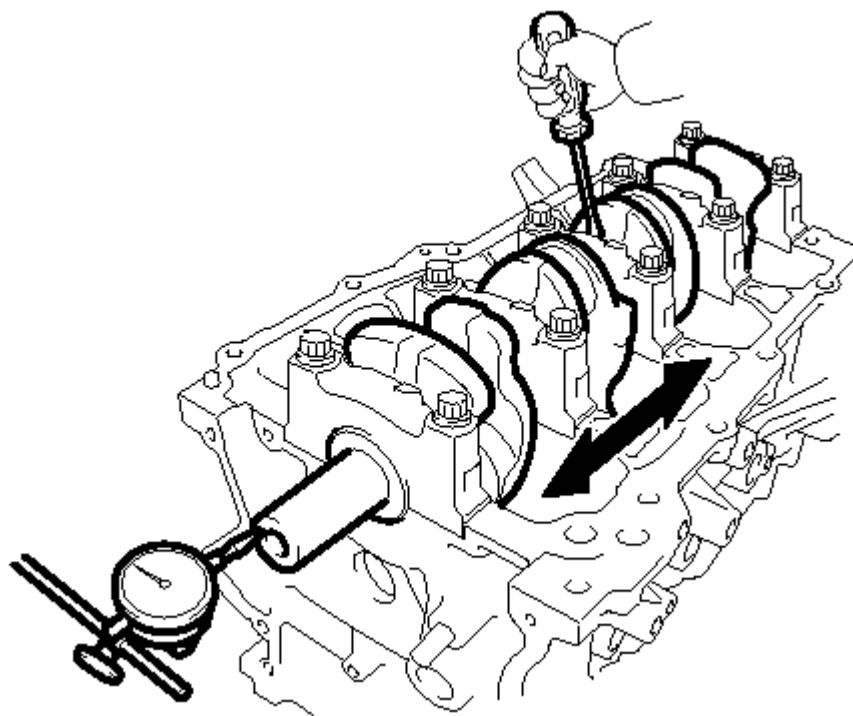


Fig. 451: Measuring Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard thrust clearance

0.04 to 0.14 mm (0.0016 to 0.0055 in.)

Maximum thrust clearance

0.18 mm (0.0071 in.)

If the thrust clearance is greater than the maximum, replace the thrust washers as a set.

HINT:

The thrust washer thickness is 2.43 to 2.48 mm (0.0957 to 0.0976 in.).

14. INSPECT CRANKSHAFT OIL CLEARANCE

- Check the crank journal and bearing for pitting and scratches.

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

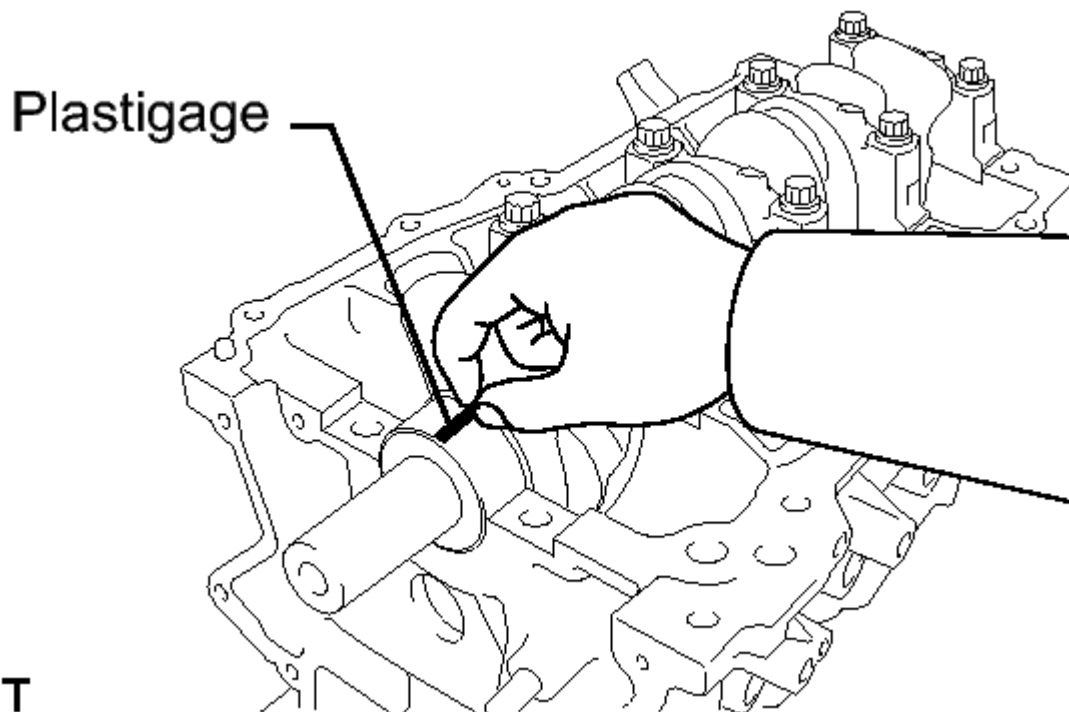
**T**

Fig. 452: Measuring Plastigage At Its Widest Point (1 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Examine the front marks and numbers and install the bearing caps on the cylinder block.

HINT:

A number is marked on each main bearing cap to indicate the installation position.

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

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

- g. Remove the main bearing caps. Refer to **DISASSEMBLY**.
- h. Measure the Plastigage at its widest point.

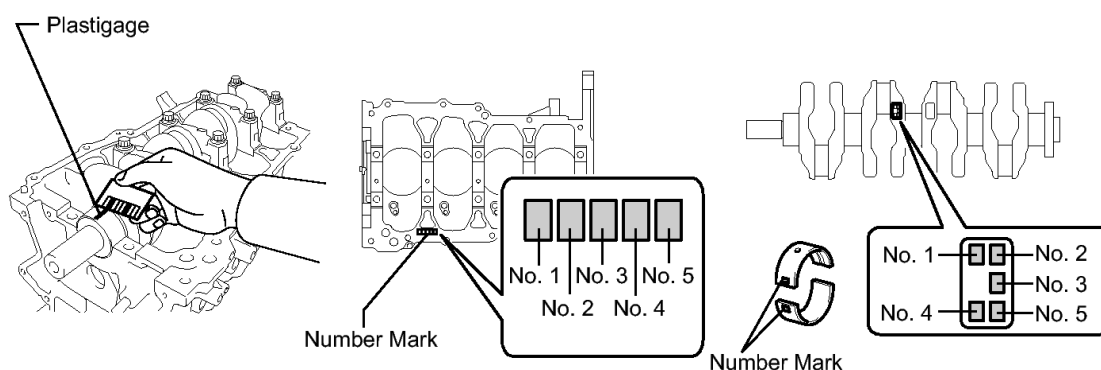


Fig. 453: Measuring Plastigage Widest Point

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

Standard oil clearance

0.016 to 0.039 mm (0.0006 to 0.0015 in.)

Maximum oil clearance

0.050 mm (0.0020 in.)

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

NOTE: Remove the Plastigage completely after the measurement.

HINT:

- If replacing a bearing, select a new one with the same number. If the number of the bearing cannot be determined, calculate the correct bearing number by adding together the numbers imprinted on the cylinder block and crankshaft. Then select a new bearing with the calculated number according to the chart below. There are 4 sizes of standard bearings, marked "1", "2", "3" and "4" accordingly.
- EXAMPLE: Cylinder block "3" + Crankshaft "5" = Total number 8 (Use bearing "3")

Cylinder block + Crankshaft	0 to 2	3 to 5	6 to 8	9 to 11
Bearing to be used	"1"	"2"	"3"	"4"

Standard Cylinder Block Journal Bore Diameter

Mark	Specified Condition
0	52.000 to 52.003 mm (2.0472 to 2.0474 in.)
1	52.003 to 52.005 mm (2.04736 to 2.04744 in.)
2	52.005 to 52.007 mm (2.0474 to 2.0475 in.)
3	52.007 to 52.010 mm (2.0475 to 2.0476 in.)
4	52.010 to 52.012 mm (2.0476 to 2.0477 in.)

2010 Toyota Corolla LE

2010 ENGINE Engine Mechanical (2ZR-FE) (Service Information) - Corolla

5	52.012 to 52.014 mm (2.0477 to 2.0478 in.)
6	52.014 to 52.016 mm (2.0478 to 2.0479 in.)

Standard Crankshaft Journal Diameter

Mark	Specified Condition
0	47.999 to 48.000 mm (1.8897 to 1.8898 in.)
1	47.997 to 47.998 mm (1.8896 to 1.8897 in.)
2	47.995 to 47.996 mm (1.88956 to 1.88960 in.)
3	47.993 to 47.994 mm (1.8895 to 1.8895 in.)
4	47.991 to 47.992 mm (1.8894 to 1.8894 in.)
5	47.988 to 47.990 mm (1.8893 to 1.8894 in.)

Standard Bearing Center Wall Thickness

Mark	Specified Condition
1	1.994 to 1.997 mm (0.0785 to 0.0786 in.)
2	1.998 to 2.000 mm (0.07866 to 0.07874 in.)
3	2.001 to 2.003 mm (0.0788 to 0.0789 in.)
4	2.004 to 2.006 mm (0.0789 to 0.0790 in.)

15. INSPECT CYLINDER HEAD SET BOLT

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

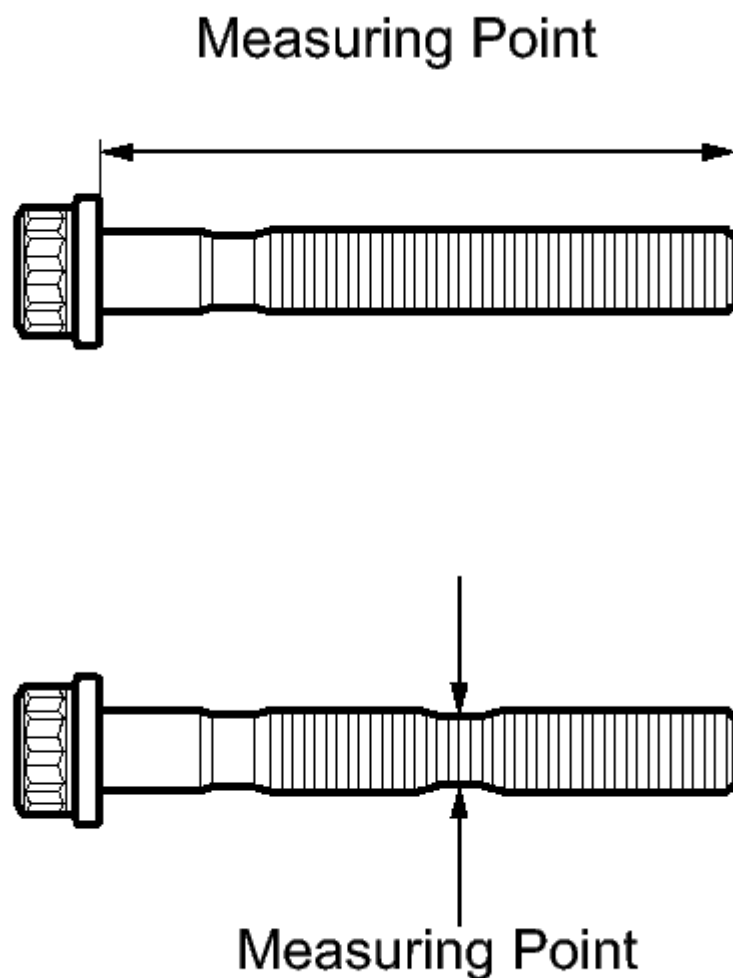


Fig. 454: Identifying Bolt Length Dimension

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

Standard bolt length

84.3 to 85.7 mm (3.3189 to 3.3740 in.)

Maximum bolt length

86.7 mm (3.4134 in.)

If the bolt length is greater than the maximum, replace the bolt.

- b. Using a vernier caliper, measure the minimum diameter of the elongated thread at the measuring point.

Standard outside diameter

9.77 to 9.96 mm (0.3846 to 0.3921 in.)

Minimum outside diameter

9.1 mm (0.3583 in.)

HINT:

Using a straightedge, visually check thinner areas of the threaded part of the crankshaft bearing cap bolt.

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

16. INSPECT NO. 1 OIL NOZZLE SUB-ASSEMBLY

- a. Check the oil nozzles for damage or clogging.

HINT:

If there is damage or clogging, replace the oil nozzle.

REPLACEMENT

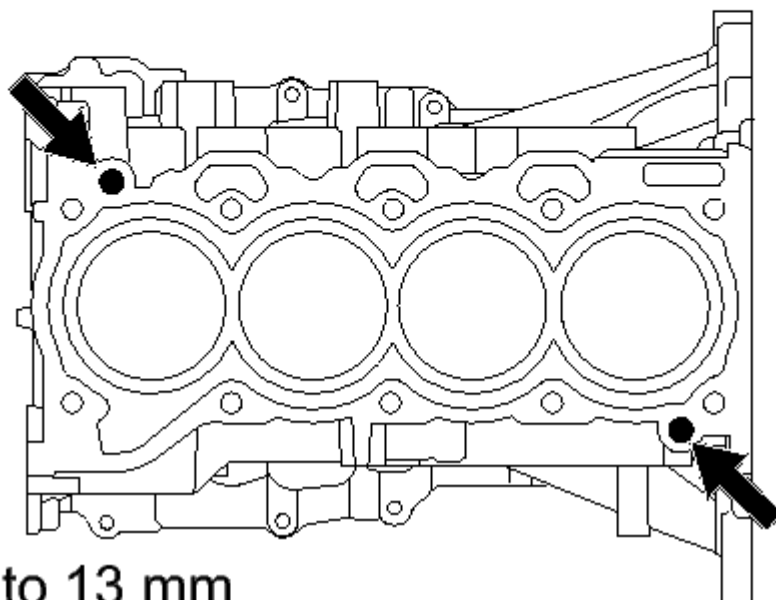
REPLACEMENT

1. REPLACE RING PIN

NOTE: It is not necessary to remove the ring pins unless they are being replaced.

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

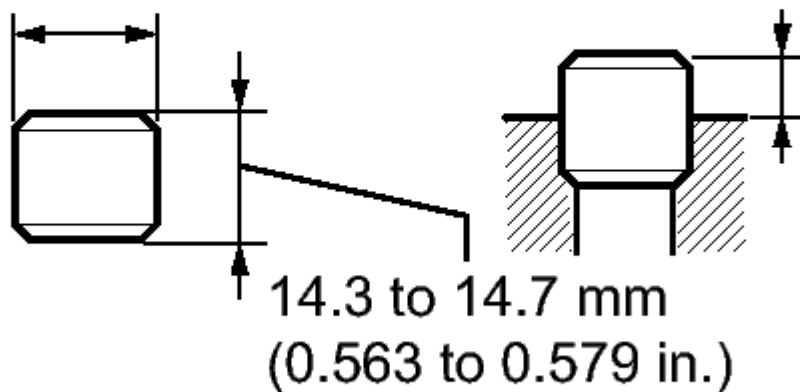
Upper Side:



12.9 to 13 mm

(0.508 to 0.512 in.)

Protrusion Height



14.3 to 14.7 mm

(0.563 to 0.579 in.)

T

Fig. 455: Locating Ring Pins Height

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

Standard protrusion

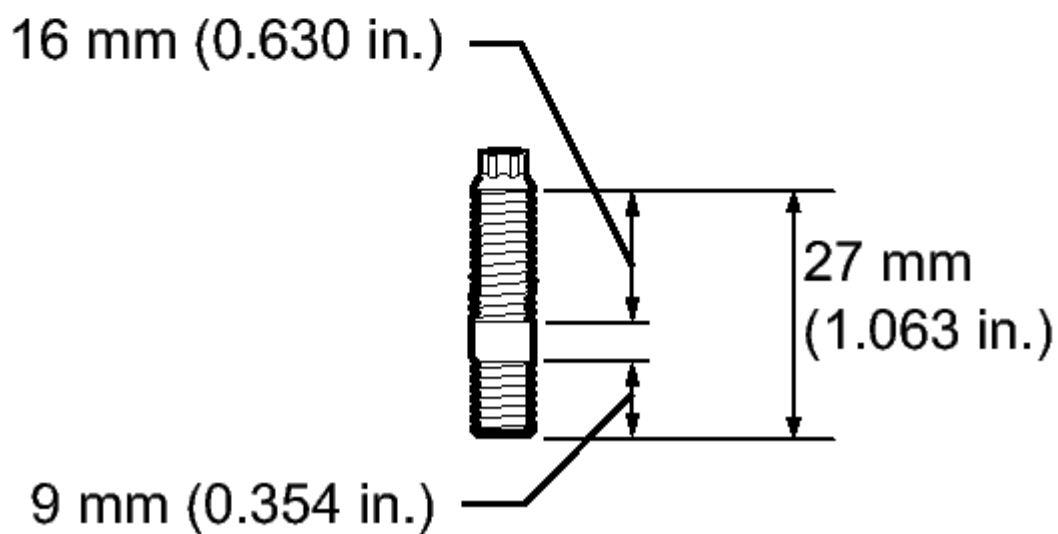
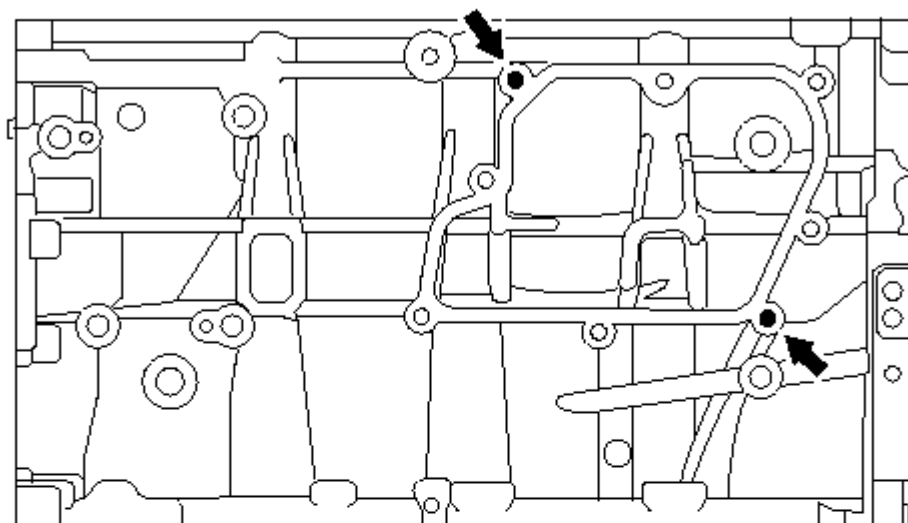
7.5 to 8.5 mm (0.295 to 0.335 in.)

2. REPLACE STUD BOLT

NOTE: If any of the stud bolts is deformed or the threads are damaged, replace it.

- a. Remove the stud bolts.
- b. Using a "TORX" socket E6, install the stud bolts as shown in the illustration.

LH Side:



T

Fig. 456: Identifying Stud Bolts Height
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

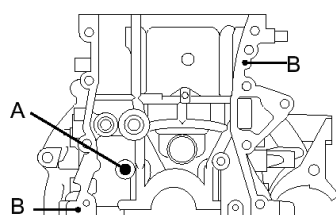
Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)

3. REPLACE STRAIGHT PIN

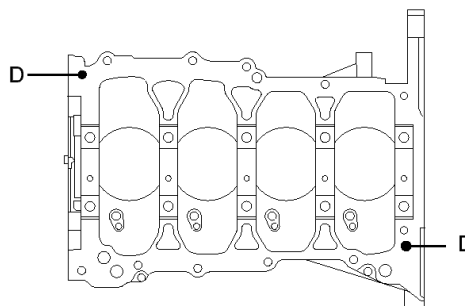
NOTE: It is not necessary to remove the straight pins unless they are being replaced.

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

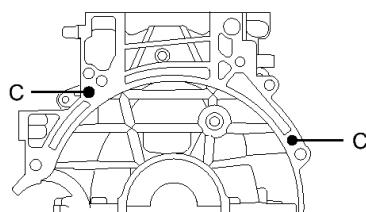
Front Side:



Lower Side:



Rear Side:



LH Side:

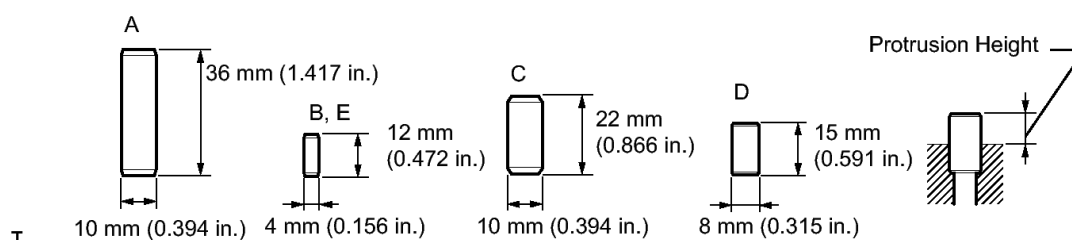
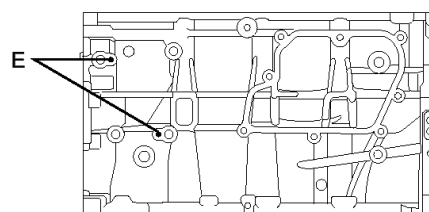


Fig. 457: Identifying Straight Pins Height
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

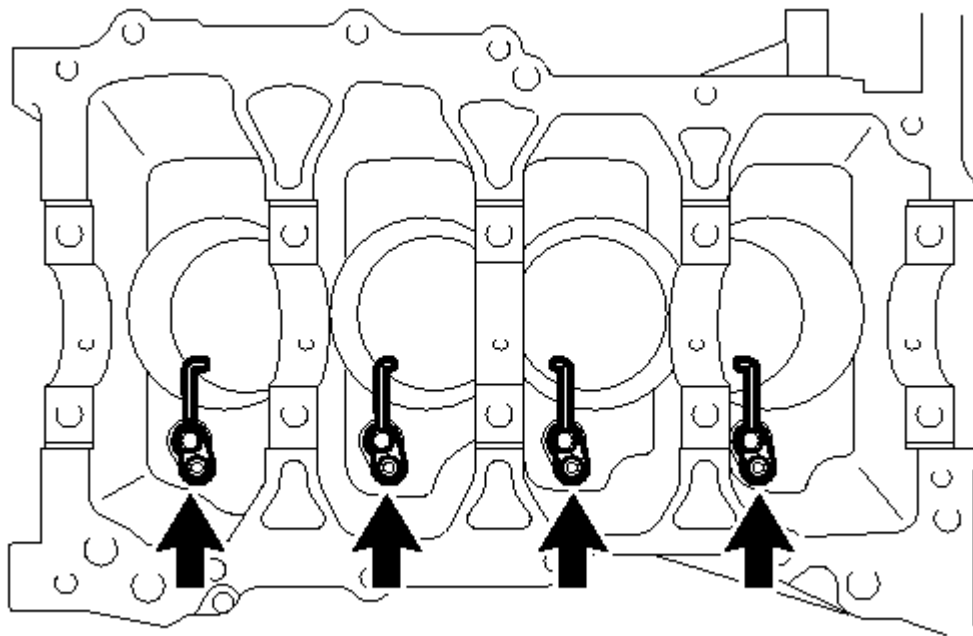
Standard Protrusion

Item	Protrusion
Pin A	18.5 to 19.5 mm (0.729 to 0.768 in.)
Pin B	5.0 to 7.0 mm (0.197 to 0.276 in.)
Pin C	11 to 13 mm (0.433 to 0.512 in.)
Pin D	5.0 to 7.0 mm (0.197 to 0.276 in.)
Pin E	5.0 to 6.0 mm (0.197 to 0.236 in.)

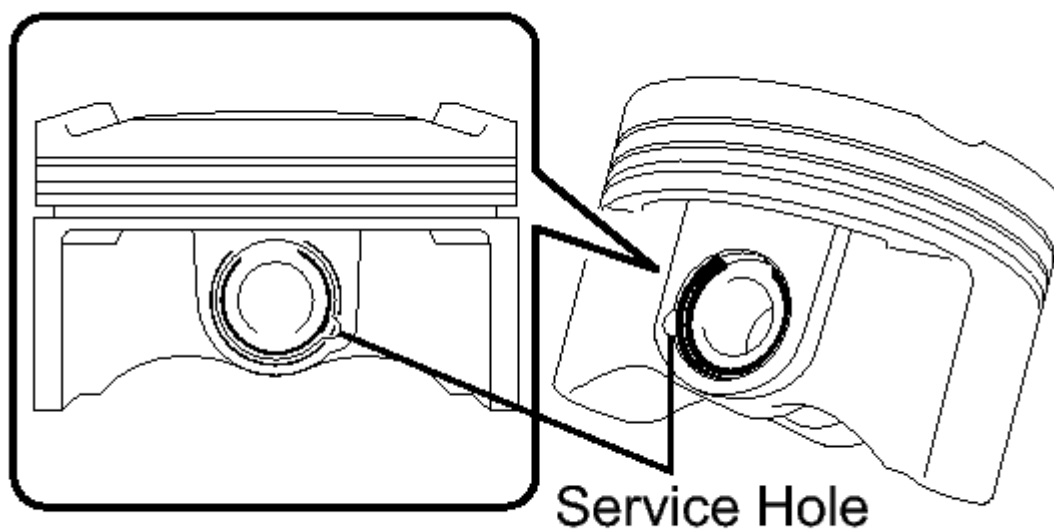
REASSEMBLY

REASSEMBLY**1. INSTALL NO. 1 OIL NOZZLE SUB-ASSEMBLY**

- a. Using a 5 mm socket hexagon wrench, install the oil nozzles with the bolts.

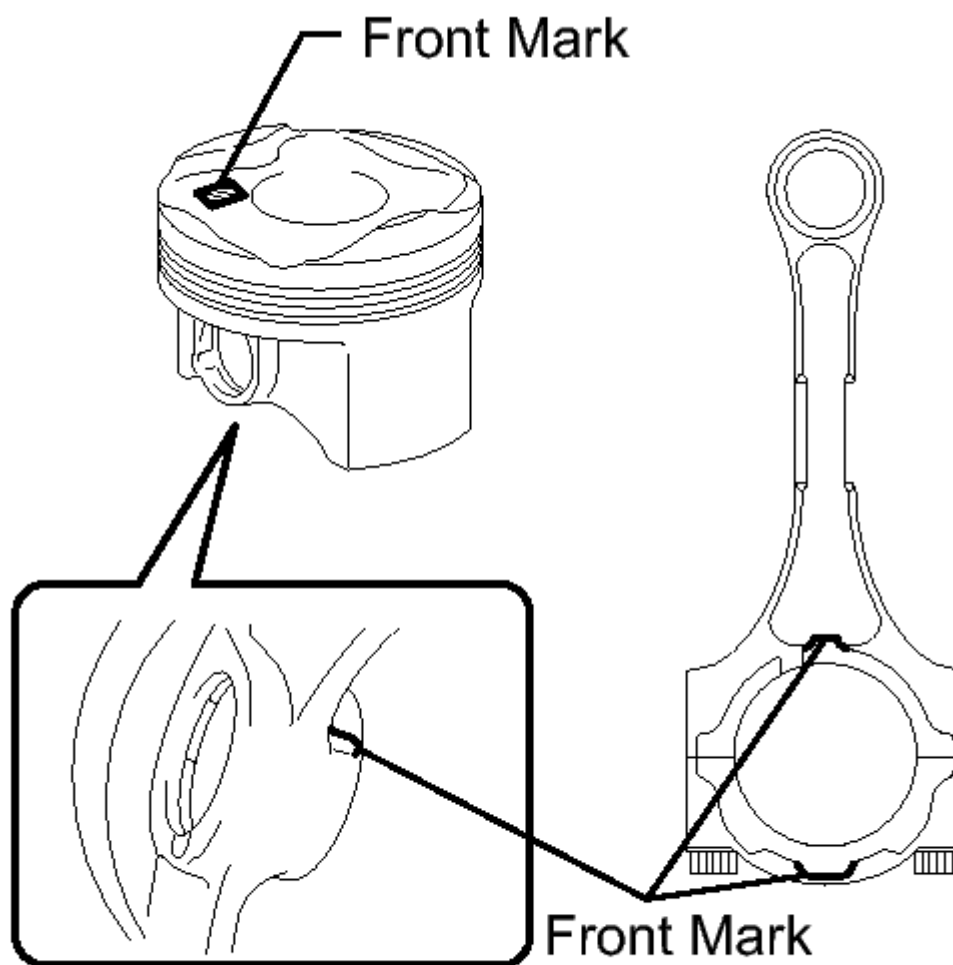
**T****Fig. 458: Locating Bolts And Oil Nozzles****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.****Torque: 10 N*m (102 kgf*cm, 7 ft.*lbf)****2. INSTALL PISTON**

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

**T****Fig. 459: Identifying Piston Pin Hole****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.****HINT:**

Make sure 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 to 90°C (176 to 194°F).
- c. Align the front marks of the piston and connecting rod, and push in the piston with your thumb.

**T****Fig. 460: Aligning Front Marks Of Piston And Connecting Rod****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.****HINT:**

The piston and pin are a matched set.

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

HINT:

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

- e. Check the fitting condition between the piston and piston pin by trying to move the piston back and forth on the piston pin.



T

Fig. 461: Checking Fitting Condition Between Piston And Piston Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL PISTON RING SET

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

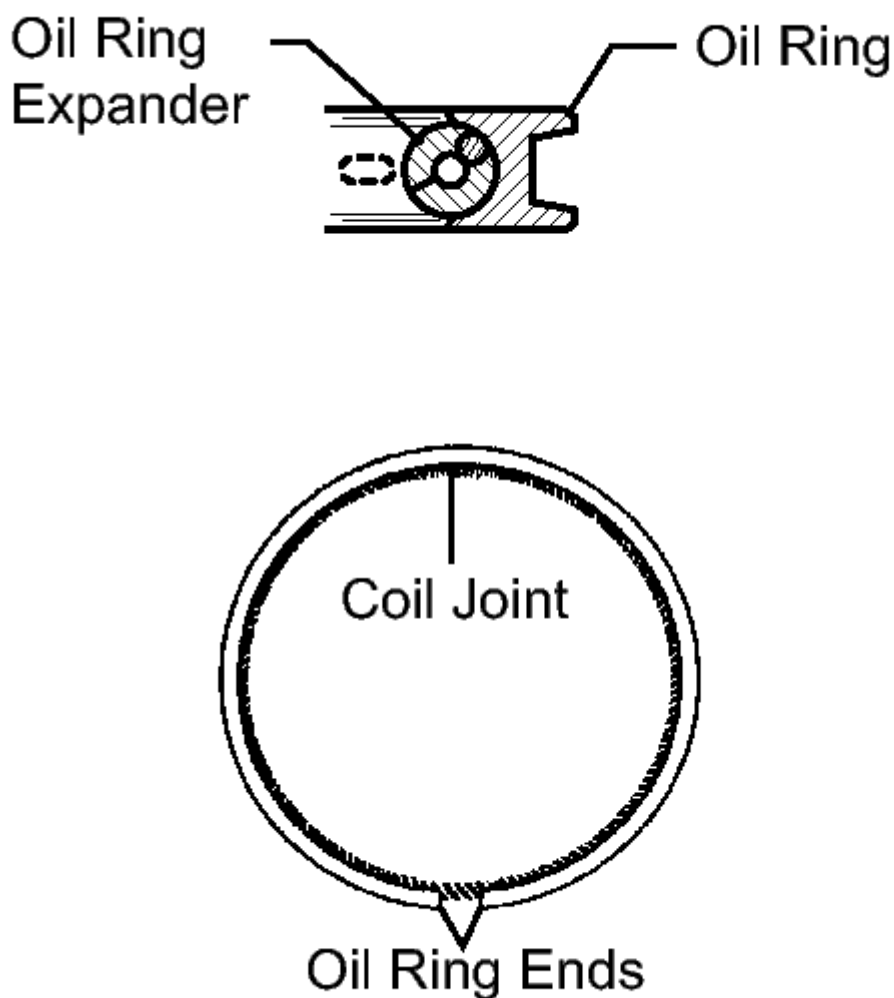


Fig. 462: Identifying Oil Ring Expander And Oil Ring Rail
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Install the expander and oil ring so that their ring ends are at opposite sides.
 - Securely install the expander to the inner groove of the oil ring.
- b. Using a piston ring expander, install the 2 compression rings so that the paint marks are positioned as shown in the illustration.

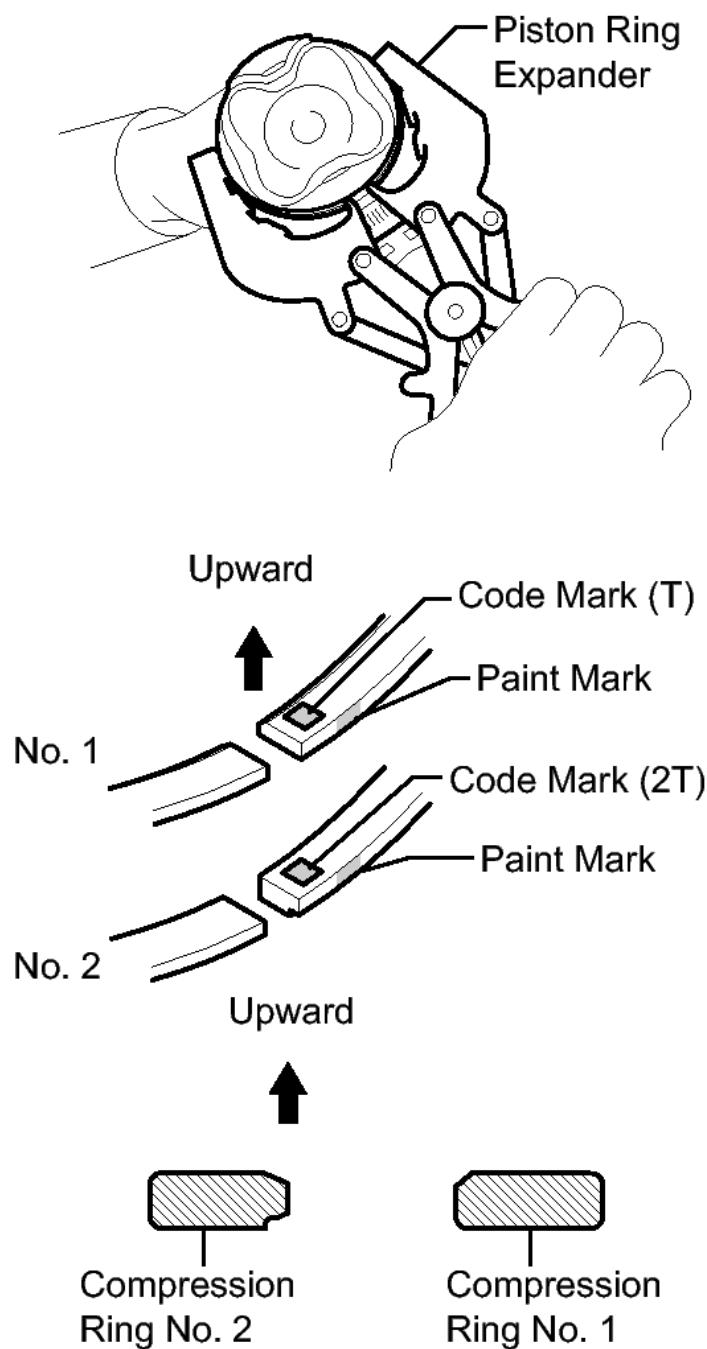
**T**

Fig. 463: Identifying Compression Ring No. 2 With Code Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Install the compression ring No. 1 with the code mark (T) facing upward.
- Install the compression ring No. 2 with the code mark (2T) facing upward.

- Paint marks can only be checked on new piston rings. When reusing piston rings, check each piston ring profile in order to install them into the correct positions.

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

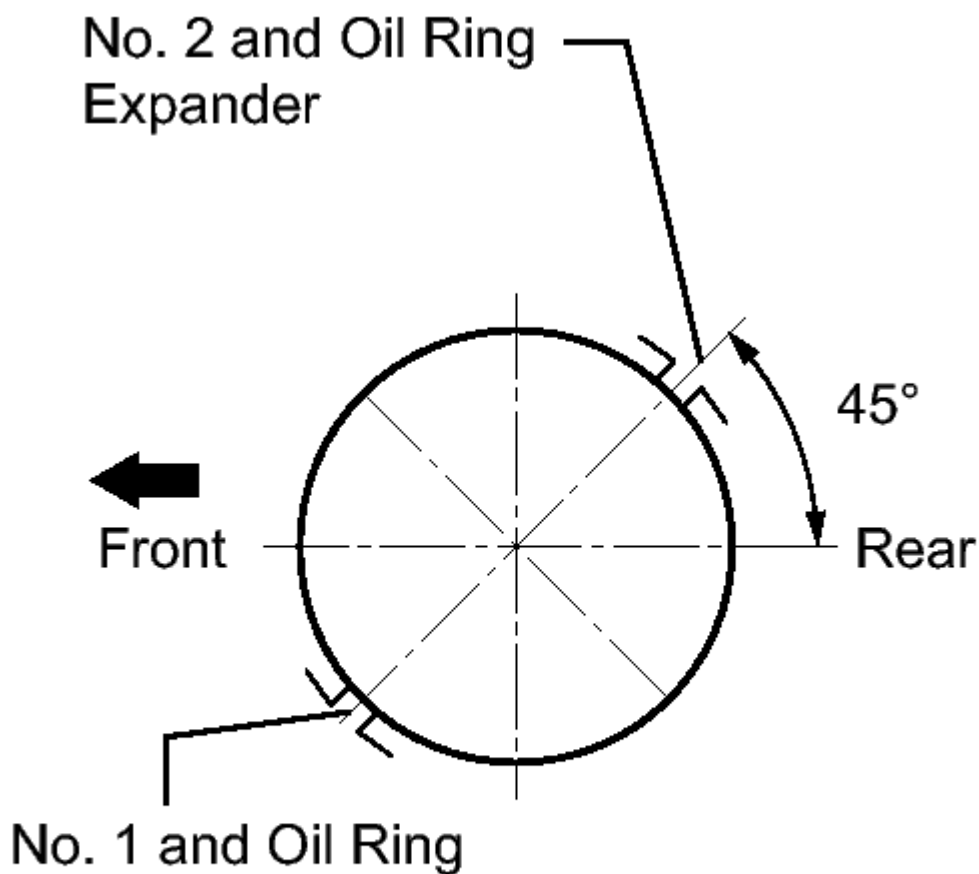


Fig. 464: Positioning Piston Rings

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

4. INSTALL CRANKSHAFT BEARING

- a. Install the upper bearing (for except No. 3 journal).

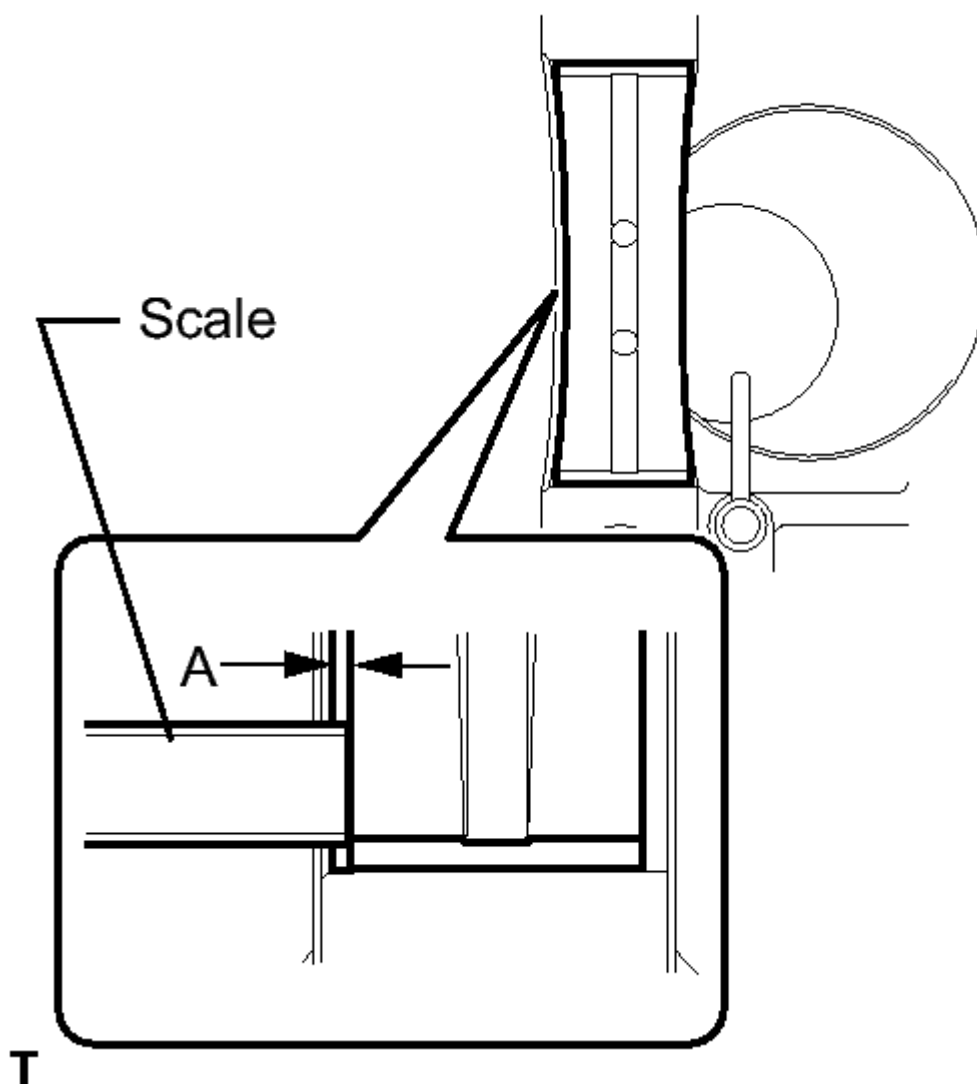


Fig. 465: Identifying Crankshaft Bearing Dimension
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Install the upper bearing with an oil groove on the cylinder block.
2. Using a scale, measure the distance between the cylinder block edge and the upper bearing edge.

NOTE: Do not apply engine oil to the bearing inner surface or journal contact surfaces.

Dimension (A)

0.5 to 1.0 mm (0.020 to 0.039 in.)

- b. Install the upper bearing (for No. 3 journal).

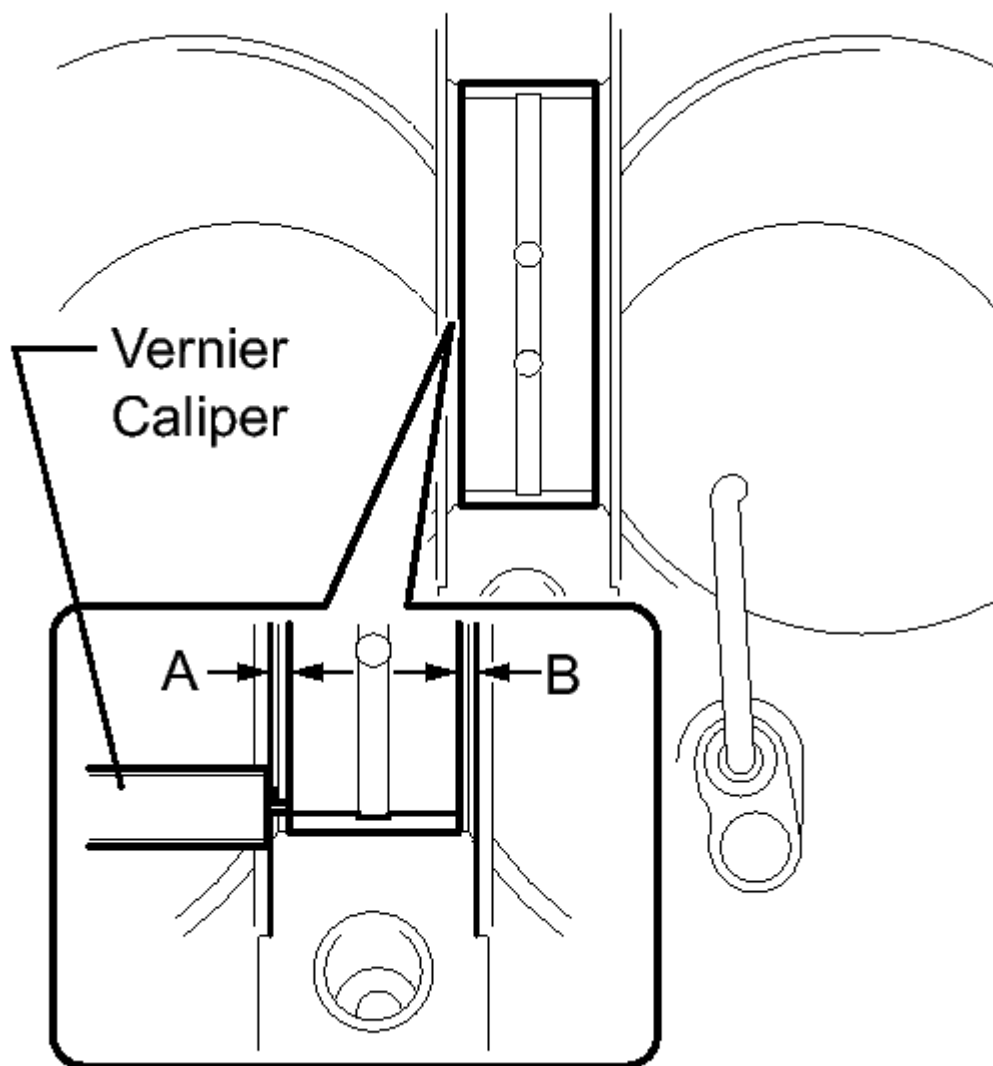
**T**

Fig. 466: Measuring Distance Between Cylinder Block Edge And Upper Bearing Edge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Install the upper bearing with an oil groove on the cylinder block.
2. Using a vernier caliper, measure the distance between the cylinder block edge and the upper bearing edge.

NOTE: Do not apply engine oil to the bearing inner surface or journal contact surfaces.

Dimension (A - B)

0.5 mm (0.0197 in.) or less

- c. Install the lower bearing.
 1. Install the lower bearing onto the bearing cap.
 2. Using a vernier caliper, measure the distance between the bearing cap edge and the lower bearing edge.

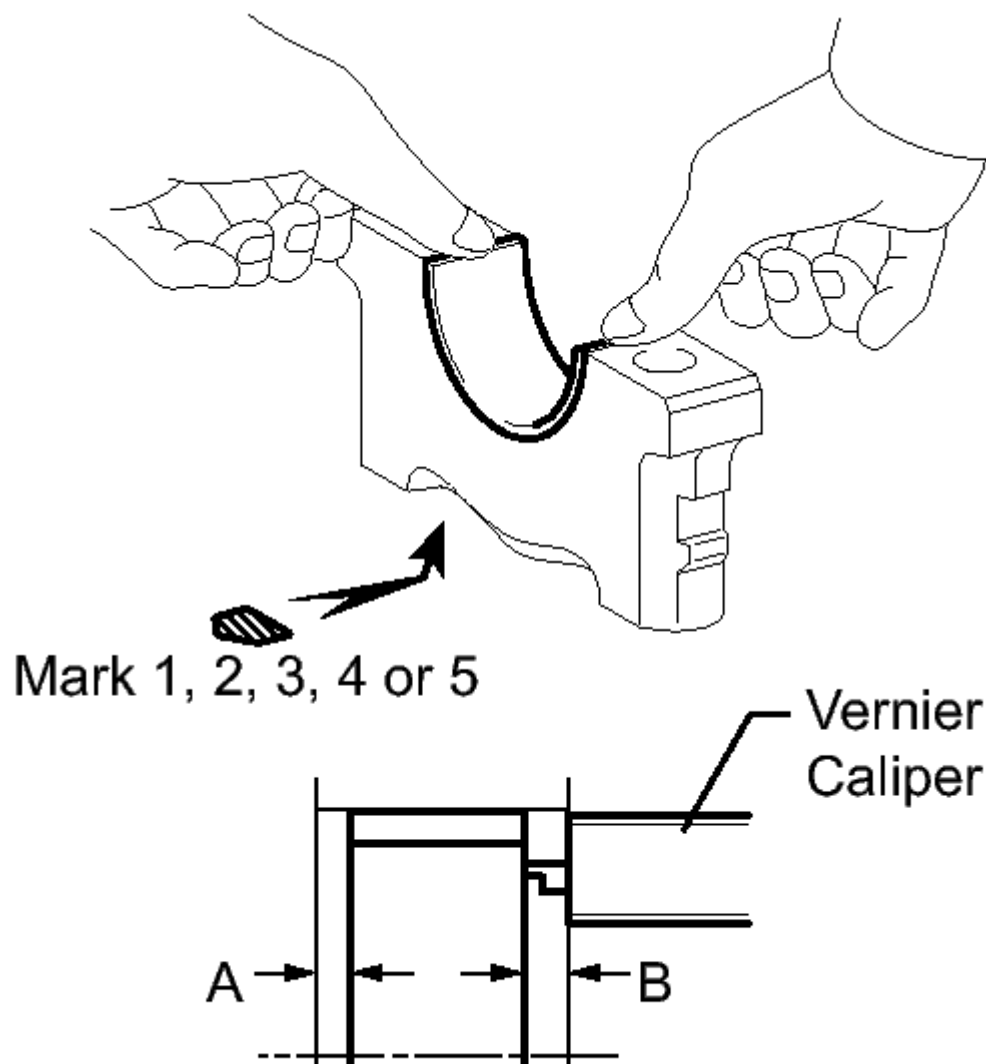
**T**

Fig. 467: Measuring Distance Between Bearing Cap Edge And Lower Bearing Edge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

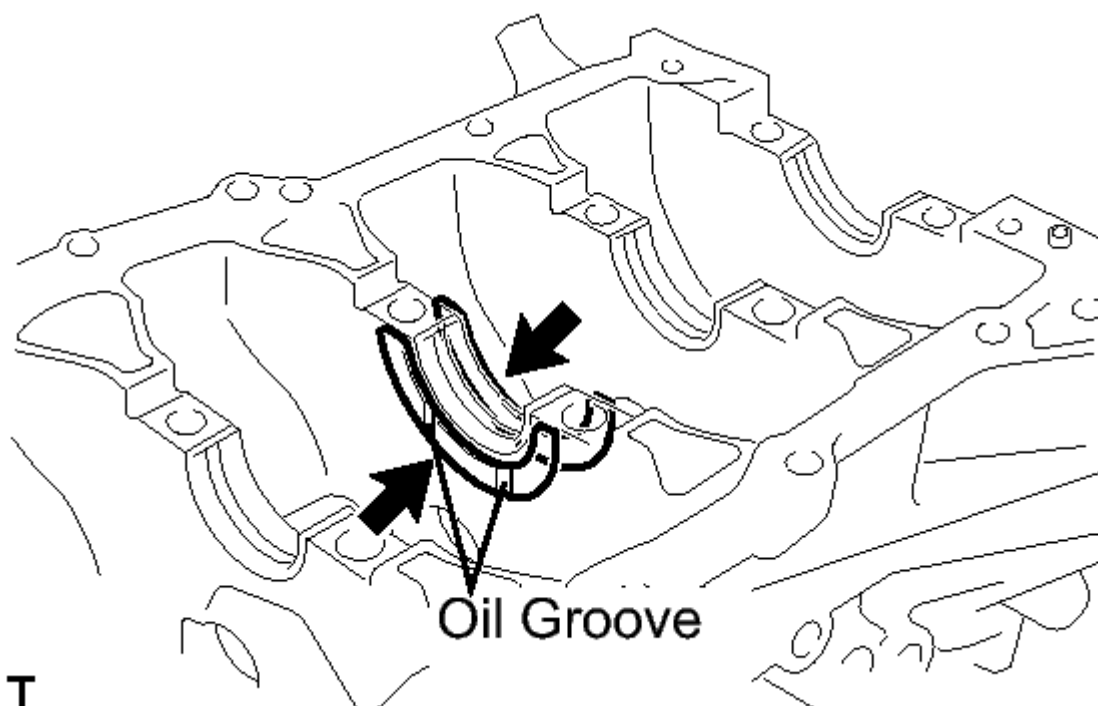
Dimension (A - B)

0.5 mm (0.0197 in.) or less

NOTE: Do not apply engine oil to the bearing inner surface or bearing cap contact surfaces.

5. INSTALL UPPER CRANKSHAFT THRUST WASHER

- Install the 2 thrust washers under the No. 3 journal of the cylinder block with the oil grooves facing outward.



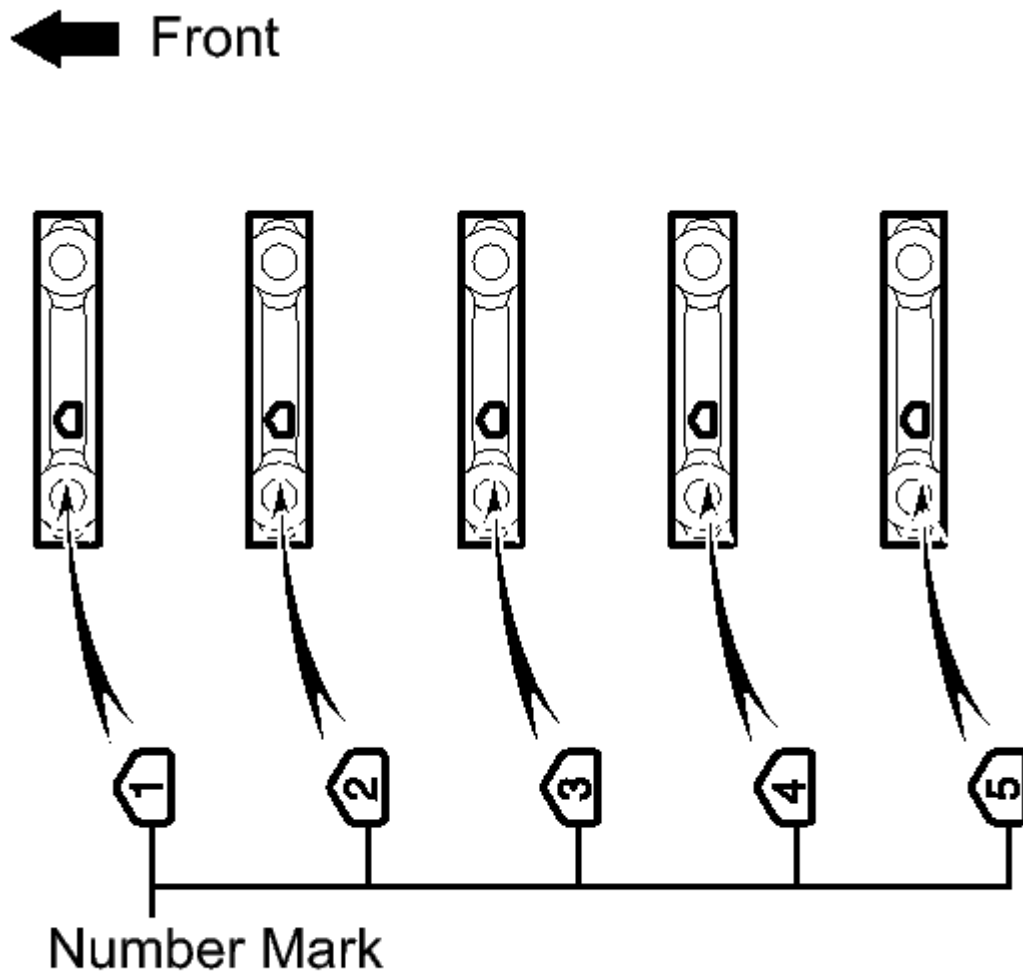
T

Fig. 468: Locating Upper Crankshaft Thrust Washer
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

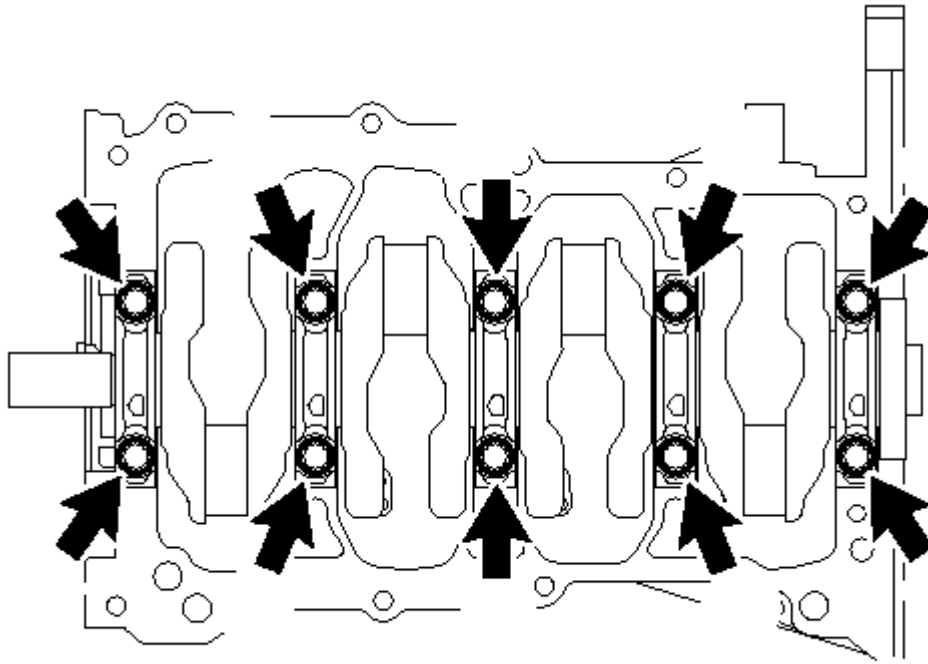
- b. Apply engine oil to the crankshaft thrust washer.

6. INSTALL CRANKSHAFT

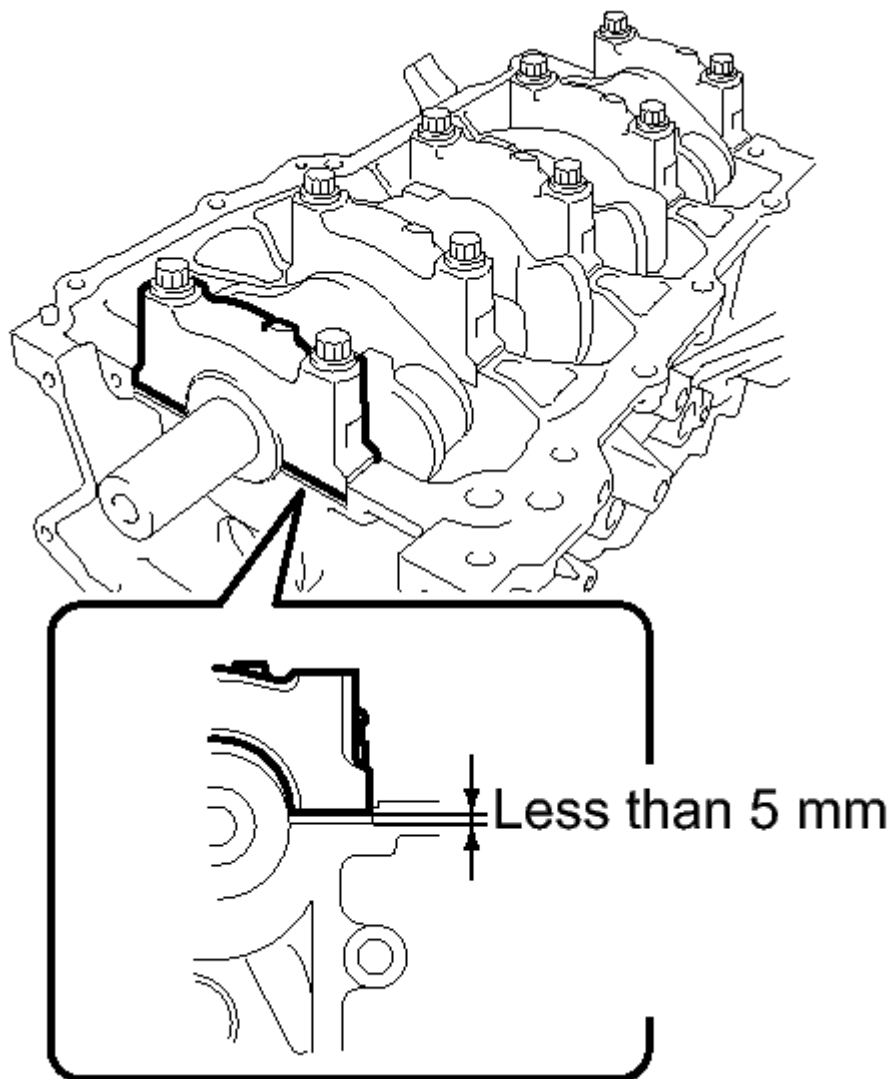
- a. Apply engine oil to the upper bearing and install the crankshaft on the cylinder block.
- b. Apply engine oil to the lower bearing.
- c. Examine the number marks and install the bearing caps on the cylinder block.

**T****Fig. 469: Identifying Marks On Bearing Caps****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- d. Apply a light coat of engine oil to the threads and under the bearing cap bolts.
- e. Temporarily install the 10 main bearing cap bolts.

**T****Fig. 470: Locating Main Bearing Cap Bolts****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

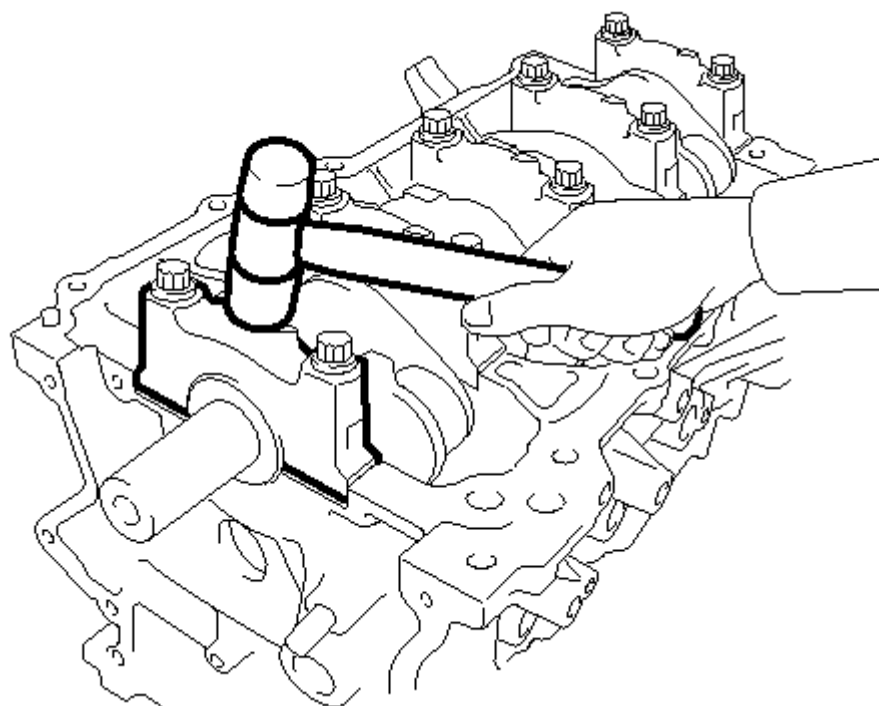
- f. Insert the main bearing cap by hand until the clearance between the main bearing cap and the cylinder block is less than 5 mm (0.20 in.) using the 2 internal bearing cap bolts as guides.



T

Fig. 471: Identifying Clearance Between Main Bearing Cap And Cylinder Block
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Using a plastic hammer, lightly tap the bearing cap to ensure a proper fit.

**T****Fig. 472: Tapping Bearing Cap**

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

- h. Install the crankshaft bearing cap bolts.

NOTE: Tighten the main bearing cap bolts in 2 progressive steps.

- i. Step 1

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

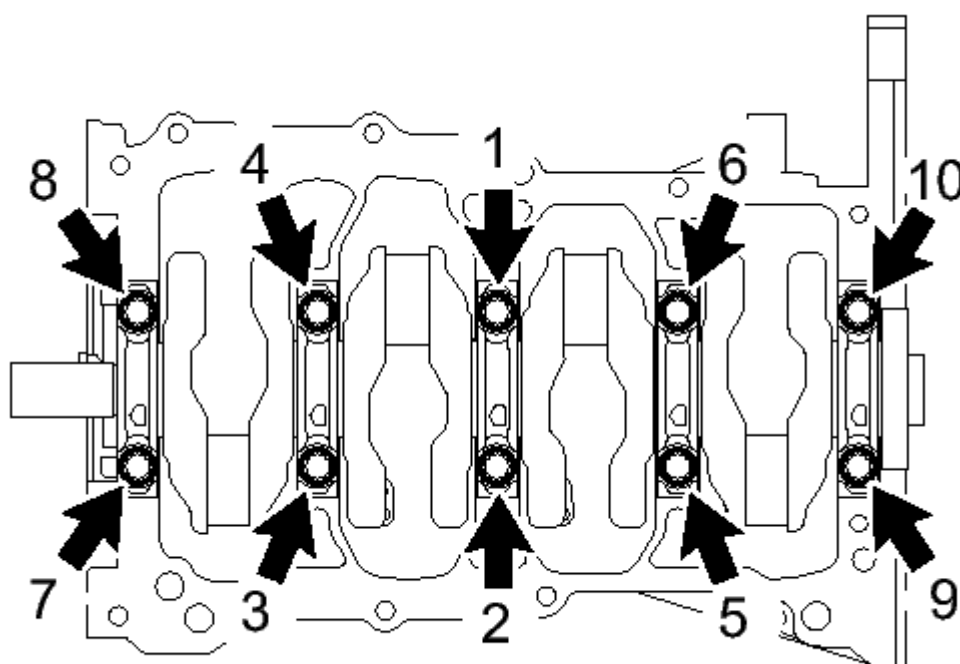
**T**

Fig. 473: Locating Main Bearing Cap Bolts And Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

j. Step 2

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

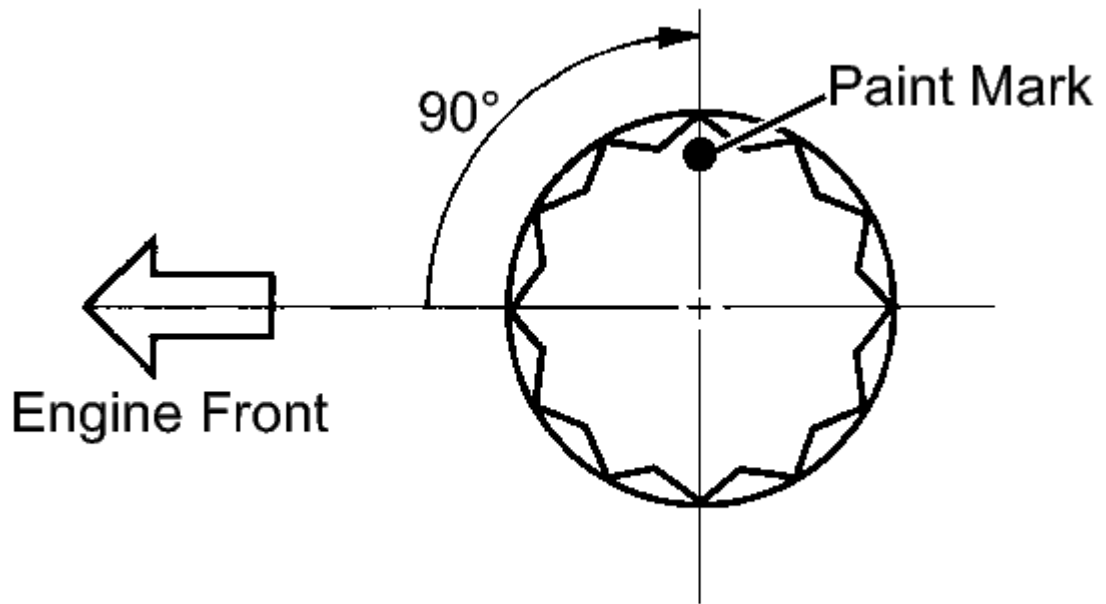
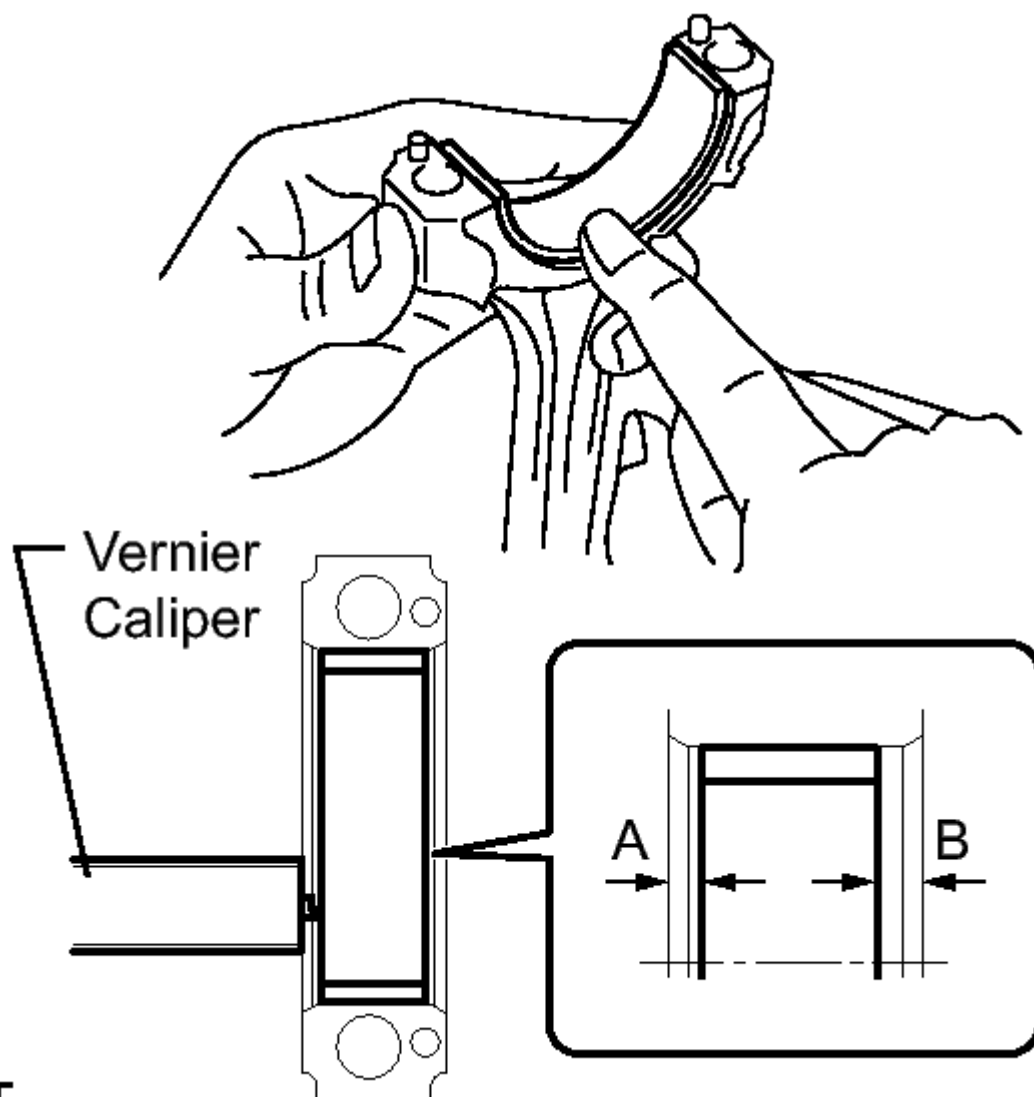


Fig. 474: Retightening Bearing Cap Bolts 90 Degrees
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Further tighten the bearing cap bolts an additional 90° in the numerical order shown in the previous illustration.
- k. Check that the paint mark is now at a 90° angle to the front.
- l. Check that the crankshaft turns smoothly.
- m. Check the crankshaft thrust clearance. Refer to **INSPECTION**.

7. INSTALL CONNECTING ROD BEARING

- a. Install the connecting rod bearing to the connecting rod and bearing cap.
- b. Using a vernier caliper, measure the distance between the connecting rod and bearing cap edges and the connecting rod bearing edge.

**T****Fig. 475: Identifying Connecting Rod Bearing Dimension**

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

Dimension (A - B)

0.7 mm (0.0276 in.) or less

NOTE: Do not apply engine oil to the bearing inner surface or connecting rod 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.

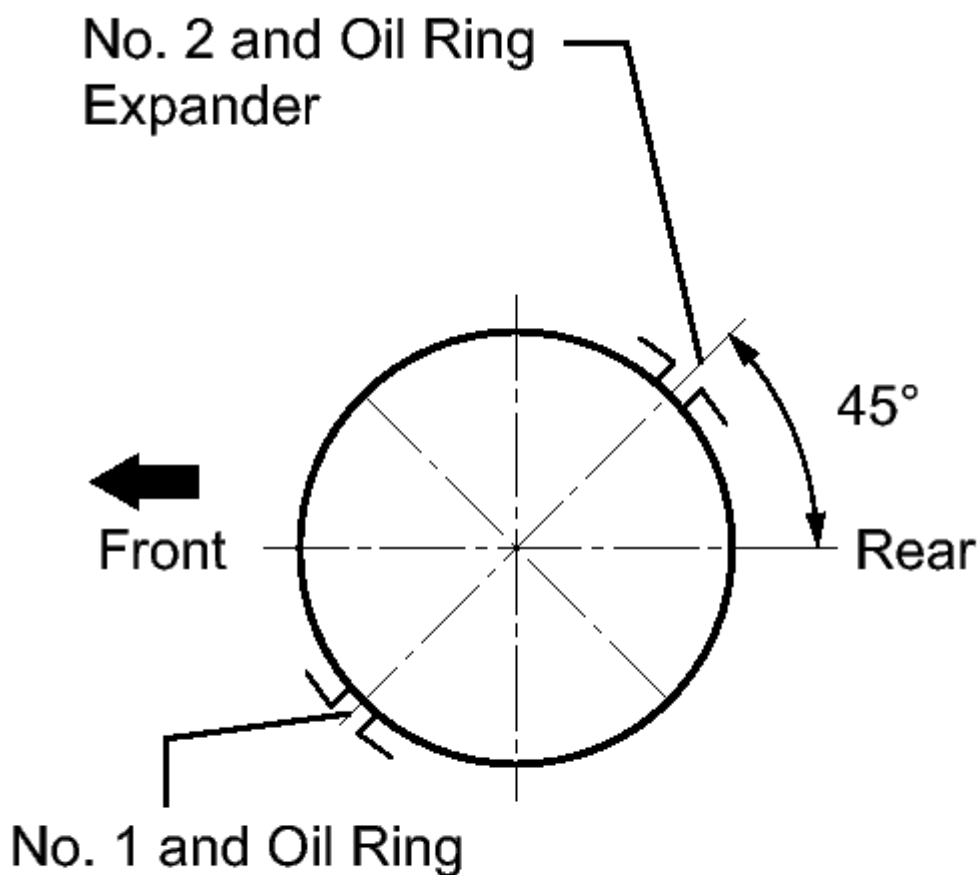
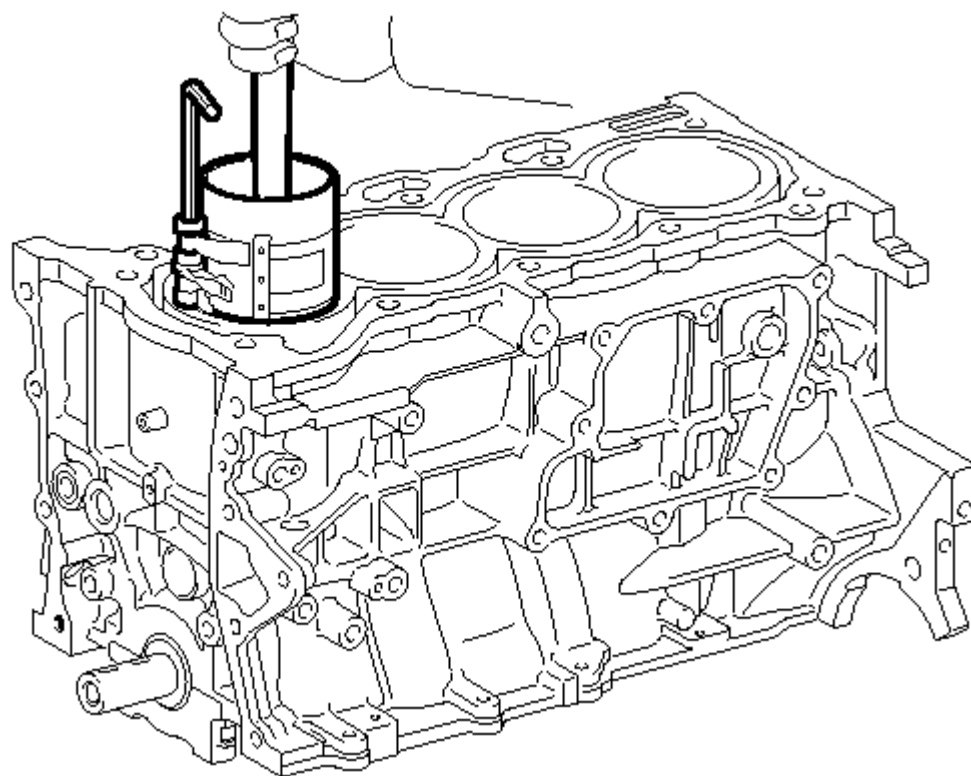


Fig. 476: Positioning Piston Rings

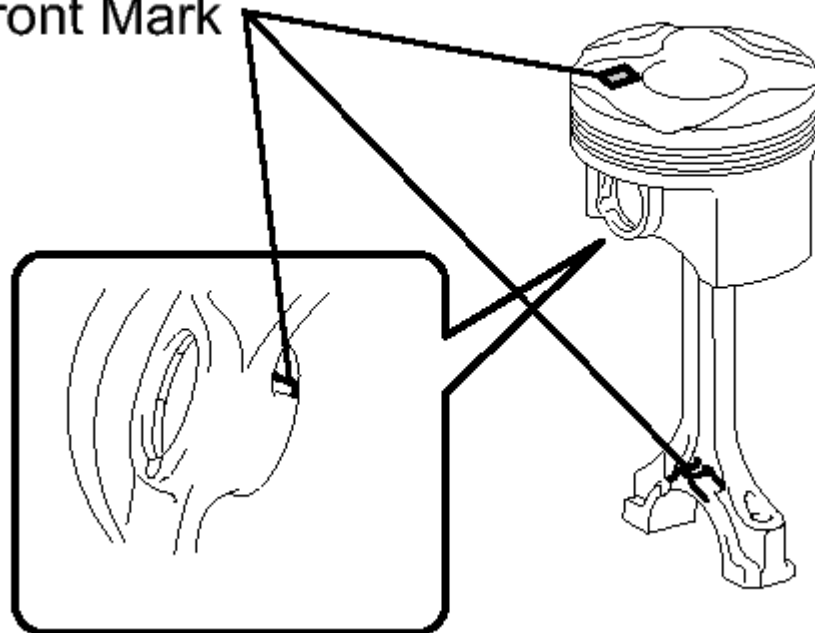
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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.



Front Mark



T

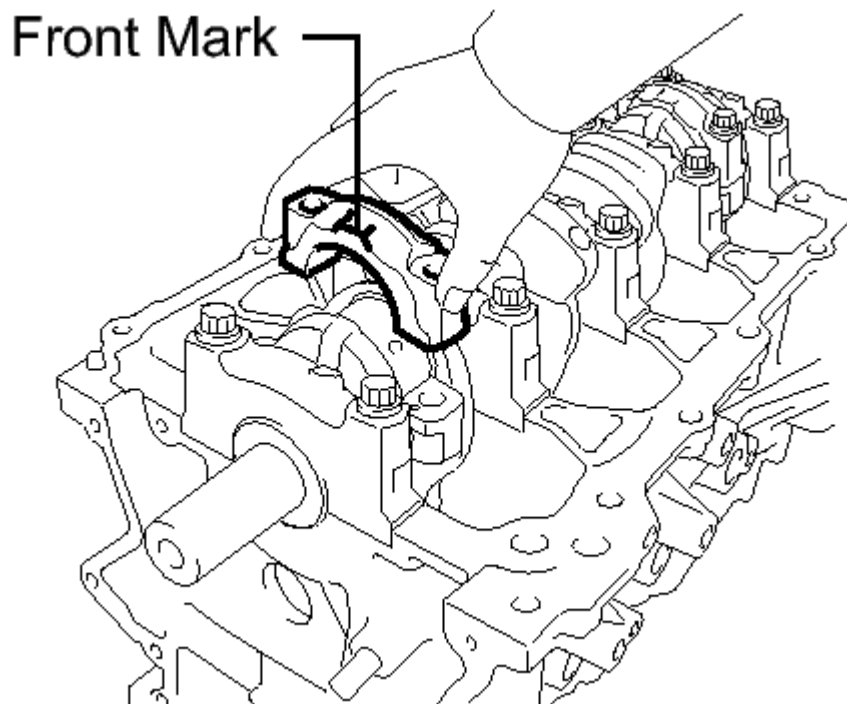
Fig. 477: Identifying Piston Front Mark Location

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

NOTE:

- When inserting the piston with connecting rod, do not allow it to make contact with the oil nozzle.
- Match the numbered connecting rod cap with the connecting rod.

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



T

Fig. 478: Identifying Front Mark Of Connecting Rod Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE: **Tighten the connecting rod cap bolts in 2 progressive steps.**

- g. Step 1
1. Using SST, install and alternately tighten the bolts of the connecting rod cap in several steps.

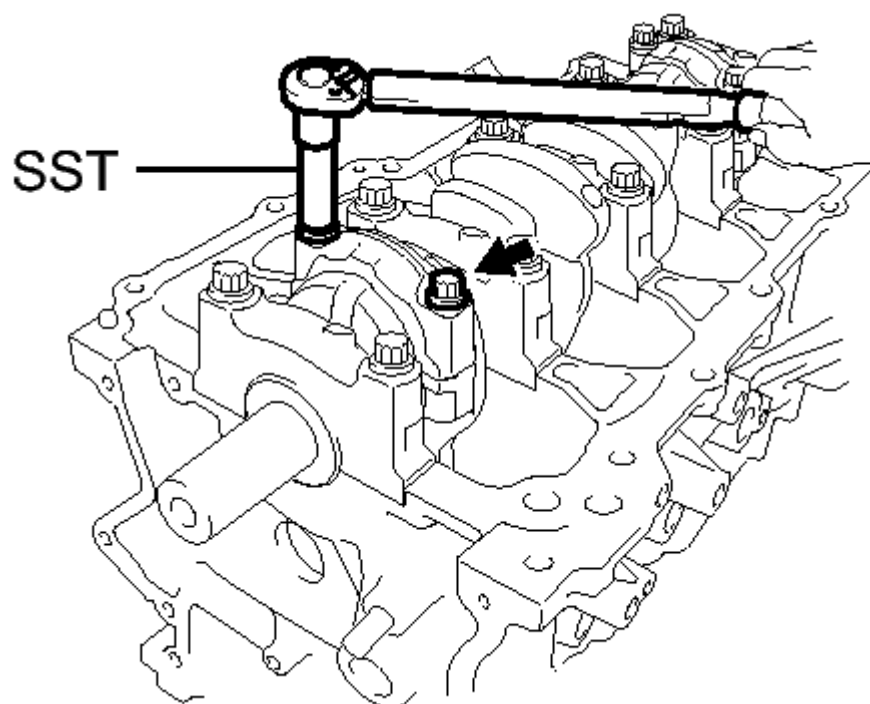


Fig. 479: Tightening Bolts

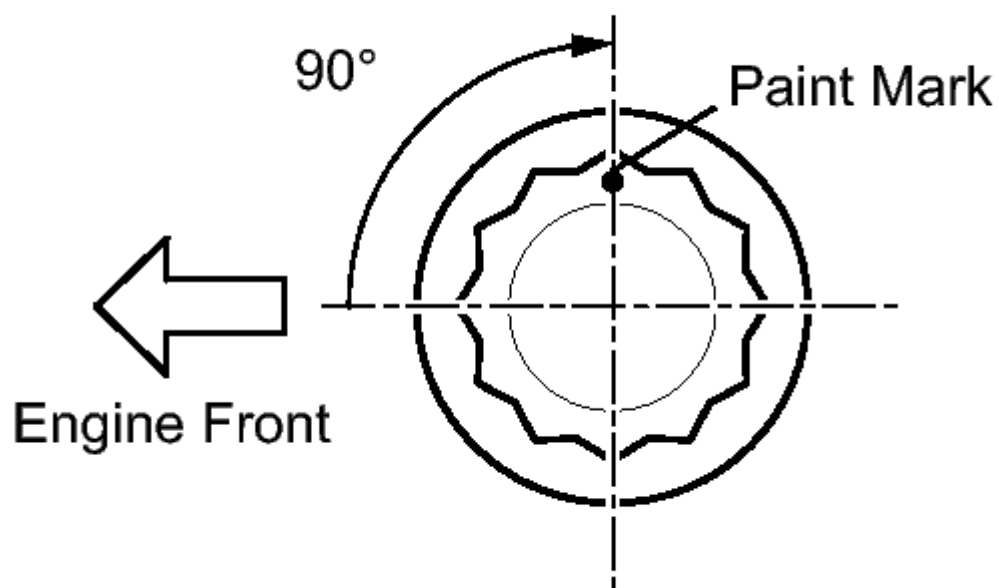
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09205-16010

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

h. Step 2

1. Mark the front of the connecting rod cap bolts with paint.



P

Fig. 480: Retightening Connecting Rod Bolts By 90 Degrees

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

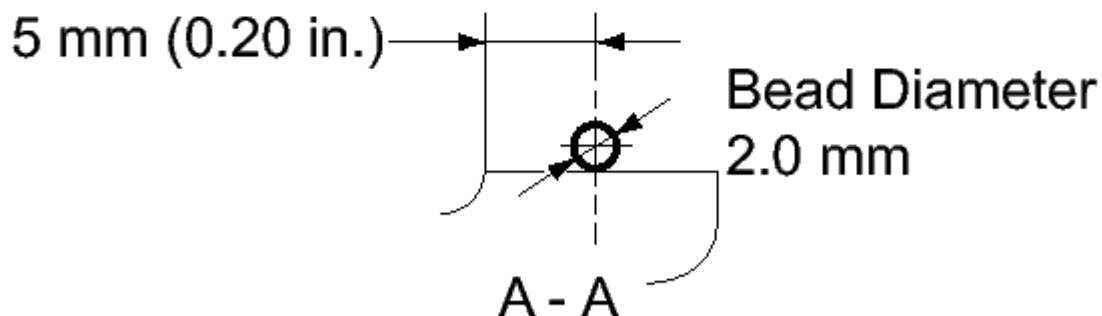
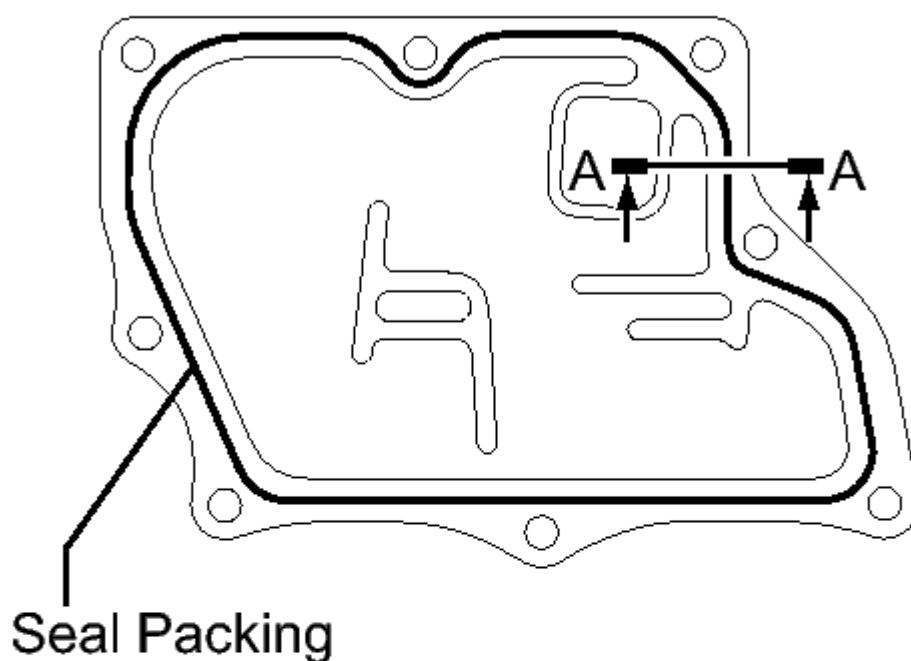
2. Further tighten the cap bolts an additional 90° as shown in the illustration.

i. Check that the crankshaft turns smoothly.

j. Check the connecting rod thrust clearance. Refer to **INSPECTION**.

9. INSTALL NO. 1 VENTILATION CASE

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



T

Fig. 481: Identifying No. 1 Ventilation Case

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

Seal packing

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

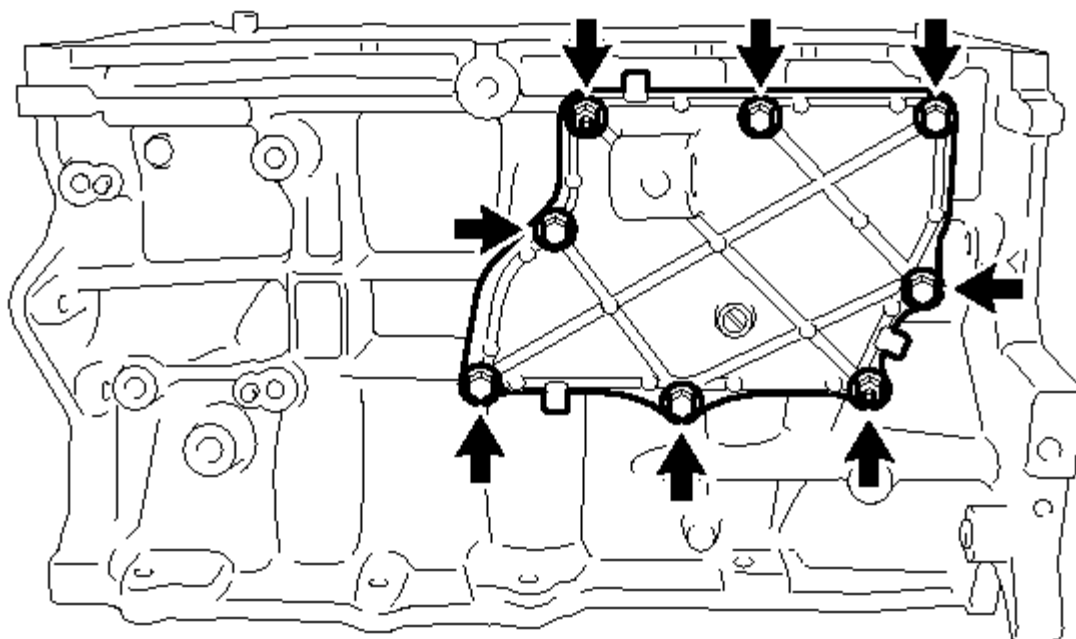
Bead diameter

2.0 mm (0.0787 in.)

NOTE:

- Remove any oil from the contact surface.
- Install the No. 1 ventilation case within 3 minutes and tighten the bolts and nuts within 15 minutes after applying seal packing.
- Do not start the engine for at least 2 hours after installing.

- b. Install the No. 1 ventilation case with the 6 bolts and 2 nuts.

**T****Fig. 482: Locating No. 1 Ventilation Case Bolts**

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

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