ENGINE

ON-VEHICLE INSPECTION

ON-VEHICLE INSPECTION

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

      HINT:

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

   c. Install the air cleaner filter element.
5. **INSPECT SPARK PLUG** . Refer to **ON-VEHICLE INSPECTION - Step 2**
6. **INSPECT VALVE LASH ADJUSTER ASSEMBLY 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.

7. **INSPECT IGNITION TIMING**
   a. Warm up and stop the engine.
   b. When using the Techstream:
      1. Connect the Techstream to the DLC3.

         NOTE: When checking the ignition timing, the transmission should be in neutral.

      2. Start the engine and idle it.

3. Turn the Techstream on.
4. Enter the following menus: Powertrain / Engine / Data List / IGN Advance.

   Standard ignition timing

   BTDC 5 to 15 deg. at idle

   HINT:

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

   If the ignition timing is not as specified, check the valve timing.

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

   Standard ignition timing

   BTDC 8 to 12 deg. at idle

   HINT:

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

   If the ignition timing is not as specified, check the valve timing.

8. Enter the following menus: Connect the TC and TE1 / OFF.
9. Turn the ignition switch off.
10. Disconnect the Techstream from the DLC3.

c. When not using the Techstream:
   1. Remove the No. 1 engine cover sub-assembly.
   2. Pull out the wire harness as shown in the illustration below.

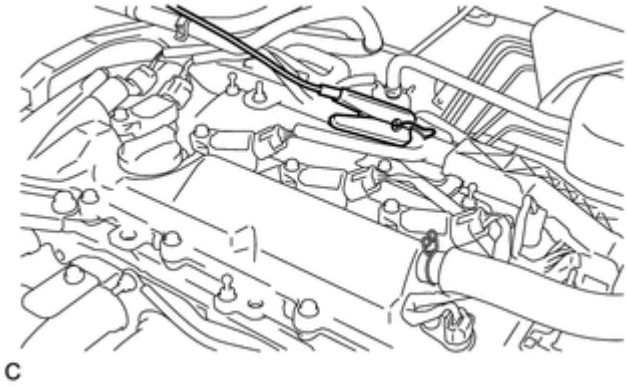


Fig. 1: Connecting Clip Of Timing Light To Wire Harness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: After checking, wrap the wire harness with tape.

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

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

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

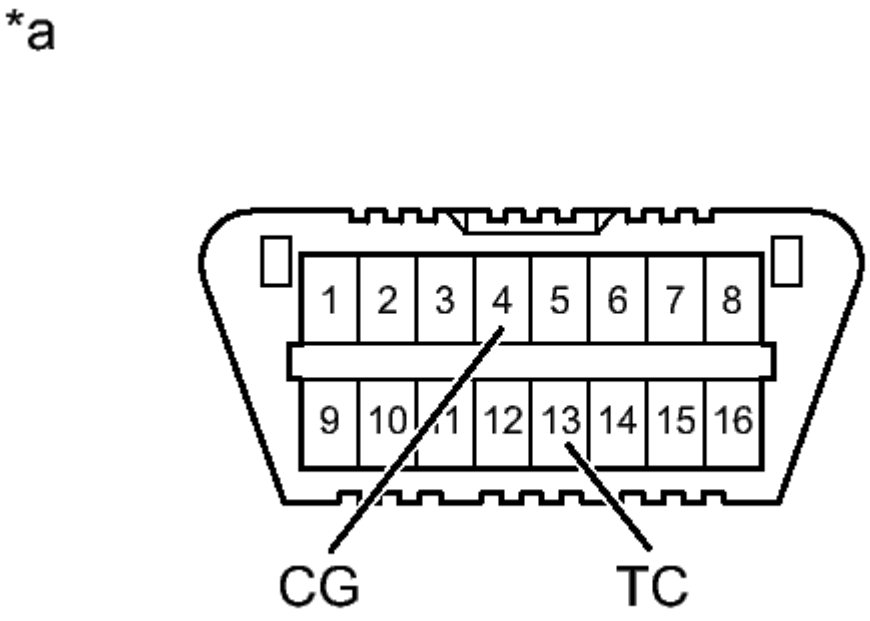


Fig. 2: DLC3 Connector End View
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front view of DLC3

- **SST: 09843-18040**

NOTE:

- **Confirm the terminal numbers before connecting them. Connecting the wrong terminals can damage the engine.**
- **When checking the ignition timing, the transmission should be in neutral.**

5. Using a timing light, check the ignition timing.

   Standard ignition timing

   8 to 12° BTDC at idle

6. Remove SST from the DLC3.
7. Check the ignition timing.

   Standard ignition timing

   5 to 15° BTDC at idle

   If the ignition timing is not as specified, check the valve timing.

8. Check that the ignition timing advances immediately when the engine speed is increased.
9. Disconnect the timing light from the engine.
10. Install the No. 1 engine cover sub-assembly.

8. **INSPECT ENGINE IDLE SPEED**
   a. Warm up and stop the engine.
   b. When using the Techstream:
      1. Connect the Techstream to the DLC3.

NOTE:

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

      2. Race the engine at 2500 RPM for approximately 90 seconds.
      3. Turn the Techstream on.
      4. Enter the following menus: Powertrain / Engine / Data List / Engine Speed.

Standard idle speed

600 to 700 RPM

HINT:

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

If the idle speed is not as specified, check the air intake system.

5. Disconnect the Techstream from the DLC3.

c. When not using the Techstream:

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

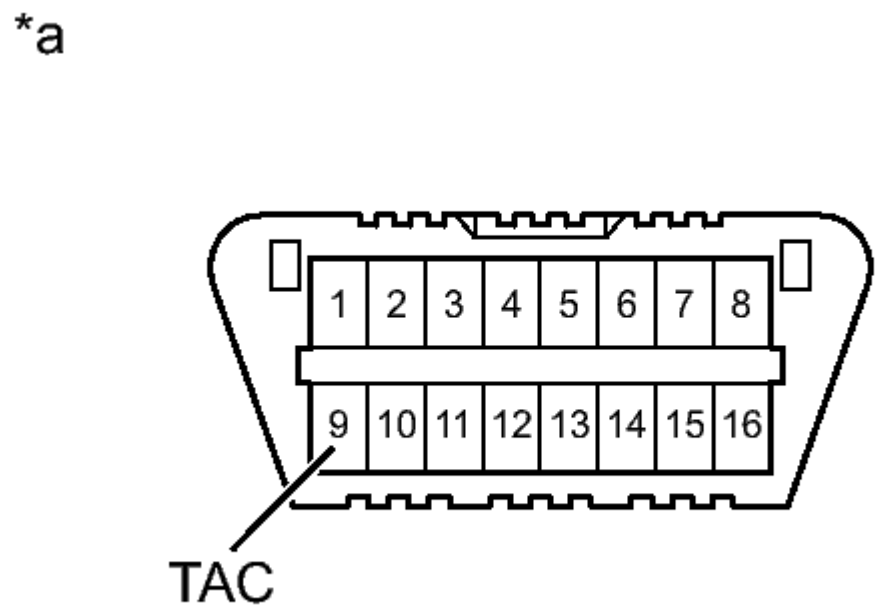


Fig. 3: DLC3 Connector End View
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front view of DLC3

- **SST: 09843-18030**

NOTE: Confirm the terminal number before connecting the probe.

Connecting the wrong terminals can damage the engine.

2. Race the engine at 2500 RPM for approximately 90 seconds.
3. Check the idle speed.

   Standard idle speed

   600 to 700 RPM

   NOTE:

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

   If the speed is not as specified, check the air intake system.

4. Disconnect the tachometer probe from the DLC3.

9. **INSPECT COMPRESSION**
   a. Warm up and stop the engine.
   b. Check for DTCs. Refer to **DTC CHECK / CLEAR** .
   c. Remove the No. 1 engine cover sub-assembly.
   d. Disconnect the 4 fuel injector connectors.
   e. Remove the 4 bolts and 4 ignition coils.
   f. Remove the 4 spark plugs.
   g. Insert a compression gauge into the spark plug hole.

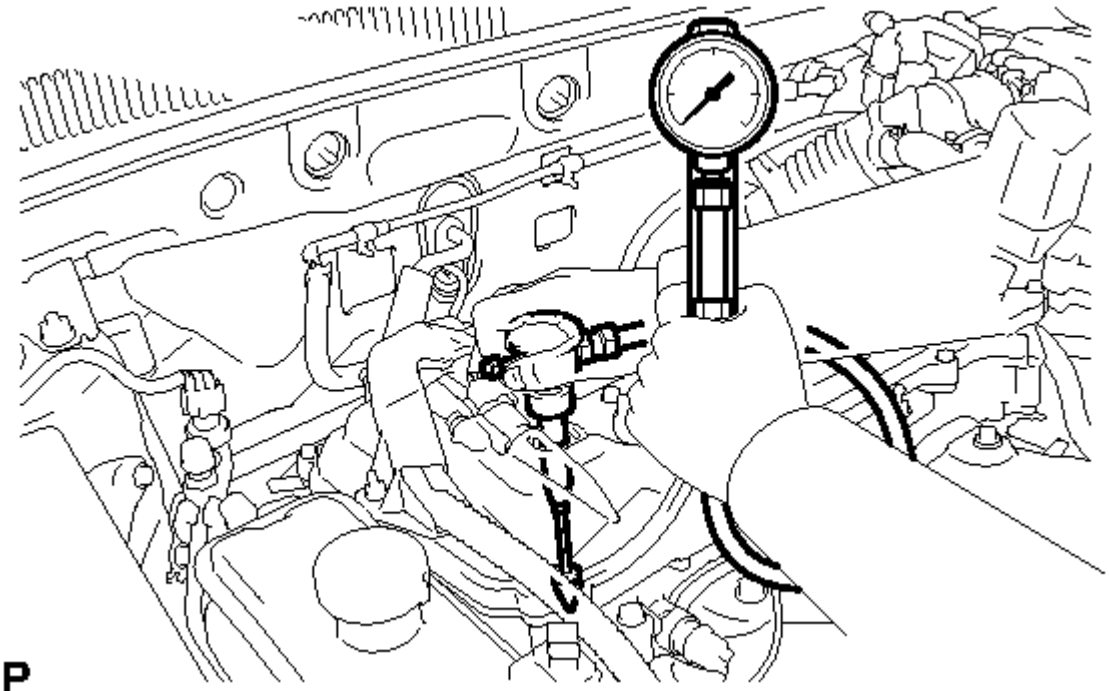


Fig. 4: Measuring Compression Pressure
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

h. Fully open the throttle.

i. While cranking the engine, measure the compression pressure.

   Standard compression pressure

   1450 kPa (14.7 kgf/cm^2 , 210 psi) or higher

   Minimum pressure

   980 kPa (9.9 kgf/cm^2 , 142 psi)

   Difference between each cylinder

   200 kPa (2.0 kgf/cm^2 , 29 psi) or less

   HINT:

   Always use a fully charged battery to obtain an engine speed of 250 RPM or more.

j. If the cylinder compression is low in one or more cylinders, pour a small amount of engine oil into the cylinder with low compression through its spark plug hole. Then inspect the cylinder compression pressure again.

HINT:

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

k. Install the 4 spark plugs.

Torque: 25 N*m (254 kgf*cm, 18 ft.*lbf)

l. Install the 4 ignition coils with the 4 bolts.

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

m. Connect the 4 fuel injector connectors.
n. Install the No. 1 engine cover sub-assembly.
o. Clear the DTCs. Refer to **DTC CHECK / CLEAR** .

10. **INSPECT CO/HC**

HINT:

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

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

HINT:

- When performing the 2 mode (2500 RPM and idle) test, follow the measurement order prescribed by the applicable local regulations.
- If the CO/HC concentration does not comply with regulations, troubleshoot in the order given below.

1. Check for DTCs. Refer to **DTC CHECK / CLEAR** .
2. See the table below for possible causes, and then inspect and correct the applicable causes if necessary.

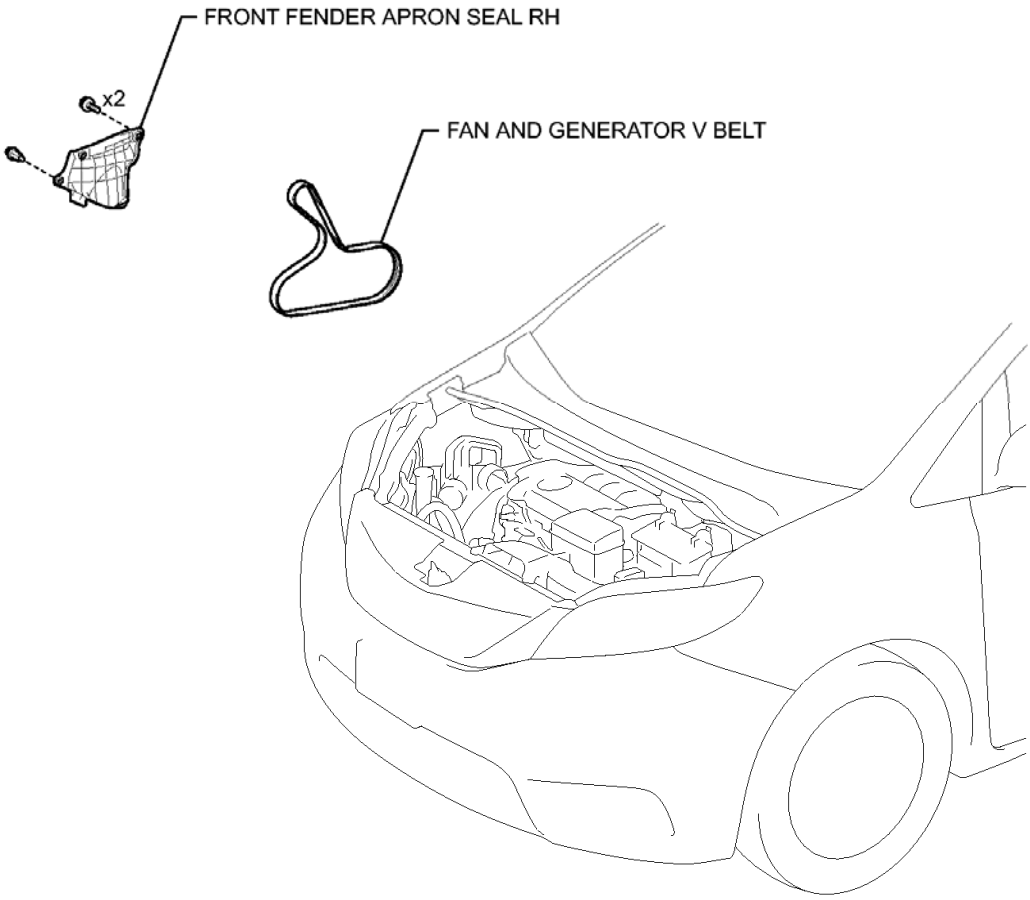
CO	HC	Symptom	Cause
			1. Faulty ignitions • Incorrect timing • Plugs are

Normal	High	Rough idle	contaminated or shorted, or gaps are defective 2. Leaky intake and exhaust valves 3. Leaky cylinder
Low	High	Rough idle (Fluctuating HC reading)	1. Vacuum leaks • PCV hose • Intake manifold • Throttle body • Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Faulty SFI system • Faulty pressure • Defective engine coolant temperature sensor • Faulty ECM • Faulty injector • Faulty throttle position sensor • Faulty mass air flow sensor

DRIVE BELT

COMPONENTS

ILLUSTRATION



P

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

ON-VEHICLE INSPECTION

ON-VEHICLE INSPECTION

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

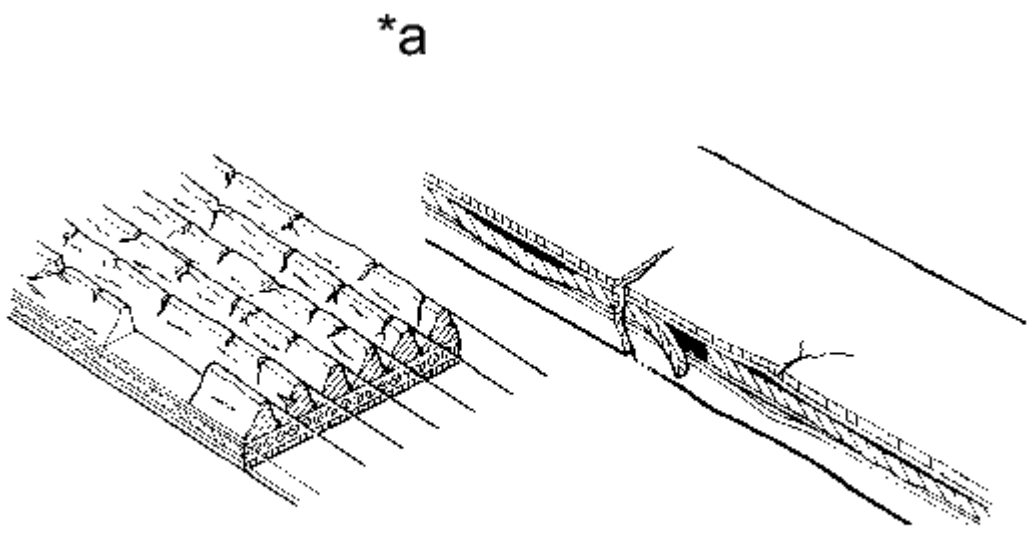


Fig. 6: Inspecting Condition Of Fan & Generator V Belt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	INCORRECT

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

- The belt is cracked.
- The belt is worn out to the extent that the cords are exposed.
- The belt has chunks missing from the ribs.

b. Check that the belt fits properly in the ribbed grooves.

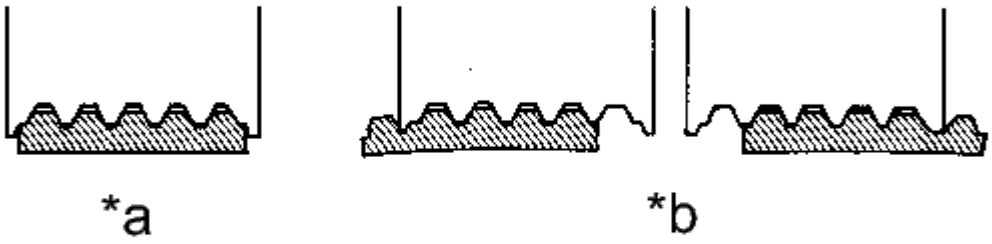


Fig. 7: Checking V Belt For Proper Installation
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	CORRECT
*b	INCORRECT

HINT:

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

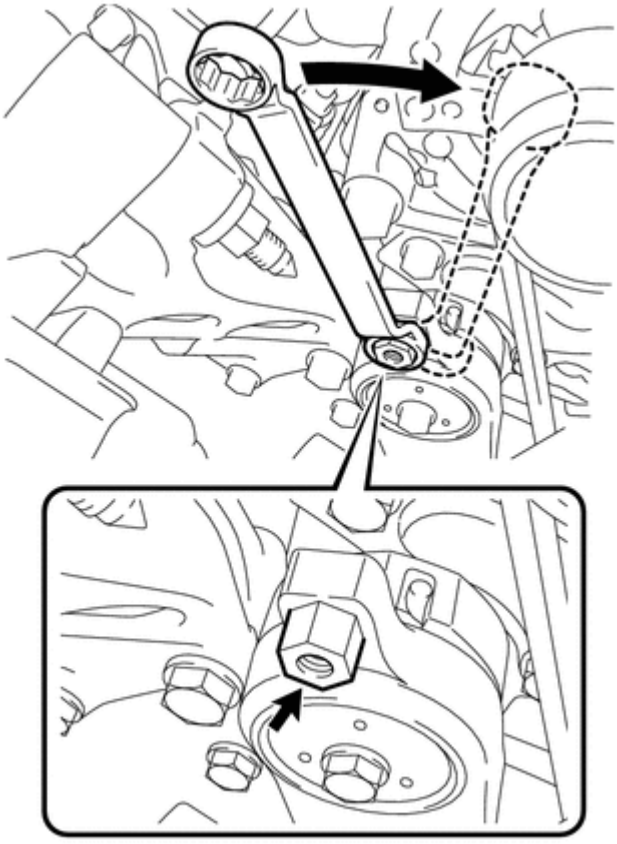
2. **INSPECT V-RIBBED BELT TENSIONER ASSEMBLY**
    a. Check that nothing gets caught in the tensioner by turning it clockwise and counterclockwise.

    If a malfunction exists, replace the V-ribbed belt tensioner.

REMOVAL

REMOVAL

1. **REMOVE FRONT WHEEL RH**
2. **REMOVE FRONT FENDER APRON SEAL RH** See step 9
3. **REMOVE FAN AND GENERATOR V BELT**
    a. Attach a wrench to the hexagonal portion of the belt tensioner as shown in the illustration below, rotate the belt tensioner clockwise, and remove the V belt.



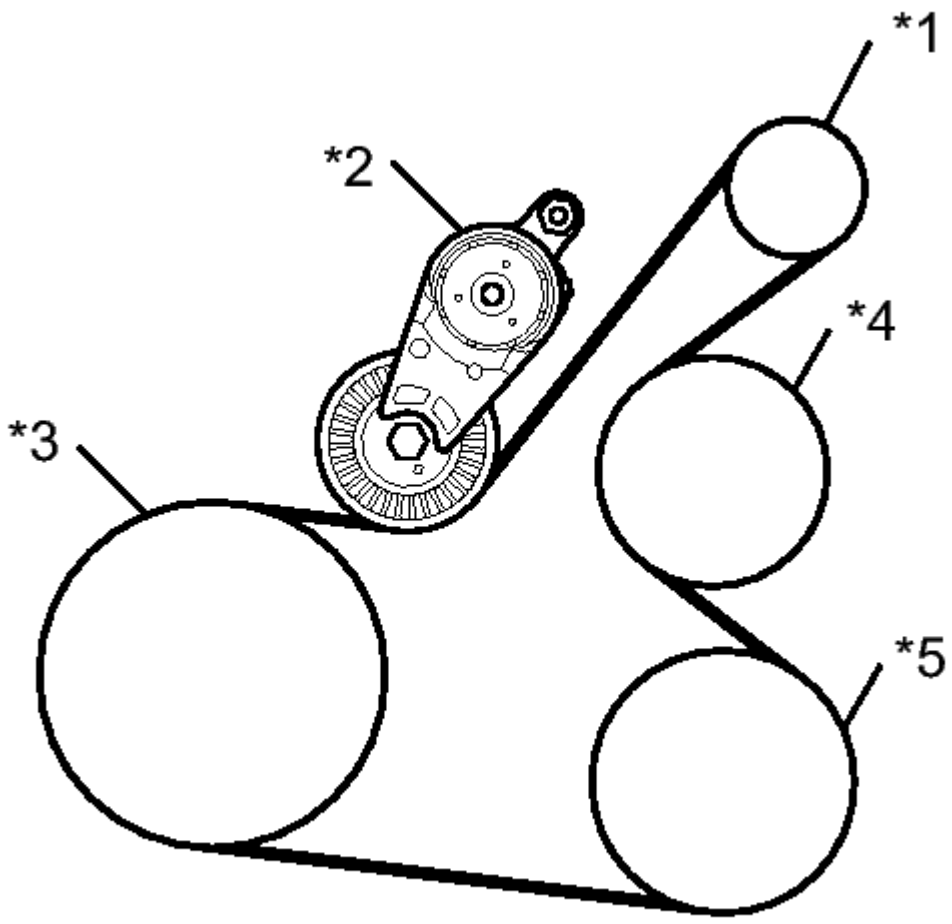
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Fig. 8: Identifying Tensioner Assembly And Hex Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

INSTALLATION

1. **INSTALL FAN AND GENERATOR V BELT**
    a. Set the V belt onto each part as shown in the illustration below, except the water pump pulley.



P

Fig. 9: Fan Belt Routing Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Generator
*2	Tensioner
*3	Crankshaft
*4	Water Pump
*5	Cooler Compressor

b. Loosen the V belt by turning the belt tensioner clockwise.
c. Set the V belt onto the water pump pulley.

NOTE: **Make sure that the belt is attached to each pulley. In particular, make sure that the belt is securely fitted into the grooves of the crankshaft pulley.**

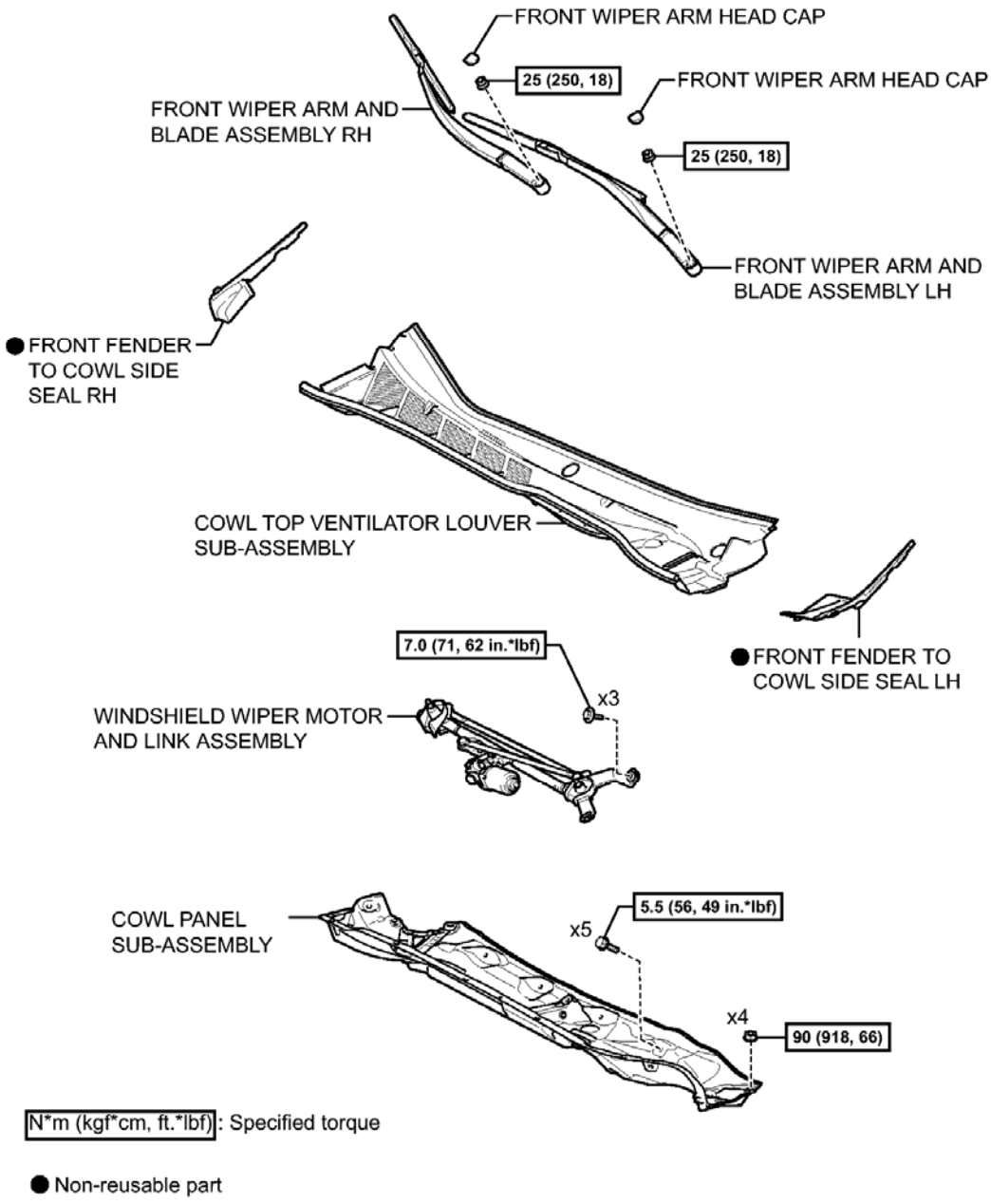
2. **INSTALL FRONT FENDER APRON SEAL RH** See step 77
3. **INSTALL FRONT WHEEL RH**

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

CAMSHAFT

COMPONENTS

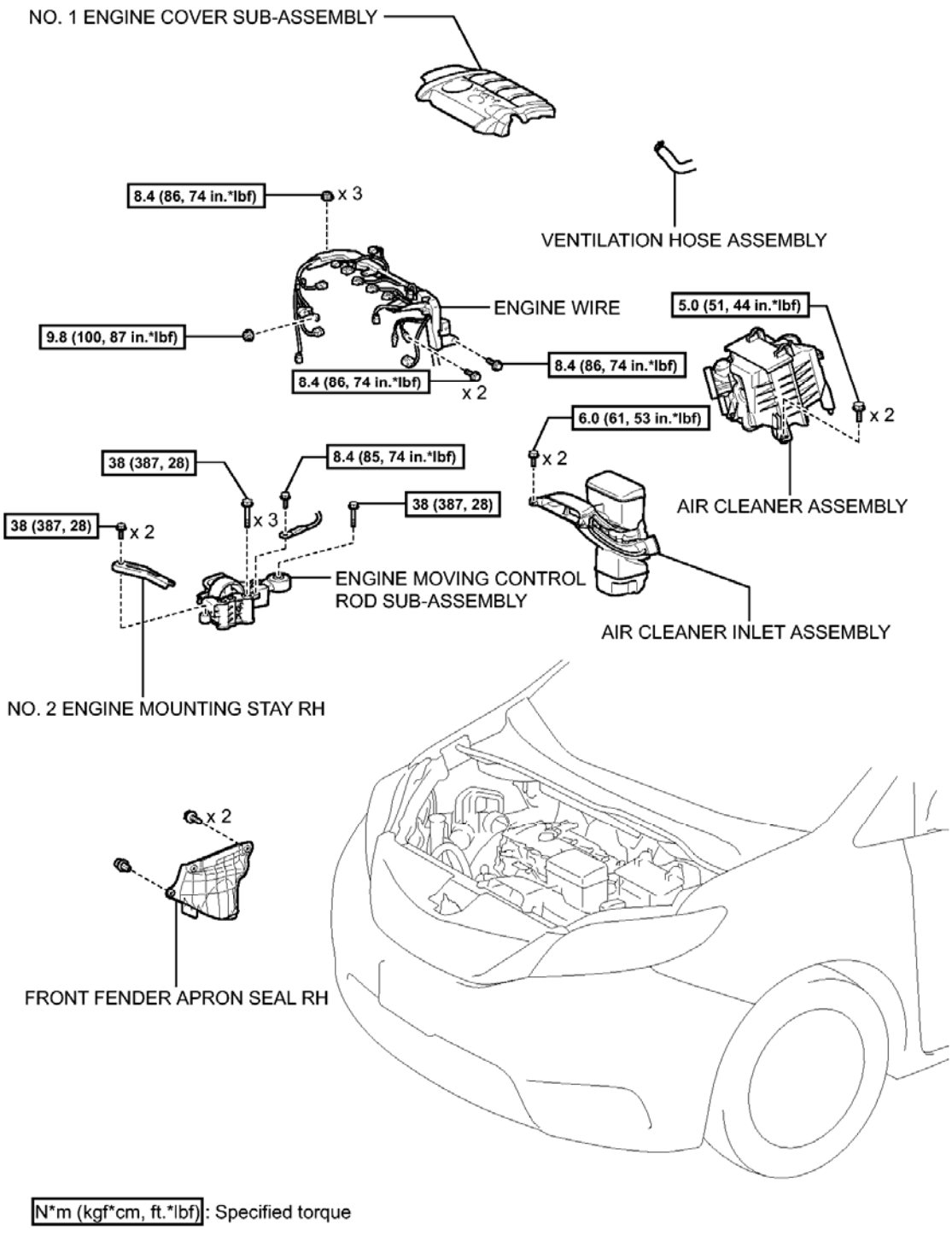
ILLUSTRATION



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Fig. 10: Camshaft Replacement Components With Torque Specifications (1 Of 3)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

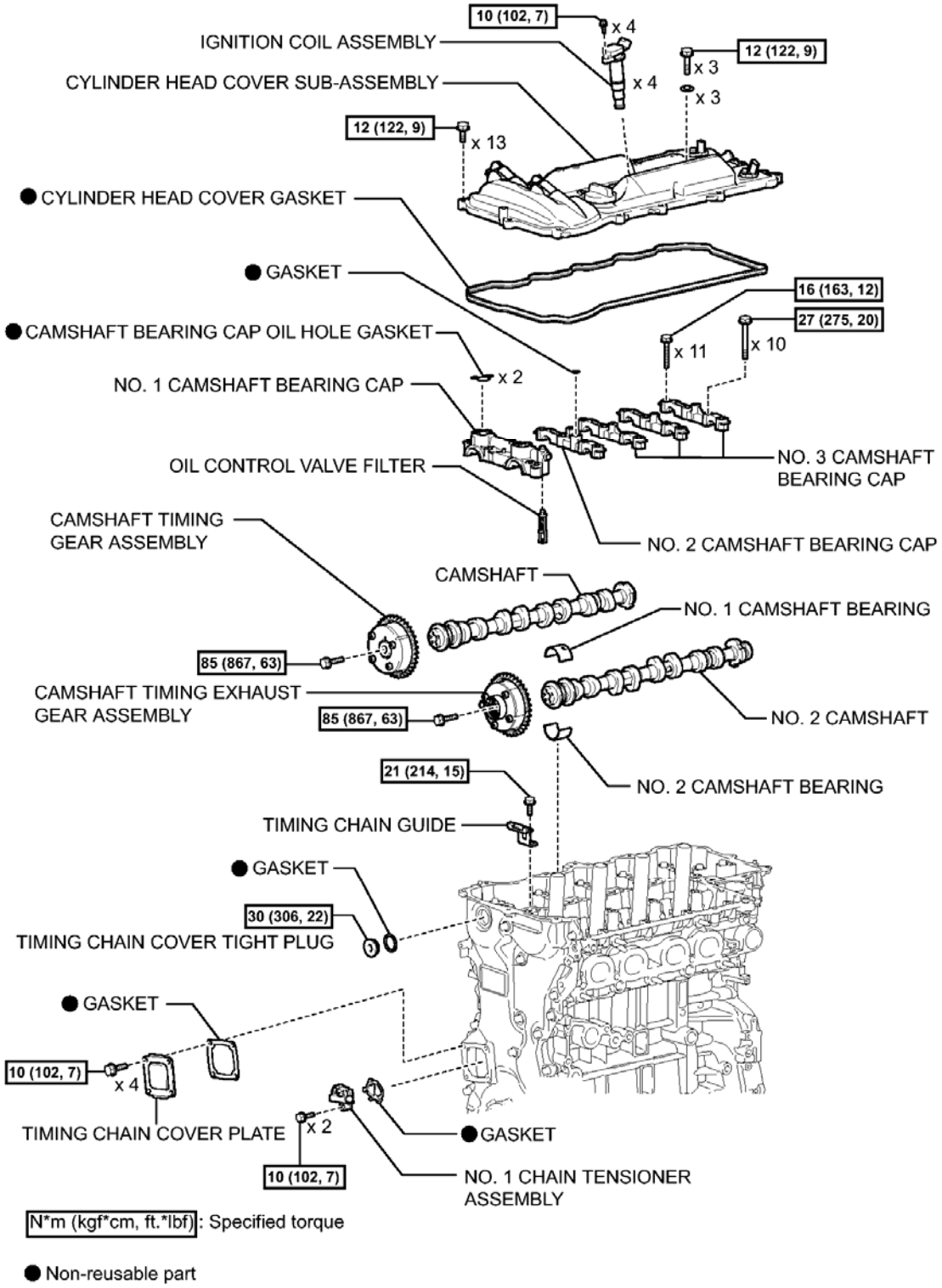
ILLUSTRATION



c

Fig. 11: Camshaft Replacement Components With Torque Specifications (2 Of 3)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



c

Fig. 12: Camshaft Replacement Component Locations With Torque Specifications (3 Of 3)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

REMOVAL

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

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

2. **REMOVE FRONT WHEEL RH**
3. **REMOVE FRONT FENDER APRON SEAL RH** See step 9
4. **REMOVE FRONT WIPER ARM HEAD CAP** . Refer to **REMOVAL - Step 1**
5. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH** . Refer to **REMOVAL - Step 2**
6. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH** . Refer to **REMOVAL - Step 3**
7. **REMOVE FRONT FENDER TO COWL SIDE SEAL LH** . Refer to **REMOVAL - Step 4**
8. **REMOVE FRONT FENDER TO COWL SIDE SEAL RH** . Refer to **REMOVAL - Step 5**
9. **REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** . Refer to **REMOVAL - Step 6**
10. **REMOVE WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** . Refer to **REMOVAL - Step 7**
11. **REMOVE COWL PANEL SUB-ASSEMBLY** . Refer to **REMOVAL - Step 10**
12. **REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY** See step 21
13. **REMOVE AIR CLEANER INLET ASSEMBLY** See step 22
14. **REMOVE AIR CLEANER ASSEMBLY** See step 24
15. **REMOVE NO. 2 ENGINE MOUNTING STAY RH** See step 37
16. **REMOVE ENGINE MOVING CONTROL ROD SUB-ASSEMBLY** See step 38
17. **DISCONNECT VENTILATION HOSE ASSEMBLY**
    a. Disconnect the ventilation hose from the cylinder head cover.

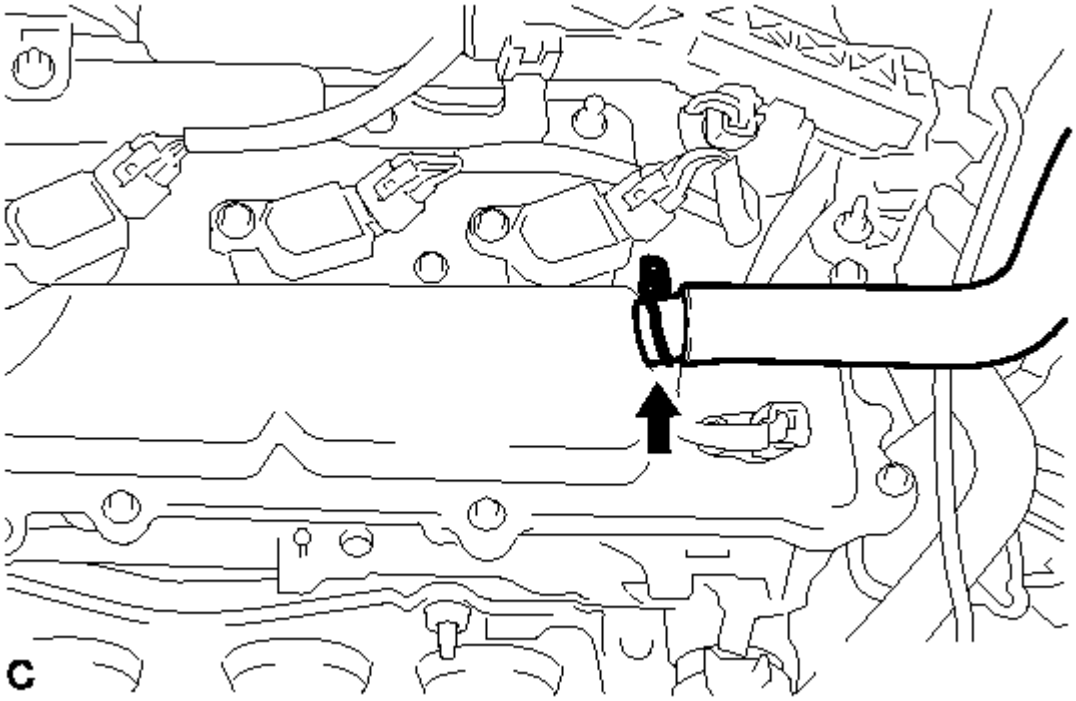
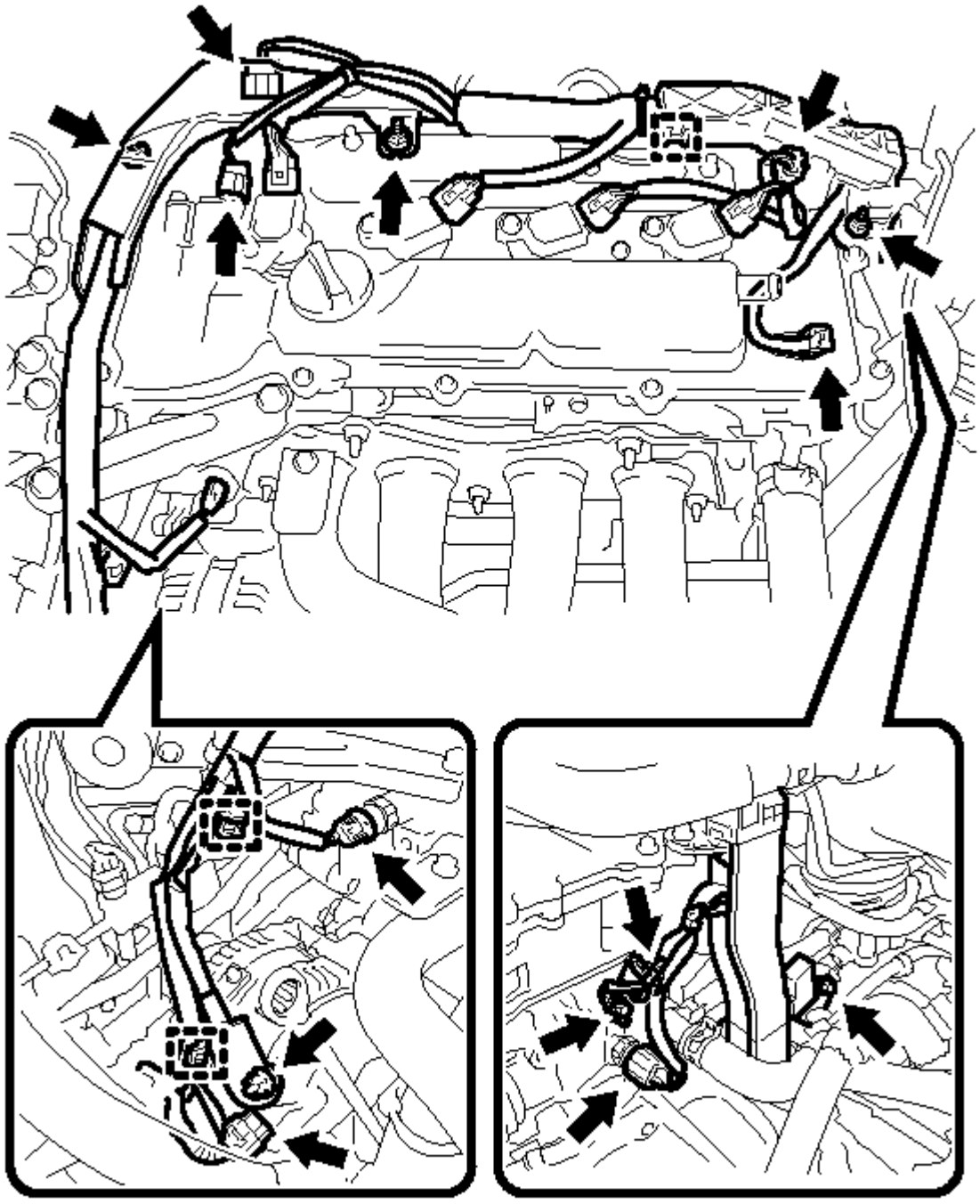


Fig. 13: Identifying Ventilation Hose & Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. **DISCONNECT ENGINE WIRE**
    a. Disconnect the connectors and clamps, remove the bolts and nuts and disconnect the engine wire from the engine.



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Fig. 14: Identifying Engine Wire, Connectors, Clamps & Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

19. **REMOVE IGNITION COIL ASSEMBLY** . Refer to **REMOVAL - Step 2**
20. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY** See step 20

21. **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.

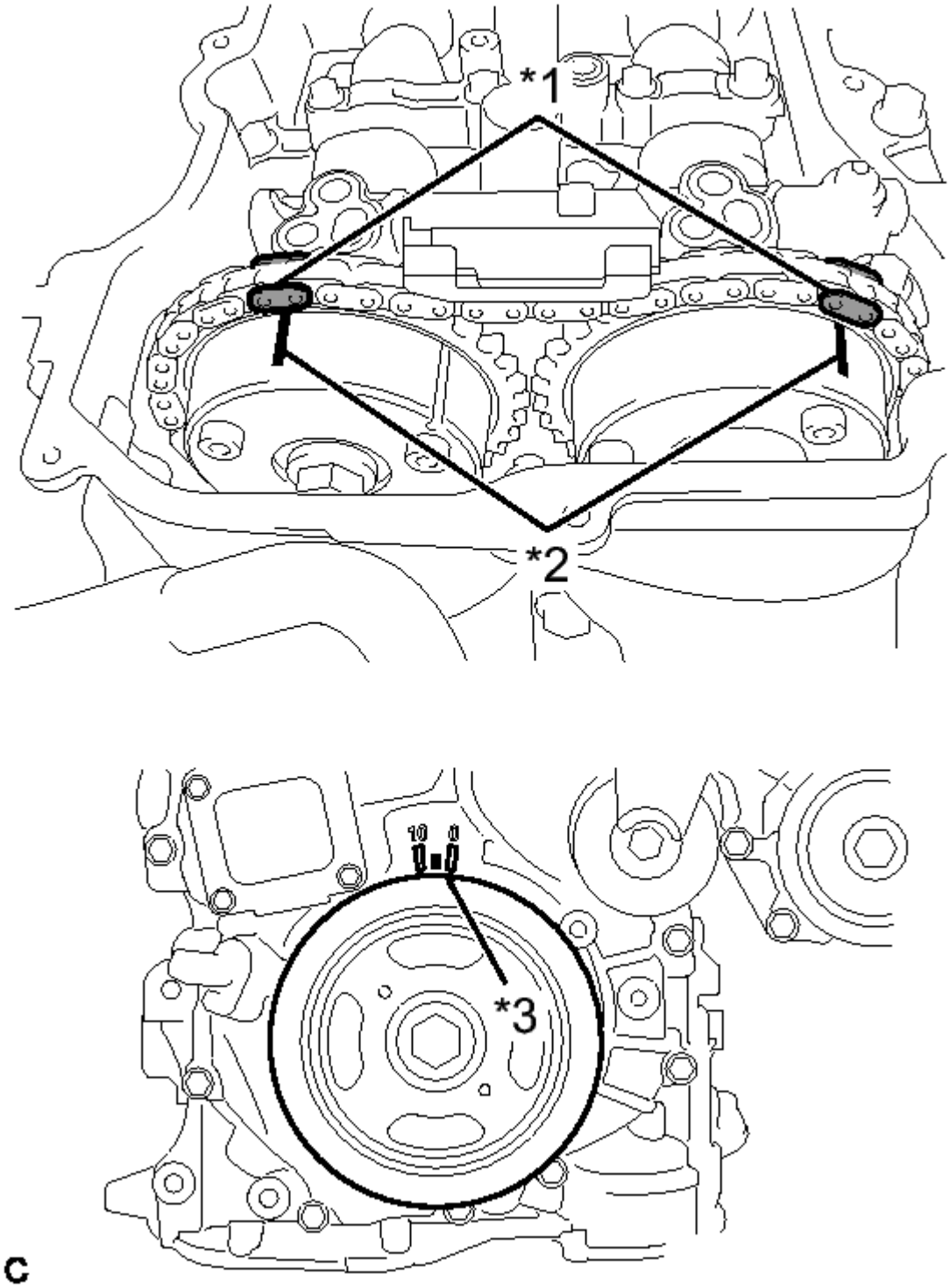


Fig. 15: Aligning Timing Notch (Groove) And Timing Mark "0"

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

TEXT IN ILLUSTRATION

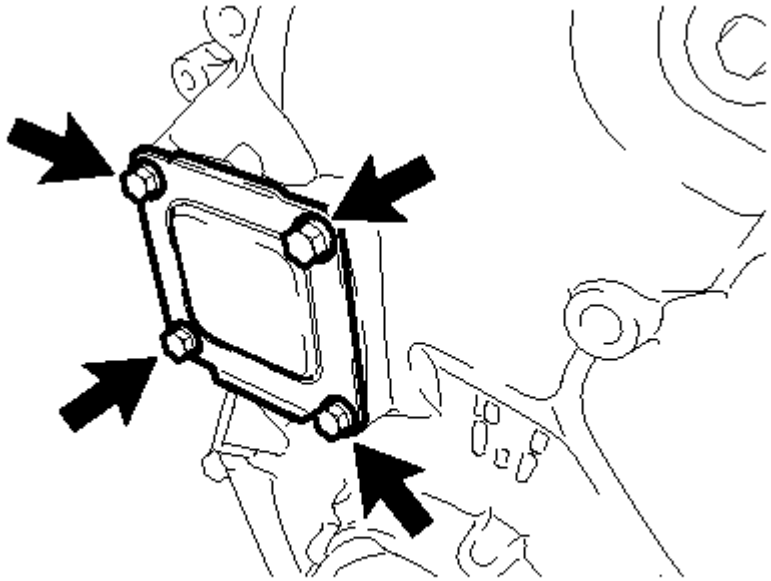
*1	Paint Mark
*2	Matchmark
*3	Timing Notch

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 above (**Fig. 15**). If not, turn the crankshaft 1 revolution (360°) to align the timing marks as shown in the illustration above (**Fig. 15**).

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

22. **REMOVE TIMING CHAIN COVER PLATE**

a. Remove the 4 bolts, timing chain cover plate and gasket.



P

Fig. 16: Identifying Timing Chain Cover Plate Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

a. Turn the crankshaft approximately 10° clockwise.

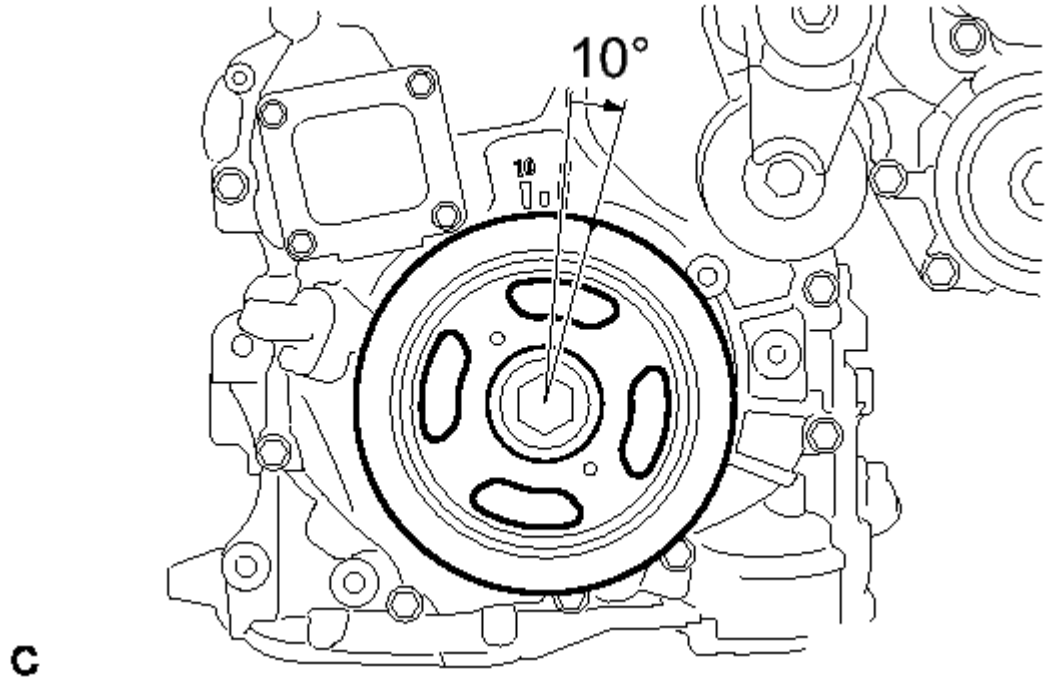


Fig. 17: Turning Crankshaft 10° Clockwise
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Turn the crankshaft approximately 10° counterclockwise.

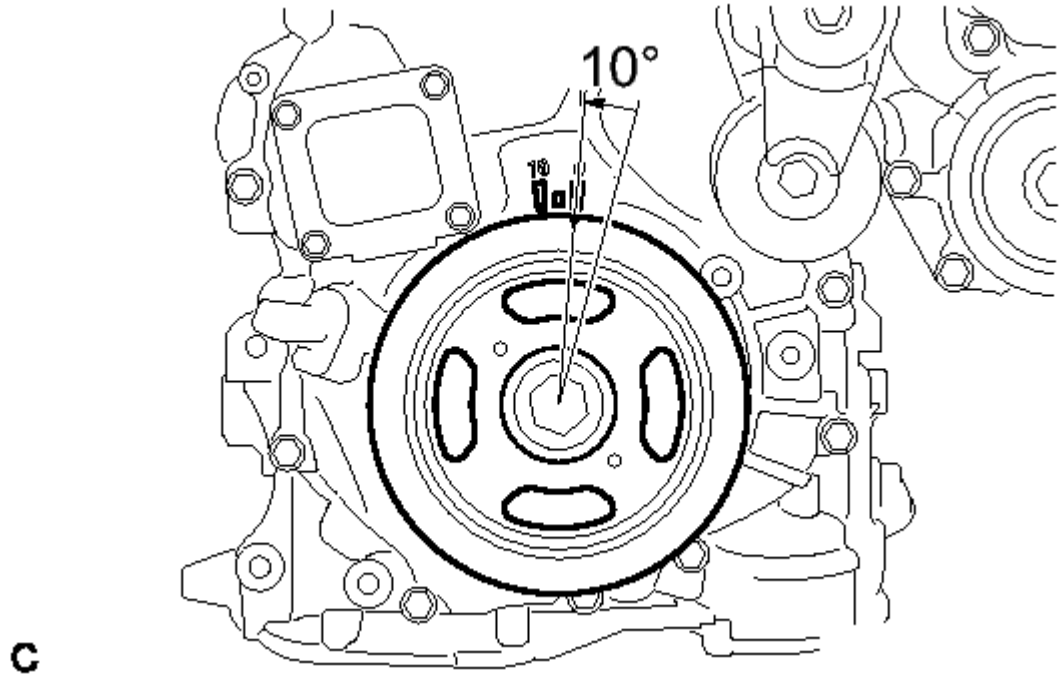


Fig. 18: Turning Crankshaft 10° Counterclockwise
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Align the holes of the stopper plate and tensioner, and insert a pin into the stopper plate hole to lock the tensioner.

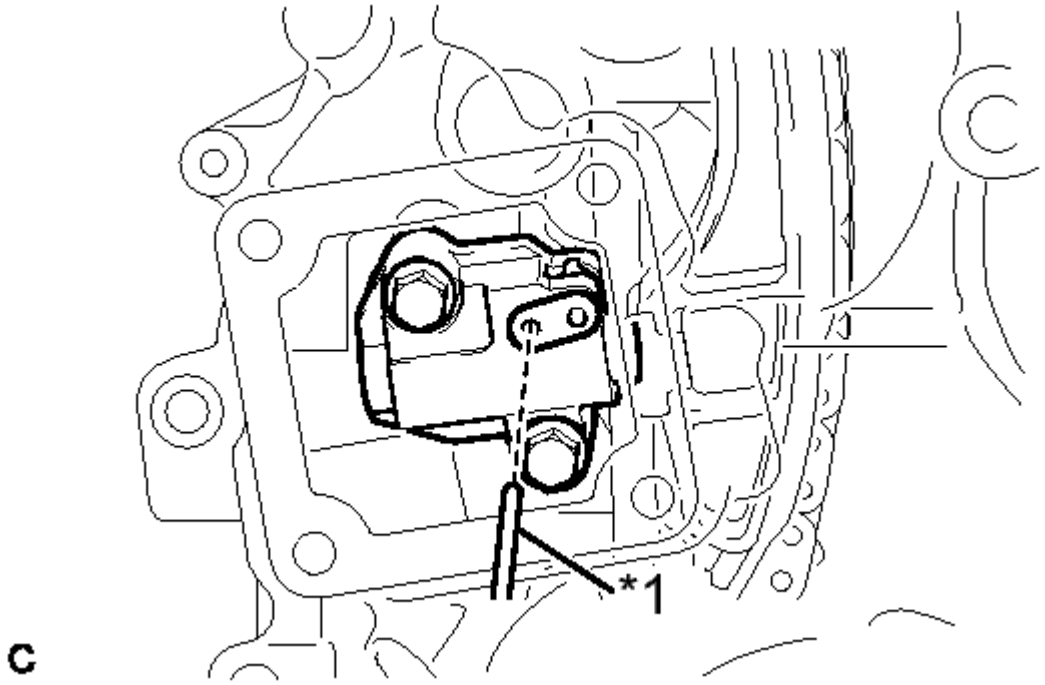
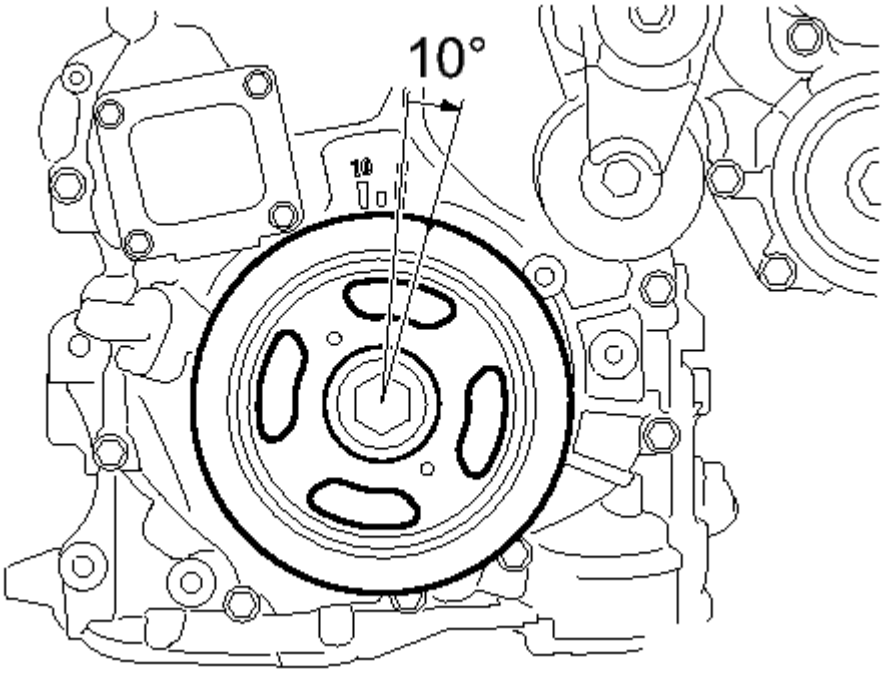


Fig. 19: Aligning Holes Of Stopper Plate & Tensioner
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Pin

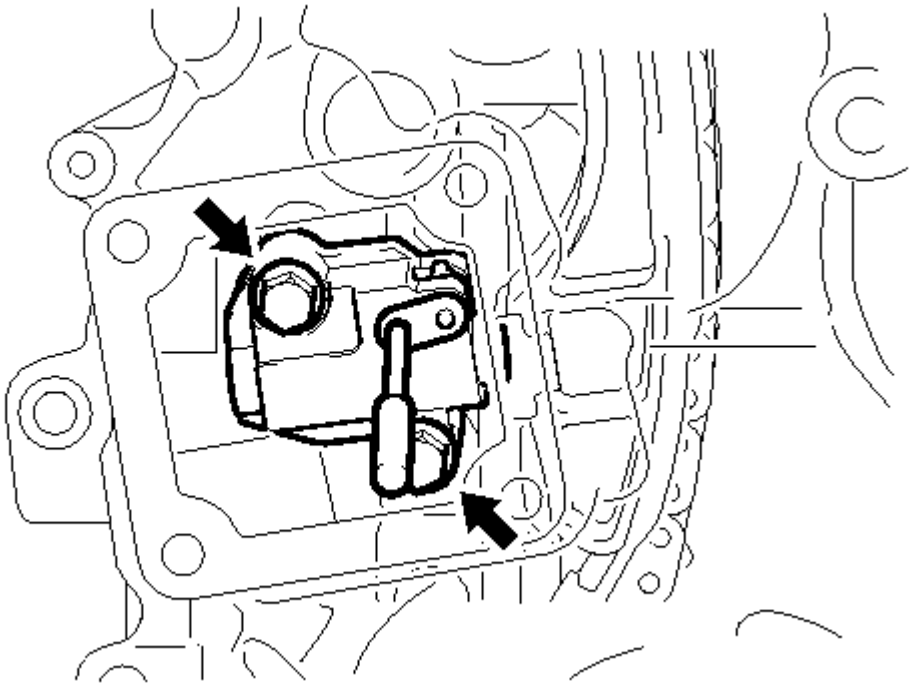
d. Turn the crankshaft approximately 10° clockwise.



C

Fig. 20: Turning Crankshaft 10° Clockwise
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Remove the 2 bolts, chain tensioner and gasket.



C

Fig. 21: Identifying No. 1 Chain Tensioner Assembly Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Make sure not to drop the gasket inside the timing chain cover.

f. Turn the crankshaft approximately 10° counterclockwise.

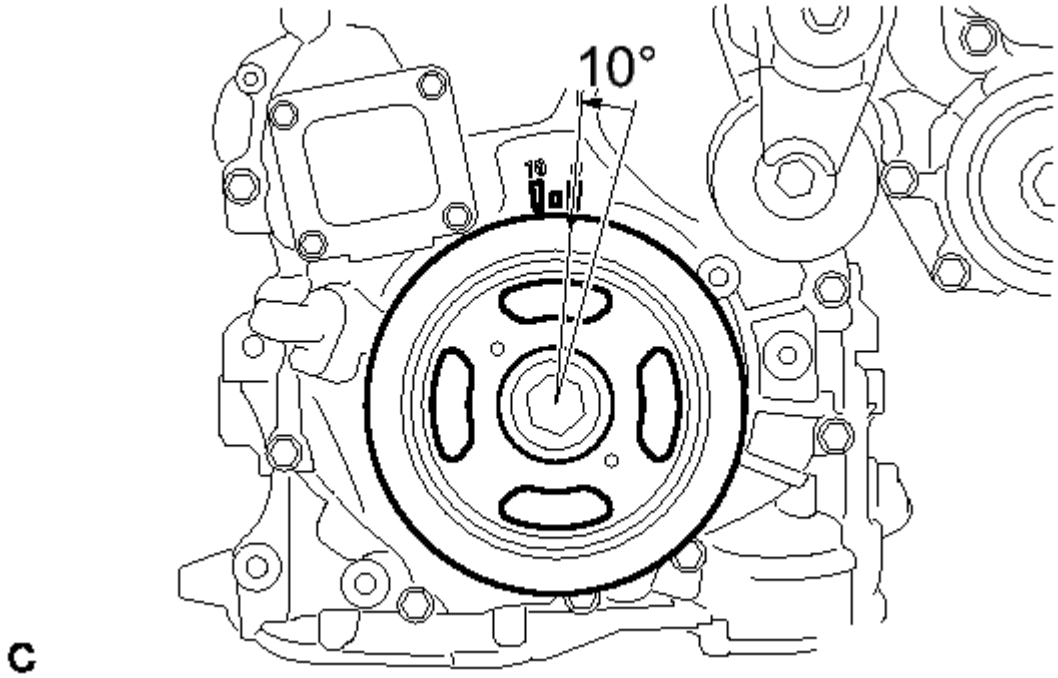


Fig. 22: Turning Crankshaft 10° Counterclockwise
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

24. **REMOVE TIMING CHAIN GUIDE** See step 21
25. **REMOVE TIMING CHAIN COVER TIGHT PLUG** See step 24
26. **REMOVE CAMSHAFT TIMING GEAR ASSEMBLY**
    a. Hold the hexagonal portion of the camshaft with a wrench and remove the bolt from the camshaft.

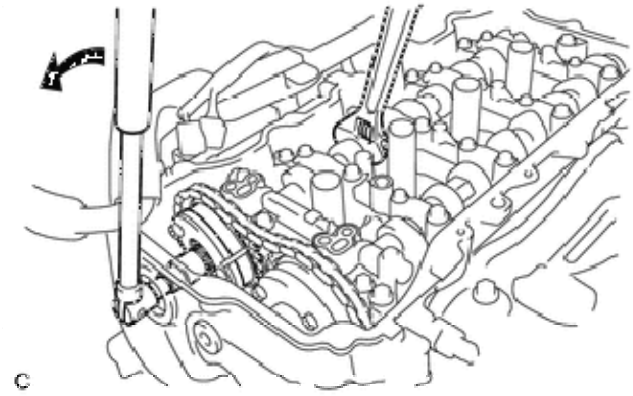


Fig. 23: Removing Bolt From The Camshaft Using A Wrench
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: **Be careful not to damage the cylinder head or spark plug tube with the wrench.**

b. Separate the camshaft timing gear assembly from the camshaft.

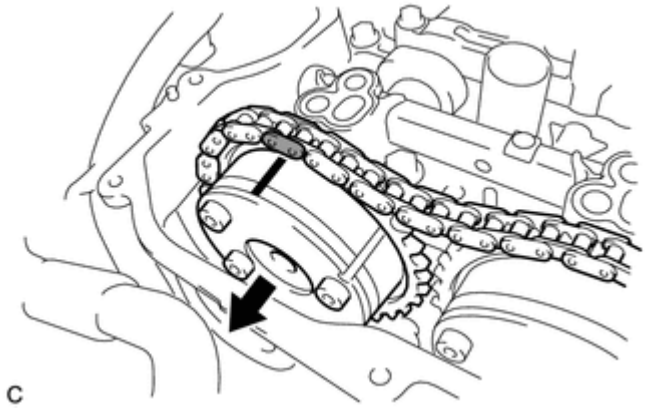


Fig. 24: Identifying Camshaft Timing Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Remove the timing chain from the camshaft timing gear assembly, and turn the camshaft timing gear assembly approximately 180°.

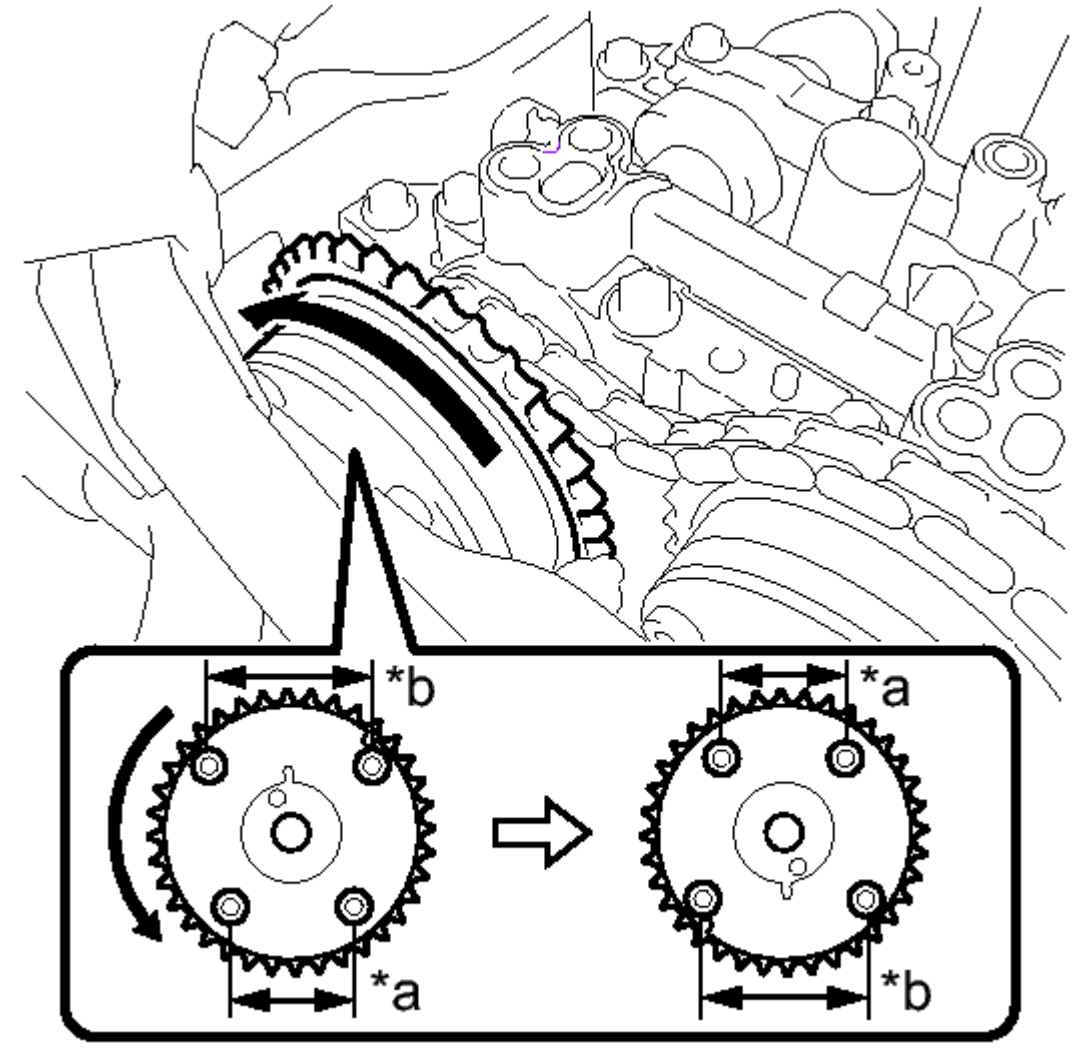


Fig. 25: Removing Timing Chain From The Camshaft Timing Gear Assembly & Turn The Camshaft Timing Gear Assembly Approximately 180°
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Narrow
*b	Wide

d. Remove the camshaft timing gear assembly.

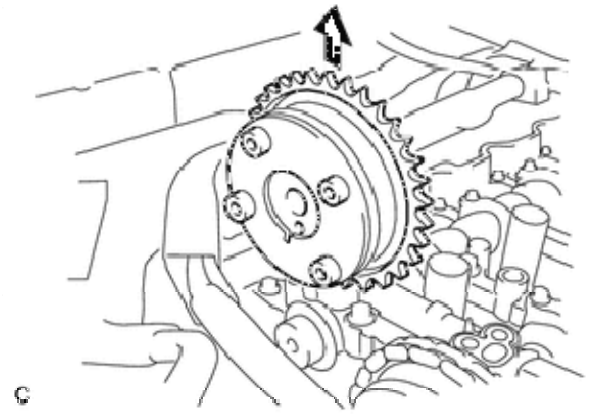


Fig. 26: Identifying Camshaft Timing Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Do not disassemble the camshaft timing gear.

27. **REMOVE CAMSHAFT BEARING CAP**
    a. Using several steps, remove the 11 bearing cap bolts in the sequence shown in the illustration below.

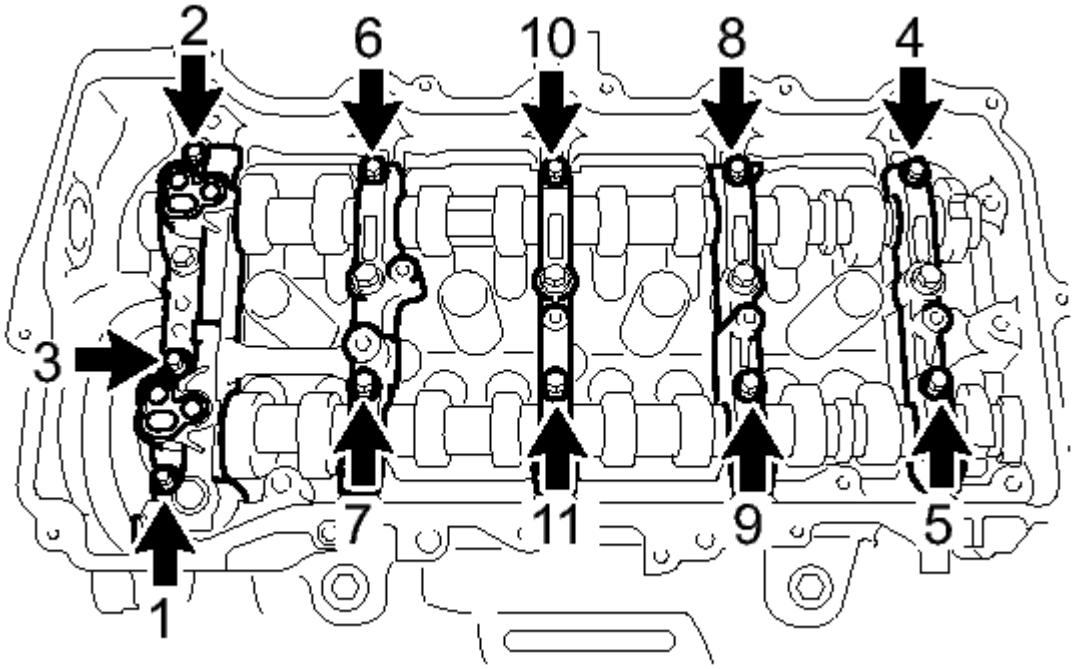


Fig. 27: Identifying Bearing Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Using several steps, remove the 10 bearing cap bolts in the sequence shown in the illustration below.

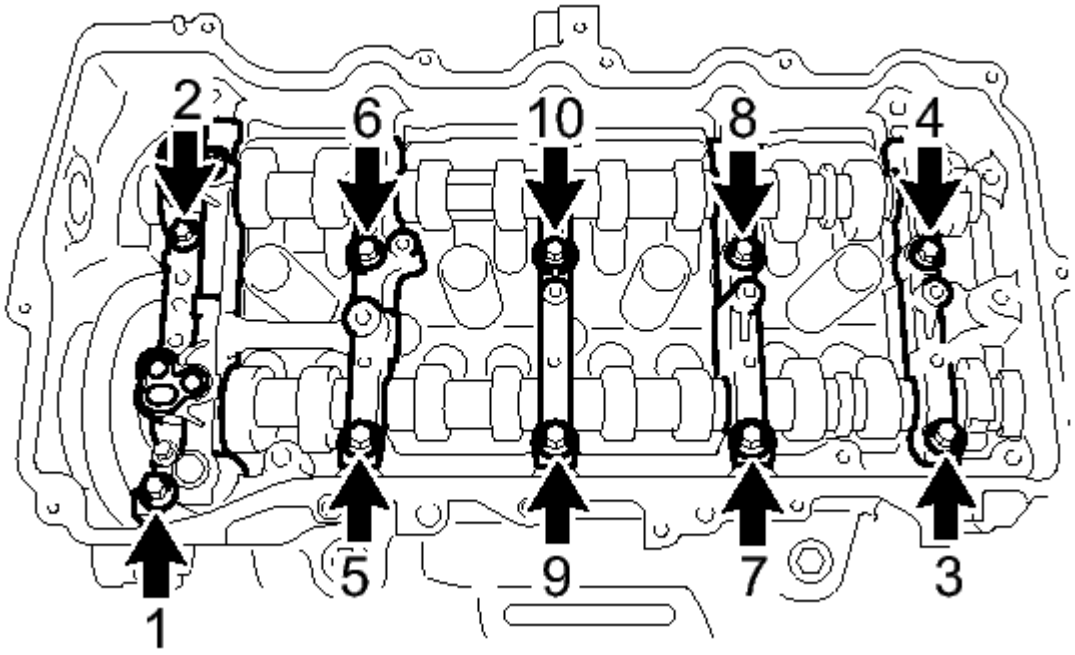


Fig. 28: Identifying Bearing Cap Bolt Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Remove the 5 bearing caps.

HINT:

Arrange the removed parts in the correct order.

28. **REMOVE CAMSHAFT**

a. Remove the camshaft from the camshaft housing.

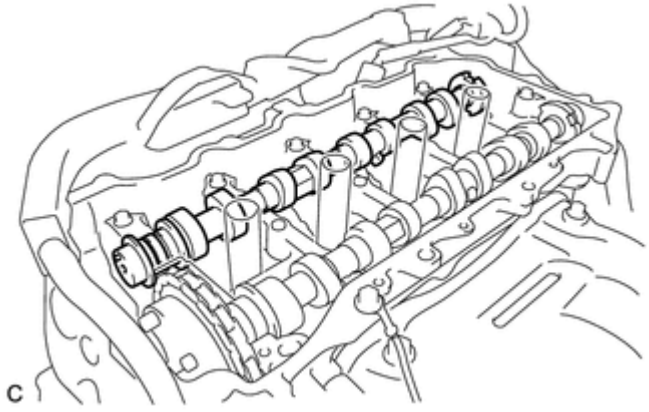


Fig. 29: Removing Camshaft From Camshaft Housing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

29. **REMOVE NO. 2 CAMSHAFT**

a. Hold up the chain and remove the No. 2 camshaft from the camshaft housing.

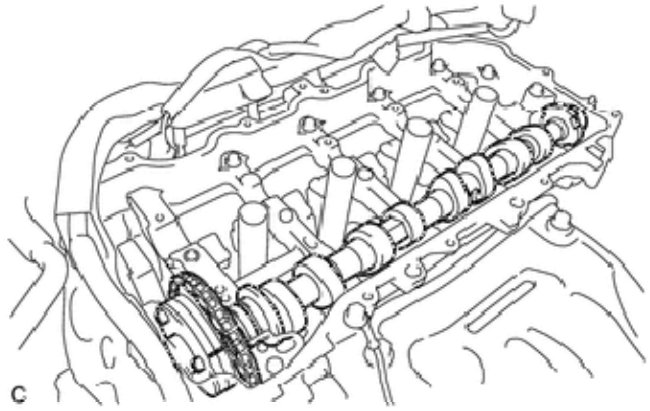


Fig. 30: Removing No. 2 Camshaft From The Camshaft Housing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Suspend the chain with a string or equivalent as shown in the illustration.

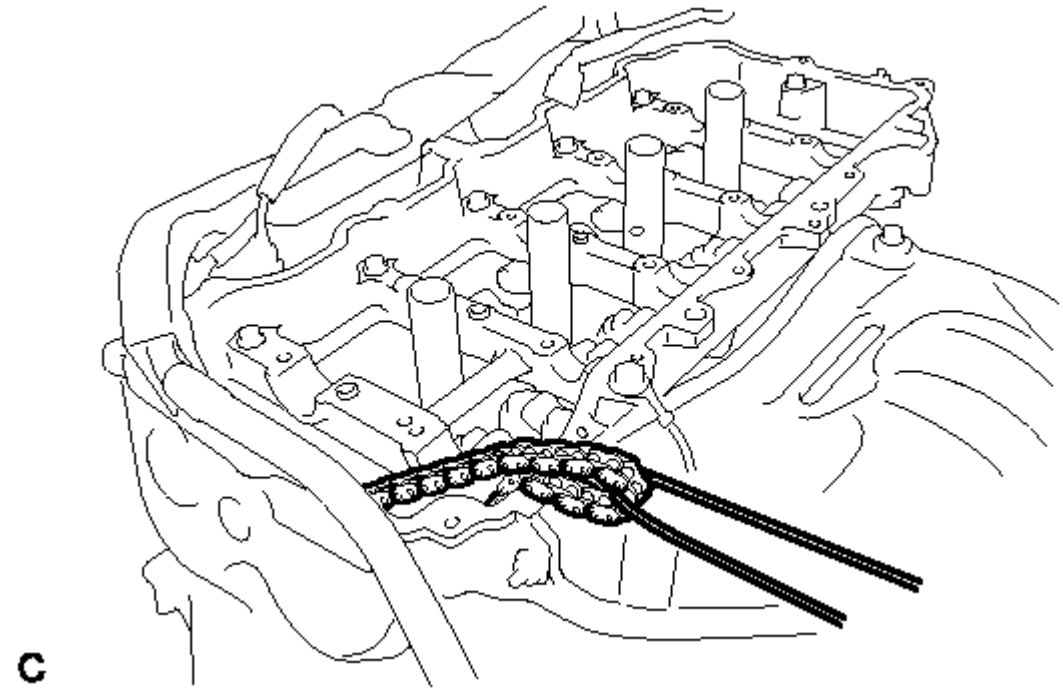


Fig. 31: Suspending Chain With A String Or Equivalent
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

30. **REMOVE CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY**

a. Remove the flange bolt and camshaft timing exhaust gear assembly.

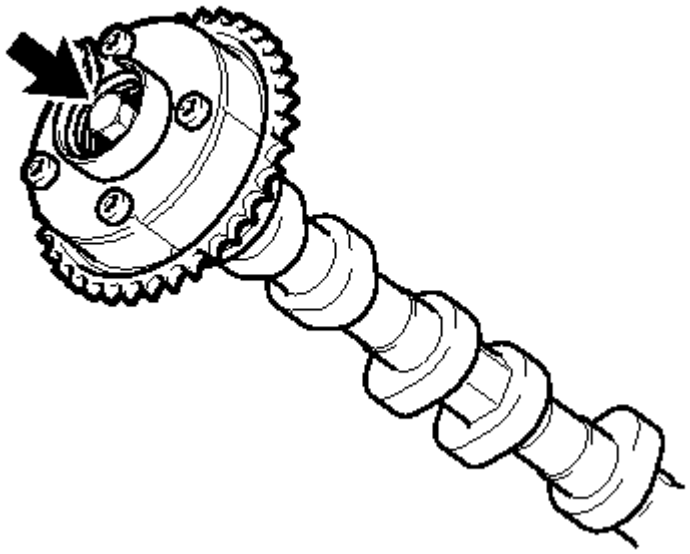


Fig. 32: Identifying Camshaft Timing Exhaust Gear Assembly & Flange Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

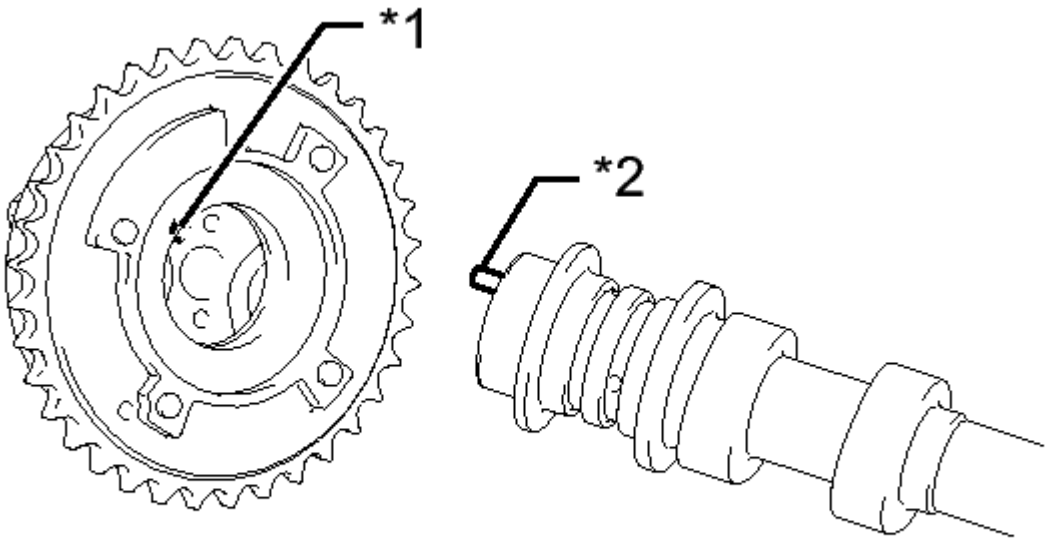
NOTE: Do not disassemble the camshaft timing exhaust gear.

31. **REMOVE OIL CONTROL VALVE FILTER** See step 38
32. **REMOVE NO. 1 CAMSHAFT BEARING** See step 40
33. **REMOVE NO. 2 CAMSHAFT BEARING** See step 41

INSTALLATION

INSTALLATION

1. **INSTALL NO. 2 CAMSHAFT BEARING** See step 17
2. **INSTALL NO. 1 CAMSHAFT BEARING** See step 16
3. **INSTALL OIL CONTROL VALVE FILTER** See step 18
4. **INSTALL CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY**
    a. Align and attach the knock pin of the No. 2 camshaft with the pin hole of the camshaft timing exhaust gear assembly.



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Fig. 33: Identifying Pin Hole And Knock Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Knock Pin Hole
*2	Knock Pin

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

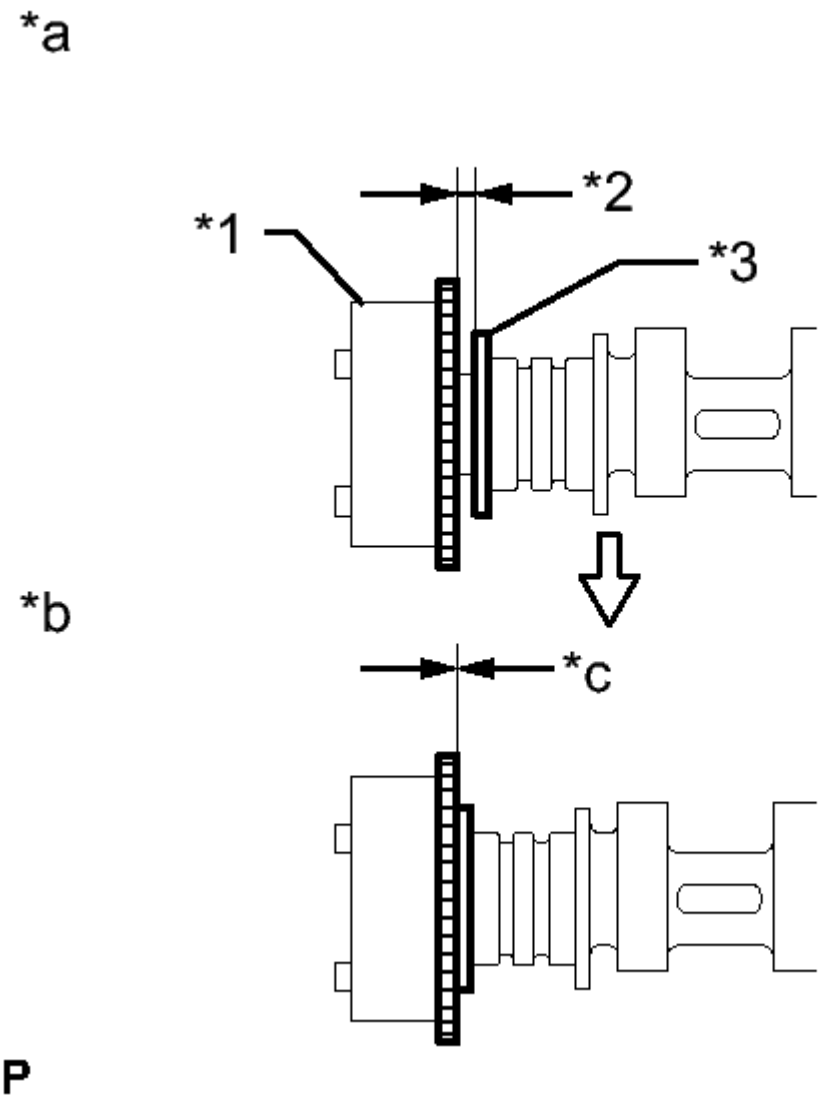


Fig. 34: Checking Clearance Between Camshaft Timing Gear And Camshaft Flange
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Camshaft Timing Exhaust Gear
*2	Clearance
*3	Camshaft Flange
*a	INCORRECT
*b	CORRECT
*c	No Clearance

c. Fix the camshaft timing exhaust gear assembly with the bolt.

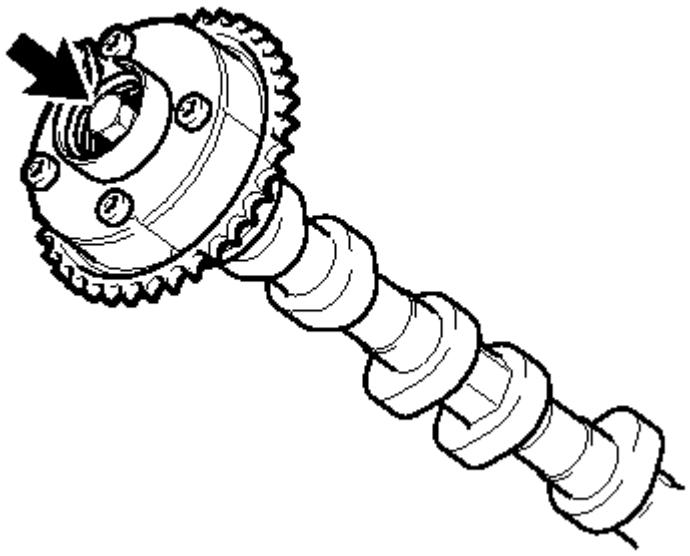
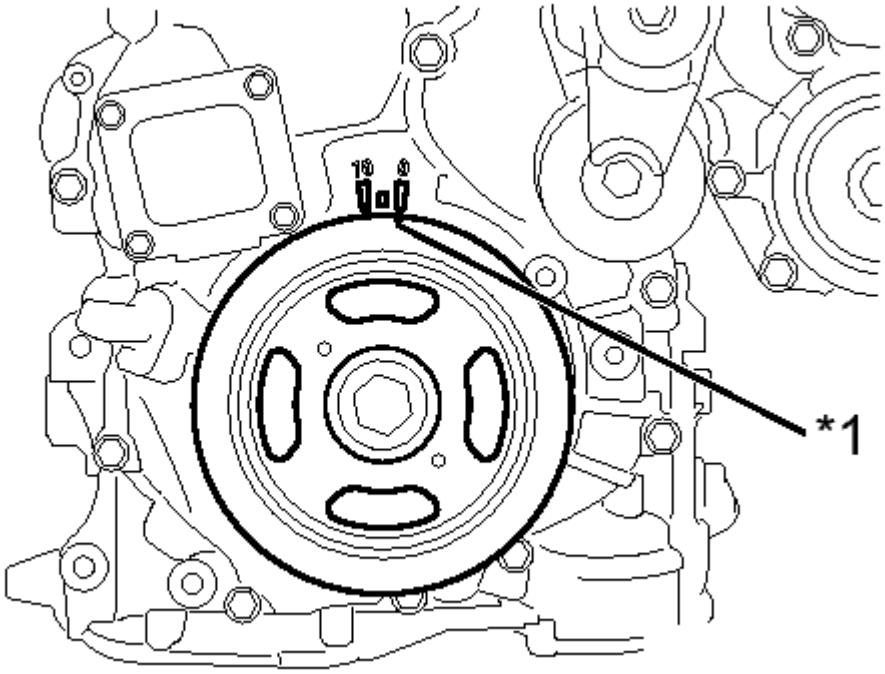


Fig. 35: Identifying Camshaft Timing Exhaust Gear Assembly & Flange Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE: Do not disassemble the camshaft timing exhaust gear.

5. **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.



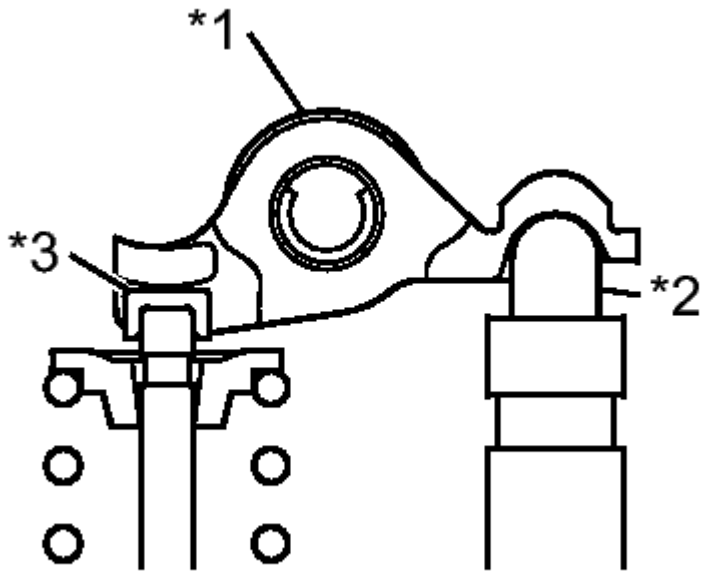
C

Fig. 36: Aligning Crankshaft Pulley Timing Notch And The Timing Mark "0" Of The Timing Chain Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Timing Notch

6. **INSTALL NO. 2 CAMSHAFT**
   a. Make sure that the valve rocker arms are installed as shown in the illustration.



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Fig. 37: Identifying Valve Rocker Arms
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

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

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.

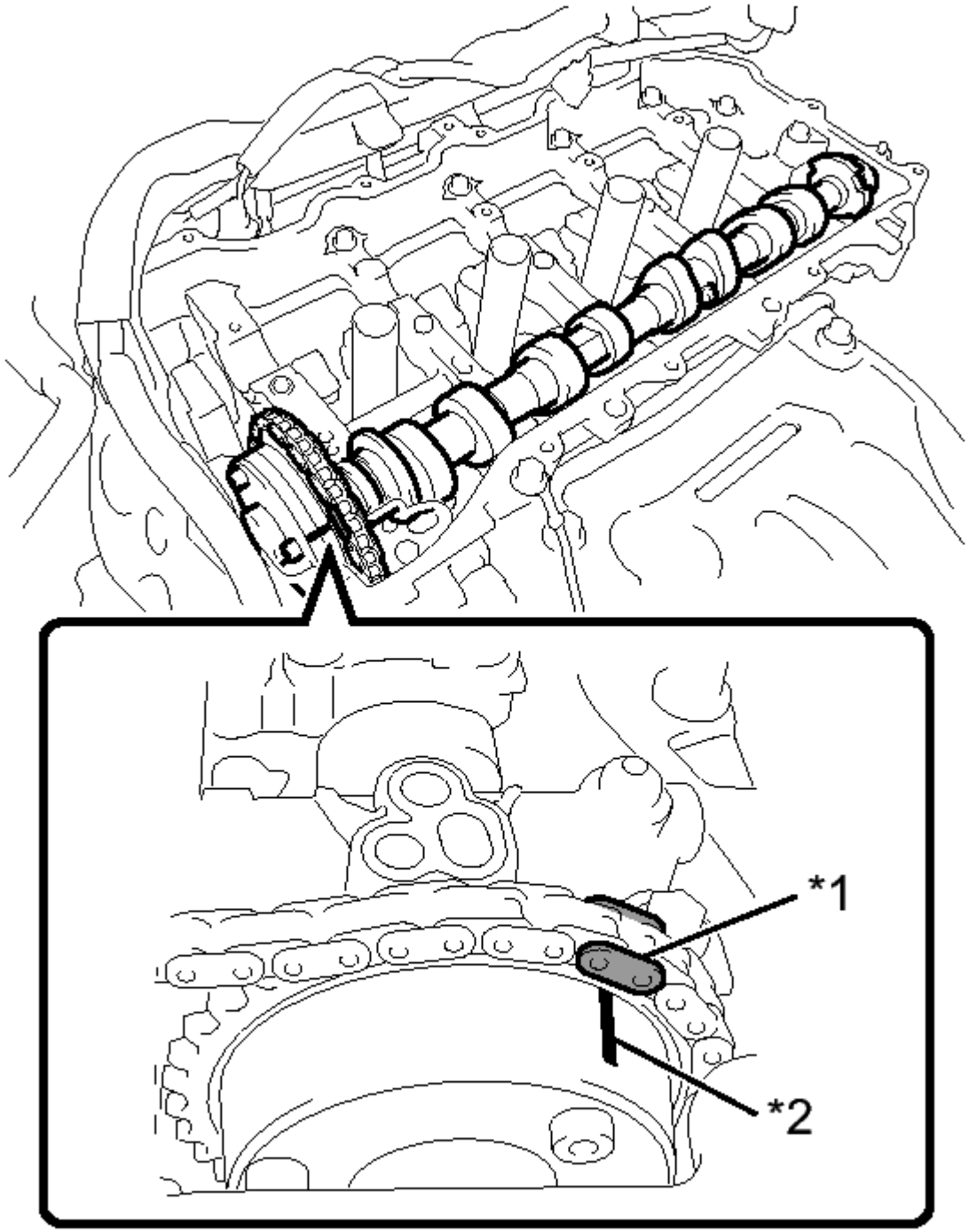


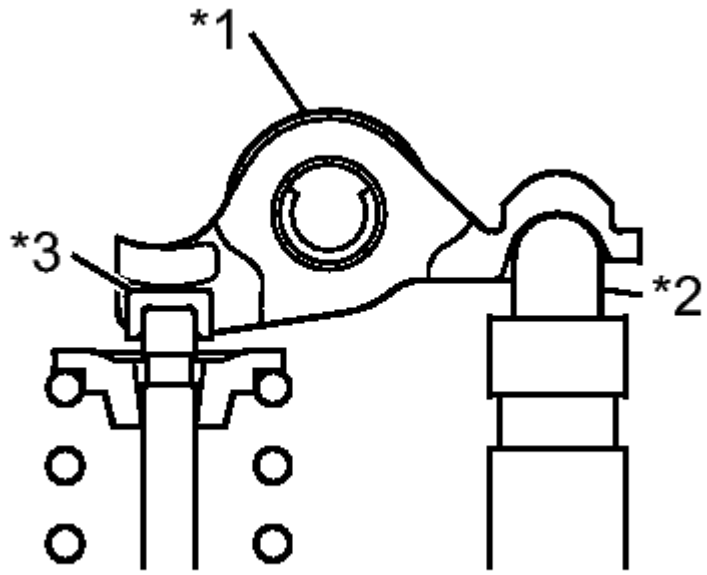
Fig. 38: Identifying Camshaft Journals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Paint Mark

*2	Matchmark

7. **INSTALL CAMSHAFT**
   a. Make sure that the valve rocker arms are installed as shown in the illustration.



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Fig. 39: Identifying Valve Rocker Arms
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

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

   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 camshaft to the camshaft housing as shown in the illustration.

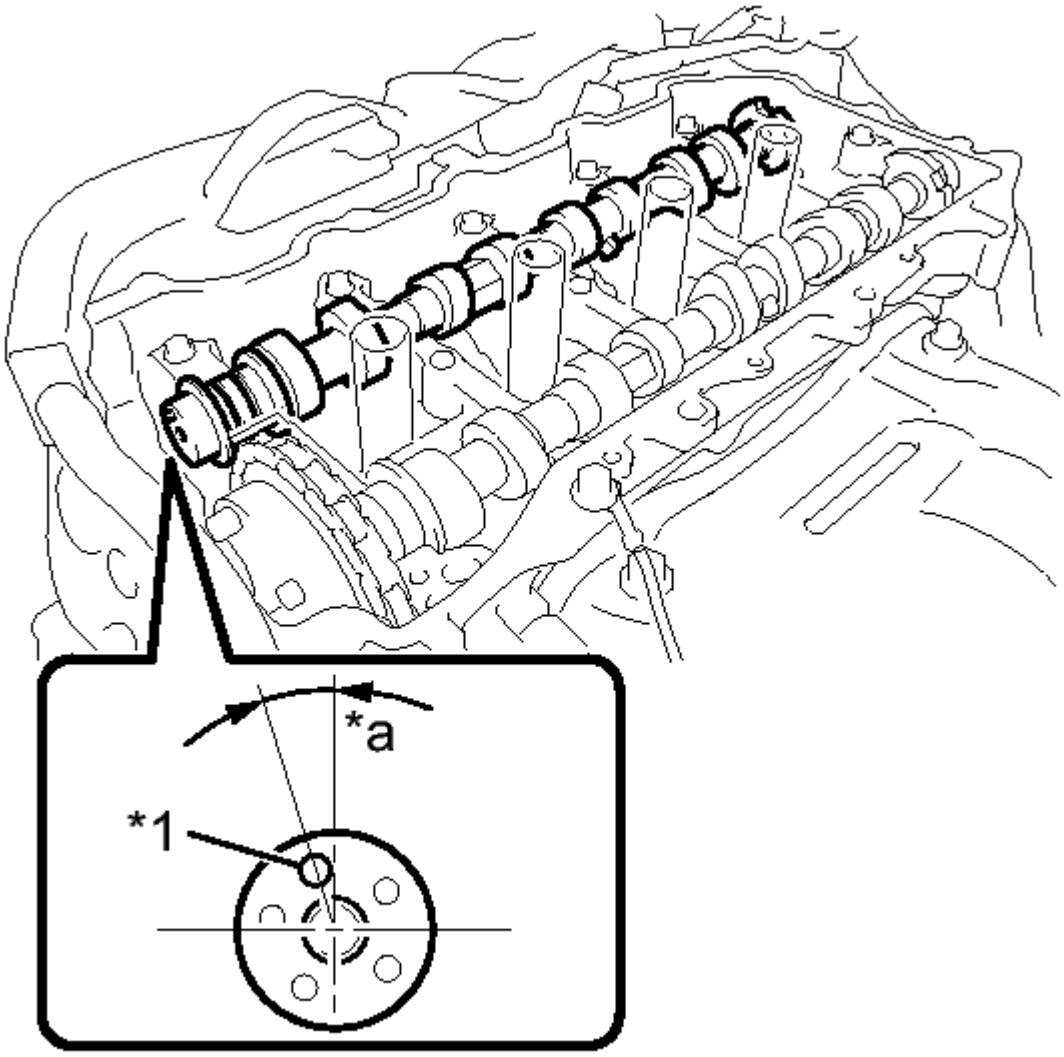


Fig. 40: Identifying Camshaft Housing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Knock Pin
*a	Approximately 17°

8. **INSTALL CAMSHAFT BEARING CAP**
   a. Confirm the marks and numbers on the camshaft bearing caps and place them in their proper positions and directions.

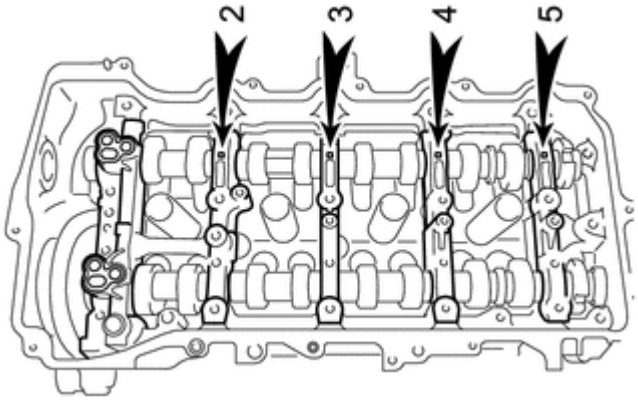


Fig. 41: Identifying Camshaft Bearing Caps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using several steps, uniformly tighten the 10 bolts in the sequence shown in the illustration.

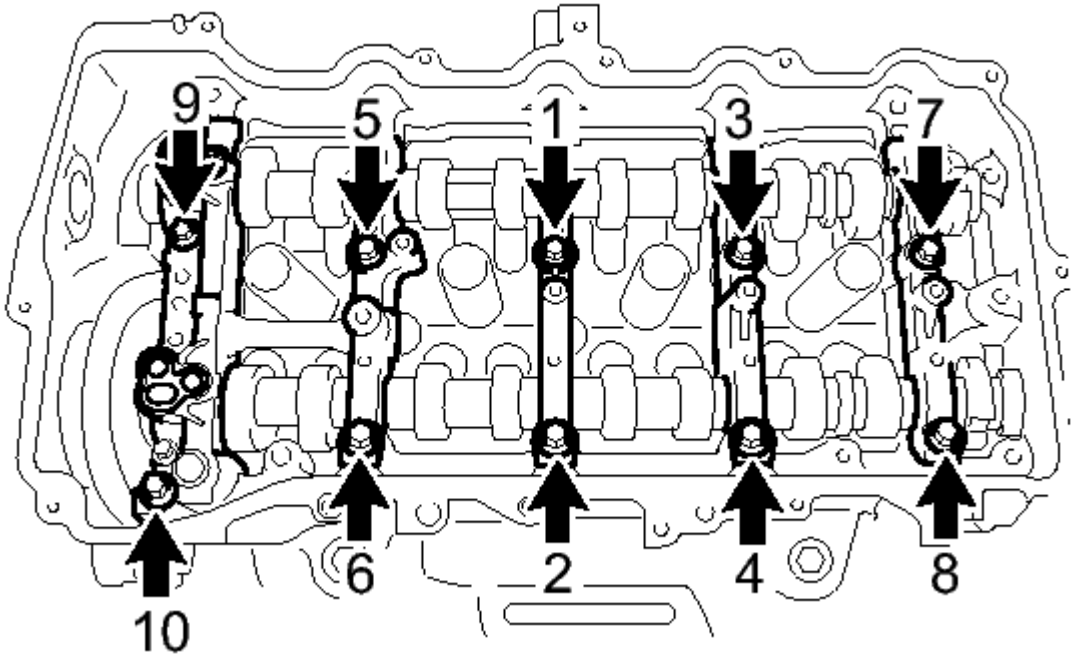


Fig. 42: Identifying Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

c. Using several steps, uniformly tighten the 11 bolts in the sequence shown in the illustration.

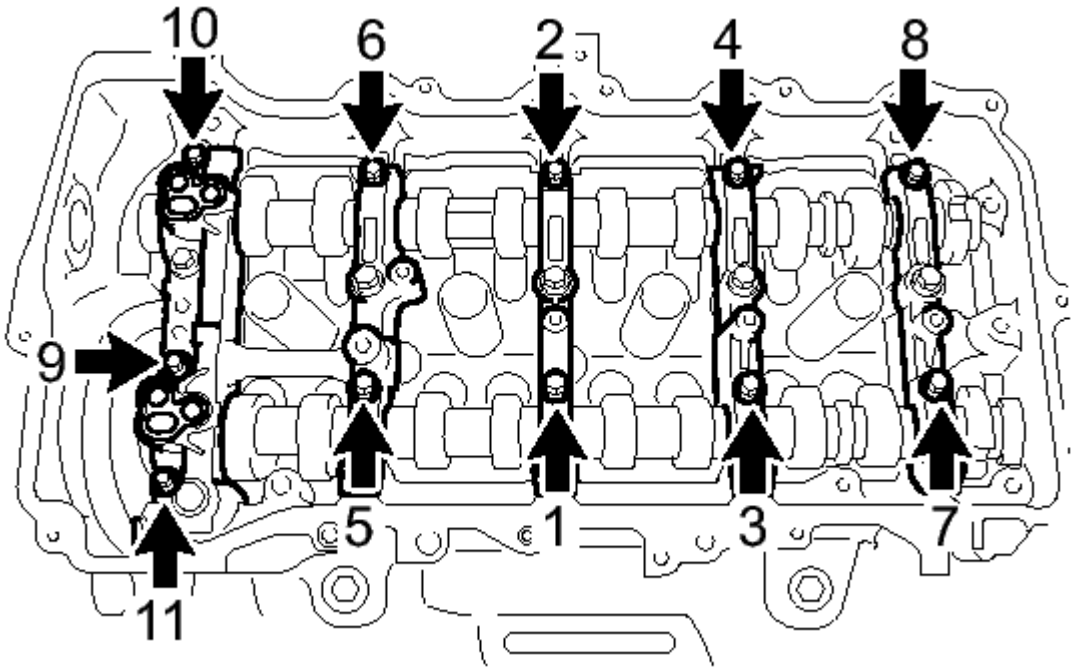


Fig. 43: Identifying Bolts With tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

d. Check the torque of each bolt again.

9. **INSTALL CAMSHAFT TIMING GEAR ASSEMBLY**
   a. Check the camshaft timing gear position.

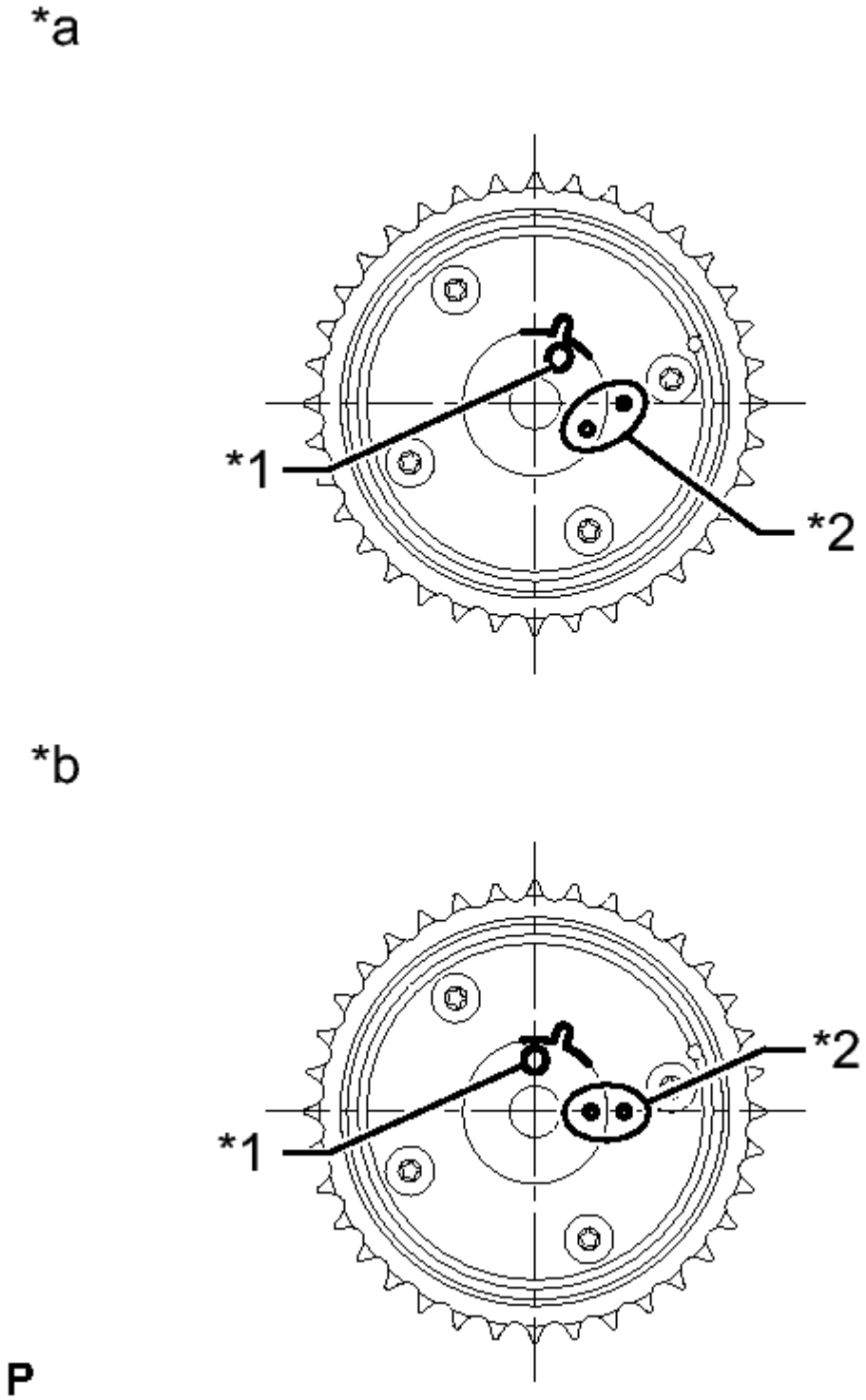


Fig. 44: Identifying Camshaft Timing Gear Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	Knock Pin

*1	Hole
*2	Alignment Mark
*a	Advanced Position
*b	Retarded Position

NOTE:

- **If the camshaft timing gear is set to the advanced position, do not let the camshaft timing gear rotate clockwise during installation.**
- **If the camshaft timing gear has rotated to the most retarded position, make sure to release the lock pin and set the camshaft timing gear to the most advanced position before tightening the camshaft timing gear.**

b. Install the camshaft timing gear as shown in the illustration.

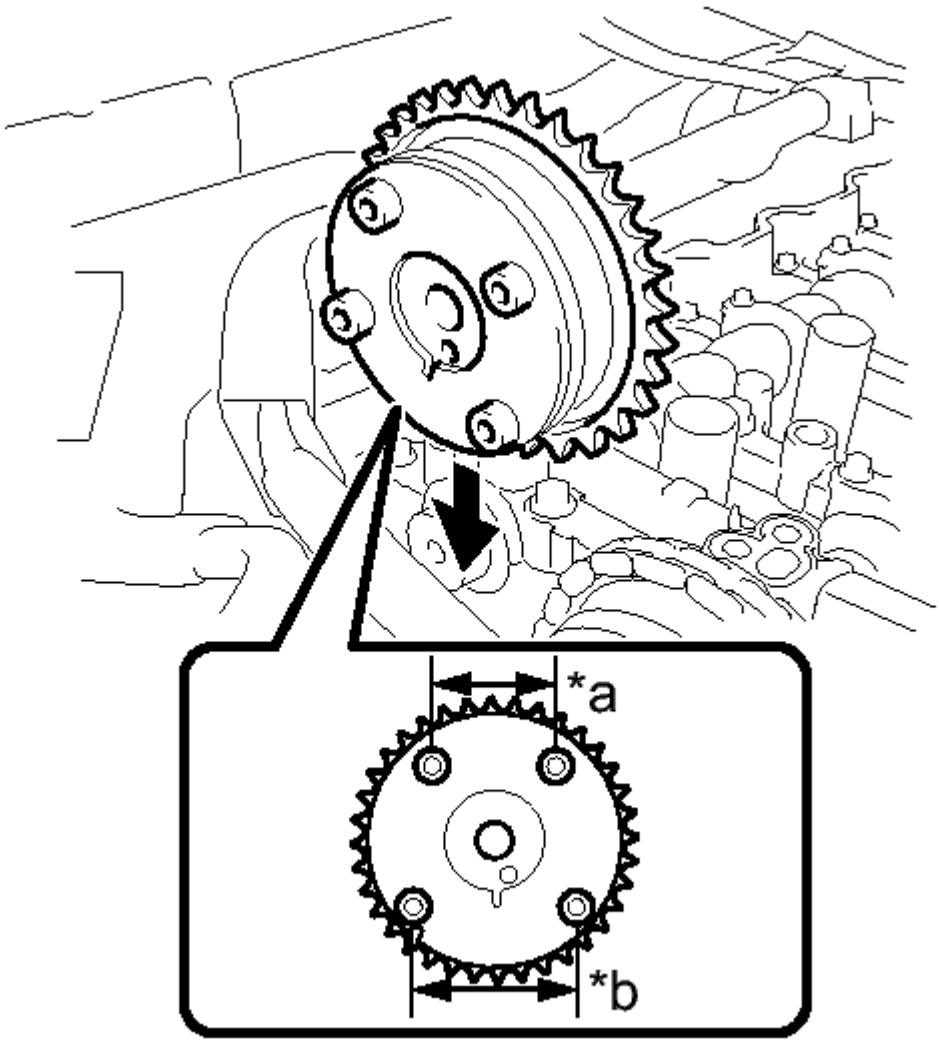


Fig. 45: Installing Camshaft Timing Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Narrow
*b	Wide

c. Turn the camshaft timing gear approximately 180° counterclockwise.

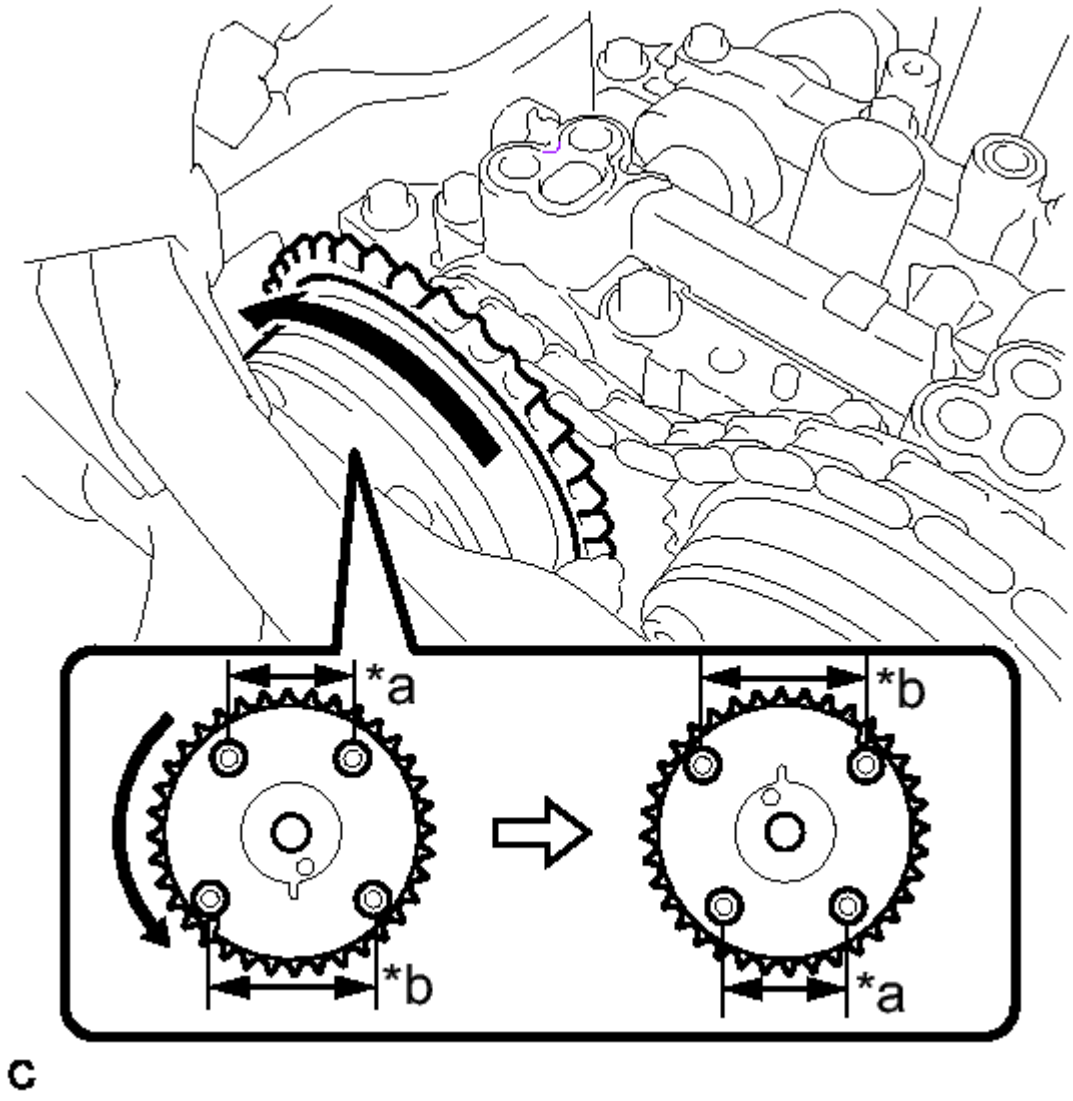


Fig. 46: Turning Camshaft Timing Gear Approximately 180° Counterclockwise
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Narrow
*b	Wide

d. Align the paint mark with the matchmark to install the chain.

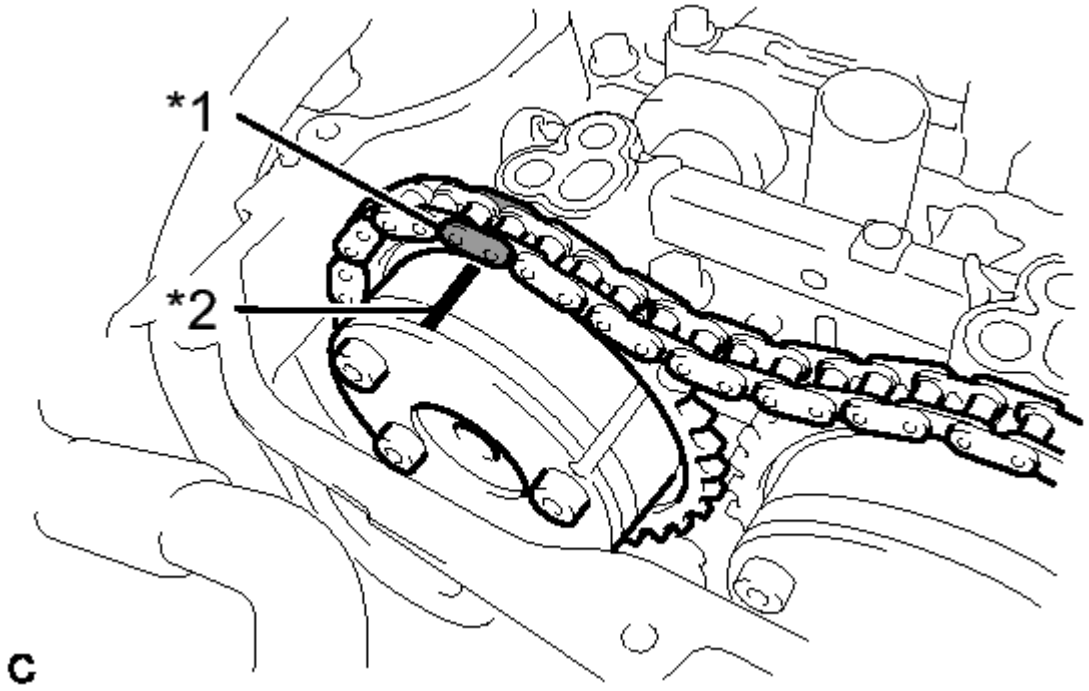
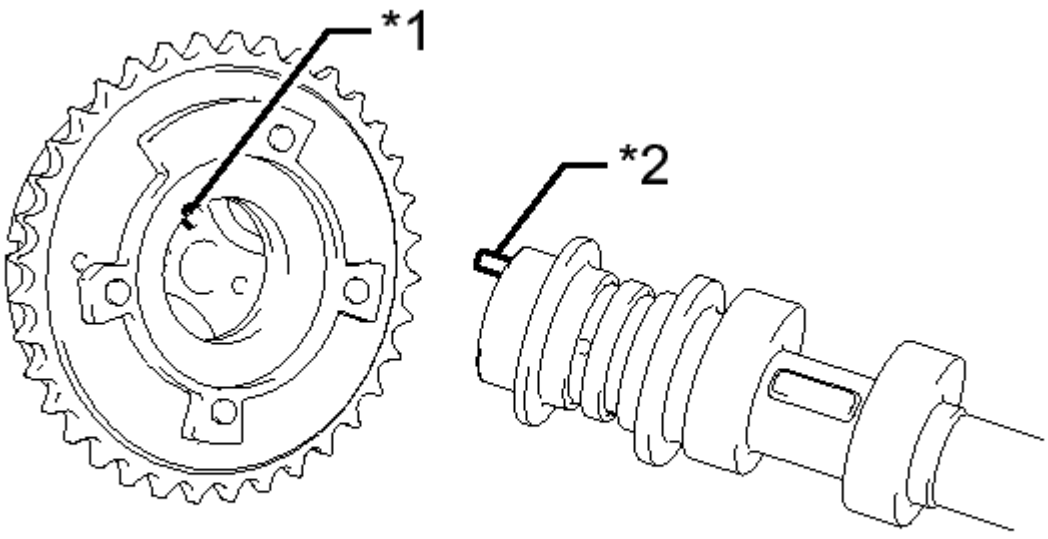


Fig. 47: Aligning Paint Mark With Matchmark To Install Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Paint Mark
*2	Matchmark

e. Align and attach the knock pin of the No. 1 camshaft with the pin hole of the camshaft timing gear.



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Fig. 48: Identifying Pin Hole And Knock Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Knock Pin Hole
*2	Knock Pin

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

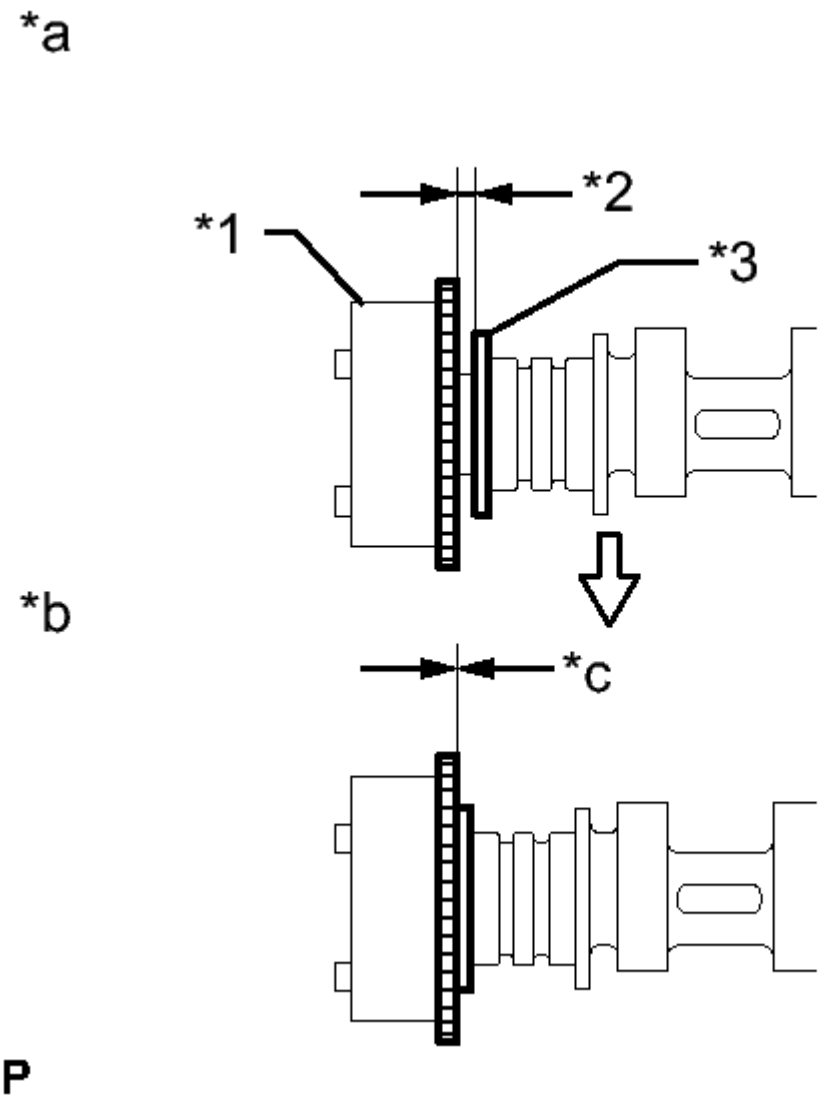


Fig. 49: Checking Clearance Between Camshaft Timing Gear And Camshaft Flange
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Camshaft Timing Gear
*2	Clearance
*3	Camshaft Flange
*a	INCORRECT
*b	CORRECT
*c	No Clearance

g. Secure the camshaft in place by hand, and then install the installation bolt of the camshaft timing gear by hand.

NOTE: **Do not use any tools to install the bolt. If the bolt is installed using a tool, the lock pin will be damaged.**

h. If the lock pin has not been released, release it.

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.

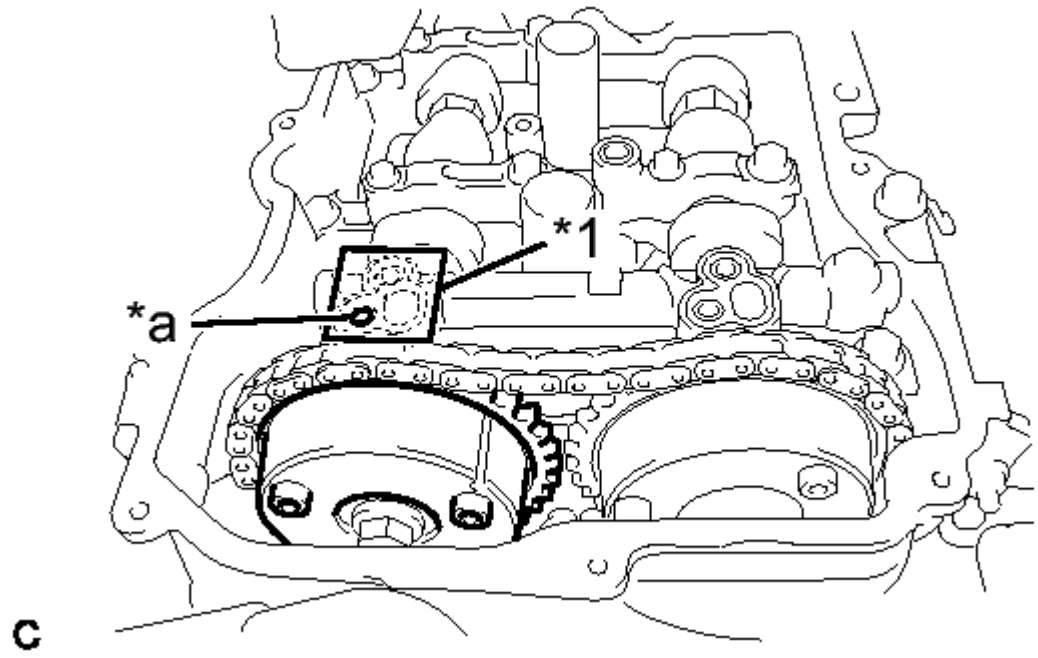


Fig. 50: Identifying VVT Oil Hole On No. 1 Camshaft Bearing Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Adhesive Tape Sealing Area
*a	Make a Hole

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 200 kPa (2.0 kgf/ cm^2 , 29 psi) of air pressure to the hole made in

procedure A to release the lock pin.

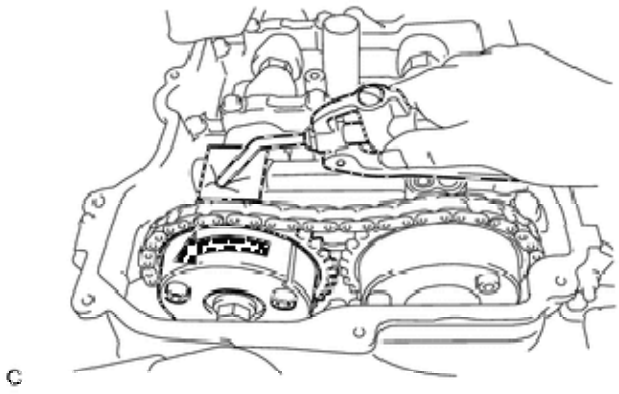


Fig. 51: Applying Air Pressure To Hole To Release Lock Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

i. Using a wrench to hold the hexagonal portion of the No. 1 camshaft, install the bolt.

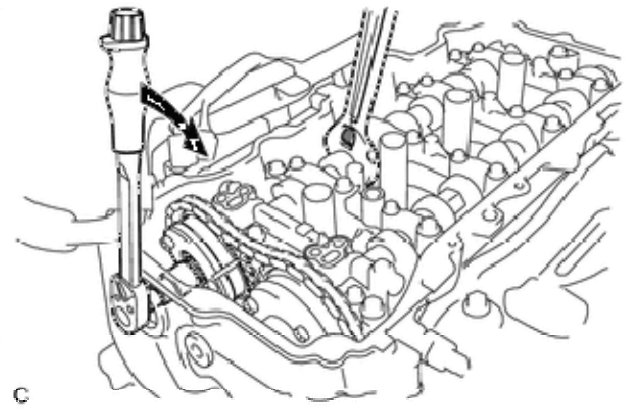


Fig. 52: Installing No. 1 Camshaft Bolt Using A Wrench
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE: Be careful not to damage the cylinder head or spark plug tube with the wrench.

j. 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.

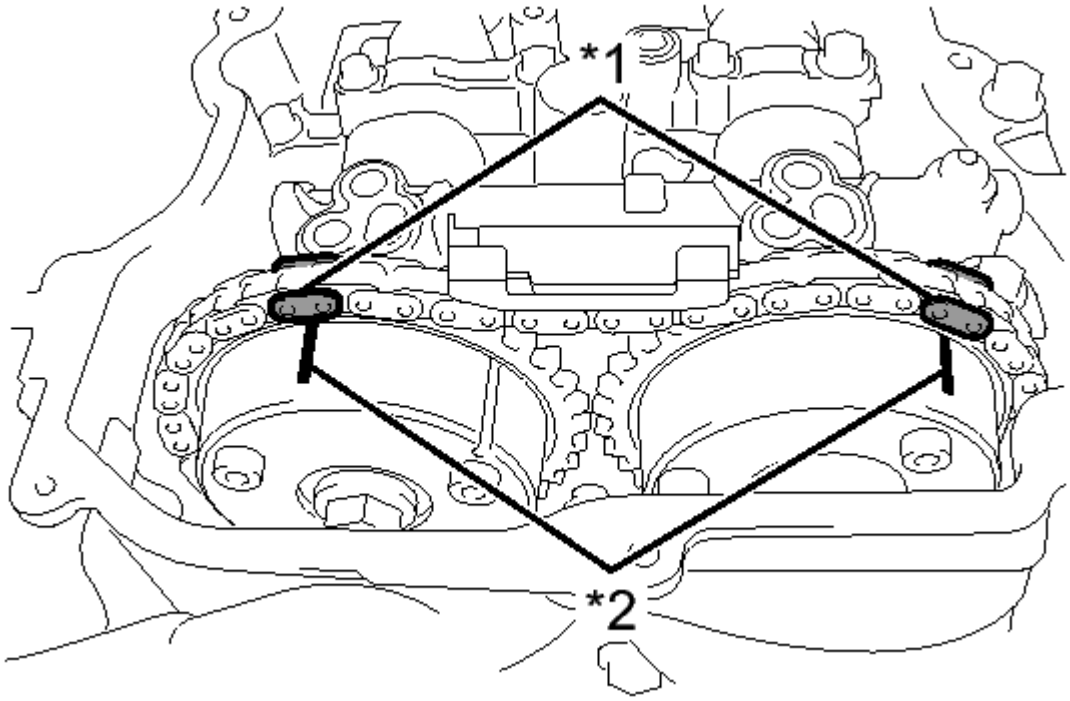


Fig. 53: Aligning Camshaft Timing Gear Matchmarks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Paint Mark
*2	Matchmark

10. **ADD ENGINE OIL** See step 17
11. **INSTALL TIMING CHAIN GUIDE** See step 23
12. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY**
    a. Turn the crankshaft approximately 10° clockwise.

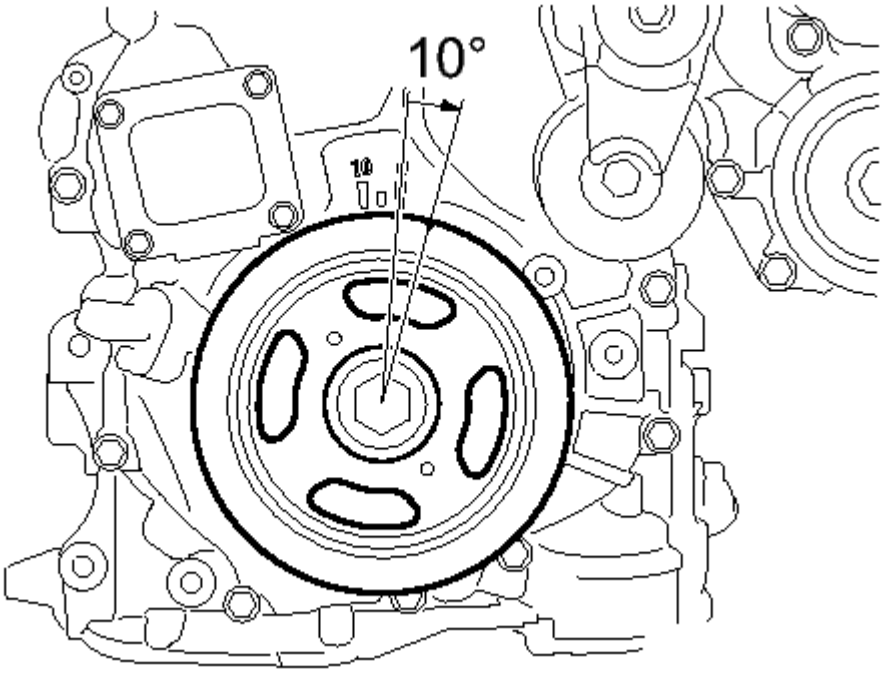


Fig. 54: Turning Crankshaft 10° Clockwise
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

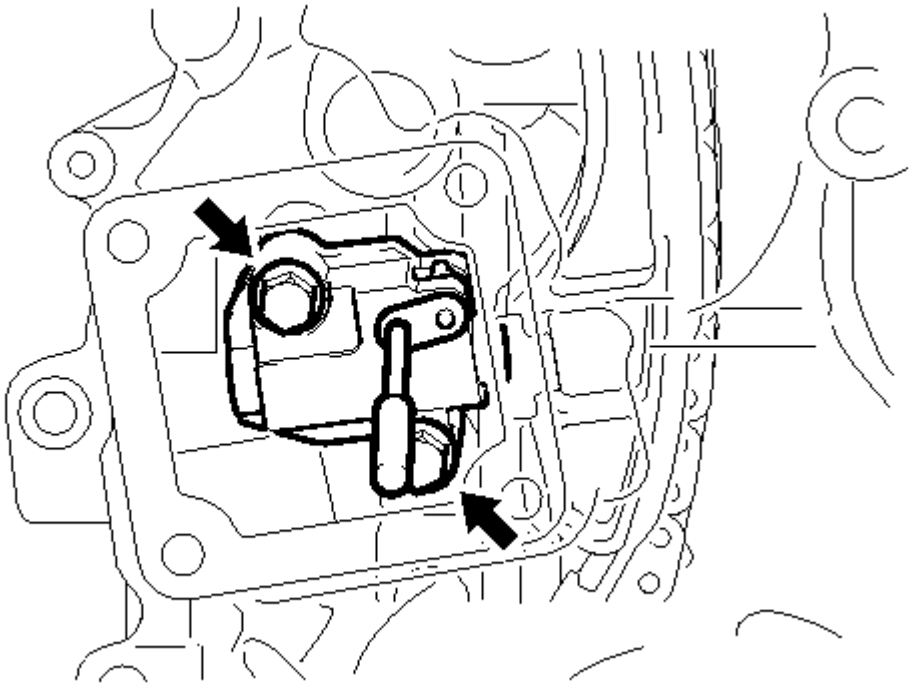


Fig. 55: Identifying No. 1 Chain Tensioner Assembly Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE: Make sure not to drop the gasket inside the timing chain cover.

c. Remove the pin from the stopper plate.

13. **CHECK 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.

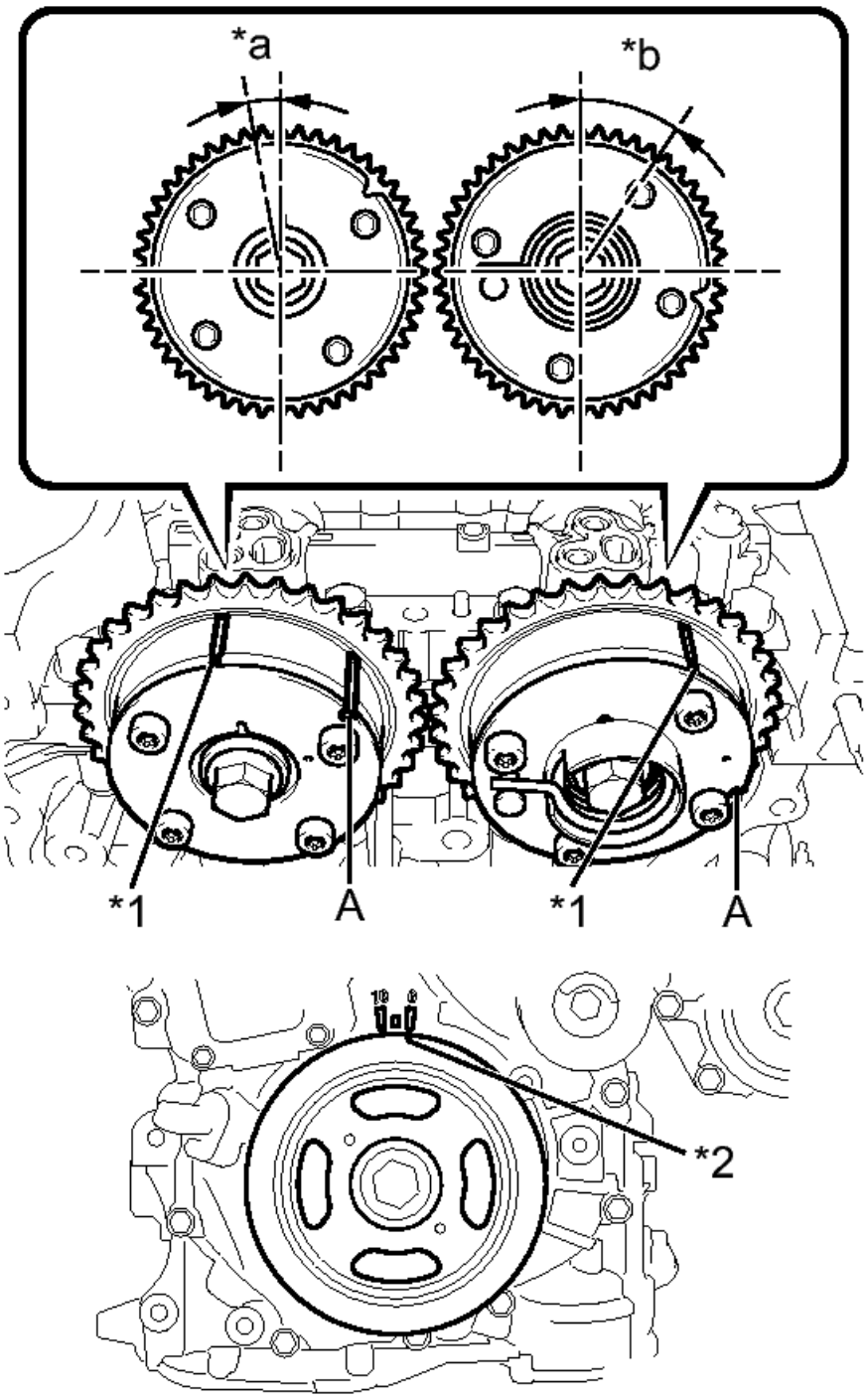


Fig. 56: Aligning Camshaft Timing Gears & Crankshaft Timing Marks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

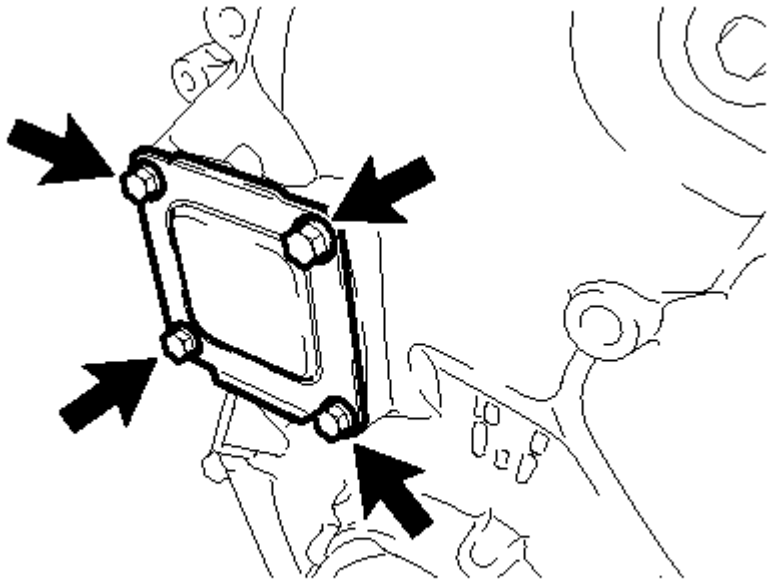
*1	Timing Mark
*2	Timing Notch
*a	Approximately 7°
*b	Approximately 32°

b. Check that the timing marks of the camshaft timing gears are as shown in the illustration above (**Fig. 56**). If not, turn the crankshaft 1 revolution (360°) to align the timing marks as shown in the illustration above (**Fig. 56**).

HINT:

"A" is not a timing mark.

14. **INSTALL TIMING CHAIN COVER PLATE**
    a. Install a new gasket and the timing chain cover plate with the 4 bolts.



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Fig. 57: Identifying Timing Chain Cover Plate Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

15. **INSTALL TIMING CHAIN COVER TIGHT PLUG** See step 37
16. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY** See step 42
17. **INSTALL IGNITION COIL ASSEMBLY** . Refer to **INSTALLATION - Step 2**

18. **CONNECT ENGINE WIRE**

a. Connect the connectors and clamps, and install the engine wire to the engine with the bolts and nuts.

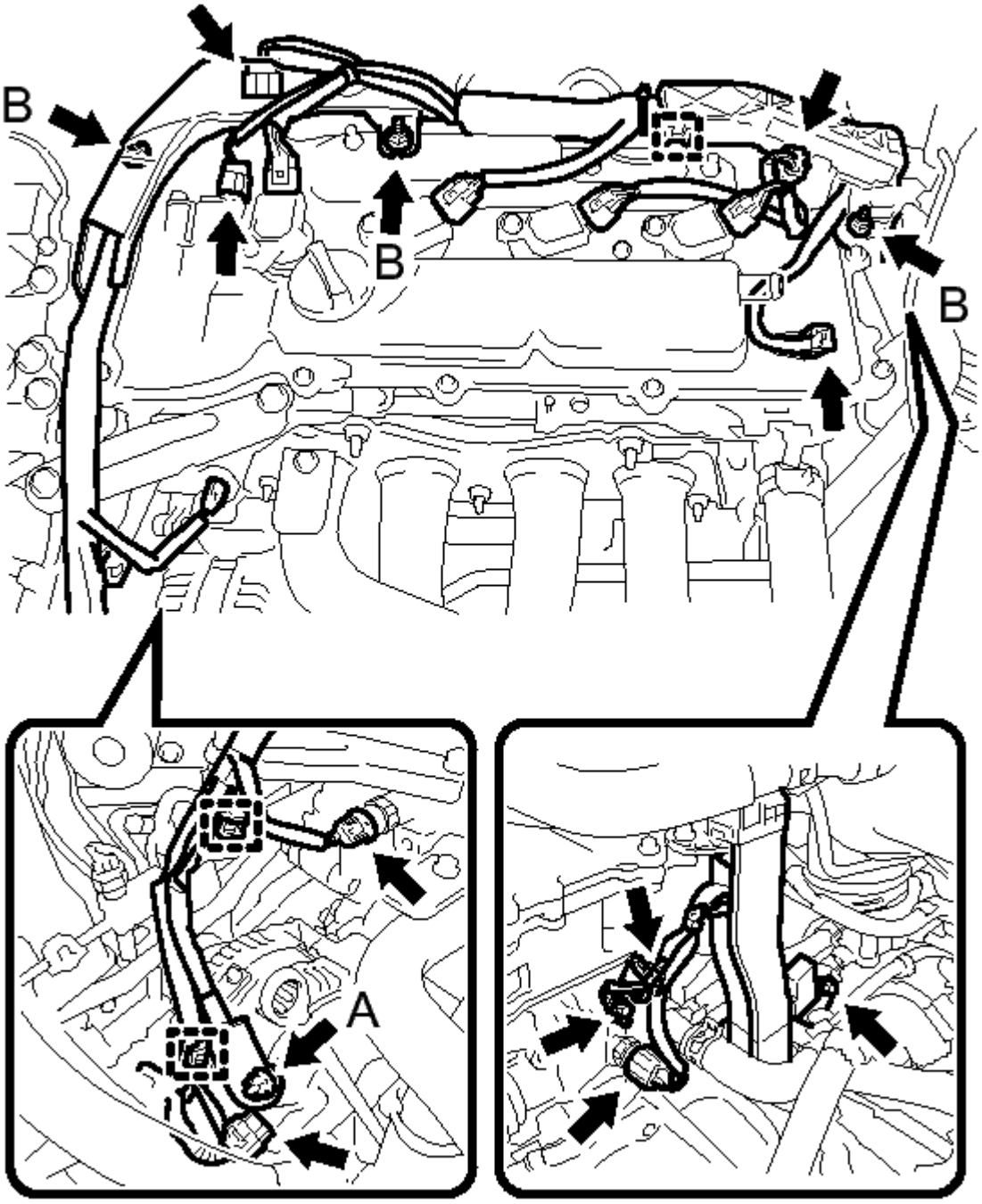


Fig. 58: Identifying Engine Wire Connectors, Clamps & Fasteners

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

Nut A

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

Nut B

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

Bolt

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

19. **CONNECT VENTILATION HOSE ASSEMBLY**
    a. Connect the ventilation hose assembly to the cylinder head cover.
20. **INSTALL ENGINE MOVING CONTROL ROD SUB-ASSEMBLY** See step 31
21. **INSTALL NO. 2 ENGINE MOUNTING STAY RH** See step 32
22. **INSTALL AIR CLEANER ASSEMBLY** See step 45
23. **INSTALL AIR CLEANER INLET ASSEMBLY** See step 47
24. **INSTALL COWL PANEL SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 12**
25. **INSTALL WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** . Refer to **INSTALLATION - Step 2**
26. **INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 3**
27. **INSTALL FRONT FENDER TO COWL SIDE SEAL LH** . Refer to **INSTALLATION - Step 4**
28. **INSTALL FRONT FENDER TO COWL SIDE SEAL RH** . Refer to **INSTALLATION - Step 5**
29. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY RH** . Refer to **INSTALLATION - Step 6**
30. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY LH** . Refer to **INSTALLATION - Step 7**
31. **INSTALL FRONT WIPER ARM HEAD CAP** . Refer to **INSTALLATION - Step 8**
32. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

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

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

33. **INSPECT OIL LEAK**
34. **INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY** See step 75
35. **INSTALL FRONT FENDER APRON SEAL RH** See step 77
36. **INSTALL FRONT WHEEL RH**

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

CYLINDER HEAD GASKET

COMPONENTS

ILLUSTRATION

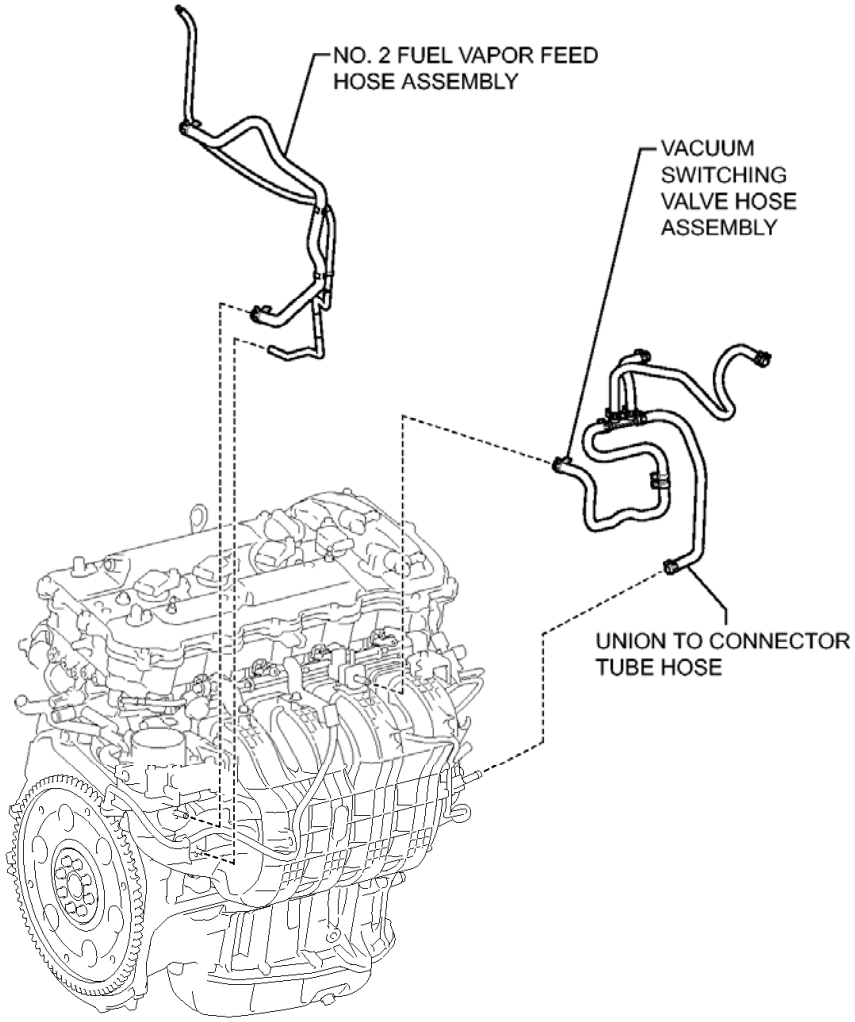


Fig. 59: Cylinder Head Gasket Replacement Components (1 of 6)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

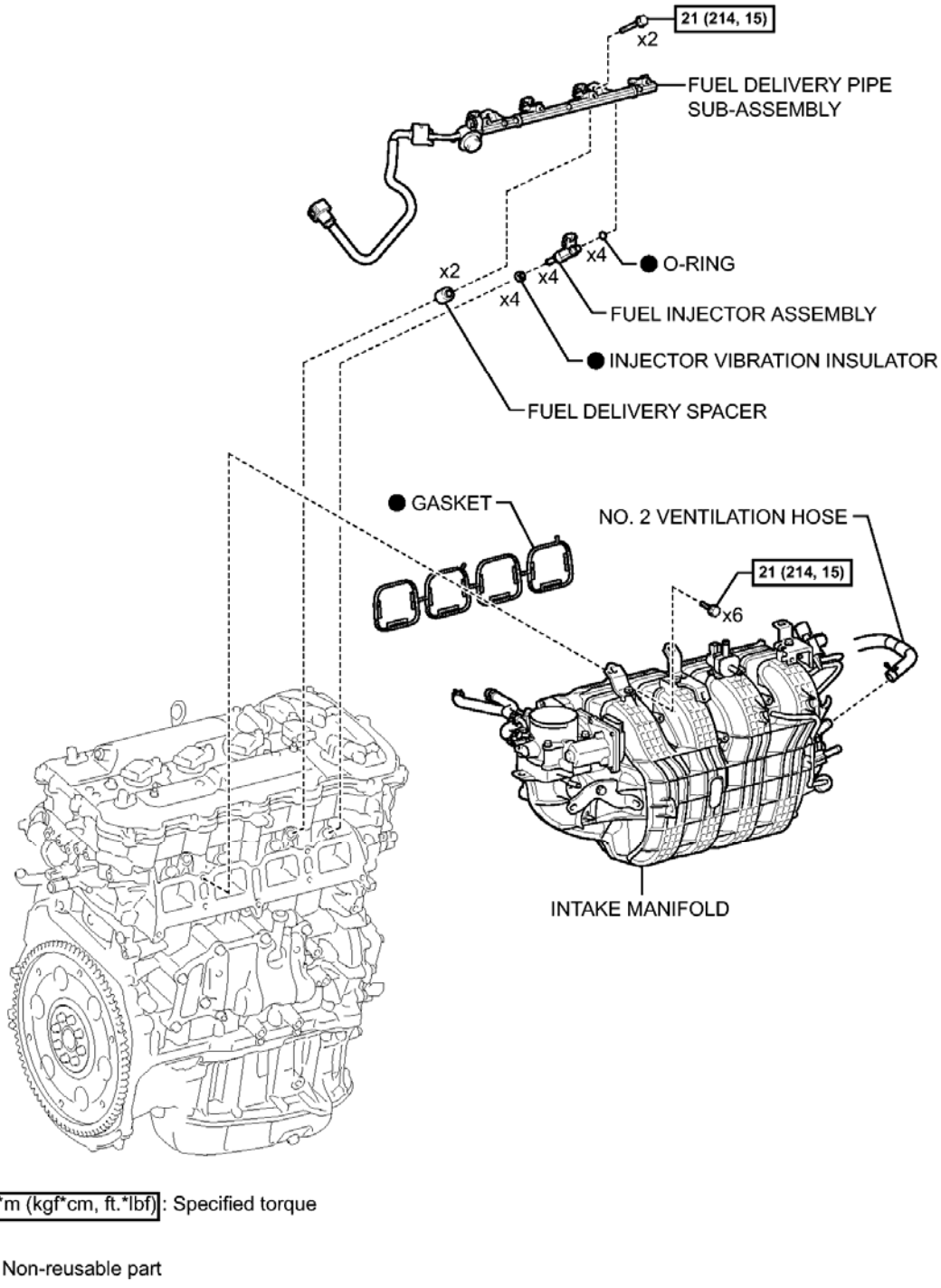
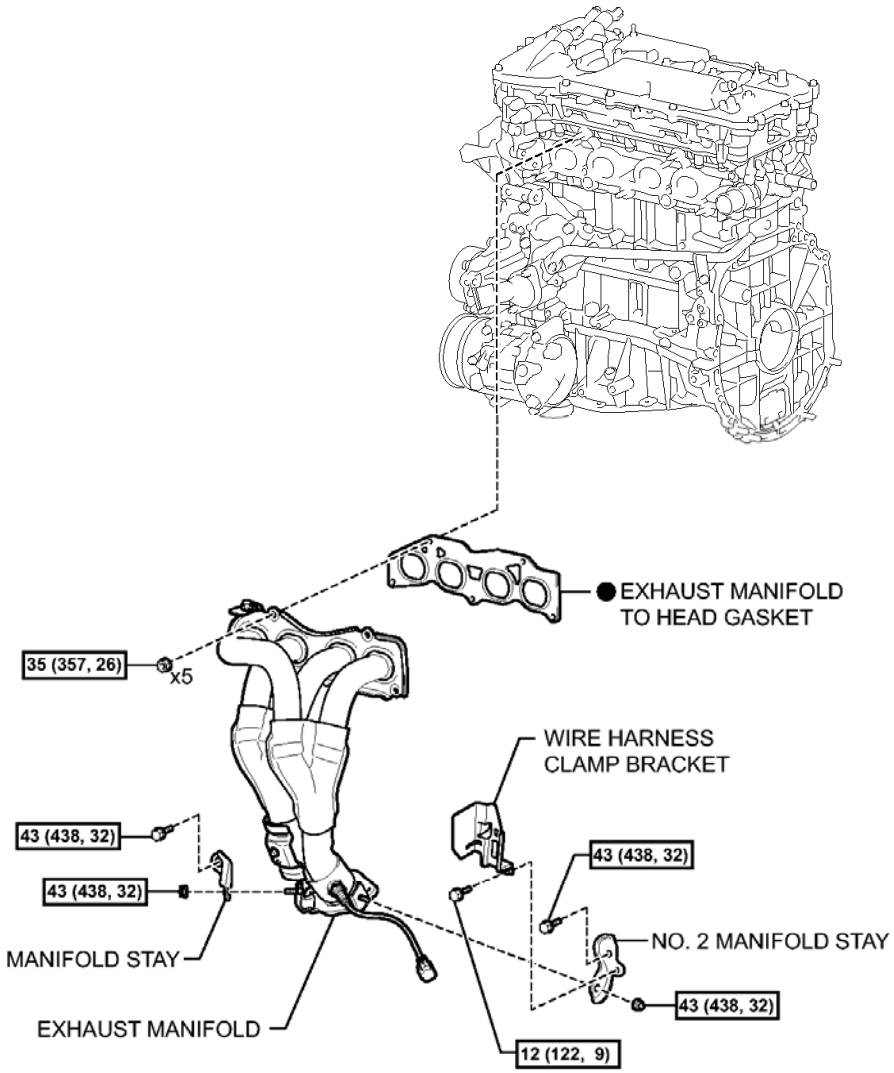


Fig. 60: Cylinder Head Gasket Replacement Components With Torque Specifications (2 of 6)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

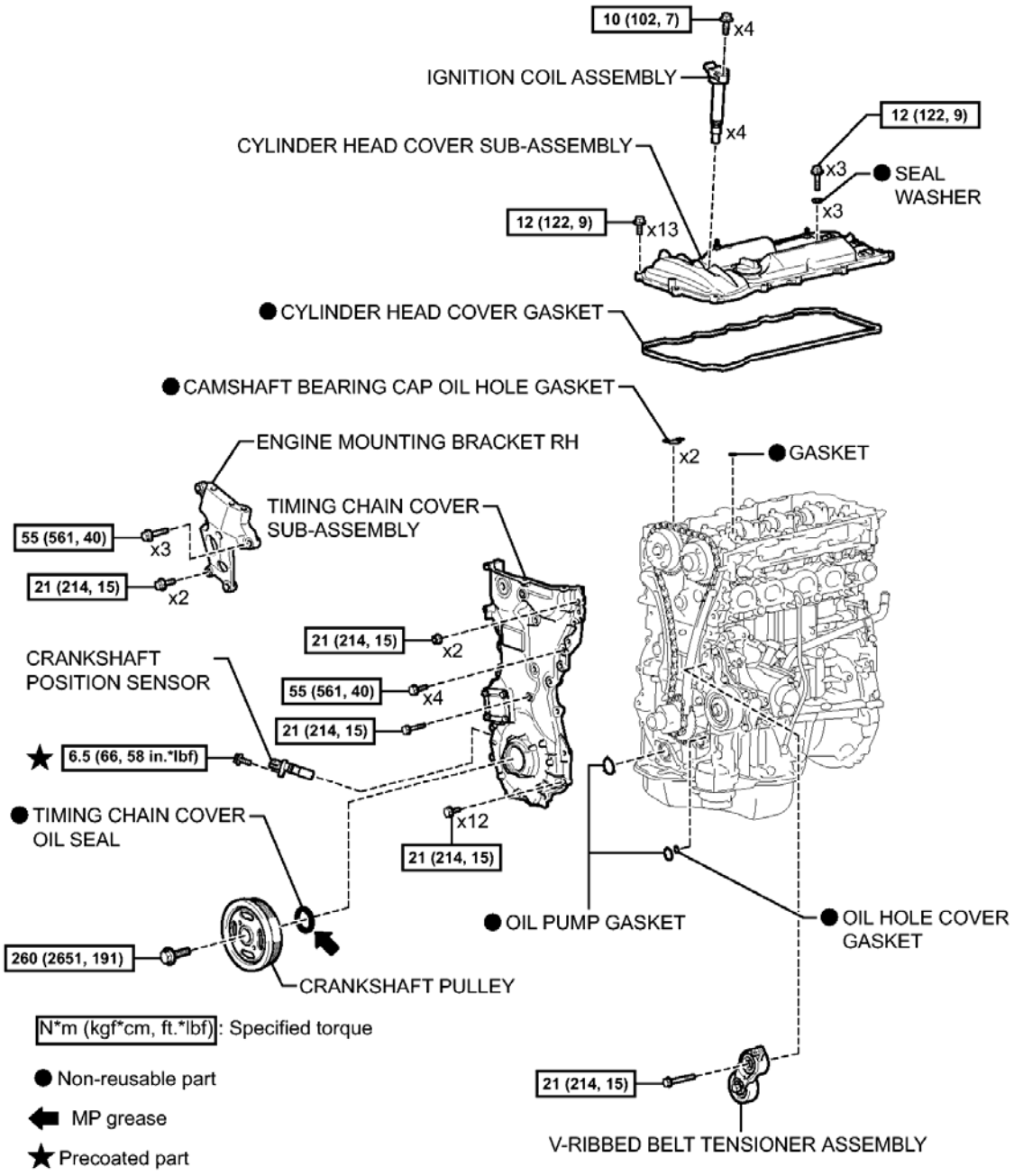
ILLUSTRATION



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Fig. 61: Cylinder Head Gasket Replacement Components With Torque Specifications (3 of 6)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



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Fig. 62: Cylinder Head Gasket Replacement Components With Torque Specifications (4 of 6)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

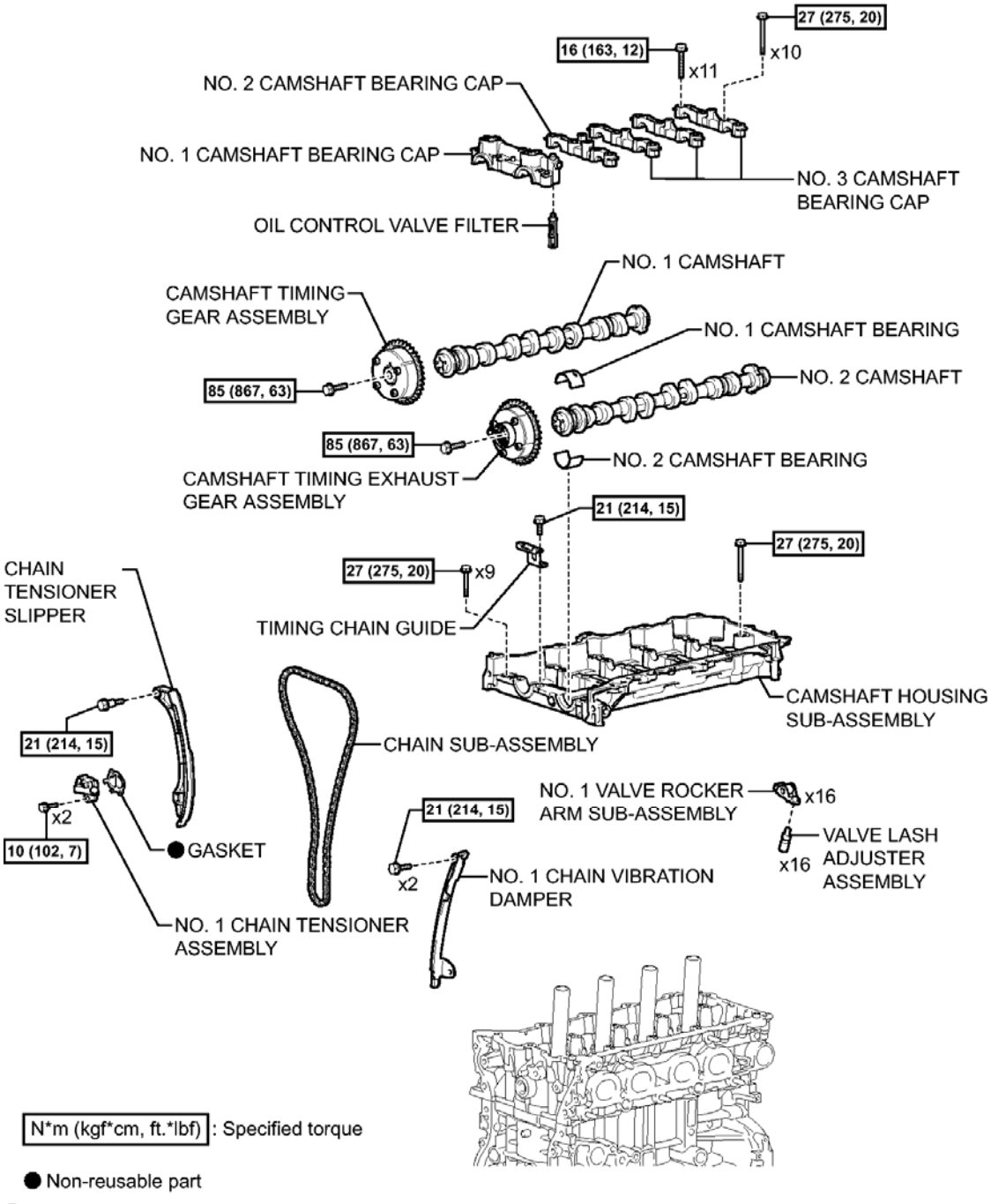


Fig. 63: Cylinder Head Gasket Replacement Components With Torque Specifications (5 of 6)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

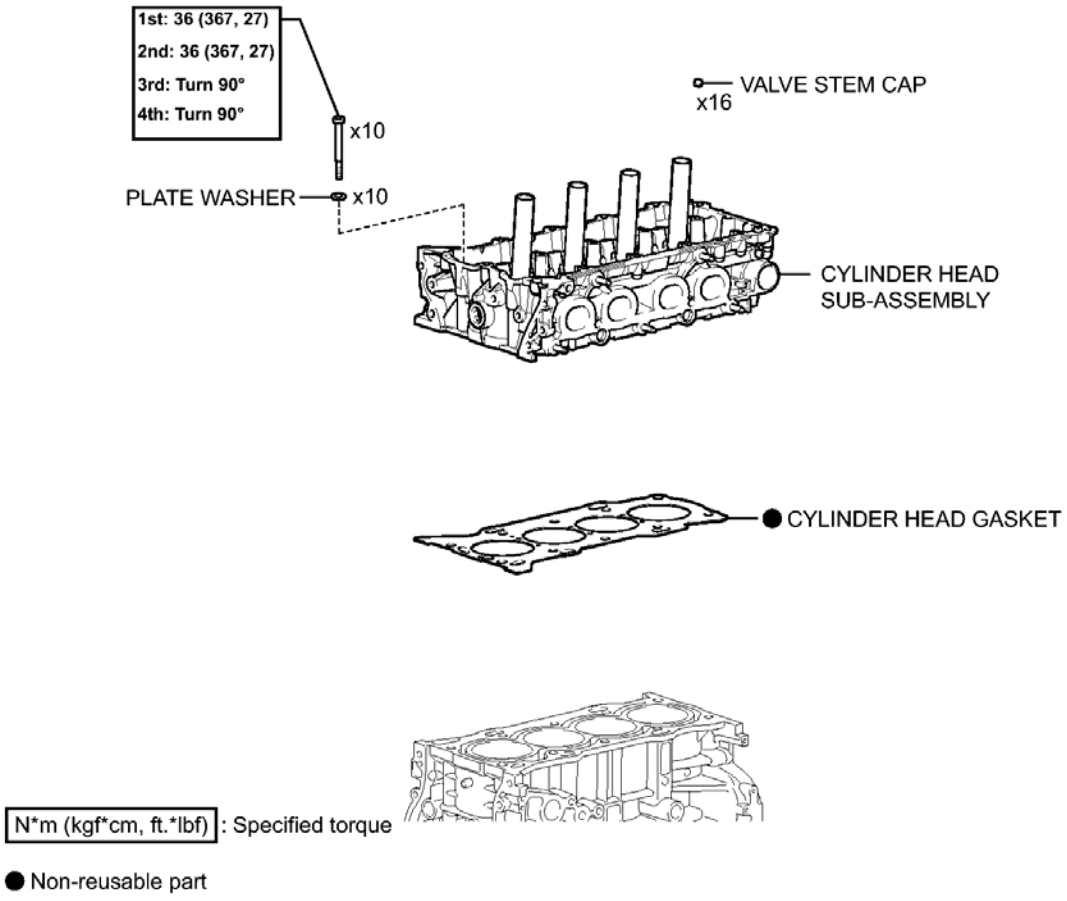


Fig. 64: Cylinder Head Gasket Replacement Components With Torque Specifications (6 of 6)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

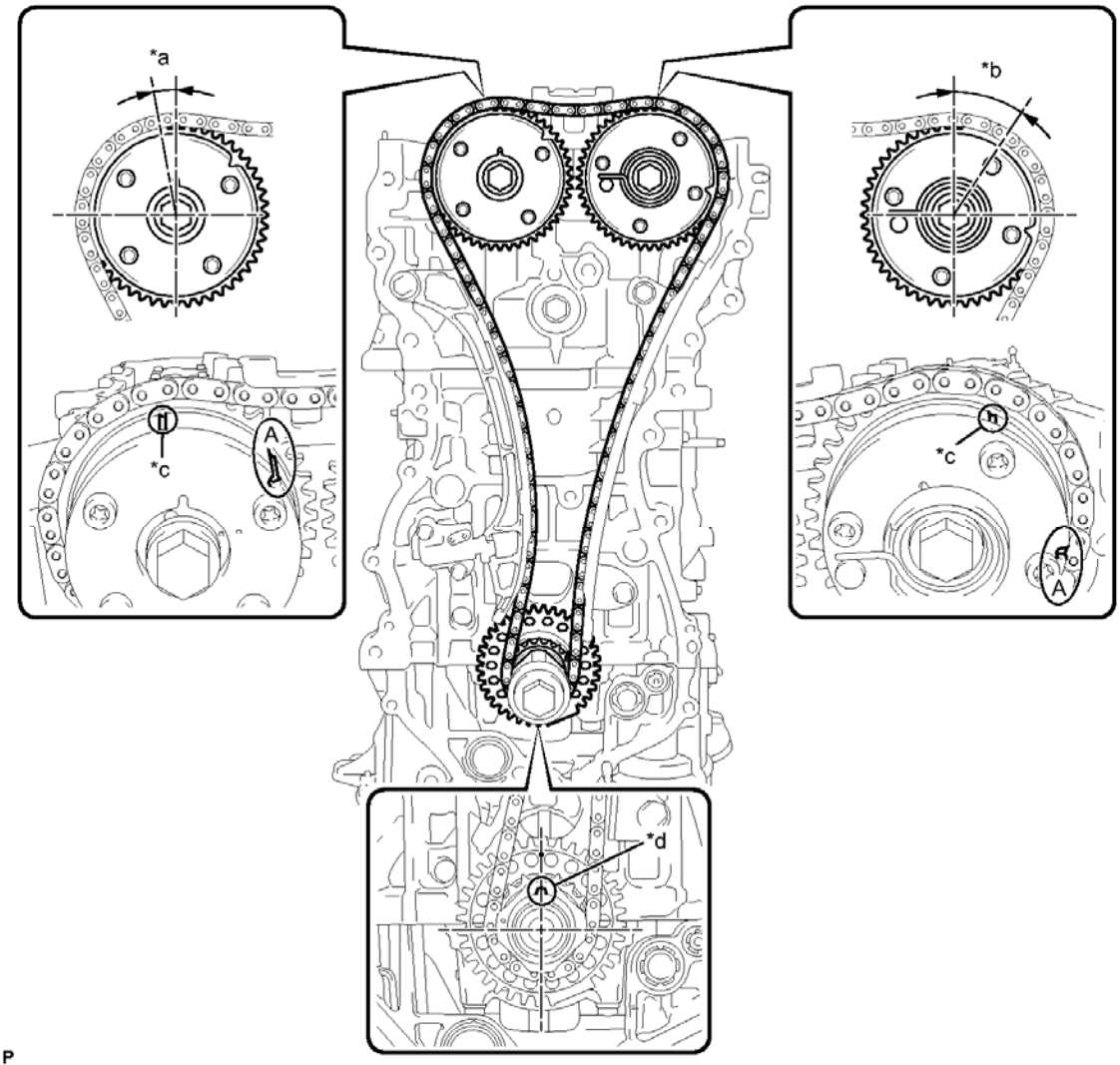
REMOVAL

1. **REMOVE ENGINE ASSEMBLY WITH TRANSAXLE**

   Refer to **REMOVAL**

2. **REMOVE MANIFOLD STAY** . Refer to **REMOVAL - Step 3**
3. **REMOVE NO. 2 MANIFOLD STAY** . Refer to **REMOVAL - Step 4**
4. **REMOVE EXHAUST MANIFOLD** . Refer to **REMOVAL - Step 6**
5. **REMOVE NO. 2 FUEL VAPOR FEED HOSE ASSEMBLY** See step 7
6. **DISCONNECT VACUUM SWITCHING VALVE HOSE ASSEMBLY** See step 8

7. **REMOVE UNION TO CONNECTOR TUBE HOSE** See step 9
8. **REMOVE INTAKE MANIFOLD** See step 10
9. **REMOVE EXHAUST MANIFOLD TO HEAD GASKET** . Refer to **REMOVAL - Step 7**
10. **REMOVE FUEL DELIVERY PIPE SUB-ASSEMBLY** . Refer to **REMOVAL - Step 13**
11. **REMOVE FUEL INJECTOR ASSEMBLY** . Refer to **REMOVAL - Step 14**
12. **REMOVE IGNITION COIL ASSEMBLY** . Refer to **REMOVAL - Step 2**
13. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY** See step 20
14. **REMOVE CRANKSHAFT POSITION SENSOR** . Refer to **REMOVAL - Step 1**
15. **REMOVE CRANKSHAFT PULLEY** See step 19
16. **DISCONNECT ENGINE MOUNTING BRACKET RH** . Refer to **REMOVAL - Step 7**
17. **REMOVE V-RIBBED BELT TENSIONER ASSEMBLY** See step 15
18. **REMOVE TIMING CHAIN COVER SUB-ASSEMBLY** . Refer to **REMOVAL - Step 9**
19. **REMOVE TIMING CHAIN COVER OIL SEAL** . Refer to **REMOVAL - Step 10**
20. **SET NO. 1 CYLINDER TO TDC / COMPRESSION**
    a. Temporarily install the crankshaft pulley bolt.



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Fig. 65: Identifying Crankshaft & Camshaft Timing Gear Timing Marks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Approximately 7°	*b	Approximately 32°
*c	Timing Mark	*d	Key

HINT:

"A" is not a timing mark.

b. Rotate the crankshaft clockwise so that the timing marks on the crankshaft timing gear and camshaft timing gears are as shown in the illustration above (**Fig. 65**).

HINT:

If the timing marks do not align, rotate the crankshaft clockwise again and align the timing marks.

c. Remove the crankshaft pulley bolt.

21. **REMOVE TIMING CHAIN GUIDE**

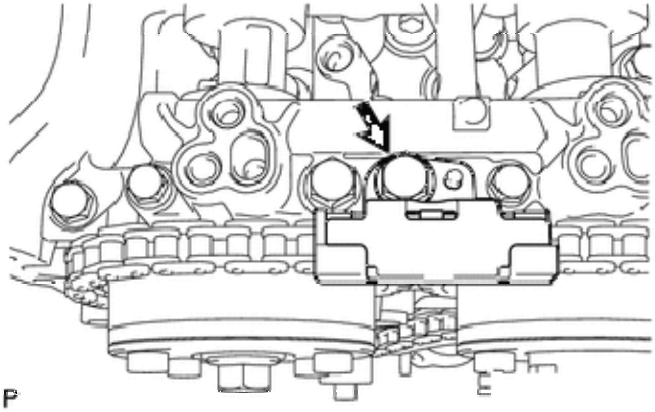


Fig. 66: Identifying Timing Chain Guide Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the bolt and the timing chain guide.

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

a. Allow the plunger to extend slightly, and then rotate the stopper plate counterclockwise to release the lock. Once the lock is released, push the plunger into the tensioner.

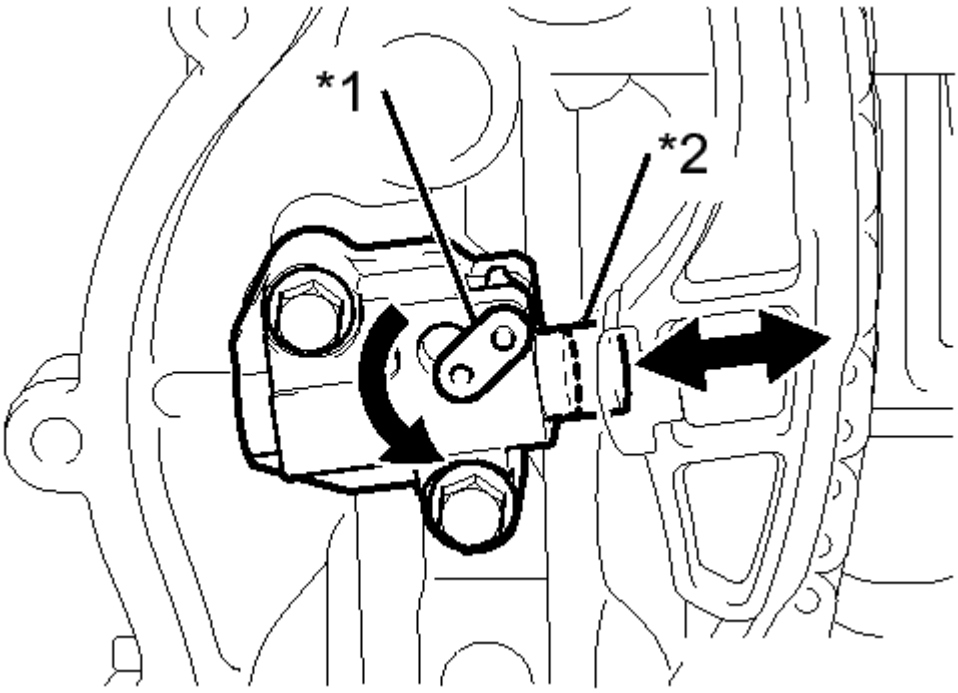


Fig. 67: Turning No. 1 Chain Tensioner Stopper Plate Counterclockwise & Pushing Plunger
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Stopper Plate
*2	Plunger

b. Move the stopper plate clockwise to set the lock, and insert a pin into the stopper plate hole.

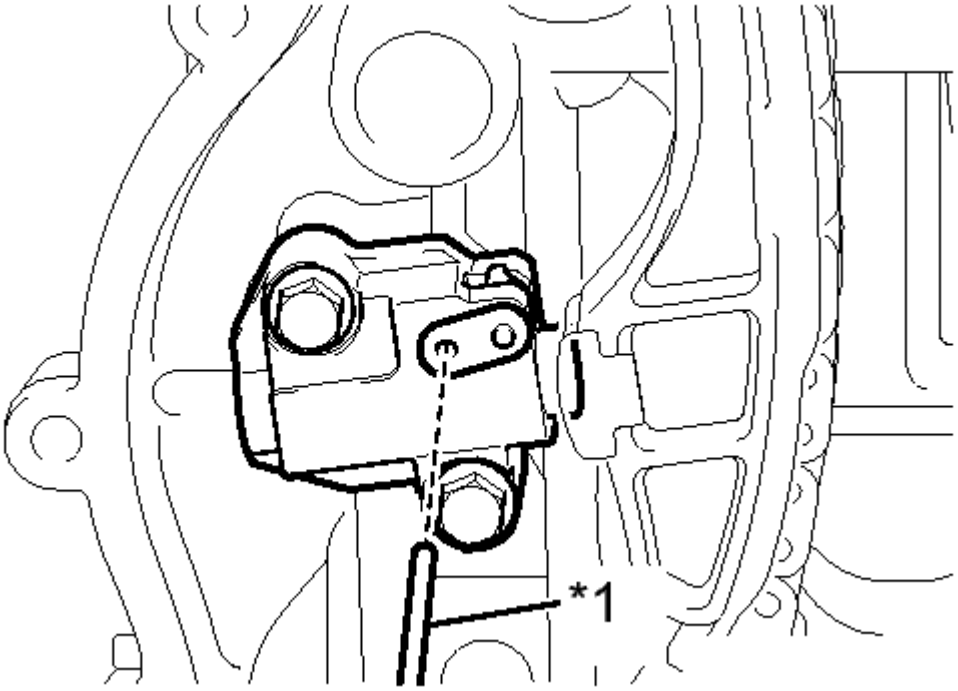


Fig. 68: Inserting Pin Into Stopper Plate Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Pin

c. Remove the 2 bolts, chain tensioner and gasket.

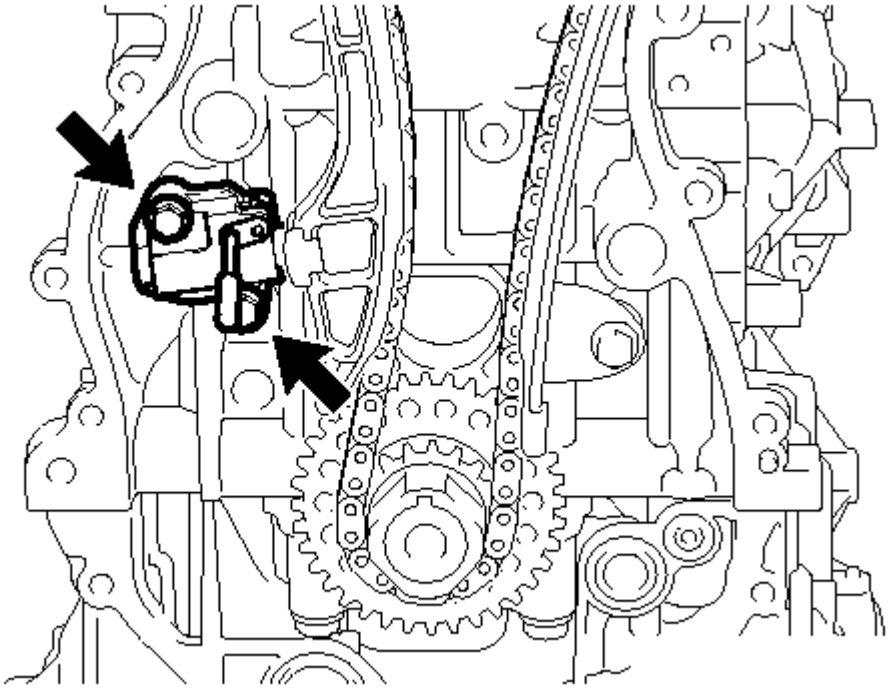


Fig. 69: Identifying Chain Tensioner Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

23. **REMOVE CHAIN TENSIONER SLIPPER**

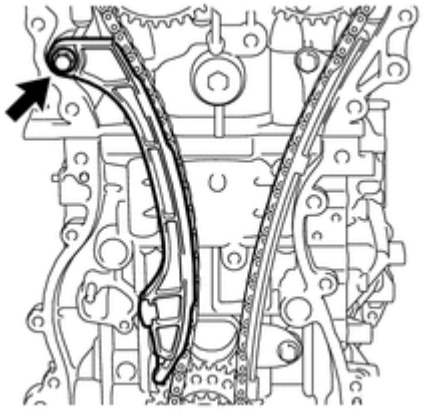


Fig. 70: Identifying Bolt And Chain Tensioner Slipper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the bolt and the chain tensioner slipper.

24. **REMOVE CHAIN SUB-ASSEMBLY**
    a. Remove the chain.
25. **REMOVE NO. 1 CHAIN VIBRATION DAMPER**

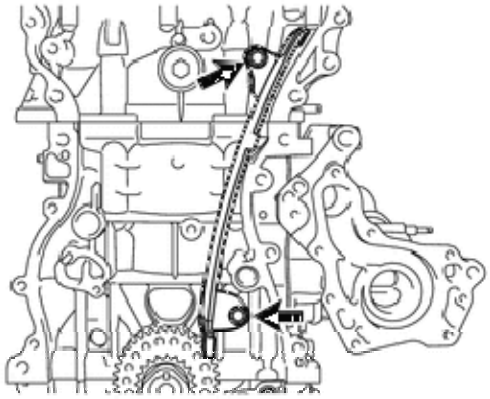


Fig. 71: Identifying Chain Vibration Damper Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

26. **REMOVE CAMSHAFT TIMING GEAR ASSEMBLY**

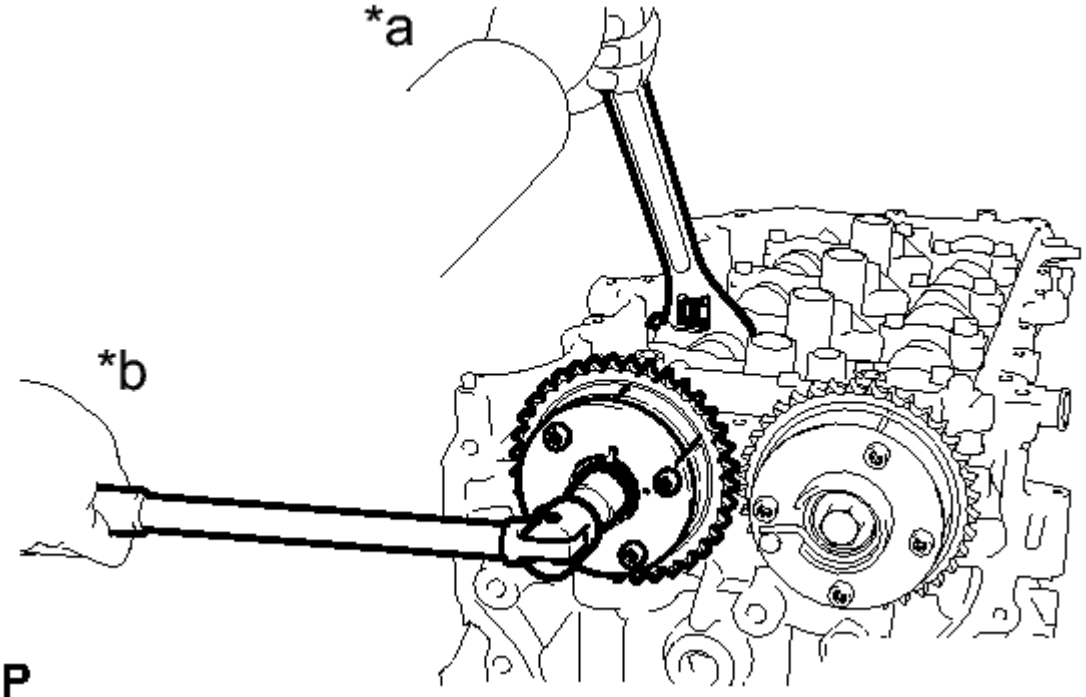


Fig. 72: Removing Camshaft Timing Gear Assembly Using A Wrench
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Hold
*b	Turn

a. Hold the hexagonal portion of the camshaft with a wrench and remove the bolt and camshaft timing gear.

NOTE:

- **Be careful not to damage the cylinder head or spark plug tube with the wrench.**
- **Do not disassemble the camshaft timing gear.**

27. **REMOVE CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY**

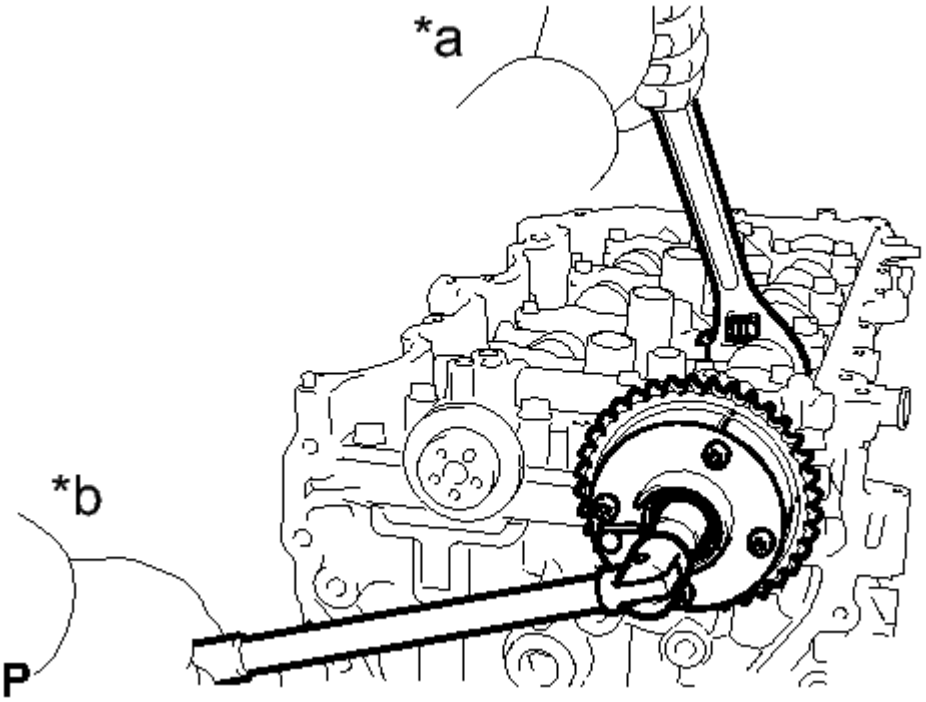


Fig. 73: Removing Camshaft Timing Exhaust Gear Assembly Using A Wrench
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Hold
*b	Turn

a. Hold the hexagonal portion of the camshaft with a wrench and remove the bolt and camshaft timing exhaust gear.

NOTE:

- **Be careful not to damage the cylinder head or spark plug tube with the wrench.**
- **Do not disassemble the camshaft timing exhaust gear.**

28. **REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY**

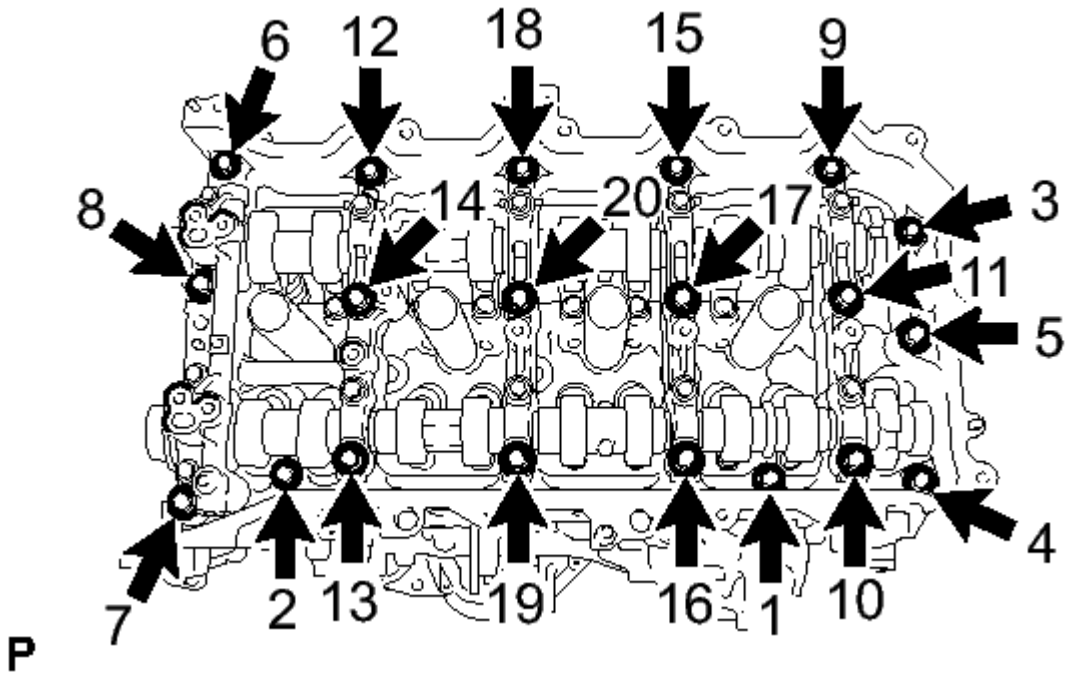


Fig. 74: Identifying Bearing Cap Bolts With Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Uniformly loosen and remove the 20 bearing cap bolts in the sequence shown in the illustration above.
b. Remove the camshaft housing by prying between the cylinder head and camshaft housing with a screwdriver.

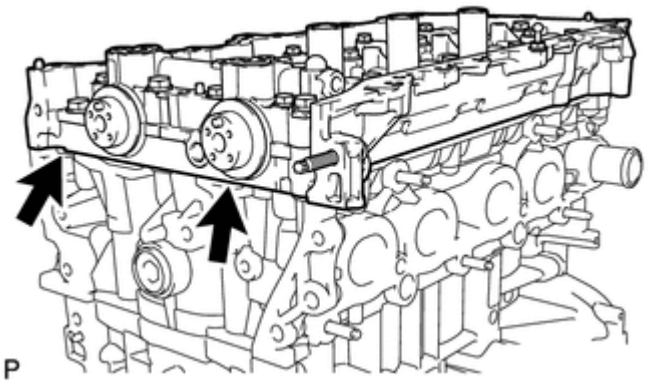


Fig. 75: Identifying Contact Surfaces Of Cylinder Head And Camshaft Housing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Tape the screwdriver tip before use.

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

29. **REMOVE CAMSHAFT BEARING CAP**

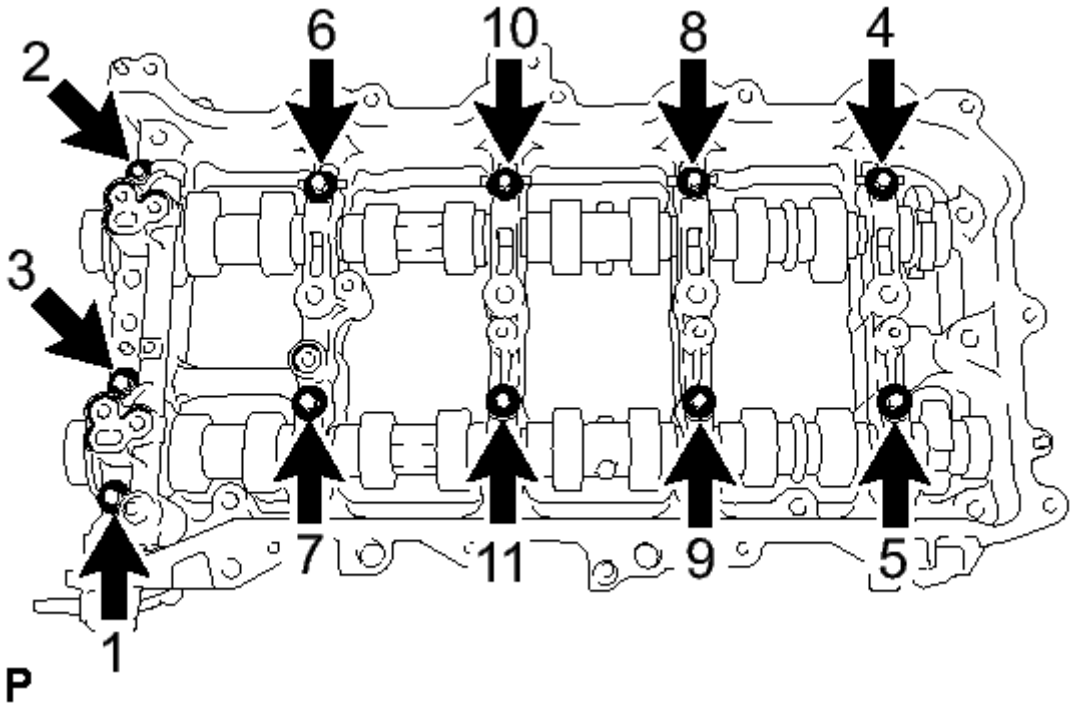


Fig. 76: Identifying Bearing Cap Bolts With Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the 11 bearing cap bolts in the sequence shown in the illustration above.
b. Remove the 5 bearing caps.

HINT:

Arrange the removed parts in the correct order.

30. **REMOVE OIL CONTROL VALVE FILTER** See step 38
31. **REMOVE NO. 1 CAMSHAFT BEARING** See step 40
32. **REMOVE CAMSHAFT**
    a. Remove the No. 1 and No. 2 camshafts.
33. **REMOVE NO. 2 CAMSHAFT BEARING** See step 41
34. **REMOVE NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY**
    a. Remove the 16 valve rocker arms from the cylinder head.

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.

    HINT:

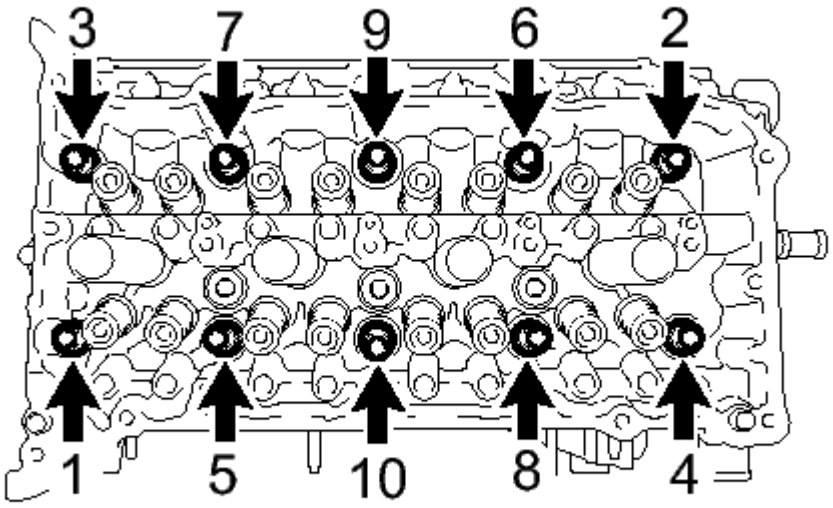
    Arrange the removed parts in the correct order.

36. **REMOVE VALVE STEM CAP**
    a. Remove the 16 valve stem caps from the cylinder head.

    HINT:

    Arrange the removed parts in the correct order.

37. **REMOVE CYLINDER HEAD SUB-ASSEMBLY**
    a. Using a 10 mm bi-hexagon wrench, uniformly loosen the 10 bolts in the sequence shown in the illustration below. Remove the 10 cylinder head bolts and plate washers.



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Fig. 77: Identifying Head Bolts With Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

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

NOTE:

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

b. Remove the cylinder head.

38. **REMOVE CYLINDER HEAD GASKET**

a. Remove the cylinder head gasket from the cylinder block.

INSTALLATION

INSTALLATION

1. **INSPECT CYLINDER HEAD BOLT** See step 16
2. **INSPECT CYLINDER HEAD SUB-ASSEMBLY** See step 1
3. **INSTALL CYLINDER HEAD GASKET**

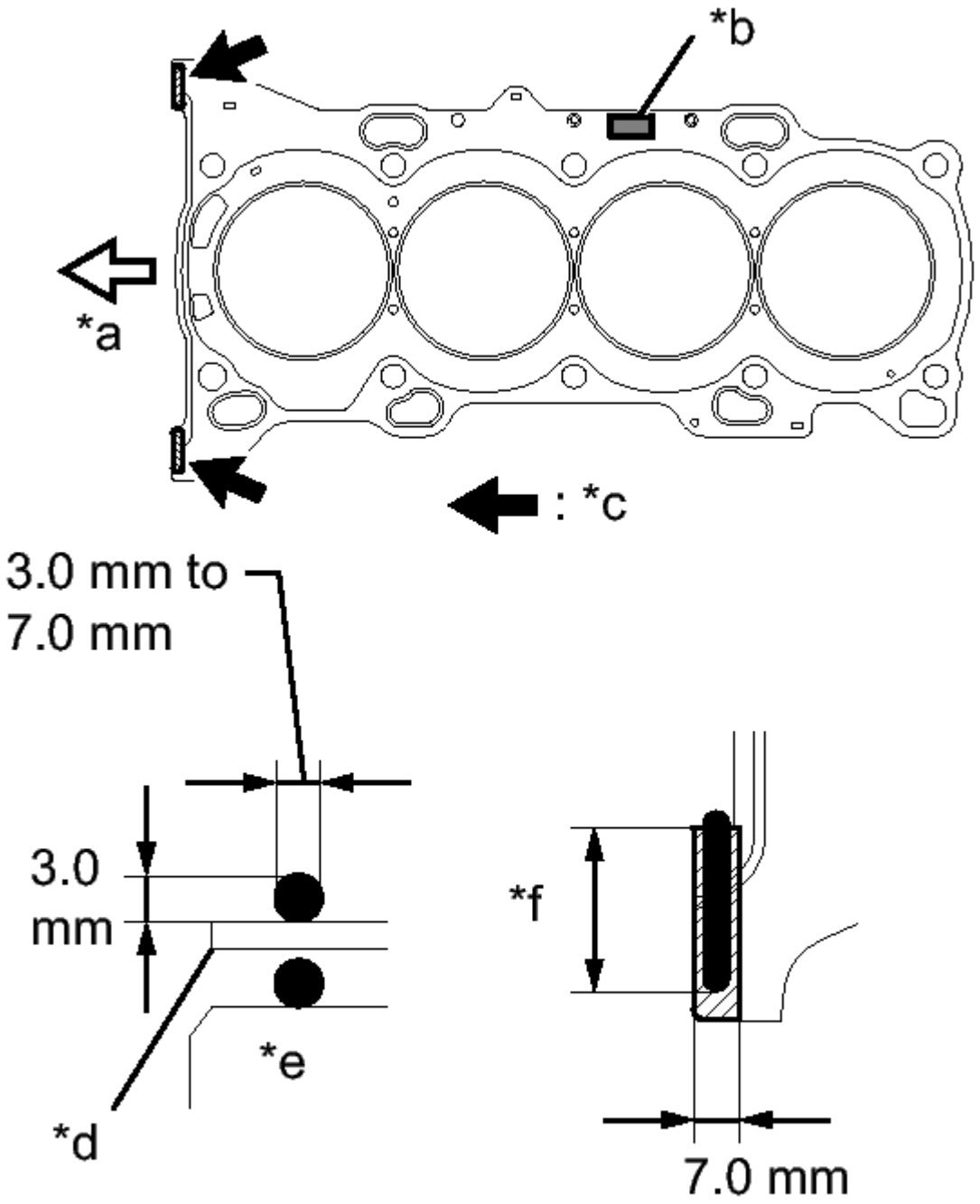


Fig. 78: Identifying Cylinder Head Gasket Seal Packing Areas
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Clean the cylinder block and cylinder head with solvent.

TEXT IN ILLUSTRATION

*a	Front
*b	Lot No.
*c	Seal Packing
*d	Cylinder Head Gasket
*e	Cylinder Block
*f	20 mm or more

b. Apply a continuous line of seal packing to a new cylinder head gasket as shown in the illustration above (**Fig. 78**).

Seal packing

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

Standard seal dimension

3.0 to 7.0 mm (0.118 to 0.276 in.) wide and 3.0 mm (0.118 in.) thick

HINT:

Apply at least 20 mm (0.787 in.) of seal packing from the inside edge of the protrusion of the cylinder block.

NOTE:

- **Remove any oil from the contact surface.**
- **Install the cylinder head gasket within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.**

c. Place a new cylinder head gasket on the cylinder block surface with the front face of the Lot No. stamp upward.

NOTE: Pay attention to the installation direction.

4. **INSTALL CYLINDER HEAD SUB-ASSEMBLY**

HINT:

The cylinder head bolts are tightened in 4 progressive steps.

a. Place the cylinder head on the cylinder block.

NOTE:

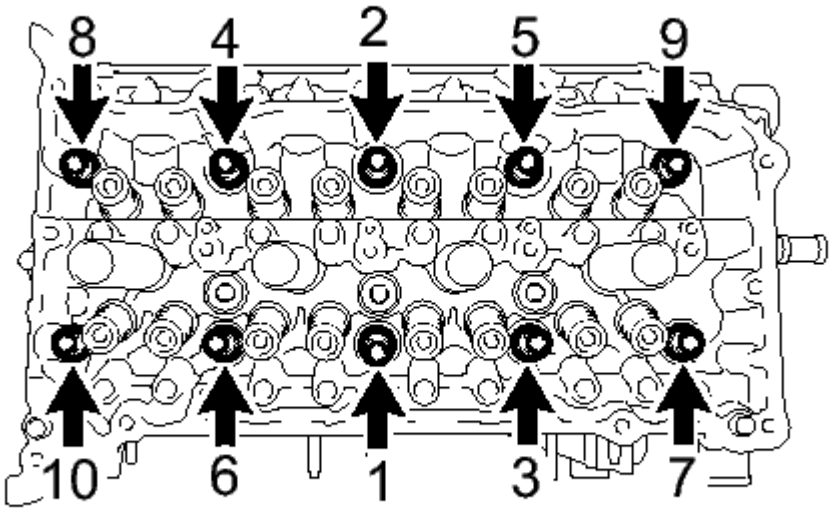
- **Ensure that no oil is on the mounting surface of the cylinder head.**
- **Place the cylinder head on the cylinder block gently in order not to damage the gasket with the bottom part of the head.**

b. Install the plate washers to the cylinder head bolts.

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

d. Step 1:

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



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Fig. 79: Identifying Cylinder Head Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

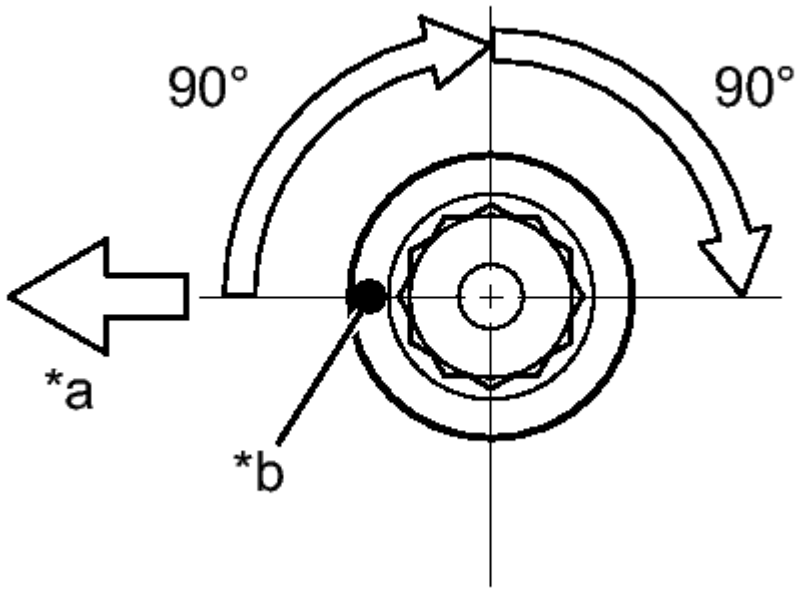
NOTE: **Do not drop the plate washer for the cylinder head bolt into the cylinder head.**

e. Step 2:

1. Tighten the cylinder head bolts again in the sequence shown in the illustration above to make sure that they are tightened to the specified torque.

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

f. Step 3:
   1. Mark each cylinder head bolt head with paint as shown in the illustration below.



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Fig. 80: Tightening Cylinder Head Bolts 90°
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front
*b	Paint Mark

   2. Tighten the cylinder head bolts 90° in the sequence shown in step 1.

g. Step 4:
   1. Tighten the cylinder head bolts another 90° in the sequence shown in step 1.
   2. Check that the painted marks are now facing rearward.

NOTE:

- **Do not apply oil for at least 4 hours after the installation.**
- **Do not start the engine for at least 4 hours after the installation.**
- **After the installation, if the seal packing has seeped out, wipe it off.**

5. **INSTALL VALVE STEM CAP**
   a. Apply a light coat of engine oil to the valve stem ends.

b. Install the 16 valve stem caps to the cylinder head.

NOTE: Do not drop the valve stem caps into the cylinder head.

6. **SET CAMSHAFT TIMING GEAR ASSEMBLY**

HINT:

When installing the camshaft timing gear, release the lock pin and set the camshaft timing gear to the advanced position before installation.

a. Check the camshaft timing gear position.

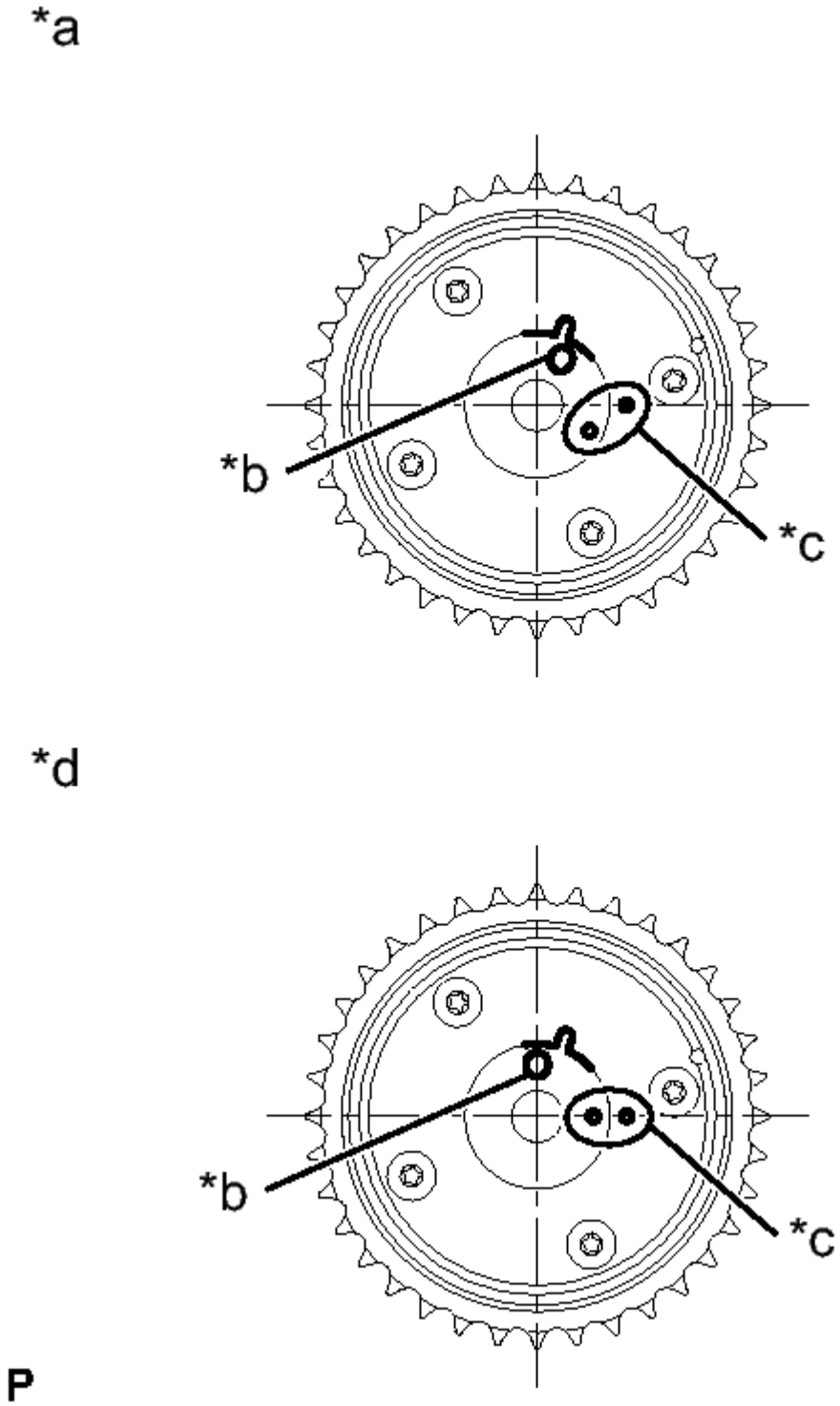


Fig. 81: Checking Camshaft Timing Gear Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

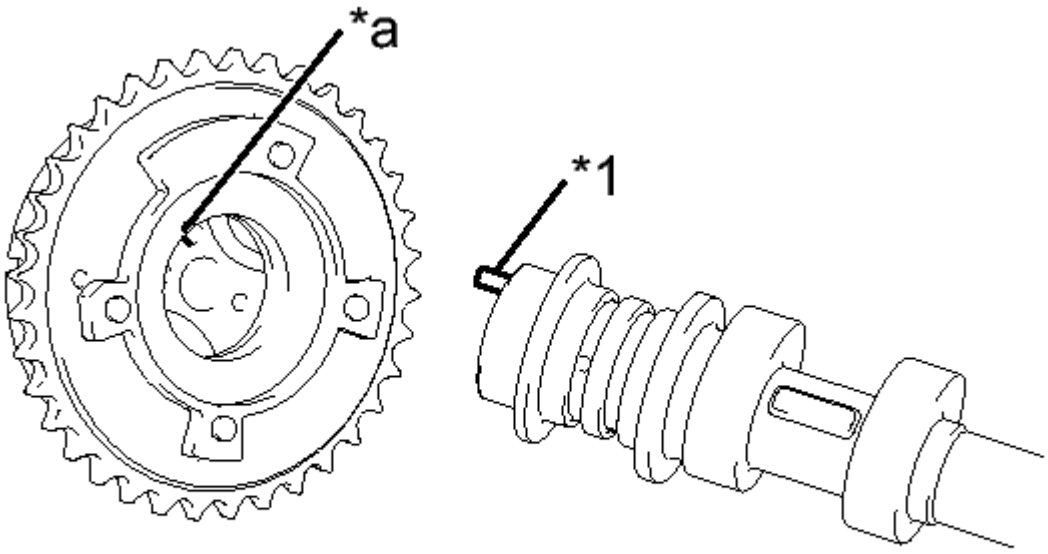
	Advanced

*a	Position
*b	Knock Pin Hole
*c	Alignment Mark
*d	Retarded Position

NOTE: **If the camshaft timing gear is set to the advanced position, do not let the camshaft timing gear rotate clockwise during installation.**

If the camshaft timing gear rotates to the retarded position, release the lock pin and set the camshaft timing gear to the advanced position.

b. Align and attach the knock pin of the No. 1 camshaft with the knock pin hole of the camshaft timing gear.



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Fig. 82: Identifying No. 1 Camshaft Knock Pin & Camshaft Timing Gear Knock Pin Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Knock Pin
*a	Knock Pin

	Hole

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

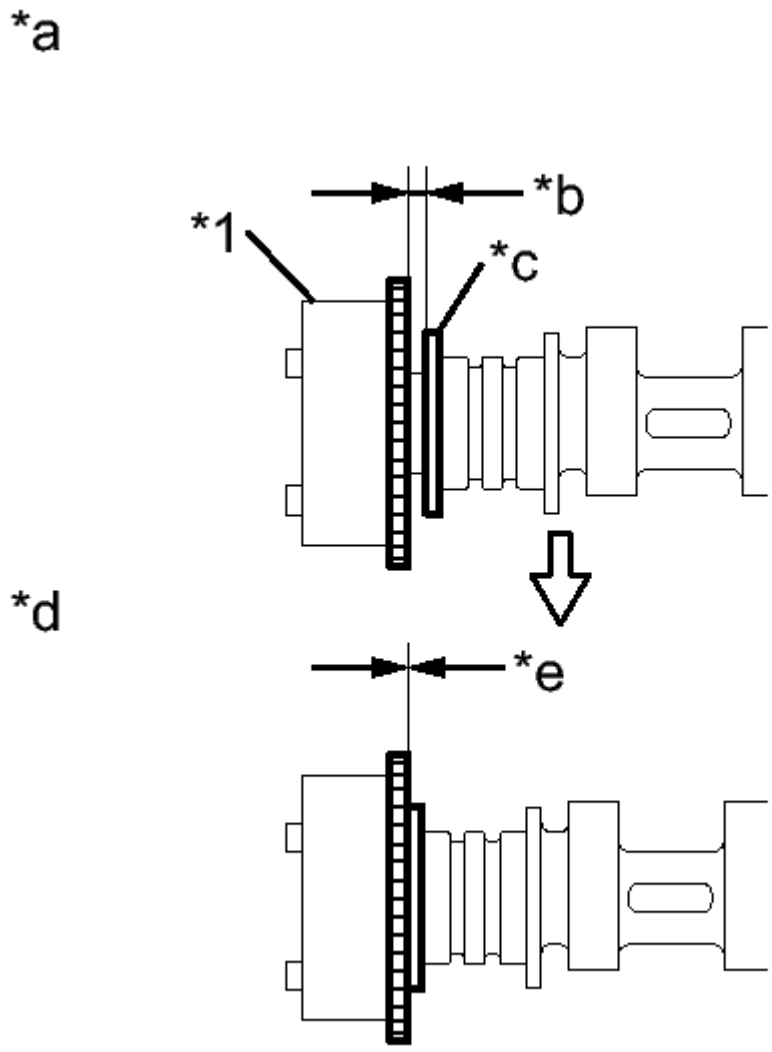


Fig. 83: Checking Clearance Between Camshaft Timing Gear & Camshaft Flange
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

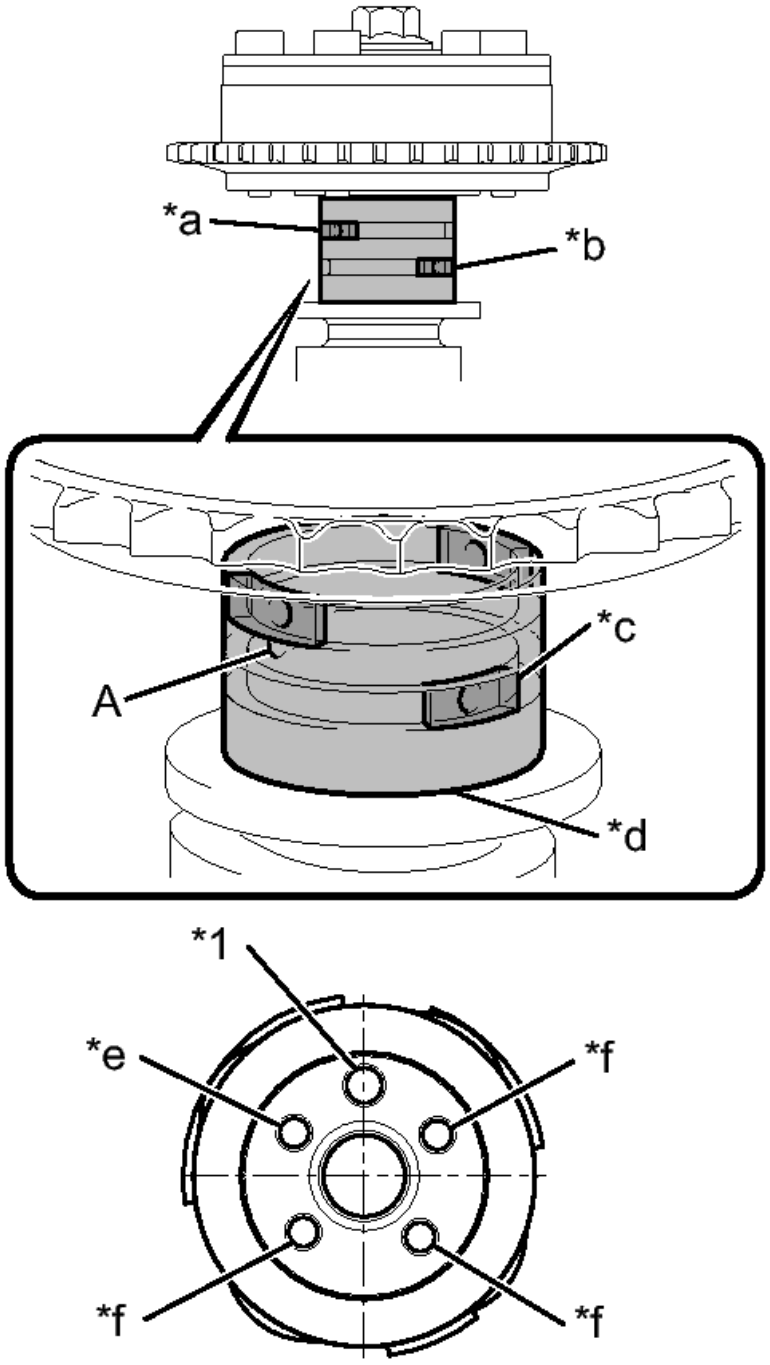
TEXT IN ILLUSTRATION

*1	Camshaft Timing Gear
*a	INCORRECT
*b	Clearance
*c	Flange
*d	CORRECT
*e	No Clearance

d. Secure the camshaft in place by hand, and then install the installation bolt of the camshaft timing gear by hand.

NOTE: Do not use any tools to install the bolt. If the bolt is installed using a tool, the lock pin will be damaged.

e. Release the lock pin.



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Fig. 84: Identifying Camshaft Journal Oil Paths & Vinyl Tape
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

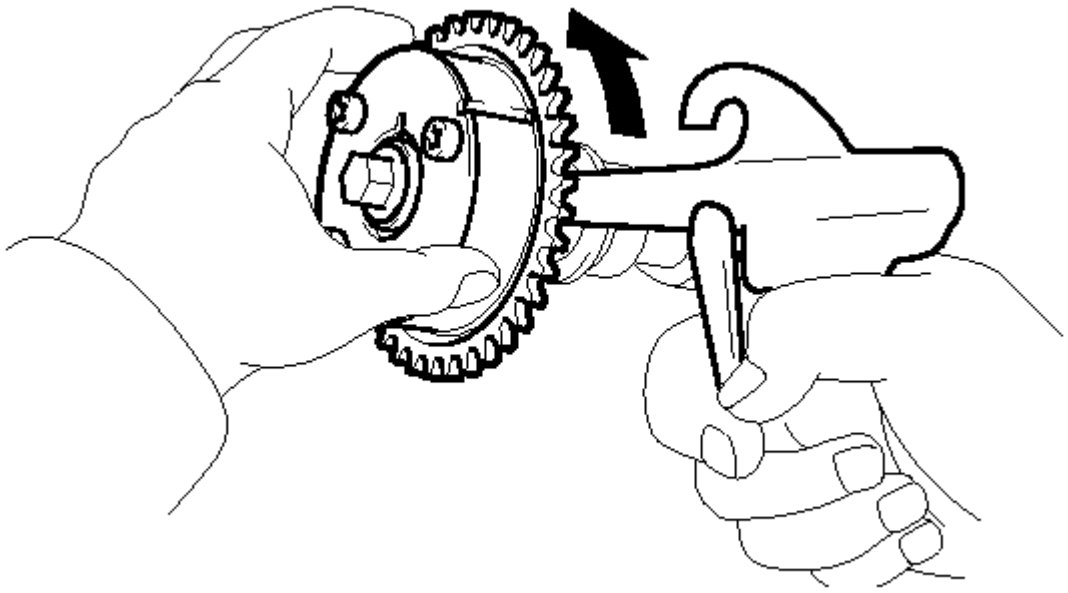
*1	Knock Pin
*a	Retard Side Path
*b	Advance Side Path
*c	Rubber
*d	Vinyl Tape
*e	Open
*f	Close

1. Clean the camshaft journal with non-residue solvent.
2. Cover the 4 oil paths of the cam journal with vinyl tape as shown in the illustration above (**Fig. 84**).

   HINT:

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

3. Open a hole at port A shown in the illustration above (**Fig. 84**).
4. While applying approximately 200 kPa (2.0 kgf/ cm^2 , 29 psi) of air pressure to the oil path, forcibly turn the camshaft timing gear in the advance direction (counterclockwise).



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Fig. 85: Turning Camshaft Timing Gear Assembly
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 allow the camshaft timing gear to lock. If it locks, release the lock pin again.

HINT:

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

5. Remove the vinyl tape and rubber pieces from the camshaft.

f. Remove the bolt and camshaft timing gear.

NOTE: Do not allow the camshaft timing gear to lock. If it locks, release the lock pin again.

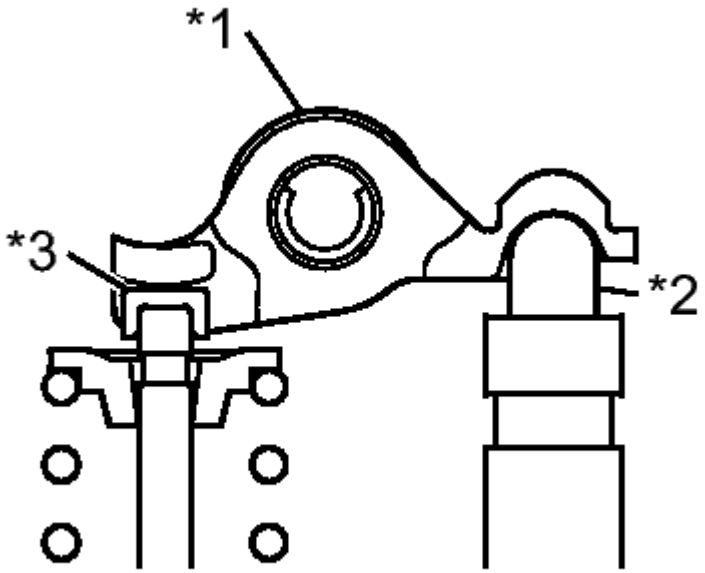
7. **INSTALL VALVE LASH ADJUSTER ASSEMBLY**

a. Inspect the valve lash adjuster before installing it. See step 2.

b. Install the 16 lash adjusters to the cylinder head.

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

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



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Fig. 86: Identifying Valve Rocker Arms
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Apply engine oil to the lash adjuster tips and valve stem caps.

TEXT IN ILLUSTRATION

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

b. Install the 16 valve rocker arms as shown in the illustration above (**Fig. 86**).

9. **INSTALL NO. 2 CAMSHAFT BEARING** See step 17
10. **INSTALL NO. 1 CAMSHAFT BEARING** See step 16
11. **INSTALL OIL CONTROL VALVE FILTER** See step 18
12. **INSTALL CAMSHAFT**

a. Clean the camshaft journals, camshaft housing and bearing caps.
b. Apply a light coat of engine oil to the camshaft journal, camshaft housing and bearing caps.
c. Install the No. 1 and No. 2 camshafts to the camshaft housing.

13. **INSTALL CAMSHAFT BEARING CAP**

a. Confirm the marks and numbers on the camshaft bearing caps and place them in their proper positions and directions.

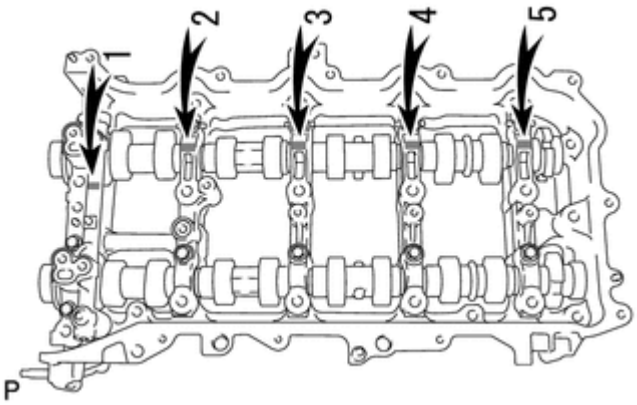


Fig. 87: Identifying Camshaft Bearing Caps Positions
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Install the 11 bolts in the order shown in the illustration below.

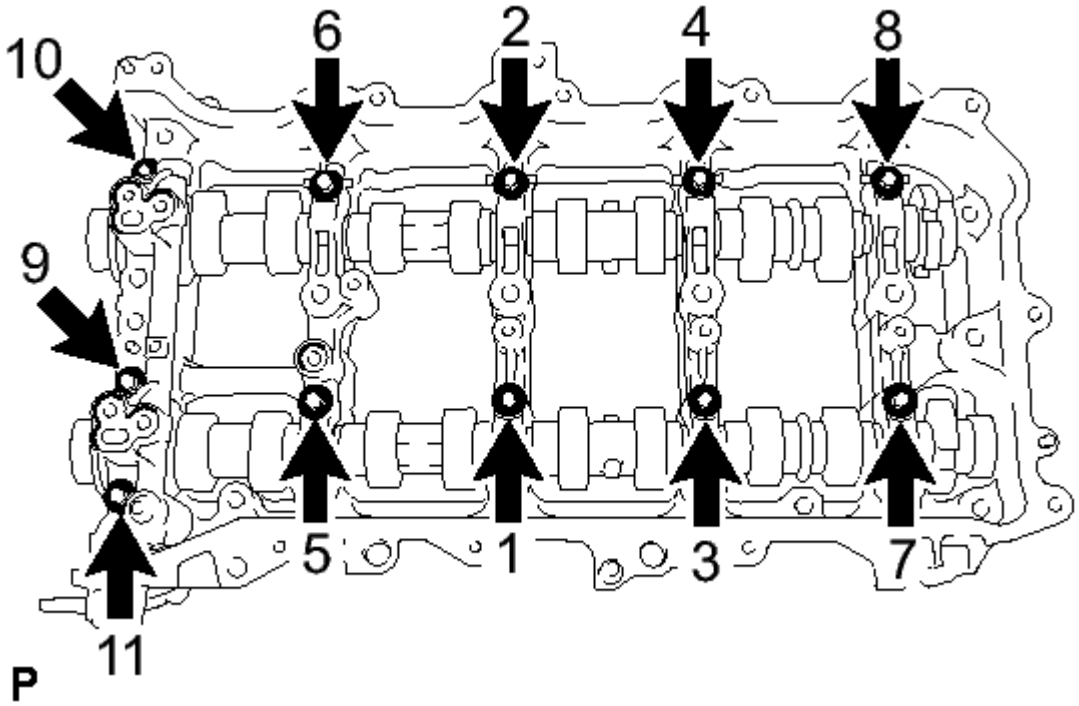


Fig. 88: Identifying Camshaft Bearing Caps Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE: Make sure that the camshaft rotates smoothly after installing the bearing caps.

14. **INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY**
    a. Check that the valve rocker arms are installed as shown in the illustration below.

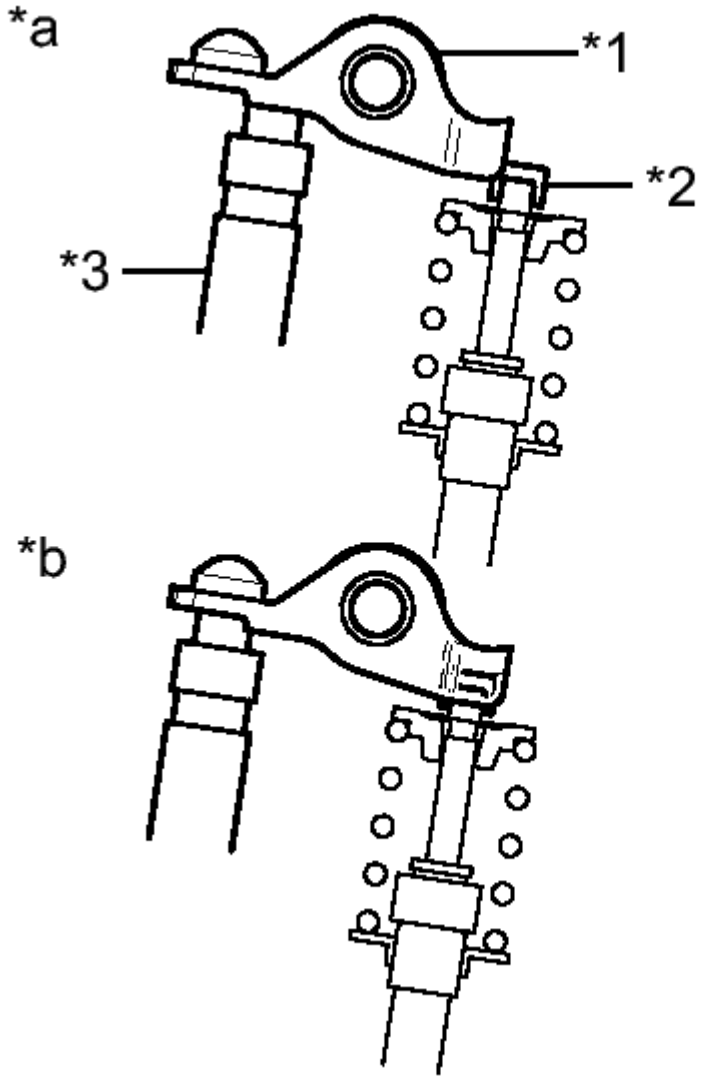


Fig. 89: Identifying Valve Rocker Arm Installation
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Valve Rocker Arm
*2	Valve Stem

	Cap
*3	Valve Lash Adjuster
*a	INCORRECT
*b	CORRECT

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

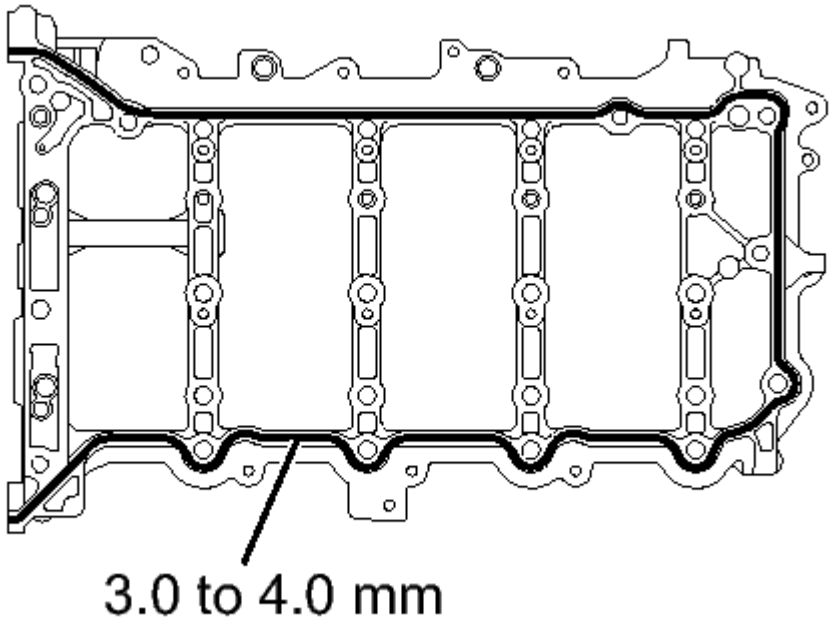


Fig. 90: Identifying Camshaft Housing Seal Packing Applying Areas
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Seal packing

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

Standard seal diameter

3.0 to 4.0 mm (0.118 to 0.157 in.)

NOTE:

- **Remove any oil from the contact surface.**
- **Install the camshaft housing within 3 minutes and tighten the bolts within 10 minutes after applying seal packing.**

c. Position the knock pin of the No. 1 and No. 2 camshafts as shown in the illustration below.

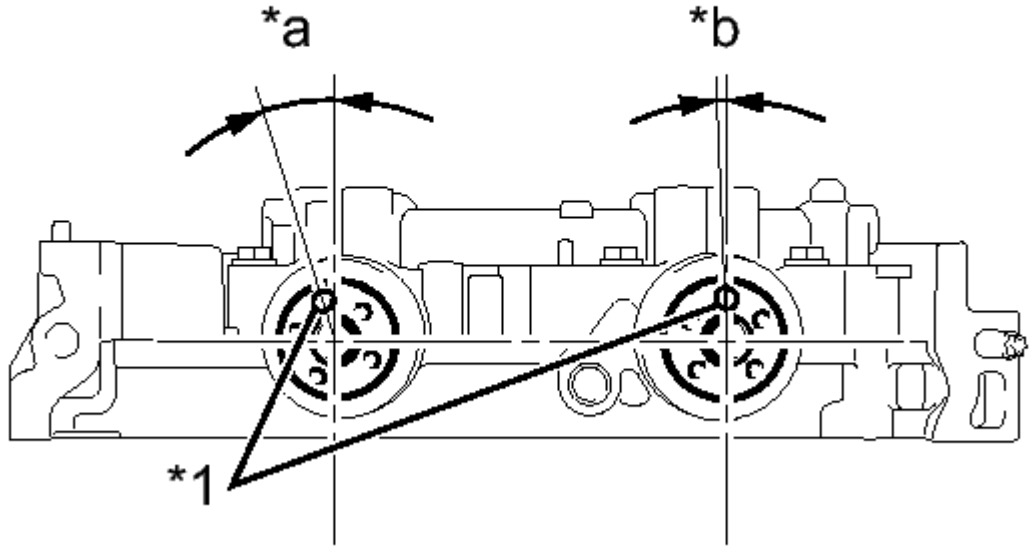


Fig. 91: Identifying No. 1 & No. 2 Camshaft Knock Pin Positions
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Knock Pin
*a	Approximately 17°
*b	Approximately 2°

d. Install the camshaft housing, and then install the 20 bolts in the order shown in the illustration below.

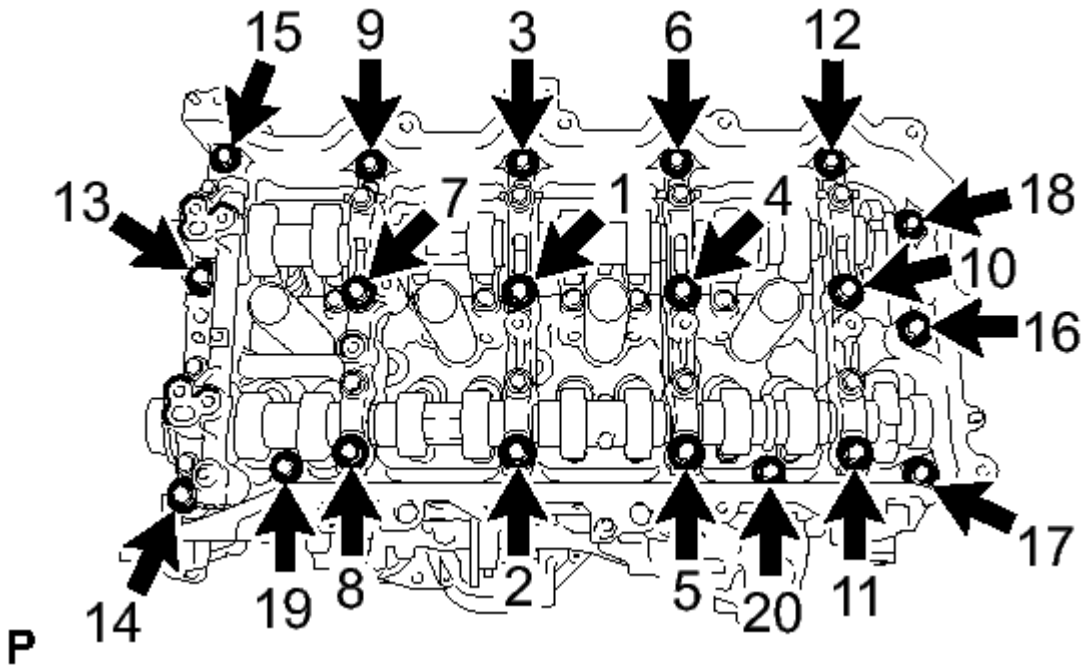


Fig. 92: Identifying Camshaft Housing Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE:

- **Do not apply oil for at least 4 hours after the installation.**
- **Do not start the engine for at least 4 hours after the installation.**
- **Thoroughly wipe clean any seal packing.**

15. **INSTALL CAMSHAFT TIMING GEAR ASSEMBLY**
    a. Check the camshaft timing gear position.

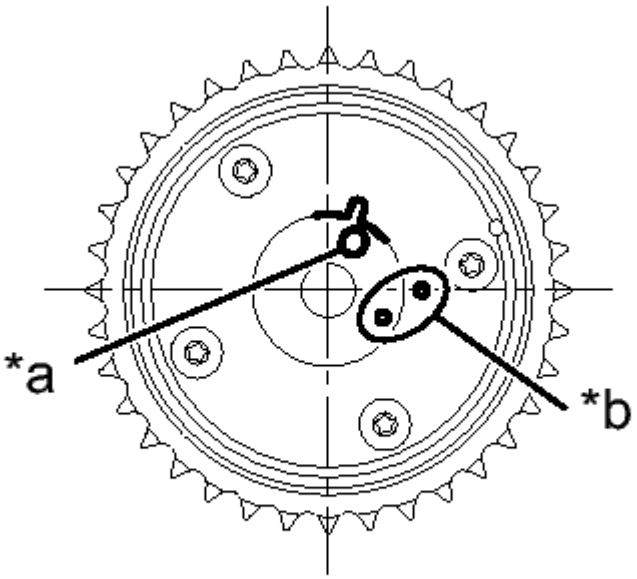


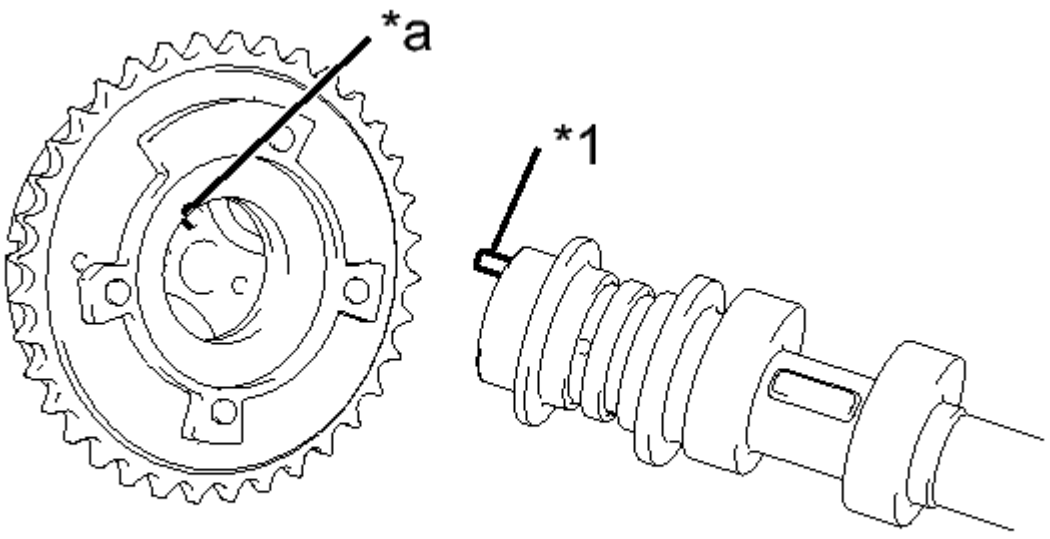
Fig. 93: Identifying Camshaft Timing Gear Knock Pin Hole & Alignment Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Knock Pin Hole
*b	Alignment Mark

If the camshaft timing gear is not set to the advanced position, release the lock pin and reset the camshaft timing gear (Refer to the "Set Camshaft Timing Gear Assembly" procedure).

b. Align and attach the knock pin of the No. 1 camshaft with the knock pin hole of the camshaft timing gear.



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Fig. 94: Identifying No. 1 Camshaft Knock Pin & Camshaft Timing Gear Knock Pin Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Knock Pin
*a	Knock Pin Hole

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

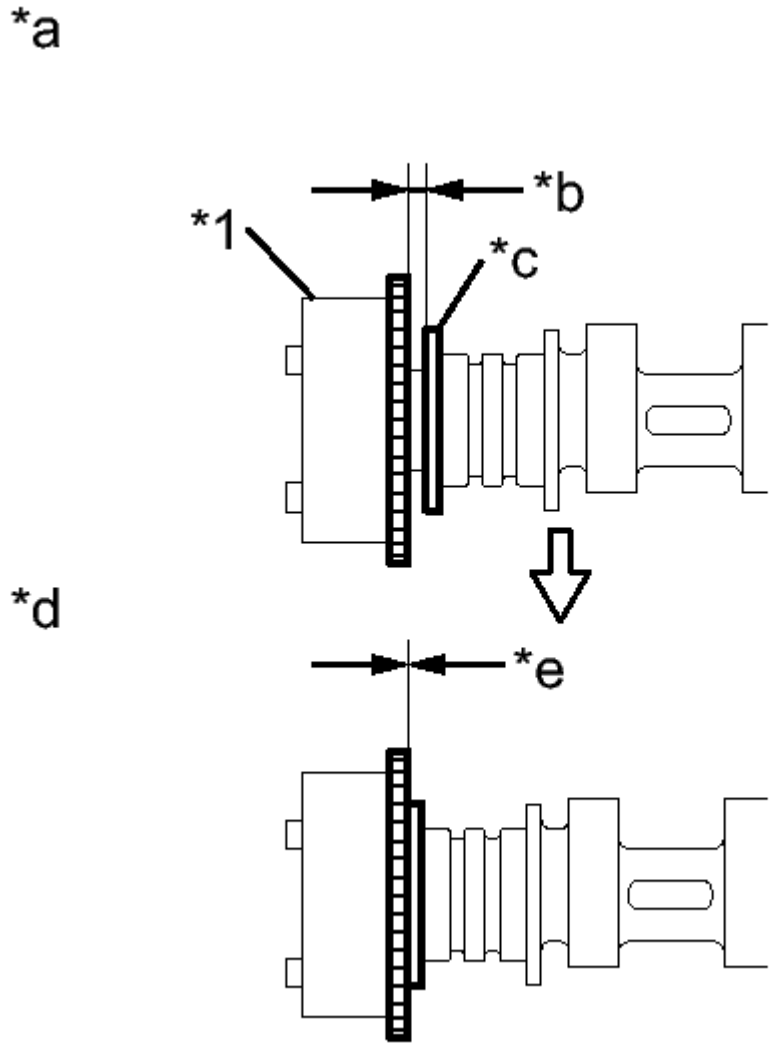


Fig. 95: Checking Clearance Between Camshaft Timing Gear & Camshaft Flange
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Camshaft Timing Gear
*a	INCORRECT
*b	Clearance
*c	Flange
*d	CORRECT
*e	No Clearance

d. Using a wrench to hold the hexagonal portion of the No. 1 camshaft, install the bolt.

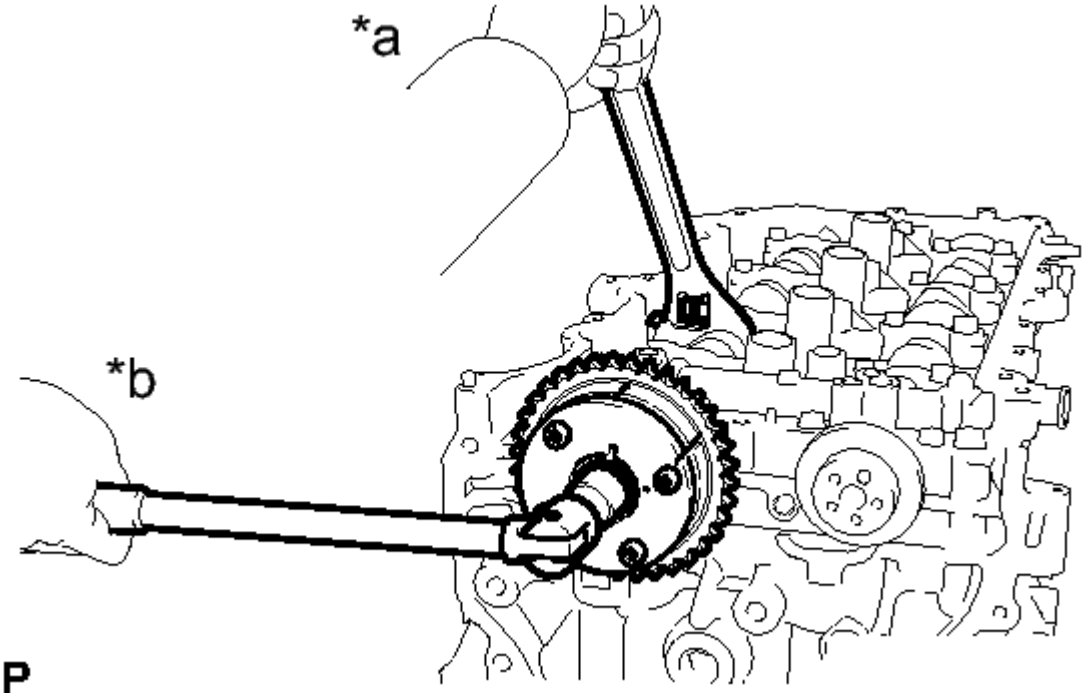


Fig. 96: Installing No. 1 Camshaft Bolt Using A Wrench
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

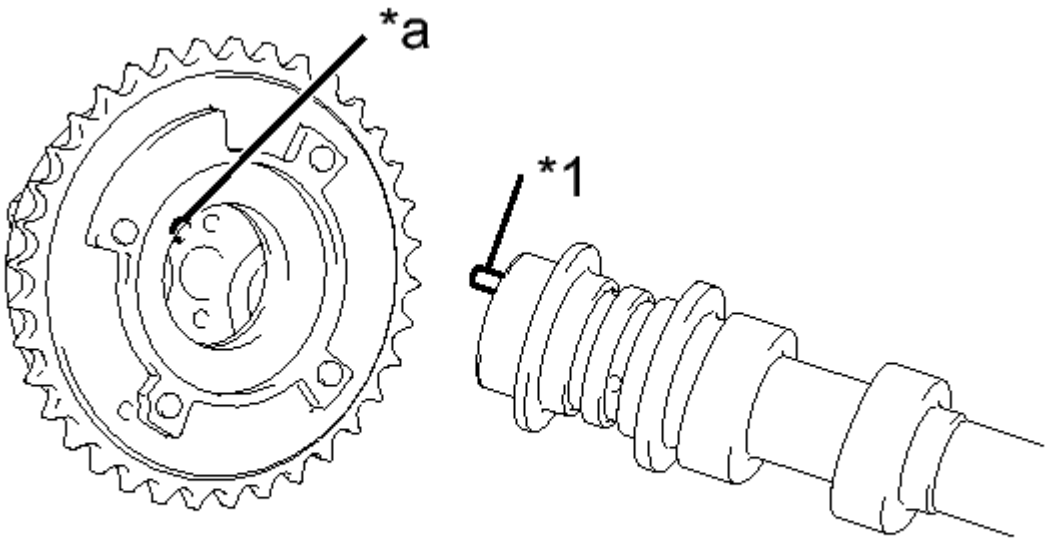
*a	Hold
*b	Turn

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

NOTE:

- **Be careful not to damage the cylinder head or spark plug tube with the wrench.**
- **Do not disassemble the camshaft timing gear.**

16. **INSTALL CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY**
    a. Align and attach the knock pin of the No. 2 camshaft with the knock pin hole of the camshaft timing exhaust gear.



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Fig. 97: Identifying No. 2 Camshaft Knock Pin & Camshaft Timing Exhaust Gear Knock Pin Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Knock Pin
*a	Knock Pin Hole

b. Check that there is no clearance between the camshaft timing exhaust gear and camshaft flange.

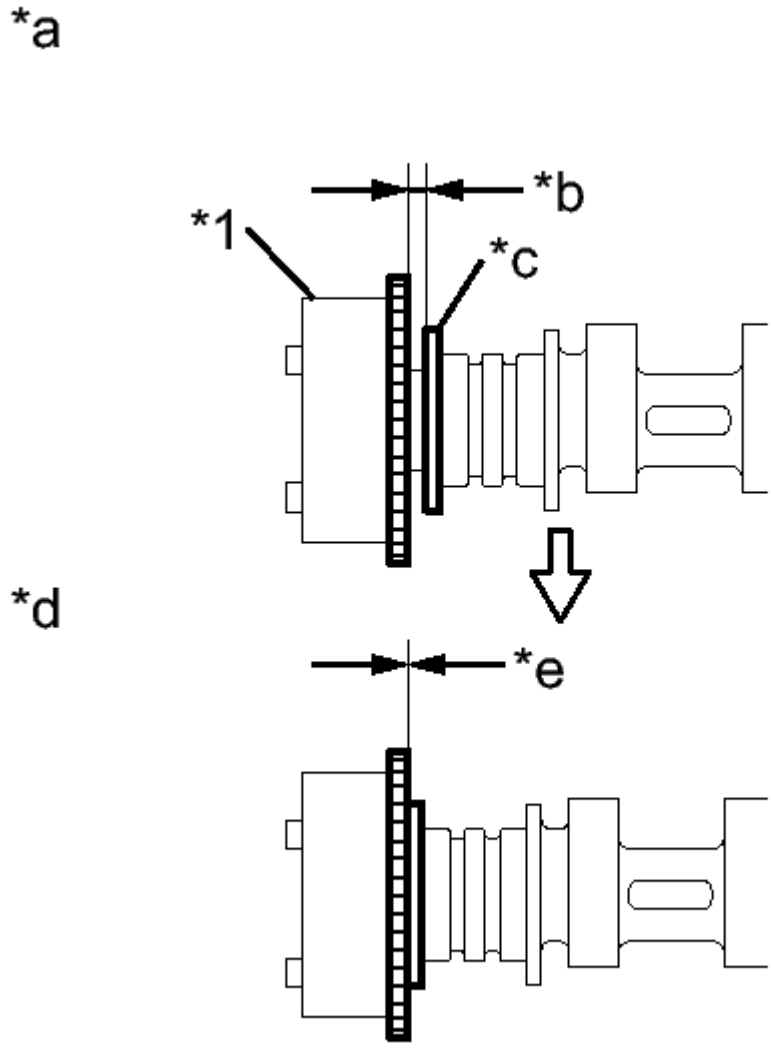


Fig. 98: Checking Clearance Between Camshaft Timing Gear & Camshaft Flange
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Camshaft Timing Gear
*a	INCORRECT
*b	Clearance
*c	Flange
*d	CORRECT
*e	No Clearance

c. Using a wrench to hold the hexagonal portion of the No. 2 camshaft, install the bolt.

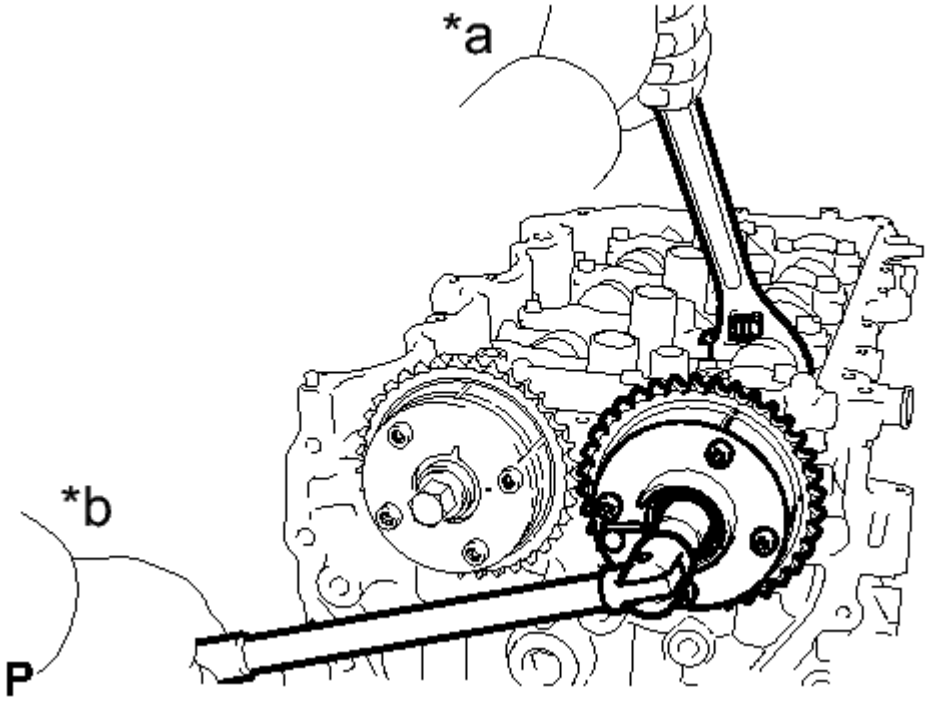


Fig. 99: Installing No. 2 Camshaft Bolt Using A Wrench
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Hold
*b	Turn

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

NOTE:

- **Be careful not to damage the cylinder head or spark plug tube with the wrench.**
- **Do not disassemble the camshaft timing exhaust gear.**

17. **ADD ENGINE OIL**
    a. Add 50 cc (3.1 cu. in) of engine oil into the oil hole shown in the illustration below.

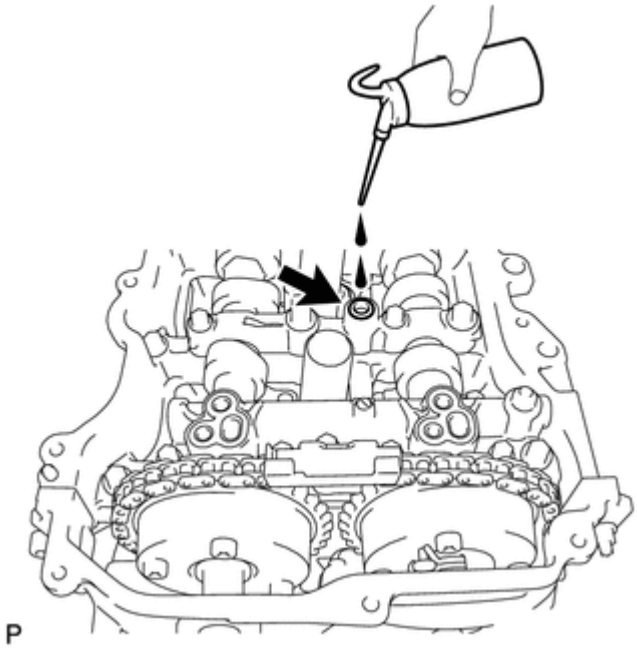


Fig. 100: Adding Engine Oil Into Oil Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- **Oil must be added if the lash adjusters were removed.**
- **Make sure that the low pressure chamber and oil paths of the lash adjusters are full of engine oil.**

18. **SET NO. 1 CYLINDER TO TDC/COMPRESSION**
    a. Temporarily install the crankshaft pulley bolt.

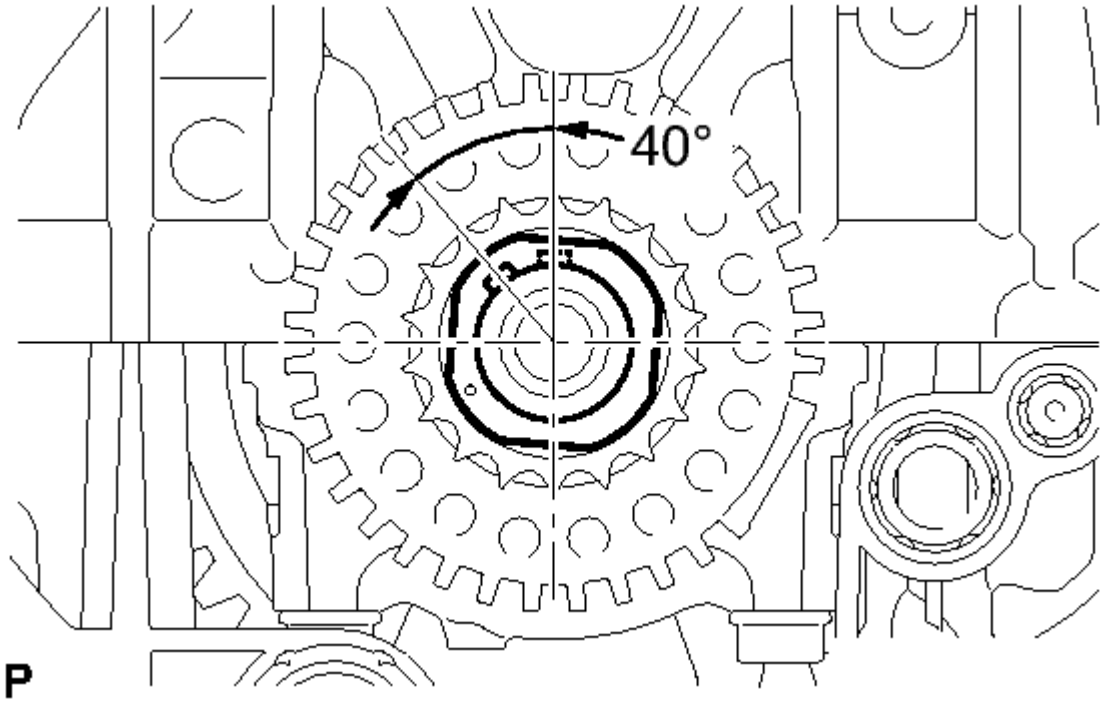


Fig. 101: Identifying Crankshaft Pulley Key Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Rotate the crankshaft 40° counterclockwise to position the crankshaft pulley key as shown in the illustration above.
c. Check that the timing marks of the camshaft timing gears are as shown in the illustration below.

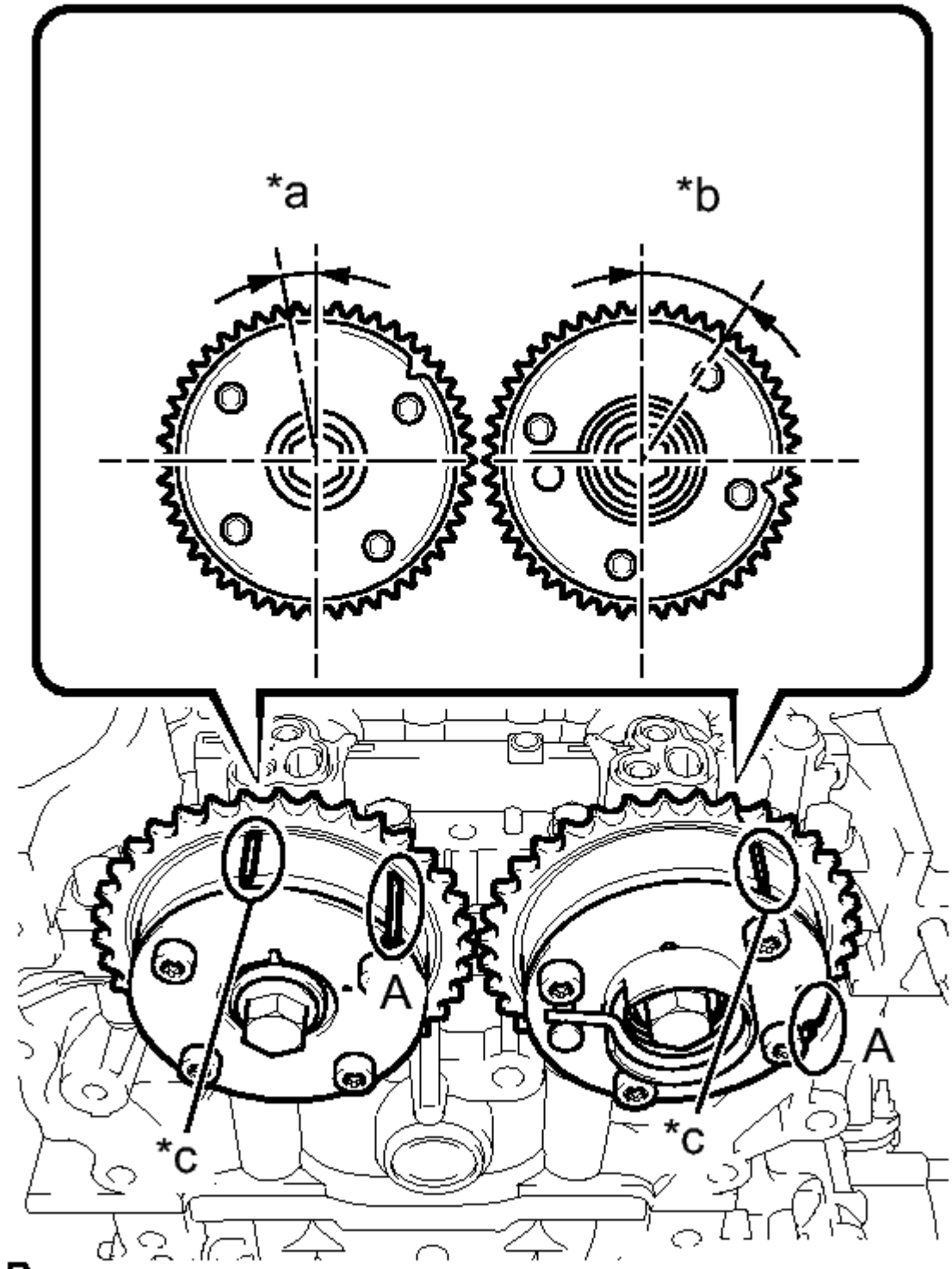


Fig. 102: Identifying Camshaft Timing Gears Timing Marks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	Approximately

*a	7°
*b	Approximately 32°
*c	Timing Mark

HINT:

"A" is not a timing mark.

19. **INSTALL NO. 1 CHAIN VIBRATION DAMPER**
    a. Install the chain vibration damper with the 2 bolts.

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

20. **INSTALL CHAIN SUB-ASSEMBLY**
    a. Place the chain onto the camshaft timing gears and crankshaft timing sprocket.

       HINT:

       - Make sure the mark plate of the chain faces away from the engine.
       - It is not necessary to install the chain to the teeth of the gears and sprocket.

    b. Align the mark plate (yellow or gold) of the chain with the timing mark of the camshaft timing exhaust gear and install the chain to the camshaft timing exhaust gear.

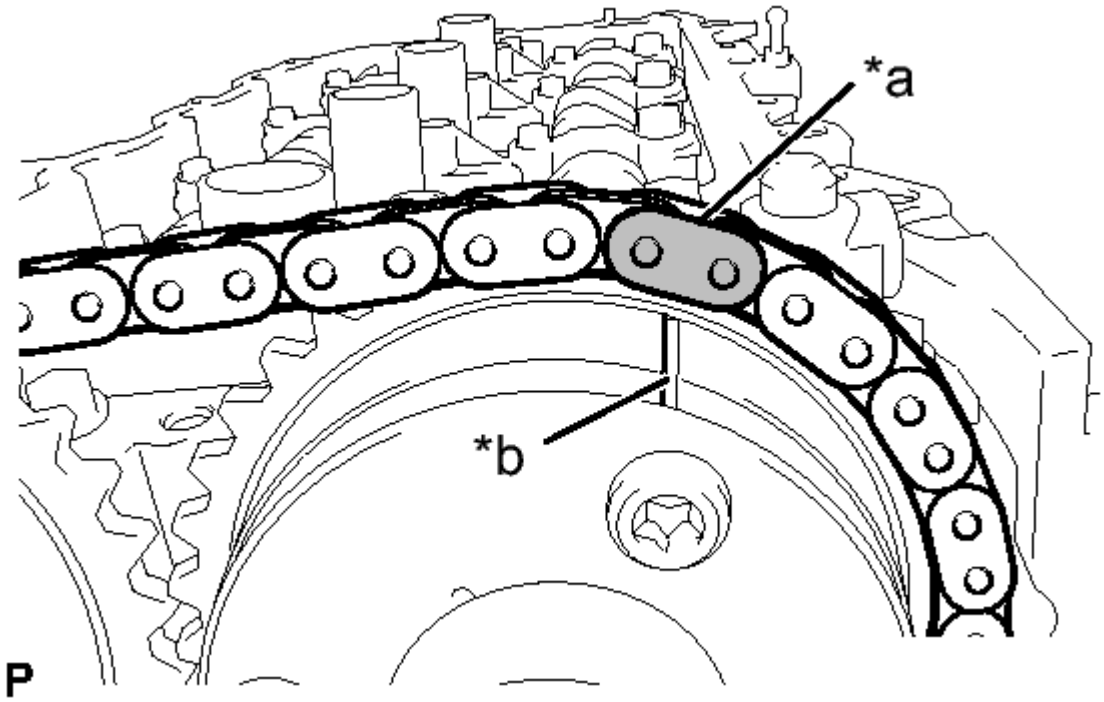


Fig. 103: Identifying Timing Chain & Camshaft Timing Exhaust Gear Matchmarks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Mark Plate
*b	Timing Mark

c. Align the mark plate (pink or gold) of the chain with the timing mark of the crankshaft timing sprocket and install the chain to the crankshaft timing sprocket.

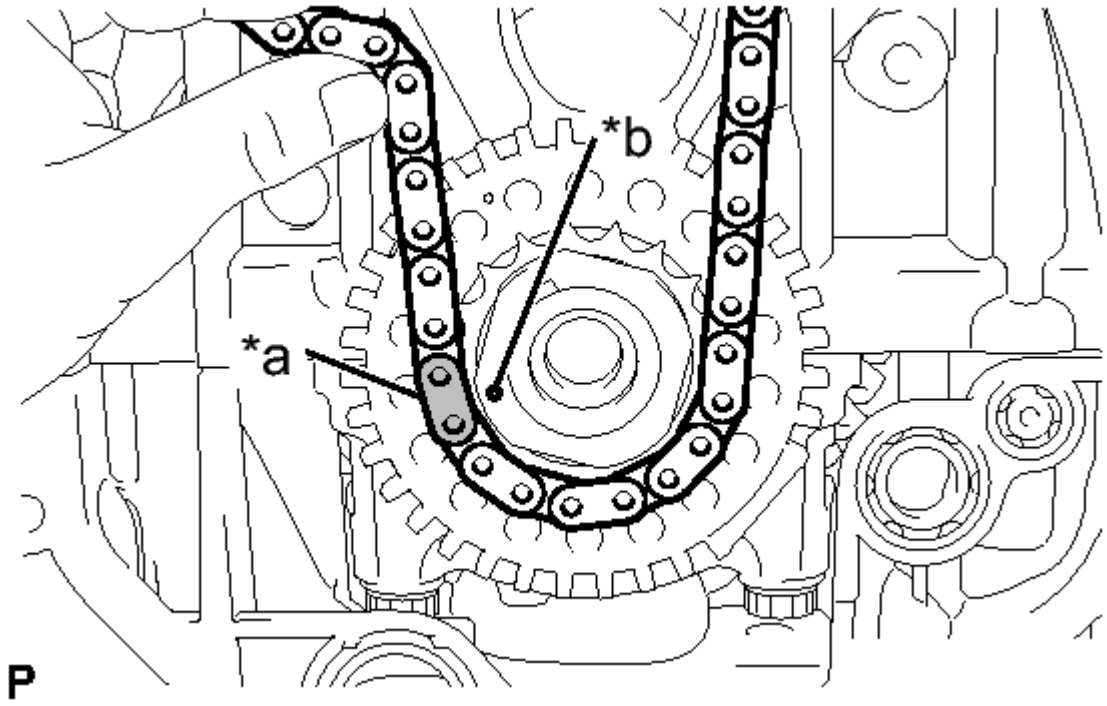


Fig. 104: Identifying Timing Chain & Crankshaft Timing Sprocket Matchmarks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Mark Plate
*b	Timing Mark

d. Tie a string above the crankshaft timing sprocket so that the chain is secure.

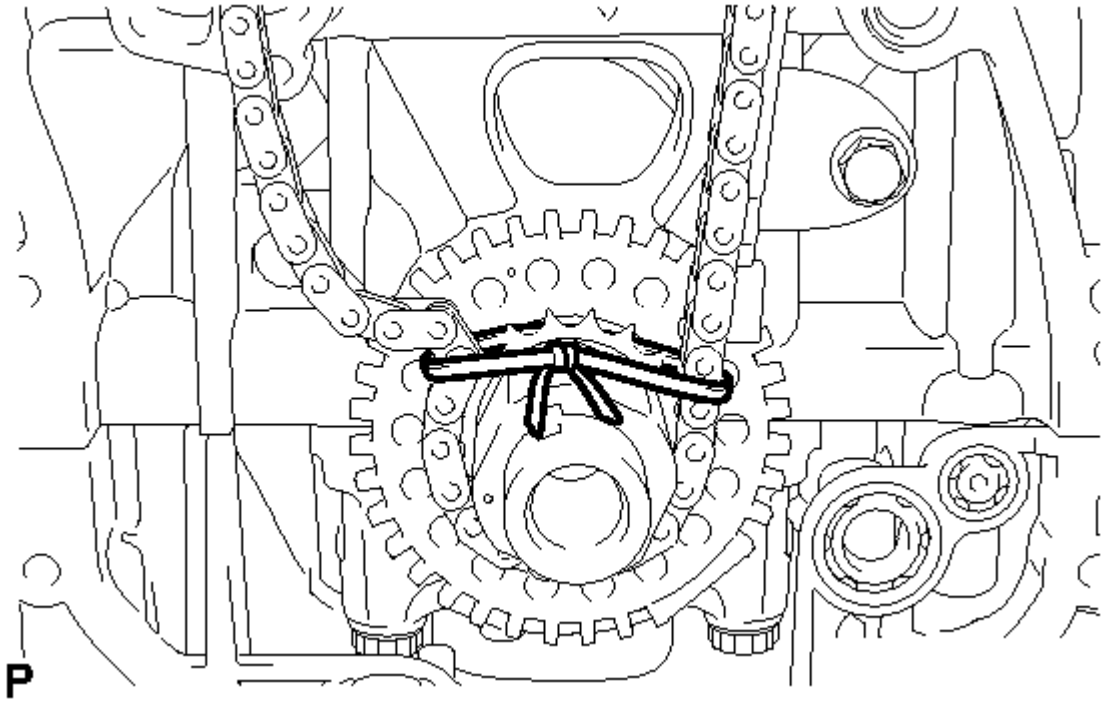


Fig. 105: Tying String Above Crankshaft Timing Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Using the hexagonal portion of the intake camshaft, rotate the intake camshaft counterclockwise with a wrench, align the timing mark of the camshaft timing gear with the mark plate (yellow or gold) of the chain and install the chain to the camshaft timing gear.

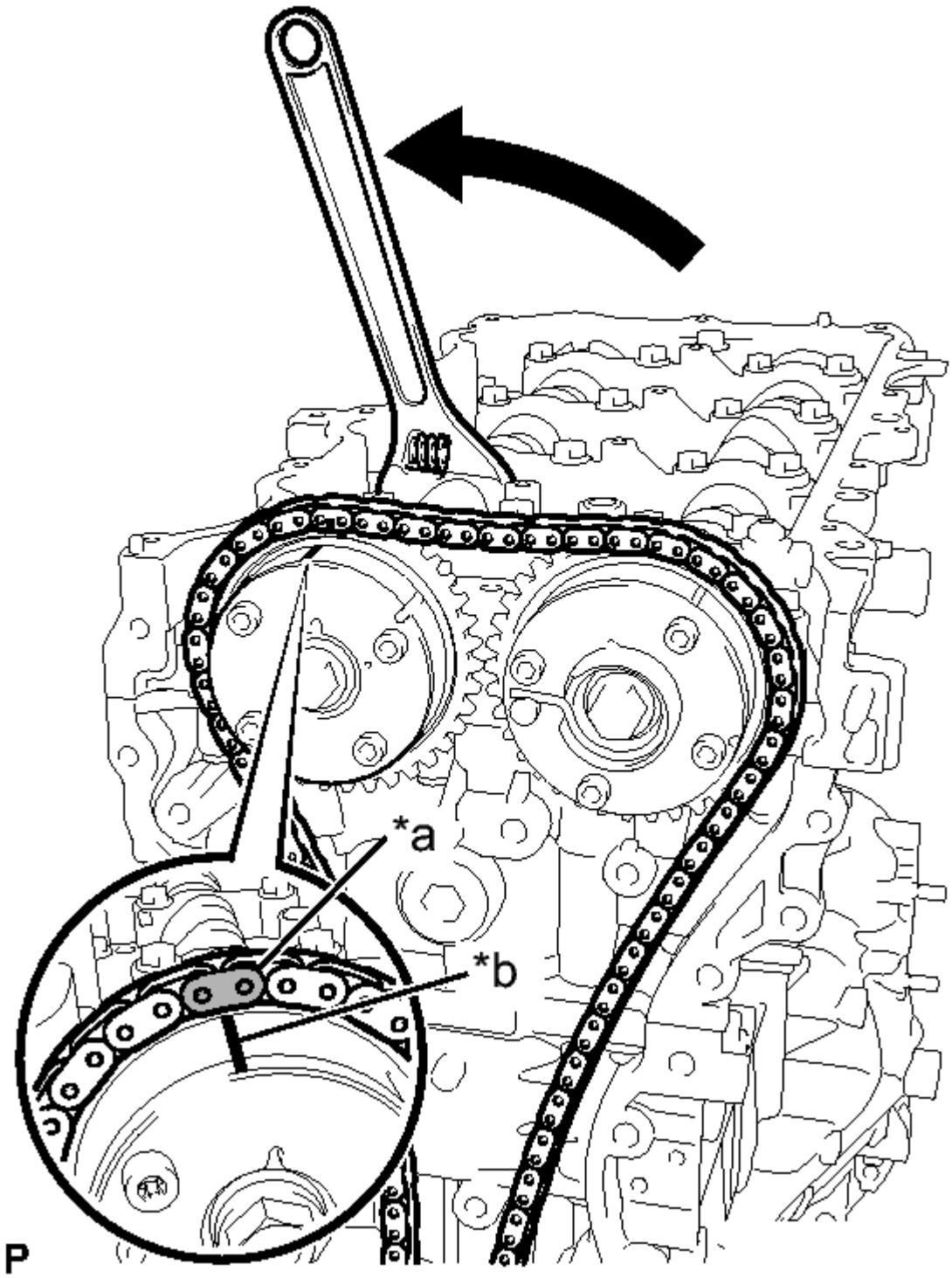


Fig. 106: Turning Intake Camshaft Counterclockwise & Aligning Camshaft Gear To Chain Matchmarks

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

TEXT IN ILLUSTRATION

*a	Mark Plate
*b	Timing Mark

HINT:

Hold the intake camshaft in place with a wrench until the chain tensioner is installed.

f. Remove the string above the crankshaft timing sprocket, rotate the crankshaft clockwise, and loosen the chain so that the chain tensioner slipper can be installed.

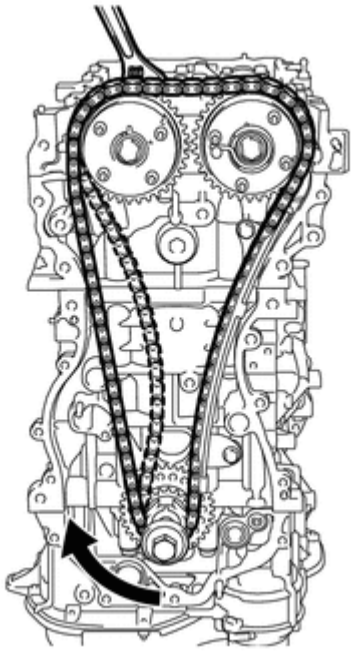


Fig. 107: Rotating Crankshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Make sure the chain is secure.

21. **INSTALL CHAIN TENSIONER SLIPPER**
    a. Install the chain tensioner slipper with the bolt.

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

22. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY**
    a. Install a new gasket and the chain tensioner with the 2 bolts.

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

b. Remove the pin from the stopper plate.

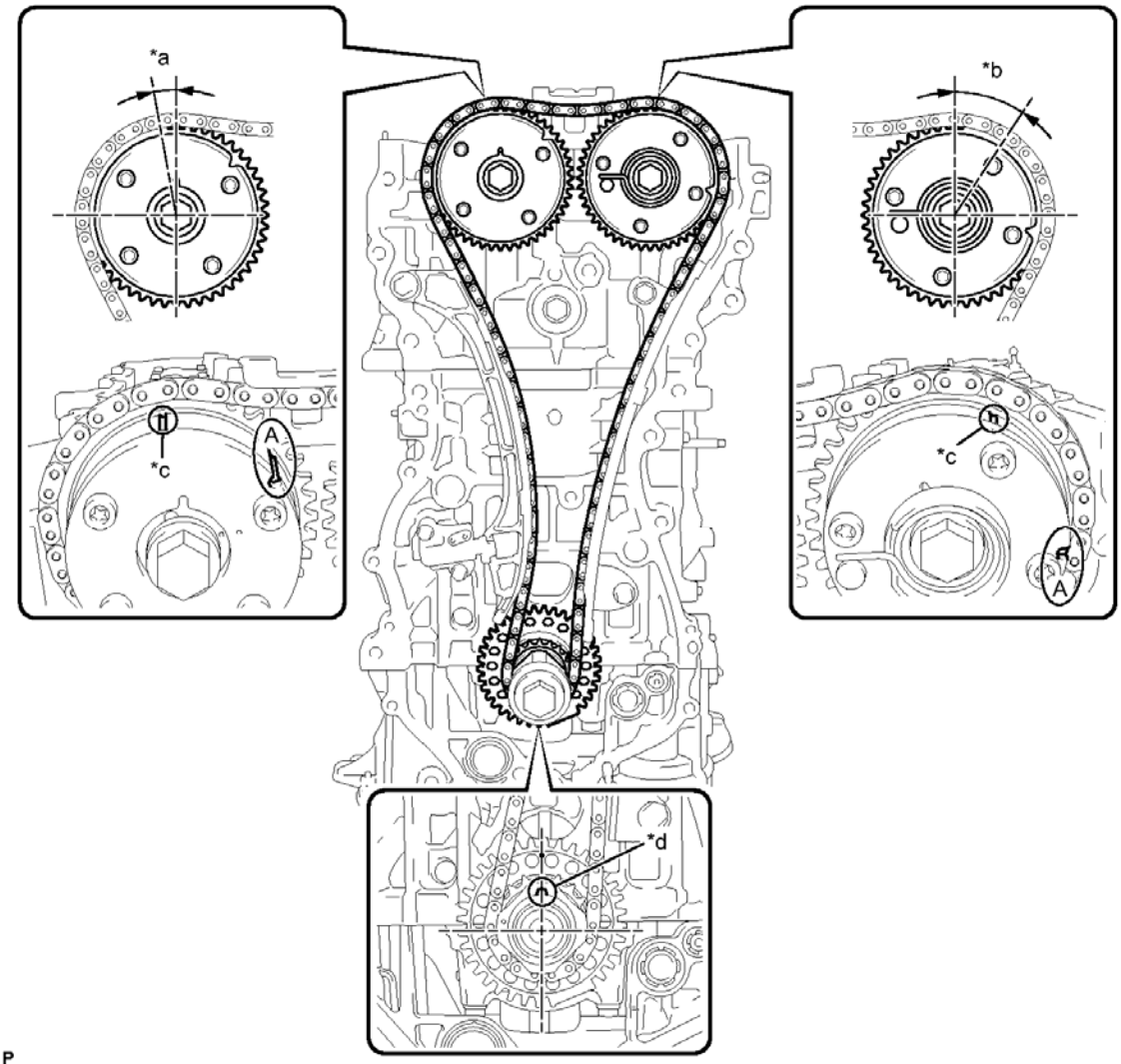
23. **INSTALL TIMING CHAIN GUIDE**

a. Install the timing chain guide with the bolt

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

24. **CHECK NO. 1 CYLINDER TO TDC / COMPRESSION**

a. Temporarily install the crankshaft pulley bolt.



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Fig. 108: Identifying Crankshaft & Camshaft Timing Gear Timing Marks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Approximately 7°	*b	Approximately 32°
*c	Timing Mark	*d	Key

b. Rotate the crankshaft clockwise, and check that the timing marks on the crankshaft timing sprocket and camshaft timing gears are as shown in the illustration.

HINT:

"A" is not a timing mark.

c. Remove the crankshaft pulley bolt.

25. **INSTALL TIMING CHAIN COVER SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 1**
26. **INSTALL ENGINE MOUNTING BRACKET RH** . Refer to **INSTALLATION - Step 2**
27. **INSTALL TIMING CHAIN COVER OIL SEAL** See step 1
28. **INSTALL CRANKSHAFT PULLEY** See step 43
29. **INSTALL CRANKSHAFT POSITION SENSOR** . Refer to **INSTALLATION - Step 1**
30. **INSTALL V-RIBBED BELT TENSIONER ASSEMBLY** See step 48
31. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY** See step 42
32. **INSTALL IGNITION COIL ASSEMBLY** . Refer to **INSTALLATION - Step 2**
33. **INSTALL FUEL INJECTOR ASSEMBLY** . Refer to **INSTALLATION - Step 1**
34. **INSTALL FUEL DELIVERY PIPE SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 2**
35. **INSTALL INTAKE MANIFOLD** See step 8
36. **INSTALL UNION TO CONNECTOR TUBE HOSE** See step 9
37. **CONNECT VACUUM SWITCHING VALVE HOSE ASSEMBLY** See step 10
38. **INSTALL NO. 2 FUEL VAPOR FEED HOSE ASSEMBLY** See step 11
39. **INSTALL EXHAUST MANIFOLD TO HEAD GASKET** . Refer to **INSTALLATION - Step 3**
40. **INSTALL EXHAUST MANIFOLD** . Refer to **INSTALLATION - Step 4**
41. **INSTALL NO. 2 MANIFOLD STAY** . Refer to **INSTALLATION - Step 6**
42. **INSTALL MANIFOLD STAY** . Refer to **INSTALLATION - Step 7**
43. **INSTALL ENGINE ASSEMBLY WITH TRANSAXLE**

Refer to **INSTALLATION**

FRONT CRANKSHAFT OIL SEAL

COMPONENTS

ILLUSTRATION

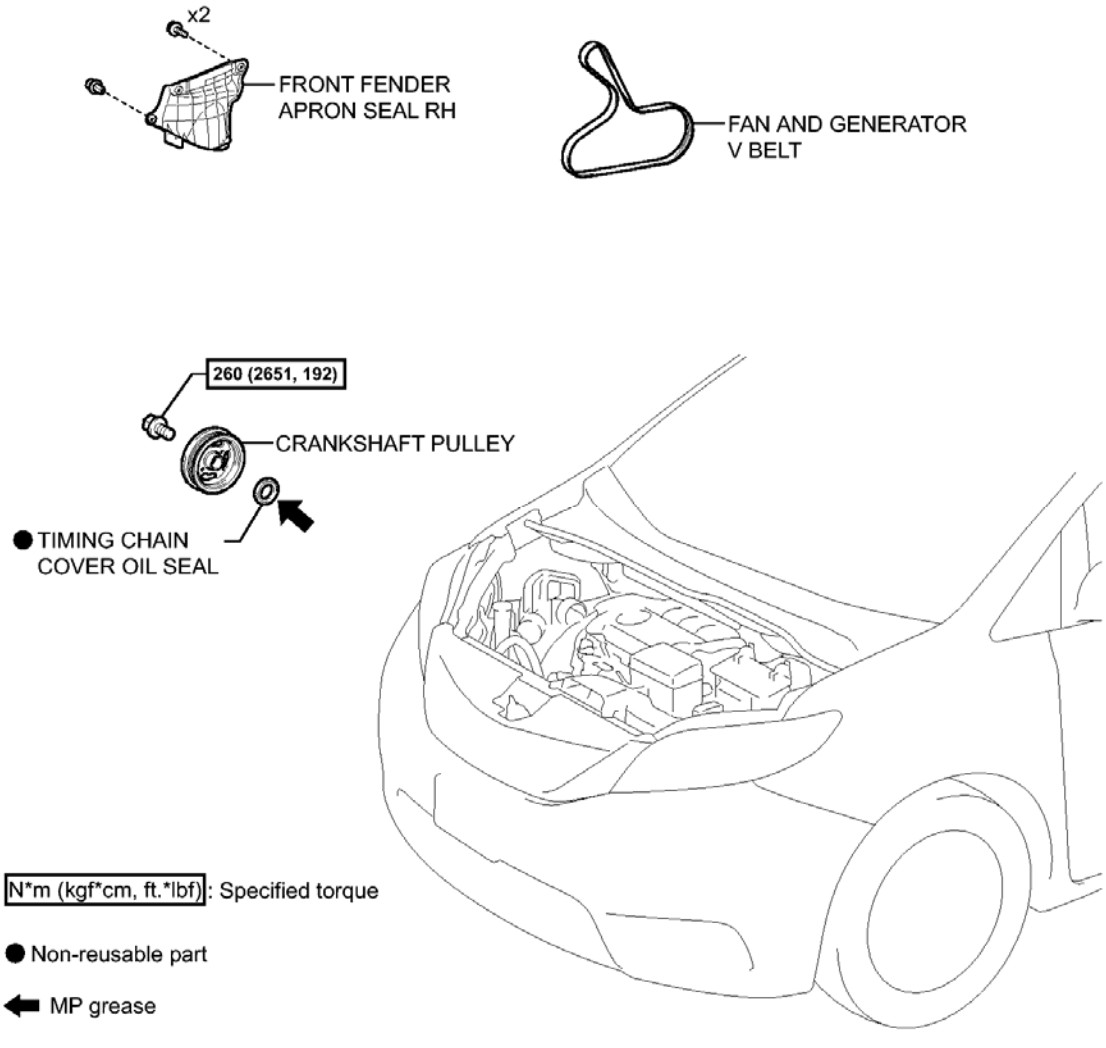


Fig. 109: Front Crankshaft Oil Seal Replacement Components With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

REMOVAL

1. **REMOVE FRONT WHEEL RH**
2. **REMOVE FRONT FENDER APRON SEAL RH** See step 8
3. **REMOVE FAN AND GENERATOR V BELT** See step 3
4. **REMOVE CRANKSHAFT PULLEY**

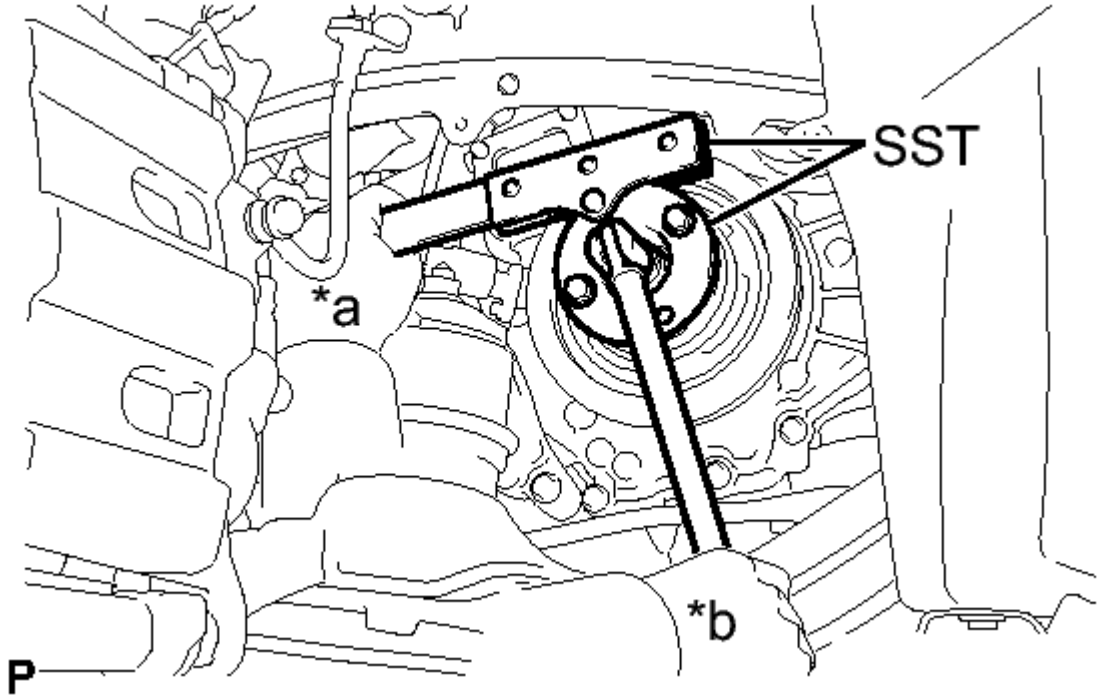


Fig. 110: Removing Crankshaft Pulley & Bolt Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Hold
*b	Turn

a. Using SST, hold the crankshaft pulley and loosen the pulley bolt. Further loosen the bolt until 2 or 3 threads are screwed into the crankshaft.
   - **SST: 09213-54015**
   - **SST: 09330-00021**
   - **SST: 91551-80650**

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

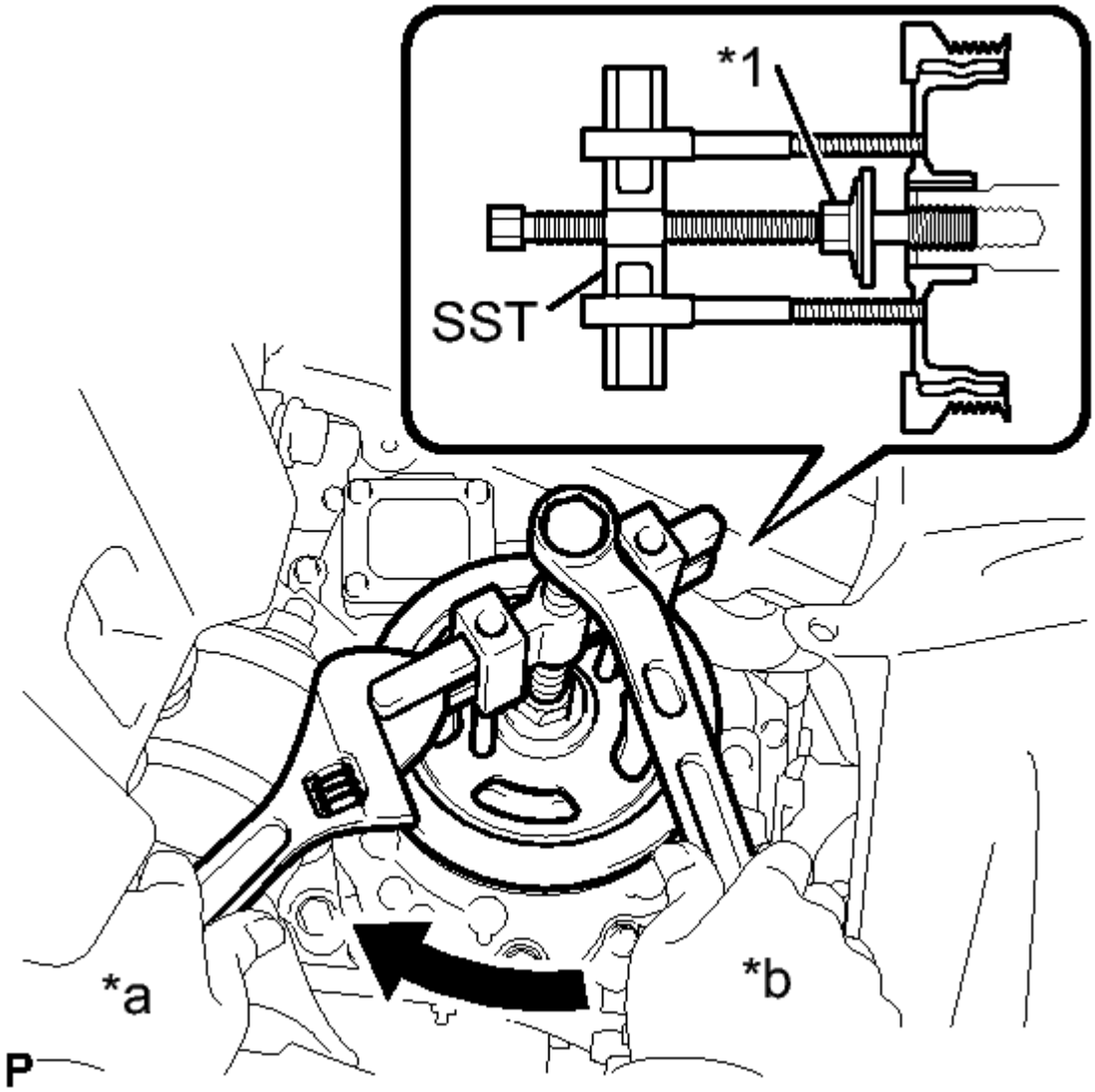


Fig. 111: Removing Crankshaft Pulley Using SST & Pulley Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Pulley Bolt
*a	Hold
*b	Turn

- **SST: 09950-50013**
  09951-05010
  09952-05010
  09953-05020
  09954-05011

HINT:

Apply a lubricant to the threads and end of SST.

5. **REMOVE TIMING CHAIN COVER OIL SEAL**

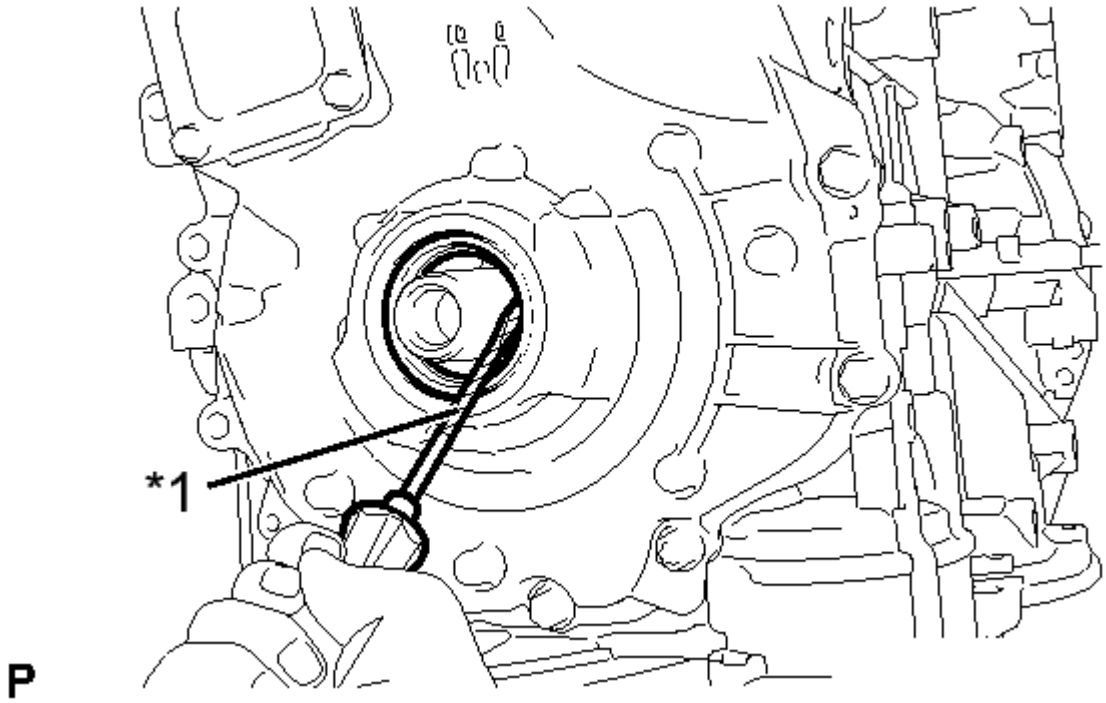


Fig. 112: Removing Timing Chain Cover Oil Seal Using A Screwdriver
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

TEXT IN ILLUSTRATION

*1	Protective Tape

HINT:

Tape the screwdriver tip before use.

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

INSTALLATION

INSTALLATION

1. **INSTALL TIMING CHAIN COVER OIL SEAL**

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

NOTE:

- **Do not allow foreign matter to contact the lip of the oil seal.**
- **Do not allow MP grease to contact the dust seal of the oil seal.**

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

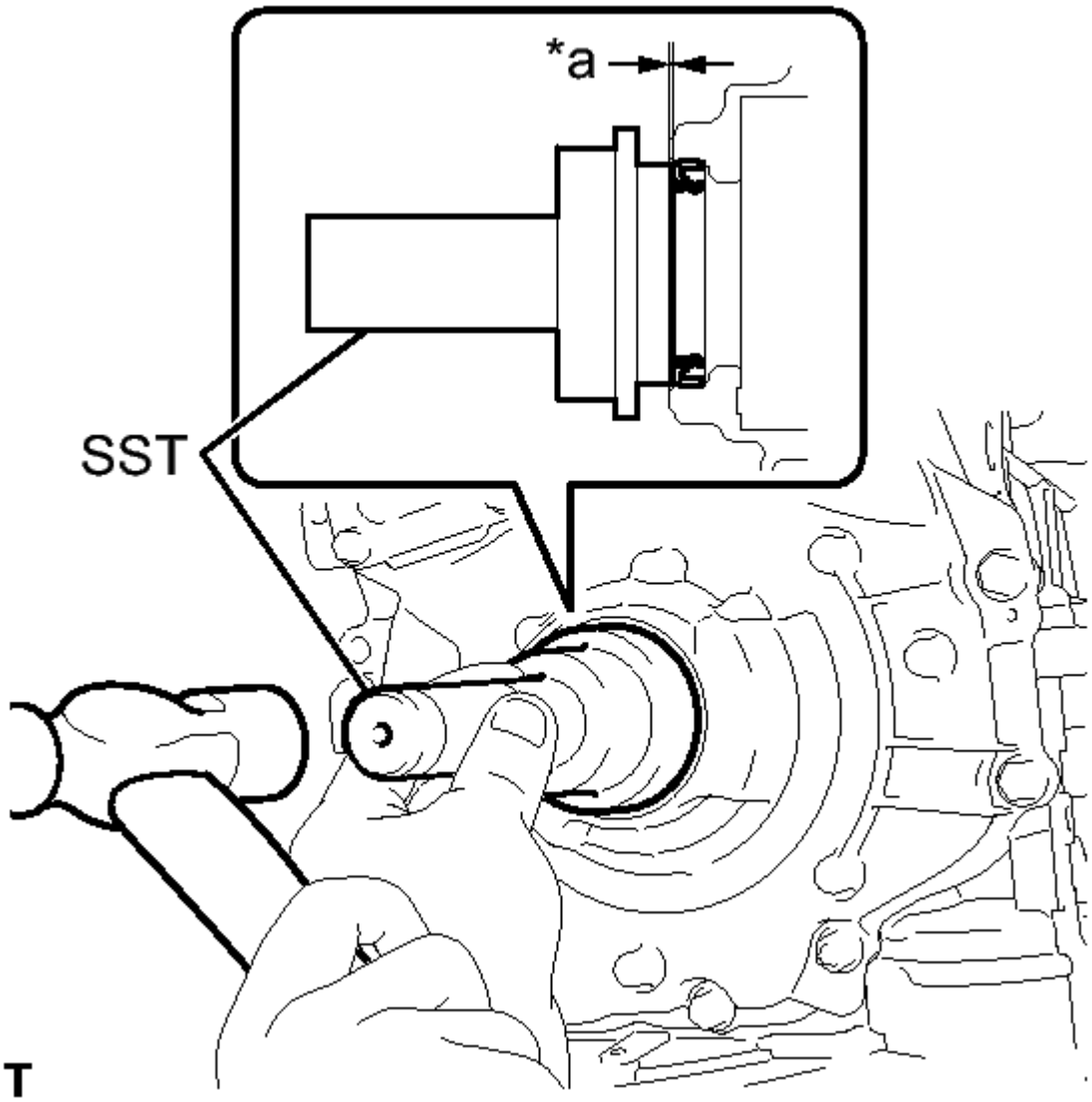


Fig. 113: Installing Timing Chain Cover Oil Seal Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	Oil seal tap

*a	in depth (0.75 to 1.45 mm)

- **SST: 09223-22010**

Oil seal tap in depth

0.75 to 1.45 mm (0.0295 to 0.0571 in.)

NOTE:

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

2. **INSTALL CRANKSHAFT PULLEY**
   a. Align the pulley set key with the key groove of the crankshaft pulley.
   b. Using SST, hold the crankshaft pulley and install the pulley bolt.
      - **SST: 09213-54015**
      - **SST: 09330-00021**
      - **SST: 91551-80650**

      Torque: 260 N*m (2651 kgf*cm, 192 ft.*lbf)

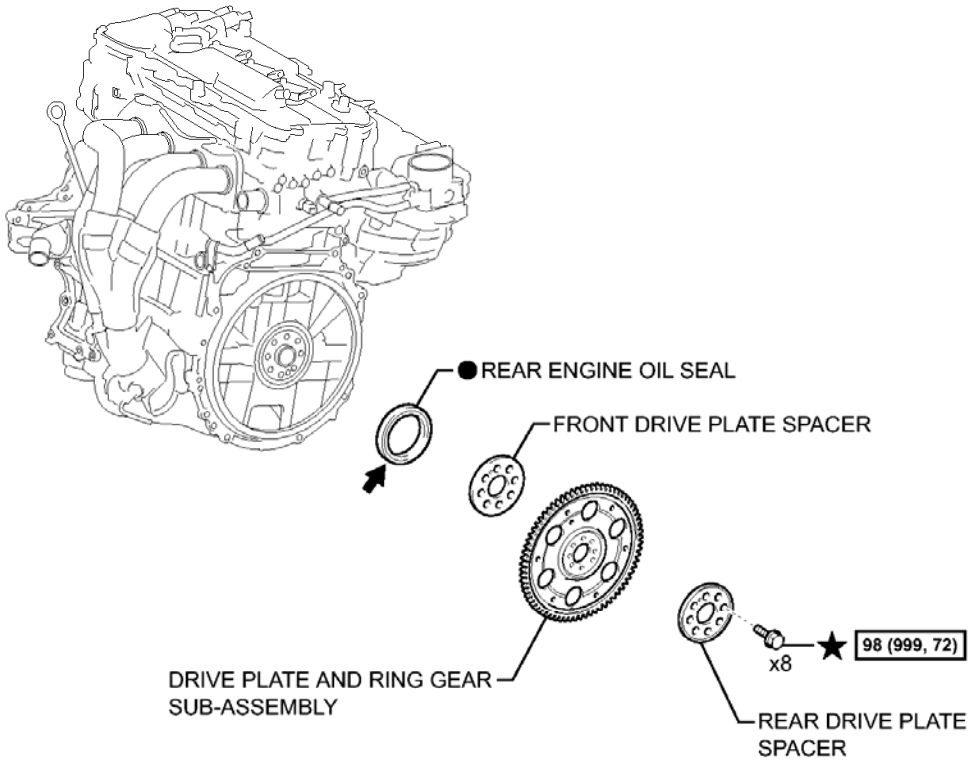
3. **INSTALL FAN AND GENERATOR V BELT** See step 1
4. **INSTALL FRONT FENDER APRON SEAL RH** See step 77
5. **INSTALL FRONT WHEEL RH**

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

REAR CRANKSHAFT OIL SEAL

COMPONENTS

ILLUSTRATION



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

● Non-reusable part

⬅ MP Grease

★ Precoated part

Fig. 114: Rear Crankshaft Oil Seal Replacement Components With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

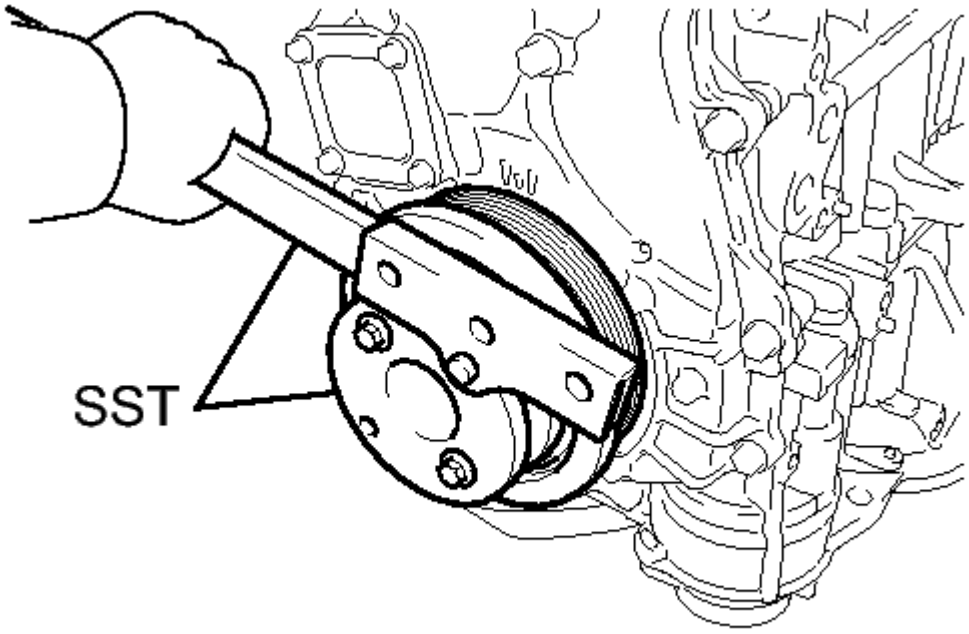
REMOVAL

REMOVAL

1. **REMOVE AUTOMATIC TRANSAXLE ASSEMBLY**

Refer to **REMOVAL**

2. **REMOVE DRIVE PLATE AND RING GEAR SUB-ASSEMBLY**

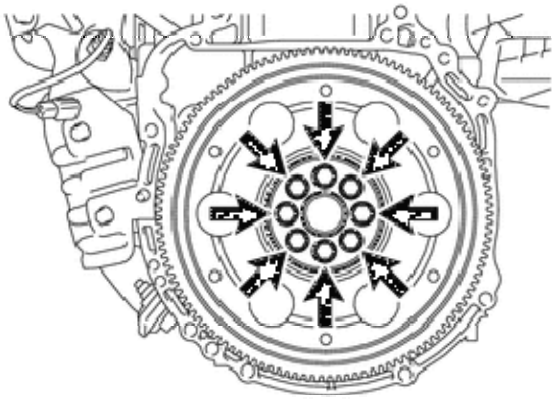


P

Fig. 115: Holding Crankshaft Pulley Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Using SST, hold the crankshaft pulley.
   - **SST: 09213-54015**
   - **SST: 09330-00021**
   - **SST: 91551-80650**

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



P

Fig. 116: Identifying Drive Plate And Ring Gear Sub-Assembly Bolts

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

3. **REMOVE REAR ENGINE OIL SEAL**

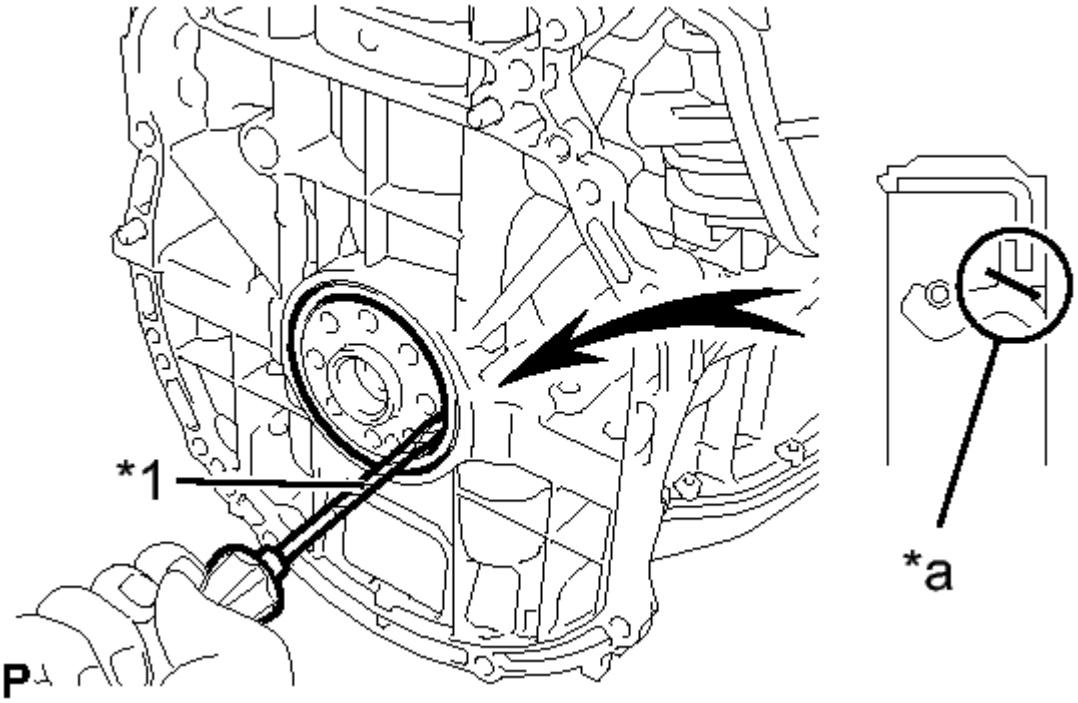


Fig. 117: Removing Rear Engine Oil Seal Using A Screwdriver
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

TEXT IN ILLUSTRATION

*1	Protective Tape
*a	Cut Position

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

HINT:

Tape the screwdriver tip before use.

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

INSTALLATION

INSTALLATION

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

NOTE:

- **Do not allow foreign matter to contact the lip of the oil seal.**
- **Do not allow MP grease to contact the dust seal.**

   b. Using SST and a hammer, tap in the oil seal until its surface is flush with the edges of the cylinder block and crankcase.

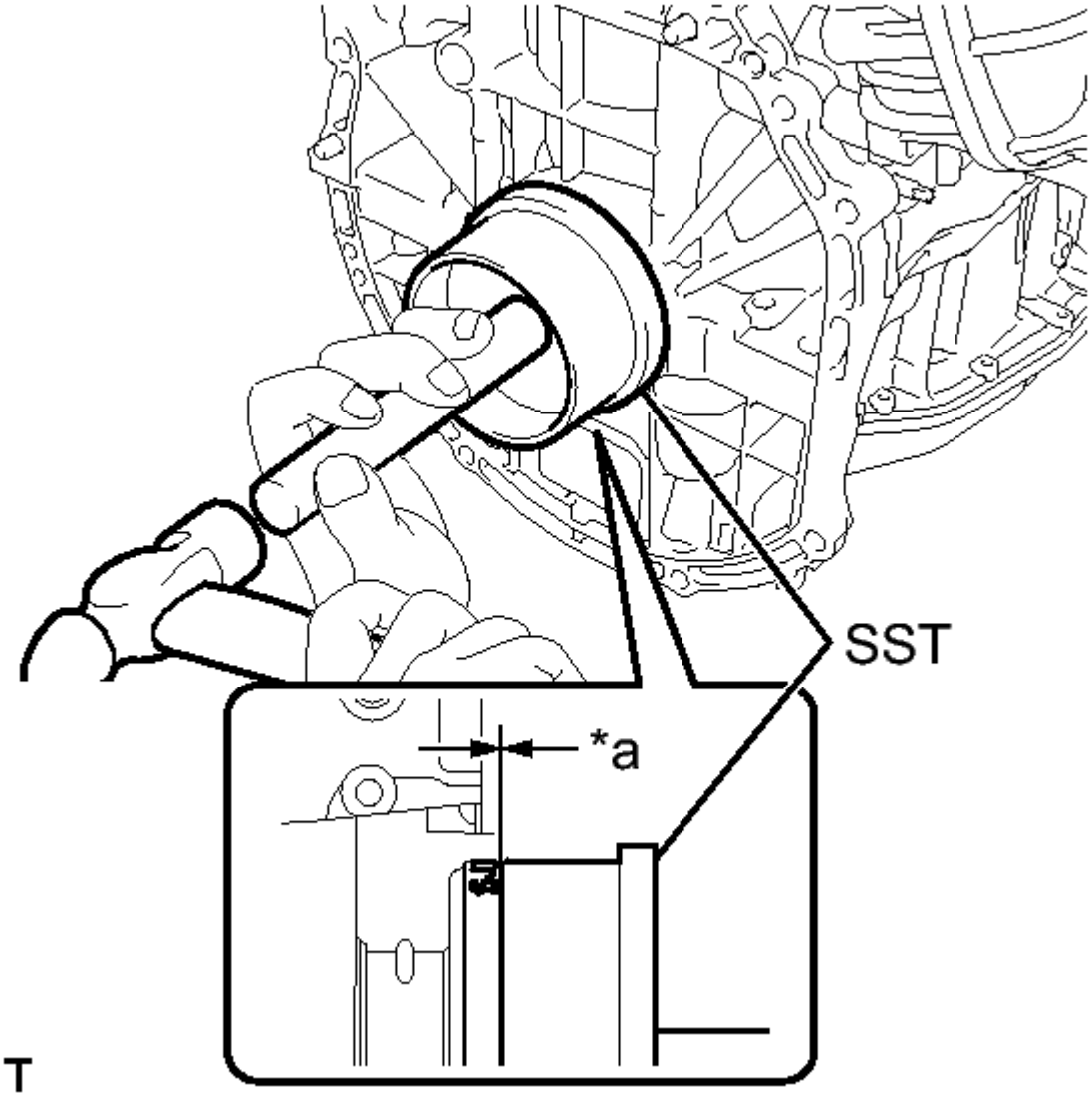


Fig. 118: Installing Rear Engine Oil Seal Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	Oil seal

*a	tap in depth (-0.5 to 0.5 mm)

- **SST: 09223-15030**
- **SST: 09950-70010**
  09951-07150

Oil seal tap in depth

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

NOTE:

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

2. **INSTALL DRIVE PLATE AND RING GEAR SUB-ASSEMBLY**
   a. Using SST, hold the crankshaft.
      - **SST: 09213-54015**
      - **SST: 09330-00021**
      - **SST: 91551-80650**
   b. Clean the bolts and their installation holes.
   c. Install the front drive plate spacer.

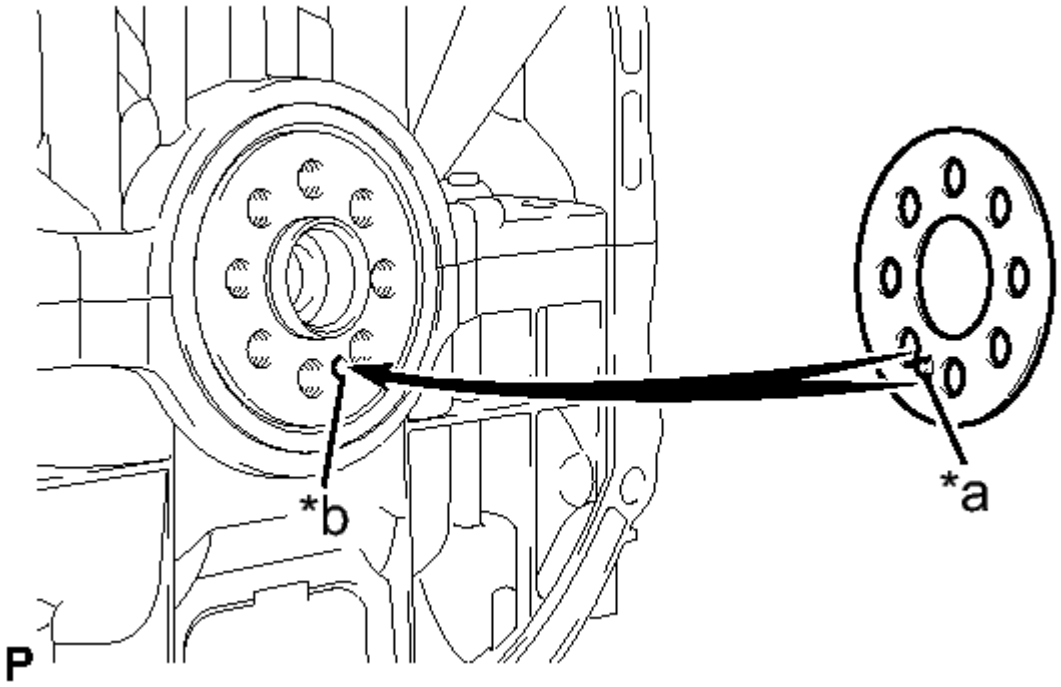


Fig. 119: Identifying Front Drive Plate Spacer Pin & Crankshaft Pin Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Pin
*b	Pin Hole

HINT:

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

d. Install the drive plate and ring gear and the rear drive plate spacer to the crankshaft.

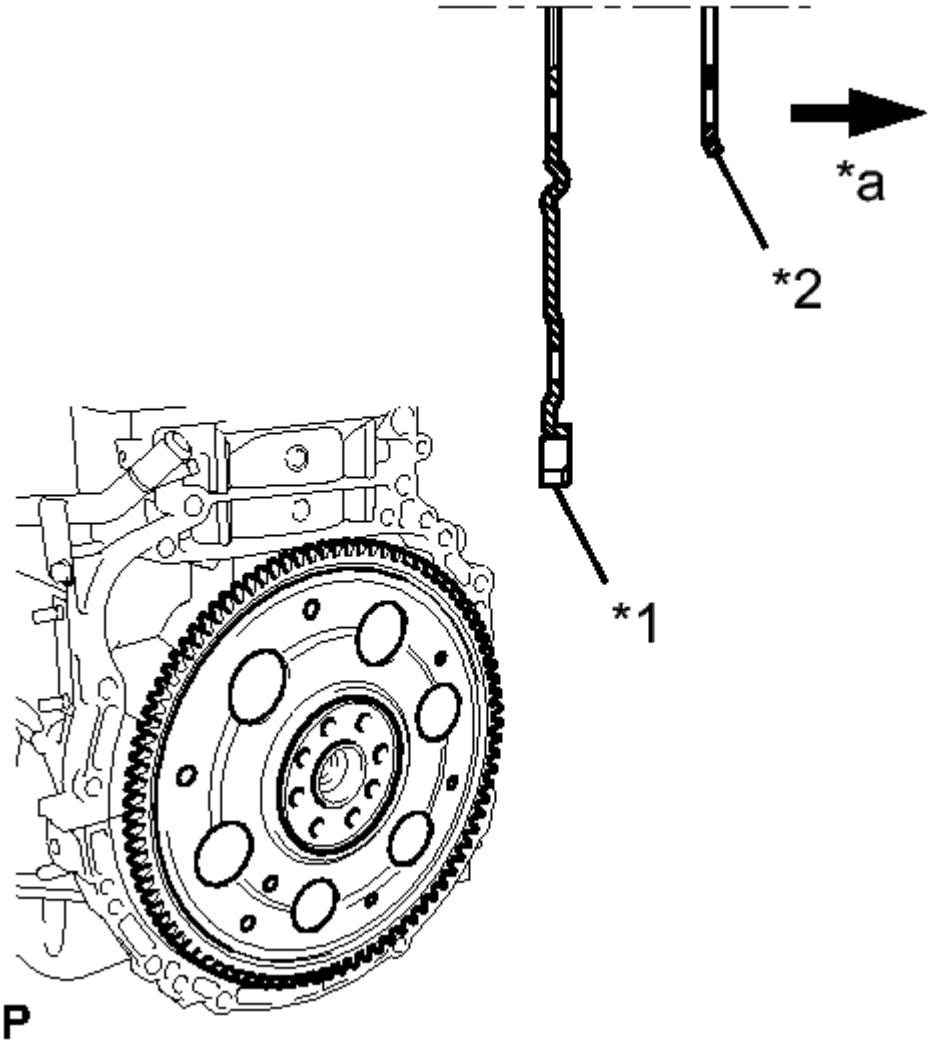


Fig. 120: Identifying Drive Plate/Ring Gear & Rear Drive Plate Spacer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Drive Plate and Ring Gear
*2	Rear Drive Plate Spacer
*a	Transaxle Side

e. Apply a few drops of adhesive to 2 or 3 threads of the bolt end.

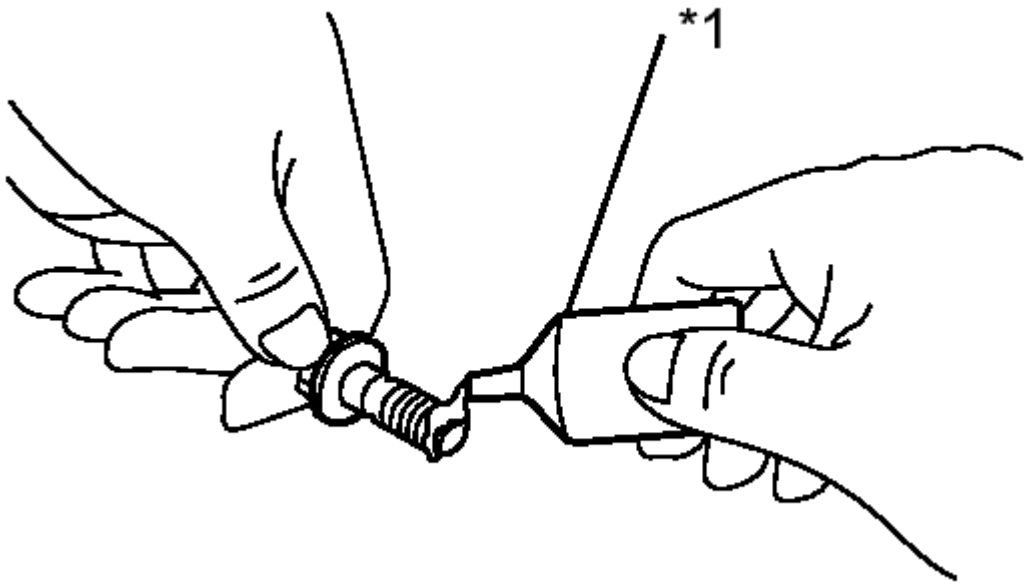


Fig. 121: Applying Adhesive To Bolt Threads
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

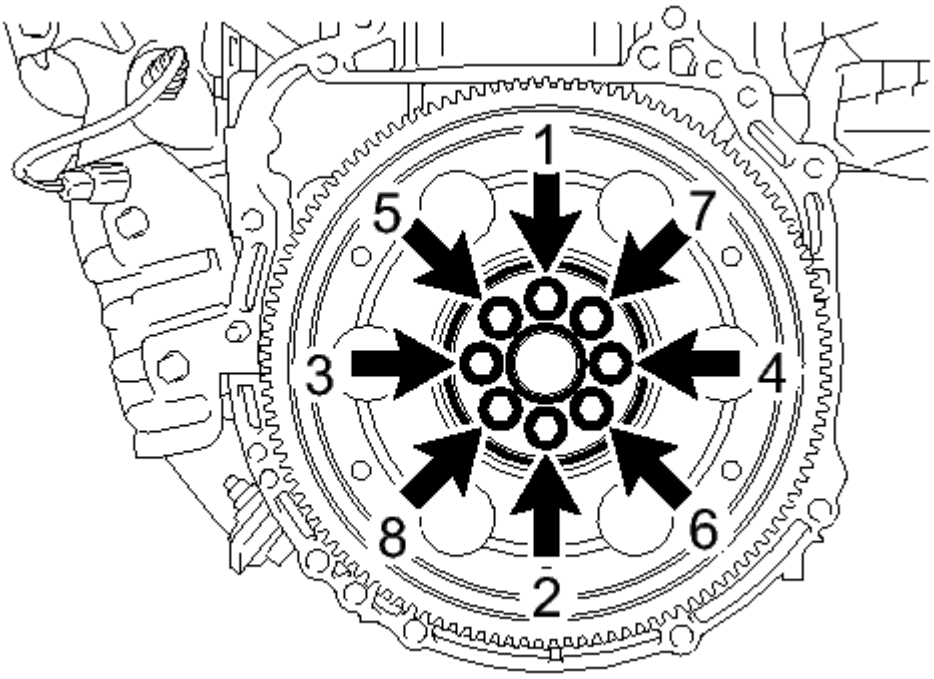
TEXT IN ILLUSTRATION

*1	Adhesive

Adhesive

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

f. Install and uniformly tighten the 8 bolts in the sequence shown in the illustration.



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Fig. 122: Identifying Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 98 N*m (999 kgf*cm, 72 ft.*lbf)

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

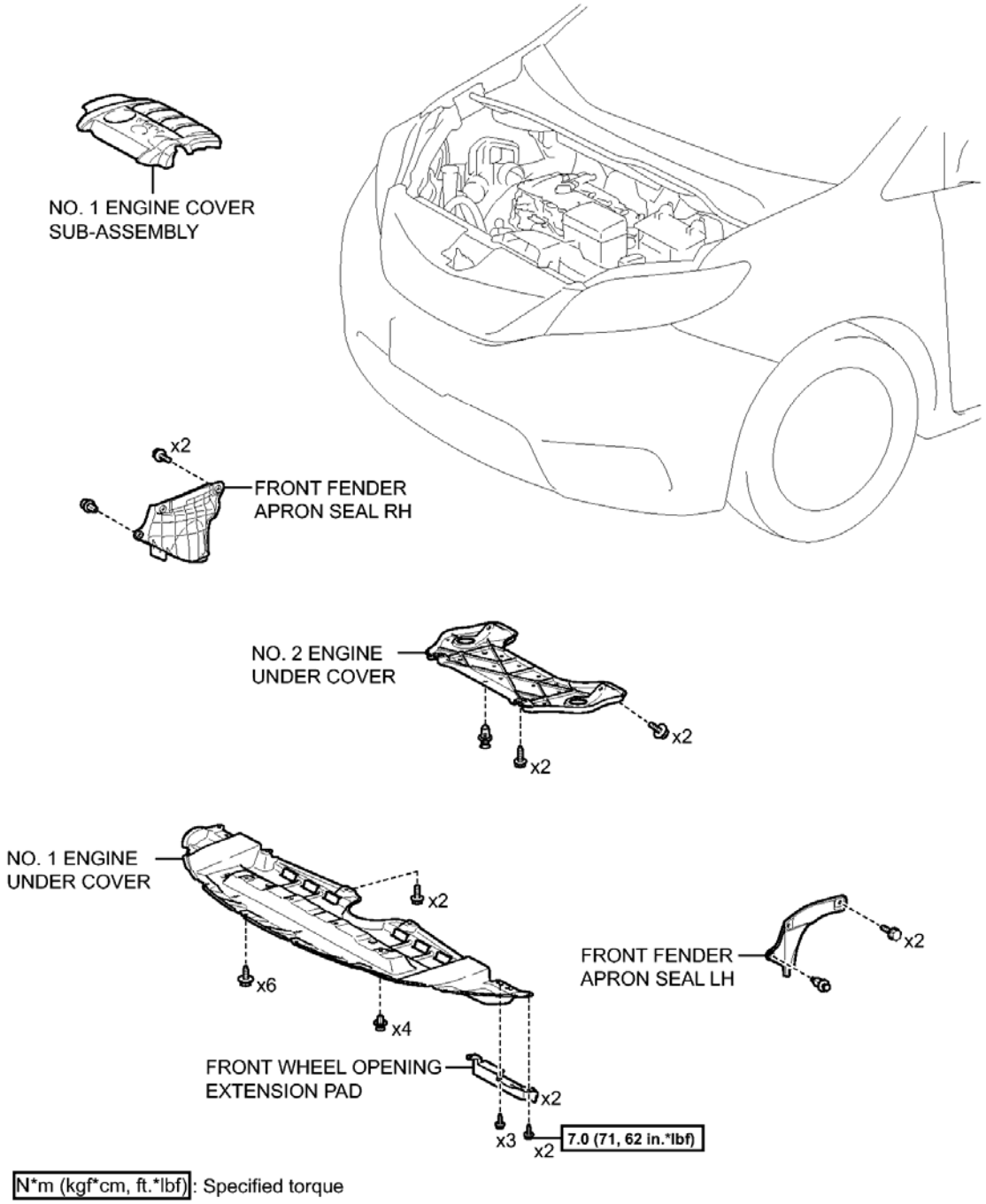
3. **INSTALL AUTOMATIC TRANSAXLE ASSEMBLY**

   Refer to **INSTALLATION**

ENGINE ASSEMBLY

COMPONENTS

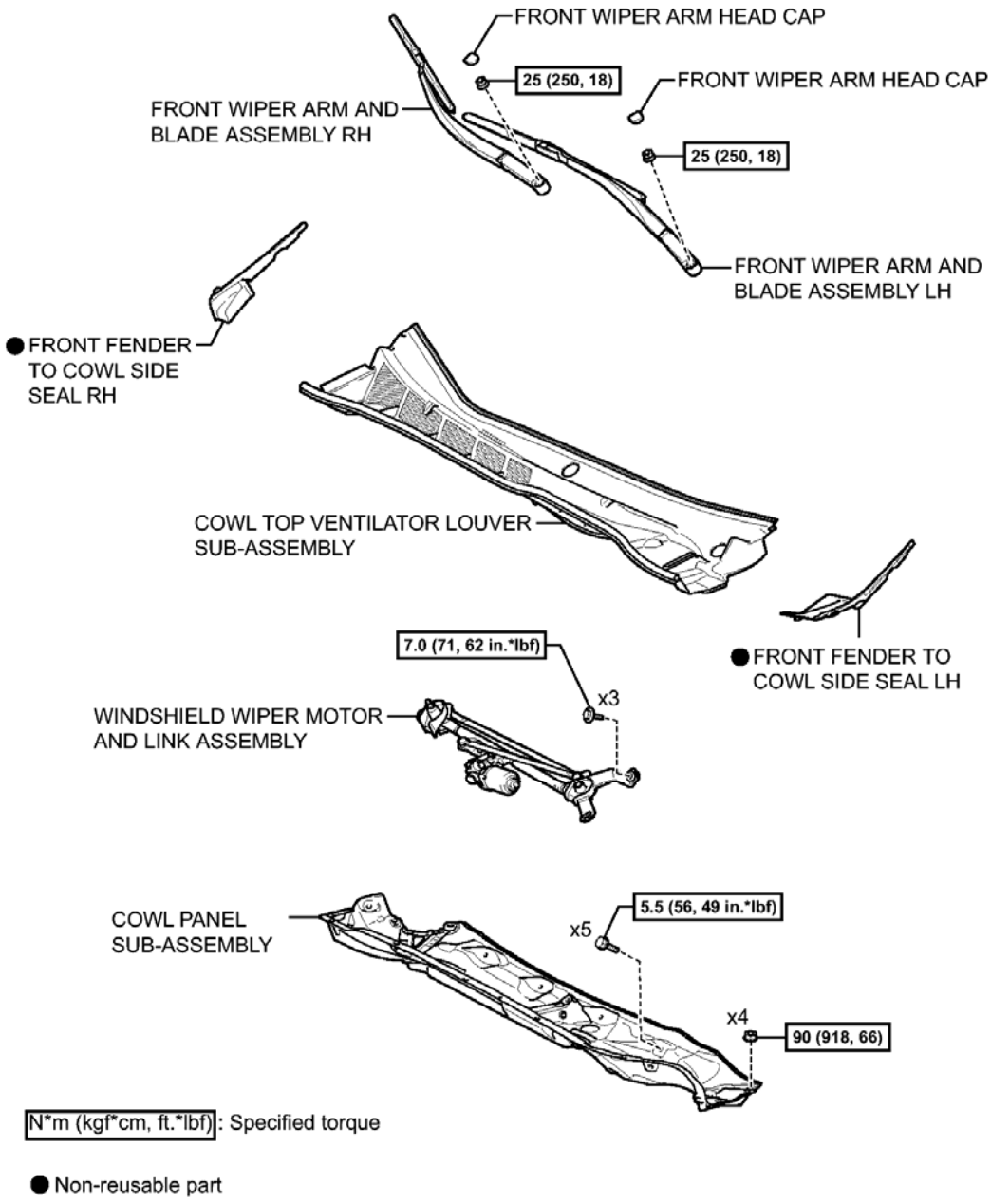
ILLUSTRATION



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Fig. 123: Engine Assembly Replacement Components With Torque Specifications (1 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

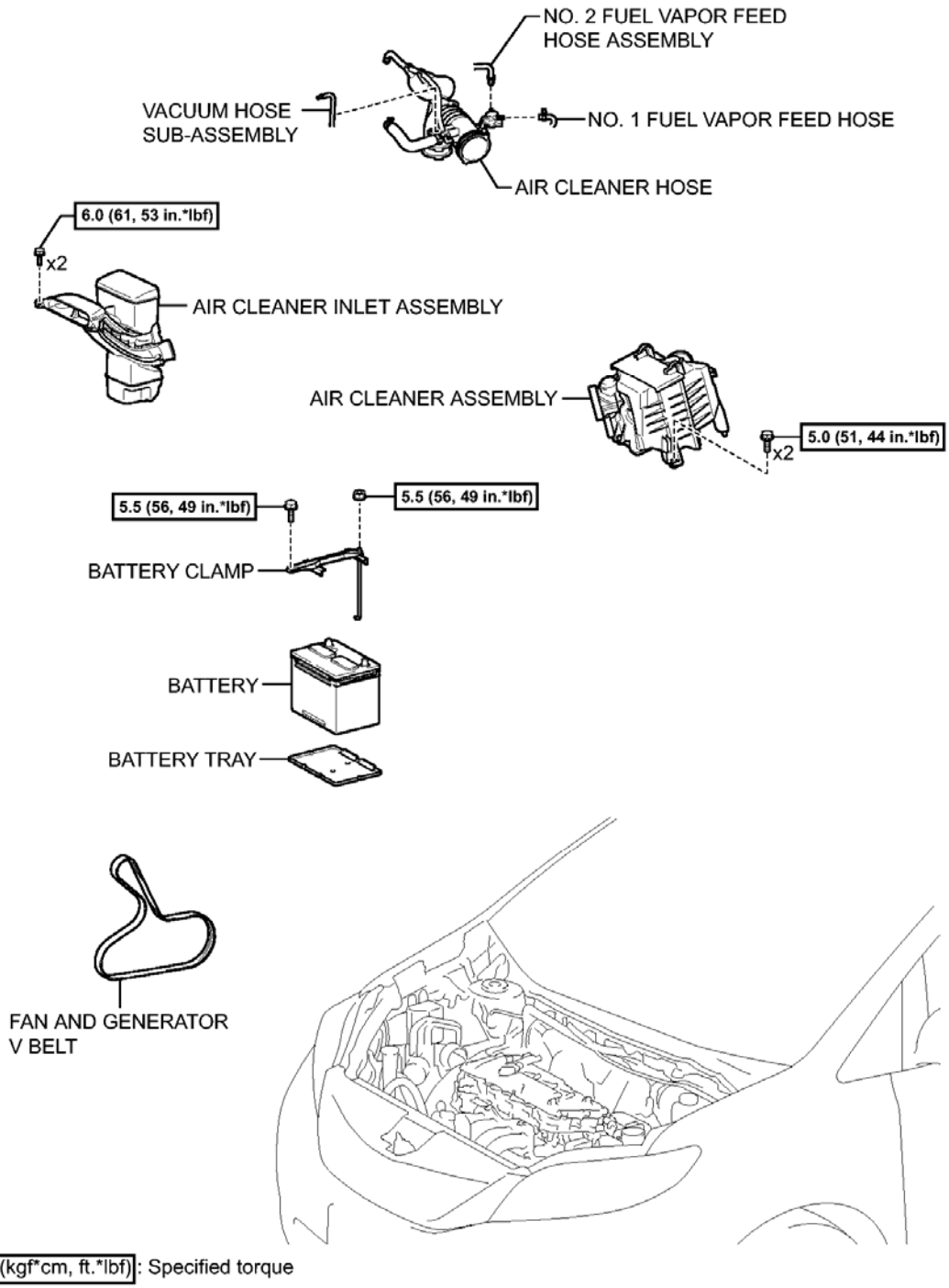
ILLUSTRATION



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Fig. 124: Engine Assembly Replacement Components With Torque Specifications (2 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

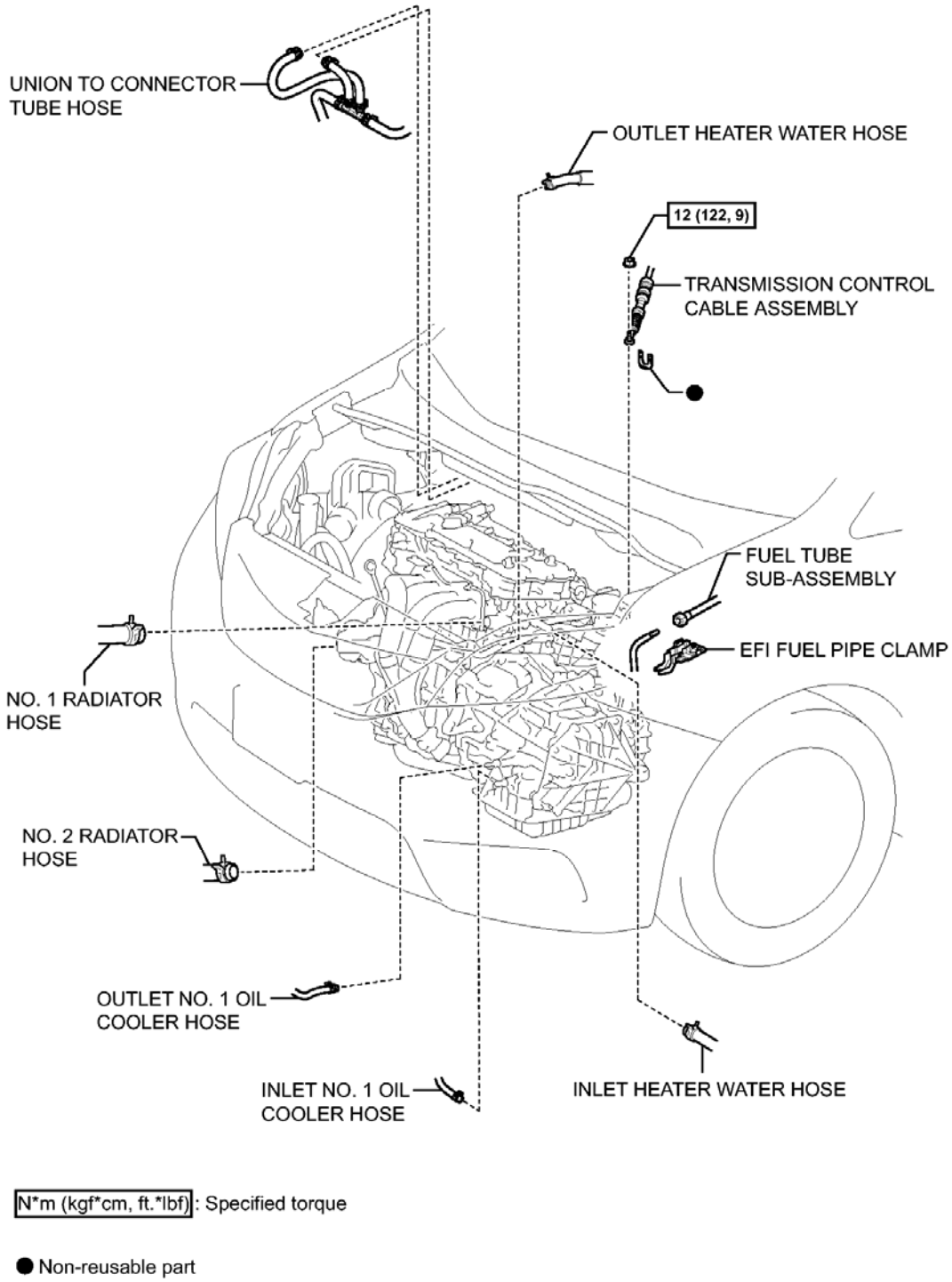
ILLUSTRATION



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Fig. 125: Engine Assembly Replacement Components With Torque Specifications (3 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

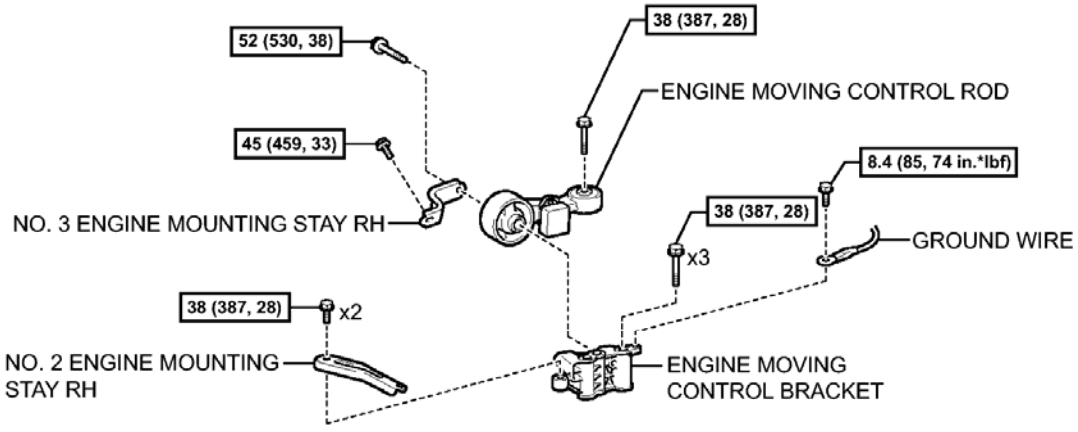
ILLUSTRATION

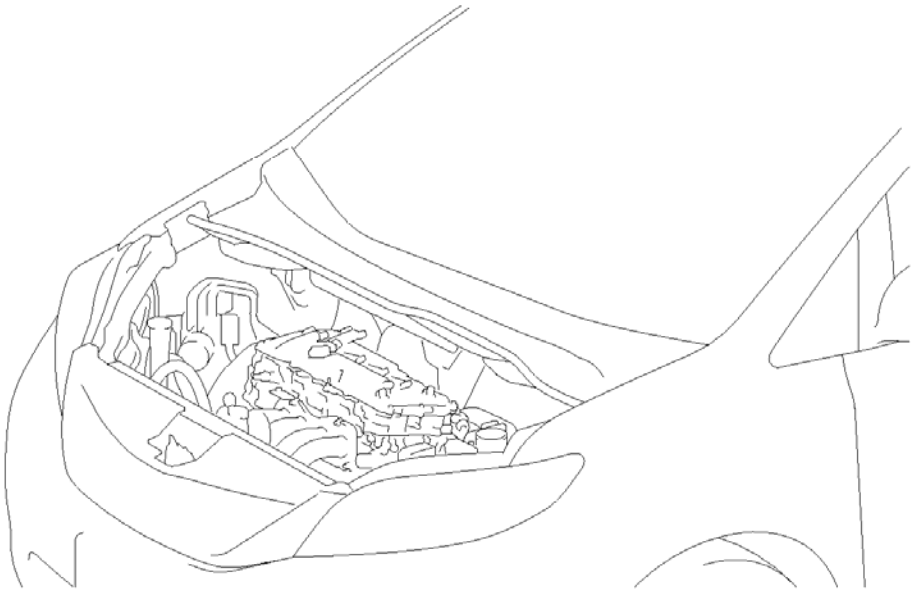


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Fig. 126: Engine Assembly Replacement Components With Torque Specifications (4 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION





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

Fig. 127: Engine Assembly Replacement Components With Torque Specifications (5 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

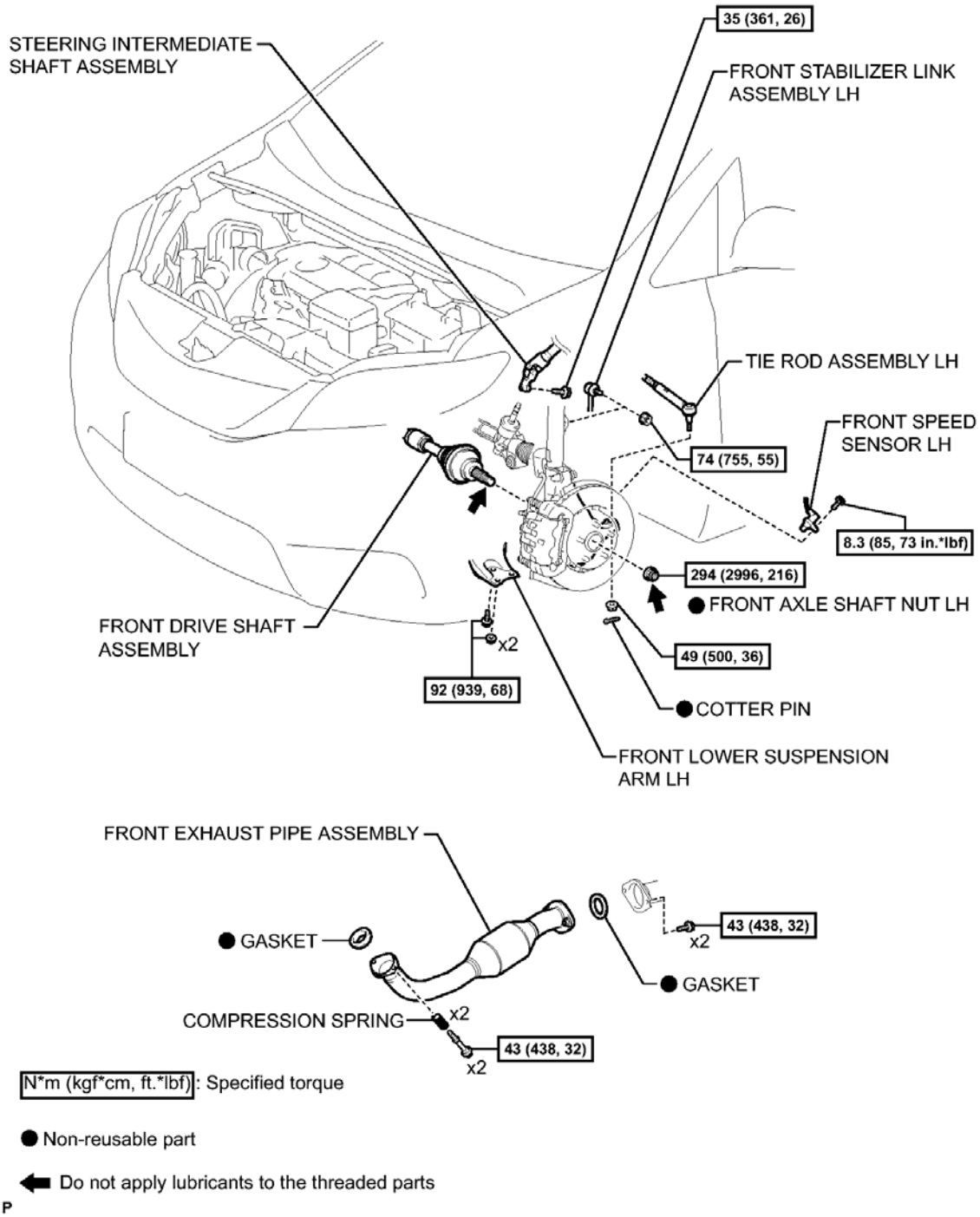
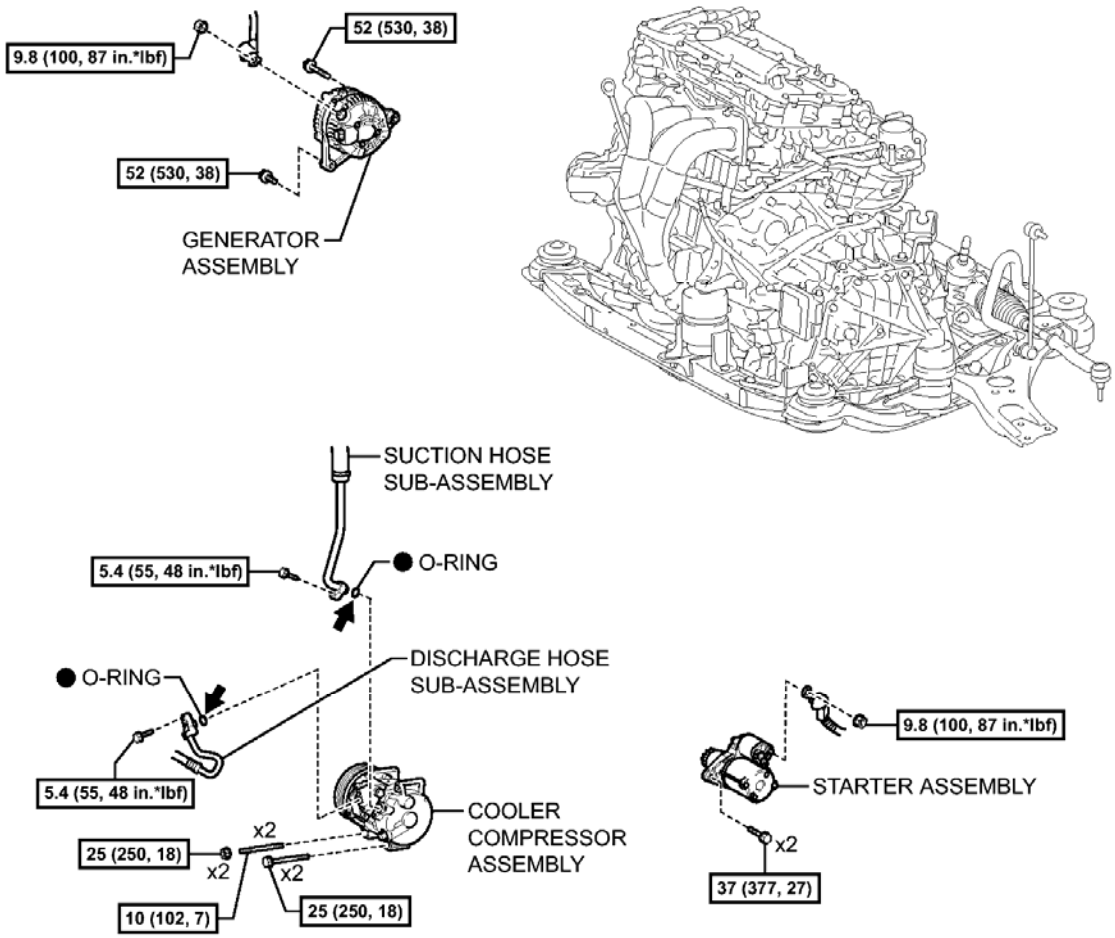


Fig. 128: Engine Assembly Replacement Components With Torque Specifications (6 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

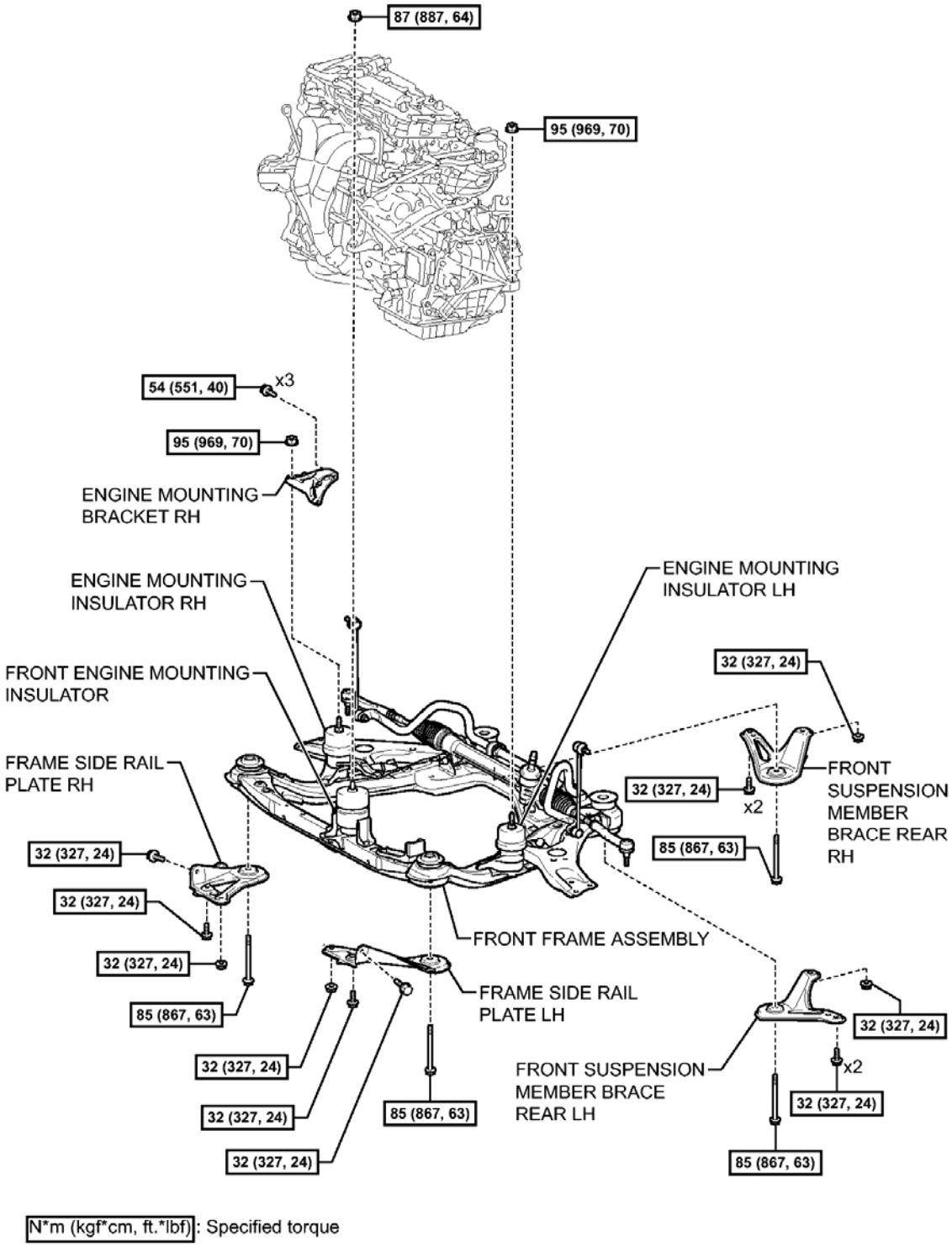
ILLUSTRATION



P

Fig. 129: Engine Assembly Replacement Components With Torque Specifications (7 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



P

Fig. 130: Engine Assembly Replacement Components With Torque Specifications (8 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

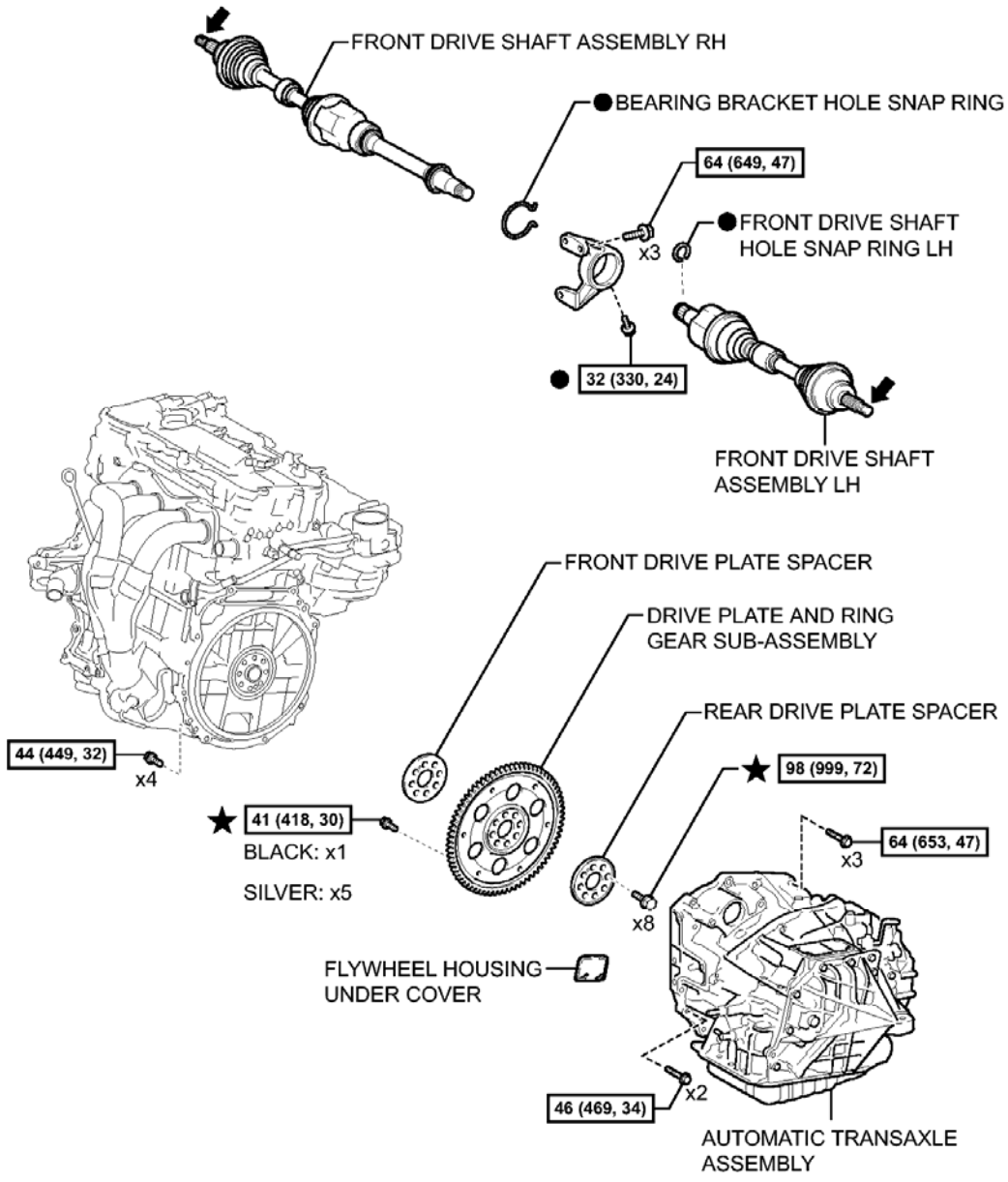


Fig. 131: Engine Assembly Replacement Components With Torque Specifications (9 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

REMOVAL

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

   Refer to **REMOVAL - Step 1**

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

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

5. **REMOVE FRONT WHEEL**
6. **REMOVE NO. 1 ENGINE UNDER COVER** . Refer to **REMOVAL - Step 1**
7. **REMOVE NO. 2 ENGINE UNDER COVER**
8. **REMOVE FRONT FENDER APRON SEAL LH**
   a. Remove the 2 bolts, clip and front fender apron seal LH.

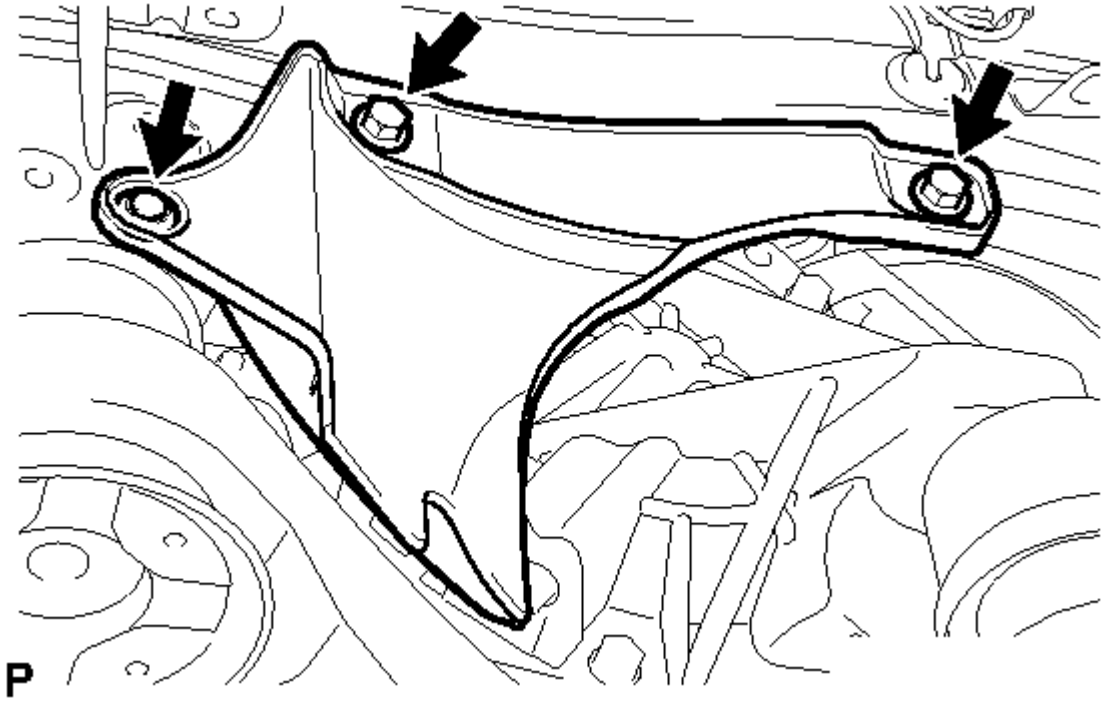


Fig. 132: Identifying Front Fender Apron Seal LH Bolts And Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. **REMOVE FRONT FENDER APRON SEAL RH**
   a. Remove the 2 bolts, clip and front fender apron seal RH.

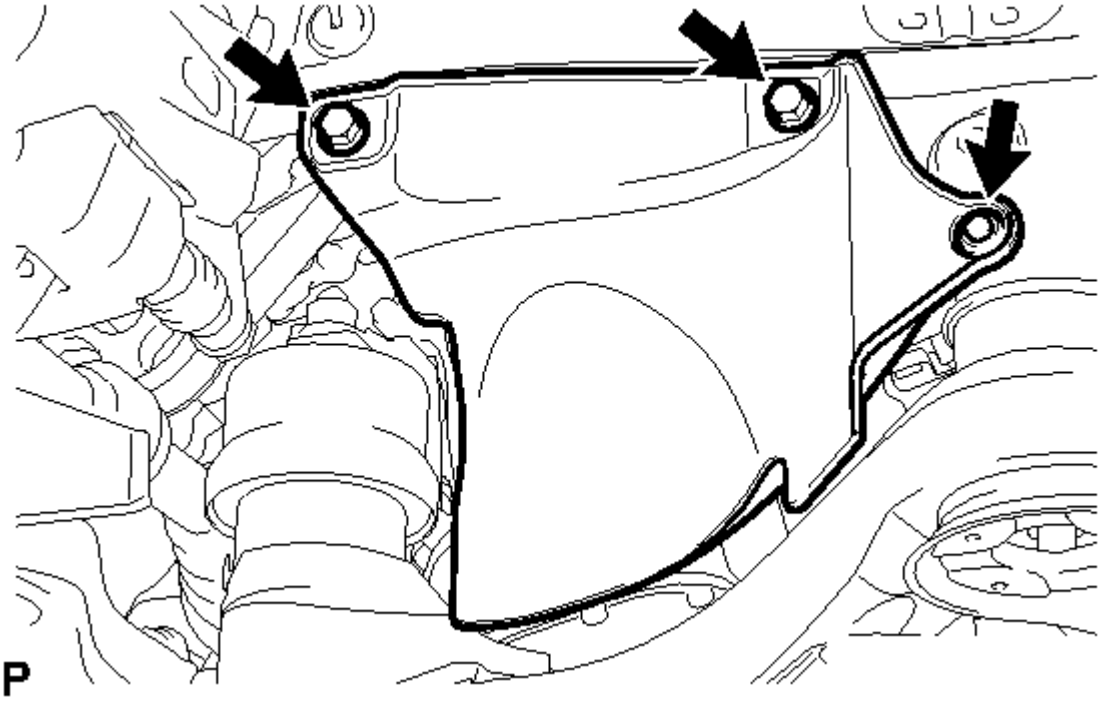


Fig. 133: Identifying Front Fender Apron Seal RH Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. **DRAIN ENGINE OIL** . Refer to **REPLACEMENT - Step 1**
11. **DRAIN ENGINE COOLANT** . Refer to **REPLACEMENT - Step 2**
12. **DRAIN AUTOMATIC TRANSAXLE FLUID** . Refer to **REPLACEMENT - Step 1**
13. **REMOVE FRONT WIPER ARM HEAD CAP** . Refer to **REMOVAL - Step 1**
14. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH** . Refer to **REMOVAL - Step 2**
15. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH** . Refer to **REMOVAL - Step 3**
16. **REMOVE FRONT FENDER TO COWL SIDE SEAL LH** . Refer to **REMOVAL - Step 4**
17. **REMOVE FRONT FENDER TO COWL SIDE SEAL RH** . Refer to **REMOVAL - Step 5**
18. **REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** . Refer to **REMOVAL - Step 6**
19. **REMOVE WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** . Refer to **REMOVAL - Step 7**
20. **REMOVE COWL PANEL SUB-ASSEMBLY** . Refer to **REMOVAL - Step 10**
21. **REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY**
    a. Lift the rear of the No. 1 engine cover to detach the cover from the 2 pins, and then lift the front of the No. 1 engine cover to detach the cover from the pin and remove the No. 1 engine cover.

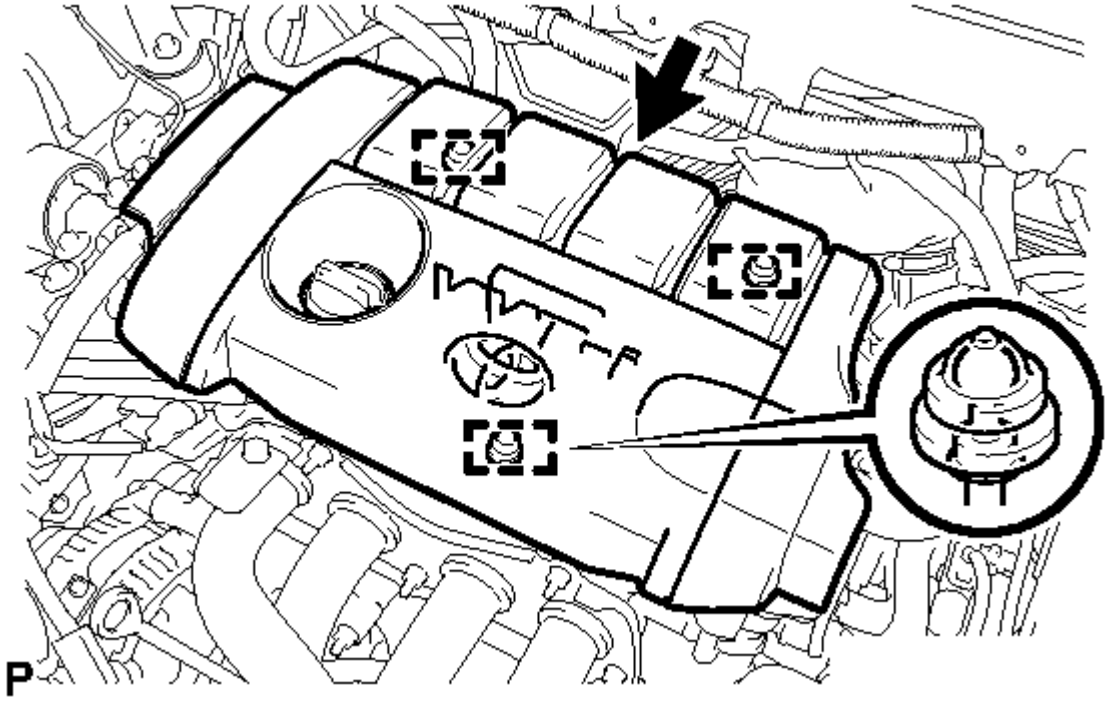


Fig. 134: Identifying No. 1 Engine Cover Sub-Assembly & Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Attempting to disengage both front and rear clips at the same time may cause the No. 1 engine cover to break.

22. **REMOVE AIR CLEANER INLET ASSEMBLY**
    a. Remove the 2 bolts and air cleaner inlet.

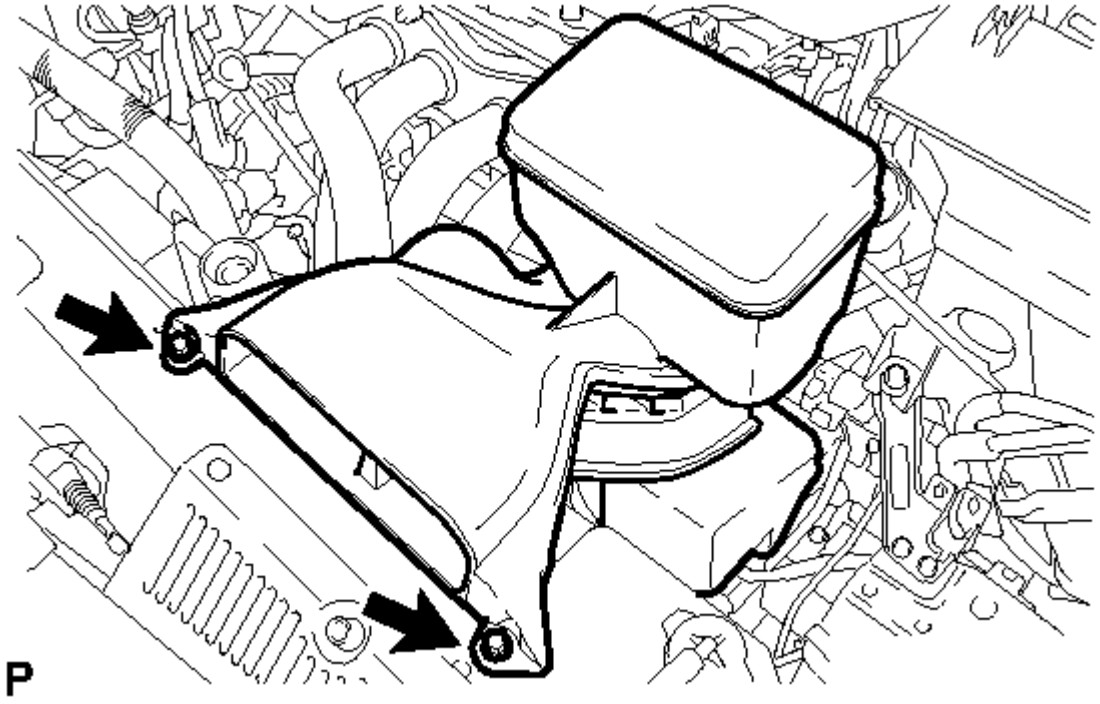


Fig. 135: Identifying Air Cleaner Inlet Assembly & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

23. **REMOVE BATTERY**
    a. Disconnect the positive (+) cable from the positive (+) battery terminal.
    b. Loosen the nut and remove the bolt from the battery clamp.

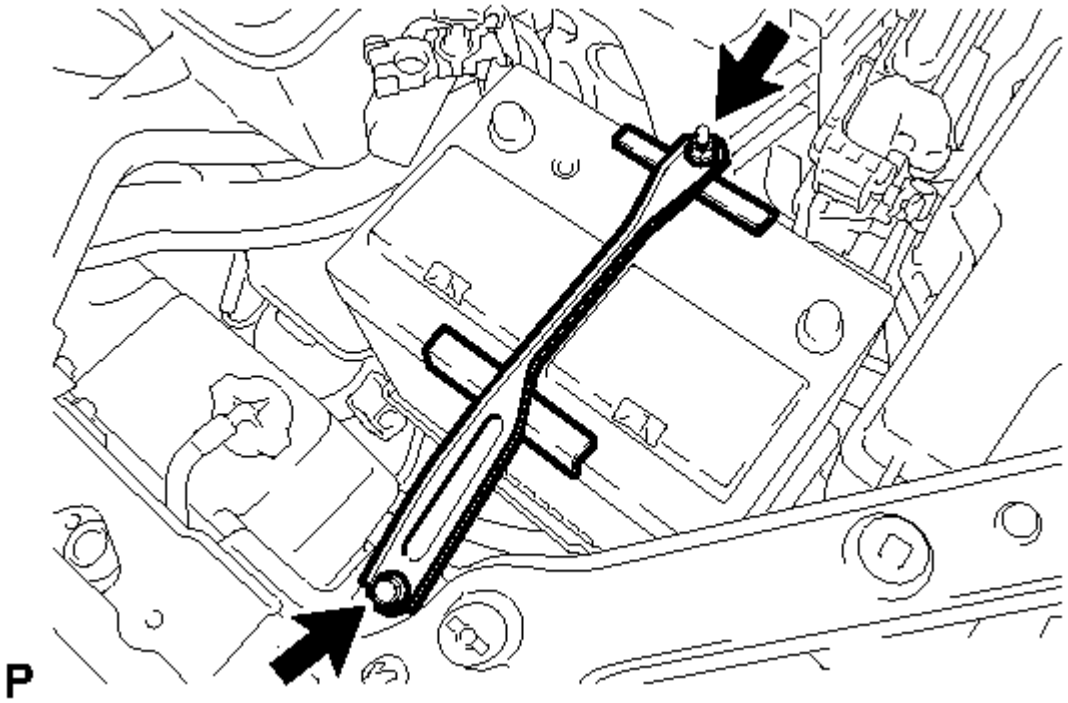


Fig. 136: Identifying Battery Clamp & Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Remove the battery clamp.
d. Remove the battery and battery tray.

24. **REMOVE AIR CLEANER ASSEMBLY**
    a. Disconnect the mass air flow meter connector.

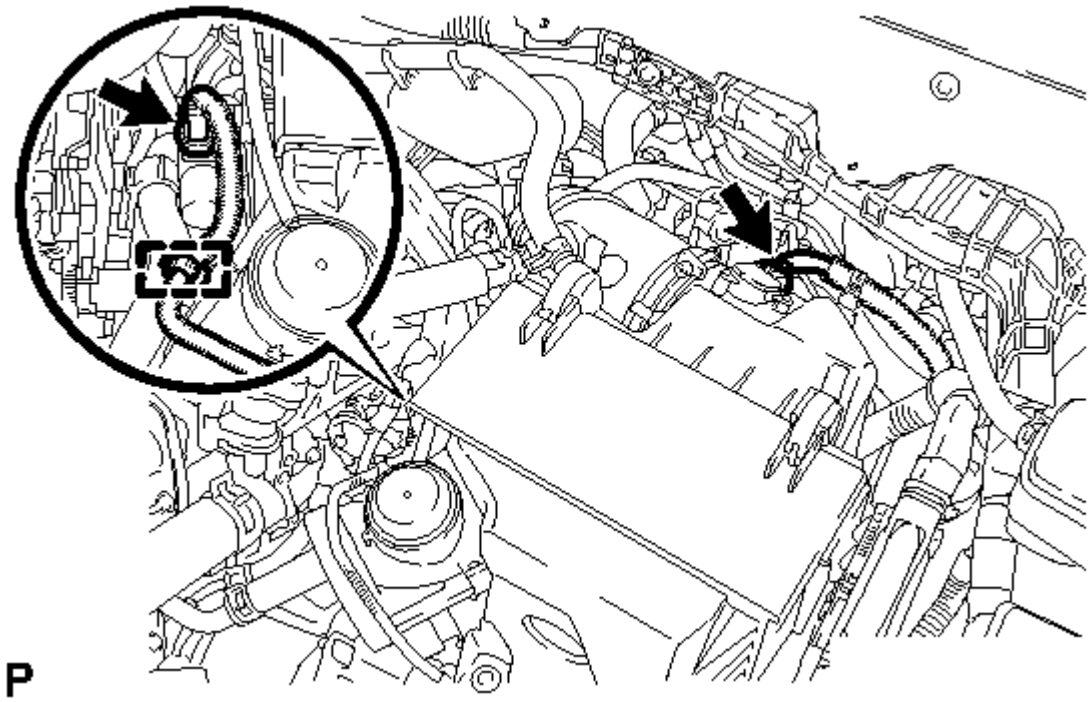


Fig. 137: Identifying Mass Air Flow Meter, Vacuum Switching Valve Connectors & Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Disconnect the vacuum switching valve connector and disengage the wire harness clamp.
    c. Disconnect the vacuum hose and disengage the hose clamp.

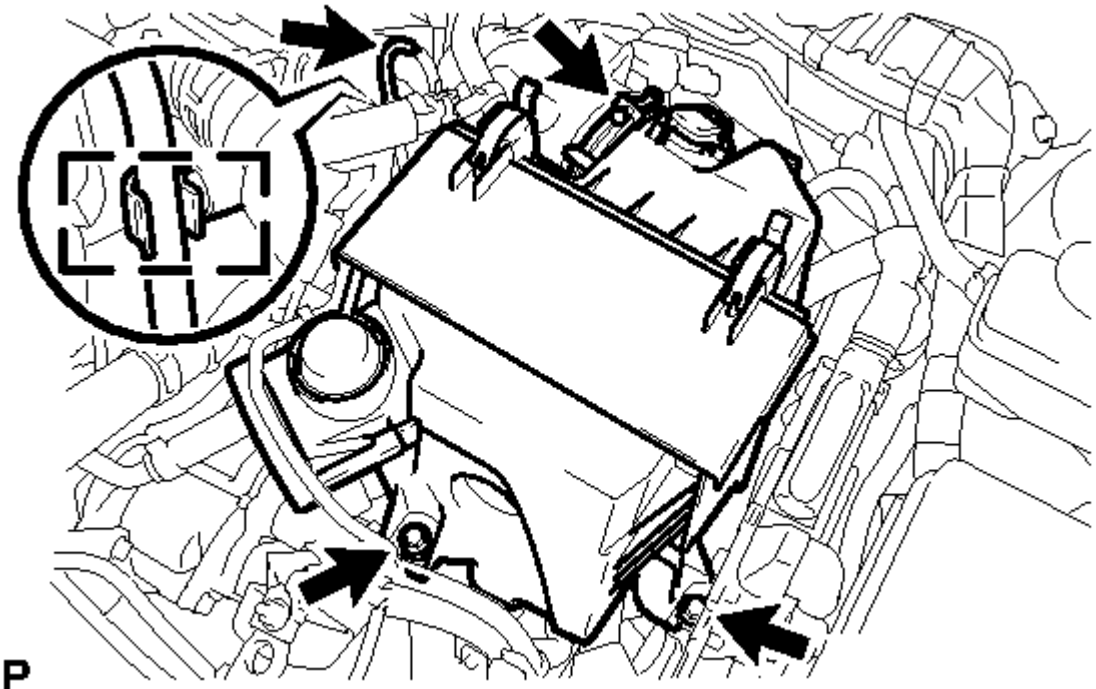


Fig. 138: Identifying Air Cleaner Assembly, Hose Clamp & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Loosen the hose clamp.
e. Remove the 2 bolts and air cleaner.

25. **REMOVE AIR CLEANER HOSE**

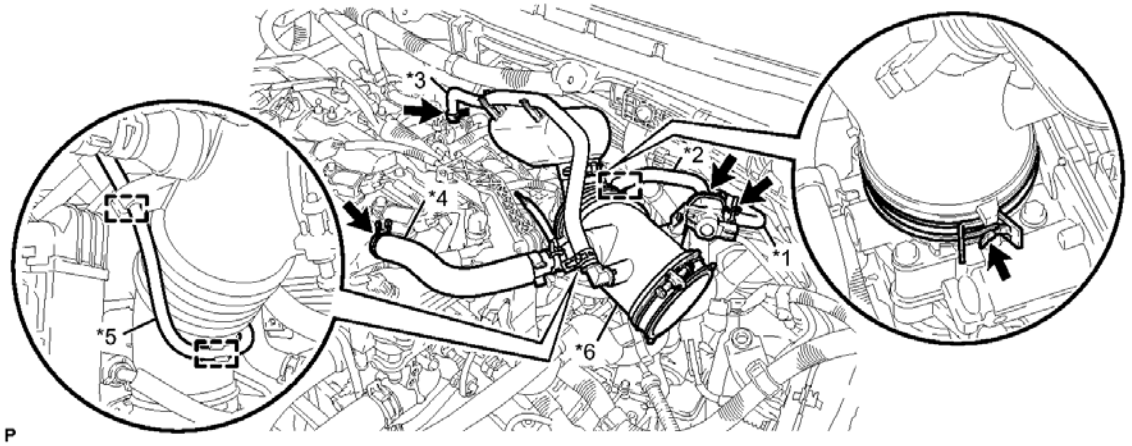


Fig. 139: Identifying Air Cleaner Hoses & Clips
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Loosen the hose clip and disconnect the No. 1 fuel vapor feed hose.

TEXT IN ILLUSTRATION

	No. 1		

*1	fuel vapor feed hose	*2	No. 2 fuel vapor feed hose
*3	No. 1 air hose	*4	Ventilation hose
*5	Vacuum hose	*6	Air cleaner hose

b. Loosen the hose clip and disconnect the No. 2 fuel vapor feed hose.
c. Disengage the hose clamp and separate the No. 2 fuel vapor feed hose.
d. Loosen the hose clip and disconnect the No. 1 air hose.
e. Loosen the hose clip and disconnect the ventilation hose.
f. Disengage the 2 hose clamps and separate the vacuum hose.
g. Loosen the hose clip and remove the air cleaner hose.

26. **DISCONNECT ENGINE WIRE**

a. Disengage the 2 wire harness clamps.

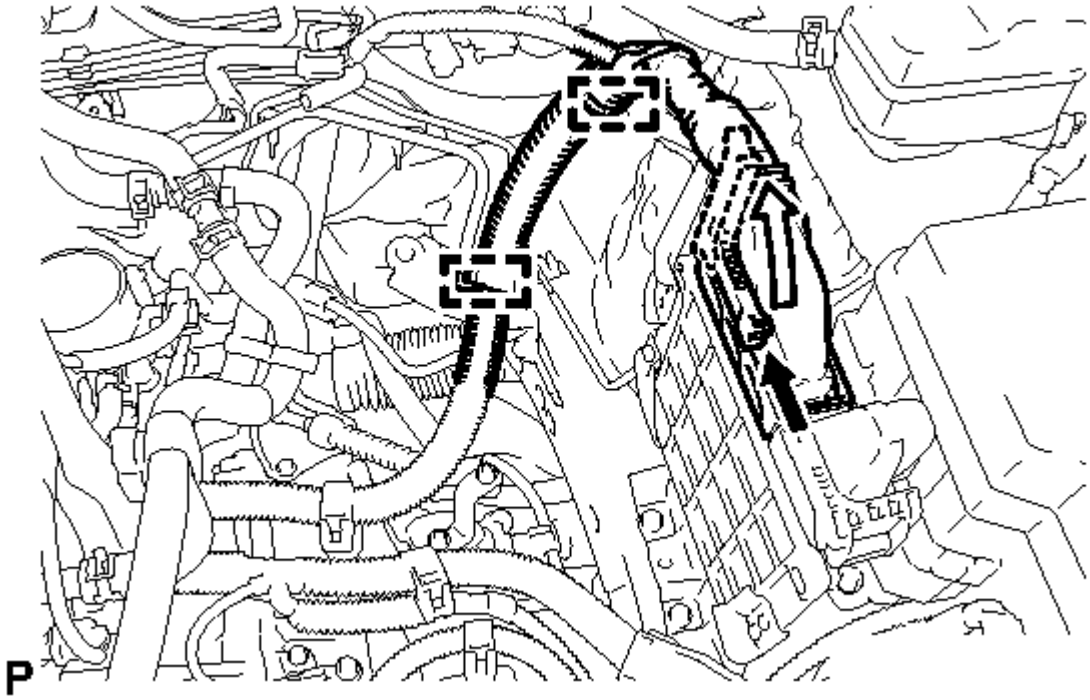


Fig. 140: Disconnecting ECM Connector & Wire Harness Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Pull up the lock lever to disconnect the ECM connector.
c. Remove the engine room relay block cover.
d. Remove the bolts and separate the ground wire.

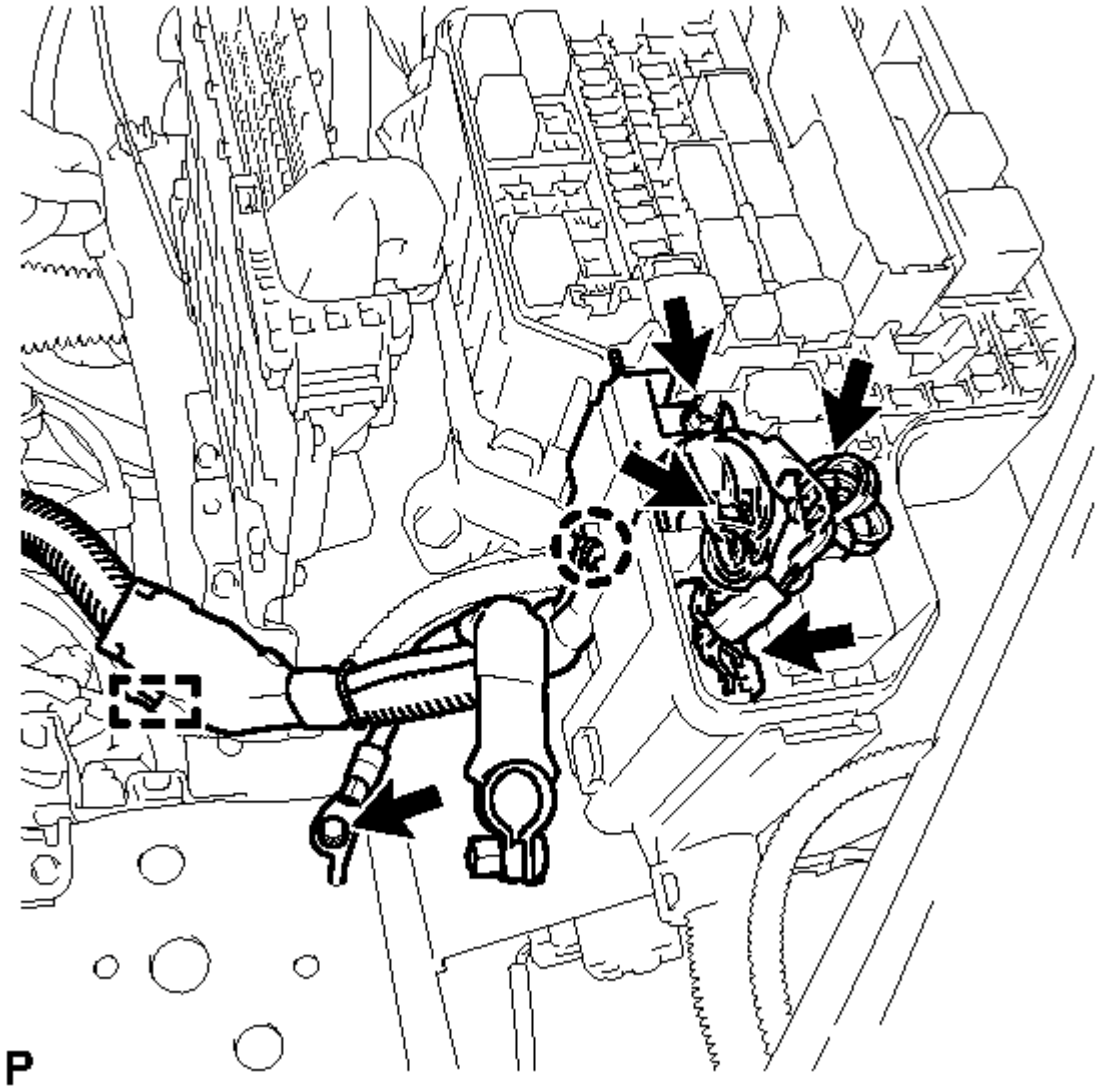


Fig. 141: Identifying Engine Wire Ground, Connectors & Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Disconnect the 3 connectors.
f. Remove the nut.
g. Disengage the wire harness clamp from the vehicle.
h. Using a screwdriver, unlock the claw and separate the engine wire from the engine room relay block.
i. Disengage the wire harness clamp from the battery carrier.

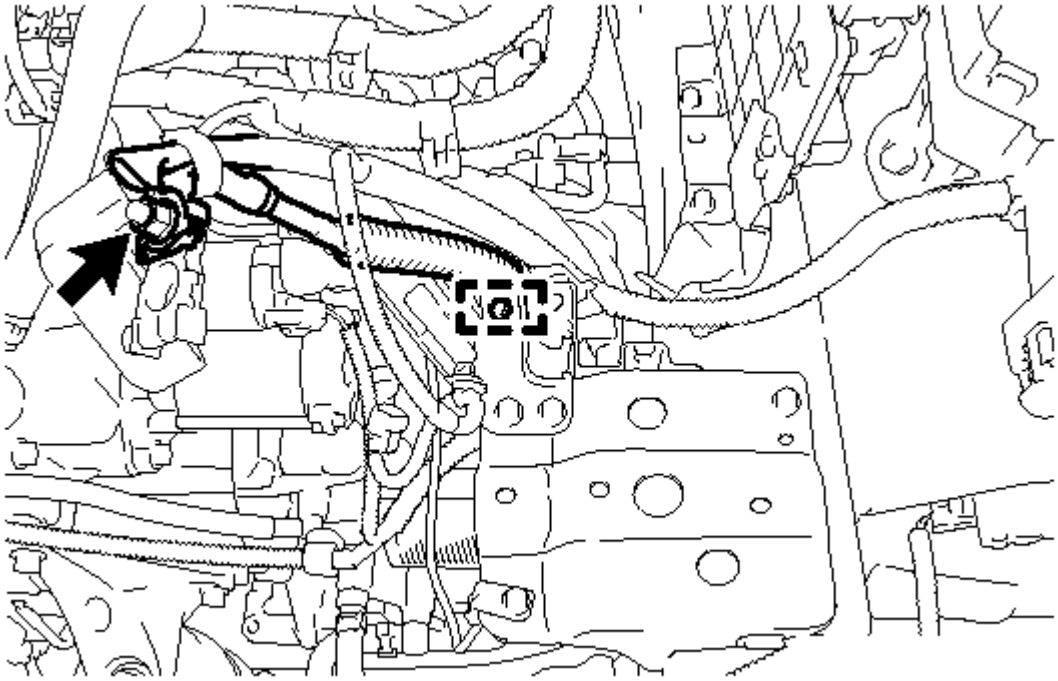


Fig. 142: Identifying Wire Harness Clamp, Positive Battery Terminal & Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

j. Remove the nut and disconnect the wire harness from the positive (+) battery terminal.

27. **DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**

a. Remove the nut from the control shaft lever.

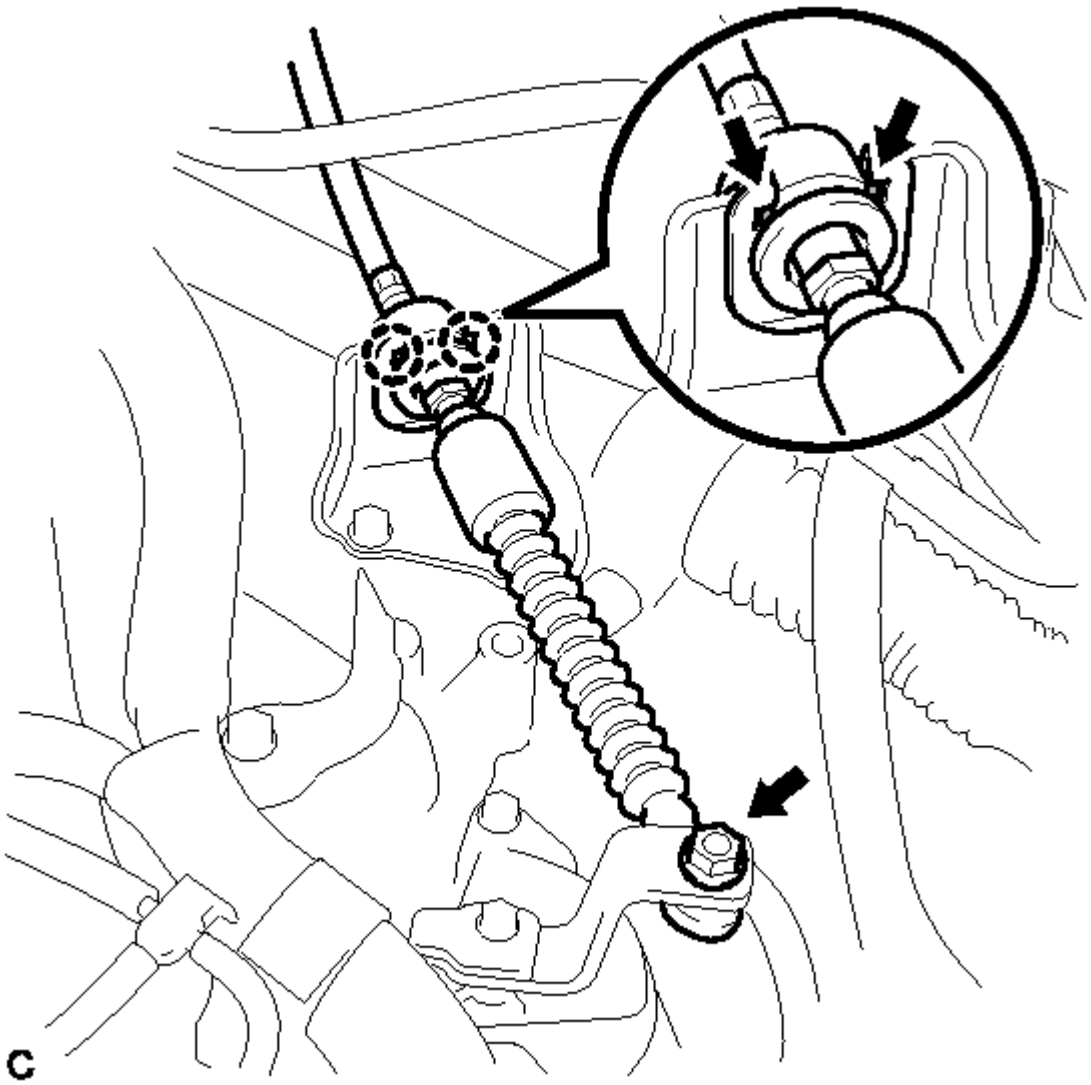


Fig. 143: Identifying Control Shaft Lever Nut And Control Cable Bracket Clip With Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

c. Remove the clip.

28. **DISCONNECT NO. 1 RADIATOR HOSE**

a. Loosen the hose clip and disconnect the No. 1 radiator hose.

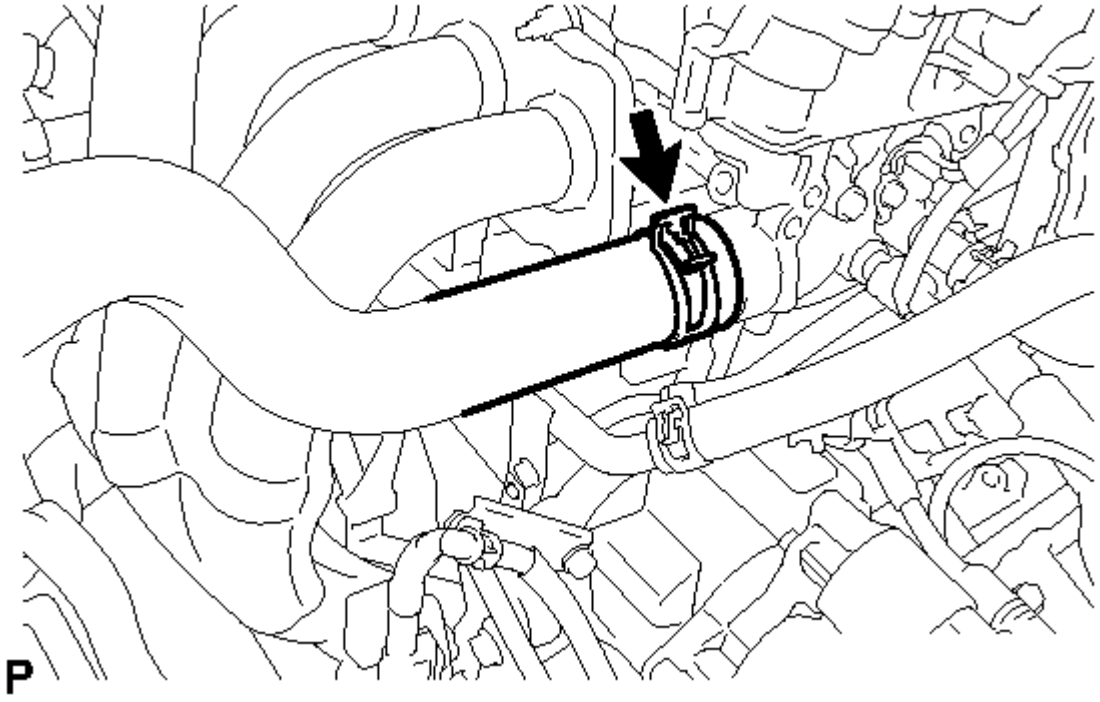


Fig. 144: Identifying No. 1 Radiator Hose & Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

29. **DISCONNECT NO. 2 RADIATOR HOSE**
    a. Loosen the hose clip and disconnect the No. 2 radiator hose.

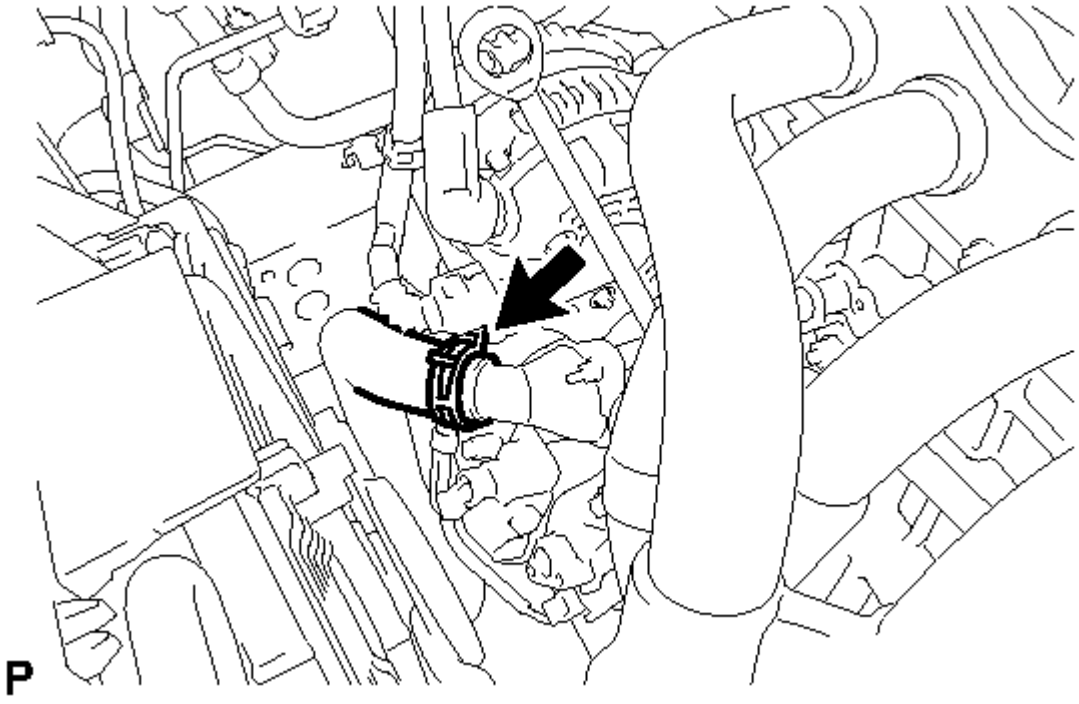


Fig. 145: Identifying No. 2 Radiator Hose & Clip

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

30. **DISCONNECT OUTLET HEATER WATER HOSE**
    a. Disengage the hose clamp.

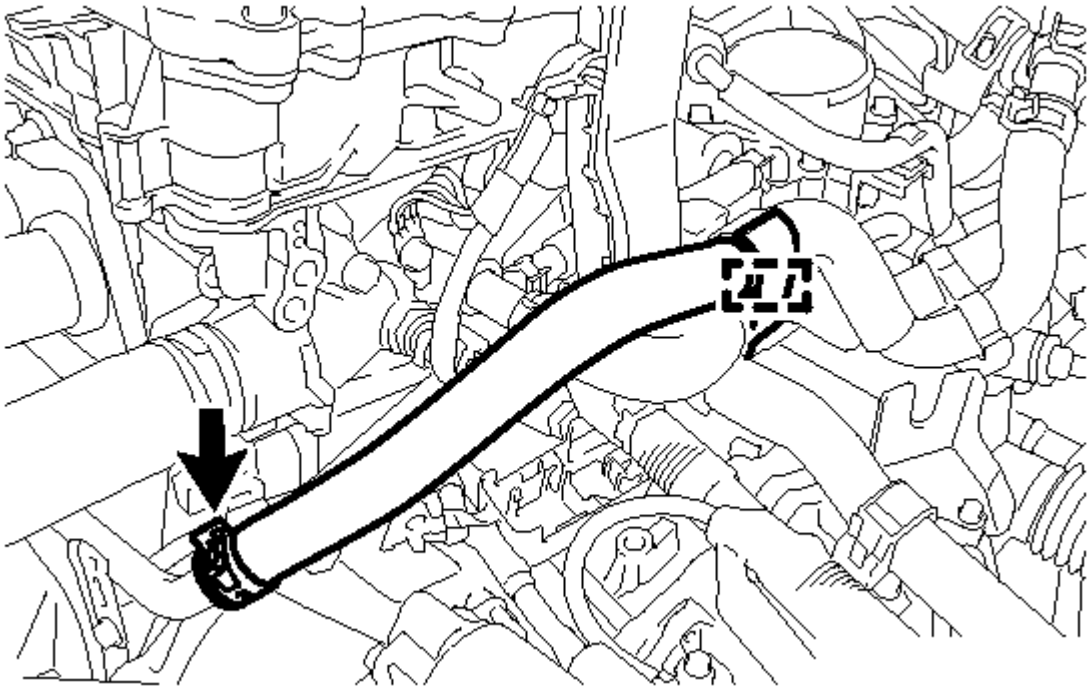


Fig. 146: Identifying Outlet Heater Water Hose, Clamp & Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Loosen the hose clip and disconnect the outlet heater water hose.

31. **DISCONNECT INLET HEATER WATER HOSE**
    a. Loosen the hose clip and disconnect the inlet heater water hose.

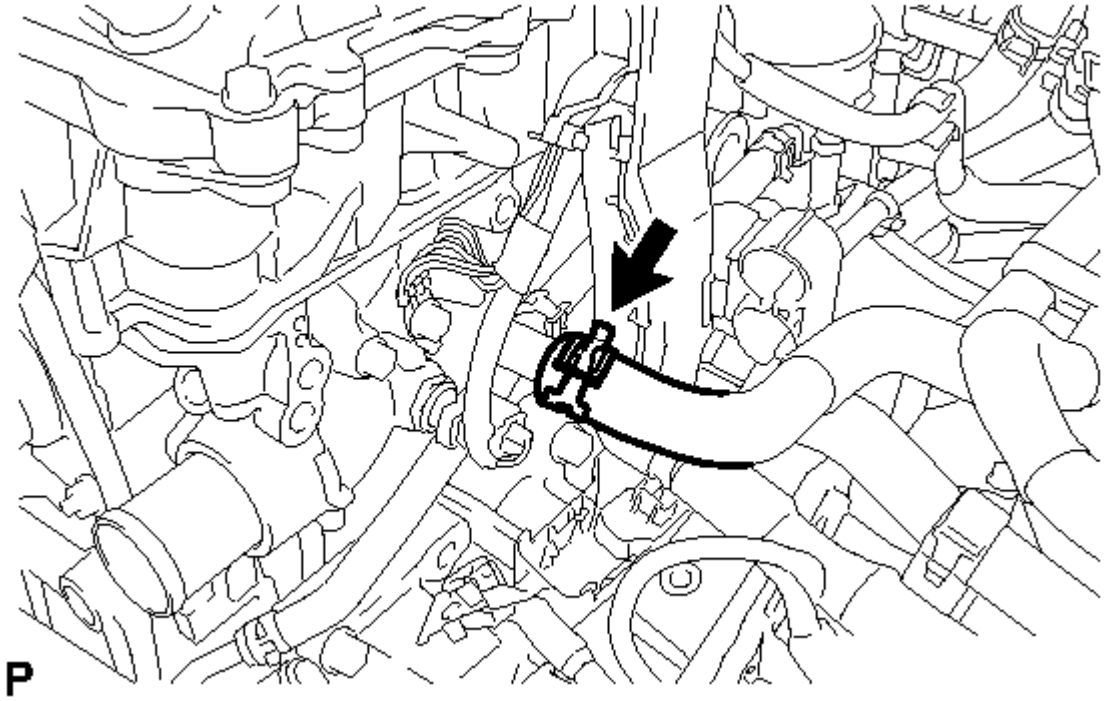


Fig. 147: Identifying Inlet Heater Water Hose & Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

32. **REMOVE EFI FUEL PIPE CLAMP** . Refer to **REMOVAL - Step 8**
33. **DISCONNECT FUEL TUBE SUB-ASSEMBLY** . Refer to **REMOVAL - Step 9**
34. **DISCONNECT UNION TO CONNECTOR TUBE HOSE**
    a. Loosen the 2 hose clips and disconnect the 2 union to connector tube hoses.

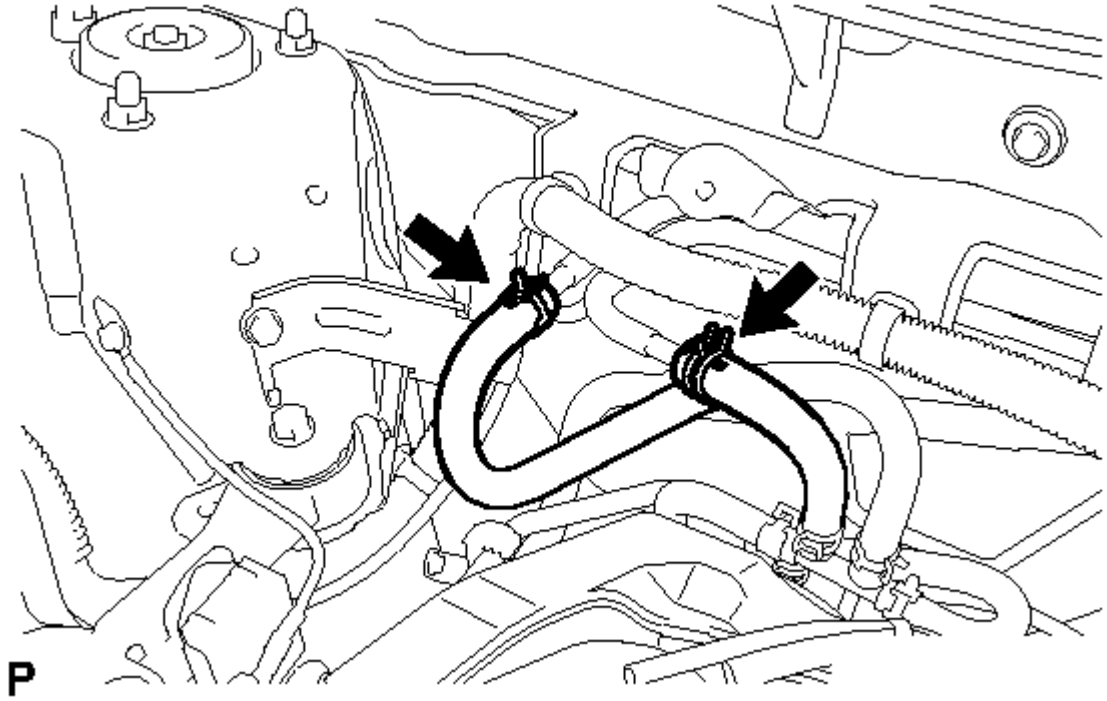


Fig. 148: Identifying Union To Connector Tube Hoses & Clips
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

35. **DISCONNECT OUTLET NO. 1 OIL COOLER HOSE**

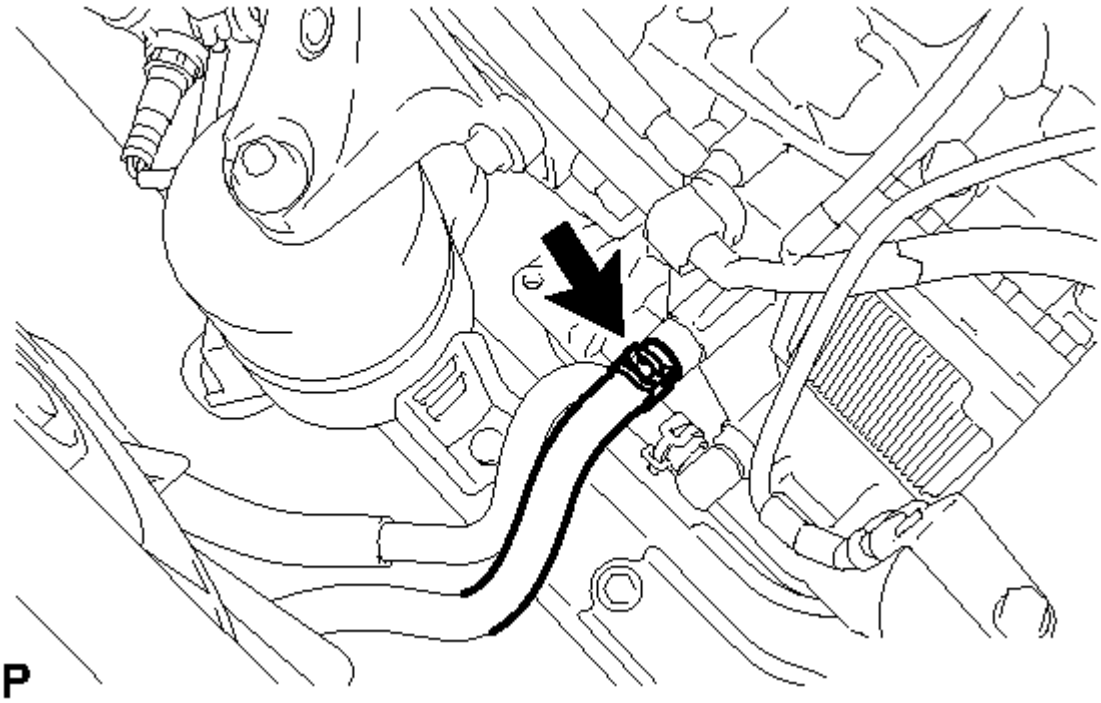


Fig. 149: Identifying Outlet No. 1 Oil Cooler Hose & Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Loosen the hose clip and disconnect the outlet No. 1 oil cooler hose.

36. **DISCONNECT INLET NO. 1 OIL COOLER HOSE**

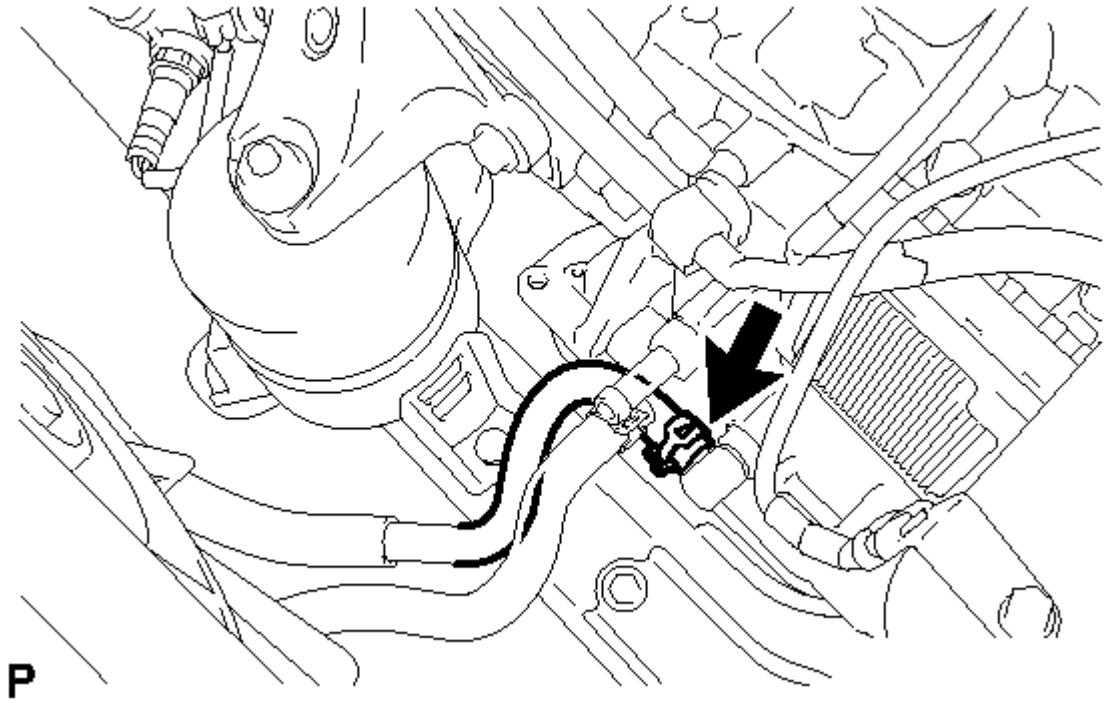


Fig. 150: Identifying Inlet No. 1 Oil Cooler Hose & Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Loosen the hose clip and disconnect the inlet No. 1 oil cooler hose.

37. **REMOVE NO. 2 ENGINE MOUNTING STAY RH**

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

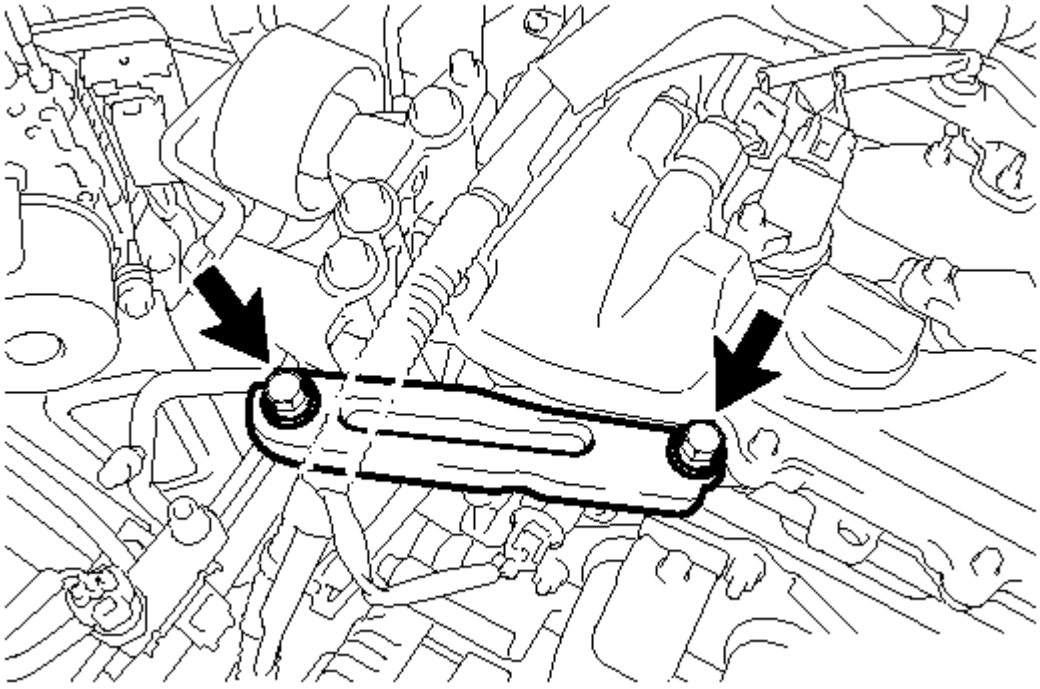


Fig. 151: Identifying No. 2 Engine Mounting Stay RH & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

38. **REMOVE ENGINE MOVING CONTROL ROD SUB-ASSEMBLY**
    a. Remove the bolt and disconnect the ground wire.

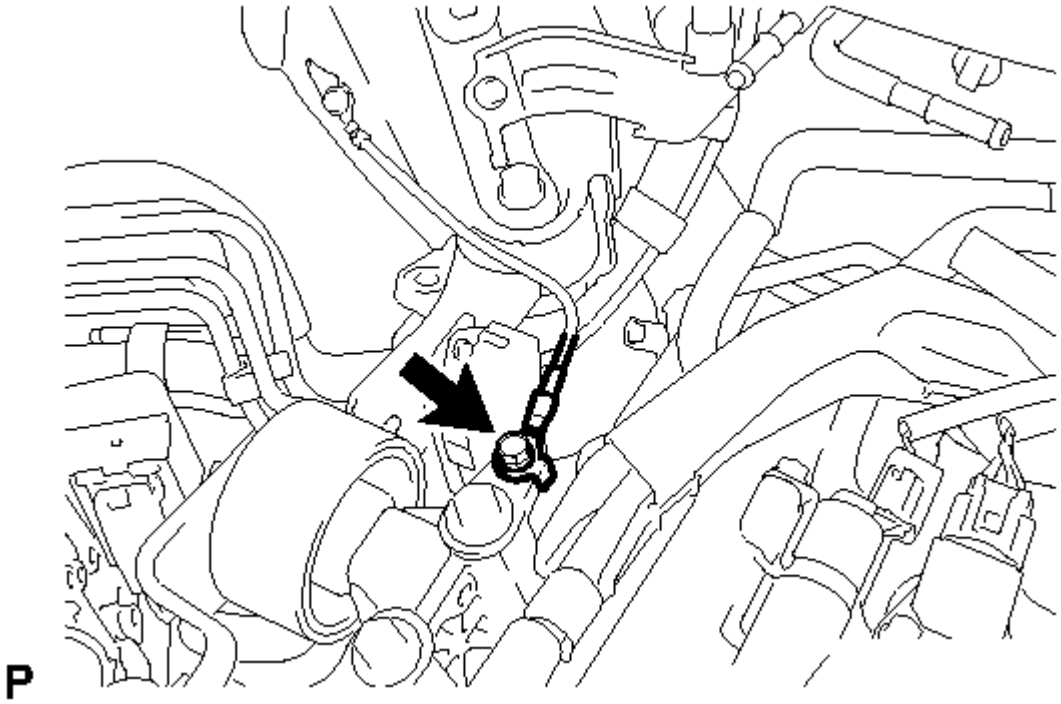


Fig. 152: Identifying Ground Wire & Bolt

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

b. Remove the 4 bolts and the engine moving control rod sub-assembly.

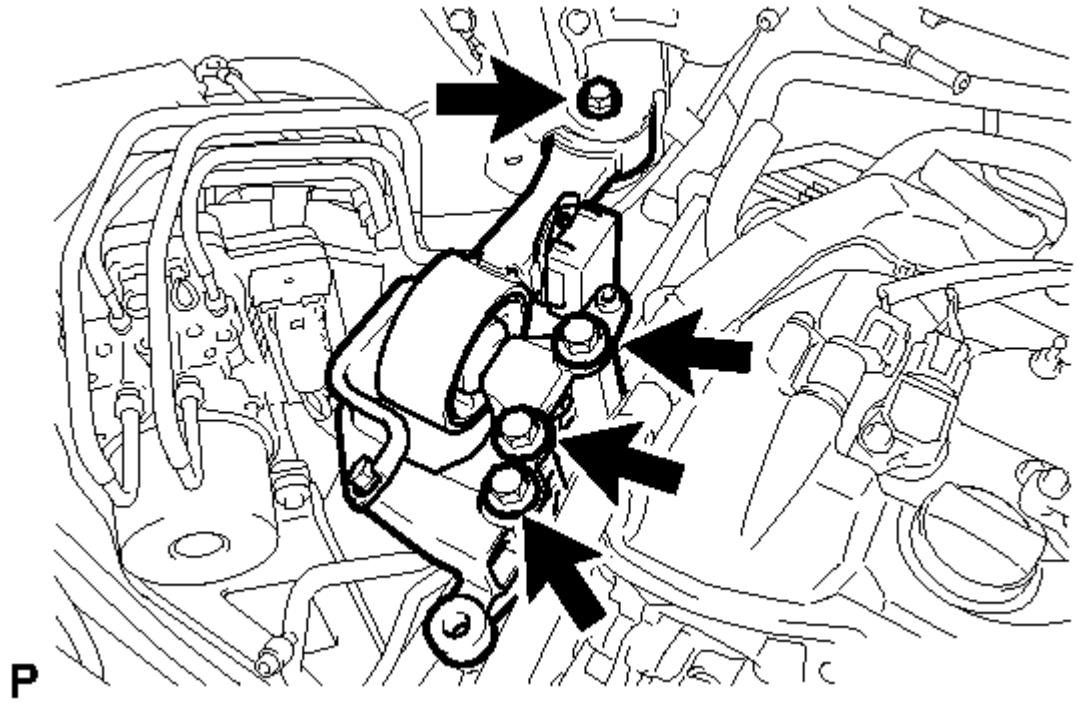


Fig. 153: Identifying Engine Moving Control Rod Sub-Assembly & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

39. **REMOVE ENGINE MOVING CONTROL ROD**

a. Remove the 2 bolts, No. 3 engine mounting stay and engine moving control rod from the engine moving control rod bracket.

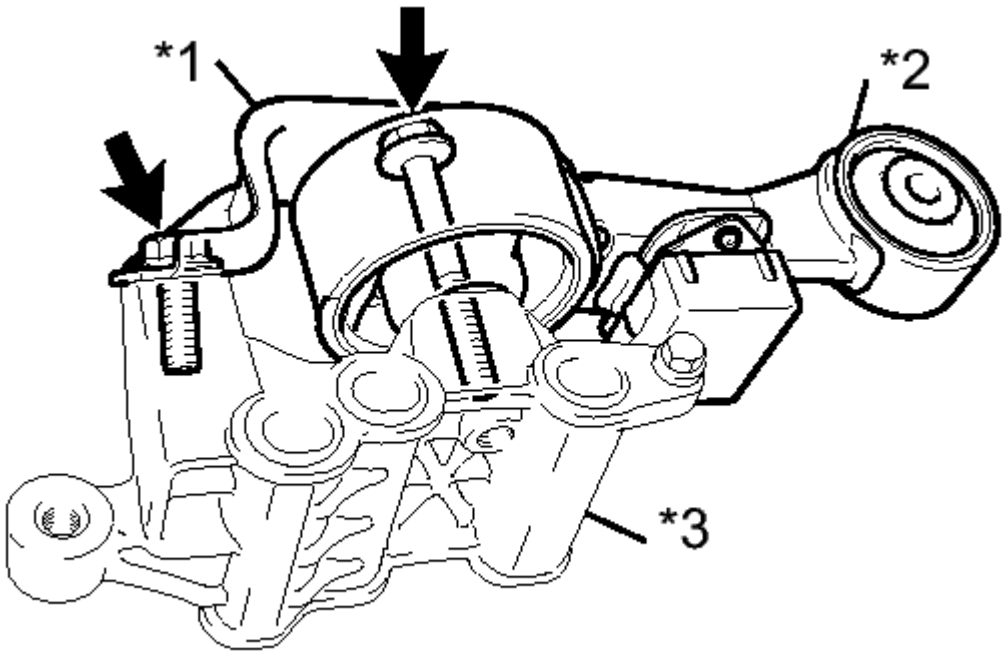


Fig. 154: Identifying Engine Moving Control Rod, No. 3 Engine Mounting Stay, Bracket & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	No. 3 engine mounting stay
*2	Engine moving control rod
*3	Engine moving control rod bracket

HINT:

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

40. **DISCONNECT DISCHARGE HOSE SUB-ASSEMBLY** . Refer to **REMOVAL - Step 18**
41. **DISCONNECT SUCTION HOSE SUB-ASSEMBLY** . Refer to **REMOVAL - Step 19**
42. **REMOVE FRONT EXHAUST PIPE ASSEMBLY** . Refer to **REMOVAL - Step 5**

43. **SECURE STEERING WHEEL** . Refer to **REMOVAL - Step 1**
44. **SEPARATE STEERING INTERMEDIATE SHAFT ASSEMBLY** . Refer to **REMOVAL - Step 12**
45. **REMOVE FRONT AXLE SHAFT NUT LH** . Refer to **REMOVAL - Step 3**
46. **REMOVE FRONT AXLE SHAFT NUT RH**

    HINT:

    Perform the same procedure as for the LH side.

47. **SEPARATE FRONT STABILIZER LINK ASSEMBLY LH** . Refer to **REMOVAL - Step 12**
48. **SEPARATE FRONT STABILIZER LINK ASSEMBLY RH**

    HINT:

    Perform the same procedure as for the LH side.

49. **SEPARATE FRONT SPEED SENSOR LH** . Refer to **REMOVAL - Step 5**
50. **SEPARATE FRONT SPEED SENSOR RH**

    HINT:

    Perform the same procedure as for the LH side.

51. **SEPARATE TIE ROD ASSEMBLY LH** . Refer to **REMOVAL - Step 6**
52. **SEPARATE TIE ROD ASSEMBLY RH**

    HINT:

    Perform the same procedure as for the LH side.

53. **SEPARATE FRONT LOWER SUSPENSION ARM LH** . Refer to **REMOVAL - Step 9**
54. **SEPARATE FRONT LOWER SUSPENSION ARM RH**

    HINT:

    Perform the same procedure as for the LH side.

55. **REMOVE FRONT DRIVE SHAFT ASSEMBLY LH** . Refer to **REMOVAL - Step 9**
56. **REMOVE FRONT DRIVE SHAFT ASSEMBLY RH** . Refer to **REMOVAL - Step 10**
57. **REMOVE FLYWHEEL HOUSING UNDER COVER**
    a. Remove the flywheel housing under cover.

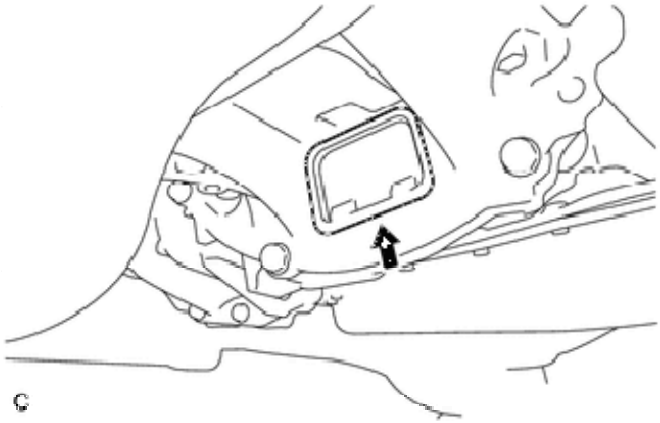
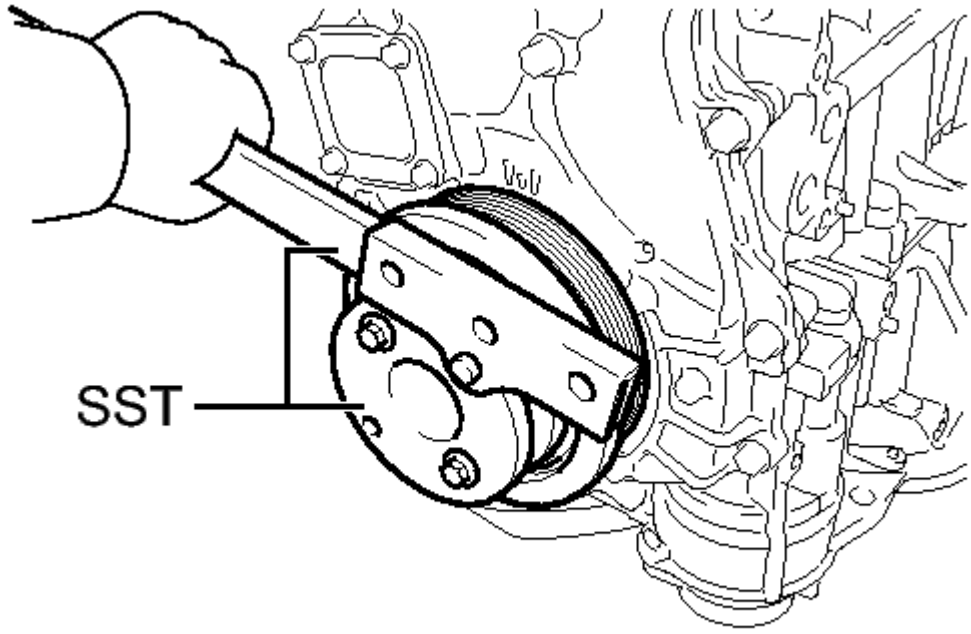


Fig. 155: Identifying Flywheel Housing Under Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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



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Fig. 156: Holding Crankshaft Pulley Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- **SST: 09213-54015**
- **SST: 09330-00021**
- **SST: 91551-80650**

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



Fig. 157: Identifying Torque Converter Clutch Setting Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

There is one black colored bolt.

59. **REMOVE ENGINE ASSEMBLY WITH TRANSAXLE**

a. Set the engine lifter.

NOTE:

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

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

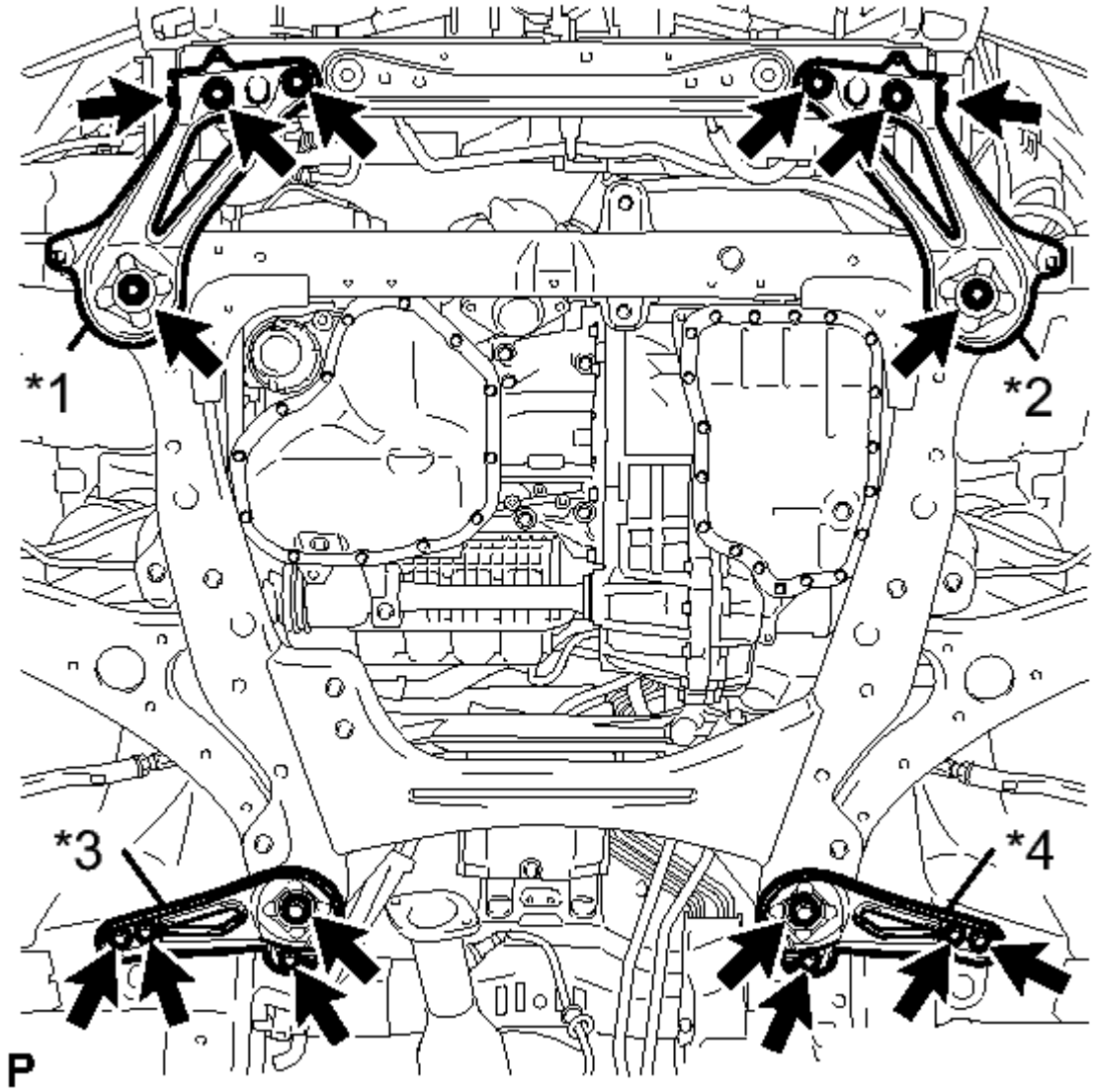


Fig. 158: Identifying Frame Side Rail Plates LH/RH & Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Frame side rail plate RH
*2	Frame side rail plate LH
*3	Front suspension member rear braces RH
	Front

*4	suspension member rear braces LH

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

NOTE:

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

e. Install the 2 engine hangers with the 2 bolts.

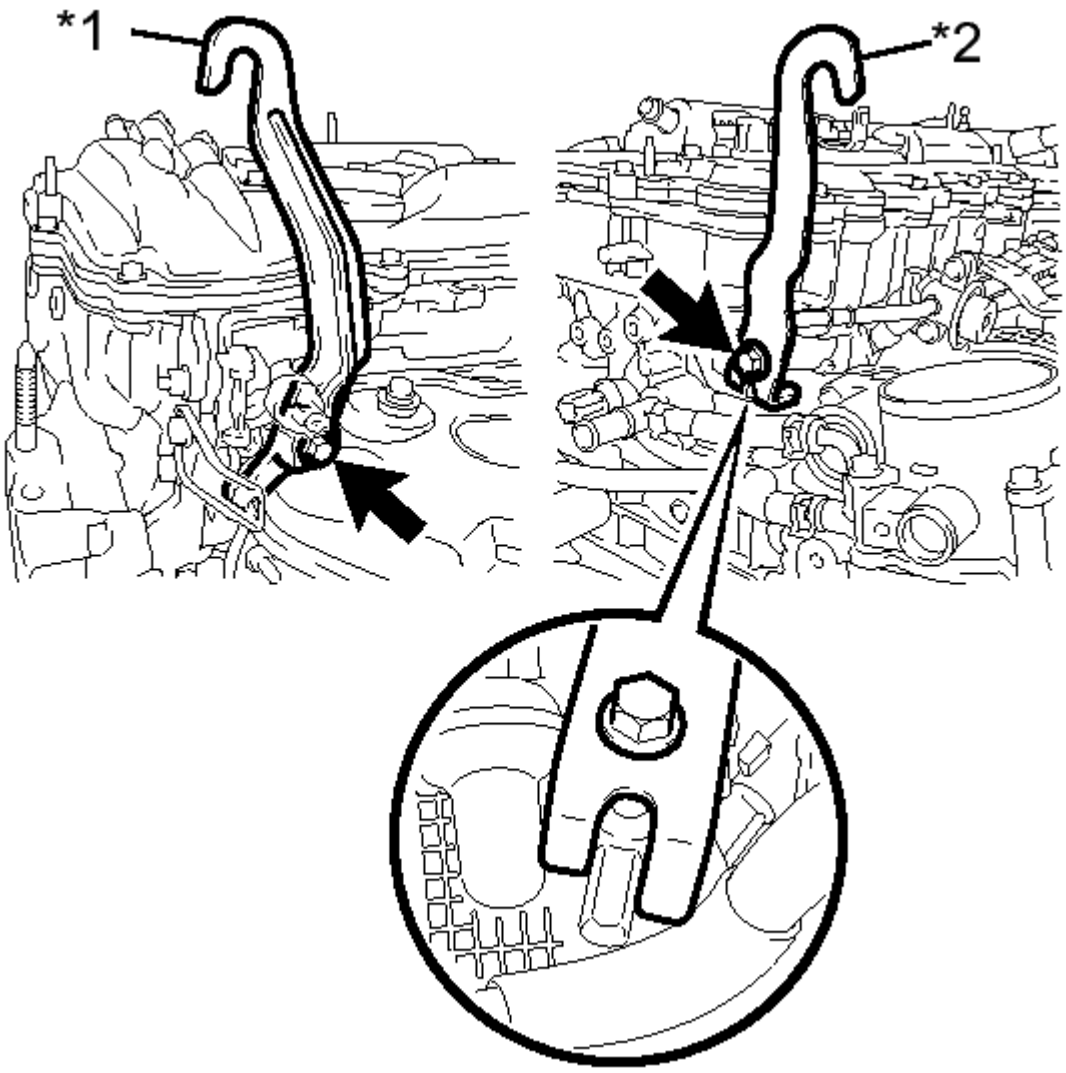


Fig. 159: Identifying No. 1 & No. 2 Engine Hangers & Bolts

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

TEXT IN ILLUSTRATION

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

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

PART NO.

Item	Part No.
No. 1 engine hanger	12281-36020
No. 2 engine hanger	12282-36020
Bolt	91552-81040, 91552-81025

HINT:

Fit the fork part of the No. 2 engine hanger onto the rib of the cylinder head.

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

60. **REMOVE FAN AND GENERATOR V BELT** See step 3
61. **REMOVE GENERATOR ASSEMBLY** . Refer to **REMOVAL - Step 3**
62. **REMOVE COOLER COMPRESSOR ASSEMBLY** . Refer to **REMOVAL - Step 20**
63. **REMOVE STARTER ASSEMBLY** . Refer to **REMOVAL - Step 5**
64. **REMOVE DRIVE SHAFT BEARING BRACKET**
    a. Remove the 3 bolts and the drive shaft bearing bracket.

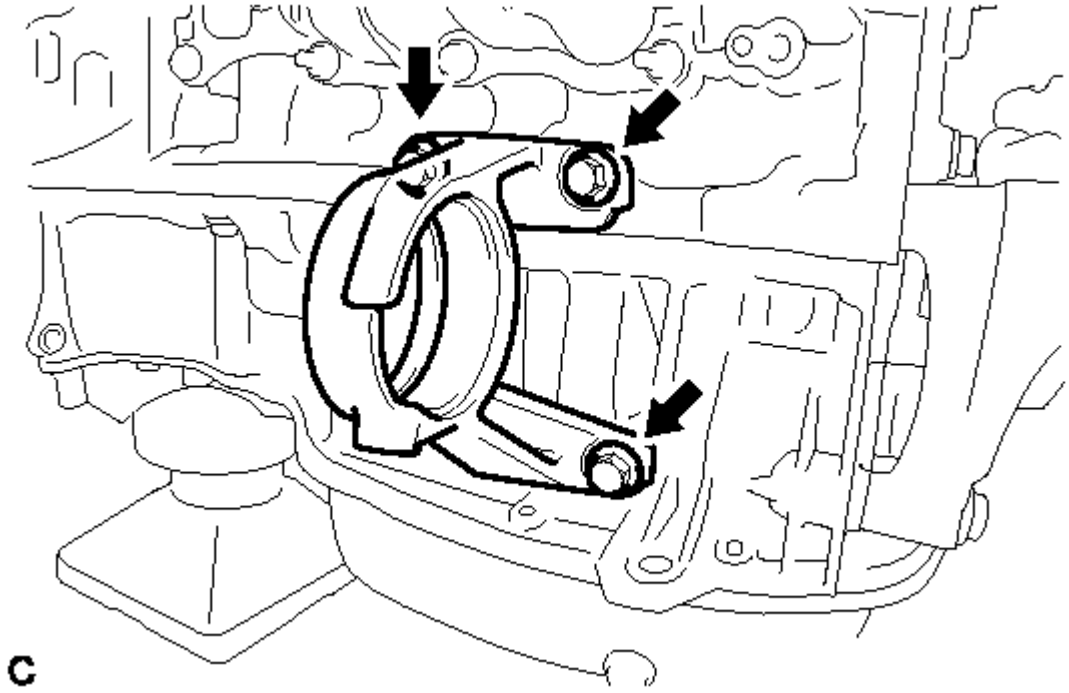


Fig. 160: Identifying Drive Shaft Bearing Bracket Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

65. **REMOVE ENGINE WIRE**
    a. Remove the engine wire from the engine with transaxle.
66. **REMOVE FRONT FRAME ASSEMBLY**

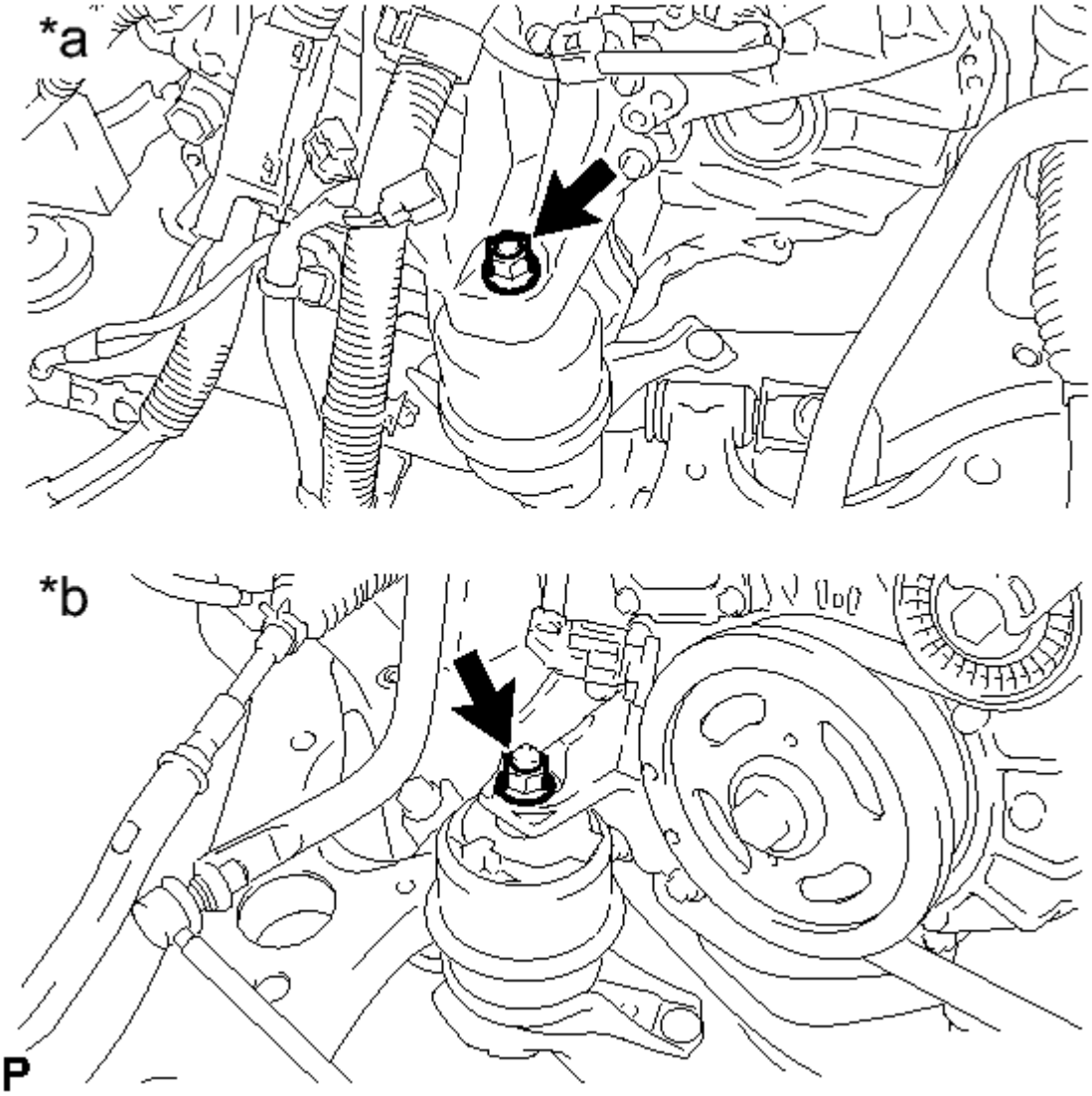


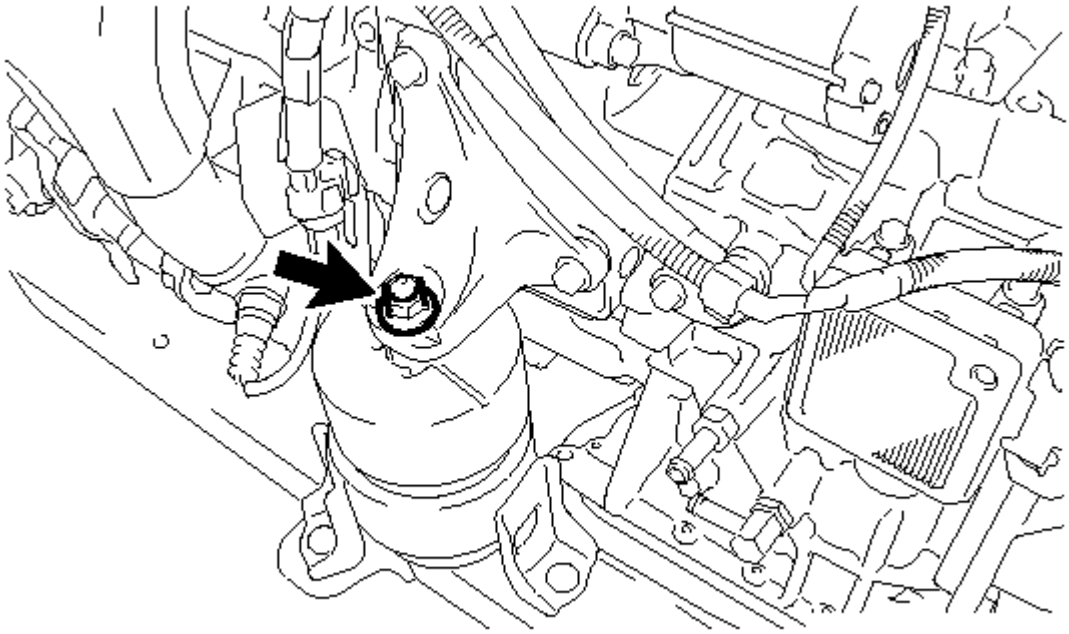
Fig. 161: Identifying Engine Mounting Insulators LH/RH & Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the 2 nuts and separate the engine mounting insulators LH and RH.

TEXT IN ILLUSTRATION

*a	Engine mounting insulator LH
*b	Engine mounting insulator RH

b. Remove the nut and separate the front engine mounting insulator.



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Fig. 162: Identifying Front Engine Mounting Insulator & Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Remove the front frame from the engine with transaxle.

67. **REMOVE AUTOMATIC TRANSAXLE ASSEMBLY** . Refer to **REMOVAL - Step 4**
68. **REMOVE ENGINE MOUNTING BRACKET RH**
    a. Remove the 3 bolts and engine mounting bracket RH.

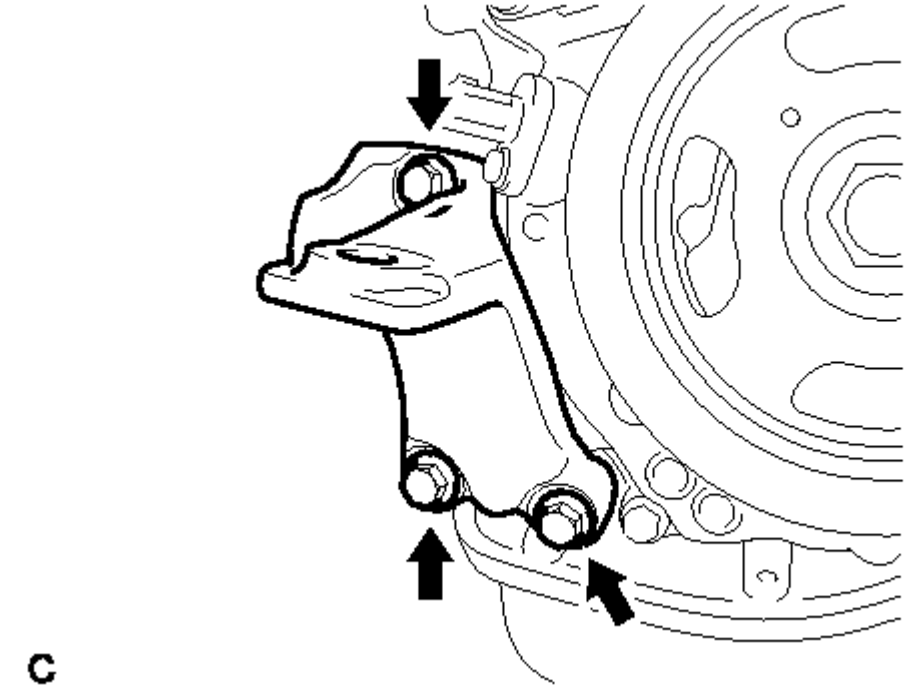


Fig. 163: Identifying Engine Mounting Bracket RH Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

69. **REMOVE DRIVE PLATE AND RING GEAR SUB-ASSEMBLY** See step 2

INSTALLATION

INSTALLATION

1. **INSTALL DRIVE PLATE AND RING GEAR SUB-ASSEMBLY** See step 2
2. **INSTALL ENGINE MOUNTING BRACKET RH**
   a. Install the engine mounting bracket RH with the 3 bolts.

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

3. **INSTALL AUTOMATIC TRANSAXLE ASSEMBLY** . Refer to **INSTALLATION - Step 9**
4. **INSTALL FRONT FRAME ASSEMBLY**
   a. Set the engine with transaxle to the front frame.
   b. Install the engine mounting insulators LH and RH with the 2 nuts.

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

   c. Install the front engine mounting insulator with the nut.

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

5. **INSTALL ENGINE WIRE**
    a. Install the engine wire to the engine with transaxle.
6. **INSTALL DRIVE SHAFT BEARING BRACKET**
    a. Install the drive shaft bearing bracket with the 3 bolts.

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

7. **INSTALL STARTER ASSEMBLY** . Refer to **INSTALLATION - Step 1**
8. **INSTALL COOLER COMPRESSOR ASSEMBLY** . Refer to **INSTALLATION - Step 2**
9. **INSTALL GENERATOR ASSEMBLY** . Refer to **INSTALLATION - Step 1**
10. **INSTALL FAN AND GENERATOR V BELT** See step 1
11. **INSTALL ENGINE ASSEMBLY WITH TRANSAXLE**
    a. Set the engine with transaxle on the engine lifter.

        NOTE:

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

        HINT:

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

    b. Remove the 2 bolts and 2 engine hangers.
    c. Install the engine with transaxle to the vehicle.

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

        HINT:

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

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

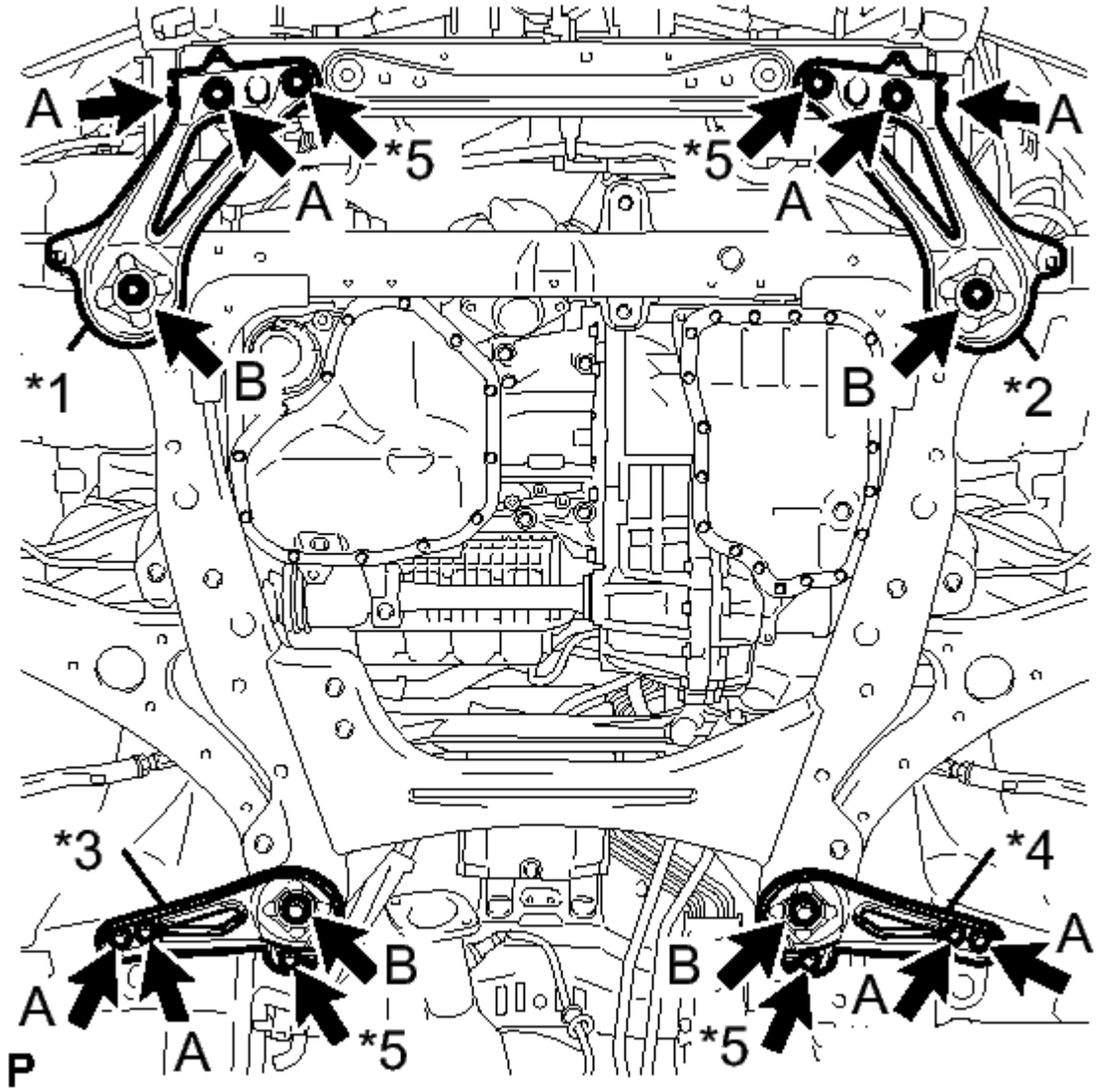


Fig. 164: Identifying Frame Side Rail Plates RH/LH & Fasteners
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Frame side rail plates RH
*2	Frame side rail plates LH
*3	Front suspension member brace rear RH
	Front

*4	suspension member brace rear LH
*5	Nut

Nut

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

Bolt A

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

Bolt B

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

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

Nut

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

Bolt A

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

Bolt B

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

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

a. Using SST, hold the crankshaft pulley.

- **SST: 09213-54015**
- **SST: 09330-00021**
- **SST: 91551-80650**

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

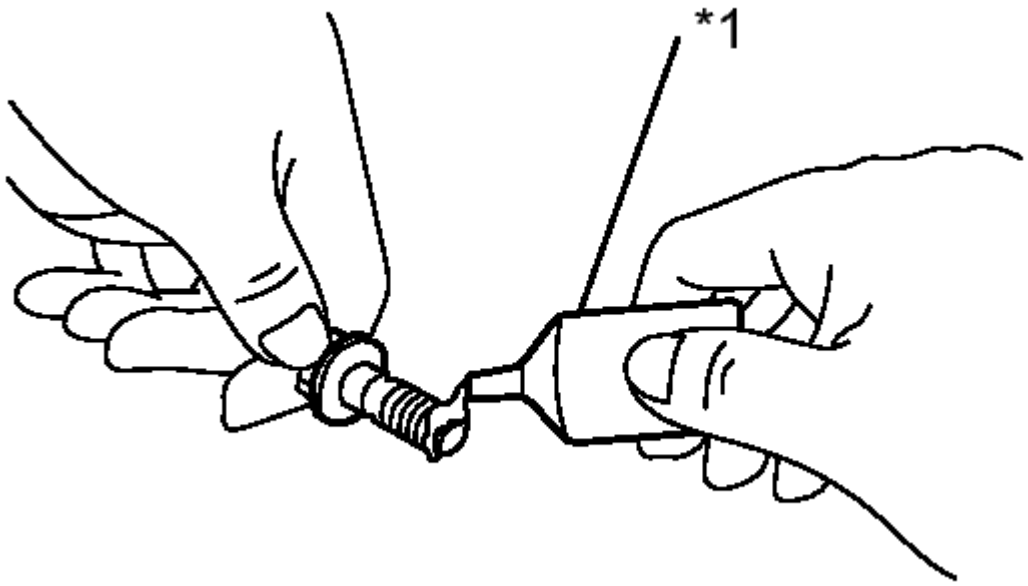


Fig. 165: Applying Adhesive To Bolt Threads
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Adhesive 1324

Adhesive

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent.

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

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

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

13. **INSTALL FLYWHEEL HOUSING UNDER COVER**
    a. Install the flywheel housing under cover.
14. **INSTALL FRONT DRIVE SHAFT ASSEMBLY LH** . Refer to **INSTALLATION - Step 1**
15. **INSTALL FRONT DRIVE SHAFT ASSEMBLY RH** . Refer to **INSTALLATION - Step 2**
16. **INSTALL FRONT LOWER SUSPENSION ARM LH** . Refer to **INSTALLATION - Step 7**
17. **INSTALL FRONT LOWER SUSPENSION ARM RH**

HINT:

Perform the same procedure as for the LH side.

18. **CONNECT TIE ROD ASSEMBLY LH** . Refer to **INSTALLATION - Step 5**
19. **CONNECT TIE ROD ASSEMBLY RH**

    HINT:

    Perform the same procedure as for the LH side.

20. **CONNECT FRONT SPEED SENSOR LH** . Refer to **INSTALLATION - Step 6**
21. **CONNECT FRONT SPEED SENSOR RH**

    HINT:

    Perform the same procedure as for the LH side.

22. **CONNECT FRONT STABILIZER LINK ASSEMBLY LH** . Refer to **INSTALLATION - Step 10**
23. **CONNECT FRONT STABILIZER LINK ASSEMBLY RH**

    HINT:

    Perform the same procedure as for the LH side.

24. **INSTALL FRONT AXLE SHAFT NUT LH** . Refer to **INSTALLATION - Step 8**
25. **INSTALL FRONT AXLE SHAFT NUT RH**

    HINT:

    Perform the same procedure as for the LH side.

26. **CONNECT STEERING INTERMEDIATE SHAFT ASSEMBLY** . Refer to **INSTALLATION - Step 9**
27. **INSTALL FRONT EXHAUST PIPE ASSEMBLY** . Refer to **INSTALLATION - Step 2**
28. **CONNECT SUCTION HOSE SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 3**
29. **CONNECT DISCHARGE HOSE SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 4**
30. **INSTALL ENGINE MOVING CONTROL ROD**
    a. Temporarily install the engine moving control rod and No. 3 engine mounting stay to the engine moving control rod bracket with the 2 bolts.

       HINT:

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

31. **INSTALL ENGINE MOVING CONTROL ROD SUB-ASSEMBLY**
    a. When replacing the engine moving control rod.

1. Temporarily tighten the engine moving control rod sub-assembly with the 4 bolts.
2. Fully tighten the 4 A bolts in the order shown in the illustration.

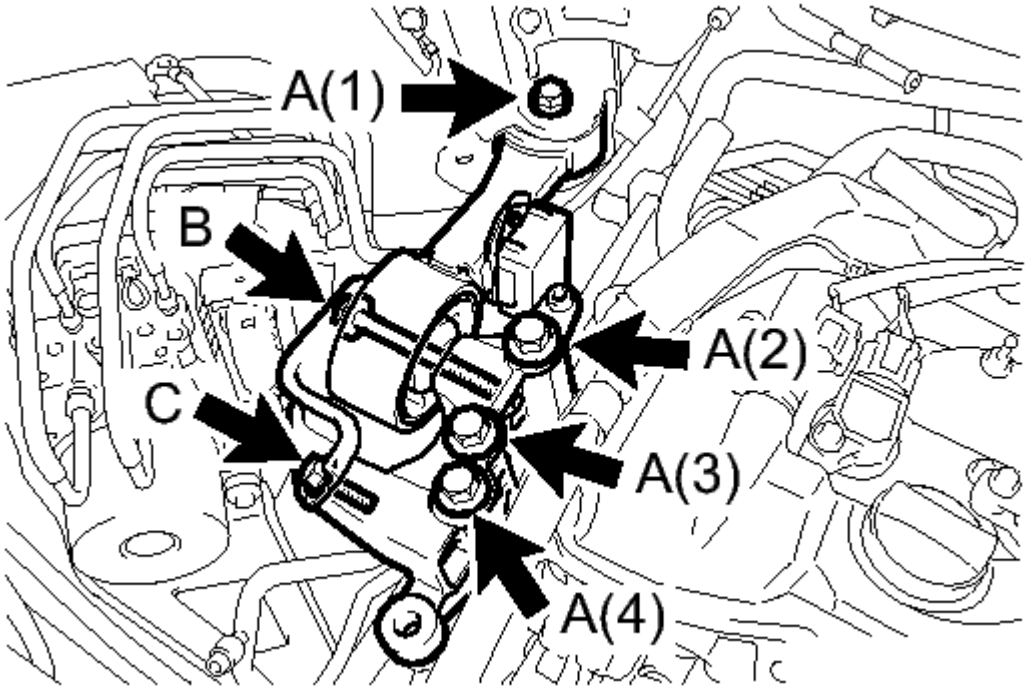


Fig. 166: Identifying Engine Moving Control Rod Sub-Assembly With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

3. Fully tighten the bolt B.

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

4. Fully tighten the bolt C.

   Torque: 45 N*m (459 kgf*cm, 33 ft.*lbf)

b. When not replacing the engine moving control rod.

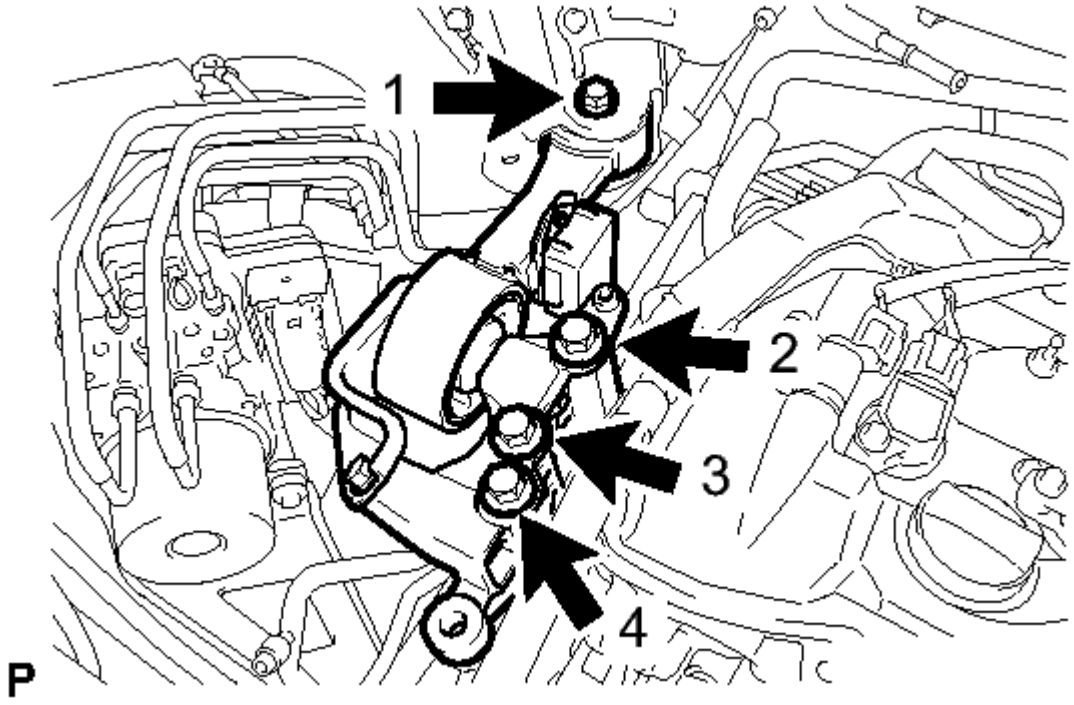


Fig. 167: Identifying Engine Moving Control Rod Sub-Assembly With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Install the engine moving control rod sub-assembly with the 4 bolts in the order shown in the illustration.

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

c. Connect the ground wire with the bolt.

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

32. **INSTALL NO. 2 ENGINE MOUNTING STAY RH**
    a. Install the No. 2 engine mounting stay RH with the 2 bolts.

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

33. **CONNECT INLET NO. 1 OIL COOLER HOSE**
    a. Connect the inlet No. 1 oil cooler hose with the hose clip.
34. **CONNECT OUTLET NO. 1 OIL COOLER HOSE**
    a. Connect the outlet No. 1 oil cooler hose with the hose clip.
35. **CONNECT UNION TO CONNECTOR TUBE HOSE**
    a. Connect the 2 union to check valve hoses with the 2 clips.
36. **CONNECT FUEL TUBE SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 6**
37. **INSTALL EFI FUEL PIPE CLAMP** . Refer to **INSTALLATION - Step 7**

38. **CONNECT INLET HEATER WATER HOSE**

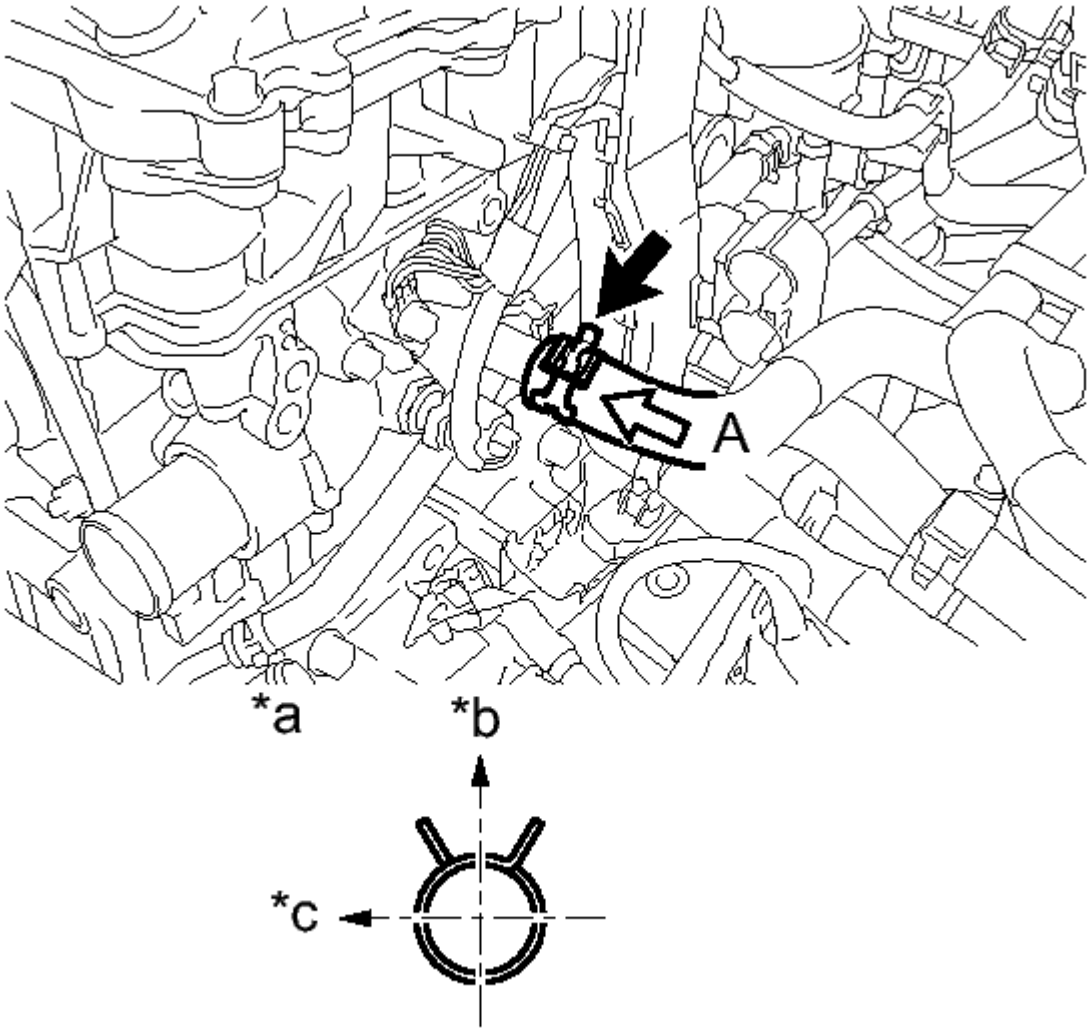


Fig. 168: Connecting Inlet Heater Water Hose & Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Connect the inlet heater water hose with the hose clip.

TEXT IN ILLUSTRATION

*a	View A
*b	Upper
*c	Front of Vehicle

NOTE: **Install the clip so that its claws positioned as shown in the illustration.**

39. **CONNECT OUTLET HEATER WATER HOSE**

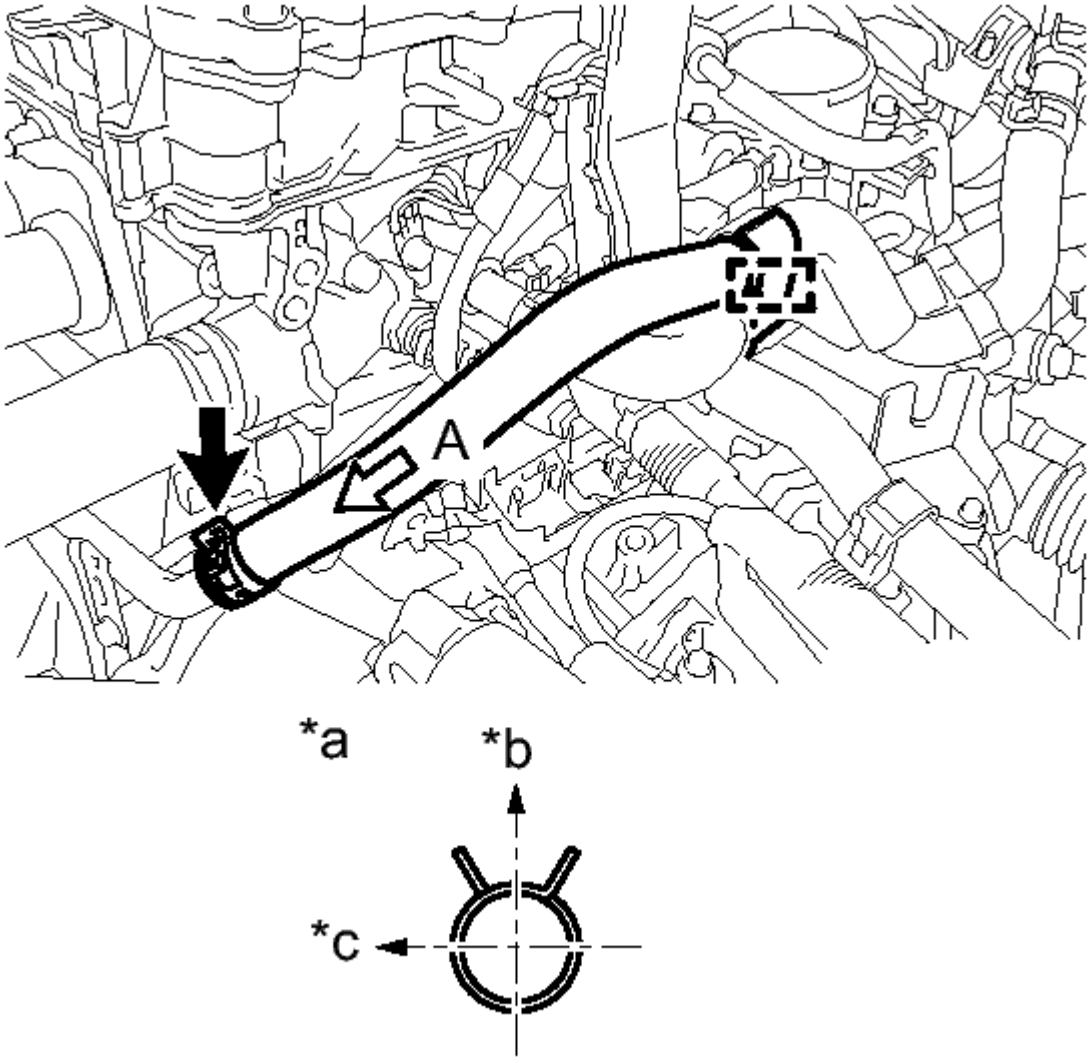


Fig. 169: Connecting Outlet Heater Water Hose & Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Connect the outlet heater water hose with the hose clip.

TEXT IN ILLUSTRATION

*a	View A
*b	Upper
	Front

*c	of Vehicle

NOTE: **Install the clip so that its claws positioned as shown in the illustration.**

b. Engage the hose clamp.

40. **CONNECT NO. 2 RADIATOR HOSE**

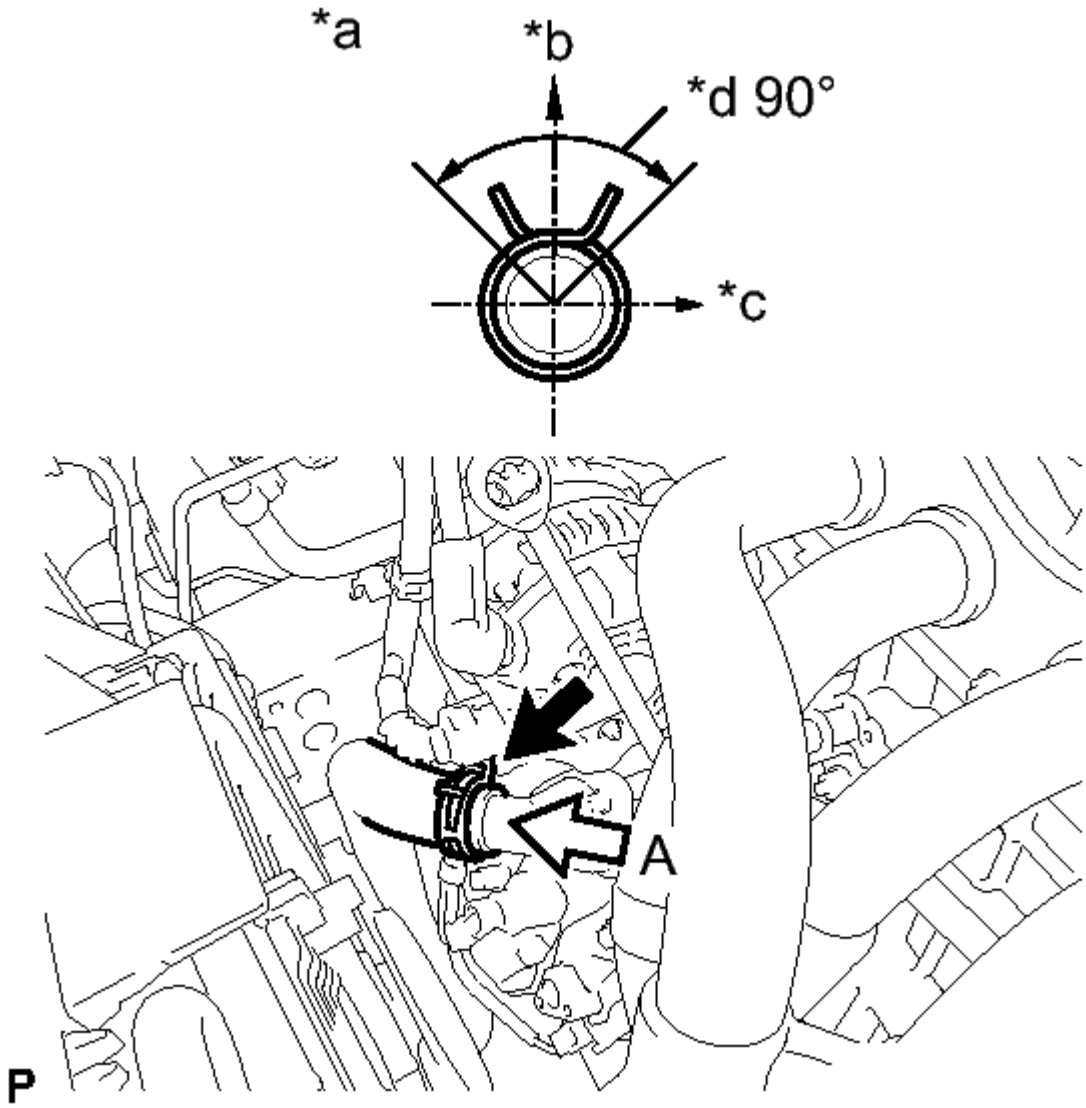


Fig. 170: Connecting No. 2 Radiator Hose & Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Connect the No. 2 radiator hose with the hose clip.

TEXT IN ILLUSTRATION

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

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

41. **CONNECT NO. 1 RADIATOR HOSE**

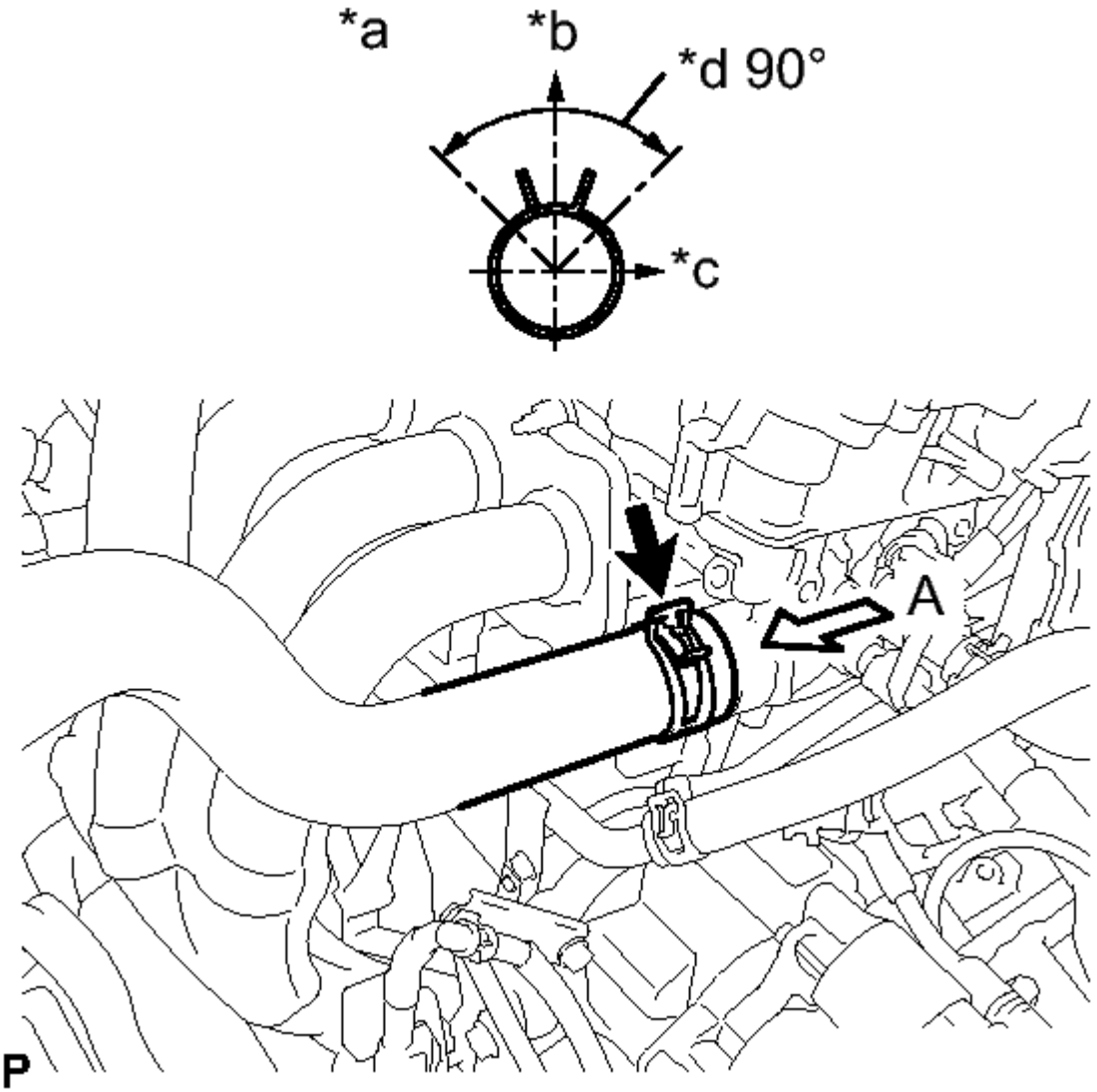


Fig. 171: Connecting No. 1 Radiator Hose & Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Connect the No. 1 radiator hose with the hose clip.

TEXT IN ILLUSTRATION

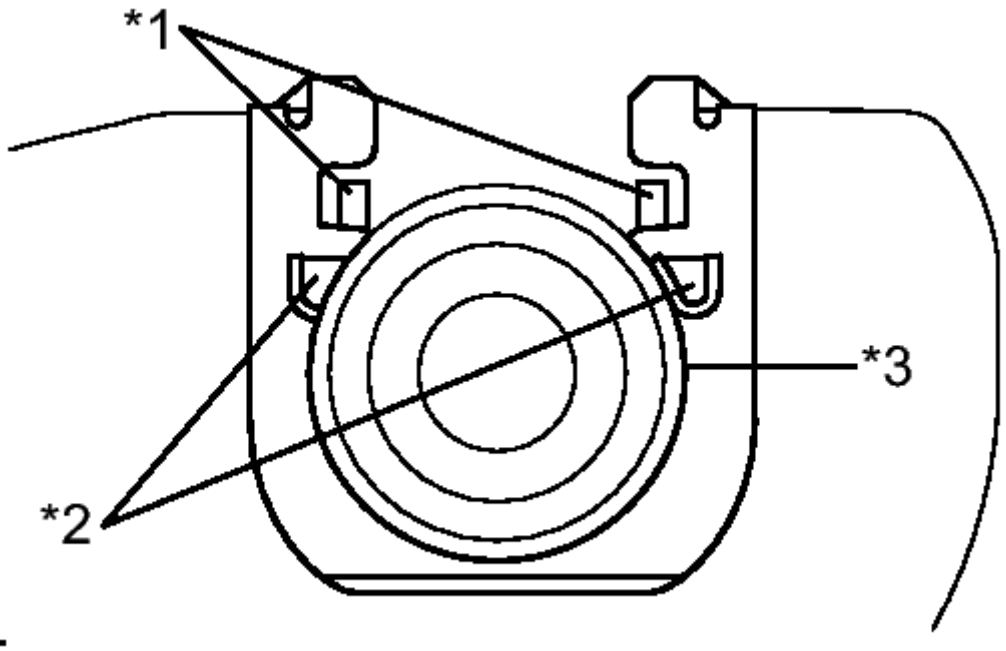
*a	View A
*b	Upper
*c	RH of Vehicle
*d	Clip installation range

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

42. **CONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**

a. Install a new clip to the control cable bracket.

b. Install the control cable to the control cable bracket.



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Fig. 172: Identifying Transmission Control Cable Assembly, Clip & Cable Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Claw (A)
*2	Claw (B)

*3	Control Cable

NOTE:

- **Make sure that the claws (A) on the clip are securely fit into the bracket holes.**
- **Make sure that the cable is securely installed inside of the claws (B) of the clip.**

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

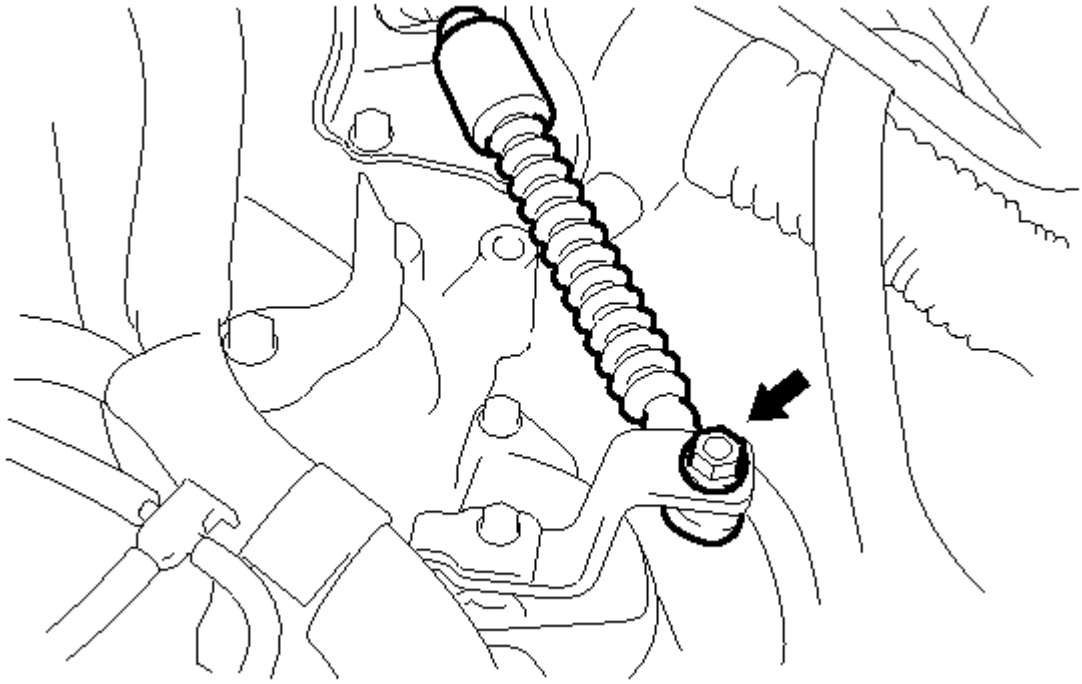


Fig. 173: Identifying Control Shaft Lever Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

43. **CONNECT ENGINE WIRE**

a. Connect the wire harness to the positive (+) battery terminal with the nut.

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

b. Engage the wire harness clamp to the battery carrier.
c. Engage the claw and connect the engine wire to the engine room relay block.

d. Engage the wire harness clamp to the vehicle.
e. Install the engine wire with the nut and 3 connectors.

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

f. Install the ground wire with the bolt.

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

g. Install the engine room relay block cover.
h. Connect the connector to the ECM with the lock lever.

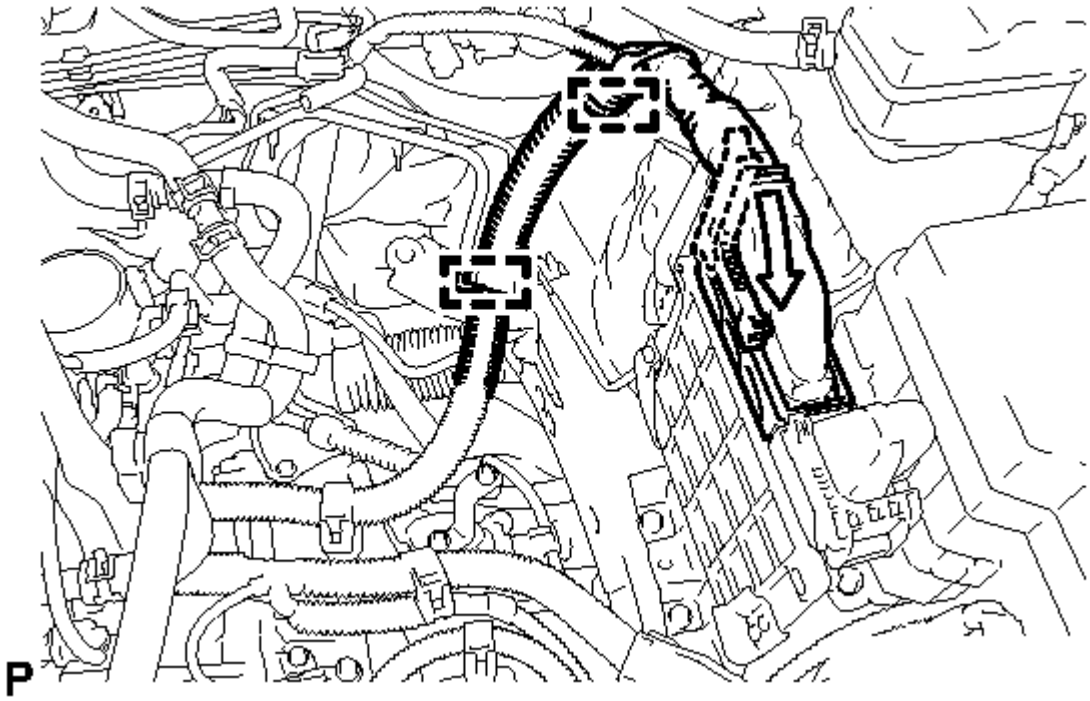


Fig. 174: Connecting ECM Connector & Wire Harness Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

i. Engage the wire 2 harness clamps.

44. **INSTALL AIR CLEANER HOSE**

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

a. Install the air cleaner hose with the hose clip.

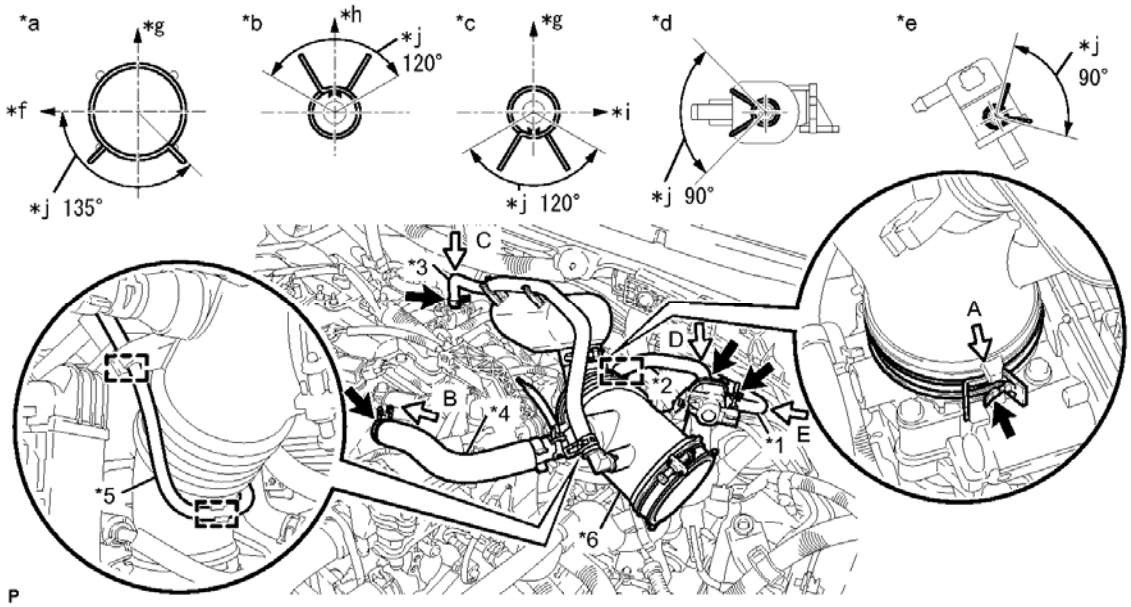


Fig. 175: Identifying Air Cleaner Hose Lip Installation Range
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	No. 1 fuel vapor feed hose	*2	No. 2 fuel vapor feed hose
*3	No. 1 air hose	*4	Ventilation hose
*5	Vacuum hose	*6	Air cleaner hose
*a	View A	*b	View B
*c	View C	*d	View D
*e	View E	*f	LH of Vehicle
*g	Front of Vehicle	*h	Upper
*i	RH of Vehicle	j	Clip installation range

b. Engage the 2 hose clamps and install the vacuum hose.
c. Connect the ventilation hose with the hose clip.
d. Connect the No. 1 air hose with the hose clip.
e. Engage the hose clamp and connect the No. 2 fuel vapor feed hose.
f. Connect the No. 2 fuel vapor feed hose with the hose clip.

g. Connect the No. 1 fuel vapor feed hose with the hose clip.

45. **INSTALL AIR CLEANER ASSEMBLY**

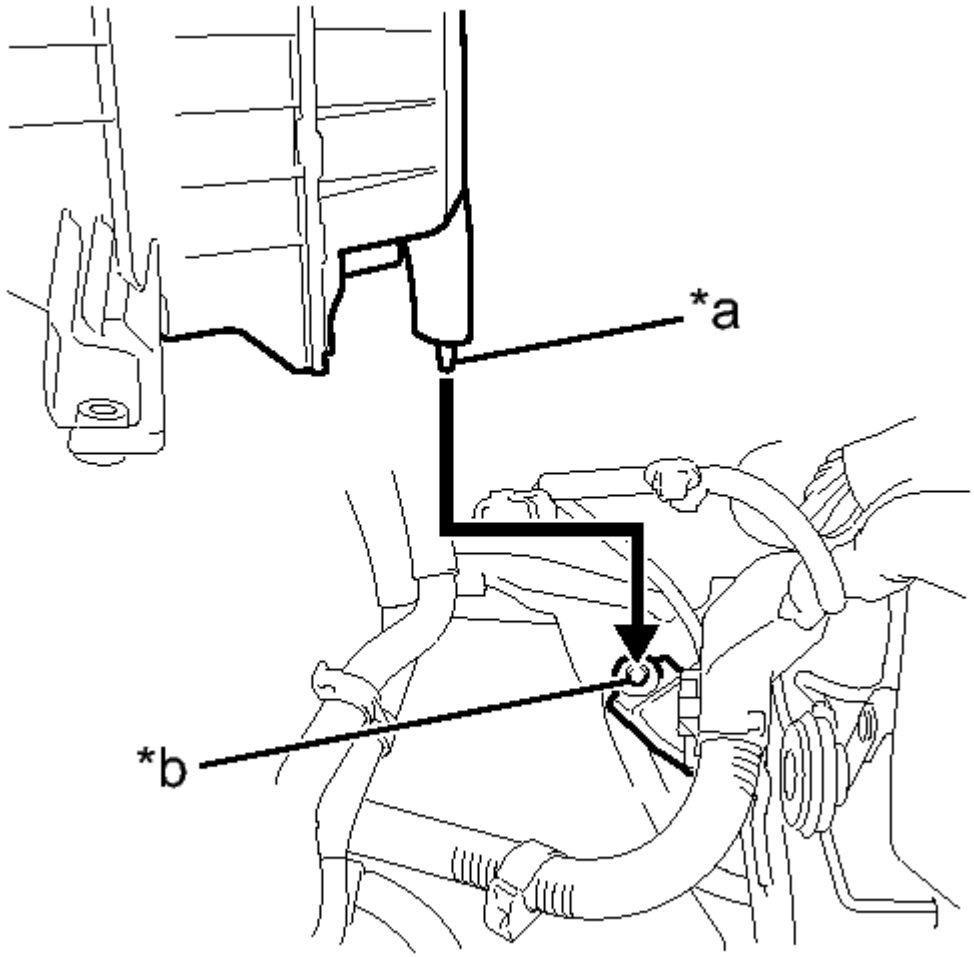


Fig. 176: Installing Air Cleaner Assembly Tab In Hole At Vehicle Body
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Insert the tab of the air cleaner to the hole of the vehicle as shown in the illustration.

TEXT IN ILLUSTRATION

*a	Tab
*b	Hole

b. Install the air cleaner with the 2 bolts.

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

c. Tighten the hose clamp.
d. Connect the vacuum hose and engage the hose clamp.
e. Connect the vacuum switching valve connector and engage the wire harness clamp.
f. Connect the mass air flow meter connector.

46. **INSTALL BATTERY**
    a. Install the battery and battery tray.
    b. Install the battery clamp with the bolt and nut.

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

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

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

47. **INSTALL AIR CLEANER INLET ASSEMBLY**
    a. Install the air cleaner inlet with the 2 bolts.

       Torque: 6.0 N*m (61 kgf*cm, 53 in.*lbf)

48. **INSTALL COWL PANEL SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 12**
49. **INSTALL WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** . Refer to **INSTALLATION - Step 2**
50. **INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 3**
51. **INSTALL FRONT FENDER TO COWL SIDE SEAL LH** . Refer to **INSTALLATION - Step 4**
52. **INSTALL FRONT FENDER TO COWL SIDE SEAL RH** . Refer to **INSTALLATION - Step 5**
53. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY RH** . Refer to **INSTALLATION - Step 6**
54. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY LH** . Refer to **INSTALLATION - Step 7**
55. **INSTALL FRONT WIPER ARM HEAD CAP** . Refer to **INSTALLATION - Step 8**
56. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

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

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

57. **INSTALL FRONT WHEEL**

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

58. **ADD ENGINE OIL** . Refer to **REPLACEMENT - Step 4**

59. **ADD ENGINE COOLANT** . Refer to **REPLACEMENT - Step 3**
60. **ADD AUTOMATIC TRANSAXLE FLUID**

    Refer to **ADJUSTMENT**

61. **WARM UP ENGINE**
62. **INSPECT ENGINE OIL LEVEL** . Refer to **ON-VEHICLE INSPECTION - Step 1**
63. **INSPECT ENGINE COOLANT LEVEL** . Refer to **ON-VEHICLE INSPECTION - Step 2**
64. **CHARGE WITH REFRIGERANT** . Refer to **REPLACEMENT - Step 2**
65. **INSPECT FOR FUEL LEAK** . Refer to **ON-VEHICLE INSPECTION - Step 1**
66. **INSPECT FOR COOLANT LEAK** . Refer to **ON-VEHICLE INSPECTION - Step 1**
67. **INSPECT FOR OIL LEAK**
68. **INSPECT FOR EXHAUST GAS LEAK**
69. **INSPECT IGNITION TIMING** See step 7
70. **INSPECT ENGINE IDLE SPEED** See step 8
71. **INSPECT CO/HC** See step 10
72. **CHECK FOR SPEED SENSOR SIGNAL**

    Refer to **TEST MODE PROCEDURE**

73. **INSPECT SHIFT LEVER POSITION** . Refer to **INSTALLATION - Step 25**
74. **INSPECT AND ADJUST FRONT WHEEL ALIGNMENT**

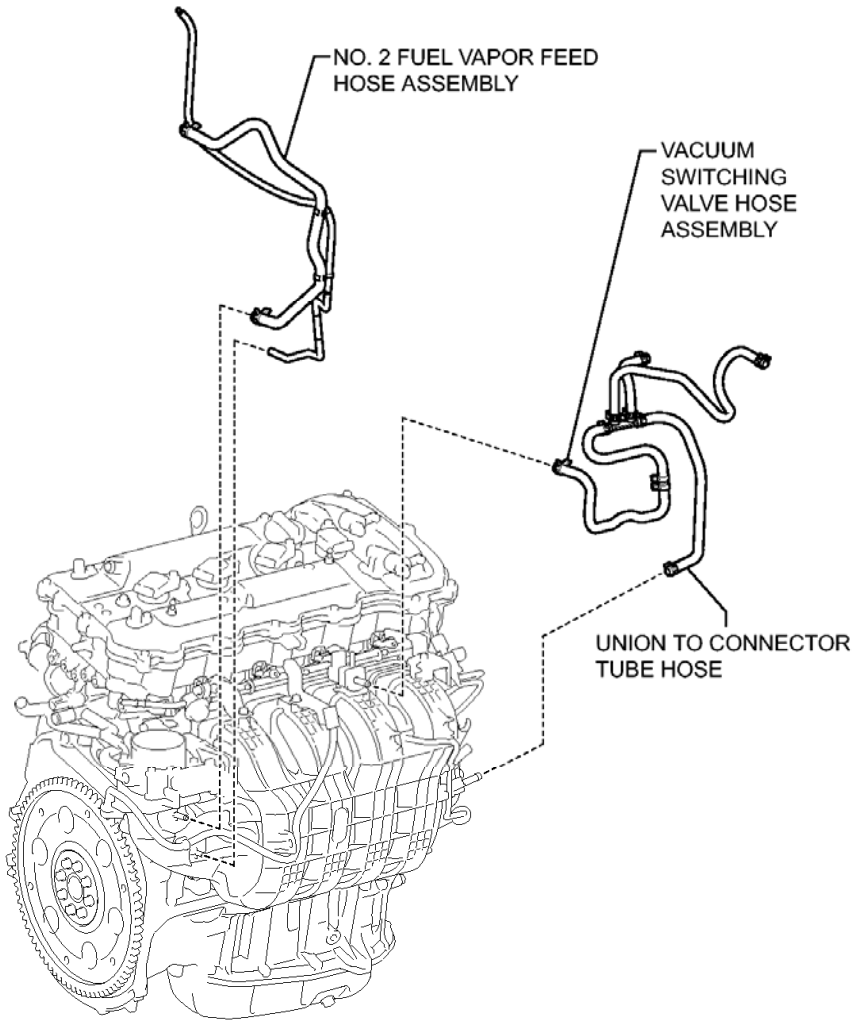
    Refer to **ADJUSTMENT**

75. **INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY**
    a. Fit the 3 retainers and install the No. 1 engine cover.
76. **INSTALL FRONT FENDER APRON SEAL LH**
    a. Install the front fender apron seal LH with the 2 bolts and clip.
77. **INSTALL FRONT FENDER APRON SEAL RH**
    a. Install the front fender apron seal RH with the 2 bolts and clip.
78. **INSTALL NO. 2 ENGINE UNDER COVER**
79. **INSTALL NO. 1 ENGINE UNDER COVER** . Refer to **INSTALLATION - Step 10**

ENGINE UNIT

COMPONENTS

ILLUSTRATION



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Fig. 177: Engine Unit Replacement Components (1 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

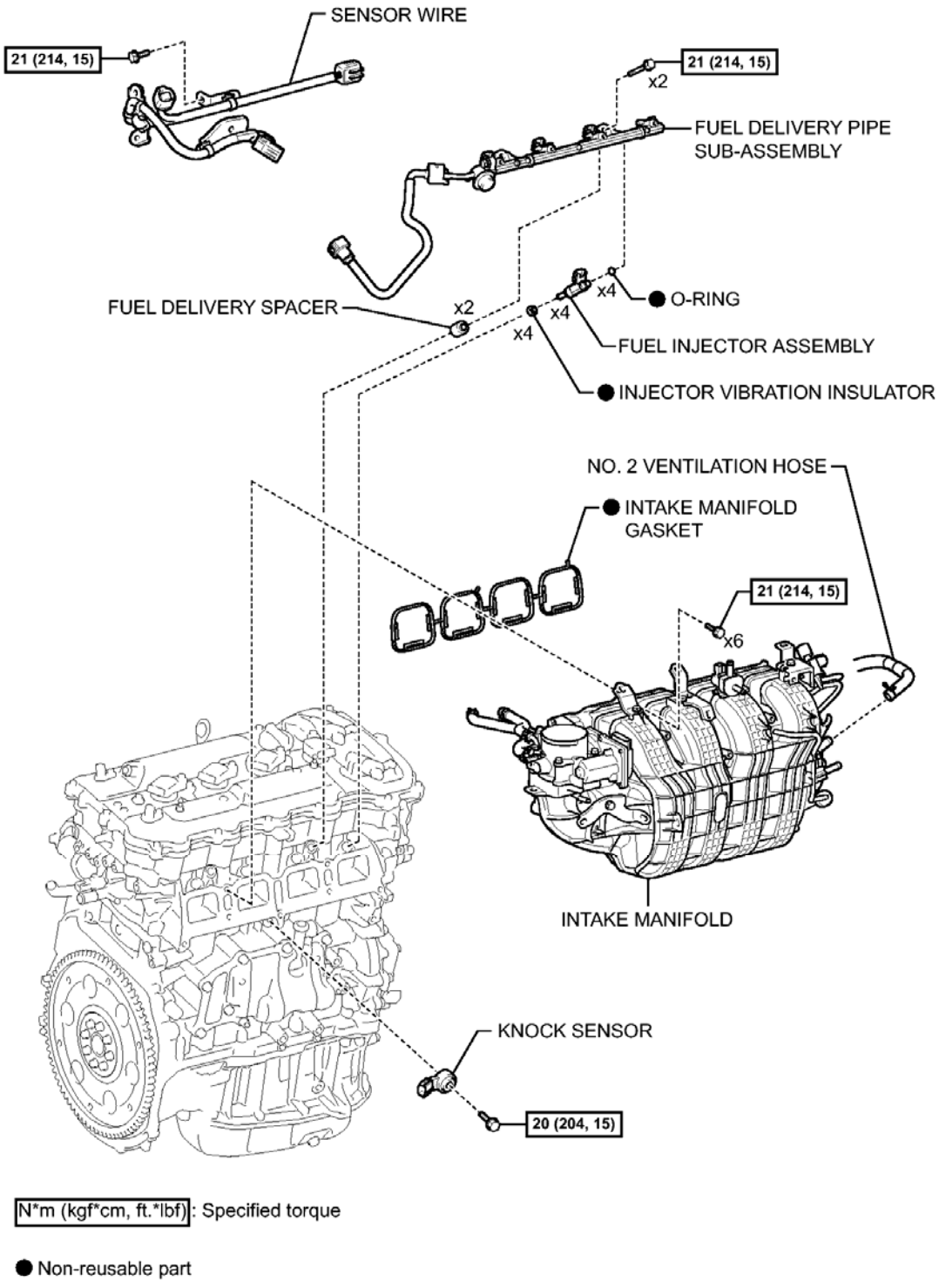
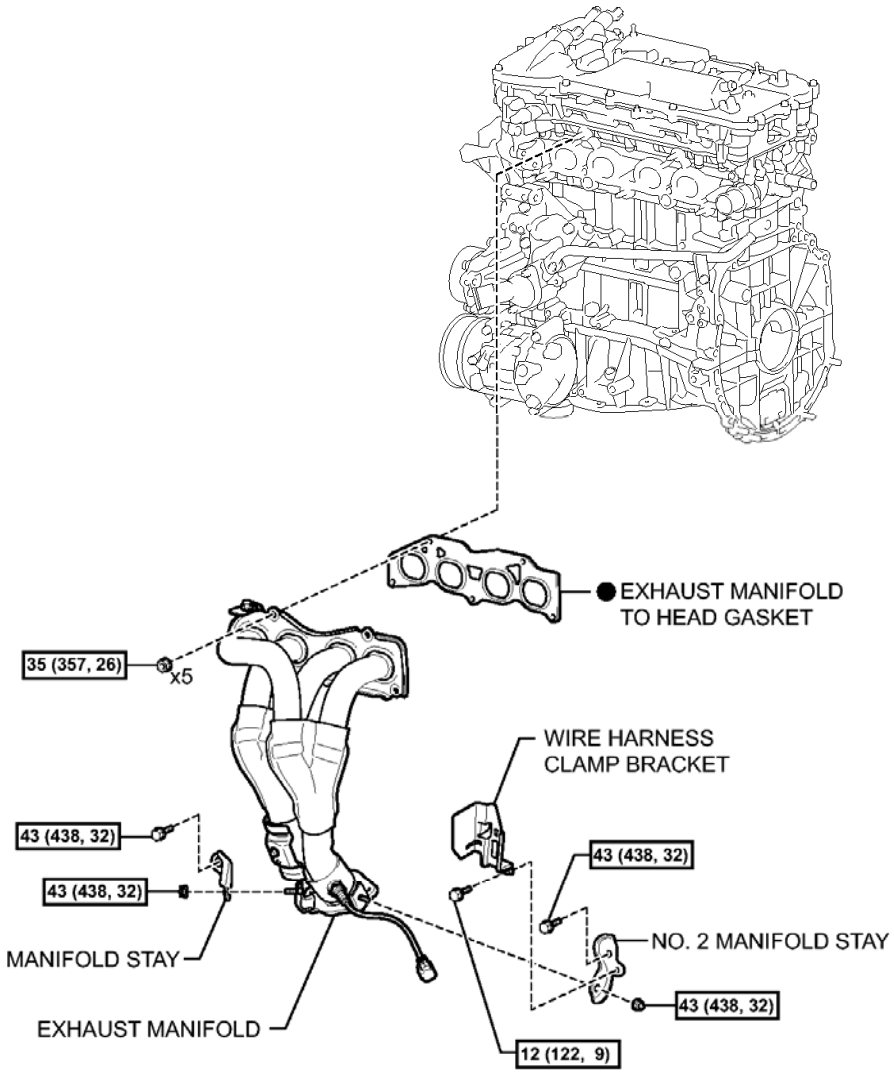


Fig. 178: Engine Unit Replacement Components With Torque Specifications (2 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

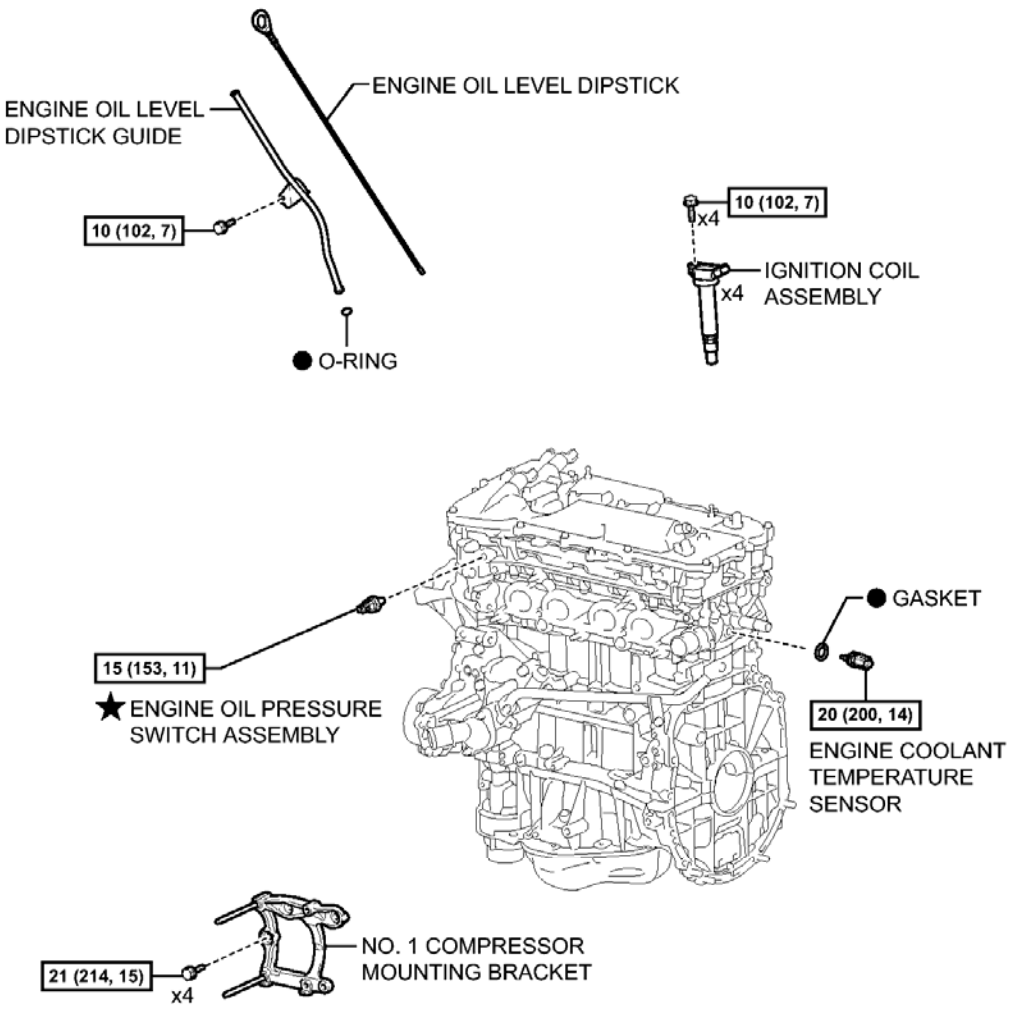
ILLUSTRATION



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Fig. 179: Engine Unit Replacement Components With Torque Specifications (3 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



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

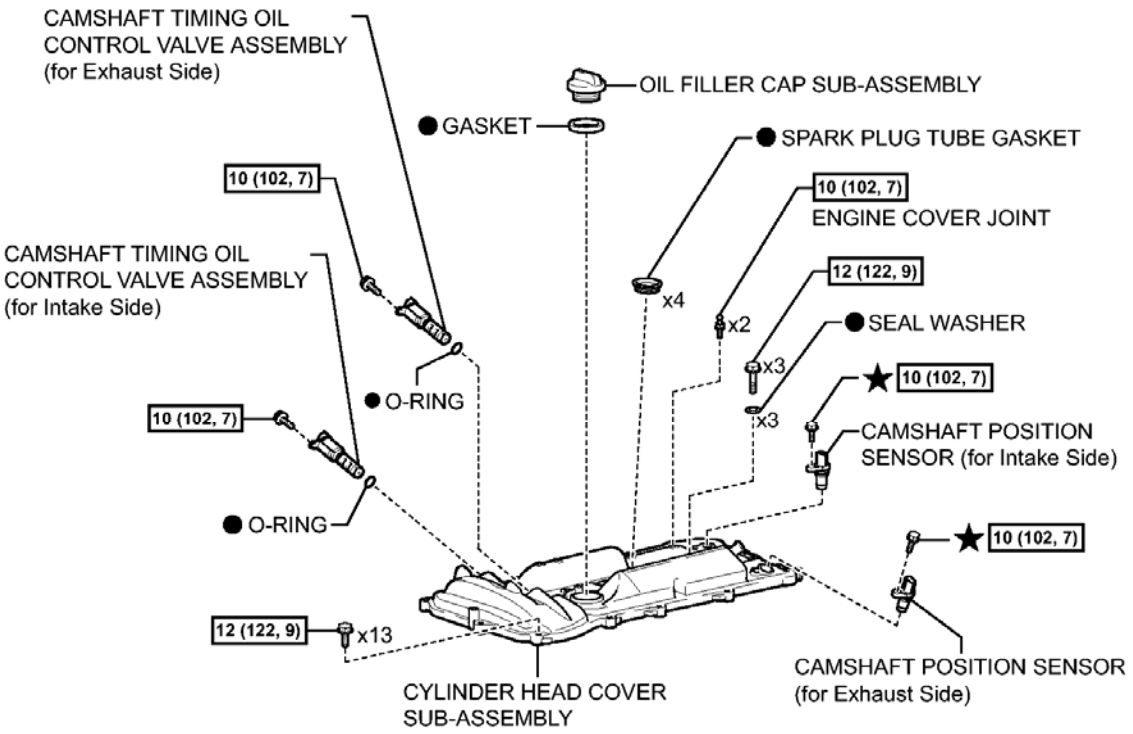
● Non-reusable part

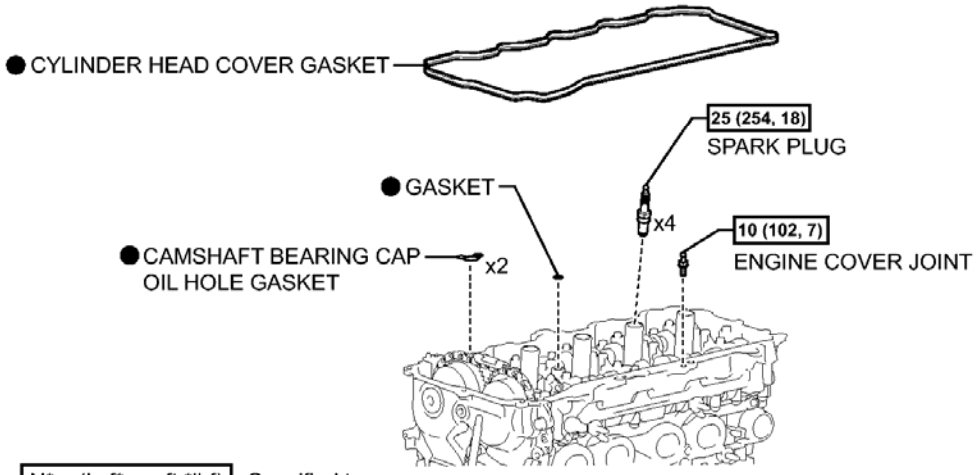
★ Precoated part

c

Fig. 180: Engine Unit 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

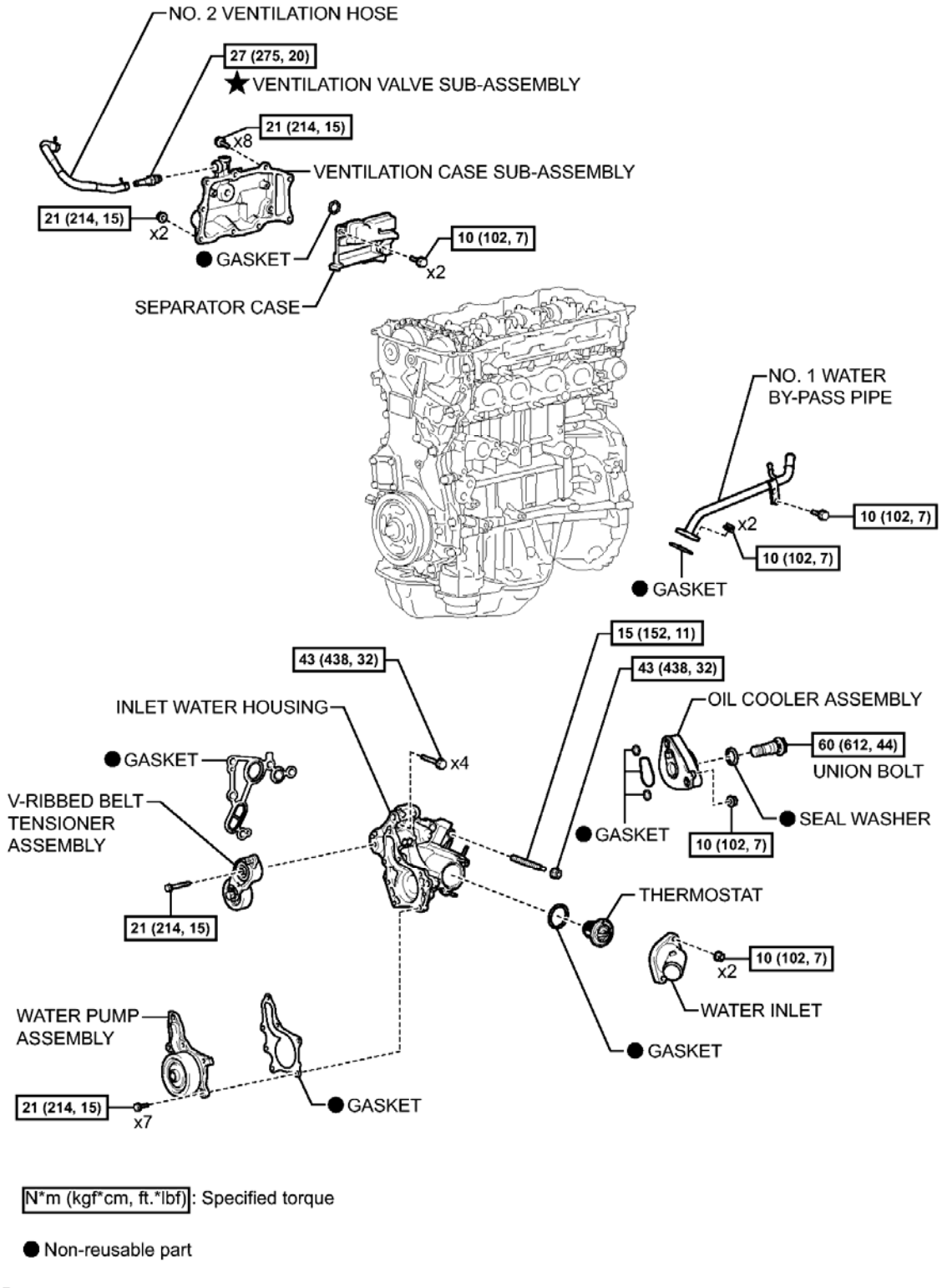
● Non-reusable part

★ Precoated part

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Fig. 181: Engine Unit Replacement Components With Torque Specifications (5 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



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Fig. 182: Engine Unit Replacement Components With Torque Specifications (6 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

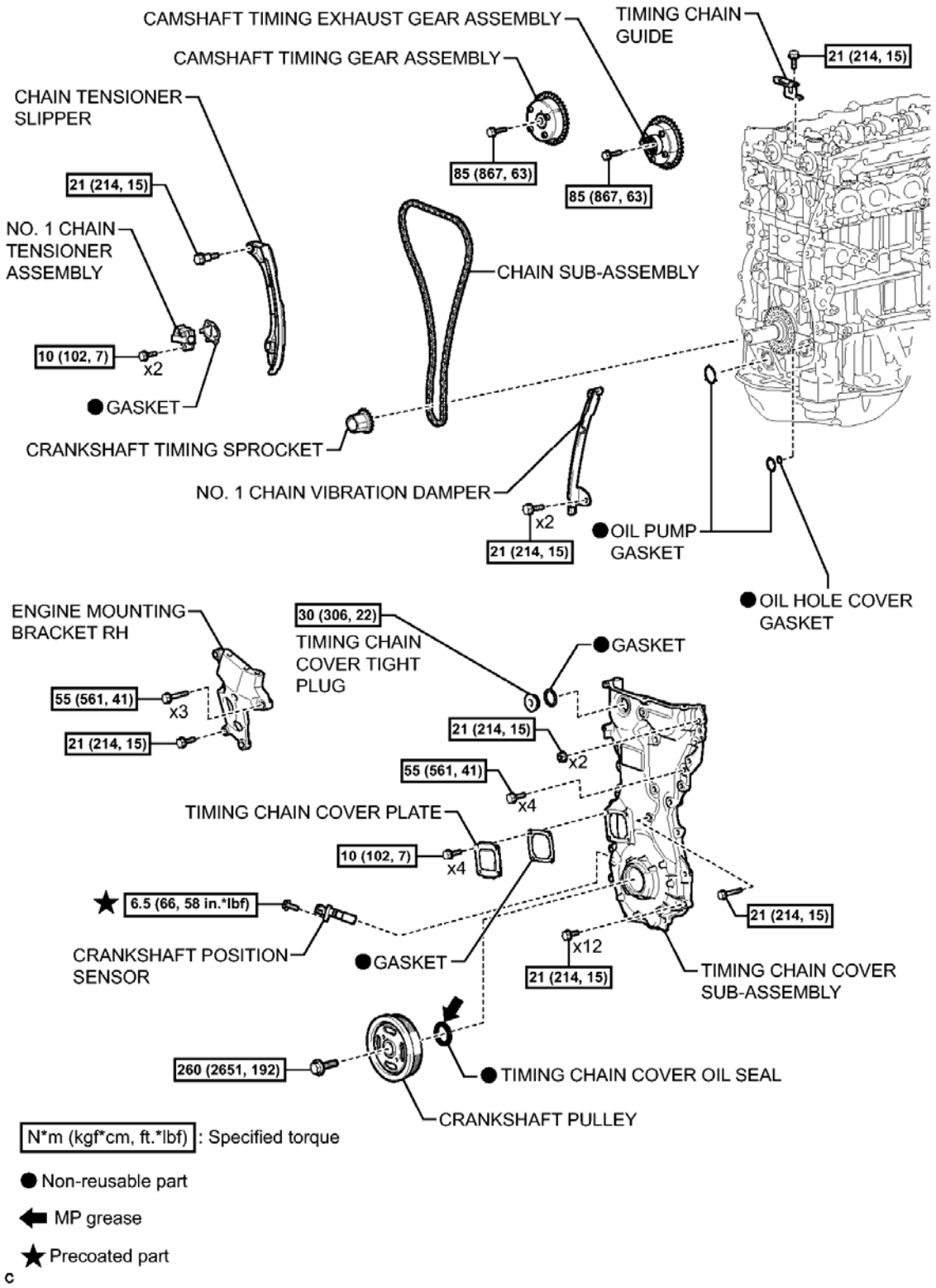
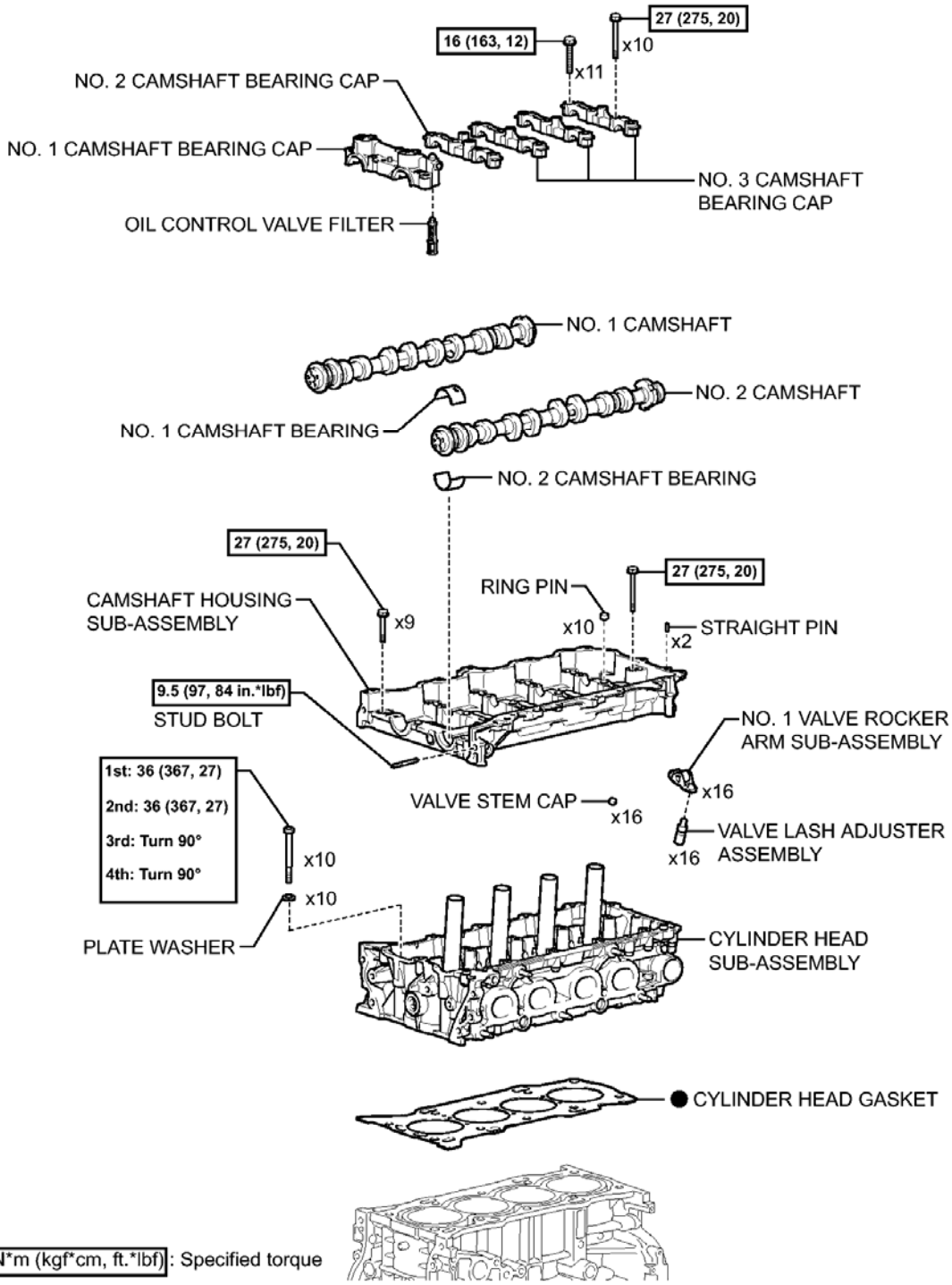


Fig. 183: Engine Unit Replacement Components With Torque Specifications (7 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



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Fig. 184: Engine Unit Replacement Components With Torque Specifications (8 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

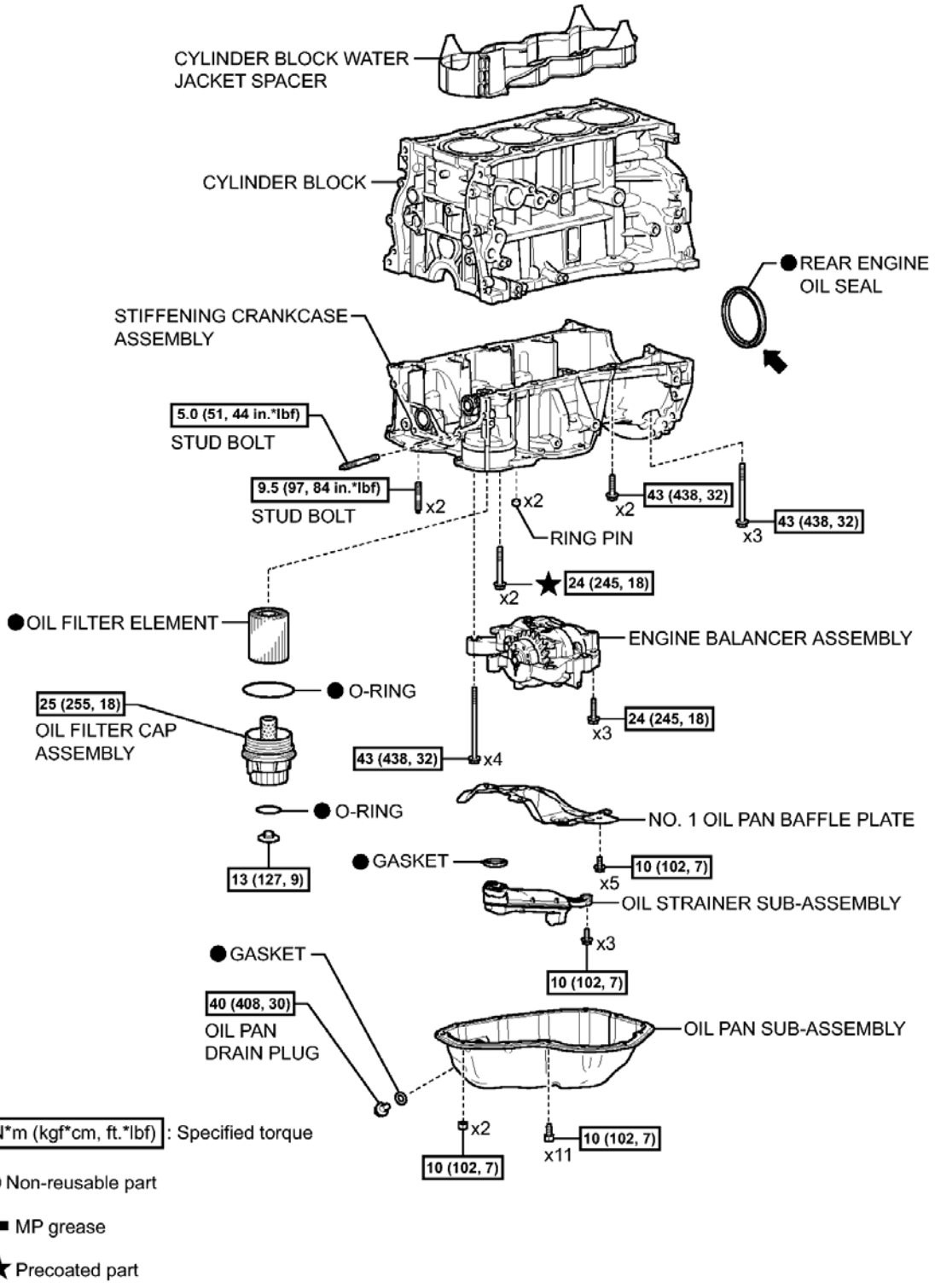


Fig. 185: Engine Unit Replacement Components With Torque Specifications (9 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

REMOVAL

1. **REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE**

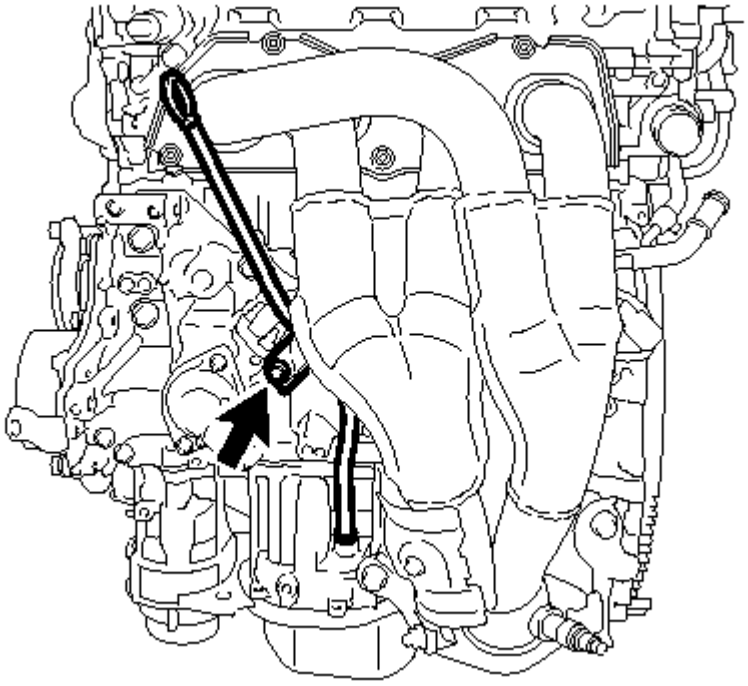
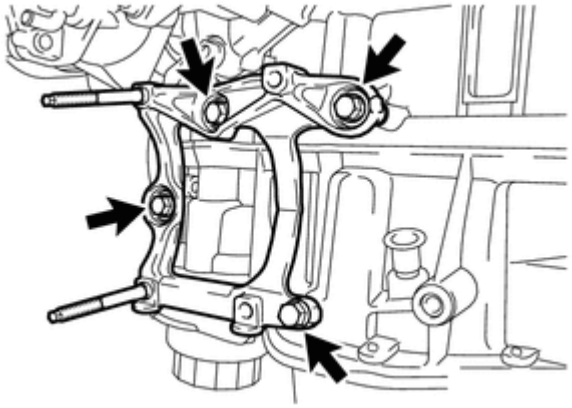


Fig. 186: Identifying Engine Oil Level Dipstick Guide Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   a. Remove the engine oil level dipstick.
   b. Remove the bolt and engine oil level dipstick guide.
   c. Remove the O-ring from the engine oil level dipstick guide.
2. **REMOVE MANIFOLD STAY** . Refer to **REMOVAL - Step 3**
3. **REMOVE NO. 2 MANIFOLD STAY** . Refer to **REMOVAL - Step 4**
4. **REMOVE EXHAUST MANIFOLD** . Refer to **REMOVAL - Step 6**
5. **REMOVE EXHAUST MANIFOLD TO HEAD GASKET** . Refer to **REMOVAL - Step 7**
6. **REMOVE NO. 1 COMPRESSOR MOUNTING BRACKET**

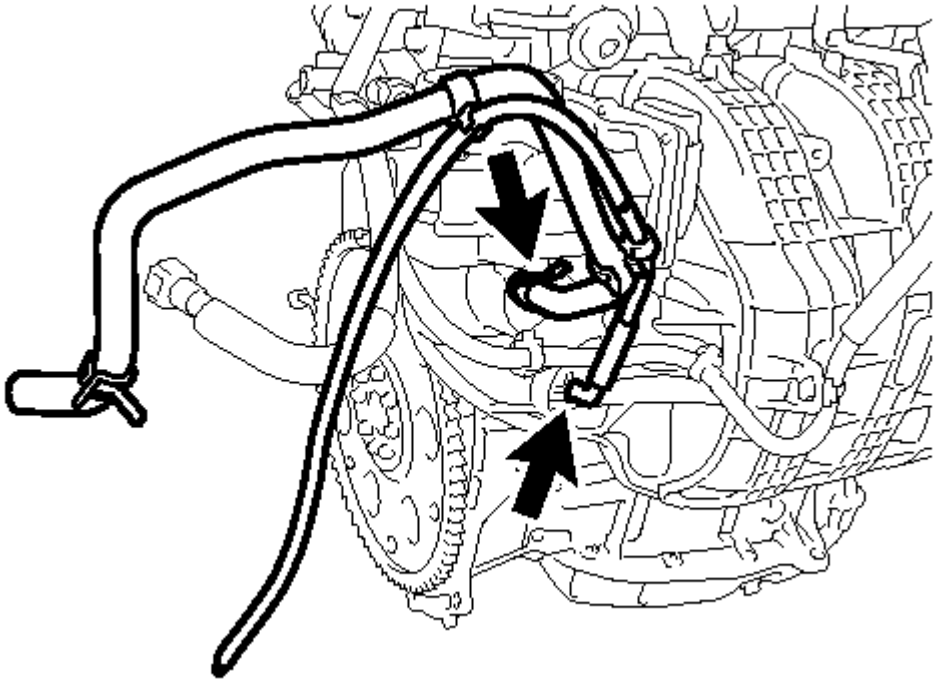


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Fig. 187: Identifying No. 1 Compressor Mounting Bracket Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the 4 bolts and bracket.

7. **REMOVE NO. 2 FUEL VAPOR FEED HOSE ASSEMBLY**

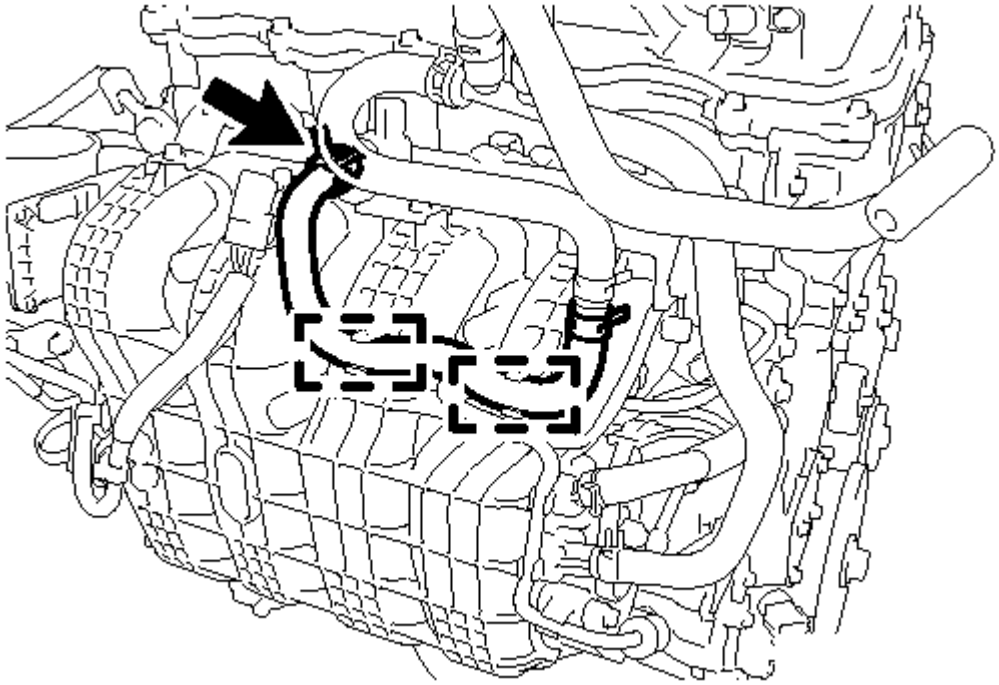


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Fig. 188: Identifying No. 2 Fuel Vapor Feed Hose & Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Disconnect the vacuum hose.
b. Loosen the hose clip and remove the No. 2 fuel vapor feed hose.

8. **DISCONNECT VACUUM SWITCHING VALVE HOSE ASSEMBLY**

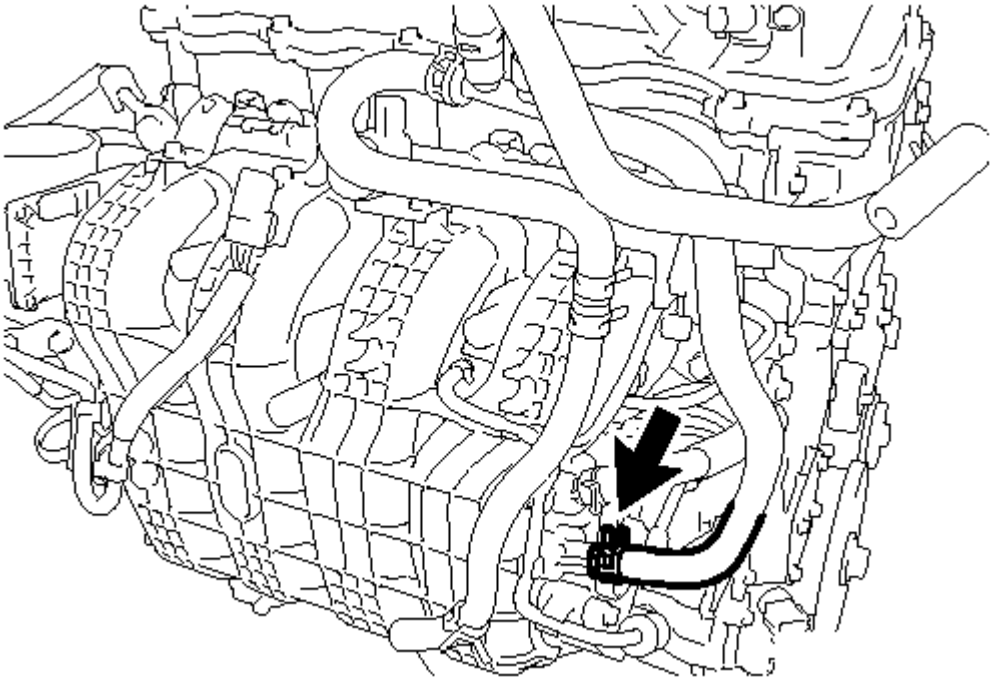


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Fig. 189: Identifying Vacuum Switching Valve Hose, Clamps & Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Disengage the 2 hose clamps and disconnect the vacuum switching valve hose.
b. Loosen the hose clip and disconnect the vacuum switching valve hose.

9. **REMOVE UNION TO CONNECTOR TUBE HOSE**

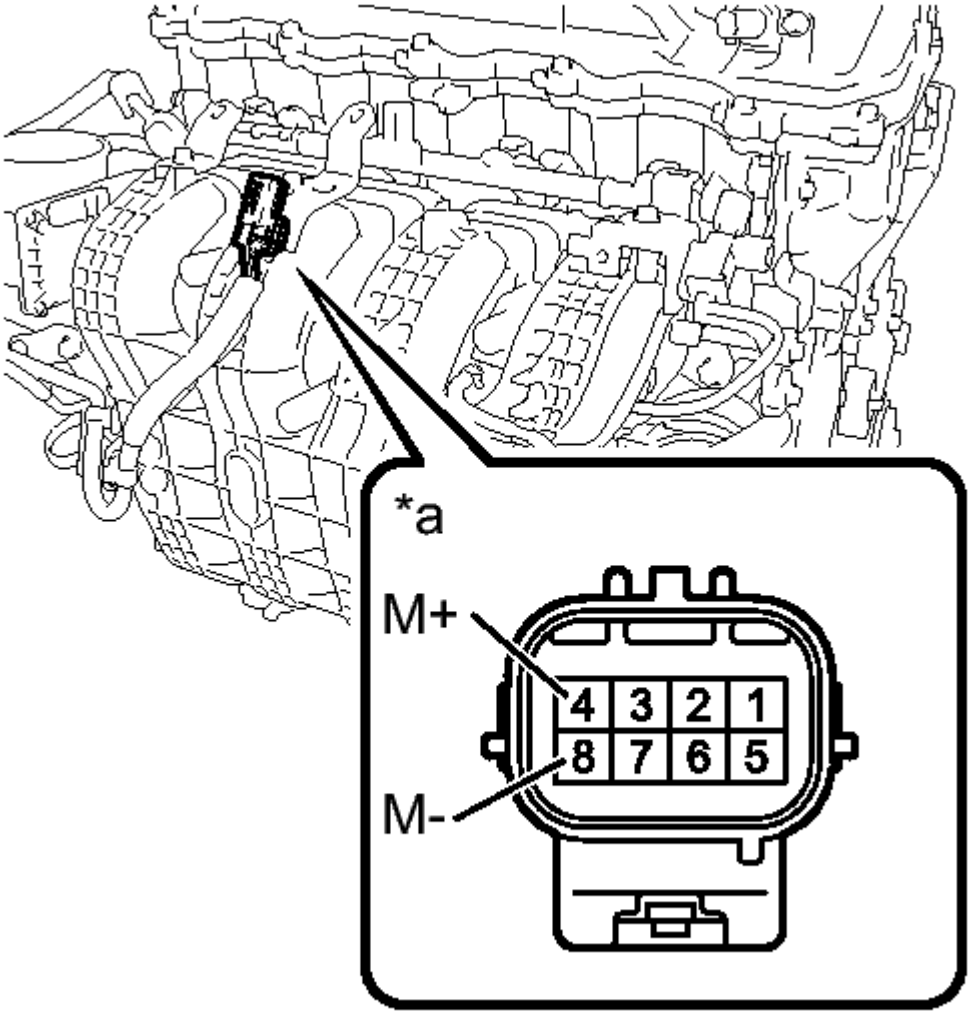


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Fig. 190: Identifying Union To Connector Tube Hose & Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Loosen the hose clip and remove the union to connector tube hose.

10. **REMOVE INTAKE MANIFOLD**



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Fig. 191: Intake Manifold Connector End View
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Apply battery voltage to the terminals of the connector to close the tumble control valves.

TEXT IN ILLUSTRATION

	Front view of wire harness

*a	connector (to Sensor Wire)

OK

Measurement Condition	Specified Condition
Positive battery voltage applied to terminal 8 (M-), and negative battery voltage applied to terminal 4 (M+)	Open --> Closed

NOTE:

- **When removing the intake manifold, be sure to remove the intake manifold slowly while confirming that the tumble control valves remain in the closed position.**
- **If this procedure is not performed, the valves may be damaged when the intake manifold is removed.**
- **Apply battery voltage for 1 to 3 seconds.**
- **If battery voltage is applied for more than 3 seconds, the actuator may be damaged.**
- **Do not allow the lead wires to contact the other terminals.**

b. Disconnect the 2 water by-pass hoses.

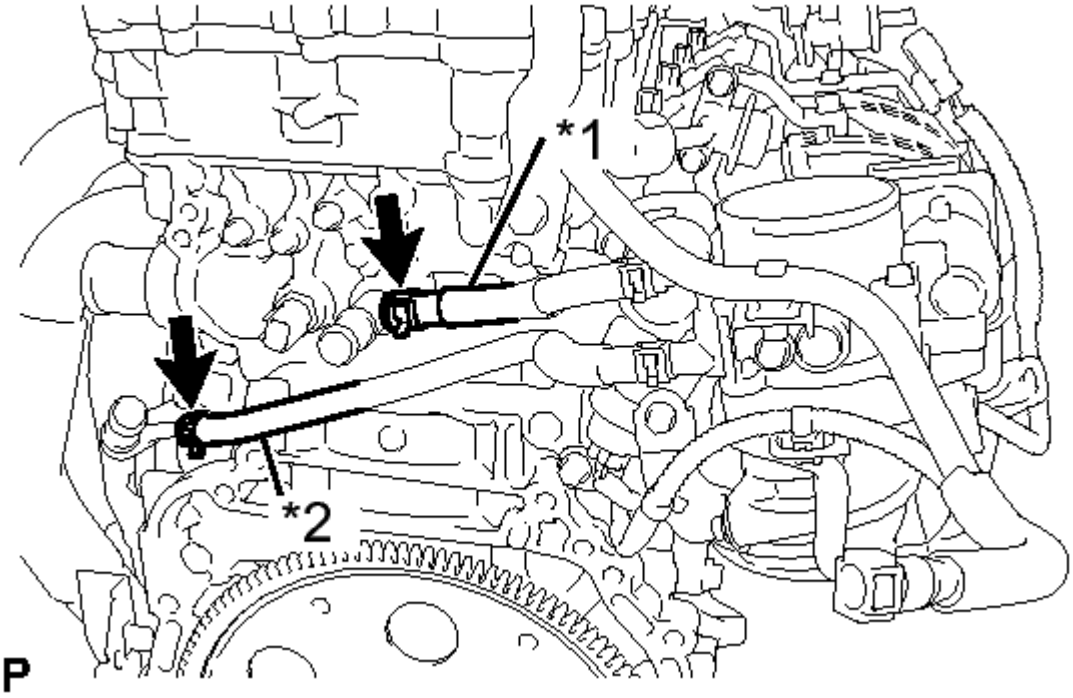


Fig. 192: Identifying Water By-Pass Hoses & Clips
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

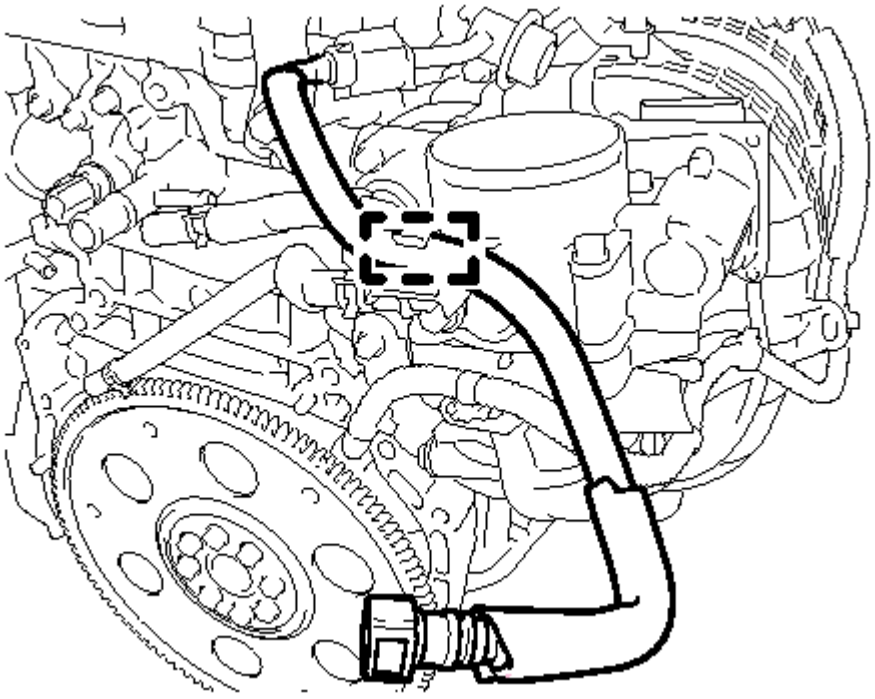
1. Loosen the hose clip and disconnect the water by-pass hose.

TEXT IN ILLUSTRATION

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

2. Loosen the hose clip and disconnect the No. 2 water by-pass hose.

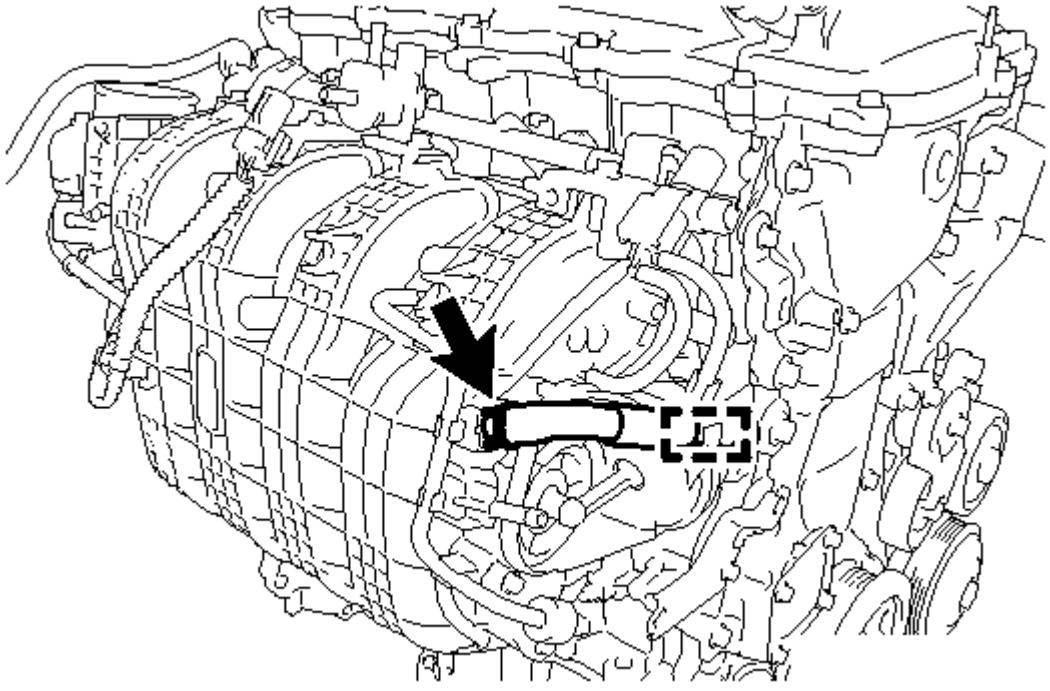
c. Disengage the hose clamp and disconnect the fuel tube.



P

Fig. 193: Identifying Fuel Tube & Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Loosen the hose clip and disconnect the No. 2 ventilation hose.



P

Fig. 194: Identifying No. 2 Ventilation Hose, Clip & Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Disengage the hose clamp and separate the No. 2 ventilation hose.

f. Disengage the 6 harness clamps and disconnect the intake air control valve actuator connector.

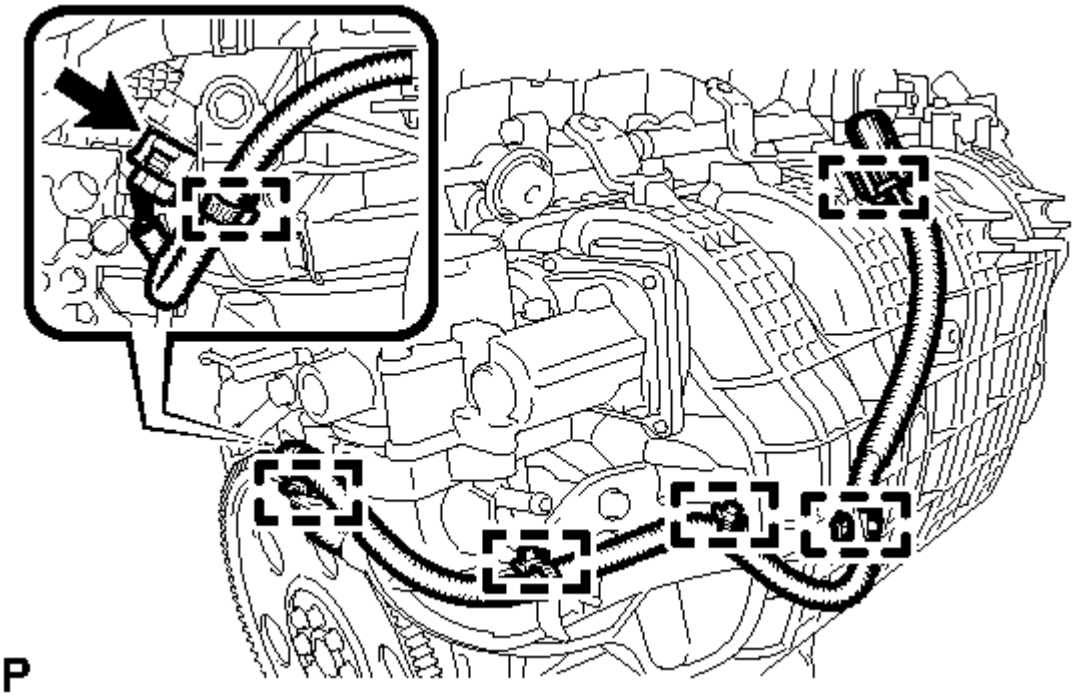
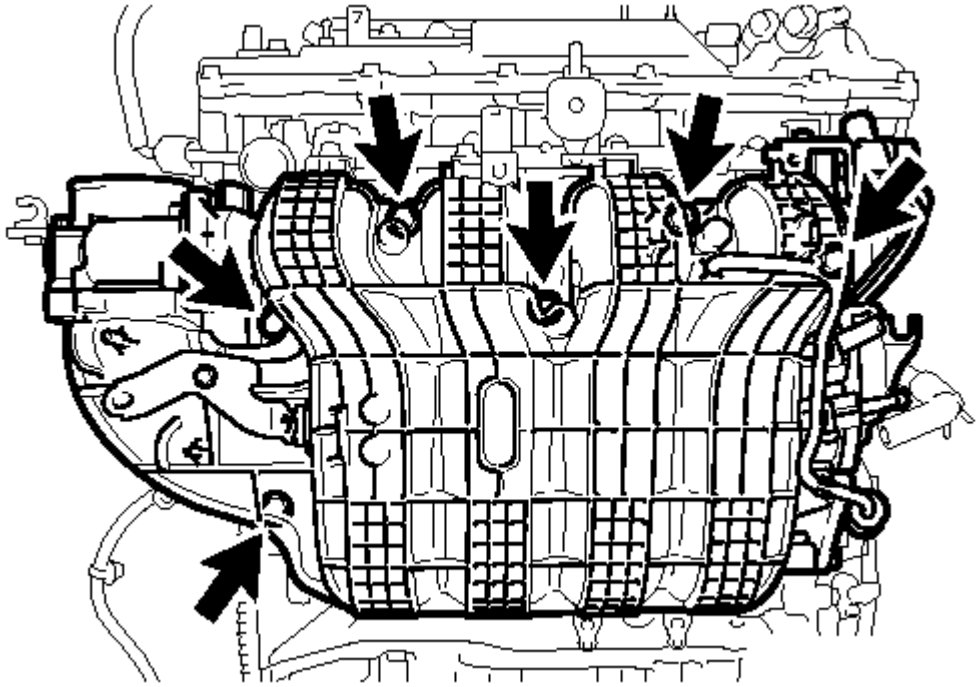


Fig. 195: Identifying Intake Air Control Valve Actuator Connector & Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Remove the 6 bolts and the intake manifold.



P

Fig. 196: Identifying Intake Manifold & Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- **The valves may be damaged if they are not closed before removing the intake manifold.**
- **When the intake manifold has been removed, set the tumble control valves to the half open position and keep them there.**

h. Remove the intake manifold gasket from the intake manifold.

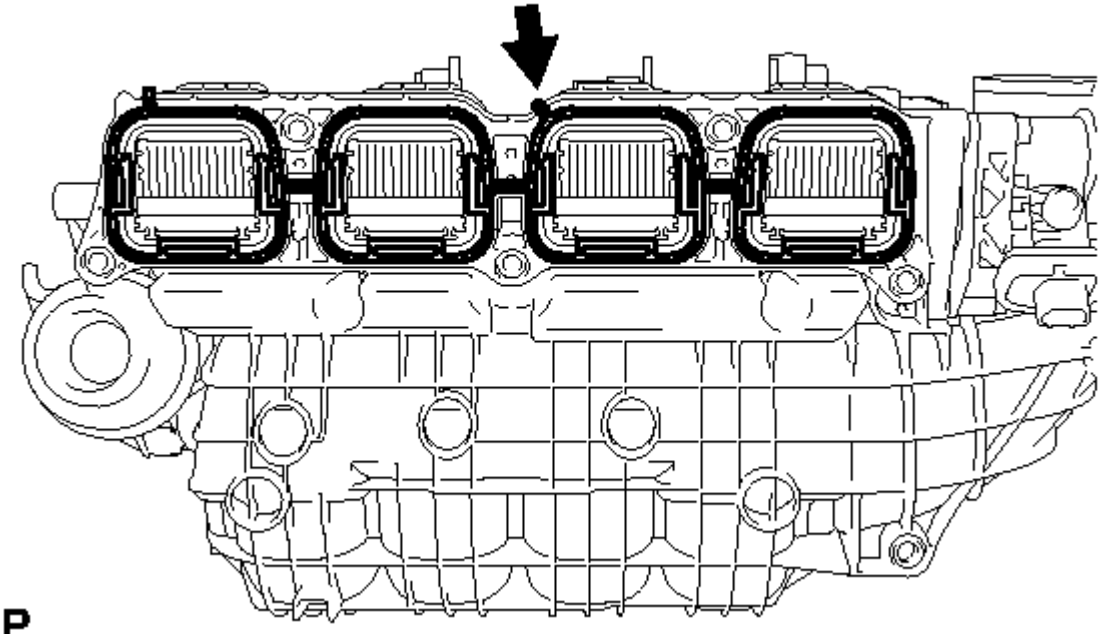


Fig. 197: Identifying Gasket And Intake Manifold
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. **REMOVE SENSOR WIRE**

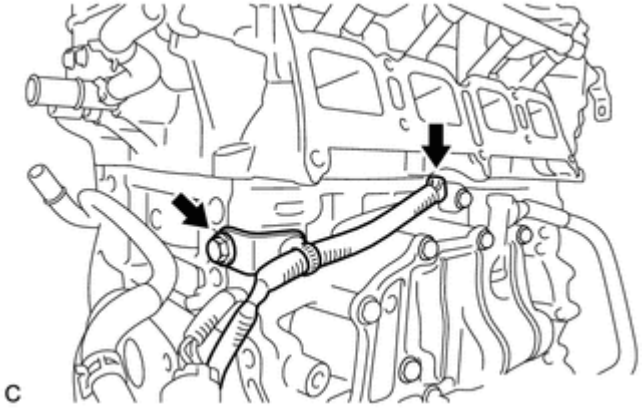


Fig. 198: Identifying Bolt And Knock Control Sensor Wire
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   a. Disconnect the knock sensor wire.
   b. Remove the bolt and knock sensor wire.

12. **REMOVE KNOCK SENSOR** . Refer to **REMOVAL - Step 2**
13. **REMOVE ENGINE OIL PRESSURE SWITCH ASSEMBLY** . Refer to **REMOVAL - Step 1**
14. **REMOVE ENGINE COOLANT TEMPERATURE SENSOR** . Refer to **REMOVAL - Step 6**
15. **REMOVE FUEL DELIVERY PIPE SUB-ASSEMBLY** . Refer to **REMOVAL - Step 13**

16. **REMOVE FUEL INJECTOR ASSEMBLY** . Refer to **REMOVAL - Step 14**
17. **REMOVE IGNITION COIL ASSEMBLY** . Refer to **REMOVAL - Step 2**

DISASSEMBLY

DISASSEMBLY

1. **REMOVE ENGINE COVER JOINT**

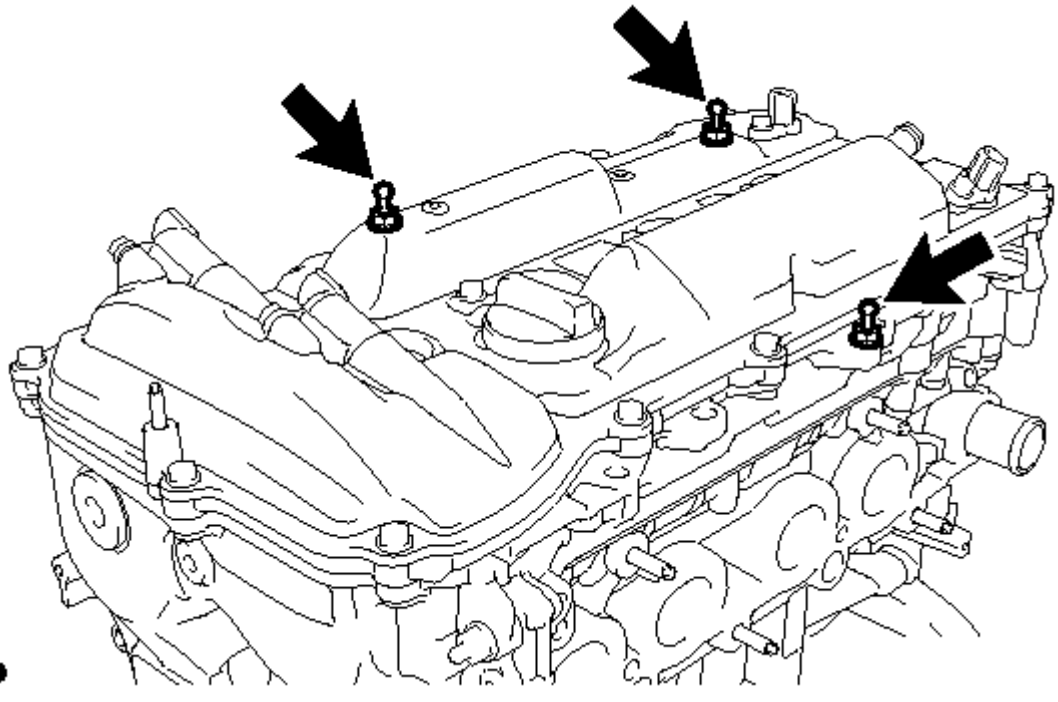


Fig. 199: Identifying Engine Cover Joint
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   a. Remove the 3 joints.
2. **REMOVE SPARK PLUG** . Refer to **REMOVAL - Step 3**
3. **REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (for Intake Side)** . Refer to **REMOVAL - Step 3**
4. **REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (for Exhaust Side)** . Refer to **REMOVAL - Step 2**
5. **REMOVE CAMSHAFT POSITION SENSOR (for Intake Side)** . Refer to **REMOVAL - Step 3**
6. **REMOVE CAMSHAFT POSITION SENSOR (for Exhaust Side)** . Refer to **REMOVAL - Step 2**
7. **REMOVE OIL FILLER CAP SUB-ASSEMBLY**
   a. Remove the oil filler cap from the cylinder head cover.
   b. Remove the gasket from the oil filler cap.
8. **REMOVE CRANKSHAFT POSITION SENSOR** . Refer to **REMOVAL - Step 1**

9. **REMOVE VENTILATION VALVE SUB-ASSEMBLY** . Refer to **REMOVAL - Step 2**
10. **REMOVE VENTILATION CASE SUB-ASSEMBLY**

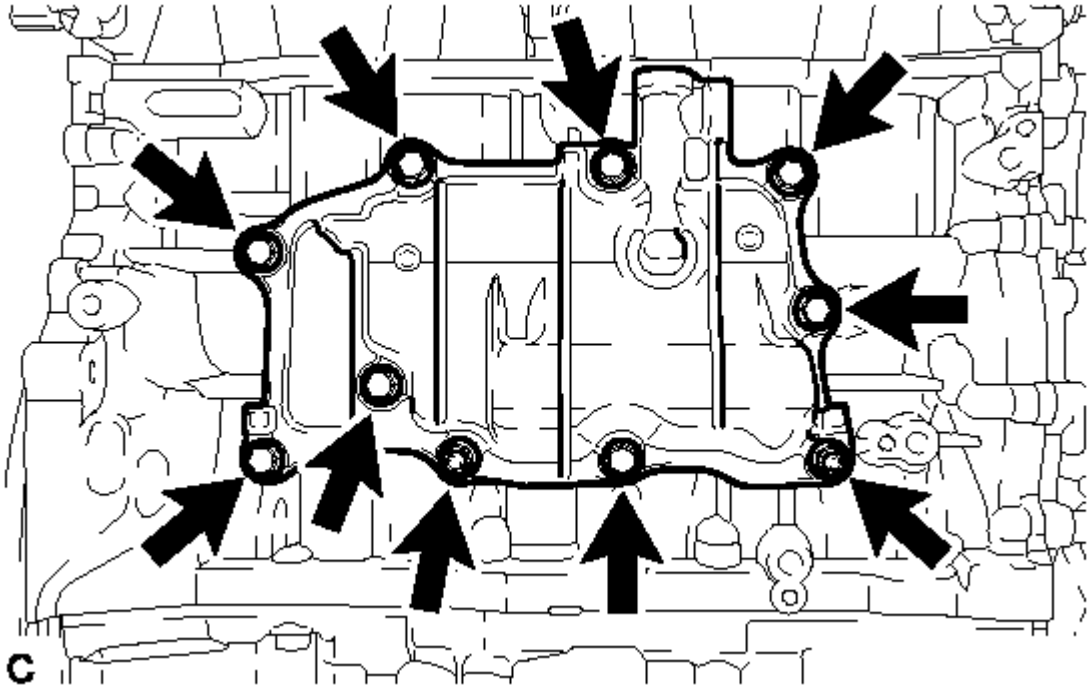


Fig. 200: Identifying Ventilation Case Sub-Assembly Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the 8 bolts and 2 nuts.
b. Remove the ventilation case by prying between the ventilation case and cylinder block with a screwdriver.

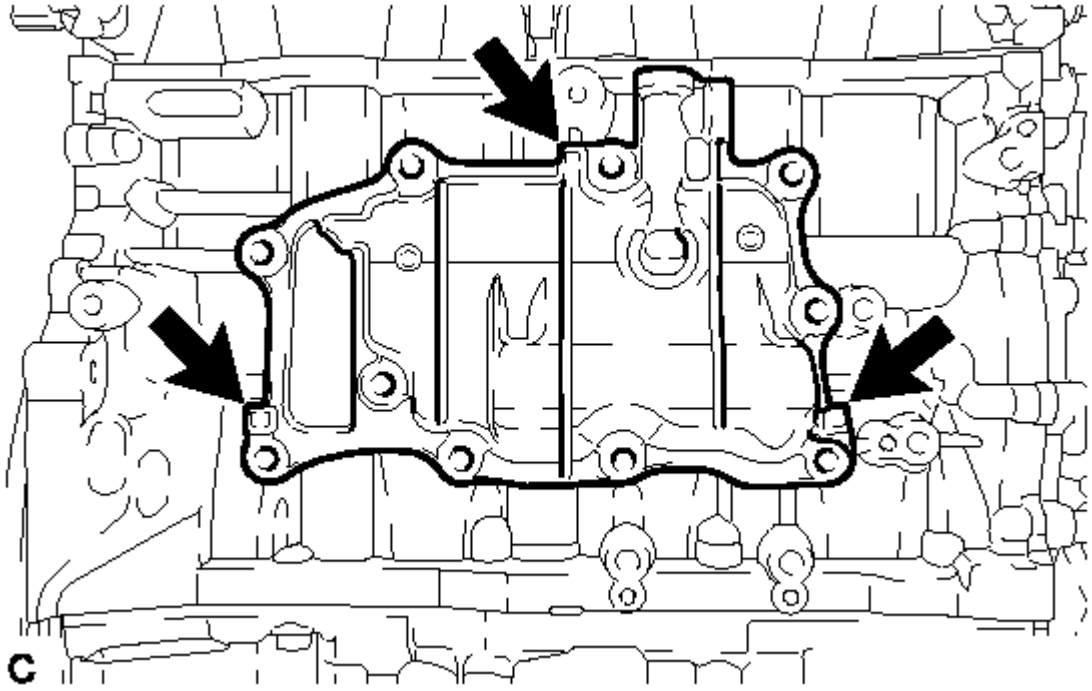


Fig. 201: Identifying Contact Surfaces Of Cylinder Block And Ventilation Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

HINT:

Tape the screwdriver tip before use.

11. **REMOVE SEPARATOR CASE**

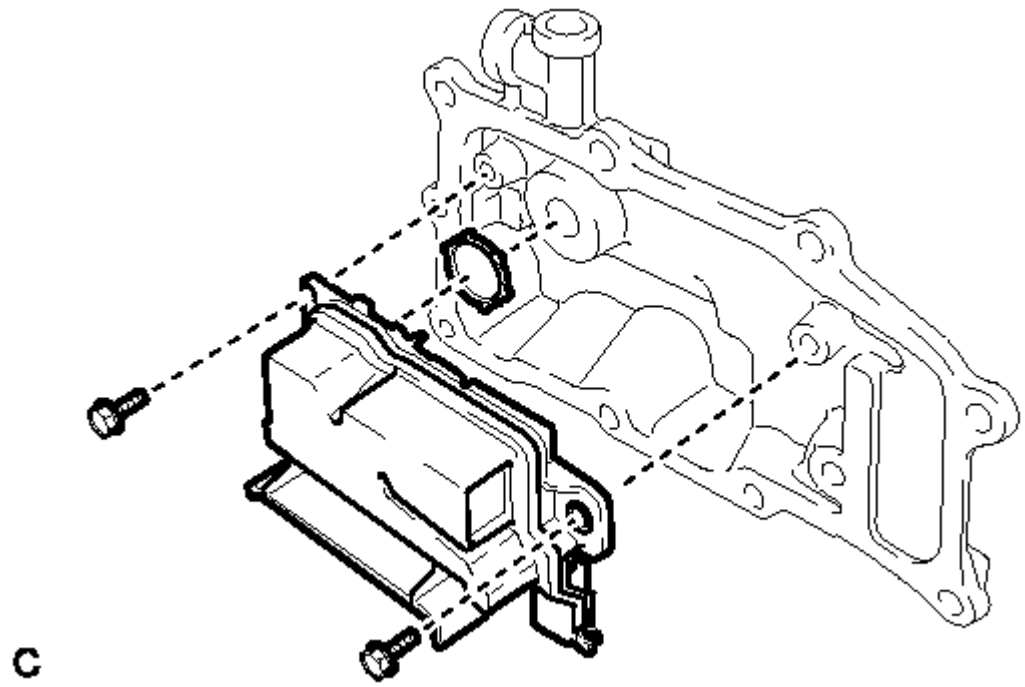


Fig. 202: Identifying Case And Gasket Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the 2 bolts, separator case and gasket.

12. **REMOVE NO. 1 WATER BY-PASS PIPE**

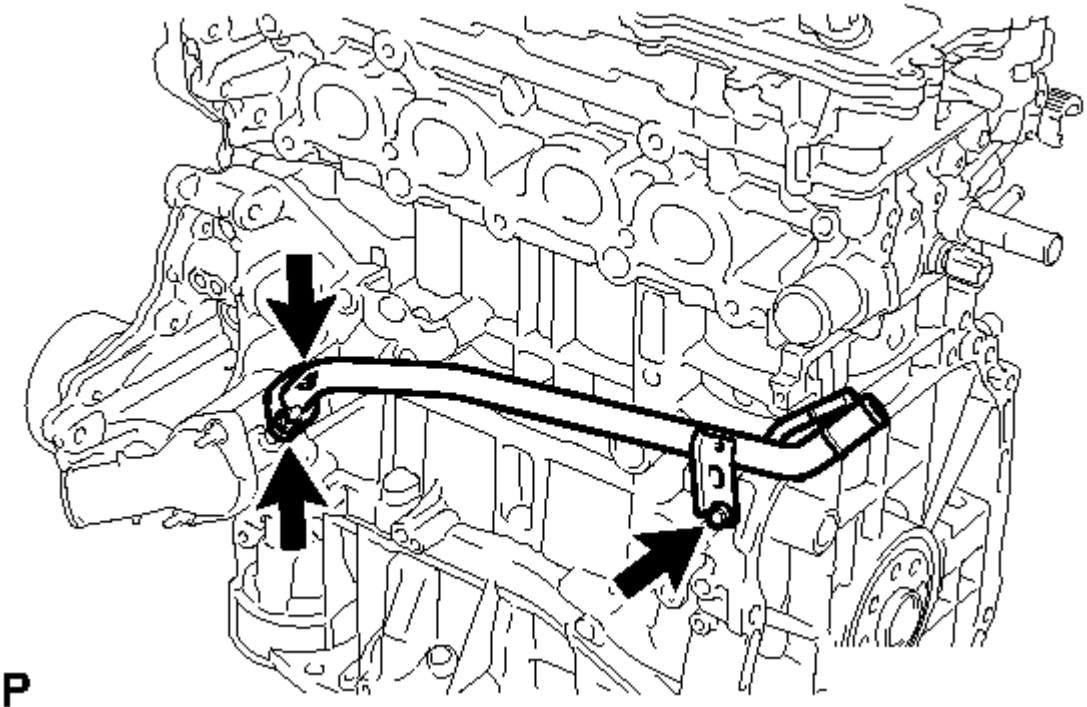


Fig. 203: Identifying Water By-Pass Pipe And Gasket Bolt And Nuts

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

a. Remove the bolt, 2 nuts, water by-pass pipe and gasket.

13. **REMOVE WATER INLET**
    a. Remove the 2 nuts and the water inlet.
14. **REMOVE THERMOSTAT** . Refer to **REMOVAL - Step 5**
15. **REMOVE V-RIBBED BELT TENSIONER ASSEMBLY**

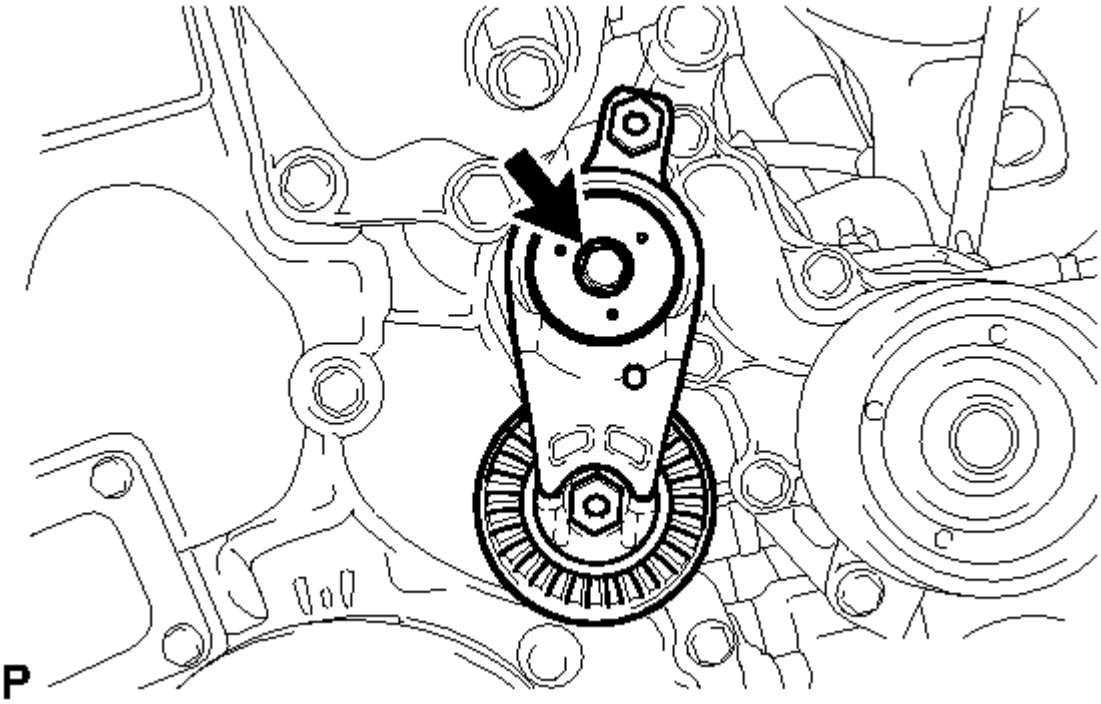
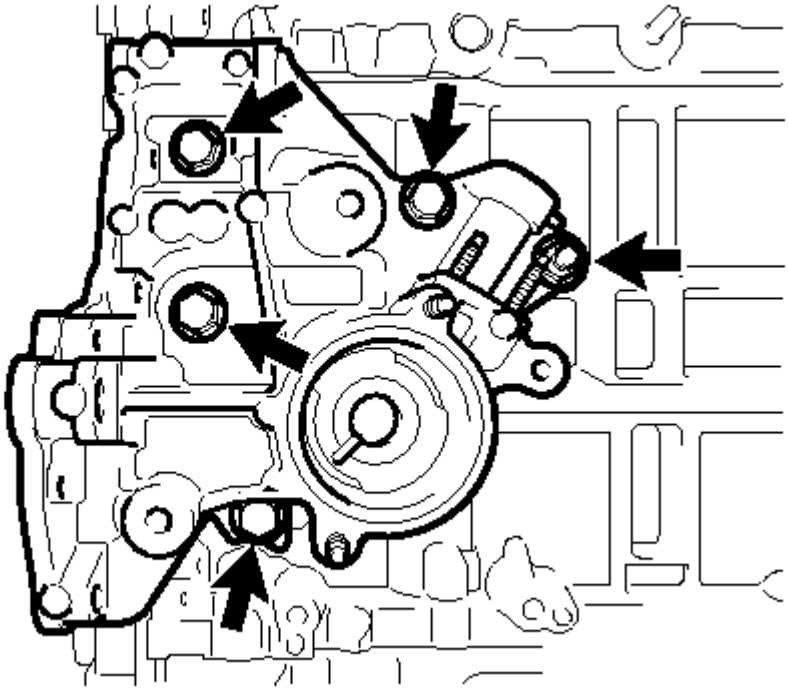


Fig. 204: Identifying Bolt And V-Ribbed Belt Tensioner
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the bolt and the V-ribbed belt tensioner.

16. **REMOVE WATER PUMP ASSEMBLY** . Refer to **REMOVAL - Step 5**
17. **REMOVE OIL COOLER ASSEMBLY** . Refer to **REMOVAL - Step 5**
18. **REMOVE INLET WATER HOUSING**

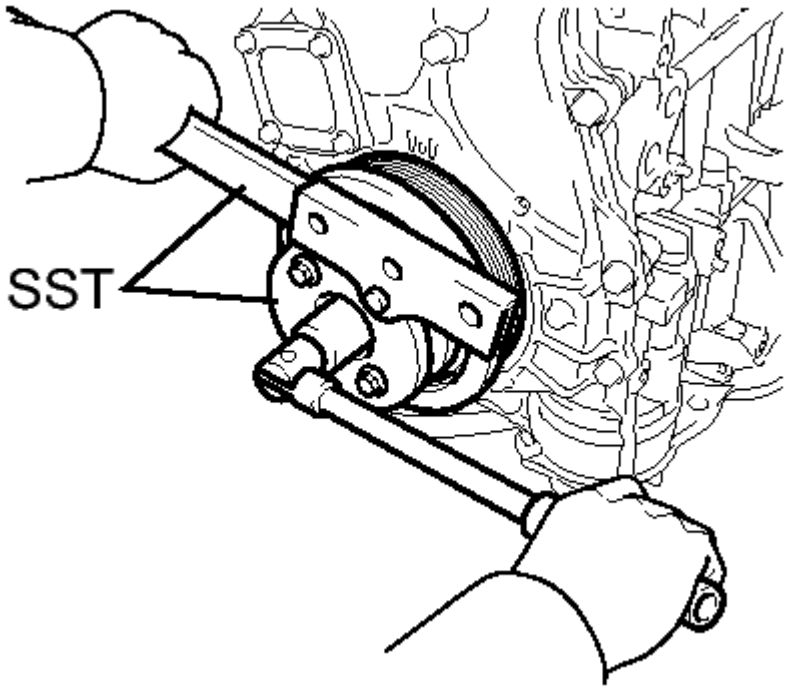


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Fig. 205: Identifying Inlet Water Housing And Gasket Bolts And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the 4 bolts, nut, inlet water housing and gasket.

19. **REMOVE CRANKSHAFT PULLEY**



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Fig. 206: Identifying Crankshaft Pulley

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

a. Using SST, hold the crankshaft pulley and loosen the pulley bolt. Further loosen the bolt until 2 or 3 threads are screwed into the crankshaft.
   - **SST: 09213-54015**
   - **SST: 09330-00021**
   - **SST: 91551-80650**

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

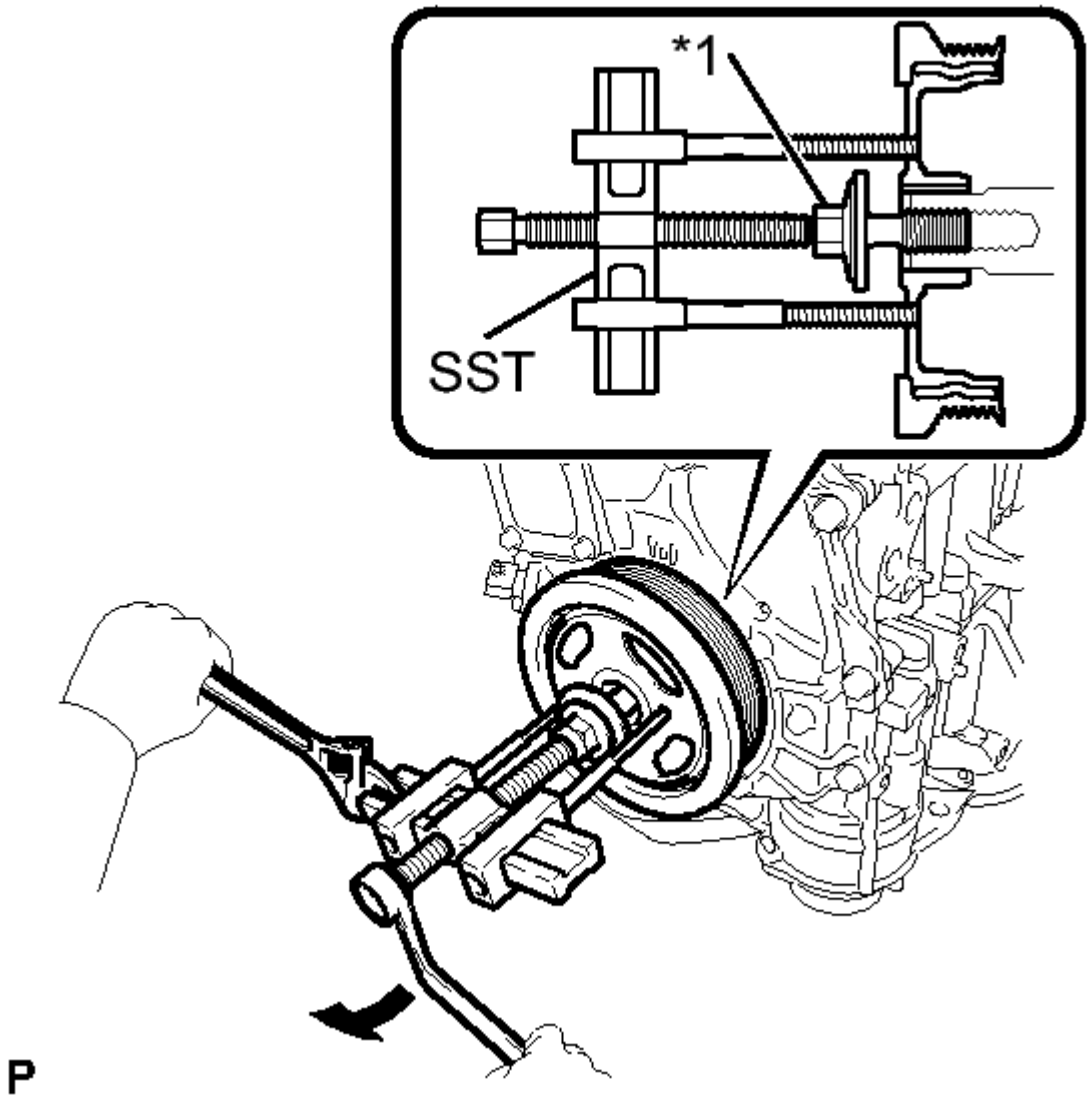


Fig. 207: Removing Crankshaft Pulley Using SST & Pulley Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

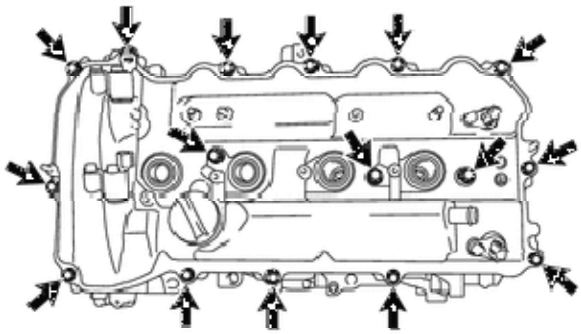
*1	Pulley Bolt

- **SST: 09950-50013**
  09951-05010
  09952-05010
  09953-05020
  09954-05011

HINT:

Apply a lubricant to the threads and end of SST.

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



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Fig. 208: Identifying Cylinder Head Cover And Gasket Bolts And Seal Washers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the 16 bolts, 3 seal washers, cylinder head cover and gasket.
b. Remove the 3 gaskets from the camshaft bearing caps.

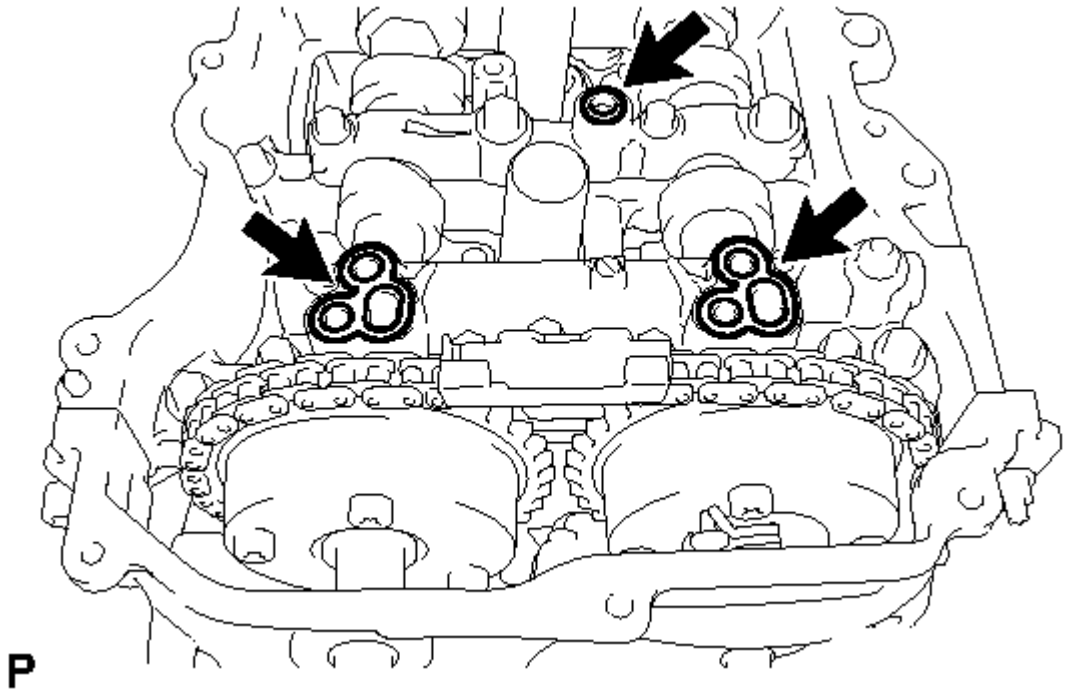


Fig. 209: Identifying Camshaft Bearing Caps Gaskets
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

21. **REMOVE SPARK PLUG TUBE GASKET**

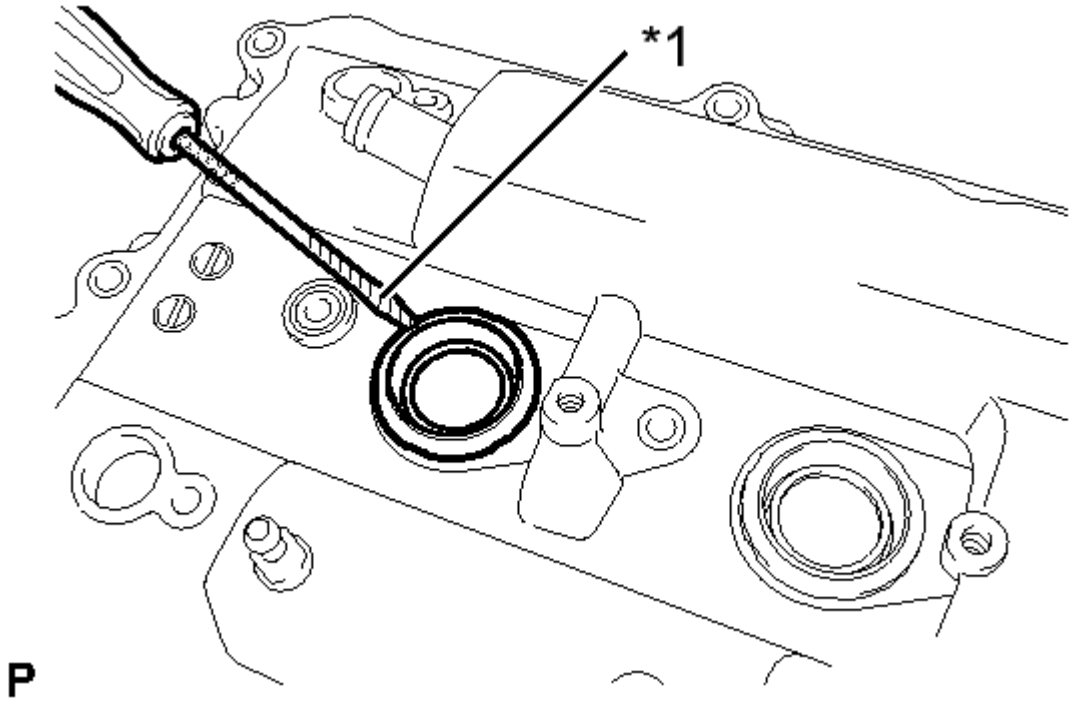


Fig. 210: Removing Spark Plug Tube Gaskets Using A Screwdriver
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Using a screwdriver, pry out the 4 plug tube gaskets.

TEXT IN ILLUSTRATION

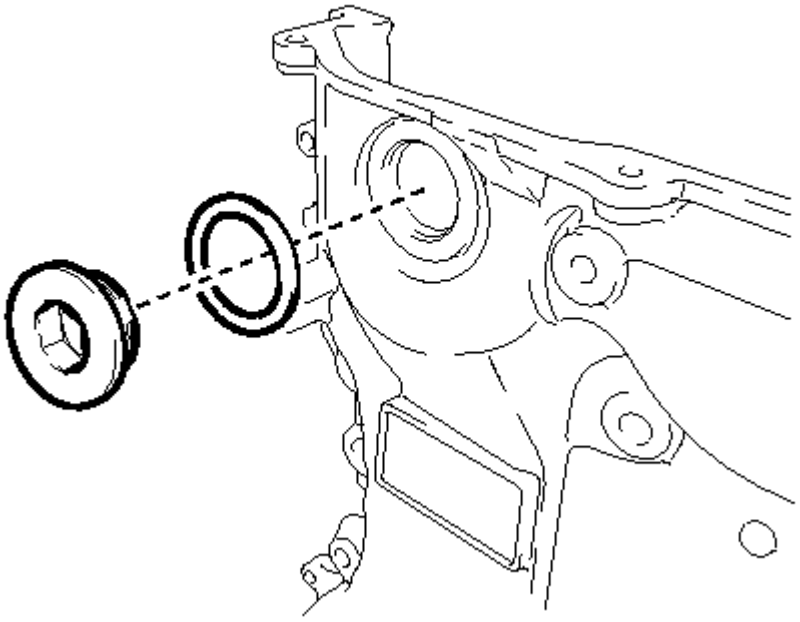
*1	Protective Tape

NOTE: Be careful not to damage the cylinder head cover.

HINT:

Tape the screwdriver tip before use.

22. **REMOVE ENGINE MOUNTING BRACKET RH** . Refer to **REMOVAL - Step 7**
23. **REMOVE TIMING CHAIN COVER SUB-ASSEMBLY** . Refer to **REMOVAL - Step 9**
24. **REMOVE TIMING CHAIN COVER TIGHT PLUG**

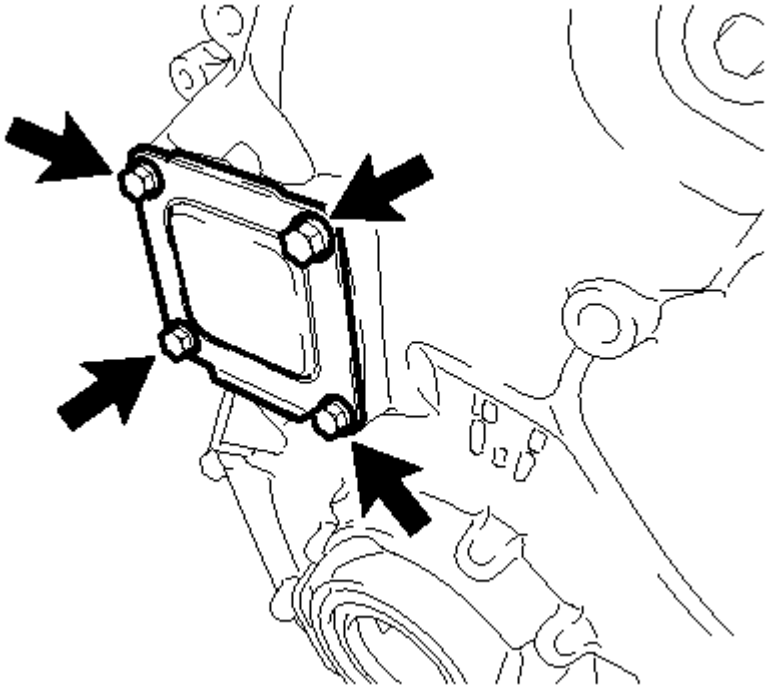


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Fig. 211: Identifying Plug And Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Using a 14 mm hexagon wrench, remove the plug and gasket.

25. **REMOVE TIMING CHAIN COVER PLATE**

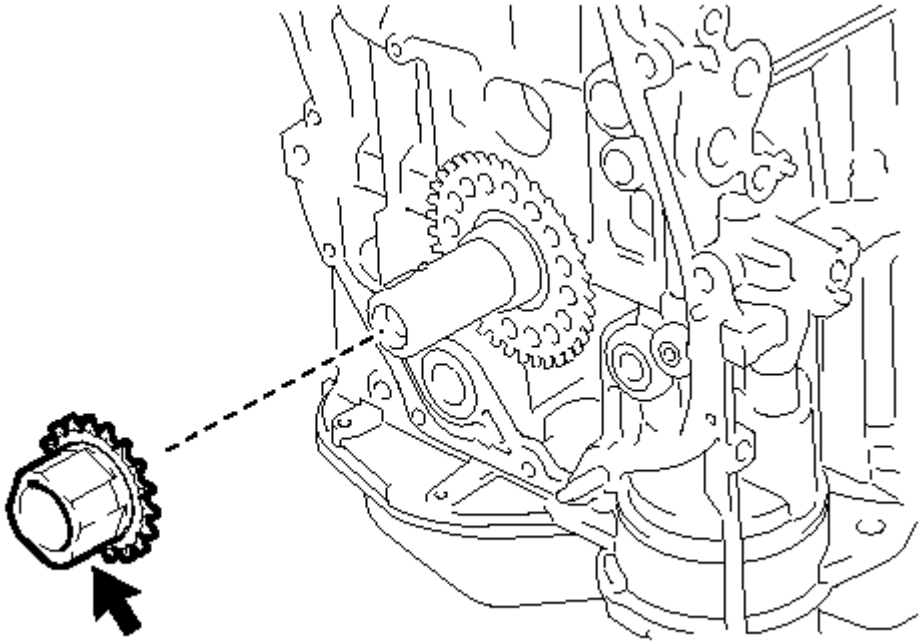


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Fig. 212: Identifying Timing Chain Cover Plate Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the 4 bolts, timing chain cover plate and gasket.

26. **REMOVE TIMING CHAIN COVER OIL SEAL** . Refer to **REMOVAL - Step 10**
27. **SET NO. 1 CYLINDER TO TDC/COMPRESSION** See step 20
28. **REMOVE TIMING CHAIN GUIDE** See step 21
29. **REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY** See step 22
30. **REMOVE CHAIN TENSIONER SLIPPER** See step 23
31. **REMOVE CHAIN SUB-ASSEMBLY** See step 24
32. **REMOVE NO. 1 CHAIN VIBRATION DAMPER** See step 25
33. **REMOVE CRANKSHAFT TIMING SPROCKET**

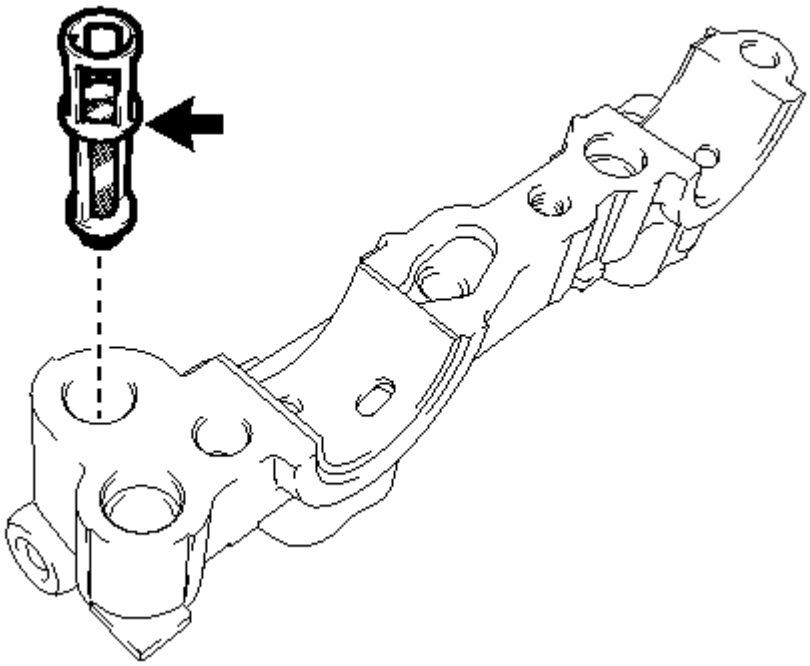


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Fig. 213: Identifying Crankshaft Timing Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the crankshaft timing sprocket from the crankshaft.

34. **REMOVE CAMSHAFT TIMING GEAR ASSEMBLY** See step 26
35. **REMOVE CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY** See step 27
36. **REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY** See step 28
37. **REMOVE CAMSHAFT BEARING CAP** See step 29
38. **REMOVE OIL CONTROL VALVE FILTER**

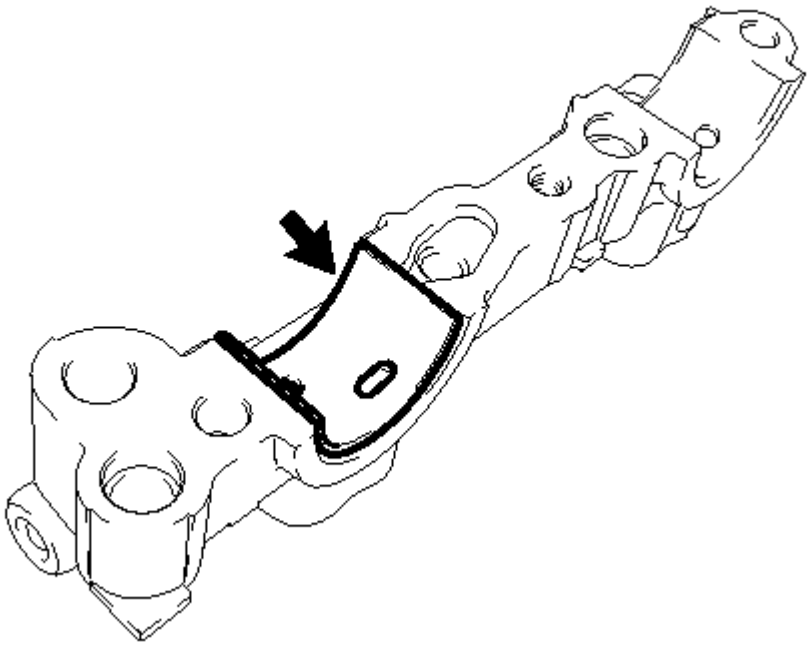


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Fig. 214: Identifying Oil Control Valve Filter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the oil control valve filter from the No. 1 camshaft bearing cap.

39. **REMOVE CAMSHAFT** See step 32
40. **REMOVE NO. 1 CAMSHAFT BEARING**



P

Fig. 215: Identifying No. 1 Camshaft Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the No. 1 camshaft bearing.

41. **REMOVE NO. 2 CAMSHAFT BEARING**
    a. Remove the No. 2 camshaft bearing.

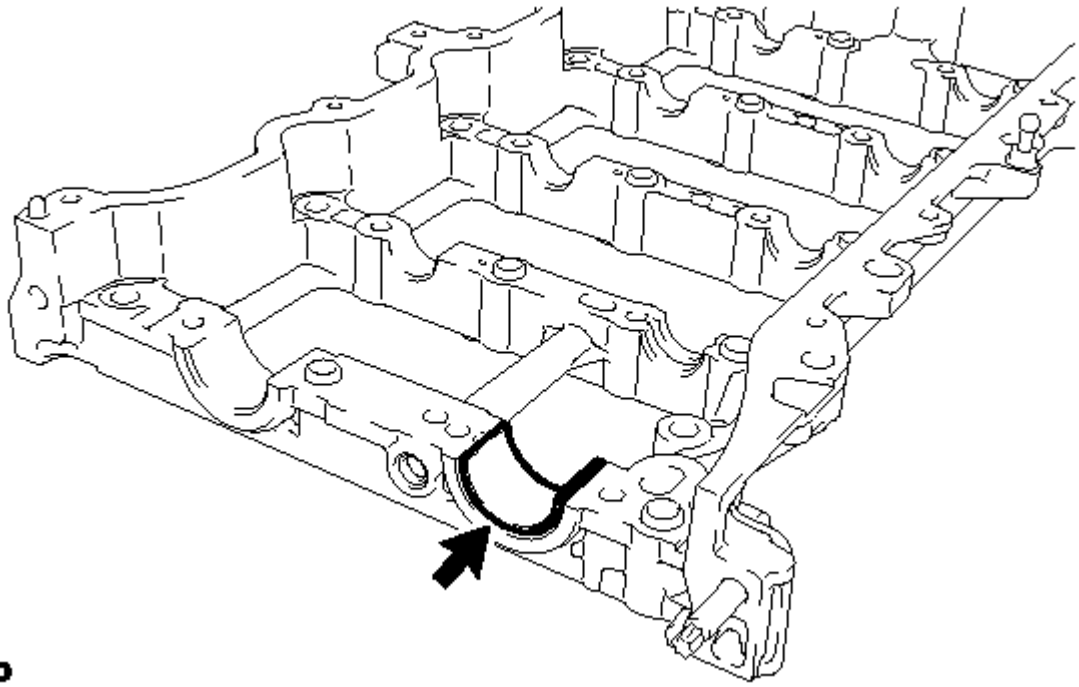


Fig. 216: Identifying No. 2 Camshaft Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

42. **REMOVE CAMSHAFT HOUSING STUD BOLT**

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

43. **REMOVE CAMSHAFT BEARING CAP SETTING RING PIN**

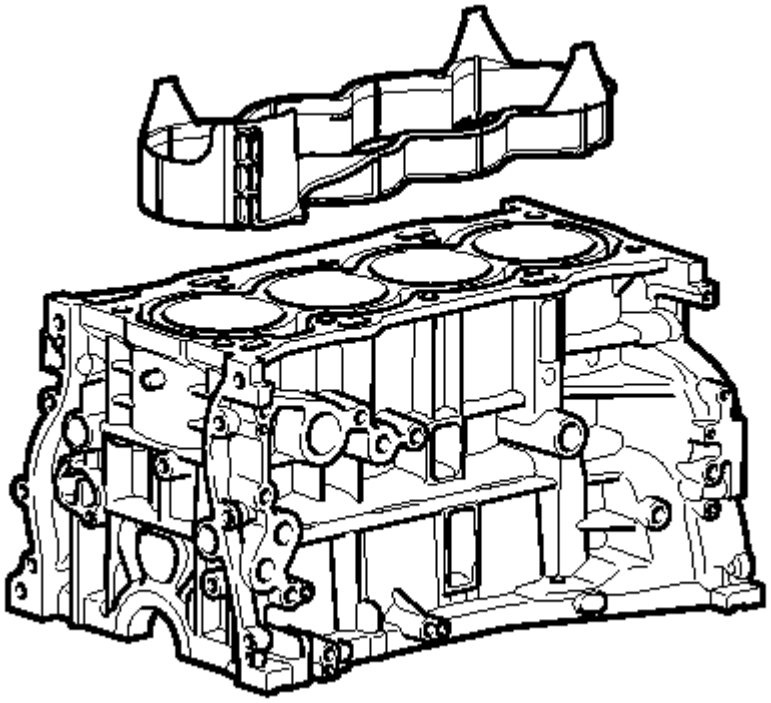
NOTE: It is not necessary to remove the ring pin unless it is being replaced.

44. **REMOVE CAMSHAFT HOUSING STRAIGHT PIN**

NOTE: It is not necessary to remove the straight pin unless it is being replaced.

45. **REMOVE NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY** See step 34
46. **REMOVE VALVE LASH ADJUSTER ASSEMBLY** See step 35
47. **REMOVE VALVE STEM CAP** See step 36

48. **REMOVE CYLINDER HEAD SUB-ASSEMBLY** See step 37
49. **REMOVE CYLINDER HEAD GASKET** See step 38
50. **REMOVE CYLINDER BLOCK WATER JACKET SPACER**



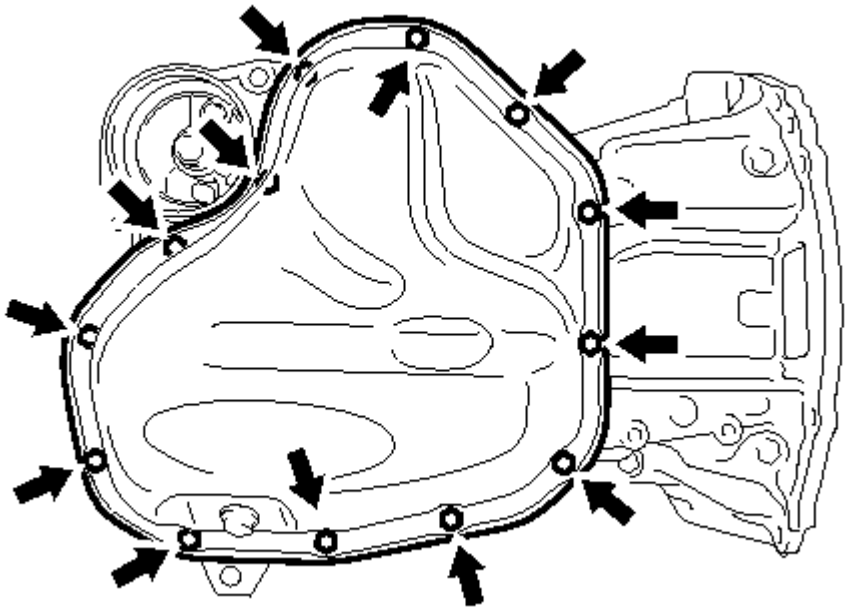
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Fig. 217: Identifying Cylinder Block Water Jacket Spacer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE: Be sure to remove the water jacket spacer. If it is not removed, it may fall and become damaged when the cylinder block is inverted.

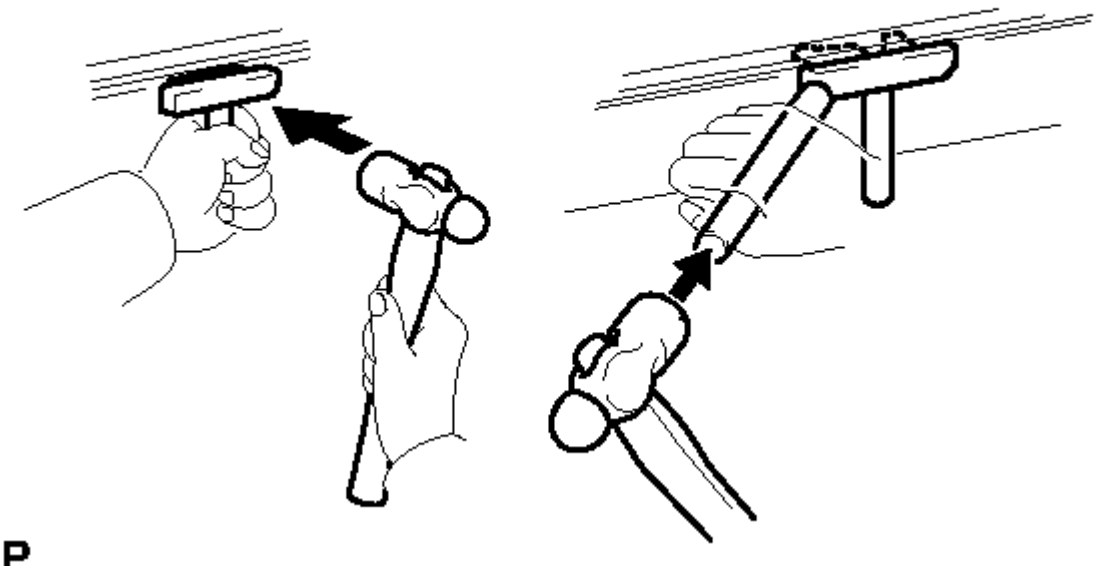
51. **REMOVE OIL FILTER CAP ASSEMBLY** . Refer to **REPLACEMENT - Step 2**
52. **REMOVE OIL PAN SUB-ASSEMBLY**



C

Fig. 218: Identifying Oil Pan Bolts & Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the 11 bolts and 2 nuts.
b. Insert the blade of an oil pan seal cutter between the oil pan and stiffening crankcase, cut off the applied sealer and remove the oil pan.



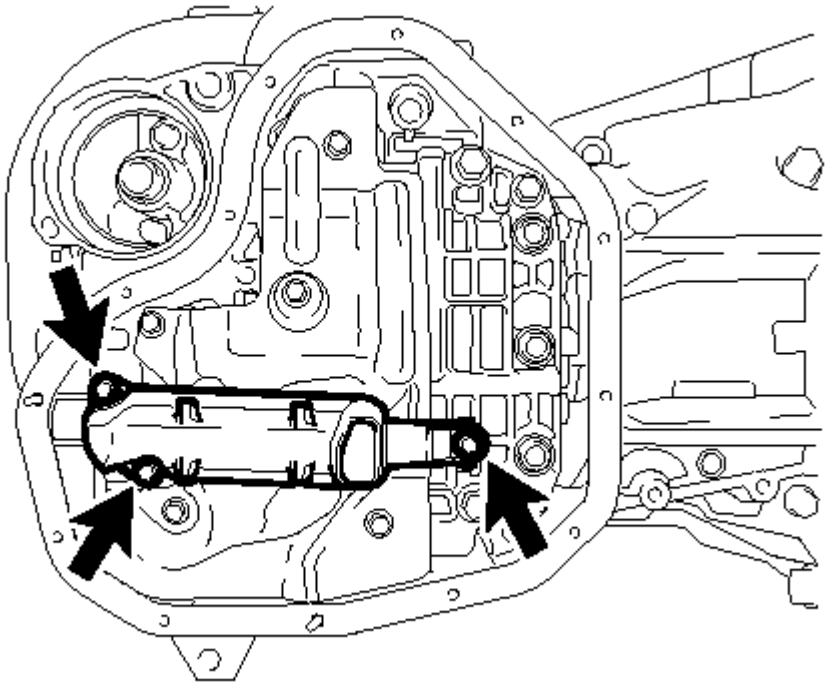
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Fig. 219: Inserting Blade Of SST Between No. 1 & No. 2 Oil Pans
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- **Be careful not to damage the stiffening crankcase contact surface of the oil pan.**
- **Be careful not to damage the stiffening crankcase flange.**

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

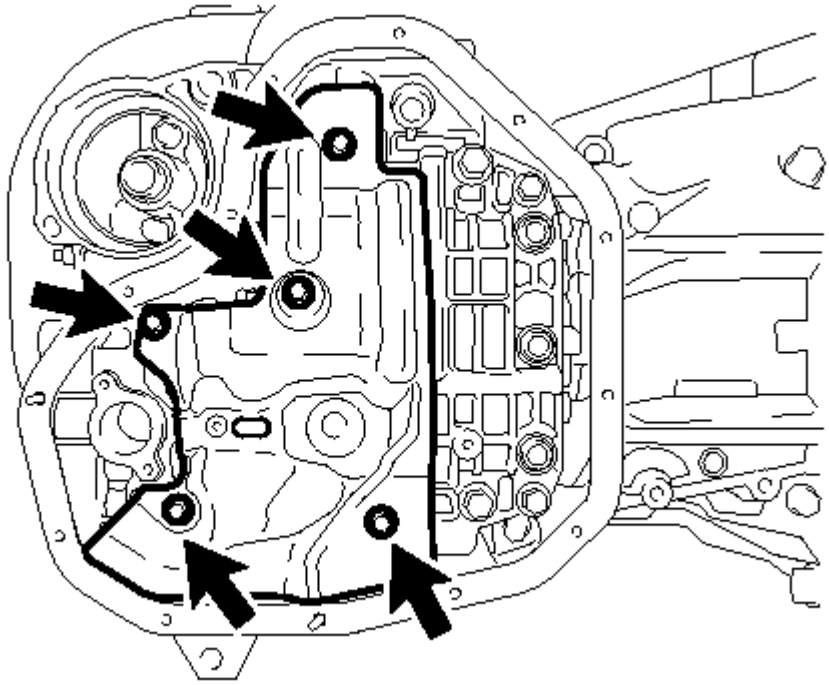


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Fig. 220: Identifying Oil Strainer And Gasket Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the 3 bolts, oil strainer and gasket.

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

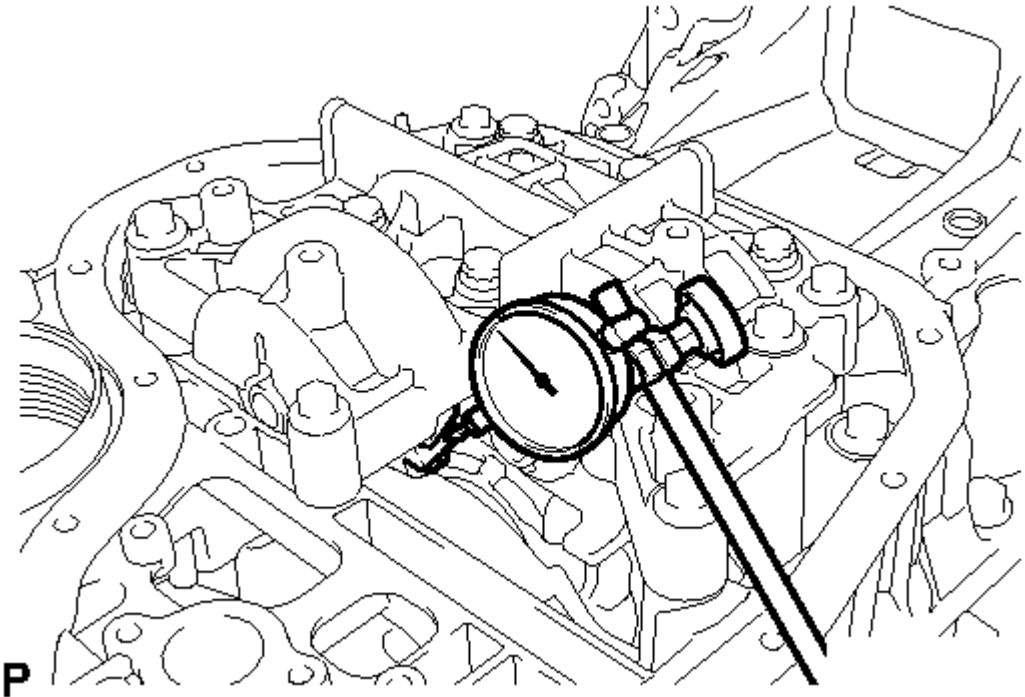


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Fig. 221: Identifying Oil Pan Baffle Plate Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the 5 bolts and the oil pan baffle plate.

55. **INSPECT CRANKSHAFT BACKLASH**



P

Fig. 222: Measuring Backlash Of Crankshaft And Balance Shaft

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

a. Using a dial indicator, measure the backlash of the crankshaft and balance shaft as shown in the illustration.

Standard backlash

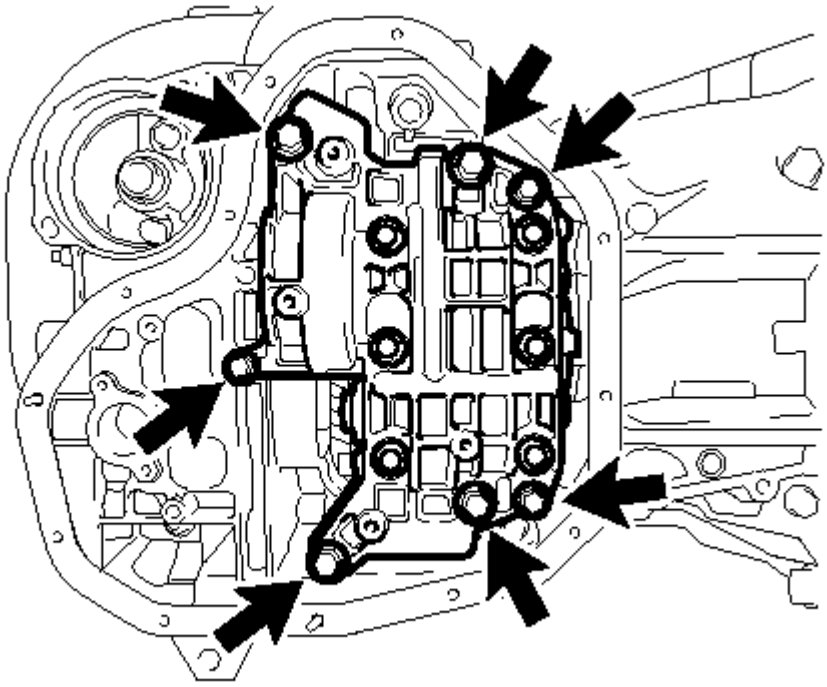
0.005 to 0.020 mm (0.000197 to 0.000787 in.)

Maximum backlash

0.020 mm (0.000787 in.)

If the backlash is more than the maximum, replace the engine balancer assembly.

56. **REMOVE ENGINE BALANCER ASSEMBLY**



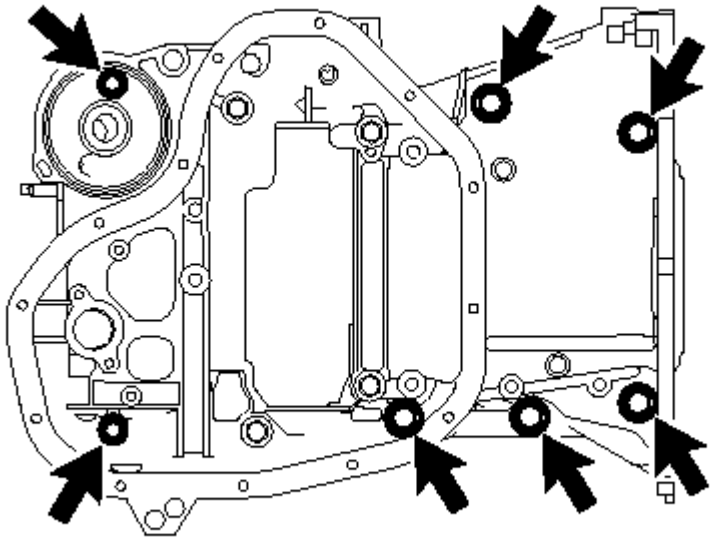
P

Fig. 223: Identifying Engine Balancer Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the 7 bolts and engine balancer.

NOTE: Do not disassemble the engine balancer.

57. **INSPECT BALANCE SHAFT THRUST CLEARANCE** See step 14
58. **REMOVE STIFFENING CRANKCASE ASSEMBLY**

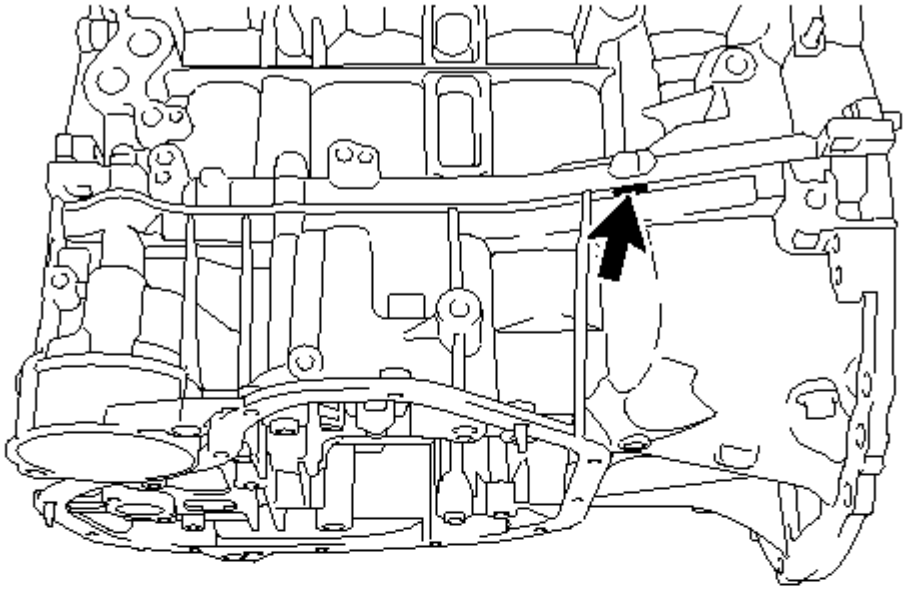


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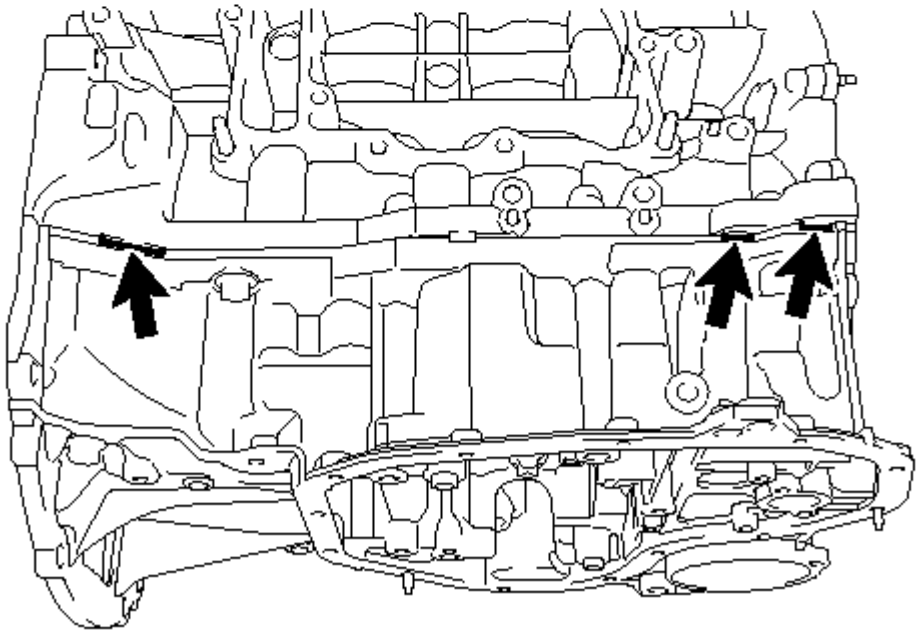
Fig. 224: Identifying Stiffening Crankcase Assembly Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the 7 bolts.
b. Using a screwdriver, remove the stiffening crankcase by prying between the stiffening crankcase and cylinder block at the places shown in the illustration.

*a



*b



P

Fig. 225: Identifying Stiffening Crankcase & Cylinder Block Prying Areas
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	LH

*a	Side
*b	RH Side

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

HINT:

Tape the screwdriver tip before use.

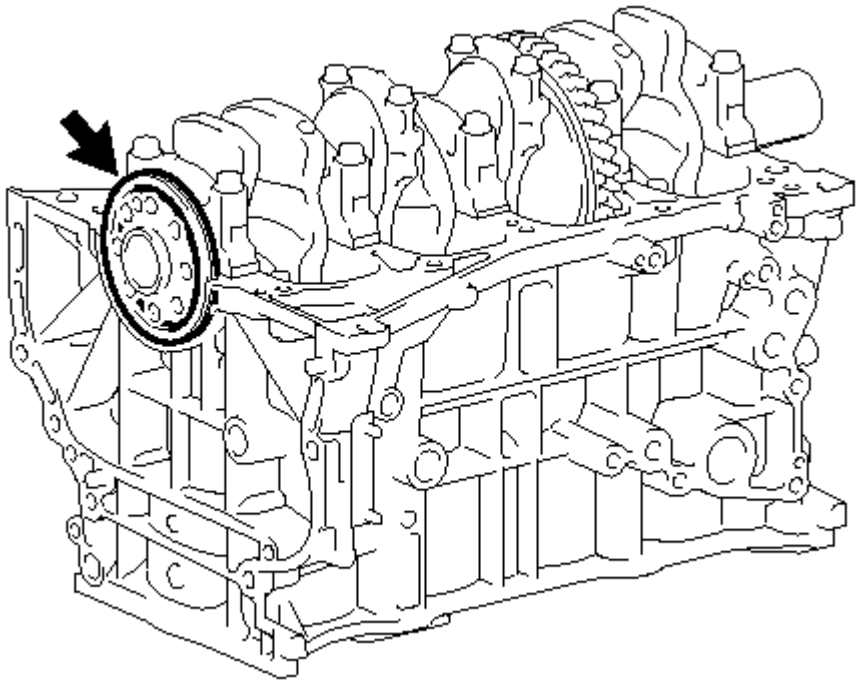
59. **REMOVE STIFFENING CRANKCASE STUD BOLT**

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

60. **REMOVE STIFFENING CRANKCASE RING PIN**

NOTE: It is not necessary to remove the ring pin unless it is being replaced.

61. **REMOVE REAR ENGINE OIL SEAL**



P

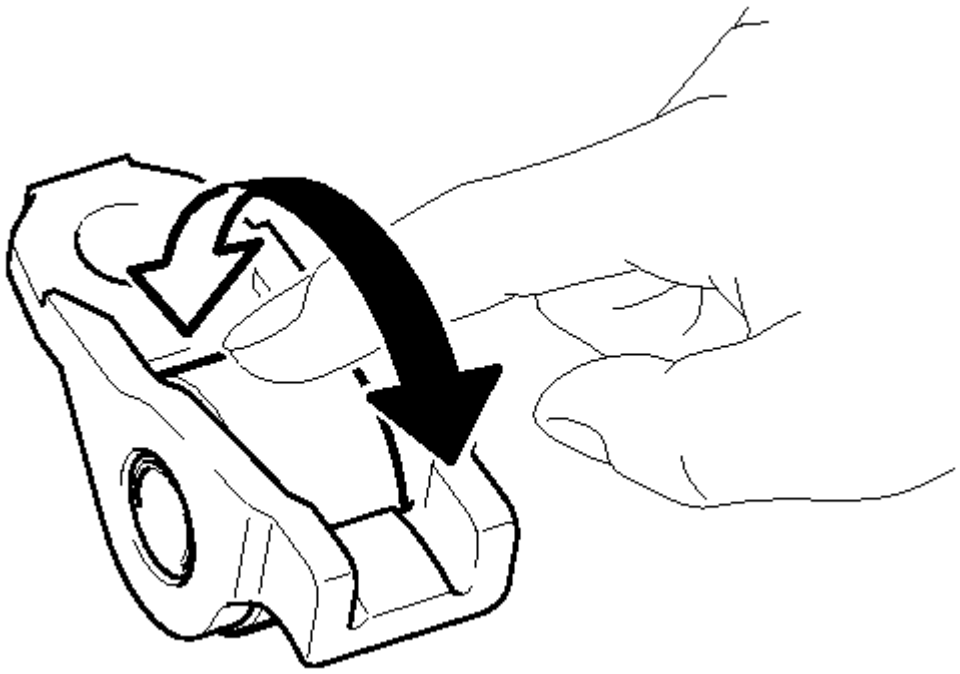
Fig. 226: Identifying Rear Engine Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Remove the rear engine oil seal from the 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.



P

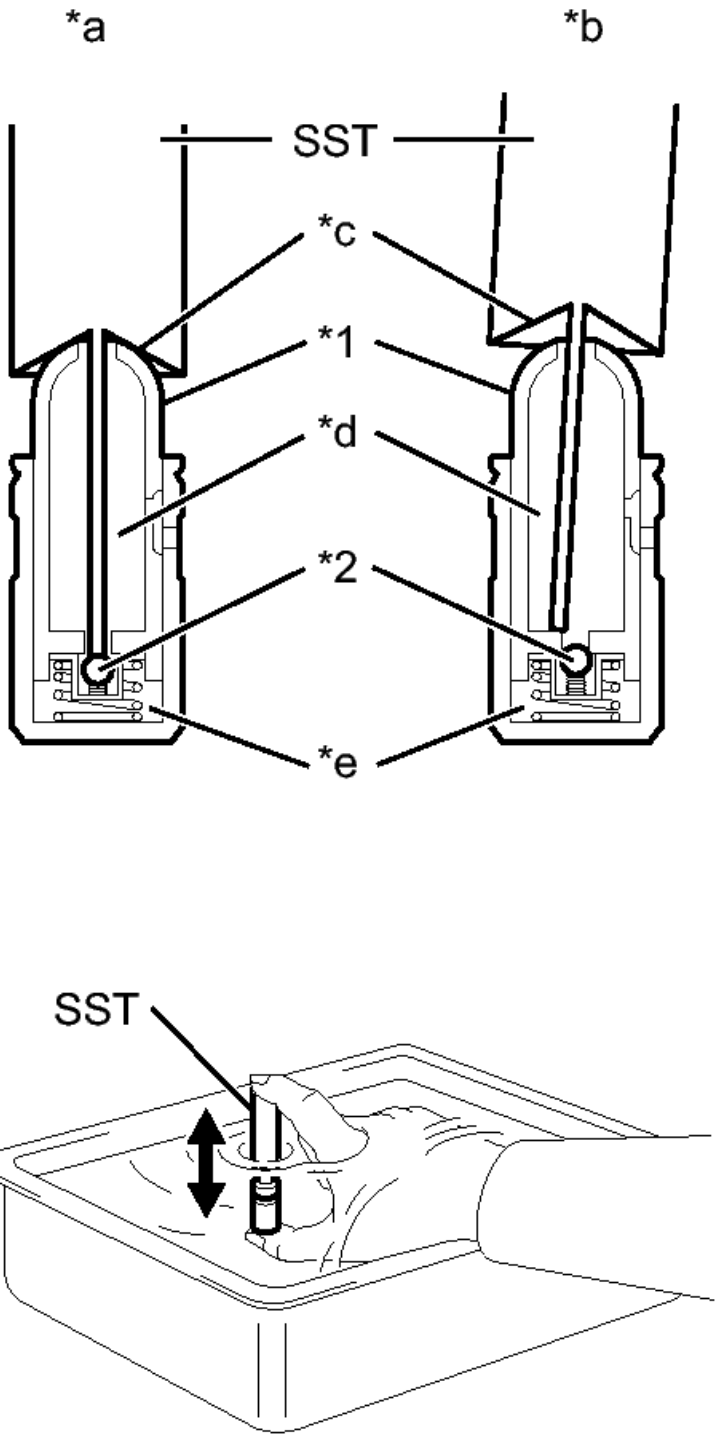
Fig. 227: Inspecting No. 1 Valve Rocker Arm Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If the roller does not turn smoothly, replace the valve rocker arm sub-assembly.

2. **INSPECT VALVE LASH ADJUSTER ASSEMBLY**

NOTE:

- **Keep the adjuster free from dirt and foreign matter.**
- **Use only clean engine oil.**



P

Fig. 228: Inspecting Valve Lash Adjuster Assembly Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Place the lash adjuster into a container full of new engine oil.

TEXT IN ILLUSTRATION

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

b. Insert the tip of SST into the lash adjuster plunger and use the tip to press down on the check ball inside the plunger.
   - **SST: 09276-75010**

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

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

   OK

   Plunger moves up and down.

   NOTE: When bleeding high-pressure air from the compression chamber, make sure that the tip of SST is actually pressing the check ball as shown in the illustration. If the check ball is not pressed, air will not bleed.

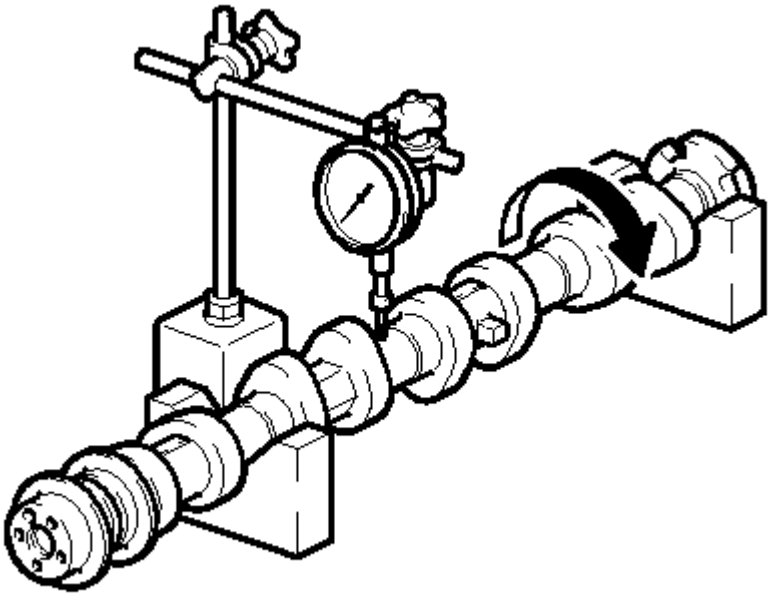
e. After bleeding the air, remove SST. Then try to quickly and firmly press the plunger with your fingers.

   OK

   Plunger can be pressed 3 times.

   If the plunger can still be compressed after pressing it 3 times, replace the valve lash adjuster with a new one.

3. **INSPECT CAMSHAFT OIL CLEARANCE** See step 8
4. **INSPECT CAMSHAFT THRUST CLEARANCE** See step 9
5. **INSPECT CAMSHAFT**
   a. Inspect the camshaft runout.



P

Fig. 229: Checking Camshaft 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

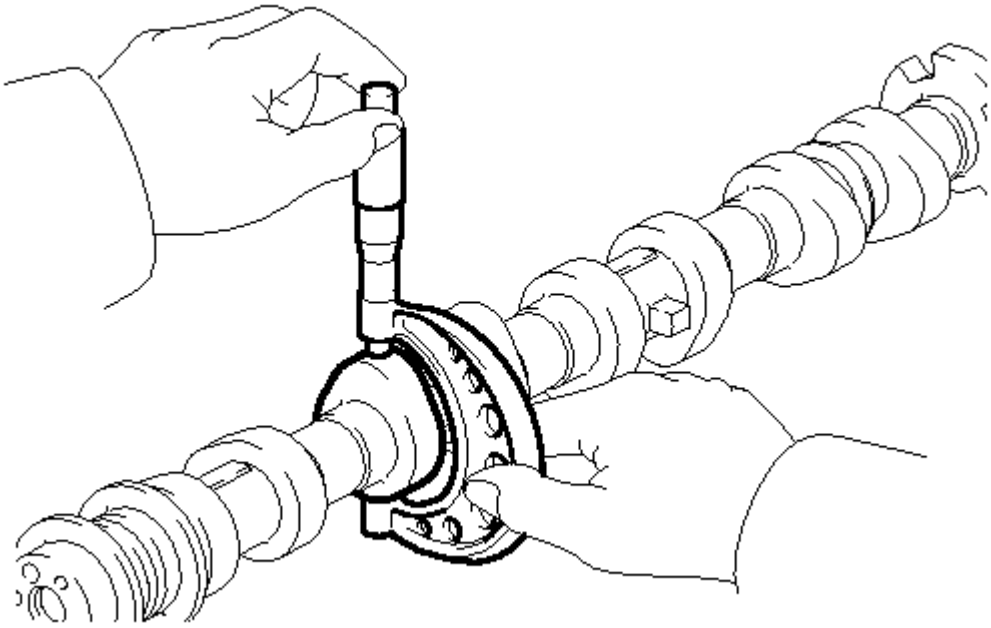
   0.03 mm (0.00118 in.)

   If the circle runout is more than the maximum, replace the camshaft sub-assembly.

   HINT:

   Check the oil clearance after replacing the camshaft.

b. Inspect the cam lobes.



P

Fig. 230: Checking Cam Lobes
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

   Standard Cam Lobe Height

Item	Specified Condition
Intake	44.163 to 44.305 mm (1.73870 to 1.74429 in.)
Exhaust	44.144 to 44.286 mm (1.73795 to 1.74354 in.)

   Minimum Cam Lobe Height

Item	Specified Condition

Intake	44.013 mm (1.73280 in.)
Exhaust	43.996 mm (1.73213 in.)

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

c. Inspect the camshaft journals.

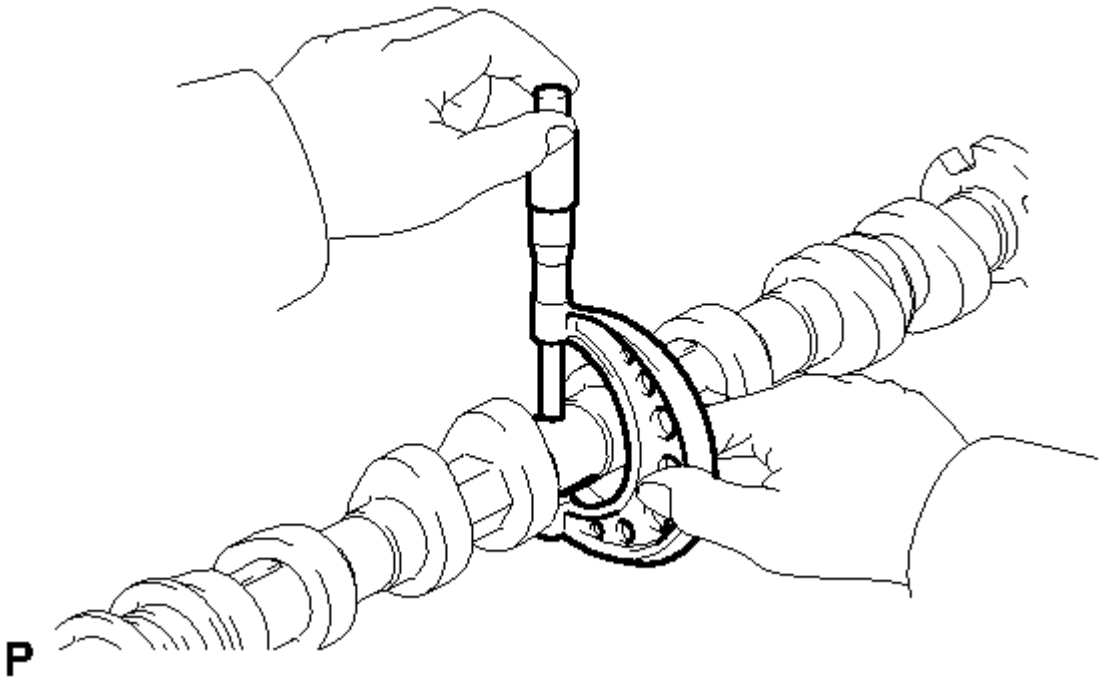


Fig. 231: Checking Camshaft Journals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Using a micrometer, measure the journal diameter.

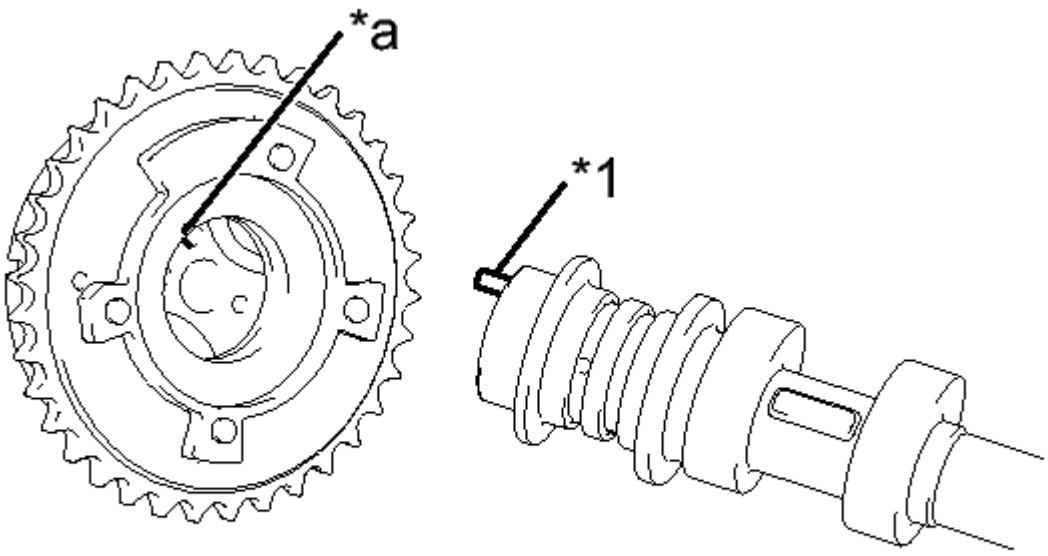
   Standard Journal Diameter

Item	Specified Condition
No. 1 journal	34.449 to 34.465 mm (1.35626 to 1.35689

	in.)
Other journals	22.959 to 22.975 mm (0.90390 to 0.90453 in.)

If the journal diameter is not as specified, check the oil clearance. See step 8.

6. **INSPECT CAMSHAFT TIMING GEAR ASSEMBLY**
   a. Align and attach the knock pin of the No. 1 camshaft with the knock pin hole of the camshaft timing gear.



P

Fig. 232: Identifying No. 1 Camshaft Knock Pin & Camshaft Timing Gear Knock Pin Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Knock Pin
*a	Knock Pin Hole

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

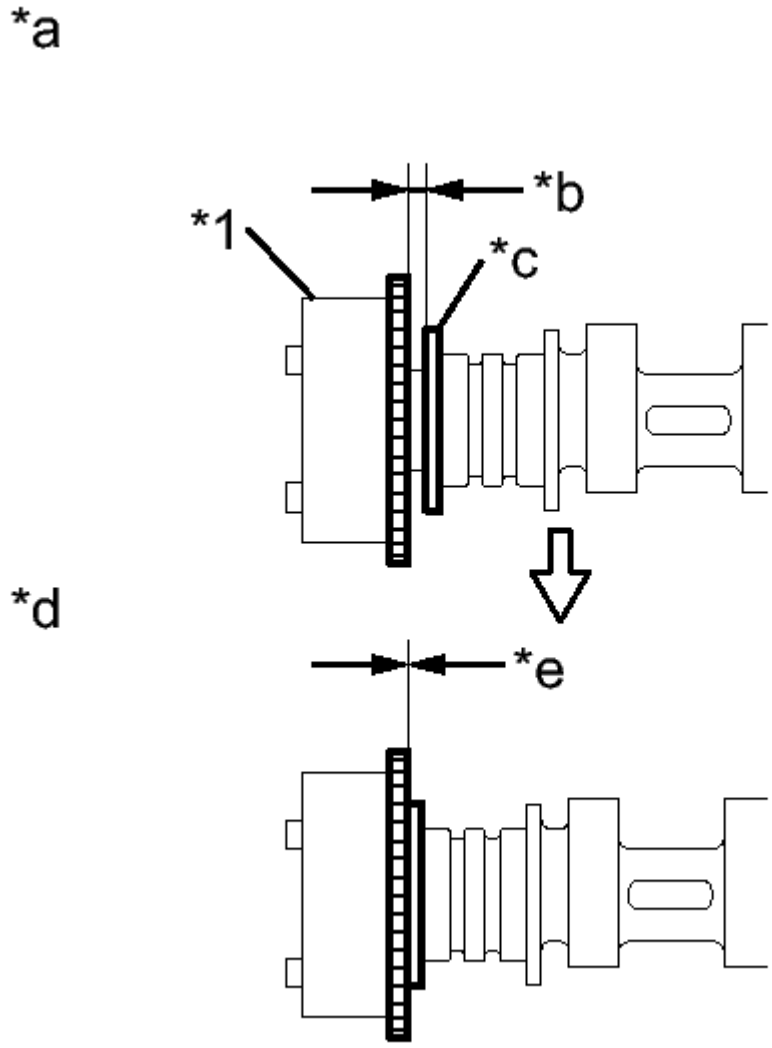


Fig. 233: Checking Clearance Between Camshaft Timing Gear & Camshaft Flange
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Camshaft Timing Gear
*a	INCORRECT
*b	Clearance
*c	Flange
*d	CORRECT
*e	No Clearance

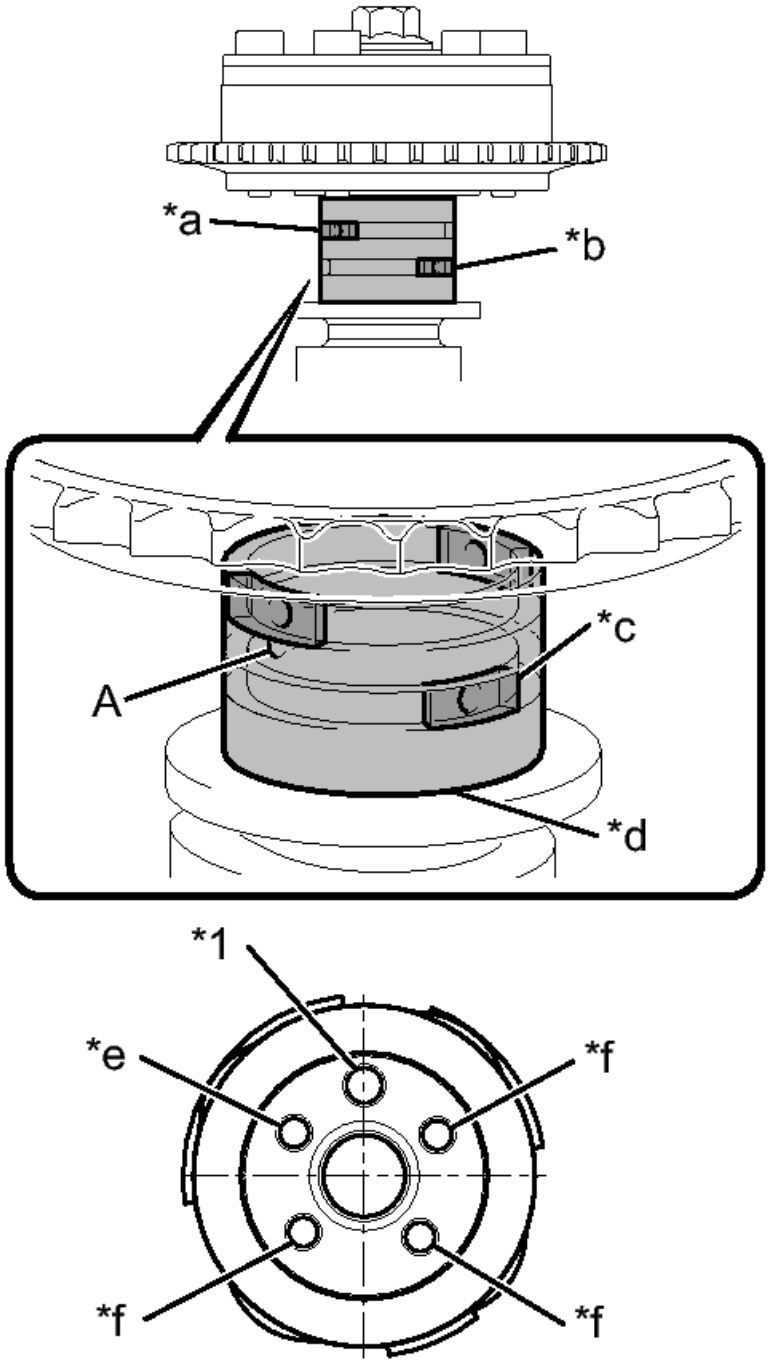
c. Secure the camshaft in place by hand, and then install the installation bolt of the camshaft timing gear by hand.

NOTE: **Do not use any tools to install the bolt. If the bolt is installed using a tool, the lock pin will be damaged.**

d. Check the lock of the camshaft timing gear.
   1. Make sure that the camshaft timing gear is locked.

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

e. Release the lock pin.



P

Fig. 234: Identifying Camshaft Journal Oil Paths & Vinyl Tape
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Clean the camshaft journal with non-residue solvent.

TEXT IN ILLUSTRATION

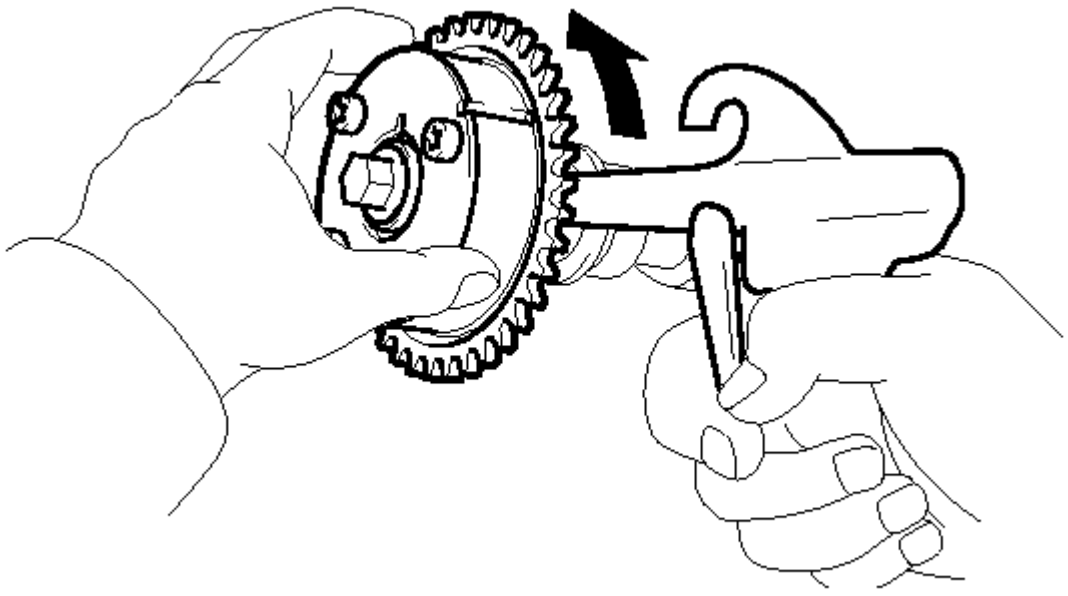
*1	Knock Pin
*a	Retard Side Path
*b	Advance Side Path
*c	Rubber
*d	Vinyl Tape
*e	Open
*f	Close

2. 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 grooves of the camshaft. Plug three of the paths with pieces of rubber.

3. Open a hole at port A shown in the illustration.
4. While applying approximately 200 kPa (2.0 kgf/ cm^2 , 29 psi) of air pressure to the oil path, forcibly turn the camshaft timing gear assembly in the advance direction (counterclockwise).



P

Fig. 235: Turning Camshaft Timing Gear Assembly
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 allow the camshaft timing gear assembly to lock. If it locks, 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.

f. 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 allow the camshaft timing gear assembly to lock.

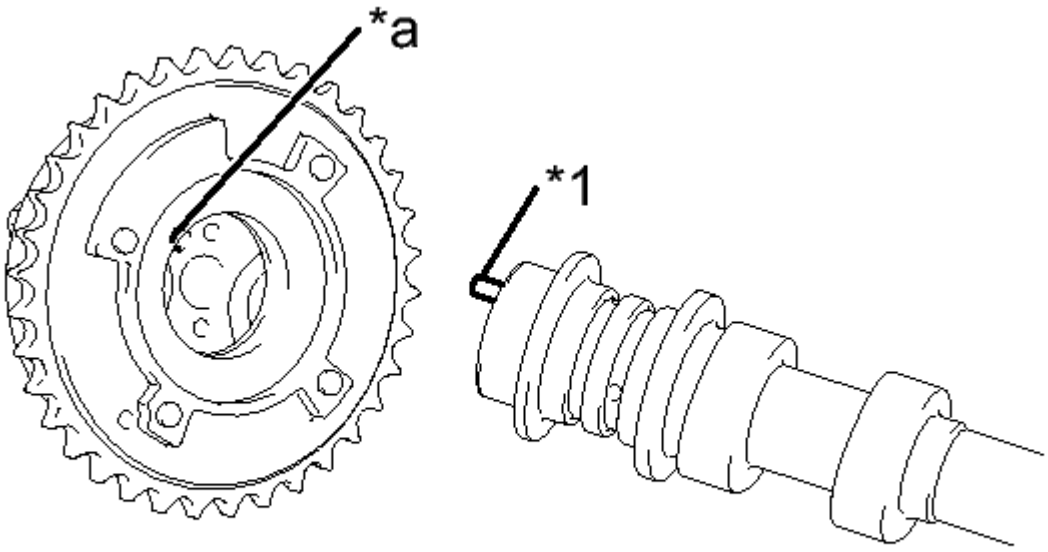
If it locks, release the lock pin again.

g. Remove the vinyl tape and rubber pieces from the camshaft.

h. Remove the bolt and camshaft timing gear.

7. **INSPECT CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY**

a. Align and attach the knock pin of the No. 2 camshaft with the knock pin hole of the camshaft timing exhaust gear.



P

Fig. 236: Identifying No. 2 Camshaft Knock Pin & Camshaft Timing Exhaust Gear Knock Pin Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Knock Pin
*a	Knock Pin Hole

b. Check that there is no clearance between the camshaft timing exhaust gear and camshaft flange.

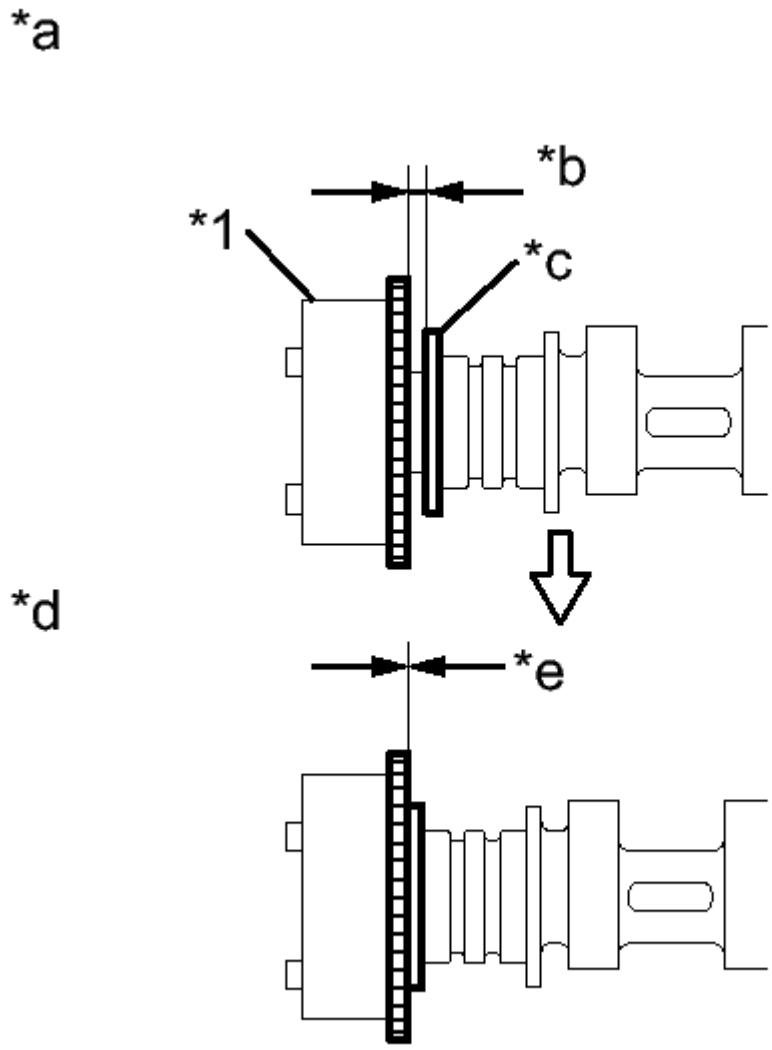


Fig. 237: Checking Clearance Between Camshaft Timing Exhaust Gear & Camshaft Flange
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

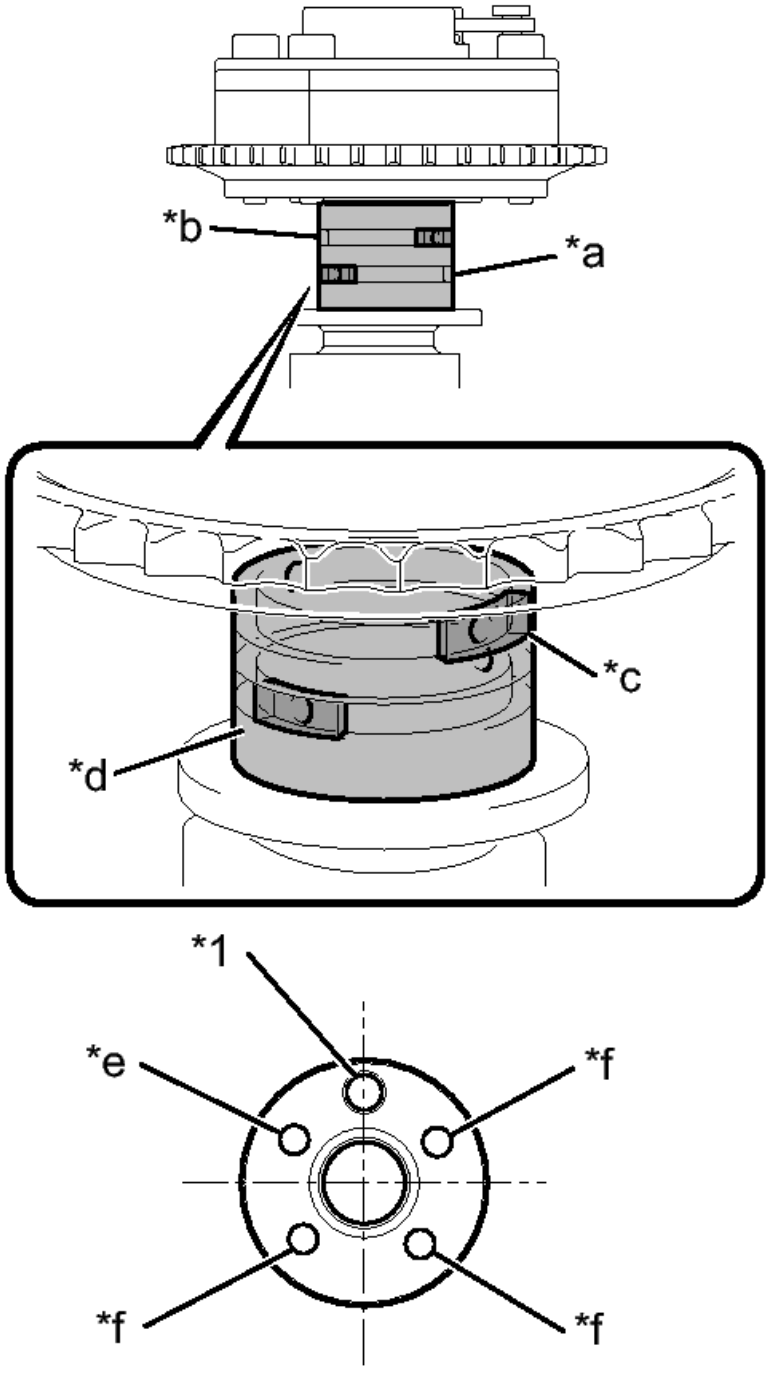
*1	Camshaft Timing Exhaust Gear
*a	INCORRECT
*b	Clearance
*c	Flange
*d	CORRECT
*e	No Clearance

c. Secure the camshaft in place by hand, and then install the installation bolt of the camshaft timing exhaust gear by hand.

d. Check the lock of the camshaft timing exhaust gear.
    1. Make sure that the camshaft timing exhaust gear is locked.

NOTE: Be careful not to damage the camshaft.

e. Release the lock pin.



P

Fig. 238: Identifying Camshaft Journal Oil Paths & Vinyl Tape
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Clean the camshaft journal with non-residue solvent.

TEXT IN ILLUSTRATION

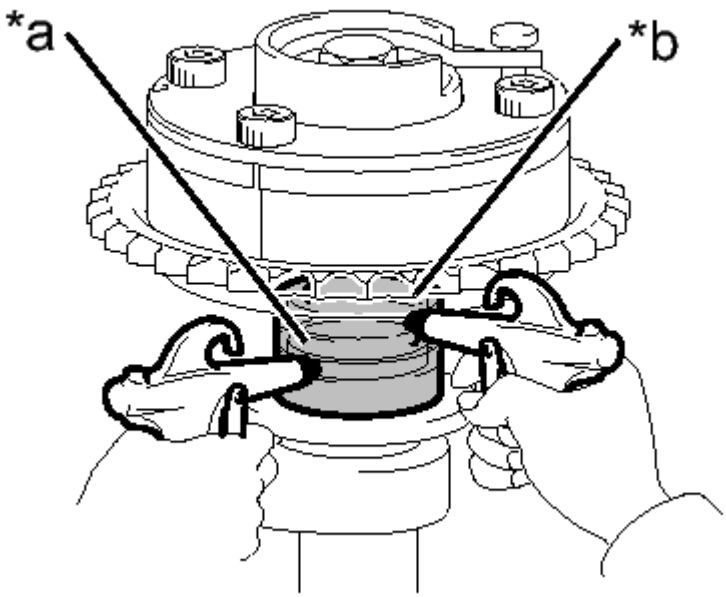
*1	Knock Pin
*a	Retard Side Path
*b	Advance Side Path
*c	Rubber
*d	Vinyl Tape
*e	Open
*f	Close

2. 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 grooves of the camshaft. Plug 2 paths with rubber pieces.

3. 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.
4. Apply approximately 200 kPa (2.0 kgf/cm^2 , 29 psi) of air pressure to the 2 open paths (the advance side path and retard side path).



P

Fig. 239: Applying Air Pressure To Retard & Advance Side Paths
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Retard Side Path
*b	Advance Side Path

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

5. Check that the camshaft timing exhaust gear turns in the retard direction when reducing the air pressure applied to the advance side path.

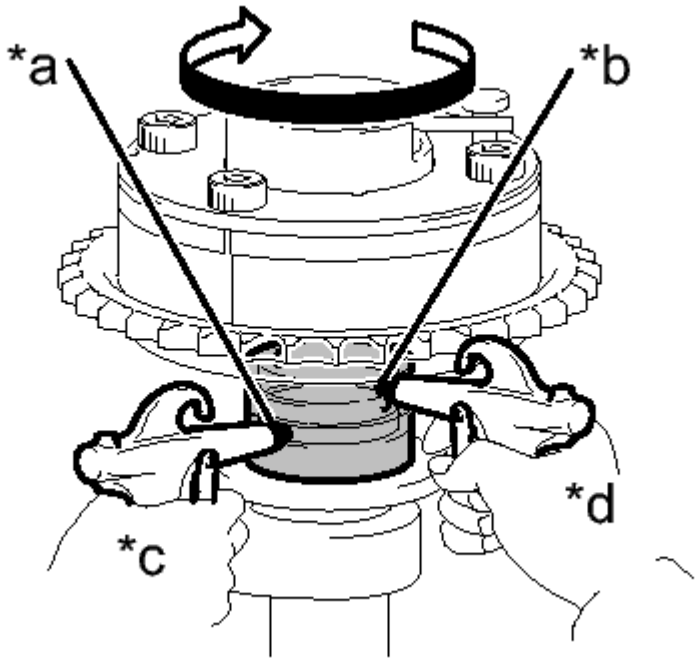


Fig. 240: Checking Camshaft Timing Exhaust Gear Turns With Air Pressure Applied To Advanced Side Path
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Retard Side Path
*b	Advance Side Path
*c	Hold Pressure
*d	Decompress

HINT:

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

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

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

f. Check for smooth rotation.

1. Turn the camshaft timing exhaust gear within its movable range (21.5 to 23.5°) 2 or 3 times, but do not turn it to the most advanced position. Make sure that the gear turns smoothly.

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

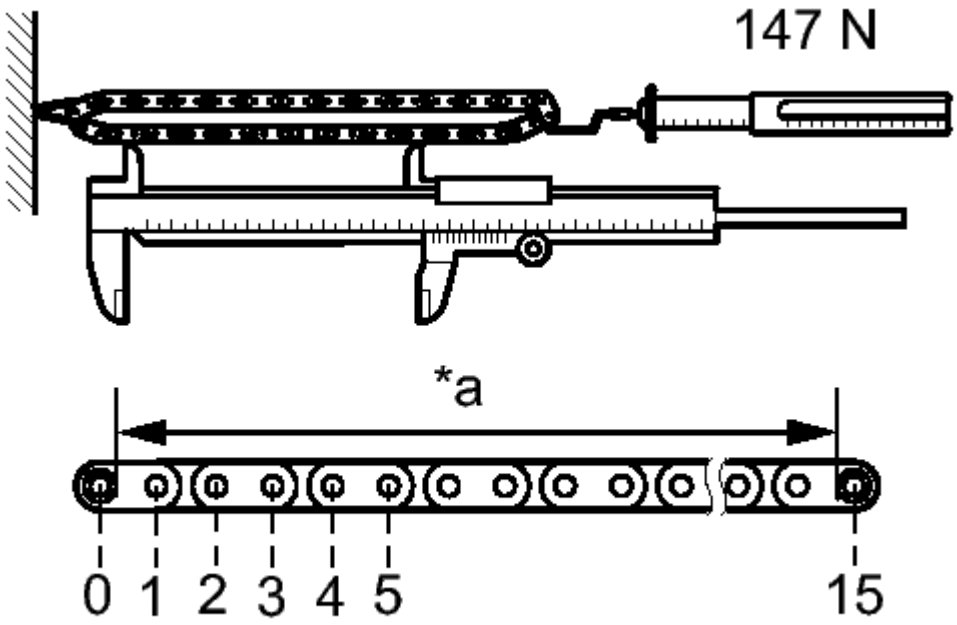
g. Check the lock at the most advanced position.

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

h. Remove the vinyl tape and rubber pieces from the camshaft.

i. Remove the bolt and camshaft timing gear.

8. **INSPECT CHAIN SUB-ASSEMBLY**



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Fig. 241: Measuring Chain Sub-Assembly Using A Vernier Caliper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Using a spring scale, pull the chain with a force of 147 N (15 kgf, 33.0 lbf) as shown in the illustration.

TEXT IN ILLUSTRATION

*a	Measurement

	Length

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

Maximum chain elongation

137.7 mm (5.42 in.)

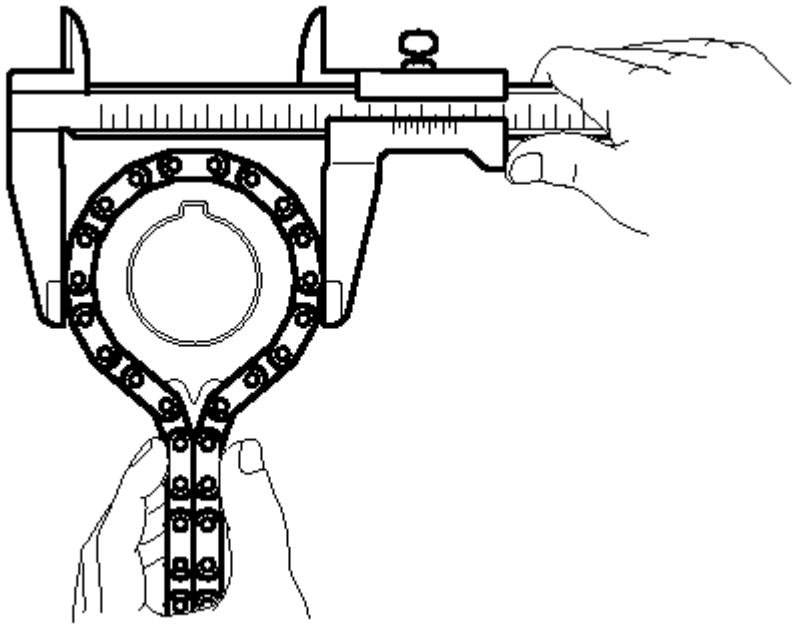
HINT:

Perform the measurement at 3 random places.

If the elongation is more than the maximum, replace the chain sub-assembly.

9. **INSPECT CRANKSHAFT TIMING SPROCKET**

a. Place the chain around the sprocket.



P

Fig. 242: Measuring Sprocket Diameter With Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using a vernier caliper, measure the sprocket diameter with the chain.

Minimum sprocket diameter (with chain)

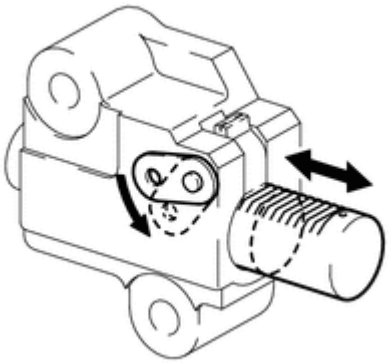
59.94 mm (2.36 in.)

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

HINT:

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

10. **INSPECT NO. 1 CHAIN TENSIONER ASSEMBLY**
    a. Move the stopper plate counterclockwise to release the lock. Push the plunger and check that it moves smoothly.

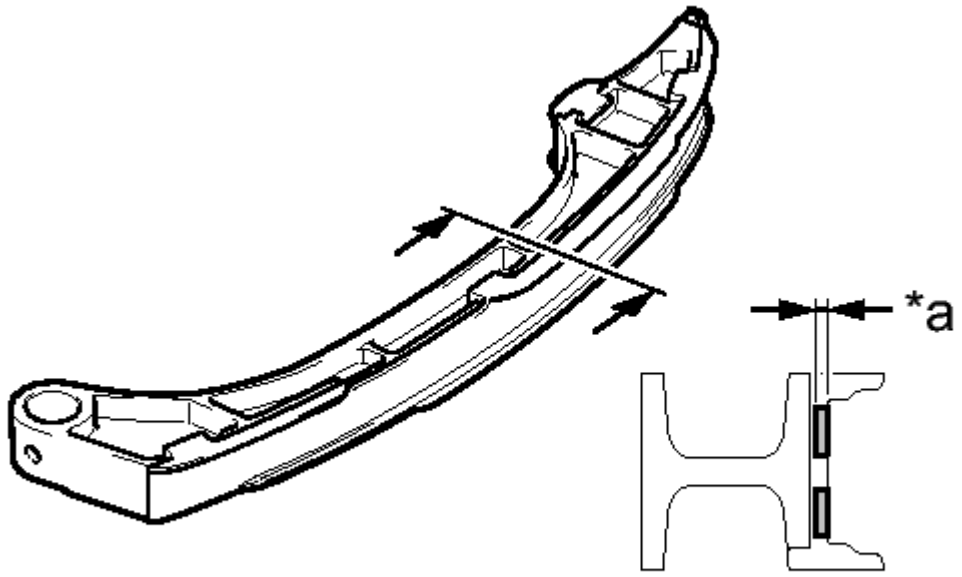


P

Fig. 243: Inspecting No. 1 Chain Tensioner Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If necessary, replace the No. 1 chain tensioner assembly.

11. **INSPECT CHAIN TENSIONER SLIPPER**
    a. Measure the worn depth of the chain tensioner slipper.



P

Fig. 244: Inspecting Chain Tensioner Slipper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

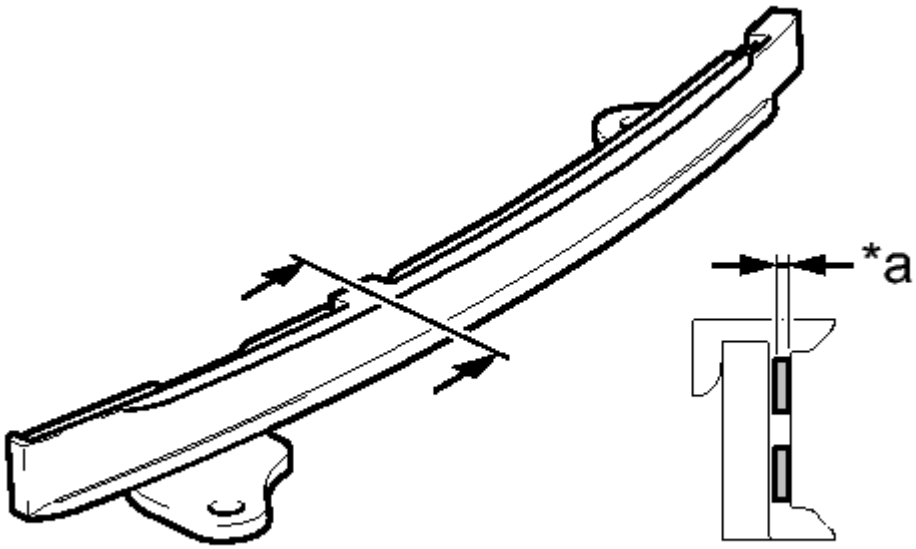
*a	Depth

Maximum depth

1.0 mm (0.0394 in.)

If the depth is more than the maximum, replace the chain tensioner slipper.

12. **INSPECT NO. 1 CHAIN VIBRATION DAMPER**
    a. Measure the worn depth of the chain vibration damper.



P

Fig. 245: Inspecting No. 1 Chain Vibration Damper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

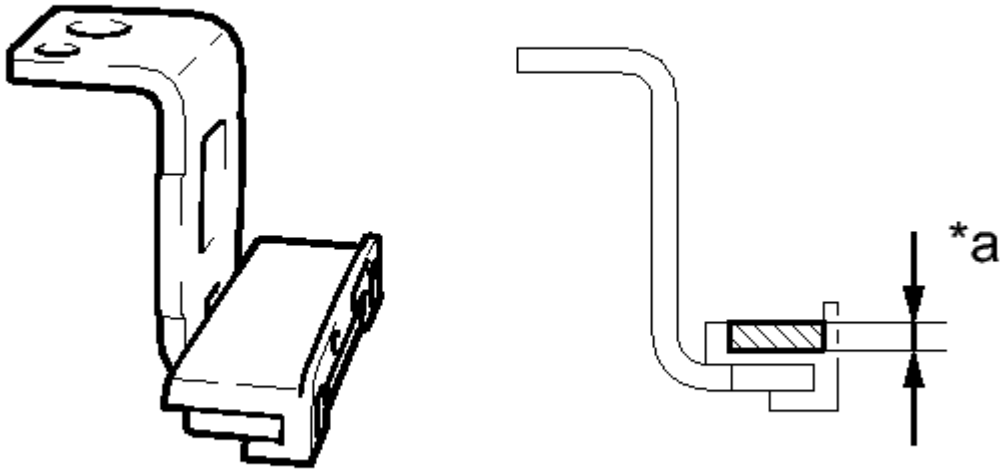
*a	Depth

Maximum depth

1.0 mm (0.0394 in.)

If the depth is more than the maximum, replace the No. 1 chain vibration damper.

13. **INSPECT TIMING CHAIN GUIDE**
    a. Measure the worn depth of the timing chain guide.



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Fig. 246: Inspecting Timing Chain Guide
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Depth

Maximum depth

1.0 mm (0.0394 in.)

If the depth is more than the maximum, replace the timing chain guide.

14. **INSPECT BALANCE SHAFT THRUST CLEARANCE**
    a. Using a dial indicator, measure the thrust clearance while moving the No. 1 balance shaft back and forth.

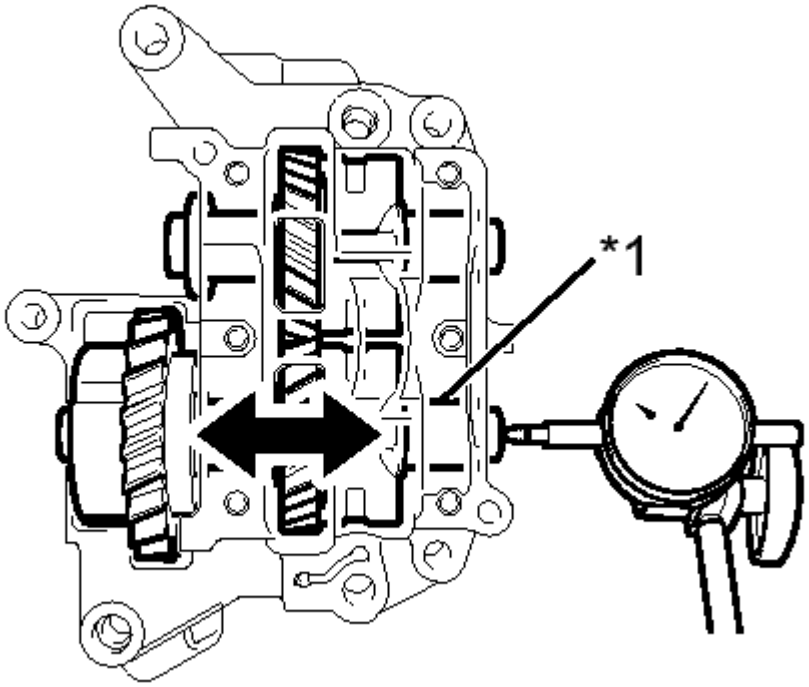


Fig. 247: Measuring Balance Shaft Thrust Clearance While Moving No. 1 Shaft Back & Forth Using A Dial Indicator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	No. 1 Balance Shaft

Standard thrust clearance

0.05 to 0.09 mm (0.00197 to 0.00354 in.)

Maximum thrust clearance

0.09 mm (0.00354 in.)

If the thrust clearance is more than the maximum, replace the engine balancer assembly.

b. Using a dial indicator, measure the thrust clearance while moving the No. 2 balance shaft back and forth.

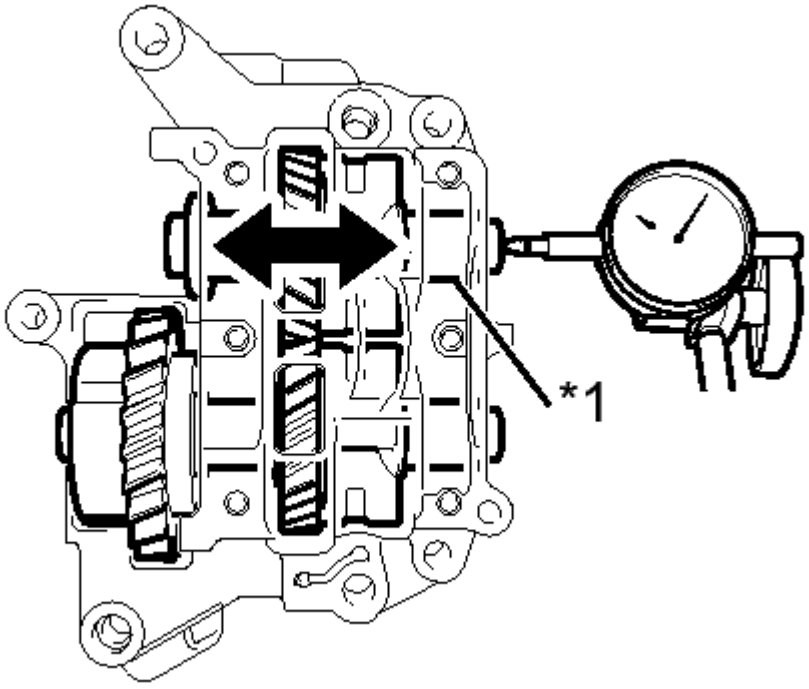


Fig. 248: Measuring Balance Shaft Thrust Clearance While Moving No. 2 Shaft Back & Forth Using A Dial Indicator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	No. 2 Balance Shaft

Standard thrust clearance

0.05 to 0.09 mm (0.00197 to 0.00354 in.)

Maximum thrust clearance

0.09 mm (0.00354 in.)

If the thrust clearance is more than the maximum, replace the engine balancer assembly.

15. **INSPECT BALANCE SHAFT BACKLASH**
    a. Secure the No. 2 balance shaft in place, and then using a dial indicator, measure the backlash of the No. 1 and No. 2 balance shafts as shown in the illustration.

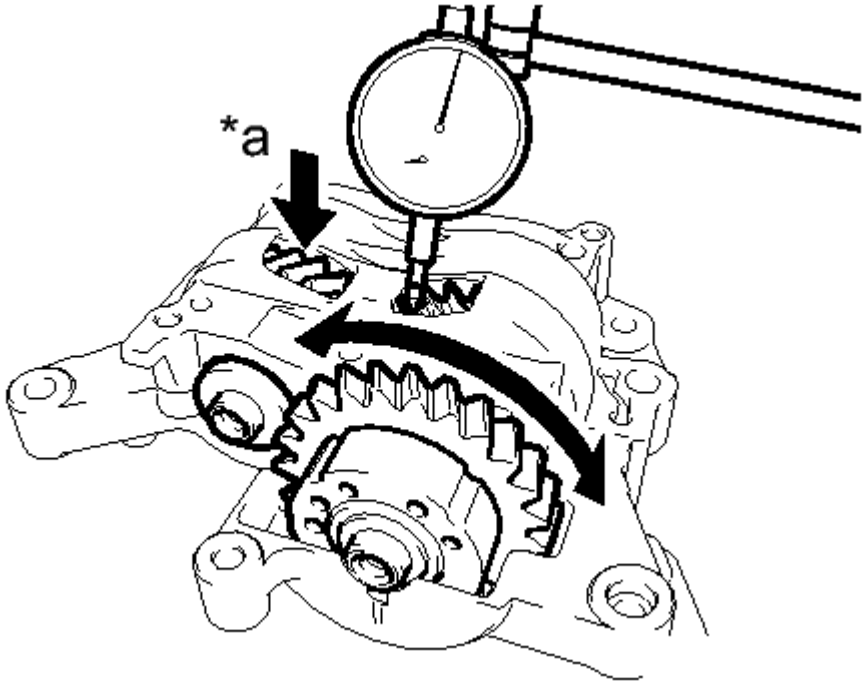


Fig. 249: Measuring No. 1 & No. 2 Balance Shafts Using A Dial Indicator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Fix

Standard backlash

0.04 to 0.17 mm (0.00157 to 0.00669 in.)

Maximum backlash

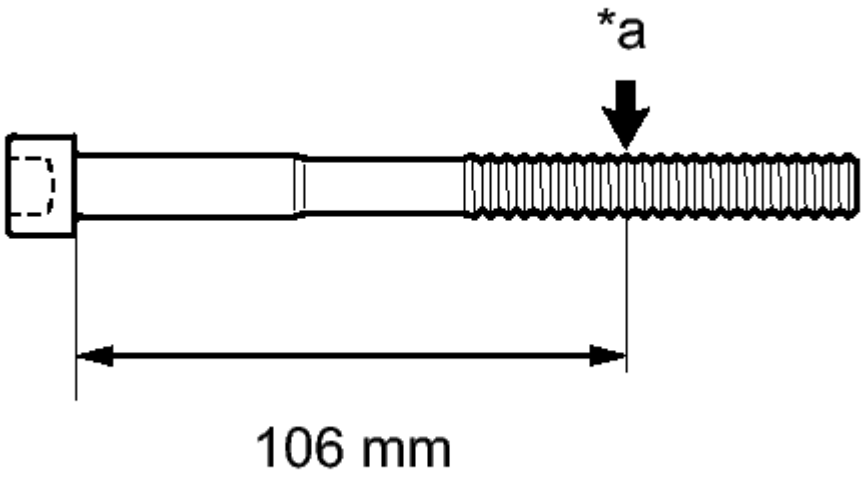
0.17 m (0.00669 in.)

HINT:

Measure at 3 or more areas around the circumference of the No. 1 and No. 2 balance shafts.

If the backlash is more than the maximum, replace the engine balancer assembly.

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



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Fig. 250: Inspecting Cylinder Head Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Measurement Point

Standard diameter

10.85 to 11.00 mm (0.427 to 0.433 in.)

Minimum diameter

10.6 mm (0.417 in.)

Measurement point (distance from the seat)

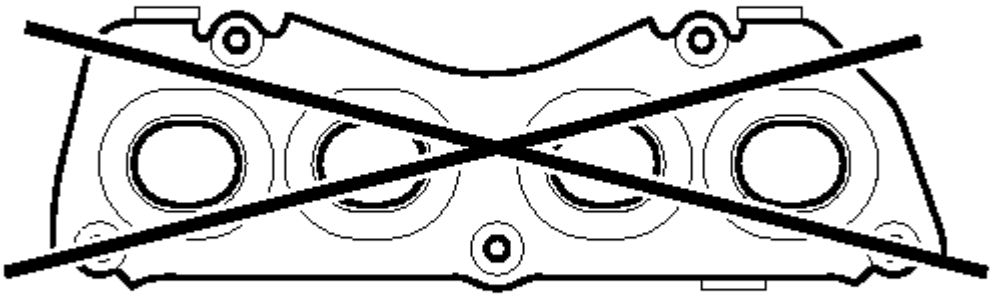
106 mm (4.17 in.)

HINT:

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

17. **INSPECT EXHAUST MANIFOLD**
    a. Using a precision straightedge and feeler gauge, measure the warpage of the surface that contacts

the cylinder head.



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Fig. 251: Checking Exhaust Manifold Converter Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum warpage

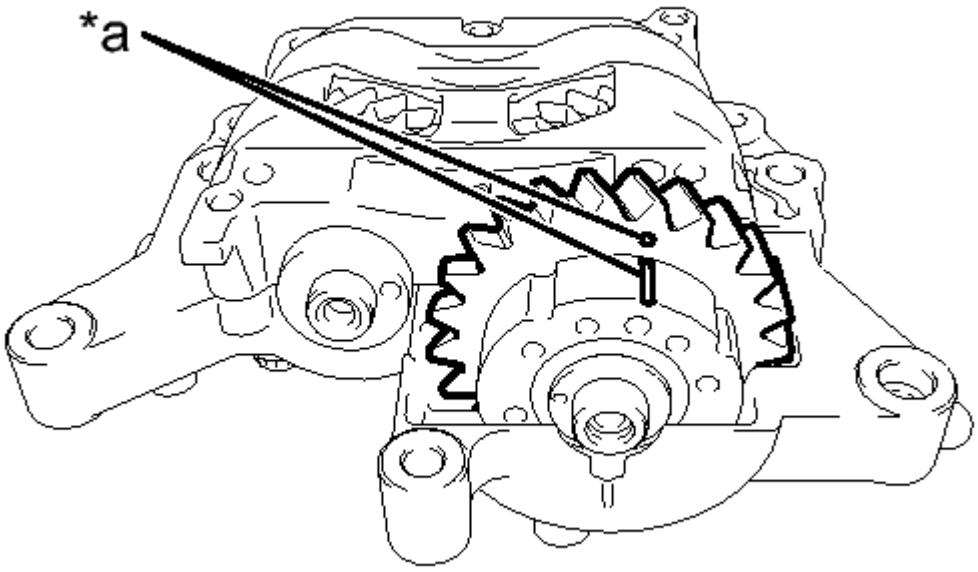
0.7 mm (0.0276 in.)

If the warpage is more than the maximum, replace the exhaust manifold.

REASSEMBLY

REASSEMBLY

1. **INSTALL ENGINE BALANCER ASSEMBLY**



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Fig. 252: Identifying Balance Shaft Damper Cover & Driven Gear Alignment Marks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Check that the alignment marks of the balance shaft damper cover and balance shaft driven gear are aligned.

TEXT IN ILLUSTRATION

*a	Alignment Mark

If the alignment marks are not aligned, realign them.

1. Place a wrench on the rear cutout part of the No. 2 balance shaft and secure the shaft in place.

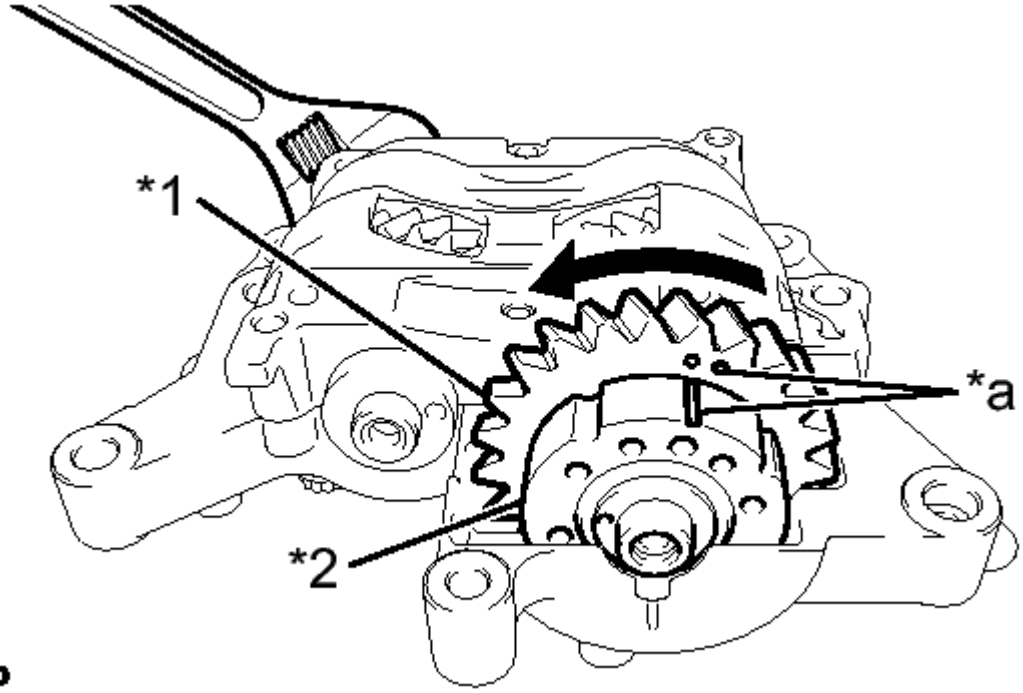


Fig. 253: Rotating No. 1 Balance Shaft Driven Gear Counterclockwise To Align Driven Gear & Damper Cover Alignment Marks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Driven Gear
*2	Damper Cover
*a	Alignment Mark

2. Rotate the balance shaft driven gear of the No. 1 balance shaft counterclockwise to align the alignment mark of the balance shaft driven gear with the alignment mark of the balance shaft damper cover.

b. Install the engine balancer to the stiffening crankcase with the 3 bolts, and tighten the bolts in the sequence shown in the illustration.

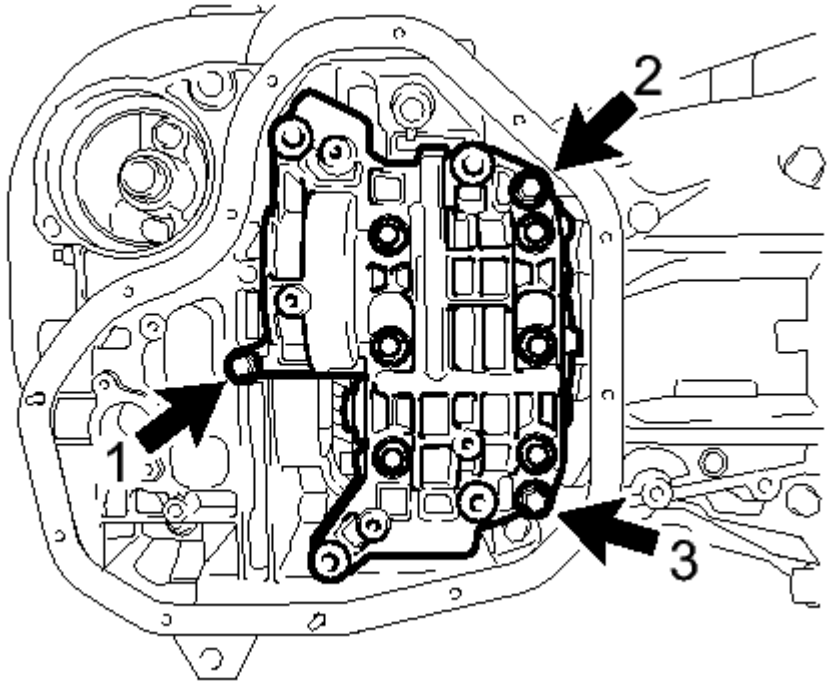


Fig. 254: Identifying Engine Balancer Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 24 N*m (245 kgf*cm, 18 ft.*lbf)

2. **INSTALL STIFFENING CRANKCASE STUD BOLT**

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

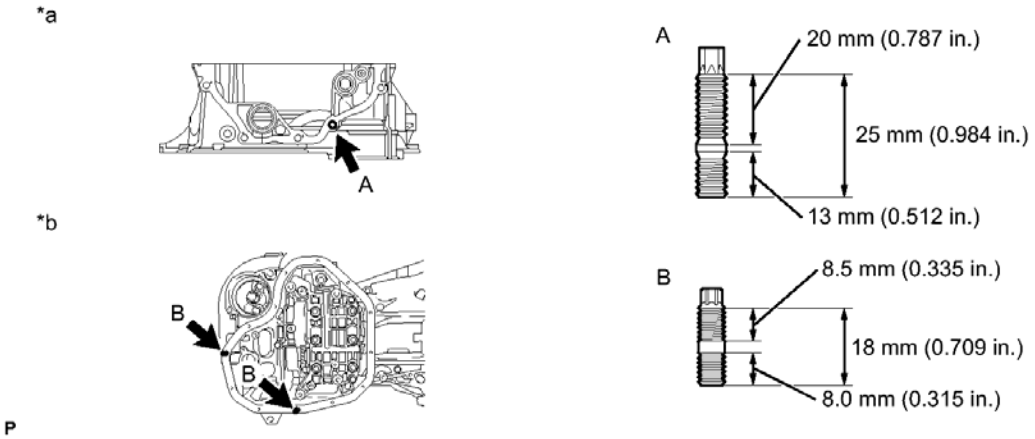


Fig. 255: Identifying Stiffening Crankcase Stud Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front	*b	Lower

	Side		Side

a. Using E5 and E8 "TORX" socket wrenches, install the stud bolts.

for stud bolt A

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

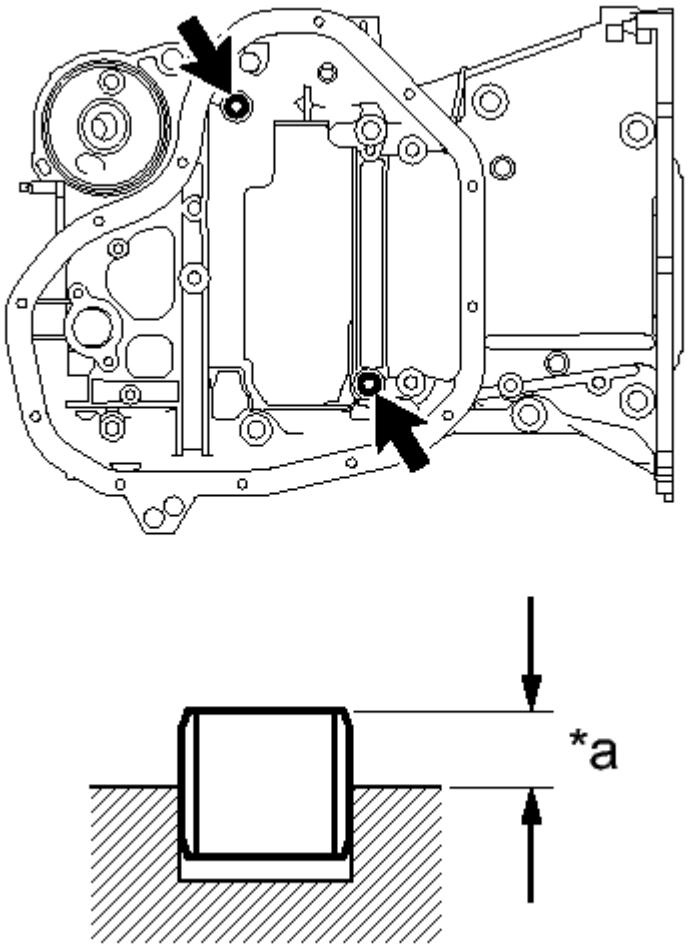
for stud bolt B

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

3. **INSTALL STIFFENING CRANKCASE RING PIN**

NOTE: It is not necessary to remove the ring pin unless it is being replaced.

a. Using a plastic-faced hammer, tap in 2 new ring pins until they stop.



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Fig. 256: Identifying Stiffening Crankcase Ring Pins
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Protrusion Height

Standard protrusion height

4.3 to 5.3 mm (0.169 to 0.209 in.)

4. **INSTALL STIFFENING CRANKCASE ASSEMBLY**
   a. Rotate the crankshaft clockwise so that the crankshaft key is at the position 90° from the bottom as shown in the illustration.

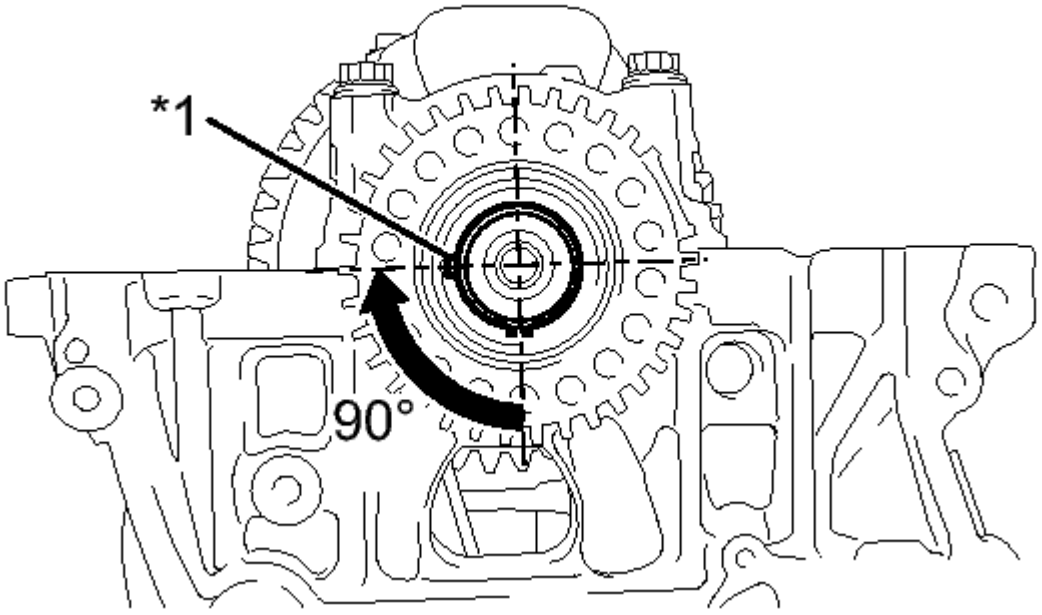


Fig. 257: Rotating Crankshaft Clockwise
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Key

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

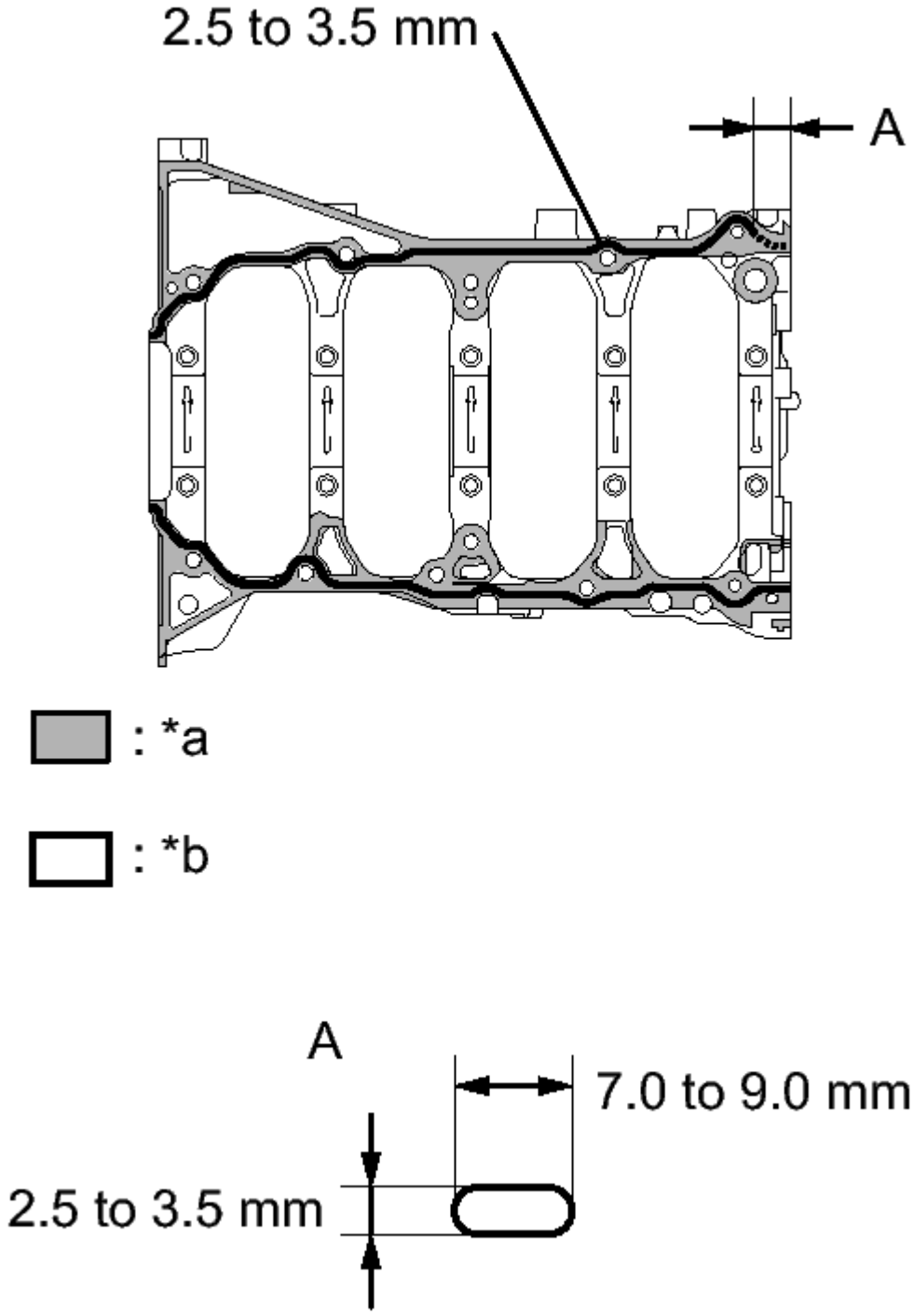


Fig. 258: Identifying Stiffening Crankcase & Cylinder Block Seal Packing Areas
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	Stiffening

*a	Crankcase
*b	Cylinder Block

Seal packing

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

Standard Seal Dimension

Area	Specified Condition
Continuous Line	2.5 to 3.5 mm (0.0984 to 0.138 in.)
Dashed Line	7.0 to 9.0 mm (0.276 to 0.354 in.) wide and 2.5 to 3.5 mm (0.0984 to 0.138 in.) thick

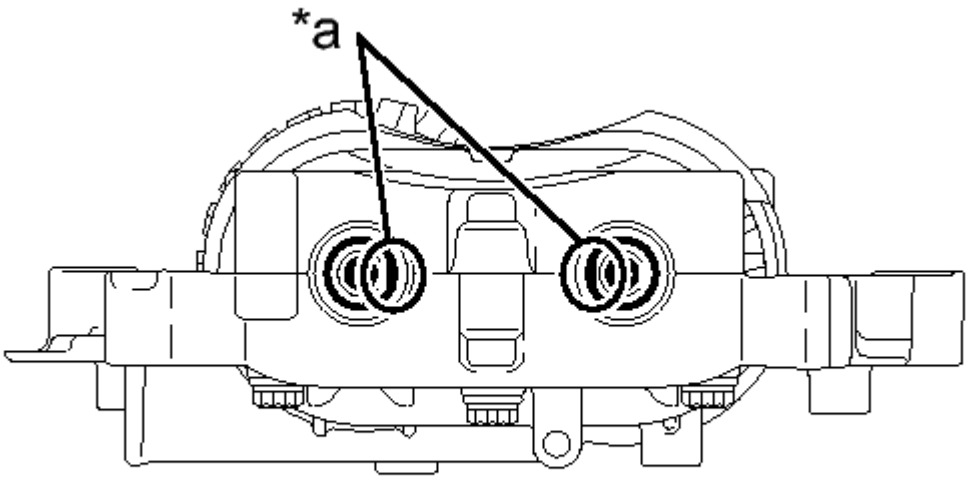
Application Length A

28 mm (1.10 in.)

NOTE:

- **Remove any oil from the contact surface.**
- **Install the oil pan within 3 minutes and tighten the bolts and nuts within 15 minutes after applying seal packing.**
- **Do not apply oil for at least 4 hours after the installation.**

c. Check that the rear cutout parts are as shown in the illustration.



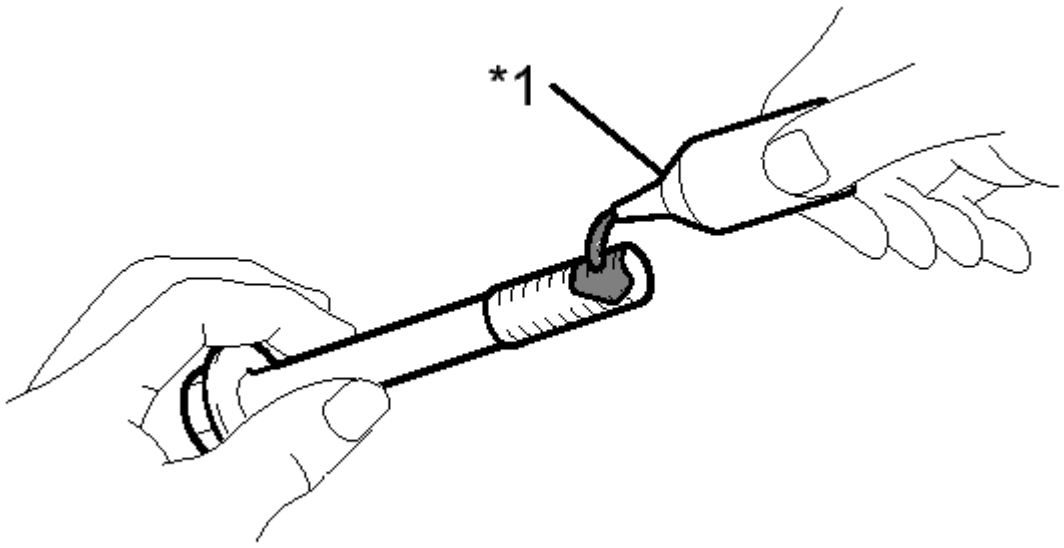
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Fig. 259: Identifying Stiffening Crankcase Rear Cutout Parts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Cutout

d. Clean the bolts and their installation holes.
e. Apply adhesive to 3 threads or more of the end of bolt A.



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Fig. 260: Applying Adhesive To Bolt Threads
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

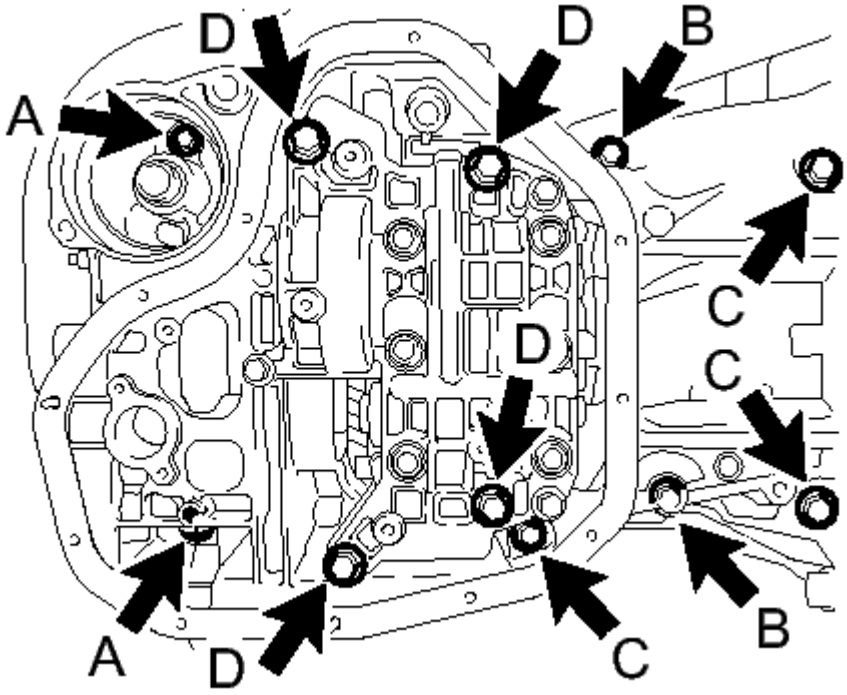
TEXT IN ILLUSTRATION

*1	Adhesive

Adhesive

Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

f. Temporarily install the stiffening crankcase with the 11 bolts.



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Fig. 261: Identifying Stiffening Crankcase Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Bolt Length

Item	Length
Bolt A	65 mm (2.56 in.)
Bolt B	35 mm (1.38 in.)
Bolt C	125 mm (4.92 in.)
Bolt D	165 mm (6.50 in.)

HINT:

Apply adhesive to bolt A before installing it.

g. Tighten the 11 bolts in the sequence shown in the illustration to install the stiffening crankcase

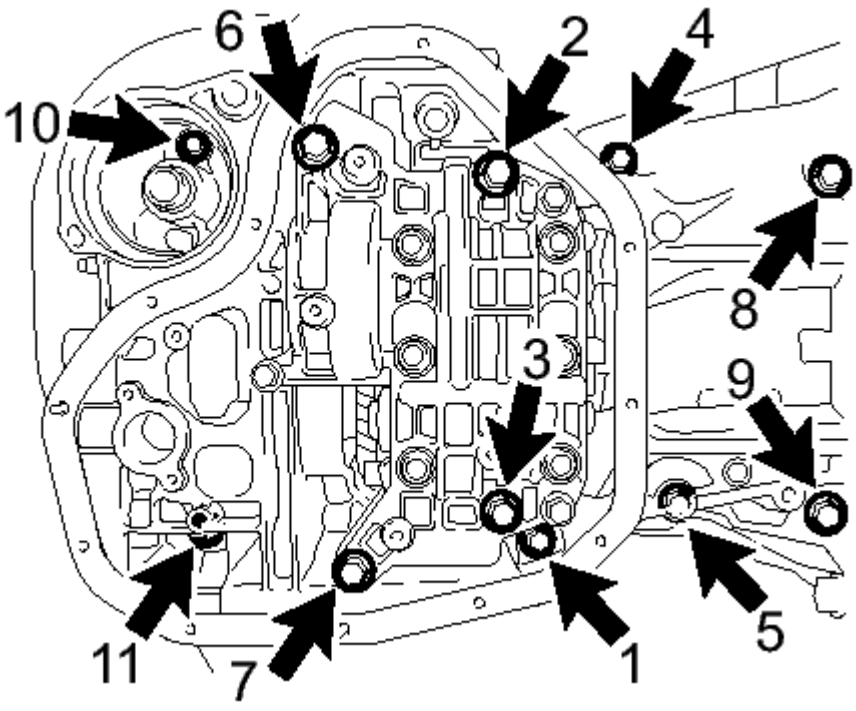


Fig. 262: Identifying Stiffening Crankcase Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

for Bolt A

Torque: 24 N*m (245 kgf*cm, 18 ft.*lbf)

except Bolt A

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

5. **INSTALL NO. 1 OIL PAN BAFFLE PLATE**

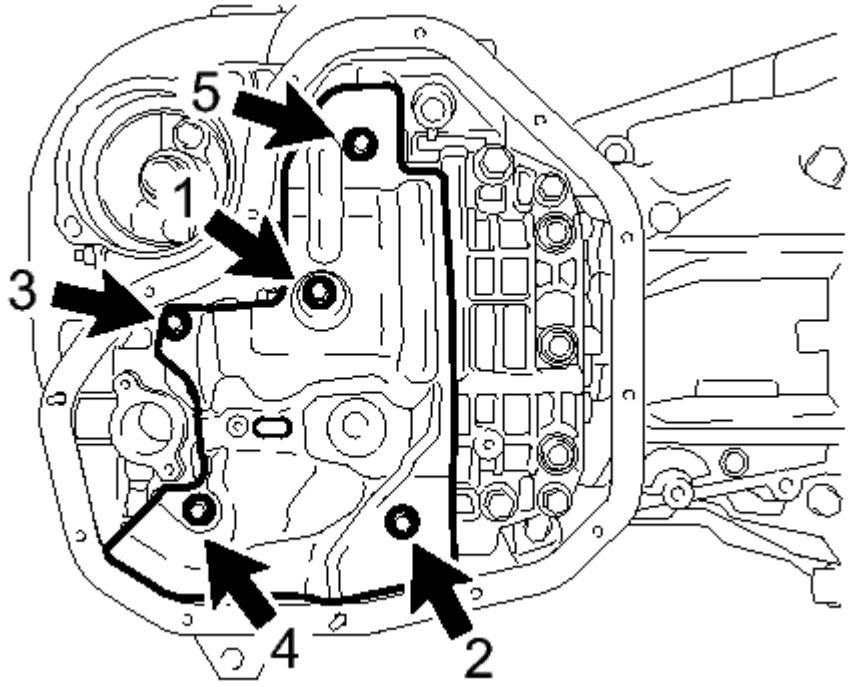


Fig. 263: Identifying No. 1 Oil Pan Baffle Plate Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Install the oil pan baffle plate and uniformly tighten the 5 bolts in several steps, in the sequence shown in the illustration.

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

6. **INSTALL OIL STRAINER SUB-ASSEMBLY**
   a. Apply a light coat of engine oil to a new gasket.
   b. Align the protrusion of the gasket with the cutout of the oil strainer, and install the gasket to the oil strainer.

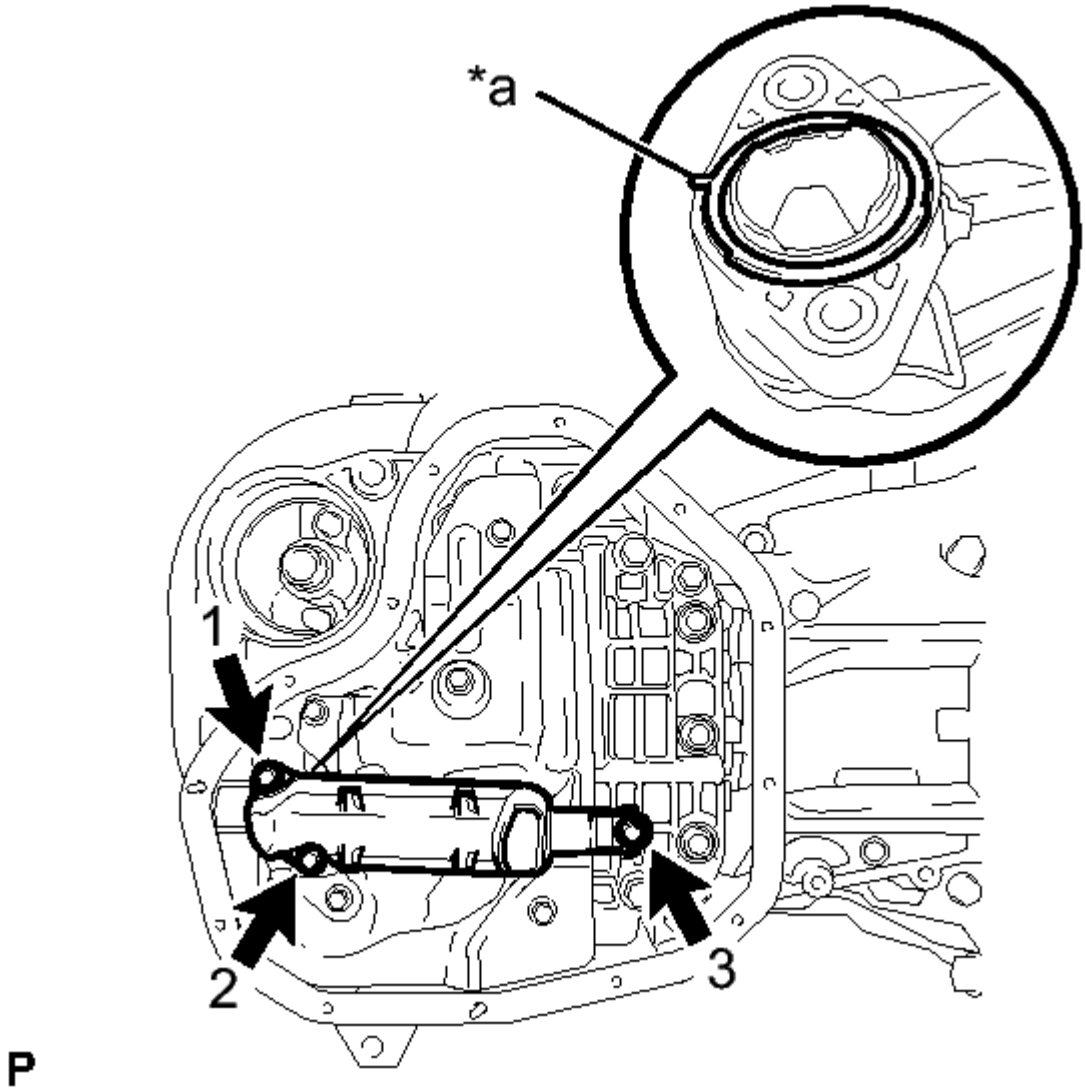


Fig. 264: Identifying 3 Oil Strainer Bolts With Tightening Sequence & Aligning Gasket Protrusion To Oil Strainer Cutout
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Protrusion

c. Install the oil strainer with the 3 bolts in several steps, in the sequence shown in the illustration.

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

7. **INSTALL OIL PAN SUB-ASSEMBLY**

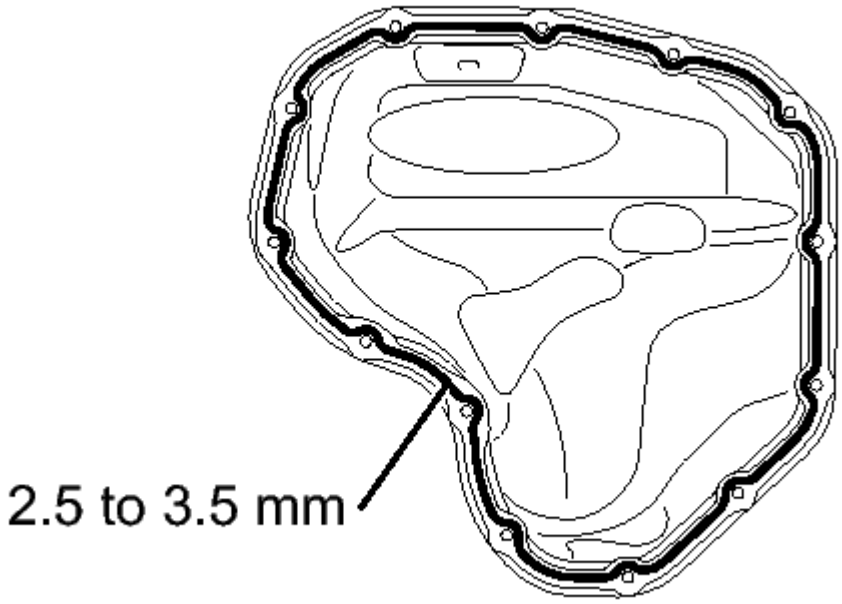


Fig. 265: Identifying Oil Pan Seal Packing Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

   Seal packing

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

   Standard seal diameter

   2.5 to 3.5 mm (0.0984 to 0.138 in.)

   NOTE:

   - **Remove any oil from the contact surface.**
   - **Install the oil pan within 3 minutes and tighten the bolts and nuts within 10 minutes after applying seal packing.**
   - **Do not apply oil for at least 4 hours after the installation.**

b. Install the oil pan with the 11 bolts and 2 nuts in several steps, in the sequence shown in the illustration.

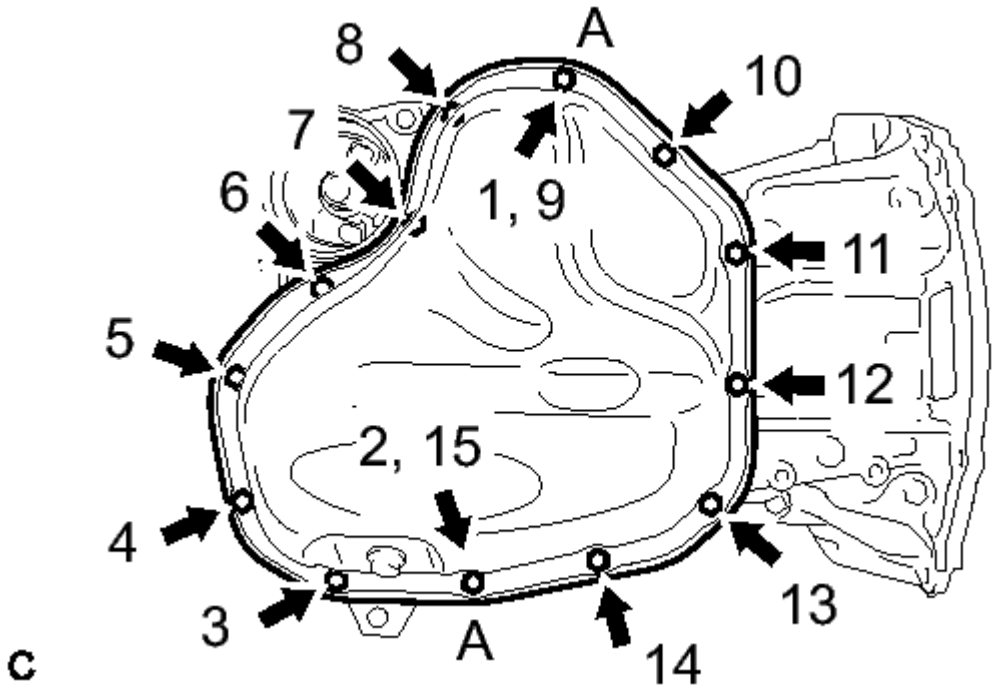


Fig. 266: Identifying Oil Pan Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

HINT:

Bolt A and Nut A are tightened twice.

8. **INSTALL OIL FILTER CAP ASSEMBLY** . Refer to **REPLACEMENT - Step 3**
9. **INSTALL REAR ENGINE OIL SEAL** See step 1
10. **INSTALL CYLINDER BLOCK WATER JACKET SPACER**
    a. Install the water jacket spacer to the cylinder block.

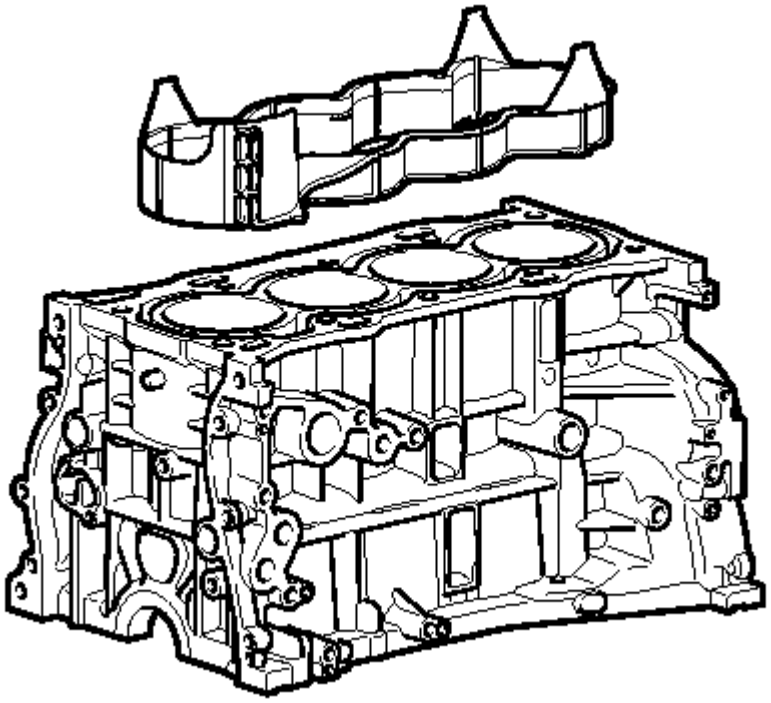


Fig. 267: Identifying Cylinder Block Water Jacket Spacer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. **INSTALL CYLINDER HEAD GASKET** See step 3
12. **INSTALL CYLINDER HEAD SUB-ASSEMBLY** See step 4
13. **INSTALL CAMSHAFT BEARING CAP SETTING RING PIN**

NOTE: It is not necessary to remove the ring pin unless it is being replaced.

a. Using a plastic-faced hammer, tap in 10 new ring pins to the camshaft housing.

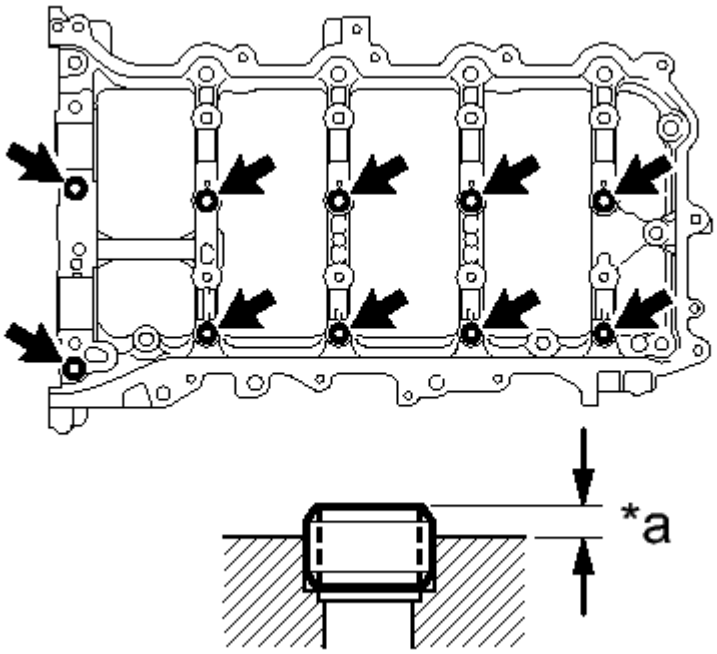


Fig. 268: Identifying Camshaft Bearing Ring Pins
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Protrusion Height

Standard protrusion height

2.7 to 3.3 mm (0.106 to 0.130 in.)

14. **INSTALL CAMSHAFT HOUSING STRAIGHT PIN**

NOTE: It is not necessary to remove the straight pin unless it is being replaced.

a. Using a plastic-faced hammer, tap in 2 new straight pins to the camshaft housing.

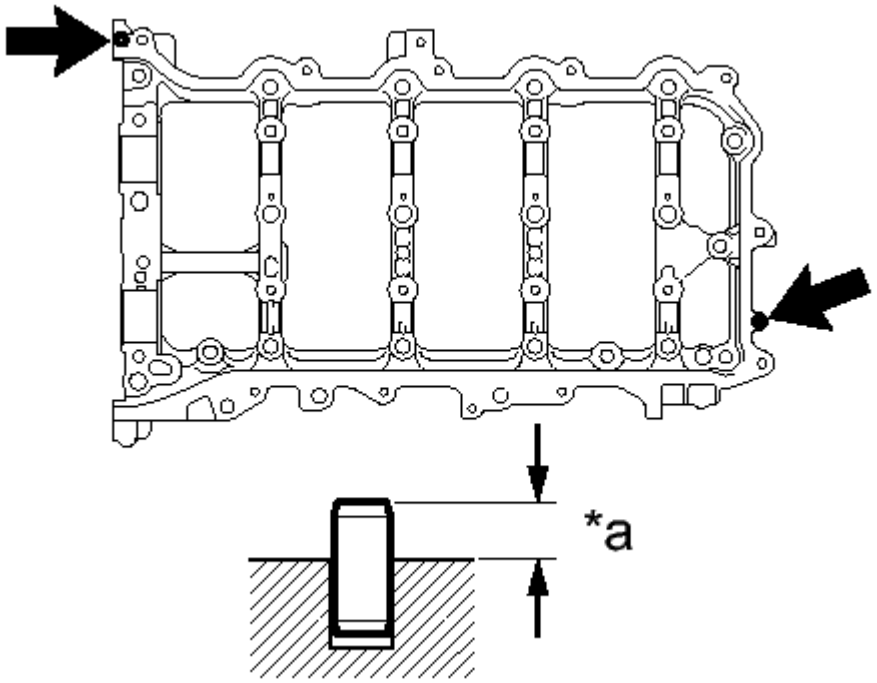


Fig. 269: Identifying Camshaft Housing Straight Pins
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Protrusion Height

Standard protrusion height

5.0 to 7.0 mm (0.197 to 0.276 in.)

15. **INSTALL CAMSHAFT HOUSING STUD BOLT**

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

a. Using an E8 "TORX" socket wrench, install the stud bolt.

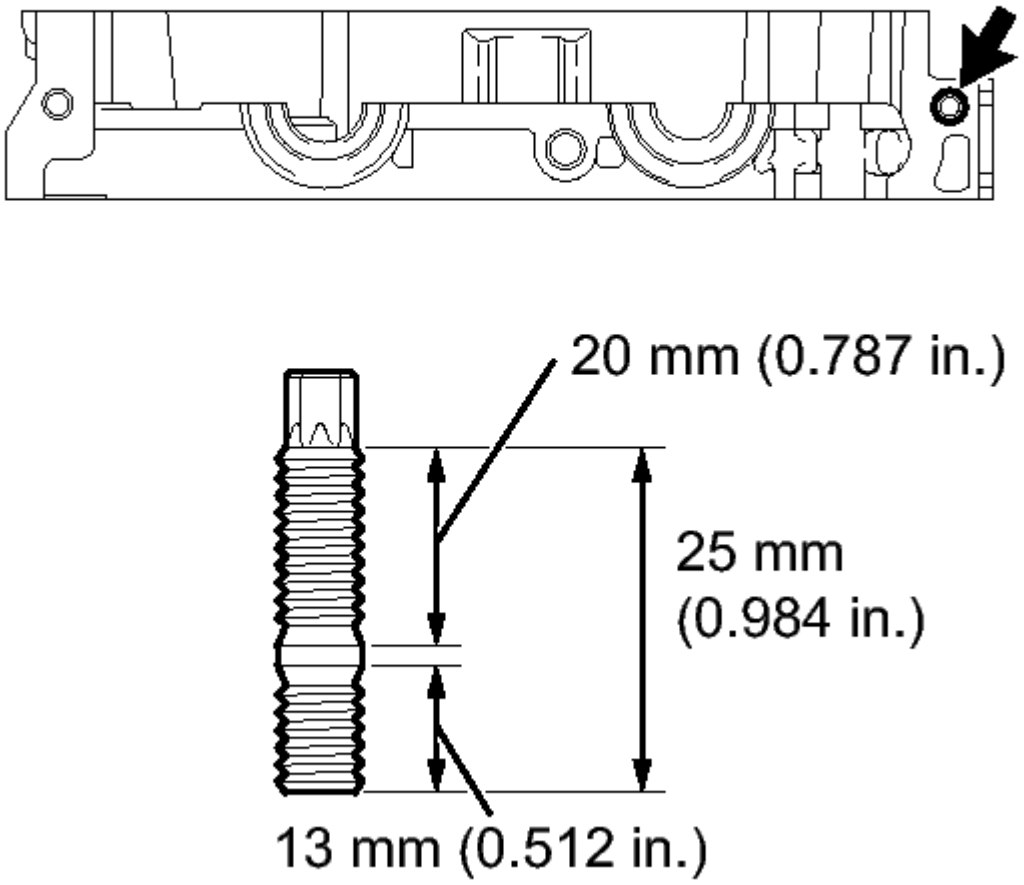


Fig. 270: Identifying Camshaft Housing Stud Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

16. **INSTALL NO. 1 CAMSHAFT BEARING**
    a. Clean the No. 1 camshaft bearing.

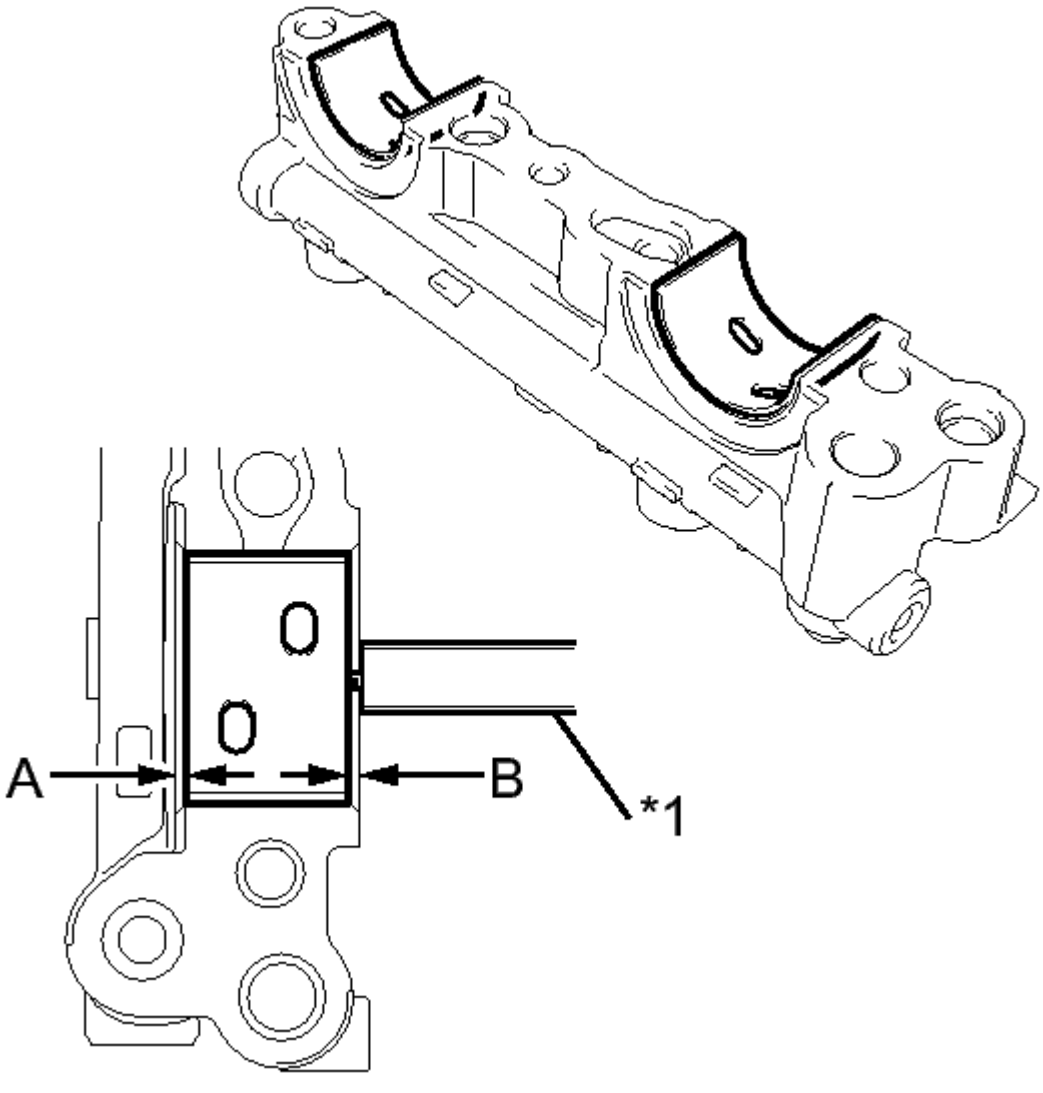


Fig. 271: Identifying Distance Between Camshaft Bearing Cap Edge & Camshaft Bearing Edge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

TEXT IN ILLUSTRATION

*1	Vernier Caliper

Standard dimension A - B or B - A

0 to 0.7 mm (0 to 0.0276 in.)

17. **INSTALL NO. 2 CAMSHAFT BEARING**

a. Clean the No. 2 camshaft bearing.

b. Install the camshaft bearing to the camshaft housing.

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

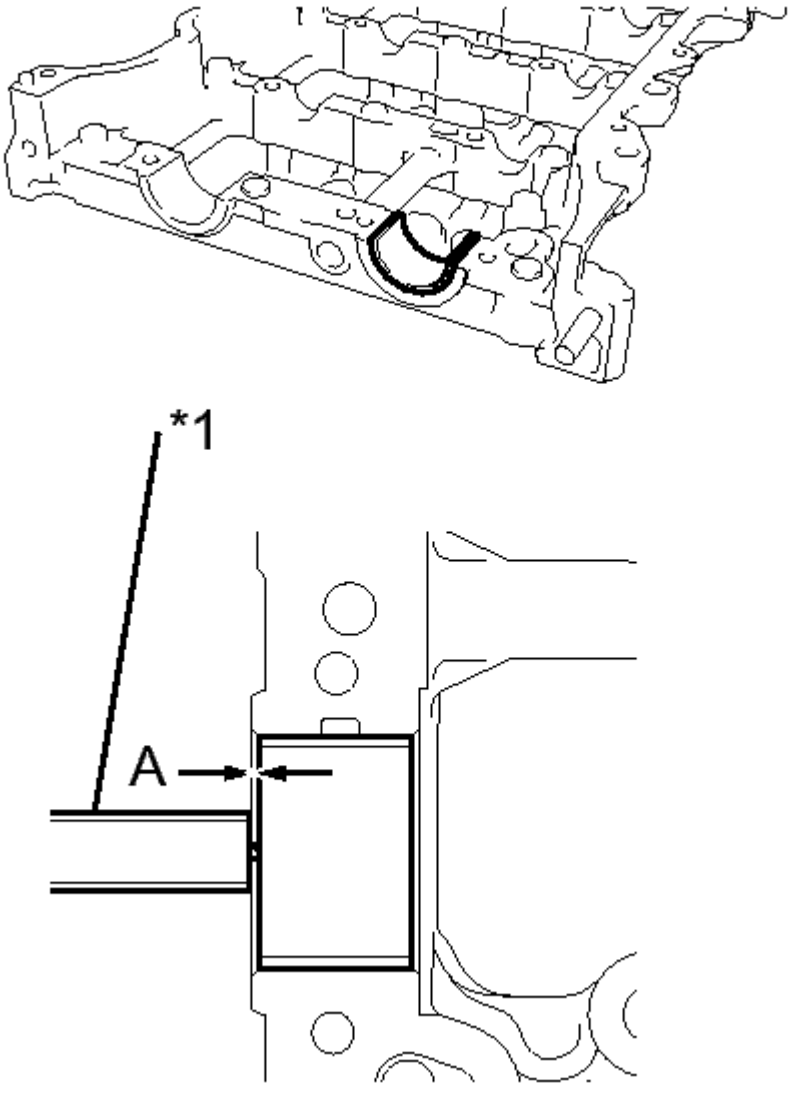


Fig. 272: Identifying Distance Between Camshaft Housing Edge & Camshaft Bearing Edge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Vernier Caliper

Standard distance

1.15 to 1.85 mm (0.0453 to 0.0728 in.)

18. **INSTALL OIL CONTROL VALVE FILTER**
    a. Install the oil control valve filter to the No. 1 camshaft bearing cap.

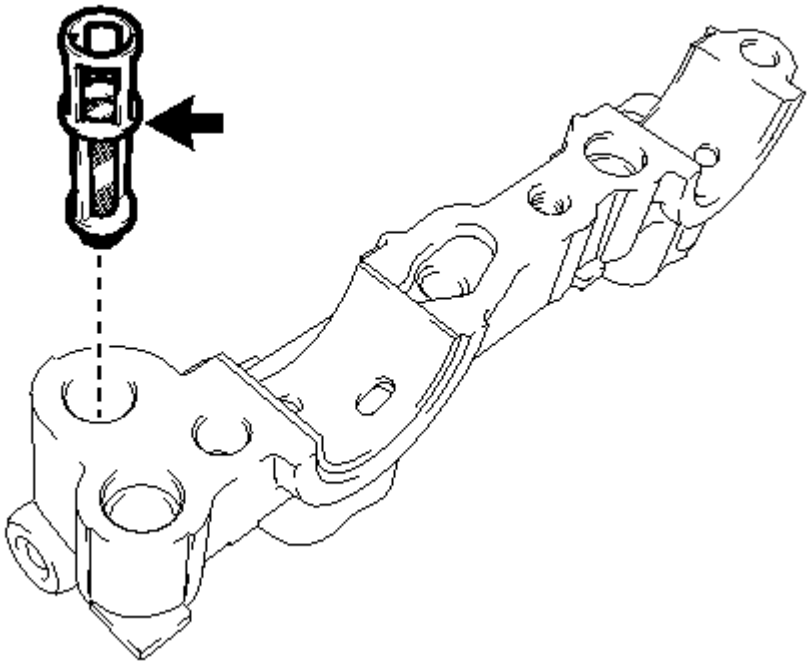
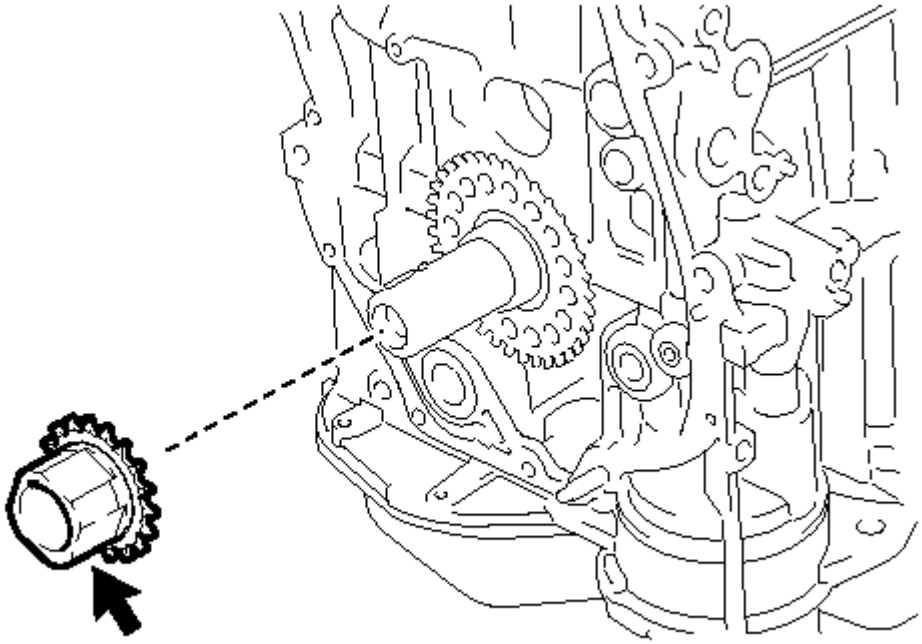


Fig. 273: Identifying Oil Control Valve Filter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

19. **INSTALL CAMSHAFT** See step 12
20. **INSTALL CAMSHAFT BEARING CAP** See step 13
21. **INSTALL VALVE STEM CAP** See step 5
22. **INSTALL VALVE LASH ADJUSTER ASSEMBLY** See step 7
23. **INSTALL NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY** See step 8
24. **INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY** See step 14
25. **INSTALL CAMSHAFT TIMING GEAR ASSEMBLY** See step 15
26. **INSTALL CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY** See step 16
27. **INSTALL CRANKSHAFT TIMING SPROCKET**

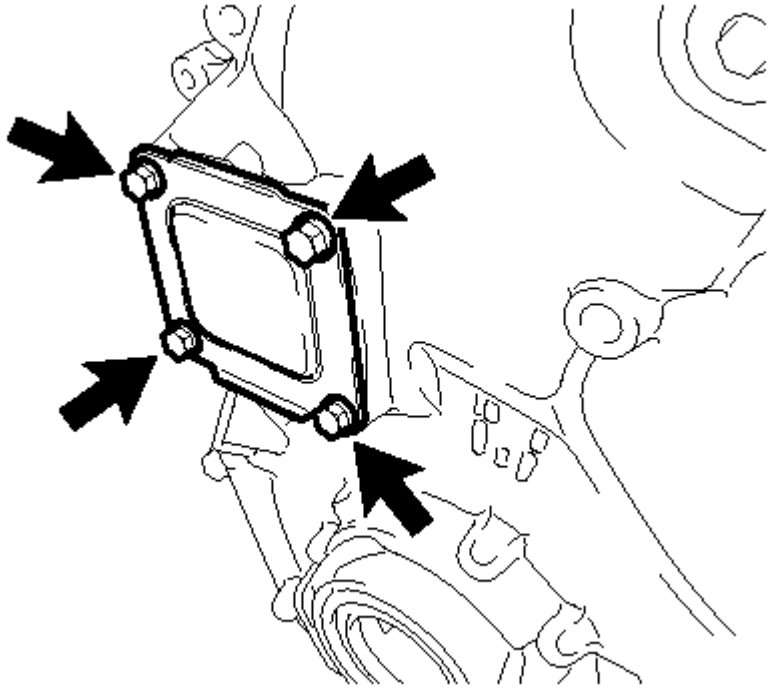


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Fig. 274: Identifying Crankshaft Timing Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Install the crankshaft timing sprocket to the crankshaft.

28. **ADD ENGINE OIL** See step 17
29. **SET NO. 1 CYLINDER TO TDC/COMPRESSION** See step 18
30. **INSTALL NO. 1 CHAIN VIBRATION DAMPER** See step 19
31. **INSTALL CHAIN SUB-ASSEMBLY** See step 20
32. **INSTALL CHAIN TENSIONER SLIPPER** See step 21
33. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY** See step 22
34. **INSTALL TIMING CHAIN GUIDE** See step 23
35. **CHECK NO. 1 CYLINDER TO TDC/COMPRESSION** See step 24
36. **INSTALL TIMING CHAIN COVER PLATE**
    a. Install a new gasket and the timing chain cover plate with the 4 bolts.

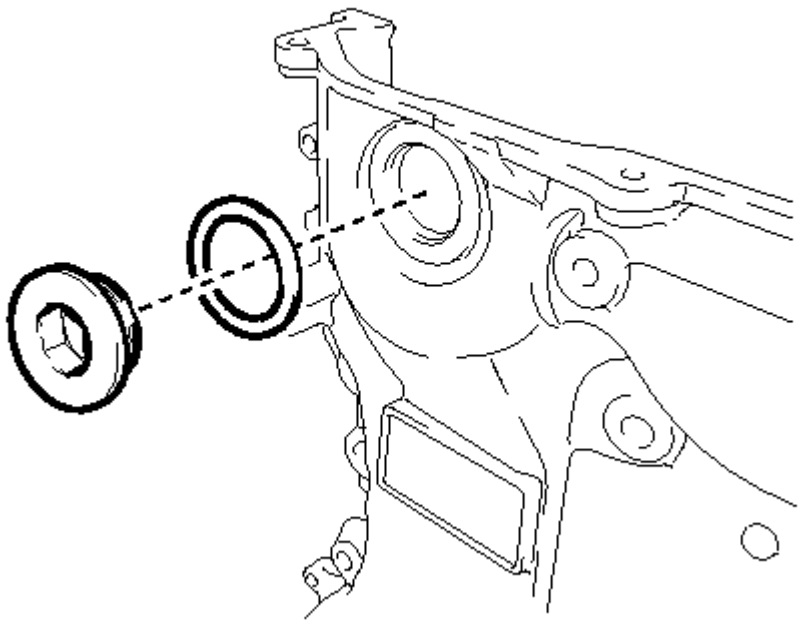


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Fig. 275: Identifying Timing Chain Cover Plate Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

37. **INSTALL TIMING CHAIN COVER TIGHT PLUG**
    a. Using a 14 mm hexagon wrench, install a new gasket and the plug.

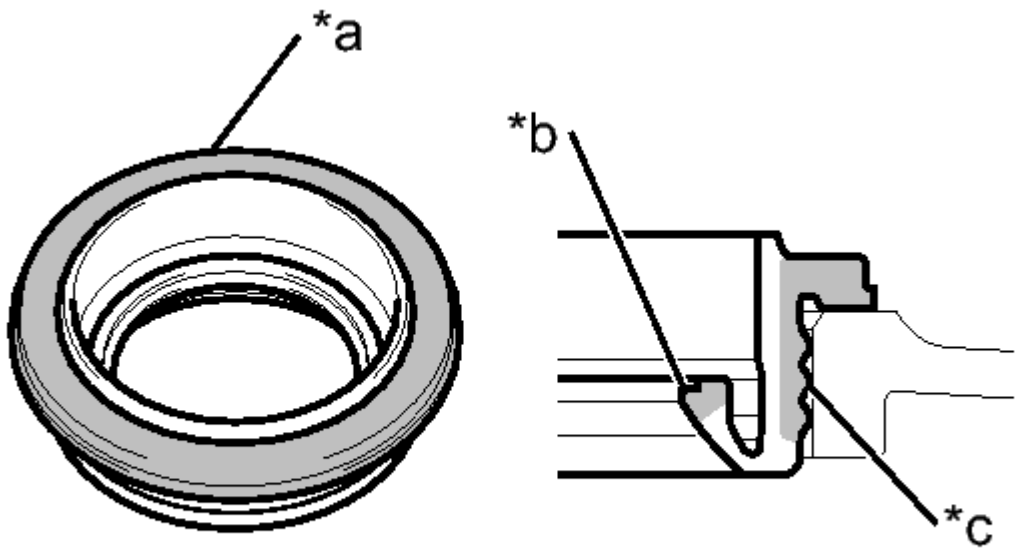


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Fig. 276: Identifying Plug And Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

38. **INSTALL TIMING CHAIN COVER SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 1**
39. **INSTALL ENGINE MOUNTING BRACKET RH** . Refer to **INSTALLATION - Step 2**
40. **INSTALL TIMING CHAIN COVER OIL SEAL** See step 1
41. **INSTALL SPARK PLUG TUBE GASKET**
    a. Visually check the spark plug tube gasket.



P

Fig. 277: Checking Spark Plug Tube Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

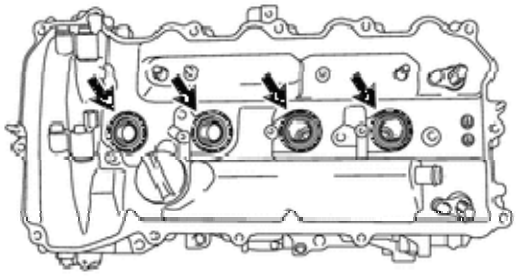
*a	Upper Surface
*b	Inner Lip
*c	Outer Lip

OK

Area	Specified Condition
Upper surface	No scratches or deformation
Outer lip	No scratches or deformation
Inner lip	No scratches

If the result is not as specified, replace the spark plug tube gasket.

b. Install the 4 plug tube gaskets to the cylinder head cover.



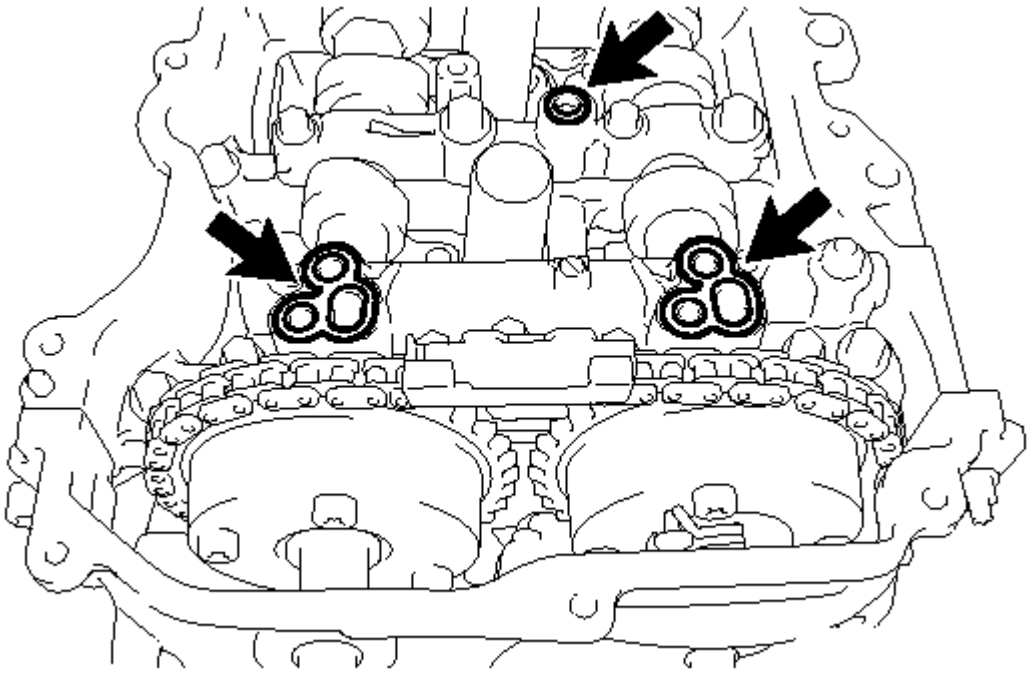
P

Fig. 278: Identifying Plug Tube Gaskets
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: After pressing in the spark plug tube gasket, make sure the gasket protrudes 1.0 mm (0.0394 in.) or less from the cylinder head cover.

42. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY**

a. Apply a light coat of engine oil to 3 new gaskets.



P

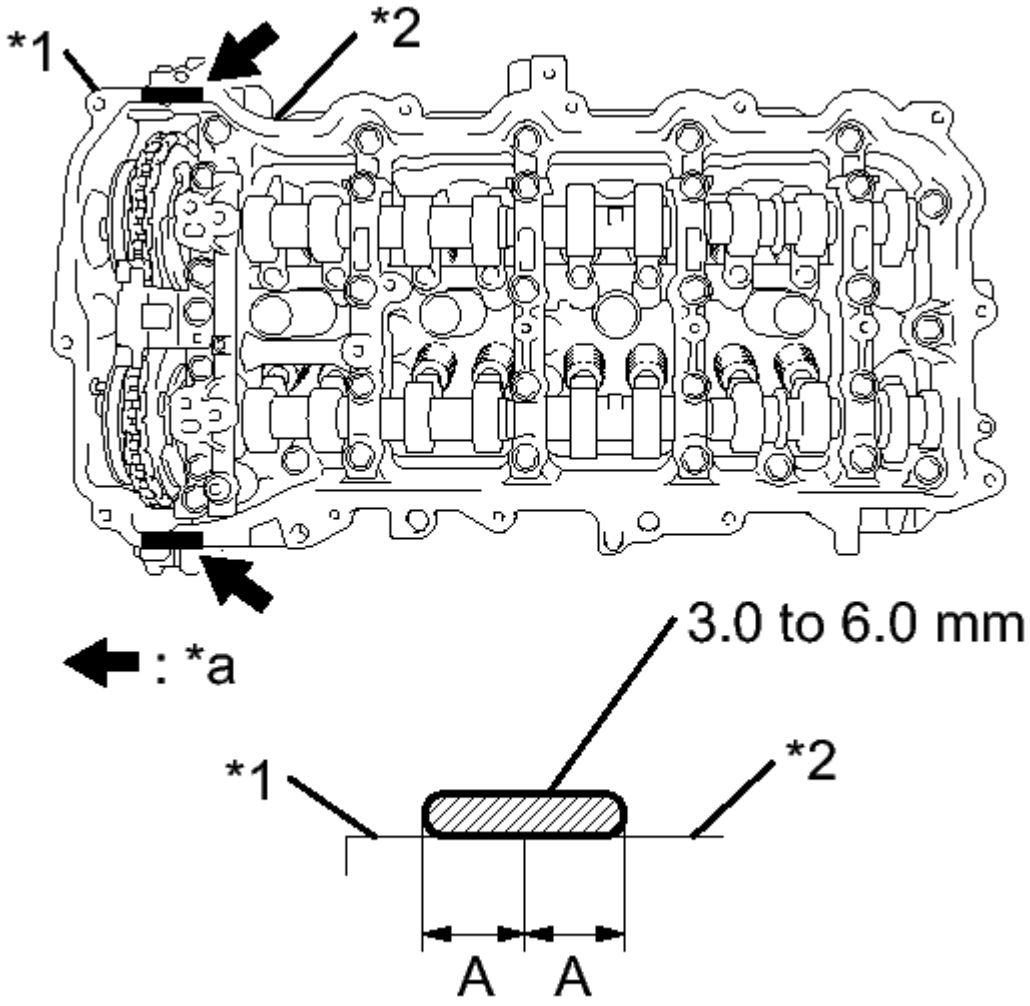
Fig. 279: Identifying Camshaft Bearing Caps Gaskets
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Install the 3 gaskets to the camshaft bearing caps.

c. Install a new gasket to the cylinder head cover.

NOTE: Remove any oil from the contact surface.

d. Apply seal packing as shown in the illustration.



P

Fig. 280: Identifying Timing Chain Cover & Camshaft Housing Seal Packing Areas
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Timing Chain Cover
*2	Camshaft Housing

*a	Seal Packing

Seal packing

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

Standard seal diameter

3.0 to 6.0 mm (0.118 to 0.236 in.)

Application width A

5.0 mm (0.197 in.)

NOTE:

- **Remove any oil from the contact surface.**
- **Install the cylinder head cover within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.**

e. Align the cylinder head cover with pin A. Then align the cylinder head cover with pin B and install the cylinder head cover.

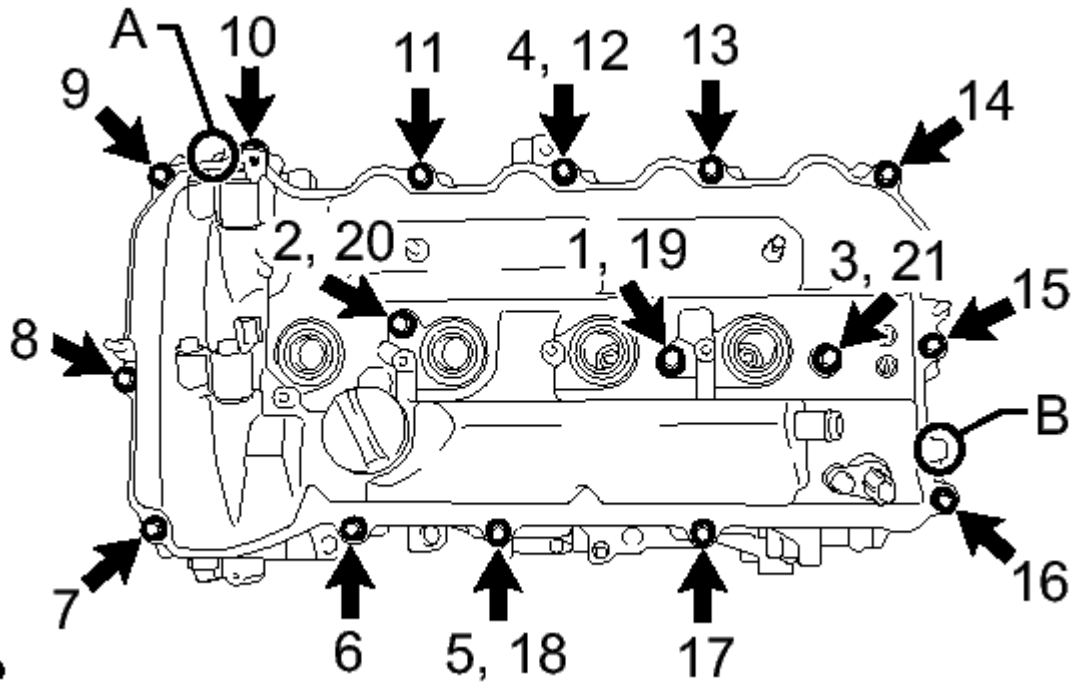


Fig. 281: Identifying Cylinder Head Cover Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Install 3 new seal washers and the 16 bolts, and then tighten the bolts in the order shown in the

illustration.

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

NOTE: Do not apply oil for at least 4 hours after the installation.

43. **INSTALL CRANKSHAFT PULLEY**
    a. Align the pulley set key with the key groove of the crankshaft pulley.

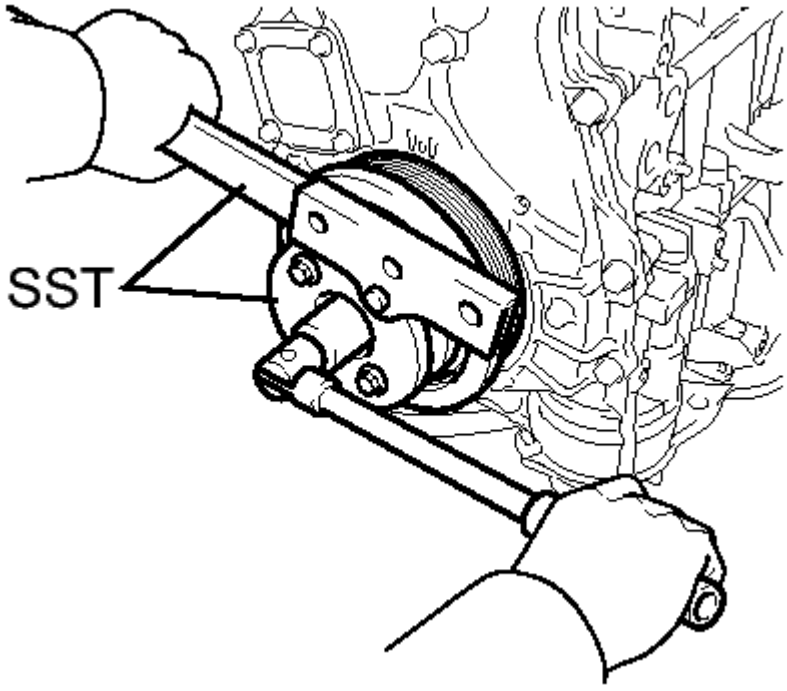
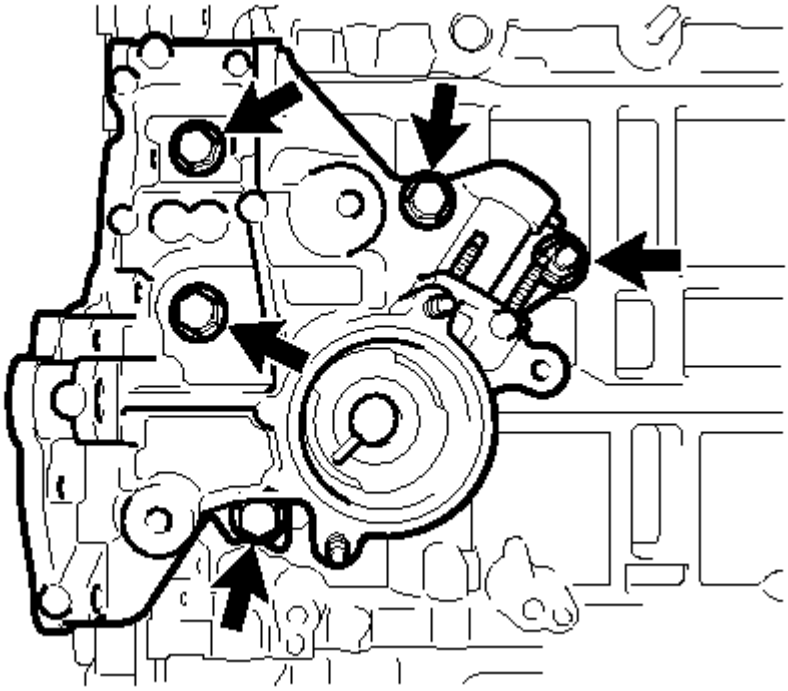


Fig. 282: Identifying Crankshaft Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Using SST, hold the crankshaft pulley and install the pulley bolt.
        - **SST: 09213-54015**
        - **SST: 09330-00021**
        - **SST: 91551-80650**

    Torque: 260 N*m (2651 kgf*cm, 192 ft.*lbf)

44. **INSTALL CRANKSHAFT POSITION SENSOR** . Refer to **INSTALLATION - Step 1**
45. **INSTALL INLET WATER HOUSING**
    a. Install a new gasket and the inlet water housing with the 4 bolts and nut.



P

Fig. 283: Identifying Inlet Water Housing And Gasket Bolts And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

46. **INSTALL OIL COOLER ASSEMBLY** . Refer to **INSTALLATION - Step 1**
47. **INSTALL WATER PUMP ASSEMBLY** . Refer to **INSTALLATION - Step 1**
48. **INSTALL V-RIBBED BELT TENSIONER ASSEMBLY**
    a. Install the V-ribbed belt tensioner with the bolt.

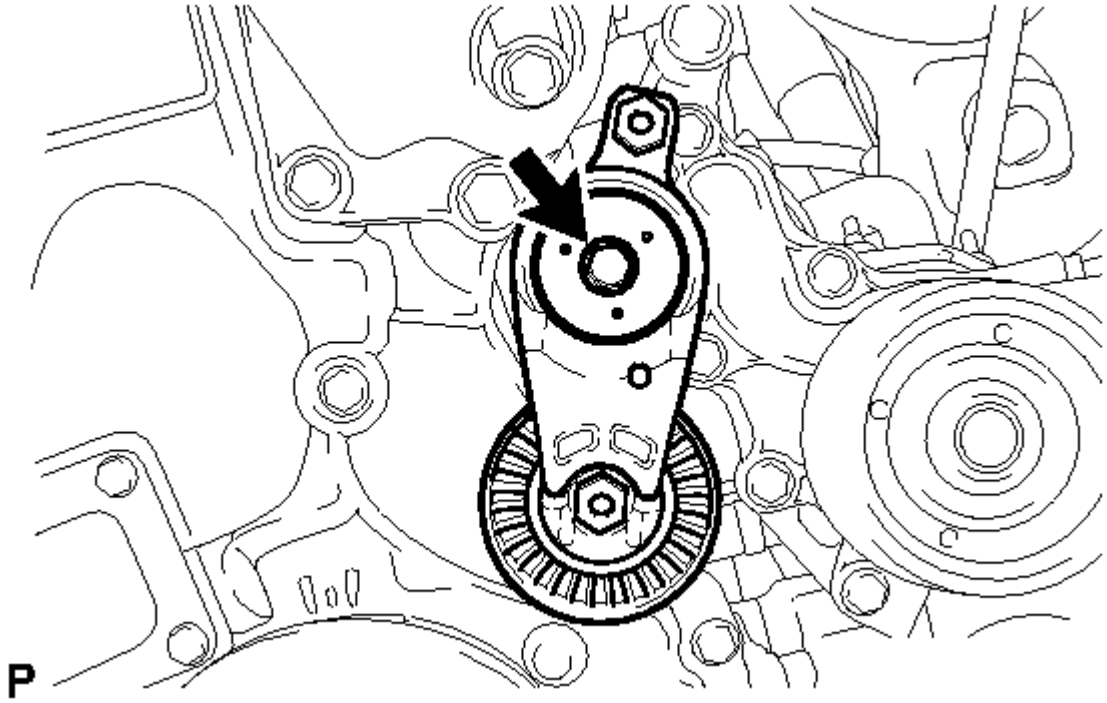


Fig. 284: Identifying Bolt And V-Ribbed Belt Tensioner
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

49. **INSTALL THERMOSTAT** . Refer to **INSTALLATION - Step 1**
50. **INSTALL WATER INLET** . Refer to **INSTALLATION - Step 2**
51. **INSTALL NO. 1 WATER BY-PASS PIPE**
    a. Install a new gasket and the water by-pass pipe with the 2 nuts and bolt.

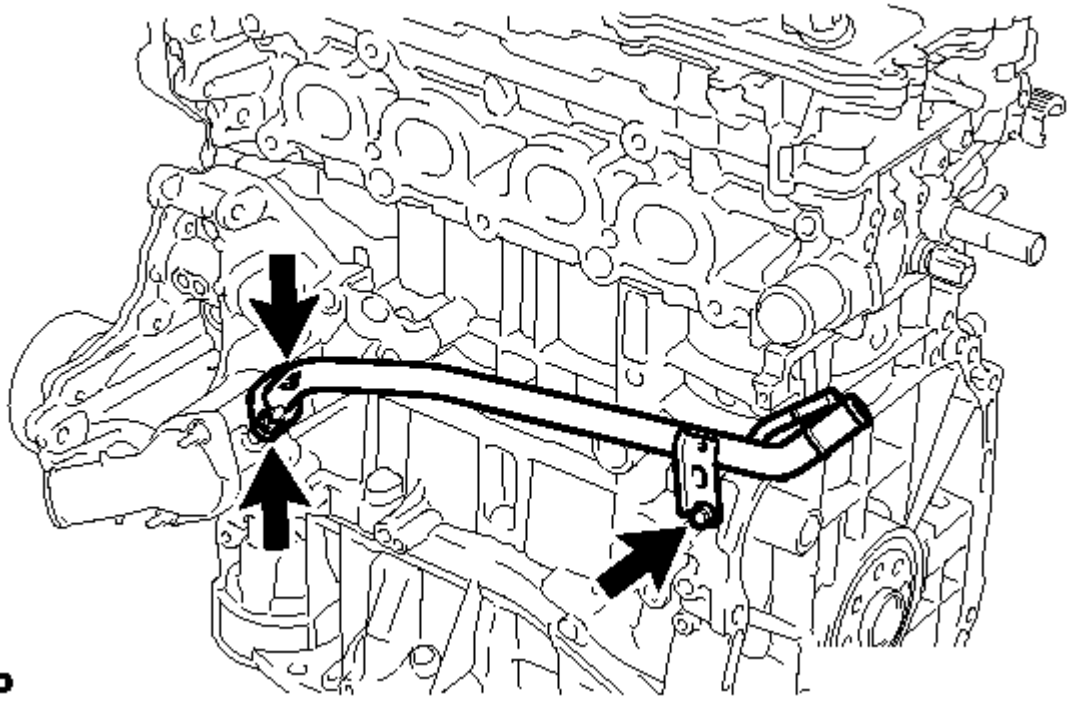


Fig. 285: Identifying Water By-Pass Pipe And Gasket Bolt And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

52. **INSTALL SEPARATOR CASE**
    a. Apply a light coat of engine oil to a new gasket.

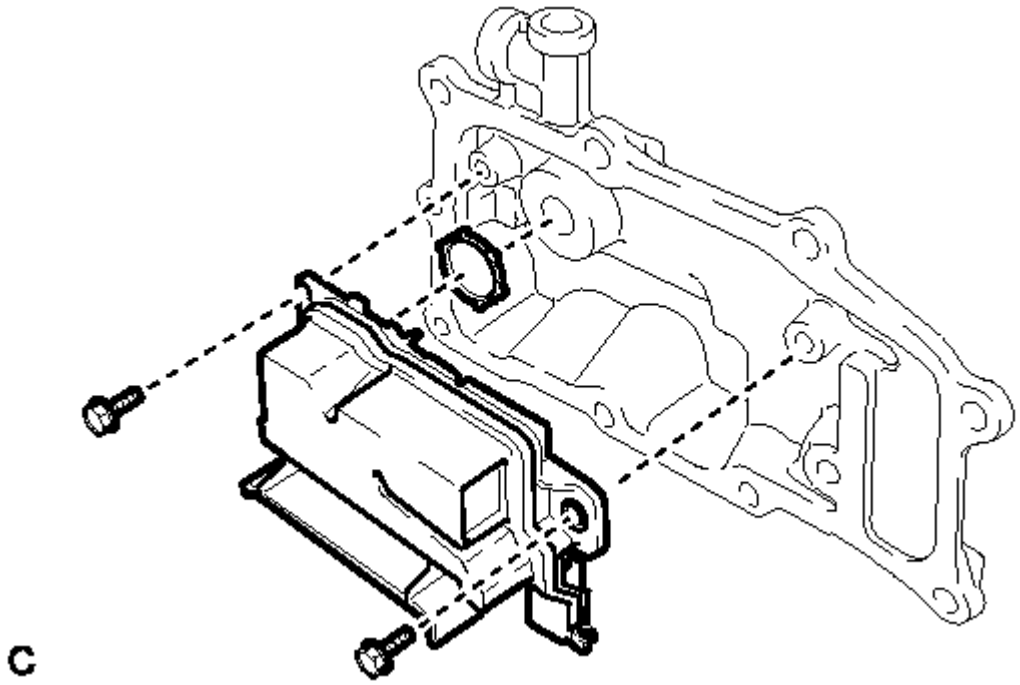


Fig. 286: Identifying Case And Gasket Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Install the gasket to the separator case.
c. Install the separator case with the 2 bolts.

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

53. **INSTALL VENTILATION CASE SUB-ASSEMBLY**
    a. Apply seal packing in a continuous line as shown in the illustration.

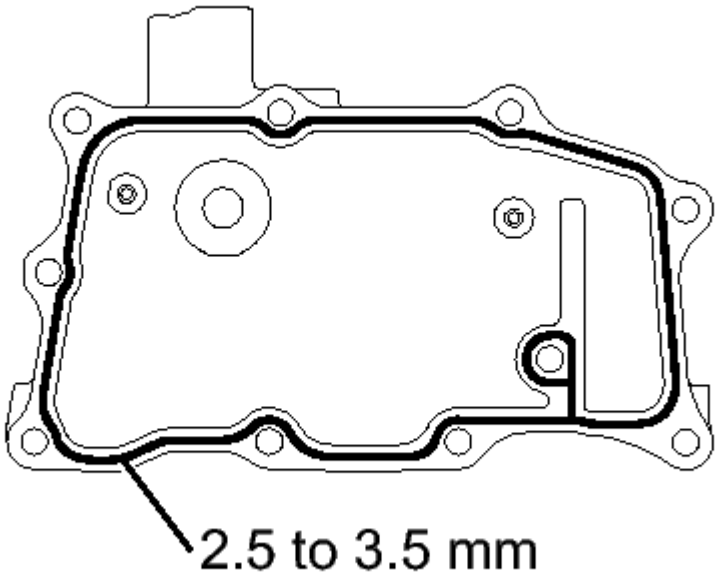


Fig. 287: Identifying Ventilation Case Seal Packing Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Seal packing

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

Standard seal diameter

2.5 to 3.5 mm (0.0984 to 0.138 in.)

NOTE:

- **Remove any oil from the contact surface.**
- **Install the ventilation case within 3 minutes and tighten the bolts and nuts within 15 minutes after applying seal packing.**

b. Install the ventilation case, and install the 8 bolts and 2 nuts in the order shown in the illustration.

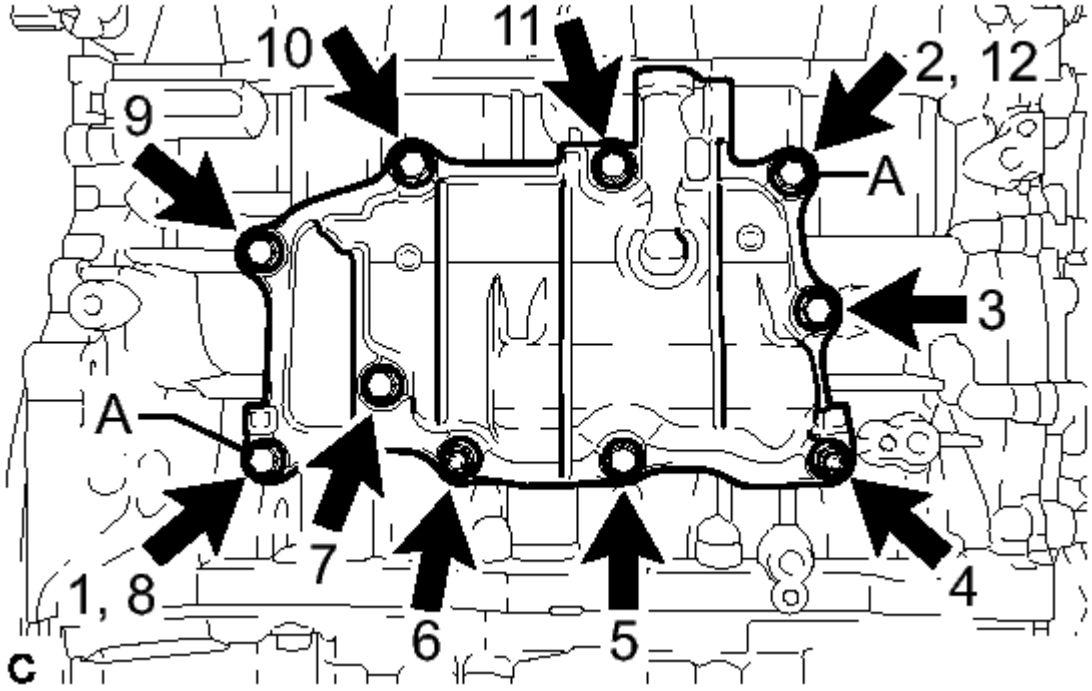


Fig. 288: Identifying Ventilation Case Sub-Assembly Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

HINT:

Bolt A is tightened twice.

54. **INSTALL VENTILATION VALVE SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 1**
55. **INSTALL CAMSHAFT POSITION SENSOR (for Intake Side)** . Refer to **INSTALLATION - Step 2**
56. **INSTALL CAMSHAFT POSITION SENSOR (for Exhaust Side)** . Refer to **INSTALLATION - Step 1**
57. **INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (for Intake Side)** . Refer to **INSTALLATION - Step 2**
58. **INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (for Exhaust Side)** . Refer to **INSTALLATION - Step 1**
59. **INSTALL OIL FILLER CAP SUB-ASSEMBLY**
    a. Install a new gasket to the oil filler cap.
    b. Install the oil filler cap to the cylinder head cover.
60. **INSTALL SPARK PLUG** . Refer to **INSTALLATION - Step 1**
61. **INSTALL ENGINE COVER JOINT**

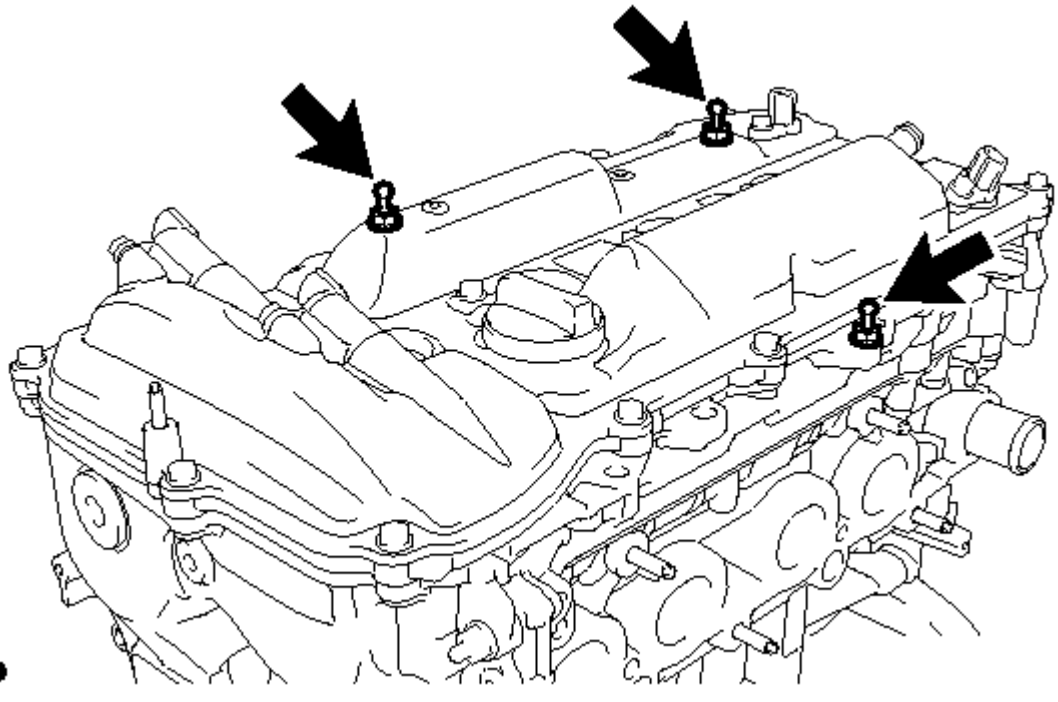


Fig. 289: Identifying Engine Cover Joint
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Install the 3 joints.

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

INSTALLATION

INSTALLATION

1. **INSTALL IGNITION COIL ASSEMBLY** . Refer to **INSTALLATION - Step 2**
2. **INSTALL FUEL INJECTOR ASSEMBLY** . Refer to **INSTALLATION - Step 1**
3. **INSTALL FUEL DELIVERY PIPE SUB-ASSEMBLY** . Refer to **INSTALLATION - Step 2**
4. **INSTALL ENGINE COOLANT TEMPERATURE SENSOR** . Refer to **INSTALLATION - Step 1**
5. **INSTALL ENGINE OIL PRESSURE SWITCH ASSEMBLY** . Refer to **INSTALLATION - Step 1**
6. **INSTALL KNOCK SENSOR** . Refer to **INSTALLATION - Step 1**
7. **INSTALL SENSOR WIRE**
   a. Install the sensor wire with the bolt.

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

   b. Connect the knock sensor connector.
8. **INSTALL INTAKE MANIFOLD**

*a

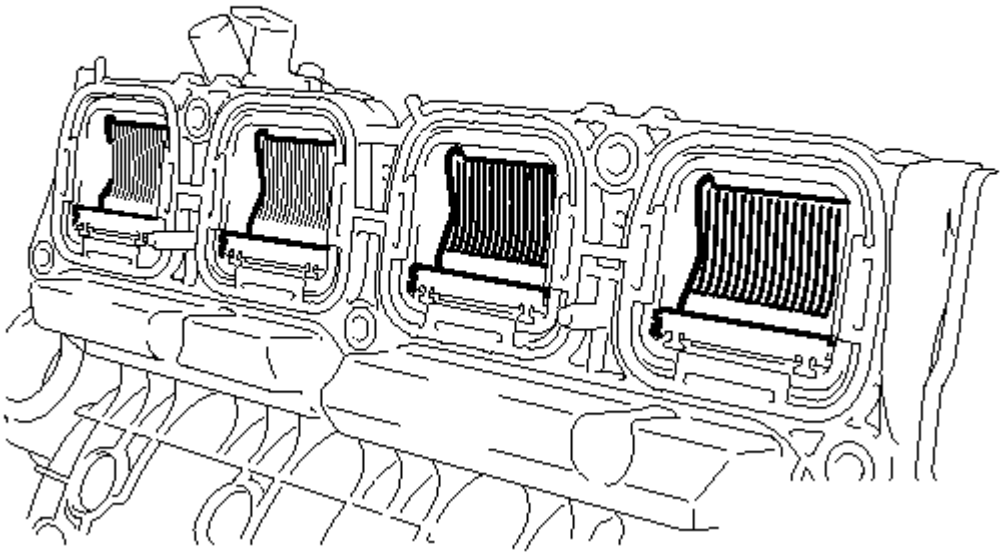


Fig. 290: Identifying Intake Manifold Valves
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Close the tumble control valves. Refer to **ON-VEHICLE INSPECTION - Step 3** .

TEXT IN ILLUSTRATION

*a	Closed

NOTE: The valves may be damaged if they are not closed before installing the intake manifold.

b. Install a new gasket to the intake manifold.
c. Temporarily tighten the 6 bolts to the intake manifold.

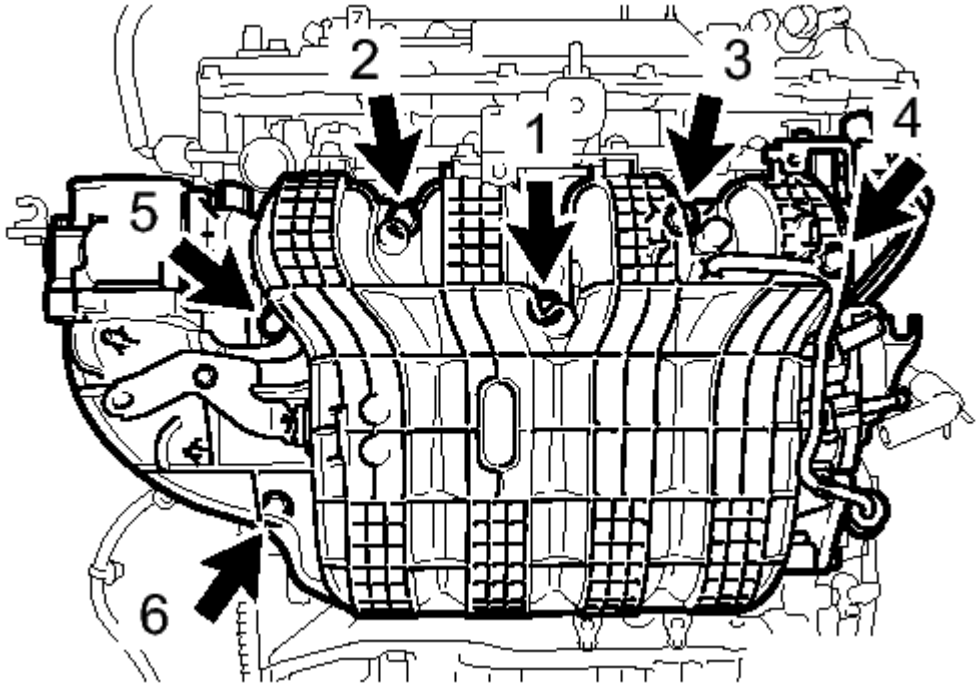


Fig. 291: Identifying 6 Intake Manifold Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Fully tighten the 6 bolts in the order shown in the illustration.

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

e. Connect the intake air control actuator connector and engage the 6 harness clamps.
f. Connect the No. 2 ventilation hose with the hose clip.

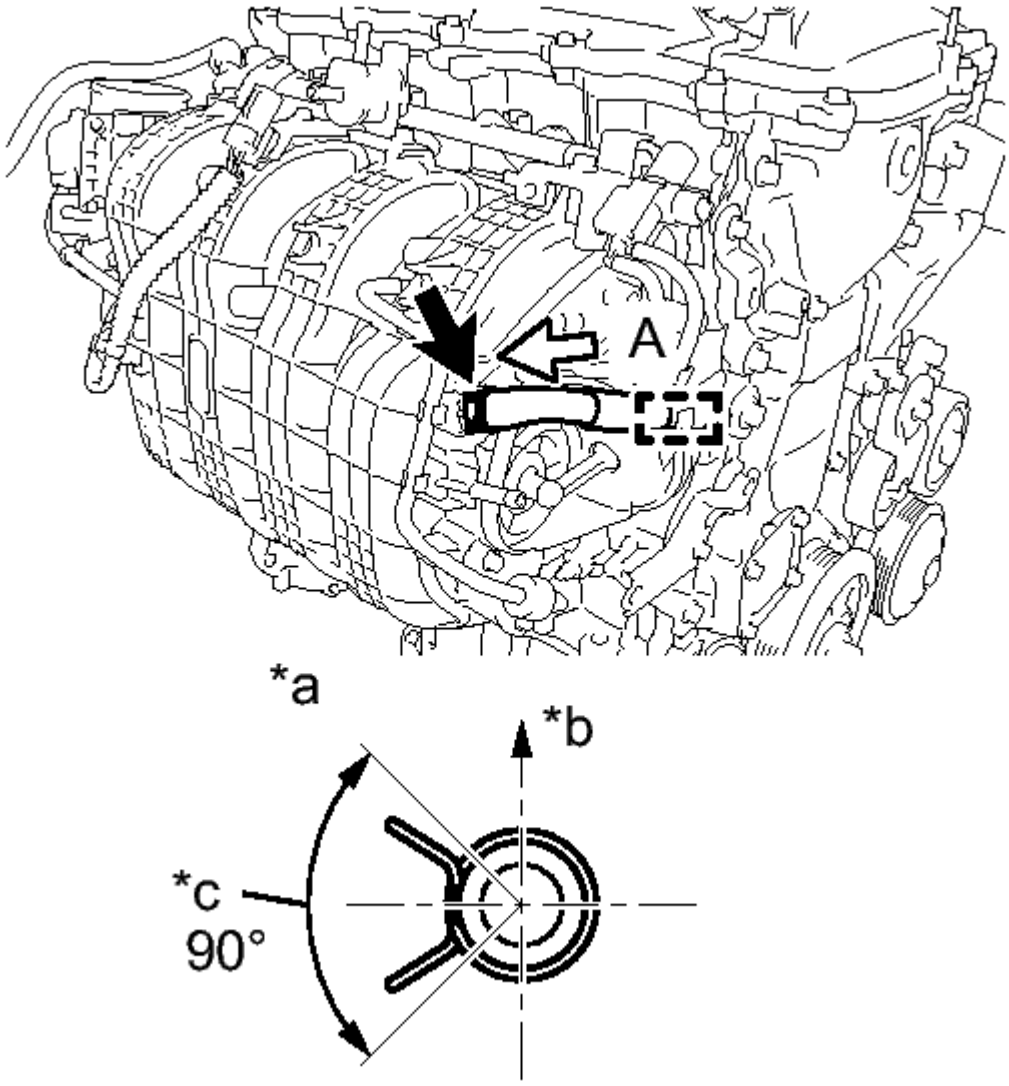


Fig. 292: Connecting No. 2 Ventilation Hose & Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

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

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

g. Engage the hose clamp and connect the No. 2 ventilation hose.
h. Engage the hose clamp and connect the fuel tube.
i. Connect the 2 water by-pass hoses.

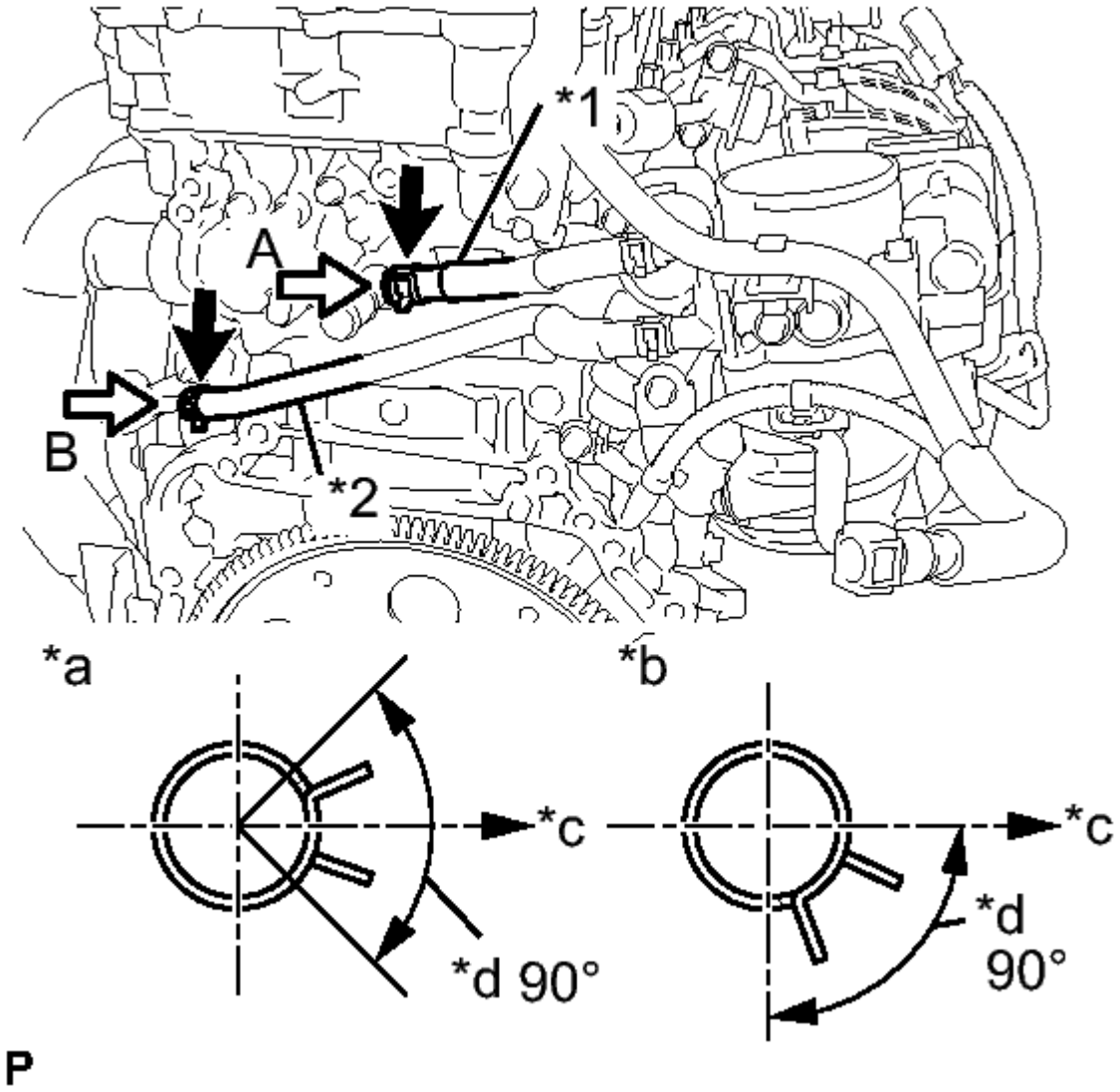


Fig. 293: Connecting Water By-Pass Hoses & Clips
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

1. Connect the water by-pass hose with the hose clip.

TEXT IN ILLUSTRATION

*1	Water By-Pass Hose
*2	No. 2 Water By-Pass Hose
*a	View A
*b	View B

*c	Rear of engine
*d	Clip installation range

2. Connect the No. 2 water by-pass hose with the hose clip.

9. **INSTALL UNION TO CONNECTOR TUBE HOSE**
   a. Install the union to connector tube hose with the hose clip.
10. **CONNECT VACUUM SWITCHING VALVE HOSE ASSEMBLY**

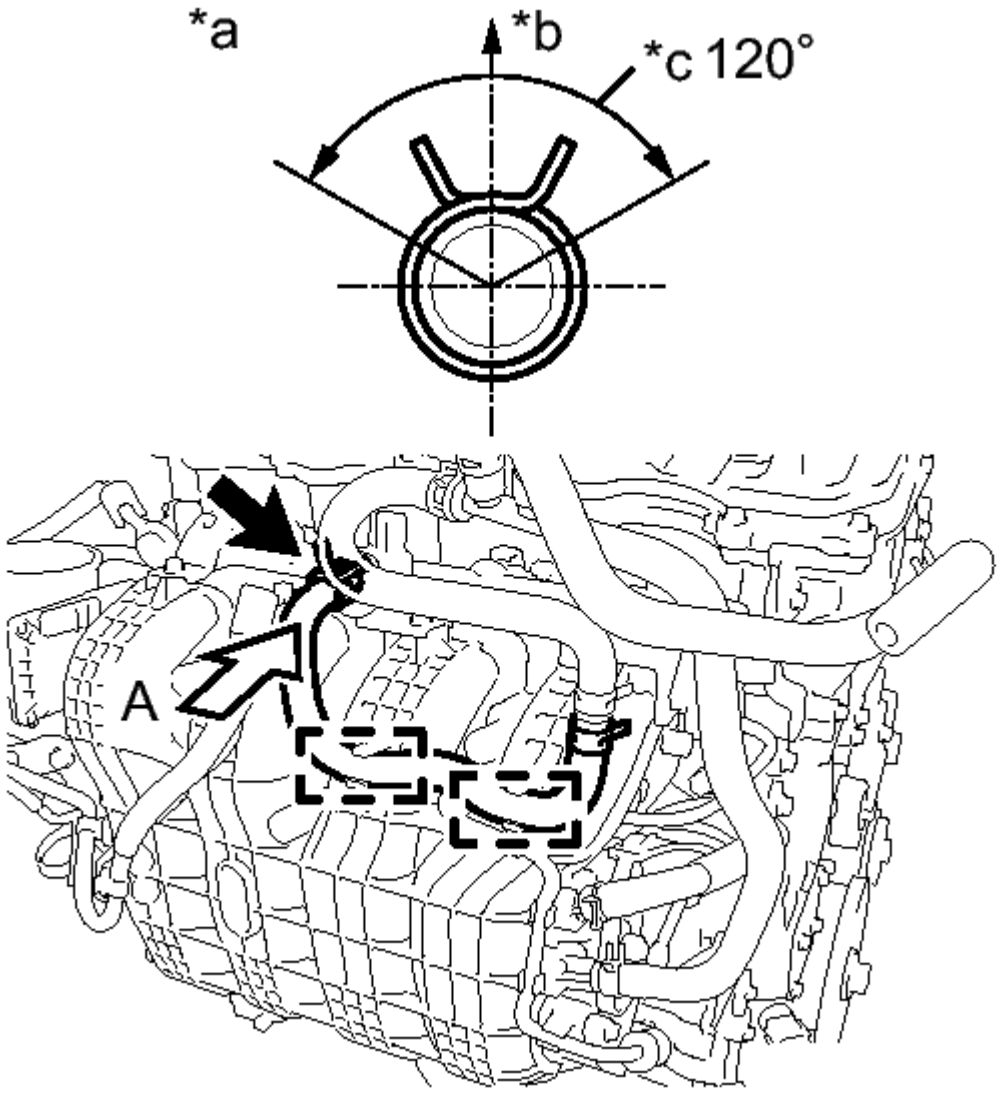


Fig. 294: Connecting Vacuum Switching Valve Hose & Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   a. Connect the vacuum switching valve hose with the hose clip.

TEXT IN ILLUSTRATION

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

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

b. Engage the 2 hose clamps and connect the vacuum switching valve hose.

11. **INSTALL NO. 2 FUEL VAPOR FEED HOSE ASSEMBLY**

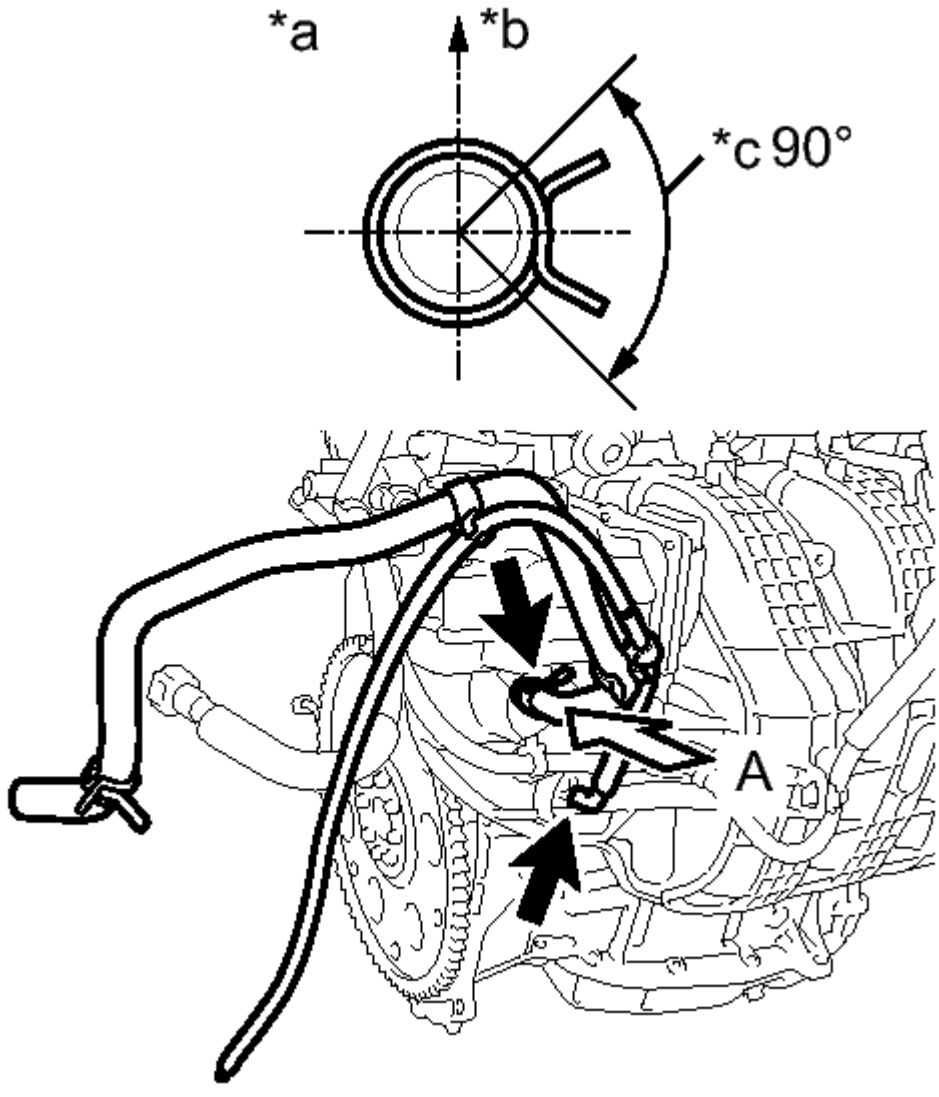


Fig. 295: Installing No. 2 Fuel Vapor Feed Hose & Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Install the No. 2 fuel vapor feed hose with the hose clip.

TEXT IN ILLUSTRATION

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

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

b. Connect the vacuum hose.

12. **INSTALL NO. 1 COMPRESSOR MOUNTING BRACKET**
    a. Install the bracket with the 4 bolts.

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

13. **INSTALL EXHAUST MANIFOLD TO HEAD GASKET** . Refer to **INSTALLATION - Step 3**
14. **INSTALL EXHAUST MANIFOLD** . Refer to **INSTALLATION - Step 4**
15. **INSTALL NO. 2 MANIFOLD STAY** . Refer to **INSTALLATION - Step 6**
16. **INSTALL MANIFOLD STAY** . Refer to **INSTALLATION - Step 7**
17. **INSTALL ENGINE OIL LEVEL DIPSTICK GUIDE**
    a. Apply a light coat of engine oil to a new O-ring.
    b. Install the O-ring to the engine oil level dipstick guide.
    c. Install the engine oil level dipstick guide with the bolt.

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

    d. Install the engine oil level dipstick.

CYLINDER HEAD

COMPONENTS

ILLUSTRATION

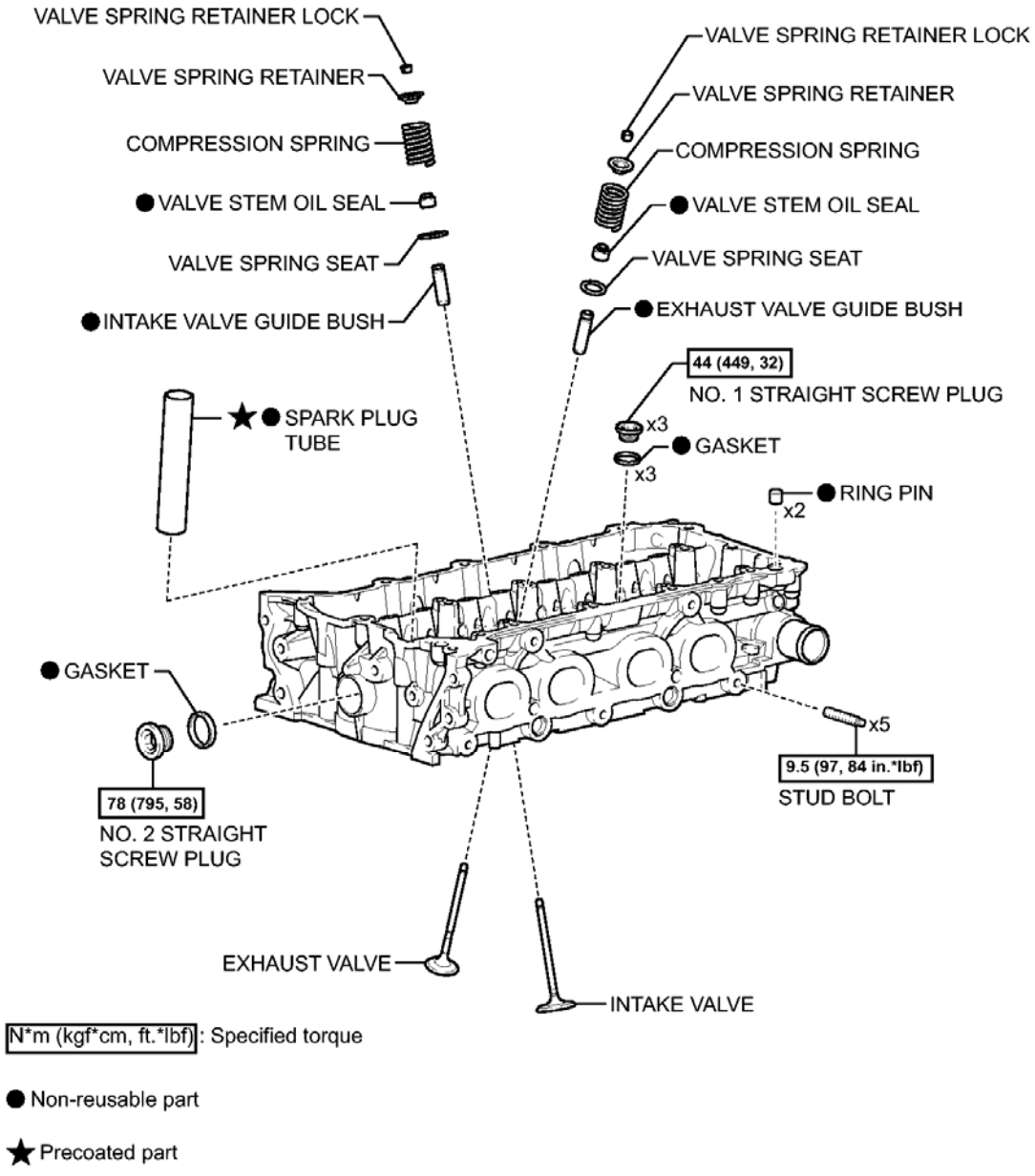


Fig. 296: Cylinder Head Replacement Components With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

DISASSEMBLY

1. **REMOVE INTAKE VALVE**

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

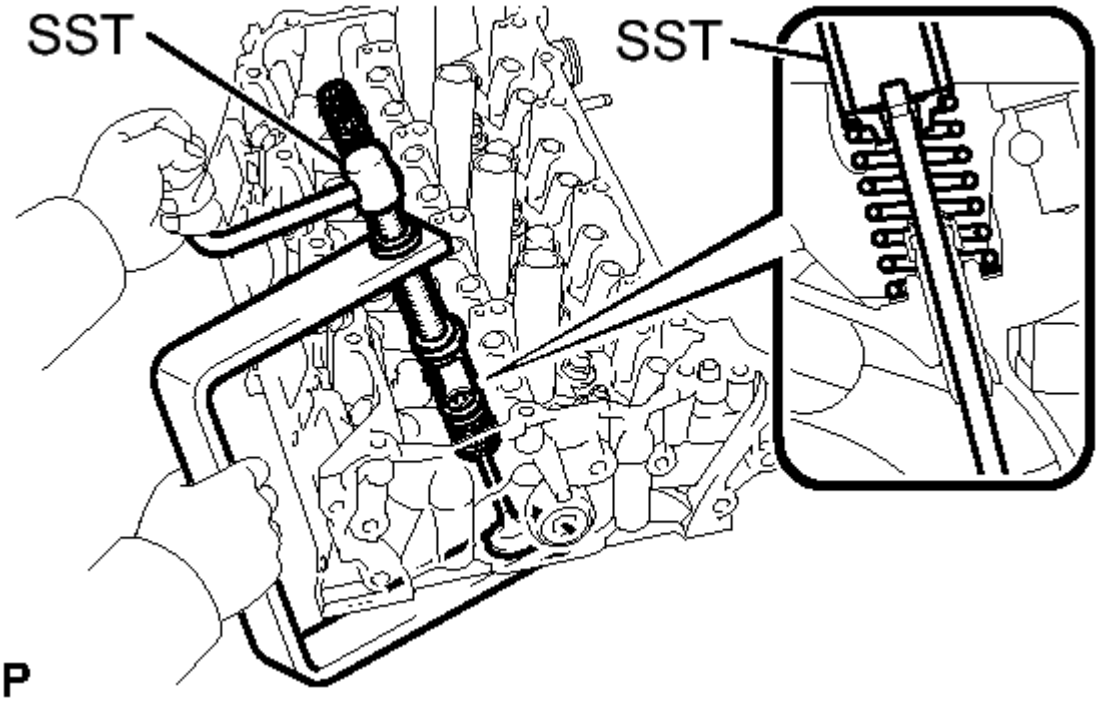


Fig. 297: Identifying Intake Valve Spring Retainer Locks Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

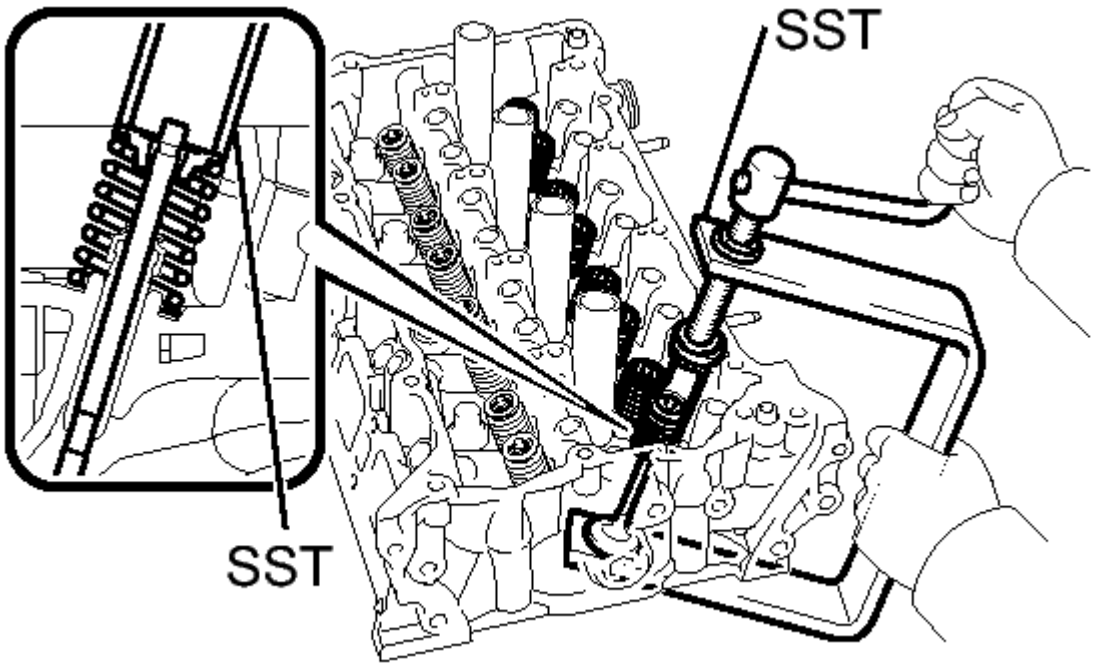
- **SST: 09202-70020**
  09202-00010

b. Remove the retainer, compression spring and valve.

HINT:

Arrange the removed parts in the correct order.

2. **REMOVE EXHAUST VALVE**
   a. Using SST and wooden blocks, compress the compression spring and remove the valve spring retainer locks.



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Fig. 298: Identifying Exhaust Valve Spring Retainer Locks Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

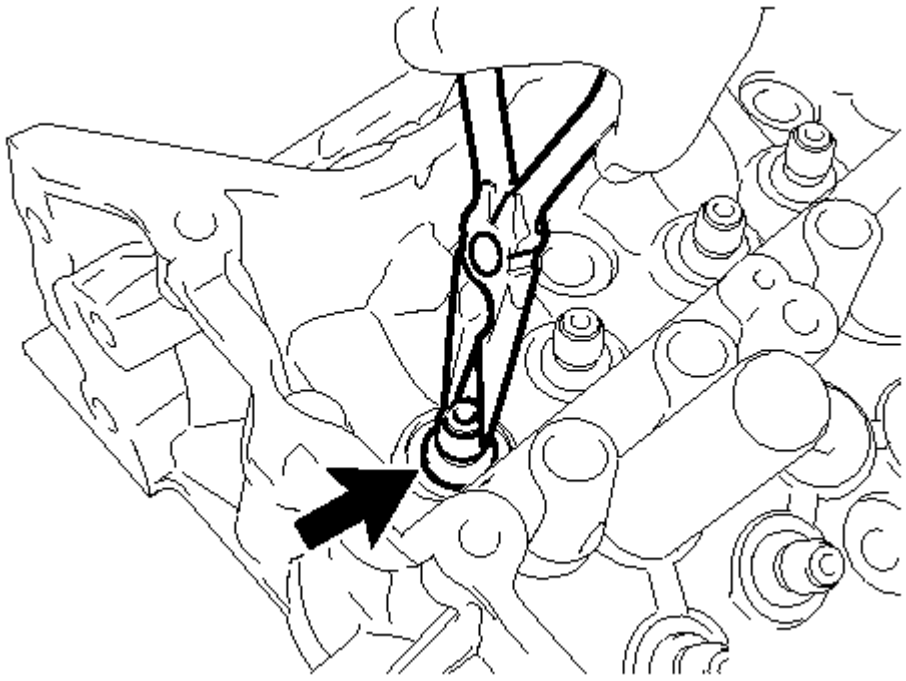
- **SST: 09202-70020**
  09202-00010

b. Remove the retainer, compression spring and valve.

HINT:

Arrange the removed parts in the correct order.

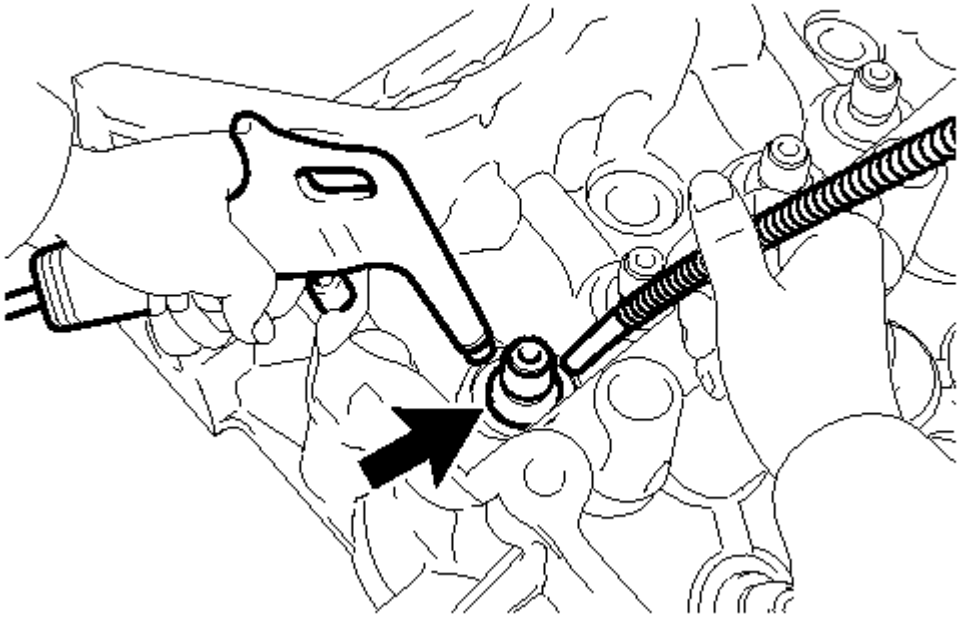
3. **REMOVE VALVE STEM OIL SEAL**
   a. Using needle-nose pliers, remove the oil seals.



P

Fig. 299: Removing Oil Seals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **REMOVE VALVE SPRING SEAT**
   a. Using compressed air and a Magnet Hand, remove the valve spring seat by blowing air onto it.



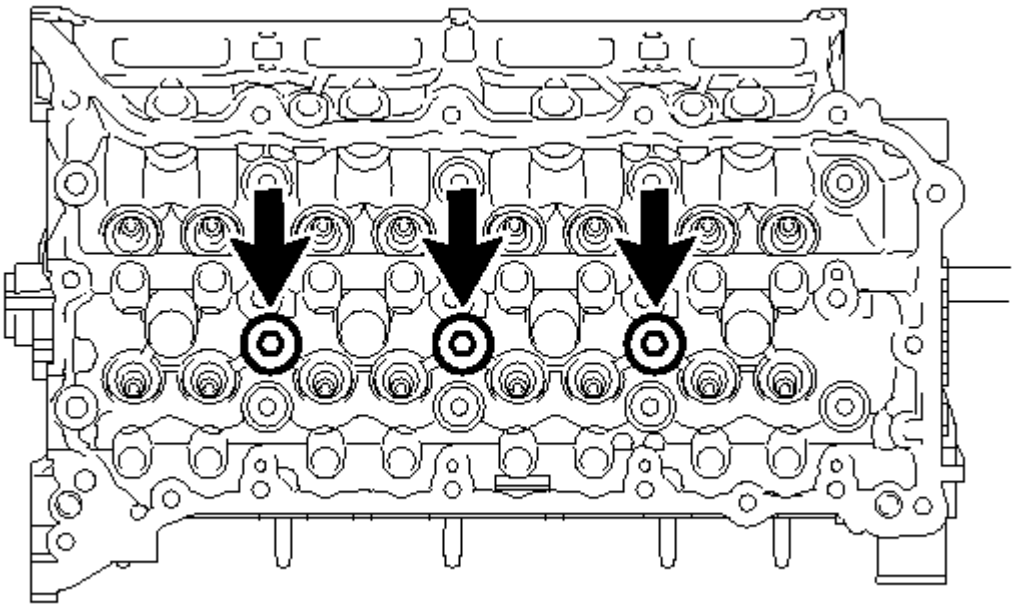
P

Fig. 300: Removing Valve Spring Seat

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

5. **REMOVE NO. 1 STRAIGHT SCREW PLUG**

NOTE: If water leaks from the No. 1 screw plug or the plug is corroded, replace it.



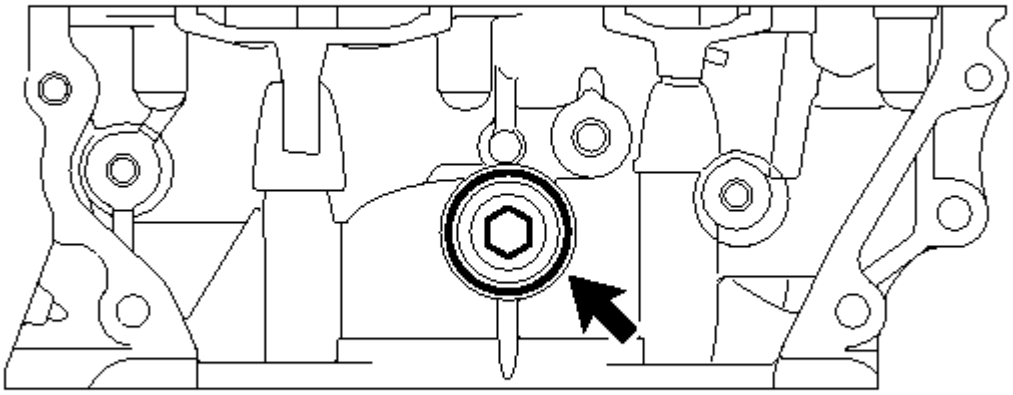
P

Fig. 301: Identifying No. 1 Straight Screw Plugs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Using a 10 mm hexagon wrench, remove the 3 screw plugs and 3 gaskets.

6. **REMOVE NO. 2 STRAIGHT SCREW PLUG**

NOTE: If water leaks from the No. 2 screw plug or the plug is corroded, replace it.



P

Fig. 302: Identifying No. 2 Straight Screw Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Using a 14 mm hexagon wrench, remove the screw plug and gasket.

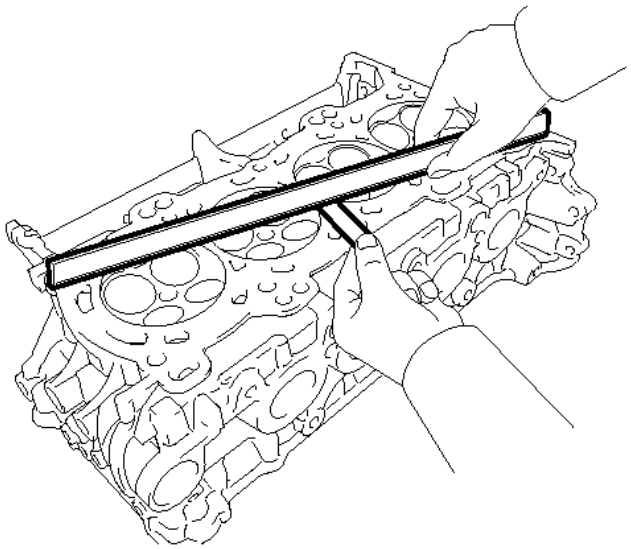
7. **REMOVE STUD BOLT**

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

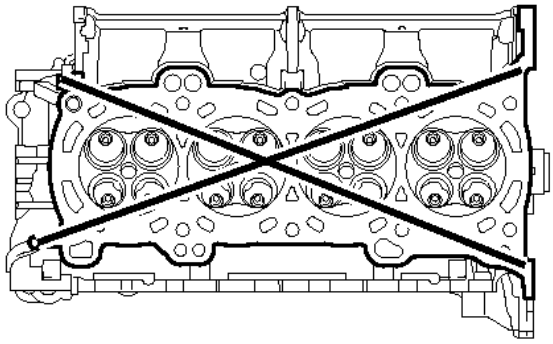
INSPECTION

INSPECTION

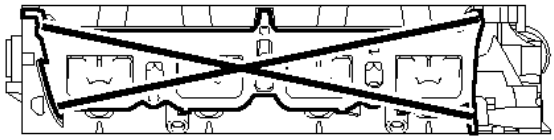
1. **INSPECT CYLINDER HEAD SUB-ASSEMBLY**
   a. Using a precision straightedge and feeler gauge, measure the warpage of the contact surfaces where the cylinder head contacts the cylinder block and manifold.



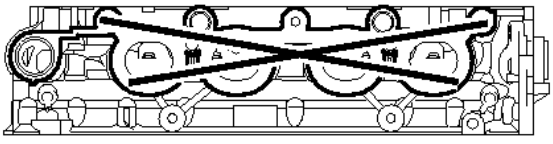
*a



*b



*c



P

Fig. 303: Inspecting Cylinder Head Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Cylinder Head Lower Side
*b	Intake Manifold Side
*c	Exhaust Manifold Side

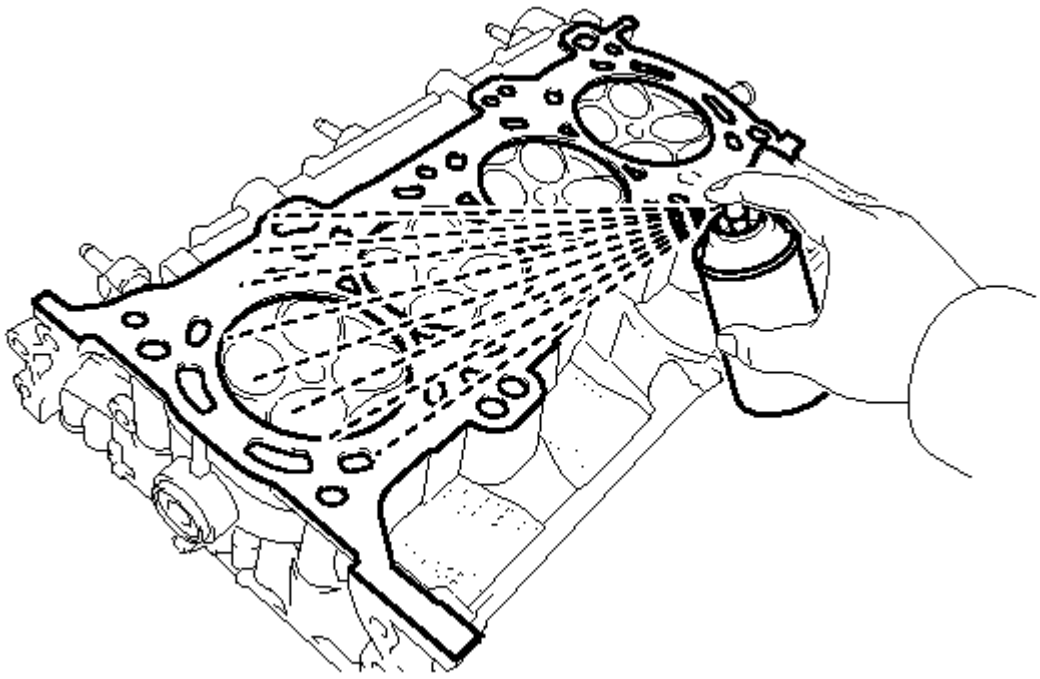
Maximum Warpage

Item	Specified Condition
Cylinder head lower side	0.05 mm (0.00197 in.)
Intake manifold side	0.10 mm (0.00394 in.)
Exhaust manifold side	0.10 mm (0.00394 in.)

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

b. Using a dye penetrant, check the intake ports, exhaust ports and cylinder surface for cracks.

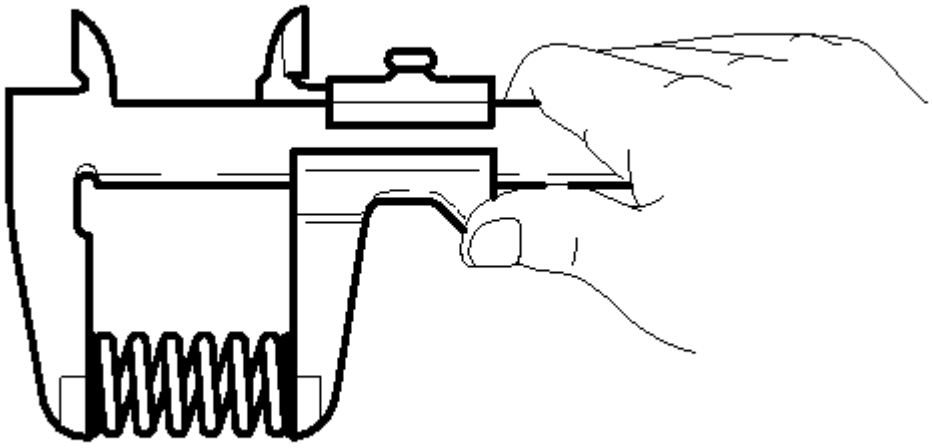
If cracked, replace the cylinder head.



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Fig. 304: Checking Cylinder Contact Surface
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSPECT COMPRESSION SPRING**
   a. Using a vernier caliper, measure the free length of the inner compression spring.



P

Fig. 305: Measuring Free Length Of Inner Compression Spring

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

Standard free length

50.0 mm (1.97 in.)

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

b. Using a steel square, measure the deviation of the inner compression spring.

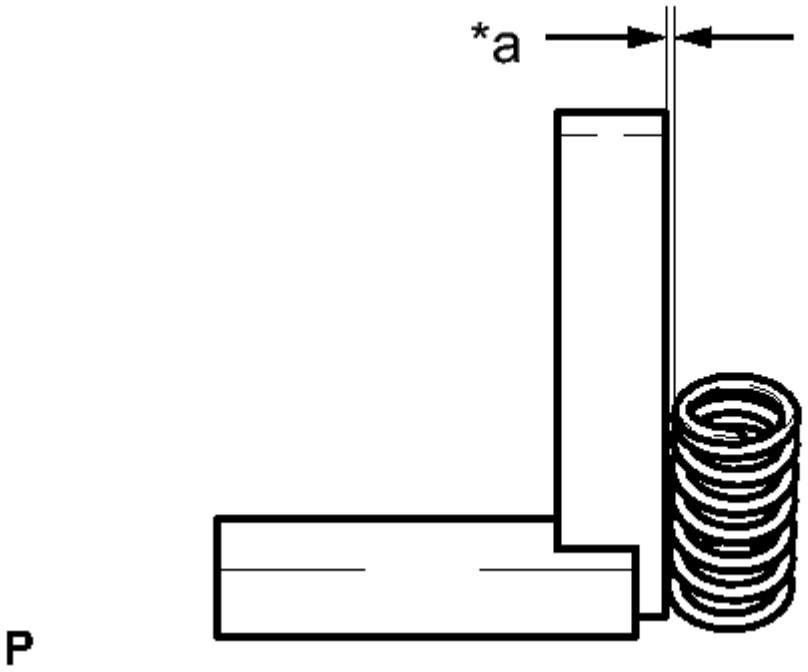


Fig. 306: Measuring Deviation Of Inner Compression Spring Using A Steel Square
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Deviation

Maximum deviation

1.0 mm (0.0394 in.)

Maximum angle

2°

If the deviation is more than the maximum, replace the spring.

3. **INSPECT INTAKE VALVE**

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

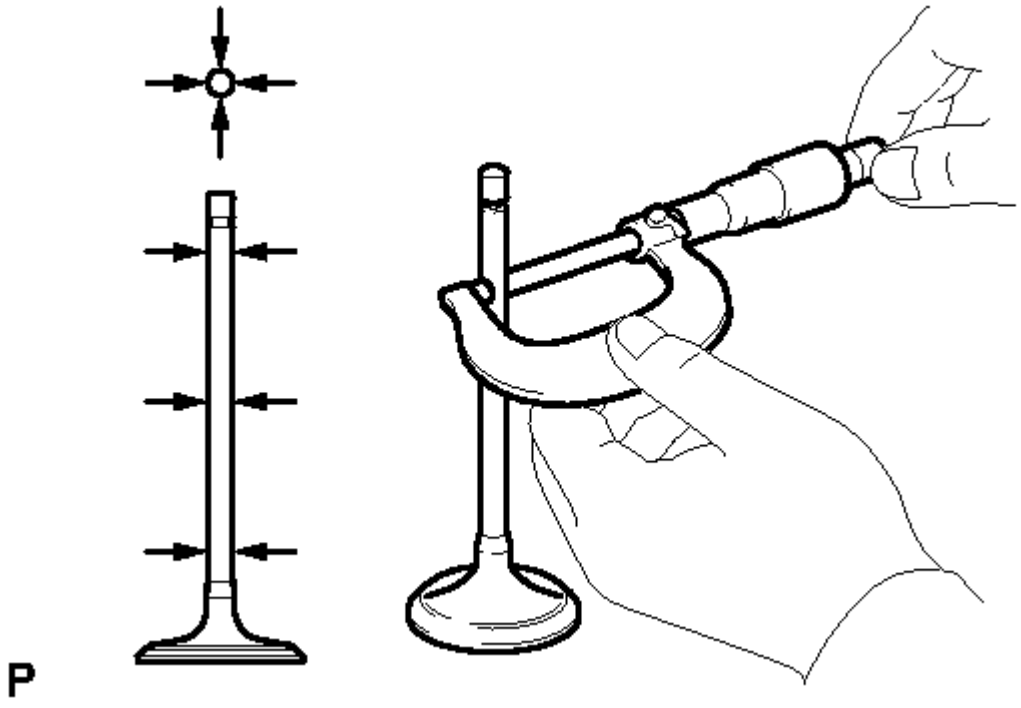
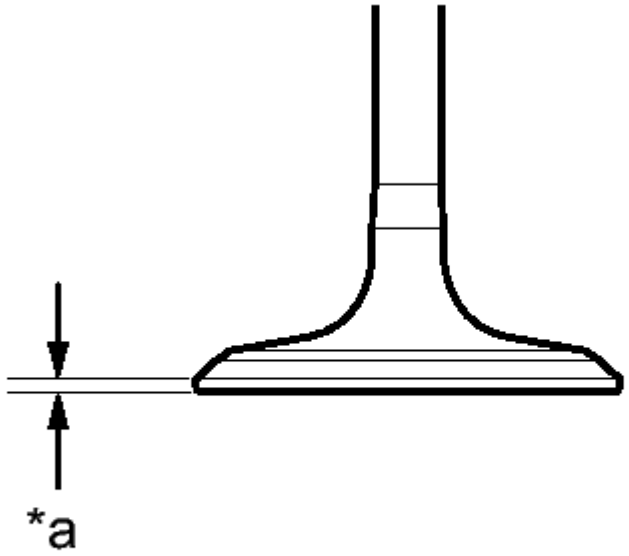


Fig. 307: Measuring Diameter Of Valve Stem
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard valve stem diameter

5.470 mm to 5.485 mm (0.2154 to 0.2159 in.)

b. Using a vernier caliper, measure the valve head margin thickness.



P

Fig. 308: Identifying Valve Head Margin Thickness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Margin Thickness

Standard margin thickness

1.0 mm (0.0394 in.)

Minimum margin thickness

0.50 mm (0.0197 in.)

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

c. Using a vernier caliper, measure the overall length of the valve.

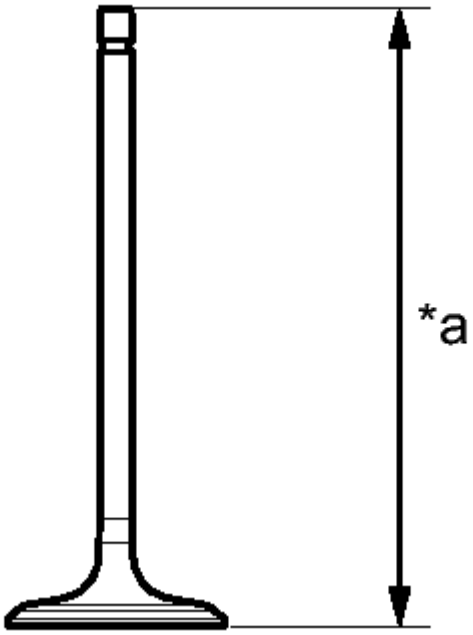


Fig. 309: Identifying Over Length Of Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Overall Length

Standard overall length

103.92 mm (4.09 in.)

Minimum overall length

103.42 mm (4.07 in.)

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

4. **INSPECT EXHAUST VALVE**
   a. Using a micrometer, measure the diameter of the valve stem.

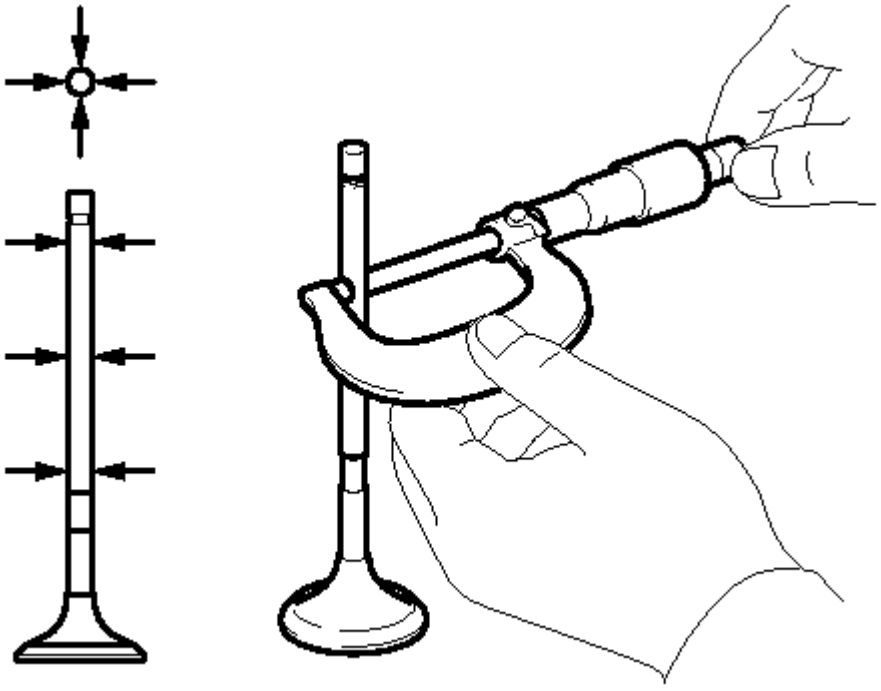
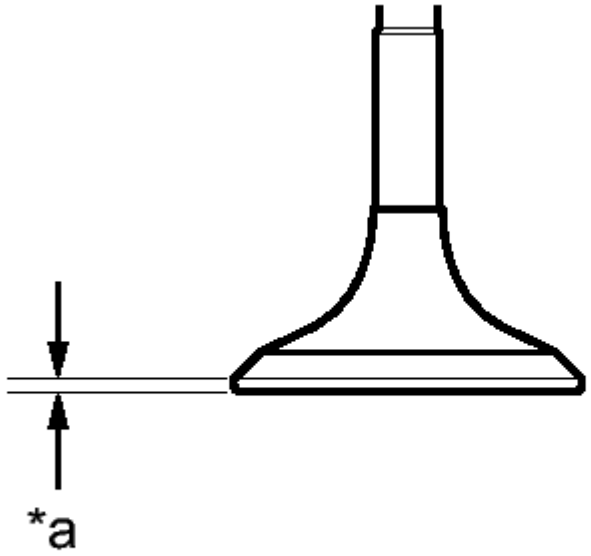


Fig. 310: Measuring Diameter Of Valve Stem
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard valve stem diameter

5.465 mm to 5.480 mm (0.2152 to 0.2157 in.)

b. Using a vernier caliper, measure the valve head margin thickness.



P

Fig. 311: Measuring Valve Head Margin Thickness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Margin Thickness

Standard margin thickness

1.0 mm (0.0394 in.)

Minimum margin thickness

0.50 mm (0.0197 in.)

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

c. Using a vernier caliper, measure the overall length of the valve.

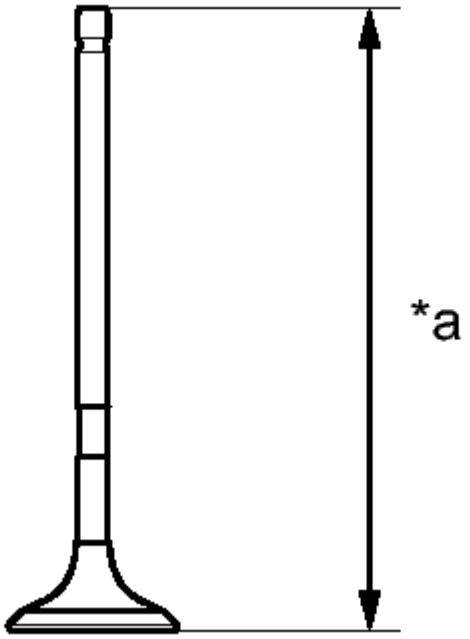


Fig. 312: Measuring Overall Length Of Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Overall Length

Standard overall length

112.91 mm (4.44 in.)

Minimum overall length

112.41 mm (4.43 in.)

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

5. **INSPECT VALVE GUIDE BUSH OIL CLEARANCE**
    a. Using a caliper gauge, measure the inside diameter of the guide bush.

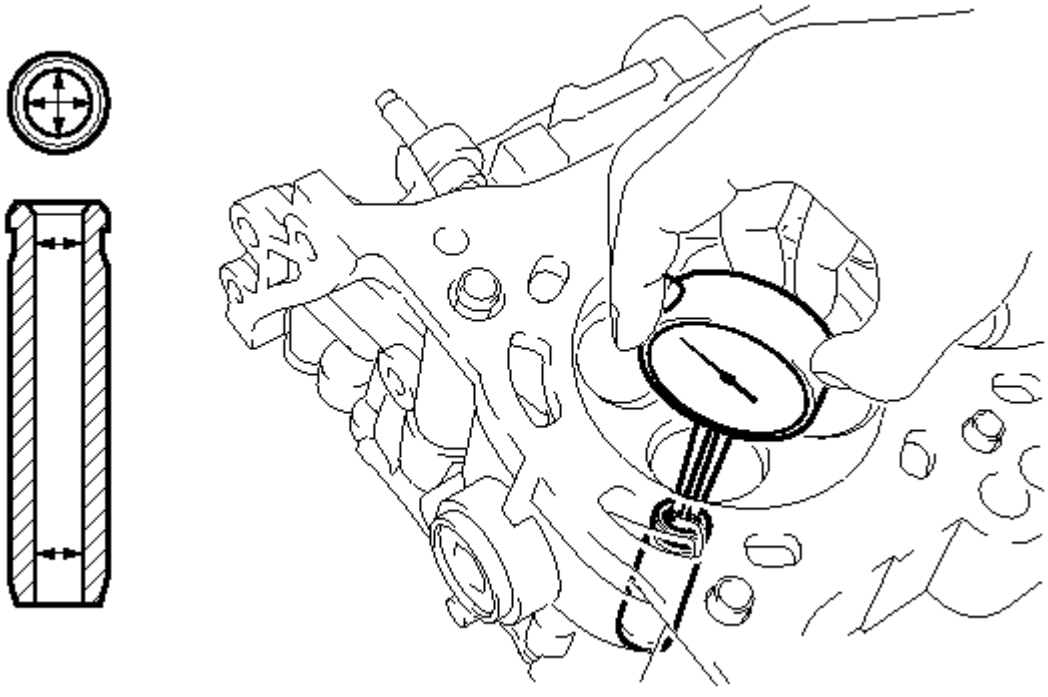


Fig. 313: Measuring Inside Diameter Of Guide Bush
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard bush 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 (0.000984 to 0.00236 in.)
Exhaust	0.030 to 0.065 mm (0.00118 to 0.00256 in.)

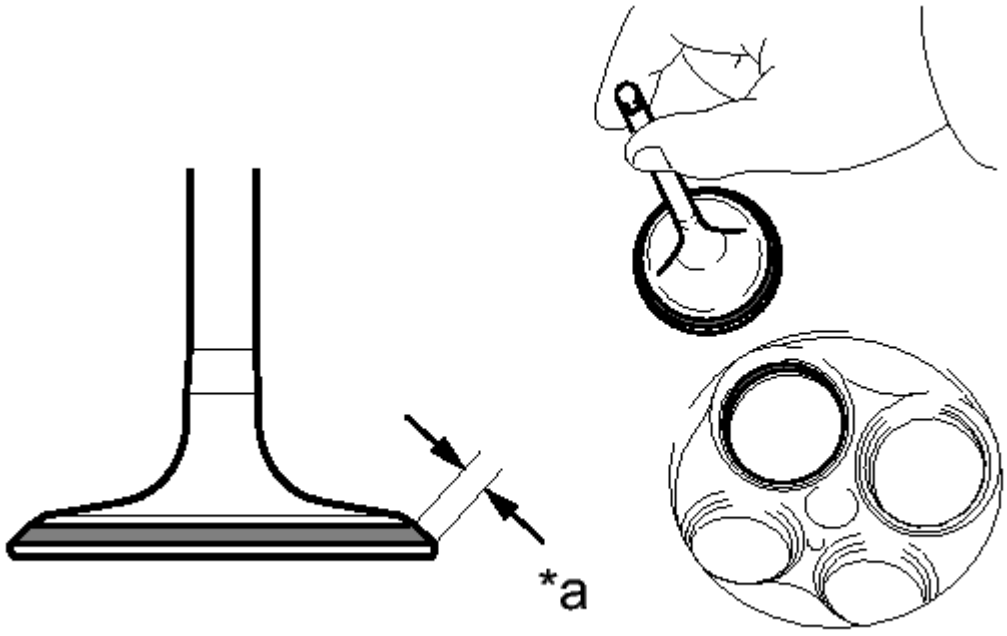
Maximum Oil Clearance

	Specified

Item	Condition
Intake	0.08 mm (0.00315 in.)
Exhaust	0.10 mm (0.00394 in.)

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

6. **INSPECT INTAKE VALVE SEAT**
   a. Apply a light coat of Prussian blue to the valve face.
   b. Lightly press the valve face against the valve seat.



P

Fig. 314: Inspecting Intake Valve Seat
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Width

HINT:

Do not rotate the valve while pressing the valve.

   c. Check the valve face and valve seat.
      1. Check that the contact surfaces of the valve seat and valve face are in the middle area of their

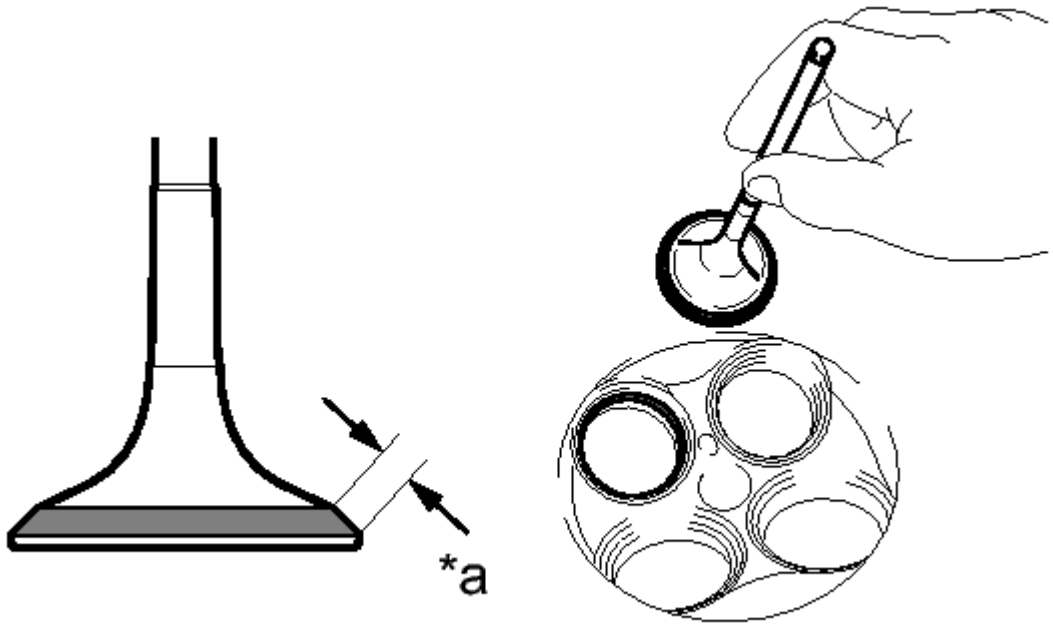
respective surfaces, with the width between 1.1 and 1.5 mm (0.0433 and 0.0591 in.).

If not, correct the valve seat.

2. Check that the contact surfaces of the valve seat and valve face are even around the entire valve seat.

   If not, correct the valve seat.

7. **INSPECT EXHAUST VALVE SEAT**
   a. Apply a light coat of Prussian blue to the valve face.
   b. Lightly press the valve face against the valve seat.



P

Fig. 315: Inspecting Exhaust Valve Seat
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Width

HINT:

Do not rotate the valve while pressing the valve.

   c. Check the valve face and valve seat.
      1. Check that the contact surfaces of the valve seat and valve face are in the middle area of their respective surfaces, with the width between 1.1 and 1.5 mm (0.0433 and 0.0591 in.).

If not, correct the valve seat.

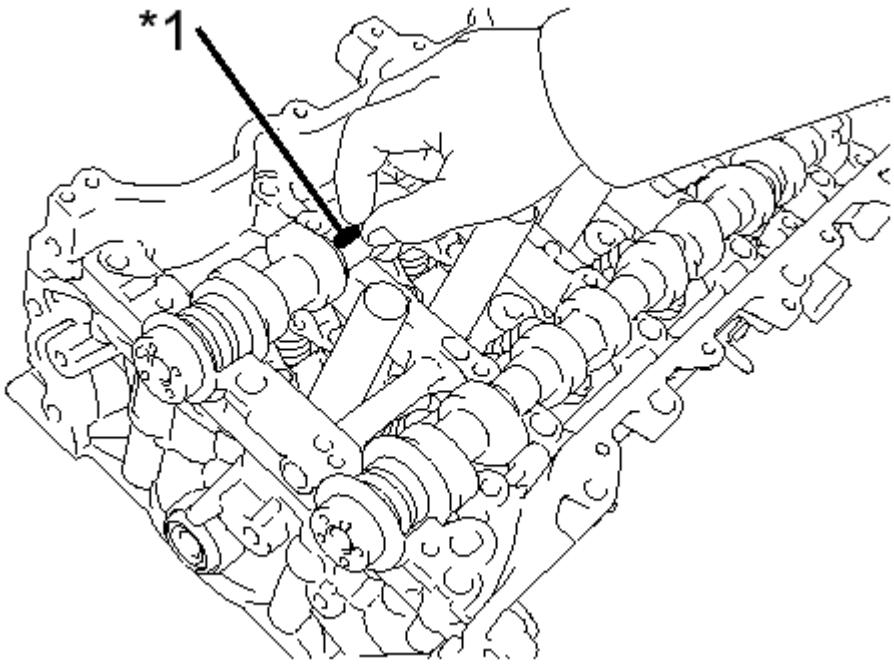
2. Check that the contact surfaces of the valve seat and valve face are even around the entire valve seat.

   If not, correct the valve seat.

8. **INSPECT CAMSHAFT OIL CLEARANCE**

NOTE: Do not turn the camshafts.

a. Clean the bearing caps, camshaft housing and camshaft journals.
b. Place the camshafts on the camshaft housing.
c. Lay a strip of Plastigage across each of the camshaft journals.



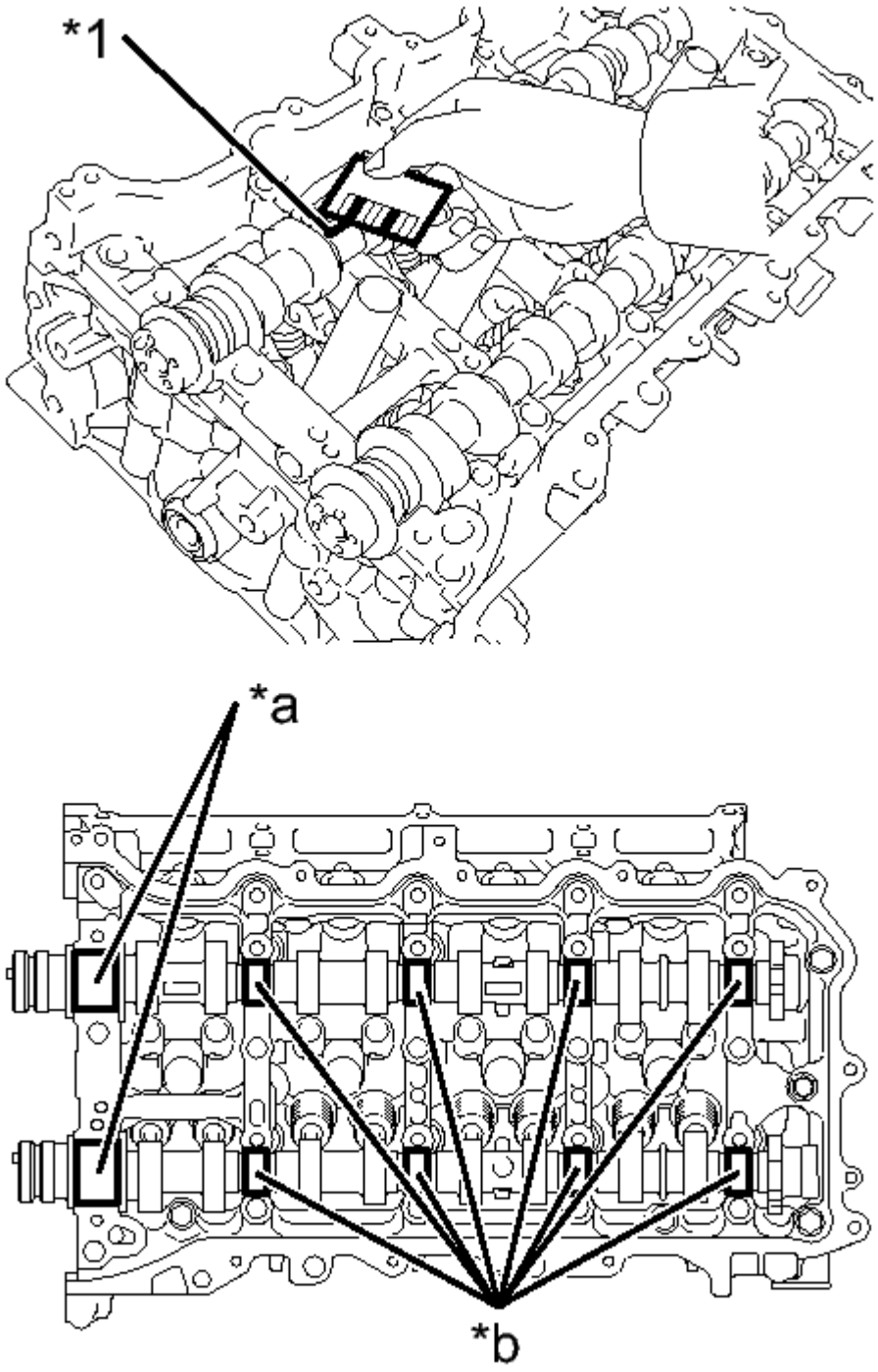
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Fig. 316: Applying Plastigage Across Camshaft Journal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Plastigage

d. Install the camshaft bearing caps. See step 13.
e. Install the camshaft housing sub-assembly. See step 14.
f. Remove the camshaft bearing caps. See step 29.
g. Measure the Plastigage at its widest point.



P

Fig. 317: Measuring Camshaft Journal Plastigage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Plastigage

*a	No. 1 Journal
*b	Other Journal

Standard Oil Clearance

Item	Specified Condition
Intake No. 1 journal	0.035 to 0.072 mm (0.00137 to 0.00283 in.)
Exhaust No. 1 journal	0.049 to 0.086 mm (0.00193 to 0.00339 in.)
Other journal	0.025 to 0.062 mm (0.000984 to 0.00244 in.)

Maximum Oil Clearance

Item	Specified Condition
Intake No. 1 journal	0.085 mm (0.00335 in.)
Exhaust No. 1 journal	0.095 mm (0.00374 in.)
Other journal	0.085 mm (0.00335 in.)

If the oil clearance is more than the maximum, replace the camshaft. If necessary, replace the camshaft housing.

9. **INSPECT CAMSHAFT THRUST CLEARANCE**
   a. Inspect the intake camshaft.
      1. Install the intake camshaft.

2. Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

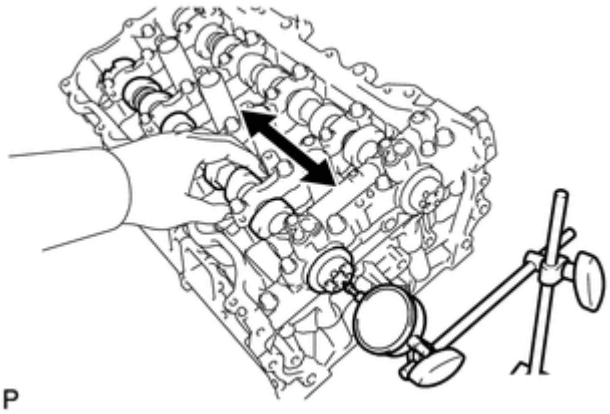


Fig. 318: Measuring Camshaft Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If the thrust clearance is more than the maximum, replace the camshaft housing. If the thrust surface is damaged, replace the camshaft.

b. Inspect the intake and exhaust camshafts.
   1. Install the intake and exhaust camshafts.
   2. Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

      Standard Thrust Clearance

      0.060 to 0.155 mm (0.00236 to 0.00610 in.)

      Maximum Thrust Clearance

      0.170 mm (0.00669 in.)

      If the thrust clearance is more than the maximum, replace the camshaft housing. If the thrust surface is damaged, replace the camshaft.

REPLACEMENT

REPLACEMENT

1. **REPLACE INTAKE VALVE GUIDE BUSH**
   a. Heat the cylinder head to approximately 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 valve guide bush.
      - **SST: 09201-01055**

- **SST: 09950-70010**
  09951-07100

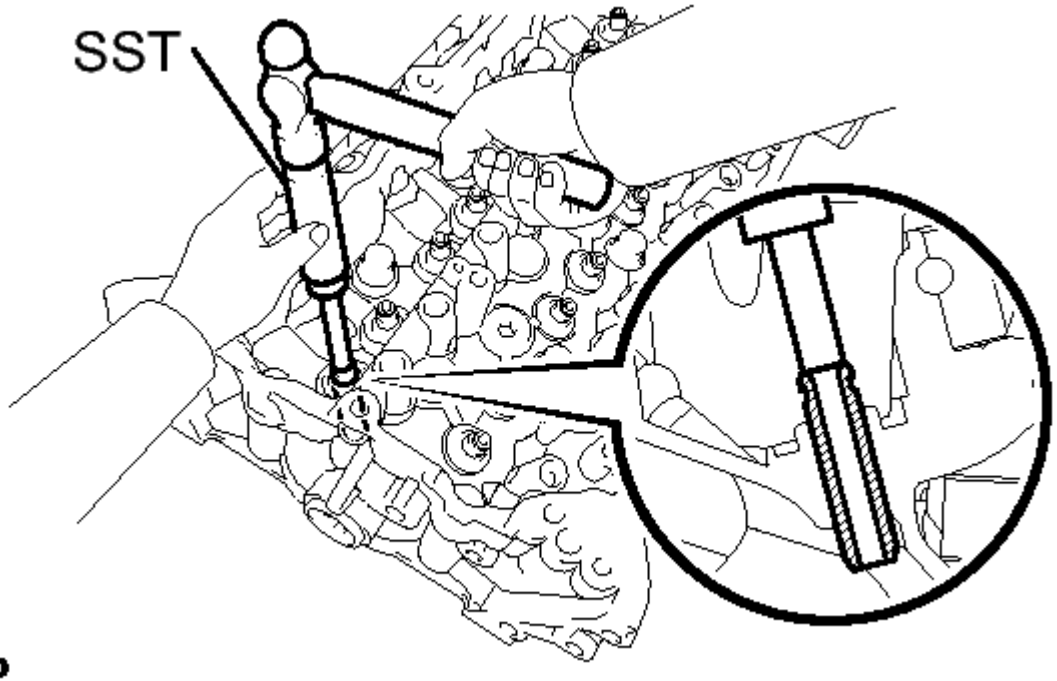


Fig. 319: Tapping Out Valve Guide Bush Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

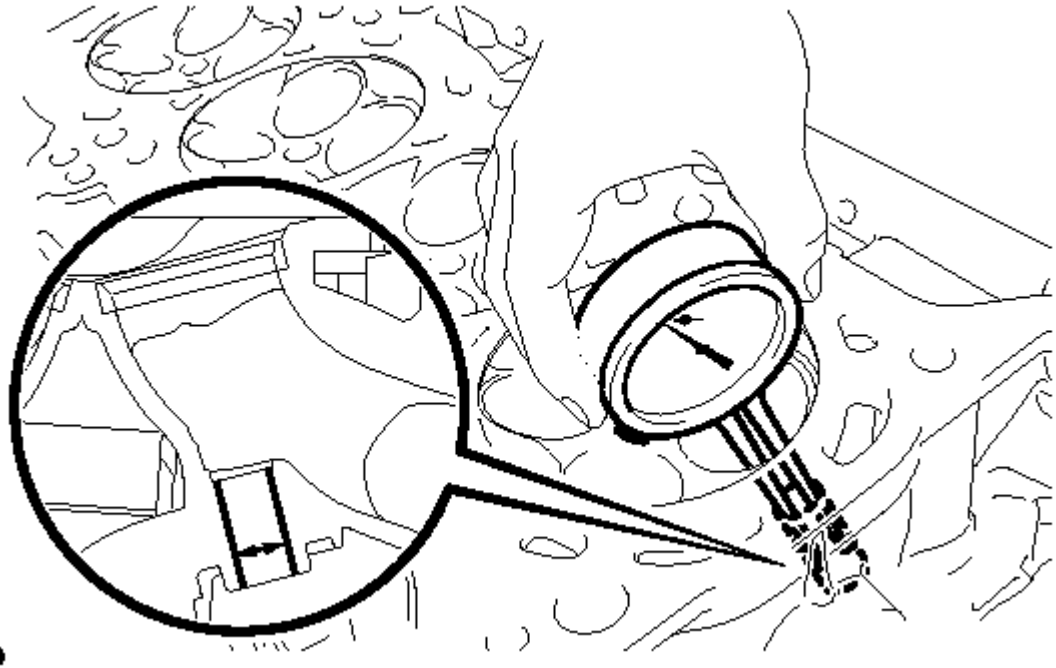


Fig. 320: Measuring Bush Bore Diameter Of Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard bush bore diameter

10.285 to 10.306 mm (0.405 to 0.406 in.)

If the bush bore diameter of the cylinder head is between 10.285 and 10.306 mm (0.405 and 0.406 in.), proceed to the next step.

If the bush bore diameter of the cylinder head is 10.356 mm (0.408 in.) or more, replace the cylinder head.

e. Select a new guide bush (STD or O/S 0.05), and measure its diameter.
f. Machine the bush bore of the cylinder head to the diameter of the selected guide bush.

Standard Bush Bore Diameter

Bush Size	Specified Condition
STD	10.333 to 10.344 mm (0.4068 to 0.4072 in.)
	10.383 to

O/S 0.05	10.394 mm (0.4088 to 0.4092 in.)

Standard bush length

41.3 to 41.7 mm (1.626 to 1.642 in.)

g. Heat the cylinder head to approximately 80 to 100°C (176 to 212°F).
h. Using SST and a hammer, tap in the selected guide bush to the standard protrusion height.

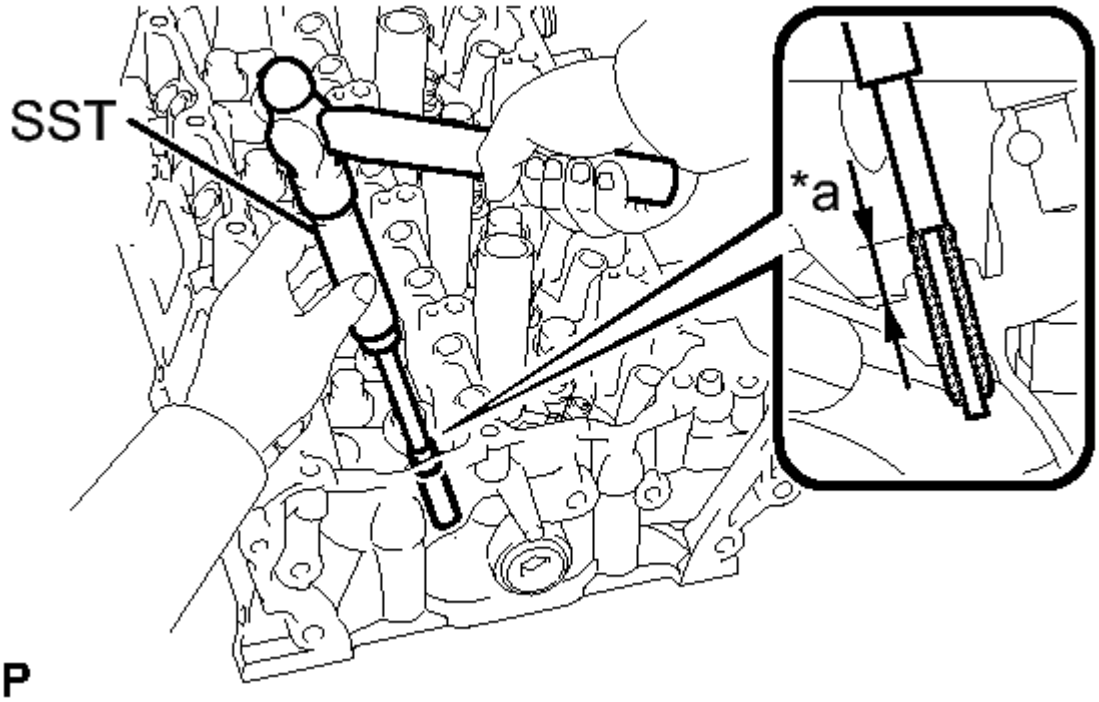


Fig. 321: Tapping Guide Bush To Standard Protrusion Height Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Height

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

Standard protrusion height

14.8 to 15.2 mm (0.582 to 0.598 in.)

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

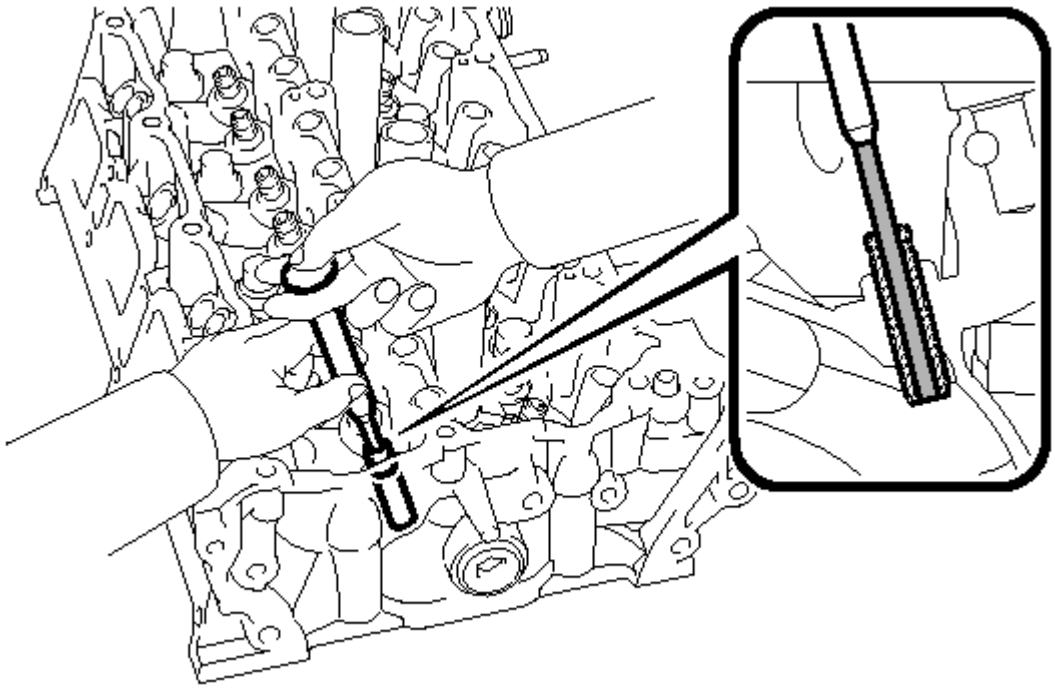


Fig. 322: Reaming Guide Bush
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard oil clearance

0.025 to 0.060 mm (0.000984 to 0.00236 in.)

2. **REPLACE EXHAUST VALVE GUIDE BUSH**
   a. Heat the cylinder head to approximately 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 valve guide bush.
      - **SST: 09201-01055**
      - **SST: 09950-70010**
        09951-07100

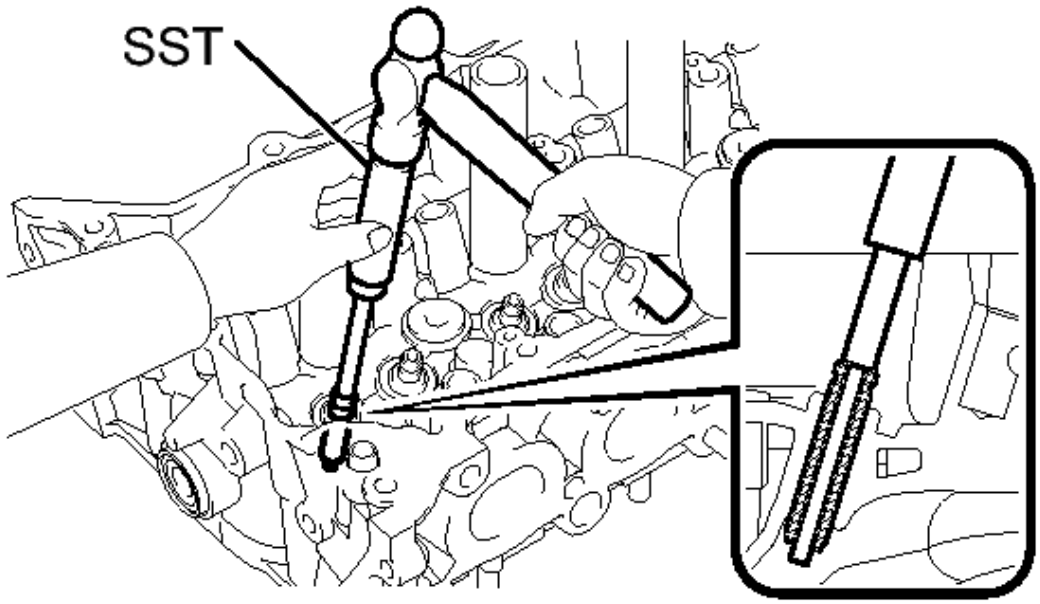


Fig. 323: Tapping Out Valve Guide Bush Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

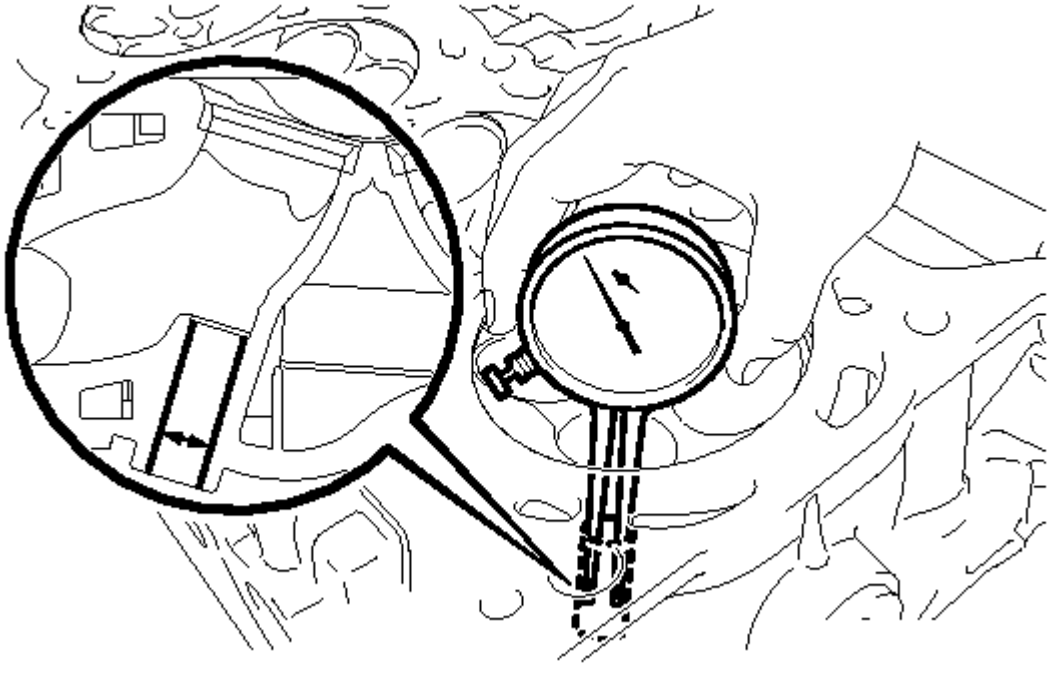


Fig. 324: Measuring Bush Bore Diameter Of Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard bush bore diameter

10.285 to 10.306 mm (0.405 to 0.406 in.)

If the bush diameter of the cylinder head is between 10.285 and 10.306 mm (0.405 and 0.406 in.), proceed to the next step.

If the bush bore diameter of the cylinder head is 10.356 mm (0.408 in.) or more, replace the cylinder head.

e. Select a new guide bush (STD or O/S 0.05), and measure its diameter.
f. Machine the bush bore of the cylinder head to the diameter of the selected guide bush.

Standard Bush Bore Diameter

Bush Size	Specified Condition
STD	10.333 to 10.344 mm (0.4068 in 0.4072 in.)
O/S 0.05	10.383 to 10.394 mm (0.4088 to 0.4092 in.)

Standard bush length

46.8 to 47.2 mm (1.843 to 1.858 in.)

g. Heat the cylinder head to approximately 80 to 100°C (176 to 212°F).
h. Using SST and a hammer, tap in the selected guide bush to the standard protrusion height.

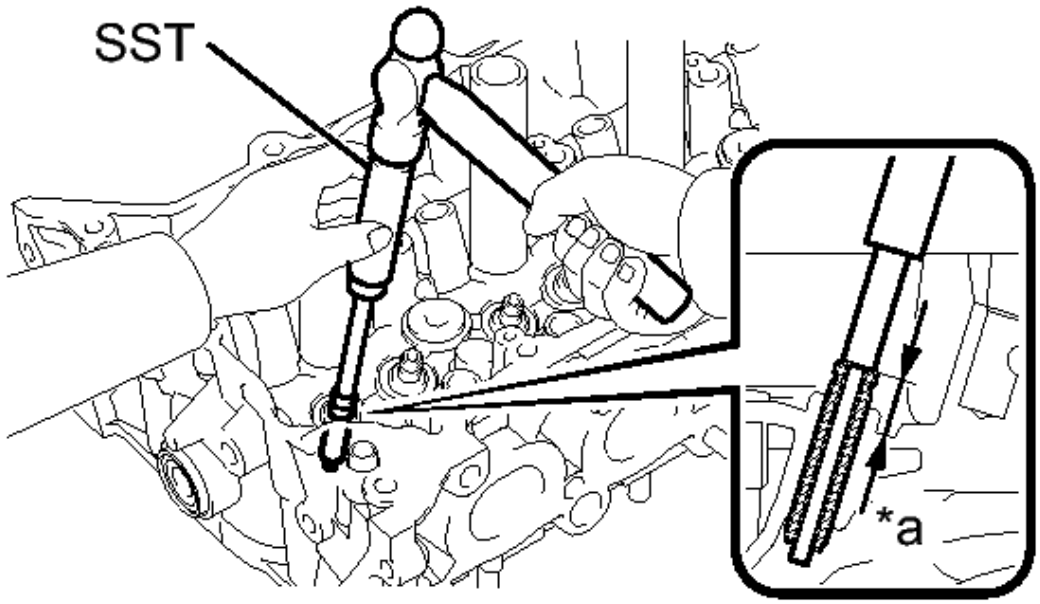


Fig. 325: Tapping Guide Bush To Standard Protrusion Height Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Height

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

Standard protrusion height

14.2 to 14.6 mm (0.559 to 0.575 in.)

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

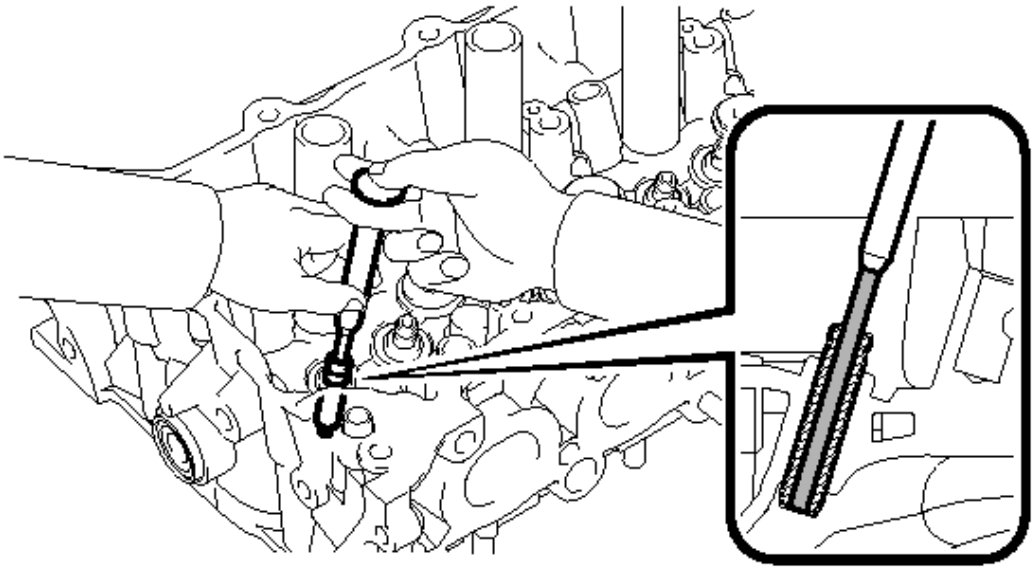


Fig. 326: Reaming Guide Bush
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

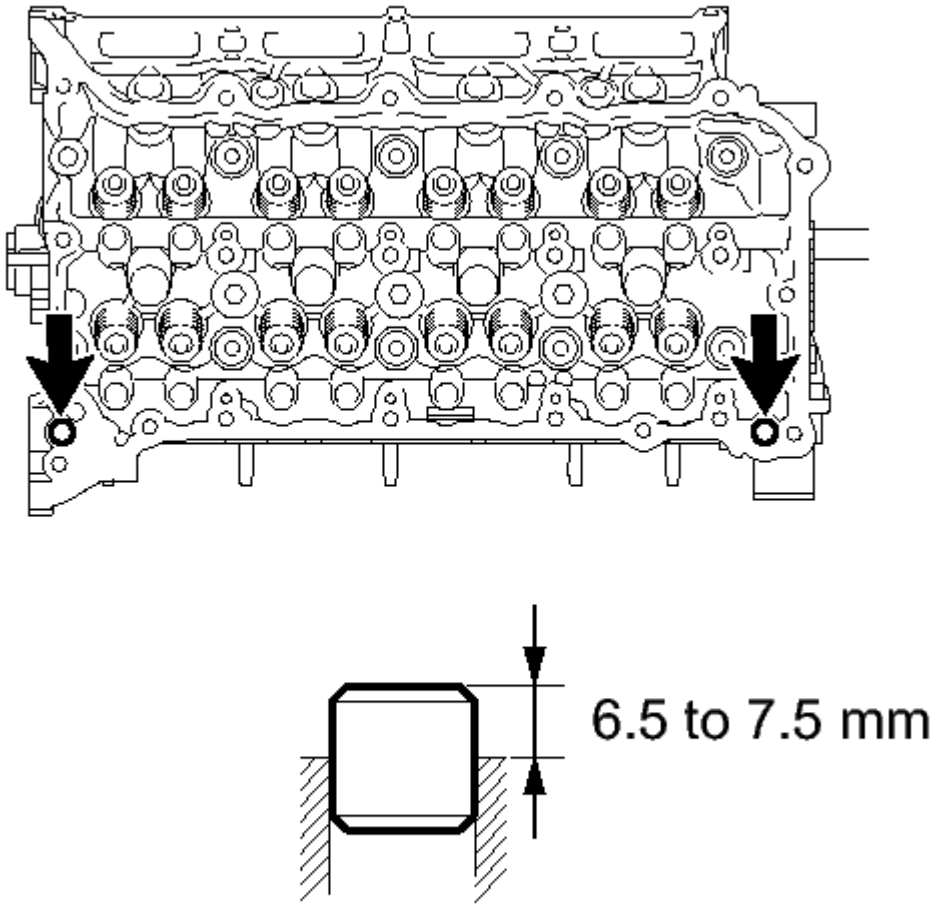
Standard oil clearance

0.030 to 0.065 mm (0.00118 to 0.00256 in.)

3. **REPLACE RING PIN**

NOTE: It is not necessary to remove the ring pin unless it is being replaced.

a. Remove the ring pins.
b. Using a plastic-faced hammer, tap in new ring pins to the cylinder head.



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Fig. 327: Identifying Protrusion Height
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard protrusion height

6.5 to 7.5 mm (0.256 to 0.295 in.)

REASSEMBLY

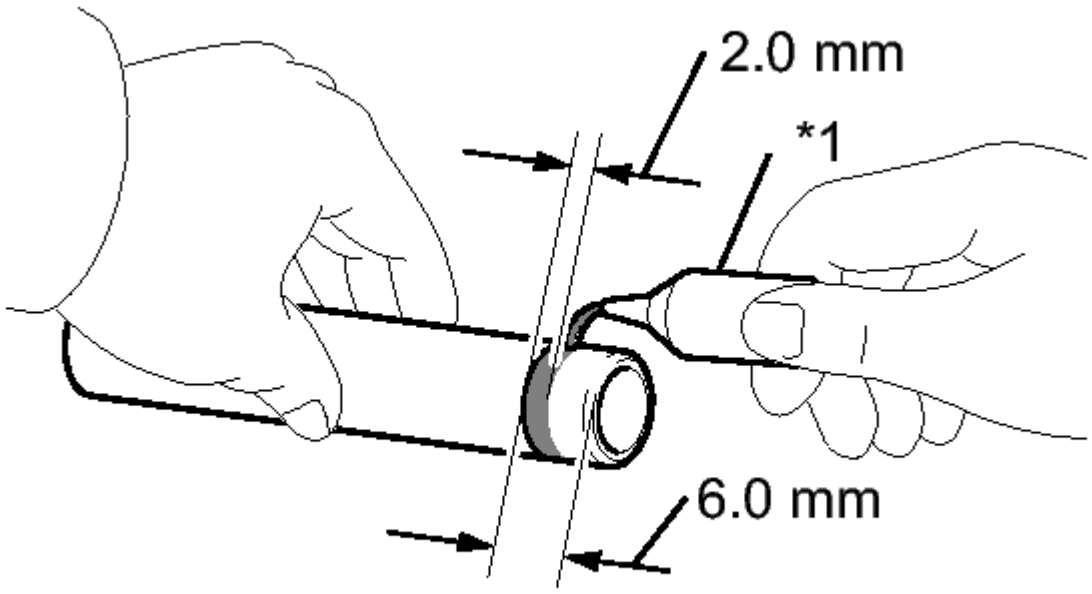
REASSEMBLY

1. **INSTALL SPARK PLUG TUBE**

   HINT:

   When using a new cylinder head, the spark plug tubes must be replaced.

a. Apply adhesive onto the shaded area of a new spark plug tube.



P

Fig. 328: Applying Adhesive To Spark Plug Tube
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Adhesive

Adhesive

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent.

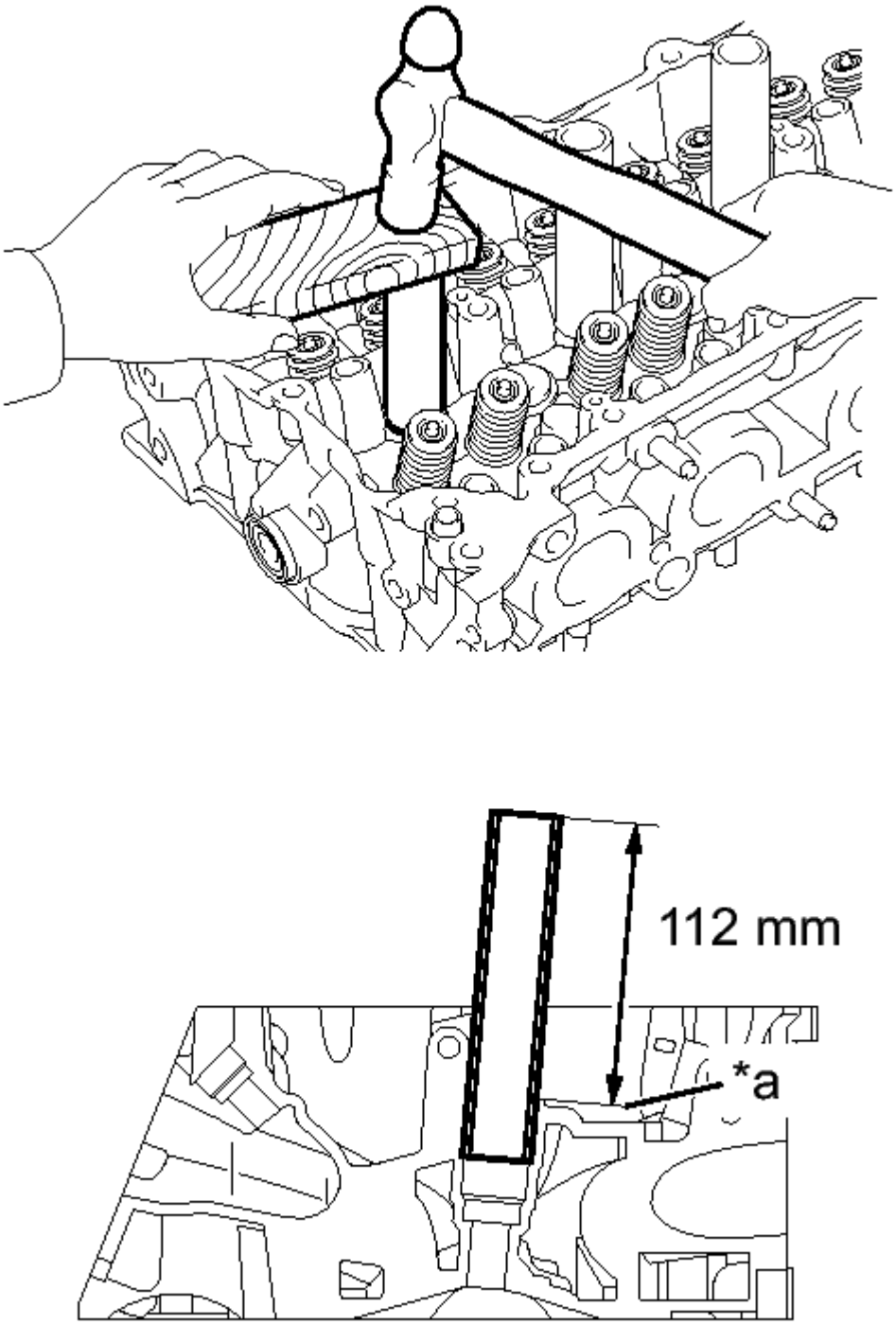
Standard application width

2.0 mm (0.0787 in.)

NOTE:

- **Install the spark plug tube within 3 minutes after applying adhesive.**
- **Be careful not to deform the spark plug tube.**
- **Be careful not to expose the seal to coolant for at least 1 hour after installing it.**

b. Using a wooden block and hammer, tap in the spark plug tube to the specified protrusion height.



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Fig. 329: Tapping Spark Plug Tube To Specified Protrusion Height Using A Wooden Block & Hammer

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

TEXT IN ILLUSTRATION

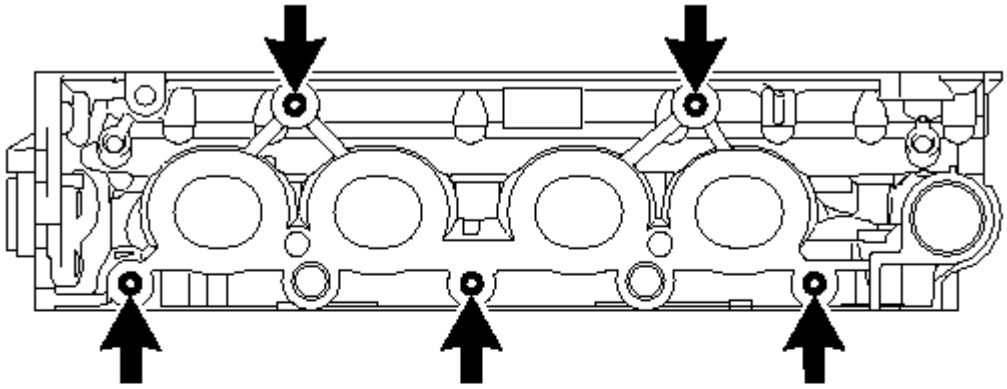
*a	Cylinder Head Casting Surface

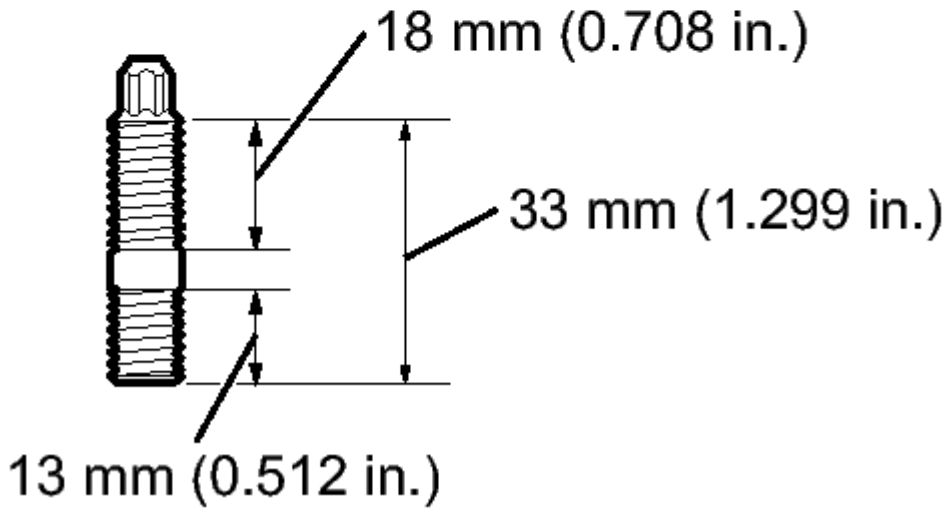
Standard protrusion height

112 mm (4.41 in.)

NOTE: To avoid tapping in the spark plug tube too far, measure the protrusion height while tapping it.

2. **INSTALL CYLINDER HEAD STUD BOLT**
   a. Using an E7 "TORX" socket wrench, install the cylinder head stud bolts.



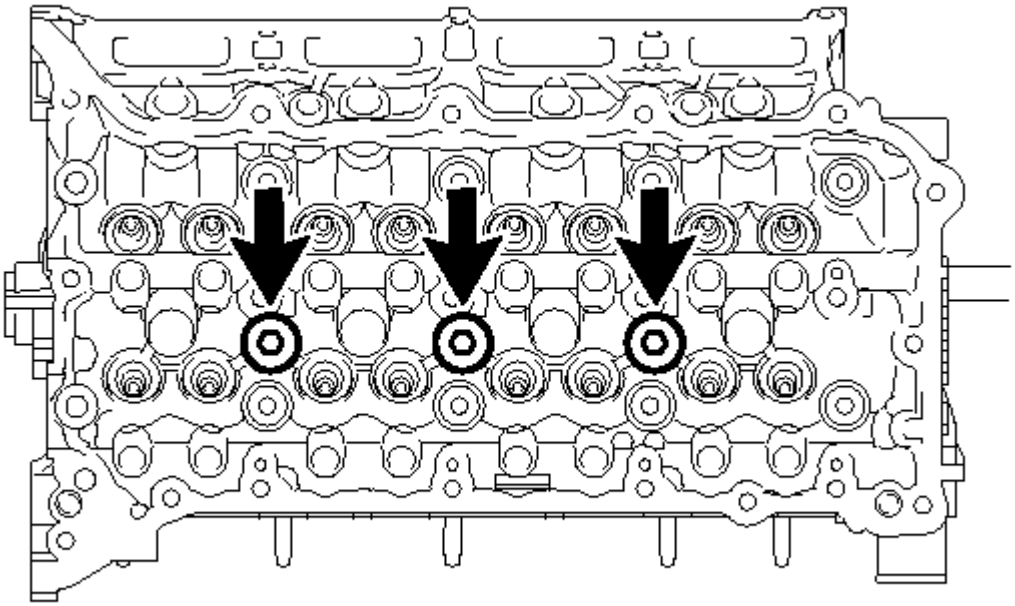


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Fig. 330: Identifying Cylinder Head Stud Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

3. **INSTALL NO. 1 STRAIGHT SCREW PLUG**
    a. Using a 10 mm hexagon wrench, install 3 new gaskets and the 3 straight screw plugs.

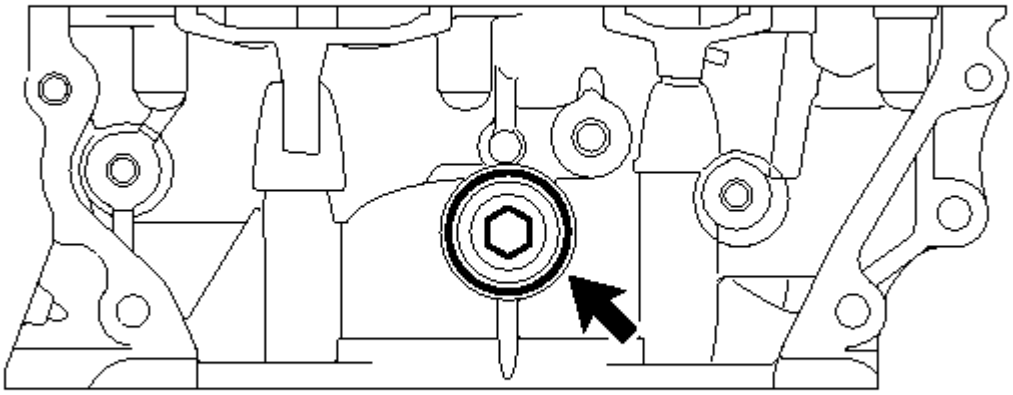


P

Fig. 331: Identifying No. 1 Straight Screw Plugs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

4. **INSTALL NO. 2 STRAIGHT SCREW PLUG**
    a. Using a 14 mm hexagon wrench, install a new gasket and the straight screw plug.

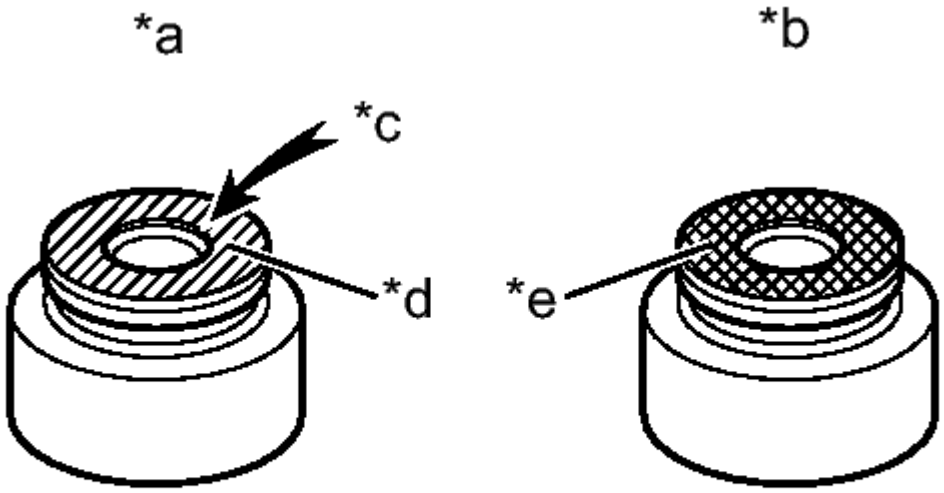


P

Fig. 332: Identifying No. 2 Straight Screw Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 78 N*m (795 kgf*cm, 58 ft.*lbf)

5. **INSTALL VALVE SPRING SEAT**
    a. Install the valve spring seats to the cylinder head.
6. **INSTALL VALVE STEM OIL SEAL**
    a. Apply a light coat of engine oil to new oil seals.



H

Fig. 333: Identifying Valve Stem Oil Seals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Intake
*b	Exhaust
*c	Mark "NOK"
*d	Gray
*e	Black

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

HINT:

The intake valve oil seals are gray and the exhaust valve oil seals are black.

b. Using SST, push in the intake and exhaust valve stem oil seals.

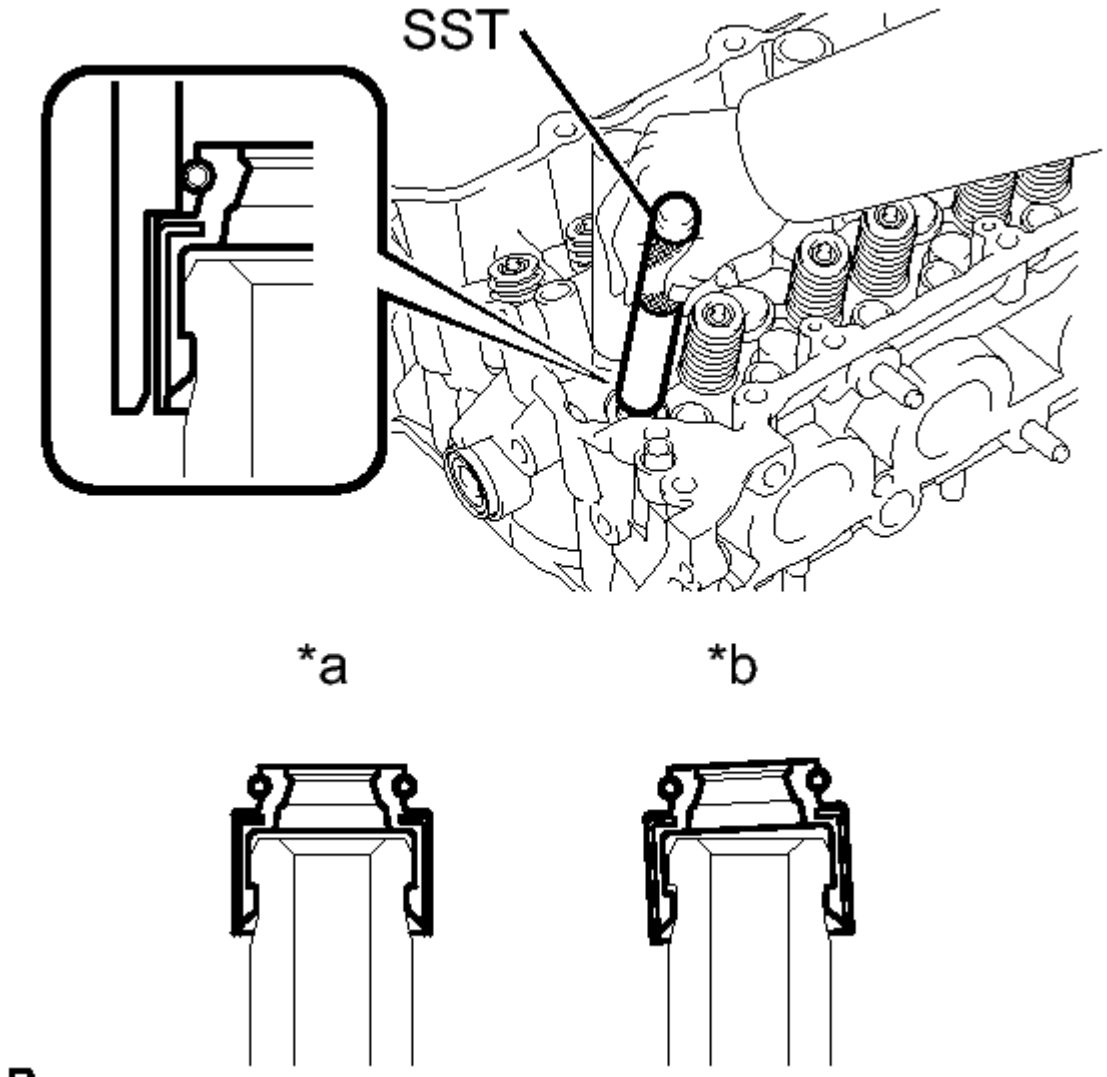


Fig. 334: Pushing Intake & Exhaust Valve Stem Oil Seals Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

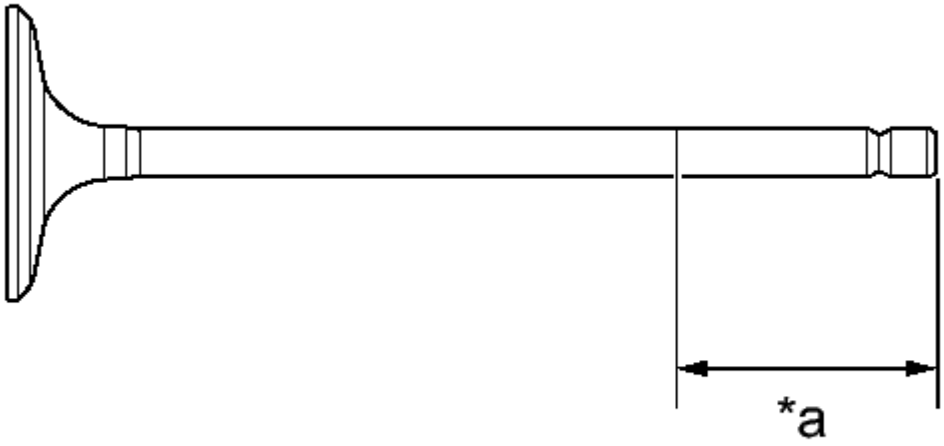
TEXT IN ILLUSTRATION

*a	CORRECT
*b	INCORRECT

- **SST: 09201-41020**

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

7. **INSTALL INTAKE VALVE**
   a. Apply plenty of engine oil to the tip area of the intake valve shown in the illustration.



T

Fig. 335: Identifying Intake Valve Engine Oil Applying Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	30 mm (1.18 in.) or more

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

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

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

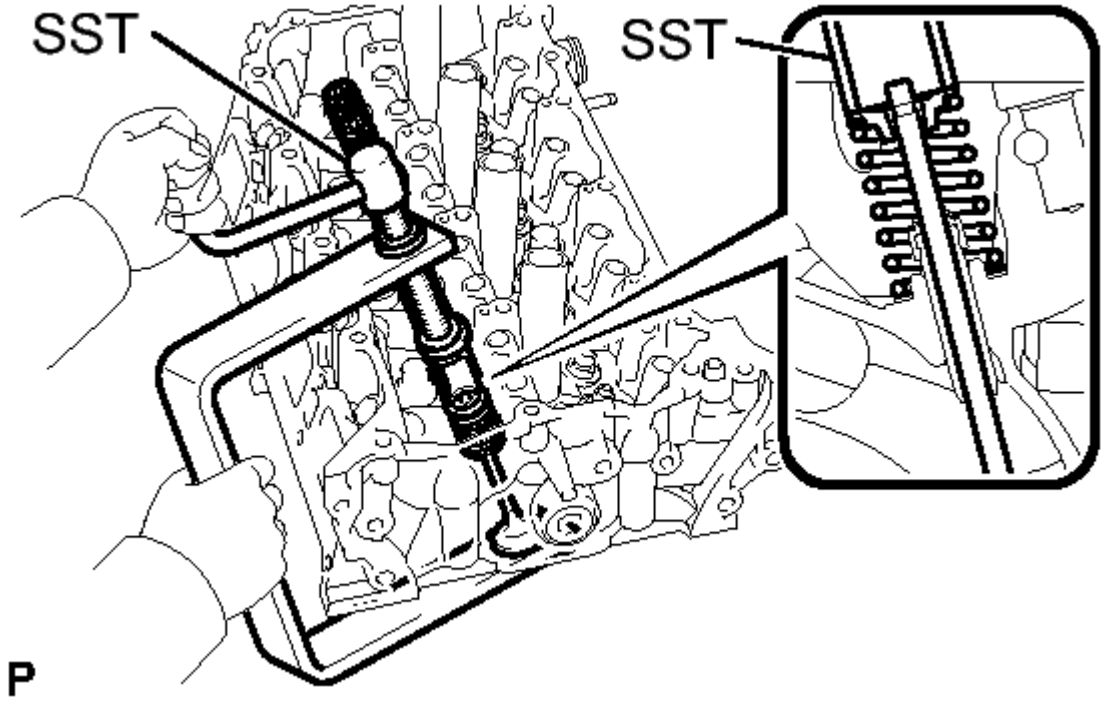


Fig. 336: Identifying Intake Valve Spring Retainer Locks Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- **SST: 09202-70020**
  09202-00010

d. Using a plastic-faced hammer, lightly tap the valve stem tip to ensure a proper fit.

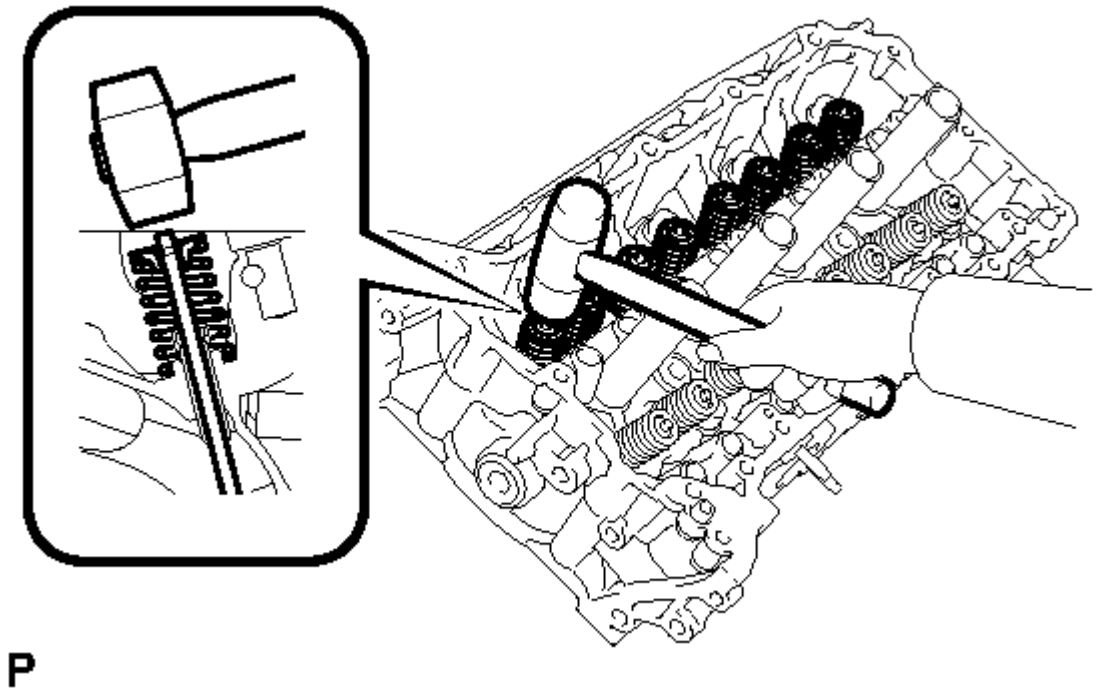
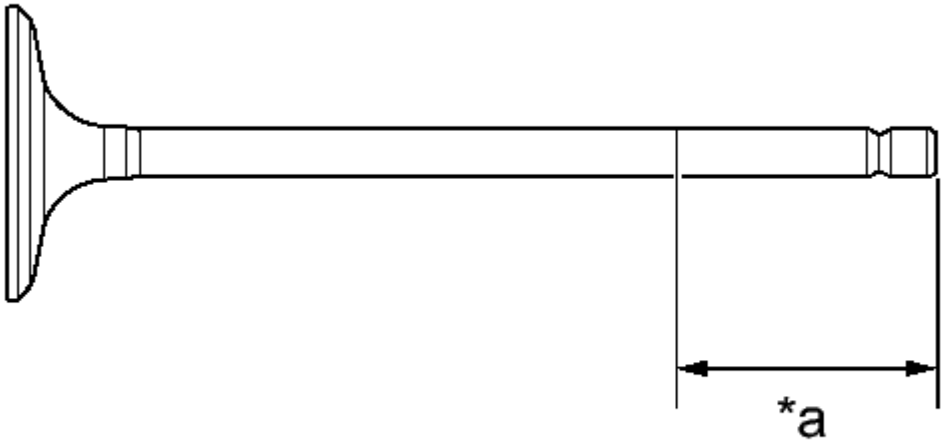


Fig. 337: Tapping Valve Stem Tip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Be careful not to damage the retainer.

8. **INSTALL EXHAUST VALVE**
   a. Apply plenty of engine oil to the tip area of the exhaust valve shown in the illustration.



T

Fig. 338: Identifying Intake Valve Engine Oil Applying Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

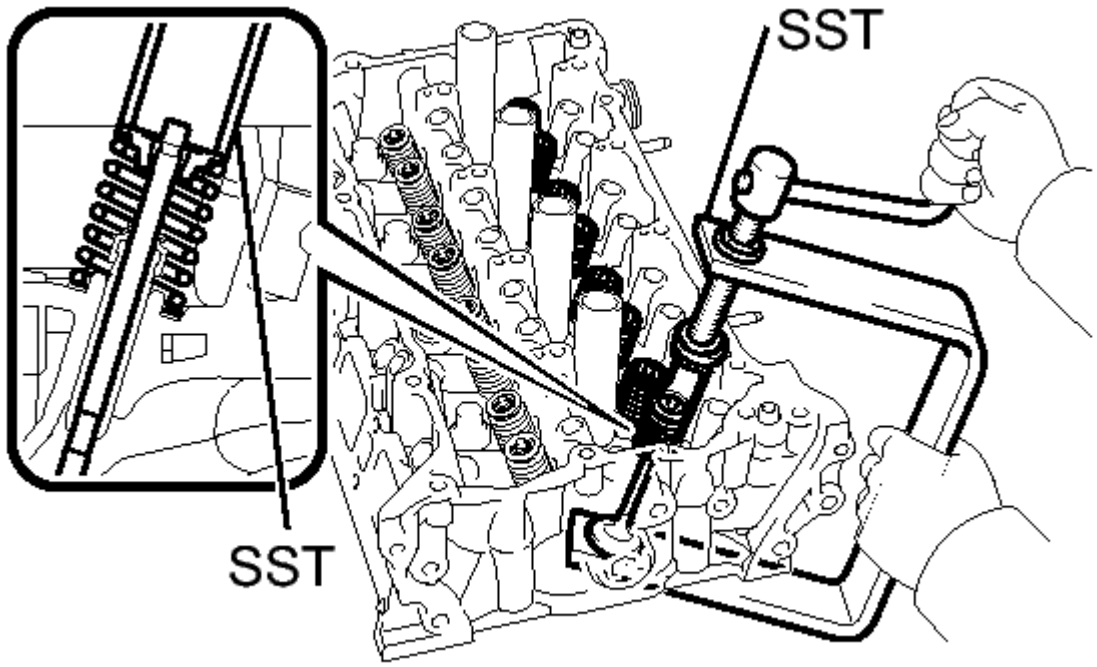
TEXT IN ILLUSTRATION

*a	30 mm (1.18 in.) or more

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

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

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

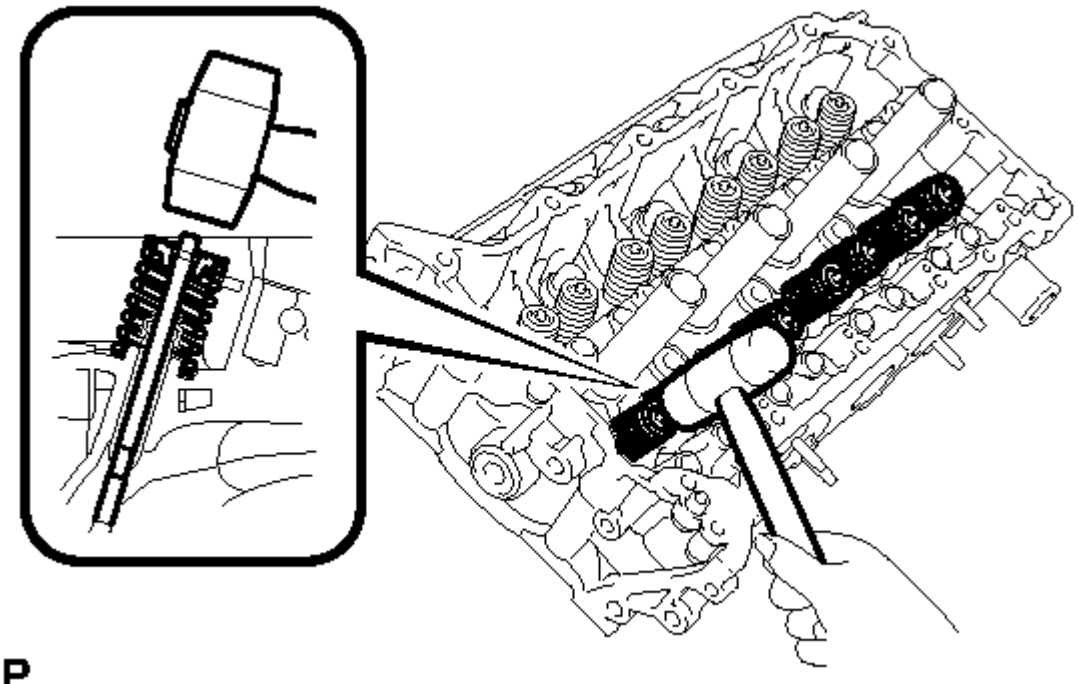


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Fig. 339: Identifying Exhaust Valve Spring Retainer Locks Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- **SST: 09202-70020**
  09202-00010

d. Using a plastic-faced hammer, lightly tap the valve stem tip to ensure a proper fit.



P

Fig. 340: Tapping Valve Stem Tip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Be careful not to damage the retainer.

REPAIR

REPAIR

1. **REPAIR INTAKE VALVE SEAT**

NOTE:

- **Repair the seat while checking the seating position.**
- **Keep the lip free of foreign matter.**
- **Take off the cutter gradually to make the intake valve seat smooth.**

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

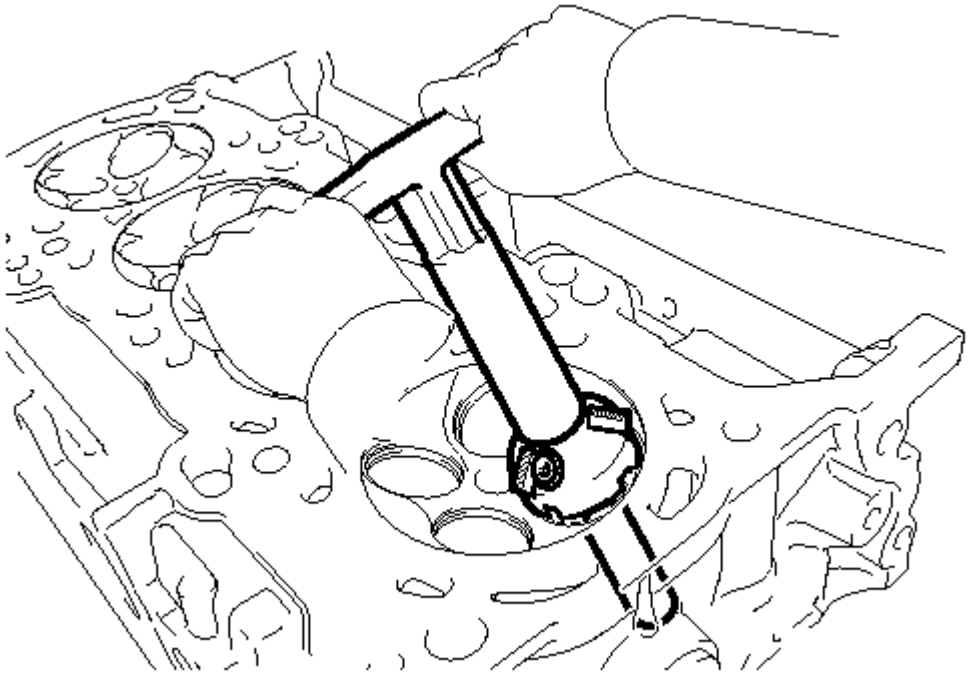
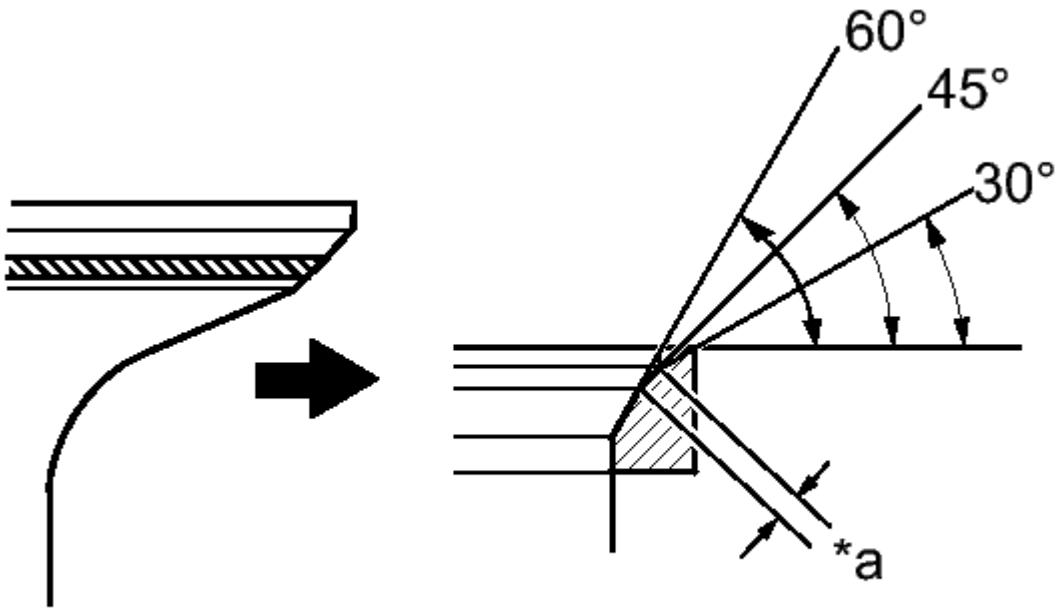


Fig. 341: Cutting Intake Valve Seat
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using 30° and 60° cutters, correct the valve seat so that the valve contacts the entire circumference of the seat. The contact should be in the center of the valve seat, and the valve seat width should be maintained within the specified range around the entire circumference of the seat.



T

Fig. 342: Identifying Valve Seat Width
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Width

Standard width

1.0 to 1.4 mm (0.0394 to 0.0551 in.)

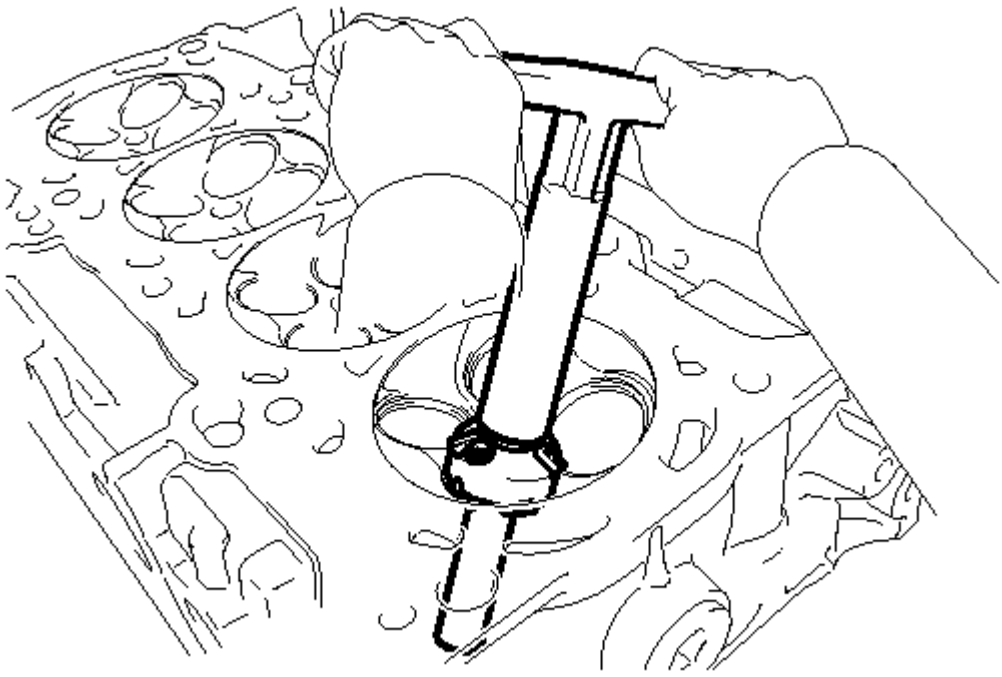
c. Hand-lap the valve and valve seat with an abrasive compound.
d. Check the valve seating position.

2. **REPAIR EXHAUST VALVE SEAT**

NOTE:

- **Repair the seat while checking the seating position.**
- **Keep the lip free of foreign matter.**
- **Take off the cutter gradually to make the exhaust valve seat smooth.**

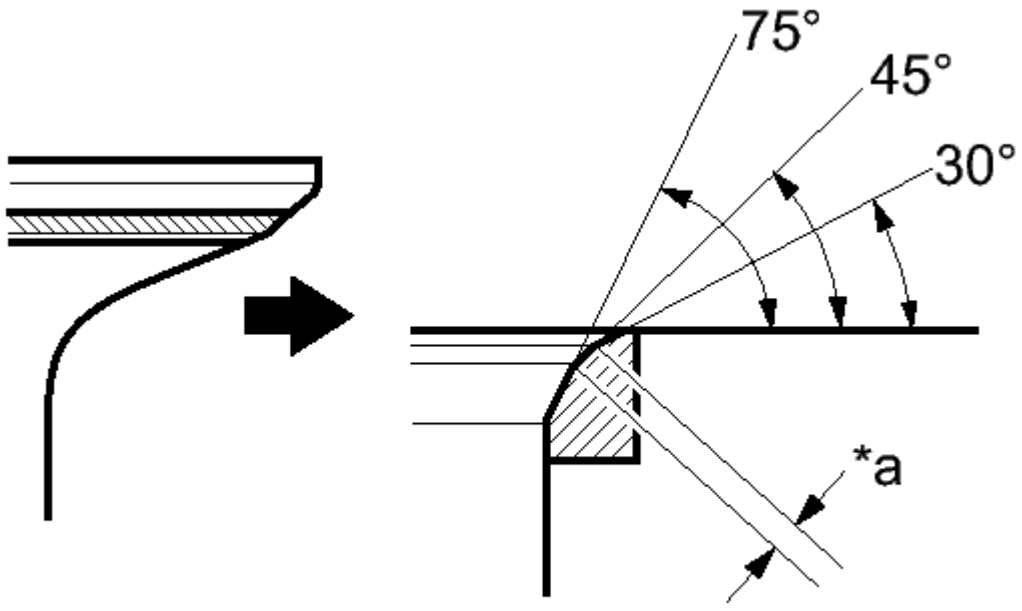
a. Using a 45° cutter, resurface the valve seat so that the valve seat width is more than the specification.



P

Fig. 343: Cutting Exhaust Valve Seat
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.



T

Fig. 344: Identifying Valve Seat Width
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Width

Standard width

1.2 to 1.6 mm (0.0472 to 0.0630 in.)

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

CYLINDER BLOCK

COMPONENTS

ILLUSTRATION

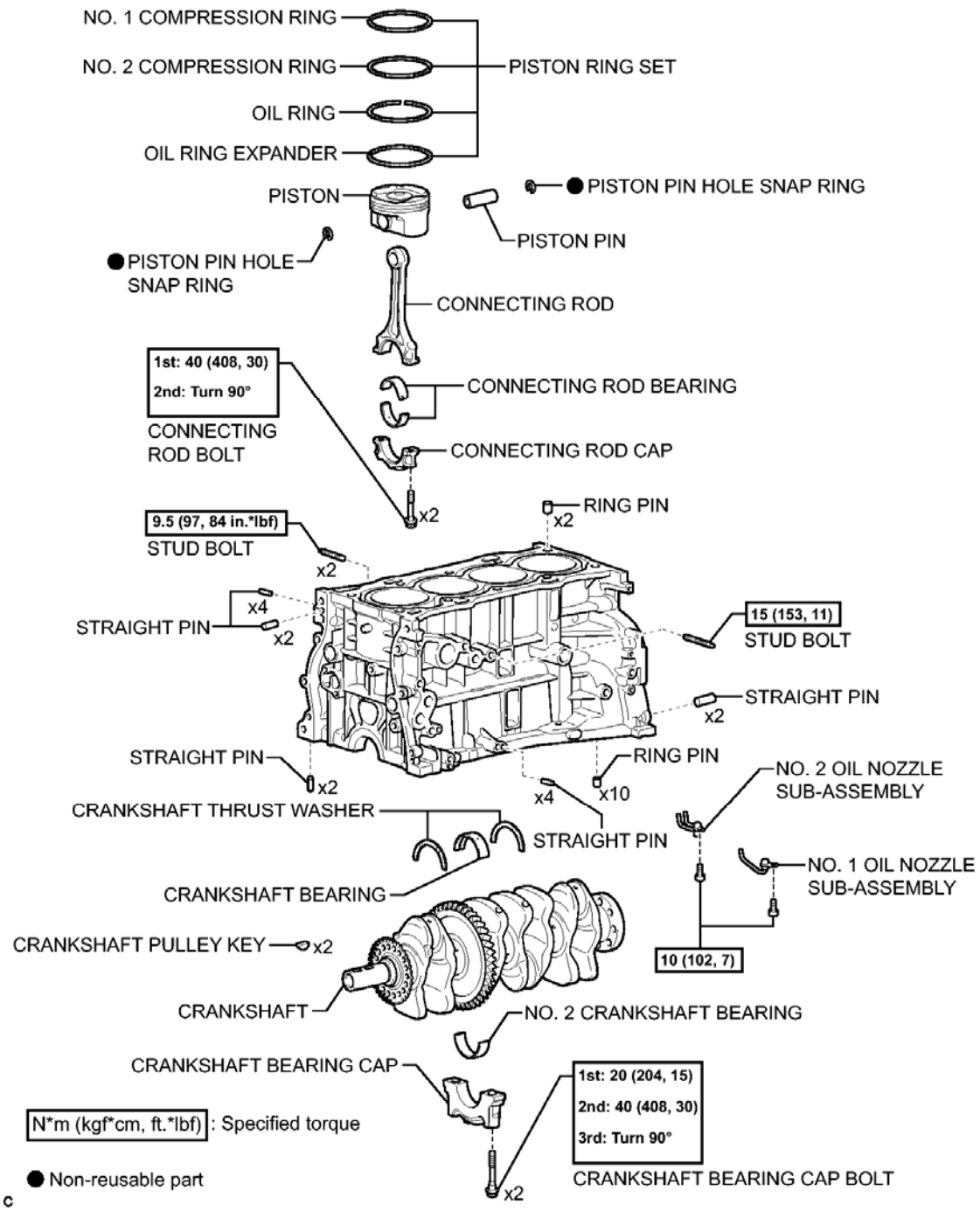


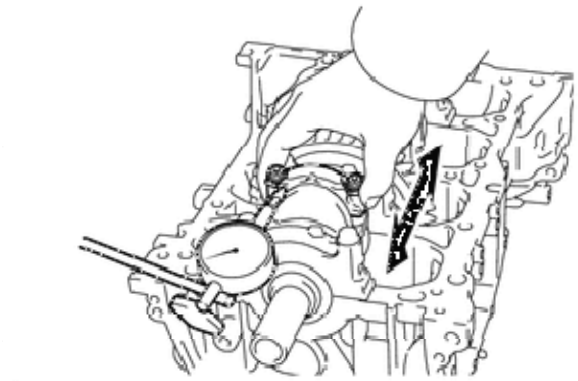
Fig. 345: Cylinder Block Replacement Components With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

DISASSEMBLY

1. **INSPECT CONNECTING ROD THRUST CLEARANCE**

a. Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.



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Fig. 346: Measuring Connecting Rod Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard thrust clearance

0.160 to 0.512 mm (0.00630 to 0.0202 in.)

Maximum thrust clearance

0.512 mm (0.0202 in.)

If the thrust clearance is more than the maximum, replace the connecting rod. If necessary, replace the crankshaft.

2. **INSPECT CONNECTING ROD OIL CLEARANCE**
   a. Check the alignment marks on the connecting rod and cap to ensure correct reassembly.

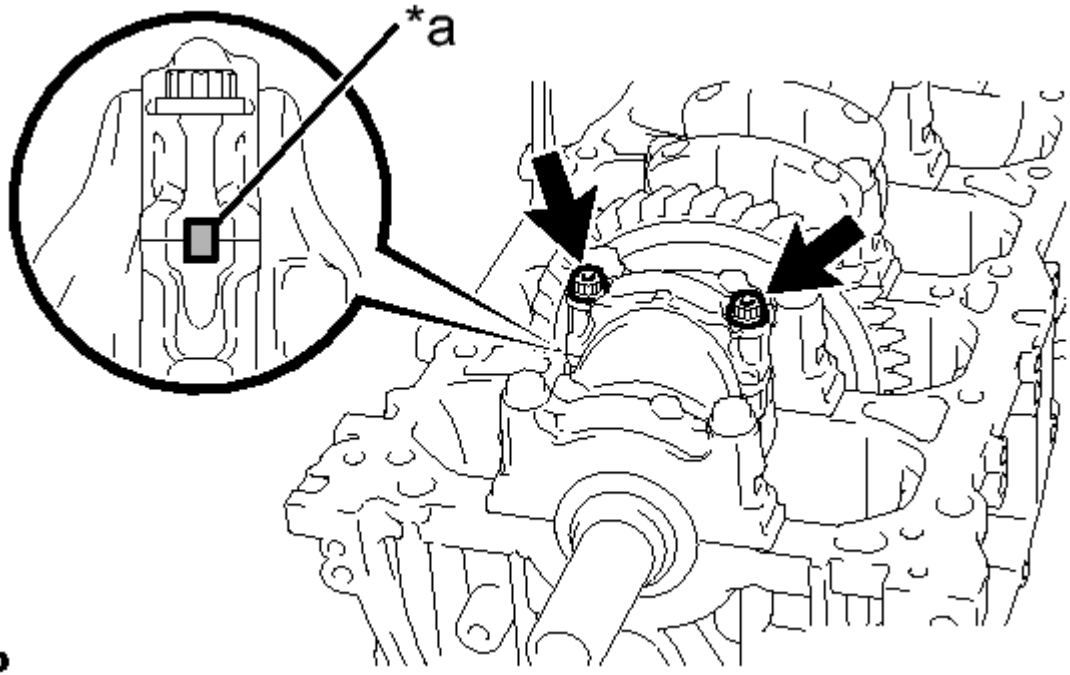
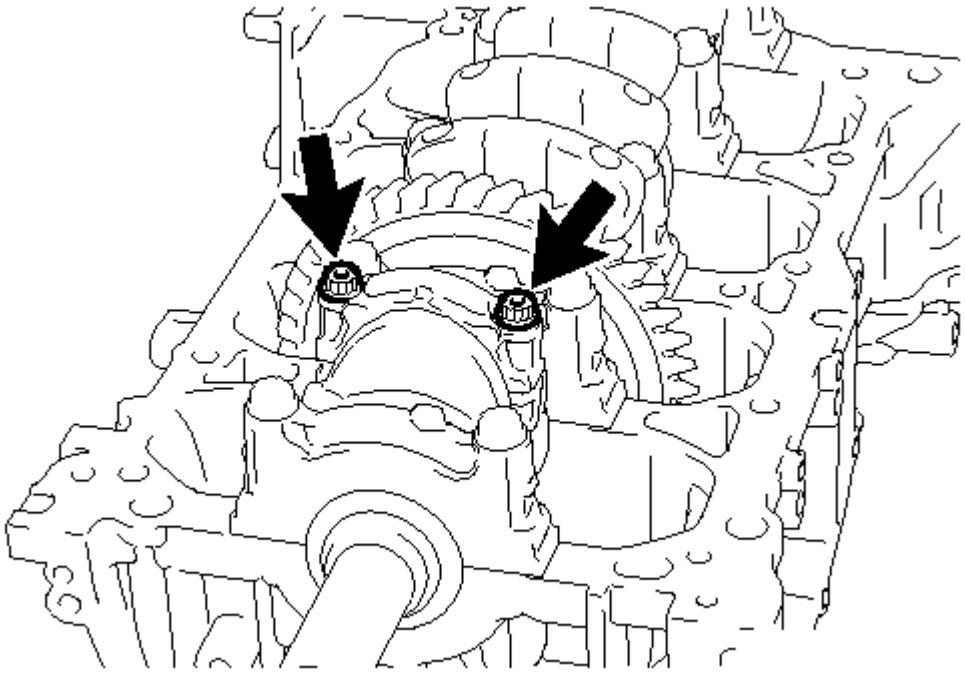


Fig. 347: Checking Connecting Rod & Cap Alignment Marks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Alignment Mark

b. Remove the 2 bolts and connecting rod cap.



P

Fig. 348: Identifying Connecting Rod Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Keep the lower bearing and connecting rod cap together.

c. Clean the crank pin and bearing.
d. Check the crank pin and bearing for pitting and scratches.

   If the crank pin or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.

e. Lay a strip of Plastigage on the crank pin.

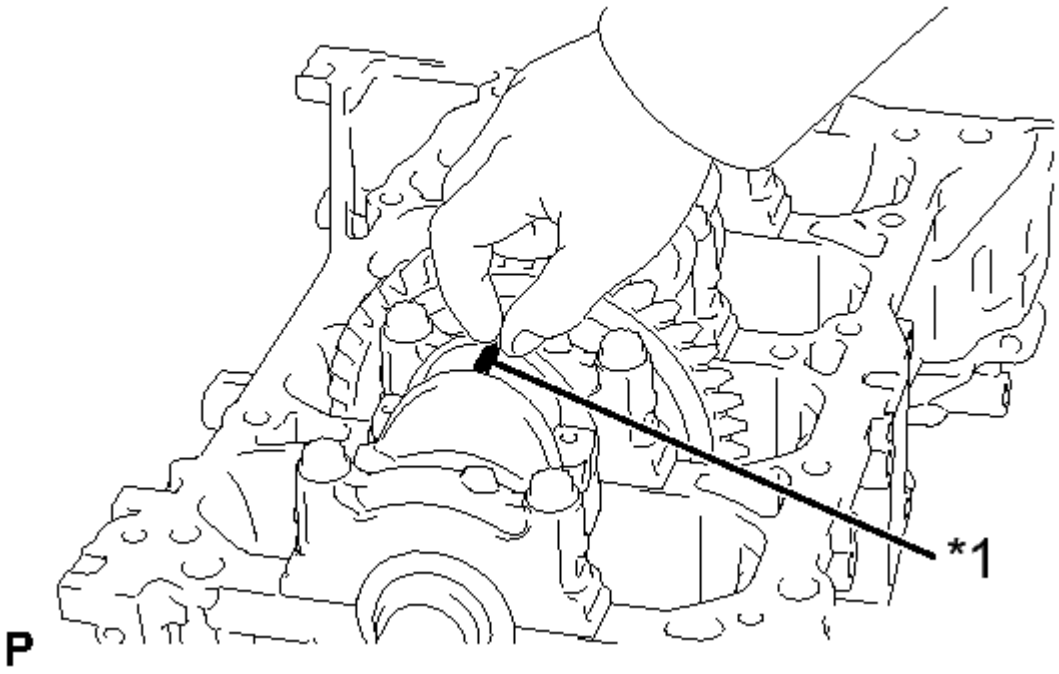


Fig. 349: Applying Plastigage Across Crank Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Plastigage

f. Check that the front mark of the connecting rod cap is facing in the correct direction.

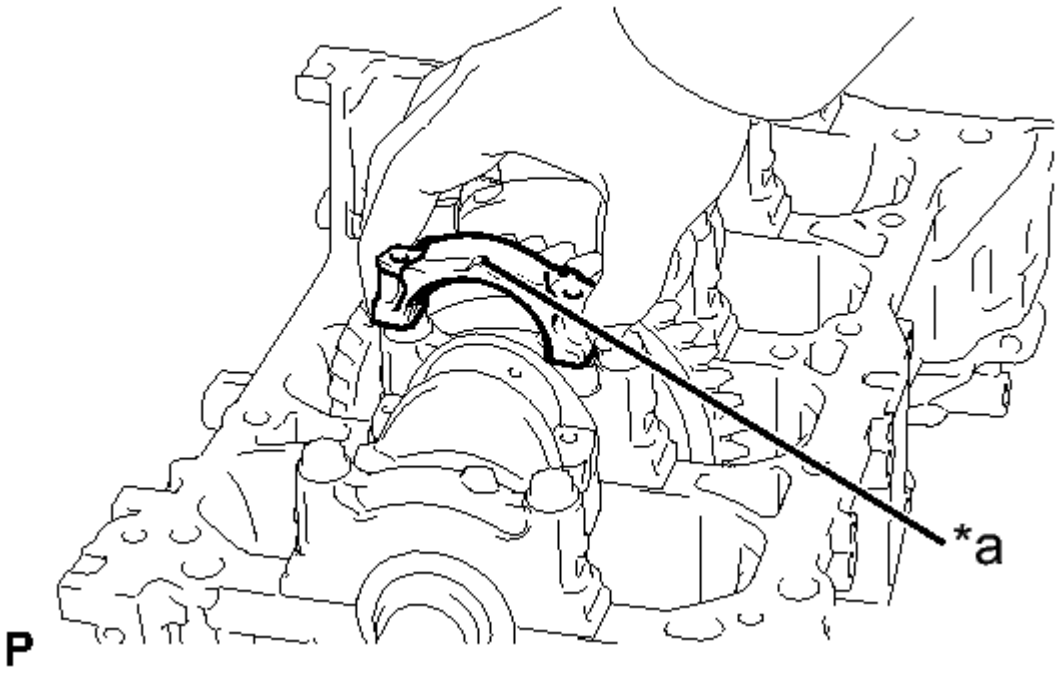
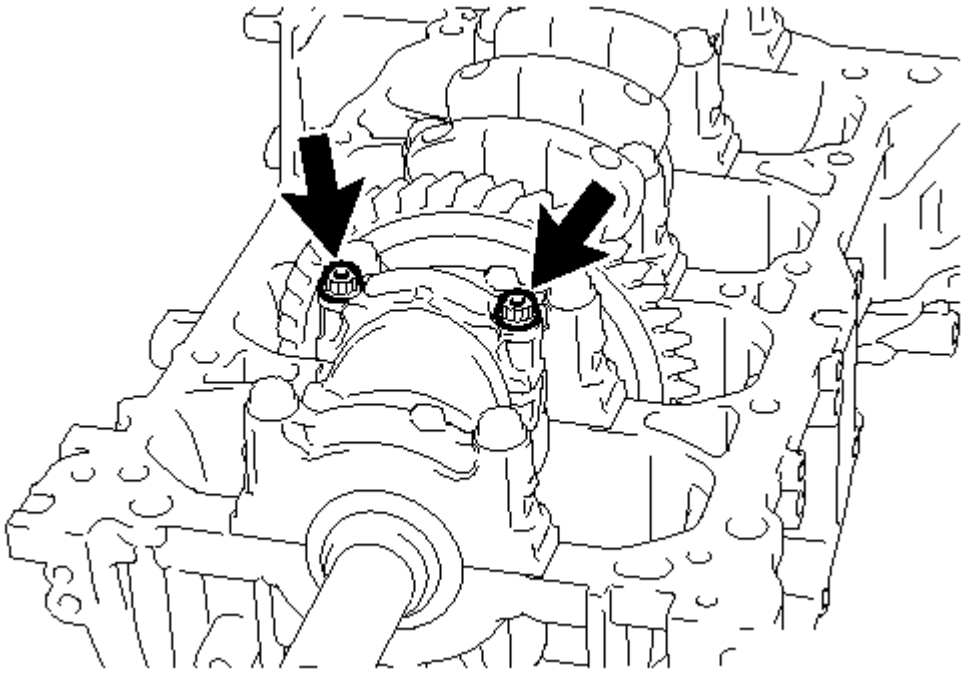


Fig. 350: Identifying Connecting Rod Cap Front Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front Mark

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



P

Fig. 351: Identifying Connecting Rod Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

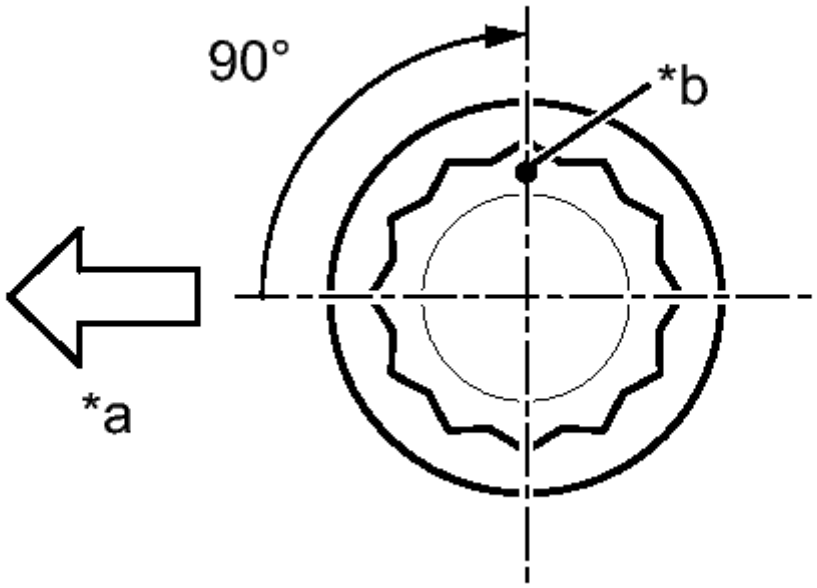
h. Install and alternately tighten the bolts of the connecting rod cap in several steps.

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

NOTE: Do not turn the crankshaft during the measurement.

If any one of the connecting rod bolts does not meet the torque specification, replace the connecting rod bolts.

i. Mark the front of each connecting rod bolt with paint.



P

Fig. 352: Identifying Connecting Rod Bolt Paint Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Engine Front
*b	Paint Mark

j. Tighten the bolts 90° as shown in the illustration.

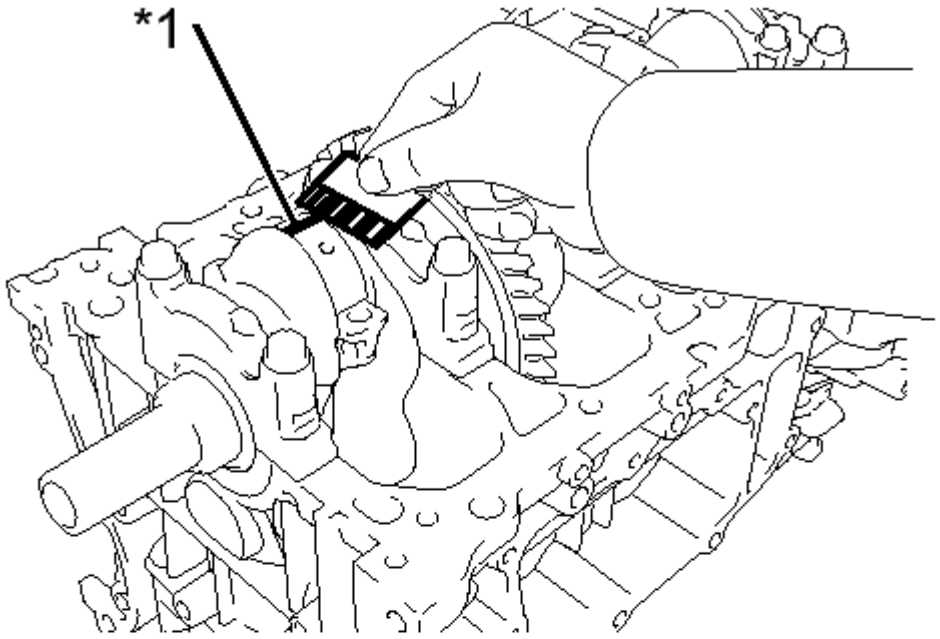
NOTE: Do not turn the crankshaft during the measurement.

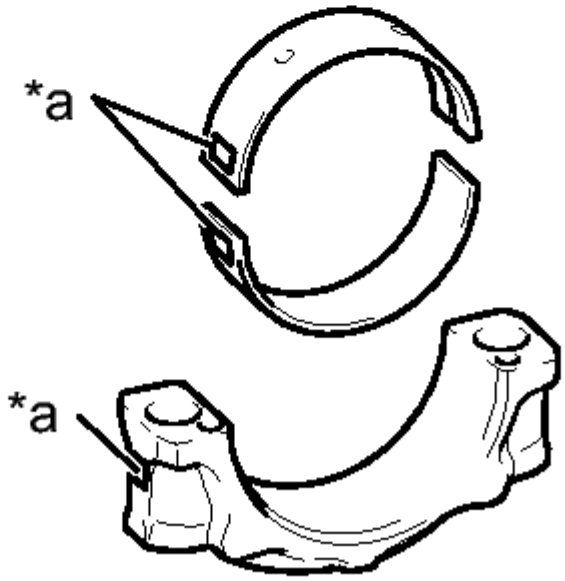
k. Remove the 2 bolts and connecting rod cap.

HINT:

Keep the lower bearing and connecting rod cap together.

l. Measure the Plastigage at its widest point.





P

Fig. 353: Measuring Widest Point Of Plastigage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Plastigage

*a	Number Mark

Standard oil clearance

0.030 to 0.063 mm (0.00118 to 0.00248 in.)

Maximum oil clearance

0.07 mm (0.00276 in.)

NOTE: Remove the Plastigage completely after the measurement.

If the oil clearance is more than the maximum, replace the connecting rod bearing. If necessary, grind or replace the crankshaft.

HINT:

If replacing a bearing, select a new one with the same number as marked on the connecting rod. There are 3 sizes of standard bearings, marked "1", "2" and "3" accordingly.

Standard crank pin diameter

51.492 to 51.500 mm (2.0272 to 2.0276 in.)

Standard Connecting Rod Big End Inside Diameter

Item	Specified Condition
Mark 1	54.500 to 54.508 mm (2.1457 to 2.1460 in.)
Mark 2	54.509 to 54.516 mm (2.1460 to 2.1463 in.)
Mark 3	54.517 to 54.524 mm (2.1463 to 2.1466

	in.)

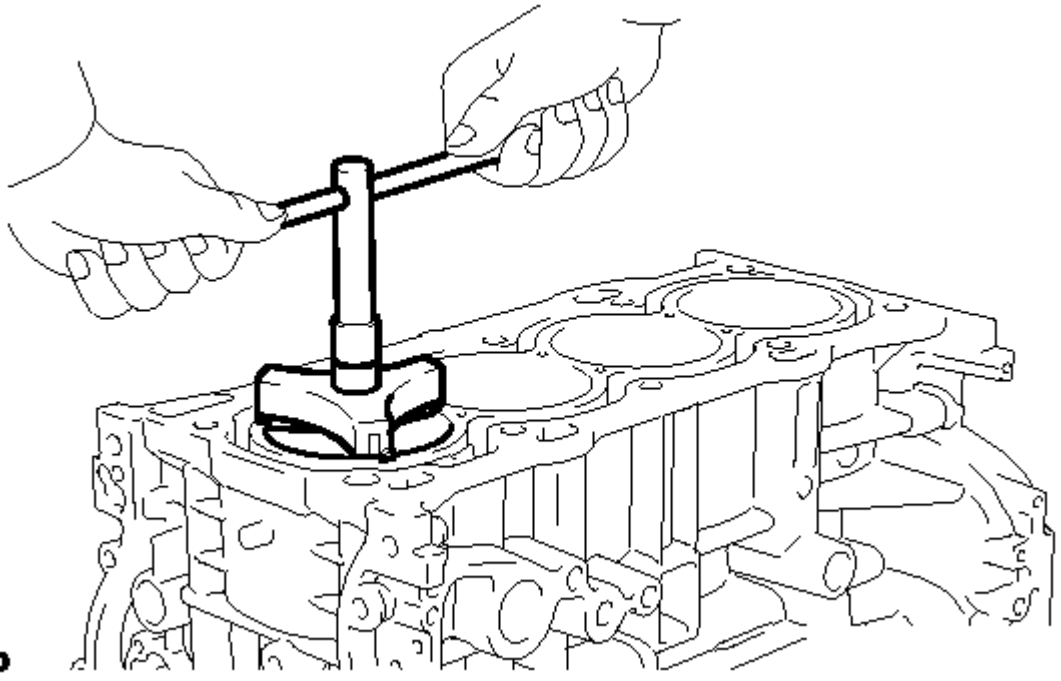
Standard Size Bearing Center Wall Thickness

Item	Specified Condition
Mark 1	1.483 to 1.487 mm (0.0584 to 0.0585 in.)
Mark 2	1.488 to 1.491 mm (0.0586 to 0.0587 in.)
Mark 3	1.492 to 1.495 mm (0.0587 to 0.0589 in.)

m. Perform the inspection above for each cylinder.

3. **REMOVE PISTON WITH CONNECTING ROD**

a. Using a ridge reamer, remove all the carbon from the top of the cylinder.



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Fig. 354: Removing Carbon From Top Of Cylinder
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the 8 bolts, 4 connecting rod caps and 4 lower bearings.
c. Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

HINT:

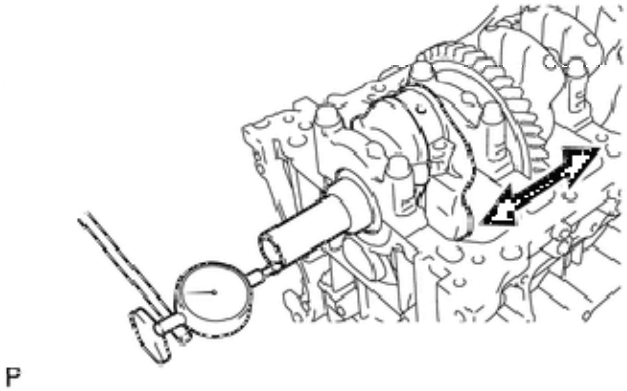
- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in the correct order.
- Be sure to arrange the removed piston and connecting rod assemblies in such a way that they can be reinstalled exactly as before.

4. **REMOVE CONNECTING ROD BEARING**
   a. Remove the connecting rod bearings from the connecting rods and connecting rod caps.

HINT:

Arrange the removed parts in the correct order.

5. **INSPECT CRANKSHAFT THRUST CLEARANCE**
   a. Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.



P

Fig. 355: Measuring Crankshaft Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard thrust clearance

0.04 to 0.24 mm (0.00157 to 0.00945 in.)

Maximum thrust clearance

0.30 mm (0.0118 in.)

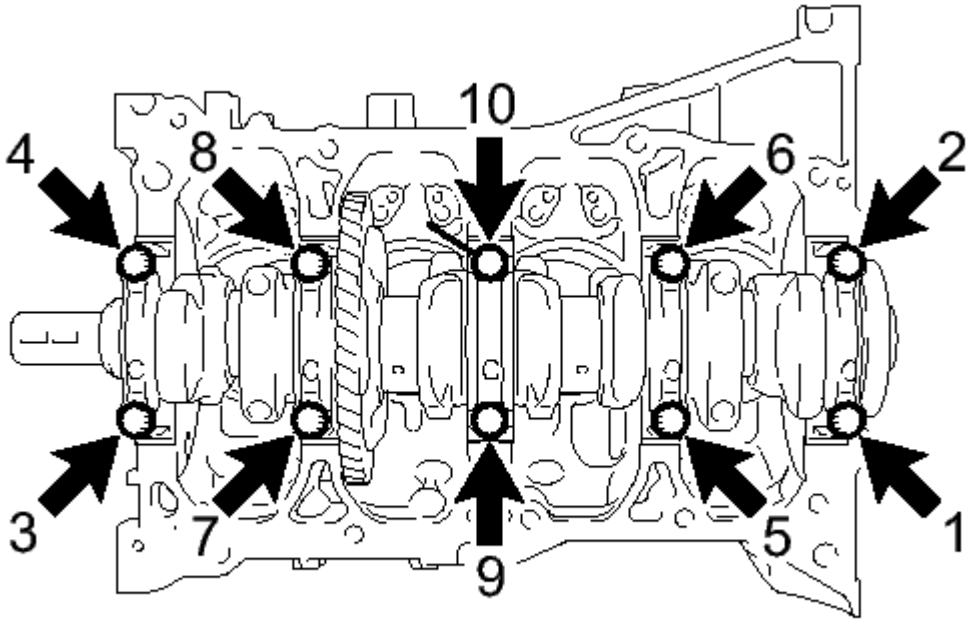
If the thrust clearance is more than the maximum, replace the thrust washers as a set. If necessary, replace the crankshaft.

Standard thrust washer thickness

1.93 to 1.98 mm (0.0760 to 0.0780 in.)

6. **REMOVE CRANKSHAFT**

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



P

Fig. 356: Identifying Bearing Cap Bolts With Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the 5 bearing caps from the cylinder block.

HINT:

- Keep the No. 2 crankshaft bearings and crankshaft bearing caps together.
- Arrange the bearing caps in the correct order.

c. Remove the crankshaft from the cylinder block.

HINT:

Keep the crankshaft bearings and crankshaft thrust washers together with the cylinder block.

d. Check each crankshaft journal and bearing for pitting and scratches.

If the journal or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.

7. **REMOVE CRANKSHAFT THRUST WASHER**
   a. Remove the thrust washers from the cylinder block.

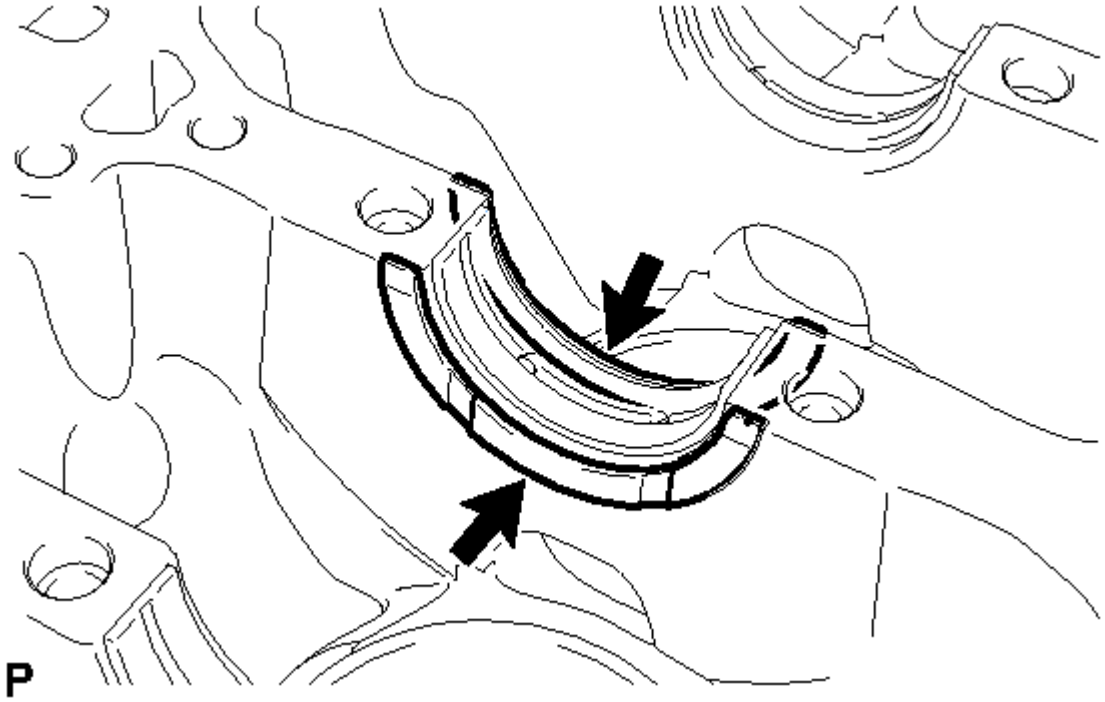


Fig. 357: Identifying Crankshaft Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **REMOVE CRANKSHAFT BEARING**
   a. Remove the crankshaft bearings from the cylinder block and bearing caps.

   HINT:

   Arrange the bearings in the correct order.

9. **REMOVE CRANKSHAFT PULLEY KEY**
   a. Using a screwdriver, remove the 2 pulley keys from the crankshaft.
10. **REMOVE PISTON RING SET**
   a. Using a piston ring expander, remove the 2 compression rings.

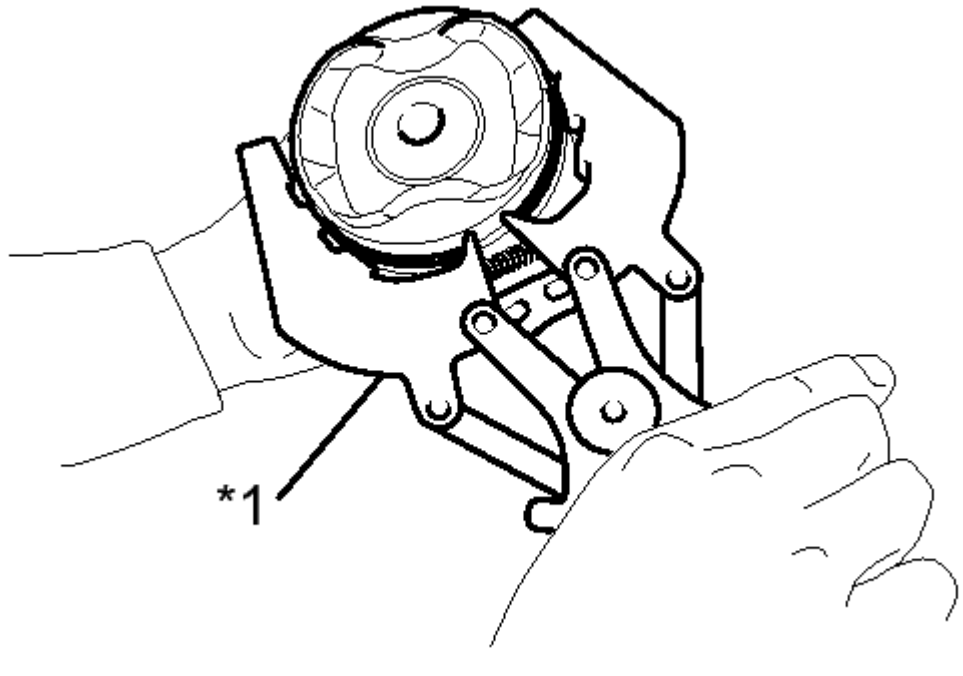


Fig. 358: Removing Piston Compression Springs Using A Piston Ring Expander
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Piston Ring Expander

b. Remove the oil ring and expander by hand.

HINT:

Arrange the removed parts in the correct order.

11. **REMOVE PISTON PIN HOLE SNAP RING**
    a. Insert a small screwdriver into the service hole and pry out the snap ring on the front side.

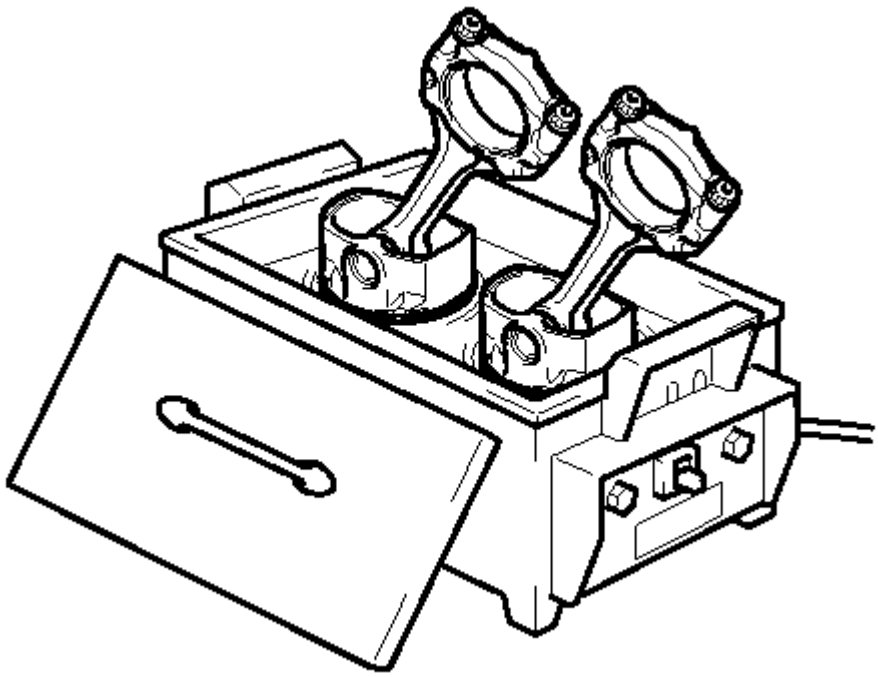


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Fig. 359: Removing Piston Pin Hole Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Do not remove the snap ring on the rear side unless it is necessary. When the snap ring needs to be removed, be careful not to damage the piston.

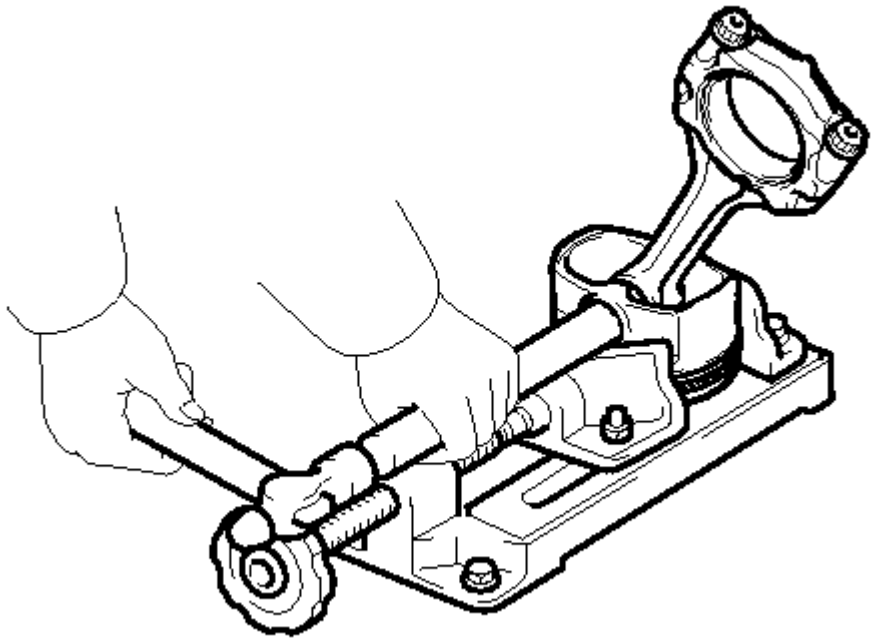
12. **REMOVE PISTON**
    a. Gradually heat the piston up to 80 to 90°C (176 to 194°F).



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Fig. 360: Heating Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Using a plastic-faced hammer and brass bar, lightly tap out the piston pin. Then remove the connecting rod.



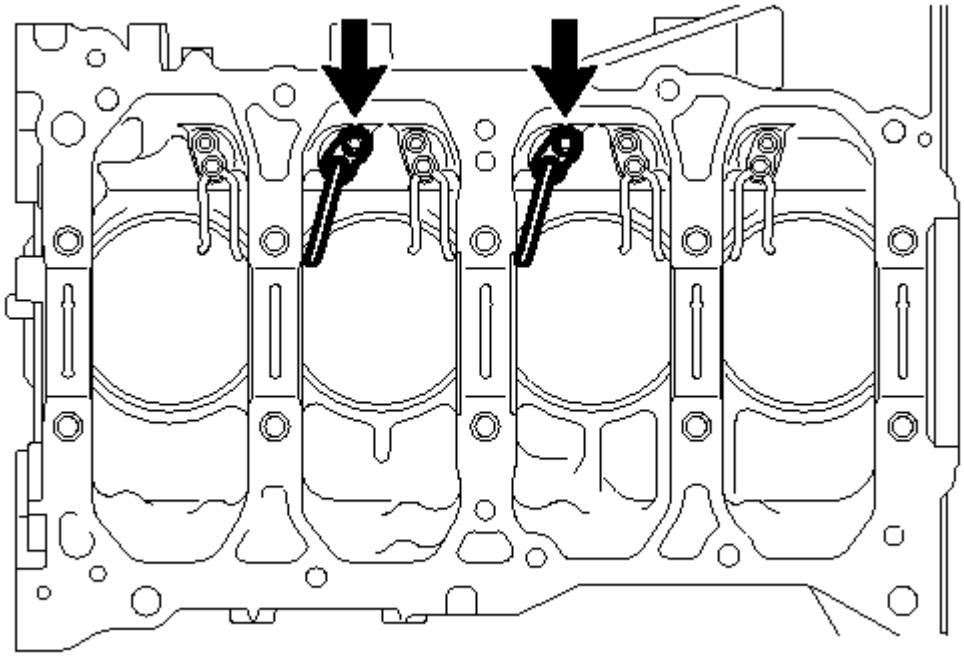
P

Fig. 361: Tapping Out Piston Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

- The piston and pin are a matched set.
- Be sure to arrange the removed pistons, pins, rings, connecting rods and bearings in such a way that the parts can be reinstalled exactly as before.
- Arrange the pistons, pins, rings, connecting rods and bearings in the correct order.

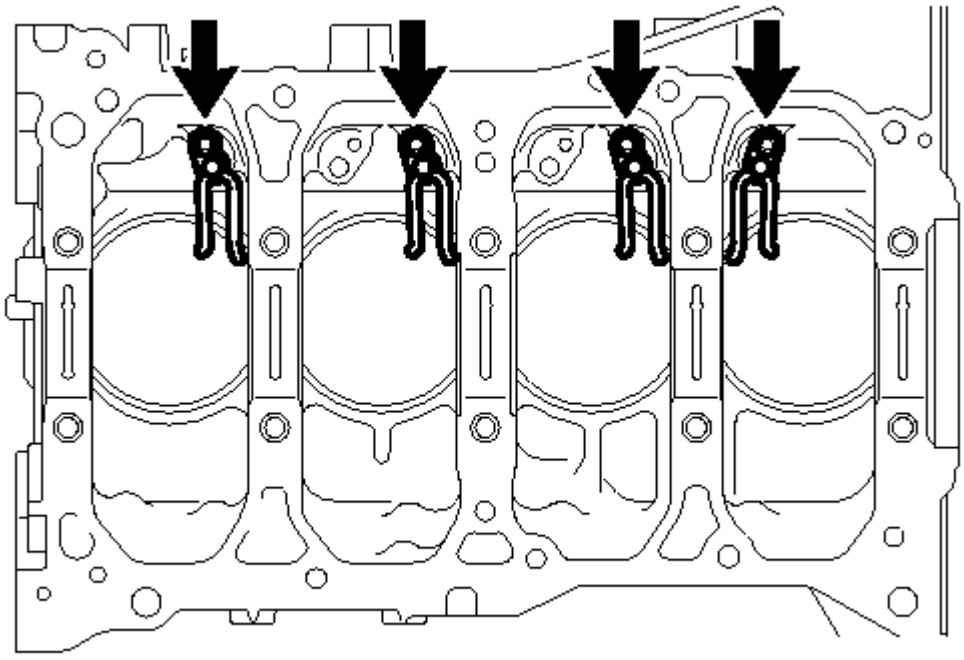
13. **REMOVE NO. 1 OIL NOZZLE SUB-ASSEMBLY**
    a. Using a 5 mm hexagon wrench, remove the 2 bolts and 2 oil nozzles.



P

Fig. 362: Identifying No. 1 Oil Nozzles Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. **REMOVE NO. 2 OIL NOZZLE SUB-ASSEMBLY**
    a. Using a 5 mm hexagon wrench, remove the 4 bolts and 4 oil nozzles.



P

Fig. 363: Identifying No. 2 Oil Nozzles Bolts

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

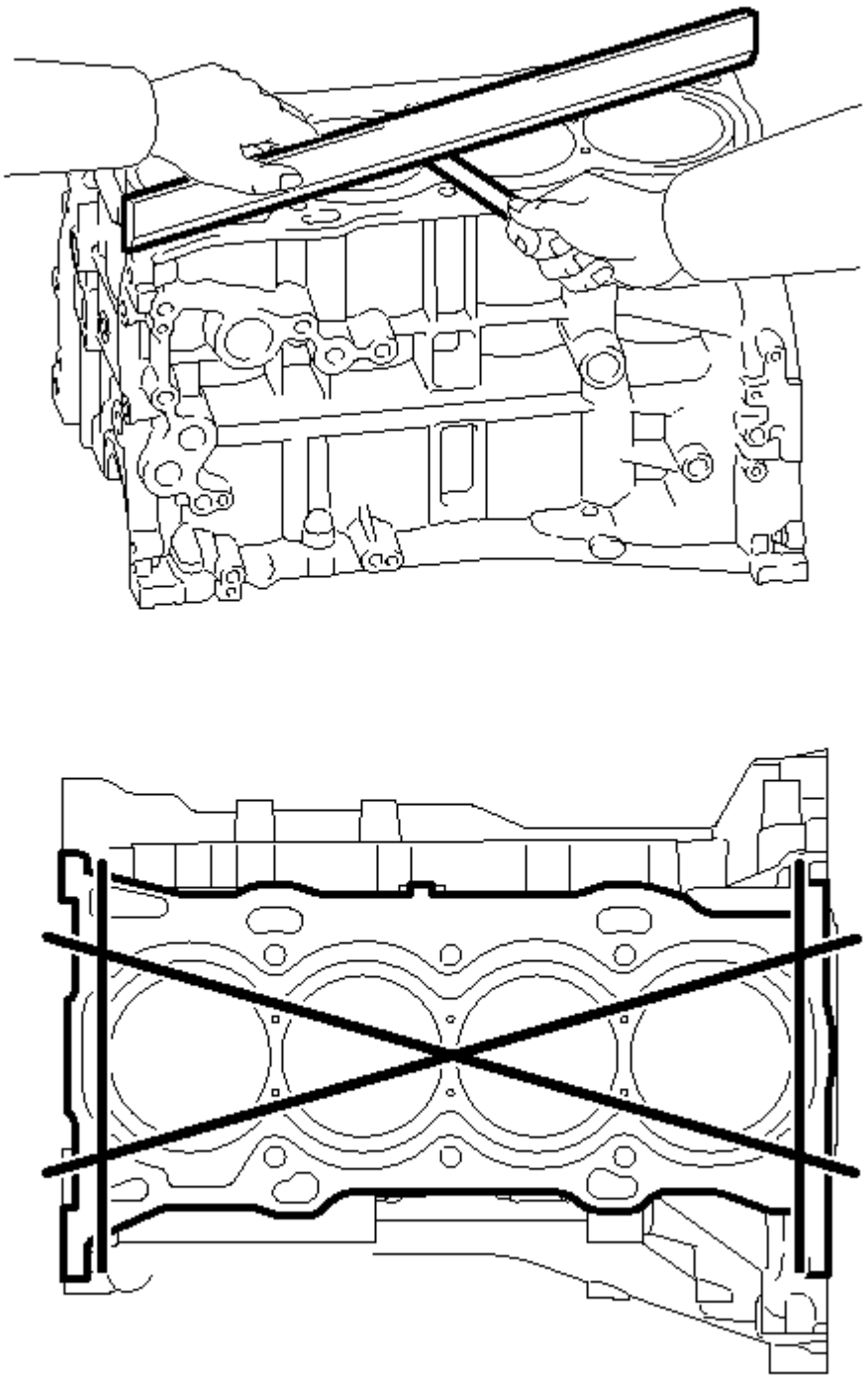
15. **REMOVE STUD BOLT**

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

INSPECTION

INSPECTION

1. **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.



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Fig. 364: Inspecting Cylinder Block For Warpage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

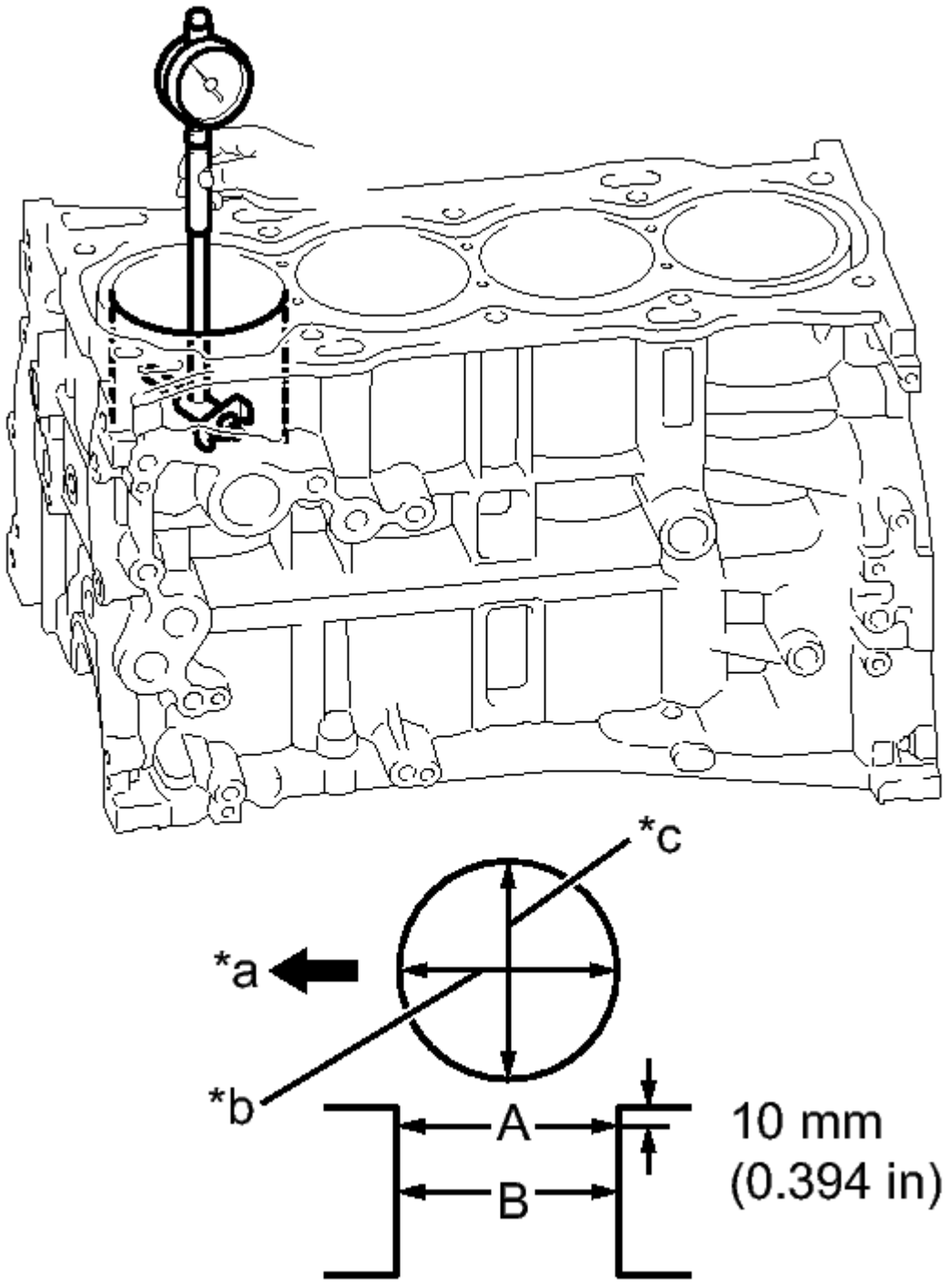
Maximum warpage

0.05 mm (0.00197 in.)

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

2. **INSPECT CYLINDER BORE**

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



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Fig. 365: Inspecting Cylinder Bore Diameter Using A Cylinder Gauge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front

*b	Axial Direction
*c	Thrust Direction

Standard diameter

90.000 to 90.013 mm (3.543 to 3.544 in.)

Maximum diameter

90.13 mm (3.548 in.)

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

3. **INSPECT PISTON**
   a. Using a gasket scraper, remove the carbon from the piston top.



Fig. 366: Removing Carbon From Piston Top
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

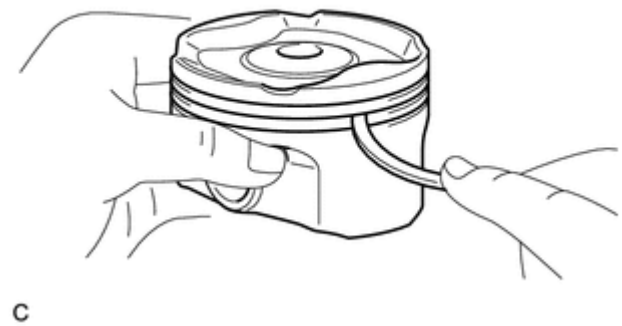


Fig. 367: Cleaning Piston Ring Grooves
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

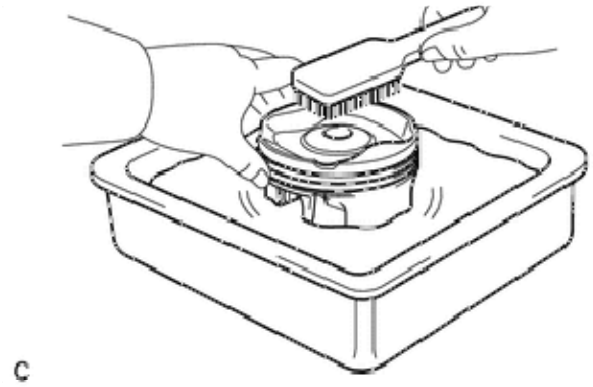


Fig. 368: Cleaning Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Do not use a wire brush.

d. Using a micrometer, measure the piston diameter at a position that is 10.5 mm (0.413 in.) from the bottom of the piston (refer to the illustration below).

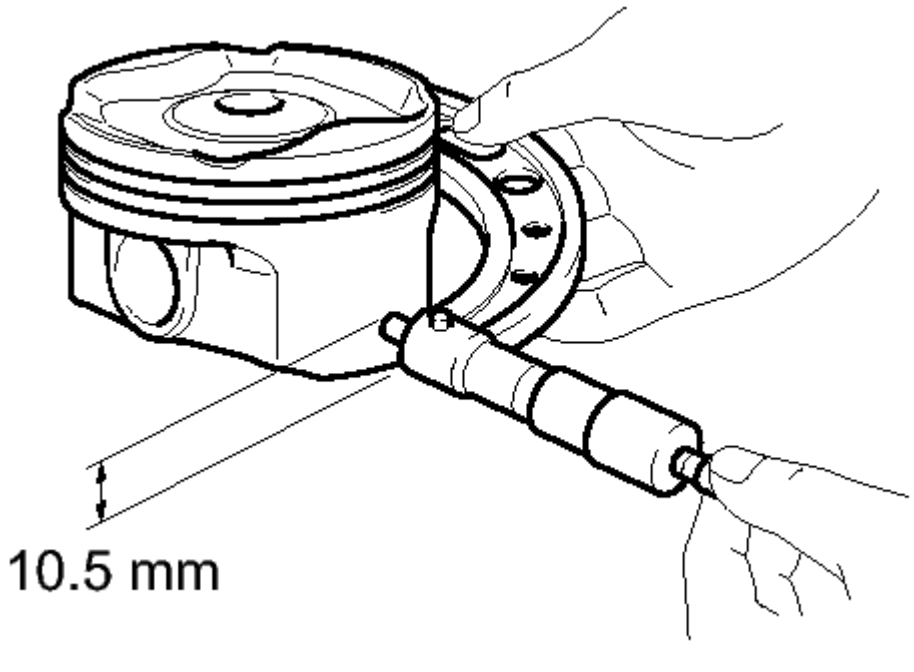


Fig. 369: Measuring Piston Diameter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard piston diameter

89.970 to 89.980 mm (3.5421 to 3.5425 in.)

If the diameter is not as specified, replace the piston.

4. **INSPECT PISTON OIL CLEARANCE**
   a. Measure the cylinder bore diameter in the thrust direction.
   b. Subtract the piston diameter measurement from the cylinder bore diameter measurement.

   Standard oil clearance

   0.020 to 0.043 mm (0.00079 to 0.00169 in.)

   Maximum oil clearance

   0.10 mm (0.00394 in.)

   If the oil clearance is more than the maximum, replace all the pistons. If necessary, replace the cylinder block.

5. **INSPECT RING GROOVE CLEARANCE**
   a. Using a feeler gauge, measure the clearance between the new piston ring and the wall of the ring groove.

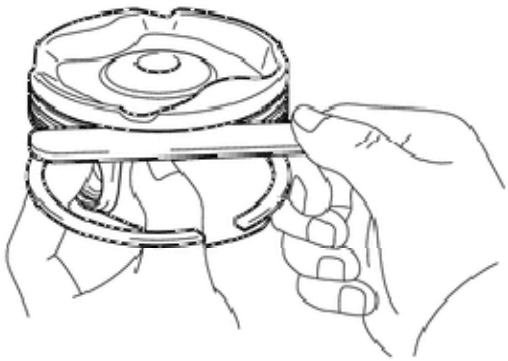


Fig. 370: Measuring Clearance Between Piston Ring And Wall Of Ring Groove
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

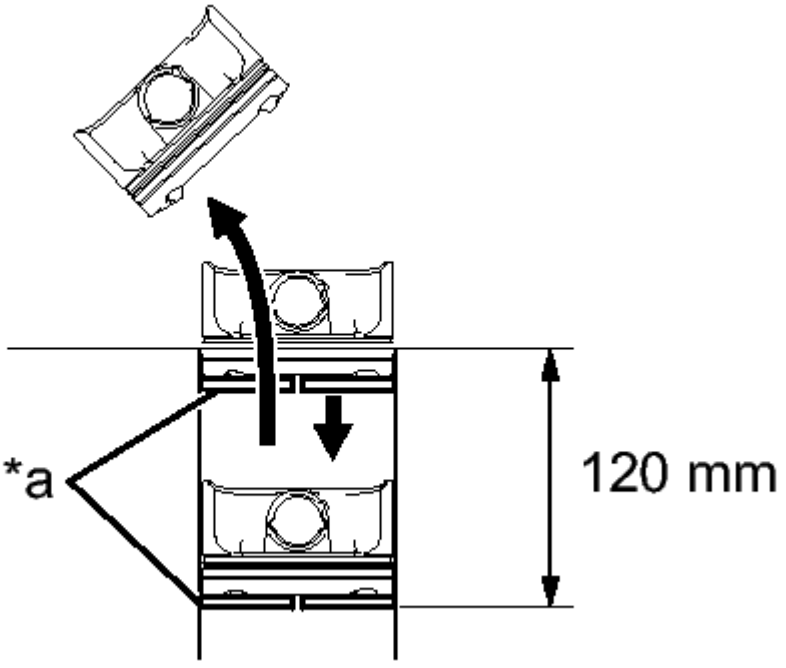
Standard Ring Groove Clearance

Item	Specified Condition
No.	0.020 to 0.070 mm

1 ring	(0.000787 to 0.00276 in.)
No. 2 ring	0.020 to 0.060 mm (0.000787 to 0.00236 in.)
Oil ring	0.020 to 0.070 mm (0.000787 to 0.00276 in.)

If the groove clearance is not as specified, replace the piston with pin.

6. **INSPECT PISTON RING END GAP**
   a. Insert the piston ring into the cylinder bore.
   b. Using a piston, push the piston ring a little beyond the bottom of the ring travel, 120 mm (4.72 in.) from the top of the cylinder block.



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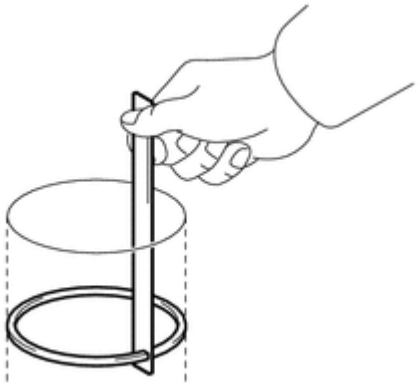
Fig. 371: Pushing Piston Ring Using A Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Piston

Ring

c. Using a feeler gauge, measure the end gap.



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Fig. 372: Measuring End Gap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard End Gap

Item	Specified Condition
No. 1 ring	0.22 to 0.27 mm (0.00866 to 0.0106 in.)
No. 2 ring	0.37 to 0.42 mm (0.0146 to 0.0165 in.)
Oil ring	0.10 to 0.20 mm (0.00394 to 0.00787 in.)

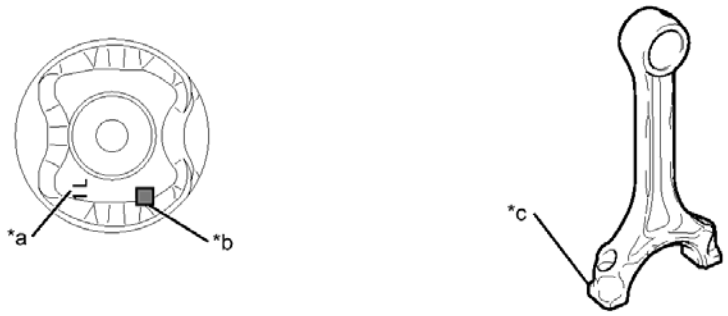
Maximum End Gap

Item	Specified Condition
No. 1 ring	0.87 mm (0.0342 in.)

No. 2 ring	1.02 mm (0.0402 in.)
Oil ring	0.80 mm (0.0315 in.)

If the end gap is more than the maximum, replace the piston ring. If the end gap is more than the maximum, even with a new piston ring, replace the cylinder block.

7. **INSPECT PISTON PIN OIL CLEARANCE**
   a. Check each mark on the piston, piston pin and connecting rod.



c

Fig. 373: Checking Each Mark On Piston, Piston Pin & Connecting Rod
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front Mark	*b	Piston Pin Hole Inside Diameter mark
*c	Connecting Rod Small End Bush Inside Diameter Mark	-	-

HINT:

The front mark is "1L" printed in raised letters.

   b. Using a caliper gauge, measure the inside diameter of the piston pin hole.

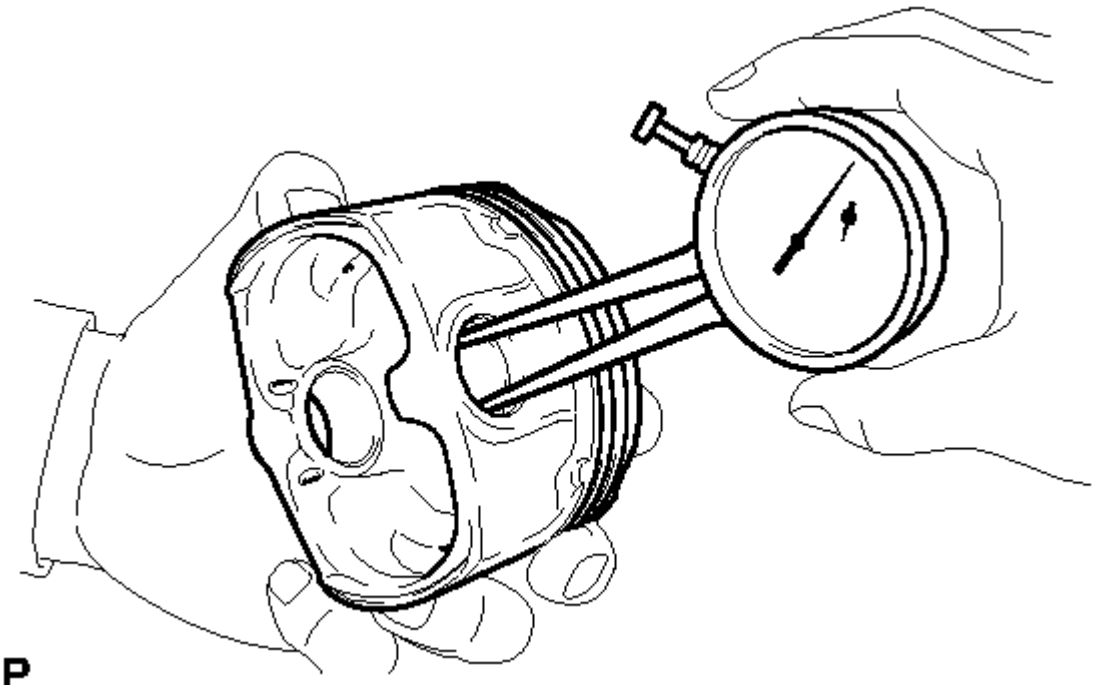
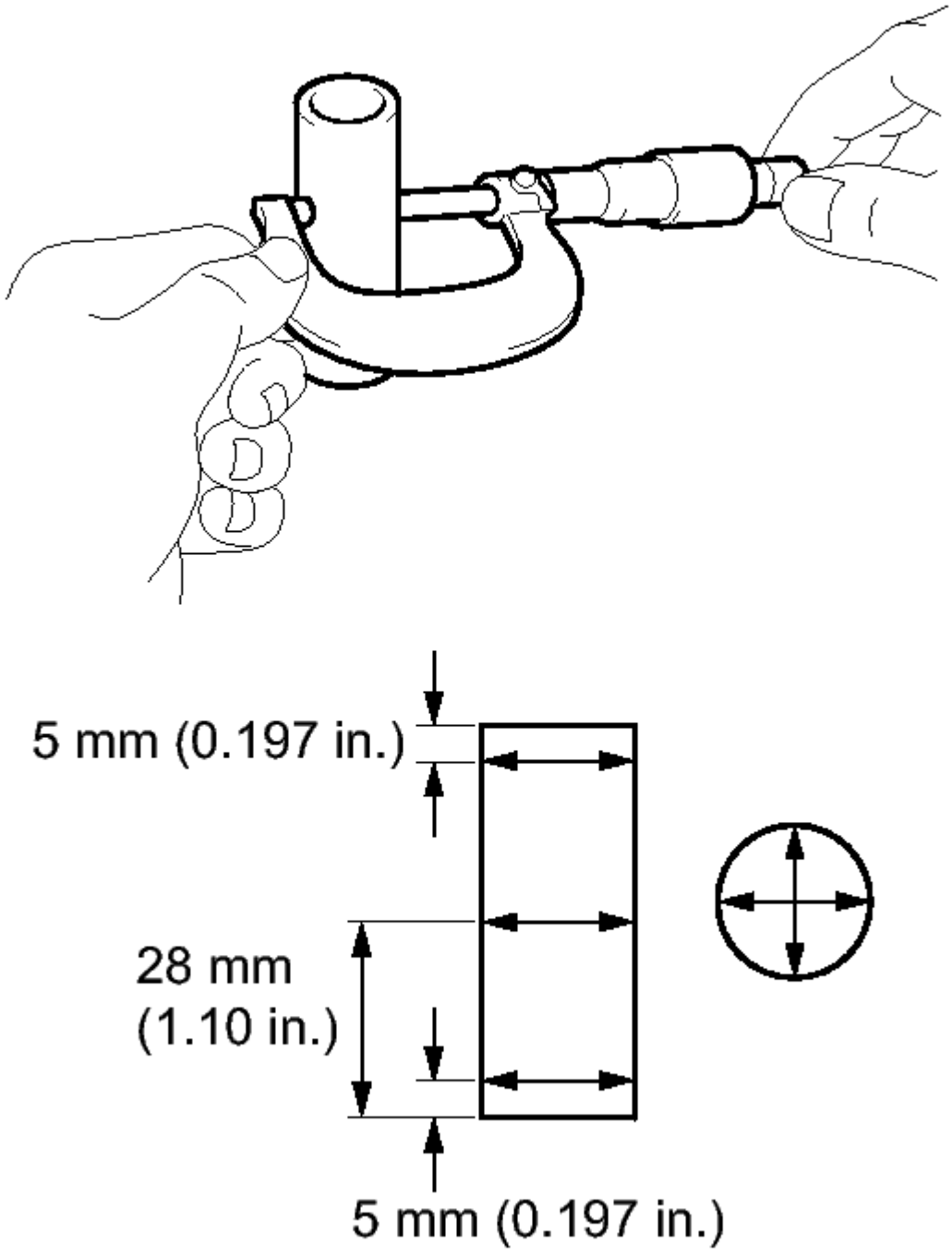


Fig. 374: Measuring Inside Diameter Of Piston Pin Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard Piston Pin Hole Inside Diameter

Item	Specified Condition
Mark A	22.001 to 22.004 mm (0.86618 to 0.86630 in.)
Mark B	22.005 to 22.007 mm (0.86634 to 0.86642 in.)
Mark C	22.008 to 22.010 mm (0.86645 to 0.86653 in.)

c. Using a micrometer, measure the piston pin diameter.



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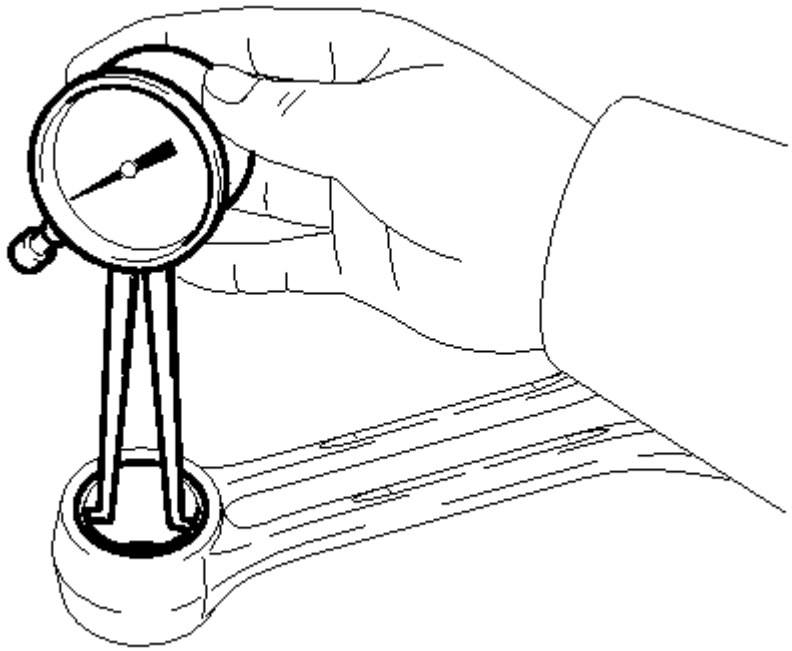
Fig. 375: Measuring Piston Pin Diameter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard Piston Pin Diameter

Item	Specified Condition
Mark A	21.997 to 22.000 mm (0.86602 to 0.86614 in.)
Mark B	22.001 to 22.003 mm (0.86617 to 0.86626 in.)
Mark C	22.004 to 22.006 mm (0.86630 to 0.86638 in.)

If the diameter is not as specified, replace the piston pin.

d. Using a caliper gauge, measure the connecting rod small end bush inside diameter.



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Fig. 376: Measuring Connecting Rod Small End Bush Inside Diameter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard Connecting Rod Small End Bush Inside Diameter

Item	Specified Condition
Mark A	22.005 to 22.008 mm (0.86634 to 0.86645 in.)
Mark B	22.009 to 22.011 mm (0.86649 to 0.86657 in.)
Mark C	22.012 to 22.014 mm (0.86661 to 0.86669 in.)

If the diameter is not as specified, replace the connecting rod.

e. Subtract the piston pin diameter measurement from the piston pin hole inside diameter measurement.

Standard oil clearance

0.001 to 0.007 mm (0.0000394 to 0.000276 in.)

Maximum oil clearance

0.013 mm (0.000512 in.)

If the oil clearance is more than the maximum, replace the piston and piston pin as a set.

f. Subtract the piston pin diameter measurement from the connecting rod small end bush inside diameter measurement.

Standard oil clearance

0.005 to 0.011 mm (0.000197 to 0.000433 in.)

Maximum oil clearance

0.017 mm (0.000669 in.)

If the oil clearance is more than the maximum, replace the connecting rod. If necessary, replace the connecting rod and piston pin as a set.

8. **INSPECT CONNECTING ROD SUB-ASSEMBLY**
   a. Using a connecting rod aligner and feeler gauge, check the connecting rod alignment.

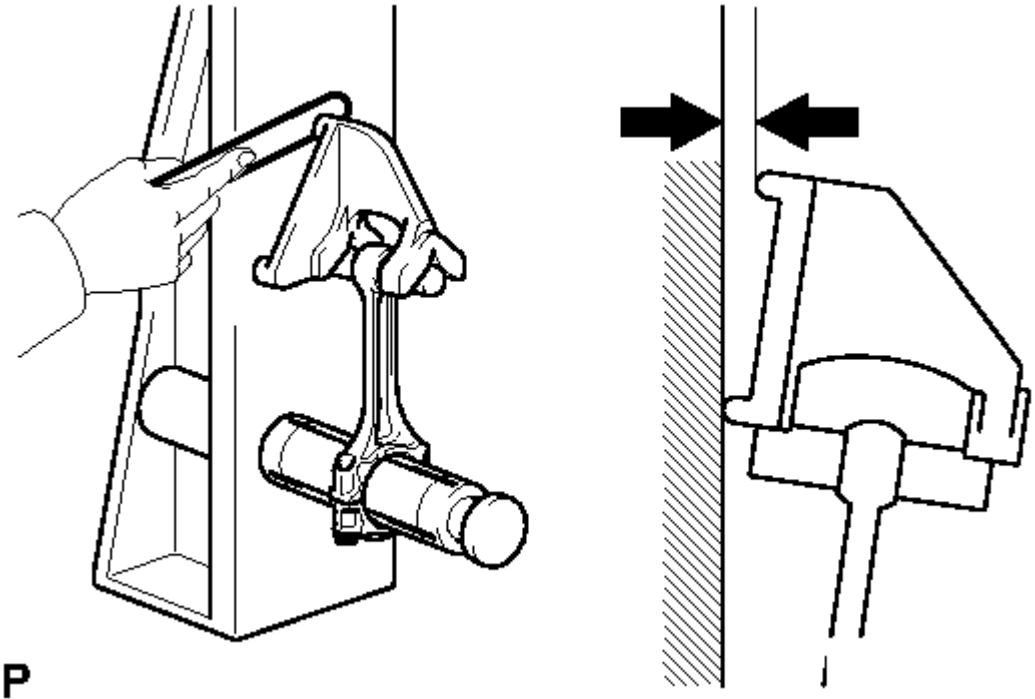


Fig. 377: Checking Connecting Rod Alignment
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

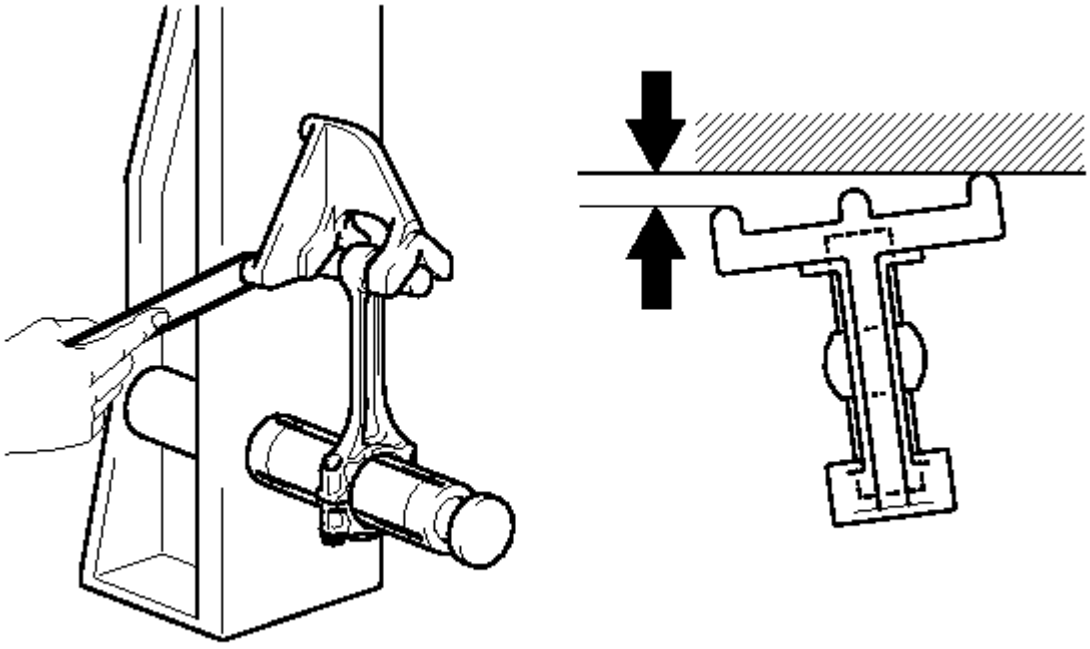
1. Check for bend.

   Maximum bend

   0.05 mm (0.00197 in.) per 100 mm (3.94 in.)

   If the bend is more than the maximum, replace the connecting rod.

2. Check for twist.



P

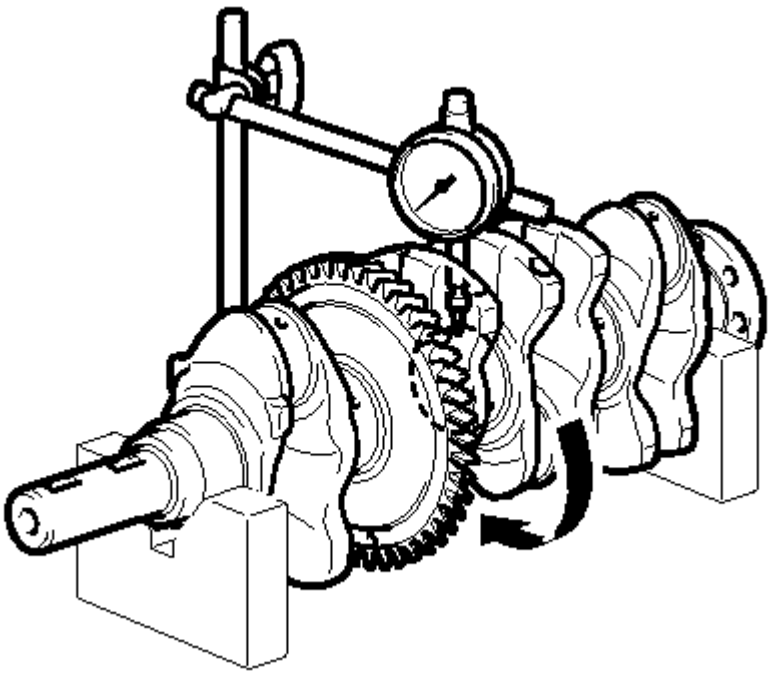
Fig. 378: Checking Connecting Rod Alignment
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum twist

0.15 mm (0.00591 in.) per 100 mm (3.94 in.)

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

9. **INSPECT CRANKSHAFT**
    a. Inspect for circle runout.



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Fig. 379: Measuring Circle Runout
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

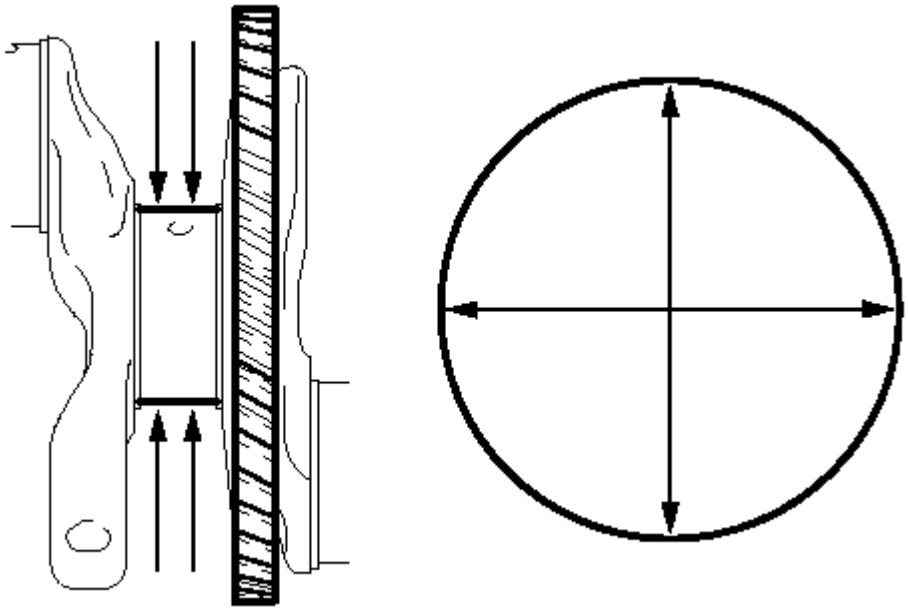
1. Using a dial indicator and V-blocks, measure the circle runout as shown in the illustration.

   Maximum circle runout

   0.003 mm (0.000118 in.)

   If the circle runout is more than the maximum, replace the crankshaft.

b. Inspect the main journals.



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Fig. 380: Checking Crankshaft Main Journal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

   Standard main journal diameter

   54.988 to 55.000 mm (2.1649 to 2.1654 in.)

   If the diameter is not as specified, check the crankshaft oil clearance. If necessary, replace the crankshaft.

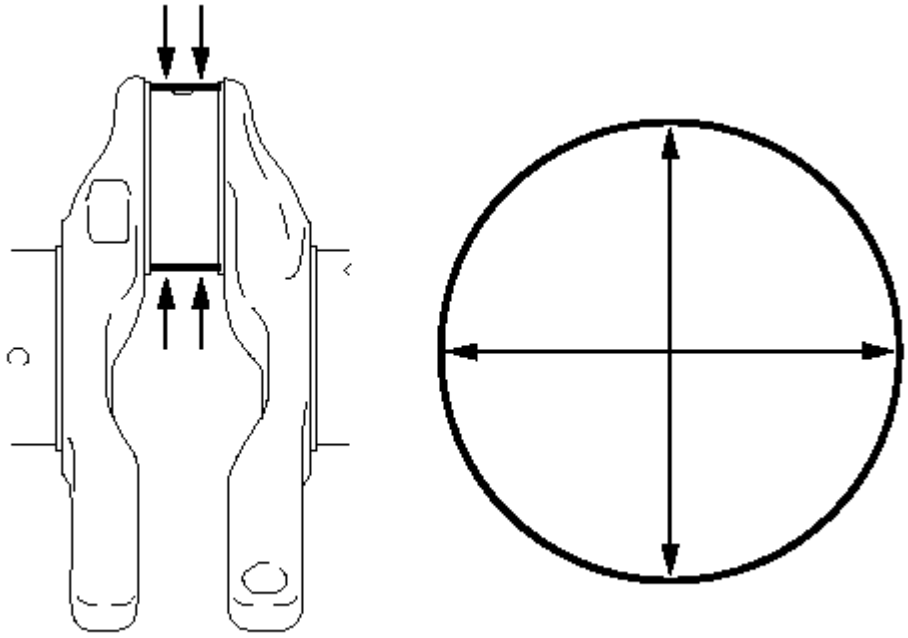
2. Check each main journal for taper and out-of-round as shown in the illustration.

   Maximum taper and out-of-round

   0.003 mm (0.000118 in.)

   If the taper and out-of-round are more than the maximum, replace the crankshaft.

c. Inspect the crank pin.



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Fig. 381: Measuring Diameter Of Crank Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Using a micrometer, measure the diameter of each crank pin.

   Standard crank pin diameter

   51.492 to 51.500 mm (2.027 to 2.028 in.)

   If the diameter is not as specified, check the connecting rod oil clearance. If necessary, replace the crankshaft.

2. Inspect each crank pin for taper and out-of-round as shown in the illustration.

   Maximum taper and out-of-round

   0.003 mm (0.000118 in.)

   If the taper and out-of-round are more than the maximum, replace the crankshaft.

10. **INSPECT CRANKSHAFT OIL CLEARANCE**
    a. Install the crankshaft bearings. See step 7.
    b. Install the crankshaft thrust washers. See step 8.
    c. Clean each main journal and bearing.

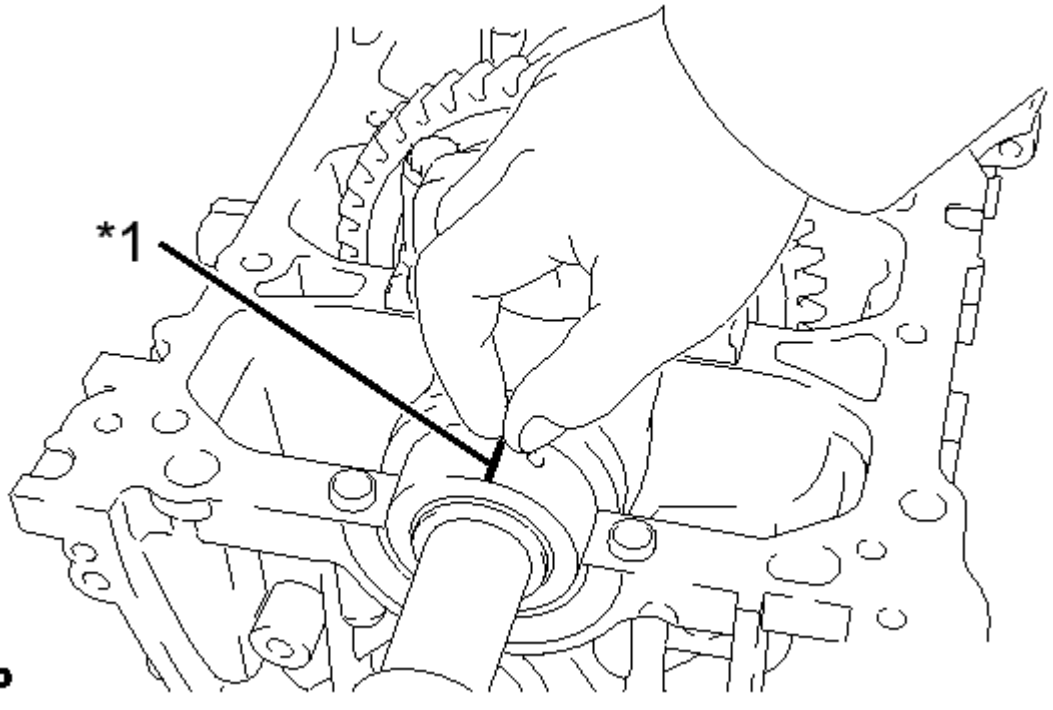


Fig. 382: Applying Plastigage Strip Across Journal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

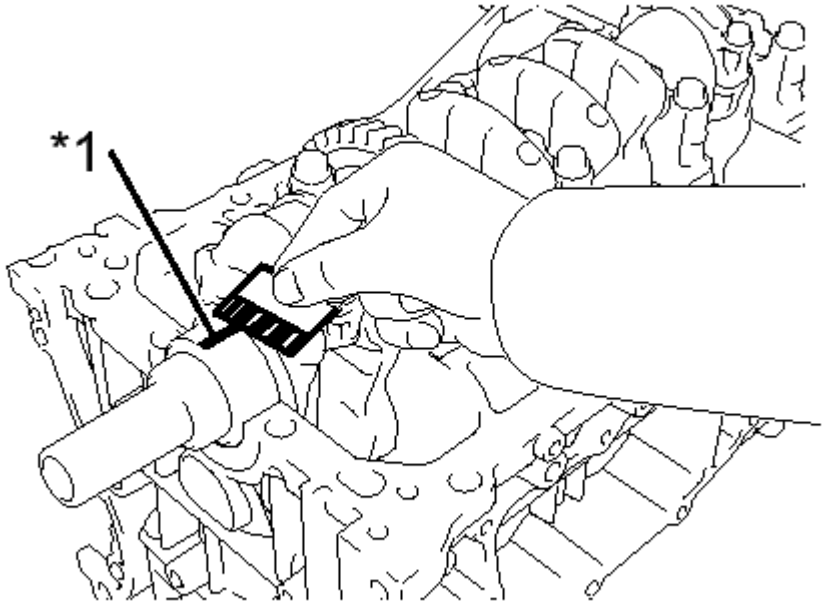
TEXT IN ILLUSTRATION

*1	Plastigage

d. Place the crankshaft onto the cylinder block.
e. Lay a strip of Plastigage across each journal.
f. Install the crankshaft bearing caps. See step 9.

NOTE: Do not turn the crankshaft.

g. Remove the crankshaft bearing caps. See step 6.
h. Measure the Plastigage at its widest point.



P

Fig. 383: Measuring Widest Point Of Plastigage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Plastigage

Standard oil clearance

0.016 to 0.039 mm (0.000630 to 0.00154 in.)

Maximum oil clearance

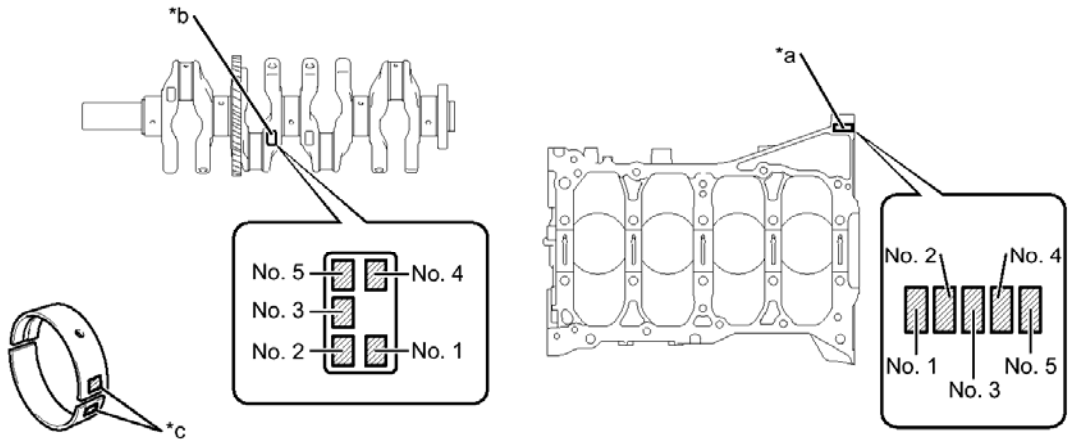
0.05 mm (0.00197 in.)

NOTE: Remove the Plastigage completely after the measurement.

If the oil clearance is more than the maximum, replace the crankshaft bearing. If necessary, replace the crankshaft.

HINT:

If replacing a bearing, select a new one with the same number. If the number of the bearing cannot be determined, calculate the correct bearing number by adding together the numbers imprinted on the cylinder block and crankshaft. Then select a new bearing with the calculated number. There are 4 sizes of standard bearings, marked "1", "2", "3" and "4" accordingly.



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Fig. 384: Identifying Cylinder Block/Crankshaft Number Marks & Diameter Marks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Cylinder Block Number Mark (A)	*b	Crankshaft Number Mark (B)
*c	Diameter Mark	-	-

EXAMPLE

Cylinder block (A) "3" + Crankshaft (B) "4" = Total "7"

Select the bearing marked "3".

Bearing Chart

(A) + (B)	Use Bearing
0 to 2	1
3 to 5	2

6 to 8	3
9 to 11	4

Standard Cylinder Block Journal Inside Diameter (A)

Item	Specified Condition
Mark 0	59.000 to 59.002 mm (2.32283 to 2.32291 in.)
Mark 1	59.003 to 59.004 mm (2.32295 to 2.32299 in.)
Mark 2	59.005 to 59.006 mm (2.32303 to 2.32307 in.)
Mark 3	59.007 to 59.009 mm (2.32311 to 2.32318 in.)
Mark 4	59.010 to 59.011 mm (2.32322 to 2.32326 in.)
Mark 5	59.012 to 59.013 mm (2.32330 to 2.32334

	in.)
Mark 6	59.014 to 59.016 mm (2.32338 to 2.32346 in.)

Standard Crankshaft Main Journal Diameter (B)

Item	Specified Condition
Mark 0	54.999 to 55.000 mm (2.16531 to 2.16535 in.)
Mark 1	54.997 to 54.998 mm (2.16523 to 2.16527 in.)
Mark 2	54.995 to 54.996 mm (2.16515 to 2.16519 in.)
Mark 3	54.993 to 54.994 mm (2.16507 to 2.16511 in.)
Mark 4	54.991 to 54.992 mm (2.16500 to 2.16504 in.)
Mark 5	54.988 to 54.990 mm (2.16488

	to 2.16496 in.)

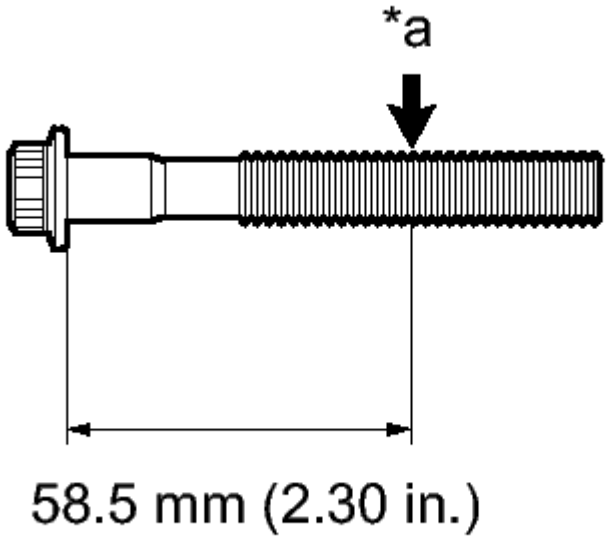
Standard Bearing Center Wall Thickness

Item	Specified Condition
Mark 1	1.991 to 1.994 mm (0.07839 to 0.07850 in.)
Mark 2	1.995 to 1.997 mm (0.07854 to 0.07862 in.)
Mark 3	1.998 to 2.000 mm (0.07866 to 0.07874 in.)
Mark 4	2.001 to 2.003 mm (0.07878 to 0.07886 in.)

i. Perform the inspection above for each journal.

11. **INSPECT CRANKSHAFT BEARING CAP BOLT**

a. Using a vernier caliper, measure the diameter of the threads at the measurement point shown in the illustration.



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Fig. 385: Inspecting Crankshaft Bearing Cap Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Measurement Point

Standard diameter

9.77 to 9.96 mm (0.385 to 0.392 in.)

Minimum diameter

9.1 mm (0.358 in.)

HINT:

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

12. **INSPECT CONNECTING ROD BOLT**
    a. Using a vernier caliper, measure the diameter of the bolt in the area show in the illustration.

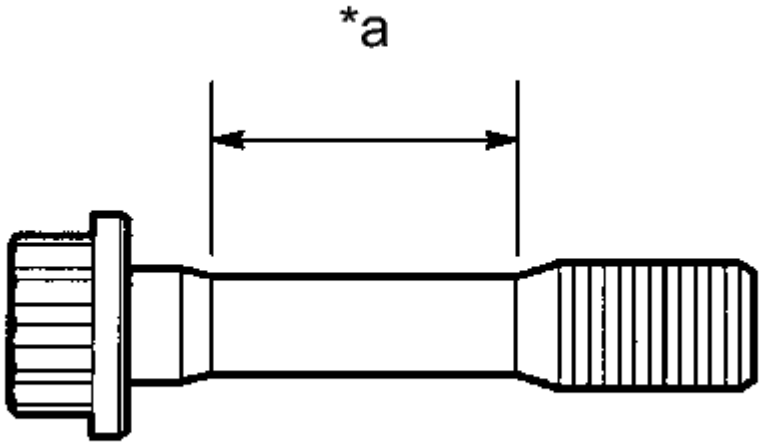


Fig. 386: Inspecting Connecting Rod Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Measurement Area

Standard diameter

8.5 to 8.6 mm (0.335 to 0.339 in.)

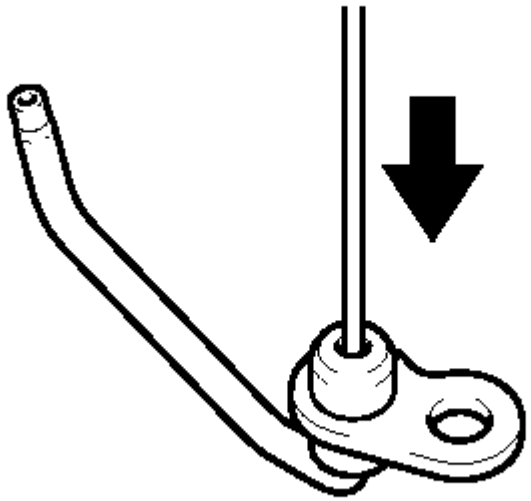
Minimum diameter

8.3 mm (0.327 in.)

HINT:

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

13. **INSPECT NO. 1 OIL NOZZLE SUB-ASSEMBLY**
    a. Push the check valve with a pin to check if it is stuck.



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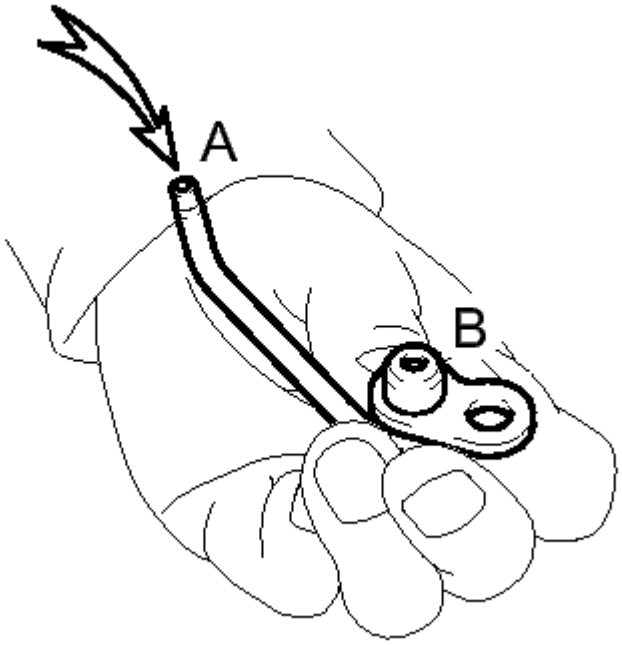
Fig. 387: Pushing Check Valve With Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If stuck, replace the No. 1 oil nozzle.

b. Push the check valve with a pin to check if it moves smoothly.

If it does not move smoothly, clean or replace the No. 1 oil nozzle.

c. Apply air into A. Check that air does not leak through B.

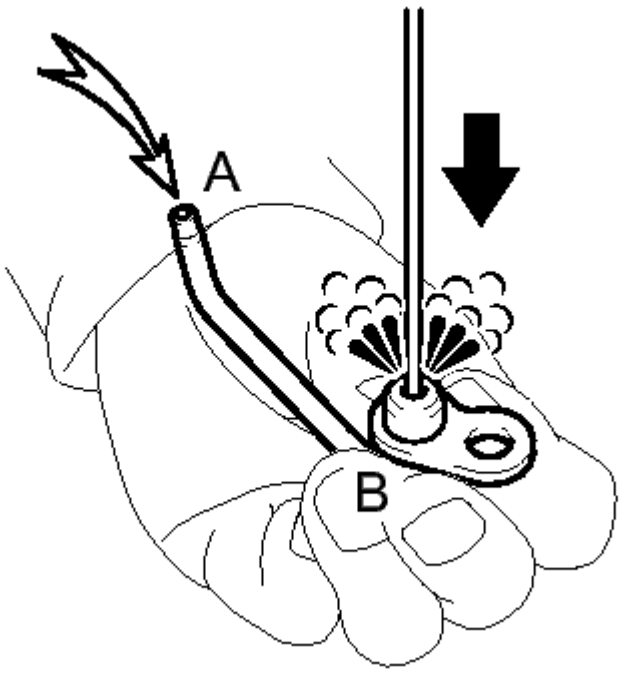


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Fig. 388: Checking The Check Valve For Air Leak
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If air leaks, clean or replace the No. 1 oil nozzle.

d. Push the check valve while applying air into A. Check that air passes through B.

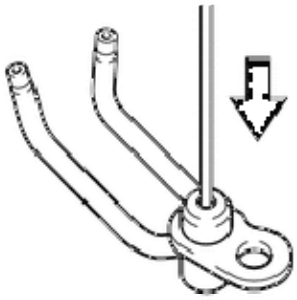


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Fig. 389: Pushing Check Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If air does not pass through B, clean or replace the No. 1 oil nozzle.

14. **INSPECT NO. 2 OIL NOZZLE SUB-ASSEMBLY**
    a. Push the check valve with a pin to check if it is stuck.



P

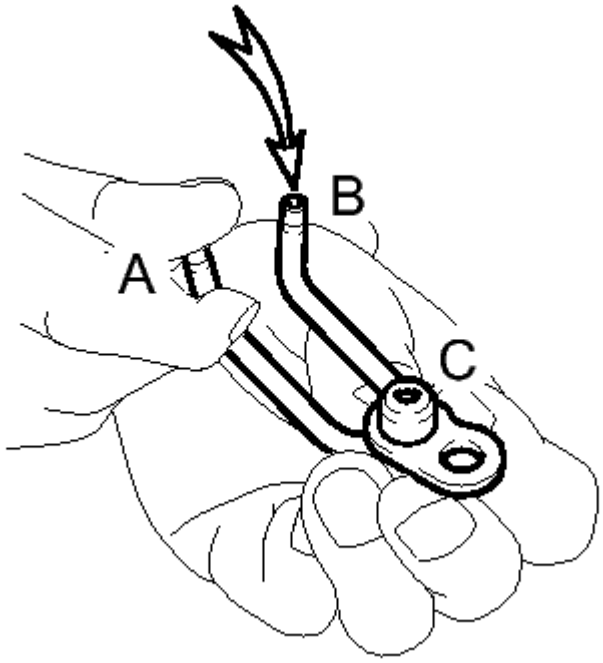
Fig. 390: Pushing Check Valve With Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If stuck, replace the No. 2 oil nozzle.

    b. Push the check valve with a pin to check if it moves smoothly.

If it does not move smoothly, clean or replace the No. 2 oil nozzle.

    c. While covering A, apply air into B. Check that air does not leak through C. Perform the check again while covering B and applying air into A.

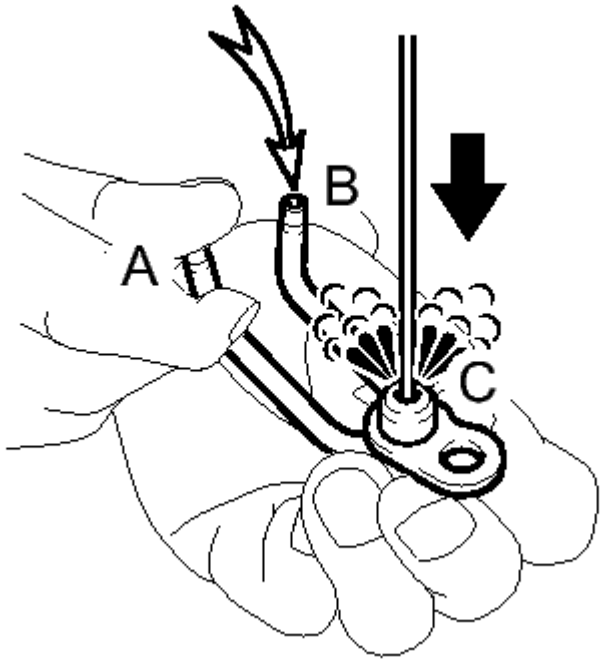


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Fig. 391: Checking For Air Leak In Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If air leaks, clean or replace the No. 2 oil nozzle.

d. Push the check valve while covering A, and apply air into B. Check that air passes through C. Perform the check again while covering B, pushing the check valve and applying air into A.



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Fig. 392: Identifying Ring Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If air does not pass through C, clean or replace the No. 2 oil nozzle.

REPLACEMENT

REPLACEMENT

1. **REPLACE RING PIN**

NOTE: It is not necessary to remove the ring pin unless it is being replaced.

a. Remove the 12 ring pins.
b. Using a plastic-faced hammer, install 12 new ring pins.

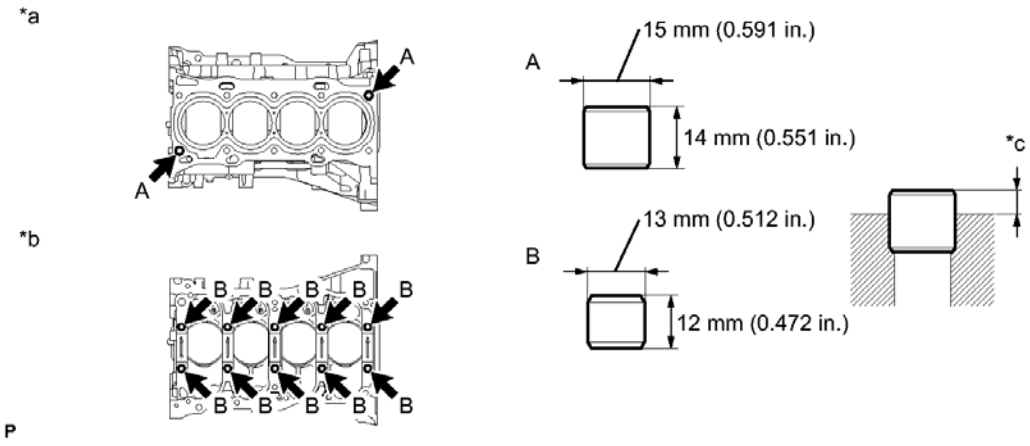


Fig. 393: Identifying Ring Pins & Standard Protrusion Height
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

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

Standard Protrusion Height

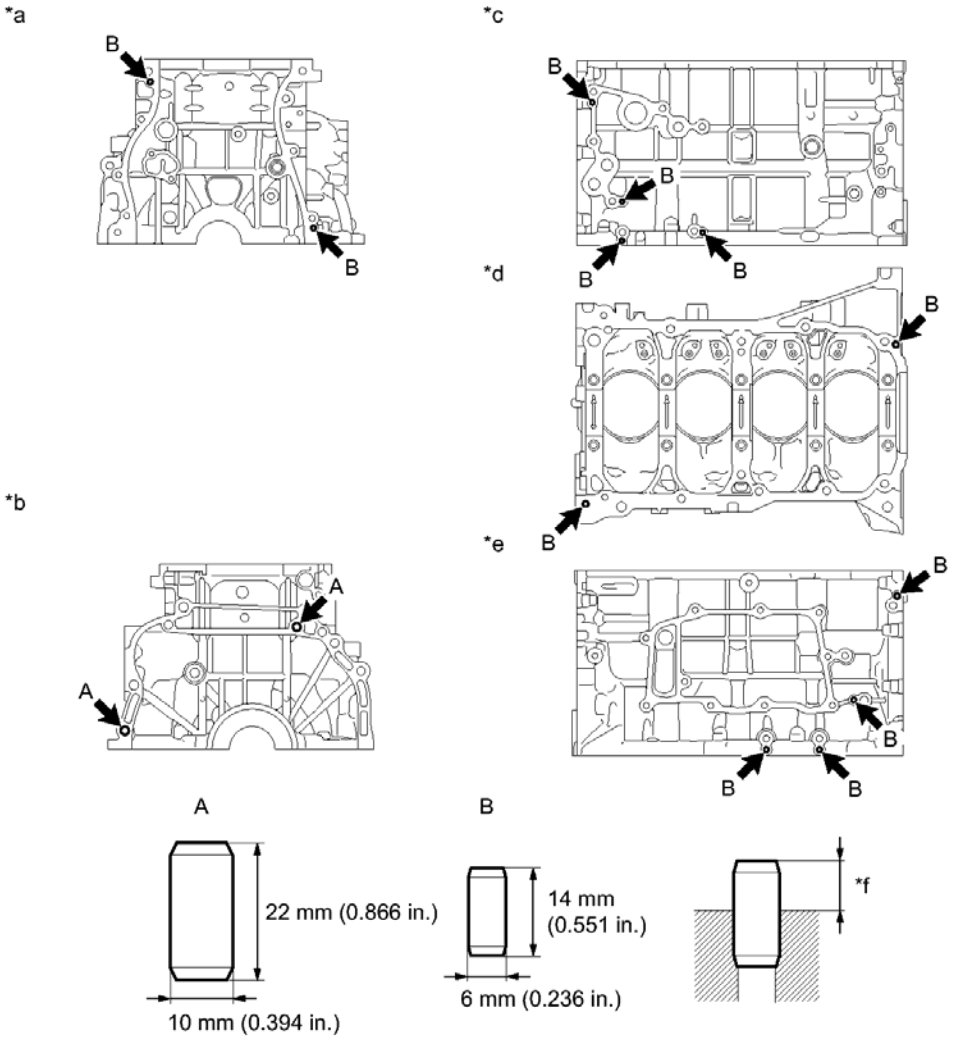
Item	Specified Condition
A	5.0 to 7.0 mm (0.197 to 0.276 in.)

B	4.0 to 7.0 mm (0.157 to 0.276 in.)

2. **REPLACE STRAIGHT PIN**

NOTE: It is not necessary to remove the straight pin unless it is being replaced.

a. Remove the 14 straight pins.
b. Using a plastic-faced hammer, install 14 new straight pins.



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Fig. 394: Identifying Straight Pins & Standard Protrusion Height
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

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

Standard Protrusion Height

Item	Specified Condition
A	11.0 to 13.0 mm (0.433 to 0.512 in.)
B	5.0 to 7.0 mm (0.197 to 0.276 in.)

REASSEMBLY

REASSEMBLY

1. **INSTALL STUD BOLT**

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

a. Using E8 and E10 "TORX" socket wrenches, install the stud bolts.

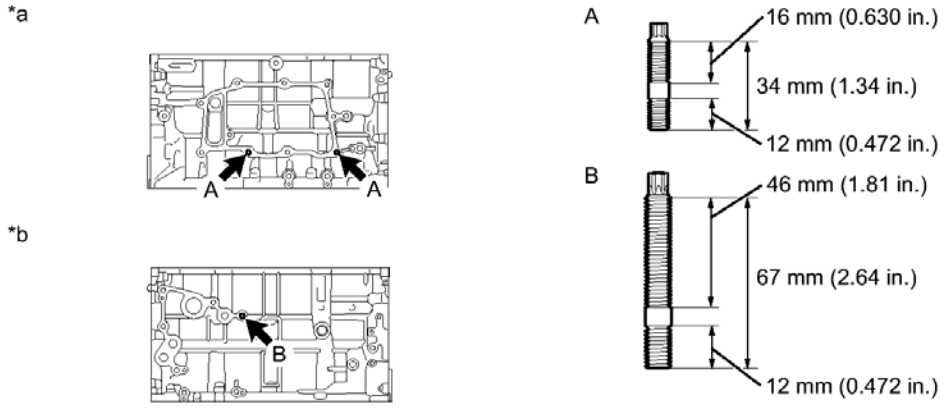


Fig. 395: Identifying Stud Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	RH Side	*b	LH Side

for stud bolt A

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

for stud bolt B

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

2. **INSTALL NO. 2 OIL NOZZLE SUB-ASSEMBLY**
   a. Using a 5 mm hexagon wrench, install the 4 oil nozzles with the 4 bolts.

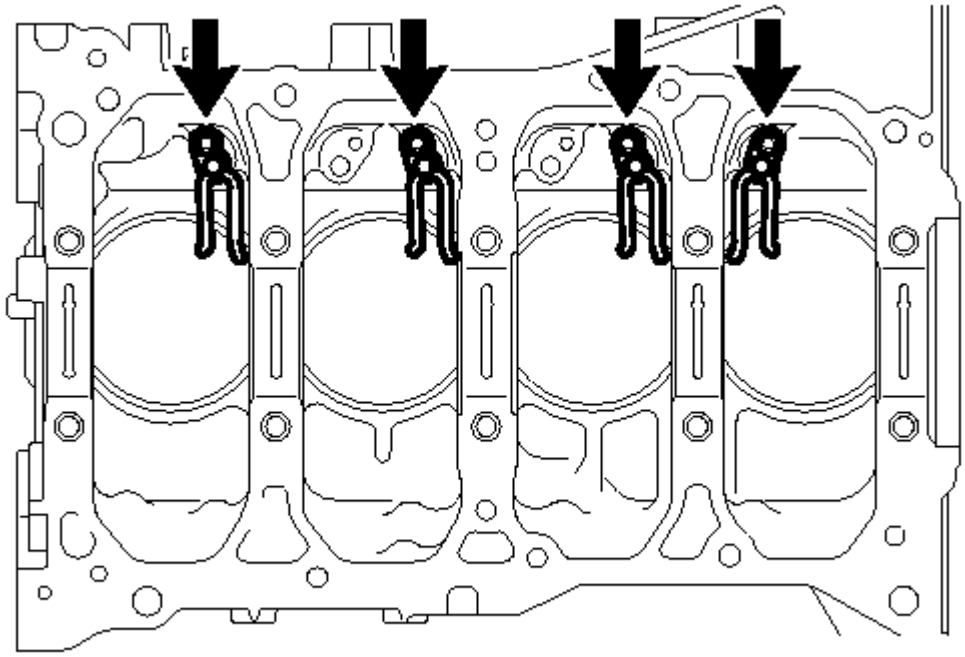


Fig. 396: Identifying No. 2 Oil Nozzles Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

3. **INSTALL NO. 1 OIL NOZZLE SUB-ASSEMBLY**
   a. Using a 5 mm hexagon wrench, install the 2 oil nozzles with the 2 bolts.

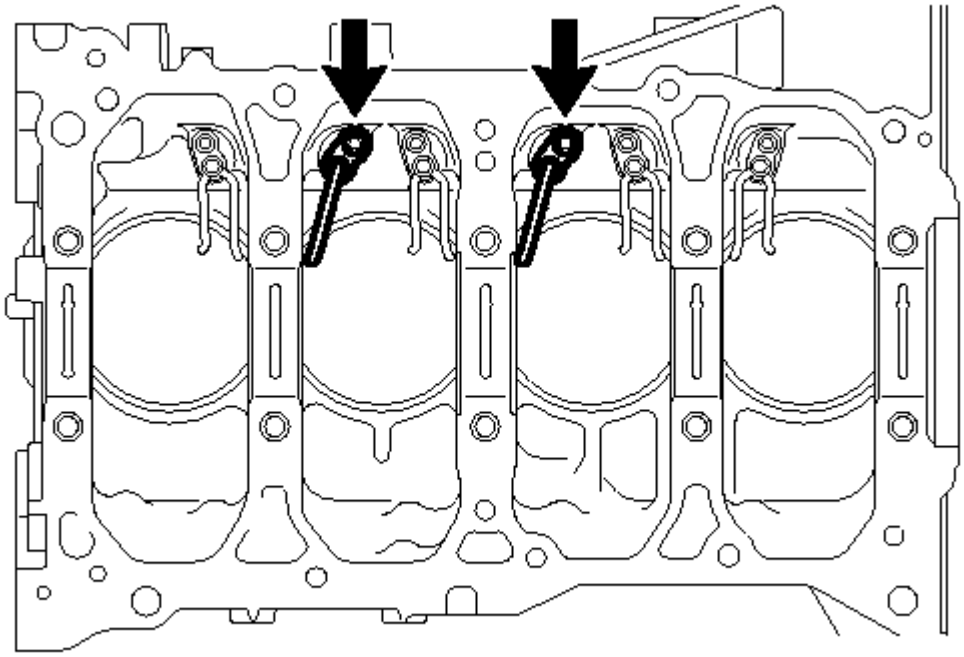


Fig. 397: Identifying No. 1 Oil Nozzles Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

4. **INSTALL PISTON**
   a. Using a small screwdriver, install a new snap ring at one end of the piston pin hole.
   b. Gradually heat the piston up to 80 to 90°C (176 to 194°F).
   c. Coat the piston, piston pin and connecting rod with engine oil.
   d. Align the front marks of the piston and connecting rod, insert the connecting rod into the piston, and then push in the piston pin with your thumb until the pin comes into contact with the snap ring.

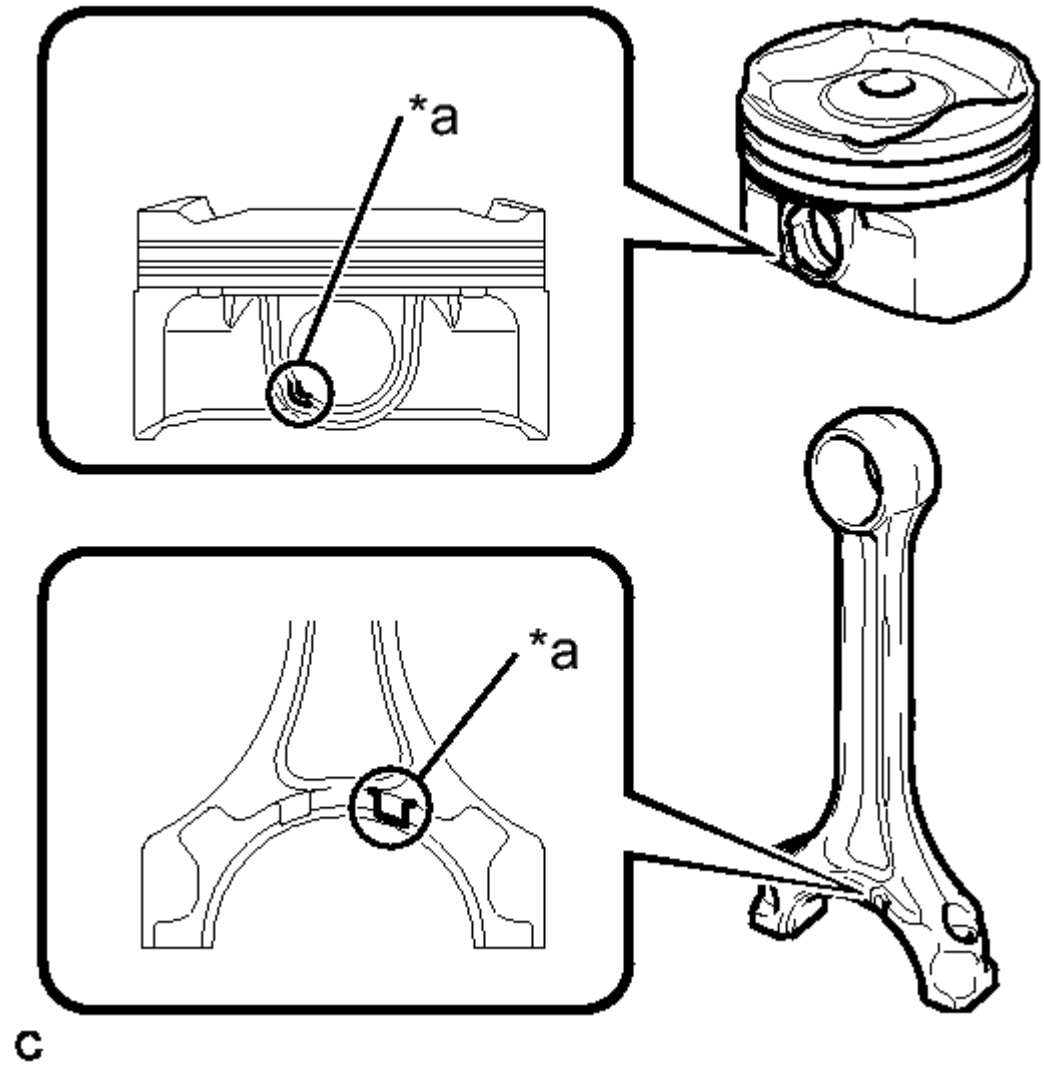


Fig. 398: Identifying Piston & Connecting Rod Front Marks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

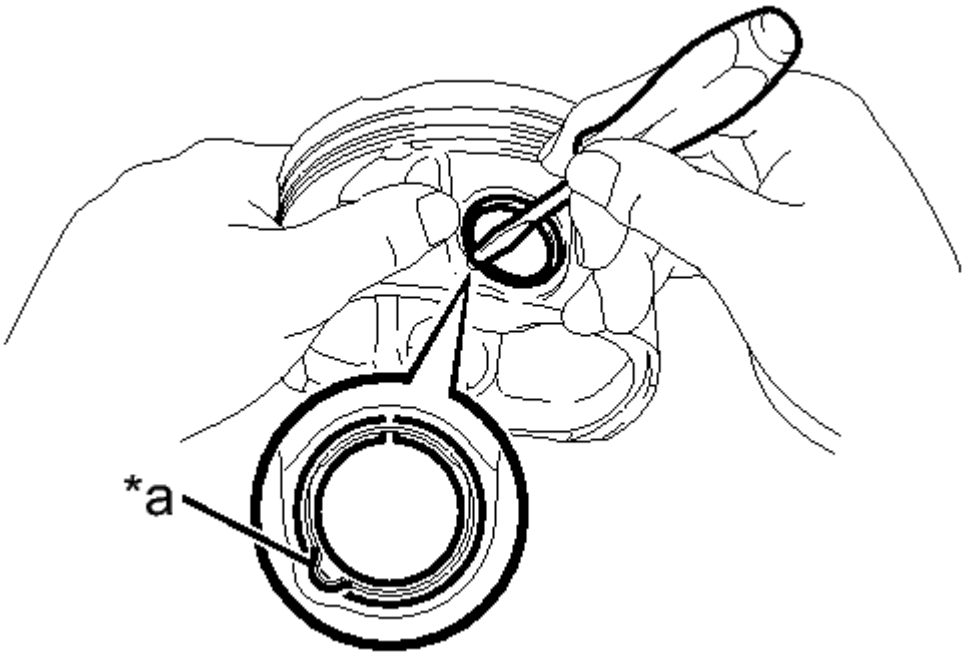
TEXT IN ILLUSTRATION

*a	Front Mark

HINT:

The piston and pin are a matched set.

e. Using a small screwdriver, install a new snap ring on the other side of the piston pin hole.



P

Fig. 399: Installing Snap Ring Using A Small Screwdriver
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Service Hole

HINT:

Be sure that the end gap of the snap ring is not aligned with the service hole cutout portion of the piston.

f. Check the fitting condition between the piston and piston pin.

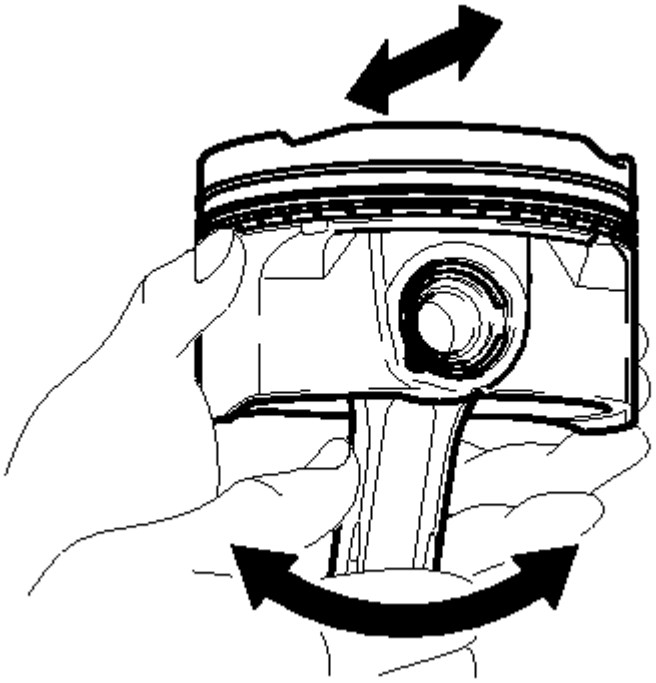


Fig. 400: Checking Fitting Condition Between Piston And Piston Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Move the connecting rod back and forth on the piston pin. Check the fitting condition.

   If abnormal movement is felt, replace the piston and pin as a set.

2. Rotate the piston back and forth on the piston pin. Check the fitting condition.

   If abnormal movement is felt, replace the piston and pin as a set.

5. **INSTALL PISTON RING SET**
   a. Install the oil ring expander and oil ring by hand.

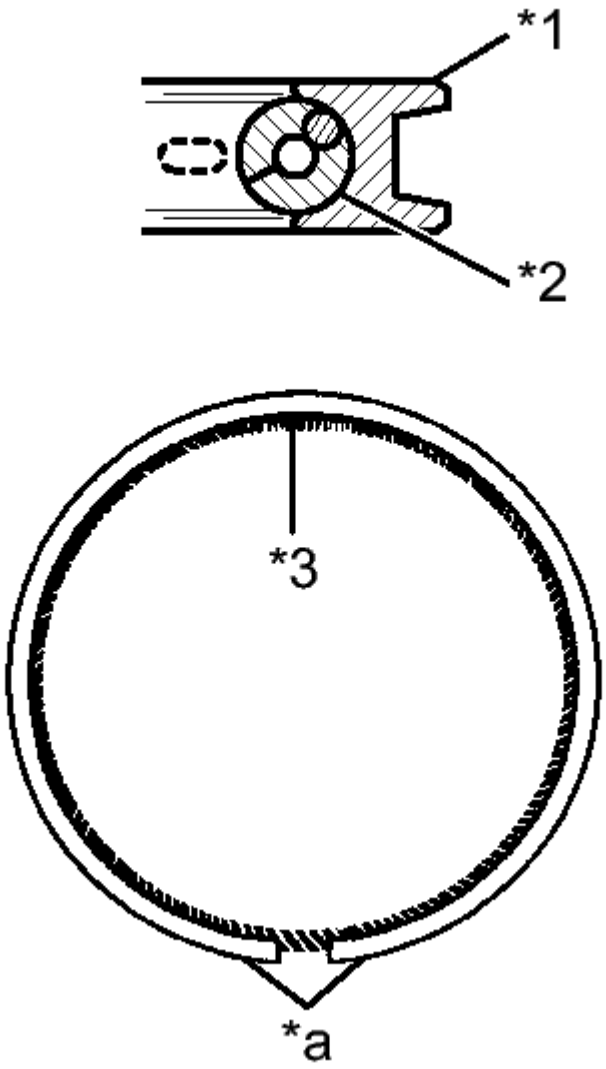


Fig. 401: Identifying Oil Ring, Expander, End & Coil Joint
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Oil Ring
*2	Oil Ring Expander
*3	Coil Joint
*a	Oil Ring End

HINT:

Arrange the oil ring ends and coil joint as shown in the illustration.

b. Using a piston ring expander, install the 2 compression rings with the code mark positioned as shown in the illustration.

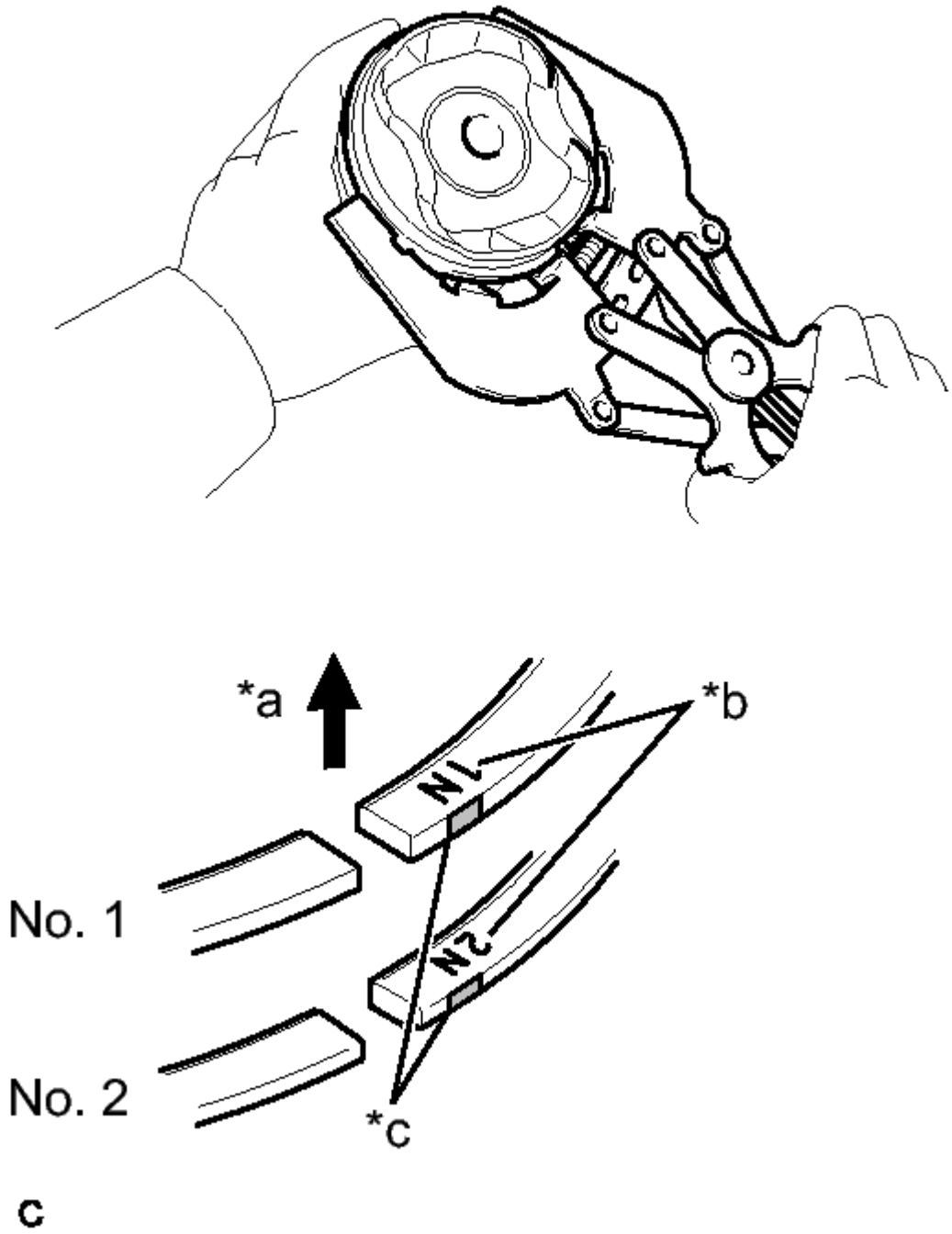


Fig. 402: Installing Compression Rings Using A Piston Ring Expander
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

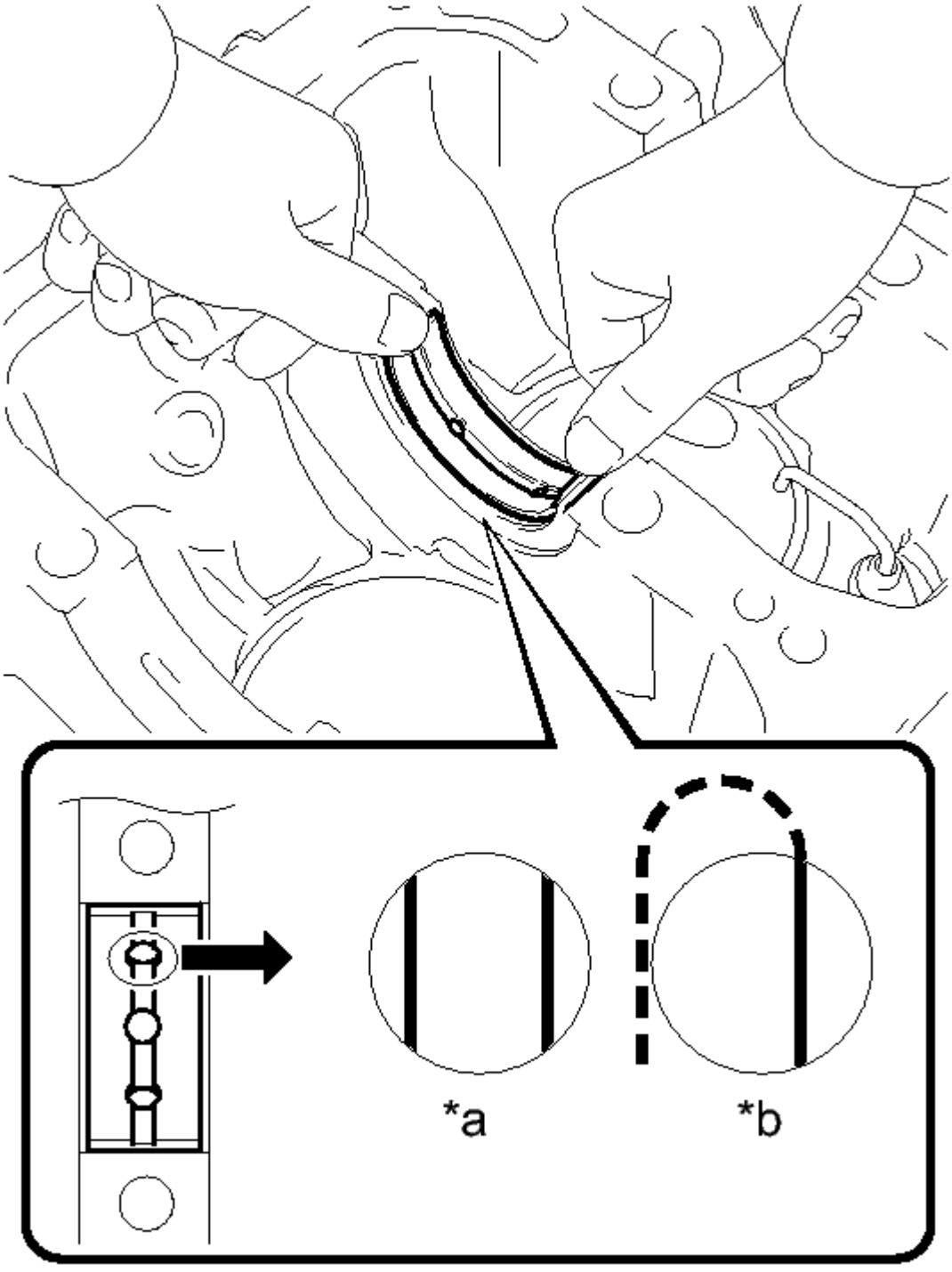
*a	Upward
*b	Code Mark
*c	Paint Mark

Piston Ring Mark

Item	Code Mark	Paint Mark
No. 1	1N	Blue
No. 2	2N	Orange

NOTE: Install the compression ring with the code mark facing upward.

6. **INSTALL CRANKSHAFT PULLEY KEY**
   a. Install the 2 crankshaft pulley keys to the crankshaft.
7. **INSTALL CRANKSHAFT BEARING**
   a. Clean the main journal and both surfaces of the bearing.



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Fig. 403: Installing Upper Bearing At Cylinder Block
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	CORRECT

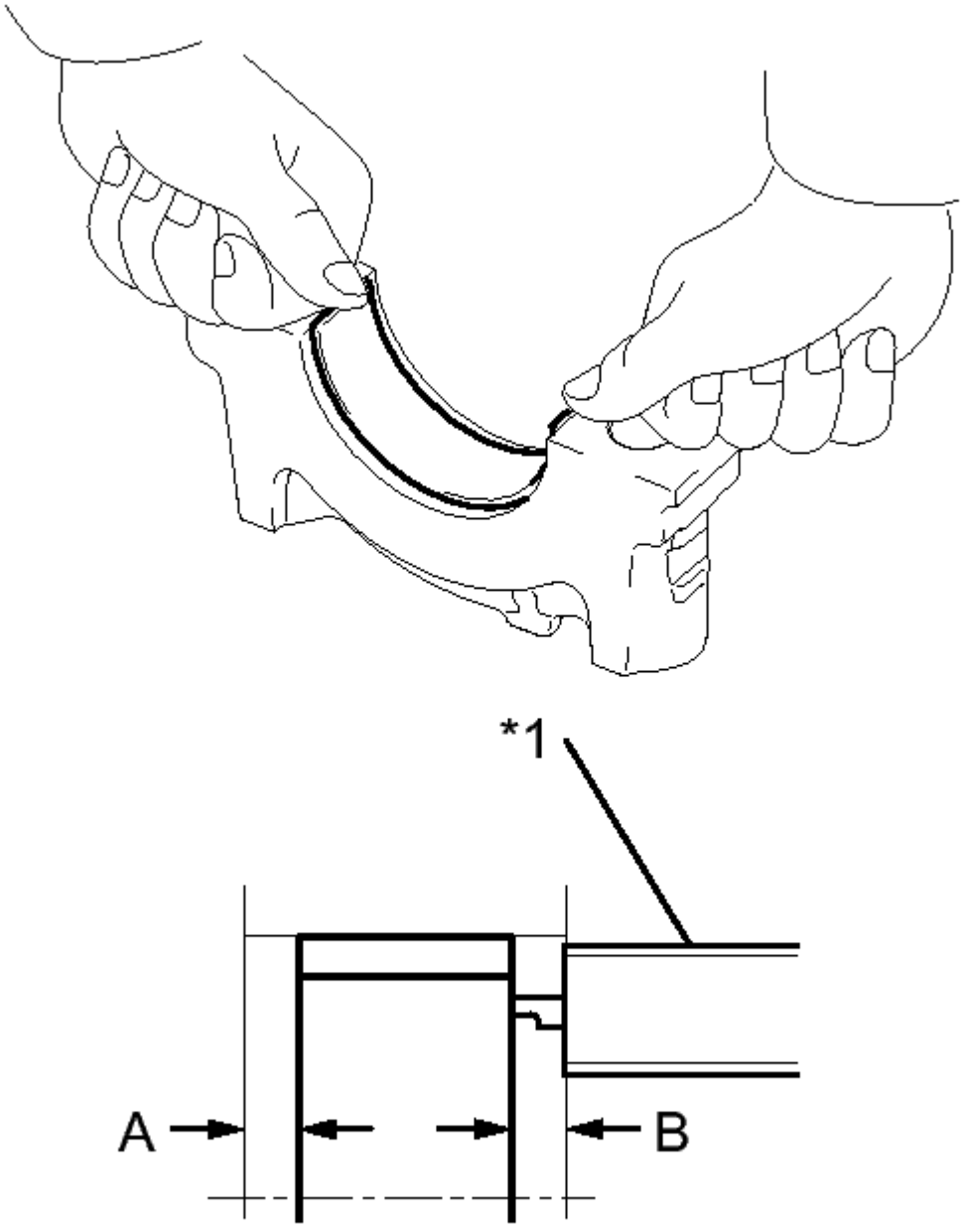
*b INCORRECT

b. Install the upper bearing to the cylinder block as shown in the illustration.

NOTE:

- **Do not apply engine oil to the bearings or their contact surfaces.**
- **Both sides of the oil groove in the cylinder block should be visible through the oil feed holes in the bearing. The amount visible on each side of the holes should be equal.**
- **Do not allow coolant to come into contact with the bearing inner surface.**
- **If any coolant comes into contact with the bearing inner surface, replace the bearing with a new one.**

c. Install the lower bearing onto the bearing cap.



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Fig. 404: Installing Lower Bearing Onto Bearing Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Using a vernier caliper, measure the distance between the crankshaft bearing cap's edge and the lower bearing's edge.

TEXT IN ILLUSTRATION

*1	Vernier Caliper

Standard dimension A - B or B - A

0 to 0.7 mm (0 to 0.0276 in.)

NOTE:

- **Do not apply engine oil to the bearings and the contact surfaces.**
- **Do not allow coolant to come into contact with the bearing inner surface.**
- **If any coolant comes into contact with the bearing inner surface, replace the bearing with a new one.**

8. **INSTALL CRANKSHAFT THRUST WASHER**
   a. Apply engine oil to the thrust washers.

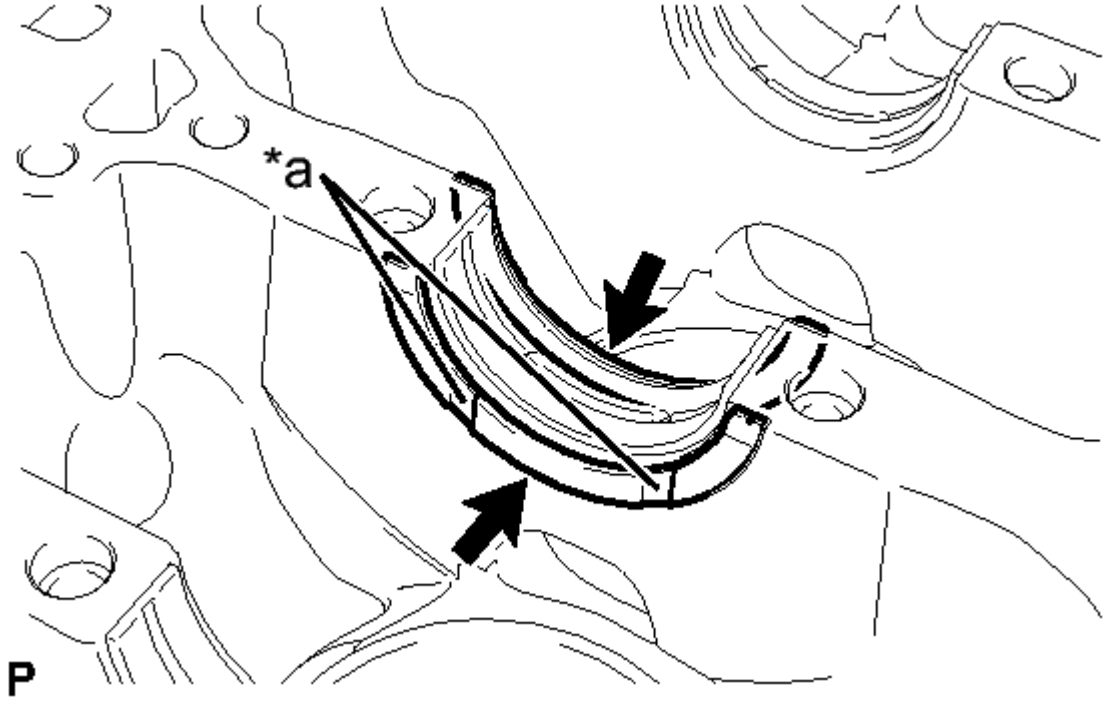


Fig. 405: Identifying Crankshaft Thrust Washers & Oil Grooves
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

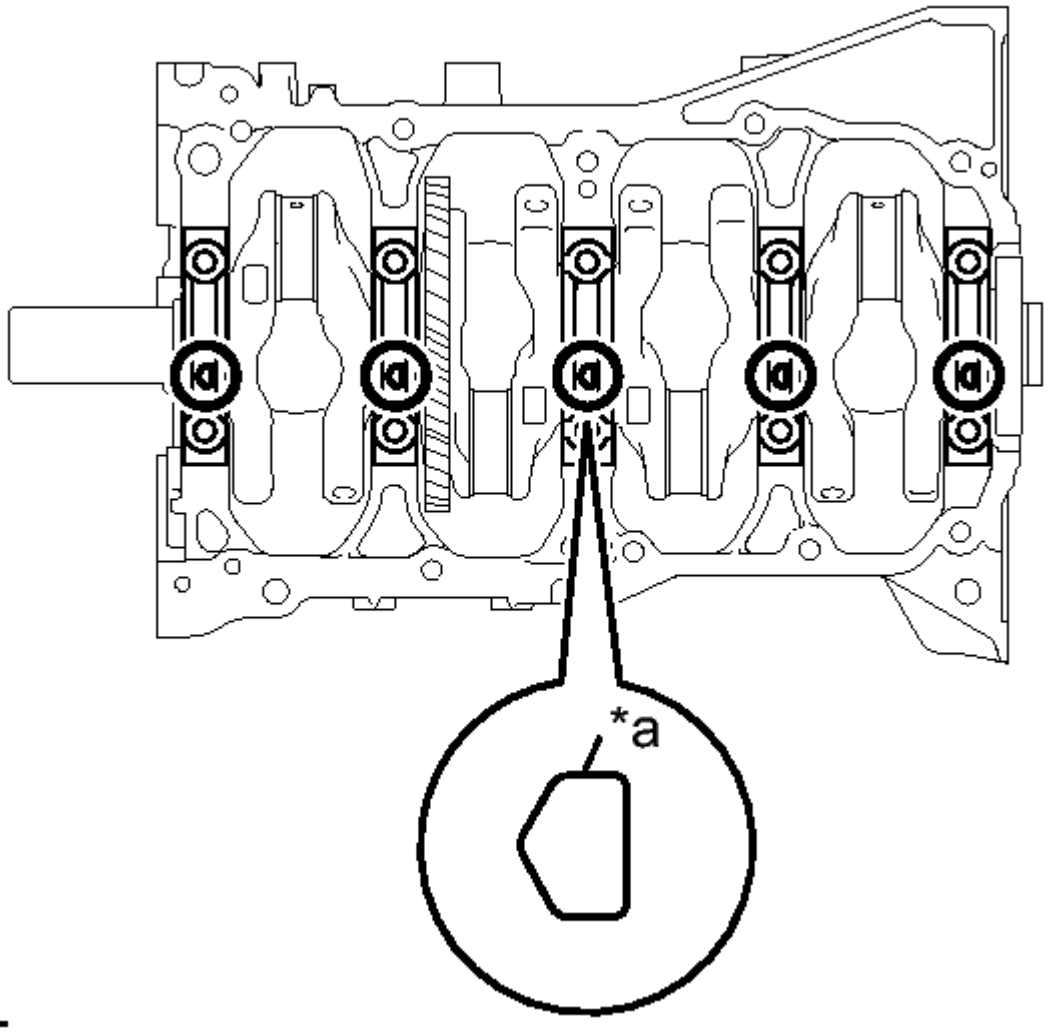
TEXT IN ILLUSTRATION

*a	Oil Groove

b. Install the 2 thrust washers onto the No. 3 journal position of the cylinder block with the oil grooves facing outward.

9. **INSTALL CRANKSHAFT**

a. Apply engine oil to the upper bearing, and install the crankshaft onto the cylinder block.



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Fig. 406: Identifying Bearing Cap Front Marks & Numbers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front Mark

b. Examine the front marks and numbers, and install the bearing caps onto the cylinder block with the front marks as shown in the illustration.

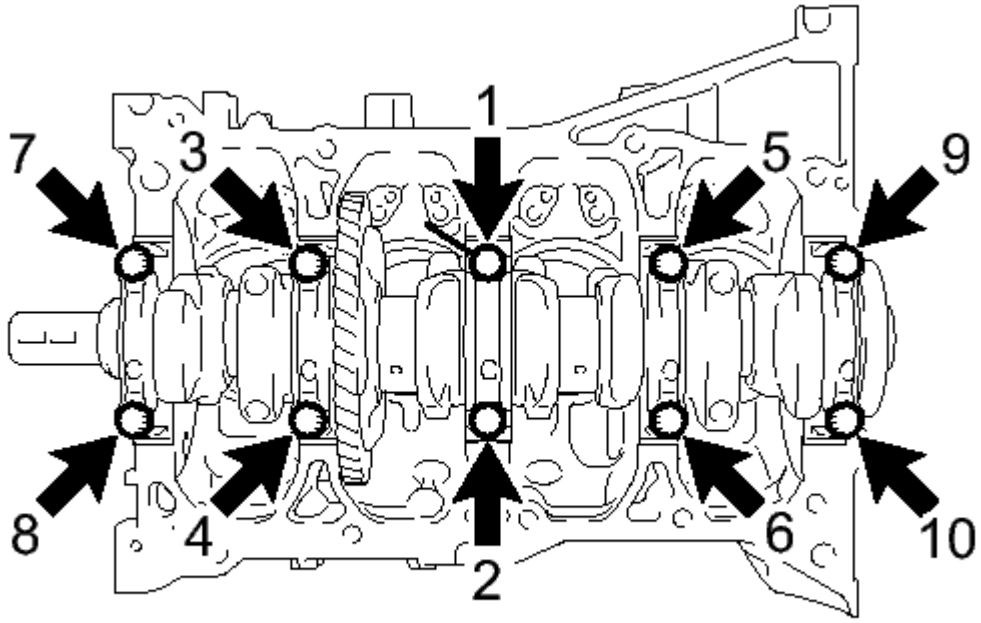
HINT:

The crankshaft bearing cap bolts are tightened in 3 progressive steps.

c. Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.

d. Step 1:

1. Using several steps, uniformly install and tighten the 10 bearing cap bolts in the sequence shown in the illustration.



P

Fig. 407: Identifying Bearing Cap Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

e. Step 2:

1. Tighten the 10 bearing cap bolts again in the sequence shown in the illustration.

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

If a crankshaft bearing cap bolt does not meet the specified torque, replace it.

f. Step 3:

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

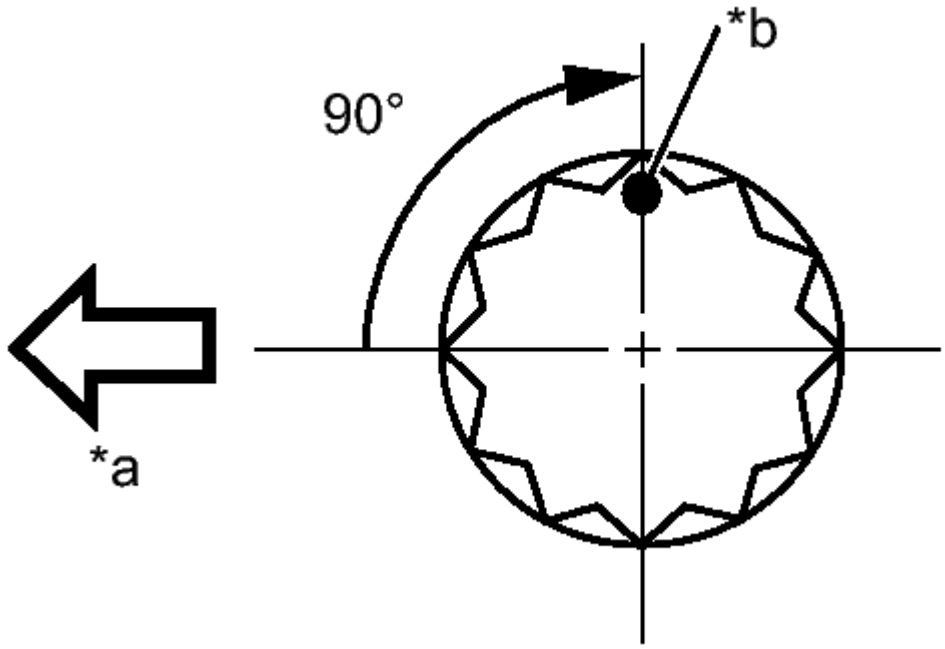


Fig. 408: Identifying Bearing Cap Bolt Paint Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

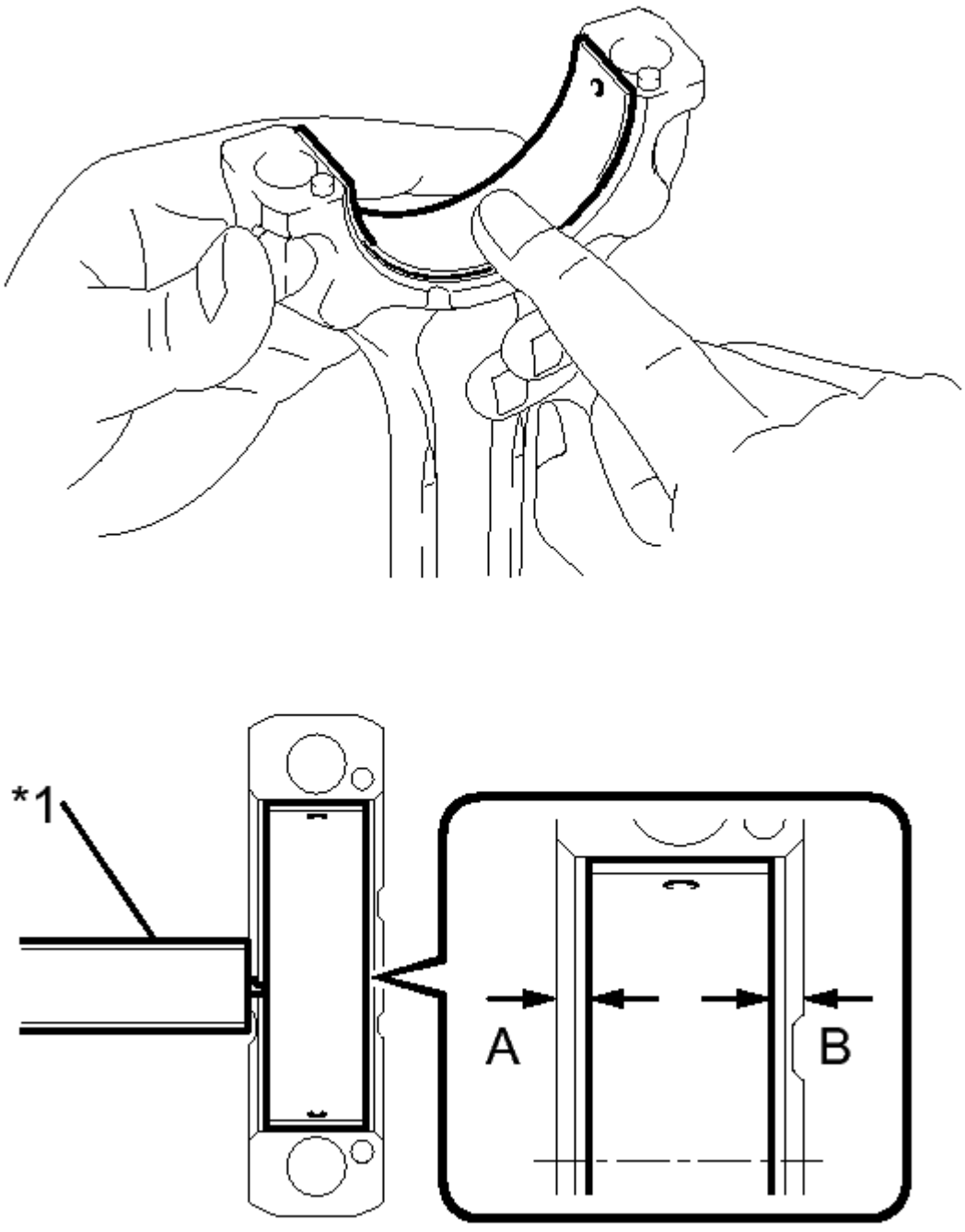
*a	Front
*b	Paint Mark

2. Tighten the 10 bearing cap bolts 90° in the same sequence.
3. Check that the paint marks are now at a 90° angle to the front.

g. Check that the crankshaft turns smoothly.

10. **INSTALL CONNECTING ROD BEARING**

a. Clean the bearing contact surface of the connecting rod and cap, and both surfaces of both bearings.



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Fig. 409: Cleaning & Measuring Connecting Rod Bearing Using A Vernier Caliper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

	Vernier

*1	Caliper

b. Install the connecting rod bearings to the connecting rods and connecting rod caps.

c. Using a vernier caliper, measure the distance between the edges of the connecting rod and connecting rod bearing, and the edges of the connecting rod cap and connecting rod bearing.

Standard dimension A - B or B - A

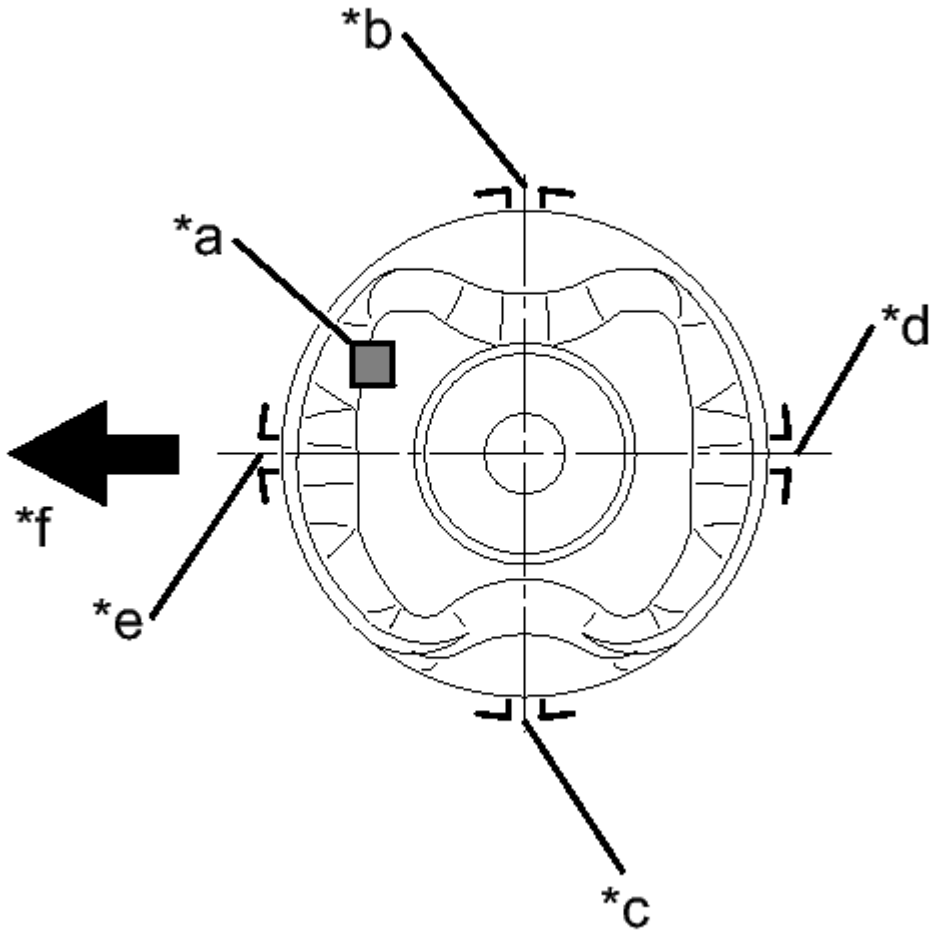
0 to 0.7 mm (0 to 0.0276 in.)

NOTE:

- **Do not apply engine oil to the bearings and the contact surfaces.**
- **Do not allow coolant to come into contact with the bearing inner surface.**
- **If any coolant comes into contact with the bearing inner surface, replace the bearing with a new one.**

11. **INSTALL PISTON WITH CONNECTING ROD**

a. Apply engine oil to the cylinder walls, pistons, and surfaces of the connecting rod bearings.



c

Fig. 410: Identifying Piston With Connecting Rod Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front Mark
*b	No. 1 Compression Ring
*c	No. 2 Compression Ring
*d	Oil Ring Rail
*e	Oil Ring Expander

*f	Front

b. Position the piston rings so that the ring ends are as shown in the illustration.
c. Using a hammer handle and piston ring compressor, press a piston with connecting rod into each cylinder with the front mark of the piston facing forward.

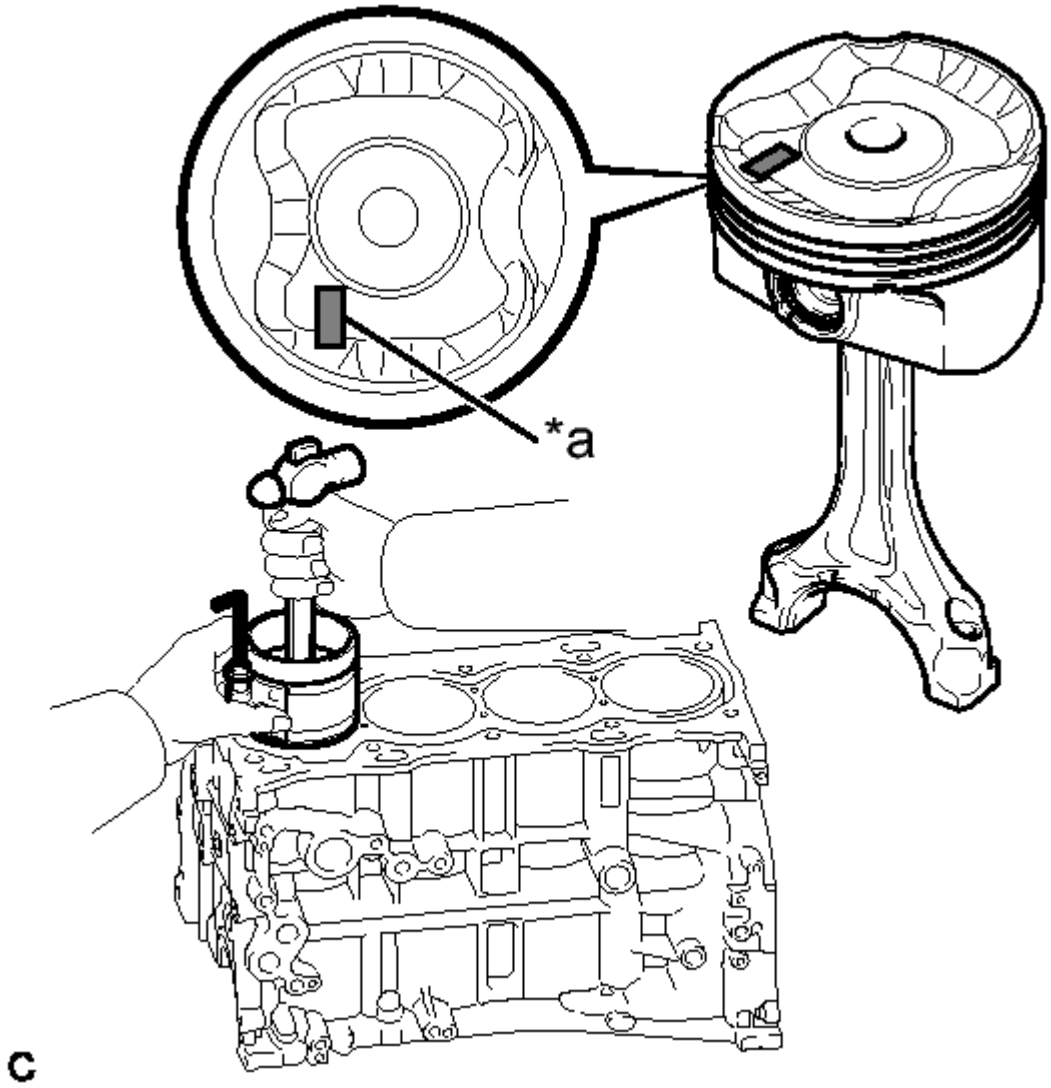


Fig. 411: Pressing Piston/Connecting Rod Using A Hammer Handle & Piston Ring Compressor With Front Mark Facing Forward
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front Mark

NOTE: When inserting the piston with connecting rod into the cylinder

block, make sure the oil nozzle does not interfere with the connecting rod.

HINT:

The front mark is "1L" printed in raised letters.

d. Check that the front mark of the connecting rod cap is facing in the correct direction.

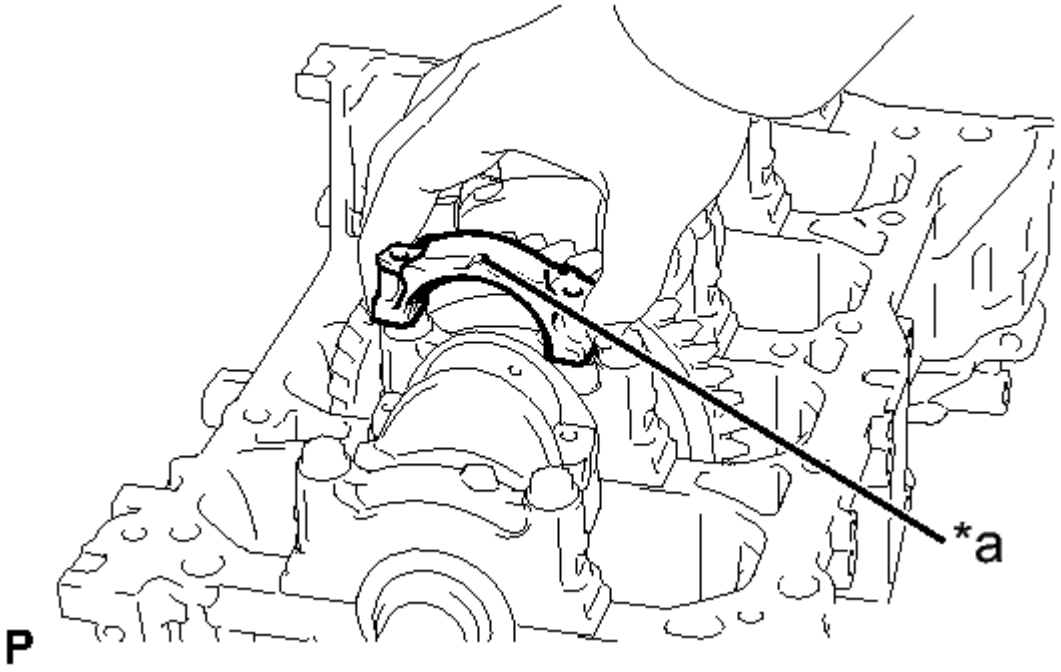


Fig. 412: Identifying Connecting Rod Cap Front Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Front Mark

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

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

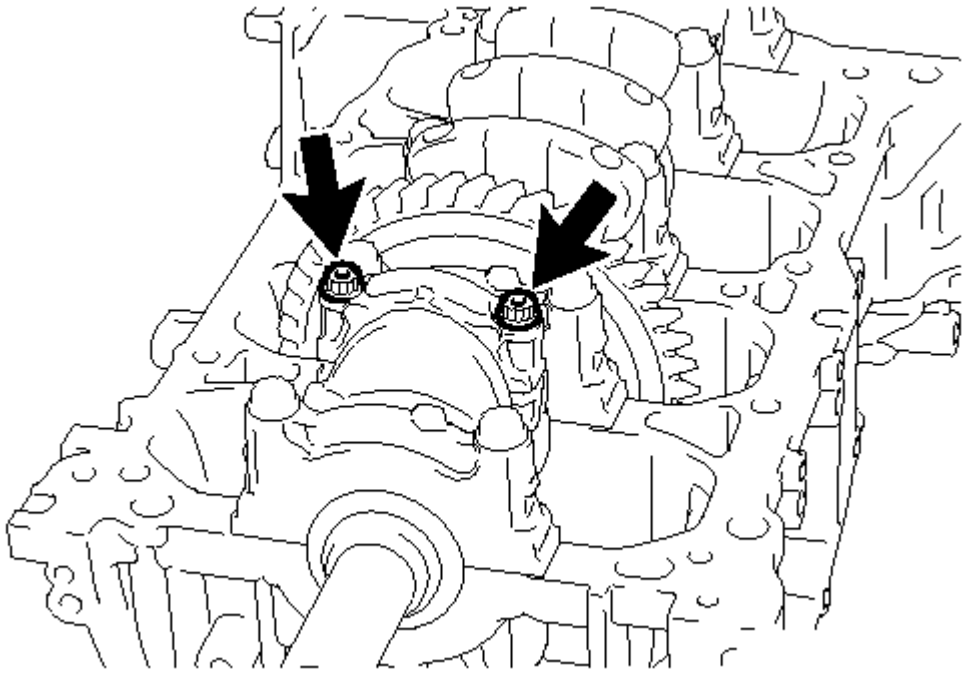


Fig. 413: Identifying Connecting Rod Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Temporarily install the connecting rod bolts.

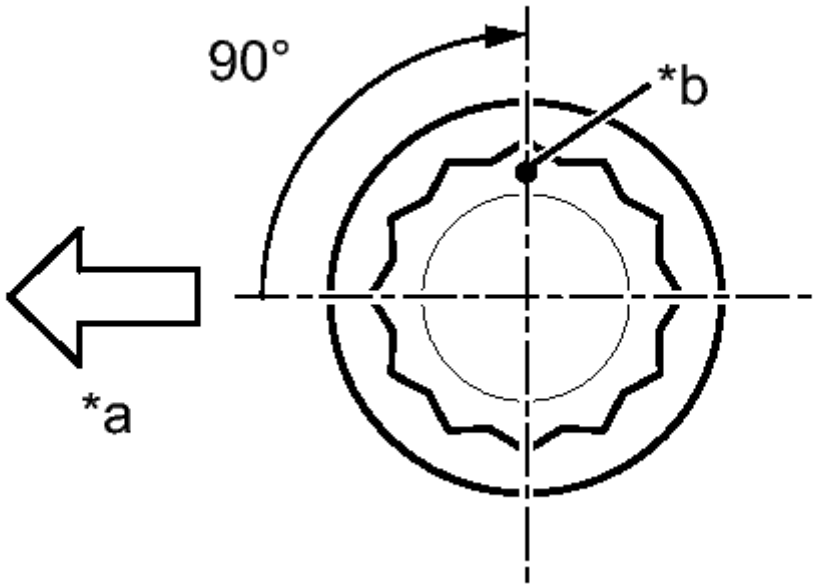
HINT:

The connecting rod bolts are tightened in 2 progressive steps.

g. Step 1:
   1. Alternately tighten the connecting rod bolts in several steps.

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

h. Step 2:



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Fig. 414: Identifying Connecting Rod Bolt Paint Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Mark the front of the connecting rod bolts with paint.

TEXT IN ILLUSTRATION

*a	Engine Front
*b	Paint Mark

2. Tighten the bolts 90° as shown in the illustration.
3. Check that the painted marks are now at a 90° angle to the front.

i. Check that the crankshaft turns smoothly.